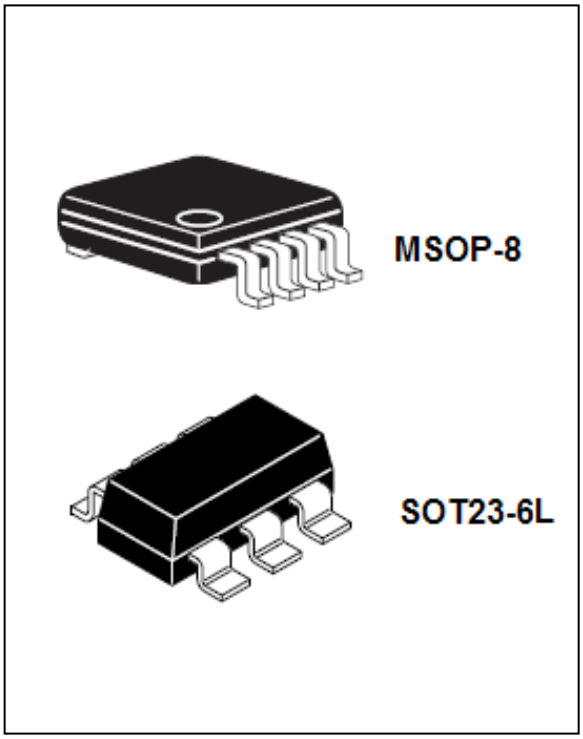
SINGEL-CELL LI-ION AND LI-POL BATTERY PROTECTOR WITH MOSFET COMBO

General Description

The SDC6073 is a single-cell lithium-ion (Li-Ion) and lithium-polymer (Li-Pol) battery protection IC that integrated an on-chip FET switch thus reducing manufacturing costs and increasing reliability. The device is designed to protect both Li-Ion and Li-Pol battery packs from either overcharge, overdischarge, or over-current.



The device contains all required protection control circuits together with a very low resistive FET switch to minimize the number of external components. The IC incorporates overcharge voltage and current protections, overdischarge voltage and current protection, overtemperature protection, short circuit protection and operates with very low power. The IC contains the other special protection.That is Battery reverse Protection and VM reverse Protection(VM>-5.5V).

The device is not only targeted for digital cellular phones, but also for any other Li-Ion and Li-Pol bat-tery-powered information appliances requiring long-term battery life time.

Features

1. No External FETs Required
2. Equivalent $R_{DS(ON)}$: 29mΩ(MSOP-8) or 34mΩ(SOT23-6L) on Chip MOSFET-Switch
3. Battery reverse and VM reverse Protection(VM>-5.5V)
4. Over Temperature Protection
5. Only one external capacitor required in application
6. Overcharger Current Protection
7. Internal High Accuracy Voltage Detection Circuit

- Overcharge Detection Voltage: 3.9V to 4.4V (Applicable in 5mV Step)Accuracy: ± 25mV
- Overcharge Hysteresis Voltage: 0.0V to 0.4V Accuracy: ± 25mV
- Overdischarge Detection Voltage: 2.0V to 3.0V (10mV step) Accuracy: ± 50mV
- Overdischarge Hysteresis Voltage: 0.0V to 0.7V Accuracy: ± 50Mv

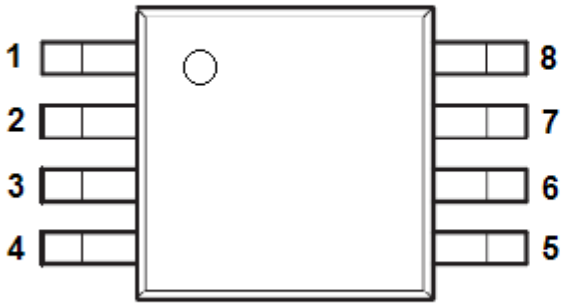
8. Delay Times (Overcharge Voltage: t_{CU}, Over-discharge Voltage: t_{DL}, Overdischarge Current 1: t_{ODC1}, Overdischarge Current 2: t_{ODC2}, Load Short-Circuit: t_{SHORT}) are generated by an internal circuit. No external capacitor is necessary. Accuracy: ± 20%
9. Three Step Overcurrent Detection Circuit is included. (Overdischarge Current 1, Overdischarge Current 2 and Load Short-Circuiting)
10. Charger Detection Function
11. Overcharge Current Detection Function
12. Low current consumption
    - Operation mode: 2.0μA typ., 4.0μA max.
    - Power-down mode: 0.1μA max.
13. Small outline MSOP-8 or SOT23(6L) Package
14. RoHS Compliant and Lead (Pb)-Free

