

IP2323

5V Input Boost Charger for Two-cell Serial Li Battery

1 Features

• charging

- Integrated 5W synchronous switch-mode boost charger
- \diamond 93% boost charging efficiency
- ♦ Constant voltage charging voltage 8.4V
- ♦ Constant current charging current 0.5A
- Programmable constant voltage charging voltage by external resistor
- Self-regulated input current, adaptive adapt-or load
- ♦ LED for charging status indication

Minimal BOM

- ♦ Power MOSFETs integrated
- 400kHz switching frequency, support 2.2uH inductor

Multiple protection, high reliability

- ♦ Output overvoltage protection
- IC over-temperature protection
- ♦ Input voltage withstand 20V
- ♦ ESD 4kV

2 Typical Applications

Two-cell Li/Li-Ion battery charging management

3 Description

The IP2323 is a boost charge management IC that supports two series Li-Battery/Li-Ion batteries.

IP2323 integrated power MOS and synchronous switching architecture enable it to require only a few peripheral components for application, and effectively reduce the size of the overall solution and BOM cost.

IP2323 integrate synchronous switching circuit with power FETs at 400kHz switching frequency. The charging efficiency is 93% when VIN is 5V and VOUT is 8V/0.5A.

IP2323 has the function of input voltage limiting. The charge current is regulated automatically. Adaptive adapter load capacity IP2323 is package in SOP8.

V1.20



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4 Reversion History

NOTE: The page numbers of the previous version may differ from the page numbers of the current version. **Initial release version V1.00 (April 2023)**

Change page numbers for version V1.00 to V1.10 (August 2023)	Page
Add mark description	14
Change page numbers for version V1.10 to V1.20 (july 2024)	Page
Modified the description of the battery charging current	5



5 Simplify application schematic



Figure 1

1 IP2323 Simplify the application schematic

6 Pin Configuration And Function





Pin Name	Pin Num	Pin Description			
VSYS	1	Two 10uF ceramic capacitors are placed close to the pin at			
		the intermediate node of the boost output			
VOUT	2	Boost output pin, connect battery positive			
TEST	3	Test pin, ground			
LED	4	LED charging status indication pin			
VIN	5	Input power supply and check pin			
BST	6	Bootstrap circuit pins with bootstrap capacitance 0.1uF			
		placed next to BST and LX pins of the chip			
GND	7	Ground			
LX	8	DCDC switch node, connect to external inductor			



7 Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
VIN/VOUT/VSYS/BST/LX	V	-0.3 - 20	V
Voltage Range	v	-0.3 ~ 20	v
Junction Temperature Range	T_J	-40 ~ 150	°C
Storage Temperature Range	T _{stg}	-60 ~ 150	°C
Junction Temperature(junction to	Α.,	180	°CAN
ambient)	UJA	180	C/W
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.

8 Recommended Operating Conditions

Parameter	Symbol	Min.	Тур.	Max.	Unit
Input Voltage	V _{IN}	4. 5	5	5.5	V
Charge Current	Ι _{ουτ}		0.5		А

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

9 Electrical Characteristics

Unless otherwise specified, TA=25°C, L=2.2uH, VIN=5V, VOUT=7.4V

Parameter	Symb ol	Test Conditions	Min.	Тур.	Max.	Unit			
Charging System	Charging System								
Input Voltage	V _{IN}		4. 5	5	5.5	V			
Input under-voltage threshold	V _{IN-U} v		4.4	4.5	4.6	V			
Input over-voltage threshold	V _{IN-O}		5.8	6.0	6.2	V			
Input overvoltage protection hysteresis				400		mV			
Input Current	I _{VIN}	VIN=5V, VOUT=NC, NO LED	10	20	30	mA			
Standby Current	I _{standb}	VIN=0, VOUT=7.4V		1	2	uA			



IP2323

	y-BAT					
Charge Current	I _{CC}	R _{ISET} =1k	0.4	0.5	0.6	А
Charge Target Voltage	V _{CV}	$\label{eq:VTRGT} \begin{array}{l} V_{TRGT} = 8.00 + R_{VSET} * 0.08 \\ R_{VSET} = 5.1k (\mbox{ Resistance accuracy } 1\%) \end{array}$	8.35	8.4	8.5	V
Full charge stop detection voltage	V_{SV}			V _{CV} -0.1		V
Charging voltage after full charge	V _{RC}			V _{CV} -0.2	•	V
Trickle over constant current voltage	V _{TK}	VIN=5V	5.9	6.0	6.1	V
Trickle Charge Current	Ι _{τκ}	VIN=5V,VOUT<6V	50	75	125	mA
Charge Cut-off Current	I _{STOP}			50	150	mA
Control System						
LED drive Current	I_{Led}	VIN=5V			5	mA
LED high level voltage	V_{Led}	VIN=5V, LED outputs high level voltage	4.5	5		V
Thermal shutdown temperature	T _{OTP}	Rising Threshold	125	135	145	°C
Thermal shutdown recovery temperature	T _{OTP-H}	Falling Threshold	100	110	120	°C



10 Function Description

10.1 Functional Block Diagram





10.2 Boost Charge

IP2323 integrated a synchronous boost charger with 400kHz switching frequency, the output boost to 8.4V for two-cell Li/Li-Ion battery. The efficiency is 93% at 5V input and 8V/0.5A output.



