



Resistor Catalogue



Why Choose Viking



Advanced, Experienced
Component Technology



Flexible Extension
Sufficient Capacity



Wide Range Products,
Excellent Technical
Support



Well-Organized, ERP
System. IATF16949,
Automotive Grade



Quick Turnaround
Time and Response

CP↑

On Public Company
Superior Management
High Yield, Cost
Effective



Short Lead Time and
Free Sample Support



Extensive RD Team,
Miniature Size, High
Power, New Product
Development



Power Rating Table

Thin Film							
size	Power Rating	Standard	General	Auto-grade	High stability/ higher ohm	High Frequency	High Voltage
0201	1/32W		AR			ARF	
	1/20W		AR				
0402	1/32W				ARM..A		
	1/20W					ARF	
	1/16W	ARG	AR	AR..A	ARM..A		
	1/10W		AR	AR..A			
	1/8W				ARM..A		
	0.13W						
	1/5W						
0603	1/16W		AR	AR..A	ARM..A		
	1/10W	ARG	AR	AR..A	ARM..A		
	1/8W			AR..A		ARF	
	3/20W						
	1/6W		AR		ARM..A		
	0.21W						
	1/4W						
	3/8W						
	1/2W						
0805	1/10W		AR	AR..A	ARM..A		
	1/8W	ARG	AR	AR..A	ARM..A		
	1/5W			AR..A		ARF	ARHV..A
	1/4W		AR		ARM..A		
	0.26W						
	2/5W						
	0.5W						
	5/8W						
	1W						
1206	1/8W		AR	AR..A	ARM..A		
	1/4W	ARG	AR	AR..A	ARM..A		ARHV..A
	1/3W		AR			ARF	
	2/5W			AR..A			
	1/2W						
	0.52W						
	1W						
	2W						
1210	1/4W		AR	AR..A			
	1/3W		AR	AR..A			ARHV..A
	1/2W			AR..A			
2010	1/4W		AR	AR..A			
	1/3W		AR	AR..A			
	1/2W		AR				
	1.5W						
2512	1/2W		AR	AR..A			
	3/4W		AR				
	1W		AR				
	2W						
	2.5W						
	6W						

AIN	High power	High Temperature	High Temperature With High power	wide terminal	meter	Anti-Corrosive	TaN
					RAM	PR	TAR
		ART..A					
			ARTP..A				
					RAM	PR	
					RAM	PR	
							TAR
		ART..A					
			ARTP..A				
	ARP						
ARN							
					RAM	PR	
					RAM	PR	
							TAR
		ART..A					
			ARTP..A				
				ARW..A.. (0508)			
	ARP						
ARN							
					RAM	PR	
					RAM	PR	
							TAR
		ART..A					
	ARP			ARW..A.. (0612)			
ARN							
					RAM		
					RAM	PR	
				ARW..A.. (1020)			
					RAM	PR	
				ARW..A.. (1225)			
	ARP						
ARN							

Power Rating Table

Thick Film							
size	Power Rating	General	Auto-grade	Tight Tolerance& Low TCR	AIN	High ohm	Pulse Withstanding / with Green
0201	1/32W						
	1/20W	CR..AC	CR..A..				
	1/12W						
0402	1/16W	CR..AC	CR..A..	CRTC..A			
	1/10W	CR..AC	CR..A..				
	1/8W	CR..AC	CR..A..	CRTC..A			PWRG PWRG..A
	1/5W						PWR PWR..A
0603	1/10W	CR..AC	CR..A..	CRTC..A			PWR PWR..A PWRG PWRG..A
	1/8W						
	1/5W			CRTC..A			
	1/4W	CR..AC	CR..A..				PWR PWR..A
	1/3W						PWR PWR..A PWRG PWRG..A
0805	1/8W	CR..AC	CR..A..	CRTC..A		HMR	PWR PWR..A PWRG PWRG..A
	1/4W			CRTC..A			
	1/3W	CR..AC	CR..A..				
	2/5W						PWR PWR..A PWRG PWRG..A
	1/2W						PWR PWR..A PWRG PWRG..A
	3/4W						
	1W						
1206	1/4W	CR..AC	CR..A..	CRTC..A		HMR	
	1/3W	CR..AC		CRTC..A			PWR PWR..A PWRG PWRG..A
	1/2W	CR..AC	CR..A..				PWR PWR..A PWRG PWRG..A

Surge Withstanding / with Green	wide terminal	High voltage / with Green	High voltage with low VCR	Green	Anti-sulfur / Array	Anti-sulfur with Green
					AS (array) AS..A (array)	
				CRG	AS AS..A	
					AS AS..A	
		HVR HVR..A		CRG CRG..A..	AS AS..A AS (array) AS..A (array) CNF/CNF..A	ASG ASG..A
					AS	ASG ASG..A
SWRG SWRG..A					AS..A	
SWR SWR..A						
		HVR HVR..A		CRG CRG..A..	AS AS..A CNF/CNF..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A					CNF/CNF..A	
SWR SWR..A					AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A						
		HVR HVR..A		CRG CRG..A..	AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A						
					AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A						
SWR SWR..A SWRG SWRG..A						
	CRW(0508) CRW..A.. (0508)					
	CRW(0508) CRW..A.. (0508)					
		HVR HVR..A HVRG HVRG..A		CRG CRG..A..	AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A			HVRC			
SWR SWR..A SWRG SWRG..A					AS AS..A	ASG ASG..A

Power Rating Table

Thick Film							
size	Power Rating	General	Auto-grade	Tight Tolerance& Low TCR	AIN	High ohm	Pulse Withstanding / with Green
1206	3/4W						PWR/ PWR..A PWRG PWRG..A
	1W						
	1.5W						
	2.4W				CRP		
1210	1/3W	CR..AC					
	1/2W	CR..AC	CR..A..				PWR PWR..A PWRG PWRG..A
	3/4W	CR..AC					PWR PWR..A
	1W		CR..A..				PWR PWR..A PWRG PWRG..A
	1.5W						
	2W						
2010	1/2W						
	3/4W	CR..AC	CR..A..				PWR PWR..A PWRG PWRG..A
	1W	CR..AC	CR..A..				PWR PWR..A
	1.25W		CR..A..				PWR PWR..A PWRG PWRG..A
	2W		CR..A..				
2512	1W	CR..AC	CR..A..				
	1.5W						PWR PWR..A PWRG PWRG..A
	2W	CR..AC	CR..A..				PWR PWR..A PWRG PWRG..A
	3W		CR..A..				
	3.5W				CRP		

Surge Withstanding / with Green	wide terminal	High voltage / with Green	High voltage with low VCR	Green	Anti-sulfur / Array	Anti-sulfur with Green
SWR SWR..A SWRG SWRG..A						
	CRW(0612) CRW..A.. (0612)					
	CRW(0612) CRW..A.. (0612)					
				CRG CRG..A..	AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A						
SWR SWR..A					AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A						
	CRW(1020) CRW..A.. (1020)					
	CRW(1020) CRW..A.. (1020)					
		HVR HVR..A HVRG HVRG..A	HVRC			
SWR SWR..A SWRG SWRG..A				CRG CRG..A..	AS AS..A	ASG ASG..A
SWR SWR..A					AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A						
		HVR HVR..A HVRG HVRG..A	HVRC	CRG CRG..A..	AS AS..A	ASG ASG..A
SWR SWR..A SWRG SWRG..A						ASG ASG..A
SWR SWR..A SWRG SWRG..A	CRW(1225) CRW..A.. (1225)					
	CRW(1225) CRW..A..(1225)					

Power Rating Table

MELF						
Size	Power Rating	High precision CSRV	Automotive CSRA	High Voltage Automotive CSRP	Carbon Film CSRC	High Frequency CSRF
0102	1/8W	V				
	1/5W	V	V			V
	0.3W	V	V			V
	jumper	2A (<15mΩ)	2A (<15mΩ)			
0204	1/4W	V	V			V
	2/5W	V	V	V		V
	jumper	3A (<15mΩ)	3A (<15mΩ)			
0207	1/2W	V	V			V
	1W	V	V	V	V	V
	jumper	5A (<15mΩ)	5A (<15mΩ)			
0411	3W				V	

Jumper											
Size		CR..AC	CR..A..	AS	AS..A	PWR/ PWR..A PWRG/ PWRG..A	LRJ	CN/ CN..A..	CNF/ CNF..A	ASF/ ASF..A	CRW/ CRW..A..
0201	<50mΩ	1A	1A	0.5A	1A			0.5A (0201*2/0201*4)			
	<20mΩ							1A (0402*4)			
0402	<50mΩ	1A	1A	1A					1A (0402*2/0402*4)	1A (0402*4)	
	<20mΩ	1.5A	1.5A								
	≤10mΩ					3A					
	≤0.5mΩ						20A				
0603	<50mΩ	1A	1A	1A					1A (0603*4)	1A (0603*4)	
	<20mΩ	2A	2A								
	≤8mΩ					5A					
	≤0.5mΩ						22.4A				
0805	<50mΩ	2A	2A	2A							
	<20mΩ	2.5A	2.5A								
	<10mΩ										5A (0508)
	≤5mΩ					6A					
	≤0.5mΩ						31.6A				
1206	<50mΩ	2A	2A	2A							
	<20mΩ	3.5A	3.5A								
	<10mΩ										6A (0612)
	≤5mΩ					10A					
	≤0.2mΩ						50A				
1210	<50mΩ	2.5A	2.5A	2.5A							
	<20mΩ	5A	5A								
	≤4mΩ					12A					
2010	<50mΩ	3.5A	3.5A	3.5A							
	<20mΩ	6A	6A								
	<10mΩ										10A (1020)
	≤5mΩ					12A					
	≤0.2mΩ						71A				
2512	<50mΩ	4A	4A	4A							
	<20mΩ	7A	7A								
	<10mΩ										12A (1225)
	≤5mΩ					16A					
	≤0.2mΩ						100A				

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◆ Resistors

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		Automotive Grade Metal Thin Film Chip Resistor	*ARM..A	201
		Automotive Grade Professional Thin Film Chip Resistor	*ART..A	205
		Automotive Grade High Power Thin Film Chip Resistor	*ARTP..A	209
		Automotive Grade High Voltage Thin Film Flat Chip Resistor	*ARHV..A	212
		Automotive Grade Tantalum Nitride Thin Film Precision Chip Resistor	*TAR	219
		Thin Film Chip Resistor	ARG	12
		Aluminum Nitride Thin Film Precision Chip Resistor	ARN	15
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		High Frequency(up to 70GHz)Thin Film Precision Chip Resistor	ARF	28
	   	Thick Film Chip Resistor	*CR..AC	31
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		Automotive Grade Thick Film High Precision Low TCR Chip Resistor	*CRTC..A	228
		Automotive Grade Thick Film High Temperature Chip Resistor	*CRHT..A	232
		Thick Film High Power Chip Resistor (Aluminum Nitride Substrate)	CRP	36
		High Ohmic Chip Resistor	HMR	39
		High Voltage Thick Film Chip Resistor	HVC	42
		Pulse Withstanding Chip Resistor	*PWR	45
		Automotive Grade Pulse Withstanding Chip Resistor	*PWR..A	257
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		Automotive Grade Surge Withstanding Chip Resistor	*SWR..A	262
		Anti-Sulfurated Thick Film Chip Resistor	AS	53
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	 	Thin Film Current Sensing Chip Resistor	TCS	64
		Current Sensing Chip Resistor	CS	67
		Automotive Grade Current Sensing Chip Resistor	*CS..A	240
		Automotive Grade Current Sensing Thin Film Chip Resistor	*CSTF..A	246
		Current Sensing Chip Resistor	CSN	72
		Automotive Grade Current Sensing Chip Resistor	*CSN..A	249
		Current Sensing Metal Chip Resistor	*CSM	76
		Current Sensing Thick Film Chip Resistor	RS	81
		Current Sensing Chip Resistor (Wide Terminal)	CSW	85
		Automotive Grade Current Sensing Chip Resistor (Wide Terminal)	*CSW..A	253

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		Total Lead-free High Voltage Thick Film Chip Resistor	HVRG	136
		Automotive Grade Total Lead-free High Voltage Thick Film Chip Resistor	*HVRG..A	300
		Total Lead-free Pulse Withstanding Chip Resistor	PWRG	139
		Automotive Grade & Total Lead-free Pulse Withstanding Chip Resistor	*PWRG..A	303
		Total Lead-free Surge Withstanding Chip Resistor	SWRG	143
		Automotive Grade & Total Lead-free Surge Withstanding Chip Resistor	*SWRG..A	308
Network	 	Thin Film Array Chip Resistor	TFAN	147
		Thick Film Flat Array Chip Resistor (Size: 0201x2 & 0201x4 Resistors)	CN21&41	150
		Anti-Sulfurated Thick Film Array Chip Resistor	AS Array	153
		Automotive Grade Anti-Sulfurated Thick Film Chip Resistor(Array)	*AS..A(Array)	316
		Anti-Sulfurated Thick Film Flat Array Chip Resistor	ASF	156
		Automotive Grade Anti-Sulfurated Thick Film Flat Array Chip Resistor	*ASF..A	320
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		Automotive Grade Metal Foil Chip Fixed Resistor	*MF..A	215
		Tantalum Nitride Thin Film Precision Chip Resistor	*TAR	219
		High Power Thin Film Chip Resistor	*ARP	18
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		Automotive Grade Thick Film High Precision Low TCR Chip Resistor	*CRTC..A	228
		Automotive Grade Thick Film High Temperature Chip Resistor	*CRHT..A	232
		Automotive Grade Anti-Sulfurated Chip Resistor	*AS..A	236
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		Automotive Grade Current Sensing Thin Film Chip Resistor	*CSTF..A	246
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		Automotive Grade Current Sensing Chip Resistor (Wide Terminal)	*CSW..A	253
		Automotive Grade Pulse Withstanding Chip Resistor	*PWR..A	257
		Automotive Grade Surge Withstanding Chip Resistor	*SWR..A	262
		Automotive Grade Thick Film Chip Resistor (Wide Terminal)	*CRW..A..	267
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Lead-Free		Automotive Grade Green Chip Resistor	*CRG..A..	291
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		Automotive Grade Total Lead-free High Voltage Thick Film Chip Resistor	*HVRG..A	300
		Automotive Grade & Total Lead-free Pulse Withstanding Chip Resistor	*PWRG..A	303
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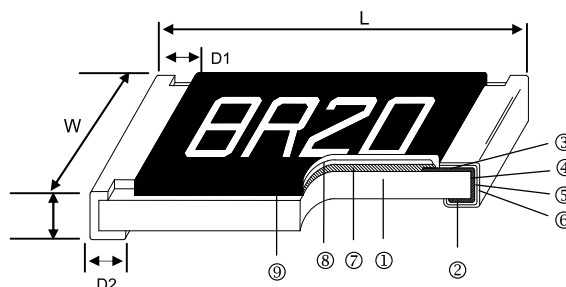
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Thin Film Precision Chip Resistor—AR Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

Features

- Advanced thin film technology
- Very tight tolerance down to $\pm 0.01\%$
- Extremely low TCR down to $\pm 1\text{PPM}/^\circ\text{C}$
- Wide resistance range 1ohm ~ 3Mega ohm
- Miniature size 0201 available
- AEC-Q200 Compliance
- Test proven immunity to biased humidity ($85^\circ\text{C}/85\text{RH}$)
- MSL: Level 1

Applications

- Medical Equipment
- Testing / Measurement Equipment
- Printer Equipment
- Automatic Equipment Controller
- Converters
- Communication Device, Cell Phone, GPS, PDA

Dimensions

Unit: mm

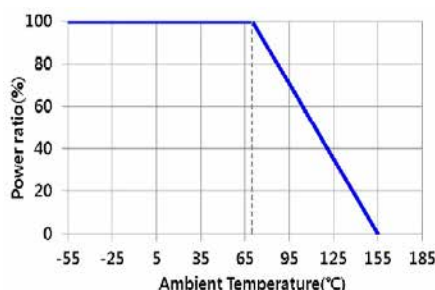
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
AR01	0201	0.58 ± 0.05	0.29 ± 0.05	0.23 ± 0.05	0.12 ± 0.05	0.15 ± 0.05	0.14
AR02	0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.15	0.20 ± 0.10	0.54
AR03	0603	1.55 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.25	0.30 ± 0.20	1.83
AR05	0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.30 ± 0.25	0.40 ± 0.20	4.71
AR06	1206	3.05 ± 0.15	1.55 ± 0.15	0.55 ± 0.10	0.42 ± 0.30	0.35 ± 0.25	9.02
AR13	1210	3.10 ± 0.15	2.40 ± 0.15	0.55 ± 0.10	0.40 ± 0.30	0.55 ± 0.25	10.00
AR10	2010	4.90 ± 0.15	2.40 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	0.50 ± 0.25	23.61
AR10 (1/2W)	2010	4.90 ± 0.15	2.40 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	2.20 ± 0.25	26.68
AR12	2512	6.30 ± 0.15	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	0.50 ± 0.25	38.06
AR12 (1W)	2512 (1-100Ω)	6.30 ± 0.15	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	0.50 ± 0.25	44.65
AR12 (1W)	2512 (101Ω above)	6.30 ± 0.15	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.40	2.50 ± 0.25	44.65

Part Numbering

AR	03	T	T	B	X	1001	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^\circ\text{C}$)	Power Rating	Resistance	Marking Code
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	T: $\pm 0.01\%$ A: $\pm 0.05\%$ B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$	T: Taping Reel B: Bulk	5: ± 1 X: ± 2 O: ± 3 S: ± 5 B: ± 10 N: ± 15 C: ± 25 D: ± 50	: Standard* (See Remark) N: 1/20W X: 1/10W W: 1/8W M: 1/6W V: 1/4W O: 1/3W U: 1/2W Q: 3/4W T: 1W	0010: 1Ω 4R70: 4.7Ω 1001: 1KΩ 1004: 1MΩ	: Standard Marking for E96 / E24 N: No Marking

*Remark: Standard parts don't need power rating code.

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.05%	±0.1%	±0.25%	±0.5%	±1%	
AR01 (0201)	1/32W	-55 ~ +155°C	15V	30V	—	22Ω - 75KΩ				±25, ±50
AR02 (0402)	1/16W	-55 ~ +155°C	50V	100V	49.9Ω - 12KΩ	4Ω - 511KΩ				±25, ±50
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	4.7Ω - 332KΩ	1Ω - 1MΩ				±25, ±50
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	4.7Ω - 1MΩ	1Ω - 2MΩ				±25, ±50
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 1MΩ	1Ω - 3MΩ				±25, ±50
AR13 (1210)	1/4W	-55 ~ +155°C	150V	300V	1Ω - 1MΩ	1Ω - 3MΩ				±25, ±50
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	1Ω - 1MΩ	1Ω - 3MΩ				±25, ±50
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	1Ω - 3MΩ				±25, ±50

■ Low Resistance: 1~10Ω

Special Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range						TCR (PPM/°C)
					±0.01%	±0.05%	±0.1%	±0.25%	±0.5%	±1%	
AR01 (0201)	1/32W	-55 ~ +155°C	15V	30V	—		22Ω - 7KΩ				±10, ±15
					—		7.01KΩ - 75KΩ				±10*, ±15
AR02 (0402)	1/16W	-55 ~ +155°C	50V	100V	49.9Ω - 4.99KΩ			—			±1, ±2, ±3
					49.9Ω - 20KΩ						±5
					49.9Ω - 20KΩ		49.9Ω - 100KΩ				±10, ±15
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	24.9Ω - 15KΩ			—			±1, ±2, ±3
					24.9Ω - 60KΩ						±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ	4.7Ω - 511KΩ				±10, ±15
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	24.9Ω - 30KΩ			—			±1, ±2, ±3
					24.9Ω - 150KΩ						±5
					24.9Ω - 200KΩ	4.7Ω - 1MΩ				±10, ±15	
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 49.9KΩ			—			±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1.5MΩ				±10, ±15	
AR13 (1210)	1/ 4W	-55 ~ +155°C	150V	300V	24.9Ω - 49.9KΩ			—			±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ			—			±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ			—			±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	

*TCR(25°C/-55°C): -15 ~ +10 PPM/°C

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range						TCR (PPM/°C)
					±0.01%	±0.05%	±0.1%	±0.25%	±0.5%	±1%	
AR01 (0201)	1/20W	-55 ~ +155°C	25V	50V	—		22Ω - 7KΩ				±10, ±15 ±25, ±50
					—		7.01KΩ - 75KΩ				±10*, ±15 ±25, ±50
AR02 (0402)	1/10W	-55 ~ +155°C	50V	100V	49.9Ω - 4.99KΩ			—			±1, ±2, ±3
					49.9Ω - 20KΩ						±5
					49.9Ω - 12KΩ		49.9Ω - 100KΩ				±10, ±15
					—	49.9Ω - 12KΩ	4.7Ω - 255KΩ				±25, ±50
AR03 (0603)	1/10W	-55 ~ +155°C	75V	150V	24.9Ω - 15KΩ			—			±1, ±2, ±3
					24.9Ω - 60KΩ						±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ	4.7Ω - 511KΩ				±10, ±15
							1Ω - 1MΩ				±25, ±50
	*1/6W	-55 ~ +155°C	100V	150V	—	10Ω - 332KΩ					±25, ±50
AR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 30KΩ			—			±1, ±2, ±3
					24.9Ω - 150KΩ						±5
					24.9Ω - 200KΩ	4.7Ω - 511KΩ	4.7Ω - 1MΩ				±10, ±15
							1Ω - 2MΩ				±25, ±50
	*1/4W	-55 ~ +155°C	150V	300V	—	10Ω - 499KΩ					±25, ±50
AR06 (1206)	1/4W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ			—			±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	
						1Ω - 1MΩ	1Ω - 3MΩ				±25, ±50
	*1/3W	-55 ~ +155°C	200V	400V	—	10Ω - 1MΩ					±25, ±50
AR13 (1210)	1/3W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ			—			±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	
						1Ω - 1MΩ	1Ω - 3MΩ				±25, ±50
AR10 (2010)	1/3W	-55 ~ +155°C	200V	400V	24.9Ω - 49.9KΩ			—			±1, ±2, ±3
					24.9Ω - 300KΩ						±5
					24.9Ω - 499KΩ	4.7Ω - 1MΩ				±10, ±15	
						1Ω - 1MΩ	1Ω - 3MΩ				±25, ±50
	1/2W ^{*1}	-55 ~ +155°C	200V	400V	24.9Ω - 2KΩ	4.7Ω - 1MΩ		1Ω - 1MΩ			±10, ±15
						4.7Ω - 1MΩ	4.7Ω - 3MΩ	1Ω - 3MΩ		±25, ±50	
AR12 (2512)	3/4W	-55 ~ +155°C	200V	400V	24.9Ω - 2KΩ	4.7Ω - 2KΩ		1Ω - 2KΩ			±10, ±15
						4.7Ω - 2KΩ	4.7Ω - 3MΩ	1Ω - 3MΩ		±25, ±50	
	1W ^{*1}	-55 ~ +155°C	200V	400V	24.9Ω - 2KΩ	4.7Ω - 1MΩ		1Ω - 1MΩ			±10, ±15
						4.7Ω - 1MΩ	4.7Ω - 3MΩ	1Ω - 3MΩ		±25, ±50	

* & *1: Ultra High Power

Operating Voltage=√(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*√(P*R) or Max. overload voltage listed above, whichever is lower.

■Viking is capable of manufacturing the optional spec based on customer's requirement.

*TCR(25°C/-55°C): -15 ~ +10 PPM/°C

■ Environmental Characteristics

Item	Requirement		Test Method
	Tol. ≤ 0.05%	Tol. > 0.05%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		+25/-55/+25/+125/+25°C
Short Time Overload	ΔR±0.05%	ΔR±0.1% ΔR ± 0.2% for 0201	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
	ΔR±0.2% for Ultra High power rating		
Insulation Resistance	>9999 MΩ		Apply 100V _{DC} for 1 minute
Endurance	ΔR±0.05%	ΔR±0.1%	70±2°C, RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”
	ΔR±0.5% for Ultra High power rating		
	0201: >7kΩ ΔR±0.5% ≤7kΩ ΔR±0.2%		
Damp Heat with Load (for 0201 size)	ΔR±0.3%		40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”
Bending Strength	ΔR±0.05%	ΔR±0.1%	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.05%	ΔR±0.1%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type		Max. Overload Voltage for 1 minute
Low Temperature Operation	ΔR±0.05%	ΔR±0.2%	1 hour, -65°C, followed by 45 minutes of RCWV
	ΔR±0.5% for high power & Ultra power high rating		
High Temperature Exposure	ΔR±0.5% 0402 ≥ 255.01K 0603 ≥ 402.01K 0805 ≥ 1.01M 1206 ≥ 1.01M 1210 ≥ 1.01M 2010 ≥ 1.01M 2512 ≥ 1.01M ΔR±0.2% for the other		at +155°C for 1000 hrs
Temperature Cycling	ΔR±0.2%(0201 product is excluded)		-55°C ~125°C, 1000 cycles
ESD	ΔR±0.5%(0201 product is excluded)		Human body model AR02, AR03: 200V AR05, AR06: 1KV AR10, AR12, AR13: 2KV
Sulfur Test	ΔR±2% (0201 product is excluded)		105±2°C no power rating for 1000 hrs
Biased Humidity	ΔR±0.1% (0201 product is excluded)		1000 hrs 85°C/85%RH 10% of operating power

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: MIL-STD-202, JIS-C-5201-1, JESD22, AEC-Q200, ASTM-B-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

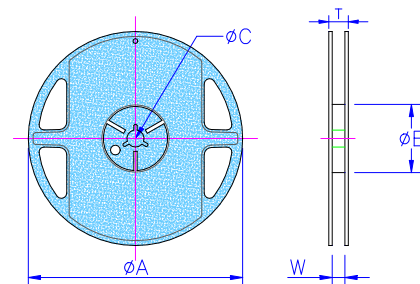
■ Shelf Life: 2 years from production date

Packaging

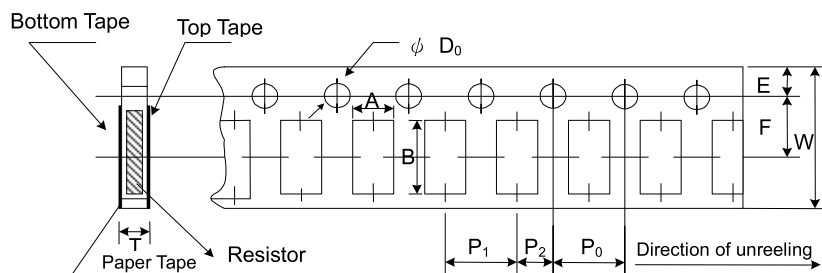
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
AR01	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
AR02	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
AR03	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
AR05	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
AR06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
AR13	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
AR10	178.0±1.0	60.0±1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
AR12	178.0±1.0	60.0±1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000



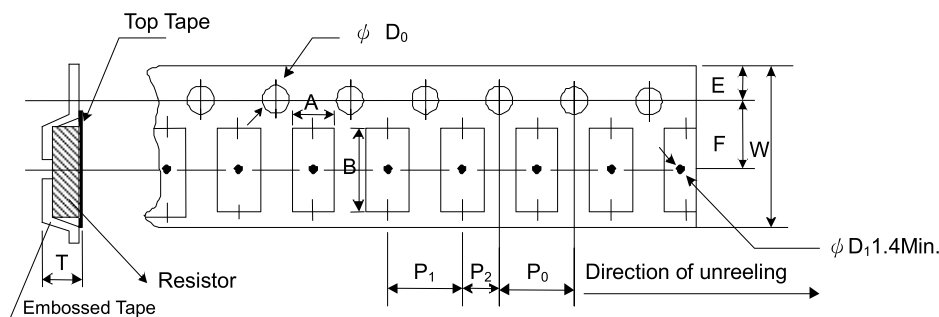
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
AR01	0.40±0.05	0.70±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.03	0.42±0.02
AR02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
AR03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
AR05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
AR06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
AR13	2.75±0.05	3.40±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.60±0.10	0.75±0.05

Embossed Plastic Tape Specifications

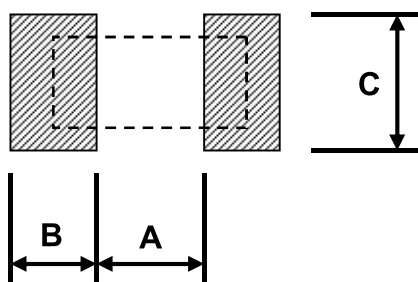


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
AR10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20
AR12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20

Recommend Land Pattern

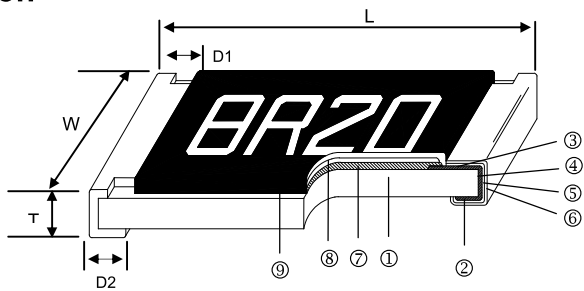
Unit: mm



Type	A	B	C
AR01	0.25	0.30	0.40±0.2
AR02	0.50	0.50	0.60±0.2
AR03	0.80	1.00	0.90±0.2
AR05	1.00	1.00	1.35±0.2
AR06	2.00	1.15	1.70±0.2
AR13	2.00	1.15	2.50±0.2
AR10	3.60	1.40	2.50±0.2
AR10(1/2W)	1.00	2.70	2.50±0.2
AR12	4.90	1.60	3.10±0.2
AR12(1W) _{1~100Ω}	4.90	1.60	3.10±0.2
AR12(1W) _{101Ω above}	1.00	3.55	3.10±0.2

Thin Film Chip Resistor—ARG Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

Features

- Advanced thin film technology
- SMD Type designed for automatic insertion
- Wide resistance range 1ohm ~ 2.49Mega ohm
- Advanced sulfur resistance verified according to ASTM B 809
- MSL: Level 1

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARG02	0402	1.00±0.05	0.50±0.05	0.30±0.10	0.20±0.15	0.20±0.15	0.54
ARG03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.25	0.30±0.25	1.83
ARG05	0805	2.00±0.15	1.25±0.15	0.50±0.10	0.30±0.25	0.40±0.25	4.71
ARG06	1206	3.10±0.15	1.55±0.15	0.55±0.10	0.42±0.25	0.35±0.25	9.02

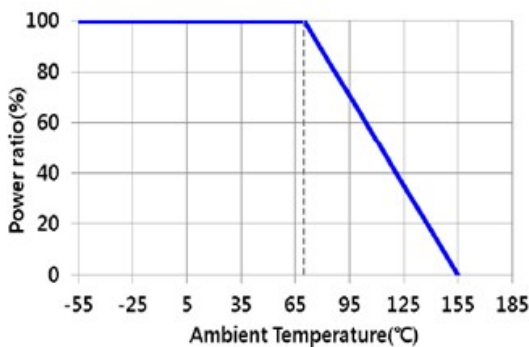
Applications

- Medical Equipment
- Testing / Measurement Equipment
- Printer Equipment
- Automatic Equipment Controller
- Converters
- Communication Device, Cell Phone, GPS, PDA

Part Numbering

ARG	03	F	T	C	1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	0010: 1Ω 4R70: 4.7Ω 1001: 1KΩ 1004: 1MΩ	: Standard Marking for E96 / E24 N: No Marking

Derating Curve



Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
						±0.1 %	±0.25 %	±0.5%	±1%	
ARG02 (0402)		1/16W	-55 ~ +155°C	50V	100V	4.7Ω - 255KΩ				±25 ±50
ARG03 (0603)		1/10W	-55 ~ +155°C	75V	150V	1Ω - 1MΩ				±25 ±50
ARG05 (0805)		1/8W	-55 ~ +155°C	150V	300V	1Ω - 2MΩ				±25 ±50
ARG06 (1206)		1/4W	-55 ~ +155°C	200V	400V	1Ω - 2.49MΩ				±25 ±50

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	$\Delta R \pm 0.2\%$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	>9999 MΩ	Apply 100V _{DC} for 1 minute
Endurance	$\Delta R \pm 0.5\%$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\Delta R \pm 0.5\%$	40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Bending Strength	$\Delta R \pm 0.1\%$	Bending amplitude 3 mm for 10 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.1\%$	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	Max. Overload Voltage for 1 minute
Thermal Shock	$\Delta R \pm 0.2\%$	-55°C ~ 150°C, 100 cycles
Low Temperature Operation	$\Delta R \pm 0.5\%$	1 hour, -65°C, followed by 45 minutes of RCWV
High Temperature Exposure	$\Delta R \pm 0.5\%$	at +155°C for 1000 hrs
Sulfur Test	$\Delta R \pm 2\%$	105±2°C no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower

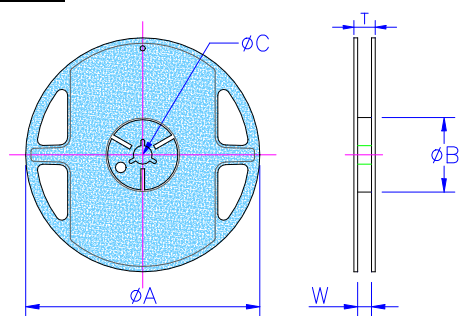
■ Reference Standards: MIL-STD-202, JIS-C 5201-1, ASTM-B-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

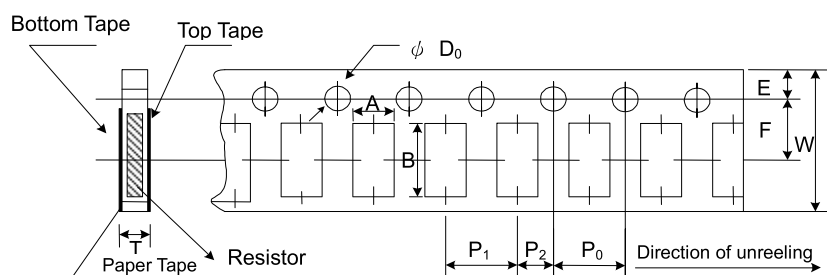
Packaging Quantity & Reel Specifications



Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)
ARG02	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000
ARG03	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARG05	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARG06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000

Paper Tape Specifications

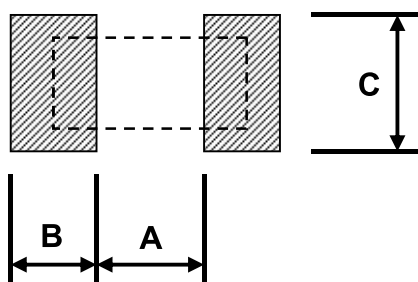


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARG02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
ARG03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ARG05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
ARG06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

Recommend Land Pattern

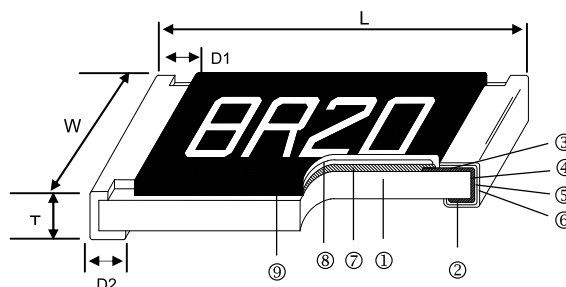
Unit: mm



Type	A	B	C
ARG02	0.50	0.50	0.60±0.2
ARG03	0.80	1.00	0.90±0.2
ARG05	1.00	1.00	1.35±0.2
ARG06	2.00	1.15	1.70±0.2

Aluminum Nitride Thin Film Precision Chip Resistor—ARN Series

Construction



Features

- High thermal conductivity aluminum nitride substrate
- Power rating up to 6.0W
- Resistance 50Ω ~ 30.1KΩ
- Resistor tolerance to $\pm 0.1\%$
- TCR to $\pm 25\text{ppm}/^\circ\text{C}$
- MSL: Level 1

① Alumina Nitride Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARN03	0603	1.55±0.10	0.80±0.10	0.43±0.15	0.30±0.15	0.50±0.20	1.73
ARN05	0805	2.00±0.15	1.25±0.15	0.43±0.15	0.35±0.15	0.60±0.20	3.95
ARN06	1206	3.05±0.20	1.55±0.20	0.43±0.15	0.50±0.15	1.20±0.20	10.98
ARN12	2512	6.30±0.20	3.10±0.20	0.43±0.15	0.70±0.25	1.60±0.25	42.32

Applications

- Power Supplies
- Power Switching
- Braking System

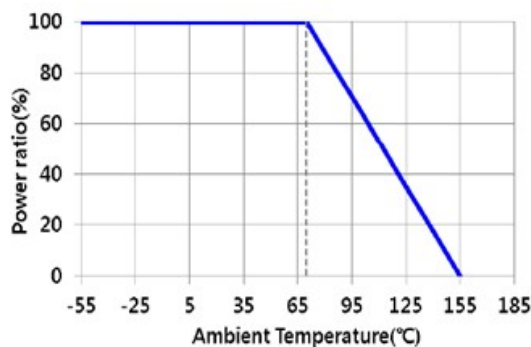
Typical Performance

- TCR 25ppm/°C
- TOL. 0.1%

Part Numbering

ARN	06	C	T	C	S	1000	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	03: 0603 05: 0805 06: 1206 12: 2512	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$	T: Taping Reel B: Bulk	C: ± 25 D: ± 50	U: 1/2W T: 1W S: 2W I: 6W	0500: 50Ω 1000: 100Ω 5000: 500Ω 1002: 10KΩ	: Standard Marking N: No Marking

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1 %	±0.25 %	±0.5%	±1%	
ARN03 (0603)	1/2W ⁽¹⁾	-55 ~ +155°C	75V	150V	50Ω – 30.1KΩ				±25 ±50
ARN05(0805)	1.0W ⁽¹⁾	-55 ~ +155°C	100V	200V	50Ω – 30.1KΩ				±25 ±50
ARN06 (1206)	2.0W ⁽¹⁾	-55 ~ +155°C	100V	200V	50Ω – 30.1KΩ				±25 ±50
ARN12 (2512)	6.0W ⁽¹⁾	-55 ~ +155°C	100V	200V	50Ω – 30.1KΩ				±25 ±50

⁽¹⁾ Dependant on component mounting by user.

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload ⁽²⁾	$\Delta R \pm 0.5\%$	Actual power handling capability is limited by the end user mounting process. As with any high power chip resistor the ability to remove the heat is critical to the overall performance of the device
Insulation Resistance	>9999 MΩ	Apply 100V _{DC} for 1 minute
Endurance	$\Delta R \pm 1\%$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\Delta R \pm 0.4\%$	40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.2\%$	260±5°C for 10 seconds
Low Temperature Operation	$\Delta R \pm 0.2\%$	1 hour, -65°C, followed by 45 minutes of RCWV
High Temperature Exposure	$\Delta R \pm 0.2\%$	at +155°C for 1000 hrs
Thermal Shock	$\Delta R \pm 0.2\%$	-55°C ~ 150°C, 100 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower

■ Reference Standards: MIL-STD-202, JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

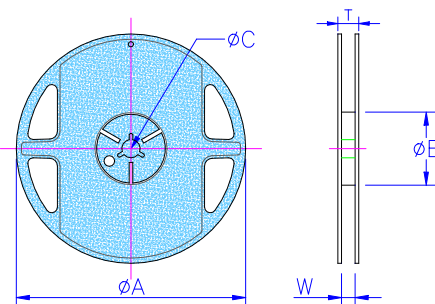
■ Shelf Life: 2 years from production date

Packaging

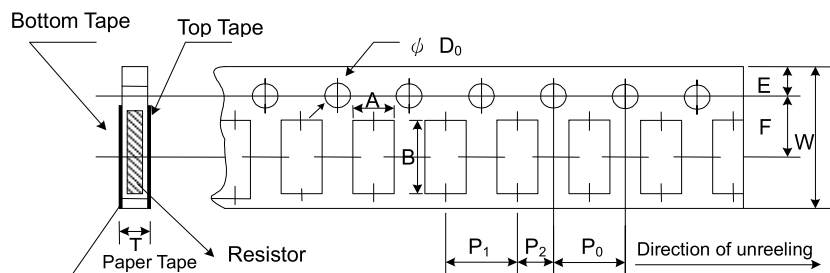
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
ARN03	178.0 ± 1.0	$60.0 + 1.0$	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
ARN05	178.0 ± 1.0	$60.0 + 1.0$	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
ARN06	178.0 ± 1.0	$60.0 + 1.0$	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
ARN12	178.0 ± 1.0	$60.0 + 1.0$	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



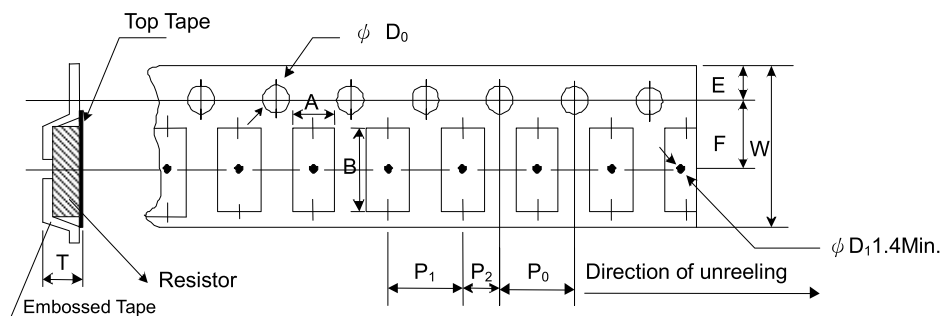
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
ARN03	1.10 ± 0.05	1.90 ± 0.05	8.00 ± 0.10	1.75 ± 0.05	3.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.60 ± 0.03
ARN05	1.60 ± 0.05	2.37 ± 0.05	8.00 ± 0.10	1.75 ± 0.05	3.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.75 ± 0.05
ARN06	2.00 ± 0.05	3.55 ± 0.05	8.00 ± 0.10	1.75 ± 0.05	3.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.75 ± 0.05

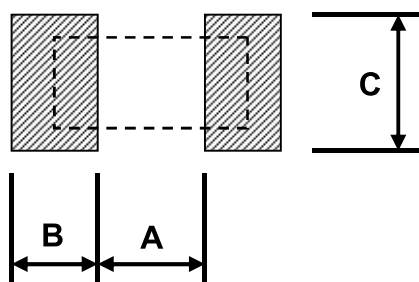
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
ARN12	3.40 ± 0.10	6.65 ± 0.10	12.0 ± 0.10	1.75 ± 0.10	5.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.00 ± 0.20

Recommend Land Pattern



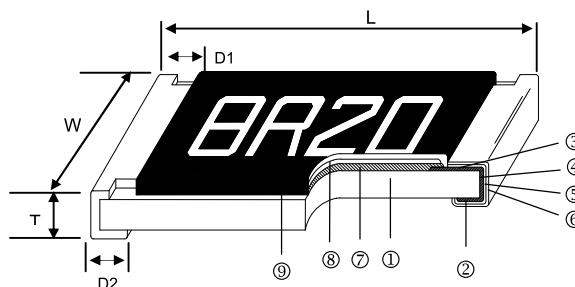
Unit: mm

Type	A	B	C
ARN03	0.37	0.99	0.86 ± 0.1
ARN05	0.50	1.08	1.32 ± 0.1
ARN06	0.60	1.90	1.80 ± 0.1
ARN12	2.77	2.31	3.20 ± 0.2

■ Use a board with a copper thickness of two ounces.

High Power Thin Film Chip Resistor – ARP Series

Construction



Features

- Wider bottom terminal enabling higher power capability (short side terminal)
- Significantly larger power handling capability than existing same size resistors
- Size: 1206, Power rating: 1.0W, Resistance 10Ω ~ 100KΩ
- High Purity Ceramic substrate
- AEC-Q200 Qualified
- Advanced sulfur resistance verified according to ASTM B 809
- MSL: Level 1

Applications

- Automotive
- Power Supplies 、 Power Source Related Devices
- Power Switching 、 DC motors 、 Inverters
- Braking
- Test and Measurement Equipment

① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

Dimensions

Unit: mm

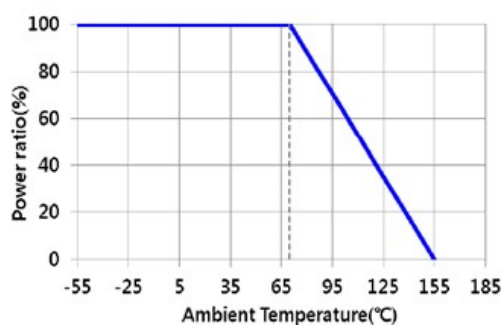
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARP03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.25±0.20	0.50±0.20	1.95
ARP05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.60±0.20	4.84
ARP06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	1.10±0.20	9.43
ARP12	2512	6.30±0.15	3.10±0.15	0.55±0.10	0.60±0.40	1.60±0.25	41.72

Part Numbering

ARP	06	B	T	C		1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	03: 0603 05: 0805 06: 1206 12: 2512	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	: Standard* (See Remark)	0100: 10Ω 10R2: 10.2Ω 1000: 100Ω 1001: 1KΩ 1003: 100KΩ	: Standard Marking for E96 / E24 N: No Marking

*Remark: Standard parts don't need power rating code.

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
ARP03 (0603)	3/8W ⁽¹⁾	-55 ~ +155°C	75V	150V	10Ω – 30.1KΩ				±25 ±50
ARP05 (0805)	5/8W ⁽¹⁾	-55 ~ +155°C	100V	200V	10Ω – 30.1KΩ				±25 ±50
ARP06 (1206)	1.0W ⁽¹⁾	-55 ~ +155°C	200V	400V	10Ω – 100KΩ				±25 ±50
ARP12 (2512)	2.5W ⁽¹⁾	-55 ~ +155°C	200V	400V	10Ω – 30.1KΩ				±25 ±50

⁽¹⁾ Dependant on component mounting by user.

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.

■Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	$\Delta R \pm 0.1\%$	0603/0805/1206: RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds 2512: RCWV*2.0 or Max. overload voltage whichever is lower for 5 seconds (Actual power handling capability is limited by the end user)
Insulation Resistance	>1000 MΩ	Apply 100V _{DC} for 1 minute
Operational Life	$\Delta R \pm 0.2\%$	Condition D Steady State T _A =125°C at derated power. Measurement at 24±4 hours after test conclusion
Biased Humidity	$\Delta R \pm 0.1\%$	1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	< 12KΩ $\Delta R \pm 0.1\%$ ≥ 12KΩ $\Delta R \pm 0.2\%$	at +155°C for 1000 hrs
Temperature Cycling	$\Delta R \pm 0.1\%$	-55°C to +125°C, 1000 cycles
Bending Strength (Board Flex)	$\Delta R \pm 0.1\%$	Bending once for 60 seconds Bending displacement: 2512 sizes: 2 mm Other sizes: 3 mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.05\%$	260±5°C for 10 seconds
Terminal Strength	No broken	Force of 1.8kg for 60 seconds
Mechanical Shock	$\Delta R \pm 0.1\%$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\Delta R \pm 0.1\%$	5 g's for 20 min., 12 cycles each of 3 orientations 10-2000 Hz
ESD	$\Delta R \pm 0.5\%$	Human body model 0603 1.0KV ; 0805 1.5KV ; 1206 · 2512 2KV
Resistance to solvents	Marking Unsmear	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Sulfur Test	$\Delta R \pm 1\%$	105±2°C no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower

■Reference Standards: MIL-STD-202; JIS-C 5201-1; JESD22; IEC-60115-1; AEC-Q200; UL-94;

ASTM-B-809-95

■Storage Temperature: 15~28°C; Humidity < 80%RH

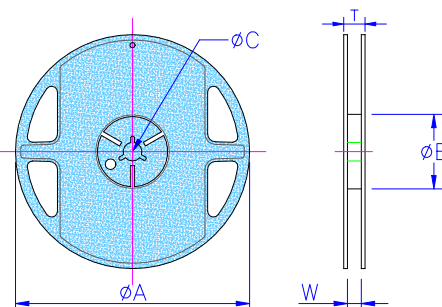
■Shelf Life: 2 years from production date

Packaging

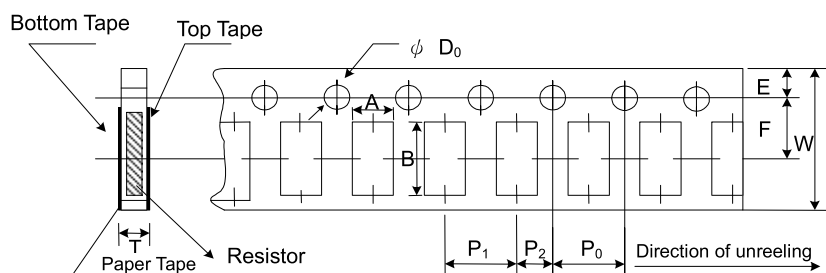
Packaging Quantity & Reel Specifications

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
ARP03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARP05	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARP06	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARP12	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000

Unit: mm



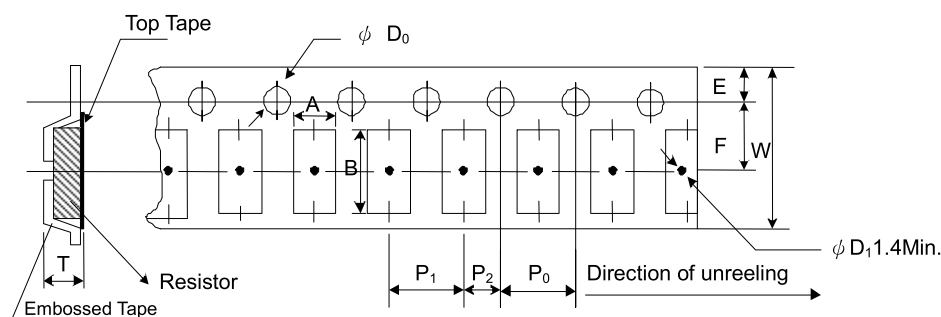
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARP03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ARP05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
ARP06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

Embossed Plastic Tape Specifications

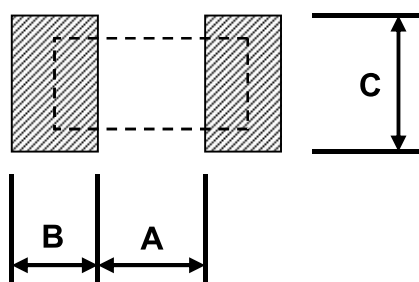


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARP12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20

Recommend Land Pattern

Unit: mm

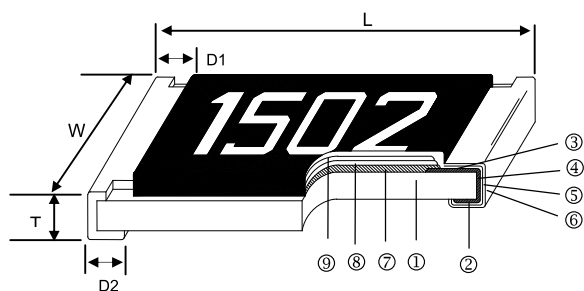


Type	A	B	C
ARP03	0.37	0.99	0.86±0.1
ARP05	0.50	1.08	1.32±0.1
ARP06	0.60	1.90	1.80±0.2
ARP12	2.77	2.31	3.20±0.2

- Please design the land pattern considering heat dissipation to the board so that the terminal temperature will not exceed 155°C
- Use a board with a copper thickness of two ounces

Anti-Corrosive Thin Film Precision Chip Resistor—PR Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Passivation
③ Top Electrode	⑥ External Electrode	⑨ Overcoat

Features

- Long term life stability and demonstrated the Anti-Corrosion claims
- Special passivated NiCr film for Anti-Acid and Anti-Damp
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 15 \text{ PPM}/^\circ\text{C}$
- Wide resistance range 10ohm ~ 1.5Mega ohm
- MSL: Level 1

Dimensions

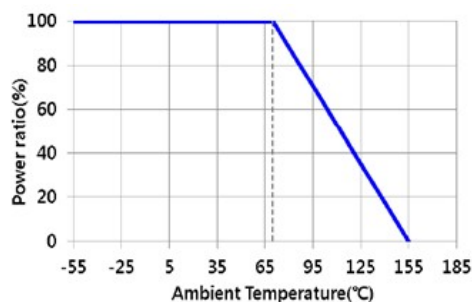
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
PR02	0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10	0.55
PR03	0603	1.55 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20	1.85
PR05	0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.30 ± 0.20	0.40 ± 0.25	4.76
PR06	1206	3.05 ± 0.15	1.55 ± 0.15	0.55 ± 0.10	0.42 ± 0.20	0.35 ± 0.25	9.11
PR10	2010	4.90 ± 0.15	2.40 ± 0.15	0.55 ± 0.10	0.60 ± 0.30	0.50 ± 0.25	23.82
PR12	2512	6.30 ± 0.15	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.30	0.50 ± 0.25	38.46

Applications

- High-end Computer
- Industrial Equipment
- Automatic Equipment Controller
- Medical Equipment
- Telecommunication Device
- High-end Multimedia Electronics
- Outdoor Electronic Applications

Derating Curve



Part Numbering

PR	03	D	T	D	X	1000	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^\circ\text{C}$)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$	T: Taping Reel B: Bulk	N: ± 15 C: ± 25 D: ± 50	: Standard* (See Remark) Y: 1/16W X: 1/10W W: 1/8W V: 1/4W U: 1/2W	1000: 100 Ω 2201: 2200 Ω 1001: 1K Ω 1004: 1M Ω	: Standard Marking for E96 / E24 N: No Marking

*Remark: Standard parts don't need for power rating code.

■ Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	
PR02 (0402)	1/16W	-55 ~ +155°C	25V	50V	49.9Ω - 12KΩ			±15
					24.9Ω - 24.9KΩ			±25 ±50
PR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	24.9Ω - 332KΩ			±15 ±25 ±50
PR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	10Ω - 1MΩ			±15 ±25 ±50
PR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	10Ω - 1MΩ			±15 ±25 ±50
PR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	24.9Ω - 1MΩ			±15
					10Ω - 1.5MΩ			±25 ±50
PR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	24.9Ω - 1MΩ			±15
					10Ω - 1.5MΩ			±25 ±50

■ High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	
PR03 (0603)	1/10W	-55 ~ +155°C	75V	150V	24.9Ω - 220KΩ			±15 ±25 ±50
PR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 680KΩ			±15 ±25 ±50
PR06 (1206)	1/4W	-55 ~ +155°C	200V	400V	24.9Ω - 1MΩ			±15 ±25 ±50

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement		Test Method
	Size 0603 / 0805 / 1206 2010 / 2512	Size 0402	
Short Time Overload	≤ ±0.02%	≤ ±0.1%	RCWV*2.5 or Max. Overload Voltage whichever is lower for 2 seconds
	≤ ±0.2% for high power rating		
Endurance	≤ ±0.05%	≤ ±0.25%	70±2°C, RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”
	≤ ±0.25% for high power rating		
Damp Heat with Load	≤ ±0.05%	≤ ±0.5%	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”
	≤ ±0.25% for high power rating		
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	≤ ±0.02%	≤ ±0.1%	260±5°C for 10 seconds
Thermal Shock	≤ ±0.02%	≤ ±0.1%	-55°C~150°C, 100 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: MIL-STD-202, JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

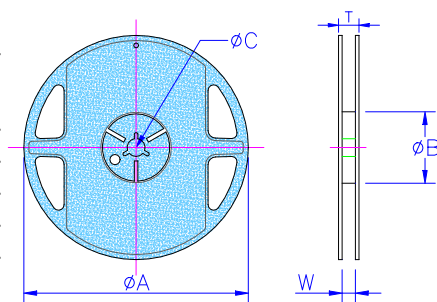
■ Shelf Life: 2 years from production date

Packaging

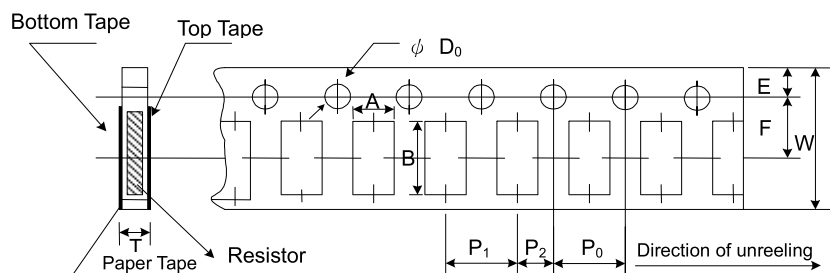
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
PR02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
PR03	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
PR05	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
PR06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
PR10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
PR12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



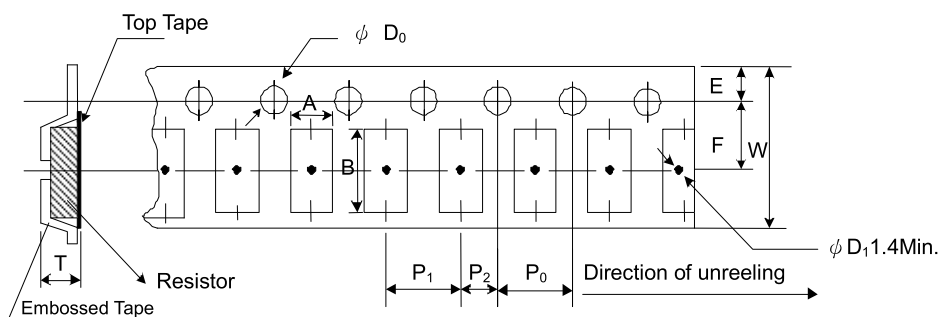
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PR02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
PR03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
PR05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
PR06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

Embossed Plastic Tape Specifications

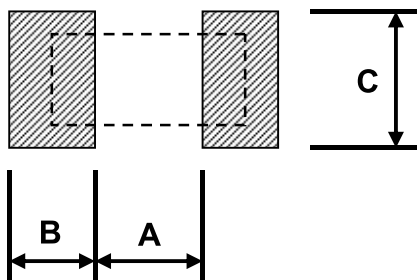


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PR10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20
PR12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20

Recommend Land Pattern

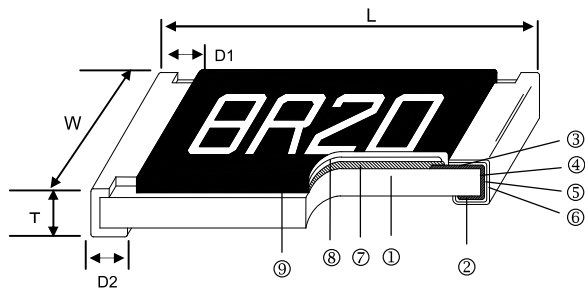
Unit: mm



Type	A	B	C
PR02	0.50	0.50	0.60±0.2
PR03	0.80	1.00	0.90±0.2
PR05	1.00	1.00	1.35±0.2
PR06	2.00	1.15	1.70±0.2
PR10	3.60	1.40	2.50±0.2
PR12	4.90	1.60	3.10±0.2

Resistor of Advanced Meter Thin Film Chip Resistor—RAM Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

Features

- Q/GDW 11179.3 Compliance
- Advanced thin film technology
- RoHS compliant
- Special materials, design, and processing for meter applications
- MSL: Level 1

Applications

- Smart Meter
- Testing / Measurement Equipment
- Advanced Metering Infrastructure

Dimensions

Unit: mm

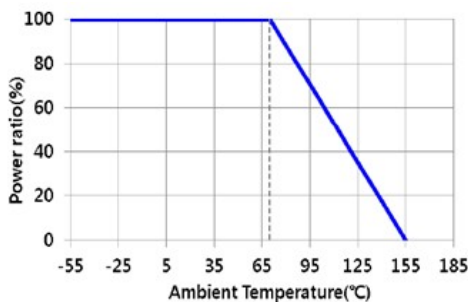
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
RAM02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.30±0.10	0.54
RAM03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.45±0.20	1.83
RAM05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.55±0.20	4.71
RAM06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.50±0.25	9.02
RAM13	1210	3.10±0.15	2.40±0.15	0.55±0.10	0.40±0.20	0.60±0.25	10
RAM10	2010	4.90±0.15	2.40±0.15	0.55±0.10	0.60±0.30	0.65±0.25	23.61
RAM12	2512	6.30±0.15	3.10±0.15	0.55±0.10	0.60±0.30	0.65±0.25	38.06

Part Numbering

RAM	03	B	T	C	X	1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	B: ±10 N: ±15 C: ±25 D: ±50	: Standard* (See Remark) Y: 1/16W X: 1/10W W: 1/8W M: 1/6W V: 1/4W O: 1/3W U: 1/2W	0010: 1Ω 4R70: 4.7Ω 1001: 1KΩ 1004: 1MΩ	: Standard Marking for E96 / E24 N: No Marking

*Remark: Standard parts don't need for power rating code.

