

## General Description

The BCT3611S is a switching control current regulator designed specially for 1 watt white LED driver with max 450mA dc current. The BCT3611S has a low dropout voltage which is suitable for using Li-ion rechargeable battery as the power source. The mode switches from continuous to flash mode is easily accommodated by main power switch to minimize the risk of battery leakage and corrosion. The internal thermal protection circuit will activate by cutting the output current in half if the chip temperature go above 110 °C.

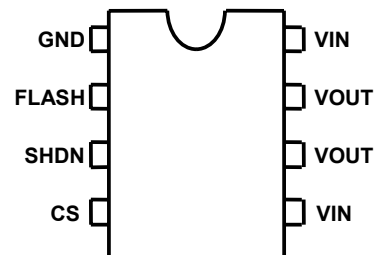
## Features

- Current regulator irrelevant to the LED forward voltage
- Enter flash mode without hardware switch:  
Flash mode is enabled by power switch ON, then OFF → ON within ~1 Second
- Maximum output current: 450mA
- Integrated thermal protection circuit
- On Chip Oscillator
- Low power consumption
- Wide operation temperature: -20°C to 70°C
- Output current adjustable by external resistor at pin CS
- SHDN can be used for dimming or shut down control by MCU
- Available in Pb-free SOP8-PP

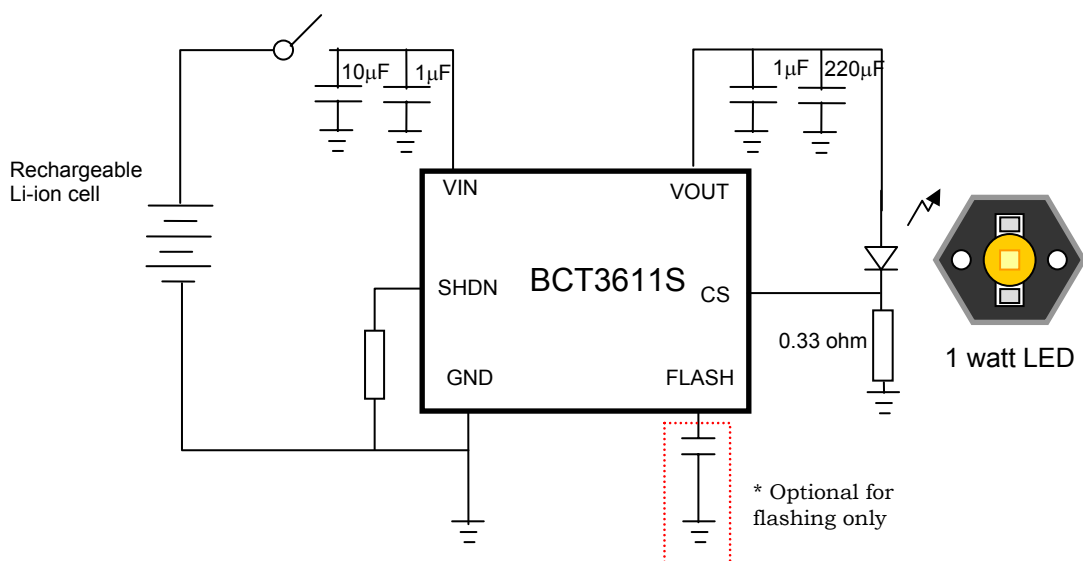
## Applications

- High power white LED Torch
- White LED driver for mobile phone
- Handheld Electronics
- Lighting Applications

