



AZV99

PECL/LVDS Oscillator Gain Stage & Buffer with Selectable Enable

FEATURES

- Green and RoHS Compliant / Lead (Pb) Free Packages Available
- Similar Operation as AZ100LVEL16VT except with **LVDS Outputs**
- Operating Range of 3.0V to 5.5V
- Minimizes External Components
- Selectable Enable Polarity and Threshold (CMOS/TTL or PECL)
- Available in a 2x2 or 3x3mm MLP Package
- S-Parameter (.s2p) and IBIS Model Files Available on Arizona Microtek Website

PACKAGE AVAILABILITY

PACKAGE	PART NUMBER	MARKING	NOTES
MLP 8 (2x2x0.75) Green / RoHS Compliant / Lead (Pb) Free	AZV99NG	V1G <Date Code>	1,2
MLP 8 (2x2x0.75)	AZV99NA	V9 <Date Code>	1,2
MLP 8 (2x2x0.75) Green / RoHS Compliant / Lead (Pb) Free	AZV99NBG	V8G <Date Code>	1,2
MLP 8 (2x2x0.75) Green / RoHS Compliant / Lead (Pb) Free	AZV99NDG	V2G <Date Code>	1,2
MLP 16 (3x3) Green / RoHS Compliant / Lead (Pb) Free	AZV99LG	AZMG V99 <Date Code>	1,2
TSSOP 8 RoHS Compliant / Lead (Pb) Free	AZV99T+	AZ+ V99	1,2,3
DIE	AZV99XP	N/A	4

- 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" for year followed by "WW" for week.
- 3 Date Code "YWW" on underside of part.
- 4 Waffle Pack

DESCRIPTION

The AZV99 is a specialized oscillator gain stage with LVDS output buffer including an enable. The enable input (EN) allows continuous oscillator operation by only controlling the Q_{HG}/\bar{Q}_{HG} outputs.

The AZV99 also provides a V_{BB} and 470Ω internal bias resistors from D to V_{BB} and \bar{D} to V_{BB} . The V_{BB} pin can support 1.5 mA sink/source current. Bypassing V_{BB} to ground with a 0.01 μF capacitor is recommended.

MLP 16, 3x3 mm Package (L) or DIE (X)

The MLP 16 and die versions of the AZV99 provide a selectable enable (EN). Enable polarity and threshold can be selected to accommodate either CMOS/TTL or PECL input levels. See the enable truth table for enable function. If enable pull-up is desired in the CMOS/TTL mode, an external $\leq 20k\Omega$ resistor connecting EN to V_{CC} will override the on-chip pull-down resistor.

Outputs Q/ \bar{Q} each have a selectable on-chip pull-down current source. See the current source truth table for current source functions. External resistors may also be used to increase pull-down current to a maximum of 25mA (includes internal on-chip current source).



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MLP 8, 2x2 mm Package, NA, NB & ND Options

The MLP 8 NA, NB and ND options of the AZV99 provide a PECL/ECL level enable input (\overline{EN}). When the \overline{EN} input is LOW, the \overline{Q} and Q_{HG}/\overline{Q}_{HG} outputs pass data from the inputs. When \overline{EN} is HIGH, the \overline{Q} output continues to pass data while the Q_{HG} output is forced high and the \overline{Q}_{HG} output is forced low.

Only the \overline{Q} output operates with a current source (4 mA) to V_{EE} . This is accomplished by internal bonding of CS-SEL. An external resistor may also be used to increase pull-down current to a maximum of 25mA (includes 4mA on-chip current source).

The AZV99NB and AZV99ND versions operates with a single ended data input (D). The \overline{D} input is internally bonded directly to the V_{BB} pin bypassing the 470 Ω bias resistor.

TSSOP 8 Package (T), MLP 8 Package, (N)

The TSSOP 8 (T) and MLP 8 (N) versions of the AZV99 provide a CMOS/TTL level enable input (EN). When the EN input is HIGH, the \overline{Q} and Q_{HG}/\overline{Q}_{HG} outputs pass data from the inputs. When EN is LOW, the \overline{Q} output continues to pass data while the Q_{HG} output is forced high and the \overline{Q}_{HG} output is forced low.

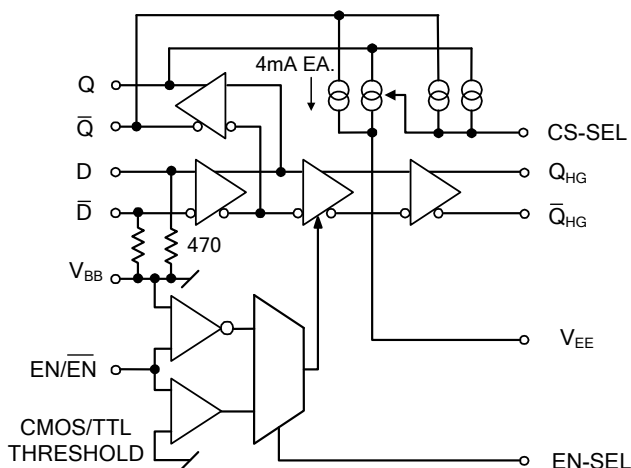
Only the \overline{Q} output operates with a current source (4 mA) to V_{EE} . This is accomplished by internal bonding of CS-SEL. An external resistor may also be used to increase pull-down current to a maximum of 25mA (includes 4mA on-chip current source).

The TSSOP 8 (T) and MLP 8 (N) AZV99 operates with a single ended data input (D). The \overline{D} input is internally bonded directly to the V_{BB} pin bypassing the 470 Ω bias resistor.

