

[查询"MPXA4115A6T1"供应商](#)

Integrated Silicon Pressure Sensor for Manifold Absolute Pressure, Altimeter or Barometer Applications On-Chip Signal Conditioned, Temperature Compensated and Calibrated

Motorola's MPX4115A/MPXA4115A series sensor integrates on-chip, bipolar op amp circuitry and thin film resistor networks to provide a high output signal and temperature compensation. The small form factor and high reliability of on-chip integration make the Motorola pressure sensor a logical and economical choice for the system designer.

The MPX4115A/MPXA4115A series 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.

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

Features

- 1.5% Maximum Error over 0° to 85°C
- Ideally suited for Microprocessor or Microcontroller-Based Systems
- Temperature Compensated from -40° to +125°C
- Durable Epoxy Unibody Element or Thermoplastic (PPS) Surface Mount Package

Application Examples

- Aviation Altimeters
- Industrial Controls
- Engine Control
- Weather Stations and Weather Reporting Devices

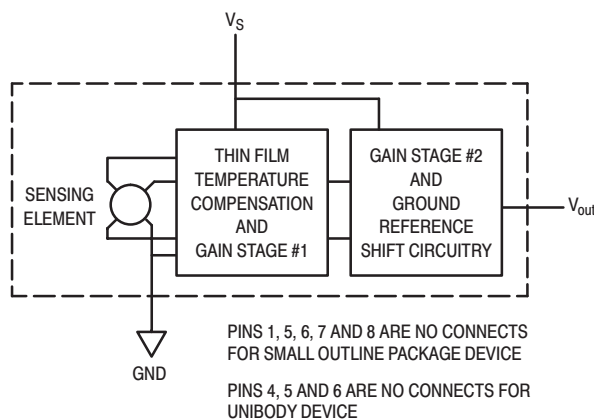
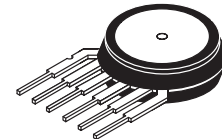


Figure 1. Fully Integrated Pressure Sensor Schematic

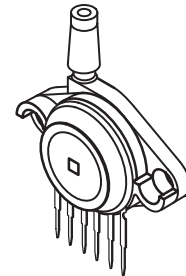
**MPX4115A
MPXA4115A
SERIES**

**INTEGRATED
PRESSURE SENSOR
15 to 115 kPa (2.2 to 16.7 psi)
0.2 to 4.8 Volts Output**

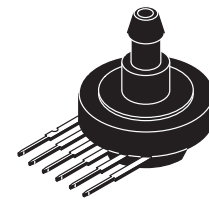
UNIBODY PACKAGE



MPX4115A
CASE 867

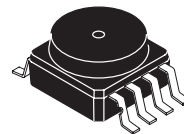


MPX4115AP
CASE 867B

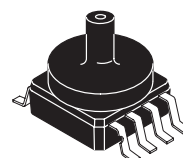


MPX4115AS
CASE 867E

SMALL OUTLINE PACKAGE



MPXA4115A6U
CASE 482



MPXA4115AC6U
CASE 482A

PIN NUMBER			
1	N/C	5	N/C
2	V _S	6	N/C
3	Gnd	7	N/C
4	V _{out}	8	N/C

NOTE: Pins 1, 5, 6, 7, and 8 are internal device connections. Do not connect to external circuitry or ground. Pin 1 is noted by the notch in the lead.

PIN NUMBER			
1	V _{out}	4	N/C
2	Gnd	5	N/C
3	V _S	6	N/C

NOTE: Pins 4, 5, and 6 are internal device connections. Do not connect to external circuitry or ground. Pin 1 is noted by the notch in the lead.



MPX4115A MPXA4115A SERIES
MAXIMUM RATINGS^(NOTE)

Parameter	Symbol	Value	Units
Maximum Pressure (P1 > P2)	P _{max}	400	kPa
Storage Temperature	T _{stg}	-40° to +125°	°C
Operating Temperature	T _A	-40° to +125°	°C

NOTE: Exposure beyond the specified limits may cause permanent damage or degradation to the device.

OPERATING CHARACTERISTICS (V_S = 5.1 Vdc, T_A = 25°C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 3 required to meet Electrical Specifications.)

