

**3W HIGH POWER WHITE LED DRIVER**

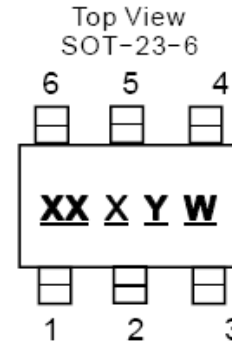
**Description**

The PAM2803 is a step-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 PAM2803 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 PAM2803 is available in the 6-lead SOT23-6 package.

**Pin Assignments**



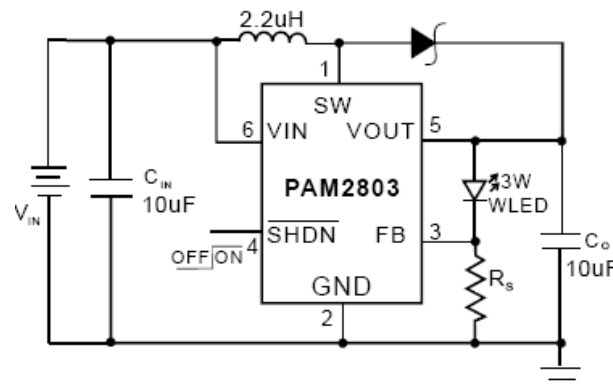
**Features**

- 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 ( $I_{LED} = 270mA$ )
- Low Hold Voltage: 0.75 ( $I_{LED} = 200mA$ )
- 1MHz Switching Frequency
- Uses Small, Low Profile External Components
- Low  $R_{DS(ON)}$ : 100m $\Omega$  (typ)
- Over Temperature Protection
- Low Profile SOT23-6 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

**Typical Applications Circuit**

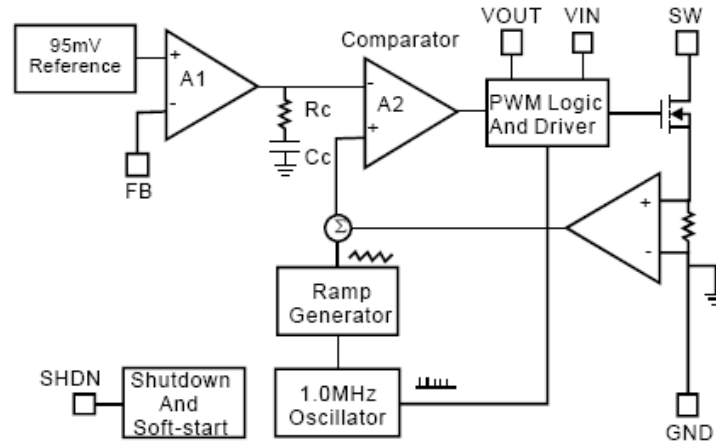


$I_{LED} = 750mA, R_s = 0.127\Omega$

**Pin Description**

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

**Block Diagram**



**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

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.

Parameter	Rating	Unit
Input Pin Voltage	-0.3 to +6	V
SW Pin Voltage	-0.3 to +6	
SHDN, FB Pin Voltage	-0.3 to +6	
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-65 to +125	
Lead Temperature (Soldering, 5 sec)	300	

**Recommended Operating Conditions** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Parameter	Rating	Unit
Junction Temperature	-40 to +125	°C
Ambient Temperature	-40 to +85	

## Thermal Information

Parameter	Symbol	Package	Max	Unit
Thermal Resistance (Junction to Case)	$\theta_{JC}$	SOT23-6	130	°C/W
Thermal Resistance (Junction to Ambient)	$\theta_{JA}$	SOT23-6	250	
Internal Power Dissipation	$P_D$	SOT23-6	400	mW

