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SEMICONDUCTOR

FSUSB11 Low Power Full Speed USB (12Mbps) Switch

General Description

The FSUSB11 is a high performance Dual Single Pole Double Throw (SPDT) switch specially designed for the switching of USB 1.1 signals. The device features ultra low R_{ON} of 1.3 Ω maximum at 4.5V V_{CC} and 4.3 Ω at 2.7V supply. High bandwidth and ultra low ON Resistance (R_{ON}) make this switch to be 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 is designed for break-beforemake operation. The select input is TTL level compatible.

April 2004

Revised July 2005

Features

- Space saving MicroPak[™] Pb-Free packaging (1.6mm x 2.1mm)
- USB 1.1 signal switching compliant
- –3db bandwidth: >350MHz
- Maximum 1.15Ω ON Resistance at 4.5V V_{CC} and 4Ω 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 Phone
- PDA
- Digital Camera
- Notebook ٠

Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
FSUSB11L10X	MAC010A	T ET	Pb-Free 10-Lead MicroPak, 1.6 mm x 2.1mm	5K Units on Tape and Reel
FSUSB11MTCX	MTC14	FSUSB11	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	2500 Units on Tape and Reel
FSUSB11MTCX_NL (Note 1)	MTC14	FSUSB11	Pb-Free 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	2500 Units on Tape and Reel

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Connection Diagrams

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100X.COM Pad Assignments for MicroPak

	D1-	S ₁	D-	D2-	
.CC	9	8	7	6	WW
GND	10			5	Vcc
oy.	1	2	3	4	V
NON	D ₁₊	S ₂	D+	D ₂₊	1
	V.C	Top V	iew)		

Analog Symbols



Truth Table

Control Input(s)	Function
	D1 Connected to D+/D-
H	D ₂ Connected to D+/D-
L H = HIGH Logic Level	T.M.

L = LOW Logic Level

Pin Descriptions

Pin Names	Function
D, D ₁ , D ₂	Data Ports
S	Control Input



胜特力电子(深圳 Http://www Absolute Maximum Ratings(Note 2)

Recommended Operating Conditions

Supply Voltage (V _{CC})	-0.5V to +6.0V
Switch Voltage (V _S) (Note 3)	-0.5V to V _{CC} + 0.5V
Input Voltage (VIN) (Note 3)	-0.5V to +6.0V
Input Diode Current	–50 mA
Switch Current	200 mA
Peak Switch Current (Pulsed at	
1 ms duration, <10% Duty Cycle)	400 mA
Storage Temperature Range (T _{STG})	-65°C to +150°C
Maximum Junction Temperature (T _J)	+150°C
Lead Temperature (T _L)	
Soldering, 10 seconds	+260°C
ESD	
Human Body Model	8000V

1.65V to 5.5V
0V to V _{CC}
0V to V _{CC}
-40°C to +85°C

FSUSB11

Note 2: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 3: The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed. Note 4: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics (All typical values are @ 25°C unless otherwise specified)

