

TPS ULTRA LOW PRESSURE DIGITAL SENSOR

Gage & Differential Pressure Sensors

The TPS (TE Connectivity Pressure Sensors) are digital, ultra-low-pressure sensors offering state-of-the-art MEMS pressure transducer technology and CMOS mixed signal processing technology to produce a digital, fully conditioned, multi-order pressure and temperature compensated sensor in JEDEC standard SOIC-16 package with a dual vertical porting option (dual horizontal porting available for selected configurations). It is available in a gage and a differential pressure configuration.

The total error band after board mount and system level autozero is less than 1%FS. The warmup behavior and long-term stability further confirms its expected performance over the life of the part.

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:
 - 125 and 250 Pa Differential
 - 250 up to 600 Pa Gage
- Pressure total error band after Autozero : $\pm 1\%$ FS
- 24-bit I²C digital output interface available
- 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 Part Number & Calibrated Pressure Ranges

Dual vertical port configuration :

Part number	Alias ¹	P _{MIN} (Pa)	P _{MAX} (Pa)
20032073-00	TPS-250PD-CA1N-00-T	-250	+250
20032001-00	TPS-150PD-CA1N-00-T	-150	+150
20032072-00	TPS-125PD-CA1N-00-T	-125	+125
20032074-00	TPS-250PG-CA1N-00-T	0	+250
20032075-00	TPS-300PG-CA1N-00-T	0	+300
20032002-00	TPS-500PG-CA1N-00-T	0	+500
20032022-00	TPS-500PG-CA2N-00-T	0	+500
20032076-00	TPS-600PG-CA1N-00-T	0	+600

Dual horizontal port configuration :

Part number	Alias ¹	P _{MIN} (Pa)	P _{MAX} (Pa)
20032213-00	TPS-250PD-BA1N-00-T	-250	+250
20032214-00	TPS-150PD-BA1N-00-T	-150	+150
20032215-00	TPS-125PD-BA1N-00-T	-125	+125
20032216-00	TPS-250PG-BA1N-00-T	0	+250
20032217-00	TPS-300PG-BA1N-00-T	0	+300
20032218-00	TPS-500PG-BA1N-00-T	0	+500
20032219-00	TPS-600PG-BA1N-00-T	0	+600

Note :

1. Alias description is given on last datasheet page.

1.2 Absolute Maximum Ratings

All parameters are specified at VDD = 3.3 V / 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
Proof Pressure ^(c)	P _{Proof}	7		kPa
Burst Pressure ^(d)	P _{Burst}	20		kPa
Media Compatibility ^(a)		Clean, dry air compatible with wetted materials ^(b)		

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	AEC Q100-002 (HBM) chip level test	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

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Datasheet

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Conversion time for 1 conversion(P, T1 or T2) based on: fadc = 1 MHz fast start no CRC no reload with calculation with transfer add 10 us from sleep mode	Tconv	OSR = 0 OSR = 1 OSR = 2 OSR = 3 OSR = 4 OSR = 5 OSR = 6 OSR = 7 OSR = 8 OSR = 9	0.07 0.10 0.15 0.27 0.50 0.96 1.89 3.76 7.48 14.93	0.08 0.11 0.17 0.30 0.56 1.07 2.09 4.14 8.24 16.43	0.09 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

