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.

FAIRCHILD SEMICONDUCTOR®

July 2013

FSUSB63 — 3:1 High-Speed USB 2.0 Switch / Multiplexer

Features

Switch Type	3:1 USB Switch
USB	USB 2.0 High-Speed & Full-Speed Compliant
Break-Before-Make Time	126µs
R_{ON}	6Ω Typical
C_{ON}	6pF Typical
Bandwidth	830MHz
V_{CC}	2.7 to 4.4V
V_{CNTRL}	0 to V_{CC}
Operating Temperature	-40°C to 85°C
I_{CCSLP}	<1µA
I_{CCACT}	7.5µA Typical
Package	12- Lead UMLP 1.80 x 1.80 x 0.55mm, 0.40mm pitch
Top Mark	KG
Ordering Information	FSUSB63UMX

Applications

- Cell Phone, Digital Camera, Notebook
- LCD Monitor, TV, and Set-Top Box
- Netbook, Mobile Internet Device (MID)

Description

The FSUSB63 is a bi-directional, low-power, High-Speed (HS) USB 2.0 3:1 Multiplexer (MUX). It is optimized for switching among three high-speed (480Mbps) sources or any combination of high-speed and full-speed (12Mbps) USB sources, such as an application processor, to one USB 2.0 connector.

The FSUSB63 has a break-before-make time to force re-enumeration by the host when switching between different HS USB 2.0 controllers and thus requires minimal software changes.

The FSUSB63 is compliant with the requirements of USB 2.0 and features extremely low on capacitance (C_{ON}). The wide bandwidth exceeds the requirement to pass the third harmonic, resulting in signals with minimum edge and phase distortion. Superior channel-to-channel crosstalk also minimizes interference.

Related Resources

- *For samples and questions, please contact: Analog.Switch@fairchildsemi.com.*
- FSUSB63 Demonstration Board