Applications

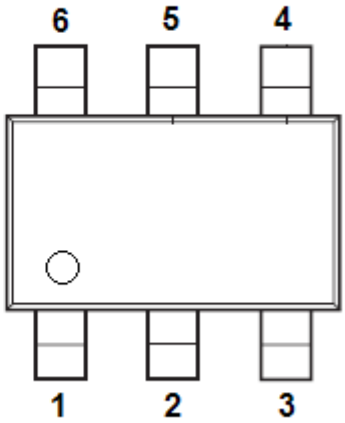
- Lithium-Ion Rechargeable Battery Packs
- Lithium Polymer Rechargeable Battery Packs

Package and Pin Configuration

MSOP-8



SOT23-6L

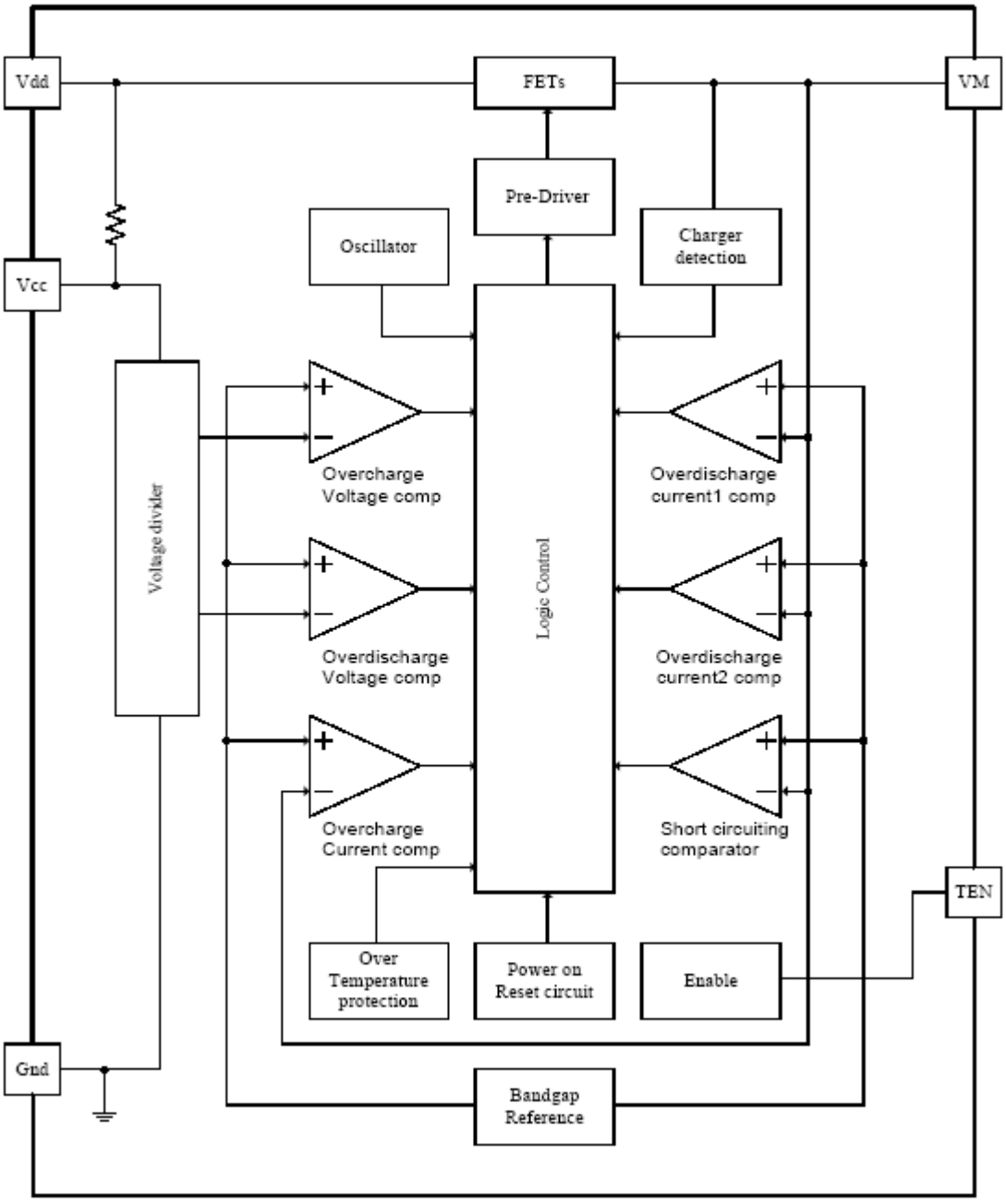


Pin Description

Pin Number		Pin Name	I/O	Function Description
MSOP-8	SOT23-6L			
1	6	VDD	I	Positive power input
2	-	VDD	I	Positive power input

