Data Sheet

Customer:	
Product:	Thick Film Chip Resistor - CRT Series
Sizes:	0075/01005/0201/0402/0603/0805/1206/1210/2010/2512
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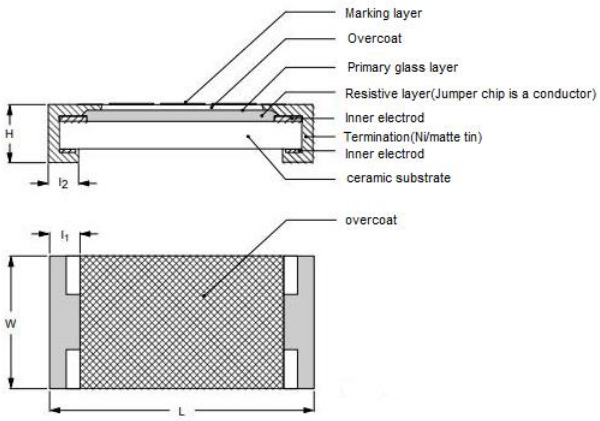
Thick Film Chip Resistor

■Features

- Halogen Free Epoxy
- RoHS compliant
- Products with lead free terminations meet RoHS requirements
- Pb-glass contained in electrodes, resistors element and glass are exempted by RoHS
- Reducing environmentally hazardous wastes
- High component and equipment reliability saving of PCB space
- None forbidden-materials used in products/production

■Construction



■Applications

- All general purpose application

■Dimensions

Type	Size (Inch)	L (mm)	W (mm)	H (mm)	I1 (mm)	I2 (mm)
CRTE1	0075	0.30±0.01	0.15±0.01	0.13±0.01	0.08±0.03	0.08±0.03
CRTE5	01005	0.40±0.02	0.20±0.02	0.13±0.02	0.10±0.03	0.10±0.03
CRT01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
CRT02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.25±0.10
CRT03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
CRT05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
CRT06	1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
CRT10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.45±0.15	0.50±0.20
CRT0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.20	0.50±0.20
CRT12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.50±0.20

■Part Numbering

CRT	01	F	0	F		1001
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	E1: 0075 E5: 01005 01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	B: ±0.1% D: ±0.5% F: ±1% J: ±5%	0: 7”Reel 15Kpcs 3: 7”Reel 40Kpcs 4: 7”Reel 4Kpcs 5: 7”Reel 20Kpcs 6: 7”Reel 10Kpcs 7: 7”Reel 5Kpcs A: 10”Reel 10Kpcs B: 10”Reel 20Kpcs D: 13”Reel 20Kpcs F: 13”Reel 80Kpcs G: 13”Reel 50Kpcs	-: No specified E: ±100 F: ±200 G: ±300	: Standard W: 1/8W P: 1/5W V: 1/4W U: 1/2W S: 2W	0010: 1Ω 0100: 10Ω 1000: 100Ω 1001: 1KΩ 1004: 1MΩ

