Features

- High resolution module, 1 Pa
- Supply voltage: 1.8V to 5.5V
- Operating range:10 to 1300 mbar,-40 to +85℃
- Integrated digital pressure sensor (24 bit ADC)
- Excellent long term stability
- Standby current<0.1μA @ 25°C
- No external components (Internal oscillator)
- High-speed I²C digital output interface
- Size: 6.8 x 6.4 x 3.2 mm

Applications

- Liquefied Petroleum Gas(LPG)Pressure Measurement
- Compressed Nature Gas(CNG)Pressure Measurement
- Water Proof Pressure Measurement
- Adventure and Sports Equipment

Descriptions

The DA17-01BA-00 employs a MEMS pressure sensor with an I²C interface to provide accurate temperature, pressure data. The sensor pressure and temperature outputs are digitized by a high resolution 24-bit ADC. Data compensation is integrated internally to save the effort of the external host MCU system. Easy command-based data acquisition interface and programmable interrupt control is available. Pressure output can be resolved with output in fractions of a Pascal. Package is surface mount with a stainless steel cap and is RoHS compliant

Sensor Performances (VDD = 3.0 V)				
Pressure	Min	Typ	Max	Unit
Range	10		1300	mbar
ADC		24		bit
Resolution		1		Pa
Accuracy@25°C(500 to 1100 mbar)	-1.5		+1.5	mbar
Accuracy@-25°C to 60°C(500 to 1100 mbar)	-2.0		+2.0	mbar
Response time@ OSR=1024		2.5		ms
Long term stability		-1		mbar/yr

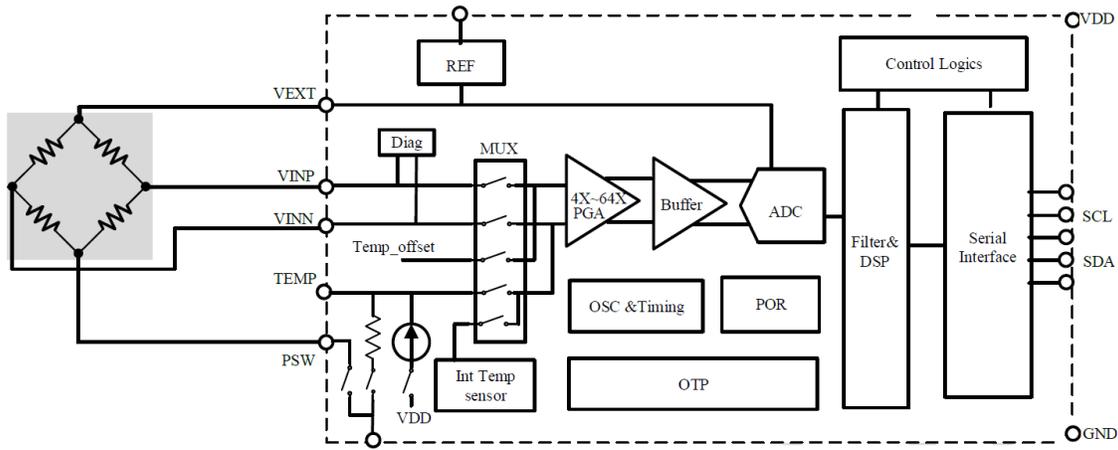**DT**Sensing

1. Block Diagram

Figure 1: Functional Block Diagram

2. ElectricalSpecifications

2.1 PressureandTemperatureCharacteristics

Table1: Pressure Output Characteristics @ VDD = 3.0V, T = 25°C unless otherwise noted

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Pressure Range	P_{FS}	Full Accuracy	300		1100	mbar
Extended Pressure Range	P_{ext}	Linear Range of ADC	10		1300	mbar
Absolute Accuracy		@25°C, 500 to 1100 mbar @ -25..60°C,500..1100 mbar	-1.5 -2	1 1.5	+1.5 +2	mbar
Absolute Accuracy, autozero at one pressure point		at 25°C, 500..1100 mbar at -25..60°C, 500..1100 mbar	-0.5 -1.5		+0.5 +1.5	mbar
Resolution RMS				0.01		mbar
Long Term Drift		After a period of 1 year	-1		1	mbar/yr

Table2: Temperature Output Characteristics @ VDD = 3.0V, T = 25°C unless otherwise noted

