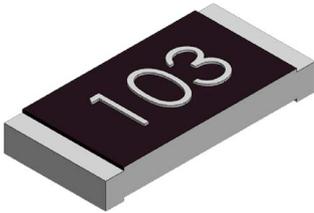


Thick Film Chip Resistors **multicomp**PRO

RoHS
Compliant



Scope: This specification for approval relates to High-Precision Anti- Surge Thick Film Chip Resistors (Lead Free)

Type designation: The type designation shall be in the following form:

Type	Power Rating	Resistance tolerance	Nominal Resistance
MCPS0603	1/4W	F,J	10Ω

Ratings:

Type	MCPS02	MCPS03	MCPS05	MCPS06	MCPS07	MCPS10	MCPS12
Power Rating	1/8W	1/4W	1/3W	1/2W	3/4W	1.25W	2W
Max. Working Voltage	50 V	50 V	150 V	200 V	200 V	400 V	500 V
Max. Overload Voltage	100 V	100 V	300 V	400 V	500 V	800 V	1000 V
Dielectric Withstanding Voltage		300 V	500 V				
Temperature Range	-55°C to +155°C						
Ambient Temperature	70°C						

Nominal Resistance

Effective figures of nominal resistance shall be in accordance :

E-24 values – these are preferred and will have standard MOQ

E-96 values – are available on case by case basis and availability and MOQ need to be confirmed with factory first

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 : Max. Working Voltage or $\sqrt{P \times R}$ whichever is lesser

Max. Overload Voltage or $2.5 \sqrt{P \times R}$ whichever is lesser

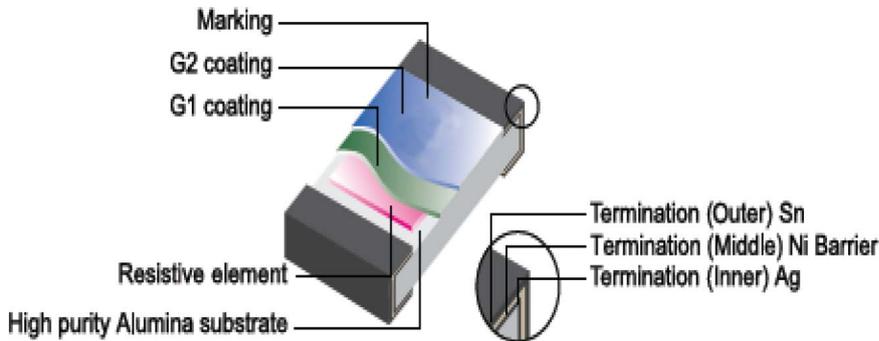
Where : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

P = Power Rating (watt)

R = Nominal Resistance (ohm)

Thick Film Chip Resistors **multicomp**PRO

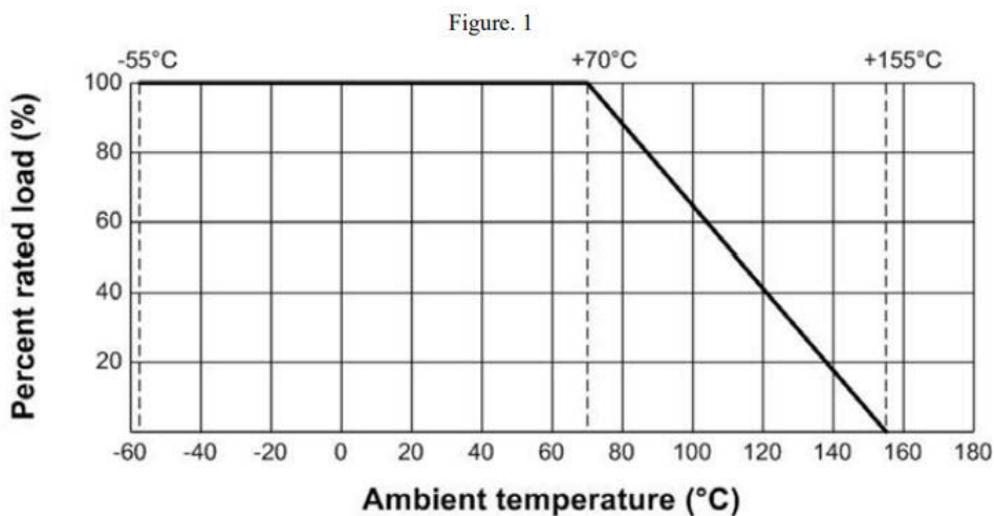
Construction



Power rating and dimensions

Power rating:

Resistors shall have a power rating based on continuous load operation at an ambient temperature of 70°C. For temperature in excess of 70°C, The load shall be derate as shown in figure 1.