Pin Number		Pin Name	I/O	Function Description
MSOP-8	SOT23-6L			
3	4	VCC	I	Internal circuit power supply input
4	2,5	GND	I	Ground pin
5	-	TOT	O	Test mode output, connect to GND in normal operation
6	3	TEN	I	Test mode enable, connect to GND in normal operation
7	1	VM	I/O	Positive charge input, overcurrent detection
8	-	VM	I/O	Positive charge input, overcurrent detection

Functional Block Diagram



Absolute Maximum Ratings (note)

Parameter	Symbol	Min	Max	Unit
Supply Voltage (between VDD and GND)	VDD	0	8.0	V
Charger Input Voltage (between VM and GND)	VMAX	VDD -10.0	10.0	V
Storage Temperature Range	TSTG	-55	125	℃
Power Dissipation	PMAX		500	mW

Note: Stresses greater than those listed under "Absolute Maximum Ratings" 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 under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply voltage (between VDD and Gnd)	VDD	2.0	4.5	V
Charger input voltage (between VM and GND)	VMAX	-0.3	4.7	V
Operating Temperature Range	TOPR	-40	85	℃

Electrical Characteristics

(Typical and limits appearing in normal type apply for T_A = 25°C)

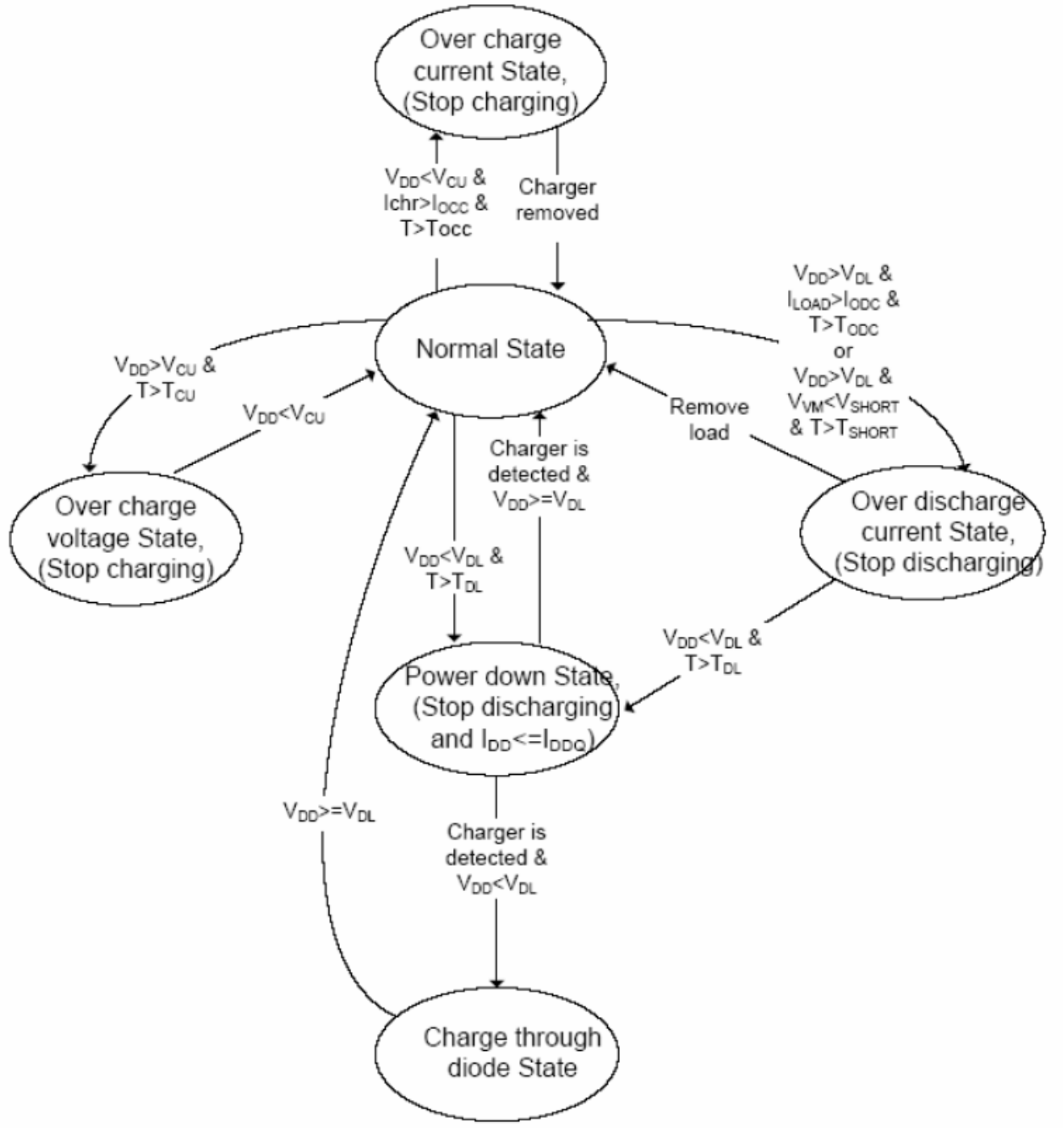
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Detection Voltage						
Overcharge Detection Voltage	V_{CU}	-	4.26	4.275	4.29	V
Overcharge hysteresis voltage	V_{HC}	-	0.15	0.175	0.2	V
Overdischarge Detection Voltage	V_{DL}	-	2.45	2.5	2.55	V
Overdischarge hysteresis voltage	V_{HD}	-	0.35	0.4	0.45	V
Charger Detection Voltage	V_{CHA}	-	VDD +0.1	VDD +0.15	VDD +0.2	V
Detection Current						
Overcharge Current Detection Current	I_{OCC}	V_{DD}=3.5V	2.1	3.0	3.9	A
Overdischarge Current 1 Detection Current	I_{ODC1}	V_{DD}=3.5V	2.1	3.0	3.9	A
Overdischarge Current 2 Detection Current	I_{ODC2}	V_{DD}=3.5V	4.5	6.0	7.0	A
Load short-circuiting detection voltage	V_{SHORT}	V_{DD}=3.5V	1.2	1.25	1.3	V

