

# Protection for Lithium-Ion Batteries (for double protection) Monolithic IC PST75XX Series

June 3, 1998

## Outline

This IC is used for double protection for 1-cell lithium-ion batteries. Some models can also be used for pulse charging.

## Features

- |  |   |
|--|---|
| 1. Detection voltage accuracy (Ta=25°C)                          | ±15 mV (PST7513, 7523) / ±30 mV (PST7512, 7528) |
| 2. Circuit current during power-on                               | 30µA typ.                                       |
| 3. Circuit current during power-off<br>(Vcc ≥ Detection voltage) | 4µA typ.  |
| 4. Circuit current during power-off (Vcc=2.000V)                 | 1µA typ.  |
| 5. Output current during power-on                                | -100µA max.                                     |
| 6. Delay time (Ctc=0.015µF, RL=100kΩ)                            | 200 ms typ.                                     |

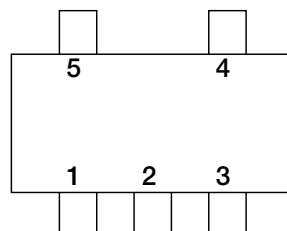
## Package

SOT-25A (Mini mold)

## Applications

For double protection for 1-cell lithium-ion batteries

## Pin Assignment

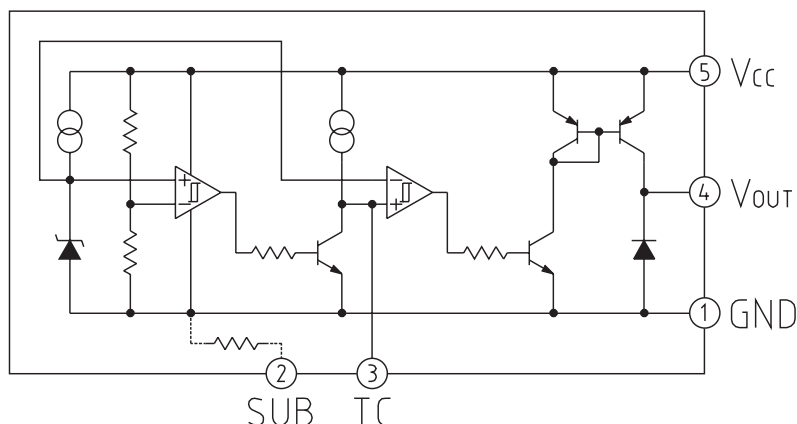


1	GND
2	SUB
3	TC
4	V <sub>OUT</sub>
5	V <sub>CC</sub>

SOT-25A

Note: Connect the 2pin to GND as it is the SUB pin.

## Block Diagram



## Pin Description

Pin No.	Pin Name	Functions
1	GND	GND pin
2	SUB	SUB pin
3	TC	Delay time establish pin
4	V <sub>OUT</sub>	Reset signal output pin
5	V <sub>CC</sub>	V <sub>CC</sub> pin / detection voltage pin

## Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Unit
Storage temperature	T <sub>STG</sub>	-40~+125	°C
Operating temperature	T <sub>OPR</sub>	-25~+75	°C
Supply voltage	V <sub>CC</sub> max.	-0.3~+12	V
Allowable loss	P <sub>d</sub>	150	mW

## Recommended Operating Conditions

Item	Symbol	Ratings	Unit
Operating temperature	T <sub>OPR</sub>	-25~+75	°C
Operating voltage	V <sub>OP</sub>	0~+12	V

