

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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Edition: REV.A



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Automotive Grade Thick Film High Precision Low TCR Chip Resistor



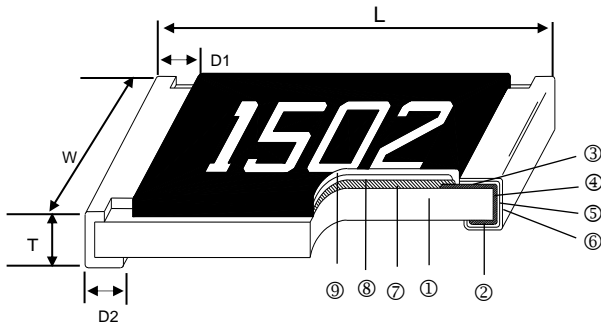
Scope

– 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

Construction



Applications

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

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	0.20±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

Part Number : **CRTC06FTCV1002A**

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

Type \ Item	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

Type \ Item	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.

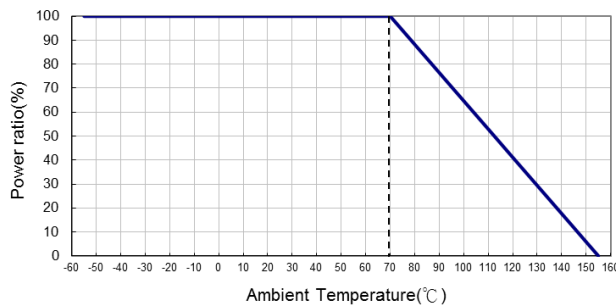
Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

*TCR(25°C/-55°C): -50~+25PPM/°C

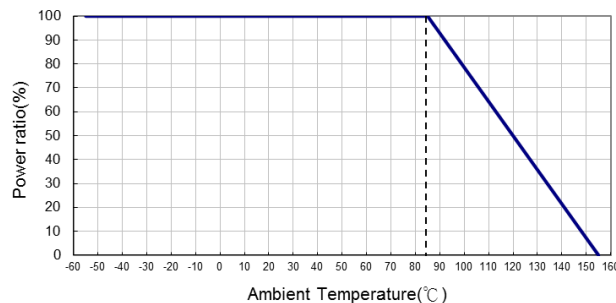
■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Derating Curve

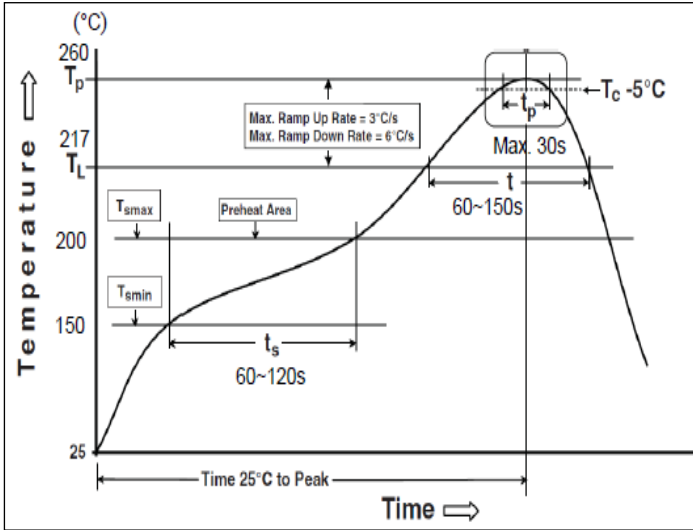
For Standard power rating:



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} in)	150 °C
Max Temperature (T _{sm} ax)	200 °C
Preheating time (t _s) from (T _{sm} in to T _{sm} ax)	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 (t _p) 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.

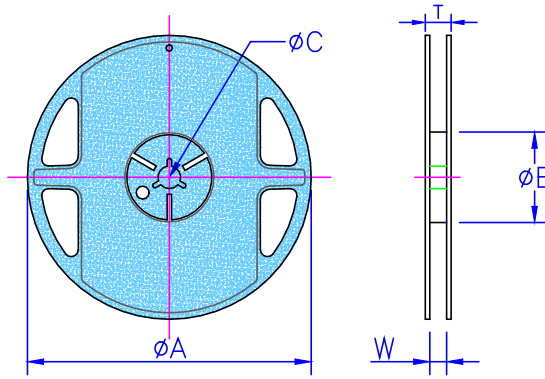
RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

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

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

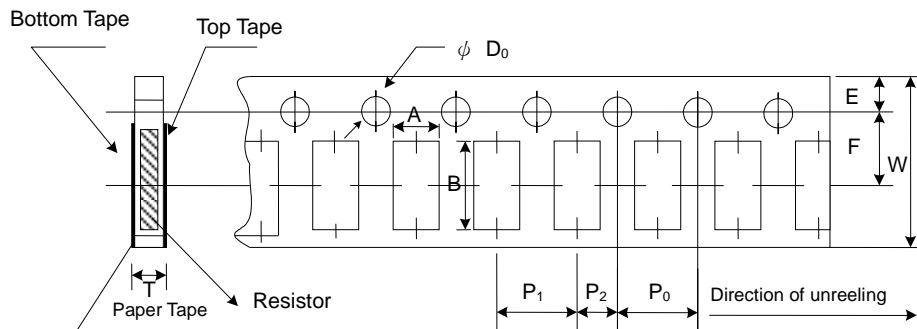
■Packaging

Reel Specifications & Packaging Quantity



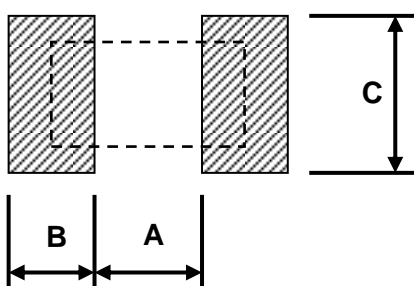
Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)	
CRTC02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CRTC03 CRTC05 CRTC06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

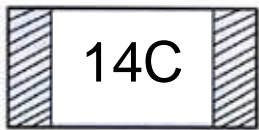
Example:

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		

【CRTC..A Series】



Automotive Grade Thick Film High Precision Low TCR Chip Resistor

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version A	Apr 02, 2024	-	- New product release