

**TRVF Series**

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

The unique pressure port isolates onboard electronics, and 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 encapsulation process. Factory pre-calibrated parts can be assembled without re-calibration or offset voltage corrections after assembly.

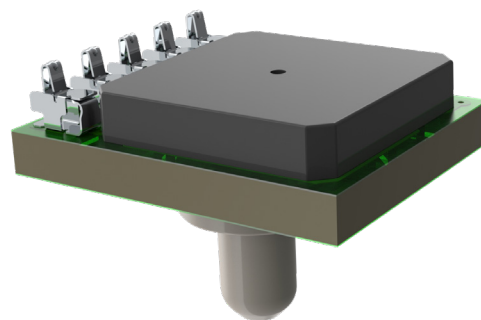
The Spring Contacts make the assembling process easier and faster.

**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**

<b>Pressure Range</b>	1 to 500 psi / 0.07 to 34.5 bar / 7 to 3450 kPa
<b>Temperature Range</b>	-40°C to 150°C
<b>Pressure Type</b>	Absolute or gage
<b>Electrical Connection</b>	SMD solder pads or Spring Contacts
<b>Output</b>	Digital I2C and Analog Ratiometric 0.5V – 4.5V,
<b>Electrical Protection</b>	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			
<b>Full Scale Pressure</b>			<b>Packaging</b>
0001 = 1 psi			0 = Tape and Reel
0015 = 15 psi			1 = Tray
0100 = 100 psi			
0500 = 500 psi			
<b>Pressure Type</b>			<b>Accuracy</b>
A = Absolute			1 = 2.5% FS (standard)
G = Gage			2 = 1% FS (high accuracy)
<b>Pressure port</b>			
0 = Ceramic Button			
			<b>Electrical Connection Type:</b>
			0 = 5 spring contacts

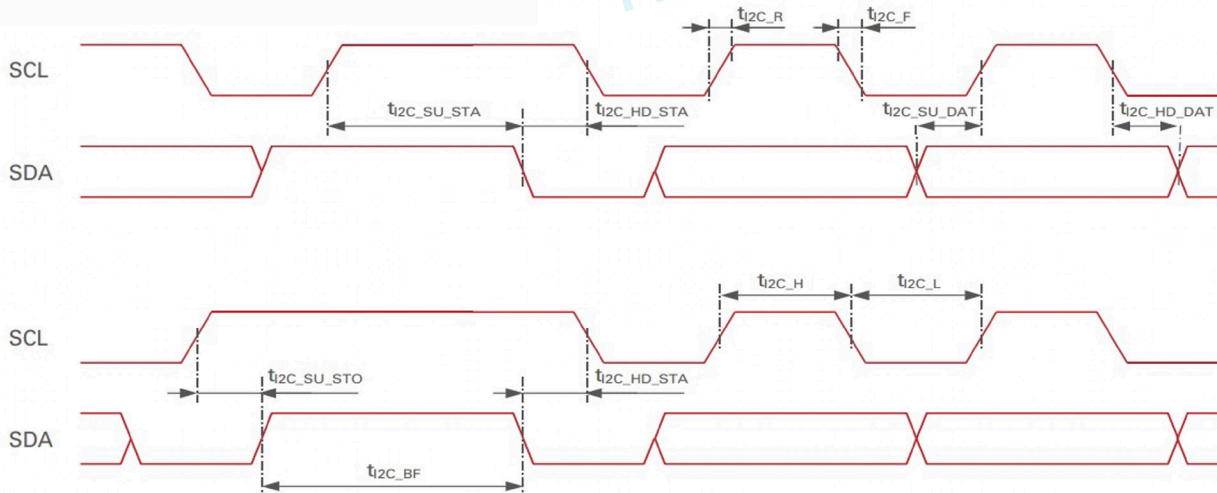
\*Custom calibration available upon request

