1.2MHz 26V Step-up DC/DC Converter

GENERAL DESCRIPTION

The SDB2203A is a high frequency, high efficiency DC to DC converter with an integrated 2.8A, 0.1Ω power switch capable of providing an output voltage up to 26V. The fixed 1.2MHz allows the use of small external inductions and capacitors and provides fast transient response. It integrates Soft start, Comp,. only need few components outside.

FEATURES

- 2.4V to 6V input voltage Rangel
- Efficiency up to 95%
- 26V Boost converter with 2.8A switch current
- 1.2Mhz fixed Switching Frequency
- Integrated soft-start
- Thermal Shutdown
- Under voltage Lockout
- SOT23-6 Package

APPLICATIONS

- Handheld Devices
- GPS Receiver
- Digital Still Camera
- Portable Applications
- DSL Modem
- PCMCIA Card
- TFT LCD Bias Supply

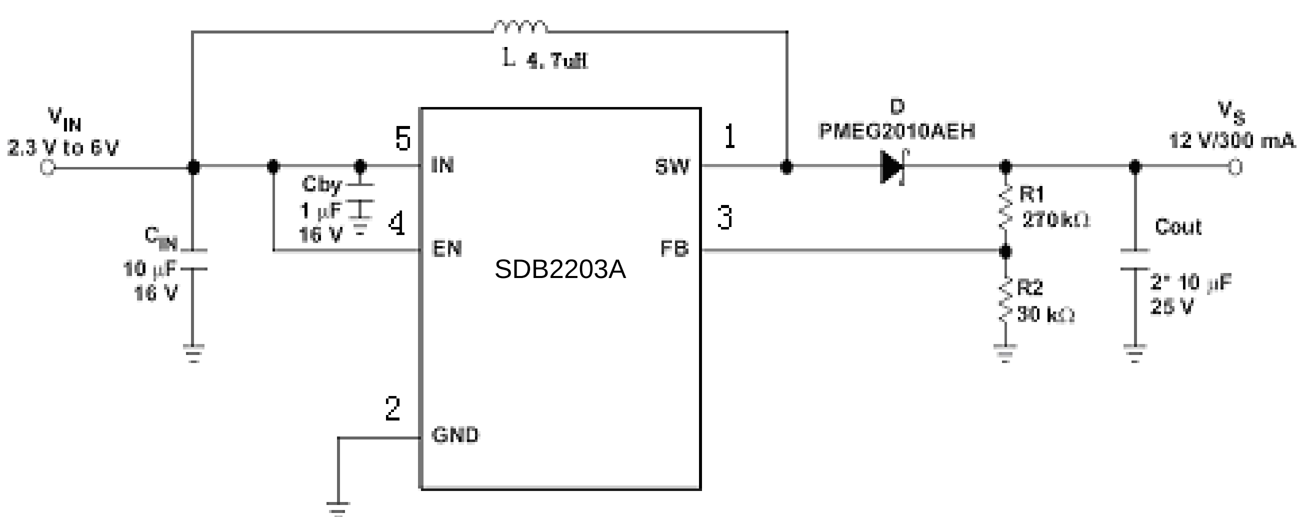
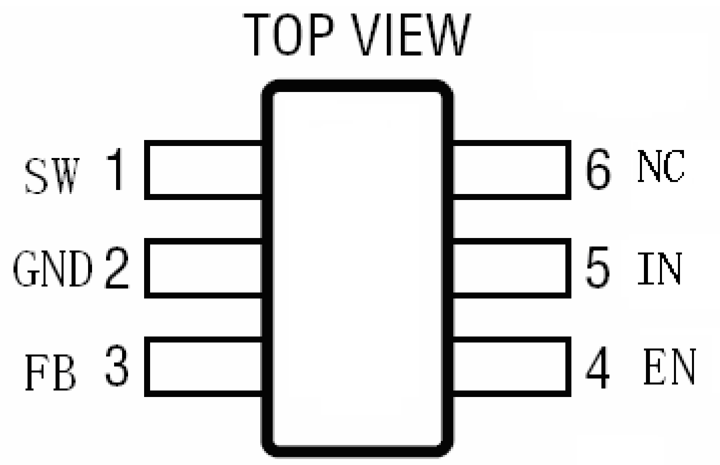


Figure 1. Typical Application Circuit

ORDERING INFORMATION

PART NUMBER	TEMP RANGE	SWICHING FREQUENCY	OUTPUT VOLTAGE (V)	ILIM (A)	PACKAGE	PINS
SDB2203A	-40°C to 85°C	1.2MHz	ADJ	2.8	SOT23-6	6

PIN CONFIGURATION



PIN DESCRIPTION

PIN NUMBER	PIN NAME	PIN DESCRIPTION
1	SW	Switch pin
2	PGND	Power ground
3	FB	Feedback pin
4	EN	Shutdown control input., Connect this pin to logic high level to enable the device
5	IN	Input power supply pin
6	NC	No Connection

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 6.5	V
FB, EN Voltage	-0.3 to VIN+0.3	V
SW Voltage	Vin+0.3 to 28V	V
Operating Ambient Temperature	-40 to 85	°C
Maximum Junction Temperature	150	°C
Storage Temperature	-55 to 150	°C

Lead Temperature (Soldering, 10 sec)	300	°C

ELECTRICAL CHARACTERISTICS

(V_{IN} = 3.6V, T_A= 25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range	V_{IN}		2.3		6.0	V
Boost output voltage range	Vout		26			V
UVLO Threshold	V_{UVLO}	$V_{HYSTERESIS}$ =100mV	2.1	2.2	2.3	V
Operating Supply Current	I_{SUPPLY}	V_{FB} =1.3V，EN=Vin, I_{Load} =0		75	135	μA
Shutdown Supply Current		V_{EN} =0V, V_{IN} =4.2V		0.1	1	
Regulated Feedback Voltage	V_{FB}		1.188	1.2	1.212	V
Peak Inductor Current	I_{PEAK}		2.5	2.8	3.0	A
Oscillator Frequency	F_{OSC}		0.9	1.2	1.5	MHz
Rds(ON) of N-channel FET		I_{SW} =-100mA		0.1	0.2	Ohm
Enable Threshold		V_{IN} = 2.3V to 5.5V	0.3	1	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

DETAILED DESCRIPTION

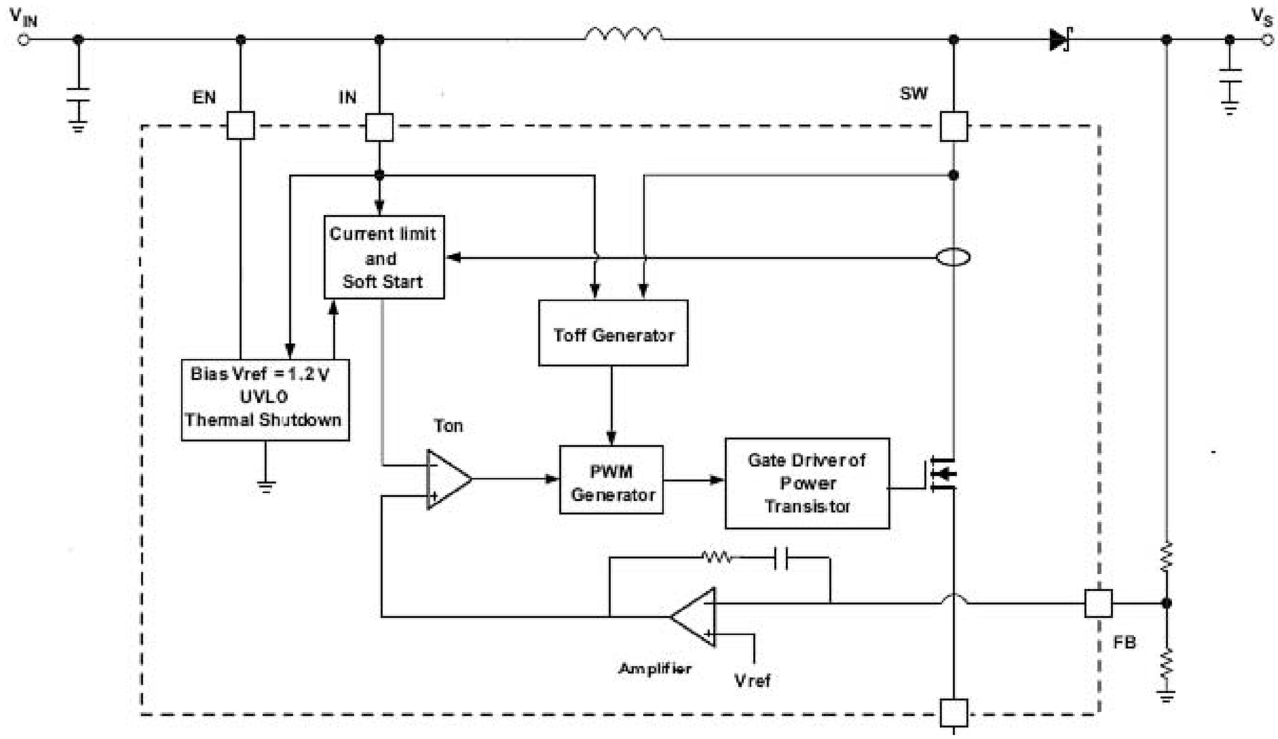


Figure 3. Functional Block Diagram

FUNCTIONAL DESCRIPTION

NORMAL OPERATION

The boost converter is designed for output voltage up to 26V with a switch peak current limit of 2.8 A. The device, which operates in a current mode scheme with quasi-constant frequency, is externally 1.2MHZ and the minimum input voltage is 2.3 V. To control the inrush current at start-up a soft-start pin is available.

During the on-time, the voltage across the inductor causes the current in it to rise. When the current reaches a threshold value set by the internal GM amplifier, the power transistor is turned off, the energy stored into the inductor is then released and the current flows through the Schottky diode towards the output of the boost converter. The off-time is fixed for a certain Vin and Vs, and therefore maintains the same frequency when varying these parameters.

However, for different output loads, the frequency may slightly change due to the voltage drop across the Rdson of the power transistor which will have an effect on the voltage across the inductor and thus on T_{on} (T_{off} remains fixed). Some slight frequency changes might also appear with a fixed output load due to the fact that the output voltage Vs is not sensed directly but via the SW Pin, which affects accuracy.

Because of the quasi-constant frequency behavior of the device , the SDB2203A eliminates the need for an internal oscillator and slope compensation, which provides better stability for the system over a wide of input and output voltages range, and more stable and accurate current limiting operation compared to boost converters operating with a conventional PWM scheme .The SDB2203A topology has also the benefits of providing very good load and line regulations, and excellent load transient response.

UNDERVOLTAGE LOCKOUT (UVLO)

To avoid mis-operation of the device at low input voltages an under voltage lockout is included that disables the device, if the input voltage falls below 2.2V

THERMAL SHUTDOWN

A thermal shutdown is implemented to prevent damages due to excessive heat and power dissipation. Typically the thermal shutdown threshold is 150℃ .When the thermal shutdown is triggered the device stops switching until the temperature falls below typically 136℃.Then the device starts switching again.

APPLICATION INFORMATION

INDUCTOR SELECTION

In normal operation, the inductor maintains continuous current to the output. The inductor current has a ripple that is dependent on the inductance value. The high inductance reduces the ripple current.

Selected inductor by actual application:

Manufacturer	***Part Number***	***Inductance(uH)***	***DRC max (Ohms)***	***Dimensions L*W*H(mm3)***
Murata	LQH44PN	3.3	0.065	4*4*1.7
		4.7	0.08	
		10	0.16	
		22	0.37	
	LQH5BP	3.3	0.044	5*5*2
		4.7	0.058	
		10	0.106	
		22	0.259	
Sumida	CDRH6D23	3.3	0.11	5*5*2.4
		4.7	0.16	

Table 1. Recommend Surface Mount Inductors

If output voltage is 5V or 12V，you can use 3.3uH or 4.7uH, or 10uH is OK，if 24V ,maybe need 10uH

Normal application: Input 3.3V (3.6V or 4.2V) to Output 5V 9V 12V 24V;

Input 5V to Output 9V 12V 24V

INPUT CAPACITOR SELECTION

The input capacitor reduces input voltage ripple to the converter, low ESR ceramic capacitor is highly recommended. For most applications, a 10uF capacitor is used. The input capacitor should be placed as close as possible to VIN and GND.

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 10uF or two 10uF ceramic output capacitor is suitable for most applications.

OUTPUT VOLTAGE PROGRAMMING

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

$$R_1 = R_2 \times \left(\frac{V_{OUT}}{1.2} - 1 \right)$$

Typically choose R2=10K and determine R1 from the following equation:

DIODE SELECTION

According to max Iout and max Vout, you can select suitable diode. Normally we select diode If=(1.5~2)*Ioutmax and VR=(1.5~2)*Voutmax. For high efficiency, suggest that you select low Vf Schottky diode.

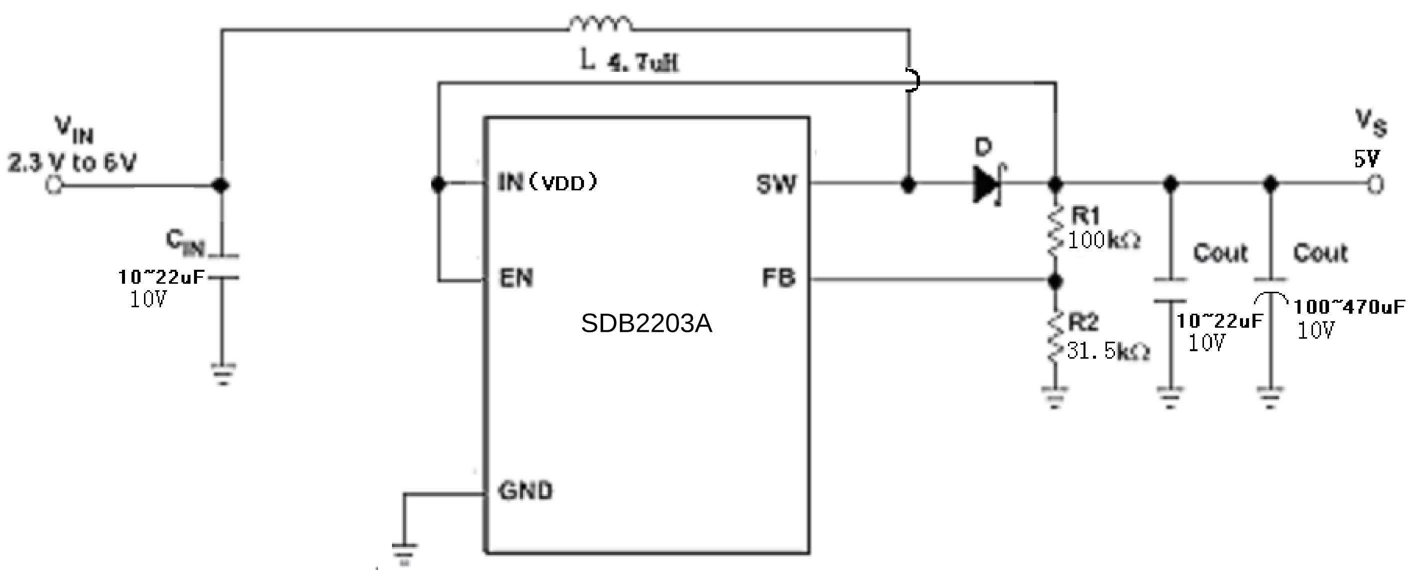
For example, 3.3V~4.2Vin 5V 1Aout,you can select MBRA210 or SS34.

5V VOUT ANOTHER TYPICAL APPLICATION

(VOUT SUPPLY POWER TO DC-DC)

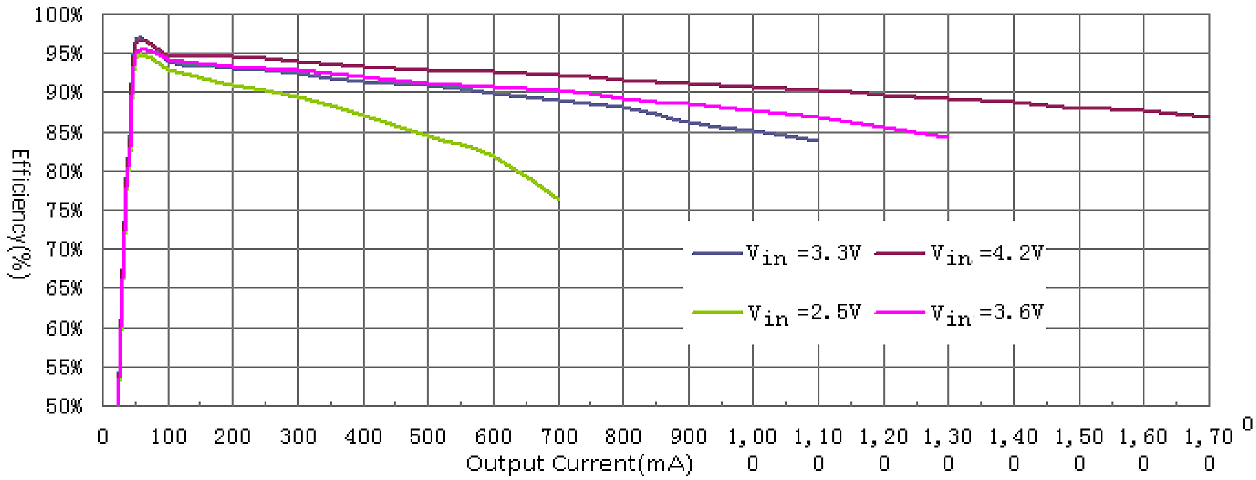
For more popular application – 5V Vout, we suggest that you use Vout to supply power to DC-DC in order to get more efficiency if Iout>700mA just as below. In this schematic, you must add 100~470uF E-Cap to limit load transient inrush ripple when unloading, if no these E-Caps, the inrush ripple maybe destroy DC-DC.

If Vout=5V Iout<700mA, we suggest you to use typical application in page 1.

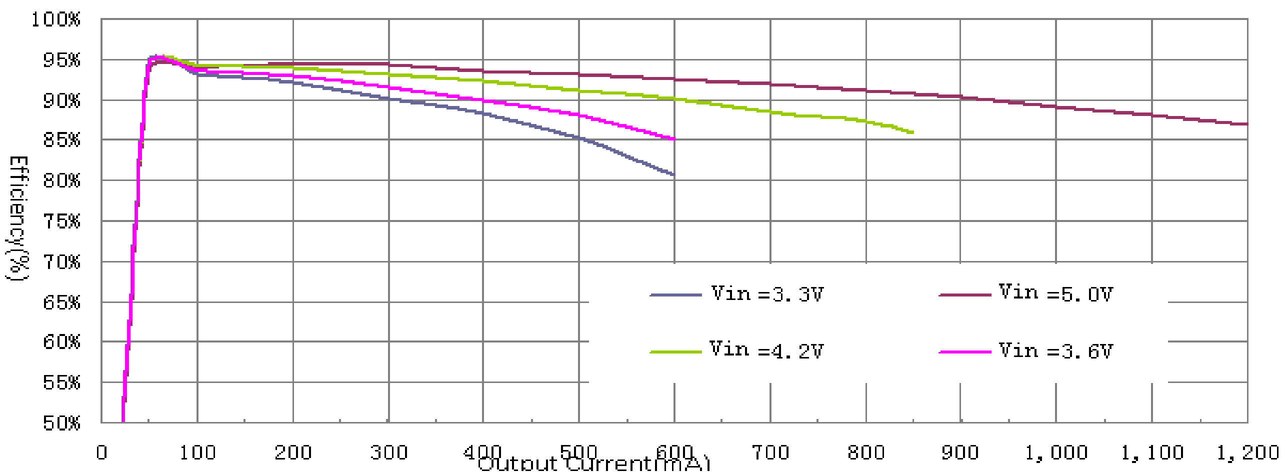


TYPICAL PERFORMANCE CHARACTERISTICS

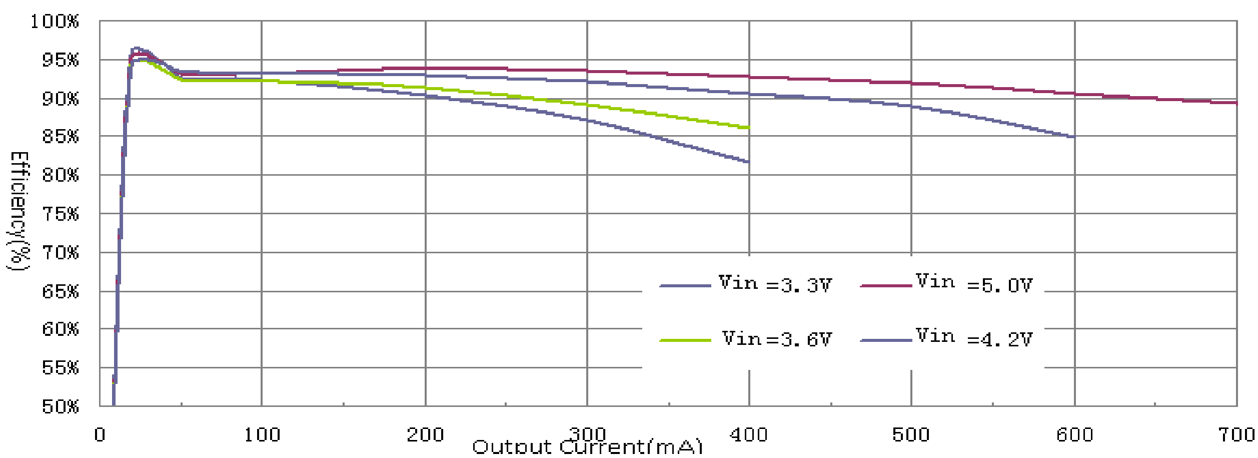
(L=4.7uH, CIN=10uF, COUT=2*10uF,if not mentioned)

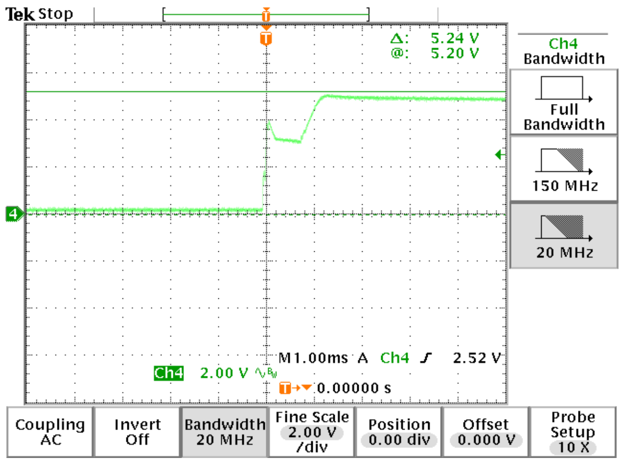


Efficiency vs. Output Current (Vout=5V)

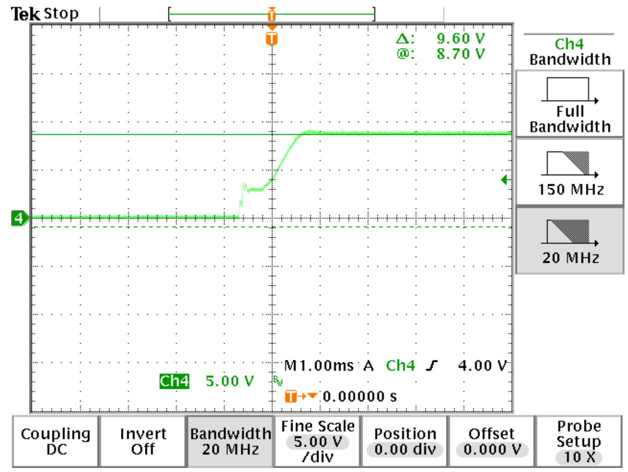


Efficiency vs. Output Current(Vout=9V) **Efficiency vs. Output Current(Vout=12V)**

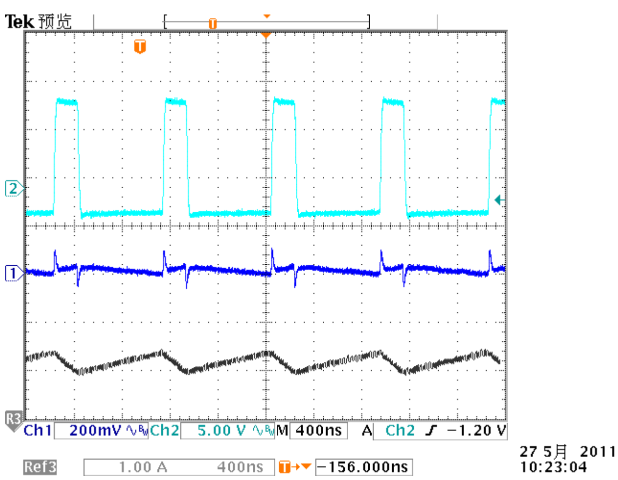




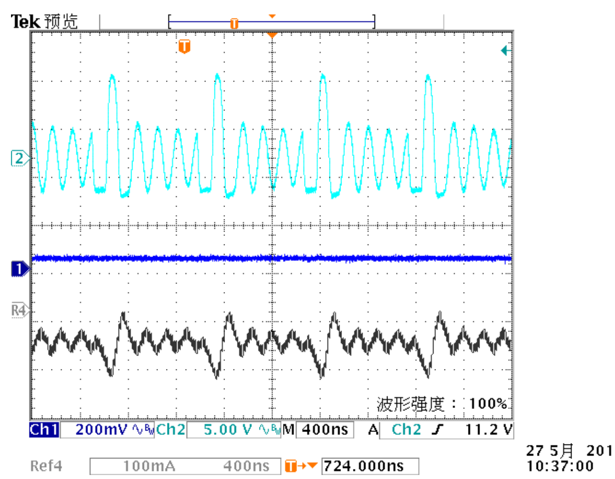
STARTUP (3.3V IN 5V 500MA OUT)



STARTUP(3.3V IN 9V 500MA OUT)

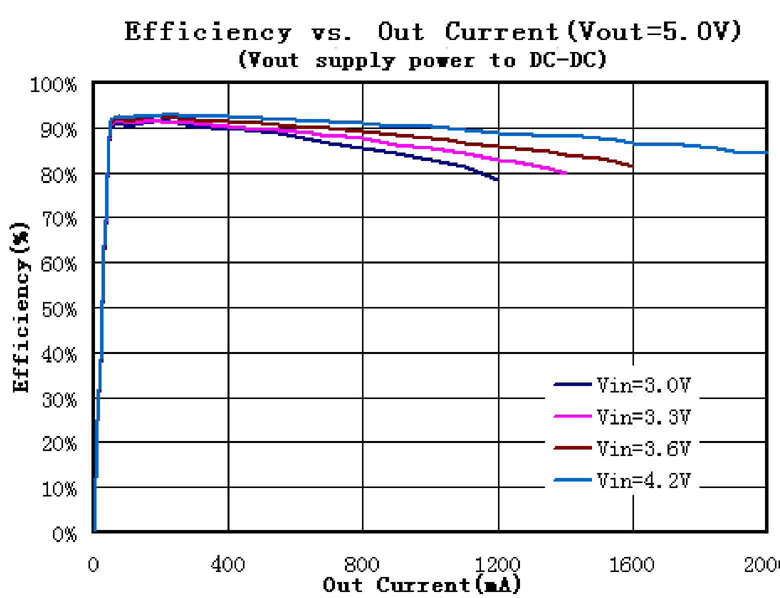


PWM SWITCHING CONTINUOUS CONDUCTION MODE



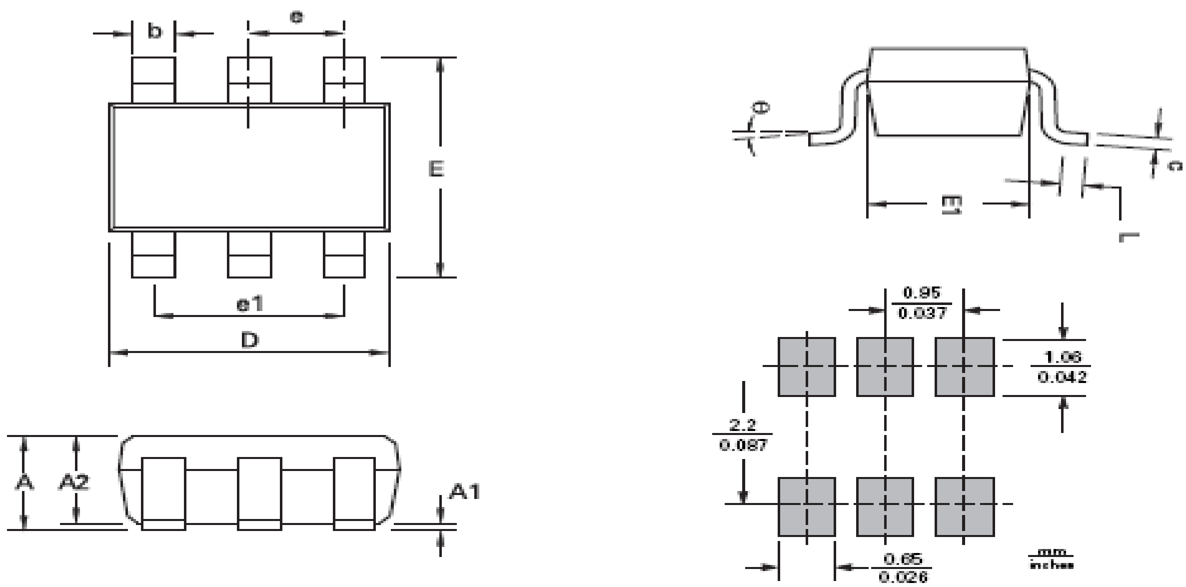
PWM SWITCHING DISCONTINUOUS CONDUCTION MODE

NOTES: The efficiency is tested under normal temperature, the actual current driver capability is 70% ~80% of the max current in sheet consider of high temperature surrounding status.



PACKAGE OUTLINE

SOT23-6 PACKAGE OUTLINE AND DIMENSIONS



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