CPS430

Consensic

Data Sheet

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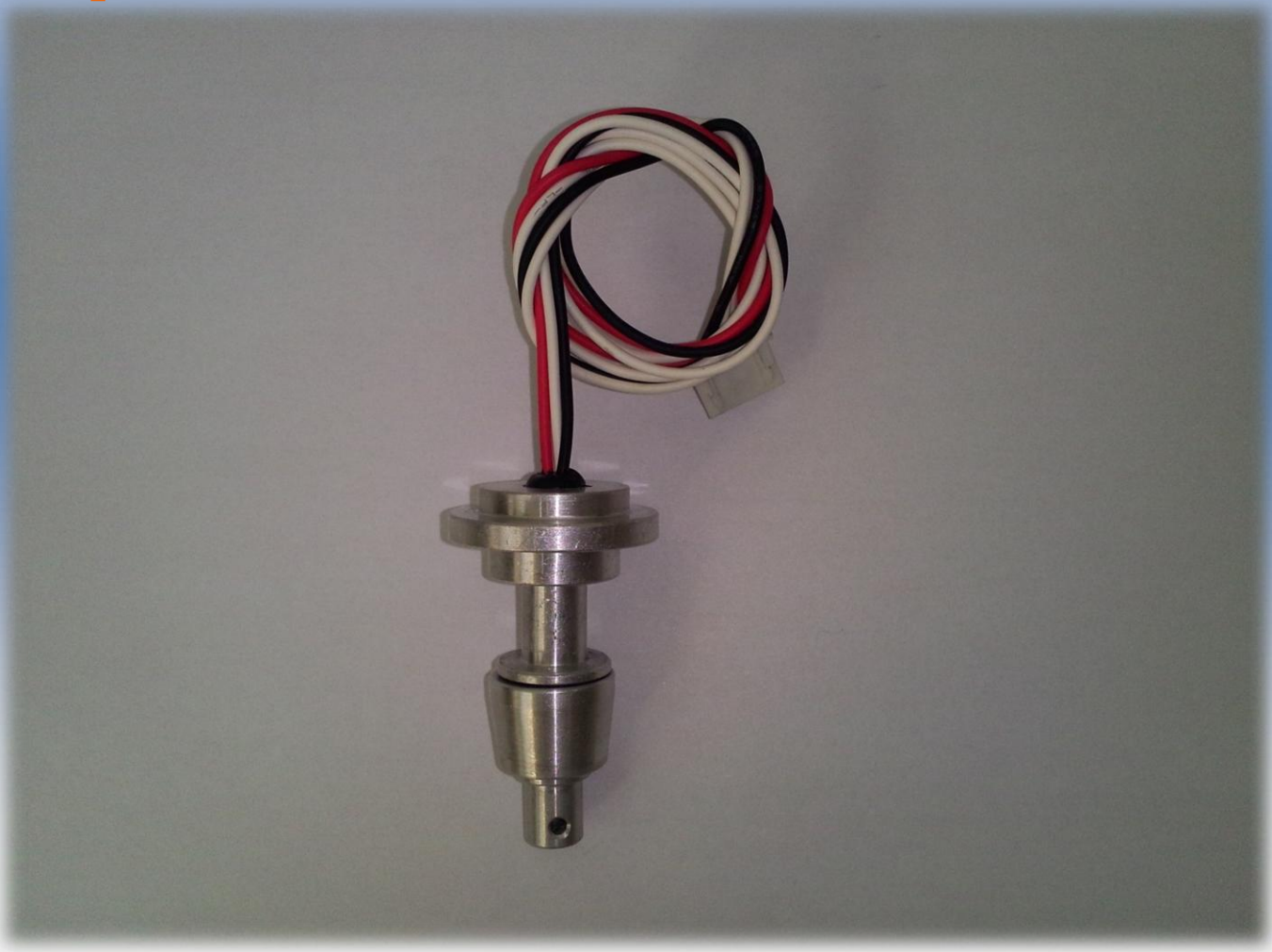
October 2014
DAT-0011

High-Temperature Steam Pressure Module



CPS430

High-Temperature Steam Pressure Module

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Overview

The CPS430 is an absolute pressure module solution with a fully calibrated pressure and temperature compensated digital output.The module is designed to operate in extreme temperatures and conditions.

