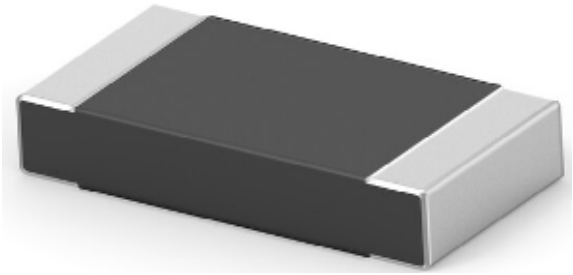
SMD ANTI-SURGE THICK FILM CHIP RESISTOR

TYPE CRGS SERIES

INTRODUCTION

TE Connectivity (TE) is pleased to introduce our AEC-Q200 compliant SMD Anti surge thick film Chip resistor, suitable for auto placement in volume and for most applications. Available in seven different packages and supplied on tape and reel for automatic insertion processes.



FEATURES

- Anti-surge voltage performance
- Suitable for both re-flow and wave soldering
- AEC-Q200 Qualified
- MSL Level 1

Note: SMD (Surface mount devices) resistors and inductors should be kept in their original packaging to protect them from ESD (Electrostatic Discharge). The full reels can be broken into smaller quantities, without exposing them to ESD, as long as the components are still in the plastic or paper tape. These resistors and inductors should not be removed from the plastic or paper tape unless they are in an ESD protected environment.

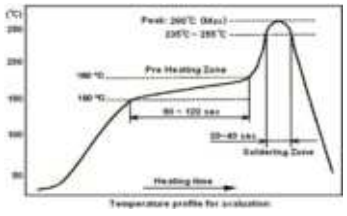
APPLICATIONS

- AV Adaptor
- LCD backlight
- Photography

ELECTRICAL CHARACTERISTICS

	CRGS0402	CRGS0603	CRGS0805	CRGS1206	CRGS1210	CRGS2010	CRGS2512
Power Rating	0.125W	0.25W	0.5W	0.6W	0.75W	1.5W	2W
Resistance Range	1R0 – 10M	1R0 – 10M	1R0 – 10M	1R0 – 10M	1R0 – 10M	1R0 – 10M	1R0 – 10M
Tolerance	5%						
T.C.R	1Ω-10Ω : ≤±400PPM/^{0}C 11Ω-10MΩ : ≤±100PPM/^{0}C						
Standard Series	E24						
Max. Working Voltage	50V	75V	150V	200V	200V	400V	500V
Max. Overload Voltage	100V	150V	300V	400V	500V	800V	1000V
Dielectric Withstanding Voltage	100V	300V	500V	500V	500V	500V	500V
Temperature Range	-55^{0}C +155						
Ambient Temperature	70 ^{0}C						

