To learn more about ON Semiconductor, please visit our website at www.onsemi.com.

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor’s system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

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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 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 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:

<table>
<thead>
<tr>
<th>Order Number</th>
<th>Package Number</th>
<th>Package Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIN1031M</td>
<td>M16A</td>
<td>16-Lead Small Outline Integrated Circuit (SOCI), JEDEC MS-012, 0.150&quot; Narrow</td>
</tr>
<tr>
<td>FIN1031MTC</td>
<td>MTC16</td>
<td>16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide</td>
</tr>
</tbody>
</table>

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

Function Table

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>EN</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>L</td>
</tr>
<tr>
<td>X</td>
<td>L</td>
</tr>
<tr>
<td>X</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>EN</td>
<td>EN</td>
</tr>
</tbody>
</table>

Inputs: H = HIGH Logic Level, L = LOW Logic Level, X = Don’t Care, Z = High Impedance

Connection Diagram

Pin Descriptions

<table>
<thead>
<tr>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D IN1−, D IN2−, D IN3−, D IN4−</td>
<td>LVTTL Data Inputs</td>
</tr>
<tr>
<td>D OUT1+, D OUT2+, D OUT3+, D OUT4+</td>
<td>Non-Inverting Driver Outputs</td>
</tr>
<tr>
<td>D OUT1−, D OUT2−, D OUT3−, D OUT4−</td>
<td>Inverting Driver Outputs</td>
</tr>
<tr>
<td>EN</td>
<td>Driver Enable Pin</td>
</tr>
<tr>
<td>EN</td>
<td>Inverting Driver Enable Pin</td>
</tr>
<tr>
<td>V CC</td>
<td>Power Supply</td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>
### Absolute Maximum Ratings (Note 1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage ($V_{CC}$)</td>
<td>$-0.5V$ to $+4.6V$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Input Voltage ($V_{IN}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CC} &gt; 3V$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CC} = 0V$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Output Voltage ($V_{OUT}$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CC} = 0V$</td>
<td>$-0.5V$ to $+4.6V$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver Short Circuit Current ($I_{OSS}$)</td>
<td>Continuous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage Temperature Range ($T_{STG}$)</td>
<td>$-65^\circ C$ to $+150^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Junction Temperature ($T_J$)</td>
<td>$150^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead Temperature ($T_L$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Soldering, 10 seconds)</td>
<td>$260^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESD (Human Body Model)</td>
<td></td>
<td>$\geq 8000V$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESD (Machine Model)</td>
<td></td>
<td>$\geq 600V$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Recommended Operating Conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage ($V_{CC}$)</td>
<td>$3.0V$ to $3.6V$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Voltage ($V_{IN}$)</td>
<td>$0V$ to $V_{CC}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature ($T_A$)</td>
<td>$-40^\circ C$ to $+85^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ (Note 2)</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{OD}$</td>
<td>Output Differential Voltage</td>
<td></td>
<td>$250$</td>
<td>$355$</td>
<td>$450$</td>
<td>mV</td>
</tr>
<tr>
<td>$\Delta V_{OD}$</td>
<td>Magnitude Change from Differential LOW-to-HIGH</td>
<td>$R_L = 100\Omega$, Driver Enabled,</td>
<td>$25$</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>$V_{OS}$</td>
<td>Offset Voltage</td>
<td>See Figure 1</td>
<td>$1.125$</td>
<td>$1.25$</td>
<td>$1.375$</td>
<td>V</td>
</tr>
<tr>
<td>$\Delta V_{OS}$</td>
<td>Offset Magnitude Change from Differential LOW-to-HIGH</td>
<td></td>
<td>$25$</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>$I_{OFF}$</td>
<td>Power Off Output Current</td>
<td>$V_{CC} = 0V$, $V_{OUT} = 0V$ or $3.6V$</td>
<td>$\leq 20$</td>
<td>$\mu A$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{DS}$</td>
<td>Short Circuit Output Current</td>
<td>$V_{OUT} = 0V$, Driver Enabled</td>
<td>$\leq 6$</td>
<td>$mA$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{OH}$</td>
<td>High Input Voltage</td>
<td></td>
<td>$2.0$</td>
<td>$V_{CC}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{OL}$</td>
<td>Low Input Voltage</td>
<td>$V_{IN} = 0V$ or $V_{CC}$</td>
<td>$\leq 20$</td>
<td>$\mu A$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{IN}$</td>
<td>Input Current</td>
<td>$EN = 0.8V$, $EN = 2.0V$</td>
<td>$\leq 20$</td>
<td>$\mu A$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{0FF}$</td>
<td>Power-OFF Input Current</td>
<td></td>
<td>$\leq 20$</td>
<td>$\mu A$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{IN}$</td>
<td>Input Clamp Voltage</td>
<td>$I_{IN} = -18 mA$</td>
<td>$-1.5$</td>
<td>$V$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{CC}$</td>
<td>Power Supply Current</td>
<td>No Load, $V_{IN} = 0V$ or $V_{CC}$, Driver Enabled</td>
<td>$3.2$</td>
<td>$5$</td>
<td>$mA$</td>
<td></td>
</tr>
<tr>
<td>$R_L = 100\Omega$, Driver Enabled</td>
<td>$3.2$</td>
<td>$5$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_L = 100\Omega$, $V_{IN} = 0V$ or $V_{CC}$, Driver Enabled</td>
<td>$17.9$</td>
<td>$25$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C_{IN}$</td>
<td>Input Capacitance</td>
<td></td>
<td>$7$</td>
<td>$pF$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C_{OUT}$</td>
<td>Output Capacitance</td>
<td></td>
<td>$4$</td>
<td>$pF$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Note 2: All typical values are at $T_A = 25^\circ C$ and with $V_{CC} = 3.3V$. *

