

# LVDS 1-Bit, High-Speed Differential Receiver

## FIN1002

### Description

This single 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 LVTTL 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 or data. The FIN1002 can be paired with its companion driver, the FIN1001, or with any other LVDS driver.

### Features

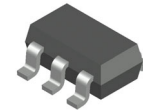
- Greater than 400 Mbs Data Rate
- 3.3 V Power Supply Operation
- 0.4 ns Maximum Pulse Skew
- 2.5 ns Maximum Propagation Delay
- Bus Pin ESD (HBM) Protection Exceeds 10 kV
- Power-Off, Over-voltage Tolerant Input and Output
- Fail-safe Protection for open-circuit and Non-driven, Shorted, or Terminated Conditions
- High-impedance Output at  $V_{CC} < 1.5$  V
- Meets or exceeds TIA/EIA-644 LVDS Standard
- 5-Lead SOT23 Package Saves Space

### PIN DEFINITIONS

Pin No.	Function	Description
1	$V_{CC}$	Power Supply
2	GND	Ground for the IC
3	$R_{IN+}$	Non-inverting Driver Input
4	$R_{IN-}$	Inverting Driver Input
5	$R_{OUT}$	LVTTL Data Output

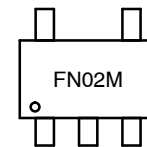
### FUNCTION TABLE

Inputs		Outputs
$R_{IN+}$	$R_{IN-}$	$R_{OUT}$
LOW	HIGH	LOW
HIGH	LOW	HIGH
Fail-Safe Condition (Open, Shorted, Terminated)		HIGH



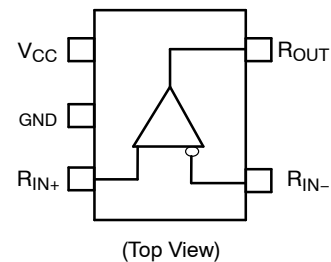
SOT-23, 5 Lead  
CASE 527AH

### MARKING DIAGRAM

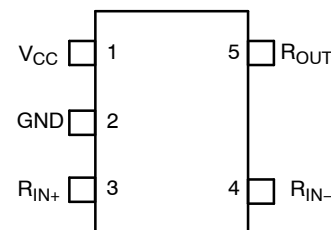


FN02 = Specific Device Code  
M = Date Code

### CONNECTION DIAGRAM



### PIN CONFIGURATION



### ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter			Min.	Max.	Unit
$V_{CC}$	Supply Voltage			-0.5	4.6	V
$R_{IN+} / R_{IN-}$	Input Voltage			-0.5	4.6	V
$D_{OUT}$	DC Output Voltage			-0.5	6.0	V
$I_O$	Output Current				16	mA
$T_{STG}$	Storage Temperature Range			-65	+150	°C
$T_J$	Maximum Junction Temperature				+150	°C
$T_L$	Lead Temperature, Soldering, 10 Seconds				+260	°C
ESD	Electrostatic Discharge	Human Body Model	All Pins		8	kV
			LVDS Pins to GND		10	
		Machine Model			400	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## RECOMMENDED OPERATING RANGES

Symbol	Parameter	Min.	Max.	Unit
$V_{CC}$	Supply Voltage	3.0	3.6	V
$V_{IN}$	Input Voltage	0	$V_{CC}$	V
$V_{ID}$	Magnitude of Differential Voltage	100	$V_{CC}$	mV
$V_{IC}$	Common-mode Input Voltage	$0 +  V_{ID}  / 2$	$2.4 -  V_{ID}  / 2$	V
$T_A$	Operating Temperature	-40	+125	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

