

3W High Power White LED Driver

General Description

The JTM2803 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 JTM2803 is targeted to be used for driving loads up to 1A from a two-cell alkaline battery. The LED current can be auto adjusted by internal smart module and programmed by the external current sense resistor, R_s , connected between the feedback pin (FB) and ground. A low 95mV(TYP.) 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 1uA. The JTM2803 is available in the 6-lead SOT-23-6L package.

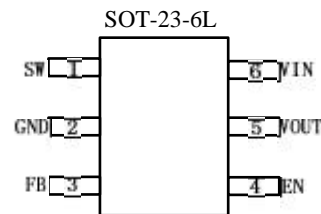
Applications

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

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
- Low Hold Voltage: 0.75V
- 1MHz Switching Frequency
- Uses small, Low Profile External Components
- Low $R_{DS(ON)}$: 100m Ω (TYP.)
- Over Temperature Protection
- Low Profile SOT-23-6L Package

Package



Typical Application Circuit

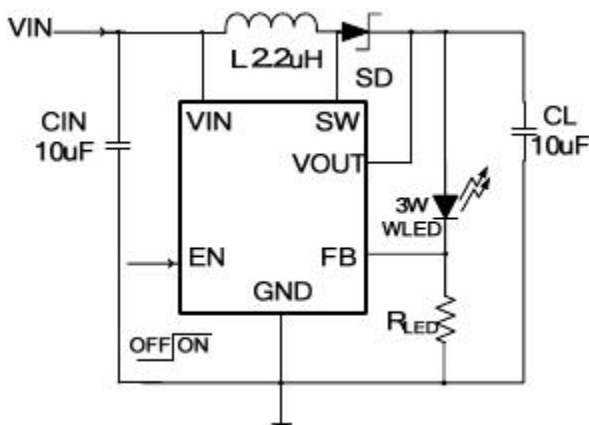


Figure 1. Basic Application Circuit with JTM2803

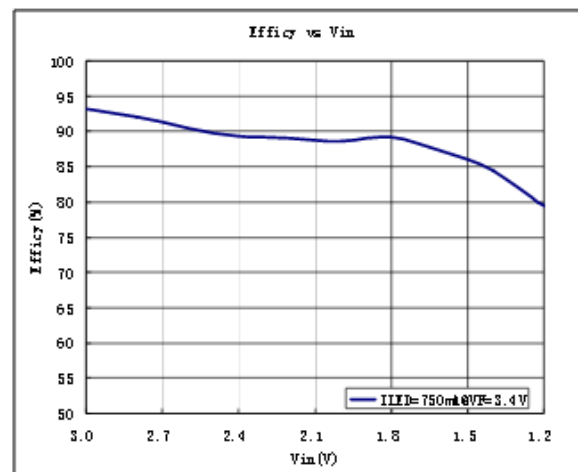


Figure 2. Typical Efficiency Curve

Pin Description

Pin No.	Pin Name	Pin Function
1	SW	Switching Pin.
2	GND	Ground Pin.
3	FB	Feedback Pin.
4	EN	Chip Enable(Active High).
5	VOUT	Output Voltage Pin.
6	VIN	Input Supply.

Function Block Diagram

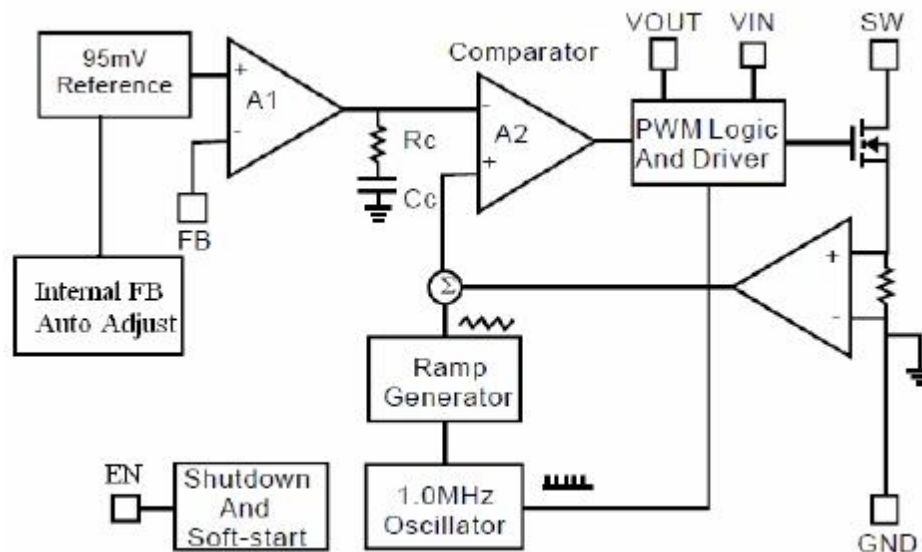


Figure 3 Function Block Diagram

Absolute Maximum Ratings (Note 1)