ENVIRONMENTAL CHARACTERISTICS

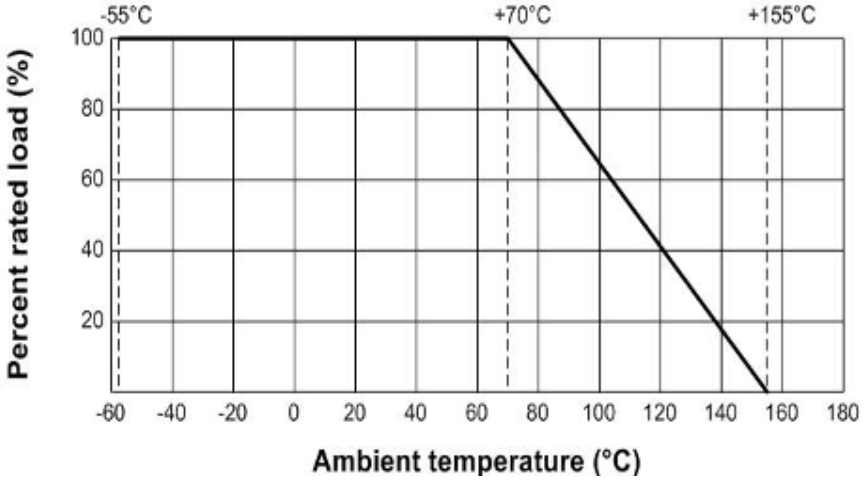
Characteristics	Standards	Test Methods
Operational life	±5%, ±10%, ±20%: ±(3%+0.1Ω)Max.	125C, at35% of operating power, 1000H (1.5 hours "ON", 0.5 hour "OFF"). **(MIL-STD-202)**
Temperature Coefficient	1Ω~10Ω : ± 400 PPM/°C 10.1Ω~10MΩ : ± 100 PPM/°C	4.8 Natural resistance change per temp. degree centigrade. $\frac{(R2-R1) \times 10^6}{R1(t2-t1)}$ (PPM/°C) R1: Resistance value at room temperature (T1) R2: Resistance value at room temp. plus 100°C(T2) Test pattern: room temp. (T1), room temp. +100°C(T2)
External Visual	No Mechanical Damage	Electrical test not required. Inspect device construction, marking and workmanship **(MIL-STD-883 Method 2009)**
Physical Dimension	Reference 2.0 Dimension Standards	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required. **(JESD22 MH Method JB-100)**
Resistance to Solvent	Marking Unsmeared	Note: Add Aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents. **(MIL-STD-202 Method 215)**
Terminal Strength	Not broken	Force of 1.8kg for 60 seconds. **(JIS-C-6429)**
High Temperature Exposure (Storage)	±(1%+0.1Ω)max	1000hrs. @T=155°C.Unpowered. Measurement at 24±2 hours after test conclusion. **(MIL-STD-202 Method 108)**
Temperature cycling	Resistance change rate is ±5%, ±10%, ±20%: ± (1.0%+0.1Ω) Max.	1000 Cycles (-55°C to +155°C). Measurement at 24±2 hours after test conclusion. **(JESD22 Method JA-104)**
Solderability	95% coverage Min.	Electrical test not required. Magnification 50X. Conditions: **(J-STD-002)**
Soldering temp. reference	Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95 % coverage Min.)	**Wave soldering condition:** (2 cycles Max.) Pre-heat : 100 ~ 120 °C, 30 ± 5 sec. Suggestion solder temp.: 235 ~ 255 °C, 10 sec. (Max.) Peak temp.: 260 °C **Reflow soldering condition:** (2 cycles Max.) Pre-heat : 150 ~ 180 °C, 90 ~ 120 sec. Suggestion solder temp.: 235 ~ 255 °C, 20 ~ 40 sec. Peak temp.: 260 °C  Hand soldering condition: The soldering iron tip temperature should be less than 300°Cand maximum contract time should be 5 sec.

Characteristics	Standards	Test Methods
Mechanical Shock	± (1% + 0.1Ω)max.	Wave form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6. **(MIL-STD-202 Method 213)**
Vibration	± (1.0% + 0.1Ω)max.	5g's for 20 min., 12cycle each of 3 orientations. Note: Use 8"*5"PCB. 031" thick 7 secure points (onone) long side and 2 secure points at corners of opposite sides. Parts mounted within 2' from any secure point. Test from 10-2000Hz. **(MIL-STD-202 Method 204)**
Biased Humidity	Resistance change rate is ±5%, ±10%, ±20%: ±(3.0%+0.1Ω)max.	10% rated power, 85°C/85%RH, 100H, Measurement at 24 hours after test conclusion. **(MIL-STD-202 Method 103)**
ESD	±(10%+0.1Ω)max.	With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of ±500V, ±1KV, ±2KV, ±4KV, ±8KV, the electrometer reading shall be within ±10% for voltages from 500V to ≤800V. **(AEC-Q200-002)**
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required. **(UL-94)**
Board Flex	±(1%+0.05Ω)Max.	2mm (Min) **(JIS-C-6429)**
Flame Retardance	No flame	Temperature sensing at 500°C, Voltage power subjected to 32VDC current clamped up to 500ADC and decreased in 1.0VDC/hour. **(AEC-Q200-001)**
Resistance to Soldering Heat	±(1%+0.05Ω)Max.	Condition B No per-heat of samples. Note: Single Wave Solder-Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body. **(MIL-STD-202 Method 210)**

*Sulfuration test: H2S 3~5PPM 50°C±2°C 91%RH 1000H

DERATING CURVE

Power rating based on continuous load operation in ambient temperature of 70°C. For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with this curve.



