

CMD2803

3W High Power White LED Driver

Features

- LED Power Efficiency: up to 90%
- Current Accuracy: $\pm 5\%$ ($V_{IN}=3.6V$ to $1.8V$ @ $V_F=3.7V$)
- Low Start-Up Voltage: $0.9V$ ($I_{LED}=270mA$)
- Low Hold Voltage: $0.75V$ ($I_{LED}=200mA$)
- 1MHz Switching Frequency
- Uses small, Low Profile External Components
- Low RDS(ON) : $100m\Omega$ (TYP.)
- Open LED Protection
- Over Temperature Protection
- Low Profile SOT-23-6 Package
- Pb-Free 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

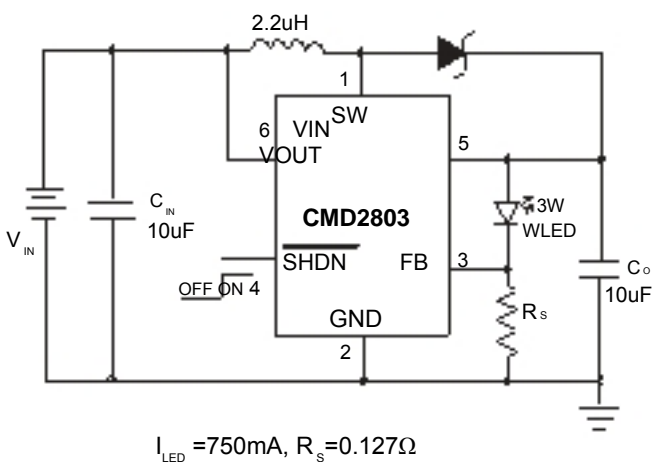
General Description

The CMD2803 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.

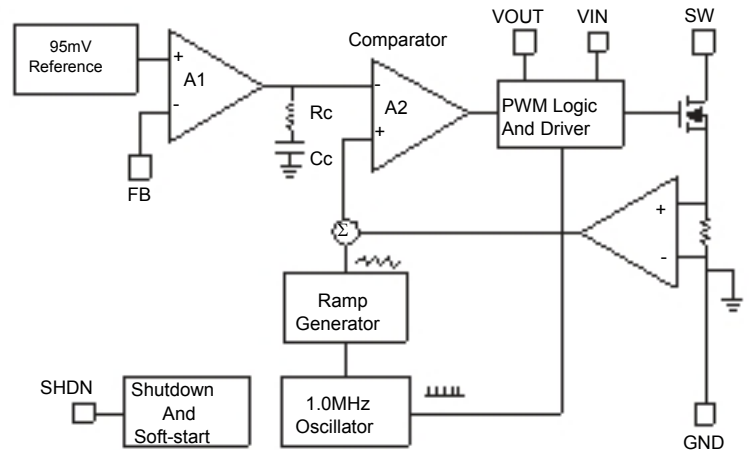
The CMD2803 is targeted to be used for driving loads up to $1A$ from a two-cell alkaline battery. The LED current can be programmed by the external current sense resistor, R_s , connected between the feedback pin (FB) and ground. A low $95mV$ feedback voltage reduces the power loss in the R_s for better efficiency. With its internal $2A$, $100m\Omega$ 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 less than $1\mu A$.

The CMD2803 is available in the 6-lead SOT-23-6 package.

Typical Application



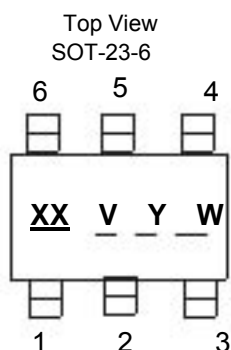
Block Diagram



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Pin Configuration & Marking Information



XX: Product Code
V: Voltage Code
Y: Year
W: Weekly

Pin Number	Name	Function
1	SW	Switch
2	GND	Ground
3	FB	Feedback
4	SHDN	Shut Down
5	VOUT	Output
6	VIN	Input

Absolute Maximum Ratings

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

Input Pin Voltage.....-0.3V to 6V
SW Pin Voltage.....-0.3V to 6V
SHDN, FB Pin Voltage.....-0.3V to 6V

Operating Temperature Range-40°C to 85°C
Storage Temperature Range..... -65°C to 125°C
Lead Temperature (Soldering, 5 sec)300°C

Recommended Operating Conditions

Junction Temperature.....-40°C to 125°C

Ambient Temperature.....-40°C to 85°C

Thermal Information

Parameter	Package	Symbol	Maximum	Unit
Thermal Resistance (Junction to Case)	SOT-23-6	θ_{JC}	130	°C/W
Thermal Resistance (Junction to Ambient)	SOT-23-6	θ_{JA}	250	
Internal Power Dissipation	SOT-23-6	P_D	400	mW