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operation Temperature Range	T_{OP}		-40	25	85	℃
Temperature Absolute Accuracy		25℃	-0.8	0.5	+0.8	℃
Temperature Absolute Accuracy		-25℃ to +60℃	-2	1	+2	℃
		-40℃ to + 85℃	-2.5	1	+2.5	℃
Temperature Resolution of Output Data				0.01		℃

2.2 Electrical Characteristics

Table3: DC Characteristics @VDD=3.0 V, T=25℃ unless otherwise noted

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operation Supply Voltage	V_{DD}		1.8	3.0	5.5	V
Operation Temperature	T_{OP}		-40		85	℃
Supply Current@25°C on during conversion	I_{BDD}_pgaoff	PGA off(Gain<=2)		0.9		mA
	I_{BDD}_pgaon	PGA on (Gain>=4)		1.5		mA
Conversion time	T_c	OSR 4096 2048 1024(1) 512 256		6.34 3.78 2.5 1.86 1.54		ms
Supply current (1 sample per sec.)	Idd	OSR 4096 2048 1024(1) 512 256		5.75 3.45 2.3 1.8 1.4		uA
Standby Supply Current	I_{DDSTB}	At 25℃			0.1	μA
Serial Data Clock Frequency	f_{SCLK}	I^2C protocol, pull-up resistor of 4k7~10k		100	400	kHz
Digital Input High Voltage	V_{IH}		0.8			V
Digital Input Low Voltage	V_{IL}				0.2	V
Digital Output High Voltage	V_{OH}	IO = 0.5 mA	0.9			V
Digital Output Low Voltage	V_{OL}	IO = 0.5 mA			0.1	V
Input Capacitance	C_{IN}			4.7		pF

(1) Standard Product. Could be customized.

2.3 Absolute Maximum Rating

Table 4: Absolute Maximum Rating

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Overpressure	P_{MA}				5	bar
Supply Voltage	V_{DD}		-0.3		5.5	V
Interface Voltage	V_{IF}		-0.3		VDD+0.3	V
Storage Temperature Range	T_{STG}		-40		125	℃
Maximum Soldering Temperature	T_{MS}	40 second maximum			250	℃
ESD Rating		Human body model	-2		+2	kV
Latch-up Current		At 85℃	-100		100	mA

Stresses above those listed as "absolute maximum ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

3. Function Descriptions

3.1 General Description

The DA17-01BA-00 is a highly integrated 24-bit sensor conditioner for applications of high precision low frequency measurement such as pressure transducer, weight scale. It can provide fully calibration for the sensor inherent temperature drift and non-linearity with multiple temperature sensing methods supported. The chip incorporates an in-amp, a buffer and a 24-bit sigma delta modulator followed by a calibration DSP. With wide gain and OSR range, the sensor could be suitable for variance sensors. One-time-programmable fuses are used to store the calibration coefficients for on-chip calibration calculations. IIC interfaces are supported for serial communication. The fully-compensated values can be read out via the I²C interface by external MCU.

3.2 Factory Calibration

Every sensor is individually factory calibrated for sensitivity and offset for both of the temperature and pressure measurements, further calibrations are not necessary to be done by the user. The OTP registers are used to store the configurations and calibration coefficients for the sensor.

3.3 Sensor Output Conversion

For each pressure measurement, customer used to send a conversion command to the sensor, read back the conversion data from the normal register to be stored from 0x06 to 0x0a, the pressure data is stored from 0x06 to 0x08, the highest bit is sign bit, the low 6bits are decimal part, unit: Pa, the temperature data is stored from 0x09 to 0x0a, the highest bit is sign bit, the low 8bits are decimal part, unit: °C. All the data are sent starting from the MSB.

4. High-Speed I²C Digital Output Interface

The I²C interface is fully compatible to the official I²C protocol specification.

