DESCRIPTION

The A4056E is a complete constant current & constant voltage linear charger for single cell lithium-ion batteries. Its PSOP8 package and low external component count make the A4056E ideally suited for portable applications. Furthermore, the A4056E is specifically designed to work within USB power specifications.

No external sense resistor is needed, and no blocking diode is required due to the internal MOSFET architecture. Thermal feedback regulates the charge current to limit the die temperature during high power operation or high ambient temperature. The charge voltage is fixed at 4.2V, and the charge current can be programmed externally with a single resistor. The A4056E automatically terminates the charge cycle when the charge current drops to 1/10th the programmed value after the final float voltage is reached.

When the input supply (wall adapter or USB supply) is removed, the A4056E automatically enters a low current state, dropping the battery drain current to less than 1uA. The A4056E can be put into shutdown mode, reducing the supply current to 3uA.

Other features include Battery temperature monitor, under-voltage lockout, automatic recharge and two status pins to indicate charge and charge termination.

The A4056E is available in PSOP8 package

ORDERING INFORMATION

Package Type	Part Number	
PSOP8 SPQ: 4,000pcs/Reel	MP8	A4056EMP8R
		A4056EMP8VR
Note	V: Halogen free package R: Tape & Reel	
AiT provides all RoHS products		

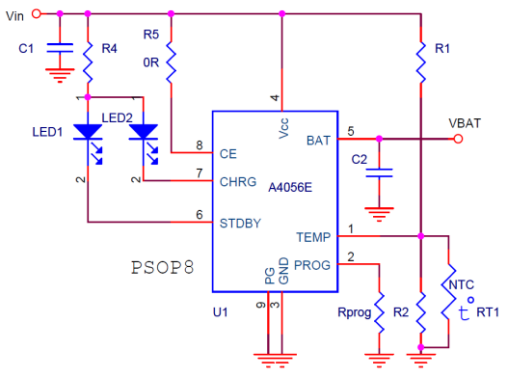
FEATURES

- Programmable Charge Current Up to 1000mA
- 1/10th of the constant charge current with C/10 Charge Termination
- No MOSFET, Sense Resistor or Blocking Diode Required
- Complete Linear Charger for single Cell Lithium-Ion Batteries
- Constant-Current/Constant-Voltage Operation with Thermal Regulation to Maximize Charge Rate Without Risk of Overheating
- Charges Single Cell Li-Ion Batteries Directly from USB Port
- Preset 4.2V Charge Voltage
- Automatic Recharge
- Charge state pairs of output, no battery and fault status display
- 1uA Supply Current in Shutdown
- 2.9V Trickle Charge Threshold
- Battery temperature monitoring function
- Available in PSOP8 package

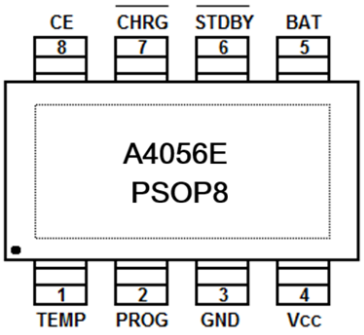
APPLICATION

- Cellular Telephones, PDAs, MP3 /MP4 Players
- Charging Docks and Cradles
- Bluetooth 、GPS Applications

TYPICAL APPLICATION



PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	TEMP	Battery temperature detection input. TEMP pin to receive the battery NTC sensor output. If the TEMP pin voltage is less than the input voltage is greater than 45% or 80% of the input voltage means the battery temperature is too low or too high, then the charge has been suspended.
2	PROG	Charge Current Program, Charge Current Monitor and Shutdown Pin. The charge current is programmed by connecting a 1% resistor, R_{PROG}, to ground. When charging in trickle-current mode, this pin servos to 0.1V. When charging in constant-current mode, this pin servos to 1V. In all modes, the voltage on this pin can be used to measure the charge current using the following formula: $I_{BAT} = (V_{PROG}/R_{PROG}) \bullet 1000$.
3	GND	Ground
4	V_{CC}	Positive Input Supply Voltage. Provides power to the charger, V_{CC} can range from 4.5V to 6.5V and should be bypassed with at least a 10uF capacitor. Charging starts only when the input voltage exceeds the undervoltage lockout threshold and is at least 144 mV higher than the BAT voltage. When V_{CC} drops to within 94mV of the BAT pin voltage, the A4056E enters shutdown mode, dropping I_{BAT} to less than 3uA (max).
5	BAT	Charge Current Output. Provides charge current to the battery and regulates the final float voltage to 4.2V. An internal precision resistor divider from this pin sets the float voltage which is disconnected in shutdown mode.
6	$\overline{STDBY}$	The completion of battery charging instructions side. When the battery charge is complete, STDBY pulled low by internal switches, indicating the completion of charging. In addition, STDBY pin will be in a high-impedance state.
7	$\overline{CHRG}$	Open-Drain Charge Status Output. When the battery is charging, the CHRG pin is pulled low by an internal N-channel MOSFET. When the charge cycle is completed, CHRG pin will be in a high-impedance state.
8	CE	This is the chip enable input. A high input level puts the A4056E into normal operating mode, while a low input level disables the device and prohibits charging. The CE pin is compatible with both TTL and CMOS logic levels.

