ISL91127IIx-EVZ

Evaluation Boards

UG045
Rev.1.00
July 15, 2016

Description

The ISL91127 is a high-current buck-boost switching regulator for systems using new battery chemistries. It uses Intersil's proprietary buck-boost algorithm to maintain voltage regulation while providing excellent efficiency and very low output voltage ripple when the input voltage is close to the output voltage. The ISL91127IIN-EVZ, ISL91127II2A-EVZ and ISL91127IIA-EVZ platforms allow quick evaluation of the high performance features of the ISL91127 buck-boost regulator series.

Specifications

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

- Input voltage rating from 1.8V to 5.5V
- Resistor programmable output voltage on the ISL91127IIA-EVZ
- Fixed 3.3V output voltage on the ISL91127IIN-EVZ
- Fixed 3.5V output voltage on the ISL91127II2A-EVZ
- Up to 2.2A output current (PVIN = 2.5V, V_{OUT} = 3.3V)
- 2.5MHz switching frequency
- Operating temperature range: -40°C to +85°C

Key Features

- Small, compact design
- Jumper selectable EN (enabled/disabled)
- Jumper selectable MODE (auto-PFM/forced-PWM)
- Connectors, test points and jumpers for easy probing

References

ISL91127 Datasheet

Ordering Information

PART NUMBER	DESCRIPTION
ISL91127IIN-EVZ	Evaluation Board for ISL91127IINZ
ISL91127II2A-EVZ	Evaluation Board for ISL91127II2AZ
ISL91127IIA-EVZ	Evaluation Board for ISL91127IIAZ

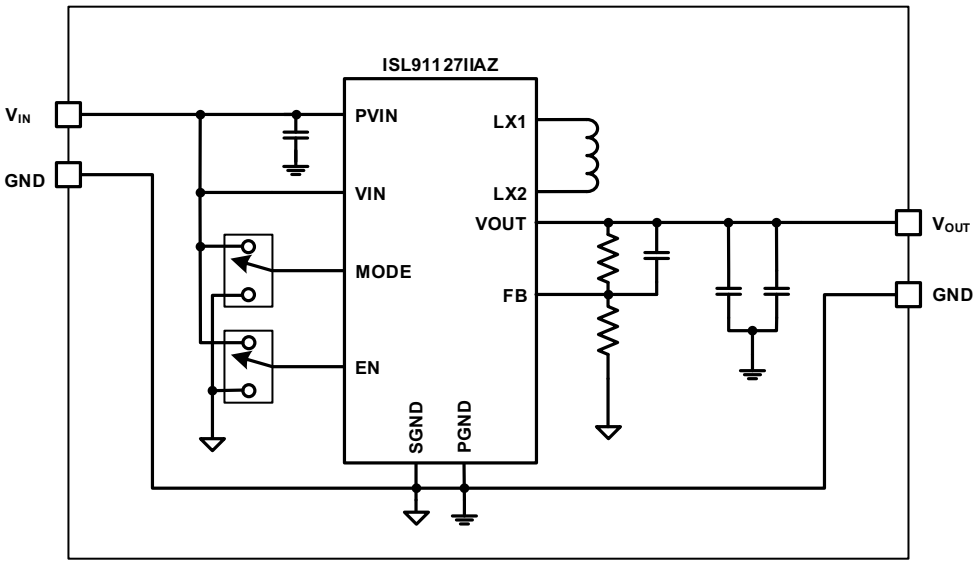

FIGURE 1. ISL91127IIA-EVZ BLOCK DIAGRAM

Functional Description

The ISL91127IIN-EVZ, ISL91127II2A-EVZ and ISL91127IIA-EVZ provide simple platforms to demonstrate the feature of the ISL91127 buck-boost regulator. The ISL91127IIN-EVZ is for the fixed 3.3V output IC ISL91127IINZ. The ISL91127II2A-EVZ is for the fixed 3.5V output IC ISL91127II2AZ and the ISL91127IIA-EVZ is for the adjustable output IC ISL91127IIAZ. The evaluation boards have been functionally optimized for best performance of the ISL91127 IC series. Input power and load connections are provided through multi pin connectors for high current operations.

