

# AZ100EL16VO

## LVPECL Oscillator Gain Stage & Buffer with Enable

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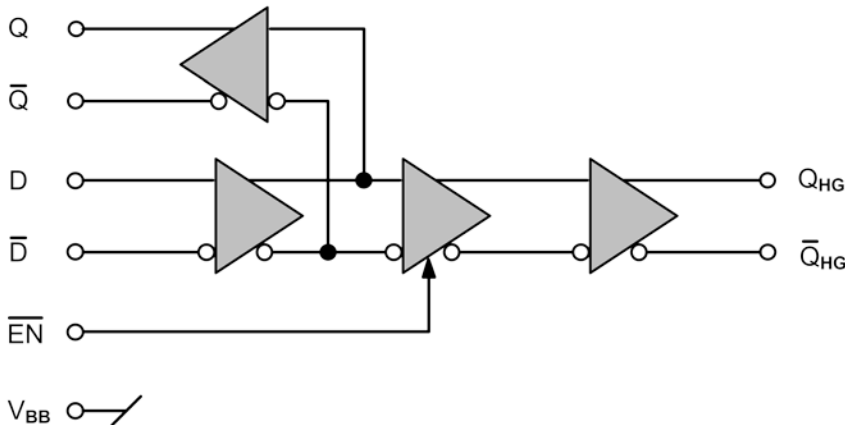
### FEATURES

- 3V to 5.5V Power Supply
- High Voltage Gain vs. Standard EL16
- 75kΩ Enable Pull-Down Resistor
- High Bandwidth for  $\geq 1\text{GHz}$
- -147 dBc/Hz Typical Noise Floor

### DESCRIPTION

The [AZ100EL16VO](#) is an oscillator gain stage with a high gain output buffer including an enable. The  $Q_{HG}/\bar{Q}_{HG}$  outputs have a voltage gain several times greater than the  $Q/\bar{Q}$  outputs. An enable input (EN) allows continuous oscillator operation. The enable can be controlled by ECL or CMOS signals

### BLOCK DIAGRAM



### APPLICATIONS

- Crystal or SAW oscillators

### PACKAGE AVAILABILITY

- MLP8
- MLP16
- MSOP8
- MSOP10
- Green/RoHS Compliant/Pb-Free

Order Number	Package	Marking
AZ100EL16VONG <sup>1</sup>	MLP8	P0G <Date Code> <sup>2</sup>
AZ100EL16VONBG <sup>1</sup>	MLP8	P4G <Date Code> <sup>2</sup>
AZ10/100EL16VOLG <sup>1</sup>	MLP16	AZMG16J <Date Code> <sup>2</sup>
AZ100EL16VOT+ <sup>1</sup>	MSOP8	HVO+ <Date Code> <sup>2</sup>
AZ100EL16VOU+ <sup>1</sup>	MSOP10	AZH+ 16VOU <sup>2</sup>

<sup>1</sup> [Tape & Reel](#) - Add 'R1' at end of order number for 7in (1k parts), 'R2' (2.5k) for 13in

<sup>2</sup> See [www.azmicrotek.com](http://www.azmicrotek.com) for [date code format](#)

## PIN DESCRIPTION AND CONFIGURATION

Table 1 - Pin description for MLP8 package

Pin	Name	Type	Function
1	Q	Output	Inverting PECL Output
2	D	Input	Data Input
3	V <sub>BB</sub>	Output	Reference Voltage
4	EN	Input	Output Enable
5	V <sub>EE</sub>	Power	Negative Supply
6	Q <sub>HG</sub>	Output	High Gain Inverting PECL Output
7	Q <sub>HG</sub>	Output	High Gain PECL Output
8	V <sub>CC</sub>	Power	Positive Supply

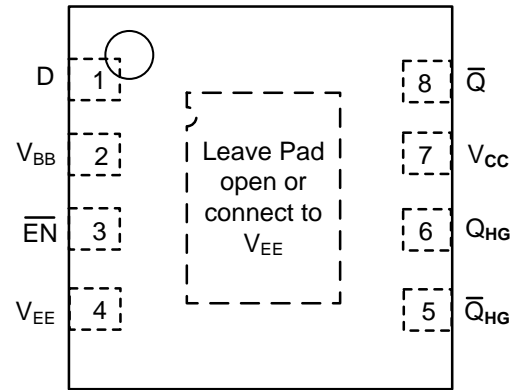


Figure 1 – Pin configuration for AZ100EL16VON (MLP8)

Table 2 - Pin description for MLP8 package

Pin	Name	Type	Function
1	D	Input	Data Input
2	V <sub>BB</sub>	Output	Reference Voltage
3	EN	Input	Output Enable
4	V <sub>EE</sub>	Power	Negative Supply
5	Q <sub>HG</sub>	Output	High Gain Inverting PECL Output
6	Q <sub>HG</sub>	Output	High Gain PECL Output
7	V <sub>CC</sub>	Power	Positive Supply
8	Q	Output	Inverting PECL Output

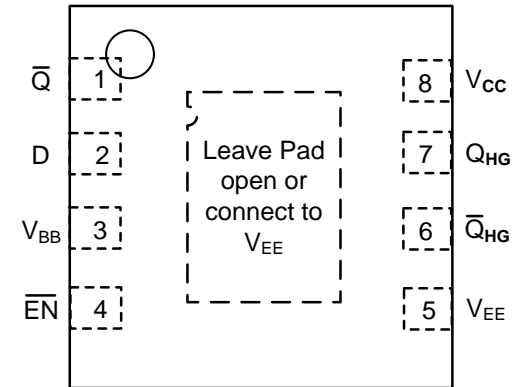


Figure 2 – Pin configuration for AZ100EL16VONB (MLP8)

Table 3 - Pin description for MSOP8 package

Pin	Name	Type	Function
1	Q	Output	Inverting PECL Output
2	D	Input	Data Input
3	V <sub>BB</sub>	Output	Reference Voltage
4	EN	Input	Output Enable
5	V <sub>EE</sub>	Power	Negative Supply
6	Q <sub>HG</sub>	Output	High Gain Inverting PECL Output
7	Q <sub>HG</sub>	Output	High Gain PECL Output
8	V <sub>CC</sub>	Power	Positive Supply

