

SMI LOW PRESSURE DIGITAL / ANALOG SENSOR

SM7000/SM6000/SM5000 Series

Gage & Differential Pressure Sensors

The SM7000/SM6000/SM5000 are low pressure MEMS sensors offering state-of-the-art pressure transducer technology and CMOS mixed signal processing technology to produce either an analog and/or digital output fully conditioned, multi-order pressure and temperature compensated. This series provides JEDEC standard SOIC-16 package with vertical or horizontal porting options. It is available in gage, differential and asymmetric differential configurations. With the dual porting, a reference measurement is possible to minimize errors due to changes in ambient pressure.

Features

- Pressure ranges:
from 0.07 up to 2.49 PSI
- Pressure type:
 - ✓ gage
 - ✓ differential
 - ✓ asymmetric differential
- 16-bit I²C digital and analog output interface available
- Total error band
 - ✓ $\pm 1\%$ FS (digital)
 - ✓ $\pm 1.5\%$ FS (analog)
- Pressure calibrated and temperature compensated output
- Compensated temperature range:
-20 to 85°C

Applications

- CPAP / Sleep Apnea
- Ventilators
- Gas Flow Instrumentation
- Air Flow Measurement
- HVAC / VAV
- Pressure Transmitters
- Pneumatic Gauges
- Pressure Switches
- Safety Cabinets

Combining the pressure sensor with a signal-conditioning ASIC in a single package simplifies the use of advanced silicon micro-machined pressure sensors. The pressure sensor can be mounted directly on a standard printed circuit board and a high level, calibrated pressure signal can be acquired from the digital interface. This eliminates the need for additional circuitry, such as a compensation network or microcontroller containing a custom correction algorithm.

Customer-specified pressure ranges and supply voltages are available.

The SM7000/SM6000/SM5000 are shipped in sticks or tape & reel.



The SM6000 and SM5000 digital output only sensors earned the AccuStable quality label. The AccuStable brand stands for <1% total error band initially and <1% shift during operation over 10 year lifetime. Qualification is based on 1000 hours HTOL (High-temperature operating life) test at 85°C with 5V.

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Performance Specification

1. Calibrated Pressure Ranges

| Series | Pressure Type | Output Type | P _{MIN} (PSI) | P _{MAX} (PSI) |
|--------|---------------|------------------|------------------------|------------------------|
| SM7291 | Gage | Digital & Analog | 0 | +0.14 to +0.29 |
| SM7231 | Gage | Digital | | |
| SM7391 | Differential* | Digital & Analog | -0.29 to -0.07 | +0.07 to +0.29 |
| SM7331 | Differential* | Digital | | |
| SM7491 | Asymmetric** | Digital & Analog | -0.29 to 0 | 0 to +0.29 |
| SM7431 | Asymmetric** | Digital | | |
| SM6291 | Gage | Digital & Analog | 0 | +0.3 to +0.79 |
| SM6231 | Gage | Digital | | |
| SM6391 | Differential* | Digital & Analog | -0.79 to -0.3 | +0.3 to +0.79 |
| SM6331 | Differential* | Digital | | |
| SM6491 | Asymmetric** | Digital & Analog | -0.79 to 0 | 0 to +0.79 |
| SM6431 | Asymmetric** | Digital | | |
| SM5291 | Gage | Digital & Analog | 0 | +0.8 to +2.49 |
| SM5231 | Gage | Digital | | |
| SM5391 | Differential* | Digital & Analog | -2.49 to -0.8 | +0.8 to +2.49 |
| SM5331 | Differential* | Digital | | |
| SM5491 | Asymmetric** | Digital & Analog | -2.49 to 0 | 0 to +2.49 |
| SM5431 | Asymmetric** | Digital | | |

Comments:

*For differential devices the absolute value of P_{MIN} must match absolute value of P_{MAX}.

**For asymmetric devices the delta between P_{MAX} and P_{MIN} must be at least 0.14 PSI.

2. Absolute Maximum Ratings

All parameters are specified at VDD = 3.3 V / 5.0 V supply voltage at 25°C, unless otherwise noted.

| Characteristic | Symbol | Min | Max | Units |
|--------------------------------------|-------------------|--|-----|-------|
| Compensated Temperature | T _{COMP} | -20 | 85 | °C |
| Operating Temperature ^(a) | T _{OP} | -40 | 105 | °C |
| Storage Temperature ^(a) | T _{STG} | -40 | 125 | °C |
| Supply Voltage | V _{DD} | -0.3 | 6 | V |
| Media Compatibility ^(a) | | Clean, dry air compatible with wetted materials ^(b) | | |

Burst pressure and proof pressure by pressure range and series

| Max Operating Pressure Range P _{MAX} (PSI) | Series | Proof Pressure ^(a, c) P _{Burst} (PSI) | Burst Pressure ^(a, d) P _{Proof} (PSI) |
|--|---------------|--|--|
| 0.07 to 0.29 | 7X91 and 7X31 | 1.5 | 3 |
| 0.3 to 0.79 | 6X91 and 6X31 | 4.5 | 6 |
| 0.8 to 2.49 | 5X91 and 5X31 | 12 | 15 |

Notes:

- a) Tested on a sample basis.
- b) Wetted materials include silicon, epoxy, RTV, gold and aluminum.
- c) Proof pressure is defined as the maximum pressure to which the device can be taken and still perform within specifications after returning to the operating pressure range.
- d) Burst pressure is the pressure at which the device suffers catastrophic failure resulting in pressure loss through the device.