**SPECIFICATIONS**

Parameter	Minimum	Typical	Maximum	Units	Notes
<b>Electrical</b>					
Supply Voltage (Vs)	4.5	5	5.5	V	
Supply Current	5.5	7	10	mA	@5.00V supply
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
<b>Performance</b>					
Output Range (Vout)	10		90	%Vs	
Output Clipping	5		95	%Vs	
Resolution			0.024	%FS	@12bits
Startup Time			10	ms	
Response Time			5.0	ms	
Accuracy Standard High Accuracy	-2.50 -1.00		2.50 1.00	%FS	Accuracy includes all error for hysteresis and linearity over the entire operating temperature range. It does not include lifetime drift. -40°C to 150°C
Lifetime Drift	-0.5		0.5	%FS	@1000hrs / 150°C
Static Proof Pressure	2.5x			FS	
Burst Pressure	5.0x			FS	
Burst Pressure (500 PSI part)	1500			PSI	
<b>Environmental</b>					
Operating Temperature	-40		150	°C	
Storage Temperature	-55		150	°C	
Weight		1.35		g	
<b>Digital Interface (for reference only)</b>					
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)

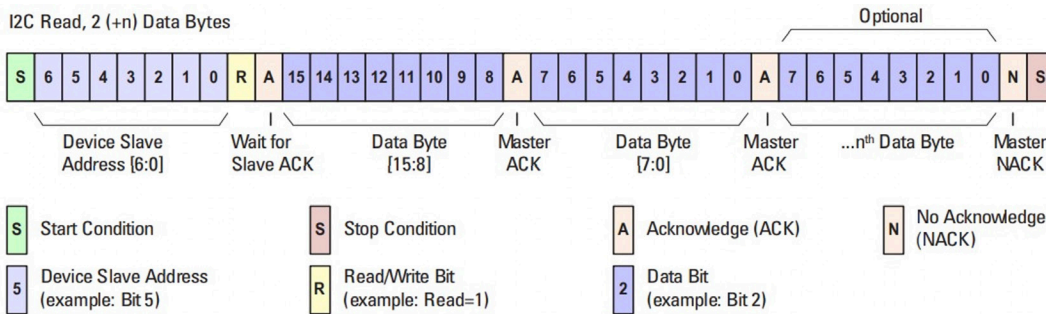
I<sup>2</sup>C TIMING DIAGRAM (FOR REFERENCE ONLY)

