IP2218

Fast Charging Physical Layer IC for USB Interfaces

TypeC PD2.0/PD3.0/PPS,QC3.0/QC2.0,FCP,SCP,AFC, Apple 2.4A, BC1.2

1. Features

- Support 11 charging standards including :
  - USB PD2.0/PD3.0/PPS DFP
  - QC3.0/QC2.0
  - SCP, FCP
  - AFC
  - Apple 2.4A, Samsung 2.0A and BC1.2
- Support USB PD2.0/PD3.0/PPS
  - Auto detect USB PD device plug in or out
  - Configurable SRC_CAP package broadcast
- Support Qualcomm® QC3.0/QC2.0 Class A
  - QC3.0 Class A: 3.6V~20V(0.2V/step)
  - QC2.0 Class A: 5V, 9V, 12V
- Support Samsung® AFC
- Support Huawei® SCP (option)
- Support Huawei® FCP
- Support Apple 2.4A: DP=2.7V, DM=2.7V
- Support Samsung 2.0A: DP=1.2V, DM=1.2V
- Support BC1.2: DP short DM automatically
- Default 5 V mode operation
- Support NTC protection
- Support 100KHz~400KHz IIC interface
- Support DP,DM,CC1,CC2 overvoltage protection
- Support DP,DM weak short to GND protection
- VIN working voltage: 3.3V~20V
- Package: SSOP10

2. Description

IP2218 is a fast charging Physical Layer IC dedicated for USB ports, which supports 11 kinds of fast charging standards, including USB PD2.0/PD3.0 /PPS (Programmable Power Supply), HVDCP QC2.0/QC3.0 (Quick Charge), AFC (Samsung® Adaptive Fast Charge)，SCP (Hisilicon® Super Charge Protocol) and FCP (Hisilicon® Fast Charge Protocol), Apple 2.4A, Samsung 2.0A and BC1.2.

IP2218 support automatically detecting the connected device's type and switching standards type to responding for fast charging requirements.
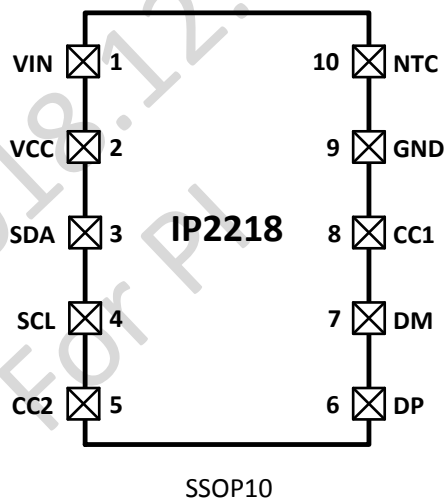
3. Typical Applications

- USB power output ports for AC adapters, Power Banka, Car chargers
- Battery chargers for smart phones, tablets, netbooks, digital cameras, and Bluetooth accessories

