Type USF Ultra-Stable Low TC Film Resistors
200 Series and 300 Series

Zero Nominal TC — Maximum Absolute TC to 2 ppm/°C, -40°C to +85°C, ref. to +25°C
Absolute Tol. to ±0.01%, Resistance Range 50 Ohm to 25 Megohm, Voltage Ratings up to 2500 Volts

The USF Ultra-Stable Low TC Ultra-Precision Film Resistors were developed to meet the requirements for increasing performance for resistors in high performance analog electronics. Utilizing Caddock proprietary resistance film systems, the Type USF resistors provide the Lowest TC with the Widest Resistance Range and the Highest Voltage Ratings available in the industry.

- Resistance Range 50 ohm to 25 Megohm.
- Temperature Coefficient -40°C to +85°C, referenced to +25°C
- 200 Series — ZERO Nominal TC — Maximum Absolute TC 2 ppm/°C
- 300 Series — ZERO Nominal TC — Max. Abs. TC 5 ppm/°C or 10 ppm/°C
- Tolerance: ±0.01% or ±0.1%
- Specific standard resistance values are available that are most commonly required in high accuracy analog design. These values were selected and optimized for producibility and performance.
- “Matched Pairs” of USF 300 Series are available with ratio TC as tight as 0.5 ppm/°C. Contact Applications Engineering.
- Ceramic package provides cool operation.

Type USF Ultra-Stable Resistors are offered in standard resistance values that are most commonly used in precision analog design. These standard resistance values can be used in precise amplifier gain setting, precise transducer sense circuits, and precise voltage dividers with up to 2500 volt input voltage.

Extremely Low Power Coefficient (Wattage Coefficient): Type USF resistors are constructed with an aluminum oxide ceramic sandwich that provides great thermal conductivity. The ceramic sandwich package very effectively minimizes the power coefficient drift. Power coefficient is the resistance drift due to temperature rise in the element caused by the power (wattage) dissipation in the resistor where the self-heating temperature rise of the resistor element results in TC drift (temp. rise in °C, times the temperature coefficient of the resistor). In the USF package, heat is pulled away from the resistance material efficiently by this ceramic sandwich package construction. Plastic molded Low TC foil resistors cannot provide this outstanding benefit since the plastic impedes the flow of heat, causing greater temperature rise at the resistor element and greater self-heating related resistance drift due to power dissipation. The USF 200 Series resistors provide a new level of performance with near ZERO TC, very low power coefficient, wide resistance range, and higher voltage ratings than is offered by other resistor technologies.

### Model Numbers and Specifications

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Wattage @ +85°C</th>
<th>Maximum Continuous Oper. Voltage</th>
<th>Resistance</th>
<th>Tolerance</th>
<th>Temperature Coefficient</th>
<th>Fig.</th>
<th>Dimensions (inches (mm))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min.</td>
<td>Max.</td>
<td></td>
<td></td>
<td>A           B           C           D</td>
</tr>
<tr>
<td>USF240</td>
<td>0.33</td>
<td>300</td>
<td>50 Ω</td>
<td>10 Meg</td>
<td>0.01% or 0.1%</td>
<td>1</td>
<td>0.51        0.51        0.51        0.51</td>
</tr>
<tr>
<td>USF270</td>
<td>0.75</td>
<td>1,400</td>
<td>990 K</td>
<td>5 Meg</td>
<td>0.01% or 0.1%</td>
<td>1</td>
<td>1.35        0.51        0.51        0.51</td>
</tr>
<tr>
<td>USF271</td>
<td>0.75</td>
<td>2,500</td>
<td>9.9 Meg</td>
<td>10 Meg</td>
<td>0.01% or 0.1%</td>
<td>1</td>
<td>1.35        0.51        0.51        0.51</td>
</tr>
<tr>
<td>USF340</td>
<td>0.33</td>
<td>300</td>
<td>50 Ω</td>
<td>20 Meg</td>
<td>0.01% or 0.1%</td>
<td>2</td>
<td>0.51        0.51        0.51        0.51</td>
</tr>
<tr>
<td>USF370</td>
<td>0.75</td>
<td>1,400</td>
<td>990 K</td>
<td>10 Meg</td>
<td>0.01% or 0.1%</td>
<td>2</td>
<td>1.35        0.51        0.51        0.51</td>
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<tr>
<td>USF371</td>
<td>0.75</td>
<td>2,500</td>
<td>19.8 Meg</td>
<td>25 Meg</td>
<td>0.01% or 0.1%</td>
<td>2</td>
<td>1.35        0.51        0.51        0.51</td>
</tr>
</tbody>
</table>
Type USF Ultra-Stable Low TC Film Resistors
200 Series and 300 Series

