SY6952B

2A Single-Cell High Efficiency Switching Charger with Adaptive Input Current Limit

General Description

SY6952B is a 4.0-23V input, 2A single-cell synchronous buck Li-Ion battery charger, suitable for portable application. VSET pin is convenient for different cell voltage. Integrated 800 kHz synchronous buck regulator consists of 25V rating FETs with extremely low ON resistance to achieve high charge efficiency and simple peripheral circuit design.

Ordering Information

SY6952□(□□)□
- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY6952BFCC	SO8E	

Features

- Wide Input Voltage Range: 4.0V to 23V
- High Efficiency Int. Synchronous Buck Regulator with Fixed 800kHz Switching Frequency
- Trickle Current / Constant Current / Constant Voltage Charge Mode
- Adaptive input current limit
- Programmable Charging Timeout
- 4.35 and 4.2V selectable cell voltage
- Programmable (2A MAX) Constant Charge Current
- Input Voltage UVLO and Battery OVP
- Over Temperature Protection
- Output Short Circuit Protection
- Charge Status Indication
- Normal Synchronous Buck Operation when Battery Removed
- Compact package SO8E

Applications

- Cellular Telephones,
- PDA, MP3 Players, MP4 Players
- Digital Cameras
- Bluetooth Applications
- PSP Game Players, NDS Game Players
- Notebook

Typical Applications

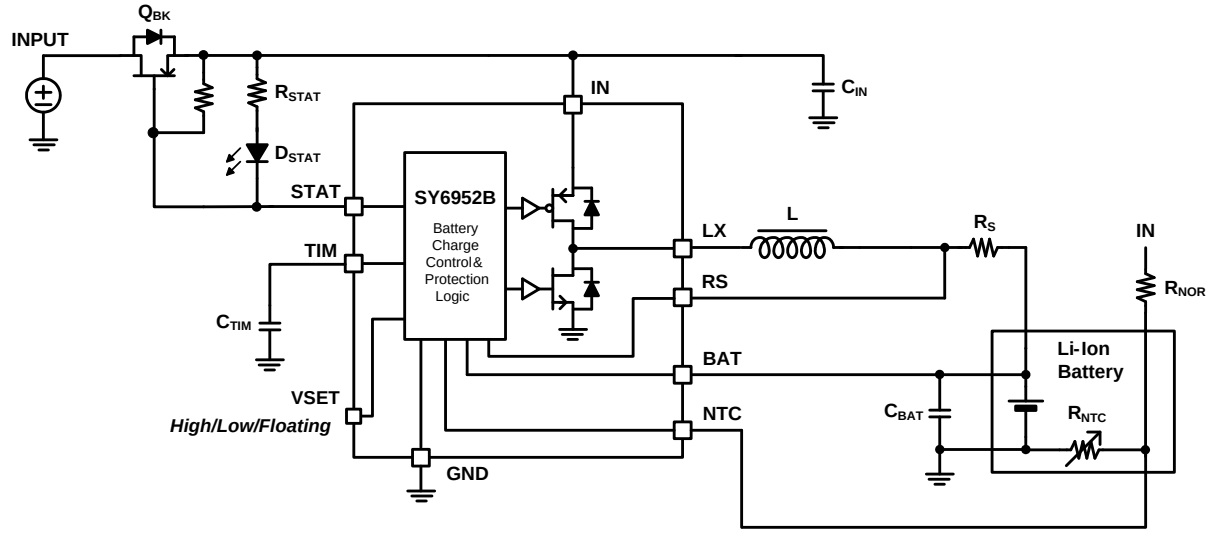
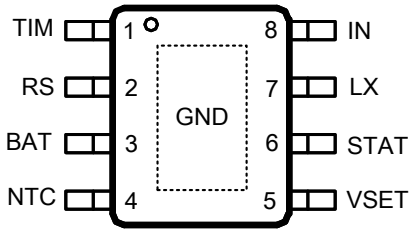


Figure1. Schematic Diagram

Pinout (top view)



(SO8E)

Top Mark: ALB*xyz* (device code: **ALB**, ***x=year code, y=week code, z= lot number code)***

