# High Frequency (up to 20 GHz) Resistor, Thin Film Surface Mount Chip

FC series chip resistors are designed with low internal reactance. They function as almost pure resistors on a very high range of frequencies. The specialized laser edge trimming allows for precision tolerances to 0.1 %.

## FEATURES

- Small standard size 0402 case size
- Edge trimmed block resistors
- High purity alumina substrate
- Ohmic range (10 Ω to 1000 Ω)
- Small internal reactance (< 10 mΩ)
- Low TCR (down to ± 25 ppm/°C)
- Epoxy bondable termination available
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free Available

RoHS* Available

HALOGEN FREE Available

GREEN (5-2008) Available

**Note**

* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information/tables in this datasheet for details.

## APPLICATIONS

- Low noise amplifiers
- Attenuation
- Line termination

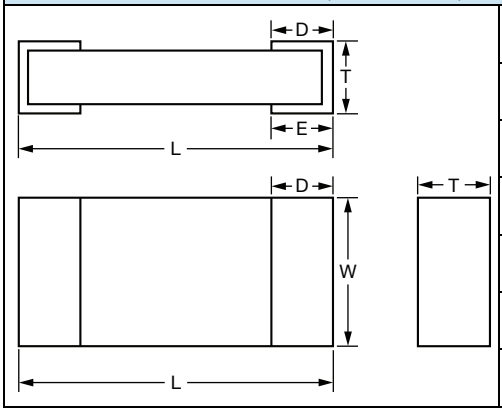
## STANDARD ELECTRICAL SPECIFICATIONS

| TEST | SPECIFICATIONS | CONDITIONS |
|---|---|---|
| **Material** | Passivated nichrome | - |
| **Resistance Range** | 10 Ω to 1000 Ω | Case size dependent |
| **TCR: Absolute** | ± 25 ppm/°C to ± 100 ppm/°C | -55 °C to +125 °C |
| **Tolerance: Absolute** | ± 0.1 % to ± 5.0 % | +25 °C |
| **Stability: Absolute** | Δ*R* ± 0.02 % | 2000 h at 70 °C |
| **Stability: Ratio** | - | - |
| **Voltage Coefficient** | 0.1 ppm/V | - |
| **Working Voltage** | 30 V to 75 V | - |
| **Operating Temperature Range** | -55 °C to +155 °C | - |
| **Storage Temperature Range** | -55 °C to +155 °C | - |
| **Noise** | < -35 dB | - |
| **Shelf Life Stability: Absolute** | Δ*R* ± 0.01 % | 1 year at +25 °C |

## COMPONENT RATINGS

| CASE SIZE | POWER RATING (mW) | WORKING VOLTAGE (V) | RESISTANCE RANGE (Ω) |
|---|---|---|---|
| 0402 | 50 | 30 | 10 to 1000 |
| 0505 | 125 | 37 | 20 to 1000 |
| 0603 | 125 | 50 | 10 to 1000 |
| 0805 | 200 | 50 | 10 to 1000 |
| 1005 | 250 | 75 | 10 to 1000 |
| 1206 | 330 | 75 | 10 to 1000 |

## DIMENSIONS in inches (millimeters)




| CASE SIZE | LENGTH | WIDTH W (± 0.005) | THICKNESS | TOP PAD D (± 0.005) | BOTTOM PAD E (± 0.005) |
|---|---|---|---|---|---|
| 0402 | 0.042 ± 0.008 (1.067 ± 0.203) | 0.022 (0.559) | 0.015 to 0.0015 (0.381 to 0.0381) | 0.010 (0.254) | 0.010 (0.254) |
| 0505 | 0.055 ± 0.006 (1.397 ± 0.152) | 0.050 (1.270) | 0.015 to 0.0015 (0.381 to 0.0381) | 0.010 (0.254) | 0.015 (0.381) |
| 0603 | 0.064 ± 0.006 (1.626 ± 0.152) | 0.032 (0.813) | 0.015 to 0.0015 (0.381 to 0.0381) | 0.012 (0.305) | 0.015 (0.381) |
| 0805 | 0.080 ± 0.006 (2.032 ± 0.152) | 0.050 (1.270) | 0.015 to 0.0015 (0.381 to 0.0381) | 0.016 ± 0.008 (0.406 ± 0.203) | 0.015 (0.381) |
| 1005 | 0.105 ± 0.008 (2.667 ± 0.203) | 0.050 (1.270) | 0.015 to 0.0015 (0.381 to 0.0381) | 0.015 (0.381) | 0.015 (0.381) |
| 1206 | 0.126 ± 0.008 (3.200 ± 0.203) | 0.063 (1.600) | 0.015 to 0.0015 (0.381 to 0.0381) | 0.020 + 0.005/- 0.010 (0.508 + 0.127/- 0.254) | |

