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March 2017

# FIN1001 3.3 V LVDS 1-Bit, High-Speed Differential Driver

## Features

- Greater than 600 Mbs Data Rate
- 3.3 V Power Supply Operation
- 0.5 ns Maximum Pulse Skew
- 1.5 ns Maximum Propagation Delay
- Low Power Dissipation
- Power-Off Protection
- Meets or exceeds TIA/EIA-644 LVDS Standard
- Flow-through pin-out simplifies PCB Layout
- 5-Lead SOT23 package saves Space

## Description

This single driver is designed for high-speed interconnects utilizing Low Voltage Differential Signaling (LVDS) technology. The driver translates LVTTTL levels to LVDS levels with a typical differential output swing of 350 mV which provides low EMI at ultra low power dissipation even at high frequencies. This device is ideal for high-speed transfer of clock or data. The FIN1001 can be paired with its companion receiver, the FIN1002, or with any other LVDS receiver.

## Ordering Information

Part Number	Operating Temperature Range	Package	Packing Method	Packing Quantity
FIN1001M5X	-40 to +125°C	5-Lead SOT23, JEDEC MO-178, 1.6 mm	Tape & Reel	3000

## Connection Diagram

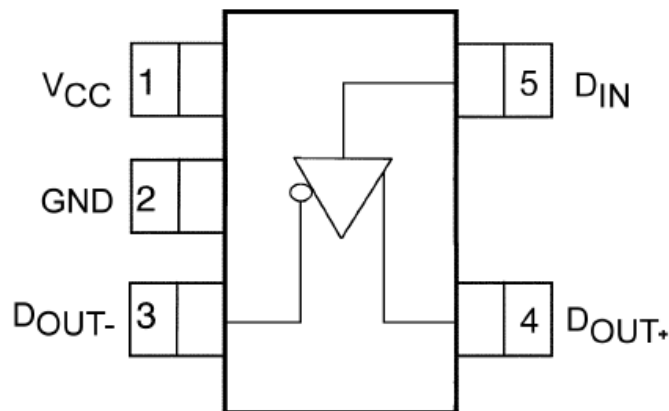


Figure 1. Top View

## Pin Definitions

Pin #	Name	Description
1	V <sub>CC</sub>	Power Supply
2	GND	Ground
3	D <sub>OUT-</sub>	Inverting LVDS Driver Output
4	D <sub>OUT+</sub>	Non-inverting LVDS Driver Output
5	D <sub>IN</sub>	LVTTTL Data Input

## Function Table

Input	Outputs	
D <sub>IN</sub>	D <sub>OUT+</sub>	D <sub>OUT-</sub>
LOW	LOW	HIGH
HIGH	HIGH	LOW

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage	-0.5	4.6	V
D <sub>IN</sub>	DC Input Voltage	-0.5	6.0	V
D <sub>OUT</sub>	DC Output Voltage	-0.5	4.6	V
I <sub>OSD</sub>	Driver Short Circuit Current	Continuous		
I <sub>O</sub>	Output Current		16	mA
T <sub>STG</sub>	Storage Temperature Range	-65	+150	°C
T <sub>J</sub>	Maximum Junction Temperature		+150	°C
T <sub>L</sub>	Lead Temperature, Soldering, 10 Seconds		+260	°C
ESD	Electrostatic Discharge	Human Body Model	7500	V
		Machine Model	400	V

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. ON Semiconductor does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
$V_{CC}$	Supply Voltage	3.0	3.6	V
$V_{IN}$	Input Voltage	0	$V_{CC}$	V
$T_A$	Operating Temperature	-40	+125	°C

## DC Electrical Characteristics<sup>(1)</sup>

All min and max values are guaranteed at  $T_A = -40^\circ$  to  $+125^\circ\text{C}$ , unless otherwise specified.

