



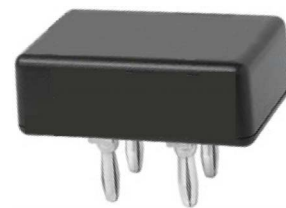
**Texas
Components
Corporation**

USA Manufacturer of Precision Resistors featuring Bulk Metal® Foil*

TXFSR

**Bulk Metal® Foil
Secondary Standard Resistor**

four pin direct DMM connection



Note: exact case dimensions and finish may vary

Secondary Standard Resistor for DMM & Other Laboratory Calibrations

Ultra High Precision, Accuracy, and Stability

Tight Tolerance, Low Temperature Coefficient of Resistance (TCR), Low EMF, and Low Voltage Coefficient of Resistance (VCR)

Resistors featuring Bulk Metal® Foil are known for their unique combination of unmatched performance in all major technical areas, including:

Temperature Coefficient of Resistance (TCR)	Voltage Coefficient of Resistance (VCR)	Electrostatic Discharge (ESD)	Thermal Stabilization	Response Time
Power Coefficient of Resistance (PCR)	Thermal Electromotive Force (EMF)	Tolerance	Load Life Stability	Noise

INTRODUCTION

The accuracy of conventional and even specialized standard resistors you may use to calibrate your instruments can vary based on what the room temperature happens to be at the time. These resistors can also suffer from other instabilities due to load forces and the many other factors listed above as major areas of technical performance for resistors.

All users of DMMs and other such meters have experienced these problems as well as other limitations of use due to the size, configuration, and/or the usable frequency response of the standard resistor.

Texas Components, a USA manufacturer of the most precise production resistors available today, has, in collaboration with VPG, made an extensive analysis of these problems and developed a new and more robust design, still in the same small form factor existing customers may be accustomed to. Utilizing the unequalled performance of Bulk Metal® Foil resistor technology, the TXFSR resistor standard takes this technology to the limit; offering a combination of accuracy, stability, frequency range, size, affordability, and general versatility never before available in a secondary standard resistor.

APPLICATIONS

In addition to standard applications for decade boxes and DMMs, the TXFSR greatly extends the range of usefulness for these and other instruments due to its excellent high frequency performance (e.g. supporting uses in R&D, incoming/outgoing inspection stations, quality control, laboratory applications, etc.).

TXCC resistors featuring Bulk Metal® Foil are used for fixed and comparative direct reading resistance and are appropriate with/for RTD, bridge, attenuators, voltage dividers, multipliers, adjustable feedback (via operational amplifiers), ladder (network) elements, and more!

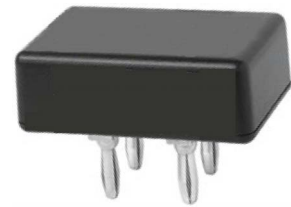
For non-standard requirements and special applications, please contact us. Our experienced Application Engineers and friendly Sales Staff are available to advise and assist you!

TXFSR FEATURES AND SPECIFICATIONS

- Made in the USA by Texas Components Corporation (TXCC).
- Features TXCC Multi-Foil Technology: The most stable single unit design we offer using Bulk Metal® Foil.
- Best price/performance ratio secondary standard available
- Lifetime warranty (excepting only abuse or misuse)

TXFSR FEATURES AND SPECIFICATIONS (continued)

