




Thin Film Technology Corp.

Product Family: Current Sensing Power Resistor

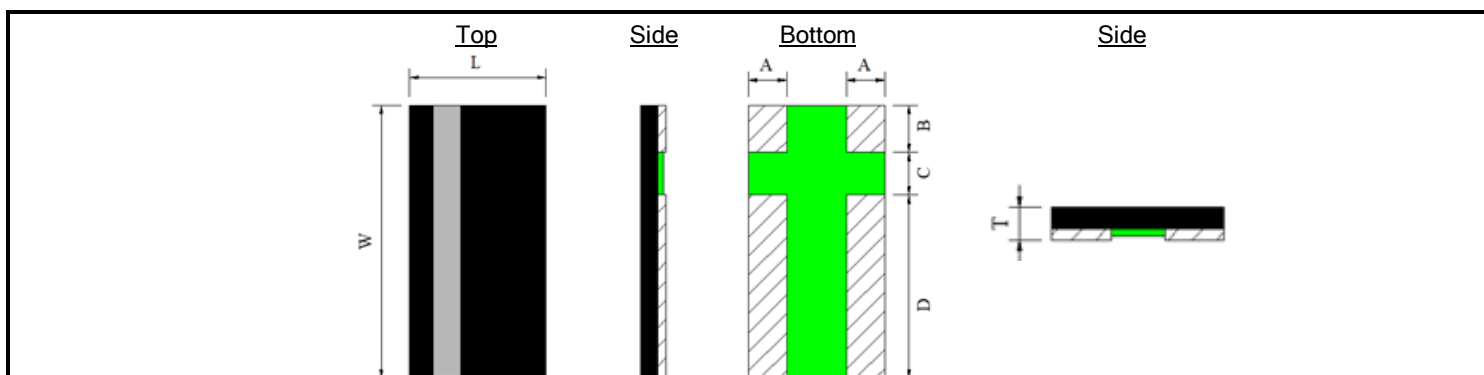
Part Number Series: D1FCP Series



| | | |
|--|--|---|
|  | <p>Construction:</p> <ul style="list-style-type: none"> • Glass epoxy substrate • Foil resistive element • 100% matte tin over Ni terminations • RoHS compliant and Pb Free • Inherently Anti-Sulfur | <p>Features:</p> <ul style="list-style-type: none"> • 0306, 0508, 0612 English case sizes • Resistances from 0.5mΩ~5mΩ • Power up to 1W • Tolerance down to ±0.5% • TCR down to ±75ppm/°C • Low height profile down to 0.35mm max • High volume production suitable for commercial and special applications |
|--|--|---|

Description:

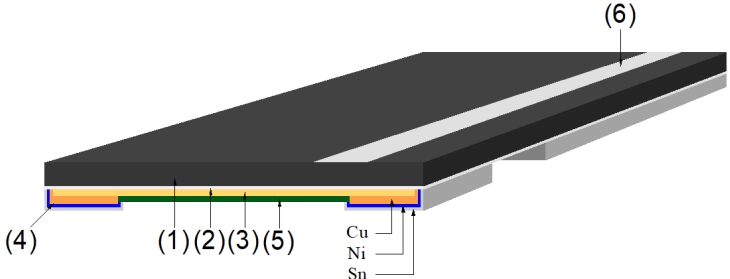
These low resistance, high power chip resistors exhibit excellent performance in resistance, noise performance, surface heat distribution and have a lower surface temperature. They are designed and produced with a face (pattern) down construction and have a very low height profile. They are useful in many current sensing applications.

Product Dimensions:

All dimensions shown in inches, mm in parenthesis.

