fitipower

FP6600Q

USB Dedicated Charging Port Controller for Fast Charging Protocol and QC 2.0/3.0

Description

The FP6600Q is a fast charge protocol controller for HiSilicon Fast Charging Protocol (FCP) and Qualcomm® Quick Charge™ 2.0/3.0(QC 2.0/3.0) USB interface. The device can fast charging FCP or QC 2.0/3.0 powered device (PD). The protocol feature monitors USB D+/D- data line voltage or D- data line transmission and automatically adjusts output voltage of power bank and wall adaptor to optimize charge time.

FP6600Q can support not only USB BC compliant devices, but also Apple / Samsung / HUAWEI devices and automatically detects whether a connected powered device is QC 2.0/3.0 or FCP capable before enabling output voltage adjustment. If a PD not compliant to QC 2.0/3.0 or FCP is detected the FP6600Q disables output voltage adjustment to ensure safe operation with legacy 5 V only USB PDs.

The FP6600Q is available in SOP-8 package.

Features

- Support HiSilicon Fast Charging Protocol (FCP) for Output Voltage and Current Communication
- Support Qualcomm® Quick Charge™ 2.0/3.0
  - Class A : 3.6V up to 12V Output Voltage
  - Class B : 3.6V up to 20V Output Voltage
- Automatic Selection FCP and QC 2.0/3.0 Protocols
- 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
- Output Over Voltage Protection
- Over Temperature Protection
- Distant Shutdown Protection
- SOP-8 Pb-Free Package
- UL Certification No. 4787452991-2

Applications

- Wall-Adapter, Smart Phones, Tablets, Notebooks
- Mobile / Tablet Power Bank
- Car Charger
- USB Power Output Ports

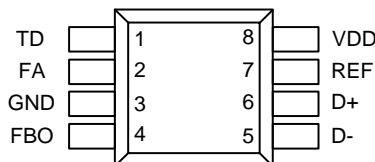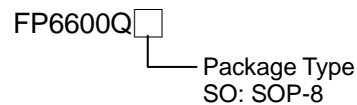## Pin Assignments

SO Package(SOP-8)

Figure 1. Pin Assignment of FP6600Q

Ordering Information

FP6600Q ☐
    └── Package Type
        SO: SOP-8

Typical Application Circuit
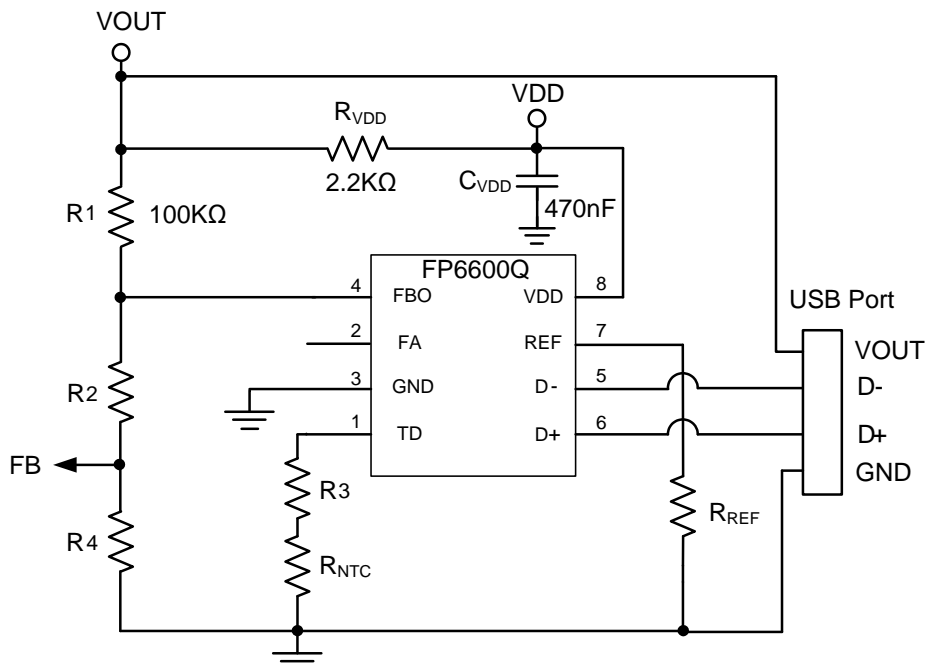
Figure 2. Typical Application Schematic

