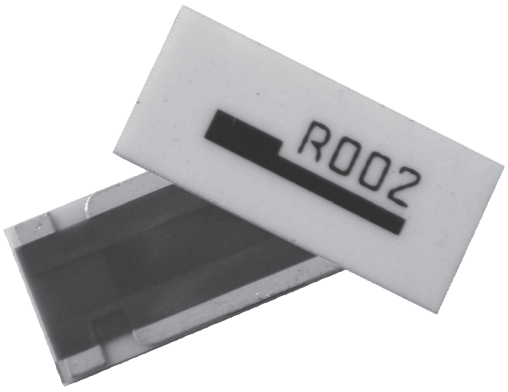
FC4L Series

FC4L Four Terminal Current Sense Metal Foil Construction



FEATURES

- Foil Construction ensures a very stable TCR (Temperature Coefficient of Resistance)
- Designed for automatic insertion
- Industry standard sizes
- High heat resistant use
- Low heat electromotive use
- Color: white (top) and green (bottom)

Ohmite offers the low TCR FC4L series in 0.25 watts up to 5 watts and values down to 1 milli-ohm. Great stability is achieved by employing a Ni-Cu-Mn resistive element. The FC4L series affords the user an added advantage of a built in 4-terminal design with 2 larger electrodes for current management and 2 smaller electrodes for current measurement.

SERIES SPECIFICATIONS

Series	Power Rating	Resistance Range	Tol.	TCR (ppm/°C)	Weight (g)
FC4L16	0.25W	5m, 10m, 20m, 50mΩ ~ 100mΩ	±1%	±50	0.004
FC4L32	1W	1mΩ	±5%	±100	0.015
		2mΩ	±2%	±100	
		3mΩ	±1%	±100	
		4mΩ ~ 500mΩ	±1%	±50	
FC4L64	2W	1mΩ	±5%	±100	0.038
		2mΩ	±2%	±100	
		3mΩ	±1%	±100	
		4m ~ 100mΩ	±1%	±50	
		10m ~ 50mΩ	±0.5%	±50	

Series	Power Rating	Resistance Range	Tol.	TCR (ppm/°C)	Weight (g)
FC4L76	3W	1m-4mΩ	±1%	±100	0.062
		5m-25mΩ	±0.5%, 1%	±50	
FC4L90	4W	1m-4mΩ	±1%	±100	0.082
		5m-25mΩ	±0.5%, 1%	±50	
FC4L110	5W	1mΩ	±5%	±100	0.110
		2mΩ	±2%	±50	
		3mΩ ~ 100mΩ	±1%	±50	
		10m ~ 50mΩ	±0.5%	±50	

CHARACTERISTICS

Test	Condition	Maximum ΔR
Max. temperature for rated power	70°C	
Operating temperature range	-55°C ~ +155°C (FC4L16: -40°C ~ +125°C)	
Rated voltage	√(Rated power x Resistance value) V	
Overload (FC4L16 only)	Rated power x 1.5 for 5s	±(0.5%+0.0005Ω)
In-rush current	Rated current 10 msec ON, 60 sec OFF, 10 cycles. (see table next page)	±(1.0% +0.0005Ω)
Rapid change of temperature	-55°C (30min.)/+155°C (30min.), 100 cycles (FC4L16: 1000 cycles)	±(1.0% +0.0005Ω) (FC4L16: ±(2.0%+0.0005Ω))
Solderability	245°C ±5°C for 3 ±0.5 sec.	Min. 90% coverage (FC4L76 & 90: 95%)
Endurance	70°C ±3°C, Rated voltage 1.5h ON, 0.5h OFF, 1000h (FC4L76 & 90: 100°C)	±(1.0% +0.0005Ω) (FC4L76 & 90: ±(3.0%+0.5mΩ))
Resistance to soldering heat	260°C ±5°C for 10 ±1 sec. (FC4L76 & 90: 20 ±1)	±(1.0% +0.0005Ω) (FC4L16: ±0.5%) (FC4L76 & 90: No evidence of mechanical damage)
Moisture resistance	60°C ±2°C, 90~95% RH, Rated voltage 1.5h ON, 0.5h OFF, 1,000h (76 & 90: 85 ±2°C, 85±5%RH, 10% Rated power, 1,000h)	±(2.0% +0.0005Ω) (FC4L16: ±1.0%) (FC4L76 & 90: ±(3% +0.0005Ω))

