USB Dedicated Charging Port Controller with QC 2.0 Fast Charging Function

Description

The FP6600 is a fast charge protocol controller and follows Quick Charge 2.0 specification for smart power bank application. The protocol feature monitors USB D+/D- data line voltage, and automatically adjusts output voltage of power bank and wall adaptor to optimize charge time.

FP6600 is a high performance solution for fast-charging mechanism and it saves charging time. It supports the full output voltage range of either Class A or Class B. Optionally Class B can be inhibited for protecting the battery charger from accidental damage.

FP6600 can support not only USB BC compliant devices, but also Apple / Samsung devices and automatically detects whether a connected powered device (PD) is Quick Charge 2.0 capable before enabling output voltage adjustment. If a PD not compliant to Quick Charge 2.0 is detected the FP6600 disables output voltage adjustment to ensure safe operation with legacy 5 V only USB PDs.

The FP6600 is available in a space-saving SOP-8.

Features

- Input Voltage Range from 4V to 6V.
- Fully Supports Quick Charge 2.0 specification:
  - Class A: 5V/9V/12V Output Voltage.
  - Class B : 5V/9V/12V/20V Output Voltage.
- Supports USB DCP Shorting D+ Line to D- Line per USB Battery Charging Specification, Revision 1.2.
- Meets Chinese Telecommunication Industrial Standard YD/T 1591-2009
- Supports USB DCP applying 2.7V on D+ line and 2.7V on D- line.
- Supports USB DCP applying 1.2V on D+ and D- lines
- Automatic selection of D+/D- mode for an attached device
- Complaint with Apple® and Samsung devices
- SOP-8 Pb-Free Package

Applications

- Wall-Adapter / Power Plugs, Outlets
- Mobile / Tablet Power Bank
- Car Charger
- USB Power Output Ports

Pin Assignments

SO Package(SOP-8)

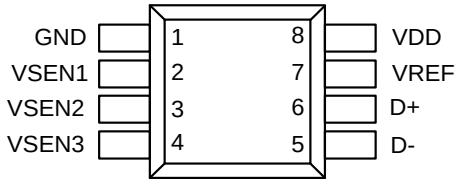
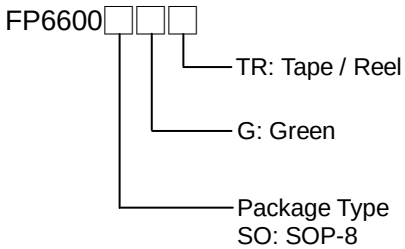


Figure 1. Pin Assignment of FP6600

Ordering Information



Typical Application Circuit

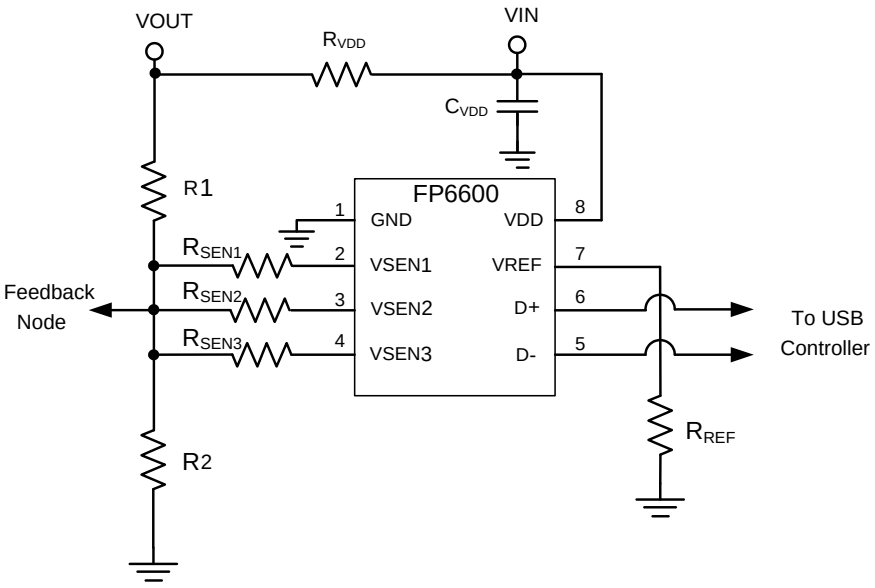


Figure 2. Typical Application Schematic

Output Voltage Lookup Table

D+	D-	Output Voltage	Internal Switch Setting		
			SW1	SW2	SW3
3.3V	3.3V	20V	0	0	0
0.6V	0.6V	12V	0	0	1
3.3V	0.6V	9V	0	1	1
0.6V	GND	5V (Default)	1	1	1

Note:1 represent the NMOS are OFF, 0 represent the NMOS are ON.