## DC ELECTRICAL CHARACTERISTICS (Note 1)

All min. and max. values are guaranteed at  $T_A = -40$  to  $+125^\circ\text{C}$ . All typical values are at  $T_A = 25^\circ\text{C}$  and with  $V_{CC} = 3.3$  V, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{TH}$	Differential Input Threshold HIGH	$V_{IC} = +0.05$ V, 1.2 V, or 2.35 V (Figure 1)			100	mV
$V_{TL}$	Differential Input Threshold LOW	$V_{IC} = +0.05$ V, 1.2 V, or 2.35 V (Figure 1)	-100			mV
$I_{IN}$	Input Current	$V_{IN} = 0$ V or $V_{CC}$			$\pm 20$	$\mu\text{A}$
$I_{I(OFF)}$	Power-OFF Input Current	$V_{CC} = 0$ V, $V_{IN} = 0$ V or 3.6 V			$\pm 20$	$\mu\text{A}$
$V_{OH}$	Output HIGH Voltage	$I_{OH} = -100$ $\mu\text{A}$	$V_{CC} - 0.2$	3.3		V
		$I_{OH} = -8$ mA	2.4	3.1		
$V_{OL}$	Output LOW Voltage	$I_{OH} = 100$ $\mu\text{A}$		0	0.2	V
		$I_{OL} = 8$ mA		0.16	0.50	
$V_{IK}$	Input Clamp Voltage	$I_{IK} = -18$ mA	-1.5	0.8		V
$I_{CC}$	Power Supply Current	( $R_{IN+} = 1$ V and $R_{IN-} = 1.4$ V) or ( $R_{IN+} = 1.4$ V and $R_{IN-} = 1$ V)		4	7	mA
$C_{IN}$	Input Capacitance	$V_{CC} = 3.3$ V		2.3		pF
$C_{OUT}$	Output Capacitance	$V_{CC} = 0$ V		2.8		pF

1. Not production tested across the full temperature range.

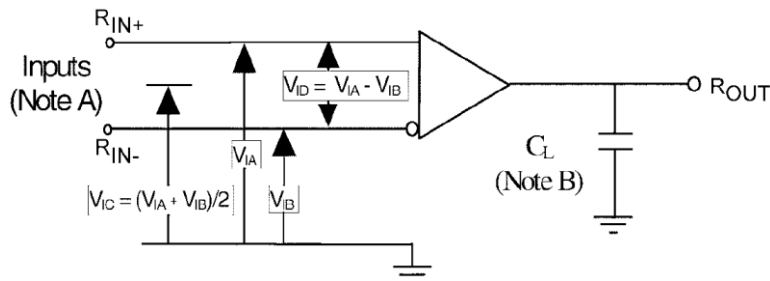
**AC ELECTRICAL CHARACTERISTICS**

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.

$|V_{ID}| = 400\text{ mV}$ ,  $C_L = 10\text{ pF}$ . See Figure 1 and Figure 2.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{PLH}$	Propagation Delay	LOW to HIGH	0.9	1.5	2.5	ns
$t_{PHL}$	Propagation Delay	HIGH to LOW	0.9	1.5	2.5	ns
$t_{TLH}$	Output Rise Time	20% to 80%		0.6		ns
$t_{THL}$	Output Fall Time	80% to 20%		0.5		ns
$t_{SK(p)}$	Pulse Skew	$ t_{PLH} - t_{PHL} $		0.02	0.4	ns
$t_{SK(PP)}$	Part-to-Part Skew (Note 2)				1.0	ns

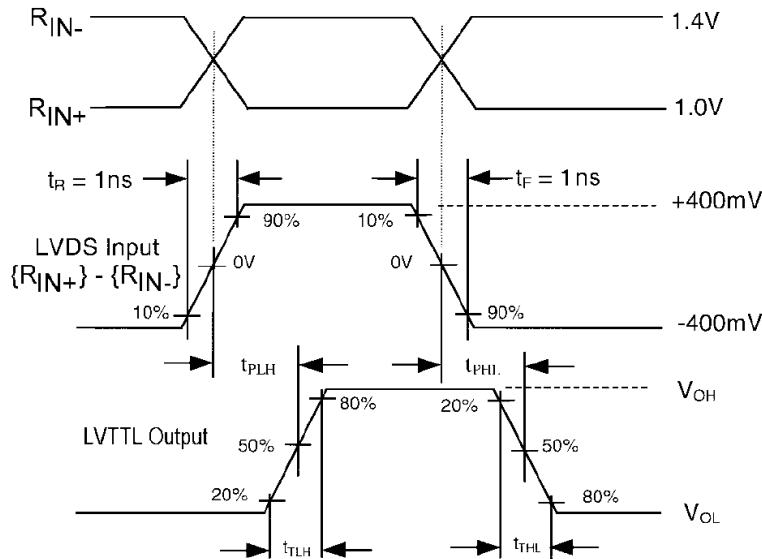
2.  $t_{SK(PP)}$  is the magnitude of the difference in propagation delay times between any specified terminals of two devices switching in the same direction (either LOW-to-HIGH or HIGH-to-LOW) when both devices operate with the same supply voltage, same temperature, and have identical test circuits.

