

# FIN1028

## 3.3V LVDS 2-Bit High Speed Differential Receiver

### General Description

This dual receiver is designed for high speed interconnects utilizing Low Voltage Differential Signaling (LVDS) technology. The receiver translates LVDS levels, with a typical differential input threshold of 100 mV, to LVTTTL signal levels. LVDS provides low EMI at ultra low power dissipation even at high frequencies. This device is ideal for high speed transfer of clock and data.

The FIN1028 can be paired with its companion driver, the FIN1027, or any other LVDS driver.

### Features

- Greater than 400Mbps data rate
- 3.3V power supply operation
- 0.4ns maximum differential pulse skew
- 2.5ns maximum propagation delay
- Low power dissipation
- Power-Off protection
- Fail safe protection for open-circuit, shorted and terminated conditions
- Meets or exceeds the TIA/EIA-644 LVDS standard
- Flow-through pinout simplifies PCB layout

### Ordering Code:

Order Number	Package Number	Package Description
FIN1028M (Note 1)	M08A	8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
FIN1028K8X (Preliminary)	MAB08A	8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide [TAPE and REEL]
FIN1028MPX (Preliminary)	MLP08C	8-Terminal Molded Leadless Package (MLP) Dual, MO-229, 2mm Square [TAPE and REEL]

**Note 1:** Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Pin Descriptions

Pin Name	Description
R <sub>OUT1</sub> , R <sub>OUT2</sub>	LVTTTL Data Outputs
R <sub>IN1+</sub> , R <sub>IN2+</sub>	Non-inverting LVDS Inputs
R <sub>IN1-</sub> , R <sub>IN2-</sub>	Inverting LVDS Inputs
V <sub>CC</sub>	Power Supply
GND	Ground

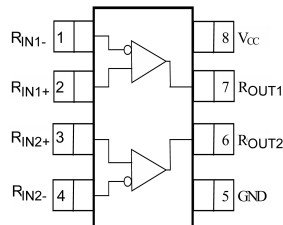
### Function Table

Input	Outputs	
	R <sub>IN+</sub>	R <sub>OUT</sub>
L	H	L
H	L	H
Fail Safe Condition		H

H = HIGH Logic Level  
L = LOW Logic Level  
Fail Safe = Open, Shorted, Terminated

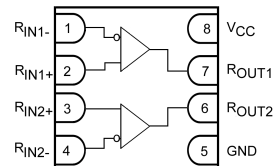
### Connection Diagrams

#### Pin Assignment for SOIC



(Top View)

#### Terminal Assignments for MLP



(Top Through View)

**Absolute Maximum Ratings**(Note 2)

Supply Voltage ( $V_{CC}$ )	-0.5V to +4.6V
DC Input Voltage ( $R_{INX+}$ , $R_{INX-}$ )	-0.5V to +4.7V
DC Output Voltage ( $R_{OUTX}$ )	-0.5V to +6V
DC Output Current ( $I_O$ )	16 mA
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Max Junction Temperature ( $T_J$ )	150°C
Lead Temperature ( $T_L$ ) (Soldering, 10 seconds)	260°C
ESD (Human Body Model)	≥ 6500V
ESD (Machine Model)	≥ 300V

**Recommended Operating Conditions**

Supply Voltage ( $V_{CC}$ )	3.0V to 3.6V
Input Voltage ( $V_{IN}$ )	0 to $V_{CC}$
Magnitude of Differential Voltage ( $ V_{ID} $ )	100 mV to $V_{CC}$
Common-mode Input Voltage ( $V_{IC}$ )	0.05V to 2.35V
Operating Temperature ( $T_A$ )	-40°C to +85°C

**Note 2:** The "Absolute Maximum Ratings" are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature and output/input loading variables. Fairchild does not recommend operation of circuits outside databook specification.