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range ±1% (E24、E96)	Resistance Range ±5% (E24)	TCR (PPM/°C)
CRTE1 (0075)	1/50W	-55 ~ +125°C	10V	25V	25V	10Ω≤R≤100Ω		±300
						100Ω<R≤1MΩ		±200
CRTE5 (01005)	1/32W	-55 ~ +125°C	15V	30V	30V	1Ω≤R≤100Ω		±300
						100Ω<R≤10MΩ	100Ω<R≤22MΩ	±200
CRT01 (0201)	1/20W	-55 ~ +125°C	25V	50V	50V	1Ω≤R≤10Ω		±300
						10Ω<R≤10MΩ		±200
CRT02 (0402)	1/16W	-55 ~ +155°C	50V	100V	100V	1Ω≤R≤10Ω	1Ω≤R≤10Ω 10MΩ<R≤22MΩ	±200
						10Ω<R≤10MΩ		±100
CRT03 (0603)	1/10W	-55 ~ +155°C	75V	150V	150V	1Ω≤R≤10Ω	1Ω≤R≤10Ω 10MΩ<R≤22MΩ	±200
						10Ω<R≤10MΩ		±100
CRT05 (0805)	1/8W	-55 ~ +155°C	150V	300V	300V	-	24MΩ≤R≤100MΩ	±300
						1Ω≤R≤10Ω	1Ω≤R≤10Ω 10MΩ<R≤22MΩ	±200
						10Ω<R≤10MΩ		±100
CRT06 (1206)	1/4W	-55 ~ +155°C	200V	400V	500V	-	24MΩ≤R≤100MΩ	±300
						1Ω≤R≤10Ω	1Ω≤R≤10Ω 10MΩ<R≤22MΩ	±200
						10Ω<R≤10MΩ		±100
CRT10 (1210)	1/2W	-55 ~ +155°C	200V	500V	500V	1Ω≤R≤10Ω	1Ω≤R≤10Ω 10MΩ<R≤22MΩ	±200
						10Ω<R≤10MΩ		±100
CRT0A (2010)	3/4W	-55 ~ +155°C	200V	500V	500V	1Ω≤R≤10Ω	1Ω≤R≤10Ω 10MΩ<R≤22MΩ	±200
						10Ω<R≤10MΩ		±100
CRT12 (2512)	1W	-55 ~ +155°C	200V	500V	500V	1Ω≤R≤10Ω	1Ω≤R≤10Ω 10MΩ<R≤22MΩ	±200
						10Ω<R≤10MΩ		±100

■High Precision Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range		TCR (PPM/°C)
						±0.1% (E24、E96)	±0.5% (E24、E96)	
CRTE5 (01005)	1/32W	-55 ~ +125°C	15V	30V	30V	-	10Ω≤R≤100Ω	±300
						-	100Ω<R≤1MΩ	±200
CRT01 (0201)	1/20W	-55 ~ +125°C	25V	50V	50V	10Ω	1Ω≤R≤10Ω	±300
						10Ω<R≤1MΩ		±200
CRT02 (0402)	1/16W	-55 ~ +155°C	50V	100V	100V	10Ω	1Ω≤R≤10Ω	±200
						10Ω<R≤1MΩ		±100
CRT03 (0603)	1/10W	-55 ~ +155°C	75V	150V	150V	10Ω	1Ω≤R≤10Ω	±200
						10Ω<R≤1MΩ		±100
CRT05 (0805)	1/8W	-55 ~ +155°C	150V	300V	300V	10Ω	1Ω≤R≤10Ω	±200
						10Ω<R≤1MΩ		±100
CRT06 (1206)	1/4W	-55 ~ +155°C	200V	400V	500V	10Ω	1Ω≤R≤10Ω	±200
						10Ω<R≤1MΩ		±100
CRT10 (1210)	1/2W	-55 ~ +155°C	200V	500V	500V	10Ω		±200
						10Ω<R≤1MΩ		±100
CRT0A (2010)	3/4W	-55 ~ +155°C	200V	500V	500V	10Ω		±200
						10Ω<R≤1MΩ		±100
CRT12 (2512)	1W	-55 ~ +155°C	200V	500V	500V	10Ω		±200
						10Ω<R≤1MΩ		±100

