



TRVF Series

The **TRVF Series** is a fully compensated harsh-media, digital I²C and analog output, pressure-sensor package. It is designed to handle today's toughest pressure-sensing environments with a temperature range of -40°C and 150°C.

The unique pressure port isolates onboard electronics, the three wetted materials—silicon, glass, and ceramic—enable the TRVF Series to withstand a variety of harsh media.

The TRVF design isolates the the FR-4 high TG substrate mechanical stress from the MEMs die avoiding possible offset shifts caused during the manufacturing process.

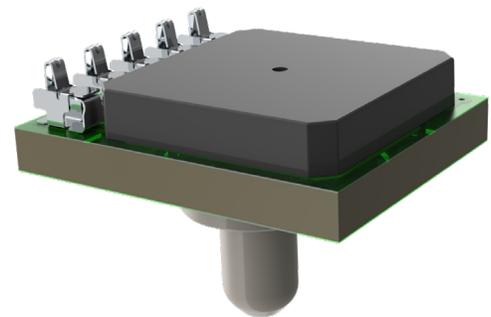
The spring contacts make the customers' assembly process easier and faster.

COMPANY: Merit Sensor is a leader in piezoresistive pressure sensing and partners with clients to create high performing solutions for a variety of applications and industries.

SENTIUM: Merit Sensor products incorporate a proprietary Sentiium® technology developed to provide a best-in-class operating temperature range and superior stability.

TECHNOLOGY: Merit Sensor utilizes a piezoresistive Wheatstone bridge in a design that anodically bonds glass to a chemically etched silicon diaphragm. All products are RoHS compliant.

CAPABILITIES: Merit Sensor designs, engineers, fabricates, dices, assembles, tests, sells and services die and packaged products from a state-of-the-art facility near Salt Lake City, Utah



FEATURES

Pressure Range	1 to 300 psi / 0.07 to 20.7bar / 7 to 2067 kPa
Temperature Range	-40°C to 150°C
Pressure Type	Absolute or gage
Electrical Connection	Spring Contacts
Output	Digital I ² C and Analog Ratiometric 0.5V – 4.5V,
Electrical Protection	output short circuit and supply high voltage / reverse polarity up to 40V

APPLICATIONS

Industrial: Pneumatic systems, water levels, water pressure. It is also used for air-conditioning and other refrigerant systems, portable-measurement and analysis instrumentation, and industrial automation.

Automotive: Monitor the pressure of transmission fluid, fuel systems, oil systems, exhaust gas, HVAC systems, Airbrake systems, etc.

Medical: Equipment for diagnosis and analysis.

TRVF Series Part Number Configurator

TRVF-XXXXX-XXXX

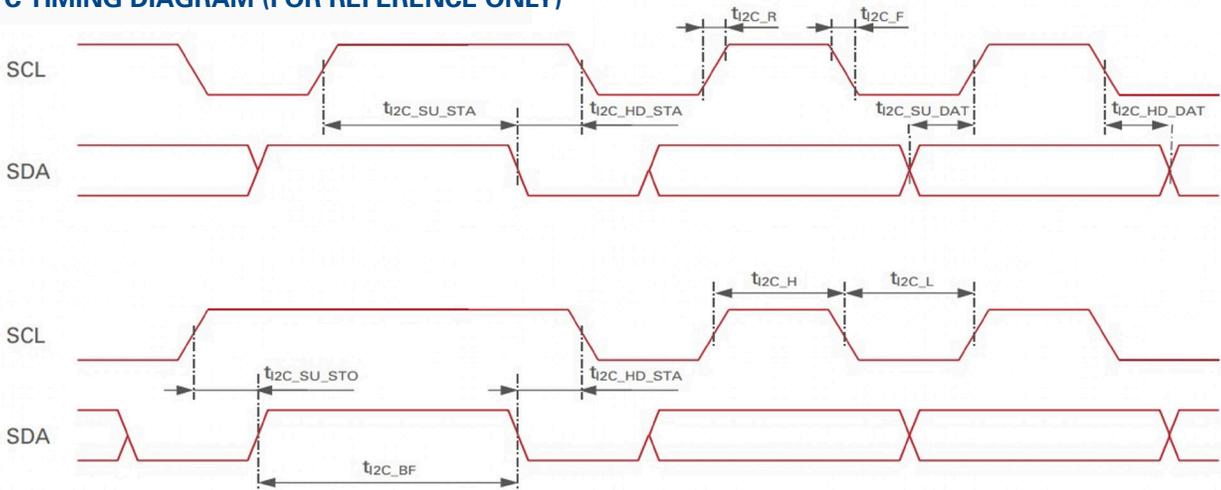
<p>Full Scale Pressure*</p> <p>0015 = 15 psi 0100 = 100 psi 0300 = 300 psi</p> <p>Pressure Type</p> <p>A = Absolute G = Gage</p> <p>Pressure port</p> <p>0 = Ceramic Button</p>	<p>Packaging</p> <p>0 = Tape and Reel 1 = Tray</p> <p>Accuracy</p> <p>1 = 2.5% FS (standard) 2 = 1% FS (high accuracy)</p> <p>Electrical Connection Type:</p> <p>0 = 5 spring contacts</p>
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*Custom calibration available upon request

