



2/3/4 Cell Boost Battery Charger for 5V Input

■ XS5822 Features

- Programmable Charge Current Up to 2000mA
- Programmable Charge Voltage with VSET pin Supports 2-cell or 3-cell or 4-cell;
- Trickle Current / Constant Current / Constant Voltage Charging mode with Thermal Regulation to Maximize Charge Rate Without Risk of Overheating;
- 4V to 5.5V Operating Input Range;
- Automatic Recharge;
- Integrated 60mΩ Power MOSFET
- 1.0MHz Fixed Switching Frequency
- Thermal Shutdown Protection
- One LED Show the Charge States
Charging---Green LED ON
Fully Charged---Green LED OFF
- ESOP8 Package

■ XS5822 General Description

The XS5822 is a Complete Constant-Current Constant-Voltage Boost Charger for two/Three/Four cell Li-Ion batteries. It's small footprint and low external component count make XS5822 especially suitable for portable applications. The charge voltage is fixed by R1/R2 and the charge current can be programmed externally with a single resistor. The XS5822 implements BAT over-voltage protection and thermal shutdown. The XS5822 is available in a space saving ESOP-8 Package.

■ XS5822 Absolute Maximum Ratings $T_c = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Rating	Unit
Supply Voltage at PIN $V_{IN}/I_{SET}/FB$	V_{PIN}	GND-0.3~GND+6	V
Supply Voltage at PIN SW		GND-0.3~ GND+20	
Supply Voltage at Other PIN		GND-0.3~GND+6	
Package thermal resistance	θ_{JA}	50	$^\circ\text{C}/\text{W}$
Junction temperature	T_J	150	$^\circ\text{C}$
Storage Temperature	T_{ST}	-65~150	$^\circ\text{C}$
Ambient temperature range	T_{AMB}	-40~85	$^\circ\text{C}$
Solder temperature(10s)	T_s	260	$^\circ\text{C}$

■ XS5822 Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
V_{IN} Voltage to GND	V_{IN}	4.0~5.5	V
BAT Pin Current	I_{BAT}	0~2.3	A
Operating Junction Temperature	T_A	-40~85	$^\circ\text{C}$



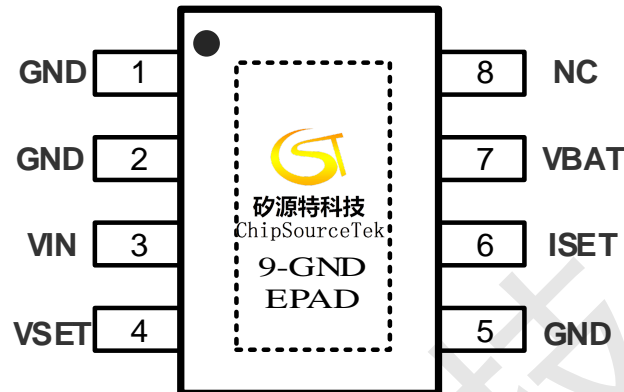
■ XS5822 Electronic Characteristics

(Typical values are at XS5822 EVB; VIN=5V, TA=25°C unless otherwise noted)

Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit
DC Electrical Characteristics						
Supply Voltage Range		V _{IN}	4.0	5.0	5.5	V
Output Voltage Range		V _{OUT}			20	V
Supply Current (Quiescent)	V _{FB} =110%	I _Q		100	200	uA
FB Feedback Voltage		V _{FB}	1.176	1.2	1.224	V
ISET Feedback Voltage		V _{ISET}	190	200	210	mV
Current Limit	Duty cycle=50%	I _{LIMIT}		4		A
Switching Frequency			---	1.0	---	MHz
Maximum Duty Cycle			---	90	---	%
Soft Start			---	2	---	mS
Thermal Shutdown		T _{LIM}	---	160	---	°C



■ XS5822 Package Information



■ XS5822 Pin Description

ESOP-8 PIN	PIN Name	Function
1/2/5	GND	Ground Pin
3	VIN	Power Supply
4	VSET	Battery Voltage Set PIN, $V_{BAT}=1.2X(R1+R2)/R2$
6	ISET	Charge current set Pin. $I_{BAT}=0.2/R_{SET}$
7	VBAT	Charge Current Output. Connect to Battery.
8	NC	Not Connect
9	EP	GND EPAD

