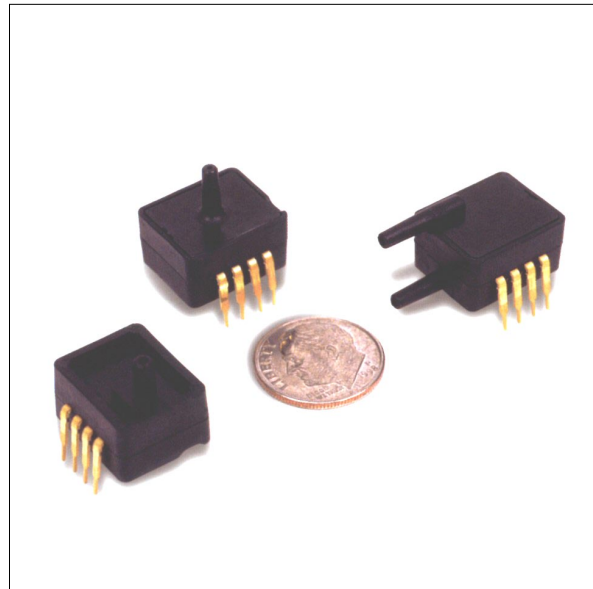


# DSDX Series *A-grade* Digital pressure transducers

## FEATURES

- 0...1 to 0...100 psi,  
0...±1 to 0...±15 psi
- Absolute, gage or differential pressure
- Digital readout via I<sup>2</sup>C-bus
- Precision ASIC conditioning
- Temperature compensated
- Non-ratiometric output
- Total accuracy ±0.5 to ±1.0 %FSS



## SPECIFICATIONS

### Maximum ratings

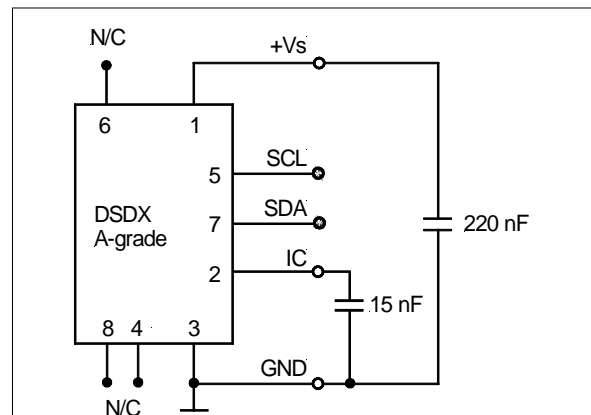
Supply voltage $V_s$	4.75 V to 5.25 $V_{DC}$ max. 6.50 $V_{DC}$
Lead temperature (2 - 4 sec.)	250°C
Temperature ranges	
Compensated	0 to +85°C
Operating	-20 to +105°C
Storage	-40 to +125°C
Vibration	10 g at 20 - 2000 Hz
Shock	100 g for 11 ms

**Caution!** The sensor is not reverse polarity protected.

Incorrect applications of excitation voltage or ground to the wrong pin can cause electrical failure.

Application of supply voltage above the maximum can cause electrical failure.

## ELECTRICAL CONNECTION



**Note:** A capacitor of 220 nF is required between +Vs and GND.

Pin 2 is an internal device connection and should be connected to ground with a 15 nF capacitor.

It is important to place the capacitors as close to the pins as possible!

Pins 4, 6 and 8 are internal device connections and should not be connected for any reason!

# DSDX Series *A-grade* Digital pressure transducers

## PRESSURE RANGES SPECIFICATIONS

( $V_S = 5.0 V_{DC}$ ,  $T_A = 25^\circ C$ )

Part number	Pressure range		Burst pressure <sup>1</sup>		Sensitivity (typ.)	
DSDX015A2R-A	0 to 15	psi(a)	30	psi(a)	218	counts/ psi
DSDX030A2R-A	0 to 30		60		109	
DSDX100A2R-A	0 to 100		150		33	
DSDX001G2R-A / D4R-A	0 to 1	psi(g,d)	5	psi(g,d)	3277	
DSDX005G2R-A / D4R-A	0 to 5		20		655	
DSDX015G2R-A / D4R-A	0 to 15		30		218	
DSDX030G2R-A / D4R-A	0 to 30		60		109	
DSDX100G2R-A / D4R-A	0 to 100		150		33	
DSDX001D4D-A	0 to $\pm 1$		5		1638	
DSDX005D4D-A	0 to $\pm 5$		20		328	
DSDX015D4D-A	0 to $\pm 15$		30		109	

