MPL115A2

Miniature I²C digital barometer, 50 to 115 kPa

Rev. 10 — 10 October 2017 Data sheet: technical data

1 General description

The MPL115A2 is an absolute pressure sensor with a digital I²C output targeting low cost applications. A miniature 5 x 3 x 1.2 mm LGA package is ideally suited for the space constrained requirements of portable electronic devices. Low current consumptions of 5 µA during Active mode and 1 µA during Shutdown (Sleep) mode are essential when focusing on low-power applications. The wide operating temperature range spans from –40 °C to +105 °C to fit demanding environmental conditions.

The MPL115A2 employs a MEMS pressure sensor with a conditioning IC to provide accurate pressure measurements from 50 to 115 kPa. An integrated ADC converts pressure and temperature sensor readings to digitized outputs via a I²C port. Factory calibration data is stored internally in an on-board ROM. Utilizing the raw sensor output and calibration data, the host microcontroller executes a compensation algorithm to render *Compensated Absolute Pressure* with ±1 kPa accuracy.

The MPL115A2 pressure sensor's small form factor, low power capability, precision, and digital output optimize it for barometric measurement applications.

2 Features

- Digitized pressure and temperature information together with programmed calibration coefficients for host micro use.
- Factory calibrated
- 50 kPa to 115 kPa absolute pressure
- ±1 kPa accuracy
- 2.375 V to 5.5 V supply
- Integrated ADC
- I²C Interface (operates up to 400 kHz)
- 7-bit I²C address = 60h
- Monotonic pressure and temperature data outputs
- Surface mount RoHS compliant package

3 Applications

- Barometry (portable and desktop)
- Altimeters
- Weather stations
- Hard-disk drives (HDD)
- Industrial equipment
- Health monitoring
- Air control systems

4 Ordering information

Table 1. Ordering information

Type number	Package		
	Name	Description	Version
MPL115A2	TSON8	LGA 8 I/O, 3 X 5 X 1.25 PITCH, SENSOR 1.2MAX MM PKG	SOT1769-1

4.1 Ordering options

Table 2. Ordering options

Device Name	Package Options	# of Ports			Pressure Type			Digital Interface
		None	Single	Dual	Gauge	Differential	Absolute	
MPL115A2	Tray	•					•	I²C
MPL115A2T1	Tape & Reel (1000)	•					•	I²C

5 Block diagram

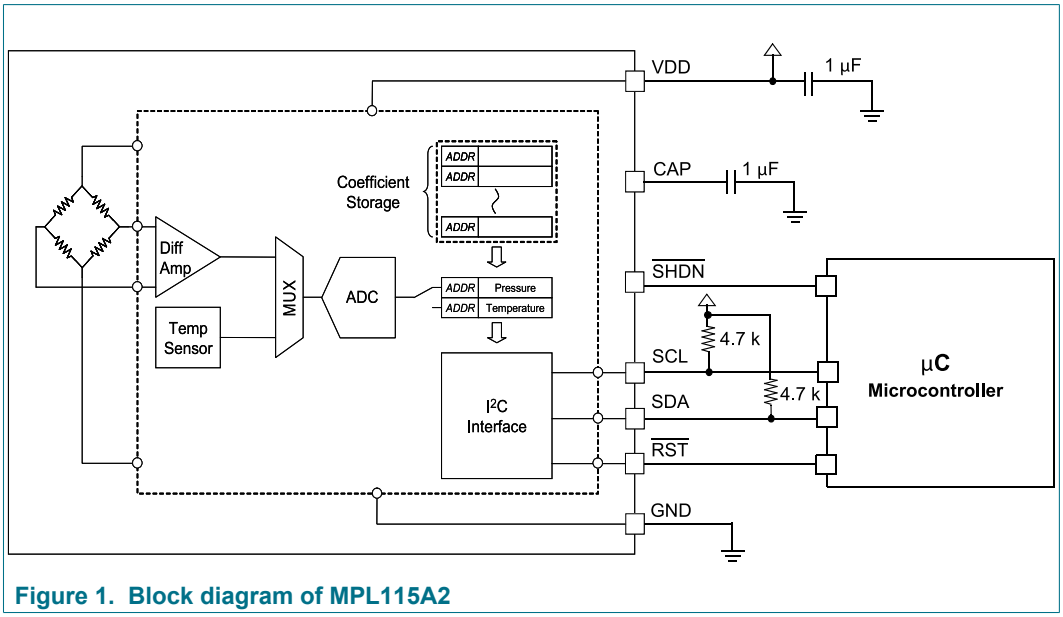


Figure 1. Block diagram of MPL115A2

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

6 Pinning information

6.1 Pinning

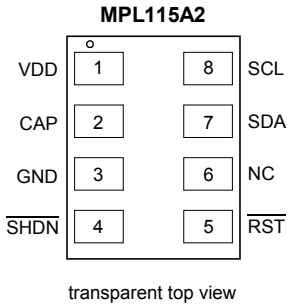


Figure 2. Pin configuration

6.2 Pin description

Table 3. Pin description

Pin	Name	Function
1	VDD	Power Supply Connection: VDD range is 2.375 V to 5.5 V.
2	CAP	1 µF connected to ground.
3	GND	Ground
4	$\overline{\text{SHDN}}$	Shutdown: Connect to GND to disable the device. When in shutdown, the part draws no more than 1 µA supply current and all communications pins ($\overline{\text{RST}}$, SCL, SDA) are high impedance. Connect to VDD for normal operation.
5	$\overline{\text{RST}}$	Reset: Connect to ground to disable I²C communications.
6	NC	No connection
7	SDA[1]	Serial data I/O line
8	SCL[1]	Serial clock input.

