

<b>LT19371K</b>	<b>P.1</b>
<b>WHITE LED STEP-UP CONVERTER</b>	

### FEATURES

- Inherently Matched LED Current
- Drives Up to 27 LEDs from a 5V Supply
- 36V Rugged Bipolar Switch
- Fast 1.2MHz Switching Frequency
- $V_{out(max)}=30V$

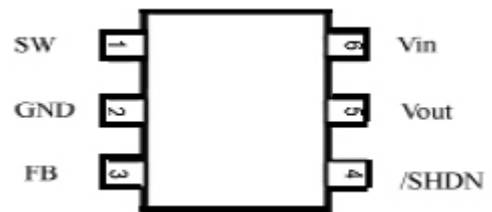
### DESCRIPTION

The LT19371K is a step-up DC/DC converter specifically designed to drive white LEDs with a constant current. The device can drive 27 LEDs from a 5V supply. Additional features include output voltage limiting when LEDs are disconnected.

### APPLICATIONS

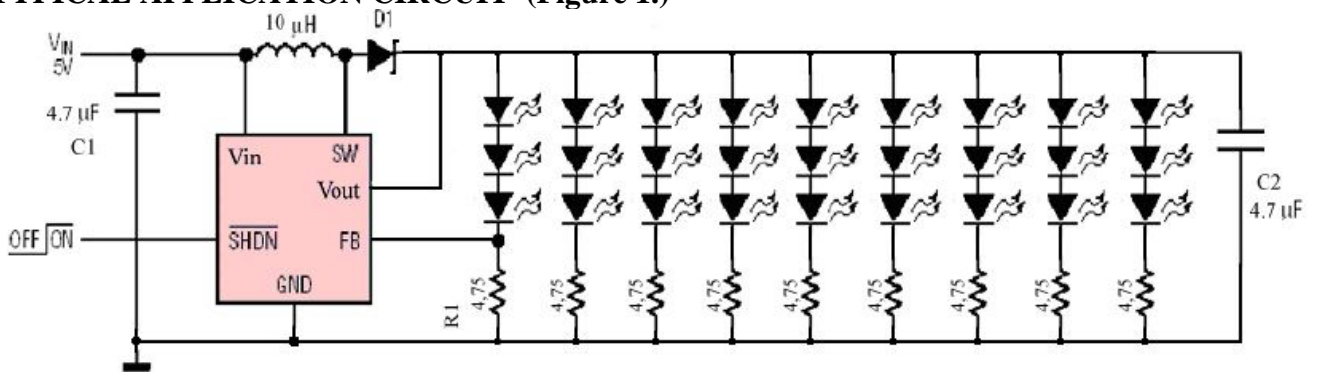
- Cellular Phones
- PDAs, Handheld Computers
- Digital Cameras
- MP3 Players
- GPS Receivers
- LED Torches

### TOP VIEW



SOT-236

### TYPICAL APPLICATION CIRCUIT (Figure 1.)



### ABSOLUTE MAXIMUM RATINGS (Note1)

<b>Input Voltage (<math>V_{IN}</math>)</b>	10V	<b>Operating Temperature Range</b>	0°C to 70°C
<b>SW Voltage</b>	36V	<b>Maximum Junction Temperature</b>	125°C
<b>FB Voltage</b>	10V	<b>Storage Temperature Range</b>	-65°C to 150°C
<b>/SHDN Voltage</b>	10V	<b>Lead Temperature (Soldering, 10 sec)</b>	300°C

Note 1: Absolute Maximum Ratings are those values beyond which the life of the device may be impaired.

