

Metal Foil Current Sense Resistors, Low Value (Down to 0.001 Ω)



FEATURES

- Ultra low sensing resistance
- Low TCR (down to 50 ppm/°C)
- Chip size down to 0402, minimizing board space
- Sulfur resistant
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Switching power supply
- Voltage regulation module
- DC/DC converter, adaptor, battery pack, charger
- Pad and cell phone
- Power management

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE	POWER RATING W	TOLERANCE %	RESISTANCE VALUE RANGE Ω	WEIGHT (typical) g/1000 pieces
WFC0402	0402	0.125	$\pm 1, \pm 2, \pm 5$	0.003 to 0.05	1.1
WFC0603	0603	0.33	$\pm 1, \pm 2, \pm 5$	0.001 to 0.005	3.3
	0603	0.25	$\pm 1, \pm 2, \pm 5$	0.0051 to 0.03	3.3
WFC0805	0805	0.50	$\pm 1, \pm 2, \pm 5$	0.001 to 0.04	6.8
WFC1206	1206	1.0	$\pm 1, \pm 2, \pm 5$	0.001 to 0.05	17.4
	1206	0.5	$\pm 1, \pm 2, \pm 5$	0.100 to 0.18	17.4

GLOBAL PART NUMBER INFORMATION

Global Part Numbering Example: WFC1206R0100FE66

W	F	C	1	2	0	6	R	0	1	0	0	F	E	6	6
GLOBAL MODEL (3 digits)			CASE SIZE (EIA) (4 digits)				RESISTANCE VALUE (5 digits) ⁽¹⁾					TOLERANCE CODE (1 digit)	PACKAGING CODE (3 digits)		
WFC			0402 0603 0805 1206				L = m Ω ⁽²⁾ R = decimal 5L000 = 0.005 Ω R0100 = 0.01 Ω					F = ± 1.0 % G = ± 2.0 % J = ± 5.0 %	E66 = lead (Pb)-free 7" tape/reel		

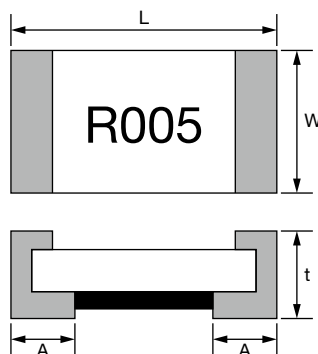
Notes

⁽¹⁾ Resistance values are available per E12 and E24 decades; www.vishay.com/doc?28372

⁽²⁾ Use "L" for resistance values < 0.01 Ω

TECHNICAL SPECIFICATIONS					
PARAMETER	UNIT	RESISTOR CHARACTERISTICS			
		WFC0402	WFC0603	WFC0805	WFC1206
Temperature coefficient	ppm/°C	± 100 for 8 mΩ to 50 mΩ	± 75 for 10 mΩ to 30 mΩ	± 50 for 10.1 mΩ to 40 mΩ	± 50 for 10.1 mΩ to 180 mΩ
		± 150 for 3 mΩ to 7 mΩ	± 150 for 5.1 mΩ to 9 mΩ	± 100 for 1 mΩ to 10 mΩ	± 100 for 1 mΩ to 10 mΩ
		-	± 100 for 1 mΩ to 5 mΩ	-	-
Operating temperature range	°C	-55 to +170			
Maximum working voltage	V	$(P \times R)^{1/2}$			
Maximum element temperature	°C	170			

DIMENSIONS in inches (millimeters)

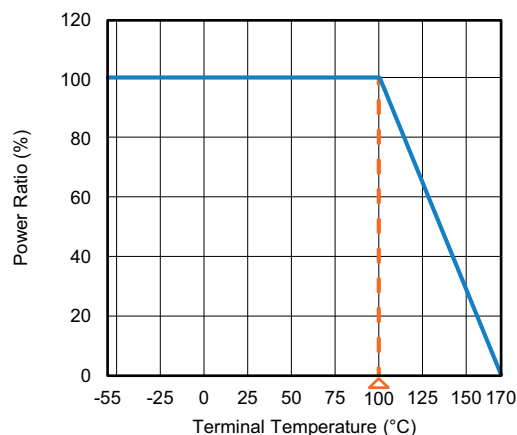


TYPE (INCH SIZE)	RESISTANCE RANGE (mΩ)	DIMENSIONS (in millimeters)			
		L	W	t	A
WFC0402	7.1 to 50	1.00 ± 0.10	0.55 ± 0.10	0.45 ± 0.10	0.25 ± 0.10
	3 to 7				0.35 ± 0.10
WFC0603	5 to 30	1.60 ± 0.10	0.80 ± 0.10	0.55 ± 0.15	0.30 ± 0.20
	1 to 5		0.95 ± 0.25	0.60 ± 0.25	0.55 ± 0.20
WFC0805	5 to 40	2.00 ± 0.20	1.30 ± 0.15	0.70 ± 0.15	0.45 ± 0.20
	1 to 5	2.10 ± 0.20	1.40 ± 0.20	0.60 max.	0.60 ± 0.20
WFC1206	1 to 3	3.10 ± 0.20	1.55 ± 0.20	0.75 ± 0.25	1.30 ± 0.20
	3 to 180			0.80 ± 0.15	0.55 ± 0.20

