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
- AEC-Q200 qualified available
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

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	± 1, ± 2, ± 5	0.003 to 0.05	1.1
WFC0603	0603	0.33	± 1, ± 2, ± 5	0.001 to 0.005	3.3
	0603	0.25	± 1, ± 2, ± 5	0.0051 to 0.03	3.3
WFC0805	0805	0.50	± 1, ± 2, ± 5	0.001 to 0.04	6.8
WFC1206 (1)	1206	1.0	± 1, ± 2, ± 5	0.001 to 0.05	17.4
	1206	0.5	± 1, ± 2, ± 5	0.100 to 0.18	17.4

Note

(1) AEC-Q200 test data available upon request

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 (3) (1 digit)	PACKAGING CODE (3 digits)
WFC	**0402** **0603** **0805** **1206**	**L** = mΩ (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

(3) Please contact factory for 0.5 % (D tolerance) availability

TECHNICAL SPECIFICATIONS					
PARAMETER	UNIT	RESISTOR CHARACTERISTICS			
		WFC0402	WFC0603	WFC0805	WFC1206
Temperature coefficient	ppm/°C	-	± 100 for 1 mΩ to 5 mΩ	-	0 to +225 for 1 mΩ to 2.9 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 3 mΩ to 9.9 mΩ
		± 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 mΩ to 180 mΩ
Operating temperature range	°C	-55 to +170			
Maximum working voltage	V	$(P \times R)^{1/2}$			
Maximum element temperature	°C	170			

Note

- Temperature range of TCR rating is 25 °C to 125 °C

DIMENSIONS in inches (millimeters)

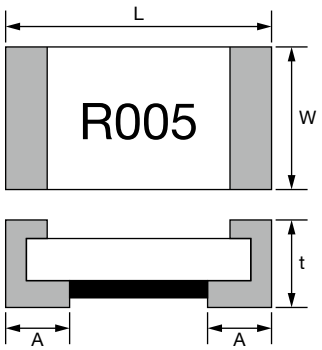


Fig. 1

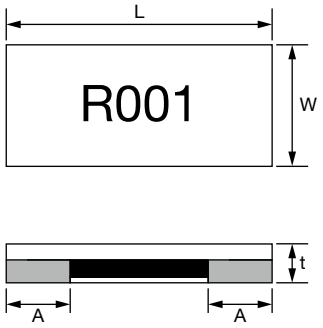


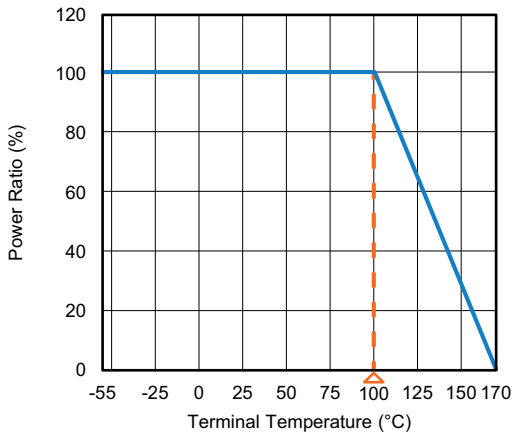
Fig. 2

TYPE (INCH SIZE)	RESISTANCE RANGE (mΩ)	DIMENSIONS (in millimeters)				DIMENSIONS FIG.
		L	W	t	A	
WFC0402	3	1.00 ± 0.15	0.55 ± 0.15	0.40 ± 0.15	0.35 ± 0.15	2
	3.1 to 8	1.00 ± 0.10	0.55 ± 0.10	0.45 ± 0.10	0.35 ± 0.10	1
	8.1 to 50				0.25 ± 0.10	1
WFC0603	1 to 5	1.60 ± 0.20	1.05 ± 0.20	0.50 ± 0.15	0.50 ± 0.20	2
	5.1 to 30	1.60 ± 0.10	0.80 ± 0.10	0.55 ± 0.15	0.30 ± 0.20	1
WFC0805	1 to 5	2.03 ± 0.20	1.40 ± 0.20	0.50 max.	0.50 ± 0.20	2
	5.1 to 40	2.10 ± 0.20	1.30 ± 0.15	0.70 ± 0.15	0.35 ± 0.20	1
WFC1206	1 to 3	3.20 ± 0.25	1.65 ± 0.25	0.65 max.	1.19 ± 0.25	2
	3.1 to 180	3.10 ± 0.20	1.55 ± 0.20	0.80 ± 0.15	0.55 ± 0.30	1