Supply Input Voltage, VIN	-----	-0.3V to 6V
Switching Pin, SW	-----	-0.3V to 6V
VOUT	-----	-0.3V to 6V
Other Pins	-----	-0.3V to 6V
Power Dissipation, PD @ TA = 25 °C		
SOT-23-6L	-----	-0.392W
Package Thermal Resistance (Note 3)		
SOT-23-6L, θ_{JA}	-----	-255 °C/W
Lead Temperature (Soldering, 10 sec.)	-----	-260 °C

Junction Temperature -----150 °C
Storage Temperature Range ----- -65 °C to 150 °C

Recommended Operating Conditions (Note 2)

Junction Temperature Range ----- -40 °C to 125 °C
Ambient Temperature Range ----- -40 °C to 85 °C

Electrical Characteristics

(VIN=2.6V, ILED=750mA, VEN=VIN, CIN=10uF, COUT=10uF, L=2.2uH, TA = 25 °C, unless otherwise specified)

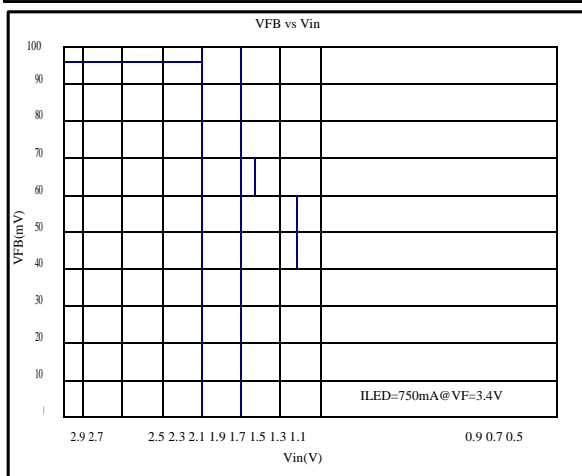
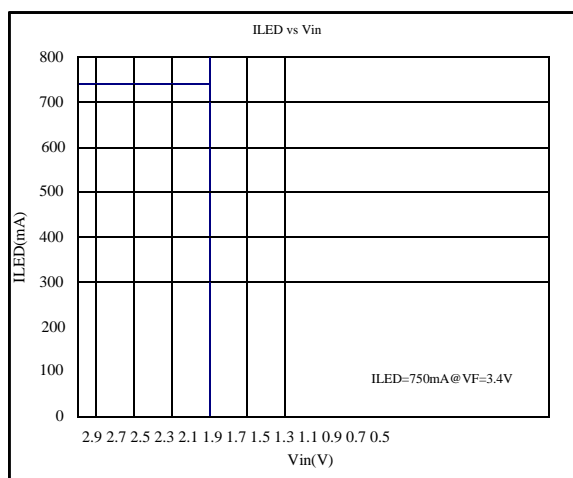
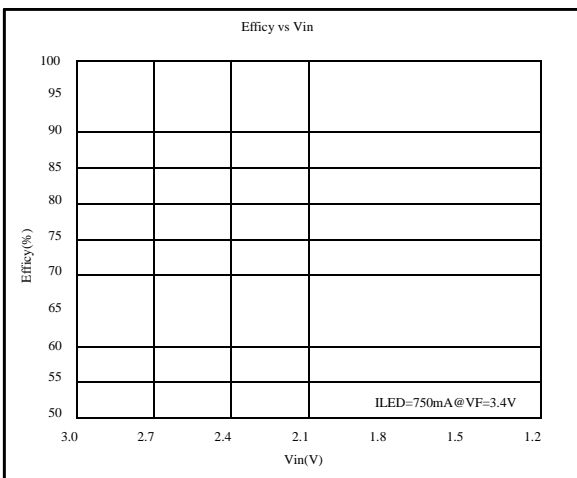
Parameter	Conditions	Min	Typ	Max	Unit
Input Voltage Range		0.9		Vf-0.2	V
Feedback Voltage	VIN=2.6V	90	95	100	mV
Start-up Voltage	VIN:0→3V		0.9		V
Hold Voltage	VIN=3→0V		0.75		V
Oscillator Frequency		0.85	1.0	1.15	MHz
EN Input High	VIN=1.8 V	1.0			V
EN Input Low	VIN=1.8 V			0.4	V
Over Temperature Shutdown			150		°C
Over Temperature Hysteresis			15		°C
Maximum Output Current Range		750			mA
Quiescent Current	ILED=0mA, VO=3.4V, Device Switching at 1MHz		1	3	mA
Shutdown Current	Shutdown mode		1		uA
Switch on Resistance	VO=3.4V		0.1		Ω
Current Limit	VO=3.4V	2			A
Efficiency	ILED=750mA		90		%

