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# FIN1101 LVDS Single Port High Speed Repeater

## General Description

This single port repeater is designed for high speed interconnects utilizing Low Voltage Differential Signaling (LVDS) technology. It accepts and outputs LVDS levels with a typical differential output swing of 330 mV which provides low EMI at ultra low power dissipation even at high frequencies. It can directly accept multiple differential I/O including: LVPECL, HSTL, and SSTL-2 for translating directly to LVDS.

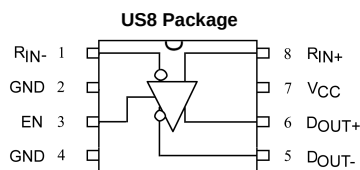
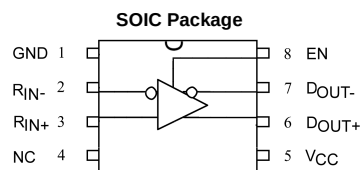
## Features

- Up to 1.6 Gb/s full differential path
- 3.5 ps max random jitter and 135 ps max deterministic jitter
- 3.3V power supply operation
- Wide rail-to-rail common mode range
- Ultra low power consumption
- LVDS receiver inputs accept LVPECL, HSTL, and SSTL-2 directly
- Power off protection
- 7 kV HBM ESD protection (all pins)
- Meets or exceeds the TA/EIA-644-A LVDS standard
- Packaged in 8-pin SOIC and US8
- Open circuit fail safe protection

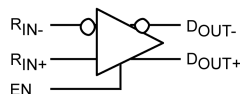
## Ordering Code:

| Order Number | Package Number | Package Description                                                                         |
|--------------|----------------|---------------------------------------------------------------------------------------------|
| FIN1101M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow [TUBE]          |
| FIN1101MX    | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow [TAPE and REEL] |
| FIN1101K8X   | MAB08A         | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide [TAPE and REEL]                           |

## Connection Diagrams



## Functional Diagram



## Pin Descriptions

| Pin Name          | Description                  |
|-------------------|------------------------------|
| R <sub>IN+</sub>  | Non-Inverting LVDS Inputs    |
| R <sub>IN-</sub>  | Inverting LVDS Inputs        |
| D <sub>OUT+</sub> | Non-Inverting Driver Outputs |
| D <sub>OUT-</sub> | Inverting Driver Outputs     |
| EN                | Driver Enable Pin            |
| V <sub>CC</sub>   | Power Supply                 |
| GND               | Ground                       |

## Function Table

| Inputs |                  |                  | Outputs           |                   |
|--------|------------------|------------------|-------------------|-------------------|
| EN     | R <sub>IN+</sub> | R <sub>IN-</sub> | D <sub>OUT+</sub> | D <sub>OUT-</sub> |
| H      | H                | L                | H                 | L                 |
| H      | L                | H                | L                 | H                 |
| H      | Fail Safe Case   |                  | H                 | L                 |
| L      | X                | X                | Z                 | Z                 |

H = HIGH Logic Level  
X = Don't Care

L = LOW Logic Level  
Z = High Impedance

**Absolute Maximum Ratings**(Note 1)

|                                            |                  |
|--------------------------------------------|------------------|
| Supply Voltage ( $V_{CC}$ )                | -0.5V to +4.6V   |
| LVDS DC Input Voltage ( $V_{IN}$ )         | -0.5V to +4.6V   |
| LVDS DC Output Voltage ( $V_{OUT}$ )       | -0.5V to +4.6V   |
| Driver Short Circuit Current ( $I_{OSD}$ ) | Continuous 10 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)                     | 7000V            |
| ESD (Machine Model)                        | 300V             |

**Recommended Operating Conditions**

|                                                        |                                                   |
|--------------------------------------------------------|---------------------------------------------------|
| Supply Voltage ( $V_{CC}$ )                            | 3.0V to 3.6V                                      |
| Operating Temperature ( $T_A$ )                        | -40°C to +85°C                                    |
| Magnitude of Input Differential Voltage ( $ V_{ID} $ ) | 100 mV to $V_{CC}$                                |
| Common Mode Input Voltage ( $V_{IC}$ )                 | (0V + $ V_{ID} /2$ ) to ( $V_{CC} -  V_{ID} /2$ ) |

