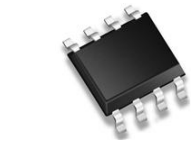
## Features

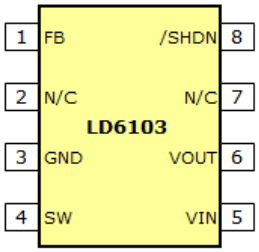
- Inherently Matched LED Current
- Drives Up to 27 LEDs from a 5V Supply
- 36V Rugged Bipolar Switch
- Fast 1.2MHz Switching Frequency
- VOUT(MAX)=30V

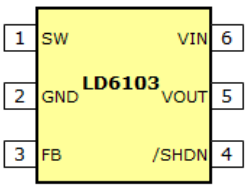
## General Description

The LD6103 is a step-up DC/DC converter specifically designed to drive white LEDs with a constant current. The device can drive up to 27 LEDs from a 5V supply. Additional feature include output voltage limiting when LEDs are disconnected.

## Package Pin Out






## Ordering Information

| | | Packing Options | |
|---|---|---|---|
| Part No. | Package | Tube (TU) | Tape & Reel (TR) |
| LD6103 | SOP-8 | LD6103S1-TU | LD6103S1-TR |
| | SOT23-6 | LD6103L3-TU | LD6103L3-TR |

- Package material default is “Green” package.

## Product Marking

LD8888
SSSSS…
●

- Line 1 – “LD” is a fixed character
  8888: product name
- Line 2 – SSSSS…: lot number

## Absolute Maximum Ratings

| Parameter | Maximum | Unit |
|---|---|---|
| Input Voltage (VIN) | 10 | V |
| SW Voltage | 36 | V |
| FB Voltage | 10 | V |
| $\overline{SHDN}$ Voltage | 10 | V |
| Operating Temperature Range | 0 to 70 | °C |
| Maximum Junction Temperature | 125 | °C |
| Storage Temperature Range | -65 to 150 | °C |
| Lead Temperature (Soldering, 10 sec) | 300 | °C |

The values beyond the boundaries of absolute maximum rating may cause the damage to the device. Functional operation in this context is not implied. Continuous use of the device at the absolute rating level might influence device reliability. All voltages have their reference to device ground.

## Electrical Characteristics

$T_A$ = 25°C, $V_{IN}$ = 5V, $V_{/SHDN}$ = 5V, unless otherwise noted.

| Parameter | Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Minimum Operating Voltage | | 2.5 | – | – | V |
| Maximum Operating Voltage | | – | 10 | – | V |
| Feedback Voltage | $I_{LOAD}$ = 180mA, Vin=5V | 83 | 95 | 107 | mV |
| | $I_{LOAD}$ = 100mA, Vin=5V | 86 | 95 | 104 | |
| FB Pin Bias Current | | 10 | 45 | 100 | nA |
| Supply Current | | – | 2.1 | 3.0 | mA |
| | $\overline{SHDN}$ = 0V | – | 0.1 | 1.0 | μA |
| Switching Frequency | | 1.1 | 1.3 | 1.6 | MHz |
| Maximum Duty Cycle | | 85 | 90 | – | % |
| Switch Current Limit | | – | 650 | – | mA |
| Switch $V_{CESAT}$ | $I_{SW}$ =250mA | – | 350 | – | mV |
| Switch Leakage Current | $V_{sw}$=5V | – | 0.01 | 5 | μA |
| $\overline{SHDN}$ Voltage High | | 1.5 | – | – | V |
| $\overline{SHDN}$ Voltage Low | | – | – | 0.4 | V |
| $\overline{SHDN}$ Pin Bias Current | | – | 65 | – | μA |
| OVP Threshold | | – | 29 | – | V |

