1A Linear Charger with Thermal Regulation for 1-cell/4.2V Li-Ion Battery

General Description

LA9010 is a linear charger for single cell Li-Ion battery. It provides maximum 1A charge current, and presets 4.2V charge voltage. The charge current can be programmed by an external resistor. The thermal regulation is build-in for limit maximum power to prevent overheating. LA9010 is well suited for portable devices due to the SOT-23-5 small package and few external components.

For 1-cell / 4.2V battery application, the input voltage range of LA9010 is from 4.25V to 5.5V that is specifically designed to meet USB power specifications. The supply current is only 100uA in standby mode, and under 45uA in shutdown.

This device consumes zero reverse current from the battery in shutdown and standby mode. No external blocking diode required. Other features of charge current monitor, under-voltage lockout, auto recharge, soft-start, and status indicator are also included.

Features

- **Adjustable charge current up to 1A**
- **Preset 4.2V charge voltage with +/-1%**
- **4.25V to 5.5V Input for 1-cell 4.2V Battery**
- **45uA Shutdown Current**
- **2.9V Trickle Charge Threshold**
- **Auto Recharge**
- **Zero Reverse Current from Battery**
- **No External Blocking Diode Required**
- **Max. Power Limit by Thermal Regulation**
- **Charge Status Indicator**
- **C/10 Charge Termination**
- **Soft-Start**
- **Under Voltage Lockout**
- **SOT-23-5 Package**
- **Meet RoHS Standard**

Applications

- **Portable Device**
- **Wireless Handset**
- **Bluetooth Application**

Ordering Information

LA9010 1 2 3 4

1 (Package Type) => C: SOT-23

2 (Number of Pins) => D: 5pin

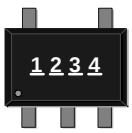
3 (Charge Voltage) => 42: 4.2V

4 (Special Feature) => Blank: N/A

Available Part Number

LA9010CD42

Marking Information



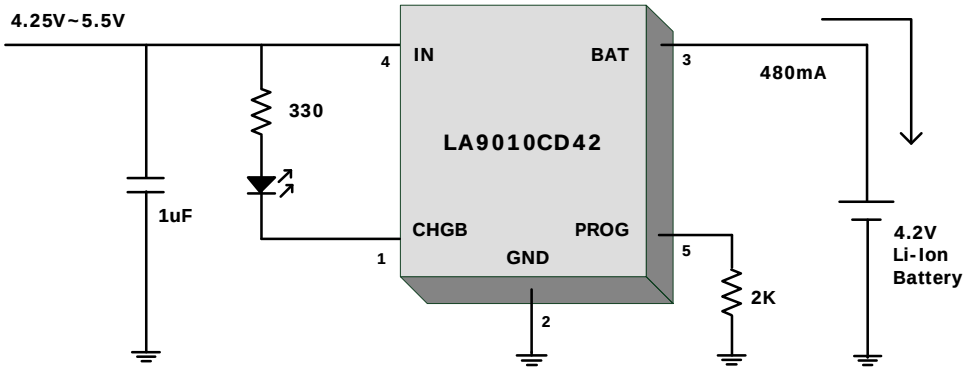
1 2 (Product Code)

LA9010CD42: S2

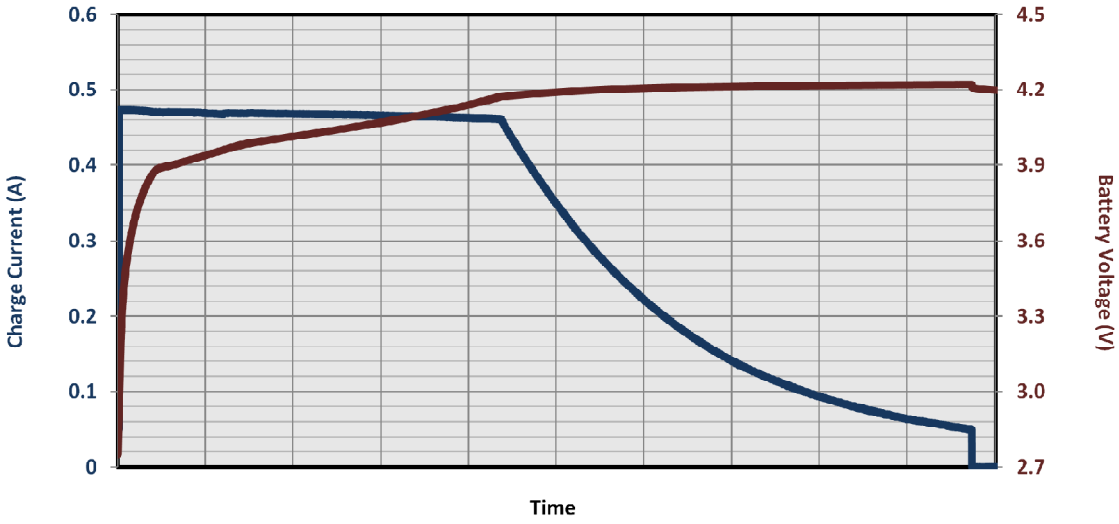
3 4 (Date Code)