Name	Number	Description
TIM	1	Charge time limit pin. Connect this pin with a capacitor to ground. Internal current source charge the capacitor for TC mode and CC mode's charge time limit. TC charge time limit is about 1/9 of CC charge time.
RS	2	Charge current program pin. Connect a current sense resistor from RS pin to BAT pin. Average charge current is detected for both TC mode and CC mode.
BAT	3	Battery positive pin.
NTC	4	Thermal protection pin. UTP threshold is about 75%V_{IN} and OTP threshold is about 30%V_{IN}. Pull up to VIN can disable charge logic and make the IC operate as normal buck regulator. Pull down to ground can shut down the IC.
VSET	5	VSET is pull down internally. Open or pull down for 4.2V cell voltage, pull up for 4.35V cell voltage.
STAT	6	Charge status indication pin. It is open drain output pin and can be used to turn on a LED to indicate the charge in process. When the charge is done, LED is off.
LX	7	Switch node pin. This pin connects the drains of the integrated main and synchronous power MOSFET switches. Connect to external inductor.
IN	8	Positive power supply input pin. V_{IN} ranges from 4V to 23V for normal operation. It has UVLO function and must be120mV greater than the battery voltage to enable normal operation.
GND	Exposed pad	Ground pin.

Absolute Maximum Ratings (Note 1)

VSET, NTC, STAT ---------- -0.5- 32V
IN, BAT, LX ---------- -0.5- 25V
TIM ---------- -0.5- 3.6V
RS ---------- BAT-0.3V to BAT+0.3V
LX Pin current continuous ---------- 2.5A
Power Dissipation, P_D @ T_A = 25 ℃, SO8E---------- 3.3W
Package Thermal Resistance
θ_{JA} ---------- 30 ℃/W
θ_{JC} ---------- 20 ℃/W
Junction Temperature Range ---------- -40 ℃ to 150 ℃
Lead Temperature (Soldering, 10 sec.) ---------- 260 ℃
Storage Temperature Range ---------- -65 ℃ to 125 ℃
ESD Susceptibility (Note 2)
HBM (Human Body Mode) ---------- 2kV
MM (Machine Mode) ---------- 200V

Recommended Operating Conditions

VSET, NTC, STAT ---------- -0.3- 30V
IN, BAT, LX ---------- -0.3- 23V
TIM ---------- -0.3- 3.6V
RS ---------- BAT-0.1V to BAT+0.1V
LX Pin current continuous ---------- 2A
Junction Temperature Range ---------- ---------- -20℃ to 125℃
Ambient Temperature Range ---------- ---------- -40℃ to 85℃

Electrical Characteristics

T_A=25 ℃, V_{IN}=15V, GND=0V, C_{IN}=10uF, L=6.8uH, R_S=25mΩ, C_{TIM}=330nF, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Bias Supply (V_{IN})						
V_{IN}	Supply voltage		4.0		23	V
V_{UVLO}	V_{IN} under voltage lockout threshold	V_{IN} rising and measured from V_{IN} to GND			3.9	V
ΔV_{UVLO}	V_{IN} under voltage lockout hysteresis	Measured from V_{IN} to GND		190		mV
V_{OVP}	Input overvoltage protection	V_{IN} rising and measured from V_{IN} to GND	23			V
ΔV_{OVP}	Input overvoltage protection hysteresis	Measured from V_{IN} to GND		750		mV
Quiescent Current						
I_{BAT}	Battery discharge current	Pull Down NTC Disable Charge			25	uA
I_{IN}	Input leakage current				1.5	mA
Oscillator and PWM						
f_{OSC}	Oscillator frequency		640	800	960	kHz
D	PFET duty cycle				100	%
Power MOSFET						
R_{NFET}	$R_{DS(ON)}$ of N-FET	Include bond-wire		150		mΩ
R_{PFET}	$R_{DS(ON)}$ of P-FET			160		mΩ
Voltage Regulation						
V_{CV}	Low VSET for 4.2V cell voltage	0 ℃ <=T_A<=70 ℃	4.16	4.20	4.24	V
	High VSET for 4.35V cell voltage		4.30	4.35	4.40	
ΔV_{RCH}	4.2V CV threshold for Recharge	0 ℃ <=T_A<=70 ℃	50	100	150	mV
	4.35V CV threshold for Recharge		100	150	200	
V_{TRK}	TC charge mode voltage threshold	0 ℃ <=T_A<=70 ℃	2.2	2.5	2.8	V
Battery Connect Detection						
V_{DET}	NTC voltage threshold for Battery detect	NTC Falling Edge	80%		90%	V_{IN}
t_{DET}	Detect delay time		30	35	40	ms
Charge Current						
	Internal charge current accuracy for Constant Current Mode	I_{CC}=25mV/R_S	-10%		10%	
	Internal charge current accuracy for Trickle Current Mode	I_{TC}=2.5mV/R_S	-50%		50%	
Charge Termination						
I_{TERM}	Charge Termination Current			10%		I_{CC}
T_{TERM}	Termination delay time			30		ms
Input current limit slow response						
V_{INSL}	IN voltage falling threshold at high current			4.6		V
ΔV_{INSL}	IN voltage hysteresis at high current			50		mV
Input current limit quick response						
ΔV	IN voltage falling threshold at high current			4.4		V
ΔV_{INQK}	IN voltage hysteresis at high current			100		mV
Output Voltage OVP						
V_{OVP}	Output voltage OVP threshold		105%	110%	115%	V_{CV}
Output Short Protection						
V_{SHOT}	Output short protection threshold	V_{BAT} falling edge	1.70	2.00	2.30	V
f_{FBK}	Frequency fold back	V_{BAT}<2V		12.5%		f_{OSC}
I_{LM}	Power FET current limit			4		A
Timer						

