Micropower Synchronous Buck-Boost DC-DC Regulator

PRELIMINARY DATASHEET

Datasheet Brierf

Description

The FH3440 is high efficiency, fixed frequency, Buck-Boost DC-DC converters which operates from input voltages above, below or equal to the output voltage. The devices are suitable for single Li-ion, multicell alkaline or NiMH applications where the output voltage is within the battery voltage range.

The switching frequencies up to 1.50MHz could be fixed by employing an external resistor, and the oscillator could be synchronized to an external clock. The quiescent current is 1.0mA, and this feature maximizing the battery life in portable applications.

Other features include a 1.0μA shutdown, soft-start control, thermal shutdown and current limit. The FH3440 converters are available in the 10-pin thermally enhanced MSOP packages (or upon request).

Package Information

- Type: 10-Pin MSOP

Features

- Synchronous rectification: Up to 95% efficiency
- Single inductor
- Fixed frequency operation with battery voltages above, below or equal to the output
- Quiescent current: 1.0mA
  (50uA low power mode: mode pin high)
- Up to 600mA continuous output current
- Input and output voltage range: 1.8V to 5.5V
- Programmable oscillator frequency from: 350kHz to 1.5MHz
- No Schottky Diodes required
- V_{OUT} disconnected from V_{IN} during shutdown
- Shutdown current: $I_Q < 1.0\mu A$
- Package: small thermally enhanced 10-pin MSOP

Application

- Palmtop computers
- Handheld instruments
- MP3/MP4 players
- Digital cameras and Wireless handsets

Typical Application Circuit

(Li-Ion to 3.3V at 600mA Buck-Boost Converter)

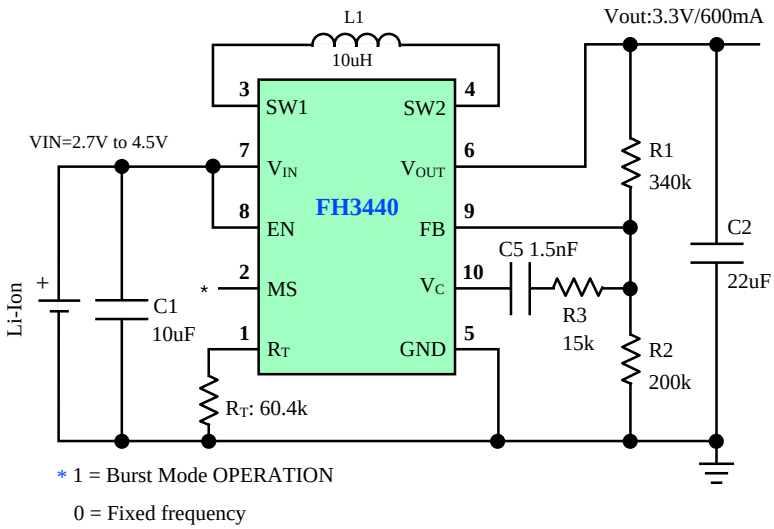
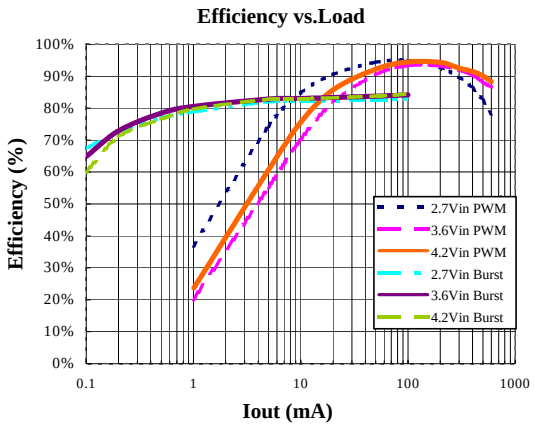
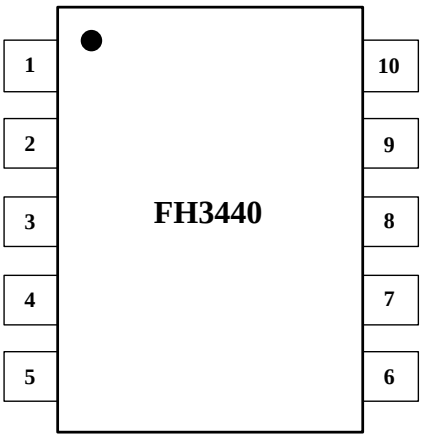