Electrical Characteristics(Continued)

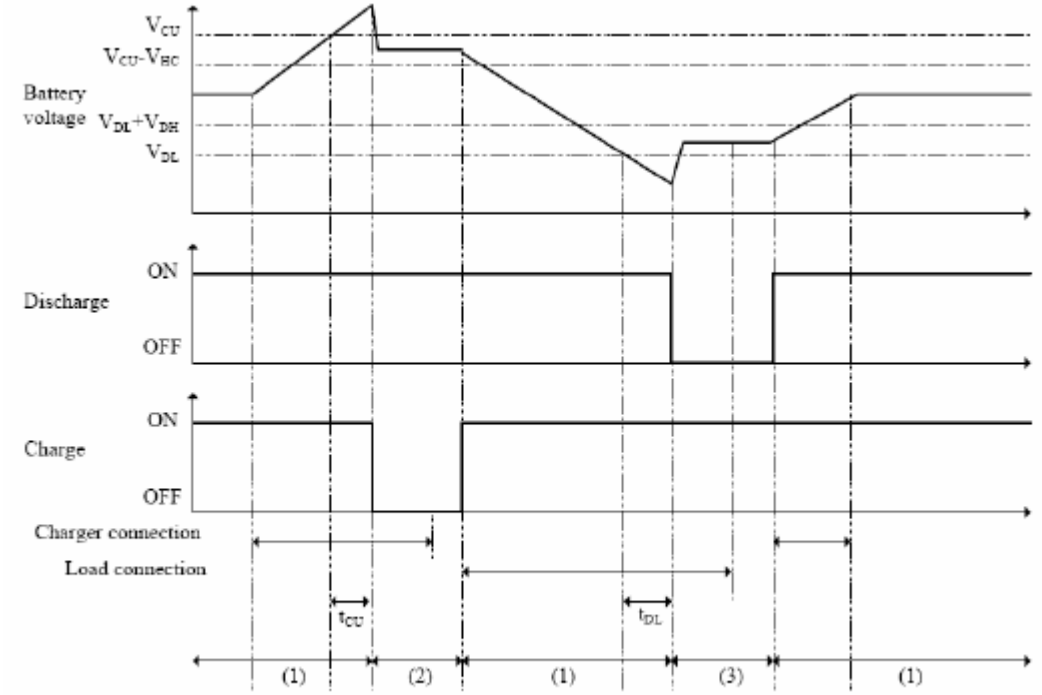
(Typical and limits appearing in normal type apply for T_A = 25°C)

