

General Description

The SUN9083 step-up switching regulator generates an output voltage of up to 28V from an input voltage as low as 2.3V. Ideal for applications where space is limited, it switches at 1.0MHz, allowing the use of tiny, low cost and low profile external components. Its internal 4A, 80mΩ NMOS switch provides high efficiency even at heavy load, while the constant frequency, current mode architecture results in low, predictable output noise that is easy to filter. Internal frequency compensation is designed to accommodate ceramic output capacitors, further reducing noise. The device features very low shutdown current of 0.5uA. The SUN9083 is available in SOT-23-6 package.

Features

- Internal 4A MOSFET Switch
- 1.0MHz Switching Frequency
- Integrated Soft-Start
- 2.3V to 24V Input Voltage
- Up to 28V Output Voltage
- Up to 93% Efficiency
- Automatic PFM Mode at Light loads
- Cost effective for using smaller devices
- Low profile(1mm):SOT-23-6 package

Application

- White LED Driver Supply
- Battery Back-up

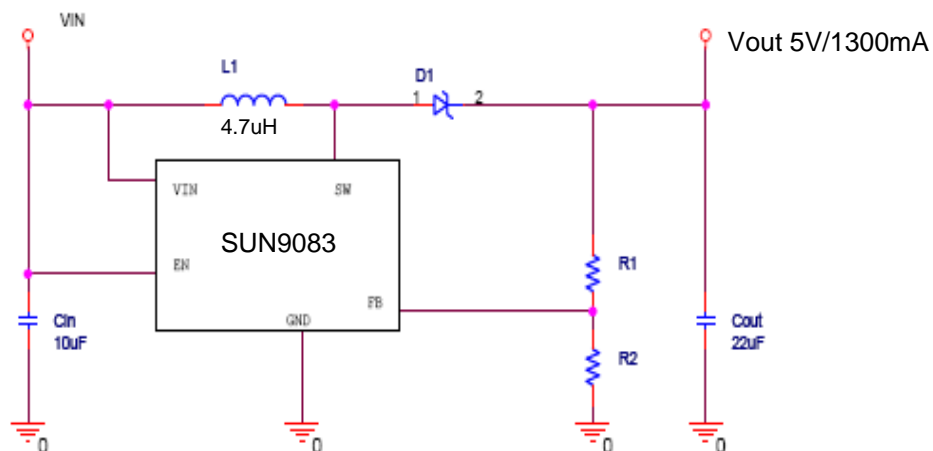
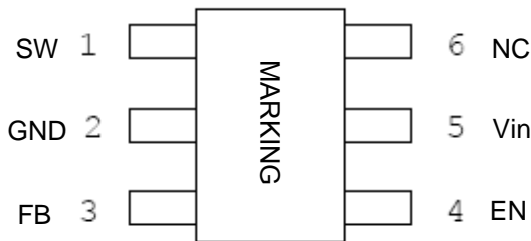


Figure 1 Typical Application Circuit

Ordering Information

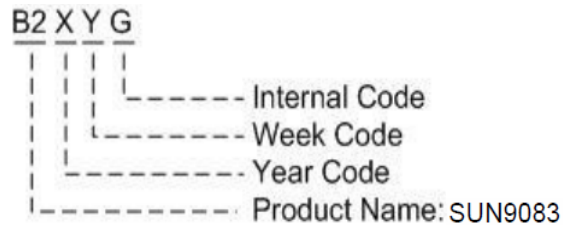
Input Voltage	Package	Pcs/Reel	Part Number (Tape and Reel)
-0.3 to 26V	SOT23-6	3000	SUN9083

Package/Order Information



SOT23-6
Figure 2 PIN Configuration

Part Number	Top Mark	Temp Range
SUN9083	B2XYG	-40°C to +85°C



Pin Description

PIN NUMBER	PIN NAME	PIN DESCRIPTION
1	SW	Switch Output. Connect this pin to the inductor.
2	GND	Ground.
3	FB	Feedback Input. The voltage at this pin is regulated to 0.6V. Connect to the resistor divider between output and ground to set output voltage
4	EN	Enable Input. When higher than 1.5V, this pin turns the IC on. When lower than 0.3V, this pin turns the IC off.
5	Vin	Power Supply
6	NC	No Connected

Absolute Maximum Ratings

(Note: Do not exceed these limits to prevent damage to the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

PARAMETER	VALUE	UNIT
Supply Voltage VIN	-0.3 to 26	V



EN Voltage	-0.3 to 26	V
SW Voltage	-0.3 to 30	V
Operating Ambient Temperature	-40 to 85	°C
Maximum Junction Temperature	125	°C
Storage Temperature	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)	300	°C

