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FAIRCHILD SEMICONDUCTOR®

May 2010

# FIN1017
# 3.3V LVDS, 1-Bit, High-Speed Differential Driver

## Features

- Greater than 600Mbs Data Rate
- 3.3V Power Supply Operation
- 0.5ns Maximum Differential Pulse Skew
- 1.5ns Maximum Propagation Delay
- Low Power Dissipation
- Power-Off Protection
- Meets or Exceeds the TIA/EIA-644 LVDS Standard
- Flow-Through Pinout Simplifies PCB Layout
- 8-Lead SOIC and US8 Packages Save Space

## Description

This single driver is designed for high-speed interconnects utilizing Low Voltage Differential Signaling (LVDS) technology. The driver translates LVTTL signal levels to LVDS levels with a typical differential output swing of 350mV, 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 FIN1017 can be paired with its companion receiver, the FIN1018, or with any other LVDS receiver.

## Ordering Information

| Part Number | Operating Temperature Range | Package | Packing Method |
|---|---|---|---|
| FIN1017MX | -40 to +85°C | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150inch Narrow | Tape and Reel |
| FIN1017K8X | -40 to +85°C | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | Tape and Reel |

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## Pin Configuration

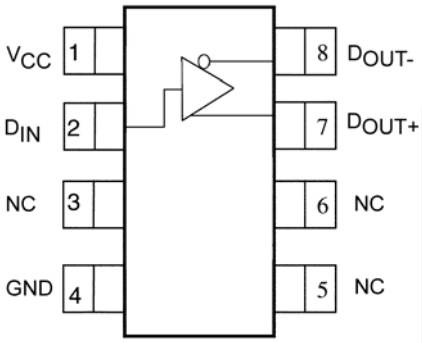



**Figure 1. SOIC**

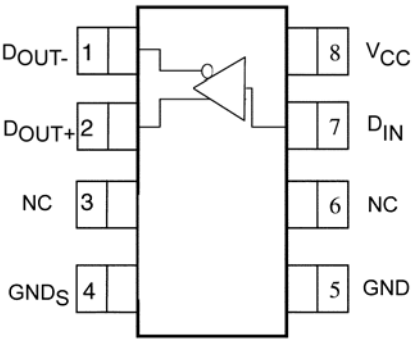



**Figure 2. US-8 (Top View)**(1)

**Note:**
1. Ground pins 4 and 5 for optimum performance.

## Pin Definitions

| Pin# US-8 | Pin# SOIC | Name | Description |
|---|---|---|---|
| 7 | 2 | $D_{IN}$ | LVTTL Data Input |
| 2 | 7 | $D_{OUT+}$ | Non-inverting Driver Output |
| 1 | 8 | $D_{OUT-}$ | Inverting Driver Output |
| 8 | 1 | $V_{CC}$ | Power Supply |
| 4, 5 | 4 | GND / $GND_S$ | Ground |
| 3, 6 | 3, 5, 6 | NC | No Connect |

## Function Table

| Input | Outputs | |
|---|---|---|
| **$D_{IN}$** | **$D_{OUT+}$** | **$D_{OUT-}$** |
| LOW | LOW | HIGH |
| HIGH | HIGH | LOW |
| OPEN | LOW | HIGH |

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## 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 |
|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | -0.5 | +4.6 | V |
| $D_{IN}$ | DC Input Voltage | -0.5 | +6.0 | V |
| $D_{OUT}$ | DC Output Voltage | -0.5 | +4.7 | V |
| $I_{OSD}$ | Driver Short-Circuit Current, Continuous | | 10 | mA |
| $T_{STG}$ | Storage Temperature Range | -65 | +150 | °C |
| $T_J$ | Max Junction Temperature | | +150 | °C |
| $T_L$ | Lead Temperature (Soldering, 10 Seconds) | | +260 | °C |
| ESD | Human Body Model, JESD22-A114 | | 6500 | V |
| | Bus Pins $D_{OUT+}$/$D_{OUT-}$ to GND | | 10500 | |
| | Machine Model, JESD22-A115 | | 350 | |

