

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

## FIN1001

### 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.

### Features

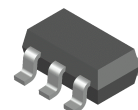
- Greater than 600 Mbs Data Rate
- 3.3 V Power Supply Operation
- 0.5 ns Maximum Pulse Skew
- 1.5 ns Maximum Propagation Delay
- Low Power Dissipation
- Power-Off Protection
- Meets or Exceeds TIA/EIA-644 LVDS Standard
- Flow-through Pin-out Simplifies PCB Layout
- 5-Lead SOT23 Package Saves Space
- This is a Pb-Free and Halide Free Device

### PIN DEFINITIONS

| Pin No. | Name            | Description                      |
|---------|-----------------|----------------------------------|
| 1       | V <sub>CC</sub> | Power Supply                     |
| 2       | GND             | Ground                           |
| 3       | DOUT-           | Inverting LVDS Driver Output     |
| 4       | DOUT+           | Non-inverting LVDS Driver Output |
| 5       | DIN             | LVTTTL Data Input                |

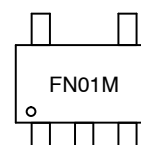
### FUNCTION TABLE

| Inputs          | Outputs |       |
|-----------------|---------|-------|
| D <sub>IN</sub> | DOUT+   | DOUT- |
| LOW             | LOW     | HIGH  |
| HIGH            | HIGH    | LOW   |



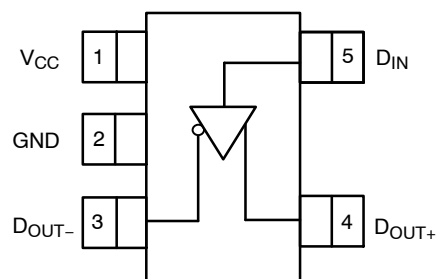
SOT-23, 5 Lead  
CASE 527AH

### MARKING DIAGRAMS



FN01 = Specific Device Code  
M = Assembly Operation  
Month

### CONNECTION DIAGRAM



(Top View)

### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

## ABSOLUTE MAXIMUM RATINGS

| 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  |

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 CONDITIONS

| Symbol          | Parameter             | Min. | Max.            | Unit |
|-----------------|-----------------------|------|-----------------|------|
| V <sub>CC</sub> | Supply Voltage        | 3.0  | 3.6             | V    |
| V <sub>IN</sub> | Input Voltage         | 0    | V <sub>CC</sub> | V    |
| T <sub>A</sub>  | 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<sub>A</sub> = -40°C to +125°C, unless otherwise specified.

All typical values are at T<sub>A</sub> = 25°C and with V<sub>CC</sub> = 3.3 V, unless otherwise specified.

