Integrated Air Pressure Sensor with I2C Interface E524.72

PRODUCT PREVIEW – Jul 14, 2017

RoHS compliant

Features

- Fully integrated pressure Sensor
- Measurement of absolute pressure: 60 - 165 kPa with over-range capability 40 - 180 kPa
- Full thermal compensation to accuracy ±1.0 kPa
- Digital I^2C data interface provides measurement, diagnostic, ID-data and controls:
  - pressure output, 16-bit resolution
  - temperature output (internal sensor), 16-bit res.
  - sensor diagnostics (state-of-health)
  - power-down control: Sleep Mode selected via I^2C
  - unique device ID
- Two I^2C slave addresses via pin coding
- Two 16-bit ADCs for acquisition of pressure and temperature inputs; pressure acquired at 20 kS/s
- Diagnosis of sensor, sensor supply wiring, and NVM check-sum supervision at power-on
- Sleep-mode with low current consumption
- Supply voltage 3.3V or 5.0V in the same device
- Large temperature range -40 ... + 125°C

General Description

The E524.72 is an absolute pressure sensor for absolute air pressure measurement. It includes a piezo-resistive pressure bridge and a signal processing IC, which performs amplification and thermal compensation of the pressure sensor output to provide a linear, thermally stable signal output.
The sensor delivers calibrated output data - pressure and temperature - at an I^2C interface.
The calibrated transfer characteristic maps the nominal input pressure range linear into a defined fraction of the positive digital number range. Also the reading temperature from an on-chip temperature sensor can be read via I^2C, as well diagnosis data. The component can be set to sleep-mode with very low consumption by a specific command. Wake-up from sleep-mode requires a toggling SCL input.

Sensor specific calibration data, configuration and product ID are stored in an embedded NVM.

Applications

- Automotive applications
- Industrial applications
- Medical applications

Ordering Information

Ordering Code	Pressure Range	Package
E52472A53D404	40 - 180 kPa	SO8n*

* cover with pressure inlet opening (see below)

