Document Number: MPXH6101A

Rev. 7.1, 06/2015



MPXH6101A, 15 to 102 kPa, Absolute, Integrated Pressure Sensor

Freescale's MPXH6101A manifold absolute pressure (MAP) sensor for engine control is designed to sense absolute air pressure within the intake manifold. This measurement can be used to compute the amount of fuel required for each cylinder. The small form factor and high reliability of on-chip integration makes the Freescale MAP sensor a logical and economical choice for automotive system designers.

MPXH6101A piezoresistive transducer is a state-of-the-art, monolithic, signal conditioned, silicon pressure sensor. This sensor combines advanced micromachining techniques, thin film metallization, and bipolar semiconductor processing to provide an accurate, high level analog output signal that is proportional to applied pressure.

Features

- 1.72% maximum error over 0 °C to 85 °C
- Specifically designed for intake manifold absolute pressure sensing in engine control systems
- Temperature compensated over -40 °C to +125 °C
- Thermoplastic (PPS) surface mount package

Applications

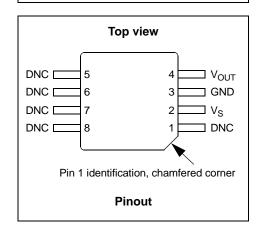
- · Manifold sensing for automotive systems
- · Ideally suited for microprocessor or microcontroller-based system
- Also ideal for non-automotive applications

MPXH6101A

Super small outline package



MPXH6101A6U/6T1 Case 98ARH99066A



	Ordering Information								
D(01. 1	Package	# of Ports		Pressure type			Device	
Part number	Part number Shipping		None	Single	Dual	Gauge	Differential	Absolute	marking
Super Small Outlin	Super Small Outline Package								
MPXH6101A6U	Rails	98ARH99066A	•					•	MPXH6101A
MPXH6101A6T1	Tape and Reel	98ARH99066A	•					•	MPXH6101A

Freescale reserves the right to change the detail specifications as may be required to permit improvements in the design of its products.

© 2006, 2008, 2009, 2015 Freescale Semiconductor, Inc. All rights reserved.





Contents

1	General Description
	1.1 Block diagram
	1.1
	1.2 Pinout
2	Mechanical and Electrical Specifications
	2.1 Maximum ratings
	2.2 Operating characteristics
3	
4	
	4.1 Pressure (P1)/Vacuum (P2) Side Identification
	4.2 Minimum recommended footprint for surface mounted applications
	4.3 Package dimensions
5	Revision History

Related Documentation

The MPXH6101A device features and operations are described in a variety of reference manuals, user guides, and application notes. To find the most-current versions of these documents:

1. Go to the Freescale homepage at:

http://www.freescale.com/

- 2. In the Keyword search box at the top of the page, enter the device number MPXH6101A.
- 3. In the Refine Your Result pane on the left, click on the Documentation link.



1 General Description

1.1 Block diagram

Figure 1 shows a block diagram of the internal circuitry integrated on a pressure sensor chip.

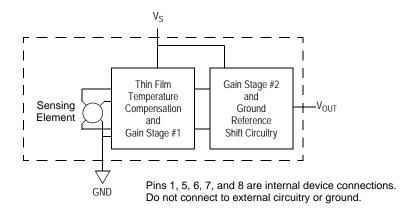


Figure 1. Fully integrated pressure sensor schematic

1.2 Pinout

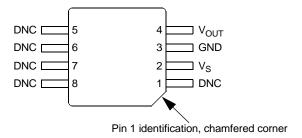


Figure 2. Device pinout (top view)

Table 1. Pin functions

Pin	Name	Function
1	DNC	Do not connect to external circuitry or ground. Pin 1 is denoted by chamfered corner.
2	V _S	Voltage supply
3	GND	Ground
4	V _{OUT}	Output voltage
5	DNC	Do not connect to external circuitry or ground.
6	DNC	Do not connect to external circuitry or ground.
7	DNC	Do not connect to external circuitry or ground.
8	DNC	Do not connect to external circuitry or ground.



2 Mechanical and Electrical Specifications

2.1 Maximum ratings

Table 2. Maximum ratings⁽¹⁾

Rating	Symbol	Value	Unit
Maximum pressure (P1 > P2)	P _{MAX}	400	kPa
Storage temperature	T _{STG}	-40 to +125	°C
Operating temperature	T _A	-40 to +125	°C

^{1.} Exposure beyond the specified limits may cause permanent damage or degradation to the device.

2.2 Operating characteristics

Table 3. Operating characteristics ($V_S = 5.0 \text{ Vdc}$, $T_A = 25 \text{ °C}$ unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 4 is required to meet electrical specifications.)

