ARIZONA MICROTEK, INC.

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/$\overline{Q}$ 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 0.01μF capacitor.

Under open input conditions for D/$\overline{D}$, the Q/$\overline{Q}$ outputs are not guaranteed.

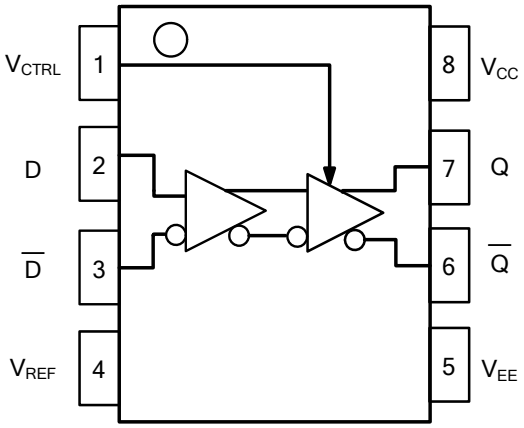
NOTE: Specifications in ECL/PECL tables are valid when thermal equilibrium is established.

PIN DESCRIPTION

PIN	FUNCTION
D, $\overline{D}$	Data Inputs
V_{CTRL}	Output Swing Control
Q, $\overline{Q}$	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

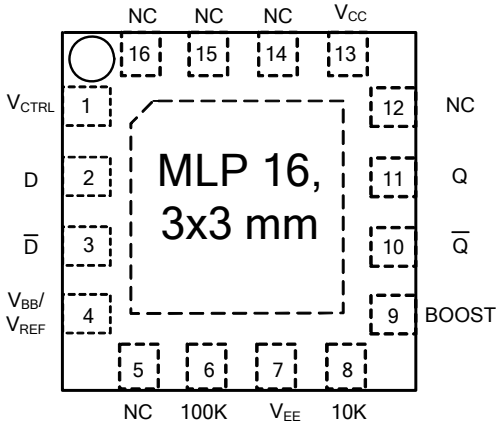
*BOOST should be tied to V_{EE} for best performance when using the variable swing feature.

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 1Ω.

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

Symbol	Characteristic	Rating	Unit
V_{CC}	PECL Power Supply (V_{EE} = 0V)	0 to +4.5	Vdc
V_I	PECL Input Voltage (V_{EE} = 0V)	0 to +4.5	Vdc
V_{EE}	ECL Power Supply (V_{CC} = 0V)	-4.5 to 0	Vdc
V_I	ECL Input Voltage (V_{CC} = 0V)	-4.5 to 0	Vdc
I_{OUT}	Output Current --- Continuous --- Surge	50 100	mA
T_A	Operating Temperature Range	-40 to +85	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C

10K 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[1]	-1095		-845	-1055		-805	-1030		-780	-970		-720	mV
V_{OL}	Output LOW Voltage[1,2] V_{CTRL} = V_{REF} BOOST = V_{EE}	-2000		-1700	-2000		-1690	-2000		-1690	-2000		-1655	mV
V_{OL}	Output LOW Voltage[1,2] V_{CTRL} = V_{CC} BOOST = V_{EE}	-1285		-1035	-1270		-1020	-1265		-1015	-1255		-1005	mV
V_{OL}	Output LOW Voltage[1,3] V_{CTRL} = NC BOOST = NC	-1950		-1650	-1950		-1630	-1950		-1630	-1950		-1595	mV
V_{REF} V_{BB}/V_{REF}	Reference Voltage[2] BOOST = V_{EE}	-1700		-1500	-1670		-1470	-1650		-1450	-1600		-1400	mV
V_{BB}/V_{REF}	Reference Voltage[3] BOOST = NC	-1430		-1300	-1380		-1270	-1350		-1250	-1310		-1190	mV
I_{IH}	Input HIGH Current D,$\overline{D}$ V_{CTRL}			80 400			80 400			80 400			80 400	µA
I_{IL}	Input LOW Current	0.5			0.5			0.5			0.5			µA
I_{EE}	Power Supply Current	21	27	36	22	28	37	22	29	38	24	30	40	mA