### Specification notes:

1. If maximum burst pressure is exceeded, even momentarily, the package may leak or burst, or the pressure sensing die may fracture.
2. Span is the algebraic difference between the output signal for the highest and lowest specified pressure.
3. Total accuracy is the combined error from offset and span calibration, linearity, pressure hysteresis, and temperature effects. Linearity is the measured deviation based on a straight line. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure. Calibration errors include the deviation of offset and full scale from nominal values.
4. Delay time between sampling and signal change at the output.
5. The smallest change in the output voltage, given any change in pressure.

# DSDX Series *A-grade* Digital pressure transducers

## PERFORMANCE CHARACTERISTICS

The output signal is not ratiometric to the supply voltage ( $V_S = 5.0 V_{DC}$ ,  $T_A = 25^\circ C$ )

### All DSDX...R-A

Characteristics		Min.	Typ.	Max.	Units
Zero pressure offset	DSDX001...	378	410	442	counts
	all others	394	410	426	
Full scale span (FSS) <sup>2</sup>			3276		
Full scale output	DSDX001...	3654	3686	3718	
	all others	3670	3686	3702	
Total accuracy (0 to 85°C) <sup>3</sup>	DSDX001...			±1.0	
	all others			±0.5	
Sample rate		100			Hz
Response delay <sup>4</sup>		2.73		14.11	ms
Startup time (power up to 1st result)				40	
Quantization step <sup>5</sup>			2		counts
Current consumption			6		mA

### All DSDX...D-A

Characteristics		Min.	Typ.	Max.	Units	
Zero pressure offset	DSDX001...	2016	2048	2080	counts	
	all others	2032	2048	2064		
Full scale span (FSS) <sup>2</sup>			3276			
Output	at max. specified pressure	DSDX001...	3654	3686		3718
		all others	3670	3686		3702
	at min. specified pressure	DSDX001...	378	410		442
		all others	394	410	426	
Total accuracy (0 to 85°C) <sup>3</sup>	DSDX001...			±1.0	%FSS	
	all others			±0.5		
Sample rate		100			Hz	
Response delay <sup>4</sup>		2.73		14.11	ms	
Startup time (power up to 1st result)				40		
Quantization step <sup>5</sup>			2		counts	
Current consumption			6		mA	

# DSDX Series *A-grade* Digital pressure transducers

## INTRODUCTION

The DSDX is capable to generate a digital output signal. It runs a cyclic program, which will store a corrected 12-bit sensor value about every 10 ms within the output registers of the internal ASIC. In order to use the pressure transducer for digital signal readout, the device should be connected to a bidirectional I<sup>2</sup>C-bus.

According to the I<sup>2</sup>C-bus communication specification, the bus is controlled by a master device, which generates the clock signal, controls the bus access and generates START and STOP conditions. The DSDX is designed to work as a slave, hence it will only respond to requests from a master device.

The I<sup>2</sup>C-bus master-slave concept requires a unique address for each device. The DSDX has a hard coded slave address (111100xb), therefore it is **not** possible to access more than one DSDX on the same I<sup>2</sup>C-bus line.

## DIGITAL I<sup>2</sup>C INTERFACE

The DSDX complies with the following protocol (FIGURE I):

**Bus not busy:** During idle periods both data line (SDA) and clock line (SCL) remain HIGH.

**START condition (S):** HIGH to LOW transition of SDA line while clock (SCL) is HIGH is interpreted as START condition. START conditions are always generated by the master. Each request for the current pressure value must be initiated with a START.

**STOP condition (P):** LOW to HIGH transition of SDA line while clock (SCL) is HIGH determines STOP condition. STOP conditions are always generated by the master. More than one request for the current pressure value can be transmitted without generation of intermediate STOP condition.

**DATA valid (D):** State of data line represents valid data when, after START condition, data line is stable for duration of HIGH period of clock signal. Data on line must be changed during LOW period of clock signal. There is one clock pulse per bit of data.

