

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_{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 ms typ. |

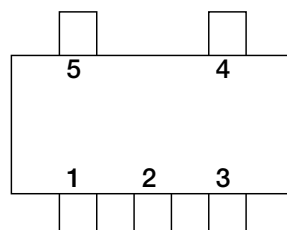
Package

SOT-25

Applications

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

Pin Assignment

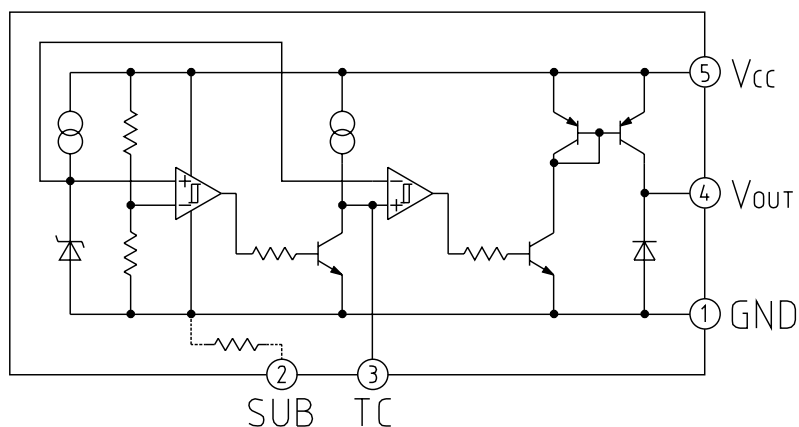


SOT-25

1	GND
2	SUB
3	TC
4	V_{OUT}
5	V_{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 _{OUT}	Reset signal output pin
5	V _{CC}	V _{CC} pin / detection voltage pin

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Unit
Storage temperature	T _{STG}	-40~+125	°C
Operating temperature	T _{OPR}	-25~+75	°C
Supply voltage	V _{CC} max.	-0.3~+12	V
Allowable loss	P _d	150	mW

Recommended Operating Conditions

Item	Symbol	Ratings	Unit
Operating temperature	T _{OPR}	-25~+75	°C
Operating voltage	V _{OP}	0~+12	V

Electrical Characteristics (Except where noted otherwise, Ta=25°C)

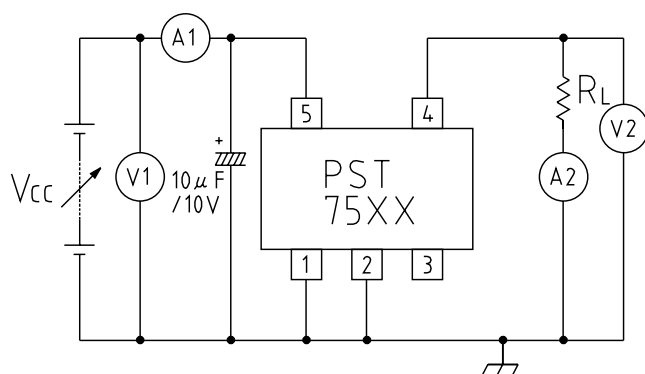
Item	Symbol	Measurement circuit	Measurement conditions	Min.	Typ.	Max.	Unit
Detection voltage	V _{SD}	1	V _{CC} =L→H R _L =100kΩ	4.120	4.135	4.150	V
Release voltage	V _{SR}	1	V _{CC} =L→H→L R _L =100kΩ	4.100	4.125	4.145	V
Hysteresis voltage	ΔV _S		ΔV _S =V _{SD} -V _{SR}	5	10	20	mV
Detection voltage temperature coefficient	V _S /ΔT	1	R _L =100kΩ Ta=-25~+75°C		±0.01		%/°C
High-level output voltage	V _{OH}	1	V _{CC} =4.20V R _L =100kΩ	3.800	4.150		V
Output leakage current	I _{OL}	1	V _{CC} =4.020V			±0.1	μA
Circuit current at on time	I _{CCH}	1	V _{CC} =4.20V R _L =∞		30	50	μA
Circuit current at off time 1	I _{CC1}	1	V _{CC} =4.02V R _L =∞		4	6	μA
Circuit current at off time 2	I _{CC2}	1	V _{CC} =2.000V R _L =∞		1	1.5	μA
Delay time	t _{PLH} *	2	R _L =100kΩ C _{TC} =0.015μF	140	200	260	mS
"L" transmission delay time	t _{PHL} *	2	R _L =100kΩ C _{TC} =0.015μF		1.1	3.5	mS
Output current at ON time	I _{OH}	1	V _{CC} =4.200V R _L =0Ω			-100	μA

