

GENERAL DESCRIPTION

The PT6104 is an high efficiency, pulse frequency modulated (PFM) switching charger controller for 2 to 4 cell li-ion battery packs. It supports three segments of charging periods, small current pre-charge, constant current and constant voltage fast charge. By changing topology and external parts, user can apply PT6104 to multiple applications, like having different battery cells, charging current. The PT6104 also provides necessary battery charging protections for short circuit, over voltage, ultra low voltage, pre-charge level, fast charge, and over current. Over temperature protection for battery pack is realized through an externally connected thermal resistor. The package of PT6104 is SOP8.

APPLICATIONS

- portable DVD player
- LCD TV
- other portable devices

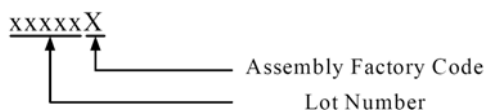
FEATURES

- Battery plug-in detect: Constant current charge; the fast charge current can be adjust by external resistor.
- Ultra low battery voltage protect: Using small pre-charge current to protect the battery in ultra low voltage.
- Normal charge mode: Using the pre-set current to fast charge the battery.
- Accurate full charge detection by sensing charging current.
- Protecting functions for over voltage, over current and ultra low voltage.
- Battery over temperature protection before and during charging.
- Charge time protections for pre-charge and fast charge periods.
- Recharging function: After being fully charged, the battery will be recharged if the battery voltage drops below $V_{re-charge}$.
- LED indicate different charging states.
- 4.5V operating voltage.
- RoHS compliant

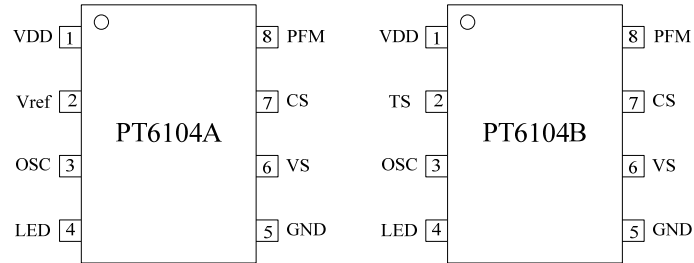
ORDERING INFORMATION

PACKAGE	TEMPERATURE RANGE	ORDERING PART NUMBER	TRANSPORT MEDIA	MARKING
SOP8	-40°C to 85°C	PT6104ESOH	Tape and Reel	PT6104A xxxxxX
SOP8	-40°C to 85°C	PT6104FSOH	Tape and Reel	PT6104B xxxxxX

Note:



PIN ASSIGNMENT



PIN DESCRIPTIONS

PIN	SYMBOL	DESCRIPTION
1	VDD	Power supply
2	Vref	External reference voltage input
2	TS	External thermal sensor input
3	OSC	Oscillator input.
4	LED	LED charge state display output
5	GND	Ground
6	VS	Battery voltage sample input
7	CS	Charge current sample input
8	PFM	Pulse Frequency modulation output

ABSOLUTE MAXIMUM RATINGS

SYMBOL	ITEMS	VALUE	UNIT
VDD	Power Supply Voltage	-0.3~7	V
V _{PFM}	PFM Pin Voltage	-0.3~7	V
V _{LED}	LED Pin Voltage	-0.3~7	V
	All Other Pins Voltage	-0.3~7	V
T _J	Junction Temperature	-40~125	°C
T _{STG}	Storage Temperature Range	-65~150	°C
T _{SOLDER}	Lead Temperature (Soldering, 10 sec)	260	°C

