2.0A, ~16V Input, 600kHz Synchronous Step-Down(buck) Converter

PRELIMINARY DATASHEET

Datasheet Brierf

GENERAL DESCRIPTION

The FH46302 is a fully integrated, high-efficiency 2.0A synchronous rectified step-down converter. The FH46302 operates at high efficiency over a wide output current load range.

This device offers two operation modes, PWM control and PFM Mode switching control, which allows a high efficiency over the wider range of the load.

The FH46302 requires a minimum number of readily available standard external components and is available in an 6-pin SOT23 ROHS compliant package.

TYPICAL APPLICATION CIRCUIT

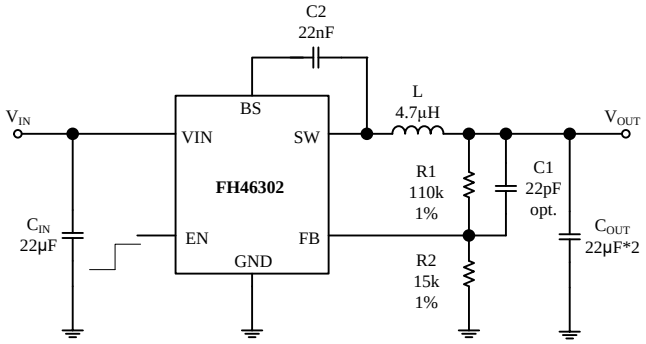
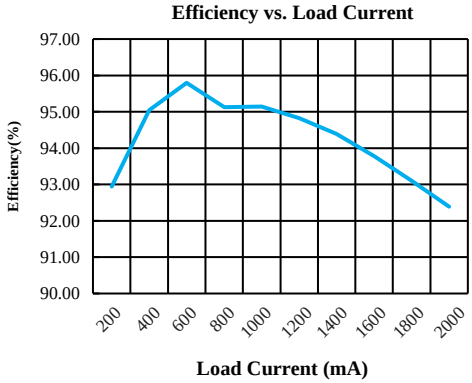


Figure 1. Basic Application Circuit



KEY FEATURES

- Input Voltage Range: 4.5V to 16V
- 2.0A Output Current
- High Efficiency: Up to 96%
- 600KHz Frequency Operation
- No Schottky Diode Required
- 0.6V ±1% Reference Voltage
- Slope Compensated Current Mode Control for Excellent Line and Load Transient Response
- Integrated internal compensation
- Stable with Low ESR Ceramic Output Capacitors
- Over Current Protection with Hiccup-Mode
- Thermal Shutdown
- Inrush Current Limit and Soft Start
- Available in SOT-23-6L Package
- Temperature Range: -40°C to +85°C

APPLICATIONS

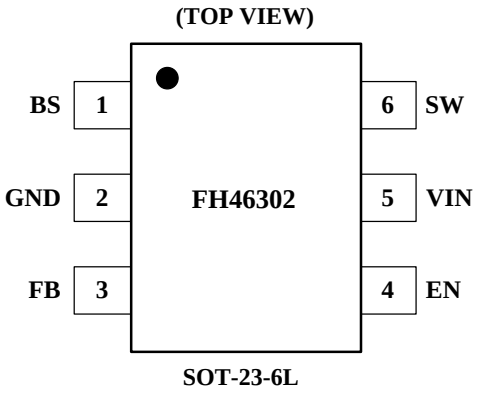
- Distributed Power Systems
- Digital Set Top Boxes
- Flat Panel Television and Monitors
- Wireless and DSL Modems
- Notebook Computer

Device Information

PART NUMBER	PACKAGE (1)	BODY SIZE (NOM)
FH46302	SOT-23 (6L)	2.90mm x 1.60mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

PIN CONFIGURATION



PIN DESCRIPTION

Pin Number	Pin Name	Description
1	BS	Bootstrap. A capacitor connected between SW and BS pins is required to form a floating supply across the high-side switch driver. Must connect a 0.1uF or greater ceramic capacitor between BS pin and SW node.
2	GND	Analog ground pin. Must be soldered directly to ground plane.
3	FB	Adjustable version feedback input. Connect FB to the center point of the external resistor divider. The device regulates FB to the internal reference of 0.6V typical.
4	EN	Drive this pin to a logic-high to enable the IC. Drive to a logic-low to disable the IC and enter micro-power shutdown mode.
5	VIN	Power supply Pin. VIN supplies the power to the IC, as well as the step down converter switches. Drive VIN with a 4.5V to 16V power source. Bypass VIN to GND with a suitably large capacitor to eliminate noise on the input to the IC. See Input Capacitor.
6	SW	Switching Pin. SW is the switching node that supplies power to the output. Connect the output LC filter from SW to the output load. Note that a capacitor is required from SW to BS to power the high-side switch.

工作原理

FH46302 是一款高效率的同步整流降压转换器芯片，集成两颗低导通电阻 NMOSFET 功率开关，采用自举电容为高侧开关的驱动供电，输入电压最高 18V，可带 2.0A 负载电流，采用恒定导通时间控制架构，具有较快的负载瞬态响应，在轻载时工作模式为 PFM，重载时工作模式为 PWM。

软启动

当 EN 从逻辑低变为逻辑高时，芯片内部控制电路的各模块开始依次工作，在 0.6 V 参考电压建立起来之后，内部一个电流对一个电容充电，电容上的电压作为软启动控制电压代替 VREF 控制误差放大器，在 2ms 时间内软启动电压上升至 0.6V，输出电压也跟随上升至设定的电压，这样可以避免启动时较大的突入电流和输出电压过冲。