For date code rule, please contact our sales representative directly.

Typical Application

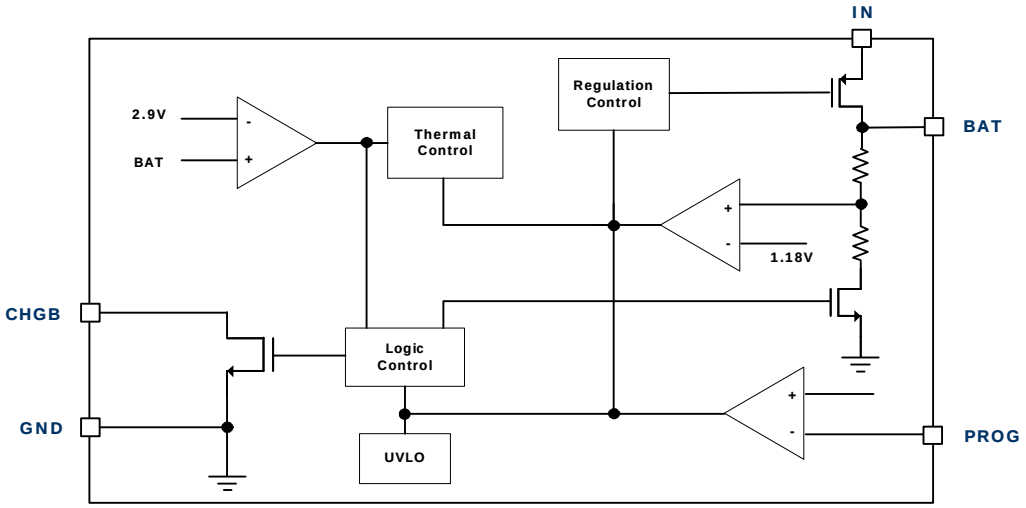


Charge Cycle

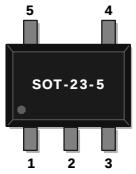


V_{IN}=5V
R_{PORG}=2K (Charge Current=480mA)
Battery Capability=890mA/h

Functional Block Diagram



Pin Configurations



Pin No.	Name	Description
1	CHGB	This pin is an open-drain output for status indicator. The internal MOSFET pulls-down to ground when battery is charging. After charge cycle is completed, this pin pulls-down with 24uA weak current. When the under voltage lockout is triggered, LA9010 forces this pin to high-impedance.
2	GND	Connect this pin to the circuit ground.
3	BAT	Charge current output and voltage feedback. It provides charge current to battery, and regulates the final float voltage to 4.2V. The internal voltage divider is disconnected in shutdown and standby mode.
4	IN	Supply voltage input. Connect at least 1uF capacitor to ground. The input voltage range is from V_{BAT}+0.5V to 5.5V. When VIN drops to V_{BAT}+0.03V, LA9010 enters shutdown mode and drops I_{BAT} to less than 1uA.
5	PROG	Charge current programming and shutdown pin. Connect this pin to ground with an 1% resistor to set the charge current by the following formula: $I_{BAT} = (V_{PROG} / R_{PROG}) \times 960$; V_{PROG}=1V in constant current mode Disconnect R_{PROG} will pull V_{PROG} to 2.4V internally, and then LA9010 will enter shutdown mode. Do not connect this pin to ground directly.