VOLTAGE RATING

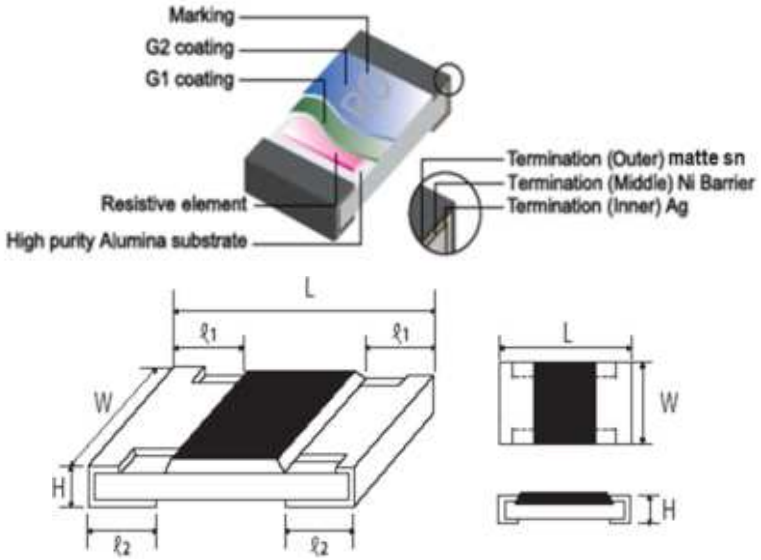
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial- line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P \times R}$$

Note:
1. Max. working voltage or $\sqrt{P \times R}$ whichever is lesser
2. Max. overload voltage or $2.5\sqrt{P \times R}$

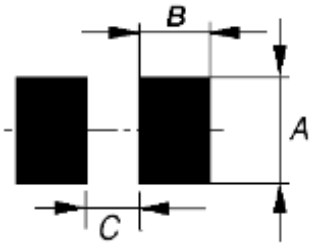
Where : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)
P = Power Rating (watt)
R = Nominal Resistance (ohm)

CONSTRUCTION AND DIMENSIONS (Unit:mm)



Type	L (mm)	W (mm)	H (mm)	l1 (mm)	l2 (mm)
CRGS0402	1.00 ± 0.10	0.50 ± 0.05	0.35 ± 0.05	0.20 ± 0.10	0.25 ± 0.10
CRGS0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
CRGS0805	2.00 ± 0.15	1.25 +0.15/- 0.10	0.55 ± 0.10	0.40 ± 0.20	0.40 ± 0.20
CRGS1206	3.10 ± 0.15	1.55 + 0.15/- 0.10		0.45 ± 0.20	0.45 ± 0.20
CRGS1210	3.10 ± 0.10	2.50 ± 0.15		0.50 ± 0.25	0.50 ± 0.20
CRGS2010	5.00 ± 0.10	2.50 ± 0.20		0.60 ± 0.25	
CRGS2512	6.35 ± 0.10	3.20 ± 0.20			

RECOMMENDED PCB LAYOUT PLAN (Unit:mm)

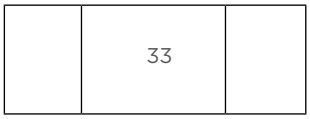


Type	A	B	C
CRGS0402	0.6±0.05	0.5±0.05	0.5±0.05
CRGS0603	0.8±0.05	0.65±0.05	0.8±0.05
CRGS0805	1.4±0.1	1.0±0.1	1.0±0.1
CRGS1206	1.8±0.1	1.1±0.1	2.0±0.1
CRGS1210	3.0±0.1	1.1±0.1	2.0±0.1
CRGS2010	3.0±0.1	1.4±0.1	3.6±0.1
CRGS2512	3.7±0.1	1.35±0.1	4.9±0.1

MARKING

For E24 values 0603 ~ 2512 sizes 3 digit marking.
The first two digits are significant figures of resistance and the third digit denoted number of zeros

Example:



33K Ohms

For ohmic values below 10Ω, letter “R” is for decimal point.

Example:



2.2 Ohms

Size 0402 has no markings

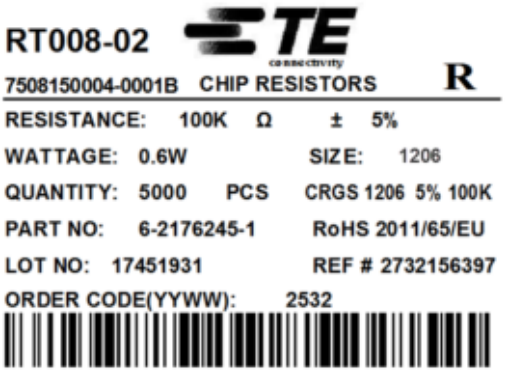
LABELS

Label shall be marked with the following item :