The ISL91127IIA-EVZ and ISL91127IIN-EVZ evaluation boards are shown in Figures 4 and 5. The board's enable function is controlled by the on-board jumper header J3. Similarly, the mode function is controlled by the on-board jumper header J4.

The schematic of the ISL91127IIA-EVZ evaluation board is shown in Figure 6. The schematic for the ISL91127IIN-EVZ and ISL91127II2A-EVZ is shown in Figure 7. The PCB layout images for all layers are shown in Figures 8 through 11. The bill of materials of the ISL91127IIA-EVZ is shown in Table 2. The bill of materials of the ISL91127IIN-EVZ and ISL91127II2A-EVZ are shown in Table 3.

Operating Range

The V_{IN} range of the boards is 1.8V to 5.5V. The V_{OUT} range for the ISL91127IIA-EVZ is 2V to 5V. The I_{OUT} range of the boards is 0 to 2A. The operating ambient temperature range is -40°C to +85°C.

Recommended PCB Layout

Correct PCB layout is critical for proper operation of the ISL91127. The input and output capacitors should be positioned as closely to the IC as possible. The ground connections of the input and output capacitors should be kept as short as possible, and should be on the component layer to avoid problems that are caused by high switching currents flowing through PCB vias.

Quick Start Guide

For the ISL91127IIA-EVZ board, the default output voltage is set at 3.3V. Should other output voltages be desired, resistor R_2 can be changed to set to a desired voltage as shown in Table 1 (use a resistor with 1% accuracy).

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 Figures 2 and 3.

Quick Setup Guide

1. Install jumper on J3, shorting EN to VIN.
2. Install jumper on J4, shorting MODE to VIN.
3. Connect power supply to J1, with voltage setting between 1.8V and 5.5V.
4. Connect electronic load to J2.
5. Place scope probes on VOUT test point and other test points of interest.
6. Turn on the power supply.
7. Monitor the output voltage start-up sequence on the scope. The waveforms will look similar to that shown in Figures 2 and 3.
8. Turn on the electronic load.
9. Measure the output voltage with the voltmeter. The voltage should regulate within datasheet spec limits.
10. To determine efficiency, measure input and output voltages at the Kelvin sense test points (S+ and S-), which are part of J1 and J2 headers. The bench power supply can be connected to the PVIN and GND headers on J1. The electronic load can be connected to the VOUT and GND headers on J2. Measure the input and output currents. Calculate efficiency based on these measurements.