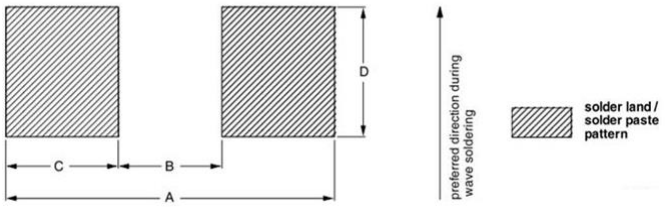
■High Power Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range		TCR (PPM/°C)
						±1% (E24、E96)	±5% (E24)	
CRT02 (0402)	1/8W	-55 ~ +155°C	50V	100V	100V	1Ω≤R≤1MΩ		±200
CRT03 (0603)	1/5W	-55 ~ +155°C	75V	150V	150V	1Ω≤R≤1MΩ		±200
CRT05 (0805)	1/4W	-55 ~ +155°C	150V	300V	300V	1Ω≤R≤1MΩ		±200
CRT06 (1206)	1/2W	-55 ~ +155°C	200V	400V	500V	1Ω≤R≤1MΩ		±200
CRT12 (2512)	2W	-55 ~ +155°C	200V	400V	500V	1Ω≤R≤1MΩ		±200

■Jumper(0Ω)

Item / Type	Rated Current	Max. Current	Operating Temp. Range	Resistance Range
				5%
CRTE1 (0075)	0.5A	1.0A	-55 ~ +125°C	≤50mΩ
CRTE5 (01005)	0.5A	1.0A	-55 ~ +125°C	≤50mΩ
CRT01 (0201)	0.5A	1.0A	-55 ~ +125°C	≤50mΩ
CRT02 (0402)	1.0A	2.0A	-55 ~ +155°C	≤50mΩ
CRT03 (0603)	1.0A	2.0A	-55 ~ +155°C	≤50mΩ
CRT05 (0805)	2.0A	5.0A	-55 ~ +155°C	≤50mΩ
CRT06 (1206)	2.0A	10.0A	-55 ~ +155°C	≤50mΩ
CRT10 (1210)	2.0A	10.0A	-55 ~ +155°C	≤50mΩ
CRT0A (2010)	2.0A	10.0A	-55 ~ +155°C	≤50mΩ
CRT12 (2512)	2.0A	10.0A	-55 ~ +155°C	≤50mΩ

■Recommend Solder Pad Size



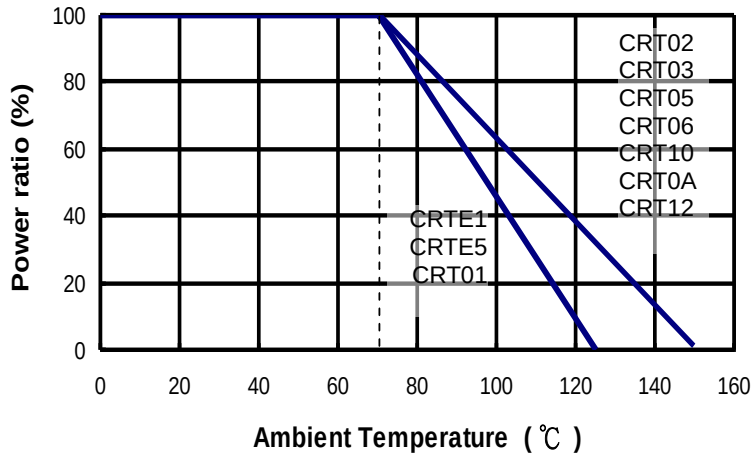
Reflow soldering footprint dimensions for relevant chip resistors size

Type	A (mm)	B (mm)	C (mm)	C (mm)	Placement accuracy (mm)
CRTE1	0.34	0.14	0.10	0.15	N/A
CRTE5	0.48	0.12	0.18	0.18 - 0.23	N/A
CRT01	1.00	0.30	0.35	0.40	N/A
CRT02	1.50	0.50	0.50	0.60	±0.15
CRT03	2.60	0.80	0.90	0.80	±0.25
CRT05	3.00	1.20	0.90	1.20	±0.25
CRT06	4.20	2.20	1.00	1.50	±0.25
CRT10	4.20	2.20	1.00	2.40	±0.25
CRT0A	6.10	3.30	1.40	2.40	±0.25
CRT12	8.00	4.40	1.80	4.00	±0.25

