

# AZ10EP16VS AZ100EP16VS

## ECL/PECL Differential Receiver with Variable Output Swing

### FEATURES

- Silicon-Germanium for High Speed Operation
- 150ps Typical Propagation Delay
- AZ100EP16VS Functionally Equivalent to ON Semiconductor MC100EP16VS at 3.3V
- Available in a 3x3mm MLP Package
- S-Parameter (.s2p) and IBIS Model Files available on Arizona Microtek Website

### PACKAGE AVAILABILITY

PACKAGE	PART NUMBER	MARKING	NOTES
SOIC 8	AZ10EP16VSD	AZM10 EP16VS	1,2,3
SOIC 8	AZ100EP16VSD	AZM100 EP16VS	1,2,3
TSSOP 8	AZ10EP16VST	AZTP EP16VS	1,2,3
TSSOP 8	AZ100EP16VST	AZHP EP16VS	1,2,3
MLP 16 (3x3)	AZ10/100EP16VSL	AZM 16S <Date Code>	1,2
MLP 16 (3x3) RoHS Compliant / Lead(Pb) Free	AZ10/100EP16VSL+	AZM+ 16S <Date Code>	1,2

- 1 Add R1 at end of part number for 7 inch (1K parts), R2 for 13 inch (2.5K parts) Tape & Reel.
- 2 Date code format: "Y" or "YY" for year followed by "WW" for week.
- 3 Date code "YWW" or "YYWW" on underside of part.

### DESCRIPTION

The AZ10/100EP16VS is a Silicon–Germanium (SiGe) differential receiver with variable output swing. The EP16VS has functionality and output transition times similar to the EP16, with an input that controls the amplitude of the Q/Q outputs.

Connecting the BOOST pin to  $V_{EE}$  increases the output swing by about 15% above standard ECL/PECL levels. The BOOST pin is internally tied to  $V_{EE}$  for the SOIC 8 and TSSOP 8 packages, and is under external user control for the MLP 16 package. When both the BOOST pin and the  $V_{CTRL}$  pin are not connected, the part operates with the standard ECL/PECL output and  $V_{BB}$  levels of the AZ10/100EP16 device. To ensure best performance, the BOOST pin should be tied to  $V_{EE}$  when the variable swing feature is used.

The operational range of the EP16VS control input,  $V_{CTRL}$ , is from  $V_{REF}$  (full swing) to  $V_{CC}$  (min. swing). Maximum swing is achieved by leaving the  $V_{CTRL}$  pin open or tied to  $V_{EE}$ . Simple control of the output swing can be obtained by a variable resistor between the  $V_{REF}$  and  $V_{CC}$  pins, with the wiper driving  $V_{CTRL}$ . Typical application circuits and results are described in this Data Sheet.

The EP16VS provides a  $V_{REF}$  ( $V_{BB}/V_{REF}$ ) output for a DC bias when AC coupling to the device. The  $V_{REF}$  pin should be used only as a bias for the EP16VS as its current sink/source capability is limited. Whenever used, the  $V_{REF}$  pin should be bypassed to ground via a 0.01 $\mu$ F capacitor.

Under open input conditions for D/D, the Q/Q outputs are not guaranteed.

NOTE: Specifications in ECL/PECL tables are valid when thermal equilibrium is established.

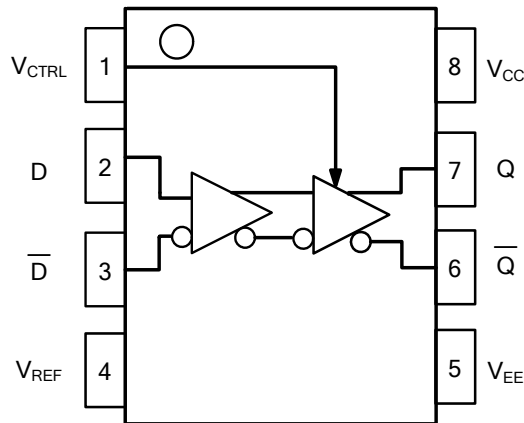
**AZ10EP16VS**  
**AZ100EP16VS**

**PIN DESCRIPTION**

PIN	FUNCTION
D, $\bar{D}$	Data Inputs
$V_{CTRL}$	Output Swing Control
Q, $\bar{Q}$	Data Outputs
$V_{REF}$ , $V_{BB}/V_{REF}$	Reference Voltage Output
BOOST	Increases Output Swing when tied to $V_{EE}$ *
$V_{CC}$	Positive Supply
$V_{EE}$	Negative Supply
NC	No Connect