SPECIFICATIONS

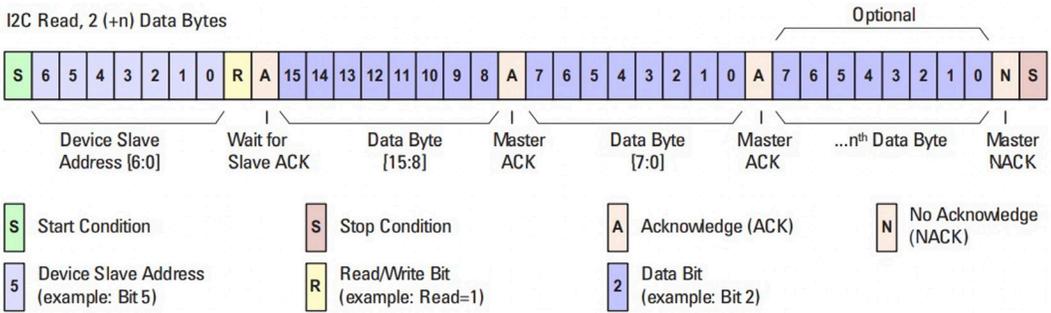
Parameter	Minimum	Typical	Maximum	Units	Notes
Electrical					
Supply Voltage (Vs)	4.5	5	5.5	V	
Supply Current		7		mA	@5.00V supply and 25°C
Supply Over Voltage Protection			40	V	Device will cease operation during supply voltage fault.
Reverse polarity Protection	-40			V	Device will cease operation during supply voltage fault.
Output overvoltage protection	-40		40	V	Device will cease operation during supply voltage fault.
ESD Protection	<= 4000			V	According to the Human Body Model
Performance					
Output Range (Vout)	10		90	%Vs	
Output Clipping	5		95	%Vs	Other custom limits available upon request
Analog Resolution			0.024	%FS	@12bits
Standard Accuracy (2.5%)					
Calibrated Temperature Range -15°C to 125°C	-2.5		2.5	%FS0	
Extended Temperature Range -40°C to -15°C and 125°C to 150°C	-5		5	%FS0	
High Accuracy (1.0%)					
Calibrated Temperature Range -15°C to 125°C	-1		1	%FS0	
Extended Temperature Range -40°C to -15°C and 125°C to 150°C	-2		2	%FS0	
Lifetime Drift	-0.8		0.8	%FS	@1000hrs / 150°C
Static Proof Pressure	2.0x			FS	
Burst Pressure	5.0x			FS	
Environmental					
Operating Temperature	-40		150	°C	
Storage Temperature	-55		150	°C	
Weight		1.35		g	
Digital Interface (for reference only)					
I2C™ voltage level HIGH	0.8x			Vdd	
I2C™ voltage level LOW			0.2x	Vdd	
SCL clock frequency			400	kHz	fSCL
I2C™ bit count	0		32768	counts	
Bus free time between start and stop condition	1.3			us	tI2C_BF
Hold time start condition	0.6			us	tI2C_HD_STA
Setup time repeated start condition	0.6			us	tI2C_SU_STA
Low period SCL/SDA	1.3			us	tI2C_L
High period SCL/SDA	0.6			us	tI2C_H
Data hold time	0.1			us	tI2C_HD_DA
Data setup time	0.1			us	tI2C_SU_DAT
Rise time SCL/SDA			0.3	us	tI2C_R
Fall time SCL/SDA			0.3	us	tI2C_F
Setup time stop condition	0.6			us	tI2C_SU_STO
Noise interception SDA/SCL			50	ns	tI2C_NI (spike suppression)