**Acknowledge (A):** Data is transferred in pieces of 8 bits (1 byte) on serial bus, MSB first. After each byte receiving device – whether master or slave – is obliged to pull data line LOW as acknowledge for reception of data. Master must generate an extra clock pulse for this purpose. When acknowledge is missed, slave transmitter becomes inactive. It is on master either to send last command again or to generate STOP condition in that case.

**Slave address:** Each device connected to the bus has a unique slave address. After generating a START condition, the master has to transmit the slave address for the DSDX with a READ command: \$F1. The DSDX must not be accessed with a WRITE command (\$F0) as the correct function of the device can not be guaranteed in this case (note: a power-down power-up change will force the sensor to use factory data again).

**DATA operation:** The DSDX starts to send 2 data bytes containing the current pressure value placed in the output registers.

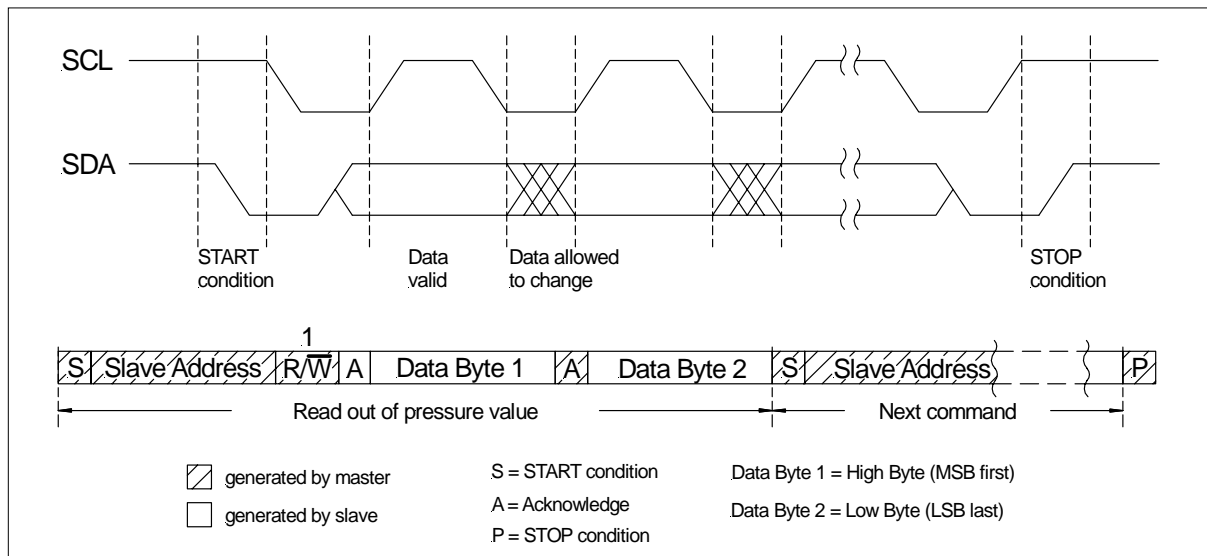


FIGURE I: I<sup>2</sup>C-BUS Protocol of DSDX

# DSDX Series *A-grade* Digital pressure transducers

## I<sup>2</sup>C INTERFACE PARAMETERS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input high level			90		100	% of Vs
Input low level			0		10	
Output low level		(open drain, IOL = -4 mA)			10	
Pull up current		(pins SCL and SDA)	5		20	μA
Load capacitance SDA					400	pF
SCL clock frequency	$F_{SCL}$		---		100	kHz
Bus free time between STOP and START condition	$t_{BUF}$		4.7			μs
Hold time (repeated) START condition	$t_{HD,STA}$	to first clock pulse	4.0			μs
LOW period of SCL	$t_{LOW}$		4.7			μs
HIGH period of SCL	$t_{HIGH}$		4.0			μs
Setup time repeated START condition	$t_{SU,STA}$		4.7			μs
Data hold time	$t_{HD,DAT}$		0			ns
Data setup time	$t_{SU,DAT}$		250			ns
Rise time of both SDA and SCL	$t_R$		---		300	ns
Fall time of both SDA and SCL	$t_F$		---		300	ns
Setup time for STOP condition	$t_{SU,STO}$		4			μs
Input filter spike suppression	$t_{SP}$	spikes on SDA or SCL of that length are suppressed			50	ns

