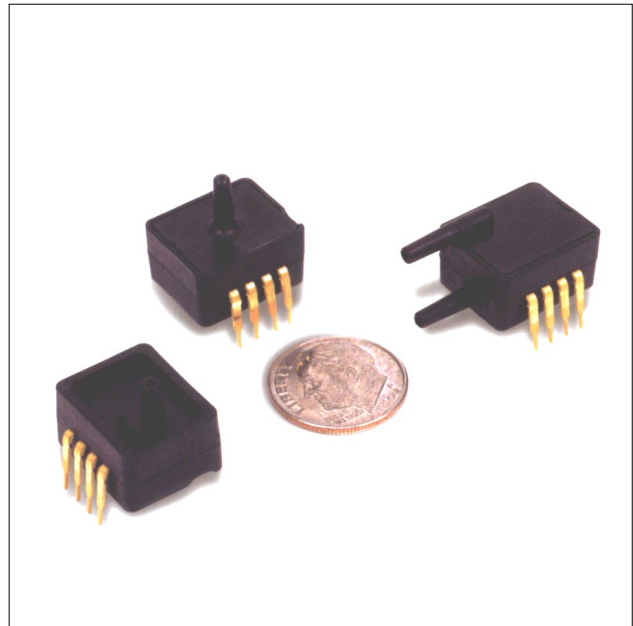


DSDX Series *A-grade*

Digital pressure transducers

FEATURES

- 0...1 to 0...100 psi,
0...±1 to 0...±15 psi
- Absolute, gage or differential pressure
- Digital readout via I²C-bus
- Precision ASIC conditioning
- Temperature compensated
- Non-ratiometric output
- Total accuracy ±0.5 to ±1.0 %FSS



SPECIFICATIONS

Maximum ratings

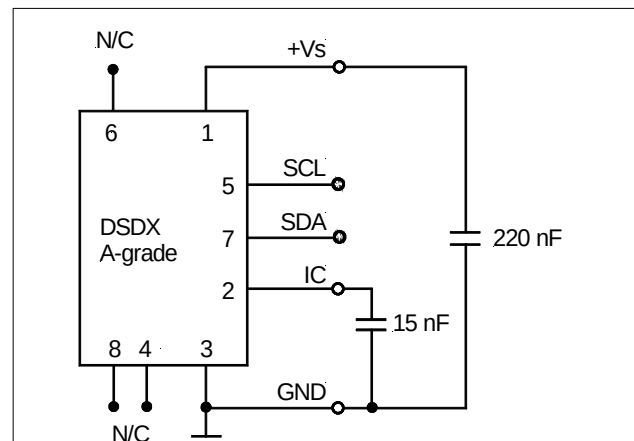
Supply voltage V_s	4.75 V to 5.25 V _{DC} max. 6.50 V _{DC}
Lead temperature (2 - 4 sec.)	250°C
Temperature ranges	
Compensated	0 to +85°C
Operating	-20 to +105°C
Storage	-40 to +125°C
Vibration	10 g at 20 - 2000 Hz
Shock	100 g for 11 ms

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 ¹	Sensitivity (typ.)
DSDX015A2R-A	0 to 15	30	218
DSDX030A2R-A	0 to 30	60	109
DSDX100A2R-A	0 to 100	150	33
DSDX001G2R-A / D4R-A	0 to 1	5	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 ± 1	5	1638
DSDX005D4D-A	0 to ± 5	20	328
DSDX015D4D-A	0 to ± 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) ²			3276		
Full scale output	DSDX001...	3654	3686	3718	
	all others	3670	3686	3702	
Total accuracy (0 to 85°C) ³	DSDX001...			±1.0	%FSS
	all others			±0.5	
Sample rate		100			Hz
Response delay ⁴		2.73		14.11	ms
Startup time (power up to 1st result)				40	
Quantization step ⁵			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) ²				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) ³		DSDX001...			±1.0	%FSS
		all others			±0.5	
Sample rate			100			Hz
Response delay ⁴			2.73		14.11	ms
Startup time (power up to 1st result)					40	
Quantization step ⁵				2		counts
Current consumption				6		mA

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 I²C-bus.