All typical values are at  $T_A = 25^\circ\text{C}$  and with  $V_{CC} = 3.3\text{ V}$ , unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{OD}$	Output Differential Voltage	$T_A = -40^\circ$ to $85^\circ\text{C}$	250	350	450	mV	
		$T_A = -40^\circ$ to $125^\circ\text{C}$	230	350	450	mV	
$\Delta V_{OD}$	$V_{OD}$ Magnitude Change from Differential Low-to-High	$R_L = 100\ \Omega$ , See Figure 2			25	mV	
$V_{OS}$	Offset Voltage		$T_A = -40^\circ$ to $125^\circ\text{C}$	1.125	1.25	1.375	V
$\Delta V_{OS}$	Offset Magnitude Change from Differential Low-to-High					25	mV
$I_{OFF}$	Power-Off Output Current		$V_{CC} = 0\text{ V}$ , $V_{OUT} = 0\text{ V}$ or $3.6\text{ V}$			$\pm 20$	$\mu\text{A}$
$I_{OS}$	Short Circuit Output Current	$V_{OUT} = 0\text{ V}$		-5.5	-8	mA	
		$V_{OD} = 0\text{ V}$		$\pm 4$	$\pm 8$		
$I_{I(OFF)}$	Power-OFF Input Current	$V_{CC} = 0\text{ V}$ , $V_{IN} = 0\text{ V}$ or $3.6\text{ V}$			$\pm 20$	$\mu\text{A}$	
$V_{IH}$	Input HIGH Voltage		2.0		$V_{CC}$	V	
$V_{IL}$	Input LOW Voltage		GND		0.8	V	
$I_{IN}$	Input Current	$V_{IN} = 0\text{ V}$ or $V_{CC}$			$\pm 20$	$\mu\text{A}$	
$I_{I(OFF)}$	Power-Off Input Current	$V_{CC} = 0\text{V}$ , $V_{IN} = 0\text{ V}$ or $3.6\text{ V}$			$\pm 20$	$\mu\text{A}$	
$V_{IK}$	Input Clamp Voltage	$I_{IK} = -18\text{ mA}$	-1.5	-0.8		V	
$I_{CC}$	Power Supply Current	No Load, $V_{IN} = 0\text{ V}$ or $V_{CC}$		4.5	8	mA	
		$R_L = 100\ \Omega$ , $V_{IN} = 0\text{ V}$ or $V_{CC}$		6.5	10		
$C_{IN}$	Input Capacitance	$V_{CC} = 3.3\text{ V}$		3.2		pF	
$C_{OUT}$	Output Capacitance	$V_{CC} = 0\text{ V}$		3.3		pF	

### Notes:

1. Not production tested across the full temperature range.



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## AC Electrical Characteristics

All min and max values are guaranteed at  $T_A = -40$  to  $+85^\circ\text{C}$ .

All typical values are at  $T_A = 25^\circ\text{C}$  and with  $V_{CC} = 3.3\text{ V}$ , unless otherwise specified.

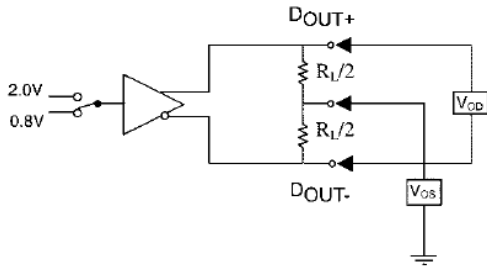
$R_L = 100\ \Omega$ ,  $C_L = 5\ \text{pF}$ . See Figure 3 and Figure 4.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{PLHD}$	Propagation Delay	LOW to HIGH	0.50	0.98	1.50	ns
$t_{PHLD}$	Propagation Delay	HIGH to LOW	0.50	0.93	1.50	ns
$t_{TLHD}$	Differential Output Rise Time	20% to 80%	0.4	0.5	1.0	ns
$t_{THLD}$	Output Fall Time	80% to 20%	0.4	0.5	1.0	ns
$t_{SK(p)}$	Pulse Skew	$ t_{PLH} - t_{PHL} $		0.05	0.5	ns
$t_{SK(PP)}$	Part-to-Part Skew <sup>(2)</sup>				1.0	ns

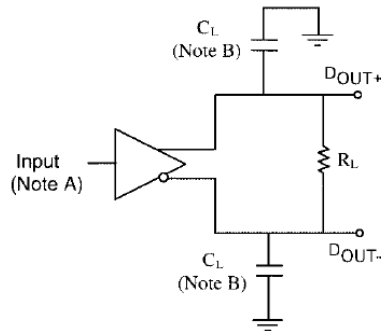
### Note:

- $t_{SK(PP)}$  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.

