DEM-XTR501C EVALUATION FIXTURE

FEATURES

- PCB SUITABLE FOR STANDARD ENCLOSURE
- DUT SUPPLIED WITH BOARD
- OPTIMUM PCB LAYOUT

APPLICATIONS

- EVALUATE XTR501 PERFORMANCE
- INCOMING INSPECTION TEST FIXTURE
- EVALUATE PELLISTOR PERFORMANCE

DESCRIPTION

The DEM-XTR501C evaluation fixtures are fully assembled and tested printed circuit boards including the XTR501. By connecting a pellistor catalytic detector and using 50% LEL of Methane, the performance of the XTR501 can be evaluated.

The evaluation fixture is set up for a 2V bridge voltage and an input span of 50mV. This is equivalent to the LEL of Methane. Refer to the "How to Calculate R_{SET} and R_{SPAN}" section for method of calculating the necessary settings.

International Airport Industrial Park • Mailing Address: PO Box 11400, Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd., Tucson, AZ 85706 • Tel: (520) 746-1111 • Twx: 910-952-1111
Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

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POWER SUPPLY

The evaluation fixture operates from a single dc supply in the range of 12V to 30V. The supply being used should be capable of delivering 1 amp.

BOARD LAYOUT AND CONNECTIONS

Refer to Figure 1, PCB Layout and Figure 2, Circuit Diagram for the connections to the evaluation fixture. The 4-part connector, Con 1, is for the power supply and current/voltage out. The connector designations are marked in Figure 1, PCB Layout. The 5-part connector, Con 2, is for pellistor connections. The numbers refer to the XTR501 pins as indicated in Figure 2. The circuit diagram also shows the manner in which the pellistor can be connected. This is for a 5-wire connection. For a normal 3-wire connection, connect terminal 15 to terminal 16, and connect terminal 17 to terminal 11.

THEORY OF OPERATION

The XTR501 demo board should be used in conjunction with the XTR501 product data sheet and is designed to provide an example of a typical application in which the XTR501 could be used. The demo board also fits into one of the standard industrial enclosures.

The evaluation fixture is set up for an LEL of Methane, and the assumption that a VQ21 gas sensor, or equivalent, is being used. Reference to the accompanying circuit diagram of this document details the circuit values for this application.

The bridge voltage, recommended by the manufacturer for the gas sensor, is set by R_3 and VR_3. When the gas sensor is connected as shown in the circuit diagram, it forms one side of a Wheatstone bridge arrangement. The bridge is balanced by VR_1, giving an output of 4mA at I_O on Con 2. The output of the XTR501 can be converted to a voltage in the range of 1V to 5V corresponding to 4 to 20mA, by SW1. This can be read on the terminal designated V_O on Con 2. The voltage output is filtered at a nominal 1kHz.

When the sensor is exposed to 2.5% Methane, i. e., midscale, the output should read 12mA, or 2.5V depending on the switch position. R_2 and VR_2 set the span of the unit and can be adjusted to bring the output to the exact value for midscale.

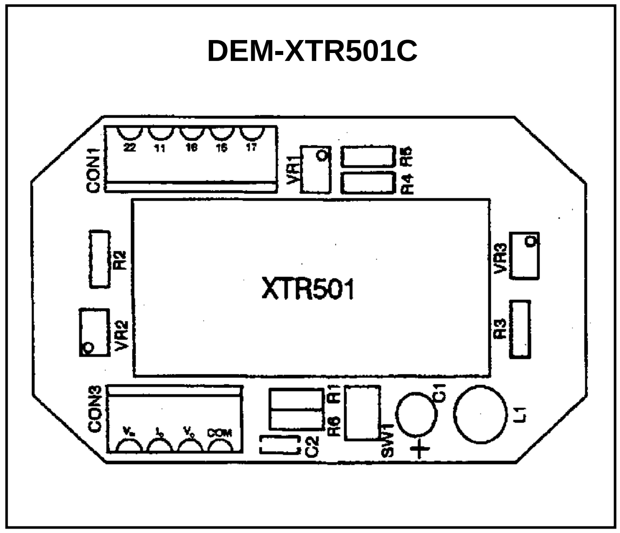

FIGURE 1. PCB Layout.