| Dimension (Metric) | Resistance Range | L | W | T | A | B | C | D |
|--------------------|------------------|----------------------------|----------------------------|----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| D1FCP0306 (0816) | 2.5mΩ~5mΩ | 0.031±0.006 (0.80±0.15) | 0.063±0.008 (1.60±0.20) | 0.014±0.004 (0.35±0.10) | 0.008 ±0.004 (0.20 ±0.10) | 0.010 ±0.004 (0.25 ±0.10) | 0.016 ±0.004 (0.40 ±0.10) | 0.012 ±0.004 (0.30 ±0.10) |
| D1FCP0508 (1220) | 1mΩ~2mΩ | 0.049±0.008 (1.25±0.20) | 0.079±0.008 (2.00±0.20) | 0.014±0.006 (0.40±0.15) | 0.014 ±0.006 (0.35 ±0.15) | 0.012 ±0.006 (0.30 ±0.15) | 0.012 ±0.006 (0.30 ±0.15) | 0.055 ±0.008 (1.40 ±0.20) |
| D1FCP0612 (1632) | 0.5mΩ~2mΩ | 0.063±0.008 (1.60±0.20) | 0.126±0.008 (3.20±0.20) | 0.014±0.006 (0.35±0.15) | 0.018 ±0.008 (0.45 ±0.20) | 0.020 ±0.008 (0.50 ±0.20) | 0.024 ±0.008 (0.60 ±0.20) | 0.083 ±0.008 (2.10 ±0.20) |
| | 2.5mΩ~5mΩ | 0.063±0.008 (1.60±0.20) | 0.126±0.008 (3.20±0.20) | 0.010±0.004 (0.25±0.10) | 0.018 ±0.008 (0.45 ±0.20) | 0.020 ±0.008 (0.50 ±0.20) | 0.024 ±0.008 (0.60 ±0.20) | 0.083 ±0.008 (2.10 ±0.20) |

Product Construction:

|  | <table border="1"> <thead> <tr> <th>Number</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Glass epoxy substrate</td> </tr> <tr> <td>2</td> <td>Adhesive (epoxy resin)</td> </tr> <tr> <td>3</td> <td>Resistive element (Cu alloy)</td> </tr> <tr> <td>4</td> <td>Terminal electrodes (Cu, Ni, Sn)</td> </tr> <tr> <td>5</td> <td>Protective coating (epoxy resin)</td> </tr> <tr> <td>6</td> <td>Marking*</td> </tr> </tbody> </table> | Number | Description | 1 | Glass epoxy substrate | 2 | Adhesive (epoxy resin) | 3 | Resistive element (Cu alloy) | 4 | Terminal electrodes (Cu, Ni, Sn) | 5 | Protective coating (epoxy resin) | 6 | Marking* |
|--|--|--------|-------------|---|-----------------------|---|------------------------|---|------------------------------|---|----------------------------------|---|----------------------------------|---|----------|
| Number | Description | | | | | | | | | | | | | | |
| 1 | Glass epoxy substrate | | | | | | | | | | | | | | |
| 2 | Adhesive (epoxy resin) | | | | | | | | | | | | | | |
| 3 | Resistive element (Cu alloy) | | | | | | | | | | | | | | |
| 4 | Terminal electrodes (Cu, Ni, Sn) | | | | | | | | | | | | | | |
| 5 | Protective coating (epoxy resin) | | | | | | | | | | | | | | |
| 6 | Marking* | | | | | | | | | | | | | | |

*Note: Marking will consist of a black marked top surface with an orientation marker in white or dark gray color.

