

USB Type-A Power Switch and Charging Controller Selector Guide

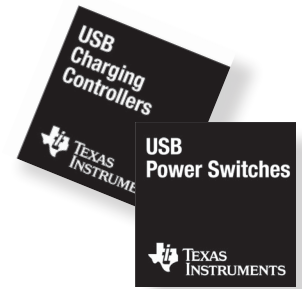


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1&2 Channels, 4.5 - 5.5 V USB Switches

Channels	Rated Current Amps	Enable Polarity	Output Discharge	SOIC	MSOP DGN PowerPAD™	MSOP DGK	SOT-23	SON DRC	
1	0.5	L	Y				TPS2041CDBV		
		H	Y				TPS2051CDBV		
	1	L	Y			TPS2061CDGN		TPS2061CDBV	
			N			TPS2065CDGN		TPS2065CDBV TPS2065DDBV	
		H	Y			TPS2065CDGN-2		TPS2065CDBV-2	
	1.5	L	Y			TPS2068CDGN			
			N			TPS2069CDGN		TPS2069CDBV TPS2069DDBV	
	2	L	Y			TPS2000CDGN	TPS2000CDGK		
H			Y		TPS2001CDGN	TPS2001CDGK			
2	0.5	H	Y		TPS2052CDGN				
		L	Y		TPS2062CD	TPS2062CDGN			
	N							TPS2062CDRB-2	
	1	H	Y		TPS2066CD	TPS2066CDGN			
			N			TPS2066CDGN-2			
	1.5	L	Y			TPS2060CDGN			
			H	Y		TPS2064CDGN			
	2	L	Y						TPS2002CDRC
H			Y					TPS2003CDRC	

Value devices in red.

Most TI USB Switches are recognized by UL under UL2367. Please consult datasheet for latest status.

Fixed I_{LIMIT} Single Channel, 2.7 - 5.5 V USB Switches

Rated Current Amps	Enable Polarity	Output Discharge	SOIC D	MSOP DGN PowerPAD™	SOT-23 DBV	P
0.1	L	N	TPS2049D			
0.2	L	N	TPS2020D TPS2020IDRQ1			
	H	N	TPS2030D TPS2030DRQ1			TPS2030P
0.25	L	N	TPS2045AD			
	H	N	TPS2055AD			
0.5	L	N	TPS2041BD	TPS2041BDGN	TPS2530BV TPS2041BDBV TPS2041BMDBVTEP TPS2041BQDBVRQ1	
	H	N	TPS2051BD TPS2051BD TPS2051BQDRQ1	TPS2051BDGN	TPS2051BDBV	
0.6	L	N	TPS2021D TPS2021DRQ1			TPS2021P
	H	N	TPS2031D			TPS2031P
1	L	N	TPS2022D TPS2022DRQ1 TPS2061D	TPS2061DGN	TPS2061DBV	
	H	Y		TPS2065DGN-1		
1.5	L	N	TPS2023D TPS2068D TPS2068IDGNRQ1	TPS2068DGN		TPS2023P
	H	N	TPS2033D	TPS2069DGN		
2	L	N	TPS2024D TPS2024IDRQ1			TPS2024P
	H	N	TPS2034D			TPS2034P

Automotive Q100 devices in blue.

Value device in red.

Fixed I_{LIMIT} Dual Channels, 2.7 - 5.5 V USB Switches

Rated Current Amps	Enable Polarity	Output Discharge	SOIC D	MSOP DGN PowerPAD™	SON DRC
0.25	L	N	TPS2046BD		
	H	N	TPS2056AD		
0.5	L	N	TPS2042BD TPS2042BQDRQ1	TPS2042BDGN	TPS2042BDRB
	H	N	TPS2052BD	TPS2052BDGN	TPS2052BDRB
1	L	Y	TPS2062D-1		
		N	TPS2062AD TPS2062D	TPS2062QDGNRQ1 TPS2062DGN	TPS2062ADBR
	H	Y		TPS2066DGN-1	
		N	TPS2066AD TPS2066D	TPS2066DGN TPS2066DGNRQ1	TPS2066ADBR
1.5	L	N		TPS2060DGN	TPS2060DBR
	H	N		TPS2064DGN	TPS2064DBR

Automotive Q100 devices in blue.