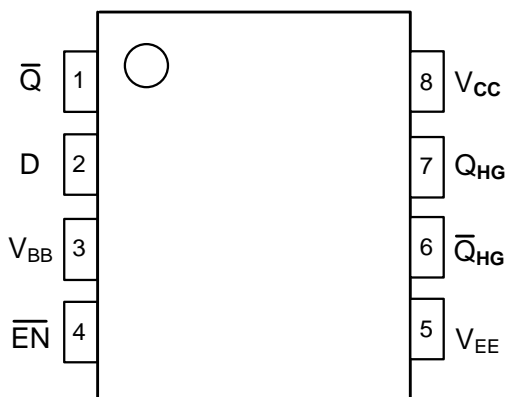


Figure 3 – Pin configuration for AZ100EL100VOT (MSOP8)

Table 4 - Pin description for MSOP10 package

Pin	Name	Type	Function
1	Q	Output	PECL Output
2	$\bar{Q}$	Output	Inverting PECL Output
3	D	Input	Data Input
4	$\bar{D}$	Input	Inverting Data Input
5	$V_{BB}$	Output	Reference Voltage
6	EN	Input	Output Enable
7	$V_{EE}$	Power	Negative Supply
8	$\bar{Q}_{HG}$	Output	High Gain Inverting PECL Output
9	$Q_{HG}$	Output	High Gain PECL Output
10	$V_{CC}$	Power	Positive Supply

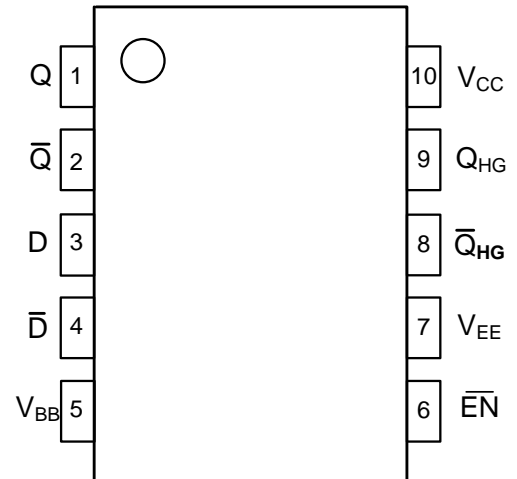


Figure 4 - Pin configuration for AZ100EL16VOU (MSOP10)

Table 5 - Pin description for MLP16 package

Pin	Name	Type	Function
1	NC		
2	D	Input	Data Input
3	$\bar{D}$	Input	Inverting Data Input
4	$V_{BB}$	Output	Reference Voltage
5	EN	Input	Output Enable
6	NC		
7	$V_{EE}$	Power	Negative Supply
8	10k	Input	10k Enable
9	NC		
10	$\bar{Q}_{HG}$	Output	High Gain Inverting PECL Output
11	$Q_{HG}$	Output	High Gain PECL Output
12	NC		
13	$V_{CC}$	Power	Positive Supply
14	NC		
15	Q	Output	PECL Output
16	$\bar{Q}$	Output	Inverting PECL Output

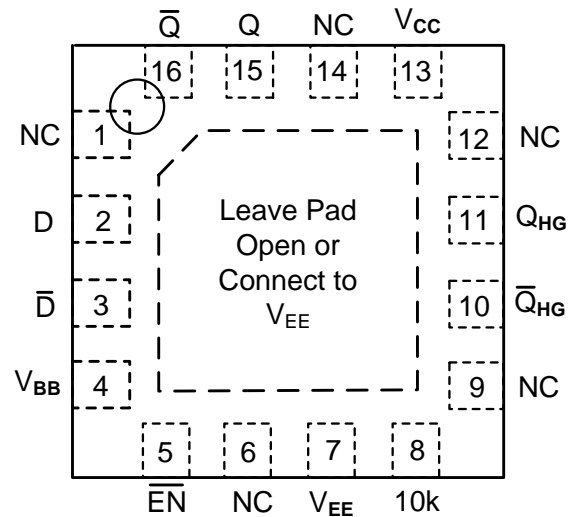


Figure 5 - Pin configuration for AZ100EL16VOL (MLP16)

**ENGINEERING NOTES**

The AZ100EL16VO provides an active low enable (EN) which can be driven with an ECL/PECL signal or a CMOS logic signal. When EN is LOW or floating (NC), input data is passed to both sets of outputs. When EN is HIGH, the  $Q_{HG}/\bar{Q}_{HG}$  outputs will be forced LOW/HIGH respectively, while input data will continue to be passed to the Q/Q outputs.

The AZ100EL16VO also provides a  $V_{BB}$  output that supports 1.5mA sink/source current. When used, the  $V_{BB}$  pin should be bypassed to ground or  $V_{CC}$  via a 0.01 $\mu$ F capacitor.

Any used output must have an external pull down resistor. For 3.3V operation, an 180 $\Omega$  resistor to  $V_{EE}$  is recommended if an AC coupled load is present. At 5.0V, a 330 $\Omega$  resistor is recommended for the AC load case. Alternately, a 50 $\Omega$  load terminated to  $V_{CC} - 2V$  or the Thevenin equivalent may be driven directly. Unused outputs may be left floating (NC).

10k temperature compensation is offered on the AZ100LVEL16VOL. If this mode is desired, connect the 10k pin to  $V_{EE}$ . The connection must be less than 1 $\Omega$ .

