

Linear Li-Ion Battery Charger

General Description

XT9502 series is a double lithium battery charge management chip. The chip includes a charge state detection, the charging process, temperature detection and so on. The chip also integrates a high-precision reference voltage module in it. It uses the SOP-8 package.

XT9502 charge contains three modes: precharge, constant current charging, constant voltage charging. Constant current charging current is five times the pre-charge current; when the voltage is lower than 6.5V into the precharge mode; when the voltage is above 6.5V into the constant current charge mode, the charging current is five times as the precharge, the charging current is determined by an external resistor.

Applications

- Digital camera
- PDAS
- The phone lithium battery

Features

- Double lithium battery charge management
- Only need a few external components
- Pre-charge, constant current charging, constant voltage charging mode
- Temperature detection
- Two charging status
- SOP-8 Package

Package

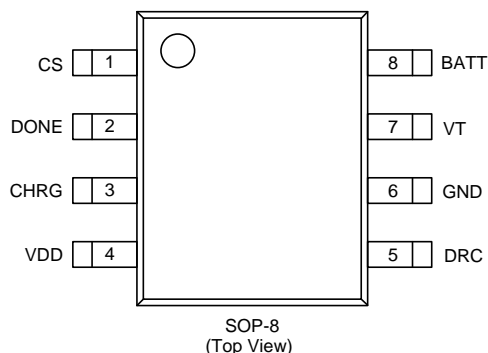
- SOP-8

Ordering Information

XT9502 ①②③④⑤⑥

Designator	Symbol	Description
①	A	Voltage accuracy: $\pm 1\%$
②③④	800-860	BATT voltage central value: Eg: ②=8 ③=0 ④=0 represent: 8.00V ②=8 ③=4 ④=0 represent: 8.40V
⑤	S	Package: SOP-8
⑥	R	Embossed tape: Standard feed
	L	Embossed tape: Reverse feed

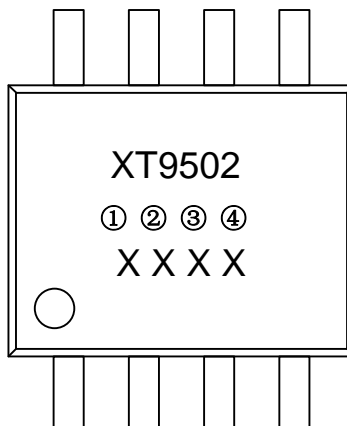
Pin Assignment



Pin Number	Pin Name	Function Description
1	CS	Overcharge detection pin
2	DONE	Charge status pin1
3	CHRG	Charge status pin2
4	VDD	Power input
5	DRC	External MOS or PNP control pin
6	GND	Ground
7	VT	Battery temperature detection pin
8	BATT	Battery voltage detection