A. Type, resistance tolerance and resistance value

B. Quantity

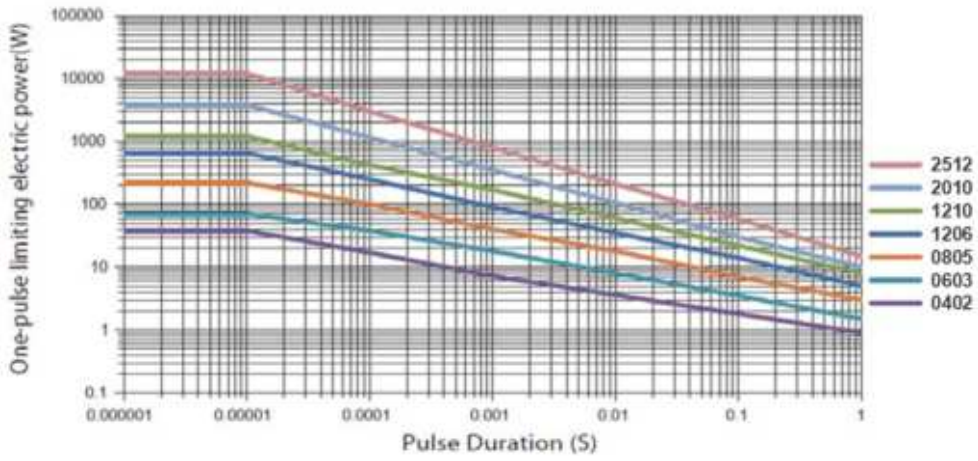
C. Lot No



PULSE WITHSTAND CAPACITY

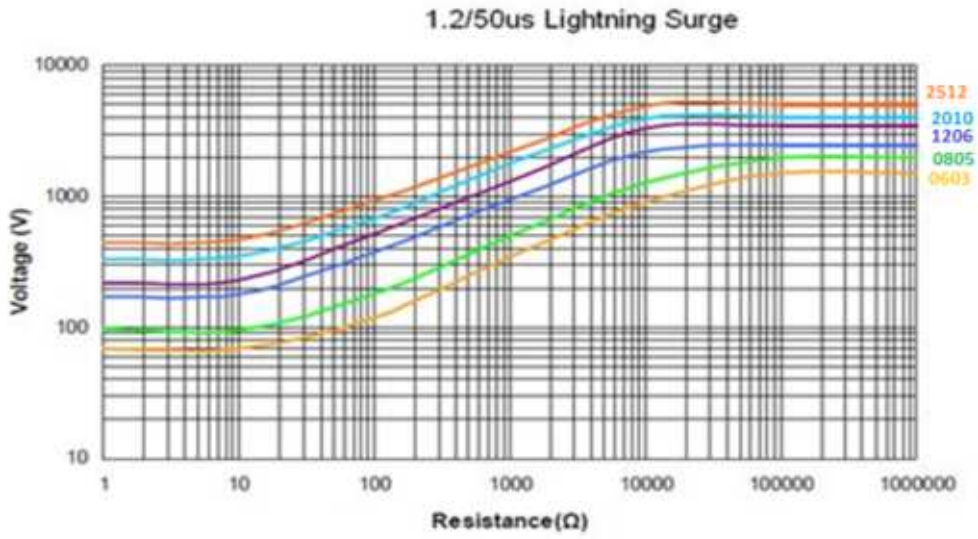
The single impulse graph is the result of 50 impulses of rectangular shape applied at one-minute intervals. The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.

SINGLE PULSE

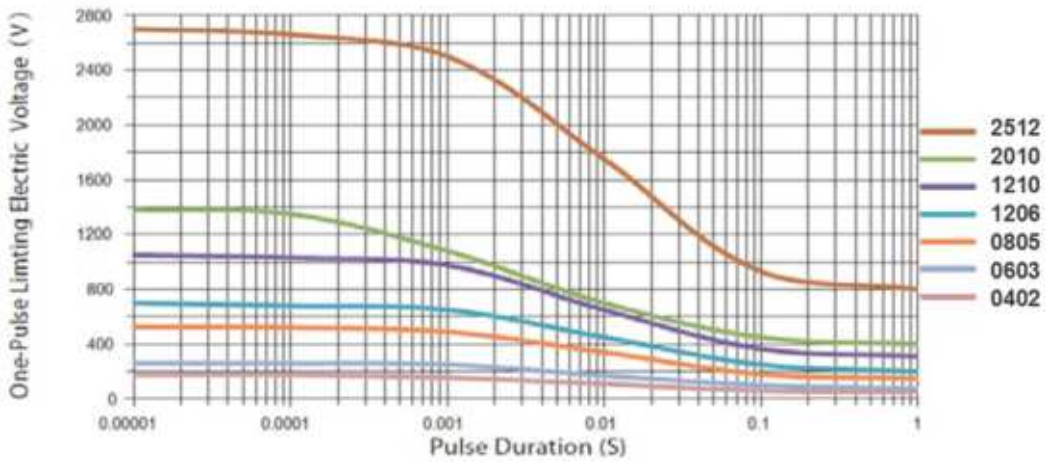


Nominal Resistance
Effective figures of nominal resistance shall be in accordance :
- E-24 series for 5%, 10%, 20%