## Electrical Characteristics (Except where noted otherwise, Ta=25°C) Models listed PST7513

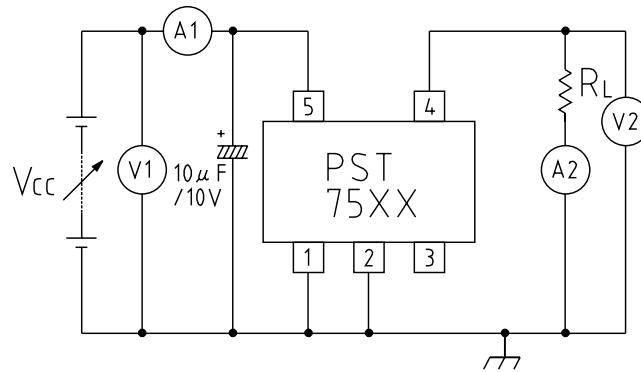
Item	Symbol	Measurement circuit	Measurement conditions	Min.	Typ.	Max.	Unit
Detection voltage	V <sub>SD</sub>	1	V <sub>CC</sub> =L→H R <sub>L</sub> =100kΩ	4.120	4.135	4.150	V
Release voltage	V <sub>SR</sub>	1	V <sub>CC</sub> =L→H→L R <sub>L</sub> =100kΩ	4.100	4.125	4.145	V
Hysteresis voltage	ΔV <sub>s</sub>		ΔV <sub>s</sub> =V <sub>SD</sub> -V <sub>SR</sub>	5	10	20	mV
Detection voltage temperature coefficient	V <sub>s</sub> /ΔT	1	R <sub>L</sub> =100kΩ Ta=-25~+75°C		±0.01		%/°C
High-level output voltage	V <sub>OH</sub>	1	V <sub>CC</sub> =4.20V R <sub>L</sub> =100kΩ	3.800	4.150		V
Output leakage current	I <sub>OL</sub>	1	V <sub>CC</sub> =4.020V			±0.1	μA
Circuit current at on time	I <sub>CCH</sub>	1	V <sub>CC</sub> =4.200V R <sub>L</sub> =∞		30	50	μA
Circuit current at off time 1	I <sub>CCL1</sub>	1	V <sub>CC</sub> =4.020V R <sub>L</sub> =∞		4	6	μA
Circuit current at off time 2	I <sub>CCL2</sub>	1	V <sub>CC</sub> =2.000V R <sub>L</sub> =∞		1	1.5	μA
Delay time	t <sub>PLH</sub> *	2	R <sub>L</sub> =100kΩ C <sub>TC</sub> =0.015μF	140	200	260	ms
"L" transmission delay time	t <sub>PHL</sub> *	2	R <sub>L</sub> =100kΩ C <sub>TC</sub> =0.015μF		1.1	3.5	ms
Output current at ON time	I <sub>OH</sub>	1	V <sub>CC</sub> =4.200V R <sub>L</sub> =0Ω			-100	μA

Note : \*t<sub>PLH</sub> : V<sub>CC</sub>=3.870V→4.370V

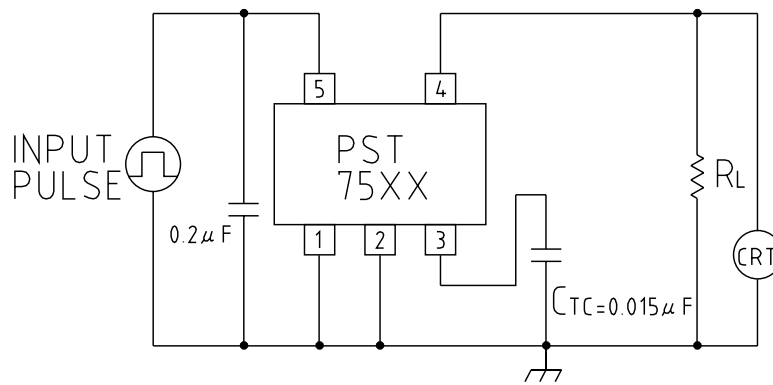
\*t<sub>PHL</sub> : V<sub>CC</sub>=4.370V→3.870V

Measuring Circuit

(1)



(2)