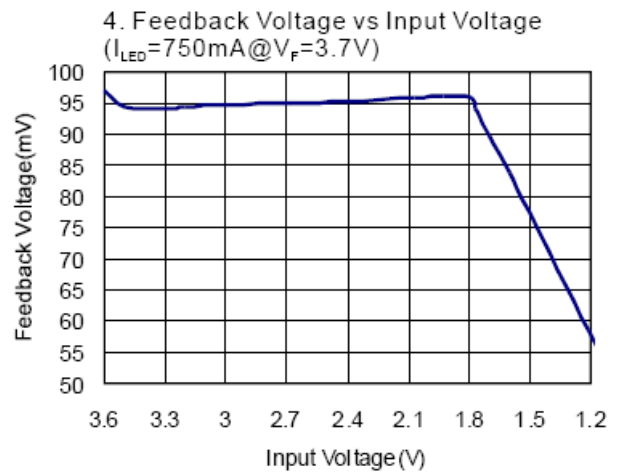
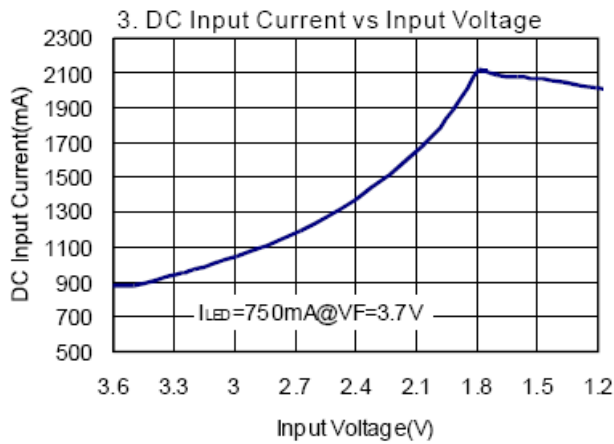
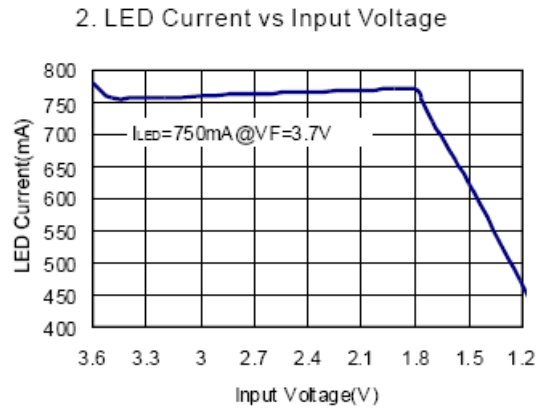
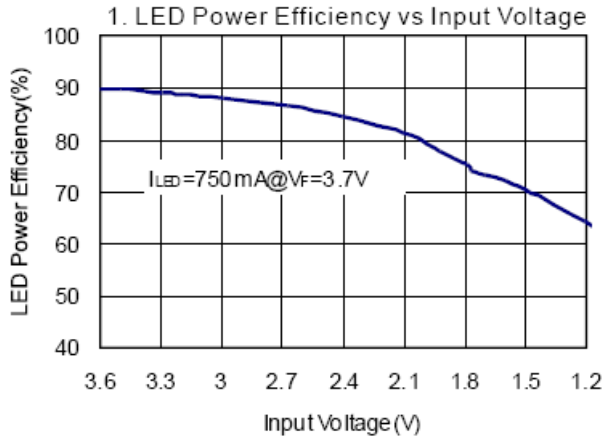
## Electrical Characteristics

