19371MK

WHITE LED STEP-UP CONVERTER
June 2009

mkron

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

DESCRIPTION

The 19371MK 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.

## Figure 1. TYPICAL APPLICATION
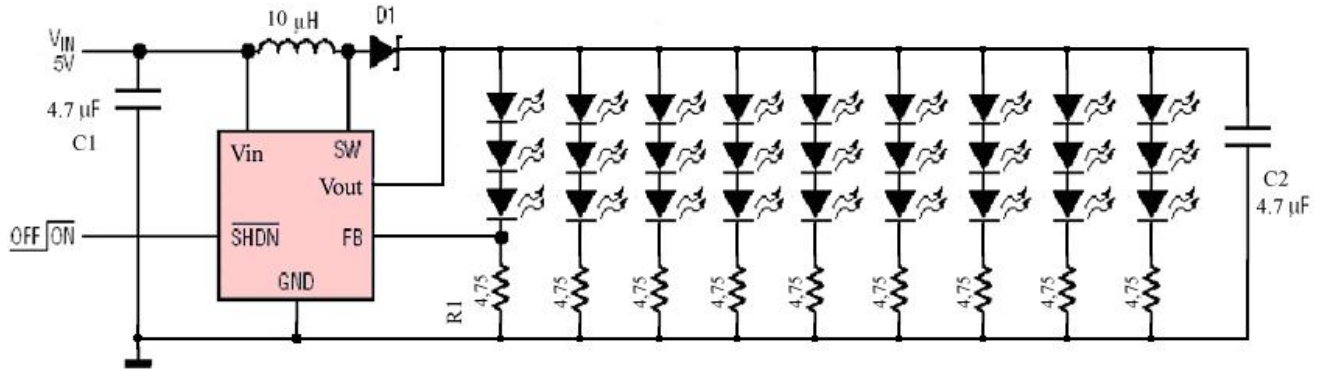
ABSOLUTE MAXIMUM RATINGS (Note 1)

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

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

PIN CONFIGURATION

SO-8

SOT-23-6
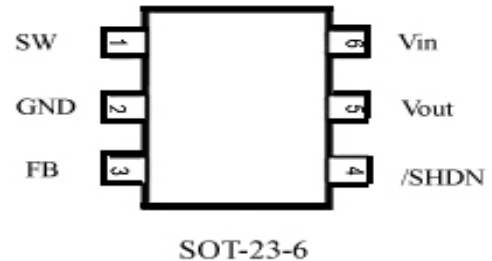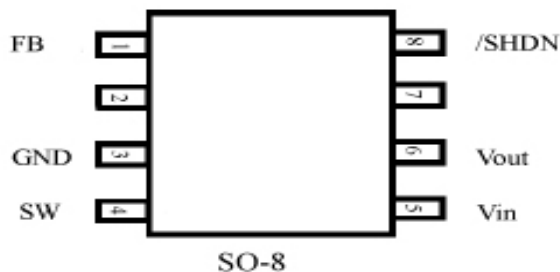
ELECTRICAL CHARACTERISTICS T_A = 25°C, V_{IN} = 5V, $V_{/SHDN}$ = 5V, unless otherwise noted.

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Minimum Operating Voltage		2.5			V
Maximum Operating Voltage				10	V
Feedback Voltage	I_{LOAD} = 180mA, V_{IN}=5V	86	95	104	mV
FB Pin Bias Current		10	45	100	nA
Supply Current	/SHDN = 0V		2.1 0.1	3.0 1.0	mA 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
/SHDN Voltage High		1.5			V
/SHDN Voltage Low				0.4	V
/SHDN Pin Bias Current			65		µA
OVP Threshhold			29		V

