SCM7B37
Isolated Thermocouple Input Modules

FEATURES

- INTERFACES TO TYPE J, K, T, E, R, S, AND B THERMOCOUPLES
- PROVIDES HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ACCURACY, ±0.03% OF SPAN TYPICAL, ±0.1% MAX
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 120Vrms CONTINUOUS
- NOISE, 500µV PEAK (5MHz), 250µV RMS (100KHz)
- CMRR, 160dB
- NMR, UP TO 85dB
- EASY DIN RAIL MOUNTING
- CSA CERTIFIED, FM APPROVAL PENDING
- CE COMPLIANT

DESCRIPTION

SCM7B37 modules accept a single channel of input from Type J, K, T, E, R, S, or B thermocouples. The signal is filtered, isolated, amplified, and converted to a high level analog voltage for output to the process control system (Figure 1).

Cold junction compensation (CJC) is performed using an NTC thermistor (see "Additional SCM7B Part Numbers" section for P/N and AN701 for further information) externally mounted under the field-side terminal block on the backpanel (Figure 1). Open thermocouple detection is upscale using a 30nA current source in the input circuitry.

These modules incorporate a five-pole filtering approach to maximize both time and frequency response by taking advantage of both Thomson (Bessel) and Butterworth characteristics. One pole of the filter is on the field side of the isolation barrier; four are on the process control system side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit and transferred across the transformer isolation barrier, suppressing transmission of common mode spikes and surges. The signal is then reconstructed and filtered for process control system output.

Modules accept a wide 14 - 35VDC power supply range (+24VDC nominal). Their compact packages (2.13"x1.705"x0.605" max) save space and are ideal for high channel density applications. They are designed for easy DIN rail mounting using any of the "-DIN" backpanels.

