

# Protection of Lithium-Ion Batteries (for Double-Protect) Monolithic IC PST7XXX

## Outline

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

## Features

- |   |                                     |
|---|-------------------------------------|
| 1. Detection voltage accuracy ( $T_a=25^{\circ}\text{C}$ )                    | $\pm 15\text{ mV}/\pm 30\text{ mV}$ |
| 2. Circuit current while on   | $30\mu\text{A typ.}$                |
| 3. Circuit current while off ( $V_{\text{CC}}$ at or below detection voltage) | $4\mu\text{A typ.}$                 |
| 4. Circuit current while off ( $V_{\text{CC}}=2.000\text{V}$ )                | $1\mu\text{A typ.}$                 |
| 5. Output current while on  | $-100\mu\text{A max.}$              |
| 6. Delay time ( $C_{\text{tc}}=0.015\mu\text{F}$ )                            | $200\text{ ms typ.}$                |

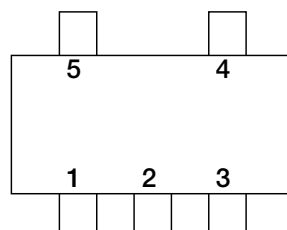
## Package

SOT-25

## Applications

IC for double-protection of lithium-ion batteries with one cell.

## Pin Assignment

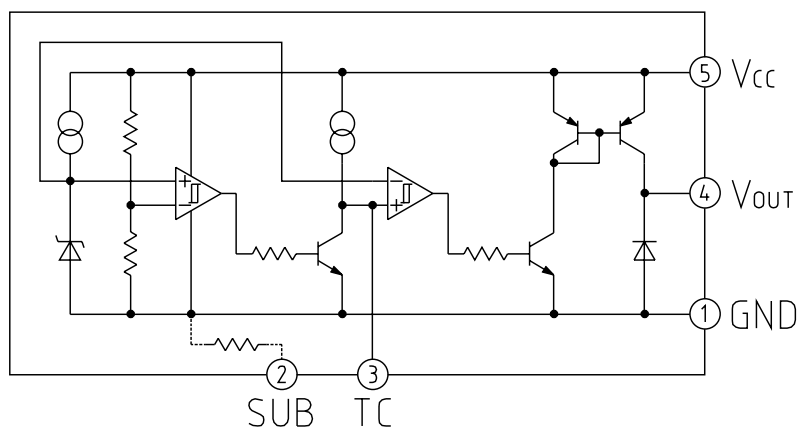


SOT-25

1	GND
2	SUB
3	TC
4	$V_{\text{OUT}}$
5	$V_{\text{CC}}$

Note 2 : The Pin 2 this product is SUB, so connect the pin to Ground.

## 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)

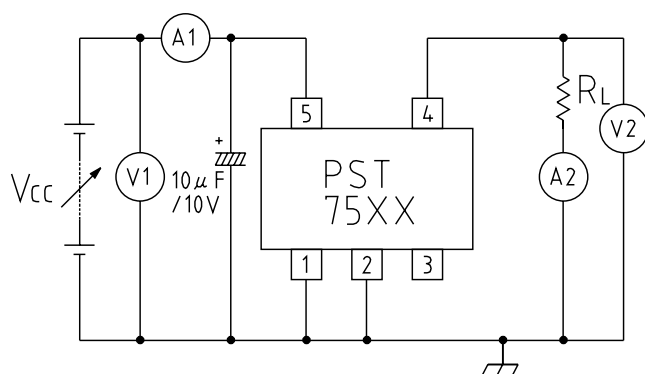
Item	Symbol	Measurement circuit	Measurement conditions	Min.	Typ.	Max.	Unit
Detection voltage	V <sub>SD</sub>	1	V <sub>CC</sub> =L→H R <sub>L</sub> =100kΩ	4.120	4.135	4.150	V
Release voltage	V <sub>SR</sub>	1	V <sub>CC</sub> =L→H→L R <sub>L</sub> =100kΩ	4.100	4.125	4.145	V
Hysteresis voltage	ΔV <sub>S</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> =4.20V R <sub>L</sub> =∞		30	50	μA
Circuit current at off time 1	I <sub>CC1</sub>	1	V <sub>CC</sub> =4.02V R <sub>L</sub> =∞		4	6	μA
Circuit current at off time 2	I <sub>CC2</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