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

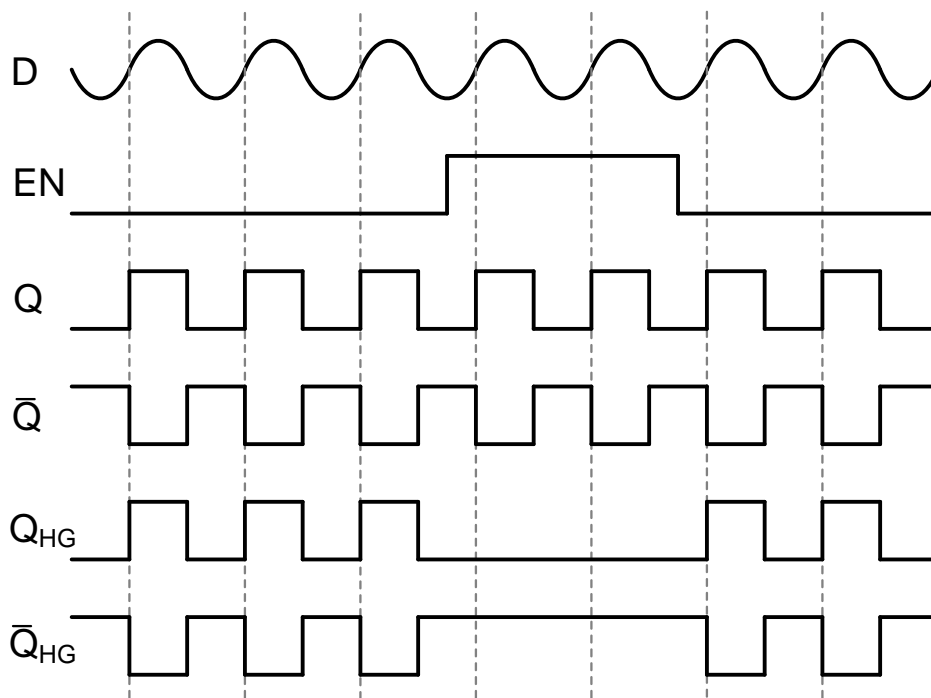


Figure 6 - AZ100EL16VO Timing Diagram

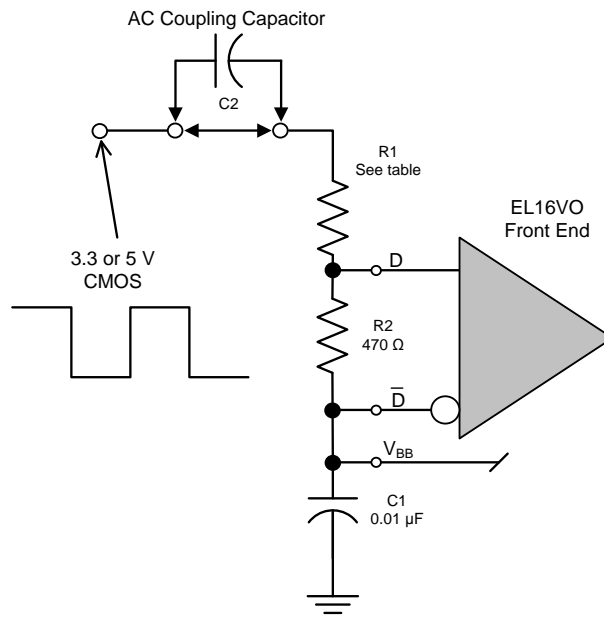
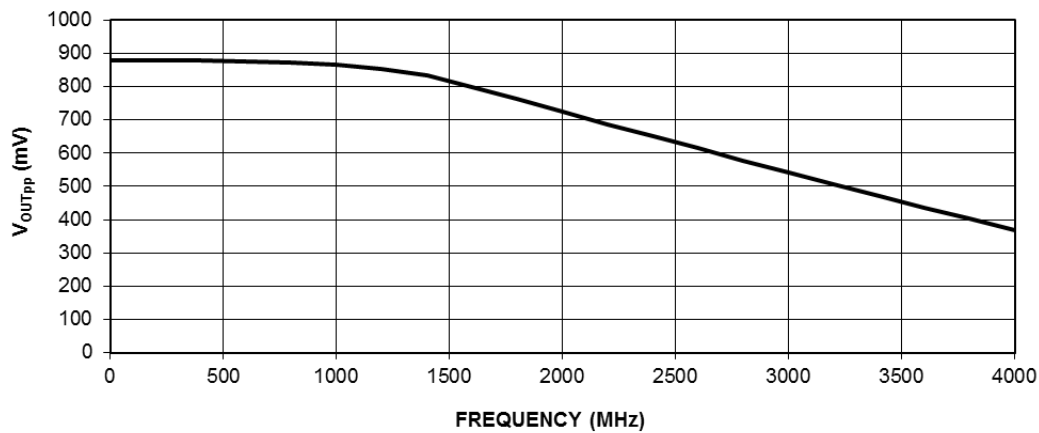


Figure 7 – Application circuit for CMOS Inputs

Recommended Component Values for CMOS Single Ended Inputs

Input Type	R1 <sup>1</sup> Value	
	AC Coupled (C2 in circuit)	DC Coupled (C2 shorted)
3.3V CMOS	430Ω	750Ω
5.0V CMOS	910Ω	1.8kΩ

<sup>1</sup>. R1 should be chosen so that the input swing on the D input with respect to D is in the range of ±80 to ±1000 mV, per the AC Characteristics table and the D input is < ±750 mV with respect to V<sub>BB</sub>.