Note : t_{PLH} : V_{CC}=3.870V→4.370V

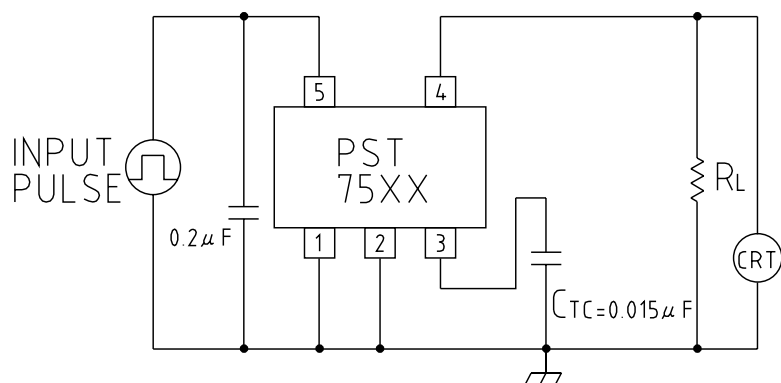
t_{PHL} : V_{CC}=4.370V→3.870V

Measuring Circuit

(1)



(2)

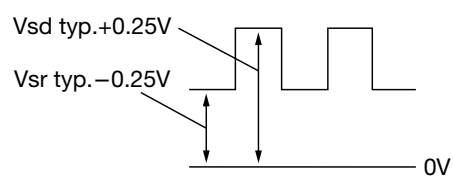


A: DC Amperemeter

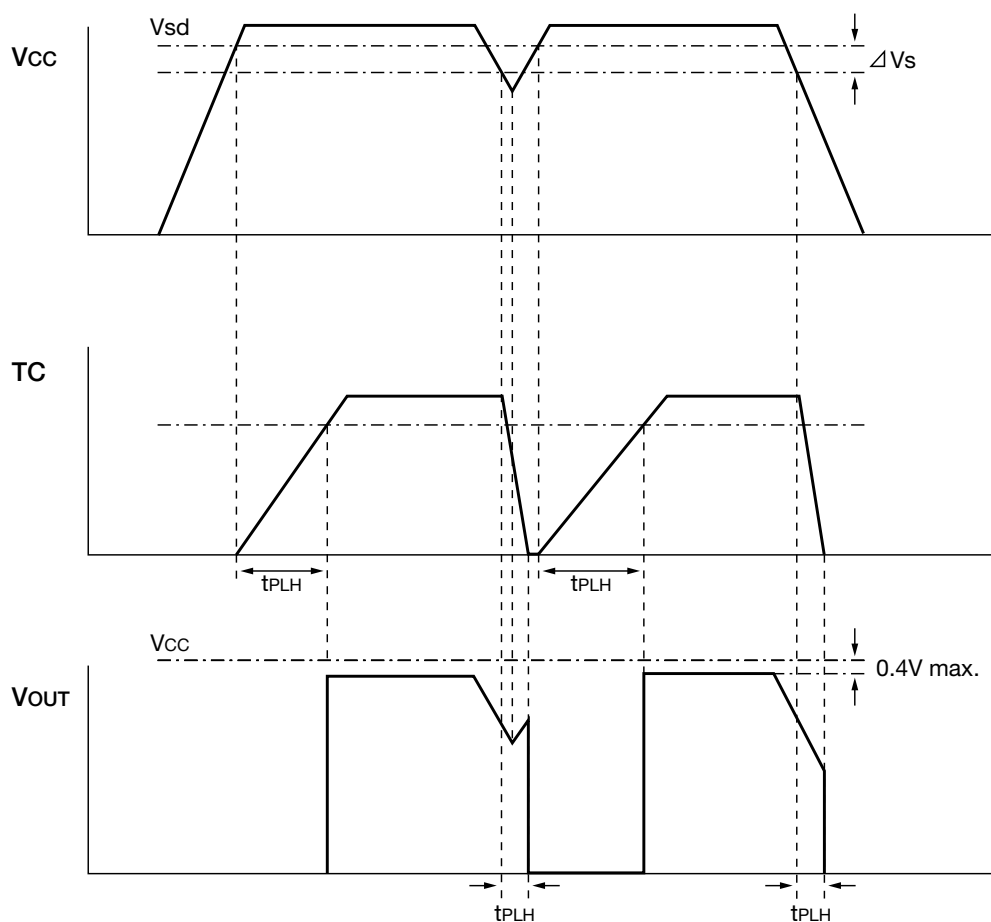
V: DC Voltmeter

CRT: Oscilloscope

Input Pulse

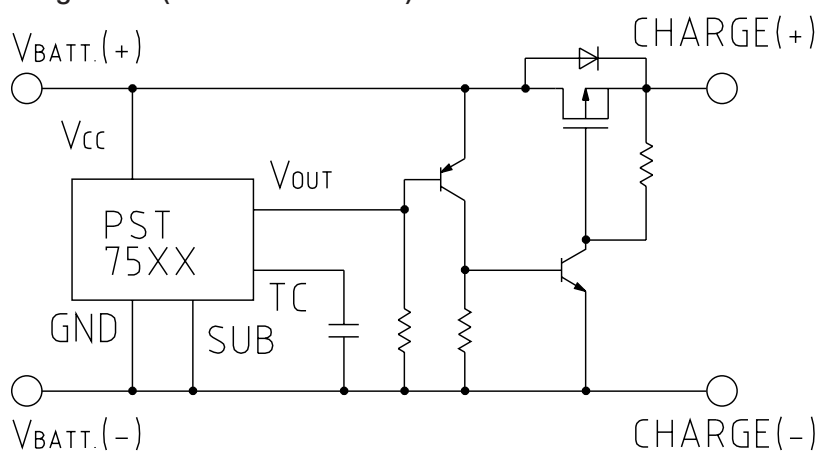


Timing Chart

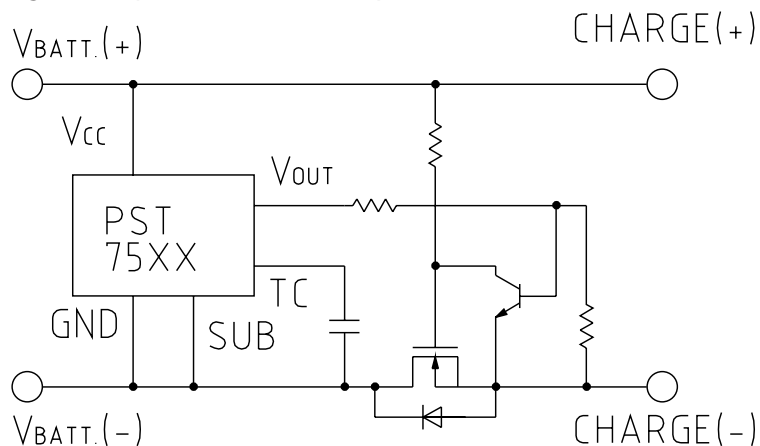


Application Circuit

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