轻载高效工作

当负载电流从重载逐渐减小到轻载时，电感电流也相应减小，当电感电流谷值下降到 0 A 时芯片开始工作在 PFM，每个开关周期先对电感进行固定时间的充电，输出电压上升至一个较高的电位，充电结束后高侧开关关断，低侧开关打开，电感开始放电，然后检测电感放电至 0 A 后关断低侧开关，电路处于双截至状态，由于负载电流减小，需要更长时间输出电压才能下降至设定的电压，之后会重新触发新的开关周期，负载的减小会让开关频率跟随下降。

输出短路保护

当输出短路时，芯片会自动停止开关切换一段时间(约 3.5ms)，之后芯片自动恢复工作，重新软启动，工作一段时间(3ms)之后，如果输出依然短路芯片会再次停止开关切换，芯片会一直重复停止工作和重新软启动直到解除输出短路状态，输出电压会软启动上升至设定值。

设定输出电压

通过选择 R1、R2 来设定输出电压，为了获得较好的功耗与噪声性能，建议 R1、R2 阻值在 10kΩ到 1MΩ之间，具体关系参考公式。

电感选择

电感选择时需要保证满负载工作时电感电流处于限流点以下，电感电流峰值大小计算公式如下，需要保证输出电流最大时 I_{PEAK} 小于芯片峰值限流值 5.5A 和电感的饱和电流，同时电感 DCR 要足够小来确保系统满足期望的效率要求。

自举电容选择

FH46302 采用自举电容来为高侧 NMOSFET 功率开关的驱动供电，建议自举电容采用不低于 0.1uF 的陶瓷电容。

输入电容选择

FH46302 芯片工作时，每次开关切换时 VIN 端和 GND 之间会存在较大的干扰，电容 C_{IN} 有助于减小干扰并提高系统工作的稳定性，并且考虑到电压达到额定电压时容值出现较大损耗，C_{IN} 电容的额定电压要超过最高输入电压，建议采用 1206 封装的 47uF 陶瓷电容并且距离芯片尽可能近地摆放。

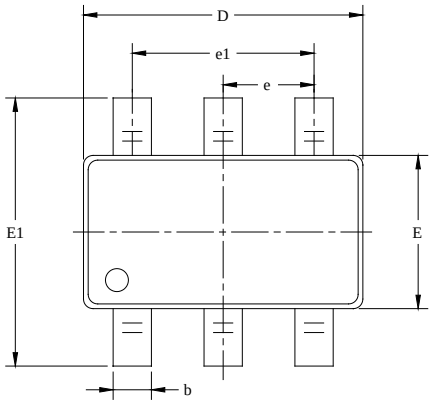
输出电容选择

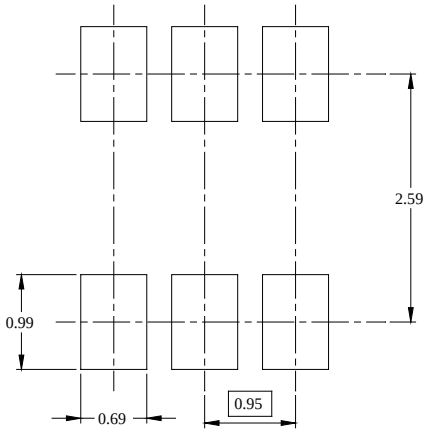
FH46302 构成的降压 DC-DC 转换器系统需要输出滤波电容，较小的电容会影响系统稳定性，并且短路保护解除瞬间 V_{OUT} 会出现较大过冲，这可能会损坏用电设备，选择 0805 封装的 2*30uF 陶瓷电容可以获得较小的 V_{OUT} 纹波。

（申明：本篇应用文本依据英文内容提取，目的是帮助电路设计人员对 FH46302 应用信息快速了解，如有错漏，请参考英文描述。）

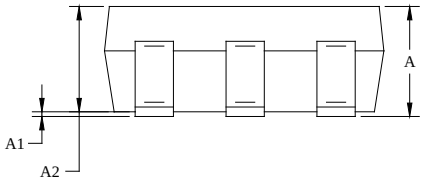
PACKAGE INFORMATION

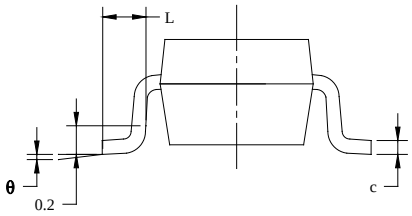
- **Type: SOT-23-6L**





RECOMMENDED LAND PATTERN(Unit: mm)





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Note:

1) All dimensions are in millimeters.

2) Package length does not include mold flash, protrusion or gate burr.

3) Package width does not include inter lead flash or protrusion.

4) Lead popularity (bottom of leads after forming) shall be 0.10 millimeters max.

5) Pin 1 is lower left pin when reading top mark from left to right.

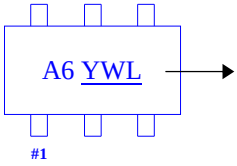
ORDERING INFORMATION

Part Number	Input Voltage	Features	Operating Temperature	Package Type	Top Mark	SPQ
FH46302M6	4.5 ~ 16.0V	● DC-DC synchronous buck ● Efficiency: Up to 96% ● Frequency: 0.6MHz ● Current limit: 2.0A ● 0.6V Reference	-40℃ to +85℃	SOT-23-6L	A6 Y W L	3000EA/Reel (Vacuum packing)

Note:

- **FH46302** devices are Pb-free and RoHs compliant.
- The surface prints of our semiconductor devices are subject to change during the production process and do not involve changes in electrical parameters, and we will not separately state the notice.
- If you have any other custom purchase needs, please contact our sales department.
- FOCMCU Inc. reserves the right to amend and legally interpret the electrical parameters of this chip device. (http://www.fordevices.com)

Device Name: SOT-23-6L



A6: Device Code
YWL: Date Code

ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

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▲ Update by Nov.2022