Isolated Current Output

5B39

FEATURES

Converts a High-level analog input voltage into a floating proportional output current.

Output current of 4 to 20 mA or 0 to 20 mA across loads from 0Ω to 750Ω.

High Accuracy of ±0.05%, Low nonlinearity of ±0.02%.

Module circuitry can withstand 240v rms at the input screw-terminals.

All 5B39 series modules are mix-and-match and Hot Swappable.

APPLICATIONS

Industrial signal conditioning

Industrial signal isolation

Industrial signal filtering

PRODUCT OVERVIEW

The 5B Series represents an innovative generation of low cost, high performance plug-in signal conditioners. Designed for industrial applications, these modules incorporate highly reliable transformer-based isolation and automated surface-mount manufacturing technology. They are compact, economical components whose performance exceeds that available from more expensive devices. Combining 1500 V rms continuous isolation, +0.05% calibrated accuracy, small size and low cost, the 5B Series is an attractive alternative to expensive signal conditioners and in-house designs

All modules are potted and identical in pin-out and size (2.27" x 2.32" x 0.595"). They can be mixed and matched, permitting users to address their exact needs, and may be "hot swapped without disturbing field wiring or power. The isolated input modules provide 0 to +5V or +5V outputs and accept J, K, T, E, R, S, N, or B type thermocouples.

These modules feature complete signal conditioning functions including 240 V rms input protection, filtering, chopper stabilized low drift +1 uV/oC amplification, 1500 V rms isolation, and sensor excitation when required.

All modules feature excellent common mode rejection and meet industrial transient surge withstand specifications.

FUNCTIONAL BLOCK DIAGRAM

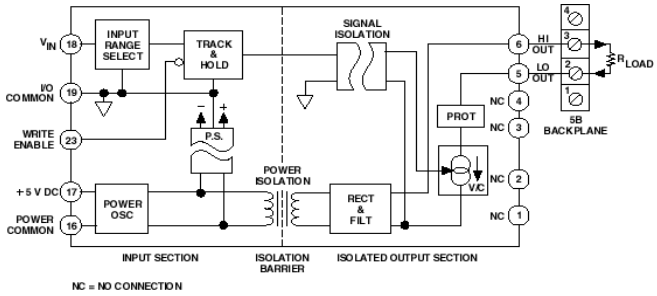


Figure 1. 5B39 Functional Block Diagram

There are also a number of backplanes and mounting sockets which provide a complete signal conditioning solution for end users. Each backplane incorporates screw terminals for field wiring inputs and outputs and cold junction sensors for thermocouple applications.

These signal conditioners are designed to provide an easy and convenient solution to signal conditioning problems of both designers and end users in measurement and control applications. Typical uses include microcomputer-based measurement systems, standard data acquisition systems, programmable controllers, analog recorders and dedicated control systems. The 5 B series modules are ideally suited to applications where monitoring and control of temperature, pressure, flow, rotation and other analog signals are required.

The 5B Series modules and backplanes are approved by Factory Mutual (FM) and the 5B Series modules are approved by the Canadian Standards Association (CSA) for use in Class 1, Division 2, Groups A, B, C, and D locations. These approvals certify that the 5B Series is suitable for use in locations where a hazardous concentration of flammable gas may exist only under fault conditions of operation. Equipment of this category is called "nonincendive" and they need no special enclosures or other physical safeguards.

The 5B series modules and backplanes have been tested and passed the stringent heavy industrial requirements of the European Union's electromagnetic compatibility (ENC) directive – EN50082-1 and EN50081-2. When used according to installation directions (refer to 5B series User Manual), any errors caused by EMI/RFI interference will be less than 0.1% of the full scale 5B measurement range for field strengths up to 10 V/M and frequencies up to 1 GHz.

Rev. 0

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GENERAL DESCRIPTION

The 5B39 is a single-channel signal conditioning module that converts a high-level analog input voltage into a floating, isolated proportional output current of 4 to 20 mA or 0 to 20 mA across loads from 0Ω to 750Ω. The module provides high accuracy of ±0.05%, low nonlinearity of ±0.02%, and the protection of 1500V rms isolation between output-to-input and output-to power supply. The input common must be held to within ±1V of power common.

Signal isolation by transformer coupling uses a proprietary modulation technique for linear, stable and reliable performance. A demodulator on the output side of the signal transformer recovers the original signal, which is then filtered and converted to an accurate current output by a current (V-to-I) converter output stage. Output protection enables the 5B39 to withstand accidental connection to 240V rms power lines without damage, while isolating computer-side circuitry. In addition, the 5B39 is mix-and-match and hot-swappable with all 5B Series modules, so can be inserted or removed from any socket in the same backplane without disrupting system power.

Track-and-Hold for DAC Applications – In applications where a single system digital-to-analog converter (DAC) is used to drive a number of current output channels, the 5B39 includes a track-and-hold input circuit. Selected by a high Write Enable input, the hold mode exhibits an output droop rate of 80 uA/s. This corresponds to a refresh interval of 25 ms for 0.01% span droop. On power-up, the module's output remains at 0 mA for about 100 ms to allow the user to initialize the track-and-hold circuit.

