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# FIN1031

## 3.3V LVDS 4-Bit High Speed Differential Driver

### General Description

This quad driver is designed for high speed interconnects utilizing Low Voltage Differential Signaling (LVDS) technology. The driver translates LVTTTL 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 and data.

The FIN1031 can be paired with its companion receiver, the FIN1032, or any other Fairchild LVDS receiver.

### Features

- Greater than 400Mbps data rate
- 3.3V power supply operation
- 0.4ns maximum differential pulse skew
- 2.0ns maximum propagation delay
- Low power dissipation
- Power OFF protection
- Meets or exceeds the TIA/EIA-644 LVDS standard
- Pin compatible with equivalent RS-422 and LVPECL devices
- 16-Lead SOIC and TSSOP packages save space

### Ordering Code:

Order Number	Package Number	Package Description
FIN1031M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
FIN1031MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

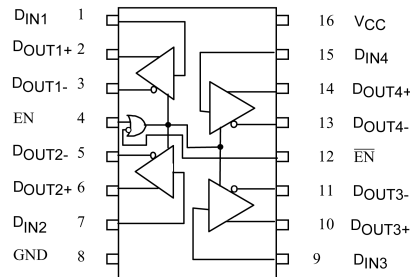
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Function Table

Inputs			Outputs	
EN	$\overline{\text{EN}}$	D <sub>IN</sub>	D <sub>OUT+</sub>	D <sub>OUT-</sub>
H	X	H	H	L
H	X	L	L	H
H	X	OPEN	L	H
X	L	H	H	L
X	L	L	L	H
X	L	OPEN	L	H
L	H	X	Z	Z

H = HIGH Logic Level      L = LOW Logic Level  
X = Don't Care              Z = High Impedance

### Connection Diagram



### Pin Descriptions

Pin Name	Description
D <sub>IN1</sub> , D <sub>IN2</sub> , D <sub>IN3</sub> , D <sub>IN4</sub>	LVTTTL Data Inputs
D <sub>OUT1+</sub> , D <sub>OUT2+</sub> , D <sub>OUT3+</sub> , D <sub>OUT4+</sub>	Non-Inverting Driver Outputs
D <sub>OUT1-</sub> , D <sub>OUT2-</sub> , D <sub>OUT3-</sub> , D <sub>OUT4-</sub>	Inverting Driver Outputs
EN	Driver Enable Pin
$\overline{\text{EN}}$	Inverting Driver Enable Pin
V <sub>CC</sub>	Power Supply
GND	Ground

**Absolute Maximum Ratings**(Note 1)

Supply Voltage ( $V_{CC}$ )	-0.5V to +4.6V
DC Input Voltage ( $V_{IN}$ )	
@ $V_{CC} \geq 3V$	-0.5V to +6V
@ $V_{CC} = 0V$	-0.5V to +4.6V
DC Output Voltage ( $V_{OUT}$ )	
@ $V_{CC} = 0V$	-0.5V to +4.6V
Driver Short Circuit Current ( $I_{OSD}$ )	Continuous
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)	$\geq 8000V$
ESD (Machine Model)	$\geq 600V$

**Recommended Operating Conditions**

Supply Voltage ( $V_{CC}$ )	3.0V to 3.6V
Input Voltage ( $V_{IN}$ )	0 to $V_{CC}$
Operating Temperature ( $T_A$ )	-40°C to +85°C