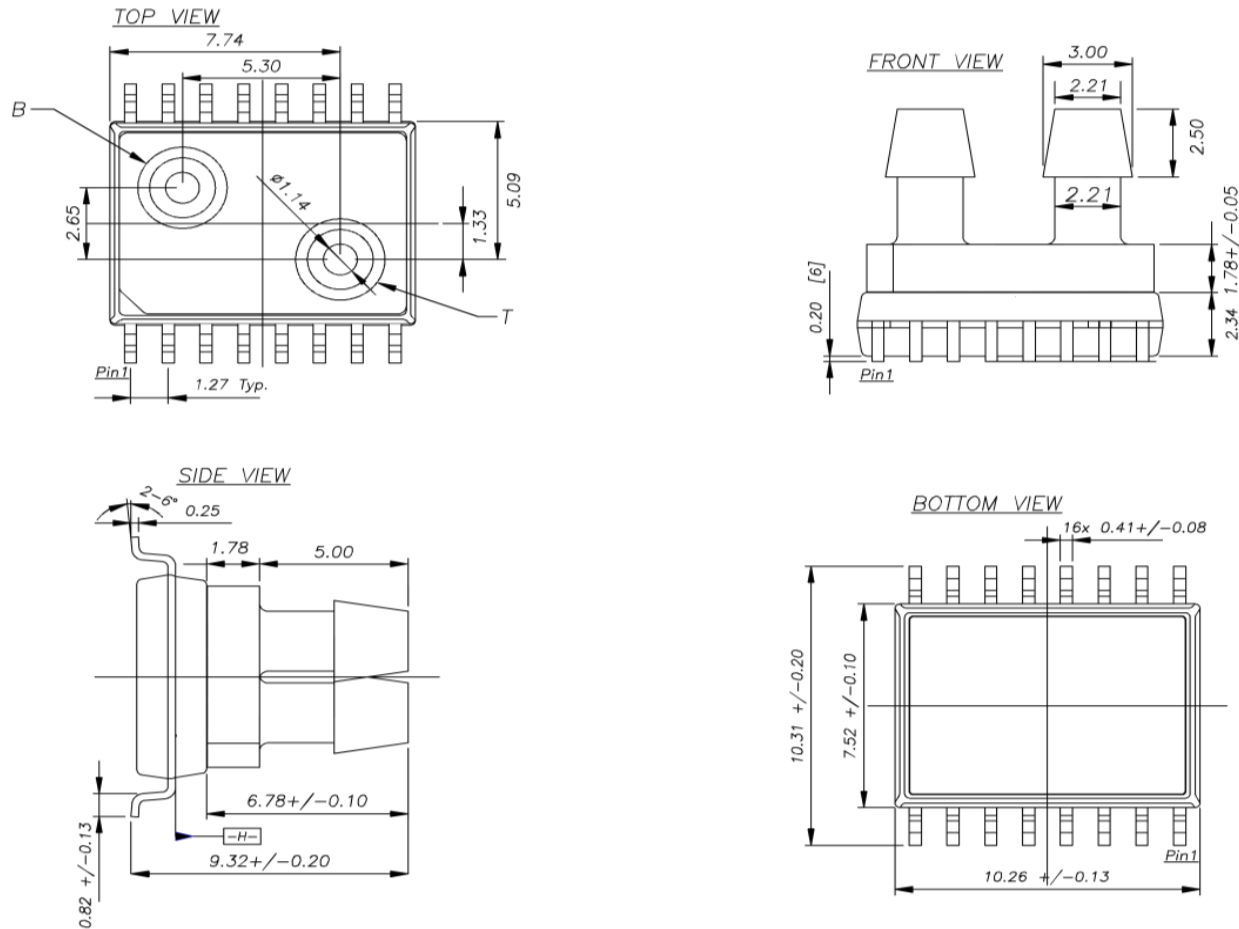
1.6 Operating Characteristics Table

All parameters are specified at V_{DD} = 3.3 V / 5.0 V supply voltage at 25°C, unless otherwise noted.

Characteristic	Symbol	Min	Typ	Max	Units
Digital Pressure Output @P _{MIN}	DOUT _{MIN}		1'677'721		Counts
Digital Pressure Output @P _{MAX}	DOUT _{MAX}		15'099'485		Counts
Digital Full Scale Span	DFS		13'421'764		Counts
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	%FS
Temperature accuracy	TACC		1		°C

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

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Lot number identification on top side