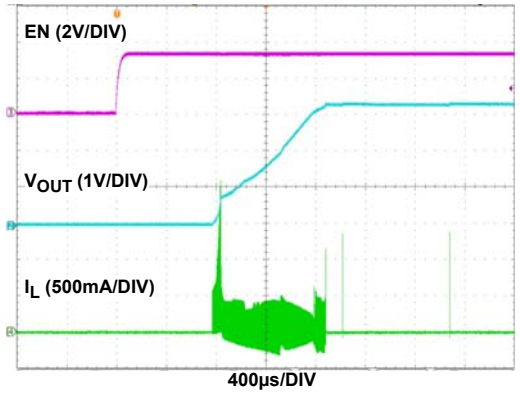

FIGURE 2. START-UP WITH V_{IN} = 3.6V and V_{OUT} = 3.3V, NO LOAD

TABLE 1. OUTPUT VOLTAGE PROGRAMMING for ISL91127IIA-EVZ

DESIRED OUTPUT VOLTAGE (V)	R_2 RESISTOR VALUE (kΩ)
2.0	665
2.5	470
3.0	365
3.3	324
3.4	309
4.0	249
4.5	215
5.0	191

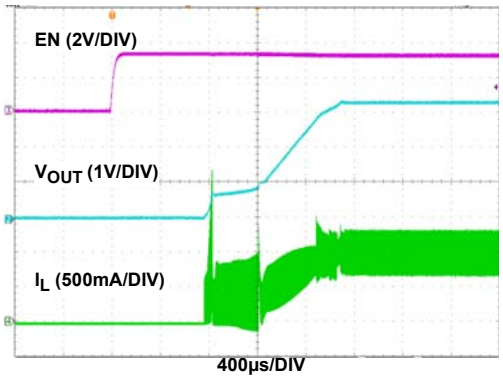

FIGURE 3. START-UP WITH V_{IN} = 3.6, V_{OUT} = 3.3V, 1A R_{LOAD}

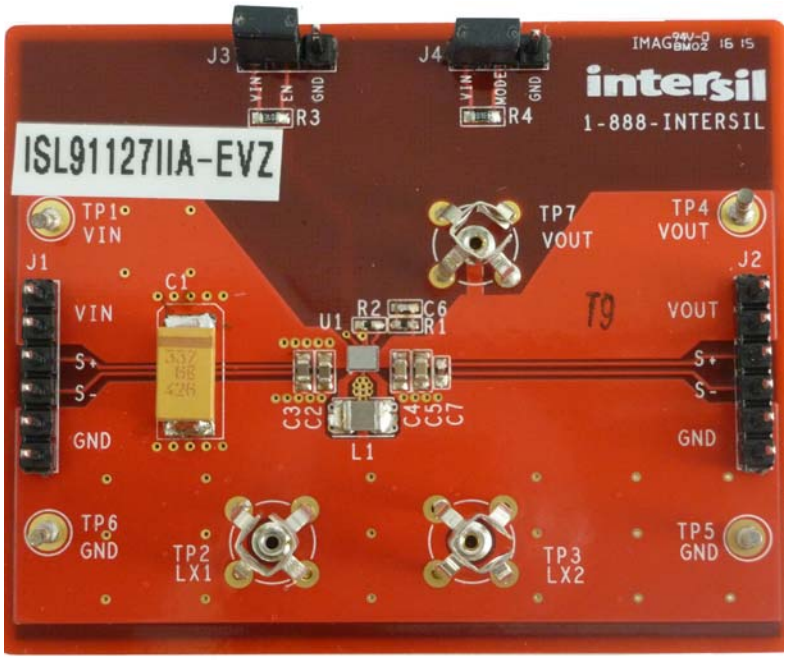

FIGURE 4. ISL91127IIA-EVZ BOARD

FIGURE 5. ISL91127IIN-EVZ BOARD

ISL91127IIA-EVZ Schematic

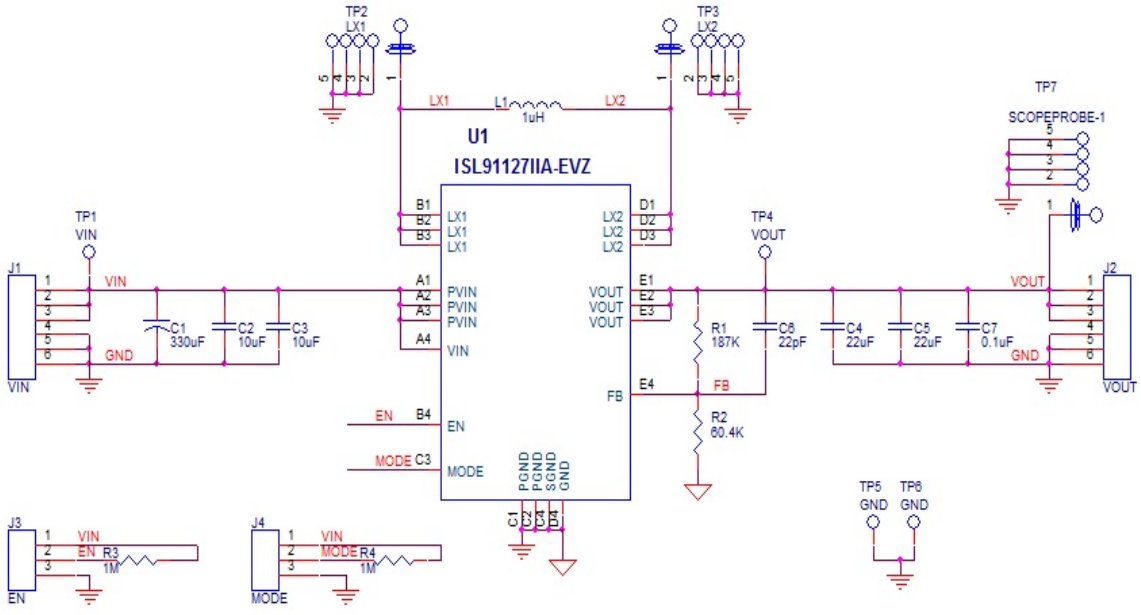

FIGURE 6. ISL91127IIA-EVZ EVALUATION BOARD SCHEMATIC

TABLE 2. ISL91127IIA-EVZ EVALUATION BOARD BILL OF MATERIALS

ITEM#	QTY	DESIGNATORS	PART TYPE	FOOTPRINT	DESCRIPTION	VENDORS
