White LED Step-Up Converter

Features

·Inherently Matched LED Current
·High Efficiency: 84% Typical
·Drives Up to Four LEDs from a 3.2V Supply
·Drives Up to Six LEDs from a 5V Supply
·36V Rugged Bipolar Switch
·Fast 1.2MHz Switching Frequency
·Uses Tiny 1mm Tall Inductors
·Requires Only 0.22mF Output Capacitor
·Low Profile SOT23-5 Packaging

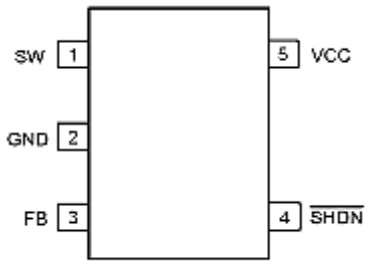
Applications

·Cellular Phones
·PDAs, Handheld Computers
·Digital Cameras
·MP3 Players
·GPS Receivers

General Description

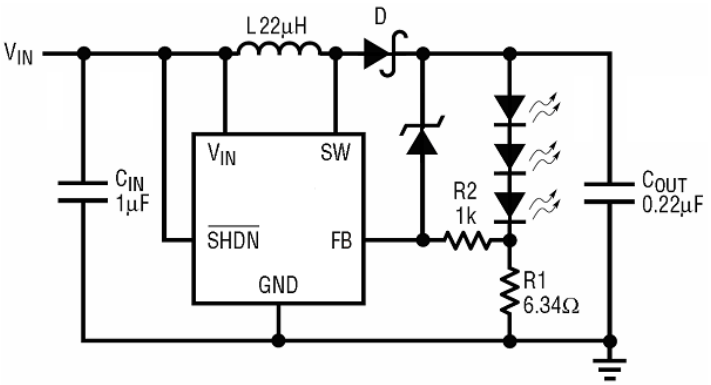
The FS1704 is a step-up DC/DC converter specifically designed to drive white LEDs with a constant current. The device can drive two, three or four LEDs in series from a Li-Ion cell. Series connection of the LEDs provides identical LED currents resulting in uniform brightness and eliminating the need for ballast resistors. The FS1704 switches at 1.2MHz, allowing the use of tiny external components. The output capacitor can be as small as 0.22uF, saving space and cost versus alternative solutions. A low 95mV feedback voltage minimizes power loss in the current setting resistor for better efficiency.
The FS1704 is available in low profile SOT23-5 packages.