Typical Application

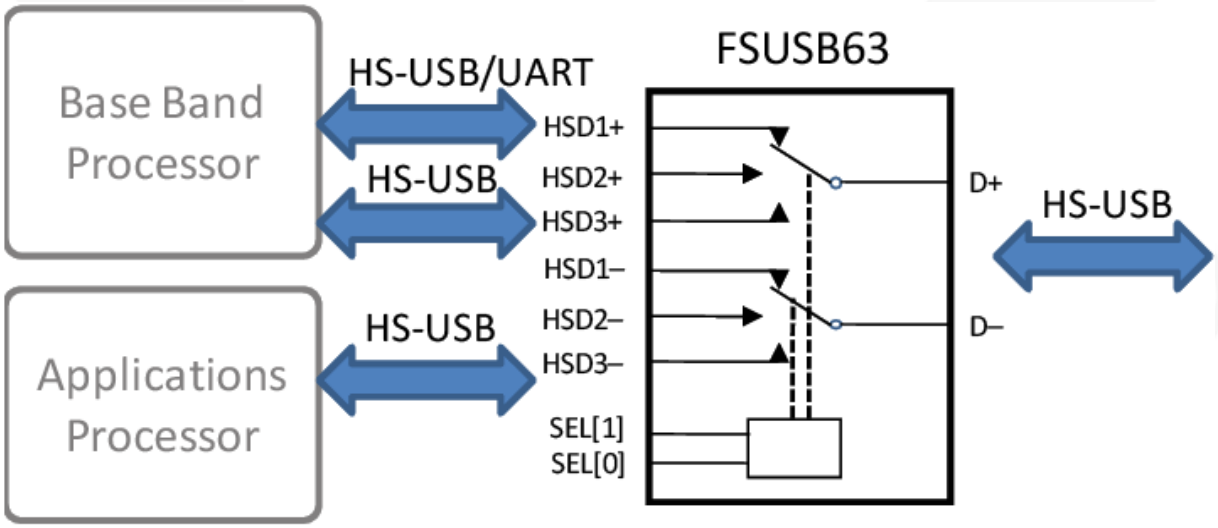


Figure 1. Analog Symbol

Pin Configuration

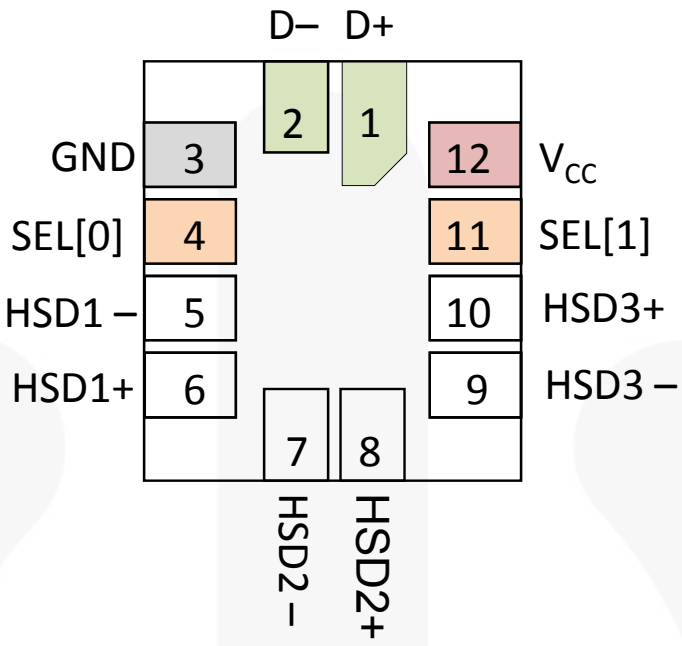


Figure 2. Pin Assignments (Top Through View)

Pin Descriptions

Pin #	Name	Description
1	D+	USB 2.0 High Speed or Full Speed Data Bus D+
2	D-	USB 2.0 High Speed or Full Speed Data Bus D-
3	GND	Ground
4	SEL[0]	Path Selection Control Inputs *(see functional table below)*
5	HSD1-	Multiplexed First Source Path for D-
6	HSD1+	Multiplexed First Source Path for D+
7	HSD2-	Multiplexed Second Source Path for D-
8	HSD2+	Multiplexed Second Source Path for D+
9	HSD3-	Multiplexed Third Source Path for D-
10	HSD3+	Multiplexed Third Source Path for D+
11	SEL[1]	Path Selection Control Inputs *(see functional table below)*
12	V_{CC}	Supply Voltage

Functional Table

Mode	SEL[1]	SEL[0]	Function
Sleep Mode	0	0	D+, D- Switch Paths Open
USB Port 1	0	1	D+=HSD1+, D-=HSD1-
USB Port 2	1	0	D+=HSD2+, D-=HSD2-
USB Port 3	1	1	D+=HSD3+, D-=HSD3-

Eye Compliance

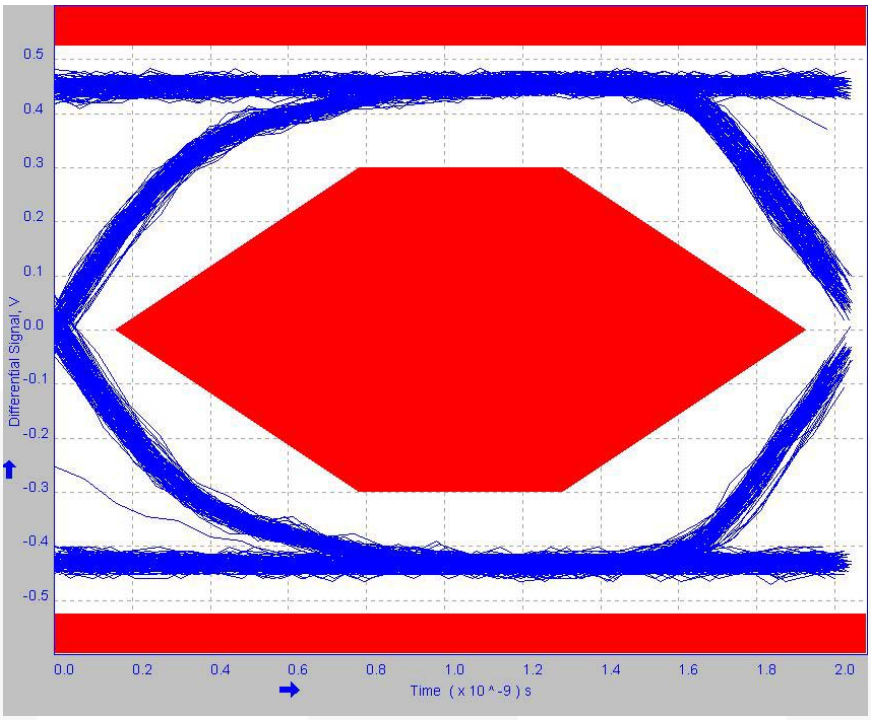


Figure 3. USB 2.0 HS-USB Eye Compliance Pass Through (without Switch)