I²C TIMING DIAGRAM (FOR REFERENCE ONLY)



SENSOR TRVF I2CTM COMMUNICATION

I2C Read, 2 (+n) Data Bytes

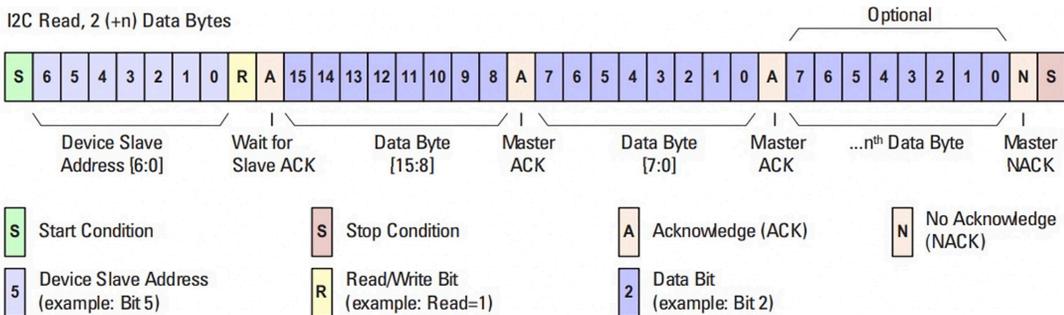


NOTE REGARDING I2C ADDRESSES:

- Address 0x28 is the default
- Other addresses (0x29, 0x2a, 0x2b available upon request,) will respond to both the given address, and 0x28

The correct command to write to the unit for setting up the data read is “0x2E 0x21 0x00”. This write command interrupts the normal operation of the ASIC and should only be used once to “activate” the register that holds the pressure data. Once the register is activated, any subsequent read of the device will return the data from that register.

I2C Read, 2 (+n) Data Bytes



A read command will return the data from the output register. It will not interrupt the normal processing of the ASIC. Three bytes of data should be read... the first byte is the original command (0x2E), the next two bytes are the pressure output in counts.

TRANSFER FUNCTION FORMULAS

$$P_{psi} = (P_{max} - P_{min}) \cdot \left(\frac{P_{counts} - 0.1 \cdot Max}{0.8 \cdot Max} \right) + P_{min}$$

Where

- P_{psi} = Measured Pressure in PSI
- P_{Max} = Maximum Pressure
- P_{Min} = Minimum Pressure
- V_{min} = Minimum Volatage (Usually 0.5V)
- V_{max} = Maximum Volatage (Usually 4.5V)
- V_{out} = Output voltage

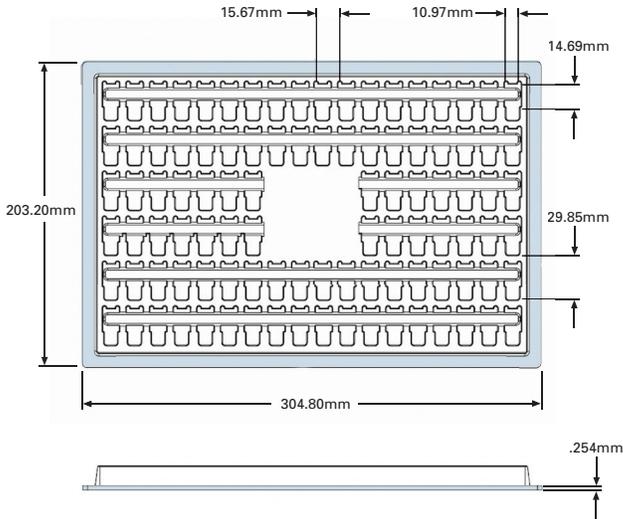
Analog

$$P_{psi} = (P_{max} - P_{min}) \cdot \left(\frac{V_{out} - V_{min}}{V_{max} - V_{min}} \right) + P_{min}$$