**DC Electrical Characteristics**

Over supply voltage and operating temperature ranges, unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ (Note 3)	Max	Units
$V_{TH}$	Differential Input Threshold HIGH	See Figure 1 and Table 1			100	mV
$V_{TL}$	Differential Input Threshold LOW	See Figure 1 and Table 1	-100			mV
$I_{IN}$	Input Current	$V_{IN} = 0V$ or $V_{CC}$			±20	μA
$I_{I(OFF)}$	Power-OFF Input Current	$V_{CC} = 0V$ , $V_{IN} = 0V$ or 3.6V			±20	μA
$V_{OH}$	Output HIGH Voltage	$I_{OH} = -100 \mu A$ $I_{OH} = -8 mA$	$V_{CC} - 0.2$ 2.4			V
$V_{OL}$	Output LOW Voltage	$I_{OH} = 100 \mu A$ $I_{OL} = 8 mA$			0.2 0.5	V
$V_{IK}$	Input Clamp Voltage	$I_{IK} = -18 mA$	-1.5			V
$I_{CC}$	Power Supply Current	( $R_{IN+} = 1V$ and $R_{IN-} = 1.4V$ ) or ( $R_{IN+} = 1.4V$ and $R_{IN-} = 1V$ )			9	mA
$C_{IN}$	Input Capacitance			4		pF
$C_{OUT}$	Output Capacitance			6		pF

**Note 3:** All typical values are at  $T_A = 25^\circ C$  and with  $V_{CC} = 3.3V$ .

**AC Electrical Characteristics**

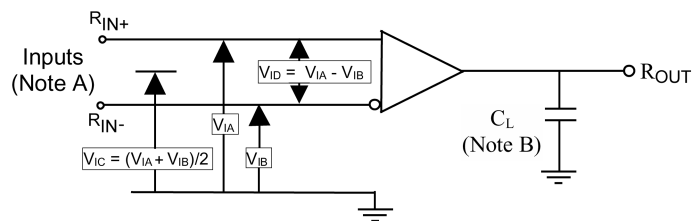
Over supply voltage and operating temperature ranges, unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ (Note 4)	Max	Units
$t_{PLH}$	Differential Propagation Delay LOW-to-HIGH	$ V_{ID}  = 400 mV$ , $C_L = 10 pF$ , See Figure 1 and Figure 2	0.9		2.5	ns
$t_{PHL}$	Differential Propagation Delay HIGH-to-LOW		0.9		2.5	ns
$t_{TLH}$	Output Rise Time (20% to 80%)			0.5		ns
$t_{THL}$	Output Fall Time (80% to 20%)			0.5		ns
$t_{SK(P)}$	Pulse Skew ( $t_{PLH} - t_{PHL}$ )				0.4	ns
$t_{SK(LH)}$ , $t_{SK(HL)}$	Channel-to-Channel Skew (Note 5)				0.3	ns
$t_{SK(PP)}$	Part-to-Part Skew (Note 6)				1.0	ns

**Note 4:** All typical values are at  $T_A = 25^\circ C$  and with  $V_{CC} = 3.3V$ .

**Note 5:**  $t_{SK(LH)}$ ,  $t_{SK(HL)}$  is the skew between specified outputs of a single device when the outputs have identical loads and are switching in the same direction.

**Note 6:**  $t_{SK(PP)}$  is the magnitude of the difference in propagation delay times between any specified terminals of two devices switching in the same direction (either LOW-to-HIGH or HIGH-to-LOW) when both devices operate with the same supply voltage, same temperature, and have identical test circuits.

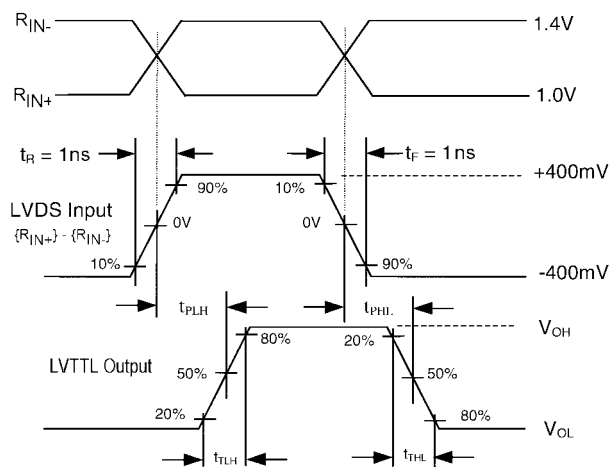


**Note A:** All input pulses have frequency = 10 MHz,  $t_R$  or  $t_F = 1$  ns  
**Note B:**  $C_L$  includes all probe and fixture capacitances

