

Data Sheet

Customer:

Product: Automotive Grade Thick Film High Precision Low
TCR Chip Resistor – CRTC..A Series

Size: 0402/0603/0805/1206

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VIKING TECH CORPORATION

光頤科技股份有限公司

No.70 Guangfu N. Rd., Hukou
Township, Hsinchu County 303,
Taiwan

TEL:886-3-5972931

FAX:886-3-5972935•886-3-5973494

E-mail:sales@viking.com.tw

VIKING TECH CORPORATION KAOHSIUNG BRANCH

光頤科技股份有限公司高雄分公司

No.248-3, Sin-Sheng Rd., Cian-Jhen Dist., Kaohsiung,
806, Taiwan

TEL:886-7-8217999

FAX:886-7-8228229

E-mail:sales@viking.com.tw

VIKING ELECTRONICS (WUXI) CO., LTD.

光頤電子(無錫)有限公司

No.22 Xixia Road, Machinery & Industry Park,
National Hi-Tech Industrial Development Zone
of Wuxi, Wuxi, Jiangsu Province, China
Zip Code:214028

TEL:86-510-85203339

FAX:86-510-85203667•86-510-85203977

E-mail:china@viking.com.tw

Produced by (QC)	Checked (QC)	Approved by (QC)	Prepared by (Sales)	Accepted by (Customer)
26-Aug-25	26-Aug-25	26-Aug-25		
Alice Hsiao	Susan Huang	Susan Huang		

Automotive Grade Thick Film High Precision Low TCR Chip Resistor



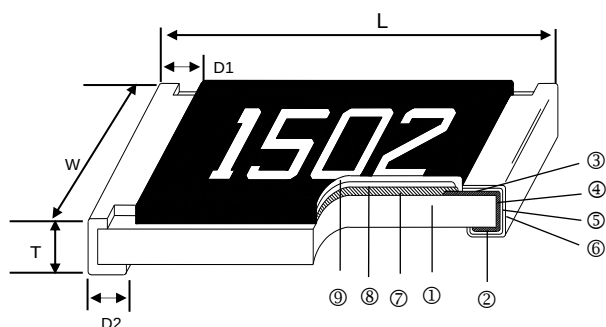
Scope

- This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

Features

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

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

Applications

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

Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (mg)
CRTC02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.18±0.10	0.25±0.10	0.6
CRTC03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
CRTC05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
CRTC06	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

CRTC	06	F	T	C	V	1002	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	C: ±25 D: ±50	Y: 1/16W X: 1/10W W: 1/8W P: 1/5W V: 1/4W O: 1/3W	1000: 100Ω 2201: 2.2KΩ 1002: 10KΩ 1004: 1MΩ	A: Automotive Grade

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range (E24 、E96)				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
CRTC02 (0402)	1/16W	-55 ~ +155°C	50V	100V	300Ω~1M				±25* ±50
CRTC03 (0603)	1/10W		75V	150V	10Ω~1MΩ				
CRTC05 (0805)	1/8W		150V	300V	10Ω~3MΩ	10Ω~6.8MΩ	10Ω~10MΩ		
CRTC06 (1206)	1/4W		200V	400V	10Ω~5.1MΩ		10Ω~10MΩ		

High Power rating Electrical Specifications

Item Type	Power Rating at 85°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range (E24 、E96)				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
CRTC02 (0402)	1/8W	-55 ~ +155°C	75V	100V	300Ω~1M				±25* ±50
CRTC03 (0603)	1/5W		100V	150V	10Ω~1MΩ				
CRTC05 (0805)	1/4W		150V	300V	10Ω~3MΩ	10Ω~6.8MΩ	10Ω~10MΩ		
CRTC06 (1206)	1/3W		200V	400V	10Ω~5.1MΩ		10Ω~10MΩ		

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

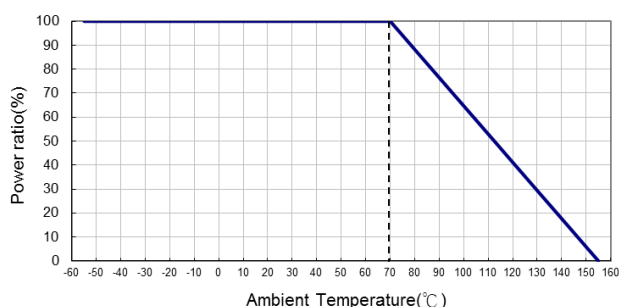
 Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage listed above, whichever is lower.

*TCR(25°C/-55°C): -50~+25PPM/°C

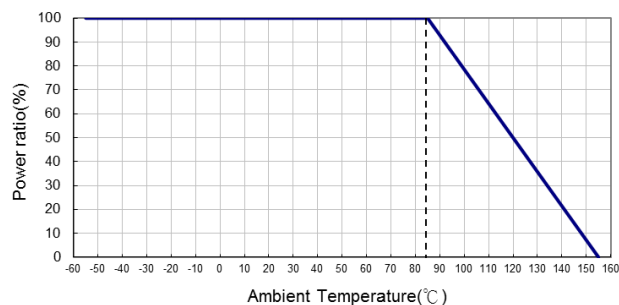
■ Viking is capable of manufacturing the optional spec based on customer's requirement.

