

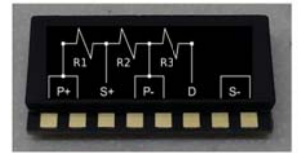


**Texas
Components
Corporation**

USA Manufacturer of Precision Measurement Devices
(featuring Bulk Metal® Foil* Technology)

TXBCM301

**Bulk Metal® Foil* Resistor Network
RTD Capable Bridge Completion Module**
for Strain/Stress Measurement Applications



Cross to Micro-Measurements
MR1-350-130

Precision Bulk Metal® Foil Bridge Completion Module (with RTD)

Precision Resistor Network for Strain/Stress Measurement Applications

Ultra Low TCR; Ultra High Precision, Accuracy, and Stability

Resistors featuring Bulk Metal® Foil are renowned 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**

Strain gage instrumentation is readily available with built-in bridge completion resistors and “dummy” gages to accept quarter-bridge and half-bridge strain gage input circuits. However, if the instrumentation at hand does not have these components, or if the particular measurement application does not permit their use, or when accuracy can be improved by completing the bridge at the measurement site, an external bridge completion module must be provided. The TXBCM series of Bridge Completion Modules employ unique metal-foil resistance elements, bonded to a ceramic substrate, combined into a special thermally conductive circuit, then packaged in an environmental protection system that ensures long-term stability and facilitates field use readiness (i.e. no supplementary environmental protection is required during most applications).

The resistance elements are specially processed to “match” the thermal expansion coefficient of the ceramic and, and then further matched to each other - resulting in a temperature coefficient of resistance as low as and equivalent to $\pm 0.50 \mu\text{E}/^\circ\text{C}$ ($\pm 0.28 \mu\text{E}/^\circ\text{F}$) for the matched (bridge) pair R1 and R2. Each module is marked with a circuit/wiring diagram for easy terminal identification, and each module is optionally provided with foam tape for easy attachment to the test-part surface or otherwise near the instrumentation site. Heavy, pre-tinned copper terminals facilitate attachment of up to 22 AWG (0.64mm diameter) leadwires. And our latest models now include the option of an on-board RTD, so you can measure temperature concurrently with resistance and stress/strain!

Completing the bridge circuit proximate to the strain gage site provides for a symmetrical, balanced leadwire system between the strain gage circuit and the instrumentation. This can also reduce the effects of noise pickup in the leadwire system in some environments. Also, where switch contacts, slip rings, or other mechanical connections are employed between the strain gages and measuring instrumentation, or when leadwires will be periodically disconnected from the measuring instrument, accuracy can be improved by completing the bridge proximate to the measurement site. Bridge Completion Modules can be customized to meet any special circuit requirements - just contact our Applications Engineering Department about your specific needs.

TXBCM301 FORM & FUNCTION

Provides a precision half bridge and a dummy gage. Recommended for use with half-bridge strain gage circuits of any resistance value, or with a specific value three-wire quarter-bridge circuit. Customized higher values can extend battery life in battery-powered instrumentation, reduce strain gage self-heating, and permit higher bridge excitation voltage to improve signal-to-noise ratio. The **advantages** of this module include:

- **Easy to use** (just solder leadwires to the pre-tinned solder pads).
- **Very rugged** (Encased and protected).
- **Less required calibration** of the standard itself (Modules becomes even more stable over time, unlike other resistor technologies).
- **Small, light, and very portable** (~1.4" x 0.83" x 0.3"; ~36mm x 21mm x 8mm; ~4g). Smaller sizes are available – just tell us what you need!

Bulk Metal® Foil technology outperforms all other resistor technologies today, making it the clear choice for applications that require high precision and high stability. This technology allows for the design and production of strain/stress measurement products and accessories that would not be possible otherwise. The TXBCM series of Bulk Metal® Foil based bridge completion modules offers **very low TCR, excellent load life stability, tight tolerance, fast response time, low current noise, low thermal EMF, low power coefficient, and low voltage coefficient** - all in a convenient, sealed design with easy solder connections. The TXBCM series is **virtually insensitive to common destabilizing factors** that can completely undermine the accuracy and usefulness of other resistor types. **The resistor element used is a solid alloy that is inherently ultra stable** which, along with the many other additional Bulk Metal® Foil benefits, **guarantees the highest degree of accuracy and stability in fixed-resistor applications.** For questions, special applications and/or unique requirements, or **if any of the specifications are inadequate, our Applications Engineering Department is on-site and available to help and advise about modifications or alternatives.**