RECOMMENDED OPERATING RANGE

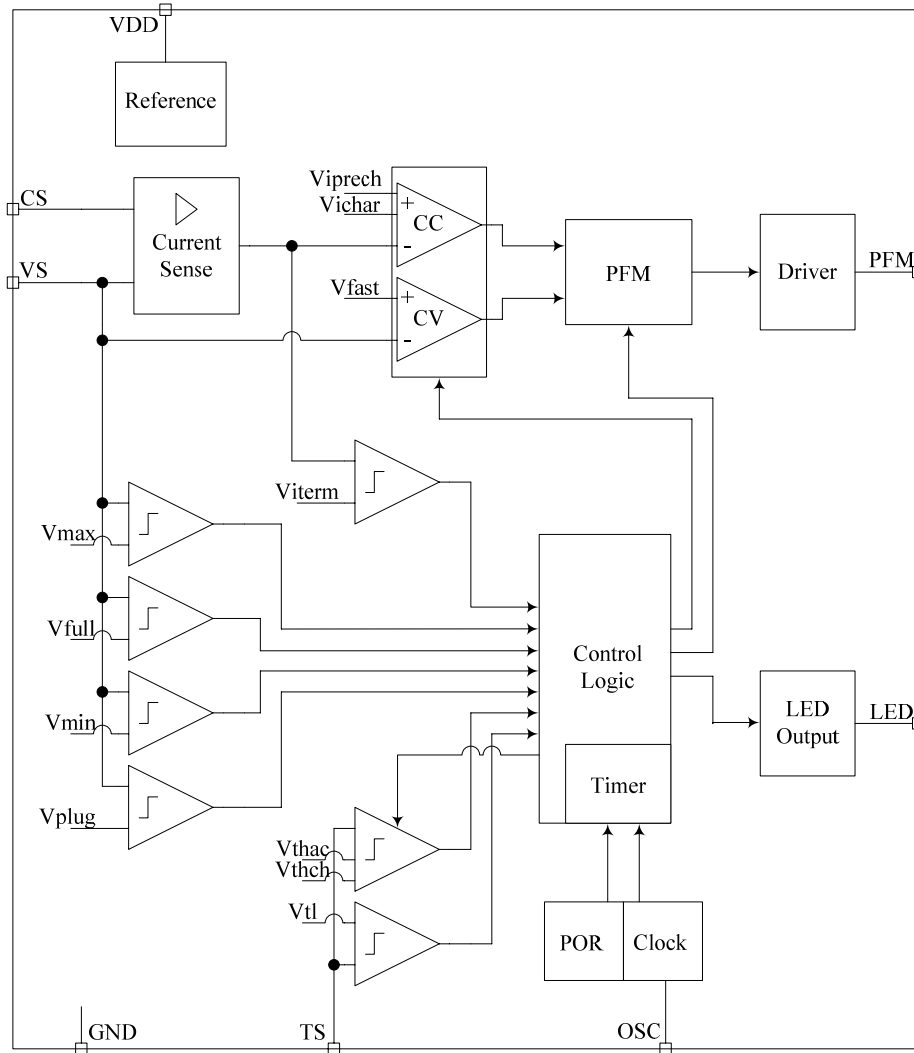
SYMBOL	ITEMS	VALUE	UNIT
VDD	Power Supply Voltage	4.5	V
V _{PFM}	PFM Pin Voltage	0~4.5	V
V _{LED}	LED Pin Voltage	0.4~4.0	V

V _{Vref}	Vref Pin Voltage	2.5	V
V _{TS}	TS Pin Voltage	0.5~4.3	V
V _{VS}	VS Pin Voltage	0.5~4.3	V
V _{CS}	CS Pin Voltage	0.5~4.3	V
TOPER	Operating Temperature Range	0~85	°C

