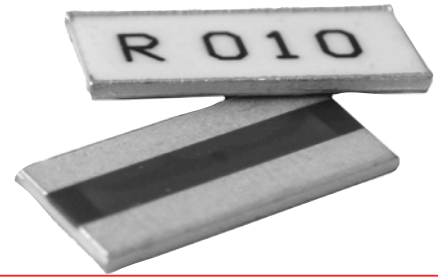


FCSL Series

Metal Foil Current Sense



Ohmite continues to add to its complement of Current Sense offerings with the FCSL Series. FCSL incorporates proven metal foil technology to produce the ultimate in a current sense resistor. FCSL features the effective combination of very low and stable TCRs (Temperature Coefficient of Resistance) available in a wide selection of very low ohmic values. Power ratings up to 10 Watts makes FCSL the ideal choice for your current sensing applications.

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)

SERIES SPECIFICATIONS

| Series | Power Rating | Resistance Range (mΩ) | Tol. | TCR (ppm/°C) | Weight (g) |
|---------|--------------|-----------------------|-------|--------------|------------|
| FCSL20 | 1.0W | 2m | ±5% | ±100 | 0.025 |
| | | 3m ~ 4m | ±2% | ±100 | |
| | | 5m ~ 9m | ±1% | ±100 | |
| | | 10m ~ 50mΩ | ±1% | ±50 | |
| FCSL32 | 1.5W | 1m ~ 2m | ±5% | ±100 | 0.030 |
| | | 3m ~ 4m | ±2% | ±100 | |
| | | 5m ~ 9m | ±1% | ±100 | |
| | | 10m ~ 50mΩ | ±1% | ±50 | |
| FCSL64 | 2.0W | 1m | ±5% | ±150 | 0.036 |
| | | 2m | ±2% | ±100 | |
| | | 3m ~ 100m | ±1% | ±50 | |
| | | 5m ~ 50mΩ | ±0.5% | ±50 | |
| FCSL76 | 3.0W | 1m | ±5% | ±150 | 0.050 |
| | | 2m | ±2% | ±100 | |
| | | 3m ~ 100m | ±1% | ±50 | |
| | | 5m ~ 50mΩ | ±0.5% | ±50 | |
| FCSL90 | 4.0W | 1m | ±5% | ±150 | 0.071 |
| | | 2m | ±2% | ±100 | |
| | | 3m ~ 100m | ±1% | ±50 | |
| | | 5m ~ 50mΩ | ±0.5% | ±50 | |
| FCSL110 | 5.0W | 1m | ±5% | ±150 | 0.096 |
| | | 2m | ±2% | ±100 | |
| | | 3m ~ 100m | ±1% | ±50 | |
| | | 5m ~ 50mΩ | ±0.5% | ±50 | |
| FCSL150 | 10.0W | 1m | ±5% | ±100 | 0.316 |
| | | 2m | ±2% | ±100 | |
| | | 3m ~ 100m | ±1% | ±100 | |

(>9m:±50)

*In-rush Current

| Series | Rated Wattage | 1mΩ~10mΩ | | 12mΩ~100mΩ | |
|---------|---------------|---------------|--------------|---------------|--------------|
| | | In-rush Power | Max. Current | In-rush Power | Max. Current |
| FCSL20 | 1W | 20W | 45A | 14W | 20A |
| FCSL32 | 1.5W | 56W | 64A | 36W | 35A |
| FCSL64 | 2W | 225W | 125A | 150W | 70A |
| FCSL76 | 3W | 325W | 150A | 210W | 80A |
| FCSL90 | 4W | 440W | 180A | 300W | 100A |
| FCSL110 | 5W | 600W | 240A | 440W | 120A |
| FCSL150 | 10W | 700W | 270A | 470W | 140A |

