FAIRCHILD SEMICONDUCTOR®

April 2013

FIN1049
LVDS Dual-Line Driver with Dual-Line Receiver

Features

- Greater than 400 Mbps Data Rate
- 3.3 V Power Supply Operation
- Low Power Dissipation
- Fail-Safe Protection for Open-Circuit Conditions
- Meets or Exceeds TIA/EIA-644-A LVDS Standard
- 16-pin TSSOP Package Saves Space
- Flow-Through Pinout Simplifies PCB Layout
- Enable/Disable for all Outputs
- Industrial Operating Temperature Range: -40°C to +85°C

Description

This dual driver-receiver is designed for high-speed interconnects utilizing Low Voltage Differential Signaling (LVDS) technology. The driver accepts LVTTL inputs and translates them to LVDS outputs. The receiver accepts LVDS inputs and translates them to LVTTL outputs. The LVDS levels have a typical differential output swing of 350 mV, which provides for low EMI at ultra-low power dissipation even at high frequencies. The FIN1049 can accept LVPECL inputs for translating from LVPECL to LVDS. The En and Enb inputs are AND-ed together to enable / disable the outputs. The enables are common to all four outputs. A single-line driver and single-line receiver function is also available in the FIN1019.

Ordering Information

Part Number	Operating Temperature Range	Package	Packing Method
FIN1049MTCX	-40 to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Tape and Reel

© 2003 Fairchild Semiconductor Corporation

Pin Configuration

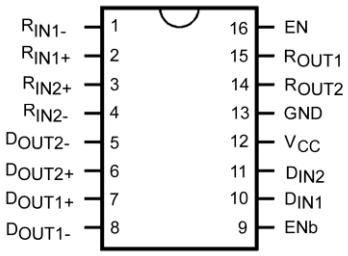


Figure 1. Pin Configuration

Functional Diagram

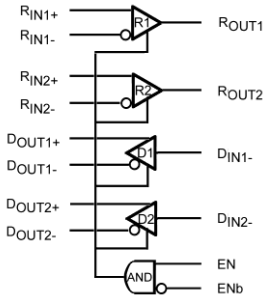


Figure 2. Functional Diagram

Pin Definitions

Pin #	Name	Description
2, 3	R_{IN1+}, R_{IN2+}	Non-Inverting LVDS Inputs
1, 4	R_{IN1-}, R_{IN2-}	Inverting LVDS Inputs
7, 6	D_{OUT1+}, D_{OUT2+}	Non-Inverting Driver Outputs
8, 5	D_{OUT1-}, D_{OUT2-}	Inverting Driver Outputs
16, 9	EN, ENb	Driver Enable Pins for All Outputs
15, 14	R_{OUT1}, R_{OUT2}	LVTTL Output Pins for R_{OUT1} and R_{OUT2}
10, 11	D_{IN1}, D_{IN2}	LVTTL Input Pins for D_{IN1} and D_{IN2}
12	V_{CC}	Power Supply (3.3 V)
13	GND	Ground

Function Table

Inputs		Outputs (LVTTL)		Inputs (LVDS)(1)		Outputs (LVDS)	
EN	**ENb**	**R_{OUT1}**	**R_{OUT2}**	**R_{INn+}**	**R_{INn-}**	**D_{OUTn+}**	**D_{OUTn-}**
H	L	ON	ON			ON	ON
H	H	Z	Z			Z	Z
L	H	Z	Z			Z	Z
L	L	Z	Z			Z	Z
H	L	H	H	Open Current Fail-Safe Condition			

Legend:

H=HIGH Logic Level

L=LOW Logic Level or OPEN

X=Don't Care

Z=High Impedance

Note:

1. Any unused receiver Inputs should be left open.

© 2003 Fairchild Semiconductor Corporation

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
V_{IN}	LVDS DC Input Voltage	-0.5	+4.6	V
V_{OUT}	LVDS DC Output Voltage	-0.5	+4.6	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		≥ 7000	V
	Machine Model, JESD22-A115		≥ 250	

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
$\|V_{ID}\|$	Magnitude of Differential Voltage	100	V_{CC}	mV
T_A	Operating Temperature	-40	+85	°C

