
High-Speed USB2.0 (480 Mbps) DPDT Switch With Single Enable

UM7222B QFN10 1.8×1.4

1 Description

The UM7222B is a high-speed, double-pole/ double-throw DPDT, low-power data switch optimized for USB 2.0 signal switching. The device multiplexes differential outputs from a USB host device to one of two corresponding outputs, or from two different hosts to one corresponding output. The switch is bidirectional and offers little or no attenuation of the high-speed signals at the outputs. It handles bidirectional signal flow, achieving a 550 MHz -3dB bandwidth, and a port to port crosstalk and isolation at -50dB at 250MHz.

The UM7222B operates from a single 1.65V to 5.5V supply, with current consumption less than 1 μ A. Its high channel-to-channel crosstalk rejection results in minimal noise interface. Its bandwidth is wide enough to pass high-speed USB 2.0 differential signals (480Mbps). The control logic threshold is guaranteed to be compatible with 1.8V logic.

The UM7222B is available in Pb-free QFN10 package (1.4mm×1.8mm×0.55mm). The device is ideal for handset and consumer applications, such as cell phones, digital cameras, and notebooks with hubs or controllers with limited USB I/Os.

2 Applications

- Differential Signal Data Routing
- USB2.0 Signal Routing
- Portable Electronics
- Consumer Products

3 Features

- Power Supply: 1.65V to 5.5V
- D+ and D- pins tolerate up to 5.5V
- 1.8V compatible control-pin inputs
- R_{ON} is Typically 9Ω at $V_{CC}=3.0V$
- Low Bit-to-Bit Skew: 50ps (Typ)
- -3dB Bandwidth: 550MHz (Typ)
- Power OFF Protection:
When $V_{CC}=0V$, D+ and D- can Tolerate up to 5.5V
- Low Crosstalk: -50dB (250MHz)
- Low Current Consumption: < 1 μ A
- Low Propagation Delay: 1.3ns
- ESD Rating: $\pm 8kV$ all pins
- QFN10 1.8×1.4 Package

4 Ordering Information

Part Number	Packaging Type	Marking Code	Shipping Qty
UM7222B	QFN10 1.8×1.4	AC	3000pcs/7 Inch Tape & Reel

5 Pin Configuration and Function

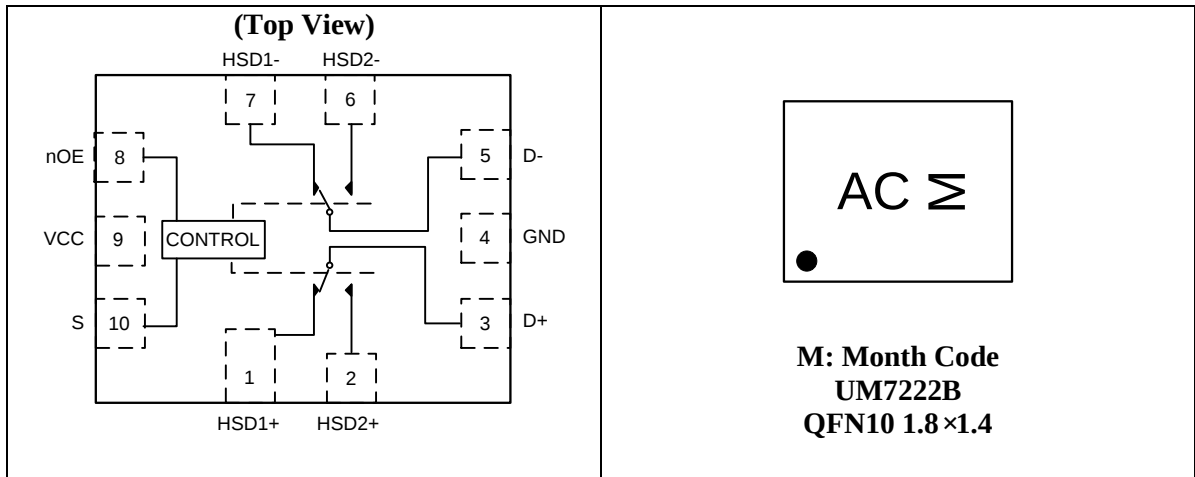


Table 5-1. Pin Functions

Pin No.	Pin Name	Function
1	HSD1+	Data Ports
2	HSD2+	Data Ports
3	D+	Data Ports
4	GND	Ground Connection
5	D-	Data Ports
6	HSD2-	Data Ports
7	HSD1-	Data Ports
8	nOE	Output Enable
9	VCC	Positive Supply Voltage
10	S	Select Input