Output Voltage Lookup Table(QC 2.0/3.0)

D+	D-	Output Voltage
3.3V	3.3V	20V
0.6V	0.6V	12V
3.3V	0.6V	9V
0.6V	3.3V	Continuous mode
0.6V	High-Z	5V (Default)

FP6600Q

Functional Pin Description

| Pin Name	Pin No. (SOP-8)	Pin Function
TD	1	Connect external temperature sensor (NTC resistor).
FA	2	If any fault (OVP, OTP, DSP) occur then FA pin source current.
GND	3	Ground pin.
FBO	4	Feedback output. Current Sink/Source FB Node.
D-	5	USB D- data line input pin.
D+	6	USB D+ data line input. Recommended this pin connect without resistors(open) or with a resistor higher than 1MΩ connect to GND.
REF	7	Through connect resistor provides output voltage selection. (R_{REF} >33k or REF pin logic high select Class A and R_{REF} <15k or REF pin logic low select Class B.)
VDD	8	Power supply input pin.

Block Diagram
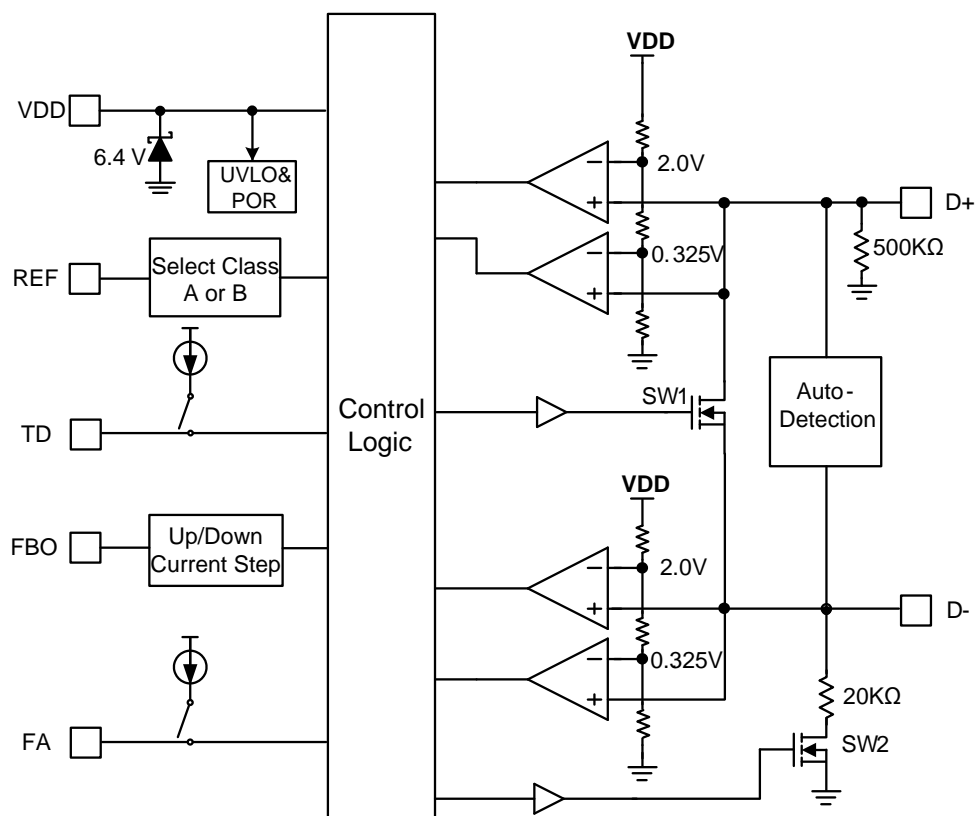
Figure 3. Block Diagram of FP6600Q

Absolute Maximum Ratings [Note 1]

● Input Supply Voltage VDD --- -0.3V to +6.5V

● All Other Pins Voltage --- -0.3V to +6.5V

● 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}) [Note 2]

      SOP-8--- 90°C/W

● Package Thermal Resistance, (θ_{JC})

      SOP-8--- 39°C/W

Note 1：Stresses beyond this listed under "Absolute Maximum Ratings" may cause permanent damage to the device.
Note 2：θ_{JA} is measured at 25°C ambient with the component mounted on a high effective thermal conductivity test board of JEDEC-51-7.