Typical Operating Circuit

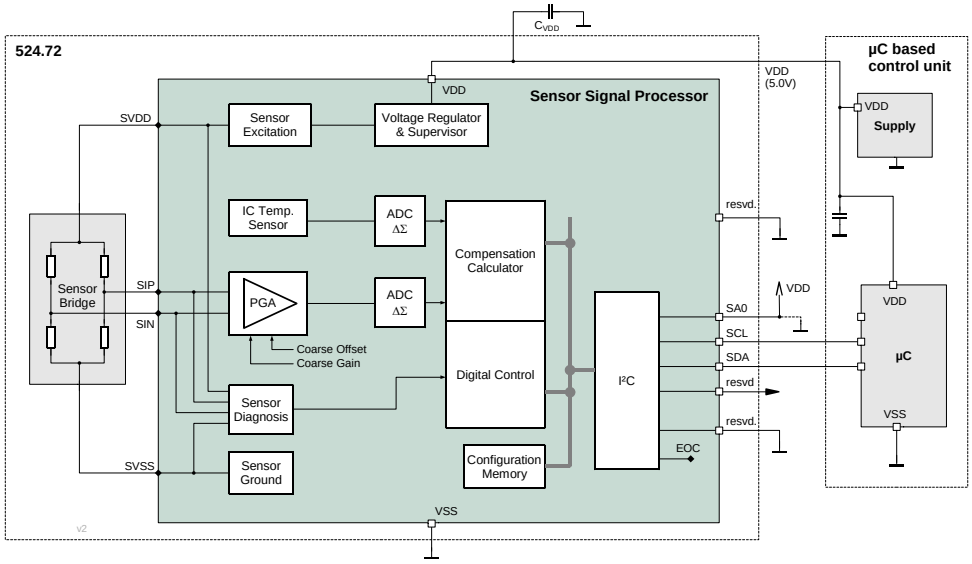

Figure 1: Typical application circuit

Functional Diagram

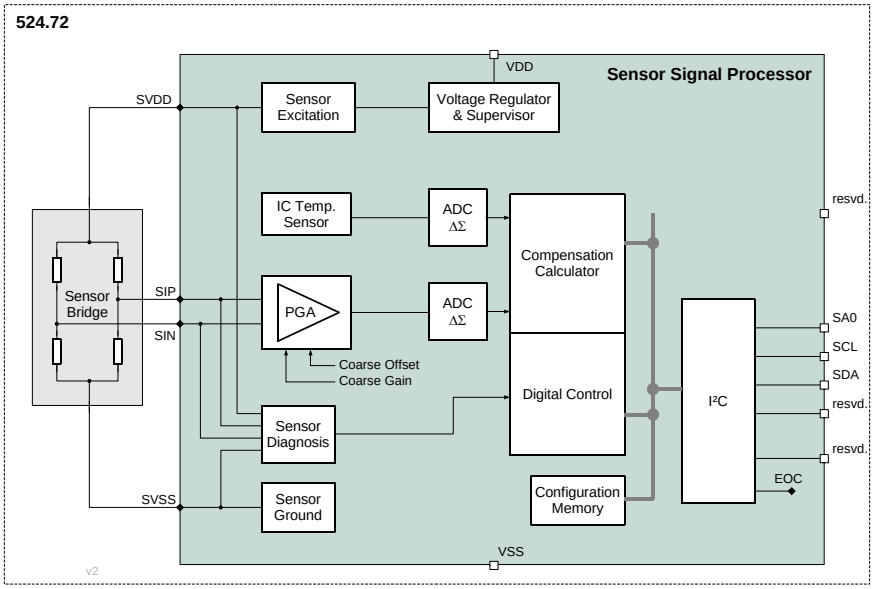

Figure 1: Functional Diagram

Pin Configuration

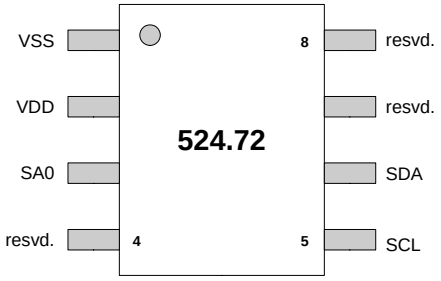

Figure 1: Pin Configuration

Pin Description

Pin	*Name*	*Type*	*Description*
1	VSS	S	Ground (Negative device supply)
2	VDD	S	Supply voltage
3	SA0	D_I	I2C secondary slave address, pin coding
4	resvd.	-	reserved, connect to VSS (on PCB)
5	SCL	D_I	I2C clock input
6	SDA	D_B	I2C data I/O
7	resvd.	D_O	reserved, connect to VSS (on PCB)
8	resvd.	-	reserved, connect to VSS (on PCB)

Note: A = Analog, D = Digital, S = Supply, I = Input, O = Output, B = Bidirectional, NC - not connected

1 Absolute Maximum Ratings

Stresses beyond these absolute maximum ratings listed below may cause permanent damage to the device. **These are stress ratings only; operation of the device at these or any other conditions beyond those listed in the operational sections of this document is not implied.** Exposure to absolute maximum rated conditions for extended periods may affect device reliability. All voltages referred to VSS. Currents flowing into terminals are positive, those drawn out of a terminal are negative.

Table 1-1: Absolute Maximum Ratings

No.	*Description*	*Condition*	*Symbol*	*Min*	*Max*	*Unit*
1	Supply Voltage		VDD	-0.3	6	V
2	Digital IO voltage		$V_{IO,DIG}$	-0.3	VDD+0.3	V
3	Max. digital IO current (DC)		$I_{IO,DIG}$	-10	+10	mA
4	Ambient pressure		p_A	1	600	kPa
5	Junction Temperature		T_J	-40	130	°C
6	Storage temperature		T_{STG}	-40	125	°C
7	Power dissipation	$T_A \leq 125°C$	P_{el}		33	mW

2 ESD

Table 2-1: ESD ratings

No.	*Description*	*Condition*	*Symbol*	*Min*	*Typ*	*Max*	*Unit*
1	ESD HBM Protection at all Pins	AEC Q100-002 (HBM) chip level test	$V_{ESD(HBM)}$	-2		-2	kV
2	ESD CDM Protection at all Pins	AEC Q100-011 (CDM) chip level test	$V_{ESD(CDM)}$	-500		-500	V
3	ESD CDM Protection at Corner Pins	AEC Q100-011 (CDM) chip level test	$V_{ESD(CDM),C}$	-750		-750	V

3 Recommended Operating Conditions

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

Table 3-1: Recommended Operating Conditions

No.	Description	Condition	Symbol	Min	Typ	Max	Unit
1	Supply Voltage		V_{VDD}	3.0	-	5.5	V
2	Low level input voltage at SDA, SCL		$V_{IN,I2C,lo}$	-0.3		0.9	V
3	High level input voltage at SDA, SCL		$V_{IN,I2C,hi}$	0.8 * V_{VDD}		V_{VDD}+0.3	V
4	Operating Pressure Range		p_A	40		180	kPa
5	Operating Temperature	ambient	T_A	-40		125	°C

4 External Components

Table 4-1: External Components

No.	Description	Condition	Symbol	Min	Typ	Max	Unit
1	Supply bypass capacitor*)		C_{VDD}		100		nF

*) Not tested in production

5 Electrical Characteristics

5.1 Global Sensor Parameters

Table 5.1-1: Sensor Accuracy Parameters

No.	Description	Condition	Symbol	Min	Typ	Max	Unit
1	Accuracy pressure measurement, mid temperature range	T_{MID} = 0 ...85°C, 60 ... 165Pa	ΔP_{TMID}	-1.0		+1.0	kPa
2	Accuracy pressure measurement, low temperature range	T_{LOW} = -40°C, 60 ... 165kPa	ΔP_{TLOW}	-2.0		+2.0	kPa
3	Accuracy pressure measurement, high temperature range	T_{HIGH} = 125°C, 60 ... 165kPa	ΔP_{THIGH}	-2.0		+2.0	kPa
4	Accuracy temperature measurement	-40°C ... +125°C, referred to ambient T	ΔT	-5.0		+5.0	°C

[1)] For a graphical description of the tolerance band see 6.2.3-1

Table 5.1-2: Sensor Timing Parameters

No.	Description	Condition	Symbol	Min	Typ	Max	Unit
1	Power-up time[*)]	from supply VDD > 3.0V to output settled to 90% of final value	t_{UP}			5	ms
2	Step response time[*)]	pressure step response; output rising from 10% to 90% of final value	t_{RESP}			1	ms
3	Step response settling time[*)]	pressure step response; output settling to full accuracy	t_{SETTLE}			10	ms