## 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. Fairchild 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 | +85 | °C |

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## DC Electrical Characteristics

Over-supply voltage and operating temperature ranges, unless otherwise specified. All typical values are at $T_A$ = 25°C and with $V_{CC}$ = 3.3V.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{OD}$ | Output Differential Voltage | $R_L$ = 100 Ω, See Figure 3 | 250 | 350 | 450 | mV |
| $\Delta V_{OD}$ | $V_{OD}$ Magnitude Change from Differential LOW-to-HIGH | | | | 25 | mV |
| $V_{OS}$ | Offset Voltage | | 1.125 | 1.250 | 1.375 | V |
| $\Delta V_{OS}$ | Offset Magnitude Change from Differential LOW-to-HIGH | | | | 25 | mV |
| $I_{OFF}$ | Power-Off Output Current | $V_{CC}$ = 0V, $V_{OUT}$ = 0V or 3.6V | | | ±20 | mA |
| $I_{OS}$ | Short-Circuit Output Current | $V_{OUT}$ = 0V | | | -8 | mA |
| | | $V_{OD}$ = 0V | | | ±8 | |
| $V_{IH}$ | Input HIGH Voltage | | 2 | | $V_{CC}$ | V |
| $V_{IL}$ | Input LOW Voltage | | GND | | 0.8 | V |
| $I_{IN}$ | Input Current | $V_{IN}$ = 0V or $V_{CC}$ | | | ±20 | mA |
| $I_{I(OFF)}$ | Power-Off Input Current | $V_{CC}$ = 0V, $V_{IN}$ = 0V or 3.6V | | | ±20 | mA |
| $V_{IK}$ | Input Clamp Voltage | $I_{IK}$ = -18mA | -1.5 | | | V |
| $I_{CC}$ | Power Supply Current | No Load, $V_{IN}$ = 0V or $V_{CC}$ | | | 8 | mA |
| | | $R_L$ = 100Ω, $V_{IN}$ = 0V or $V_{CC}$ | | | 10 | mA |
| $C_{IN}$ | Input Capacitance | | | 4 | | pF |
| $C_{OUT}$ | Output Capacitance | | | 6 | | pF |

## AC Electrical Characteristics

Over-supply voltage and operating temperature ranges, unless otherwise specified. All typical values are at $T_A$ = 25°C and with $V_{CC}$ = 3.3V.

| Symbol | Parameter | Test Conditions | Min. | Max. | Units |
|---|---|---|---|---|---|
| $t_{PLHD}$ | Differential Propagation Delay, LOW-to-HIGH | $R_L$ = 100Ω, $C_L$ = 10pF, see Figure 4 and Figure 5 | 0.5 | 1.5 | ns |
| $t_{PHLD}$ | Differential Propagation Delay, HIGH-to-LOW | | 0.5 | 1.5 | ns |
| $t_{TLHD}$ | Differential Output Rise Time (20% to 80%) | | 0.4 | 1.0 | ns |
| $t_{THLD}$ | Differential Output Fall Time (80% to 20%) | | 0.4 | 1.0 | ns |
| $t_{SK(P)}$ | Pulse Skew $\|t_{PLH} - t_{PHL}\|$ | | | 0.5 | ns |
| $t_{SK(PP)}$ | Part-to-Part Skew[2] | | | 1.0 | ns |

**Note:**

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.