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
RAM02 (0402)	1/16W	-55 ~ +155°C	25V	50V	1Ω - 100KΩ				±25 ±50
RAM03 (0603)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 332KΩ				±25 ±50
RAM05 (0805)	1/10W	-55 ~ +155°C	100V	200V	1Ω - 1MΩ				±25 ±50
RAM06 (1206)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 1MΩ				±25 ±50
RAM13 (1210)	1/4W	-55 ~ +155°C	150V	300V	1Ω - 1MΩ				±25 ±50
RAM10 (2010)	1/4W	-55 ~ +155°C	150V	300V	1Ω - 1MΩ				±25 ±50
RAM12 (2512)	1/2W	-55 ~ +155°C	150V	300V	1Ω - 1MΩ				±25 ±50

Special Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
RAM05 (0805)	1/10W	-55 ~ +155°C	100V	200V	4.7Ω - 15KΩ				±10 ±15
RAM06 (1206)	1/8W	-55 ~ +155°C	150V	300V	4.7Ω - 20KΩ				±10 ±15
RAM13 (1210)	1/4W	-55 ~ +155°C	150V	300V	4.7Ω - 20KΩ				±10 ±15
RAM10 (2010)	1/4W	-55 ~ +155°C	150V	300V	4.7Ω - 20KΩ				±10 ±15
RAM12 (2512)	1/2W	-55 ~ +155°C	150V	300V	4.7Ω - 20KΩ				±10 ±15

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
RAM03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 100KΩ				±25 ±50
RAM05 (0805)	1/8W	-55 ~ +155°C	150V	300V	4.7Ω - 15KΩ				±10 ±15
					1Ω - 1MΩ				±25 ±50
RAM06 (1206)	1/4W	-55 ~ +155°C	200V	400V	4.7Ω - 20KΩ				±10 ±15
					1Ω - 1MΩ				±25 ±50

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

■Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		+25/-55/+25/+125/+25°C
Short Time Overload	$\Delta R \pm 0.2\%$		RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds Measurement at 0.5 hours after test conclusion.
Endurance	$\Delta R \pm 0.2\%$		70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" Measurement at 2 hours after test conclusion.
Biased Humidity	96 hrs	$\Delta R \pm 0.2\%$	96 hrs 85°C/85%RH 10% of operating power. 96 hrs 85°C/85%RH No operating power. 1000 hrs 85°C/85%RH 10% of operating power. Measurement at 4 hours after test conclusion.
	1000 hrs	$\Delta R \pm 0.5\%$	
Solderability	95% min. coverage		Solder bath method; 245±3°C for 5 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.1\%$		260±5°C for 5±1 seconds
High Temperature Exposure	96 hrs	$\Delta R \pm 0.1\%$	at +155°C Measurement at 4 hours after test conclusion
	1000 hrs	$\Delta R \pm 0.3\%$	

Item	Requirement	Test Method
Thermal Shock	$\Delta R \pm 0.5\%$	-40°C 30min , 85°C 30min, Temperature Change Time 2~3 min, 1 Cycle, Total 5 Cycles. Measurement at 16 hours after test conclusion
Low Temperature Operation	$\Delta R \pm 0.2\%$	1 hour, -45°C, followed by 45 minutes of RCWV 1 hour, -65°C, followed by 45 minutes of RCWV Measurement at 24 hours after test conclusion
Low Temperature Exposure	$\Delta R \pm 0.5\%$	at -55°C for 96 hrs Measurement at 4 hours after test conclusion
Single Pulse High Voltage Overload	$\Delta R \pm 0.5\%$	Class C:10* RCWV or 5*Max. Operating voltage whichever is lower
Vibration	$\Delta R \pm 0.5\%$	Vibration Frequency Range : 10Hz-150Hz crossover frequency: 60Hz f<60Hz : uniform amplitude: 0.075mm f>60Hz : Constant acceleration: 9.8m/ s ² (1g) Scanning cycles for every axis: 10 Note: 10 Scanning cycles-75min.
Sulfur Test	$\Delta R \pm 1\%$	105±2 °C no power rating for 1000 hrs

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower

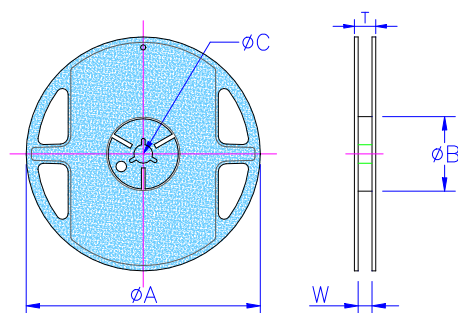
■ **Reference Standards:** MIL-STD-202, GB/T 5729, Q/GDW 11179.3, GB/T 17215.211, ASTM-B-809-95

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging

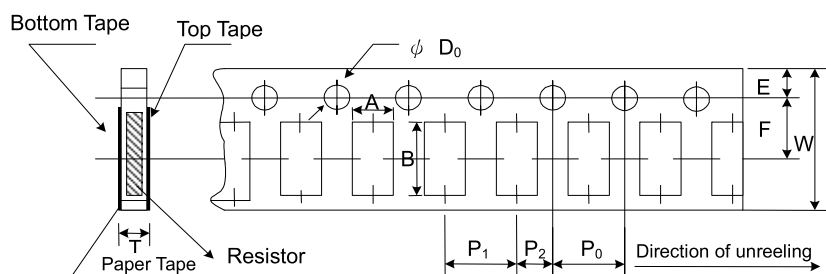
Packaging Quantity & Reel Specifications



Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
RAM02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
RAM03	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
RAM05	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
RAM06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
RAM13	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
RAM10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
RAM12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000

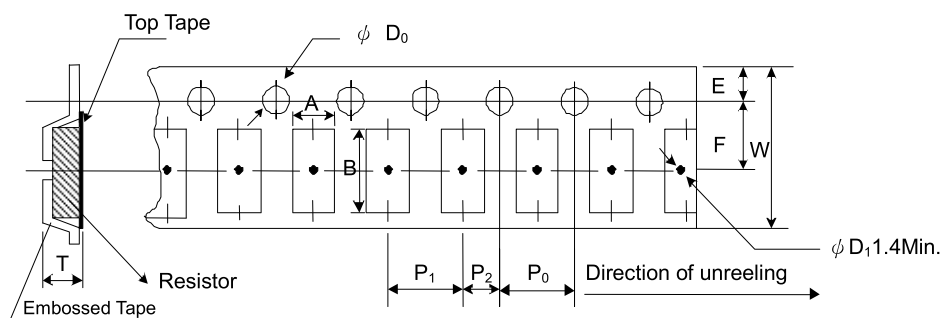
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
RAM02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
RAM03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
RAM05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
RAM06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
RAM13	2.75±0.05	3.40±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.60±0.10	0.75±0.05

Embossed Plastic Tape Specifications

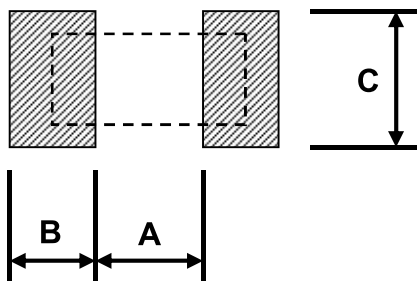


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
RAM10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
RAM12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

Recommend Land Pattern

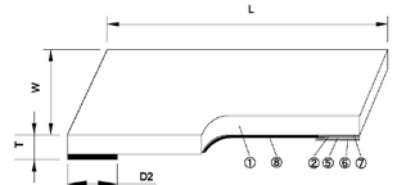
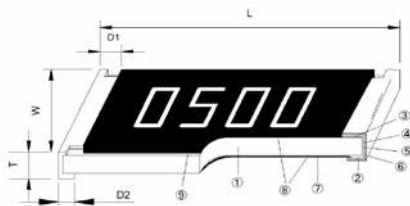
Unit: mm



Type	A	B	C
RAM02	0.50	0.50	0.60±0.2
RAM03	0.80	1.00	0.90±0.2
RAM05	1.00	1.00	1.35±0.2
RAM06	2.00	1.15	1.70±0.2
RAM13	2.00	1.15	2.50±0.2
RAM10	3.60	1.40	2.50±0.2
RAM12	4.90	1.60	3.10±0.2

High Frequency (up to 70GHz) Thin Film Precision Chip Resistor— ARF Series

Construction



0402/0603/0/05/1206

0201

Features

- Small standard size 0201 case size
- High frequency up to 70GHz for 0201
- High frequency up to 50GHz for 0402, 0603
- High purity alumina substrate
- Ohmic range (10Ω~1KΩ)
- Resistor tolerance to ±0.1%
- Low TCR (down to ±25ppm/°C)
- MSL: Level 1

Applications

- Low Noise Amplifiers
- Attenuation
- Line Termination

Typical Performance

- TCR: 25 ppm/°C
- TOL: 0.1%

Dimensions

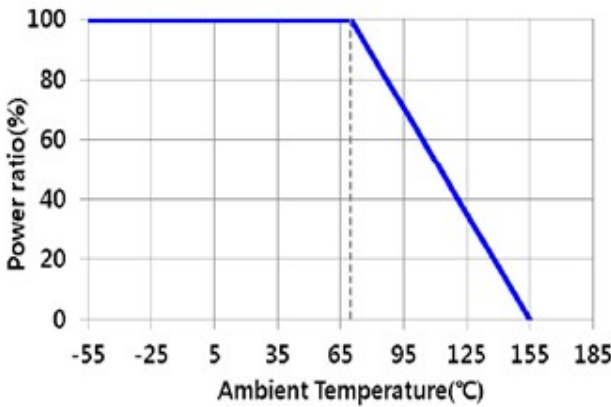
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARF01	0201	0.58±0.05	0.30±0.05	0.21±0.07	-	0.15±0.10	0.12
ARF02	0402	1.00±0.07	0.50±0.07	0.38±0.15	0.20±0.15	0.20±0.15	0.73
ARF03	0603	1.55±0.10	0.80±0.10	0.45±0.15	0.30±0.20	0.30±0.20	2.08
ARF05	0805	2.00±0.15	1.25±0.15	0.45±0.15	0.30±0.20	0.35±0.20	4.15
ARF06	1206	3.05±0.20	1.55±0.20	0.45±0.15	0.45±0.20	0.35±0.25	7.59

Part Numbering

ARF	02	B	T	C	N	0500	N
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	Z: 1/32W N: 1/20W W: 1/8W P: 1/5W O: 1/3W	0500: 50Ω 1000: 100Ω 1500: 150Ω 1001: 1KΩ	:Standard Marking N: No Marking

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max Operating Voltage	Max Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
ARF01 (0201)	1/32W	-55°C ~ +155°C	15V	30V	20Ω~500Ω				±25 ±50
ARF02 (0402)	1/20W	-55°C ~ +155°C	30V	60V	10Ω~1KΩ				±25 ±50
ARF03 (0603)	1/8W	-55°C ~ +155°C	50V	100V	10Ω~1KΩ				±25 ±50
ARF05 (0805)	1/5W	-55°C ~ +155°C	50V	100V	10Ω~1KΩ				±25 ±50
ARF06 (1206)	1/3W	-55°C ~ +155°C	75V	150V	10Ω~1KΩ				±25 ±50

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	$\Delta R \pm 0.2\%$	RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Insulation Resistance	>9999 MΩ	Apply 100V _{DC} for 1 minute
Endurance	$\Delta R \pm 0.5\%$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\Delta R \pm 0.5\%$	40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending Strength	$\Delta R \pm 0.1\%$	Bending once for 60 seconds 2010 2512 sizes: 2 mm Other sizes: 3 mm
Solderability	95% min. coverage 0201: excep	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.1\%$ 0201: excep	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	Max. overload voltage for 1 minute
Low Temperature Operation	$\Delta R \pm 0.2\%$	1 hour, -65°C, followed by 45 minutes of RCWV
High Temperature Exposure	$\Delta R \pm 0.5\%$	at +155°C for 1000 hrs

RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

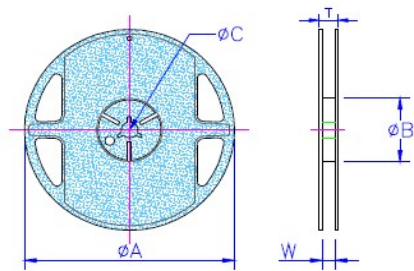
■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Reference Standards: JIS-C 5201-1; MIL-STD-202

■ Shelf Life: 2 years from production date

Packaging

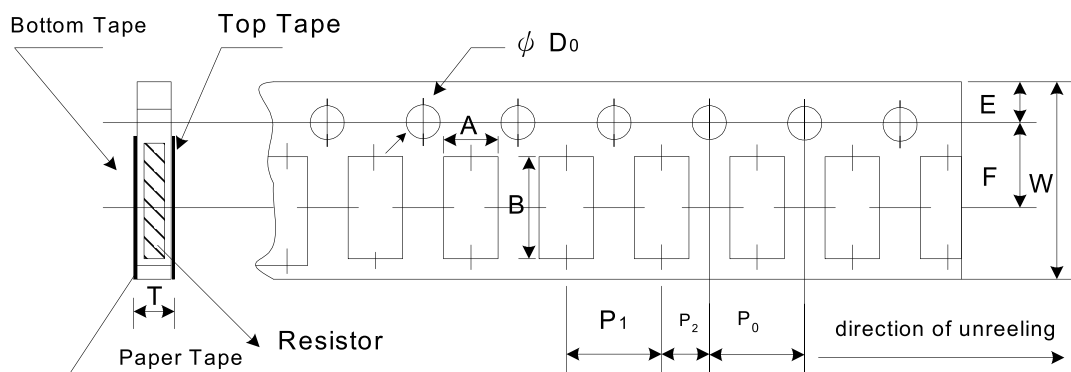
Packing Quantity & Reel Specifications



Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)
ARF01	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000
ARF02	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000
ARF03	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARF05	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARF06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000

Paper Tape Specifications

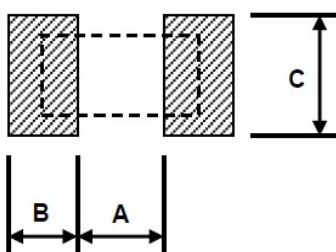


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARF01	0.40±0.05	0.70±0.05	8.00±0.20	1.75±0.10	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.03	0.42±0.02
ARF02	0.66±0.06	1.18±0.06	8.00±0.20	1.75±0.10	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.60±0.03
ARF03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ARF05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
ARF06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

Recommend Land Pattern

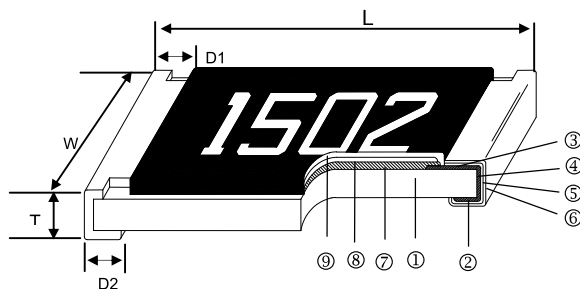
Unit: mm



Type	A	B	C
ARF01	0.25	0.30	0.40±0.2
ARF02	0.50	0.50	0.60±0.2
ARF03	0.80	1.00	0.90±0.2
ARF05	1.00	1.00	1.35±0.2
ARF06	2.00	1.15	1.70±0.2

Thick Film Chip Resistor—CR..AC Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- AEC-Q200 Compliance
- Small size and light weight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- 100% CCD inspection
- MSL: Level 1

Applications

- Telecommunication Equipment
- Car Media
- Digital Cameras, Watches, Pocket Calculators
- Computers, Instruments
- Medical Equipment

Dimensions

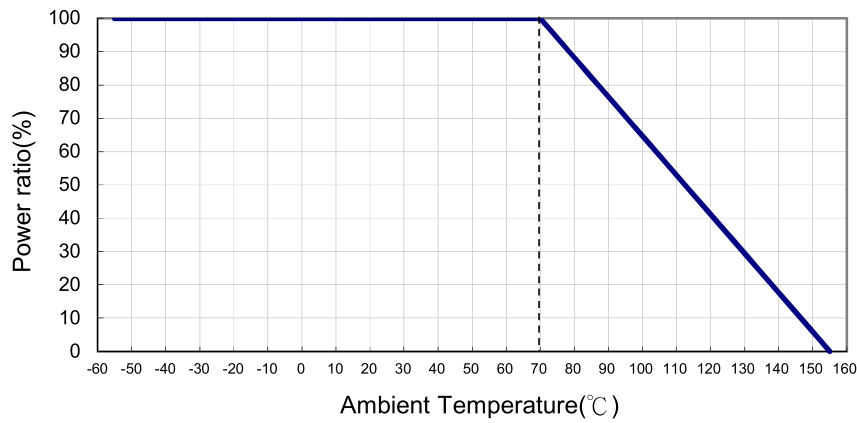
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CR-01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.2
CR-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
CR-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
CR-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
CR-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
CR-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
CR-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
CR-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

CR-	03	F	L	7	---10R	AC
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance	Packaging Code
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% J: ±5%	L: Standard & High Precision E: TC50 P: High Power H: Ultra High Power M: High Power 1	0: 7" Reel 15Kpcs 2: 7" Reel 2Kpcs 4: 7" Reel 4Kpcs 5: 7" Reel 20Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs 9: 10" Reel 8Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs	--- 1R2: 1.2Ω --- 3K3: 3.3KΩ --- 10K: 10KΩ -- 100K: 100KΩ “-“ to fill up 6 spaces	AC:100% CCD inspection

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
CR-01 (0201)	1/20W	-55 ~ +155°C	25V	50V	1Ω - 10MΩ		±200
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
CR-06 (1206)	1/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
CR-10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 39MΩ		±200 ±100 ±200 ±400
CR-0A (2010)	3/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
CR-12 (2512)	1W	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400

TC50 Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	-		100Ω - 1MΩ		±50
CR-03 (0603)	1/10W		75V	150V	10Ω - 1MΩ	10Ω - 10MΩ			
CR-05 (0805)	1/8W		150V	300V					
CR-06 (1206)	1/4W		200V	400V					
CR-10 (1210)	1/3W		200V	400V					
CR-0A (2010)	3/4W		200V	400V					
CR-12 (2512)	1W		250V	500V					

High Precision Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	-		10Ω - 1MΩ	±100
					-		1.02M - 10MΩ	±200
CR-03 (0603)	1/10W		75V	150V	10Ω - 1MΩ			±100
					-		1.02M - 10MΩ	±200
CR-05 (0805)	1/8W		150V	300V	10Ω - 1MΩ			±100
					-		1.02M - 10MΩ	±200
CR-06 (1206)	1/4W		200V	400V	10Ω - 1MΩ			±100
					-		1.02M - 10MΩ	±200
CR-10 (1210)	1/3W		200V	400V	10Ω - 1MΩ			±100
					-		1.02M - 10MΩ	±200
CR-0A (2010)	3/4W		200V	400V	10Ω - 1MΩ			±100
					-		1.02M - 10MΩ	±200
CR-12 (2512)	1W		250V	500V	10Ω - 1MΩ			±100
					-		1.02M - 10MΩ	±200

High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Function Code	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
						±0.5%	±1%	±5%	
CR-02 (0402)	1/10W	M	-55 ~ +155°C	50V	100V	- 10Ω - 1MΩ	1Ω - 9.76Ω 10Ω - 1MΩ	1Ω - 9.76Ω 10Ω - 1MΩ	±200 ±100
	1/8W	P							
CR-03 (0603)	1/4W	P		75V	150V				
CR-05 (0805)	1/3W	P		150V	300V				
CR-06 (1206)	1/3W	P		200V	400V				
	*1/2W	H							
CR-10 (1210)	1/2W	P		200V	400V				
	*3/4W	H							
CR-0A (2010)	1W	P		200V	400V				
CR-12 (2512)	2W	P		250V	500V				

*: Ultra High Power

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Jumper(0Ω)

Type \ Item	Rated Current	Function Code	Resistance	Operating Temp. Range
			5%	
CR-01 (0201)	1A	L	<50mΩ	-55 ~ +155°C
CR-02 (0402)	1A			
CR-03 (0603)	1A			
CR-05 (0805)	2A			
CR-06 (1206)	2A			
CR-10 (1210)	2.5A			
CR-0A (2010)	3.5A			
CR-12 (2512)	4A			

■ High Current Jumper(0Ω)

Type	Item	Rated Current	Function Code	Resistance	Operating Temp. Range
				5%	
CR-02 (0402)		1.5A	P	<20mΩ	-55 ~ +155°C
CR-03 (0603)		2A			
CR-05 (0805)		2.5A			
CR-06 (1206)		3.5A			
CR-10 (1210)		5A			
CR-0A (2010)		6A			
CR-12 (2512)		7A			

■ Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	At +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

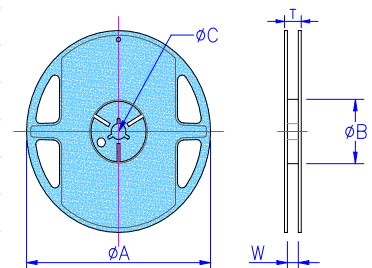
■ Shelf Life: 2 years from production date

■ Packaging

Reel Specifications & Packaging Quantity

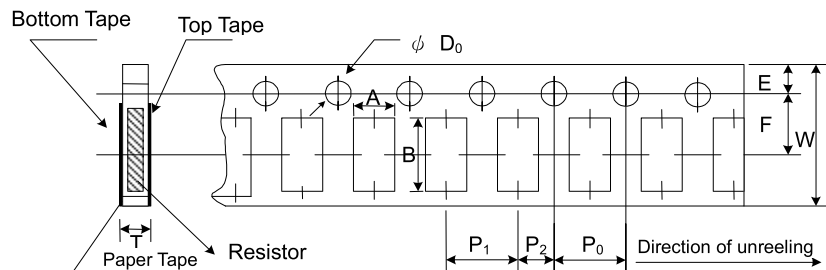
Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CR-01	Paper	15K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CR-01 CR-02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-03 CR-05 CR-06 CR-10	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-0A CR-12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
		8K	12mm	10 inch	250.0±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



Packaging

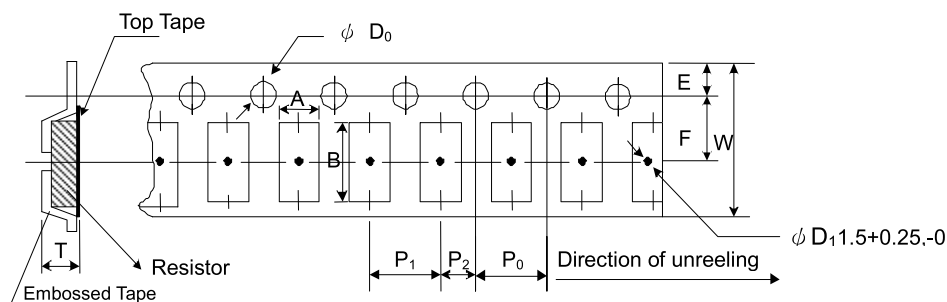
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CR-01	0.38±0.05	0.68±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CR-02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CR-03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CR-05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-10	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

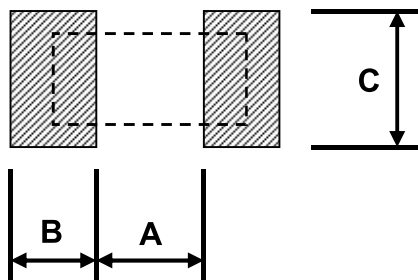


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CR-0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
CR-12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰

Recommend Land Pattern

Unit: mm

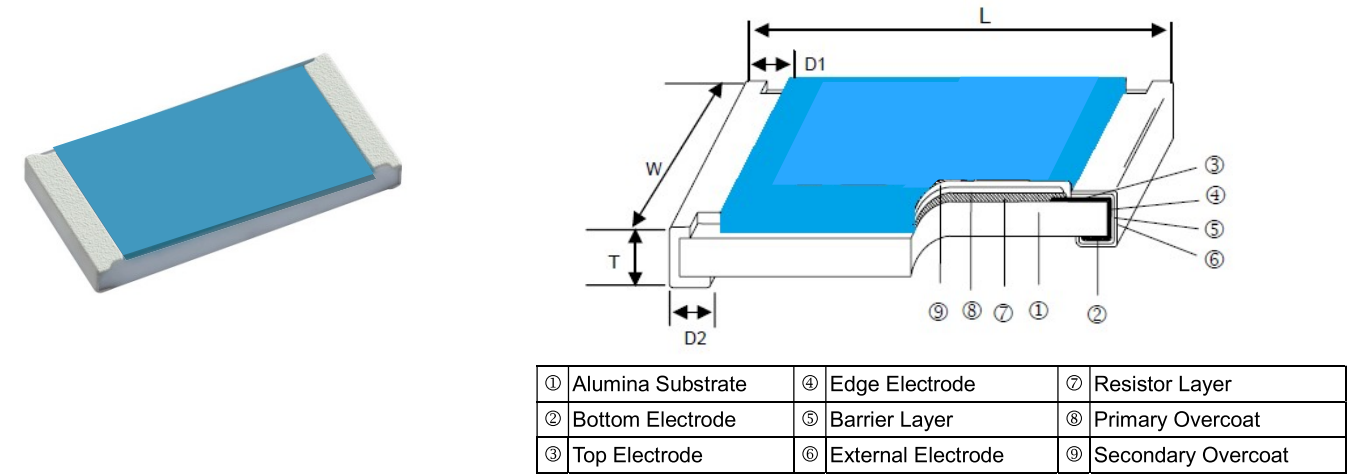


Type	A	B	C
CR-01	0.30	0.25	0.30
CR-02	0.50	0.45	0.60
CR-03	0.90	0.60	0.90
CR-05	1.20	0.70	1.30
CR-06	2.00	0.90	1.60
CR-10	2.00	0.90	2.80
CR-0A	3.80	0.90	2.80
CR-12	4.90	1.60	3.50

Thick Film High Power Chip Resistor—CRP Series

(Aluminum Nitride Substrate)

Construction



Features

- Thick film resistive element on an aluminum nitride (AlN) substrates
- Lead (Pb)-free wraparound termination over nickel barrier
- MSL: Level 1

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2
CRP06	1206	3.10±0.13	1.52±0.13	0.51±0.13	0.38±0.13	1.22±0.13
CRP12	2512	6.35±0.13	3.15±0.13	0.51±0.13	0.60±0.25	2.70±0.10

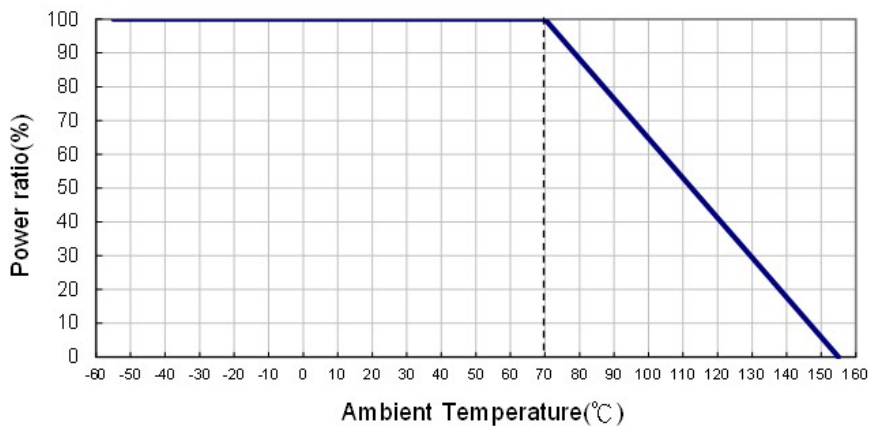
Applications

- Industrial
- Telecom markets

Part Numbering

CRP	12	F	L	4	----1K
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
CRP	06: 1206 12: 2512	F: ±1% J: ±5%	L: Standard	4: 7" Reel 4Kpcs 7: 7" Reel 5Kpcs	---1K: 1KΩ ---10R: 10Ω “-“ to fill up 6 spaces

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Resistance Range		TCR (PPM/°C)
				±1%	±5%	
CRP06 (1206)	2.4W	-55 ~ +155°C	200V	10Ω – 2KΩ		±150
CRP12 (2512)	3.5W	-55 ~ +155°C	200V	3Ω – 2KΩ		±150

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. The maximum power rating only applies if the temperature of the resistive element is maintained below 155°C.

Environmental Characteristics

Item	Requirement	Typical	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	± 120 ppm	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	± 0.50 %	± 0.10 %	CRP06:4.7W applied for 5s CRP12:7.7W applied for 5s
Endurance	± 0.50 %	± 0.20 %	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
High Temperature Exposure	± 0.50 %	± 0.10 %	+150°C for 100hrs
Solderability	95% min. coverage	95% min. coverage	245±5°C for 3 seconds
Terminal Strength	No evidence of mechanical damage	No evidence of mechanical damage	CRP06:2kg force applied CRP12:3kg force applied
Moisture Resistance	± 0.50 %	± 0.15 %	≥ 80% RH, 240 hrs
Resistance to Soldering Heat	± 0.50 %	± 0.20 %	260±5°C for 10 seconds

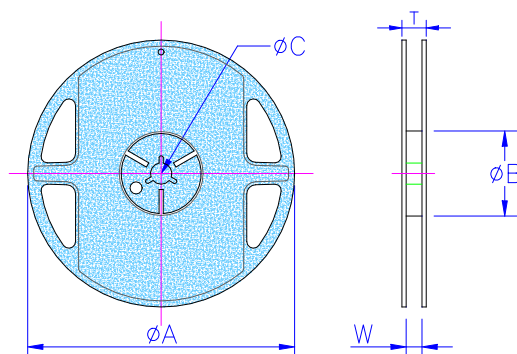
RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; MIL-STD-202

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging



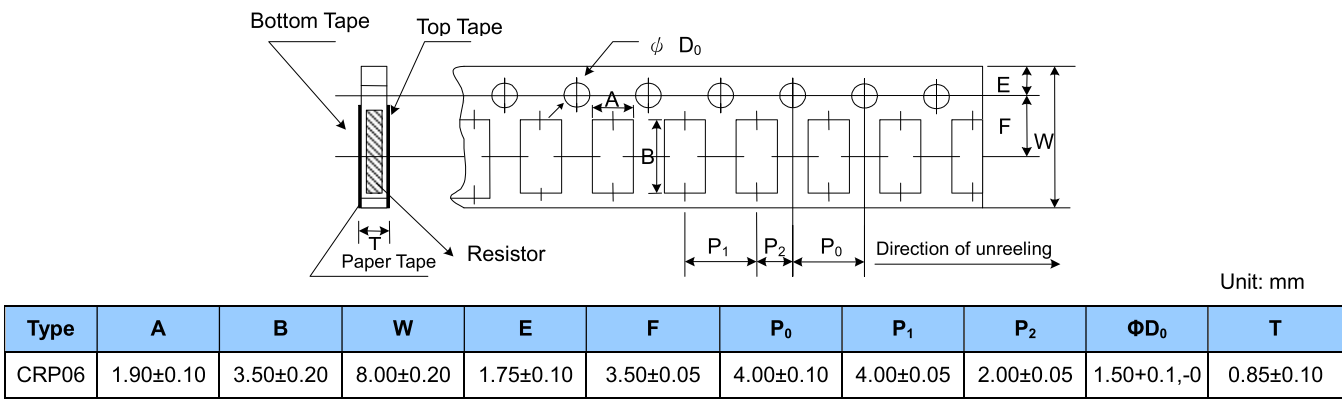
Reel Specifications & Packaging Quantity

Unit: mm

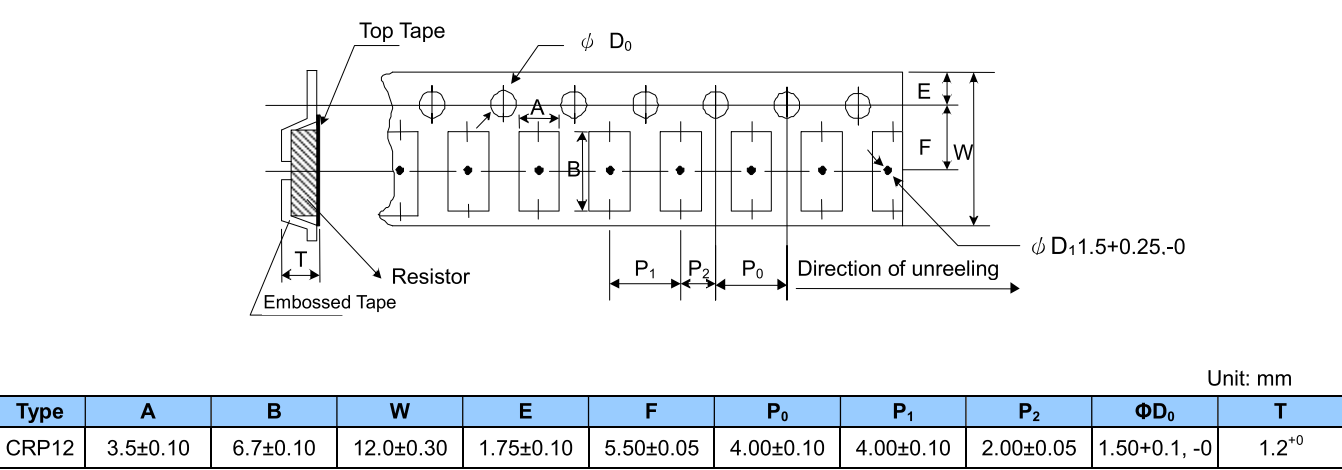
Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CRP06	Paper	5K	8mm	7 inch	178.5±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.5
CRP12	Embossed	4K	12mm	7 inch	178.5±1.5	60+1/-0	13.0±0.5	13.0±0.5	15.5±0.5

■Packaging

Paper Tape Specifications



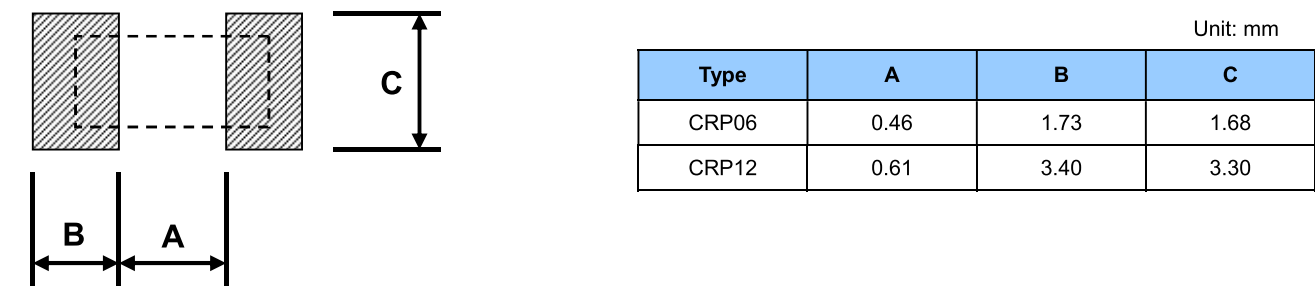
Embossed Plastic Tape Specifications



■Marking

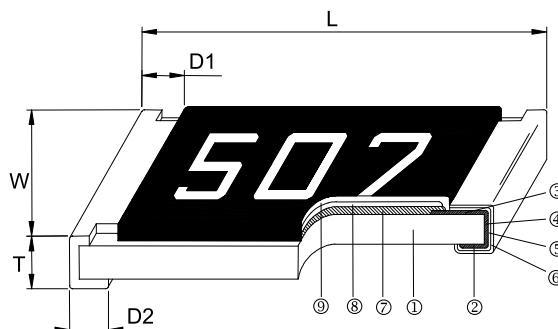
No Marking

■Recommend Land Pattern



High Ohmic Chip Resistor—HMR Series

Construction



Features

- Extended resistance range(110MΩ~ 1GΩ)
- Surface mount package
- Highly reliable multilayer electrode construction
- MSL: Level 1

Applications

- Voltage dividers and hybrids
- X-Ray equipment
- Low signal detection or amplification circuits
- High input impedance quartz amplifiers
- Testing devices

① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Dimensions

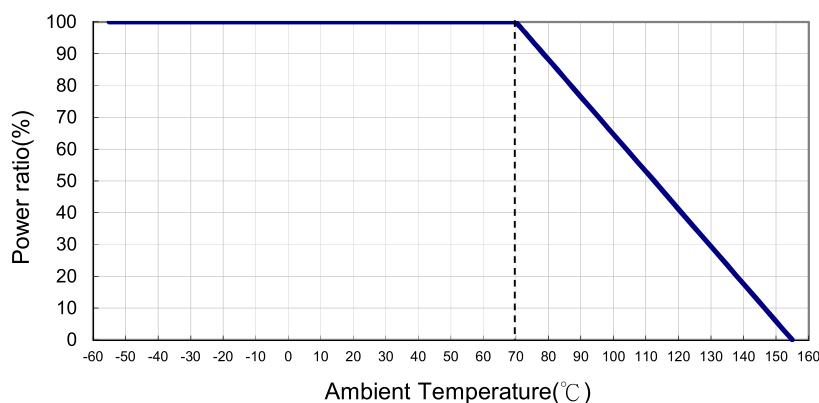
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HMR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
HMR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9

Part Numbering

HMR	05	J	L	7	-- 200M
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	05: 0805 06: 1206	J: ±5%	L: Standard	7: 7" Reel 5Kpcs A: 10" Reel 10Kpcs D: 13" Reel 20Kpcs	-- 200M: 200MΩ --- 1G: 1GΩ " " to fill up 6 spaces

Derating Curve



■ Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	TCR (PPM/°C)
					±5%	
HMR05 (0805)	1/8W	-55 ~ +125°C	150V	300V	110MΩ - 500MΩ	±500
					510MΩ - 1GΩ	±1000
HMR06 (1206)	1/4W		200V	400V	110MΩ - 500MΩ	±500
					510MΩ - 1GΩ	±1000

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(2.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G	Max. Overload Voltage for 1 minute
Endurance	±(3.0%+0.10Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(3.0%+0.10Ω)	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.5%+0.10Ω)	at +125°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	Bending once for 60 seconds 0805, 1206 sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(1.0%+0.05Ω)	-55°C to +125°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

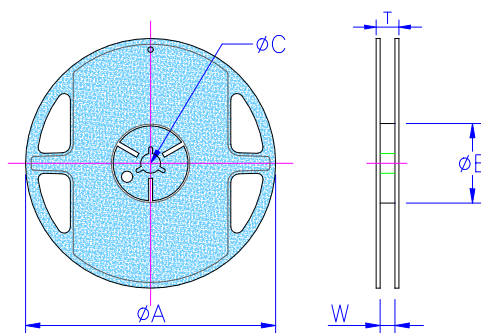
■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

Packaging

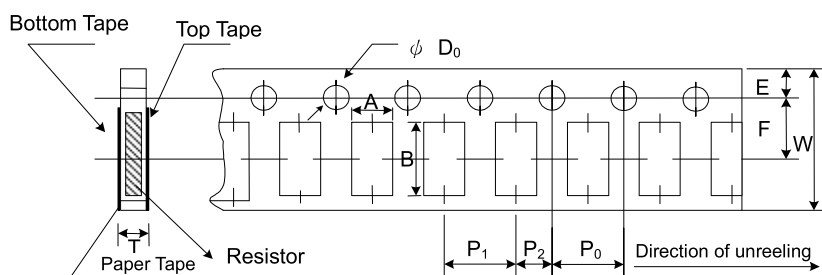
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HMR05 HMR06	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5

Paper Tape Specifications

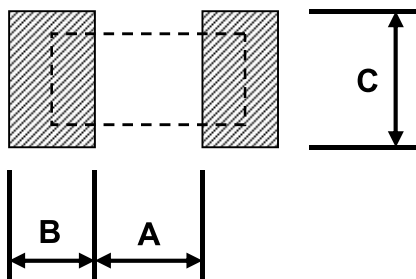


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HMR05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
HMR06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Recommend Land Pattern

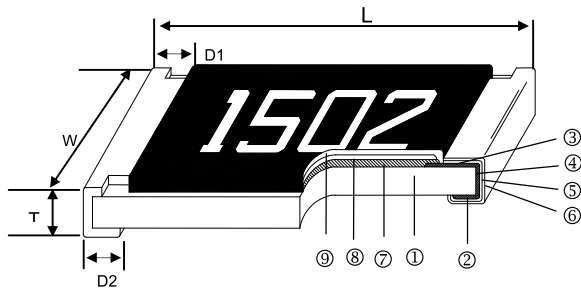
Unit: mm



Type	A	B	C
HMR05	1.20	0.70	1.30
HMR06	2.00	0.90	1.60

High Voltage Thick Film Chip Resistor - HVC Series

Construction



Features

- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Excellent performance at high voltage
- Reduced size of final equipment
- MSL: Level 1

Applications

- Inverter
- Outdoor Equipments
- Converter
- High Pulse Equipment

Dimensions

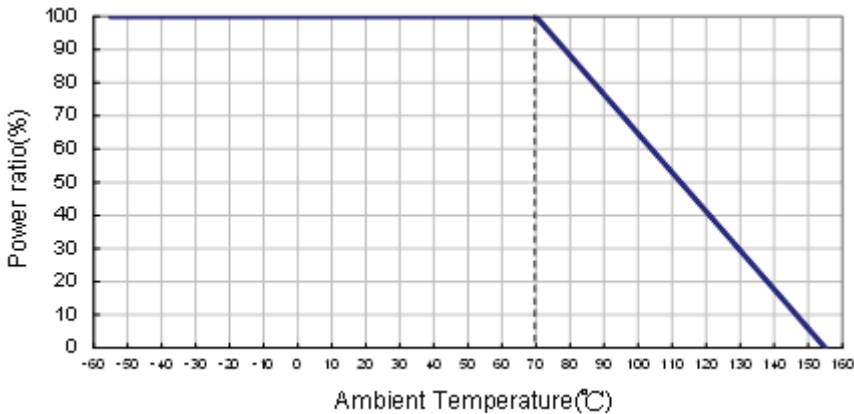
unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HVC02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.6
HVC03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.
HVC05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
HVC06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
HVC0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
HVC12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

HVC	03	F	T	E	X	1003
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 0A: 2010 12: 2512	F: ±1% J: ±5%	T: 7" Taping Reel	E: ±100 F: ±200	Y: 1/16W X: 1/10W W: 1/8W V: 1/4W U: 1/2W T: 1W	1003: 100KΩ 1004: 1MΩ 1005: 10MΩ

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
HVC02 (0402)	1/16W	-55 ~ +155°C	100V	200V	39KΩ - 1MΩ		±100
					1.1MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
HVC03 (0603)	1/10W		200V	400V	56KΩ - 1MΩ		±100
					1.1MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
HVC05 (0805)	1/8W		400V	800V	100KΩ - 1MΩ		±100
					1.1MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
HVC06 (1206)	1/4W		500V	1000V	100KΩ - 1MΩ		±100
					1.1MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
HVC0A (2010)	1/2W		2000V	3000V	51KΩ - 1MΩ		±100
					1.1MΩ - 20MΩ		±200
HVC12 (2512)	1W		3000V	4000V	30KΩ - 1MΩ		±100
					1.1MΩ - 20MΩ		±200

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	$\pm(2.0\%+0.05\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$		Max. Overload Voltage for 1 minute
Endurance	$\pm(2.0\%+0.10\Omega)$	$\pm(3.0\%+0.10\Omega)$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(2.0\%+0.10\Omega)$	$\pm(3.0\%+0.10\Omega)$	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(1.0\%+0.05\Omega)$	$\pm(1.5\%+0.10\Omega)$	at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		HVC02: 150V for 1 minute HVC03: 300V for 1 minute HVC05/HVC06/HVC0A/HVC12: 500V for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$		260±5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

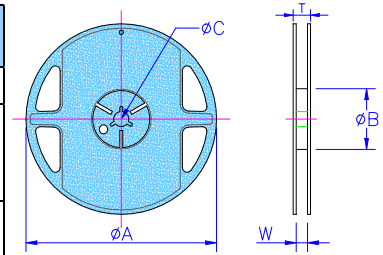
■ Shelf Life: 2 years from production date

Packaging

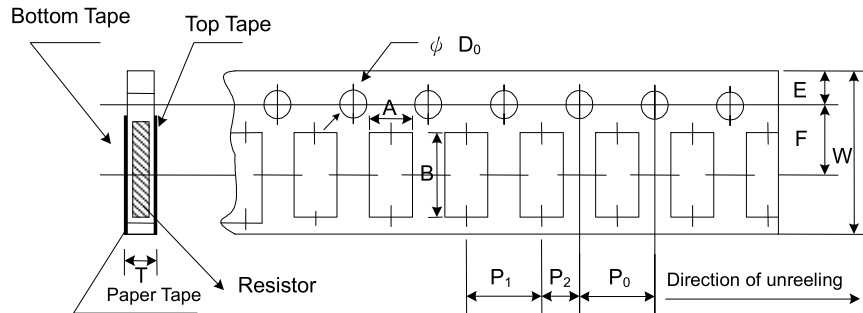
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HVC02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
HVC03 HVC05 HVC06	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
HVC0A HVC12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5



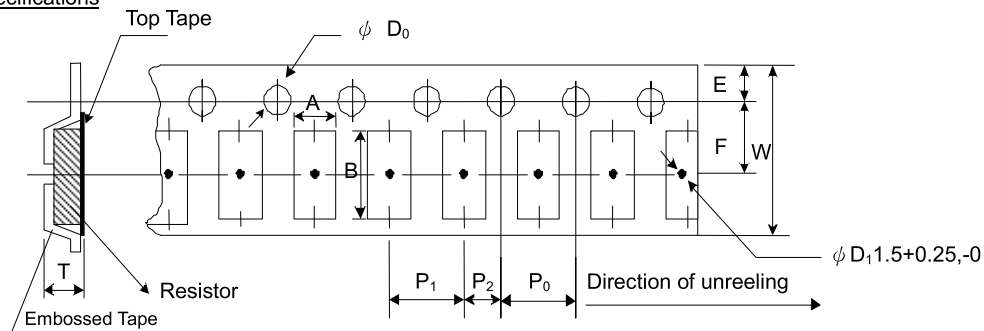
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVC02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
HVC03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
HVC05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
HVC06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

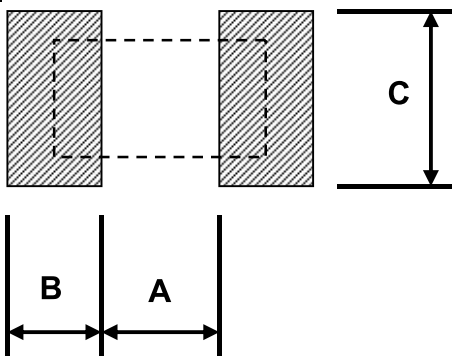


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVC0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
HVC12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

Recommend Land Pattern

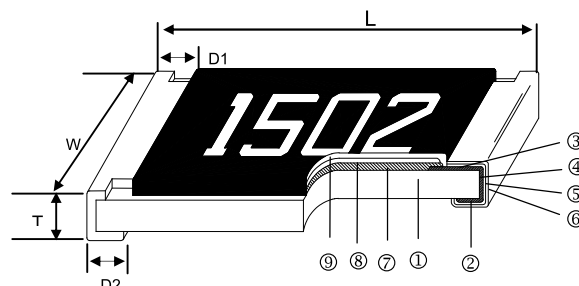
Unit: mm



Type	A	B	C
HVC02	0.50	0.45	0.60
HVC03	0.90	0.60	0.90
HVC05	1.20	0.70	1.30
HVC06	2.00	0.90	1.60
HVC0A	3.80	0.90	2.80
HVC12	4.90	1.60	3.50

Pulse Withstanding Chip Resistor—PWR Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Tolerance from $\pm 0.5\%$ ~ 5%
- High power rating
- Excellent pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402~2512
- AEC-Q200 Compliance
- MSL: Level 1

Applications

- Metering (Testing/Measurement)
- Diagnostic Equipment
- Medical Devices
- Industrial Controls
- Plasma
- LCD Video Monitors

Dimensions

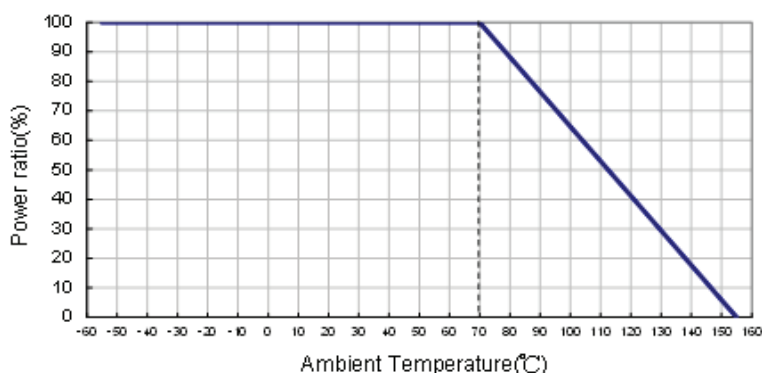
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
PWR02	0402	1.00 ± 0.05	0.50 ± 0.05	0.35 ± 0.05	0.20 ± 0.10	0.25 ± 0.10	0.6
PWR03	0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20	2.0
PWR05	0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.10	0.35 ± 0.20	0.40 ± 0.20	4.4
PWR05 (1/2W)	0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.10	0.35 ± 0.20	0.40 ± 0.20	5.0
PWR06	1206	3.10 ± 0.10	1.55 ± 0.10	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	8.9
PWR06 (3/4W)	1206	3.10 ± 0.10	1.55 ± 0.10	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	9.5
PWR13	1210	3.10 ± 0.10	2.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	16.0
PWR10	2010	5.00 ± 0.10	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	24.2
PWR12	2512	6.35 ± 0.10	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	39.4
PWR12 (2W)	2512	6.35 ± 0.20	3.15 ± 0.15	0.60 ± 0.10	0.60 ± 0.25	0.60 ± 0.20	42.0

Part Numbering

PWR	12	J	T	E	A	1001	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$ -: No specified (for Jumper)	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ± 100 F: ± 200 G: ± 300 4: ± 350 -: No specified (for Jumper)	A: 1.5W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W W: 1/8W X: 1/10W P: 1/5W S: 2W K: 1.25W	1001: 1K Ω 1004: 1M Ω R0R0: 0 Ω	: Standard Marking N: No Marking

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
PWR02 (0402)	1/5W	-55 ~ +155°C	50V	100V	-	1Ω-20Ω		±300
					100Ω-1MΩ	20Ω-1MΩ		±100
PWR03 (0603)	1/10W	-55 ~ +155°C	50V	100V	10Ω - 294Ω	1Ω - 294Ω		±200
					10Ω - 1MΩ			±100
PWR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	10Ω - 294Ω	1Ω - 294Ω		±200
					10Ω - 20MΩ			±100
PWR06 (1206)	1/3W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 20MΩ			±100
PWR13 (1210)	1/2W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 20MΩ			±100
PWR10 (2010)	3/4W	-55 ~ +155°C	400V	800V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 20MΩ			±100
PWR12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 20MΩ			±100

High Power & Ultra High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
PWR03 (0603)	1/4W 1/3W	-55 ~ +155°C	75V	150V	10Ω - 294Ω	1Ω - 294Ω		±200
					10Ω - 1MΩ		±100	
PWR05 (0805)	2/5W	-55 ~ +155°C	150V	300V	10Ω - 294Ω	1Ω - 294Ω		±200
					10Ω - 1MΩ		±100	
PWR05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	10Ω - 294Ω	1Ω - 294Ω		±200
					10Ω - 1MΩ		±100	
PWR06 (1206)	1/2W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 1MΩ		±100	
PWR06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 1MΩ		±100	
PWR13 (1210)	3/4W 1W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω- 1MΩ		±100	
PWR10 (2010)	1W 1.25W	-55 ~ +155°C	400V	800V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω- 1MΩ		±100	
PWR12 (2512)	*2W	-55 ~ +155°C	500V	1000V	10Ω	1Ω - 10Ω		±350
					10Ω - 200K		±100	

Jumper(0Ω)

Item Type	Power Rating	Rated Current	Overload Current	Resistance	Operating Temp. Range
PWR02 (0402)	1/5W	3A	6A	0Ω (≤10mΩ)	-55 ~ +155°C
PWR03 (0603)	1/3W	5A	10A	0Ω (≤8mΩ)	
PWR05 (0805)	*1/2W	6A	12A	0Ω (≤5mΩ)	
PWR06 (1206)	*3/4W	10A	20A	0Ω (≤5mΩ)	
PWR13 (1210)	1W	12A	24A	0Ω (≤4mΩ)	
PWR10 (2010)	1.25W	12A	24A	0Ω (≤5mΩ)	
PWR12 (2512)	2W	16A	32A	0Ω (≤5mΩ)	

*: Ultra High Power: double side printed resistor element

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155°C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
	±5% and Below	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	As Spec.	RCWV*2.5 or Max.Overload Voltage whichever is lower for 5 seconds Jumper:2*I _{max} for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.05Ω)	As Spec.	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	± (0.5%+0.05Ω)	As Spec.	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	Ultra High Power * ± (1.0%+0.05Ω)		
Dry Heat	± (0.5%+0.05Ω)	As Spec.	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	As Spec.	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	± (0.5%+0.05Ω)	As Spec.	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%		260±5°C for 30 seconds
Rapid Change of Temperature	± (0.5%+0.05Ω)	As Spec.	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

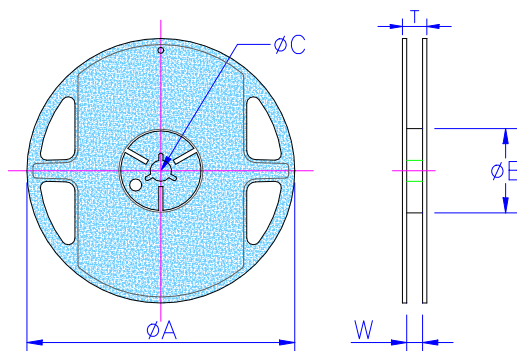
■ **Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1**

■ **Storage Temperature: 15~28°C; Humidity < 80%RH**

■ **Shelf Life: 2 years from production date**

Packaging

Reel Specifications & Packaging Quantity

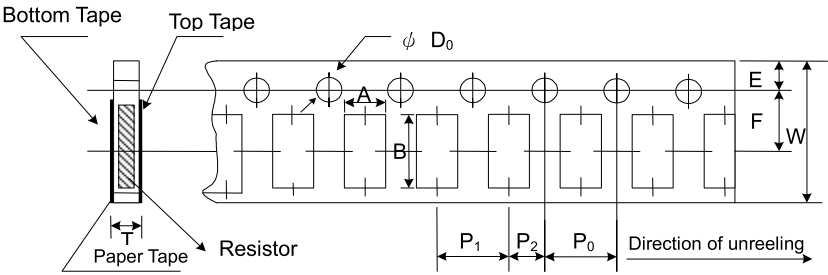


Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
PWR02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5
PWR03 PWR05 PWR06 PWR13	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5
PWR10 PWR12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5
		8K	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5

■Packaging

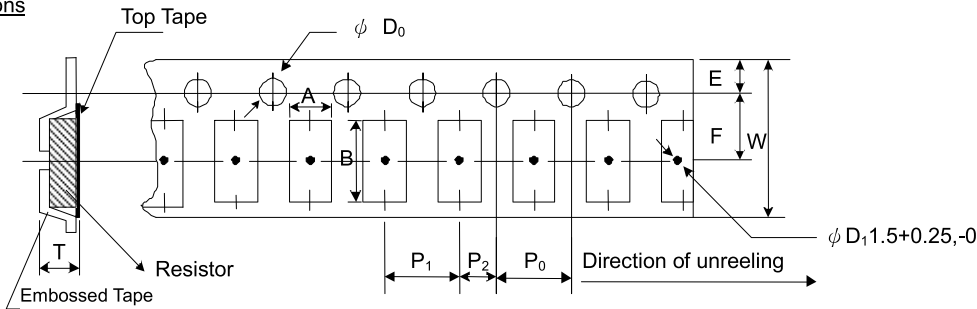
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PWR02	0.65±0.10	1.15±0.10	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.1
PWR03	1.10±0.10	1.90±0.10	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.1
PWR05	1.60±0.10	2.40±0.20	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
PWR06	1.90±0.10	3.50±0.20	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
PWR13	2.90±0.10	3.50±0.20	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1

Embossed Plastic Tape Specifications

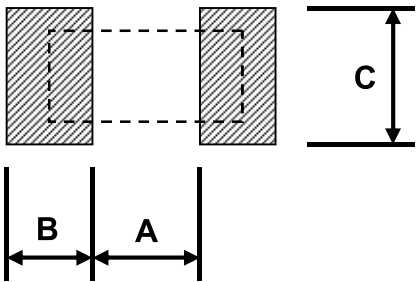


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PWR10	2.80±0.10	5.40±0.20	12.0±0.3	1.75±0.1	5.50±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
PWR12	3.50±0.10	6.70±0.10	12.0±0.3	1.75±0.1	5.50±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

■Recommend Land Pattern

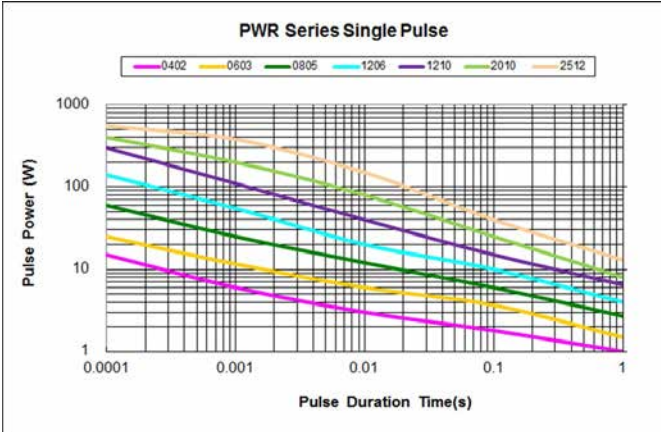
Unit: mm



Type	A	B	C
PWR02	0.50	0.45	0.60
PWR03	0.90	0.60	0.90
PWR05	1.20	0.70	1.30
PWR06	2.00	0.90	1.60
PWR13	2.00	0.90	2.80
PWR10	3.80	0.90	2.80
PWR12	4.90	1.00	3.40

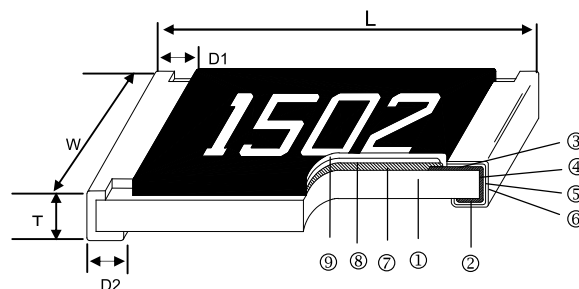
■Pulse withstanding capacity

The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.