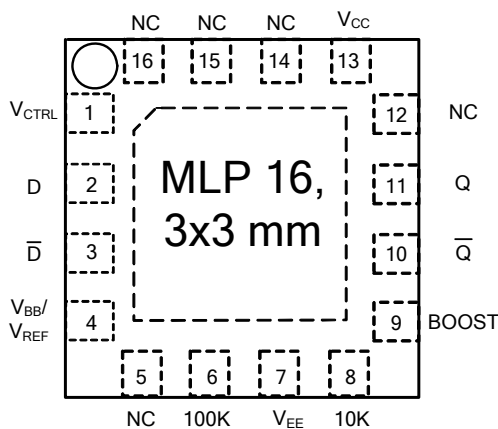
\*BOOST should be tied to  $V_{EE}$  for best performance when using the variable swing feature.

**LOGIC DIAGRAM AND PINOUT ASSIGNMENT**



SOIC 8 & TSSOP 8

**TOP VIEW**



Bottom Center Pad may be left open or tied to  $V_{EE}$

**MLP 16 Package:**  
**10K/100K Selection**

Connect pin 10K to  $V_{EE}$  and float (NC) pin 100K to select 10K operation. Connect pin 100K to  $V_{EE}$  and float (NC) pin 10K to select 100K operation.

**Variable Swing Selection**

Connect pin BOOST to  $V_{EE}$  to support variable swing operation. Float (NC) pins BOOST and  $V_{CTRL}$  to disable variable swing operation.

All  $V_{EE}$  connections must be less than  $1\Omega$ .

**AZ10EP16VS**  
**AZ100EP16VS**

**Absolute Maximum Ratings are those values beyond which device life may be impaired.**

Symbol	Characteristic	Rating	Unit
V <sub>CC</sub>	PECL Power Supply (V <sub>EE</sub> = 0V)	0 to +4.5	Vdc
V <sub>I</sub>	PECL Input Voltage (V <sub>EE</sub> = 0V)	0 to +4.5	Vdc
V <sub>EE</sub>	ECL Power Supply (V <sub>CC</sub> = 0V)	-4.5 to 0	Vdc
V <sub>I</sub>	ECL Input Voltage (V <sub>CC</sub> = 0V)	-4.5 to 0	Vdc
I <sub>OUT</sub>	Output Current --- Continuous --- Surge	50 100	mA
T <sub>A</sub>	Operating Temperature Range	-40 to +85	°C
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C

**10K ECL DC Characteristics (V<sub>EE</sub> = -3.0V to -3.6V, V<sub>CC</sub> = GND)**

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V <sub>OH</sub>	Output HIGH Voltage <sup>1</sup>	-1095		-845	-1055		-805	-1030		-780	-970		-720	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,2</sup> V <sub>CTRL</sub> = V <sub>REF</sub> BOOST = V <sub>EE</sub>	-2000		-1700	-2000		-1690	-2000		-1690	-2000		-1655	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,2</sup> V <sub>CTRL</sub> = V <sub>CC</sub> BOOST = V <sub>EE</sub>	-1285		-1035	-1270		-1020	-1265		-1015	-1255		-1005	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,3</sup> V <sub>CTRL</sub> = NC BOOST = NC	-1950		-1650	-1950		-1630	-1950		-1630	-1950		-1595	mV
V <sub>REF</sub> V <sub>BB</sub> /V <sub>REF</sub>	Reference Voltage <sup>2</sup> BOOST = V <sub>EE</sub>	-1700		-1500	-1670		-1470	-1650		-1450	-1600		-1400	mV
V <sub>BB</sub> /V <sub>REF</sub>	Reference Voltage <sup>3</sup> BOOST = NC	-1430		-1300	-1380		-1270	-1350		-1250	-1310		-1190	mV
I <sub>IH</sub>	Input HIGH Current D,D V <sub>CTRL</sub>			80 400			80 400			80 400			80 400	μA
I <sub>IL</sub>	Input LOW Current	0.5			0.5			0.5			0.5			μA
I <sub>EE</sub>	Power Supply Current	21	27	36	22	28	37	22	29	38	24	30	40	mA

- Each output is terminated through a 50Ω resistor to V<sub>CC</sub> - 2V.
- BOOST is internally bonded to V<sub>EE</sub> for both the SOIC 8 and TSSOP 8 packages.
- Supported in MLP 16 package only.