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3. ESD

| Description | Condition | Symbol | Min | Max | Units |
|--------------------------------|------------------------------------|----------------|-----|-----|-------|
| ESD HBM Protection at all Pins | AEC Q100-002 (HBM) chip level test | $V_{ESD(HBM)}$ | -2 | 2 | kV |

4. External Components

| Description | Symbol | Min | Typ | Max | Units |
|-------------------------|-----------|-----|-----|-----|-------|
| Supply bypass capacitor | C_{VDD} | | 100 | | nF |

5. Recommended Operating Conditions

The recommended operating conditions must not be exceeded in order to provide proper functionality of the device. All parameters specified in the following sections refer to these recommended operating conditions unless stated otherwise.

| Description | Symbol | Min | Typ | Max | Units |
|---|-----------------|----------------|-----|--------------|-------|
| Supply Voltage | V_{DD} | 4.75 | 5.0 | 5.25 | V |
| | | 3.0 | 0.3 | 3.6 | |
| Low level input voltage at Digital I/O | $V_{IN,I2C,lo}$ | -0.3 | | 0.9 | V |
| High level input voltage at Digital I/O | $V_{IN,I2C,hi}$ | $0.8 * V_{DD}$ | | $V_{DD}+0.3$ | V |
| Current Consumption with analog output (only applicable for XX91) | | | 4.5 | | mA |
| Current Consumption without analog output | | | 3 | | mA |

6. Operating Characteristics Table

All parameters are specified at $V_{DD} = 3.3\text{ V} / 5.0\text{ V}$ supply voltage at 25°C , unless otherwise noted.

| Characteristic | Series | Symbol | Min | Typ | Max | Units |
|--|--------|--------------|------|---------|------|--------|
| Digital Pressure Output @ $P_{MIN}^{(e)}$ | All | $DOUT_{MIN}$ | | -26,215 | | Counts |
| Digital Pressure Output @ $P_{MAX}^{(e)}$ | | $DOUT_{MAX}$ | | 26,214 | | Counts |
| Digital Full Scale Span ^(e) | | DFS | | 52,429 | | Counts |
| Resolution | | | | 16 | | Bits |
| Digital Output Total Error Band ^(f, g, h) | | DACC | -1 | | +1 | %FS |
| Analog Pressure Output @ $P_{MIN}^{(e)}$ | XX91 | $AOUT_{MIN}$ | | 10 | | %VDD |
| Analog Pressure Output @ $P_{MAX}^{(e)}$ | | $AOUT_{MAX}$ | | 90 | | %VDD |
| Analog Full Scale Span | | AFS | | 80 | | %VDD |
| Analog Output Accuracy ^(f, g, h) | | AACC | -1.5 | | +1.5 | %FS |

Notes:

- e) Only the typical values are shown here. However, the output values can be customized or changed upon request.
- f) The total error band specification applies over all operating conditions in dry clean air. This specification includes the combination of linearity, repeatability, and hysteresis errors over pressure, temperature, and voltage.
- g) Maximum 10-year zero pressure offset shift < $\pm 2\%$ FS based on 1000 hours of HTOL, TC and THB testing.
- h) For less demanding applications, devices with relaxed accuracy specifications are available.

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7. Digital Output Transfer Function

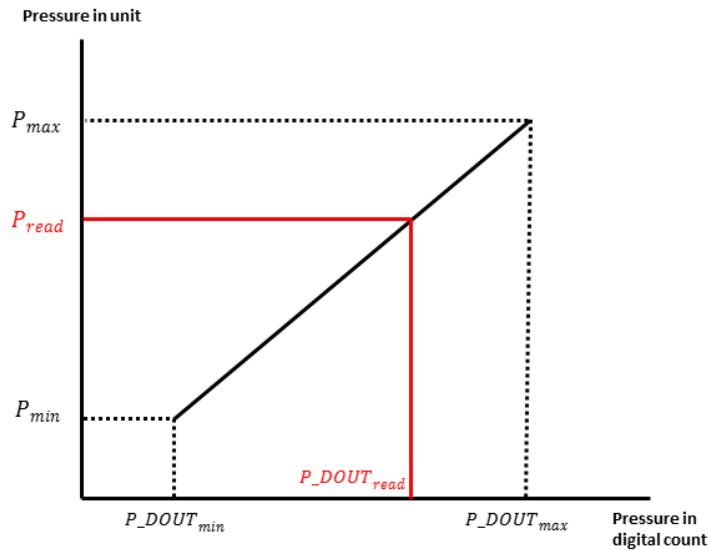
$$P_{\text{read}} = P_{\text{min}} + \frac{P_{\text{DOUT}_{\text{read}}} - P_{\text{DOUT}_{\text{min}}}}{P_{\text{DOUT}_{\text{max}}} - P_{\text{DOUT}_{\text{min}}}} (P_{\text{max}} - P_{\text{min}})$$

$$P_{\text{read}} = P_{\text{min}} + \frac{P_{\text{DOUT}_{\text{read}}} - P_{\text{DOUT}_{\text{min}}}}{P_{\text{DOUT}_{\text{max}}} - P_{\text{DOUT}_{\text{min}}}} (P_{\text{max}} - P_{\text{min}})$$

P_{min} and P_{max} are minimum and maximum rating pressure in specified pressure unit on the specification.

$P_{\text{DOUT}_{\text{min}}}$ and $P_{\text{DOUT}_{\text{max}}}$ are minimum and maximum digital counts on the specification.

$P_{\text{DOUT}_{\text{read}}}$ is digital reading from the output and P_{read} is the converted pressure output based on $P_{\text{DOUT}_{\text{read}}}$.