**TEST DIAGRAMS**

Note A: All input pulses have frequency = 10MHz,  $t_R$  or  $t_F = 1\text{ ns}$

Note B:  $C_L$  includes all probe and fixture capacitances

**Figure 1. Differential Receiver Voltage Definitions and Propagation Delay and Transition Time Test Circuit**



**Figure 2. LVDS Input to LVTTTL Output AC Waveforms**

## TYPICAL CHARACTERISTICS

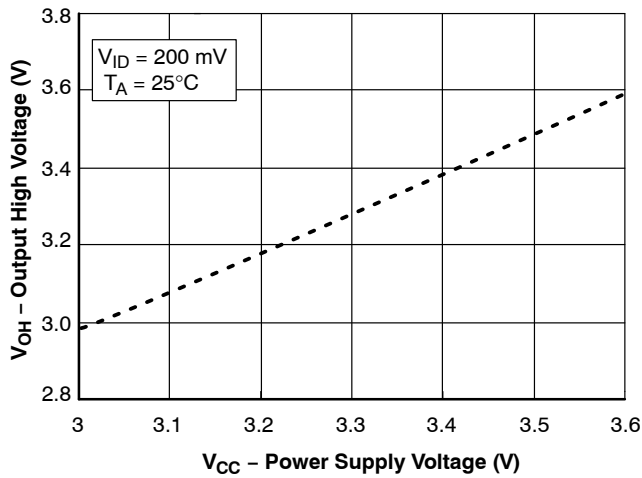