Electrical Characteristics

($V_{IN} = 3.6V$, $T_A = 25^\circ C$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range	V_{IN}		2.3		24	V
Quiescent Current	I_q	$V_{FB} = 0.7V$, $EN = V_{in}$, $I_{Load} = 0$		65	120	uA
Shutdown Current		$V_{EN} = 0V$, $V_{IN} = 3.3V$		0.5	1	
Regulated Feedback Voltage	V_{FB}	$T_a = 25^\circ C$	0.588	0.6	0.612	V
		$0 < T_a < 85^\circ C$	0.6865	0.6	0.6135	
		$-40^\circ C < T_a < 85^\circ C$	0.585	0.6	0.615	
Reference Voltage Line Regulation		$V_{IN} = 2.3V$ to $24V$		0.05	0.5	%
Output Voltage Load Regulation				0.5		%
Current Limit	I_{PEAK}			4		A
Oscillator Frequency	F_{OSC}	$V_{FB} = 0.6V$ or $V_{OUT} = 100\%$	0.8	1.0	1.2	MHz
Rds(ON) of N-channel FET		$I_{SW} = -100mA$		80	150	mΩ
Enable Threshold		$V_{IN} = 1.6V$ to $5.5V$	0.3	1.5		V
Enable Leakage Current			-0.1		0.1	μA
SW Leakage Current		$V_{EN} = 0V$, $V_{SW} = 0V$ or $5V$, $V_{IN} = 5V$			1	uA

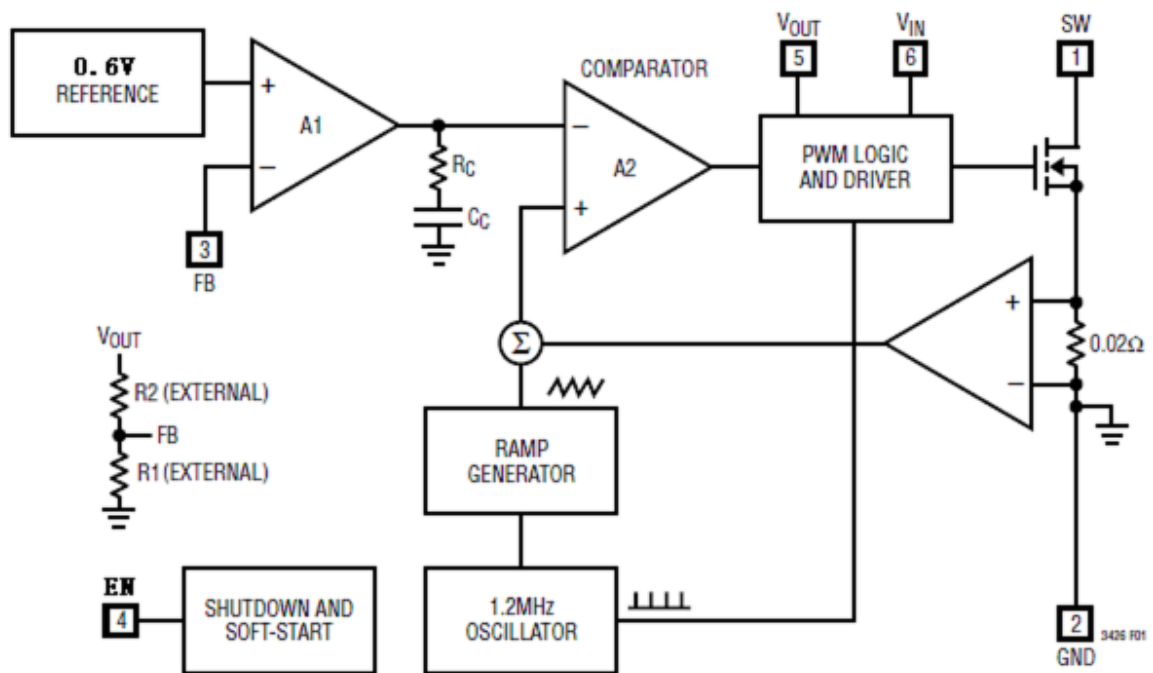


Figure 3 Functional Block Diagram

FUNCTIONAL DESCRIPTION

NORMAL OPERATION

The SUN9083 is a monolithic 1.0MHz boost converter housed in a 6-lead SOT-23 package. The device features fixed frequency, current mode PWM control for excellent line and load regulation. The low $R_{ds(on)}$ NMOS switch enables the device to maintain high efficiency over a wide range of load current. Operation of the feedback loop which sets the

peak inductor current to keep the output in regulation can be best understood by referring to the Block Diagram in Figure 1. At the start of each clock cycle a latch in the PWM logic is set and the NMOS switch is turned on. The sum of a voltage proportional to the switch current and a slope compensating voltage ramp is fed to the positive input to the PWM



