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November 2009

FSUSB11 — Low-Power, Full-Speed (12Mbps) Switch

Features

- Space Saving MicroPak[™] (1.6 x 2.1mm)
- USB 1.1 Signal Switching Compliant
- 3db Bandwidth: >350MHz
- Maximum 1.15 Ω R_{ON} at 4.5V V_{CC} and 4 Ω for 2.7V Supply
- 0.3Ω Maximum R_{ON} Flatness for +5V Supply
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Fast Turn-On and Turn-Off Time
- Break-Before-Make Enable Circuitry
- Over-Voltage Tolerant, TTL-Compatible Control Input

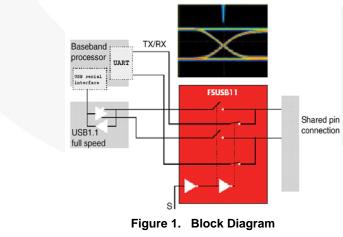
Applications

 Cell Phones, PDAs, Digital Cameras, Notebook Computers

Ordering Information

Operating 🥖 Eco Packing Part Number Temperature Package Method Status Range FSUSB11L10X -40 to +85°C RoHS 10-Lead, MicroPak™, JEDEC MO255,1.6 X 2.1mm Tape and Reel 14-Lead Thin Shrink Small Outline Package FSUSB11MTCX -40 to +85°C RoHS Tape and Reel (TSSOP), JEDEC MO-153, 4.4mm Wide

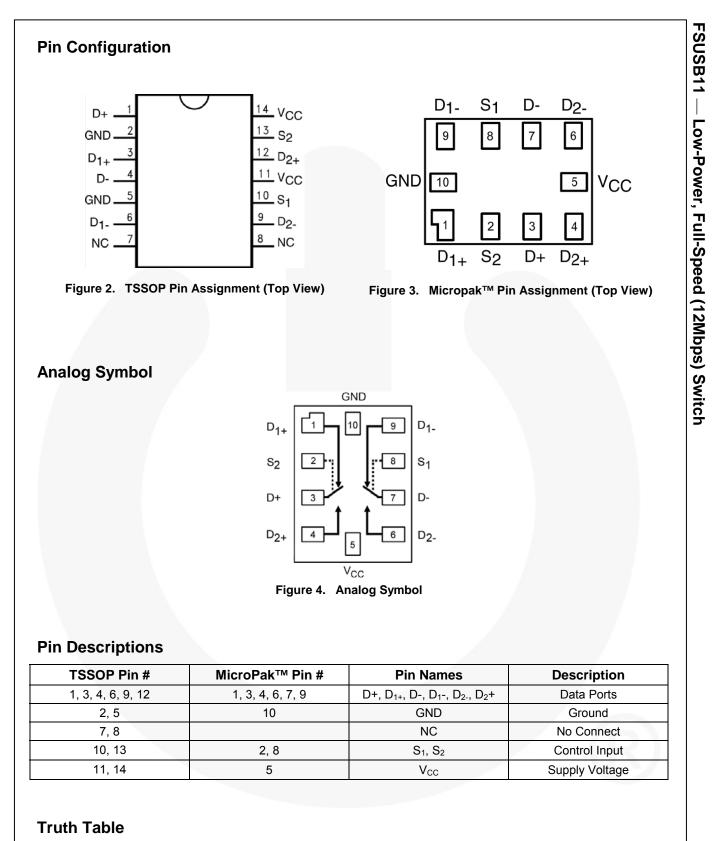
Ø For Fairchild's definition of Eco Status, please visit: <u>http://www.fairchildsemi.com/company/green/rohs_green.html</u>.



MicroPak[™] is a trademark of Fairchild Semiconductor Corporation.

Description

The FSUSB11 is a high-performance, dual Single-Pole Double-Throw (SPDT) switch designed for switching USB 1.1 signals. The device features ultra-low on resistance (R_{ON}) of 1.15 Ω maximum at 4.5V V_{CC} and 4.3 Ω at 2.7V supply. High bandwidth and ultra low (R_{ON}) make this switch able to pass both USB low- and full-speed signal with minimum signal distortion. The device is fabricated with sub-micron CMOS technology to achieve fast switching speeds and designed for breakbefore-make operation. The select input is TTL-level compatible.



