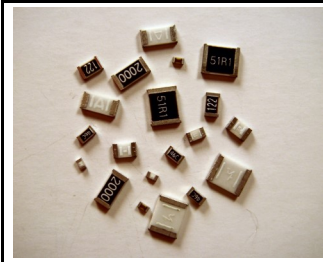




**Product Family:** [Precision Thin Film Chip Resistor](#)  
**Part Number Series:** [TF Series](#)



#### Construction:

- High Purity Alumina Substrate
- Ni alloy thin-film resistive element
- Wrap around electrodes
- 100% matte tin over Ni terminations (RoHS compliant and Pb Free)
- AEC-Q200 Qualified Available
- Anti-Sulfur

#### Features:

- 0201, 0402, 0603, 0805, 1206, 1210, 2010, and 2512 sizes and E24 + E192 values
- TCR's down to  $\pm 5$  ppm/ $^{\circ}$ C
- Resistance down to  $4.7\Omega$  available
- High volume production suitable for commercial and special applications

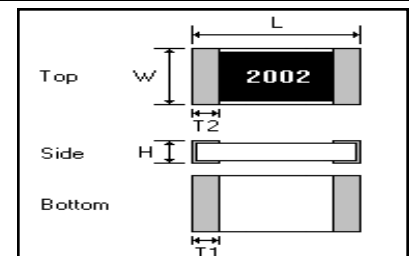
#### Description:

These precision chip resistors offer excellent performance and tolerance in TCR, current noise, and linearity for high frequency circuit applications and other applications requiring precision and stability. High volume manufacturing allows for lower costs for the customer.

#### Product Dimensions:

| Dimension | TF0201<br>(0603)     | TF0402<br>(1005)     | TF0603<br>(1608)     | TF0805<br>(2012)     | TF1206<br>(3216)     | TF1210<br>(2632)     | TF 2010<br>(5025)    | TF2512<br>(6432)     |
|-----------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| L         | 0.024<br>$\pm 0.001$ | 0.039<br>$\pm 0.002$ | 0.061<br>$\pm 0.004$ | 0.079<br>$\pm 0.004$ | 0.122<br>$\pm 0.004$ | 0.126<br>$\pm 0.004$ | 0.197<br>$\pm 0.004$ | 0.250<br>$\pm 0.004$ |
| W         | 0.012<br>$\pm 0.001$ | 0.020<br>$\pm 0.002$ | 0.031<br>$\pm 0.004$ | 0.049<br>$\pm 0.004$ | 0.063<br>$\pm 0.004$ | 0.102<br>$\pm 0.006$ | 0.098<br>$\pm 0.006$ | 0.126<br>$\pm 0.006$ |
| H         | 0.009<br>$\pm 0.001$ | 0.012<br>$\pm 0.002$ | 0.018<br>$\pm 0.006$ | 0.020<br>$\pm 0.006$ | 0.022<br>$\pm 0.004$ | 0.022<br>$\pm 0.004$ | 0.022<br>$\pm 0.004$ | 0.022<br>$\pm 0.004$ |
| T1        | 0.006<br>$\pm 0.002$ | 0.010<br>$\pm 0.004$ | 0.012<br>$\pm 0.006$ | 0.016<br>$\pm 0.008$ | 0.016<br>$\pm 0.008$ | 0.020<br>$\pm 0.008$ | 0.024<br>$\pm 0.010$ | 0.035<br>$\pm 0.010$ |
| T2        | 0.004<br>$\pm 0.002$ | 0.006<br>$\pm 0.004$ | 0.010<br>$\pm 0.006$ | 0.010<br>$\pm 0.008$ | 0.016<br>$\pm 0.008$ | 0.020<br>$\pm 0.008$ | 0.024<br>$\pm 0.008$ | 0.024<br>$\pm 0.008$ |

All dimensions are shown in inches, Metric case sizes are shown in parenthesis.



#### Part Numbering: Ex:TF0603LE2002D-T5

| Product Designator | Size W x L English   | Power                              | Temp. Coefficient of Resistance (TCR)   | Resistance Value  | Resistance Tolerance   | Automotive Grade  | T&R Packaging Quantity  |
|--------------------|--|------------------------------------|---|---|--|---|---|
| TF                 | 0201<br>0402<br>0603<br>0805<br>1206<br>1210<br>2010<br>2512 | H = Hi Power**<br>L = Normal Power | M = $\pm 5$ ppm/ $^{\circ}$ C<br>Y = $\pm 10$ ppm/ $^{\circ}$ C<br>E = $\pm 25$ ppm/ $^{\circ}$ C<br>Q = $\pm 50$ ppm/ $^{\circ}$ C | For all sizes, use 4 digit code for all values. "R" denotes decimal position as necessary | T = $\pm 0.01\%$ ***<br>A = $\pm 0.05\%$ ***<br>B = $\pm 0.10\%$<br>C = $\pm 0.25\%$<br>D = $\pm 0.50\%$<br>F = $\pm 1.00\%$ | A = Automotive AEC-Q200<br>Leave Blank for Non AEC-Q200 | -T4 = 4,000 PCS* (2010, 2512)<br>-T5 = 5,000 PCS (0603, 0805, 1206, 1210)<br>-T10 = 10,000 PCS (0402)<br>-T15 = 15,000 PCS (0201) |

\* Note 1: Tape quantity codes can be left off when ordering or requesting quote. These will be assigned by us based on part/quantity ordered.