■ Marking Rule

● SOP-8



①②③ Represents the BATT central voltage value

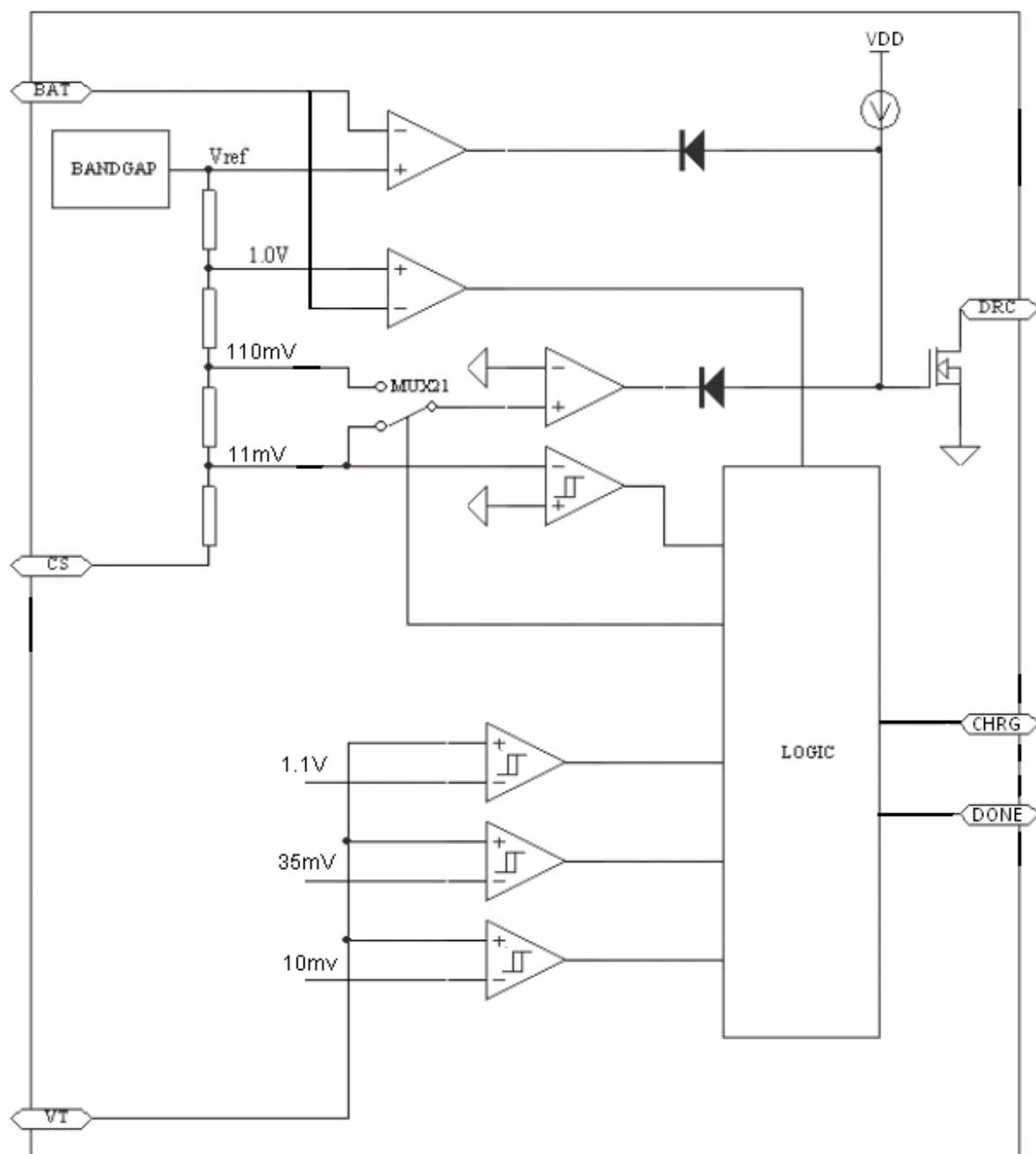
Symbol	Voltage	Product Name
780	7.80V	XT9502*780**
800	8.00V	XT9502*800**
820	8.20V	XT9502*820**
840	8.40V	XT9502*840**
860	8.60V	XT9502*860**
880	8.80V	XT9502*880**

④ Represents the voltage accuracy

Symbol	Voltage Accuracy	Product Name
A	± 1%	XT9502***A**
B	± 2%	XT9502***B**

XXXX represents the production batch

■ Block Diagram



■ Absolute Maximum Ratings

Parameter	Symbol	Maximum Rating	Unit
Input Supply Voltage	V_{DD}	$V_{SS}-0.3 \sim V_{SS}+18$	V
DRC pin Voltage	V_{drc}	$V_{SS}-0.3 \sim V_{cc}+18$	
BAT pin Voltage	V_{bat}	$V_{SS}-0.3 \sim 12$	
CS pin Voltage	V_{cs}	$V_{SS}-0.3 \sim 6$	
CHAG pin Voltage	V_{chrg}	$V_{SS}-0.3 \sim 18$	
DONE pin Voltage	V_{done}	$V_{SS}-0.3 \sim 18$	
NTC pin Voltage	V_{ntc}	$V_{SS}-0.3 \sim 6$	
Operating Ambient Temperature	T_{opa}	$-40 \sim +85$	°C
Storage Temperature	T_{str}	$-65 \sim +125$	

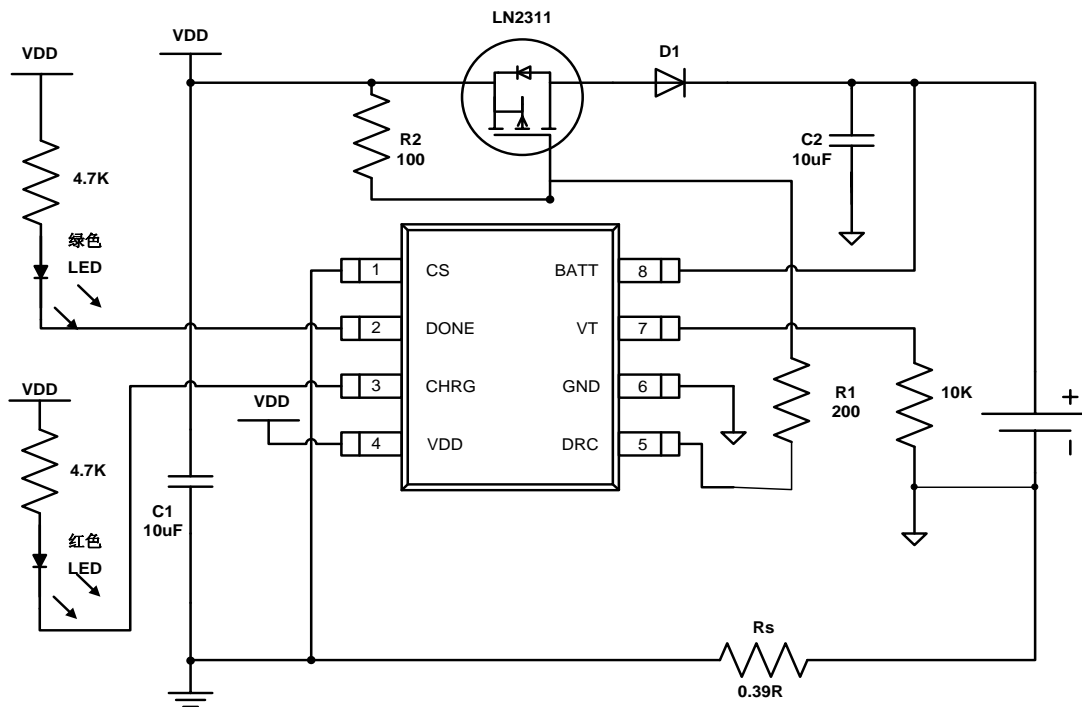
Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

