SC8812A High Efficiency, Synchronous, Bi-Directional Buck-Boost Charger Controller with I2C Interface

1 Description

SC8812A is a synchronous buck-boost charger controller which can support reverse discharging operation. It can support up to 26V battery voltage, so can be used to effectively manage the charging process for 1~4 cell Li-ion batteries no matter adapter voltage is higher, lower or equal to battery voltage. When a system needs to generate an output from the battery, SC8812A can also discharge the cells and delivers desired output up to 36V.

Through its I2C interface, user can set the charging / discharging mode easily, and program the charging current, charging voltage, reserve output voltage, current limits, switching frequency and other parameters flexibly. Besides that, SC8812A supports fast charging handshake. It also integrates 10-bit ADC, so user can read the VBUS / VBAT voltage and current in real time, simplifying the system design.

SC8812A supports internal current limit, over voltage protection, output short protection and over temperature protections to ensure safety under abnormal conditions.

The SC8812A is in a 32 pin 4x4 QFN package.

2 Features

- Buck-Boost Battery Charger for 1 to 4 Cell Batteries
- Charging Management including Trickle Charge, CC Charge, CV Charge and Charge Termination
- Buck-Boost Reverse Discharging Mode
- Wide V_{BAT} Range: 2.7 V to 26 V, 40V sustainable
- Wide V_{BUS} Range: 2.7 V to 36 V, 40V sustainable
- I2C Programmable Charging Current and Voltage
- I2C Programmable Discharging Output Voltage
- I2C Programmable Input / Output Current Limit
- I2C Programmable Switching Frequency
- High Efficiency Buck-Boost Conversion
- DP/DM Handshake for Fast Charging
- 10-bit ADC Resources
- Charging Status Indication
- Event Detections, including Automatic Adapter Insert and Automatic Load Insert Detection
- Power Path Control
- Under Voltage Protection, Over Voltage Protection, Over Current Protection, Short Circuit Protection and Thermal Shutdown Protection
- QFN-32 Package

