

## 89BSD Digital Output



- Stainless Steel with O-Ring Seal
- Pressure/Temperature Read-Out
- Digital Output (24-bit  $\Delta\Sigma$  ADC)
- ASIC Calibrated
- Absolute, Sealed Gage
- 9mm Diameter

### DESCRIPTION

The 89BSD is a 9mm diameter small profile, media compatible, piezoresistive silicon pressure sensor packaged in a 316L stainless steel housing. This low power 24-bit  $\Delta\Sigma$  ADC digital output pressure sensor supports an I<sup>2</sup>C interface protocol and is designed for threaded o-ring mounting. A custom ASIC is used for temperature compensation and offset correction. The sensing package utilizes silicone oil to transfer pressure from the 316L stainless steel diaphragm to the sensing element. A flex cable allows the 89BSD to connect to a smaller connection terminal where size is of primary concern.

The 89BSD is designed for high performance, low pressure applications.

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

### FEATURES

- Threaded/Weldable
- I<sup>2</sup>C Interface
- Low Power: <1 $\mu$ A
- Standby Power: <0.15 $\mu$ A
- Supply Voltage: 1.8 to 3.6Vdc

### APPLICATIONS

- Level Controls
- Tank Level Measurement
- Corrosive Fluids and Gas Measurement Systems
- Sealed Systems
- Manifold Pressure Measurement
- Barometric Pressure Measurement
- Dive Computers

### STANDARD RANGES

| Range    | BarA | BarS |
|----------|------|------|
| 0 to 006 | •    | •    |
| 0 to 012 | •    | •    |
| 0 to 018 | •    | •    |
| 0 to 028 | •    | •    |
| 0 to 030 | •    | •    |

Intermediate pressure ranges available, contact factory

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### PERFORMANCE SPECIFICATIONS

Supply Voltage: 3Vdc

Ambient Temperature: 25°C (unless otherwise specified)

| PARAMETERS              | MIN                                                        | TYP              | MAX  | UNITS    | NOTES |
|-------------------------|------------------------------------------------------------|------------------|------|----------|-------|
| ADC                     |                                                            |                  | 24   | bit      |       |
| Input Voltage Range     | 1.8                                                        |                  | 3.6  | V        | 2     |
| Supply Current          |                                                            | See Table 1      |      | mA       |       |
| Pressure Resolution     |                                                            | See Table 3      |      | %Span    | 3     |
| Pressure Accuracy       |                                                            | ±0.3             |      | %Span    |       |
| Total Error Band        |                                                            | See Graph 1      |      | %Span    |       |
| Conversion Time         |                                                            | See Table 2      |      | ms       | 3     |
| Long Term Stability     |                                                            | ±0.2             |      | %Span/yr |       |
| Compensated Temperature | -20                                                        |                  | +85  | °C       |       |
| Temperature Resolution  |                                                            | See Table 3      |      | °C       |       |
| Temperature Accuracy    | -2                                                         |                  | +2   | °C       |       |
| Operating Temperature   | -40                                                        |                  | +85  | °C       |       |
| Storage Temperature     | -40                                                        |                  | +125 | °C       |       |
| Pressure Overload       |                                                            |                  | 2X   | Rated    | 4     |
| Pressure Burst          |                                                            |                  | 3X   | Rated    | 5     |
| Interface Type          |                                                            | I <sup>2</sup> C |      |          | 6     |
| Media, Pressure Port    | Liquids and gases compatible with 316/316L Stainless Steel |                  |      |          |       |

#### Notes

1. Coefficients must be read by microcontroller software and are to be used in a mathematical calculation for converting D1 and D2 into compensated pressure and temperature values. For calculation methods and coefficients, see application note APP-01006.
2. Output is not ratiometric to supply voltage.
3. Oversampling ratio: 256 / 512 / 1024 / 2048 / 4096. See Table 2.
4. 2X or 400psi, whichever is less. The maximum pressure that can be applied without changing the transducer's performance or accuracy.
5. 3X or 600psi, whichever is less. The maximum pressure that can be applied to a transducer without rupture of either the sensing element or transducer.
6. Output protocol is I<sup>2</sup>C only. CSB is tied to GND, setting I<sup>2</sup>C address: 1110111