■ XS5822 Ordering Information

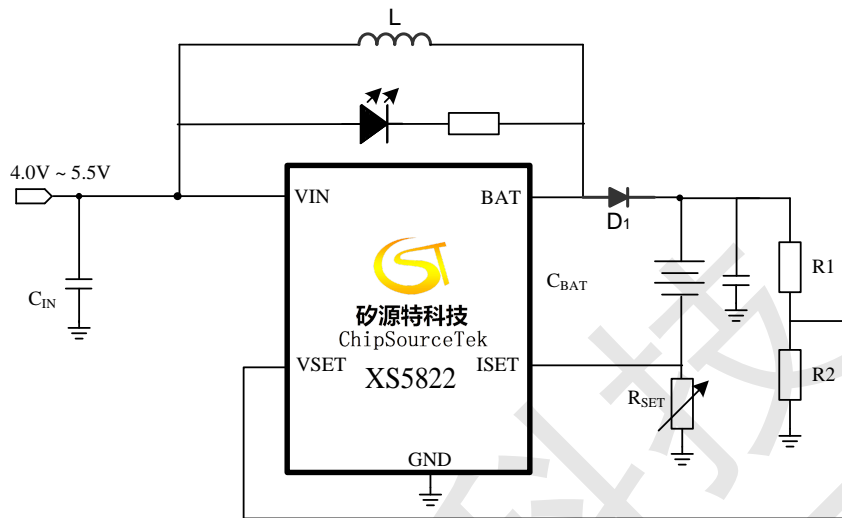
Part Number	Marking ID	Temperature Range	Package	T/R Qty
XS5822	5822 ****	-40°C to 85°C	ESOP-8	3000PCS

■ XS5822 Charge Status Table

LED	Status
OFF	Battery Full
ON	Charging



■ XS5822 Application Circuit



■ XS5822 Functions Description

The XS5822 is a lithium-ion battery charger using a constant-current/constant-voltage algorithm. It can deliver up to 2000mA of charge current (using a good thermal PCB layout) with a final float voltage accuracy of $\pm 1\%$. The XS5822 includes an internal N-channel power MOSFET and thermal regulation circuitry.

■ XS5822 Normal Charge Cycle

A charge cycle begins when the voltage at the VIN pin rises above the UVLO threshold level and a 1% program resistor is connected from the ISET pin to ground and when a battery is connected to the charger output. If the BAT pin is less than $2.9V \cdot N$ (N : 2-cell or 3-cell or 4-cell), the charger enters trickle charge mode. In this mode, the XS5822 supplies approximately 1/4 the programmed charge current to bring the battery voltage up to a safe level for full current charging. (Note: The XS5822 does not include this trickle charge feature).

When the BAT pin voltage rises above 2.9V, the charger enters constant-current mode, where the programmed charge current is supplied to the battery. When the BAT pin approaches the final float voltage, the XS5822 enters constant-voltage mode and the charge current begins to decrease. When the charge current drops to 1/4 of the programmed value, the charge cycle ends.



■ XS5822 Programming Charge Current

The charge current is programmed using a single resistor from the ISET pin to ground. The program resistor and the charge current are calculated using the following equations:

$$I_{bat} = 0.2 / R3$$

■ XS5822 Programming Battery Voltage

The Battery Voltage is programmed as below:

$$V_{bat} = 1.2 * (R1 + R2) / R2$$

NOTE: In order to reduce the influence of battery internal resistance and speed up the charging process, the Vbat voltage is usually set to be 100mV ~ 200mV higher than the terminal voltage of the battery. The elevation voltage is confirmed by the following expression: $I_{terminal} * R_{BAT}$

■ XS5822 Charge Termination

A charge cycle is terminated when the charge current falls to 1/4th the programmed value after the final float voltage is reached. Once the average charge current drops below 1/4th the programmed value, the XS5822 terminates the charge cycle and ceases to provide any current through the BAT pin. In this state, all loads on the BAT pin must be supplied by the battery.

The XS5822 constantly monitors the BAT pin voltage in standby mode. If this voltage drops below the $1V * N$ (N: 2-cell or 3-cell or 4-cell) recharge threshold (VRECHRG), another charge cycle begins and current is once again supplied to the battery.

■ XS5822 Charge Status Indicator

The charge status output has two different states: The LED indicator is on and the LED indicator is off. The LED ON state indicates that the XS5822 is in a charge cycle. Once the charge cycle has terminated, LED is off. In the UN charged state, such as UVLO, the LED indicator is off.