4. Typical Application Schematic

5. PIN Description

SSOP10
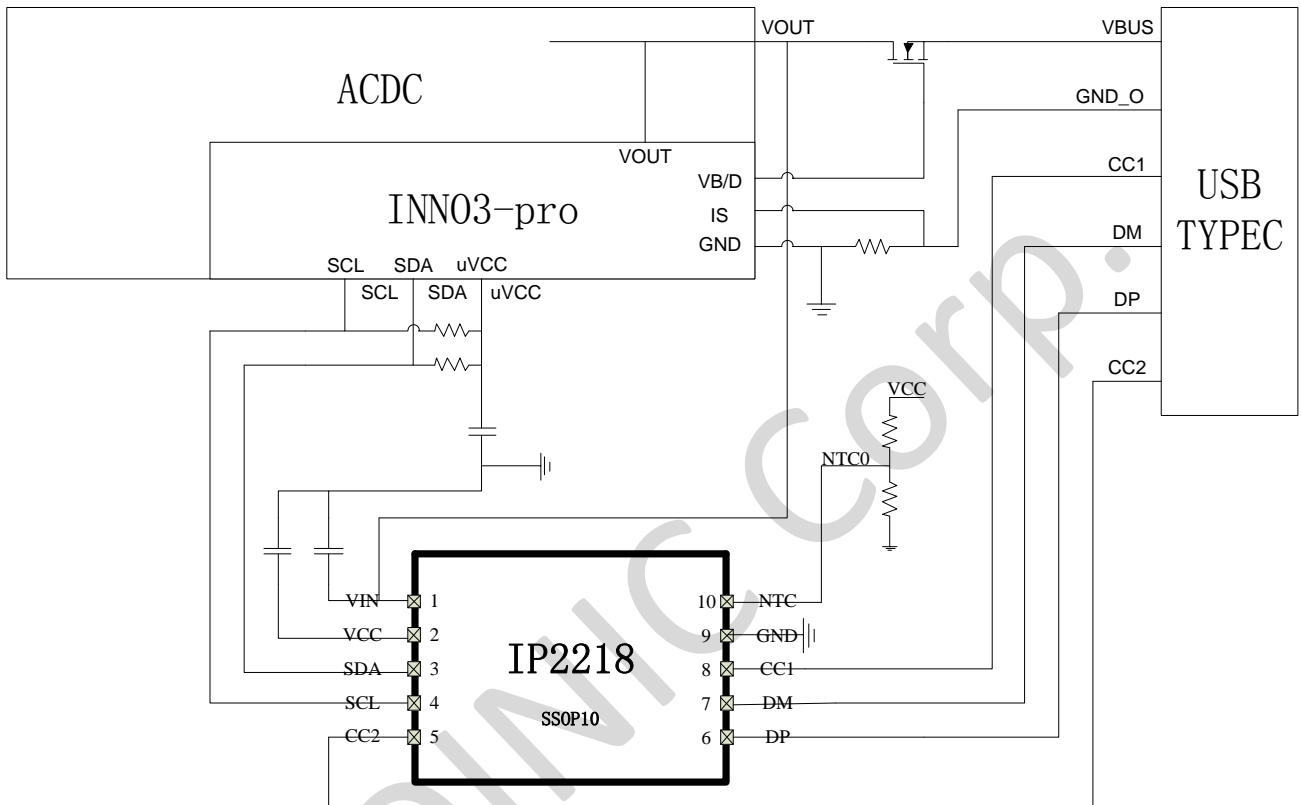
Pin No.	Pin name	Pin description
1	VIN	Power Input
2	VCC	Power Input
3	SDA	I2C interface data line
4	SCL	I2C interface clock line
5	CC2	Connect to the CC2 pin of the USB port

6	DP	Connect to the DP pin of the USB port
7	DM	Connect to the DM pin of the USB port
8	CC1	Connect to the CC1 pin of the USB port
9	GND	Ground
10	NTC	Temperature sensing pin

6. Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
VIN Input Voltage Range	VIN	-0.3 ~ 30	**V**
VCC Input Voltage Range	VCC	-0.3 ~ 6	**V**
DP, DM Input Voltage Range	V_{DP}, V_{DM}	-0.3~30	**V**
CC1,CC2 Input Voltage Range	V_{CC1}, V_{CC2}	-0.3~30	**V**
Other Pins Input Voltage Range	V_{other}	-0.3~6	**V**
Junction Temperature Range	T_J	-40 ~ 150	℃
Storage Temperature Range	T_{STG}	-60 ~ 150	℃
Lead Temperature Range (Soldering, 10sec)	T_s	260	℃
Package Thermal Resistance	$θ_{JA}$	90	℃
Package Thermal Resistance	$θ_{JC}$	39	℃
Human Body Model (HBM)	ESD	2	**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.

7. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Voltage	VIN	3		24	V
Ambient Temperature	T_A	-40		85	℃

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

8. Electrical Characteristics

Unless otherwise specified, T A =25℃

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage	VIN	Supplied directly	3		24	V
Input UVLO Threshold	UVLO	VIN/VCC Falling	2.5		2.9	V

Quiescent Current	I_Q	No load, VIN=5V		1		mA
		No load, VIN=20V		5		mA
Startup Time	Ts		20	37	50	us
HVDCP (QC2.0&QC3.0)						
Data Detect Voltage Threshold	V_{DATA_REF}		0.25	0.325	0.4	V
Output Voltage Selection Reference	V_{SEL_REF}		1.8	2	2.2	V
DP High Glitch Filter Time	$T_{GLITCH(BC)\_DP\_H}$		1000	1250	1500	ms
DM Low Glitch Filter Time	$T_{GLITCH(BC)\_DM\_L}$			2		ms
Output Voltage Glitch Filter Time	$T_{GLITCH(V)\_CHANGE}$		20	40	60	ms
Continuous Mode Glitch Filter Time	$T_{GLITCH\_CONT\_CHANGE}$		100		200	us
DM and DP Short Resistance	R_{SHORT}	V_{DP}=0.6V		30		Ohm
DM Pull-down Resistance	R_{DM_DOWN}	V_{DP}=0.6V		20		kOhm
DP Pull-down Resistance	R_{DAT_LKG}	V_{DP}=0.6V		500		kOhm
DCP						
Samsung DP/DM Output Voltage			1.08	1.2	1.32	V
Samsung DP/DM Output Impedance				100		kOhm
Apple 2.4A DP/DM Output Voltage			2.64	2.7	2.76	V
Apple 2.4A DP/DM Output Impedance				30		kOhm