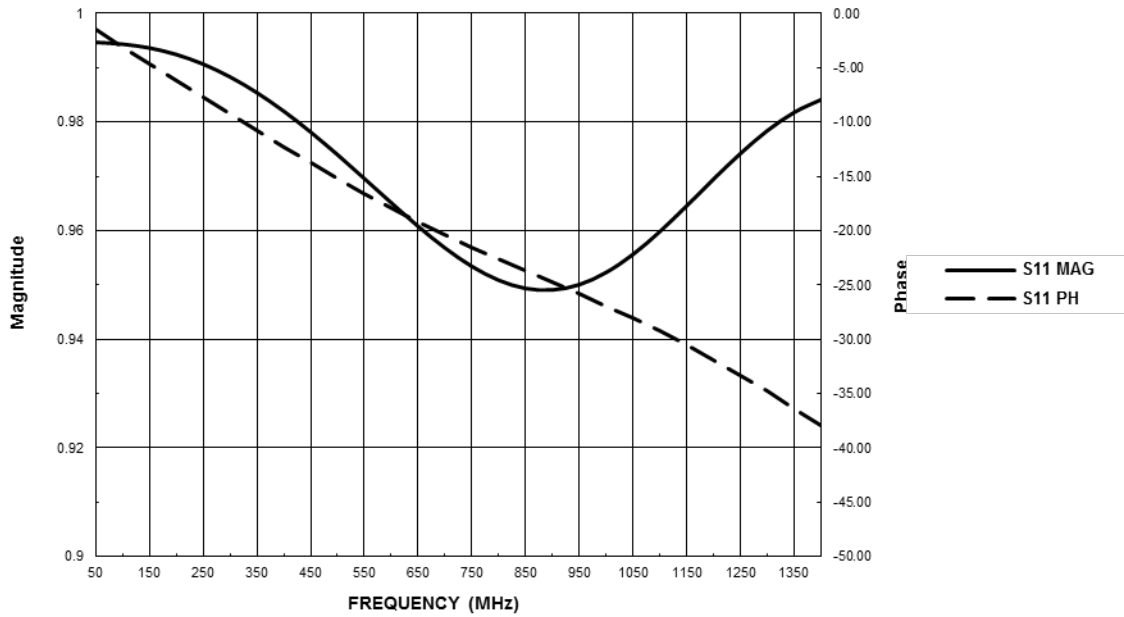


Figure 8 - S11, 50Ω load to V<sub>CC</sub> - 2V

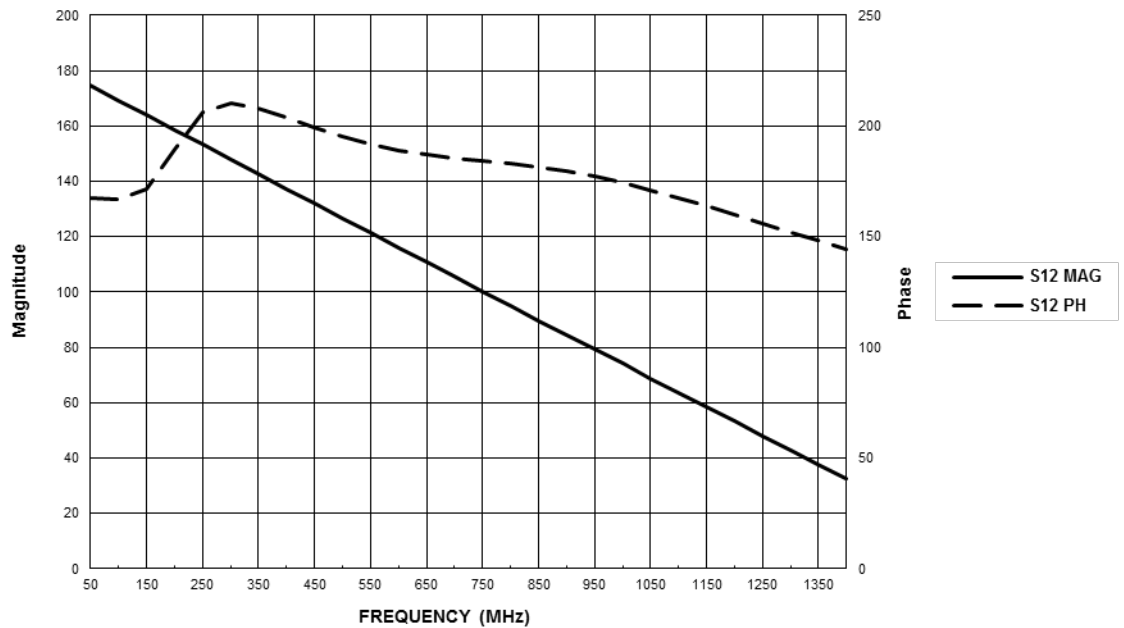


Figure 9 - S12, 50Ω load to V<sub>CC</sub> - 2V

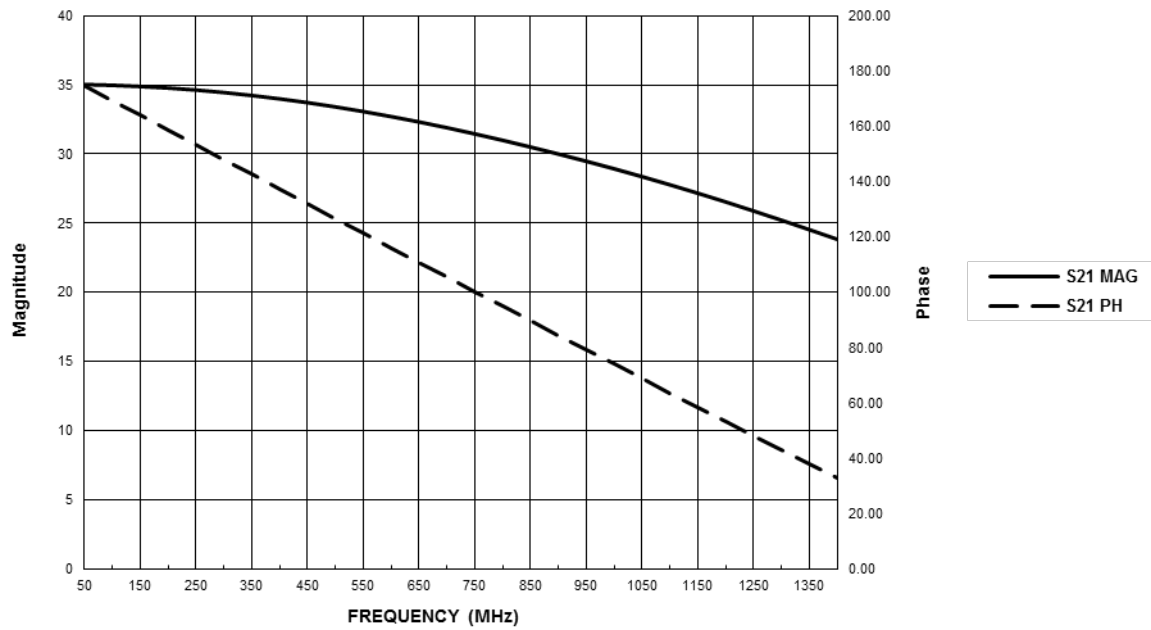


Figure 10 – S21, 50Ω load to V<sub>CC</sub> - 2V

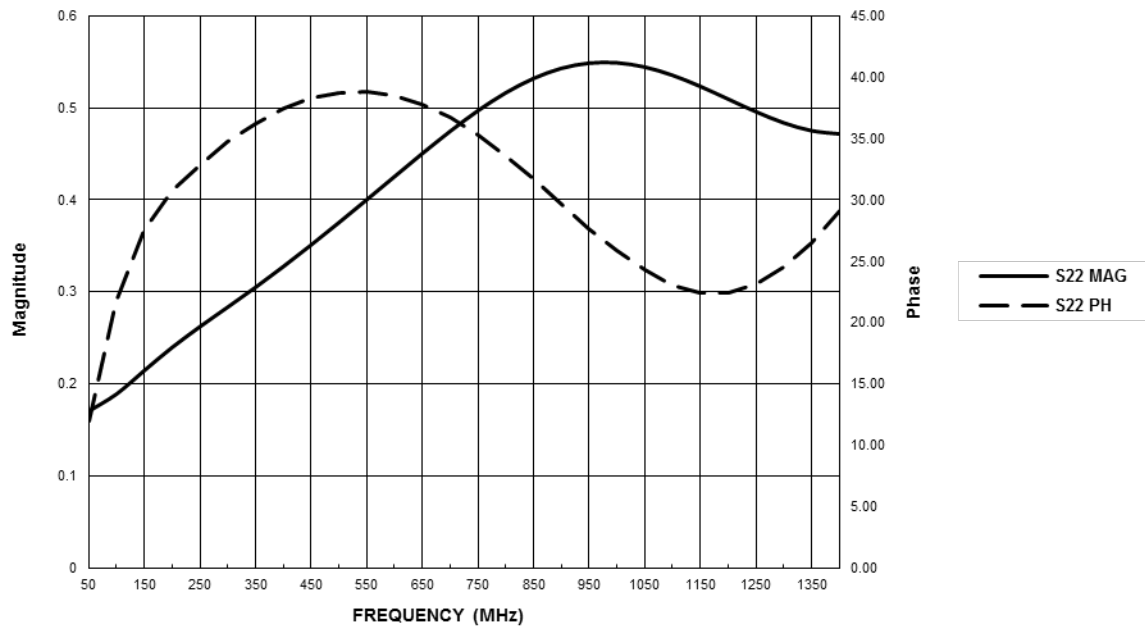


Figure 11 - S22, 50Ω load to V<sub>CC</sub> - 2V

**PERFORMANCE DATA****Table 6 – Absolute Maximum Ratings**

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

Symbol	Characteristic	Condition	Rating	Unit
$V_{CC}$	PECL Power Supply	$V_{EE} = 0V$	0 to + 6.0	V
$V_{LPECL}$	PECL Input Voltage	$V_{EE} = 0V$	0 to + 6.0	V
$I_{OUT}$	Output Current	Continuous	50	mA
		Surge	100	
$T_A$	Operating Temperature Range	-	-40 to +85	°C
$T_{STG}$	Storage Temperature Range	-	-65 to +150	°C
$ESD_{HBM}$	Human Body Model Electro Static Discharge	-	2500	V
$ESD_{MM}$	Machine Model Electro Static Discharge	-	200	V
$ESD_{CDM}$	Charged Device Model Electro Static Discharge	-	2000	V

**Table 7 - 100K ECL DC Characteristics**

100K ECL DC Characteristics ( $V_{EE} = -3.0V$  to  $-5.5V$ ,  $V_{CC} = GND$ )

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
$V_{OH}$	Output HIGH Voltage <sup>1</sup>	-1085	-880	-1025	-880	-1025	-880	-1025	-880	mV
$V_{OL}$	Output LOW Voltage <sup>1</sup>	-1900	-1555	-1900	-1620	-1900	-1620	-1900	-1620	mV
$V_{BB}$	Reference Voltage	-1390	-1250	-1390	-1250	-1390	-1250	-1390	-1250	mV
$V_{IH}$	Input HIGH Voltage D/D	-1165	-390	-1165	-390	-1165	-390	-1165	-390	mV
	Input HIGH Voltage EN	-1165	$V_{CC}$	-1165	$V_{CC}$	-1165	$V_{CC}$	-1165	$V_{CC}$	mV
$V_{IL}$	Input LOW Voltage D/D	-2250	-1475	-2250	-1475	-2250	-1475	-2250	-1475	mV
	Input LOW Voltage EN	$V_{EE}$	-1475	$V_{EE}$	-1475	$V_{EE}$	-1475	$V_{EE}$	-1475	mV
$I_{IH}$	Input HIGH Current D/D		60		60		60		60	μA
	Input HIGH Current EN		150		150		150		150	μA
$I_{IL}$	Input LOW Current D/D	0.5		0.5		0.5		0.5		μA
$I_{EE}$	Power Supply Current		40		40		40		46	mA

1. Specified with each output terminated through 50Ω resistors to  $V_{CC} - 2V$ .



Table 8 - 100K LVPECL DC Characteristics

## 100K LVPECL DC Characteristics (VEE = GND, VCC = +3.3V)

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
V <sub>OH</sub>	Output HIGH Voltage <sup>1,2</sup>	2215	2420	2275	2420	2275	2420	2275	2420	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,2</sup>	1400	1745	1400	1680	1400	1680	1400	1680	mV
