

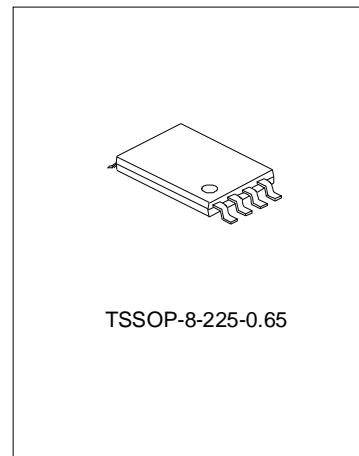
PROTECTION OF LITHIUM-ION BATTERIES

DESCRIPTIONS

SA1412 protects for Lithium-Ion Batteries. When the Lithium-Ion Batteries is in state of overcharge, overdischarge and overcurrent. The IC turns off the external mosfet to protect the batteries.

FEATURES

- * Overcharge consumption current($V_{CELL}=4.5V$ $R_{OC}=270K\Omega$): $150\mu A$
- * Normal consumption current($V_{CELL}=3.5V$): $18\mu A$
- * Overcharge consumption current($V_{CELL}=1.9V$): $0.5\mu A$
- Overcharge consumption current($V_{CELL}=1.0V$): $0.1\mu A$



APPLICATIONS

- * Digital camcorder
- * Digital vidicon
- * Special illumination
- * Portable DVD
- * PDA
- * Interphone
- * 7.2V large capacity battery.

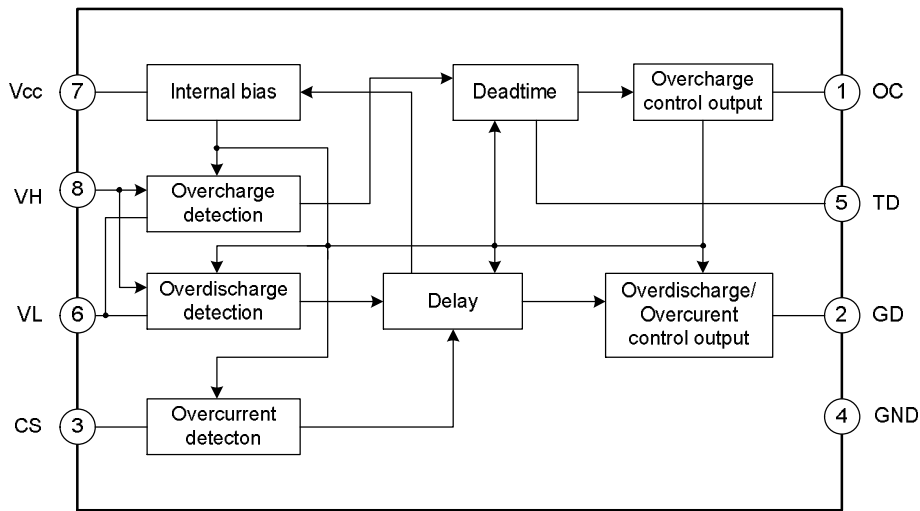
ORDERING INFORMATION

Device	Package
SA1412	TSSOP-8-225-0.65

PRODUCTS CATALOG

Part No.	Overcharge Detection Voltage	Overcharge Detection Hysteresis Voltage	Overdischarge Detection Voltage	Overdischarge Release Voltage	Overcurrent Detection Voltage
SA1412A	$4.350\pm0.025V$	$220\pm50mV$	$2.3\pm0.1V$	$3.5\pm0.2V$	$150\pm15mV$
SA1412B	$4.300\pm0.025V$	$220\pm50mV$	$2.3\pm0.1V$	$3.5\pm0.2V$	$150\pm15mV$
SA1412C	$4.250\pm0.025V$	$220\pm50mV$	$2.3\pm0.1V$	$3.5\pm0.2V$	$150\pm15mV$
SA1412D	$4.300\pm0.025V$	$200\pm50mV$	$2.5\pm0.1V$	$3.0\pm0.1V$	$75\pm15mV$

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING

Characteristics	Symbol	Rating	Unit
Supply Voltage	VCC max	-0.3~18	V
CS Pin Voltage	VCSmax	-0.6~VCC	V
OC Pin Voltage	VOCmax	-0.6~VCC	V
Allowable Dissipation	Pd	300	mW
Storage Temperature Range	Tstg	-40~125	°C
Operating Temperature Range	Tamb	-20~70	°C

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, take SA1412B for instance, Tamb=25°C)