## Block Diagram

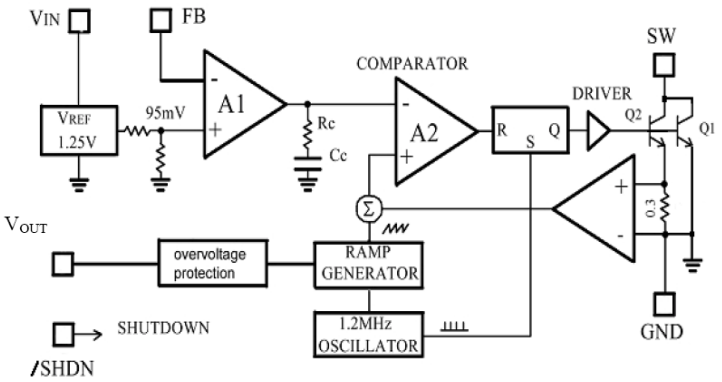



Figure 1. BLOCK DIAGRAM LD6103

## Typical Application Circuit

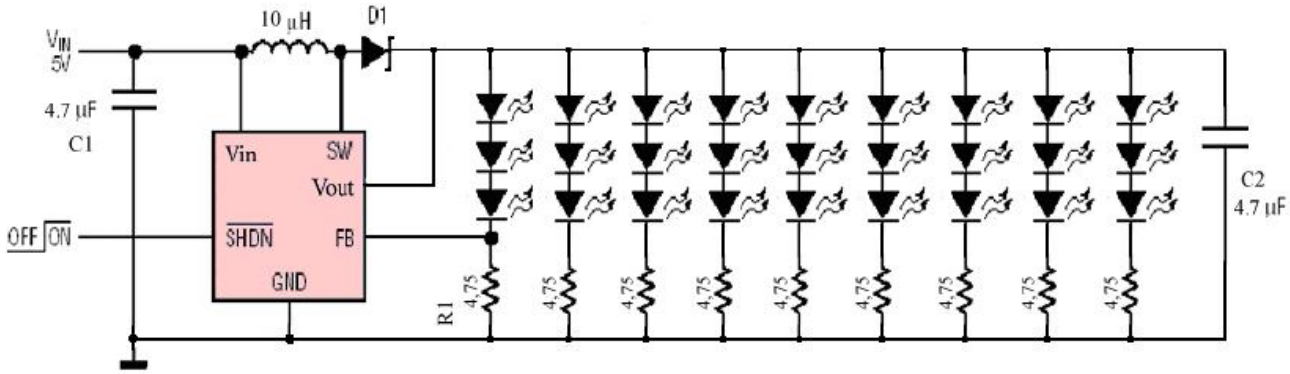



Figure 2. TYPICAL APPLICATION

## OPERATION

The LD6103 uses a constant frequency, current mode control scheme to provide excellent line and load regulation. Operation can be best understood by referring to the block diagram in Figure 1. At the start of each oscillator cycle, the RS latch is set, which turns on the power switch Q1. A voltage proportional to the switch current is added to a stabilizing ramp and the resulting sum is fed into the positive terminal of the PWM comparator A2. When this voltage exceeds the level at the negative input of A2, the RS latch is reset turning off the power switch. The level at the negative input of A2 is set by the error amplifier A1, and is simply an amplified version of the difference between the feedback voltage and the reference voltage of 95mV. In this manner, the error amplifier sets the correct peak current level to keep the output in regulation. If the error amplifier's output increases, more current is delivered to the output; if it decreases, less current is delivered.

## APPLICATIONS INFORMATION

### Inductor Selection

A 10µH inductor is recommended for most LD6103 applications. Although small size and high efficiency are major concerns, the inductor should have low core losses at 1.2MHz and low DCR (copper wire resistance).

### Capacitor Selection

The small size of ceramic capacitors makes them ideal for LD6103 applications. X5R and X7R types are recommended because they retain their capacitance over wider voltage and temperature ranges than other types such as Y5V or Z5U. A 4.7µF input capacitor and a 4.7µf output capacitor are sufficient for most LD6103 applications.

### Diode Selection

Schottky diodes, with their low forward voltage drop and fast reverse recovery, are the ideal choices for LD6103 applications. The forward voltage drop of a Schottky diode represents the conduction losses in the diode, while the diode capacitance (CT or CD) represents the switching losses. For diode selection, both forward voltage drop and diode capacitance need to be considered. Schottky diodes with higher current ratings usually have lower forward voltage drop and larger diode capacitance, which can cause significant switching losses at the 1.2MHz switching frequency of the LD6103. A Schottky diode rated at 1000mA t is sufficient for most LD6103 applications.

