MCSS-4512 SERIES

METAL SHUNT RESISTOR

CURRENT METAL SHUNT RESISTOR ▲ SMD type
Low resistance values up to 10mΩ
Sulfur resistant construction
Low inductance
Moisture Sensitivity Level ▲ MSL 1
Excellent long-term stability

SPECIFICATION

Item		Characteristics
Operating Temperature Range		-55°C to +170°C
Resistive Element Material		FeCrAl
Resistance Range Note 1	R	10mΩ to 20mΩ
Resistance Tolerance	ΔR	±1% ▲ ±5%
Power Rating at 70°C Note 2	P_{70}	7W to 8W
Max. Working Voltage Note 3	V_W	$\sqrt{P \cdot R}$
Temperature Coefficient Component Note 4	TCR_{COMP}	±40ppm

Case size	Size	Resistance	Length	Width	Height
	4512	10mΩ	11.18mm	3.175mm	3.05mm
		20mΩ	11.35mm	6.100mm	3.50mm

Notes:

1: **R** — **Other values may be available, consult MGT.**

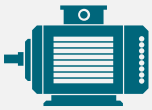
2: **P_{70}** — **Power rating is guaranteed for use on aluminum substrate (MCPCB). Please check with MGT before order or using.**

3: **V_W** — **Working voltage is the maximum DC or AC (rms) continuous voltage, corresponding to the rated power P at the operating temperature.**

$V_W = \sqrt{P \cdot R}$ **[P = Rated power (W) at operating temperature; R = Resistance value (Ω)]**

4: **TCR_{COMP}** — **Component TCR - Total TCR that includes the TCR effects of the whole resistor**

APPLICATIONS

Battery Charger	Welding Inverter	Renewable Energy	Motors & Drives	AC/DC Converter	DC/DC Converter	Industrial
						

ELECTRICAL CHARACTERISTICS

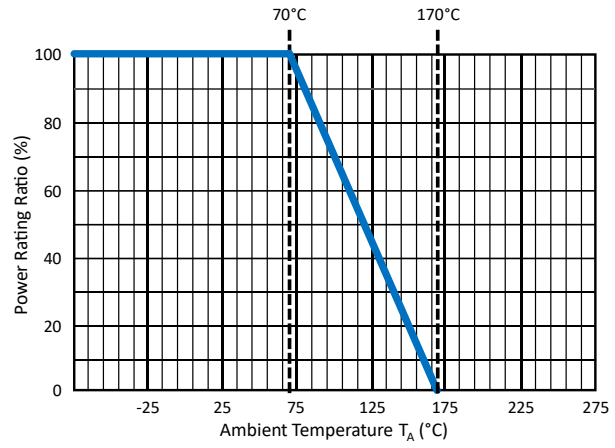
Part number shows blister tape on plastic reel.

Size	R Resistance (mΩ)	P_{70} Power Rating at 70°C (W)	P_{100} Power Rating at 100°C (W)	TCR_{Comp} Temperature Coefficient Compenent (ppm)	Element Material	Part Number
4512	10.00	8	5	±40	FeCrAl	MCSS4512E ☐ G10L0
	20.00	7	5	±40	FeCrAl	MCSS4512E ☐ B20L0

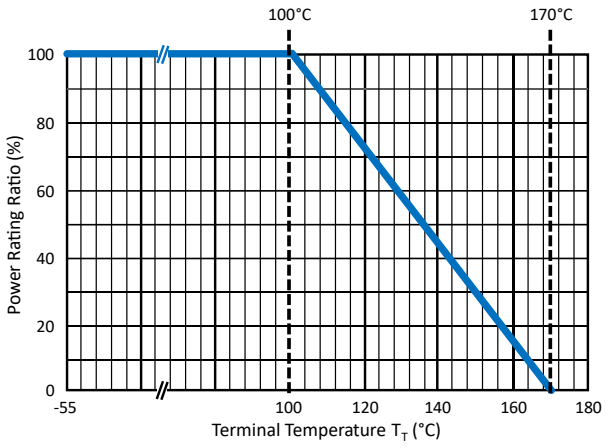
Note: ☐ **: Enter the appropriate resistance tolerance code. F for ±1% or J for ±5%.**