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

CHARACTERISTICS

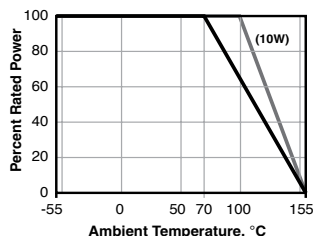
| Test | Condition | Maximum ΔR |
|---|--|--|
| Overload | (10W) Rated power x1.5, 5s | ±(1.0%+0.0005Ω) |
| Max. temperature for rated power | 70°C (10W: 100°C) | |
| Operating temp. range | -55°C ~ +155°C | |
| Rated voltage | $\sqrt{(\text{Rated power} \times \text{Resistance value})}$ V | |
| In-rush current* | Rated current 10 msec ON, 60 sec OFF, 10 cycles* (see table below) | ±(1.0% +0.0005Ω) |
| Rapid change of temperature | -55°C (30min.)/+155°C (30min.), 100 cy. | ±(1.0% +0.0005Ω) |
| | -55°C (30min), Room temp (3min), +155°C (30min), Room temp (3min), 100 cy., FCSL20 & 32 only | ±(1.0% +0.0005Ω) |
| | -40°C (30min), Room temp (3min), +125°C (30min), Room temp (3min), 1000 cy., FCSL150 only | ±0.6% |
| Solderability | 245°C ±5°C for 3 ±0.5 sec. | Min. 90% coverage (FCSL20-32: 95%) |
| Endurance at 70°C | 70°C ±3°C, Rated voltage 1.5h ON, 0.5h OFF, 1000h | ±(1.0% +0.0005Ω) (FCSL20-32: ±(2.0% +0.0005Ω)) |
| Resistance to soldering heat | 260°C ±5°C for 10 ±1 sec. | ±(0.5% +0.0005Ω) (FCSL20-32: No evid. of mech. damage) |
| Moisture resistance | 60°C ±2°C, 90~95% RH, Rated voltage 1.5h ON, 0.5h OFF, 1000h | ±(2.0% +0.0005Ω) |
| Terminal strength | 10W: Bending width: 2mm for 10s±1s, Glass epoxy substrate 1.6mm thick | ±(1.0%+0.0005Ω) |

FCSL Series

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CHARACTERISTICS

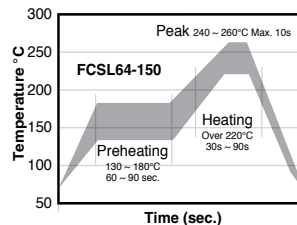
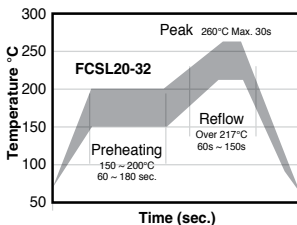
Derating



Recommended Reflow Temperature Profile

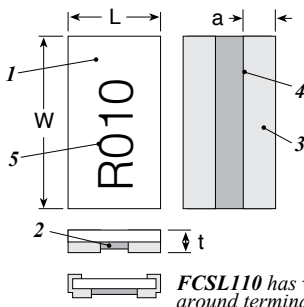
For lead free soldering (Sn-Ag-Cu solder)

| | |
|------------------------------------|-----------------------|
| FCSL20-32 | FCSL64-110 |
| Preheating: 150° ~ 200° 60s ~ 180s | 130° ~ 180° 60s ~ 90s |
| Heating: Over 217° 60s ~ 150s | Over 220° 30s ~ 90s |
| Peak: 260° Max. 30s | 240° ~ 260° Max. 10s |
| Max. number of reflow: 2 | |



DIMENSIONS

(in.±.008/mm ±0.20)



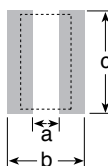
1. Alumina substrate
2. Resistive element (Ni-Cu-Mn alloy)
3. Electrode (Ni, Sn)
4. Protective coating (Epoxy resin)
5. Marking (Epoxy resin)