[1] Use 4.7 kΩ pullup resistors for I²C communication.

7 Handling and Board Mount Recommendations

The sensor die is sensitive to light exposure. Direct light exposure through the port hole can lead to varied accuracy of pressure measurement. Avoid such exposure to the port during normal operation.

7.1 Methods of Handling

Components can be picked from the carrier tape using either the vacuum assist or the mechanical type pickup heads. A vacuum assist nozzle type is most common due to its lower cost of maintenance and ease of operation. The recommended vacuum nozzle configuration should be designed to make contact with the device directly on the metal cover and avoid vacuum port location directly over the vent hole in the metal cover of the

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

device. Multiple vacuum ports within the nozzle may be required to effectively handle the device and prevent shifting during movement to placement position.

Vacuum pressure required to adequately support the component should be approximately 25 inches Hg (85 kPa). This level is typical of in-house vacuum supply. Pickup nozzles are available in various sizes and configurations to suit a variety of component geometries. To select the nozzle best suited for the specific application, it is recommended that the customer consult their pick and place equipment supplier to determine the correct nozzle. In some cases it may be necessary to fabricate a special nozzle depending on the equipment and speed of operation.

Tweezers or other mechanical forms of handling that have a sharp point are not recommended since they can inadvertently be inserted into the vent hole of the device. This can lead to a puncture of the MEMS element that will render the device inoperable.

7.2 Board Mount Recommendations

Components can be mounted using solder paste stencil, screen printed or dispensed onto the PCB pads prior to placement of the component. The volume of solder paste applied to the PCB is normally sufficient to secure the component during transport to the subsequent reflow soldering process. Use of adhesives to secure the component is not recommended, but where necessary can be applied to the underside of the device.

Solder pastes are available in variety of metal compositions, particle size and flux types. The solder paste consists of metals and flux required for a reliable connection between the component lead and the PCB pad. Flux aids the removal of oxides that may be present on PCB pads and prevents further oxidation from occurring during the solder process.

The use of a No-Clean (NC) flux is recommended for exposed cavity components. Using pressure spray, wire brush, or other methods of cleaning is not recommended since it can puncture the MEMS device and render it unusable. If cleaning of the pcb is performed, Water Soluble (WS) flux can be used. However, it is recommended the component cavity is protected by adhesive Kapton tape, vinyl cap or other means prior to the cleaning process. This covering will prevent damage to the MEMS device, contamination, and foreign materials from being introduced into device cavity as result of cleaning processes.

Ultrasonic cleaning is not recommended as the frequencies can damage wire bond interconnections and the MEMS device.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

8 Functional description

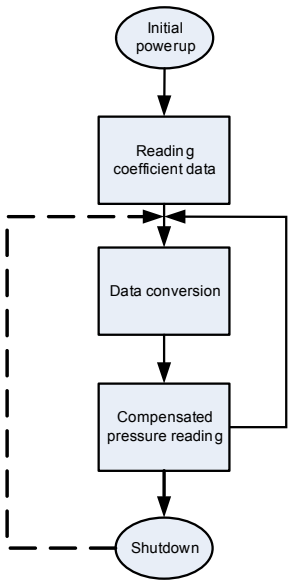


Figure 3. Sequence flow chart

The MPL115A interfaces to a host (or system) microcontroller in the user's application. All communications are via I2C. A typical usage sequence is as follows:

Initial power-up

All circuit elements are active. I2C port pins are high impedance and associated registers are cleared. The device then enters standby mode.

Reading coefficient data

The user then typically accesses the part and reads the coefficient data. The main circuits within the slave device are disabled during read activity. The coefficients are usually stored in the host microcontoller local memory but can be re-read at any time.

It is not necessary to read the values stored in the host microcontroller multiple times because the coefficients within a device are constant and do not change. However, note that the coefficients will be different from device to device, and cannot be used for another part.

Data conversion

This is the first step that is performed each time a new pressure reading is required which is initiated by the host sending the CONVERT command. The main system circuits are activated (wake) in response to the command and after the conversion completes, the result is placed into the Pressure and Temperature ADC output registers.

The conversion completes within the maximum conversion time, tc (see row 7, in Table 10). The device then enters standby mode.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Compensated pressure reading

After the conversion has been given sufficient time to complete, the host microcontroller reads the result from the ADC output registers and calculates the Compensated Pressure, a barometric/atmospheric pressure value which is compensated for changes in temperature and pressure sensor linearity. This is done using the coefficient data from the MPL115A and the raw sampled pressure and temperature ADC output values, in a compensation equation (detailed later). Note that this is an absolute pressure measurement with a vacuum as a reference.

From this step the host controller may either wait and then return to the Data Conversion step to obtain the next pressure reading or it may go to the Shutdown step.

Shutdown

For longer periods of inactivity the user may assert the $\overline{\text{SHDN}}$ input by driving this pin low to reduce system power consumption. This removes power from all internal circuits, including any registers. In the shutdown state, the Pressure and Temperature registers will be reset, losing any previous ADC output values.

This step is exited by taking the $\overline{\text{SHDN}}$ pin high. Wait for the maximum wakeup time, tw (see row 8, in Table 10), after which another pressure reading can be taken by transitioning to the data Conversion step.