**FIGURE 1. Differential Driver Propagation Delay and Transition Time Test Circuit**

**TABLE 1. Receiver Minimum and Maximum Input Threshold Test Voltages**

Applied Voltages (V)		Resulting Differential Input Voltage (mV)	Resulting Common Mode Input Voltage (V)
$V_{IA}$	$V_{IB}$	$V_{ID}$	$V_{IC}$
1.25	1.15	100	1.2
1.15	1.25	-100	1.2
2.4	2.3	100	2.35
2.3	2.4	-100	2.35
0.1	0	100	0.05
0	0.1	-100	0.05
1.5	0.9	600	1.2
0.9	1.5	-600	1.2
2.4	1.8	600	2.1
1.8	2.4	-600	2.1
0.6	0	600	0.3
0	0.6	-600	0.3



**FIGURE 2. AC Waveforms**

DC / AC Typical Performance Curves

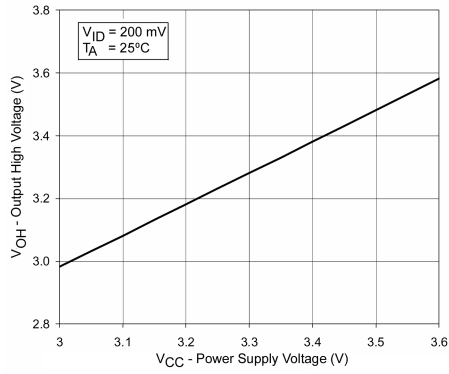


FIGURE 3. Output High Voltage vs. Power Supply Voltage

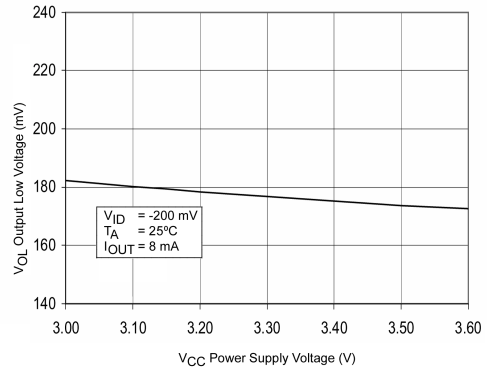


FIGURE 4. Output Low Voltage vs. Power Supply Voltage

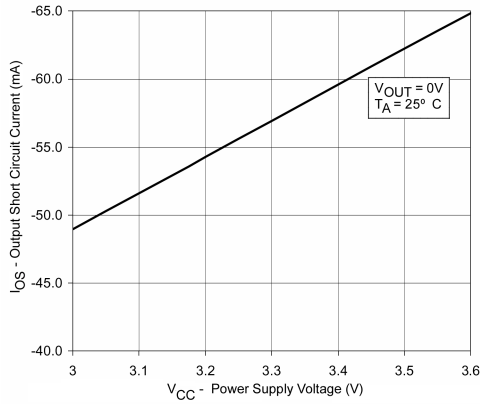


FIGURE 5. Output Short Circuit Current vs. Power Supply Voltage

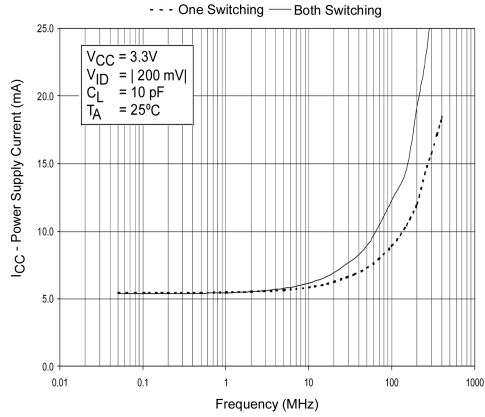


FIGURE 6. Power Supply Current vs. Frequency

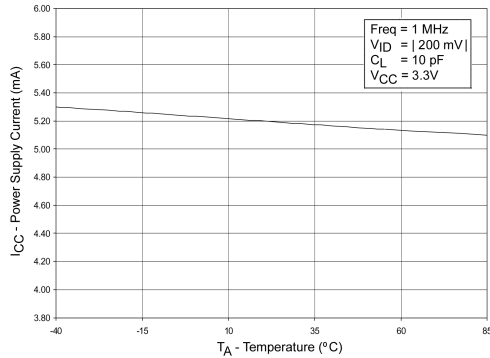


FIGURE 7. Power Supply Current vs. Ambient Temperature

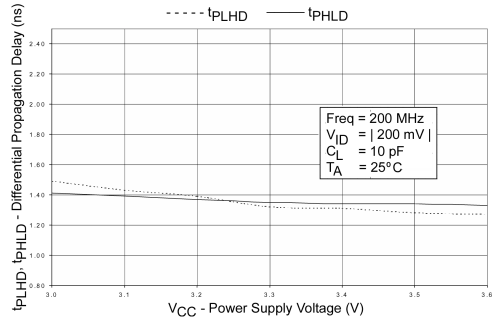


FIGURE 8. Differential Propagation Delay vs. Power Supply Voltage

DC /AC Typical Performance Curves (Continued)