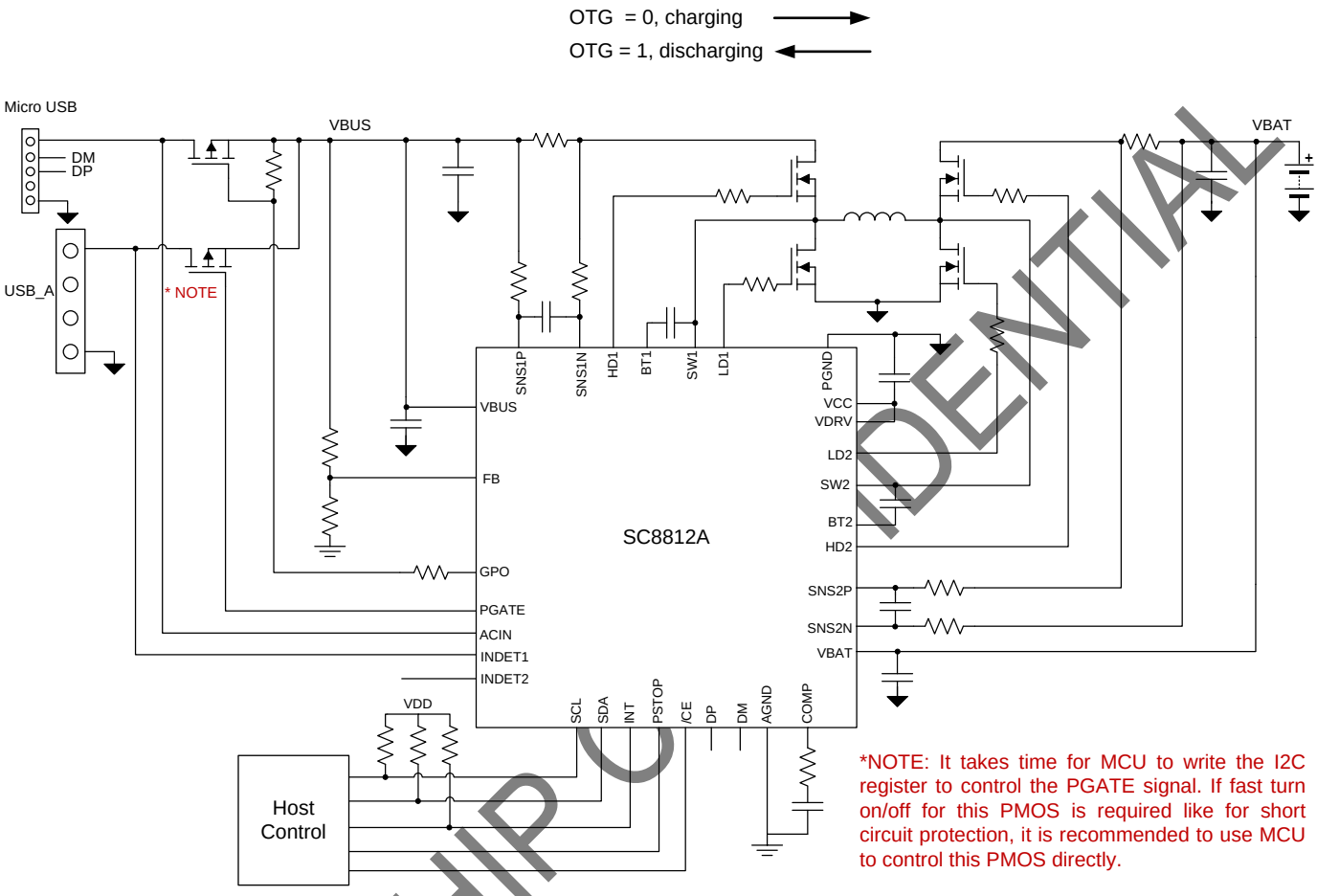
3 Applications

- Power Bank with Fast Charge Function
- USB Power Delivery
- Type C Hub
- Industrial Power Supplies

4 Device Information

Part Number	Package	Dimension
SC8812AQDER	32 pin QFN	4.0mm x 4.0mm x 0.75mm

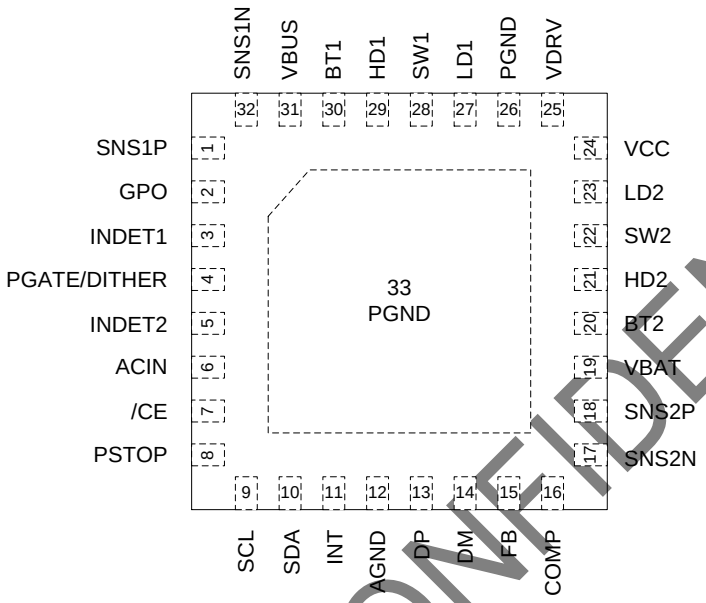
5 Typical Application Circuit



*NOTE: It takes time for MCU to write the I2C register to control the PGATE signal. If fast turn on/off for this PMOS is required like for short circuit protection, it is recommended to use MCU to control this PMOS directly.