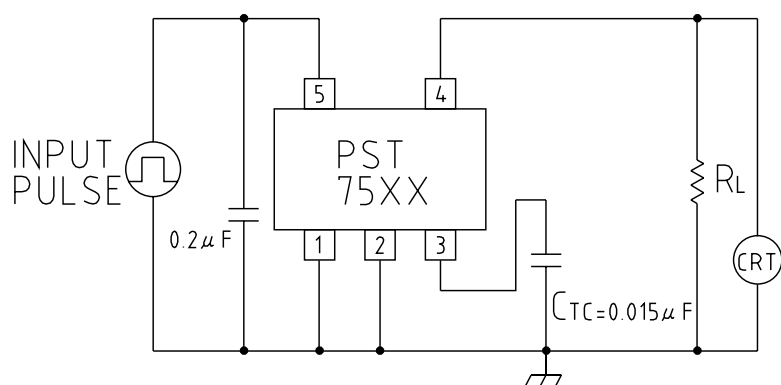
t<sub>PHL</sub> : V<sub>CC</sub>=4.370V→3.870V

# Measuring Circuit

(1)



(2)

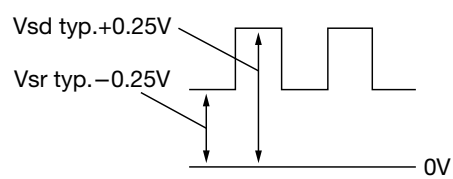


A: DC Amperemeter

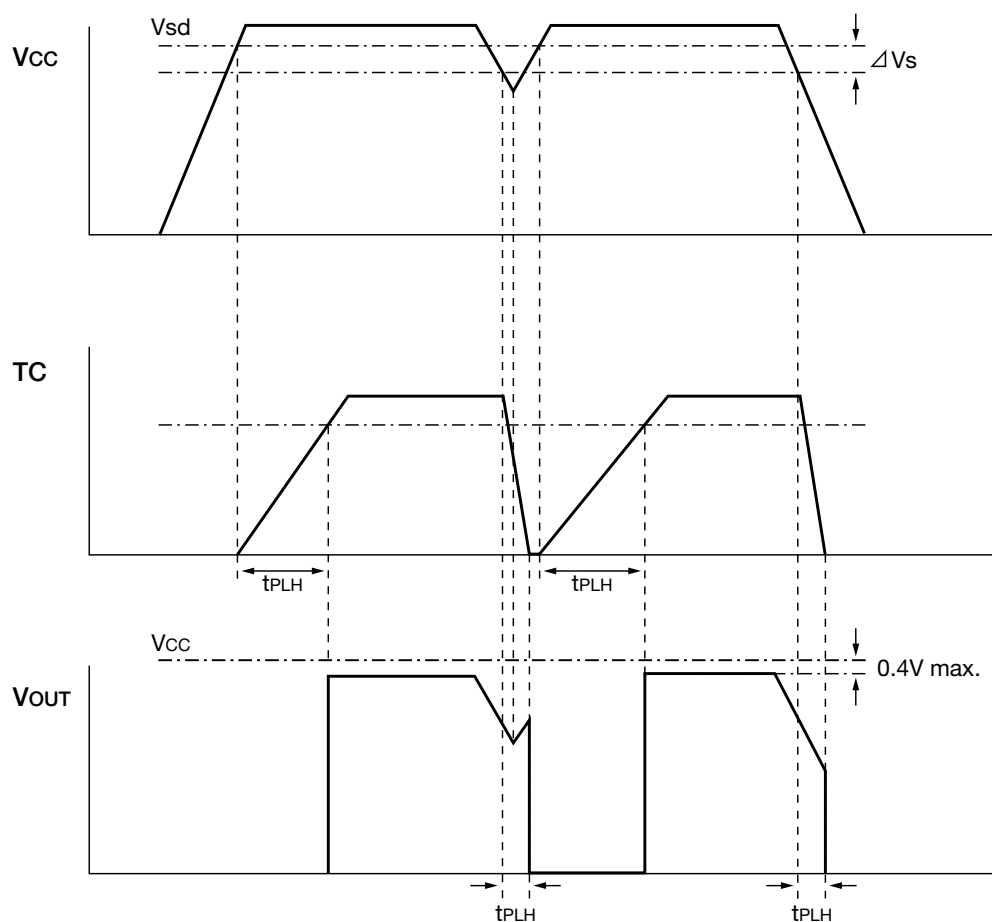
V: DC Voltmeter

CRT: Oscilloscope

Input Pulse

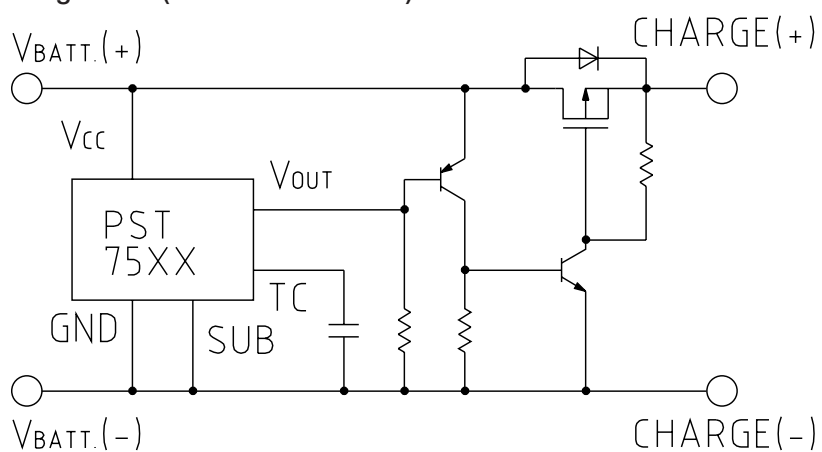


## Timing Chart

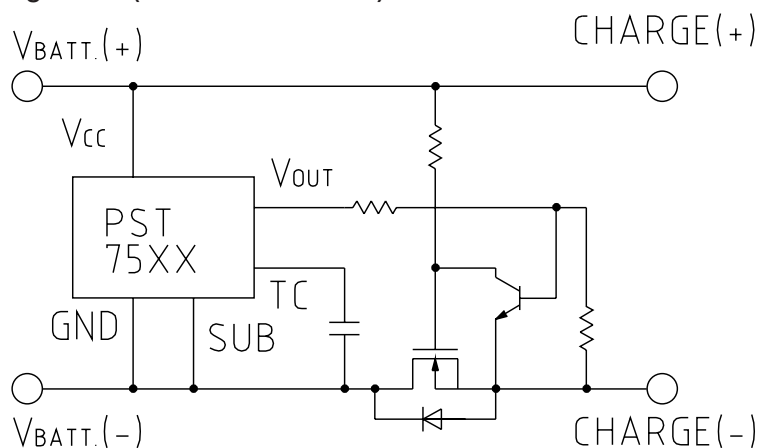


## Application Circuit

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

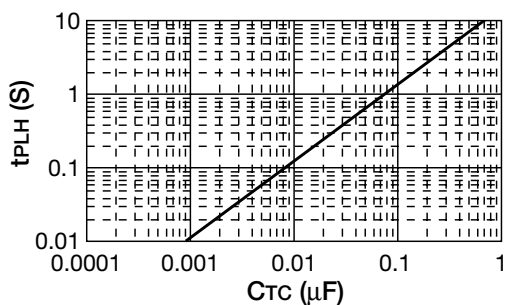


