

TPS LOW PRESSURE DIGITAL / ANALOG SENSOR

Gage & Differential Pressure Sensors

The TPS (TE Connectivity Pressure Sensors) are low pressure MEMS sensors offering state-of-the-art pressure transducer technology and CMOS mixed signal processing technology to produce either an analog and/or digital output fully conditioned, multi-order pressure and temperature compensated. This series provides JEDEC standard SOIC-16 package with dual vertical, dual horizontal or Manifold porting options. It is available in gage, differential and asymmetric differential configurations. With the dual porting, a reference measurement is possible to minimize errors due to changes in ambient pressure.

Combining the pressure sensor with a signal-conditioning ASIC in a single package simplifies the use of advanced silicon micro-machined pressure sensors. The pressure sensor can be mounted directly on a standard printed circuit board and a high level, calibrated pressure signal can be acquired from the digital interface. This eliminates the need for additional circuitry, such as a compensation network or microcontroller containing a custom correction algorithm.

The TPS products are shipped in tape & reel.

Features

- Pressure ranges:
from 25mbar to 100mbar
- Pressure type:
 - ✓ gage
 - ✓ differential
 - ✓ asymmetric differential
- 24 bits ADC
- I²C/ I³C digital and analog output interface available
- Pressure total error band : $\pm 1\%$ FS (digital & analog)
- Pressure calibrated and temperature compensated output
- Compensated temperature range: -20 to 85°C

Applications

- CPAP / Sleep Apnea
- Ventilators
- Gas Flow Instrumentation
- Air Flow Measurement
- HVAC / VAV

1 PERFORMANCE SPECIFICATION

1.1 Available Part Number & Calibrated Pressure Ranges

Dual vertical port configuration :

Part number	Part Description ¹	P _{MIN} (mbar)	P _{MAX} (mbar)
20030258-00	TPS-070MG-CA1N-00-T	0	70
20032025-00	TPS-070MG-CA2N-00-T	0	70
20032023-00	TPS-025MG-CA1N-00-T	0	25

Dual horizontal port configuration :

Part number	Part Description ¹	P _{MIN} (mbar)	P _{MAX} (mbar)
20032512-00	TPS-040MD-BABN-00-T	-40	40

Note :

1. Part description is given on last datasheet page.

For specific part request, please contact TE representative for support.

1.2 Absolute Maximum Ratings

All parameters are specified at VDD = 5.0 V supply voltage at 25°C, unless otherwise noted.

Characteristic	Symbol	Min	Max	Units
Compensated Temperature	T _{COMP}	-20	85	°C
Operating Temperature ^(a)	T _{OP}	-40	105	°C
Storage Temperature ^(a)	T _{STG}	-40	125	°C
Supply Voltage	V _{DD}	-0.3	6	V
Media Compatibility ^(a)		Clean, dry air compatible with wetted materials ^(b)		

Burst pressure and proof pressure by pressure range

Part number	Proof Pressure ^(a, c) P _{Proof} (mbar)	Burst Pressure ^(a, d) P _{Burst} (mbar)
Up to P _{max} = 40mbar	310	415
Up to P _{max} = 100mbar	830	1035

Notes:

- a) Tested on a sample basis.
- b) Wetted materials include Silicon, glass, gold, aluminum, copper, silicone, epoxy, mold compound.
- c) Proof pressure is defined as the maximum pressure to which the device can be taken and still perform within specifications after returning to the operating pressure range.
- d) Burst pressure is the pressure at which the device suffers catastrophic failure resulting in pressure loss through the device.