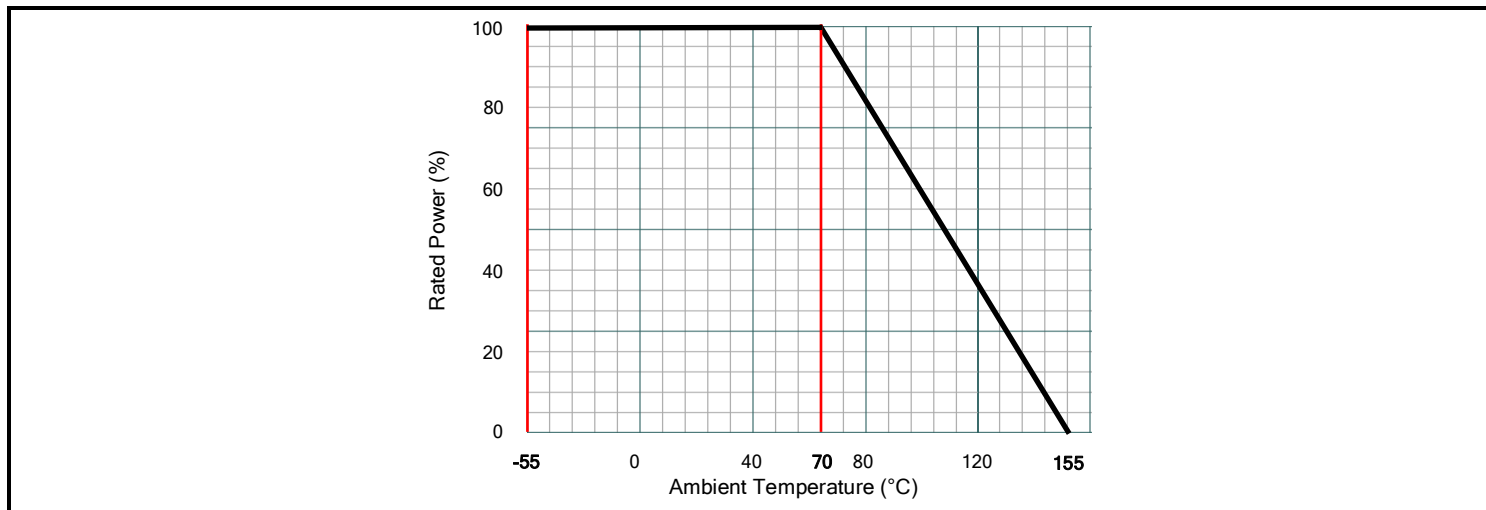
Part Numbering: Ex: D1FCP0306RR005FF-T5

| Series Name | English Size (Metric Size) | Temp. Coefficient of Resistance (TCR) | Resistance Value* | Resistance Tolerance | Serial Code | T&R Packaging Quantity |
|-------------|---|--|---|----------------------|------------------|-------------------------|
| D1FCP | 0306 (0816) 0508 (1220) 0612 (1632) | D = $\pm 75\text{ppm}/^\circ\text{C}$ R = $\pm 100\text{ppm}/^\circ\text{C}$ (refer to electrical table) | Ex. R001 = 0.001Ω 0M50 = 0.0005Ω (4 digits) | F = $\pm 1.0\%$ | F = Face Down | -T5 = 5,000pcs/ reel |

*Note: For resistance values of one milliohm or greater, use "R" to specify the decimal point (i.e. R005= 0.005Ω). For resistance values less than one milliohm or those with 1/2 milliohm increments, use "M" to specify the decimal point (i.e. 0M50= 0.0005Ω and 7M50 = $7.50\text{m}\Omega$).

Electrical Specifications:

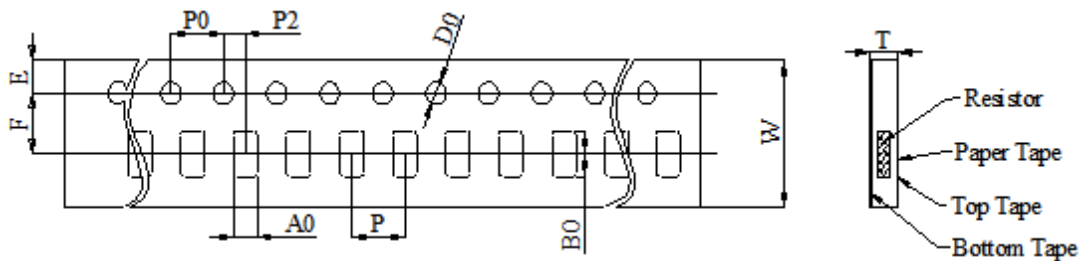
| Type | D1FCP0306 | D1FCP0508 | D1FCP0612 | |
|----------------------------------|--|--------------------------|-----------------|--------------------------|
| Metric Size | 0816 | 1220 | 1632 | |
| Power Rating | 1/2W | 1/2W | 1 W | |
| Resistance Range | 2.5m Ω ~5m Ω | 1m Ω ~2m Ω | 0.5m Ω | 1m Ω ~5m Ω |
| Resistance Tolerance (code) | $\pm 1.0\%$ (F) | $\pm 1.0\%$ (F) | $\pm 1.0\%$ (F) | |
| TCR ppm/ $^\circ\text{C}$ (code) | ± 100 (R) | ± 100 (R) | ± 100 (R) | ± 75 (D) |
| Rated Voltage | $\sqrt{(\text{Power} \times \text{Resistance})}$ | | | |
| Operating Temp. Range | -55 $^\circ\text{C}$ ~+155 $^\circ\text{C}$ | | | |
| Packaging (code) | 5,000 pcs/reel (-T5) | | | |