6 Function Table

nOE	S	HSD1+, HSD1-	HSD2+, HSD2-
1	X	OFF	OFF
0	0	ON	OFF
0	1	OFF	ON

7 Absolute Maximum Ratings

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CC}	Supply Voltage		-0.5		6.5	V
V _{IS}	Analog Switch Input Voltage		-0.5		6.5	V
V _{IN}	Digital Select Input Voltage		-0.5		6.5	V
V _{ESD}	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001	All pins		±8		kV
I _D	Continuous DC Current			50		mA
P _D	Power Dissipation			0.5		W
T _A	Operating Temperature Range		-40		125	℃
T _{STG}	Storage Temperature Range		-65		150	℃

8 DC Electrical Characteristics (Note 1)

Symbol	Parameter	Test Conditions	V _{CC} (V)	Temp	Limits (-40 ℃ to 125 ℃)			Unit
					Min	Typ	Max	
I _{IN}	Input Leakage Current	0 ≤ V _{IS} ≤ V _{CC}	3.6	Full	-1.0		1.0	μA
I _{OFF}	Power Off Leakage Current	0 ≤ V _{IS} ≤ V _{CC}	0	Full	-1.0		1.0	μA
I _{CCT}	Increase in I _{CC} per Control Voltage	V _{IN} =2.6V	3.6	Full			10	μA
I _{OZ}	OFF State Leakage Current	0 ≤ V _{IS} ≤ V _{CC}	3.6	Full	-1.0		1.0	μA
I _{CC}	Quiescent Supply Current	V _{IS} =V _{CC} or GND	3.6	Full			1.0	μA
V _{IH}	Input High Voltage		3.0 to 3.6	Full	1.3			V
V _{IL}	Input Low Voltage		3.0 to 3.6	Full			0.5	V
V _{IK}	Clamp Diode Voltage	I _{IS} =-18mA	3.0	Full			-1.2	V
R _{ON}	On-Resistance (Note 2)	V _{IS} =0 to 0.4V I _D =8mA	3.0	Full		9	14	Ω
ΔR _{ON}	On Resistance Match Between Channels (Note 2, 3)	V _{IS} =0 to 0.4V I _D =8mA	3.0	Full		0.35		Ω
R _{FLAT}	On Resistance Flatness (Note 2, 3)	V _{IS} =0 to 1.0V I _D =8mA	3.0	Full		4.5		Ω

Note 1: Typical values are at V_{CC}=3.3V and T_A=+25 ℃.

Note 2: Guaranteed by design. Resistance measurements do not include test circuit or package resistance.

Note 3: Parameter is characterized but not tested in production.

9 AC Electrical Characteristics (Note 1)

Symbol	Parameter	Test Conditions	V _{CC} (V)	Temp	Limits (-40 °C to 125 °C)			Unit
					Min	Typ	Max	
t _{ON}	Turn On Time	V _{IS} =0.8V	3.0 to 3.6	Full		27	40	ns
t _{OFF}	Turn Off Time	V _{IS} =0.8V	3.0 to 3.6	Full		40	55	ns
t _{BBM}	Break Before Make Time (Note 2)	V _{IS} =0.8V	3.0 to 3.6	Full		18	25	ns
t _{PD}	Propagation Delay	C _L =10pF	3.0 to 3.6	Full		1.3		ns
t _{SK(O)}	Channel to Channel Skew	C _L =10pF	3.0 to 3.6			0.05		ns
O _{IRR}	Off Isolation	R _L =50Ω, f=250MHz	3.0 to 3.6	Full		-25		dB
X _{TALK}	Crosstalk	R _L =50Ω, f=250MHz	3.0 to 3.6	Full		-35		dB
BW	-3dB Bandwidth	R _L =50Ω	3.0 to 3.6	Full		550		MHz
Capacitance								
C _{IN}	Control Pin Input Capacitance (Note 3)	V _{CC} =0V				2.5		pF
C _{OFF}	HSD+, HSD- Off Capacitance (Note 3)	V _{CC} =V _{IS} =3.3V, nOE=3.3V				4.5		pF
C _{ON}	HSD+, HSD- ON Capacitance (Note 3)	V _{CC} =3.3V, nOE=0V				12		pF

Note 1: Typical values are at V_{CC}=3.3V and T_A=+25 °C.

Note 2: Guaranteed by design.

Note 3: T_A=+25 °C, f=1MHz, Capacitance is characterized but not tested in production.