The CPS430 module comprises of an ultra-smallMEMS pressure sensor and a conditioning ASIC for accurate pressure measurements. Fully calibrated pressure and temperature digital output are read via the I²C interface. There is no need to separately download internal calibration coefficients and have the host microcontroller conduct complicated compensation calculations. The pressure measurement range of 80 to 400kPa makes the CPS430 suitable for a wide range of applications.

Applications

- Home Appliance
- Industrial Equipment
- Air Control Systems
- Vacuum Systems

Benefits

- Fully Calibrated Pressure and Temperature Compensated Digital Output
- External Clock not Required
- High Resistance to Sensing Media

Features

- Pressure Measurement Range: 80 to 400kPa
- Conversion Time: >5ms
- Supply Voltage: 5.0V ±10%
- Absolute Temperature Range: -40°C to +125°C
- Pressure Accuracy: <±2kPa
- Temperature Accuracy: ±2.0°C

Interfaces

- I²C ™* Compatible (≤400kHz)

*I²C ™ is a registered trademark of NXP

RoHS Compliant

CPS430APPLICATION CIRCUIT

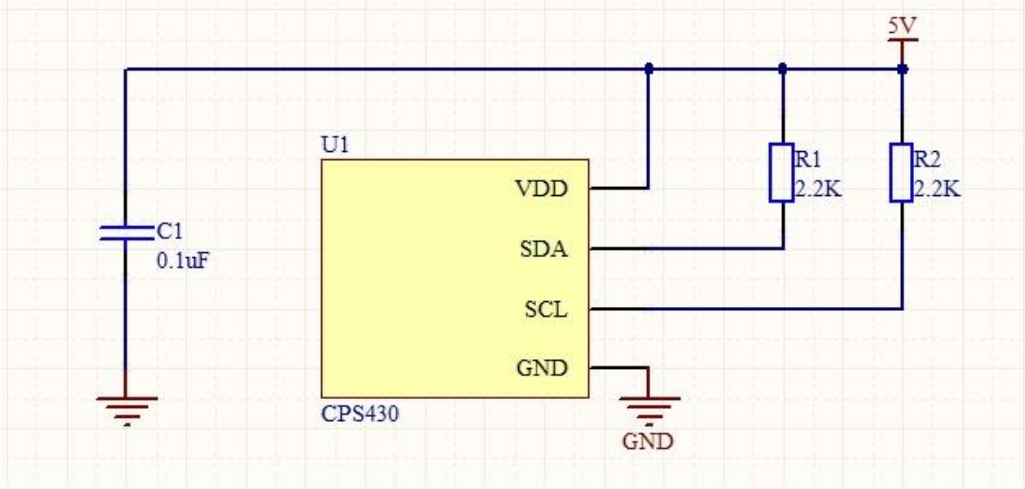

TABLE1: ORDERING INFORMATION

PART NUMBER	OUTPUT MODE	OPERATION MODE	PACKAGE
CPS430-M	I^2C	Sleep	Modular Product
SALES and CONTACT INFORMATION contact@consensic.com www.consensic.com			

United States
Consensic, Inc.
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1 OPERATING CHARACTERISTICS

1.1 ABSOLUTE RATINGS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Over Pressure					2X FS	kPa (bar)
Supply Voltage (with respect to GND)	V_{DD}		-0.3		6.5	V
Voltages at Analog and Digital I/O Pins	V_{A_IO} V_{D_IO}		-0.3		V_{DD} +0.3	V
Storage Temperature	T_{STOR}		-60		150	°C

1.2 OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
PRESSURE SENSOR						
Range			80 (800)		400 (4000)	kPa (mbar)
Resolution				0.0625 (0.625)		kPa (mbar)
Accuracy		@125°C	-2.5 (-25)	2 (20)	2.5 (25)	kPa (mbar)
TEMPERATURE SENSOR						
Range			-40		125	°C
Resolution				0.01		°C
Accuracy		-40°C to 85°C	-2	±1	+2	°C
OPERATION						
Supply Voltage to GND[1]	V_{SUPPLY}		2	5.0	5.5	V
Operating Temperature Range			-40		125	°C
I^2C Pull-Up Resistors	R_{PU}		1	2.2		kΩ

[1] Factory calibrated for Pressure and Temperature at 5.0V±10%. Output accuracy will be affected if used outside this range. Other ranges available upon request.