■ Electrical Characteristics

($T_a=25^{\circ}\text{C}$ unless specified)

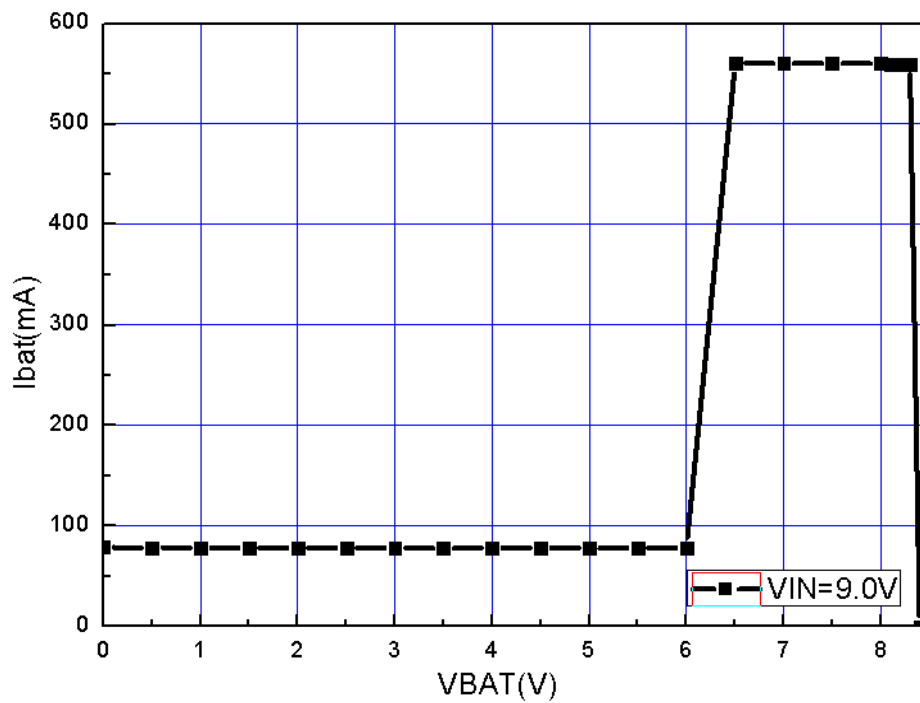
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating current 1	$I_{DD} \text{ (OPE)}$	$9V < V_{DD} < 20V$			350	μA
Input current 2	$I_{DD} \text{ (SLP)}$	$V_{DD} < 7.5$			20	μA
VBATT pin voltage	V_{batt}		8.27	8.36	8.45	V
Constant current charging current	I_{const}		90/ R_s	100/ R_s	110/ R_s	mA
Trickle charge current	I_{pre}		18/ R_s	20/ R_s	22/ R_s	mA
Precharge threshold voltage	$V_O(\text{min})$		6.2	6.5	6.8	V
Recharge threshold voltage	$V_O(\text{RCH})$			-400		mV
VT high temperature shutdown voltage	$V_{T\text{-hot}}$		45	50	55	mV
VT low temperature shutdown voltage	$V_{T\text{-cold}}$		1800	2000	2200	mV
Low power lockout threshold voltage	V_{uvlo}			7.5		V

Typical Application Circuit



Note: D1 is a Schottky; RS has been suggested that high-precision (1%) in order to ensure current accuracy, R1 and R2 is not required precision.

