

MPXA6115A MPXAZ6115A

MPXH6115A

MPXHZ6115A

Series

Top view

Pinout



V_{OUT}

GND

⊐ V_S

DNC

3

2

1

Pin 1 identification

chamfered corner or notch in pin

MPXxx6115A, 15 to 115 kPa, Absolute, Integrated Pressure Sensor

The MPXxx6115A 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 pressure sensor a logical and economical choice for the system designer.

The MPXxx6115A 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.

Features

- Resistant to high humidity and common automotive media
- Improved accuracy at high temperature
- Available in small and super small outline packages
- 1.5% maximum error over 0 °C to 85 °C
- Ideally suited for microprocessor or microcontroller-based systems
- Temperature compensated from -40 °C to +125 °C
- Durable Thermoplastic (PPS) Surface Mount Package

Typical applications

- Industrial controls
- Engine control/manifold absolute pressure (MAP)
- Weather station and weather reporting device barometers



MPXA6115A6U/T1 Case 98ASB17756C



MPXA6115AC6U/T1 MPXAZ6115AC6T1 Case 98ASB17757C

Super small outline packages

Small outline packages



MPXH6115A6U/T1 MPXHZ6115A6U/T1 Case 98ARH99066A



MPXA6115AC7U

Case 98ASB17759C

MPXH6115AC6U/T1 MPXHZ6115AC6U/T1 Case 98ARH99089A

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DNC I

DNC [

DNC [

DNC C

5

6

7

8



MPXAZ6115AP/T1 Case 98ASA99303D





i.

Ordering information										
Device name	Chinning	Deekere		# of Port	s		Pressure type	9	Device	
Device name	Shipping	Package	None	Single	Dual	Gauge	Differential	Absolute	marking	
Small outline package	ge (MPXA6115A	series)								
MPXA6115A6U	Rails	98ASB17756C	•					•	MPXA6115A	
MPXA6115A6T1	Tape and Reel	98ASB17756C	•					•	MPXA6115A	
MPXA6115AC6U	Rails	98ASB17757C		•				•	MPXA6115A	
MPXA6115AC6T1	Tape and Reel	98ASB17757C		•				•	MPXA6115A	
MPXA6115AC7U	Rails	98ASB17759C		•				•	MPXA6115A	
Small outline package	ge (Media resista	ant gel) (MPXAZ61 [,]	15A serie	es)						
MPXAZ6115AC6T1	Tape and Reel	98ASB17757C		•				•	MPXAZ6115A	
MPXAZ6115AP	Trays	98ASA99303D		•				•	MPXAZ6115A	
MPXAZ6115APT1	Tape and Reel	98ASA99303D		•				•	MPXAZ6115A	
Super small outline	package (MPXH	6115A series)								
MPXH6115A6U	Rails	98ARH99066A	•					•	MPXH6115A	
MPXH6115A6T1	Tape and Reel	98ARH99066A	•					•	MPXH6115A	
MPXH6115AC6U	Rails	98ARH99089A		•				•	MPXH6115A	
MPXH6115AC6T1	Tape and Reel	98ARH99089A		•				•	MPXH6115A	
Small outline packa	ge (Media resista	ant gel) (MPXHZ61 ⁻	15A seri	es)						
MPXHZ6115A6U	Rails	98ARH99066A	•					•	MPXHZ6115A	
MPXHZ6115A6T1	Tape and Reel	98ARH99066A	•					•	MPXHZ6115A	
MPXHZ6115AC6U	Rails	98ARH99089A		•				•	MPXHZ6115A	
MPXHZ6115AC6T1	Tape and Reel	98ARH99089A		•				•	MPXHZ6115A	



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Related Documentation

The MPXxx6115A 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/

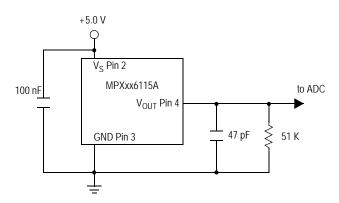
- 2. In the Keyword search box at the top of the page, enter the device number MPXxx6115A.
- 3. In the Refine Your Result pane on the left, click on the Documentation link.