Table 4. Device memory map

Address	Name	Description
00h	Padc_MSB	10-bit Pressure ADC output value MSB
01h	Padc_LSB	10-bit Pressure ADC output value LSB
02h	Tadc_MSB	10-bit Temperature ADC output value MSB
03h	Tacd_LSB	10-bit Temperature ADC output value LSB
04h	a0_MSB	a0 coefficient MSB
05h	a0_LSB	a0 coefficient LSB
06h	b1_MSB	b1 coefficient MSB
07h	b1_LSB	b1 coefficient LSB
08h	b2_MSB	b2 coefficient MSB
09h	b2_LSB	b2 coefficient LSB
0Ah	c12_MSB	c12 coefficient MSB
0Bh	c12_LSB	c12 coefficient LSB
0Ch	reserved[1]	—
0Dh	reserved[1]	—
0Eh	reserved[1]	—
0Fh	reserved[1]	—

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Address	Name	Description
10h	reserved	—
11h	reserved	—
12h	CONVERT	Start Pressure and Temperature Conversion

[1] This register is set to 00h. It is reserved, and was previously utilized as Coefficient values, c11 and c22, which were always 00h.

For values with less than 16 bits, the lower LSBs are zero. For example, c12 is 14 bits and is stored into 2 bytes as follows:

c12 MS byte = c12[13:6] = [$c12_{b13}$, $c12_{b12}$, $c12_{b11}$, $c12_{b10}$, $c12_{b9}$, $c12_{b8}$, $c12_{b7}$, $c12_{b6}$]
c12 LS byte = c12[5:0] & "00" = [$c12_{b5}$, $c12_{b4}$, $c12_{b3}$, $c12_{b2}$, $c12_{b1}$, $c12_{b0}$, 0 , 0]

8.1 Pressure, temperature and coefficient bit-width specifications

The table below specifies the initial coefficient bit-width specifications for the compensation algorithm and the specifications for Pressure and Temperature ADC values.

Table 5. Pressure, temperature and compensation coefficient specifications

	a0	b1	b2	c12	Padc	Tadc
Total Bits	16	16	16	14	10	10
Sign Bits	1	1	1	1	0	0
Integer Bits	12	2	1	0	10	10
Fractional Bits	3	13	14	13	0	0
dec pt zero pad	0	0	0	9	0	0

Example Binary Format Definitions:

a0 Signed, Integer Bits = 12, Fractional Bits = 3 :	Coeff a0 = S I_{11} I_{10} I_9 I_8 I_7 I_6 I_5 I_4 I_3 I_2 I_1 I_0 . F_2 F_1 F_0
b1 Signed, Integer Bits = 2, Fractional Bits = 13 :	Coeff b1 = S I_1 I_0 . F_{12} F_{11} F_{10} F_9 F_8 F_7 F_6 F_5 F_4 F_3 F_2 F_1 F_0
b2 Signed, Integer Bits = 1, Fractional Bits = 14 :	Coeff b2 = S I_0 . F_{13} F_{12} F_{11} F_{10} F_9 F_8 F_7 F_6 F_5 F_4 F_3 F_2 F_1 F_0
c12 Signed, Integer Bits = 0, Fractional Bits = 13, dec pt zero pad = 9 :	Coeff c12 = S 0 . 000 000 000 F_{12} F_{11} F_{10} F_9 F_8 F_7 F_6 F_5 F_4 F_3 F_2 F_1 F_0
Padc Unsigned, Integer Bits = 10 :	Padc U = I_9 I_8 I_7 I_6 I_5 I_4 I_3 I_2 I_1 I_0
Tadc Unsigned, Integer Bits =10 :	Tadc U = I_9 I_8 I_7 I_6 I_5 I_4 I_3 I_2 I_1 I_0

Note: *Negative coefficients are coded in 2's complement notation.*

8.2 Compensation

The 10-bit compensated pressure output, Pcomp, is calculated as follows:

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

$$Pcomp = a0 + \left(b1 + c12 \cdot Tadc\right) \cdot Padc + b2 \cdot Tadc \quad (1)$$

Where:

Padc is the 10-bit pressure ADC output of the MPL115A
Tadc is the 10-bit temperature ADC output of the MPL115A
a0 is the pressure offset coefficient
b1 is the pressure sensitivity coefficient
b2 is the temperature coefficient of offset (TCO)
c12 is the temperature coefficient of sensitivity (TCS)

Pcomp will produce a value of 0 with an input pressure of 50 kPa and will produce a full-scale value of 1023 with an input pressure of 115 kPa.

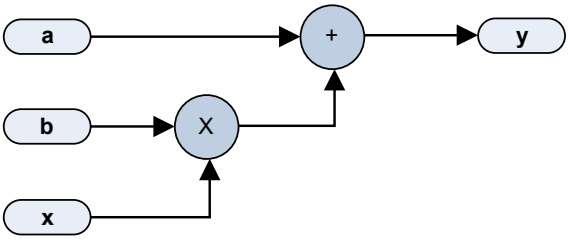
$$\text{Pressure (kPa)} = Pcomp \cdot \left[\frac{115-50}{1023}\right] + 50 \quad (2)$$

8.3 Evaluation sequence, arithmetic circuits

The following is an example of the calculation for Pcomp, the compensated pressure output. Input values are in **bold.**

c12x2 = **c12** * **Tadc**
a1 = **b1** + c12x2
a1x1 = a1 * **Padc**
y1 = **a0** + a1x1
a2x2 = **b2** * **Tadc**
Pcomp = y1 + a2x2