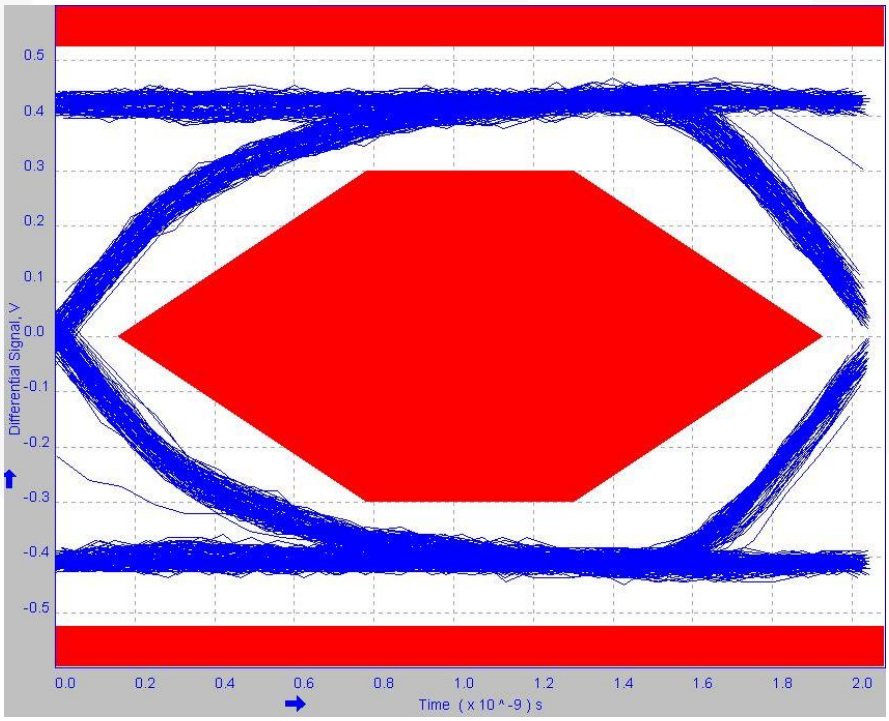


Figure 4. USB 2.0 HS-USB Eye Compliance with Switch

Notes:

1. Figure 3 indicates the HS-USB eye compliance of the source across a characterization board proir to the implementation of the swtich.
2. Figure 4 shows the total impact the swich has on HS-USB eye compliance when compared to Figure 3

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		-0.50	5.25	V
V_{CNTRL}	DC Input Voltage (SEL[1:0])[3]		-0.5	V_{CC}	V
V_{SW}	DC Switch I/O Voltage[3]		-0.50	5.25	V
I_{IK}	DC Input Diode Current		-50		mA
I_{OUT}	DC Switch Current			50	mA
T_{STG}	Storage Temperature		-65	+150	°C
MSL	Moisture Sensitivity Level (JEDEC J-STD-020A)			1	Level
ESD	IEC61000-4-2 System on USB Connector Pins D+ & D-	Air Gap	15.0		kV
		Contact	8.0		
	Human Body Model, JEDEC: JESD22-A114	Power to GND	16.0		
		I/O to GND	5.0		
		All Pins	5.0		
	Charged Device Model, JEDEC: JESD22-C101		1.5		

Note:

3. The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.

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	2.7	4.4	V
V_{CNTRL}[4]	Control Input Voltage (SEL[1:0])	0	V_{CC}	V
V_{SW}	Switch I/O Voltage	-0.5	4.3	V
T_A	Operating Temperature	-40	+85	°C

Note:

4. The control input must be held HIGH or LOW and it must not float.

DC Electrical Characteristics

All typical values are for V_{CC}=3.3V at T_A=25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	T_A=- 40ºC to +85ºC			Units
				Min.	Typ.	Max.	
V_{IK}	Clamp Diode Voltage	I_{IN}=-18mA	2.7			-1.2	V
V_{IH}	Input Voltage High	SEL[1], SEL[0] Inputs	2.7 to 4.3	1.0			V
V_{IL}	Input Voltage Low	SEL[1], SEL[0] Inputs	2.7 to 4.3			0.35	V
I_{IN}	Control Input Leakage	All Combinations of SEL[1] & SEL[0] in the Truth Table (LOW=0V & HIGH=V_{CC})	4.3			1	µA
I_{OZ}	Off-State Leakage	0 ≤ D_n, $HSD1_n$, $HSD2_n$, $HSD3_n$ ≤ 3.6V	4.3	-2		2	µA
I_{OFF}	Power-Off Leakage Current (All I/O Ports)	V_{SW}=0V to 4.3V, V_{CC}=0V, Figure 7	0	-2		2	µA
R_{ON}(5)	HS Switch On Resistance	V_{SW}=0.4V, I_{ON}=-8mA, Figure 6	3.0		6.0	7.8	Ω
ΔR_{ON}	HS Delta R_{ON}(6)	V_{SW}=0.4V, I_{ON}=-8mA	3.0		0.50		Ω
I_{CCSLP}	Sleep Mode Supply Current	SEL[1]=SEL[0]=0	3.6			1	µA
I_{CCACT}	Active Mode Supply Current	V_{CNTRL}=0 or V_{CC}, I_{OUT}=0	2.7		7.5	15.0	µA
			3.6		8.5	16.0	µA
I_{CCT}	Increase in I_{CC} Current per Control Input and V_{CC}	V_{CNTRL}=1.8V	3.6		1.5	4.0	µA
		V_{CNTRL}=1.2V	3.6		3.0	5.0	µA

Notes:

5. Measured by the voltage drop between HSD_n and D_n pins at the indicated current through the switch. On resistance is determined by the lower of the voltage on the two (HSD_n or D_n ports).
6. Guaranteed by characterization.

AC Electrical Characteristics

All typical values are for V_{CC}=3.3V at T_A=25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	T_A=- 40ºC to +85ºC			Units
				Min.	Typ.	Max.	
t_{ON}	Turn-On Time when Switching from One USB Path (or Disabled i.e. SEL=00) to Another USB Path	R_L=50Ω, C_L=35pF V_{SW}=0.8V Figure 8, Figure 9	3.0 to 3.6	126		400	µs
t_{OFF}	Turn-Off Time SEL≠00 (Any of the Three USB Paths Active) to SEL=00 (Disabled)	R_L=50Ω, C_L=35pF V_{SW}= 0.8V Figure 8, Figure 9	3.0 to 3.6			45	ns
t_{PD}	Propagation Delay(7)	C_L=5pF, R_L=50Ω Figure 8, Figure 10	3.3		0.25		ns
t_{BBM}	Break-Before-Make Time	R_L=50Ω, C_L=35pF V_{SW1}=V_{SW2}= 0.8V, Figure 12	3.0 to 3.6	126		400	µs
O_{IRR}	Off Isolation(7)	R_L=50Ω, f=240MHz Figure 14	3.0 to 3.6		-42		dB
Xtalk	Non-Adjacent Channel Crosstalk(7)	R_L=50Ω, f=240MHz Figure 15	3.0 to 3.6		-33		dB
BW	-3db Bandwidth(7)	R_L=50Ω, C_L=0pF Figure 13	3.0 to 3.6		830		MHz
		R_L=50Ω, C_L=5pF Figure 13	3.0 to 3.6		510		MHz

Note:

7. Guaranteed by characterization.

USB High-Speed Related AC Electrical Characteristics

Symbol	Parameter	Conditions	Vcc (V)	TA=- 40ºC to +85ºC			Units
				Min.	Typ.	Max.	
$t_{SK(P)}$	Pulse Skew[8]	V_{SW}=0.2V$diff_{PP}$, Figure 11, C_L=5pF	3.0 to 3.6		10		ps
$t_{SK(I)}$	Skew Between Differential Signals within a Pair[8]	V_{SW}=0.2V$diff_{PP}$, Figure 11, C_L=5pF	3.0 to 3.6		10		ps

Capacitance

Symbol	Parameter	Conditions	T_A=- 40ºC to +85ºC			Units
			Min.	Typ.	Max.	
C_{iN}	SEL[1:0] Input Capacitance[8]	V_{CC}=0V		3		pF
C_{ON}	D+/D- On Capacitance[8]	V_{CC}=3.3V, Any of the Three Switch Paths Enabled, f=1MHz, Figure 17		6		
		V_{CC}=3.3V, Any of the Three Switch Paths Enabled, f=240MHz[9]		5		
C_{OFF}	$HSD1_n$, $HSD2_n$, $HSD3_n$ Off Capacitance[8]	V_{CC}=0V or (V_{CC}=3.3V and SEL[1]=SEL[0]=0V) Figure 16		2		

Notes:
8. Guaranteed by characterization.
9. Effective capacitance measured on a network analyzer.