Note 1. Stresses listed as the above “Absolute Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

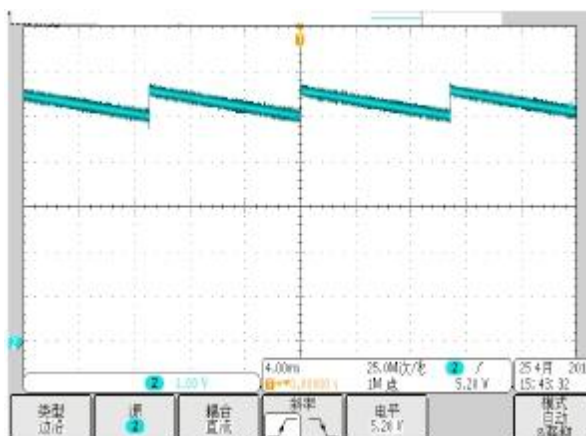
Note 2. The device is not guaranteed to function outside its operating conditions.

Note 3. θ_{JA} is measured in the natural convection at TA = 25 °C on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

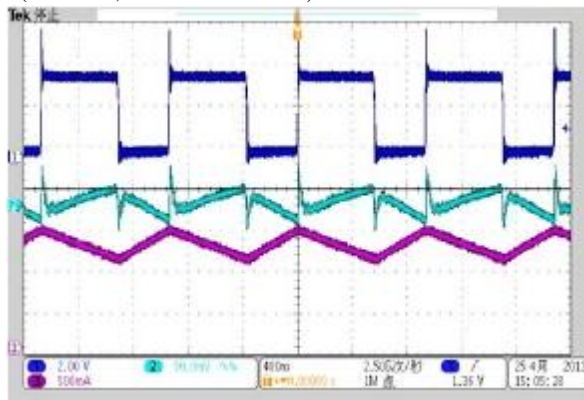
Typical Performance Characteristics



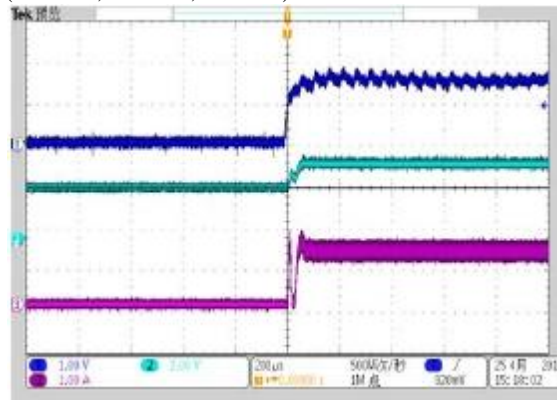
Overvoltage Protection



Switching Waveform (CH1:SW,CH2:VO;CH3:Isw)



Start-up Waveform (CH1:EN,CH2:VO;CH3:Isw)



Ordering Information

Part number	Mark	Package
HM2803	WBXYP ¹	SOT-23-6L

1. XY=date code
P=Package factory

Applications Information

Inductor Selection

The JTM2803 can use small value inductors due to its switching frequency of 1MHz. The value of inductor will focus in the range of 2.2uH to 4.7uH for most JTM2803 applications. In typical high current white LED applications, it is recommended to use a 4.7uH inductor. The inductor should have low DCR (DC resistance) to minimize the IR 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 JTM2803. For good input decoupling, Low ESR(equivalent series resistance) capacitors should be used at the input. At least 2.2uF input capacitor is recommended for most applications. A minimum output capacitor value of 6.8uF is recommended under normal operating conditions, while a 10uF-22uF 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 JTM2803 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 JTM2803. 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 Rs 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(TYP.). The LED current is 95mV/Rs. It's recommended to use a 1% or better precision resistor for the better LED current accuracy. The formula and table 1 for Rs selection are shown as follows:

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

Table 1. Rs Resistor Value Selection

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

PCB Layout Guidelines

For best performance of the JTM2803, the following guidelines must be strictly followed.

Input and Output capacitors should be placed close to the IC and connected to ground plane to reduce noise coupling.

Keep the main current traces as possible as short and wide.

SW node of DC-DC converter is with high frequency voltage swing. It should be kept at a small area.

Place the feedback components as close as possible to the IC and keep away from the noisy devices.

Package Information