Characteristic	Symbol	Min	Typ	Max	Unit
Pressure Range	P _{OP}	15	—	115	kPa
Supply Voltage ⁽¹⁾	V _S	4.85	5.1	5.35	Vdc
Supply Current	I _o	—	7.0	10	mAdc
Minimum Pressure Offset ⁽²⁾ @ V _S = 5.1 Volts	V _{off}	0.135	0.204	0.273	Vdc
Full Scale Output ⁽³⁾ @ V _S = 5.1 Volts	V _{FSO}	4.725	4.794	4.863	Vdc
Full Scale Span ⁽⁴⁾ @ V _S = 5.1 Volts	V _{FSS}	4.521	4.590	4.659	Vdc
Accuracy ⁽⁵⁾	—	—	—	±1.5	%V _{FSS}
Sensitivity	V/P	—	45.9	—	mV/kPa
Response Time ⁽⁶⁾	t _R	—	1.0	—	ms
Output Source Current at Full Scale Output	I _{o+}	—	0.1	—	mAdc
Warm-Up Time ⁽⁷⁾	—	—	20	—	ms
Offset Stability ⁽⁸⁾	—	—	±0.5	—	%V _{FSS}

NOTES:

- Device is ratiometric within this specified excitation range.
- Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.
- Full Scale Output (V_{FSO}) is defined as the output voltage at the maximum or full rated pressure.
- 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.
- Accuracy is the deviation in actual output from nominal output over the entire pressure range and temperature range as a percent of span at 25°C due to all sources of error including 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 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 pressure applied, over the temperature range of 0° to 85°C, relative to 25°C.
- 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.
- Warm-up Time is defined as the time required for the product to meet the specified output voltage after the pressure has been stabilized.
- Offset Stability is the product's output deviation when subjected to 1000 cycles of Pulsed Pressure, Temperature Cycling with Bias Test.

MECHANICAL CHARACTERISTICS

Characteristics	Typ	Unit
Weight, Basic Element (Case 867)	4.0	grams
Weight, Small Outline Package (Case 482)	1.5	grams

查询"MPXA4115A6T1"供应商

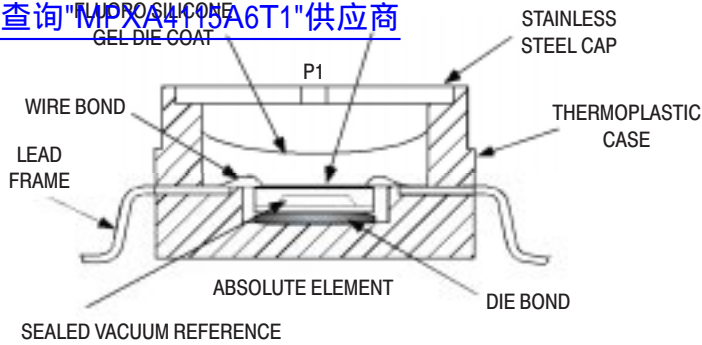


Figure 2. Cross Sectional Diagram SOP (not to scale)

Figure 2 illustrates the absolute sensing chip in the basic chip carrier (Case 482).

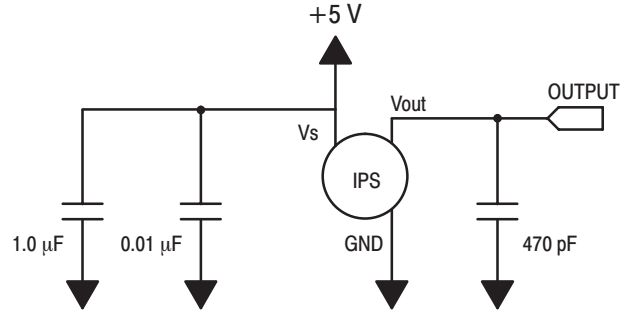


Figure 3. Recommended power supply decoupling and output filtering.
 For additional output filtering, please refer to Application Note AN1646.

Figure 3 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.

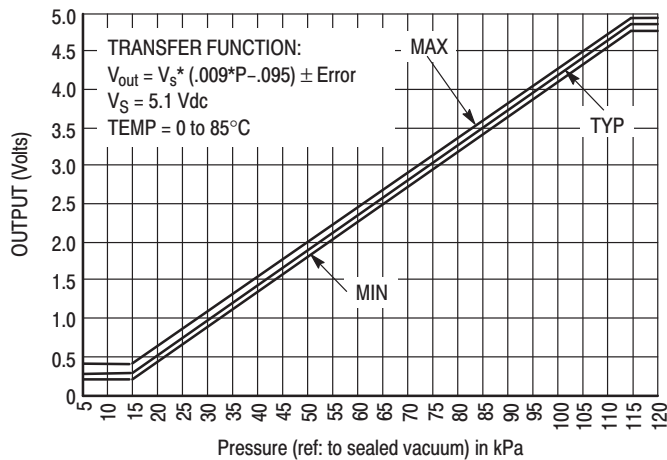


Figure 4. Output versus Absolute Pressure

Figure 4 shows the sensor output signal relative to pressure input. Typical minimum and maximum output curves are shown for operation over 0 to 85°C temperature range. The output will saturate outside of the rated pressure range.