(2) Over charge detecting circuit (N-MOS FET control)



**Characteristics**

**Delay time ( $t_{PLH}$ ) –  $C_{TC}$  characteristics**

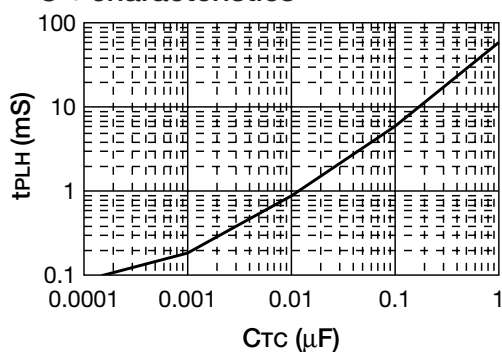


Delay time ( $t_{PLH}$ )

$$\approx 13.33 \times C_{TC} \text{ (S)}$$

$C_{TC}$ :  $\mu\text{F}$

**"L" transmission delay time ( $t_{PHL}$ ) –  $C_{TC}$  characteristics**



"L" Transmission delay time ( $t_{PHL}$ )

$$\approx 73.35 \times 10^{-3} \times C_{TC} \text{ (S)}$$

$C_{TC}$ :  $\mu\text{F}$

Note: The above are representative, not guaranteed values.