| Symbol              | Parameter                                             | Conditions                                                       |                                 | Min   | Typ  | Max             | Unit |
|---------------------|-------------------------------------------------------|------------------------------------------------------------------|---------------------------------|-------|------|-----------------|------|
| V <sub>OD</sub>     | Output Differential Voltage                           | R <sub>L</sub> = 100 Ω,<br>See Figure 1                          | T <sub>A</sub> = −40°C to 85°C  | 250   | 350  | 450             | mV   |
|                     |                                                       |                                                                  | T <sub>A</sub> = −40°C to 125°C | 230   | 350  | 450             | mV   |
| ΔV <sub>OD</sub>    | VOD Magnitude Change from Differential Low-to-High    |                                                                  | T <sub>A</sub> = −40° to 125°C  | –     | –    | 25              | mV   |
| V <sub>OS</sub>     | Offset Voltage                                        |                                                                  |                                 | 1.125 | 1.25 | 1.375           | V    |
| ΔV <sub>OS</sub>    | Offset Magnitude Change from Differential Low-to-High |                                                                  | –                               | –     | 25   | mV              |      |
| I <sub>OFF</sub>    | Power-Off Output Current                              | V <sub>CC</sub> = 0 V, V <sub>OUT</sub> = 0 V or 3.6 V           |                                 | –     | –    | ±20             | μA   |
| I <sub>OS</sub>     | Short Circuit Output Current                          | V <sub>OUT</sub> = 0 V                                           |                                 | –     | –5.5 | –8              | mA   |
|                     |                                                       | V <sub>OD</sub> = 0 V                                            |                                 | –     | ±4   | ±8              |      |
| I <sub>I(OFF)</sub> | Power-OFF Input Current                               | V <sub>CC</sub> = 0 V, V <sub>IN</sub> = 0 V or 3.6 V            |                                 | –     | –    | ±20             | μA   |
| V <sub>IH</sub>     | Input HIGH Voltage                                    |                                                                  |                                 | 2.0   | –    | V <sub>CC</sub> | V    |
| V <sub>IL</sub>     | Input LOW Voltage                                     |                                                                  |                                 | GND   | –    | 0.8             | V    |
| I <sub>IN</sub>     | Input Current                                         | V <sub>IN</sub> = 0 V or V <sub>CC</sub>                         |                                 | –     | –    | ±20             | μA   |
| I <sub>I(OFF)</sub> | Power-Off Input Current                               | V <sub>CC</sub> = 0 V, V <sub>IN</sub> = 0 V or 3.6 V            |                                 | –     | –    | ±20             | μA   |
| V <sub>IK</sub>     | Input Clamp Voltage                                   | I <sub>IK</sub> = −18 mA                                         |                                 | −1.5  | −0.8 | –               | V    |
| I <sub>CC</sub>     | Power Supply Current                                  | No Load, V <sub>IN</sub> = 0 V or V <sub>CC</sub>                |                                 | –     | 4.5  | 8               | mA   |
|                     |                                                       | R <sub>L</sub> = 100 Ω, V <sub>IN</sub> = 0 V or V <sub>CC</sub> |                                 | –     | 6.5  | 10              |      |
| C <sub>IN</sub>     | Input Capacitance                                     | V <sub>CC</sub> = 3.3 V                                          |                                 | –     | 3.2  | –               | pF   |
| C <sub>OUT</sub>    | Output Capacitance                                    | V <sub>CC</sub> = 0 V                                            |                                 | –     | 3.3  | –               | pF   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Not production tested across the full temperature range.

**AC ELECTRICAL CHARACTERISTICS**

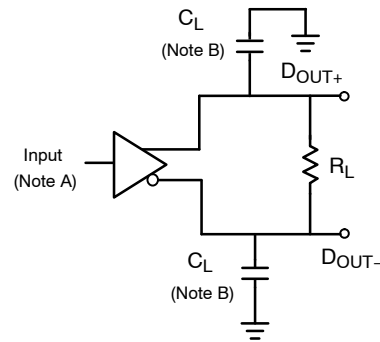
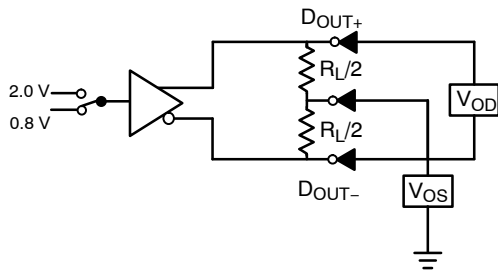
All min and max values are guaranteed at  $T_A = -40$  to  $+85^\circ\text{C}$ .

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

$R_L = 100\ \Omega$ ,  $C_L = 5\text{ pF}$ . See Figure 2 and Figure 3.

| Symbol       | Parameter                     | Test 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 (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 = 10 MHz,  $t_R$  or  $t_F = 2\text{ ns}$