## Test Diagrams

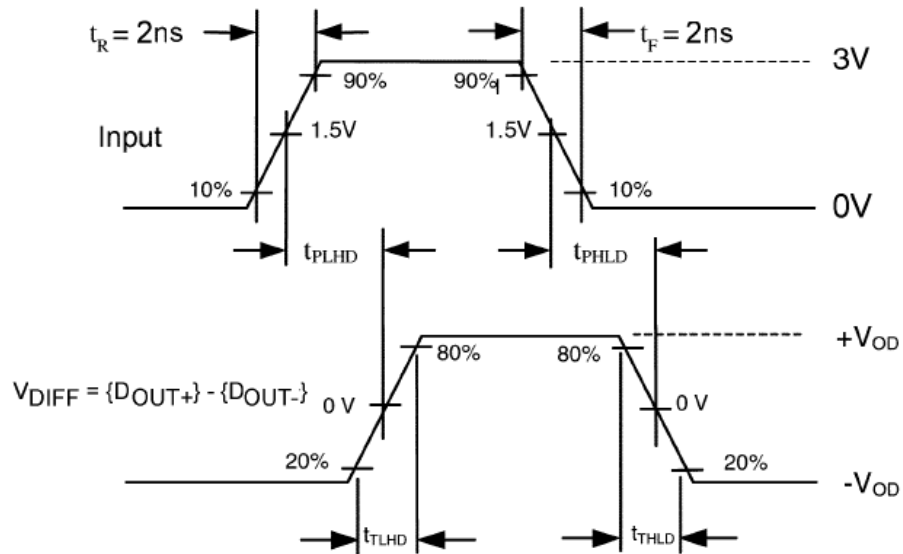


**Figure 2. Differential Driver DC Test Circuit**



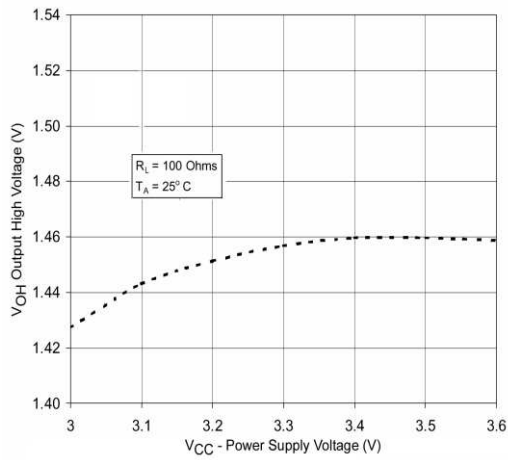
**Note A:** All input pulses have frequency = 10 MHz,  $t_R$  or  $t_F$  = 2 ns  
**Note B:**  $C_L$  includes all probe and fixture capacitances