[*)] Not tested in production

5.2 Voltage Supply

Table 5.2-1: Supply Parameters

No.	Description	Condition	Symbol	Min	Typ	Max	Unit
1	Current consumption	continuous operation	I_{VDD}	0.5	4.5	6.0	mA
2	Current consumption, sleep-mode[1)]	Sleep-mode, Pin 4 connected to VSS	$I_{VDD,SM}$	3.0	10	20	µA
3	VDD reset threshold, rising edge		$V_{VDD,TH}$	2.1	2.35	2.6	V
4	VDD reset threshold, falling edge		$V_{VDD,TL}$	1.8	2.05	2.3	V

[1)] Device set to sleep mode by digital control command.

5.3 I2C Interface

Table 5.3-1: I2C electrical characteristics

No.	Description	Condition	Symbol	Min	Typ	Max	Unit
1	SDA output low voltage	I_{SDA} = 3 mA	$V_{SDA,OL}$	0		0.4	V
2	Low-to-High transition threshold	pins SA0, SCL, SDA	$V_{SDA,LH}$	0.5	0.6	0.7	VDD
3	High-to-Low transition threshold	pins SA0, SCL, SDA	$V_{SDA,HL}$	0.3	0.4	0.5	VDD

Table 5.3-2: I2C timing parameters: Fast Mode [a)]

No.	Description	Condition	Symbol	Min	Typ	Max	Unit
1	I2C clock frequency[*)]		f_{SCL}	0		400	kHz
2	Bus free time between a START and STOP condition[*)]		t_{BUSF}	1300			ns
3	Clock low time[*)]		t_{LO}	1300			ns
4	Clock high time[*)]		t_{HI}	600			ns
5	START condition hold time[*)]		t_{SH}	100			ns
6	Data setup time[*)]		t_{SU}	100			ns
7	Data hold time[*)]		t_{HI2C}	0			ns
8	Setup time for repeated START condition[*)]		t_{RSH}	600			ns
9	Setup time for STOP condition[*)]		t_{PSU}	600			ns
10	Rise time of SDA and SCL signals[*)]		t_R			300	ns
11	Fall time of SDA and SCL signals[*)]		t_F			300	ns
12	Capacitive load at bus lines[*)]		C_{Bus}			400	pF

[*)] Not tested in production

[a)] See 6.6-1 for the corresponding timing diagram

6 Functional Description

6.1 Overview

The E524.72 is a high precision, factory calibrated absolute pressure sensor for absolute air pressure measurement. Pressure output data are available at a digital data interface (I2C).
Also temperature measurement data from an integrated temperature sensor and information on the sensor integrity are accessible via this digital interface.

6.2 Global Sensor Parameters

6.2.1 Digital Pressure Transfer Function

In general digital output data are available with a word length of 16 bit. The numeric representation is always as 2's complement, which results in a range of:

0 ... +32767 LSB (positive range, or 0000h ... 7FFFh)
-32768 ... -1 LSB (negative range, or 8000h ... FFFFh)

For representation of absolute pressure output only the positive range of values is used. In case of under pressure with pressure falling below the lower definition range, the MSB of the output data can be used as an under-range indicator (showing negative pressure data).

The pressure sensor device is calibrated in Elmos end-of-line production test. The linear pressure transfer function is described by the following equation:

$$D_p = a_1 * P_A + a_0$$

Sensitivity a_1 and offset a_0 are trimmed during the calibration process to exhibit as low as possible sensitivity to external conditions (temperature).

See 6.2.2-1 depicting the pressure transfer characteristic.

6.2.2 Pressure range: 40 - 180 kPa

Table 6.2.2-1: Pressure transfer function parameters, digital output

Pressure		***Digital Output***		***Sensitivity / Offset***		
Symbol	**Pressure [kPa]**	**Symbol**	**Value [LSB_{16}]**	**Symbol**	**Value**	**Unit**
$P_{A,1}$	40	$D_{P,1}$	0	a_1	220	LSB_{16}/kPa
$P_{A,2}$	180	$D_{P,2}$	30800	a_0	-8800	LSB_{16}