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

PIN DESCRIPTION

PIN	FUNCTION
D/ \overline{D}	Data Inputs
Q/ \overline{Q}	PECL Data Outputs
Q_{HG}/\overline{Q}_{HG}	LVDS Data Outputs
V_{BB}	Reference Voltage Output
EN-SEL	Selects Enable Logic
EN/ \overline{EN}	Enable Input
CS-SEL	Selects Q and \overline{Q} Current Source Magnitude
V_{EE}	Negative Supply
V_{CC}	Positive Supply



ENABLE TRUTH TABLE

EN-SEL	EN/ \overline{EN}	Q/ \overline{Q}	Q_{HG}	\overline{Q}_{HG}
NC	PECL Low or NC	Data	Data	Data
NC	PECL High or V_{CC}	Data	High	Low
V_{EE}^1	CMOS/TTL Low, V_{EE} or NC	Data	High	Low
V_{EE}^1	CMOS/TTL High or V_{CC}^2	Data	Data	Data

¹ EN-SEL connections must be less than 1 Ω .

² An external $\leq 20k\Omega$ pull-up resistor between EN and V_{CC} ensures a High when the EN pin is not driven.

CURRENT SOURCE TRUTH TABLE

CS-SEL	Q	\overline{Q}
NC	4mA typ.	4mA typ.
V_{EE}^1	8mA typ.	8mA typ.
V_{CC}^1	0	4mA typ.

¹ CS-SEL connections must be less than 1 Ω .

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

Symbol	Characteristic	Rating	Unit
V _{CC}	Power Supply	0 to +6.0	Vdc
V _I	Input Voltage	0 to +6.0	Vdc
V _{D/D}	D/D Input Voltage	±0.75 with respect to V _{BB}	Vdc
I _{OUT}	Output Current — Continuous Q/Q	25	mA
	— Surge Q/Q	50	
	— Continuous Q _{HG} /Q _{HG}	5	
	— Surge Q _{HG} /Q _{HG}	10	
T _A	Operating Temperature Range	-40 to +85	°C
T _{STG}	Storage Temperature Range	-65 to +150	°C

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

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
V _{OH}	Output HIGH Voltage ^{1,2} Q/Q	2255	2465	2275	2465	2275	2465	2275	2465	mV
V _{OL}	Output LOW Voltage ^{1,2} Q/Q	1375	1745	1400	1680	1400	1680	1400	1680	mV
V _{IH}	Input HIGH Voltage	2135	2560	2135	2560	2135	2560	2135	2560	mV
	D/D ¹ , EN (EN-SEL open) ¹ EN (EN-SEL tied to V _{EE})									
V _{IL}	Input LOW Voltage	1400	1825	1400	1825	1400	1825	1400	1825	mV
	D/D ¹ , EN (EN-SEL open) ¹ EN (EN-SEL tied to V _{EE})									
V _{BB}	Reference Voltage ¹	1910	2050	1910	2050	1910	2050	1910	2050	mV
I _{IL}	Input LOW Current EN ³	0.5		0.5		0.5		0.5		µA
I _{IH}	Input HIGH Current EN ³		150		150		150		150	µA
I _{EE}	Power Supply Current ²		48		48		48		52	mA

1. Voltage levels vary 1:1 with V_{CC}.
2. Specified with CS-SEL open.
3. Specified with EN-SEL open.

100K PECL DC Characteristics (V_{EE} = GND, V_{CC} = +5.0V)

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
V _{OH}	Output HIGH Voltage ^{1,2} Q/Q	3955	4165	3975	4165	3975	4165	3975	4165	mV
V _{OL}	Output LOW Voltage ^{1,2} Q/Q	3075	3445	3100	3380	3100	3380	3100	3380	mV
V _{IH}	Input HIGH Voltage	3835	4260	3835	4260	3835	4260	3835	4260	mV
	D/D ¹ , EN (EN-SEL open) ¹ EN (EN-SEL tied to V _{EE})									
V _{IL}	Input LOW Voltage	3100	3525	3100	3525	3100	3525	3100	3525	mV
	D/D ¹ , EN (EN-SEL open) ¹ EN (EN-SEL tied to V _{EE})									
V _{BB}	Reference Voltage ¹	3610	3750	3610	3750	3610	3750	3610	3750	mV
I _{IL}	Input LOW Current EN ³	0.5		0.5		0.5		0.5		µA
I _{IH}	Input HIGH Current EN ³		150		150		150		150	µA
I _{EE}	Power Supply Current ²		48		48		48		52	mA

1. Voltage levels vary 1:1 with V_{CC}.
2. Specified with CS-SEL open.
3. Specified with EN-SEL open.

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LVDS DC Characteristics for Q_{HG}/Q̄_{HG} Outputs¹ (V_{EE} = GND, V_{CC} = +3.0V to +5.5V)

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
V _{OH}	Output HIGH Voltage		1600		1600		1600		1600	mV
V _{OL}	Output LOW Voltage	900		900		900		900		mV
V _{OC}	Output Common Mode Voltage ²	1125	1375	1125	1375	1125	1375	1125	1375	mV
ΔV _{OC}	Change in Common Mode Voltage ³	-50	50	-50	50	-50	50	-50	50	mV
V _{OUT}	Single-Ended Output Swing	250	450	250	450	250	450	250	450	mV
V _{DIFF OUT}	Differential Output Swing	500	900	500	900	500	900	500	900	mV

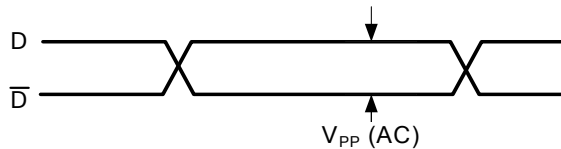
1. Specified with 100Ω resistor connecting Q_{HG} and Q̄_{HG} together.
2. Common mode voltage is the center voltage between Q_{HG} and Q̄_{HG} during a steady state.
3. Change in common mode voltage is the difference between common mode voltages at opposite binary states.