4.1 I²C Specification

Table5: I²C Slave Timing Values

| Parameter	Symbol	Conditions	I²C			Unit
			Min	Typ	Max	
Clock frequency	f_{BsclB}				400	kHz
SCL low pulse	t_{BLOWB}		1.3			µs
SCL high pulse	t_{BHIGHB}		0.6			µs
SDA setup time	$t_{BSUDATB}$		0.1			µs
SDA hold time	$t_{BHDDATB}$		0.0			µs
Setup Time for a repeated start condition	$t_{BSUSTAB}$		0.6			µs
Hold time for a start condition	$t_{BHDSTAB}$		0.6			µs
Setup Time for a stop condition	$t_{BSUSTOB}$		0.6			µs
Time before a new transmission can start	t_{BBUFB}		1.3			µs
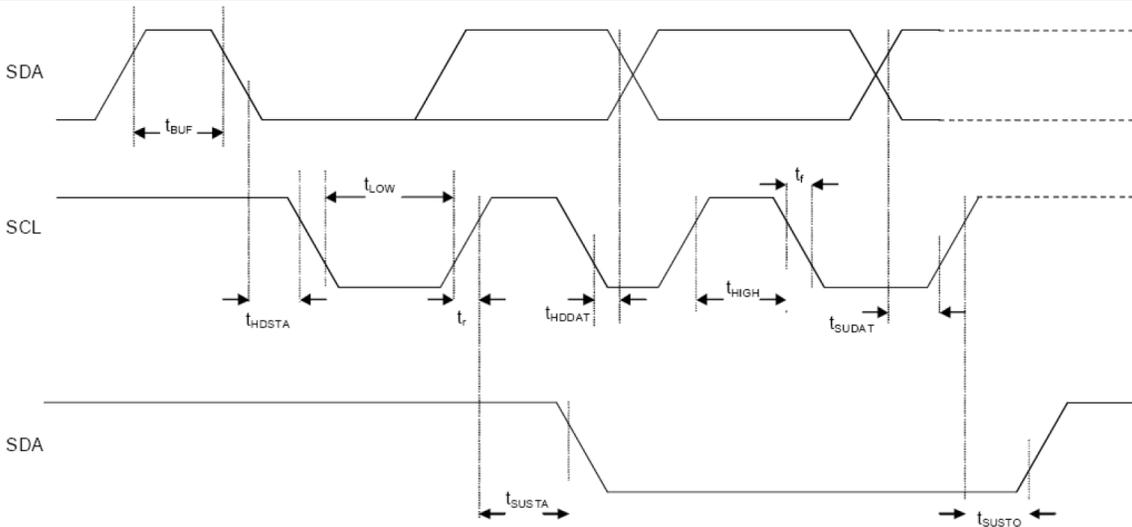
Figure 2: I²C Timing Diagram

The I²C interface protocol has special bus signal conditions. Start (S), stop (P) and binary data conditions are shown below. At start condition, SCL is high and SDA has a falling edge. Then the slave address is sent. After the 7 address bits, the direction control bit R/W selects the read or write operation. When a slave device recognizes that it is being addressed, it should acknowledge by pulling SDA low in the ninth SCL (ACK) cycle.

At stop condition, SCL is also high, but SDA has a rising edge. Data must be held stable at SDA when SCL is high. Data can change value at SDA only when SCL is low.
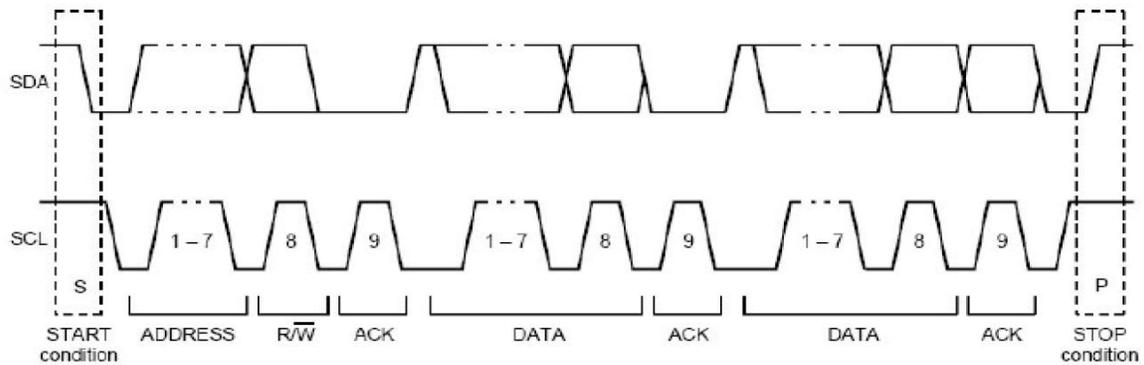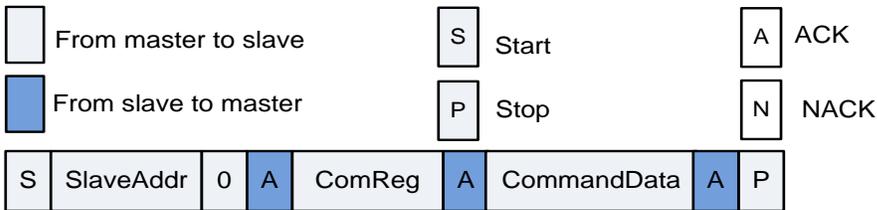
Figure 3: I²C Protocol