PRELIMINARY



## SENSOR TRVF I2CTM COMMUNICATION

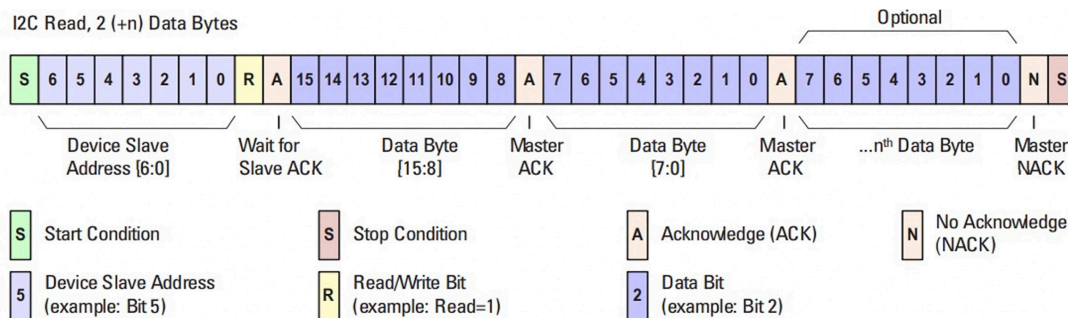
I2C Read, 2 (+n) Data Bytes



NOTE: Standard address = 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

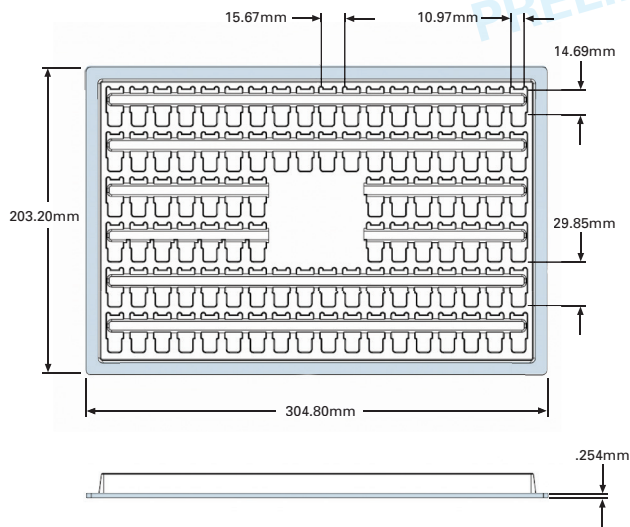
## Analog

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

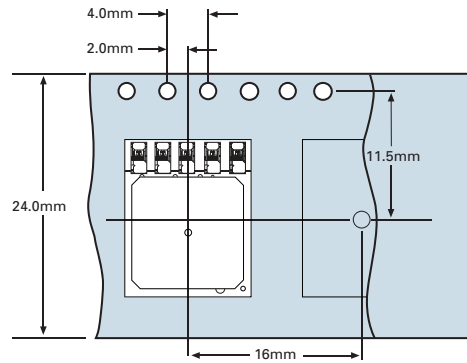
## Where

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

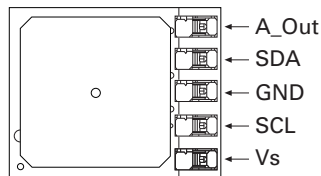
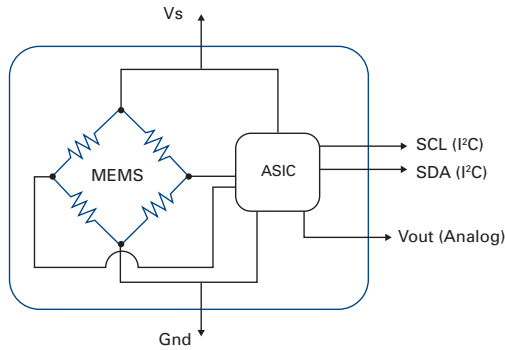
## PACKAGING AND SHIPPING (TRAY)



## PACKAGING AND SHIPPING (TAPE AND REEL)



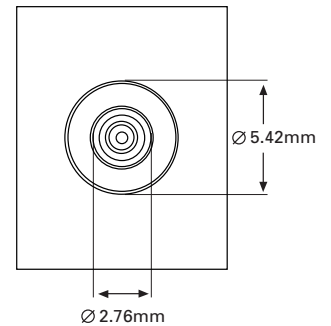
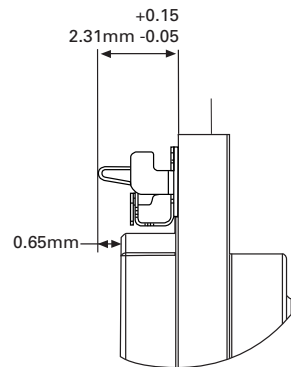
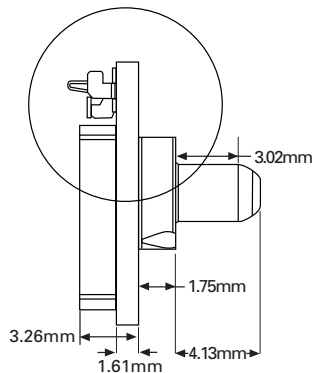
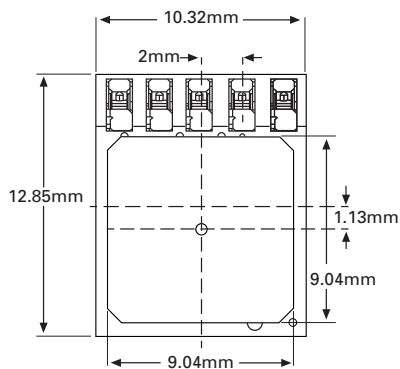
## ELECTRICAL



**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)