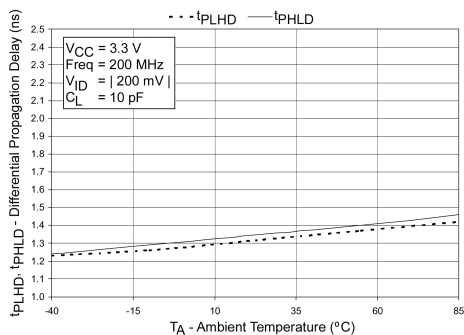


FIGURE 9. Differential Propagation Delay vs. Ambient Temperature

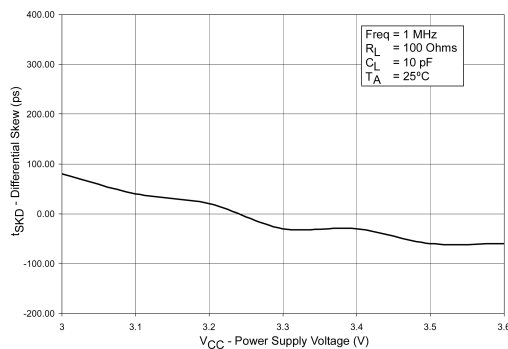


FIGURE 10. Differential Skew ( $t_{PLH} - t_{PHL}$ ) vs. Power Supply Voltage

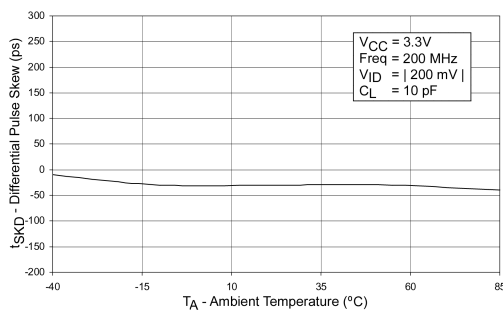


FIGURE 11. Differential Skew ( $t_{PHL} - t_{PLH}$ ) vs. Ambient Temperature

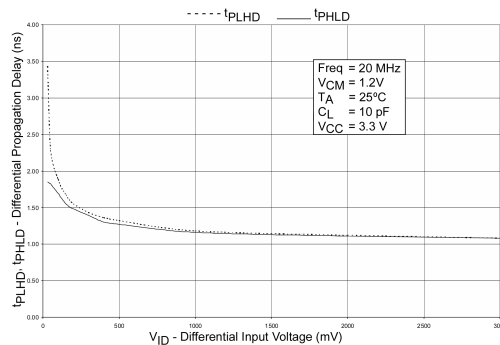


FIGURE 12. Differential Propagation Delay vs. Differential Input Voltage

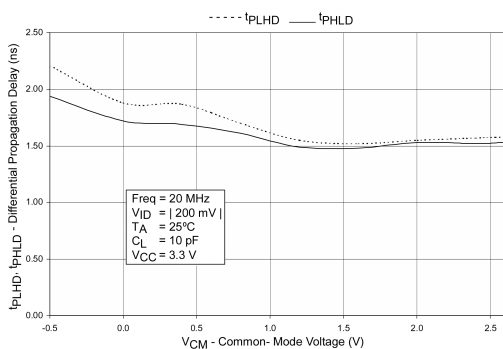


FIGURE 13. Differential Propagation Delay vs. Common-Mode Voltage

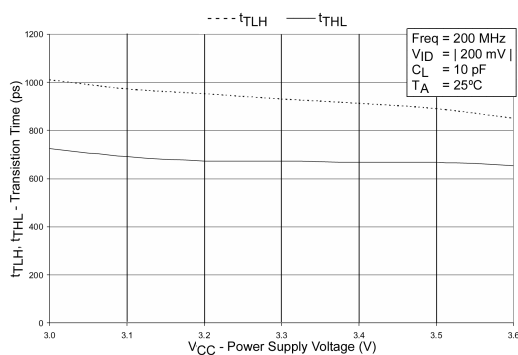


FIGURE 14. Transition Time vs. Power Supply Voltage

DC /AC Typical Performance Curves (Continued)

