

Is Now Part of



ON Semiconductor®

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.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

FAIRCHILD SEMICONDUCTOR™

August 2001
Revised December 2001

FIN1032
3.3V LVDS 4-Bit High Speed Differential Receiver

General Description

This quad receiver is designed for high speed interconnect utilizing Low Voltage Differential Signaling (LVDS) technology. The receiver translates LVDS levels, with a typical differential input threshold of 100mV, to LVTTL signal levels. LVDS 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 FIN1032 can be paired with its companion driver, the FIN1031, or any other Fairchild LVDS driver.

Features

- Greater than 400Mbs data rate
- 3.3V power supply operation
- 0.4ns maximum differential pulse skew
- 2.5ns maximum propagation delay
- Low power dissipation
- Power OFF protection
- Fail safe protection for open-circuit, shorted and terminated conditions
- 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
FIN1032M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
FIN1032MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

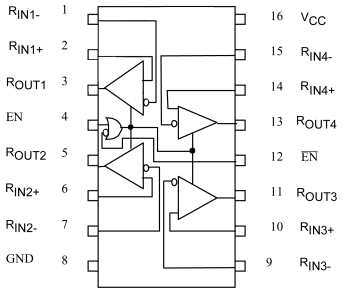
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Function Table

Inputs				Outputs
EN	**$\overline{EN}$**	**R_{IN+}**	**R_{OUT-}**	**R_{OUT}**
H	X	H	L	H
H	X	L	H	L
H	X	Fail Safe Condition		H
X	L	H	L	H
X	L	L	H	L
X	L	Fail Safe Condition		H
L	H	X		Z

H = HIGH Logic Level L = LOW Logic Level X = Don't Care
Z = High Impedance Fail Safe = Open, Shorted, Terminated

Connection Diagram



Pin Descriptions

Pin Name	Description
R_{OUT1}, R_{OUT2}, R_{OUT3}, R_{OUT4}	LVTTL Data Outputs
R_{IN1+}, R_{IN2+}, R_{IN3+}, R_{IN4+}	Non-Inverting LVDS Inputs
R_{IN1-}, R_{IN2-}, R_{IN3-}, R_{IN4-}	Inverting LVDS Inputs
EN	Driver Enable Pin
$\overline{EN}$	Inverting Driver Enable Pin
V_{CC}	Power Supply
GND	Ground

© 2001 Fairchild Semiconductor Corporation

Absolute Maximum Ratings(Note 1)

Supply Voltage (V_{CC})	−0.5V to +4.6 V
DC Input Voltage (V_{IN})	−0.5V to +4.6 V
DC Input Voltage (V_{OUT})	−0.5V to 6 V
DC Output Current (I_O)	16 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)	≥ 10,000 V
ESD (Machine Model)	≥ 500 V

Recommended Operating Conditions

Supply Voltage (V_{CC})	3.0 V to 3.6 V
Magnitude of Differential Voltage ($\|V_{ID}\|$)	100 mV to V_{CC}
Common-Mode Input Voltage (V_{IC})	0.05 V to 2.35V
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_{TH}	Differential Input Threshold HIGH	See Figure 1 and Table 1			100	mV
V_{TL}	Differential Input Threshold LOW	See Figure 1 and Table 1	−100			mV
I_{IN}	Input Current	V_{IN} = 0V or V_{CC}			±20	µA
$I_{I(OFF)}$	Power-OFF Input Current	V_{CC} = 0V, V_{IN} = 0V or 3.6V			±20	µA
V_{IH}	Input High Voltage (EN or $\overline{EN}$)		2.0		V_{CC}	V
V_{IL}	Input Low Voltage (EN or $\overline{EN}$)		GND		0.8	V
V_{OH}	Output HIGH Voltage	I_{OH} = −100 µA	V_{CC} −0.2			V
		I_{OH} = −8 mA	2.4			
V_{OL}	Output LOW Voltage	I_{OH} = 100 µA			0.2	V
		I_{OL} = 8 mA			0.5	
V_{IK}	Input Clamp Voltage	I_{IK} = −18 mA	−1.5			V
I_{OZ}	Disabled Output Leakage Current	EN = 0.8 and $\overline{EN}$ = 2V, V_{OUT} = 3.6V or 0V			±20	µA
I_{OS}	Output Short Circuit Test	Receiver Enabled, V_{OUT} = 0V (one output shorted at a time)	−15		−100	mA
I_{CCZ}	Disabled Power Supply Current	Receiver Disabled			5	mA
I_{CC}	Power Supply Current	Receiver Enabled, (R_{IN+} = 1V and R_{IN-} = 1.4V) or (R_{IN+} = 1.4V and R_{IN-} = 1V)			15	mA
$I_{PU/PD}$	Output Power Up/Power Down High Z Leakage Current	V_{CC} = 0V to 1.5V			±20	µA
C_{IN}	Input Capacitance			3.5		pF
C_{OUT}	Output Capacitance			6		pF