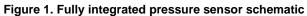


1 General Description

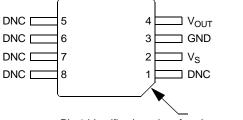
1.1 Block diagram

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





1.2 Pinout



Pin 1 identification, chamfered corner or notch in pin

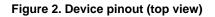


Table 1. Pin functions

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	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
Output source current @ full-scale output ⁽²⁾	I _o +	0.5	mAdc
Output sink current @ minimum pressure offset ⁽²⁾	l _o -	-0.5	mAdc

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

2. Maximum output current is controlled by effective impedance from V_{OUT} to GND or V_{OUT} to V_S in the application circuit.

2.2 Operating characteristics

Table 3. Operating characteristics (V_S = 5.0 Vdc, T_A = 25 °C unless otherwise noted, P1 > P2)

Characteristic	Symbol	Min	Тур	Max	Unit
Pressure range	P _{OP}	15	—	115	kPa
Supply voltage ⁽¹⁾	V _S	4.75	5.0	5.25	Vdc
Supply current	Ι _ο	—	6.0	10	mAdc
Minimum pressure offset ⁽²⁾ (0 °C to 85° C) @ $V_S = 5.0$ Volts	V _{off}	0.133	0.200	0.268	Vdc
Full-scale output ⁽³⁾ (0 °C to 85° C) @ $V_S = 5.0$ Volts	V _{FSO}	4.633	4.700	4.768	Vdc
Full-scale span ⁽⁴⁾ (0 °C to 85° C) @ $V_S = 5.0$ Volts	V _{FSS}	4.433	4.500	4.568	Vdc
Accuracy ⁽⁵⁾ (0 °C to 85° C)	_	_	—	±1.5	%V _{FSS}
Sensitivity	V/P	—	45.0	—	mV/kPa
Response time ⁽⁶⁾	t _R	-	1.0	—	ms
Warm-up time ⁽⁷⁾	_	—	20	—	ms
Offset stability ⁽⁸⁾	-	-	±0.25	—	%V _{FSS}

1. Device is ratiometric within this specified excitation range.

2.Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.

3.Full-scale output (V_{FSO}) is defined as the output voltage at the maximum or full-rated pressure.

4. 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.

5. 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 °C to 85 °C, relative to 25 °C.
TcOffset:	Output deviation with minimum pressure applied, over the temperature range of 0 °C to 85 °C, relative to 25 °C.

6.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.

7.Warm-up time is defined as the time required for the product to meet the specified output voltage after the pressure has been stabilized.

8.Offset stability is the product's output deviation when subjected to 1000 cycles of pulsed pressure, temperature cycling with bias test.



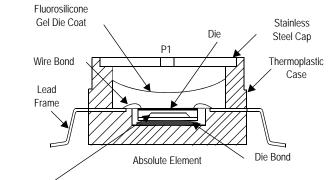
3 On-chip Temperature Compensation and Calibration

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

Figure 4 shows a typical application circuit (output source current operation).

Figure 5 shows the sensor output signal relative to pressure input. Typical minimum and maximum output curves are shown for operation over 0 °C 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 MPXxx6115A 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.



Sealed Vacuum Reference



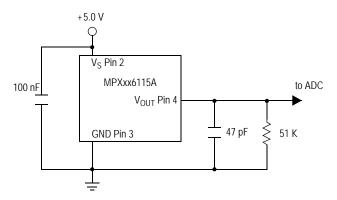
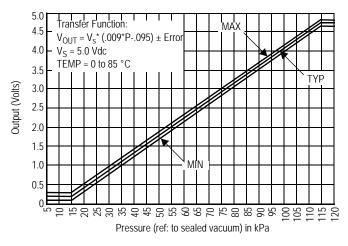
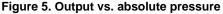


Figure 4. Typical application circuit (output source current operation)

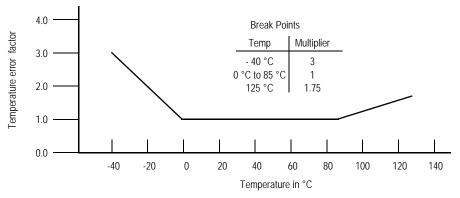






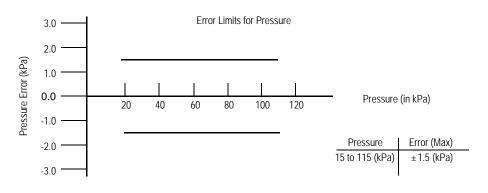
Nominal Transfer Value: $V_{OUT} = V_S \times (0.009 \times P - 0.095)$ ± (Pressure Error x Temp. Factor x 0.009 x V_S) $V_S = 5.0 \pm 0.25$ Vdc