For example, the P_{min} and P_{max} for the sensor are specified as -15 psi and +15 psi. The DOUT_{min} and DOUT_{max} are 26214 and +26214. So,

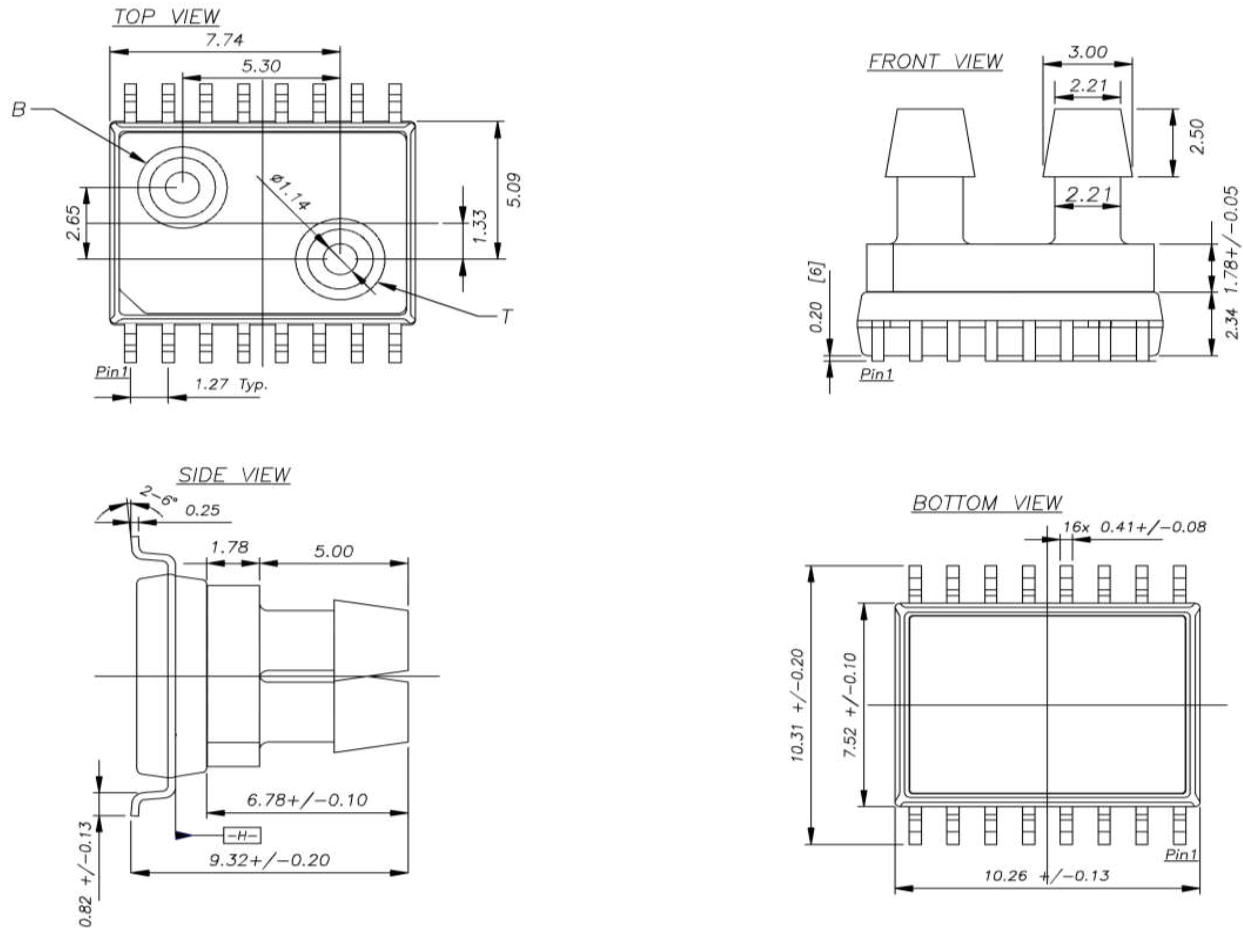
$$P_{\text{read}} = -15 + \frac{\text{DOUT}_{\text{read}} + 26214}{52428} \times 30 \text{ psi}$$

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8. Package Reference

SOIC-16 (C) Dual Vertical Package Dimensions



Lot number identification on top side

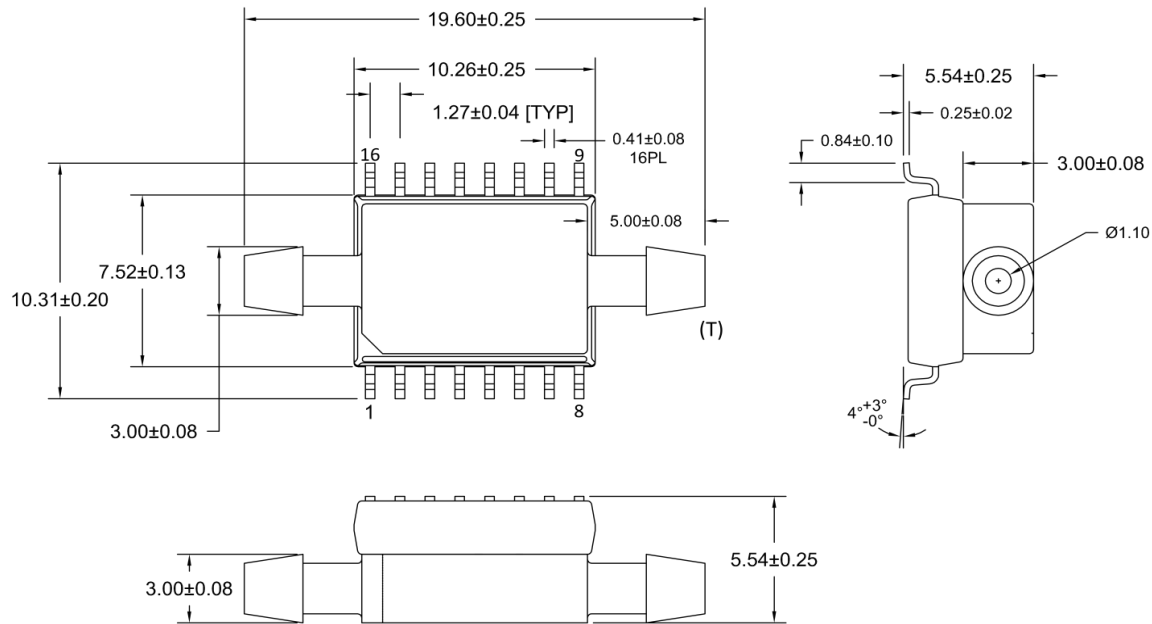
Notes:

- All dimensions in units of [mm]
- Moisture Sensitivity Level (MSL): Level 3
- Wetted materials: Silicon, glass, gold, aluminum, copper, silicone, epoxy, mold compound.
- [B] is tube connected to bottom side of sensor die.
- [T] is tube connected to top side of sensor die. Topside pressure is positive pressure. An increase in topside pressure will result in an increase in sensor output.
- Bottom plate is stainless steel.
- Electrically isolate the bottom metal cover, do not connect to the cover and keep the board underneath free from electrical circuits.
- Robust JEDEC SOIC-16 package for automated assembly
- Manufactured according to ISO9001, ISO14001 and ISO/TS 16949 standards

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SOIC-16 (C) Dual Horizontal Package Dimensions



Dimensions are in mm

Lot number identification on top side

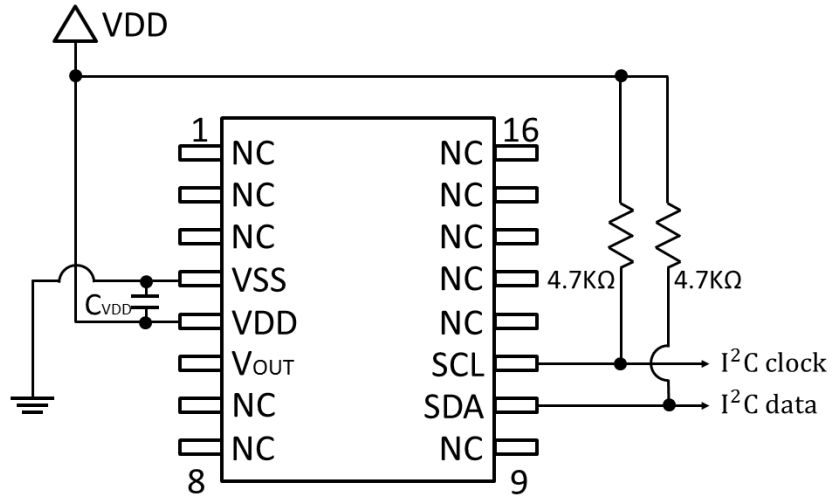
Notes:

- All dimensions in units of [mm]
- Moisture Sensitivity Level (MSL): Level 3
- Wetted materials: Silicon, glass, gold, aluminum, copper, silicone, epoxy, mold compound.
- [B] is tube connected to bottom side of sensor die.
- [T] is tube connected to top side of sensor die. Topside pressure is positive pressure. An increase in topside pressure will result in an increase in sensor output.
- Bottom plate is stainless steel
- Robust JEDEC SOIC-16 package for automated assembly
- Electrically isolate the bottom metal cover, do not connect to the cover and keep the board underneath free from electrical circuits.
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Applications Circuit



| Pin No | Pin Function (XX91) | Pin Function (XX31) |
|--------|----------------------|---------------------|
| 1 | NC (No Connect) | NC (No Connect) |
| 2 | NC | NC |
| 3 | NC | NC |
| 4 | VSS | VSS |
| 5 | VDD | VDD |
| 6 | VOUT (Analog Output) | NC |
| 7 | NC | NC |
| 8 | NC | NC |
| 9 | NC | NC |
| 10 | SDA | SDA |
| 11 | SCL | SCL |
| 12 | NC | NC |
| 13 | NC | NC |
| 14 | NC | NC |
| 15 | NC | NC |
| 16 | NC | NC |