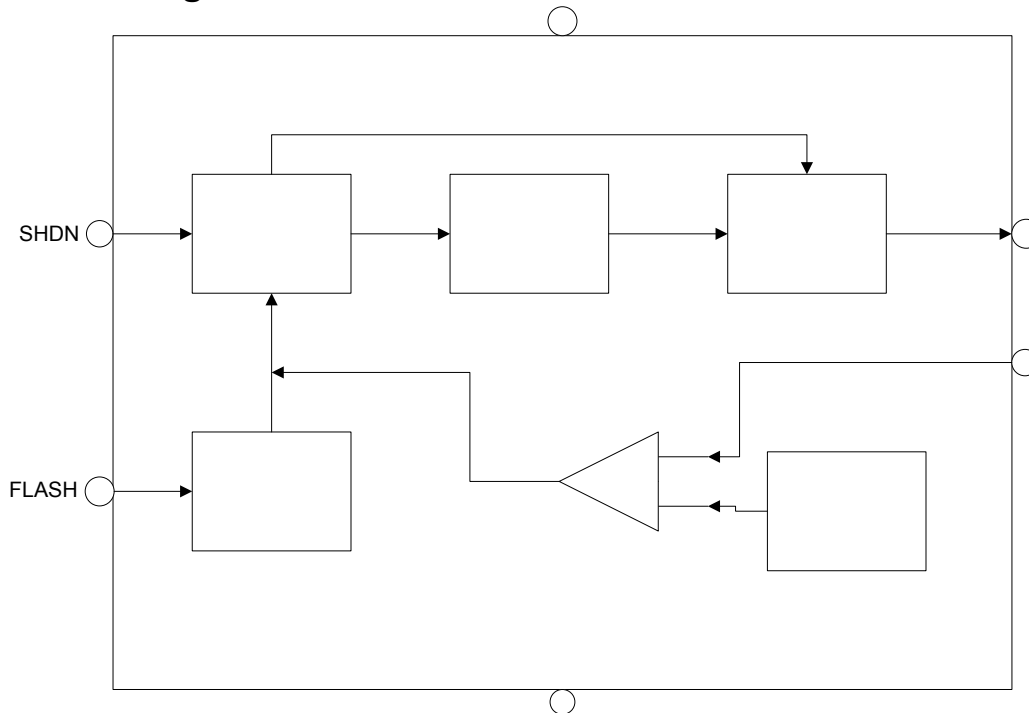
## Package



## Typical Application Circuit



## Block Diagram



## Pin Descriptions

Pin Number	Pin Name	I/O	Description
1	GND	Power	Ground 0V
2	FLASH	I/O	Capacitor pin for Flash Mode. To connect a 1 $\mu$ F ~ 6.8 $\mu$ F capacitor from FLASH to GND
3	SHDN	Input	Chip shutdown and reset (Active high)
4	CS	Input	Current sense feedback for Regulation Control Loop, feedback voltage = 0.11V
6, 7	VOUT	Output	Voltage Output. To connect a 100 ~ 470 $\mu$ F capacitor from VOUT to GND
5, 8	VIN	Power	Input Supply 2.2V – 4.3V

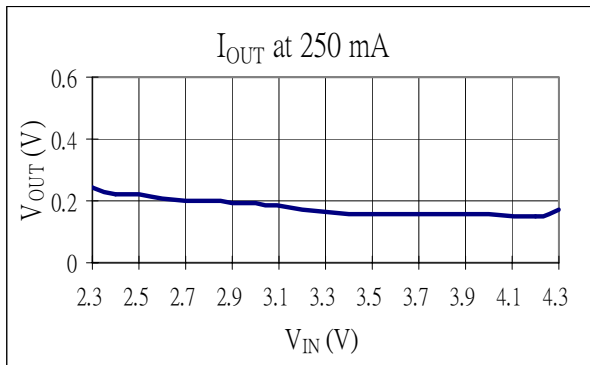
CONTROL

**Typical Characteristics**

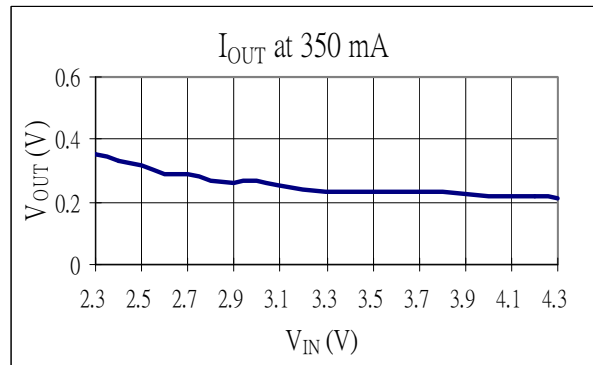
$C(V_{IN}) = 10\mu F \parallel 1\mu F \parallel 1\mu F$ ,  $C(V_{OUT}) = 1\mu F \parallel 220\mu F$