**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 (Note 2)	Max	Units
$V_{OD}$	Output Differential Voltage	$R_L = 100\Omega$ , Driver Enabled, See Figure 1	250	350	450	mV
$\Delta V_{OD}$	$V_{OD}$ Magnitude Change from Differential LOW-to-HIGH				25	mV
$V_{OS}$	Offset Voltage		1.125	1.25	1.375	V
$\Delta V_{OS}$	Offset Magnitude Change from Differential LOW-to-HIGH				25	mV
$I_{OFF}$	Power Off Output Current	$V_{CC} = 0V$ , $V_{OUT} = 0V$ or 3.6V			$\pm 20$	$\mu A$
$I_{OS}$	Short Circuit Output Current	$V_{OUT} = 0V$ , Driver Enabled $V_{OD} = 0V$ , Driver Enabled			-6 $\pm 6$	mA
$V_{IH}$	Input HIGH Voltage		2.0		$V_{CC}$	V
$V_{IL}$	Input LOW Voltage		GND		0.8	V
$I_{IN}$	Input Current	$V_{IN} = 0V$ or $V_{CC}$			$\pm 20$	$\mu A$
$I_{OZ}$	Disabled Output Leakage Current	$EN = 0.8V$ , $\overline{EN} = 2.0V$ $V_{OUT} = 0V$ or 4.7V			$\pm 20$	$\mu A$
$I_{I(OFF)}$	Power-OFF Input Current	$V_{CC} = 0V$ , $V_{IN} = 0V$ or 3.6V			$\pm 20$	$\mu A$
$V_{IK}$	Input Clamp Voltage	$I_{IK} = -18 mA$	-1.5			V
$I_{CC}$	Power Supply Current	No Load, $V_{IN} = 0V$ or $V_{CC}$ , Driver Enabled $R_L = 100 \Omega$ , Driver Disabled $R_L = 100 \Omega$ , $V_{IN} = 0V$ or $V_{CC}$ , Driver Enabled		3.2 3.2 17.9	5 5 25	mA
$C_{IN}$	Input Capacitance			7		pF
$C_{OUT}$	Output Capacitance			4		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 (Note 3)	Max	Units
$t_{PLHD}$	Differential Propagation Delay LOW-to-HIGH	$R_L = 100 \Omega$ , $C_L = 10 \text{ pF}$ , See Figure 2 and Figure 3 (Note 7)	0.8	1.4	2.0	ns
$t_{PHLD}$	Differential Propagation Delay HIGH-to-LOW		0.8	1.4	2.0	ns
$t_{TLHD}$	Differential Output Rise Time (20% to 80%)		0.6	0.85	1.2	ns
$t_{THLD}$	Differential Output Fall Time (80% to 20%)		0.6	0.85	1.2	ns
$t_{SK(P)}$	Pulse Skew $ t_{PLH} - t_{PHL} $				0.4	ns
$t_{SK(LH)}$	Channel-to-Channel Skew (Note 4)				0.3	ns
$t_{SK(HL)}$						
$t_{SK(PP)}$	Part-to-Part Skew (Note 5)				1.0	ns
$f_{MAX}$	Maximum Frequency (Note 6)		200	275		MHz
$t_{ZHD}$	Differential Output Enable Time from Z to HIGH	$R_L = 100\Omega$ , $C_L = 10 \text{ pF}$ , See Figure 4 and Figure 5 (Note 7)		2.5	5.0	ns
$t_{ZLD}$	Differential Output Enable Time from Z to LOW			2.7	5.0	ns
$t_{HZD}$	Differential Output Disable Time from HIGH to Z			3.2	5.0	ns
$t_{LZD}$	Differential Output Disable Time from LOW to Z			3.4	5.0	ns

**Note 3:** All typical values are at  $T_A = 25^\circ\text{C}$  and with  $V_{CC} = 3.3\text{V}$ .

**Note 4:**  $t_{SK(LH)}$ ,  $t_{SK(HL)}$  is the skew between specified outputs of a single device when the outputs have identical loads and are switching in the same direction.

**Note 5:**  $t_{SK(PP)}$  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.

**Note 6:**  $f_{MAX}$  Criteria: Input  $t_R = t_F < 1 \text{ ns}$ , 0V to 3V, 50% Duty Cycle; Output  $V_{OD} > 250 \text{ mV}$ , 45% to 55% Duty Cycle; all output channels switching in phase.

