

Description

The SD3303 is a set-up DC-DC converter that delivers a regulated output current. The device switches at a 1.0MHz constant frequency, allowing for the use of small value external inductor and ceramic capacitors.

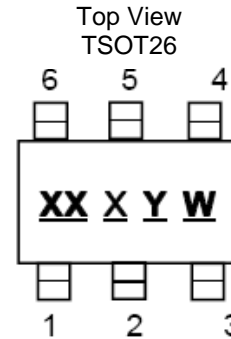
The SD3303 is targeted to be used for driving loads up to 1A from a two-cell alkaline battery. The LED current can be programmed by the external current sense resistor, R_S , connected between the feedback pin (FB) and ground. A low 95mV feedback voltage reduces the power loss in the R_S for better efficiency. With its internal 2A, 100m Ω NMOS switch, the device can provide high efficiency even at heavy load. During the shutdown mode, the feedback resistor R_S and the load are completely disconnected and the current consumption is reduced to less than 1 μ A.

The SD3303 is available in the 6-lead TSOT26 package.

Features

- LED Power Efficiency: up to 90%
- Current Accuracy: 5% ($V_{IN} = 3.6V$ to $1.8V$ @ $V_F = 3.7V$)
- Low Start-Up Voltage: 0.9V ($I_{LED} = 270mA$)
- Low Hold Voltage: 0.75 ($I_{LED} = 200mA$)
- 1MHz Switching Frequency
- Uses Small, Low Profile External Components
- Low $R_{DS(ON)}$: 100m Ω (typ)
- Over Temperature Protection
- Low Profile TSOT26 Package
- Pb-Free Package

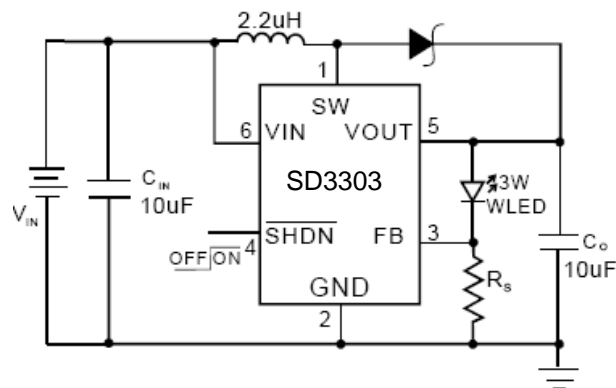
Pin Assignments



Applications

- White LED Torch (Flashlight)
- White LED Camera Flash
- DSC(Digital Still Camera)Flash
- Cellular Camera Phone Flash
- PDA Camera Flash
- Camcorder Torch(Flashlight) Lamp

Typical Applications Circuit

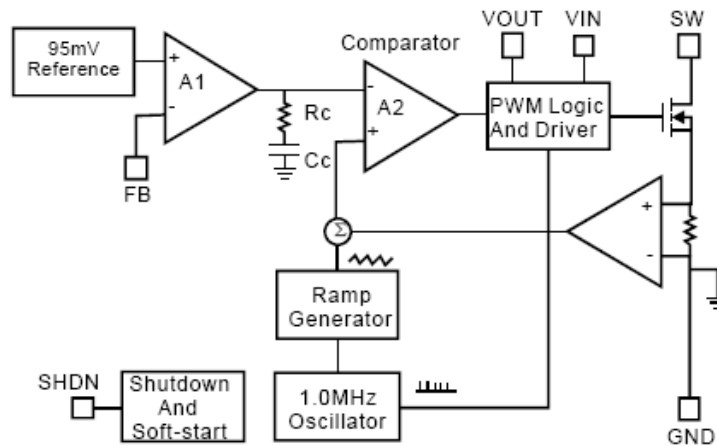


$$I_{LED} = 750mA, R_S = 0.127\Omega$$

Pin Description

| Pin Number | Pin Name | Function |
|------------|----------|-----------|
| 1 | SW | Switch |
| 2 | GND | Ground |
| 3 | FB | Feedback |
| 4 | SHDN | Shut Down |
| 5 | VOUT | Output |
| 6 | VIN | Input |

Block Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

| Parameter | Rating | Unit |
|-------------------------------------|-------------|------|
| Input Pin Voltage | -0.3 to +6 | V |
| SW Pin Voltage | -0.3 to +6 | |
| SHDN, FB Pin Voltage | -0.3 to +6 | |
| Operating Temperature Range | -40 to +85 | °C |
| Storage Temperature Range | -65 to +125 | |
| Lead Temperature (Soldering, 5 sec) | 300 | |

Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

| Parameter | Rating | Unit |
|----------------------|-------------|------|
| Junction Temperature | -40 to +125 | °C |
| Ambient Temperature | -40 to +85 | |

Thermal Information

| Parameter | Symbol | Package | Max | Unit |
|--|---------------|---------|-----|------|
| Thermal Resistance (Junction to Case) | θ_{JC} | TSOT26 | 130 | °C/W |
| Thermal Resistance (Junction to Ambient) | θ_{JA} | TSOT26 | 250 | |
| Internal Power Dissipation | P_D | TSOT26 | 400 | mW |

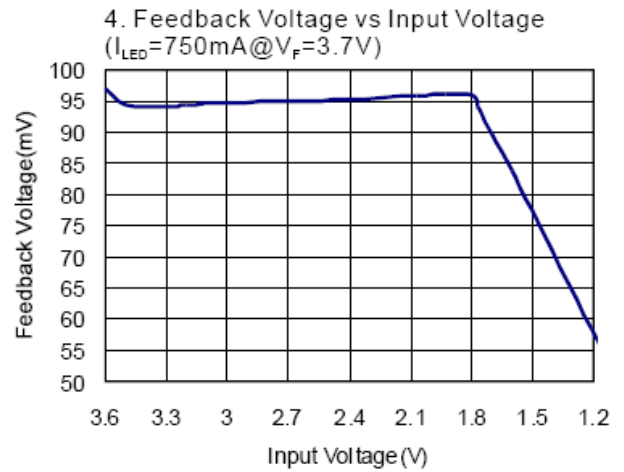
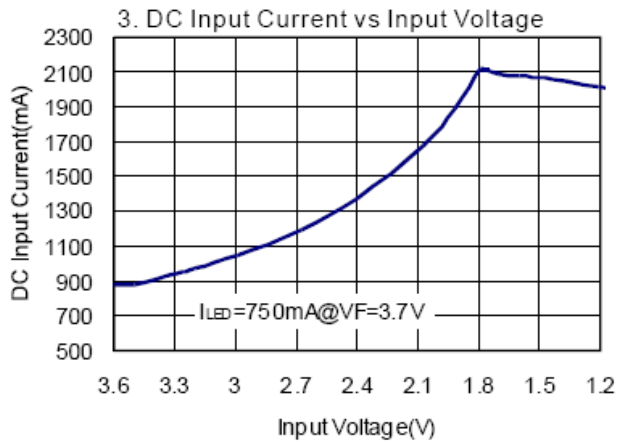
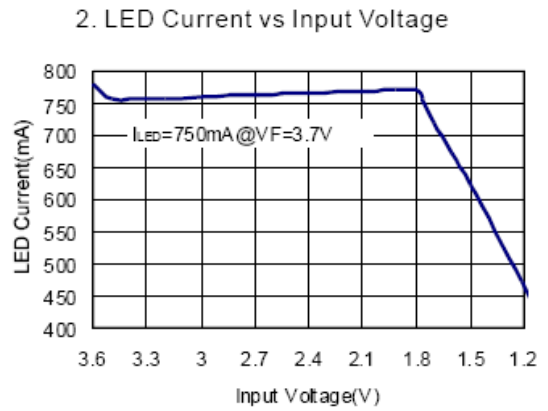
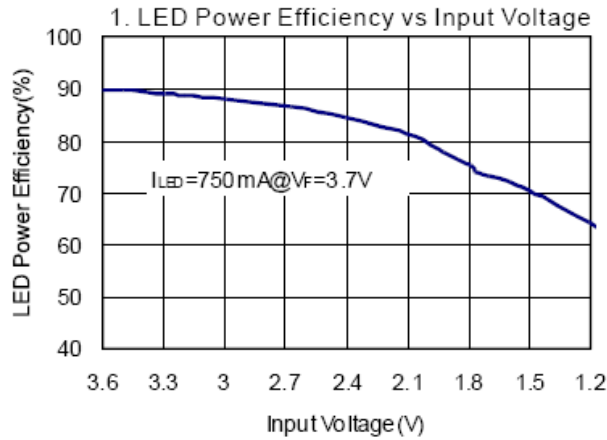
Electrical Characteristics

(@ $T_A = +25^\circ\text{C}$, $V_{IN} = 2.4\text{V}$, $I_{LED} = 750\text{mA}$, $V_{SHDN} = V_{IN}$, $L = 2.2\mu\text{H}$, $C_{IN} = 10\mu\text{F}$, $C_O = 10\mu\text{F}$, unless otherwise specified.)