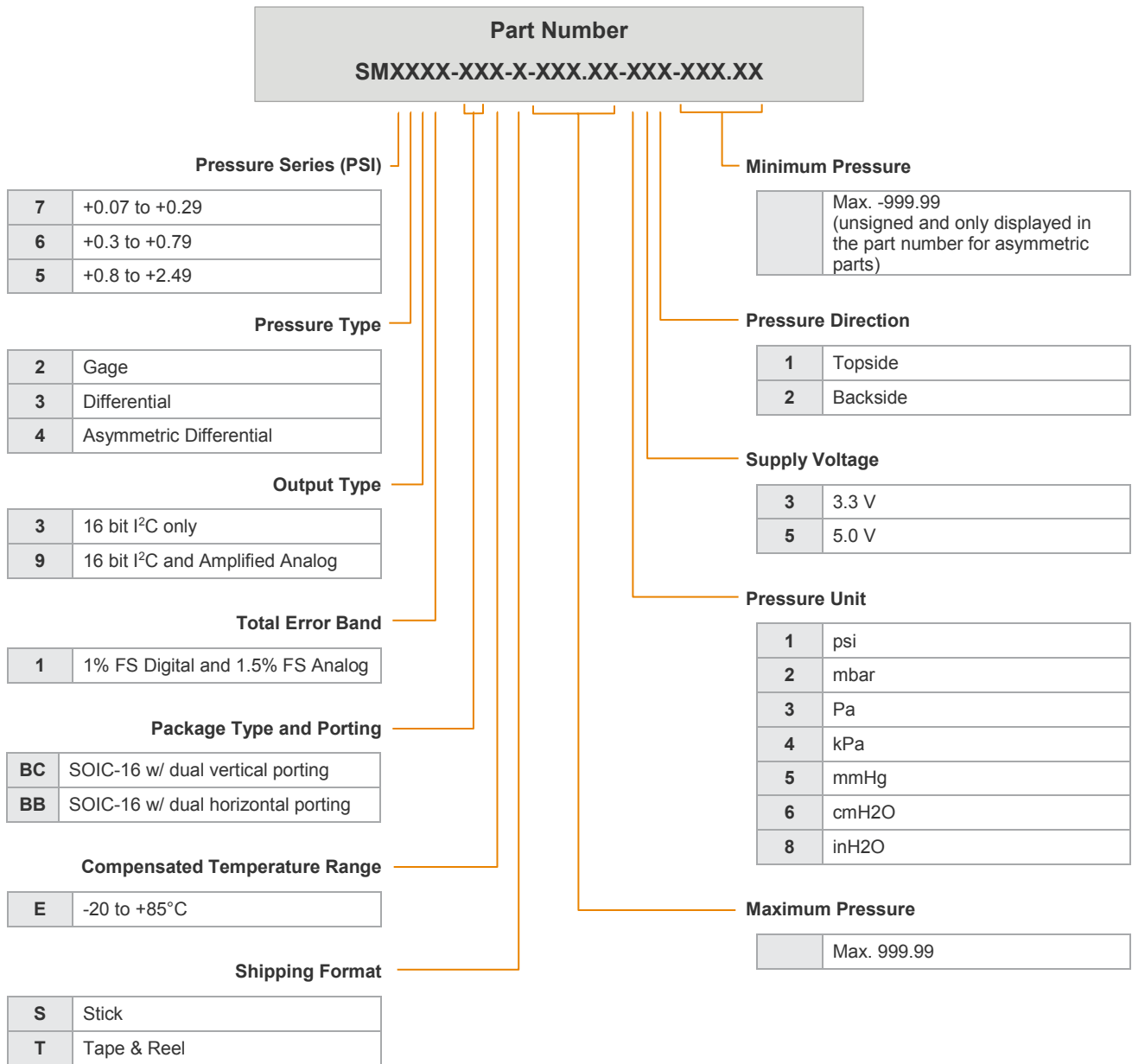
Notes:

- Do not connect to NC pins

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9. Part Numbering Key



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10. Ordering Information (Example Configurations)

| Part Number | Part Description | Pressure Range | Output Type | Package Configuration | Voltage | Shipping ^(a) |
|--------------------|-------------------------|---------------------------------|------------------|-----------------------|---------|-------------------------|
| 7391-BCE-S-500-000 | SM7391-BCE-S-500.00-331 | -500 to +500 Pa | Digital & Analog | SOIC-16 Dual Vertical | 3.3 V | Sticks (45 parts/stick) |
| 7291-BCE-S-001-000 | SM7291-BCE-S-001.00-431 | 0 to +1 kPa | Digital & Analog | | | |
| SM7391-BCE-S-500 | SM7391-BCE-S-500.00-331 | -500 to +500 Pa | Digital & Analog | | | |
| 6391-BCE-S-040-000 | SM6391-BCE-S-040.00-631 | -40 to +40 cmH ₂ O | Digital & Analog | | | |
| 5391-BCE-S-100-000 | SM5391-BCE-S-100.00-631 | -100 to +100 cmH ₂ O | Digital & Analog | | | |
| 5291-BCE-S-100-000 | SM5291-BCE-S-100.00-631 | 0 to +100 cmH ₂ O | Digital & Analog | | | |

Notes:

- a) All parts also available in shipping configuration Tape & Reel (SOIC-16 Dual Horizontal 500 parts/reel; SOIC-16 Dual Vertical 350 parts/reel), see section 10. Part Numbering Key for ordering information
- b) **The above table shows example configurations, not all available part numbers are listed. Contact Customer Care (customercare.mlpt@te.com) and provide configuration information based on part numbering key to order other configurations.**
- c) **If support is needed during the part selection process, please contact the Sensor Qualification Team (sensorsqt@te.com).**

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11. I²C Communication protocol

11.1 I²C Electrical Table

| Description | Condition | Symbol | Min | Typ | Max | Units |
|--|-------------------------|---------------------|------|-----|-----|-------|
| SDA output low voltage | I _{SDA} = 3 mA | V _{SDA,OL} | 0 | | 0.4 | V |
| Low-to-High transition threshold | pins SA0, SCL | V _{SDA,LH} | 0.5 | 0.6 | 0.7 | *VDD |
| High-to-Low transition threshold | pins SA0, SCL | V _{SDA,HL} | 0.3 | 0.4 | 0.5 | *VDD |
| I ² C clock frequency ^{**)} | | f _{SCL} | 0 | | 400 | kHz |
| Bus free time between a START and STOP condition ^{*)} | | t _{BUSF} | 1300 | | | ns |
| Clock low time ^{*)} | | t _{LO} | 1300 | | | ns |
| Clock high time ^{*)} | | t _{HI} | 600 | | | ns |
| START condition hold time ^{*)} | | t _{SH} | 100 | | | ns |
| Data setup time ^{*)} | | t _{SU} | 100 | | | ns |
| Data hold time ^{*)} | | t _H | 0 | | | ns |
| Setup time for repeated START condition ^{*)} | | t _{RSH} | 600 | | | ns |
| Setup time for STOP condition ^{*)} | | t _{PSU} | 600 | | | ns |
| Rise time of SDA and SCL signals ^{*)} | | t _R | | | 300 | ns |
| Fall time of SDA and SCL signals ^{*)} | | t _F | | | 300 | ns |

^{*)} Not tested in production

^{**)} For I²C bus capacitance load >100pF maximum possible clock frequency is 100kHz