Figure 3. Output High Voltage vs. Power Supply Voltage

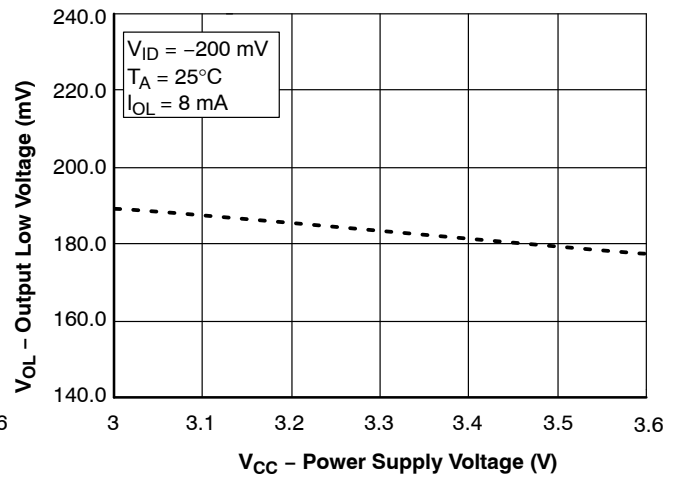


Figure 4. Output Low Voltage vs. Power Supply Voltage

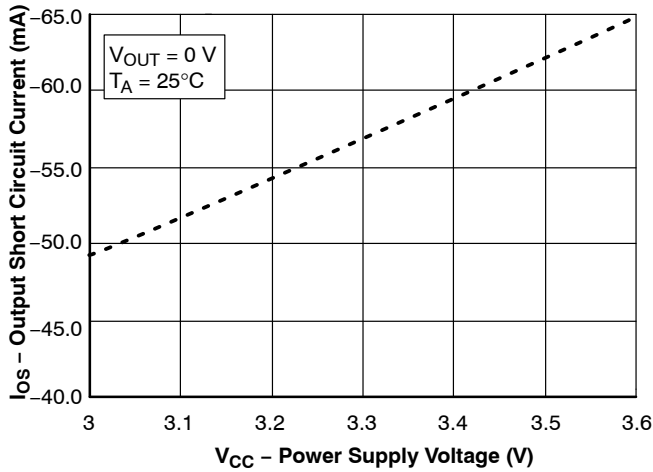


Figure 5. Output Short Circuit Current vs. Power Supply Voltage

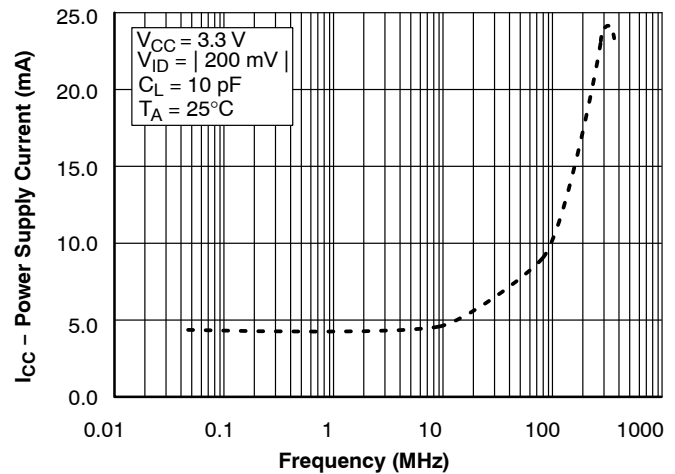


Figure 6. Power Supply Current vs. Frequency