**Note 7:** Test Circuits in Figure 2 and Figure 4 are simplified representations of test fixture and DUT loading.

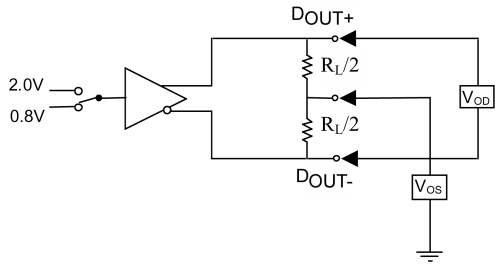
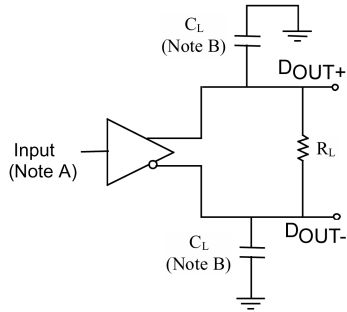


FIGURE 1. Differential Driver DC Test Circuit



**Note A:** All input pulses have frequency = 10 MHz,  $t_R$  or  $t_F$  = 1 ns  
**Note B:**  $C_L$  includes all fixture and instrumentation capacitances

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

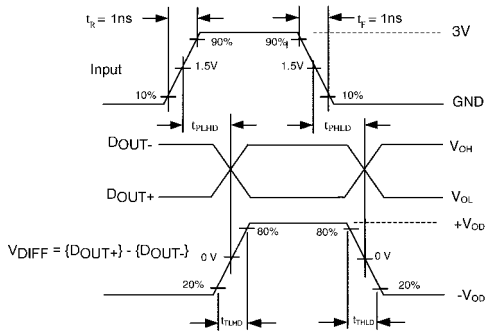
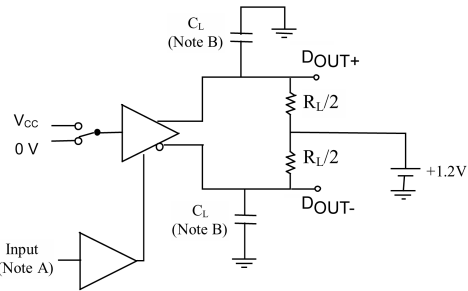


FIGURE 3. AC Waveforms



**Note B:** All input pulses have the frequency = 10 MHz,  $t_R$  or  $t_F$  = 1 ns  
**Note A:**  $C_L$  includes all fixture and instrumentation capacitances

FIGURE 4. Differential Driver Enable and Disable Test Circuit

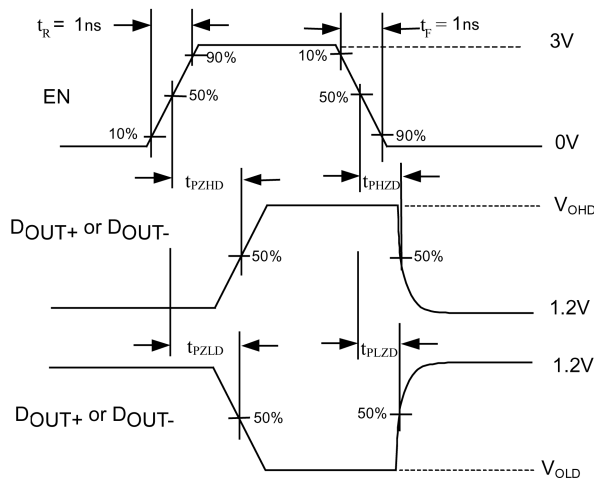
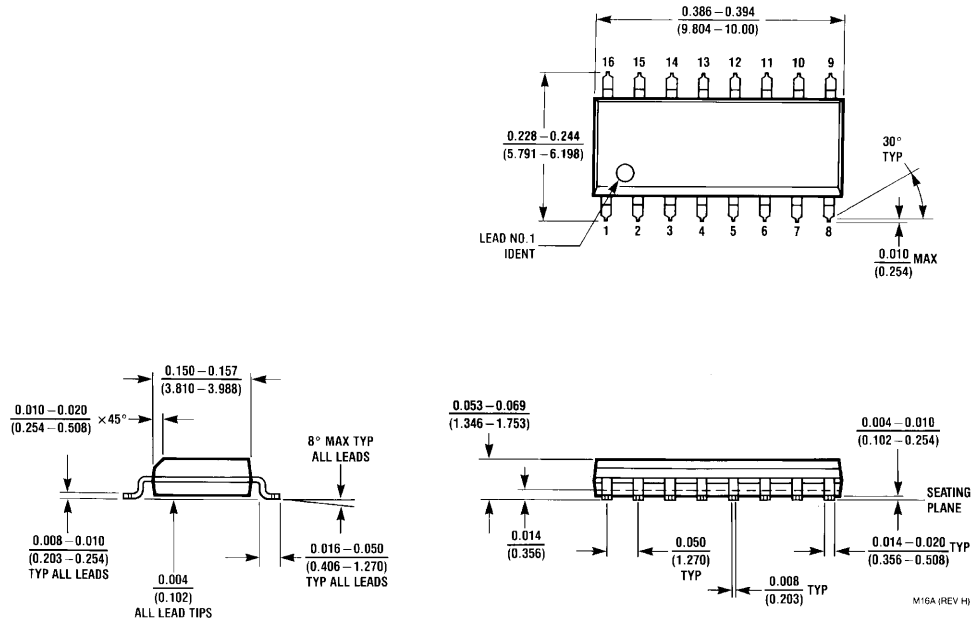