Surge Withstanding Chip Resistor – SWR Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- High power rating
- Excellent surge withstanding & pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402~2512
- AEC-Q200 Compliance
- MSL: Level 1

Applications

- Metering (Testing/Measurement)
- Medical Devices
- Power supply
- Charger
- Inverter
- LCD Video Monitors

Dimensions

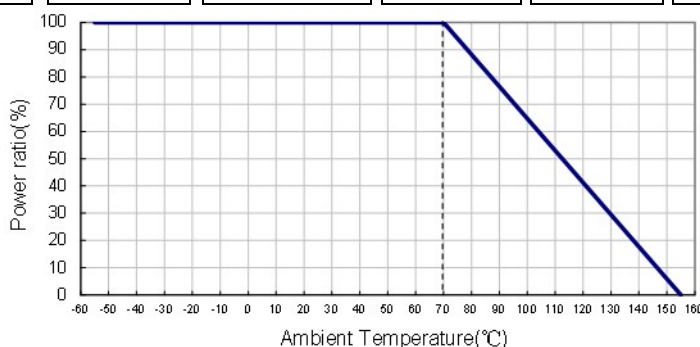
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
SWR02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
SWR03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
SWR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
SWR05 (1/2W)	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	5.0
SWR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
SWR06 (3/4W)	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	9.5
SWR13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
SWR10	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
SWR12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4
SWR12 (2W)	2512	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.25	0.60±0.20	42.0

Part Numbering

SWR	12	J	T	E	A	1001	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	J: ±5% K: ±10% M: ±20%	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ±100 F: ±200 G: ±300 4: ±350	S: 2W A: 1.5W K: 1.25W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W P: 1/5W W: 1/8W	1001: 1KΩ 1004: 1MΩ 1005: 10MΩ	: Standard Marking N: No Marking

Derating Curve



■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±5%	±10%	±20%	
SWR02 (0402)	1/5W	-55 ~ +155°C	50V	100V	1Ω - 20Ω			±300
					22Ω - 1MΩ			±100
SWR03 (0603)	1/8W	-55 ~ +155°C	50V	100V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR05 (0805)	1/4W	-55 ~ +155°C	150V	300V	1Ω - 270Ω			±200
					300Ω - 20MΩ			±100
SWR06 (1206)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100
SWR13 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100
SWR10 (2010)	3/4W	-55 ~ +155°C	400V	800V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100
SWR12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100

■ High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±5%	±10%	±20%	
SWR03 (0603)	1/4W 1/3W	-55 ~ +155°C	75V	150V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR05 (0805)	2/5W	-55 ~ +155°C	150V	300V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR06 (1206)	1/2W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR13 (1210)	3/4W 1W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR10 (2010)	1W 1.25W	-55 ~ +155°C	400V	800V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR12 (2512)	*2W	-55 ~ +155°C	500V	1000V	1Ω - 10Ω			±350
					11Ω - 200KΩ			±100

*: Ultra High Power: double side printed resistor element

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155 °C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	RCWV*2.5 or Max.Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload voltage for 1 minute
Endurance	$\pm(3.0\%+0.05\Omega)$	70 $\pm$ 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(3.0\%+0.05\Omega)$	40 $\pm$ 2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(3.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(1.0\%+0.05\Omega)$	260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 $\pm$ 5°C for 30 seconds
Rapid Change of Temperature	$\pm(1.0\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

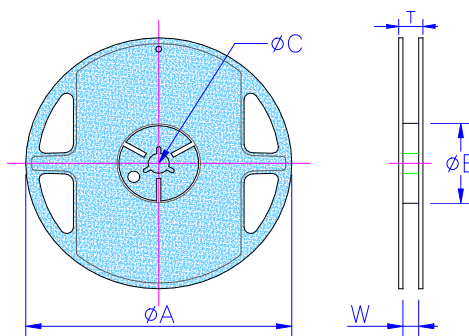
■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

Reel Specifications & Packaging Quantity

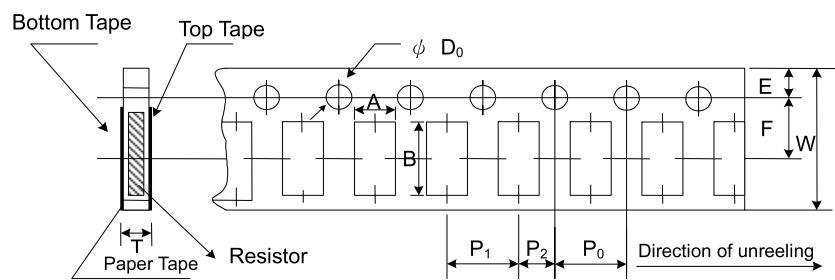


Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
SWR02	Paper	10K	8mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.2	9.0 $\pm$ 0.5
		20K	8mm	10 inch	254.0 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
		40K	8mm	13 inch	330.0 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
SWR03 SWR05 SWR06 SWR13	Paper	5K	8mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.2	9.0 $\pm$ 0.5
		10K	8mm	10 inch	254.0 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
		20K	8mm	13 inch	330.0 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
SWR10 SWR12	Embossed	4K	12mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.5	13.0 $\pm$ 0.5
		8K	12mm	10 inch	250.0 $\pm$ 1.0	62 $\pm$ 0.5	13.0 $\pm$ 0.5	12.5 $\pm$ 0.5

■Packaging

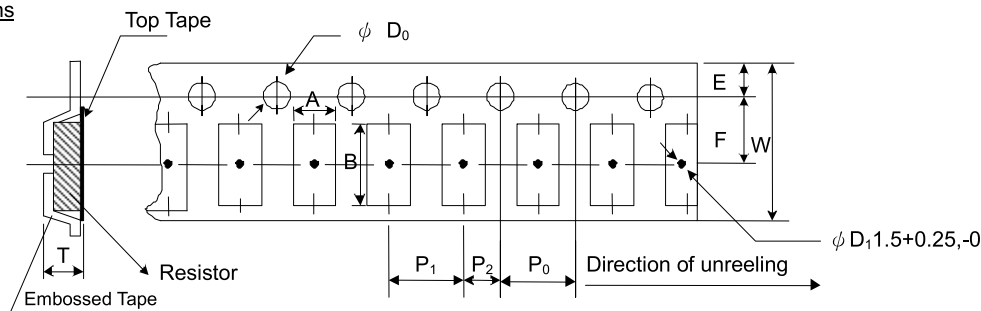
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWR02	0.65±0.10	1.15±0.10	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.1
SWR03	1.10±0.10	1.90±0.1	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.1
SWR05	1.60±0.10	2.40±0.2	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
SWR06	1.90±0.10	3.50±0.2	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
SWR13	2.90±0.10	3.50±0.2	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1

Embossed Plastic Tape Specifications

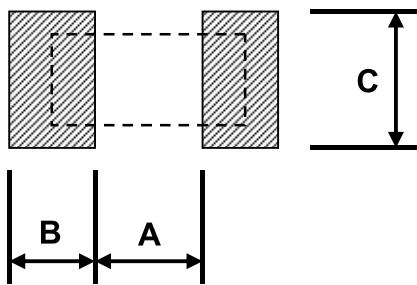


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWR10	2.80±0.10	5.40±0.20	12.0±0.3	1.75±0.1	5.5±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
SWR12	3.50±0.10	6.70±0.10	12.0±0.3	1.75±0.1	5.5±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

■Recommend Land Pattern

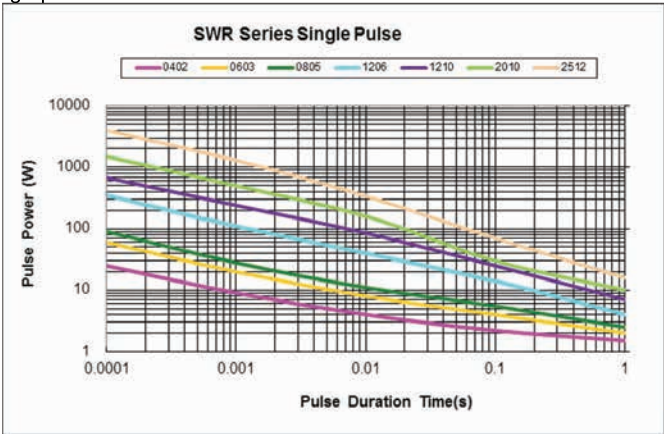
Unit: mm



Type	A	B	C
SWR02	0.50	0.45	0.60
SWR03	0.90	0.60	0.90
SWR05	1.20	0.70	1.30
SWR06	2.00	0.90	1.60
SWR13	2.00	0.90	2.80
SWR10	3.80	0.90	2.80
SWR12	4.90	1.00	3.40

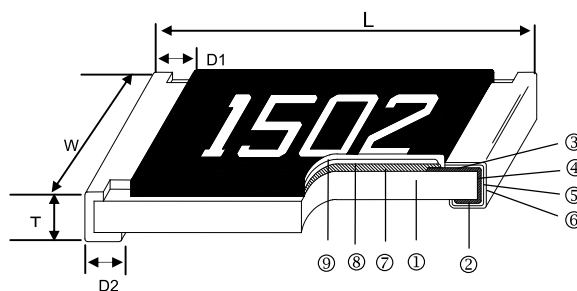
■Pulse withstanding capacity

The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.



Anti-Sulfurated Thick Film Chip Resistor—AS Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Special construction to prevent sulfuration in a sulfur containing environment
- MSL: Level 1

Applications

- High-end Computer
- Industrial Equipment
- Automatic Equipment Controller
- Medical Equipment
- High-end Multimedia Electronics
- Outdoor Electronic Applications

Dimensions

Unit: mm

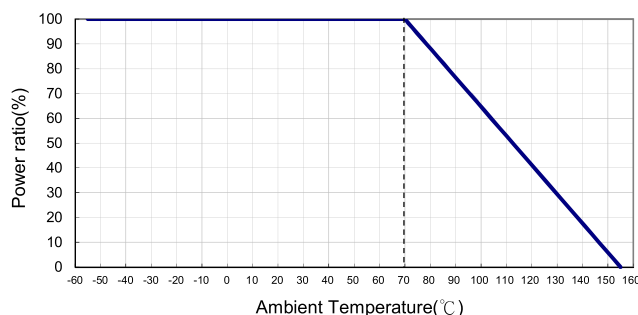
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
AS01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.2
AS02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
AS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
AS05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
AS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
AS10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
AS0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
AS12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

AS	03	F	T	E		1003
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel K: 7"15K/Reel	E: ±100 F: ±200 - : No Specified (For Jumper)	: Standard* (See Remark) 3: 1/12W X: 1/10W W: 1/8W V: 1/4W O: 1/3W U: 1/2W Q: 3/4W T: 1W	R0R0: 0Ω 0010: 1Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ

*Remark: Standard parts don't need power rating code.

Derating Curve



■ Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
AS01 (0201)	1/20W	-55 ~ +155°C	25V	50V	—	1Ω – 10MΩ		±200
	Jumper: 1A				—		0Ω(<50mΩ)	—
AS02 (0402)	1/16W		50V	100V	—	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A					—		0Ω(<50mΩ)
AS03 (0603)	1/10W		75V	150V	—	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A					—		0Ω(<50mΩ)
AS05 (0805)	1/8W		150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				—		0Ω(<50mΩ)	—
AS06 (1206)	1/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				—		0Ω(<50mΩ)	—
AS10 (1210)	1/3W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2.5A				—		0Ω(<50mΩ)	—
AS0A (2010)	3/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 3.5A				—		0Ω(<50mΩ)	—
AS12 (2512)	1W		250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 4A				—		0Ω(<50mΩ)	—

■ High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
AS01 (0201)	1/12W	-55 ~ +155°C	25V	50V	-	10Ω - 1MΩ		±200
AS02 (0402)	1/10W		50V	100V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
AS03 (0603)	1/4W		75V	150V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
AS05 (0805)	1/3W		150V	300V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
AS06 (1206)	1/2W		200V	400V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
AS10 (1210)	3/4W		200V	400V	-	1Ω - 9.76Ω		±200
		10Ω - 1MΩ			±100			
AS0A (2010)	1W	200V	400V	-	1Ω - 9.76Ω		±200	
				10Ω - 1MΩ		±100		

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 125 °C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +155°C, 5 cycles
Sulfur Test	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	<50mΩ	H2S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; ASTM-B-809

■ Storage Temperature: 15~28°C; Humidity < 80%RH

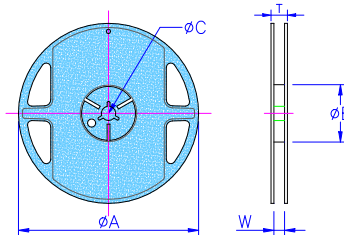
■ Shelf Life: 2 years from production date

Packaging

Reel Specifications & Packaging Quantity

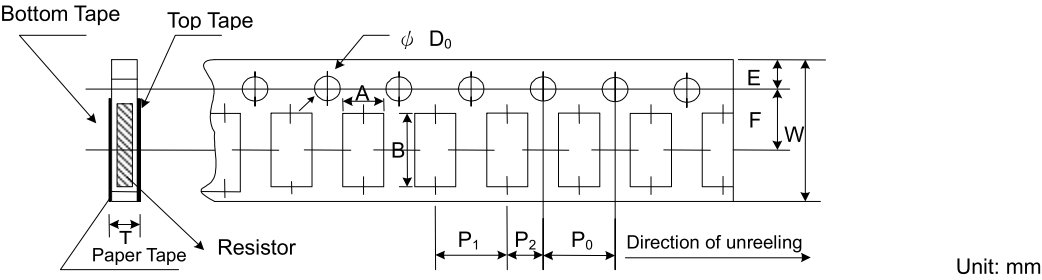
Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
AS01 AS02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AS03 AS05 AS06 AS10	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AS0A AS12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



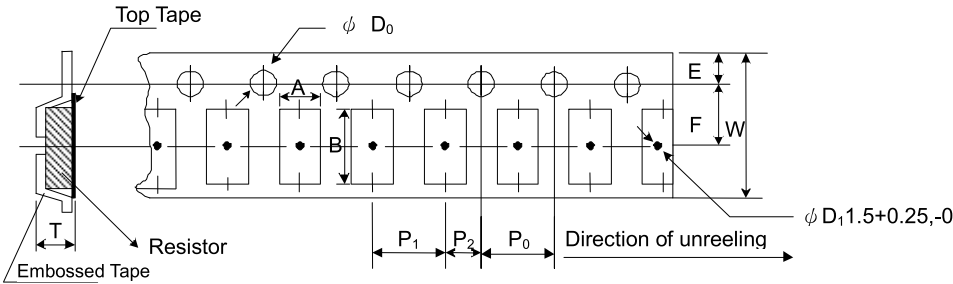
■Packaging

Paper Tape Specifications



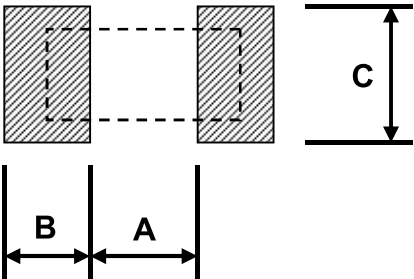
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
AS01	0.38±0.05	0.68±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
AS02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
AS03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
AS05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AS06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AS10	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications



Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
AS0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
AS12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰

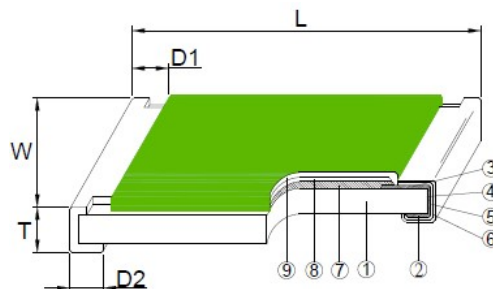
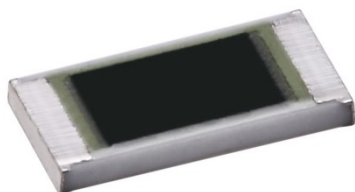
■Recommend Land Pattern



Type	A	B	C
AS01	0.30	0.25	0.30
AS02	0.50	0.45	0.60
AS03	0.90	0.60	0.90
AS05	1.20	0.70	1.30
AS06	2.00	0.90	1.60
AS10	2.00	0.90	2.80
AS0A	3.80	0.90	2.80
AS12	4.90	1.60	3.50

Trimmable Thick Film Chip Resistor—RT Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Suitable for laser fine tune
- Small size and light weight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- MSL: Level 1

Applications

- Tuner
- Sensor Control Circuit
- Camcorder
- Portable Audio
- Photo Sensor
- Portable Measuring Equipment

Dimensions

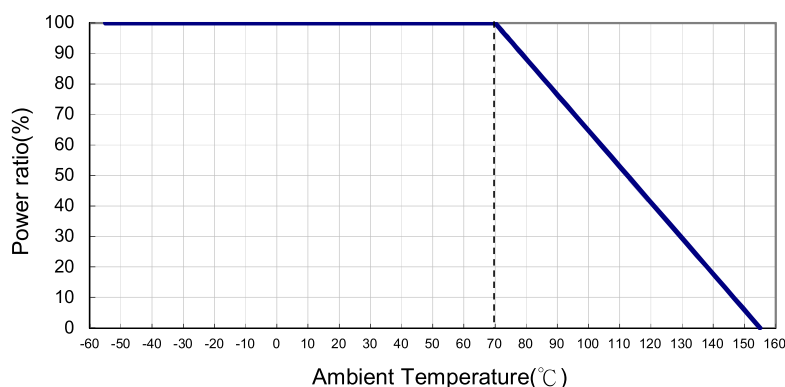
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
RT-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
RT-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
RT-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.3
RT-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
RT-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
RT-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.0
RT-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

RT-	03	N	L	7	---1R2
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	N: 0~10% P: 0~20% Q: 0~30%	L: Standard	4: 7" Reel 4Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs 9: 10" Reel 8Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs	--- 1R2: 1.2Ω --- 3K3: 3.3KΩ --- 10K: 10KΩ --- 100K: 100KΩ "-" to fill up 6 spaces

Derating Curve



■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range(E24)			TCR (PPM/°C)
					0~ -10%	0~ -20%	0~ -30%	
RT-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 10MΩ			±200
RT-03 (0603)	1/10W		50V	100V	1Ω - 9.1Ω 10Ω - 1MΩ 1.1MΩ - 10MΩ			±200 ±100 ±200
RT-05 (0805)	1/8W		150V	300V				
RT-06 (1206)	1/4W		200V	400V				
RT-10 (1210)	1/3W		200V	400V				
RT-0A (2010)	3/4W		200V	400V				
RT-12 (2512)	1W		250V	500V				

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload Voltage for 1 minute
Endurance	$\pm(2.0\%+0.10\Omega)$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(2.0\%+0.10\Omega)$	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(1.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260±5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

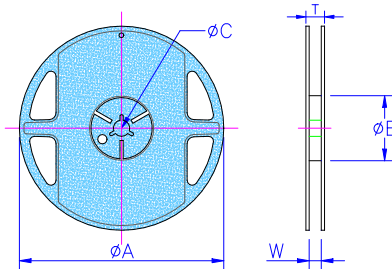
■ Shelf Life: 2 years from production date

Packaging

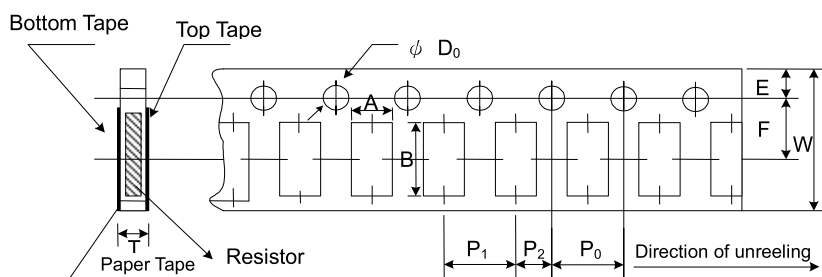
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T	
RT-02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
RT-03 RT-05 RT-06 RT-10	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
10K		8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	
20K		8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	
RT-0A RT-12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
8K		12mm	10 inch	250.0±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5	



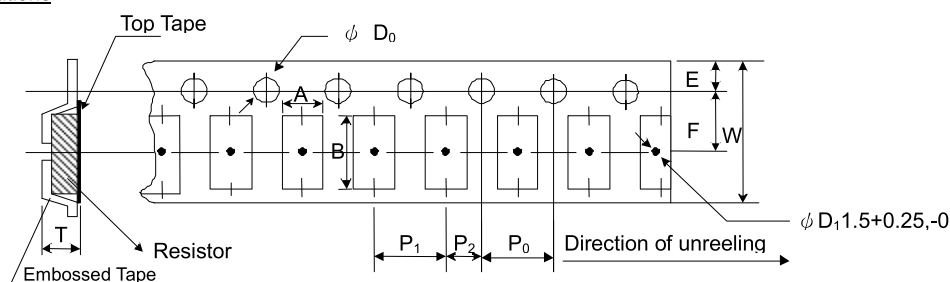
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
RT-02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
RT-03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
RT-05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RT-06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RT-10	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

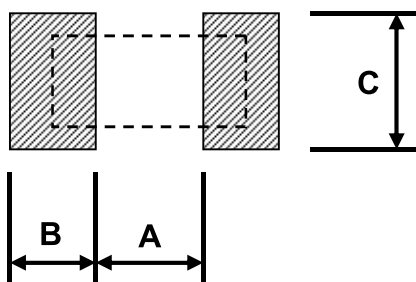


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
RT-0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
RT-12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

Recommend Land Pattern

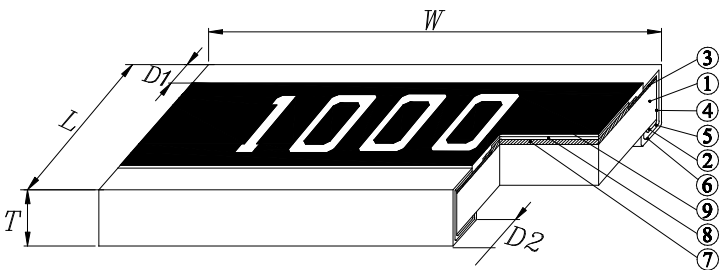
Unit: mm



Type	A	B	C
RT-02	0.50	0.45	0.60
RT-03	0.90	0.60	0.90
RT-05	1.20	0.70	1.30
RT-06	2.00	0.90	1.60
RT-10	2.00	0.90	2.80
RT-0A	3.80	0.90	2.80
RT-12	4.90	1.60	3.50

Thick Film Chip Resistor(Wide Terminal)—CRW Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- MSL: Level 1

Applications

- Telecommunication Equipments
- Radio and Tape Recorders, TV Tuners
- Digital Cameras, Watches, Pocket Calculators
- Computers, Instruments
- Medical Equipment

Dimensions

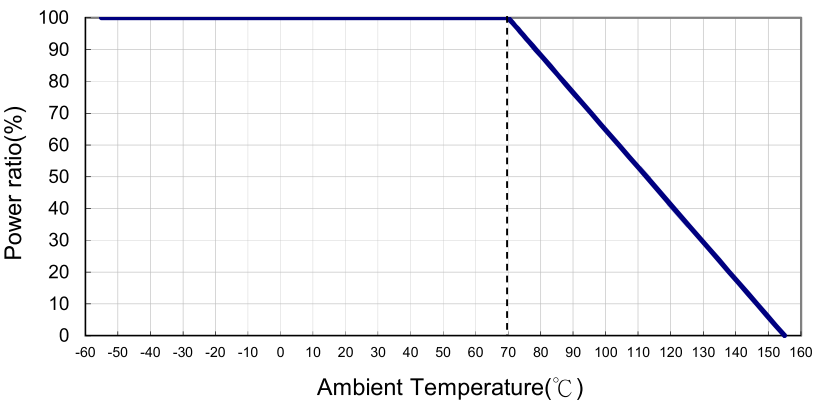
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2
CRW08	0508	1.25±0.10	2.00±0.10	0.55±0.10	0.30±0.15	0.30±0.15
CRW08(Jumper)					0.20±0.15	
CRW62	0612	1.55±0.10	3.00±0.15	0.55±0.10	0.25±0.15	0.40±0.15
CRW62(Jumper)					0.25±0.15	
CRW20	1020	2.45±0.15	5.00±0.10	0.60±0.15	0.35±0.20	0.70±0.20
CRW20(Jumper)					0.45±0.20	
CRW25	1225	3.20±0.20	6.40±0.15	0.65±0.15	0.40±0.20	1.10±0.20
CRW25(Jumper)					0.50±0.20	

Part Numbering

CRW	25	F	L	4	---10R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	08: 0508 62: 0612 20: 1020 25: 1225	D: ±0.5% F: ±1% J: ±5%	L: Standard & High Precision P: High Power	4: 7" Reel 4Kpcs 7: 7" Reel 5Kpcs	--- 20R: 20Ω --- 1R2: 1.2Ω --- 0R: 0Ω " " " to fill up 6 spaces

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
CRW08 (0508)	0.75W	-55 ~ +155°C	200V	400V	1Ω~9.76Ω			±150
					10Ω~1MΩ			±100
CRW62 (0612)	1W	-55 ~ +155°C	200V	400V	1Ω~1MΩ			±100
CRW20 (1020)	1.5W	-55 ~ +155°C	200V	400V	1Ω~9.76Ω			±150
					10Ω~1MΩ			±100
CRW25 (1225)	2W	-55 ~ +155°C	200V	400V	1Ω~29.4Ω			±200
					30Ω~1MΩ			±100

High Power Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
CRW08 (0508)	1W	-55 ~ +155°C	200V	400V	1Ω~9.76Ω			±150
	10Ω~1MΩ				±100			
	Jumper:5A				-	0Ω(<10mΩ)	-	
CRW62 (0612)	1.5W	-55 ~ +155°C	200V	400V	1Ω~1MΩ			±100
	Jumper:6A				-	0Ω(<10mΩ)	-	
CRW20 (1020)	2W	-55 ~ +155°C	200V	400V	1Ω~9.76Ω			±150
	10Ω~1MΩ				±100			
	Jumper:10A				-	0Ω(<10mΩ)	-	
CRW25 (1225)	3W	-55 ~ +155°C	200V	400V	1Ω~29.4Ω			±200
	30Ω~1MΩ				±100			
	Jumper:12A				-	0Ω(<10mΩ)	-	

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G	Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	70°C±2°C,RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(1.0%+0.10Ω)	40±2°C,90~95% R.H.,RCWV for 1000hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds

Item	Requirement	Test Method
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$260\pm5^{\circ}\text{C}$ for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	$260\pm5^{\circ}\text{C}$ for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	-55°C to $+155^{\circ}\text{C}$, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

* Not include 0Ω Jumper

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

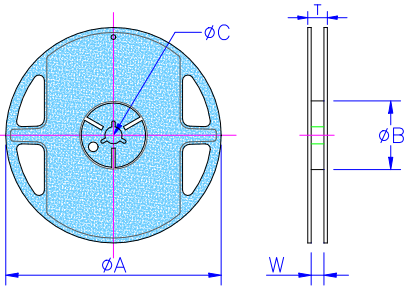
■ Shelf Life: 2 years from production date

Packaging

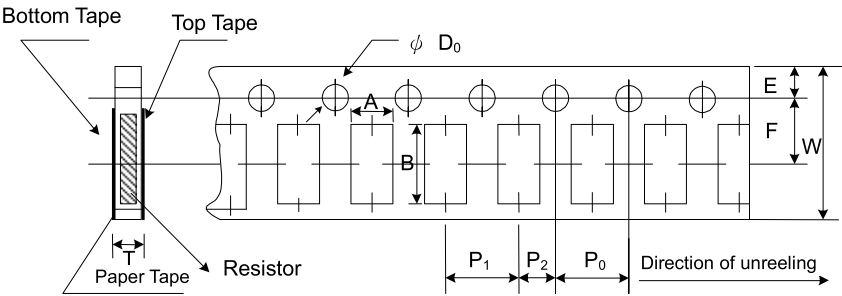
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CRW08 CRW62	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CRW20 CRW25	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5



Paper Tape Specifications

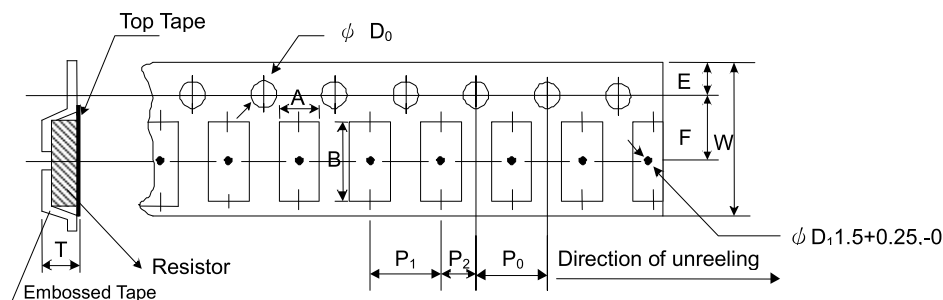


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRW08	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CRW62	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

■ Packaging

Embossed Plastic Tape Specifications

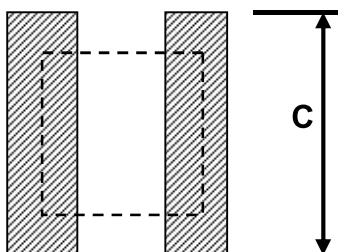


Unit: mm

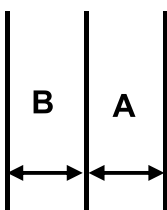
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRW20	2.80±0.15	5.40±0.20	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.55±0.10	1.00±0.20
CRW25	3.50±0.10	6.70±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.55±0.10	1.00±0.20

■ Recommend Land Pattern

Unit: mm

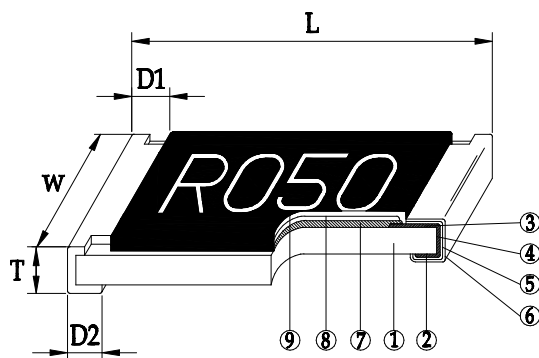


Type	A	B	C
CRW08	0.55	0.90	2.00
CRW62	0.70	0.80	3.20
CRW20	1.00	1.20	5.00
CRW25	1.00	2.00	7.00



Thin Film Current Sensing Chip Resistor—TCS Series

Construction



Features

- Thin film process
- High power rating up to 3 Watts in 2512 size
- Tight tolerance down to $\pm 0.5\%$
- Extremely low TCR down to ± 50 PPM/ $^{\circ}\text{C}$
- Resistance values from 50m to 1ohm
- High purity alumina substrate for high power dissipation
- MSL: Level 1

Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver
- Portable Devices (PDA, Cell Phone)

① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

Dimensions

Unit: mm

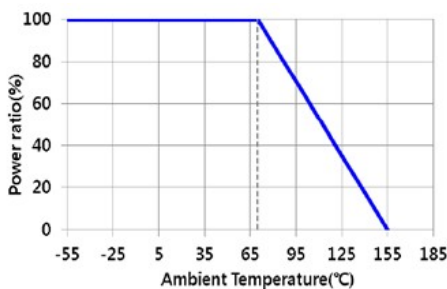
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
TCS02	0402	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.32 $\pm$ 0.10	0.25 $\pm$ 0.10	0.20 $\pm$ 0.10	0.56
TCS03	0603	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	3.1
TCS05	0805	2.00 $\pm$ 0.15	1.25 $\pm$ 0.15	0.55 $\pm$ 0.10	0.30 $\pm$ 0.20	0.40 $\pm$ 0.25	5.6
TCS06	1206	3.05 $\pm$ 0.15	1.55 $\pm$ 0.15	0.55 $\pm$ 0.10	0.50 $\pm$ 0.30	0.40 $\pm$ 0.25	12.3
TCS10	2010	5.00 $\pm$ 0.20	2.45 $\pm$ 0.15	0.60 $\pm$ 0.15	0.60 $\pm$ 0.30	0.50 $\pm$ 0.25	26.7
TCS12	2512	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.60 $\pm$ 0.10	0.60 $\pm$ 0.30	0.55 $\pm$ 0.25	49.6
TCS12 (3W)	2512	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.75 $\pm$ 0.10	0.60 $\pm$ 0.30	0.55 $\pm$ 0.25	49.6

Part Numbering

TCS	12	F	T	E		R050	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}\text{C}$)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	D: $\pm 0.5\%$ F: $\pm 1\%$	T: Taping Reel B: Bulk	D: ± 50 E: ± 100 F: ± 200	: Standard* (See Remark) R: 3W	R050: 0.05 Ω R100: 0.1 Ω 1R00: 1 Ω	: Standard N: No Marking

*Remark: Standard parts don't need for power rating code.

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)		TCR (PPM/°C)
			±0.5%	±1%	
TCS02 (0402)	1/16W	-55~+155°C	500 - 1000		±100 ±50
TCS03 (0603)	1/10W	-55~+155°C	200 - 300 301 - 1000		±100 ±50
TCS05 (0805)	1/8W		200 - 300 301 - 1000		±100 ±50
TCS06 (1206)	1/4W	-55~+155°C	—	50 - 100	±200 ±100 ±50
			101 - 300 301 - 1000		
TCS10 (2010)	3/4W	-55~+155°C	50 - 100 101 - 300 301 - 1000		±200 ±100 ±50
TCS12 (2512)	1W	-55~+155°C	50 - 100 101 - 300 301 - 1000		±200 ±100 ±50

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)		TCR (PPM/°C)
			±0.5%	±1%	
TCS12 (2512)	3W	-55~+155°C	100 - 1000		±100

Operating Voltage= $\sqrt{P \cdot R}$

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	±1%	RCWV*2.5 or Max.Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	>1000MΩ	Apply 100V _{DC} for 1 minute
Endurance	±1%	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±0.5%	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Bending Strength	As Spec.	Bending amplitude 3mm for 60 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	Apply Max. Overload Voltage for 1 minute
Thermal Shock	±0.5%	-55°C ~150°C, 100 cycles
Low Temperature Operation	±0.5%	1 hour, -65°C followed by 45 minutes of RCWV

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: MIL-STD-202, JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

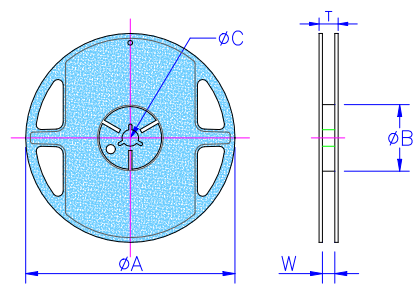
■ Shelf Life: 2 years from production date

Packaging

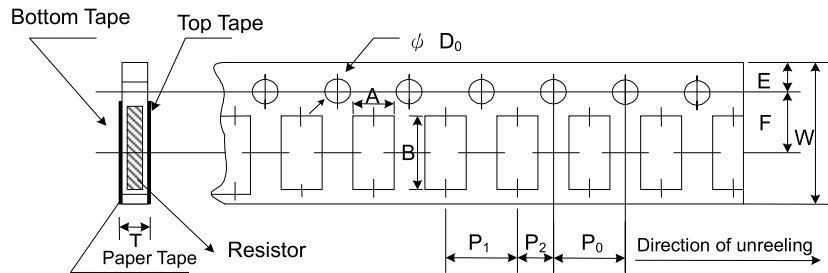
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
TCS02	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
TCS03	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS05	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS06	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS10	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
TCS12	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



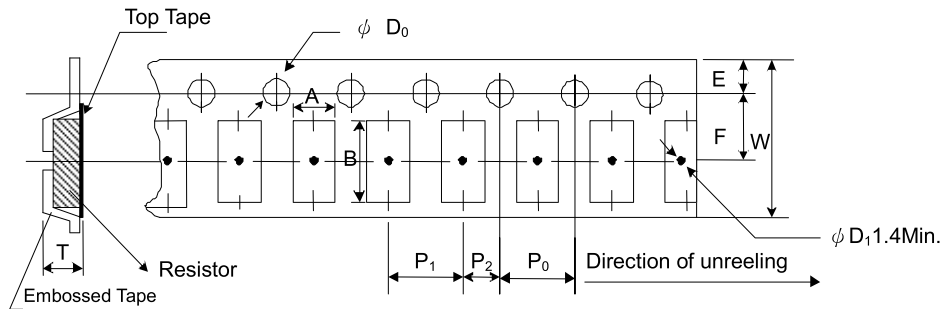
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
TCS02	0.70 ± 0.05	1.16 ± 0.05	8.00 ± 0.10	1.75 ± 0.05	3.5 ± 0.05	4.00 ± 0.10	2.00 ± 0.05	2.00 ± 0.05	1.55 ± 0.05	0.40 ± 0.03
TCS03	1.10 ± 0.05	1.90 ± 0.05	8.00 ± 0.10	1.75 ± 0.05	3.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.60 ± 0.03
TCS05	1.60 ± 0.05	2.37 ± 0.05	8.00 ± 0.10	1.75 ± 0.05	3.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.75 ± 0.05
TCS06	2.00 ± 0.05	3.55 ± 0.05	8.00 ± 0.10	1.75 ± 0.05	3.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.75 ± 0.05

Embossed Plastic Tape Specifications

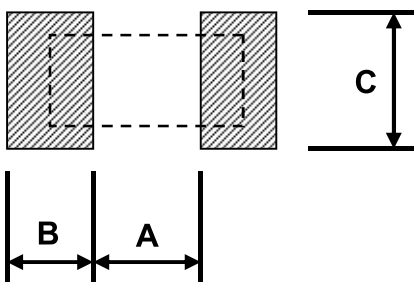


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
TCS10	2.85 ± 0.10	5.45 ± 0.10	12.0 ± 0.10	1.75 ± 0.10	5.5 ± 0.05	4.00 ± 0.05	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.00 ± 0.20
TCS12	3.40 ± 0.10	6.65 ± 0.10	12.0 ± 0.10	1.75 ± 0.10	5.5 ± 0.05	4.00 ± 0.05	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.00 ± 0.20

Recommend Land Pattern

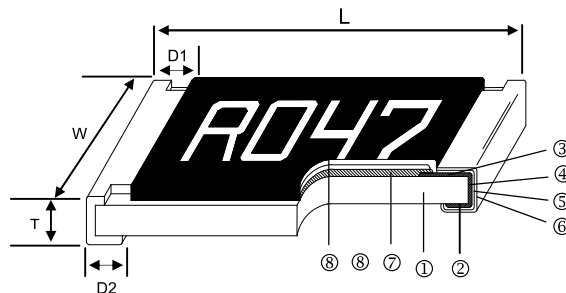
Unit: mm



Type	A	B	C
TCS02	0.50	0.50	0.60 ± 0.20
TCS03	0.80	1.00	0.90 ± 0.20
TCS05	1.00	1.00	1.35 ± 0.20
TCS06	2.00	1.15	1.70 ± 0.20
TCS10	3.60	1.40	2.50 ± 0.20
TCS12	4.90	1.60	3.10 ± 0.20

Current Sensing Chip Resistor—CS Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of ± 100 PPM/ $^{\circ}$ C
- Resistance values from 1m to 1 ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating
- RoHS Compliance
- MSL: Level 1

Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Disk Driver

Dimensions

Unit: mm

Type	Size	L	W	T	D1	D2	Weight (g) (1000pcs)
CS01	0201	0.60 $\pm$ 0.03	0.30 $\pm$ 0.03	0.23 $\pm$ 0.05	0.12 $\pm$ 0.05	0.15 $\pm$ 0.05	0.2
CS02	0402	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.32 $\pm$ 0.10	0.25 $\pm$ 0.10	0.25 $\pm$ 0.10	0.7
CS03	0603	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	2.0
CS05	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.55 $\pm$ 0.10	0.30 $\pm$ 0.20	0.40 $\pm$ 0.25	5.3
CS06	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.30	0.40 $\pm$ 0.25	8.8
CS06 (1W)	1206 (102 - 1000m Ω)	3.15 $\pm$ 0.10	1.60 $\pm$ 0.15	0.65 $\pm$ 0.10	0.80 $\pm$ 0.20	0.80 $\pm$ 0.20	12.2
CS13	1210	3.10 $\pm$ 0.10	2.60 $\pm$ 0.15	0.55 $\pm$ 0.10	0.50 $\pm$ 0.30	0.50 $\pm$ 0.25	15.5
CS10	2010	5.00 $\pm$ 0.10	2.50 $\pm$ 0.15	0.60 $\pm$ 0.15	0.60 $\pm$ 0.30	0.50 $\pm$ 0.25	27.0
CS12	2512	6.35 $\pm$ 0.10	3.10 $\pm$ 0.15	0.60 $\pm$ 0.10	0.60 $\pm$ 0.30	0.55 $\pm$ 0.25	43.1
CS12 (2W)	2512 (10 - 99m Ω)	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.74 $\pm$ 0.10	0.60 $\pm$ 0.30	0.55 $\pm$ 0.25	53.1
CS12 (2W)	2512 (100 - 1000m Ω)	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.74 $\pm$ 0.10	0.60 $\pm$ 0.30	2.10 $\pm$ 0.10	53.1
CS25	1225	3.20 $\pm$ 0.15	6.45 $\pm$ 0.15	0.90 $\pm$ 0.15	0.60 $\pm$ 0.30	0.80 $\pm$ 0.25	64.9
CS37	3720	2.00 $\pm$ 0.20	3.75 $\pm$ 0.20	0.60 $\pm$ 0.10	0.40 $\pm$ 0.20	0.40 $\pm$ 0.20	20.0
CS75	7520	2.00 $\pm$ 0.20	7.50 $\pm$ 0.30	0.60 $\pm$ 0.10	0.40 $\pm$ 0.20	0.40 $\pm$ 0.20	35.7
CS62	0612	1.55 $\pm$ 0.10	3.10 $\pm$ 0.15	0.55 $\pm$ 0.10	0.30 $\pm$ 0.15	0.45 $\pm$ 0.15	10.2
CS12 (2W) (± 100 ppm/ $^{\circ}$ C)	2512 (100m Ω)	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.74 $\pm$ 0.10	0.60 $\pm$ 0.30	0.55 $\pm$ 0.25	53.1

Part Numbering

CS	06	F	T	G	U	R100	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}$ C)	Power Rating	Resistance	Marking
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512 25: 1225 37: 3720 75: 7520 62: 0612	F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$	T: Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ± 100 F: ± 200 G: ± 300 H: ± 400 J: ± 600 K: ± 150 R: ± 1000	: Standard* (See Remark) A: 1.5W Q: 3/4W S: 2W T: 1W U: 1/2W V: 1/4W P: 1/5W W: 1/8W	R010: 0.01 Ω R100: 0.1 Ω 1R00: 1 Ω	: Standard N: No Marking

*Remark: Standard parts don't need power rating code.

■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS01 (0201)	1/20W	-55 ~ +155°C	0.70A	100 - 147 150 - 500 510 - 1000			±1000 ±600 ±300
CS02 (0402)	1/16W		1.11A	50 - 100 102 - 500 510 - 1000			±400 ±300 ±200
CS03 (0603)	1/10W		2.23A	20 - 50 51 - 100 102 - 300 301 - 1000			±600 ±400 ±300 ±200
CS05 (0805)	1/8W		2.50A	20 - 50 51 - 100 102 - 196 200 - 1000			±600 ±400 ±300 ±200
CS06 (1206)	1/4W		5.00A	10 - 20 21 - 50 51 - 91 100 - 1000			±600 ±400 ±300 ±200
CS13 (1210)	1/2W		7.07A				
CS10 (2010)	3/4W		8.66A				
CS12 (2512)	1W		10.0A				
CS25 (1225)	3W		31.6A	3 - 5 6 - 20 21 - 30 33 - 8000			±300 ±200 ±150 ±100
CS37 (3720)	1W		10.0A	10 - 18 20 - 500			±300 ±150
CS75 (7520)	2W		44.7A	—	1 - 4		±300
				5 - 10 11 - 350		±200 ±150	
CS62 (0612)	1W		10.0A	10 - 27 30 - 91 100 - 499 500 - 1000			±600 ±300 ±200 ±100

■ High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS02 (0402)	1/8W	-55 ~ +155°C	1.56A	51 - 100 102 - 500 510 - 1000			±400 ±300 ±200
CS03 (0603)	1/8W 1/5W		1.98A				
CS05 (0805)	1/4W 1/2W		2.21A				
CS06 (1206)	1/2W	-55 ~ +155°C	7.07A	10 - 20 21 - 50 51 - 91 100 - 1000			±600 ±400 ±300 ±200
CS13 (1210)	3/4W		8.66A				
CS10 (2010)	1W		10.0A				
CS12 (2512)	1.5W		12.2A				
CS12 (2512)	*2W		14.1A				
CS06 (1206)	*1W	-55 ~ +155°C	3.13A	102 - 1000			±100

*: Ultra High Power

■ CS06 1W: double side printed resistor element without marking

Low TCR Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
					±1%	±2%	±5%	
CS05 (0805)		1/8W	-55 ~ +155°C	1.11A	100 - 1000			±100
CS06 (1206)		1/4W		1.58A	100 - 1000			±100
CS13 (1210)		1/2W		2.58A	75 - 1000			±100
CS10 (2010)		3/4W		3.87A	50 - 1000			±100
CS12 (2512)		1W		7.07A	20 - 1000			±100
CS12 (2512)		*2W		6.32A	50 - 1000			±100
CS37 (3720)		1W		3.16A	100 - 500			±100
CS75 (7520)		2W		6.32A	50 - 350			±100

*: Ultra High Power

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(0.5%+0.05Ω)	RCWV*2.5 or Max.Overload Voltage whichever is lower for 5 seconds CS06 1W: 5*rated power for 5 seconds
	±(1.0%+0.05Ω) For High power rating	
Insulation Resistance	≥ 10G	Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.05Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(0.5%+0.05Ω)	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	CS06 1W: ±(1.0%+0.05Ω)	
Dry Heat	±(0.5%+0.05Ω)	at +155°C for 1000 hrs
	CS06 1W: ±(1.0%+0.05Ω)	
Bending Strength	±(1.0%+0.05Ω)	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	260±5°C for 10 seconds
	CS06 1W: ±(1.0%+0.05Ω)	
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute CS01:50V; CS02:100V; CS03:150V; CS05:300V CS06/13/10/25/37/75/62:400V; CS12:500V
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	-55°C to +155°C, 5 cycles
	CS06 1W: ±(1.0%+0.05Ω)	

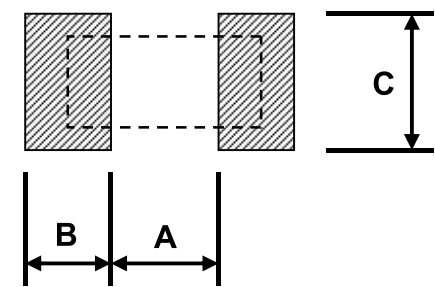
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

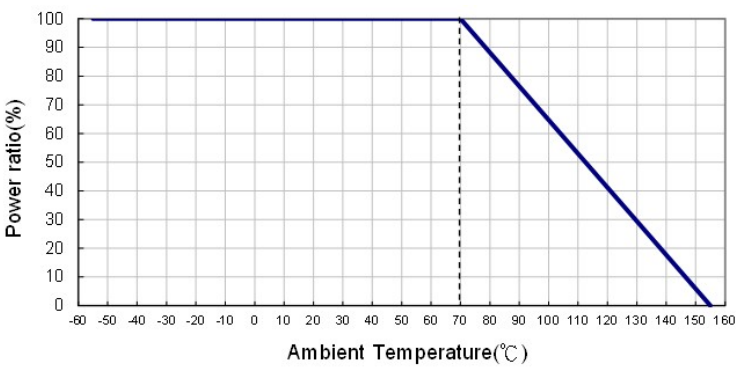
Recommend Land Pattern



Pad Layout (Except For CS12: Ultra High Power Rating Series)

Type	A	B	C
CS01	0.25	0.30	0.40±0.2
CS02	0.50	0.50	0.60±0.2
CS03	0.80	1.00	0.90±0.2
CS05	1.00	1.00	1.35±0.2
CS06	2.00	1.15	1.70±0.2
CS06 (1W)	0.90	1.70	1.70±0.2
CS13	2.00	1.15	2.50±0.2
CS10	3.60	1.40	2.50±0.2
CS12	4.90	1.60	3.20±0.2
CS25	1.20	2.00	7.00±0.2
CS37	1.00	1.80	3.90±0.2
CS75	1.00	1.80	7.60±0.2
CS62	0.60	1.00	3.20±0.2

Derating Curve



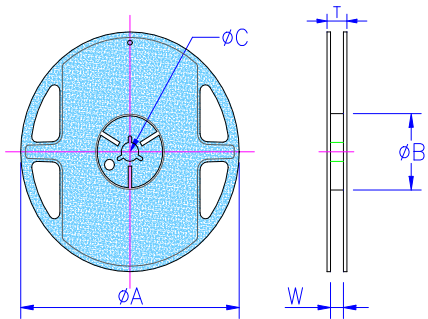
Pad Layout (For CS12: Ultra High Power Rating Series)

Unit: mm

Type	Resistance Range	A	B	C
CS12	10 - 99mΩ	4.90	1.60	3.20±0.2
CS12	100 - 1000mΩ	1.00	3.55	3.20±0.2
CS12 (±100ppm/°C)	100mΩ	4.90	1.60	3.20±0.2

Packaging

Packaging Quantity & Reel Specifications

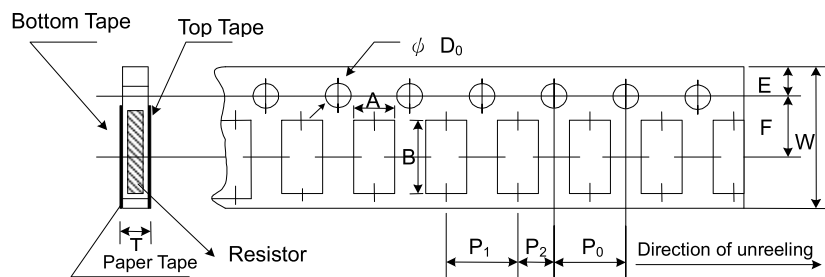


Unit: mm

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
CS01 CS02	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	10,000	-
	10 inch	254.0 ± 1.0	100.0±0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	20,000	-
	13 inch	330.0 ± 1.0	100.0±0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	40,000	-
CS03 CS05 CS06 CS13	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
	10 inch	254.0 ± 1.0	100.0 ± 0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	10,000	-
	13 inch	330.0 ± 1.0	100.0 ± 0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	20,000	-
CS10 CS12	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
	10 inch	250.0 ± 1.0	62.0 ± 0.5	13.0 ± 0.5	12.5 ± 0.5	16.5 ± 0.5	-	8,000
CS12 (2W)	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS25	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS37	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS75	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	17.5 ± 1.0	19.5 ± 1.0	-	2,000
CS62	7 inch	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-

Packaging

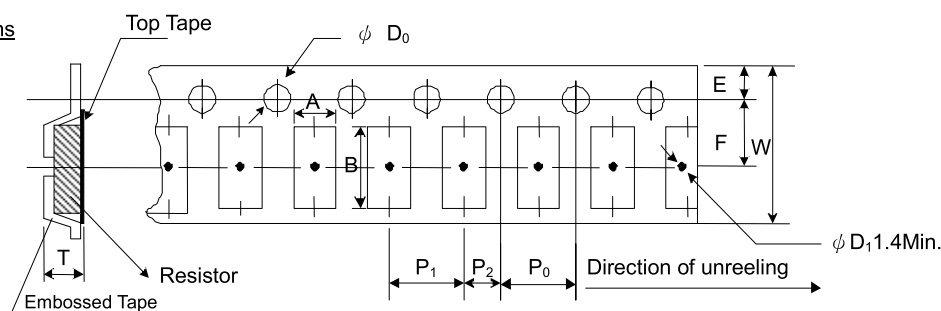
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CS01	0.38±0.05	0.68±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CS02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CS03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CS05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS13	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS62	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CS10	2.80±0.10	5.40±0.20	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS12	3.50±0.10	6.70±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS12 (2W)	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CS25	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CS37	2.50±0.20	4.45±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.20±0.20
CS75	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.10	7.80±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.20±0.20

Marking

No Marking for 0201/0402/1206(1W)

1%, 5% for 0805/1206/1210/2010/2512/1225/3720/7520/0612 : 4 digits marking

Example:

Resistance	47mΩ	75mΩ	15mΩ	750mΩ	820mΩ
Marking	R047	R075	R015	R750	R820

Marking for 0603

E24 Series (<100mΩ): 3 digits marking with under-line

E24 Series (≥ 100mΩ): 3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ

E96 Series (≥ 100mΩ): 3 digits marking with under-line in E96 (non-including E24 series)



3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ

3 digits marking for E96: 243=243mΩ; 511=511mΩ

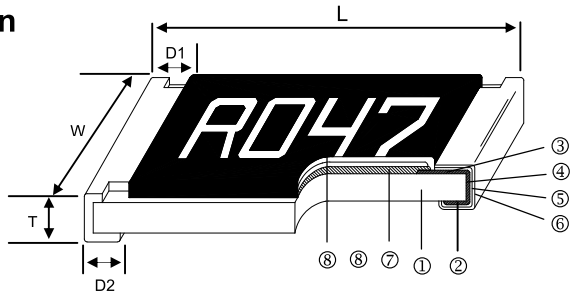
Example:

Resistance	1.000Ω	0.100Ω	0.010Ω	0.102Ω	0.024Ω
Marking	1R0	R10	R01	<u>102</u>	<u>024</u>

Current Sensing Chip Resistor—CSN Series



Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	

Features

- Resistance values from 10m to 1ohm
- Low TCR
- High purity alumina substrate for high power dissipation
- RoHS Compliance
- MSL: Level 1

Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Disk Driver

Dimensions

Unit: mm

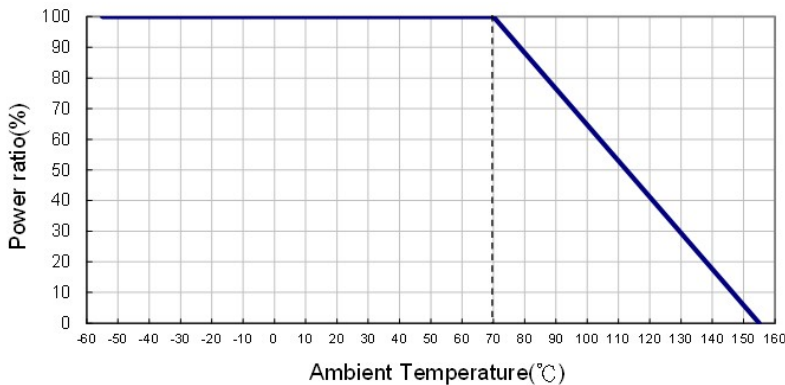
Type	Size	L	W	T	D1	D2	Weight (g) (1000pcs)
CSN05	0805	2.00±0.10	1.25±0.10	0.55±0.10	0.30±0.20	0.40±0.25	4.6
CSN06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.30	0.40±0.25	8.7
CSN13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.30	0.50±0.25	16.0
CSN10	2010	5.00±0.10	2.50±0.15	0.60±0.15	0.60±0.30	0.50±0.25	23.7
CSN12	2512	6.35±0.10	3.10±0.15	0.60±0.10	0.60±0.30	0.55±0.25	40.0
CSN12 (2W)	2512	6.35±0.10	3.10±0.15	0.74±0.10	0.60±0.30	2.10±0.10	53.6
CSN12 (2W)	*2512 (20-45mΩ)	6.45±0.10	3.25±0.15	0.85±0.10	0.60±0.30	0.60±0.30	65.3

*: Low TCR

Part Numbering

CSN	06	F	T	F	V	R100
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	F: ±1% G: ±2% J: ±5%	T: Taping Reel	D: ±50 W: ±75 E: ±100 F: ±200 G: ±300 H: ±400 J: ±600	A: 1.5W T: 1W S: 2W Q: 3/4W U: 1/2W V: 1/4W W: 1/8W	R051: 0.051Ω R100: 0.1Ω 1R00: 1Ω

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1% ^{*1}	±2%	±5%	
CSN05 (0805)	1/8W	-55 ~ +155°C	2.5A	20 - 50 51 - 100 102 - 196 200 - 1000	20 - 50 51 - 100 110 - 180 200 - 1000		±600 ±400 ±300 ±200
CSN06 (1206)	1/4W	-55 ~ +155°C	5.0A	10 - 20 22 - 50 51 - 91 100 - 1000	10 - 20 22 - 50 51 - 91 100 - 1000		±600 ±400 ±300 ±200
CSN13 (1210)	1/2W		7.07A				
CSN10 (2010)	3/4W		8.66A				
CSN12 (2512)	1W		10.0A				

High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1% ^{*1}	±2%	±5%	
CSN05 (0805)	1/4W	-55 ~ +155°C	3.5A	20 - 50 51 - 100 102 - 196 200 - 1000	20 - 50 51 - 100 110 - 180 200 - 1000		±600 ±400 ±300 ±200
CSN06 (1206)	1/2W		7.07A	10 - 20 22 - 50 51 - 91 100 - 1000	10 - 20 22 - 50 51 - 91 100 - 1000		±600 ±400 ±300 ±200
CSN13 (1210)	3/4W		8.66A				
CSN10 (2010)	1W		10.0A				
CSN12 (2512)	1.5W		12.2A				
CSN12 (2512)	*2W		14.1A				

High Power Rating & Low TCR Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1% ^{*1}	±2%	±5%	
CSN05 (0805)	1/4W	-55 ~ +155°C	1.58A	100 - 196 200 - 499 500 - 1000	100 - 180 200 - 470 500 - 1000		±100 ±75 ±50
CSN06 (1206)	1/2W		2.58A	75 - 100 102 - 147 150 - 1000	75 - 100 110 - 140 150 - 1000		±100 ±75 ±50
CSN06 (1206)	*1W		3.65A				
CSN13 (1210)	3/4W		3.87A	50 - 147 150 - 1000	50 - 140 150 - 1000		±75 ±50
CSN10 (2010)	1W		4.47A				
CSN12 (2512)	1.5W		5.47A				
CSN12 (2512)	*2W		10A	20 - 47 50 - 147 150 - 1000	20 - 47 50 - 140 150 - 1000		±100 ±75 ±50

*: Ultra High Power

*1: The nominal resistance value for less than 100mΩ is in E-24 series, other requirement of resistance value please contact our sales office.