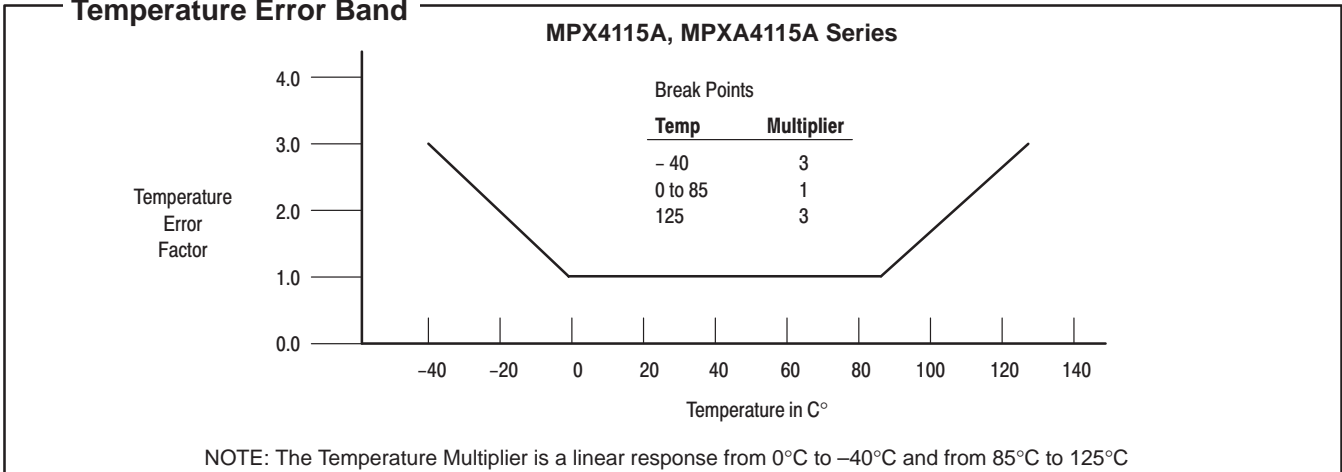
A fluorosilicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the silicon diaphragm. The

MPX4115A/MPXA4115A series pressure sensor operating characteristics, 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.

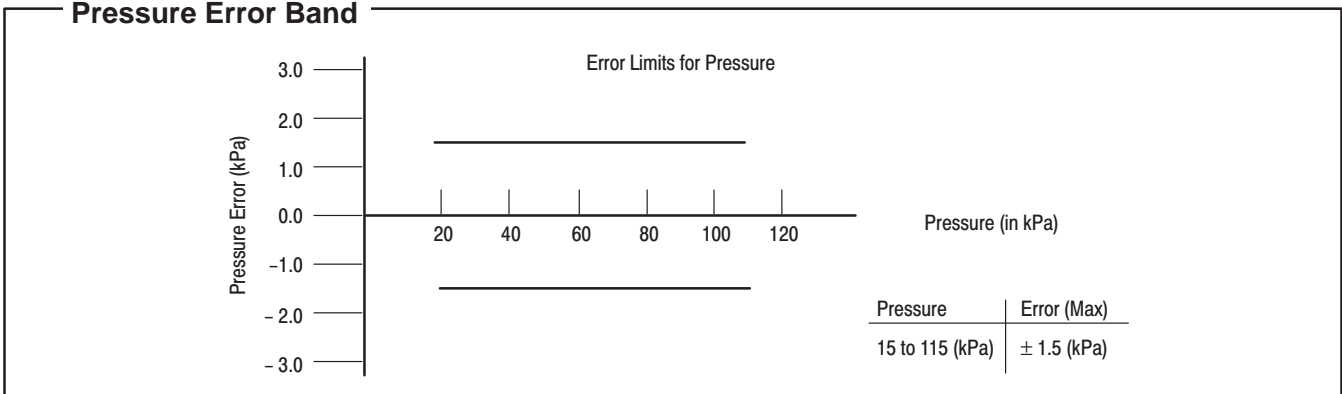
Transfer Function (MPX4115A, MPXA4115A)