**Figure 3. Differential Driver Propagation Delay and Transition Time Test Circuit**

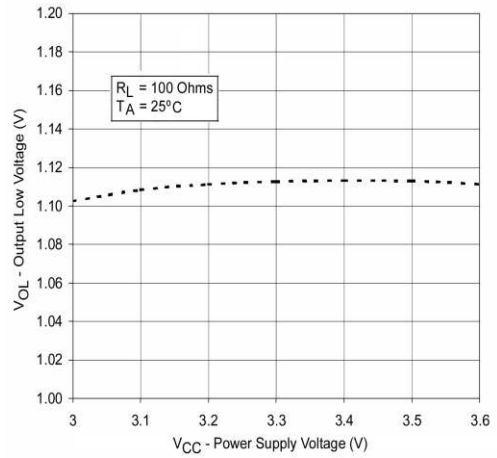


**Figure 4. AC Waveforms**

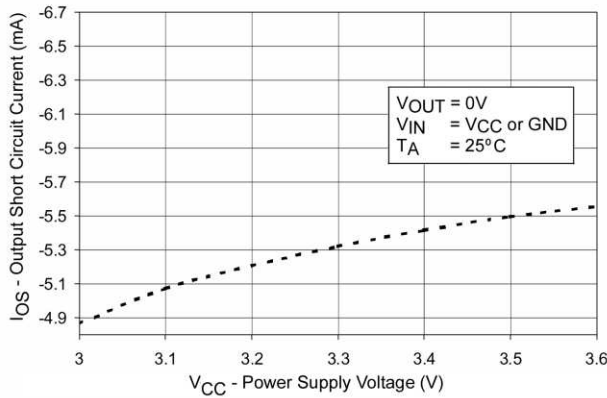
## Typical Performance Characteristics



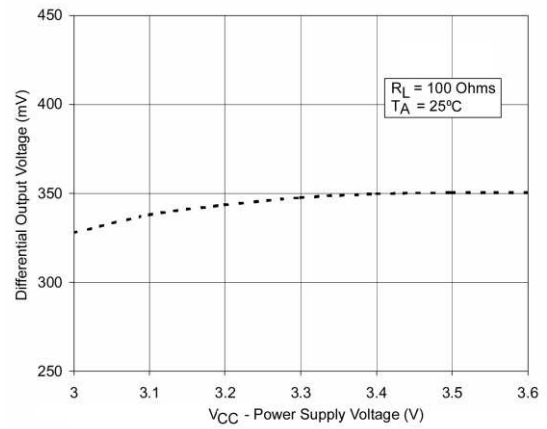
**Figure 5. Output High Voltage vs. Power Supply Voltage**



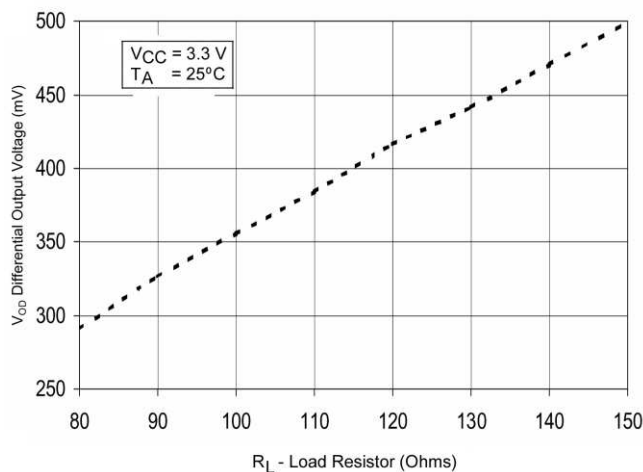
**Figure 6. Output Low Voltage vs. Power Supply Voltage**



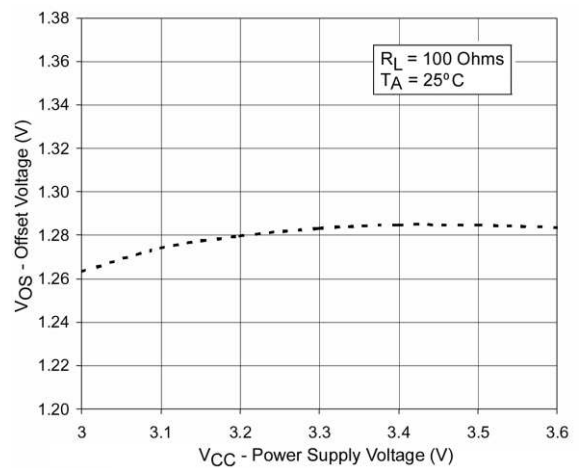
**Figure 7. Output Short Circuit Current vs. Power Supply Voltage**



