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MSUSB30

Hi-Speed USB2.0 Double Pole Double Throw Analog Switch

1. Overview

MSUSB30 is a high-speed, low-power double-pole double-throw USB analog switch chip, its operating voltage range is

+1.8V to +4.3V. It has the characteristics of low inter-symbol skew, high channel noise isolation and large bandwidth.

The D+/D- ports are fault protected to +5.25V to prevent damage to the device if the switch is shorted to the USB bus power. The

main applications include: handheld devices with USB2.0 interface and consumer electronics such as mobile phones, digital

cameras, notebook computers, etc.

Features 1)

Typical value of on-resistance at 3V is 4.5ÿ 2)

Typical value of inter-symbol offset is 50ps 3) Low

operating voltage: +1.8V to +4.3V 4) Fast switching

speed: On time: 10ns off time : 22ns 5) Crosstalk is

-41dB at 250MHz 6) When V+=0V, D+/D- ports

can withstand 5.25V power failure protection 7)

Channel isolation is -41dB at 250MHz 8) Rail-to-rail

input and output Operating range 9) Industrial temperature

range 10) MSOP-10, QFNWB package
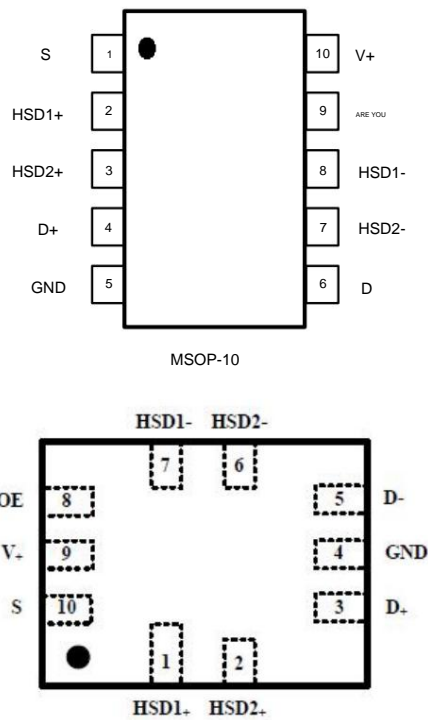
MSOP-10

·Product specification classification

product	Package form	print name
MSUSB30	MSOP-10	MSUSB30
MSUSB30N	QFNWB	7222

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·Pin description

pin number		name	Pin Description
MSOP-10	QFNWB		
10	9	V+	power supply
5	4	GND	land
1	10	S	alternative
9	9	ARE YOU	output enable
2,3,8,7,4, 6	1ÿ2ÿ6ÿ7ÿ 3ÿ5	HSD1+, HSD2+, HSD1-, HSD2-, D+, D	data terminal

·Functional block diagram
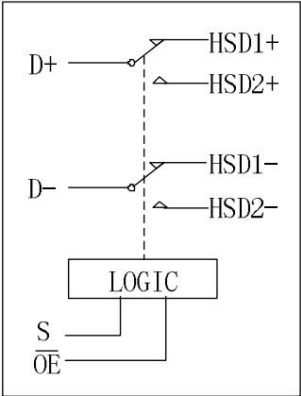
·Menu

ARE YOU	S	HSD1+ ÿHSD1-	HSD2+ ÿHSD2-
0	0	turn on	shut down
0	1	shut down	turn on
1	X	shut down	shut down

2. Characteristics

·Limit parameters

Input, supply voltage range	-0V to +4.6V
Analog, digital voltage range	-0V to +4.6V
Data terminal maximum current	±100mA
Data terminal maximum peak current	±100mA