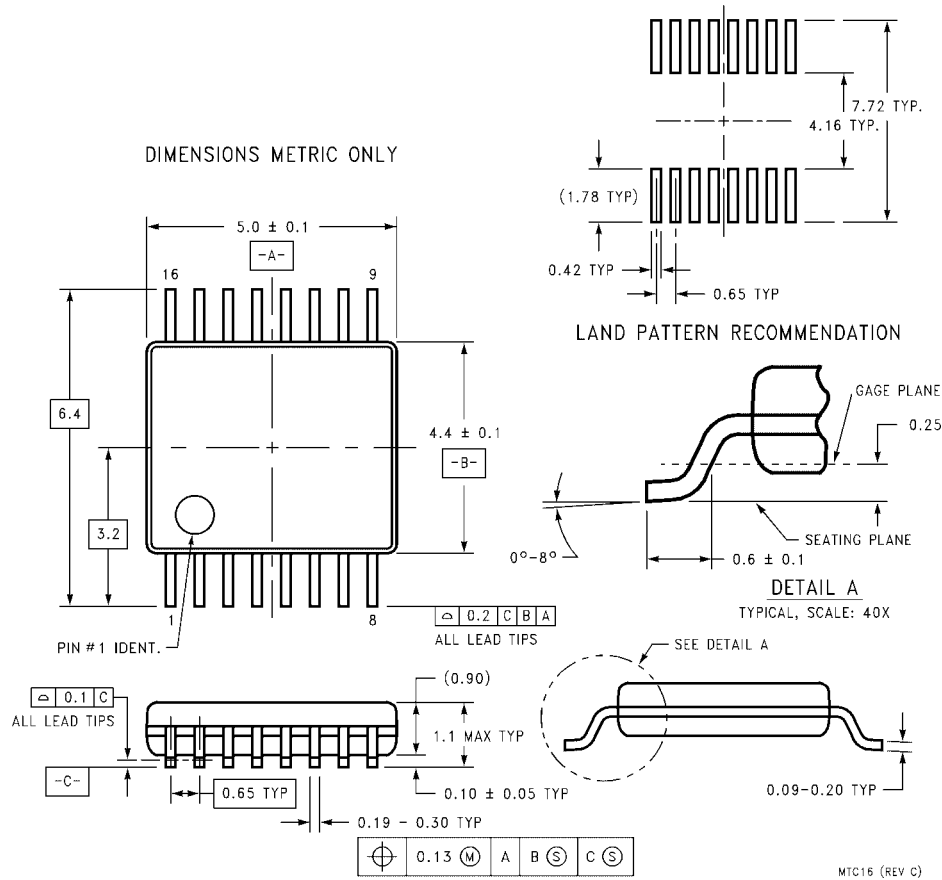
FIGURE 5. Enable and Disable AC Waveforms

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



**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Package Number M16A**

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



**16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  
Package Number MTC16**

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