

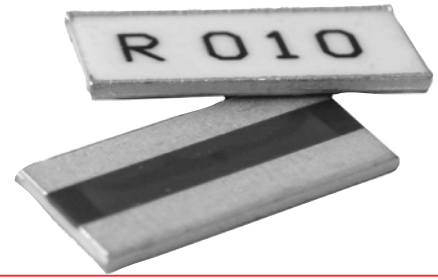


**THE DATASHEET OF
FCSL110R005DER**



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

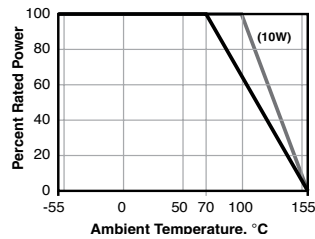
Test	Condition	Maximum ΔR
Overload	(10W) Rated power x1.5, 5s	±(1.0%+0.0005Ω)
Max. temperature for rated power	70°C (10W: 100°C)	
Operating temp. range	-55°C ~ +155°C	
Rated voltage	$\sqrt{(\text{Rated power} \times \text{Resistance value})}$ V	
In-rush current*	Rated current 10 msec ON, 60 sec OFF, 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

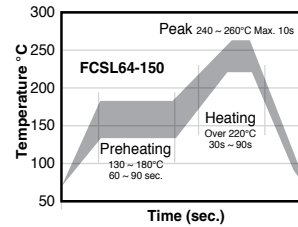
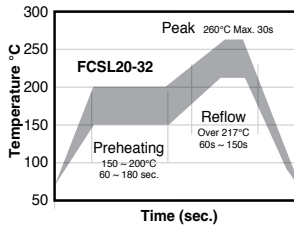
Derating



Recommended Reflow Temperature Profile

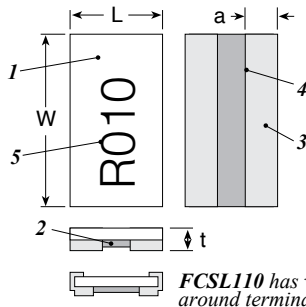
For lead free soldering (Sn-Ag-Cu solder)

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)

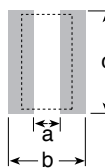


1. Alumina substrate
2. Resistive element (Ni-Cu-Mn alloy)
3. Electrode (Ni, Sn)
4. Protective coating (Epoxy resin)
5. Marking (Epoxy resin)

Series	Power Rating	L	W	a		
				1mΩ	2mΩ and higher	t
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

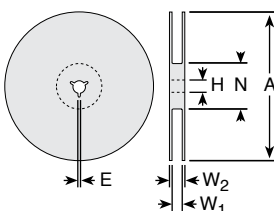
Land Pattern



(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)

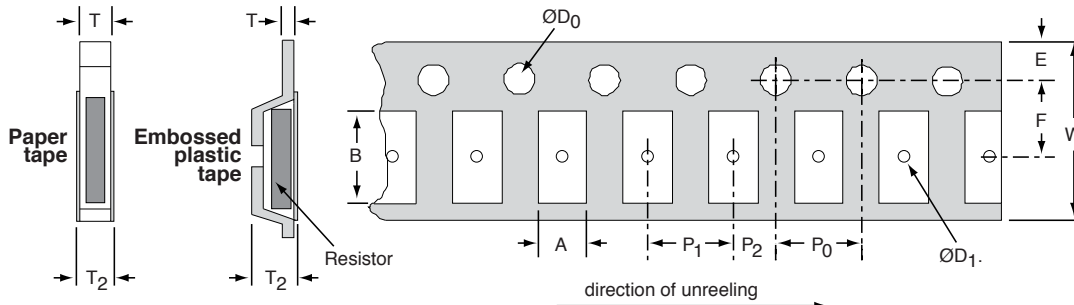
(continued)

FCSL Series

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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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