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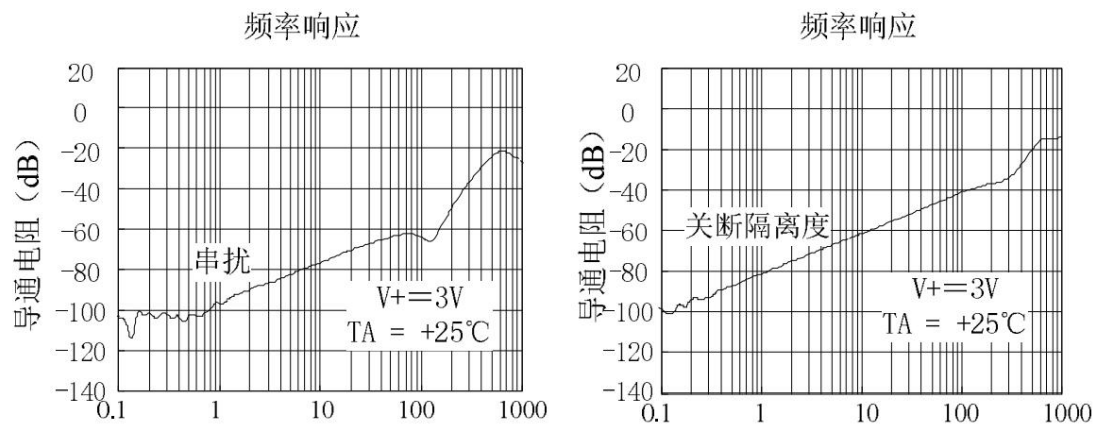| range of working temperature | -40ÿ to +85ÿ |
Maximum Junction Temperature	+150ÿ
Storage temperature range	-65ÿ to +150ÿ
Maximum lead temperature (soldering, 10s)	+260ÿ
ESD voltage:	
human body model	4000V
machine mode	400V

·Electrical parameters

(V+ = +1.8V to +4.3V, GND = 0V, VIH = +1.6V, VIL = +0.5V, TA = -40°C to +85°C. Typical

Type value is at V+ = +3.3V, TA = +25ÿ, other cases see note)

parameter	symbol	condition	Temperature °C	Min	Typ	Max	Unit	
analog switch								
analog input output voltage	VIS		-40ÿ85	0		V+	V	
On-resistance RON		Test circuit 1, V+=3.0V, VIS=0ÿ0.4V, ID=8mA	+25		4.5	8.5	Oh	
			-40ÿ85			9		
Conduction between channels Resistor matching	ÿRON	Ditto	+25		0.15	0.6	Oh	
			-40ÿ85			1.6		
On-resistance level Tandu	RFLAT(ON)	Test circuit 1, V+=3.0V, VIS=0ÿ1.0VÿID=8mA	+25		1.5	2.0	Oh	
			-40ÿ85			2.6		
Power-off leakage current ÿD+,D-ÿ	IOFF	V+ = 0V,VD = 0ÿ3.6 V, VS , VOE = 0 or 3.6 V	-40ÿ85			1	uA	
different control power press down ICC current Incremental	ICCT	V+=3.6V, VS, VOE =2.6 V	-40ÿ85			5	uA	
port disconnect drain current	IHSD2(OFF) IHSD1(OFF)	V+=3.6V, VIS = 3.3V/ 0.3V, VD= 0.3V/ 3.3V	-40ÿ85			1	uA	
On leakage current	IHSD2(ON) IHSD1(ON)	V+=3.6V, VIS = 3.3V/ 0.3V, VD= 3.3V/ 0.3V or floating	-40ÿ85			1	uA	

