DESCRIPTION

The A4062 is a complete battery charger controller for two (8.4V) cell lithium-ion batteries. With a 500kHz switching frequency, the A4062 provides a small, simple and efficient solution to fast charge Li-Ion batteries from a wide range of supply voltages. An external sense resistor sets the charge current. An internal resistor divider and precision reference set the final float voltage with ±1% accuracy.

When the input supply is removed, the A4062 automatically enters a low current sleep mode, dropping the battery drain current to 20μA. An internal comparator detects the near end-of-charge condition while an internal timer sets the total charge time and terminates the charge cycle.

The chip includes an internal benchmark, bias, voltage comparator and a temperature sensing modules.

The A4062 is available in SOP8 package.

ORDERING INFORMATION

Package Type	Part Number	
SOP8	M8	A4062M8R-XX
		A4062M8VR-XX
Note	XX: Output Voltage V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products Suffix " V " means Halogen free Package		

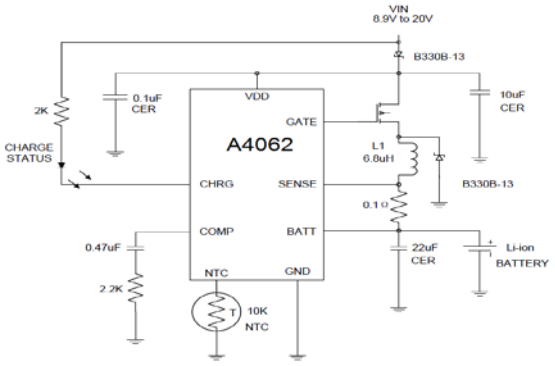
FEATURES

- Wide Input Supply Range: 8.9V to 20V
- Current Mode PWM Controller DC-DC
- ±1% Charge Voltage Accuracy
- ±5% Charge Current Accuracy
- End-of-Charge Current Detection Output
- Charge Termination Timer
- Constant Switching Frequency for Minimum Noise
- Automatic Battery Recharge
- Automatic Shutdown When Input Supply is Removed
- Automatic Trickle Charging of Low Voltage Batteries
- Stable with Ceramic Output Capacitor
- Available in SOP8 Package

APPLICATION

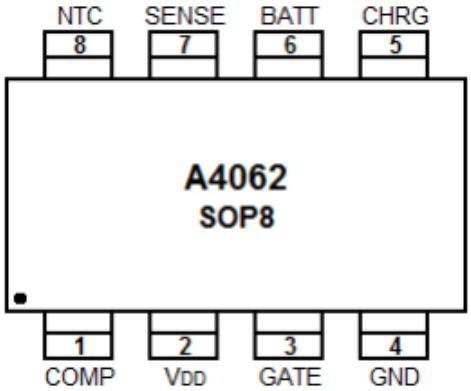
- Mobile Phone
- Digital Cameras
- MP4 players
- Bluetooth applications
- Electronic Dictionary
- Portable devices
- A variety of chargers

TYPICAL APPLICATION



1A two cell lithium-ion battery applications

PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	COMP	Compensation and charge set
2	V_{DD}	Power Supply
3	GATE	External MOS drive port
4	GND	Ground
5	CHRG	Charge status
6	BATT	Battery test input
7	SENSE	Current detection
8	NTC	Temperature detection

ABSOLUTE MAXIMUM RATINGS

V_{CC} , Input Voltage	V_{SS}-0.3V~V_{SS}+22V
V_{GATE}, GATE pin voltage	V_{SS}-0.3V~V_{CC}+0.3
V_{BAT}, BAT pin voltage	V_{SS}-0.3V~14V
V_{SENSE}, SENSE pin voltage	V_{SS}-0.3V~14V
V_{CHRG}, CHAG pin voltage	V_{SS}-0.3V~14V
V_{COMP}, COMP pin voltage	V_{SS}-0.3V~7V
V_{NTC}, NTC pin voltage	V_{SS}-0.3V~7V
T_{OPR}, Operating Ambient Temperature	-40°C~+85°C
T_{STR}, Storage Temperature	-65°C~+125°C
ESD Discharge capacity (HBM)	2000V
Reflow Temperature (soldering,10s)	300°C