Characteristic	Symbol	Min	Тур	Max	Unit
Pressure range ⁽¹⁾	P _{OP}	15	_	102	kPa
Supply voltage ⁽²⁾	Vs	4.75	5	5.25	Vdc
Supply current	Io	_	7.0	10	mAdc
Minimum pressure offset ⁽³⁾ (0 to 85 °C)	V _{off}	0.168	0.247	0.326	Vdc
Full-scale output ⁽⁴⁾ (0 to 85 °C)	V _{FSO}	4.775	4.854	4.933	Vdc
Full-scale span ⁽⁵⁾ (0 to 85 °C)	V _{FSS}	4.448	4.607	4.765	Vdc
Accuracy ⁽⁶⁾ (0 to 85 °C)	_	_	_	±1.72	%V _{FSS}
Sensitivity	V/P	_	52.950	_	mV/kPa
Response time ⁽⁷⁾	t _R	_	15	_	ms
Output source current at full-scale output	I _{o+}	_	0.1	_	mAdc
Warm-up time ⁽⁸⁾	_	_	20	_	ms
Offset stability ⁽⁹⁾	_	_	±0.5	_	%V _{FSS}

^{1. 1.0} kPa (kilopascal) equals 0.145 psi.

- 2. Device is ratiometric within this specified excitation range.
- 3. Offset (Voff) is defined as the output voltage at the minimum rated pressure.
- 4. Full-scale output (V_{FSO}) is defined as the output voltage at the maximum or full rated pressure.
- 5. Full-scale span (V_{FSS}) is defined as the algebraic difference between the output voltage at full rated pressure and the output voltage at the minimum rated pressure.
- 6. Accuracy (error budget) consists of the following:

Linearity: Output deviation from a straight line relationship with pressure over the specified pressure range.

Temperature hysteresis: Output deviation at any temperature within the operating temperature range, after the temperature is cycled to

and from the minimum or maximum operating temperature points, with zero differential pressure applied.

Pressure hysteresis: Output deviation at any pressure within the specified range, when this pressure is cycled to and from the

minimum or maximum rated pressure, at 25 °C.

TcSpan: Output deviation over the temperature range of 0 to 85 °C, relative to 25 °C.

TcOffset: Output deviation with minimum rated pressure applied, over the temperature range of 0 to 85 °C, relative to

25 °C.

Variation from nominal: The variation from nominal values, for offset or full-scale span, as a percent of V_{FSS}, at 25 °C.

- 7. Response time is defined as the time for the incremental change in the output to go from 10% to 90% of its final value when subjected to a specified step change in pressure.
- 8. Warm-up time is defined as the time required for the product to meet the specified output voltage after the pressure has been stabilized.
- 9. Offset stability is the product's output deviation when subjected to 1000 hours of pulsed pressure, temperature cycling with bias test.



3 On-Chip Temperature Compensation and Calibration

Figure 3 illustrates an absolute sensing chip in the super small outline package (case 98ARH99066A).

Figure 5 shows the sensor output signal relative to pressure input. Typical, minimum, and maximum output curves are shown for operation over a temperature range of 0 °C to 85 °C. The output will saturate outside of the specified pressure range.

A fluorosilicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the sensor diaphragm. The MPXH6101A pressure sensor operating characteristics, and internal reliability and qualification tests are based on use of dry air as the pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Contact the factory for information regarding media compatibility in your application.

Figure 4 shows the recommended decoupling circuit for interfacing the output of the integrated sensor to the A/D input of a microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

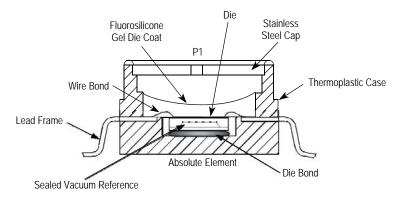


Figure 3. Cross-sectional diagram SSOP (not to scale)

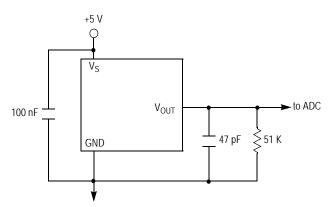


Figure 4. Recommended power supply decoupling and output filtering

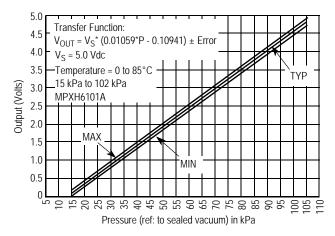


Figure 5. Output versus absolute pressure



4 Package Information

4.1 Pressure (P1)/Vacuum (P2) Side Identification

Freescale designates the two sides of the pressure sensor as the pressure (P1) side and the vacuum (P2) side. The pressure (P1) side is the side containing fluorosilicone gel which protects the die from harsh media. The pressure sensor is designed to operate with positive differential pressure applied, P1 > P2.