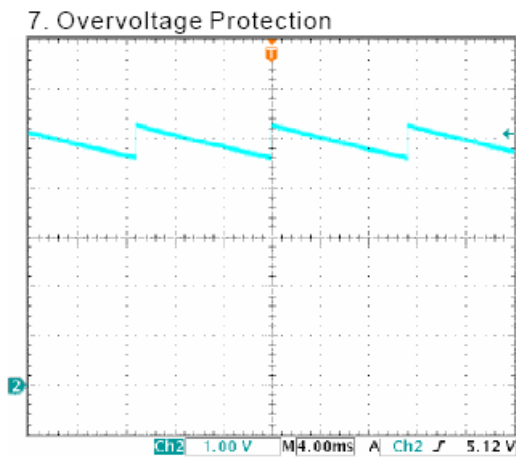
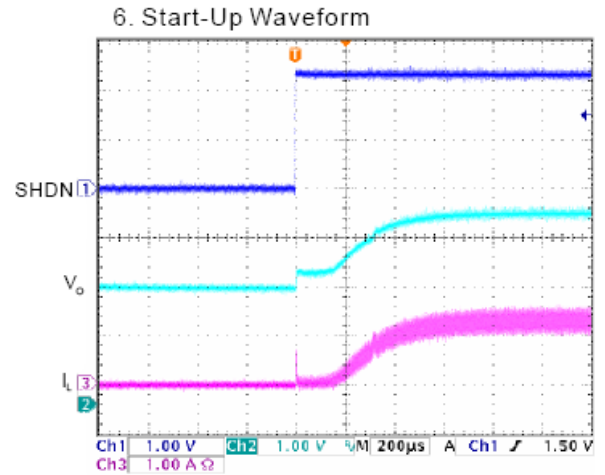
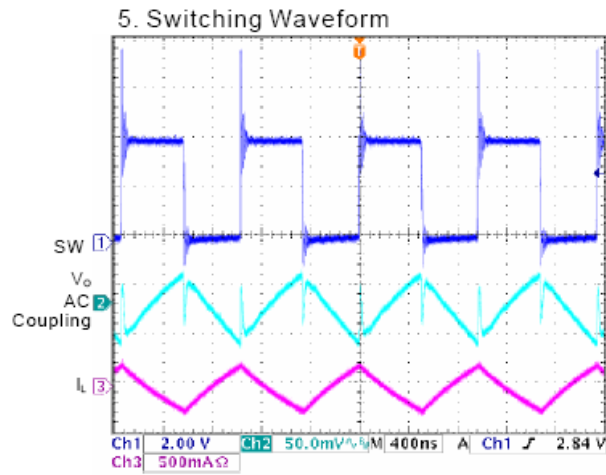
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------|--------------|---|------|------|-------------------------|---------------|
| Input Voltage Range | V_{IN} | | 0.9 | | $V_F - 0.2$ (Note 1) | V |
| Feedback Voltage | V_{FB} | | 90 | 95 | 100 | mV |
| Start-Up Voltage | V_{START} | $V_{IN}: 0\text{V} - 3\text{V}$, $I_{LED} = 370\text{mA}$ | | 0.9 | | V |
| Hold Voltage | V_{HOLD} | $V_{IN}: 3\text{V} - 0\text{V}$, $I_{LED}: 750\text{mA} - 200\text{mA}$ | | 0.75 | | V |
| Oscillator Frequency | F_{OSC} | | 0.85 | 1.0 | 1.15 | MHz |
| SHDN Input High | V_{SH} | $V_{IN} = 1.8\text{V}$ | 1.0 | | | V |
| SHDN Input Low | V_{SL} | $V_{IN} = 1.8\text{V}$ | | | 0.4 | V |
| Over Temperature Shutdown | OTS | | | 150 | | °C |
| Over Temperature Hysteresis | OTH | | | 15 | | °C |
| Maximum Output Current Range | $I_{O(MAX)}$ | | 750 | | | mA |
| Quiescent Current | I_Q | $I_{LED} = 0\text{mA}$, $V_O = 3.4\text{V}$, Device Switching @ 1MHz | | 1 | 3 | mA |
| Shutdown Current | I_{SD} | Shutdown Mode | | | 1 | μA |
| Switch On Resistance | $R_{DS(ON)}$ | $V_O = 3.4\text{V}$ | | 0.1 | | Ω |
| Current Limit | I_{LIM} | $V_O = 3.4\text{V}$ | 2 | | | A |
| Efficiency | η | $I_{LED} = 750\text{mA}$ | | 90 | | % |