1.3 ELECTRICAL PARAMETERS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
SUPPLY CURRENT						
Supply Current, average(1) during conversion(2) standby(no conversion)	 Iavg Isc Iss	VDD=5V		 3.95 1.5	 0.2	 µA mA uA
ANALOG TO DIGITAL CONVERTER						
Resolution	r_{ADC}				24	Bit
I^2C Clock Frequency	$F_{C,I2C}$				400	kHz

Notes

1) Under the assumption of one conversion every second. Conversion means either a pressure or a temperature measurement
2) During conversion, the sensor will be switched on to VDD, and after conversion ended, the sensor will automatically be switched off from VDD.

2 OPERATION MODES

The CPS430 is factory programmed in Sleep Mode. In Sleep Mode, the CPS430 waits for commands from the master before taking measurements. After it receives a MR command, it runs a full measurement, and then turns into sleep mode again.

3 OUTPUT MODES

3.1 I²C ADDRESS

Two-wire I²C is available for reading data from the CPS430.

The factory setting for the I²C slave address is **0x6D**and the communication is restricted to this address only.

3.1.1 I²C COMMANDS

Table 2 details the commands to interface with the device in the I²C mode.

TABLE 2: I²C COMMANDS

TYPE	DESCRIPTION
Get Data (GD)	Used to Get Data in Active Mode, and AutomaticallyTurns into Sleep Mode Again
Measurement Request (MR)	Used to Enter Active Mode from Sleep Mode, and Take a Measurement

The Get Data (GD) command is used to get data in Activemode. With the start of communication (after reading the slave address) the entire output packet will be loaded in a serial output register. The register will be updated after the communication is finished. The output is always scaled to 24-bits.

The ordering of the bits is “big-endian”.

3.1.1.1 I²C GET DATA

An I²C Get Data command starts with the 7-bit slave address and the 8th bit = 1 (READ). The device as the slave sends and acknowledges (ACK) indicating success. The number of data bytes returned by the device is determined by when the master sends the NACK and stop condition.

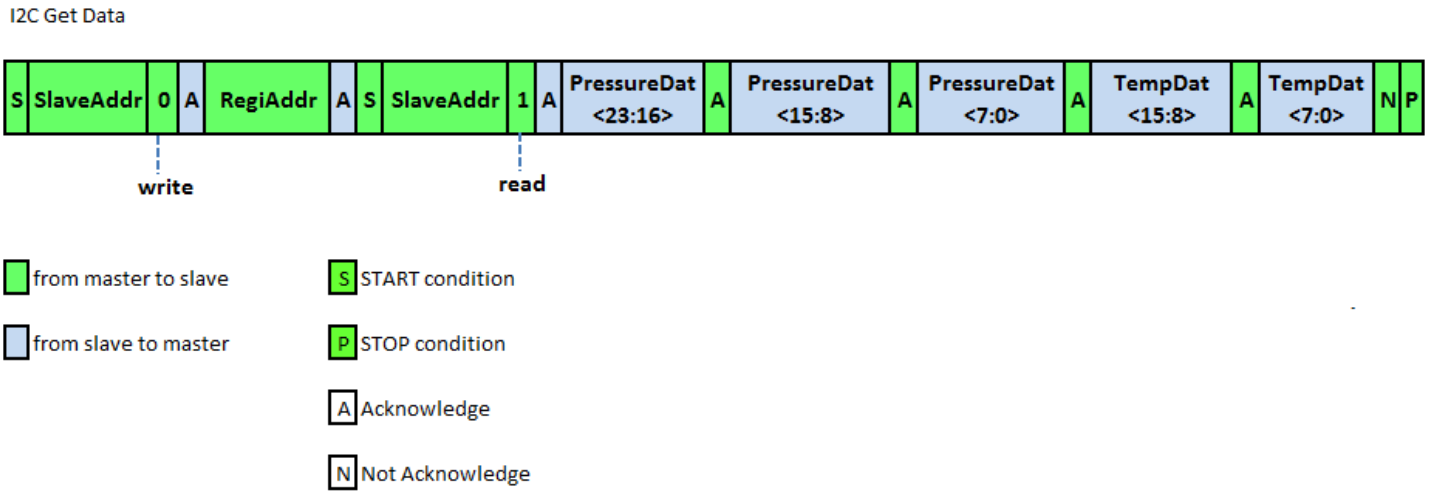
Figure 1 shows examples of receiving a total of 8 bytes. The first byte contains the I²C address followed byinternal register address(0x06), and then restart again, with I²C address,three pressure bytes and two temperature bytes then output.

In Figure 1, the last five bytes returns 3 bytes of pressure data followed by 2 bytes of temperature data.

After executing the MR command, use the GD command to retrieve the Pressure and Temperature raw output counts.