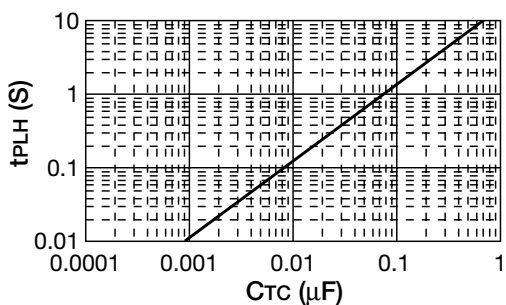


(2) Over charge detecting circuit (N-MOS FET control)



Characteristics

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

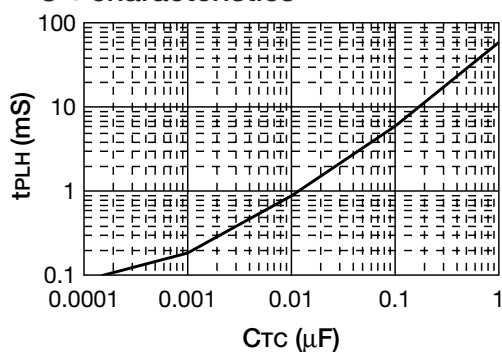


Delay time (t_{PLH})

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

C_{TC} : μF

"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} : μF

Note: The above are representative, not guaranteed values.