Control InputsFunctionLow Logic LevelD1 Connected to D+/D-High Logic LevelD2 Connected to D+/D-

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	6.0	V
Vs	Switch Voltage	-0.5	V _{CC} + 0.5	V
V _{IN}	Input Voltage ⁽¹⁾	-0.5	6.0	V
I _{IK}	Input Diode Current	-50		mA
I _{SW}	Switch Current		200	mA
ISWPEAK	Peak Switch Current (Pulsed at 1ms Duration, <10% Duty Cycle)		400	mA
T _{STG}	Storage Temperature Range	-65	+150	°C
TJ	Maximum Junction Temperature		+150	°C
TL	Lead Temperature (Soldering, 10 Seconds)		+260	°C
ESD	Human Body Model, JESD22-A114		8	kV

Note:

1. The input and output negative voltage 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}	Power Supply	1.65	5.50	V
V _{IN}	Control Input Voltage ⁽²⁾	0	V _{CC}	V _{CC}
Vsw	Switch Input Voltage	0	Vcc	Vcc
T _A	Operating Temperature	-40	+85	°C

Note:

2. Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Unless otherwise specified, typical values are at +25°C.

Symbol	Paramete	ər	Conditions	V _{cc} (V)	т	_A =+25	°C	T _A =-40 to +85°C		Units	
-					Min.	Тур.	Max.	Min.	Max.		
VIH	Input Voltage High			2.7 to 3.6				2.0		V	
VIH	input voitage High			4.5 to 5.5				4.0		v	
VIL	Input Voltage Low			2.7 to 3.6						v	
VIL	input voltage Low			4.5 to 5.5						v	
I _{IN}	Control Input Leaka	ade	V _{IN} =0V to V _{CC}	2.7 to 3.6						μA	
•111	Control input Louite	.90		4.5 to 5.5						μ. ι	
I _{NO(OFF),} I _{NO(OFF)}	Off-Leakage Currer D ₁ and D ₂	nt of Port	A=1V, 4.5V, B ₀ or B ₁ =1V, 4.5V	5.5	-50		50	-100	100	nA	
I _{A(ON)}	On-Leakage Currer Port D	nt of	A=1V, 4.5V, B_0 or B ₁ =1V, 4.5V or Floating	5.5	50		50	-100	100	nA	
			Mieropoly	I _{OUT} = 100mA, D ₁ or D ₂ =1.5V	2.7		2.60	4.00		4.30	
R _{on}	Switch On	Micropak	I _{OUT} = 100mA, D ₁ or D ₂ =3.5V	4.5		0.95	1.15		1.30	Ω	
RON	Resistance ⁽³⁾	TSSOP	I _{OUT} = 100mA, D ₁ or D ₂ =1.5V	2.7		2.80			4.50	52	
		1330F	I _{OUT} = 100mA, D ₁ or D ₂ =3.5V	4.5		1.50			3.00		
	On Resistance	Micropak	I _{OUT} = 100mA,			0.06	0.12		0.15		
ΔR_{ON}	Matching Between Channel ⁽⁴⁾	TSSOP	$D_1 \text{ or } D_2=3.5V$	4.5		0.07			0.30	Ω	
P	On Resistance Flat	nooo ⁽⁵⁾	I _{OUT} =100mA, D ₁ or D ₂ =0V, 0.75V, 1.5V	2.7		1.4					
R _{FLAT(ON)}		ness	I _{OUT} =100mA, B ₀ or B ₁ =0V, 1V, 2V	4.5		0.2	0.3		0.4	Ω	
laa	Quiescent Supply (urrent	V _{IN} =0V or V _{CC} ,	3.6		0.1	0.5		1.0		
Icc	Quiescent Supply (I _{OUT} =0	5.5		0.1	0.5		1.0	μA	

Notes:

3. On resistance is determined by the voltage drop between D and Dn pins at the indicated current through the switch.

4. $\Delta R_{ON} = R_{ONmax} - R_{ONmin}$ measured at identical V_{CC}, temperature, and voltage.

5. Flatness is defined as the difference between the maximum and minimum value of on resistance over the specified range of conditions.

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AC Electrical Characteristics

Unless otherwise specified, typical values are at +25°C.

