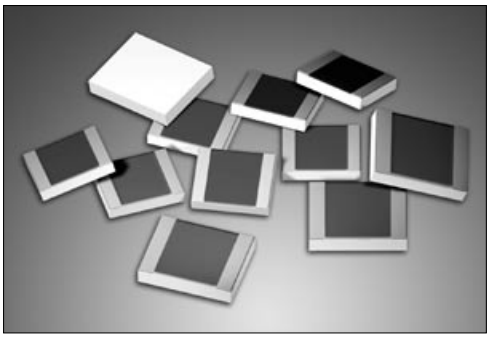
Type CC Low Resistance Precision Chip Resistors

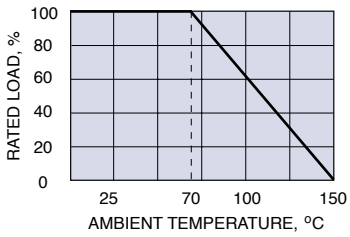
- **Style FC** - Flip Chip version for surface mount applications.
  Style WB - Wire Bond version for hybrid applications with metallized back surface for solder down heat sinking of the chip, includes bondable termination pads to receive aluminum wire bonds.
- Thermal resistance is provided to optimize high power designs when utilizing higher thermal conductivity circuit board substrates such as IMS or Alumina.
- Resistance range down to 0.010 ohm at ±5%, 0.050 ohm at ±2%, and 0.10 ohm at ±1%.
- Low inductance provides excellent high frequency and pulse response.
- High pulse handling and overload capability.
- Best choice for switching power supplies, motor speed controls, and high current sensing applications.



Style FC - Flip Chip Version is a surface mount version with solderable pads for **flip chip** soldering.

Model	Resistance		Power Capability Information			Dimensions in inches and (millimeters)				Comments
			General Applications Power Rating at 70° C (see note 1)	High Power Applications Thermal Resistance - $R_{\theta JC}$ Film (J) to Solder Pad (C) (see note 2)	Max. Chip Temperature					
	Min.	Max.				A	B	C	D	
CC1512FC	0.010 Ω	0.015 Ω	0.75 Watt	22.7°C/Watt	150°C	.150 ±.007 (3.81 ±.18)	.120 ±.007 (3.05 ±.18)	.027 ±.005 (.69 ±.13)	.035 min. (0.89 min.)	Solder Coated Pads
	0.020 Ω	10.0 Ω	0.75 Watt	22.7°C/Watt	150°C	.150 ±.007 (3.81 ±.18)	.120 ±.007 (3.05 ±.18)	.022 ±.003 (.56 ±.08)	.035 min. (0.89 min.)	Solderable Pads
CC2015FC	0.020 Ω	10.0 Ω	1.0 Watt	16.0°C/Watt	150°C	.200 ±.007 (5.08 ±.18)	.150 ±.007 (3.81 ±.18)	.027 ±.003 (.69 ±.08)	.050 min. (1.27 min.)	Solderable Pads
CC2520FC	0.010 Ω	0.020 Ω	1.5 Watts	13.0°C/Watt	150°C	.250 ±.007 (6.35 ±.18)	.200 ±.007 (5.08 ±.18)	.032 ±.005 (.81 ±.13)	.065 min. (1.66 min.)	Solder Coated Pads
	0.025 Ω	10.0 Ω	1.5 Watts	11.5°C/Watt	150°C	.250 ±.007 (6.35 ±.18)	.200 ±.007 (5.08 ±.18)	.041 ±.004 (1.04 ±.10)	.040 min. (1.02 min.)	Solderable Pads

Style FC Derating Curve For General Applications



Note 1: General Applications - The power rating for general applications is based upon 0.5 sq. in. (300 mm²) of termination pad or trace area (2 oz. copper) connected to each end of the resistor. Maximum chip temperature is 150°C. Use Derating Curve to derate appropriately for the maximum ambient temperature and for the temperature limitations of the adjacent materials.