In applications using one DAC per channel, where the track-and-hold feature of the 5B39 is not used, the Write Enable input should be set to low by grounding it to power common, as on the 5B01 and 5B08 backplanes. The module current output will then track its input signal.

Generating A Voltage Output Signal – The 0 to 20 mA output of the 5B39-04 and the 5B39-03, can produce a 0 to +10V output by connecting a 500Ω conversion resistor across the modules' output terminals,. This approach should be used with caution because the output lacks the low impedance of a true voltage source. This means that the tolerance and size of the load impedance relative to the conversion resistor can introduce significant error. For example, a load impedance < 500kΩ would contribute <0.1% error.



Figure 2

5B39 Models Available

5B39 Specifications
(typical @ +25°C and V_s = +5 V dc)

Description	Model 5B39
Input Voltage Ranges	0 V to +5 V or -5 V to +5 V
Input, Without Damage	-10 V to +10 V, maximum
Input Resistance	10 MΩ
Output Ranges	
Standard Ranges	4 mA to 20 mA or 0 mA to 20 mA
Custom Ranges	Not Available
Output Over-range Capability	10%
Output Load Resistance Range	0 to 650 Ω (V_s > +4.75 V) 0 to 750 Ω (V_s > +4.95 V)
Voltage Output Protection	Continuous Short to Ground
Output Under Fault	26 mA maximum
Output Protection	
Normal Mode, Continuous	240 V rms, maximum
Transient	ANSI/IEEE C37.90.1-1989
Accuracy[1]	
Initial @ +25°C	±0.05% Span
Nonlinearity	±0.02% Span
Zero vs. Temperature	±0.5 µA/°C
Span vs. Temperature	±0.002% of Reading/°C
Noise	
Output Ripple, 100 Hz Bandwidth	30 µA peak-peak
Bandwidth, -3 dB	400 Hz
Output Rise Time, 10% to 90% Span	2 ms
Common-Mode Voltage (CMV)	
Output-to-Input and Power Supply	1500 V rms, maximum
Input-to-Power, Continuous[2]	±1 V, maximum
Output Transient Protection	ANSI/IEEE C37.90.1-1989
Common Mode Rejection (CMR)	
1 kΩ Source Imbalance, 50/60 Hz	90 dB
Normal Mode Rejection (NMR)	-3 dB @ 400 Hz

	Sample and Hold
Output Droop Rate	80 µA/s
Acquisition Time	50 µs
	Track-and-Hold Enable Control
Max Logic "0"	+1 V
Min Logic "1"	+2.5 V
Max Logic "1"	+36 V
Input Current "0"	1.5 mA
Power Supply Voltage	+5 V ±5%
Power Supply Current	170 mA
Power Supply Sensitivity, RTI	±0.25µA/Vs%
Mechanical Dimensions	2.275" x 2.375" x 0.595" (57.8 mm x 59.1 mm x 15.1 mm)
	Environmental
	Temperature Range
Rated Performance	-25°C to +85°C
Operating	-40°C to +85°C
Storage	-40°C to +85°C
Relative Humidity	0 to 93% @ +40°C non-condensing
RFI Susceptibility	±0.5% Span error @ 400 MHz, 5 Watt, 3 ft

[1]Includes the combined effects of repeatability, hysteresis, and nonlinearity.
[2]The input common must be kept within ±1 V of power common.
Specifications subject to change without notice.