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature Low TCR: At 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(0.5\%+0.05\Omega)$	RCWV*2.5 or Max.Overload Voltage whichever is lower for 5 seconds
	$\pm(1.0\%+0.05\Omega)$ For $\leq 50mR$ & all High power · Ultra High Power	
Insulation Resistance	$\geq 10G$	Max. Overload Voltage for 1 minute
Endurance	$\pm(1.0\%+0.05\Omega)$	70 $\pm$ 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	$\pm(2.0\%+0.05\Omega)$ For $\leq 50mR$ & all High power · Ultra High Power	
Damp Heat with Load	$\pm(0.5\%+0.05\Omega)$	40 $\pm$ 2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	$\pm(1.0\%+0.05\Omega)$ For $\leq 50m\Omega$ & all High power · Ultra High Power	
Dry Heat	$\pm(1.0\%+0.05\Omega)$	at +155°C for 1000 hrs
	$\pm(2.0\%+0.05\Omega)$ For $\leq 50m\Omega$ & all High power · Ultra High Power	
Bending Strength	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute CSN05:300V CSN06/13/10:400V; CSN12:500V
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 $\pm$ 5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

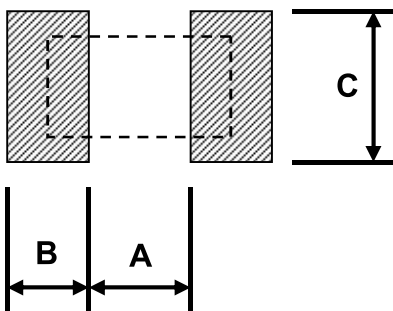
■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

■ Recommend Land Pattern

Pad Layout (Except For CSN12: Ultra High Power Rating & Low TCR Series)

Unit: mm



Type	A	B	C
CSN05	1.00	1.00	1.35 $\pm$ 0.2
CSN06	2.00	1.15	1.70 $\pm$ 0.2
CSN13	2.00	1.15	2.50 $\pm$ 0.2
CSN10	3.60	1.40	2.50 $\pm$ 0.2
CSN12	4.90	1.60	3.20 $\pm$ 0.2
CSN12 (2W)	1.00	3.55	3.20 $\pm$ 0.2

Pad Layout (For CSN12: Ultra High Power Rating & Low TCR Series)

Unit: mm

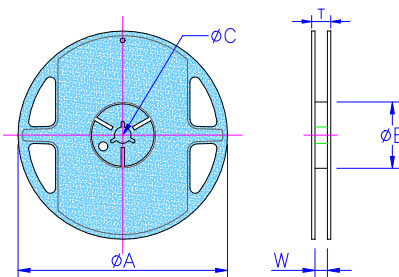
Type	Resistance Range	A	B	C
CSN12 (2W)	46-1000m Ω	1.00	3.55	3.20 $\pm$ 0.2
	20-45m Ω	4.90	1.60	3.20 $\pm$ 0.2

Packaging

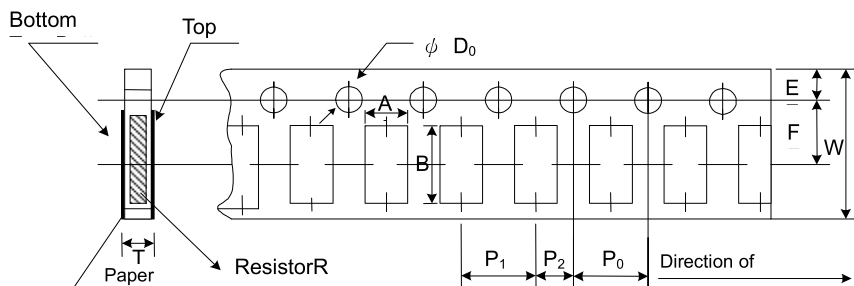
Packaging Quantity & Reel Specifications

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CSN05 CSN06 CSN13	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CSN10 CSN12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
CSN12 (2W)	Embossed	2K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5



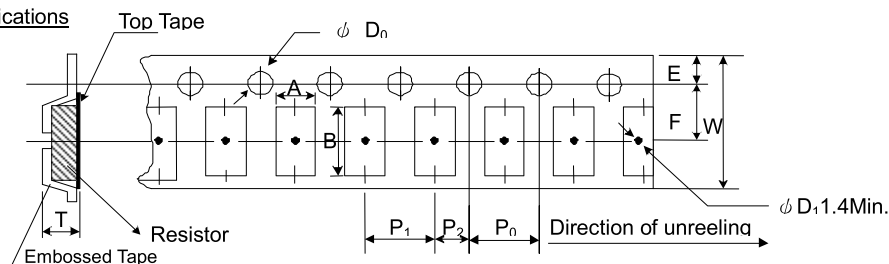
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CSN05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CSN06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CSN13	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CSN10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSN12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSN12 (2W)	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
*CSN12 (2W) (20-45mΩ)	3.55±0.10	6.75±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.45±0.20

*: Low TCR

Marking

1%, 5% for 0805/1206/1210/2010/2512 : 4 digits marking

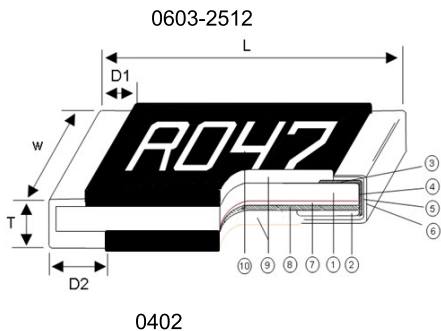
Example:

Resistance	10mΩ	51mΩ	75mΩ	100mΩ	549mΩ
Marking	R010	R051	R075	R100	R549

Current Sensing Metal Chip Resistor— CSM Series

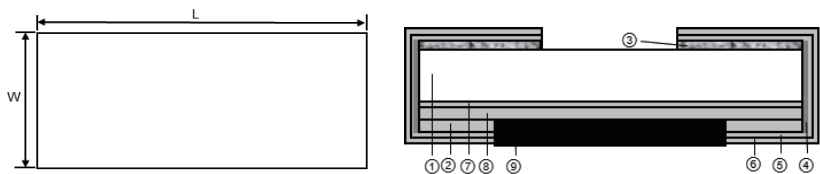


Construction



Features

- SMD Type designed for automatic insertion (CSM02 : The soldering side has a black mark on the product surface .)
- High power rating in small size
- Low resistance resistor for current detection
- Metal foil construction ensures high reliability and performance with very low and stable TCR
- Designed for current sense circuits in power electronic systems
- Pb-Free to meet RoHS requirements
- AEC-Q200 Qualified
- Inherently Anti-Sulfur
- MSL: Level 1



①	Alumina Substrate	⑤	Barrier Layer	⑨	Primary Overcoat
②	Bottom Electrode	⑥	External Electrode	⑩	Marking
③	Top Electrode	⑦	Adhesive		
④	Edge Electrode	⑧	Resistor Layer		

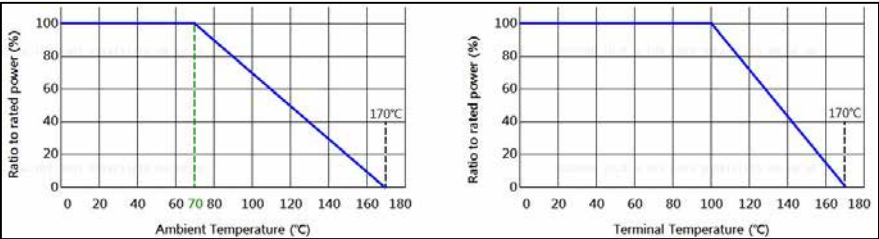
Applications

- Automotive
- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor

Part Numbering

CSM	06	F	T	E	U	R100	
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	D: ±0.5% F: ±1% G: ±2% J: ±5%	T: Taping Reel	D: ±50 E: ±100 K: ±150 F: ±200 G: ±300	W : 1/8W V : 1/4W U: 1/2W Q: 3/4W T: 1W A: 1.5W S: 2W	R003: 0.003Ω R010: 0.01Ω R100: 0.1Ω	Marking for E96/E24

Derating Curve



■ Dimensions

Unit: mm

Type	Size (Inch)	Power Rating	Resistance Range (mΩ)	L	W	T	D1	D2	Weight (g) (1000pcs)
CSM02	0402	1/4W	3 - 4	1.05±0.10	0.55±0.10	0.45±0.10	-	0.40±0.20	1.09
			5 - 9	1.05±0.10	0.55±0.10	0.45±0.10	-	0.35±0.15	1.09
			10 - 18	1.05±0.10	0.55±0.10	0.45±0.10	-	0.30±0.15	1.11
			19 - 50	1.05±0.10	0.55±0.10	0.40±0.10	-	0.30±0.15	0.93
CSM03	0603	1/8W	10 - 18	1.60±0.15	0.85±0.15	0.45±0.15	0.30±0.25	0.35±0.25	2.63
			19 - 100	1.60±0.15	0.85±0.15	0.40±0.15	0.30±0.25	0.35±0.25	2.53
		1/2W	3 - 4	1.60±0.15	0.85±0.15	0.45±0.15	0.30±0.25	0.60±0.25	2.50
			5 - 9	1.60±0.15	0.85±0.15	0.45±0.15	0.30±0.25	0.55±0.25	2.50
			10 - 18	1.60±0.15	0.85±0.15	0.45±0.15	0.30±0.25	0.35±0.25	2.63
			19 - 100	1.60±0.15	0.85±0.15	0.40±0.15	0.30±0.25	0.35±0.25	2.53
			10 - 18	2.05±0.15	1.25±0.15	0.60±0.15	0.30±0.25	0.35±0.25	6.24
			19 - 100	2.05±0.15	1.25±0.15	0.60±0.15	0.30±0.25	0.35±0.25	5.63
CSM05	0805	1/4W	3 - 9	2.05±0.15	1.25±0.15	0.60±0.15	0.30±0.25	0.60±0.25	6.37
			10 - 18	2.05±0.15	1.25±0.15	0.60±0.15	0.30±0.25	0.35±0.25	6.24
		3/4W	19 - 100	2.05±0.15	1.25±0.15	0.60±0.15	0.30±0.25	0.35±0.25	5.63
			10 - 18	2.05±0.15	1.25±0.15	0.60±0.15	0.30±0.25	0.35±0.25	5.63
CSM06	1206	1/2W	10 - 18	3.10±0.15	1.55±0.15	0.60±0.15	0.50±0.25	0.60±0.25	13.30
			19 - 100	3.10±0.15	1.55±0.15	0.60±0.15	0.50±0.25	0.60±0.25	11.63
		1W	3 - 4	3.10±0.15	1.55±0.15	0.60±0.15	0.50±0.25	1.10±0.25	12.14
			5 - 9	3.10±0.15	1.55±0.15	0.60±0.15	0.50±0.25	1.00±0.25	12.14
			10 - 18	3.10±0.15	1.55±0.15	0.60±0.15	0.50±0.25	0.60±0.25	13.30
			19 - 100	3.10±0.15	1.55±0.15	0.60±0.15	0.50±0.25	0.60±0.25	11.63
			10 - 18	5.00±0.20	2.50±0.20	0.60±0.15	0.60±0.30	0.80±0.30	31.42
			19 - 100	5.00±0.20	2.50±0.20	0.60±0.15	0.60±0.30	0.80±0.30	28.35
CSM10	2010	3/4W	3 - 4	5.00±0.20	2.50±0.20	0.60±0.15	0.60±0.30	1.80±0.30	28.59
			5 - 9	5.00±0.20	2.50±0.20	0.60±0.15	0.60±0.30	1.55±0.30	28.59
		1.5W	10 - 18	5.00±0.20	2.50±0.20	0.60±0.15	0.60±0.30	0.80±0.30	31.42
			19 - 100	5.00±0.20	2.50±0.20	0.60±0.15	0.60±0.30	0.80±0.30	28.35
			10 - 18	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	0.80±0.30	45.21
			19 - 100	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	0.90±0.30	43.49
			3 - 4	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	2.10±0.30	48.30
			5 - 9	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	1.80±0.30	48.30
CSM12	2512	1W	10 - 18	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	0.80±0.30	45.21
			19 - 100	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	0.80±0.30	43.49
		2W	3 - 4	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	2.10±0.30	48.30
			5 - 9	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	1.80±0.30	48.30
			10 - 18	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	0.80±0.30	45.21
			19 - 100	6.40±0.20	3.10±0.20	0.60±0.15	0.70±0.30	0.80±0.30	43.49

■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Overload Current	Resistance Range (mΩ)				TCR (PPM/°C)
				±0.5%	±1%	±2%	±5%	
CSM03 (0603)	1/8W	-55 ~ +170°C	7.9A	-	10 – 19			±100
			5.6A		20 – 100			±50 ±100
CSM05 (0805)	1/4W		11.2A	-	10 – 19			±100
			7.9A	30 – 100	20 – 100			±50 ±100
CSM06 (1206)	1/2W		15.8A	-	10 – 19			±100
			11.2A	30 – 100	20 – 100			±50 ±100
CSM10 (2010)	3/4W		19.4A	-	10 – 19			±100
			13.7A	30 – 100	20 – 100			±50 ±100
CSM12 (2512)	1W		20A	-	10 – 19			±100
			14.1A	30 – 100	20 – 100			±50 ±100

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P / R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

High Power Rating Electrical Specifications

Type\Item	Power Rating at 70°C	Operating Temp. Range	Max. Overload Current	Resistance Range (mΩ)				TCR (PPM/°C)
				±0.5%	±1%	±2%	±5%	
CSM02 (0402)	1/4W	-55 ~ +170°C	20.4A	-	3 - 4		±300	
			15.8A	-	5 - 6		±300	
			13.4A	-	7 - 9		±200	
			11.2A	30 - 50	10 - 50		±100	
CSM03 (0603)	1/2W		28.9A	-	3 - 4		±200	
			22.7A	-	5 - 6		±150	
			18.9A	-	7 - 9		±100	
			15.8A	30 - 100	10 - 100		±100	
CSM05 (0805)	3/4W		35.4A	-	3 - 4		±150	
			27.4A	-	5 - 9		±100	
			19.4A	30 - 100	10 - 100		±50	
			40.8A	-	3 - 4		±100	
CSM06 (1206)	1W		31.6A	-	5 - 9		±100	
			22.4A	30 - 100	10 - 100		±50	
			50.0A	-	3 - 4		±100	
			38.7A	-	5 - 9		±100	
CSM10 (2010)	1.5W		27.4A	30 - 100	10 - 100		±50	
			51.6A	-	3 - 4		±100	
			40.0A	-	5 - 9		±100	
			28.3A	30 - 100	10 - 100		±50	
CSM12 (2512)	2W	51.6A	-	3 - 4		±100		
		40.0A	-	5 - 9		±100		
		28.3A	30 - 100	10 - 100		±50		

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
	Standard	High Power	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	$\Delta R: \pm(0.5\% + 0.0005\Omega)$	$\Delta R: \pm(1\% + 0.0005\Omega)$	2512 size: 4* Rated Power for 5 seconds. Other sizes: 5* Rated Power for 5 seconds.
Insulation Resistance	$\geq 1000M\Omega$		Max. Overload Voltage for 1 minute
Operational Life	$\Delta R \leq \pm 1\%R$		Condition D Steady State $T_A = 125^\circ\text{C}$ at derated power. Measurement at 24 ± 4 hours after test conclusion
Biased Humidity	$\Delta R: \pm(1\% + 0.0005\Omega)$		85°C/85RH., 1000 hrs, apply 10% of operating power (current) or limiting element current whichever is lower
High Temperature Exposure	$\Delta R: \pm(0.5\% + 0.0005\Omega)$	$\Delta R: \pm(1\% + 0.0005\Omega)$	at +155°C for 1000 hrs
Temperature Cycling	$\Delta R: \pm(1\% + 0.0005\Omega)$		-55°C to +125°C, 1000 cycles
Bending Strength (Board Flex)	$\Delta R: \pm(1\% + 0.0005\Omega)$		Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R: \pm(0.5\% + 0.0005\Omega)$	$\Delta R: \pm(1\% + 0.0005\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Resistance to solvents	Marking Unsmearred		Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	$\Delta R: \pm(1\% + 0.0005\Omega)$		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

Item	Requirement		Test Method
	Standard	High Power	
Vibration	$\Delta R: \pm(1\%+0.0005\Omega)$		5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\Delta R: \pm(1\%+0.0005\Omega)$		Human body model 0402 size: 1KV Other sizes: 2KV
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.
Terminal strength	No broken		Force of 1.8kg for 60 seconds
Flame Retardance	No flame		Subjected to voltage from 9.0 to 32.0 VDC(current clamped up to 500A), and each voltage level shall be increased in 1.0 VDC for one hour minimum
Sulfur Test	$\Delta R: \pm(1\%+0.0005\Omega)$		105 $\pm$ 2 °C no power rating for 1000 hrs
External Visual	As Spec		Electrical test not required. Inspect device construction, marking and workmanship.
Physical Dimension	As Spec		Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, JIS-C 5201-1, AEC-Q200, MIL-STD-202, UL-94, JEDS22, ASTM-B-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

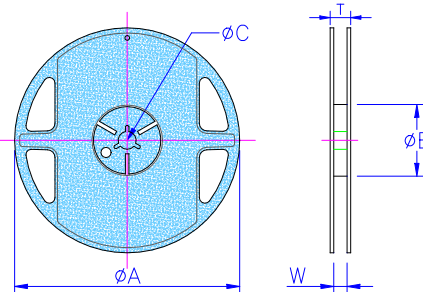
Shelf Life: 2 years from production date

Packaging

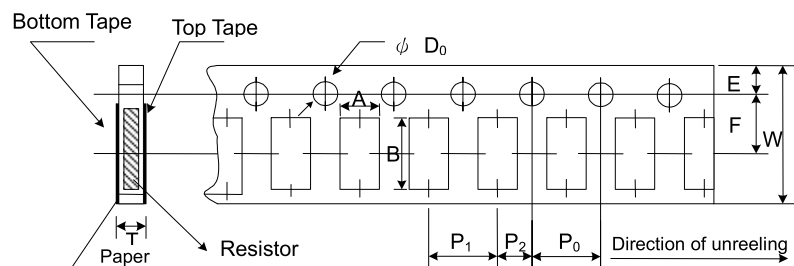
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
CSM02	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 0.1	11.5 $\pm$ 1.0	10,000	-
CSM03	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 0.1	11.5 $\pm$ 1.0	5,000	-
CSM05	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 0.1	11.5 $\pm$ 1.0	5,000	-
CSM06	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 0.1	11.5 $\pm$ 1.0	5,000	-
CSM10	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	13.5 $\pm$ 1.0	15.5 $\pm$ 1.0	-	4,000
CSM12	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	13.5 $\pm$ 1.0	15.5 $\pm$ 1.0	-	4,000



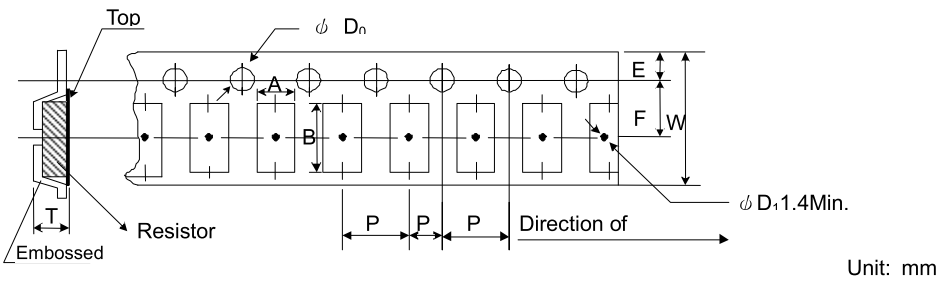
Paper Tape Specifications



Unit: mm

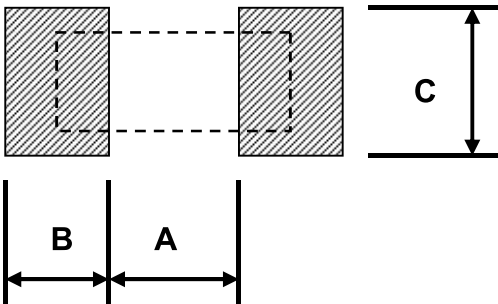
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CSM02	0.66 $\pm$ 0.06	1.18 $\pm$ 0.06	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.60 $\pm$ 0.06
CSM03	1.10 $\pm$ 0.10	1.85 $\pm$ 0.10	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.60 $\pm$ 0.05
CSM05	1.60 $\pm$ 0.10	2.35 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.95 $\pm$ 0.05
CSM06	1.90 $\pm$ 0.10	3.50 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.95 $\pm$ 0.05

Embossed Plastic Tape Specifications



Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CSM10	2.80±0.10	5.50±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSM12	3.50±0.10	6.70±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

Recommend Land Pattern

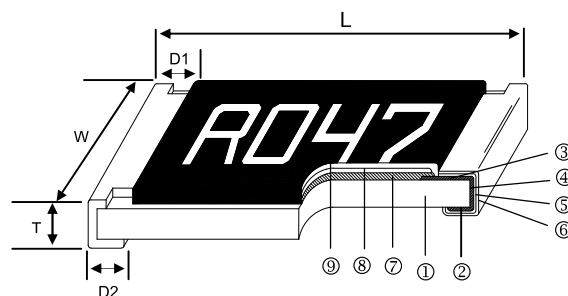


Pad Layout						Unit: mm	
Type	Resistance Range	A	B	C	t (μm)		
CSM02	3-50mΩ	0.50	0.50	0.60	35		
CSM03	3-4mΩ	0.50	1.00	0.90	35		
	5-9mΩ	0.40	1.20	0.90	35		
CSM05	10-100mΩ	0.70	1.05	0.90	35		
	3-4mΩ	0.80	1.30	1.30	70		
	5-9mΩ	0.80	1.10	1.35	70		
CSM06	10-100mΩ	1.00	1.00	1.35	70		
	3-4mΩ	1.50	1.40	1.70	105		
	5-9mΩ	0.90	1.70	1.70	105		
CSM10	10-100mΩ	1.50	1.40	1.70	105		
	3-4mΩ	2.70	1.80	2.90	105		
	5-9mΩ	1.70	2.35	2.50	105		
CSM12	10-100mΩ	2.80	1.80	2.50	105		
	3-4mΩ	3.80	2.10	3.40	105		
	5-9mΩ	2.30	2.90	3.20	105		
CSM12	10-100mΩ	3.60	2.25	3.20	105		

t: copper foil minimum thickness of PCB

Current Sensing Thick Film Chip Resistor—RS Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Low inductance
- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Reduced size of final equipment reliability
- RoHS Compliance
- MSL: Level 1

Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Application
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Disk Driver

Dimensions

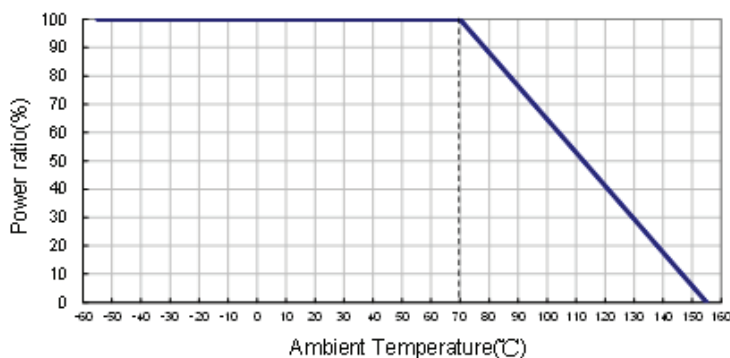
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
RS-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
RS-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
RS-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
RS-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
RS-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
RS-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
RS-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

RS-	03	F	L	7	- 0R047
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	F: ±1% J: ±5%	L: Standard P: High Power	4: 7" Reel 4Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs 9: 10" Reel 8Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs	- 0R047: 0.047Ω - - - 0R1: 0.1Ω "-" to fill up 6 spaces

Derating Curve



■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
RS-02 (0402)	1/16W	-55~+155°C	1.11A	50 - 91 100 - 976		±800 ±500
RS-03 (0603)	1/10W	-55~+155°C	2.23A	20 - 47 50 - 91 100 - 976		±1200 ±800 ±500
RS-05 (0805)	1/8W	-55~+155°C	3.53A	10 - 18 20 - 47	50 - 91 100 - 976	±1500 ±1200 ±800 ±500
RS-06 (1206)	1/4W		5.00A	50 - 91 100 - 976		
RS-10 (1210)	1/3W	-55~+155°C	5.77A	10 - 18 20 - 91 100 - 976		±1500 ±800 ±500
RS-0A (2010)	3/4W		8.66A			
RS-12 (2512)	1W		10.0A			

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
RS-02 (0402)	1/10W	-55~+155°C	1.40A	50 - 91 100 - 976		±800 ±500
RS-03 (0603)	1/8W	-55~+155°C	2.50A	20 - 47 50 - 91 100 - 976		±1200 ±800 ±500
RS-05 (0805)	1/4W	-55~+155°C	5.00A	10 - 18 20 - 47	50 - 91 100 - 976	±1500 ±1200 ±800 ±500
RS-06 (1206)	1/2W		7.07A	50 - 91 100 - 976		
RS-10 (1210)	1/2W	-55~+155°C	7.07A	10 - 18 20 - 91 100 - 976		±1500 ±800 ±500
RS-0A (2010)	1W		10.0A			
RS-12 (2512)	2W		14.1A			

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute RS-02:100V; RS-03:150V; RS-05:300V RS-06/10/0A:400V; RS-12:500V
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%		260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1**

■ **Storage Temperature: 15~28°C; Humidity < 80%RH**

■ **Shelf Life: 2 years from production date**

Marking

No Marking for 0402

1%, 5% for 0805/1206/1210/2010/2512: 4 digits marking

Example:

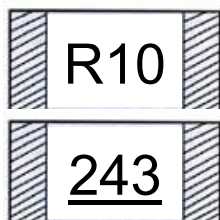
Resistance	47mΩ	75mΩ	15mΩ	750mΩ	820mΩ
Marking	R047	R075	R015	R750	R820

Marking for 0603

E24 Series (<100mΩ): 3 digits marking with under-line

E24 Series (≥ 100mΩ): 3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ

E96 Series (≥ 100mΩ): 3 digits marking with under-line in E96 (non-including E24 series)



3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ

3 digits marking for E96: 243=243mΩ; 511=511mΩ

Example:

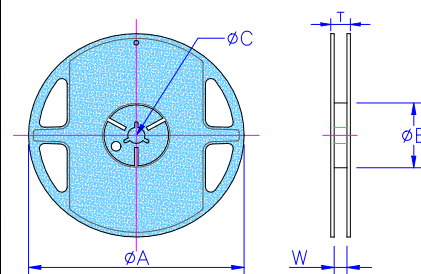
Resistance	1.000Ω	0.100Ω	0.010Ω	0.102Ω	0.024Ω
Marking	1R0	R10	R01	<u>102</u>	<u>024</u>

Packaging

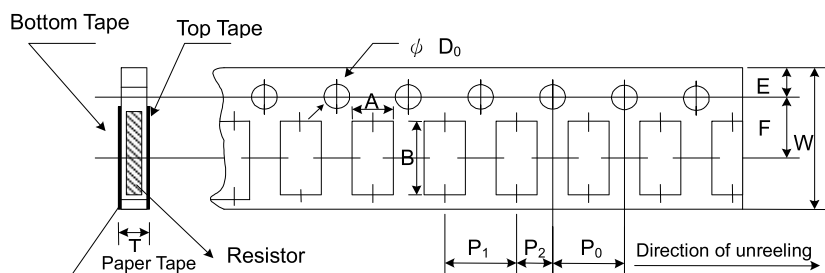
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T	
RS-02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
RS-03 RS-05 RS-06 RS-10	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
10K		8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	
20K		8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	
RS-0A RS-12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
8K		12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5	



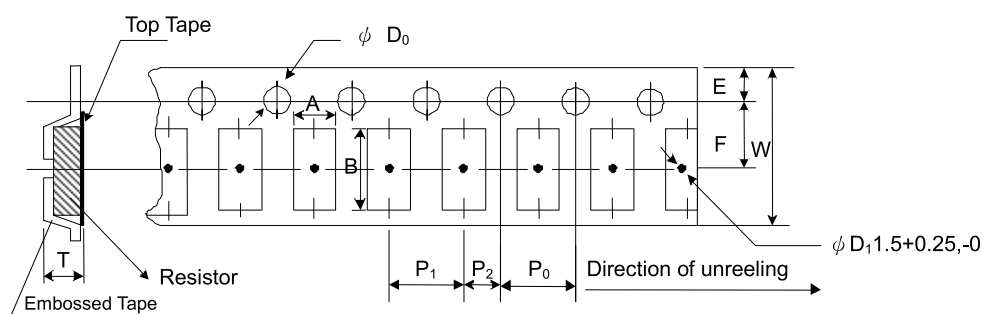
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
RS-02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
RS-03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
RS-05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RS-06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RS-10	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

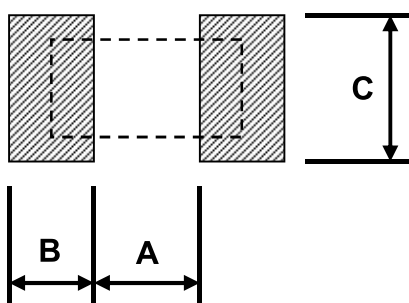


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
RS-0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
RS-12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

Recommend Land Pattern

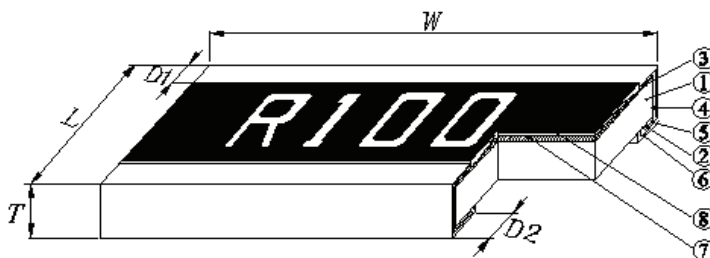
Unit: mm



Type	A	B	C
RS-02	0.50	0.45	0.60
RS-03	0.90	0.60	0.90
RS-05	1.20	0.70	1.30
RS-06	2.00	0.90	1.60
RS-10	2.00	0.90	2.80
RS-0A	3.80	0.90	2.80
RS-12	3.80	1.60	3.50

Current Sensing Chip Resistor (Wide Terminal) – CSW Series

Construction



Features

- Highly reliable multilayer electrode construction
- Reduced size of final equipment reliability
- 3 Watts power rating in 1 Watt size, 1225 package
- Resistance values from 10m to 510m ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating
- RoHS Compliance
- MSL: Level 1

Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Disk Driver
- Medical Equipment

Dimensions

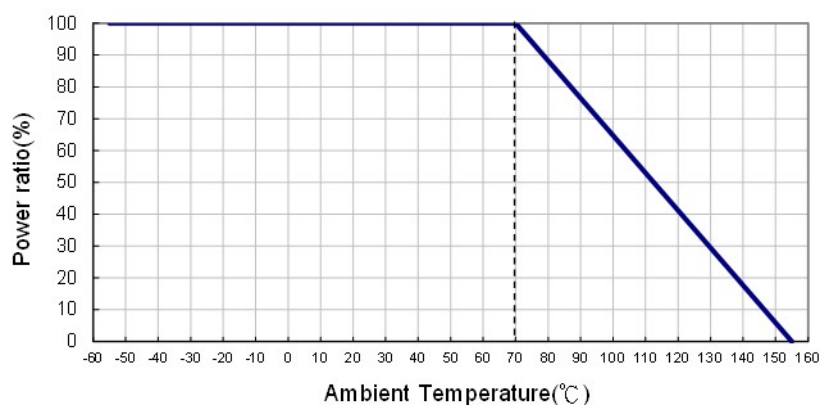
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CSW08	0508	1.25±0.15	2.00±0.15	0.60±0.10	0.30±0.20	0.35±0.15	6
CSW62	0612	1.60±0.15	3.20±0.15	0.60±0.10	0.30±0.20	0.45±0.15	12
CSW20	1020	2.50±0.15	5.00±0.15	0.60±0.10	0.40±0.20	0.75±0.15	35
CSW25	1225	3.10±0.15	6.30±0.15	0.60±0.10	0.45±0.20	0.75±0.15	48

Part Numbering

CSW	25	F	T	E	U	R100	
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	08: 0508 62: 0612 20: 1020 25: 1225	F: ±1% J: ±5%	T: Taping Reel	E: ±100 F: ±200 J: ±600	U: 1/2W Q: 3/4W T: 1W A: 1.5W S: 2W R: 3W	R010: 0.01Ω R100: 0.1Ω	N: No Marking

Derating Curve



■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
CSW08 (0508)	1/2W	-55 ~ +155°C	7.07A	10-27		±600
				30-510		±200
CSW62 (0612)	3/4W		8.66A	10-27		±600
				30-510		±200
CSW20 (1020)	1W		10A	10-27		±600
				30-750		±200
CSW25 (1225)	1.5W		12.24A	10-27		±600
				30-750		±200

■ High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
CSW08 (0508)	1W	-55~+155°C	10.0A	10 - 27		±600
				30 - 510		±200
CSW62 (0612)	1.5W		12.2A	10 - 27		±600
				30 - 510		±200
CSW20 (1020)	2W		14.1A	10 - 27		±600
				30 - 750		±200
CSW25 (1225)	3W		17.3A	10 - 27		±600
				30 - 750		±200

■ High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
CSW08 (0508)	1W	-55~+155°C	3.16A	100 - 510		±100
CSW62 (0612)	1.5W		7.07A	30 - 510		±100
CSW20 (1020)	2W		8.16A	30 - 750		±100
CSW25 (1225)	3W		10.0A	30 - 750		±100

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P / R}$

■ The nominal resistance value for less than 100mΩ is in E-24 series, other requirement of resistance value please contact our sales office.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(2.0%+0.05Ω)	RCWV*2 for 5 seconds
Insulation Resistance	≥ 10G	Max. Overload Voltage for 1 minute

Item	Requirement	Test Method
Endurance	$\pm(2.0\%+0.05\Omega)$	70°C±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(2.0\%+0.05\Omega)$	40±2°C, 90~95% R.H., RCWV for 1000hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(1.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(1.0\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute CSW08:300V , CSW62/20/25:400V
Leaching	Individual leaching area ≤5% Total leaching area ≤10%	260±5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	-55°C (30 minutes) / +125°C (30 minutes) , 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

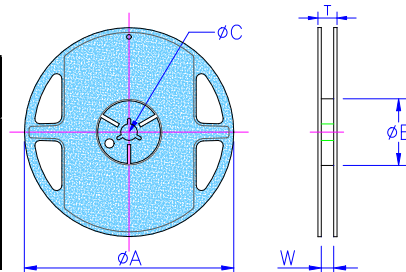
■ Shelf Life: 2 years from production date

■ Packaging

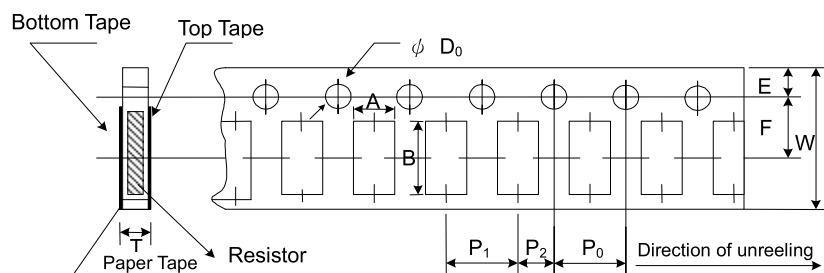
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CSW08 CSW62	Paper	5K	8mm	7 inch	178.0±1.0	60 ^{+1/-0}	13.5±0.7	9.5±0.1	11.5±1.0
CSW20 CSW25	Embossed	4K	12mm	7 inch	178.0±1.0	60 ^{+1/-0}	13.5±0.7	13.5±1.0	15.5±1.0



Paper Tape Specifications

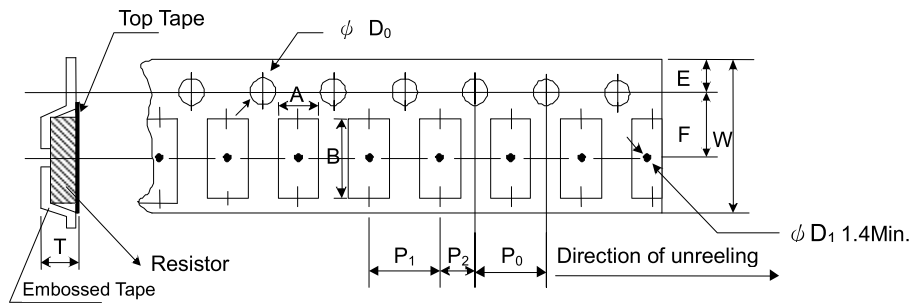


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSW08	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CSW62	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

■Packaging_

Embossed Plastic Tape Specifications

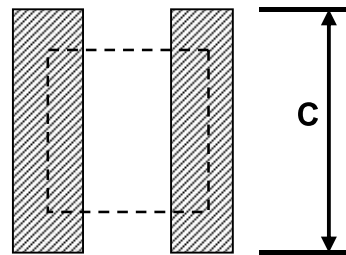


Unit: mm

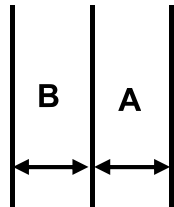
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CSW20	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSW25	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

■Recommend Land Pattern

Unit: mm

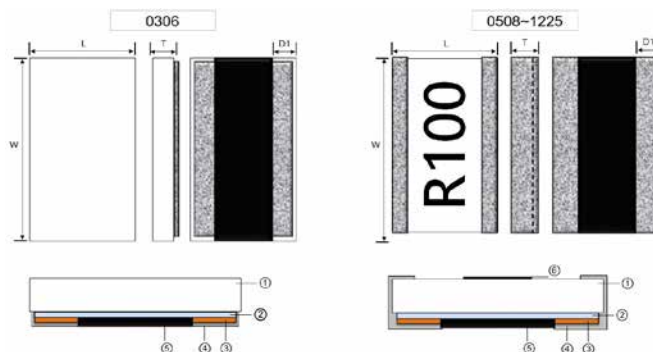


Type	A	B	C
CSW08	0.55	0.90	2.00
CSW62	0.70	0.80	3.20
CSW20	1.00	1.30	5.00
CSW25	1.60	1.20	6.40



Current Sensing Metal Chip Resistor (Wide Terminal)—CSMW Series

Construction



Features

- SMD Type designed for automatic insertion on the product surface
- Low resistance resistor for current detection
- Metal foil construction ensures high reliability and performance with very low and stable TCR
- Designed for current sense circuits in power electronic systems
- Pb-Free to meet RoHS requirements
- AEC-Q200 Qualified
- Inherently Anti-Sulfur
- MSL: Level 1

Applications

- Automotive
- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor

① Alumina Substrate	② Resistor Layer	③ Bottom Electrode
④ External Electrode	⑤ Primary Overcoat	⑥ Marking

Dimensions

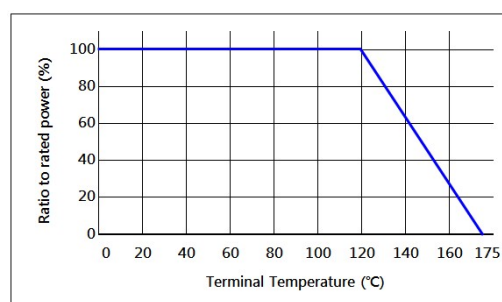
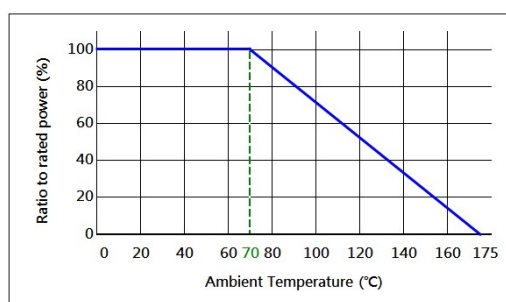
Unit: mm

Type	Size (Inch)	Resistance Range (mΩ)	L	W	T	D1	Weight (g) (1000pcs)
CSMW36	0306	5 - 19	0.85±0.20	1.50±0.20	0.50±0.20	0.20±0.15	2.626
		5 - 100	0.85±0.20	1.50±0.20	0.50±0.20	0.20±0.15	2.448
CSMW08	0508	3 - 19	1.25±0.20	2.00±0.20	0.55±0.20	0.30±0.20	6.671
		20 - 100	1.25±0.20	2.00±0.20	0.55±0.20	0.30±0.20	5.884
CSMW62	0612	3 - 19	1.55±0.20	3.00±0.20	0.55±0.20	0.30±0.20	13.237
		3 - 100	1.55±0.20	3.00±0.20	0.55±0.20	0.30±0.20	12.094
CSMW20	1020	3 - 19	2.45±0.30	4.90±0.20	0.55±0.20	0.45±0.30	33.246
		20 - 100	2.45±0.30	4.90±0.20	0.55±0.20	0.45±0.30	31.873
CSMW25	1225	3 - 19	3.15±0.30	6.30±0.20	0.55±0.20	0.55±0.30	51.846
		20 - 100	3.15±0.30	6.30±0.20	0.55±0.20	0.55±0.30	50.015

Part Numbering

CSMW	36	F	T	D	U	R100	
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	36: 0306 08: 0508 62: 0612 20: 1020 25: 1225	F: ±1% G: ±2% J: ±5%	T: Taping Reel	D: ±50 E: ±100 K: ±150	U: 1/2W T: 1W A: 1.5W S: 2W R: 3W	R010: 0.01Ω R100: 0.1Ω	: Standard N: No Marking

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
			±1%	±2%	±5%	
CSMW36 (0306)	1/2W	-55 ~ +175°C	5-19			±150
			20-100			±100
CSMW08 (0508)	1W		3-19			±100
			20-100			±50
CSMW62 (0612)	1.5W		3-19			±100
			20-100			±50
CSMW20 (1020)	2W		3-19			±100
			20-100			±50
CSMW25 (1225)	3W		3-19			±100
			20-100			±50

Operating Current= $\sqrt{P/R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	$\Delta R \leq \pm 1\%R$	2.5 x Rated Power for 5 seconds
Insulation Resistance	$\geq 1000M\Omega$	Apply DC 100V±15V between substrate and terminations for 1min, then check insulation resistance
Operational Life	$\Delta R \leq \pm 1\%R$	Condition D Steady State $T_A=125^\circ\text{C}$ at derated power. Measurement at 24±4 hours after test conclusion
Biased Humidity	$\Delta R \leq \pm 1\%R$	85°C/85RH., 1000 hrs, apply 10% of operating power (current) or limiting element current whichever is lower
High Temperature Exposure	$\Delta R \leq \pm 1\%R$	at +155°C for 1000 hrs
Temperature Cycling	$\Delta R \leq \pm 1\%R$ $\Delta R \leq \pm 2\%R$	-55°C to +155°C, 100 cycles -55°C to +155°C, 1000 cycles
Bending Strength (Board Flex)	$\Delta R \leq \pm 1\%R$	Bending once for 60 seconds Bending displacement:2mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \leq \pm 1\%R$	260±5°C for 10 seconds
Resistance to solvents	Marking Unsmearred	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	$\Delta R \leq \pm 1\%R$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\Delta R \leq \pm 1\%R$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\Delta R \leq \pm 1\%R$	Human body model 0306 size: 1KV Other sizes: 2KV
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Terminal strength	No broken	Force of 1.8kg for 60 seconds
Sulfur Test	$\Delta R \leq \pm 1\%R$	105±2 °C no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, JIS-C 5201-1, AEC-Q200, MIL-STD-202, UL-94, JEDS22, ASTM-B-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

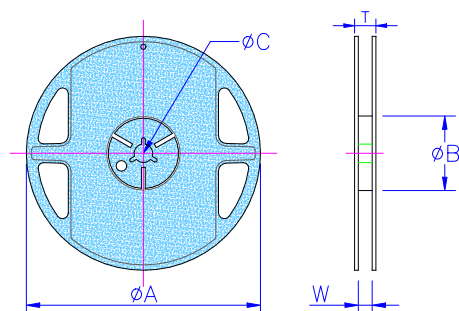
■ Shelf Life: 2 years from production date

Packaging

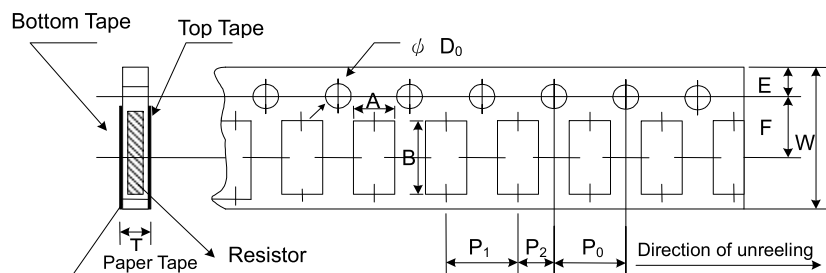
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
CSMW36	178.0±1.0	60.0±1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSMW08	178.0±1.0	60.0±1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSMW62	178.0±1.0	60.0±1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSMW20	178.0±1.0	60.0±1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
CSMW25	178.0±1.0	60.0±1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000



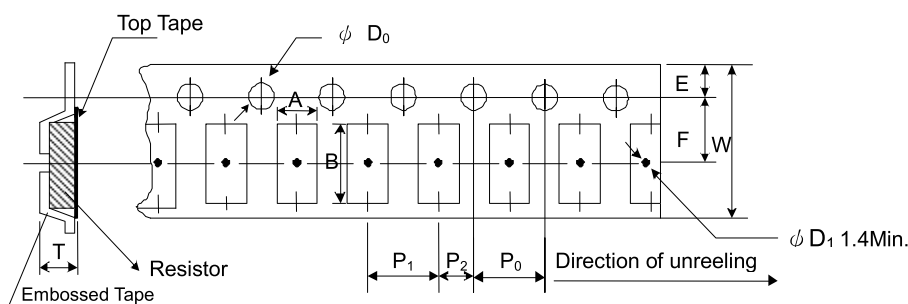
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSMW36	1.10±0.10	1.85±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.60±0.05
CSMW08	1.60±0.10	2.37±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.75±0.05
CSMW62	2.00±0.10	3.55±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.75±0.05

Embossed Plastic Tape Specifications



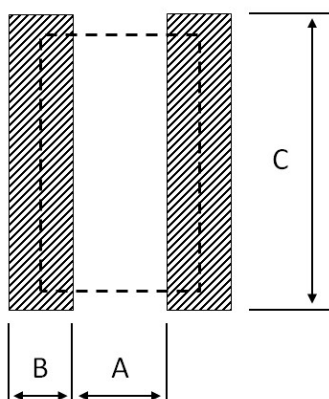
Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSMW20	2.80±0.10	5.50±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSMW25	3.50±0.10	6.70±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

Recommend Land Pattern

Pad Layout

Unit: mm

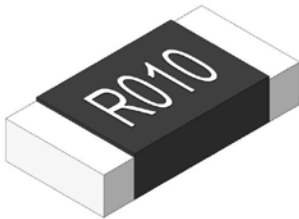


Type	A	B	C	t (μm)
CSMW36	0.25	0.68	1.70	35
CSMW08	0.60	0.70	2.20	35
CSMW62	0.60	0.90	3.40	35
CSMW20	1.20	1.40	5.20	100
CSMW25	2.20	1.00	6.60	100

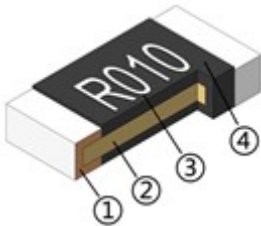
t: copper foil minimum thickness of PCB

Current Sense Alloy Resistors – CSA Series

Construction



1206

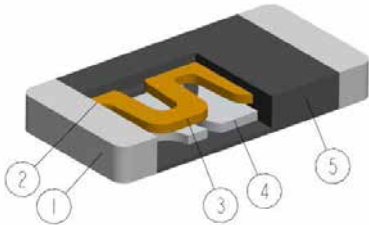


①	Pure Copper Electrode Surface Plated (Copper+Nickel+Tin)	③	Marking Code
②	Resistance alloy	④	Insulation Protective Layer

Features

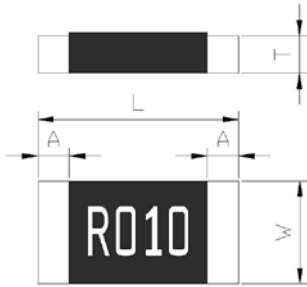
- High reliability and stability , superb pulse load capability
- Full metal structure , using lead-free, halogen-free epoxy resin, low resistance, anti-sulfurization
- Ultra-low parasitic inductance, fast response , suitable for high frequency AC current detection
- Design for current sense circuits in power electronic systems
- AEC-Q200 Reliability Testing passed
- RoHS compliant

2512



①	Terminal Surfaces	④	Heat Dissipation Plate
②	Full Alloy Structure	⑤	Resin
③	Resistive Element-Karma		

Dimensions



Unit: mm

Type	Size (Inch)	L	W	A	T
CSA06	1206	3.20±0.20	1.60±0.20	0.60±0.20	0.60±0.20
CSA12	2512	6.40±0.20	3.20±0.20	0.90±0.20	0.80±0.15

Part Numbering

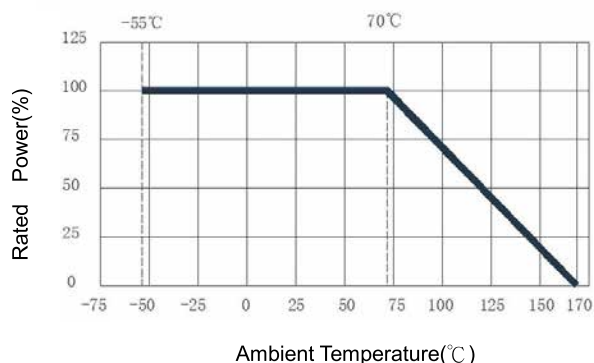
CSA	06	F	T	D	T	R100	K
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Material Code
	06: 1206 12: 2512	F: ±1% J: ±5%	T: Taping Reel	D: ±50 4: ±350	T: 1W R: 3W	R001: 0.001Ω R010: 0.01Ω R100: 0.1Ω	K: Kamar

Standard Electrical Specifications

Type	Item	Power Rating	Operating Temp. Range	Material	Resistance Range(mΩ)		TCR (PPM/°C)
					±1%	±5%	
CSA06 (1206)	1W	-55 ~ +170°C	Kamar		1 ≤ R < 4		±350
					4 – 100		±50
CSA12 (2512)	3W	-55 ~ +170°C	Kamar		100 – 500		±50

Maximum Operating Voltage=(P*R)^{1/2}

Derating Curve



Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	Within the specified value	1206 size: Measured value 25~ +125°C, reference value +25°C 2512 size: Measured value 20~ +130°C, reference value +20°C
Solderability	95% min. coverage	245°C for 3 seconds
Short Time Overload	No visible damage, ΔR±1.0% maximum	5 times rated voltage, 5 seconds
Resistance to Soldering Heat	No visible damage, ΔR±1.0% maximum	260°C for 10 seconds
Bending Strength	Within the specified value	Bending amplitude 2 mm for 60±5 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Insulation Resistance	>100MΩ	Applying a direct current voltage of 100 V between the electrode and the substrate., maintaining 60s , then test insulation resistance value
Dielectric Withstand Voltage	No breakdown or arcing	Applying an AC VOLTS which the effective value is the maximum load voltage to the electrode and substrate at a rate of approximately 100 V/s, maintaining it for 60±5 seconds
High Temperature and Humidity	No visible damage, ΔR±1.0% maximum	1000 hrs 85°C / 85%RH 10% of Rated power (current) or component limit current (whichever is smaller)
High Temperature Storage	No visible damage, ΔR±1.0% maximum	1000 hrs @ 125°C, without load
Low Temperature Load	No visible damage, ΔR±1.0% maximum	-55°C, no load for 1.5 hours, apply rated power, continue for 45 minutes, cool for another 15 minutes, return to room temperature and test again
Temperature Cycling	No visible damage, ΔR±1.0% maximum	-55°C @ 30 min ~ +125°C @ 30 min, 1000 cycles
Load Life	No visible damage, ΔR±1.0% maximum	1000 hrs @ 70±2°C, rated current or component limit current (whichever is less), 90 min on, 30 min off

■ Reference Standards: MIL-STD-202, IEC60115, UL-94

■ Storage Temperature: 5~35°C; Humidity: 40~75%RH

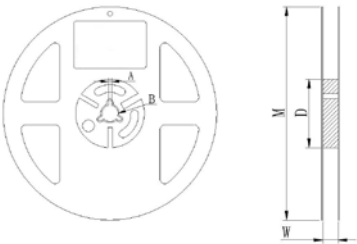
■ Shelf Life: 1 years from production date

■Packaging

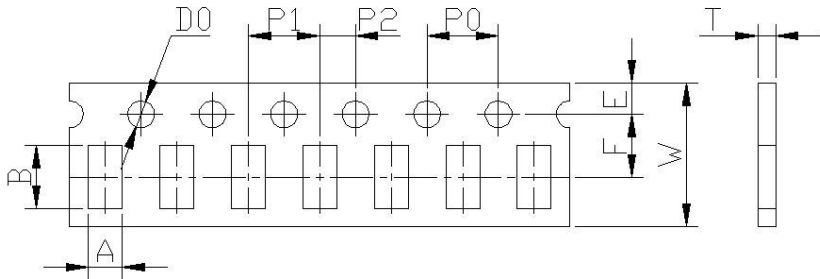
Packing Quantity & Reel Specifications

Unit :mm

Type	W	M	A	B	D	Paper Tape (EA)	Emboss Plastic Tape (EA)
CSA06	9.0±0.3	178.0±2.0	2.0±0.5	13.5±0.5	60.0±1.0	5,000	-
CSA12	12.3±0.5	178.0±2.0	2.0±0.5	13.5±0.5	60.0±1.0	-	4,000



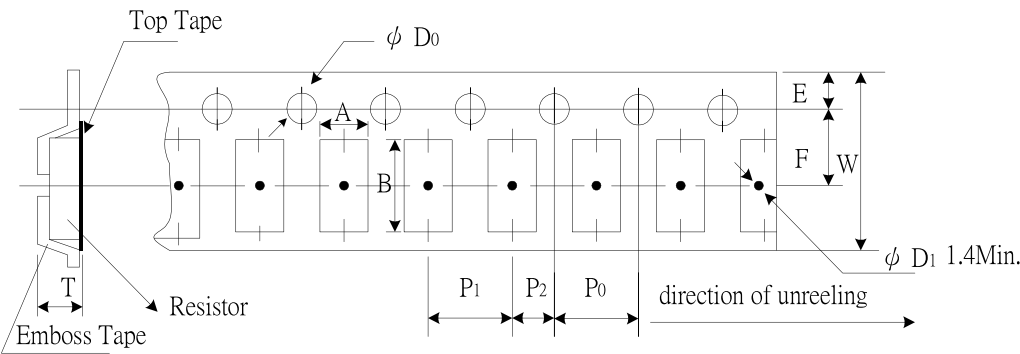
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P0	P1	P2	D0	T
CSA06	2.00	3.60	8.00	1.75	3.50	4.00	4.00	2.00	1.50	0.90

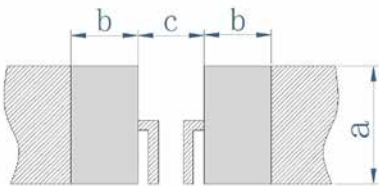
Emboss Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ϕD0	T
CSA12	3.50	6.80	12.00	1.75	5.50	4.00	4.00	2.00	1.50	1.20

■Recommend Land Pattern

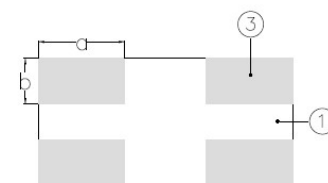
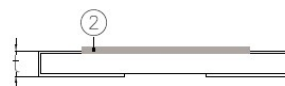
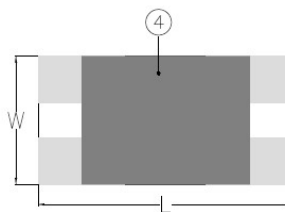


Unit: mm

Type	a	b	c
CSA06	1.80	1.70	1.60
CSA12	3.70	1.90	3.60

Four Terminal High Precision Current Sense Resistors – 4T Series

Construction



Features

- SMD Type designed for automatic insertion
- High power rating in small size
- Metal foil construction ensures high reliability and performance with very low and stable TCR
- Design for current sense circuits in power electronic systems
- Industry standard sizes
- MSL: Level 1

Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Disk Driver
- Portable Devices (PDA, Cell Phone)

① Alumina Substrate	③ Electrode
② Resistor Layer	④ Protection coat

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
4T06	1206	3.0±0.2	1.6±0.2	0.5±0.15	1.0±0.2	0.55±0.2	10
4T10	2010	5.0±0.2	2.5±0.2	0.5±0.15	1.7±0.2	0.9±0.2	29

Schematic diagram

- V = voltage terminal
- I = current terminal



Part Numbering

4T	10	F	T	F	Q	R010	N
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	06: 1206 10: 2010	D: ±0.5% F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	D: ±50 W: ±75 E: ±100	Q: 3/4W U: 1/2W	R010: 0.01Ω	: Standard N: No Marking

Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range				TCR (PPM/°C)
			±0.5%	±1%	±2%	±5%	
4T06 (1206)	1/2W	-55 ~ +155°C	10mΩ– 20mΩ				±50 ±75 ±100
4T10 (2010)	3/4W	-55 ~ +155°C	10mΩ– 20mΩ				±50 ±75 ±100

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	±(0.5%+0.0005Ω)	RCWV*1.5 for 5 seconds
Insulation Resistance	>1000MΩ	Apply 100V _{DC} for 1 minute
Endurance	±(0.5%+0.0005Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(0.5%+0.0005Ω)	40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending Strength	±(0.5%+0.0005Ω)	Bending amplitude 3 mm for 10 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Dielectric Withstand Voltage	By Type	Apply Max. Overload Voltage for 1 minute
Resistance to Soldering Heat	±(0.5%+0.0005Ω)	260±5°C for 10 seconds
Rapid change of temperature	±(0.5%+0.0005Ω)	-55°C ~155°C, 5 cycles

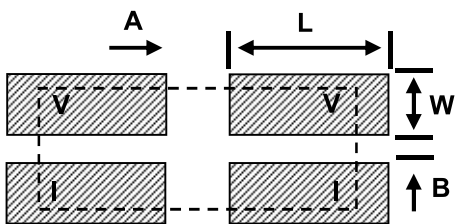
RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

■ Reference Standards: MIL-STD-202, JIS-C 5201

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

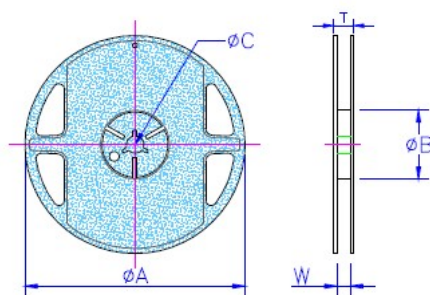
Recommend Land Pattern



Unit: mm

Type	L	W	A	B
4T06	1.75	1.10	1.00	0.30
4T10	2.55	1.55	1.40	0.50

Packaging

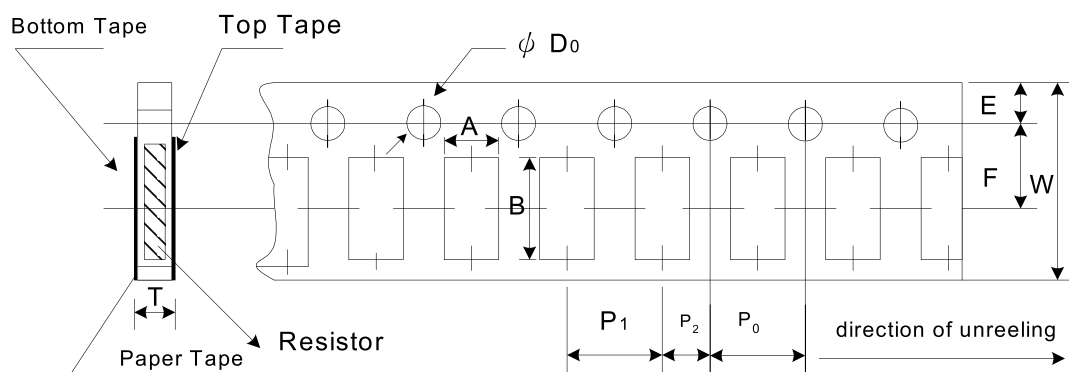


Packing Quantity & Reel Specifications

Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
4T06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
4T10	178.0±1.0	60.0±1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000

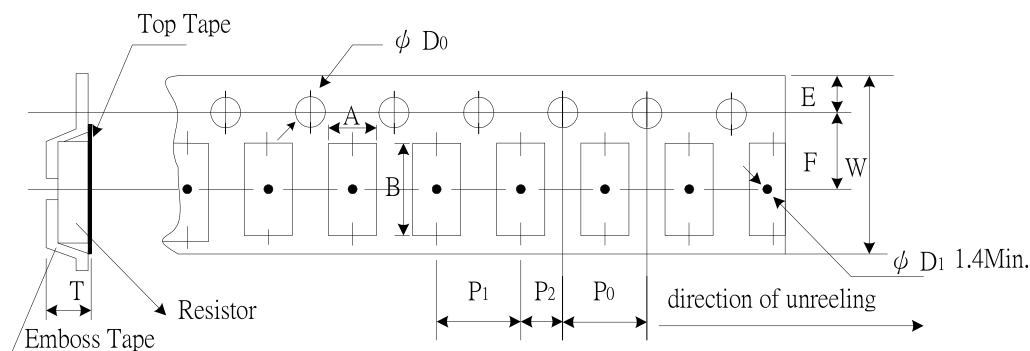
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ØD ₀	T
4T06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

Emboss Plastic Tape Specifications

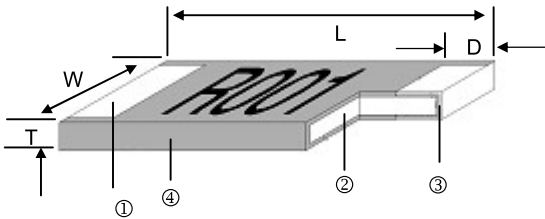


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ØD ₀	T
4T10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20

Ultra Low Ohm (Metal Strip) Chip Resistor— LR Series

Construction



Black—Wave or IR reflow soldering

①	Solder Plating	③	Barrier Layer
②	Alloy Plate	④	Overcoat

Features

- High power rating up to 3 Watts
- Low TCR down to ± 50 PPM/ $^{\circ}\text{C}$
- Resistance values from 0.5 to 10m ohm
- Customized resistance available
- Wide range package sizes 2512
- AEC-Q200 Compliance
- MSL: Level 1

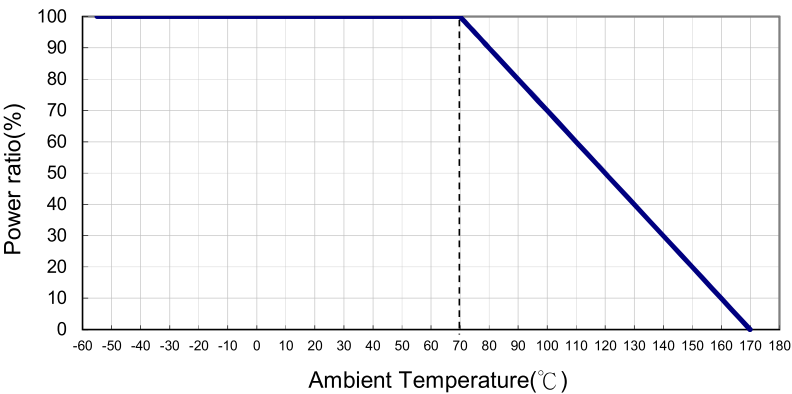
Applications

- NB (for Power Management)
- MB (for Power Management)
- SWPS (DC-DC Converter, Charger, Adaptor)
- Monitor (for Power Management)

Part Numbering

LR	12	J	T	E	S	R002	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}\text{C}$)	Power Rating	Resistance	Marking
	12: 2512	F: $\pm 1\%$ H: $\pm 3\%$ J: $\pm 5\%$	T: Taping Reel	D: ± 50 W: ± 75 E: ± 100 K: ± 150	: Standard A: 1.5W S: 2W R: 3W	R002: 0.002Ω R020: 0.02Ω 0M50: 0.0005Ω 1M50: 0.0015Ω	: Black Coating

Derating Curve



■ Dimensions

Unit: mm

Part No.	Resistance (mΩ)	L	W	T	D	Weight (g) (1000pcs)
LR12□T□0M50	0.50	6.35±0.254	3.18±0.254	1.25±0.20	1.85±0.38	184.11
LR12□T□0M75	0.75	6.35±0.254	3.18±0.254	0.75±0.20	1.55±0.38	131.11
LR12□T□R001	1.00	6.35±0.254	3.18±0.254	0.65±0.20	1.55±0.38	110.85
LR12□T□1M50	1.50	6.35±0.254	3.18±0.254	0.45±0.20	1.55±0.38	67.16
LR12□T□R002	2.00	6.35±0.254	3.18±0.254	0.35±0.20	1.55±0.38	49.3
LR12□T□2M50	2.50	6.35±0.254	3.18±0.254	0.65±0.20	1.40±0.38	97.95
LR12□T□R003	3.00	6.35±0.254	3.18±0.254	0.55±0.20	1.40±0.38	83.49
LR12□T□R004	4.00	6.35±0.254	3.18±0.254	0.45±0.20	1.40±0.38	62.59
LR12□T□R005	5.00	6.35±0.254	3.18±0.254	0.35±0.20	1.40±0.38	49.84
LR12□T□R006	6.00	6.35±0.254	3.18±0.254	0.32±0.20	1.40±0.38	41.76
LR12□T□6M50	6.50	6.35±0.254	3.18±0.254	0.30±0.20	1.40±0.38	35.85
LR12□T□R007	7.00	6.35±0.254	3.18±0.254	0.27±0.20	1.40±0.38	34.01
LR12□T□R010	10.00	6.35±0.254	3.18±0.254	0.25±0.20	1.40±0.38	25.97

■ Standard Electrical Specifications

Part No.	Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±3%	±5%	
LR12□TD□□□□		1W	-55°C ~ +170°C	0.5, 0.75, 1, 1.5, 2			±50
LR12□TW□□□□		1W		6, 6.5, 7			±75
LR12□TE□□□□		1W		4, 5, 10			±100
LR12□TK□□□□		1W		2.5, 3			±150

Operating Current= $\sqrt{P/R}$, Operating Voltage= $\sqrt{P \cdot R}$

■ High Power Rating Electrical Specifications

Part No.	Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±3%	±5%	
LR12□TDS□□□□		2W	-55°C ~ +170°C	0.5, 0.75, 1, 1.5, 2			±50
LR12□TWS□□□□		2W		6, 6.5, 7			±75
LR12□TES□□□□		2W		4, 5, 10			±100
LR12□TKS□□□□		2W		2.5, 3			±150
LR12□TDR□□□□		3W		0.5, 0.75, 1, 1.5, 2			±50
LR12□TWR□□□□		3W		6, 6.5, 7			±75
LR12□TER□□□□		3W		4, 5, 10			±100
LR12□TKR□□□□		3W		2.5, 3			±150

Operating Current = $\sqrt{P/R}$, Operating Voltage= $\sqrt{P \cdot R}$

■ Viking has the ability of manufacture following options based on customer's requirement.