Note 2: All typical values are at T_A = 25°C and with V_{CC} = 3.3V.

AC Electrical Characteristics

Over supply voltage and operating temperature ranges, unless otherwise specified

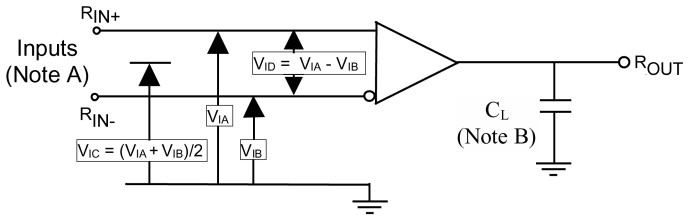
Symbol	Parameter	Test Conditions	Min	Typ (Note 3)	Max	Units
t_{PLH}	Propagation Delay LOW-to-HIGH	$\|V_{ID}\|$ = 400 mV, C_L = 10 pF, R_L = 1kΩ See Figure 1 and Figure 2	1.0		2.5	ns
t_{PHL}	Propagation Delay HIGH-to-LOW		1.0		2.5	ns
t_{TLH}	Output Rise Time (20% to 80%)			0.7	1.2	ns
t_{THL}	Output Fall Time (80% to 20%)			0.7	1.2	ns
$t_{SK(P)}$	Pulse Skew $\|t_{PLH} - t_{PHL}\|$				0.4	ns
$t_{SK(LH)}$ $t_{SK(HL)}$	Channel-to-Channel Skew (Note 4)				0.3	ns
$t_{SK(PP)}$	Part-to-Part Skew (Note 5)				1.0	ns
f_{MAX}	Maximum Operating Frequency (Note 6)	R_L = 1kΩ, C_L = 10 pF, see Figure 1 and Figure 2	200	325		MHz
t_{ZH}	LVTTL Output Enable Time from Z to HIGH	R_L = 1kΩ, C_L = 10 pF, See Figure 3 and Figure 4			5.0	ns
t_{ZL}	LVTTL Output Enable Time from Z to LOW				5.0	ns
t_{HZ}	LVTTL Output Disable Time from HIGH to Z				5.0	ns
t_{LZ}	LVTTL Output Disable Time from LOW to Z				5.0	ns

Note 3: All typical values are at T_A = 25°C and with V_{CC} = 3.3V.

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 $t_R = t_F < 1$ ns, V_{ID} = 300 mV, (1.05V to 1.35V pp), 50% duty cycle; Output duty cycle 40% to 60%, $V_{OL} < 0.5V$, $V_{OH} > 2.4V$. All channels switching in phase.