**Figure 8. Differential Output Voltage vs. Power Supply Voltage**

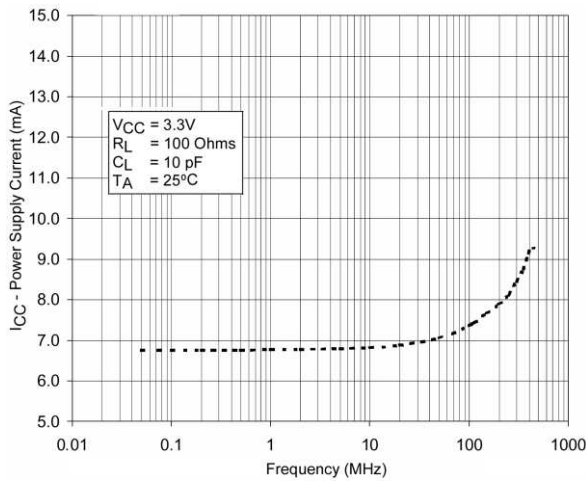


**Figure 9. Differential Output Voltage vs. Load Resistor**

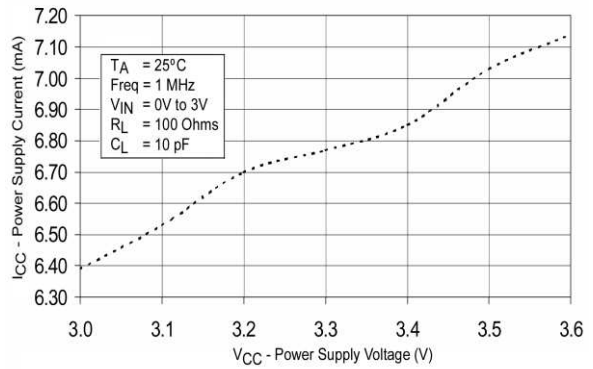


**Figure 10. Offset Voltage vs. Power Supply Voltage**

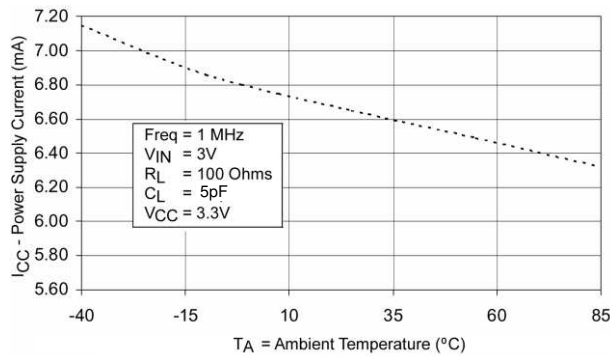
### Typical Performance Characteristics (Continued)



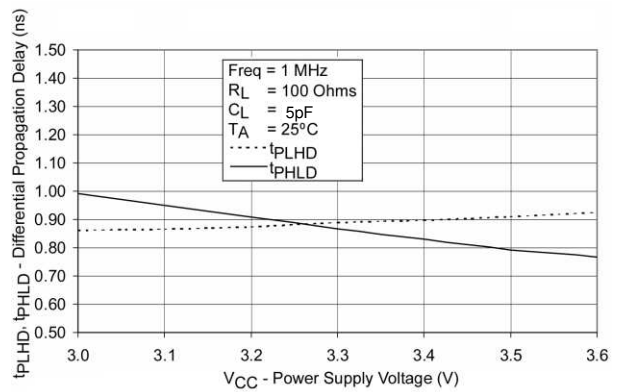
**Figure 11. Power Supply Current vs. Frequency**



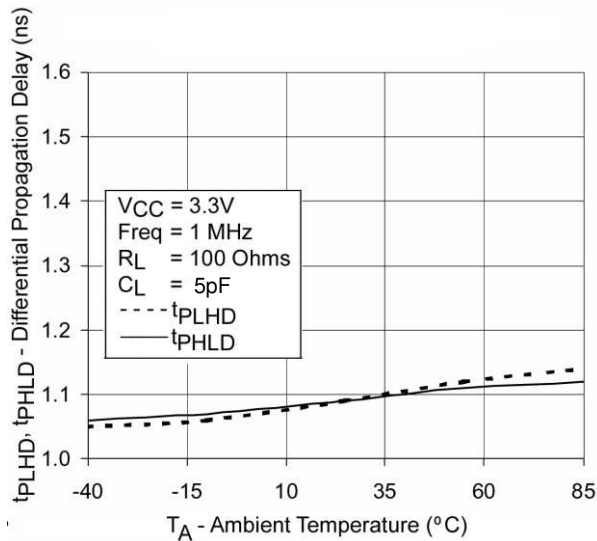
**Figure 12. Power Supply Current vs. Power Supply Voltage**



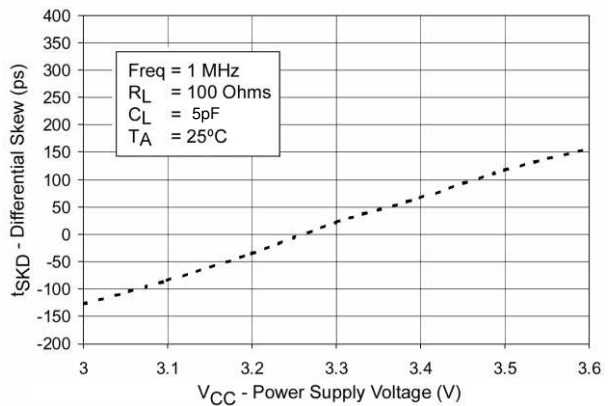
**Figure 13. Power Supply Current vs. Ambient Temperature**