Reference Schematic

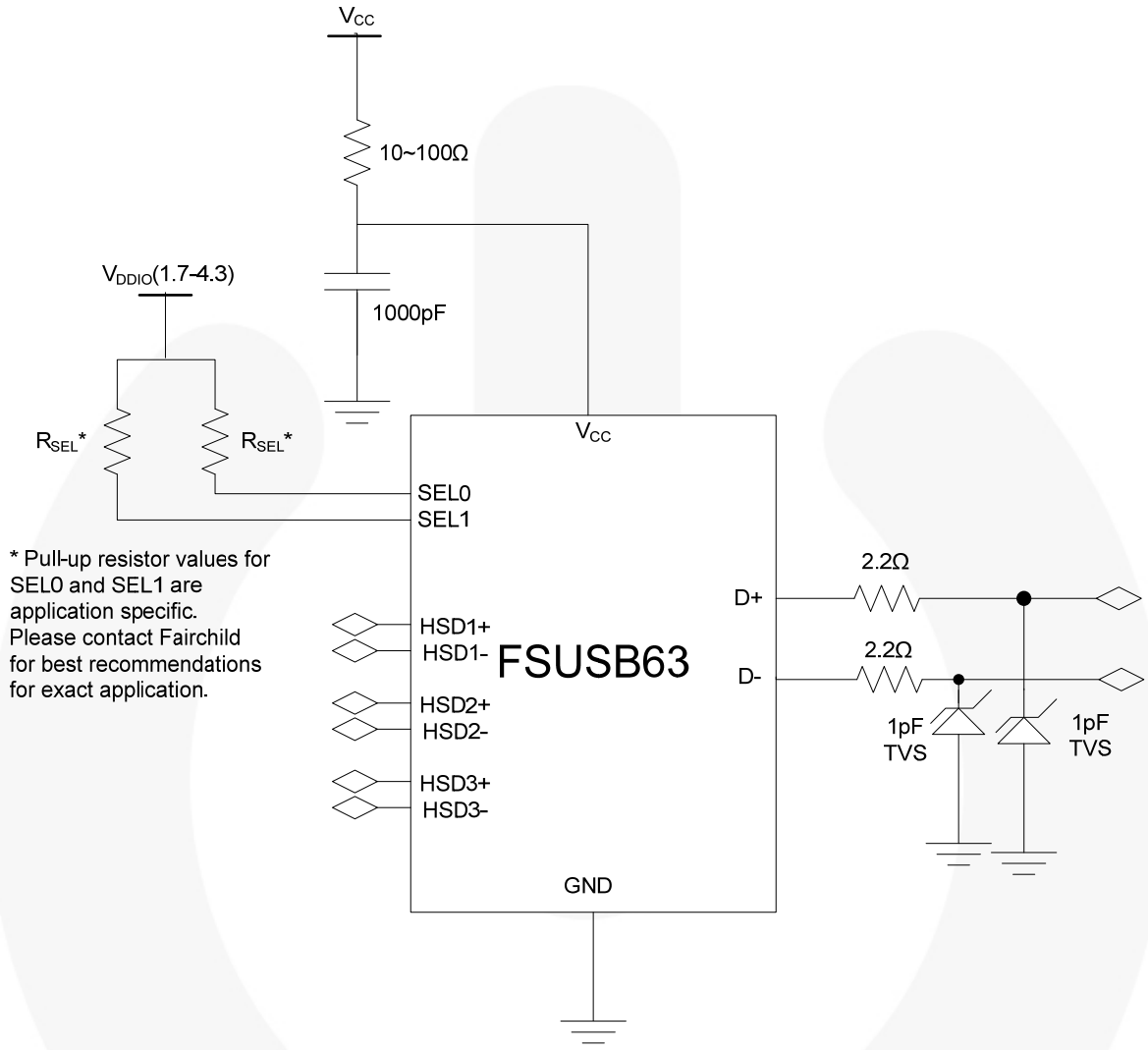


Figure 5. Reference Schematic

Test Diagrams

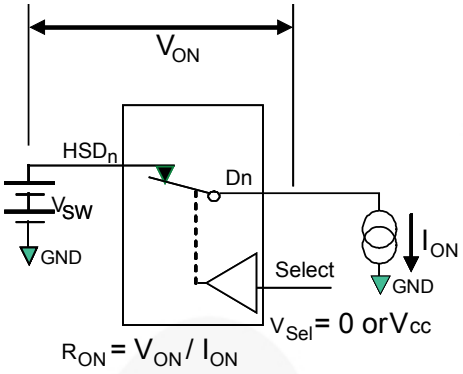
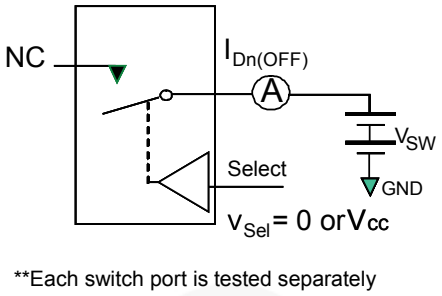
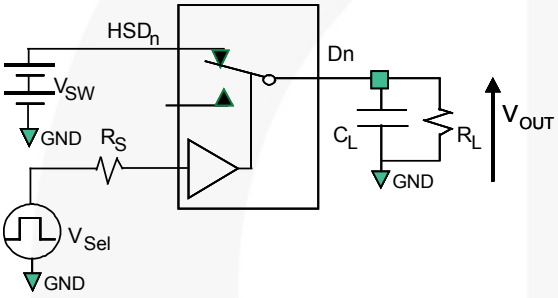


Figure 6. On Resistance



**Each switch port is tested separately

Figure 7. Off Leakage



R_L, R_S, and C_L are functions of the application environment (see AC Tables for specific values)