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

Figure 1. Differential Driver DC Test Circuit

Figure 2. Differential Driver Propagation Delay and Transition Time Test Circuit

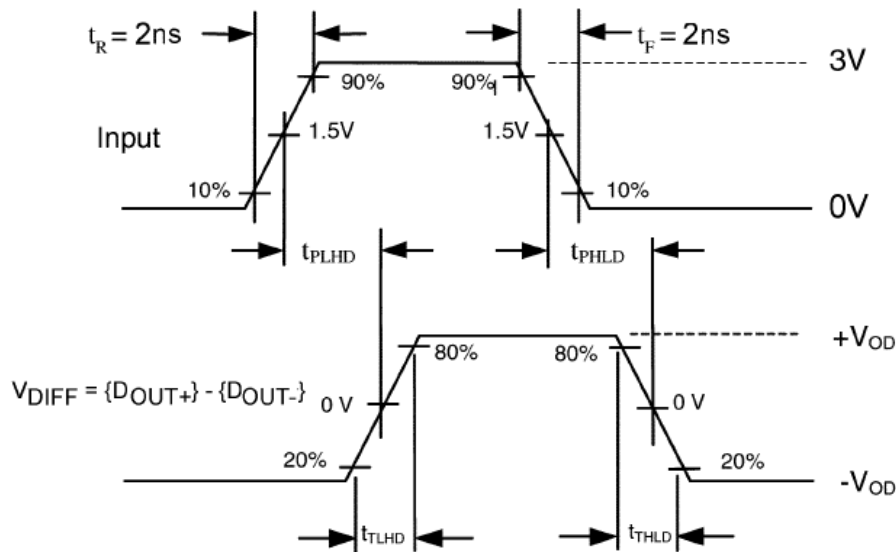


Figure 3. AC Waveforms

## TYPICAL PERFORMANCE CHARACTERISTICS

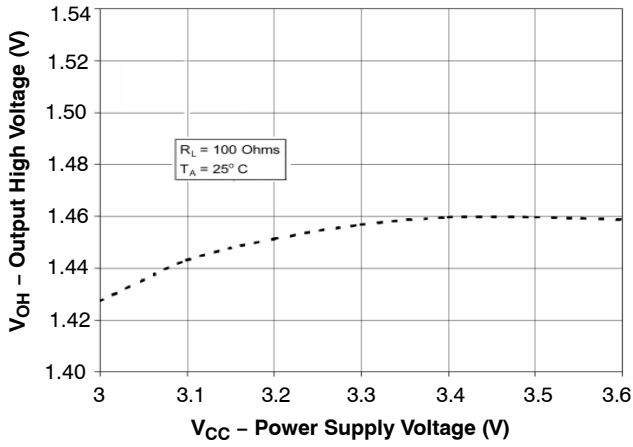


Figure 4. Output High Voltage vs. Power Supply Voltage

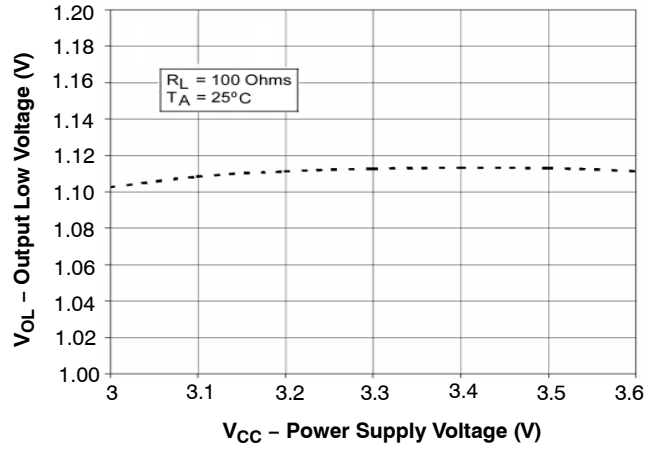


