86BSD Backside Digital Output

- **Stainless steel with O-ring seal**
- **Pressure/temperature read-out**
- **Backside digital output**
- **ASIC calibrated**
- **Absolute, gage**
- **Cable/connector option**
- **Low power option**

✓RoHS CE

DESCRIPTION

The 86BSD is a small profile, media compatible, piezoresistive silicon pressure sensor packaged in a 316L stainless steel housing. This backside digital output pressure sensor supports I^{2}C and SPI interface protocols, may come in a 3.3 or 5.0Vdc supply voltage and is designed for o-ring mounting. The sensing package utilizes silicone oil to transfer pressure from the 316L stainless steel diaphragm to the sensing element.

The 86BSD is designed for high performance, low pressure applications. A custom ASIC is used for temperature compensation, offset correction, and provides a digital output of 10~90% or 5~95%.

For a similar sensor with a plastic threaded fitting, refer to the LM pressure transducer.

FEATURES

- Mountable with O-ring seal
- ±0.1% Non-linearity
- ±1.0 Total Error Band
- Cable/connector option
- Low power option
- I^{2}C or SPI Interface protocols

APPLICATIONS

- Level controls
- Tank level measurement
- Corrosive fluids and gas measurement systems
- Sealed systems
- Manifold pressure measurement
- Barometric pressure measurement
- Submersible depth monitoring

STANDARD RANGES

Range	psiG	psiA	Range	BarG	BarA
0 to 001	•		0 to .07	•	
0 to 002	•				
0 to 005	•		0 to .35	•	
0 to 015	•	•	0 to 001	•	•
0 to 030	•	•	0 to 002	•	•
0 to 050	•	•	0 to 005	•	•
0 to 100	•	•	0 to 007	•	•
0 to 150	•	•	0 to 010	•	•
0 to 200	•	•	0 to 014	•	•
0 to 300	•	•	0 to 020	•	•

PERFORMANCE SPECIFICATIONS

Supply Voltage: 3.3Vdc

Ambient Temperature: 25°C (unless otherwise specified)