Functional Pin Description

Pin Name	Pin No. (SOP-8)	Pin Function
GND	**1**	Ground Pin.
VSEN1	**2**	Open Drain Output of output voltage adjustment switch. Active for 9V, 12V, 20V output setting.
VSEN2	**3**	Open Drain Output of output voltage adjustment switch. Active for 12V, 20V output setting.
VSEN3	**4**	Open Drain Output of output voltage adjustment switch. Active for 20V output setting.
D-	**5**	USB D- data line input
D+	**6**	USB D+ data line input
VREF	**7**	Internal Reference Voltage Output Pin. It must be with a resistor to GND
VDD	**8**	Power Supply Input Pin.

Block Diagram

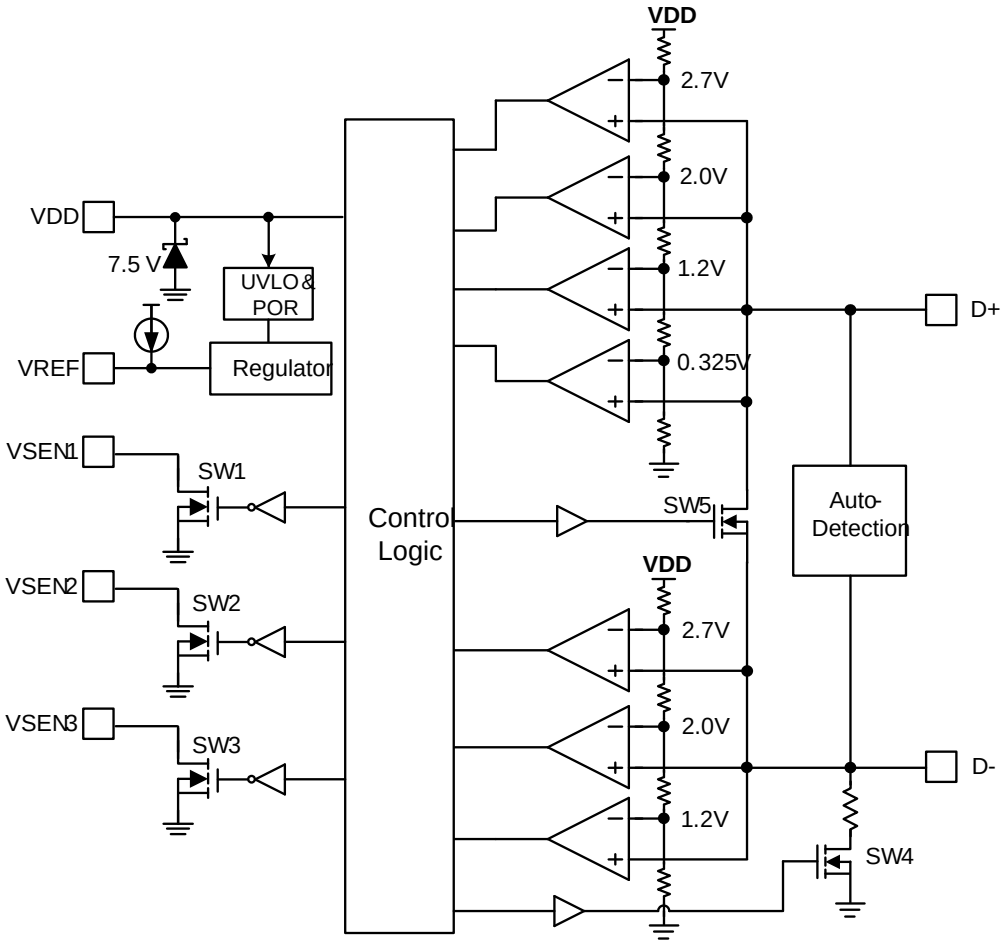


Figure 3. Block Diagram of FP6600

Absolute Maximum Ratings

- Input Supply Voltage VDD ---------- - 0.3V to + 8V
- All Other Pins Voltage ---------- - 0.3V to + 8V
- Maximum Junction Temperature (T_J)---------- + 150℃
- Storage Temperature (T_S)---------- - 65℃ to + 150℃
- Lead Temperature (Soldering, 10sec.) ---------- +260°C
- Power Dissipation @T_A=25℃, (P_D)

  SOP-8 ---------- 1.39W
- Package Thermal Resistance, (θ_{JA}):

  SOP-8---------- 90°C/W
- Package Thermal Resistance, (θ_{JC}):

  SOP-8---------- 39°C/W

Note1：Stresses beyond those listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

- Input Supply Voltage (VDD)---------- 4V ~ 6V
- Operation Temperature Range (T_{OPR}) ---------- -40°C to +85°C

Note：Over operating free-air temperature range (unless otherwise noted)

Electrical Characteristics

(VDD=5V, T_A=25℃ and the recommended supply voltage range, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Power						
VDD Input Voltage Range	V_{DD}		4		6	V
Input UVLO Threshold	$V_{UVLO(VTH)}$	V_{DD} Rising	2.0		3.9	V