Figure 6. Transfer function



NOTE: The Temperature Multiplier is a linear response from 0 °C to -40 °C and from 85 °C to 125 °C

Figure 7. Temperature error band







4 Package Information

4.1 Minimum recommended footprint for small and super small packages

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

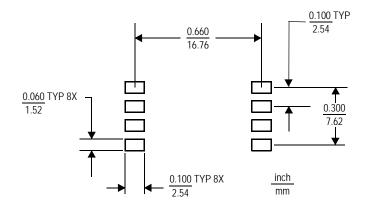


Figure 9. SOP Footprint (Case 98ASB17756C)

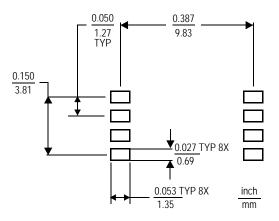
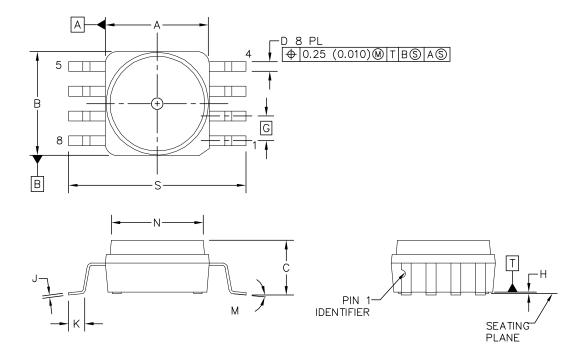


Figure 10. SSOP Footprint (Case 98ARH99066A and 98ARH99089A)



4.2 Package dimensions

This drawing is located at http://cache.freescale.com/files/shared/doc/package_info/98ASB17756C.pdf.



	MILLIMETERS		INCH	HES	
DIM	MIN	MAX	MIN	MAX	
А	10.54	10.79	0.415	0.425	
В	10.54	10.79	0.415	0.425	
С	5.38	5.84	0.212	0.230	
D	0.96	1.07	0.038	0.042	
G	2.54 BSC		0.100 BSC		
Н	0.05	0.25	0.002	0.010	
J	0.23	0.28	0.009	0.011	
К	1.55	1.80	0.061	0.071	
М	0.	7.	0.	7'	
Ν	10.29	10.54	0.405	0.415	
S	18.01	18.41	0.709	0.725	

NOTES:

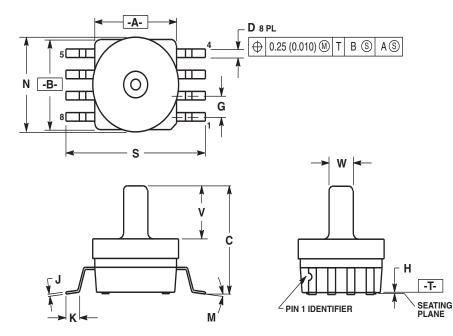
- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994
- 2. CONTROLLING DIMENSION: INCH.
- 3. DIMENSION "A" AND "B" DO NOT INCLUDE MOLD PROTRUSION.
- 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006).
- 5. ALL VERTICAL SURFACES 5' TYPICAL DRAFT.

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8 LD SENSOR SOP			RD: NON-JEDEC
			10 JAN 2013

Case 98ASB17756C, Small outline package



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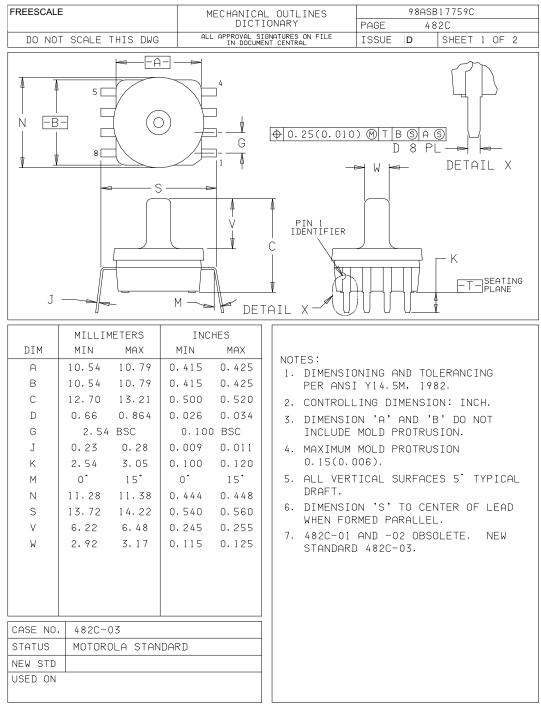


