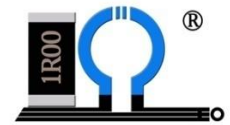


METAL FOIL CHIP FIXED RESISTOR

LRF Series



■Features

Low TCR down to 50 ppm/°C .

※High power rating up to 2Watts

Superior mechanical and frequency characteristics

The size down to 0402.

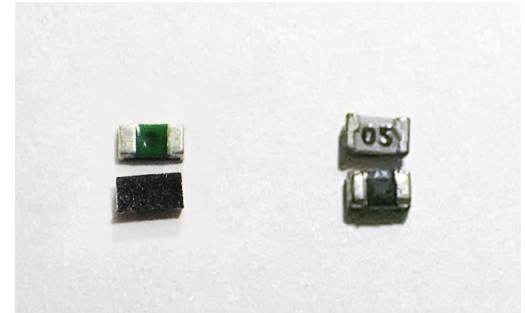
Compliant with RoHS directive. Halogen free requirement

■Applications

Current detecting resistors for power supply, motor circuits, etc

Converter Charger Automotive Engine Control Portable Devices etc.

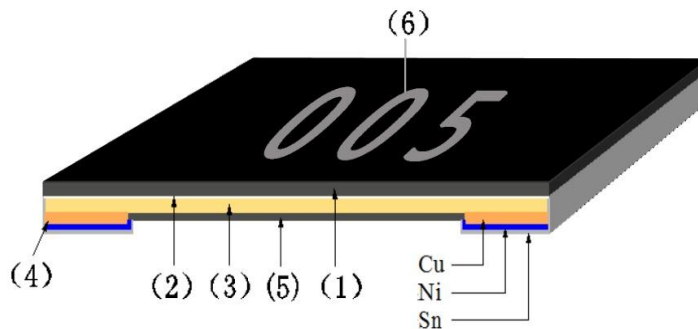
Switching Power Supply Over Current Protection Voltage Regulation Module (VRM) DC-DC



■PART NUMBER

LRF	0603	F	F	R002	T	50	
PART CODE	SIZE	TOLERANCE	TCR	RESISTANCE	PACKAGING	PACKAGE	
	0402	J=±5%	F±50PPM/°C	R010=0.01Ω	B=BULK	40=4000PCS	=STANDARD
	0603	F=±1%	M±75PPM/°C	R005=0.005Ω		50=5000PCS	B=1W
	0805		G±100PPM/°C		T=		D=1/2W
	1206		L±150PPM/°C		TAPING		
			H±200PPM/°C		REEL		

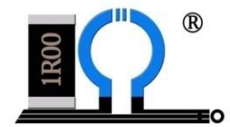
■DIMENSION



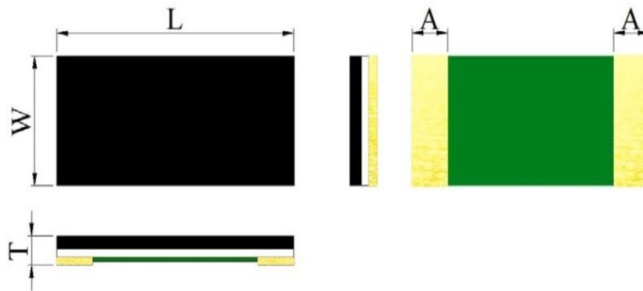
①	Substrate :Epoxy	④	Terminal electrode Sn、Ni、Cu		
②	Adhesive:Epoxy	⑤	Protective coating		
③	Resistive element:MnCu alloy	⑥	Marking coating		

METAL FOIL CHIP FIXED RESISTOR

LRF Series



■PRODUCT DIMENSIONS



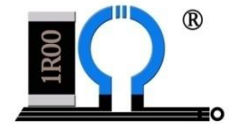
TYPE	SIZE	L (mm)	W(mm)	T(mm)	A(mm)	A(mm)
LRF0402	0402	1.0±0.10	0.55±0.10	0.30±0.05	0.30±0.05	0.30±0.10 & 0.230±0.10
LRF0603	0603	1.60±0.25	0.80±0.25	0.40±0.25	0.45±0.20	0.35±0.2 & 0.30±0.2
LRF0805	0805	2.0±0.25	1.25±0.25	0.40±0.20	0.60±0.25	0.60±0.2 & 0.40±0.2
LRF1206	1206	3.20±0.25	1.60±0.25	0.40±0.25	1.25±0.30	1.05±0.30 & 0.80±0.3