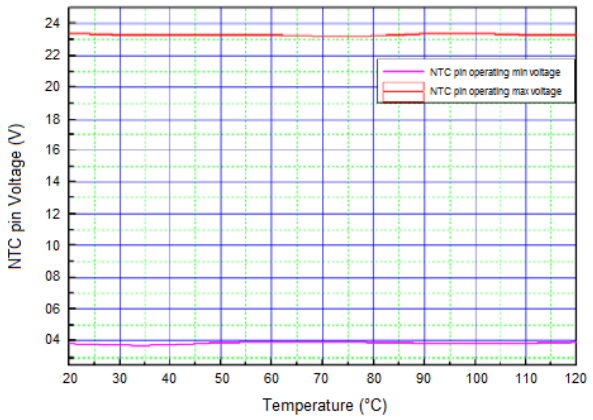
Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

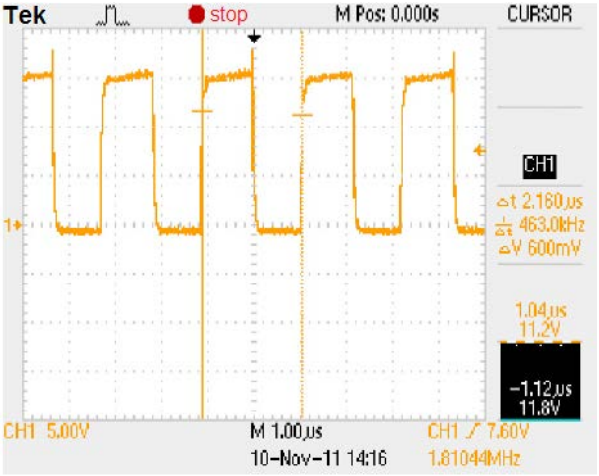
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
V_{CC} Supply Voltage	V_{CC}		8.9		20	V
V_{CC} Supply Current	I_{CC}	Current Mode		3	5	mA
		Shutdown Mode		3	5	mA
		Sleep Mode		20	30	μA
Battery Regulated Float Voltage	V_{BATT}	R_L=100mA	8.316	8.4	8.484	V
Constant Current Sense Voltage	V_{SNS}	5V<V_{BATT}<8V	90	100	110	mV
		V_{BATT}<4V	20	25	30	mV
Trickle Current Sense Voltage	V_{TRIKL}		4.7	5.0	5.3	V
Manual Shutdown Threshold	V_{MSD}		200	350	500	mV
V_{CC} Undervoltage Lockout Threshold Voltage	V_{UVLO}	V_{CC} Rising		8.4		V
C/10 terminal Threshold current	I_{TERM}		0.04	0.05	0.6	mA
COMP Pin Current	I_{COMP}			100		uA
NTC Pin Current	I_{NTC}			85		uA
NTC Pin Threshold Voltage(Hot)	$V_{NTC-HOT}$		340	355	370	mV
NTC Pin Threshold Voltage(Cold)	$V_{NTC-COLD}$		2.291	2.35	2.386	V
Switching Frequency	F_{OSC}	R_L=100mA	450	500	550	KHz
Temperature Protection	T_HOT			155		℃
Battery Recharge Hysteresis voltage	ΔV_{RECG}	V_{BATT} - $V_{RECHARGE}$	200	300	400	mV

TYPICAL PERFORMANCE CHARACTERISTICS

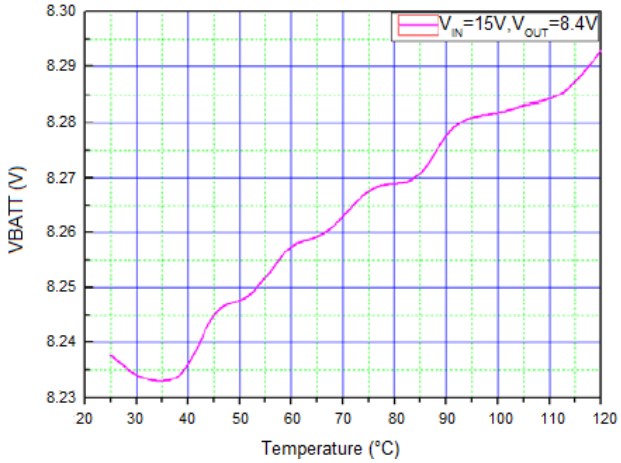
1. NTC Pin Operating Range VS Temperature