Pin Configurations



SOT23-5L

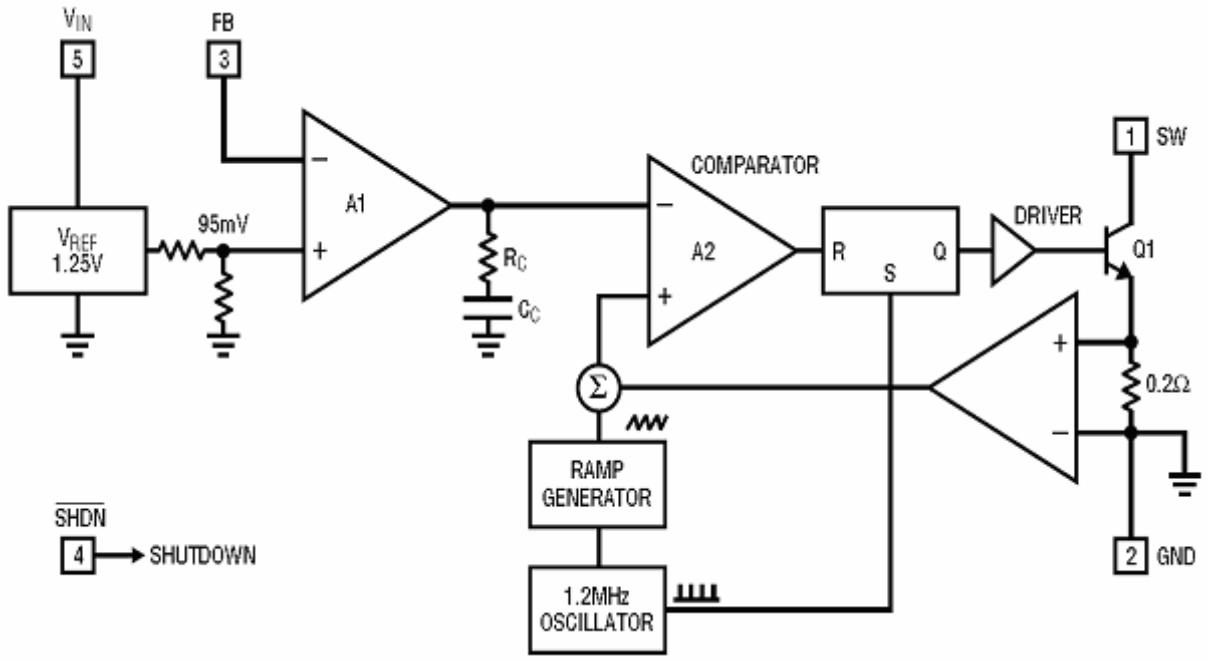
Typical Application Circuit



- **Pin Description**

Pin No.	Pin Name	Pin Function
1	SW	Switch Pin. Connect inductor/diode here. 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.Connect cathode of lowest LED and resistor here. Calculate resistor value according to the formula: R_{FB} = 95mV/I_{LED}
4	SHDN	Shutdown Pin. Connect to 1.0V or higher to enable device; 0.4V or less to disable device.
5	VIN	Input Supply Pin. Must be locally bypassed.

- **Functional Block Diagram**



Absolute Maximum Ratings

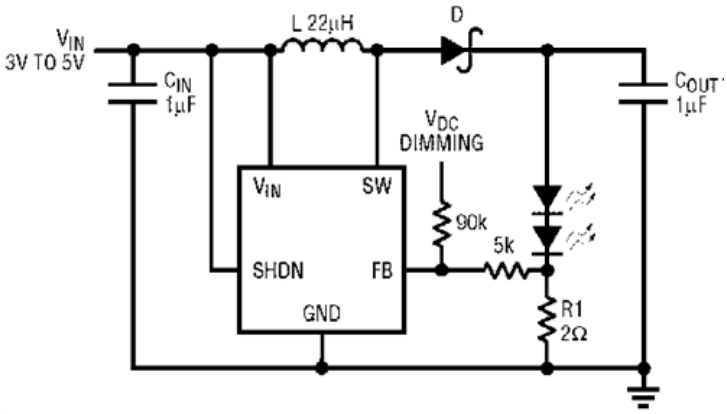
Parameter	Symbol	Ratings	Unit
IN Voltage	V_{IN}	12	V
SW Voltage	V_{OUT}	36	V
FB Voltage	V_{FB}	10	V
SHDN Voltage	V_{SHDN}	10	V
Operating Junction Temperature	T_{opr}	–40 to +85	℃
Storage Temperature Range	T_{stg}	–65 to +150	℃

Electrical Characteristics

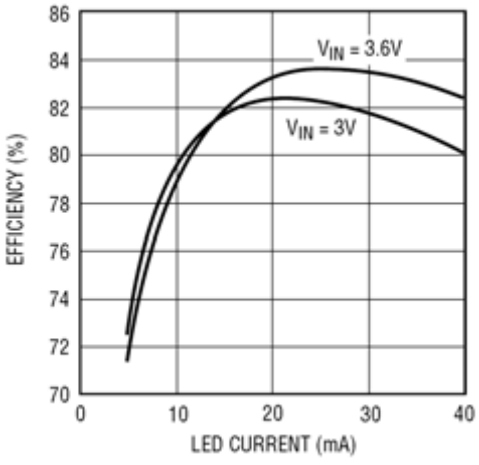
(V_{IN} = V_{OUT} + 0.5V, V_{EN} = V_{IN}, C_{OUT} = 1μF, T_J = 25°C unless otherwise specified)