Fixed I_{LIMIT} 3 & 4 Channels, 2.7 - 5.5 V USB Switches

V Operating	Channels	Rated Current Amps	Enable Polarity	SOIC D16
2.7 to 5.5	3	0.25	L	TPS2047BD
			H	TPS2057AD
		0.5	L	TPS2043BD
			H	TPS2053BD
		1	L	TPS2063D
			H	TPS2067D
	4	0.25	L	TPS2048AD
			H	TPS2058AD
		0.5	L	TPS2044BD
			H	TPS2054BD

Most TI USB Switches are recognized by UL under UL2367. Please consult datasheet for latest status.

Fixed I_{LIMIT} with Boost Converter USB Switches

V Operating	USB Channels	I _{LIMIT} Adj. Range (Amps/Channel)	3.3V LDO	Enable Polarity	F _{VARIABLE} ECO-MODE™	QFN20	SON10 DRC
1.8 to 5.5	1	0.13 to 1.4	N	H	Y		TPS2500
					N		TPS2501
	2	0.1 to 1.1	Y		TPS2505		

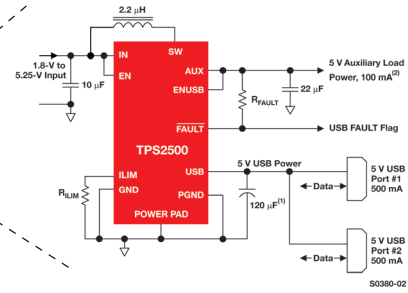


Figure 1. TPS2500 Application Diagram

Precision Adjustable I_{LIMIT} USB Switches

Channels	I _{CONT.} Adj Range (Amps/Channel)	V Operating	V _{ABSMAX}	Number of Programmable Thresholds	Latch Off Retry	Output Discharge	Active Reverse Current Blocking Threshold (mV)	RON mΩ	Packages	Device
1	0.075 to 1.5	2.5 to 6.5	7	1	Retry	N	135	85	SOT 23-6	TPS2551QDBVRQ1
					Retry			85	SOT 23-6	TPS2552DBV
					Latch Off			100	SON6 2 x 2 mm	TPS2552DRV
					Retry			85	SOT 23-6	TPS2552DBV-1
					Latch Off			100	SON6 2 x 2 mm	TPS2552DRV-1
					Retry			85	SOT 23-6	TPS2553DBV
	0.075 to 2.5 Dual Adjustable, Selectable	4.5 to 5.5	7	2	Latch Off	N	na	60	SOT 23-6	TPS25200DRV TPS25200QDRVQ1
					Retry	Y	na	73	SON10 3 x 3 mm	TPS2555DRC
					Latch Off	N	na	22	SON8 3 x 3 mm	TPS2556DRB TPS2556QDRBRQ1
					Retry	Y	na	13	SON8 3 x 3 mm	TPS2557DRB TPS2557QDRBRQ1
2	0.25 to 2.8 (tuned for I _{LIMIT} = 2.3 ± 0.2 A)	2.5 to 6.5	7	1	Retry	N	na	13	SON10 3 x 3 mm	TPS2559DRCR
								45	SON10 3 x 3 mm	TPS2560DRC
								45	SON10 3 x 3 mm	TPS2561DRC TPS2561QDRCRQ1
								45	SON10 3 x 3 mm	TPS2560ADRC TPS2561ADRC TPS2561AQDRCRQ1

Automotive Q100 devices in blue.

Value devices in red.

USB Charge Port Controllers (USB CPC) Features Matrix

Device	Typ. R _{ON} mW	I _{CONT.} Max (A)	iOS ID(s) (A)	1.2V / 1.2V Divider Mode	BC1.2 Mode(s) Supported	S3 Mouse HID Wake	Power Wake, Port Power Mgmt	Cable Comp	Short to V _{BATT} Protect	IMON	Package
TPS254900-Q1	45	3.1	NA	No	SDP, CDP	No	No	Linear	Yes	Yes	QFN 20
TPS2549/49-Q1	47	3.1	2.4	Yes	SDP, CDP	No	No	Linear	No	Yes	QFN 16
TPS2513A/4A/3AQ1/4A-Q1	NA	NA	2.4	Yes	DCP	No	No	No	No	No	SOT-23
TPS2513/14	NA	NA	1, 2	Yes	DCP	No	No	No	No	No	SOT-23
TPS2511/-Q1	70	2.7	1, 2	Yes	DCP	No	No	1 Step	No	No	MSOP 8
TPS2547	73	3.1	1, 2	Yes	SDP, CDP	LS/FS	Yes	No	No	No	QFN 16
TPS2546/-Q1	73	2.7	1, 2	Yes	SDP, CDP	LS/FS	Yes	No	No	No	QFN 16
TPS2544	73	2.7	1, 2	Yes	SDP, CDP	LS/FS	No	No	No	No	QFN 16
TPS2543/-Q1	73	2.7	1, 2	No	SDP, CDP	LS	Yes	No	No	No	QFN 16
TPS2540A/1A	73	2.5	1	No	SDP, CDP	No	No	No	No	No	QFN 16
TPS2540/1	73	2.5	1	No	SDP, CDP	No	No	No	No	No	QFN 16

Automotive Q100 devices in blue.