DERATING CURVE

Power Derating Characteristics at T_A = 70°C

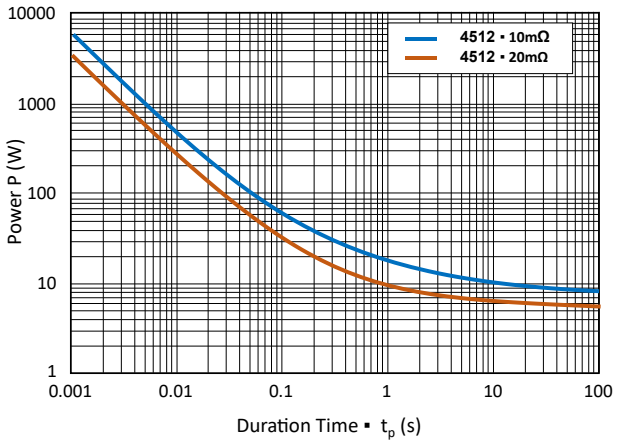


Power Derating Characteristics at T_T = 100°C



PULSE CAPABILITY

Pulsed Power Characteristics ▪ MCSS 4512 Series



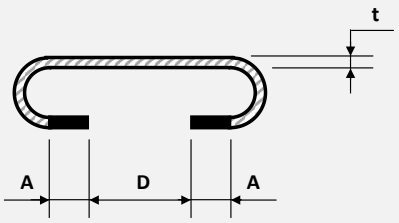
Note:
Other pulsed power characteristics on request

Note: **Other pulsed power characteristics on request.**

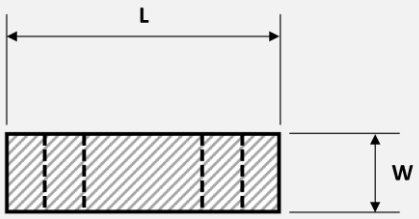
PACKAGE OUTLINE ▲ All dimensions in mm

Size 4512

Front view



Top view



Side view

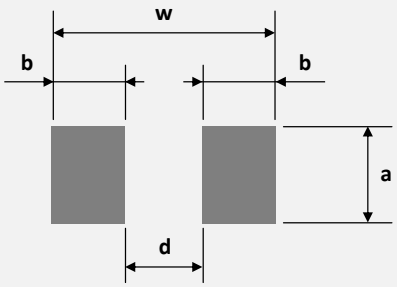
Size	R Resistance (mΩ)	L	W	H	D	A	t
4512	10	11.18±0.38	3.20±0.38	3.05±0.76	4.83±0.76	2.36±0.25	0.24±0.20
	20	11.35±0.65	3.40±0.38	3.50±1.10	4.83±0.76	2.36±0.25	0.24±0.20

