IP2701

Fast Charging Physical Layer IC for USB Interfaces

Supports 8 standards: Type-C, QC3.0/QC2.0, FCP, AFC, SFCP, Apple® 2.4A, BC1.2

1. Features

- Support several charging standards including : QC3.0/QC2.0, FCP, AFC, SFCP and Apple® 2.4A, Samsung® 2.0A, BC1.2

- Support USB Type-C DFP

  ➢ CC1, CC2 output pull-up automatically

  ➢ Support broadcast 3A maximum current

- Support QC3.0&QC2.0 Class B (Compatible with Class A)

  ➢ QC3.0 Class B: 3.6V~20V (0.2V/step) output voltage

  ➢ QC2.0 Class B: 5 V, 9 V, 12 V or 20V

- Support Huawei® FCP of 5V and 9V

- Support Samsung® AFC of 5V and 9V

- Support Spreadtrum® SFCP of 12V, 9V and 5V

- Support Apple® 2.4A: DP=2.7V, DM=2.7V

- Support Samsung® 2.0A: DP=1.2V, DM=1.2V

- Support BC1.2: Automatic shorting D+ to D- line

- SEL configure the maximum voltage, allowed to applied for, as 20V or 12V or 5V

- Default 5 V mode operation

- Support auto-detect and auto-switching fast charging standards

- FB for voltage regulation

- Working voltage: 3V~5.5V

- Very low power consumption I_Q = 66uA(Typ.)

- Package: SOP8

2. Typical Applications

- USB power output ports for AC adapters, Power Banka, Car chargers

- Battery chargers for smart phones, tablets, netbooks, digital cameras, and Bluetooth accessories
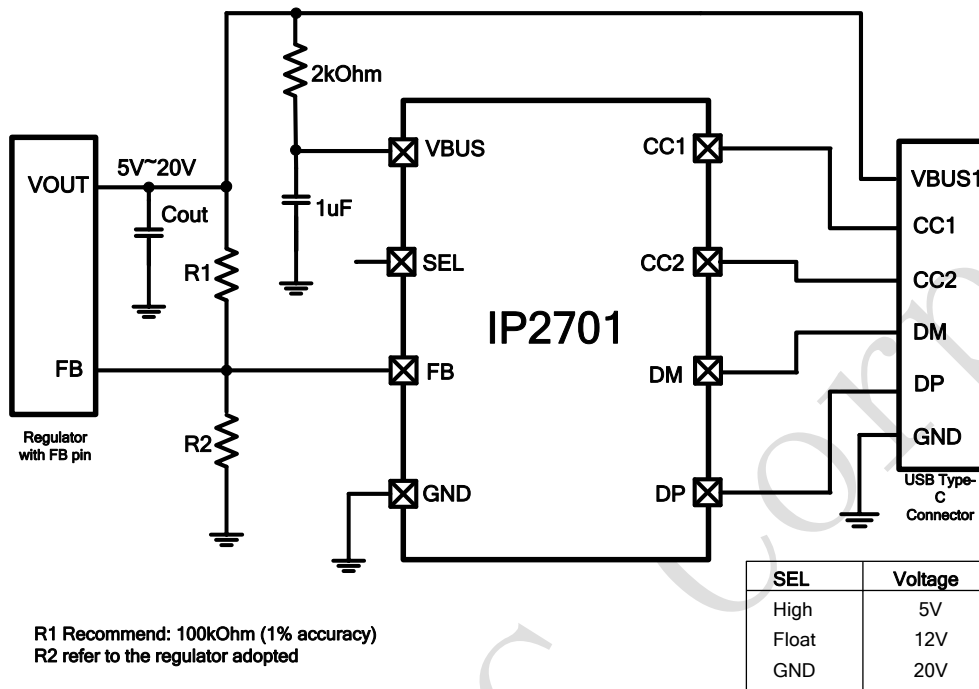
3. Description

IP2701 is a low-cost fast charging Physical Layer IC dedicated for USB ports, which supports 8 kinds of fast charging standards, including Type-C DFP, HVDCP QC3.0/QC2.0 (Quick Charge) Class A&B, FCP (Hisilicon® Fast Charge Protocol), AFC (Samsung® Adaptive Fast Charge), SFCP (Spreadtrum® Fast Charge Protocol), Apple® 2.4A, BC1.2 and Samsung® 2.0A.