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digital input							
Input high level VIH			-40ÿ85 1.6				IN
Input low level VIL			-40ÿ85			0.5 V	
Input leakage current IIN		V+ = 3.0V, VS , VOE = 0 or V+	-40ÿ85			1	uA
Dynamic parameters							
On time tON		Test circuit 2, VIS = 0.8V, RL = 50ÿ,	+25		10		ns
OFF time tOFF		CL = 10pF	+25		22		ns
break-before-make time between	tD	Test circuit 3, VIS = 0.8V, RL = 50ÿ, CL = 10pF	+25		4		ns
Propagation delay tPD		RL = 50ÿ, CL = 10pF	+25		0.3		ns
Off isolation OISO		Test Circuit 4, Signal Amplitude Degree 0dBm, RL = 50ÿ, f = 250MHz	+25		-35		dB
Channel-to-channel crosstalk XTALK		Test Circuit 5, Signal Amplitude Degree 0dBm, RL = 50ÿ, f = 250MHz	+25		-41		dB
-3dB bandwidth BW		Test Circuit 6, Signal Amplitude Degree 0dBm, RL = 50ÿ, CL = 5pF	+25		550		MHz
Channel-to-channel skew tSKEW		RL = 50ÿ, CL = 10pF	+25				ns
select end-to-male with I/O charge injection	Q	Test circuit 7, VG = GND, CL = 1.0nF, RG = 0ÿ, Q = CL x*VOUT	+25			11	pC
HSDÿHSD-ÿ D+ÿD On Capacitance	WITH		+25				pF
Power consumption parameters							
voltage	V+		-40ÿ85 1.8			4.3 V	
current	I+	V+ = 3.0V, VS , VOE = 0V or V+	-40ÿ85			1	uA

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·Typical performance curve
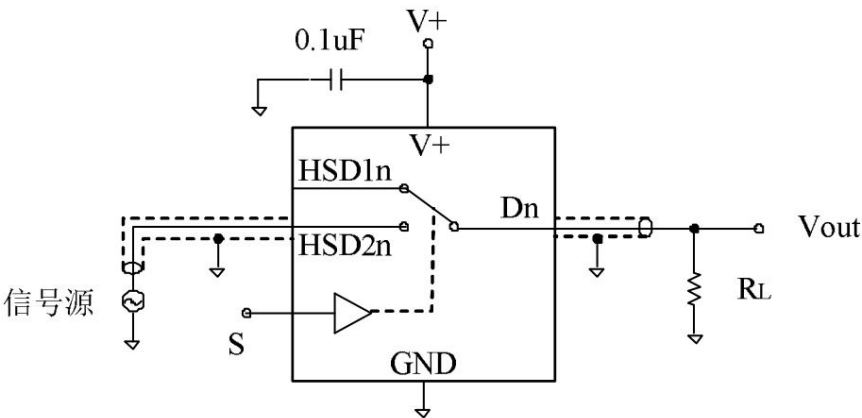
频率响应