**Note 1:** 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<br>(Note 2) | Max                     | Units   |
|-----------------|---------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------|-----------------|-------------------------|---------|
| $V_{TH}$        | Differential Input Threshold HIGH                       | See Figure 1; $V_{IC} = +0.05V, +1.2V$ , or ( $V_{CC} - 0.05V$ )                      |                   |                 | 100                     | mV      |
| $V_{TL}$        | Differential Input Threshold LOW                        | See Figure 1; $V_{IC} = +0.05V, +1.2V$ , or ( $V_{CC} - 0.05V$ )                      | -100              |                 |                         | mV      |
| $V_{IH}$        | Input High Voltage (EN)                                 |                                                                                       | 2.0               |                 | $V_{CC}$                | V       |
| $V_{IL}$        | Input Low Voltage (EN)                                  |                                                                                       | GND               |                 | 0.8                     | V       |
| $V_{OD}$        | Output Differential Voltage                             |                                                                                       | 250               | 330             | 450                     | mV      |
| $\Delta V_{OD}$ | $V_{OD}$ Magnitude Change from Differential LOW-to-HIGH | $R_L = 100 \Omega$ , Driver Enabled,<br>See Figure 2                                  |                   |                 | 25                      | mV      |
| $V_{OS}$        | Offset Voltage                                          |                                                                                       | 1.125             | 1.23            | 1.375                   | V       |
| $\Delta V_{OS}$ | Offset Magnitude Change from Differential LOW-to-HIGH   |                                                                                       |                   |                 | 25                      | mV      |
| $I_{OS}$        | Short Circuit Output Current                            | $D_{OUT+} = 0V$ & $D_{OUT-} = 0V$ , Driver Enabled                                    |                   | -3.4            | -6                      | mA      |
|                 |                                                         | $V_{OD} = 0V$ , Driver Enabled                                                        |                   | $\pm 3.4$       | $\pm 6$                 | mA      |
| $I_{IN}$        | Input Current (EN, $D_{INX+}$ , $D_{INX-}$ )            | $V_{IN} = 0V$ to $V_{CC}$ ,<br>Other Input = $V_{CC}$ or 0V (for Differential Inputs) |                   |                 | $\pm 20$                | $\mu A$ |
| $I_{OFF}$       | Power-Off Input or Output Current                       | $V_{CC} = 0V$ , $V_{IN}$ or $V_{OUT} = 0V$ to 3.6V                                    |                   |                 | $\pm 20$                | $\mu A$ |
| $I_{CCZ}$       | Disabled Power Supply Current                           | Drivers Disabled                                                                      |                   | 3.2             | 5.5                     | mA      |
| $I_{CC}$        | Power Supply Current                                    | Drivers Enabled, Any Valid Input Condition                                            |                   | 9.3             | 13.5                    | mA      |
| $I_{OZ}$        | Disabled Output Leakage Current                         | Driver Disabled, $D_{OUT+} = 0V$ to 3.6V or<br>$D_{OUT-} = 0V$ to 3.6V                |                   |                 | $\pm 20$                | $\mu A$ |
| $V_{IC}$        | Common Mode Voltage Range                               | $ V_{ID}  = 100$ mV to $V_{CC}$                                                       | $0V +  V_{ID} /2$ |                 | $V_{CC} - ( V_{ID} /2)$ | V       |
| $C_{IN}$        | Input Capacitance                                       | EN Input                                                                              |                   | 2.2             |                         | pF      |
|                 |                                                         | Data Input                                                                            |                   | 2.0             |                         |         |
| $C_{OUT}$       | Output Capacitance                                      |                                                                                       |                   | 2.6             |                         | pF      |

**Note 2:** 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<br>(Note 3) | Max  | Units |
|--------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|------|-------|
| $t_{PLHD}$   | Differential Propagation Delay<br>LOW-to-HIGH   | $R_L = 100\ \Omega$ , $C_L = 5\ \text{pF}$ ,<br>$V_{ID} = 200\ \text{mV}$ to $450\ \text{mV}$ ,<br>$V_{IC} =  V_{ID} /2$ to $(V_{CC} -  V_{ID} /2)$ ,<br>Duty Cycle = 50%,<br>See Figure 3 and Figure 4 | 0.75 | 1.1             | 1.75 | ns    |
| $t_{PHLD}$   | Differential Propagation Delay<br>HIGH-to-LOW   |                                                                                                                                                                                                         | 0.75 | 1.1             | 1.75 | ns    |
| $t_{TLHD}$   | Differential Output Rise Time (20% to 80%)      |                                                                                                                                                                                                         | 0.29 | 0.40            | 0.58 | ns    |
| $t_{THLD}$   | Differential Output Fall Time (80% to 20%)      |                                                                                                                                                                                                         | 0.29 | 0.40            | 0.58 | ns    |
| $t_{SK(P)}$  | Pulse Skew $ t_{PLH} - t_{PHL} $                |                                                                                                                                                                                                         |      | 0.01            | 0.2  | ns    |
| $t_{SK(PP)}$ | Part-to-Part Skew (Note 4)                      |                                                                                                                                                                                                         |      |                 | 0.5  | ns    |
| $f_{MAX}$    | Maximum Frequency (Note 5)(Note 6)              |                                                                                                                                                                                                         | 400  | 800             |      | MHz   |
| $t_{PZHD}$   | Differential Output Enable Time from Z to HIGH  | $R_L = 100\ \Omega$ , $C_L = 5\ \text{pF}$ ,<br>See Figure 2 and Figure 3                                                                                                                               |      | 2.1             | 5    | ns    |
| $t_{PZLD}$   | Differential Output Enable Time from Z to LOW   |                                                                                                                                                                                                         |      | 2.3             | 5    | ns    |
| $t_{PHZD}$   | Differential Output Disable Time from HIGH to Z |                                                                                                                                                                                                         |      | 1.5             | 5    | ns    |
| $t_{PLZD}$   | Differential Output Disable Time from LOW to Z  |                                                                                                                                                                                                         |      | 1.8             | 5    | ns    |
| $t_{DJ}$     | LVDS Data Jitter,<br>Deterministic              | $V_{ID} = 300\ \text{mV}$ , PRBS = $2^{23} - 1$ ,<br>$V_{IC} = 1.2\ \text{V}$ at 800 Mbps                                                                                                               |      | 85              | 135  | ps    |
| $t_{RJ}$     | LVDS Clock Jitter, Random<br>(RMS)              | $V_{ID} = 300\ \text{mV}$ ,<br>$V_{IC} = 1.2\ \text{V}$ at 400 MHz                                                                                                                                      |      | 2.1             | 3.5  | ps    |