NOTES:
 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: INCH.
 DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
 MAXIMUM MOLD PROTRUSION 0.15 (0.006).
 ALL VERTICAL SURFACES 5' TYPICAL DRAFT.

	INC	HES	MILLIM	ETERS
DIM	MIN	MAX	MIN	MAX
Α	0.415	0.425	10.54	10.79
В	0.415	0.425	10.54	10.79
С	0.500	0.520	12.70	13.21
D	0.038	0.042	0.96	1.07
G	0.100) BSC	2.54	BSC
Н	0.002	0.010	0.05	0.25
J	0.009	0.011	0.23	0.28
Κ	0.061	0.071	1.55	1.80
М	0°	7°	0°	7°
Ν	0.444	0.448	11.28	11.38
S	0.709	0.725	18.01	18.41
٧	0.245	0.255	6.22	6.48
W	0.115	0.125	2.92	3.17

Case 98ASB17757C, small outline package



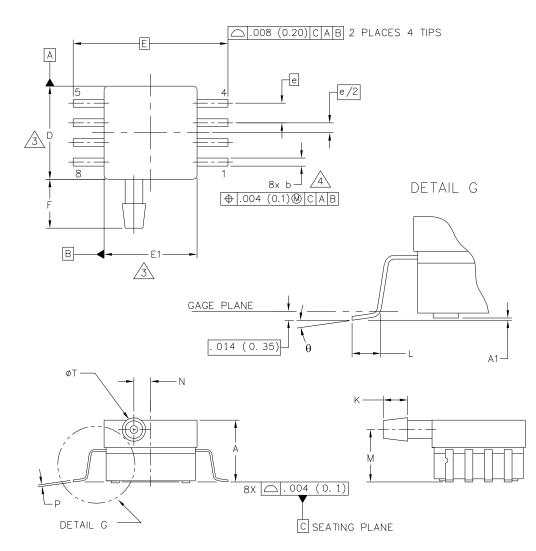


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Case 98ASB17759C, small outline package



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8 LD SOP, SIDE PO	DRT C,	ASE NUMBER	2: 1369-01	13 DEC 2010
	S	TANDARD: NO	N-JEDEC	

PAGE 1 OF 2

Case 98ASA99303D, Small Outline Package



NOTES:

1. CONTROLLING DIMENSION: INCH

2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.

△ DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PPROTRUSIONS. MOLD FLASH AND PROTRUSIONS SHALL NOT EXCEED .006 (0.152) PER SIDE.

A DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .008 (0.203) MAXIMUM.

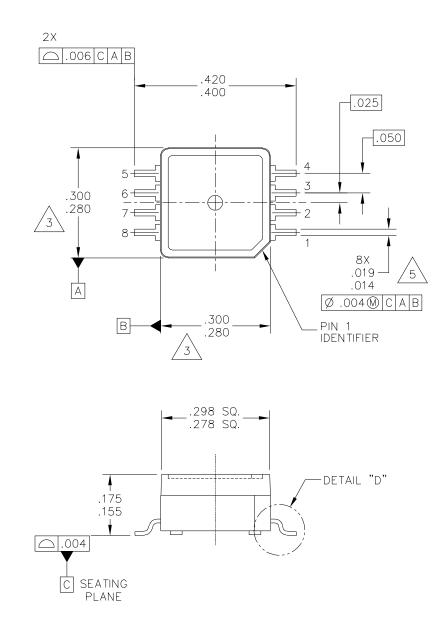
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DIM	MIN	MAX	Min	MAX	DIM	MIN	MAX	MIN	MAX
A	.300	.330	7.62	8.38	θ	0.	7.	0.	7'
A1	.002	.010	0.05	0.25	-				
b	.038	.042	0.96	1.07	-				
D	.465	.485	11.81	12.32	-				
E	.717	BSC	18	8.21 BSC	-				
E1	.465	.485	11.81	12.32	-				
е	.100	BSC	2.	54 BSC	-				
F	.245	.255	6.22	6.47	-				
к	.120	.130	3.05	3.30	_				
L	.061	.071	1.55	1.80	-				
М	.270	.290	6.86	7.36	_				
N	.080	.090	2.03	2.28	-				
Р	.009	.011	0.23	0,28	-				
Т	.115	.125	2.92	3.17	-				
	FREESCALE SEN		INC.						
		TS RESERVED.	INC.	MECHANICA	L OU	TLINE	PRINT VER	SION NO	DT TO SCALE
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PAGE 2 OF 2