- **Exceptional overall stability:** Typically $\pm 0.0005\%$ (5ppm) at +25°C over 12 months.
- **Temperature coefficient of resistance (TCR):** $< \pm 1.2$ ppm/°C max, typically ± 0.3 ppm/°C (from +15°C to +45°C), as low as ± 0.05 ppm/°C. (See Table 3)
- **High initial and operational accuracy:** Typically 2ppm to 10ppm
- **Standard resistance range:** 1Ω to 250 kΩ (higher or lower values are available by custom order)
- **Standard values and even specific custom values are available;** typically to 5 significant digits (e.g. 1K23456 vs 1K or 9K99962 vs 10K), but even six significant digits is possible. Standard values are 1Ω, 10Ω, 100Ω, 1kΩ, 10kΩ, & 100kΩ.
- **Resistance tolerance:** As low as $\pm 0.001\%$ (10 ppm) by special order, but see Table 3 - the actual measured/calibrated value will be printed on each unit.)
- **Each unit is supplied with dated certification of calibrated accuracy** as referenced to and directly measured against TXCC/NIST primary standards in controlled laboratory conditions.
- **No humidity effect:** Resistive element cavity is oil filled and hermetically sealed.
- **Hermeticity:** 10^{-7} atmospheric cc/s max.
- **Convenient form factor:** Small size, sealed unit, robust construction.
- **Direct plug-in device for most DMMs** (Keithley, HP/Agilent, etc). (For custom configurations please contact us.) Optional male to female banana plug adapters allow use with other devices and in other configurations and applications.
- **Four terminal construction** excludes reading variations due to external factors or wire length.
- **Terminal Finish:** Gold plated for exceptional electrical conductivity and low EMF or Seebeck voltage with most DMMs.
- **RF shielded case** protects against external noise.
- **Integrated grounding jack or stud:** Allows shielded case to be grounded by a variety of cabling options (spade, lug, alligator clip, banana plug, etc.).
- **Thermal stabilization time:** < 1.0 sec (nominal value achieved within 10 ppm of steady state value)
- **Electrostatic discharge (ESD):** At least to 25 kV
- **Rise time:** 1.0 ns; effectively no ringing
- **Current noise:** 0.010 μV (rms)/Volt of Applied Voltage (< -40 dB)
- **Voltage coefficient:** < 0.1 ppm/V
- **Inductance:** < 0.08 μH typical; 0.1 μH max (non-inductive design)
- **Hot spot free design**
- **Power coefficient of resistance** (ΔR due to self heating): $< \pm 1$ ppm at rated power
- **Maximum Working Voltage:** 300 V, always subject to $V < \sqrt{P \times R}$
- **Rated power:** 0.20 W at +25 °C (higher ratings are possible by special order)
- **Short time overload:** $\leq 0.005\%$
- **Capacitance:** 0.5 pF typical; 1.0 pF max (non-capacitive design)
- **Thermal EMF** due to temperature difference between leads: 0.05 μV/°C typical (0.10 μV/°C max); or due to self-heating at 0.1 W: < 1 μV
- **Fast delivery of custom made units:** Standard values are often in stock. Custom values and configurations can be expedited.
- **Recalibration services are available** for these and other resistor standards.



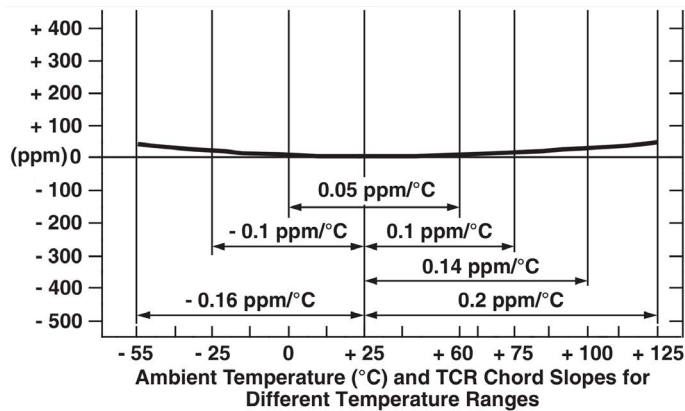
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TABLE 1 - Best Characteristics Available from Different Types of Resistor Technologies

Technology	Temperature Coefficient of Resistance (TCR) (-25°C to +125°C, +25°C ref)	Initial Tolerance	End of Life Tolerance	Load Life Stability at +70°C, Rated Power at 2000 Hours and then at 10,000 Hours	ESD (V)	Thermal Stabilization	Noise (dB)
Bulk Metal® Foil	± < 0.2 ppm/°C	From 0.001%	< 0.05%	0.0025% (25 ppm) 0.005% (50 ppm)	25,000V	< 1 second	-42db
Thin Film	±2 ppm/°C	From 0.01%	< 0.4%	0.02% (200 ppm) 0.1% (1000 ppm)	2,500V	> minutes	-35db
Thick Film	±50 ppm/°C	From 0.5%	< 5%	0.5% (5000 ppm) 2% (20,000 ppm)	2,000V	> minutes	+20db
Wirewound	±3 ppm/°C	From 0.005%	< 0.5%	0.05% (500 ppm) 0.15% (1500 ppm)	25,000V	> minutes	-35db

FIGURE 1 – EXAMPLE Z-FOIL RESISTANCE/TEMPERATURE CURVE(S) [STATISTICALLY COMBINED]



Note: The TCR values for < 100Ω become more influenced by the lead/termination composition and result in a greater effective deviation from this curve for the resistor itself.

TABLE 2 – MATERIALS AND DIMENSIONS

SPECIFICATIONS	PARAMETERS
Body and Cover	High impact polystyrene
Finish	Black textured
Terminal Finish	Gold
Standard Terminal Separation (other dimensions available)	0.75 inches
	19.05 mm
Weight	Approximately 50 grams