Recommended Operating Conditions

● Input Supply Voltage (VDD)--- 3.2V to 6.4V

● Operation Temperature Range (T_{OPR}) --- -40°C to +85°C

Note 3：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$_{DD}$		3.2		6.4	V
Input UVLO Threshold	V$_{UVLO(VTH)}$	V$_{DD}$ Falling	2.5		2.9	V
VDD Supply Current		V$_{DD}$ =5V, Measure V$_{DD}$		200		µA
VDD Shunt Voltage	V$_{DD(SHUNT)}$	IV$_{DD}$ = 3mA	5.9	6.4	6.8	V
High Voltage Dedicated Charging Port (HVDCP)						
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
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
Continuous Mode Glitch Filter Time [Note 4]	T$_{GLITCH-CONT-CHANGE}$		100		200	µs
D+ Leakage Resistance	R$_{DAT-LKG}$	V$_{DD}$ =3.2-6.4V,VD+=0.6-3.6V Switch SW1=Off	300	500	800	kΩ
Switch SW1 On-Resistance	R$_{DS\_ON\_N1}$	V$_{DD}$ =5V,SW1= 200µA			40	Ω
Up/Down Current Step		I$_{UP}$ = 40µA (9V), 70µA (12V)		2		µA
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
Protection						
Over Voltage Protection Threshold Voltage	V$_{OV}$	QC 2.0 Mode — I$_{UP}$ =0A (5V)	1.42	1.52	1.62	V
		I$_{UP}$ =40µA (9V)	1.58	1.72	1.86	
		I$_{UP}$ =70µA (12V)	1.72	1.87	2.02	
		I$_{UP}$ =150µA(20V)	2.1	2.28	2.46	

Electrical Characteristics

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

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Over Voltage Protection Threshold Voltage	V_{OV}	QC 3.0 Continuous Mode	$R_{REF} > 33$ kΩ or Logic High, Class A	1.72	1.87	2.02	V
			$R_{REF} < 15$ kΩ or Logic Low, Class B	2.1	2.28	2.46	
Over Voltage Detection Deglitch Time [Note 4]					60		µs
Over Voltage Detection Blanking Time				500			ms
Over Temperature Threshold	V_{OT}			1.1	1.2	1.3	V
Over Temperature Deglitch Time					1		ms
Temperature Monitor Current Source				80		120	µA
Temperature Monitor On Time				10		13	ms
Protection Current Source				90	130	170	µA
D- SECTION (FCP)							
D- FCP Tx Valid Output High	V_{TX-VOH}			2.55		3.6	V
D- FCP Tx Valid Output Low	V_{TX-VOL}					0.3	V
D- FCP Rx Valid Output High	V_{RX-VIH}			1.4		3.6	V
D- FCP Rx Valid Output Low	V_{RX-VIL}					1.0	V
D- Output Pull-Low Resistance (FCP) [Note 4]	R_{PD}			400	500	600	Ω
Unit Interval For FCP PHY Communication	UI	$f_{CLK} = 125$kHz		144	160	180	µs

Note 4：Not production tested.

Application Information

Function Description

The FP6600Q is a USB high voltage dedicated charging port interface IC for Qualcomm® Quick Charge™ 2.0/3.0, HiSilicon FCP specification.

The FP6600Q is a USB Dedicated Charging Port Controller can fast charge most of the handheld devices. It can be like the original charging adapter. The FP6600C can support BC1.2, Apple, Samsung and HUAWEI.

It also supports full output voltage range of QC 2.0/3.0 Class A or Class B.