Symbol	Parameter Conditions		V _{cc} (V)	1	Γ _A =+25	°C		40 to 5°C	Units	Figure	
				Min.	Тур.	Max.	Min.	Max.			
	Turn-on Time	$D_1 \text{ or } D_2$ =1.5V, R _L =50 Ω , C _L =35pF	2.7 to 3.6			50		60	20	Figure F	
t _{on}	S-to-Bus B	$D_1 \text{ or } D_2$ =3.0V, R_L =50 Ω , C_L =35pF	4.5 to 5.5			35		30	ns	Figure 5	
	Turn-off Time	$D_1 \text{ or } D_2$ =1.5V, R_L =50 Ω , C_L =35pF	2.7 to 3.6			20		20		Figure F	
toff	S-to-Bus B	$D_1 \text{ or } D_2$ =3.0V, R _L =50 Ω , C _L =35pF	4.5 to 5.5			15			ns	Figure 5	
t _{ввм}	Break-Before-Make	$D_1 \text{ or } D_2$ =1.5V, R _L =50 Ω , C _L =35pF	2.7 to 3.6				1		ns	Figure 6	
цвви	Time	$D_1 \text{ or } D_2$ =3.0V, R _L =50 Ω , C _L =35pF	4.5 to 5.5		20		1		115	Tigure o	
		C _L =1.0nF,	2.7 to 3.6		20					F i 0	
Q	Charge Injection	V_{GEN} =0V, R_{GEN} =0 Ω	4.5 to 5.5		10				рС	Figure 8	
O _{IRR}	Off Isolation	f=1MHz, R _L =50Ω	2.7 to 3.6		-70				dB	Figure 7	
VIRR		1- 110112, IXL=3032	4.5 to 5.5		-70				ub	riguie /	
X _{TALK}	Non-Adjacent	f=1MHz, R _L =50Ω	2.7 to 3.6		-75				dB	Figure 7	
TIALK	Channel Crosstalk	1- HVII 12, INL-3002	4.5 to 5.5		-75				UD	i igule /	
BW	-3dB Bandwidth	RL=50Ω	2.7 to 3.6		350				MHz	Figure 10	
511		112-0022	4.5 to 5.5		350				101112	i iguic 10	

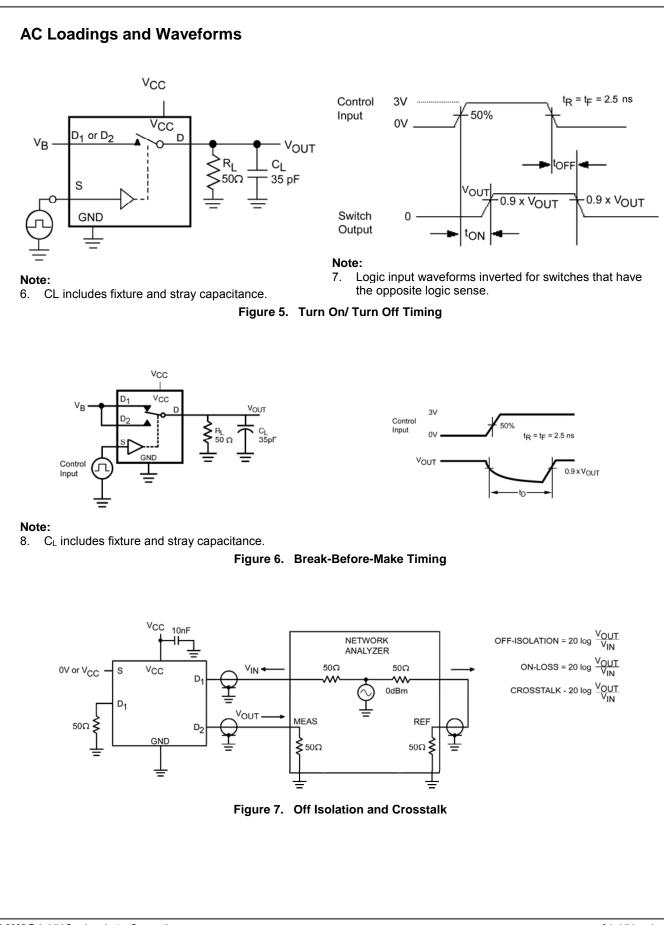
USB Related AC Electrical Characteristics

Unless otherwise specified, typical values are at 25°C.