Parameter	Symbol	Remarks		Min	Typ	Max	Unit
Current Consumption							
Current Consumption in Normal Operation	IOPE	VDD=3.5V VM pin floating		1.0	1.5	3.0	μA
Current Consumption in power Down	IDDQ	VDD=1.5V VM pin floating				0.23	μA
VM Internal Resistance							
Internal Resistance between VM and VDD	RVMD	VDD=3.5V VM=1.0V		13	20	30	kΩ
Internal Resistance between VM and GND	RVMS	VDD=2.0V VM=1.0V		300	450	675	kΩ
FET on Resistance							
Equivalent FET on Resistance	RON	VDD=2.6V	IVM=1.0A/2.0A		70/75		mΩ
		VDD=3.0V			65/70		
		VDD=3.5V			60/65		
		VDD=4.0V			55/60		
Over Temperature Protection							
Over Temperature Protection	TSHD+				115		℃
Detection Delay Time							
Overcharge Voltage Detection Delay Time	tCU			0.6	0.7	0.9	S
Overdischarge Voltage Detection Delay Time	tDL			144	180	216	mS
Overdischarge Current 1 Detection DelayTime	tODC1	VDD=3.5V		9.0	11	13.5	mS
Overdischarge Current 2 Detection DelayTime	tODC2	VDD=3.5V		4.48	5.38	6.45	mS
Load Short-Circuiting Detection Delay Time	tSHORT	VDD=3.5V		300	450	600	μS
Overcharge Current Detection Delay Time	tOCC	VDD=3.5V		9.0	11	13.5	mS