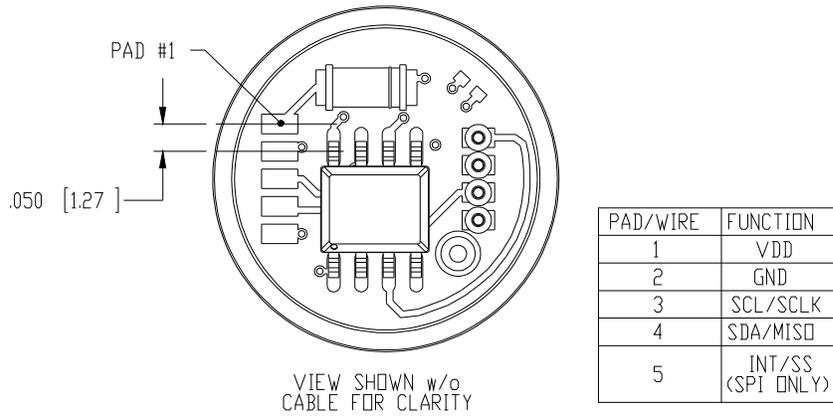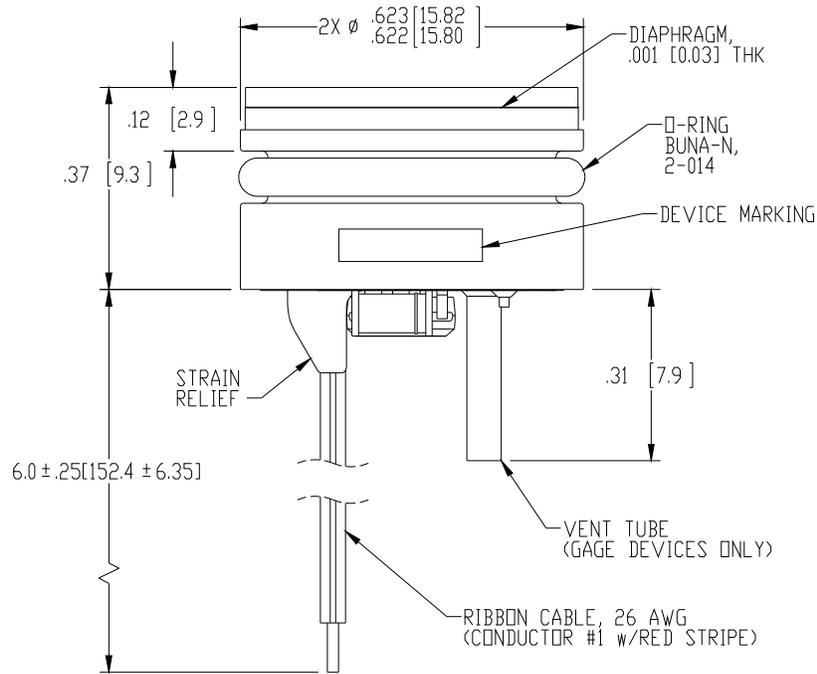| PARAMETERS	MIN	TYP	MAX	UNITS	NOTES
Zero Pressure Output (10% ~ 90%)		666		Count Hex	1
Zero Pressure Output (5% ~ 95%)		333		Count Hex	1
Full Scale Pressure Output (10% ~ 90%)		399A		Count Hex	1
Full Scale Pressure Output (5% ~ 95%)		3CCB		Count Hex	1
Pressure Non-Linearity	-0.1		0.1	%Span	2
Pressure Hysteresis	-0.1		0.1	%Span	
Accuracy	-0.25		0.25	%Span	3
Total Error Band	-1		1	%Span	4
Resolution – Pressure		0.008		%Span	
Temperature Accuracy		±1.5		°C	5
Resolution – Temperature		0.1		°C	
Input Voltage Range	2.70	3.3	5.50	V	1
Supply Current		3		mA	
Overpressure			3X	Rated	8
Burst Pressure			4X	Rated	9
Load Resistance (R_L)	10			KΩ	
Long Term Stability (Offset & Span)		±0.5		%Span/Year	
Insulation Resistance (50Vdc)	50			MΩ	6
Compensated Temperature (≤5psi)	0		50	°C	
Compensated Temperature (≥15psi)	-20		+85	°C	
Operating Temperature	-40		+125	°C	
Storage Temperature	-40		+125	°C	
Output Pressure Resolution			14	Bits	
Output Temperature Resolution	8		11	Bits	
Response Time		0.5		ms	7
Start Time to Data Ready			8.4	ms	7
Output Type	10% to 90% or 5% to 95%				
Interface Type	I^2C (ADDR, 0x28H) I^2C (ADDR, 0X36H) I^2C (ADDR, 0x46H) SPI				
Media – Pressure	Liquids and gases compatible with 316L Stainless Steel				

Notes
1. Measured at vacuum for absolute(A), ambient for gage(G) and sealed gage(S). Output is not ratiometric to supply voltage.
2. Best fit straight line.
3. Accuracy: combined linearity, hysteresis and repeatability.
4. Total Error Band: includes calibration errors and temperature effects over the compensated range.
5. The deviation from a best fit straight line (BFSL) fitted to the output measured over the compensated temperature range. For errors beyond the compensated temperature range, See Fig 2. (0°C to 50°C for ≤5psi)
6. Between case and sensing element.
7. Start time to data ready is the time to get valid data after POR (Power on Reset). The time to get subsequent valid data is then specified by the response time specification.
8. 3X or 500psi, whichever is less. The maximum pressure that can be applied to a transducer without changing the transducer's performance or accuracy.
9. 4X or 500psi, whichever is less. The maximum pressure that can be applied to a transducer without rupture of either the sensing element or transducer.
10. Maximum temperature range for product with standard cable and connector is -20°C to +105°C.

DIMENSIONS

DIMENSIONS ARE IN INCHES [mm].