**10K LVPECL DC Characteristics (V<sub>EE</sub> = GND, V<sub>CC</sub> = +3.3V)**

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V <sub>OH</sub>	Output HIGH Voltage <sup>1,2</sup>	2205		2455	2245		2495	2270		2520	2330		2580	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,2,3</sup> V <sub>CTRL</sub> = V <sub>REF</sub> BOOST = V <sub>EE</sub>	1300		1600	1300		1610	1300		1610	1300		1645	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,2,3</sup> V <sub>CTRL</sub> = V <sub>CC</sub> BOOST = V <sub>EE</sub>	2015		2265	2030		2280	2035		2285	2045		2295	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,3,4</sup> V <sub>CTRL</sub> = NC BOOST = NC	1350		1650	1350		1670	1350		1670	1350		1670	mV
V <sub>REF</sub> V <sub>BB</sub> /V <sub>REF</sub>	Reference Voltage <sup>3</sup> BOOST = V <sub>EE</sub>	1600		1800	1630		1830	1650		1850	1700		1900	mV
V <sub>BB</sub> /V <sub>REF</sub>	Reference Voltage <sup>4</sup> BOOST = NC	1870		2000	1920		2030	1950		2050	1990		2110	mV
I <sub>IH</sub>	Input HIGH Current D,D V <sub>CTRL</sub>			80 400			80 400			80 400			80 400	μA
I <sub>IL</sub>	Input LOW Current	0.5			0.5			0.5			0.5			μA
I <sub>EE</sub>	Power Supply Current	21	27	36	22	28	37	22	29	38	24	30	40	mA

- For supply voltages other than 3.3V, use the ECL table values and ADD supply voltage value.
- Each output is terminated through a 50Ω resistor to V<sub>CC</sub> - 2V.
- BOOST is internally bonded to V<sub>EE</sub> for both the SOIC 8 and TSSOP 8 packages.
- Supported in MLP 16 package only.

# AZ10EP16VS

## AZ100EP16VS

### 100K ECL DC Characteristics ( $V_{EE} = -3.0V$ to $-3.6V$ , $V_{CC} = GND$ )

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$V_{OH}$	Output HIGH Voltage <sup>1</sup>	-1130		-840	-1090		-840	-1090		-840	-1090		-840	mV
$V_{OL}$	Output LOW Voltage <sup>1,2</sup> $V_{CTRL} = V_{REF}$ BOOST = $V_{EE}$	-1950		-1700	-1950		-1700	-1950		-1700	-1950		-1700	mV
$V_{OL}$	Output LOW Voltage <sup>1,2</sup> $V_{CTRL} = V_{CC}$ BOOST = $V_{EE}$	-1200		-940	-1190		-940	-1190		-940	-1190		-940	mV
$V_{OL}$	Output LOW Voltage <sup>1,3</sup> $V_{CTRL} = NC$ BOOST = NC	-1900		-1640	-1890		-1640	-1890		-1640	-1890		-1640	mV
$V_{REF}$ $V_{BB}/V_{REF}$	Reference Voltage <sup>2</sup> BOOST = $V_{EE}$	-1650		-1450	-1650		-1450	-1650	-1550	-1450	-1650		-1450	mV
$V_{BB}/V_{REF}$	Reference Voltage <sup>3</sup> BOOST = NC	-1440		-1320	-1380		-1260	-1380		-1260	-1380		-1260	mV
$I_{IH}$	Input HIGH Current D,D $V_{CTRL}$			80 400			80 400			80 400			80 400	$\mu A$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			0.5			$\mu A$
$I_{EE}$	Power Supply Current	20	26	35	21	27	36	22	28	38	25	31	41	mA

- Each output is terminated through a 50 $\Omega$  resistor to  $V_{CC} - 2V$ .
- BOOST is internally bonded to  $V_{EE}$  for both the SOIC 8 and TSSOP 8 packages.
- Supported in MLP 16 package only.