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

10K 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[1,2]	2205		2455	2245		2495	2270		2520	2330		2580	mV
V_{OL}	Output LOW Voltage[1,2,3] V_{CTRL} = V_{REF} BOOST = V_{EE}	1300		1600	1300		1610	1300		1610	1300		1645	mV
V_{OL}	Output LOW Voltage[1,2,3] V_{CTRL} = V_{CC} BOOST = V_{EE}	2015		2265	2030		2280	2035		2285	2045		2295	mV
V_{OL}	Output LOW Voltage[1,3,4] V_{CTRL} = NC BOOST = NC	1350		1650	1350		1670	1350		1670	1350		1670	mV
V_{REF} V_{BB}/V_{REF}	Reference Voltage[3] BOOST = V_{EE}	1600		1800	1630		1830	1650		1850	1700		1900	mV
V_{BB}/V_{REF}	Reference Voltage[4] BOOST = NC	1870		2000	1920		2030	1950		2050	1990		2110	mV
I_{IH}	Input HIGH Current D,$\overline{D}$ V_{CTRL}			80 400			80 400			80 400			80 400	µA
I_{IL}	Input LOW Current	0.5			0.5			0.5			0.5			µA
I_{EE}	Power Supply Current	21	27	36	22	28	37	22	29	38	24	30	40	mA

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

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[1]	-1130		-840	-1090		-840	-1090		-840	-1090		-840	mV
V_{OL}	Output LOW Voltage[1,2] $V_{CTRL} = V_{REF}$ BOOST = V_{EE}	-1950		-1700	-1950		-1700	-1950		-1700	-1950		-1700	mV
V_{OL}	Output LOW Voltage[1,2] $V_{CTRL} = V_{CC}$ BOOST = V_{EE}	-1200		-940	-1190		-940	-1190		-940	-1190		-940	mV
V_{OL}	Output LOW Voltage[1,3] V_{CTRL} = NC BOOST = NC	-1900		-1640	-1890		-1640	-1890		-1640	-1890		-1640	mV
V_{REF} V_{BB}/V_{REF}	Reference Voltage[2] BOOST = V_{EE}	-1650		-1450	-1650		-1450	-1650	-1550	-1450	-1650		-1450	mV
V_{BB}/V_{REF}	Reference Voltage[3] BOOST = NC	-1440		-1320	-1380		-1260	-1380		-1260	-1380		-1260	mV
I_{IH}	Input HIGH Current D,$\overline{D}$ V_{CTRL}			80 400			80 400			80 400			80 400	µA
I_{IL}	Input LOW Current	0.5			0.5			0.5			0.5			µA
I_{EE}	Power Supply Current	20	26	35	21	27	36	22	28	38	25	31	41	mA

1. Each output is terminated through a 50Ω resistor to V_{CC} – 2V.
2. BOOST is internally bonded to V_{EE} for both the SOIC 8 and TSSOP 8 packages.
3. 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[1,2]	2170		2460	2210		2460	2210		2460	2210		2460	mV
V_{OL}	Output LOW Voltage[1,2,3] $V_{CTRL} = V_{REF}$ BOOST = V_{EE}	1350		1600	1350		1600	1350		1600	1350		1600	mV
V_{OL}	Output LOW Voltage[1,2,3] $V_{CTRL} = V_{CC}$ BOOST = V_{EE}	2100		2360	2110		2360	2110		2360	2110		2360	mV
V_{OL}	Output LOW Voltage[1,3,4] V_{CTRL} = NC BOOST = NC	1410		1660	1410		1660	1410		1660	1410		1660	mV
V_{REF} V_{BB}/V_{REF}	Reference Voltage[3] BOOST = V_{EE}	1650		1850	1650		1850	1650		1850	1650		1850	mV
V_{BB}/V_{REF}	Reference Voltage[4] BOOST = NC	1860		1980	1920		2040	1920		2040	1920		2040	mV
I_{IH}	Input HIGH Current D,$\overline{D}$ V_{CTRL}			80 400			80 400			80 400			80 400	µA
I_{IL}	Input LOW Current	0.5			0.5			0.5			0.5			µA
I_{EE}	Power Supply Current	20	26	35	21	27	36	22	28	38	25	31	41	mA