V <sub>BB</sub>	Reference Voltage <sup>1</sup>	1910	2050	1910	2050	1910	2050	1910	2050	mV
V <sub>IH</sub>	Input HIGH Voltage D/D <sup>1</sup>	2135	2910	2135	2910	2135	2910	2135	2910	mV
	Input HIGH Voltage EN	2135 <sup>1</sup>	V <sub>CC</sub>	2135 <sup>1</sup>	V <sub>CC</sub>	2135 <sup>1</sup>	V <sub>CC</sub>	2135 <sup>1</sup>	V <sub>CC</sub>	mV
V <sub>IL</sub>	Input LOW Voltage D/D <sup>1</sup>	1050	1825	1050	1825	1050	1825	1050	1825	mV
	Input LOW Voltage EN	V <sub>EE</sub>	1825 <sup>1</sup>	V <sub>EE</sub>	1825 <sup>1</sup>	V <sub>EE</sub>	1825 <sup>1</sup>	V <sub>EE</sub>	1825 <sup>1</sup>	mV
I <sub>IH</sub>	Input HIGH Current D/D		60		60		60		60	μA
	Input HIGH Current EN		150		150		150		150	μA
I <sub>IL</sub>	Input LOW Current D/D	0.5		0.5		0.5		0.5		μA
	Input LOW Current EN <sup>3</sup>	-300		-300		-300		-300		μA
I <sub>EE</sub>	Power Supply Current		40		40		40		46	mA

1. For supply voltages other than 3.3V, use the ECL table values and ADD supply voltage value.
2. Specified with each output terminated through 50Ω resistors to V<sub>CC</sub> - 2V.
3. Specified with EN forced to V<sub>EE</sub>.

Table 9 - 100K PECL DC Characteristics

## 100K PECL DC Characteristics (VEE = GND, VCC = +5.0V)

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
V <sub>OH</sub>	Output HIGH Voltage <sup>1,2</sup>	3915	4120	3975	4120	3975	4120	3975	4120	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,2</sup>	3100	3445	3100	3380	3100	3380	3100	3380	mV
V <sub>BB</sub>	Reference Voltage <sup>1</sup>	3610	3750	3610	3750	3610	3750	3610	3750	mV
V <sub>IH</sub>	Input HIGH Voltage D/D <sup>1</sup>	3835	4610	3835	4610	3835	4610	3835	4610	mV
	Input HIGH Voltage EN	3835 <sup>1</sup>	V <sub>CC</sub>	3835 <sup>1</sup>	V <sub>CC</sub>	3835 <sup>1</sup>	V <sub>CC</sub>	3835 <sup>1</sup>	V <sub>CC</sub>	mV
V <sub>IL</sub>	Input LOW Voltage D/D <sup>1</sup>	2270	3525	2270	3525	2270	3525	2270	3525	mV
	Input LOW Voltage EN	V <sub>EE</sub>	3525 <sup>1</sup>	V <sub>EE</sub>	3525 <sup>1</sup>	V <sub>EE</sub>	3525 <sup>1</sup>	V <sub>EE</sub>	3525 <sup>1</sup>	mV
I <sub>IH</sub>	Input HIGH Current D/D		60		60		60		60	μA
	Input HIGH Current EN		150		150		150		150	μA
I <sub>IL</sub>	Input LOW Current D/D	0.5		0.5		0.5		0.5		μA
	Input LOW Current EN <sup>3</sup>	-1400		-1400		-1400		-1400		μA
I <sub>EE</sub>	Power Supply Current		40		40		40		46	mA