### 100K LVPECL DC Characteristics ( $V_{EE} = GND$ , $V_{CC} = +3.3V$ )

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$V_{OH}$	Output HIGH Voltage <sup>1,2</sup>	2170		2460	2210		2460	2210		2460	2210		2460	mV
$V_{OL}$	Output LOW Voltage <sup>1,2,3</sup> $V_{CTRL} = V_{REF}$ BOOST = $V_{EE}$	1350		1600	1350		1600	1350		1600	1350		1600	mV
$V_{OL}$	Output LOW Voltage <sup>1,2,3</sup> $V_{CTRL} = V_{CC}$ BOOST = $V_{EE}$	2100		2360	2110		2360	2110		2360	2110		2360	mV
$V_{OL}$	Output LOW Voltage <sup>1,3,4</sup> $V_{CTRL} = NC$ BOOST = NC	1410		1660	1410		1660	1410		1660	1410		1660	mV
$V_{REF}$ $V_{BB}/V_{REF}$	Reference Voltage <sup>3</sup> BOOST = $V_{EE}$	1650		1850	1650		1850	1650		1850	1650		1850	mV
$V_{BB}/V_{REF}$	Reference Voltage <sup>4</sup> BOOST = NC	1860		1980	1920		2040	1920		2040	1920		2040	mV
$I_{IH}$	Input HIGH Current D,D $V_{CTRL}$			80 400			80 400			80 400			80 400	$\mu A$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			0.5			$\mu A$
$I_{EE}$	Power Supply Current	20	26	35	21	27	36	22	28	38	25	31	41	mA

- For supply voltages other than 3.3V, use the ECL table values and ADD supply voltage value.
- Each output is terminated through a 50 $\Omega$  resistor to  $V_{CC} - 2V$ .
- BOOST is internally bonded to  $V_{EE}$  for both the SOIC 8 and TSSOP 8 packages.
- Supported in MLP 16 package only.

# AZ10EP16VS

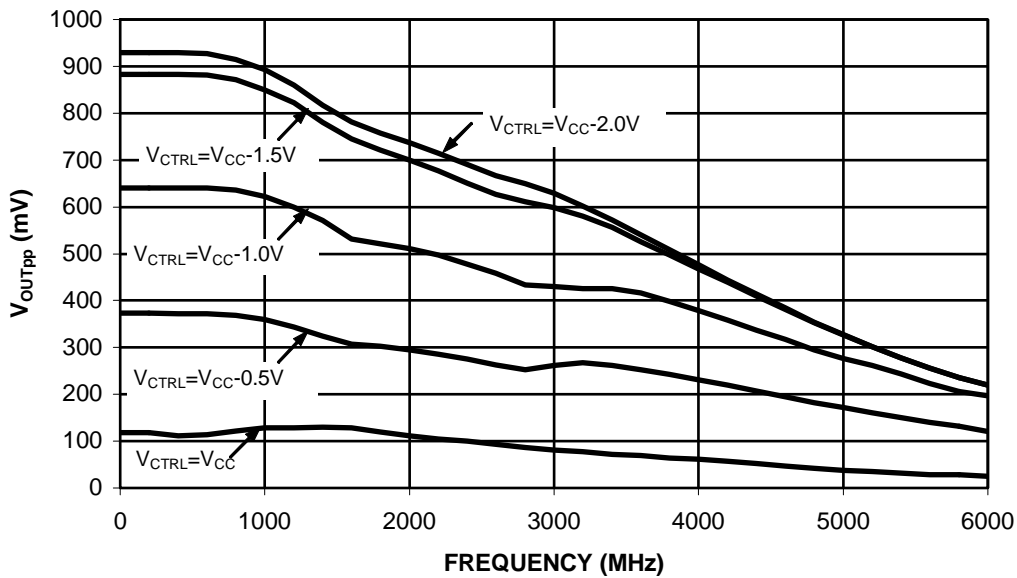
## AZ100EP16VS

**AC Characteristics** ( $V_{EE} = -3.0$  to  $-3.6V$ ,  $V_{CC} = GND$ ,  $V_{CTRL} = V_{REF}$  or  $V_{EE} = GND$ ,  $V_{CC} = +3.0V$  to  $3.6V$ ,  $V_{CTRL} = V_{REF}$ )