1.3 ESD

Description	Condition	Symbol	Min	Max	Units
ESD HBM Protection at all Pins	JEDEC JESD47	V _{ESD(HBM)}	-2	2	kV

1.4 External Components

Description	Symbol	Min	Typ	Max	Units
Supply bypass capacitor	C _{VDD}		100		nF

1.5 Operating Conditions

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	VDD		3.0	5.0	5.5	V
Sleep supply Current	I _{slp_25oC}	VDD = 5.0V, T = 25°C (no conversion, DAC off)		1.8	8	μA
Standby supply Current	I _{sty_25oC}	VDD = 5.0V, T = 25°C (no conversion, DAC off, fast_start = "1")		156	200	μA
Supply current during analog output	I _{aout}	VDD = 5.0 V, T = 25°C, hvreg off, buffer on, ratiometric output		362		μA
Supply current during active conversion ¹	I _{ac_p} I _{ac_Tr} I _{ac_Tdsvdd}	VDD = 5.0 V, T = 25°C, svdd = 1.8 V, fadc = 1 MHz excluding sensor current pressure resistive temperature diode temperature		2058 1857 1715		μA

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Conversion time for 1 conversion (P or T1) based on: fadc = 1 MHz fast start no CRC with calculation with transfer add 10 us from sleep mode	Tconv	OSR = 1 OSR = 2 OSR = 3 OSR = 4 OSR = 5 OSR = 6 OSR = 7 OSR = 8 OSR = 9	0.10 0.15 0.27 0.50 0.96 1.89 3.76 7.48 14.93	0.11 0.17 0.30 0.56 1.07 2.09 4.14 8.24 16.43	0.12 0.19 0.33 0.62 1.19 2.32 4.59 9.14 18.24	ms
Start up time	Tstart	Applying Power Supply to digital output ready		16.2		ms
Wake up time	Twaket	Wake up from sleep mode Wake up from standby		30 0		μs
Digital I/O leakage	Ileak	VDD = 5.0 V, T = 25°C	-1		1	μA

Note :

1. Analog output add 200μA
2. Default osr is 4

1.6 Operating Characteristics Table

All parameters are specified at V_{DD} = 5.0 V supply voltage at 25°C, unless otherwise noted.

Characteristic	Symbol	Min	Typ	Max	Units
Digital Pressure Output @ P _{MIN}	DOUT _{MIN}		10		%Full Scale
Digital Pressure Output @ P _{MAX}	DOUT _{MAX}		90		%Full Scale
Digital Full-Scale Span	DFS		80		%Full Scale
Resolution			24		Bits
Digital Output Total Error Band	DACC	-1		+1	%FS
Analog Pressure Output @ P _{MIN}	AOUT _{MIN}		10		%VDD
Analog Pressure Output @ P _{MAX}	AOUT _{MAX}		90		%VDD
Analog Full-Scale Span	AFS		80		%VDD
Analog Output Total Error Band	AACC	-1		+1	%Full Scale
Temperature accuracy	TACC		2		°C