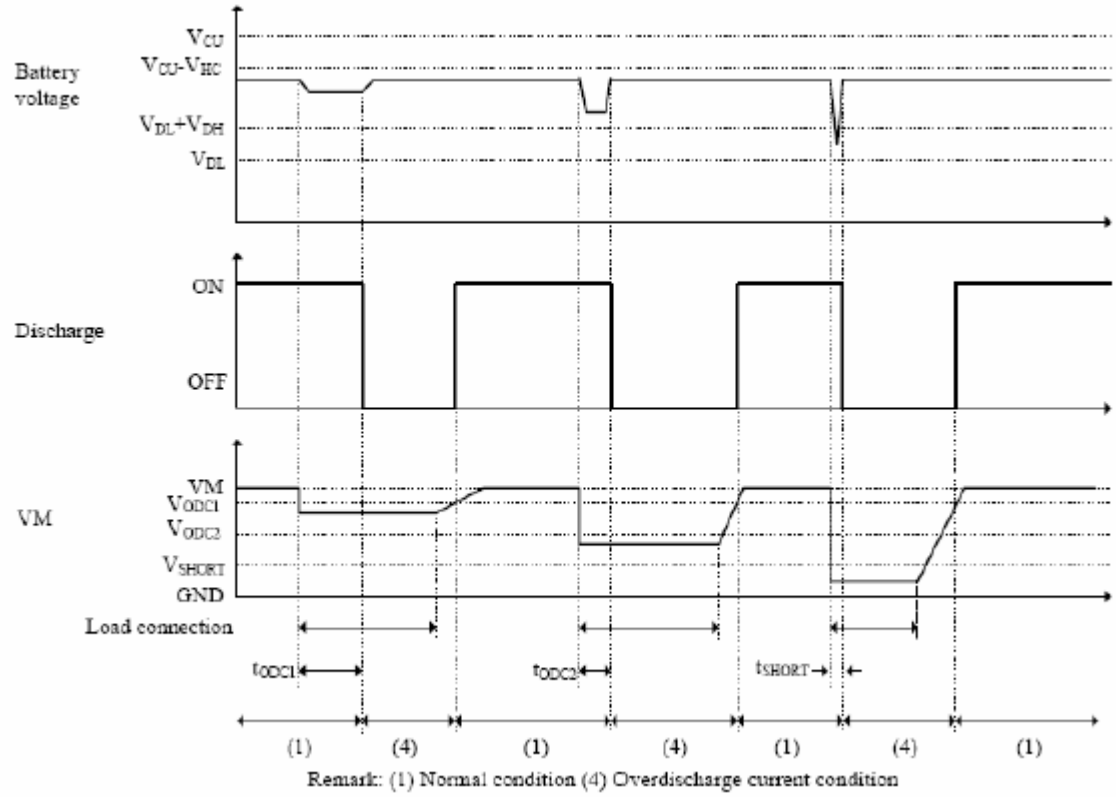
Operation State Diagram



Operation Timing Chart

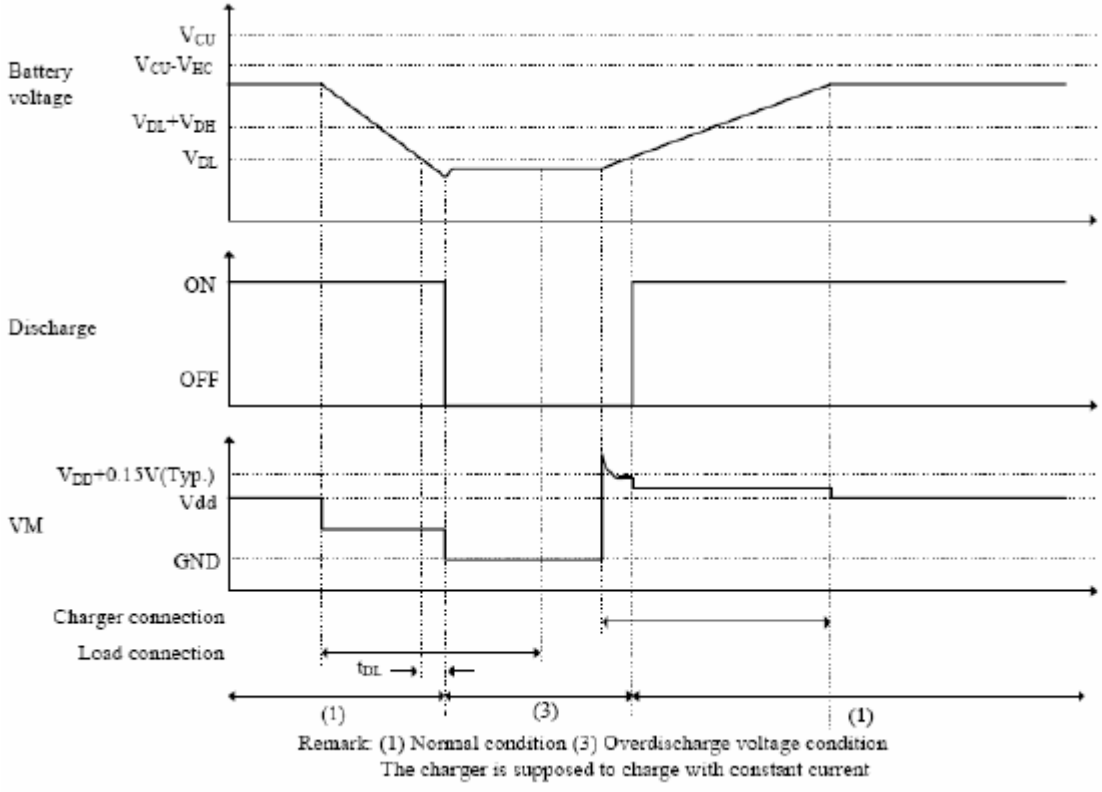


Remark: (1) Normal condition (2) Overcharge voltage condition (3) Overdischarge volatge condition
The charger is supposed to charge with constant current