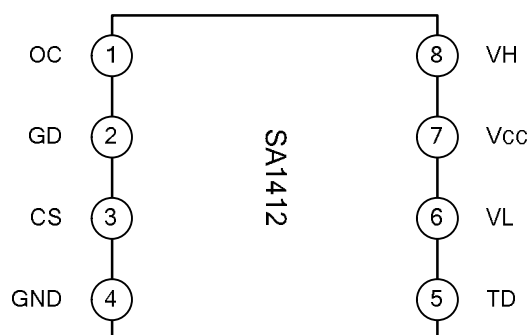
Characteristics	Symbol	Test condition	Min.	Typ.	Max.	Unit
Overcharge Detection Voltage	VOC	Tamb=-20°C ~70°C;	4.275	4.300	4.325	V
Overcharge Detection Hysteresis Voltage	ΔVOC		170	220	270	mV
Overdischarge Detection Voltage	VOD		2.20	2.30	2.40	V
Consumption Current 1	IVH1	VH=VL=1.0V, VCS=1.4V	--	--	0.1	μA
Consumption Current 2	IVH2	VH=VL=1.9V, VCS=3.2V	--	0.5	0.8	μA
Consumption Current 3	IVH3	VH=VL=3.5V	--	18.0	23.0	μA
Consumption Current 4	IVH4	VH=VL=4.5V, ROC=270 KΩ	--	150	--	μA
VL pin input Current	IVL	VH=VL=3.5V	-0.3	0	0.3	μA
Overdischarge Release Voltage	VDF	Discharge resume by voltage rise	3.3	3.5	3.7	V
GD Pin H Output Voltage	VGDH	VH=VL=3.5V, IL=-10μA	VH-0.3	VH-0.2	--	V
GD Pin L Output Voltage	VGDL	VH=VL=3.5V, IL=10μA	--	0.2	0.3	V

(To be continued)

(Continued)

Characteristics	Symbol	Test condition	Min.	Typ.	Max.	Unit
OC Pin Output Current	IOCH	V _H =V _L =4.5V	30	150	--	μA
Overcurrent Detection Threshold Value	VCS1		135	150	165	mV
Overcurrent Short Threshold Value	VCS2		0.35	0.45	0.55	V
Overcurrent Release		Load release: Load of 5MΩ or more between both battery pack pins				
Overcurrent Detection Delay Time 1	TOC1		7	12	18	ms
Overcurrent Detection Delay Time 2	TOC2		--	30	100	μs
Overdischarge Detection Delay Time	T _{od}		8	13	20	ms
Overcharge Detection Dead Time	T _{och}	CTC=0.18Uf	0.5	1.0	1.5	s
Start-Up Voltage	VST	V _H =V _L =2.5V	-0.24	-0.12	-0.04	V

PIN DESCRIPTIONS



PIN DESCRIPTION

Pin no.	Pin name	I/O	Description
1	OC	O	Overcharge detection output pin
2	GD	O	Discharge control FET (N-ch) control output pin
3	CS	I	Overcurrent detection input pin
4	GND	--	Ground pin, or lower cell load negative pole input pin.
5	TD	--	Overcharge detection dead time setting pin
6	VL	--	Connection pin for lower cell positive electrode side and upper cell negative electrode side.
7	VCC	--	Power supply input pin
8	VH	--	Upper cell positive electrode input pin

FUNCTION DESCRIPTION

This IC is a lithium ion battery (2-cell in-series type) protection IC. It has functions below: Overcharge detection, Overdischarge detection, Overcurrent detection. It controls the batteries charging or discharging by control the

external mosfet off and on. There are four operation modes as follows:

1. Overcharge mode:

The battery voltage of either the H or L cell goes above overcharge detection voltage. The IC shuts down the charging loop. Detection operation delay for overcharge detection can be set with the dead time setting pin.

2. Normal mode

The battery voltage of both H and L cells is above overdischarge detection voltage and below overcharge detection voltage.

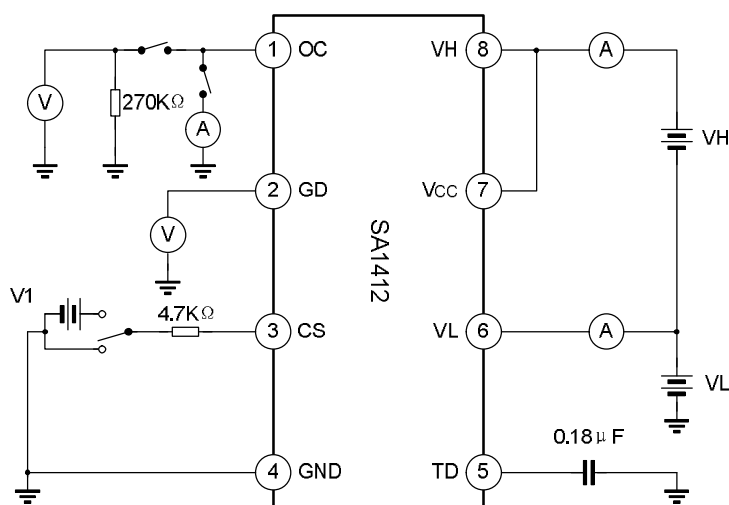
3. Overdischarge mode

The battery voltage of either the H or L cell drops below overdischarge detection voltage. The IC shuts down the discharging loop. Dead time for overdischarge detection is set internally.