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{max}$	Maximum Toggle Frequency <sup>5</sup>		>4			>4			>4			>4		GHz
$t_{PLH} / t_{PHL}$	Input to Output (Diff) Delay (SE)	100	150 155	240	100	150 155	240	100	150 155	240	120	170 175	280	ps
$t_{SKEW}$	Duty Cycle Skew <sup>1</sup> (Diff)		4	20		4	15		4	15		4	15	ps
$V_{DP}$	Minimum Input Swing <sup>2</sup>	150			150			150			150			mV
$V_{CMR}$	Common Mode Range <sup>3</sup>	$V_{EE} + 2.0$		$V_{CC}$	$V_{EE} + 2.0$		$V_{CC}$	$V_{EE} + 2.0$		$V_{CC}$	$V_{EE} + 2.0$		$V_{CC}$	V
$A_v$	Small Signal Gain <sup>4</sup>							28						dB
$t_r / t_f$	Output Rise/Fall Times Q (20% - 80%)		120	170		120	180		120	180		120	200	ps

- Duty cycle skew is the difference between a  $t_{PLH}$  and  $t_{PHL}$  propagation delay through a device.
- $V_{PP}$  is the minimum peak-to-peak differential input swing for which AC parameters are guaranteed.
- The  $V_{CMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{PP}(\min)$  and  $1V$ .
- Differential input, differential output.  $240\Omega$  to  $V_{EE}$  on Q/Q outputs,  $V_{CTRL} = NC$  and  $BOOST = V_{EE}$  (for MLP 16 package).
- See graph below.

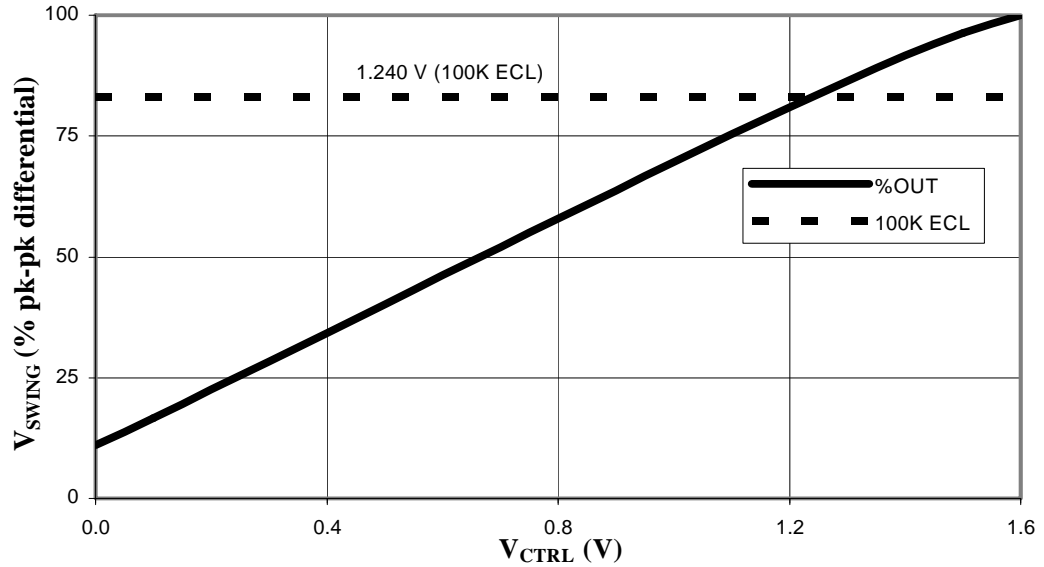
### Typical Large Signal Performance, AZ100EP16VS\*



\*Measured using a 750mV differential input source at 50% duty cycle. Valid for SOIC 8, TSSOP 8, or MLP 16 with  $BOOST = V_{EE}$ .

**AZ10EP16VS**  
**AZ100EP16VS**

**Typical AZ100EP16VS Voltage Output Swing at +25C, Nominal Supply**  
 (see Figure 1 and Figure 2)



(BOOST tied to  $V_{EE}$  for MLP 16, or SOIC 8/TSSOP 8 Package)