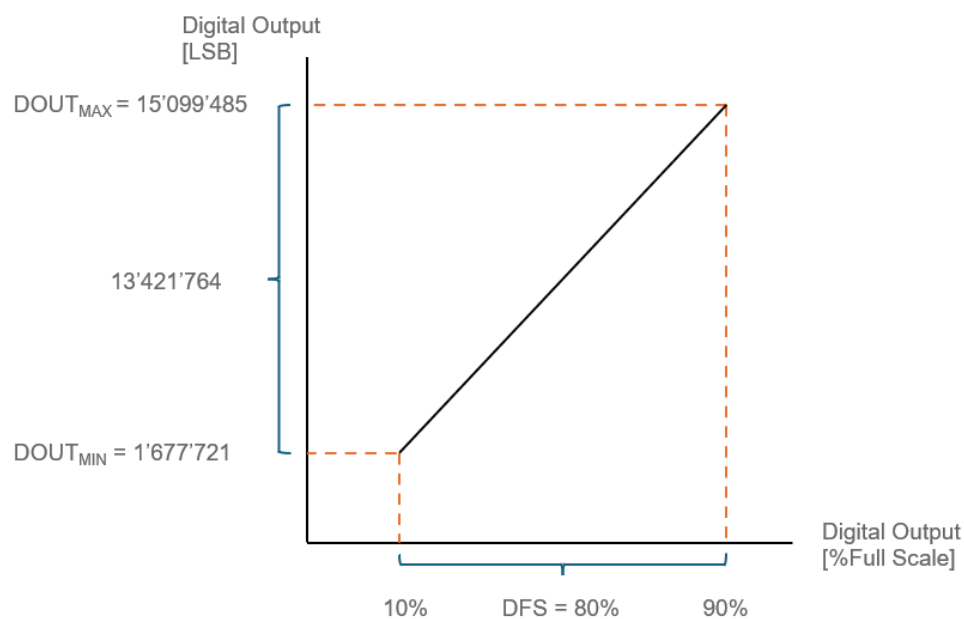
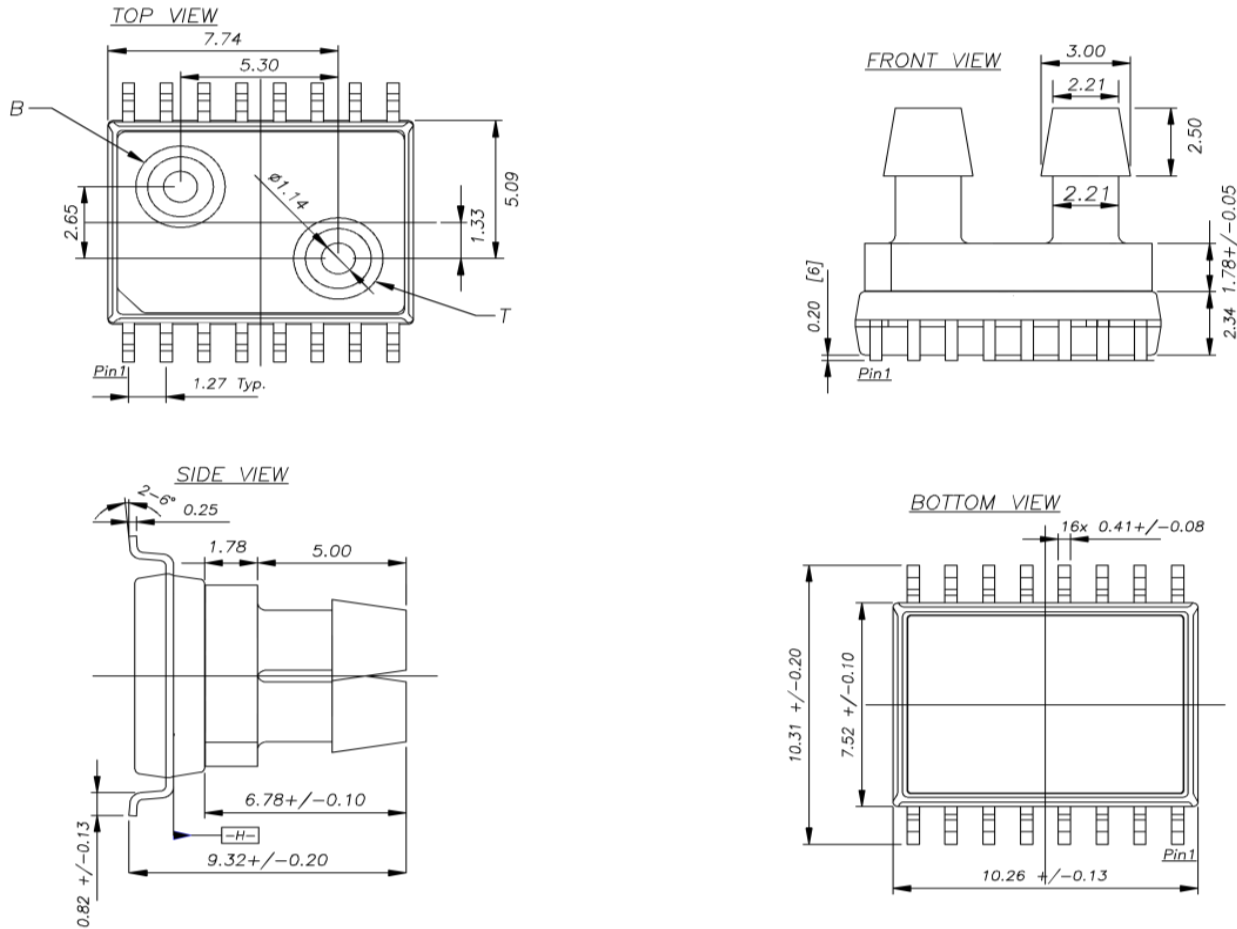