Absolute Maximum Ratings

Parameter	Rating
IN, BAT, and CHGB Voltage Range	-0.3V ~ 6V
PROG Voltage Range	-0.3V ~ V_{IN}+0.3V
BAT Output Current	1A
Storage Temperature Range	-65°C ~ 160°C
Junction Temperature	150 °C
Lead Soldering Temperature (5 sec)	260 °C

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

Recommended Operating Conditions

Parameter	Rating
Input Voltage Range	4.25V ~ 5.5V
Ambient Temperature Range	-40°C ~ 85°C
Junction Temperature Range	-40°C ~ 125°C

These are conditions under which the device functions but the specifications might not be guaranteed. For guaranteed specifications and test conditions, please see the *Electrical Specifications*.

Package Information

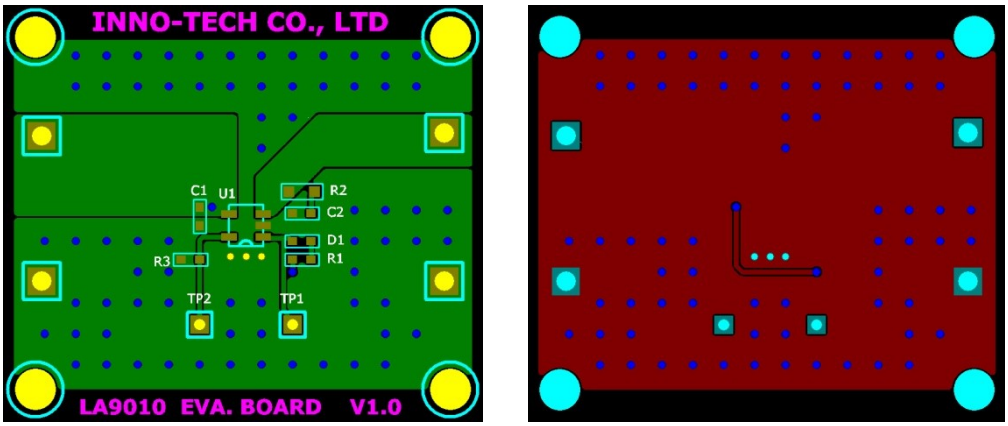
Parameter	Package	Symbol	Rating
Thermal Resistance (Junction to Case)	SOT-23-5	θ_{JC}	110 °C/W
Thermal Resistance (Junction to Ambient)		θ_{JA}	250 °C/W

Electrical Specifications

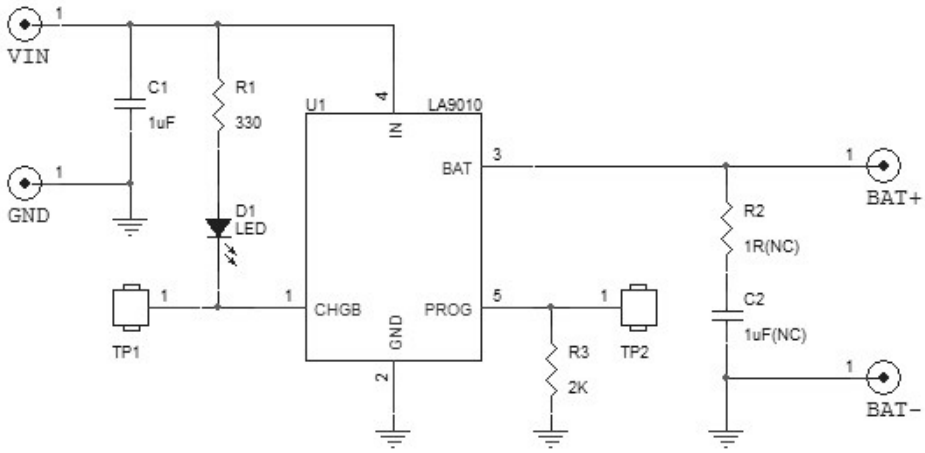
V_{IN}=5V, T_A=25°C, unless otherwise noted.

