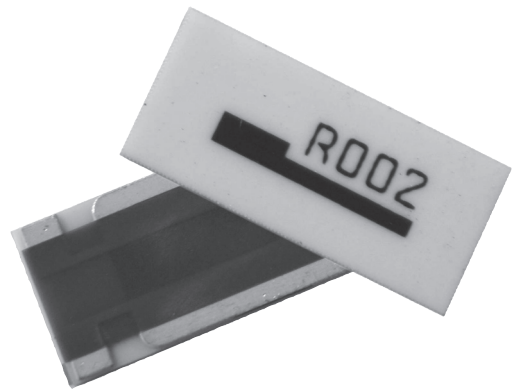


FC4L Series

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) | Series | Power Rating | Resistance Range | Tol. | TCR (ppm/°C) | Weight (g) |
|--------|--------------|---|-----------------------------------|------------------------------------|------------|---------|--------------|---|----------------------------|---------------------------|------------|
| FC4L16 | 0.25W | 5m, 10m, 20m, 50mΩ ~ 100mΩ | ±1% | ±50 | 0.004 | FC4L76 | 3W | 1m-4mΩ 5m-25mΩ | ±1% ±0.5%, 1% | ±100 ±50 | 0.062 |
| FC4L32 | 1W | 1mΩ 2mΩ 3mΩ 4mΩ ~ 500mΩ | ±5% ±2% ±1% ±1% | ±100 ±100 ±100 ±50 | 0.015 | FC4L90 | 4W | 1m-4mΩ 5m-25mΩ | ±1% ±0.5%, 1% | ±100 ±50 | 0.082 |
| FC4L64 | 2W | 1mΩ 2mΩ 3mΩ 4m ~ 100mΩ 10m ~ 50mΩ | ±5% ±2% ±1% ±1% ±0.5% | ±100 ±100 ±100 ±50 ±50 | 0.038 | FC4L110 | 5W | 1mΩ 2mΩ 3mΩ ~ 100mΩ 10m ~ 50mΩ | ±5% ±2% ±1% ±0.5% | ±100 ±50 ±50 ±50 | 0.110 |

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 $\sqrt{(\text{Rated power} \times \text{Resistance value})}$ 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)) |

FC4L Series

FC4L Four Terminal Current Sense Metal Foil Construction

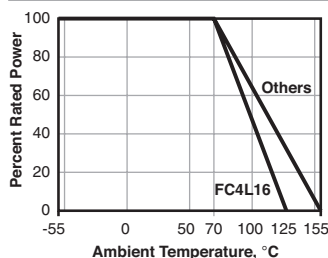
CHARACTERISTICS

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 = $\sqrt{\text{(in-rush power/resistance value)}}$, or max. current, whichever is smaller

Derating



Recommended Reflow Temperature Profile

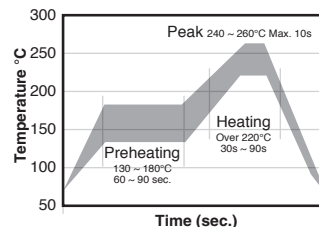
For lead free soldering (Sn-Ag-Cu solder)