RECOMMENDED PAD LAYOUT (REFERENCE ONLY) ▲ All dimensions in mm

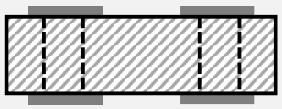
Size 4512

Resistance	10mΩ	20mΩ
a	4.07	7.24
b	3.07	3.18
d	3.23	3.23
w	9.37	9.58

Land pattern



Resistor mounted

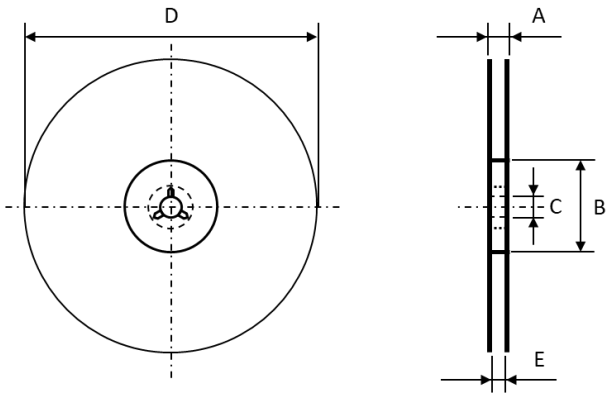


PRODUCT CODE

Example: MCSS series ▲ Size 4512 ▲ 10mΩ ▲ ±1% ▲ 8W ▲ Tape & Reel

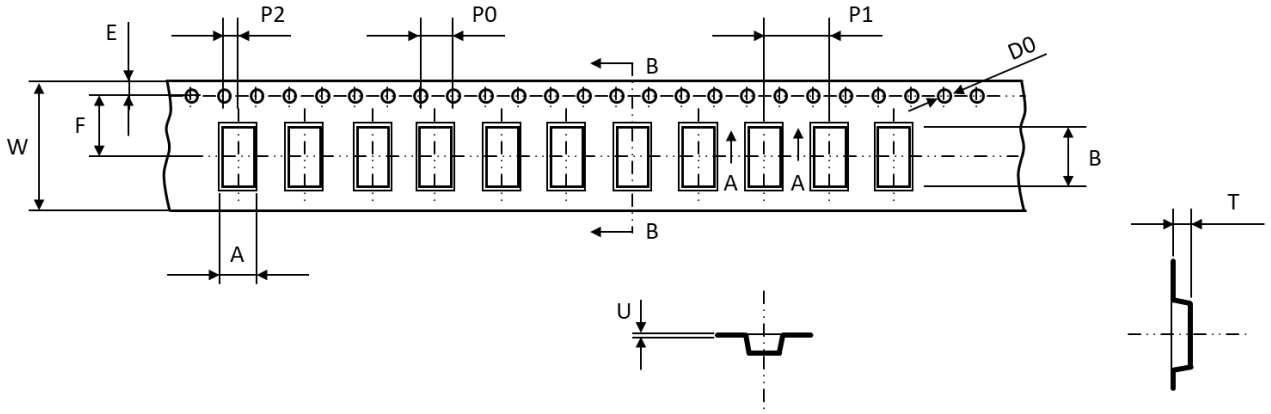
MCSS		4512		E		F		G		10L0	
Series		Dimensions		Packaging		Tolerance		Power Rating		Resistance	
Code	Desc.	Code	Size	Code	Desc.	Code	%	Code	P_{70} (W)	Code	mΩ
MCSS	Standard	4512	4512	E	Emboss	F J	±1 ±5	B G	7 8	10L0 20L0	10.00 20.00

REEL DIMENSIONS ▲ All dimensions in mm



Size	A	B	C	D	E
4512	20.7±1.0	99±0.5	13±0.5	330±1.0	16.7±1.0

TAPE DIMENSIONS ▲ All dimensions in mm

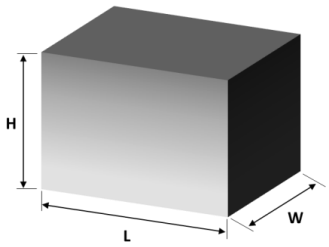


Size	A	B	E	F	W	P0	P1	P2	D0	T (Ref.)	U (Ref.)
4512/10L0	4.32±0.08	11.7±0.08	1.75±0.1	11.5±0.1	24.0±0.3	4.0±0.1	8.0±0.1	8.0±0.1	1.5±0.1	3.1±0.1	0.30±0.1
4512/20L0	4.32±0.08	11.56±0.1	1.75±0.1	11.5±0.1	24.0±0.3	4.0±0.1	8.0±0.1	8.0±0.1	1.5±0.1	3.5±0.1	0.30±0.1

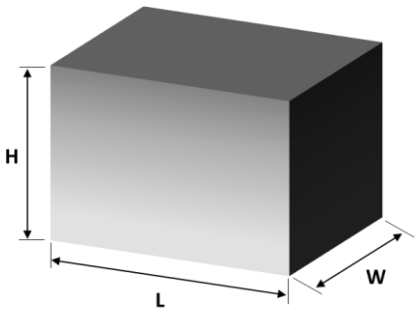
PACKAGING

Size	Quantity (pcs) Chip / Reel	Quantity Inner Box (pcs)	L x W x H (mm) Inner Box	Quantity (pcs) Outer Carton	L x W x H (mm) Outer Carton
4512	1 900	3 800	340 x 340 x 50	19 000	360 x 320 x 360