Normal Transfer Value: $V_{out} = V_S \times (0.009 \times P - 0.095)$
 \pm (Pressure Error \times Temp. Factor $\times 0.009 \times V_S$)
 $V_S = 5.1 \pm 0.25$ Vdc

Temperature Error Band



Pressure Error Band



ORDERING INFORMATION — UNIBODY PACKAGE

Device Type	Options	Case No.	MPX Series Order No.	Marking
Basic Element	Absolute, Element Only	867	MPX4115A	MPX4115A
Ported Elements	Absolute, Ported	867B	MPX4115AP	MPX4115AP
	Absolute, Stove Pipe Port	867E	MPX4115AS	MPX4115A

ORDERING INFORMATION — SMALL OUTLINE PACKAGE

Device Type	Options	Case No.	MPX Series Order No.	Packing Options	Marking
Basic Element	Absolute, Element Only	482	MPXA4115A6U	Rails	MPXA4115A
	Absolute, Element Only	482	MPXA4115A6T1	Tape and Reel	MPXA4115A
Ported Element	Absolute, Axial Port	482A	MPXA4115AC6U	Rails	MPXA4115A
	Absolute, Axial Port	482A	MPXA4115AC6T1	Tape and Reel	MPXA4115A

Freescale Semiconductor, Inc.
 ARCHIVED BY FREESCALE SEMICONDUCTOR, INC. 2005
MPXA4115A MPXA4115A SERIES
INFORMATION FOR USING THE SMALL OUTLINE PACKAGE (CASE 482)

[查询"MPXA4115A6T1"供应商](#)

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.

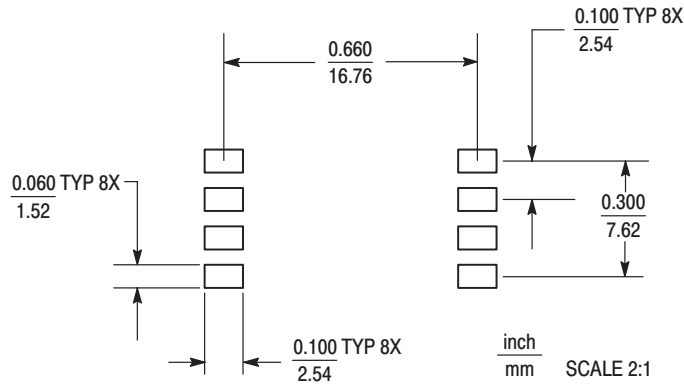
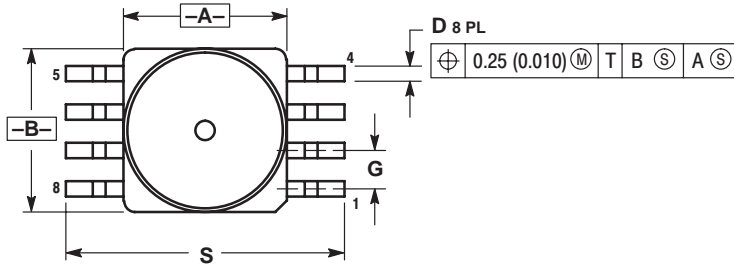


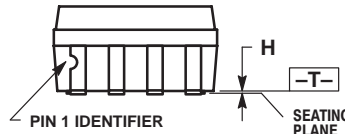
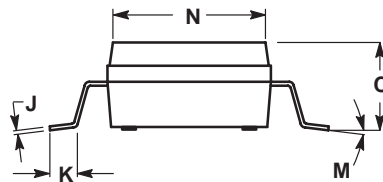
Figure 5. SOP Footprint (Case 482)

查询"MPXA4115A6T1"供应商

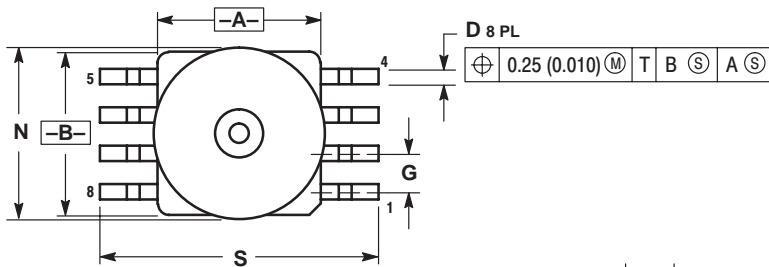


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006).
 5. ALL VERTICAL SURFACES 5° TYPICAL DRAFT.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.415	0.425	10.54	10.79
B	0.415	0.425	10.54	10.79
C	0.212	0.230	5.38	5.84
D	0.038	0.042	0.96	1.07
G	0.100 BSC		2.54 BSC	
H	0.002	0.010	0.05	0.25
J	0.009	0.011	0.23	0.28
K	0.061	0.071	1.55	1.80
M	0°	7°	0°	7°
N	0.405	0.415	10.29	10.54
S	0.709	0.725	18.01	18.41