Figure 1: Voltage Source Implementation

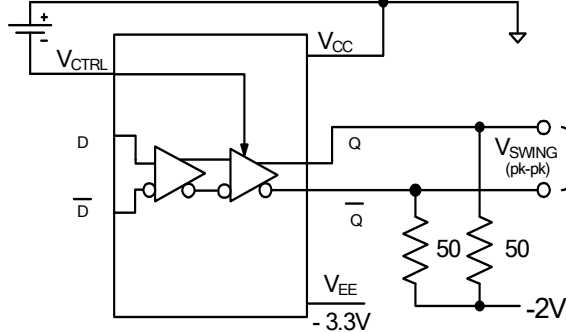
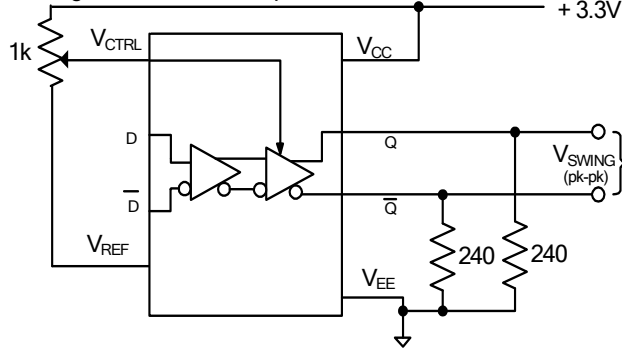
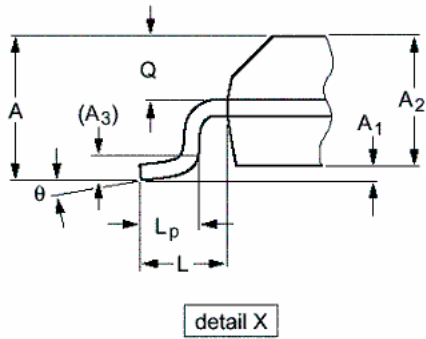
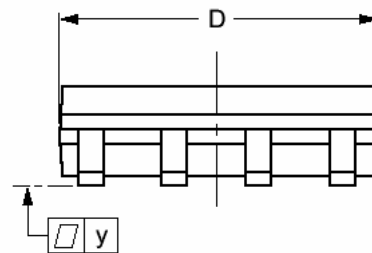
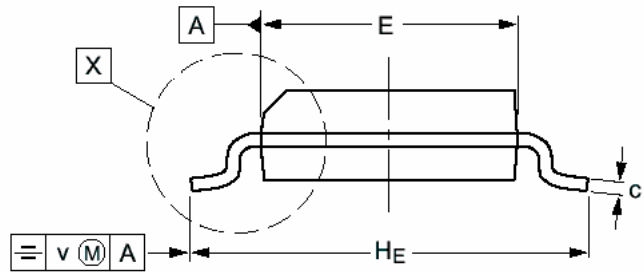
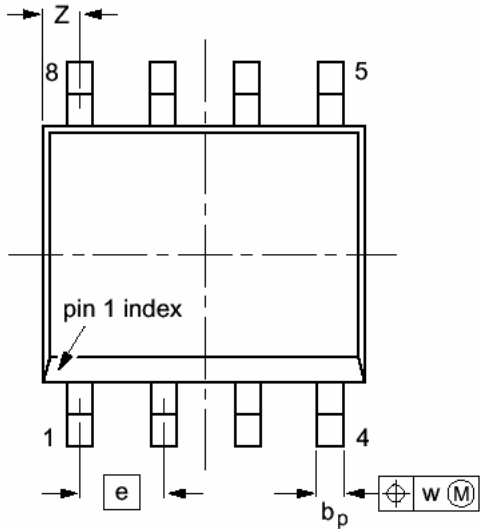