ABSOLUTE MAXIMUM RATINGS

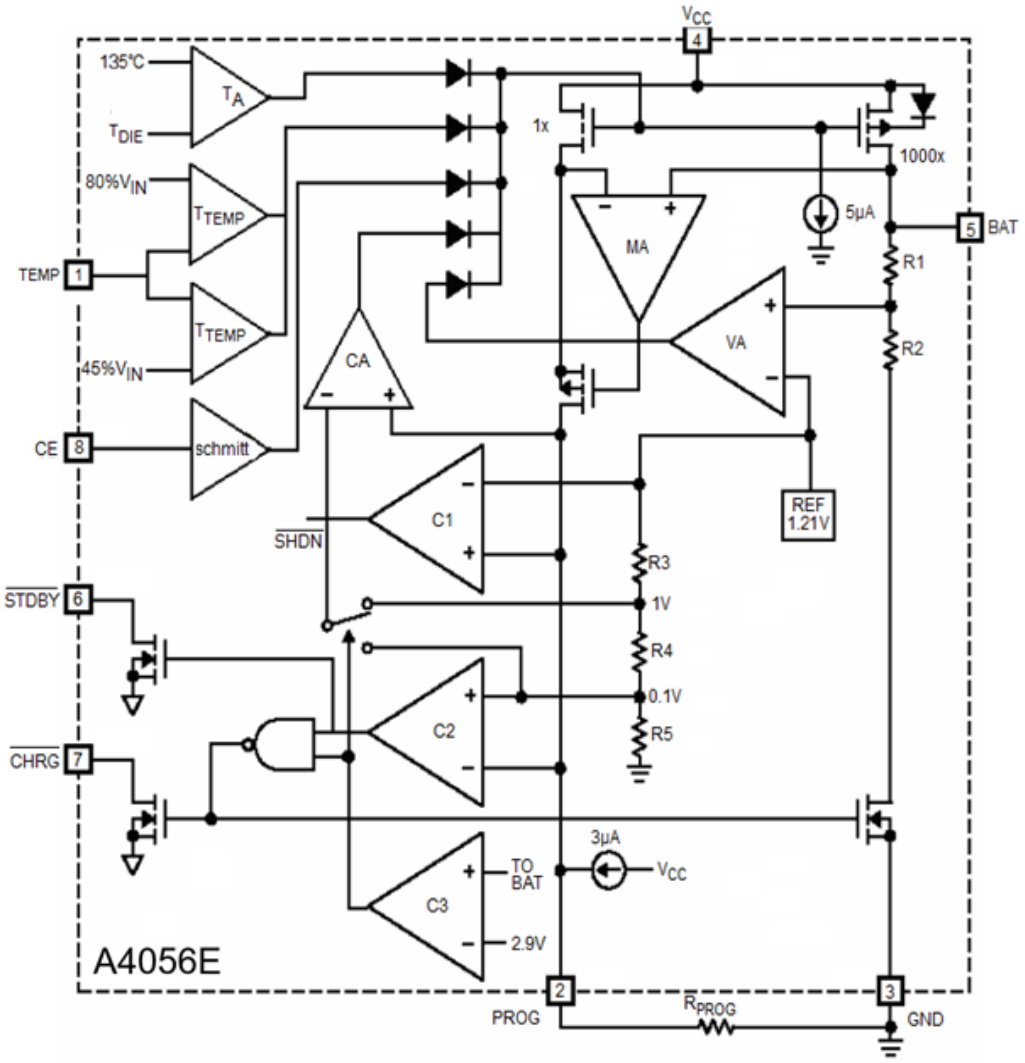
V_{CC}, Input Supply Voltage	-0.3V~ +9V
V_{PROG}, PROG pin Voltage	-0.3V~ +9V
V_{TEMP}, TEMP pin Voltage	-0.3V~9V
V_{CE}, CE pin Voltage	-0.3V~9V
V_{BAT}, BAT pin Voltage	-4.2V~9V
V_{STDBY}, STDBY pin Voltage	-0.3V~9V
V_{CHRG}, CHAG pin Voltage	-0.3V~9V
I_{BAT}, BAT pin Current	1000mA
I_{PROG}, PROG pin Current	600uA
T_{OPA}, Operating Ambient Temperature	-40℃ ~ +85℃
T_{STR}, Storage Temperature	-65℃ ~ +125℃
ESD, HBM	4000V
Lead Temperature (Soldering, 10s)	260℃