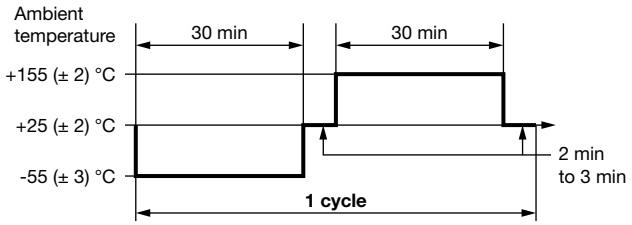
Note

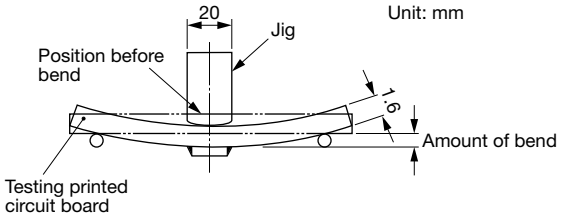
- 0402, 0603 (1 mΩ to 5 mΩ), 0805 (1 mΩ to 5 mΩ), and 1206 (1 mΩ to 3 mΩ) do not have marking. All other values have two digits for resistance in marking

DERATING

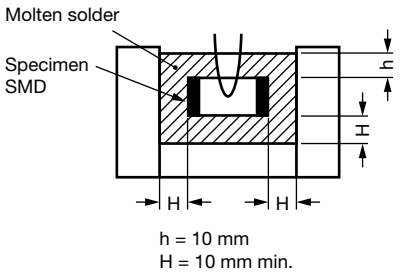


PERFORMANCES

ENVIRONMENTAL PERFORMANCE			
NO.	**ITEM**	**TEST CONDITION**	**SPECIFICATION**
1	Short time overload	5 times rated power for 5 seconds (JIS-C5202-5.5)	ΔR: ± (1 % + 0.0005 Ω)
2	Temperature coefficient of resistance (TCR)	+25 °C / +125 °C (JIS-C5202-5.2) $TCR\ (ppm/°C) = \frac{\Delta R}{R \times \Delta t} \times 10^6$	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 ± 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)	ΔR: ± (1 % + 0.0005 Ω)
4	High temperature exposure	The chip (mounted on board) is exposed in the heat chamber 125 °C ± 3 °C for 1000 hours. (JIS-C5202-7.2)	ΔR: ± (1 % + 0.0005 Ω)
5	Load life	Apply rated power at 70 °C ± 2 °C for 1000 hours with 1.5 hours ON and 0.5 hour OFF. (JIS-C5202-7.10)	ΔR: ± (1 % + 0.0005 Ω)
6	Rapid change of temperature	The chip (mounted on board) is exposed, -55 °C ± 3 °C (30 min.) / +155 °C ± 2 °C (30 min.) for 5 cycles. The following conditions as the following figure. (JIS-C5202-7.4) 	ΔR: ± (1 % + 0.0005 Ω)

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 ± 1 s. (JIS-C5202-6.1) 	ΔR: ± (1 % + 0.0005 Ω)
2	Solvent resistance	Complete immersion of specimens in isopropyl alcohol for 3 (+5, -0) min. 25 °C ± 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 ± 5 °C for 10 s ± 1 s. (MIL-STD-202, method 210)	ΔR: ± (1 % + 0.0005 Ω)

FUNCTION PERFORMANCE

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

Notes

- 0.5 W with total solder pad trace size of 100 mm^2. The surface temperature of component should below 100 °C
- 1.0 W with total solder pad trace size of 100 mm^2. The surface temperature of component should below 100 °C

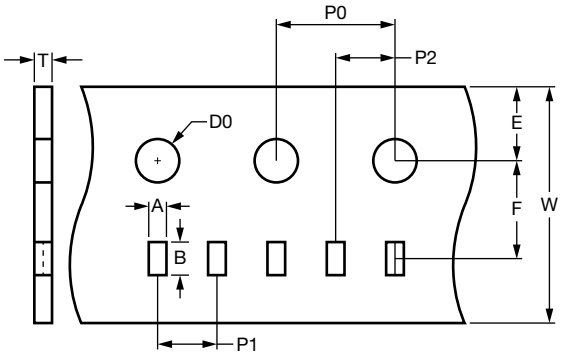
TAPE PACKAGING SPECIFICATIONS

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

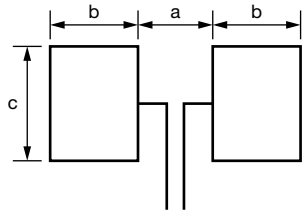
Notes

- 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 (3 mΩ to 7 mΩ)	0.30	0.60	0.60
0402 (7.1 mΩ to 50 mΩ)	0.50	0.50	0.60
0603 (1 mΩ to 5 mΩ)	0.30	1.10	1.50
0603 (5.1 mΩ to 9 mΩ)	0.60	0.90	1.00
0603 (9.1 mΩ to 30 mΩ)	0.90	0.70	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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