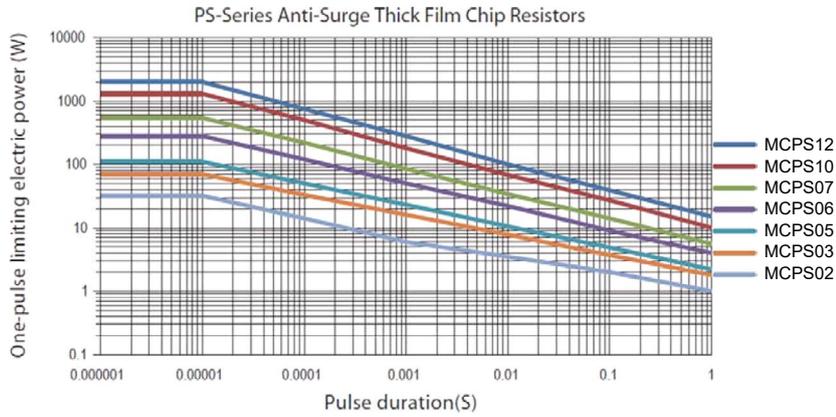


Power Rating

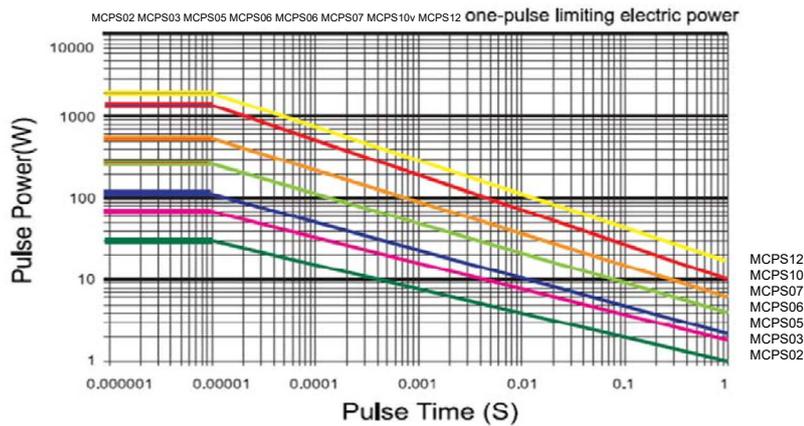
Type	Power Rating at 70°C	Tolerance %	Resistance Range	Standard Series
MCPS02	1/8W	±1% ±5%	1Ω ~ 10MΩ	±5%; E-24 ±1%; E-96
MCPS03	1/4W			
MCPS05	1/3W		0.1Ω ~ 10MΩ	
MCPS06	1/2W			
MCPS07	3/4W		1Ω ~ 10MΩ	
MCPS10	1.25W		0.1Ω ~ 10MΩ	
MCPS12	2W			

Thick Film Chip Resistors **multicomp**PRO

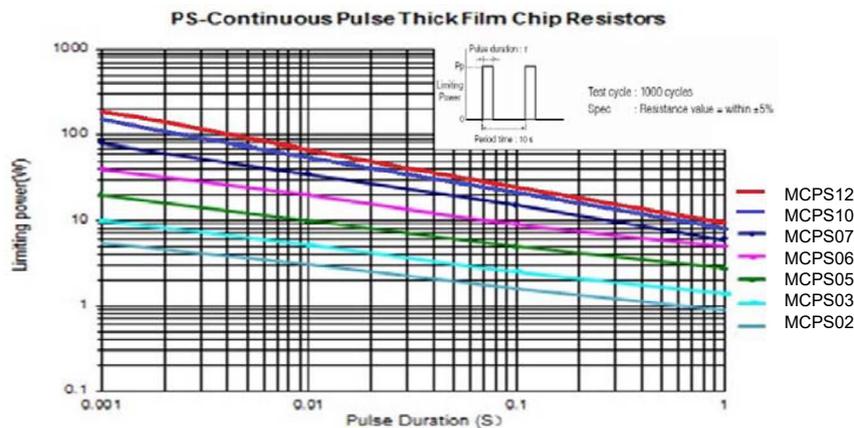
Pulse Voltage Limit



Pulse Withstanding Capacity (Single pulse)