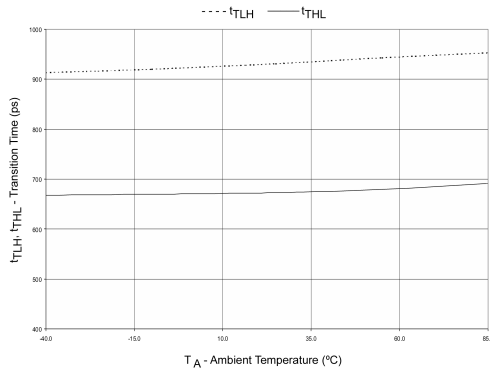


FIGURE 15. Transition Time vs. Ambient Temperature

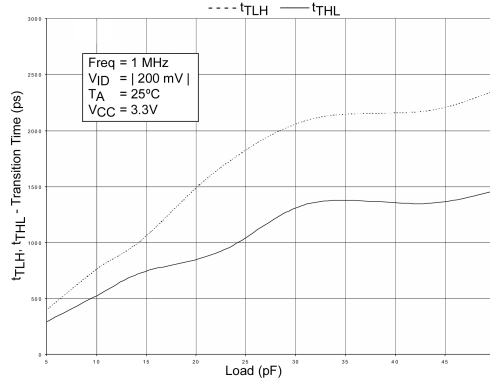


FIGURE 16. Differential Propagation Delay vs. Load

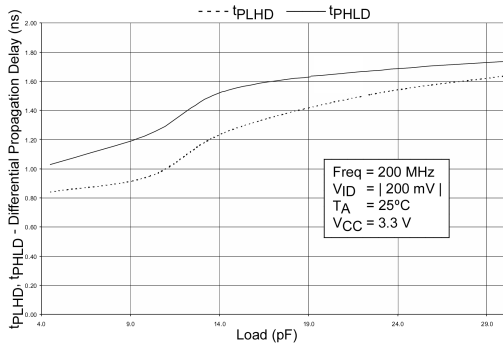


FIGURE 17. Differential Propagation Delay vs. Load

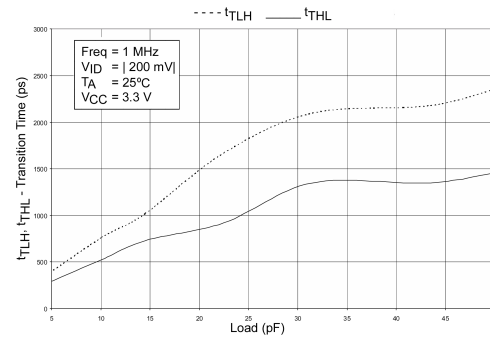


FIGURE 18. Transition Time vs. Load

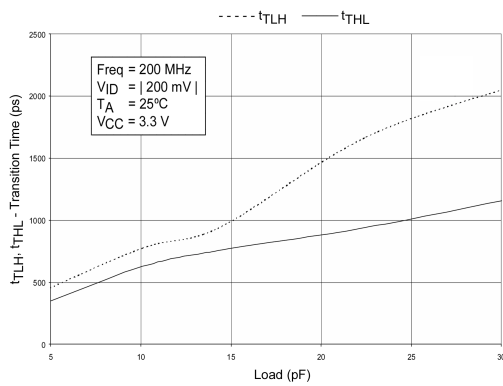


FIGURE 19. Transition Time vs. Load