Note 2: Thermal Resistance - In High Power Applications where the circuit board material provides high heat sinking benefits (such as IMS, Alumina, or other) the thermal resistance of the chip resistor is useful to establish the maximum power capability of the chip resistor in the application. The film temperature is measured at the center of the resistor element and the solder pad temperature is measured at the center of the termination pad (point X in the recommended circuit layouts shown below). Maximum temperature of the chip resistor (at the center of chip) should not exceed 150°C through the temperature range of the application.

Recommended Circuit Board Layout (current and sense connections):

Fig. 1A: Kelvin layout recommended for values below 0.20Ω

C = Current connection
S = Sense connection

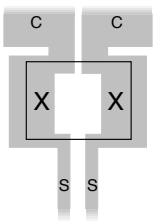
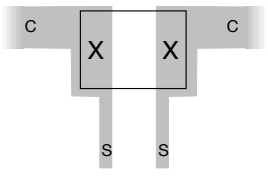


Fig. 1B: Kelvin layout recommended for higher resistance values.



Note: Actual width of current trace is based on magnitude of current. Point of connection should be in the area shown.

CC1512FC Standard Resistance Values:

Tolerance CC1512FC ±1% Standard (except as noted).

0.010 Ω 5%	0.033 Ω 5%	0.20 Ω	0.75 Ω	3.30 Ω
0.015 Ω 5%	0.040 Ω 5%	0.25 Ω	1.00 Ω	4.00 Ω
0.020 Ω 5%	0.050 Ω 2%	0.30 Ω	1.50 Ω	5.00 Ω
0.025 Ω 5%	0.075 Ω 2%	0.33 Ω	2.00 Ω	7.50 Ω
0.030 Ω 5%	0.10 Ω	0.40 Ω	2.50 Ω	8.00 Ω
	0.15 Ω	0.50 Ω	3.00 Ω	10.0 Ω

CC2015FC Standard Resistance Values:

Tolerance CC2015FC ±1% Standard (except as noted).

0.020 Ω 5%	0.033 Ω 5%	0.20 Ω	0.75 Ω	3.30 Ω
0.025 Ω 5%	0.040 Ω 5%	0.25 Ω	1.00 Ω	4.00 Ω
0.030 Ω 5%	0.050 Ω 2%	0.30 Ω	1.50 Ω	5.00 Ω
	0.075 Ω 2%	0.33 Ω	2.00 Ω	7.50 Ω
	0.10 Ω	0.40 Ω	2.50 Ω	8.00 Ω
	0.15 Ω	0.50 Ω	3.00 Ω	10.0 Ω

CC2520FC Standard Resistance Values:

Tolerance CC2520FC ±1% Standard (except as noted).

0.010 Ω 5%	0.033 Ω 5%	0.20 Ω	0.75 Ω	3.30 Ω
0.015 Ω 5%	0.040 Ω 5%	0.25 Ω	1.00 Ω	4.00 Ω
0.020 Ω 5%	0.050 Ω 2%	0.30 Ω	1.50 Ω	5.00 Ω
0.025 Ω 5%	0.075 Ω 2%	0.33 Ω	2.00 Ω	7.50 Ω
0.030 Ω 5%	0.10 Ω	0.40 Ω	2.50 Ω	8.00 Ω
	0.15 Ω	0.50 Ω	3.00 Ω	10.0 Ω

Custom resistance values and non-standard tolerances can be manufactured for high quantity applications. Please contact Caddock Applications Engineering.

Applications Engineering
17271 North Umpqua Hwy.
Roseburg, Oregon 97470-9422
Phone: (541) 496-0700
Fax: (541) 496-0408

CADDOCK ELECTRONICS, INC.
e-mail: caddock@caddock.com • web: www.caddock.com
For Caddock Distributors listed by country see caddock.com/contact/dist.html

Sales and Corporate Office
1717 Chicago Avenue
Riverside, California 92507-2364
Phone: (951) 788-1700
Fax: (951) 369-1151

© 2004 Caddock Electronics, Inc.

