

# **SSD1030**

## ***Product Preview***

### **Boost Regulating White LED drivers**

### 1 GENERAL DESCRIPTION

SSD1030 is a boost regulating white LED driver designed to drive up to 4 white LEDs in series with constant current.

LED brightness can be adjusted by PWM (Pulse Width Modulation) control or resistor value.

### 2 FEATURES

- $V_{IN}$  operation range 2.4 to 5.0V
- Drive up to 4 LEDs at 3.0V supply
- High efficiency operations: over 80%
- 500KHz Switching Frequency
- Low shutdown current: 1uA max
- Digital brightness control by PWM method
- Analog brightness control by feedback resistor adjustment
- Low feedback voltage minimizes power loss
- TSOT23-5 pin package

### 3 ORDERING INFORMATION

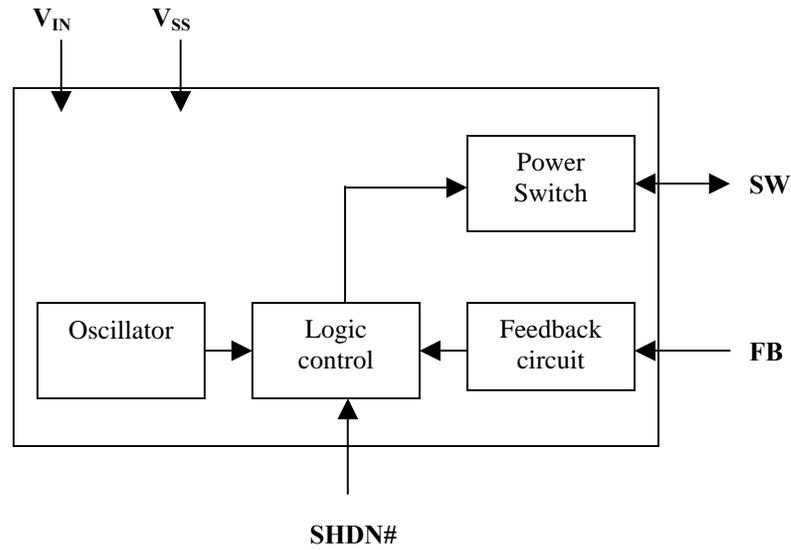
Table 3-1: Ordering Information

Ordering Part Number	Package Form
SSD1030JA02R3	TSOT23-5

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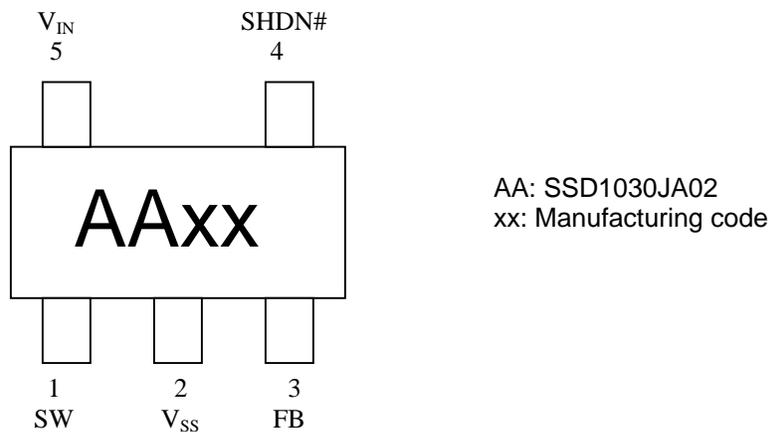
## 4 BLOCK DIAGRAM

Figure 4-1: Block diagram of SSD1030



## 5 SSD1030 PIN ASSIGNMENT AND MARKING

Figure 5-1: Pin assignment diagram (Topview)



## 6 PIN DESCRIPTIONS

**Table 6-1: Pin Descriptions**

Pin Name	Type	Pin no.	Description
SW	IO	1	Power switch switching terminal connecting to external inductor and diode. The signal at SW has high frequency switching properties. Connecting trace should have minimized length to reduce EMI.
V <sub>SS</sub>	P	2	Ground pin.
FB	IO	3	Feedback pin. A R <sub>FB</sub> resistor connected between this pin and ground controlled the LED current (I <sub>LED</sub> ).  Relationship between R <sub>FB</sub> and I <sub>LED</sub> is:  $I_{LED} = \text{Reference voltage} / R_{FB}$  where Reference voltage is the voltage at FB, which is 95mV typical.
SHDN#	IO	4	Shutdown pin. H – Normal operation L – Shutdown mode
V <sub>IN</sub>	P	5	Input Power supply.