PAD/WIRE	FUNCTION
1	VDD
2	GND
3	SCL/SCLK
4	SDA/MISO
5	INT/SS (SPI ONLY)

BLOCK DIAGRAM
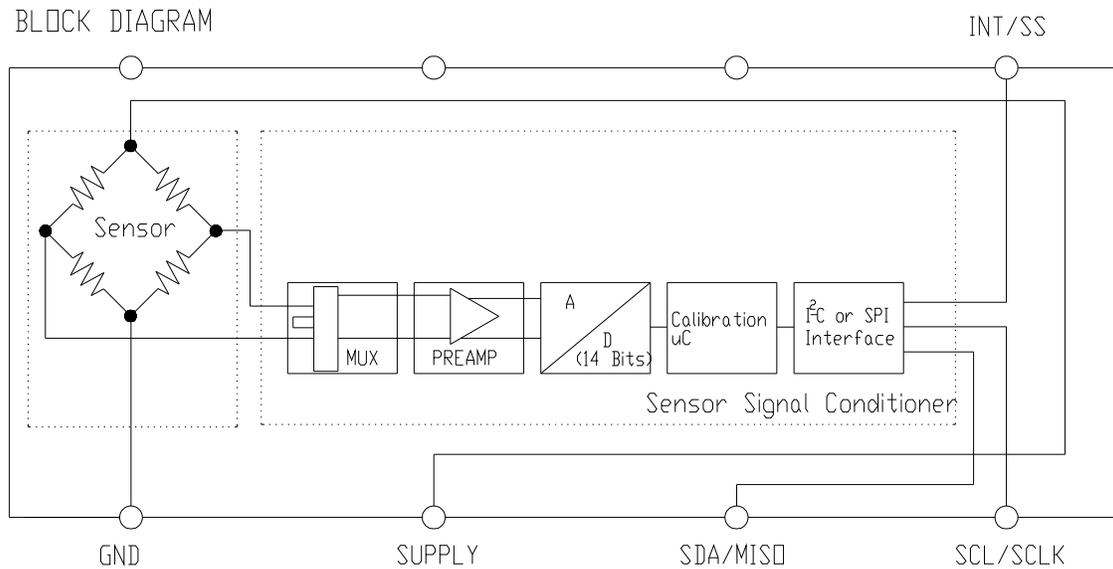
BLOCK DIAGRAM — Fig 1

I2C INTERFACE PRRAMETERS

PARAMETERS	SYMBOL	MIN	TYP	MAX	UNITS
SCLK CLOCK FREQUENCY	FSCL	100		400	KHz
START CONDITION HOLD TIME RELATIVE TO SCL EDGE	tHDSTA	0.1			us
MINIMUM SCL CLOCK LOW WIDTH @1	tLOW	0.6			us
MINIMUM SCL CLOCK HIGH WIDTH @1	tHIGH	0.6			us
START CONDITION SETUP TIME RELATIVE TO SCL EDGE	tSUSTA	0.1			us
DATA HOLD TIME ON SDA RELATIVE TO SCL EDGE	tHDDAT	0			us
DATA SETUP TIME ON SDA RELATIVE TO SCL EDGE	tSUDAT	0.1			us
STOP CONDITION SETUP TIME ON SCL	tSUSTO	0.1			us
BUS FREE TIME BETWEEN STOP AND START CONDITION	tBUS	2			us

SPI INTERFACE PARAMETERS

PARAMETERS	SYMBOL	MIN	TYP	MAX	UNITS
SCLK CLOCK FREQUENCY	FSCL	50		800	KHz
SS DROP TO FIRST CLOCK EDGE	tHDSS	2.5			uS
MINIMUM SCL CLOCK LOW WIDTH @1	tLOW	0.6			uS
MINIMUM SCL CLOCK HIGH WIDTH @1	tHIGH	0.6			uS
CLOCK EDGE TO DATA TRANSITION	tCLKD	0		0.1	uS
RISE OF SS RELATIVE TO LAST CLOCK EDGE	tSUSS	0.1			uS
BUS FREE TIME BETWEEN RISE AND FALL OF SS	tBUS	2			uS