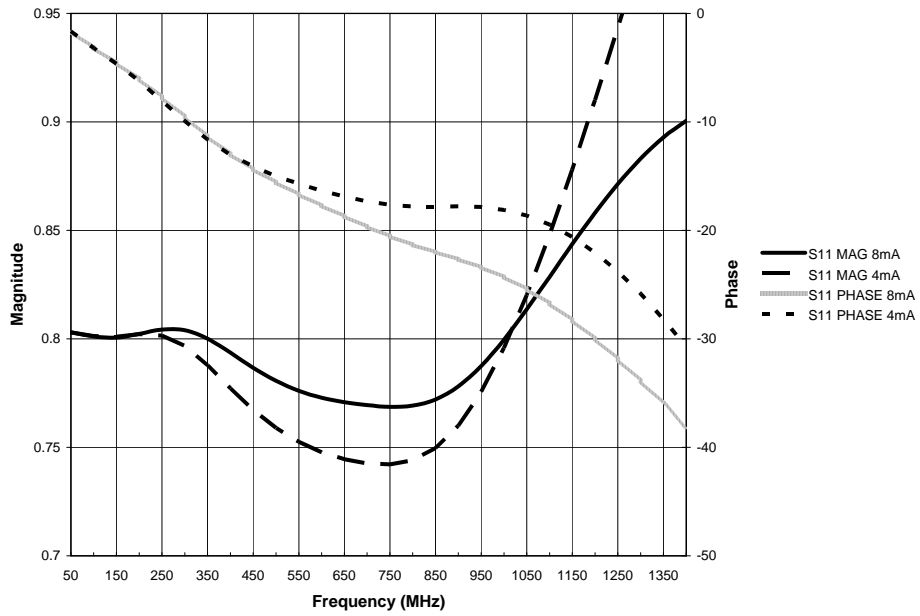
AC Characteristics (V_{EE} = GND, V_{CC} = +3.0V to +5.5V)

Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
t _{PLH} / t _{PHL}	Propagation Delay D to Q/Q̄ Outputs ¹ (SE)			400			400			400			430	ps	
	D to Q _{HG} /Q̄ _{HG} Outputs ² (SE)			550			550			550			630		
t _{SKEW}	Duty Cycle Skew Q/Q̄ ³ (SE)		5	20		5	20		5	20		5	20	ps	
V _{PP (AC)}	Differential Input Swing ⁴	80		1000	80		1000	80		1000	80		1000	mV	
t _r / t _f	Output Rise/Fall Times (20% - 80%)	Q/Q̄ ¹	100		260	100		260	100		260	100		260	ps
		Q _{HG} /Q̄ _{HG} ²	180		280	180		280	180		280	180		280	

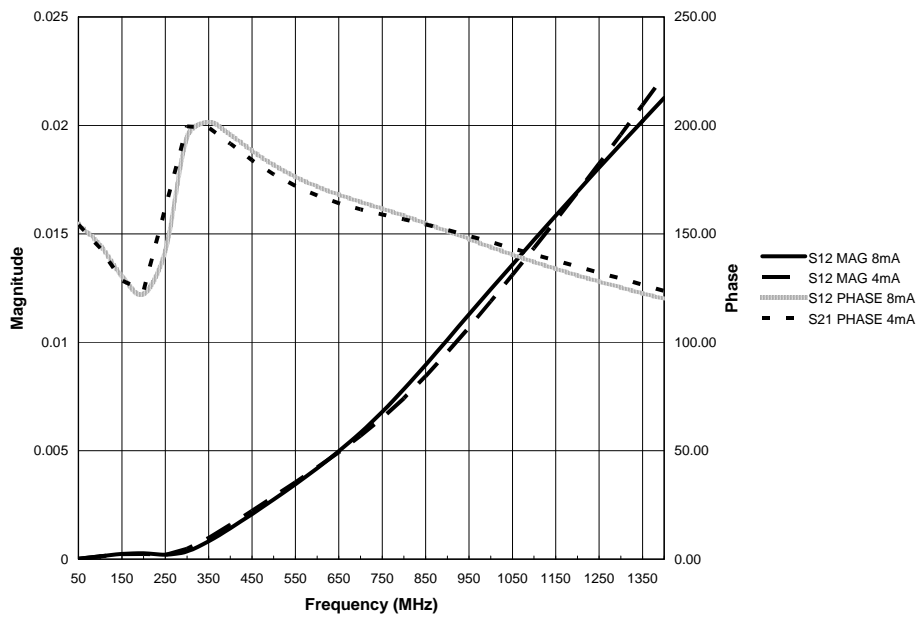
1. Specified with CS-SEL connected to V_{EE} and Q/Q̄ with AC coupled 50Ω loads.
2. Specified with 100Ω resistor connecting Q_{HG} and Q̄_{HG} together.
3. Duty cycle skew is the difference between a t_{PLH} and t_{PHL} propagation delay through a device.
4. The peak-to-peak differential input swing is the range for which AC parameters guaranteed. V_D and V_D must remain within the range of ±750 mV with respect to V_{BB}.