Type CC Low Resistance Precision Chip Resistors

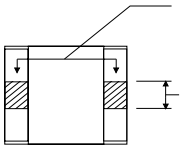
Style WB - Wire Bond Version

is a hybrid mountable version with metallized pads for wire bonding utilizing **aluminum wire** and a metallized back surface for solder attachment of the back surface to a heat sinking substrate.

Model	Resistance		Power Capability Information		Dimensions in inches and (millimeters)				Comments
			Thermal Resistance $R_{\theta JC}$ Film (J) to Solder Pad (C) (see note 3)	Max. Chip Temperature					
	Min.	Max.			A	B	C	D	
CC2015WB	0.020 Ω	10.0 Ω	13.9°C/Watt	150°C	.200 ±.007 (5.08 ±.18)	.150 ±.007 (3.81 ±.18)	.027 ±.003 (.69 ±.08)	.050 min. (1.27 min.)	Aluminum wire to be used for bonding
CC2520WB	0.025 Ω	10.0 Ω	8.33°C/Watt	150°C	.250 ±.007 (6.35 ±.18)	.200 ±.007 (5.08 ±.18)	.027 ±.003 (.69 ±.08)	.040 min. (1.02 min.)	Aluminum wire to be used for bonding

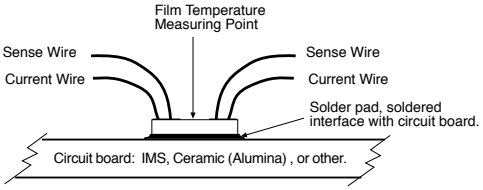
Note 3: Thermal Resistance - In High Power Applications where the circuit board material provides high heat sinking benefits (such as IMS, Alumina, or other) the thermal resistance of the chip resistor is useful to establish the maximum power capability of the chip resistor in the application. The film temperature is measured at the center of the resistor element and the solder pad temperature is measured at the soldered interface with the circuit board. Maximum temperature of the chip resistor (at the center of chip) should not exceed 150°C through the temperature range of the application.

Location for Sense (Potential) Connection:



Sense connection shall be made in the crosshatched portion of the termination pad.

.055 (1.40) centered



WB Resistor mounting

CC2015WB Standard Resistance Values:

Tolerance CC2015WB ±1% Standard (except as noted).

0.020 Ω 5%	0.050 Ω 2%	0.25 Ω	0.75 Ω	3.30 Ω
0.025 Ω 5%	0.075 Ω 2%	0.30 Ω	1.00 Ω	4.00 Ω
0.030 Ω 5%	0.10 Ω	0.33 Ω	1.50 Ω	5.00 Ω
0.033 Ω 5%	0.15 Ω	0.40 Ω	2.00 Ω	7.50 Ω
0.040 Ω 5%	0.20 Ω	0.50 Ω	2.50 Ω	8.00 Ω
			3.00 Ω	10.0 Ω

CC2520WB Standard Resistance Values:

Tolerance CC2520WB ±1% Standard (except as noted).

0.025 Ω 5%	0.050 Ω 2%	0.25 Ω	0.75 Ω	3.30 Ω
0.030 Ω 5%	0.075 Ω 2%	0.30 Ω	1.00 Ω	4.00 Ω
0.033 Ω 5%	0.10 Ω	0.33 Ω	1.50 Ω	5.00 Ω
0.040 Ω 5%	0.15 Ω	0.40 Ω	2.00 Ω	7.50 Ω
	0.20 Ω	0.50 Ω	2.50 Ω	8.00 Ω
			3.00 Ω	10.0 Ω

Custom resistance values and non-standard tolerances can be manufactured for high quantity applications. Please contact Caddock Applications Engineering.

General Information for Type CC - Style FC and Style WB - Chip Resistors

Specifications:

Temperature Coefficient: TC referenced to +25°C, ΔR taken at +150°C.