Inner box



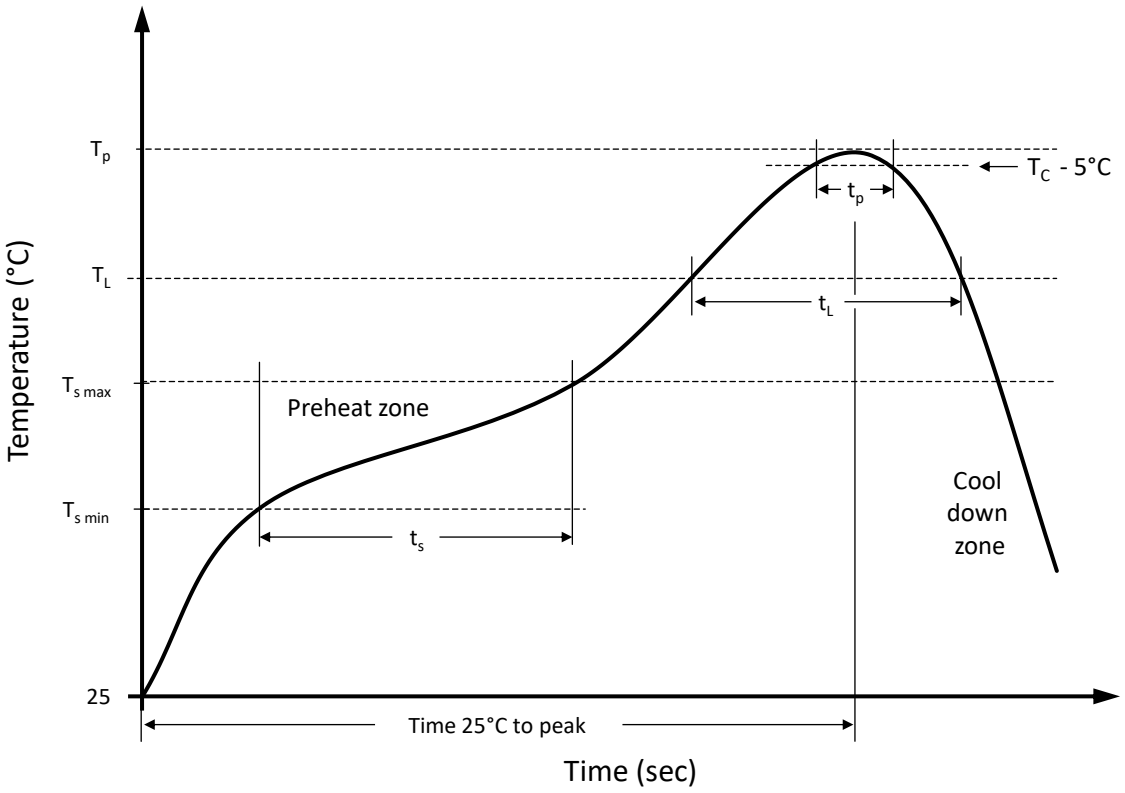
Outer carton



STORAGE AND HANDLING CONDITIONS

Floor life	Temperature	Humidity	MSL
Unlimited	T_A = 22 to 28°C	RH = 40 to 75%	1

RECOMMENDED REFLOW SOLDERING PROFILE

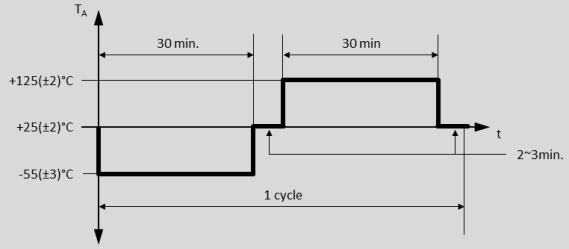


Recommended reflow soldering conditions ▲ Refer to JEDEC J-STD-020E

Profile Features		Sn-Pb Eutetic Assembly	Pb-Free Assembly
Preheat temperature min.	$T_{s\,min}$	100 °C	150 °C
Preheat temperature max.	$T_{s\,max}$	150 °C	200 °C
Preheat time t_s from $T_{s\,min}$ to $T_{s\,max}$	t_s	120 seconds	120 seconds
Ramp-up rate (T_L to T_p)		max. 3 °C/second	max. 3 °C/second
Liquidous temperature	T_L	183 °C	217 °C
Time t_L maintained above T_L	t_L	150 seconds max.	60 seconds max.
Peak package body temperature	T_p	235°C	260°C
Timeframe of within 5°C below and up to max actual peak body temperature	t_p	20 seconds max.	30 seconds max.
Ramp-down rate (T_L to T_p)		max. 6 °C/second	max. 6 °C/second
Time 25°C to peak temperature		max. 6 minutes	max. 8 minutes