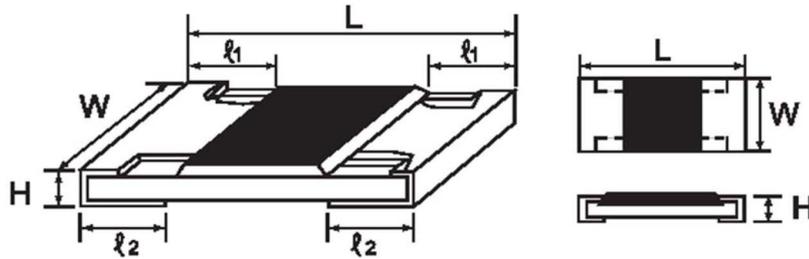


Pulse Withstanding Capacity (Continuous pulse)



Thick Film Chip Resistors **multicomp** PRO

Dimension



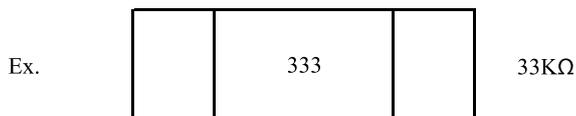
Dimensions : Millimetres

Type	Dimension (mm)				
	L	W	H	l1	l2
MCPS02	1 ± 0.1	0.5 ± 0.05	0.35 ± 0.05	0.2 ± 0.1	0.25 ± 0.1
MCPS03	1.6 ± 0.1	0.8 ± 0.1	0.45 ± 0.1	0.3 ± 0.2	0.3 ± 0.2
MCPS05	2 ± 0.15	1.25 + 0.15 - 0.1	0.55 ± 0.1	0.4 ± 0.2	0.4 ± 0.2
MCPS06	3.1 ± 0.15	1.55 + 0.15 - 0.1	0.55 ± 0.1	0.45 ± 0.2	0.45 ± 0.2
MCPS07	3.1 ± 0.1	2.6 ± 0.2	0.55 ± 0.1	0.5 ± 0.25	0.5 ± 0.2
MCPS10	5 ± 0.1	2.5 ± 0.2	0.55 ± 0.1	0.6 ± 0.25	0.5 ± 0.2
MCPS12	6.35 ± 0.1	3.2 ± 0.2	0.55 ± 0.1	0.6 ± 0.25	0.5 ± 0.2

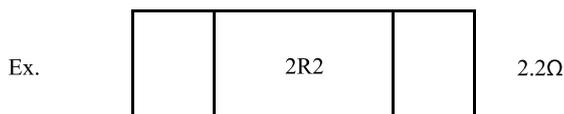
Marking : Resistors

A. Marking for E-24 series in MCPS03, MCPS05, MCPS06, MCPS07, MCPS10, MCPS12 size: 3 Digits

*The first two digits are significant figures of resistance and the third digit denoted number of zeros



*For ohmic values below 10 Ω, letter "R" is for decimal point.



B. Chip Resistors type MCPS02 No marking

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Performance specification

Characteristics	Limits	Test Methods (AEC - Q200)
Operational Life	Resistance change rate is ±1%: ±(1%+0.1Ω)Max. ±5%: ±(3%+0.1Ω)Max.	125°C, at 35% of operating power, 1000H(1.5 hours "ON", 0.5 hour "OFF") (MIL-STD-202 Method 108)
Temperature Coefficient of Resistance	PS02: 1Ω~10Ω : ± 400 PPM/°C 10.1Ω~100Ω : ± 200 PPM/°C >100Ω : ± 100 PPM/°C PS03, PS05, PS06, PS07, PS10, PS12 ± 100 PPM/°C	4.8 Natural resistance change per temp. degree centigrade. $\frac{R2-R1}{R1(t2-t1)} \times 10^6 \text{ (PPM/°C)}$ 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 Unsmearred	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. (MIL-STD-202 Method 213)
High Temperature Exposure (Storage)	Resistance change rate is ±(1%+0.1W)max	1000hrs. at T=155°C.Unpowered. Measurement at 24±2 hours after test conclusion. (MIL-STD-202 Method 108)
Temperature cycling	Resistance change rate is ±1%: ± (1.0%+0.1Ω) Max. ±5%: ± (3.0%+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.	For both leaded & SMD. Electrical test not required. Magnification 50X. Conditions: (J-STD-002)