1

Figure 2. BLOCK DIAGRAM 19371MK
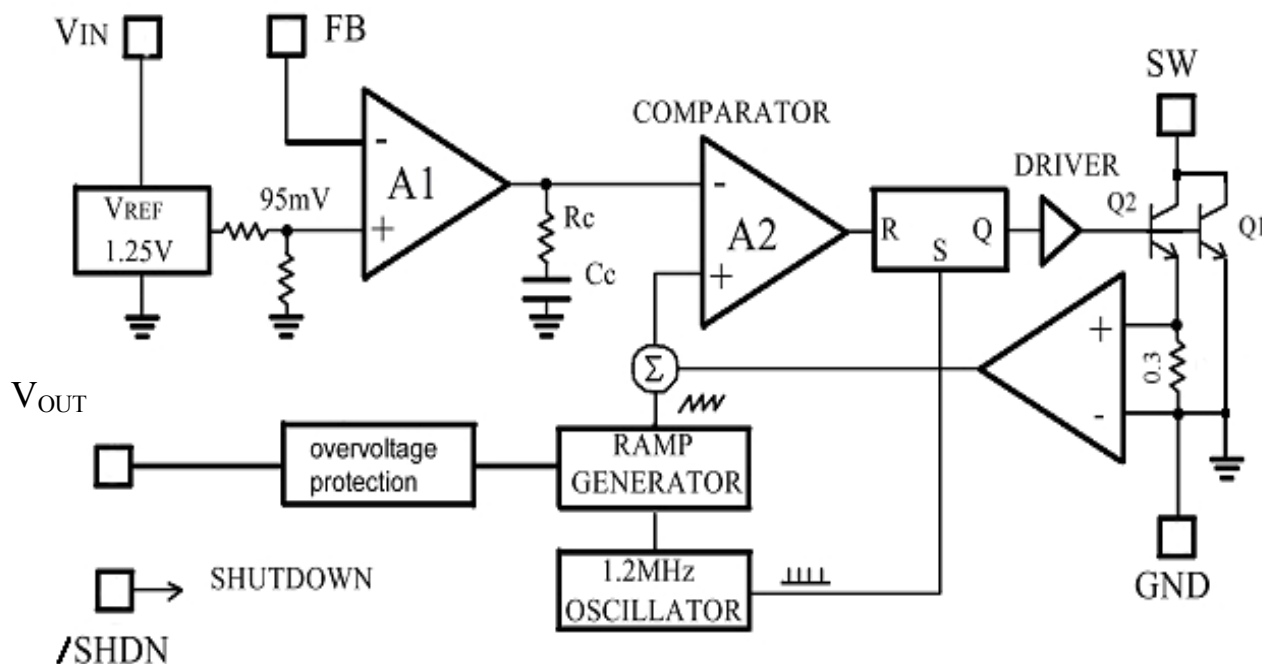
OPERATION

The 19371MK 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 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 19371MK 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 19371MK 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 19371MK applications.

Diode Selection
Schottky diodes, with their low forward voltage drop and fast reverse recovery, are the ideal choices for 19371MK 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 19371MK. A Schottky diode rated at 1000mA t is sufficient for most 19371MK applications.
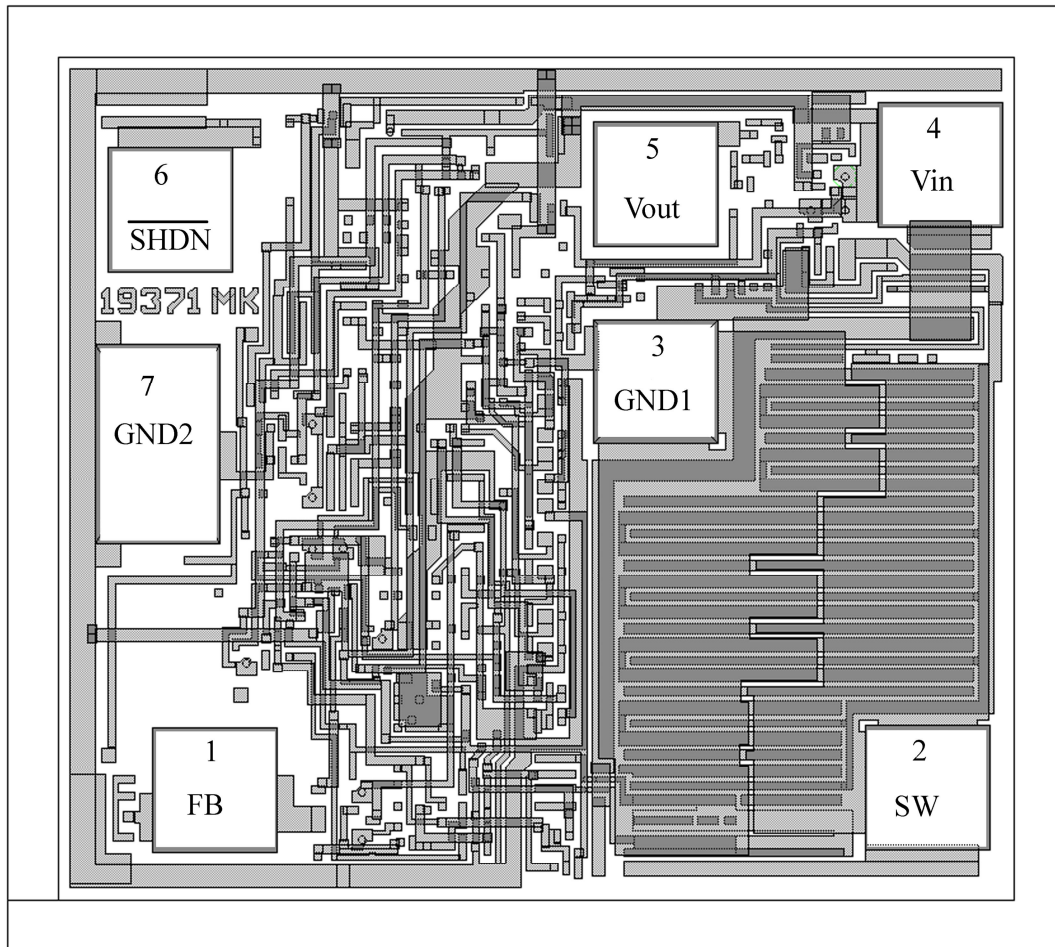
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LED Current Control