Parameter	Parameter	Min	Typ	Max	Units
Operating Voltage		2.5		10	V
Feedback Voltage	I_{SW} = 100mA, Duty Cycle = 66%	86	95	104	mV
FB Pin Bias Current		10	45	100	nA
Supply Current			1.9	2.5	mA
	SHDN = 0V		0.1	1.0	mA
Switching Frequency		0.8	1.2	1.6	MHz
Maximum Duty Cycle			85	90	%
Switch Current Limit			320		mA
Switch VCESAT	I_{SW} = 250mA		350		mV
Switch Leakage Current	V_{SW} = 5V		0.01	5	mA
SHDN Voltage High		1.0			V
SHDN Voltage Low				0.4	V
SHDN Pin Bias Current			65		mA

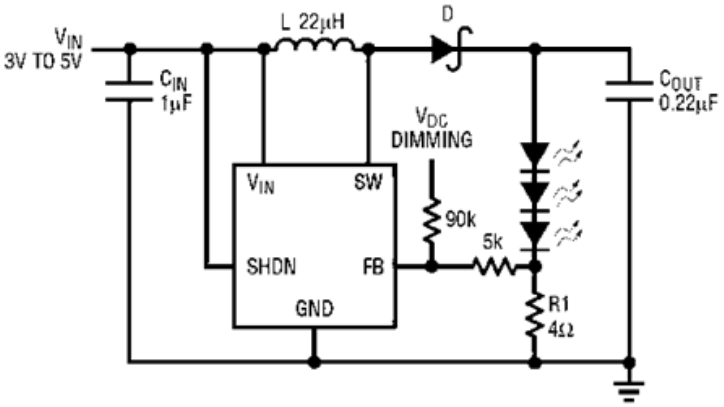
Typical Performance Characteristics