AC PP INPUT

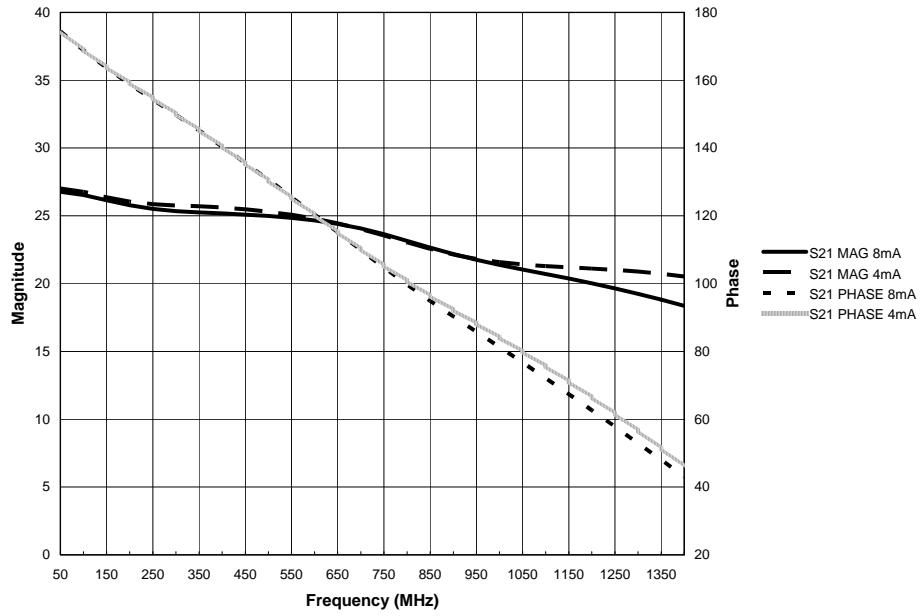




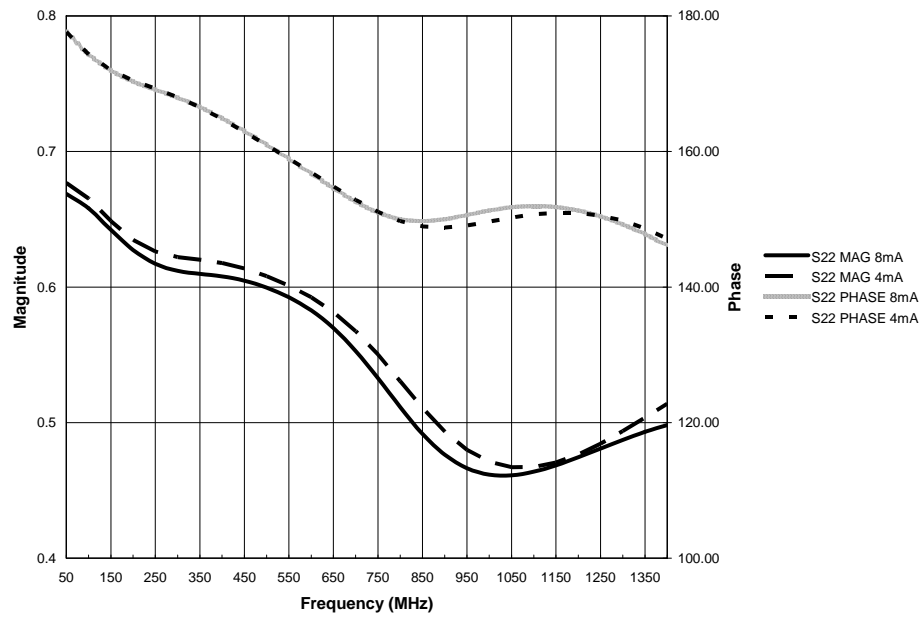
S11, D to Q, 50 Ω AC load on Q



S12, D to Q, 50 Ω AC load on Q

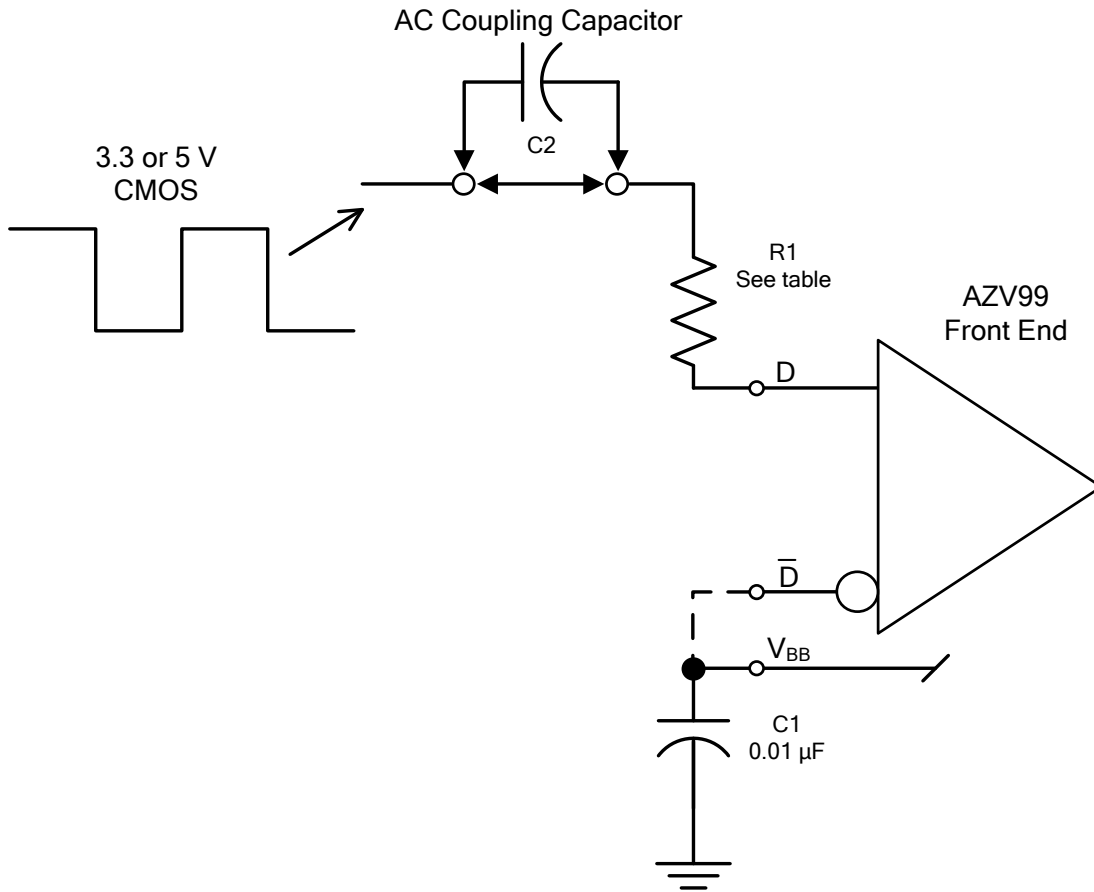


S21, D to Q, 50 Ω AC load on Q



S22, D to Q, 50 Ω AC load on Q

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Application Circuit for CMOS Inputs

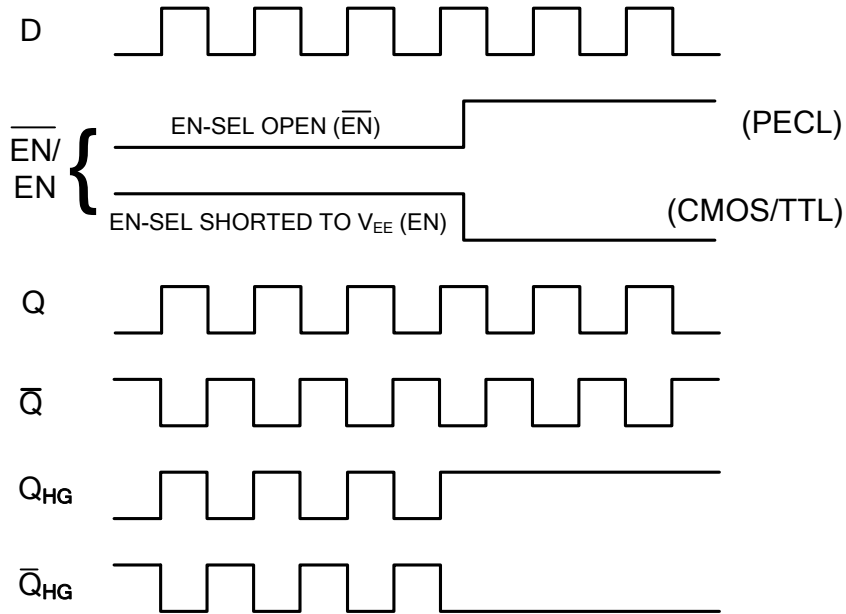
Input Type	R1 ¹	
	AC Coupled (C2 in circuit)	DC Coupled (C2 shorted)