FCSL110 has wrap-around terminals

| Series | Power Rating | L | W | a | | t |
|---------|--------------|------------|------------|------------|----------------|------------|
| | | | | 1mΩ | 2mΩ and higher | |
| FCSL20 | 1.0W | 0.049/1.25 | 0.079/2.0 | 0.011/0.28 | | 0.024/0.60 |
| FCSL32 | 1.5W | 0.063/1.6 | 0.126/3.2 | 0.016/0.40 | 0.014/0.35* | 0.024/0.60 |
| FCSL64 | 2.0W | 0.122/3.1 | 0.248/6.3 | 0.047/1.20 | 0.020/0.50 | 0.020/0.50 |
| FCSL76 | 3.0W | 0.15/3.8 | 0.3/7.6 | 0.053/1.35 | 0.024/0.60 | 0.020/0.50 |
| FCSL90 | 4.0W | 0.177/4.5 | 0.35/8.9 | 0.063/1.60 | 0.028/0.70 | 0.020/0.50 |
| FCSL110 | 5.0W | 0.197/5.0 | 0.43/11.0 | 0.063/1.60 | 0.031/0.80 | 0.020/0.50 |
| FCSL150 | 10W | 0.295/7.5 | 0.591/15.0 | 0.043/1.10 | | |

*5mΩ and higher: 0.010"/0.25mm

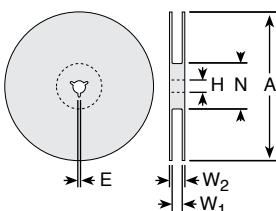
Land Pattern



| (mm) | Value range | a | b | c |
|----------------|-------------|------|------|------|
| FCSL20 | 2mΩ-50mΩ | 0.50 | 2.80 | 2.30 |
| FCSL32 | 1mΩ-4mΩ | 0.50 | 3.20 | 3.68 |
| | 5mΩ-50mΩ | 0.60 | 3.20 | 3.68 |
| FCSL64 | 1mΩ | 0.9 | 4.2 | 6.6 |
| | 2mΩ-100mΩ | 2.2 | 4.2 | 6.6 |
| FCSL76 | 1mΩ | 1.1 | 4.6 | 7.8 |
| | 2mΩ-100mΩ | 2.6 | 4.6 | 7.8 |
| FCSL90 | 1mΩ | 1.3 | 5.1 | 9.2 |
| | 2mΩ-100mΩ | 3.1 | 5.1 | 9.2 |
| FCSL110 | 1mΩ | 1.5 | 5.6 | 11.2 |
| | 2mΩ-100mΩ | 3.6 | 5.6 | 11.2 |
| FCSL150 | 1mΩ | 2.0 | 8.4 | 15.2 |
| | 2mΩ-100mΩ | 5.0 | 8.4 | 15.2 |

PACKAGING SPECIFICATIONS

Reel (in./mm)



| | FCSL20/32 | FCSL64 | FCSL76/90 | FCSL110 | FCSL150 |
|----|-------------------|-------------------|-------------------|-------------------|-------------------|
| A | 7.087 (180 +0/-3) | 7.087 (180 +0/-3) | 7.087 (180 +0/-3) | 7.087 (180 ±2.0) | 12.992 (330±2.0) |
| H | 0.512 (13 ±0.2) | 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) | 0.079 (2.0 ±0.5) |
| N | 0.236 (60 +1/-0) | 0.236 (60 +1/-0) | 0.236 (60 +1/-0) | 0.827 (21 ±0.8) | 3.937 (100±1.0) |
| W1 | 0.354 (9.0 ±0.3) | 0.518 (13.0 ±0.3) | 0.669 (17.0 ±0.3) | 1.000 (25.4 ±1.0) | 1.000 (25.4 ±1.0) |
| W2 | 0.449 (11.4 ±1.0) | 0.669 (17.0 ±1.4) | 0.764 (19.4 ±1.0) | 1.157 (29.4 ±1.0) | 1.157 (29.4 ±1.0) |

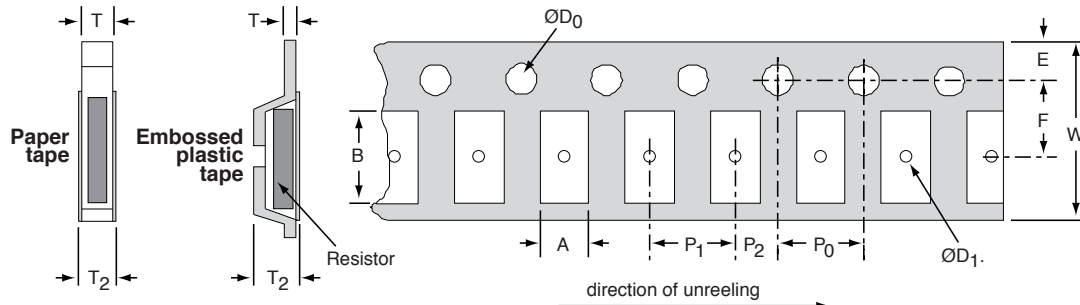
(continued)

FCSL Series

Metal Foil Current Sense

PACKAGING SPECIFICATIONS (CONT.)