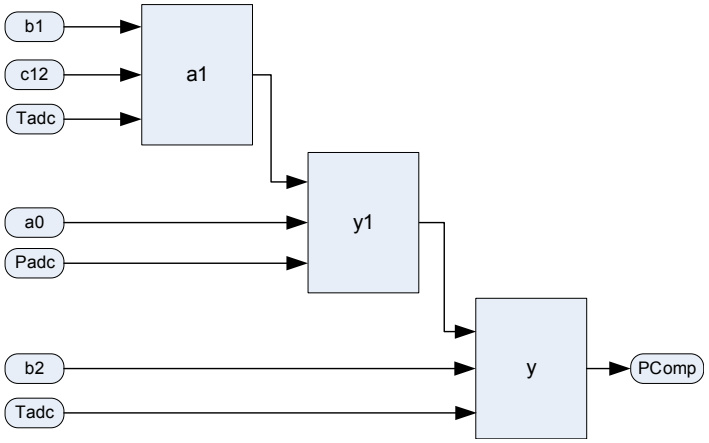
This can be calculated as a succession of Multiply Accumulates (MACs) operations of the form *y = a + b * x:*



The polynomial can be evaluated (Equation 1) as a sequence of 3 MACs:

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.



Please refer to NXP application note AN3785 for more detailed notes on implementation.

8.4 I²C device read/write operations

All device read/write operations are memory mapped. Device actions, for example, Start Conversions, are controlled by writing to the appropriate memory address location.

- For I²C the 7-bit device address (from Table 2) has a read/write toggle bit, where the least significant bit is '1' for read operations or '0' for write operations. The Device Address is C0h for a *Write* and the Device Address is C1h for a *Read*.
- The most significant bit in the Command tables below is not used and is don't care (X). In examples given it's set to '0'.

Refer to Sensor I²C Setup and FAQ Application Note AN4481 for more information on I²C communication between the sensor and host controller.

Table 6. I²C write commands

Legend: X - don't care

Command	Binary	HEX[1]
Devices Address + Write bit	1100 0000	C0h
Start Conversions	X001 0010	12h

[1] The command byte needs to be paired with a 00h as part of the I²C exchange to complete the passing of Start Conversions.

The actions taken by the part in response to each command are as follows:

Table 7. I²C write command description

Command	Action Taken
Start Conversions	Wake main circuits. Start clock. Allow supply stabilization time. Select pressure sensor input. Apply positive sensor excitation and perform A to D conversion. Select temperature input. Perform A to D conversion. Load the Pressure and Temperature registers with the result. Shut down main circuits and clock.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Table 8. I²C read command description

Legend: X - don't care

Command	Binary	HEX
Device Address + Read bit	1100 0001	C1h
Read Pressure MSB	X000 0000	00h
Read Pressure LSB	X000 0001	01h
Read Temperature MSB	X000 0010	02h
Read Temperature LSB	X000 0011	03h
Read Coefficient data byte 1	X000 0100	04h

These are MPL115A2 I²C commands to read coefficients, execute pressure and temperature conversions, and to read pressure and temperature data. The sequence of the commands for the interaction is given as an example to operate the MPL115A2.

Utilizing this gathered data, an example of the calculating the compensated pressure reading is given in floating point notation.

I²C commands (simplified for communication)

Device Address + write bit "To Write" = C0h
Device Address + read bit "To Read" = C1h
Command to Write "Convert Pressure and Temperature" = 12h
Command to Read "Pressure ADC High byte" = 00h
Command to Read "Pressure ADC Low byte" = 01h
Command to Read "Temperature ADC High byte" = 02h
Command to Read "Temperature ADC Low byte" = 03h
Command to Read "Coefficient data byte 1 High byte" = 04h

Read coefficients

[C0h], [04h], [C1h], [3Eh], [CEh], [B3h], [F9h], [C5h], [17h], [33h], [C8h]

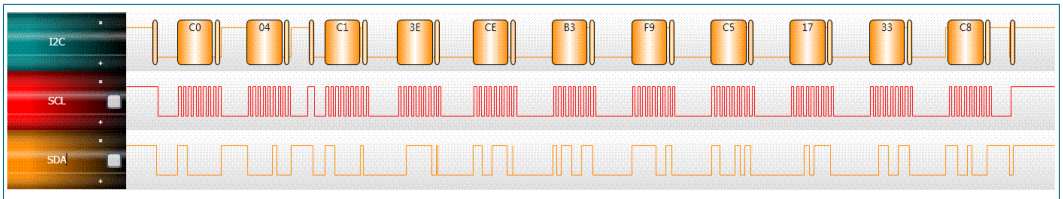
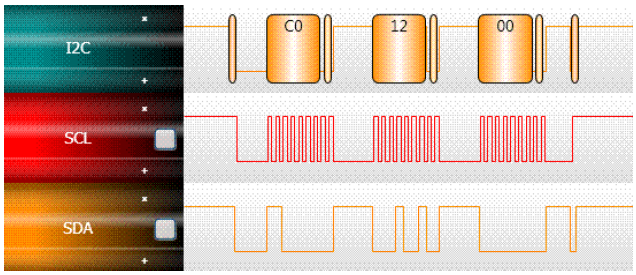


Figure 4. I²C read coefficient datagram

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

a0 coefficient MSB	=	3Eh					
a0 coefficient LSB	=	CEh	a0 coefficient	=	3ECEh	=	2009.75
b1 coefficient MSB	=	B3h					
b1 coefficient LSB	=	F9h	b1 coefficient	=	B3F9h	=	-2.37585
b2 coefficient MSB	=	C5h					
b2 coefficient LSB	=	17h	b2 coefficient	=	C517h	=	-0.92047
c12 coefficient MSB	=	33h					
c12 coefficient LSB	=	C8h	c12 coefficient	=	33C8h	=	0.000790