3.3 V CMOS	1.1 kΩ	2.0 kΩ
5 V CMOS	1.6 kΩ	3.3 kΩ

¹ R1 should be chosen so that the input swing on the D input with respect to \bar{D} is in the range of ± 80 to ± 1000 mV, per the AC Characteristics table and the D input is $< \pm 750$ mV with respect to V_{BB}.

Recommended Component Values for CMOS Single Ended Inputs

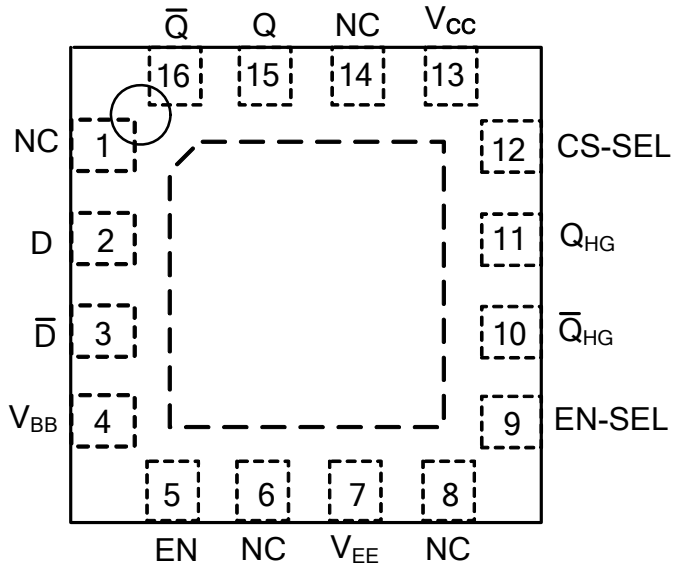
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TIMING DIAGRAM