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**Table 1:** Supply Current Characteristics

| PARAMETERS                              | Symbol   | Conditions        | MIN | TYP  | MAX  | UNITS   |
|-----------------------------------------|----------|-------------------|-----|------|------|---------|
| Supply Current<br>(1 Sample per second) | $I_{DD}$ | OSR 4096          |     | 12.5 |      | $\mu A$ |
|                                         |          | 2048              |     | 6.3  |      |         |
|                                         |          | 1024              |     | 3.2  |      |         |
|                                         |          | 512               |     | 1.7  |      |         |
|                                         |          | 256               |     | 0.9  |      |         |
| Peak Supply Current                     |          | During Conversion |     | 1.4  |      | mA      |
| Standby Supply Current                  |          | @ 25°C            |     | 0.02 | 0.14 | $\mu A$ |

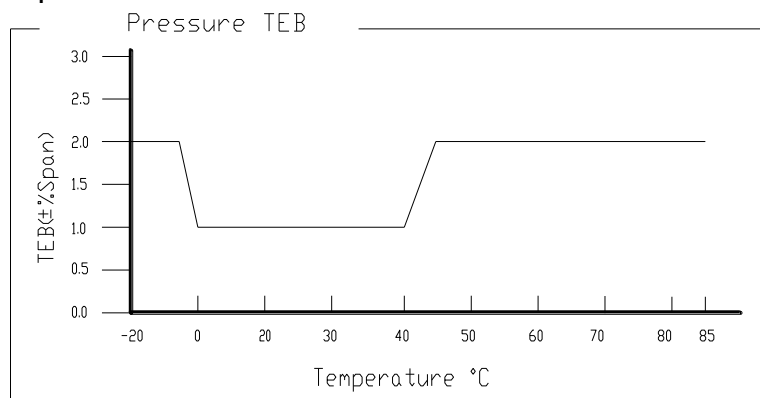
**Table 2:** Analog Digital Converter (ADC)

| PARAMETERS      | Symbol | Conditions | MIN  | TYP  | MAX  | UNITS |
|-----------------|--------|------------|------|------|------|-------|
| Conversion Time | $t_c$  | OSR 4096   | 7.40 | 8.22 | 9.04 | ms    |
|                 |        | 2048       | 3.72 | 4.13 | 4.54 |       |
|                 |        | 1024       | 1.88 | 2.08 | 2.28 |       |
|                 |        | 512        | 0.95 | 1.06 | 1.17 |       |
|                 |        | 256        | 0.48 | 0.54 | 0.60 |       |

**Table 3:** Typical Resolution

| OSR  | Typical Pressure Resolution<br>(%Span) | Typical Temperature Resolution<br>(°C) |
|------|----------------------------------------|----------------------------------------|
| 4096 | 0.0015                                 | 0.002                                  |
| 2048 | 0.0025                                 | 0.003                                  |
| 1024 | 0.003                                  | 0.005                                  |
| 512  | 0.005                                  | 0.008                                  |
| 256  | 0.008                                  | 0.012                                  |