Thick Film Chip Resistors **multicomp** PRO

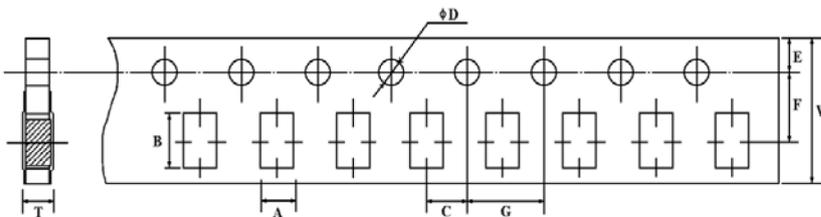
Characteristics	Limits	Test Methods (AEC - Q200)
Soldering Temperature Reference	Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95 % coverage Min.)	<p>Wave soldering condition: (2 cycles Max.) Pre-heat : 100°C to 120°C, 30 ± 5 sec. Suggestion solder temp.: 235°C to 255°C, 10 sec. (Max.) Peak temp.: 260°C</p> <p>Reflow soldering condition: (2 cycles Max.) Pre-heat : 150°C to 180°C, 90°C to 120 sec. Suggestion solder temp.: 235°C to 255°C, 20 to 40 sec. Peak temp.: 260°C</p> <p>Temperature profile for avaluation</p> <p>Hand soldering condition: The soldering iron tip temperature should be less than 300°C and maximum contract time should be 5 sec.</p>
Mechanical Shock		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6. (MIL-STD-202 Method 213)
Vibration	Resistance change rate is ±1%: ±(1%+0.1Ω)Max. ±5%: ±(3%+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		10% rated power, 85°C/85%RH, 1000H, Measurement at 24 hours after test conclusion. (MIL-STD-202 Method 103)
ESD	Resistance change rate is ± (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 or ISO/DIS 10605)
Flammability		V-0 or V-1 are acceptable. Electrical test not required. (UL-94)
Board Flex	±1%: ± (1.0%+0.1Ω) Max ±5%: ± (3.0%+0.1Ω) Max.	60 seconds minimum holding time. (JIS-C-6429)

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Characteristics	Limits	Test Methods (AEC - Q200)
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	Resistance change rate is $\pm(1\%+0.05\Omega)\text{max.}$	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 \pm 2°C 91%~93%RH 1000H		

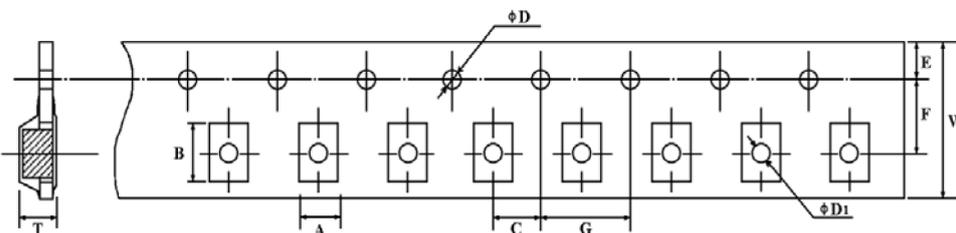
Packing specification

Tapping Dimension



Type	A \pm 0.2	B \pm 0.2	C \pm 0.05	$\text{ØD} +0.1$ -0	E \pm 0.1	F \pm 0.05	G \pm 0.1	W \pm 0.2	T \pm 0.1
MCPS02	0.65 \pm 0.1	1.2 \pm 0.1	2	1.5	1.75	3.5	4	8	0.42 \pm 0.05
MCPS03	1.10	1.9							0.67
MCPS05	1.65	2.4							0.81
MCPS06	2	3.6							0.75
MCPS07	2.8	3.5							