IP2701 integrated USB Type-C DFP port controller, which can co-work with Type-C UFP/DRP devices.
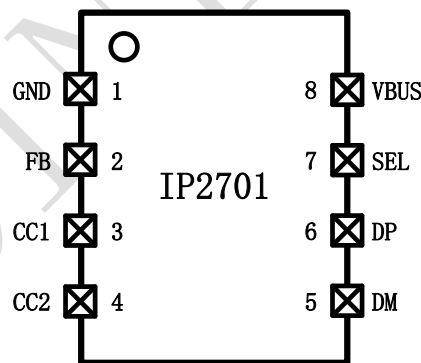
IP2701 support automatically detecting the connected device's type and switching standards type to responding for fast charging requirements.

FB control line is integrated to source/sink current with precise 2uA/step in minimum, for accurate voltage regulation.

4. Typical Application Schematic

R1 Recommend: 100kOhm (1% accuracy)
R2 refer to the regulator adopted

SEL	Voltage
High	5V
Float	12V
GND	20V

5. PIN Description

Pin Name	Pin No.	Pin Description
GND	1	Ground
FB	2	Connect to the Regulator's FB line, current source/sink for voltage regulation
CC1	3	Connect to USB Type-C CC1 pin
CC2	4	Connect to USB Type-C CC2 pin
DP	5	Connect to USB DP data line
DM	6	Connect to USB DM data line
SEL	7	Configure the maximum voltage allowed to apply for: • V_{SELH} for 5V output • Floating for 12V output

		• GND for 20V output
VBUS	8	Power supply input, connect with 1uF capacitor to GND, a resistor of 2kOhm should be applied between VOUT and VBUS

6. IP Series Products List

Power Bank IC

IC Part No.	Charge /Discharge		Features							Package	
	Charge	Dis-charge	LED Num	Lighting	Keys	I2C	DCP	Type-C	QC Certificate	Package	Compatibility
IP5303	1.0A	1.2A	1,2	√	√	-	-	-	-	eSOP8	PIN2PIN
IP5305	1.0A	1.2A	1,2,3,4	√	√	-	-	-	-	eSOP8	
IP5306	2.4A	2.1A	1,2,3,4	√	√	-	-	-	-	eSOP8	
IP5206	2A (Max)	1.5A	3,4,5	√	√	-	-	-	-	eSOP16	PIN2PIN
IP5108E	2.0A	1.0A	3,4,5	√	√	-	-	-	-	eSOP16	
IP5108	2.0A	2.0A	3,4,5	√	√	√	-	-	-	eSOP16	
IP5207	1.2A	1.2A	3,4,5	√	√	-	-	-	-	QFN24	PIN2PIN
IP5207T	1.2A	1.2A	1,2,3,4	√	√	√	√	-	-	QFN24	
IP5109	2.1A	2.1A	3,4,5	√	√	√	-	-	-	QFN24	
IP5209	2.4A	2.1A	3,4,5	√	√	√	√	-	-	QFN24	
IP5219	2.4A	2.1A	1,2,3,4	√	√	√	√	√	-	QFN24	
IP5310	3.1A	3.0A	1,2,3,4	√	√	√	√	√	-	QFN32	
IP5312	15W	3.6A	2,3,4,5	√	√	√	√	-	-	QFN32	
IP5318Q	18W	4.0A	2,3,4,5	√	√	√	√	-	√	QFN40	PIN2 PIN
IP5318	18W	4.0A	2,3,4,5	√	√	√	√	√	√	QFN40	
IP5322	18W	4.0A	1,2,3,4	√	√	√	√	-	√	QFN32	
IP5328	18W	4.0A	1,2,3,4	√	√	√	√	√	√	QFN40	