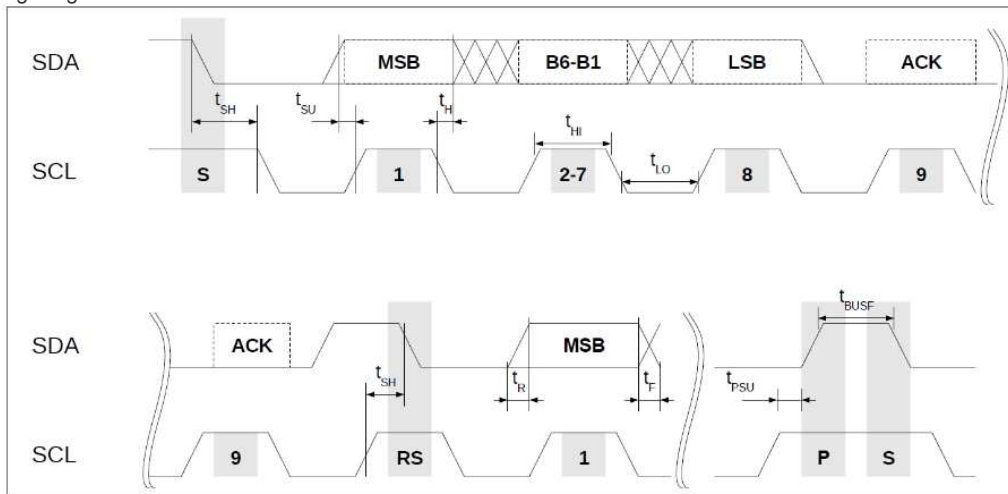
11.2 I²C Interface

The sensor features an I²C slave interface. This interface provides direct access to registers of the memory of the pressure sensor. An external I²C master (e.g. a microcontroller) can read from and write to memory addresses (registers) of the device using the following commands:

- **Random write:** Sets a memory address and writes data to consecutive memory addresses of the device starting at the set memory address.
- **Random read:** Sets a memory address and reads data from consecutive memory addresses of the device starting at the set memory address.
- **Read last:** Reads data from the device starting at the last memory address set by the master. This facilitates repeated reading of the same memory addresses without transmitting a memory address first.

All reads/writes must start at word aligned addresses (i.e. LSB of memory address equals 0) and read/write an even number of bytes.

I²C Interface Timing Diagram:



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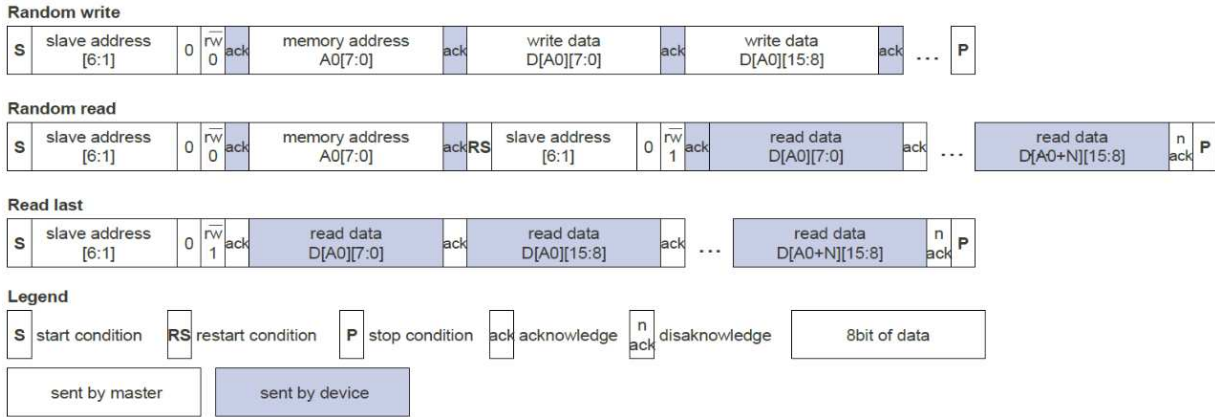
11.3 I²C Command Format

The sensor uses a standard 7-bit I²C slave address field. The LSB of the slave address specifies the frame type used to perform read and write operations.

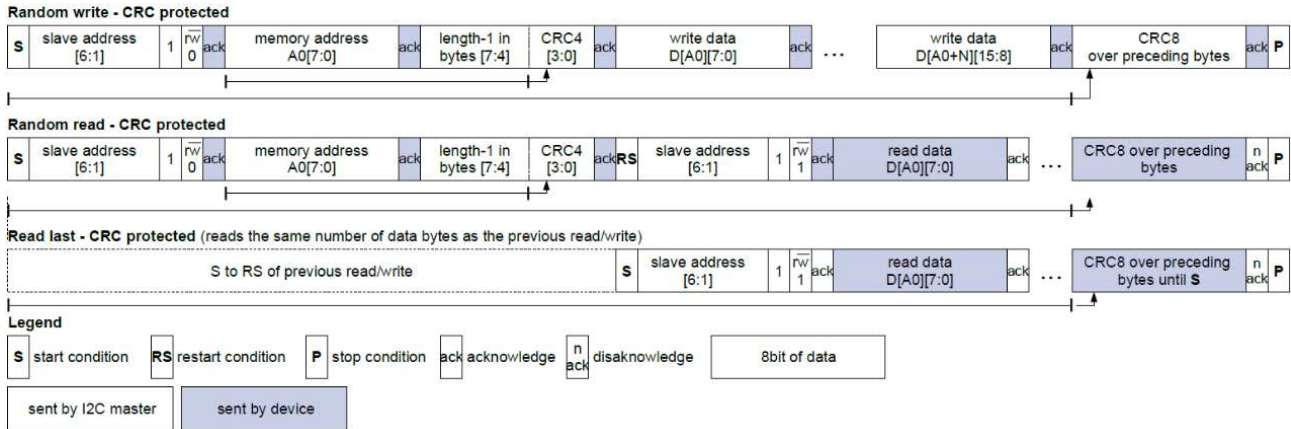
For LSB = 0 the protocol is compatible to standard I²C EEPROMs, for LSB = 1 the protocol is extended by a CRC protection. Thus, each device occupies two I²C addresses: even addresses are for standard EEPROM compatible protocols and odd addresses are for CRC protected protocols. Unprotected and CRC protected frames can be interleaved.