■ELECTRICAL CHARACTERISTICS

TYPE	VALUE RANGE	Power Rating (Watt)	Resistance Tolerance (%)	TCR (ppm)
LRF0402	0.002Ω~0.003Ω	0.33	±1% (F)	±150
	0.005Ω~0.02Ω			±100
LRF0603	0.001Ω~0.002Ω	0.5	±1% (F)	±150
	0.003~0.005Ω	0.5=STANDARD OR 0.33		±200
	0.006~0.02Ω	0.33		±75
LRF0805	0.0015Ω	0.5	±1% (F)	±100
	0.002~0.005Ω			±75
	0.006~0.02Ω			±50
LRF1206	0.001Ω~0.004Ω	1.0	±1% (F)	±75
	0.005Ω~0.02Ω			±50

METAL FOIL CHIP FIXED RESISTOR

LRF Series

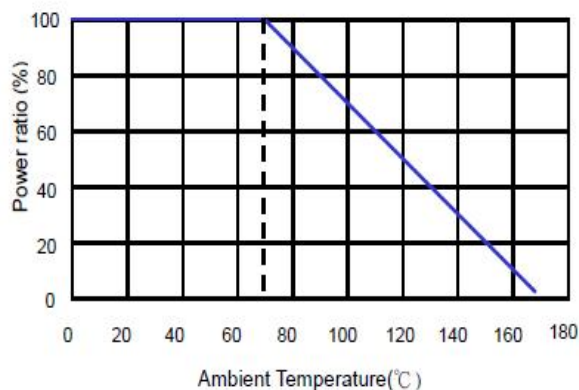


■PRODUCT CHARACTERISTICS AND RELIABILITY TEST STANDARD

Test Item	Specification	Test Method (AEC-Q200. IEC 60115)
Short Time Over Load	$P = 2.5P_r$; $T = 25 \pm 2^\circ\text{C}$, $t = 5\text{sec.}$	$\pm(1.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.13
High Temp. Exposure	$T = +155 \pm 2^\circ\text{C}$; $t = 1000\text{h}$	$\pm(1.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.25
Low Temp. Storage	$T = -55 \pm 2^\circ\text{C}$; $t = 1000\text{h}$	$\pm(1.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.25
Moisture Load Life (60°C、95%RH)	$V_{\text{test}} = V_{\text{max}}$; $T = 60 \pm 2^\circ\text{C}$; $\text{RH} = 95\%$; $t = 90\text{min ON}$, 30min OFF , 1000h	$\pm(2.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.25
Thermal Shock	$[-55^\circ\text{C } 30\text{min.} \rightarrow \text{R.T. } 3\text{min.} \rightarrow$ $+155^\circ\text{C } 30\text{min.} \rightarrow \text{R.T. } 3\text{min.}]$	$\pm(1.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.19
Load Life at 70°C	$V_{\text{test}} = V_{\text{max}}$; $T = 70 \pm 2^\circ\text{C}$; $t =$ 90min ON , 30min OFF , 1000h	$\pm(2.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.25
Solderability	Dip into solder at $T = 245 \pm 5^\circ\text{C}$, $t = 3 \pm 0.5\text{sec}$	The covered area $> 95\%$ IEC60115-1 4.17
Resistance to Solder Heat	Through Reflow $T = 275 \pm 5^\circ\text{C}$, $t = 20 \pm 1\text{sec.}$	$\pm(1.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.18
Mechanical Shock	$a = 100\text{G}$, $t = 11\text{ms}$, 5 times shock	$\pm(1.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.21
Substrate Bending	Span between fulcrums : 90mm ; Bend Width: 2mm ; Testboard: GlassEpoxyBoard ; Thickness = 1.6mm	$\pm(1.0\% + 0.5\text{m}\Omega)$ IEC60115-1 4.33

■ENVIRONMENTAL CHARACTERISTIC

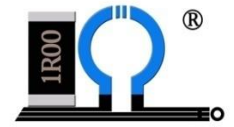
-55°C ~ 155°C / Operating Temperature: -55°C ~ 155°C



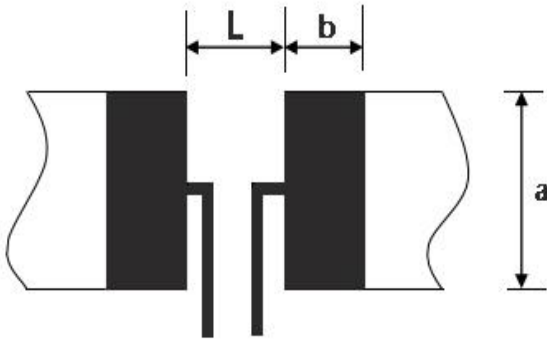
■Power rating is based on continuous full load operation at rated ambient temperature of 70 °C. For resistors operated at ambient temp. in excess of 70 °C, the max. load shall be derated in accordance with the following curve.