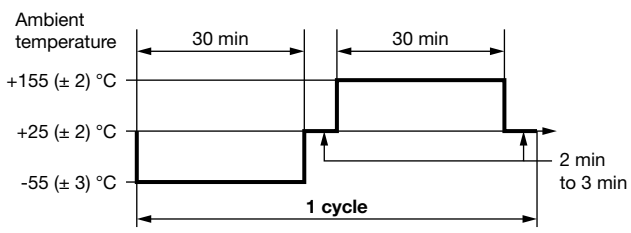
Note

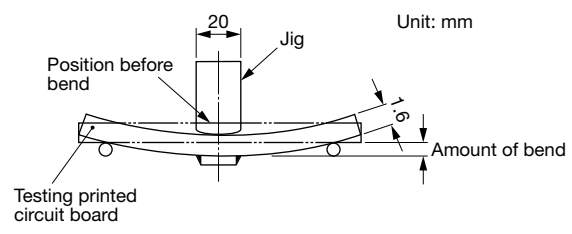
- 0402 has no marking; 0603, 0805, 1206 marking shows two digits for resistance

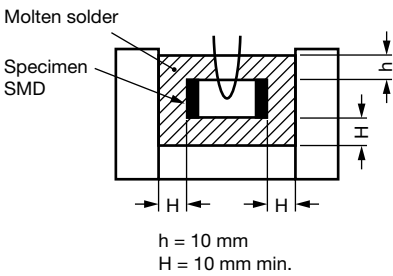
DERATING



PERFORMANCES

ENVIRONMENTAL PERFORMANCE			
NO.	ITEM	TEST CONDITION	SPECIFICATION
1	Short time overload	5 times rated power for 5 seconds (JIS-C5202-5.5)	$\Delta R: \pm (1 \% + 0.0005 \Omega)$
2	Temperature coefficient of resistance (TCR)	+25 °C / +125 °C (JIS-C5202-5.2) $TCR (ppm/^{\circ}C) = \frac{\Delta R}{R \times \Delta t} \times 10^6$	Refer to Electrical Specification
3	Damp heat with load	The specimens shall be placed in a chamber and subjected to a relative humidity of 90 % to 95 % and a temperature of 40 °C \pm 2 °C for the period of 1000 hours with applying rated power 1.5 hours ON and 0.5 hour OFF. (MIL-STD-202, method 103)	$\Delta R: \pm (1 \% + 0.0005 \Omega)$
4	High temperature exposure	The chip (mounted on board) is exposed in the heat chamber 125 °C \pm 3 °C for 1000 hours. (JIS-C5202-7.2)	$\Delta R: \pm (1 \% + 0.0005 \Omega)$
5	Load life	Apply rated power at 70 °C \pm 2 °C for 1000 hours with 1.5 hours ON and 0.5 hour OFF. (JIS-C5202-7.10)	$\Delta R: \pm (1 \% + 0.0005 \Omega)$
6	Rapid change of temperature	The chip (mounted on board) is exposed, -55 °C \pm 3 °C (30 min.) / +155 °C \pm 2 °C (30 min.) for 5 cycles. The following conditions as the following figure. (JIS-C5202-7.4) 	$\Delta R: \pm (1 \% + 0.0005 \Omega)$

FUNCTION PERFORMANCE			
NO.	ITEM	TEST CONDITION	SPECIFICATION
1	Bending strength	Mount the chip to test substrate. Apply pressure in direction of arrow unit band width reaches 2 mm (+0.2 / -0 mm) illustrated in the figure below and hold for 10 s \pm 1 s. (JIS-C5202-6.1) 	$\Delta R: \pm (1 \% + 0.0005 \Omega)$
2	Solvent resistance	Complete immersion of specimens in isopropyl alcohol for 3 (+5, -0) min. 25 °C \pm 5 °C. (MIL-STD-202, method 215)	Verify marking permanency. (not required for laser etched parts or parts with no marking)
3	Resistance to solder heat	The specimen chip shall be immersed into the flux specified in the solder bath 260 °C \pm 5 °C for 10 s \pm 1 s. (MIL-STD-202, method 210)	$\Delta R: \pm (1 \% + 0.0005 \Omega)$

FUNCTION PERFORMANCE			
NO.	ITEM	TEST CONDITION	SPECIFICATION
4	Solderability	<p>The specimen chip shall be immersed into the flux specified in the solder bath $235^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for $2 \text{ s} \pm 0.5 \text{ s}$. It shall be immersed to a point 10 mm from its root. (Sn96.5 / Ag3.0 / Cu0.5) (JIS-C5 202-6.11)</p>  <p>h = 10 mm H = 10 mm min.</p>	Solder shall be covered 95 % or more of the electrode area.