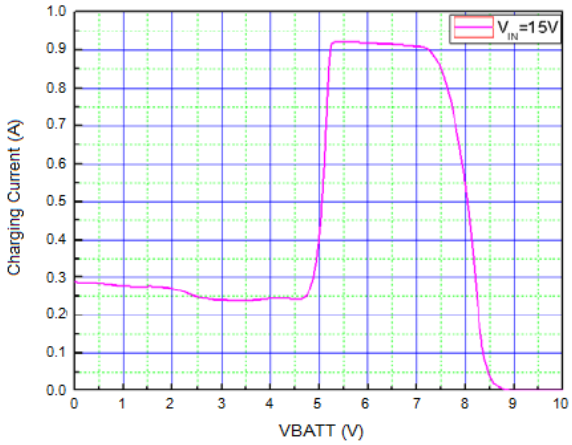
2. GATE Pin Waveform



3. BATT Pin VS Temperature

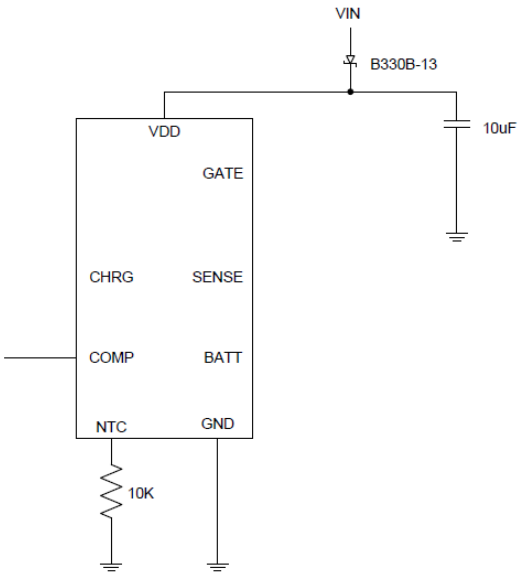


4. Charging Current

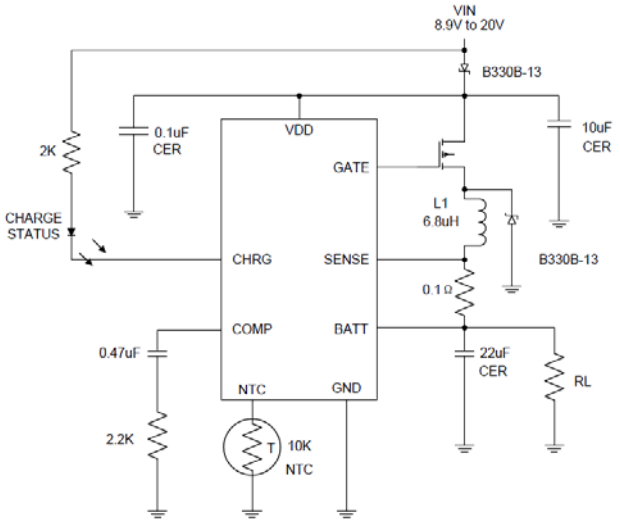


TEST CIRCUIT

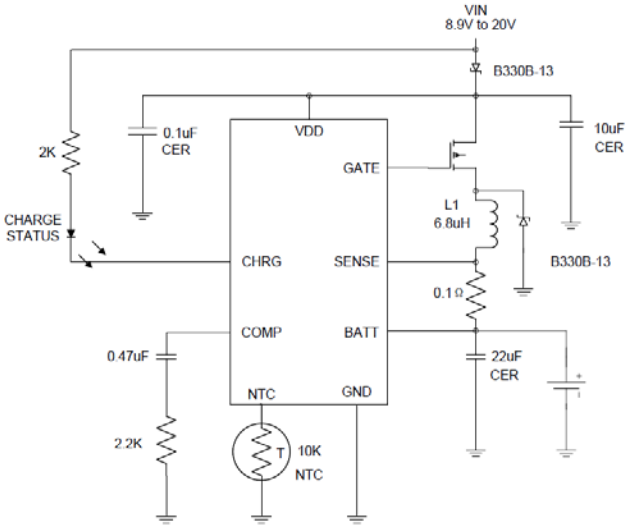
Test circuit 1



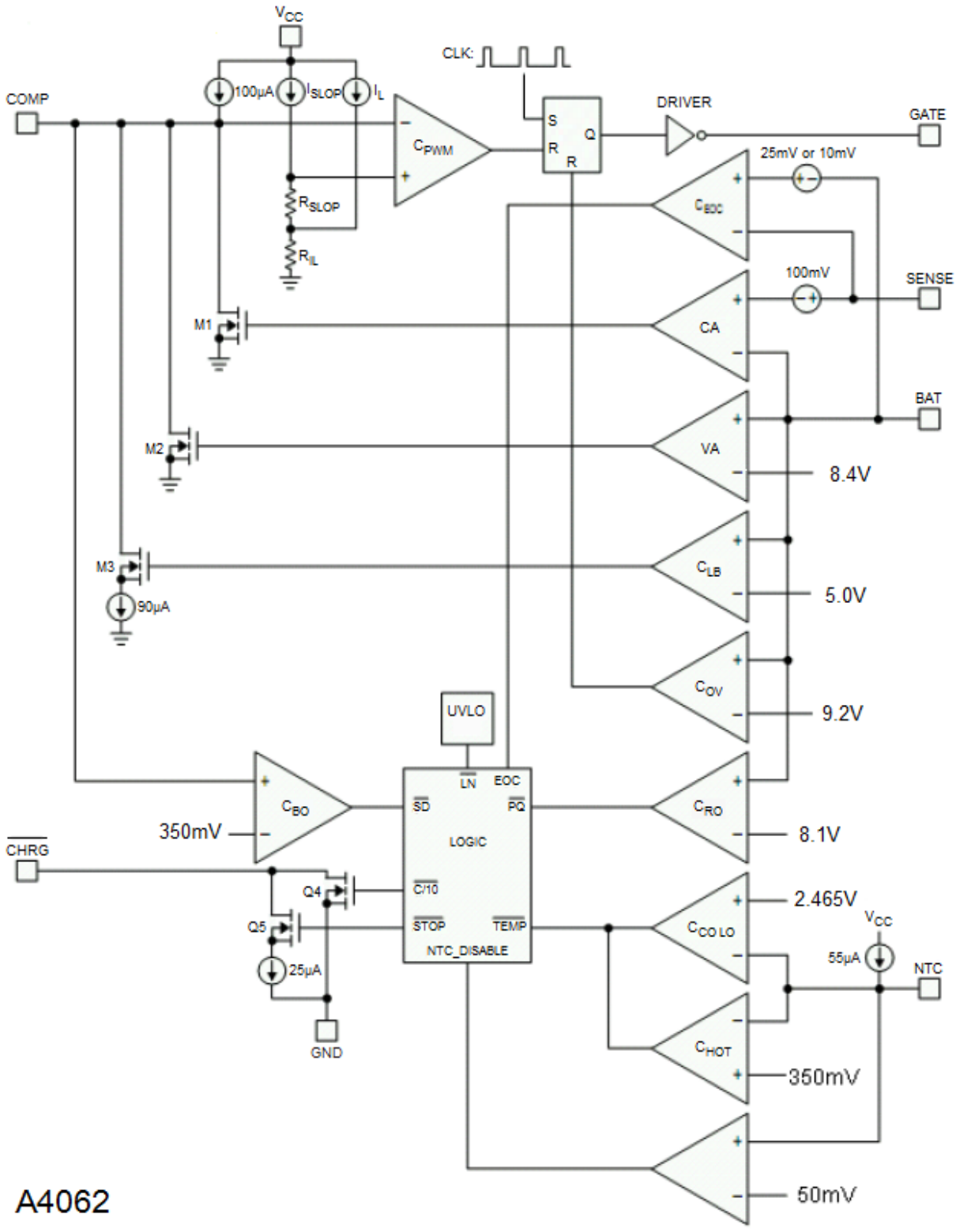
Test circuit 2



Test circuit 3



BLOCK DIAGRAM



DETAILED INFORMATION

The A4062 is a constant current, constant voltage Li-Ion battery charger controller that uses a current mode PWM step-down (buck) switching architecture. The charge current is set by an external sense resistor (RSENSE) across the SENSE and BAT pins.

A charge cycle begins when the voltage at the V_{CC} pin rises above the UVLO level and is 250mV or more greater than the battery voltage. At the beginning of the charge cycle, if the battery voltage is less than the trickle charge thresh-old, 5V for the 8.4 version, the charger goes into trickle charge mode. The trickle charge current is internally set to 20% of the full-scale current. If the battery voltage stays low for 30 minutes, the battery is considered faulty and the charge cycle is terminated.
When the battery voltage exceeds the trickle charge thresh-old, the charger goes into the full-scale constant current charge mode. In constant current mode, the charge current is set by the external sense resistor RSENSE and an internal 100mV reference, The formula is as follows:

$$I_{BATT} = \frac{100mV}{R_{SENSE}}$$

When the battery voltage approaches the programmed float voltage, the charge current will start to decrease. When the current drops to 5% of the full-scale charge current, an internal comparator turns off the internal pull-down N-channel MOSFET at the CHRG pin, and connects a weak current source to ground to indicate a near end-of-charge condition.