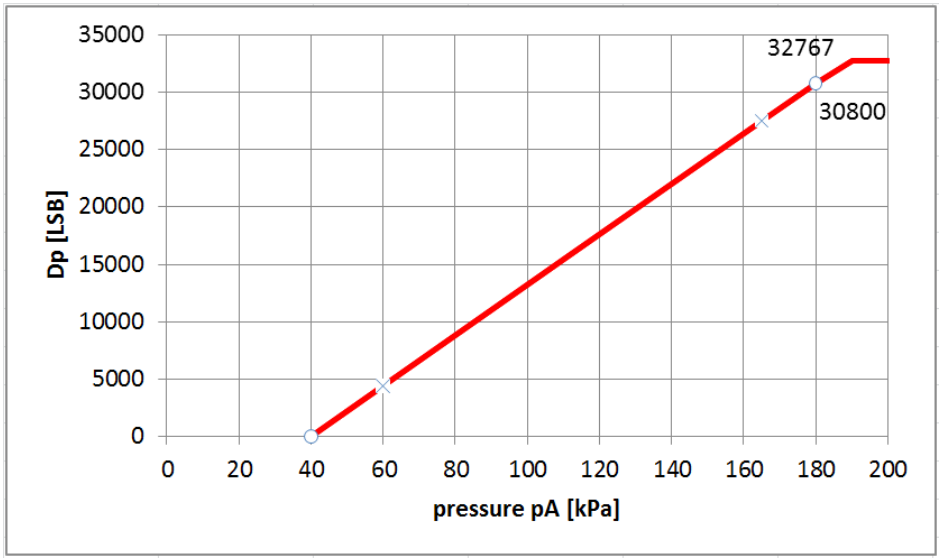

Figure 6.2.2-1: Digital Pressure Transfer Characteristic

The positive number range is exploited for regular pressure output data up to the maximum +32767.
If the MSB of the 16-bit data word is 1, this indicates negative numbers, which can be used as an indicator for under pressure (pressure below minimum value $P_{A,1}$.

6.2.3 Pressure Accuracy

The accuracy of the measured pressure output is given in medium temperature range T_{MID} = 0 ... 85°C, low temperature range T_{LOW} = -40°C ... 0°C, and high temperature range T_{HIGH} = 85°C ... 125°C, respectively. Best accuracy is achieved in the medium temperature range.

The detailed accuracy data are given in 5.1-1.
The accuracy bands are enlarged linearly towards min. and max. temperatures as depicted in 6.2.3-1.

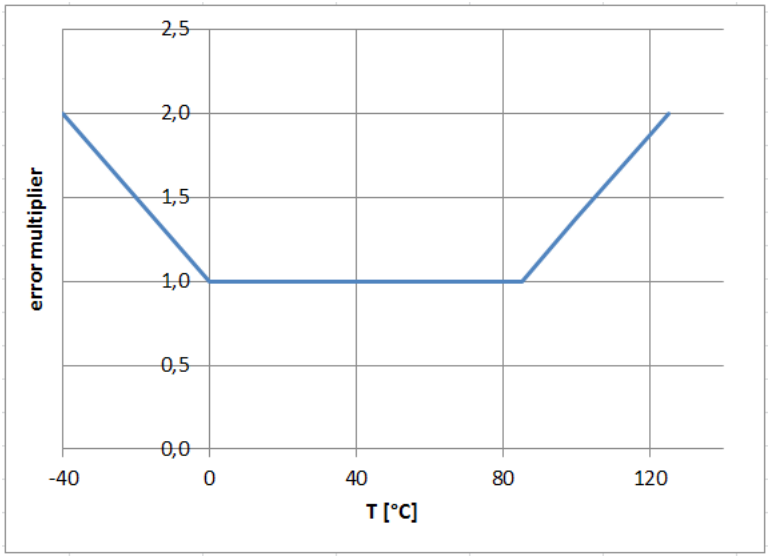

Figure 6.2.3-1: Temperature Dependent Error Multiplier of Pressure Accuracy (60 -165 kPa)

6.2.4 Digital Temperature Transfer Function

An internal temperature sensor measures the chip temperature. The temperature output which can be read via the digital interface is calibrated in Elmos' functional test. The temperature characteristic is linear and is described by the following equation:

$$D_T = b_1 * T_A + b_0$$

Sensitivity b_1 and offset b_0 are trimmed during the end-of-line calibration at Elmos.

Table 6.2.4-1: Temperature transfer function parameters

Pressure		***Digital Output***		***Sensitivity / Offset***		
Symbol	**Temperature [°C]**	**Symbol**	**Value [LSB_{16}]**	**Symbol**	**Value**	**Unit**
$T_{A,1}$	-50	$D_{T,OUT,1}$	0	b_1	150	LSB_{16}/°C
$T_{A,2}$	150	$D_{T,OUT,2}$	30000	b_0	7500	LSB_{16}

The positive number range are exploited up to the maximum +32767. When the MSB is 1, this indicates negative numbers and it can be used as an indicator for temperature below -50 °C (typical).