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Electrical Characteristic

$T_A = 25^\circ\text{C}$, $V_{IN} = 2.4\text{V}$, $I_{LED} = 750\text{mA}$, $V_{SHDN} = V_{IN}$, $L = 2.2\mu\text{H}$, $C_{IN} = 10\mu\text{F}$, $C_O = 10\mu\text{F}$, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		0.9		VF-0.2 (note 1)	V
Feedback Voltage	V_{FB}		90	95	100	mV
Start-up Voltage	V_{START}	$V_{IN} : 0\text{V} \rightarrow 3\text{V}$ $I_{LED} = 270\text{mA}$		0.9		V
Hold Voltage	V_{HOLD}	$V_{IN} : 3\text{V} \rightarrow 0\text{V}$ $I_{LED} : 750\text{mA} \rightarrow 200\text{mA}$		0.75		V
Oscillator Frequency	F_{OSC}		0.85	1.0	1.15	MHz
SHDN Input High	V_{SH}	$V_{IN} = 1.8\text{V}$	1.0			V
SHDN Input Low	V_{SL}	$V_{IN} = 1.8\text{V}$			0.4	V
Over Temperature Shutdown	OTS			150		$^\circ\text{C}$
Over Temperature Hysteresis	OTH			15		$^\circ\text{C}$
Maximum Output Current Range	$I_{O(MAX)}$		750			mA
Quiescent Current	I_Q	$I_{LED} = 0\text{mA}$, $V_O = 3.4\text{V}$, Device Switching at 1MHz		1	3	mA
Shutdown Current	I_{SD}	Shutdown mode			1	μA
Switch on Resistance	$R_{DS(ON)}$	$V_O = 3.4\text{V}$		0.1		Ω
Current Limit	I_{LIM}	$V_O = 3.4\text{V}$	2			A
Efficiency	η	$I_{LED} = 750\text{mA}$		90		%

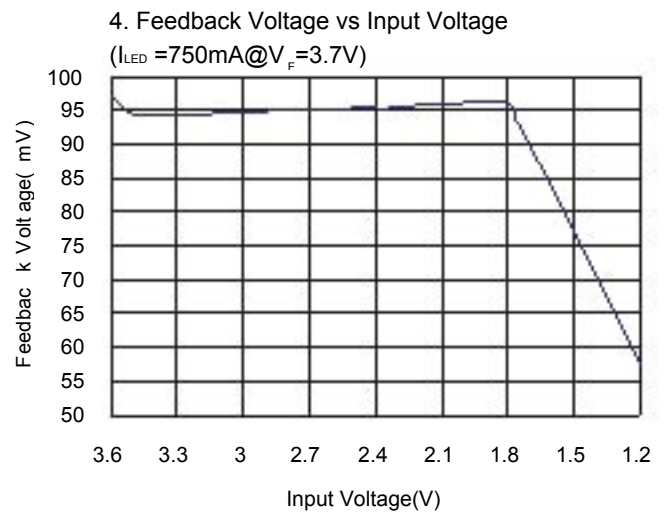
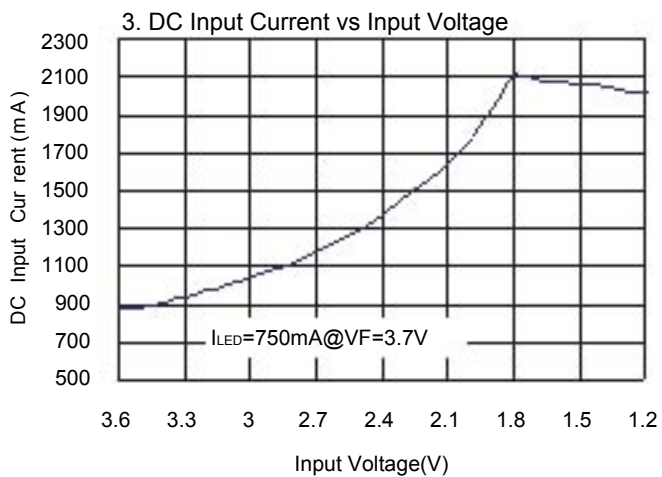
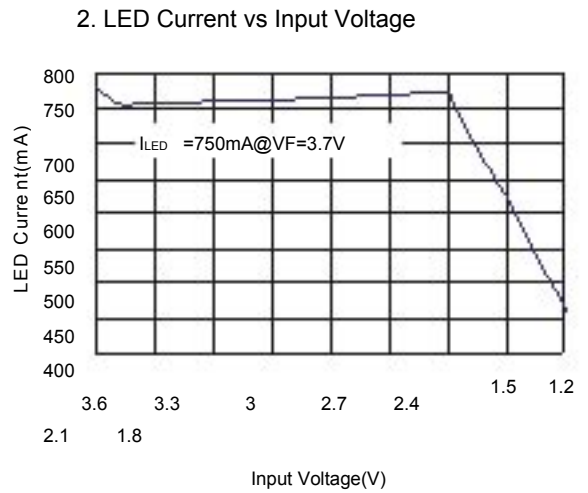
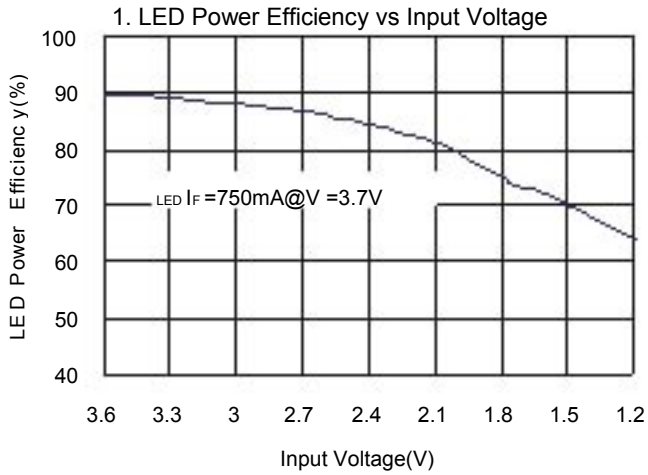
Note1: V_f - LED Forward Voltage