**Figure 14. Differential Propagation Delay vs. Power Supply**



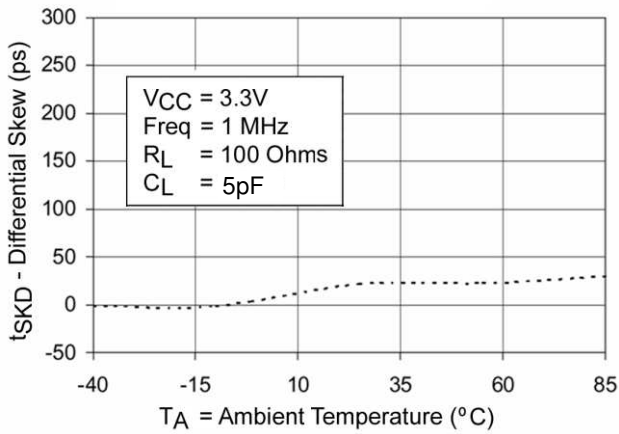
**Figure 15. Differential Propagation Delay vs. Ambient Temperature**



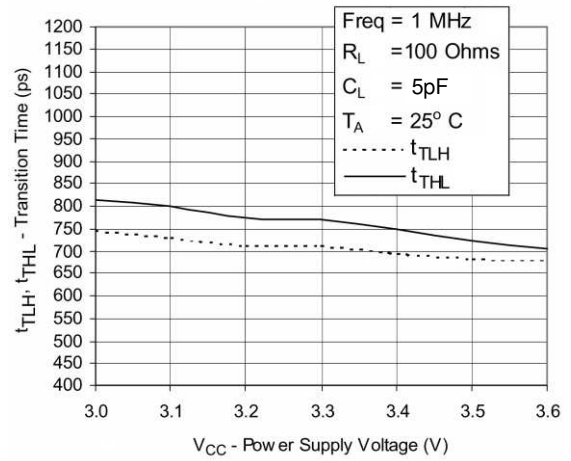
**Figure 16. Differential Pulse Skew ( $t_{PLH} - t_{PHL}$ ) vs. Power Supply Voltage**



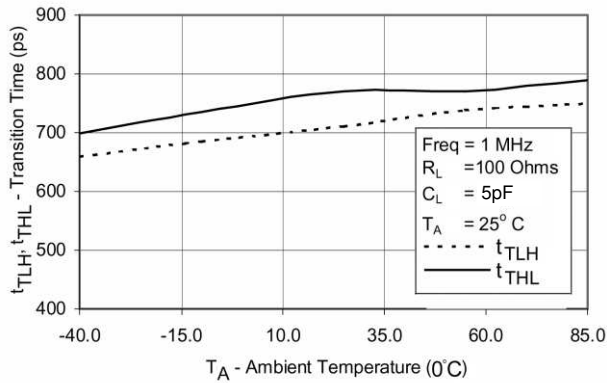
**Typical Performance Characteristics** (Continued)



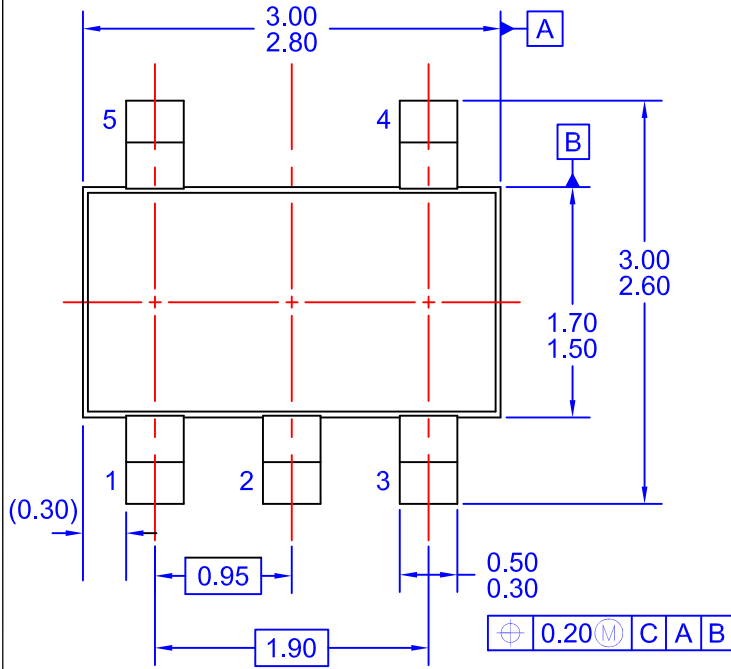
**Figure 17. Differential Pulse Skew ( $t_{PLH} - t_{PHL}$ ) vs. Ambient Temperature**