Figure 5. Output Low Voltage vs. Power Supply Voltage

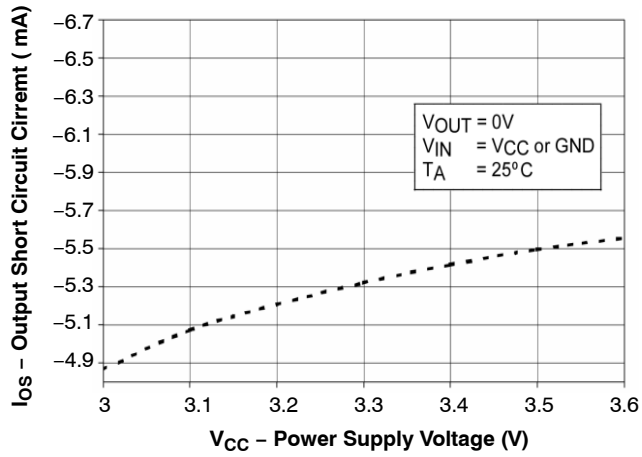


Figure 6. Output Short Circuit Current vs. Power Supply Voltage

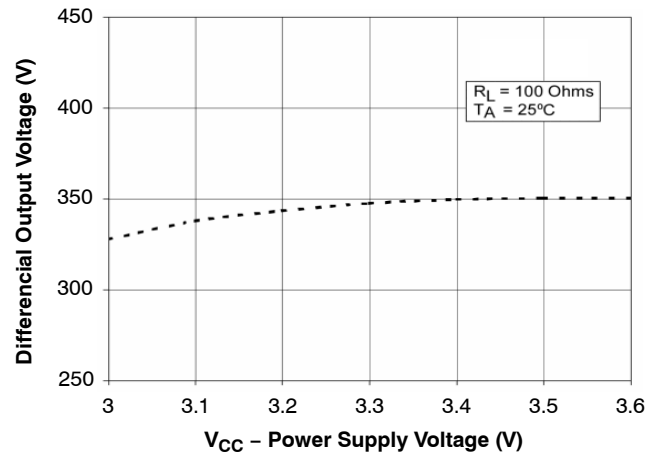


Figure 7. Differential Output Voltage vs. Power Supply Voltage

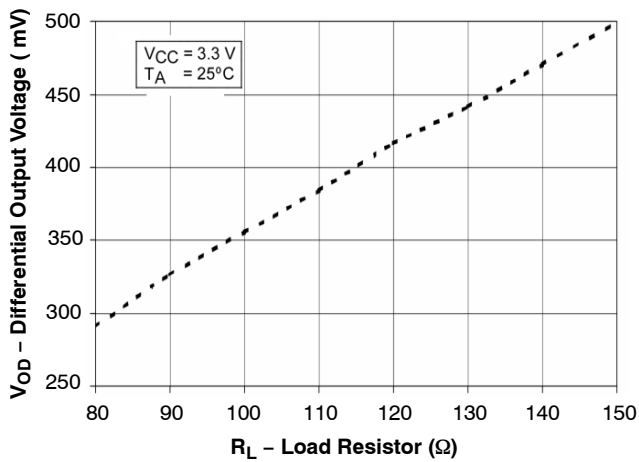


Figure 8. Differential Output Voltage vs. Load Resistor

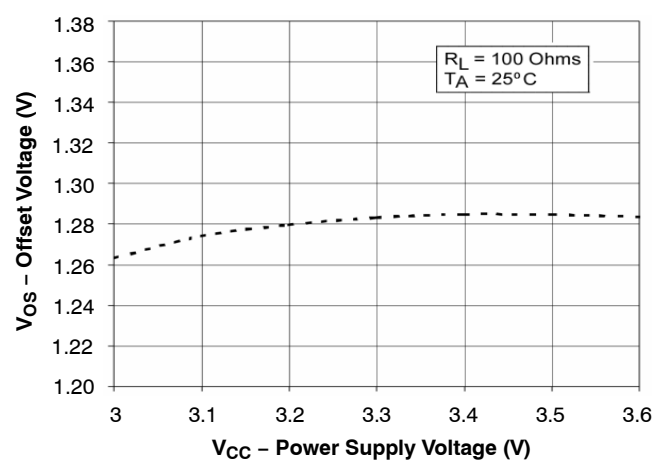