New devices are listed in bold red.

All devices with switches (except TPS254900 Q1) are UL recognized or recognition is pending, TPS254900 is AEC-Q100 Qualified iOS devices with up to date SW will recognize any of the charge current IDs (divider modes)
 SDP = BC1.2 Standard downstream port, supports USB 2.0 (500 mA) and USB 3.0 (900 mA)
 CDP = BC1.2 Charging downstream port, supports data and charging to 1.5 A
 DCP = BC1.2 Dedicated charging port, supports charging to 1.5 A but not data (wall charger)
 TPS2513/A = 2 Channels; TPS2514/A = 1 Channel; TPS2513A/14A support 2.7V/2.7V divider mode

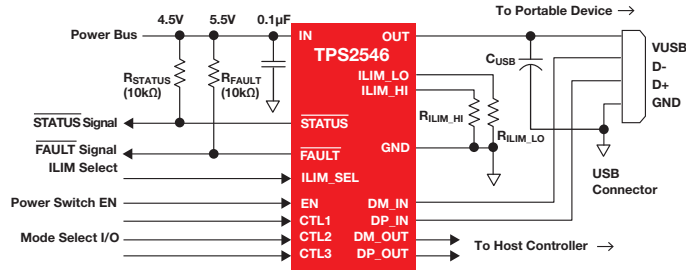


Figure 2. TPS2546 Application Schematic

A Brief Explanation of USB Charging Handshakes Found in Type A Charging Ports

As the market transitions from Type A to Type C, some ports will have both Type A and Type C Charge Port Control. The most common Type A protocols are:

- USB Battery Charging Specification BC1.2
- Chinese Telecommunications Industry Standard YD/T 1591-2009
- Divider Mode 1 and Divider Mode 2
- 1.2V Mode

YD/T 1591-2009 is a subset of the BC1.2 specification which supports the vast majority of devices that implement USB charging. Divider modes 1 and 2 and 1.2V charging schemes support popular devices from specific manufacturers.

BC1.2 lists three different port types as listed below.

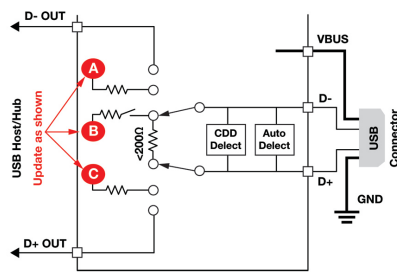


Figure 3. USB charging Controller Handshake Interface

Mode	Switch		Node (V)		
	D-	D+	A	B	C
BC1.2	200Ω to D+	200Ω to D-	—	—	—
Divider 1	2.7V	2.0V	2.7	—	2.0
Divider 2	2.0V	2.7V	2.0	—	2.7
1.2V	1.2V	1.2V	—	1.2	—

Table 1. Standard Handshaking Schemes Supported by TI USB Charging Controllers

DCP BC1.2 and YD/T 1591-2009

Both standards define that the D+ and D- data lines should be shorted together at the host with a maximum series impedance of 200Ω as shown in **Table 1** and **Figure 3**.

DCP Divider Charging Scheme

Some charging controllers support divider modes “Divider 1” and “Divider 2”. The DCP interface configurations for Divider 1 and Divider 2 are shown in **Table 1** and **Figure 3**. Divider 1 charging applies 2.0V and 2.7V to D+ and D- data line respectively. This is reversed in Divider 2 mode.

DCP 1.2V Charging Scheme

1.2V charging scheme is used by some handheld devices to enable fast charging at 2.0A. Certain devices (as shown in **Table 1** and **Figure 3**) support this scheme in the DCP-Auto mode before the device enters BC1.2 shorted mode. To simulate this charging scheme D+/D- lines are shorted and pulled-up to 1.2V for a fixed duration then the device moves to DCP shorted mode as defined in BC1.2 specification.

Most TI USB Switches are recognized by UL under UL2367. Please consult datasheet for latest status.

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