comparator. When this voltage exceeds either a voltage proportional to the 4A current limit or the PWM control voltage, the latch in the PWM logic is reset and NMOS switch is turned off. The PWM control voltage at the output of the error amplifier is the amplified and compensated difference between the feedback voltage on the FB pin and the internal reference voltage of 0.6V. If the control voltage increases, more current is delivered to the output. When the control voltage exceeds the I_{LIMIT} reference voltage, the peak current is limited to a

minimum of 4A. The current limit helps protect the SUN9083 internal switch and external components connected to it. If the control voltage decreases, less current is delivered to the output. During load transients control voltage may decrease to the point where no switching occurs until the feedback voltage drops below the reference. The SUN9083 has an integrated soft-start feature which slowly ramps up the feedback control node from 0V. The soft-start is initiated when EN is pulled high.

APPLICATION INFORMATION

INDUCTOR SELECTION

The SUN9083 can utilize small surface mount inductors due to its 1.0MHz switching frequency. A 4.7 μ H or 22 μ H inductor will be the best choice for most SUN9083 applications.

The inductor should have low DCR (DC resistance) to reduce the I^2R power losses, and must be able to handle the peak inductor current without saturating.

Several inductor manufacturers are listed in Table 1 Selected inductor by actual application:

Manufacturer	Part Number	Inductance(μ H)	DCR max (Ohms)	Dimensions (mm)
Murata	LQH5BPN	4.7	0.03	5*5*2
	LQH32PN	4.7	0.06	3.2*2.5*1.7
Sumida	CDRH3D16	4.7	0.03	4*4*1.8
		4.7	0.07	

Table 1. Recommend Surface Mount Inductors

Diode Selection

A Schottky diode is recommended for use with the SUN9083. Use of a low forward voltage diode such as the ON Semiconductor MBRA210LT3 is recommended. A Schottky diode rated at 4A is recommended for use with the SUN9083.

INPUT CAPACITOR SELECTION

The input capacitor reduces input voltage ripple

to the converter, low ESR ceramic capacitor is highly recommended. For most applications, a 10~22 μ F capacitor is used. The input capacitor should be placed as close as possible to VIN and GND.

Recommended: Murata GRM32ER61A106KA01L

Murata GRM32NR61A226KE19L

OUTPUT CAPACITOR SELECTION

A low ESR output capacitor is required in order to maintain low output voltage ripple. In the case of ceramic output capacitors, capacitor ESR is very small and does not contribute to the ripple, so a lower capacitance value is acceptable when ceramic capacitors are used. A 22 μ F ceramic output capacitor is suitable for most applications.

Recommended: Murata GRM32NR61A226KE19L

OUTPUT VOLTAGE PROGRAMMING

In the adjustable version, the output voltage is set by a resistive divider according to the following equation:

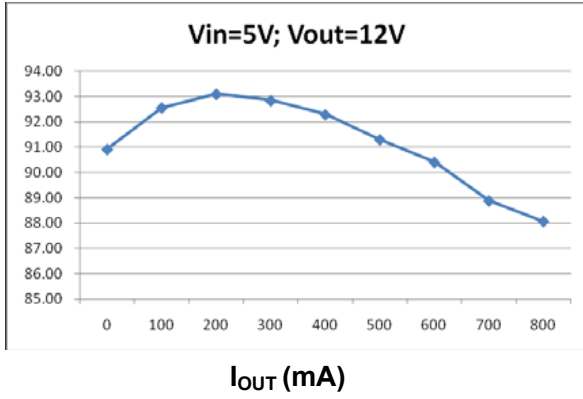
$$R_1 = R_2 \times \left(\frac{V_{OUT}}{0.6} - 1 \right)$$

Typically choose $R_2=20K$ and determine R_1 from the following equation:

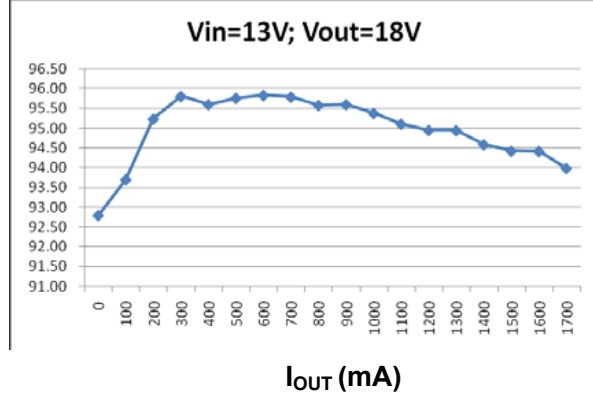
Connect a small capacitor across R_2 feed forward capacitance at the FB pin for better performance.