Derating Curve

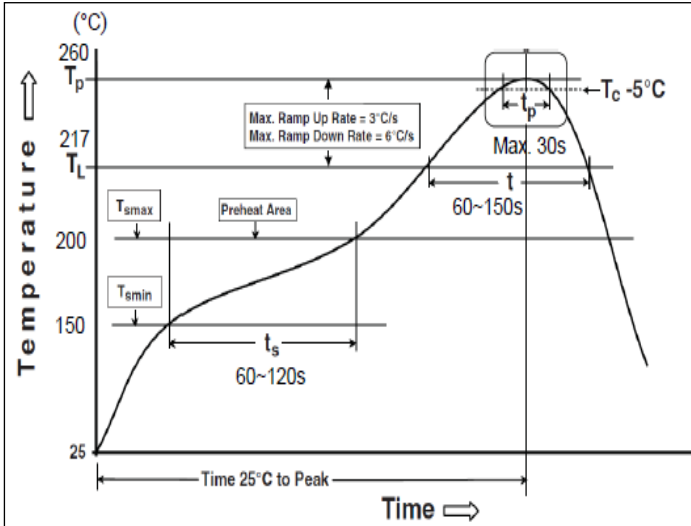
For Standard power rating:



For High power rating:



■ Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)



Reflow Profiles	
Profile Feature	Pb-Free Assembly
Preheat	
Min. Temperature (T _{sm})	150 °C
Max Temperature (T _{sm})	200 °C
Preheating time (ts) from (T _{sm} to T _{sm})	60-120 seconds
Ramp-up rate (T _L to T _p)	3 °C/second max.
Liquidous temperature (T _L)	217 °C
Time (t _L) maintained above T _L	60-150 seconds
Min. Peak temperature (T _p min)	235°C
Max. Peak temperature (T _p max)	260°C
Time (tp) within 5 °C of the specified classification temperature (T _c)	30 seconds max.
Ramp-down rate (T _p to T _L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	JIS-C-5201-1 4.8 IEC-60115-1 4.8 At 25°C/+125°C and 25°C/-55°C, 25°C is the reference temperature
Short Time Overload	±(0.2%+0.05Ω)	JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds.
Insulation Resistance	≥10G	JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Endurance	For Standard power rating: 02(R≤30KΩ): ±(0.2%+0.05Ω) 02(R>30KΩ): ±(0.4%+0.05Ω) 03,05,06: ±(0.2%+0.05Ω)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	For High power rating: 02(R≤30KΩ): ±(0.2%+0.05Ω) 02(R>30KΩ): ±(0.4%+0.05Ω) 03,05,06: ±(0.2%+0.05Ω)	MIL-STD-202 Method 108 85±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	±(1.0%+0.10Ω)	MIL-STD-202 Method 103 1000hrs 85°C/85%RH 10% of operating power (≤100V).
High Temperature Exposure	02(R≤30KΩ)/03(R≤200KΩ): ±(0.2%+0.05Ω) 02(R>30KΩ)/03(R>200KΩ): ±(0.5%+0.05Ω) 05,06: ±(0.2%+0.05Ω)	MIL-STD-202 Method 108 At +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	AEC-Q200-005 Bending once for 60 seconds 3mm

Automotive Grade Thick Film High Precision Low TCR Chip Resistor

Item	Requirement	Test Method
Solderability	95% min. coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 J-STD-002 260±5°C for 3 seconds
Resistance to Soldering Heat	±(0.2%+0.05Ω)	MIL-STD-202 Method 210 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds
Temperature Cycling	02(R ≤ 30KΩ): ±(0.2%+0.05Ω) 02(R > 30KΩ): ±(0.5%+0.05Ω) 03,05,06: ±(0.2%+0.05Ω)	JESD22 Method JA-104 -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	MIL-STD-202 Method 213 Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's, Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	MIL-STD-202 Method 204 5 g's for 20 min., 12cycles each of 3 orientations, 10-2000 HZ
ESD	±(3%+0.05Ω)	AEC-Q200-002 Human body model 0402/0603: 1KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.	MIL-STD-202 Method 215 Add aqueous wash chemical – OKEM Clean or equivalent. DO not use banned solvents.
Terminal Strength	No broken	AEC-Q200-006 Force of 1.8kg for 60 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board	UL-94 V-0 or V-1 are acceptable. Electrical test not required
Sulfur Test	△R±1%	EIA-977 (Condition A) 60±2°C, no power rating for 500 hrs.