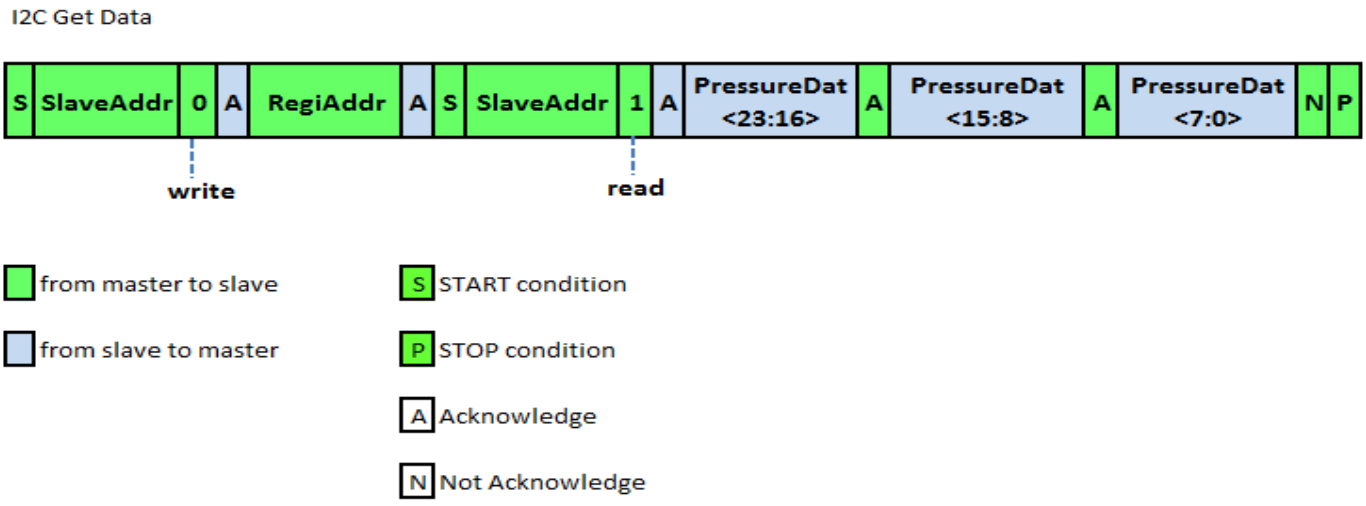
For 2 bytes temperature counts, they are 2's complement code.

FIGURE 1: 7-BIT SLAVE ADDRESS FOLLOWED BY THREE PRESSURE AND TWO TEMPERATURE BYTES



For Pressure data only, the data stream can be terminated after thesixthpressure byte. See Figure 2below.

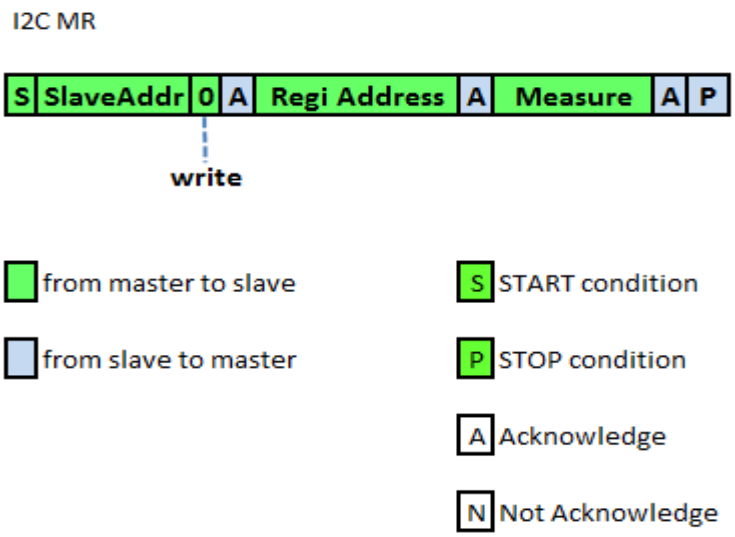
FIGURE 2: 7-BIT SLAVE ADDRESS FOLLOWED BY THREE PRESSURE BYTES



3.1.1.2 I²C MEASUREMENT REQUEST

The I²C MR is used to wake up the device in Sleep Mode and start a complete cycle starting with thePressure measurement, followed by the Temperature measurements; after the DSP calculations. The results are then written to the digital output register. As shown in Figure 6, the communication contains firstly the slave address and the WRITE bit (0), and then the Register Address of 0x30, finally 0xA for measurement, sent by the master. After the IC responds with the slave ACK, the master creates a stop condition.