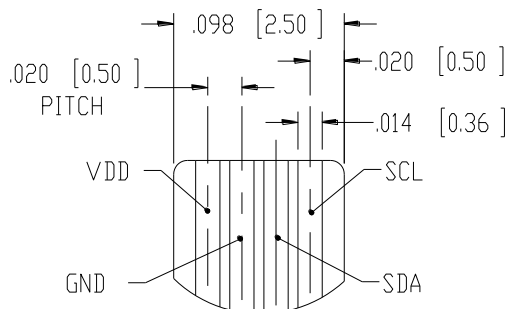
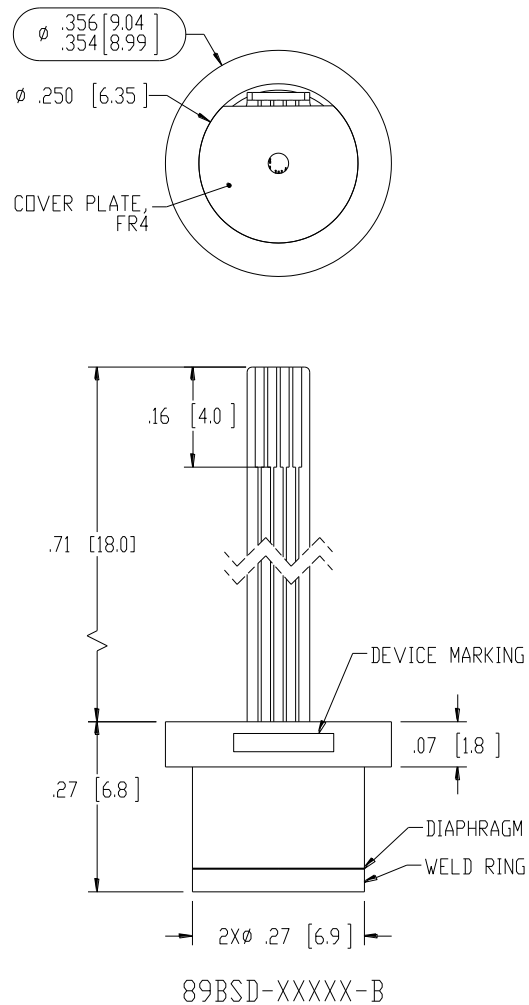
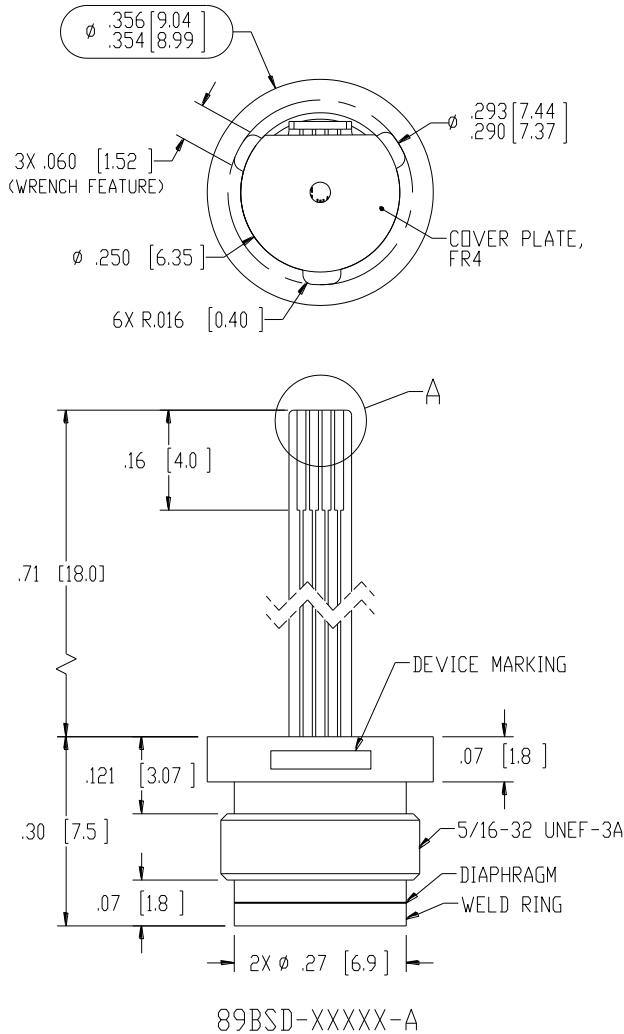
**Graph 1:**