PINOUT FOR AZV99L

**MLP 16, 3x3mm
AZV99L**

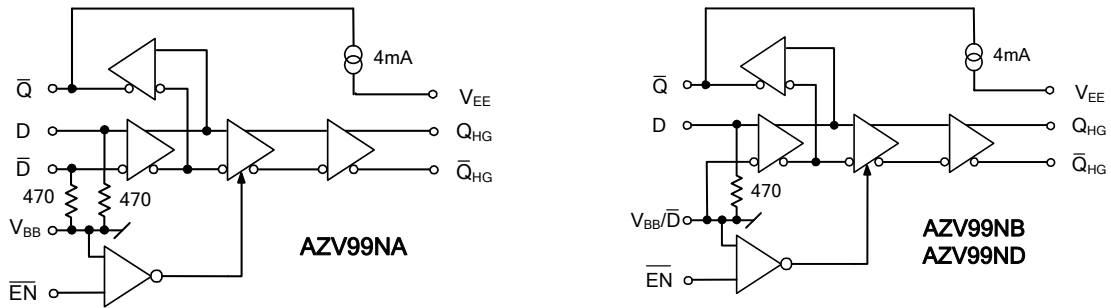


TOP VIEW

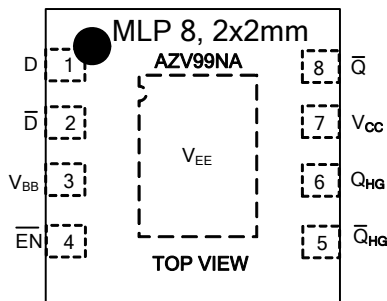
Bottom Center Pad may be left open or tied to V_{EE}

AZV99

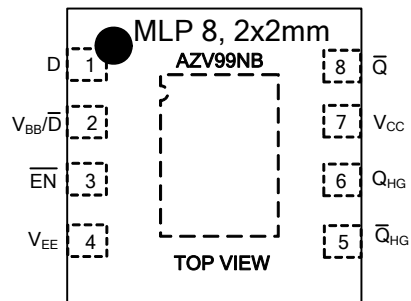
LOGIC DIAGRAMS AND PINOUTS FOR AZV99NA, AZV99NB, AZV99ND



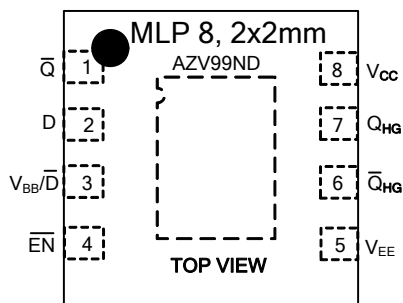
EN operation follows PECL functionality. See the Timing Diagram.



Bottom Center Pad is the V_{EE} return.



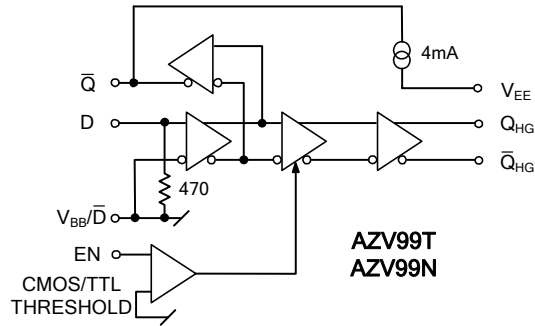
Bottom Center Pad may be left open or tied to V_{EE} . Pin 4 is the V_{EE} return.



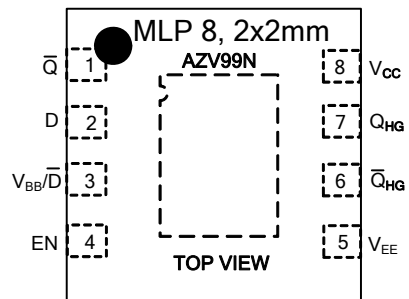
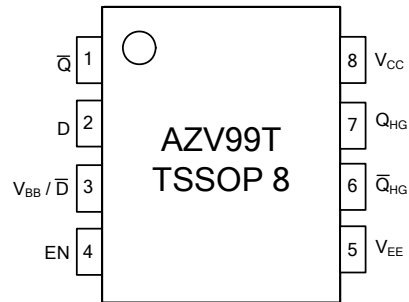
Bottom Center Pad may be left open or tied to V_{EE} . Pin 5 is the V_{EE} return.

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**LOGIC DIAGRAM AND PINOUTS FOR
AZV99T, AZV99N**



EN follows CMOS/TTL functionality. See the Timing Diagram.

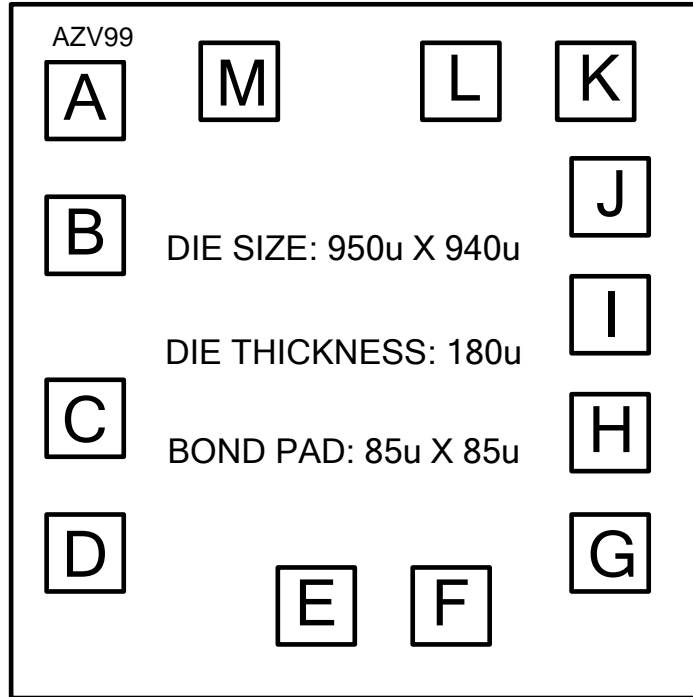


Bottom Center Pad may be left open or tied to V_{EE}. Pin 5 is the V_{EE} return.

