

Important Notice

Restrictions in Use

IDT's ZLED7015KIT-E1 Evaluation Kit hardware is designed for ZLED7015 demonstration, evaluation, laboratory setup, and module development only. The ZLED7015KIT-E1 Evaluation Kit hardware must not be used for module production or production test setups.

Disclaimer

IDT shall not be liable for any damages arising out of defects resulting from

- (i) delivered hardware and software
- (ii) non-observance of instructions contained in this manual and in any other documentation provided to user, or
- (iii) misuse, abuse, use under abnormal conditions or alteration by anyone other than IDT.

To the extent permitted by law, IDT hereby expressly disclaims and user expressly waives any and all warranties, whether express, implied or statutory, including, without limitation, implied warranties of merchantability and of fitness for a particular purpose, statutory warranty of non-infringement and any other warranty that may arise by reason of usage of trade, custom or course of dealing.

Contents

1	Kit Contents	3
2	Kit Description	3
2.1.	ZLED7015 Overview	3
2.2.	ZLED7015KIT-E1 Evaluation Board Overview.....	3
2.3.	Connections.....	4
2.4.	Power Supply.....	5
2.5.	Circuit Operation.....	5
2.6.	Schematic Diagram	6
3	Ordering Information	7
4	Related Documents.....	7
5	Glossary	7
6	Document Revision History.....	8

List of Figures

Figure 2.1 ZLED7015KIT-E1 Evaluation Board (Top View)4
Figure 2.2 ZLED7015KIT-E1 Schematic Diagram 6

List of Tables

Table 2.1 Connections for the Evaluation Board4

1 Kit Contents

The ZLED7015KIT-E1 Evaluation Kit includes the following:

- ZLED7015-E1 Evaluation Board v.X
- Five ZLED7015 samples, MSOP10 with thermal pad package
- *ZLED7015KIT-E1 Evaluation Kit Start-up Information*
- *Kit Disclaimer*

The ZLED7015KIT-E1 Evaluation Kit is fully assembled and ready for immediate operation.

2 Kit Description

2.1. ZLED7015 Overview

The ZLED7015KIT-E1 Evaluation Kit provides a quick and easy method for evaluating the ZLED7015 within its basic application circuit. Reading the *ZLED7015 Data Sheet* before using the Evaluation Kit is recommended for understanding the operation of the ZLED7015 and the Evaluation Board.

The ZLED7015 is a constant current boost converter with an internal FET switch. The step-up converter topology allows series connection of multiple white LEDs so that the LED currents are identical for uniform brightness. The nominal output current can be set by an external resistor with the option to also dim the brightness of the LEDs with a PWM signal or DC voltage. A low 0.3V feedback voltage minimizes power loss in the current setting resistor for better efficiency. The over-voltage protection (OVP) circuit safeguards the chip and the system even if the load is not connected. The ZLED7015 is available in an MSOP-10 package.

The ZLED7015 IC is designed for LED current drive applications of up to 1.8A.

The main features of ZLED7015 driver are

- 6VDC to 30VDC supply voltage
- High efficiency: up to 95%
- PWM or DC voltage dimming control
- Fast 1.0MHz switching frequency
- Internal high power 35V MOSFET switch
- Adjustable over-voltage protection (including open LED string detection)
- Over-temperature protection

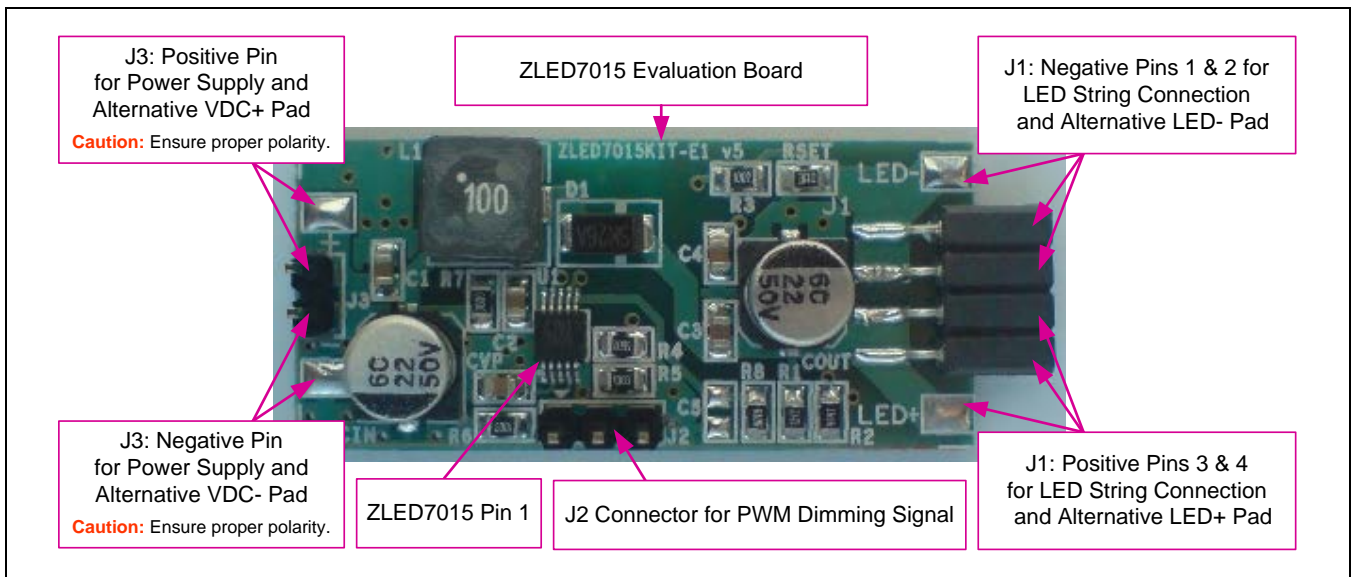
2.2. ZLED7015KIT-E1 Evaluation Board Overview