频率响应
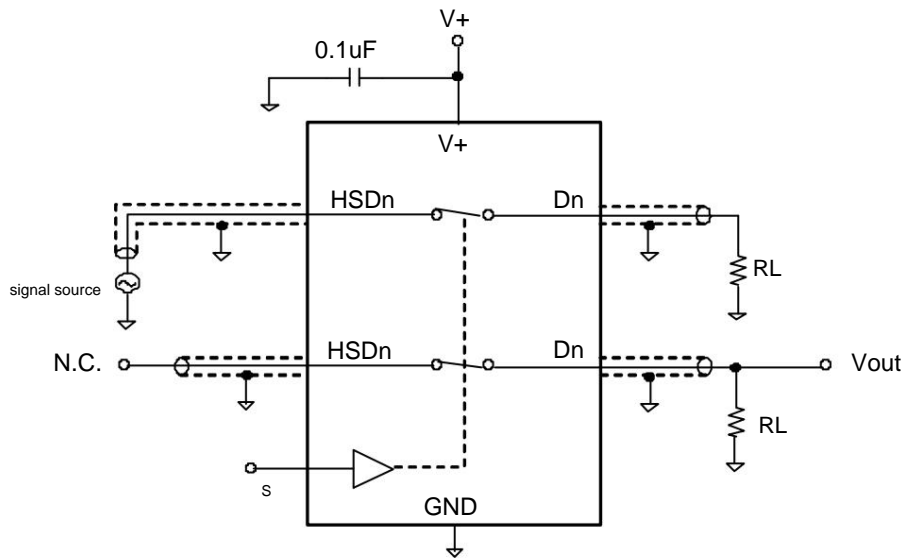

3. Test circuit

$$Ron＝V1/8mA$$
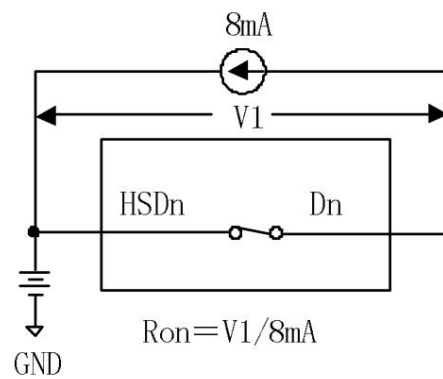
测试电路1.导通电阻
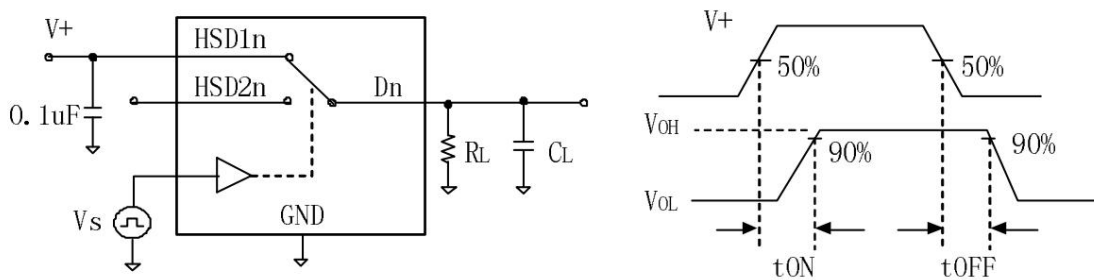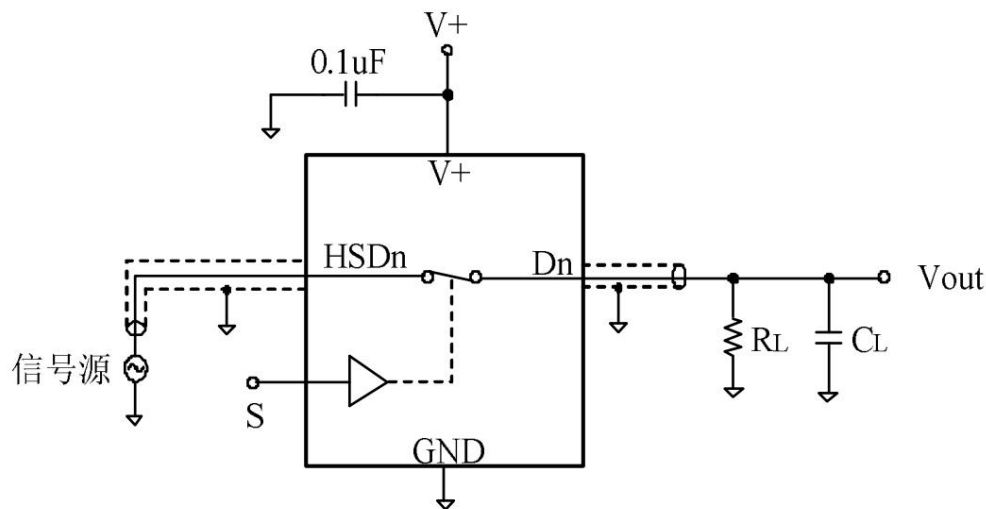