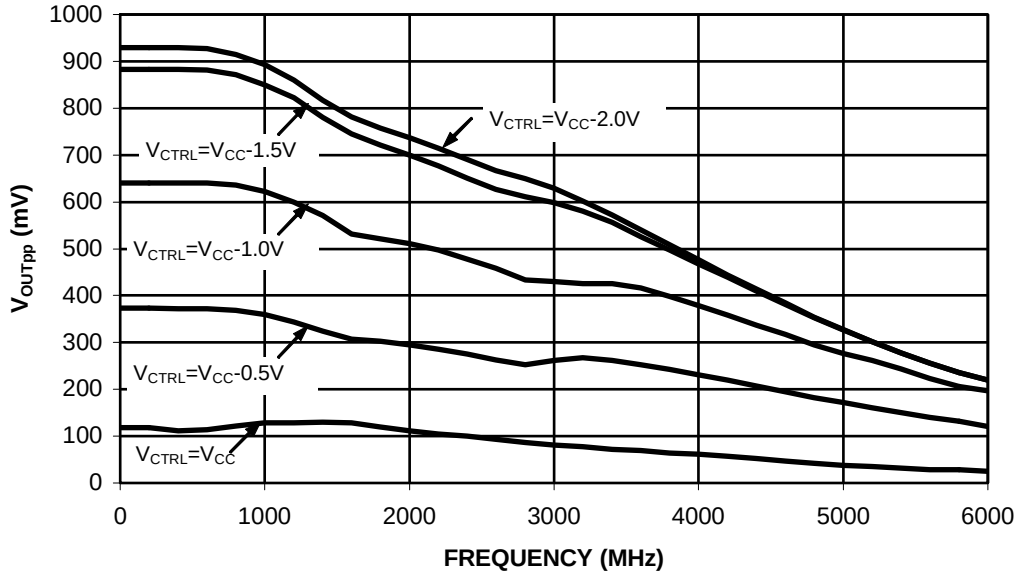
1. For supply voltages other that 3.3V, use the ECL table values and ADD supply voltage value.
2. Each output is terminated through a 50Ω resistor to V_{CC} – 2V.
3. BOOST is internally bonded to V_{EE} for both the SOIC 8 and TSSOP 8 packages.
4. Supported in MLP 16 package only.

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[5]		>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[1] (Diff)		4	20		4	15		4	15		4	15	ps
V_{pp}	Minimum Input Swing[2]	150			150			150			150			mV
V_{CMR}	Common Mode Range[3]	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[4]								28					dB
t_r / t_f	Output Rise/Fall Times Q (20% - 80%)		120	170		120	180		120	180		120	200	ps

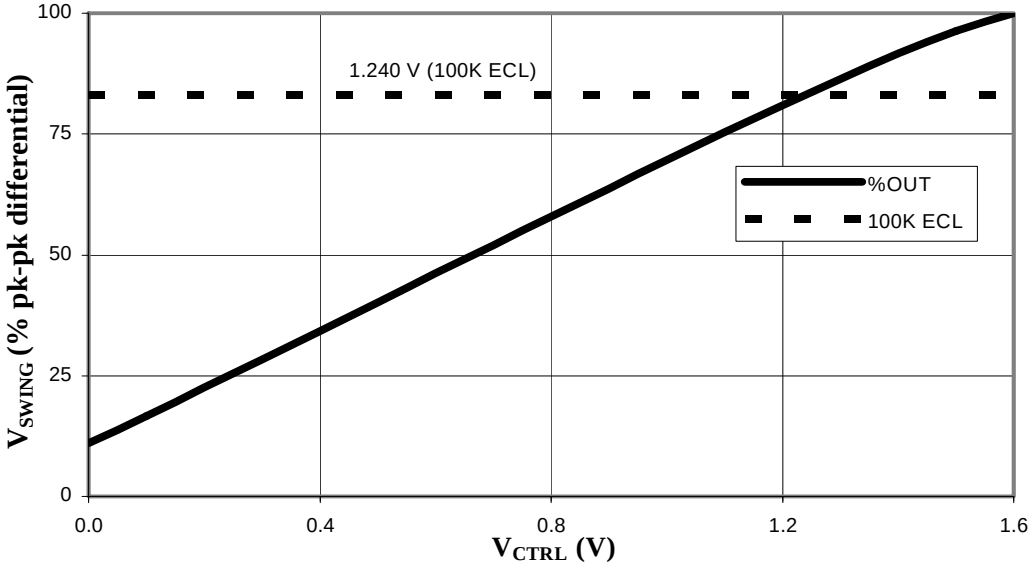
1. Duty cycle skew is the difference between a t_{PLH} and t_{PHL} propagation delay through a device.
2. V_{PP} is the minimum peak-to-peak differential input swing for which AC parameters are guaranteed.
3. The V_{CMR} range is referenced to the most positive side of the differential input signal. 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.
4. Differential input, differential output. 240Ω to V_{EE} on Q/$\overline{Q}$ outputs, V_{CTRL} = NC and BOOST = V_{EE} (for MLP 16 package).
5. 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}.