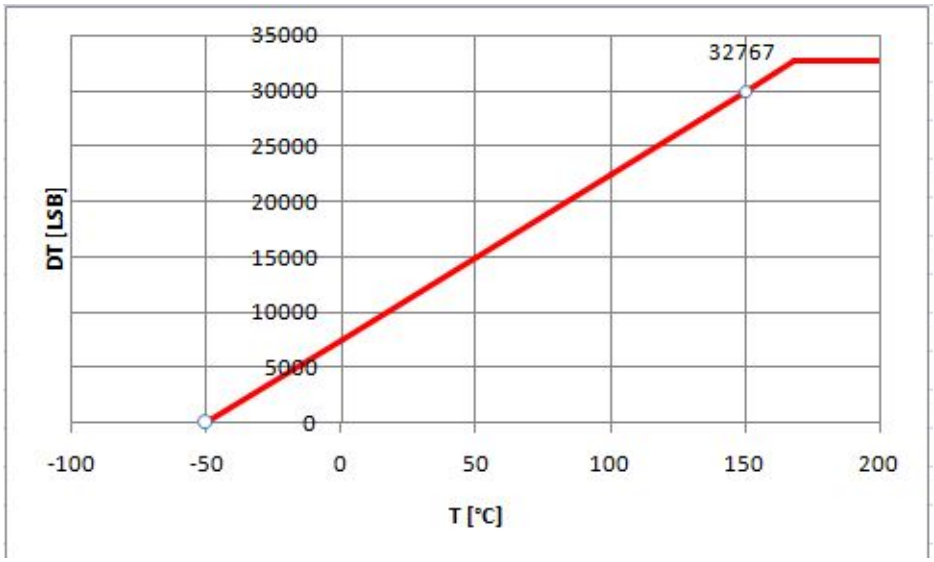

Figure 6.2.4-1: Digital Temperature Transfer Characteristic

6.3 Voltage Supply

The sensor device is supplied from pin VDD (typical 5.0 or 3.3V). From this supply input several internal voltage regulators are generating stabilized voltage levels for analog and digital circuit sections. The different internal voltages are supervised by power-OK comparator structures.
Also a stabilized voltage for the resistive pressure sensor cell is derived from VDD.
The digital data interface allows to set it into *Sleep Mode* using a specific command (*Enter Sleep Mode*), which ensures very low consumption $I_{VDD,SM}$. Of course, in *Sleep Mode* no pressure data are acquired.

For the I2C command to send the sensor into *Sleep Mode* see 6.6.2. To wake-up the sensor to normal operation, the clock input SCL shall be toggled (a rising edge at SCL will wake-up the device).

6.4 Pressure Signal Path

The signal from a resistive pressure sensor bridge is processed in the analog front-end (AFE) of the integrated sensor signal conditioner as depicted in 6.4-1.

Here, the differential voltage input is amplified in a two stage programmable gain amplifier (PGA1, PGA2). This allows to optimize the gain setting to the full-scale input from the resistive bridge. Additionally, an offset correction network in the analog front-end (after the first amplifier stage PGA1) supports coarse offset trimming by a voltage injected from a DAC. The output from the 2nd amplifier stage is fed to a high resolution ADC. A digital low-pass filter is used to adjust the response time and overall noise performance of the sensor IC.
The complete signal pre-processing in the analog front-end is fully ratiometric to an on-chip voltage reference, i.e. the bridge supply, offset-DAC and the ADC reference are related to the same reference. By this any variations of the reference voltage will be cancelled in the digitized output of the ADC, resulting in negligible temperature variation of the acquired pressure signal and an excellent power supply rejection.

All trimming parameters are adjusted to achieve optimum performance for the resistive sensor bridge used inside this pressure sensor device.

The resistive bridge type pressure sensor cell connected at pins SIP, SIN, SVDD, and SVSS, respectively, is supervised by the sensor bridge diagnostic as described in chapter 6.5.1.

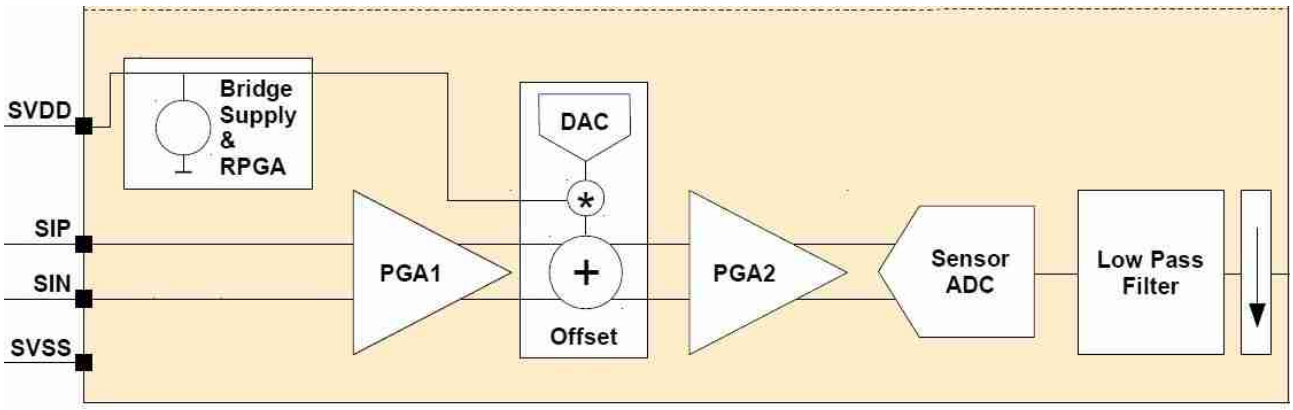

Figure 6.4-1: Pressure Signal Path (AFE)

6.5 Diagnosis Functions

6.5.1 Sensor Bridge Diagnostics

Internal errors of the pressure sensor shall be detected and indicated at the signal output of the component.

Bridge Diagnostics
An integrated bridge diagnostic circuit supervises the resistive pressure sensor cell to detect any of the faults as follows:

- *Sensor faults*:
  - Short of any of the four bridge resistors of the pressure cell
  - Interruption of any of the four of bridge resistors

- *Wiring faults*:
  - Open connection of any of the bridge supply or signal inputs SVDD, SVSS, SIP, or SIN
  - Wrong connection of any sensor bridge terminal SIP or SIN to either SVDD or SVSS

For bridge diagnostics the signal input path pins SIP and SIN are pulled to ground with two matched low current sinks, which are active permanently (true background diagnostics). The voltage levels of the two signal path inputs (SIP and SIN) are monitored by two window comparators with detection thresholds of the low and high comparators at 25% SVDD and 75% SVDD, respectively.
The comparator outputs are combined in a logic (OR) and fed to a debouncing low pass filter. In case of an error the bridge check fail event is indicated by setting the bit **bc_fail** in the internal STATUS register.