10 Typical Performance Characteristics

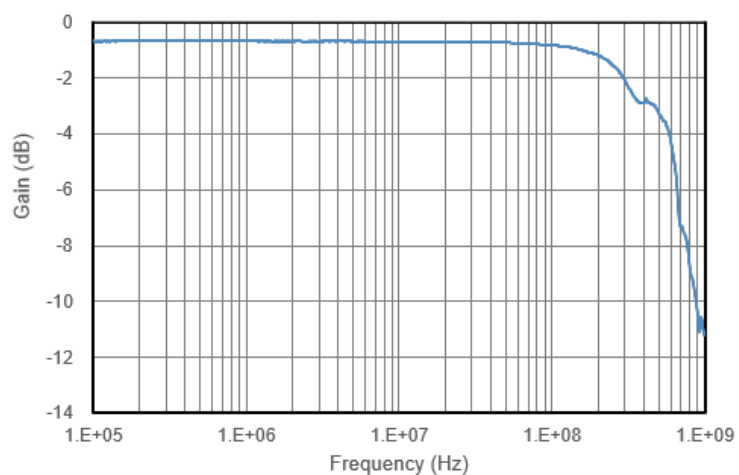


Figure 10-1. Gain vs Frequency

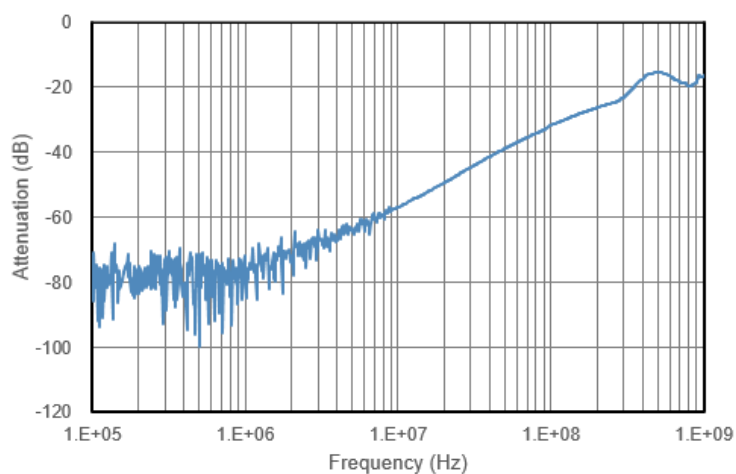


Figure 10-2. OFF Isolation

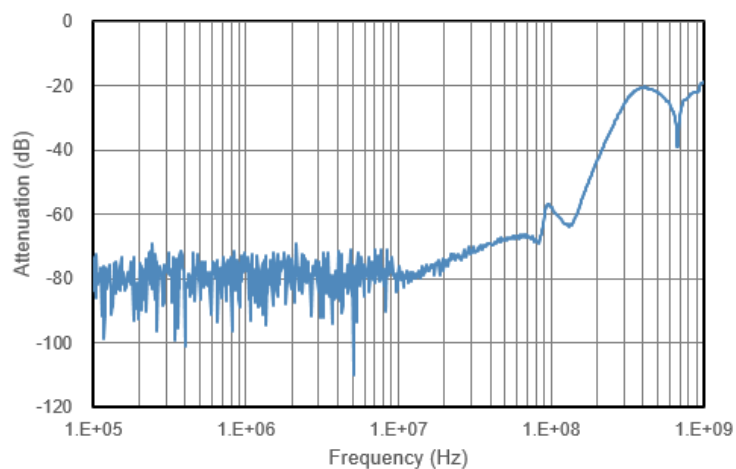


Figure 10-3. Crosstalk

11 Applications Information

11.1 Power-Off Protection

For a VBUS short circuit, the switch is expected to withstand such a condition for at least 24 hours. The UM7222B has specially designed circuitry which prevents unintended signal bleed through as well as guaranteed system reliability during a power-down, over-voltage condition. The protection has been added to the common pins (D+, D-).

11.2 Power-On Protection

The USB 2.0 specification also notes that the USB device should be capable of withstanding a VBUS short during transmission of data. This modification works by limiting current flow back into the V+ rail during the over-voltage event so current remains within the safe operating range. In this application, the switch passes the full 5.25V input signal through to the selected output while maintaining specified off isolation on the un-selected pins.