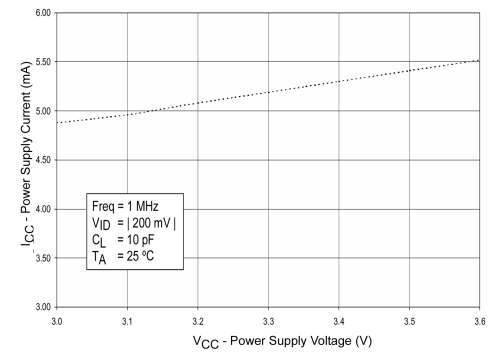


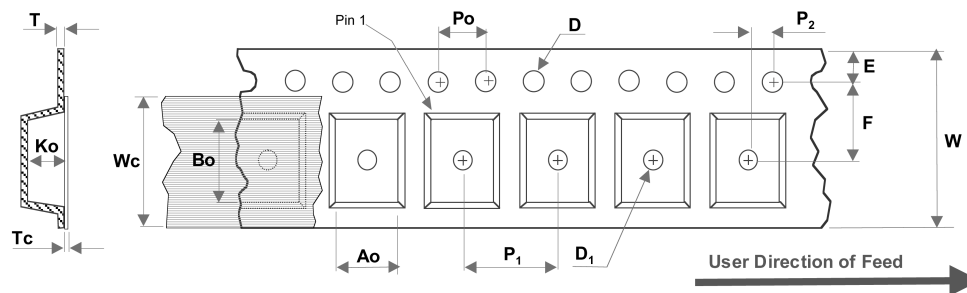
FIGURE 20. Power Supply Current vs. Power Supply Voltage

## Tape and Reel Specification

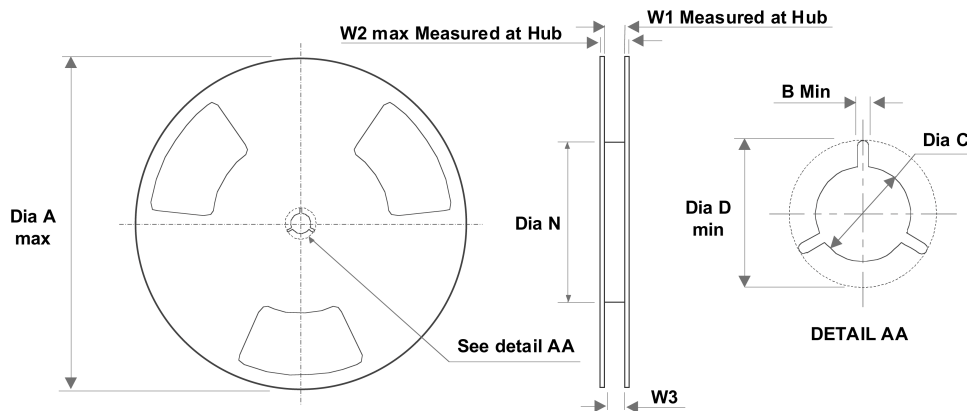
### TAPE FORMAT for MLP

Package	Ao	Bo	D	D <sub>1</sub>	E	F	Ko	P <sub>1</sub>	Po	P <sub>2</sub>	T	T <sub>c</sub>	W	Wc
	±0.10	±0.10	±0.05	Min	±0.1	±0.1	±0.1	TYP	TYP	±0/05	TYP	±0.005	±0.3	TYP
2 x 2	2.30	2.30	1.55	1.0	1.75	3.5	1.0	8.0	4.0	2.0	0.3	0.06	8.0	5.3