Parameter	Test Condition	Min.	Typ.	Max.	Units
Supply Current	Charge Mode ; (R_{PROG}=10K)		250	330	uA
	Standby Mode ; (Charge Terminated)		100	150	uA
	Shutdown Mode ; (PROG Floating, V_{IN}<V_{BAT}, V_{IN}<V_{UVLO})		45	80	uA
Regulated Output (Float) Voltage	T_A=0°C ~85°C	4.158	4.2	4.242	V
BAT Current	Current Mode ; (R_{PROG}=2K)	447	480	513	mA
	Standby Mode ; (V_{BAT}=4.2V)	-1	0	1	uA
	Shutdown Mode ; (PROG Floating)	-1	0	1	uA
	Sleep Mode ; (V_{IN}=0V)	-1	0	1	uA
Trickle Charge Current	V_{BAT}<$V_{TRICKLE}$, R_{PROG}=2K	20	50	75	mA
Trickle Charge Threshold Voltage	R_{PROG}=10K, V_{BAT} rising	2.8	2.9	3.0	V
Trickle Charge Hysteresis Voltage	R_{PROG}=10K		0.2		V
Input UVLO	V_{IN} rising	2.45	3	3.75	V
Input UVLO Hysteresis			0.2		V
Manual Shutdown Threshold	V_{PROG} rising			1.25	V
PROG Voltage	R_{PROG}=10K, Current Mode	0.93	1	1.07	V
Recharge Threshold Voltage	V_{FLOAT}-$V_{RECHARGE}$		0.16		V
Thermal Regulation	Constant Junction Temperature		120		°C
MOSFET ON-Resistance			0.53		Ohm
Soft-Start Time	I_{BAT}=0~(960/R_{PROG})		100		us

Evaluation Board Layout

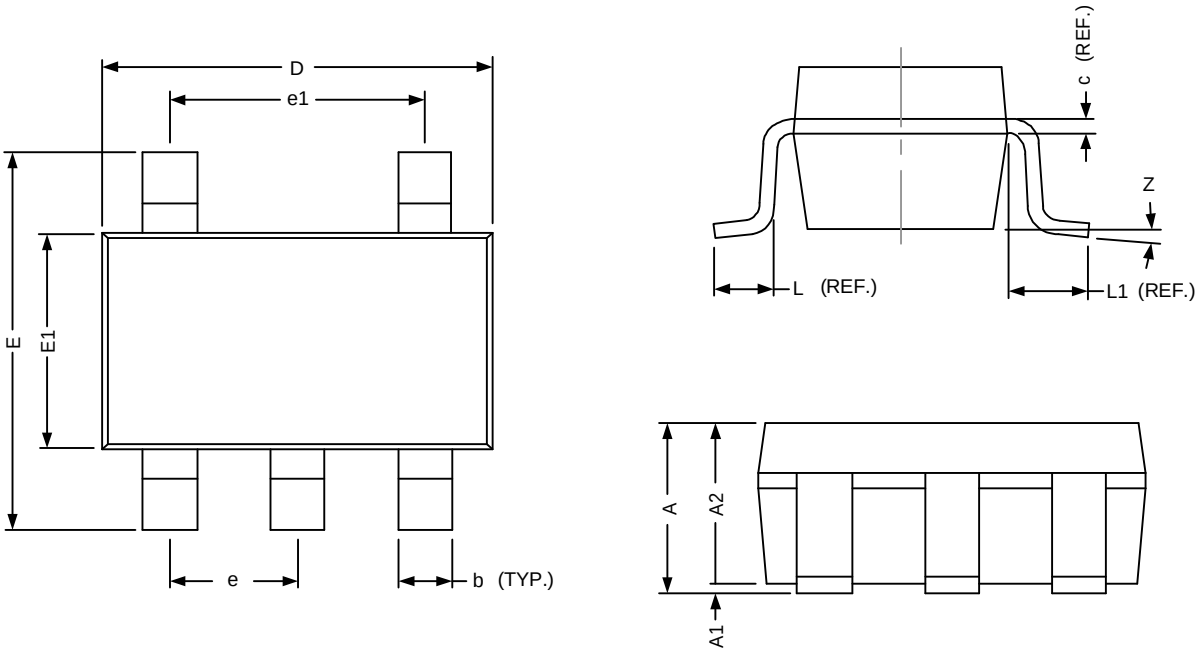


Evaluation Board Schematic



Package Outline

SOT-23-5



Dimensions				
Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.250	0.036	0.050
A1	0.000	0.100	0.000	0.004
A2	0.900	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
C	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.650	2.950	0.104	0.116
E1	1.500	1.700	0.060	0.068
L	0.300	0.600	0.012	0.024
L1	0.700 REF.		0.028 REF.	
e	0.95 Bsc.		0.038 Bsc.	
e1	1.90 Bsc.		0.076 Bsc.	
Z	0°	8°	0°	8°

NOTICE

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