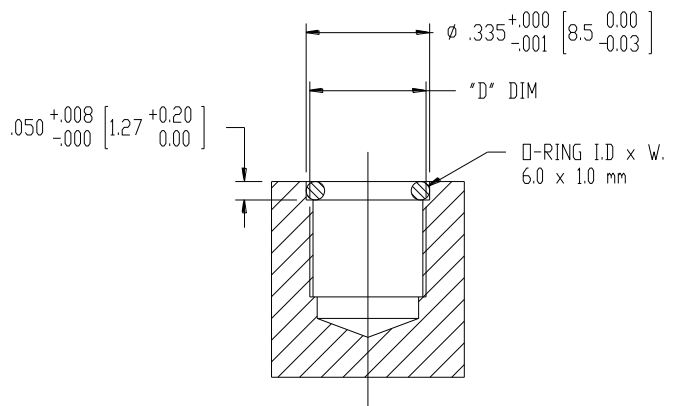
# 89BSD Digital Output

## PERFORMANCE SPECIFICATIONS

DIMENSIONS ARE IN INCHES [MM]

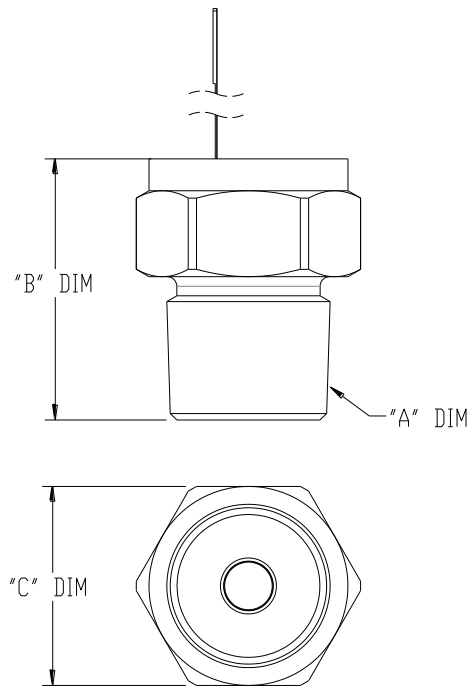


DETAIL A  
SCALE 8 : 1  
RECOMMEND MOLEX CONNECTOR 52746-0471  
(OR EQUIVALENT) TO MATE WITH FPC CABLE



O-RING SEAL MOUNTING  
RECOMMENDATIONS  
FOR FITTING TYPES A & B

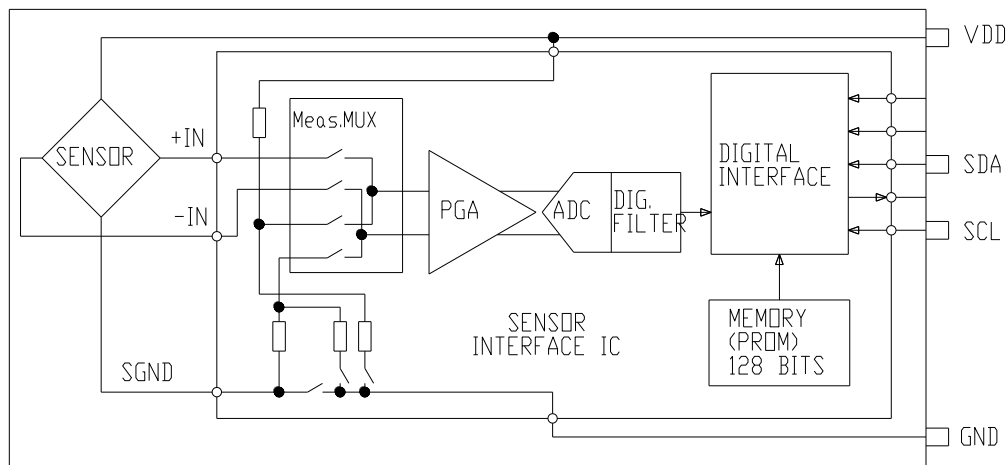
## 89BSD Digital Output



89BSD-XXXX-4, -5, -8

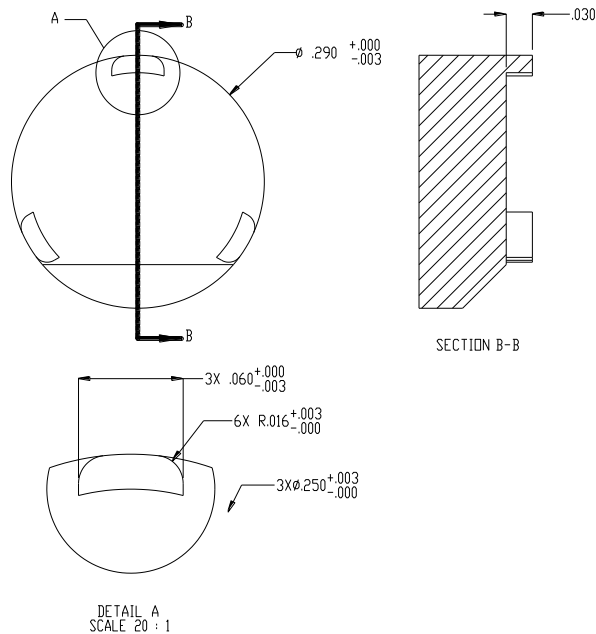
| TABLE 4                                                                             |                                               |            |                |                     |
|-------------------------------------------------------------------------------------|-----------------------------------------------|------------|----------------|---------------------|
| FITTING TYPE                                                                        | "A" DIM                                       | "B" DIM    | "C" DIM        | "D" DIM             |
| 4                                                                                   | 1/4-18 NPT                                    | .82 [20.8] | 5/8 [15.9] HEX | N/A                 |
| 5                                                                                   | 1/4-19 BSP                                    | .82 [20.8] | 3/4 [19.0] HEX |                     |
| 8                                                                                   | 1/8-27 NPT                                    | .71 [18.0] | 5/8 [15.9] HEX |                     |