- 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

2.1 Pinout functions

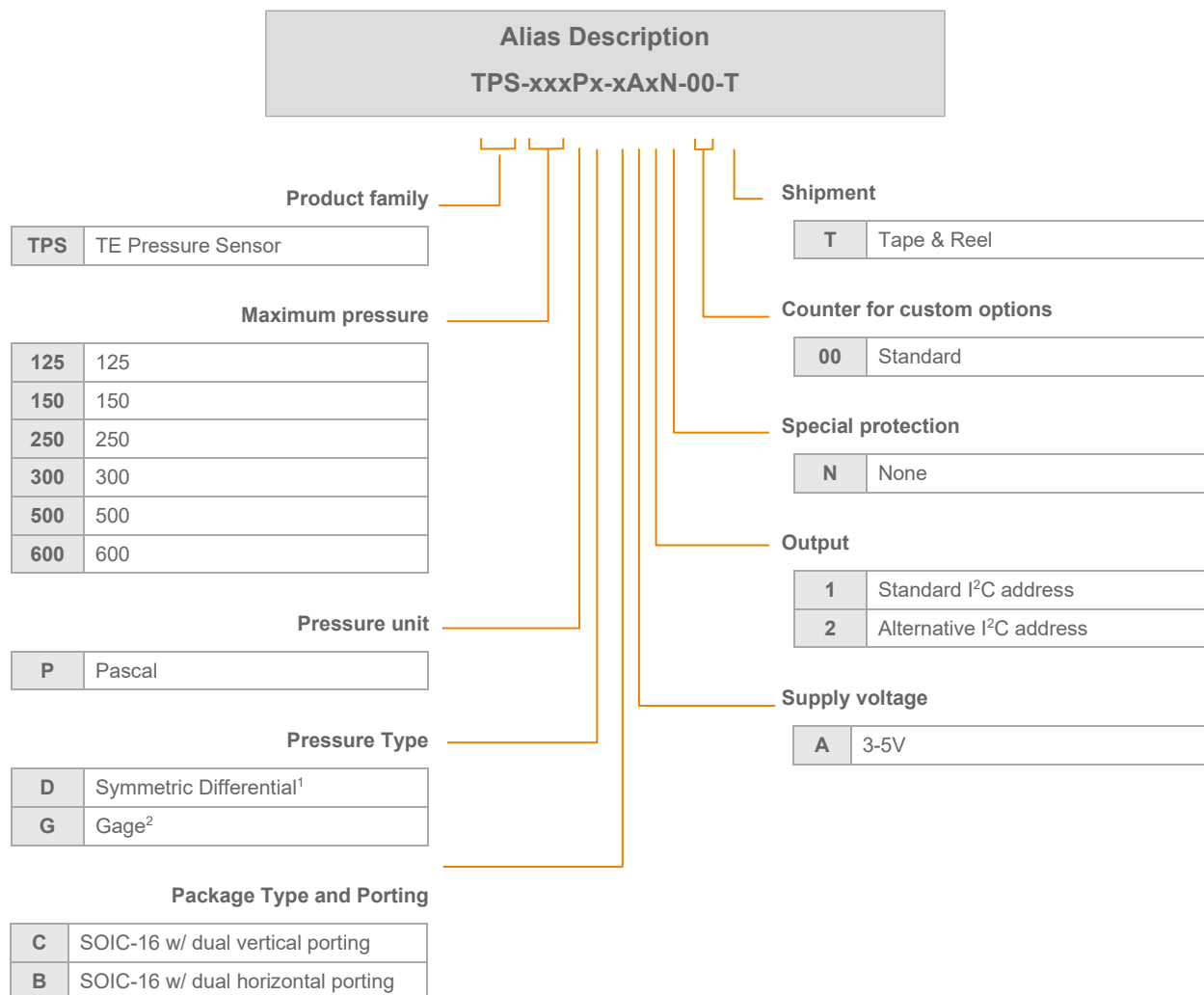
Dual port

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

Notes:

- SDO : Refer to chapter **Error! Reference source not found..**

. Alias description



Notes :

1. Minimum pressure is negative value of maximum pressure
2. Minimum pressure is 0 mbar.