@1 COMBINED LOW AND HIGH WIDTHS MUST EQUAL OR EXCEED MINIMUM SCL PERIOD.
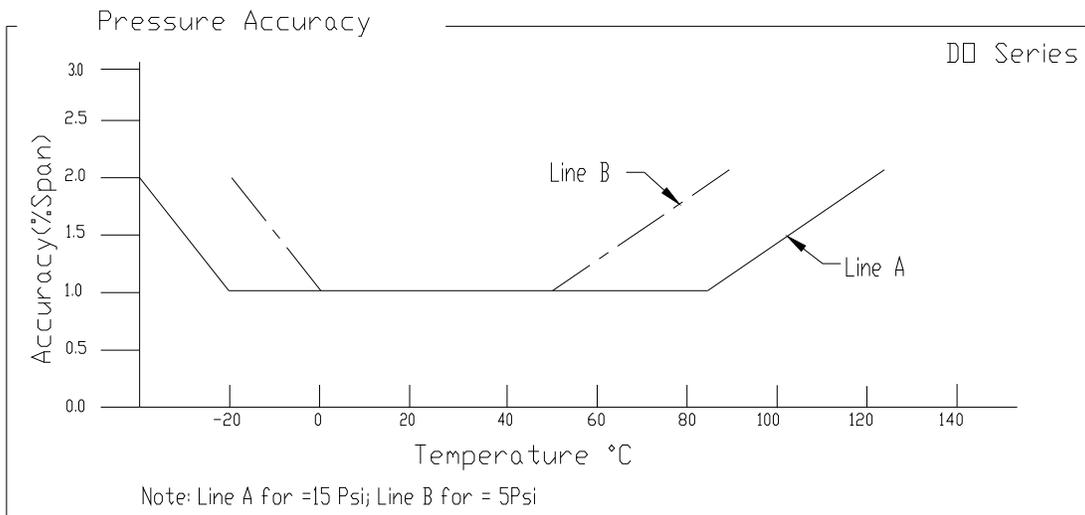
TEMPERATURE/PRESSURE ACCURACY
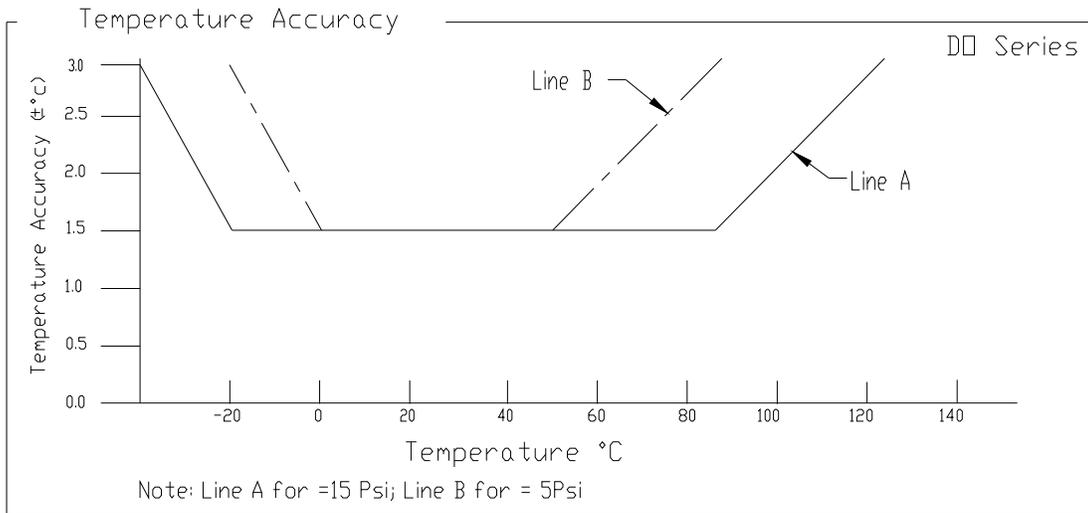
Fig 2

Fig 3

PRESSURE TRANSFER FUNCTIONS

Pressure Transfer Functions

A Type（Output（Decimal counts ）= $\dfrac{80\% * 16383}{Pmax-Pmin}$ * (Pressure$_{applied}$ -Pmin) + 10%*16383