Figure 9. Offset Voltage vs. Power Supply Voltage

## TYPICAL PERFORMANCE CHARACTERISTICS

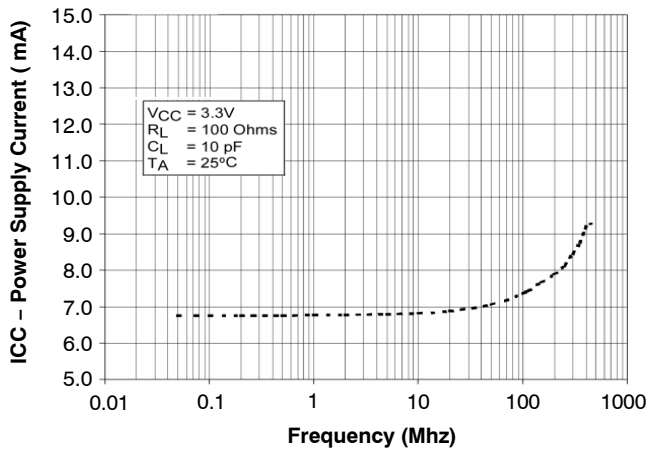


Figure 10. Power Supply Current vs. Frequency

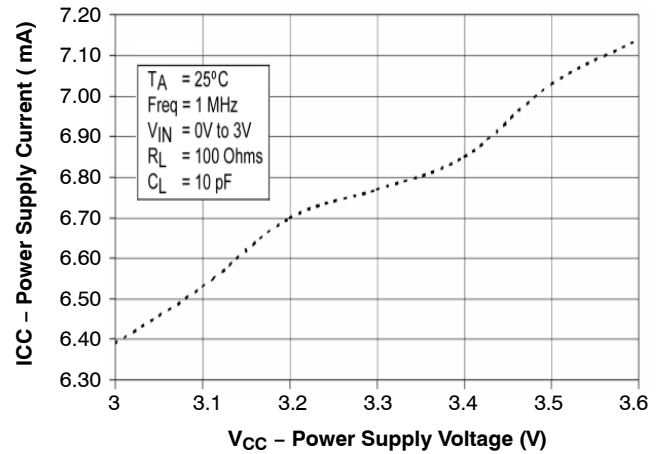


Figure 11. Power Supply Current vs. Power Supply Voltage

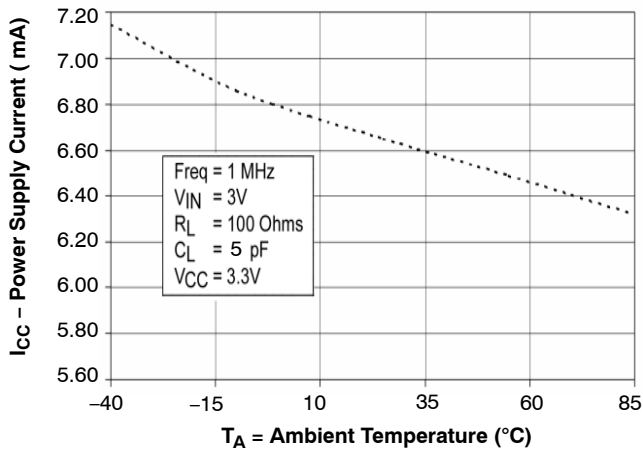


Figure 12. Power Supply Current vs. Ambient Temperature

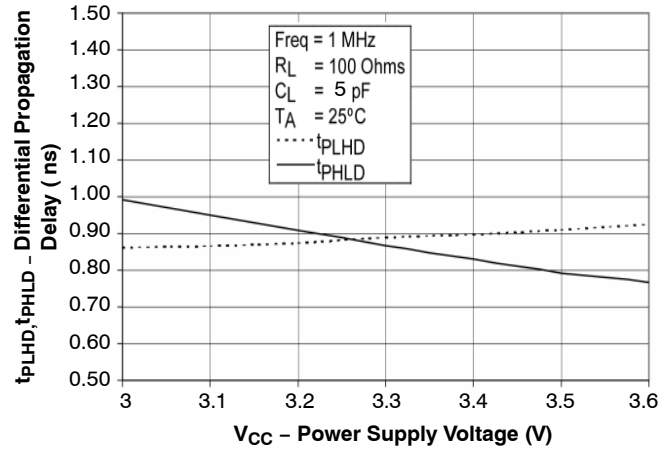