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## Test Diagrams

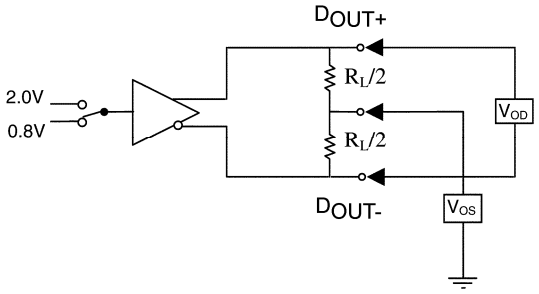



**Figure 3. Differential Driver DC Test Circuit**

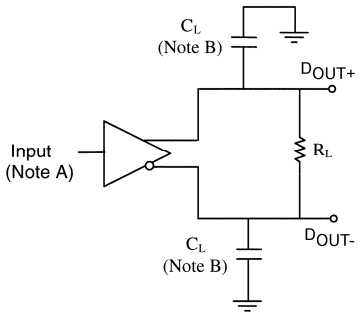



**Figure 4. Differential Driver Propagation Delay and Transition Time Test Circuit**

**Notes:**

Note A: All input pulses have frequency = 10MHz, $t_R$ or $t_F$ = 2ns.

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

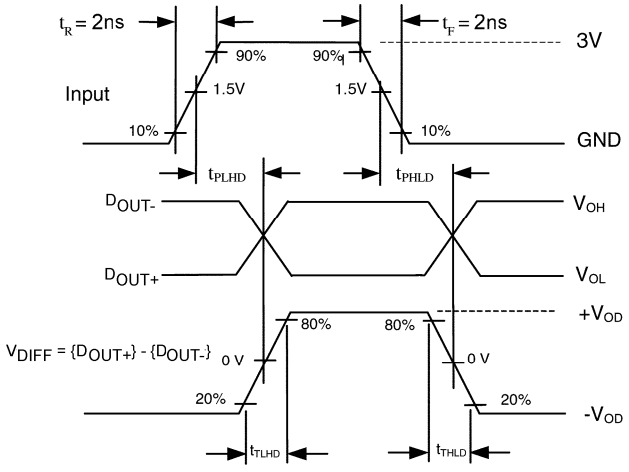



**Figure 5. AC Waveforms**

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## Typical Performance Characteristics