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**PIN FUNCTION**

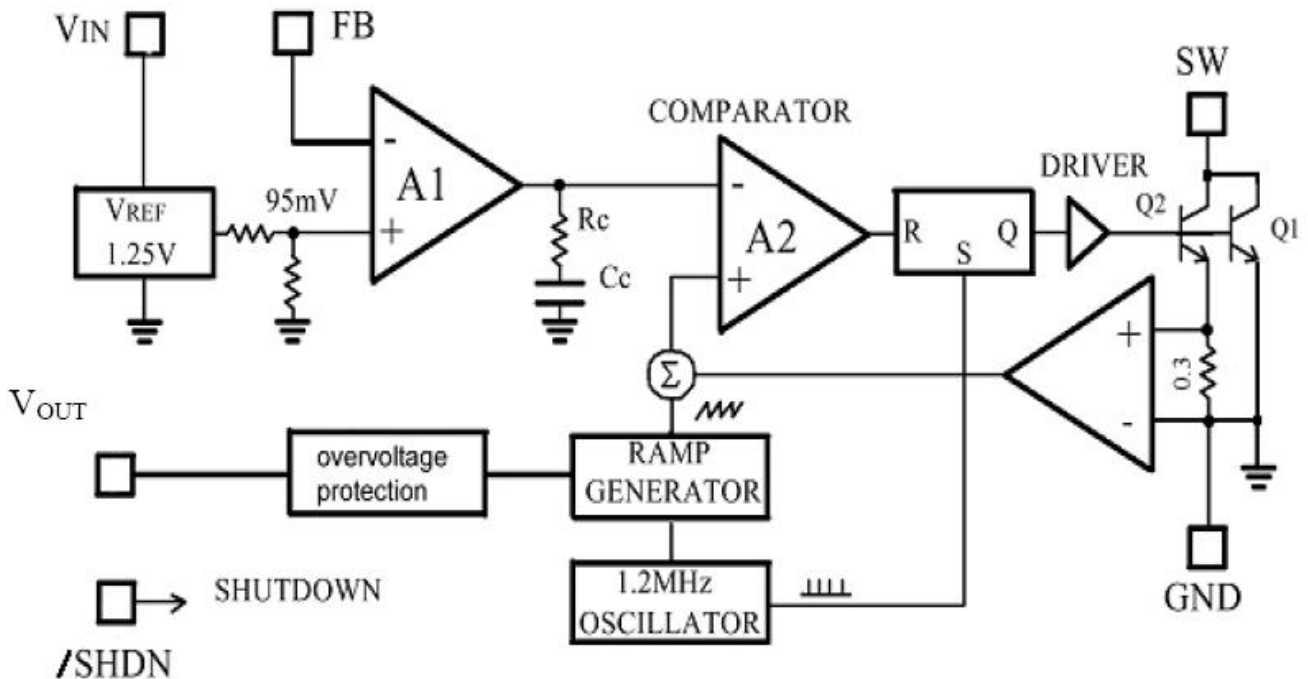
<b>PIN</b>	<b>PIN NAME</b>	<b>PIN DESCRIPTION</b>
1	SW	Switch Pin. (Minimize trace area at this pin to reduce EMI)
2	GND	Ground Pin. Connect directly to local ground plane.
3	FB	Feedback Pin. Reference voltage is 95mV. (Calculate resistor value according to the formula: $R_{FB}=95mV/I_{LED}$ .)
4	$\overline{SHDN}$	Shutdown Pin. (Connect to 1.5V or higher to enable device; 0.4V or less to disable device.)
5	V <sub>OUT</sub>	Output Supply Pin. (Must be locally bypassed.)
6	V <sub>IN</sub>	Input Supply Pin. (Must be locally bypassed.)

**ELECTRICAL CHARACTERISTICS** T<sub>A</sub>=25°C, V<sub>IN</sub> =3V, V $\overline{SHDN}$  =3V, unless otherwise noted.

<b>PARAMETER</b>	<b>CONDITION</b>	<b>MIN.</b>	<b>TYP.</b>	<b>MAX.</b>	<b>UNIT</b>
Minimum Operating Voltage		2.5			V
Maximum Operating Voltage				10	V
Feedback Voltage	I <sub>LOAD</sub> =180mA, V <sub>IN</sub> =5V	86	95	104	mV
FB Pin Bias Current		10	45	100	nA
Supply Current	$\overline{SHDN}$ =0V		2.1 0.1	3.0 1.0	mA $\mu$ A
Switching Frequency		1.1	1.3	1.6	MHz
Maximum Duty Cycle		85	90		%
Switch Current Limit			650		mA
Switch V <sub>CESAT</sub>	I <sub>SW</sub> =250mA		350		mV
Switch Leakage Current	V <sub>SW</sub> =5V		0.01	5	$\mu$ A
$\overline{SHDN}$ Voltage High		1.5			V
$\overline{SHDN}$ Voltage Low				0.4	V
$\overline{SHDN}$ Pin Bias Current			65		$\mu$ A
OVP Threshold			29		V

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BLOCK DIAGRAM LT19371K (Figure 2.)



OPERATION

The LT19371K 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 2. At the start of each oscillator cycle, the SR 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 SR 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 10  $\mu$  H inductor is recommended for most LT19371K 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 LT19371K 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 4.7  $\mu$  F input capacitor and a 4.7  $\mu$  F output capacitor are sufficient for most LT19371K applications.

**WHITE LED STEP  
UP CONVERTER****Diode Selection**

Schottky diodes, with their low forward voltage drop and fast reverse recovery, are the ideal choices for LT19371K applications. The forward voltage drop of a Schottky diode represents the conduction losses in the diode, while the diode capacitance ( $C_T$  or  $C_D$ ) 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 LT19371K. A Schottky diode rated at 1000mA is sufficient for most LT19371K applications.