According to the I²C-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 I²C-bus master-slave concept requires a unique address for each device. The DSDX has a hard coded slave address (1111000xb), therefore it is **not** possible to access more than one DSDX on the same I²C-bus line.

DIGITAL I²C 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.

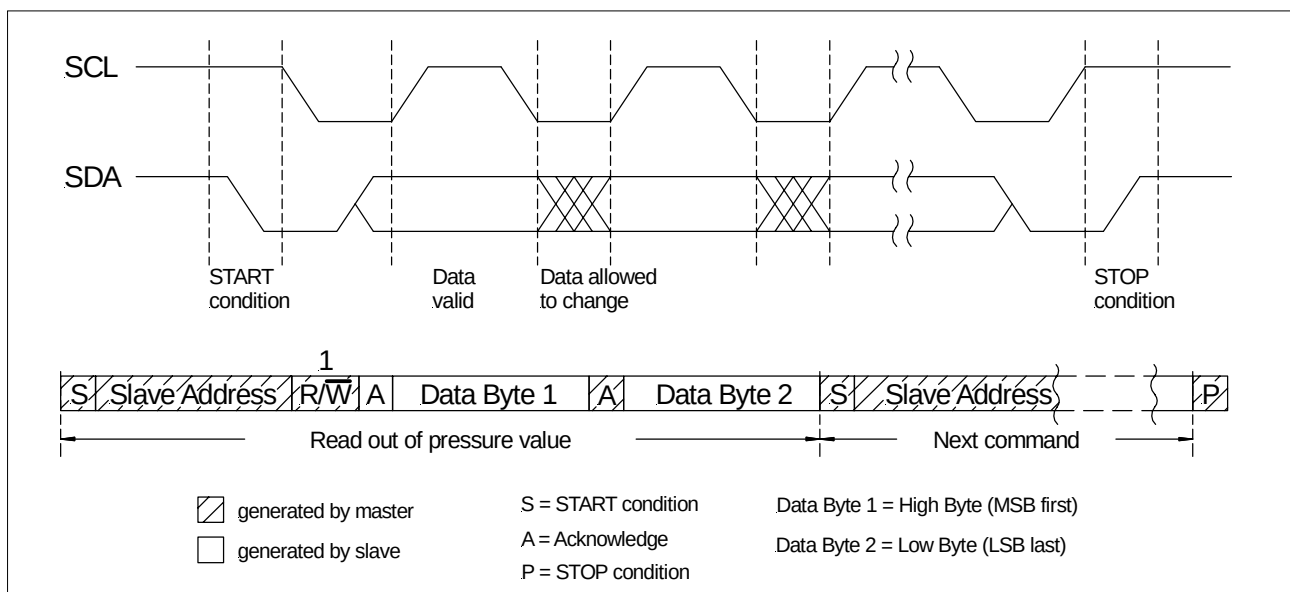


FIGURE I: I²C-BUS Protocol of DSDX

I²C 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

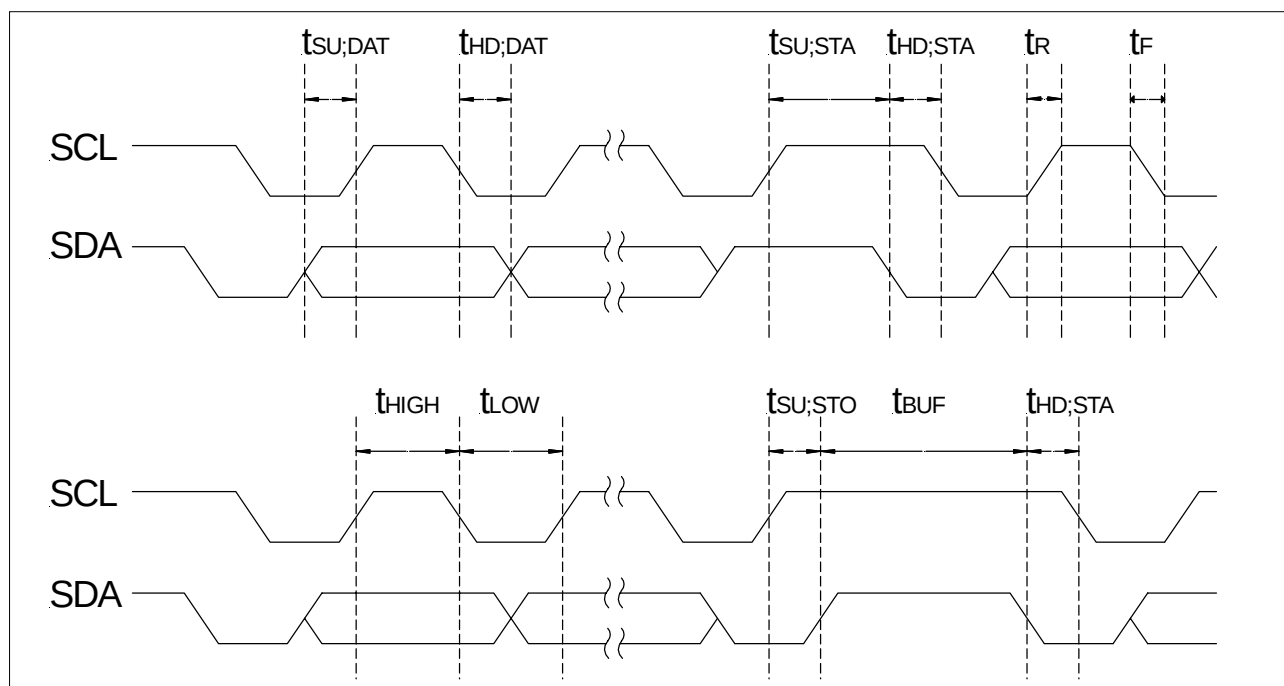
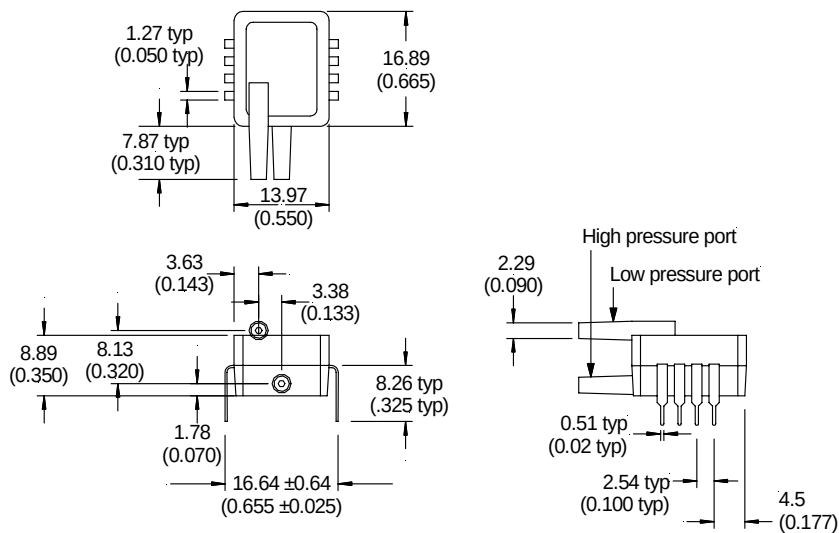


FIGURE II: Timing characteristics of the I²C interface

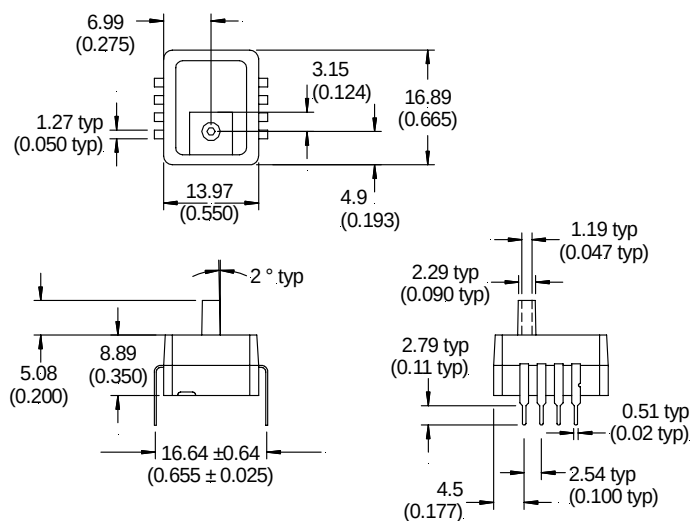
DSDX Series *A-grade* Digital pressure transducers