| A                                                                                   | NO FITTING, THREADED CAPSULE, 5/16-32 UNEF-3A |            |                | 5/16-32 UNEF-3B .25 |
| B                                                                                   | NO FITTING, NO THREAD CAPSULE                 |            |                | ø .28 .25           |
| NOTE : FITTING TYPE '-4' ASSEMBLY SHOWN FAR LEFT<br>ALL DIMS ARE FOR REFERENCE ONLY |                                               |            |                |                     |

## BLOCK DIAGRAM



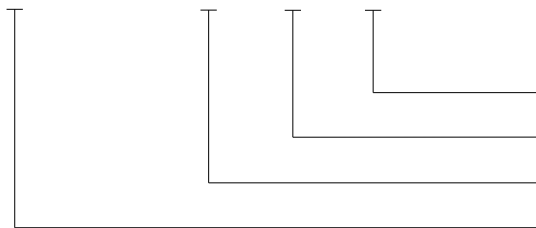
## 89BSD Digital Output

### RECOMMENDED WRENCH DIMENSIONS



### ORDERING INFORMATION

89BSD - 012BA - A



Fitting Type (See Table 4)

Type (A = Absolute, S = Sealed Gage)

Pressure Range

Model

#### NORTH AMERICA

Measurement Specialties  
45738 Northport Loop West  
Fremont, CA 94538  
Tel: 1-800-767-1888  
Fax: 1-510-498-1578  
Sales: [pfg.cs.amer@meas-spec.com](mailto:pfg.cs.amer@meas-spec.com)

#### 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  
Sales: [pfg.cs.emea@meas-spec.com](mailto:pfg.cs.emea@meas-spec.com)

#### ASIA

Measurement Specialties  
(China), Ltd.  
No. 26 Langshan Road  
Shenzhen High-Tech Park (North)  
Nanshan District, Shenzhen 518057  
China  
Tel: +86 755 3330 5088  
Fax: +86 755 3330 5099  
Sales: [pfg.cs.asia@meas-spec.com](mailto:pfg.cs.asia@meas-spec.com)

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