Figure 2: Alternative Implementation



**AZ10EP16VS**  
**AZ100EP16VS**

**PACKAGE DIAGRAM**  
**SOIC 8**

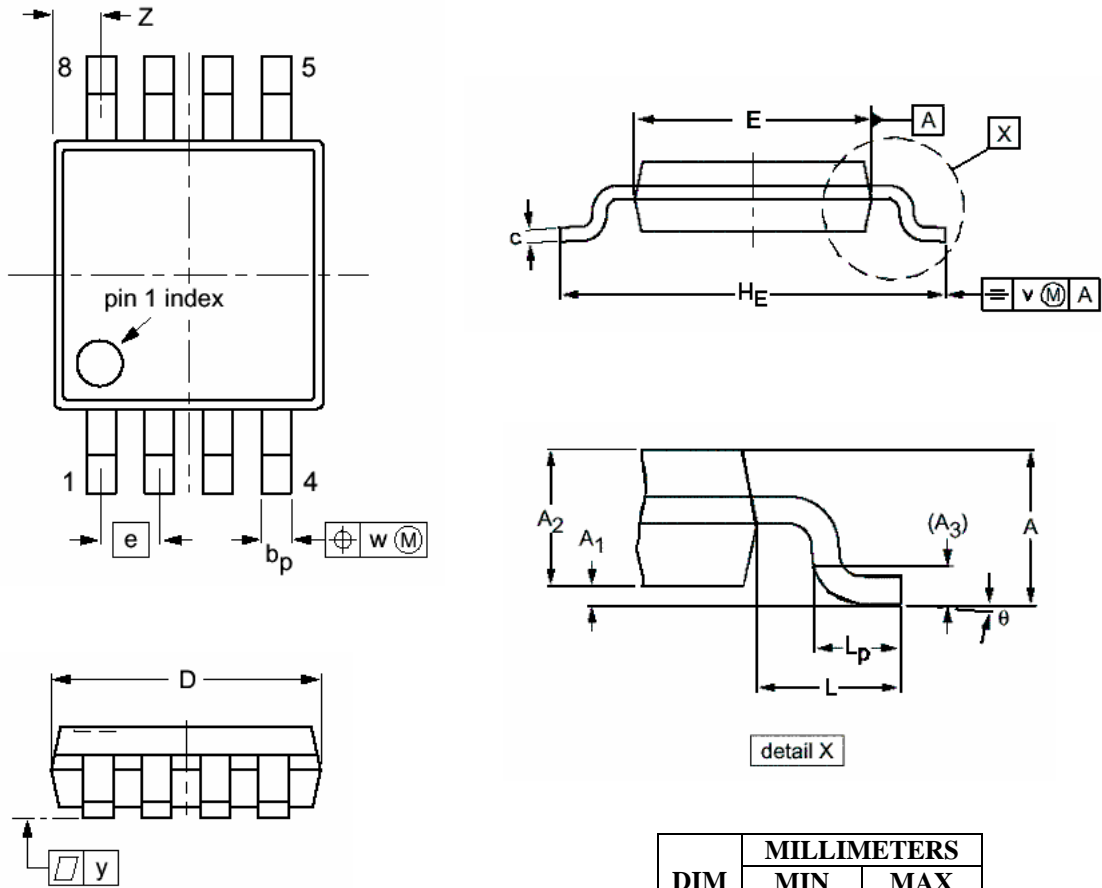


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A		1.75		0.069
A <sub>1</sub>	0.10	0.25	0.004	0.010
A <sub>2</sub>	1.25	1.45	0.049	0.057
A <sub>3</sub>	0.25		0.01	
b <sub>p</sub>	0.36	0.49	0.014	0.019
c	0.19	0.25	0.0075	0.0100
D	4.8	5.0	0.19	0.20
E	3.8	4.0	0.15	0.16
e	1.27		0.050	
H <sub>E</sub>	5.80	6.20	0.228	0.244
L	1.05		0.041	
L <sub>p</sub>	0.40	1.00	0.016	0.039
Q	0.60	0.70	0.024	0.028
v	0.25		0.01	
w	0.25		0.01	
y	0.10		0.004	
Z	0.30	0.70	0.012	0.028
θ	0°	8°	0°	8°

**NOTES:**

1. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
2. MAXIMUM MOLD PROTRUSION FOR D IS 0.15mm.
3. MAXIMUM MOLD PROTRUSION FOR E IS 0.25mm.