1	1	U1	ISL91127IIAZ	W4x5.20; WLCSP	Intersil ISL91127 Buck-boost Regulator with Adjustable Output Voltage	INTERSIL
2	1	L1	1µH	3.2mmx2.5mmx1.2mm	Power Inductor Toko DFE322512C series, 4.6A (typical), 34m? (typical)	TOKO
3	1	C1	330µF	7343	Capacitor, Tantalum	ANY
4	2	C2, C3	10µF/6.3V/X5R	0603	Capacitor, Generic	ANY
5	2	C4, C5	22µF/6.3V/X5R	0603	Capacitor, Generic	ANY
6	1	C6	22pF	0402	Capacitor, 22pF 50V 5% NP0 0402	ANY
7	1	C7	0.1µF	0402	Capacitor, Generic	ANY
8	1	R1	187k, 1%	0402	Resistor, Generic	ANY
9	1	R2	60.4k, 1%	0402	Resistor, Generic	ANY
10	2	R3, R4	1M?, 5%	0603	Resistor, Generic	ANY
11	2	J1, J2	HDR-6	HDR-6	Vertical Pin Header, 6-Pin, 0.1” Spacing, Generic	ANY
12	2	J3, J4	HDR-3	HDR-3	Vertical Pin Header, 3-Pin, 0.1” Spacing, Generic	ANY
14	3	TP2, TP3, TP7	SCOPE PROBE	SCOPE PROBE	Test Point, Scope Probe 131-5031-00	TEKTRONIX