Embossed tapping

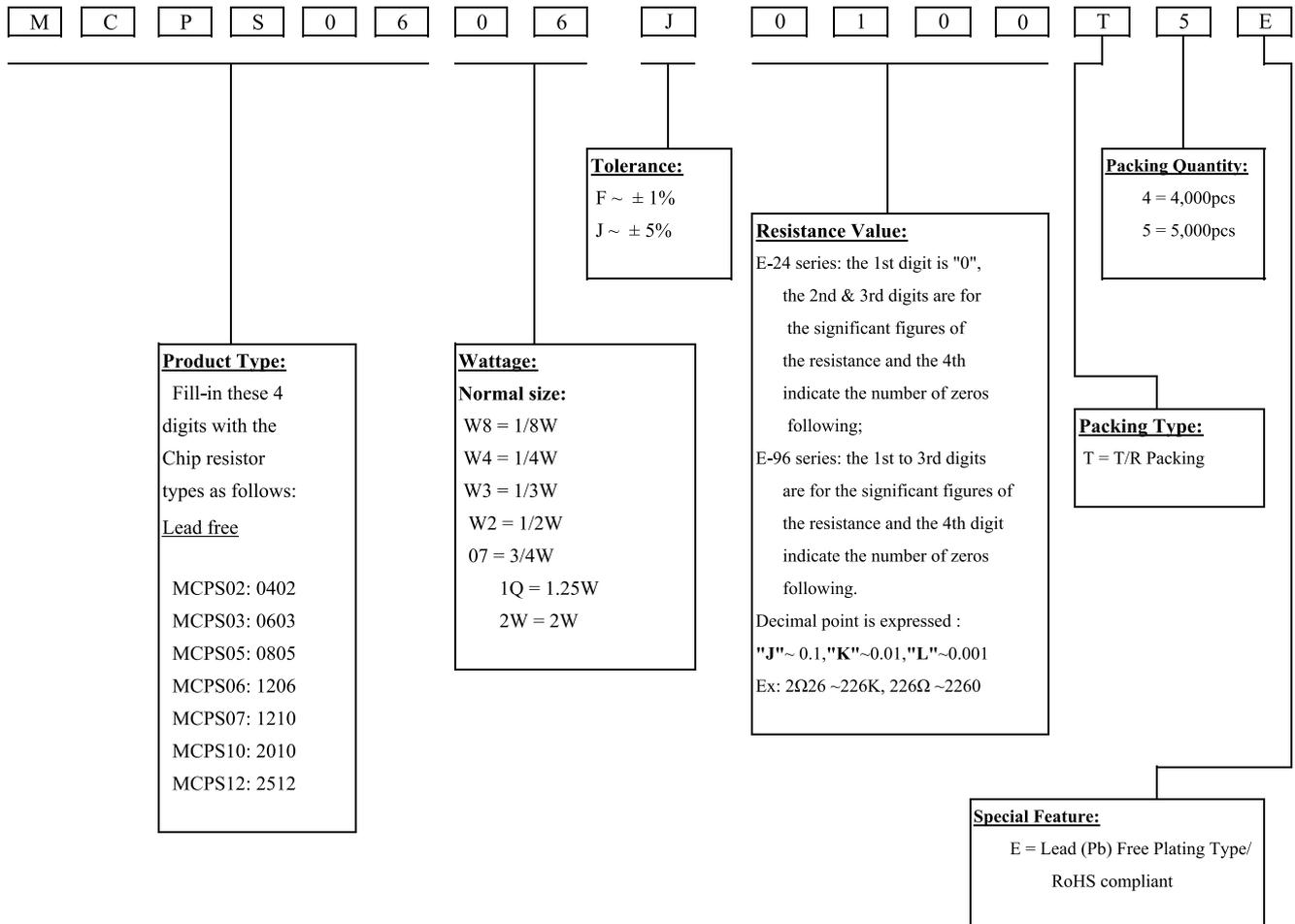


Type	A \pm 0.2	B \pm 0.2	C \pm 0.05	$\text{ØD} +0.1$ -0	E \pm 0.1	F \pm 0.05	G \pm 0.1	W \pm 0.2	$\text{ØD1} +0.1$ -0	T \pm 0.1
MCPS10	2.9	5.6	2	1.5	1.75	5.5	4	12	1.5	1
MCPS12	3.5	6.7								

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Explanation of Part Number System

High-Precision Anti-Surge Thick Film Chip Resistors (Lead Free) AEC-Q200 Compliant



Sample : MCPS03 (0603) 1/4W +/- 1% 10Ω T/R--5000 → PS03W4F100JT5E
 MCPS03 (0603) 1/4W +/- 5% 10Ω T/R--5000 → PS03W4J0100T5E

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