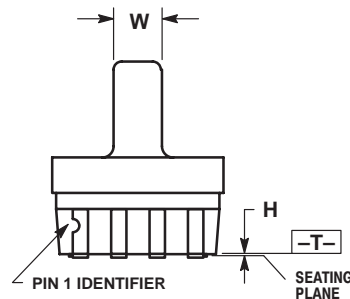
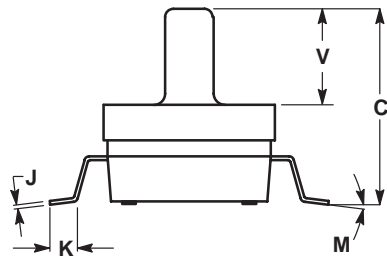


**CASE 482-01
ISSUE O**



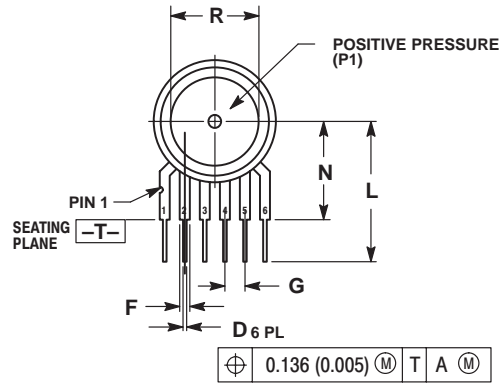
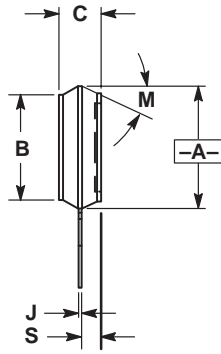
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006).
 5. ALL VERTICAL SURFACES 5° TYPICAL DRAFT.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.415	0.425	10.54	10.79
B	0.415	0.425	10.54	10.79
C	0.500	0.520	12.70	13.21
D	0.038	0.042	0.96	1.07
G	0.100 BSC		2.54 BSC	
H	0.002	0.010	0.05	0.25
J	0.009	0.011	0.23	0.28
K	0.061	0.071	1.55	1.80
M	0°	7°	0°	7°
N	0.444	0.448	11.28	11.38
S	0.709	0.725	18.01	18.41
V	0.245	0.255	6.22	6.48
W	0.115	0.125	2.92	3.17



**CASE 482A-01
ISSUE A**

查询"MPXA4115A6T1"供应商



- NOTES:
 9. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 10. CONTROLLING DIMENSION: INCH.
 11. DIMENSION -A- IS INCLUSIVE OF THE MOLD STOP RING. MOLD STOP RING NOT TO EXCEED 16.00 (0.630).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.595	0.630	15.11	16.00
B	0.514	0.534	13.06	13.56
C	0.200	0.220	5.08	5.59
D	0.027	0.033	0.68	0.84
F	0.048	0.064	1.22	1.63
G	0.100 BSC		2.54 BSC	
J	0.014	0.016	0.36	0.40
L	0.695	0.725	17.65	18.42
M	30°NOM		30°NOM	
N	0.475	0.495	12.07	12.57
R	0.430	0.450	10.92	11.43
S	0.090	0.105	2.29	2.66

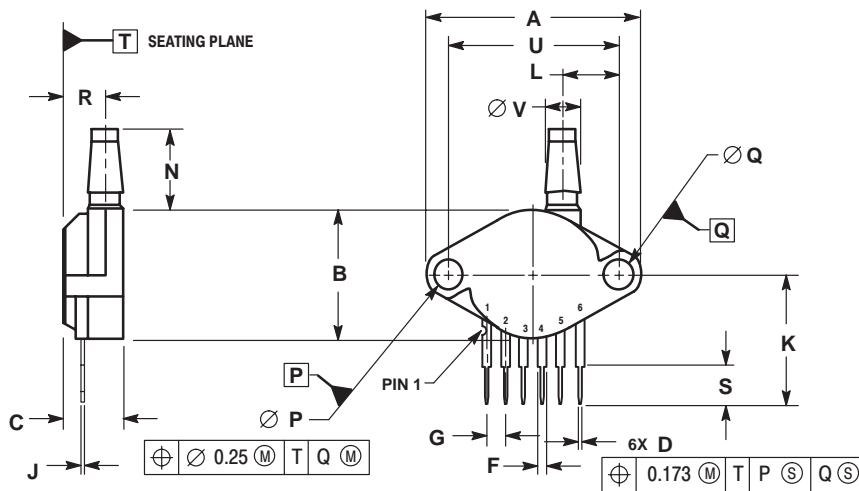
- STYLE 1:
 PIN 1: VOUT
 2. GROUND
 3. VCC
 4. V1
 5. V2
 6. VEX