Note: 1. V_F – LED forward voltage.

Typical Performance Characteristics (@ $T_A = +25^\circ\text{C}$, $L = 2.2\mu\text{F}$, $C_{IN} = 10\mu\text{F}$, $C_O = 10\mu\text{F}$, unless otherwise specified.)



Typical Performance Characteristics (cont.) @ $T_A = +25^\circ\text{C}$, $L = 2.2\mu\text{F}$, $C_{IN} = 10\mu\text{F}$, $C_O = 10\mu\text{F}$, unless otherwise specified.)



Application Information

Inductor Selection

The SD3303 can use small value inductors due to its switching frequency of 1MHz. The value of inductor will focus in the range of 2.2μH to 4.7μH for most SD3303 applications. In typical high current white LED applications, it is recommended to use a 4.7μH inductor. The inductor should have low DCR (DC resistance) to minimize the I²R power loss, and it requires a current rating of 2A to handle the peak inductor current without saturating.

Capacitor Selection

An input capacitor is required to reduce the input ripple and noise for proper operation of the SD3303. For good input decoupling, Low ESR (equivalent series resistance) capacitors should be used at the input. At least 2.2μF input capacitor is recommended for most applications.

A minimum output capacitor value of 6.8μF is recommended under normal operating conditions, while a 10μF-22μF capacitor may be required for higher power LED current. A reasonable value of the output capacitor depends on the LED current. The ESR of the output capacitor is the important parameter to determine the output voltage ripple of the converter, so low ESR capacitors should be used at the output to reduce the output voltage ripple. The small size of ceramic capacitors is an excellent choice for SD3303 applications. The X5R and X7R types are preferred because they maintain capacitance over wide voltage and temperature ranges.

Diode Selection

It's indispensable to use a Schottky diode rated at 2A with the SD3303. Using a Schottky diode with a lower forward voltage drop is better to improve the power LED efficiency, and its voltage rating should be greater than the output voltage. In application, the ON Semiconductor MBRA210LT3G is recommended.

LED Current Setting

The LED current is set by the single external R_S resistor connected to the FB pin as shown in the typical application circuit on Page 1. The typical FB reference is internally regulated to 95mV. The LED current is 95mV/R_S. It's recommended to use a 1% or better precision resistor for the better LED current accuracy. The formula and table 1 for R_S selection are shown as follows:

$$R_S = 95\text{mV} / I_{\text{LED}}$$

Table 1. R_S Resistor Value Selection

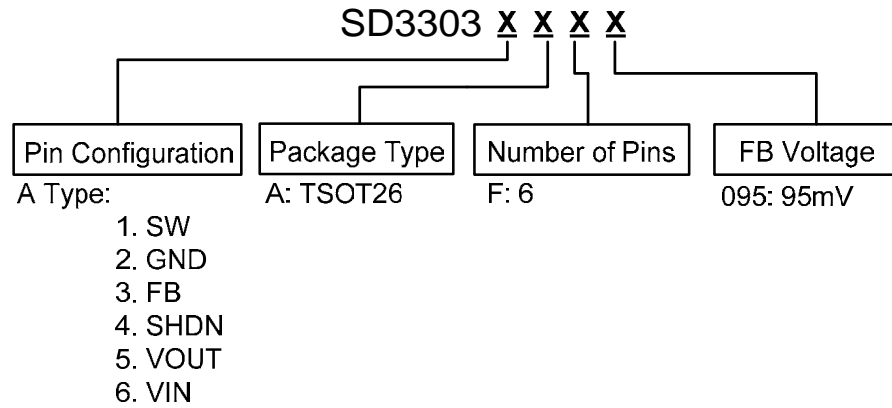
| Standard Value (Ω) | I _{LED} (mA) |
|--------------------|-----------------------|
| 0.18 | 528 |
| 0.15 | 633 |
| 0.12 | 792 |
| 0.10 | 950 |

PCB Layout Guidelines

As for all switching power supplies, the layout and components placement of the SD3303 is an important step in the design; especially at high peak currents and high switching frequencies.