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



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

Figure 1: Voltage Source Implementation

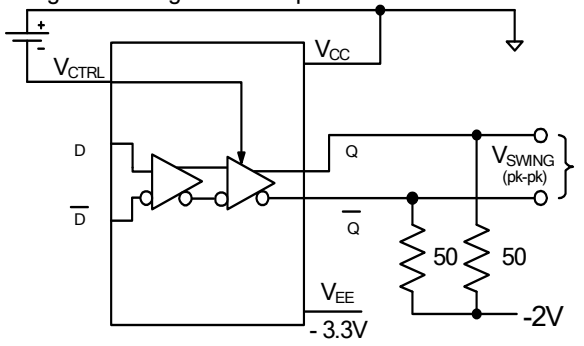
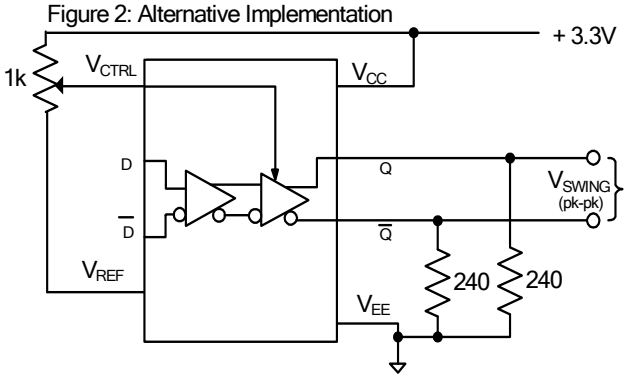
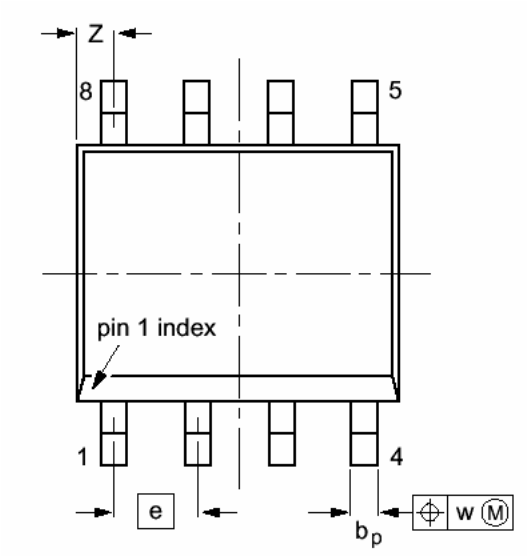
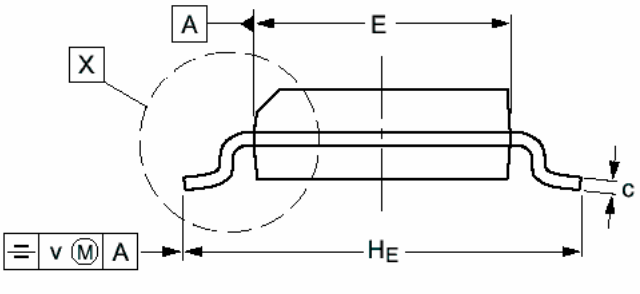