Preheating: 130° ~ 180° 60s ~ 90s

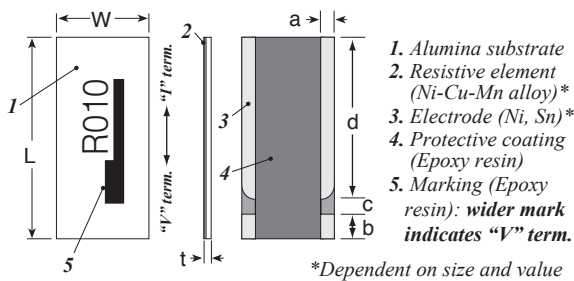
Heating: Over 220° 30s ~ 90s

Peak: 240° ~ 260° Max. 10s

Max. number of reflow: 2



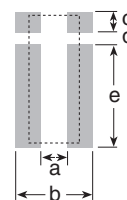
DIMENSIONS



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

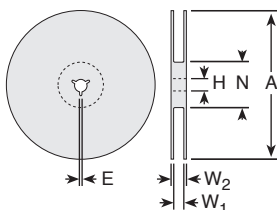


| Rating | L (in.±.008/mm±0.20) | W (in./mm) | a (in./mm) | b mm ±0.15 | c mm ±0.1 | d mm ±0.15 | t mm |
|---------|-------------------------|----------------------|-----------------------|----------------|----------------|----------------|---------------|
| FC4L16 | 0.063 / 1.60 | 0.031 / 0.8 | 0.010 / 0.26 | 0.30 ±.2 | 0.3 ±.2 | 1.0 ±.2 | 0.5 +.2/-0.05 |
| FC4L32 | 0.126 / 3.20 | 0.063 / 1.6 | 0.014 / 0.35 | 0.35 | 0.2 | 2.6 | 0.5 +.2/-0.05 |
| FC4L64 | 0.251 / 6.40 | 0.126 / 3.2 | 0.020 / 0.5 | 0.7 | 0.5 | 5.2 | 0.5 +.2/-0.05 |
| FC4L76 | 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 | 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 | 0.433 / 11.0 | 0.197 / 5.0 | 0.028 / 0.7 | 1.4 | 1.1 | 8.5 | 0.5 +.2/-0.05 |

| (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)

FC4L Series

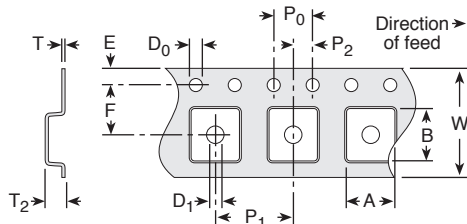
FC4L Four Terminal Current Sense Metal Foil Construction

PACKAGING SPECIFICATIONS

(continued)

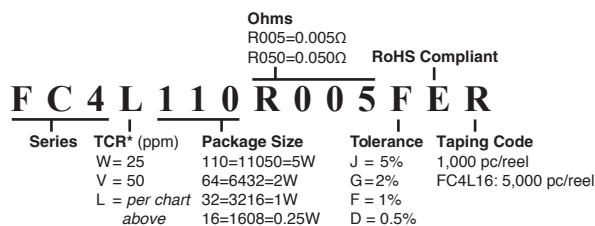
Tape

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



*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 |
|---------------|-----------|---------------|---------------|---------------|---------------|----------------|
| | | FC4L32R001JER | FC4L64R001JER | FC4L76R001GER | FC4L90R001GER | FC4L110R001JER |
| | | FC4L32R002GER | FC4L64R002GER | FC4L76R002FER | FC4L90R002FER | FC4L110R002GER |
| | | FC4L32R003FER | FC4L64R003FER | FC4L76R003FER | FC4L90R003FER | FC4L110R003FER |
| FC4L16R005FER | | FC4L32R005FER | FC4L64R005FER | FC4L76R005FER | FC4L90R005FER | FC4L110R005FER |
| | | | FC4L64R010DER | FC4L76R010FER | FC4L90R010FER | FC4L110R010DER |
| FC4L16R010FER | | FC4L32R010FER | FC4L64R010FER | | | FC4L110R010FER |
| | | | FC4L64R015DER | FC4L76R015FER | FC4L90R015FER | FC4L110R015DER |
| FC4L16R015FER | | FC4L32R015FER | FC4L64R015FER | | | FC4L110R015FER |
| | | | FC4L64R020DER | FC4L76R020FER | FC4L90R020FER | FC4L110R020DER |
| FC4L16R020FER | | FC4L32R020FER | FC4L64R020FER | | | FC4L110R020FER |
| | | | FC4L64R025DER | FC4L76R025FER | FC4L90R025FER | FC4L110R025DER |
| FC4L16R025FER | | FC4L32R025FER | FC4L64R025FER | | | FC4L110R025FER |
| | | | FC4L64R030DER | FC4L76R030FER | FC4L90R030FER | FC4L110R030DER |
| FC4L16R030FER | | FC4L32R030FER | FC4L64R030FER | | | FC4L110R030FER |
| | | | FC4L64R050DER | FC4L76R050FER | FC4L90R050FER | FC4L110R050DER |
| FC4L16R050FER | | FC4L32R050FER | FC4L64R050FER | | | FC4L110R050FER |
| FC4L16R100FER | | FC4L32R100FER | FC4L64R100FER | | | FC4L110R100FER |

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А