TXBCM301 FEATURES & SPECIFICATIONS

- **Accuracy:** Individual calibrated resistance tolerances to $\pm 0.005\%$ and matched pairs (R1 and R2) to $< \pm 0.01\%$ (100 ppm) max separation. (See Table 1)
- **Temperature Coefficient (TCR):** R1, R2, & R3 to $< \pm 1.0 \text{ ppm}/^\circ\text{C}$ ($\pm 0.28 \mu\text{E}/^\circ\text{F}$ for GF=2) and R1 & R2 (half bridge) temperature matched to a max tracking separation of $< \pm 1.0 \text{ ppm}/^\circ\text{C}$ ($\pm 0.28 \mu\text{E}/^\circ\text{F}$ for GF=2); (See Table 1)
- **Continuous Operating Temperature range** (recommended): **-45°C to +125°C** (-49°F to +257°F); [Transient -50°C to +150°C (-58°F to +300°F); Max momentary -55°C to +175°C (-67°F to +347°F)] (Wider ranges are available – just ask.)
- **Rated power: 0.6 W** across any/each resistor (at +70°C). See Figure 2.
- **Resistance range: 1Ω to 250KΩ** (Any resistance value is available to 6 digits.)
- **Exceptional load life stability: $\pm 0.005\%$** (< 50 ppm) at 2000 hours, 0.1 W and 70°C; $\pm 0.015\%$ (< 150 ppm) after 10,000 hours.
- **Power coefficient of (PCR) or ΔR** due to self heating: **$\pm 5 \text{ ppm/watt}$** at rated power (0.6W).
- **Voltage coefficient of resistance (VCR): $< 0.1 \text{ ppm/V}$** (essentially zero)
- **Typical working voltage: 0V to 25V** (300V max but always subject to $V \leq \sqrt{0.6 \times R}$) for each individual resistor.)
- **Electrostatic discharge protection (ESD): $> 25 \text{ kV}$**
- **Capacitance:** 0.5 pF typical; 1.0 pF max (**non-capacitive design**)
- **Inductance:** $< 0.08 \mu\text{H}$ typical; 0.1 μH max; (**non-inductive design**)
- **Hot spot free design; Rise time:** 1.0 ns at 1kΩ (**effectively no ringing**)
- **Current noise:** 0.010 μV_{RMS}/Volt of Applied Voltage (< -40 dB)
- **Thermal EMF:** 0.05 μV/°C typical (0.10 μV/°C max) and 1 μV/W (μV/°C relates to EMF due to ΔT wrt to leads and μV/watt due to the applied power)
- **Total accumulated ΔR over life (EOL):** to $\pm 0.05 \%$ (an order of magnitude better than any other resistor technology!) Pre & Post Manufacturing Operations are available to reduce this even further.
- **RTD Capable: Optional PT100, PT500, or PT1000 scale RTD option allows for concurrent temperature and resistance measurements!**
- **Made in the USA**

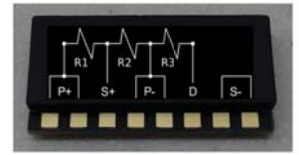


TABLE 1 – ACCURACY & TCR BY RESISTANCE RANGE**
(Full temperature range of -55°C to +125°C, +25 °C Reference)

RESISTANCE VALUE (Ω)	CALIBRATED TOLERANCE (%)		MAX TCR per resistor (Can be as low as 0.05 ppm/°C) 25°C to +100°C* (ppm/°C)	STRAIN ACCURACY (temperature based variance per resistor) GF = 2; $\mu\epsilon / ^\circ\text{C}$	
	R1 to R2 Match	R1, R2, R3 Absolute		R1 to R2 match/tracking	R1, R2, R3
				+25°C to +100°C	0°C to +100°C*
(1Ω to 250KΩ)					
$\geq 350\Omega$	$< \pm 0.01$	± 0.005	± 1.0	$< \pm 0.50$	$< \pm 0.50$
80Ω to $< 350\Omega$	$< \pm 0.02$	± 0.010	± 1.5	$< \pm 0.75$	$< \pm 0.75$
50Ω to $< 80\Omega$	$< \pm 0.05$	± 0.025	± 2.0	$< \pm 1.00$	$< \pm 1.00$
25Ω to $< 50\Omega$	$< \pm 0.10$	± 0.05	± 2.5	$< \pm 1.25$	$< \pm 1.25$
10Ω to $< 25\Omega$	$< \pm 0.20$	± 0.10	± 3.5	$< \pm 1.75$	$< \pm 1.75$
5Ω to $< 10\Omega$	$< \pm 1.0$	± 0.25	± 4.5	$< \pm 2.25$	$< \pm 2.25$
1Ω to $< 5\Omega$	$< \pm 2.0$	± 0.50	± 5.5	$< \pm 2.75$	$< \pm 2.75$