Wave soldering footprint dimensions for relevant chip resistors size

Type	A (mm)	B (mm)	C (mm)	C (mm)	Placement accuracy (mm)
CRT03	2.70	0.90	0.90	0.80	±0.25
CRT05	3.30	1.30	1.00	1.30	±0.25
CRT06	4.70	2.50	1.10	1.70	±0.25
CRT10	4.70	2.50	1.10	2.50	±0.25
CRT0A	6.40	4.20	1.10	2.50	±0.25
CRT12	8.20	5.50	1.35	3.20	±0.25

■Derating Curve



■Mounting

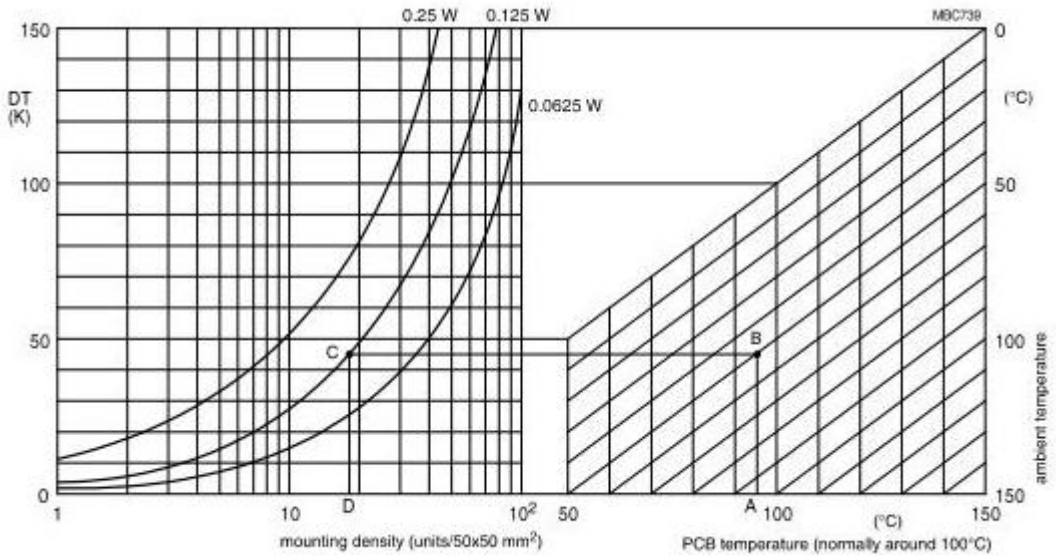
Due to their rectangular shape and small dimensional tolerances, Surface Mounted Resistors are suitable for handling by automatic placement systems. Chip placement can be on ceramic substrates and printed-circuit boards(PCBs).Electrical connection to the circuit is by wave, vapour phase or infrared soldering. The end terminations guarantee a reliable contact and the protective coating enables 'face down' mounting.

The laws of heat conduction, convection and radiation determine the temperature rise in a resistor owing to power dissipation. The maximum body temperature usually occurs in the middle of the resistor and is called the hot-spot temperature. The hot-spot temperature depends on the ambient temperature and the dissipated power. This is described in the data sheet under the chapter heading " Derating Curve ".

The hot-spot temperature is important for mounting because the connections to the chip resistors will reach a temperature close to the hot-spot temperature. Heat conducted by the connections must not reach the melting point of the solder at the joints. Therefore a maximum solder joint temperature of l10"C is advised. The ambient temperature on large or very dense printed-circuit boards(PCBs)is influenced by the dissipated power. The ambient temperature will again influence the hot-spot temperature. Therefore, the packing density that is allowed on the PCB is influenced by the dissipated power