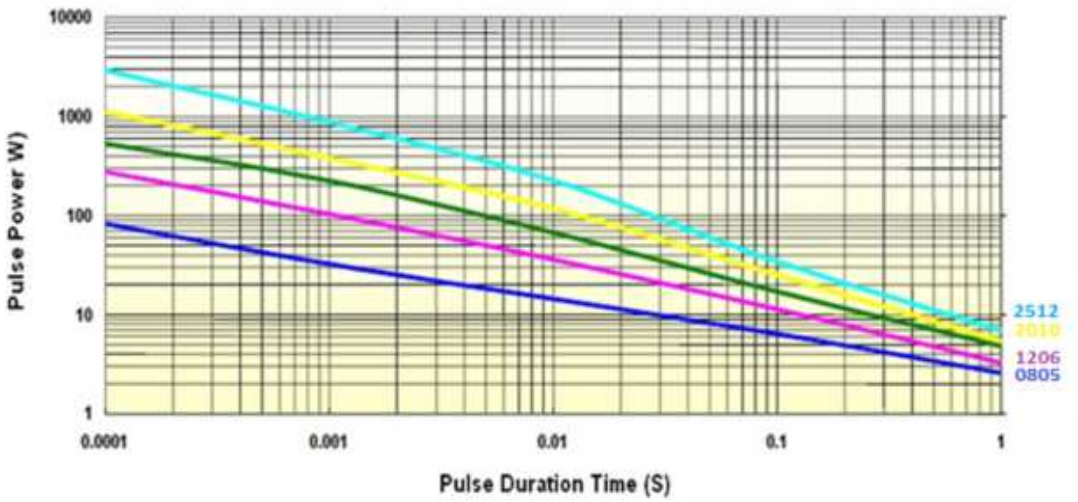
LIGHTNING SURGE



PULSE VOLTAGE LIMIT

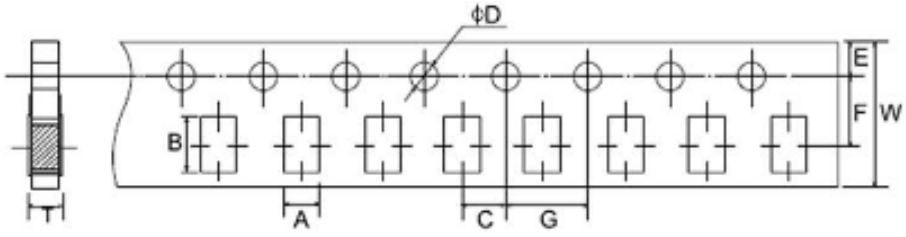


CONTINUOUS PULSE (100Kohm)



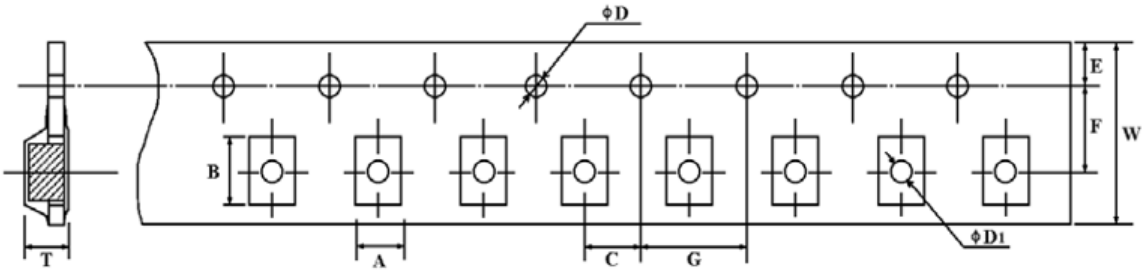
PACKAGING SPECIFICATION

PAPER TAPING (Unit:mm)