B Type: Output (Decimal counts)= $\dfrac{90\% * 16383}{Pmax-Pmin}$ * (Pressure$_{applied}$ -Pmin) + 5%*16383
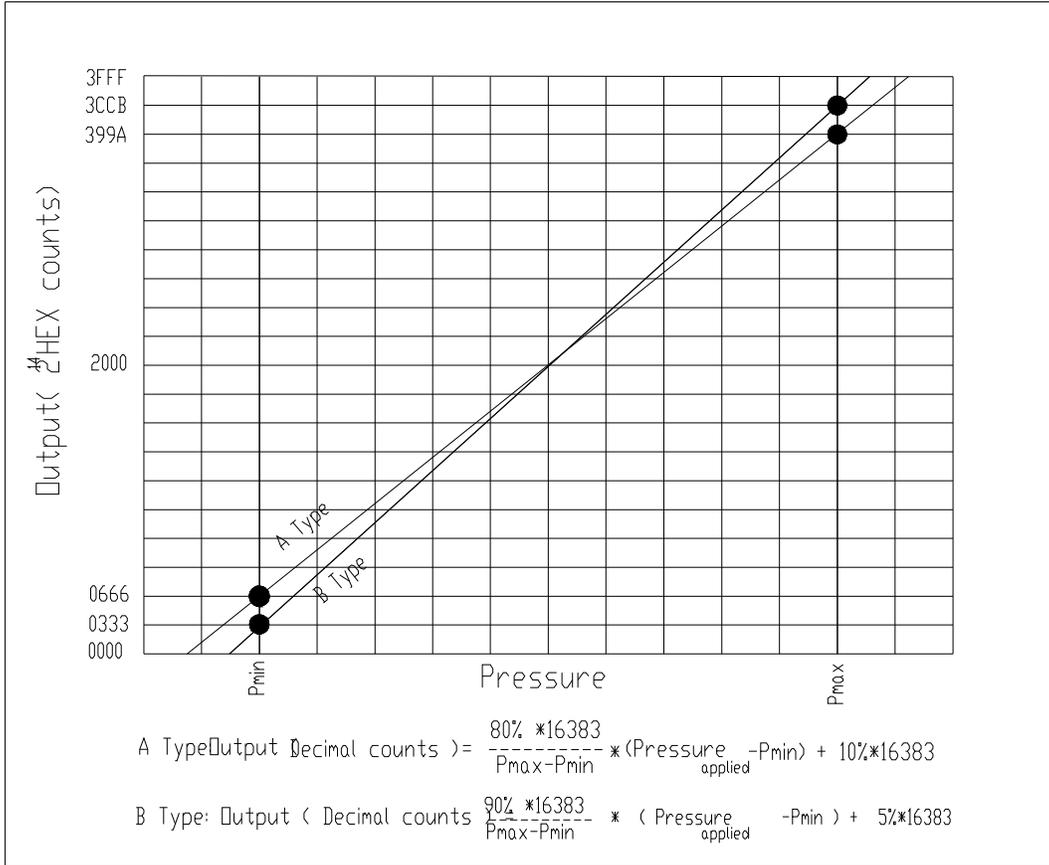
Fig 4

Sensor Output at Significant Percentages

% Output	Digital Counts (decimal)	Digital Counts (hex)
0	0	0 X 0000
5	819	0 X 0333
10	1638	0 X 0666
50	8192	0 X 2000
90	14746	0 X 399A
95	15563	0 X 3CCB
100	16383	0 X 3FFF