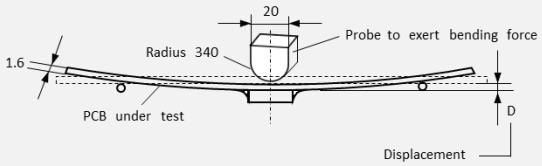
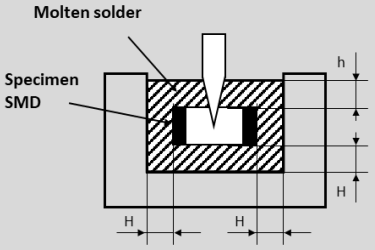
RELIABILITY TESTS ▲ STANDARD

Standard: JIS C 5202, MIL-STD 202

No.	Test	Test Specification	Test Standard	Test Limits
1	Short Time Overload	Loading 5 times rated power for 5sec	JIS C 5202-5.5	ΔR: ±(1%+0.0005Ω)
2	Temperature Coef-ficient of Re-sistance (T.C.R.)	+25°C to +125°C $$TCR(ppm/°C) = \frac{\Delta R}{R \cdot \Delta T} \cdot 10^6$$	JIS C 5202-5.2	Refer to electrical specification.
3	Moisture Resistance	The specimens shall be placed in a chamber and subjected to a relative humidity of 90~98% percent and a tempera-ture of 25°C / 65°C with 10 cycles.	MIL-STD-202, Method 106	ΔR: ±(1%+0.0005Ω)
4	High Temperature Exposure	The chip (mounted on board) is exposed in the heat cham-ber 125°C for 1000 hrs.	JIS C 5202-7.2	ΔR: ±(1%+0.0005Ω)
5	Load Life	Apply rated power for 1000 hours with 1.5 hours ON and 0.5 hour OFF.	JIS C 5202-7.10	ΔR: ±(1%+0.0005Ω)
6	Thermal Shock	-55°C to +155°C, 1000 cycles, 15 min at each extreme	MIL-STD-202 Method 107	ΔR: ±(1%+0.0005Ω)
7	Vibration	5 g's for 20 min., 12 cycles each of 3 orientations.	MIL-STD-202 Method 201	ΔR: ±(0.5%+0.0005Ω)
8	Rapid change of temperature	The chip (mounted on board) is exposed, -55±3°C (30min.)/+125±2°C (30min.) for 5 cycles. The following conditions as the following figure. 	JIS C 5202-7.4	ΔR: ±(1%+0.0005Ω)

RELIABILITY TESTS ▲ STANDARD

Standard: JIS C 5202, MIL-STD 202

No.	Test	Test Specification	Test Standard	Test Limits
9	Bending Strength	Mount the chip to test 90mm(L)*40mm(W) FR4 printed circuit board substrate. Apply pressure in direction of arrow unit band width reaches 2mm(+0.2/-0mm) illustrated in the figure below and hold for 10±1 sec. Unit: mm 	JIS C 5202-6.1	ΔR: ±(1%+0.0005Ω)
10	Solderability	The specimen chip shall be immersed into the flux specified in the solder bath 235±5°C for 2±0.5 sec. It shall be immersed to a point 10mm from its root. (Sn96.5/Ag3.0/Cu0.5)  h = 10mm H = 10mm min.	JIS C 5202-6.11	Solder shall be covered 95% or more of the electrode area

Notes:

- **The terminal electron temperature of component should below 100°C.**

REVISION TABLE

Revision	Date	Status	Notes
001	01/10/2021	Initial release	Initial publication

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