Figure 13. Differential Propagation Delay vs. Power Supply

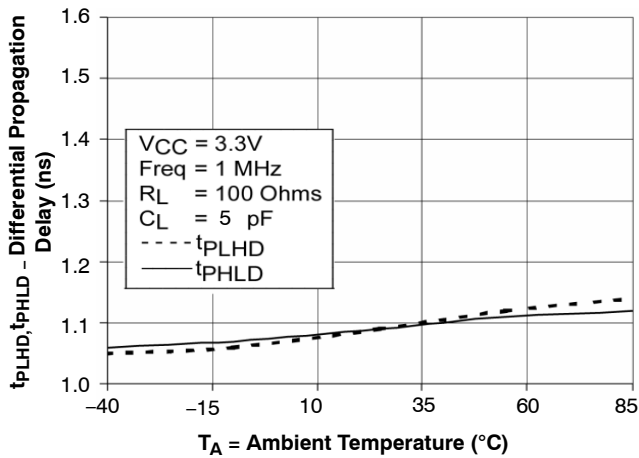
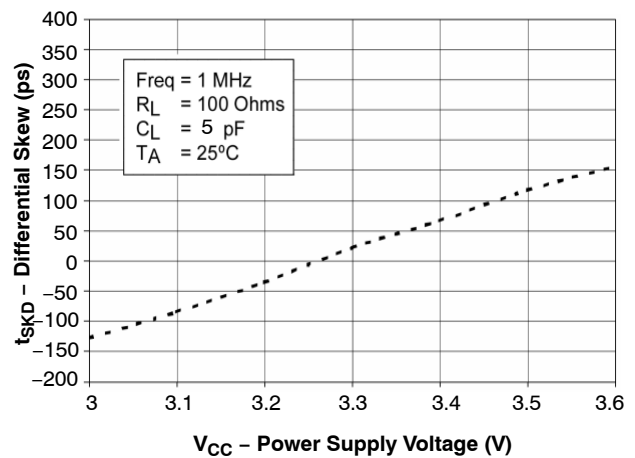


Figure 14. Differential Propagation Delay vs. Ambient Temperature

Figure 15. Differential Pulse Skew ( $t_{PLH} - t_{PHL}$ ) vs. Power Supply Voltage

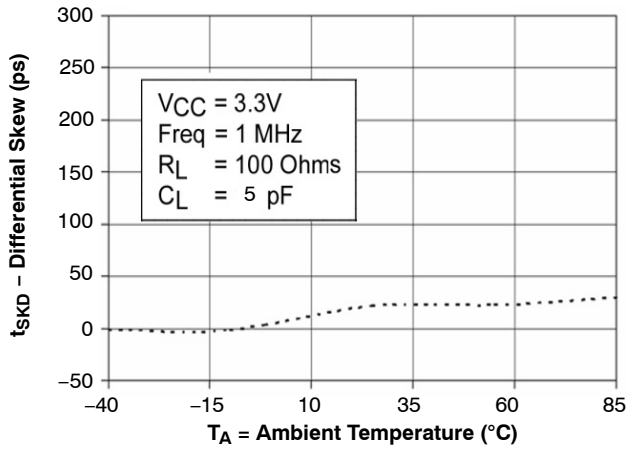


Figure 16. Differential Pulse Skew ( $t_{PLH} - t_{PHL}$ ) vs. Ambient Temperature