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25°C ~125°C, 25°C is the reference temperature
Short Time Overload	±0.5%	5*rated power for 5 seconds
Endurance	±1%	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±1%	at +170°C for 1000 hrs
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	260±5°C for 10 seconds
Thermal Shock	±0.5%	-55°C ~ 150°C, 100 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

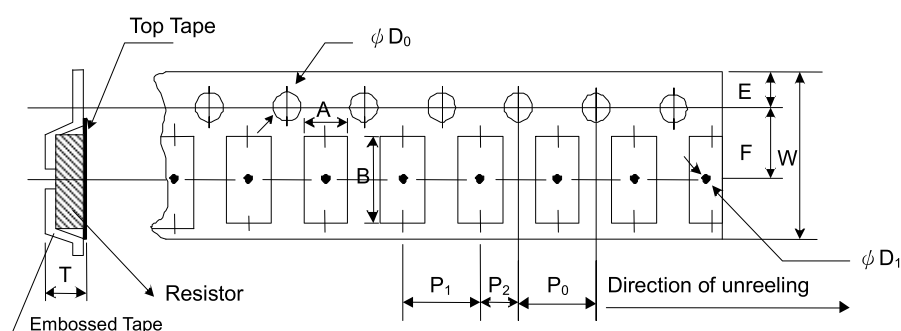
■ **Reference Standards:** MIL-STD-202, JIS-C 5201-1

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging

Embossed Plastic Tape Specifications



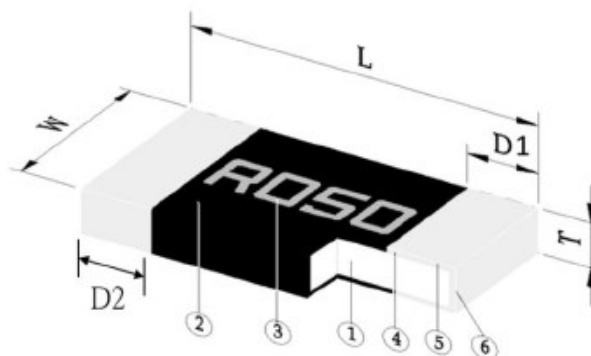
Unit: mm

Type	Resistance (mΩ)	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	ΦD ₁	T	Quantity (EA)
LR12	0.50 - 0.75	3.40±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.05	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.4min.	1.45±0.2	2,000
	1 - 10	3.40±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.05	4.0±0.1	4.0±0.1	2.0±0.05	1.55±0.05	1.4min.	0.81±0.1	2,000

1. The cumulative tolerance of 10 sprockets hole pitch is ± 0.2mm.
2. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
3. A & B measured 0.3mm from the bottom of the packet
4. T measured at a point on the inside bottom of the packet to the top surface of the carrier.
5. Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

Low Ohm (Metal Strip) Chip Resistor—LRP Series

Construction



Features

- Low TCR down to ± 25 PPM/ $^{\circ}$ C
- Customized resistance available
- Low inductance < 5nH
- AEC-Q200 Compliance
- Sulfur resistance unaffected by sulfur environments
- Lead-free and RoHS compliant
- MSL: Level 1

① Alloy Plate	④ Internal Electrode
② Overcoat	⑤ Barrier Layer
③ Marking	⑥ Solder Plating

Dimensions

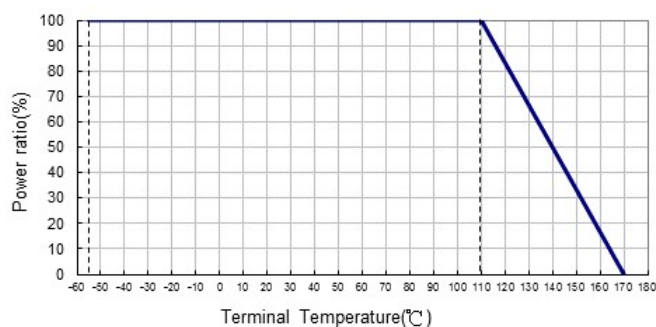
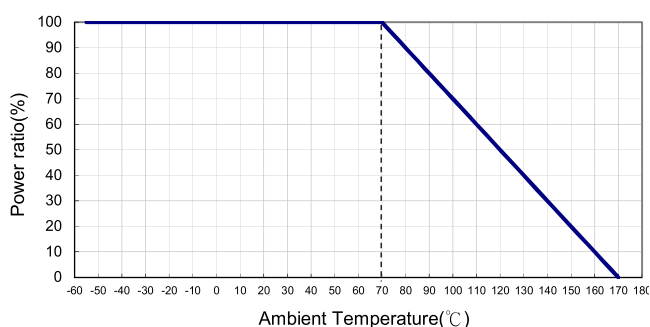
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
LRP05	0805 2m Ω	2.05 $\pm$ 0.10	1.25 $\pm$ 0.10	0.50 $\pm$ 0.15	0.65 $\pm$ 0.15	0.65 $\pm$ 0.15	6.5
LRP05	0805 5~20m Ω	2.05 $\pm$ 0.10	1.25 $\pm$ 0.10	0.43 $\pm$ 0.15	0.45 $\pm$ 0.15	0.45 $\pm$ 0.15	4.5
LRP06	1206	3.15 $\pm$ 0.10	1.45 $\pm$ 0.10	0.55 $\pm$ 0.10	0.55 $\pm$ 0.15	0.55 $\pm$ 0.15	10.5
LRP10	2010	5.00 $\pm$ 0.15	2.40 $\pm$ 0.15	0.60 $\pm$ 0.10	0.80 $\pm$ 0.20	0.80 $\pm$ 0.20	40.0
LRP12	2512 2~200m Ω	6.40 $\pm$ 0.25	3.20 $\pm$ 0.25	0.70 $\pm$ 0.20	0.90 $\pm$ 0.30	0.90 $\pm$ 0.30	52.6
	2512 1.5m Ω	6.40 $\pm$ 0.25	3.20 $\pm$ 0.25	0.70 $\pm$ 0.20	0.90 $\pm$ 0.30	1.45 $\pm$ 0.30	52.6
	2512 1m Ω	6.40 $\pm$ 0.25	3.20 $\pm$ 0.25	0.70 $\pm$ 0.20	0.90 $\pm$ 0.30	1.85 $\pm$ 0.30	52.6

Applications

- NB (for Power Management)
- MB (for Power Management)
- SWPS (DC-DC Converter, Charger, Adaptor)
- Monitor (for Power Management)

Derating Curve



Part Numbering

LRP	12	F	T	D	S	R015
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}$ C)	Power Rating	Resistance
	05:0805 06:1206 10: 2010 12: 2512	D: $\pm$ 0.5% F: $\pm$ 1% J: $\pm$ 5%	T: Taping Reel	C: $\pm$ 25 D: $\pm$ 50 W: $\pm$ 75 E: $\pm$ 100	R: 3W S: 2W T: 1W Q: 3/4W	R015: 0.015 Ω R050: 0.05 Ω 1M50: 0.0015 Ω

Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Rated Terminal Temperature	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
					±0.5%	±1%	±5%	
LRP05 (0805)	0.75W	110°C	-55 ~ +170°C	10, 15, 20				±50 ±75
				5				±75
				2				±100
	1W	110°C	-55 ~ +170°C	10				±50 ±75
				5				±75
				2				±100
LRP06 (1206)	1W	110°C	-55 ~ +170°C	8, 10, 12, 15, 20, 25, 30, 33, 40				±50
				3, 4, 5, 7, 8, 10, 12, 15, 20, 25, 30, 33, 40				±75 ±100
LRP10 (2010)	1W	110°C	-55 ~ +170°C	4, 5, 10, 15, 20, 30, 50, 68, 75, 100				±75
	2W	110°C	-55 ~ +170°C	4, 5, 10, 15, 20, 30, 50, 68, 75				
LRP12 (2512)	2W, 3W	110°C	-55 ~ +170°C	3, 4, 5, 6, 7, 18, 20, 22, 25, 30, 33, 35, 39, 40, 47, 50, 60, 68, 70, 75, 80, 82, 90, 91, 100, 120, 150, 180, 200				±25
				1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 8.5, 9, 10, 12, 15, 18, 20, 22, 25, 30, 33, 35, 39, 40, 47, 50, 60, 68, 70, 75, 80, 82, 90, 91, 100, 120, 150, 180, 200				±50 ±75

Operating Current = $\sqrt{P/R}$, Operating Voltage = $\sqrt{P \cdot R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25°C ~125°C, 25°C is the reference temperature
Short Time Overload	±1.0%	5*rated power for 5 seconds
Insulation Resistance	≥10G	100V DC for 1 minute
Endurance	±1.0%	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	±1.0%	1000 hrs 85°C/85%RH 10% of operating power
Dry Heat	±1.0%	at +170°C for 1000 hrs
Bending Strength	±1.0%	Bending width 2mm once for 60 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	260±5°C for 10 seconds
Rapid Change of Temperature	±1.0%	-55°C to +155°C, 5 cycles
Low Temperature Storage	±1.0%	at -55°C for 2 hrs

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower. Operating Current = $\sqrt{P/R}$.

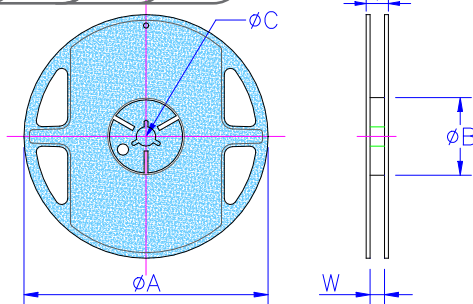
■ Reference Standards: MIL-STD-202, JIS-C 5201-1, IEC-60115

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

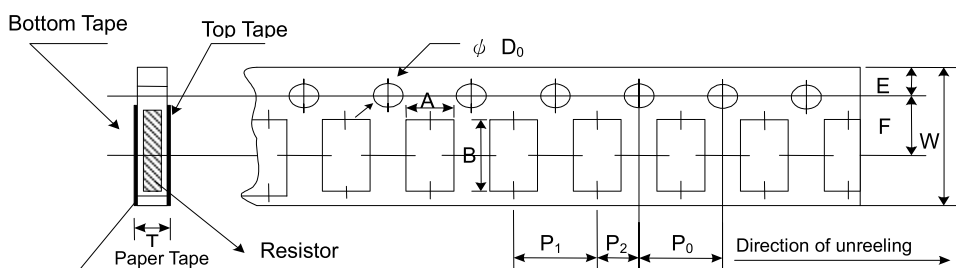
Reel Specifications & Packaging Quantity



Unit: mm

Type	Resistance (mΩ)	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
LRP05	2~20	Paper	5K	8mm	7 inch	178.5±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.5
LRP06	3~40	Paper	5K	8mm	7 inch	178.5±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.5
LRP10	4~100	Embossed	4K	12mm	7 inch	178.5+/-1.5	60±1.0	13.0±0.5	13.0±1.0	15.5±0.5
LRP12	1~200	Embossed	4K	12mm	7 inch	178.5+/-1.5	60±1.0	13.0±0.5	13.0±1.0	15.5±0.5

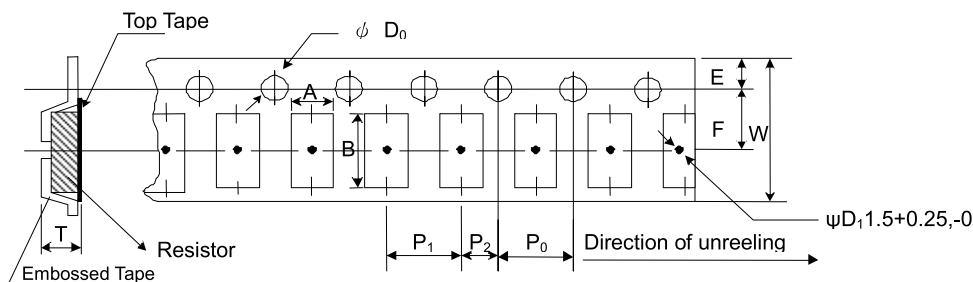
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
LRP05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
LRP06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

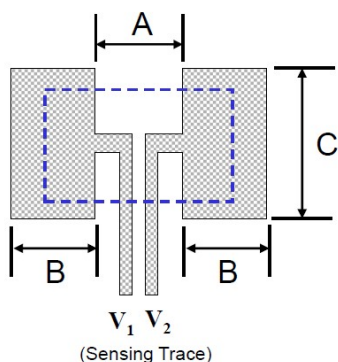


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
LRP10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.20+0
LRP12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.20+0

Recommend Land Pattern

Unit: mm



Type	A	B	C
LRP05	0.65	1.10	1.40
LRP06	1.50	1.40	1.70
LRP10	3.60	1.40	2.50
LRP12 (2~200mΩ)	4.00	2.00	3.50
LRP12 (1~1.5mΩ)	2.30	2.65	3.50

*FR4 copper board, 100μm of copper pad thickness

Ultra-Low Chip Resistor Jumper – LRJ Series

Construction

LRJ06 / LRJ10 / LRJ12

①	Alloy Plate	④	Internal Electrode
②	Overcoat	⑤	Barrier Layer
③	Marking	⑥	Solder Plating

Features

- Ultra-Low resistance values Max. 0.5 mΩ
- High current application
- Pb Free
- MSL: Level 1

Applications

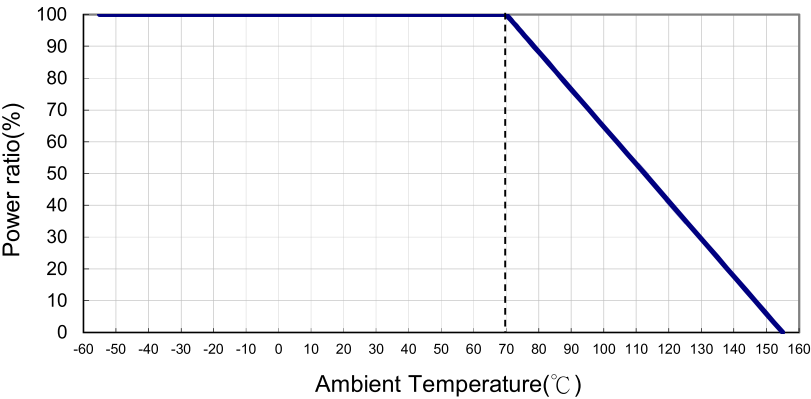
- NB
- Mobil Device
- Server
- Electrical tools
- Power Management

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D	Weight (g) (1000pcs)
LRJ02	0402	1.00±0.05	0.50±0.05	0.25±0.10	0.30±0.10	0.7
LRJ03	0603	1.50±0.15	0.80±0.15	0.42±0.10	0.40±0.10	1.9
LRJ05	0805	1.95±0.15	1.20±0.15	0.58±0.10	0.55±0.10	5.5
LRJ06	1206	3.10±0.20	1.45±0.20	0.45±0.20	0.55±0.20	9.6
LRJ10	2010	4.85±0.20	2.50±0.20	0.45±0.20	0.75±0.20	31.5
LRJ12	2512	6.20±0.20	3.20±0.20	0.60±0.20	0.90±0.20	55.8

Derating Curve



Part Numbering

LRJ	10	-	T	-		R0R0
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	-: No Specified	T: Taping Reel	-: No Specified	: Standard	R0R0: Jumper

Standard Electrical Specifications

Item Type	Operating Temp. Range	Resistance Range (mΩ)	Rated Current (A)
LRJ02 (0402)	-55 ~ +155°C	0.5 mΩ Max.	20.0
LRJ03 (0603)	-55 ~ +155°C	0.5 mΩ Max.	22.4
LRJ05 (0805)	-55 ~ +155°C	0.5 mΩ Max.	31.6
LRJ06 (1206)	-55 ~ +155°C	0.2 mΩ Max.	50.0
LRJ10 (2010)	-55 ~ +155°C	0.2 mΩ Max.	71.0
LRJ12 (2512)	-55 ~ +155°C	0.2 mΩ Max.	100

Operating Current = $\sqrt{P/R}$, Operating Voltage = $\sqrt{P \cdot R}$

Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Variation of resistance with temperature	Max. 0.5 mΩ	+25/-55°C, +25/+125°C
Short Time Overload	Max. 0.5 mΩ	Rated current*1.5 for 2 seconds(LRJ02/06/10/12) Rated current*2.5 for 5 seconds(LRJ03/05)
Endurance	Max. 0.5 mΩ	70±2°C, Rated current for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat	Max. 0.5 mΩ	40±2°C, 90~95% R.H. for 1000 hrs
Dry Heat	Max. 0.5 mΩ	at +155°C for 1000 hrs
Bending Strength	Max. 0.5 mΩ	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	Max. 0.5 mΩ	260±5°C for 10 seconds
Rapid Change of Temperature	Max. 0.5 mΩ	-55°C to +125°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

Operating Current = $\sqrt{P/R}$. Operating Voltage = $\sqrt{P \cdot R}$.

Reference Standards: JIS-C 5201-1, IEC-60115

Storage Temperature: 15~28°C; Humidity < 80%RH

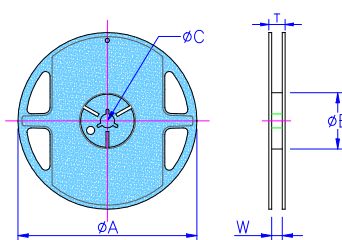
Shelf Life: 2 years from production date

Packaging

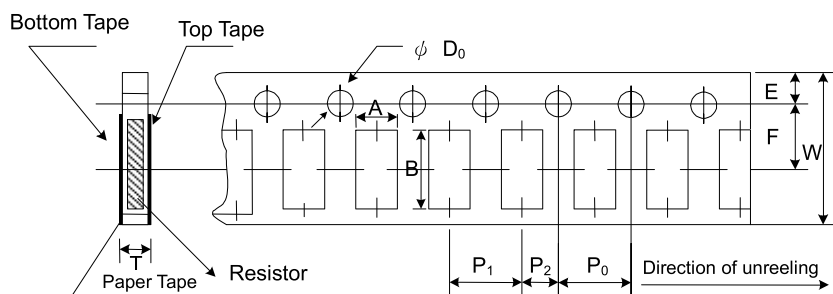
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
LRJ02	Paper	10K	8mm	7 inch	178±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5 ± 1.0
LRJ03	Paper	5K	8mm	7 inch	178±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5 ± 1.0
LRJ05	Paper	5K	8mm	7 inch	178±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5 ± 1.0
LRJ06	Paper	5K	8mm	7 inch	178.5±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5 ± 0.5
LRJ10	Embossed	4K	12mm	7 inch	178.5±1.5	60+1/-0	13.0±0.5	13.0±0.5	15.5 ± 0.5
LRJ12	Embossed	4K	12mm	7 inch	178.5±1.5	60.0±1.0	13.0±0.5	13.0±1.0	15.5 ± 0.5



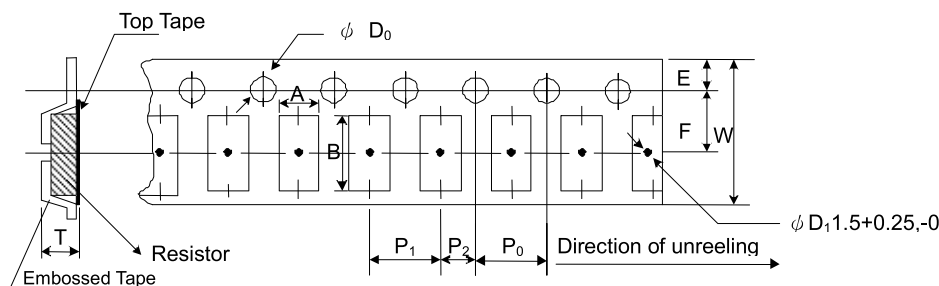
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
LRJ02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.45±0.10
LRJ03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
LRJ05	1.63±0.05	2.40±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
LRJ06	1.90±0.15	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1/-0	0.85±0.10

Embossed Plastic Tape Specifications

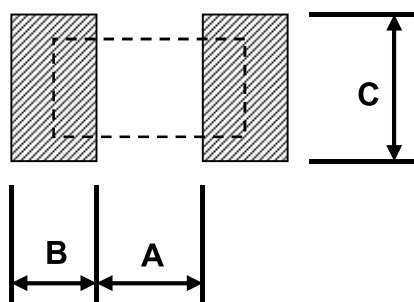


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
LRJ10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
LRJ12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰

Recommend Land Pattern

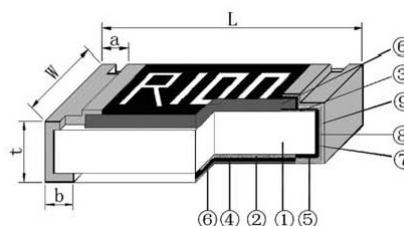
Unit: mm



Type	A	B	C
LRJ02	0.50	0.65	0.50
LRJ03	0.50	1.00	0.90
LRJ05	0.80	1.30	1.30
LRJ06	2.00	0.90	1.60
LRJ10	3.80	0.90	2.80
LRJ12	4.00	2.00	3.50

Metal Foil Chip Fixed Resistor—MF Series

Construction



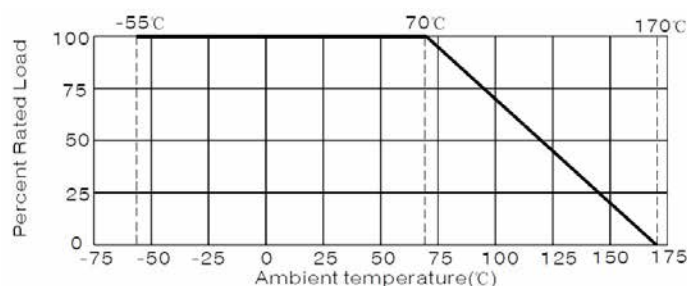
Features

- High power rating up to 2 Watts
- Low TCR down to ± 50 PPM/ $^{\circ}\text{C}$
- Current detecting resistors
- Superior mechanical and frequency characteristics
- Compliant with RoHS directive
- Halogen free requirement
- MSL: Level 1

Applications

- Switching Power Supply, Over Current Protection
- Voltage Regulation Module (VRM)
- DC-DC Converter, Charger
- Portable Devices etc

Derating Curve



Dimensions

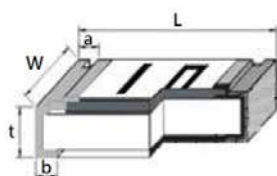


Figure1

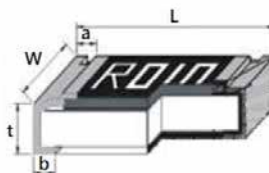


Figure2

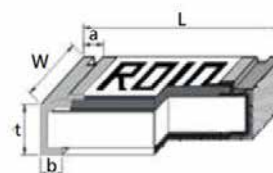


Figure3

Unit: mm

Type	Size (Inch)	Resistance (m Ω)	L	W	t	a	b
MF02	0402	10, 20	1.00 ± 0.10	0.50 ± 0.10	0.40 ± 0.10	≤ 0.35	0.30 ± 0.15
MF03	0603	≥ 5	1.60 ± 0.20	0.80 ± 0.20	0.70 ± 0.15	≤ 0.60	0.35 ± 0.20
MF05	0805	3-4	2.00 ± 0.20	1.25 ± 0.20	0.70 ± 0.15	0.40 ± 0.25	0.70 ± 0.30
		≥ 5					0.40 ± 0.30
MF06	1206	3-4	3.20 ± 0.20	1.60 ± 0.20	0.75 ± 0.15	0.50 ± 0.30	0.90 ± 0.30
		≥ 5					0.50 ± 0.30
MF10	2010	2	5.00 ± 0.20	2.50 ± 0.20	0.75 ± 0.20	0.60 ± 0.30	1.80 ± 0.30
		3					1.60 ± 0.30
		4-5					1.30 ± 0.30
		>5					0.80 ± 0.30
MF12	2512	2	6.40 ± 0.20	3.20 ± 0.20	0.75 ± 0.20	0.90 ± 0.30	2.30 ± 0.30
		3					1.90 ± 0.30
		4					1.70 ± 0.30
		5-6					1.20 ± 0.30
		7					1.10 ± 0.30
		>7					0.90 ± 0.30

Figure 1 for MF03 ; Figure 2 for MF05 $\geq 10\text{m}\Omega$ / MF06 type / MF12 type; Figure 3 for MF05 $< 10\text{m}\Omega$ / MF10 type

MF02 chip resistor is without marking.

Part Numbering

MF	06	J	T	E	U	R005
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	D: ±0.5% F: ±1% G: ±2% J: ±5%	T: Taping Reel	D: ±50 W: ±75 E: ±100 F: ±200	P: 1/5W V: 1/4W O: 1/3W U: 1/2W Q: 3/4W T: 1W S: 2W	R005: 0.005Ω R010: 0.01Ω R100: 0.1Ω

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Limiting Element Current	Max. Overload Current	Resistance Range(mΩ)				TCR (PPM/°C)
					±0.5%	±1%	±2%	±5%	
MF02	1/5W, 1/4W	-55 ~ +170°C	5.0A	11.2A	-	10, 20			±100, ±200
MF03	1/2W	-55 ~ +170°C	12.9A	28.9A	-	5 - 9			±100, ±200
					-	10 - 30			±50,±100
MF05	3/4W	-55 ~ +170°C	15.8A	35.4A	-	3 - 9			±100
					-	10			±50
	1/4W, 1/3W, 1/2W		12.9A	28.9A		3 - 9			±100
					-	10 - 50			±50
					-	3 - 5			±75, ±100
MF06	1/2W, 1W	-55 ~ +170°C	18.3A	40.8A	6 - 9			±50,±100	
					10 - 68			±50	
					-	2 - 4			±100, ±200
MF10	1W	-55 ~ +170°C	22.4A	50A	-	5 - 100			±50,±100
					-	101 - 200			±50,±100
MF12	1W	-55 ~ +170°C	3.2A	7.1A	-	2 - 4			±100, ±200
	2W		31.6A	63.3A	-	5 - 100			±50,±100
					-				

Current of DC or AC RMS value.

Rated current= $\sqrt{(P/R)}$ or Limiting element voltage whichever is lower.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+20/+125/+20°C
Short Time Overload	No mechanical damage $\Delta R \leq \pm 1\%$	1/5W~1W: 5x rated power for 5s 2W: 4x rated power for 5s
Endurance		70±2°C, 1000 hrs, rated current or limiting element current whichever is lower for 1.5 hrs "ON" and 0.5 hr "OFF"
Endurance at upper Category Temperature		at 170±2°C for 1000 hrs
Damp Heat Steady State		40±2°C, 93±3% RH, 1000 hrs, rated current or limiting element current whichever is lower for 1.5 hrs "ON" and 0.5 hr "OFF"
Rapid Change of Temperature		-55°C(30min) → normal temperature(5min) → 125°C(30min), 100 cycles
Solderability	95% min. coverage	245±5°C for 3±0.3 seconds
Resistance to Soldering Heat	No mechanical damage $\Delta R \leq \pm 1\%$	270±5°C for 10±1 seconds
Substrate Bending Test		2010, 2512 sizes: 2mm Other sizes: 3mm Duration: 60±5 seconds
Insulation Resistance	>1000MΩ	Apply DC 100V±15V between substrate and terminations for 1min, then check insulation resistance
Voltage Proof	No breakdown or flashover	Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60±5 seconds
Component Solvent Resistance	No mechanical damage $\Delta R \leq \pm 1\%$	Iso-propyl alcohol (IPA), 23±5°C, 10hrs

Reference Standards: IEC 60115-1

Storage Temperature: 5~30°C; Humidity 30~70%RH

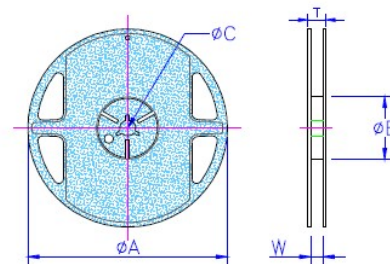
Shelf Life: 1 year from production date

Packaging

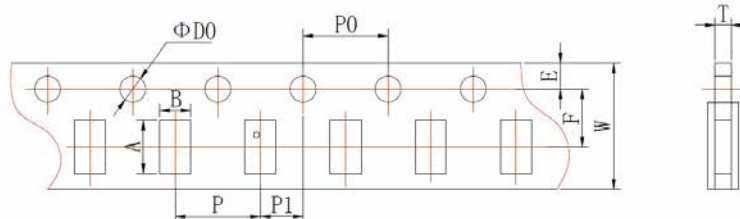
Packing Quantity & Reel Specifications

Unit : mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
MF02	178.0±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	10,000	-
MF03	178.0±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	5,000	-
MF05	178.0±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	5,000	-
MF06	178.0±2.0	58.0±2.0	13.0±0.5	9.5±1.0	12.5±1.5	5,000	-
MF10	178.0±2.0	57.0±2.0	13.0±0.5	13.0±0.5	15.5±1.5	-	4,000
MF12	178.0±2.0	57.0±2.0	13.0±0.5	13.0±0.5	15.5±1.5	-	4,000



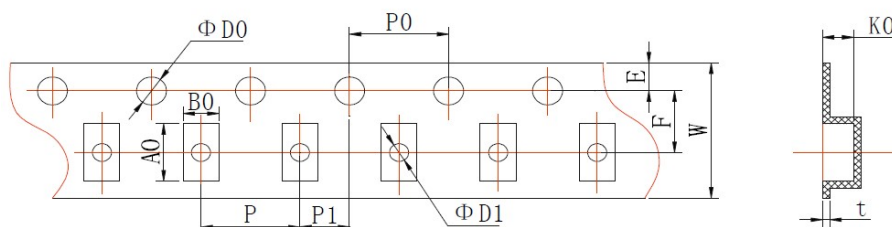
Paper Tape Specifications



Unit: mm

Type	A	B	W	F	E	P	P0	P1	ØD0	T
MF02	1.20±0.10	0.7±0.10	8.00±0.20	3.50±0.05	1.75±0.10	2.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	0.50±0.10
MF03	1.85±0.10	1.10±0.10	8.00±0.20	3.50±0.05	1.75±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
MF05	2.35±0.10	1.65±0.10	8.00±0.20	3.50±0.05	1.75±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.95±0.10
MF06	3.50±0.20	1.90±0.20	8.00±0.20	3.50±0.05	1.75±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.95±0.10

Plastic Tape Specifications

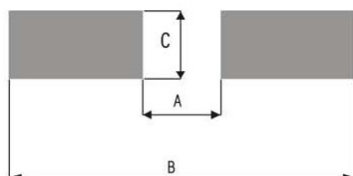


Unit: mm

Type	A0	B0	W	E	F	P	P0	P1	ØD0	ØD1	K0	t
MF10	5.50±0.15	2.82±0.15	12.0±0.10	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	1.50±0.10	0.84±0.10	0.25±0.05
MF12	6.78±0.15	3.45±0.15	12.0±0.10	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	1.50±0.10	1.00±0.10	0.25±0.05

Recommend Land Pattern

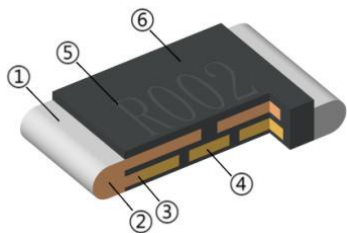
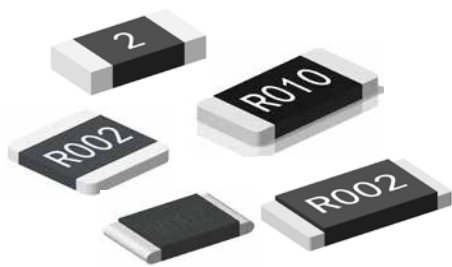
Unit: mm



Type	Resistance	A	B	C
MF02	10 mΩ, 20 mΩ	0.35	1.45	0.6
MF03	5mΩ - 30mΩ	0.6	2.8	1.0
MF05	3mΩ - 4mΩ	0.5	3.2	1.4
	5mΩ - 50mΩ	0.8		
MF06	3mΩ - 4mΩ	0.8	4.4	1.8
	5mΩ - 68mΩ	1.8		
MF10	2mΩ	1.0	6.3	2.9
	3mΩ - 9mΩ	1.6		
	10mΩ - 100mΩ	2.7		
MF12	2mΩ - 4mΩ	1.0	8.0	3.4
	5mΩ - 200mΩ	3.8		

Molding E-Beam Welded Metal Strip Resistor—WMR Series

Construction



①	Ni / Sn Plating	④	Alloy Body
②	Pure Copper Terminal	⑤	Marking
③	Electron Beam Welding Structure	⑥	Overcoat

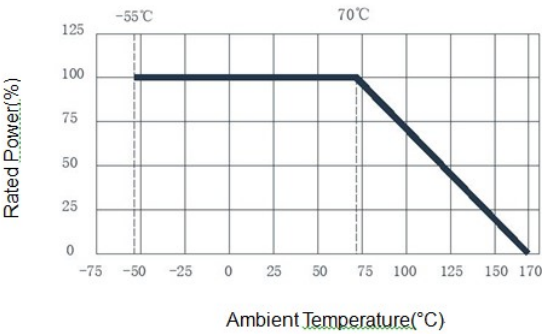
Features

- E-beam welded metal strip resistors, pure copper Electrodes are the ideal solution for current sensing applications
- Excellent reliability, stability, Anti-pulse capability
- Special welding process, all-metal construction, Supports low resistance , High temperature resistant resin molded encapsulation, strong weather resistance
- Low thermal EMF(<1 $\mu\text{V}/^\circ\text{C}$)
- Ultra-low parasitic inductance , fast response, can be used for high frequency AC current detection
- AEC-Q200 Compliance
- RoHS compliant

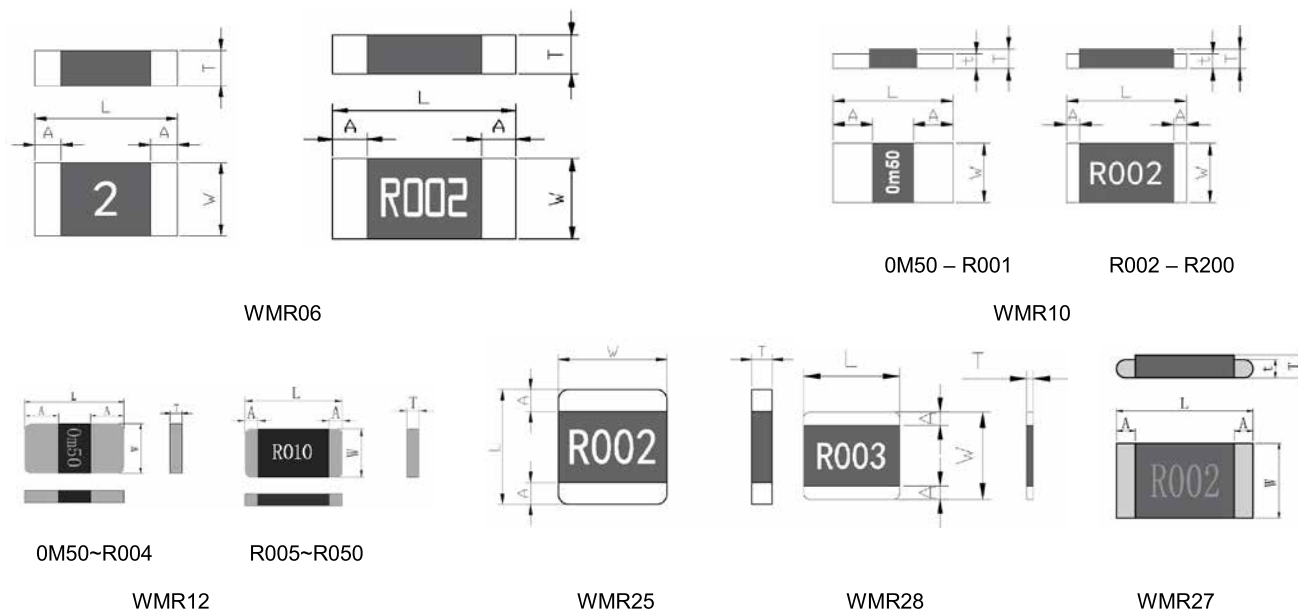
Part Numbering

WMR	12	F	T	D	R	R005	K
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Material Code
	06: 1206 10: 2010 12: 2512 25: 2725 28: 2728 27: 4527	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$	T: Taping Reel	C: ± 25 D: ± 50 W: ± 75 E: ± 100 K: ± 150 12: ± 175	S: 2W R: 3W H: 4W D: 5W 9: 9W	0M50: 0.0005 Ω R001: 0.001 Ω R010: 0.01 Ω R100: 0.1 Ω	M: Manganin K: Kamar F: FeCrAl

Derating Curve



■ Dimensions



Unit: mm

Type	Size (Inch)	Resistance (mΩ)	Material	L	W	T	A	t
WMR06	1206	1	Manganin	3.20±0.20	1.65±0.20	0.80±0.15	0.70±0.20	-
		2 – 8	Manganin	3.20±0.20	1.65±0.20	0.80±0.15	0.60±0.20	-
		9 – 25	Kamar	3.20±0.20	1.65±0.20	0.80±0.15	0.60±0.20	-
		9 – 25	FeCrAl	3.20±0.20	1.65±0.20	0.80±0.15	0.60±0.20	-
WMR10	2010	0.5 – 1	Manganin	5.10±0.20	2.50±0.20	0.80±0.15	1.70±0.20	0.60±0.10
		2 – 7	Manganin	5.10±0.20	2.50±0.20	0.80±0.15	0.55±0.20	0.60±0.10
		8 – 200	Kamar	5.10±0.20	2.50±0.20	0.80±0.15	0.55±0.20	0.60±0.10
WMR12	2512	0.5 – 1	Manganin	6.40±0.20	3.20±0.20	0.80±0.15	2.30±0.20	-
		1 – 4	Manganin	6.40±0.20	3.20±0.20	0.80±0.15	1.50±0.20	-
		5 – 50	Manganin	6.40±0.20	3.20±0.20	0.80±0.15	0.85±0.20	-
		3 – 4	FeCrAl	6.40±0.20	3.20±0.20	0.80±0.15	1.50±0.20	-
		5 – 50	FeCrAl	6.40±0.20	3.20±0.20	0.80±0.15	0.85±0.20	-
		3 – 4	Kamar	6.40±0.20	3.20±0.20	0.80±0.15	1.50±0.20	-
WMR25	2725	0.2, 0.25	Manganin	6.80±0.25	6.50±0.25	1.20±0.10	1.70±0.15	-
		0.5	Manganin	6.80±0.25	6.50±0.25	1.20±0.10	1.20±0.15	-
		1, 2, 2.5	FeCrAl	6.80±0.25	6.50±0.25	1.20±0.10	1.20±0.15	-
		3	FeCrAl	6.80±0.25	6.50±0.25	1.20±0.10	1.00±0.15	-
WMR28	2728	3 – 50	FeCrAl	7.20±0.20	6.80±0.20	1.00±0.10	1.10±0.15	-
WMR27	4527	1 – 5	Manganin	11.6±0.50	6.60±0.50	2.00±0.20	1.60±0.50	1.60±0.10
		6	Kamar	11.6±0.50	6.60±0.50	2.00±0.20	1.60±0.50	1.60±0.10
		7 – 100	Kamar	11.6±0.50	6.60±0.50	2.00±0.20	1.60±0.50	1.60±0.10

■ Standard Electrical Specifications

Type\Item	Power Rating	Operating Temp. Range	Material	Resistance Range(mΩ)			TCR (PPM/°C)
				±0.5%	±1%	±5%	
WMR06 (1206)	2W	-55 ~ +170°C	Manganin	-	1		±150
				-	2 - 8		±100
			Kamar	-	9 - 25		±75
			FeCrAl	-	9 - 25		±50
WMR10 (2010)	2W	-55 ~ +170°C	Manganin	-	0.5 - 1		±175
				-	2 - 7		±100
			Kamar	-	8 - 200		±75
WMR12 (2512)	3W	-55 ~ +170°C	Manganin	0.5 – 1			±150
				1 - 50			±100
			FeCrAl	3 - 4			±50
				5 - 50			±25
			Kamar	3 - 50			±50
WMR25 (2725)	4W	-55 ~ +170°C	Manganin	0.2, 0.25, 0.5			±200
			FeCrAl	1, 2, 3	1, 2, 2.5, 3		±25
WMR28 (2728)	5W	-55 ~ +170°C	FeCrAl	3 - 50			±50
WMR27 (4527)	9W	-55 ~ +170°C	Manganin	-	1 - 5		±75
			Kamar	-	6		±75
			Kamar	-	7 - 100		±50

■ Environmental Characteristics

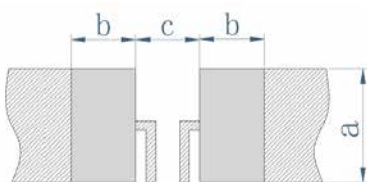
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	Within the specified value	Measured value -55°C and +125°C, reference value +20°C
Solderability	No visible damage, weldable area 95% minimum	245°C for 3 seconds
Short time overload	No visible damage, ΔR±0.5% maximum	2.5 times rated voltage, 5 sec
Resistance to solder heat	No visible damage, ΔR±0.5% maximum	270°C for 10 sec
Bending Strength	Within the specified value	Bending amplitude 2 mm for 60 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Insulation Resistance	>1000MΩ	Apply 100VDC for 1 minute
Dielectric Withstand Voltage	No breakdown or arcing	Apply 100VAC for 1 minute
Resistance to solvents	Marking Unsmeared	IPA, 23°C, 5±0.5 minute
High temperature and humidity	No visible damage, ΔR±1.0% maximum	temperature 85°C, humidity 85% of the conditions applied 10% of the rated power (current) or component limit current (whichever is less), for 1000 hours
High temperature storage	No visible damage, ΔR±1.0% maximum	1000 hrs @ 170°C, without load
Low temperature load	No visible damage, ΔR±0.5% maximum	-55°C, No load for one hour, rated voltage load for 45 min, no load for 15 min
Temperature cycling	No visible damage, ΔR±0.5% maximum	-55°C @ 30 min ~ room temperature @ <5 min ~ +155°C @ 30 min, 500 cycles
Load life	No visible damage, ΔR±1.0% maximum	1000 h @ 70°C, rated current or component limit current (whichever is less), 90 min on, 30 min off

■ Reference Standards: IEC 60115-1, UL-94; MIL-STD-202

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 1 year from production date

Recommend Land Pattern



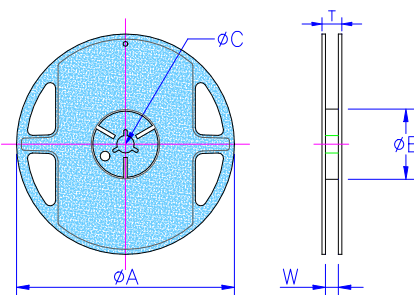
Type	Resistance (mΩ)	a (mm)	b (mm)	c (mm)
WMR06	1 – 25	1.78	1.27	1.40
WMR10	0.5 – 1	3.00	2.40	1.40
	2 – 200	3.00	1.60	3.00
WMR12	0.5 – 1	3.70	3.00	1.30
	1 – 4	3.70	2.30	2.80
	5 – 50	3.70	1.90	3.60
WMR25	0.2 – 0.25	6.86	3.18	1.32
	0.5 – 3	6.86	2.28	3.12
WMR28	3 – 50	7.82	2.75	3.51
WMR27	1 – 100	8.70	3.40	8.00

Packaging

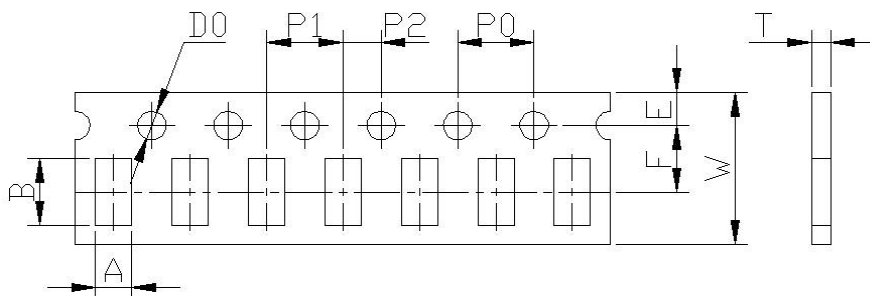
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W
WMR06	Embossed 5K	8mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	8.3±0.5
WMR10	Embossed 4K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.3±0.5
WMR12	Embossed 4K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.3±0.5
WMR25	Embossed 1K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.0±0.3
WMR28	Embossed 1K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.0±0.3
WMR27	Embossed 0.5K	24mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	25.0±0.5



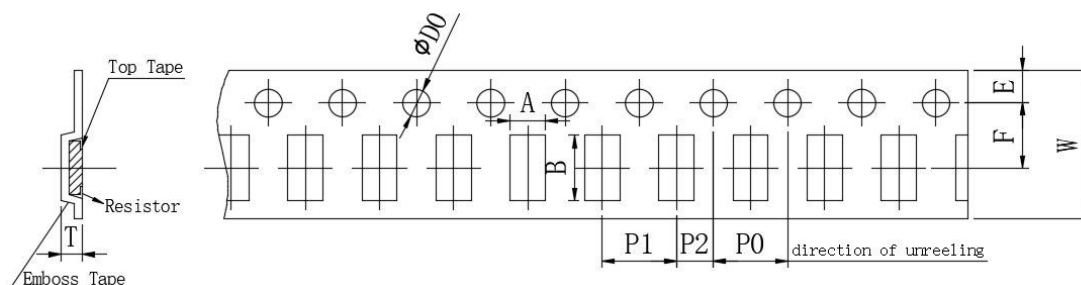
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMR06	1.90	3.50	8.00	1.75	3.50	4.00	4.00	2.00	1.50	1.10

Embossed Plastic Tape Specifications

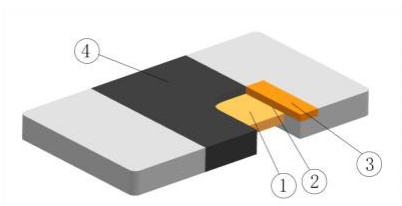
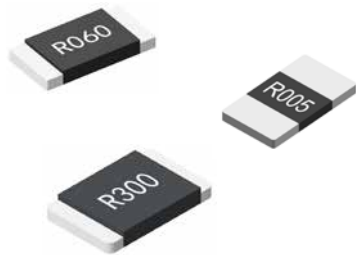


Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMR10	2.80	5.40	12.00	1.75	5.50	4.00	4.00	2.00	1.50	1.20
WMR12	3.50	6.80	12.00	1.75	5.50	4.00	4.00	2.00	1.50	1.20
WMR25	6.80	7.20	12.00	1.75	5.50	4.00	8.00	2.00	1.50	1.50
WMR28	7.70	7.20	12.00	1.75	5.50	4.00	12.00	2.00	1.50	1.45
WMR27	7.40	11.80	24.00	1.75	11.50	4.00	12.00	2.00	1.50	2.30

Molding E-Beam Welded Metal Strip Resistor—WMB Series

Construction

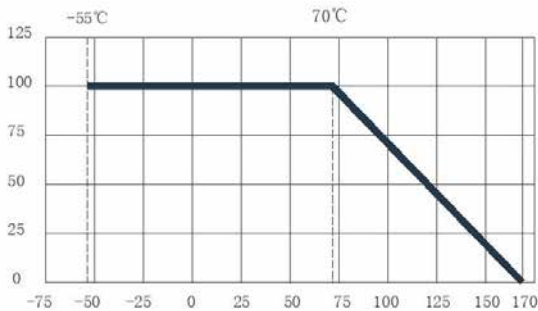


①	Alloy Body	③	Alloy Body
②	Electron Beam Welding Structure	④	Overcoat

Features

- E-beam welded metal strip resistors, pure copper
- Electrodes are the ideal solution for current sensing applications
- Excellent reliability, stability, Anti-pulse capability
- Special welding process, all-metal construction, Supports low resistance , High temperature resistant resin molded encapsulation, strong weather resistance
- Low thermal EMF(<1 $\mu\text{V}/^\circ\text{C}$)
- Ultra-low parasitic inductance , fast response, can be used for high frequency AC current detection
- AEC-Q200 Compliance
- RoHS compliant

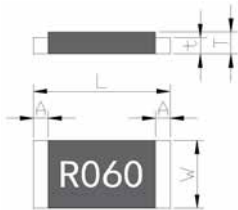
Derating Curve



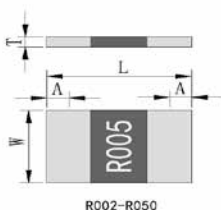
Part Numbering

WMB	12	F	T	D	S	R050	K
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Material Code
	12: 2512 27: 4527	F: $\pm 1\%$ J: $\pm 5\%$	T: Taping Reel	D: ± 50 K: ± 150	S: 2W H: 4W I: 6W	R002: 0.002 Ω R050: 0.05 Ω R100: 0.1 Ω	M: Manganin K: Kamar

Dimensions

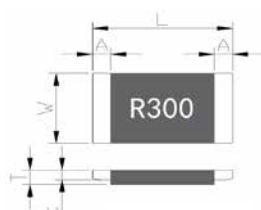


2512



R002-R050

4527



R051-R300

Unit: mm

Type	Size (Inch)	Resistance (m Ω)	Material	L	W	A	t	T
WMB12	2512	51 – 300	Kamar	6.40 $\pm$ 0.20	3.20 $\pm$ 0.20	0.95 $\pm$ 0.20	0.60 $\pm$ 0.20	0.80 $\pm$ 0.15
WMB27	4527	0.5	Manganin	11.50 $\pm$ 0.20	7.20 $\pm$ 0.20	4.10 $\pm$ 0.20	-	1.00 $\pm$ 0.15
		1	Manganin	11.50 $\pm$ 0.20	7.20 $\pm$ 0.20	3.50 $\pm$ 0.20	-	1.00 $\pm$ 0.15
		2 – 50	Kamar	11.50 $\pm$ 0.20	7.20 $\pm$ 0.20	3.50 $\pm$ 0.20	-	1.00 $\pm$ 0.15
		51 – 300	Kamar	11.50 $\pm$ 0.20	7.20 $\pm$ 0.20	1.50 $\pm$ 0.20	1.00 $\pm$ 0.15	1.50 $\pm$ 0.15

Standard Electrical Specifications

Item Type	Power Rating	Operating Temp. Range	Material	Resistance Range(mΩ)		TCR (PPM/°C)
				±1%	±5%	
WMB12 (2512)	2W	-55 ~ +170°C	Kamar	51 – 300		±50
WMB27 (4527)	6W		Manganin	0.5, 1		±150
	4W		Kamar	2 - 50		±50
			Kamar	51 - 300		±50

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	Within the specified value	Measured value 20°C and +130°C, reference value +20°C
Solderability	No visible damage, weldable area 95% minimum	245°C for 3 seconds
Short time overload	No visible damage, ΔR±1.0% maximum	5 times rated voltage, 5 sec
Resistance to solder heat	No visible damage, ΔR±0.5% maximum	260°C for 10 sec
Bending Strength	Within the specified value	Bending amplitude 2 mm for 60 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Insulation Resistance	>1000MΩ	Apply a DC voltage of 100V between the electrode and the substrate, keep it for 60 seconds, and then measure the insulation resistance value
Dielectric Withstand Voltage	No breakdown or arcing	Apply an AC voltage with an effective value of the maximum load voltage between the electrode and the substrate at a speed of about 100V/s, and keep it for 60 seconds
Resistance to solvents	Marking Unsmearred	IPA, 23°C , 5±0.5 min
Biased Humidity	No visible damage, ΔR±1.0% maximum	Temperature 85°C, humidity 85% of the conditions applied 10% of the rated power (current) or component limit current (whichever is less), for 1000 hours
High temperature storage	No visible damage, ΔR±1.0% maximum	1000 hrs @ 170°C, without load
Low temperature load	No visible damage, ΔR±0.5% maximum	-55°C, No load for one hour, rated voltage load for 45 min, no load for 15 min
Temperature cycling	No visible damage, ΔR1.0% maximum	-55°C @ 30 min ~ room temperature @ <5 min ~ +155°C @ 30 min, 1000 cycles
Load life	No visible damage, ΔR±1.0% maximum	1000 h @ 70±2°C, rated current or component limiting current (whichever is smaller), 90 min on, 30 min off