**Note**

<sup>(1)</sup> Normal operation is to connect the SHDN# pin with V<sub>IN</sub>; Shutdown mode is to connect the SHDN# pin with V<sub>SS</sub>.

## 7 FUNCTIONAL BLOCK DESCRIPTIONS

### 7.1 Feedback circuit

The feedback block senses the voltage at FB pin and maintains constant current output  $I_{LED}$ .

### 7.2 Logic Control

This is the main control logic block for the operation of the power switch.

When SHDN# connects to  $V_{IN}$ , it generates clocks to the power switch according to the feedback circuit sensing inputs.

When SHDN# connects to  $V_{SS}$ , IC operation turns off.

### 7.3 Oscillator

The internal oscillator generates clock signal for DC/DC switching operations.

### 7.4 Power Switch

The power switch is the basic element of a boost converter. The control logic block controls the on-off operation of the power switch to achieve boost up function.

## 8 INPUT VOLTAGE SETTING

For LED voltage required is larger than 14V,  $V_{IN}$  voltage should be larger than or equal to 3.0V.

## 9 LED CURRENT SETTING

The current passing through the LED can be set by external resistor  $R_{FB}$  (Refer to application circuit Figure 13-1)

The relationship between  $R_{FB}$  and  $I_{LED}$  is:

$$I_{LED} = \text{Reference voltage} / R_{FB}$$

where Reference voltage = 95mV typical

**Table 9-1:  $I_{LED}$  Configuration Reference Table**

<b><math>I_{LED}</math> current (mA)</b>	<b><math>R_{FB}</math> resistance (<math>\Omega</math>)</b>
2	47.50
4	23.75
6	15.83
8	11.88
10	9.50
12	7.92
14	6.79
16	5.94
18	5.28
20	4.75

## 10 MAXIMUM RATINGS

**Table 10-1: Maximum Ratings (Voltage Referenced to V<sub>SS</sub>)**

Symbol	Parameter	Value	Unit
V <sub>IN</sub>	Supply voltage	-0.3 to 6.0	V
V <sub>SW</sub>	Switch voltage	18	V
I <sub>OUT-MAX</sub>	Output current drive	25	mA
T <sub>A</sub>	Operating temperature	-40 to +85	°C
T <sub>STG</sub>	Storage temperature	-65 to +150	°C
T <sub>J</sub>	Junction temperature	125	°C

### Note

The device contains ESD protection with the following voltage level:

Human Body Model (HBM) ±2.0kV per JEDEC JESD22 standard for all pins.

Machine Model (MM) ±200V per JEDEC JESD22 standard for all pins except SW pin.

Machine Model (MM) ±150V for SW pin.

Latch-up Rating: ±200mA per JEDEC JESD78standard

Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics tables or Pin Description section.

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit. Reliability of operation is enhanced if unused input is connected to an appropriate logic voltage level (e.g., either V<sub>SS</sub> or V<sub>IN</sub>). Unused outputs must be left open. This device is not radiation protected.

## 11 DC CHARACTERISTICS

### Conditions:

Unless otherwise specified,  
Voltage referenced to  $V_{SS}$   
 $V_{IN} = 3.0V$

**Table 11-1: DC Characteristics**

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
$V_{IN}$	Operating voltage		2.4	-	5	V
ISTD	Shut down supply current				1	$\mu A$
IOP	Operating current	Quiescent current, No loading (1)			250	$\mu A$
$V_{FB}$	Feedback voltage		86	95	104	mV
$I_{SWLIM}$	Switch current limit			250		mA
$I_{SWLEAKAGE}$	Switch leakage current				1	$\mu A$
$V_{IH}$	Input Logic High Voltage		$0.8 \times V_{IN}$			V
$V_{IL}$	Input Logic Low Voltage				$0.2 \times V_{IN}$	V

### Note

<sup>(1)</sup> No loading condition applies only for the application circuit in Figure 13-1: Typical Application with Open Circuit Current Protection.