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DIE PAD COORDINATES

AZV99 DIE:

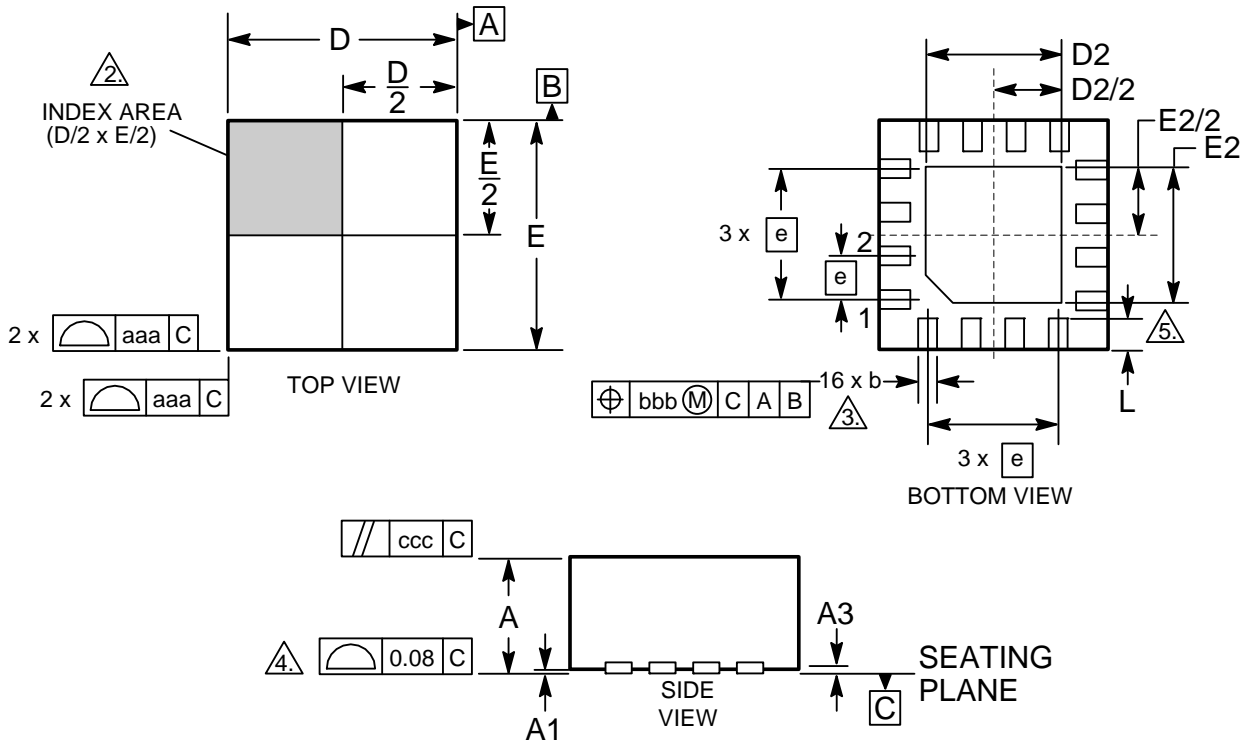


PAD COORDINATES¹

NAME	PAD DESIGNATION	PAD CENTERS	
		X(Microns)	Y(Microns)
A	D	-342.5	312.5
B	\bar{D}	-342.5	144.5
C	V_{BB}	-342.5	-87.0
D	EN/ \bar{EN}	-342.5	-255.0
E	V_{EE}	-33.5	-312.5
F	NC	126.5	-312.5
G	EN-SEL	312.5	-248.5
H	\bar{Q}_{HG}	312.5	-98.5
I	Q_{HG}	312.5	51.5
J	CS-SEL	312.5	201.5
K	V_{CC}	302.5	342.5
L	Q	142.5	342.5
M	\bar{Q}	-140.5	342.5

1. 0, 0 is center of die.