TEMPERATURE TRANSFER FUNCTIONS

Temperature Transfer Functions

$$Output\ (Decimal\ Counts) = \frac{(\ Output\ ^\circ C\ (-50^\circ C)_{Tmin}\ *\ 2047}{(\ 150^\circ C_{Tmax}\ (-50^\circ C)_{Tmin}\ )}$$
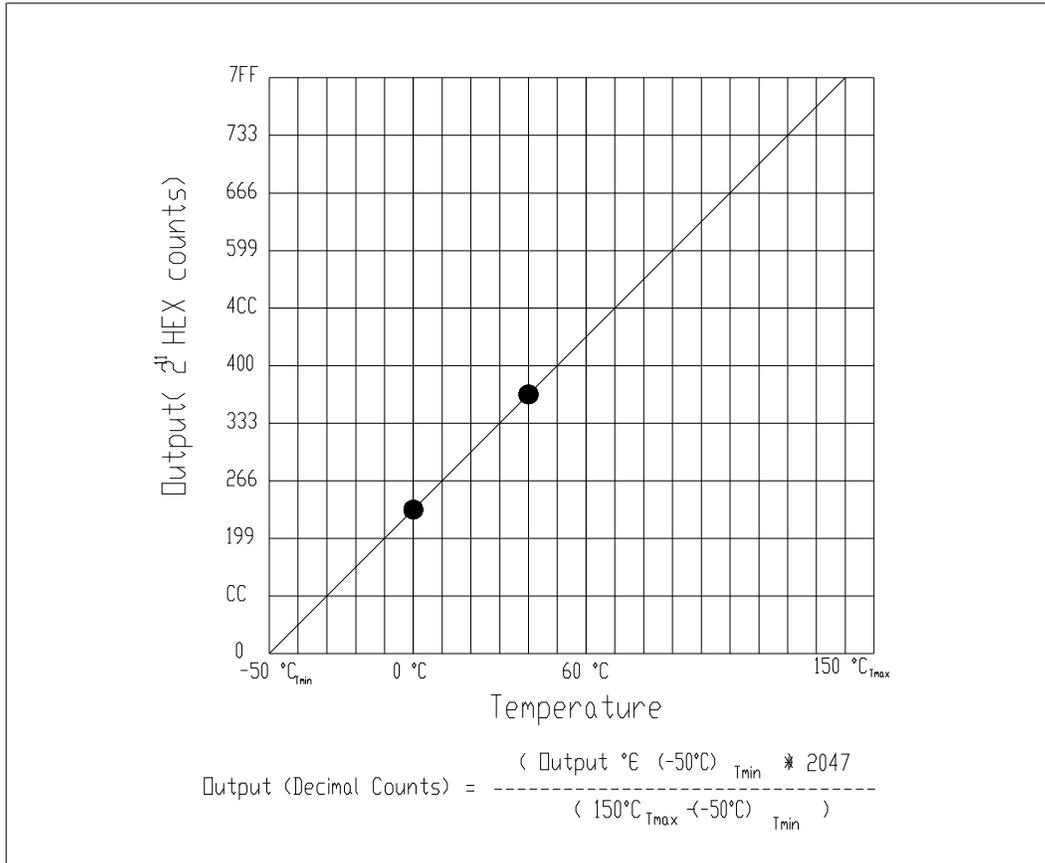
Fig 5

Temperature Output vs Counts

Output °C	Digital Counts (decimal)	Digital Counts (hex)
-50	0	0 X 0000
0	512	0 X 0200
10	614	0 X 0266
25	767	0 X 02FF
40	921	0 X 0399
85	1381	0 X 0565
150	2047	0 X 07FF

ORDERING INFORMATION

86B S D 015P A - 3 A I C L
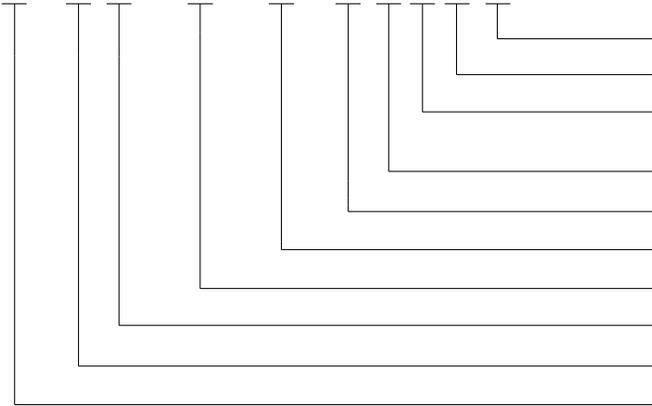
Low Power (Blank = None, L = Low Power)

Connection (P = Pads, R = Ribbon Cable, C = Cable w/ Connector)

Interface (I = I2C (ADDR. 0X28H, J = I2C (ADDR. 0X36H),
K = I2C (ADDR. 0X46H, S = SPI)

Output (A = 10~90%, B = 5~95%)

Supply Voltage (3 = 3.3Vdc, 5 = 5.0Vdc)

Type (A = Absolute, G = Gage)

Pressure Range

Digital Output

Stainless Steel

Model

NORTH AMERICA

Measurement Specialties
45738 Northport Loop West
Fremont, CA 94538
Tel: 1-800-767-1888
Fax: 1-510-498-1578

EUROPE

Measurement Specialties
(Europe), Ltd.
26 Rue des Dames
78340 Les Clayes-sous-Bois, France
Tel: +33 (0) 130 79 33 00
Fax: +33 (0) 134 81 03 59

ASIA

48
C 1002
86 010 8477 5646
86 010 5894 9029
sales@sensorway.cn

http://www.sensorway.cn