\*\* Note 2: TCR of  $\pm 5$ ppm (M) and  $\pm 10$ ppm (Y) are only offered in the H Power Code. TCR of  $\pm 25$ ppm (E) and  $\pm 50$ ppm (Q) are offered in both L and H Power Code, see electrical specifications for power specifications for power ratings

\*\*\* Note 3: Confirm availability of  $\pm 0.01\%$  &  $\pm 0.05\%$  tolerance with TFT prior to ordering

**Electrical Specifications:**

| Type                  | TF0201   |         |                    | TF0402             |         |        |                    | TF0603             |          |          |         |
|-----------------------|--|---------|--------------------|--------------------|---------|--------|--------------------|--------------------|----------|----------|---------|
| English Size          | 0201   |         |                    | 0402               |         |        |                    | 0603               |          |          |         |
| Power (watts)         | 1/32   | 1/20    |                    | 1/16               | 1/10    |        | 1/16               | 1/10               |          |          |         |
| Tolerance% (code)     | ±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T) |         |                    |                    |         |        |                    |                    |          |          |         |
| Resistance Range (Ω)  | 27~12K   | 27~22K  | 100~12K            | 10~255K            | 10~20K  | 10~10K | 10~100K            | 4.7~1M             | 4.7~680K | 4.7~100K | 4.7~50K |
| Resistance Offering   | E-24 + E-192 Values                                  |         |                    |                    |         |        |                    |                    |          |          |         |
| TCR ppm/°C (code)     | ±25 (E)  | ±50 (Q) | ±50 (Q)<br>±25 (E) | ±50 (Q)<br>±25 (E) | ±10 (Y) | ±5 (M) | ±50 (Q)<br>±25 (E) | ±50 (Q)<br>±25 (E) |          | ±10 (Y)  | ±5 (M)  |
| Max Operating Voltage | 15V  |         |                    | 50V                | 25V     |        | 50V                | 50V                |          | 75V      |         |
| Operating Temp. Range | -55°C ~ 155°C De-rating @ 70°C                       |         |                    |                    |         |        |                    |                    |          |          |         |
| Packaging             | 15,000 pcs/reel                                      |         |                    | 10,000 pcs/reel    |         |        |                    | 5,000 pcs/reel     |          |          |         |

| Type                  | TF0805   |                    |          |          | TF1206             |        |          |          |
|-----------------------|--|--------------------|----------|----------|--------------------|--------|----------|----------|
| English Size          | 0805   |                    |          |          | 1206               |        |          |          |
| Power (watts)         | 1/10   | 1/8                |          |          | 1/8                | 1/4    |          |          |
| Tolerance% (code)     | ±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T) |                    |          |          |                    |        |          |          |
| Resistance Range (Ω)  | 4.7~2M   | 4.7~1M             | 4.7~200K | 4.7~100K | 4.7~2.49M          | 4.7~1M | 4.7~300K | 4.7~150K |
| Resistance Offering   | E-24 + E-192 Values                                  |                    |          |          |                    |        |          |          |
| TCR ppm/°C (code)     | ±50 (Q)<br>±25 (E)                                   | ±50 (Q)<br>±25 (E) | ±10 (Y)  | ±5 (M)   | ±50 (Q)<br>±25 (E) |        | ±10 (Y)  | ±5 (M)   |
| Max Operating Voltage | 100V   | 150V               | 100V     |          | 200V               |        |          |          |
| Operating Temp. Range | -55°C ~ 155°C De-rating @ 70°C                       |                    |          |          |                    |        |          |          |
| Packaging             | 5,000 pcs/reel                                       |                    |          |          |                    |        |          |          |

| Type                  | TF1210   |          |          |                    | TF2010             |          |          |                    |
|-----------------------|--|----------|----------|--------------------|--------------------|----------|----------|--------------------|
| English Size          | 1210   |          |          |                    | 2010               |          |          |                    |
| Power (watts)         | 1/4  |          | 2/5      |                    | 1/2                |          | 3/4      |                    |
| Tolerance% (code)     | ±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T) |          |          |                    |                    |          |          |                    |
| Resistance Range (Ω)  | 4.7~2.49M  | 4.7~400K | 4.7~150K | 10~1M              | 4.7~3M             | 4.7~900K | 4.7~360K | 10~1.5M            |
| Resistance Offering   | E-24 + E-192 Values                                  |          |          |                    |                    |          |          |                    |
| TCR ppm/°C (code)     | ±50 (Q)<br>±25 (E)                                   | ±10 (Y)  | ±5 (M)   | ±50 (Q)<br>±25 (E) | ±50 (Q)<br>±25 (E) | ±10 (Y)  | ±5 (M)   | ±50 (Q)<br>±25 (E) |
| Max Operating Voltage | 200V   |          |          |                    |                    |          |          |                    |
| Operating Temp. Range | -55°C ~ 155°C De-rating @ 70°C                       |          |          |                    |                    |          |          |                    |
| Packaging             | 5,000 pcs/reel                                       |          |          |                    | 4,000 pcs/reel     |          |          |                    |

