

5B39 Isolated Current Output

Functional 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 0 Ω to 750 Ω . The module provides high accuracy of $\pm 0.05\%$, low nonlinearity of $\pm 0.02\%$, and the protection of 1500 V rms isolation between output-to-input and output-to-power supply. The input common must be held to within ± 1 V of power common.



Inside the 5B39

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 240 V 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 μ A/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 +10 V output by connecting a 500 Ω conversion resistor across the module's 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 < 500 k Ω would contribute < 0.1% error.

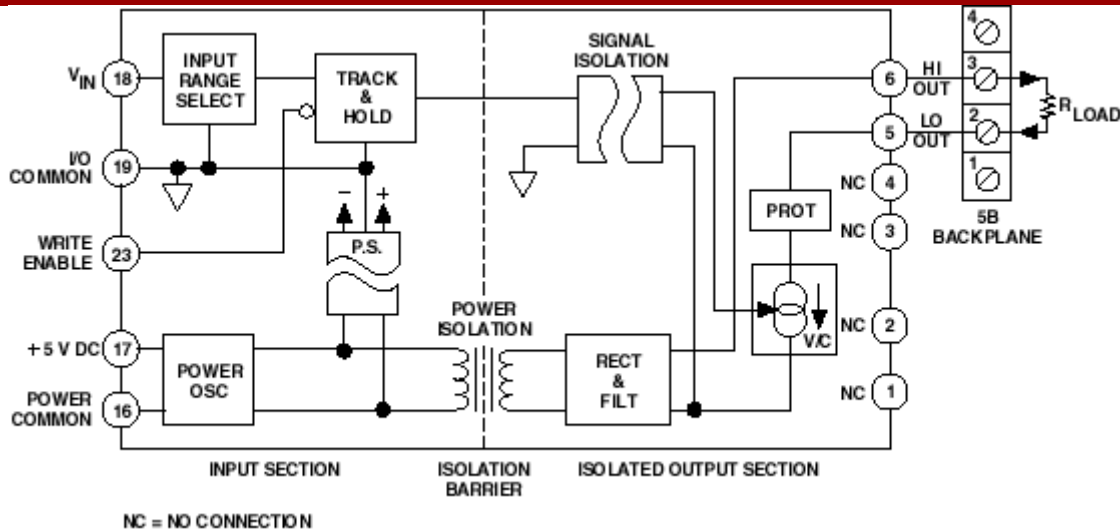


Figure 1. 5B39 Functional Block Diagram

Input Ranges

0 to +5 V or -5 to +5 V

Output Ranges

4 to 20 mA or 0 to 20 mA

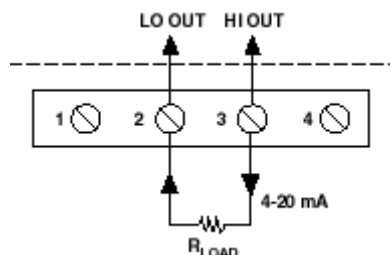


Figure 2. 5B39 Output Field Connections

5B39 Models Available

Model	Input Range	Output Range
5B39-01	0 V to +5 V	4 mA to 20 mA
5B39-02	-5 V to +5 V	4 mA to 20 mA
5B39-03	0 V to +5 V	0 mA to 20 mA
5B39-04	-5 V to +5 V	0 mA to 20 mA

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 M Ω
Output Ranges	
Standard Ranges	4 mA to 20 mA or 0 mA to 20 mA
Custom Ranges	Not Available
Output Overage 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
Accuracy¹	
Initial @ +25°C	$\pm 0.05\%$ Span
Nonlinearity	$\pm 0.02\%$ Span
Zero vs. Temperature	± 0.5 μ A/°C
Span vs. Temperature	$\pm 0.002\%$ of Reading/°C
Noise	
Output Ripple, 100 Hz Bandwidth	30 μ A 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 k Ω Source Imbalance, 50/60 Hz	90 dB
Normal Mode Rejection (NMR)	-3 dB @ 400 Hz
Sample and Hold	
Output Droop Rate	80 μ A/s
Acquisition Time	50 μ s
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 $\pm 5\%$
Power Supply Current	170 mA
Power Supply Sensitivity, RTI	± 0.25 μ A/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 noncondensing
RFI Susceptibility	$\pm 0.5\%$ Span error @ 400 MHz, 5 Watt, 3 ft

¹Includes the combined effects of repeatability, hysteresis, and nonlinearity.

²The input common must be kept within ± 1 V of power common.