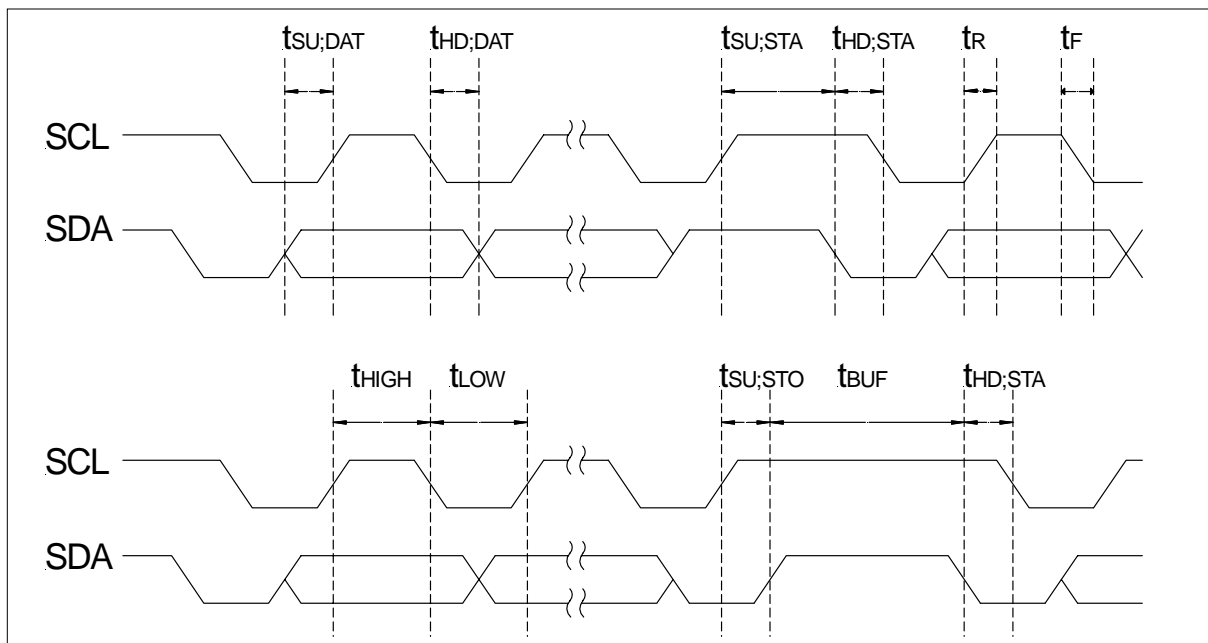
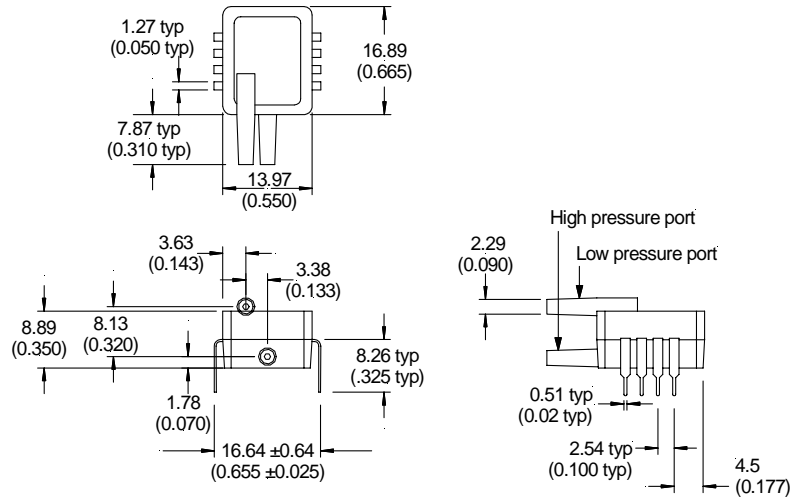