PHYSICAL DIMENSIONS

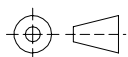
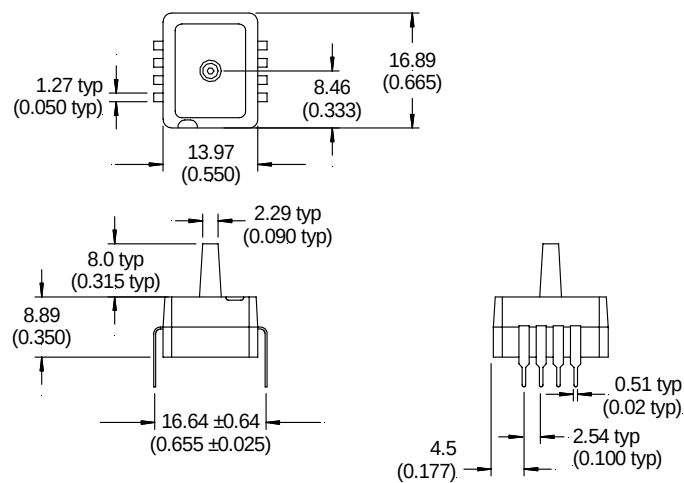
D4 package



G2 package



A2 package



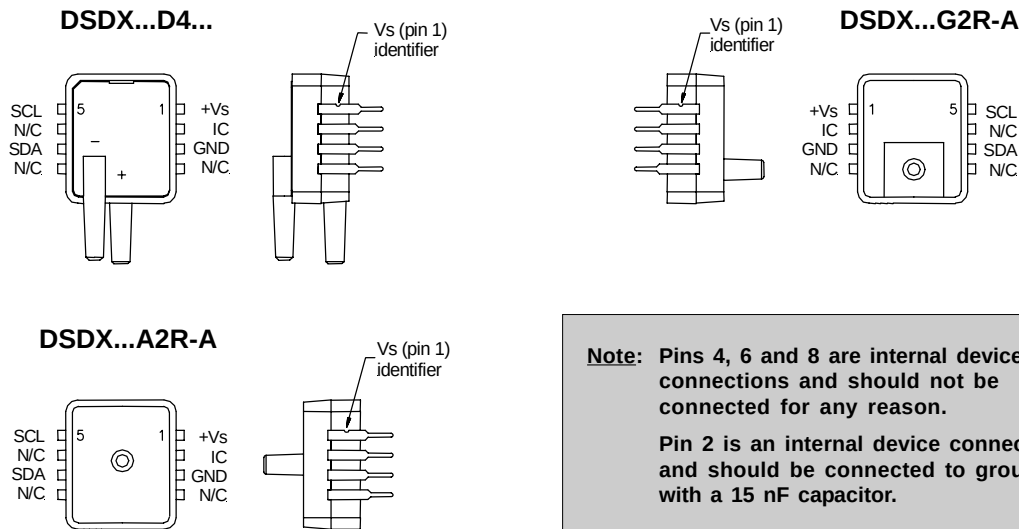
third angle projection

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	DSDX015A2R-A DSDX030A2R-A DSDX100A2R-A	DSDX001G2R-A	DSDX001D4R-A
0 to 5 psi		DSDX005G2R-A	DSDX005D4R-A
0 to 15 psi		DSDX015G2R-A	DSDX015D4R-A
0 to 30 psi		DSDX030G2R-A	DSDX030D4R-A
0 to 100 psi		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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