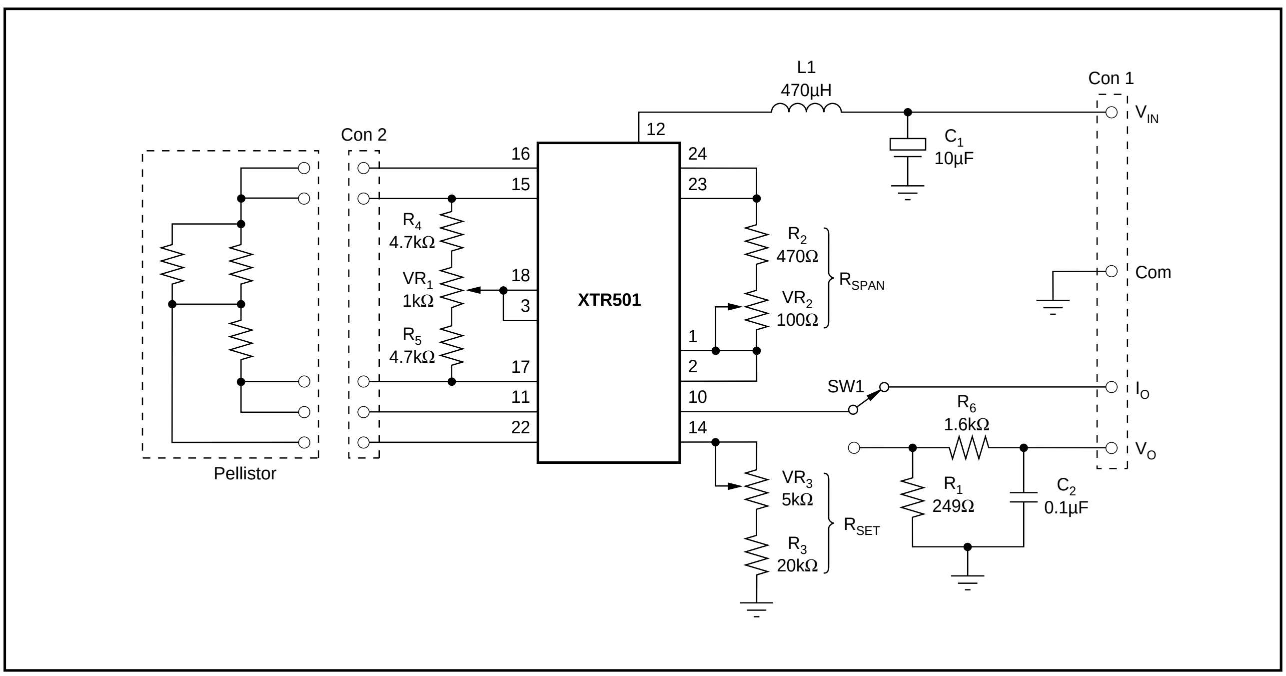

FIGURE 2. Circuit Diagram.

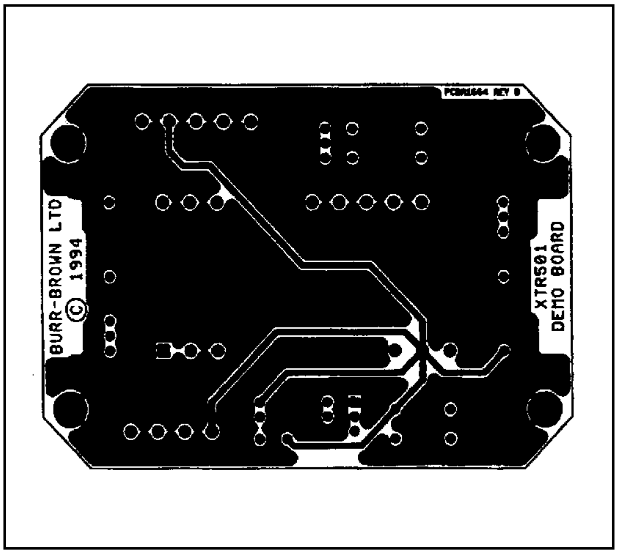

FIGURE 3. PCB Tracking—Component Side.