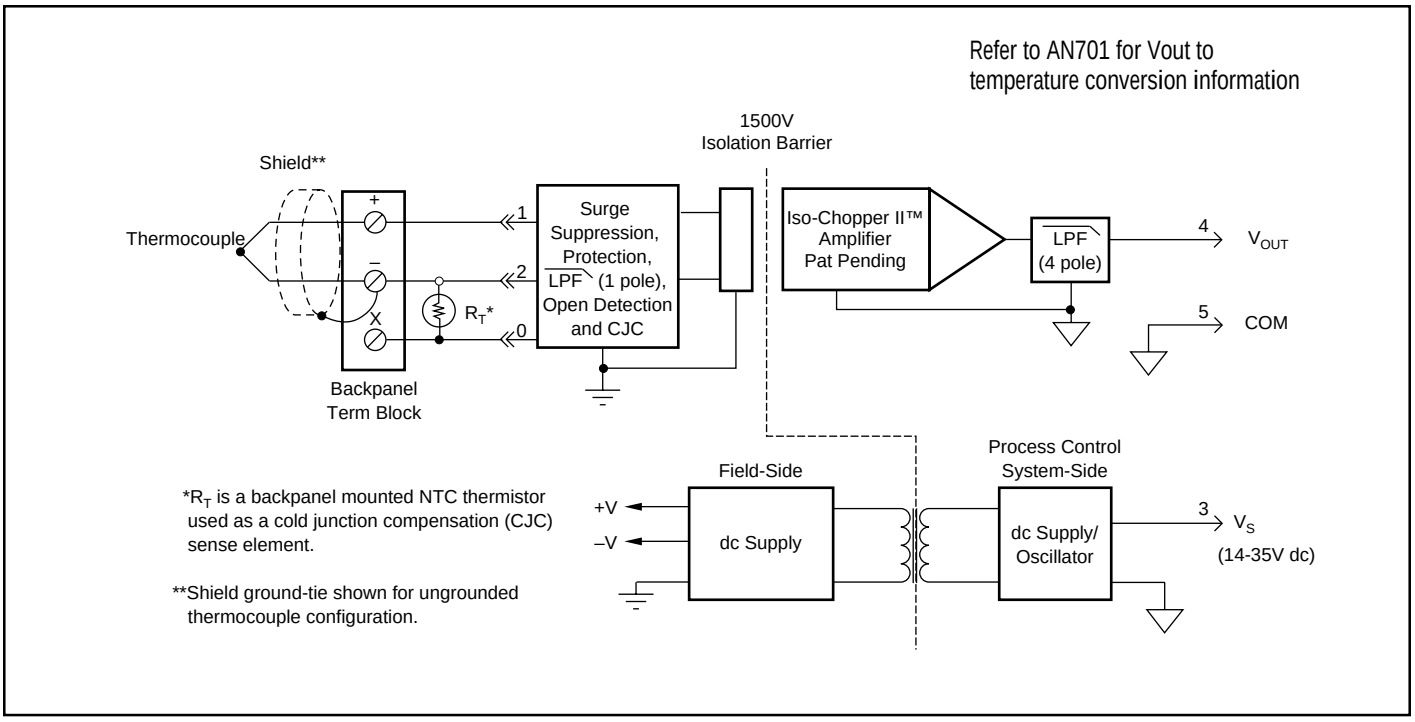

Fig 1: SCM7B37 Block Diagram

SPECIFICATIONS Typical at 25°C and +24VDC

Module	SCM7B37
Input	
Signal Range	Thermocouple[1] (See Ordering Information below)
Bias Current	-30nA
Resistance	
Normal	50MΩ
Power Off	30kΩ min
Overload	30kΩ min
Protection	
Continous	120Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Output	
Signal Range[2]	◆
Effective Available Power[2]	40mW
Resistance	<1Ω
Protection	Continuous Short-to-Ground
Voltage/Current Limit	±12V, ±14mA
CMV (Input-to-Output)	
Continuous	1500Vrms
Transient	ANSI/IEEE C37.90.1-1989
CMRR (50 or 60Hz)	160dB
Accuracy[3]	±0.03% Span typical, ±0.1% Span max
Nonlinearity[4]	See Ordering Information
Stability (-40C to +85°C)	
Gain	±35ppm/°C
Input Offset	±0.5µV/°C
Zero Suppression	±0.005%(V_z)[5]/°C
Output Offset	±0.002% Span/°C
Noise	
Peak @ 5MHz B/W	500µV
RMS @ 10Hz to 100kHz B/W	250µV
Peak @ 0.1Hz to 10Hz B/W	1µV
CJC Accuracy[6], +5°C to +45°C ambient	±0.25˚C typ, ±1°C max
Open Input Response	Upscale
Open Input Detection Time	10s max
Frequency and Time Response	
Bandwidth, -3dB	3Hz
NMR (50/60Hz)	80/85dB
Step Response, 90% Span	150ms
Supply Voltage	14 to 35VDC
Current[2]	12mA
Sensitivity	±0.0001%/%V_S
Mechanical Dimensions (H)(W)(D)	2.13" x 1.705" x 0.605" max 54.1mm x 43.3mm x 15.4mm max
Environmental	
Operating Temperature Range	-40°C to +85°C
Storage Temperature Range	-40°C to +85°C
Relative Humidity	0 to 90% noncondensing
Emmissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

****THERMOCOUPLE ALLOY COMBINATIONS**
Standards: DIN IEC 584, ANSI MC96-1-82, JIS C 1602-1981

TYPE	MATERIAL
J	Iron vs. Copper-Nickel
K	Nickel-Chromium vs. Nickel-Aluminum
T	Copper vs. Copper-Nickel
E	Nickel-Chromium vs. Copper-Nickel
R	Platinum-13% Rhodium vs. Platinum
S	Platinum-10% Rhodium vs. Platinum
B	Platinum-30% Rhodium vs. Platinum-6% Rhodium
N	Nickel-14.2% Chromium-1.4% Silicon vs. Nickel-4.4% Silicon- 0.1% Magnesium