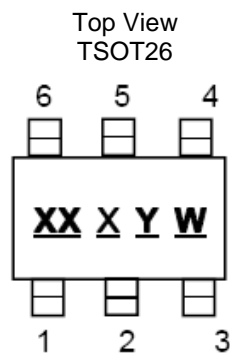
The input capacitor and output capacitor should be placed respectively as close as possible to the input pin and output pin of the IC; the inductor and schottky diode should be placed as close as possible to the switch pin by using wide and short traces for the main current path; the current sense resistor should be placed as close as possible between the ground pin and feedback pin.

Ordering Information



| Part Number | Marking | Package Type | Standard Package |
|--------------|------------------------------------|--------------|----------------------|
| SD3303AAF095 | Refer to Marking Information Below | TSOT26 | 3000 Units/Tape&Reel |

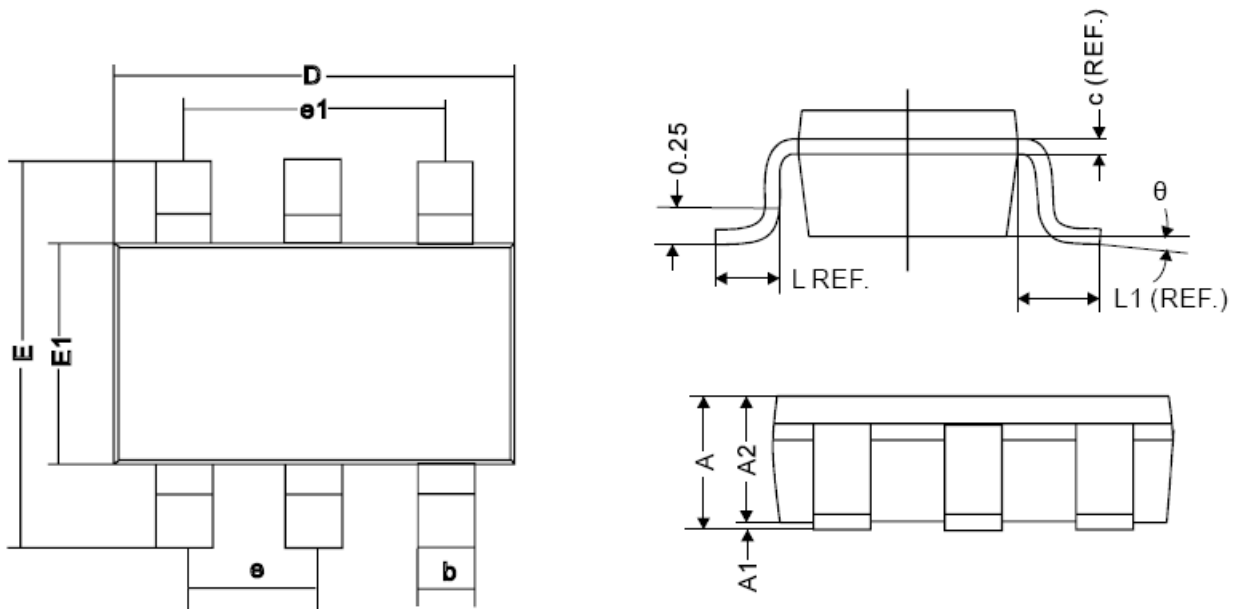
Marking Information



XX: Product Code
 X: Internal Code
 Y: Year
 W: Weekly

Package Outline Dimensions (All dimensions in mm.)

TSOT26



| REF. | Millimeter | |
|------|------------|------|
| | Min | Max |
| A | 1.10MAX | |
| A1 | 0 | 0.10 |
| A2 | 0.70 | 1 |
| c | 0.12REF. | |
| D | 2.70 | 3.10 |
| E | 2.60 | 3.00 |
| E1 | 1.40 | 1.80 |
| L | 0.45REF. | |
| L1 | 0.60REF. | |
| θ | 0° | 10° |
| b | 0.30 | 0.50 |
| e | 0.95REF. | |
| e1 | 1.90REF. | |