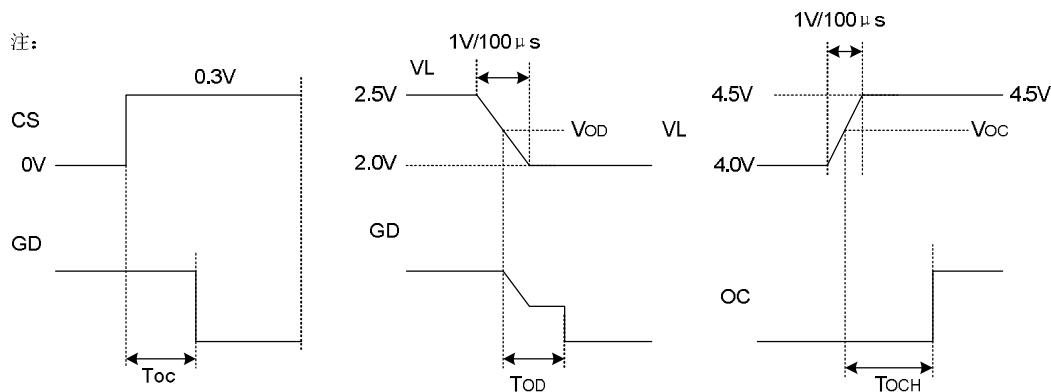
4. Overcurrent mode

The voltage between CS-GND goes above overcurrent detection voltage during discharge. The IC shuts down the discharging loop.

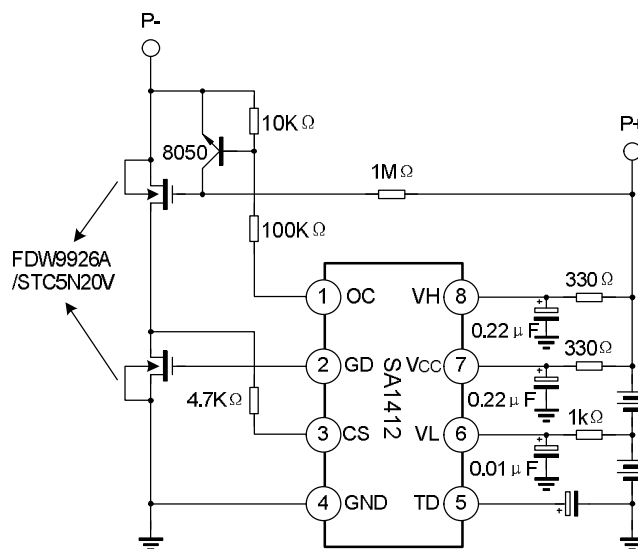
TEST CIRCUIT



注:



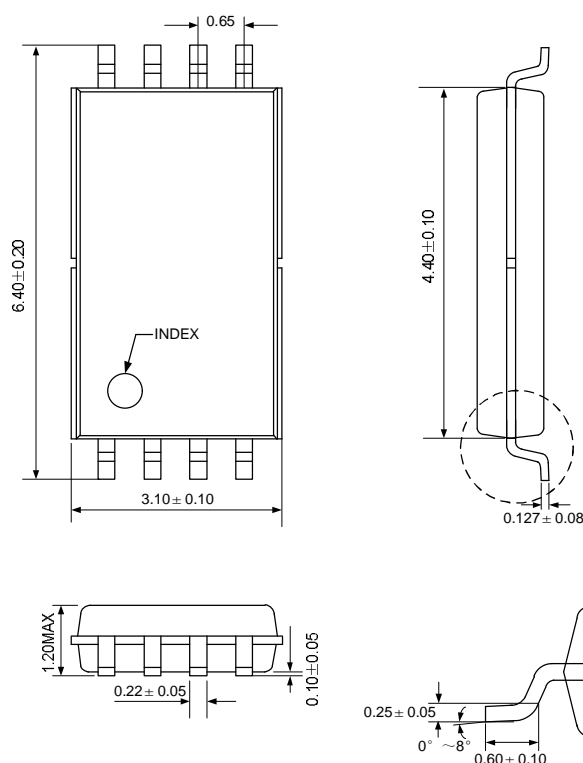
TYPICAL APPLICATION CIRCUIT



PACKAGE OUTLINE

TSSOP-8-225-0.65

UNIT: mm



ATTACHMENT

Revision History

Data	REV	Description	Page
2004.11.25	1.0	Original	
2005.01.18	1.1	Modify the "FEATURES", "APPLICATIONS", "BLOCK DIAGRAM"	
2005.03.10	1.2	Modify the "ELECTRICAL CHARACTERISTICS", "TYPICAL APPLICATION CIRCUIT" and "PACKAGE OUTLINE"	
2005.03.28	1.3	Modify the "ELECTRICAL CHARACTERISTICS"	3
2005.07.18	1.4	Modify the "TYPICAL APPLICATION CIRCUIT"	4
2005.07.26	1.5	Add "TEST CIRCUIT"	4
2005.06.05	2.0	Add "PRODUCTS CATALOG" Delete "SOP-8-225-1.27" package Modify "ELECTRICAL CHARACTERISTICS", "PIN DESCRIPTION" and "TYPICAL APPLICATION CIRCUIT"	
2006.06.15	2.1	Add D item.	