Symbol	Parameter	V _{cc}	т,	₄ = +25	°C	T _A = −40°C	to +85°C	Units	Conditions
Cymbol	, ununcter	(V)	Min	Тур	Max	Min	Max	onno	
VIH	Input Voltage High	2.7 to 3.6		-	1 M	2.0	COn	V	N N N
	100Y.	4.5 to 5.5		N		2.4		v	100
VIL	Input Voltage Low	2.7 to 3.6		-			0.6	V	NAN AN
	11001. M.	4.5 to 5.5		1	- 11	x1100	0.8	N.	1.W.1
IIN	Control Input Leakage	2.7 to 3.6			NV.	-1.0	1.0		N/ OV/to V/
	a 100 1. and	4.5 to 5.5				-1.0	1.0	μΑ	$v_{\rm IN} = 00$ to $v_{\rm CC}$
I _{NO(OFF)} , I _{NC(OFF)}	OFF-Leakage Current of Port D ₁ and D ₂	5.5	-50.0		50.0	-100	100	nA	A = 1V, 4.5V B ₀ or B ₁ = 1V, 4.5V
I _{A(ON)}	ON Leakage Current of Port D	5.5	-50.0		50.0	-100	100	nA	A = 1V, 4.5V B ₀ or B ₁ = 1V, 4.5V or Floating
R _{ON}	Switch ON Resistance	2.7	1	2.6	4.0		4.3		I _{OUT} = 100 mA, D ₁ or D ₂ = 1.5V
	MicroPak (Note 5)	4.5		0.95	1.15	N W	1.3		I _{OUT} = 100 mA, D ₁ or D ₂ = 3.5V
	Switch ON Resistance	2.7	7.1.	2.8		-1	4.5	\$2	I _{OUT} = 100 mA, D ₁ or D ₂ = 1.5V
	TSSOP (Note 5)	4.5	E.	1.5		NN	3.0	N	I _{OUT} = 100 mA, D ₁ or D ₂ = 3.5V
ΔR_{ON}	ON Resistance Matching Between Channels (Note 6) MicroPak	4.5	л.Т	0.06	0.12	WV	0.15	00	I_{OUT} = 100 mA, D ₁ or D ₂ = 3.5V
	ON Resistance Matching Between Channels (Note 6) TSSOP	4.5	M.	0.07			0.3		I_{OUT} = 100 mA, D_1 or D_2 = 3.5V
R _{FLAT(ON)}	ON Resistance Flatness	2.7	O.	1.4			NN.	0	$I_{OUT} = 100 \text{ mA}, D_1 \text{ or } D_2 = 0V, 0.75V, 1.5V$
	(Note 7)	4.5		0.2	0.3		0.4		$I_{OUT} = 100 \text{ mA}, B_0 \text{ or } B_1 = 0V, 1V, 2V$
I _{CC}	Quiescent Supply Current	3.6		0.1	0.5		1.0		
		5.5		0.1	0.5	r	1.0	μΑ	$v_{IN} = 0v$ or v_{CC} , $v_{OUT} = 0v$
Note 5: O	N Resistance is determined by the	ne voltage dro	op betwe	en D ar	nd D _n pi	ns at the indic	ated currer	t throug	h the switch.

Note 6: $\Delta R_{ON} = R_{ONmax} - R_{ONmin}$ measured at identical V_{CC}, temperature, and voltage.

Note 7: Flatness is defined as the difference between the maximum and minimum value of ON Resistance over the specified range of conditions.



AC E	Electrical Ch	naracte	eristics	6 (All ty	pical value	e are @ 25	5°C unl	ess otherwise specified)	
		V _{cc}	T _A = +	25°C	T _A =-40°	C to +85°C		1.	Figure
Symbol	Parameter	(V)	Min Ty	p Max	Min	Max	Units	Conditions	Number
ton	Turn ON Time	2.7 to 3.6	1001	50.0	ALL Y	60.0		$D_1 \text{ or } D_2 = 1.5 \text{V}, \text{ R}_L = 50 \Omega, \text{ C}_L = 35 \text{ pF}$	Figure 4
	-	4.5 to 5.5		35.0		40.0	ns	$D_1 \text{ or } D_2 = 3.0 \text{V}, \text{ R}_L = 50 \Omega, \text{ C}_L = 35 \text{ pF}$	Figure 1
tOFF	Turn OFF Time	2.7 to 3.6	x1 100	20.0		30.0		$D_1 \text{ or } D_2 = 1.5 \text{V}, \text{R}_\text{L} = 50 \Omega, \text{C}_\text{L} = 35 \text{ pF}$	Figure 1
		4.5 to 5.5		15.0		20.0	ns	$D_1 \text{ or } D_2 = 3.0 \text{V}, \text{R}_\text{L} = 50 \Omega, \text{C}_\text{L} = 35 \text{ pF}$	Figure 1
t _{B-M}	Break-Before-Make	2.7 to 3.6	N.IV	0.21	1.0			$D_1 \text{ or } D_2 = 1.5 \text{V}, \text{ R}_L = 50 \Omega, \text{ C}_L = 35 \text{ pF}$	Figure 2
	Time	4.5 to 5.5	20	0	1.0	W	ns	$D_1 \text{ or } D_2 = 3.0 \text{V}, \text{ R}_L = 50 \Omega, \text{ C}_L = 35 \text{ pF}$	Figure 2
Q	Charge Injection	2.7 to 3.6	20	0	CON		-0	C _L = 1.0 nF, V _{GEN} = 0V,	Figure 4
1.00	WT .	4.5 to 5.5	10	0			ρC	$R_{GEN} = 0\Omega$	Figure 4
OIRR	OFF-Isolation	2.7 to 3.6	-70	.0	CO)		dD		Figure 2
	WT.	4.5 to 5.5	-70	.0		1.1	αB	$I = IMHZ, R_L = 50\Omega$	Figure 3
Xtalk	Crosstalk	2.7 to 3.6	-75	.0	N C			(-
	TIM	4.5 to 5.5	-75	.0	1 × 1	M.	dB	$f = 1MHz, R_L = 50\Omega$	Figure 3
BW	-3db Bandwidth	2.7 to 3.6	35	0	1.0			D 500	F
	I.M.	4.5 to 5.5	35	0	N. C.		MHZ	$R_{L} = 50\Omega$	Figure 6