0.50 ohm and above, -20 to +80 ppm/°C
0.050 ohm to 0.49 ohm, 0 to +200 ppm/°C
below 0.050 ohm, 0 to +300 ppm/°C.

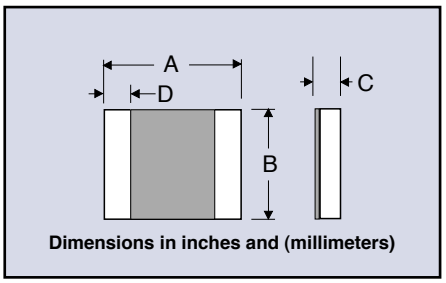
Inductance: Less than 5 nH typical.

Load Life: 1000 hours at rated power, based upon 150°C max. chip temperature, ΔR ± (0.5% + 0.0005 ohm).

Momentary Overload: 1.5 times rated power, for 5 seconds, ΔR ± (0.5% + 0.0005 ohm).

Operating Temperature: -55°C to +150°C.

Measurement Note: All measurements are taken using Kelvin connections per the recommended connection locations.



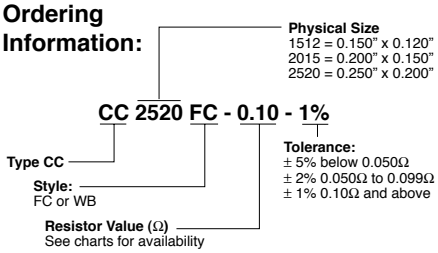
Dimensions in inches and (millimeters)

Solder attachment note:

Style FC has a bare ceramic back surface. The recommended solders for flip chip solder attachment are 62Sn / 36Pb / 2Ag, 96.5Sn / 3.5Ag, or standard Sn / Ag / Cu solder alloys.

Style WB has a metallized back surface for soldering to a substrate or a heat sink. The recommended solders to be used are 62Sn / 36Pb / 2Ag, 96.5Sn / 3.5Ag, or standard Sn / Ag / Cu solder alloys.

Ordering Information:

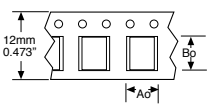


Packaging information:

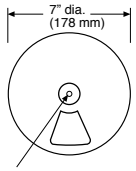
Style FC, flip chip resistors, are shipped with the bare ceramic side up in the pocket, with the solderable pads facing down.

Style WB, wire bondable resistors, are shipped with the wire bondable pads facing up in the pocket.

The illustration shows the orientation of the CC1512 and CC2015 chip resistors in the tape. The CC2520 chip resistors are rotated 90° from what is shown in the illustration.



Ko signifies tape thickness and dimension



	Size 1512	Size 2015	Size 2520
Ao	0.135" (3.43mm)	0.189" (4.80mm)	0.271" (6.88mm)
Bo	0.167" (4.24mm)	0.209" (5.31mm)	0.216" (5.49mm)
Ko	0.037" (0.94mm)	0.087" (2.21mm)	0.066" (1.68mm)

Carrier Tape and pocket dimensions:
Tape is 12mm Carrier Tape (8mm pitch)

Full reel quantities:
1500 pieces per reel for CC1512
1000 pieces per reel for CC2015 and CC2520

Quantities of less than 250 will be shipped in tape without reel and without tape leader at the option of Caddock.

Tape dimensions and materials will be consistent with EIA-481-1. Reels will be marked with a label containing Caddock logo, part number, resistor value, tolerance, packaging date, and quantity.

Applications Engineering
17271 North Umpqua Hwy.
Roseburg, Oregon 97470-9422
Phone: (541) 496-0700
Fax: (541) 496-0408

CADDOCK ELECTRONICS, INC.
e-mail: caddock@caddock.com • web: www.caddock.com
For Caddock Distributors listed by country see caddock.com/contact/dist.html

Sales and Corporate Office
1717 Chicago Avenue
Riverside, California 92507-2364
Phone: (951) 788-1700
Fax: (951) 369-1151

© 2004 Caddock Electronics, Inc.