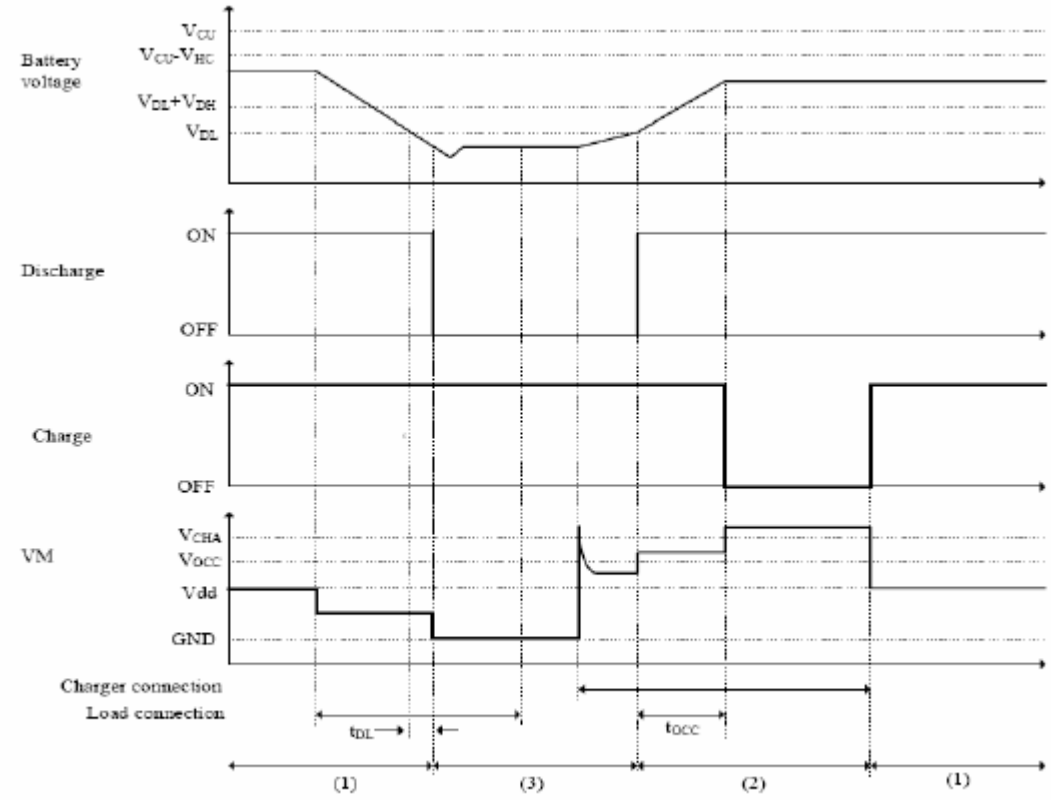


Remark: (1) Normal condition (4) Overdischarge current condition

Operation Timing Chart(Continued)

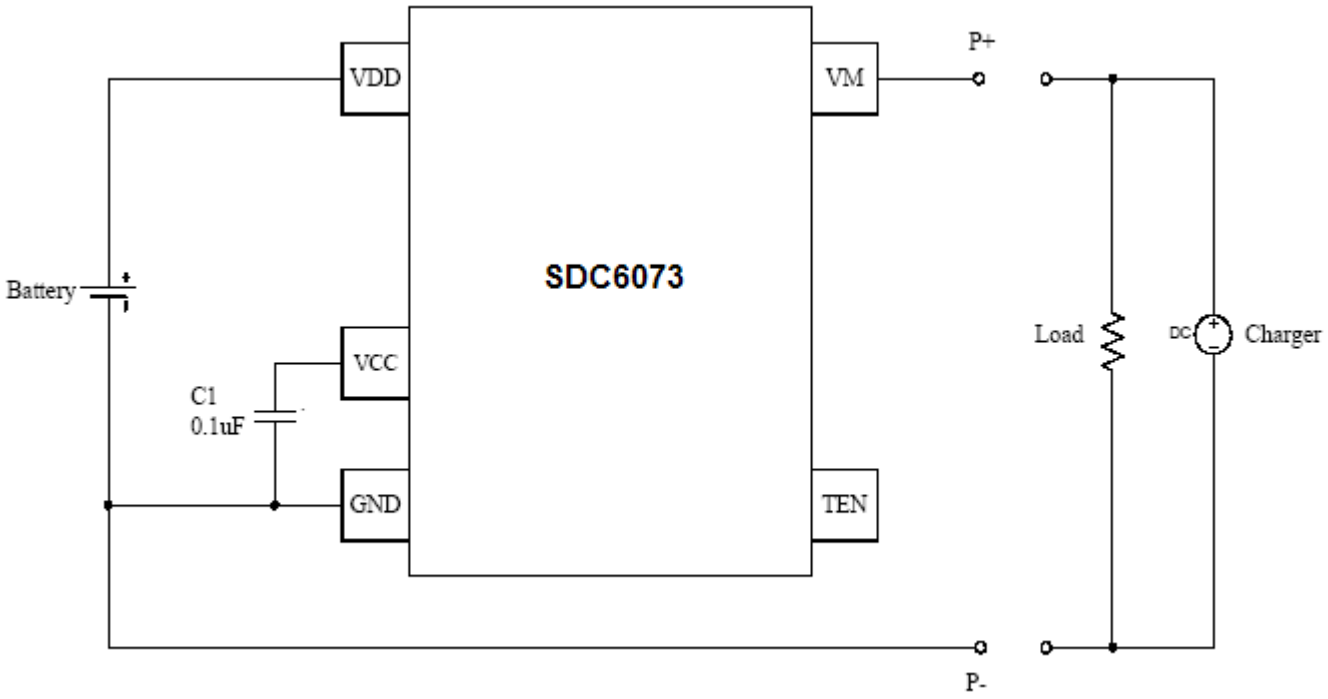


Remark: (1) Normal condition (3) Overdischarge voltage condition
The charger is supposed to charge with constant current