## 12 AC CHARACTERISTICS

### Conditions:

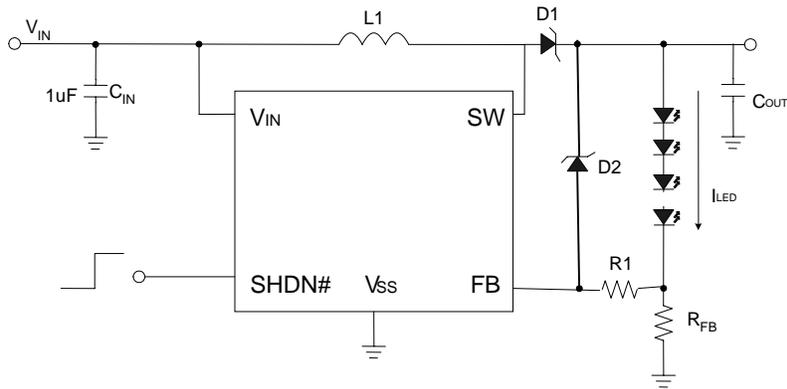
Unless otherwise specified,  
Voltage referenced to  $V_{SS}$   
 $V_{IN} = 3.0V$

**Table 12-1: AC Characteristics**

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
F <sub>SW</sub>	Switching frequency	$V_{FB}=0V$			600	KHz
DCYC	Maximum duty cycle			85		%

## 13 APPLICATION EXAMPLES

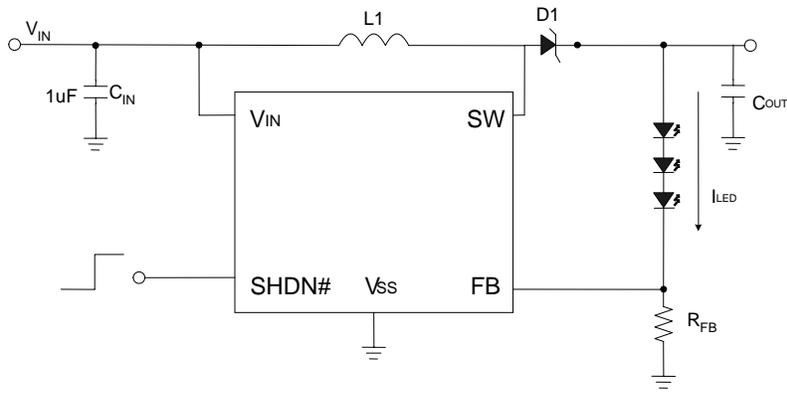
**Figure 13-1: Typical Application with Open Circuit Current Protection**



**Table 13-1: Typical Component Values of Open circuit current protection application**

Components	Typical Value	Remark
$C_{IN}$	1uF, 16V	
$C_{OUT}$	0.22uF, 25V	
D1	30V, 200mA	Schottky diode, e.g. On Semiconductors BAT54ALT1
D2	18V, 0.1mA rating	Zener diode, DO-35 package, e.g. 1N4112
L1	22uH, 300mA	
$R_{FB}$	4.75 $\Omega$ , $\pm 1\%$	Feedback resistor
R1	1k $\Omega$ , $\pm 5\%$	