METAL FOIL CHIP FIXED RESISTOR

LRF Series



■SOLDER PAD SIZE AND WELDING CONDITIONS



loading :suit for specific pad layout and specific steady current

TYPE	L	a	b	Loading
LRF0402:0.002~0.003Ω	0.35mm	0.60mm	0.60mm	0.33w
LRF0402:0.005~0.025Ω	0.40mm	0.60mm	0.60mm	0.33w

TYPE	L	a	b	Loading
LRF0603:0.001Ω~0.002Ω	0.38mm	0.92mm	1.41mm	0.33w 0.5w
LRF0603:0.002~0.003Ω	0.50mm	0.92mm	1.35mm	0.33w 0.5w
LRF0603:0.004~0.02Ω	0.60mm	0.92mm	1.30mm	0.33w 0.5w

TYPE	L	a	b	Loading
LRF0805:0.0015~0.002Ω	0.50mm	1.44mm	1.55mm	0.5w
LRF0805:0.003~0.02Ω	0.80mm	1.44mm	1.40mm	0.5w

TYPE	L	a	b	Loading
LRF1206:0.001Ω	0.50mm	1.84mm	2.15mm	1w
LRF1206:0.002Ω	0.60mm	1.84mm	2.10mm	1w
LRF1206:0.003~0.02Ω	1.20mm	1.84mm	1.80mm	1w

METAL FOIL CHIP FIXED RESISTOR

LRF Series



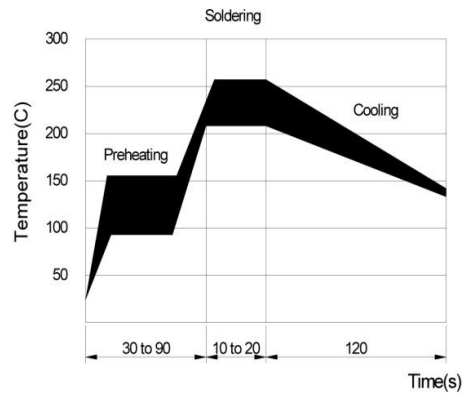
Recommended Customer Soldering Parameters

Solder reflow Temperature condition

Preheating : $145 \pm 15^{\circ}\text{C}$, max.120 sec.

Soldering : min. 220°C , max. 60 sec.

Maximum temperature : $260 \pm 5^{\circ}\text{C}$, max. 10sec.



Rework temperature (hot air equipment) : 350°C ,

Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements

TCR : Getting the sampling device resistance values measured in 25°C and 125°C and put them in to the following equation to calculate the TCR

Acceptance Criteria :

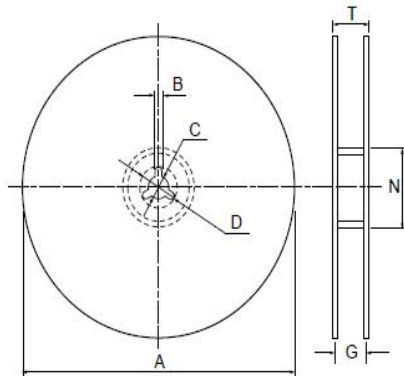
All parts must within the specific

PACKAGING INFORMATION

QUANTITY & WEIGHT

Type Number	Quantity (pcs)	Weight (g)
LRF0402	10000	100 ± 30
LRF0603	5000	110 ± 30
LRF0805	5000	120 ± 30
LRF1206	5000	140 ± 30

Reel Dimensions



SIZE	A	B	N	C	T
LRF0402	$178\text{mm} \pm 2.0$	$2.0\text{mm} \pm 0.5$	$60\text{mm} \pm 1.0$	$9\text{mm} \pm 1.0$	$11\text{mm} \pm 2.0$
LRF0603	$178\text{mm} \pm 2.0$	$2.0\text{mm} \pm 0.5$	$60\text{mm} \pm 1.0$	$9\text{mm} \pm 1.0$	$11\text{mm} \pm 2.0$
LRF0805	$178\text{mm} \pm 2.0$	$2.0\text{mm} \pm 0.5$	$60\text{mm} \pm 1.0$	$9\text{mm} \pm 1.0$	$11\text{mm} \pm 2.0$
LRF1206	$178\text{mm} \pm 2.0$	$2.0\text{mm} \pm 0.5$	$60\text{mm} \pm 1.0$	$9\text{mm} \pm 1.0$	$11\text{mm} \pm 2.0$