Quick Charge 2.0/3.0 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 FP6600Q can automatic choose into QC 2.0/3.0 or FCP operation mode.

When $V_{DAT(REF)}$< D+ <V_{SEL_REF} and D- > V_{SEL_REF} , the FP6600Q enter continuous mode. Each step D+ from 1V to 3V Pulse-width during 200us cause current sink 2uA by FBO. The maximum output sink current is 70uA for output voltage reach to 12V.

Each step D- from 3V to 1V Pulse-width during 200us cause current source 2uA by FBO. The minimum output source current is 14uA for output voltage reach to 3.6V.

If PD without QC 2.0 the device will keep output voltage level 5V guarantee safe operation for only 5V USB PD. When USB cable unplug the D+ voltage < $V_{DAT(REF)}$ and output voltage recovery default mode 5V.

Shunt Regulator

The wide power supply output voltage through external resistor from R_{VDD} to VDD. The internal with Zener-Diode clamp VDD pin at 6.4V. Recommend R_{VDD} =2.2KΩ and C_{VDD}=470nF.

Output Voltage Select

Support output range Class A (3.6V to 12V) for R_{REF} >33k or REF pin connect to VDD. Otherwise, Class B (3.6V to 20V) for R_{REF} <15k or REF pin connect to GND.

Output Overvoltage Protection

When FBO > V_{OV} represent the output voltage exceed 1.2 times for setting output voltage level lead to the FA pin protection current source. When output voltage step down   (an example 12V to 5V) and the OVP Blanking for 500ms.
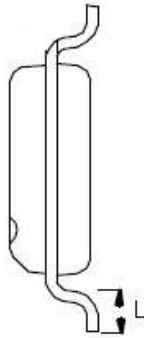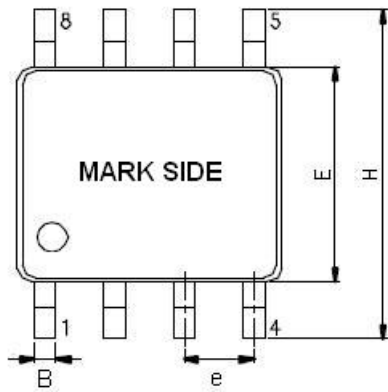
Over Temperature Protection

When over temperature occur by TD pin voltage level below V_{OT} lead to FA pin protection current source.

Distant Shutdown Protection

FP6600Q permit the powered device (PD) can shut down the power by DSP. When Distant shutdown occur lead to FA pin protection current source.
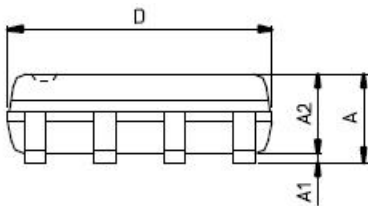
Outline Information
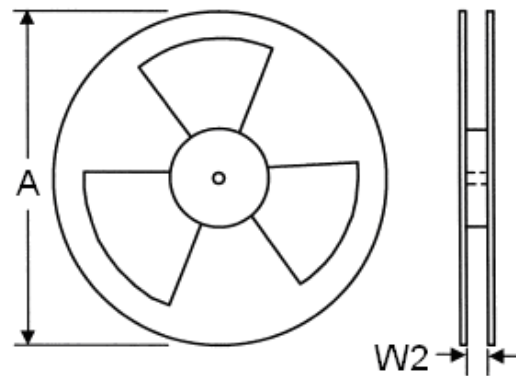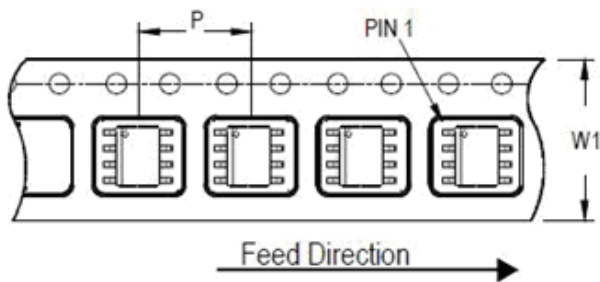
SOP-8 Package (Unit: mm)

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.