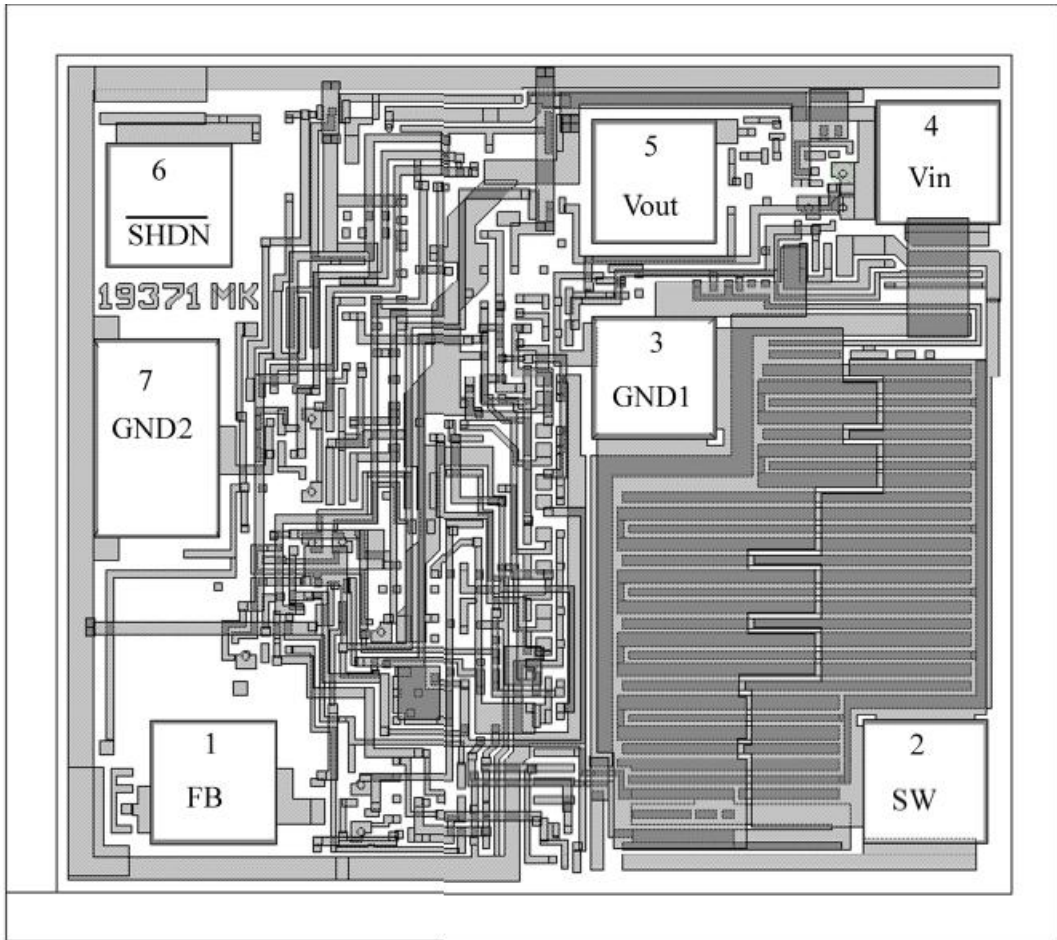
**LED Current Control**

The LED current is controlled by the feedback resistor ( $R_1$  in Figure 1). The feedback reference is 95mV. The LED current is  $95\text{mV}/R_1$ . In order to have accurate LED current, precision resistors are preferred (1% is recommended). The formula and table 3 for  $R_1$  selection are shown below.  $R_1=95\text{mV}/I_{LED}$ .

**Table 3. R1 Resistor Value Selection**

$I_{LED}$ (mA)	$R_1$ ( $\Omega$ )
5	19.1
10	9.53
12	7.87
15	6.34
20	4.75

**PAD LOCATION AND COORDINATION**



Chip Size: 0.85 x 0.76mm<sup>2</sup>

Pad Number	Pad Name	Pad Center Coordinates X x Y (μm)	Pad Size (μm)
1	FB	166 x 129	100 x 100
2	SW	770 x 131	100 x 100
3	GND1	521.5 x 458	100 x 100
4	Vin	750 x 633	100 x 100
5	Vout	521 x 617	100 x 100
6	/SHDN	130.5 x 597	100 x 100
7	GND2	120 x 408	100 x 160

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**ASSEMBLY DRAWING SOT-236 (BOTTOM VIEW)**

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