Tape (in./mm)



| | FCSL20 | FCSL32 | FCSL64 | FCSL76 | FCSL90 | FCSL110 | FCSL150 |
|----------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|-----------------------|
| A | 0.066 (1.68 ±0.20) | 0.081 (2.05 ±0.20) | 0.135 (3.43 ±0.2) | 0.163 (4.15 ±0.10) | 0.191 (4.85 ±0.10) | 0.213 (5.40 ±0.10) | 0.327 (8.30 ±0.1) |
| B | 0.094 (2.38 ±0.20) | 0.144 (3.65 ±0.20) | 0.261 (6.63 ±0.2) | 0.313 (7.95 ±0.10) | 0.368 (9.35 ±0.10) | 0.453 (11.50 ±0.10) | 0.614 (15.60 ±0.1) |
| W | 0.315 (8.00 ±0.30) | 0.315 (8.00 ±0.30) | 0.472 (12.0 ±0.3) | 0.630 (16.00 ±0.30) | 0.630 (16.00 ±0.30) | 0.945 (24.00 ±0.30) | 0.945 (24.00 ±0.2) |
| E | 0.069 (1.75 ±0.10) | 0.069 (1.75 ±0.10) | 0.069 (1.75 ±0.1) | 0.295 (7.50 ±0.10) | 0.295 (7.50 ±0.10) | 0.453 (11.50 ±0.10) | 0.069 (1.75 ±0.1) |
| F | 0.138 (3.50 ±0.10) | 0.138 (3.50 ±0.10) | 0.217 (5.5 ±0.05) | 0.069 (1.75 ±0.10) | 0.069 (1.7 ±0.10) | 0.069 (1.75 ±0.10) | 0.453 (11.50 ±0.1) |
| P ₀ | 0.157 (4.00 ±0.10) | 0.157 (4.00 ±0.10) | 0.157 (4.0 ±0.1) | 0.157 (4.00 ±0.10) | 0.157 (4.00 ±0.10) | 0.157 (4.00 ±0.10) | 0.157 (4.00 ±0.1) |
| P ₁ | 0.157 (4.00 ±0.10) | 0.157 (4.00 ±0.10) | 0.157 (4.0 ±0.1) | 0.315 (8.00 ±0.10) | 0.315 (8.00 ±0.10) | 0.315 (8.00 ±0.10) | 0.472 (12.00 ±0.1) |
| P ₂ | 0.079 (2.00 ±0.10) | 0.079 (2.00 ±0.10) | 0.079 (2.0 ±0.05) | 0.079 (2.00 ±0.10) | 0.079 (2.00 ±0.10) | 0.079 (2.00 ±0.10) | 0.079 (2.00 ±0.1) |
| D ₀ | 0.059 (1.50 ±0.10) | 0.059 (1.50 ±0.10) | 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) | 0.059 (1.50 +0.05/-0) |
| D ₁ | | | 0.059 (1.5 +0.2/-0) | 0.059 (1.50 ±0.10) | 0.059 (1.50 ±0.10) | 0.059 (1.50 ±0.10) | 0.059 (1.50 +0.05/-0) |
| T | 0.039 (1.00 max.) | 0.039 (1.00 max.) | 0.008 (0.2 ±0.05) | 0.012 (0.30 ±0.05) | 0.012 (0.30 ±0.05) | 0.012 (0.30 ±0.05) | 0.012 (0.30 ±0.05) |
| T ₂ | 0.055 (1.40 max.) | 0.055 (1.40 max.) | 0.059 (1.5 max.) | 0.047 (1.2 ±0.15) | 0.047 (1.2 ±0.15) | 0.047 (1.2 ±0.15) | 0.091 (2.3 ±0.1) |