VDD Supply Current		VDD=5V, Measure $V_{DD,}$ SW1 = SW2 = SW3 = Off		200		μA
VDD Shunt Voltage	$V_{DD(SHUNT)}$	IV_{DD} = 3mA		TBD		V
Reference Voltage Output	V_R		1.18	1.23	1.28	V
High Voltage Dedicated Charging Port (HVDCP)						
20 V Output Inhibit Threshold	V_{DDH}		V_{DD}-0.6			V
Data Detect Voltage	$V_{DAT(REF)}$		0.25	0.325	0.4	V
Output voltage selection reference	V_{SEL_REF}		1.8	2.0	2.2	V
Data Lines Short-Circuit Delay	$T_{DAT(SHORT)}$	VOUT ≥ 0.8 V		10	20	ms
D+ High Glitch Filter Time	$T_{GLITCH(BC)-D+\_H}$		1000	1250	1500	ms
D- Low Glitch Filter Time	$T_{GLITCH(BC)-D-\_L}$			1		ms
Output Voltage Glitch Filter Time	$T_{GLITCH(V)CHANGE}$		20	40	60	ms
D- Pull-Down Resistance	$R_{D-(DWN)}$			20		KΩ
Switch SW1 on-resistance	$R_{DS\_ON\_N1}$	SW1 = 200μA			300	Ω
Switch SW2 on-resistance	$R_{DS\_ON\_N2}$	SW2 = 200μA			300	Ω
Switch SW3 on-resistance	$R_{DS\_ON\_N3}$	SW3 = 200μA			300	Ω
Switch SW5 on-resistance	$R_{DS\_ON\_N5}$	SW5 = 200μA			40	Ω
DCP 1.2V Charging Mode						
$D+_{\_1.2V}$/$D-_{\_1.2V}$ line output voltage			1.08	1.2	1.32	V
$D+_{\_1.2V}$/$D-_{\_1.2V}$ line output Impedance				100		KΩ
Apple 2.4A Mode						
$D+_{\_2.7V}$/$D-_{\_2.7V}$ line output voltage			2.57	2.7	2.84	V
$D+_{\_2.7V}$/$D-_{\_2.7V}$ line output Impedance				33.6		KΩ

Note ：Not production tested.

Application Information

Function Description

The FP6600 is a USB Dedicated Charging Port Controller can fast charge most of the handheld devices. It can be like the original charging adapter. The FP6600 can support BC1.2, Apple Divider mode, Samsung device.

The FP6600 is a low cost USB high voltage dedicated charging port interface IC for Quick Charge 2.0 specification. It also supports full output voltage range of Quick Charge 2.0 Class A or Class B.