Command to I²C start conversion, 12h

Figure 5. I²C Start conversion datagram

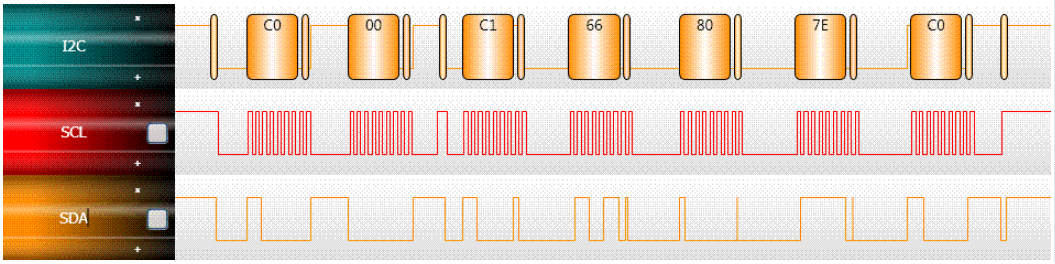


Figure 6. I²C read results datagram

Pressure MSB	=	66h					
Pressure LSB	=	80h	Pressure	=	6680h	=	0110 0110 1100 0000
						=	410 ADC counts
Temperature MSB	=	7Eh					
Temperature LSB	=	C0h	Temperature	=	7EC0h	=	0111 1110 1100 0000
						=	507 ADC counts

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

8.5 Example of pressure compensated calculation in floating-point notation

a0 coefficient	=	2009.75
b1 coefficient	=	-2.37585
b2 coefficient	=	-0.92047
c12 coefficient	=	0.000790

Pressure	=	410 ADC counts
Temperature	=	507 ADC counts

Pressure compensation

$$Pcomp = a0 + (b1 + c12 \cdot Tadc) \cdot Padc + b(c)$$

Using the evaluation sequence

The evaluation sequence is located in Section 8.3.

c12x2	=	c12 * Tadc	=	0.000790 * 507	=	0.40053
a1	=	b1 + c12x2	=	-2.37585 + 0.40053	=	-1.97532
a1x1	=	a1 * Padc	=	-1.97532 * 410	=	-809.8812
y1	=	a0 + a1x1	=	2009.75 + (-809.8812)	=	1199.8688
a2x2	=	b2 * Tadc	=	-0.92047 * 507	=	-466.67829
PComp	=	y1 + a2x2	=	1199.8688 + (-466.67829)	=	733.19051

$$\text{Pressure (kPa)} = Pcomp \cdot \left[\frac{115-50}{1023}\right] + 50$$

$$= 96.59kPa$$

$$= 733.19 \cdot \left[\frac{115-50}{1023}\right] + 50$$

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

9 Maximum ratings

Table 9. Maximum ratings

Voltage (with respect to GND unless otherwise noted)

Symbol	Value	Units
V_{DD}	–0.3 to +5.5	V
$\overline{SHDN}$, RST, SDA, SCL	–0.3 to V_{DD} + 0.3	V
Operating Temperature Range	–40 to +105	°C
Storage Temperature Range	–40 to +125	°C
Overpressure	1000	kPa

10 Mechanical and electrical characteristics

Table 10. Mechanical and electrical characteristics

V_{DD} = 2.375 V to 5.5 V, T_A = –40 °C to +105 °C, unless otherwise noted. Typical values are at V_{DD} = 3.3 V, T_A = +25 °C.

Ref	Parameters	Symbol	Conditions	Min	Typ	Max	Units
1	Operating Supply Voltage	V_{DD}		2.375	3.3	5.5	V
2	Supply Current	I_{DD}	Shutdown ($\overline{SHDN}$ = GND)	—	—	1	µA
			Standby	—	3.5	10	µA
			Average – at one measurement per second	—	5	6	µA
Pressure Sensor							
3	Range			50	—	115	kPa
4	Resolution			—	0.15	—	kPa
5	Accuracy		–20 ºC to 85 ºC	—	—	±1	kPa
6	Power Supply Rejection		Typical operating circuit at DC		0.1	—	kPa/V
			100 mV p-p 217 Hz square wave plus 100 mV pseudo random noise with 10 MHz bandwidth		0.1	—	kPa
7	Conversion Time (*Start Pressure and Temperature Conversion*)	tc	Time between start convert command and data available in the Pressure and Temperature registers	—	1.6	3	ms
8	Wakeup Time	tw	Time between leaving Shutdown mode ($\overline{SHDN}$ goes high) and communicating with the device to issue a command or read data.	—	3	5	ms
I²C I/O Stages: SCL, SDA							
9	SCL Clock Frequency	f_{SCL}		—	—	400	kHz
10	Low Level Input Voltage	VIL		—	—	$0.3V_{DD}$	V
11	High Level Input Voltage	VIH		$0.7V_{DD}$	—	—	V

All information provided in this document is subject to legal disclaimers.