Example of Mounting Effects

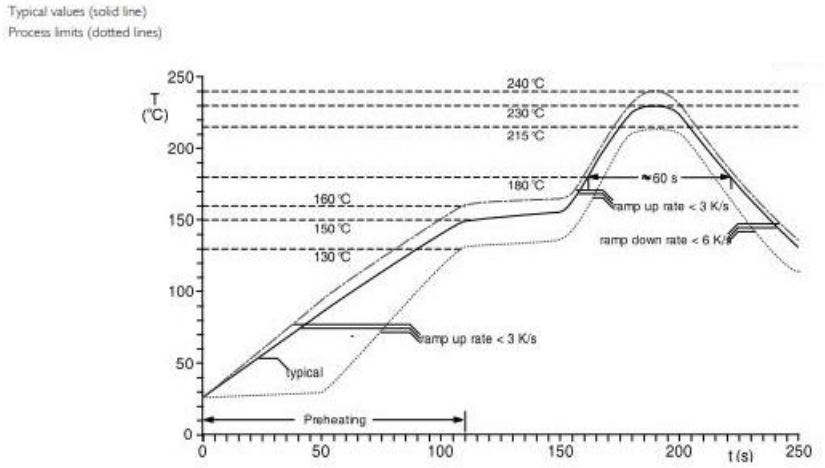
Assume that the maximum temperature of a PCB is 95"C and the ambient temperature is 50"C. In this case the maximum temperature rise that may be allowed is 45"C.
In the graph (see Fig.5),this point is found by drawing the line from point A(PCB = 95"C)to point B (Tam= 50 "C) and from here to the left axis.
To find the maximum packing density, this horizontal line is extended until it intersects with the curve 0.I25 W(point C).The maximum packing density，19units/50× 50 mm2(point D), is found on the horizontal axis



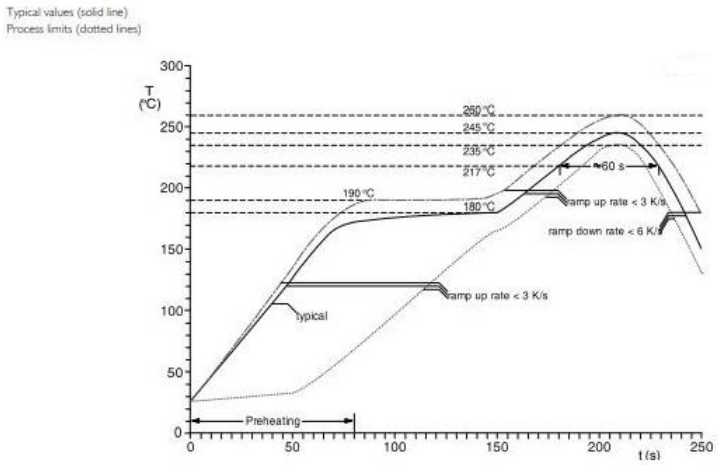
PCB temperature as a function of applied power , mounting density ambient temperature

■Soldering Conditions

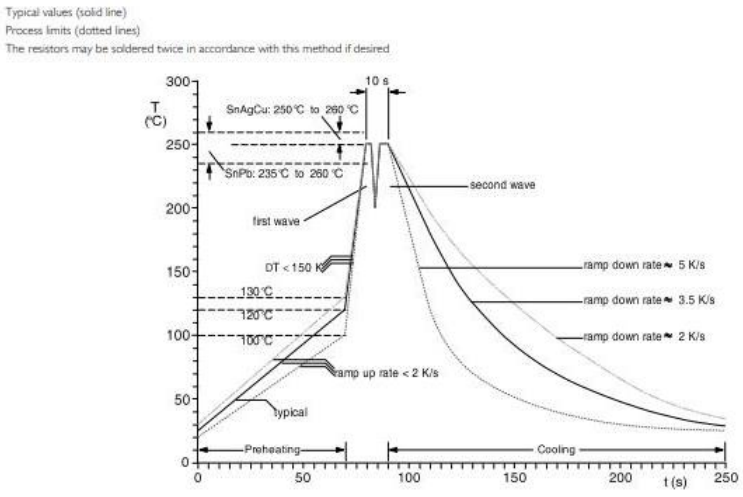
The lead free Surface Mount Resistors are able to stand the reflow soldering conditions as below:
Temperature: above 220 °C
Endurance: 95 to 120 seconds
Cycles: 3 times The test of "soldering heat resistance" is carried out in accordance with the schedule of "MIL-STD-202G-method 210F", "The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260 °C for 10 seconds". Therefore, it is possible to mount Surface Mount Resistors on one side of a PCB and other discrete components on the reverse (mixed PCBs).
Surface Mount Resistors are tested for solder ability at 245 °C during 2 seconds. The test condition for no leaching is 260 °C for 30 seconds.
Typical examples of soldering processes that provide reliable joints without any damage, the recommended soldering profiles referring to "IEC 61760-1" are given in Figs 6, 7 and 8.