C_L includes test fixture and stray capacitance.

Figure 8. AC Test Circuit Load

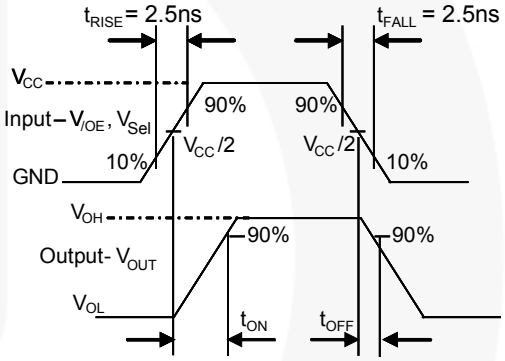


Figure 9. Turn-On / Turn-Off Waveforms

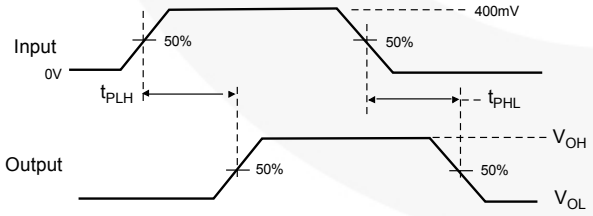


Figure 10. Propagation Delay ($t_R t_F$ – 500ps)

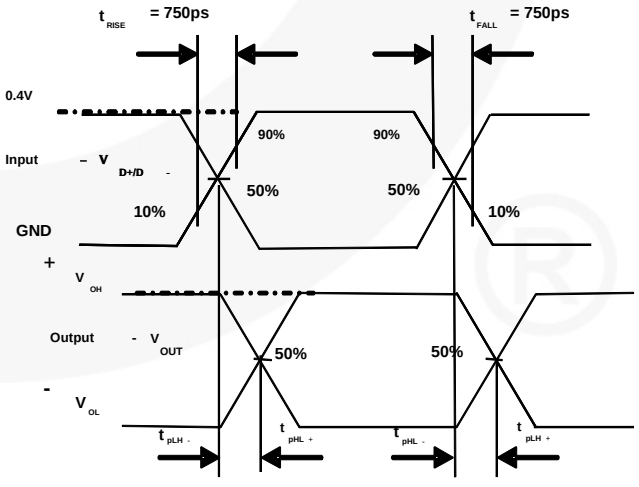
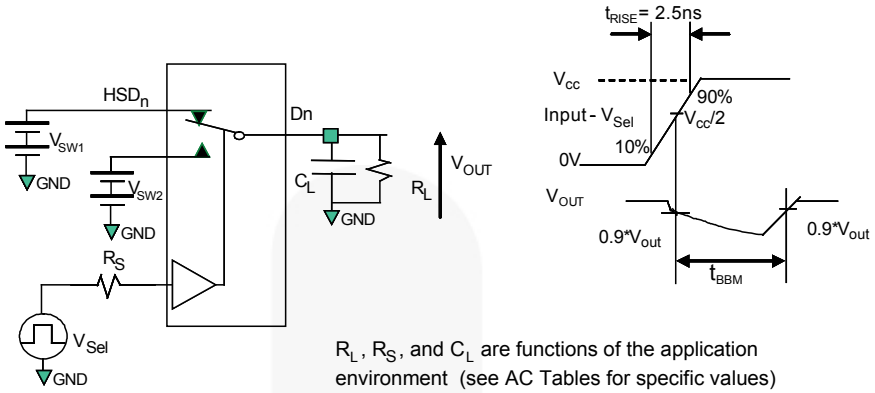