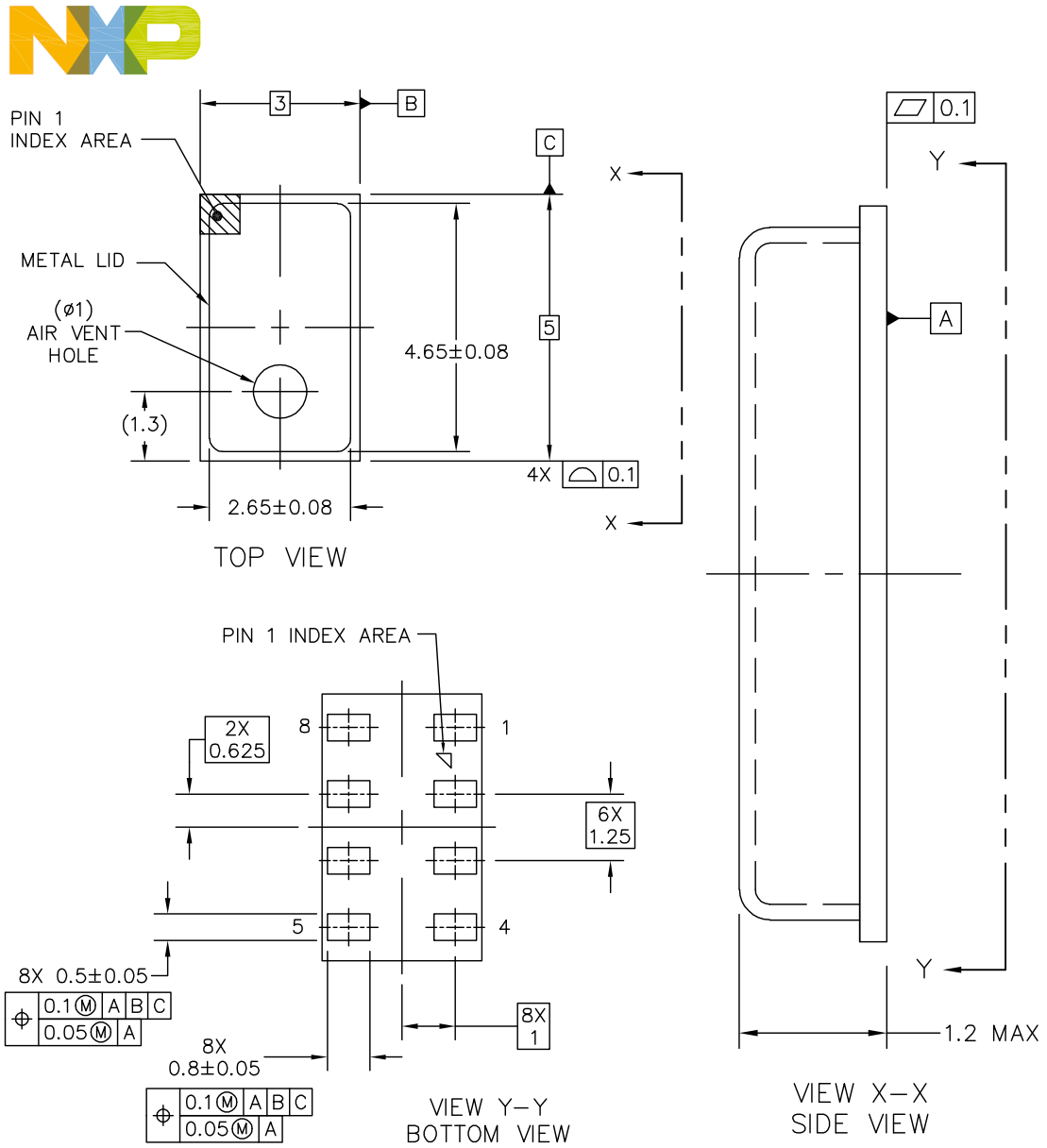
© NXP B.V. 2017. All rights reserved.

Ref	Parameters	Symbol	Conditions	Min	Typ	Max	Units
I²C Outputs: SDA							
12	Data Setup Time	t_{SU}	Setup time from command receipt to ready to transmit	0	—	0.4	s
I²C Addressing							
MPL115A2 uses 7-bit addressing, does not acknowledge the general call address 0000000. Slave address has been set to 60h or 1100000.							

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

11 Package outline



© NXP SEMICONDUCTORS N.V. ALL RIGHTS RESERVED	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: LGA 8 I/O, 3 X 5 X 1.25 PITCH, SENSOR 1.2MAX MM PKG	DOCUMENT NO: 98ASA10829D	REV: B
	STANDARD: NON–JEDEC	
	SOT1769–1	19 JAN 2016

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS.