4.2 I²C Device Address

The I²C device address is shown below. The LSB of the device address is corresponding to address 0XDA (write) and 0XDB (read).

A7	A6	A5	A4	A3	A2	A1	W/R
1	1	0	1	1	0	SDO/ADDR	0/1

4.3 I²CProtocol

4.3.1 Send Command

ComReg=0x30
CommandData:

Address	Description	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x30	CMD	RW	Sleep_time<3:0>				Sco	Measurement_ctrl<2:0>		

Sleep_time<3:0>:0000:0ms, 0001:62.5ms,0010:125ms... 1111: 1s, only active during sleep mode conversion. **Measurement_control<1:0>:** 000b, indicate a single shot temperature signal conversion. 001b, indicate a single shot sensor signalconversion.010b: indicate a combined conversion (once temperature conversion immediately followed by once sensor signal conversion).011b: indicate a sleep mode conversion (periodically perform once combined conversion with an interval time of 'sleep_time').

Sco: 1, Start of conversion, automatically come back to 0 after conversion ends (except sleep mode conversion).
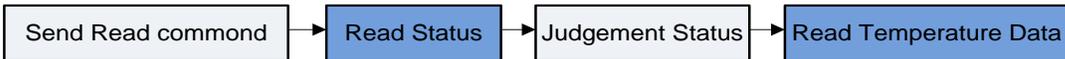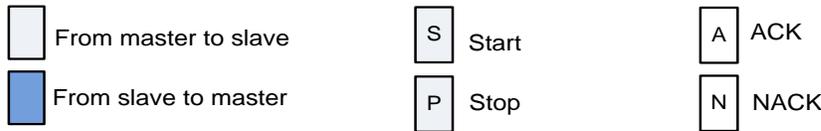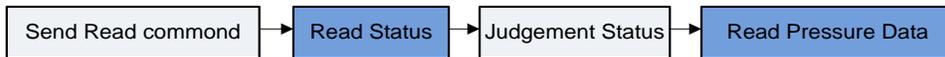
4.3.2 Read Status

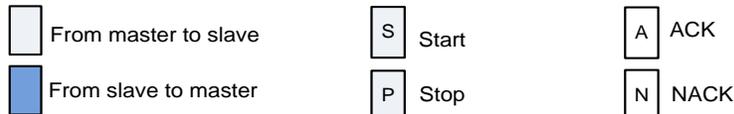| | From master to slave | | S | Start | | A | ACK |
| | From slave to master | | P | Stop | | N | NACK |

| S | SlaveAddr | 0 | A | StatusReg | A | S | SlaveAddr | 1 | A | Status | A | P |
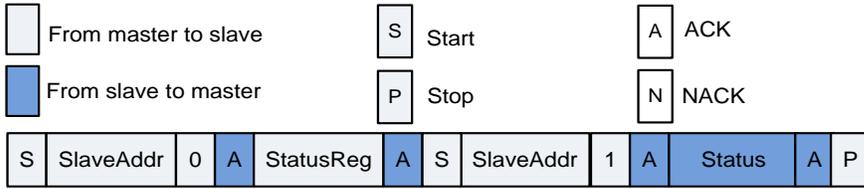
StatusReg=0x02

Status:

Address	Description	R/W	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x02	Status	R	Error_code<3:0>				1'b0			DRDY

DRDY：1, indicates once conversion complete, and the output data is ready for reading.