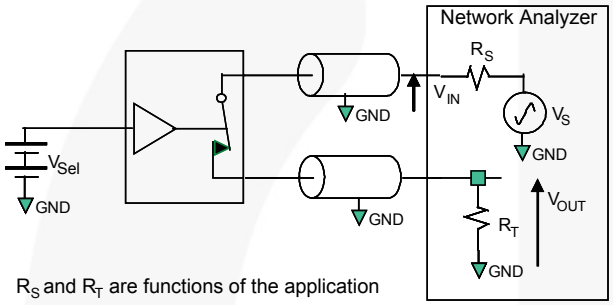
Figure 11. Skew Test Waveforms
$t_{SK(P)}$=| $t_{PLH-} - t_{PHL-}$ | or | $t_{PLH+} - t_{PHL+}$ |
$t_{SK(I)}$=| $t_{PLH-} - t_{PHL+}$ | or | $t_{PLH+} - t_{PHL-}$ |

Test Diagrams (Continued)



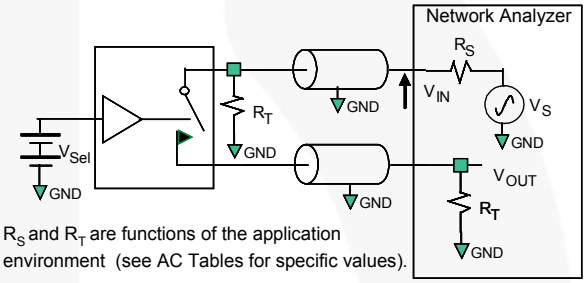
R_L, R_S, and C_L are functions of the application environment (see AC Tables for specific values)
C_L includes test fixture and stray capacitance.

Figure 12. Break-Before-Make Interval Timing



R_S and R_T are functions of the application environment (see AC Tables for specific values).

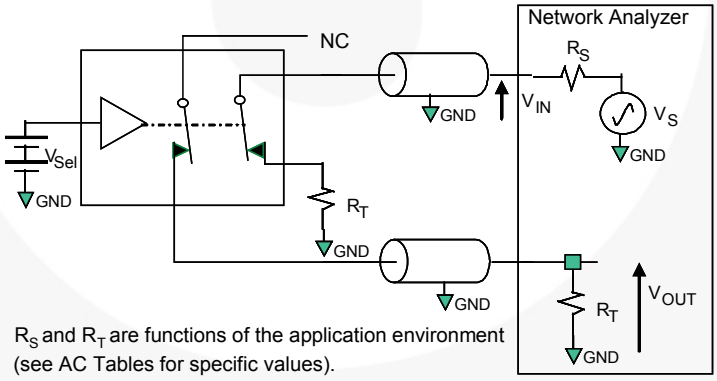
Figure 13. Bandwidth



R_S and R_T are functions of the application environment (see AC Tables for specific values).

Off isolation = 20 Log (V_{OUT} / V_{IN})

Figure 14. Channel Off Isolation



R_S and R_T are functions of the application environment (see AC Tables for specific values).

Crosstalk = 20 Log (V_{OUT} / V_{IN})

