

METAL FILM ANTI-SURGE LOW RESISTANCE CHIP RESISTOR

MFSL SERIES

Features

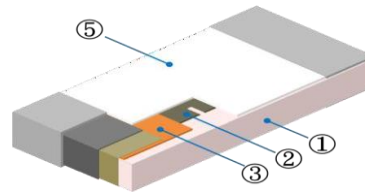
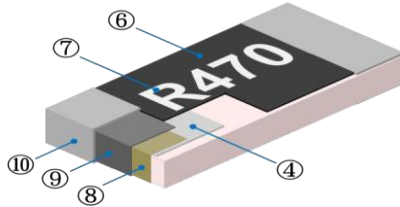
- * Low Resistance/TCR/Inductance ($\leq 5nH$)
- * Excellent long-term stability
- * High precision current sensing
- * High rated power capability and excellent Anti-Surge
- * Halogen free and lead free
- * RoHS compliant
- * AEC-Q200 compliant

Application

- * Consumer electronics
- * Computer&relative products
- * Communication devices
- * Measuring instrument
- * Industrial/power supply
- * Battery management system

Construction

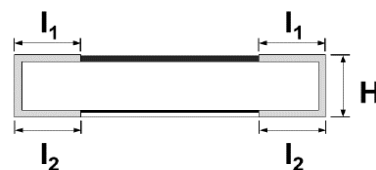
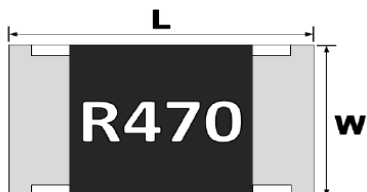
1	Alumina Substrate	7	Bottom Protective Overcoat
2	Top Resistive Layer	8	Marking
3	Bottom Resistive Layer	9	Side Inner Electrode
4	Top Inner Electrode(Cu)	10	Barrier Layer (Ni)
5	Bottom Inner Electrode (Cu)	11	Solder Coating (Sn)
6	Top Protective Overcoat		



Type Dimension

Unit:mm

Type	L	W	H	I ₁	I ₂
MFSL 1206	3.10±0.10	1.60±0.10	0.55±0.10	0.40±0.20	0.45±0.20
MFSL 1210	3.10±0.10	2.50±0.15	0.55±0.10	0.50±0.20	0.50±0.20
MFSL 2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
MFSL 2512	6.30±0.20	3.20±0.20	0.55±0.10	0.65±0.25	0.65±0.25
MFSL 2512X	6.30±0.20	3.20±0.20	0.70±0.15	0.65±0.25	0.65±0.25



Standard Electrical Specifications

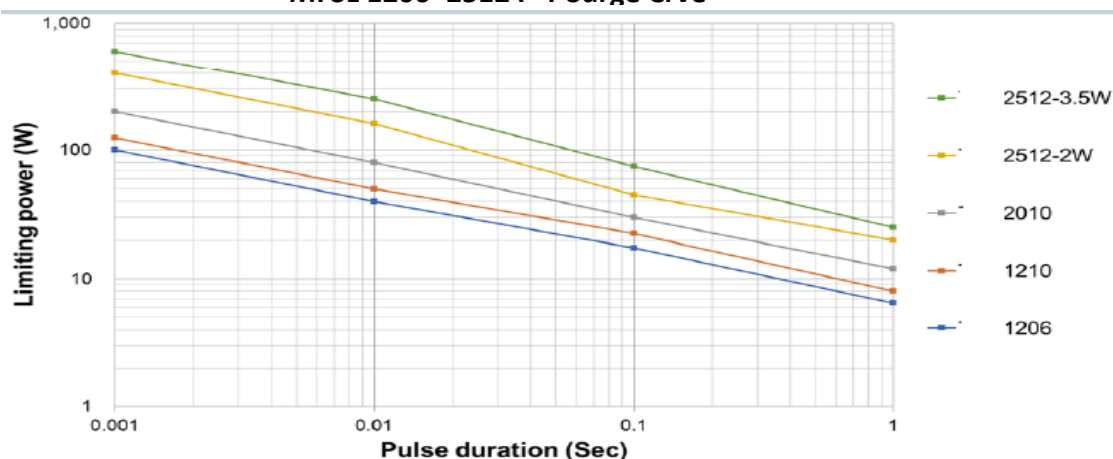
Type	Power Rating at 70°C	MAX. Rated Current	Max overload Current	TCR(ppm/°C)	Resistance Range
					±0.5%(D), ±5%(J), ±1%(F)
MFSL 1206	1W	4.47A	10.00A	±100	$50\text{ m}\Omega \leq R < 100\text{ m}\Omega$
MFSL 1210	1W	4.47A	10.00A	±50	$100\text{ m}\Omega \leq R \leq 33\text{ }\Omega$
MFSL 2010	1.5W	5.48A	12.25A	±50	$50\text{ m}\Omega \leq R \leq 50\text{ }\Omega$
MFSL 2512	2W	6.32A	14.14A		
MFSL 2512X	3.5W	8.37A	18.71A		