Power Derating Curve:**Reliability Specifications:**

| Test | Procedure | Specification |
|---|---|--------------------------------|
| Short Time Overload JIS-C-5201, 4.13 | Applied voltage: 2.5X rated voltage. Test duration: 5 seconds | $\pm(1.0\%+0.5\text{m}\Omega)$ |
| Load Life JIS-C-5201-1, 4.25 | Test Temperature: 70 $^\circ\text{C} \pm 2^\circ\text{C}$ Applied voltage: rated power Test period: 1,000 hours with power cycling as follows: 90 min. power ON/30 min. power OFF, | $\pm(2.0\%+0.5\text{m}\Omega)$ |
| Moisture Resistance JIS-C-5201-1, 4.24 | Test Condition: 60 $^\circ\text{C} \pm 2^\circ\text{C}/95\%$ RH Test period: 1,000 hours | $\pm(2.0\%+0.5\text{m}\Omega)$ |
| Temperature Cycle (Thermal Shock) | Repeat 1,000 cycles as follows: -55 $^\circ\text{C}$ (30 min.) / +155 $^\circ\text{C}$ (30 min.) | $\pm(1.0\%+0.5\text{m}\Omega)$ |

Reliability Specifications (Cont.):

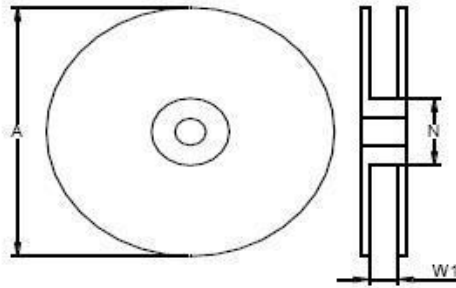
| Test | Procedure | Specification |
|---|---|---------------------------------------|
| Resistance To Solder Heat J-STD-020 | Through reflow, parts are subjected to 3 reflow cycles | $\pm(1.0\%+0.5m\Omega)$ |
| High Temperature Exposure MIL-STD-202, Method 108, Condition D | Test Temperature: Maximum rated operational temperature Test period: 1,000 hours No electrical load | $\pm(1.0\%+0.5m\Omega)$ |
| Low Temperature Exposure IEC60115-1 4.25 | T= -55°C \pm 2°C; t= 1000h | $\pm(1.0\%+0.5m\Omega)$ |
| Mechanical Shock MIL-STD-202, Method 213, Condition A | Force: 100G Test Duration: 6 milliseconds | $\pm(1.0\%+0.5m\Omega)$ |
| Solderability MIL-STD-202, Method 208H, Category 3 | Dipped into molten solder for 3 \pm 1 seconds at 245°C \pm 5°C Flux activity type R0 | New solder coverage of 90% minimum |
| Substrate Bending IEC60115-1 4.33 | Span between fulcrums: 90mm Bend width: 2mm Test board: glass-epoxy Thickness: 1.6mm | $\pm(1.0\%+0.5m\Omega)$ |

Paper Tape Dimensions:

All dimensions in mm.

| Size | W | P0 | P | P2 | A0 | B0 | D0 | F | E | T |
|-------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 0306 | 8.00 \pm 0.30 | 4.00 \pm 0.10 | 4.00 \pm 0.10 | 2.00 \pm 0.10 | 0.98 \pm 0.20 | 1.85 \pm 0.20 | 1.50 \pm 0.10 | 3.50 \pm 0.10 | 1.75 \pm 0.10 | 0.60 \pm 0.10 |
| 0508 | 8.00 \pm 0.30 | 4.00 \pm 0.10 | 4.00 \pm 0.10 | 2.00 \pm 0.10 | 2.05 \pm 0.20 | 3.65 \pm 0.20 | 1.50 \pm 0.10 | 3.50 \pm 0.10 | 1.75 \pm 0.10 | 0.75 \pm 0.10 |
| 0612 | 8.00 \pm 0.30 | 4.00 \pm 0.10 | 4.00 \pm 0.10 | 2.00 \pm 0.10 | 1.90 \pm 0.20 | 3.50 \pm 0.20 | 1.50 \pm 0.10 | 3.50 \pm 0.10 | 1.75 \pm 0.10 | 0.50 \pm 0.15 |