The Evaluation Board contains a standard 4-pin terminal connector to allow the user to easily connect and supply an LED's board. The Evaluation Board also has two LED power pads (LED+ and LED-) to provide more flexibility in supplying a power LED or LED string. A 10 μ H shielded inductor sets the nominal frequency around 300kHz. The shielded inductor has been selected to minimize radiated EMI. The layout with any switching regulator is crucial to minimize radiated EMI. This reference design keeps the critical track lengths to a minimum. Ground has been maximized around critical areas.

The Evaluation Board offers the following features and benefits:

- Wide input voltage range (see section 2.4).
- Standard 2.54mm 4-pin header for attaching of LEDs and additional duplicate SMD pads (LED- , LED+).
- Standard 2.54mm 2-pin male header and alternative duplicate SMD pads for power supply.
- Standard 2.54mm 3-pin male header for dimming the LED brightness with an external PWM signal.
- All devices are SMD and on the same side of the board (as shown in the top view given in Figure 2.1).
- Maximized power ground copper on top and bottom sides with thermal vias for good heat distribution.
- Track connecting R2 (current sense resistor) to ZLED7015 is as short as possible (sense tracks).
- The C3 filter capacitor and COUT are connected as close as possible to the LED output pins.
- The flyback current path is as short as possible to ensure system precision and efficiency.

Figure 2.1 ZLED7015KIT-E1 Evaluation Board (Top View)



2.3. Connections

Refer to Figure 2.1 for an illustration of the following set up for the Evaluation Board.

Table 2.1 Connections for the Evaluation Board

Connector	Description
J1	Standard 2.54mm 4-pin female header with the following connections. Pins 1 and 2: Negative pole for voltage output to drive the LED string (also see LED- pad) Pins 3 and 4: Positive pole for voltage output to drive the LED string (also see LED+ pad)
J2	Standard 2.54mm 3-pin male header for dimming the brightness of the LEDs with an external PWM signal or DC voltage.
J3	Standard 2.54mm 2-pin male header for power supply. Input voltage range: 6VDC to 30VDC. See section 2.4 for additional requirements.
VDC+	Positive pad for an optional alternative connection for the power supply (instead of J3).

Connector	Description
VDC-	Negative pad for an optional alternative connection for the power supply (instead of J3).
LED+	Positive pad for an optional alternative connection for the positive ZLED7015 driver supply voltage (instead of J1, pins 3 and 4).
LED-	Negative pad for an optional alternative connection for the negative ZLED7015 driver supply voltage (instead of J1, pins 1 and 2).

2.4. Power Supply

The Evaluation Board requires a DC power supply of $\geq 6V$ for the LED string, but it also must be 3V higher than the normally working output voltage (the total forward voltage of the LED or the LED string).



Caution: Ensure proper polarity when making connections. The system is not reverse polarity protected.

See section 2.3 for connection options for the power supply.

2.5. Circuit Operation

The reference current on the Evaluation Board has been set to 100mA but can be adjusted by changing the Rset set resistor according to the formula:

$$I_{LED} = V_{FB} / R_{SET}, [A]$$

Where

I_{LED} = Average output current through the LED(s) in amperes

V_{FB} = Internal feedback reference voltage of the ZLED7015: approx. 0.3V

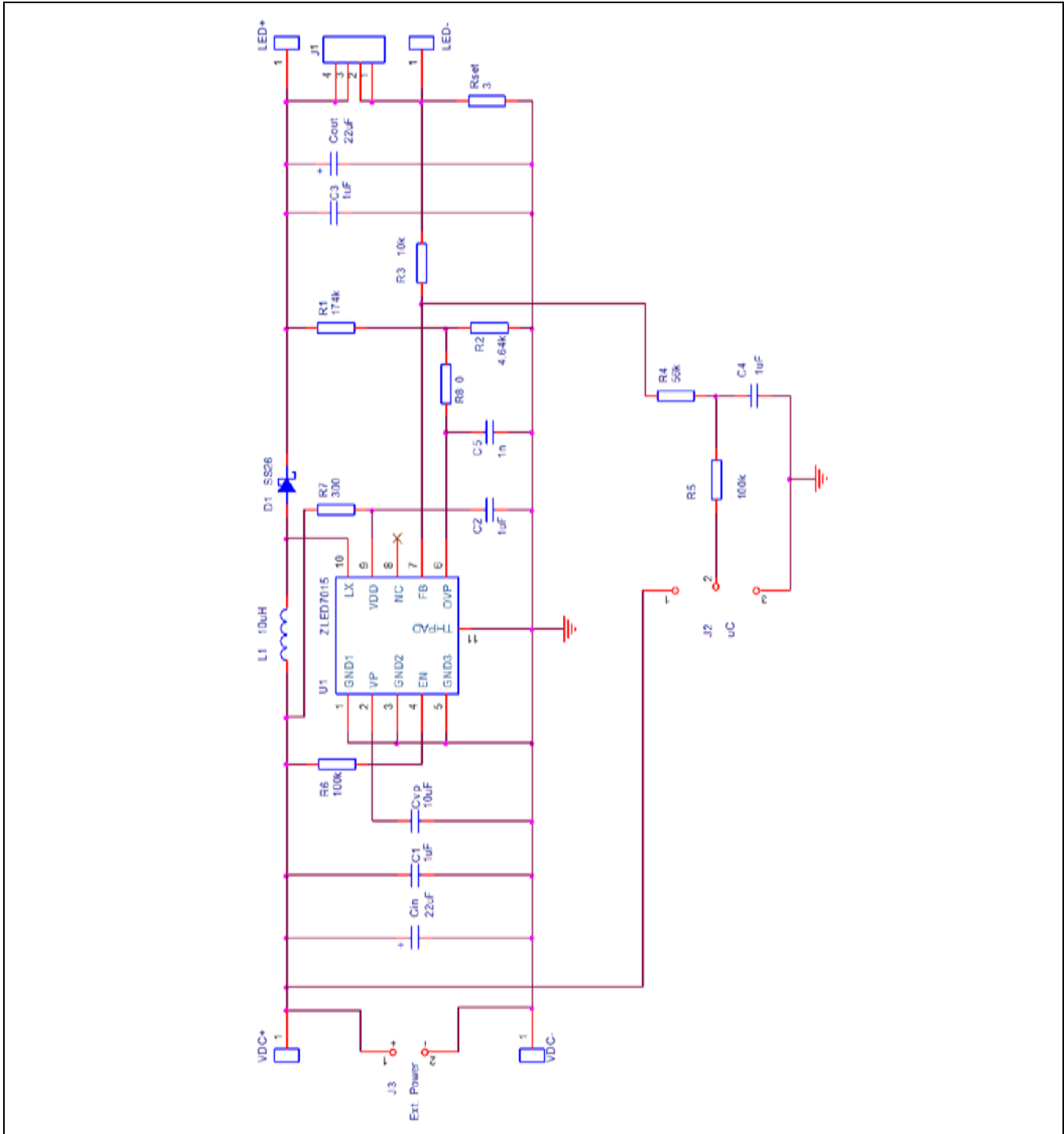
R_{SET} = Nominal current output setting resistor, which is approx. 3Ω on the Evaluation Board

For $R_{SET} = 3.0\Omega \rightarrow I_{LED} = 0.1A$

For detailed calculations about dimming control, PWM signal control, and setting the over-voltage protection level, refer to the ZLED7015 datasheet.

2.6. Schematic Diagram

Figure 2.2 ZLED7015KIT-E1 Schematic Diagram



3 Ordering Information

Product Sales Code	Description
ZLED7015KIT-E1	ZLED7015KIT-E1 Evaluation Kit VX.x including 5 IC samples

4 Related Documents

Document
ZLED7015 Datasheet

Visit www.IDT.com/ZLED7015 or contact your nearest sales office for the latest version of these documents.

5 Glossary

Term	Description
LED	Light Emitted Diode
EMI	Electromagnetic Interference
MOSFET	Metal–Oxide–Semiconductor Field Effect Transistor
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
MSOP10	Mini Small Outline Package

6 Document Revision History

Revision	Date	Description
1.00	March 6, 2013	First release.
	April 20, 2016	Changed to IDT branding.

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01 Jan 2024)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit www.renesas.com/contact-us/.