Figure 1: Digital Output / %FS Output

2 PACKAGE DIMENSIONS

SOIC-16 Dual Vertical port (C) Package Dimensions

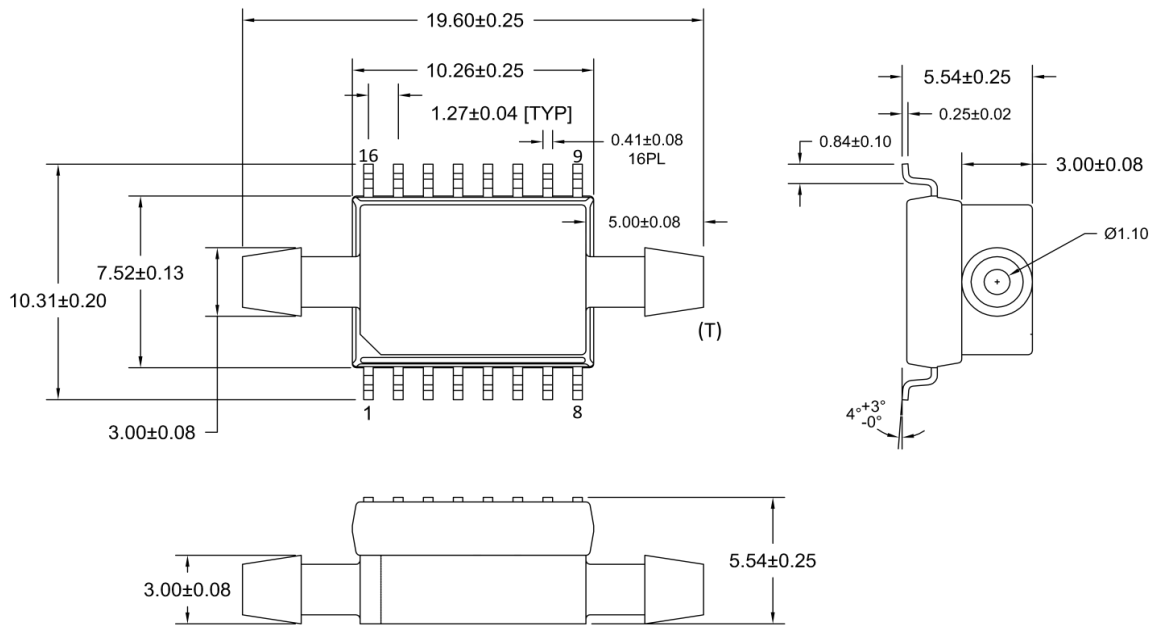


Lot number identification on top side

Notes:

- All dimensions in units of [mm]
- Moisture Sensitivity Level (MSL): Level 3
- Wetted materials: Silicon, glass, gold, aluminum, copper, silicone, epoxy, mold compound.
- [B] is tube connected to bottom side of sensor die.
- [T] is tube connected to top side of sensor die. Topside pressure is positive pressure. An increase in topside pressure will result in an increase in sensor output.
- Bottom plate is anodized lid.
- Robust JEDEC SOIC-16 package for automated assembly
- Manufactured according to ISO9001, ISO14001 and ISO/TS 16949 standards