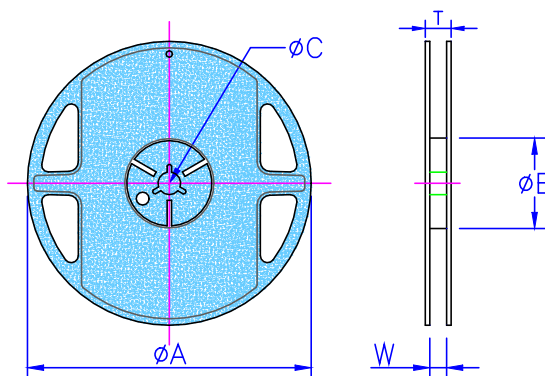
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

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

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

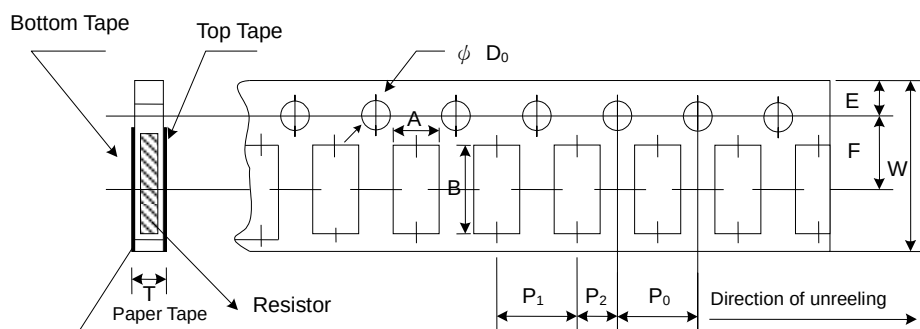
■Packaging

Reel Specifications & Packaging Quantity



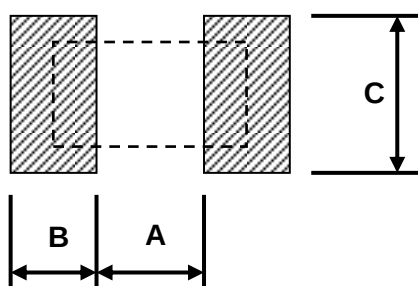
Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
CRTC02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CRTC03 CRTC05 CRTC06	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



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P ₀ (mm)	P ₁ (mm)	P ₂ (mm)	ΦD ₀ (mm)	T (mm)
CRTC02	0.65±0.10	1.15±0.10	8.0±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
CRTC03	1.10±0.10	1.90±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	0.70±0.10
CRTC05	1.60±0.10	2.40±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	0.85±0.10
CRTC06	1.90±0.10	3.50±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	0.85±0.10

■Recommend Land Pattern



Type	A (mm)	B (mm)	C (mm)
CRTC02	0.50	0.45	0.60
CRTC03	0.90	0.60	0.90
CRTC05	1.20	0.70	1.30
CRTC06	2.00	0.90	1.60

■ Marking

No Marking for 0402

0805/1206: 4 digits marking

Example:

Resistance	97.6Ω	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking	97R6	1000	2201	1002	4992	1003

0603(E24): 3 digits marking in E24, When the E24 and E96 are the same resistance, this marking in E96

Example: 01A= 100Ω 05C=11KΩ 123=12KΩ 273=27KΩ

0603(E96): 3 digits marking in E96



3 digits marking for Example: 14C=13K7Ω 13C=13K3Ω

68B=4K99Ω 68X=49.9Ω

Marking Table

Code	E96		Code	E96		Code	E96		Code	E96	
01	100		25	178		49	316		73	562	
02	102		26	182		50	324		74	576	
03	105		27	187		51	332		75	590	
04	107		28	191		52	340		76	604	
05	110		29	196		53	348		77	619	
06	113		30	200		54	357		78	634	
07	115		31	205		55	365		79	649	
08	118		32	210		56	374		80	665	
09	121		33	215		57	383		81	681	
10	124		34	221		58	392		82	698	
11	127		35	226		59	402		83	715	
12	130		36	232		60	412		84	732	
13	133		37	237		61	422		85	750	
14	137		38	243		62	432		86	768	
15	140		39	249		63	442		87	787	
16	143		40	255		64	453		88	806	
17	147		41	261		65	464		89	825	
18	150		42	267		66	475		90	845	
19	154		43	274		67	487		91	866	
20	158		44	280		68	499		92	887	
21	162		45	287		69	511		93	909	
22	165		46	294		70	523		94	931	
23	169		47	301		71	536		95	953	
24	174		48	309		72	549		96	976	
Code	A	B	C	D	E	F	G	X	Y		
Multiplier	10 ⁰	10 ¹	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁻¹	10 ⁻²		

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version A	Apr 02, 2024	-	- New product release
Version A1	Mar 26, 2025	-	- Modify the descriptions in the Features
Version A2	Aug 26, 2025	-	- Modify 0402 Dimensions