Bridge Supply Diagnostics
Another comparator function checks if the supply to the sensor bridge is in its specified range. Here, in case of a supply error the bit **bs_fail** in the STATUS register will be set.

Error indication
The diagnosis bits **bc_fail** and **bs_fail** in the STATUS register (see 6.7) can be read via the digital I2C interface.

6.5.2 Configuration Memory Check

The integrity of data stored in the embedded NVM used as the configuration memory (calibration parameters, device configuration, device ID, etc.) is checked at power-up of the component by calculation of a check sum (CRC). If a check sum error is detected no reliable pressure calculation is possible.
Therefore, the sensor remains in idle state, i.e. no pressure data transferred to the output registers DSP_T and DSP_S. In this case the bits **STATUS.dsp_s_up** and **dsp_t_up** will never be set.

6.6 I2C Interface

The E524.72 features an I²C slave interface. This interface provides direct access to registers of the memory of the IAP sensor. An external I²C master (e.g. a µC) can read and write 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 read/writes must start at **word aligned addresses** (i.e. LSB of memory address equals 0) and read/write an **even number of bytes**.

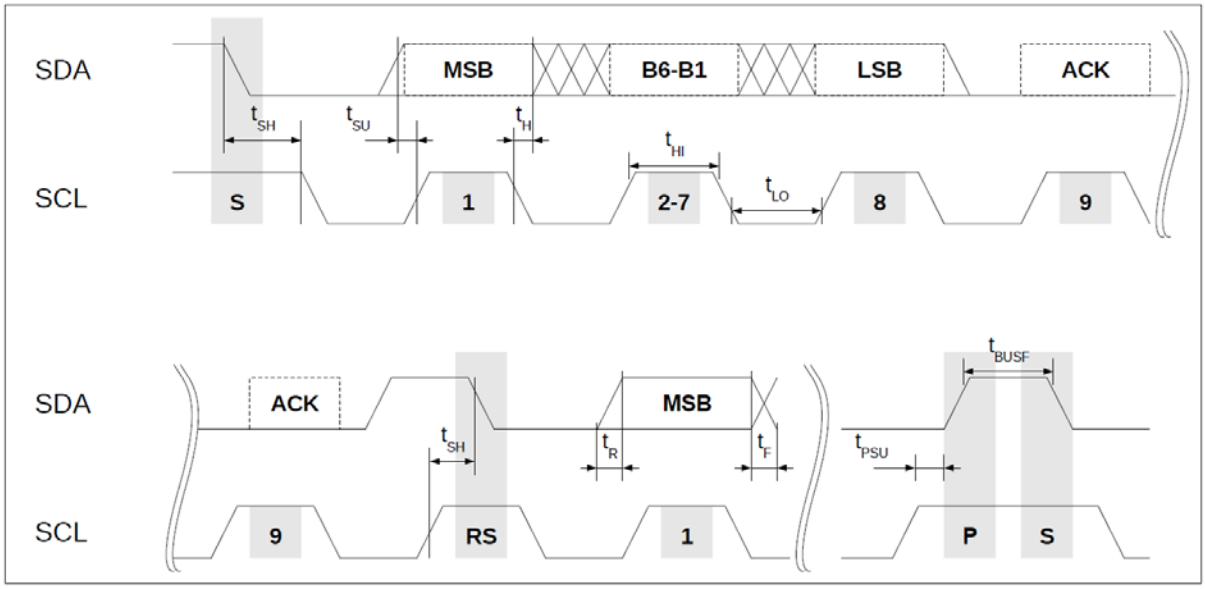

Figure 6.6-1: I2C Interface Timing Diagram

6.6.1 I2C Command Format

The IAP-Sensor 524.72 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 (see 6.6.1-1), for LSB = 1 the protocol is extended by a CRC protection (see 6.6.1-2). 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 depicted in the next two figures 6.6.1-1 and 6.6.1-2, respectively.