* Momentary operating temperature range limited to -55°C to +175°C.
Recommended continuous operating temperature range is -45°C to +125°C.
** Tighter specifications are available. Just tell us what you need!

TABLE 2 – MATERIALS AND DIMENSIONS

SPECIFICATIONS	PARAMETERS
Body	PCB + Conformal Coating
Finish	Polyolefin wrap; Silicone Foam Tape Backing
Outer dimensions (can vary)	~1.4" x 0.83" x 0.3" (~36 mm x 21mm x 8mm)
Tinned solder pad size	0.08" x 0.08" (2.03 mm x 2.03 mm)
Solder pad spacing/separation (c-c)	0.14 inches (3.56 mm)
Weight	Approximately 4 grams

FIGURE 1 – NOMINAL RESISTANCE/TEMPERATURE CURVE(S) and Chord Slopes (Statistically Combined)

Accurate and Precise in Any Actual Physical Environment
(The TXBCM series uses Z-Foil by default, shown in green)

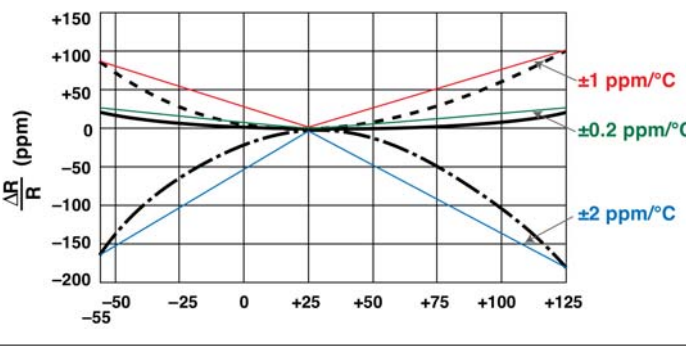


FIGURE 2 - POWER DERATING CURVE

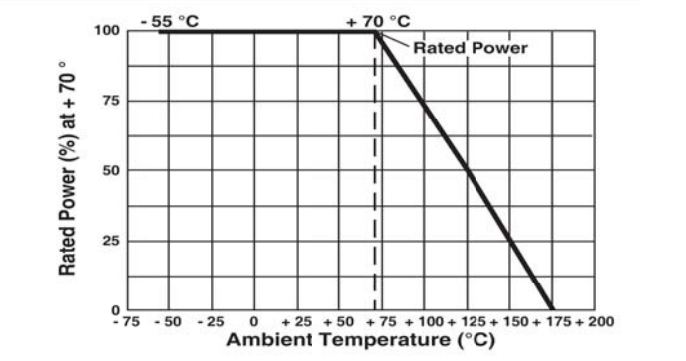
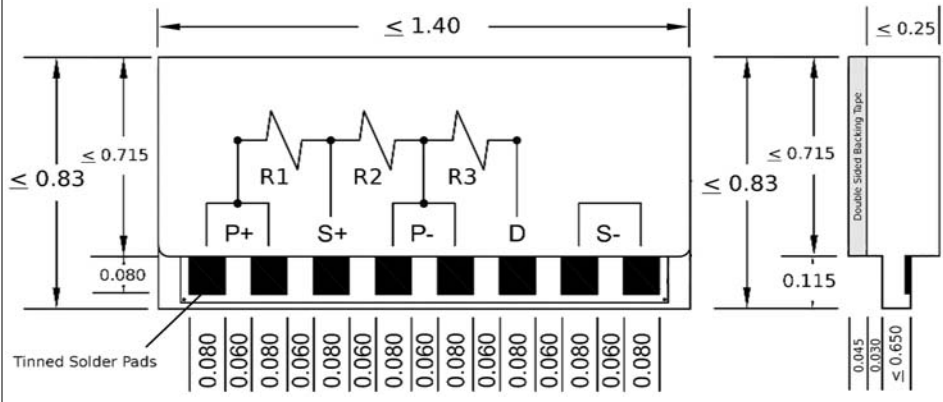


FIGURE 3 – MAXIMUM DIMENSIONS



Note: The TXBCM301 does not have the circuit design printed on the body of the device. All measurements are in inches. Not to scale. Optional double sided backing tape shown.