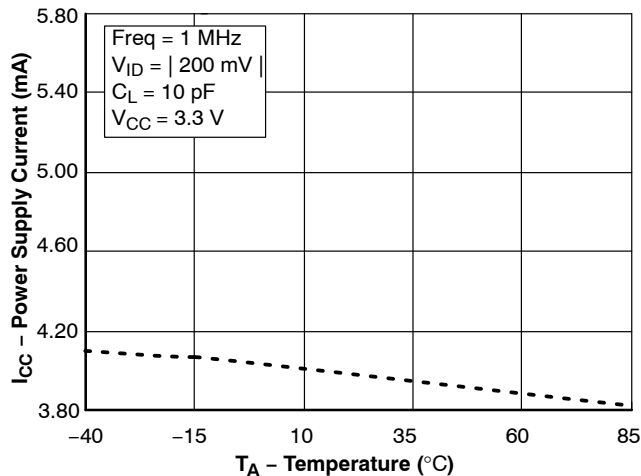


Figure 7. Power Supply Current vs. Ambient Temperature

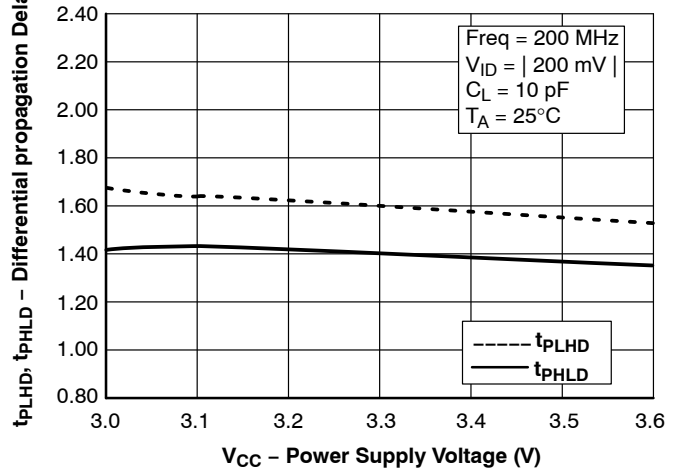
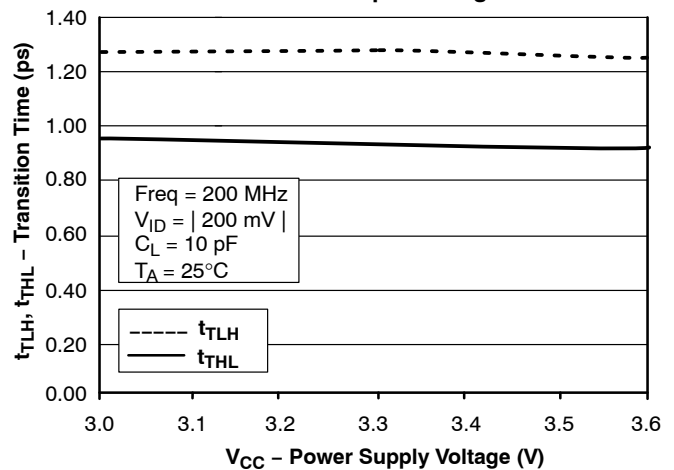
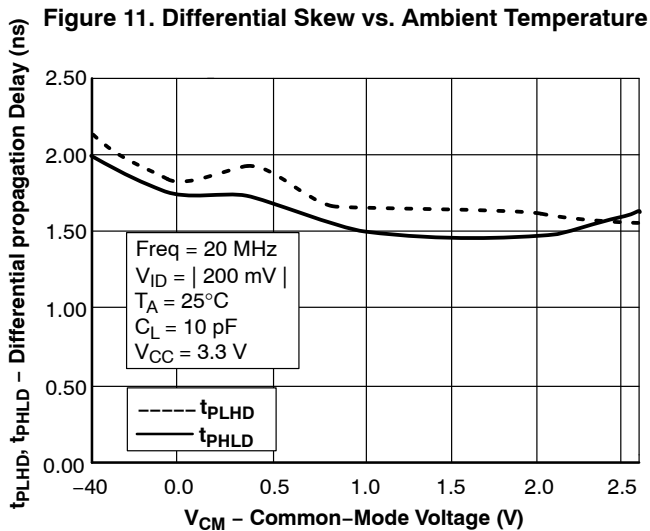
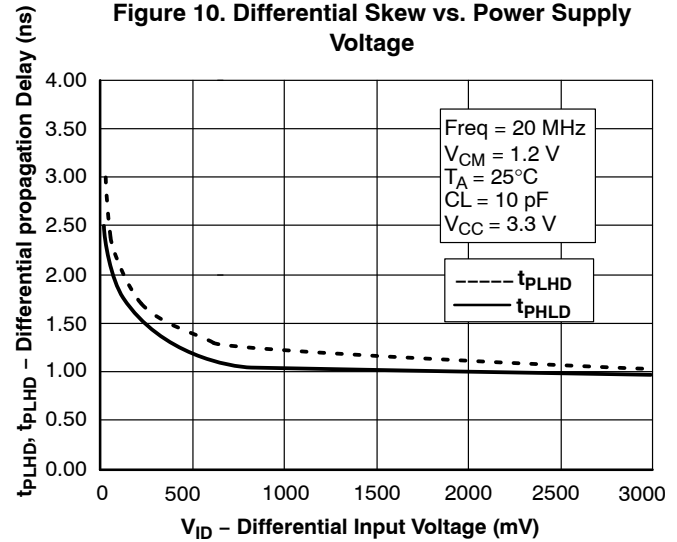
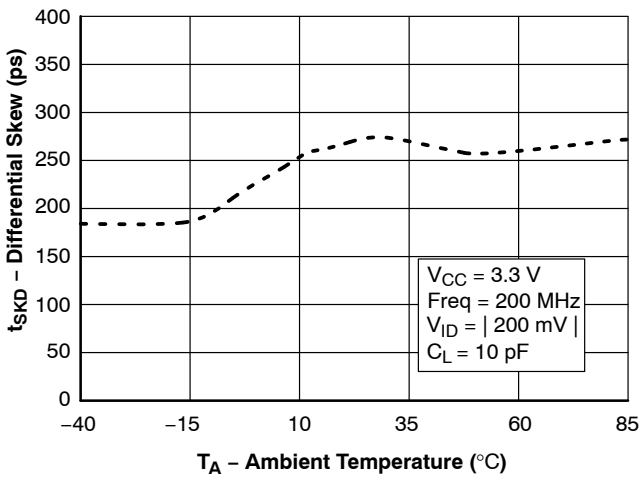
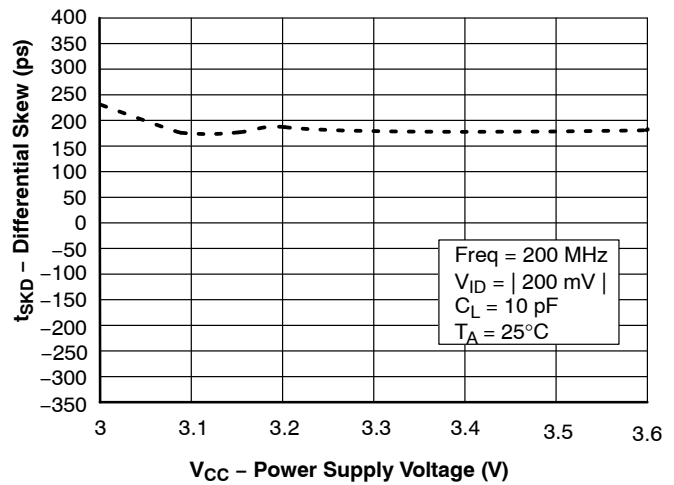
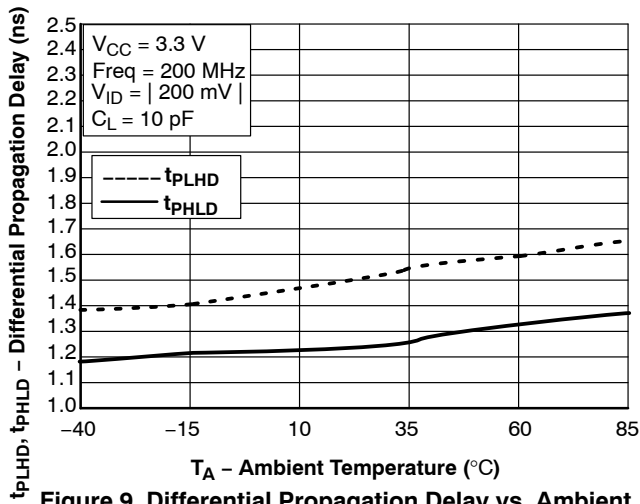