The two different frame types - standard EEPROM (without CRC) or CRC protected - are shown in the next two figures.

I²C Read / Write Commands - Standard EEPROM compatible protocol



I²C Read / Write Commands - CRC protected protocol



The memory address field sets the byte address of the first memory location to be read from or written to. Only 16-bit-word aligned reads/writes are supported, i.e. the LSB of memory address has to be zero always. The read/write data is transferred MSB first, low byte before high byte.

The length field (bits[7:4]) required for CRC protected frames specifies the number of data bytes to be transferred decremented by one, i.e. a value of 0001b corresponds to two bytes. All frames must transfer an even number of bytes. The maximum length for CRC protected read/write frames is 4 bytes (2 registers). For unprotected frames the length is unlimited.

The CRC4 and CRC8 for redundancy check are computed in the same bit and byte order as the transmission over the bus. The polynomials employed are:

- CRC4: polynomial 0x03; initialization value: 0x0F
- CRC8: polynomial 0xD5; initialization value: 0xFF

If a CRC errors occurs, then the event bit com_crc_error in the STATUS register will be set.

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11.4 I²C Command Examples

For all examples below the 7-bit device slave address used is 0x6C for unprotected commands, and 0x6D for CRC protected commands, respectively.

The command sequence following describes an unprotected Read command (without CRC) of 3 subsequent 16-bit words starting at memory address 0x2E to read the corrected IC temperature, corrected pressure signal, and (synchronized) status bits of the sensor.

| Byte # | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------------------|--------------------------------------|----------------|-------------------------------------|--------------------------|-----------------|--------------------------|-----------------|-----------------------------------|---------------------------|
| SBM (sent by master) | 0xD8 | 0x2E | 0xD9 | | | | | | |
| SBM comment | slave address 6C + LSB = 0 for Write | memory address | slave address 6C + LSB = 1 for Read | | | | | | |
| SBS (sent by sensor) | | | | 0xF2 | 0x7D | 0xEA | 0x82 | 0x1E | 0x00 |
| SBS comment | | | | DSP_T (Lo-Byte) ad. 0x2E | DSP_T (Hi-Byte) | DSP_S (Lo-Byte) ad. 0x30 | DSP_S (Hi-Byte) | sync'ed Status (b7 - b0) ad. 0x32 | sync'ed Status (b15 - b8) |

Random Read – protected by CRC:

The following sequence describes the CRC protected version of reading 3 subsequent 16-bit words starting at memory address 0x2E to read the corrected IC temperature, corrected pressure signal, and (synchronized) status bits of the sensor.

| Byte # | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------------------|--------------------------------------|----------------|------------------------------|-------------------------------------|-------------------------|----------------|-------------------------|----------------|---------------|
| SBM (sent by master) | 0xDA | 0x50 | 0x39 | 0xDB | | | | | |
| SBM comment | slave address 6D + LSB = 0 for Write | memory address | 3: length = 4Byte 9: CRC4 | slave address 6D + LSB = 1 for Read | | | | | |
| SBS (sent by sensor) | | | | | 0x0C | 0x00 | 0xF3 | 0x61 | 0x0A |
| SBS comment | | | | | SER0 (Lo-Byte) ad. 0x50 | SER0 (Hi-Byte) | SER1 (Lo-Byte) ad. 0x52 | SER1 (Hi-Byte) | CRC8 (calc'd) |

Random Write:

The following sequence writes one 16-bit word to address 0x22 (without CRC protection). This will copy 0x6C32 into the command register CMD to move the component to Sleep Mode.

| Byte # | 0 | 1 | 2 | 3 |
|-------------------------|--------------------------------------|----------------|-----------------------------|------------------------------|
| SBM (sent by master) | 0xD8 | 0x22 | 0x32 | 0x6C |
| SBM comment | slave address 6C + LSB = 0 for Write | memory address | Lo-Byte written to CMD[7:0] | Hi-Byte written to CMD[15:8] |
| SBS (sent by sensor) | | | | |
| SBS comment | | | | |

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Random Write - protected with CRC:

The next example describes a Write of one 16-bit word (contents 0xCF9E) with CRC protection to address 0x36 to clear events in the STATUS register.

| Byte # | 0 | 1 | 2 | 3 | 4 | 5 |
|-------------------------|--|----------------|------------------------------|---------------------------------|---------------------|----------------------|
| SBM (sent by master) | 0xDA | 0x36 | 0x16 | 0x9E | 0xCF | 0x0E |
| SBM comment | slave address 6D + LSB = 0 for Write | memory address | 1: length = 2Byte 1: CRC4 | STATUS (Lo-Byte) ad. 0x36 | STATUS (Hi-Byte) | CRC8 (calculated) |
| SBS (sent by sensor) | | | | | | |
| SBS comment | | | | | | |

11.5 Register Descriptions

Register Read or Write are performed via the digital communication interface. After power-up of the IC all registers except STATUS and CMD are write protected.