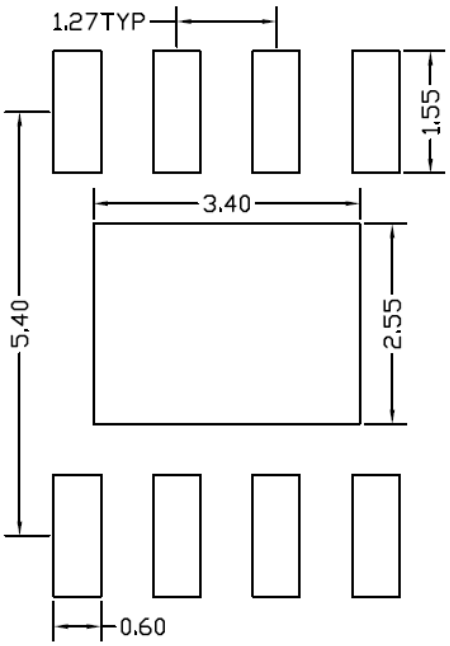
T_{TC}	Trickle current charge timeout	C_{TIM}=330nF	0.425	0.5	0.575	hour
T_{CC}	Constant current charge timeout		3.825	4.5	5.175	hour
T_{MC}	Charge mode change delay time			30		ms
T_{RCHG}	Recharge time delay			30		ms
Battery Thermal Protection NTC						
UTP	Under temperature protection		70%	75%	80%	V_{IN}
	Under temperature protection hysteresis	Falling edge		5%		
OTP	Over temperature protection		28%	30%	32%	
	Over temperature protection hysteresis	Rising edge		2%		
Automatic Shutdown						
ΔV_{ASD}	ASD voltage threshold hysteresis	Measured from V_{IN} to V_{BAT}		80		mV
Thermal Shutdown						
T_{SD}	Thermal shutdown temperature	Rising Threshold		160		℃
T_{SDHYS}	Thermal shutdown temperature hysteresis			20		℃

Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

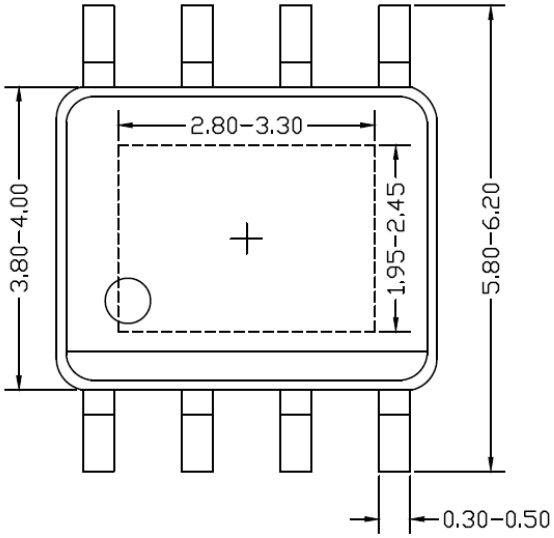
Note 2: θ_{JA} is measured in the natural convection at T_A = 25℃ on a low effective four-layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