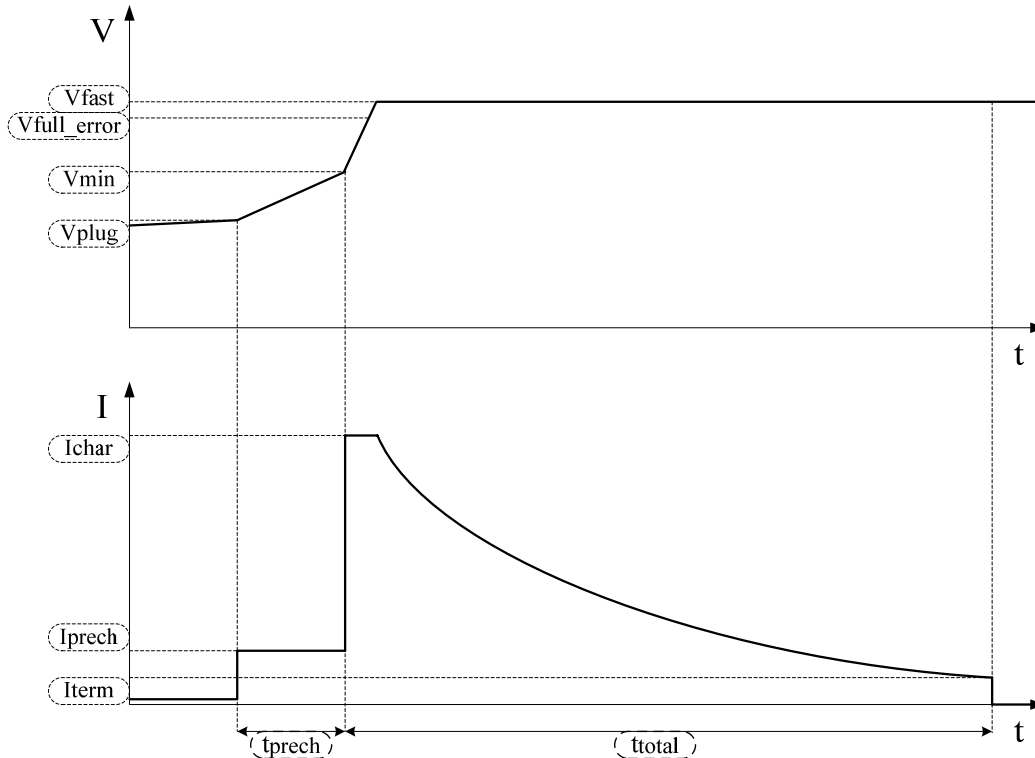
ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
Supply voltage						
VDD	Supply voltage			4.5		V
Charge voltage control						
V _{plug}	Battery plug-in voltage		1.95	2	2.05	V
V _{min}	Pre-charge voltage		2.85	2.9	2.95	V
V _{full-error}	Charge full error voltage		3.91	3.96	4.01	V
V _{re-charge}	Re-charge voltage		3.82	3.87	3.92	V
V _{fast}	Voltage in constant voltage fast charge		4.18	4.23	4.28	V
V _{max}	Maximum voltage		4.25	4.3	4.35	V
Charge current control						
V(I _{char})	Voltage difference in constant current fast charge		303	330	357	mV
V(I _{prech})	Voltage difference in small current pre-charge		46	70	100	mV
V(I _{term})	Voltage difference of charge termination		17	40	63	mV
LED indication						
I _{led}	LED driving current			10		mA
Charge time control						
t _{pre}	Pre-charge protection time			20		min
t _{total}	Total charge protection time			2		hr
Over temperature protection						
V _{tl}	Cold temperature voltage			3.3		V
V _{thac}	Hot temperature voltage			1.5		V
V _{thch}	Cutoff temperature voltage			1.2		V

FUNCTIONAL BLOCK DIAGRAM



OPERATION DESCRIPTION



Battery Pack Detect: The charger will detect intermittently whether the battery pack was present. If the battery pack was plugged in, the charge process will started.

Pre-charge: A smaller constant current will be filled into battery pack firstly, if it was over discharged for its voltage lower than V_{min} .

Pre-charge Time Protect: The Charger will terminate pre-charging forcibly for bad battery pack, because its voltage was still lower than V_{min} when pre-charge protection time was expired.

Constant Current Charge: A regulated constant current will be filled into normal battery pack for enhancing its voltage soon.