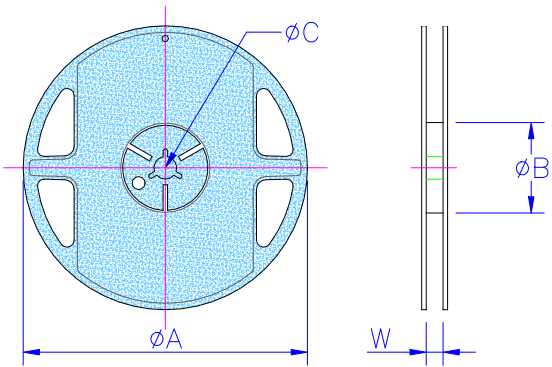
Reference Standards: IEC 60115-1, UL-94; MIL-STD-202

Storage Temperature: 5~28°C; Humidity: 40%~75%RH

Shelf Life: 1 year from production date

■Packaging

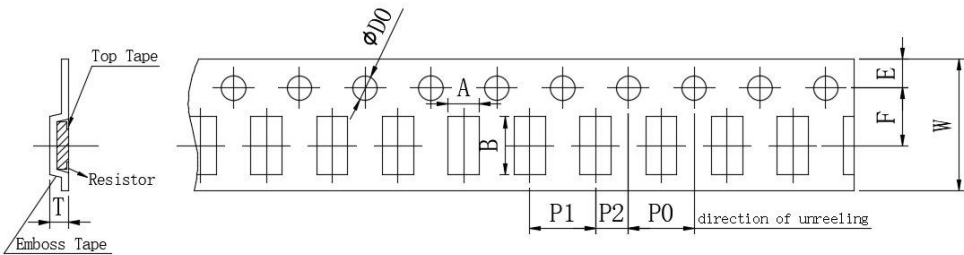
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W
WMB12	Embossed	4K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.3±0.5
WMB27 (0M50-R050)	Embossed	1K	25mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	25.0±0.5
(R051-R300)	Embossed	0.5K	25mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	25.0±0.5

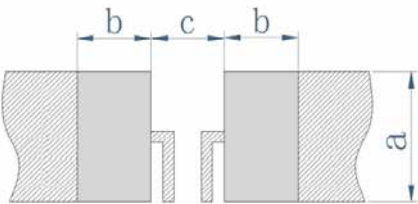
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMB12	3.50	6.80	12.00	1.75	5.5	4.00	4.00	2.00	1.50	1.20
WMB27 (0M50-R050)	7.50	11.80	24.00	1.75	11.5	4.00	12.00	2.00	1.50	1.30
WMB27 (R051-R300)	7.50	11.80	24.00	1.75	11.5	4.00	12.00	2.00	1.50	2.30

■Recommend Land Pattern



Unit: mm

Type	a	b	c
WMB12	3.70	1.90	3.60
WMB27 (0M50)	8.70	5.00	3.00
WMB27 (R001-R050)	8.70	5.00	3.50
WMB27 (R051-R300)	8.70	3.00	7.50

Four Terminal Molding E-Beam Welded Metal Strip Resistor—WMK Series

Construction



Features

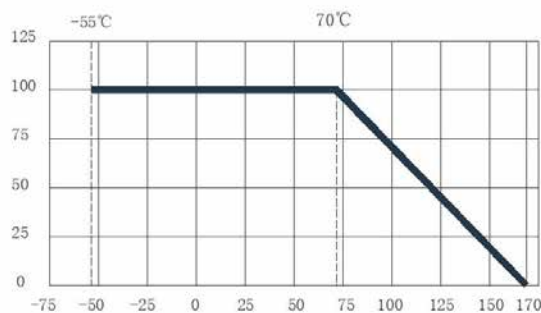
- E-beam welded metal strip resistors, 4-terminal structure, pure copper Electrodes are the ideal solution for current sensing applications
- Excellent reliability, stability, Anti-pulse capability
- Special welding process, all-metal construction, Supports low resistance , High temperature resistant resin molded encapsulation, strong weather resistance
- Low thermal EMF(<1 $\mu\text{V}/^\circ\text{C}$)
- Ultra-low parasitic inductance , fast response, can be used for high frequency AC current detection
- AEC-Q200 Compliance
- RoHS compliant

① Ni / Sn Plating	④ Marking
② Electron Beam Welding Structure	⑤ Overcoat
③ Alloy Body	

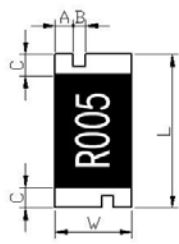
Part Numbering

WMK	12	F	T	E	R	R001	K
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Material Code
	12: 2512 37: 3637	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$	T: Taping Reel	C: ± 25 D: ± 50 W: ± 75 E: ± 100 K: ± 150	R: 3W D: 5W	0M50: 0.0005 Ω R001: 0.001 Ω R010: 0.01 Ω	M: Manganin K: Kamar F: FeCrAl

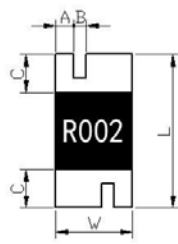
Derating Curve



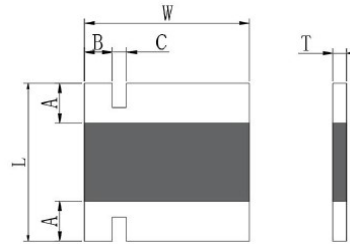
■ Dimensions



$5 \leq R \leq 50$



$0.5 \leq R < 5$
2512



3637

Unit: mm

Type	Size (Inch)	Resistance (mΩ)	Material	L	W	T	A	B	C
WMK12	2512	0.5	Manganin	6.40±0.20	3.20±0.20	0.80±0.15	0.76±0.25	0.51±0.25	2.30±0.20
		1 – 4	Manganin FeCrAl	6.40±0.20	3.20±0.20	0.80±0.15	0.76±0.25	0.51±0.25	1.50±0.20
		5 – 50	FeCrAl Kamar	6.40±0.20	3.20±0.20	0.80±0.15	0.76±0.25	0.51±0.25	0.85±0.20
WMK37	3637	0.2	Manganin	9.10±0.25	9.40±0.25	0.80±0.25	3.50±0.25	1.60±0.25	0.82±0.25
		0.3	Manganin	9.10±0.25	9.40±0.25	0.80±0.25	3.20±0.25	1.60±0.25	0.82±0.25
		1	Manganin	9.10±0.25	9.40±0.25	0.80±0.25	2.40±0.25	1.60±0.25	0.82±0.25
		2 – 30	Kamar	9.10±0.25	9.40±0.25	0.80±0.25	2.40±0.25	1.60±0.25	0.82±0.25
		1 – 30	FeCrAl	9.10±0.25	9.40±0.25	0.80±0.25	2.40±0.25	1.60±0.25	0.82±0.25

■ Standard Electrical Specifications

Type	Power Rating	Operating Temp. Range	Material	Resistance Range(mΩ)			TCR (PPM/°C)
				±0.5%	±1%	±5%	
WMK12 (2512)	3W	-55 ~ +170°C	Manganin	0.5			±150
			Manganin FeCrAl	1 - 4			±100
			FeCrAl Kamar	5 - 50			±25
WMK37 (3637)	5W	-55 ~ +170°C	Manganin	0.2, 0.3, 1			±75
			Kamar	2 - 30			±25
			FeCrAl	1 - 30			±50

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	Within the specified value	Measured value -55°C and +130°C, reference value +20°C
Solderability	No visible damage, weldable area 95% minimum	245°C for 3 seconds
Short time overload	No visible damage, ΔR±1.0% maximum	2.5 times rated voltage, 5 sec
Resistance to solder heat	No visible damage, ΔR±1.0% maximum	270°C for 10 sec
Bending Strength	Within the specified value	Bending amplitude 2 mm for 60 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Insulation Resistance	>1000MΩ	Apply a DC voltage of 100V between the electrode and the substrate, keep it for 60 seconds, and then measure the insulation resistance value
Dielectric Withstand Voltage	No breakdown or arcing	Apply an AC voltage with an effective value of the maximum load voltage between the electrode and the substrate at a speed of about 100V/s, and keep it for 60 seconds
Resistance to solvents	Marking Unsmear	IPA, 23°C, 5±0.5 min
High temperature storage	No visible damage, ΔR±1.0% maximum	1000 hrs @ 170°C, without load
High temperature storage	No visible damage, ΔR±1.0% maximum	1000 hrs @ 170°C, without load
Low temperature load	No visible damage, ΔR±0.5% maximum	-55°C, No load for one hour, rated voltage load for 45 min, no load for 15 min

Item	Requirement	Test Method
Temperature cycling	No visible damage, $\Delta R \pm 1.0\%$ maximum	-55°C @ 30 min ~ room temperature @ <5 min ~ +155°C @ 30 min, 1000 cycles
Load life	No visible damage, $\Delta R \pm 1.0\%$ maximum	1000 h @ 70±2°C, rated current or component limiting current (whichever is smaller), 90 min on, 30 min off

■ Reference Standards: IEC 60115-1, UL-94; MIL-STD-202

■ Storage Temperature: 5~28°C; Humidity: 40%~75%RH

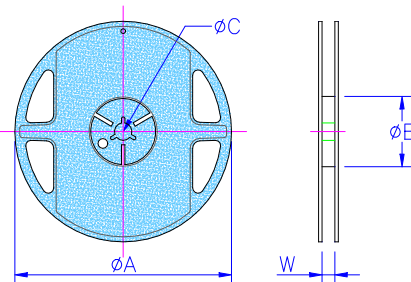
■ Shelf life: 1 year from production date

■ Packaging

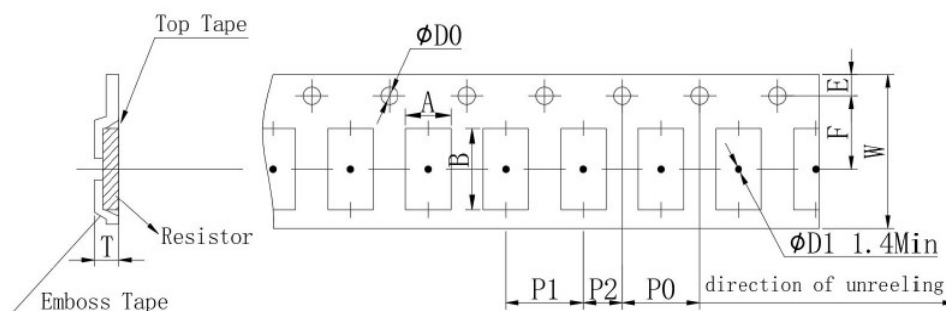
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W
WMK12	Embossed	4K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5
WMK37	Embossed	4K	16mm	13 inch	330.0±2.0	60.0±1.0	13.5±0.5

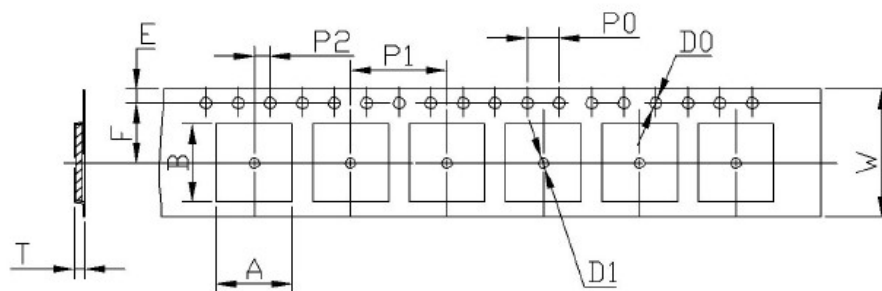


Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMK12	3.50	6.80	12.00	1.75	5.5	4.00	4.00	2.00	1.50	1.20

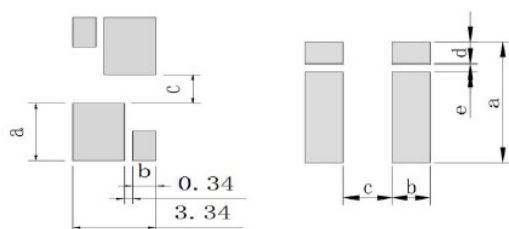


Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMK37	9.50	9.80	16.00	1.75	7.50	12.00	12.00	6.00	1.50	1.20

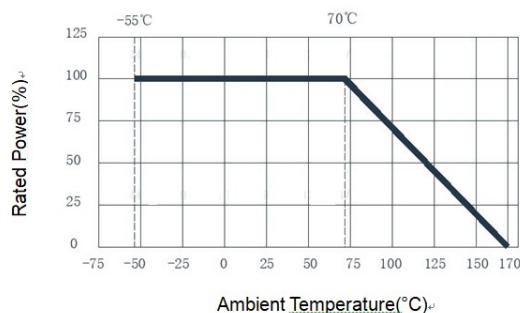
■ Recommend Land Pattern

Unit: mm



Type	Resistance (mΩ)	a	b	c	d	e
WMK12	0.5 – 4	3.30	0.93	1.66	-	-
	5 – 50	2.29	0.93	3.68	-	-
WMK37	0.2 – 0.3	9.90	4.20	1.80	1.80	0.60
	1 – 30	9.90	3.20	4.00	1.80	0.60

Derating Curve



Standard Electrical Specifications

Type\Item	Power Rating	Operating Temp. Range	Material	Resistance Range(mΩ)			TCR (PPM/°C)
				±0.5%	±1%	±5%	
WMP12 (2512)	3W	-55 ~ +170°C	Manganin	0.5			±150
			Manganin	1 - 2			±100
			FeCrAl	3 - 4			±50
			FeCrAl	5 - 50			±25
			Kamar	3 - 50			±50
WMP17 (2817)	5W	-55 ~ +170°C	Manganin	-	1 - 3		±75
	3W		Kamar	-	4 - 50		±50
			Kamar	-	51 - 100		±50
WMP27 (4527)	12W	-55 ~ +170°C	Manganin	-	1 - 6		±75
			Kamar	-	7 - 100		±50

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	Within the specified value	Measured value 20°C and +130°C, reference value +20°C
Solderability	No visible damage, weldable area 95% minimum	245°C for 3 seconds
Short time overload	No visible damage, ΔR±1.0% maximum	Standard: 5 times rated voltage, 5 sec High Power: 2.5 times rated voltage, 5 sec
Resistance to solder heat	No visible damage Standard: ΔR±0.5% maximum High Power: ΔR±1.0% maximum	Standard: 260°C for 10 sec High Power: 270°C for 10 sec
Bending Strength	Within the specified value	Bending amplitude 2 mm for 60 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Insulation Resistance	>1000MΩ	Apply a DC voltage of 100V between the electrode and the substrate, keep it for 60 seconds, and then measure the insulation resistance value
Dielectric Withstand Voltage	No breakdown or arcing	Apply an AC voltage with an effective value of the maximum load voltage between the electrode and the substrate at a speed of about 100V/s, and keep it for 60 seconds
Resistance to solvents	Marking Unsmeared	IPA, 23±5°C, 5±0.5 minute
Biased Humidity	No visible damage, ΔR±1.0% maximum	Temperature 85°C, humidity 85% of the conditions applied 10% of the rated power (current) or component limit current (whichever is less), for 1000 hours
High temperature storage	No visible damage, ΔR±1.0% maximum	1000 hrs @ 170°C, without load
Low temperature load	No visible damage, ΔR±1.0% maximum	-55°C, No load for 1.5 hour, rated voltage load for 45 min, no load for 15 min
Temperature cycling	No visible damage, ΔR±1.0% maximum	-55°C @ 30 min ~ +155°C @ 30 min, 1000 cycles
Load life	No visible damage, ΔR±1.0% maximum	1000 h @ 70±2°C, rated current or component limiting current (whichever is smaller), 90 min on, 30 min off

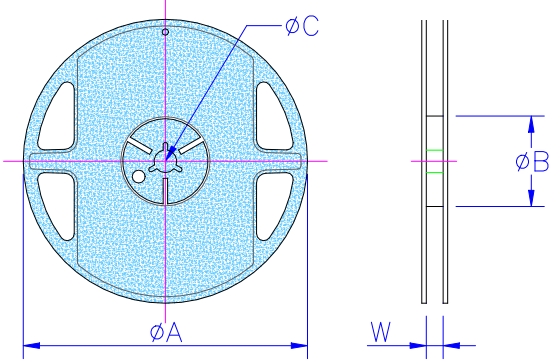
Reference Standards: IEC 60115-1, UL-94; MIL-STD-202

Storage Temperature: 5~35°C; Humidity: 40~75%RH

Shelf life: 1 year from production date

■Packaging

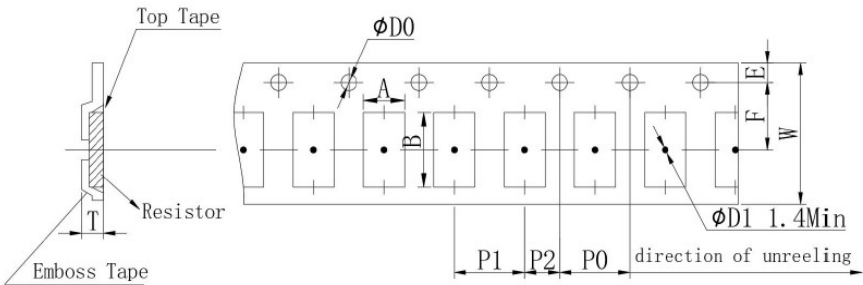
Reel Specifications & Packaging Quantity



Unit: mm

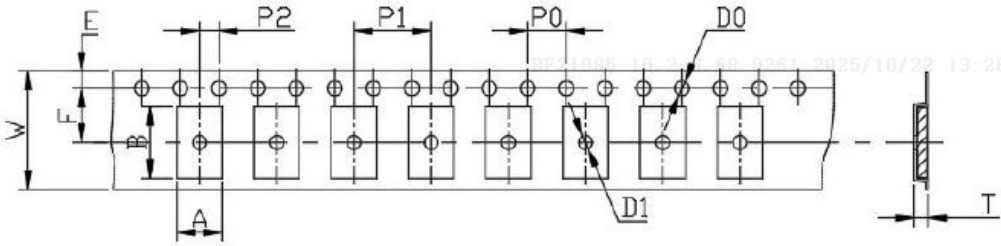
Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W
WMP12	Embossed	4K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.3±0.5
WMP17	Embossed	1K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.3±0.5
WMP27	Embossed	0.5K	24mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	25.0±0.5

Embossed Plastic Tape Specifications



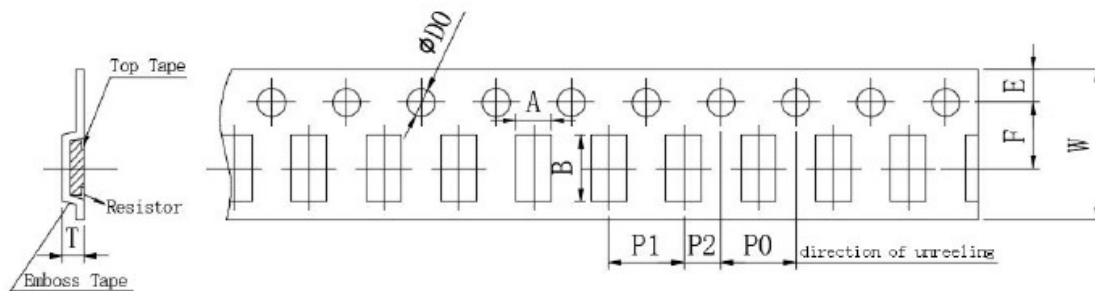
Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMP12	3.5	6.8	12	1.75	5.5	4	4	2	1.5	1.2



Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMP17	4.7	7.25	12	1.75	5.5	4	8	2	1.5	1.5

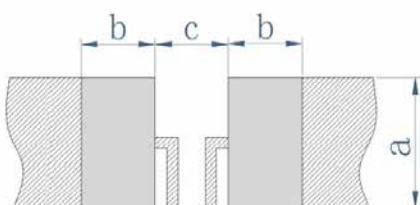


Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
WMP27	7.4	11.8	24	1.75	11.5	4	12	2	1.5	2.3

Recommend Land Pattern

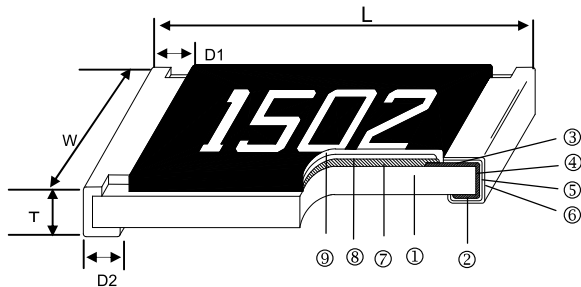
Unit: mm



Type	Resistance (mΩ)	a	b	c
WMP12	0.5	3.7	3.0	1.3
	1 – 4	3.7	2.3	2.8
	5 – 50	3.7	1.9	3.6
WMP17	1 – 50	5.2	2.75	3.5
WMP27	1 – 100	8.7	3.4	8.0

High Voltage Thick Film Chip Resistor – HVR Series

Construction



Features

- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Excellent performance at high voltage
- Reduced size of final equipment
- IEC 62368-1 & IEC 60950-1 Safety Certificate issued by UL Demko
- AEC-Q200 Compliance
- MSL: Level 1

Applications

- Inverter
- Outdoor Equipments
- Converter
- High Pulse Equipment

① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Dimensions

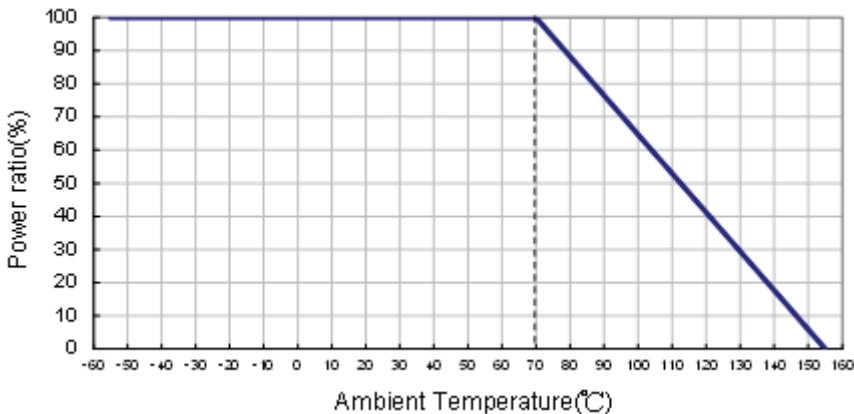
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HVR02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
HVR03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
HVR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
HVR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
HVR0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
HVR12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

HVR	03	F	T	E	X	1003
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 0A: 2010 12: 2512	F: ±1% J: ±5%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100 F: ±200 H: ±400	Y: 1/16W X: 1/10W W: 1/8W V: 1/4W U: 1/2W T: 1W	1003: 100KΩ 1004: 1MΩ 1005: 10MΩ

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
HVR02 (0402)	1/16W	-55 ~ +155°C	100V	200V	39KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR03 (0603)	1/10W		200V	400V	56KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR05 (0805)	1/8W		400V	800V	100KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR06 (1206)	1/4W		500V	1000V	100KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR0A (2010)	1/2W		2000V	3000V	51KΩ - 1MΩ		±100
					1.02MΩ - 20MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR12 (2512)	1W		3000V	4000V	30KΩ - 1MΩ		±100
					1.02MΩ - 20MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

IEC 62368-1 & IEC 60950-1 Safety Certificate Scope

Scope \ Size	HVR02	HVR03	HVR05	HVR06	HVR0A	HVR12
G.10.3 (impulse test)	10M~100M	10M~100M	100K~100M	470K~100M	51K~100M	30K~100M
G.10.4 (Voltage surge test)			10M~100M			
G.10.5 (Impulse test)			100K~100M			
G.10.6 (Overload test)	10M~100M	10M~100M	100K~100M			

Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	at +155°C for 1000 hrs

Item	Requirement		Test Method
	±1%	±5%	
Bending Strength	$\pm(1.0\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		HVR02: 150V for 1 minute HVR03: 300V for 1 minute HVR05/HVR06/HVR0A/HVR12: 500V for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$		260±5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

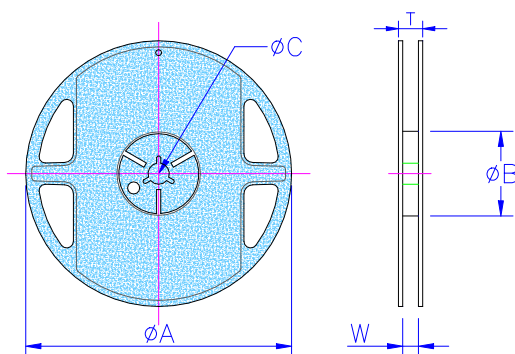
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

■ Packaging



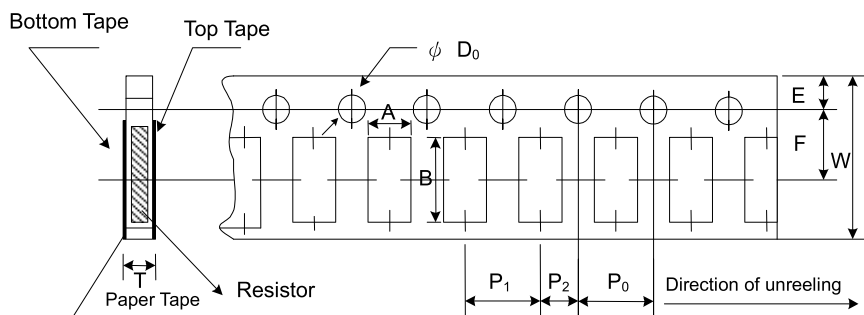
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HVR02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVR03 HVR05 HVR06	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVR0A HVR12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
		8K	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

Packaging

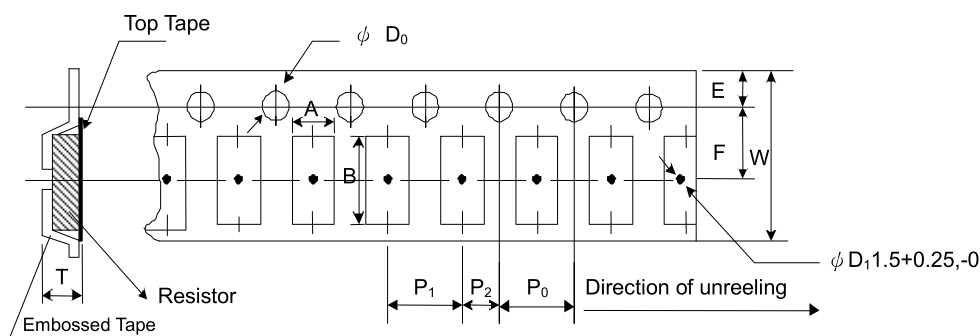
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVR02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
HVR03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
HVR05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
HVR06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

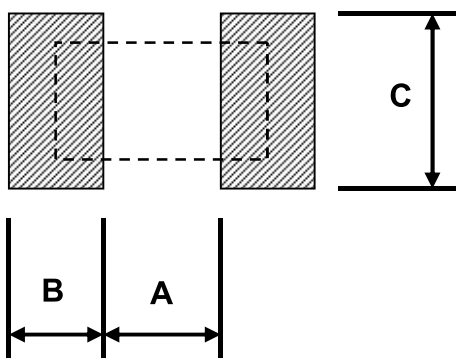


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVR0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
HVR12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

Recommend Land Pattern

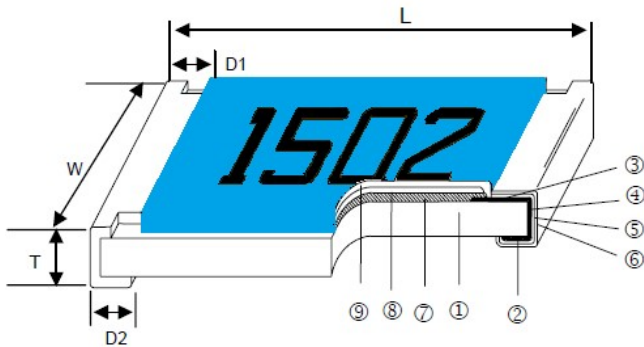
Unit: mm



Type	A	B	C
HVR02	0.50	0.45	0.60
HVR03	0.90	0.60	0.90
HVR05	1.20	0.70	1.30
HVR06	2.00	0.90	1.60
HVR0A	3.80	0.90	2.80
HVR12	4.90	1.60	3.50

Green Thick Film Chip Resistor—CRG Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Green Resistor without RoHS exemptions
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- MSL: Level 1

Applications

- Telecommunication Equipments
- Radio and Tape Recorders, TV Tuners
- Digital Cameras, Watches, Pocket Calculators
- Computers, Instruments
- Medical Equipment

Dimensions

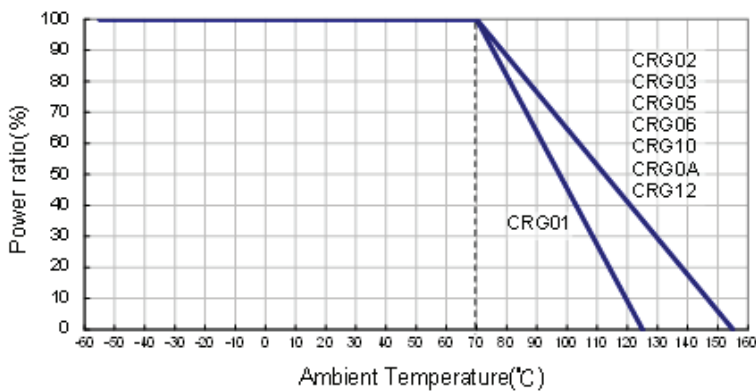
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CRG01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.15
CRG02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
CRG03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2
CRG05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.3
CRG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
CRG10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16
CRG0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24
CRG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39

Part Numbering

CRG	03	F	L	7	-- -10R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	F: ±1% J: ±5%	L: Standard P: High Power H: Ultra High Power	4: 7" Reel 4Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs	-- - 1R2: 1.2Ω -- - 3K3: 3.3KΩ -- - 10K: 10KΩ -- - 100K: 100KΩ “-” to fill up 6 spaces

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
CRG01 (0201)	1/20W	-55 ~ +125°C	25V	50V	1Ω – 4.3MΩ		±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CRG02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CRG03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CRG05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2A				-	0Ω (<50mΩ)	-
CRG06 (1206)	1/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2A				-	0Ω (<50mΩ)	-
CRG10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2.5A				-	0Ω (<50mΩ)	-
CRG0A (2010)	3/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 3.5A				-	0Ω (<50mΩ)	-
CRG12 (2512)	1W	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 4A				-	0Ω (<50mΩ)	-

High Power & Ultra High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Function Code	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
						±1%	±5%	
CRG05 (0805)	1/3W	P	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ	1Ω - 9.76Ω 10Ω - 1MΩ	±200 ±100
CRG06 (1206)	1/3W	P		200V	400V			
	*1/2W	H						
CRG10 (1210)	1/2W	P		200V	400V			
	*3/4W	H						
CRG0A (2010)	1W	P		200V	400V			
CRG12 (2512)	2W	P	250V	500V				

*: Ultra High Power

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series High power & Ultra High Power: RCWV*2 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G			Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +125°C /+155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +125°C /+155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

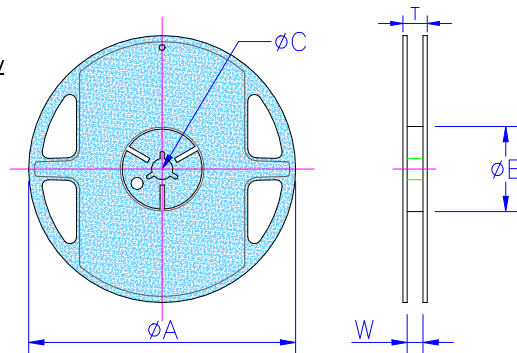
■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging

Reel Specifications & Packaging Quantity

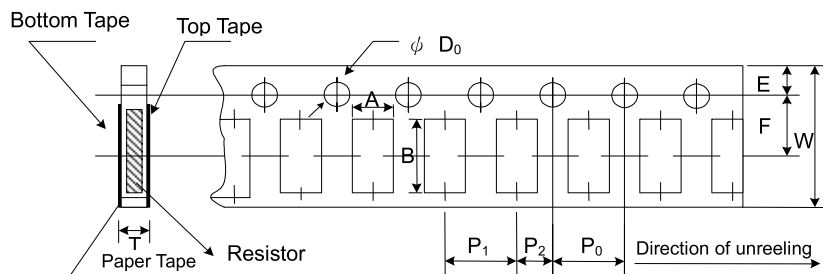


Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CRG01 CRG02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CRG03 CRG05 CRG06 CRG10	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CRG0A CRG12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5

Packaging

Paper Tape Specifications

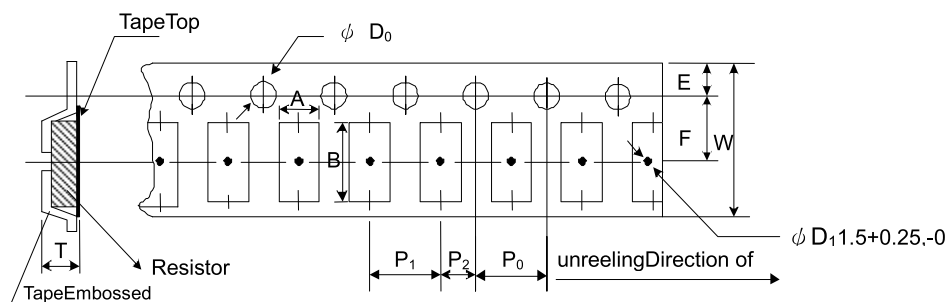


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRG01	0.38±0.05	0.68±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CRG02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CRG03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CRG05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CRG06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CRG10	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Packaging

Embossed Plastic Tape Specifications

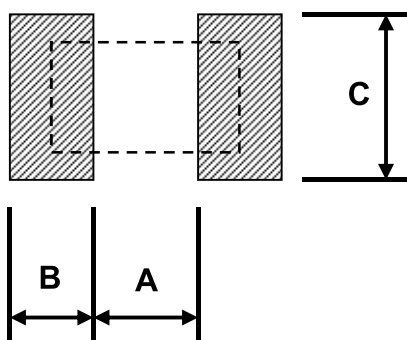


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRG0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
CRG12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

Recommend Land Pattern

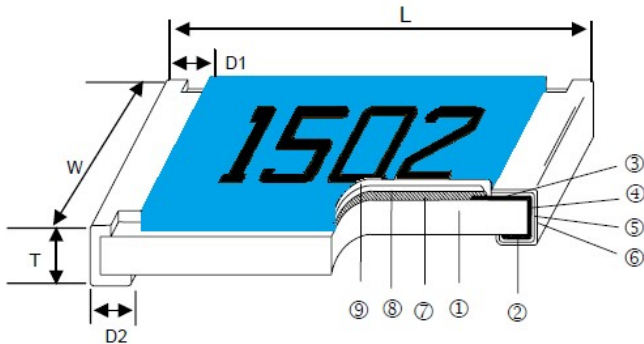
Unit: mm



Type	A	B	C
CRG01	0.30	0.25	0.30
CRG02	0.50	0.45	0.60
CRG03	0.90	0.60	0.90
CRG05	1.20	0.70	1.30
CRG06	2.00	0.90	1.60
CRG10	2.00	0.90	2.80
CRG0A	3.80	0.90	2.80
CRG12	4.90	1.60	3.50

Green Anti-Sulfurated Thick Film Chip Resistor—ASG Series

Construction



①	Alumina Substrate	④	Edge Electrode	⑦	Resistor Layer
②	Bottom Electrode	⑤	Barrier Layer	⑧	Primary Overcoat
③	Top Electrode	⑥	External Electrode	⑨	Secondary Overcoat

Features

- Special construction to prevent sulfuration in a sulfur containing environment
- Total Lead(Pb)-free without RoHS exemptions
- MSL: Level 1

Applications

- High-end Computer
- Industrial Equipment
- Automatic Equipment Controller
- Medical Equipment
- High-end Multimedia Electronics
- Outdoor Electronic Applications

Dimensions

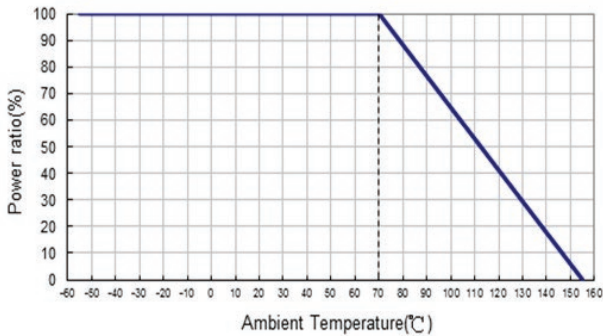
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ASG02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
ASG03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
ASG05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
ASG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
ASG10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.9
ASG0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
ASG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

ASG	06	F	T	E	V	1002
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100 F: ±200 - : No Specified	Y: 1/16W X: 1/10W W: 1/8W V: 1/4W O: 1/3W U: 1/2W Q: 3/4W T: 1W A: 1.5W	R0R0: 0Ω 0010: 1Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
ASG02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				— 0Ω(<50mΩ)			—
ASG03 (0603)	1/10W		75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				— 0Ω(<50mΩ)			—
ASG05 (0805)	1/8W		150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				— 0Ω(<50mΩ)			—
ASG06 (1206)	1/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				— 0Ω(<50mΩ)			—
ASG10 (1210)	1/3W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2.5A				— 0Ω(<50mΩ)			—
ASG0A (2010)	3/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 3.5A				— 0Ω(<50mΩ)			—
ASG12 (2512)	1W		250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 4A				— 0Ω(<50mΩ)			—

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
ASG02 (0402)	1/10W	-55 ~ +155°C	50V	100V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
ASG03 (0603)	1/4W		75V	150V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
ASG05 (0805)	1/3W		150V	300V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
ASG06 (1206)	1/2W		200V	400V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
ASG10 (1210)	3/4W		200V	400V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
ASG0A (2010)	1W		200V	400V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
ASG12(2512)	1.5W		250V	500V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 125 °C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +155°C, 5 cycles
Sulfur Test	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	<50mΩ	H2S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; ASTM-B-809

■ Storage Temperature: 15~28°C; Humidity < 80%RH

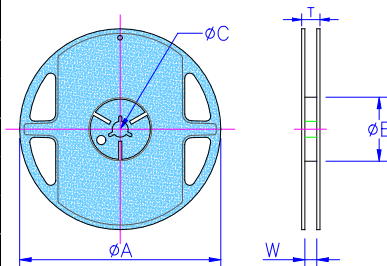
■ Shelf Life: 2 years from production date

Packaging

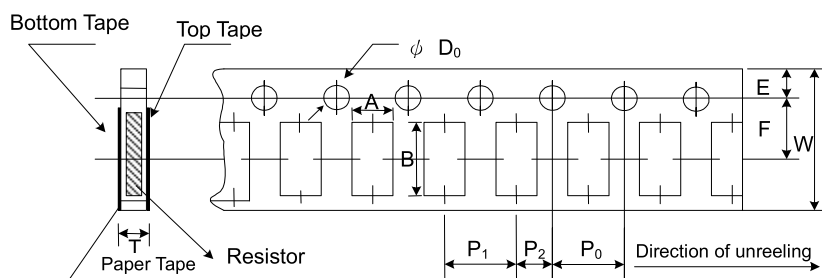
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
ASG02	Paper	10K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG03	Paper	5K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
ASG05		10K	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG06		20K	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG10	Paper	5K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
ASG03		10K	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG06		20K	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG0A	Embossed	4K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
ASG12		8K	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



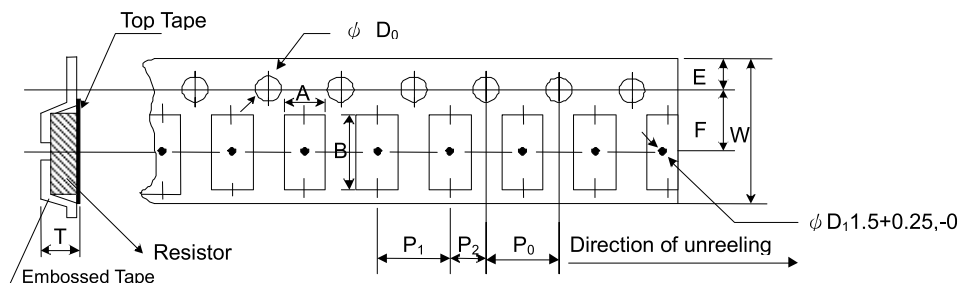
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ASG02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
ASG03	1.10±0.10	1.90±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
ASG05	1.60±0.10	2.40±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
ASG06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
ASG10	2.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

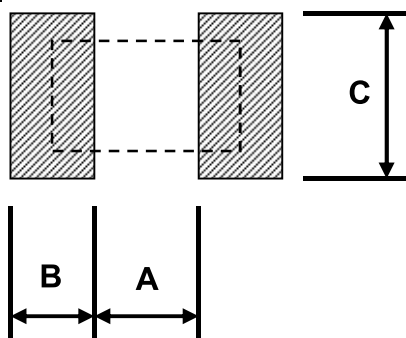


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ASG0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
ASG12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

Recommend Land Pattern

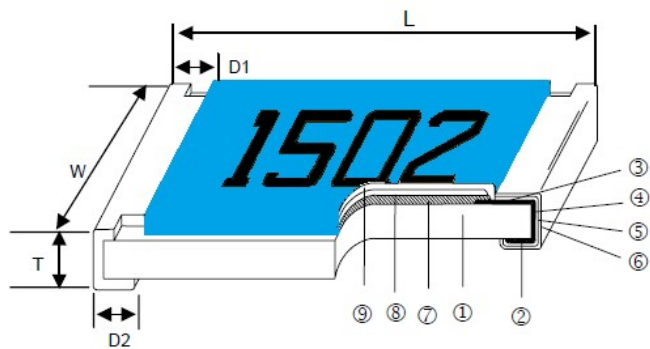
Unit: mm



Type	A	B	C
ASG02	0.50	0.45	0.60
ASG03	0.90	0.60	0.90
ASG05	1.20	0.70	1.30
ASG06	2.00	0.90	1.60
ASG10	2.00	0.90	2.80
ASG0A	3.80	0.90	2.80
ASG12	4.90	1.60	3.50

Total Lead-free High Voltage Thick Film Chip Resistor—HVRG Series

Construction



Features

- Total Lead(Pb)-free without RoHS exemptions
- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Excellent performance at high voltage
- Reduced size of final equipment
- MSL: Level 1

① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Dimensions

unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HVRG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
HVRG0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
HVRG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

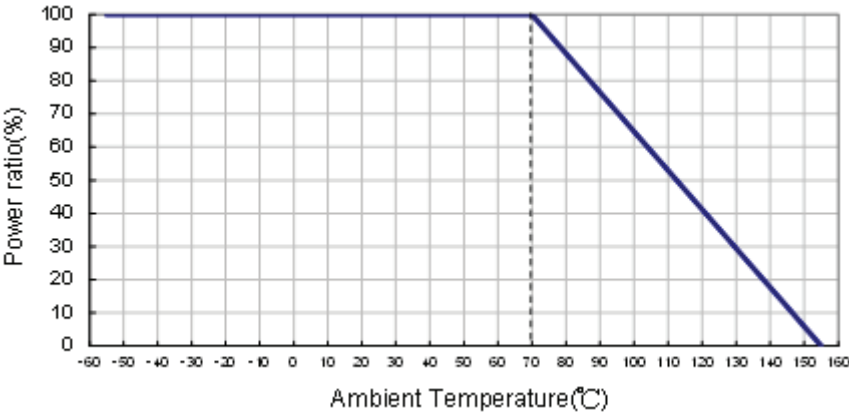
Applications

- Inverter
- Outdoor Equipments
- Converter
- High Pulse Equipment

Part Numbering

HVRG	06	F	T	E	V	1003
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	06: 1206 0A: 2010 12: 2512	F: ±1% J: ±5%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100	V: 1/4W U: 1/2W T: 1W	1003: 100KΩ 1004: 1MΩ 1005: 10MΩ

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
HVRG06 (1206)	1/4W	-55 ~ +155°C	500V	1000V	100KΩ - 10MΩ	100KΩ - 100MΩ	±100
HVRG0A (2010)	1/2W		2000V	3000V	51KΩ - 20MΩ	51KΩ - 100MΩ	±100
HVRG12 (2512)	1W		3000V	4000V	30KΩ - 20MΩ	30KΩ - 100MΩ	±100

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	$\pm(2.0\%+0.05\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$		Max. Overload Voltage for 1 minute
Endurance	$\pm(2.0\%+0.10\Omega)$	$\pm(3.0\%+0.10\Omega)$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(2.0\%+0.10\Omega)$	$\pm(3.0\%+0.10\Omega)$	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(1.0\%+0.05\Omega)$	$\pm(1.5\%+0.10\Omega)$	at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		500V for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$		260±5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

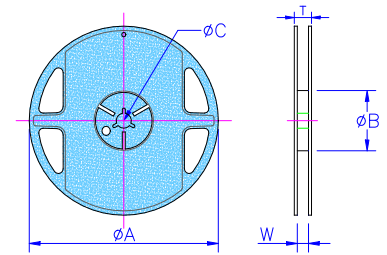
■ Shelf Life: 2 years from production date

Packaging

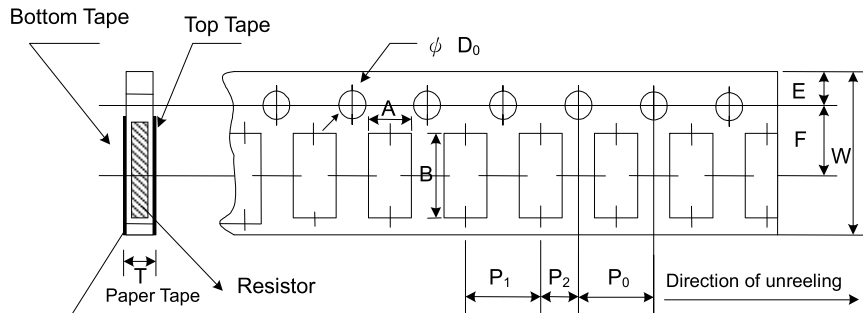
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HVRG05	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVRG0A	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
HVRG12		8K	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



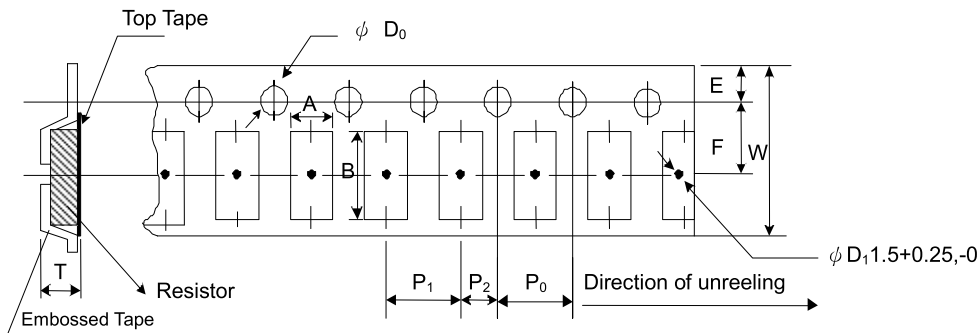
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
HVRG06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

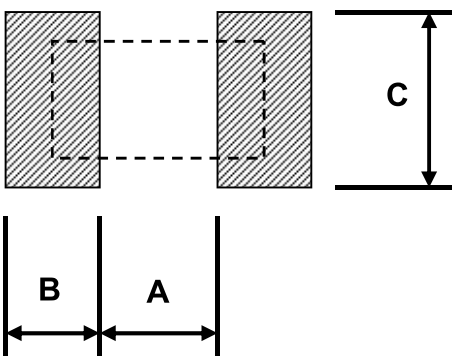


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
HVRG0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
HVRG12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰

Recommend Land Pattern

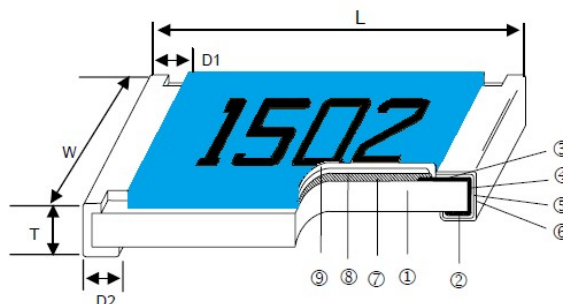
Unit: mm



Type	A	B	C
HVRG06	2.00	0.90	1.60
HVRG0A	3.80	0.90	2.80
HVRG12	4.90	1.60	3.50

Total Lead-free Pulse Withstanding Chip Resistor—PWRG Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Total Lead(Pb)-free without RoHS exemptions
- Tolerance from $\pm 0.5\%$ ~ 5%
- High power rating
- Excellent pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402~2512
- AEC-Q200 Compliance
- MSL: Level 1

Applications

- Metering (Testing/Measurement)
- Diagnostic Equipment
- Medical Devices
- Industrial Controls
- Plasma
- LCD Video Monitors

Dimensions

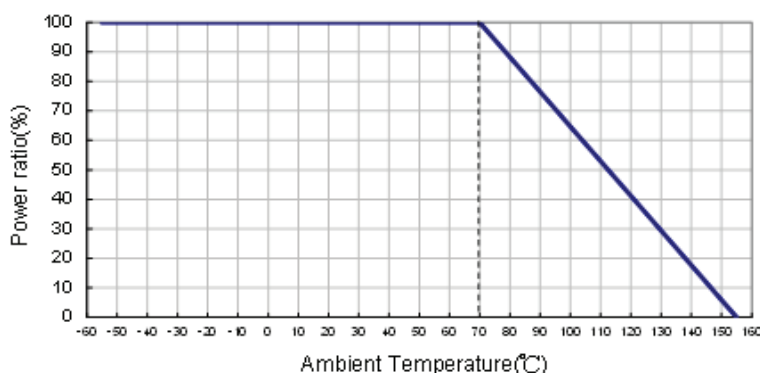
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
PWRG02	0402	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.35 $\pm$ 0.05	0.20 $\pm$ 0.10	0.25 $\pm$ 0.10	0.6
PWRG03	0603	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	2.0
PWRG05	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.50 $\pm$ 0.10	0.35 $\pm$ 0.20	0.40 $\pm$ 0.20	4.4
PWRG05 (1/2W)	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.50 $\pm$ 0.10	0.35 $\pm$ 0.20	0.40 $\pm$ 0.20	5.0
PWRG06	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	8.9
PWRG06 (3/4W)	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	9.5
PWRG13	1210	3.10 $\pm$ 0.10	2.60 $\pm$ 0.15	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	16.0
PWRG10	2010	5.00 $\pm$ 0.10	2.50 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	24.2
PWRG12	2512	6.35 $\pm$ 0.10	3.10 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	39.4
PWRG12 (2W)	2512	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.60 $\pm$ 0.10	0.60 $\pm$ 0.25	0.60 $\pm$ 0.20	42.0

Part Numbering

PWRG	12	J	T	E	A	1001	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	F: $\pm 1\%$ J: $\pm 5\%$ -: No specified (for Jumper)	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ± 100 F: ± 200 L: ± 250 4: ± 350 -: No specified (for Jumper)	A: 1.5W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W W: 1/8W X: 1/10W P: 1/5W S: 2W K: 1.25W	1001: 1K Ω 1004: 1M Ω R0R0: 0 Ω	: Standard Marking N: No Marking

Derating Curve



■ Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
PWRG02 (0402)	1/8W	-55 ~ +155°C	75V	100V	1Ω-9.76Ω		±250
					10Ω-1MΩ		±100
PWRG03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω-9.76Ω		±200
					10Ω-10MΩ		±100
PWRG06 (1206)	1/3W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±100
PWRG13 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±100
PWRG10 (2010)	3/4W	-55 ~ +155°C	400V	800V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±100
PWRG12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±100

■ High Power & Ultra High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
PWRG03 (0603)	1/3W	-55 ~ +155°C	75V	150V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG05 (0805)	2/5W	-55 ~ +155°C	150V	300V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG06 (1206)	1/2W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG13 (1210)	1W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG10 (2010)	1.25W	-55 ~ +155°C	400V	800V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG12 (2512)	*2W	-55 ~ +155°C	500V	1000V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100

■ Jumper(0Ω)

Item Type	Power Rating	Rated Current	Overload Current	Resistance	Operating Temp. Range
PWRG02 (0402)	1/5W	3A	6A	0Ω (≤10mΩ)	-55 ~ +155°C
PWRG03 (0603)	1/3W	5A	10A	0Ω (≤8mΩ)	
PWRG05 (0805)	*1/2W	6A	12A	0Ω (≤5mΩ)	
PWRG06 (1206)	*3/4W	10A	20A	0Ω (≤5mΩ)	
PWRG13 (1210)	1W	12A	24A	0Ω (≤4mΩ)	
PWRG10 (2010)	1.25W	12A	24A	0Ω (≤5mΩ)	
PWRG12 (2512)	2W	16A	32A	0Ω (≤5mΩ)	

*: Ultra High Power: double side printed resistor element

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155°C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement		Test Method
	±5% and Below	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(2.0%+0.05Ω)	As Spec.	RCWV*2.5 or Max.Overload Voltage whichever is lower for 5 seconds Jumper:2*I _{max} for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.05Ω)	As Spec.	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	± (2.0%+0.05Ω)	As Spec.	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	± (1.0%+0.05Ω)	As Spec.	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	As Spec.	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	± (0.5%+0.05Ω)	As Spec.	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%		260±5°C for 30 seconds
Rapid Change of Temperature	± (1.0%+0.05Ω)	As Spec.	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

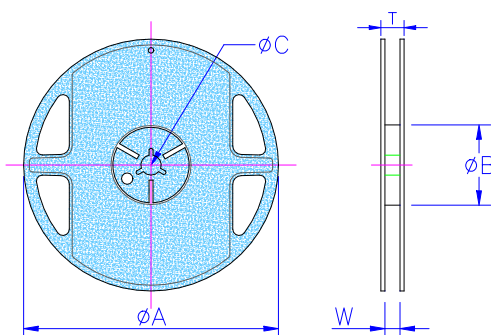
■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

Reel Specifications & Packaging Quantity

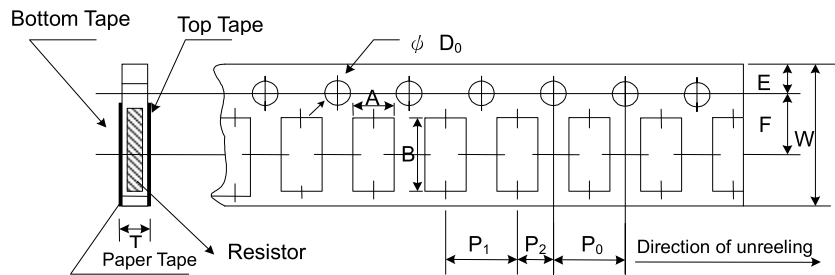


Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T	
PWRG02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
PWRG03	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
PWRG05		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
PWRG06		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
PWRG13	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
PWRG10		8K	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5
PWRG12									

■Packaging

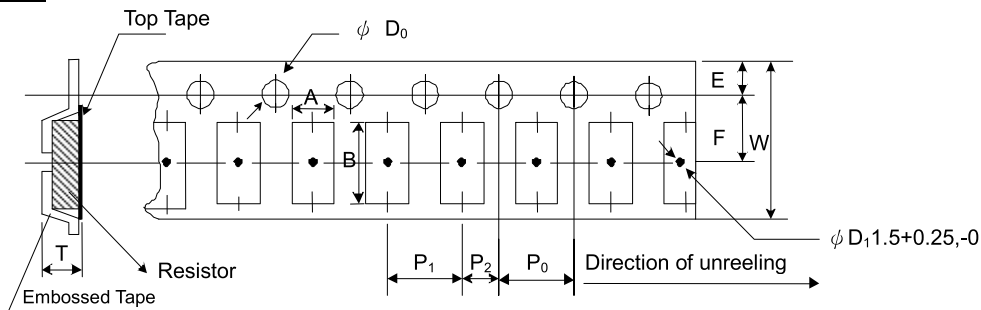
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PWRG02	0.65±0.10	1.15±0.10	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.1
PWRG03	1.10±0.10	1.90±0.10	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.1
PWRG05	1.60±0.10	2.40±0.20	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
PWRG06	1.90±0.10	3.50±0.20	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
PWRG13	2.90±0.10	3.50±0.20	8.00±0.2	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1

Embossed Plastic Tape Specifications

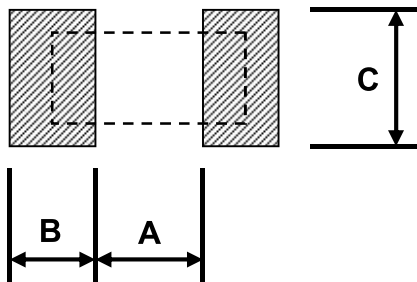


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PWRG10	2.80±0.10	5.40±0.20	12.0±0.3	1.75±0.1	5.50±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
PWRG12	3.50±0.10	6.70±0.10	12.0±0.3	1.75±0.1	5.50±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰

■Recommend Land Pattern

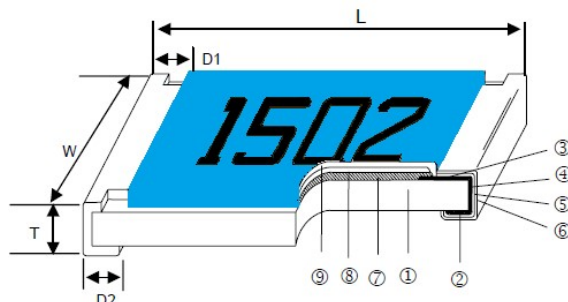
Unit: mm



Type	A	B	C
PWRG02	0.50	0.45	0.60
PWRG03	0.90	0.60	0.90
PWRG05	1.20	0.70	1.30
PWRG06	2.00	0.90	1.60
PWRG13	2.00	0.90	2.80
PWRG10	3.80	0.90	2.80
PWRG12	4.90	1.00	3.40

Total Lead-free Surge Withstanding Chip Resistor – SWRG Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Total Lead(Pb)-free without RoHS exemptions
- High power rating
- Excellent surge withstanding & pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402~2512
- AEC-Q200 Compliance
- MSL: Level 1

Applications

- Metering (Testing/Measurement)
- Medical Devices
- Power supply
- Charger
- Inverter
- LCD Video Monitors