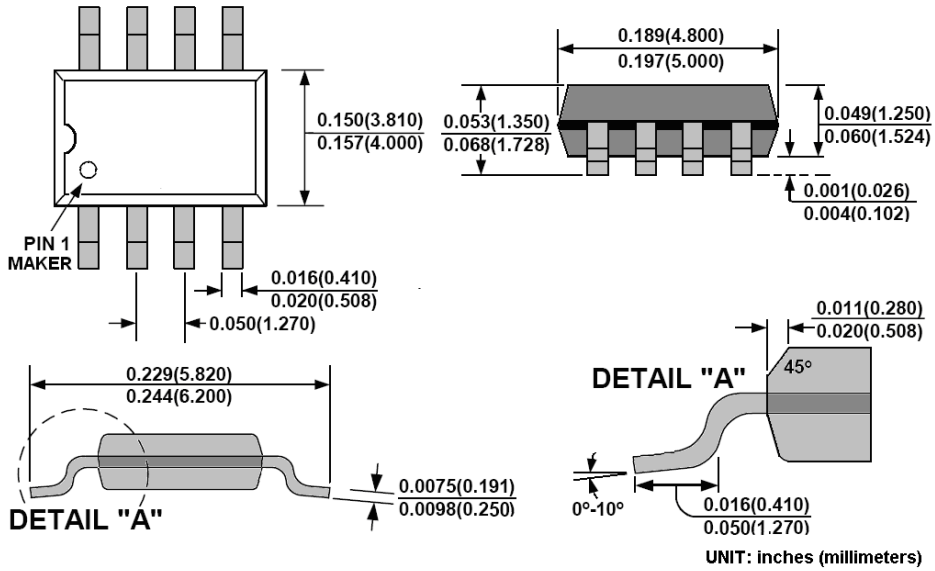
### LED Current Control

The LED current is controlled by the feedback resistor (R1 in Figure 2). The feedback reference is 95mV. The LED current is 95mV/R1. The formula and table 3 for R1 selection are shown below. R1 = 95mV/$I_{LED}$

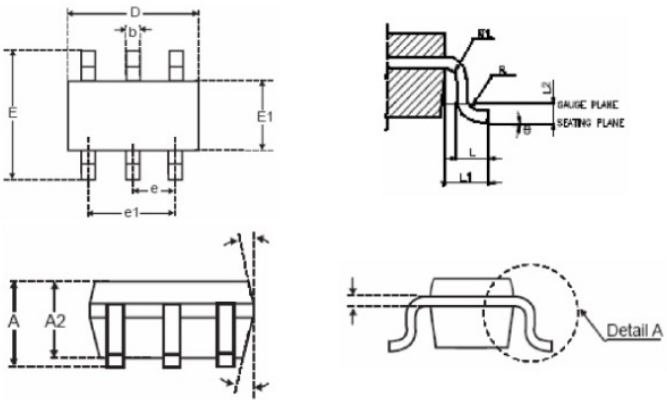
Table 1. R1 Resistor Value Selection

| $I_{LED}$ (mA) | R1(Ω) |
|---|---|
| 5 | 19.1 |
| 10 | 9.53 |
| 12 | 7.87 |
| 15 | 6.34 |
| 20 | 4.75 |

## Package Outline
## SOP8:




## SOT23-6:




| SYMBOLS | MILLMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | | | 1.45 |
| A1 | | | 0.15 |
| A2 | 0.90 | 1.15 | 1.30 |
| b | 0.30 | | 0.50 |
| c | 0.08 | | 0.22 |
| D | | 2.90 BSC. | |
| E | | 2.80 BSC. | |
| E1 | | 1.60 BSC. | |
| e | | 0.95 BSC. | |
| e1 | | 1.90 BSC. | |
| L | 0.30 | 0.45 | 0.60 |
| L1 | | 0.60 REF | |
| L2 | | 0.25 BSC. | |
| R | 0.10 | | |
| R1 | 0.10 | | 0.25 |
| $\theta$ | 0° | 4° | 8° |
| $\theta$1 | 5° | 10° | 15° |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