**PACKAGE DIAGRAM  
TSSOP 8**



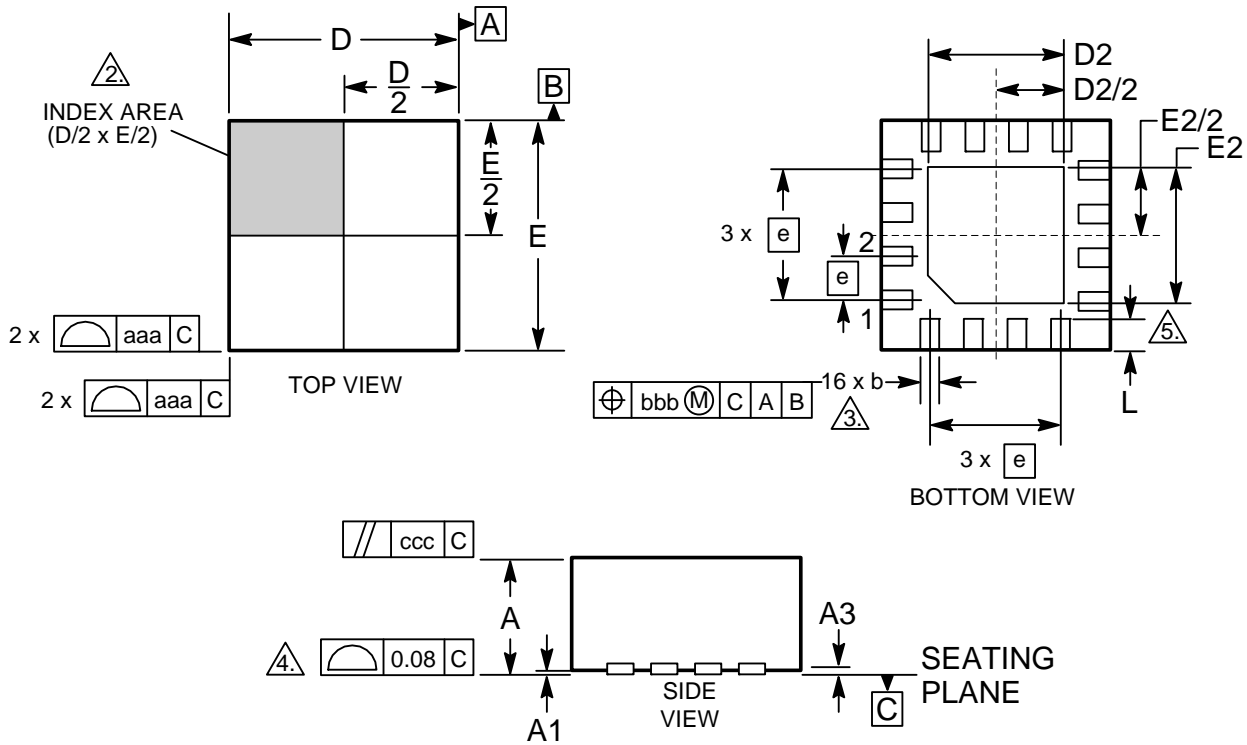
**NOTES:**

1. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
2. MAXIMUM MOLD PROTRUSION FOR D IS 0.15mm.
3. MAXIMUM MOLD PROTRUSION FOR E IS 0.25mm.

DIM	MILLIMETERS	
	MIN	MAX
A		1.10
A <sub>1</sub>	0.05	0.15
A <sub>2</sub>	0.80	0.95
A <sub>3</sub>	0.25	
b <sub>p</sub>	0.25	0.45
c	0.15	0.28
D	2.90	3.10
E	2.90	3.10
e	0.65	
H <sub>E</sub>	4.70	5.10
L	0.94	
L <sub>p</sub>	0.40	0.70
v	0.10	
w	0.10	
y	0.10	
Z	0.35	0.70
θ	0°	6°



**PACKAGE DIAGRAM**  
**MLP 16 3x3mm**



NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME T14-1994.
- $\triangle 2$  THE TERMINAL #1 AND PAD NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012.
- $\triangle 3$  DIMENSION  $b$  APPLIES TO METALLIZED PAD AND IS MEASURED BETWEEN 0.25 AND 0.30 mm FROM PAD TIP.
- $\triangle 4$  COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
- $\triangle 5$  INSIDE CORNERS OF METALLIZED PAD MAY BE SQUARE OR ROUNDED

DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.25 REF	
b	0.18	0.30
D	2.90	3.10
D2	0.25	1.95
E	2.90	3.10
E2	0.25	1.95
e	0.50 BSC	
L	0.30	0.50
aaa	0.25	
bbb	0.10	
ccc	0.10	

**AZ10EP16VS**  
**AZ100EP16VS**

Arizona Microtek, Inc. reserves the right to change circuitry and specifications at any time without prior notice. Arizona Microtek, Inc. makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Arizona Microtek, Inc. 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 special, consequential or incidental damages. Arizona Microtek, Inc. does not convey any license rights nor the rights of others. Arizona Microtek, Inc. products are not designed, intended or authorized for use as components in systems intended to support or sustain life, or for any other application in which the failure of the Arizona Microtek, Inc. product could create a situation where personal injury or death may occur. Should Buyer purchase or use Arizona Microtek, Inc. products for any such unintended or unauthorized application, Buyer shall indemnify and hold Arizona Microtek, Inc. 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 Arizona Microtek, Inc. was negligent regarding the design or manufacture of the part.