1. For supply voltages other than 3.3V, use the ECL table values and ADD supply voltage value.
2. Specified with each output terminated through 50Ω resistors to V<sub>CC</sub> - 2V.
3. Specified with EN forced to V<sub>EE</sub>.

Table 10 - 10K ECL DC Characteristics

10K ECL DC Characteristics ( $V_{EE} = -3.0V$  to  $-5.5V$ ,  $V_{CC} = GND$ )

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
$V_{OH}$	Output HIGH Voltage <sup>1</sup>	-1080	-890	-1020	-840	-980	-810	-910	-720	mV
$V_{OL}$	Output LOW Voltage <sup>1</sup>	-1950	-1650	-1950	-1630	-1950	-1630	-1950	-1595	mV
$V_{BB}$	Reference Voltage	-1430	-1300	-1380	-1260	-1360	-1240	-1310	-1190	mV
$V_{IH}$	Input HIGH Voltage D/D	-1230	-430	-1170	-380	-1130	-360	-1060	-310	mV
	Input HIGH Voltage EN	-1230	$V_{CC}$	-1170	$V_{CC}$	-1130	$V_{CC}$	-1060	$V_{CC}$	mV
$V_{IL}$	Input LOW Voltage D/D	-2300	-1500	-2260	-1480	-2240	-1480	-2190	-1445	mV
	Input LOW Voltage EN	$V_{EE}$	-1500	$V_{EE}$	-1480	$V_{EE}$	-1480	$V_{EE}$	-1445	mV
$I_{IH}$	Input HIGH Current D/D		60		60		60		60	$\mu A$
	Input HIGH Current EN		150		150		150		150	$\mu A$
$I_{IL}$	Input LOW Current D/D	0.5		0.5		0.5		0.5		$\mu A$
$I_{EE}$	Power Supply Current		40		40		40		40	mA

1. Specified with each output terminated through 50 $\Omega$  resistors to  $V_{CC} - 2V$ .

Table 11 - 10K LVECL DC Characteristics

10K 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 <sup>1,2</sup>	2220	2410	2280	2460	2320	2490	2390	2580	mV
$V_{OL}$	Output LOW Voltage <sup>1,2</sup>	1350	1650	1350	1670	1350	1670	1350	1705	mV
$V_{BB}$	Reference Voltage <sup>1</sup>	1870	2000	1920	2040	1940	2060	1990	2110	mV
$V_{IH}$	Input HIGH Voltage D/D <sup>1</sup>	2070	2870	2130	2920	2170	2940	2240	2990	mV
	Input HIGH Voltage EN	2070 <sup>1</sup>	$V_{CC}$	2130 <sup>1</sup>	$V_{CC}$	2170 <sup>1</sup>	$V_{CC}$	2240 <sup>1</sup>	$V_{CC}$	mV
$V_{IL}$	Input LOW Voltage D/D <sup>1</sup>	1000	1800	1040	1820	1060	1820	1110	1855	mV
	Input LOW Voltage EN	$V_{EE}$	1800 <sup>1</sup>	$V_{EE}$	1820 <sup>1</sup>	$V_{EE}$	1820 <sup>1</sup>	$V_{EE}$	1825 <sup>1</sup>	mV
$I_{IH}$	Input HIGH Current D/D		60		60		60		60	$\mu A$
	Input HIGH Current EN		150		150		150		150	$\mu A$
$I_{IL}$	Input LOW Current D/D	0.5		0.5		0.5		0.5		$\mu A$
	Input LOW Current EN <sup>3</sup>	-300		-300		-300		-300		$\mu A$
$I_{EE}$	Power Supply Current		40		40		40		46	mA

1. For supply voltages other than 3.3V, use the ECL table values and ADD supply voltage value.

2. Specified with each output terminated through 50 $\Omega$  resistors to  $V_{CC} - 2V$ .

3. Specified with EN forced to  $V_{EE}$ .

Table 12 - 10 PECL DC Characteristics

10K PECL DC Characteristics (V<sub>EE</sub> = GND, V<sub>CC</sub> = +5.0V)

Symbol	Characteristic	-40°C		0°C		25°C		85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
V <sub>OH</sub>	Output HIGH Voltage <sup>1,2</sup>	3920	4110	3980	4160	4020	4190	4090	4280	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1,2</sup>	3050	3350	3050	3370	3050	3370	3050	3405	mV
V <sub>BB</sub>	Reference Voltage <sup>1</sup>	3570	3700	3620	3740	3640	3760	3690	3810	mV
V <sub>IH</sub>	Input HIGH Voltage D/D <sup>1</sup>	3770	4570	3830	4620	3870	4640	3940	4690	mV
	Input HIGH Voltage EN	3770 <sup>1</sup>	V <sub>CC</sub>	3830 <sup>1</sup>	V <sub>CC</sub>	3870 <sup>1</sup>	V <sub>CC</sub>	3940 <sup>1</sup>	V <sub>CC</sub>	mV
V <sub>IL</sub>	Input LOW Voltage D/D <sup>1</sup>	2700	3500	2740	3520	2760	3520	2810	3555	mV
	Input LOW Voltage EN	V <sub>EE</sub>	3500 <sup>1</sup>	V <sub>EE</sub>	3520 <sup>1</sup>	V <sub>EE</sub>	3520 <sup>1</sup>	V <sub>EE</sub>	3555 <sup>1</sup>	mV
I <sub>IH</sub>	Input HIGH Current D/D		60		60		60		60	μA
	Input HIGH Current EN		150		150		150		150	μA
I <sub>IL</sub>	Input LOW Current D/D	0.5		0.5		0.5		0.5		μA
	Input LOW Current EN <sup>3</sup>	-1400		-1400		-1400		-1400		μA
I <sub>EE</sub>	Power Supply Current		40		40		40		46	mA

1. For supply voltages other than 3.3V, use the ECL table values and ADD supply voltage value.
2. Specified with each output terminated through 50Ω resistors to V<sub>CC</sub> - 2V.
3. Specified with EN forced to V<sub>EE</sub>.