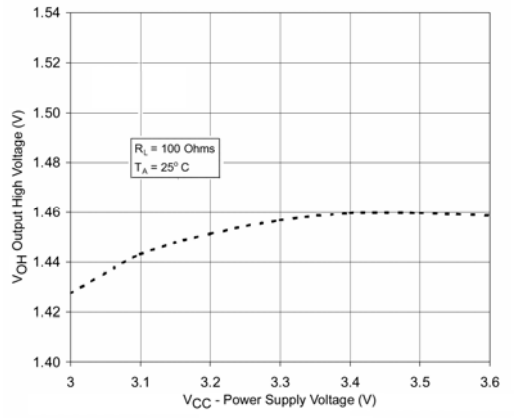



**Figure 6. Output High Voltage vs. Power Supply Voltage**

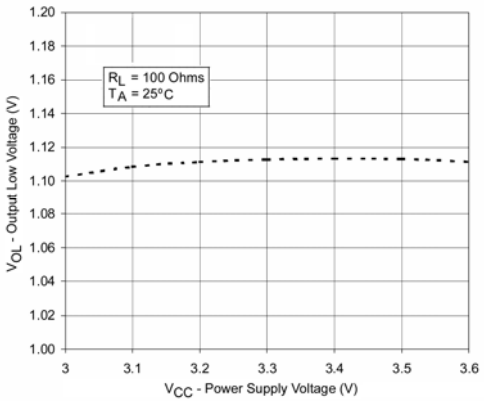



**Figure 7. Output Low Voltage vs. Power Supply Voltage**

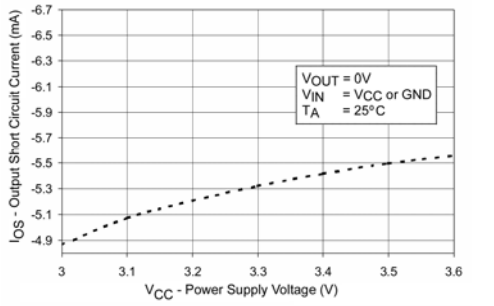



**Figure 8. Output Short Circuit Current vs. Power Supply Voltage**

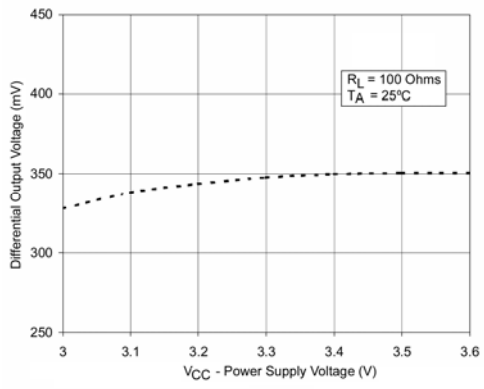



**Figure 9. Differential Output Voltage vs. Power Supply Voltage**

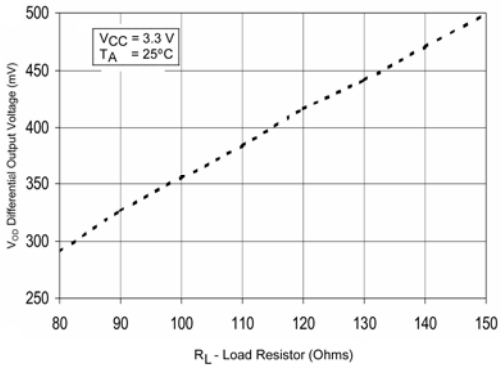



**Figure 10. Differential Output Voltage vs. Load Resistor**

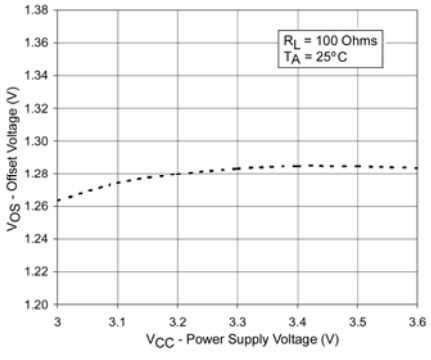



**Figure 11. Offset Voltage vs. Power Supply Voltage**

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## Typical Performance Characteristics