NOTES
[1] Thermocouple characteristics per NIST monograph 175, ITS-90.
[2] Output Range and Supply Current specifications are based on minimum output load resistance. Minimum output load resistance is calculated by V_{OUT}^2/P_E, where P_E is the output Effective Available Power that guarantees output range, accuracy, and linearity specifications.
[3] Accuracy includes the effects of repeatability, hysteresis, and linearity.
[4] Nonlinearity is calculated using the best-fit straight line method.
[5] V_Z is the nominal input voltage that results in a 0V output.
[6] The CJC sensor accuracy should be added to the module accuracy and thermocouple accuracy to compute the overall measurement accuracy.

◆OUTPUT RANGES AVAILABLE

OUTPUT RANGE	PART NUMBER MODIFIER	EXAMPLE
+1 to +5V	(none)	SCM7B37J-01
0 to +5V	A	SCM7B37J-01A
0 to +10V	D	SCM7B37J-01D

ORDERING INFORMATION

MODEL **	INPUT RANGE	ACCURACY (TYP)[3]	ACCURACY (MAX)[3]	NONLINEARITY (TYP)[4]	NONLINEARITY (MAX)[4]
SCM7B37J-01	-100°C to +760°C (-148°F to +1400°F)	±0.03% (0.26˚C)	±0.1% (0.86˚C)	±0.1% (0.09˚C)	±0.02% (0.17˚C)
SCM7B37J-10	0°C to +200°C (+32°F to +392°F)	" (0.06˚C)	" (0.20˚C)	" (0.02˚C)	" (0.04˚C)
SCM7B37J-11	0°C to +400°C (+32°F to +752°F)	" (0.12˚C)	" (0.40˚C)	" (0.04˚C)	" (0.08˚C)
SCM7B37J-12	0°C to +600°C (+32°F to +1112°F)	" (0.18˚C)	" (0.60˚C)	" (0.06˚C)	" (0.12˚C)
SCM7B37J-13	+300°C to +600°C (+572°F to +1112°F)	" (0.09˚C)	" (0.30˚C)	" (0.03˚C)	" (0.24˚C)
SCM7B37K-02	-100°C to +1350°C (-148°F to +2462°F)	" (0.44˚C)	" (1.45˚C)	" (0.15˚C)	" (0.29˚C)
SCM7B37K-20	0°C to +300°C (+32°F to +572°F)	" (0.09˚C)	" (0.30˚C)	" (0.03˚C)	" (0.06˚C)
SCM7B37K-21	0°C to +600°C (+32°F to +1112°F)	" (0.18˚C)	" (0.60˚C)	" (0.06˚C)	" (0.12˚C)
SCM7B37K-22	0°C to +1200°C (+32°F to +2192°F)	" (0.36˚C)	" (1.20˚C)	" (0.12˚C)	" (0.24˚C)
SCM7B37K-23	+600°C to +1200°C (+1112°F to +2192°F)	" (0.18˚C)	" (0.60˚C)	" (0.06˚C)	" (0.12˚C)
SCM7B37T-03	-100°C to +400°C (-148°F to +752°F)	" (0.15˚C)	" (0.50˚C)	" (0.05˚C)	" (0.10˚C)
SCM7B37E-04	0°C to +900°C (+32°F to +1652°F)	" (0.27˚C)	" (0.90˚C)	" (0.09˚C)	" (0.18˚C)
SCM7B37R-05	0°C to +1750°C (+32F to +3182°F)	" (0.53˚C)	" (1.75˚C)	" (0.18˚C)	" (0.35˚C)
SCM7B37S-06	0°C to +1750°C (+32F to +3182°F)	" (0.53˚C)	" (1.75˚C)	" (0.18˚C)	" (0.35˚C)
SCM7B37B-07	0°C to +1800°C (+32F to +3272°F)	" (0.54˚C)	" (1.80˚C)	" (0.18˚C)	" (0.36˚C)