**Figure 13-2: Typical Application of Li-ion Powered Driver for 3 White LEDs**

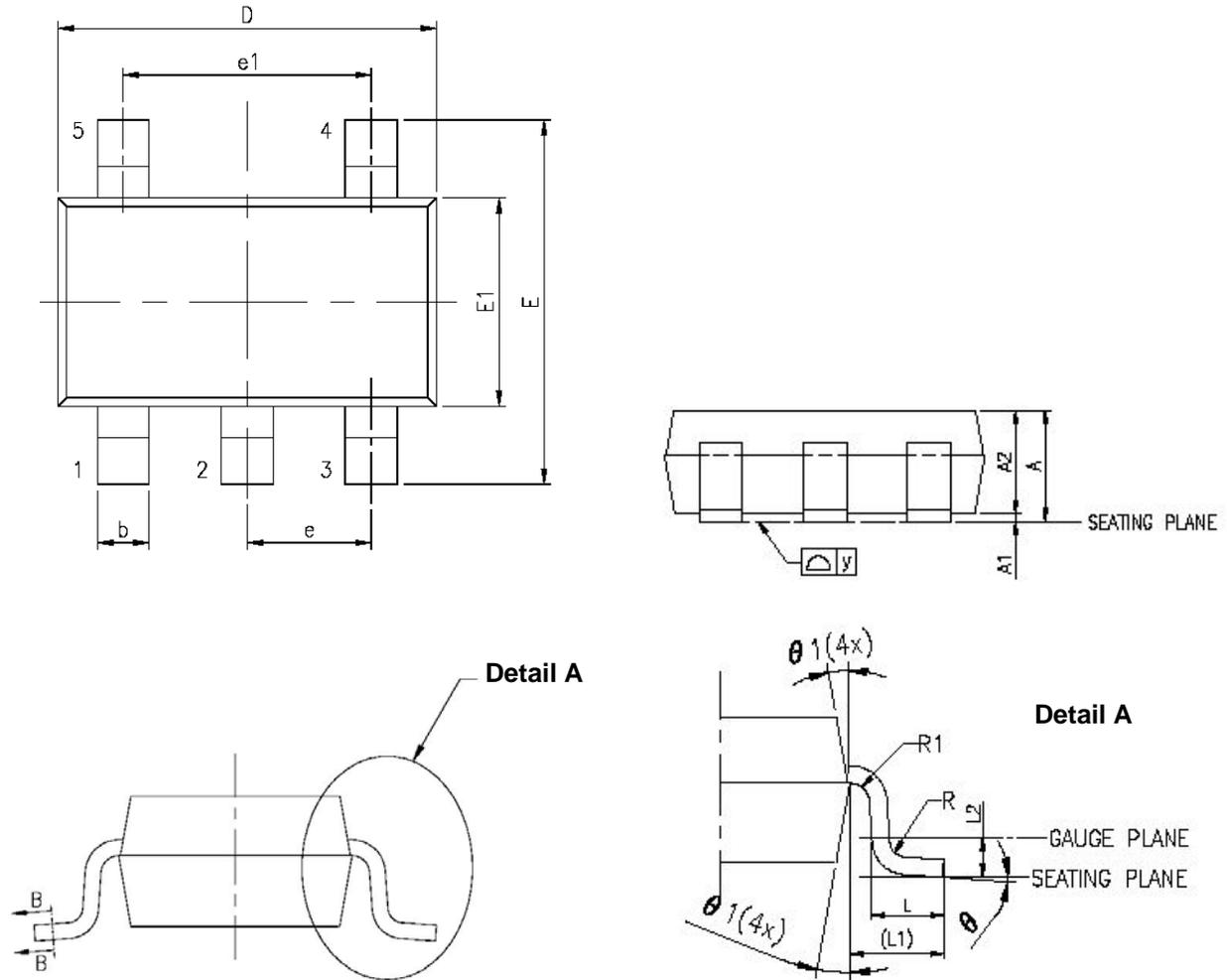


**Table 13-2: Typical Component Values of typical application.**

Components	Typical Value	Remark
$C_{IN}$	1uF, 16V	
$C_{OUT}$	0.22uF, 25V	
D1	30V, 200mA	Schottky diode, e.g. On Semiconductors BAT54ALT1
L1	22uH, 300mA	
$R_{FB}$	5.6 ohm, $\pm 1\%$	Feedback resistor

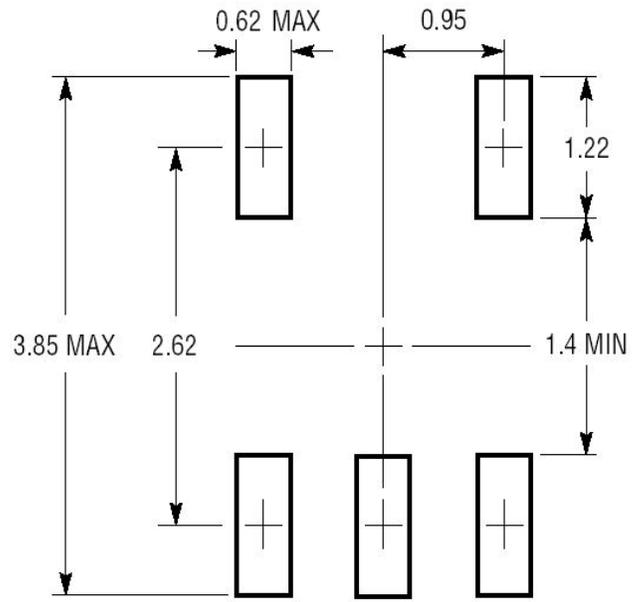
## 14 PACKAGE DIMENSIONS

Figure 14-1: Package Dimension



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	TYPICAL	MAX
A	-	-	1.1
A1	0	-	0.1
A2	0.7	0.9	1
b	0.3	-	0.5
b1	0.3	0.4	0.45
c	0.08	-	0.2
c1	0.08	0.13	0.16
D	-	2.9	-
E	-	2.8	-
E1	-	1.6	-
L	0.3	0.45	0.6
L1	-	0.6	-
L2	-	0.25	-
R	0.1	-	-
R1	0.1	-	0.25
e	-	0.095	-
e1	-	1.9	-
$\theta$	0°	4°	8°
$\theta_1$	4°	10°	12°

**Figure 14-2: Recommended PCB Landing Pattern**



Unit: mm

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