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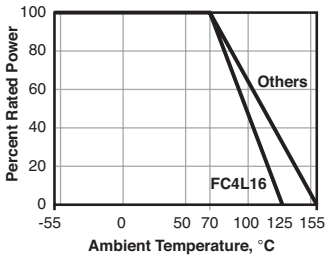
In-rush current

Series	Power Rating	Resistance Range	In-rush Power	Max. Current
FC4L16	0.25 watt	5m, 10mΩ	2.5W	5A
FC4L32	1 watt	1mΩ~9mΩ 10mΩ~500mΩ	25W 12.5W	45A 24A
FC4L64	2 watt	1mΩ~9mΩ 10mΩ~100mΩ	100W 50W	85A 35A
FC4L76	3 watt	1mΩ~9mΩ 10mΩ~***mΩ	110W 55W	90A 40A
FC4L90	4 watt	1mΩ~9mΩ 10mΩ~***mΩ	120W 60W	95A 45A
FC4L110	5 watt	1mΩ~50mΩ	100W	100A

In-rush current = √(in-rush power/resistance value), or max. current, whichever is smaller

Derating

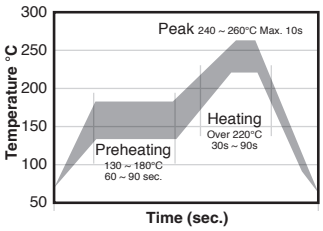


Recommended Reflow Temperature Profile

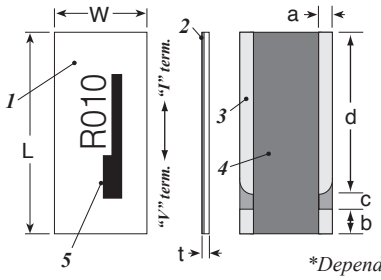
For lead free soldering (Sn-Ag-Cu solder)

Preheating:	130° ~ 180°	60s ~ 90s
Heating:	Over 220°	30s ~ 90s
Peak:	240° ~ 260°	Max. 10s

Max. number of reflow: 2



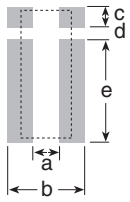
DIMENSIONS



1. *Alumina substrate*
2. *Resistive element (Ni-Cu-Mn alloy)**
3. *Electrode (Ni, Sn)**
4. *Protective coating (Epoxy resin)*
5. *Marking (Epoxy resin): **wider mark indicates "V" term.***

**Dependent on size and value*

Land Pattern

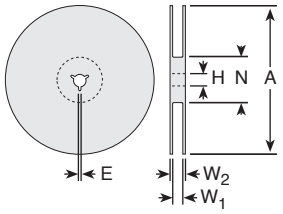


	Rating	L (in.±.008/mm ±0.20)	W (in.±.008/mm ±0.20)	a (in./mm)	b mm ±0.15	c mm ±0.1	d mm ±0.15	t mm
FC4L16	0.25 watt	0.063 / 1.60	0.031 / 0.8	0.010 / 0.26	0.30 ±.2	0.3 ±.2	1.0 ±.2	0.5 +.2/-.05
FC4L32	1 watt	0.126 / 3.20	0.063 / 1.6	0.014 / 0.35	0.35	0.2	2.6	0.5 +.2/-.05
FC4L64	2 watt	0.251 / 6.40	0.126 / 3.2	0.020 / 0.5	0.7	0.5	5.2	0.5 +.2/-.05
FC4L76	3 watt	0.30 / 7.60 ±0.3mm	0.15 / 3.8 ±0.3mm	0.02 / 0.55 ±0.2mm	0.75 ±0.2mm	0.60 ±0.2mm	6.15 ±0.3mm	0.60 ±.20
FC4L90	4 watt	0.35 / 9.00 ±0.3mm	0.18 / 4.5 ±0.3mm	0.03 / 0.65 ±0.2mm	0.90 ±0.2mm	0.75 ±0.2mm	7.25 ±0.3mm	0.60 ±.20
FC4L110	5 watt	0.433 / 11.0	0.197 / 5.0	0.028 / 0.7	1.4	1.1	8.5	0.5 +.2/-.05