Figure 15. Non-Adjacent Channel-to-Channel Crosstalk

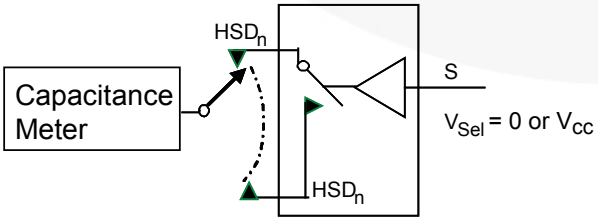


Figure 16. Channel Off Capacitance

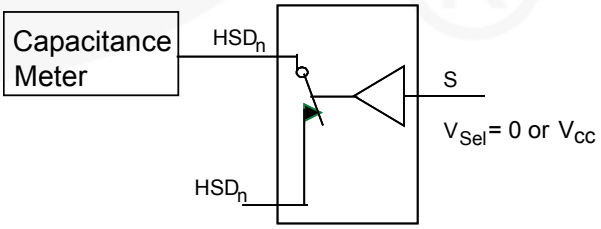
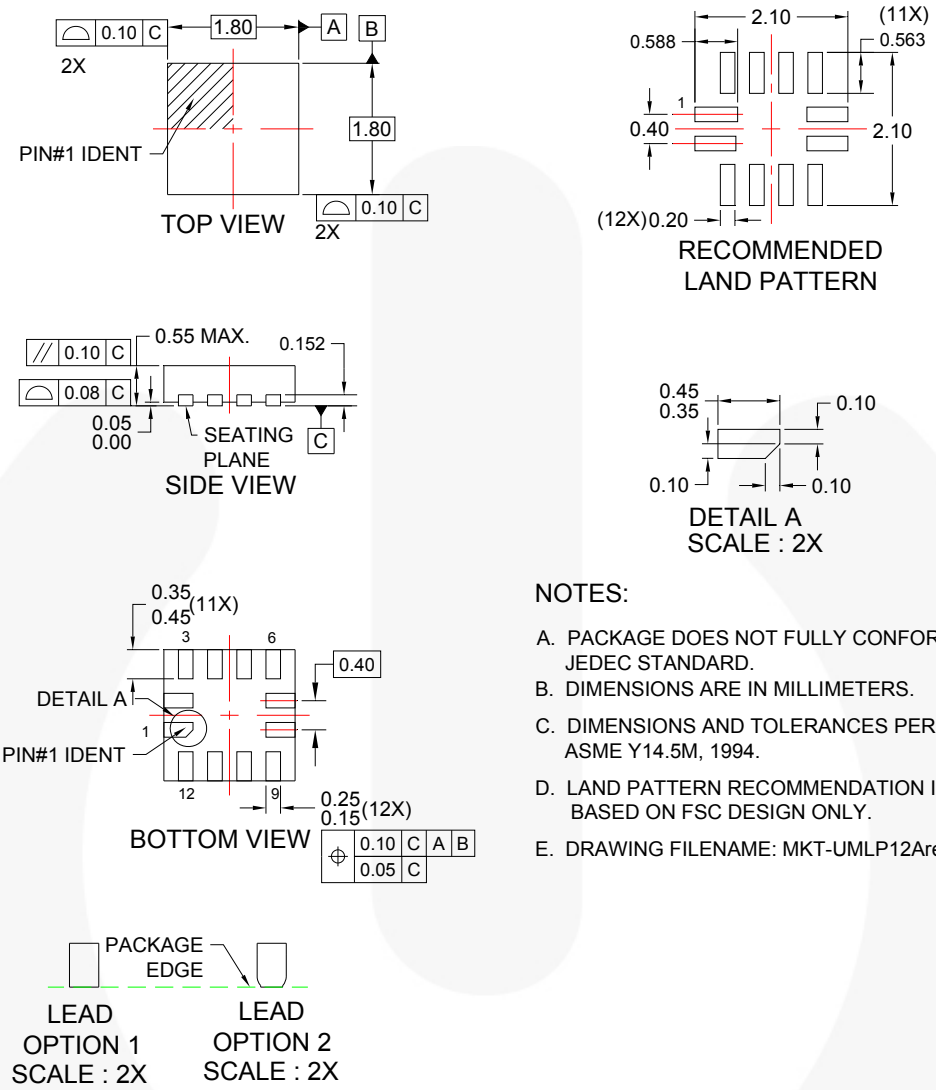


Figure 17. Channel On Capacitance

Physical Dimensions



NOTES:

A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC STANDARD.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY.
E. DRAWING FILENAME: MKT-UMLP12Arev4.

Figure 18. 12-Lead, Ultrathin Molded Leadless Package (UMLP)

Ordering Information

Part Number	Top Mark	Operating Temperature Range	Package
FSUSB63UMX	KG	-40 to +85°C	12-Lead, Quad, Ultrathin Molded Leadless Package (UMLP), 1.8mm x 1.8mm x 0.55mm, 0.4mm pitch

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/.

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™
FlashWriter®*
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®*
The Power Franchise®
the power franchise
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. I62

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

Mouser Electronics

Authorized Distributor

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

ON Semiconductor:

FSUSB63UMX

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