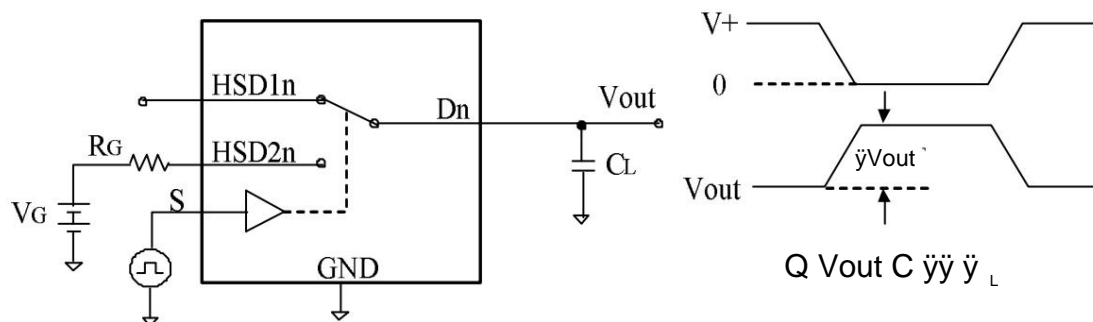测试电路2. 开关时间
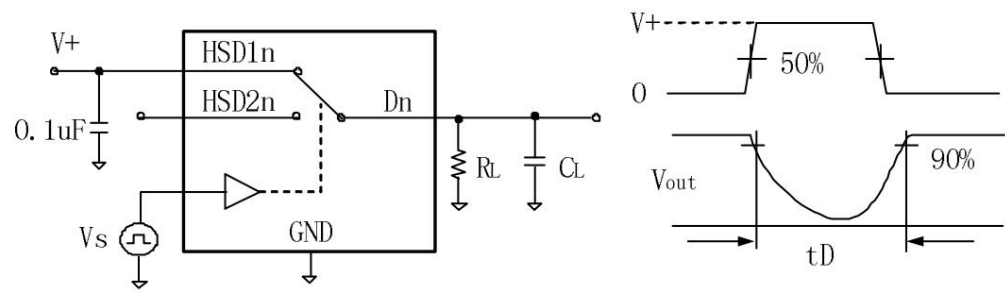
测试电路3. 先断后通时间tD

测试电路4. 关断隔离度

Crosstalk between channels $20 \log \dfrac{IN_{HSDn}}{IN_{out}}$

Test Circuit 5. Channel-to-Channel Crosstalk

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测试电路6. -3dB带宽

测试电路7. 电荷注入（Q）

Q Vout C ÿÿ ÿ L

4. Application Guide

1) Comply with USB 2.0 Vbus short circuit requirements

Section 7.1.1 of the USB 2.0 specification states that a USB device must withstand a short between Vbus and D+ or D- when

powered down or powered up. MSUSB30 can be successfully set up to fully meet the above two requirements. 2) Power loss

protection For Vbus short circuit, the switch is expected to withstand at least 24 hours under this condition. The MSUSB30 has specially

designed circuitry to prevent accidental signal passage while maintaining system reliability under undervoltage and overvoltage

conditions. This protection circuit has been added to the common ports (D+, D-). 3) Power-on protection The USB 2.0 specification

also stipulates that USB devices can withstand Vbus short-circuits when transmitting data. In the event of overvoltage, this

improvement limits the current flowing back to the VCC rail, keeping the current within a safe operating range. In this application, the

switch can pass an input signal of 5.25V to the selected output, while the unselected pins maintain the specified open isolation
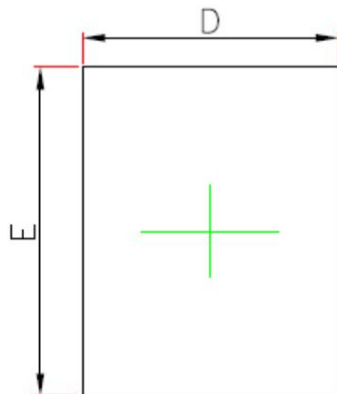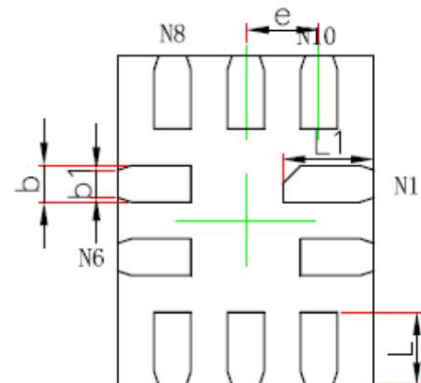
state.