FIGURE II: Timing characteristics of the I<sup>2</sup>C interface

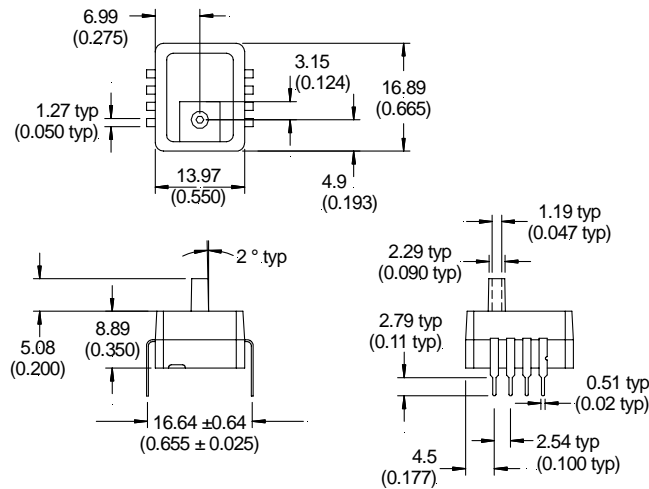
# DSDX Series *A-grade* Digital pressure transducers

## PHYSICAL DIMENSIONS

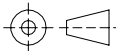
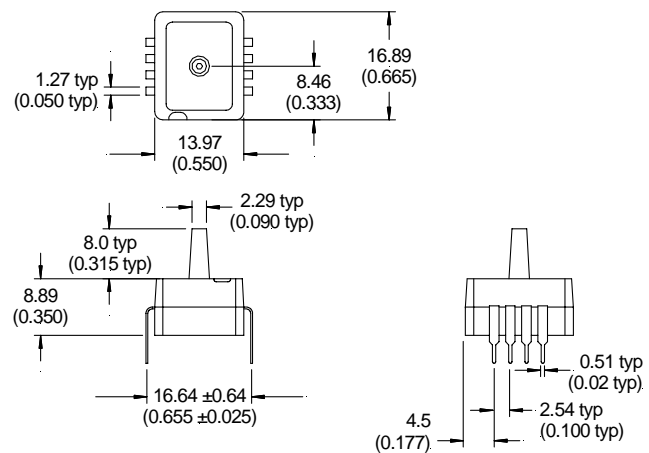
### D4 package



### G2 package



### A2 package

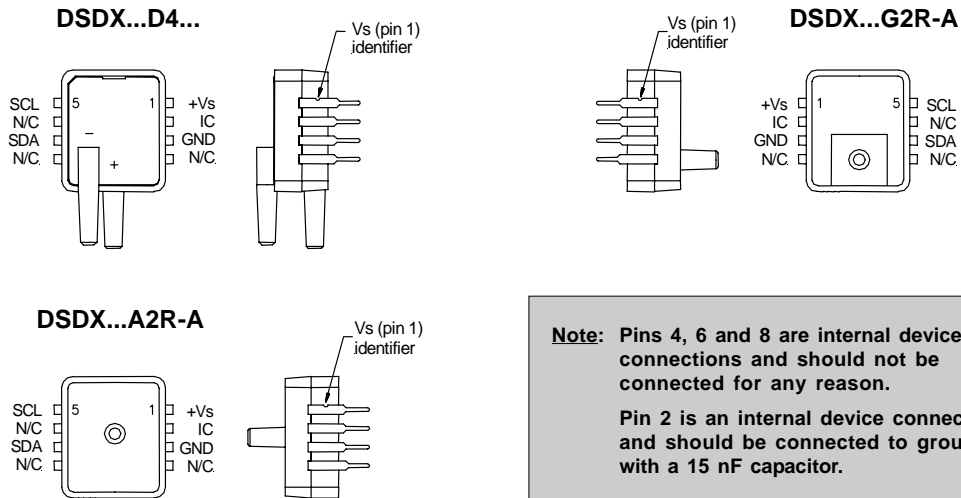


third angle projection

dimensions in mm (inches)

# DSDX Series *A-grade* Digital pressure transducers

## ELECTRICAL CONNECTIONS



## ORDERING INFORMATION

Pressure range	Absolute	Gage	Differential/Gage	
0 to 1 psi		DSDX001G2R-A	DSDX001D4R-A	
0 to 5 psi		DSDX005G2R-A	DSDX005D4R-A	
0 to 15 psi		DSDX015A2R-A	DSDX015G2R-A	DSDX015D4R-A
0 to 30 psi		DSDX030A2R-A	DSDX030G2R-A	DSDX030D4R-A
0 to 100 psi		DSDX100A2R-A	DSDX100G2R-A	DSDX100D4R-A
0 to ±1 psi			DSDX001D4D-A	
0 to ±5 psi			DSDX005D4D-A	
0 to ±15 psi			DSDX015D4D-A	

Other pressure ranges or calibrations are available on request

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