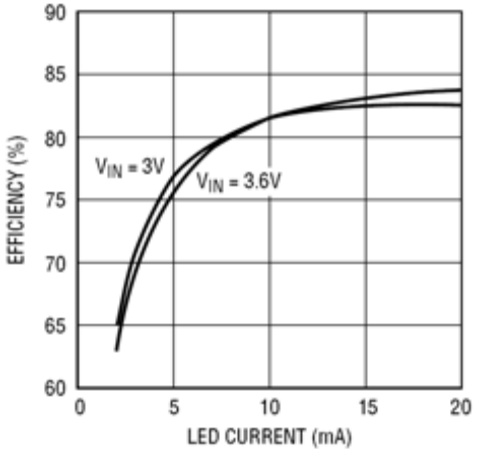
Li-Ion to Two White LEDs



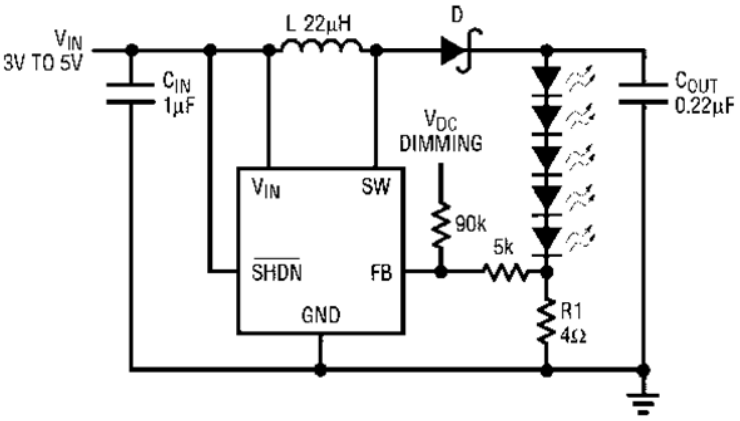
Two LED Efficiency



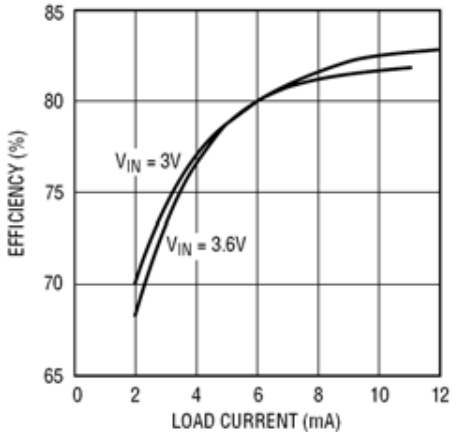
Li-Ion to Three White LEDs



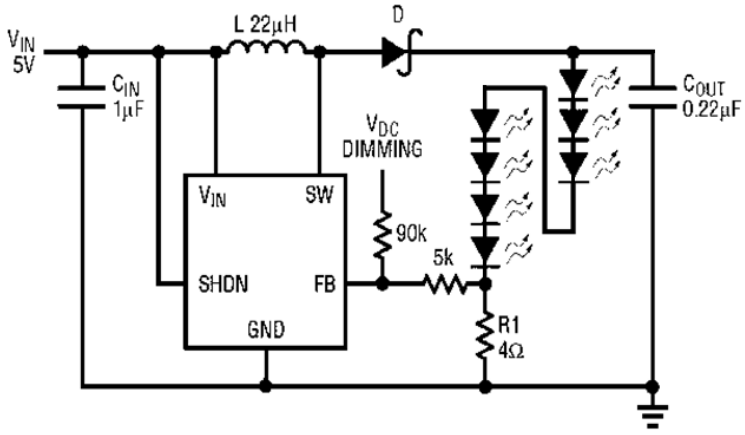
Three LED Efficiency



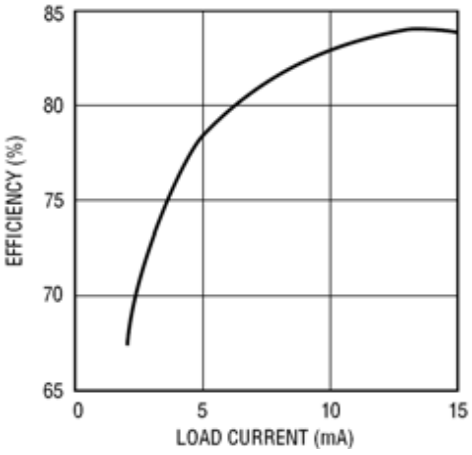
Li-Ion to Five White LEDs



Five LED Efficiency



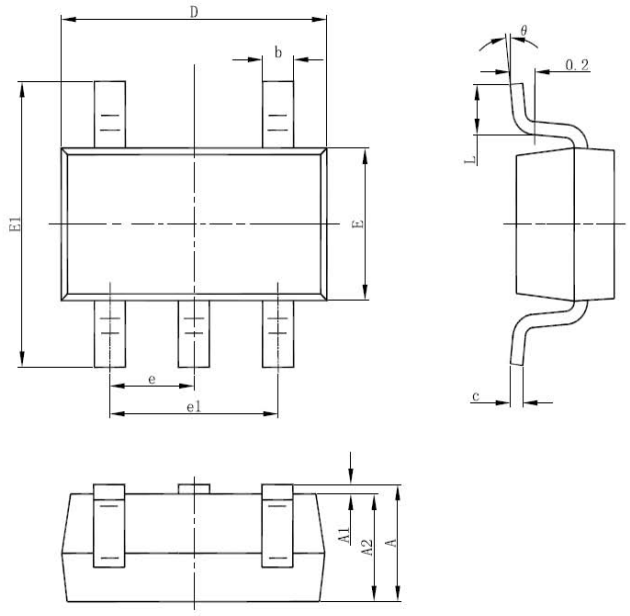
5V to Seven White LEDs



Seven LED Efficiency

- **Package Information**

SOT-23-5L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°