Dimensions

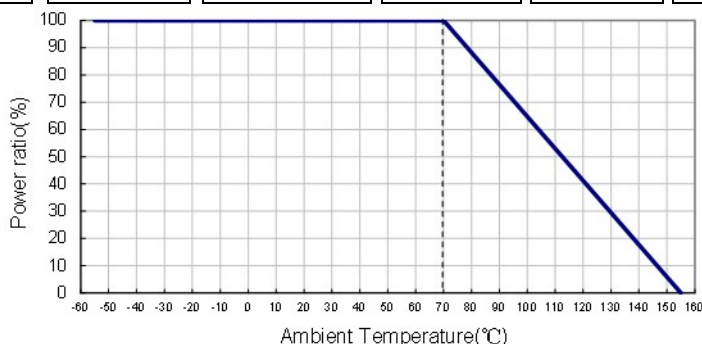
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
SWRG02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
SWRG03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
SWRG05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
SWRG05 (1/2W)	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	5.0
SWRG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
SWRG06 (3/4W)	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	9.5
SWRG13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
SWRG10	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
SWRG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4
SWRG12 (2W)	2512	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.25	0.60±0.20	42.0

Part Numbering

SWRG	05	J	T	E	V	1001	
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	J: ±5% K: ±10% M: ±20%	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ±100 F: ±200 L: ±250	S: 2W A: 1.5W K: 1.25W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W P: 1/5W W: 1/8W	1001: 1KΩ 1004: 1MΩ 1005: 10MΩ	: Standard Marking N: No Marking

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±5%	±10%	±20%	
SWRG02 (0402)	1/8W	-55 ~ +155°C	75V	100V	1Ω – 9.1Ω			±250
					10Ω - 1MΩ			±100
SWRG03 (0603)	1/8W	-55 ~ +155°C	75V	150V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG05 (0805)	1/4W	-55 ~ +155°C	150V	300V	1Ω – 9.1Ω			±200
					10Ω - 10MΩ			±100
SWRG06 (1206)	1/3W	-55 ~ +155°C	200V	400V	1Ω – 9.1Ω			±200
					10Ω - 20MΩ			±100
SWRG13 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω – 9.1Ω			±200
					10Ω - 20MΩ			±100
SWRG10 (2010)	3/4W	-55 ~ +155°C	400V	800V	1Ω – 9.1Ω			±200
					10Ω - 20MΩ			±100
SWRG12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	1Ω – 9.1Ω			±200
					10Ω - 20MΩ			±100

High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±5%	±10%	±20%	
SWRG03 (0603)	1/3W	-55 ~ +155°C	75V	150V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG05 (0805)	2/5W	-55 ~ +155°C	150V	300V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG06 (1206)	1/2W	-55 ~ +155°C	200V	400V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG13 (1210)	1W	-55 ~ +155°C	200V	400V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG10 (2010)	1.25W	-55 ~ +155°C	400V	800V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100
SWRG12 (2512)	*2W	-55 ~ +155°C	500V	1000V	1Ω – 9.1Ω			±200
					10Ω - 1MΩ			±100

*: Ultra High Power: double side printed resistor element

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155 °C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(2.0\%+0.05\Omega)$	RCWV*2.5 or Max.Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload voltage for 1 minute
Endurance	$\pm(2.0\%+0.05\Omega)$	70 $\pm$ 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(2.0\%+0.05\Omega)$	40 $\pm$ 2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(1.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245 $\pm$ 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(1.0\%+0.05\Omega)$	260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 $\pm$ 5°C for 30 seconds
Rapid Change of Temperature	$\pm(1.0\%+0.05\Omega)$	-55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

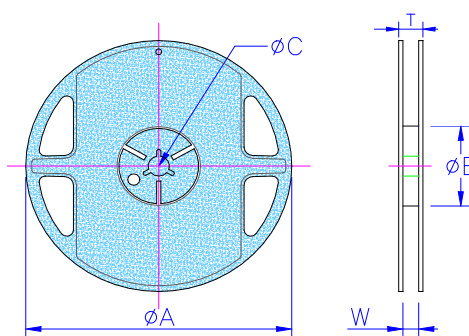
■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

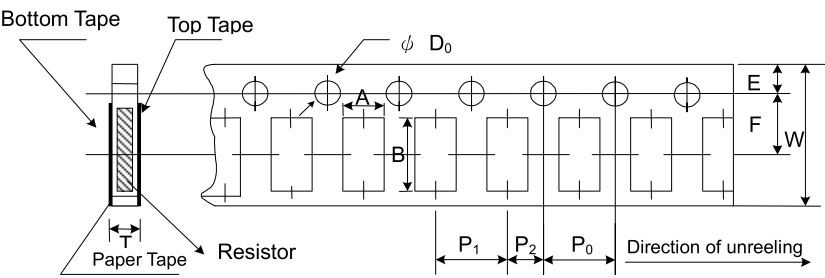
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
SWRG02	Paper	10K	8mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.2	9.0 $\pm$ 0.5
		20K	8mm	10 inch	254 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
		40K	8mm	13 inch	330 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
SWRG03 SWRG05 SWRG06 SWRG13	Paper	5K	8mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.2	9.0 $\pm$ 0.5
		10K	8mm	10 inch	254 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
		20K	8mm	13 inch	330 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
SWRG10 SWRG12	Embossed	4K	12mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.5	13.0 $\pm$ 0.5
		8K	12mm	10 inch	250 $\pm$ 1.0	62 $\pm$ 0.5	13.0 $\pm$ 0.5	12.5 $\pm$ 0.5

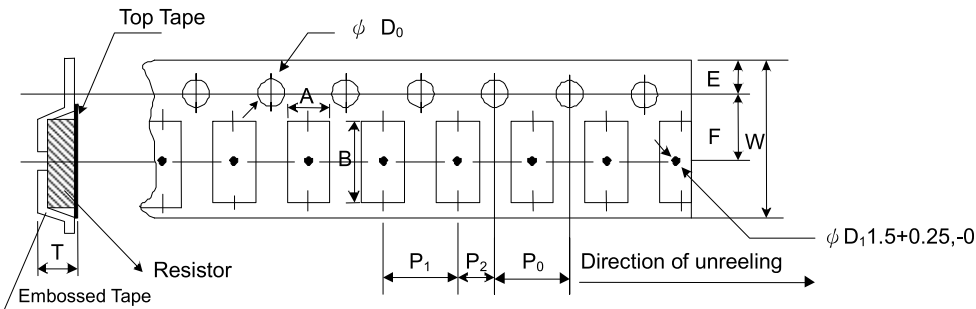
Packaging
 Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWRG02	0.65±0.10	1.15±0.1	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.1
SWRG03	1.10±0.10	1.90±0.1	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.1
SWRG05	1.60±0.10	2.40±0.2	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
SWRG06	1.90±0.10	3.50±0.2	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1
SWRG13	2.90±0.10	3.50±0.2	8.00±0.2	1.75±0.1	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.1

Embossed Plastic Tape Specifications

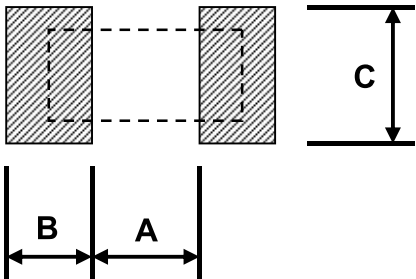


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWRG10	2.80±0.10	5.40±0.20	12.0±0.3	1.75±0.1	5.5±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
SWRG12	3.50±0.10	6.70±0.10	12.0±0.3	1.75±0.1	5.5±0.05	4.00±0.10	4.00±0.1	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰

Recommend Land Pattern

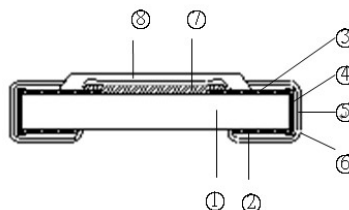
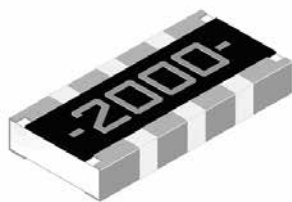
Unit: mm



Type	A	B	C
SWRG02	0.50	0.45	0.60
SWRG03	0.90	0.60	0.90
SWRG05	1.20	0.70	1.30
SWRG06	2.00	0.90	1.60
SWRG13	2.00	0.90	2.80
SWRG10	3.80	0.90	2.80
SWRG12	4.90	1.00	3.40

Thin Film Array Chip Resistor—TFAN Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	

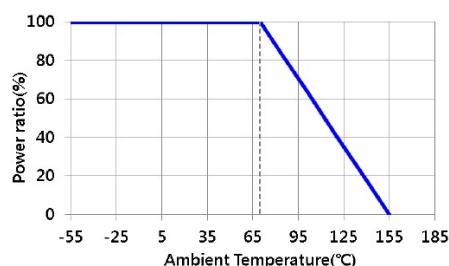
Features

- Advanced thin film technology
- Very tight tolerance down to $\pm 0.05\%$
- Extremely low TCR down to $\pm 5\text{PPM}/^\circ\text{C}$
- TCR tracking down to $5\text{ppm}(\pm 2.5\text{ppm})$ and Tolerance matching down to $0.1\%(\pm 0.05\%)$
- RoHS compliant component, compatible With lead (Pb)-free
- MSL: Level 1

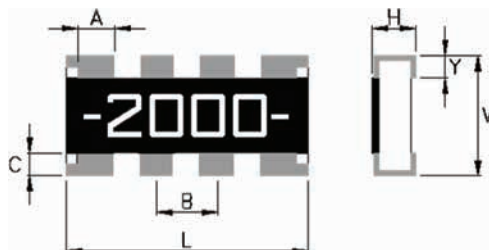
Applications

- Voltage divider
- Feedback circuits
- Signal conditioning

Derating Curve



Dimensions



Unit:mm

Type	Number of Resistors	L	W	H	A	B	C	Y
TFAN43	4	3.20 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.15	0.80 ± 0.05	0.25 ± 0.15	0.30 ± 0.15

Part Numbering

TFAN	43	B0	T	C0	Y	1001	N
Product Type	Dimensions	Tolerance Grade	Packaging Code	TCR Grade	Power Rating	Resistance	Marking Code
	0603X4	Reference Tolerance Grade Table	T: Taping Reel B: Bulk	Reference TCR Grade Table	Y: 1/16W W: 1/8W X: 1/10W	1000: 100Ω 1001: 1KΩ 1211: 1.21KΩ 3323: 332KΩ	: Standard Marking for E96 N: No Marking

Accuracy Grade Table							
Tolerance Grade				TCR Grade			
Code	Absolute Tolerance	Tolerance Matching	Resistance Value	Code	Absolute TCR	TCR Tracking	Resistance Value
A0	±0.05%	N/A	24.9~332K	S0	±5ppm	N/A	24.9~60K
B0	±0.1%	N/A	24.9~332K	S5	±5ppm	5ppm	24.9~60K
B3	±0.1%	0.1%	24.9~332K	B0	±10ppm	N/A	24.9 ~332K
C0	±0.25%	N/A	24.9~332K	B4	±10ppm	10ppm	24.9 ~332K
C2	±0.25%	0.25%	24.9~332K	B5	±10ppm	5ppm	24.9~60K
C3	±0.25%	0.1%	24.9~332K	N0	±15ppm	N/A	24.9 ~332K
D0	±0.5%	N/A	24.9~332K	N3	±15ppm	15ppm	24.9 ~332K
D1	±0.5%	0.5%	24.9~332K	N4	±15ppm	10ppm	24.9 ~332K
D2	±0.5%	0.25%	24.9~332K	N5	±15ppm	5ppm	24.9~60K
F0	±1%	N/A	24.9~332K	C0	±25ppm	N/A	24.9~332K
F1	±1%	0.5%	24.9~332K	C2	±25ppm	25ppm	24.9~332K
F2	±1%	0.25%	24.9~332K	C3	±25ppm	15ppm	24.9~332K
				C4	±25ppm	10ppm	24.9~332K
				D0	±50ppm	N/A	24.9~332K
				D1	±50ppm	50ppm	24.9~332K
				D2	±50ppm	25ppm	24.9~332K

Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.05%	±0.1%	±0.25%	±0.5%	±1%	
TFAN 43	1/16W	-55 ~ +155°C	50V	100V	24.9Ω~332KΩ					±10 ±15 ±25 ±50
	1/10W 1/8W	-55 ~ +155°C	75V	150V	24.9Ω~332KΩ					±25 ±50
	1/16W	-55 ~ +155°C	50V	100V	24.9Ω~60KΩ					±5
	1/10W	-55 ~ +155°C	75V	150V						

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	$\Delta R \pm 0.1\%$	RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Insulation Resistance	>1000 MΩ	Apply 100V _{DC} for 1 minute
Endurance	1000Hr : $\Delta R \pm 0.15\%$ 8000Hr : $\Delta R \pm 0.3\%$	70±2°C, RCWV with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\Delta R \pm 0.25\%$	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load(85°C/85% R.H.)	$\Delta R \pm 0.5\%$	85±2°C, 80~90% R.H. 10% of RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	1000Hr : $\Delta R \pm 0.25\%$ 8000Hr : $\Delta R \pm 0.5\%$	At +125°C
Bending Strength	$\Delta R \pm 0.2\%$	Bending amplitude 3 mm for 10 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.2\%$	260±5°C for 10 seconds
Dielectric Withstand Voltage	100V	Max. overload voltage for 1 minute
Thermal Shock	$\Delta R \pm 0.25\%$	-55°C ~150°C, 100 cycles
Low Temperature Operation	$\Delta R \pm 0.25\%$	1 hour, -65°C, followed by 45 minutes of RCWV

RCWV(Rated continuous working voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating voltage whichever is lower

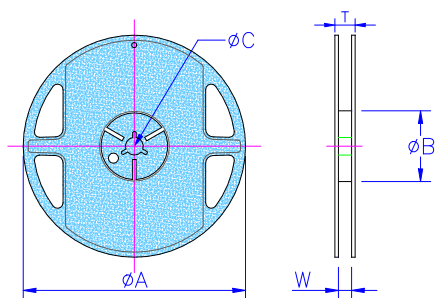
■ Reference Standards: MIL-STD-202, JIS-C-5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

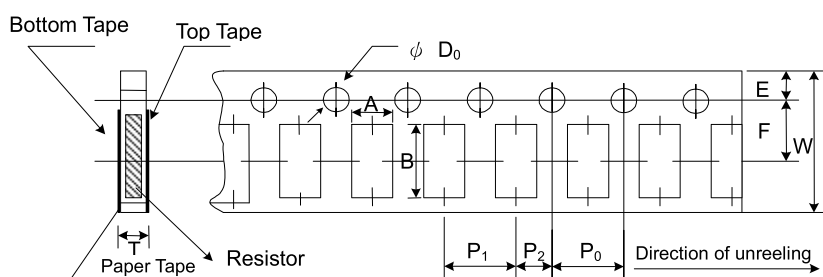
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape width	Reel Diameter	ΦA	ΦB	ΦC	W	T
TFAN 43	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5

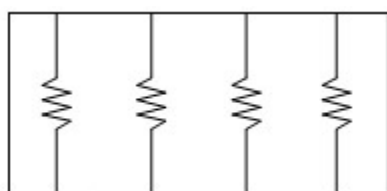
Paper Tape Specifications



Unit: mm

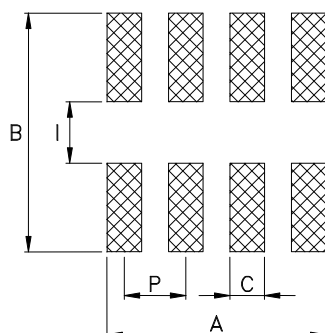
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
TFAN43	1.95±0.10	3.50±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1/-0	0.85±0.10

Equivalent Circuit Diagram



TFAN43

Recommend Land Pattern

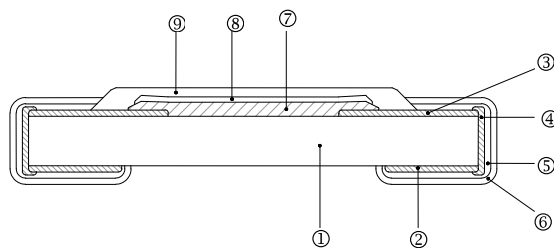
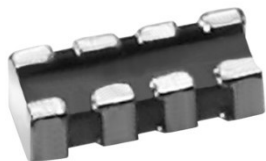


Unit: mm

Type	A	B	C	I	P
TFAN43	3.10	2.85	0.45	0.80	0.80

Thick Film Flat Array Chip Resistor—CN-21 & CN-41

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Features

- Contribute to higher-density mounting and reduction in size of devices by remarkably PCB
- Contribute to the size reduction of small electronic equipment such as Mobile phone, HDD
- Reduced the mounting time by decreasing the number of components
- Suitable for IR reflow soldering
- MSL: Level 1

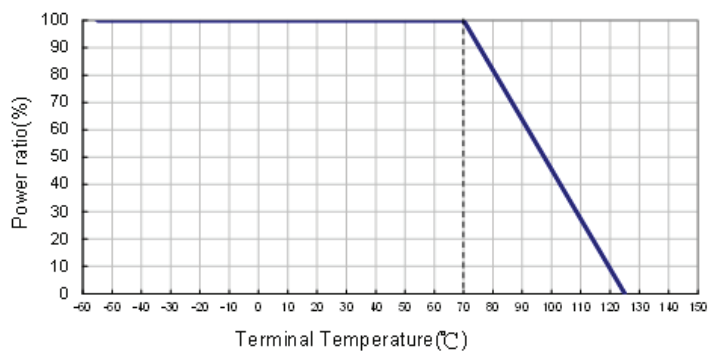
Part Numbering

CN-	41	J	L	6	---1K
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	21: 0201x2 41: 0201x4	F: $\pm 1\%$ J: $\pm 5\%$	L: 8P4R / 4P2R	6: 7" Reel 10Kpcs	---1K: 1K Ω ---3K3: 3.3K Ω ---10K: 10K Ω --- to fill up 6 spaces

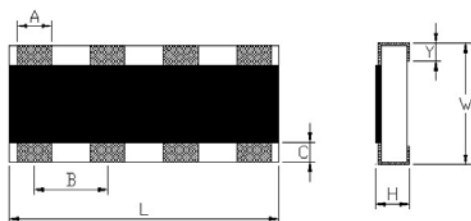
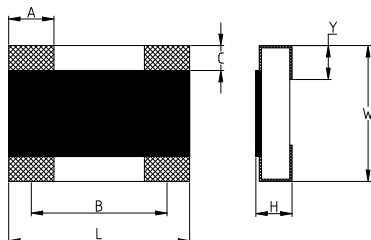
Applications

- Pull-up/pull-down resistors for digital circuits
- Used in interface circuits of LCD displays, memory modules, etc.
- Communication Equipments

Derating Curve



Dimensions



Unit: mm

Type	Number of Resistors	L	W	H	A	B	C	Y	Weight (g) (1000pcs)
CN-21	2	0.80 $\pm$ 0.10	0.60 $\pm$ 0.10	0.35 $\pm$ 0.10	0.30 $\pm$ 0.10	0.50 $\pm$ 0.10	0.15 $\pm$ 0.10	0.15 $\pm$ 0.10	0.5
CN-41	4	1.40 $\pm$ 0.10	0.60 $\pm$ 0.10	0.35 $\pm$ 0.10	0.20 $\pm$ 0.10	0.40 $\pm$ 0.10	0.10 $\pm$ 0.07	0.15 $\pm$ 0.05	0.8

Standard Electrical Specifications

Type	Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
							±1%	±5%	
CN-21	1/32W	-55 ~ +125°C	12.5V	25V	2	-	3Ω –9.1Ω	±300	
	10Ω -1MΩ					±200			
	Jumper: 0.5A					-	0Ω (<50mΩ)	-	
CN-41	1/32W	-55 ~ +125°C	12.5V	25V	4	10Ω - 1MΩ		±200	
	Jumper: 0.5A					-	0Ω (<50mΩ)	-	

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage Listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	$\pm(2.0\%+0.05\Omega)$	<50mΩ	2.5 times RCWV or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$			Max. Overload Voltage for 1 minute
Endurance	$\pm(2.0\%+0.10\Omega)$	$\pm(3.0\%+0.10\Omega)$	<100mΩ	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	$\pm(2.0\%+0.10\Omega)$	$\pm(3.0\%+0.10\Omega)$	<50mΩ	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	$\pm(1.0\%+0.05\Omega)$	$\pm(3.0\%+0.10\Omega)$	<100mΩ	at +125°C for 1000 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	<50mΩ	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage for 1 minute
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	<50mΩ	-55°C to +125°C, 5 cycles

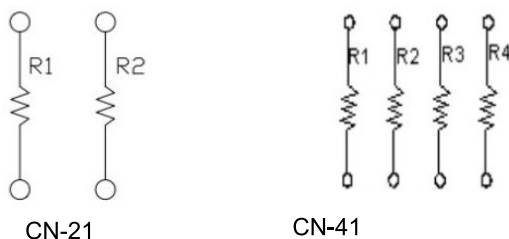
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity < 80%RH

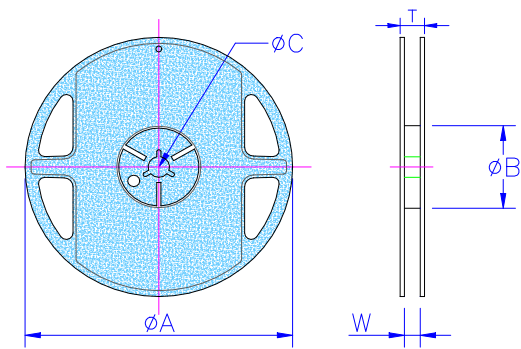
■ Shelf Life: 2 years from production date

Equivalent Circuit Diagram



■Packaging

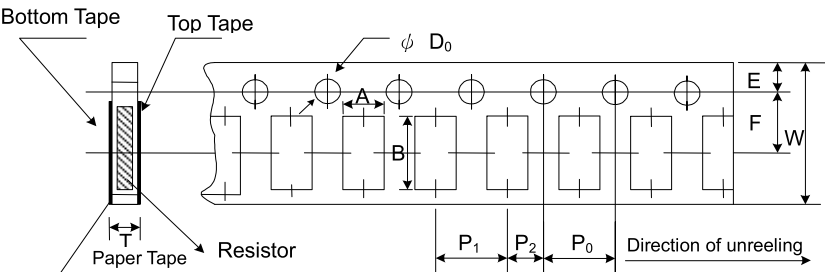
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CN-21	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CN-41	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5

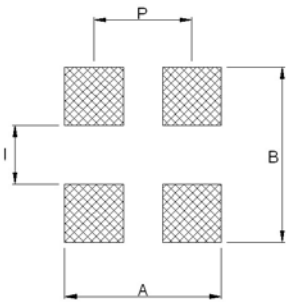
Paper Tape Specifications



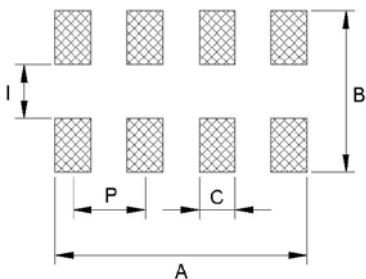
Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CN-21	0.77±0.05	0.97±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.5 ^{+0.1/-0}	0.50±0.10
CN-41	0.77±0.05	1.57±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.5 ^{+0.1/-0}	0.50±0.10

■Recommend Land Pattern



CN-21



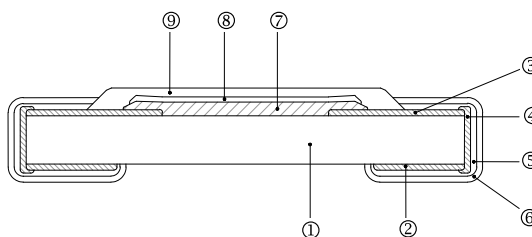
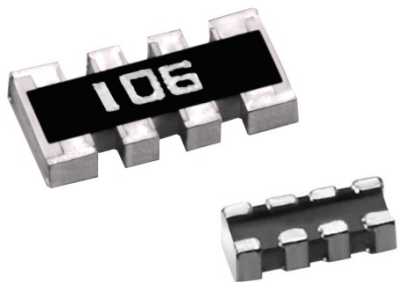
CN-41

Unit : mm

Type	A	B	C	I	P
CN-21	0.80	0.90	--	0.30	0.50
CN-41	1.40	0.90	0.20	0.30	0.40

Anti-Sulfurated Thick Film Array Chip Resistor – AS Array Series

Construction



Features

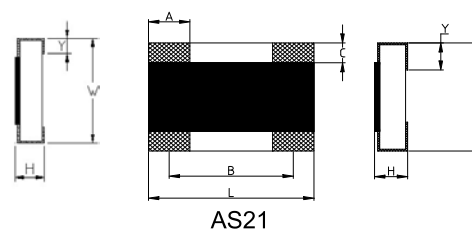
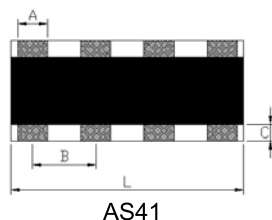
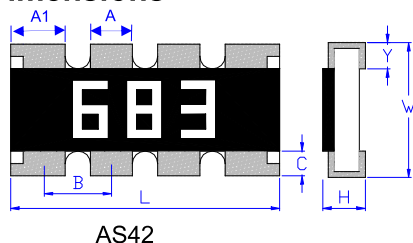
- Special construction to prevent sulfuration in a sulfur containing environment
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Suitable for IR reflow soldering
- Small size and light weight
- MSL: Level 1

① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Part Numbering

AS	42	J	T	F		1002
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	21: 0201*2 41: 0201*4 42: 0402*4	F: ±1% J: ±5%	T: Taping Reel V: 10" Taping Reel W: 13" Taping Reel	F: ±200 G: ±300	: Standard	0010: 1Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ

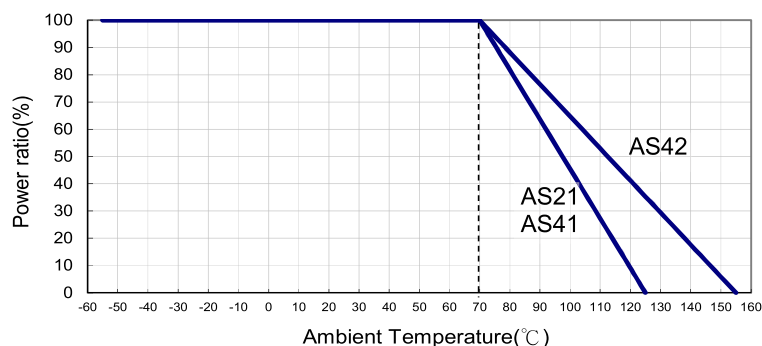
Dimensions



Unit: mm

Type	Number of Resistors	L	W	H	A	A1	B	C	Y	Weight (g) (1000pcs)
AS21	2	0.80±0.10	0.60±0.10	0.35±0.10	0.30±0.10	-	0.50±0.10	0.15±0.10	0.15±0.10	0.5
AS41	4	1.40±0.10	0.60±0.10	0.35±0.10	0.20±0.10	-	0.40±0.10	0.10±0.07	0.15±0.05	0.8
AS42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.30±0.10	0.40±0.10	0.50±0.05	0.22±0.15	0.22±0.15	2.8

Derating Curve



■ Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
							±1%	±5%	
AS21	1/32W	-55 ~ +125°C	12.5V	25V	2		-	3Ω - 9.1Ω	±300
							10Ω - 1MΩ		±200
AS41	1/32W	-55 ~ +125°C	12.5V	25V	4		10Ω - 1MΩ		±200
AS42	1/16W	-55 ~ +155°C	25V	50V	4		10Ω - 1MΩ	1Ω - 1MΩ	±200

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 125 °C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	at +125°C /+155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%		260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	-55°C to +125°C /+155°C, 5 cycles
Sulfur Test	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	H2S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1 ; ASTM-B-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

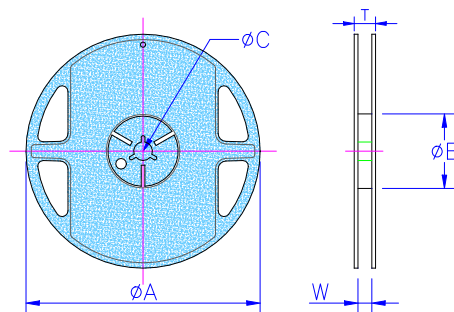
■ Shelf Life: 2 years from production date

Packaging

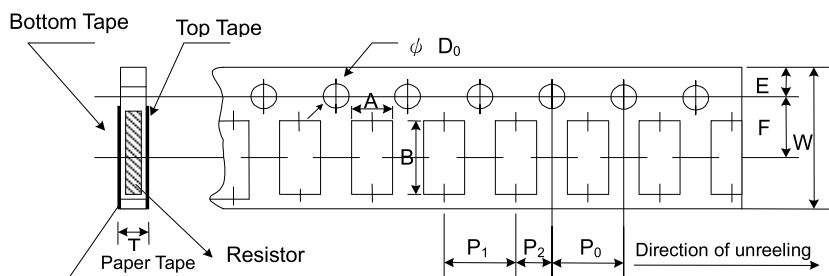
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
AS21	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
AS41	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
AS42	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5



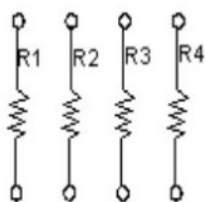
Paper Tape Specifications



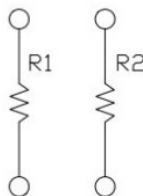
Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
AS21	0.77±0.05	0.97±0.05	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.50±0.1
AS41	0.77±0.05	1.57±0.05	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.50±0.1
AS42	1.20±0.1	2.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.70±0.1

Equivalent Circuit Diagram

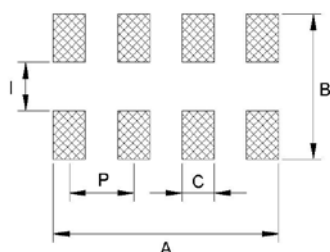


AS41/AS42

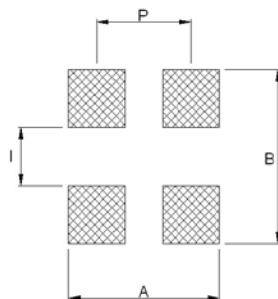


AS21

Recommend Land Pattern



AS41/AS42



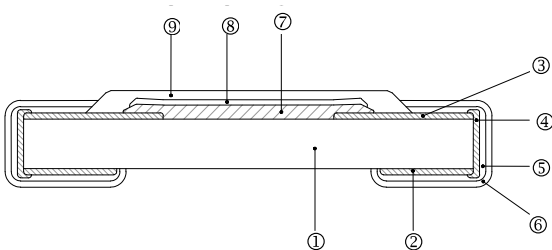
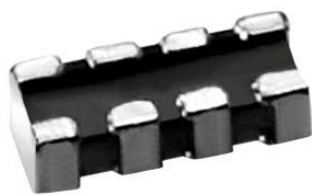
AS21

Unit: mm

Type	A	B	C	I	P
AS21	0.80	0.90	--	0.30	0.50
AS41	1.40	0.90	0.20	0.30	0.40
AS42	2.10	1.80	0.30	0.50	0.50

Anti-Sulfurated Thick Film Flat Array Chip Resistor – ASF Series

Construction



①	Alumina Substrate	④	Edge Electrode	⑦	Resistor Layer
②	Bottom Electrode	⑤	Barrier Layer	⑧	Primary Overcoat
③	Top Electrode	⑥	External Electrode	⑨	Secondary Overcoat

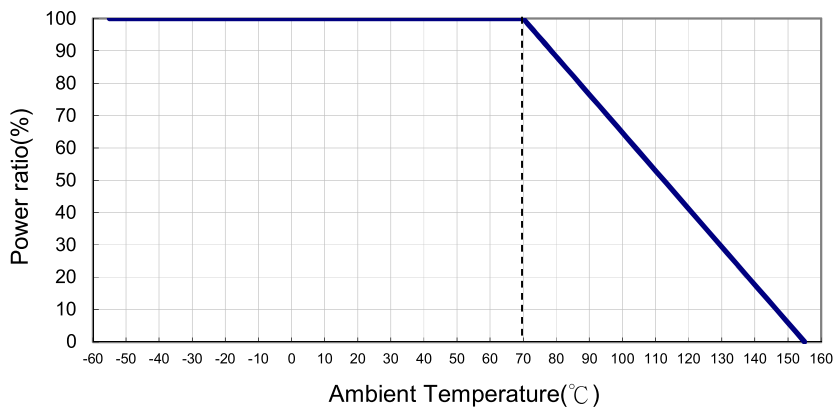
Features

- Special construction to prevent sulfuration in a sulfur containing environment
- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Suitable for IR reflow soldering
- MSL: Level 1

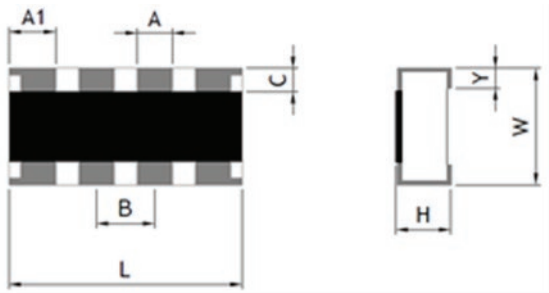
Applications

- High-end Computer
- Industrial Equipment
- Automatic Equipment Controller
- Medical Equipment
- High-end Multimedia Electronics
- Outdoor Electronic Applications

Derating Curve



Dimensions



Unit: mm

Type	Number of Resistors	L	W	H	A	A1	B	C	Y	Weight (g) (1000pcs)
ASF42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.30±0.10	0.40±0.10	0.50±0.10	0.20±0.10	0.30±0.10	3.3
ASF43	4	3.20±0.10	1.55±0.10	0.55±0.10	0.50±0.15	0.65±0.10	0.80±0.05	0.23±0.15	0.40±0.10	9.0

Part Numbering

ASF	43	F	T	F	X	1002
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	42: 0402x4 43: 0603x4	F: ±1% J: ±5% or Jumper	T: Taping Reel V: 10" Taping Reel W: 13" Taping Reel	F: ±200 - : No Specified (For Jumper)	Y: 1/16W X: 1/10W	0030: 3Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ R0R0: 0Ω

Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
							±1%	±5%	
ASF42		1/16W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
							-	0Ω (<50mΩ)	-
ASF43		1/10W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
							-	0Ω (<50mΩ)	-

Operating Voltage = $\sqrt{P \cdot R}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage = $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage Listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 125°C.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

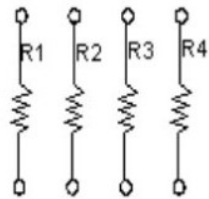
Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥ 10G			Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<50mΩ	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<50mΩ	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%			260±5°C for 30 seconds

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +155°C, 5 cycles
Sulfur Test	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	<50mΩ	H ₂ S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs

RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

- **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1
- **Storage Temperature:** 15~28°C; Humidity < 80%RH
- **Shelf Life:** 2 years from production date

■Equivalent Circuit Diagram

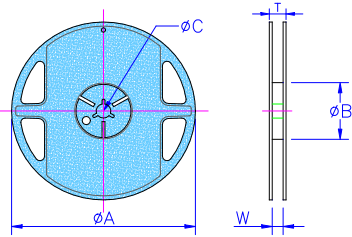


■Packaging

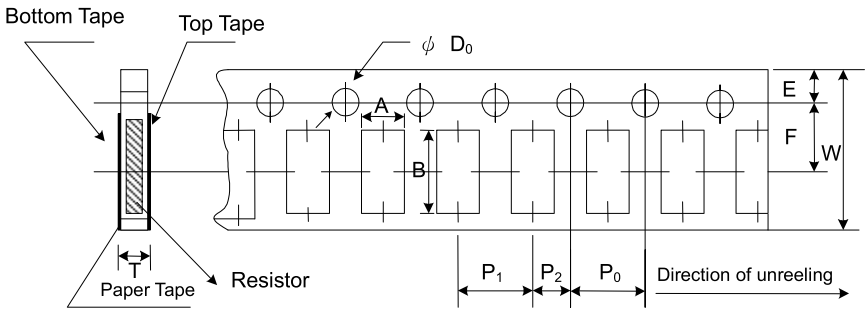
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
ASF42 ASF43	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
	10K	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
	20K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5



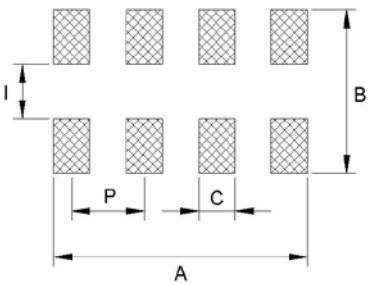
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ASF42	1.20±0.1	2.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.70±0.1
ASF43	1.95±0.1	3.50±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.85±0.1

■Recommend Land Pattern

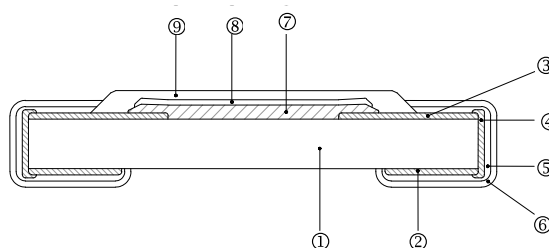
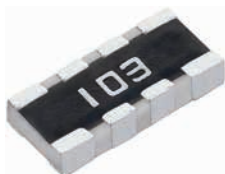


Unit: mm

Type	A	B	C	I	P
ASF42	2.10	1.80	0.30	0.50	0.50
ASF43	3.10	2.85	0.45	0.80	0.80

Thick Film Array Chip Resistor (Flat Termination)—CNF Series

Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

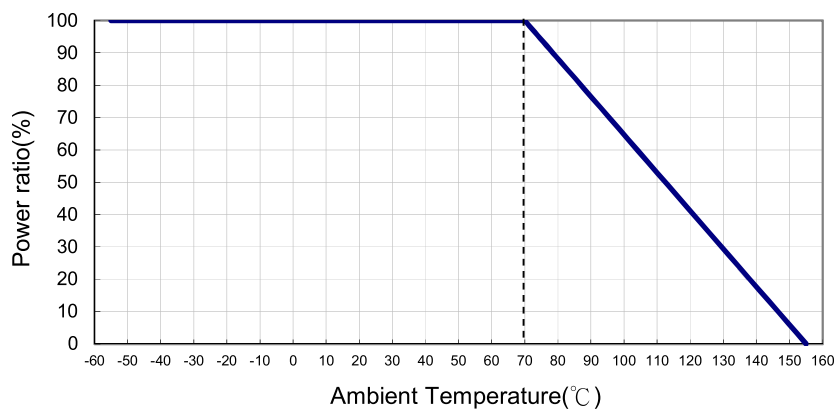
Features

- AEC-Q200 Compliance
- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Suitable for IR reflow soldering
- Alternative CN series
- MSL: Level 1

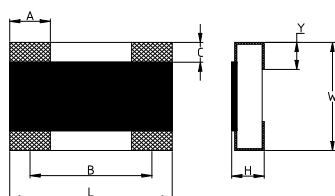
Applications

- Entertainment
- Computer & Related Products
- Communication Equipment
- Power Equipment
- Measuring Instrument

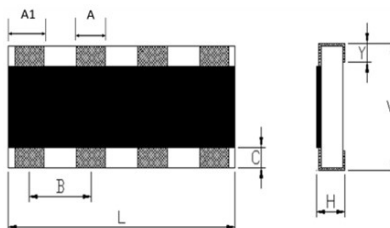
Derating Curve



Dimensions



CNF22



CNF42/43

Unit: mm

Type	Number of Resistors	L	W	H	A	A1	B	C	Y	Weight (g) (1000pcs)
CNF22	2	1.20±0.10	1.00±0.10	0.35±0.10	0.43±0.10	-	0.82±0.05	0.22±0.10	0.30±0.15	1.6
CNF42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.35±0.10	0.45±0.10	0.50±0.10	0.20±0.10	0.35±0.15	3.2
CNF43	4	3.20±0.10	1.55±0.10	0.55±0.10	0.45±0.15	0.60±0.10	0.80±0.05	0.20±0.10	0.47±0.15	10.2

Part Numbering

CNF	22	F	T	F	Y	1002
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	22: 0402x2 42: 0402x4 43: 0603x4	F: ±1% J: ±5% or Jumper	T: Taping Reel	F: ±200 - : No Specified (For Jumper)	Y: 1/16W X: 1/10W W: 1/8W	0030: 3Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ R0R0: 0Ω

Standard Electrical Specifications

Type \ Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
						±1%	±5%	
CNF22	1/16W	-55 ~ +155°C	25V	50V	2	1Ω - 1MΩ		±200
	Jumper: 1A					-	0Ω (<50mΩ)	-
CNF42	1/16W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
	Jumper: 1A					-	0Ω (<50mΩ)	-
CNF43	1/10W 1/8W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
	Jumper: 1A					-	0Ω (<50mΩ)	-

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage Listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥ 10G			Max. Overload Voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<50mΩ	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<50mΩ	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	<50m Ω	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$			260±5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	<50m Ω	-55°C to +155°C, 5 cycles

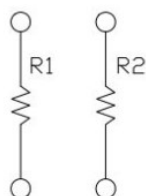
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

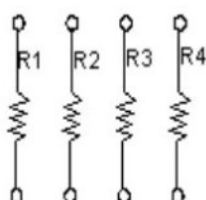
■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Equivalent Circuit Diagram



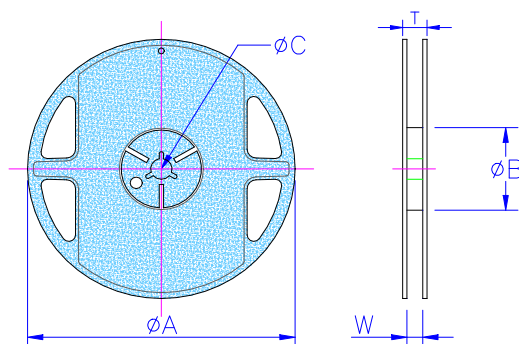
CNF22



CNF42/CNF43

Packaging

Reel Specifications & Packaging Quantity

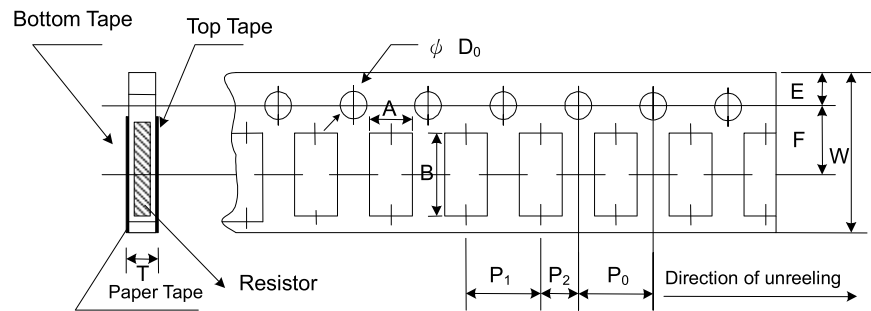


Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CNF22	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CNF42	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CNF43	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5

■Packaging_

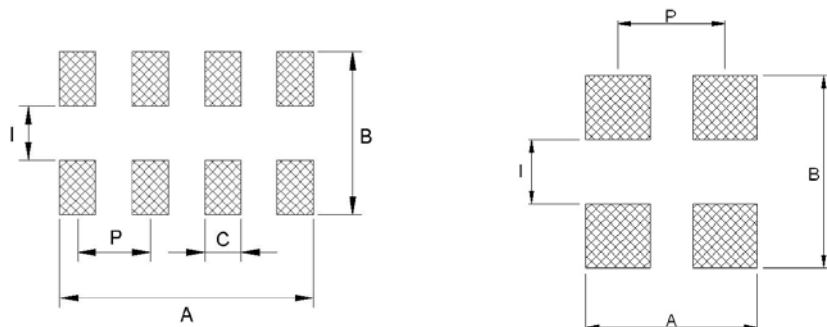
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CNF22	1.20±0.1	1.45±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.43±0.1
CNF42	1.20±0.1	2.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.70±0.1
CNF43	1.95±0.1	3.50±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.85±0.1

■Recommend Land Pattern



CNF42/CNF43

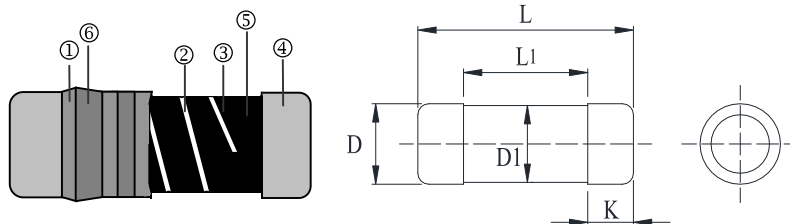
CNF22

Unit: mm

Type	A	B	C	I	P
CNF22	1.50	1.25	-	0.35	0.80
CNF42	2.10	1.80	0.30	0.50	0.50
CNF43	3.10	2.85	0.45	0.80	0.80

Metal Film Precision MELF Resistor—CSRV Series

Construction



Features

- AEC-Q200 Compliance
- Thin film technology
- Excellent overall stability
- Sn termination on Ni barrier layer
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 5 \text{ PPM}/^\circ\text{C}$
- High power rating up to 1 Watts
- SMD enabled structure
- Lead-free and RoHS compliant
- MSL: Level 1

①	Insulation Coating	④	Electrode Cap
②	Trimming Line	⑤	Resistor Layer
③	Ceramic Rod	⑥	Marking

Dimensions

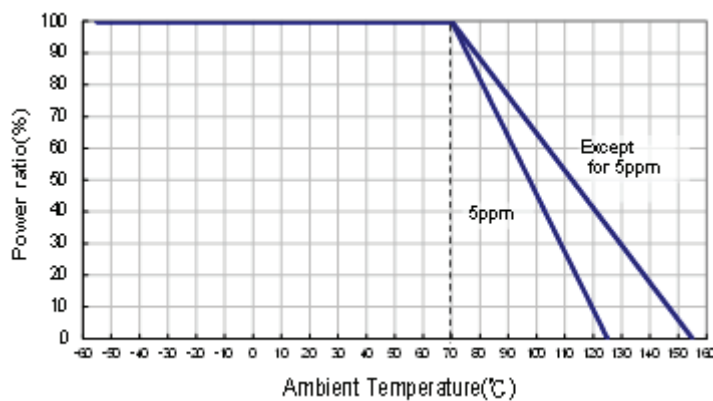
Unit: mm

Type	L	L ₁ min.	ΦD	ΦD ₁	K	Weight (g) (1000pcs)
CSRV0102	2.20±0.10	1.1	1.10±0.10	D +0/-0.15	0.45±0.05	7.7
CSRV0204	3.50±0.20	1.7	1.40±0.15	D +0/-0.2	0.8±0.1	18.7
CSRV0207	5.90±0.20	2.9	2.20±0.20	D +0/-0.2	1.3±0.1	80.9

Applications

- Automotive (non-safety parts)
- Industrial
- Telecommunication
- Medical Equipment
- Measurement/Testing Equipment

Derating Curve



Part Numbering

CSRV	0204	D	T	D	V	1000
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0102: 2.2x1.1 0204: 3.5x1.4 0207: 5.9x2.2	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$ or Jumper	T: Taping Reel S: 7" Taping Reel, Antistatic Tape* W: 13" Taping Reel M: 13" Taping Reel, Antistatic Tape*	S: ± 5 B: ± 10 N: ± 15 C: ± 25 D: ± 50 E: ± 100 - : Jumper	T: 1W U: 1/2W V: 1/4W G: 2/5W P: 1/5W W: 1/8W L: 0.3W	0100: 10Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ R0R0: 0Ω R050: 0.05Ω 22R1: 22.1Ω R100: 0.1Ω

Standard Electrical Specifications

Item Type	Power Rating at 70 °C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	±5%	
0102	1/8W	-55 ~ +155°C	150V	300V	49.9Ω-56KΩ					±15
					100Ω-82KΩ		4.02Ω- 200KΩ	4.02Ω- 390KΩ	-	±25
					-		1Ω-1MΩ	0.22Ω-1MΩ		±50
					-		0.22Ω-1MΩ		-	±100
0204	1/4W	-55 ~ +125°C	200V	400V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	200V	400V	10Ω-20KΩ				-	±10
					10Ω-300KΩ				-	±15
					10Ω-1MΩ		10Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-		0.1Ω-10MΩ		-	±100
0207	1/2W	-55 ~ +125°C	300V	600V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	300V	600V	10Ω-20KΩ				-	±10
					10Ω-300KΩ				-	±15
					10Ω-1MΩ		10Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-		0.1Ω-10MΩ		-	±100

High Power Rating Electrical Specifications

Item Type	Power Rating at 70 °C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	±5%	
0102	1/5W 0.3W	-55 ~ +155°C	200V	400V	49.9Ω-56KΩ					±15
					100Ω-82KΩ		4.02Ω- 200KΩ	4.02Ω- 390KΩ	-	±25
					-		1Ω-1MΩ	0.22Ω-1MΩ		±50
					-		0.22Ω-1MΩ		-	±100
0204	2/5W	-55 ~ +125°C	200V	400V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	200V	400V	10Ω-20KΩ				-	±10
					10Ω-300KΩ				-	±15
					10Ω-1MΩ		10Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-		0.1Ω-10MΩ		-	±100
0207	1W	-55 ~ +125°C	350V	700V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	350V	700V	10Ω-20KΩ				-	±10
					10Ω-300KΩ				-	±15
					10Ω-1MΩ		10Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-		0.1Ω-10MΩ		-	±100

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage Listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Jumper Specifications

Item Type	Power Rating	Operating Temp.Range	Resistance	Rated Current
CSRV0102	1/8W	-55 ~ +155°C	0Ω(<15mΩ)	2A
	1/5W			
	0.3W			
CSRV0204	1/4W	-55 ~ +155°C		3A
	2/5W			
CSRV0207	1/2W	-55 ~ +155°C		5A
	1W			

Environmental Characteristics

Item	Requirement		Test Method
	5% and Below	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature 5ppm: At 25°C/-10°C and 25°C/+85°C, 25°C is the reference temperature
Short Time Overload	10Ω-270KΩ: $\pm(0.1\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.15\%+0.01\Omega)$ 0102: $\pm(0.15\%+0.01\Omega)$ 5ppm: $\pm(0.05\%+0.01\Omega)$	<15mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Operational Life	10Ω-270KΩ: $\pm(0.25\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.5\%+0.01\Omega)$ 0102: $\pm(0.5\%+0.01\Omega)$	<15mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion. 5ppm: 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	<10Ω: $\pm(1\%+0.01\Omega)$ 10Ω-270KΩ: $\pm(0.5\%+0.01\Omega)$ >270KΩ-3.4MΩ: $\pm(1\%+0.01\Omega)$ >3.4MΩ: $\pm(2\%+0.01\Omega)$ 0102: $\pm(2\%+0.01\Omega)$	<15mΩ	1000 hrs 85°C/85%RH 10% of operating power. (≤100V)
High Temperature Exposure	10Ω-270KΩ: $\pm(0.25\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(1\%+0.01\Omega)$ 0102: $\pm(1\%+0.01\Omega)$	<15mΩ	at +125°C/+155°C for 1000 hrs
Board Flex	10Ω-270KΩ: $\pm(0.1\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.5\%+0.01\Omega)$ 0102: $\pm(0.5\%+0.01\Omega)$	<15mΩ	Bending once for 60 seconds with 2mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	10Ω-270KΩ: $\pm(0.1\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.25\%+0.01\Omega)$ 0102(≥1Ω): $\pm(0.25\%+0.01\Omega)$ 0102(<1Ω): $\pm(0.50\%+0.01\Omega)$ 5ppm: $\pm(0.05\%+0.01\Omega)$	<15mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%		260±5°C for 30 seconds
Temperature Cycling	10Ω-270KΩ: $\pm(0.25\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.5\%+0.01\Omega)$ 0102: $\pm(1\%+0.01\Omega)$	<15mΩ	-55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(0.25\%+0.01\Omega)$	<15mΩ	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.01\Omega)$	<15mΩ	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(0.5\%+0.01\Omega)$	<15mΩ	Human body, 0102/0204:2KV; 0207:4KV

Item	Requirement		Test Method
	5% and Below	Jumper	
Resistance to solvents	No visible damage on appearance and marking.		Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1, 6429; AEC-Q200; MIL-STD-202; JESD22; UL94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

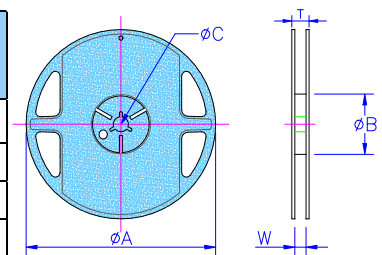
■ **Shelf Life:** 2 years from production date

■ Packaging

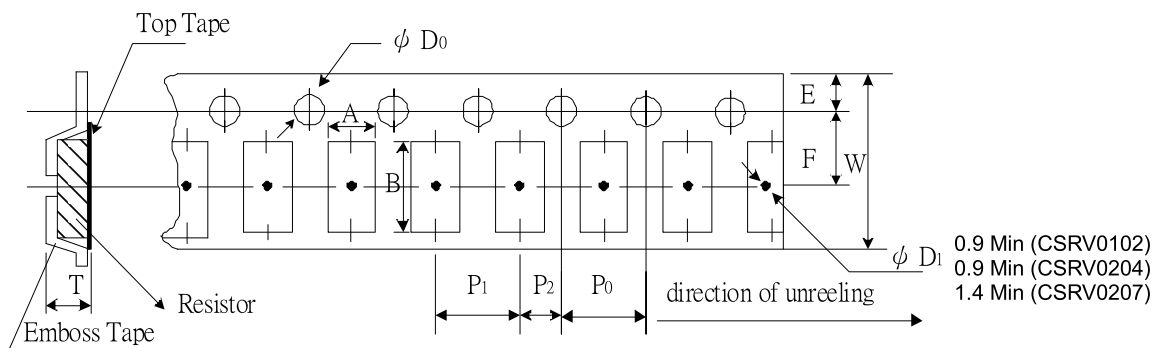
Packaging Quantity & Reel Specifications

Unit :mm

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Emboss Plastic Tape (EA)
CSR0102	7 inch	178.5±1.5	60.0±1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330.0±1.0	100.0±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSR0204	7 inch	178.5±1.5	60.0±1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330.0±1.0	100.0±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSR0207	7 inch	178.5±1.5	60.0±1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000
	13 inch	330.0±1.0	99.0±0.5	13.5±0.5	13.4±1.0	17.8±1.0	6,000



Emboss Plastic Tape Specifications

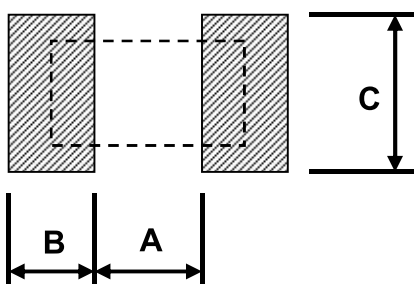


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSR0102	1.30±0.20	2.40±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	1.50±0.10
CSR0204	1.55±0.20	3.65±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	1.80±0.10
CSR0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	2.70±0.10

■ Recommend Land Pattern

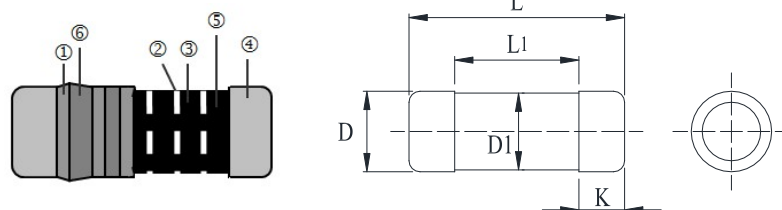
Unit: mm



Type	A	B	C
CSR0102	1.0	0.8	1.5
CSR0204	1.6	1.2	1.6
CSR0207	3.0	1.7	2.4

Metal Film High Frequency MELF Resistor – CSRF Series

Construction



Features

- Thin film technology
- Suitable for RF applications
- Specialty trimmed technology
- Sn termination on Ni barrier layer
- SMD enabled structure
- Lead-free and RoHS compliant
- MSL: Level 1

① Insulation Coating	④ Electrode Cap
② Trimming Line	⑤ Resistor Layer
③ Ceramic Rod	⑥ Marking

Dimensions

Unit: mm

Type	L	L _{1 min.}	ΦD	ΦD ₁	K	Weight (g) (1000pcs)
CSRF0102	2.20±0.10	1.1	1.10±0.10	D +0/-0.15	0.45±0.05	7.7
CSRF0204	3.50±0.20	1.7	1.40±0.15	D +0/-0.2	0.80±0.10	18.7
CSRF0207	5.90±0.20	2.9	2.20±0.20	D +0/-0.2	1.30±0.10	80.9

Applications

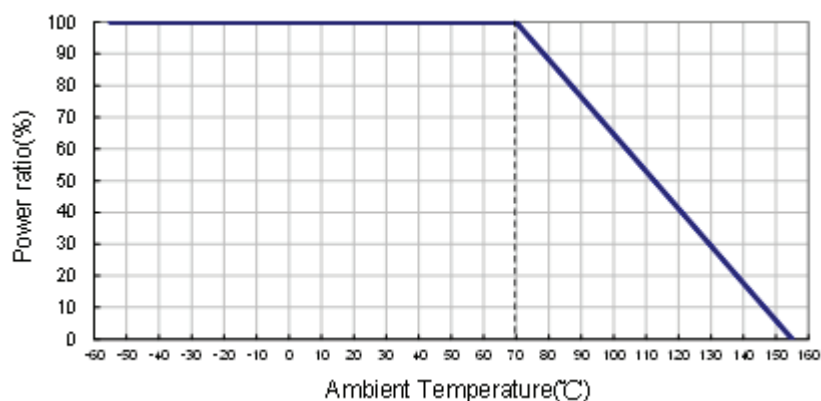
- Industrial
- Telecommunication

Part Numbering

CSRF	0204	F	T	D	V	1000
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0102: 2.2x1.1 0204: 3.5x1.4 0207: 5.9x2.2	F: ±1%	T: Taping Reel S: 7" Taping Reel, Antistatic Tape* W: 13" Taping Reel M: 13" Taping Reel, Antistatic Tape*	D: ±50	T: 1W U: 1/2W V: 1/4W G: 2/5W P: 1/5W L: 3/10W	1R50: 1.5Ω 0100: 10Ω 1000: 100Ω

** Letter "R" is a decimal point.

Derating Curve



■ Standard Electrical Specifications

Type \ Item	Power Rating at 70° C	Operating Temp. Range	Max. Operating Voltage	Resistance Range	TCR (PPM/° C)
				±1%	
0102	1/5W	-55 ~ +155°C	150V	50Ω, 6.8Ω-100Ω	±50
0204	1/4W	-55 ~ +155°C	200V	50Ω, 1.5Ω-220Ω	±50
0207	1/2W	-55 ~ +155°C	300V	50Ω, 6.8Ω-220Ω	±50

■ High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70° C	Operating Temp. Range	Max. Operating Voltage	Resistance Range	TCR (PPM/° C)
				±1%	
0102	3/10W	-55 ~ +155°C	150V	50Ω, 6.8Ω-100Ω	±50
0204	2/5W	-55 ~ +155°C	200V	50Ω, 1.5Ω-220Ω	±50
0207	1W	-55 ~ +155°C	300V	50Ω, 6.8Ω-220Ω	±50