USB Charging Port Control IC

IC Part No.	Channel Num	Standards Supported											Package
		BC1.2 & APPLE	QC3.0 & QC2.0	FCP	SCP	AFC	SFCP	MTK PE+ 2.0&1.1	Type-C	NTC	QC Certificate	PD3.0	Package
IP2110	1	√	-	-	-	-	-	-	-	-	-	-	SOT23-5
IP2111	1	√	-	-	-	-	-	-	-	-	-	-	SOT23-6
IP2112	2	√	-	-	-	-	-	-	-	-	-	-	SOT23-6
IP2161	1	√	√	-	-	-	√	-	-	-	√	-	SOT23-6
IP2163	1	√	√	√	-	√	√	√	-	√	√	-	SOP8
IP2701	1	√	√	√	-	√	√	-	√	-	-	-	SOP8
IP2703	1	√	√	√	-	√	√	√	√	√	-	-	DFN10

IP2705	1	√	√	√	-	√	√	√	√	√	-	-	DFN12
IP2707	2	√	√	√	-	√	√	√	√	√	-	-	QFN16
IP2716	1	√	√	√	√	√	-	1.1	√	-	√	√	QFN32

7. Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
VBUS Input Voltage Range	VBUS	-0.3 ~ 7	**V**
DP, DM Input Voltage Range	V_{DP}, V_{DM}	-0.3~11	**V**
CC1,CC2 input Voltage Range	V_{CC1}, V_{CC2}	-0.3~12	**V**
Junction Temperature Range	T_J	-40 ~ 150	℃
Storage Temperature Range	Tstg	-60 ~ 150	℃
Ambient Temperature Range	T_A	-40~150	℃
Human Body Model (HBM)	ESD	4	**KV**

*Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to Absolute Maximum Rated conditions for extended periods may affect device reliability.

*Voltages are referenced to GND unless otherwise noted.

8. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Voltage	VBUS	3		5.5	V
Ambient Temperature	T_A	-40		85	℃

*Devices' performance cannot be guaranteed when working beyond those Recommended Operating Conditions.

9. Electrical Characteristics

Unless otherwise specified, T_A=25℃, 4.5V ≤ VBUS ≤ 5.5V

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Quiescent Current	I_Q	No load, VBUS=5V	50	66	100	uA
Startup Time	Ts		8	10	12	ms
SEL Input High Voltage Range	V_{SELH}		3	5	5.5	V
SEL Default Output Voltage	V_{SELO}		1.35	1.5	1.65	V

10. Function Description

Charging Standards

IP2701 is a high-voltage, fast charging Physical Layer IC dedicated for charging applications where charging standards required to be negotiated between USB ports. IP2701 is needed at the host-side, when the attached portable client-side device negotiate the power allotment from the power source host-side, IP2701 can auto-detect and respond to the those charging standards and may grant or deny the request based on the available voltage/current. IP2701 will inform the power source host-side to adjust the output voltage by FB line once charging request granted.

IP2701 support analysis several charging standards, including HVDCP QC3.0/QC2.0 (Quick Charge) Class A, FCP (Hisilicon® Fast Charge Protocol), AFC (Samsung® Adaptive Fast Charge), SFCP (Spreadtrum® Fast Charge Protocol), Apple® 2.4A, BC1.2 and Samsung® 2.0A.

IP2701 monitors the real-time voltage on DP line and DM line, when the attached device is not the fast charging type, IP2701 will change the voltage on the DP, DM line to fulfill the negotiation process. When fast charging client-side device connected, IP2701 auto-detect the type of charging standard and analysis the power requirements, source/sink current on FB line to grant the request voltage. When the output voltage is default 5V, FB line neither source nor sink current. IP2701 is not in control of the charging power loop, the actual charging loop and charging current is determined by the host-side power source and the client-side USB port device.

IP2701 integrated USB Type-C DFP port controller, support discharge to devices, at which moment CC1, CC2 will output 330uA current, for 3A maximum current capability broadcasting, IP2701 can work with Type-C UFP and DRP devices.

SEL

SEL line is used to configure the maximum voltage allotment that can be request, when SEL line is pull up to high-voltage of V_{SELH}, the IP2701 will not respond to any fast charging requirements and output default 5V; When SEL line is floating, the maximum voltage allotment is 12V; When SEL line is pull down to GND, the maximum voltage allotment is 20V.