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

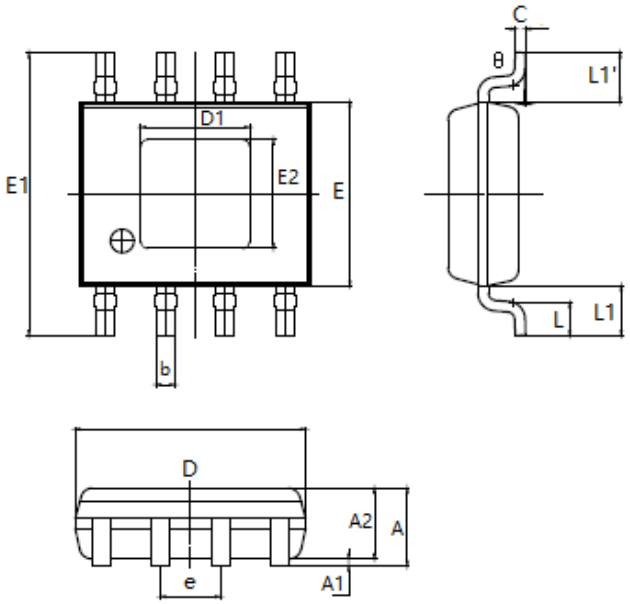
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Supply Voltage	V_{CC}		4.25	5.5-	6.5	V
Output Floating Voltage	V_{FLOAT}		4.158	4.2	4.242	V
Supply Current mode	I_{CC}	Current mode, R_{PROG}=1k	-	1000	-	mA
Regulated Output Voltage	V_{FLOAT}	T_A=25°C, I_{BAT}=40mA	4.177	-	4.263	V
BAT Pin Current	I_{BAT}	R_{PROG} =1k, Current mode	900	1000	1100	mA
		Standby mode, V_{BAT}=4.2V V_{CC}=5V	-	1	3	uA
		Shutdown mode V_{CC}=0V	-	1	3	
Trickle Charge Current	I_{TRIKL}	V_{BAT}<V_{TRIKL}, R_{PROG}=1k	90	100	110	mA
Trickle Charge Threshold Voltage	V_{TRIKL}	R_{PROG} =1k, V_{BAT} Rising	2.78	2.9	3.0	V
Trickle Voltage Hysteresis Voltage	V_{TRHYS}	R_{PROG} =1k	-	80	-	mV
Battery Reverse protection Current	$I_{reverse}$	$V_{BAT=4.2V}$		0.5		mA
V_{CC} Undervoltage Lockout Threshold	V_{UV}	From V_{CC} low to high	-	3.73	-	V
V_{CC} Undervoltage Lockout Hysteresis	V_{UVHYS}	From V_{CC} high to low	-	230	-	mV
V_{CC}-V_{BAT} Lockout Threshold Voltage	V_{ASD}	V_{CC} from low to high	-	144	-	mV
		V_{CC} from high to low	-	94	-	
C/10 Termination Current Threshold	I_{TERM}	R_{PROG}=1k	0.085	0.11	0.125	mA
PROG pin Voltage	V_{PROG}	R_{PROG} =1k, Current mode	0.93	1.0	1.07	V
CHRG pin Output Low Voltage	V_{CHRG}	I_{CHRG}=5mA	-	0.30	-	V
STDBY pin Output Low Voltage	V_{STDBY}	I_{STDBY}=5mA	-	0.30	-	V
Recharge Battery Threshold Voltage	ΔV_{RECG}	V_{FLOAT} - V_{RECHRG}	-	210	-	mV
V_{PROG} Pin Voltage	V_{PROG}	R_{PORG}=1K, Current mode	-	1.0	-	V
Recharge Comparator Filter Time	T_{RECHG}	V_{BAT} Fall		1.8		mS
Termination Comparator Filter Time	T_{TERM}	I_{BAT} < I_{CHG} /10		1.8		mS
Thermal Regulation Mode Junction Temperature	T_{LIM}			135		℃
TEMP Pin Overtemperature Detection Threshold	V_{TEMP-H}	TEMP pin connects the NTC resistor		45		%V_{CC}
TEMP PIN Low-Temperature Detection Threshold	V_{TEMP-L}	TEMP Pin connects the NTC resistor		80		%V_{CC}

BLOCK DIAGRAM



PACKAGE INFORMATION

Dimension in PSOP8 Package (Unit: mm)



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.002	0.006
A2	1.350	1.550	0.053	0.061
b	0.306	0.510	0.012	0.020
C	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.200
D1	2.170	2.400	0.085	0.094
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.172	2.400	0.090	0.099
e	1.270 ± 0.13		0.050 ± 0.005	
L	0.400	1.270	0.016	0.050
L1	1.025 ± 0.2		0.0404 ± 0.007	
L1-L1´	-	0.12	-	0.005
θ	0°	8°	0°	8°

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