Typical Performance Characteristics



Charging process description

■ Function Description

When the input voltage VDD is below the UVLO level, the chip will enter into the SLEEP MODE, the chip power consumption will down to 20μA; When the VDD pin voltage rises above the UVLO voltage or more, the chip will into the CHRG the MODE, a charge cycle begins, early in the charge cycle, if the battery voltage is lower than the trickle charge threshold voltage (6.5V) the charger goes into trickle charge mode. The trickle charge current is internally set to 20% of the maximum charging current. When the battery voltage exceeds the trickle charge threshold, the charger enters constant current charging mode, the charging

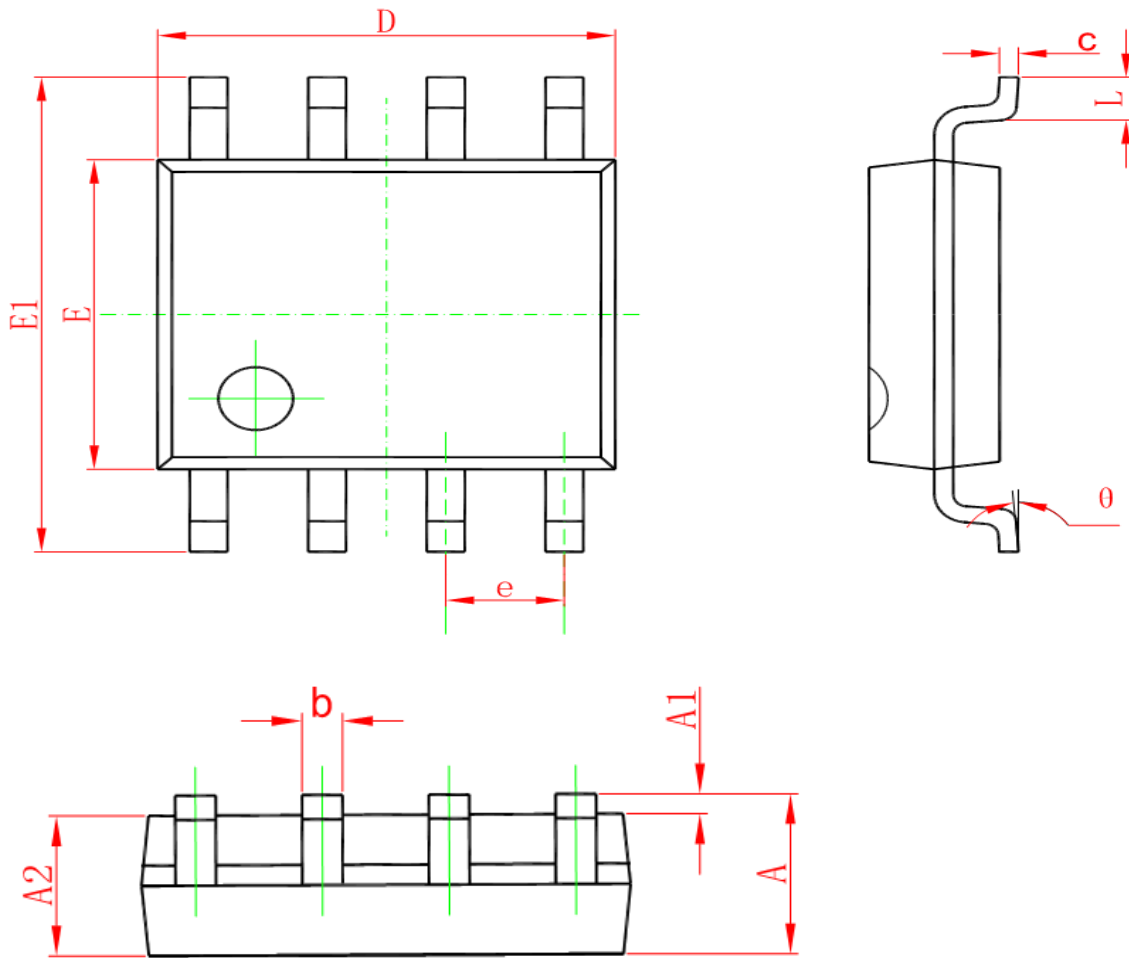
current from the internal 100mv baseline and the external sense resistor to a decision.
$$I_{BATT} = \frac{100mV}{R_s}$$

The chip also with battery temperature detection function, this function through the VT side, and in VT termination of a negative temperature coefficient 10KΩ thermistor (DALE NTHS1206N02), as the temperature rises to 80 degrees, the pin voltage is 50mV for low temperature to reach -30 degrees, the point voltage of 2V, only there voltage in the range of the two voltage values, the chip in order to work properly, otherwise the charge is stopped, the LED is not lit, this pin can be directly connected to shield of the temperature detection. Charging status display in the table below:

	No-load	Trickle charge	High current charging	Fully charged	NTC is not in the scope of state
Done (Green)	Flicker	Off	Off	On	Off
Charge (Red)	Off	On	On	Off	Off

Package Information

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	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°