Symbol	Deremeter	Conditions	V 00	T,	₄=+25°C	;	Units	Figure
Symbol	Parameter	Conditions	V _{cc} (V)	Min.	Тур.	Max.	Units	Figure
+	Skew	R _S =39, C _L =50pF, t _R =t _F =12ns	2.7 to 3.6		0.15		ns	Figure 11
t _{SK(O)}	Skew	at 12Mbps	4.5 to 5.5		0.15	1	115	Figure 11
+	Rising/Fall Time	(Duty Cyclo=50%)	2.7 to 3.6		30		ps	Figure 12
t _{SK(P)}	Mismatch	(Duty Cycle=50%)	4.5 to 5.5		20			
т.	Total littor	R _S =39, C _L =50pF, t _R =t _F =12ns at 12Mbps (PRBS=2 ¹⁵ 1)	2.7 to 3.6		1.7		20	Eiguro 12
TJ Total J	Total Jitter	12Mbps (PRBS=2 ¹⁵ 1)	4.5 to 5.5		1.6		ps	Figure 12

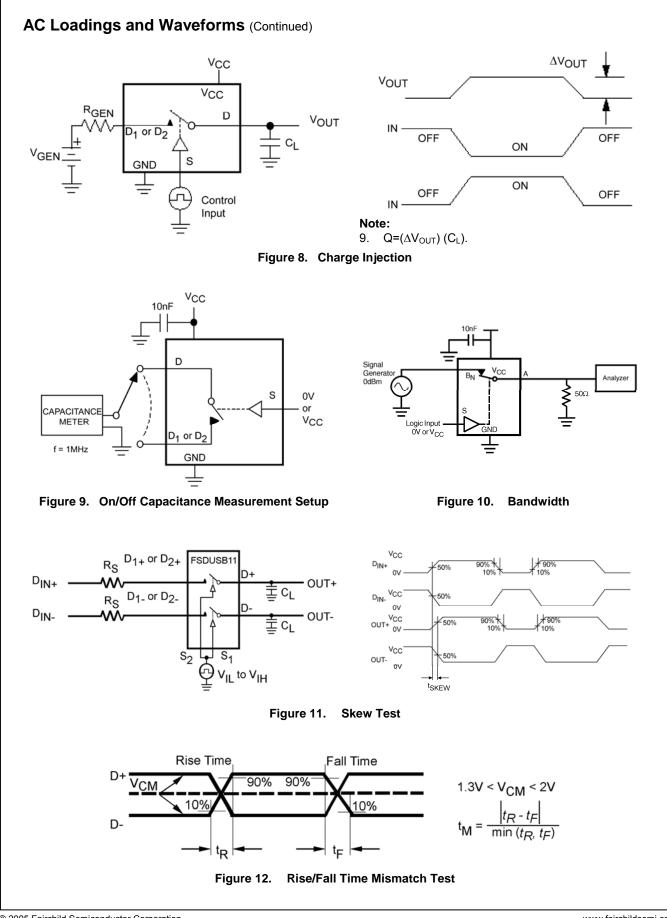
Capacitance

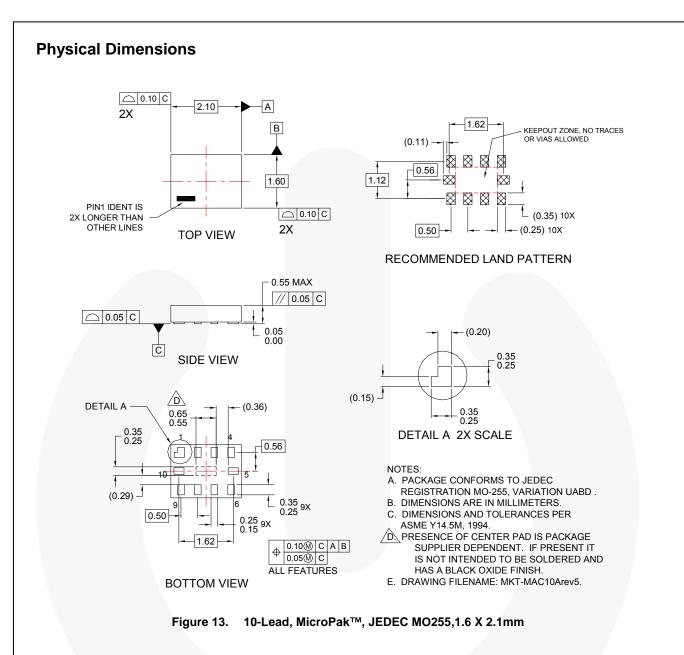
	D			T _A =+25°C		=+25°C		
Symbol	Parameter	Conditions	V _{cc} (V)	Min.	Тур.	Max.	Units	Figure
C _{IN}	Control Pin Input Capacitance	f=1MHz	0.0		3.5		pF	Figure 9
C _{OFF}	D _n Port Off Capacitance	f=1MHz	4.5		12.0		pF	Figure 9
CON	D Port On Capacitance	f=1MHz	4.5		40.0		pF	Figure 9