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

Note B: C_L includes all probe and jig capacitances

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

TABLE 1. Receiver Minimum and Maximum Input Threshold Test Voltages

Applied Voltages (V)		Resulting Differential Input Voltage (mA)	Resulting Common Mode Input Voltage (V)
V_{IA}	V_{IB}	V_{ID}	V_{IC}
1.25	1.15	100	1.2
1.15	1.25	−100	1.2
2.4	2.3	100	2.35
2.3	2.4	−100	2.35
0.1	0	100	0.05
0	0.1	−100	0.05
1.5	0.9	600	1.2
0.9	1.5	−600	1.2
2.4	1.8	600	2.1
1.8	2.4	−600	2.1
0.6	0	600	0.3
0	0.6	−600	0.3

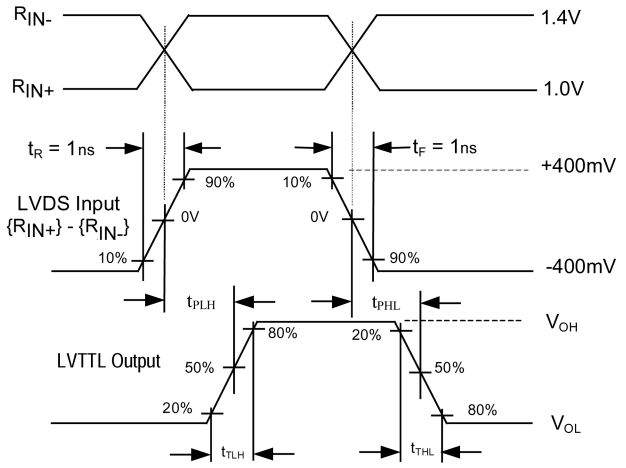


FIGURE 2. LVDS Input to LVTTL Output AC Waveforms

Test Circuit for LVTTL Outputs

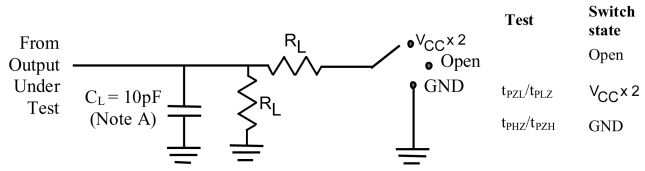
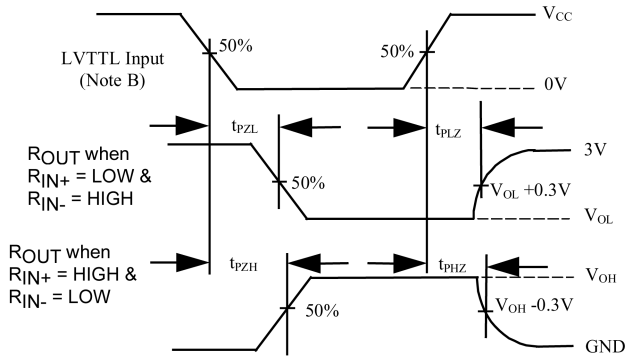