An internal 6 hour timer determines the total charge time. After a time out occurs, the charge cycle is terminated and the CHRG pin is forced high impedance. To restart the charge cycle, remove and reapply the input voltage or momentarily shut the charger down. Also, a new charge cycle will begin if the battery voltage drops below the recharge threshold voltage of 8.1V.

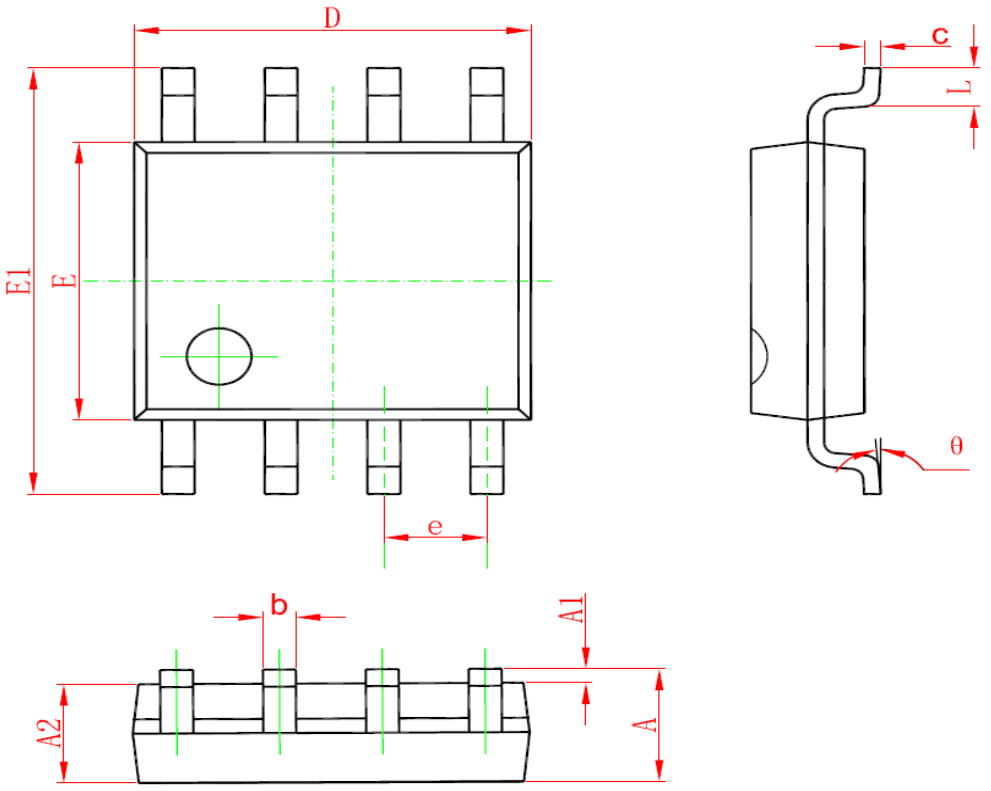
A 10kΩ NTC (negative temperature coefficient) thermistor can be connected from the NTC pin to ground for battery temperature qualification. The charge cycle is suspended when the temperature is outside of the 0°C to 50°C window (with DALENTHS-1206N02).If the temperature rises to 50°C, the resistance of the NTC will be approximately 4.1kΩ. With the 85μA pull-up current source, the hot temperature voltage threshold is 350mV. For Cold temperature, the voltage threshold is set at 2.35V which is equal to 0°C (RNTC ≅ 28.4kΩ) with 85μA of pull-up current. If the temperature is outside the window, the GATE pin will be pulled up to V_{CC} and the timer frozen while the output status at the CHRG pin remains the same. The charge cycle begins or resumes once the temperature is within the acceptable range. Short the NTC pin to ground to disable the temperature qualification feature.

A4062-chip status VS LED display status for the CHARGE Pin:

Work Status	Charge	Charge Full	No Battery	Error
LED Display status	Highlight	Weak Light	Flicker	OFF

PACKAGE INFORMATION

Dimension in SOP8 (Unit: mm)



Symbol	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
E	3.800	4.000
E1	5.800	6.200
e	1.270(BSC)	
L	0.400	1.270
θ	0°	8°

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