FSUSB11 — Low-Power, Full-Speed (12Mbps) Switch

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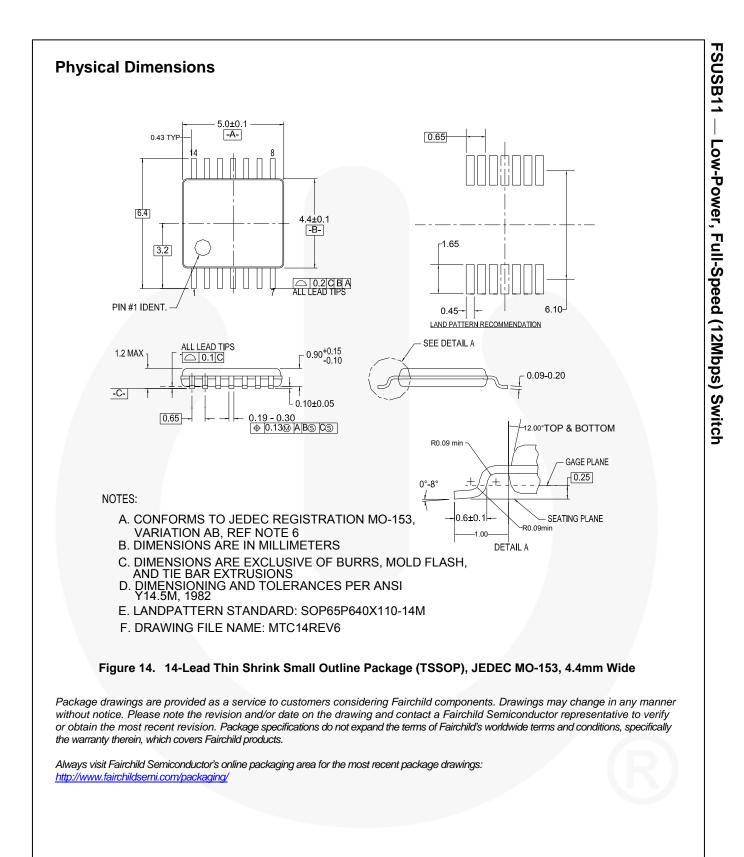
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings: <u>http://www.fairchildsemi.com/packaging/</u>.

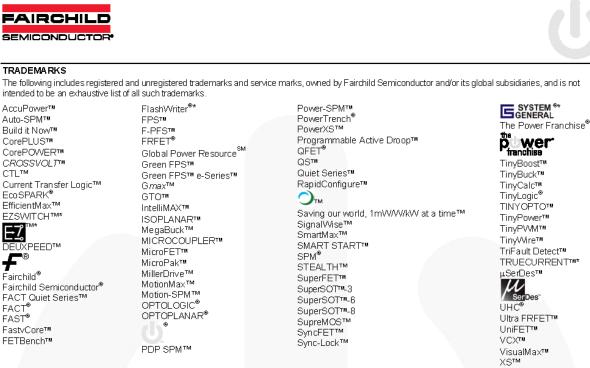
Tape and Reel Specification

Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: <u>http://www.fairchildsemi.com/products/logic/pdf/micropak_tr.pdf</u>.

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
	Leader (Start End)	125 (Typical)	Empty	Sealed
L10X	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

FSUSB11 — Low-Power, Full-Speed (12Mbps) Switch





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