4.3.3 Read the Temperature Values

| | From master to slave | | S | Start | | A | ACK |
| | From slave to master | | P | Stop | | N | NACK |

| S | SlaveAddr | 0 | A | ComReg | A | Read_Temp | A | P |

| S | SlaveAddr | 0 | A | StatusReg | A | S | SlaveAddr | 1 | A | Status | A | P |

| S | SlaveAddr | 0 | A | TempReg 0x09 | A | S | SlaveAddr | 1 | A | Temp_Msb | A | Temp_Lsb | A | P |

| Send Read commond | → | Read Status | → | Judgement Status | → | Read Temperature Data |

4.3.4 Read the Pressure Values

| | From master to slave | | S | Start | | A | ACK |
| | From slave to master | | P | Stop | | N | NACK |

| S | SlaveAddr | 0 | A | ComReg | A | Read_Press | A | P |

| S | SlaveAddr | 0 | A | StatusReg | A | S | SlaveAddr | 1 | A | Status | A | P |

| S | SlaveAddr | 0 | A | PressReg 0x06 | A | S | SlaveAddr | 1 | A | PressData [23:16] | A | PressData [15:8] | A | PressData [7:0] | A | P |

| Send Read commond | → | Read Status | → | Judgement Status | → | Read Pressure Data |

5. Application Circuit
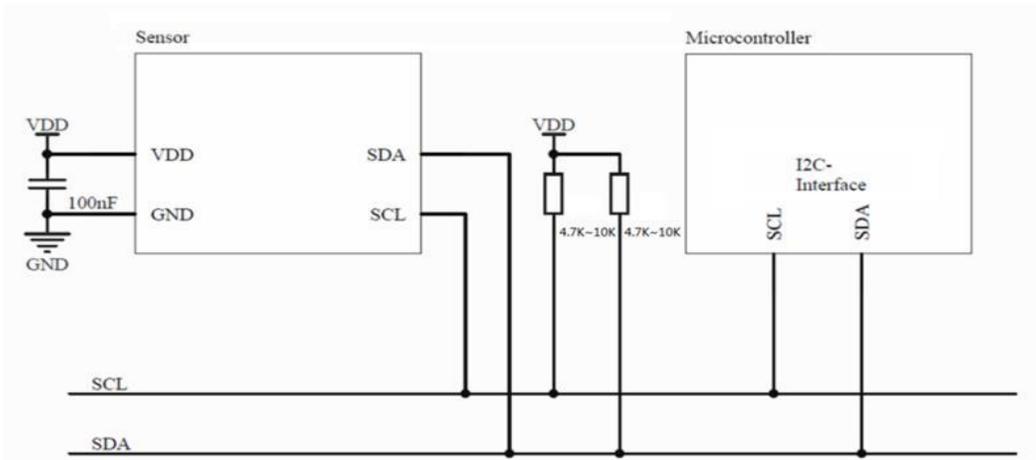
Figure4: Application Circuit

6. Package Outline and Pin Configuration
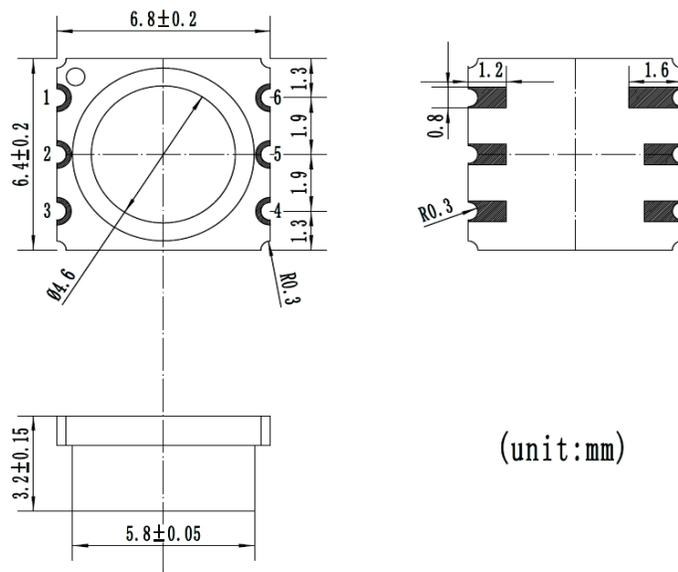
(unit:mm)

Pin	Name	Type	Function
1	GND	G	Power Ground
2	VDD	P	Positive supply voltage
3	NC		Not connect
4	NC		Not connect
5	SDA	I/O	Serial data input/output
6	SCL	I	Serial data clock

Figure 5: Package Outlines, Pin Configuration and Description