2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994

3. STYLE:
   PIN 1: VDD PIN 5: CS
   PIN 2: CAP PIN 6: DOUT
   PIN 3: GND PIN 7: DIN
   PIN 4: SHDN PIN 8: SCLK

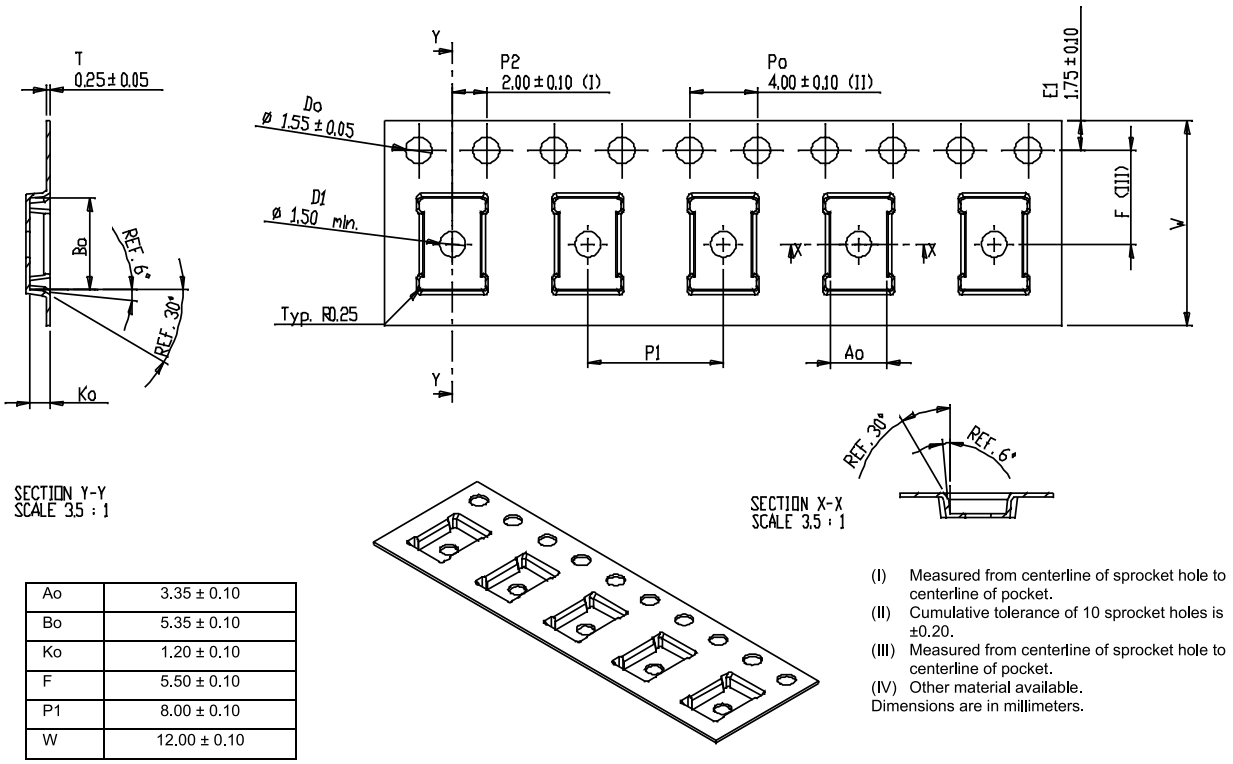
© NXP SEMICONDUCTORS N.V. ALL RIGHTS RESERVED	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE: LGA 8 I/O, 3 X 5 X 1.25 PITCH SENSOR 2.0MM PKG	DOCUMENT NO: 98ASA10829D	REV: B
	STANDARD: NON–JEDEC	
	SOT1769–1	19 JAN 2016

Figure 7. Package outline SOT1769-1 (TSON8)

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

12 Packing information



Ao	3.35 ± 0.10
Bo	5.35 ± 0.10
Ko	1.20 ± 0.10
F	5.50 ± 0.10
P1	8.00 ± 0.10
W	12.00 ± 0.10

(I) Measured from centerline of sprocket hole to centerline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ±0.20.
(III) Measured from centerline of sprocket hole to centerline of pocket.
(IV) Other material available.
Dimensions are in millimeters.

Figure 8. LGA (3 x 5) embossed carrier tape dimensions

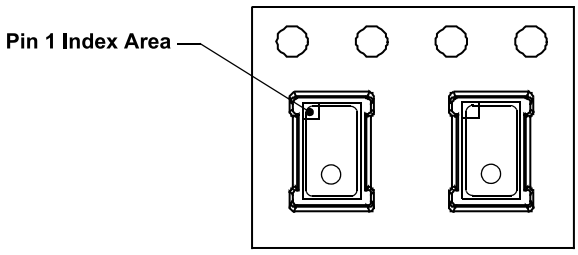


Figure 9. Device orientation in chip carrier

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

13 Soldering

1. Use SAC solder alloy, i.e., Sn-Ag-Cu, with a melting point of about 217 °C. It is recommended to use SAC305, i.e., Sn-3.0 wt.% Ag-0.5 wt.% Cu.
2. Reflow
   - Ramp up rate: 2 to 3 °C/s.
   - Preheat flat (soak): 110 to 130 s.
   - Reflow peak temperature: 250 °C to 260 °C (depends on exact SAC alloy composition).
   - Time above 217°C: 40 to 90s (depends on board type, thermal mass of the board/ quantities in the reflow).
   - Ramp down: 5 to 6 °C/s.
   - Using an inert reflow environment (with O_2 level about 5 to 15 ppm).

Note: *The stress level and signal offset of the device also depends on the board type, board core material, board thickness and metal finishing of the board.*

Please refer to NXP application note AN3150, Soldering Recommendations for Pressure Sensor Devices for any additional information.

14 Soldering/landing pad information

The LGA package is compliant with the RoHS standard. It is recommended to use a no-clean solder paste to reduce cleaning exposure to high pressure and chemical agents that can damage or reduce life span of the Pressure sensing element.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