$T_A = 25^\circ C$ , unless otherwise noted

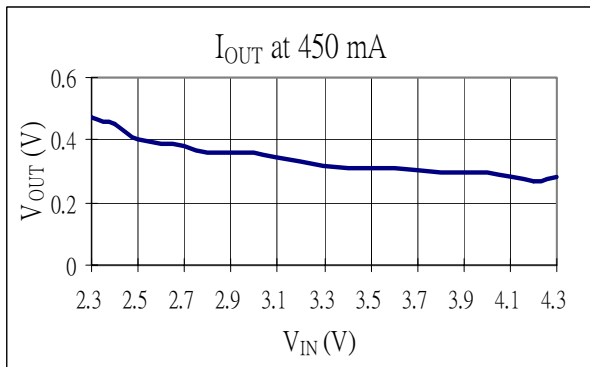
**Output Voltage Dropout vs. Vin**  
**At  $I_{OUT} = 250\text{ mA}$**



**Output Voltage Dropout vs. Vin**  
**At  $I_{OUT} = 350\text{ mA}$**



**Output Voltage Dropout vs. Vin**  
**At  $I_{OUT} = 450\text{ mA}$**

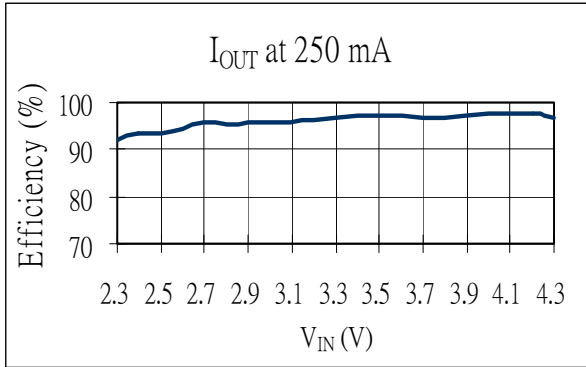


### Performance Curves

$T_A = 25^\circ\text{C}$ , unless otherwise noted

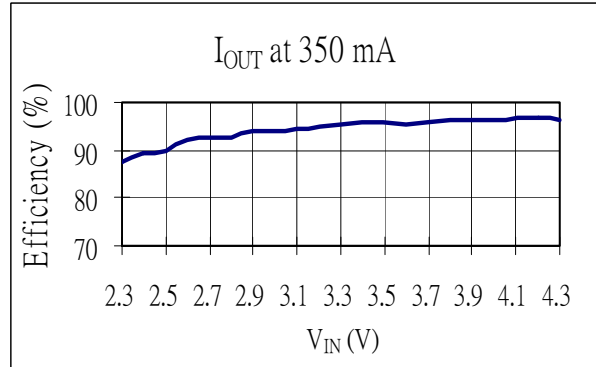
#### Efficiency vs. $V_{IN}$

At  $I_{OUT} = 250\text{ mA}$  and min. voltage dropout



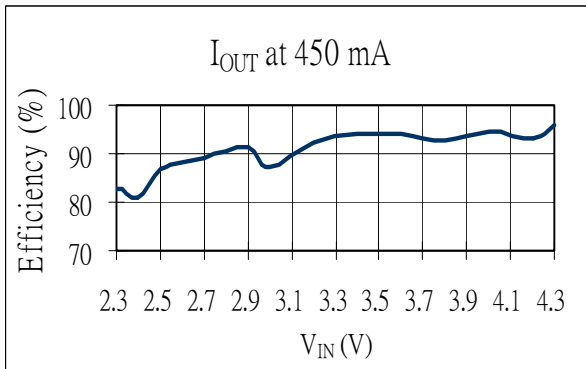
#### Efficiency vs. $V_{IN}$

At  $I_{OUT} = 350\text{ mA}$  and min. voltage dropout

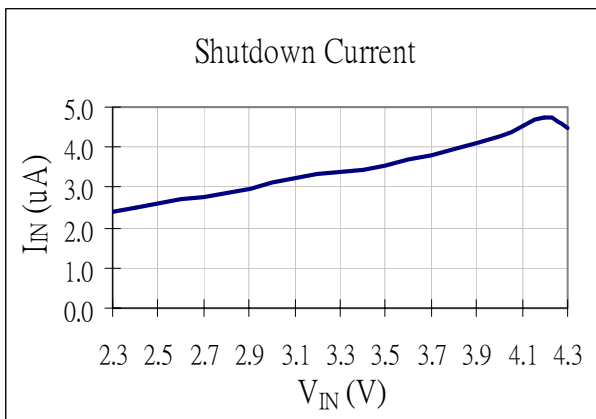


#### Efficiency vs. $V_{IN}$

At  $I_{OUT} = 450\text{ mA}$  and min. voltage dropout



#### Shutdown Current vs. Supply Voltage $C(\text{Pin } 2) = 2.2\mu\text{F}$



## Absolute Maximum Specifications

Rating	Symbol	Value	Unit
Supply voltage range	$V_{IN}$	-0.3 to 4.3	Volts
Input voltage range	SHDN	-0.3 to $V_{IN}+0.3$	Volts
Output current Range	$I_{OUT}$	0 to 450	mA
Output voltage range	$V_{OUT}$	-0.3 to $V_{IN} +0.3$	Volts
Operating temperature range	$T_{OPR}$	-20 to 70	$^{\circ}C$
Storage temperature range	$T_{STR}$	-20 to 100	$^{\circ}C$

## Electrical Specifications

All electrical specifications are specified at  $T_{AMBIENT}$  from  $-20^{\circ}C$  to  $70^{\circ}C$ ,  $V_{IN}$  from 2.2V to 4.3V, unless otherwise specified.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{IN}$	Input Power Supply		2.2		4.3	V
$I_{CC}$	Operating Current	$I_{OUT} = 0mA$ $V_{OUT} = 3.6Volts$		1.1		mA
$I_{SHDN}$	Shutdown Current	SHDN= High $V_{OUT} = 0V$		5		$\mu A$
$V_{CS}$	Feedback Voltage at CS			110		mV
$F_{OSC}$	Internal Oscillator Frequency			1		MHz
$V_{IL}$	Input Voltage Low for SHDN		0		0.3	V
$V_{IH}$	Input Voltage High for SHDN		$V_{IN}-0.3$		$V_{IN}$	V
$T_j$	Junction Temperature			110		$^{\circ}C$

## Applications

Care should be taken when batteries are connected to the chip. It will damage the chip when batteries are connected with reverse polarity.

The BCT3611S is a current regulator with small voltage dropout from the input voltage by using switching control. Hence, the current regulation can only be maintained under the following condition

The minimum input supply voltage  $V_{IN}$  to maintain current regulation:

$$V_{IN} \geq V_{OUT} + V_{drop}$$

The  $V_{drop}$  is the dropout voltage which depends on the output current

### Example:

A 1W LED (3.4V forward voltage @ 350mA) is driven by BCT3611S which is powered by 3.6V Li-ion re-chargeable battery.