Figure 1. FH3440 Basic Application Circuit



Pin Assignment

Pin Assignment	MSOP-10L		
	PIN NUMBER	PIN NAME	FUNCTION
(TOP VIEW)  MSOP-10L	1	RT	Program the Oscillator Frequency
	2	MS	MODE/SYNC
	3	SW1	Switch 1
	4	SW2	Switch 2
	5	GND	Ground
	6	VOUT	Output
	7	VIN	Input
	8	EN	ON/OFF Control (High Enable)
	9	FB	Feedback
	10	VC	Error Amp Output

Pin Description

PIN NAME	PIN NUMBER	DESCRIPTION
R_T	Pin 1	Timing Resistor to Program the Oscillator Frequency. The programming frequency range is 350kHz to 1.5MHz. $f_{OSC} = \frac{6 \bullet 10^{10}}{R_T}$ Hz
Mode/ SYNC	Pin 2	MODE/SYNC = External CLK: Synchronization of the internal oscillator. A clock frequency of twice the desired switching frequency and with a pulse width between 100ns and 2μs is applied. The oscillator free running frequency is set slower than the desired synchronized switching frequency to guarantee sync. The oscillator RT component value required is given by: $R_T = \frac{8 \bullet 10^{10}}{f_{sw}}$ where f_{SW} = desired synchronized switching frequency.
SW1	Pin 3	Switch Pin Where the Internal Switches A and B are Connected. Connect inductor from SW1 to SW2. An optional Schottky diode can be connected from SW1 to ground. Minimize trace length to keep EMI down.
SW2	Pin 4	Switch Pin Where the Internal Switches C and D are Connected. For applications with output voltages over 4.3V, a Schottky diode is required from SW2 to V_{OUT} to ensure the SW pin does not exhibit excess voltage.
GND	Pin 5	Signal and Power Ground for the IC.
V_{OUT}	Pin 6	Output of the Synchronous Rectifier. A filter capacitor is placed from V_{OUT} to GND.
V_{IN}	Pin 7	Input Supply Pin. Internal VCC for the IC. A ceramic bypass capacitor as close to the VIN pin and GND (Pin 5) is required.
EN	Pin 8	Combined Soft-Start and Shutdown. Grounding this pin shuts down the IC. Tie to > 1.5V to enable the IC and > 1.8V to ensure the error amp is not clamped from soft-start. An RC from the shutdown command signal to this pin will provide a soft-start function by limiting the rise time of the VC pin.
FB	Pin 9	Feedback Pin. Connect resistor divider tap here. The output voltage can be adjusted from 1.8V to 5.0V. The feedback reference voltage is typically 1.212V. $V_{OUT} = 1.212V \bullet \left[1 + \frac{R1}{R2}\right]$
V_C	Pin 10	Error Amp Output. A frequency compensation network is connected from this pin to the FB pin to compensate the loop.

微功率同步整流降压-升压 DC-DC 变换器

器件描述

FH3440 是一种高效率、固定频率的降压-升压 DC-DC 变换器，能在输入电压高于、低于或等于输出电压的情况下工作。该芯片所采用的拓扑结构提供了一种可在所有工作描述进行连续转换的功能，从而成为输出电压处于电池电压范围内的单节锂电池、多节碱性电池或 NiMH 电池的应用最佳选择。

FH3440 包含两个 0.19Ω的 N 沟道 MOSFET 开关和两个 0.22Ω的 P 沟道开关。可利用一个外部电阻对高至 1.5MHz 的开关频率进行设置，并能使振荡器与外部时钟信号同步。在突发模式工作中，静态电流仅为 25uA，因而最大限度地延长了便携式产品应用中的电池使用寿命。突发模式工作由电路开发者控制，并可通过把 MODE/SYNC 引脚驱动至高电平来开启使能。如果 MODE/SYNC 引脚有一个时钟或被驱动至低电平，则使能固定频率开关工作。

FH3440 的其他特点还包括电流仅为 1.0uA 的停机模式、软启动控制、热停机和电流限定设置。FH3440 采用热特性增强型 10 引脚 MSOP 封装结构。

电气特性

- 2.5V 至 5.5V 输入和输出电压范围
- 可利用高于、低于或等于输出的电池电压进行固定频率工作
- 同步整流效率可达：95%
- 单颗电感器
- 连续输出电流可达 600mA
- 无需肖特基二极管（V_{OUT} < 4.3V）
- 在停机期间将 V_{OUT} 与 V_{IN} 断接
- 可设置开关频率从 350 至 1.5MHz
- 低于 1.0uA 的停机电流（静态电流）
- 小型 10 引脚耐热增强型 MSOP 封装

工作原理

FH3440 可为便携式仪表等应用提供高效率和低噪声电源。专有的拓扑架构通过输出开关的正确定相，使得输入电压可以高于、低于或等于输出电压。

V_C 引脚上的误差放大器输出电压决定开关的输出占空比。由于 V_C 引脚上是一个滤波信号，因而能对低于开关频率的频率进行抑制。低导通电阻 $R_{DS(ON)}$、低栅极电荷同步开关提供了在高效率的高频脉宽调制控制。

在同步开关 D 和同步开关 B 的两端无需增加肖特基二极管，但它在先离合后合期间（通常为 15ns）产生的压降较小。因此增加肖特基二极管将在 600kHz 条件下把峰值效率提高 1%至 2%（典型值）。

当进入突发模式工作时能在轻负载条件下实现高效率，此时 FH3440 的静态电流低于 25uA。

绝对最大额定值

V_{IN}, V_{OUT} 电压 ..... -0.3V 至 6.0V

SW1，SW2 电压 ..... -0.3V 至 6.0V

V_C, R_T, FB, EN, MODE/SYNC 电压 ..... -0.3V 至 6.0V

工作温度范围 ..... -40℃ 至 +85℃

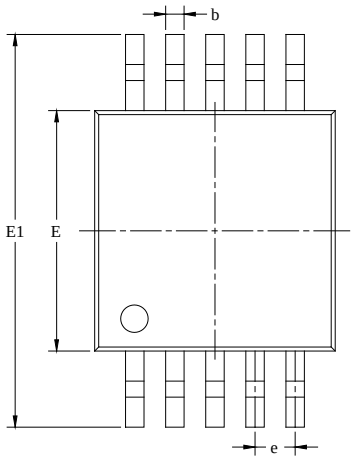
存储温度范围 ..... -65℃ 至 +125℃

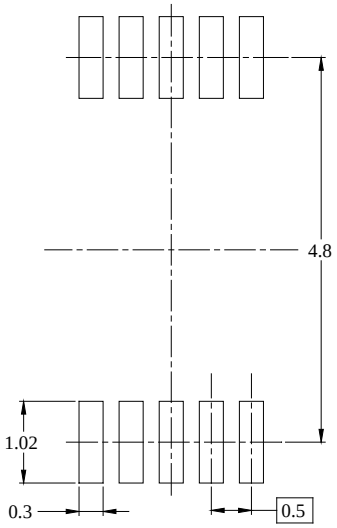
应用领域

- 手持式仪器
- 数码多媒体播放机
- 影像产品
- 便携式个人终端

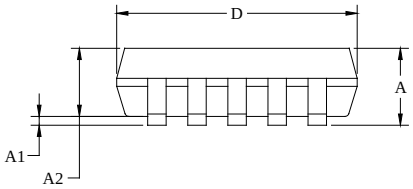
Packaging Information

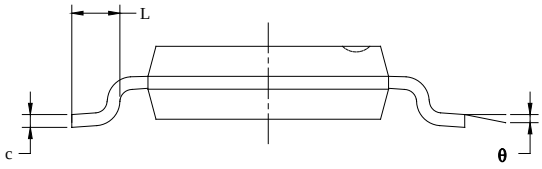
MSOP-10L Package Outline Dimension





RECOMMENDED LAND PATTERN (Unit: mm)





Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.50 (BSC)		0.020 (BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

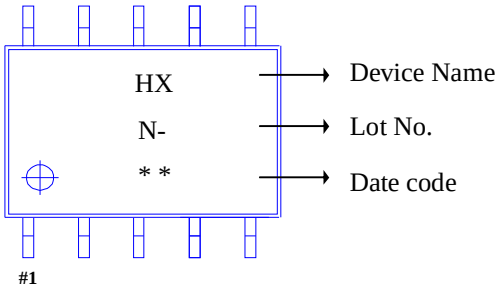
Ordering Information

Part Number	Description	Temperature Range	Package Type	Top Mark	SPQ
FH3440S10	DC-DC Buck-Boost Control Vin: 1.8~5.5V Iout: 600mA, 350KHz~1.5MHz VFB: 1.212V	-40 ~ +85℃	MSOP-10L	HXN-**	4000EA/Reel

Note:

- FH3440 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.

Device Name: for MSOP-10L



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 Jul.2022