* For non-standard parts, please contact our sales dept.

* Operating Temperature Range : -55°C~+170°C.

Anti-Surge Ability:

MFSL 1206~2512 P-T Surge Curve



Performance Characteristics

* Power Derating Curve

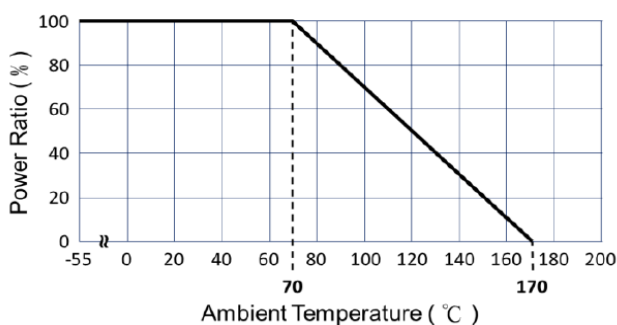
*Power Derating Curve

The Operating Temperature Range:-55°C~+170°C

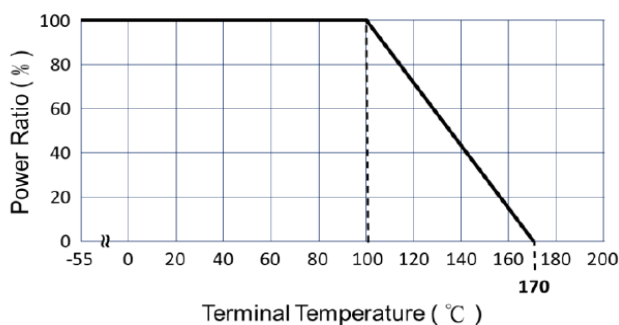
Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C

For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.(Terminal temperature derating from above 100°C)

Derating Curve



Derating Curve



* Rated Current

Resistance range: < 1Ω

Rated Current: The resistor shall have a DC continuous working current of a AC(rms) continuous working current at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$I = \sqrt{P/R}$$

I = Rated current (A)
 P = Rated power (W)
 R = Nominal resistance (Ω)

* Rated Voltage

Resistance range: ≥ 1Ω

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

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

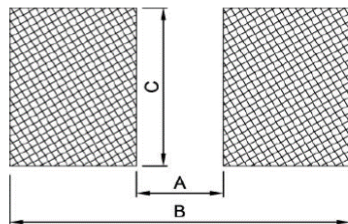
V = Rated voltage (V)
 P = Rated power (W)
 R = Nominal resistance (Ω)