Typical Performance Characteristics

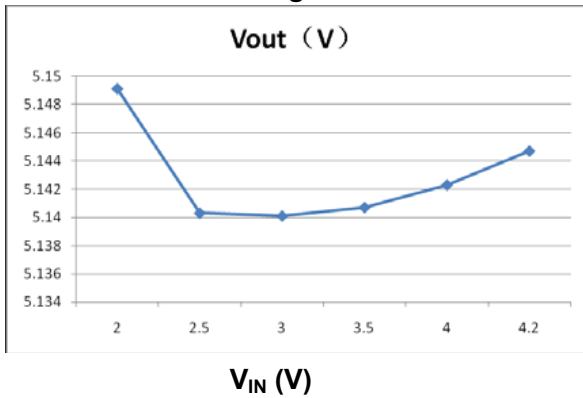
Efficiency Curve



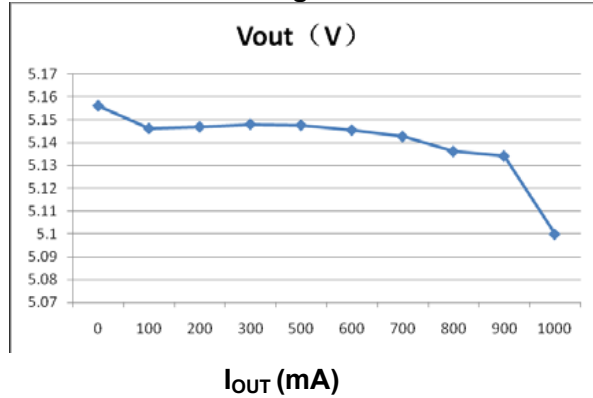
Efficiency Curve



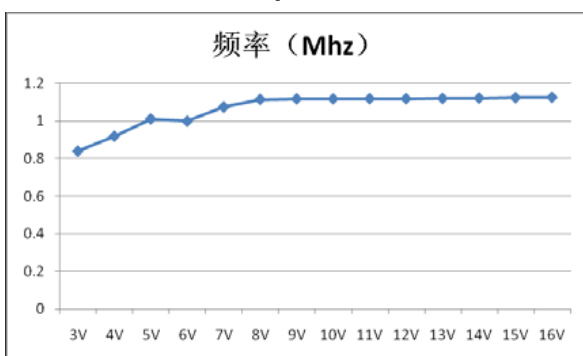
line Regulation



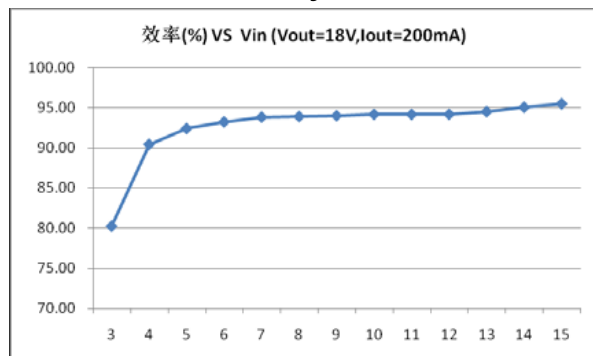
Load regulation



Freq VS V_{IN}

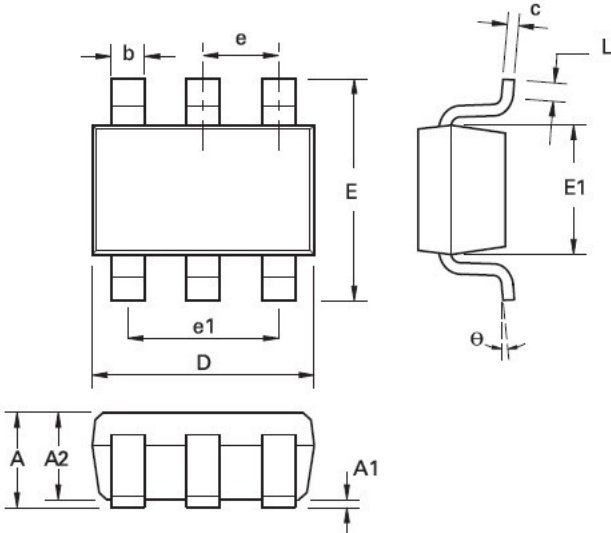


Efficiency VS V_{IN}



Surface mounted, 6 pin package

Package outline



DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.45	0.0354	0.0570
A1	0.00	0.15	0.00	0.0059
A2	0.90	1.30	0.0354	0.0511
b	0.35	0.50	0.0078	0.0196
C	0.09	0.26	0.0035	0.0102
D	2.70	3.10	0.1062	0.1220
E	2.20	3.20	0.0866	0.1181
E1	1.30	1.80	0.0511	0.0708
L	0.10	0.60	0.0039	0.0236
e	0.95 REF		0.0374 REF	
e1	1.90 REF		0.0748 REF	
L	0°	30°	0°	30°

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