(mm)	a	b	c	d	e
FC4L16	0.25	1.2	0.40	0.30	1.2
FC4L32	0.4	2.7	0.35	0.3	2.7
FC4L64	2.0	4.4	0.7	0.5	5.4
FC4L76	2.4	4.80	0.95	0.45	6.60
FC4L90	2.8	5.60	1.10	0.55	7.80
FC4L110	3.2	5.6	1.6	1.1	8.7

PACKAGING SPECIFICATIONS

Reel



	FC4L16	FC4L32 & 64	FC4L76 & 90	FC4L110
A	7.087 (180 +0/-3)	7.087 (180 +0/-3)	7.087 (180 +1.0/-3.0)	7.087 (180 ±2.0)
H	0.512 (13 ±0.2)	0.512 (13 ±0.2)	0.512 (13 ±0.2)	0.512 (13 ±0.2)
E	0.079 (2.0 ±0.5)	0.079 (2.0 ±0.5)	0.079 (2.0 ±0.5)	0.079 (2.0 ±0.5)
N	2.362 (60 +1/-0)	2.362 (60 +1/-0)	2.362 (60 +1/-0)	0.827 (21 ±0.8)
W1	0.354 (9.0 ±0.3)	0.512 (13.0 ±0.3)	0.827 (21 ±0.8)	1.000 (25.4 ±1.0)
W2	0.512 (13.0 ±0.3)	0.669 (17.0 ±1.4)	0.669 (17.0 ±.3)	1.157 (29.4 ±1.0)

(continued)

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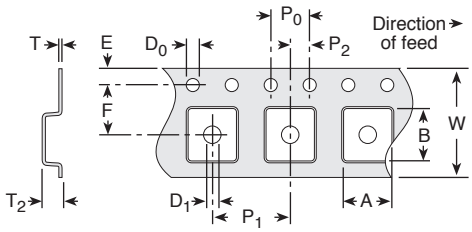
PACKAGING SPECIFICATIONS

(continued)

Tape

inches (mm)