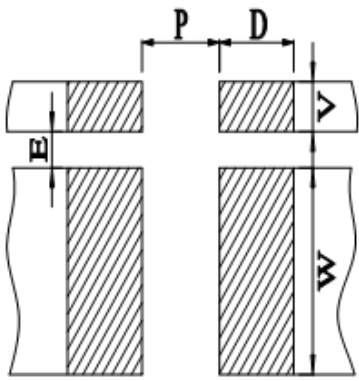
Reel Dimensions:



All dimensions in mm.

| Size | Quantity | A | N | W1 |
|------|----------------|------------|-------------|-------------|
| 0306 | 5,000 pcs/reel | 178 ± 5.00 | 60.0 ± 2.00 | 9.00 ± 1.00 |
| 0508 | | | | |
| 0612 | | | | |

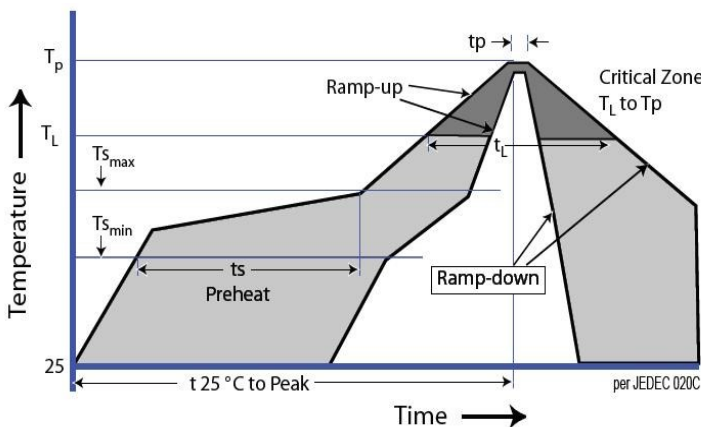
Recommended Land Pattern:



All dimensions in mm.

| Size | 0306 | 0508 | 0612 |
|------|------|------|-------|
| P | 0.35 | 0.50 | 0.762 |
| W | 1.30 | 1.60 | 2.29 |
| D | 0.40 | 0.70 | 1.014 |
| V | 0.40 | 0.45 | 0.762 |
| E | 0.20 | 0.25 | 0.381 |

Soldering Profile:



| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|---|-------------------------|------------------|
| Average Ramp-Up Rate (T _{smax} to T _p) | 3 °C/second max. | 3 °C/second max. |
| Preheat | | |
| - Temperature Min (T _{smin}) | 100 °C | 150 °C |
| - Temperature Max (T _{smax}) | 150 °C | 200 °C |
| - Time (t _{smin} to t _{smax}) | 60-120 seconds | 60-180 seconds |
| Time maintained above: | | |
| - Temperature (T _L) | 183 °C | 217 °C |
| - Time (t _L) | 60-150 seconds | 60-150 seconds |
| Peak Temperature (T _p) | 240 +0/-5 °C | 260 +0 °C |
| Time within 5 °C of actual Peak Temperature (t _p) | 10-30 seconds | 20-40 seconds |
| Ramp-Down Rate | 6 °C/second max. | 6 °C/second max. |
| Time 25 °C to Peak Temperature | 6 minutes max. | 8 minutes max. |

Storage Conditions:

Environment Conditions:

Products should be stored under the following environmental conditions.

- Temperature: +5 to +35°C
- Humidity: 45 to 85% relative humidity
- Do not keep products in environments where they may be subject to particulate contamination or harmful gases such as sulfuric acid or hydrogen chloride as it may cause oxidization on electrodes, resulting in poor solderability.
- Products should be stored in a space that does not expose it to high temperatures, vibration, or direct sunlight.
- Products should be stored in the original airtight packaging until use.