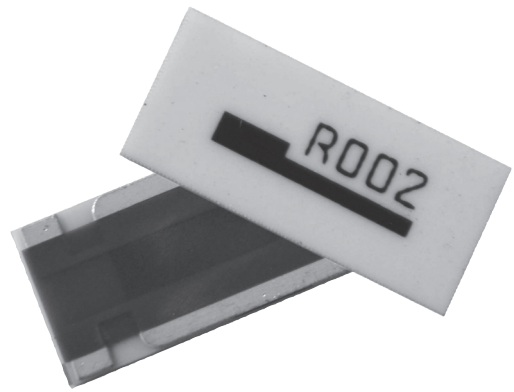


# FC4L Series

## 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<br>5m-25mΩ                       | ±1%<br>±0.5%, 1%           | ±100<br>±50               | 0.062      |
| FC4L32 | 1W           | 1mΩ<br>2mΩ<br>3mΩ<br>4mΩ ~ 500mΩ              | ±5%<br>±2%<br>±1%<br>±1%          | ±100<br>±100<br>±100<br>±50        | 0.015      | FC4L90  | 4W           | 1m-4mΩ<br>5m-25mΩ                       | ±1%<br>±0.5%, 1%           | ±100<br>±50               | 0.082      |
| FC4L64 | 2W           | 1mΩ<br>2mΩ<br>3mΩ<br>4m ~ 100mΩ<br>10m ~ 50mΩ | ±5%<br>±2%<br>±1%<br>±1%<br>±0.5% | ±100<br>±100<br>±100<br>±50<br>±50 | 0.038      | FC4L110 | 5W           | 1mΩ<br>2mΩ<br>3mΩ ~ 100mΩ<br>10m ~ 50mΩ | ±5%<br>±2%<br>±1%<br>±0.5% | ±100<br>±50<br>±50<br>±50 | 0.110      |

### CHARACTERISTICS

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

# FC4L Series

## FC4L Four Terminal Current Sense Metal Foil Construction

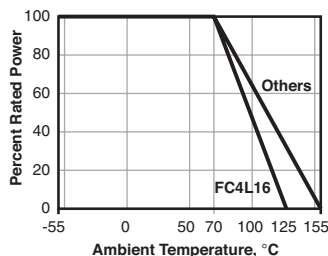
### CHARACTERISTICS

#### 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<br>10mΩ~500mΩ  | 25W<br>12.5W  | 45A<br>24A   |
| FC4L64  | 2 watt       | 1mΩ~9mΩ<br>10mΩ~100mΩ  | 100W<br>50W   | 85A<br>35A   |
| FC4L76  | 3 watt       | 1mΩ~9mΩ<br>10mΩ~****mΩ | 110W<br>55W   | 90A<br>40A   |
| FC4L90  | 4 watt       | 1mΩ~9mΩ<br>10mΩ~****mΩ | 120W<br>60W   | 95A<br>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

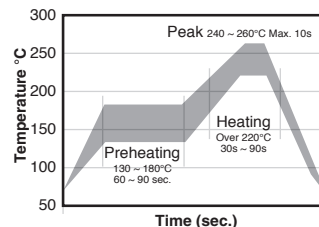
For lead free soldering (Sn-Ag-Cu solder)

Preheating: 130° ~ 180° 60s ~ 90s

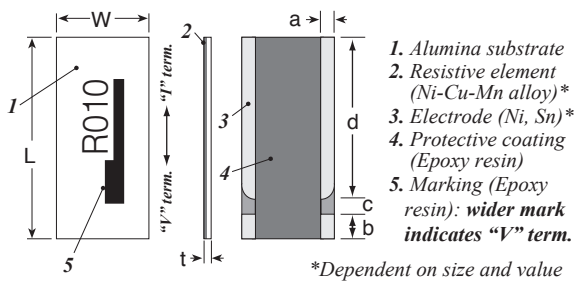
Heating: Over 220° 30s ~ 90s

Peak: 240° ~ 260° Max. 10s

Max. number of reflow: 2



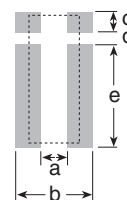
### DIMENSIONS



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

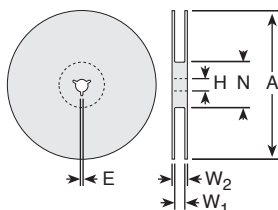


| Rating  | L (in.±.008/mm ±0.20) | W (in./mm)        | a (in./mm)         | b mm ±0.15  | c mm ±0.1   | d mm ±0.15  | t mm          |
|---------|-----------------------|-------------------|--------------------|-------------|-------------|-------------|---------------|
| FC4L16  | 0.063 / 1.60          | 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

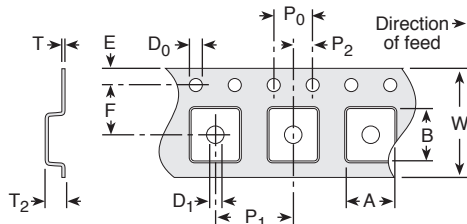
## FC4L Four Terminal Current Sense Metal Foil Construction

### PACKAGING SPECIFICATIONS

(continued)

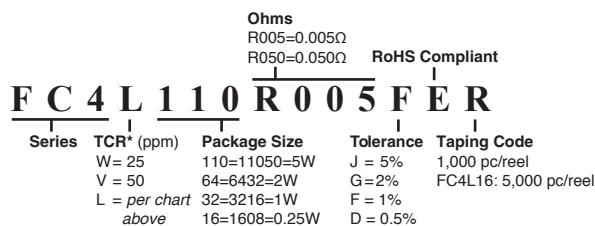
#### Tape

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](mailto:ocean@oceanchips.ru)

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

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