Note 3: The device is not guaranteed to function outside its operating conditions

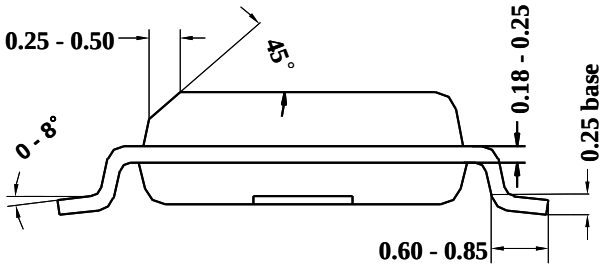
SO8E Package Outline & PCB layout

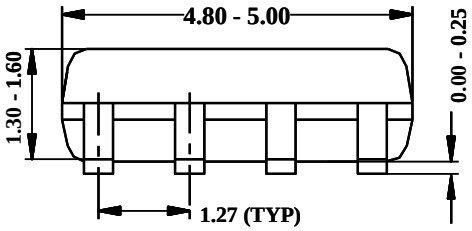


Recommended Pad Layout



Top view





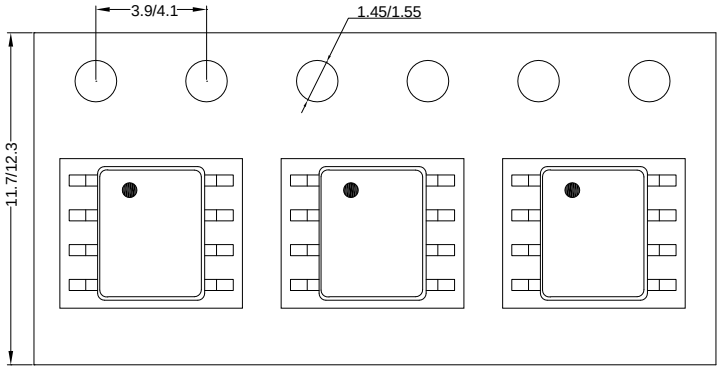
Side view

Notes: **All dimension in MM**
All dimension don't not include mold flash & metal burr

Taping & Reel Specification

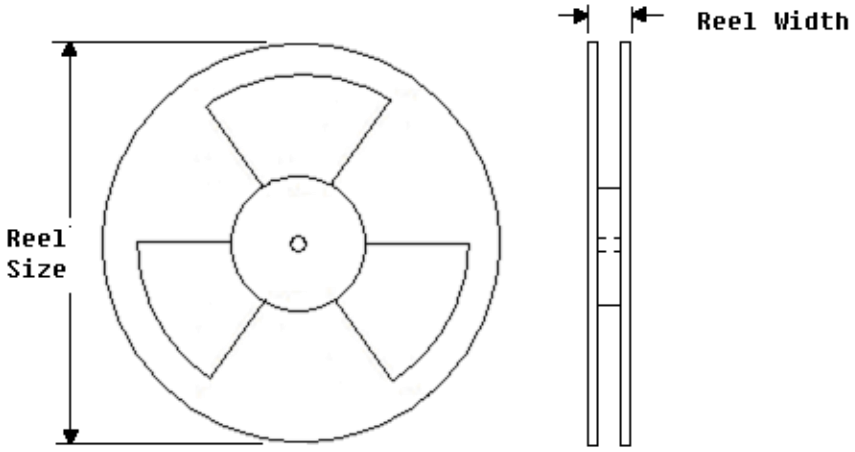
1. Taping orientation

SO8E



Feeding direction ⟶

2. Carrier Tape & Reel specification for packages



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Reel width(mm)	Trailer length(mm)	Leader length (mm)	Qty per reel
SO8E	12	8	13"	12.4	400	400	2500

3. Others: NA

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