Infrared soldering forced air convection reflow soldering-temperature/time profile for SnPb solders



Infrared soldering forced air convection reflow soldering-temperature/time profile for **SnAgCu** solders



Double wave soldering for SnPb and leadfree SnAgCu solder-temperature/time profile (terminal temperature)

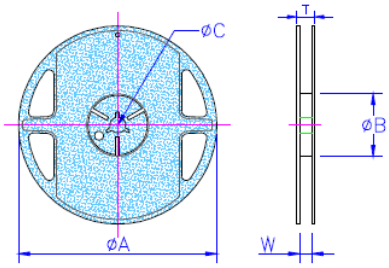
■Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			**MIL-STD-202 Method 304** At +25°C /-55°C and +25°C/+125°C
Short Time Overload	0075, 01005 sizes: ±(2.0%+0.05Ω)		<50mΩ	**IEC-60115-1 4.13** 2.5 times RCWV or maximum overload voltage which is less for 5 seconds at room temperature
	Other sizes: ±(1.0%+0.05Ω)	Other sizes: ±(2.0%+0.05Ω)		
Endurance	0075 size: ±(5.0%+0.10Ω) 01005 size: ±(2.0%+0.05Ω)		≤100mΩ	**MIL-STD-202 Method 108A** **IEC-60115-1 4.25.1** 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	Other sizes: ±(1.0%+0.05Ω)	Other sizes: ±(3.0%+0.05Ω)		
High Temperature Exposure	0075 size: ±(5.0%+0.10Ω)		<100mΩ	**MIL-STD-202 Method 108A** **IEC-60068-2-2** 1,000 hrs at maximum operating temperature depending on specification, unpowered.
	01005 size: ±(1.0%+0.05Ω)		<50mΩ	
	Other sizes: ±(1.0%+0.05Ω)	Other sizes: ±(2.0%+0.05Ω)		
Moisture Resistance	0075, 01005 sizes: ±(2.0%+0.10Ω)		<100mΩ	**MIL-STD-202 Method 106G** 4 Each temperature / humidity cycle is defined at 8 hrs (method 106F), 3 cycles / 24 hrs for 10d with 25°C / 65°C 95% R.H, without teps7a&7b, unpowered Parts mounted on test-boards, without condensation on parts
	Other sizes: ±(0.5%+0.05Ω)	Other sizes: ±(2.0%+0.05Ω)		
Damp Heat with Load	0075 size: ±(5.0%+0.10Ω) 01005 size: ±(3.0%+0.05Ω)		<100mΩ	**IEC-60115-1 4.24.2** 40°C, 95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	Other sizes: ±(1.0%+0.05Ω)	Other sizes: ±(2.0%+0.05Ω)		
Thermal Shock	0075, 01005 sizes: ±(1.0%+0.05Ω)		<50mΩ	**MIL-STD-202 Method 107G** -55/+125°C Note Number of cycles required is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air - Air
	Other sizes: ±(0.5%+0.05Ω)	Other sizes: ±(1.0%+0.05Ω)		
Bending Strength	±(1.0%+0.05Ω)		<50mΩ	**IEC-60115-1 4.33** Bending once for 60±5 seconds 0075, 01005, 0201, 0402 sizes: 5mm； 0603, 0805 sizes: 3mm 1206, 1210, 2010, 2512 sizes: 2mm
Solderability - Wetting	95% min. coverage			**J-STD-002 Test B** Electrical Test not required Magnification 50X SMD conditions: 1st step: method B, aging 4 hours at 155°C dry heat 2nd step: leadfree solder bath at 245± 3°C Dipping time: 3±0.5 seconds
Leaching	No visible damage			**J-STD-002 Test A** Leadfree solder ,260°C, 30 seconds immersion time
Resistance to Soldering Heat	0075 size: ±(3.0%+0.10Ω) 01005 size: ±(1.0%+0.05Ω)		<50mΩ	**MIL-STD-202 Method 210F** **IEC-60115-1 4.18** Condition B, no pre-heat of samples Leadfree solder, 260°C ±5°C, 10 ± 1 seconds immersion time Procedure 2 for SMD: devices fluxed And cleaned with isopropanol
	Other sizes: ±(0.5%+0.05Ω)	Other sizes: ±(1.0%+0.05Ω)		

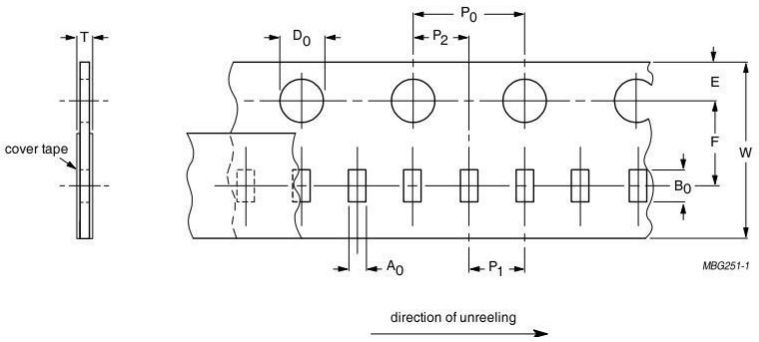
■Packaging

Reel Specifications & Packaging Quantity

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
CRTE1	Paper	20K	8mm	7 inch	180+0/-3	60+1/-0	13.0±0.2	9.0±0.2	12.0±0.2
CRTE5	Paper	20K	8mm	7 inch	180+0/-3	60+1/-0	13.0±0.2	9.0±0.2	12.0±0.2
		40K	8mm	7 inch	180+0/-3	60+1/-0	13.0±0.2	9.0±0.2	12.0±0.2
		80K	8mm	13 inch	330+0/-3	100±0.5	13.5±0.5	10.0±0.5	14.0±0.5
CRT01	Paper	10K	8mm	7 inch	180+0/-3	60+1/-0	13.0±0.2	9.0±0.2	12.0±0.2
		20K	8mm	10 inch	254+0/-3	100±0.5	13.0±0.2	9.8±0.5	13.0±0.5
		50K	8mm	13 inch	330+0/-3	100±0.5	13.5±0.5	10.0±0.5	14.0±0.5
CRT02	Paper	10K	8mm	7 inch	180+0/-3	60+1/-0	13.0±0.2	9.0±0.2	12.0±0.2
		20K	8mm	10 inch	254+0/-3	100±0.5	13.0±0.2	9.8±0.5	13.0±0.5
		50K	8mm	13 inch	330+0/-3	100±0.5	13.5±0.5	10.0±0.5	14.0±0.5
CRT03 CRT05 CRT06 CRT10	Paper	5K	8mm	7 inch	180+0/-3	60+1/-0	13.0±0.2	9.0±0.2	12.0±0.2
		10K	8mm	10 inch	254+0/-3	100±0.5	13.0±0.2	9.8±0.5	13.0±0.5
		20K	8mm	13 inch	330+0/-3	100±0.5	13.5±0.5	10.0±0.5	14.0±0.5
CRT0A CRT12	Embossed	4K	12mm	7 inch	180+0/-3	60+1/-0	13.0±0.2	13.6±0.5	16.5±0.5



