DESCRIPTION

The A4030 provides a high integration solution for lithium-ion/polymer battery protection. The A4030 contains advanced power MOSFET, high-accuracy voltage detection circuits and delay circuits.

The A4030 has all the protection functions required in the battery application including over-charging, over-discharging, over-current and load short circuiting protection etc. The low standby current drains little current from the cell while in storage.

The device is targeted for any Li-Ion and Li-Poly battery-powered information appliances requiring long-term battery life.

The A4030 is available in DFN6(2x2) package.

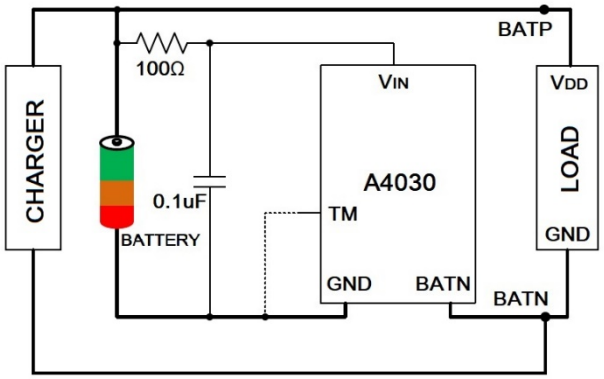
FEATURES

- Protection of Charger Reverse Connection
- Protection of Battery Cell Reverse Connection
- High-accuracy Voltage Detection
- Charger Detection Function
- 0V Battery Charging Enable/Disable Function
- Integrate Advanced Power MOSFET(50mΩ)
- Low Current Consumption
  Operation Mode: 3.0μA typ.
  Power-down Mode: 0.1μA max.

APPLICATION

- One-Cell Lithium-ion Battery Pack
- Lithium-Polymer Battery Pack

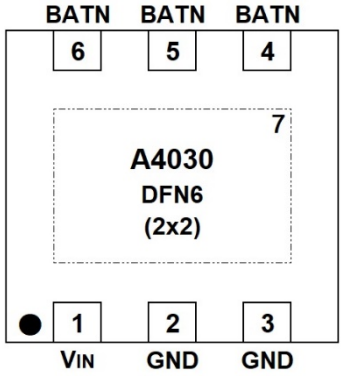
TYPICAL APPLICATION



ORDERING INFORMATION

Package Type	Part Number	
DFN6 (2x2) SPQ: 4,000pcs/Reel	J6	A4030J6R
		A4030J6VR
Note	V: Halogen Free Package R: Tape & Reel	
AiT provides all RoHS products		

PIN DESCIPTION



DFN6(2x2), J6

Top View

Pin # DFN6(2x2)	Symbol	Function
1	V_{IN}	Power Supply
2	GND	Ground
3	GND	Ground
4	BATN	The Negative Terminal of Battery Pack
5	BATN	The Negative Terminal of Battery Pack
6	BATN	The Negative Terminal of Battery Pack
7	HEARTSINK	Heatsink Must be Connected to BATN

ABSOLUTE MAXIMUM RATINGS

V_{IN}, Supply Voltage Range	GND-0.3V ~ GND+6.0V
PD, Power Dissipation @T_A=25℃	0.4W
Package Thermal Resistance (Junction to Ambient)	130℃/W
Lead Temperature	260℃
T_{OPA}, Ambient Temperature	-40℃ ~ +85℃
T_{STR}, Storage Temperature	-55℃ ~ +125℃
HBM, ESD Susceptibility	4000V

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.