PIN CONFIGURATIONS AND FUNCTIONAL DESCRIPTIONS

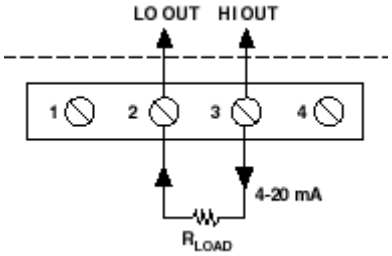


Figure 3 5B39 Input Field Connections

Table 1. Pin Function Descriptions—

Pin No.	Description
1	LO OUT
2	HI OUT

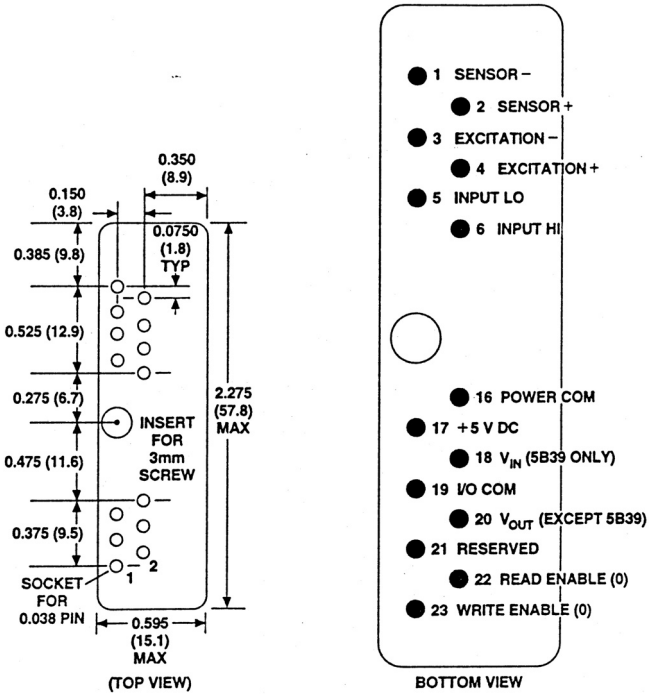


Figure 4 . Model 5B Series Module, with pin-out assignments.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



OUTLINE DIMENSIONS

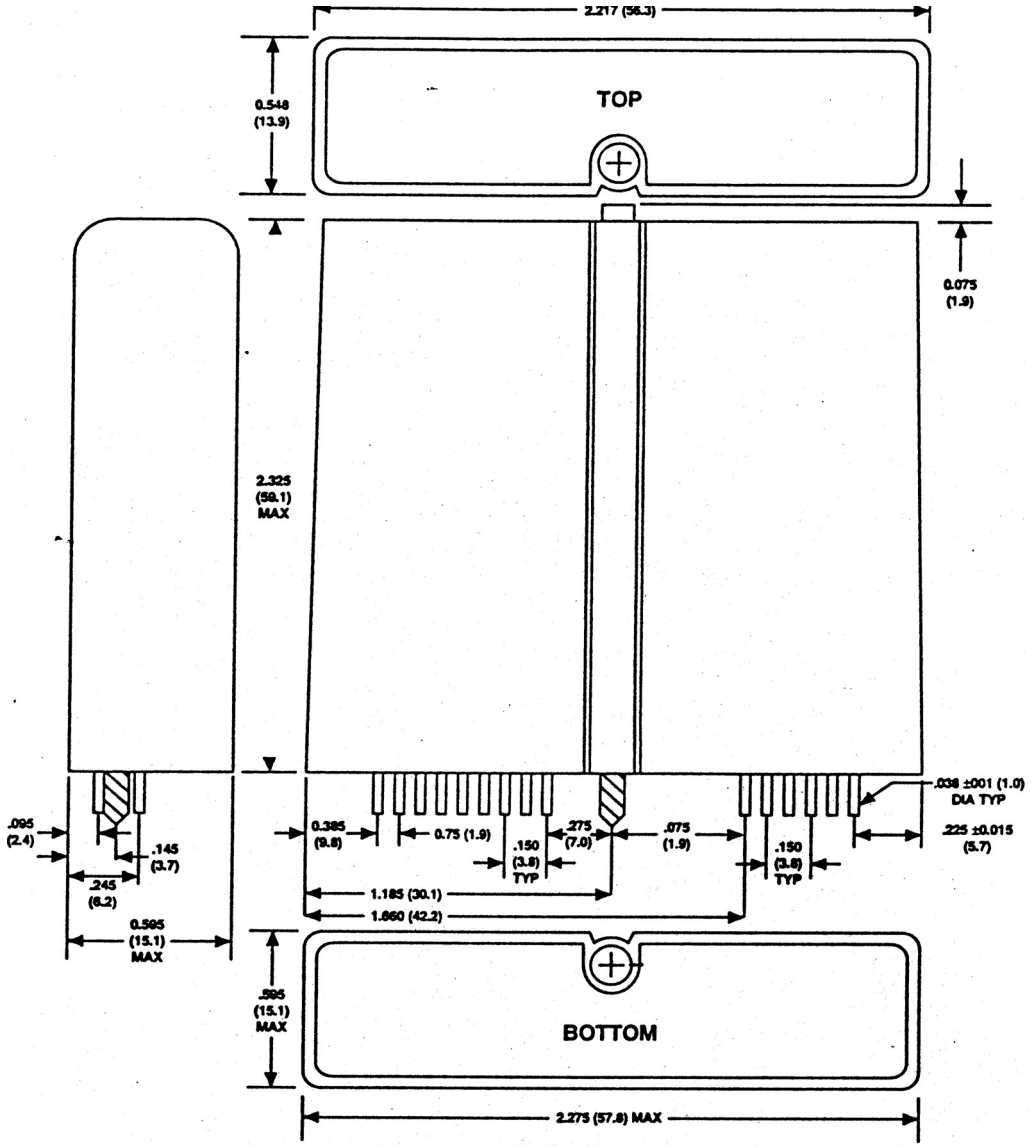


Figure 5. Outline Dimensions

5B32 Models Available

5B32-01	4 mA to 20 mA	0 V to +5 V
5B32-02	0 mA to 20 mA	0 V to +5 V
5B32-Custom	*	*

* Custom Input/Output ranges are available.
Refer to configuration guide.

NOTES

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