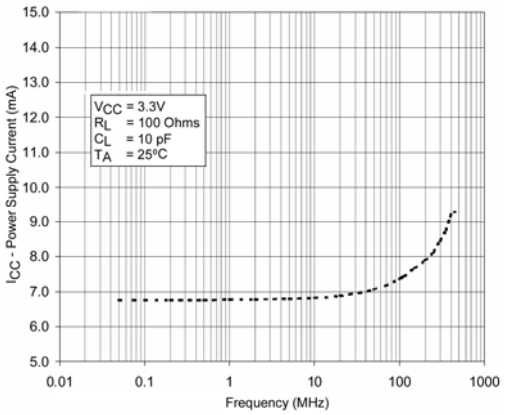



**Figure 12. Power Supply Current vs. Frequency**

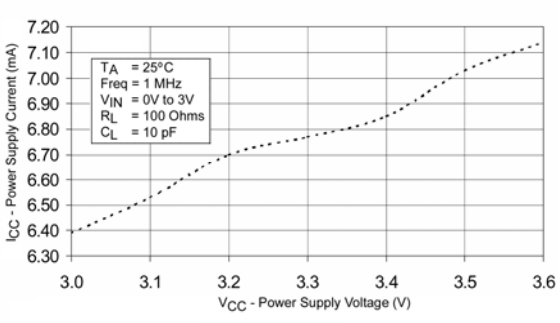



**Figure 13. Power Supply Current vs. Power Supply Voltage**

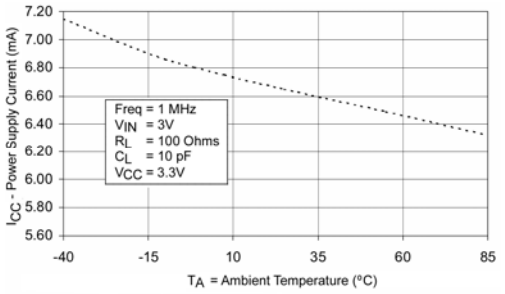



**Figure 14. Power Supply Current vs. Ambient Temperature**

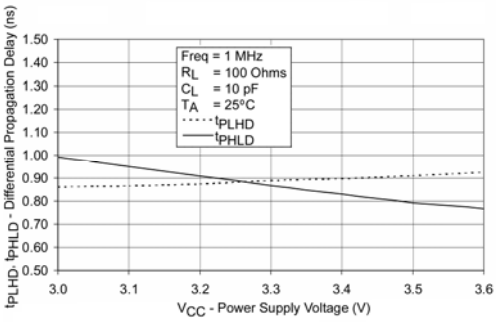



**Figure 15. Differential Propagation Delay vs. Power Supply**

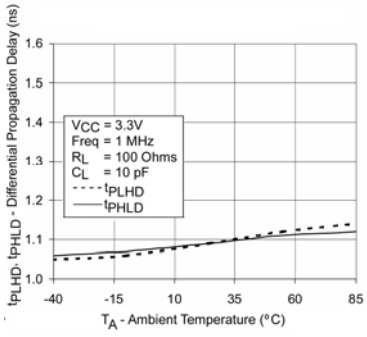



**Figure 16. Differential Propagation Delay vs. Ambient Temperature**

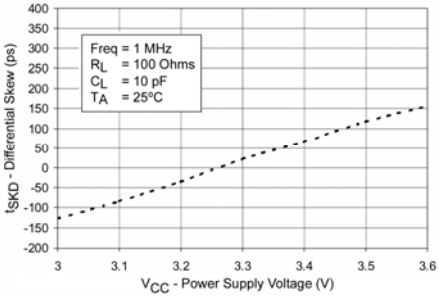



**Figure 17. Differential Pulse Skew ($t_{PLH}$ - $t_{PHL}$) vs. Power Supply Voltage**

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## Typical Performance Characteristics