## MECHANICAL SPECIFICATIONS

| | |
|---|---|
| **Resistive Element** | Passivated nichrome |
| **Substrate Material** | Alumina |
| **Terminations** | Pre-soldered or gold |
| **Lead (Pb)-free Option** | 96.5 % Sn, 3.0 % Ag, 0.5 % Cu |
| **Tin/Lead Option** | Sn63 |
| **Lead (Pb)-free Finish and Tin / Lead** | Hot solder dip |

## GLOBAL PART NUMBER INFORMATION

**New Global Part Numbering: FC1206E1001BBTS**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | C | 1 | 2 | 0 | 6 | E | 1 | 0 | 0 | 1 | B | | B | | T | S |
| F | C | 1 | 2 | 0 | 6 | K | 1 | 0 | 0 | 0 | B | T | B | S | T | S |

| GLOBAL MODEL | CASE SIZE | TCR CHARACTERISTIC | RESISTANCE | TOLERANCE | TERMINATION (1, 2 or 3 digits) | PACKAGING |
|---|---|---|---|---|---|---|
| **FC** | **0402**<br>**0505**<br>**0603**<br>**0805**<br>**1005**<br>**1206** | **E** = 25 ppm/°C<br>**H** = 50 ppm/°C<br>**K** = 100 ppm/°C | The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. "R" designates the decimal point.<br><br>Example:<br>10R0 = 10 Ω<br>1000 = 100 Ω<br>1001 = 1 kΩ | **B** = 0.1 %<br>**D** = 0.5 %<br>**F** = 1 %<br>**G** = 2 %<br>**J** = 5 % | **T** = Top sided Au (gold) term Au over Ni epoxy bondable RoHS-compliant - e4<br>**B** = Wraparound Sn/Pb solder 63 % Sn/37 % Pb with nickel barrier<br>**G** = Wraparound Au over Ni (gold) termination epoxy bondable RoHS-compliant - e4<br>**TB** = Top sided Sn/Pb solder 63 % Sn/37 % Pb with nickel barrier<br>**TBS** = Top sided lead (Pb)-free solder with nickel barrier RoHS-compliant - e1<br>**S** = Wraparound lead (Pb)-free solder 96.5 % Sn/3.0 % Ag/0.5 %Cu RoHS-compliant - e1 | **BS** = BULK 100 min., 1 mult<br>**WS** = WAFFLE 100 min., 1 mult<br><br>TAPE AND REEL<br>**T0** = 100 min., 100 mult<br>**T1** = 1000 min., 1000 mult (1)<br>**T3** = 300 min., 300 mult<br>**T5** = 500 min., 500 mult<br>**TF** = Full reel<br>**TS** = 100 min., 1 mult |

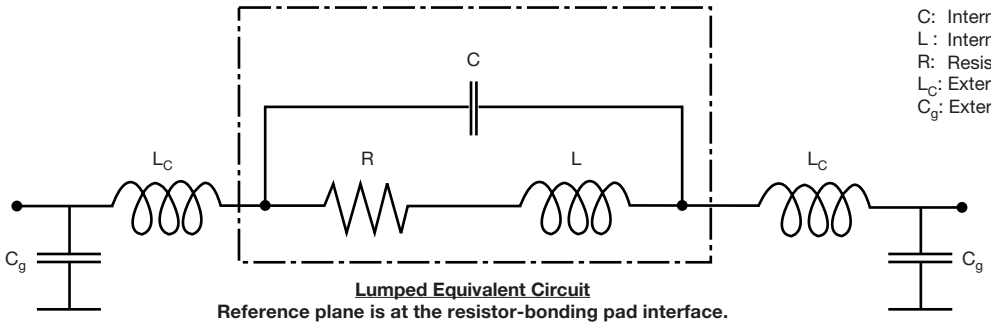
**Historical Part Number example: FC1206E1001BBT (for reference purposes only)**

| FC | 1206 | E | 1001 | B | B | T |
|---|---|---|---|---|---|---|
| SERIES | CASE SIZE | TCR CHARACTERISTIC | RESISTANCE | TOLERANCE | TERMINATION | PACKAGING |

**Note**

(1) Preferred packaging code

## TYPICAL HIGH FREQUENCY PERFORMANCE ELECTRICAL MODEL AND TESTING



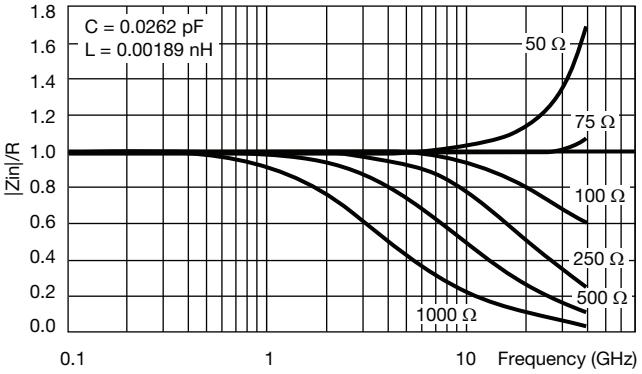

C: Internal shunt capacitance
L : Internal inductance
R: Resistance
$L_C$: External connection inductance
$C_g$: External capacitance to ground