The LED current is controlled by the feedback resistor (R1 in Figure 1). 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

PAD LOCATION AND COORDINATES

Chip Size : 0.85 x 0.76 mm^2

Pad number	Pad Name	Pad center coordinates, X x Y (μm)	Pad size, (μm)
1	FB	166 x 129	100x100
2	SW	770 x 131	100x100
3	GND1	521.5 x 458	100x100
4	Vin	750 x 633	100x100
5	Vout	521 x 617	100x100
6	/SHDN	130.5 x 597	100x100
7	GND2	120 x 408	100x160

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**Assembly Drawing SOT-23-6
(bottom view)**

SOT-23-6

/SHDN   OVP   Vin

FB   GND   SW
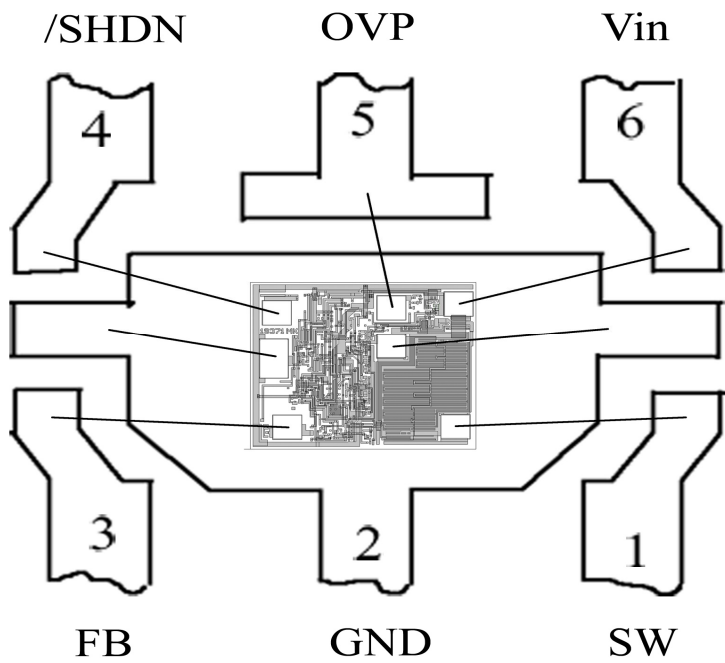
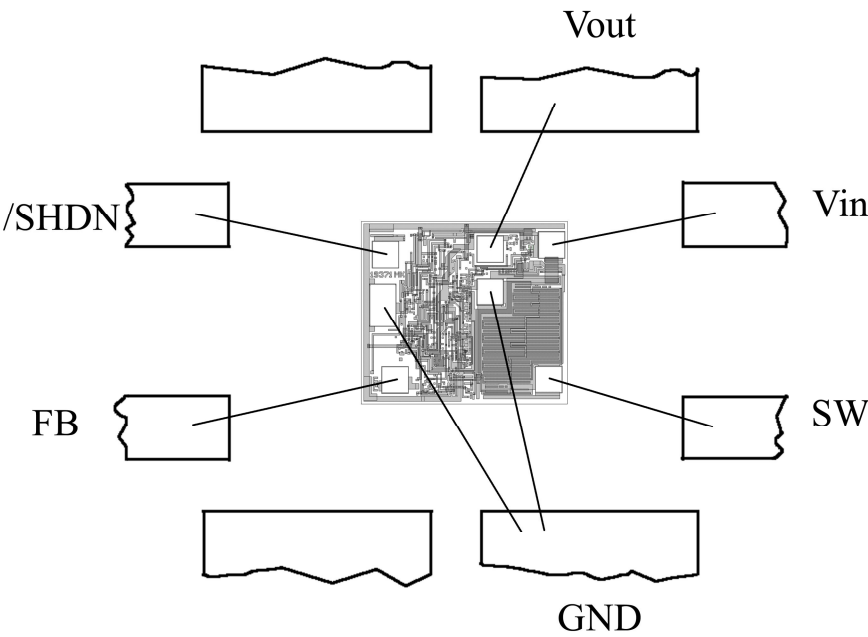**Assembly Drawing SO-8**

Vout

/SHDN   Vin

FB   SW

GND

The appearance complies with the requirements of the company standards.