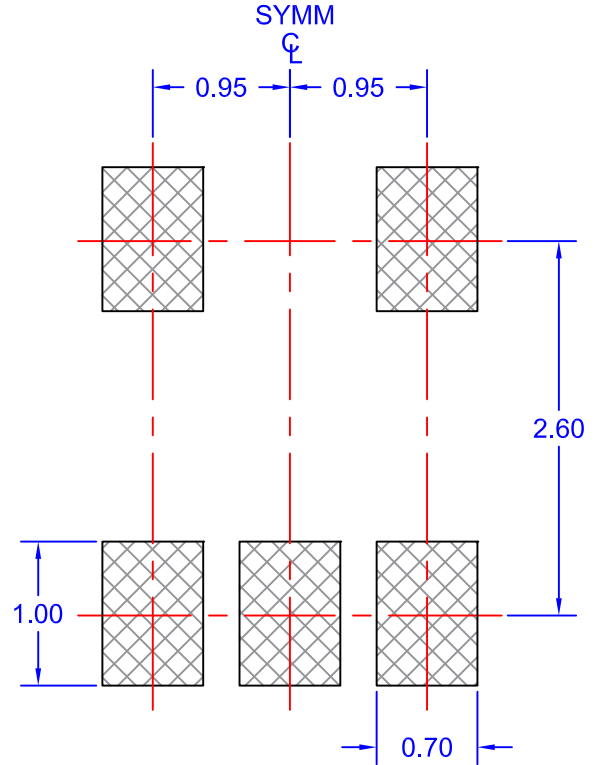
**Figure 18. Transition Time vs. Power Supply Voltage**



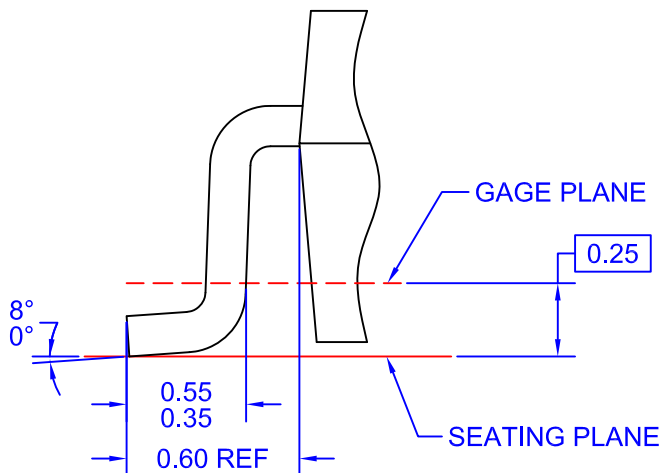
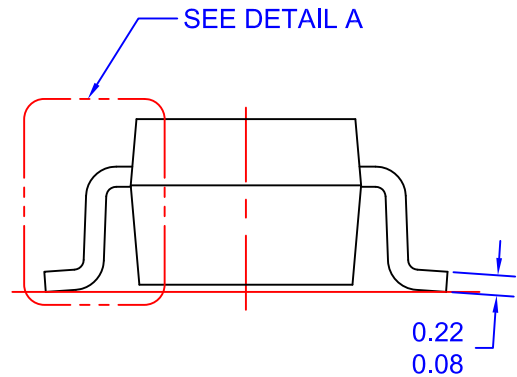
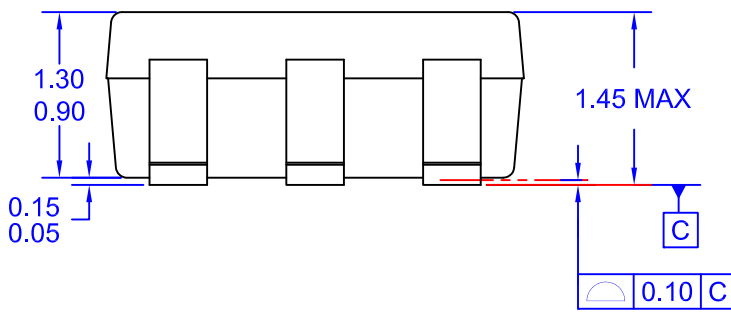
**Figure 19. Transition Time vs. Ambient Temperature**



TOP VIEW




LAND PATTERN RECOMMENDATION



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) PACKAGE STANDARD REFERENCE: JEDEC REGISTRATION, MO-178, ISSUE B, VARIATION AA.
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
  - D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
  - E) DRAWING FILE NAME: MKT-MA05BREV6



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