Remark: (1) Normal condition (2) Overcharge current condition (3) Overdischarge voltage condition
The charger is supposed to charge with constant current

Typical Application



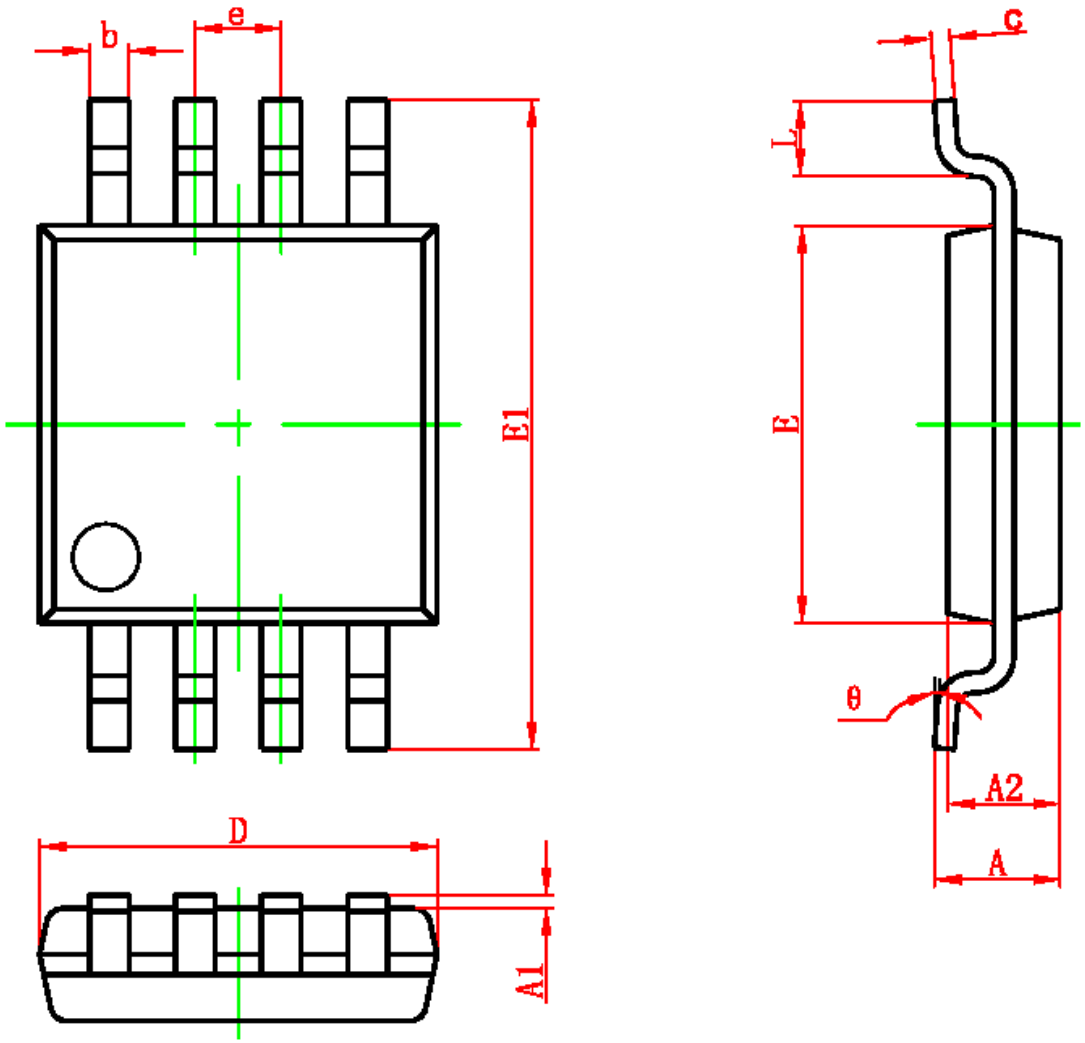
Remarks:

1. C1 is used for protecting power fluctuation. Recommend Value is 0.1μF, minimum value 0.022μF, and maximum value 1.0μF.
2. The above connection diagram and constants may do not guarantee proper operation. Evaluate upon actual application and determine constants properly.

Precaution

Pay attention to the operating conditions of input/output voltage and load current so that the loss in the IC does not exceed the permissible loss (power dissipation) of the package.

Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°