© 2003 Fairchild Semiconductor Corporation

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}=3.3 V.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
LVDS Input DC Specifications (R_{IN1+}, R_{IN1-}, R_{IN2+}, R_{IN2-}) *See Figure 3 and Table 1*						
V_{TH}	Differential Input Threshold HIGH	V_{CM}=1.2 V, 0.05 V, 2.35 V		0	35	mV
V_{TL}	Differential Input Threshold LOW		-100	0		mV
V_{IC}	Common Mode Voltage Range	V_{ID}=100 mV, V_{CC}=3.3 V	V_{ID}/2		V_{CC} - (V_{ID}/2)	V
I_{IN}	Input Current	V_{CC}=0 V or 3.6 V, V_{IN}=0 V or 2.8 V			±20	mA
CMOS/ LVTTL Input DC Specifications (EN, ENb, D_{IN1}, D_{IN2})						
V_{IH}	Input High Voltage (LVTTL)		2.0		V_{CC}	V
V_{IL}	Input Low Voltage (LVTTL)		GND		0.8	V
I_{IN}	Input Current (EN, ENb, D_{IN1}, D_{IN2}, R_{INx+}, R_{INx-})	V_{IN}=0 V or V_{CC}			±20	µA
V_{IK}	Input Clamp Voltage	V_{IK}=-18 mA	-1.5	-0.7		V
LVDS Output DC Specifications (D_{OUT1+}, D_{OUT1-}, D_{OUT2+}, D_{OUT2-})						
V_{OD}	Output Differential Voltage	*See Figure 4*	250	350	450	mV
ΔV_{OD}	V_{OD} Magnitude Change from	R_L=100 Ω			35	mV
	Differential LOW-to-HIGH	Driver Enabled				
V_{OS}	Offset Voltage	*See Figure 4*	1.125	1.250	1.375	V
ΔV_{OS}	Offset Magnitude Change from Differential LOW-to-HIGH				25	mV
I_{OS}	Short-Circuit Output Current	D_{OUT+}=0V & D_{OUT-}=0 V, Driver Enabled			-9	mA
I_{OSD}		V_{OD}=0 V, Driver Enabled			-9	mA
I_{OFF}	Power-Off Input or Output Current	V_{CC}=0 V, V_{OUT}=0 V or V_{CC}			±20	mA
I_{OZD}	Disabled Output Leakage Current	Driver Disabled, D_{OUT+}=0 V or V_{CC} or D_{OUT-}=0V or V_{CC}			±10	mA
CMOS/LVTTL Output DC Specifications (R_{OUT1}, R_{OUT2})						
V_{OH}	Output High Voltage	I_{OH}=-2 mA, V_{ID}=200 mV	2.7			V
V_{OL}	Output Low Voltage	I_{OL}=2 mA, V_{ID}=200 mV			0.25	V
I_{OZ}	Disabled Output Leakage Current	Driver Disabled, R_{OUTn}=0 V or V_{CC}			±10	mA
I_{CC}	Power Supply Current[(2)]	Drivers Enabled, Any Valid Input Condition			25	mA
I_{CCZ}	Power Supply Current	Drivers Disabled			10	mA
C_{IND}	Input Capacitance	LVDS Input		3.0		pF
C_{OUT}	Output Capacitance	LVDS Output		4.0		pF
C_{INT}	Input Capacitance	LVTTL Input		3.5		pF

Note:

2. Both driver and receiver inputs are static. All LVDS outputs have 100 Ω load. None of the outputs have any lumped capacitive load.

© 2003 Fairchild Semiconductor Corporation

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}=3.3 V.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Switching Characteristics - LVDS Outputs						
t_{PLHD}	Differential Propagation Delay LOW-to-HIGH	*See Figure 5, Figure 6*			2	ns
t_{PHLD}	Differential Propagation Delay HIGH-to-LOW				2	ns
t_{TLHD}	Differential Output Rise Time (20% to 80%)		0.2		1.0	ns
t_{THLD}	Differential Output Fall Time (80% to 20%)		0.2		1.0	ns
$t_{SK(P)}$	Pulse Skew $\|t_{PLH} - t_{PHL}\|$				0.35	ns
$t_{SK(LH)}$, $t_{SK(HL)}$	Channel-to-Channel Skew[3]				0.35	ns
$t_{SK(PP)}$	Part-to-Part Skew[4]				1	ns
t_{PZHD}	Differential Output Enable Time, Z-to-HIGH	*See Figure 7, Figure 8*			6	ns
t_{PZLD}	Differential Output Enable Time, A-to-LOW				6	ns
t_{PHZD}	Differential Output Disable Time, HIGH-to-Z				3	ns
t_{PLZD}	Differential Output Disable Time, LOW-to-Z				3	ns
f_{MAXD}	Maximum Frequency[5]	*See Figure 5*	200			MHz
Switching Characteristics - LVTTL Outputs						
t_{PHL}	Propagation Delay HIGH-to-LOW	Measured from 20% to 80% Signal	0.5	1.0	3.5	ns
t_{PLH}	Propagation Delay LOW-to-HIGH	V_{ID}=200 mV	0.5	1.0	3.5	ns
t_{SK1}	Pulse Skew	Distributed Load	0	35	400	ps
t_{SK2}	Channel-to-Channel Skew	C_L=15 pF and 50 Ω	0	50	500	ps
t_{SK3}	Part-to-Part Skew	R_L=1 kΩ	0		1	ns
t_{LHR}	Transition Time LOW-to-HIGH	V_{OS}=1.2 V	0.10	0.25	1.40	ns
t_{HLR}	Transition Time HIGH-to-LOW	*See Figure 9, Figure 10*	0.10	0.18	1.40	ns
t_{PHZ}	Disable Time HIGH-to-Z	*See Figure 11, Figure 12*	2.2	4.5	8.0	ns
t_{PLZ}	Disable Time LOW-to-Z		1.3	3.5	8.0	ns
t_{PZH}	Enable Time Z-to-HIGH		1.8	3.0	7.0	ns
t_{PZL}	Enable Time Z-to-LOW		0.9	1.4	7.0	ns
f_{MAXT}	Maximum Frequency[6]	*See Figure 9*	200			MHz