Command register:

| 0x22 | CMD | | | |
|------|------|---------|----|--|
| bits | name | default | rw | description |
| 15:0 | cmd | 0 | w | Writing to this register controls the state of the device. 0x6C32: SLEEP Mode Initiate the power state SLEEP, powering down the ASIC 0xB169: RESET Performs a reset. After reset the power-up sequence will be executed, i.e. the registers are loaded with data from the configuration memory, also a CRC check is performed. |

Temperature register:

| 0x2E | DSP_T | | | |
|------|-------|---------|----|--|
| bits | name | default | rw | description |
| 15:0 | dsp_t | | r | Corrected temperature measurement value of the sensor. Whenever this register is updated with a new measurement the STATUS.dsp_t_up event bit is set. |

Pressure register:

| 0x30 | DSP_S | | | |
|------|-------|---------|----|---|
| bits | name | default | rw | description |
| 15:0 | dsp_s | | r | Corrected pressure measurement value of the sensor. Whenever this register is updated with a new measurement the STATUS.dsp_s_up event bit is set. |

The registers DSP_T and DSP_S contain invalid data after power-up until the first temperature and pressure values have been measured by the device and transferred to these registers. In case a NVM CRC error occurred, the DSP_T and DSP_S registers would never be updated. Thus, after power up it is necessary to wait until the STATUS.dsp_s_up and dsp_t_up bits have been set at least once before using the temperature or pressure data. It is not sufficient to wait just for a fixed time delay.

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Status register - synchronized:

| 0x32 | STATUS_SYNC | | | | | |
|------|---------------|---------|----|--------|---|--|
| bits | name | default | rw | type | description | |
| 0 | idle | 0 | rw | status | STATUS.idle | |
| 1 | - reserved - | 0 | rw | event | reserved | |
| 2 | - reserved - | 0 | rw | event | reserved | |
| 3 | dsp_s_up | 0 | rw | event | when DSP_S is read STATUS.dsp_s_up is copied here | |
| 4 | dsp_t_up | 0 | rw | event | when DSP_T is read STATUS.dsp_t_up is copied here | |
| 5 | - reserved - | 0 | rw | status | reserved | |
| 6 | - reserved - | 0 | rw | status | reserved | |
| 7 | bs_fail | 0 | rw | event | STATUS.bs_fail | |
| 8 | bc_fail | 0 | rw | event | STATUS.bc_fail | |
| 9 | - reserved - | 0 | rw | event | reserved | |
| 10 | dsp_sat | 0 | rw | status | STATUS.dsp_sat | |
| 11 | com_crc_error | 0 | rw | event | STATUS.com_crc_error | |
| 12 | - reserved - | 0 | rw | status | reserved | |
| 13 | - reserved - | 0 | rw | status | reserved | |
| 14 | dsp_s_missed | 0 | rw | event | STATUS.dsp_s_missed | |
| 15 | dsp_t_missed | 0 | rw | event | STATUS.dsp_t_missed | |

The bits STATUS_SYNC[15:5,0] are identical to the bits STATUS[15:5,0].

The bits STATUS_SYNC[4:3] are copied from the STATUS register when the corresponding DSP registers are read. First reading the DSP registers and then STATUS_SYNC confirms that both values are consistent to each other.

The synchronized status STATUS_SYNC register can be used to continuously poll the pressure, temperature and status of the device with a single read command by reading three 16 bit words starting at address 0x2E. By evaluating STATUS_SYNC.dsp_t_up and STATUS_SYNC.dsp_s_up it can be determined if the values in DSP_T and DSP_S acquired during the same read contain recently updated temperature or pressure values.

Status register:

| 0x36 | STATUS | | | | | |
|------|---------------|---------|----|-------------------|---|--|
| bits | name | default | rw | type ¹ | description | |
| 0 | idle | 0 | rw | status | 0: chip in busy state 1: chip in idle state | |
| 1 | - reserved - | 0 | rw | event | reserved | |
| 2 | - reserved - | 0 | rw | event | reserved | |
| 3 | dsp_s_up | 0 | rw | event | 1: DSP_S register has been updated. Cleared when DSP_S is read | |
| 4 | dsp_t_up | 0 | rw | event | 1: DSP_T register has been updated. Cleared when DSP_T is read. | |
| 5 | - reserved - | 0 | rw | status | reserved | |
| 6 | - reserved - | 0 | rw | status | reserved | |
| 7 | bs_fail | 0 | rw | event | 1: bridge supply failure occurred | |
| 8 | bc_fail | 0 | rw | event | 1: sensor bridge check failure occurred | |
| 9 | - reserved - | 0 | rw | event | reserved | |
| 10 | dsp_sat | 0 | rw | status | 1:a DSP computataion leading to current DSP_T or DSP_S values was saturated to prevent overflow | |
| 11 | com_crc_error | 0 | rw | event | 1:communication CRC error | |
| 12 | - reserved - | 0 | rw | status | reserved | |
| 13 | - reserved - | 0 | rw | status | reserved | |
| 14 | dsp_s_missed | 0 | rw | event | 1:dsp_s_up was 1 when DSP_S updated | |
| 15 | dsp_t_missed | 0 | rw | event | 1:dsp_t_up was 1 when DSP_T updated | |

- "Event" type flags remain set until cleared by writing '1' to the respective bit position in STATUS register (not STATUS_SYNC). Writing 0xFFFF to the STATUS register will clear all event bits.
- "Status" type flag represents a condition of a hardware module of the IC and persists until the condition has disappeared.

LOW PRESSURE DIGITAL AND ANALOG SENSOR

SM7000/SM6000/SM5000 Series

Serial Number register 0:

| 0x50 | SER0 | | | |
|------|------|---------|----|----------------------------------|
| bits | name | default | rw | description |
| 15:0 | ser0 | | r | Serial number of the IC, Lo-Word |

Serial Number register 1:

| 0x52 | SER1 | | | |
|------|------|---------|----|----------------------------------|
| bits | name | default | rw | description |
| 15:0 | ser1 | | r | Serial number of the IC, Hi-Word |

12. Qualification Standards

REACH Compliant
RoHS Compliant
PFOS/PFOA Compliant
For qualification specifications



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