EV3416-QH-00B

1.1A Switching Current, Low-I_Q, Step-Up Converter with Output Disconnect Evaluation Board

DESCRIPTION

The EV3416-QH-00A is an evaluation board designed to demonstrate the capabilities of the MP3416, a 1.1A switching current, low quiescent current (I_Q), step-up converter with output disconnect.

Peak current control provides fast transient response. The integrated, synchronous P-channel rectifier improves efficiency and eliminates the need for an external Schottky diode.

The MP3416 employs pulse-skip mode (PSM) to reduce power loss during light-load operation. During shutdown, the output disconnects from input to allow for a shutdown current (I_{SD}) below 0.65μA.

The MP3416 is available in a small QFN-8 (1.5mmx2mm) package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	0.86 to 5.5	V
Startup voltage	V_{START}	1.25 to 5.5	V
Output voltage	V_{OUT}	3.3	V

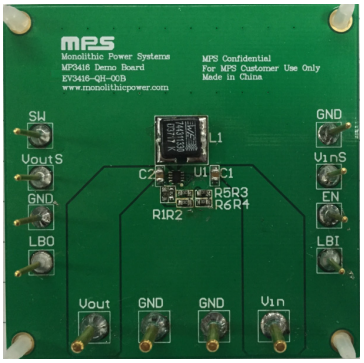
FEATURES

- 0.86V to 5.5V Operating Input Voltage (V_{IN}) Range
- 1.25V to 5.5V Start-Up Voltage Range
- 1.8V to 5.5V Output Voltage (V_{OUT}) Range
- 9.5μA Quiescent Current (I_Q)
- <0.65μA Shutdown Current (I_{SD})
- Up to 80% Efficiency under Light-Load Conditions (100μA to 200μA)
- Output Disconnect during Shutdown
- Down Mode when $V_{IN} > V_{OUT}$
- Adjustable Low-Battery Detection
- Internal Synchronous Rectifier
  OTP with Thermal Shutdown at 155°C
- Available in a QFN-8 (1.5mmx2mm) Package

APPLICATIONS

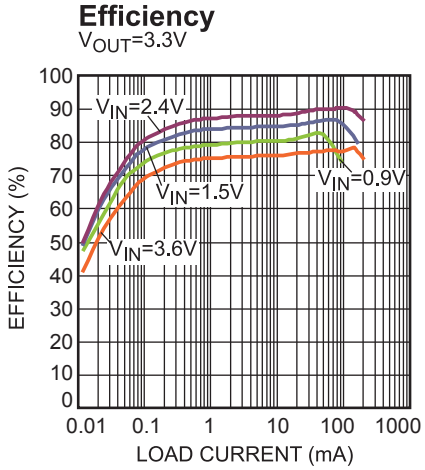
- Medical Devices
- Digital Retail Displays
- Gaming Controllers
- Remote Controls
- Battery-Powered Products
- Handheld Computers and Smartphones

EV3416-QH-00B EVALUATION BOARD



LxWxH (6.35cmx6.35cmx0.6cm)

Board Number	MPS IC Number	MPS Inductor
EV3416-QH-00B	MP3416GQH	MPL-AL5030-3R3



QUICK START GUIDE

The evaluation board's output voltage (V_{OUT}) is set at 3.3V. The board layout accommodates most commonly used components.

1. Preset the power supply between 1.25V and 5.5V.
2. Turn off the power supply.
3. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
4. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
5. After making the connections, turn on the power supply. The board should start up automatically.
6. A resistor (R2) sets V_{OUT}. The adjusted V_{OUT} can be calculated with Equation (1):

$$V_{OUT} = V_{FB} \times (1 + \frac{R1}{R2}) \quad (1)$$

   Where V_{FB} is the feedback voltage (0.504V), and R1 is 1MΩ.
7. To use the enable (EN) function, apply a digital input to the EN pin. Pull EN above 0.7V to turn the converter on; pull EN below 0.2V to turn it off.

EVALUATION BOARD SCHEMATIC

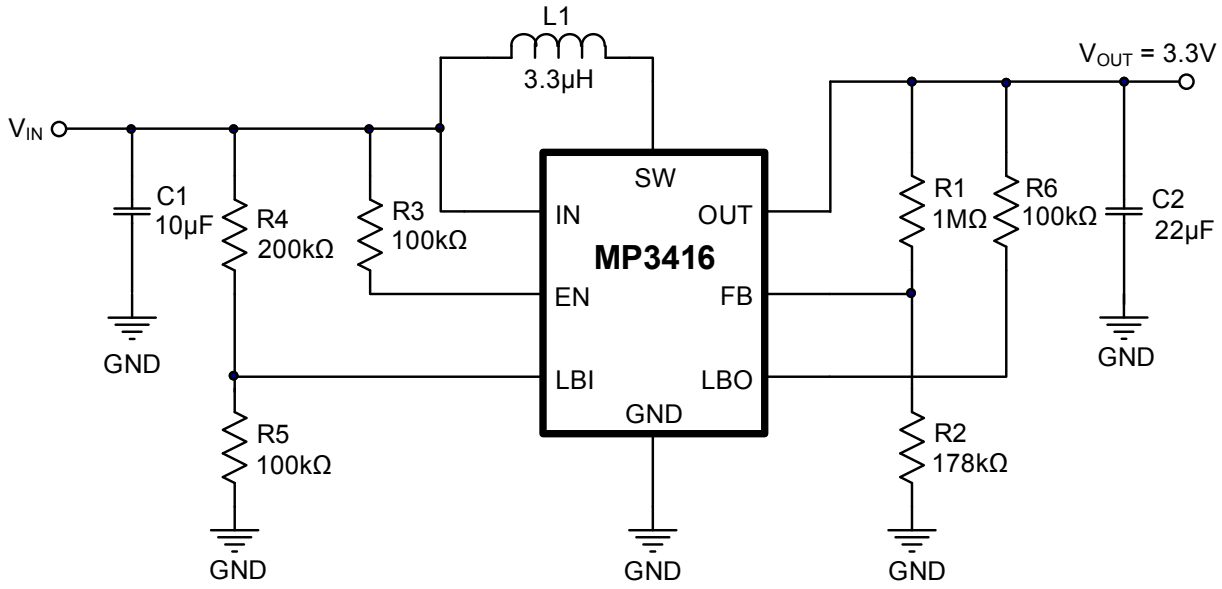


Figure 1: Evaluation Board Schematic

EV3416-QH-00B BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1	10µF	Ceramic capacitor, 10V	0805	Murata	GRM219R61A106KE44D
1	C2	22µF	Ceramic capacitor, 6.3V	0805	Murata	GRM21BR60J226ME39L
1	L1 (1)	3.3µH	Inductor, I_{SAT} = 6A, RDC = 21mΩ	SMD	MPS	MPL-AL5030-3R3
			Inductor, I_{SAT} = 1.8A, RDC = 65mΩ	SMD	Wurth	744042003
1	R1	1MΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071ML
1	R2	178kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07178KL
3	R3, R5, R6	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R4	200kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07200KL
1	U1	MP3416	Boost Converter	QFN-8 (1.5mmx2mm)	MPS	MP3416GQH-Z

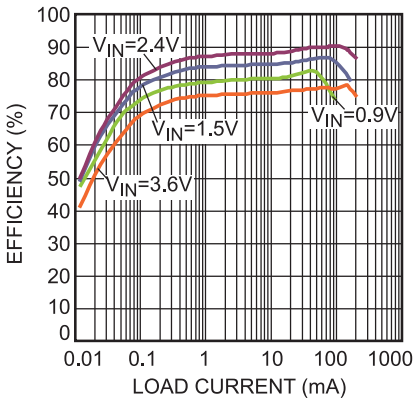
Note:

1) Older versions of the EV3416-QH-00B evaluation board included the Wurth inductor listed in the EV3416-QH-00B Bill of Materials (BOM). Newer versions of the evaluation board include the MPS inductor listed in the BOM.

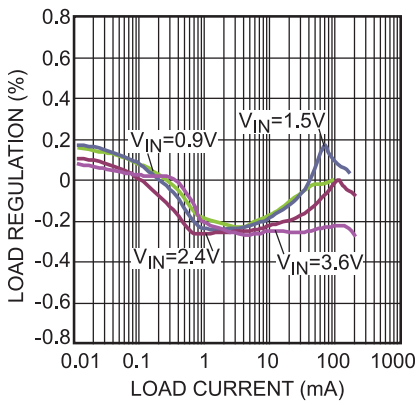
EVB TEST RESULTS

V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3µH, T_A = 25°C, unless otherwise noted.

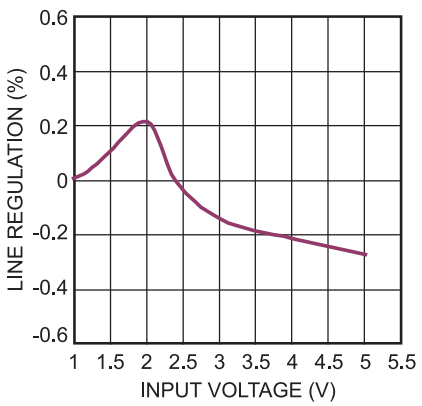
Efficiency
V_{OUT}=3.3V



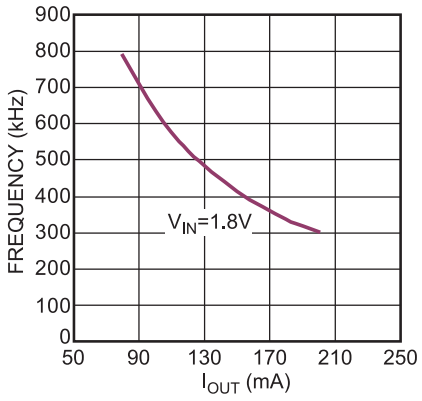
Load Regulation
V_{OUT}=3.3V



Line Regulation
V_{OUT}=3.3V, I_{OUT}=100mA



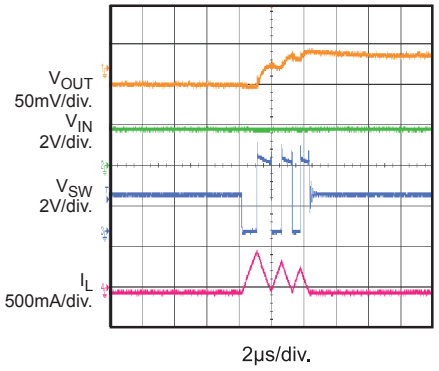
SW Frequency vs. Load Current



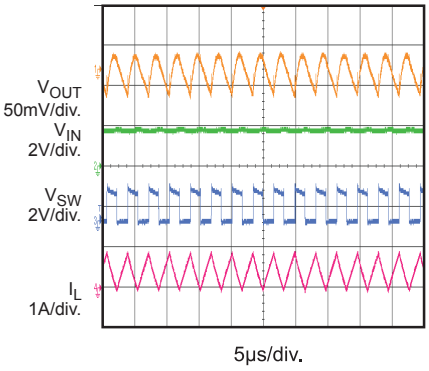
EVB TEST RESULTS *(continued)*

V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3µH, T_A = 25°C, unless otherwise noted.

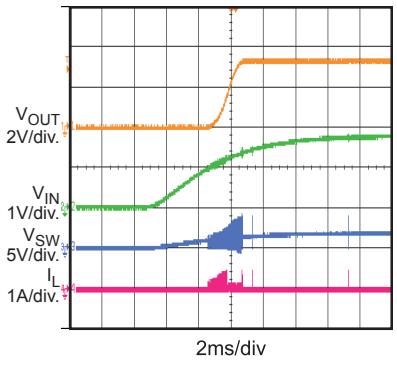
Output Ripple
I_{OUT}=0A



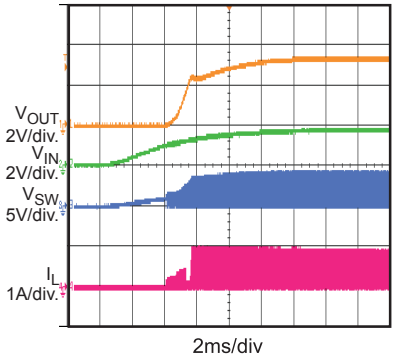
Output Ripple
I_{OUT}=0.2A



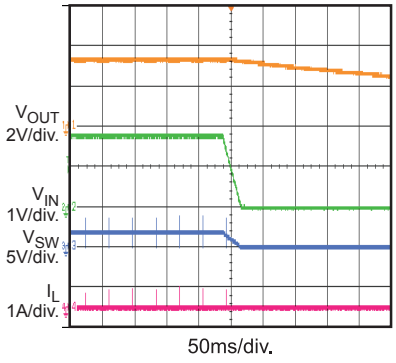
V_{IN} Startup
I_{OUT} = 0A



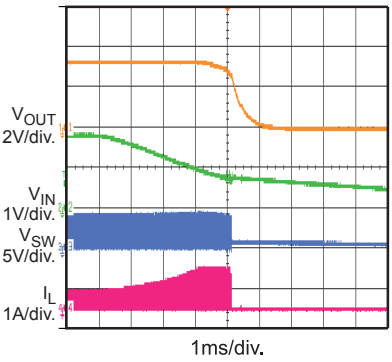
V_{IN} Startup
I_{OUT} = 0.2A



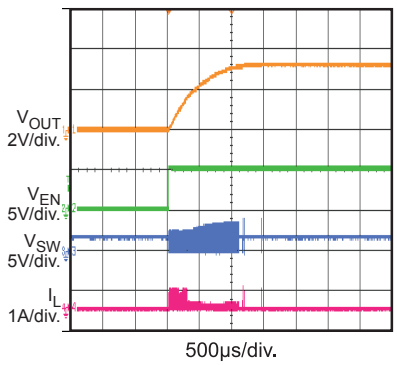
V_{IN} Shutdown
I_{OUT} = 0A



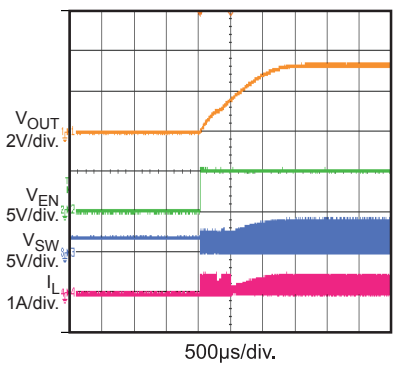
V_{IN} Shutdown
I_{OUT} = 0.2A



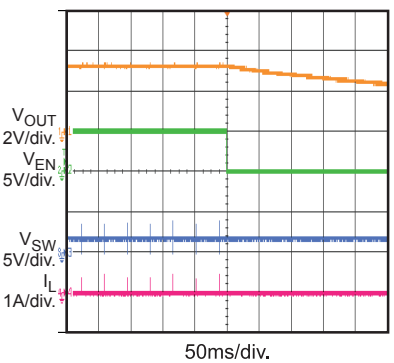
EN Startup
I_{OUT} = 0A



EN Startup
I_{OUT} = 0.2A



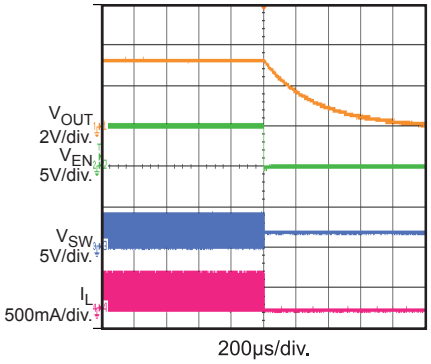
EN Shutdown
I_{OUT} = 0A



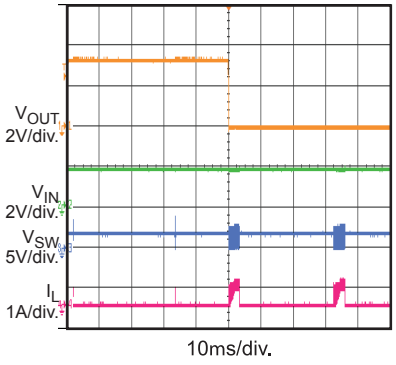
EVB TEST RESULTS *(continued)*

V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3µH, T_A = 25°C, unless otherwise noted.

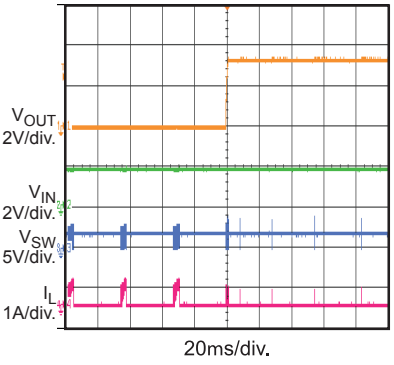
EN Shutdown
I_{OUT} = 0.2A



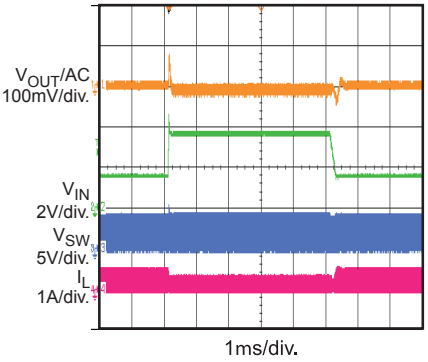
SCP Enter



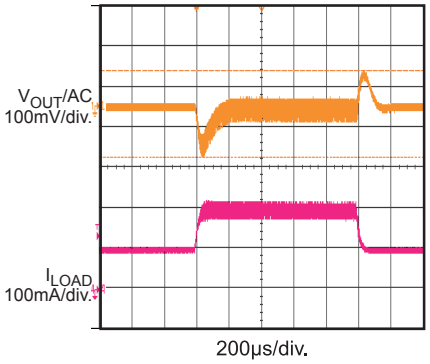
SCP Recover



Line Transient
V_{IN} = 1.8V to 3.6V, I_{OUT} = 0.1A



Load Transient
I_{OUT} = 0.1A to 0.2A



PCB LAYOUT

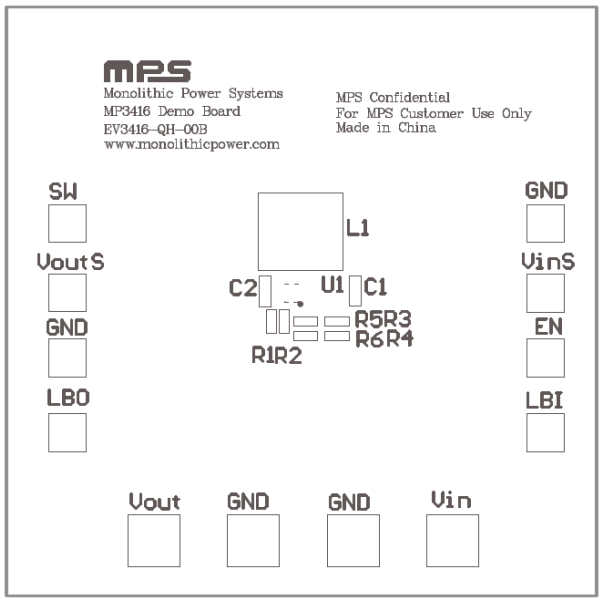


Figure 2: Top Silk

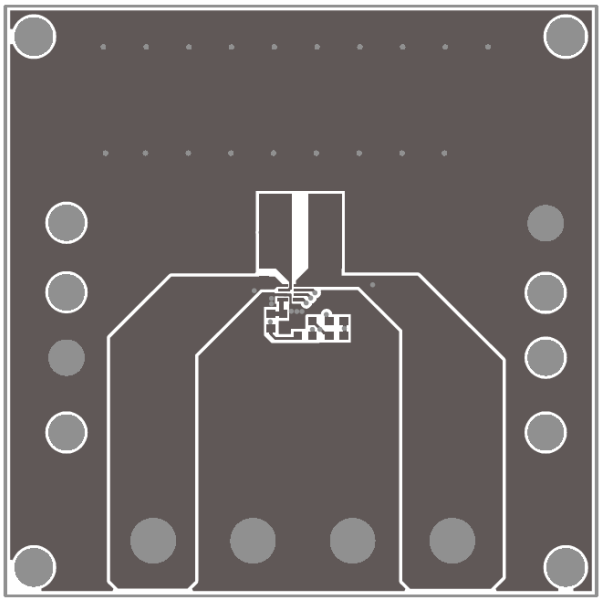


Figure 3: Top Layer

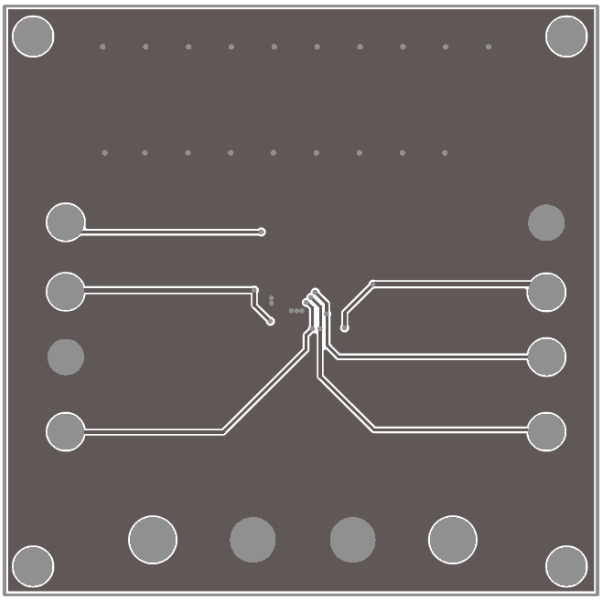


Figure 4: Bottom Layer