SOIC-16 Dual Horizontal port (B) Package Dimensions



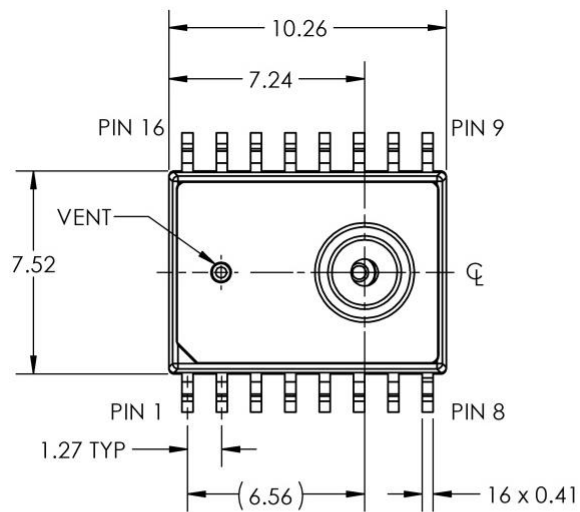
Dimensions are in mm

Lot number identification on top side

Notes:

- All dimensions in units of [mm]
- Moisture Sensitivity Level (MSL): Level 3
- Wetted materials: Silicon, glass, gold, aluminum, copper, silicone, epoxy, mold compound.
- [B] is tube connected to bottom side of sensor die.
- [T] is tube connected to top side of sensor die. Topside pressure is positive pressure. An increase in topside pressure will result in a increase in sensor output.
- Bottom plate is stainless steel
- Robust JEDEC SOIC-16 package for automated assembly
- Electrically isolate the bottom metal cover, do not connect to the cover and keep the board underneath free from electrical circuits.
- Manufactured according to ISO9001, ISO14001 and ISO/TS 16949 standards

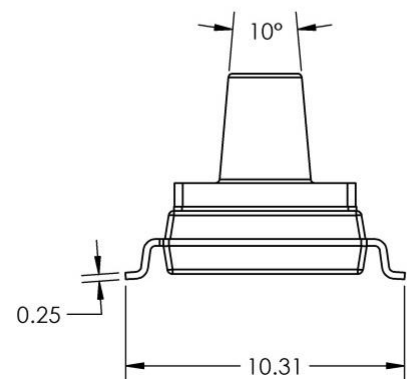
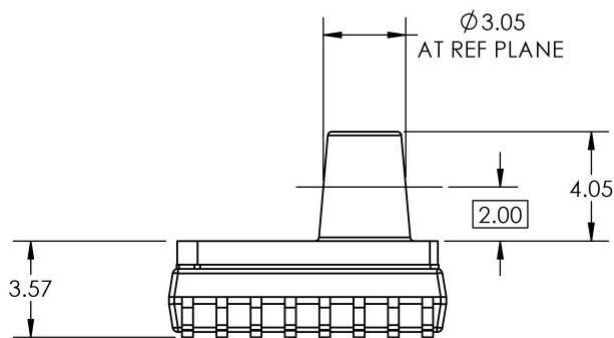
SOIC-16 Manifold port (K) Package Dimensions



Lot number identification on top side

Notes:

- All dimensions in units of [mm]
- Moisture Sensitivity Level (MSL): Level 3
- Wetted materials: Silicon, RTV, Epoxy, Plastic
- Pressure to the port is applied to the die back side
- Stainless steel lid



2.1 Pinout functions

Dual port

Dual port	
Pin No	Pin Function
1	Aout
2	-
3	-
4	-
5	-
6	-
7	SDO
8	-
9	-
10	SDA
11	SCL
12	VSS
13	-
14	-
15	-
16	VDD

Notes:

- SDO : Refer to chapter 7.