ISL91127IIN-EVZ, ISL91127II2A-EVZ Schematic

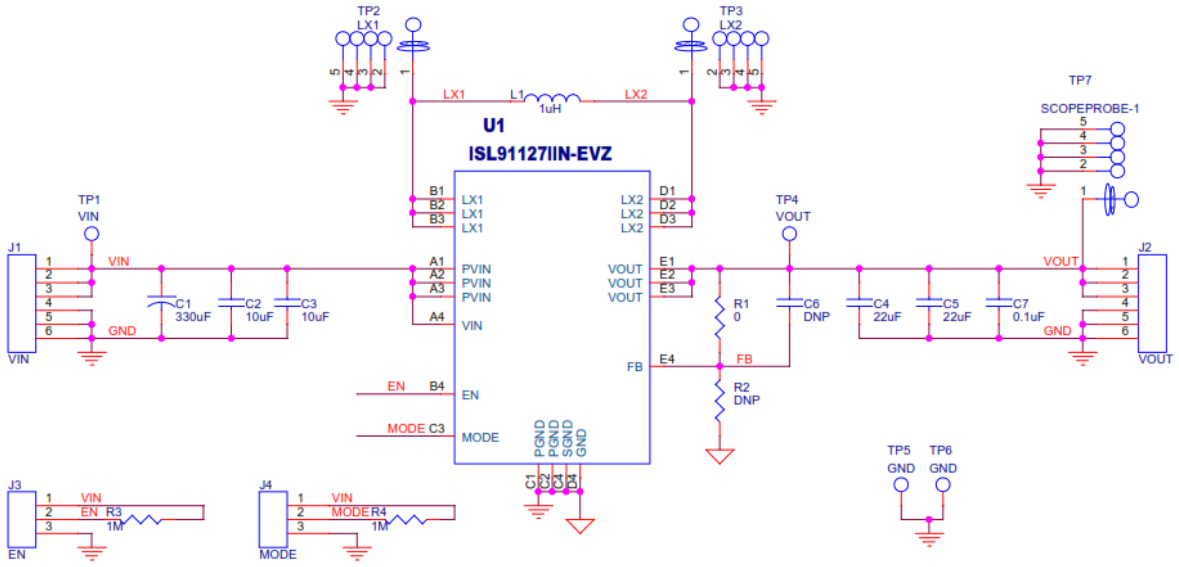

FIGURE 7. ISL91127IIN-EVZ, ISL91127II2A-EVZ EVALUATION BOARD SCHEMATIC

TABLE 3. ISL91127IIN-EVZ, ISL91127II2A-EVZ EVALUATION BOARD BILL OF MATERIALS

ITEM#	QTY	DESIGNATORS	PART TYPE	FOOTPRINT	DESCRIPTION	VENDORS
1	1	U1	ISL91127IINZ, ISL91127II2AZ	W4x5.20; WLCSP	Intersil ISL91127 Buck-boost Regulator	INTERSIL
2	1	L1	1µH	3.2mmx2.5mmx1.2mm	Power Inductor Toko DFE322512C series, 4.6A (typical), 34m? (typical)	TOKO
3	1	C1	330µF	7343	Capacitor, Tantalum	ANY
4	2	C2, C3	10µF/6.3V/X5R	0603	Capacitor, Generic	ANY
5	2	C4, C5	22µF/6.3V/X5R	0603	Capacitor, Generic	ANY
6	1	C6	DNP	0402		ANY
7	1	C7	0.1µF	0402	Capacitor, Generic	ANY
8	1	R1	0?	0402	Resistor, Generic	ANY
9	1	R2	DNP	0402		ANY
10	2	R3, R4	1M?, 5%	0603	Resistor, Generic	ANY
11	2	J1, J2	HDR-6	HDR-6	Vertical Pin Header, 6-Pin, 0.1” Spacing, Generic	ANY
12	2	J3, J4	HDR-3	HDR-3	Vertical Pin Header, 3-Pin, 0.1” Spacing, Generic	ANY
13	3	TP2, TP3, TP7	SCOPE PROBE	SCOPE PROBE	Test Point, Scope Probe 131-5031-00	TEKTRONIX