Case 98ASA99303D, Small outline package



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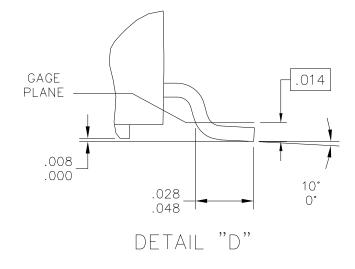


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			CASE NUMBER: 1317-04 13 APF		13 APR 2012
		STANDAF	RD: NON-JEDEC		

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Case 98ARH99066A, Super small outline package





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	3301		STANDAF	RD: NON-JEDEC	

PAGE 2 OF 3

Case 98ARH99066A, Super small outline package



NOTES:

- 1. ALL DIMENSIONS IN INCHES.
- 2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- A DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSION SHALL NOT EXCEED .006 INCHES PER SIDE.
- 4. ALL VERTICAL SURFACES TO BE 5' MAXIMUM.

5. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .008 INCHES MAXIMUM.

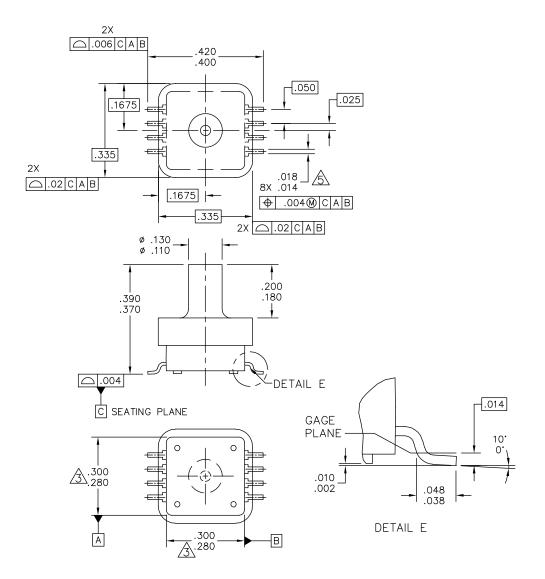
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		CASE NU	JMBER: 1317-04	13 APR 2012
330P		STANDAF	RD: NON-JEDEC	

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Case 98ARH99066A, Super small outline package



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TITLE:	DOCUMENT	NO: 98ARH99089A	REV: D
8 LD, PORTED SS	SOP CASE NUMB	ER: 1317A-04	26 OCT 2006
	STANDARD:	NON-JEDEC	

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Case 98ARH99089A, Super small outline package



NOTES:

- 1. ALL DIMENSIONS IN INCHES.
- 2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.



- DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSION SHALL NOT EXCEED .006 INCHES PER SIDE.
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- DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .008 INCHES MAXIMUM.

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TITLE:				DOCUMENT NO): 98ARH99089A	REV: D
8 LD, PORTED SSOP		CASE NUMBER	R: 1317A-04	26 OCT 2006		
				STANDARD: NO	N-JEDEC	

PAGE 2 OF 2

Case 98ARH99089A, Super small outline package



5 Revision History

Table 4. Revision history

Revision number	Revision date	Description of changes	
7.1	05/2012	 Updated Package Drawing 98ARH99066A was Rev. F, updated to Rev. H, 	
7.2	10/2012	 On page 1, changed typical output voltage from 4.8V to 4.7V to match typical output voltage listed on page 3 of document 	
7.3	04/2015	 Removed obsolete part numbers MPXAZ6115A6U and MPXAZ6115AC6U from data sheet. Updated format. 	



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