■ XS5822 Automatic Recharge

Once the charge cycle is terminated, the XS5822 continuously monitors the voltage on the BAT pin using a comparator with a 1ms filter time. A charge cycle restarts when the battery voltage falls below $1V * N$ (N: 2-cell or 3-cell or 4-cell). This ensures that the battery is kept at or near a fully charged condition and eliminates the need for periodic charge cycle initiations.



■ XS5822 Battery Over Voltage Protection

The battery over voltage limit is clamped at 1% above the battery regulation voltage. When battery over voltage occurs, the charger device immediately disables charging.

■ XS5822 Under Voltage Lockout

An internal under voltage lockout circuit monitors the input voltage and keeps the charger in shutdown mode until VIN rises above the under voltage lockout threshold. The UVLO circuit has a built-in hysteresis of 300mV. When VIN is greater than UVLO but less than 4.5V, XS5822 will automatically reduce the charging current to ensure the normal operation of the adapter.

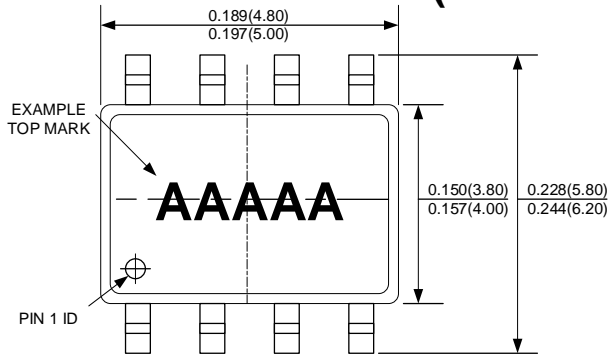
■ XS5822 Thermal Limiting

An internal thermal feedback loop reduces the programmed charge current if the die temperature attempts to rise above a preset value of approximately 120°C. This feature protects the XS5822 from excessive temperature and allows the user to push the limits of the power handling capability of a given circuit board without risk of damaging the XS5822. The charge current can be set according to typical (not worst-case) ambient temperature with the assurance that the charger will automatically reduce the current in worst-case conditions.

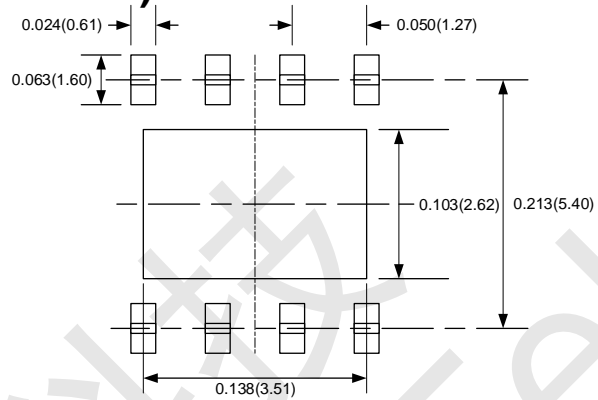


■ XS5822 Package Description

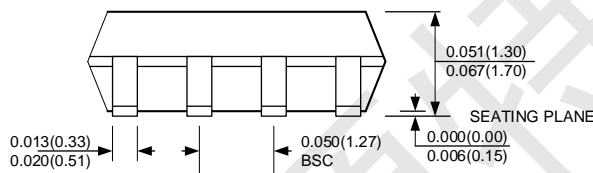
**ESOP8
(EXPOSED PAD)**



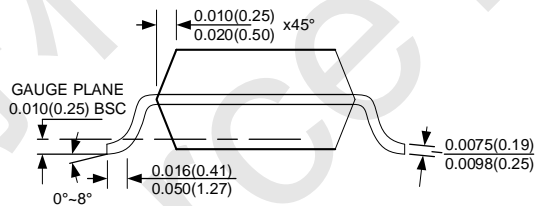
TOP VIEW



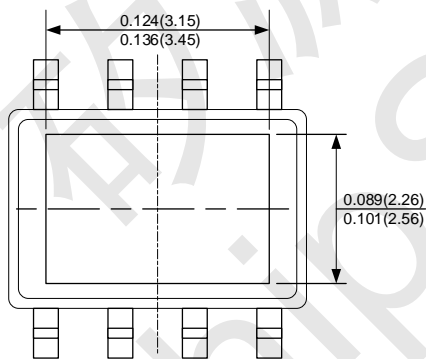
RECOMMENDED PAD LAYOUT



FRONT VIEW



SIDE VIEW



BOTTOM VIEW

NOTE:

1. CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
2. PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3. PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
4. LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
5. DRAWING CONFORMS TO JEDEC MS-012, VARIATION BA.
6. DRAWING IS NOT TO SCALE.

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