PCB Layout

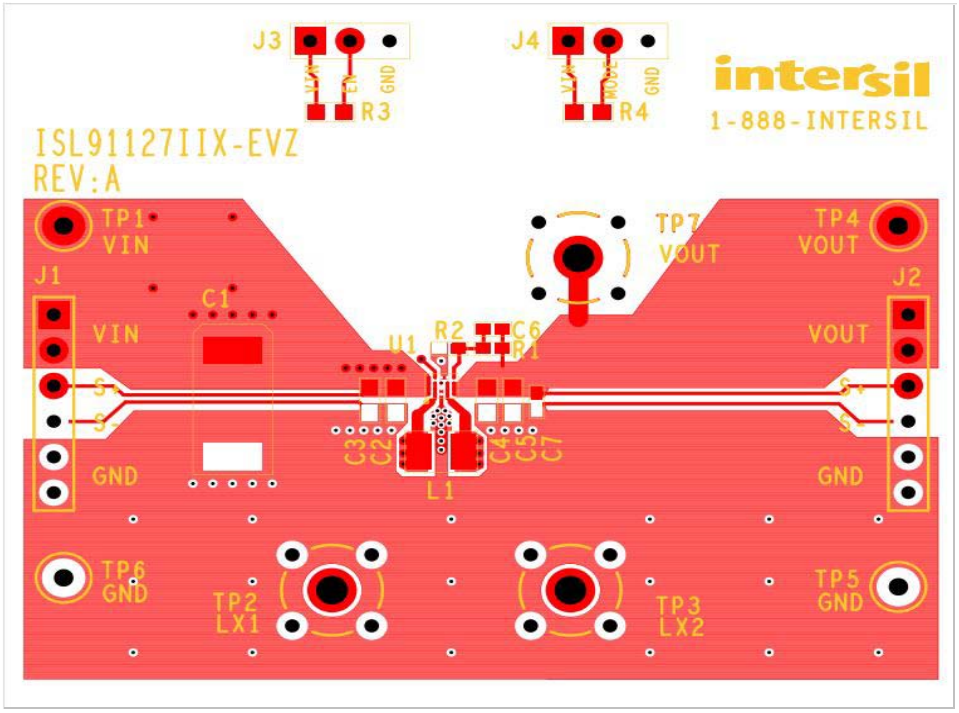

FIGURE 8. TOP LAYER

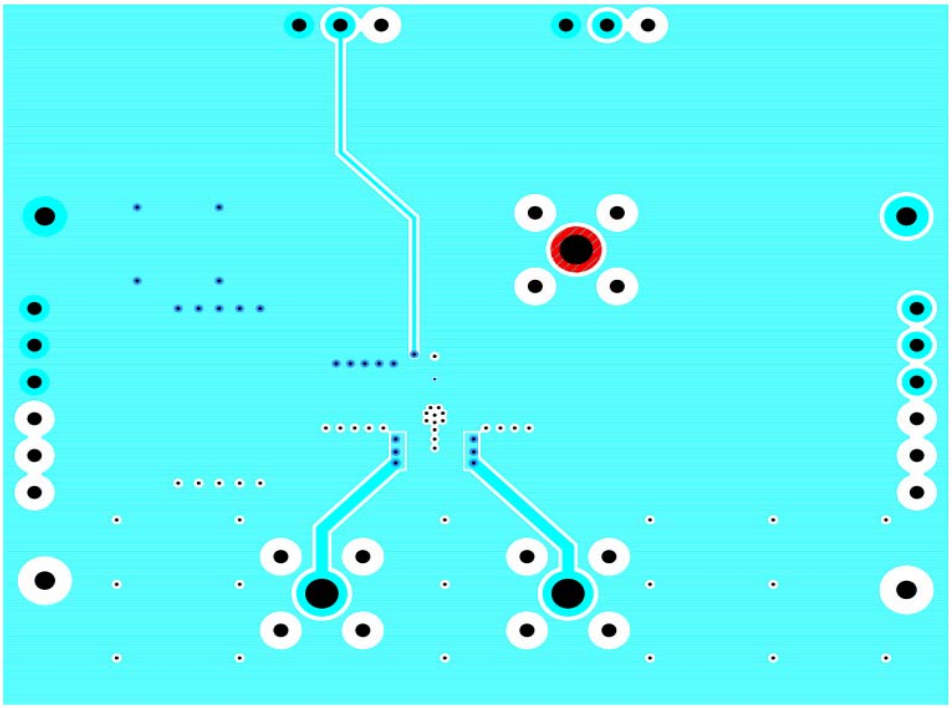

FIGURE 9. INNER LAYER 1

PCB Layout (Continued)