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Typical Performance Characteristics

$T_A = 25^\circ\text{C}$, $L = 2.2\mu\text{H}$, $C_{IN} = 10\mu\text{F}$, $C_O = 10\mu\text{F}$, unless otherwise noted.

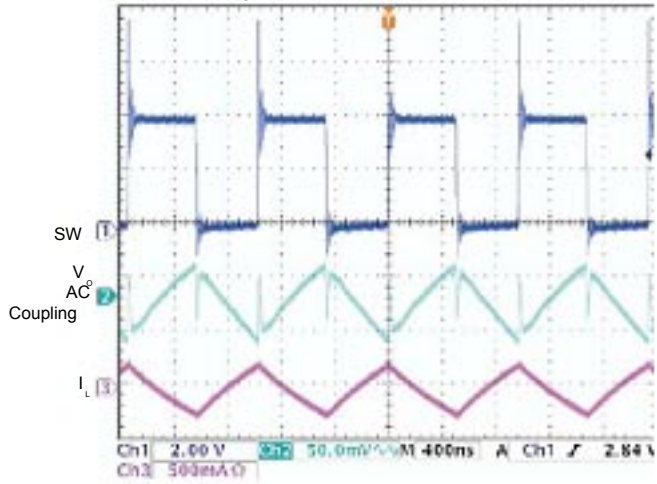


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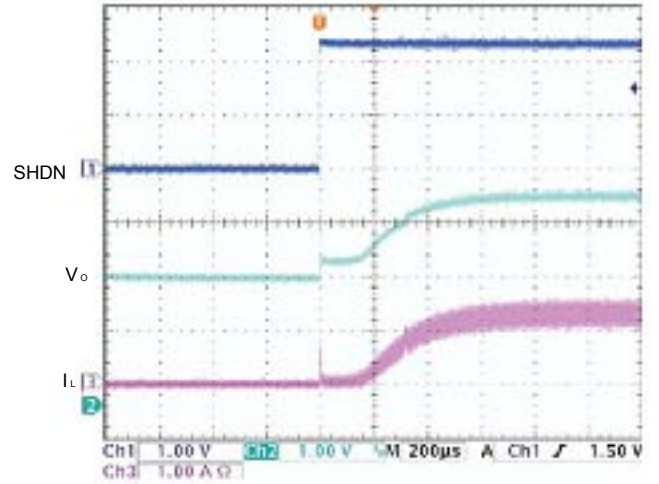
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Typical Performance Characteristics (continued)

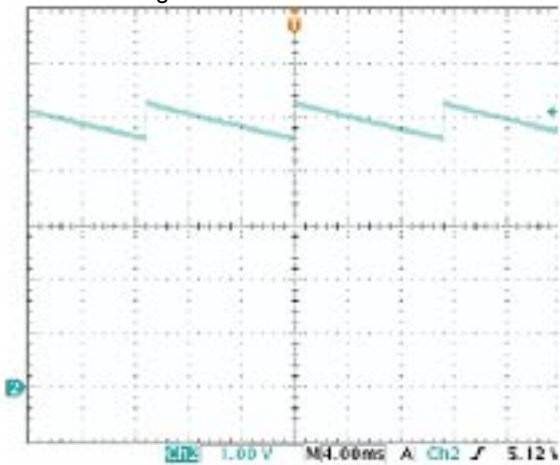
5. Switching Waveform



6. Start-Up Waveform



7. Overvoltage Protection



Application Information

Inductor Selection

The CMD2803 can use small value inductors due to its switching frequency of 1 MHz. The value of inductor will focus in the range of 2.2uH to 4.7uH for most CMD2803 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 I^2R 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 CMD2803. 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 CMD2803 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 CMD2803. 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 R_s 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. The LED current is $95mV/R_s$. It's recommended to use a 1% or better precision resistor for the better LED current accuracy. The formula and table 1 for R_s selection are shown as follows:

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

Table 1. R_s Resistor Value Selection

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

PCB Layout Guidelines

As for all switching power supplies, the layout and components placement of the CMD2803 is an important step in the design; especially at high peak currents and high switching frequencies.

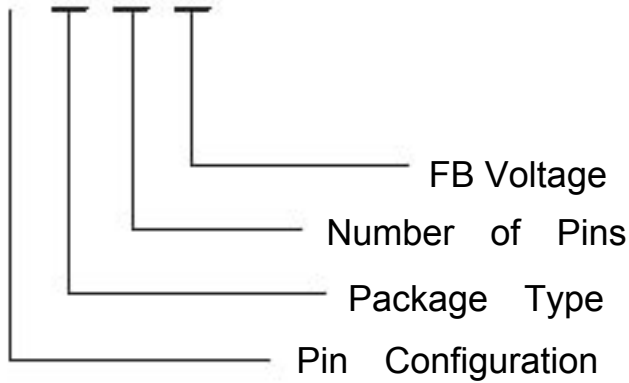
The input capacitor and output capacitor should be placed respectively as close as possible to the input pin and output pin of the IC; the inductor and schottky diode should be placed as close as possible to the switch pin by using wide and short traces for the main current path; the current sense resistor should be placed as close as possible between the ground pin and feedback pin.

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Ordering Information

CMD2803 X X X X



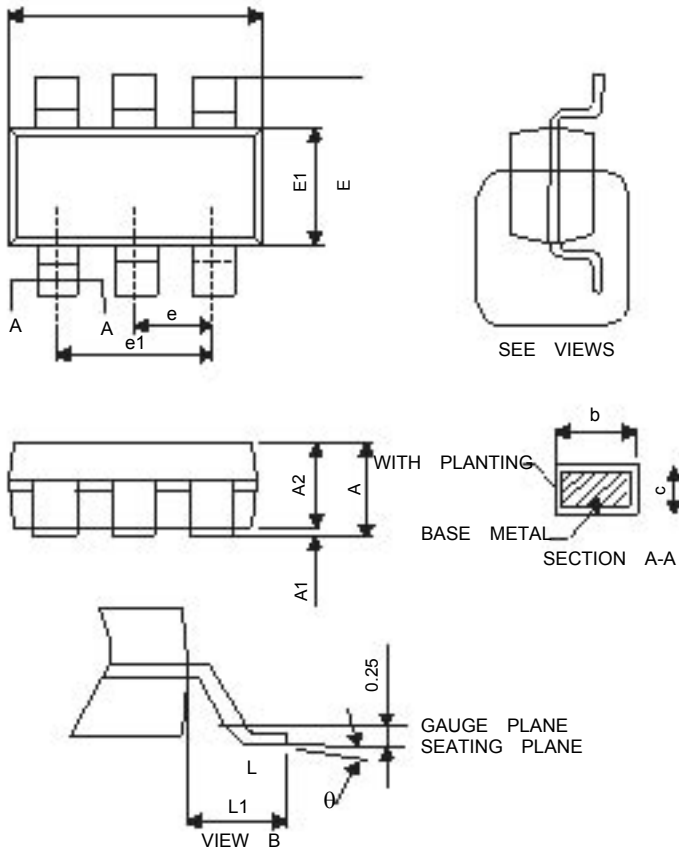
Pin Configuration	Package Type	Number of Pins	FB Voltage
A Type 1. SW 2. GND 3. FB 4. SHDN 5. VOUT 6. VIN	A: SOT-23-6	F: 6	095: 95mV

Part Number	Marking	Package Type	Standard Package
CMD2803AAF095	CFAYW	SOT-23-6	3,000Units/Tape&Reel

Please consult PAM sales office or authorized Rep./Distributor for detailed ordering information.

Outline Dimension

SOT-23-6



Symbol	A	A1	A2	b	c	D	E
Spec	1.20±0.25	0.10±0.05	1.10±0.2	0.40±0.1	0.15±0.07	2.90±0.1	2.80±0.2
Symbol	E11	e	e 1	L	L1	θ	
Spec	1.60±0.1	0.95BSC	1.90BSC	0.55±0.25	0.60REF	4°±4°	