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

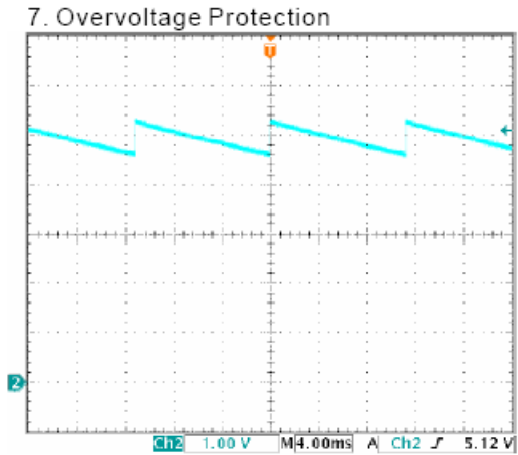
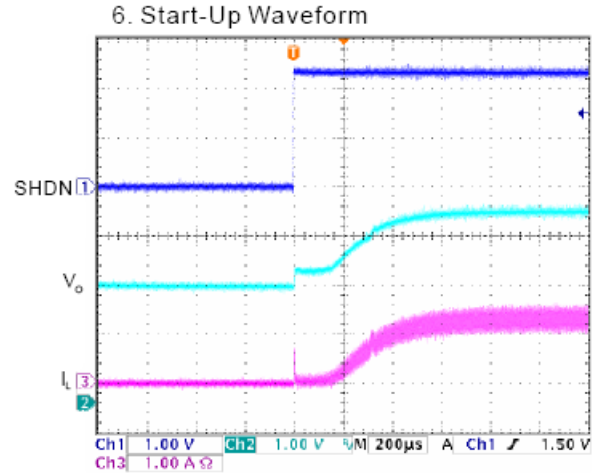
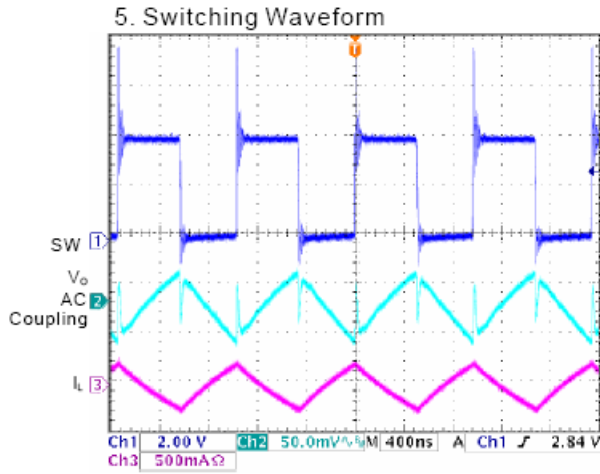
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Input Voltage Range	$V_{IN}$	—	0.9	—	$V_F - 0.2$ (Note 1)	V
Feedback Voltage	$V_{FB}$	—	90	95	100	mV
Start-Up Voltage	$V_{START}$	$V_{IN}: 0\text{V} - 3\text{V}$ , $I_{LED} = 370\text{mA}$	—	0.9	—	V
Hold Voltage	$V_{HOLD}$	$V_{IN}: 3\text{V} - 0\text{V}$ , $I_{LED}: 750\text{mA} - 200\text{mA}$	—	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	—	°C
Over Temperature Hysteresis	OTH	—	—	15	—	°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 @ 1MHz	—	1	3	mA
Shutdown Current	$I_{SD}$	Shutdown Mode	—	—	1	$\mu\text{A}$
Switch On Resistance	$R_{DS(ON)}$	$V_O = 3.4\text{V}$	—	0.1	—	$\Omega$
Current Limit	$I_{LIM}$	$V_O = 3.4\text{V}$	2	—	—	A
Efficiency	$\eta$	$I_{LED} = 750\text{mA}$	—	90	—	%

Note: 1.  $V_F$  – LED forward voltage.

**Typical Performance Characteristics** (@ $T_A = +25^\circ\text{C}$ ,  $L = 2.2\mu\text{F}$ ,  $C_{IN} = 10\mu\text{F}$ ,  $C_O = 10\mu\text{F}$ , unless otherwise specified.)



**Typical Performance Characteristics** (cont.) @ $T_A = +25^\circ\text{C}$ ,  $L = 2.2\mu\text{F}$ ,  $C_{IN} = 10\mu\text{F}$ ,  $C_O = 10\mu\text{F}$ , unless otherwise specified.)



## Application Information

### Inductor Selection

The PAM2803 can use small value inductors due to its switching frequency of 1MHz. The value of inductor will focus in the range of 2.2µH to 4.7µH for most PAM2803 applications. In typical high current white LED applications, it is recommended to use a 4.7µH inductor. The inductor should have low DCR (DC resistance) to minimize the I<sup>2</sup>R 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 PAM2803. For good input decoupling, Low ESR (equivalent series resistance) capacitors should be used at the input. At least 2.2µF input capacitor is recommended for most applications.

A minimum output capacitor value of 6.8µF is recommended under normal operating conditions, while a 10µF-22µF 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 PAM2803 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 PAM2803. 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 Semi conductor MBRA210LT3G is recommended.

### LED Current Setting

The LED current is set by the single external R<sub>S</sub> 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<sub>S</sub>. It's recommended to use a 1% or better precision resistor for the better LED current accuracy. The formula and table 1 for R<sub>S</sub> selection are shown as follows:

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

Table 1. R<sub>S</sub> Resistor Value Selection

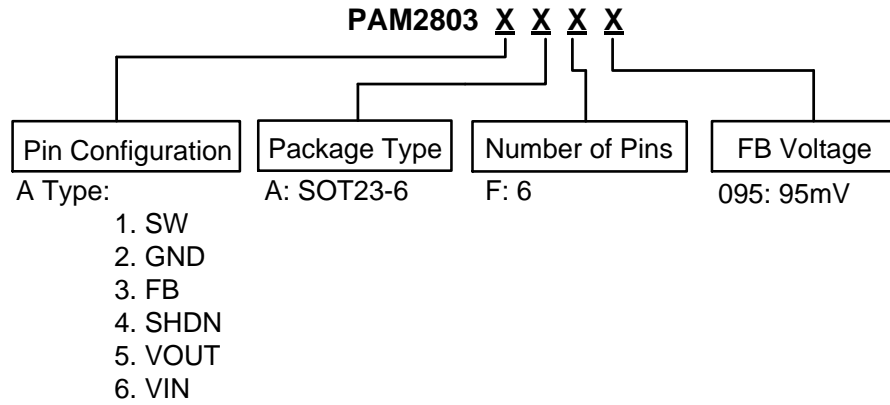
Standard Value (Ω)	I <sub>LED</sub> (mA)
0.18	528
0.15	633
0.12	792
0.10	950