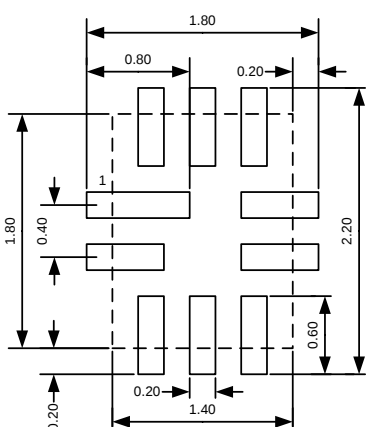
Package Information

QFN10 1.8×1.4

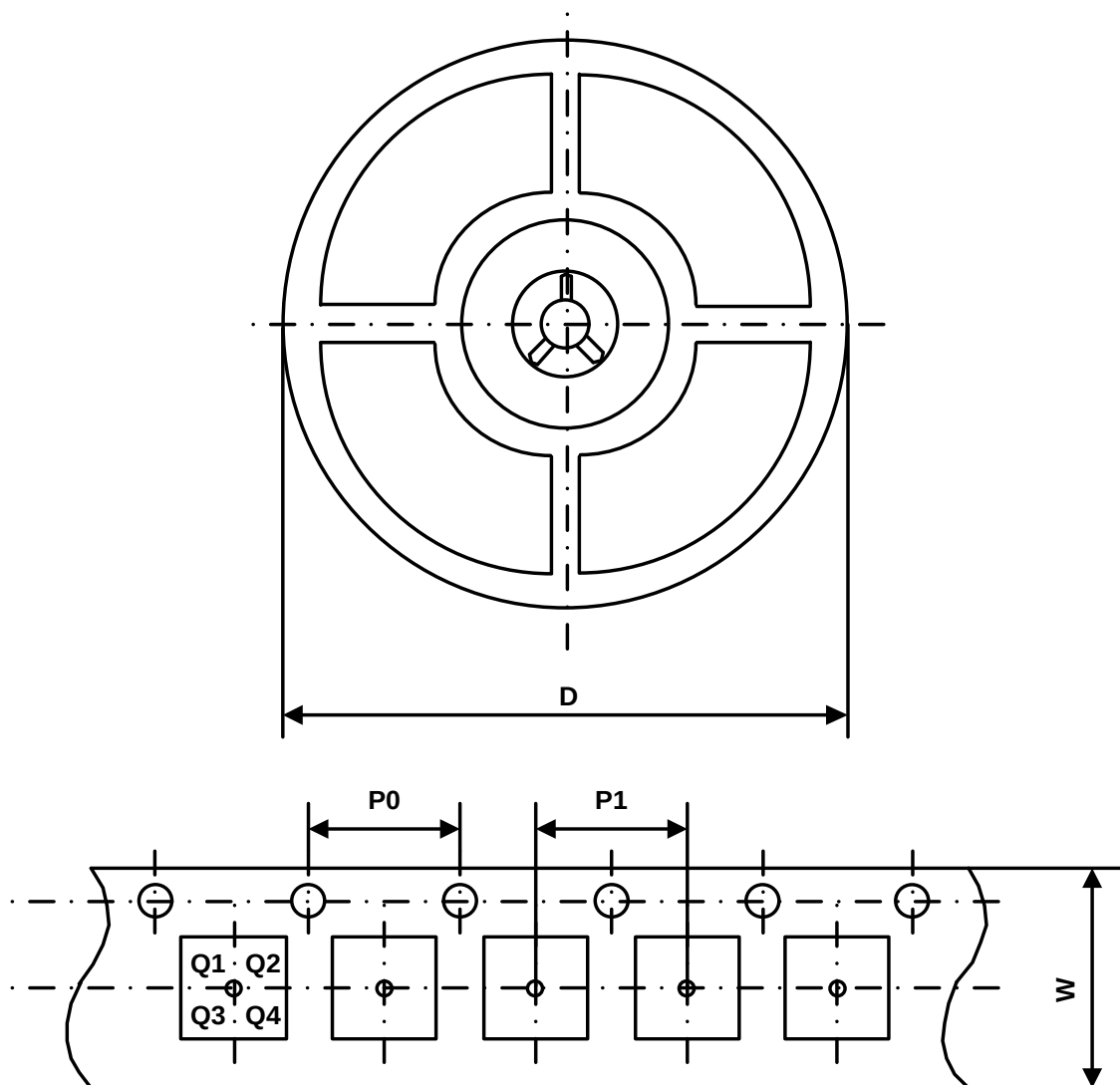
Outline Drawing

DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.40	-	0.60	0.016	-	0.024
A1	0.00	-	0.05	0.000	-	0.002
A3	0.15REF			0.006REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.30	1.40	1.50	0.052	0.056	0.060
E	1.70	1.80	1.90	0.068	0.072	0.076
e	0.40BSC			0.016BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020
L1	0.40	0.50	0.60	0.016	0.020	0.024

Land Pattern

	NOTES: 1. Unit: mm; 2. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified; 3. The layout is just for reference.
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Packing Information



Part Number	Package Type	Carrier Width (W)	Pitch (P0)	Pitch (P1)	Reel Size (D)	PIN 1 Quadrant
UM7222B	QFN10 1.8×1.4	8 mm	4 mm	4 mm	180 mm	Q1

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