Notes:

3. $t_{SK(LH)}$, $t_{SK(HL)}$ is the skew between specified outputs of a single device when the outputs have identical loads and are switching in the same direction.
4. $t_{SK(PP)}$ 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.
5. f_{MAXD} generator input conditions: t_r=t_f < 1 ns (10% to 90%), 50% duty cycle, 0 V to 3 V. Output criteria: duty cycle=45% / 55%, V_{OD} > 250 mV, all channels switch.
6. f_{MAXT} generator input conditions: t_r=t_f < 1 ns (10% to 90%), 50% duty cycle, V_{ID}=200 mV, V_{CM}=1.2 V. Output criteria: duty cycle=45% / 55%, V_{OH} > 2.7 V. V_{OL} < 0.25 V, all channels switching.

© 2003 Fairchild Semiconductor Corporation

Required Specifications and Test Diagrams

Notes:

7. Electrostatic Discharge Capability: Human Body Model and Machine Model ESD should be measured using MIL-STD-883C method 3015.7 standard.
8. Latch-up immunity should be tested to the EIA/JEDEC Standard Number 78 (EIA/JESD78).

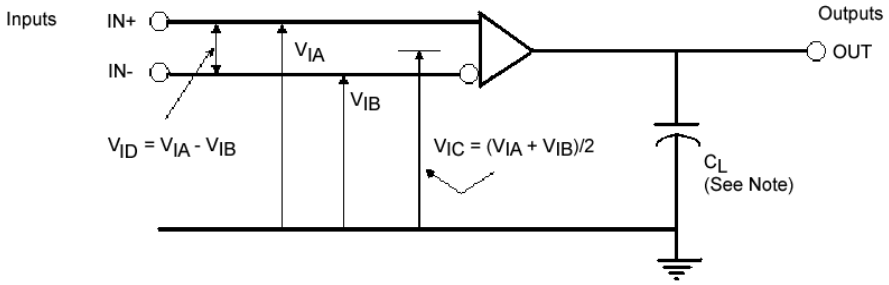


Figure 3. Differential Receiver Voltage Definitions Test Circuit

Note:

9. C_L=15 pF, includes all probe and jig capacitances.

Table 1. Receiver Minimum and Maximum Input Threshold Test Voltages

Applied Voltages (V)		Resulting Differential Input Voltage (mV)	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
V_{CC}	V_{CC} - 0.1	100	V_{CC} - 0.05
V_{CC} - 0.1	V_{CC}	-100	V_{CC} - 0.05
0.1	0.0	100	0.05
0.0	0.1	-100	0.05
1.75	0.65	1100	1.2
0.65	1.75	-1100	1.2
V_{CC}	V_{CC} - 1.1	1100	V_{CC} - 0.55
V_{CC} - 1.1	V_{CC}	-1100	V_{CC} - 0.55
1.1	0.0	1100	0.55
0.0	1.1	-1100	0.55

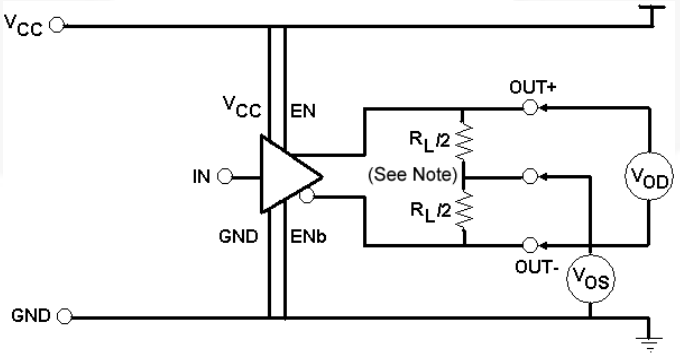


Figure 4. LVDS Output Circuit for DC Test

Note:

10. R_L=100 Ω.

© 2003 Fairchild Semiconductor Corporation

Required Specifications and Test Diagrams (Continued)

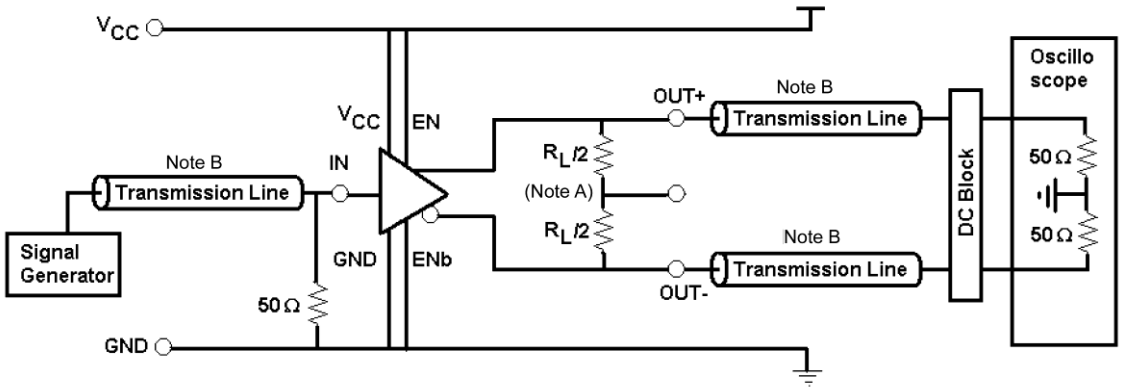


Figure 5. LVDS Output Propagation Delay and Transition Time Test Circuit

Notes:

11. A: R_L=100 Ω.
12. B: Z_O=50 Ω and C_T=15 pF distributed.

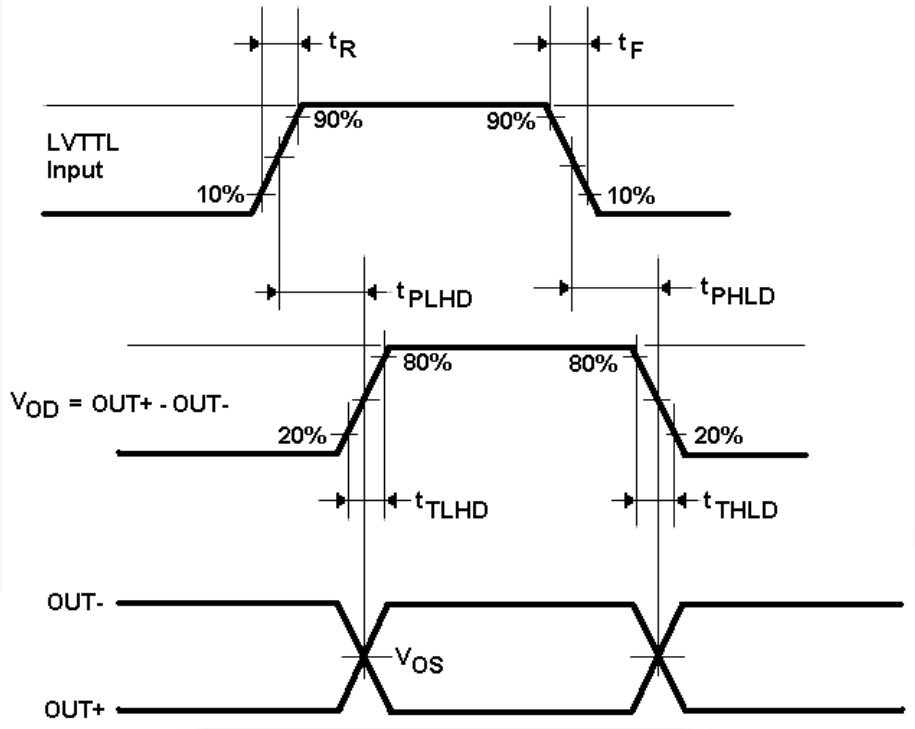


Figure 6. LVTTL Input to LVDS Output AC Waveform

Required Specifications and Test Diagrams (Continued)