	FC4L16	FC4L32	FC4L64	FC4L76	FC4L90	FC4L110
A	0.037 (0.95±0.05)	0.075 (1.90 ±0.1)	0.135 (3.43 ±0.2)	0.163 (4.15 ±0.20)	0.191 (4.85 ±0.20)	0.213 (5.40 ±0.10)
B	0.073 (1.85±0.05)	0.138 (3.50 ±0.1)	0.261 (6.63 ±0.2)	0.313 (7.95 ±0.20)	0.368 (9.35 ±0.20)	0.453 (11.50 ±0.10)
W	0.315 (8.00±0.10)	0.315 (8.00 ±0.2)	0.472 (12.0 ±0.3)	0.630 (16.00 ±0.30)	0.630 (16.00 ±0.30)	0.945 (24.00 ±0.30)
F	0.138 (3.50±0.05)	0.138 (3.50 ±0.05)	0.069 (1.75 ±0.1)	0.295 (7.50 ±0.10)	0.295 (7.50 ±0.10)	0.069 (1.75 ±0.10)
E	0.069 (1.75±0.10)	0.069 (1.75 ±0.1)	0.217 (5.5 ±0.05)	0.069 (1.75 ±0.10)	0.069 (1.75 ±0.10)	0.453 (11.50 ±0.10)
P0	0.157 (4.00±0.10)	0.157 (4.0 ±0.1)	0.157 (4.0 ±0.1)	0.157 (4.00 ±0.10)	0.157 (4.00 ±0.10)	0.157 (4.00 ±0.10)
P1	0.157 (4.00±0.10)	0.157 (4.0 ±0.1)	0.157 (4.0 ±0.1)	0.315 (8.00 ±0.10)	0.315 (8.00 ±0.10)	0.315 (8.00 ±0.10)
P2	0.079 (2.00±0.05)	0.079 (2.0 ±0.05)	0.079 (2.0 ±0.05)	0.079 (2.00 ±0.10)	0.079 (2.00 ±0.10)	0.079 (2.00 ±0.10)
D0	0.059 (1.50+0.10/-0)	0.059 (1.50 +0.1/-0)	0.059 (1.5 +0.1/-0)	0.059 (1.50 ±0.10)	0.059 (1.50 ±0.10)	0.059 (1.50 ±0.10)
D1	0.024 (0.60±0.05)	0.039 (1.00 +0.2/-0)	0.059 (1.5 +0.2/-0)			0.059 (1.50 ±0.10)
T	0.008 (0.20±0.05)	0.008 (0.20 ±0.05)	0.008 (0.20 ±0.05)	0.012 (0.30 ±0.10)	0.012 (0.30 ±0.10)	0.012 (0.30 ±0.05)
T2	0.022 (0.55±0.05)	0.039 (1.00 ±0.2)	0.059 (1.5) max.	0.063 (1.60) max.	0.063 (1.60) max.	0.047 (1.2 ±0.15)

ORDERING INFORMATION

Ohms
R005=0.005Ω
R050=0.050Ω

RoHS Compliant

F C 4 L 1 1 0 R 0 0 5 F E R

Series	TCR* (ppm)	Package Size	Tolerance	Taping Code
	W= 25	110=11050=5W	J = 5%	1,000 pc/reel
	V = 50	64=6432=2W	G=2%	FC4L16: 5,000 pc/reel
	L = *per chart above*	32=3216=1W	F = 1%	
		16=1608=0.25W	D = 0.5%	

**FC4L32 and FC4L64 values over 0.100Ω only*

Standard Part Numbers for FC4L series

0.25 watt	1 watt	2 watt	3 watt	4 watt	5 watt
			FC4L76R001GER	FC4L90R001GER	
	FC4L32R001JER	FC4L64R001JER			FC4L110R001JER
			FC4L76R002FER	FC4L90R002FER	
	FC4L32R002GER	FC4L64R002GER			FC4L110R002GER
	FC4L32R003FER	FC4L64R003FER	FC4L76R003FER	FC4L90R003FER	FC4L110R003FER
FC4L16R005FER	FC4L32R005FER	FC4L64R005FER	FC4L76R005FER	FC4L90R005FER	FC4L110R005FER
		FC4L64R010DER			FC4L110R010DER
FC4L16R010FER	FC4L32R010FER	FC4L64R010FER	FC4L76R010FER	FC4L90R010FER	FC4L110R010FER
		FC4L64R015DER			FC4L110R015DER
FC4L16R015FER	FC4L32R015FER	FC4L64R015FER	FC4L76R015FER	FC4L90R015FER	FC4L110R015FER
		FC4L64R020DER			FC4L110R020DER
FC4L16R020FER	FC4L32R020FER	FC4L64R020FER	FC4L76R020FER	FC4L90R020FER	FC4L110R020FER
		FC4L64R025DER			FC4L110R025DER
FC4L16R025FER	FC4L32R025FER	FC4L64R025FER	FC4L76R025FER	FC4L90R025FER	FC4L110R025FER
		FC4L64R030DER			FC4L110R030DER
FC4L16R030FER	FC4L32R030FER	FC4L64R030FER			FC4L110R030FER
		FC4L64R050DER			FC4L110R050DER
FC4L16R050FER	FC4L32R050FER	FC4L64R050FER			FC4L110R050FER
FC4L16R100FER	FC4L32R100FER	FC4L64R100FER			FC4L110R100FER

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