FIGURE 3: I²C MEASUREMENT REQUEST COMMAND (0xA)



4 CALCULATING OUTPUT

After retrieving the data, the compensated output can be calculated by following the equations below.

4.1 PRESSURE OUTPUT

An example of the 24-bit compensated pressure with a full scale range of 80 to 400kPa can be calculated as follows:

Pressure [kPa] = (Pressure 3rd Byte [23:16] x 65536+Pressure 2nd Byte [15:8] x 256 + Pressure1st Byte [7:0]) / 2^4/1000

4.2 TEMPERATURE OUTPUT

The 16-bit compensated temperature can be calculated as follows:

Positive Temperature [°C] = (Temperature High Byte [15:8] x 256 + Temperature Low Byte [7:0]) / 2^8

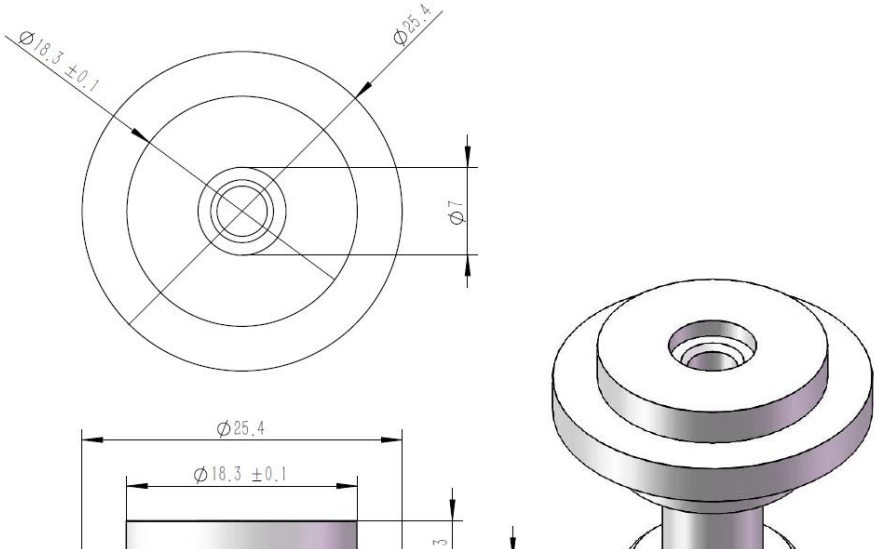
Negative Temperature [°C] = (Temperature High Byte [15:8] x 256 + Temperature Low Byte [7:0]-65536) / 2^8

5 MODULE ASSEMBLY AND DIMENSION

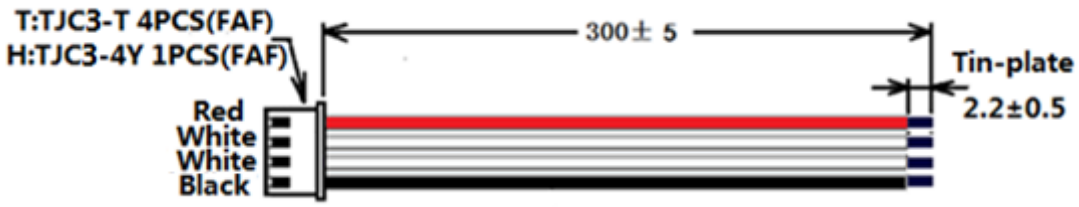
5.1 HOUSING

Material: AluminumAlloy A6061.

FIGURE 4: CPS430 MODULE DIMENSIONS



5.2 POWER AND SIGNAL CABLE



POWER AND SIGNAL CABLE

As the picture shown above, the power and signal cable has 4 conductor wires---one red, one black and two white, connected to a white connector (TJC3-4Y).The cable definition is as below:

WIRE COLOR	DESCRIPTION
Red	VDD
Black	GND
White Adjacent Red	SCL
White Adjacent Black	SDA

Conductor wire spec:

1. UL3398 24AWG, VW-1, 150°C, 300V, XL-PE.
2. Connector: TJC3-4Y, Tensile Strength> 5.1kgf， Terminal: TJC3-T
3. All materials comply with ROHS and REACH

6 DOCUMENT HISTORY

REVISION	DATE	DESCRIPTION
0.0	27-OCT-2014	Initial Release

7 DISCLAIMER

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