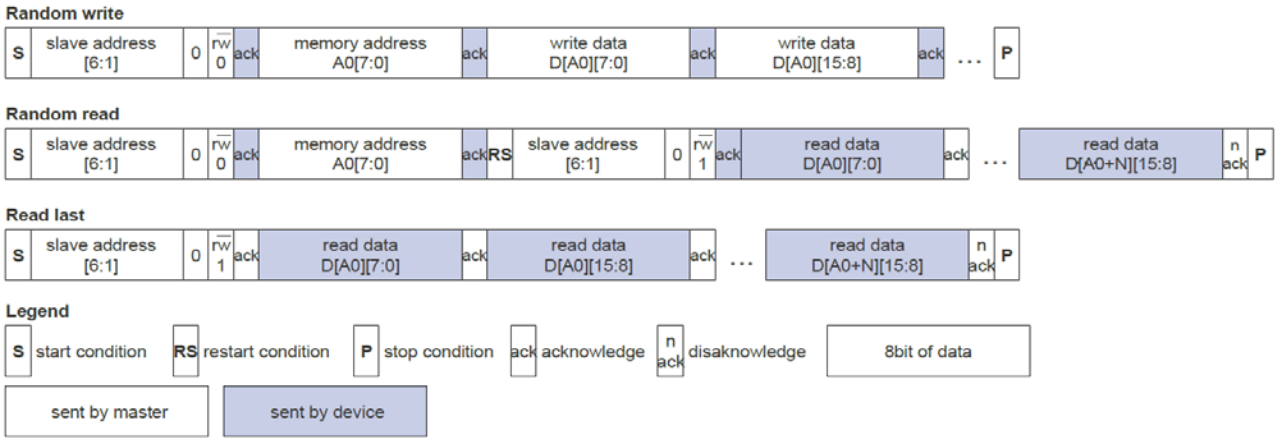

Figure 6.6.1-1: I²C Read / Write Commands - Standard EEPROM compatible protocol

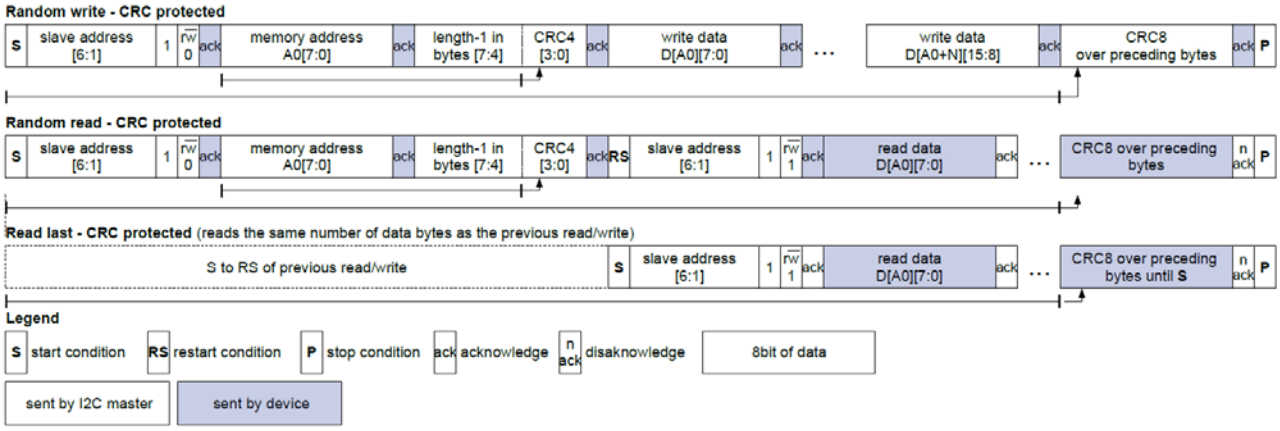

Figure 6.6.1-2: I²C Read / Write Commands - CRC protected protocol

Two different slave addresses can be selected by use of pin-coding at SA0. This coding affects the LSB+1 of the slave address. Slave addresses as described in the next table are supported:

Table 6.6.1-1: BAP sensor slave address

SA0 setting	*7-bit slave address (EEPROM compatible)*	*7-bit slave address (CRC protected)*
0	[b6:b0] = 1101100 (default)	[b6:b0] = 1101101 (default)
1	[b6:b0] = 1101110 (default)	[b6:b0] = 1101111 (default)

The *memory address* field sets the byte address of the first memory location to be read or written. Only 16-bit-word aligned read/writes are supported, i.e. the LSB of memory address has to be zero always. The read/write data are 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 4/4 bytes. 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.

6.6.2 I²C Command Examples

For all examples below the 7-bit device slave address used is 6C for unprotected commands, and 6D for CRC protected commands, respectively. Exemplary C-code is available for all commands.

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.

Table 6.6.2-1: Random Read

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'd Status (b7 - b0) ad. 0x32	sync'd Status (b15 - b8)

The following sequence writes one 16-bit word to address 0x22. This will copy 0x6C32 into the command register CMD to move the component to Sleep Mode.

Table 6.6.2-2: Random Write

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				

The next command sequence describes a CRC protected *Read* command of 2 subsequent 16-bit words starting at memory address 0x50 to read the serial number of the sensor IC.

Table 6.6.2-3: Random Read - protected by CRC

Byte #	***0***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
SBM (sent by master)	0xDA	0x50	0x3y	0xDB					
SBM comment	slave address 6D + LSB = 0 for *Write*	memory address	3: length = 4Byte y: CRC4	slave address 6D + LSB = 1 for *Read*					
SBS (sent by sensor)					0x48	0x6A	0x01	0x00	0xYY
SBS comment					SER0 (Lo-Byte) ad. 0x50	SER0 (Hi-Byte)	SER1 (Lo-Byte) ad. 0x52	SER1 (Hi-Byte)	CRC8 (calc'd)

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.

Table 6.6.2-4: Random Write - protected with CRC

Byte #	***0***	***1***	***2***	***3***	***4***	***5***
SBM (sent by master)	0xDA	0x36	0x16	0x9E	0xCF	0xA1
SBM comment	slave address 6D + LSB = 0 for *Write*	memory address	1: length = 2Byte 6: CRC4	STATUS (Lo-Byte) ad. 0x36	STATUS (Hi-Byte)	CRC8 (calculated)
SBS (sent by sensor)						
SBS comment						

6.7 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.