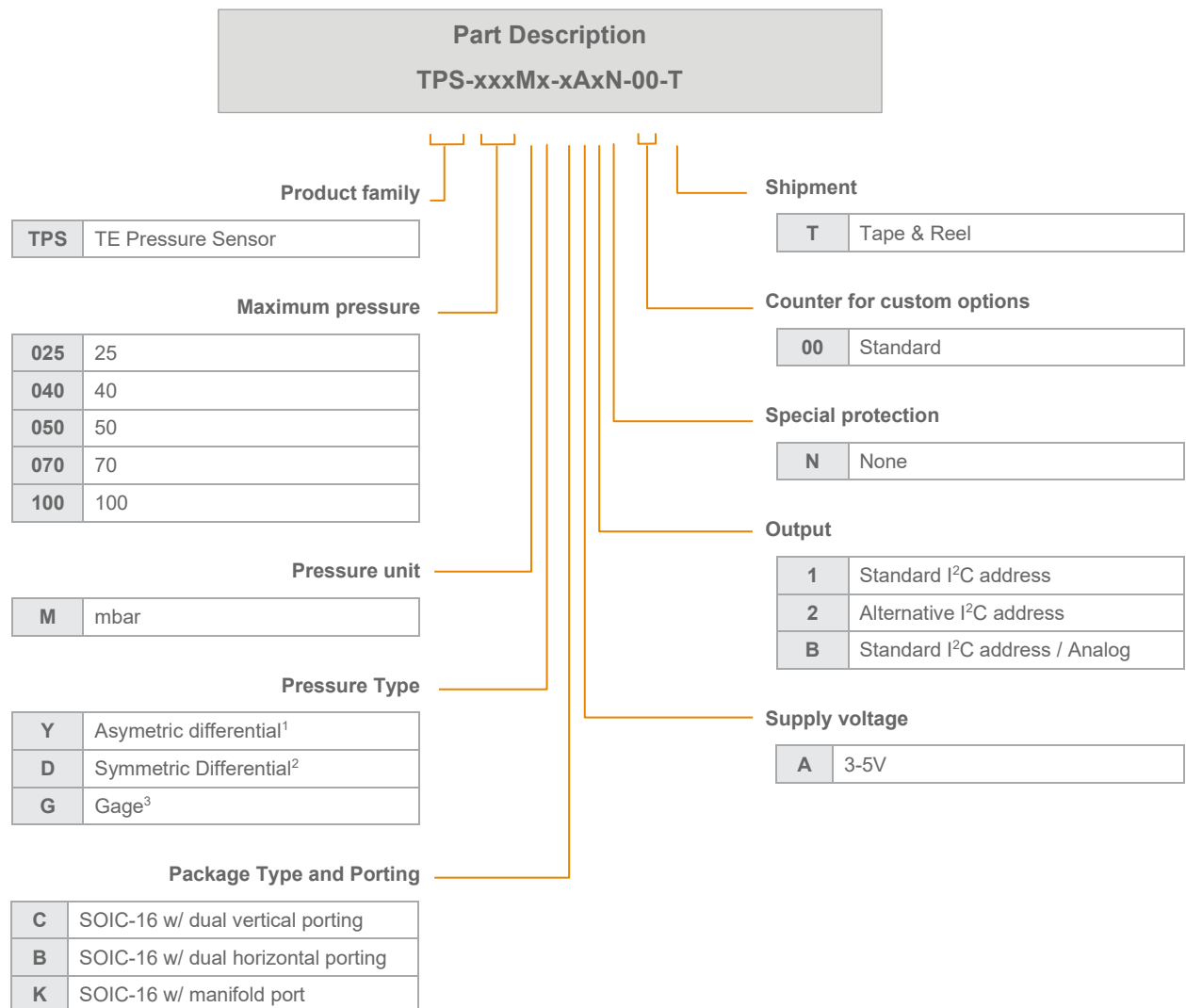
Manifold port

Manifold port	
Pin No	Pin Function
1	-
2	SDA
3	SCL
4	CSB
5	-
6	VSS
7	-
8	VDD
9	-
10	-
11	-
12	-
13	-
14	Aout
15	SDO
16	-

Notes:

- CSB : Refer to chapter 8.4.
- SDO : Refer to chapter 7.

Part description



Notes :

1. Minimum pressure is -5 mbar as standard.
2. Minimum pressure is negative value of maximum pressure
3. Minimum pressure is 0 mbar.

For specific part request, please contact TE representative for support.