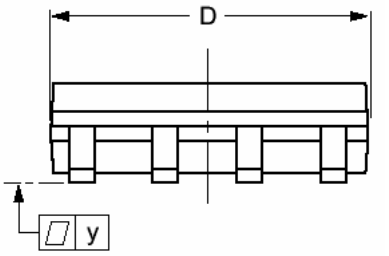
Figure 2: Alternative Implementation

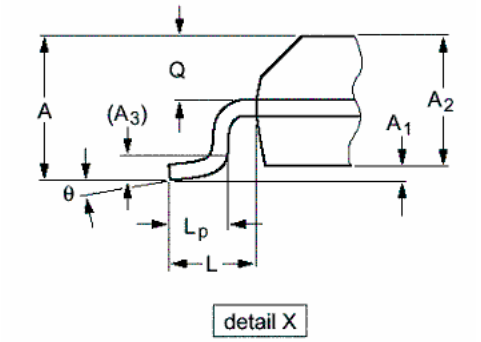


PACKAGE DIAGRAM
SOIC 8





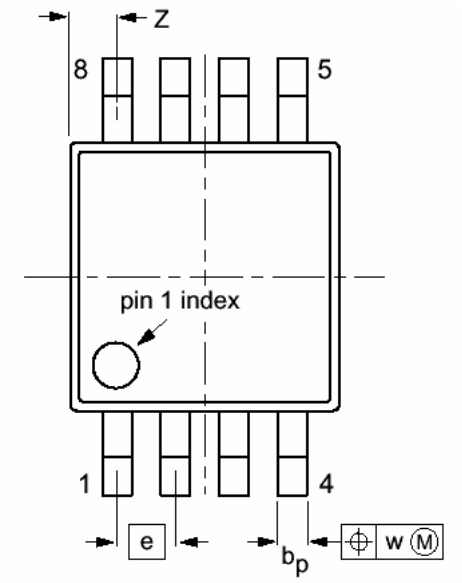


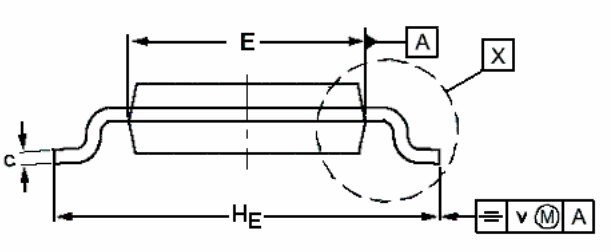


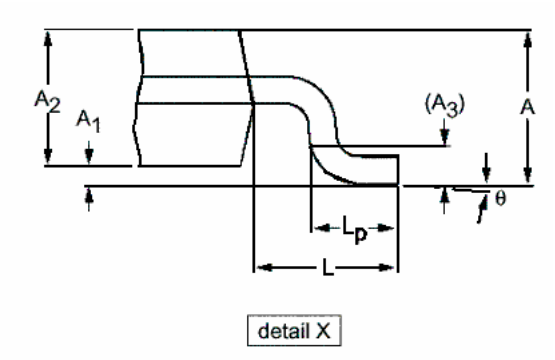
NOTES:
1. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
2. MAXIMUM MOLD PROTRUSION FOR D IS 0.15mm.
3. MAXIMUM MOLD PROTRUSION FOR E IS 0.25mm.

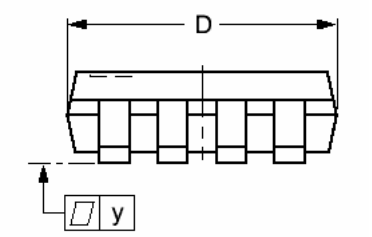
	MILLIMETERS		INCHES	
DIM	**MIN**	**MAX**	**MIN**	**MAX**
A		1.75		0.069
A_1	0.10	0.25	0.004	0.010
A_2	1.25	1.45	0.049	0.057
A_3	0.25		0.01	
b_p	0.36	0.49	0.014	0.019
c	0.19	0.25	0.0075	0.0100
D	4.8	5.0	0.19	0.20
E	3.8	4.0	0.15	0.16
e	1.27		0.050	
H_E	5.80	6.20	0.228	0.244
L	1.05		0.041	
L_p	0.40	1.00	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^O	8^O	0^O	8^O