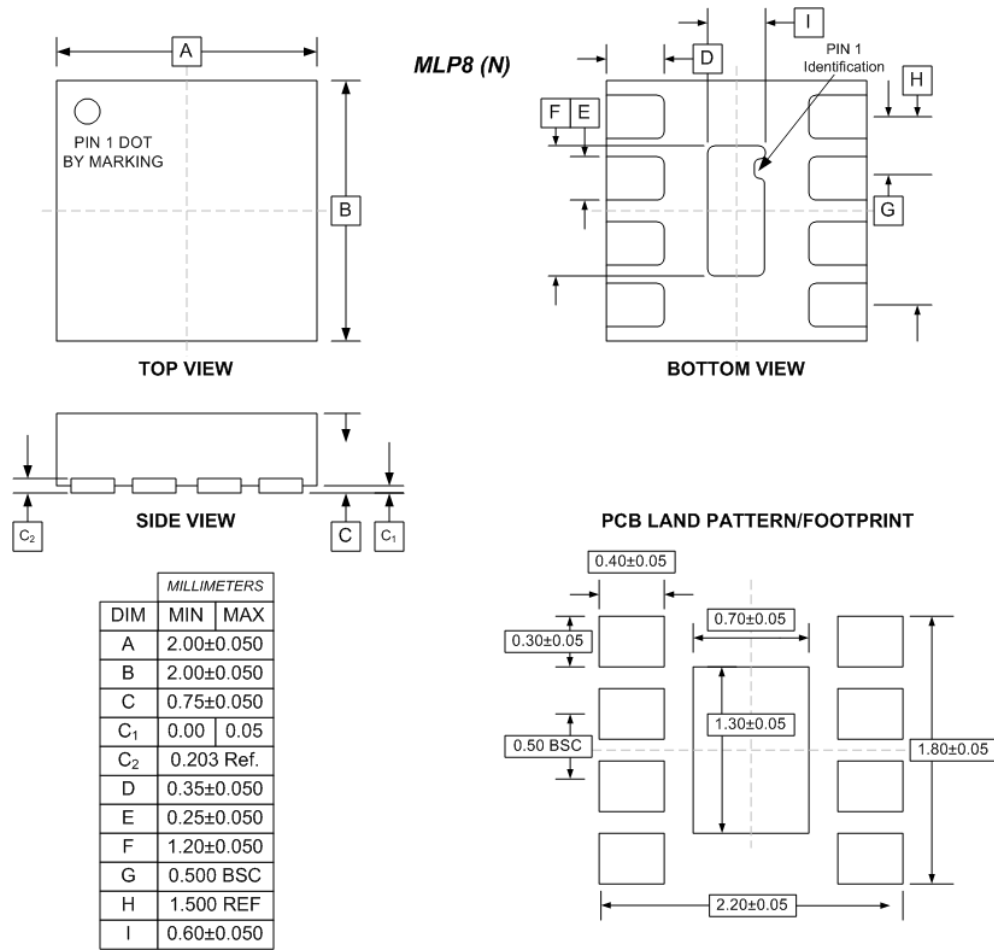
Table 13 - AC Characteristics

AC Characteristics (V<sub>EE</sub> = -3.0V to -5.5V; V<sub>CC</sub>=GND or V<sub>EE</sub>=GND; V<sub>CC</sub> = +3.0V to +5.5V)

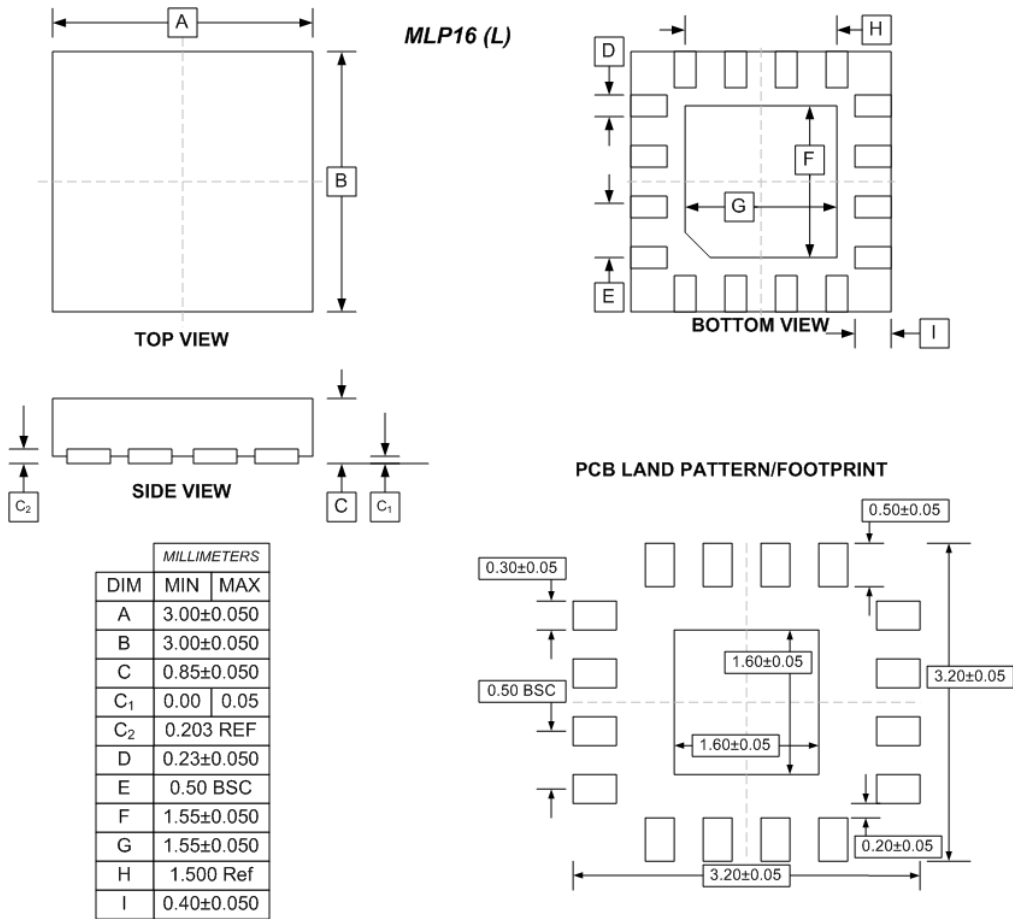
Symbol	Characteristic	-40°C			0°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
t <sub>PLH</sub> /t <sub>PHL</sub>	Propagation Delay													
	D to Q/Q <sup>1</sup>	100		300	100		300	100	200	300	100		300	ps
	D to Q <sub>HG</sub> /Q <sub>HG</sub> <sup>2</sup>	150		450	150		450	150	290	450	150		450	ps
t <sub>SKEW</sub>	Duty Cycle Skew <sup>3</sup>		5	20		5	20		5	20		5	20	ps
V <sub>pp</sub> (AC)	Input Swing <sup>4</sup>													
	Differential	80		1000	80		1000	80		1000	80		1000	mV
	Single Ended	150		2000	150		2000	150		2000	150		2000	mV
t <sub>r</sub> /t <sub>f</sub>	Output Rise/Fall <sup>1,2</sup> (20%-80%)	80		240	80		240	80	135	240	80		240	ps