6 Terminal Configuration and Functions

Top View



TERMINAL		I/O	DESCRIPTION
NUMBER	NAME		
1	SNS1P	I	Positive input of a current sense amplifier. Connect to one pad of the current sense resistor (typical 10 mΩ) on the power path to sense the current into or out from VBUS.
2	GPO	O	Open drain output for general purpose. It is controlled by GPO_CTRL bit. User can use this pin to drive external PMOS with a pull up resistor.
3	INDET1	I	Connect this pin to a USB-A port to detect the load insertion event. When an insertion event is detected, the IC sets INDET1 bit and outputs an INT interrupt pulse to inform MCU.
4	PGATE/DITHER	IO	PMOS gate driver controlled by PGATE bit, used to control the external PMOS on the power path. This pin can be configured through I2C for switching frequency dithering function. Connect a ceramic capacitor (typical 100nF) from this pin to ground when for frequency dither function.
5	INDET2	I	Connect this pin to a USB-A port to detect the load insertion event. When an insertion event is detected, the IC sets INDET2 bit and outputs an INT interrupt pulse to inform MCU.
6	ACIN	I	Connect this pin to AC adapter input node or micro-USB port to detect an AC adapter insertion event. When an insertion event is detected, the IC sets AC_OK bit and outputs an INT interrupt pulse to inform MCU.
7	/CE	I	Chip enable control. Pull this pin to logic low to enable the IC; pull this pin to logic high to disable the IC. This pin is internally pulled low.
8	PSTOP	I	Power stop control. Pull this pin to logic low to enable the power blocks; pull this pin to logic high to disabled the power blocks, and the IC enters into Standby mode. In Standby mode, only the AC adapter and load insert detection functions and the I2C circuits keep working.

			This pin is internally pulled low.
9	SCL	I	I2C interface clock. Connect SCL to the logic rail through a pull up resistor (typical 10 kΩ). The IC works as a slave, and the I2C address is 0x74H.
10	SDA	I/O	I2C interface data. Connect SDA to the logic rail through a pull up resistor (typical 10 kΩ).
11	INT	O	An open drain output for interrupt signal. The IC sends a logic low pulse at INT pin to inform the host if an interrupt event happens.
12	AGND	I/O	Analog ground. Connect PGND and AGND together at the thermal pad under IC.
13	DP	IO	Positive data line for USB interface. Can be controlled by MCU to implement the handshaking with adapter to realize fast charging.
14	DM	IO	Negative data line for USB interface. Can be controlled by MCU to implement the handshaking with adapter to realize fast charging.
15	FB	I	Feedback node for VBUS voltage. Connect a resistor divider from VBUS to FB to set the VBUS discharging output voltage in external way. The FB reference can also be programmed through I2C.
16	COMP	I	Connect resistor and capacitor at this pin to compensate the control loop.
17	SNS2N	I	Negative input of a current sense amplifier. Connect to one pad of the current sense resistor (typical 10 mΩ) on the power path to sense the current into or out from battery.
18	SNS2P	I	Positive input of a current sense amplifier. Connect to the other pad of the current sense resistor (typical 10 mΩ) on the power path to sense the current into or out from battery.
19	VBAT	I	Power supply to the IC. Connect to the battery positive node. Place a 1 μF capacitor from this pin to PGND as close to the IC as possible.
20	BT2	I	Connect a 100nF capacitor between BT2 pin and SW2 pin to bootstrap a bias voltage for high side MOSFET driver.
21	HD2	O	Gate driver output to control the external high side power MOSFET.
22	SW2	I/O	Switching node. Connect to the inductor.
23	LD2	O	Gate driver output to control the external low side power MOSFET.
24	VCC	O	Output of an internal 6V linear regulator. Connect a 1 μF capacitor from VCC pin to PGND as close to the IC as possible.
25	VDRV	I	Power supply input for internal driver circuits. Connect VCC to this pin directly
26	PGND	I/O	Power ground. Connect PGND and AGND together at the PGND thermal pad under IC.
27	LD1	O	Gate driver output to the external low side MOSFET.
28	SW1	I/O	Switching Node. Connect to the inductor.
29	HD1	O	Gate driver output to the external high side MOSFET.
30	BT1	I	Connect a 100nF capacitor between BT1 pin and SW1 pins to bootstrap a bias voltage for high side MOSFET driver.
31	VBUS	I	Power supply to the IC. Connect to the VBUS rail. Place a 1 μF capacitor from this pin to PGND as close to the IC as possible.

32	SNS1N	I	Negative input of a current sense amplifier. Connect to one pad of the current sense resistor (typical 10 mΩ) on the power path to sense the current into or out from VBUS.
33	Thermal Pad		PGND thermal pad. Connect PGND and AGND together at the thermal pad under IC.