The pressure (P1) side may be identified by using the following table:

Table 4. Pressure (P1)/vacuum (P2) side identification

Part number	Package	Pressure (P1) side identifier
MPXH6101A6U/T1	98ARH99066A	Stainless steel cap

4.2 Minimum recommended footprint for surface mounted applications

Surface mount board layout is a critical portion of the total design. The footprint for the surface mount packages must be the correct size to ensure proper solder connection interface between the board and the package. With the correct footprint, the packages will self-align when subjected to a solder reflow process. It is always recommended to design boards with a solder mask layer to avoid bridging and shorting between solder pads.

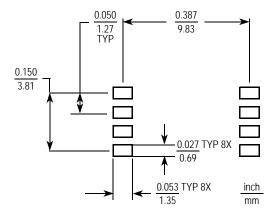
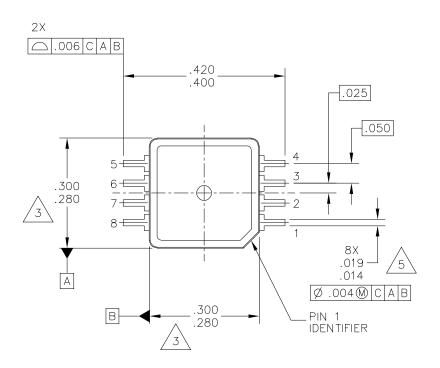


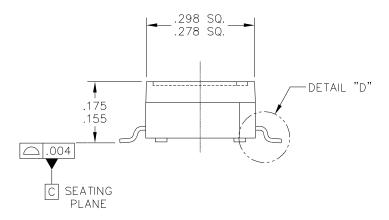
Figure 6. SSOP footprint (case 98ARH99066A)



4.3 Package dimensions

This drawing is located at http://cache.freescale.com/files/shared/doc/package_info/98ARH99066A.pdf.

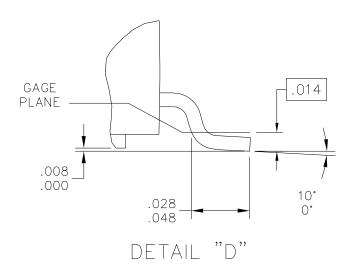




	ALE SEMICONDUCTOR, INC. RIGHTS RESERVED.	MECHANICAL OU	TLINE	PRINT VERSION NO	T TO SCALE
TITLE:	8 IFAD		DOCUME	NT NO: 98ARH99066A	REV: H
	SSUB		CASE NU	JMBER: 1317-04	13 APR 2012
SSOP			STANDAF	RD: NON-JEDEC	

Case 98ARH99066A, 8-lead super small outline package





© FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED.		MECHANICAL OU	TLINE	PRINT VERSION NO	T TO SCALE
TITLE:	8 IFAD		DOCUME	NT NO: 98ARH99066A	REV: H
	CCUD		CASE NU	JMBER: 1317-04	13 APR 2012
	3301		STANDAF	RD: NON-JEDEC	

Case 98ARH99066A, 8-lead super small outline package



NOTES:

- 1. ALL DIMENSIONS IN INCHES.
- 2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- 4. ALL VERTICAL SURFACES TO BE 5' MAXIMUM.



© FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED.	MECHANICAL OUTLIN	PRINT VERSION NOT TO SCALE
TITLE: 8 FAD	DOC	CUMENT NO: 98ARH99066A REV: H
O LLAD	CAS	SE NUMBER: 1317-04 13 APR 2012
330P	STAI	NDARD: NON-JEDEC

Case 98ARH99066A, 8-lead super small outline package



5 Revision History

Table 5. Revision history

Revision number	Revision date	Description
7.1	06/2015	 Updated format. Corrected pressure range from 105 kPa to 102 kPa. Deleted part numbers MPXH6101AC6U and MPXH6101AC6T1 and all pertaining information. Section 2: Table 2. Updated max value for Pressure range and Supply voltage. Removed V_S range in Characteristic column and updated Min, Typ and Max values for Minimum pressure offset, Full-scale output and Full-scale span rows. Updated package drawing with current version.



How to Reach Us:

Home Page: freescale.com

Web Support:

freescale.com/support

Information in this document is provided solely to enable system and software implementers to use Freescale products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits based on the information in this document.

Freescale reserves the right to make changes without further notice to any products herein. Freescale makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in Freescale data sheets and/or specifications can and do vary in different applications, and actual performance may vary over time. All operating parameters, including "typicals," must be validated for each customer application by customer's technical experts. Freescale does not convey any license under its patent rights nor the rights of others. Freescale sells products pursuant to standard terms and conditions of sale, which can be found at the following address: freescale.com/salestermsandconditions.

Freescale and the Freescale logo are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. All other product or service names are the property of their respective owners.

© 2006, 2008, 2009, 2015 Freescale Semiconductor, Inc.

Document Number: MPXH6101A

Rev. 7.1 06/2015





OOO «ЛайфЭлектроникс" "LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 P/C 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 3010181090000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный) Email: org@lifeelectronics.ru