| Type                  | TF2512   |          |          |                    |
|-----------------------|--|----------|----------|--------------------|
| English Size          | 2512   |          |          |                    |
| Power (watts)         | 3/4  |          |          | 1                  |
| Tolerance% (code)     | ±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T) |          |          |                    |
| Resistance Range (Ω)  | 4.7~3M   | 4.7~1.5M | 4.7~600K | 10~1.5M            |
| Resistance Offering   | E-24 + E-192 Values                                  |          |          |                    |
| TCR ppm/°C (code)     | ±50 (Q)<br>±25 (E)                                   | ±10 (Y)  | ±5 (M)   | ±50 (Q)<br>±25 (E) |
| Max Operating Voltage | 200V   |          |          |                    |
| Operating Temp. Range | -55°C ~ 155°C De-rating @ 70°C                       |          |          |                    |
| Packaging             | 4,000 pcs/reel                                       |          |          |                    |

**Reliability Specifications:**

| Test                | Test Method   | Specification  |
|---------------------|---|--|
| Short Time Overload | Applied voltage: 2.5X rated voltage or 2X maximum operating voltage, whichever is less. Test duration: 5 seconds  | $\pm 0.2\% + 0.05\Omega$<br>TCR=50PPM & 25PPM<br>$\pm 0.1\% + 0.05\Omega$<br>TCR=10PPM & 5PPM  |
| Load Life           | Test Temperature: 70°C<br>Applied voltage: rated voltage<br>Test period: 1000 hours with power cycling as follows:<br>90 min. power ON/30 min. power OFF,     | $\pm 0.5\% + 0.05\Omega$<br>TCR=50PPM & 25PPM<br>$\pm 0.25\% + 0.05\Omega$<br>TCR=10PPM & 5PPM |
| Moisture Load Life  | Test Condition: 40°C/95% RH<br>Applied voltage: rated voltage<br>Test period: 1000 hours with power cycling as follows:<br>90 min. power ON/30 min. power OFF | $\pm 0.5\% + 0.05\Omega$<br>TCR=50PPM & 25PPM<br>$\pm 0.25\% + 0.05\Omega$<br>TCR=10PPM & 5PPM |
| Temperature Cycle   | Repeat 5 cycles as follows:<br>-55°C(30 min.) / Room temp (2 min) /<br>+125°C(30 min.) / Room temp (2 min)  | $\pm 0.2\% + 0.05\Omega$<br>TCR=50PPM & 25PPM<br>$\pm 0.1\% + 0.05\Omega$<br>TCR=10PPM & 5PPM  |

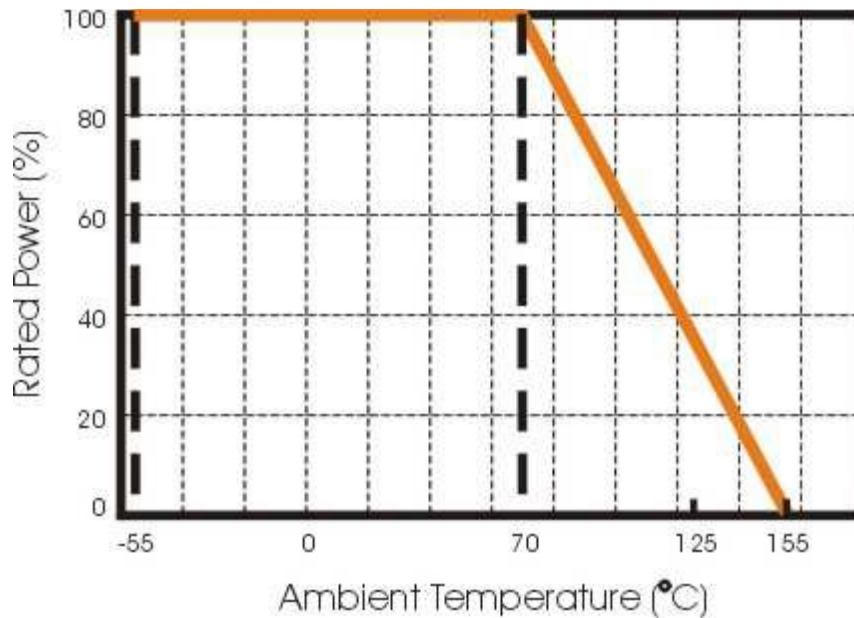
**Derating Curve:**

Fig.2 Maximum dissipation in percentage of rated power  
As a function of the ambient temperature