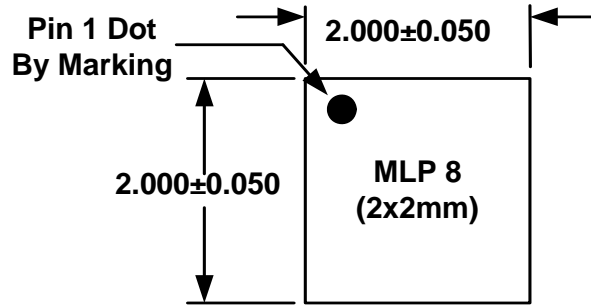
**PACKAGE DIAGRAM
MLP 16**



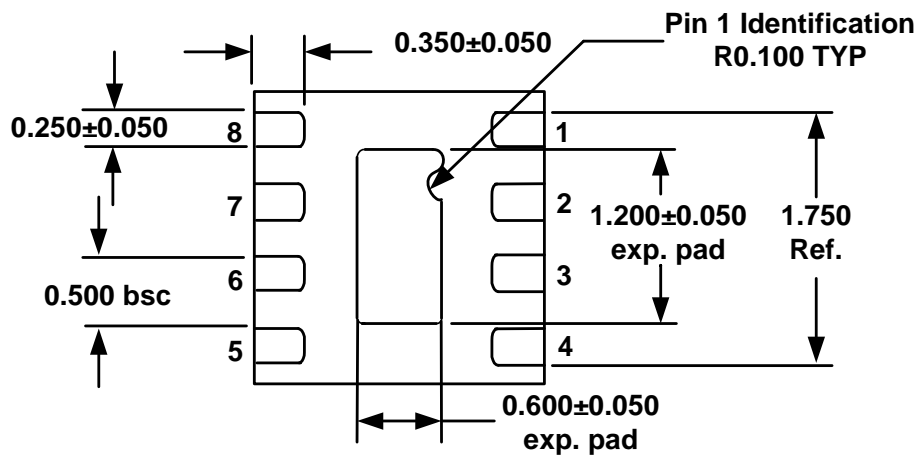
- NOTES:
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME T14-1994.
 - $\triangle 2$. THE TERMINAL #1 AND PAD NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012.
 - $\triangle 3$. DIMENSION b APPLIES TO METALLIZED PAD AND IS MEASURED BETWEEN 0.25 AND 0.30 mm FROM PAD TIP.
 - $\triangle 4$. COPLANARITY 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	

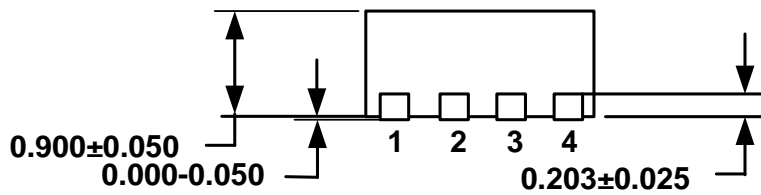
PACKAGE DIAGRAM
MLP 8 2x2mm



TOP VIEW



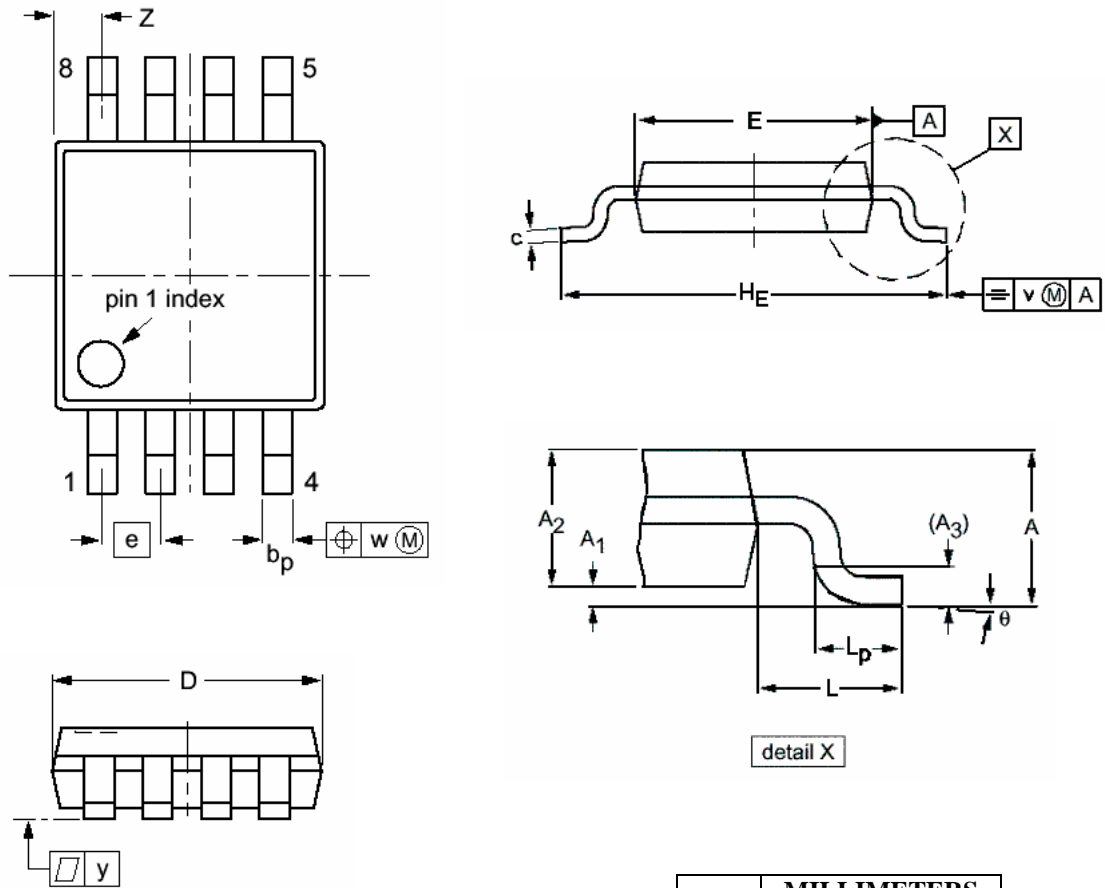
BOTTOM VIEW



SIDE VIEW

Note: All dimensions are in mm

**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°	6°

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