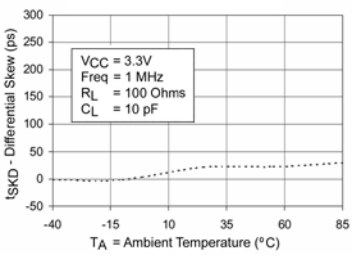



**Figure 18. Differential Pulse Skew ($t_{PLH}$ - $t_{PHL}$) vs. Ambient Temperature**

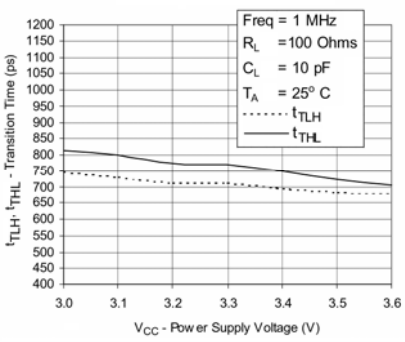



**Figure 19. Transition Time vs. Power Supply Voltage**

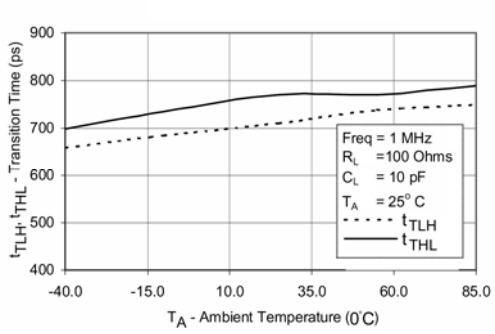



**Figure 20. Transition Time vs. Ambient Temperature**

## Physical Dimensions

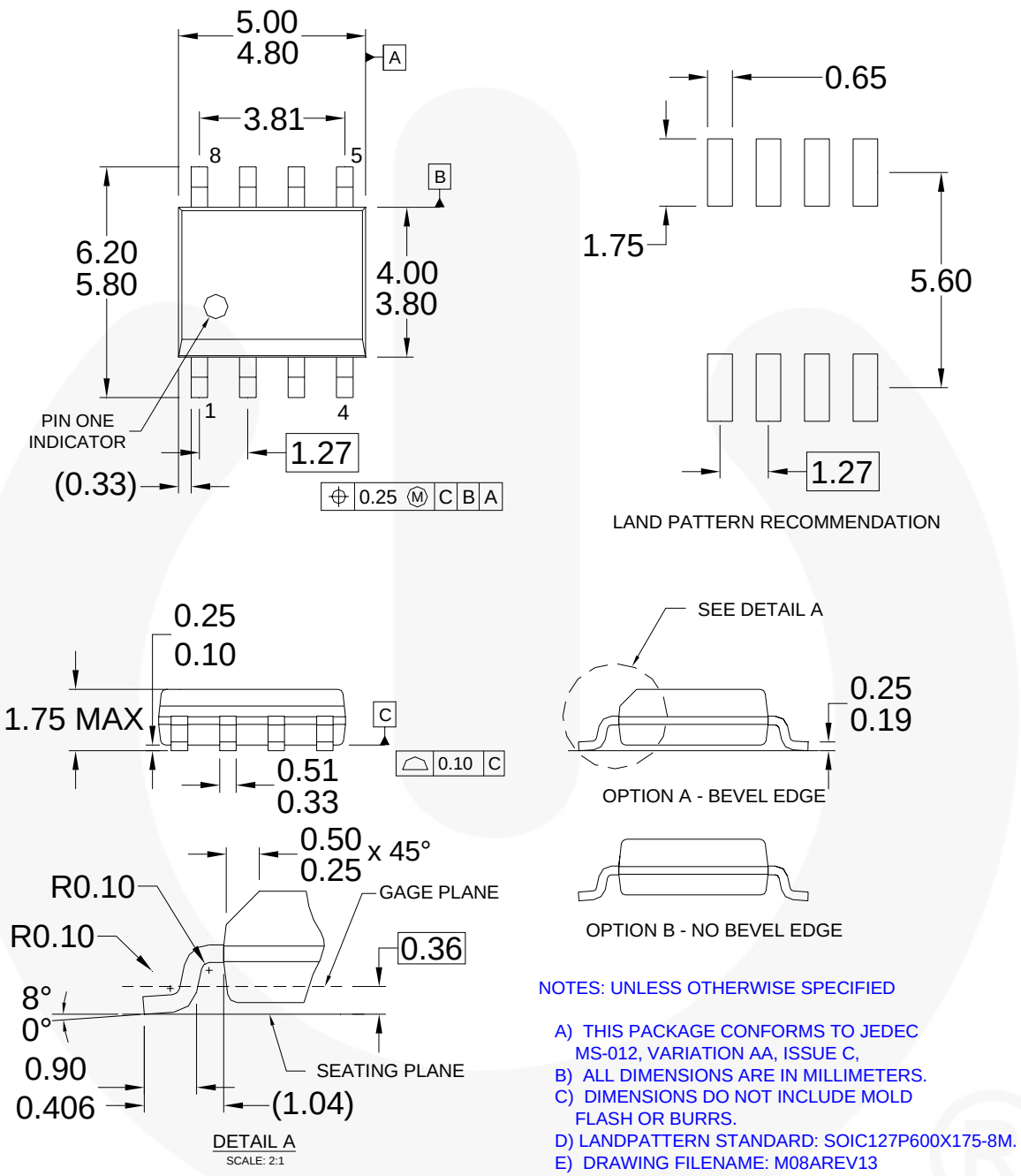