Figure 4 IP2323 Charging efficiency curve



10.3 Charge Process

The IP2323 uses a full trickle/constant/constant voltage charging mode.

When the battery voltage is less than the trickle to constant current voltage V_{TK} , it is charged with trickle charging current I_{TK} .

When the battery voltage is greater than V_{TK} , charge with constant current charging current I_{CC} .

When the battery voltage approaches the set constant voltage charging voltage V_{CV} , the charging voltage V_{CV} remains unchanged, the charging current slowly decreases, and the constant voltage charging mode is entered.

After entering the constant voltage charging mode, if the charging current is less than the full charge stop detection current I_{STOP} . The charging will be stopped first, and then detect whether the battery voltage is higher than the stop voltage V_{SV} . If it is higher than the charging stop voltage V_{SV} , stop charging. If the stop voltage is lower, charging continues.

After the battery is fully charged and stopped, and the input VIN continues to be active, if the battery voltage is less than V_{RC} , it will enter the full charge stage and start the charging process again.



Figure 5 IP2323 Schematic diagram of the charging process

10.4 Charging protection

IP2323 has perfect protection functions, integrated input undervoltage, overvoltage protection, IC over temperature protection and other functions to ensure stable and reliable system work.

IP2323 has an input voltage stabilizing loop for VIN. When the input voltage is close to 4.5V under-voltage threshold, the charging current will be lowered automatically to ensure the input voltage is



stable near the input under-voltage threshold and that the adapter will not fail.

IP2323 integrated input over-voltage protection function, when detected input voltage is greater than 6.0V over-voltage threshold, it will stop charging.

IP2323 integrated over-temperature protection function, when the chip internal temperature is detected more than 135° C, the system will be forced to stop charging.

10.5 Charging LED indication

The LED light will light up during charging. The LED light will go off when fully charged. When an abnormal state is detected (abnormal states include: input overvoltage protection, chip overtemperature protection, no access to the battery) LED will flash.

10.6 Battery detection function

IP2323 has battery detection function, When VIN is not connected to the battery, the LED will flash to indicate an abnormality.

When LED flashes abnormally, the normal charging process will enter after the battery is connected.

10.7 PCB LAYOUT Notes

Note 1: The VSYS pin must be added with a 10uF ceramic capacitor, the capacitance should be close to the VSYS pin (pin 1) and GND pin (pin 7) of the chip, and the capacitor ground cannot be separated from the pin ground;



Figure 6 VSYS capacitor LAYOUT



Note 2: The VIN pin must be added with a 10uF capacitor, the capacitor should be close to the VIN pin (pin 5) and GND pin (pin 7) of the chip, and the capacitor ground cannot be separated from the pin ground;



Figure 7 VIN capacitor LAYOUT



11 Typical Application Schematic



Figure 8 Typical Application Schematic



12 BOM

No.	Part Name	Type &Specification	Unit s	Quantity	Location	Note
1	IC	IP2323	PCS	1	U1	
2	Inductance	CD43	PCS	1	L1	Saturate current (Isat), temperature rise current (Idc) larger than 5A, DCR less than 20mΩ, inductance 2.2uH @ 500kHz
3	SMD capacitors	0805 10uF 25V 10%	PCS	2	C1、C3	Capacitor's voltage higher than 16V, SMD ceramic capacitor is required
4	SMD capacitors	0603 1uF 25V 10 %	PCS	1	C2	Capacitor's voltage higher than 16V, SMD ceramic capacitor is required
5	SMD capacitors	0603 104 25V 10%	PCS	1	C4	
6	SMD capacitors	0603 NC	PCS	1	C6	Certified reservations
7	SMD resistors	0603 1k 5%	PCS	1	R1	Adjust LED brightness
8	SMD resistors	0603 NC	PCS	2	R2、R3	Certified reservations
9	LED	0603	PCS	D ₁	LED	LED indicator, maximum drive capacity 5mA



13 MARK DESCRIPTION



instructions:

1,	(j)	Injoinic Logo
0	тродод	

- 2、IP2323 --Product Model
- 3、XXXXXXX --Manufacture Number
- 4, O --Pin1 Location

Figure 9 Mark illustration



14 PACKAGE INFORMATION





	POD	SOP8L				
		Si	Size unit: mm			
	Symbol	Minimum	Normal	Maximum		
Total Thickness	Α	-	-	1.75		
Molding Thickness	A1	1.30	1.40	1.50		
LF Thickness	A2	0.20	-	0.24		
Stand Off	A3	0.05	-	0.225		
Dody Cize	D	4.80	4.90	5.00		
Body Size	E	3.80	3.90	4.00		
	E1	5.80	6.00	6.20		
Lead Width	b	0.39	-	0.47		
Lead Length	L	0.50	-	0.80		
Lead Pitch	е	1.27 BSC				



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