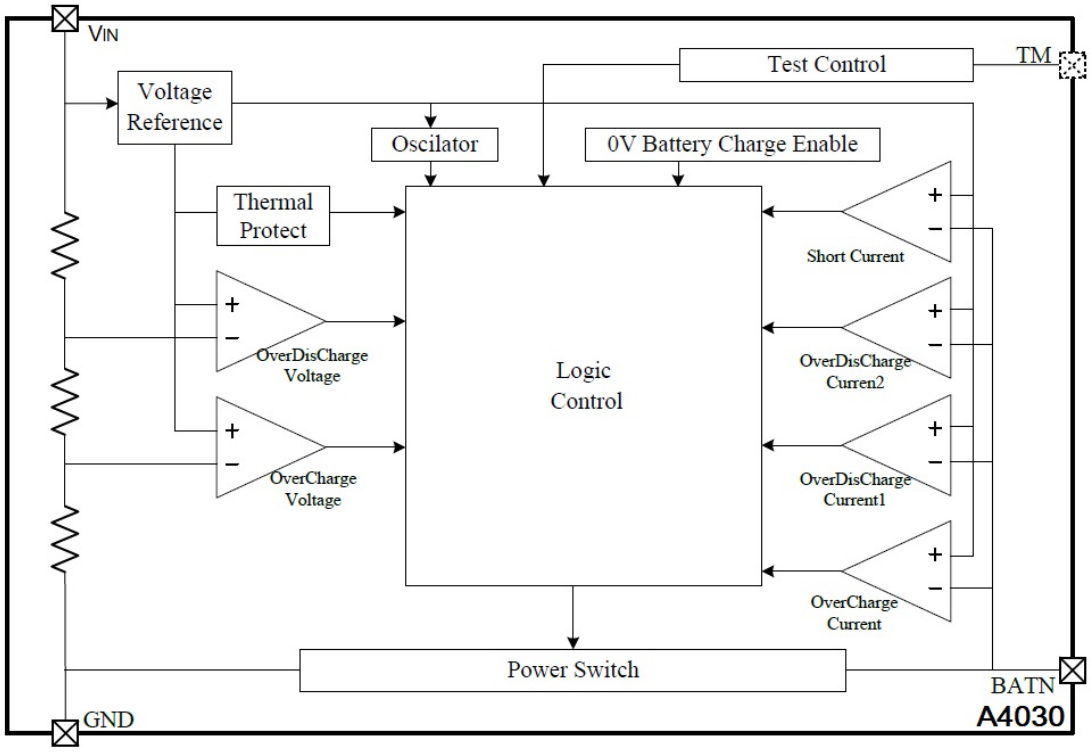
ELECTRICAL CHARACTERISTICS

V_{VIN} =3.5V, T_A=25℃,unless otherwise specification.

Parameter	Conditions	Typ.	Min.	Max.	Unit
VOLTAGE					
Over-Charge Detection Voltage		4.27	4.30	4.33	V
Over-Charge Release Voltage		4.12	4.15	4.18	V
Over-Discharge Detection Voltage		2.46	2.50	2.54	V
Over-Discharge Release Voltage		2.86	2.90	2.94	V
Charger Detection Voltage		-	-0.50	-	V
CURRENT					
Over-Discharge Current Detection 1	V_{DD}=3.5V	-	1.0	-	A
Over-Discharge Current Detection 2	V_{DD}=3.5V	-	5.0	-	A
Load Short Detection	V_{DD}=3.5V	-	5.0	-	A
Normal Operator Current	V_{DD}=3.5V, V_{BATN}=0V	-	3.0	6.0	μA
Power Down Current	V_{DD}=2.0V, BATN floating	-	-	0.1	μA
DELAY TIME					
Over-Charge Voltage Detection Delay Time		-	200	-	mS
Over-Discharge Voltage Detection Delay Time		-	50	-	mS
Over-Discharge Current Detection 1 Delay Time		-	12	-	mS
Over-Discharge Current Detection 2 Delay Time		-	2.5	-	mS
Load Short Detection Delay Time		-	40	-	μS
BATN INTERNAL RESISTANCE					
Internal Resistance between BATN and V_{DD}	V_{DD}=3.5V BATN=1.0V	-	320		kΩ
Internal Resistance between BATN and GND	V_{DD}=2.0V BATN=1.0V	-	100		kΩ
Power FET on Resistance	V_{DD}=3.5V, I_{BATN} =1.0A	-	50		mΩ
Over Temperature Protection		-	100		℃
Over Temperature Hybrid		-	20		℃

Note: Parameter with * is used for 4.35V Battery Protect, Other is for 4.2V Battery Protect

BLOCK DIAGRAM



DETAILED INFORMATION

The A4030 monitors the voltage and current of a battery and protects it from being damaged due to overcharge voltage, over-discharge voltage, over-discharge current, and short circuit conditions by disconnecting the battery from the load or charger. These functions are required in order to operate the battery cell within specified limits.

Normal Operating Mode：

If no exception condition is detected, charging and discharging can be carried out freely. This condition is called the normal operating mode.

Over-Charge Condition:

When the battery voltage becomes higher than the over-charge detection voltage (V_{CU}) during charging under normal condition and the state continues for the overcharge detection delay time (t_{CU}) or longer, the A4030 turns off the power switch FET.

Over-Discharge Condition:

When the battery voltage drops below the over-discharge detection voltage (V_{DL}) during discharging under normal condition and it continues for the over-discharge detection delay time (t_{DL}) or longer, the A4030 turns off the power switch FET and stops discharging. After over-discharging condition, the BATN pin is pulled up to high state by the internal control of A4030, the current of the chip is reduced to the power-down current (I_{PDN}).

At the over-discharge condition, when a charger is connected, the power switch FET is still off. At this time, charging is still permitted through the parasitic diode of the power switch FET, when the battery voltage becomes higher than the over-discharge detection voltage (V_{DL}), the A4030 turns on the power switch FET and changes to the normal condition from the over-discharge condition