FIGURE 2 – EXAMPLE TCR CURVES +15°C to +45°C

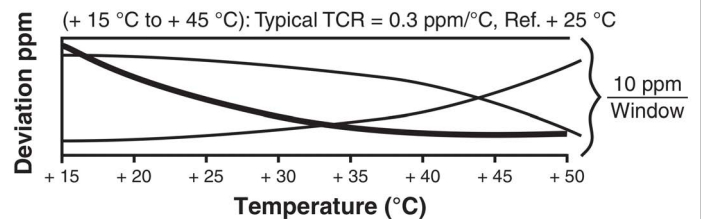


TABLE 3 – PERFORMANCE SPECIFICATIONS

NOMINAL RESISTANCE VALUE ⁽¹⁾ (Ω)	TYPICAL/TARGETED TOLERANCE ^{(1) (2)} (%)	TYPICAL/TARGETED TCR +15°C TO +45°C (PPM/°C)	STABILITY AT 25°C, 12 MONTHS (PPM)	SPECIFICATIONS BASED ON MAXIMUM ALLOWED POWER AT 25°C ⁽³⁾ (Watts)	INTENDED OPERATING TEMPERATURE RANGE
1 to 9.9	0.1%	± 1.2	5	0.20	+15°C to +45°C
10 to 49.9	0.05%	± 0.9	5	0.20	+15°C to +45°C
50 to 99.9	0.025%	± 0.6	5	0.20	+15°C to +45°C
100 to 999	0.01%	± 0.4	5	0.20	+15°C to +45°C
1K to 100K	0.005%	± 0.3	5	0.20	+15°C to +45°C
>100K to 250K	0.01%	± 0.9	5	0.20	+15°C to +45°C

Notes: (1) For resistance values below 1Ω or above 250KΩ, or for other tighter and extended performance specifications, please contact us. (2) Target tolerances are guidelines only. Units are not marked for tolerance as each unit is labeled with the actual measured value as referenced to a primary NIST certified standard – typically to better than 10ppm accuracy. (3) The maximum voltage for a given resistance value is calculated using $V < \sqrt{P \times R}$



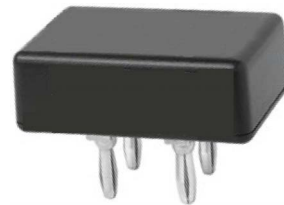
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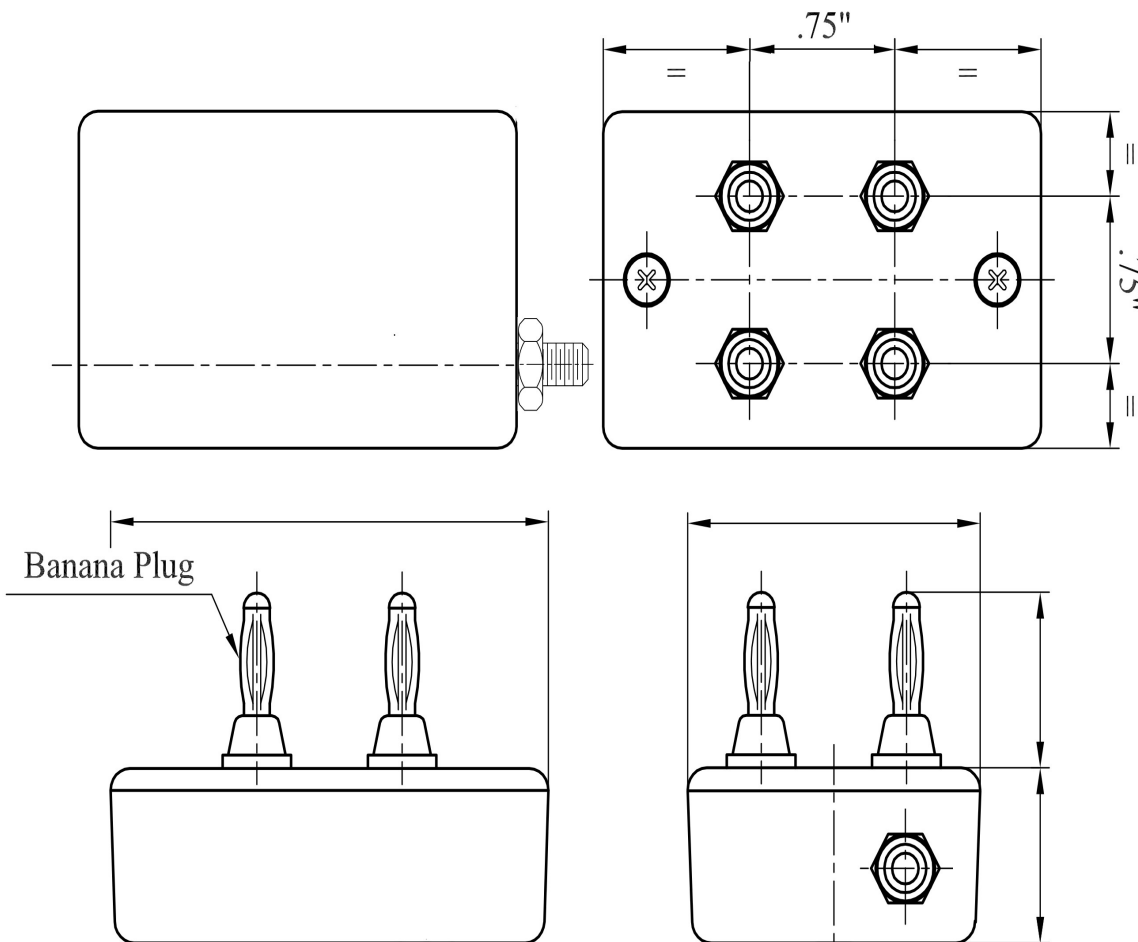
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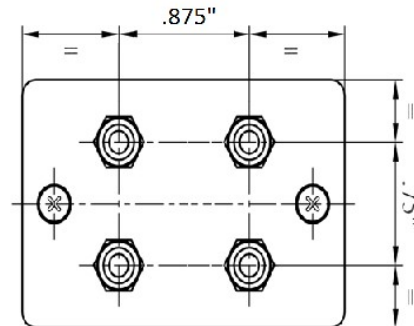