USB Related AC Electrical Characteristics

Symbol	Parameter	V _{cc}	NV	$T_A = +25^{\circ}C$		Unite	Conditions	Figure
Gymbol	rarameter	(V)	Min	Тур	Min	Onita	Conditions	Number
SKEW	Skew	2.7 to 3.6		0.15	1001		$R_S = 39\Omega, C_L = 50 \text{ pF}$	Figure 7
	COM	4.5 to 5.5		0.15		115	$t_R = t_F = 12ns$	Figure 7
м	Rising/Fall Time	2.7 to 3.6			10.0	0/	at 12Mbps	Figure 7
	Mismatch	4.5 to 5.5			10.0	%	(Duty Cycle = 50%)	Figure 7
J	Total Jitter	2.7 to 3.6		1.7	AT 10		$R_S = 39\Omega$, $C_L = 50$ pF, $t_R = t_F = 12$ ns at	Figure 7
	CON	4.5 to 5.5		1.6	N	ns	12Mbps (PRBS = 2 ¹⁵ - 1)	Figure 7

Capacitance

Symbol Parameter (V) Min Typ Max Onits Control No C _{IN} Control Pin Input Capacitance 0.0 3.5 pF f=1MHz (see Figure 5) C _{OFF} D _n Port OFF Capacitance 4.5 12.0 pF f=1MHz (see Figure 5) C _{ON} D Port ON Capacitance 4.5 40.0 pF f=1MHz (see Figure 5)	Symbol Parameter (V) Min Typ Max Onits Control Second Horis C _{IN} Control Pin Input Capacitance 0.0 3.5 pF f = 1MHz (see Figure 5) C _{OFF} D _n Port OFF Capacitance 4.5 12.0 pF f = 1MHz (see Figure 5) C _{ON} D Port ON Capacitance 4.5 40.0 pF f = 1MHz (see Figure 5)	Sumbol	Parameter	Vcc	-	$T_A = +25^{\circ}C$		Unito	Conditions
	C _{IN} Control Pin Input Capacitance 0.0 3.5 pF f = 1MHz (see Figure 5) C _{OFF} D _n Port OFF Capacitance 4.5 12.0 pF f = 1MHz (see Figure 5) C _{ON} D Port ON Capacitance 4.5 40.0 pF f = 1MHz (see Figure 5)	Symbol	Falalleter	(V)	Min	Тур	Max	Units	Conditions
	C _{OFF} D _n Port OFF Capacitance 4.5 12.0 pF f = 1MHz (see Figure 5) C _{ON} D Port ON Capacitance 4.5 40.0 pF f = 1MHz (see Figure 5)	C _{IN}	Control Pin Input Capacitance	0.0		3.5		pF	f = 1MHz (see Figure 5)
C _{ON} D Port ON Capacitance 4.5 40.0 pF f = 1MHz (see Figure 5)	C _{ON} D Port ON Capacitance 4.5 40.0 pF f = 1MHz (see Figure 5)	COFF	D _n Port OFF Capacitance	4.5		12.0		pF	f = 1MHz (see Figure 5)
WWW.100Y.COM.TW WWW.100Y.COM.TW	WWW.100Y.COM.TW WWW.100Y.COM.TW	C _{ON}	D Port ON Capacitance	4.5		40.0	- 1007	pF	f = 1MHz (see Figure 5)

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