### MLP Embossed Tape Dimensions (Dimensions are in millimeters)

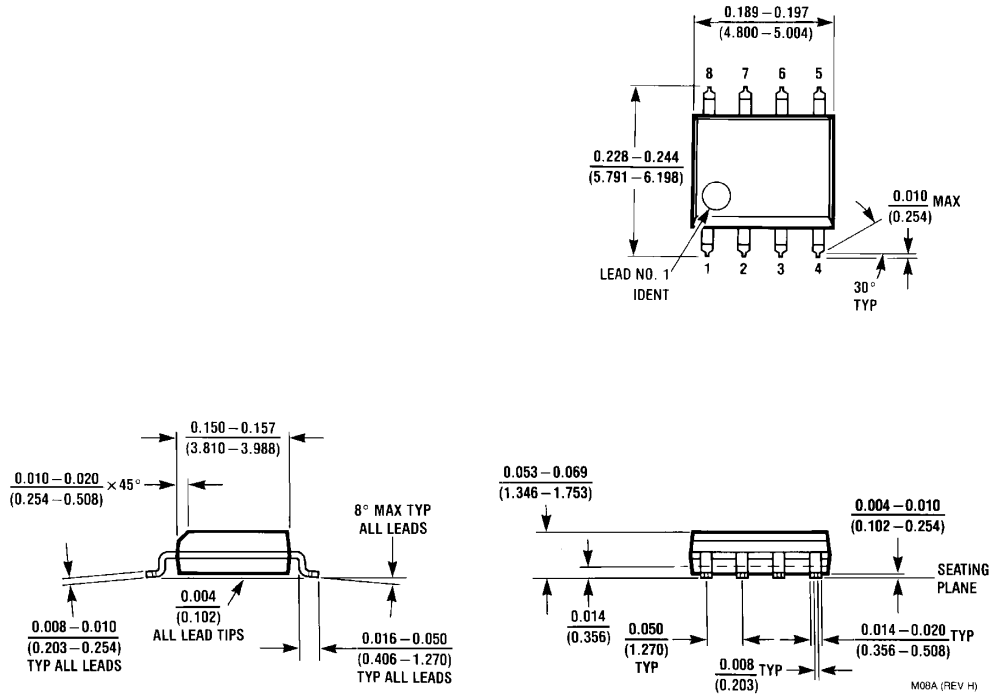


### REEL DIMENSIONS (millimeters)



Tape Width	Dia A Max	Dim B Min	Dia C +0.5/-0.2	Dia D Min	Dim N Min	Dim W1 +2/-0	Dim W2 Max	Dim W3 (LSL - USL)
8 mm	330	1.5	13	20.2	178	8.4	14.4	7.9 ~ 10.4

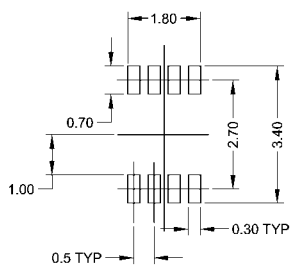
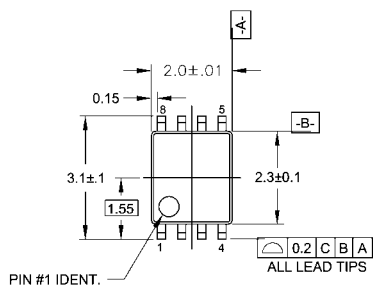
**Physical Dimensions** inches (millimeters) unless otherwise noted



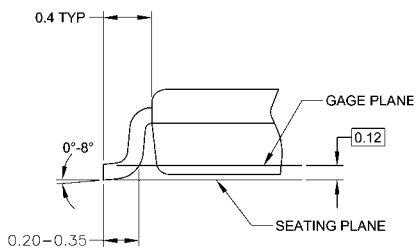
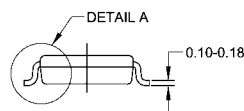
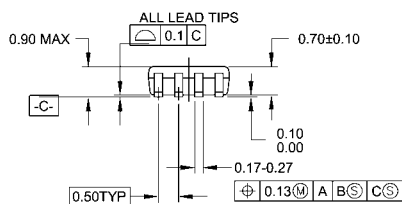
**8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Package Number M08A**



**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**LAND PATTERN RECOMMENDATION**



**DETAIL A**

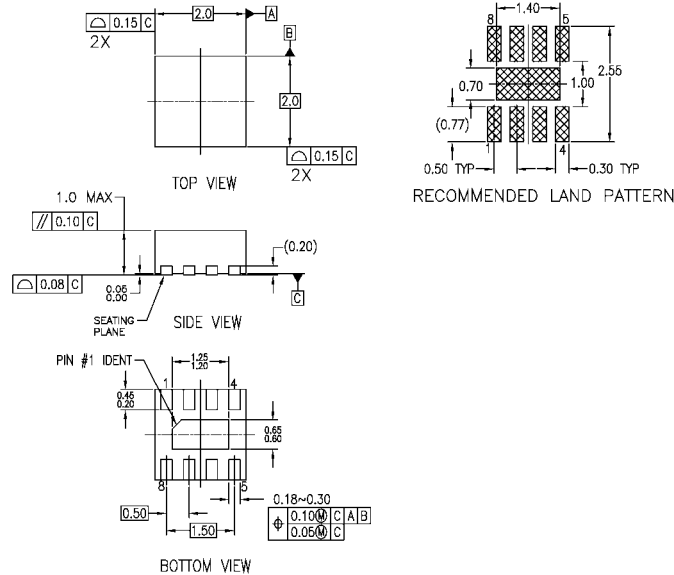
**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MAB08AREVC

**8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide  
Package Number MAB08A**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION VCCD-3, DATED 11/2001
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP08CrevB

**8-Terminal Molded Leadless Package (MLP) Dual, MO-229, 2mm Square  
Package Number MLP08C  
(Preliminary)**

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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