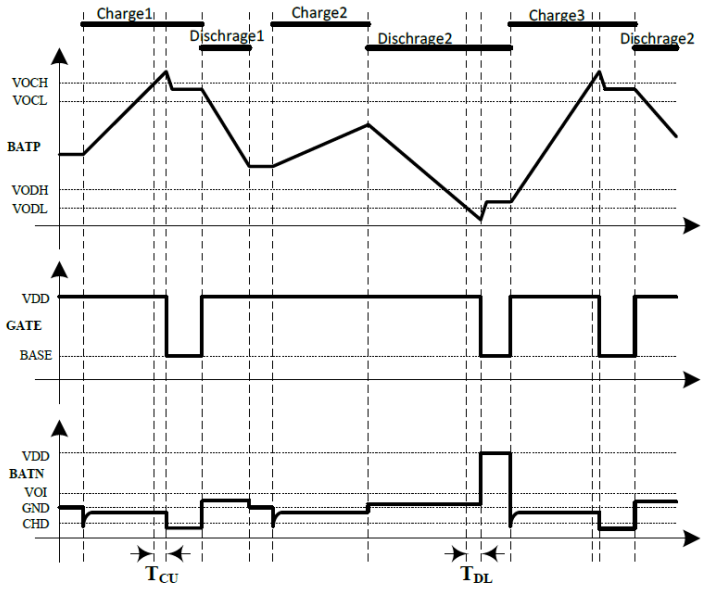
Over-Current Condition:

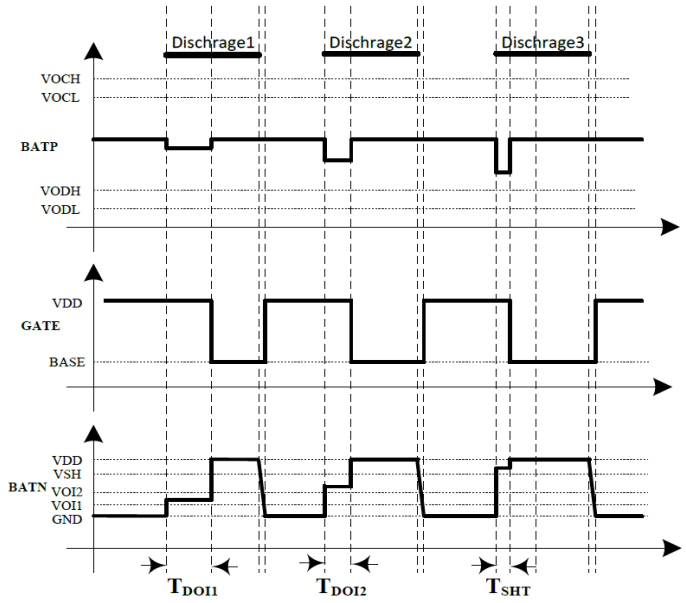
When the discharging current becomes equal to or higher than a specified value during discharging under normal condition and the state continues for the over-current detection delay time or longer, the A4030 turns off power switch FET to stop discharging, and the BATN pin is pulled up to high state by the internal control of A4030. This condition includes over-current1, over-current2 or load short-circuiting.

The over-current condition returns to the normal mode when the load is released or the impedance between BATP and BATN is larger than 500kΩ.

The A4030 provides two over-current detection levels (3A and 10A) with two over-current delay time (T_{OI1} and T_{OI2}) corresponding to each over-current detection level.

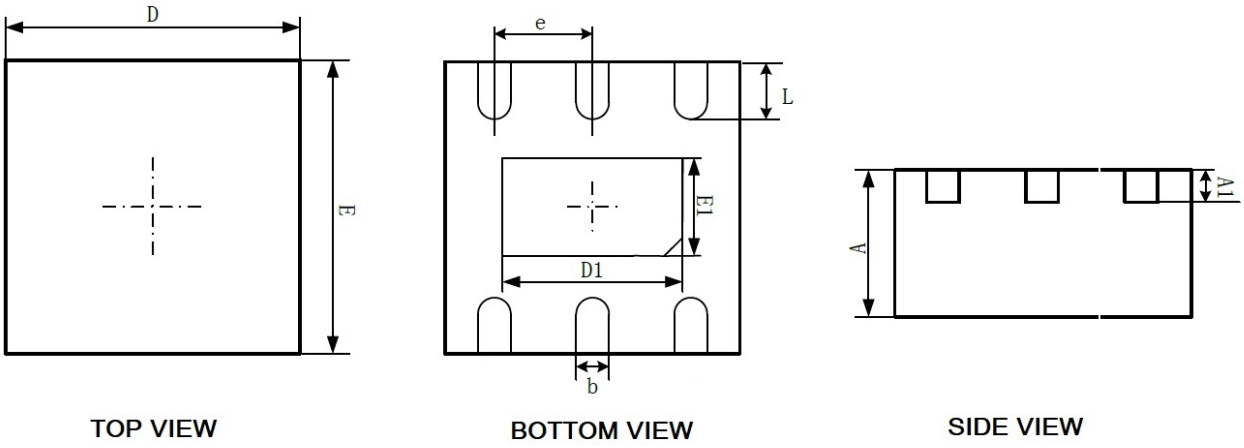
Delay Circuits:





PACKAGE INFORMATION

Dimension in DFN6(2x2) (Unit: mm)



TOP VIEW BOTTOM VIEW SIDE VIEW

Symbol	MILLIMETERS	
	Min.	Max.
A	0.527	0.577
A1	0.127 TYP	
b	0.200	0.300
D	1.900	2.100
D1	1.600	1.800
E	1.900	2.100
E1	0.800	1.000
e	0.650 REF	
L	0.250	0.350

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