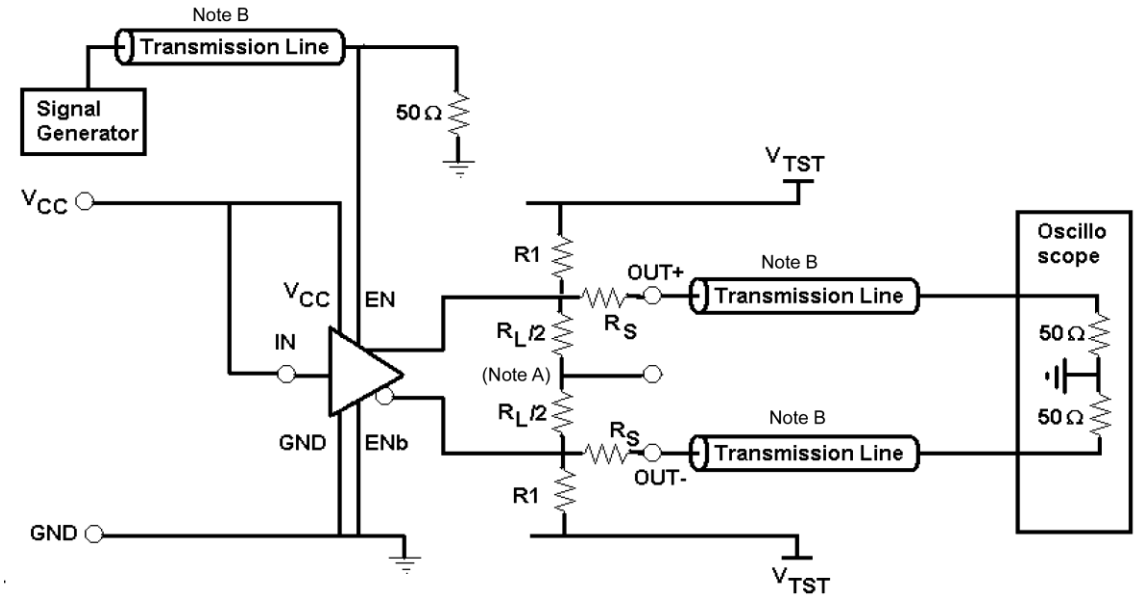


Figure 7. LVDS Output Enable / Disable Delay Test Circuit

Notes:

13. A: R_L=100 Ω.
14. B: Z_O=50 Ω and C_T=15 pF distributed.
15. R1=1000 Ω, R_S=950 Ω.
16. V_{TST}=2.4 V.

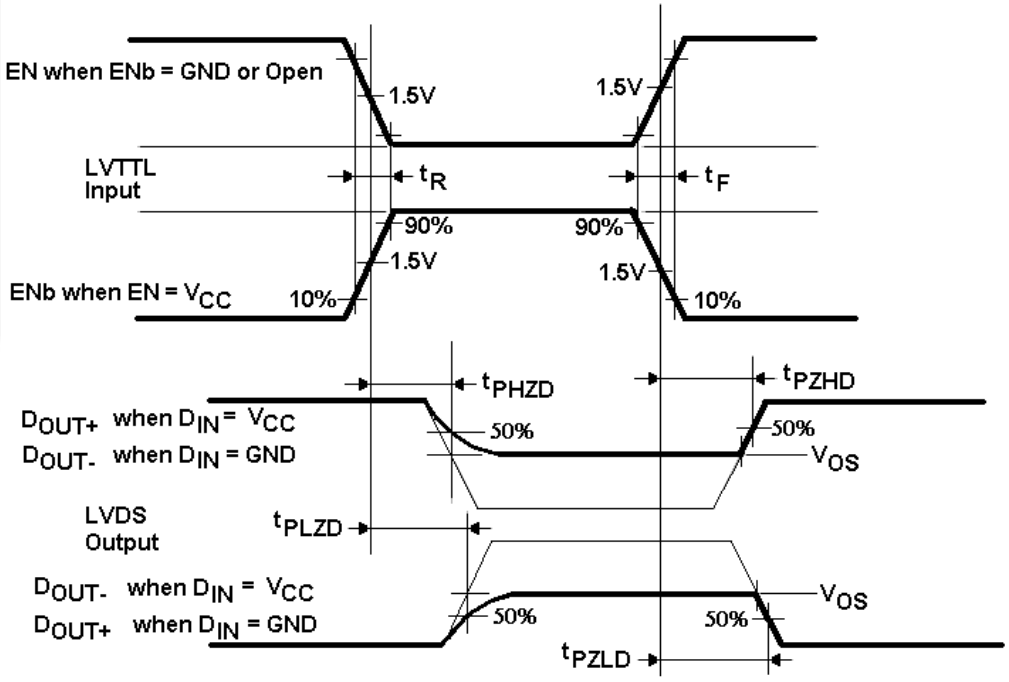


Figure 8. LVDS Output Enable / Disable Timing Waveforms

© 2003 Fairchild Semiconductor Corporation

Required Specifications and Test Diagrams (Continued)