Type	A ± 0.2	B ± 0.2	C ± 0.05	ØD +0.1/- 0	E ± 0.1	F ± 0.05	G ± 0.1	W ± 0.2	T ± 0.1
CRGS0402	0.65 ± 0.1	1.2 ± 0.1	2 ± 0.05	1.5 + 0.1 -0	1.75 ±0.1	3.5 ± 0.05	4 ± 0.1	8 ± 0.2	0.42 ± 0.05
CRGS0603	1.1 ± 0.2	1.9 ± 0.2							0.67 ± 0.1
CRGS0805	1.65 ± 0.2	2.4 ± 0.2							0.81 ± 0.1
CRGS1206	2 ± 0.2	3.6 ± 0.2							
CRGS1210	2.8 ± 0.2	3.5 ± 0.2							7.5±0.1

EMBOSSED TAPING (Unit:mm)



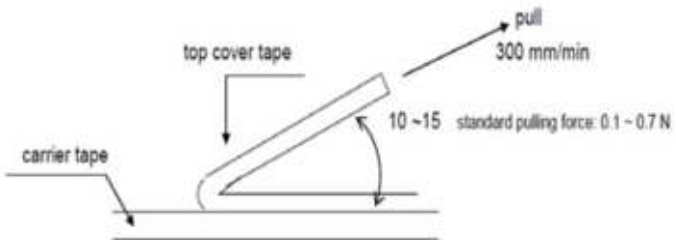
Type	A ±0.2	B ±0.2	C ±0.05	ØD +0.1/- 0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	ØD1 +0.1/-0	T ±0.1
CRGS2010	2.90	5.60	2.0	1.5	1.75	5.5	4.0	12.0	1.5	1.0
CRGS2512	3.50	6.70								

PEELING STRENGTH TOP COVER

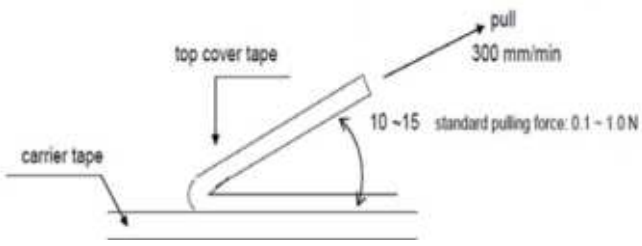
TEST CONDITION:

Embossed Tape: 0.1 to 1 (10-100g) N at a peel-off speed of 300 mm / min.

Paper Tape: 0.1 to 0.7 (10-70g) N at a peel-off speed of 300 mm / min.

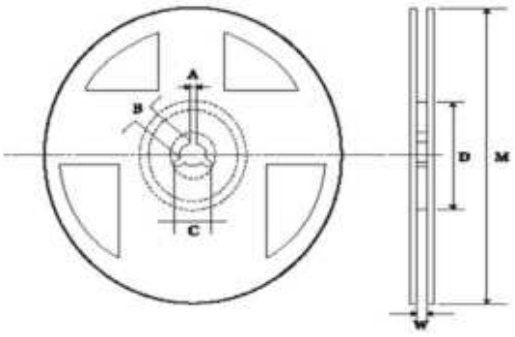


PAPER TAPE



EMBOSSED TAPE

REEL DIMENSIONS (Unit:mm)



Type	Taping	Quantity Per Reel	A ±0.5	B ±0.5	C ±0.5	D ±1	M ±2	W ±1
CRGS0402	Paper	10,000 pcs	2	13	21	60	178	10
CRGS0603	Paper	5,000 pcs	2	13	21	60	178	10
CRGS0805	Paper	5,000 pcs	2	13	21	60	178	10
CRGS1206	Paper	5,000 pcs	2	13	21	60	178	10
CRGS1210	Paper	5,000 pcs	2	13	21	60	178	10
CRGS2010	Embossed	4,000 pcs	2	13	21	60	178	13.8
CRGS2512	Embossed	4,000 pcs	2	13	21	60	178	13.8

ENVIRONMENT RELATED SUBSTANCE

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances: Ozone depleting substances are not used in our manufacturing process of this product.

This product is not manufactured using Chlorofluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

STORAGE CONDITION (MSL1)

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 25°C ± 5°C and a relative humidity of 60%RH ± 10%RH

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_2
2. In direct sunlight

PRODUCT CODE STRUCTURE

Part Number

CRGS 0603 J 100K

Type

IM	SMD anti-surge thick film chip resistor

Size

0402
0603
0805
1206
1210
2010
2512

Resistance Value

1R0	1 ohm (1Ω)
1K0	1K (1000Ω)
100K	10K (100000Ω)
1M0	1M (10000000Ω)
10M	10K (10000000Ω)

Tolerance

J	5%

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9-1773463-8 REV:B3 09/25 ED