### PCB Layout Guidelines

As for all switching power supplies, the layout and components placement of the PAM2803 is an important step in the design; especially at high peak currents and high switching frequencies.

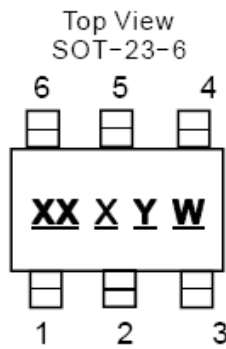
The input capacitor and output capacitor should be placed respectively as close as possible to the input pin and output pin of the IC; the inductor and schottky diode should be placed as close as possible to the switch pin by using wide and short traces for the main current path; the current sense resistor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

**Ordering Information**



Part Number	Marking	Package Type	Standard Package
PAM2803AAF095	Refer to Marking Information Below	SOT23-6	3,000 Units/Tape&Reel

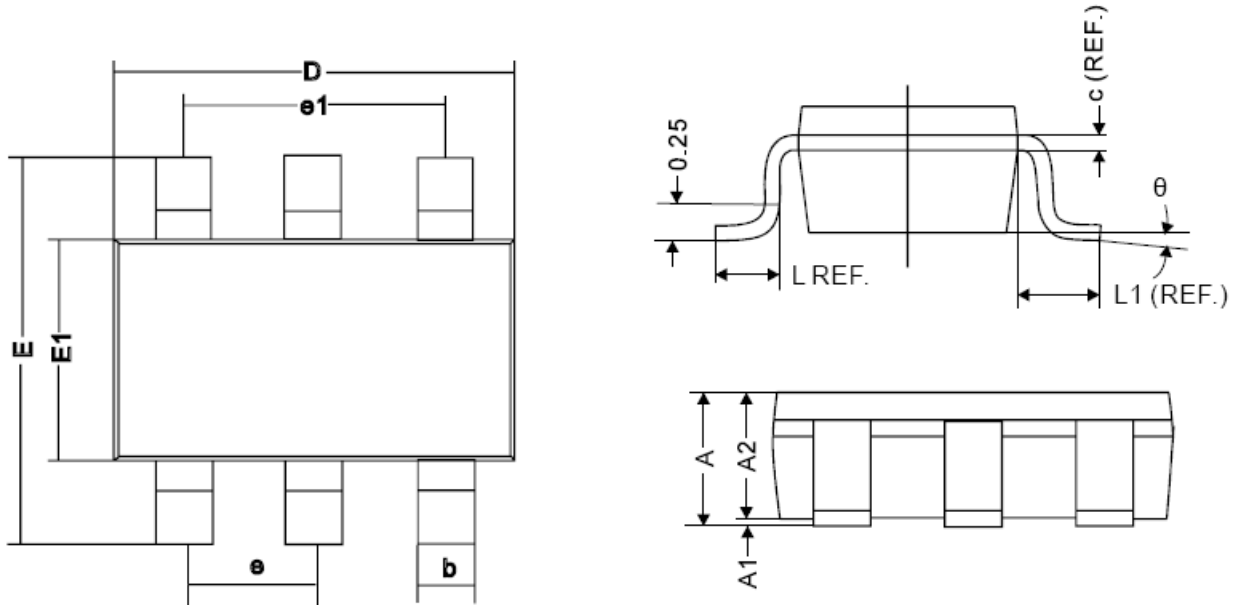
**Marking Information**



XX: Product Code  
X: Internal Code  
Y: Year  
W: Weekly

**Package Outline Dimensions** (All dimensions in mm.)

SOT23-6



REF.	Millimeter	
	Min	Max
A	1.10MAX	
A1	0	0.10
A2	0.70	1
c	0.12REF.	
D	2.70	3.10
E	2.60	3.00
E1	1.40	1.80
L	0.45REF.	
L1	0.60REF.	
$\theta$	0°	10°
b	0.30	0.50
e	0.95REF.	
e1	1.90REF.	



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