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4. Package diagram

MSOP—10ÿ
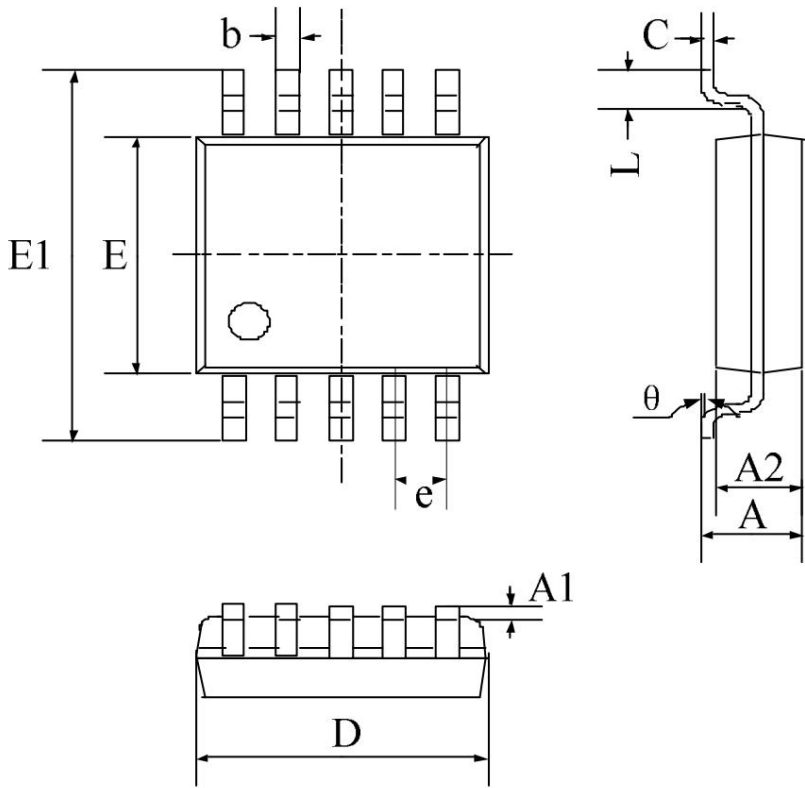
symbol	Dimensions (mm)	
	minimum	maximum value
A	0.800	1.200
A1	0.000	0.200
A2	0.760	0.970
b	0.30 TYPE	
c	0.152 TYPE	
D	2.900	3.100
and	0.50 TYPE	
AND	2.900	3.100
E1	4.700	5.100
L	0.410	0.650
i	0°	6°

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QFNWBÿ

TOP VIEW

BOTTOM VIEW
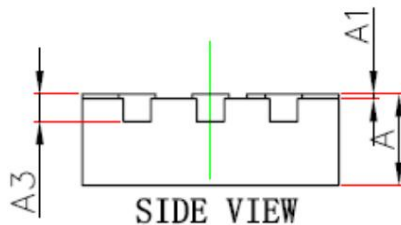
SIDE VIEW

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.550	0.650	0.022	0.026
A1	0.000	0.050	0.000	0.002
A3	0.152REF.		0.006REF.	
D	1.350	1.450	0.053	0.057
E	1.750	1.850	0.069	0.073
D1	—	—	—	—
E1	—	—	—	—
k	—		—	
b	0.150	0.250	0.006	0.010
b1	0.100	0.200	0.004	0.008
e	0.400TYP.		0.016TYP.	
L	0.350	0.450	0.014	0.018
L1	0.450	0.550	0.018	0.022