**Note 3:** All typical values are at  $T_A = 25^\circ\text{C}$  and with  $V_{CC} = 3.3\text{V}$ ,  $V_{ID} = 300\text{mV}$ ,  $V_{IC} = 1.2\text{V}$  unless otherwise specified.

**Note 4:**  $t_{SK(PP)}$  is the magnitude of the difference in differential propagation delay times between identical channels 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 5:** Passing criteria for maximum frequency is the output  $V_{OD} > 200\ \text{mV}$  and the duty cycle is 45% to 55% with all channels switching.

**Note 6:** Output loading is transmission line environment only;  $C_L$  is  $< 1\ \text{pF}$  of stray test fixture capacitance.

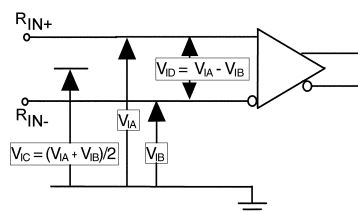


**FIGURE 1. Differential Receiver Voltage Definitions and Propagation I and Transition Time Test Circuit**

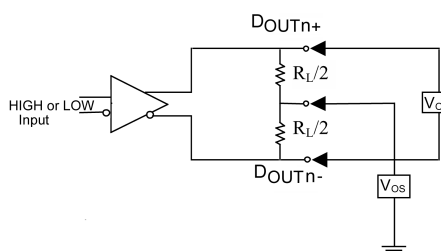
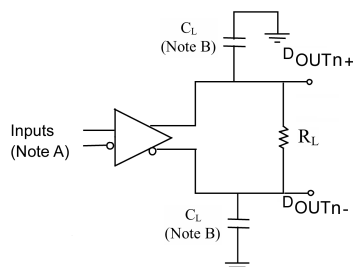


**FIGURE 2. Differential Driver DC Test Circuit**



**Note A:** All LVDS input pulses have frequency = 10MHz,  $t_R$  or  $t_F < 0.5\ \text{ns}$

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

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

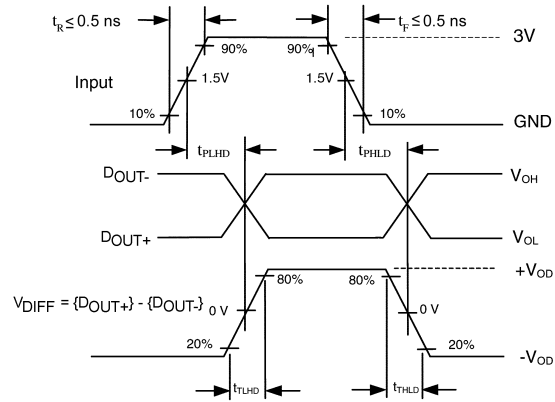
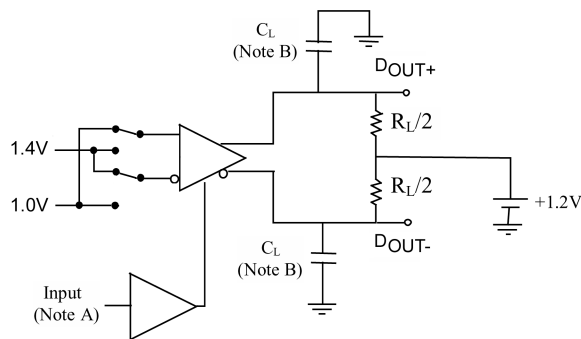