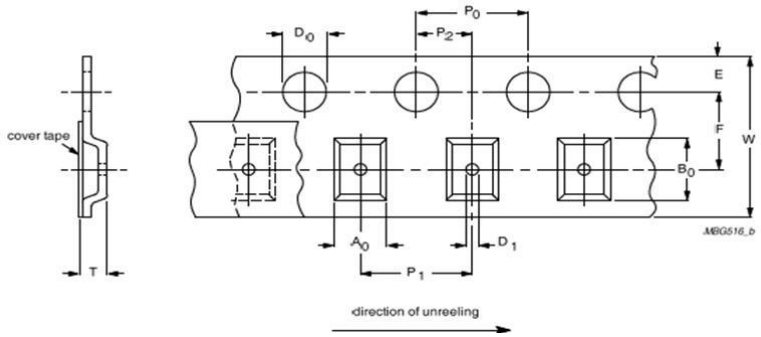
Paper Tape Specifications



Type	A0 (mm)	B0 (mm)	W (mm)	E (mm)	F (mm)	P0 (mm)	P1 (mm)	P2 (mm)	ΦD0 (mm)	T (mm)
CRTE1	0.18±0.03	0.33±0.03	4.0±0.05	0.90±0.03	1.88±0.02	2.00±0.04	1.00±0.02	1.00±0.02	0.84±0.04	0.20±0.03
CRTE5	0.25±0.05	0.45±0.05	8.0±0.02	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	0.31±0.03
CRT01	0.40±0.05	0.70±0.05	8.0±0.02	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±0.03
CRT02	0.67±0.03	1.17±0.03	8.0±0.10	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±0.05
CRT03	1.09±0.05	1.86±0.05	8.0±0.10	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±0.03
CRT05	1.64±0.05	2.37±0.05	8.0±0.10	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
CRT06	1.89±0.05	3.37±0.05	8.0±0.10	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
CRT10	2.85±0.10	3.50±0.05	8.0±0.10	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

Note:
1. For size 0201, the typical value of thickness (excluding cover tape) is 0.42 mm for paper tape and 0.33 mm for PE tape.
2. M is reversed type.
3. For size 1206, the typical value of thickness (excluding cover tape) is 0.75±0.1.

Embossed Plastic Tape Specifications



Type	A0 (mm)	B0 (mm)	W (mm)	E (mm)	F (mm)	P0 (mm)	P1 (mm)	P2 (mm)	ΦD0 (mm)	T (mm)
CRT0A	2.77±0.10	5.45±0.10	12.0±0.20	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	1.10±0.10
CRT12	7.40±0.10	6.37±0.10	12.0±0.20	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	1.10±0.10

■Marking

Size	Tolerance 1%, 0.5%	Description	Tolerance 5%	Description
0075 01005 0201 0402		NO marking		NO marking
0603		1%，0.5%，E24 exception values 10/11/13/15/20/75 of E24 series 240=24×100=24		5%，E24 series: 3 digits First two digits for significant figure and 3rd digit for number of zeros 223=22×103=22K
		1%，0.5%，E96 refer to EIA-96 marking method ,including values 10/11/13/15/20/75 of E24 series * 29B=196×10=1.96K		
0805 1206 1210 2010 2512		1%，0.5%，E96 refer to EIA-96 marking method ,including values 10/11/13/15/20/75 of E24 series First three digits for significant figure and 4th digit for number of zeros. 2203=220×103=220K		5%，E24 series: 3 digits First two digits for significant figure and 3rd digit for number of zeros 223=22×103=22K

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}		

E24 code	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91