- STYLE 2:
 PIN 1: OPEN
 2. GROUND
 3. -VOUT
 4. VSUPPLY
 5. +VOUT
 6. OPEN

- STYLE 3:
 PIN 1: OPEN
 2. GROUND
 3. +VOUT
 4. +VSUPPLY
 5. -VOUT
 6. OPEN

CASE 867-08
ISSUE N

BASIC ELEMENT



- NOTES:
 1. DIMENSIONS ARE IN MILLIMETERS.
 2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.

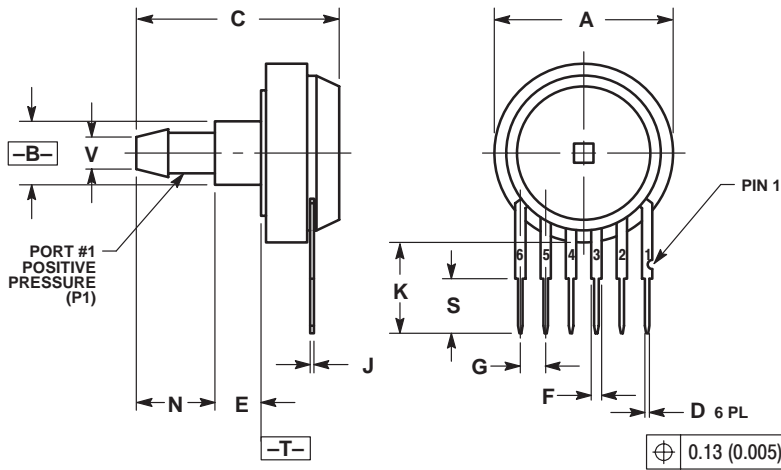
DIM	MILLIMETERS	
	MIN	MAX
A	29.08	29.85
B	17.4	18.16
C	7.75	8.26
D	0.68	0.84
F	1.22	1.63
G	2.54 BSC	
J	0.36	0.41
K	17.65	18.42
L	7.37	7.62
N	10.67	11.18
P	3.89	4.04
Q	3.89	4.04
R	5.84	6.35
S	5.59	6.1
U	23.11 BSC	
V	4.62	4.93

- STYLE 1:
 PIN 1: VOUT
 2. GROUND
 3. VCC
 4. V1
 5. V2
 6. VEX

CASE 867B-04
ISSUE F

PRESSURE SIDE PORTED (AP, GP)

查询"MPXA4115A6T1"供应商



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.690	0.720	17.53	18.28
B	0.245	0.255	6.22	6.48
C	0.780	0.820	19.81	20.82
D	0.027	0.033	0.69	0.84
E	0.178	0.186	4.52	4.72
F	0.048	0.064	1.22	1.63
G	0.100 BSC		2.54 BSC	
J	0.014	0.016	0.36	0.41
K	0.345	0.375	8.76	9.53
N	0.300	0.310	7.62	7.87
S	0.220	0.240	5.59	6.10
V	0.182	0.194	4.62	4.93

- STYLE 1:
 PIN 1. V_{OUT}
 2. GROUND
 3. V_{CC}
 4. V_1
 5. V_2
 6. V_{EX}

CASE 867E-03
 ISSUE D

PRESSURE SIDE PORTED (AS, GS)

[查询"MPXA4115A6T1"供应商](#)

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola 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 which may be provided in Motorola 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. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

JAPAN: Motorola Japan Ltd.; SPS, Technical Information Center, 3-20-1,
Minami-Azabu, Minato-ku, Tokyo 106-8573 Japan. 81-3-3440-3569

Technical Information Center: 1-800-521-6274

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre,
2, Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.
852-26668334

HOME PAGE: <http://www.motorola.com/semiconductors/>



MOTOROLA

**For More Information On This Product,
Go to: www.freescale.com**

MPXA4115A/D