FIGURE 4. AC Waveforms



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

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

FIGURE 5. Differential Driver Enable and Disable Test Circuit

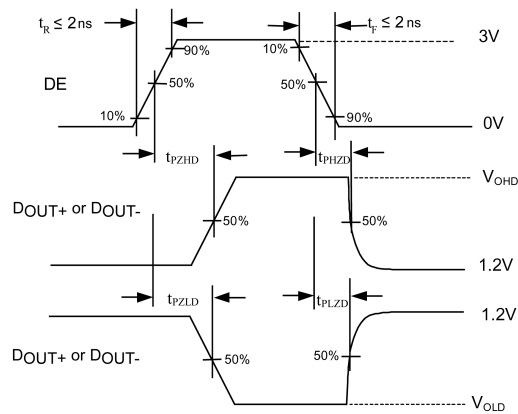
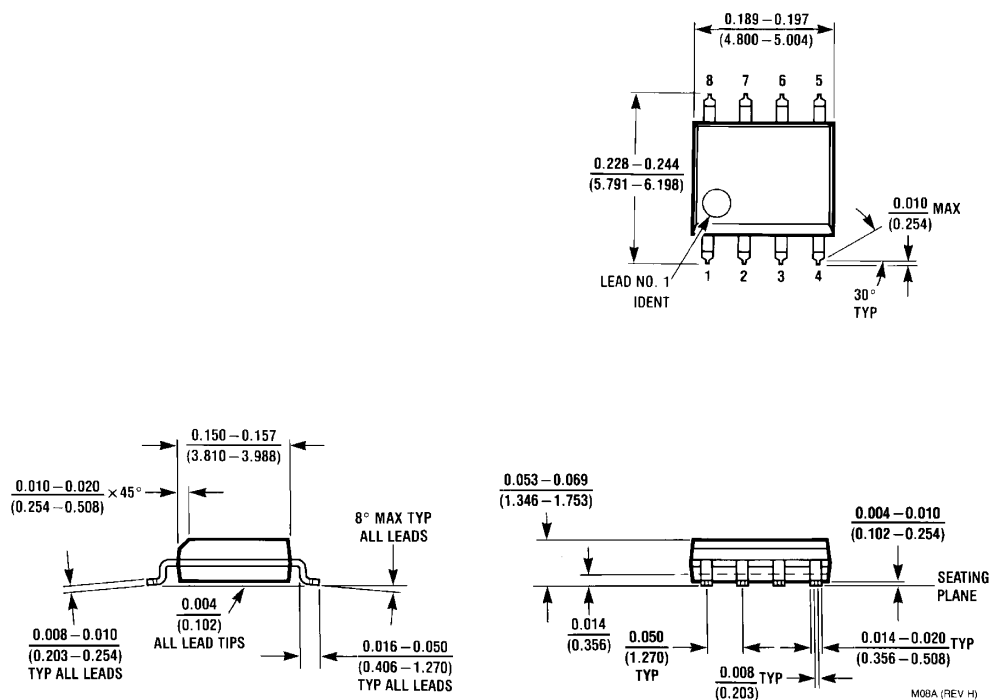


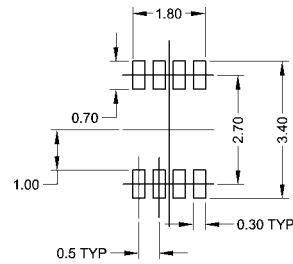
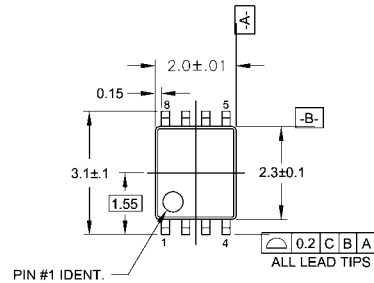
FIGURE 6. Enable and Disable AC Waveforms

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

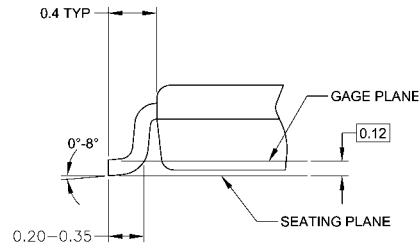
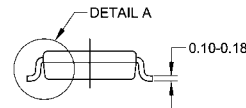
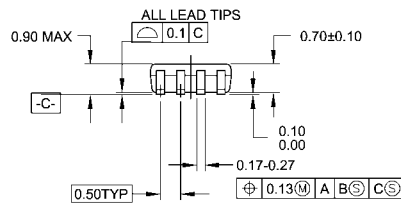


**8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Package Number M08A**

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



### LAND PATTERN RECOMMENDATION



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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
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MAB08AREVC

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

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