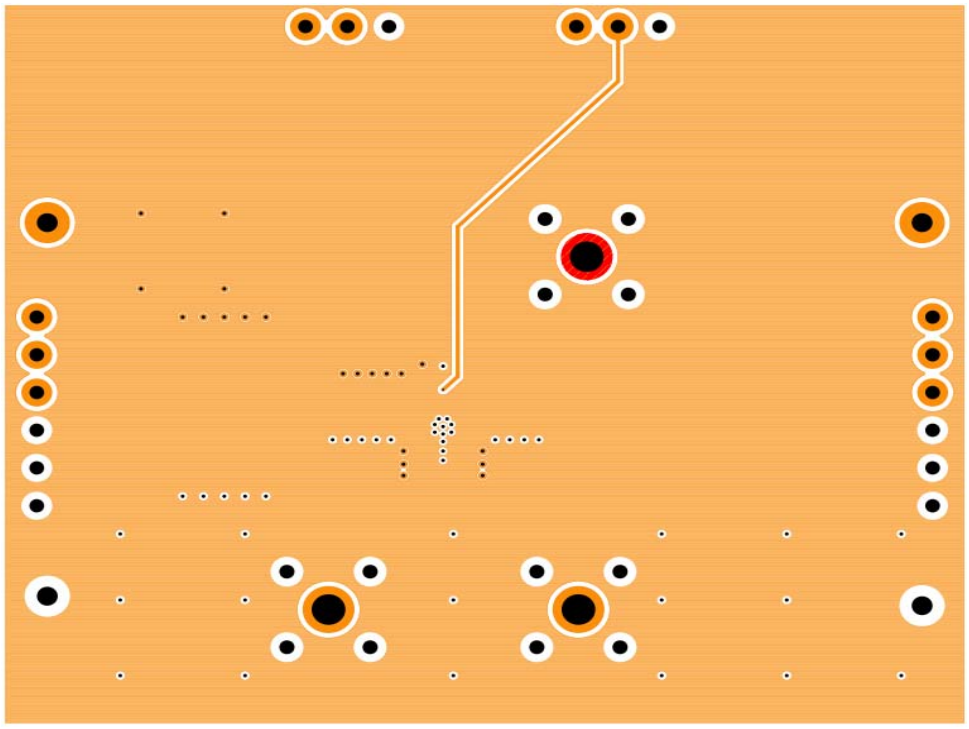

FIGURE 10. INNER LAYER 2

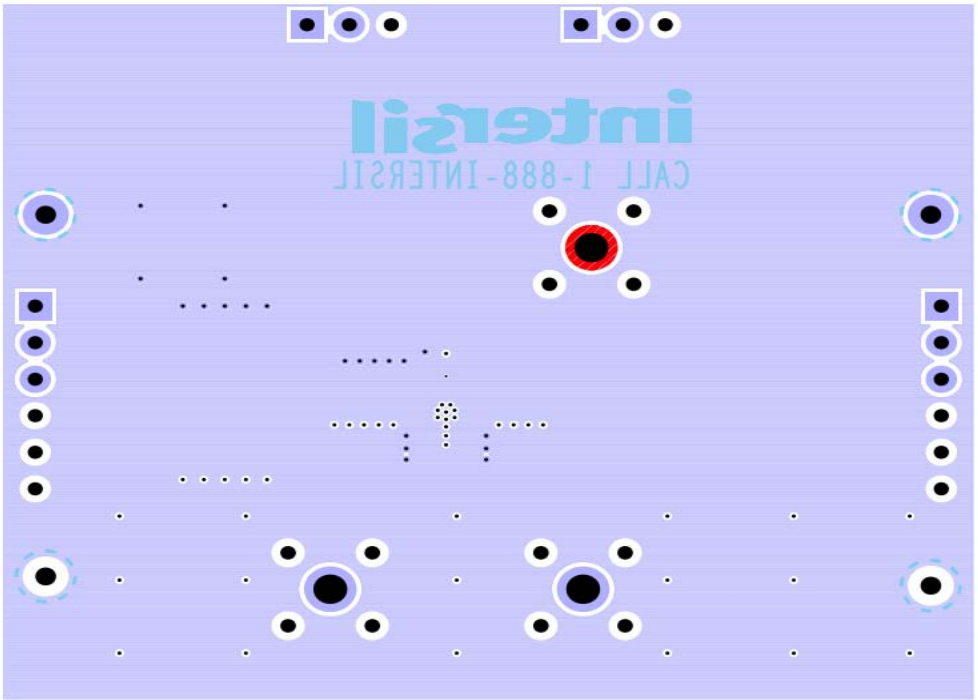

FIGURE 11. BOTTOM LAYER

Typical Performance Curves

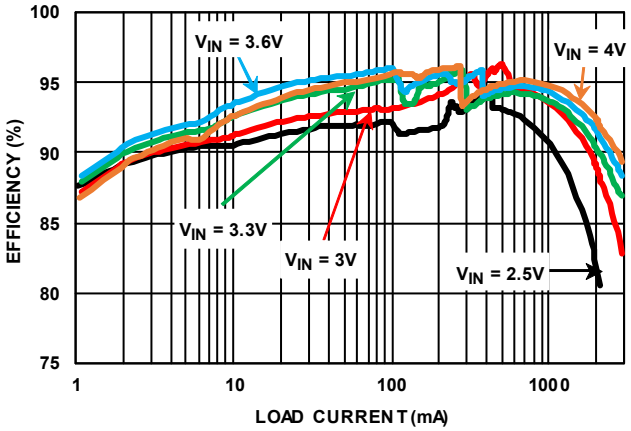

FIGURE 12. EFFICIENCY: V_{OUT} = 3.3V

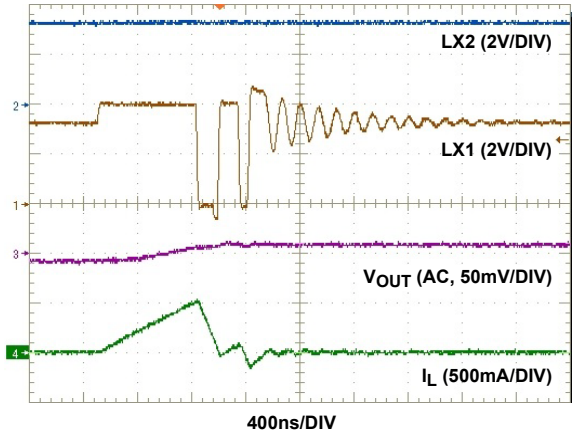

FIGURE 13. STEADY-STATE OPERATION IN PFM (V_{IN} = 4V, V_{OUT} = 3.3V, NO LOAD)

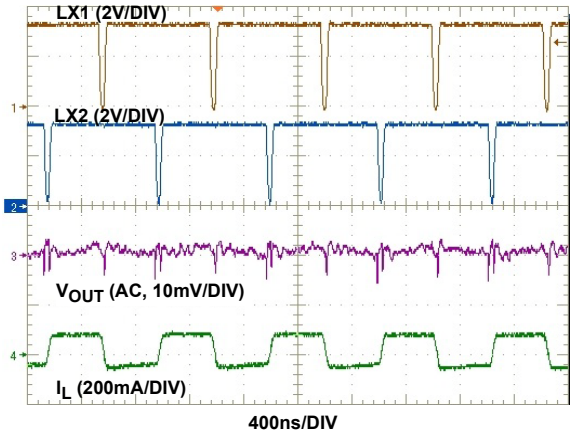

FIGURE 14. STEADY-STATE OPERATION IN PWM (V_{IN} = 3.3V, V_{OUT} = 3.3V, NO LOAD)

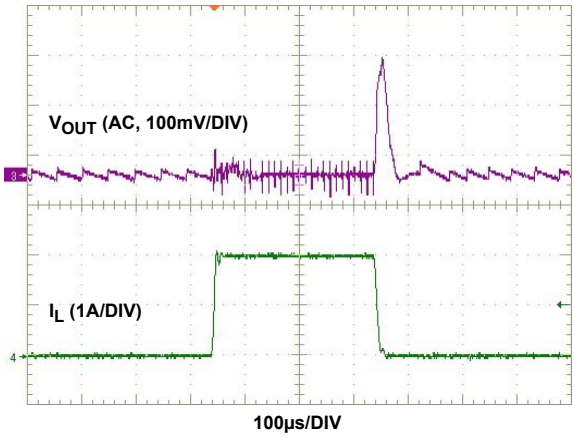

FIGURE 15. 0A TO 2A LOAD TRANSIENT (V_{IN} = 3.6V, V_{OUT} = 3.3V)

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
5. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The intended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

   Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user’s manual or other Renesas Electronics document.
6. When using Renesas Electronics products, refer to the latest product information (data sheets, user’s manuals, application notes, “General Notes for Handling and Using Semiconductor Devices” in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

RENESAS

SALES OFFICES

Renesas Electronics Corporation

http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338

Colophon 7.0