Figure 8. Differential Propagation Delay Power Supply Voltage

## TYPICAL CHARACTERISTICS (continued)



## TYPICAL CHARACTERISTICS (continued)

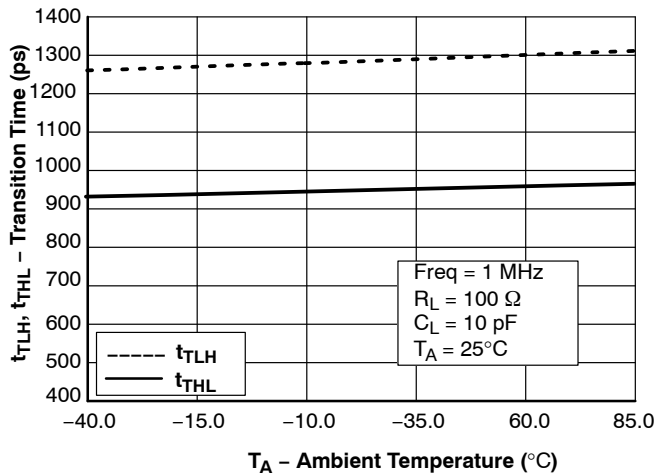


Figure 15. Transition Time vs. Ambient Temperature

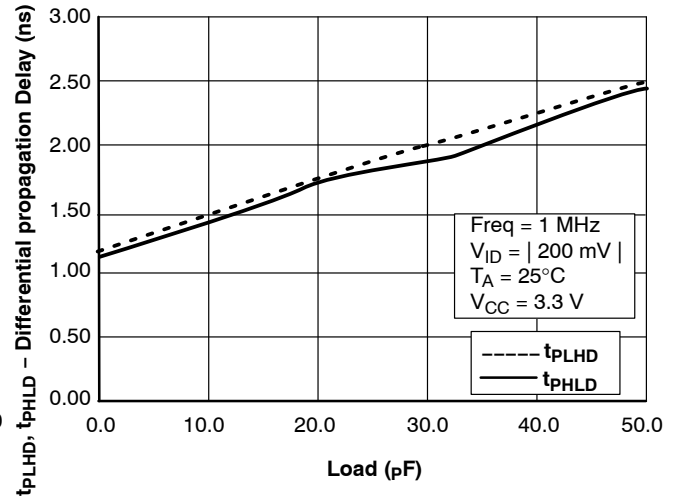


Figure 16. Differential Propagation Delay vs. Load

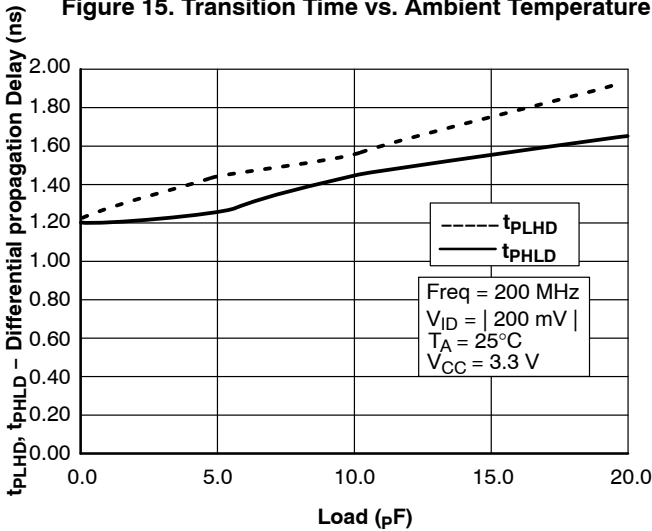


Figure 17. Differential Propagation Delay vs. Load

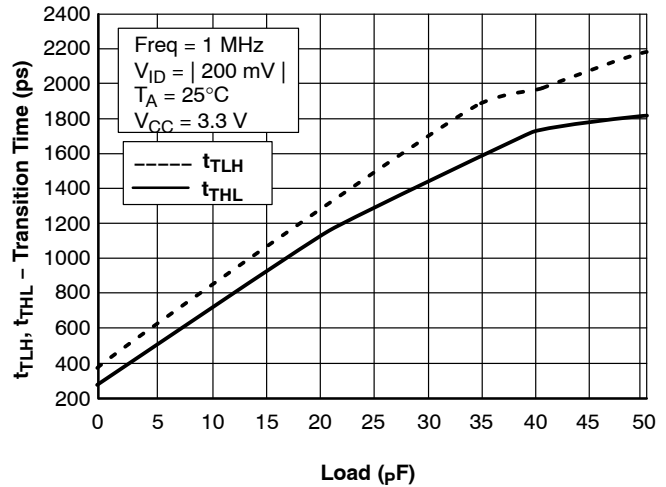


Figure 18. Transition Time vs. Load

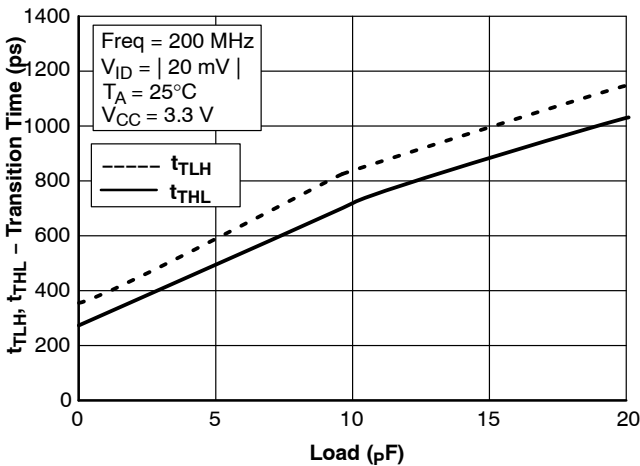


Figure 19. Transition Time vs. Load

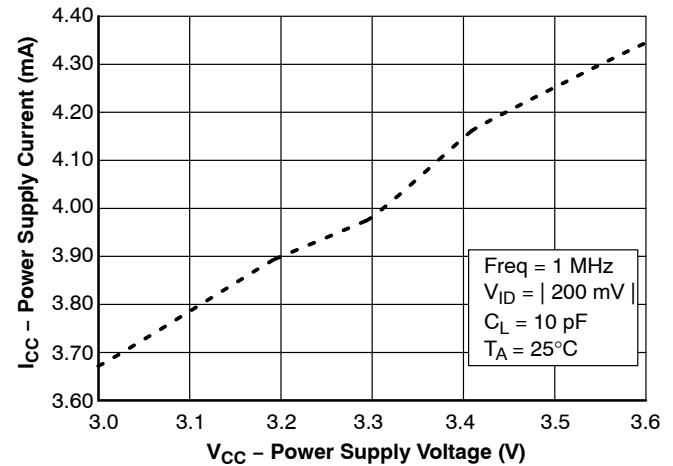


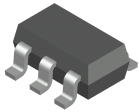