Note: exact case dimensions and finish may vary

FIGURE 3 - PHYSICAL LAYOUT



For HP/Agilent DMMs



Made in the USA



 Texas Components Corporation	<h1>TXFSR</h1>	 <p>Note: exact case dimensions and finish may vary</p>
	Bulk Metal® Foil Secondary Standard Resistor four pin direct DMM connection	
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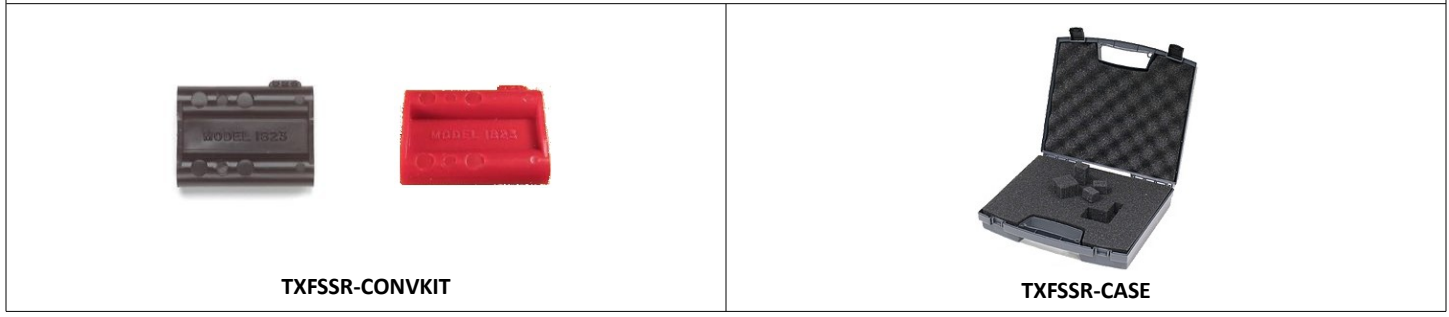
TABLE 4 – HOW TO ORDER THE CORRECT PART NUMBER

MODEL	RESISTANCE VALUE	PIN CONFIGURATION	CHASSIS GROUND	PACKAGING
TXFSR	10Ω to 100kΩ (R = Ω and K = kΩ) Shown as 7 characters ²	Standard = S HP/Agilent = H Custom = C ⁽¹⁾	Banana Jack = J #6 Stud = S	All units are individually packaged. A carrying case is available.

Notes:
(1) Custom pin configuration requires a special order agreement.
(2) 6 significant digits, is available by special order only.

A 100,005 ohm value, standard pin configuration, and banana jack ground connector would be ordered as: **TXFSR-100K005-S-J**
A 10,000 ohm value, standard pin configuration, and banana jack ground connector, would be ordered as: **TXFSR-10K0000-S-J**
A 100 ohm value, HP type pin configuration, and a #6 threaded ground connector, would be ordered as: **TXFSR-100R000-H-S**
A 50.5 ohm value, custom pin configuration, and banana jack ground connector would be ordered as: **TXFSR-50R5000-C-J**

Related Accessories and Services:
(1) Pin Conversion Kit (converts 4 male banana pins/plugs to female jacks to allow for alternative cabling and use with other DMM's and other equipment and/or configurations). Order part number **TXFSR-CONVKIT**
(2) Padded carrying case allows for combined storage and transport of up to 9 units plus some other accessories. Order part number **TXFSR-CASE**
(3) Calibration/Recalibration of these and other standard resistors. Order part number **TXFSR-RECAL**



For more information about this product or subject please contact us at: txccsales@texascomponents.com

Visit us at: www.texascomponents.com

You can also “Follow” Texas Components and Bulk Metal® Foil Resistors on Twitter: [@TexasComponents](https://twitter.com/TexasComponents)

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