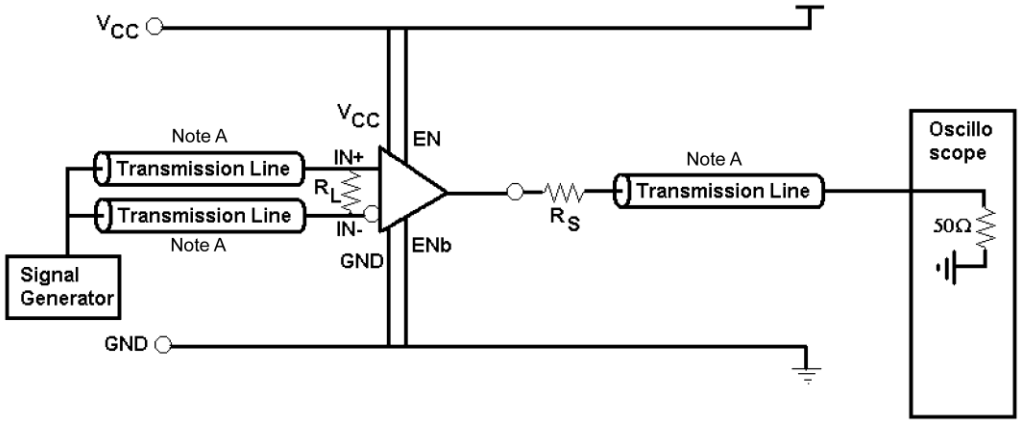


Figure 9. LVTTL Output Propagation Delay and Transition Time Test Circuit

Notes:

17. A: Z_O=50 Ω and C_T=15 pF distributed.
18. R_L=100 Ω and R_S=950 Ω.

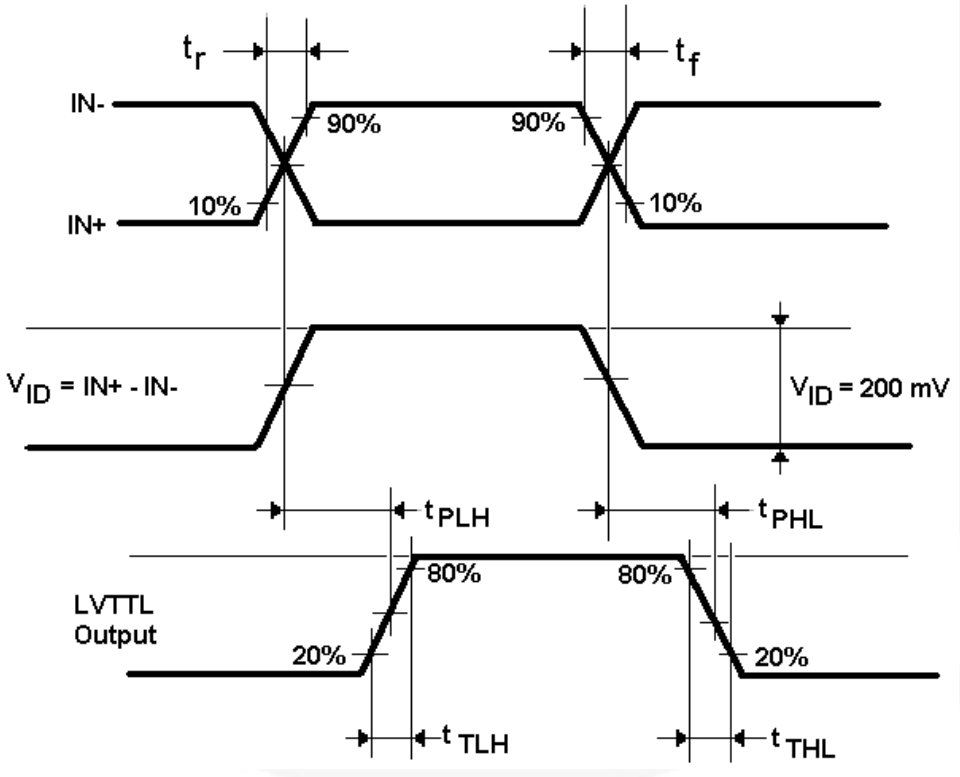


Figure 10. LVDS Input to LVTTL Output Propagation Delay and Transition Time Waveforms