Standard Resistance Values:

USF240 Standard Resistance Values:
Absolute Tolerance: ±0.01% or ±0.1%, Absolute TC: 2 ppm/°C
50.0Ω  350Ω  2.00K  10.0K  90.0K  250K  2.50Meg  10.0Meg
100Ω  500Ω  2.50K  20.0K  99.0K  500K  5.00Meg  5.00Meg
200Ω  900Ω  5.00K  25.0K  100K  1.00Meg  9.90Meg
250Ω  1.00K  9.00K  50.0K  200K  2.00Meg  9.99Meg

USF270 Standard Resistance Values:
Absolute Tolerance: ±0.01% or ±0.1%, Absolute TC: 2 ppm/°C
990K  1.00Meg  2.00Meg  5.00Meg

USF271 Standard Resistance Values:
Absolute Tolerance: ±0.01% or ±0.1%, Absolute TC: 2 ppm/°C
990K  1.00Meg  2.00Meg  5.00Meg

USF300 Standard Resistance Values:
Absolute Tolerance: ±0.01% or ±0.1%, Absolute TC: 2 ppm/°C
990K  1.00Meg  2.00Meg  5.00Meg

Specifications:
Resistance Tolerance: ±0.01% or ±0.1% measured at +23°C ±2°C.
Absolute Temperature Coefficient: TC referenced to +25°C, ΔR taken at -40°C and +85°C.
Load Life Stability: 2,000 hours at +85°C at rated voltage, not to exceed rated power, ΔR (±0.015 ±0.015)% max.
10,000 hours at +85°C at rated voltage, not to exceed rated power, ΔR (±0.030 ±0.030)% max.
Thermal Shock: Mil-Std-202 Method 107 condition A, except min. temp. is -40°C, ΔR ±0.01% maximum.
Voltage Coefficient: USF270 at 5 Meg, and USF271, USF370, USF371 at resistances of 9 Meg or greater, 0.02 ppm/volt maximum.
Shelf Life Stability: Typical +(20ppm ±20ppm)/yr. after 1 year. Extended shelf life (ten years) 10 ppm/year maximum.
Operating Temperature: -40°C to +85°C.
Lead Finish: Matte Tin (Sn)

Ordering Information:
USF200 Series Part Numbers:

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Resistor Value</th>
<th>Tolerance (0.01% or 0.1%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USF240 - 10.0M</td>
<td>0.01% - 2ppm</td>
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</tbody>
</table>

USF300 Series Part Numbers:

<table>
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<tr>
<th>Model Number</th>
<th>Resistor Value</th>
<th>Tolerance (0.01% or 0.1%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USF370 - 990K</td>
<td>0.1% - 5ppm</td>
<td></td>
</tr>
</tbody>
</table>

Custom USF 200 Series and 300 Series Resistors:
USF 200 Series and 300 Series Resistors are available, for high quantity applications, with custom performance:
- In the 200 Series, Absolute TC to as tight as 1 ppm/°C is available for certain resistances.
- Matched Ratio TC to as tight as 0.5 ppm/°C for equal resistances.
- Matched Ratio TC can be provided in the 200 Series style “bonded” Resistor pairs.

Other Low TC Resistor Products from Caddock:
- Type TF Low TC Ultra-Precision Film Resistors (1K to 125Meg)
- Type TK Low TC Precision Radial-Lead Film Resistors
- Type TG Low TC Precision High Voltage Resistors (up to 30KV)
- Type USG Low TC Ultra-Precision High Voltage Resistors
- Type USVD Ultra-Precision Voltage Dividers (up to 2000 Volts)
- Type THV Precision High Voltage Dividers (up to 15KV)