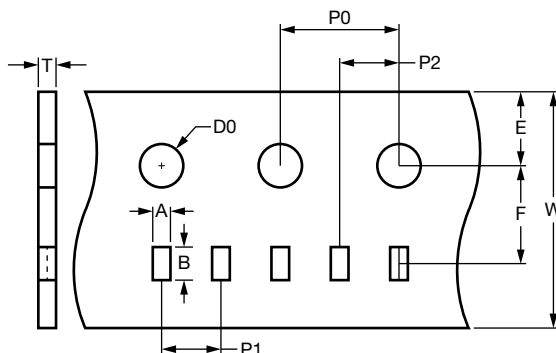
Notes

- 0.5 W with total solder pad trace size of 100 mm². The surface temperature of component should below 100 °C
- 1.0 W with total solder pad trace size of 100 mm². The surface temperature of component should below 100 °C

TAPE PACKAGING SPECIFICATIONS			
MODEL	REEL		
	TAPE WIDTH	DIAMETER	PIECES/REEL
WFC0402	Embossed paper tape	178 mm / 7"	10 000
WFC0603, WFC0805, WFC1206	Embossed paper tape	178 mm / 7"	5000

Note

- Embossed carrier tape per EIA (EIAJ)

PAPER TAPE SPECIFICATIONS


TYPE	RESISTANCE RANGE	CARRIER DIMENSIONS (in millimeters)									
		A	B	E	F	W	P0	P1	P2	D0	T
WFC0402	3 mΩ to 50 mΩ	0.7 ± 0.05	1.2 ± 0.05	1.75 ± 0.1	3.5 ± 0.05	8.0 ± 0.2	4.0 ± 0.1	2.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	0.6 ± 0.1
WFC0603	1 mΩ to 5 mΩ	1.4 ± 0.1	1.9 ± 0.1	1.75 ± 0.1	3.5 ± 0.05	8.0 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	0.75 ± 0.1
WFC0603	5.1 mΩ to 30 mΩ	1.1 ± 0.1	1.9 ± 0.1	1.75 ± 0.1	3.5 ± 0.05	8.0 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	0.70 ± 0.1
WFC0805	1 mΩ to 5 mΩ	2.4 ± 0.1	1.9 ± 0.1	1.75 ± 0.1	3.5 ± 0.05	8.0 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	0.75 ± 0.1
WFC0805	5.1 mΩ to 40 mΩ	1.6 ± 0.1	2.4 ± 0.1	1.75 ± 0.1	3.5 ± 0.05	8.0 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	0.97 ± 0.1
WFC1206	1 mΩ to 3 mΩ	2.0 ± 0.1	3.6 ± 0.1	1.75 ± 0.1	3.5 ± 0.05	8.0 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	0.87 ± 0.1
WFC1206	3.1 mΩ to 180 mΩ	2.0 ± 0.1	3.6 ± 0.1	1.75 ± 0.1	3.5 ± 0.05	8.0 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	0.97 ± 0.1

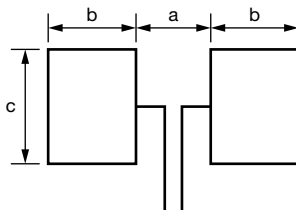
Notes

- Embossed carrier tape per EIA (EIAJ)
- Additional packaging details at www.vishay.com/doc?20051

STORAGE CONDITIONS

Temperature: 5 °C to 35 °C, humidity: 40 % to 75 %

RECOMMENDED SOLDER PAD LAYOUT



TYPE	PAD LAYOUT DIMENSIONS (in millimeters)		
	a	b	c
0402 (7.1 mΩ to 50 mΩ)	0.50	0.50	0.60
0402 (3 mΩ to 7 mΩ)	0.30	0.60	0.60
0603 (9.1 mΩ to 30 mΩ)	0.90	0.70	1.00
0603 (5 mΩ to 9 mΩ)	0.60	0.90	1.00
0805 (1 mΩ to 5 mΩ)	0.80	1.60	1.45
0805 (5.1 mΩ to 40 mΩ)	1.20	1.20	1.40
1206 (1 mΩ to 3 mΩ)	0.40	1.80	2.20
1206 (3.1 mΩ to 180 mΩ)	2.20	1.30	1.80

Note

- Recommend to use the steel plate which thickness > 100 μm to avoid the insufficient solder height

SOLDERING RECOMMENDATIONS

- Peak reflow temperatures and durations:
 - IR reflow peak = 260 °C max. for 10 s
 - Wave solder = 260 °C max. for 10 s
- Compatible with lead and lead (Pb)-free solder reflow processes
- Recommended IR reflow profile for surface mount devices: www.vishay.com/doc?31052



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