SEL	Voltage
High (V_{SELH})	5V
Float	12V
GND	20V

FB

IP2701 integrated FB control line used for accurate voltage regulation by source/sink current with precise 2uA/step in minimum. FB source 40uA current for 9V output voltage; FB source 70uA current for 12V output voltage; FB source 150uA current for 20V output voltage; when the output voltage is default 5V, FB neither source
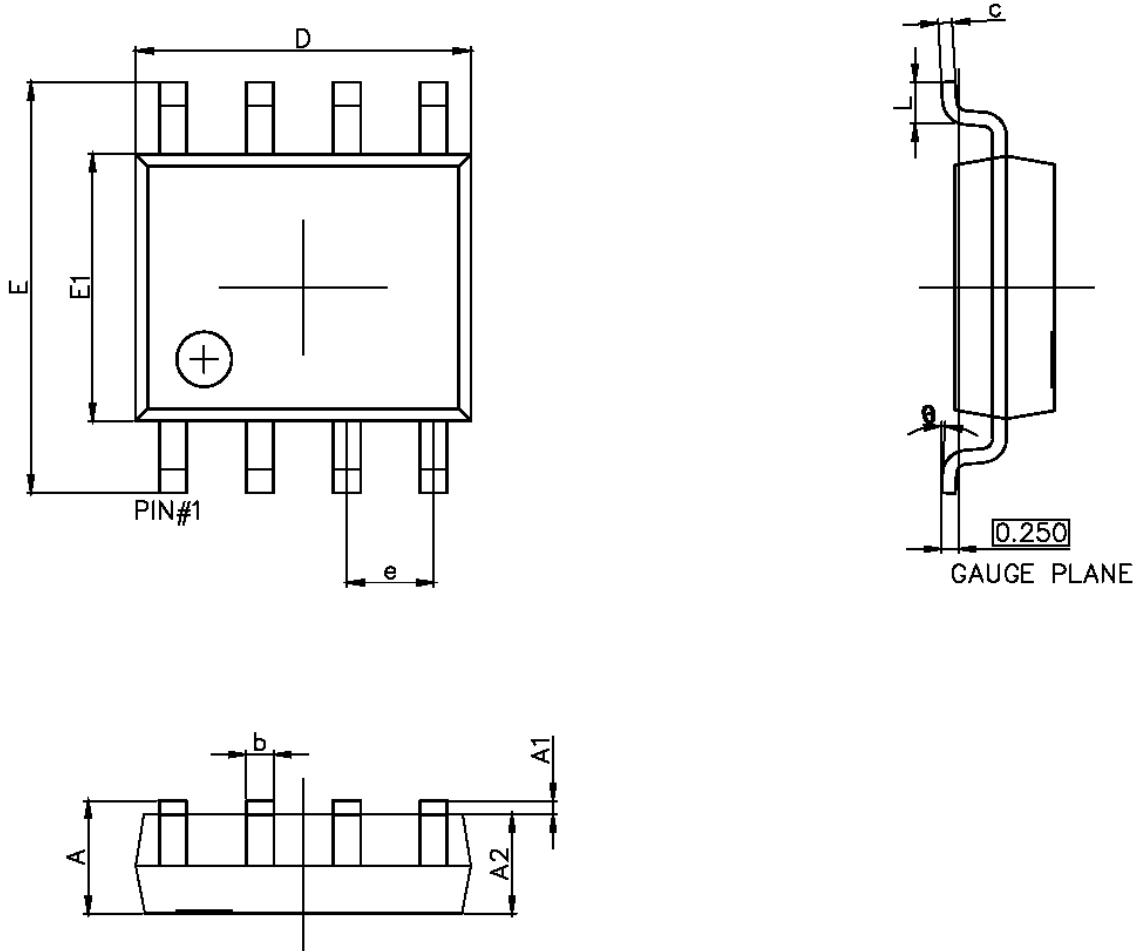
nor sink current.

In typical applications, IP2701 FB connects to the regulator's FB line, resistor (R1) between VOUT and FB should apply 100kOhm with high precision (1%), resistor (R2) value between FB and GND should refer to the regulator adopted, resistance of R2 can be calculated by equation:

$$VFB = \frac{VOUT}{R1+R2} * R2$$

11. Package

GAUGE PLANE

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270（BSC）		0.050（BSC）	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

12.IMPORTANT NOTICE

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