1. Duty cycle skew is the difference between a t<sub>PLH</sub> and t<sub>PHL</sub> propagation delay through a device.
2. V<sub>pp</sub> is the peak-to-peak differential input swing for which AC parameters are guaranteed. The device has a voltage gain of ≈20 to Q/Q outputs and a voltage gain of ≈100 to Q<sub>HG</sub>/Q<sub>HG</sub> outputs.

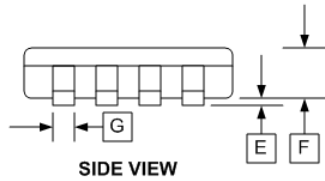
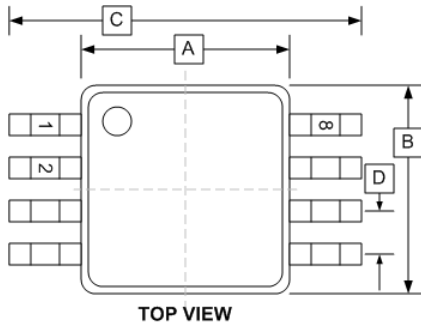
**PACKAGE DIAGRAM**  
MLP8  
Green/RoHS compliant/Pb-Free  
MSL=1



**PACKAGE DIAGRAM**  
MLP16  
Green/RoHS compliant/Pb-Free  
MSL=1

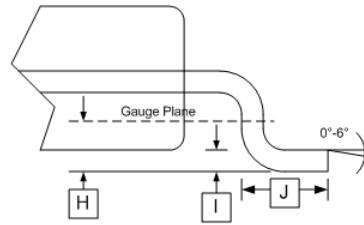


**PACKAGE DIAGRAM**  
MSOP8  
Green/RoHS compliant/Pb-Free  
MSL=1

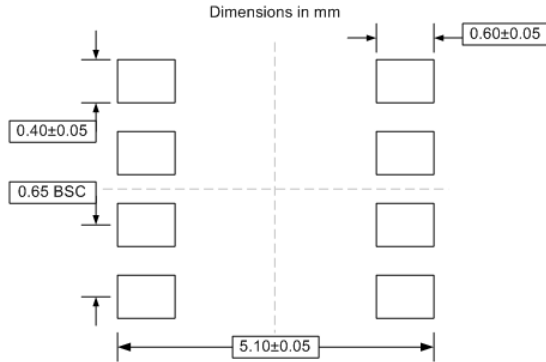


DIM	INCHES	
	MIN	MAX
A	0.118±0.004	
B	0.118±0.004	
C	0.192±0.008	
D	0.0256 TYP	
E	0.004±0.002	
F	0.034±0.002	
G	0.009±0.014	
H	0.010	
I	0.006±0.002	
J	0.021±0.004	

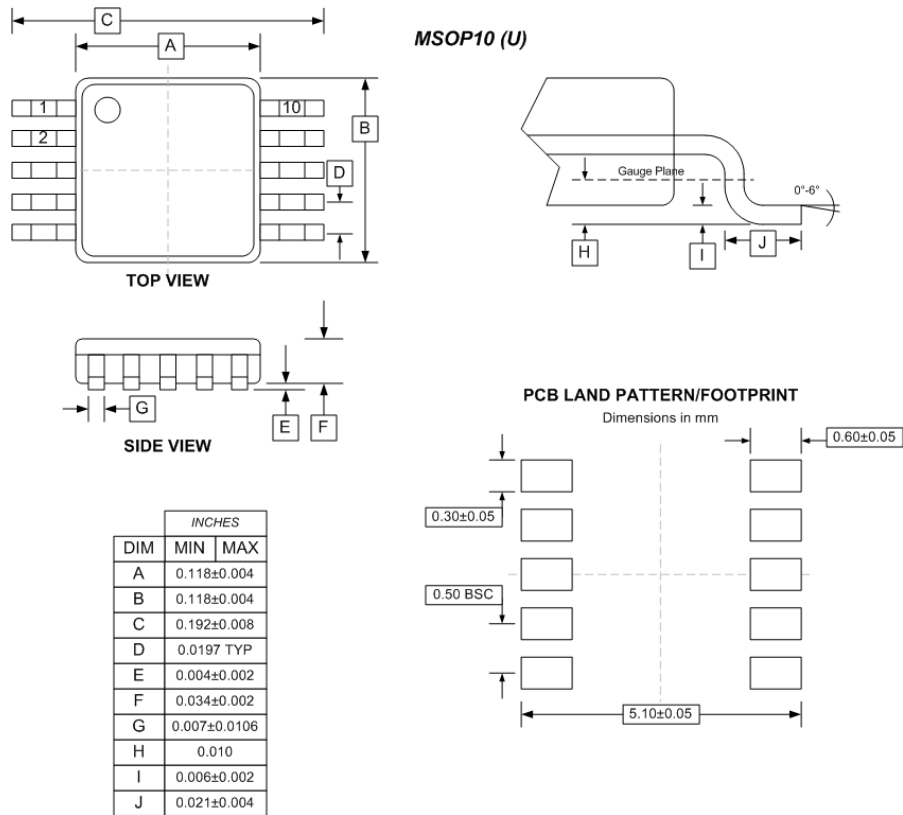
MSOP8 (T)



PCB LAND PATTERN/FOOTPRINT



**PACKAGE DIAGRAM**  
 MSOP10  
 Green/RoHS compliant/Pb-Free  
 MSL=1



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