Required Specifications and Test Diagrams (Continued)

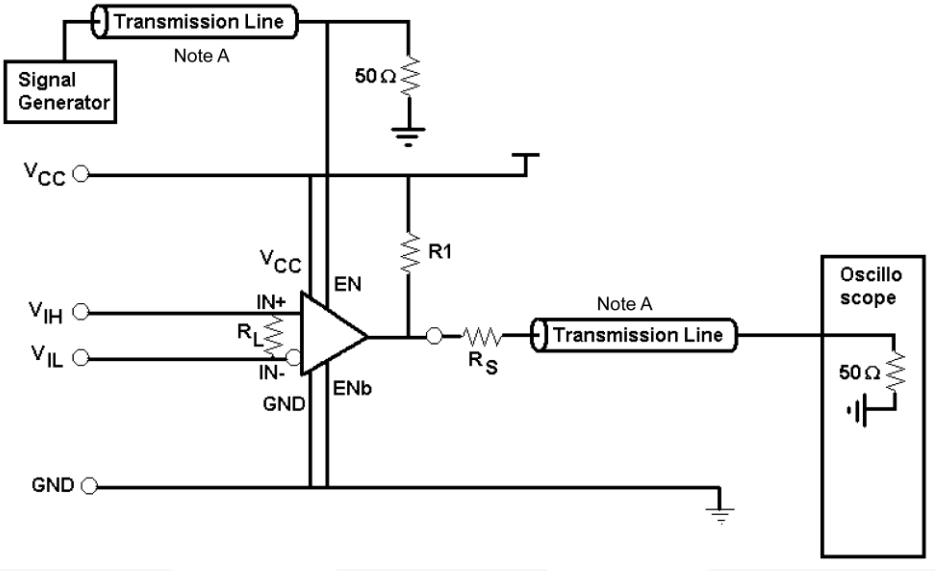


Figure 11. LVTTL Output Enable / Disable Test Circuit

Notes:

19. A: Z_O=50 Ω and C_T=15 pF distributed.
20. R_L=100 Ω, R1=1000 Ω, and R_S=950 Ω.

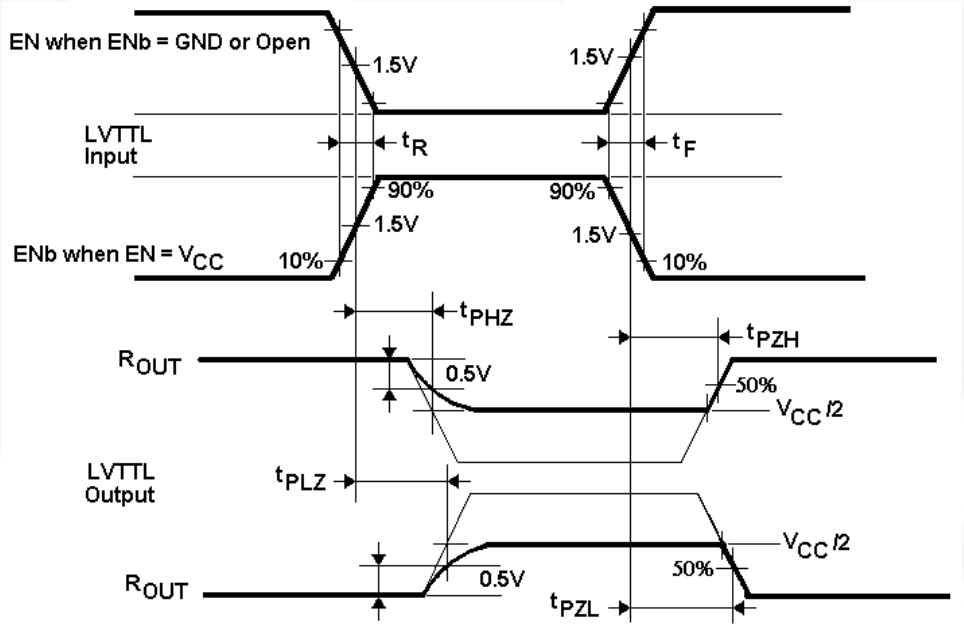
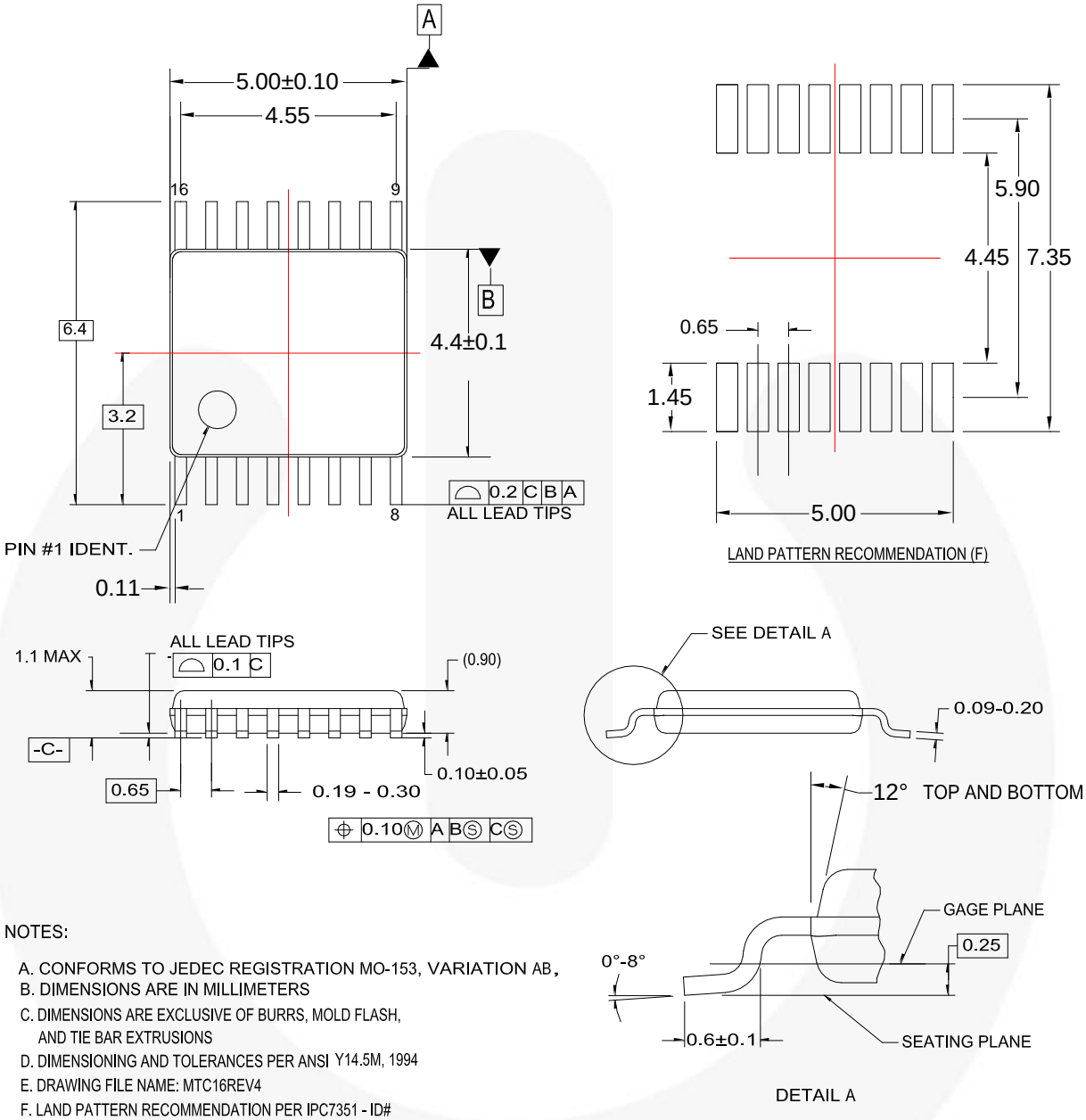


Figure 12. LVTTL Output Enable / Disable Timing Waveforms

Physical Dimensions



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB,
B. DIMENSIONS ARE IN MILLIMETERS
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1994
E. DRAWING FILE NAME: MTC16REV4
F. LAND PATTERN RECOMMENDATION PER IPC7351 - ID# TSOP65P640X110-16N

MTC16rev4

Figure 13.16-Lead, Thin-Shrink Small-Outline Package (TSSOP), JEDEC MO-153, 4.4 mm Wide

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
http://www.fairchildsemi.com/packaging/.

© 2003 Fairchild Semiconductor Corporation

FAIRCHILD SEMICONDUCTOR®

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

2Cool™
AccuPower™
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
F®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
mWSaver™
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
TinyBoost™
TinyBuck™
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
µSerDes™
SerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

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 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 of 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.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I64

© 2003 Fairchild Semiconductor Corporation

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Fairchild Semiconductor:
FIN1049MTCX_Q FIN1049MTCX

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А