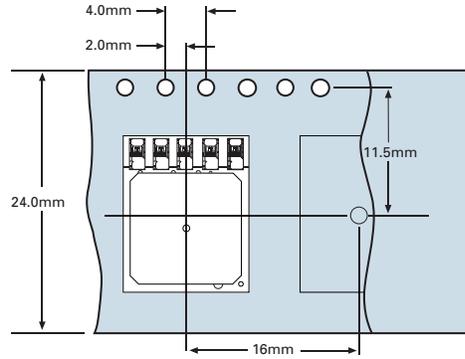
Where

- P_{psi} = Measured Pressure in PSI
- P_{counts} = Pressure Counts from Merit Sensor Part
- P_{Min} = Minimum Pressure
- P_{max} = Maximum Pressure
- MAX = 32768 = 15 Bits

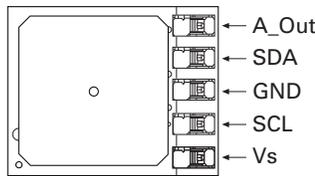
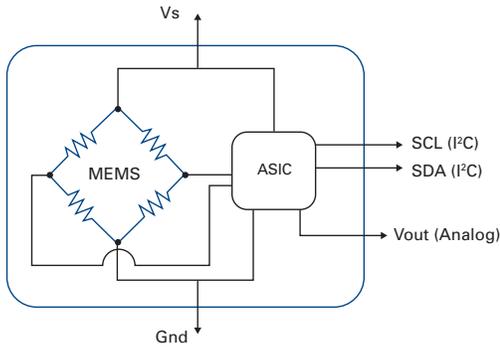
PACKAGING AND SHIPPING (TRAY)



PACKAGING AND SHIPPING (TAPE AND REEL)



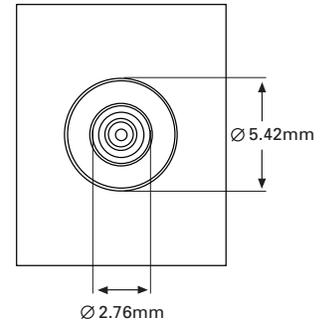
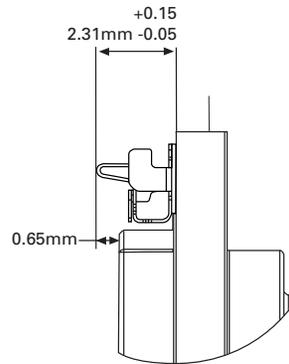
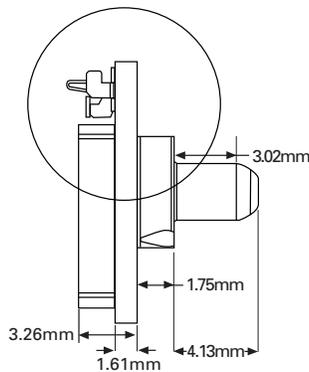
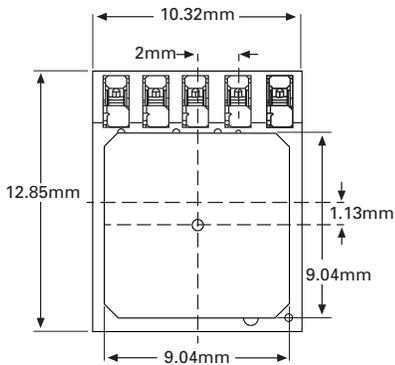
ELECTRICAL



Note: Power supply decoupling and output filtering included

DIMENSIONS FOR STANDARD OPTIONS (in millimeters):

Dimensions for reference only. Engineering drawings (with tolerance) available upon order



SMD Solder Pads Size: 2.1 X 1.0mm

Spring Contact Recommended Deflection:
0.65mm ±0.25mm (Normal Force @0.65mm = 0.67N)