ORDERING INFORMATION

RoHS Compliant

F C S L 6 4 R 0 0 5 J E R

| | | | | |
|--------|---------------|---------------|-----------|-------------------|
| Series | Package Size | Ohms | Tolerance | Taping Code |
| | 20=2012=1W | R005 = 0.005Ω | J = 5% | 1,000 pc/reel |
| | 32=3216=1.5W | R050 = 0.050Ω | G = 2% | (10W: 500pc/reel) |
| | 64=6432=2W | | F = 1% | |
| | 76=7638=3W | | D = 0.5% | |
| | 90=9045=4W | | | |
| | 110=11050=5W | | | |
| | 150=15075=10W | | | |

Standard Part Numbers

| Ohms | 1.0 Watt | 1.5 Watts | 2 Watts | 3 Watts | 4 Watts | 5 Watts | 10 Watt |
|--------|--------------|--------------|------------------------------|------------------------------|------------------------------|--------------------------------|--------------------------------|
| 0.0010 | | | FCSL64R001JE | FCSL76R001JE | FCSL90R001JE | FCSL110R001JE | FCSL150R001JE |
| 0.0020 | | | FCSL64R002GE | FCSL76R002GE | FCSL90R002GE | FCSL110R002GE | FCSL150R002GE |
| 0.0030 | FCSL20R003GE | FCSL32R003GE | | | | | |
| 0.0050 | FCSL20R005FE | FCSL32R005FE | FCSL64R005FE FCSL64R005DE | FCSL76R005FE FCSL76R005DE | FCSL90R005FE FCSL90R005DE | FCSL110R005FE FCSL110R005DE | FCSL150R005FE FCSL150R005DE |
| 0.0100 | FCSL20R010FE | FCSL32R010FE | FCSL64R010FE FCSL64R010DE | FCSL76R010FE FCSL76R010DE | FCSL90R010FE FCSL90R010DE | FCSL110R010FE FCSL110R010DE | FCSL150R010FE FCSL150R010DE |
| 0.0150 | FCSL20R015FE | FCSL32R015FE | FCSL64R015FE FCSL64R015DE | FCSL76R015FE FCSL76R015DE | FCSL90R015FE FCSL90R015DE | FCSL110R015FE FCSL110R015DE | FCSL150R015FE FCSL150R015DE |
| 0.0200 | FCSL20R020FE | FCSL32R020FE | FCSL64R020FE FCSL64R020DE | FCSL76R020FE FCSL76R020DE | FCSL90R020FE FCSL90R020DE | FCSL110R020FE FCSL110R020DE | FCSL150R020FE FCSL150R020DE |
| 0.0250 | FCSL20R025FE | FCSL32R025FE | FCSL64R025FE FCSL64R025DE | FCSL76R025FE FCSL76R025DE | FCSL90R025FE FCSL90R025DE | FCSL110R025FE FCSL110R025DE | FCSL150R025FE FCSL150R025DE |
| 0.0300 | FCSL20R030FE | FCSL32R030FE | FCSL64R030FE FCSL64R030DE | FCSL76R030FE FCSL76R030DE | FCSL90R030FE FCSL90R030DE | FCSL110R030FE FCSL110R030DE | FCSL150R030FE FCSL150R030DE |
| 0.0500 | FCSL20R050FE | FCSL32R050FE | FCSL64R050FE FCSL64R050DE | FCSL76R050FE FCSL76R050DE | FCSL90R050FE FCSL90R050DE | FCSL110R050FE FCSL110R050DE | FCSL150R050FE FCSL150R050DE |
| 0.1000 | | | FCSL64R100FE | FCSL76R100FE | FCSL90R100FE | FCSL110R100FE | FCSL150R100FE |

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[PF2512FKF7W0R033L](#) [CD2015FC-0.10-1%](#) [PR2512FKF7W0R004L](#) [RC1005F124CS](#) [RL73K3AR56JTDF](#) [RL7520WT-R001-F](#)
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[SR731ERTTP2R0J](#) [SR731ERTTP4R7J](#) [SR731ERTTP9R1J](#) [SR731ERTTP1R0J](#) [SR731ERTTP2R2J](#) [SR731ERTTP5R1J](#)