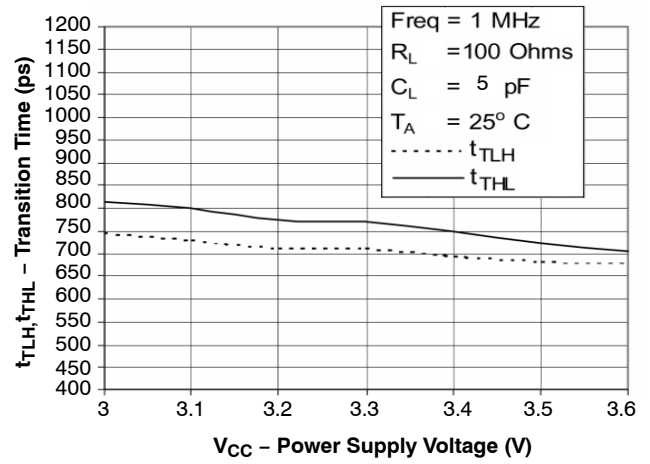


Figure 17. Transition Time vs. Power Supply Voltage

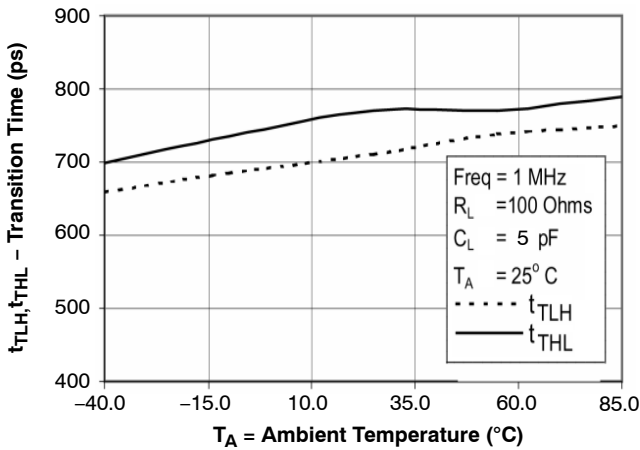
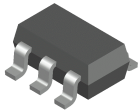


Figure 18. Transition Time vs. Ambient Temperature

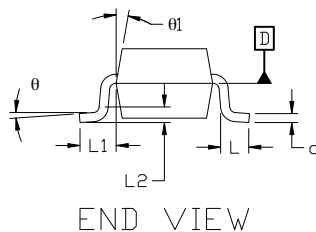
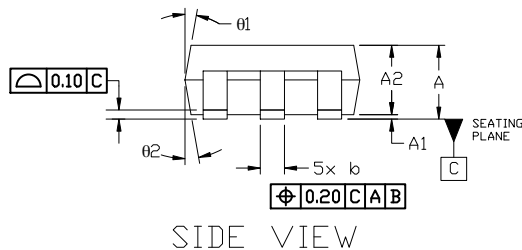
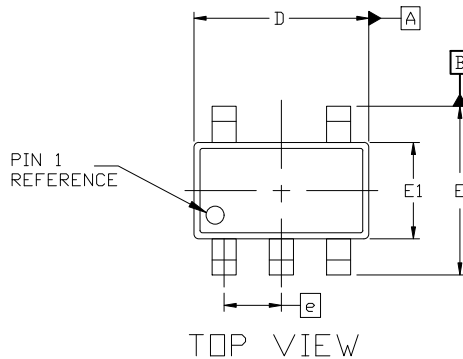
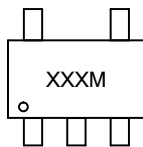
#### ORDERING INFORMATION

| Part Number | Operating Temperature Range | Package                                      | Shipping <sup>†</sup> |
|-------------|-----------------------------|----------------------------------------------|-----------------------|
| FIN1001M5X  | -40°C – +125°C              | 5-Lead SOT23, JEDEC MO-178, 1.6 mm (Pb-Free) | 3000 / Tape & 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

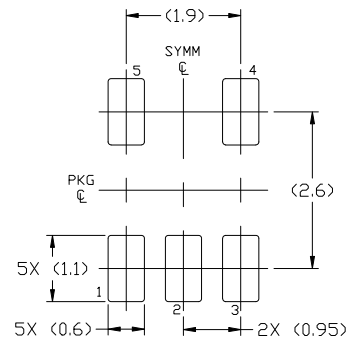

**GENERIC**  
**MARKING DIAGRAM\***

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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