Marking

* MFSL 1206~MFSL 2512 : 4 digit marking

Resistance value	Code	Example
50 mΩ ~ 99 mΩ	R0XX	R050=0.05Ω
100 mΩ ~ 999 mΩ	RXXX	R470=0.47Ω
1 Ω ~ 9.9 Ω	XRXX	4R70=4.7Ω
10 Ω ~ 50 Ω	XXRX	50R0=50Ω

* Recommend Land Pattern Design



Unit:mm

TYPE	A	B	C
MFSL 1206	2.20	4.20	1.80
MFSL 1210	2.00	4.40	2.70
MFSL 2010	3.80	6.60	2.70
MFSL 2512	4.90	8.10	3.40

*Plating Thickness

Ni: ≥ 3μm Sn(Tin): ≥ 3μm



Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R.)	JIS- C- 5201-1 4.8 IEC-60115-1 4.8	At 25°C/+125°C, 25°C is the reference temperature	Refer to Standard Electrical Spec.
Short Time Overload	JIS- C- 5201-1 4.13 IEC-60115-1 4.13	5 times rated power whichever is less for 5 seconds.	$\pm(1.0\%+0.001\Omega)$
Insulation Resistance	JIS- C- 5201-1 4.6 IEC-60115-1 4.6	Applied 100VDC for 1 minute	$\geq 10G\Omega$
Dielectric Withstanding Voltage	JIS-C5201-1 4.7	Applied 500VAC for 1 minute	No short or burned on the appearance
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force: 10N, 10 seconds	No broken
Solderability	JIS- C- 5201-1 4.17 IEC-60115-1 4.17	245 $\pm$ 5°C for 3 seconds.	> 95% Coverage No Visual damage
Resistance to Soldering Heat	JIS -C- 5201-1 4.18 IEC-60115-1 4.18	260 $\pm$ 5°C for 10 seconds.	$\pm(1.0\%+0.001\Omega)$ No Visual damage
Leaching	JIS- C- 5201-1 4.18 IEC-60068-2-58 8.2.1	260 $\pm$ 5°C for 30 seconds	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS -C- 5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	$\pm(1.0\%+0.001\Omega)$ No Visual damage
Damp Heat with Load	JIS- C- 5201-1 4.24 IEC-60115-1 4.24	40 $\pm$ 2°C, 90~95% R.H. ,Rcwv or Max. working current whichever is less for 1000hrs with 1.5hrs "ON" and 0.5hr "OFF"	$\pm(1.0\%+0.001\Omega)$
Biased Humidity	MIL-STD-202 Method 103	1,000 hours,85°C/85% RH, 10% of operating power.Measurement at 24 $\pm$ 4 hours after test conclusion	$\pm(1.0\%+0.05\Omega)$
Load Life (Endurance)	JIS -C- 5201-1 4.25 IEC-60115-1 4.25.1	70 $\pm$ 2°C, Rated power or Max. working current whichever is less for 1000hrs with 1.5hrs "ON" and 0.5hr "OFF"	$\pm(1.0\%+0.001\Omega)$
High Temperature Exposure	JIS C 5201-1 4.23.2 IEC-60068-2-2	At +170 $\pm$ 5°C for 1000 hours	$\pm(1.0\%+0.001\Omega)$
Resistance to Solvent	JIS -C- 5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20-25°C for 60 secs. Then the resistor is left in the room for 48 hrs.	$\pm(1.0\%+0.001\Omega)$ No Visual damage
Terminal Strength (SMD)	JIS-C-5201-1 4.32 AEC Q200-006	Pressurizing force for 60 seconds 1206 and above :17.7N	No broken
Bending Strength	JIS -C- 5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds	$\pm(1.0\%+0.001\Omega)$
		D: 1206 、 1210 = 3mm 2010 、 2512 = 2mm	No Visual damage

* Temperature Coefficient of Resistance test to -55°C is available on request.

* We can also provide AEC-Q200 test reports if required by customers.

