HM3123

+85V - 2A BUCK
高耐压高效率恒压降压转换器

DESCRIPTION

The HM3123 is a monolithic step-down switch mode controller with a programmable output current limit. It achieves continuous output current over a wide input supply range with excellent load and line regulation.

The maximum output current can be programmed by sensing current through an accurate input sense resistor.

It can output constant voltage. Internal thermal shutdown, cycle-by-cycle current limit protection.

The HM3123 requires a minimum number of readily available standard external components. The chip is available in 8-pin SOIC8 packages.

HM3123,降压PWM控制器，SOP8封装，MOS外挂;
高耐压到+90V输入，0.8V的基准，完善的短路保护电路;
支持低压输入（+12V~24V），6-8A大电流输出;
支持高压输入（+75V~48V），完美支持1.5A输出
可以广泛的用于电动汽车，电动自行车，电瓶车，扭扭车，卡车。

替代 MP4688，MP4689，XL7015，XL70XX 等
电流能做得比他们大很多，系统更稳定，不容易损坏。

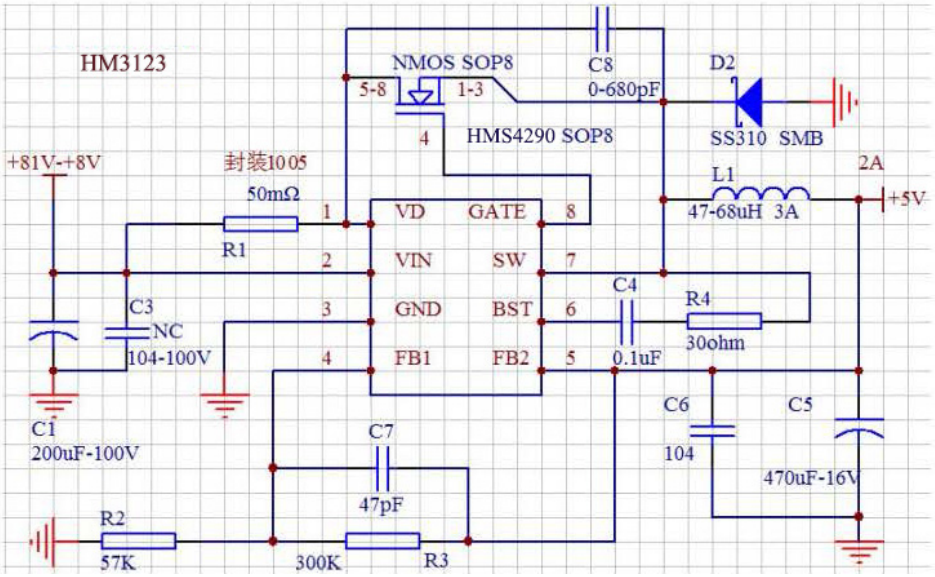
FEATURES

- Wide +8V to +85V Operating Input Range
- Programmable up to 8A Output Current when 12V input.
- Output Adjustable from 0.8V to +35V
- Programmable Output Current Limit without power loss
- Outside Power MOSFET Switch
- Mature output short protection circuit
- 85% Efficiency @ 1000mA@9Vout when +75V input
- Fixed 200KHz Frequency
- Ouput up to 2A when +72V input
- Cycle-by-Cycle Over Current Protection
- Available in 8-Pin SOIC8 Packages

支持 USB 3.0,3.1 支持 Type-C 对外充电
Support USB Type-C and USB3.0,3.1 charger

TYPICAL APPLICATION

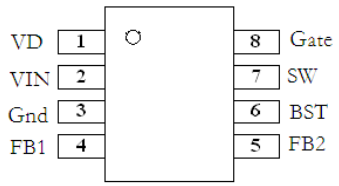
1.C8消除下过冲，请在0-680pF取值；R4消除上过冲，20-30欧；
C7根据实际板子稳定波形22pF-100pF
2.在输入输出可以各加个TVS对地保护.
3.大电流时C3不装，选择HM30N10K TO252封装的MOS 。
4.可以实现80V转5V-3A，可以实现24V转12V-5A。



ORDERING INFORMATION

PART NUMBER	HM3123
TEMPERATURE RANGE	-40°C to 85°C
PACKAGE	SOP8

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS (1)

Supply Voltage V_{IN} 90V
V_{SW} ..... -0.3V to V_{IN} + 0.3V
V_{BST} ..... VSW + 6.0V
V_{ISN}, V_{ISP} 0V to15V
All Other Pins ..... -0.3V to +6.5V
Junction Temperature ..... 150°C
Lead Temperature ..... 260°C
Storage Temperature ..... -65°C to +150°C

Recommended Operating Conditions (2)

Supply Voltage V_{IN} ..... +8V to 80V
Output Voltage V_{OUT} 0.8V to 30V
Output Voltage V_{OUT} (V_{IN}<=16.5V)..... .0.8V to (V_{IN}-3.0)V
Operating Temperature ..... -40°C to +85°C

Thermal Resistance (3) θ_{JA} θ_{JC}
SOIC8 ....50 ..... 10 ... °C/W

Notes:
1) Exceeding these ratings may damage the device.
2) The device is not guaranteed to function outside of its operating conditions.
3) Measured on approximately 1" square of 1 oz copper.

PIN No.	PIN NAME	PIN DESCRIPTION
1,2	VD, VIN	Supply Voltage. It operates from +8V to +80V.Use a resistor between Vd and pin2 to limit current. C_{IN} is needed to prevent large voltage spikes at the input. Put C_{IN} as close to the IC as possible. It is also drain of the external power device and power supply for the whole system.
3	Gnd	Ground. This pin is the voltage reference for the regulated output voltage. For this reason care must be taken in its layout. This node should be placed outside of the D1 to C_{IN} ground path to prevent switching current spikes from inducing voltage noise into the part.
4,5	FB1,FB2	Feedback. FB1: An external resistor divider from the output to GND, tapped to the FB pin sets the output voltage via the 0.8V reference. FB2: detect the ouput voltage to stable the system.
6	BST	Bootstrap. This pin acts as the positive rail for the high-side switch's gate driver. Connect a 104 cap between this pin and SW.
7	SW	Switch Output. To the switching of the inductor together with the source of MOS
8	GATE	Drive the external switching NMOS gate

ELECTRICAL CHARACTERISTICS

V_{IN} = 12V, T_A = +25°C, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Feedback Voltage	V_{FB}	8V ≤ V_{IN} ≤ 80V	0.785	0.805	0.825	V
Feedback Bias Current	$I_{BIAS(FB)}$	V_{FB} = 0.8V		10		nA
Oscillator Frequency	f_{SW}	V_{FB} = 0.8V	175	200	225	KHz
Boot-Strap Voltage	V_{BST} - V_{SW}			6.4		V
Minimum On Time (4)	t_{ON}	V_{FB} = 1V		100		ns
Under Voltage Lockout Threshold Rising			3.0	3.3	3.6	V
Under Voltage Lockout Threshold Hysteresis			200			mV
Supply Current (Quiescent)		V_{EN} = 2V, V_{FB} = 1V		400	500	μA
Thermal Shutdown(4)				160		℃

Note:
4) Guaranteed by design

EFFICIENCY TEST效率测试表：

INPUT	Iout	Vout	Efficiency
12V	1A	5V	87%
24V	1A	5V	85%
48V	1A	5V	81%
60V	1A	5V	79%
72V	1A	5V	77%
60V	1.5A	5V	80%
60V	2A	5V	80%
24V	1A	12V	93%
48V	1A	12V	91%
60V	1A	12V	89%
72V	1A	12V	88%

更换电感或其他 NMOS
就会测试到不同的效率

限流电阻对应的负载电流

INPUT	R1(limit)	Iout(max)
12V	50mohm	1.34A
48V	50mohm	1.53A
72V	50mohm	1.61A
12V	75mohm	0.89A
48V	75mohm	0.95A
72V	75mohm	1.01A
12V	100mohm	0.64A
48V	100mohm	0.66A
72V	100mohm	0.74A

If the ouput current is over the current in the form, should modify the resistor to start up.
负载超过了表格中的电流,将不能带负载启动,必须改小电阻后才可以启动.
OCP 限流也是很好的电路保护措施,也对输出的短路保护电路有帮助.

APPLICATION and PCB reference:

1. Put input capacitor close to HM3123 and larger than 100uF or 200uF if over 60V input.
尽量把输入电容靠近芯片输入脚,容量不小于**100uF**,如输入电压超过**70V**,最好在输入对**GND**加**80V**的**TVS**管,防止过冲.

2. Put Schottky diode close to SW and GND pin of chip, choose better heat-sink package like SMB or SMC.
尽量把肖特基二极管靠近芯片的**SW**脚与**GND**，选择**SMB**或**SMC**等散热好的封装.电流耐压都要有**20%**以上的余量.

3. Choose high efficiency inductor, like the Iron-silicon-aluminum, or some SMT inductors.
尽量选择材质好点的贴片电感或铁硅铝电感.标称电流相对实际电流要有**50%**的余量.

4. The external NMOS, choose the Vds value 20V higher than the input volage at least.
外置**MOS**的标称耐压要比实际的输入电压高**20V**,譬如输入**70V**，选择**100V**的**MOS**.

5. The external NMOS, choose the I(D) value 8-12 times higher than the output current at least.
外置**MOS**的标称耐流要比实际的输出电流高**8-12**倍,譬如输出**1A**，建议选择**10A**的**MOS**.

6. In order to reduce output ripple, the output capacitor should be larger than 220uF.
为了得到更好的输出纹波,输出电容别小于**220uF**.

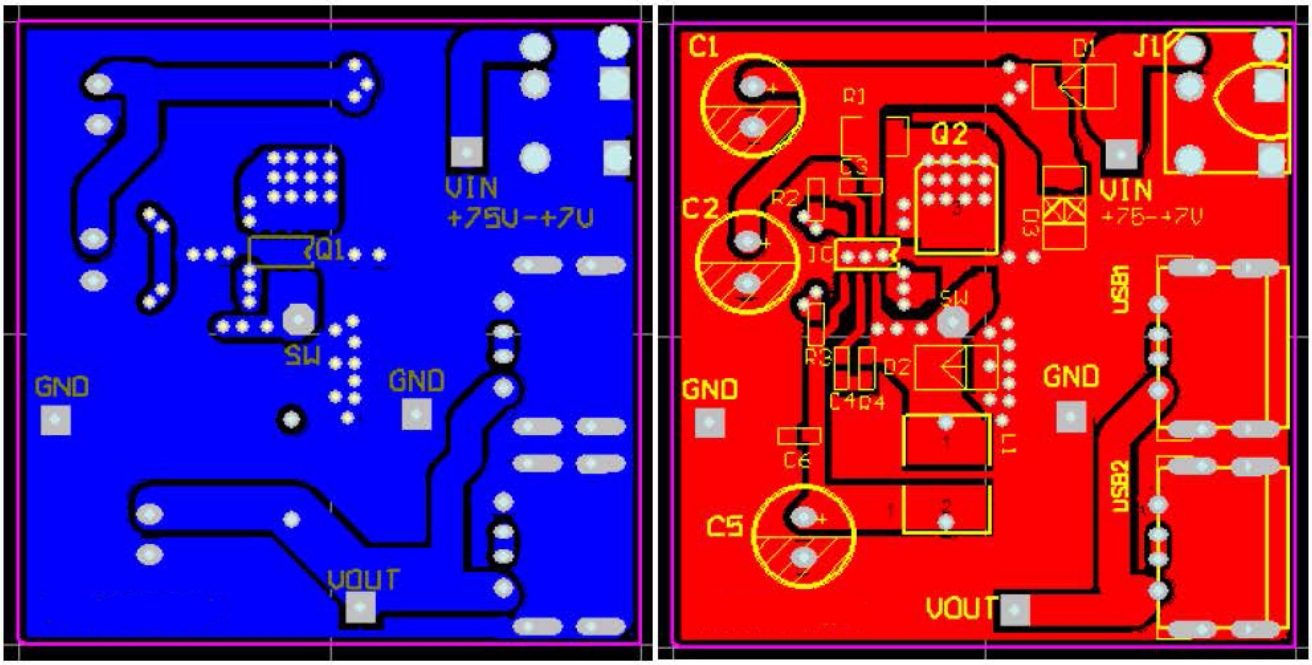
7. In order to reduce the heat, use more ground area all around PCB.
为了得到更好的散热,**PCB**板上,**IC**的底部与周边空的地方,包括**PCB** 的正反面全部铺满地.

8. Vout = 0.8V * (1 + R3/R2)
R2 = 47K ~ 82K

9. If need 5A-6A or 8A output when +12-24V input, should use the inductors strong enough, And also the external NMOS use the HM75N06K, the schottky should also choose the 10A or larger.
如果是**12-24V**输入，输出**5V,6-8A**的应用，除了电感有足够的余量,**NMOS**建议选用**HM75N06K**,二极管要能达到接近**10A**.

10. C7 and R4 are also necessary for loop stable and EMC pass.
C7与**R4**也是环路工作稳定与过**EMC**必不可少的小贴片器件.

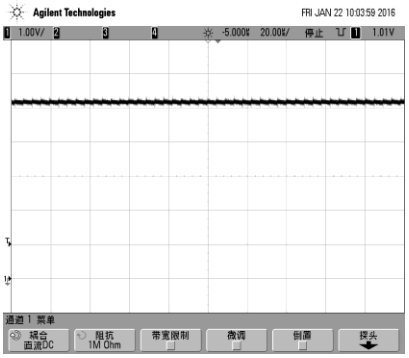
11. Here below the PCB reference, support both TO252 or SOP8 N-MOSFET.
如下是同时支持**TO252**与**SOP8**的**NMOS**的参考**PCB**图。



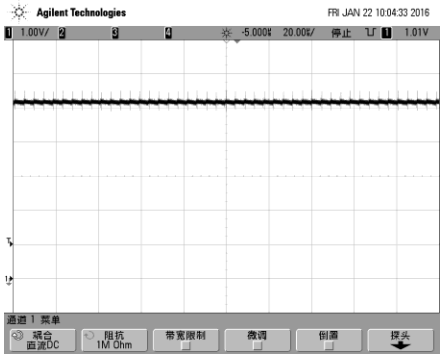
TYPICAL PERFORMANCE CHARACTERISTICS

C1=C2=100μF, C5=470μF, L=47μH, T_A=25ºC, unless otherwise noted

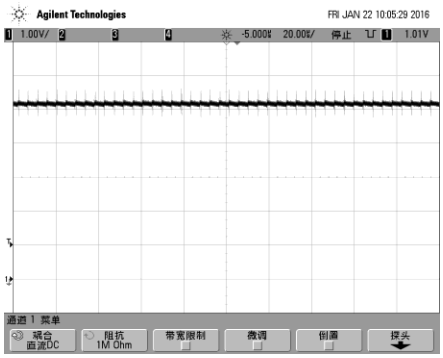
VIN=60V,VOUT=5V,Iload=0.5A



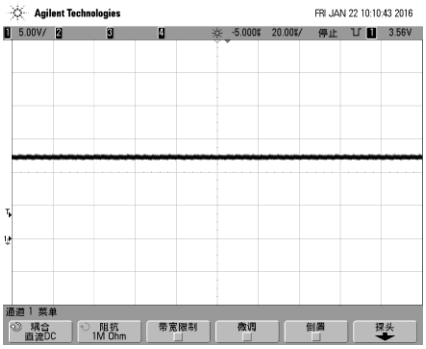
VIN=60V,VOUT=5V,Iload=1.0A



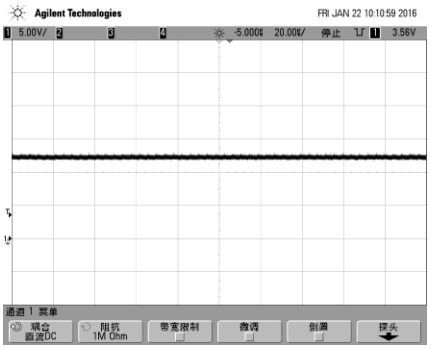
VIN=60V,VOUT=5V,Iload=1.5A



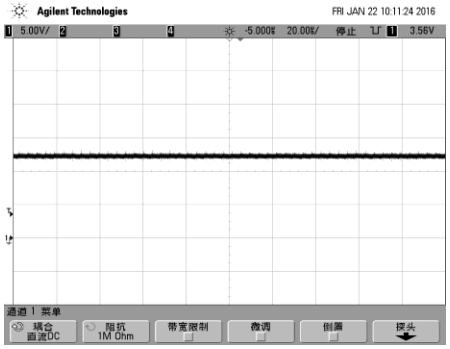
VIN=60V,VOUT=12V,Iload=0.5A



VIN=60V,VOUT=12V,Iload=1.0A

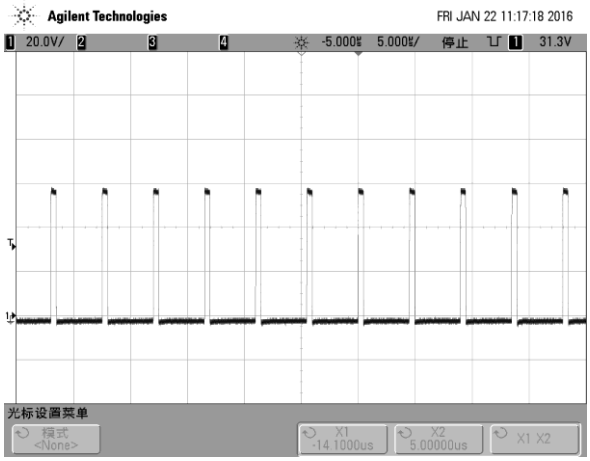


VIN=60V,VOUT=12V,Iload=1.5A



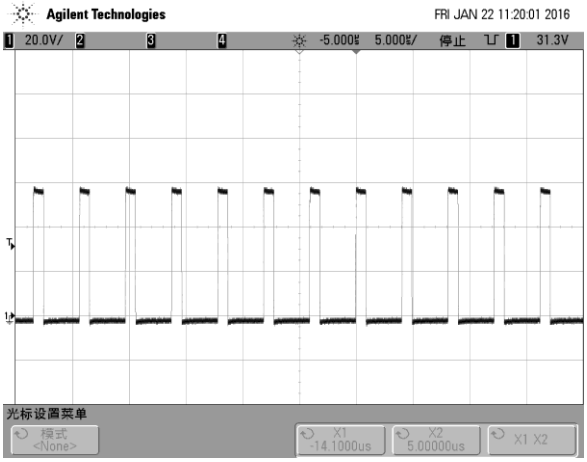
SW WAVE

VIN=60V,VOUT=5V,Iload=1.5A



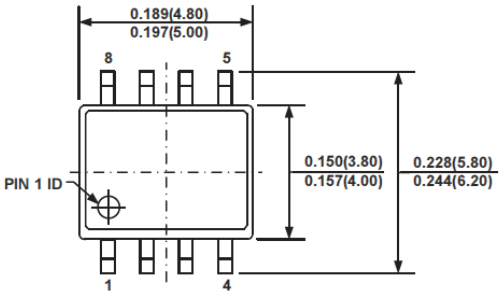
SW WAVE

VIN=60V,VOUT=12V,Iload=1A

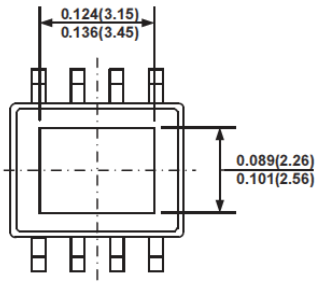


PACKAGE OUTLINE

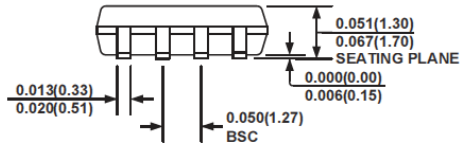
SOP8 PACKAGE OUTLINE AND DIMENSIONS



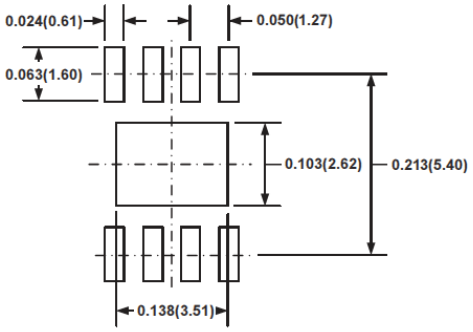
TOP VIEW



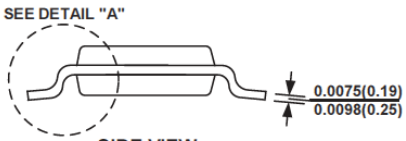
BOTTOM VIEW



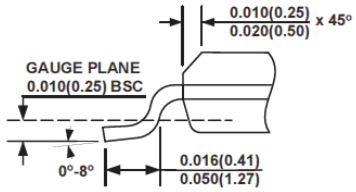
FRONT VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



DETAIL "A"

NOTE:

1) CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
2) PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3) PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
4) LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
5) DRAWING CONFORMS TO JEDEC MS-012, VARIATION BA.
6) DRAWING IS NOT TO SCALE.