Table 6.7-1: *Command* register

0x22		***CMD***		
bits	**name**	**default**	**rw**	**description**
15:0	cmd	0	w	Writing to this register controls the state of the IAPS 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.

Table 6.7-2: *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.

Table 6.7-3: *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.

Table 6.7-4: *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 ensures 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.

Table 6.7-5: *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

0x36		*STATUS*			
10	dsp_sat	0	rw	event	1: a DSP computation leading to the 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

1)

- "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.

Table 6.7-6: *Serial Number* register 0

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

Table 6.7-7: *Serial Number* register 1

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

7 Package Reference

The E524.72 is available in a Pb free, RoHs compliant, 8-pin SO plastic package with footprint according to JEDEC MO-012-F, variant AA. The package is classified to Moisture Sensitivity Level 3 (MSL 3) according to JEDEC J-STD-020E with a soldering peak temperature of 260°C.
Note: Thermal resistance junction to ambient $R_{th,ja}$ is 160 °C/W, based on JEDEC standard JESD-51.

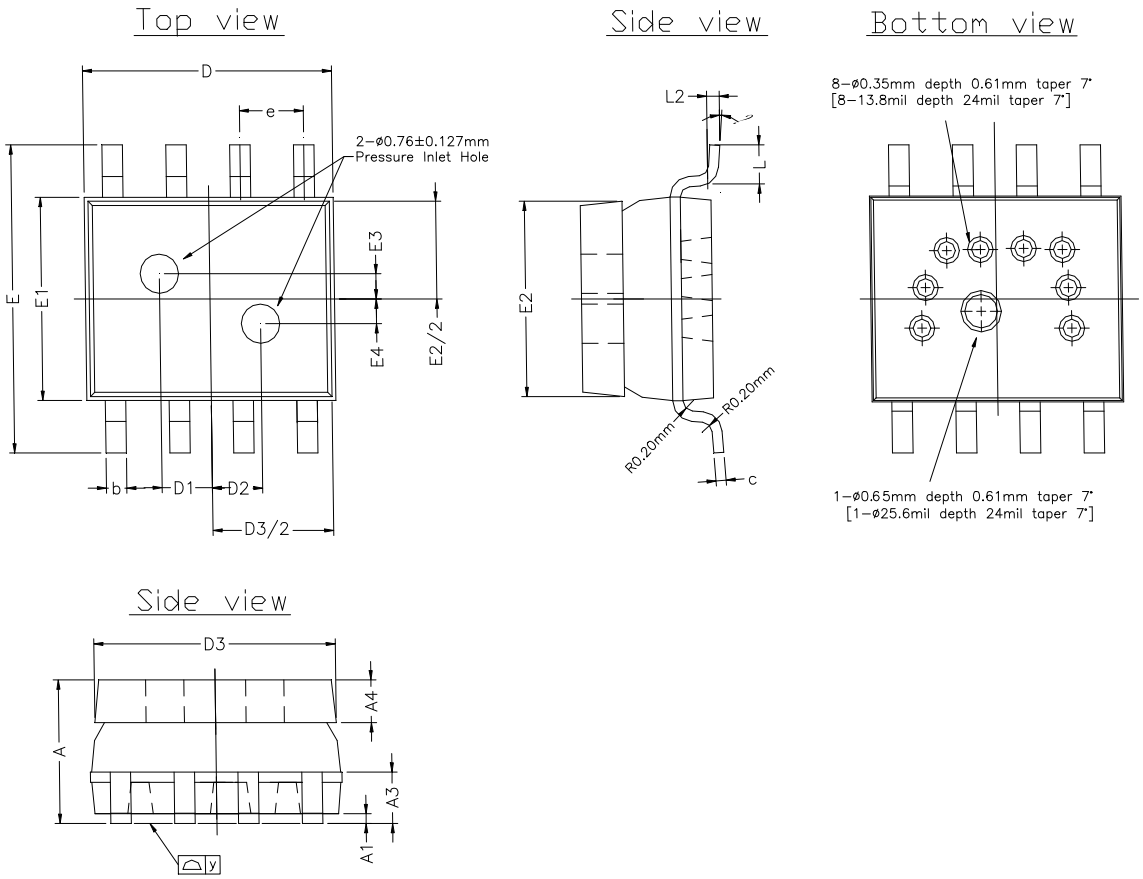

Figure 7-1: Package Outline

Note: Contact factory for specific location and type of pin 1 identification.

Table 7-1: Package Characteristics

Description	***Symbol***		***mm***	
		min	**typ**	**max**
Package height	A		2.79	
Stand off	A1		0.19	
Width of terminal leads	b		0.41	
Thickness of terminal leads	c		0.20 Ref	
Length of terminal for soldering to substrate	L		0.76	
Angle of lead mounting area	Θ [°]	0	-	8
Lead pitch	e		1.27 BSC	
Package length	D		4.95	
Package total width	E		6.00	

Description	*Symbol*		*mm*	
Package body width	E1		3.95	
Thickness of the lid	A4		0.83 Ref	
Length of lid	D3		4.80	
Width of lid	E2		3.80	
Off center position, longitudinal, inlet hole	D1 / D2		1.00	
Off center position, lateral, inlet hole	E3 / E4		0.49	

8 General

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9 Contact Info

Table 9-1: Contact Information

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