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage Listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(0.15%+0.01Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Endurance	±(0.5%+0.05Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(0.5%+0.05Ω)	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±(1.0%+0.05Ω)	at +155°C for 1000 hrs
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(0.25%+0.05Ω)	-55°C to +155°C, 5 cycles
ESD	±(0.5%+0.01Ω)	Human body, 0102:800V; 0204:1000V; 0207:2000V
Resistance to Solvents	No visible damage on appearance and marking.	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1 ; JIS-C 5201-1 ; MIL-STD-202 ; AEC-Q200 ; JESD22 ; UL94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

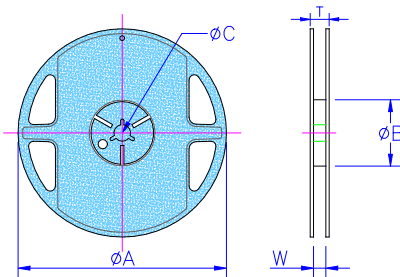
■ Shelf Life: 2 years from production date

Packaging

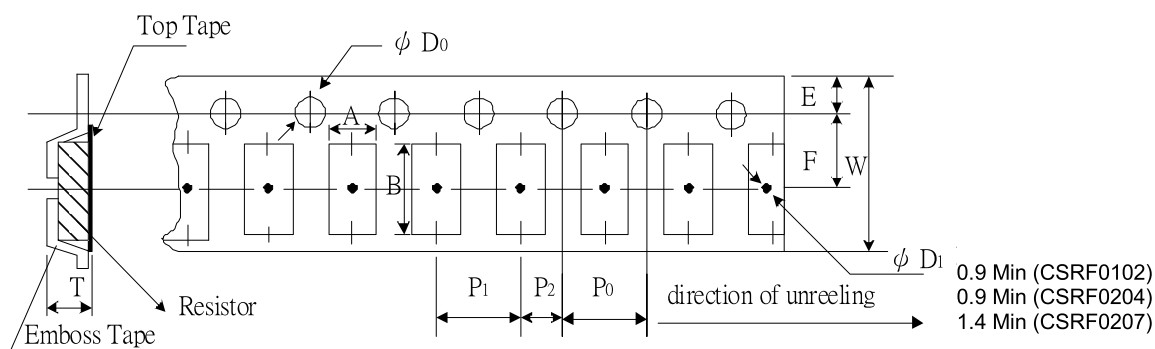
Packaging Quantity & Reel Specifications

Unit: mm

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Emboss Plastic Tape (EA)
CSRF0102	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330.0±1.0	100.0±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSRF0204	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330.0±1.0	100.0±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSRF0207	7 inch	178.5±1.5	60.0+1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000
	13 inch	330.0±1.0	99.0±0.5	13.5±0.5	13.4±1.0	17.8±1.0	6,000



Emboss Plastic Tape Specifications

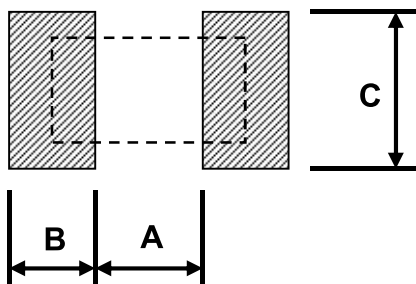


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CSRF0102	1.30±0.20	2.40±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.50±0.10
CSRF0204	1.55±0.20	3.65±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.80±0.10
CSRF0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	2.70±0.10

Recommend Land Pattern

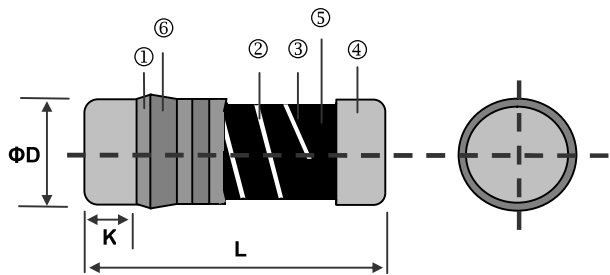
Unit: mm



Type	A	B	C
CSRF0102	1.0	0.8	1.5
CSRF0204	1.6	1.2	1.6
CSRF0207	3.0	1.7	2.4

Carbon Film Resistor—CFS Series

Construction



①	Insulation Coating	④	Electrode Cap
②	Trimming Line	⑤	Resistor Layer
③	Ceramic Rod	⑥	Marking

Features

- SMD style carbon resistor
- Free direction for mounting due to cylindrical design
- High solder ability due to specially plated electrodes
- Electrodes strength is higher than flat chip resistors
- Lower current noise than thick film flat chip resistors
- Suitable for reflow, flow and iron soldering

Dimensions

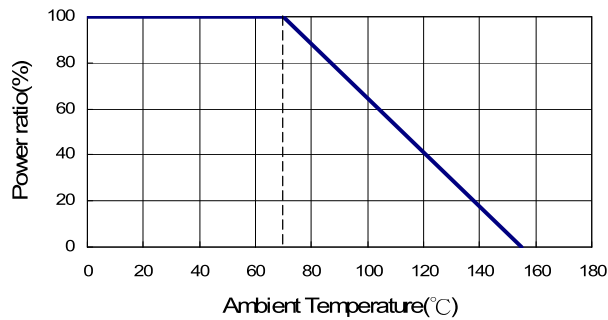
Unit: mm

Type	L	ΦD	K min.	Wight (g) (1000pcs)	Packaging
					180mm/7"
CFS0204	3.50±0.20	1.40±0.15	0.5	19	3,000EA
CFS0207	5.90±0.20	2.20±0.20	0.5	81	2,000EA

Applications

- Telecommunication
- Medical Equipment
- Consumer Product

Derating Curve



Part Numbering

CFS	0204	G	T	-	V	1000
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0204: 3.5x1.4 0207: 5.9x2.2	G: ±2% J: ±5%	T: Taping Reel B: Bulk	-: No specified	S: 2W T: 1W U: 1/2W V: 1/4W	0010: 1Ω 1R20: 1.2Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	
					±2%	±5%
0204	1/4W	-55 ~ +155°C	200V	400V	1Ω - 1MΩ	
0207	1/2W		300V	600V	1Ω - 1MΩ	

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	
					±2%	±5%
0207	1W	-55 ~ +155°C	350V	700V	1Ω - 1MΩ	

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. operating voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. overload voltage Listed above, whichever is lower.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	1Ω – 100KΩ: ±350ppm 101KΩ – 500KΩ: ±700ppm 501KΩ – 1MΩ: ±1000ppm	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(0.5%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Endurance	±(3%+0.05Ω)	Standard: 70±2°C, for 24 hrs High Power: 70±2°C, for 1000 hrs with DC 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(5%+0.05Ω)	Standard: Room temperature + 100°C, 90%~95% RH, Dipping time: 0.5hr High Power: 40±2°C, 90~95% R.H., for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Solderability	95% min. coverage	235±5°C for 3 seconds
Resistance to Soldering Heat	±(1%+0.05Ω)	260±5°C for 10 seconds
Resistance to Solvent	Epoxy Insulation coating can not be peeled	There are 3 cycles, each circle takes 1 min

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

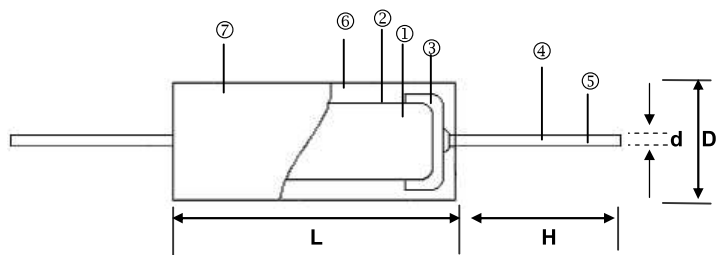
Reference Standards: JIS-C 5201-1

Storage Temperature: 15~28°C; Humidity <80%RH

Shelf Life: 1 year from production date

High Precision Metal Film Led Resistor—MFD Series

Construction



①	Ceramic Core	⑤	Lead Wire
②	Resistor Element	⑥	Molding
③	Terminal	⑦	Marking
④	Connection		

Features

- Very tight tolerance down to $\pm 0.02\%$
- Extremely low TCR down to $\pm 5\text{PPM}/^{\circ}\text{C}$
- High precision
- Excellent stability

Dimensions

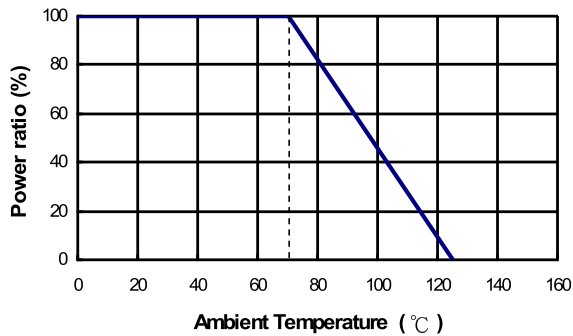
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)	Packaging
						Ammo
MFD0727	7.0 $\pm$ 0.3	2.7 $\pm$ 0.4	26 $\pm$ 3	0.6 $\pm$ 0.05	230	1,000
						2,000
MFD1040	10.2 $\pm$ 0.3	4.0 $\pm$ 0.4	25 $\pm$ 3	0.6 $\pm$ 0.05	430	1,000

Applications

- Precision Equipment
- Measurement Equipment

Derating Curve



Part Numbering

MFD	0727	B	B	C	V	1001
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0727: 7.0x2.7 1040: 10.2x4.0	Q: $\pm 0.02\%$ A: $\pm 0.05\%$ B: $\pm 0.1\%$ F: $\pm 1\%$	A: Ammo B: Bulk	S: ± 5 B: ± 10 N: ± 15 C: ± 25	U: 1/2W V: 1/4W	0100: 10 Ω 2201: 2200 Ω 1002: 10000 Ω 1001: 1K Ω 1004: 1M Ω

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.02%	±0.05%	±0.1%	±1%	
0727	1/4W	-55 ~ +125°C	250V	500V	10Ω - 500KΩ				±5
					10Ω - 1MΩ				±10 ±15 ±25
1040	1/2W		300V	600V	10Ω – 500KΩ				±5
					10Ω - 1MΩ				±10 ±15 ±25

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage Listed above, whichever is lower.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Resistance value at room temperature and room temperature +60°C
Short Time Overload	±(0.05%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	> 1,000MΩ	Apply 500V _{DC} for 1 minute
Endurance	±(0.2%+0.05Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(0.2%+0.05Ω)	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Solderability	95% min. coverage	245±5°C for 5 seconds
Resistance to Soldering Heat	±(0.05%+0.01Ω)	350±10°C for 3 seconds or 260±5°C for 10 seconds
Terminal Strength	Tensile: ≥2.5kg	Tensile strength: for 10 sec. Torsional strength: Rotated through 360°, 5 rotations
Pulse Overload	±(0.1%+0.01Ω)	4 times RCWV for 10000 cycles with 1second "ON" and 25 seconds "OFF"
Temperature Cycle	±(0.05%+0.05Ω)	-25°C (30min.)/+85°C (30min.), 5 cycles
Resistance to Solvent	No deterioration of coatings and markings	Trichroethane for 3 min. with ultrasonic

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

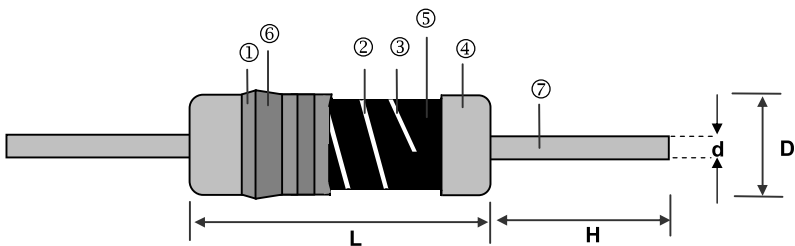
■ Reference Standards: MIL-STD-202, JIS-C 5201-1

■ Storage Temperature: 15~28°C; Humidity <80%RH

■ Shelf Life: 1 year from production date

Metal Film Ledged Precision Resistor—MFR Series

Construction



①	Insulation Coating	⑤	Resistor Layer
②	Trimming Line	⑥	Marking
③	Ceramic Core	⑦	Lead Wire
④	Electrode Cap		

Features

- Excellent overall stability
- Very tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 10 \text{ PPM}/^\circ\text{C}$
- High power rating up to 3 Watts
- Excellent ohmic contact

Applications

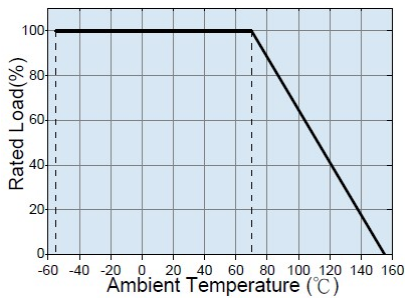
- Telecommunication
- Medical Equipment

Dimensions

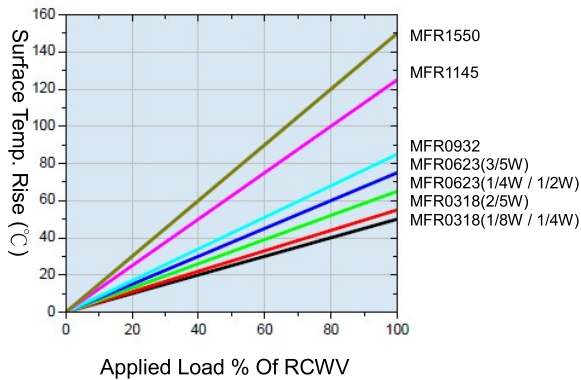
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
MFR0318	3.4 ± 0.3	1.8 ± 0.30	29 ± 3.0	0.45 ± 0.03	90
MFR0623	6.3 ± 0.5	2.3 ± 0.30	28 ± 3.0	0.55 ± 0.03	150
MFR0932	9.0 ± 0.5	3.2 ± 0.50	26 ± 3.0	0.65 ± 0.03	350
MFR1145	11.5 ± 1.0	4.5 ± 0.50	35 ± 3.0	0.78 ± 0.03	770
MFR1550	15.5 ± 1.0	5.0 ± 0.50	32 ± 3.0	0.78 ± 0.03	1040

Derating Curve



Hot-Spot Temperature



Part Numbering

MFR	0318	B	T	N	W	1001	
Product Type	Dimensions (LxD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Special
	0318: 3.4x1.8 0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0	A: $\pm 0.05\%$ B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$	A: Ammo B: Bulk T: Taping Reel	S: ± 5 B: ± 10 N: ± 15 C: ± 25 D: ± 50 E: ± 100	R: 3W S: 2W T: 1W U: 1/2W V: 1/4W F: 3/5W G: 2/5W W: 1/8W	R100: 0.1Ω 0010: 1Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ	: Standard MA: MA-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type FD: FD-type

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Voltage Proof	Resistance Range					TCR (PPM/°C)
						±0.05%	±0.1%	±0.25%	±0.5%	±1%	
0318	1/8W	-55 ~ +155°C	150V	300V	300V	-	10Ω-1MΩ	10Ω-100KΩ	-	-	±5 ±10
						-	10Ω-1MΩ	-	-	-	±15
						-	10Ω-1MΩ				±25
						-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	-	±100
0623	1/4W	-55 ~ +155°C	250V	500V	500V	-	10Ω-1MΩ	-	-	-	±5
						-	10Ω-1MΩ	-	-	100Ω-22KΩ	±10
						-	10Ω-1MΩ	10Ω-499KΩ	-	-	±15
						-	10Ω-1MΩ				±25
						-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±50
0932	1/2W	-55 ~ +155°C	350V	500V	500V	-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±100
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	-	±5
						-	10Ω-1MΩ	-	-	-	±10
						-	10Ω-1MΩ				±15
						-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±25
1145	1W	-55 ~ +155°C	500V	700V	700V	-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	-	±100
						-	10Ω-1MΩ	-	-	-	±25
						-	10Ω-1MΩ				±15
						-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±50
1550	2W	-55 ~ +155°C	500V	1000V	1000V	-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±100
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	-	±5
						-	10Ω-1MΩ	-	-	-	±25
						-	10Ω-1MΩ				±15
						-	10Ω-1MΩ	10Ω-4.99MΩ	10Ω-10MΩ	-	±50

High Power & Ultra High Power Rating Electrical Specifications

Type\Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Voltage Proof	Resistance Range					TCR (PPM/°C)
						±0.05%	±0.1%	±0.25%	±0.5%	±1%	
0318	1/4W	-55 ~ +155°C	200V	400V	300V	-	10Ω-1MΩ				±25
						-	10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-		10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
	2/5W		200V	400V	300V	-	10Ω-1MΩ				±25
						-	10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-		10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
0623	1/2W	-55 ~ +155°C	300V	500V	500V	10Ω-1MΩ				-	±5
						10Ω-1MΩ				100Ω-22KΩ	±10
						10Ω-1MΩ		10Ω-499KΩ			±15
						10Ω-1MΩ					±25
						-	10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-		10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
	3/5W	350V	500V	500V	-	100Ω-22KΩ				±10	
					-	10Ω-499KΩ				±15	
					-	10Ω-1MΩ				±25	
					-	10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50	
					-		10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100	

■ High Power & Ultra High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Voltage Proof	Resistance Range					TCR (PPM/°C)
						±0.05%	±0.1%	±0.25%	±0.5%	±1%	
0932	1W	-55 ~ +155°C	400V	600V	500V	10Ω-1MΩ				-	±5 ±10
						10Ω-1MΩ		-			±15
						10Ω-1MΩ					±25
						-	10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-		10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
1145	2W	-55 ~ +155°C	500V	700V	700V	-	10Ω-1MΩ				±25
						-	10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-		10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
1550	3W	-55 ~ +155°C	500V	1000V	1000V	-	10Ω-1MΩ				±25
						-	10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-		10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage Listed above, whichever is lower.

■ Environmental Characteristics

Item	Requirement	Test Method
Resistance Value	1Ω-10MΩ	Measure at a distance of 10mm from the cap end
Short Time Overload	±(0.25%+0.05Ω)	2.5 times RCWV for 5 seconds
Insulation Resistance	> 1000MΩ	The measure was executed by V-Block methods
Endurance	±(1.5%+0.05Ω)	70±2°C, at RCWV (or Umax., whichever less) for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat, Steady State	±(1.5%+0.05Ω)	40±2°C, 90~95% R.H. for 56 days, loaded with 0.1 times RCWV (or Umax., whichever less)
Solderability	95% min. Coverag	245±5°C for 3±0.5 seconds
Voltage Proof	By Type	In V-Block for 60 seconds
Temperature Coefficient	By Type	Resistance value at room temperature and room temperature+100°C
Periodic-Pulse Overload Test	±(0.75%+0.05Ω)	4 times RCWV (or Umax., whichever less) for 10000 cycles with 1 second "ON" and 25 seconds "OFF"
Solvent Resistance To Marking	No obvious abnormality in coatings and markings	IPA for 5±0.5 Min. with ultrasonic
Robustness of Terminalations	Tensile: ≥ 2.5kg (24.5N)	Direct Load for 10 sec. In the direction off the terminal leads
Resistance to Soldering Heat	0318: ±(0.75%+0.05Ω) 0623&0932: ±(0.5%+0.05Ω) 1145&1550: ±(0.25%+0.05Ω)	The solder iron heated to 260°C±5°C and applied to the termination for a duration of 10±1 seconds
Temperature Cycling	±(0.75%+0.05Ω)	-55°C/125°C with 5 cycles. the duration at each temperature 30 min

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

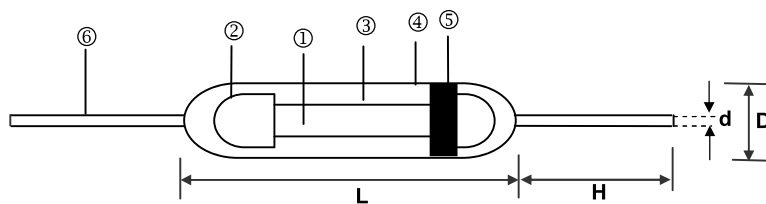
■ Reference Standards: IEC 60115-1

■ Storage Temperature: 25±3°C; Humidity <80%RH

■ Shelf Life: 1 year from production date

Metal Oxide Film Leaded Resistor—MOF Series

Construction



Features

- Excellent Long-Time stability
- Complete Flameproof Construction UL-94V0
- Wide resistance range: 0.1Ω~1MΩ
- Controlled temperature coefficient
- Resistance standard tolerance: $\pm 5\%$
- Coating and marking resist trichlorethylene, freon, and other cleaing agents

Applications

- Telecommunication
- Medical Equipment

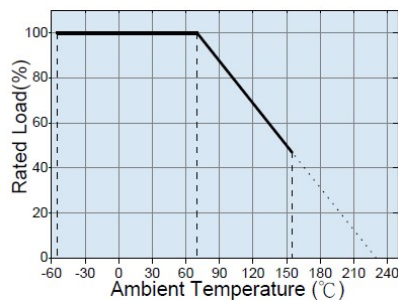
① Ceramic Rod	④ Non-flame Paint With Sol Vent-proof
② Tinned Iron Caps	⑤ Color Code
③ Metal Oxide Film	⑥ Lead Wire

Dimensions

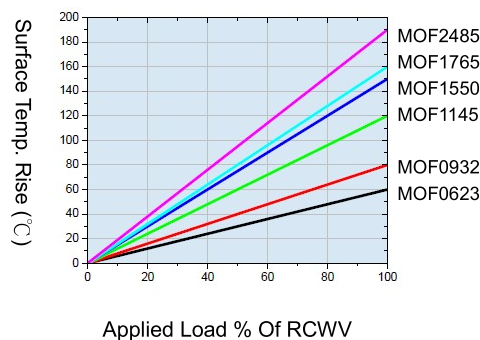
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
MOF0623	6.3 $\pm$ 0.5	2.3 $\pm$ 0.3	28 $\pm$ 3.0	0.55 $\pm$ 0.03	156
MOF0932	9.0 $\pm$ 0.5	3.2 $\pm$ 0.5	26 $\pm$ 3.0	0.65 $\pm$ 0.03	355
MOF1145	11.5 $\pm$ 1.0	4.5 $\pm$ 0.5	35 $\pm$ 3.0	0.78 $\pm$ 0.03	760
MOF1550	15.5 $\pm$ 1.0	5.0 $\pm$ 0.5	32 $\pm$ 3.0	0.78 $\pm$ 0.03	1040
MOF1765	17.5 $\pm$ 1.0	6.0 $\pm$ 0.5	35 $\pm$ 3.0	0.78 $\pm$ 0.03	1800
MOF2485	24.5 $\pm$ 1.0	8.0 $\pm$ 0.5	35 $\pm$ 3.0	0.78 $\pm$ 0.03	4000

Derating Curve



Hot-Spot Temperature



Part Numbering

MOF	0623	F	A	G	U	1001	MA
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Special
	0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0 1765: 17.5x6.0 2485: 24.5x8.0	F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$	A: Ammo B: Bulk T: Taping Reel	G: ± 300	D: 5W R: 3W S: 2W T: 1W U: 1/2W V: 1/4W	R100: 0.1Ω 0010: 1Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ	: Standard MA: MA-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type

■ Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range			TCR (PPM/°C)
						±1%	±2%	±5%	
0623	1/4W	-55 ~ +235°C	200V	350V	350V	0.1Ω - 1MΩ			±300
0932	1/2W		250V	400V	350V	0.1Ω - 1MΩ			
1145	1W		500V	600V	500V	0.1Ω - 1MΩ			
1550	2W		500V	600V	500V	0.1Ω - 1MΩ			
1765	3W		500V	1000V	750V	0.1Ω - 1MΩ			
2485	5W		750V	1000V	750V	0.1Ω - 1MΩ			

■ High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range			TCR (PPM/°C)
						±1%	±2%	±5%	
0623	1/2W	-55 ~ +235°C	250V	400V	350V	0.1Ω - 1MΩ			±300
0932	1W		300V	500V	400V	0.1Ω - 1MΩ			
1145	2W		500V	600V	500V	0.1Ω - 1MΩ			
1550	3W		500V	800V	600V	0.1Ω - 1MΩ			
1765	5W		700V	1000V	750V	0.1Ω - 1MΩ			

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. operating voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. overload voltage Listed above, whichever is lower.

■ For resistance value out of above range is by request. Below 10Ω and over 51K(excluded) are using alloy film.

■ Resistor body color: Standard Power Rating: Grey

High Power Rating: Grey or Pink are available

■ Environmental Characteristics

Item	Requirement	Test Method
Resistance Value	0.1Ω – 1MΩ	Measure at a distance of 10mm from the cap end
Short Time Overload	±(1%+0.05Ω) for standard power ±(2%+0.05Ω) for high power	2.5 times RCWV for 5 seconds
Insulation Resistance	> 1000MΩ	The measure was executed by V-Block methods
Endurance	±(5%+0.05Ω)	70±2°C, RCWV (or Umax., whichever less) for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat, Steady State	±(5%+0.05Ω)	40±2°C, 90~95% R.H. for 56 days, loaded with 0.1 times RCWV (or Umax., whichever less)
Solderability	95% min. Coverage	245±5°C for 3±0.5 seconds
Voltage Proof	By Type	In V-Block for 60 seconds
Temperature Coefficient	By Type	Resistance value at room temperature and room temperature+100°C
Periodic-Pulse Overload Test	±(2%+0.05Ω)	4 times RCWV (or Umax., whichever less) for 10000 cycles with 1second "ON" and 25 seconds "OFF"
Solvent Resistance of Marking	No obvious deterioration of coatings and markings	IPA for 5±0.5 Min. with ultrasonic
Robustness of Terminations	Tensile: ≥ 2.5kg(24.5N)	Direct Load for 10 seconds In the direction off the terminal leads
Temperature Cycling	±(1%+0.05Ω)	55°C / 155°C with 5 cycles the duration at each temperature 30 min
Resistance to Soldering Heat	±(1%+0.05Ω)	The solder iron heated to 260±5°C and applied to the termination for duration of 10±1 seconds

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

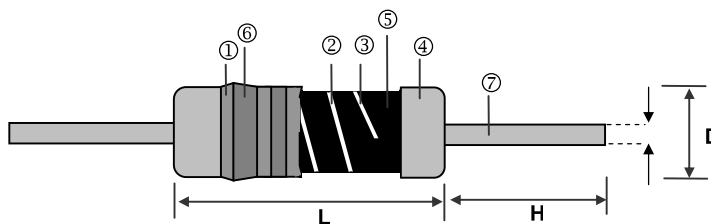
■ Reference Standards: IEC 60115-1 JIS-C 5201-1

■ Storage Temperature: 25±10°C; Humidity <80%RH

■ Shelf Life: 1 year from production date

High Ohmic / High Voltage Metal Glazed Led Resistor—MGQ Series

Construction



Features

- Similar characteristic With metal film but resistance Value can be as high as 1GB
- Metal-glaze elements high stable performance against environmental conditions and overload Resistant to heat, Humidity & solvents
- Tolerance: $\pm 1\%$, $\pm 5\%$
- RoHS compliant / Lead-free available

① Insulation Coating	⑤ Resistor Layer
② Trimming Line	⑥ Marking
③ Ceramic Core	⑦ Lead Wire
④ Electrode Cap	

Dimensions

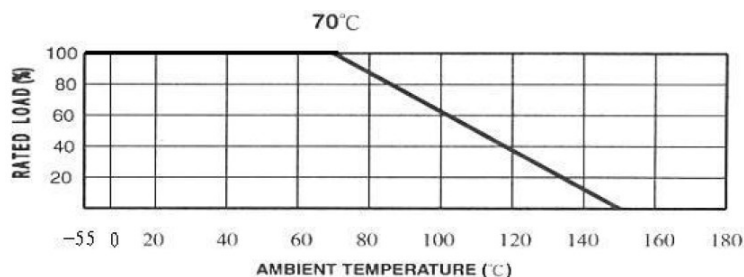
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)	Packaging Ammo
MGQ0623	6.3 $\pm$ 0.5	2.3 $\pm$ 0.3	27 $\pm$ 3.0	0.45 $\pm$ 0.05	196.0	5,000
MGQ0932	9.0 $\pm$ 1.0	3.5 $\pm$ 0.5	26 $\pm$ 2.0	0.56 $\pm$ 0.05	389.0	2,500
MGQ1145	11.0 $\pm$ 1.0	4.5 $\pm$ 0.5	34 $\pm$ 2.0	0.65 $\pm$ 0.05	776.0	1,000
MGQ1550	15.0 $\pm$ 1.0	5.0 $\pm$ 0.5	33 $\pm$ 2.0	0.80 $\pm$ 0.05	1108.5	1,000
MGQ1760	17.0 $\pm$ 1.0	6.0 $\pm$ 0.5	32 $\pm$ 2.0	0.80 $\pm$ 0.05	1800.0	500

Part Numbering

MGQ	0623	J	A	4	V	1004
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0623: 6.3x2.3 0932: 9.0x3.5 1145: 11.5x4.5 1550: 15.5x5.0 1760: 17.0x6.0	F: $\pm 1\%$ J: $\pm 5\%$	A: Ammo	4: ± 350	V: 1/4W U: 1/2W T: 1W S: 2W R: 3W	1003: 100K Ω 1004: 1M Ω 1006: 100M Ω

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
0623	1/4W	1600V	3000V	300V	100Ω~100MΩ		±350
0932	1/2W	3500V	7000V	500V	100Ω~100MΩ		±350
1145	1W	5000V	10000V	500V	100Ω~100MΩ		±350
1550	2W	7000V	14000V	600V	100Ω~100MΩ		±350
1760	3W	7000V	14000V	600V	100Ω~100MΩ		±350

Resistor body color: Pink

Environmental Characteristics

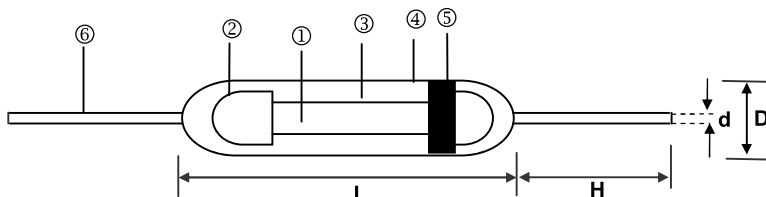
Item	Requirement	Test Method
Short Time Overload	$\leq \pm(1\%R+0.5\Omega)$ Shall be no mechanical breakage	AC or DC voltage 2.5 times the rated voltage for 5 seconds
Endurance	$\leq \pm(5\%R+0.1\Omega)$ Shall be no mechanical breakage	70°C, apply rated voltage for 1000 hrs with 1 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\leq \pm(5\%R+0.1\Omega)$ Shall be no mechanical breakage	40±2°C, 90~95% R.H. apply rated voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Solderability	95% min. Coverage	260±5°C for 5±0.5 seconds
Voltage Endurance	No breakdown or flashover	Place the resistor in the "V" slot and hold for one minute, as shown in specifications
Temperature Coefficient of Resistance (T.C.R)	±350PPM	$PPM/^{\circ}C = \frac{R - R_0}{R_0} \times \frac{10^6}{T - T_0}$ R = Measured resistance (Ω) at T Ro = Measured resistance (Ω) at To T = Measured test temperature(°C) To = Measured base temperature(°C)
Resistance to solvent	No visible damages to protective coating and marking	The resistor shall be completely immersed for 3 min in IPA and rubbed 10 times with the whisk
Resistance To Soldering Heat	$\leq \pm(1\%R+0.5\Omega)$ Shall be no mechanical breakage	Dip the lead in to a solder bath having a temperature of 350 ±10°C up to 3±0.05mm from the body of the resistor and hold it for 3.5±0.5seconds leave the resistor ,at room temperature 1 hours after ,then Measure
Terminal Strength	Shall be no mechanical breakage	Pull test apply 3.5KG force to the lead in the direction of lead axis for 30±5 seconds
Endurance at upper-limit temperature	$\leq \pm(5\%R+0.1\Omega)$	At 125°C temperature, duration of 1000h
Flammability	No evidence of flaming	The test flame shall be applied and removed for 15 secretary respectively, and repeated cycle for 5times

Storage Temperature: 30+/-5°C ; Humidity: <65%

Shelf Life: 2 years from production date

Carbon Film Ledged Resistor—CFR Series

Construction



Features

- The characteristics correspond to the IEC 60115-1 standard specification
- General-purpose lead-type resistors
- Automatic insertion is applicable
- Availability of various types and excellent long time stability
- Wide resistance range from 0.1 Ω to 10 M Ω

Applications

- Telecommunication
- Medical Equipment

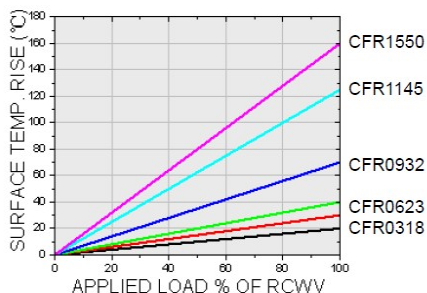
① Ceramic Rod	④ Non-flame Paint With Sol Vent-proof
② Tinned Iron Caps	⑤ Color Code
③ Carbon Film	⑥ Lead Wire

Dimensions

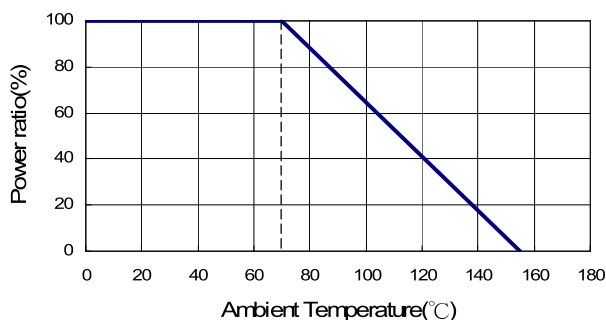
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
CFR0318	3.4 $\pm$ 0.5	1.8 $\pm$ 0.3	29 $\pm$ 3.0	0.41~0.48	92
CFR0623	6.3 $\pm$ 0.5	2.3 $\pm$ 0.3	28 $\pm$ 3.0	0.43~0.58	155
CFR0932	9.0 $\pm$ 0.5	3.2 $\pm$ 0.5	26 $\pm$ 3.0	0.58~0.68	352
CFR1145	11.5 $\pm$ 1.0	4.5 $\pm$ 0.5	35 $\pm$ 3.0	0.68~0.81	775
CFR1550	15.5 $\pm$ 1.0	5.0 $\pm$ 0.5	32 $\pm$ 3.0	0.75~0.81	1042

Hot-Spot Temperature



Derating Curve



Part Numbering

CFR	0318	J	T	-	W	1001	MA
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Special
	0318: 3.4x1.8 0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0	J: $\pm$ 5%	A: Ammo B: Bulk T: Taping Reel	—: No specified	R: 3W S: 2W T: 1W U: 1/2W V: 1/4W W: 1/8W	R500: 0.5 Ω 0010: 1 Ω 1000: 100 Ω 2201: 2200 Ω 1001: 1K Ω 1004: 1M Ω	: Standard MA: MA-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type FD: FD-type

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	
						±5%(E6)	±5%(E24)
0318	1/8W	-55 ~ +155°C	150V	300V	300V	0.1Ω – 0.68Ω	1Ω - 10MΩ
0623	1/4W		250V	500V	500V	0.1Ω – 0.68Ω	1Ω - 10MΩ
0932	1/2W		350V	700V	700V	0.1Ω – 0.68Ω	1Ω - 10MΩ
1145	1W		450V	1000V	1000V	0.1Ω – 0.68Ω	1Ω - 10MΩ
1550	2W		500V	1000V	1000V	0.1Ω – 0.68Ω	1Ω - 10MΩ

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	
						±5%(E6)	±5%(E24)
0318	1/4W	-55 ~ +155°C	200V	400V	400V	0.1Ω – 0.68Ω	1Ω - 10MΩ
0623	1/2W		300V	500V	500V	0.1Ω – 0.68Ω	1Ω - 10MΩ
0932	1W		400V	800V	800V	0.1Ω – 0.68Ω	1Ω - 10MΩ
1145	2W		500V	1000V	1000V	0.1Ω – 0.68Ω	1Ω - 10MΩ
1550	3W		500V	1000V	1000V	0.1Ω – 0.68Ω	1Ω - 10MΩ

Operating Voltage= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage Listed above, whichever is lower.

Resistor body color:

Standard power rating: Light Brown

High power rating 0318 size: Light Brown is available only other sizes: Light Brown or Pink are available.

Please specify which color is acceptable else the light brown is a top priority.

For resistance value out of above range is by request. Below 10Ω are using alloy film

Environmental Characteristics

Item	Requirement	Test Method
Resistance Value	1Ω ~ 10MΩ	Measure at a distance of 10mm from the cap end
Short Time Overload	±(0.75%+0.05Ω)	2.5 times RCWV for 5 seconds
Insulation Resistance	>1000MΩ	The measure was executed by V-Block methods
Endurance	±(3%+0.05Ω)	70±2°C, RCWV (or Umax., whichever less) for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat, Steady State	<100KΩ±3% >101KΩ±5%	40±2°C, 90~95% R.H. for 56 days, loaded with 0.1 times RCWV (or Umax., whichever less)
Solderability	95% min. coverage	245±5°C for 3±0.5 seconds
Voltage Proof	By Type	In V-Block for 60 seconds
Temperature Coefficient	1145/1550: < 1Ω ±1500ppm 1Ω~100KΩ ±350ppm 100KΩ~1MΩ -0ppm-500ppm 1MΩ~10MΩ -0ppm-1000ppm Other sizes: < 1Ω ±1500ppm 1Ω~100KΩ +350ppm-500 ppm 100KΩ~1MΩ -0ppm-700ppm 1MΩ~10MΩ -0ppm-1500ppm	Resistance value at room temperature and room temperature+100°C
Periodic-Pulse Overload Test	±(1%+0.05Ω)	4 times RCWV (or Umax., whichever less) for 10000 cycles with 1 second "ON" and 25 seconds "OFF"
Solvent Resistance of Marking	No obvious deterioration of coatings and markings	IPA for 5±0.5 Min. with ultrasonic
Robustness of Terminations	Tensile: ≥ 2.5 kg (24.5N)	Direct Load for 10 seconds In the direction off the terminal leads
Temperature Cycling	±(1%+0.05Ω)	-55°C /155°C with 5 cycles the duration at each temperature 30 min
Resistance to Soldering Heat	±(1%+0.05Ω)	The solder iron heated to 260±5°C and applied to the termination for duration of 10±1 seconds

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

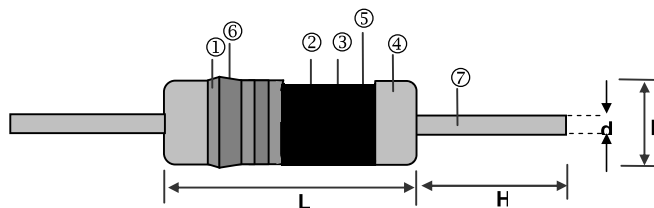
Reference Standards: IEC 60115-1

Storage Temperature: 25±10°C; Humidity <80%RH

Shelf Life: 1 year from production date

Metal Film Flame-Proof Resistor – FMR Series

Construction



Features

- Low Noise
- Low TCR from $\pm 15 \sim 100 \text{PPM}/^\circ\text{C}$
- High Precision from $\pm 0.1\% \sim 1\%$
- Flameproof Coating equivalent to UL94V-0

①	Insulation Coating	⑤	Resistor Layer
②	Trimming Line	⑥	Marking
③	Ceramic Core	⑦	Lead Wire
④	Electrode Cap		

Dimensions

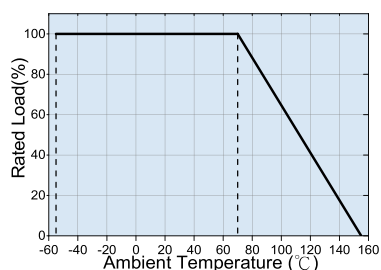
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
FMR0623	6.3 $\pm$ 0.5	2.3 $\pm$ 0.3	28 $\pm$ 3.0	0.55 $\pm$ 0.03	196.0
FMR0932	9.0 $\pm$ 0.5	3.2 $\pm$ 0.5	26 $\pm$ 3.0	0.65 $\pm$ 0.03	389.0
FMR1145	11.5 $\pm$ 1.0	4.5 $\pm$ 0.5	35 $\pm$ 3.0	0.78 $\pm$ 0.03	776.0
FMR1550	15.5 $\pm$ 1.0	5.0 $\pm$ 0.5	32 $\pm$ 3.0	0.78 $\pm$ 0.03	1108.5

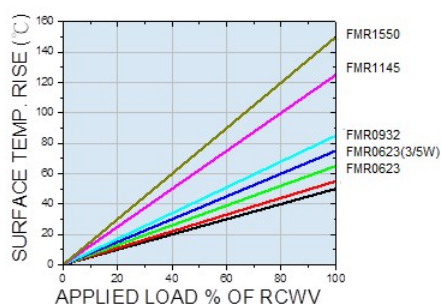
Part Numbering

FMR	0623	B	T	N	V	1001	
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/ $^\circ\text{C}$)	Power Rating	Resistance	Special
	0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$	A: Ammo B: Bulk T: Taping Reel	B: ± 10 N: ± 15 C: ± 25 D: ± 50 E: ± 100	R: 3W S: 2W T: 1W F: 3/5W U: 1/2W V: 1/4W	0010: 1 Ω 1000: 100 Ω 2201: 2200 Ω 1001: 1K Ω 1004: 1M Ω	: Standard MA: MA-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type FD: FD-type

Derating Curve



Hot-spot Temperature



■ Standard Electrical Specifications

Type\Item	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Voltage Proof	Resistance Range				TCR (±PPM/°C)
						±0.1%	±0.25%	±0.5%	±1%	
0623	1/4W	-55 ~ +155°C	250V	500V	350V	100Ω~22KΩ				±10
						10Ω~499KΩ				±15
						10Ω-1MΩ				±25
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
0932	1/2W		350V	500V	400V	10Ω-1MΩ				±25
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
1145	1W		500V	700V	500V	10Ω-1MΩ				±25
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100
1550	2W		500V	1000V	750V	10Ω-1MΩ				±25
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-10MΩ	±100

■ High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Voltage Proof	Resistance Range				TCR (±PPM/°C)
						±0.1%	±0.25%	±0.5%	±1%	
0623	1/2W	-55 ~ +155°C	300V	500V	350V	100Ω-22KΩ				±10
						10Ω-499KΩ				±15
						10Ω-1MΩ				±25
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-1MΩ	±100
	3/5W		300V	500V	350V	100Ω-22KΩ				±10
						10Ω-499KΩ				±15
						10Ω-1MΩ				±25
						10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50
						-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-1MΩ	±100
0932	1W	400V	600V	400V	10Ω-1MΩ				±25	
					10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50	
					-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-1MΩ	±100	
1145	2W	500V	700V	500V	10Ω-1MΩ				±25	
					10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50	
					-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-1MΩ	±100	
1550	3W	500V	1000V	750V	10Ω-1MΩ				±25	
					10Ω-1MΩ		10Ω-4.99MΩ	10Ω-10MΩ	±50	
					-	10Ω-1MΩ	10Ω-4.99MΩ	0.1Ω-1MΩ	±100	

Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.

■ Resistor body color : Grey

■ Environmental Characteristics

Item	Specification	Test Method
Resistance Value	1Ω-10MΩ	Measure at a distance of 10mm from the cap end
Short Time Overload	±(0.25%+0.05Ω)	RCWV*2.5 for 5 seconds
Temperature Coefficient	By Type	Resistance value at room temperature and room temperature+100℃
Voltage Proof	By Type	In V-Block for 60 seconds
Periodic-Pulse Overload	±(0.75%+0.05Ω)	4 times RCWV (or Umax. whichever less) for 10000cycles (1sec.on , 25secs.off)
Insulation Resistance	> 1000MΩ	The measure was executed by V-Block methods
Endurance	±(1.5%+0.05Ω)	70±2℃, at RCWV (or Umax., whichever less) for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat (Steady State)	±(1.5%+0.05Ω)	40±2℃, 90~95% R.H., for 56 days , loaded with 0.1 times RCWV (or Umax. whichever less)
Solderability	95% Min. Coverage	245±5℃ for 3±0.5 seconds
Resistance to Soldering Heat	0623 / 0932 sizes: ±(0.5%+0.05Ω) 1145 / 1550 sizes: ±(0.25%+0.05Ω)	The solder iron heated to 260±5℃ and applied to the termination for a duration of 10±1 seconds
Solvent Resistance of Marking	No obvious deterioration of coatings and markings	IPA for 5±0.5 min. with ultrasonic
Robustness of Terminations	Tensile: ≥ 2.5kg (24.5N)	Direct Load for 10 sec. In the direction off the terminal leads.
Temperature Cycling	±(0.75%+0.05Ω)	-55℃/155℃ with 5 cycles. the duration at each temperature 30 min

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower

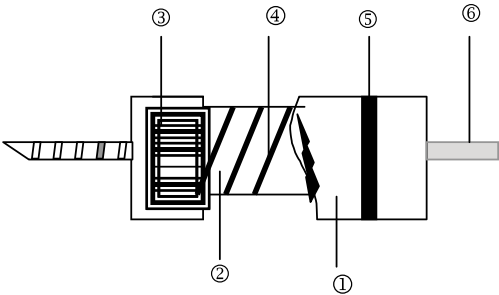
■ Reference Standards: IEC 60115-1

■ Storage Temperature: 25±10℃; Humidity <80%RH

■ Shelf Life: 1 year from production date

Wire Wound Ledged Resistor – KNQ Series

Construction



Features

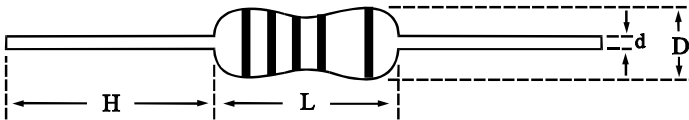
- Low resistance value
- Flame retardant coating
- Standard tolerance $\pm 5\%$
- RoHS compliant / lead-free available

①	Non-flame Paint With Sol Vent-proof	④	Copper-Nickel Alloy Wire Wound Film
②	Ceramic Rod	⑤	Marking (Expose)
③	End Cap	⑥	Lead Wire

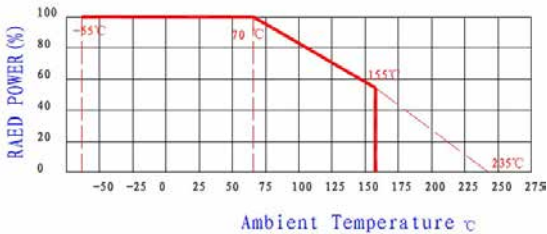
Applications

- Suitable for Use In A Variety of Military Electronics Power, Sampling, Start, Oscillation Circuit, etc.

Dimensions



Derating Curve



Type	L	D	H	d	Weight (g) (1000pcs)	Unit: mm Packaging
						Ammo
0932	9.0 $\pm$ 0.5	3.5 $\pm$ 0.5	26 $\pm$ 2.0	0.56 $\pm$ 0.05	373.0	2500PCS
1145	11.5 $\pm$ 1.0	4.5 $\pm$ 0.5	34 $\pm$ 2.0	0.65 $\pm$ 0.05	758.0	1000PCS
1550	15.5 $\pm$ 1.0	5.0 $\pm$ 0.5	33 $\pm$ 2.0	0.70 $\pm$ 0.05	1108.5	1000PCS
1760	17.0 $\pm$ 1.0	6.0 $\pm$ 0.5	32 $\pm$ 2.0	0.70 $\pm$ 0.05	1648.0	500PCS
2480	24.0 $\pm$ 1.0	8.0 $\pm$ 0.5	28 $\pm$ 2.0	0.70 $\pm$ 0.05	3832.0	250PCS

Part Numbering

KNQ	0932	J	A	G	U	1000
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0932: 9.0x3.5 1145: 11.5x4.5 1550: 15.0x5.0 1760: 17.0x6.0 2480: 24.0x8.0	J: $\pm 5\%$	A: Ammo B: Bulk	G: ≤ 300	D: 5W R: 3W S: 2W T: 1W U: 1/2W	R100: 0.1 Ω 0010: 1 Ω 0100: 10 Ω 1000: 100 Ω

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Dielectric Withstanding Voltage	Resistance Range	TCR (PPM/°C)
				±5%	
0932	1/2W	-55 ~ +155°C	300V	0.1Ω~300Ω	≤ 300
1145	1W		350V	0.1Ω~500Ω	
1550	2W		350V	0.1Ω~1KΩ	
1760	3W		500V	0.1Ω~1.5KΩ	
2480	5W		500V	0.1Ω~2.5KΩ	

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Dielectric Withstanding Voltage	Resistance Range	TCR (±PPM/°C)
				±5%	
0932	1W	-55 ~ +155°C	300V	0.1Ω~500Ω	≤ 300
1145	2W		350V	0.1Ω~500Ω	
1550	3W		350V	0.1Ω~1KΩ	
1760	5W		500V	0.1Ω~1.5KΩ	

■ Resistor body color : Grey

Environmental Characteristics

Item	Requirement	Test Method
Short Time Overload	≤ ±(2%R+0.05Ω) Shall be no mechanical breakage	AC or DC voltage 2.5 times the rated voltage for 5 seconds
Endurance	≤ ±(5%R+0.05Ω) Shall be no mechanical breakage	70°C, apply rated voltage for 1000 hrs with 1 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	≤ ±(5%R+0.1Ω) Shall be no mechanical breakage	40±2°C, 90~95% R.H. apply rated voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Solderability	95% min. Coverage	260±5°C for 5±0.5 seconds
Voltage Endurance	No breakdown or flashover	Place the resistor in the "V" slot and hold for one minute, as shown in specifications
Temperature Coefficient of Resistance (T.C.R)	≤ 300PPM	$\text{PPM/}^{\circ}\text{C} = \frac{R - R_0}{R_0} \times \frac{10^6}{T - T_0}$ R = Measured resistance (Ω) at T R₀ = Measured resistance (Ω) at T₀ = Measured test temperature(°C) T₀ = Measured base temperature(°C)
Resistance To Soldering Heat	≤ ±(2%R+0.05Ω) Shall be no mechanical breakage	Dip the lead in to a solder bath having a temperature of 350 ±10°C up to 3±0.05mm from the body of the resistor and hold it for 3.5±0.5seconds leave the resistor ,at room temperature 1 hours after ,then Measure
Terminal Strength	Shall be no mechanical breakage	Pull test apply 3.5KG force to the lead in the direction of lead axis for 30±5 seconds
Vibration	Shall be no mechanical breakage	set a resistor at the vibration table and vibrate 10HZ—55HZ 10HZ/s. with 1.5mm amplitude in 1 min. when the change of frequency shall be completed uniformly. the vibration shall apply to 3 directions, vertical and horizontal to the axis of resistor each for 3h.
Endurance at upper-limit temperature	≤ ±(5%R+0.1Ω)	At 125°C temperature, duration of 1000h

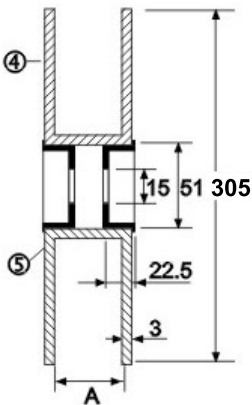
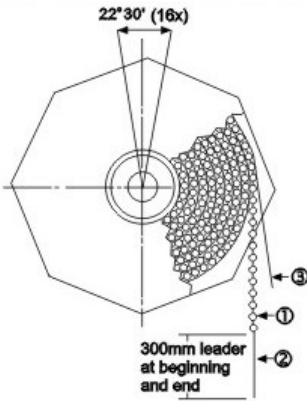
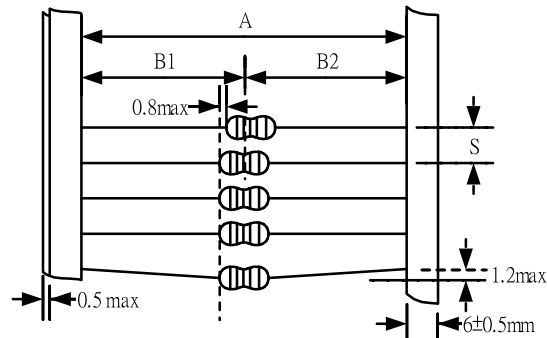
■ Storage Temperature: 30±5°C ; Humidity: < 65% RH

■ Shelf life: 2 years from production date

■Taping/Packing Specifications (For MFR / MOF / CFR / FMR)

1.Standard Type (Reel & Ammo)

Packing Methods

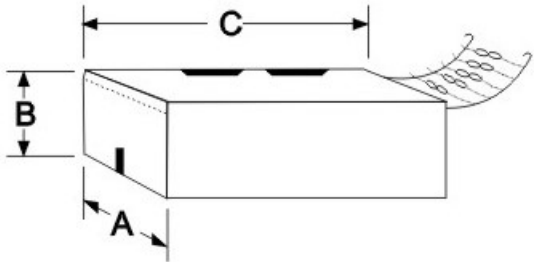


- (1) Resistor (4) Flange
(2) Bandolier (5) Cylinder
(3) Paper

Unit: mm

Type	Packing Methods			Reel Packing				
	A	B1-B2	S	Across Flange (A)	MFR Qty	CFR Qty	MOF Qty	FMR Qty
0318	52+1/-0	1.2	5±0.3	72	5,000	5,000	-	-
	26+0.5/-0	1.0		-				
0623	52+1/-0	1.2	5±0.3	72	5,000	5,000	5,000	5,000
	26+0.5/-0	1.0		-				
0932	52+1/-0	1.2	5±0.3	72	2,500	2,500	2,500	2,500
1145	73+1/-0	1.5	5±0.3	95	2,000	2,000	2,000	2,000
	52+1/-0							
1550	73+1/-0	1.5	10±0.8	95	1,000	1,000	1,000	1,000
	52+1/-0							
1760	73+1/-0	1.5	10±0.8	95	-	-	-	-
1765	73+1/-0	1.5	10±0.8	95	-	-	1,000	-
2480	88+1/-0	1.5	10±0.8	110	-	-	-	-
2485	88+1/-0	1.5	10±0.8	110	-	-	500	-

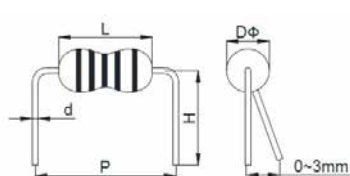
Ammo Packing



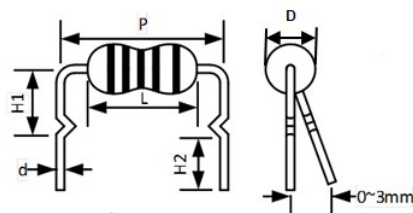
Unit: mm

Type	Packing Methods			Ammo Packing						
	A	B1-B2	S	A	B	C	MFR Qty	CFR Qty	MOF Qty	FMR Qty
0318	52+1/-0	1.2	5±0.3	79±2	73±3	257±5	5,000	5,000	-	-
	26+0.5/-0	1.0		52±2	74±3	252±5				
0623	52+1/-0	1.2	5±0.3	79±2	100±3	257±5	5,000	5,000	5,000	5,000
	26+0.5/-0	1.0		52±2	109±3	252±5				
0932	52+1/-0	1.2	5±0.3	79±2	58±3	257±5	1,000	1,000	1,000	1,000
1145	73+1/-0	1.5	5±0.3	103±2	82±3	262±5	1,000	1,000	1,000	1,000
	52+1/-0			81±2	85±3	256±5				
1550	73+1/-0	1.5	10±0.8	103±2	96±3	265±5	1,000	1,000	1,000	1,000
	52+1/-0			82±2	108±3	258±5				
1760	73+1/-0	1.5	10±0.8	103±2	82±3	262±5	-	-	-	-
1765	73+1/-0	1.5	10±0.8	103±2	82±3	262±5	-	-	500	-
2480	88+1/-0	1.5	10±0.8	115±2	73±3	265±5	-	-	-	-
2485	88+1/-0	1.5	10±0.8	115±2	73±3	265±5	-	-	250	-

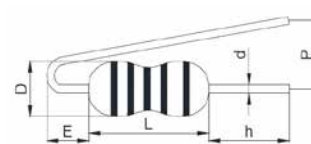
2. Special Type (Bulk)



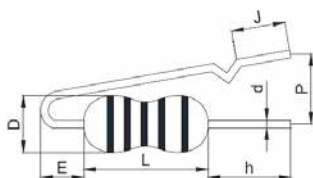
MA Type



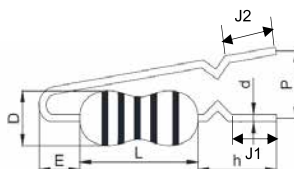
MC Type



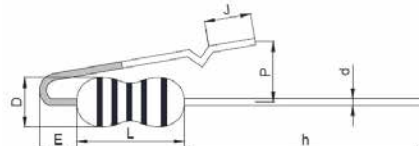
FA Type



FB Type



FC Type



FD Type

Unit: mm

Product Type	Type	P	H /H1/h	H2/G	J/J1/J2	D	L	d	E
0318	MA	5±1	8.0±1	-	-	1.8±0.3	3.4±0.5	0.45±0.03	-
0623	MA	10±1	10.0±1	-	-	2.3±0.3	6.3±0.5	0.55±0.03	-
	FD	5~15	27.0±2	-	12±2	2.3±0.3	6.3±0.5	0.55±0.03	3±1
0932	MA	12.5±1	10.0±1	-	-	3.2±0.5	9.0±0.5	0.65±0.03	-
	MC	12.5±1	6.5±2	3.5±2	-	3.2±0.5	9.0±0.5	0.65±0.03	-
	FA	5~15	5.0±2	-	-	3.2±0.5	9.0±0.5	0.65±0.03	3±1
	FB	5~15	4.0±2	-	3±2	3.2±0.5	9.0±0.5	0.65±0.03	3±1
	FC	5~15	10.0±3	-	4±2	3.2±0.5	9.0±0.5	0.65±0.03	3±1
1145	MA	15±1	12.5±1	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	MC	15±1	9.5±2	4.5±2	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	FA	5~15	5.0±2	-	-	4.5±0.5	11.5±1.0	0.78±0.03	3±1
	FB	5~15	4.0±2	-	3±2	4.5±0.5	11.5±1.0	0.78±0.03	3±1
	FC	5~15	10.0±3	-	4±2	4.5±0.5	11.5±1.0	0.78±0.03	3±1
1550	MA	20±1	15.0±1	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	MC	20±1	13.5±2	3.5±2	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	FA	5~15	5.0±2	-	-	5.0±0.5	15.5±1.0	0.78±0.03	3±1
	FB	5~15	4.0±2	-	3±2	5.0±0.5	15.5±1.0	0.78±0.03	3±1
	FC	5~15	10.0±3	-	4±2	5.0±0.5	15.5±1.0	0.78±0.03	3±1
1760 1765	MA	25±1	15.0±1	-	-	6.0±0.5	17.5±1.0	0.78±0.03	-
	MC	24±1	5.0±1	6.0±2	-	6.0±0.5	17.5±1.0	0.78±0.03	-
	FB	5~15	7.0±3	-	3±2	6.0±0.5	17.5±1.0	0.78±0.03	3±1
	FC	5~15	7.0±3	-	4±2	6.0±0.5	17.5±1.0	0.78±0.03	3±1
2480 2485	MA	30±1	15.0±1	-	-	8.0±0.5	24.5±1.0	0.78±0.03	-
	FC	5~15	7.0±3	-	4±2	8.0±0.5	24.5±1.0	0.78±0.03	3±1