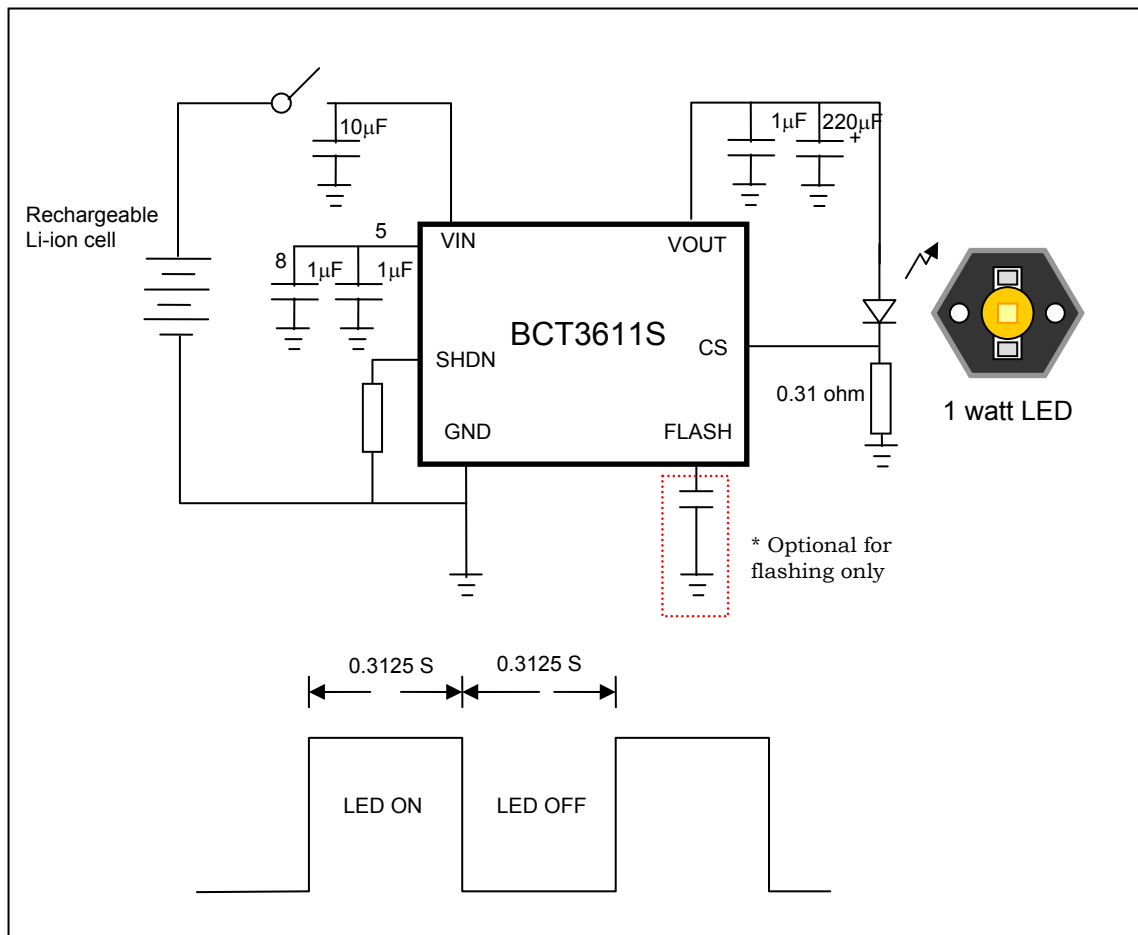
The input supply voltage  $V_{IN}$  to maintain current regulation:

$$V_{IN} \geq V_{OUT} + V_{drop} = 3.4V + (\sim 0.23V) = \sim 3.63V$$

In this application, it is advice to choose LED with low forward voltage to maintain constant brightness.