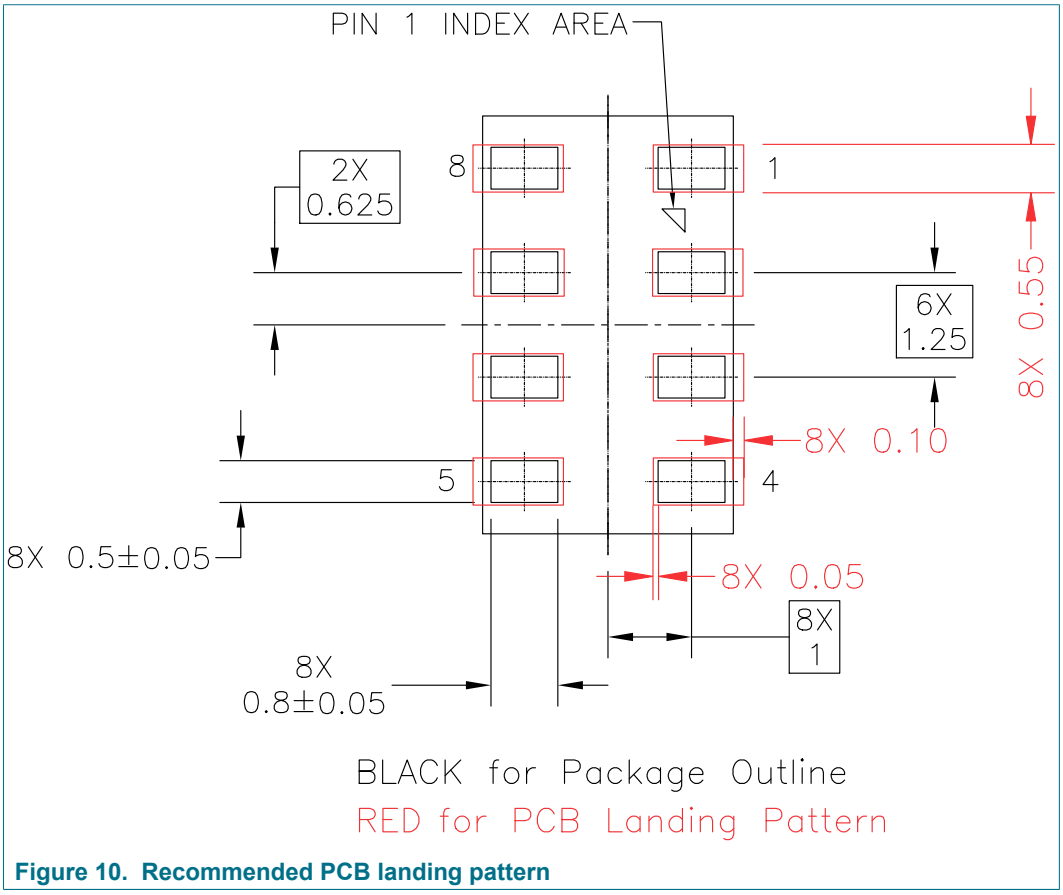


Figure 10. Recommended PCB landing pattern

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

15 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
MPL115A2 v.10	20171010	Technical data	—	MPL115A2 v.9
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Removed the first paragraph of Section 7. • Added Section 7.1 and Section 7.2 in Section 7 "Handling and Board Mount Recommendations" • Updated Figure 7. No technical changes.			
MPL115A2 v.9	10/2012	Technical data	—	MPL115A2 v.8
MPL115A2 v.8	06/2012	Technical data	—	—

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

16 Legal information

16.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
[short] Data sheet: product preview	Development	This document contains certain information on a product under development. NXP reserves the right to change or discontinue this product without notice.
[short] Data sheet: advance information	Qualification	This document contains information on a new product. Specifications and information herein are subject to change without notice.
[short] Data sheet: technical data	Production	This document contains the product specification. NXP Semiconductors reserves the right to change the detail specifications as may be required to permit improvements in the design of its products.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

16.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a technical data data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the technical data data sheet.

16.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors. In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nxp.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications. In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

16.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

NXP — is a trademark of NXP B.V.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Tables

Tab. 1. Ordering information 2
Tab. 2. Ordering options 2
Tab. 3. Pin description 3
Tab. 4. Device memory map 6
Tab. 5. Pressure, temperature and compensation coefficient specifications 7
Tab. 6. I2C write commands 9
Tab. 7. I2C write command description 9
Tab. 8. I2C read command description 10
Tab. 9. Maximum ratings 13
Tab. 10. Mechanical and electrical characteristics 13
Tab. 11. Revision history 20

Figures

Fig. 1. Block diagram of MPL115A2 2
Fig. 2. Pin configuration 3
Fig. 3. Sequence flow chart 5
Fig. 4. I2C read coefficient datagram 10
Fig. 5. I2C Start conversion datagram 11
Fig. 6. I2C read results datagram 11
Fig. 7. Package outline SOT1769-1 (TSON8) 15
Fig. 8. LGA (3 x 5) embossed carrier tape dimensions 17
Fig. 9. Device orientation in chip carrier 17
Fig. 10. Recommended PCB landing pattern 19

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Contents

1 General description 1
2 Features 1
3 Applications 1
4 Ordering information 2
4.1 Ordering options 2
5 Block diagram 2
6 Pinning information 3
6.1 Pinning 3
6.2 Pin description 3
7 Handling and Board Mount Recommendations 3
7.1 Methods of Handling 3
7.2 Board Mount Recommendations 4
8 Functional description 5
8.1 Pressure, temperature and coefficient bit-width specifications 7
8.2 Compensation 7
8.3 Evaluation sequence, arithmetic circuits 8
8.4 I2C device read/write operations 9
8.5 Example of pressure compensated calculation in floating-point notation 12
9 Maximum ratings 13
10 Mechanical and electrical characteristics 13
11 Package outline 15
12 Packing information 17
13 Soldering 18
14 Soldering/landing pad information 18
15 Revision history 20
16 Legal information 21

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2017. All rights reserved.

For more information, please visit: http://www.nxp.com
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 10 October 2017
Document identifier: MPL115A2

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9