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## AC Electrical Characteristics

Over supply voltage and operating temperature ranges, unless otherwise specified

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ  (Note 3)</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPLHD</td>
<td>Differential Propagation Delay LOW-to-HIGH</td>
<td></td>
<td>0.8</td>
<td>1.4</td>
<td>2.0</td>
<td>ns</td>
</tr>
<tr>
<td>tPHLD</td>
<td>Differential Propagation Delay HIGH-to-LOW</td>
<td></td>
<td>0.8</td>
<td>1.4</td>
<td>2.0</td>
<td>ns</td>
</tr>
<tr>
<td>tTDHD</td>
<td>Differential Output Rise Time (20% to 80%)</td>
<td>R&lt;sub&gt;L&lt;/sub&gt; = 100 Ω, C&lt;sub&gt;L&lt;/sub&gt; = 10 pF, See Figure 2 and Figure 3 (Note 7)</td>
<td>0.6</td>
<td>0.85</td>
<td>1.2</td>
<td>ns</td>
</tr>
<tr>
<td>tTDLD</td>
<td>Differential Output Fall Time (80% to 20%)</td>
<td></td>
<td>0.6</td>
<td>0.85</td>
<td>1.2</td>
<td>ns</td>
</tr>
<tr>
<td>tSKP</td>
<td>Pulse Skew</td>
<td>[t&lt;sub&gt;PLH&lt;/sub&gt; - t&lt;sub&gt;PHL&lt;/sub&gt;]</td>
<td></td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSKLH</td>
<td>Channel-to-Channel Skew</td>
<td></td>
<td>0.3</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>tSKHL</td>
<td>(Note 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSKPP</td>
<td>Part-to-Part Skew (Note 5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fMAX</td>
<td>Maximum Frequency</td>
<td></td>
<td></td>
<td></td>
<td>200</td>
<td>275</td>
</tr>
<tr>
<td>tZHD</td>
<td>Differential Output Enable Time from Z to HIGH</td>
<td></td>
<td></td>
<td></td>
<td>2.5</td>
<td>5.0</td>
</tr>
<tr>
<td>tZLD</td>
<td>Differential Output Enable Time from Z to LOW</td>
<td>R&lt;sub&gt;L&lt;/sub&gt; = 100 Ω, C&lt;sub&gt;L&lt;/sub&gt; = 10 pF, See Figure 4 and Figure 5 (Note 7)</td>
<td>2.7</td>
<td></td>
<td>5.0</td>
<td>ns</td>
</tr>
<tr>
<td>tHZD</td>
<td>Differential Output Disable Time from HIGH to Z</td>
<td></td>
<td></td>
<td></td>
<td>3.2</td>
<td>5.0</td>
</tr>
<tr>
<td>tLZD</td>
<td>Differential Output Disable Time from LOW to Z</td>
<td></td>
<td></td>
<td></td>
<td>3.4</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**Note 3:** All typical values are at T<sub>A</sub> = 25°C and with V<sub>CC</sub> = 3.3V.

**Note 4:** t<sub>SKL</sub>, t<sub>SKH</sub> 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<sub>SKPP</sub> 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<sub>MAX</sub> Criteria: Input t<sub>in</sub> = t<sub>p</sub> < 1 ns, 0V to 3V, 50% Duty Cycle; Output V<sub>OD</sub> > 250 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

Note A: All input pulses have the frequency = 10 MHz, \( t_R \) or \( t_F \) = 1 ns

Note B: \( C_L \) includes all fixture and instrumentation capacitances

FIGURE 3. AC Waveforms

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)

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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