PACKAGE DIAGRAM
TSSOP 8





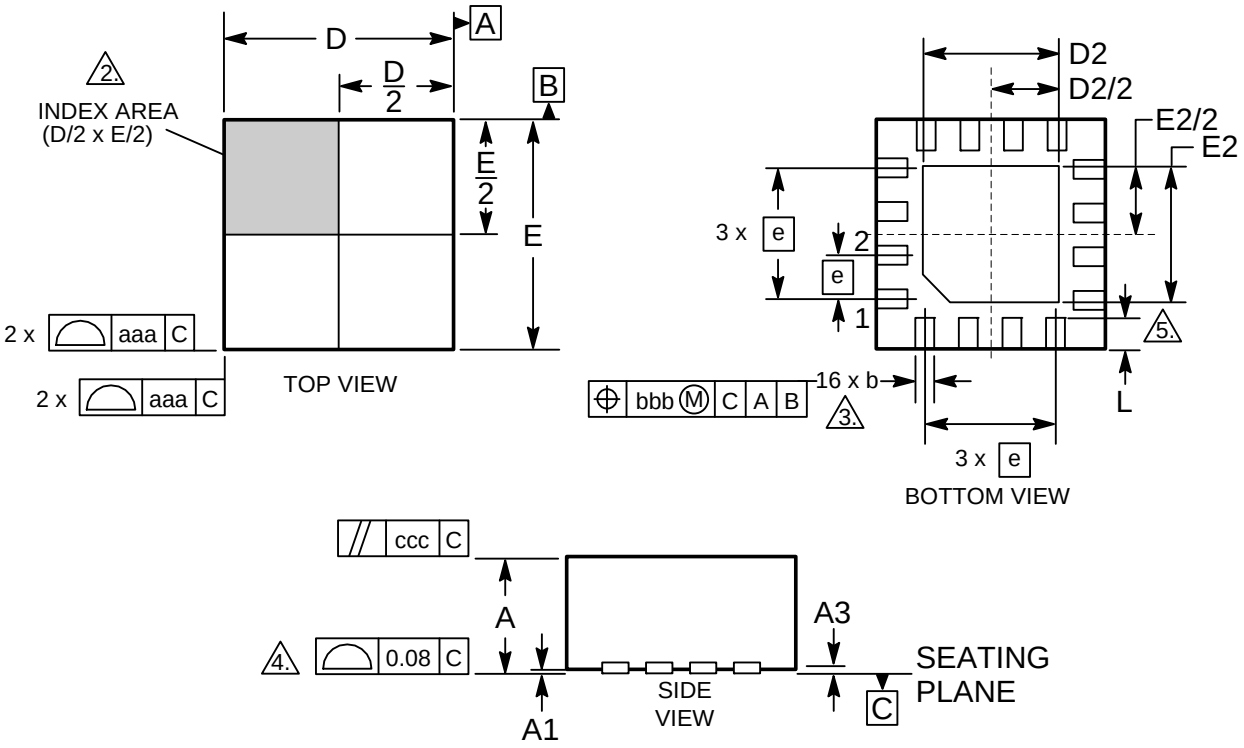




NOTES:
1. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
2. MAXIMUM MOLD PROTRUSION FOR D IS 0.15mm.
3. MAXIMUM MOLD PROTRUSION FOR E IS 0.25mm.

DIM	MILLIMETERS	
	MIN	MAX
A		1.10
A_1	0.05	0.15
A_2	0.80	0.95
A_3	0.25	
b_p	0.25	0.45
c	0.15	0.28
D	2.90	3.10
E	2.90	3.10
e	0.65	
H_E	4.70	5.10
L	0.94	
L_p	0.40	0.70
v	0.10	
w	0.10	
y	0.10	
Z	0.35	0.70
θ	0^O	6^O

PACKAGE DIAGRAM
MLP 16 3x3mm



NOTES:

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

	MILLIMETERS	
DIM	**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	