9. Function Description

Charging Standards

IP2218 is a high-voltage, fast charging Physical Layer IC dedicated for charging applications where charging standards required to be negotiated between USB ports. IP2218 is needed at the host-side, when the attached portable client-side device negotiate the power allotment from the power source host-side, IP2218 can auto-detect and respond to the those charging standards and may grant or deny the request based on the available voltage/current. IP2218 will inform the power source host-side to adjust the output voltage by I2C communication once charging request granted.

IP2218 support analysis several charging standards, including USB PD2.0/PD3.0/PPS, HVDCP QC3.0/QC2.0 (Quick Charge), AFC (Adaptive Fast Charge), SCP (Super Charge Protocol) and FCP (Fast Charge Protocol).

IP2218 detects both CC pins for USB PD protocol and monitors the real-time voltage on DP line and DM line for other fast charge protocol detection. Once the attached device fast charge type is determined, the negotiation will be accomplished on CC lines or DP and DM lines accordingly. IP2218 will analysis the protocol and fulfill the power requirements, and send the required voltage information to host through I2C interface.

Fast Charge Selection

IP2218 can be classified into two kinds of fast charge configuration:

	BC1.2 & APPLE	QC3.0 & QC2.0	FCP	SCP	AFC	TypeC	PD2.0/PD3.0/PPS	NTC
Option 1	√	√	√	√	√	√	-	√
Option 2	√	√	-	-	-	√	√	√

10. Package
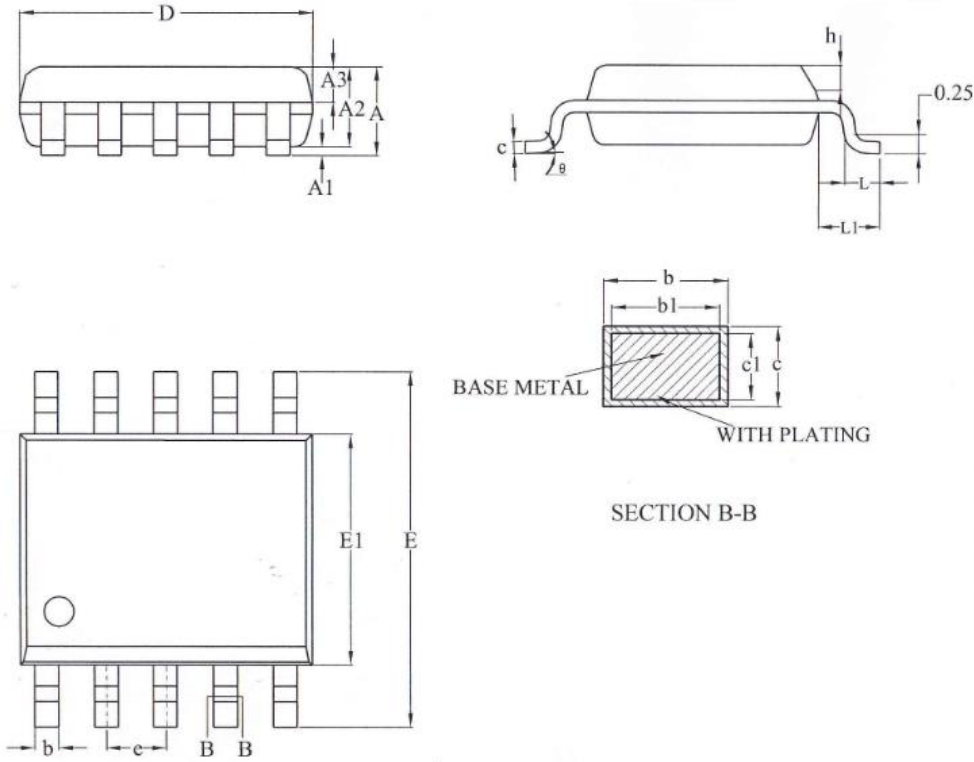
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.00BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°

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