Figure 20. Power Supply Current vs. Power Supply Voltage

## FIN1002

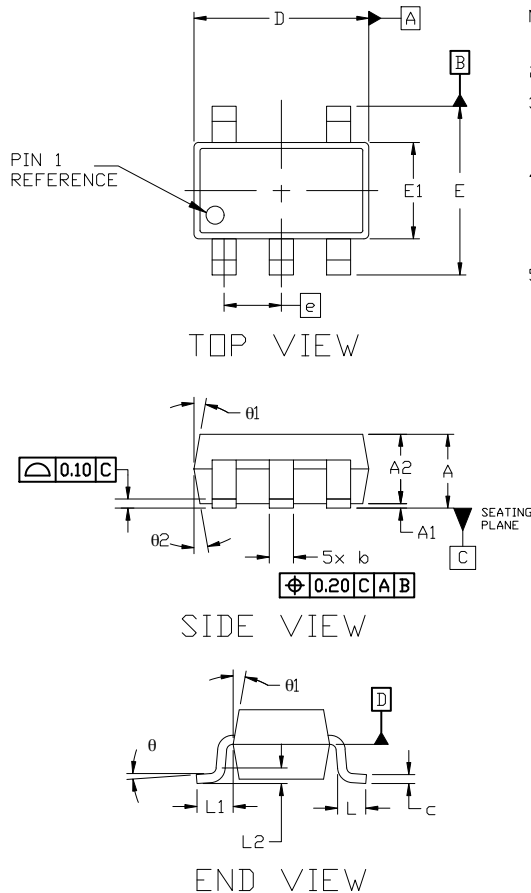
### ORDERING INFORMATION

Product Number	Package	Shipping <sup>†</sup>
FIN1002M5X	5 Lead SOT23, JEDEC MO-178, 1.6 mm (Pb-Free)	3000 / Tape and Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).


**SOT-23, 5 Lead**  
**CASE 527AH**  
**ISSUE A**

DATE 09 JUN 2021

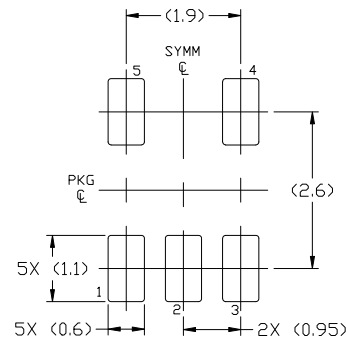

XXX = Specific Device Code  
M = Date Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1989A
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.25 PER SIDE. D AND E1 DIMENSIONS ARE DETERMINED AT DATUM D.
5. DIMENSION 'b' DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08mm TOTAL IN EXCESS OF THE 'b' DIMENSION AT MAXIMUM MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD SHALL NOT BE LESS THAN 0.07mm.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	—	1.45
A1	0.00	—	0.15
A2	0.90	1.15	1.30
b	0.30	—	0.50
c	0.08	—	0.22
D	2.90 BSC		
E	2.80 BSC		
E1	1.60 BSC		
e	0.95 BSC		
L	0.30	0.45	0.60
L1	0.60 REF		
L2	0.25 REF		
θ	0°	4°	8°
θ1	0°	10°	15°
θ2	0°	10°	15°


**RECOMMENDED**  
**MOUNTING FOOTPRINT**

For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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<b>DESCRIPTION:</b>	<b>SOT-23, 5 LEAD</b>	<b>PAGE 1 OF 1</b>

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