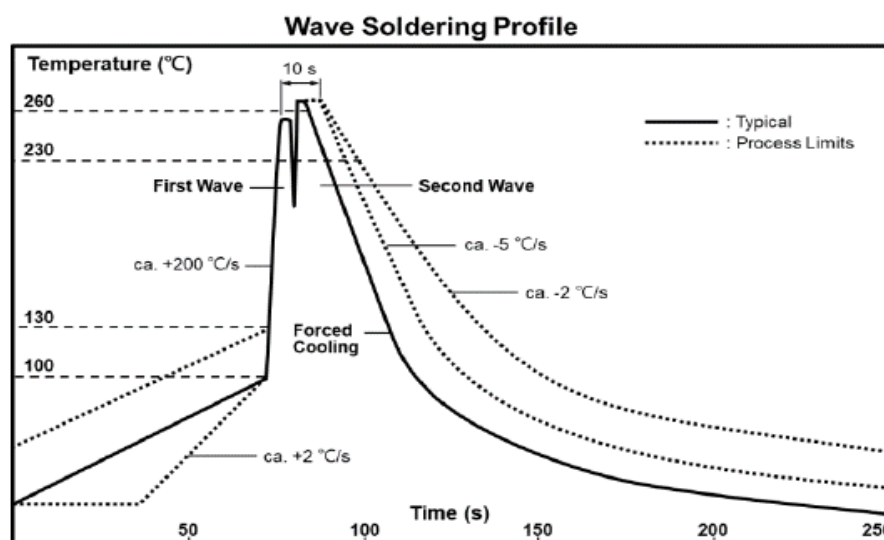


Parts Number System

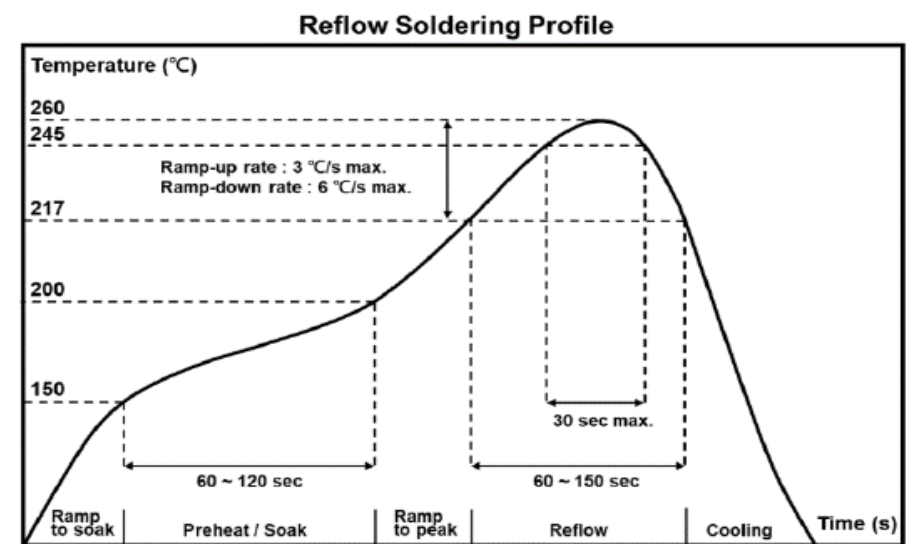
MFSL -	10 -	R050	F	R
Type MFSL - Anti-Surge Low-Resistance Metal Film chip Resistor	Size 18=1206 20=1210 22=2010 24=2512	Resistance EX. R050= 0.05Ω R470= 0.47Ω 4R70=4.7Ω 33R0=33Ω	Tolerance D = ±0.5% F = ±1% J = ±5%	Standard Packing R=Paper tape reel(5000PCS) K=Embossed plastic tape reel (4000PCS)

Recommended Customer Soldering Parameters

* Wave Solder Temperature Condition



* Solder Reflow Temperature Condition



* Rework Temperature (hot air equipment) : 350°C, 3~5seconds