Quick Charge 2.0 Interface

Power up D+/D- is supply 2.7V to Apple Device and then supply D+ short to D- into BC1.2. Set the output voltage level 5V. If D+ continuous above 0.325V and keep 1.25 seconds FP6600 into Quick Charge 2.0 operation mode.

The output voltage(12V) can be inhibited by connect VSEN2 to VDD. The output voltage(20V) can be inhibited by connect VSEN3 to VDD.

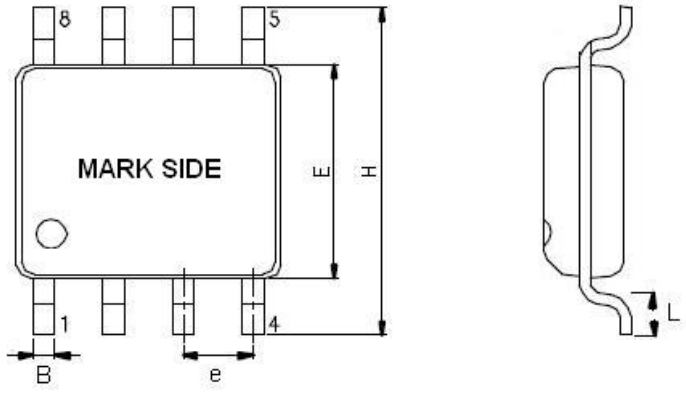
If PD without QC 2.0 the device will keep output voltage level 5V guarantee safe operation for only 5V USB PD.

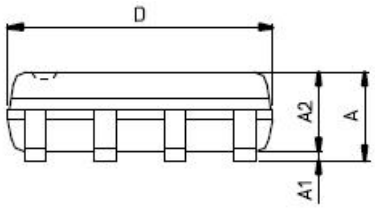
Shunt Regulator

The wide power supply output voltage through external resistor from RVDD to VIN. The internal with Zener-Diode clamp VIN pin at 7.5V. RVDD =2.2KΩ and CVDD=1uF. R_{REF}=127 KΩ.

Outline Information

SOP–8 Package (Unit: mm)

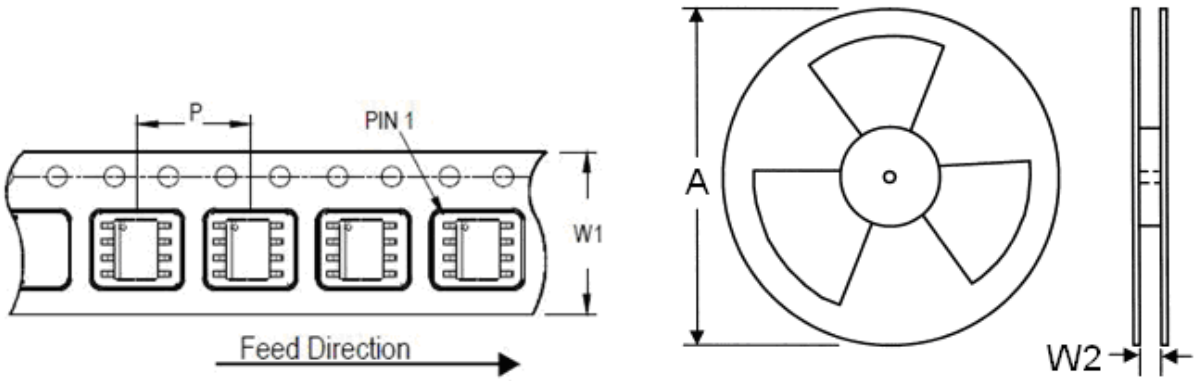




SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
A2	1.25	1.50
B	0.31	0.51
D	4.80	5.00
E	3.80	4.00
e	1.20	1.34
H	5.80	6.20
L	0.40	1.27

Note：Followed from JEDEC MO-012-E

Carrier dimensions



Tape Size (W1) mm	Pocket Pitch (P) mm	Reel Size (A)		Reel Width (W2) mm	Empty Cavity Length mm	Units per Reel
		in	mm			
12	8	13	330	12.4	400~1000	2,500

Life Support Policy

Fitipower's products are not authorized for use as critical components in life support devices or other medical systems.