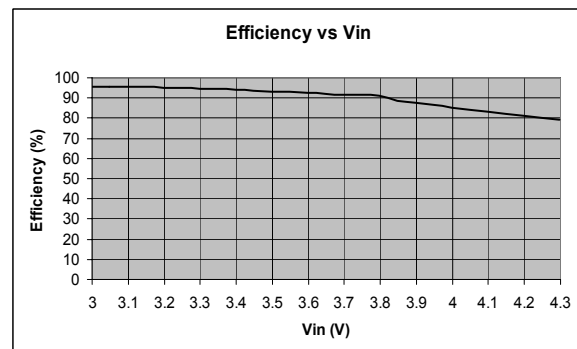
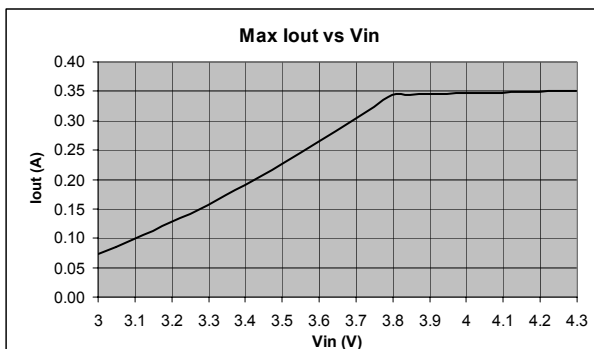
## 1. One Watt White LED Torch with Digital Timer Flash

The flash mode is enabled by power switch ON, then OFF → ON within ~1 second. The switching frequency is fixed digitally at 1.6Hz with 50% duty cycle as shown in following diagram:



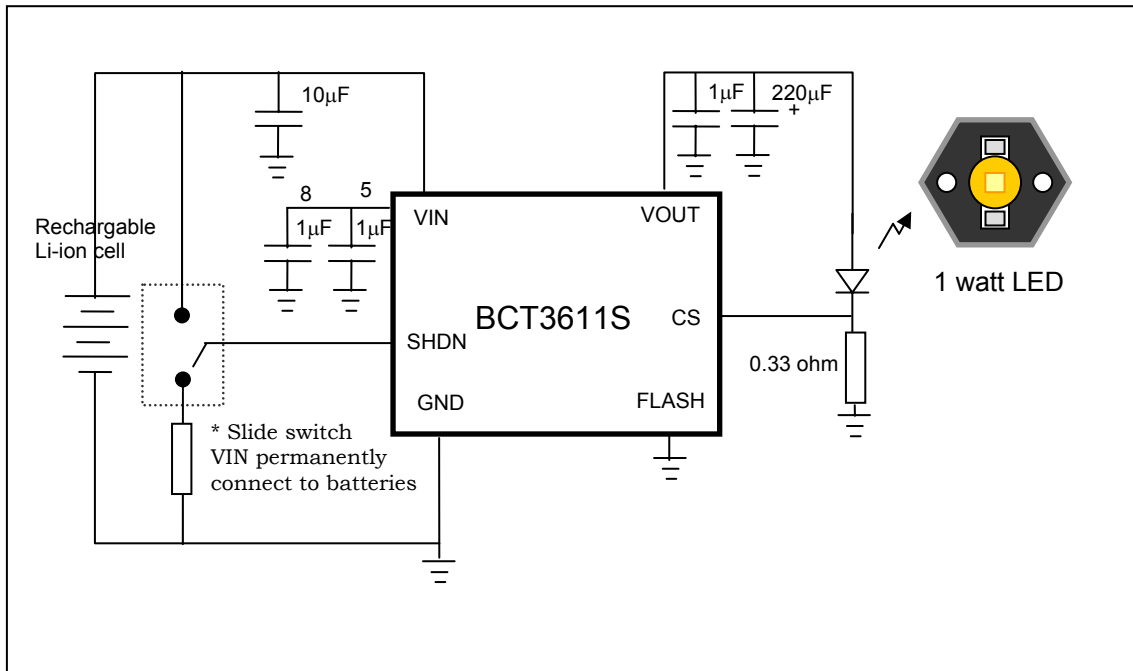
### Typical Performance

LED forward voltage = 3.6V@350mA

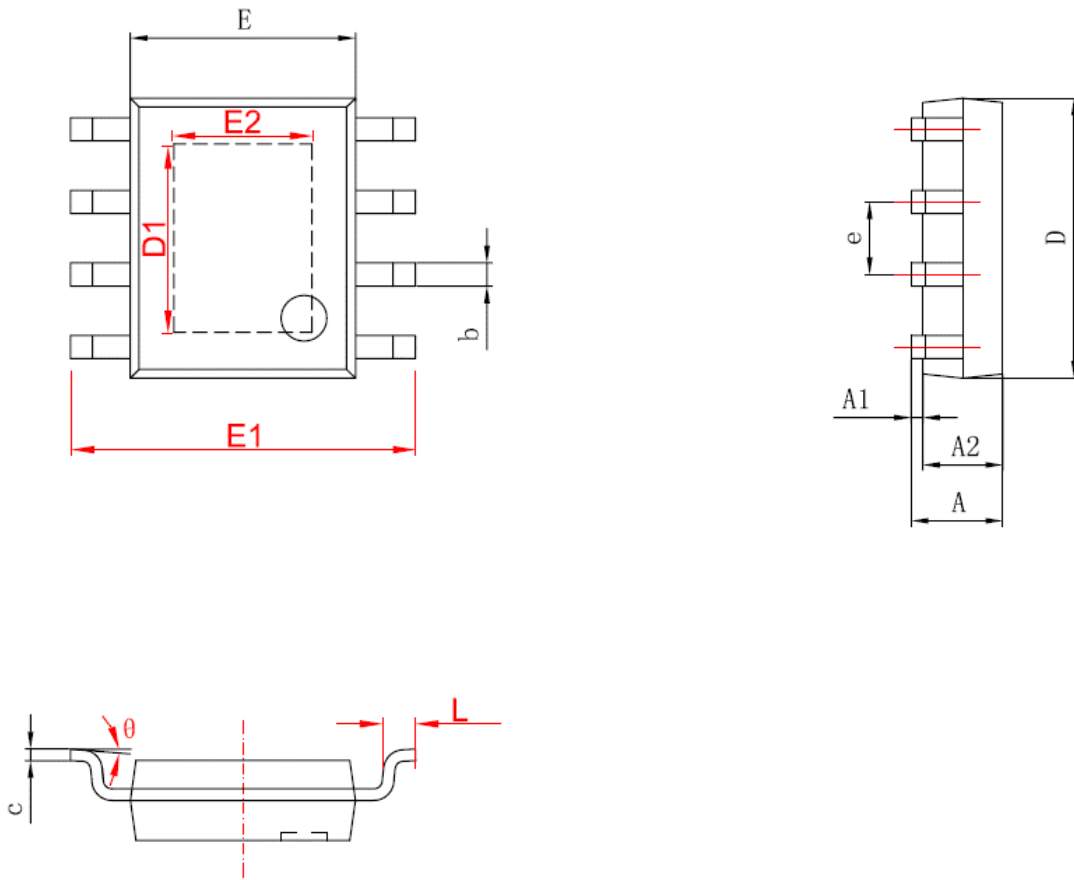


## 2. White LED Torch without Flash

The batteries is connected permanently to VIN of BCT3611S, the ON/OFF operation is controlled by the SHDN pin by a slide switch. The flash operation is disabled by connect the FLASH pin to GND.

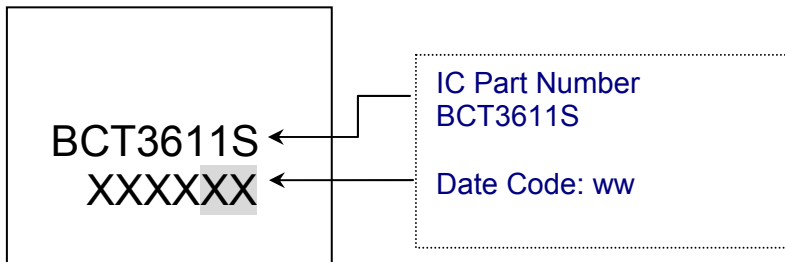


**Package Information: SOP8-PP**



SYMBOL	MIN (Millimeter)	MAX (Millimeter)
A	1.350	1.750
A1	0.050	0.150
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
D1	3.202	3.402
E	3.800	4.000
E1	5.840	6.240
E2	2.313	2.513
e	1.270 (BSC)	
L	0.400	1.270
θ	0°	8°

## Marking Notation / Ordering Information



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