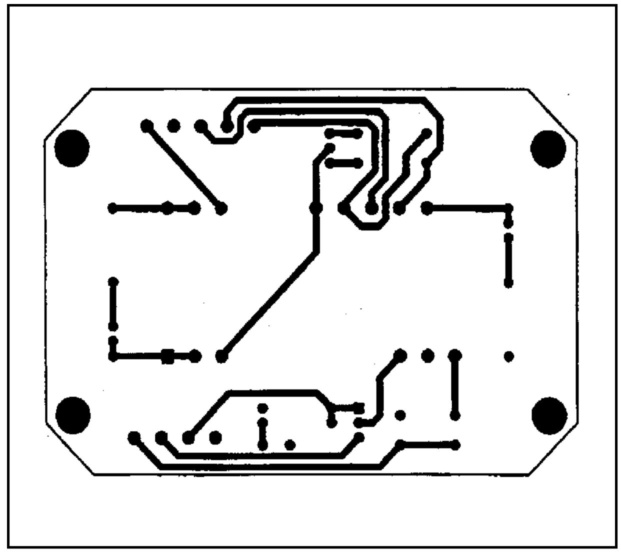

FIGURE 4. PCB Tracking—Solder Side.

OPERATING INSTRUCTIONS

The XTR501 demo board, as supplied, is set up for a LEL of Methane (5% by volume in air). The gas sensor used was a VQ21 from EEV Gas Sensors, which requires a 2V supply from the bridge and gives a 50mV deflection for full scale.

Refer to the "How to Calculate R_{SET} and R_{SPAN}" section for help in calculating values for the bridge voltage and the span of the unit.

Connect a 24V dc supply to the demo board by means of the terminals V_{IN} and Com.

Connect a DVM to terminals referred to as 16 and 17 on Con 1 in the layout diagram, and adjust the voltage by means of VR_3 to 2V.

Switch off the power supply.

Connect the sensor to the unit as shown in the circuit diagram, referring to the component layout diagram which contains the terminal labeling.

Switch on the power supply.

Connect the DVM to the I_O terminal on Con 2 and adjust VR_1 to read 4mA.

Expose the sensor to the 2.5% Methane and adjust the I_O to read 12mA by means of VR_2.

Do not overexpose the sensor to this level of gas as the sensor can be poisoned through time.

SW1 configures the demo board to produce a voltage or current output. This can be read on the terminals designated V_O and I_O on Con 2 in the layout diagram.

HOW TO CALCULATE R_{SET} AND R_{SPAN}

To Calculate R_{SET}

See Figure 5. Point (a) will be maintained as 1.235V.

$$\frac{V_B - 1.235}{10k\Omega} = \frac{1.235\left(50k\Omega + R_{SET}\right)}{R_{SET}\ 50k\Omega}$$

$$\frac{50k\Omega\left(V_B - 1.235\right)}{(10k\Omega)(1.235)} = \frac{50k\Omega + R_{SET}}{R_{SET}}$$

$$= 1 + \frac{50k\Omega}{R_{SET}}$$

$$\frac{5\left(V_B - 1.235\right)}{1.235} - 1 = \frac{50k\Omega}{R_{SET}}$$

$$R_{SET} = \frac{(50k\Omega)(1.235)}{5\left(V_B - 1.235\right) - 1.235}$$

Example:

V_B	R_{SET} CALCULATED
1.5	Open
2.0	21.858kΩ
3.0	7.891kΩ
4.0	4.815kΩ
5.0	3.464kΩ

To Calculate R_{SPAN}

$$I_O = 0.004 + 0.016\left(\frac{1 + 50k\Omega / R_{SPAN}}{4.94}\right)V_{IN}$$

For V_{IN} = 10mV and I_O = 20mA

$$0.02 = 0.004 + 0.016\left(\frac{1 + 50k\Omega / R_{SPAN}}{4.94}\right)0.01$$

$$\frac{0.016}{(0.016)(0.01)} = \frac{1 + (50k\Omega / R_{SPAN})}{4.94}$$

$$494 = 1 + 50k\Omega / R_{SPAN}$$

$$R_{SPAN} = \frac{50k\Omega}{493}$$

$$= 101.4$$

i.e.

$$\frac{4.94}{V_{IN}} = 1 + \frac{50k\Omega}{R_{SPAN}}$$

$$R_{SPAN} = \frac{50k\Omega}{\frac{4.94}{V_{IN}} - 1}$$

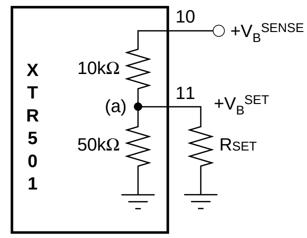

FIGURE 5. Internal Circuit $+V_B^{SET}$.

ORDERING INFORMATION

DEM-XTR501C	For Evaluation of the XTR501