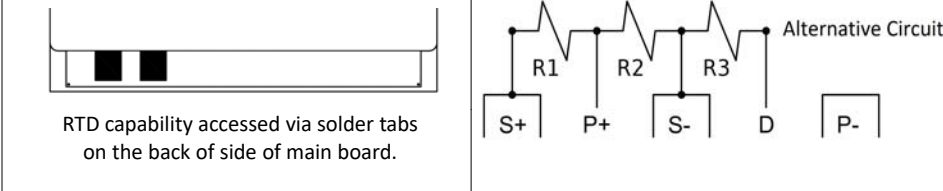
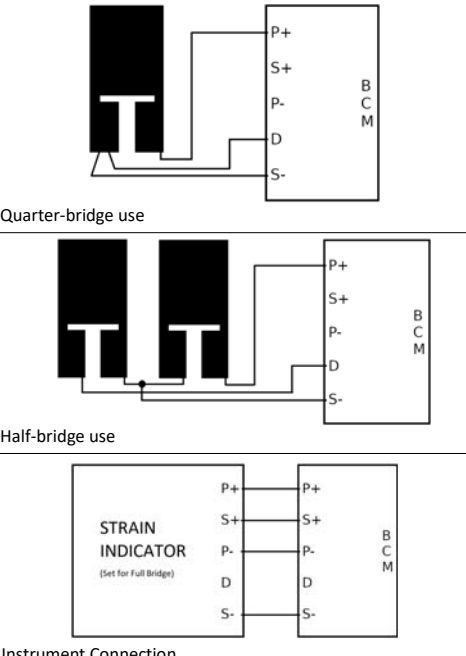


FIGURE 4 – GAGE CONNECTIONS



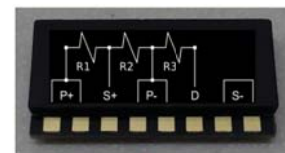


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TABLE 3 - SPECIFICATIONS

MODEL*	RESISTANCES** R1/R2/R3	CONTINUOUS OPERATING TEMPERATURE RANGE***	MAX WORKING VOLTAGE (per resistor)	CALIBRATED ACCURACY	AMBIENT POWER RATING	PACKAGING
					at +70 °C	
TXBCM301	1Ω to 250KΩ	-40°C to +125°C (-49°F to +257°F)	300V _____ (and always $\leq \sqrt{0.6 \times R}$)	0.005% to 0.50% (see Table 1)	0.6 W (per resistor)	Bulk Pack

* RTD version adds an RTD capability for concurrent temperature and resistance/stress/strain measurements! See below.

** Any precise value is available to 6 characters.

*** Wider operating temperatures are available. Just tell us what you need!

TABLE 4 – HOW TO ORDER THE CORRECT PART NUMBER

MODEL	RESISTANCE VALUE(S)	RTD OPTIONS
TXBCM301	1Ω to 250KΩ (R = Ω, K = 1000 Ω) Use up to 6 characters (e.g. 100R01 = 100.01 ohms)	RTD100, RTD500, or RTD1000* (*RTD1000 is recommended)
A standard 120 ohm module would be ordered as: TXBCM301-120R/120R/120R		
A standard 350 ohm module would be ordered as: TXBCM301-350R/350R/350R		
A standard 1,000 ohm module with the RTD 100 option enabled would be ordered as: TXBCM301-1K/1K/1K-RTD1000		
A mixed value module with, for example, two 10,000 ohm resistors and one 45 ohm resistor would be: TXBCM301-10K/10K/45R		

Feel free to ask about a custom design!

For more information about this subject or this product line, please call us at (+1) **713-468-3882** or email us at txccsales@texascomponents.com.

You can also "Follow" Texas Components and Bulk Metal® Foil Resistors on Twitter [@TexasComponents](https://twitter.com/TexasComponents) and/or "Like" Texas Components on [Facebook](https://www.facebook.com/TexasComponents).

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