**Lumped Equivalent Circuit**
**Reference plane is at the resistor-bonding pad interface.**

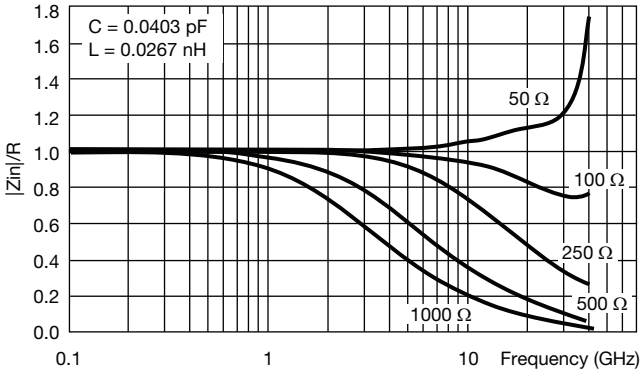
The lumped circuit above was used to model the data at the bonding pad-resistor reference plane. High frequency testing was performed by Modelithics, Inc. on parts mounted to quartz test boards. Quartz test boards were chosen to minimize the contribution of the board effects at high frequencies.

## INTERNAL IMPEDANCE

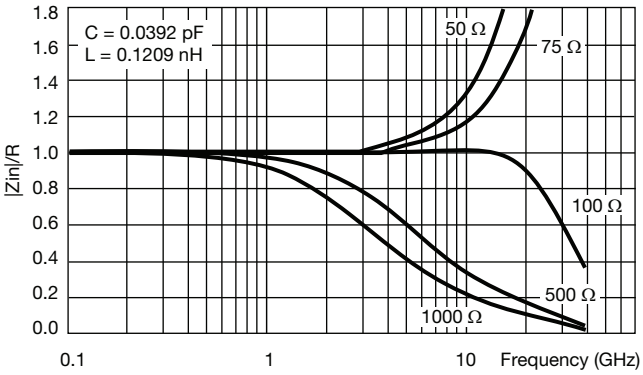
**0402 Flip chip**



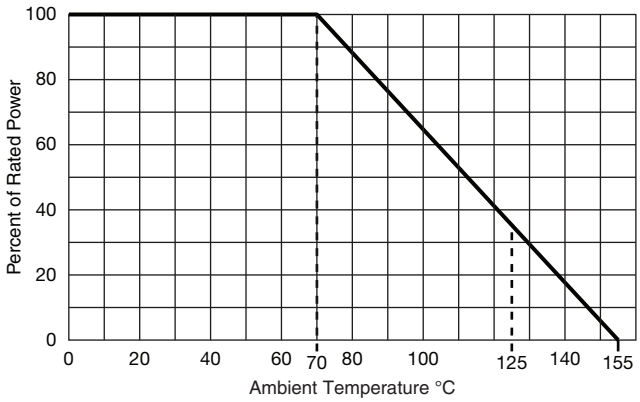

**0603 Flip chip**



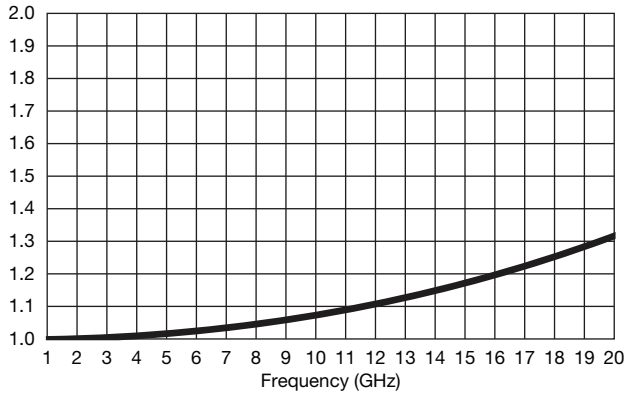

**0402 Wraparound**



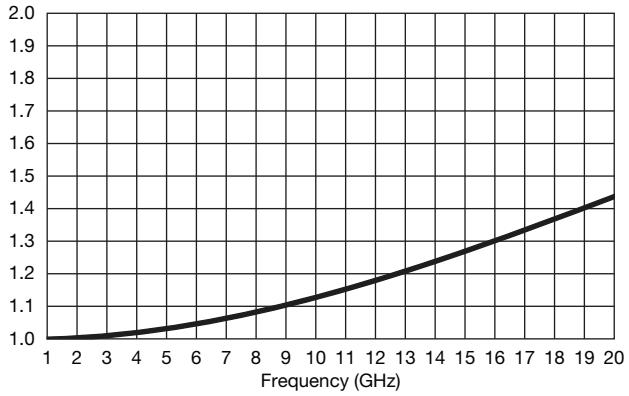
**DERATING CURVE**




**VSWR FC Series 0402 size 50 Ω**




**VSWR FC Series 0402 size 100 Ω**



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