DATAFORTH[®]

SCM5B38 Strain Gage Input Modules, Wide Bandwidth

Description

Each SCM5B38 Strain Gage input module provides a single channel of strain gage input which is filtered, isolated, amplified, and converted to a high-level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to $\pm 50V$ from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin, to I/O Common, pin 19.

The SCM5B38 can interface to full-bridge or half-bridge transducers with a nominal resistance of 100Ω to $10k\Omega$. A matched pair of bridge-completion resistors (to ±1mV at +10V excitation) allows use of low cost half-bridge or quarter-bridge transducers (Figures 2, 3, 4). The 10kHz bandwidth allows measurement of high speed processes such as vibration analysis.

Strain gage excitation is provided from the module by a very stable 10V or 3.333V source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. This feature offers significant flexibility in real world applications. Full scale sensitivities of 2mV/V, 3mV/V or 10mV/V are offered as standard. With 10V excitation, this results in $\pm 20mV$, $\pm 30mV$ or $\pm 100mV$ full scale input range producing $\pm 5V$ full scale output.

The input signal is processed through a pre-amplifier on the field side of the isolation barrier. This pre-amplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 10kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling,

► Features

- Interfaces to 100Ω Thru $10k\Omega$, Full-Bridge, Half-Bridge, or Quarter-Bridge Strain Gages
- High-Level Voltage Output
- 1500Vrms Transformer Isolation
- ANSI/IEEE C37.90.1 Transient Protection
- · Input Protected to 240VAC Continuous
- · Fully Isolated Excitation Supply
- 100dB CMR
- 10kHz Signal Bandwidth
- ±0.03% Accuracy
- ±0.01% Linearity
- ±1µV/°C Drift
- · CSA C/US Certified, CE and ATEX Compliant
- Mix and Match SCM5B Types on Backpanel

again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, $\pm 5\%$.

Special input circuits on the SCM5B38 module provide protection of the signal inputs and the isolated excitation supply up to 240VAC.

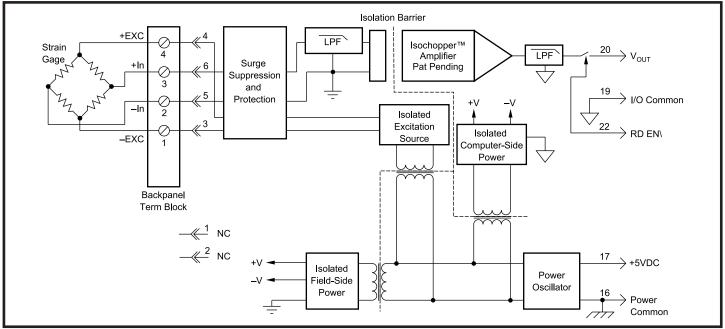


Figure 1: SCM5B38 Block Diagram

22

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Specifications Typical at $T_A = +25^{\circ}C$ and +5V power

Half Bridge SCM5B38-01,-02,-05,-06,-07Half Bridge SCM5B38-03,-04Input Range Input Resistance Normal±10mV to ±100mV ±0.3nA:Normal Power Of Outroad50MQ 40KQ:Signal Input Potection Continuous240Vmms max ANS/IEEE C37,90.1:Excitation Output (42, 44, 45, 47) Load Resistance::Excitation Output (42, 44, 45, 47) Load Resistance::Excitation Output (43, 44, 45, 47) Load Resistance::Excitation Collput (41, 44, 45, 47) Load Resistance::Excitation Collput (42, 44, 45, 47) Load Resistance::Excitation Collput (42, 44, 45, 47) Load Resistance::Excitation Station:::Excitation Collput (42, 44, 45, 47) Load Resistance::Excitation Station:::Excitation Load Regulation:::Excitation Station:::Haff Bridge Voltage Level (40) Haff Bridge Voltage Level (40) Haff Bridge Voltage Level (40) Haff Bridge Voltage Level (41) Haff Bridge Voltage Level (42) Haff Bridge Voltage Level (43) Haff Bridge Voltage Level (44) Haff Bridge Volta	Specifications Typical at I _A =+25°C and +5V power						
Input Bias Current Input Resistance Normal $\pm 0.3nA$ \cdot $\pm 0.3nA$ Normal Power Off Overtoad $50MQ$ \cdot $\pm 00K2$ Signal Input Protection Continuous $240Vrms max$ $40K2$ \cdot Signal Input Protection Continuous $240Vrms max$ $40K2$ \cdot Excitation Output ($20, 40, 50, 07$) Load Resistance $300Q$ to 10K2Excitation Statistice $300Q$ to 10K2Excitation Culput ($21, 40, 40, 60, 07$) Load Resistance $100Q$ to 10K2Excitation Stability $\pm 55ppm/mA$ Excitation Stability $\pm 55ppm/mC$ Haff Bridge Voltage Level (40) Haff Bridge Voltage Level (40 Haff Bridge Voltage Level (40 Haff Bridge Voltage Level (40 Haf	Module		Half Bridge SCM5B38-03,-04				
Continuous240Vrms max·TransientANS/IEEE C37.90.1·Excitation Output (02, 44, 65, 07)+10V + 3mV·Laad Resistance33002 to 10kQ·Excitation Load Regulation $\pm 3333 \pm 2mV$ ·Excitation Load Regulation $\pm 5ppm/raA$ ·Excitation Stability $\pm 5ppm/raA$ ·Half Bridge Voltage Level (40)NA $\pm 5V \pm 1mV$ Half Bridge Voltage Level (40)NA $\pm 5V \pm 1mV$ Half Bridge Voltage Level (40)NA $\pm 5V \pm 1mV$ Isolated Excitation Protection240Vrms max·CMV, Input to OutputToold In NANS/IEEE C37.90.1·CMV (s0 or 60Hz)1500Vrms max·NMR (-3dB at 10kHz)120dB per Decade above 10kHz·Accuracy? $\pm 0.03\%$ Span·Input Offset $\pm 1\mu/V/C$ ·Output Offset $\pm 1\mu/V/C$ ·Output Offset $\pm 25ppm$ of Reading/'C·Output Offset 505 ·Output Resistance··Output Resistance··Output Resistance··Output Resistance··Output Resistance··Output Resistance··Output Resistance··Output Offset··Innu Offset··Innu Offset··Innu Offset··Innu Offset··Output Resistance·Output	Input Bias Current Input Resistance Normal Power Off Overload	±0.3nA 50MΩ 40kΩ	* * * *				
Load Resistance300Q2 to 10kQ \cdot Excitation Output (01, 03, 06) $+3.333 + 2mV$ \cdot Load Resistance $\pm 5ppm/nA$ \cdot Excitation Stability $\pm 5ppm/nA$ \cdot Half Bridge Voltage Level (04)NA $+5V \pm 1mV$ Half Bridge Voltage Level (03)NA $+15V \pm 1mV$ Isolated Excitation Protection240Vrms max \cdot ContinuousTransientANSI/IEEE C37.90.1 \cdot Continuous100Q1 per Decade above 10kHz \cdot Transient $\pm 0.01\%$ Span \cdot CMR (50 or 60Hz) $\pm 0.01\%$ Span \cdot Inearity $\pm 0.01\%$ Span \cdot Stability $\pm 0.01\%$ Span \cdot Input 0ffset $\pm 1\muV/rC$ \cdot Output 0ffset $\pm 1\muV/rC$ \cdot Output 0ffset $\pm 25ppm$ of Reading/rC \cdot NoiseInput 0ffset $\pm 25ppm$ of Reading/rCNoiseSee Ordering Information \cdot Output 100kHz $\pm 0.01\%$ \cdot Output RangeSee Ordering Information \cdot Output RangeSee Ordering Information \cdot Output RangeSee Ordering Information \cdot Output Range $\pm 0.01\%$ $\pm 2.00\%$ \cdot Output Range $\pm 2.01\%$ $\pm 2.00\%$ \cdot Output Range $\pm 0.01\%$ $\pm 2.00\%$ \cdot Output Range $\pm 0.01\%$ $\pm 0.01\%$ \cdot Output Range $\pm 0.01\%$ $\pm 0.01\%$ \cdot Output Range $\pm 0.01\%$ $\pm 0.00\%$ \cdot <	Continuous		*				
CMV, Input to Output Continuous Transient1500Vrms max ANSI/IEEE C37.90.1 100dB:CMR (50 or 60H2) NMR (~3dB at 10kH2)120dB per Decade above 10kHz:Accuracy? $\pm 0.03\%$ Span $\pm 0.01\%$ Span:Accuracy? $\pm 0.03\%$ Span $\pm 0.01\%$ Span:Stability Input Offset Output Offset Output 10KHz $\pm 1\mu V/^{\circ} C$ $\pm 25ppm of Reading/^{\circ} C:NoiseInput, 0.1 to 10HzOutput, 100kHz0.4\mu Vrms10mVp-p2\mu Vrms2\mu VrmsBandwidth, -3dBRise Time, 10 to 90% SpanSettling Time, to 0.1%10kHz250\mu s:Output ResistanceOutput ProtectionOutput Selection Time(to ±1mV of Vout)See Ordering Information50\OmegaContinuous Short to Ground6\mu st C_{toat} = 0 to 2000pF:Output Enable ControlMax Logic 1"Input Current Limit+ 8mA:Power Supply VoltagePower Supply VoltagePower Supply Sensitivity+ 5VDC 163\%\pm 2µV/\% RTI®:Power Supply Sensitivity\pm 2µV/\% RTI®::EnvironmentalOperating Temperature RangeStorage Temperature RangeRelative HumidityEmissions EN/1000-6-2RF::Performance At 0.5% Span Error::EnvironmentalImmunity EN61000-6-2::Performance At 0.5% Span Error:$	Load Resistance Excitation Output (-01, -03, -06) Load Resistance Excitation Load Regulation Excitation Stability Half Bridge Voltage Level (-04) Half Bridge Voltage Level (-03) Isolated Excitation Protection Continuous	300Ω to 10kΩ +3.333V ±2mV 100Ω to 10kΩ ±5ppm/mA ±15ppm/°C NA NA 240Vrms max	+1.667V ±1mV *				
Linearity $\pm 0.01\%$ Span*Stability $\pm 1\mu V/^{\circ}C$ *Input Offset $\pm 1\mu V/^{\circ}C$ *Output Offset $\pm 40\mu V/^{\circ}C$ *Gain $\pm 25ppm$ of Reading/°C*NoiseInput, 0.1 to 10Hz $0.4\mu Vrms$ $2\mu Vrms$ Output, 100kHz $0.4\mu Vrms$ $2\mu Vrms$ Bandwidth, -3dB $10kHz$ *Rise Time, 10 to 90% Span $35\mu s$ *Settling Time, to 0.1%See Ordering Information*Output RangeSee Ordering Information*Output RangeSee Ordering Information*Output Resistance 50Ω *Output Selection Time $(b\mu s t C_{bast} = 0 to 2000pF)$ *Output Current Limit $\pm 8mA$ *Output Enable Control $+0.8V$ *Max Logic *1" $+36V$ *Input Current *0,1" $0.5\mu A$ *Power Supply Voltage $+5VDC \pm 5\%$ *Power Supply Voltage $+2\mu V/\%$ RTI ⁽³⁾ *Power Supply Sensitivity $2.28^{\circ} x 2.26^{\circ} x 0.60^{\circ}$ *Charles Charles Dimensions $2.28^{\circ} x 2.26^{\circ} x 0.60^{\circ}$ *(h)(w)(d)(58mm x 57mm x 15mm)*Environmental 0 to 95% Noncondensing*Operating Temperature Range $-40^{\circ}C$ to $+85^{\circ}C$ *Storage Temperature Range 0 to 95% Noncondensing*Emissions EN61000-6-2ISM, Group 1*RFPerformance A ±0.5% Span Error*	Continuous Transient CMR (50 or 60Hz)	1500Vrms max ANSI/IEEE C37.90.1 100dB	* * *				
Input, 0.1 to 10Hz Output, 100kHz0.4μVrms 10mVp-p2μVrms *Bandwidth, -3dB Rise Time, 10 to 90% Span Settling Time, to 0.1%10kHz 35µs*Output Range Output Resistance Output Protection Output Selection Time (to ±1mV of V _{our}) Output Current LimitSee Ordering Information 50Q Continuous Short to Ground 6µs at C _{load} = 0 to 2000pF*Output Enable Control Max Logic *0" Min Logic *1" Input Current *0,1"See Ordering Information 50Q Continuous Short to Ground 6µs at C _{load} = 0 to 2000pF*Output Enable Control Max Logic *1" Input Current *0,1"+0.8V +2.4V*Power Supply Voltage Power Supply Voltage Power Supply Sensitivity+5VDC ±5% ±2µV/% RTI ⁽³⁾ *Power Supply Sensitivity2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)*Environmental Operating Temperature Range Relative Humidity Emissions EN61000-6-2 RF-40°C to +85°C C 15M, Group 1 Class A 15M, Group 1 Class A 21M*	Linearity Stability Input Offset Output Offset	±0.01% Span ±1μV/°C ±40μV/°C	* * * * *				
Rise Time, 10 to 90% Span Settling Time, to 0.1% $35\mu s250\mu s$ *Output Range Output ResistanceSee Ordering Information 50Ω *Output Protection Output Selection Time (to $\pm 1mV$ of V_{OUT})Continuous Short to Ground $6\mu s$ at $C_{hoad} = 0$ to 2000pF*Output Current Limit $\pm 8mA$ *Output Enable Control Max Logic "0" Min Logic "1" Input Current "0,1" $+0.8V$ $\pm 36V$ *Power Supply Voltage Power Supply Voltage Power Supply Current $+5VDC \pm 5\%$ $170mA Full Exc. Load,70mA No Exc. Load70mA No Exc. Load70mA No Exc. Load,70mA No Exc. Load2.28" x 2.26" x 0.60"(h)(w)(d)*EnvironmentalOperating Temperature RangeRelative HumidityEmissions EN61000-6-4Radiated, ConductedImmunity EN61000-6-2RF-40°C to +85^{\circ}C-40^{\circ}C to +85^{\circ}C$	Input, 0.1 to 10Hz		2µVrms				
Output Resistance50ΩOutput ProtectionContinuous Short to GroundOutput Selection Time $6\mu s$ at $C_{had} = 0$ to 2000pF(to ±1mV of V_{out})±8mAOutput Current Limit±8mAOutput Enable Control+0.8VMax Logic "0"+0.8VMax Logic "1"+2.4VMax Logic "1"+36VInput Current "0,1"0.5µAPower Supply Voltage+5VDC ±5%Power Supply Voltage+5VDC ±5%Power Supply Sensitivity±2µV/% RTI ⁽³⁾ Mechanical Dimensions2.28" x 2.26" x 0.60"(h)(w)(d)(58mm x 57mm x 15mm)Environmental0perating Temperature RangeOperating Temperature Range-40°C to +85°CStorage Temperature Range-40°C to +85°CRelative HumidityISM, Group 1Emissions EN61000-6-4ISM, Group 1RFPerformance A ±0.5% Span Error	Rise Time, 10 to 90% Span	35µs	* * *				
Max Logic "0"+0.8VMin Logic "1"+2.4VMax Logic "1"+36VInput Current "0,1"0.5µAPower Supply Voltage+5VDC ±5%Power Supply Current170mA Full Exc. Load, 70mA No Exc. LoadPower Supply Sensitivity±2µV/% RTI(3)Mechanical Dimensions (h)(w)(d)2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)Environmental Operating Temperature Range Relative Humidity-40°C to +85°C 0 to 95% Noncondensing 1SM, Group 1Emissions EN61000-6-4 Radiated, Conducted RFISM, Group 1 Class A 4.05% Span Error	Output Resistance Output Protection Output Selection Time (to ±1mV of V _{OUT})	50Ω Continuous Short to Ground 6µs at C _{load} = 0 to 2000pF	* * *				
Power Supply Current 170mA Full Exc. Load, 70mA No Exc. Load ±2µV/% RTI ⁽³⁾ * Mechanical Dimensions (h)(w)(d) 2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm) * Environmental Operating Temperature Range Storage Temperature Range Relative Humidity -40°C to +85°C 0 to 95% Noncondensing * Emissions EN61000-6-4 ISM, Group 1 * Radiated, Conducted Class A * Immunity EN61000-6-2 ISM, Group 1 * RF Performance A ±0.5% Span Error *	Max Logic "0" Min Logic "1" Max Logic "1"	+2.4V +36V	* * *				
Mechanical Dimensions (h)(w)(d) 2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm) Environmental Operating Temperature Range Storage Temperature Range Relative Humidity -40°C to +85°C 0 to 95% Noncondensing Emissions EN61000-6-4 Radiated, Conducted ISM, Group 1 Class A Immunity EN61000-6-2 RF ISM, Group 1	Power Supply Current	170mA Full Exc. Load, 70mA No Exc. Load	* *				
Operating Temperature Range-40°C to +85°C*Storage Temperature Range-40°C to +85°C*Relative Humidity0 to 95% Noncondensing*Emissions EN61000-6-4ISM, Group 1*Radiated, ConductedClass A*Immunity EN61000-6-2ISM, Group 1*RFPerformance A ±0.5% Span Error*	Mechanical Dimensions	2.28" x 2.26" x 0.60"	*				
	Environmental Operating Temperature Range Storage Temperature Range Relative Humidity Emissions EN61000-6-4 Radiated, Conducted Immunity EN61000-6-2 RF	-40°C to +85°C -40°C to +85°C 0 to 95% Noncondensing ISM, Group 1 Class A ISM, Group 1 Performance A ±0.5% Span Error	* * * * * * *				

Ordering Information

Model (10kHz)	Input Bridge Type	Input Range	Excitation	Sens.	Output Range [†]
SCM5B38-01	Full	-10mV to +10mV	+3.333V	3mV/V	1, 2
SCM5B38-02	Full	-30mV to +30mV	+10.0V	3mV/V	1, 2
SCM5B38-03	Half	-10mV to +10mV	+3.333V	3mV/V	1, 2
SCM5B38-04	Half	-30mV to +30mV	+10.0V	3mV/V	1, 2
SCM5B38-05	Full	-20mV to +20mV	+10.0V	2mV/V	1, 2
SCM5B38-06	Full	-33.3mV to +33.3mV	+3.333V	10mV/V	1, 2
SCM5B38-07	Full	-100mV to +100mV	+10.0V	10mV/V	1, 2

[†]Output Ranges Available

Output Range	Part No. Suffix	Example
15V to +5V	NONE	SCM5B38-01
210V to +10V	D	SCM5B38-01D

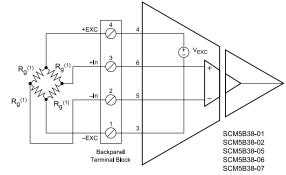


Figure 2: Full Bridge Connection

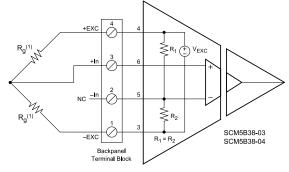


Figure 3: Half Bridge Connection

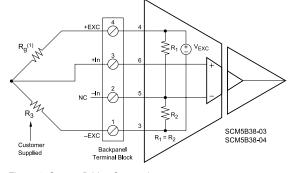


Figure 4: Quarter Bridge Connection

NOTES:

* Same as -01, -02, -05, -06, -07 modules.
 (1) Strain element. (2) Includes linearity, hysteresis and repeatability. (3) RTI = Referenced to input.

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SCM5B