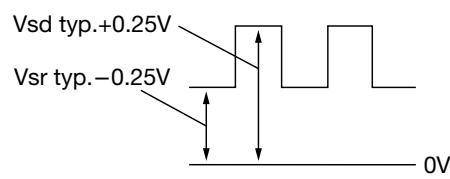


A: DC Amperemeter

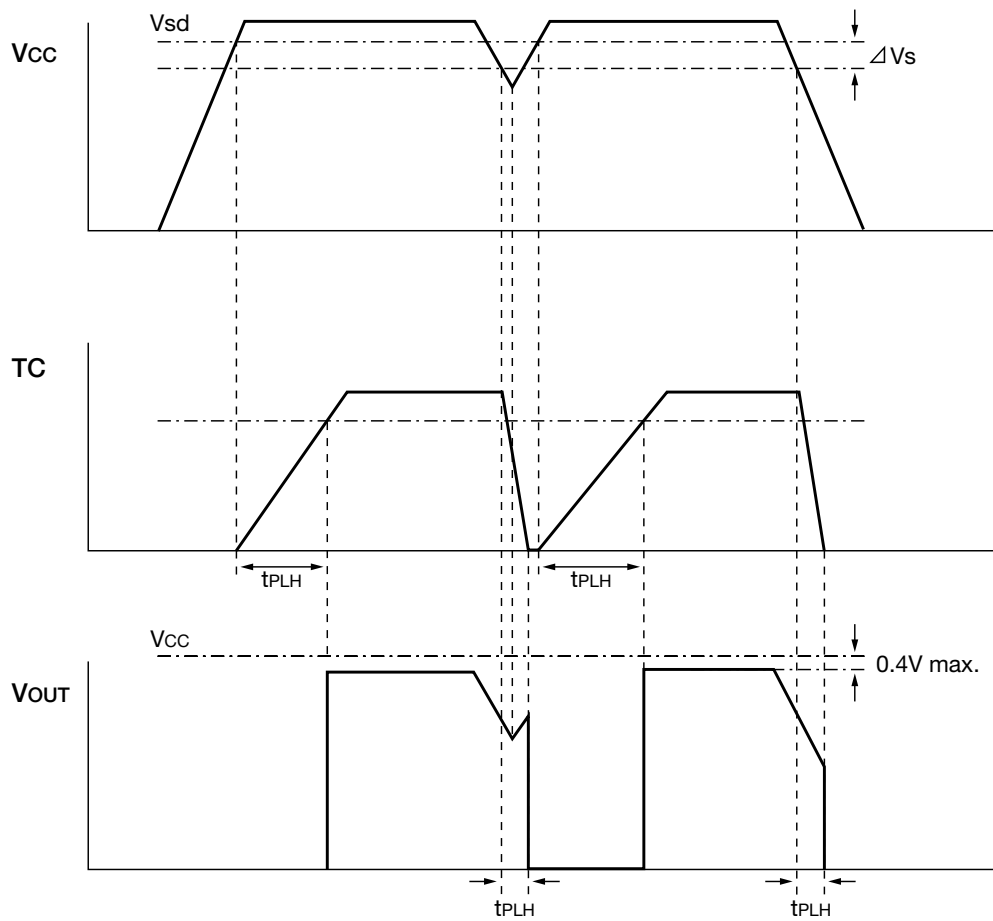
V: DC Voltmeter

CRT: Oscilloscope

Input Pulse

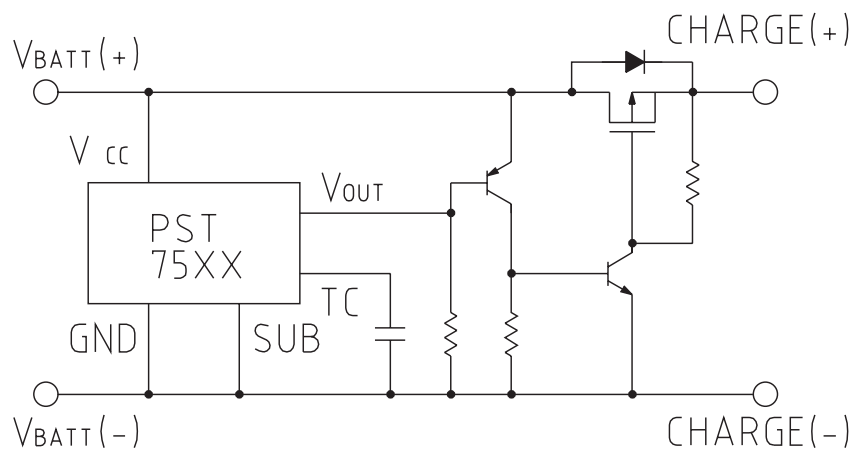


Timing Chart

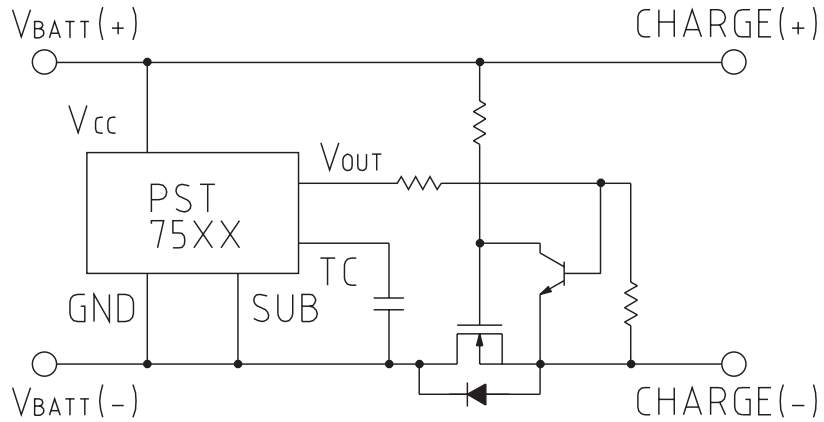


Application Circuit

(1) Over charge detecting circuit (P-MOS FET control)

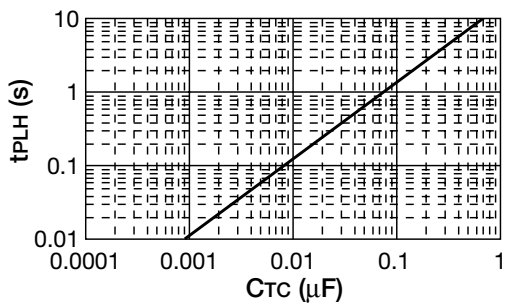


(2) Over charge detecting circuit (N-MOS FET control)



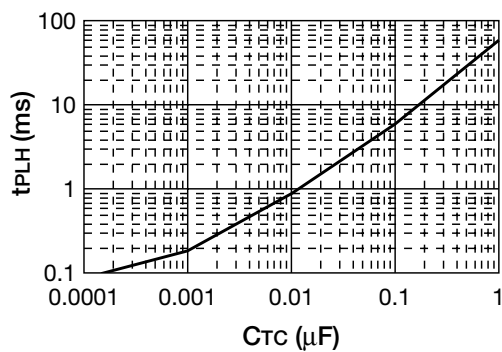
Characteristics

■ Delay time (t<sub>PLH</sub>) vs C<sub>TC</sub> characteristics



Delay time (t<sub>PLH</sub>)  
 $\approx 13.33 \times C_{TC}$  (s)  
 C<sub>TC</sub>:  $\mu$ F

■ "L" transmission delay time (t<sub>PHL</sub>) vs C<sub>TC</sub> characteristics



"L" Transmission delay time (t<sub>PHL</sub>)  
 $\approx 73.35 \times 10^{-3} \times C_{TC}$  (s)  
 C<sub>TC</sub>:  $\mu$ F

Note: The above are representative, not guaranteed values.