FIGURE 3. AC Loading Circuit for LVTTL Outputs

Voltage Waveforms Enable and Disable Times

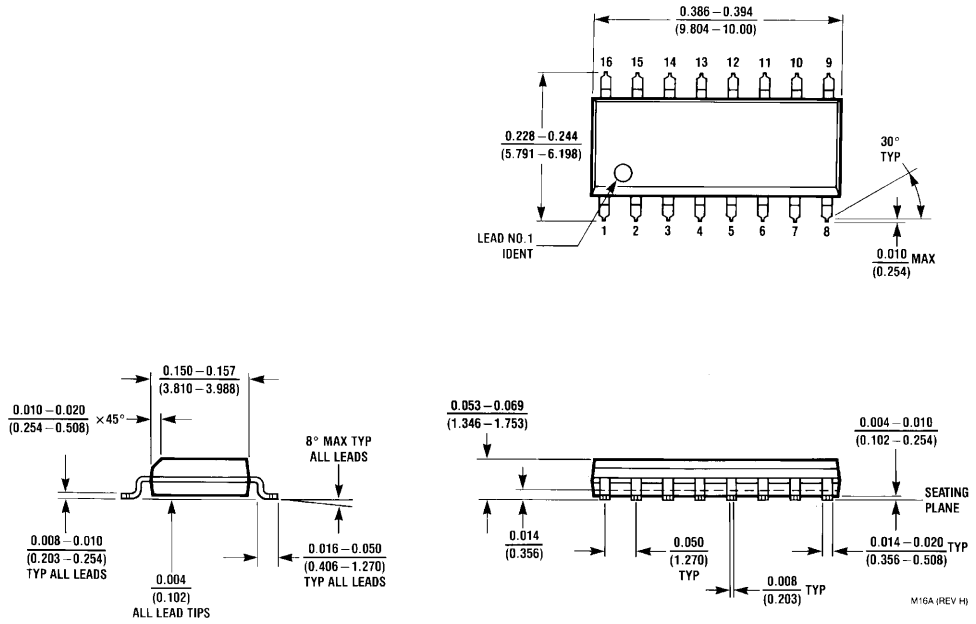


Note A: C_L includes probes and jig capacitance

Note B: All LVTTL input pulses have the following characteristics: Frequency = 10 MHz t_R or $t_F \leq 2$ ns

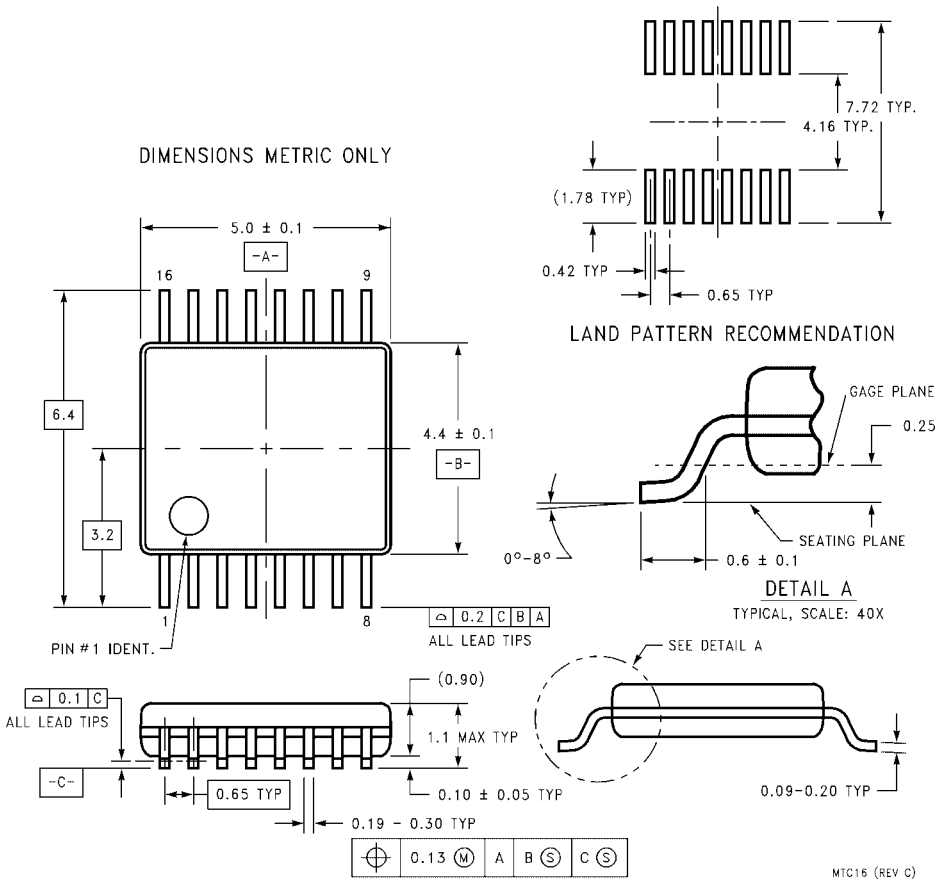
FIGURE 4. LVTTL Outputs Test Circuit and AC Waveforms

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

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
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.

www.fairchildsemi.com

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative