ISL91134IIQ-EVZ

Evaluation Board

AN1957
Rev 0.00
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Description

The ISL91134 is an integrated boost with bypass switching regulator for battery powered applications. The device provides a power supply solution for products using one cell Li-ion or Li-polymer battery. The device is capable of delivering up to 1.8A output current from V_{IN} = 3V and V_{OUT} = 5V. The no-load quiescent current is only 108µA in boost mode and 45µA in forced bypass mode, which significantly reduces the standby consumption. The ISL91134 evaluation board allows quick evaluation of the high performance features of this regulator.

Specifications

The boards are designed to operate at the following operating conditions:

- Input voltage rating from 2.35V to 5.4V
- Output current: up to 1.8A (V_{IN} = 3V, V_{OUT} = 5V)
- Forced bypass or auto bypass modes with a 38mΩ switch
- PFM mode at light-load currents
- 108µA quiescent current minimizes standby consumption in boost mode
- 2.5MHz switching frequency

Key Board Features

- Jumper selectable EN (Enabled/Disabled)
- Jumper selectable $\overline{BYPS}$ (Auto/Forced)
- Jumper selectable VSET (No offset/offset on V_{OUT})
- Connectors, test points, and jumpers for easy probing

References

- ISL91134 Datasheet

Ordering Information

EVALUATION BOARD NUMBER	V_{OUT} OPTION
ISL91134IIQ-EVZ	5.0/5.2V (VSET L/H)

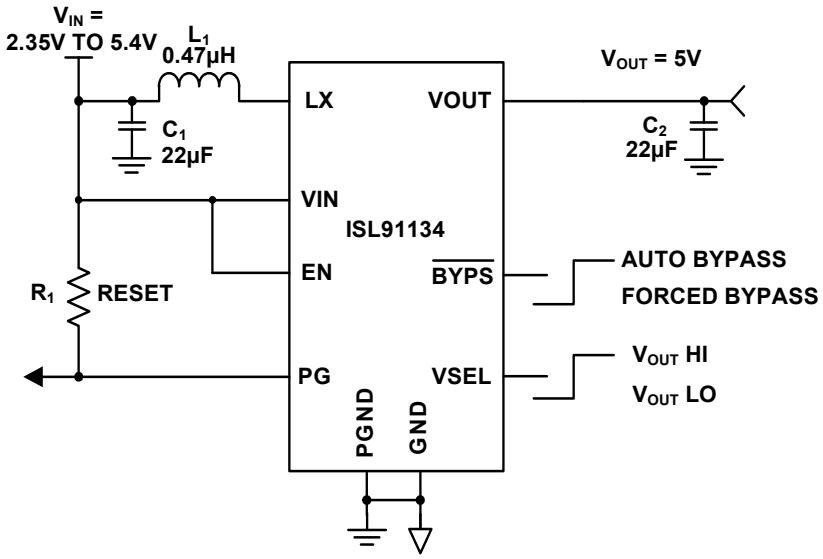

FIGURE 1. ISL91134 TYPICAL APPLICATION SCHEMATIC

Functional Description

The ISL91134 implements a complete boost switching regulator, with PWM controller, internal switches, references, protection circuitry and bypass control. The ISL91134 is designed to support 5V output voltage. A voltage select pin (VSET) is available to scale up the output voltage by a small offset to compensate the load transient droop. The evaluation boards have been functionally optimized for best performance of the ISL91134. This part requires only an inductor and a few external components to operate. The 2.5MHz switching frequency further reduces the size of external components. The input power and load connections are provided through multi pin connectors for high current operations.

The ISL91134 evaluation board is shown in Figures 3 and 4. The board's enable function is controlled by the on-board jumper header J3. Similarly, the VSET function is controlled by the on-board jumper header J4 and the BYPASS function can be set to Forced or Auto mode by controlling the on-board jumper header J5.

The schematic of the ISL91134-EVZ evaluation board is shown on page 4.The PCB layout images for all layers are shown in Figures 5 and 6. The bill of materials of the ISL91134-EVZ is shown in Table 1.

Operating Range

The V_{IN} range of the boards is 2.35V to 5.4V. The V_{OUT} for the ISL91134 is 5V. The I_{OUT} range of the boards is 0 to 2A. The operating ambient temperature range is -40°C to +85°C.

Quick Start Guide

For the ISL91134 board, the voltage can be set to 5V with VSET = 0 and 5.2V with VSET = 1.

Refer to the following Quick Setup Guide to configure and power-up the board for proper operation. During the power-on process, the expected waveforms are shown in Figure 2.

Quick Setup Guide

1. Install jumpers on J3 shorting EN to VIN.
2. Install jumper on J5 shorting $\overline{BYPS}$ to VIN, auto bypass mode.
3. Install jumper on J4 shorting VSET to GND or leave it as NC.
4. Connect power supply to J1, with voltage setting between 2.35V and 5.4V.
5. Connect electronic load to J2.
6. Place scope probes on VOUT test point, and other test points of interest.
7. Turn on the power supply.
8. Monitor the output voltage V_{OUT} = 5.05V when V_{IN} < 5V (Boost mode), V_{IN} = V_{OUT} when V_{IN} > 5.15 (bypass mode), the supply current should be ~110µA (boost mode) and ~95µA in (auto bypass mode). In forced bypass ($\overline{BYPS}$ pin = GND), supply current should be ~45µA.
9. Turn on the electronic load.
10. Measure the output voltage with the voltmeter. The voltage should regulate within data sheet spec limits.
11. To determine efficiency, measure input and output voltages at the test points J1 and TP3. The bench power supply can be connected to the PVIN and GND headers on J1. The electronic load can be connected to the V_{OUT} and GND headers on J2 measure the input and output currents. Calculate efficiency based on these measurements.

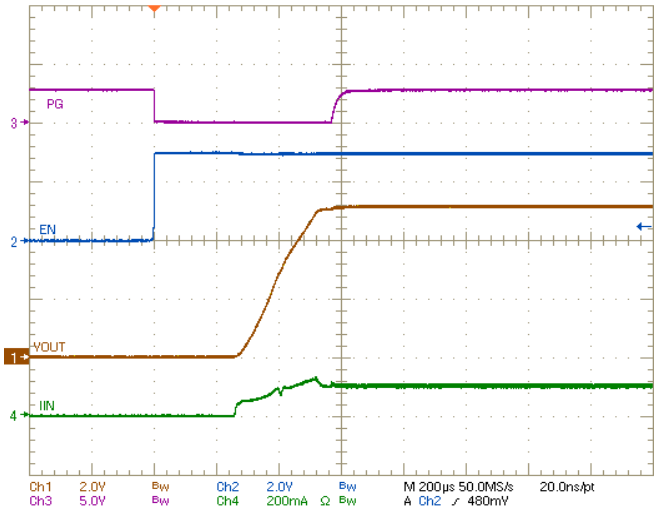

FIGURE 2. START-UP WAVEFORM 50Ω LOAD

Layout Considerations

1. C_1 is used to compensate for line drops on cables from power supply to the IC, this will not be required for the actual board design.
2. The Input capacitor (C_2) should be placed close to the IC to reduce V_{IN} spikes/noise.
3. Output capacitors (C_3, C_4) should be placed as close as possible to the IC to minimize V_{OUT} spikes.
4. Boost Inductor (L_1) between VIN and LX should be connected using short and wide traces. It is recommended to use multiple vias between the LX pin and the inductor. Three vias of 7mils width were used on the evaluation board.
5. Recommend maximizing copper pour area for VIN, VOUT and GND for better thermal performance.
6. AGND and PGND of the IC should be connected to each other. It is crucial to connect these two grounds at a location very close to the IC.

ISL91134 Evaluation Board

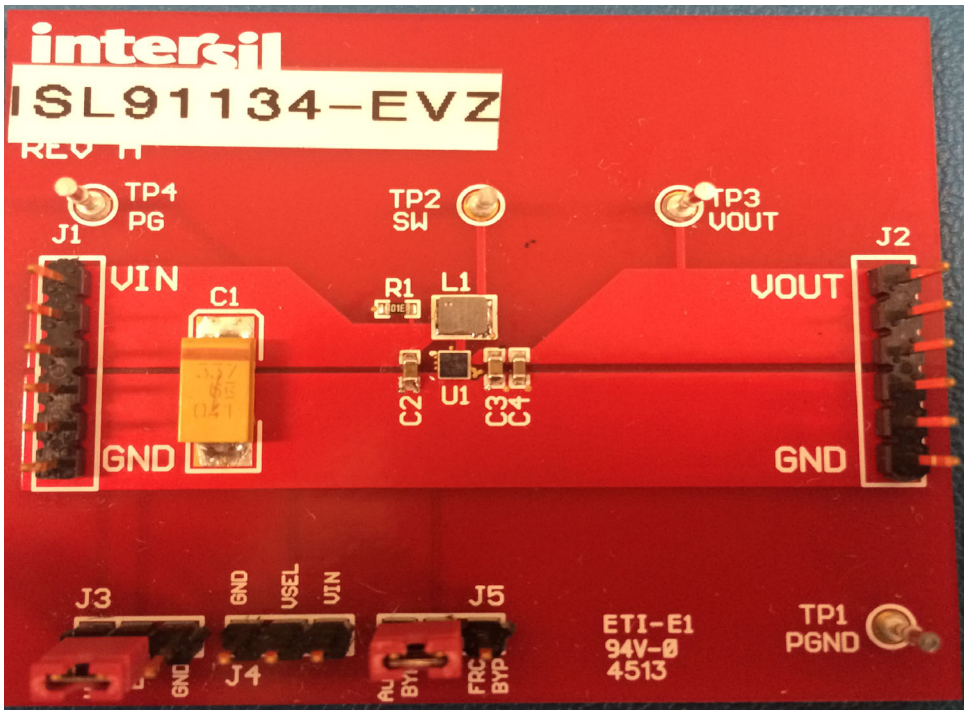

FIGURE 3. TOP VIEW

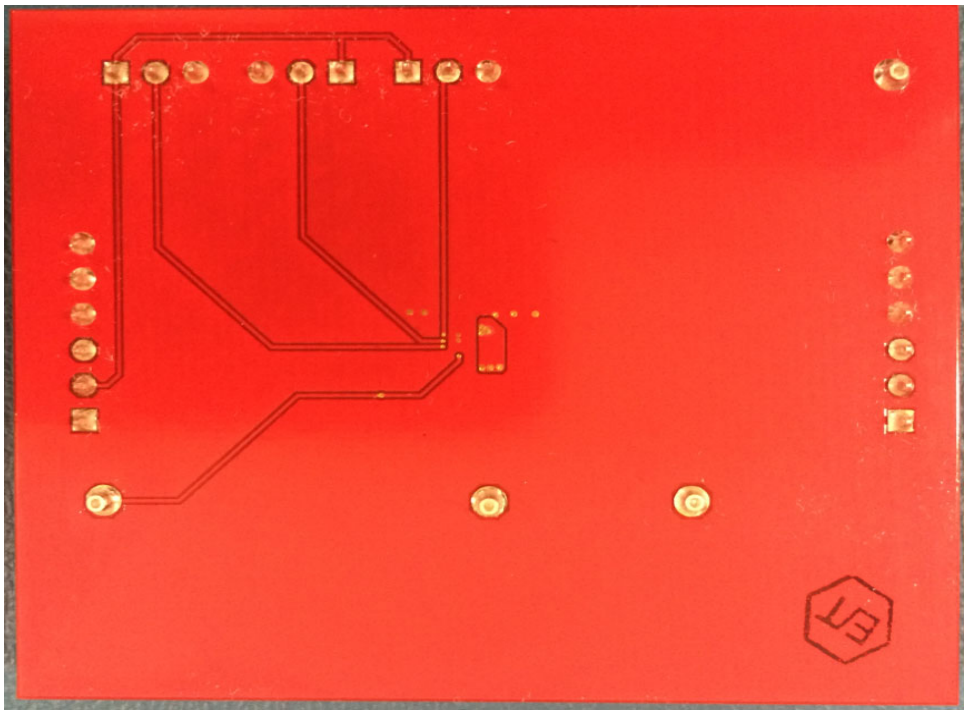

FIGURE 4. BOTTOM VIEW

ISL91134 Evaluation Board Schematic

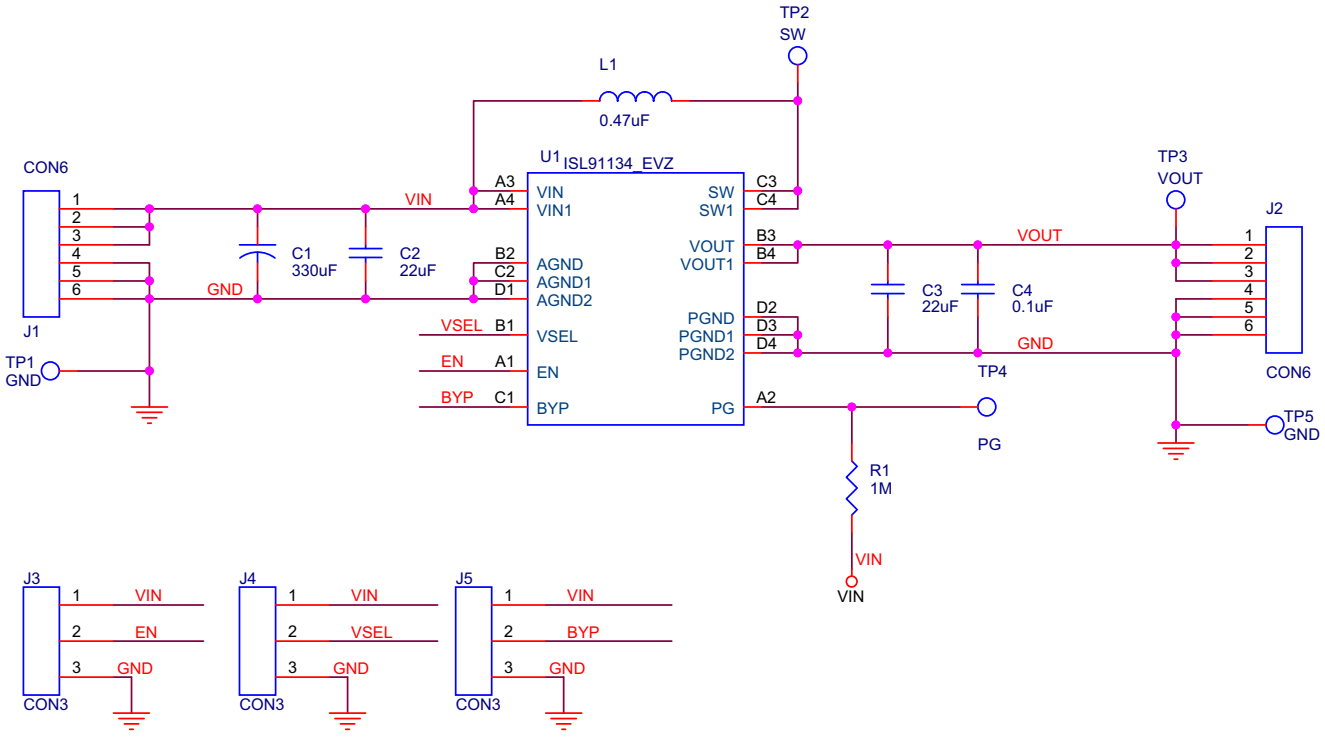

TABLE 1. ISL91134 EVALUATION BOARD BILL OF MATERIALS

ITEM#	QTY	DESIGNATORS	PART TYPE	FOOTPRINT	DESCRIPTION	VENDORS
1	1	U1	ISL91134	W4x4.16E WLCSP	Intersil ISL91134 Boost with Bypass Regulator	INTERSIL
2	1	L1	0.47µH	3.2x2.5mm	PIFE32251B-R47MS-39	Cyntec
3	1	C1	330µF/6.3V/X5R	7343	T491D337K006AT	Kemet
4	2	C2, C3	22µF/6.3V/X5R	0603	GRM188R61A226M	ANY
5	1	C4	0.1µF	0603	GRM188R71H104KA93D	ANY
6	1	R1	1MΩ, 1%	0603	Resistor, Generic	ANY
7	2	J1, J2	HDR-6	HDR-6	Vert. Pin Header, 6-Pin, 0.1” Spacing, Generic	FCI
8	3	J3, J4, J5	HDR-3	HDR-3	Vert. Pin Header, 3-Pin, 0.1” Spacing, Generic	FCI
9	4	TP1, TP2, TP3, TP4	TEST POINT	TEST POINT	Test Point, 1514-2	KEYSTONE

PCB Layout

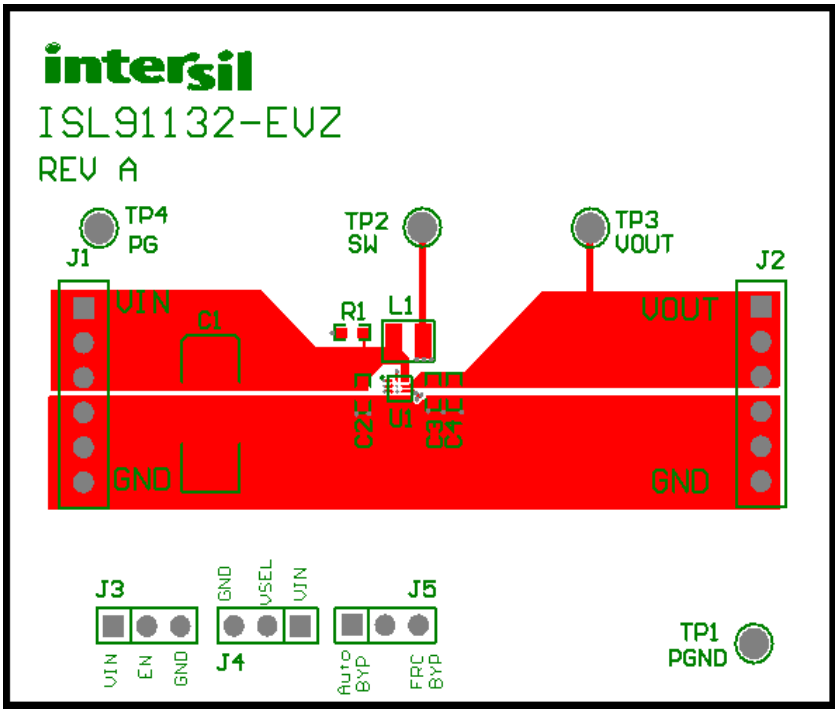

FIGURE 5. TOP LAYER (RECOMMEND USING ISL91132 LAYOUT PLAN FOR ISL91134)

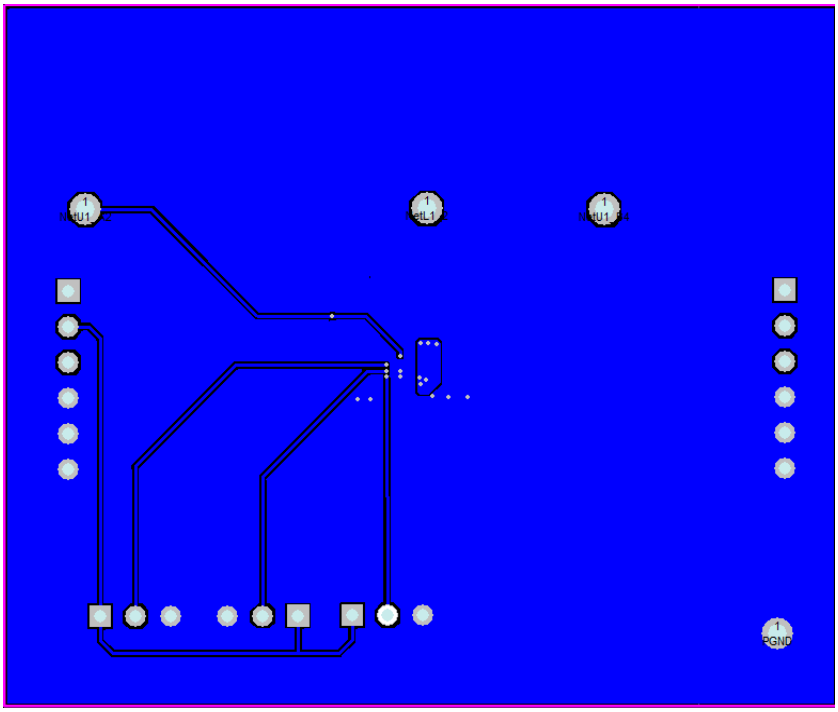

FIGURE 6. BOTTOM LAYER

Typical Performance Curves

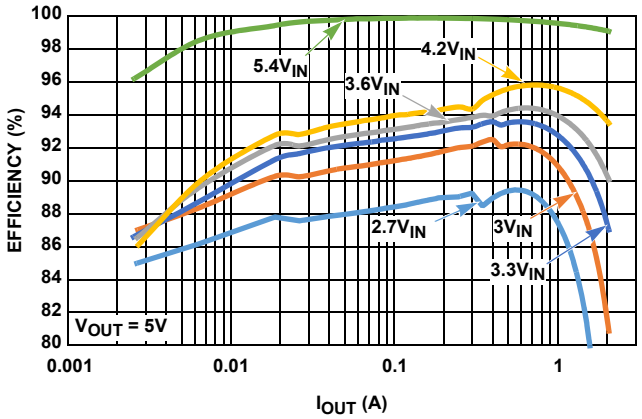

FIGURE 7. EFFICIENCY vs LOAD CURRENT, V_{OUT} = 5V

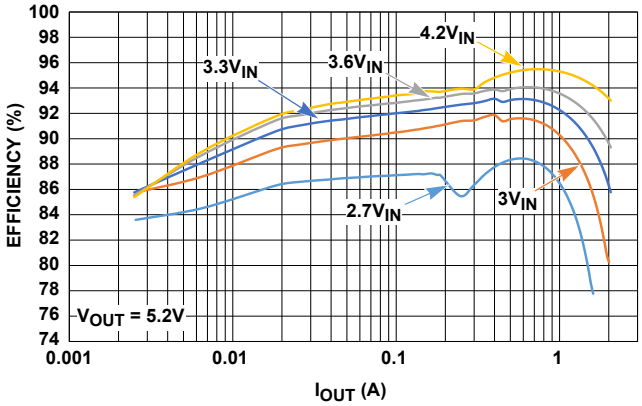

FIGURE 8. EFFICIENCY vs LOAD CURRENT, V_{OUT} = 5.2V

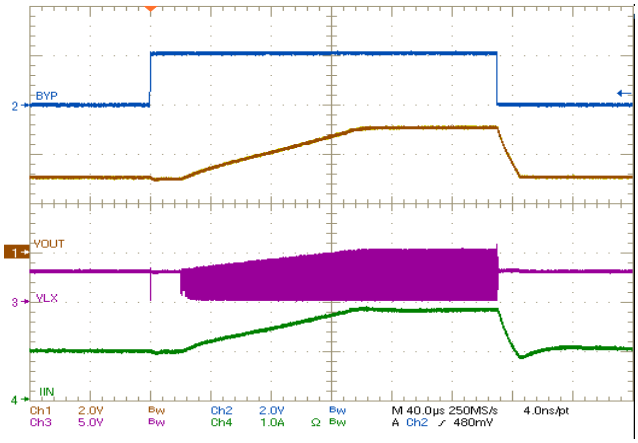

FIGURE 9. FORCED BYPASS TO BOOST TRANSITION, 1A LOAD, V_{IN} = 3V

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