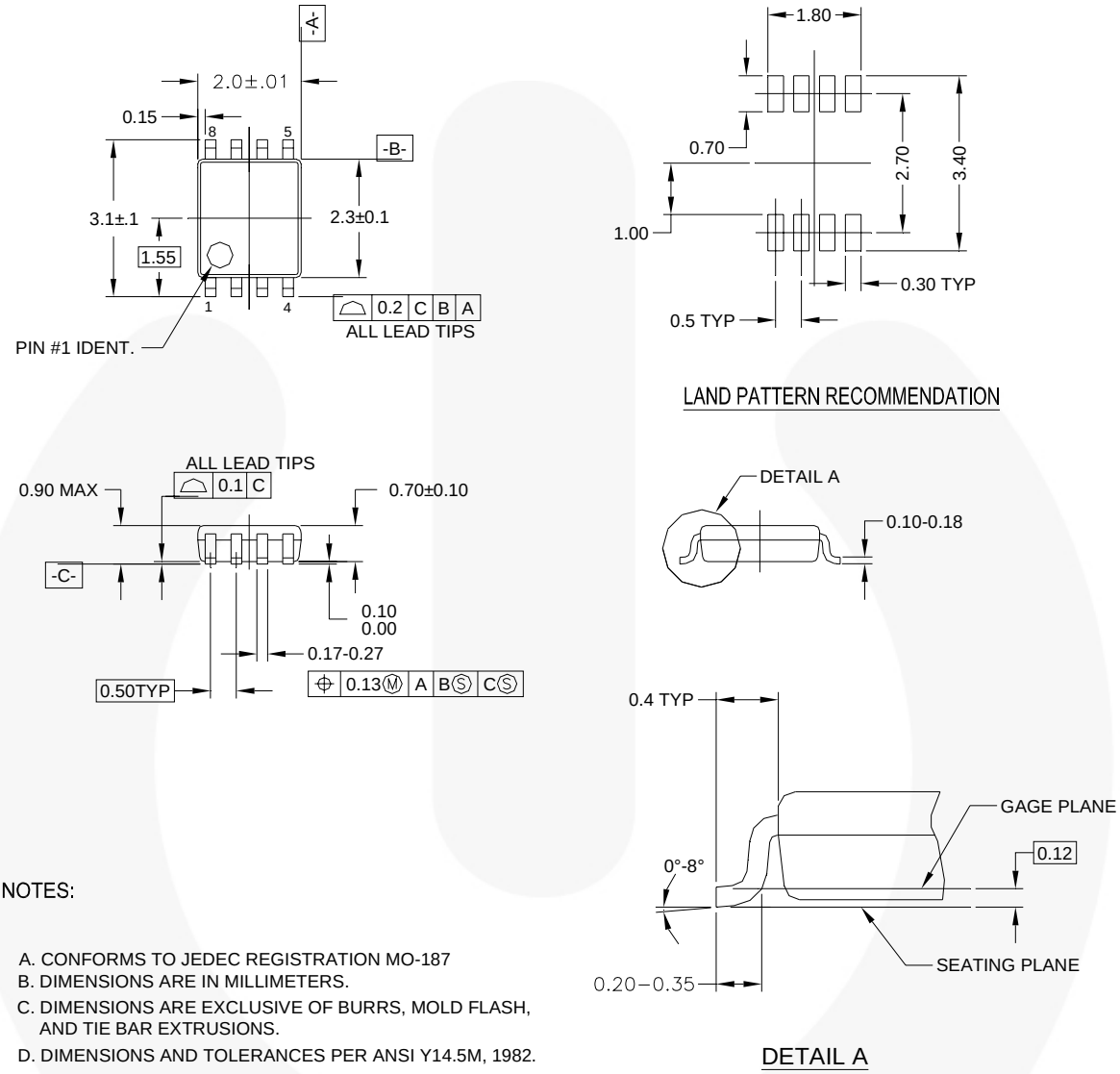

**Figure 21. 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150inch Narrow**

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## Physical Dimensions




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

**Figure 22. 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide**

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