Constant Voltage Charge: When the battery pack voltage has been achieving V_{fast} , the charger will keep on charging by regulating the output voltage at V_{fast} .

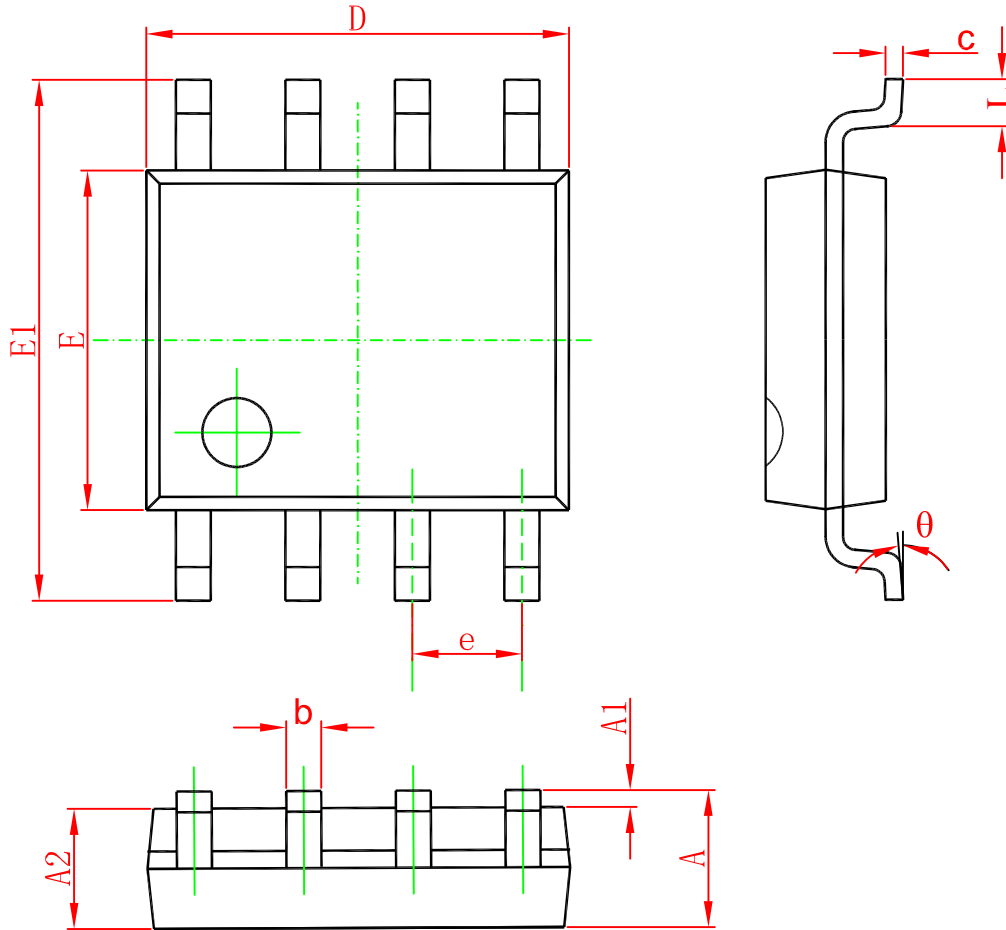
Charge Termination: The charging will be terminated immediately, once the current streaming into battery pack descended lower than I_{term} . A full LED indication will be output.

Fast Charge Time Protect: When fast charge protection time was expired, the charging will be terminated too. Only the battery pack that its voltage exceeded V_{full_error} will be indicated for full. Contrarily, the battery pack lower voltage remaining will be indicated that it was damaged.

Battery Pack Temperature Protect: If the temperature in battery pack exceeded threshold value setting by charger, the charging will be suspended until the temperature fell down.

Re-charge: If the battery pack that has been filled full still be placed in, its voltage will descend slowly due to discharging through external components. When its voltage fell down lower than $V_{re-charge}$, the new charge process will restart.

PACKAGE INFORMATION



SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCH	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°