

Important Notice

Restrictions in Use

IDT's ZLED7022KIT-E1 Evaluation Kit hardware and software are designed for ZLED7022 evaluation, laboratory setup, and module development only. The ZLED7022KIT-E1 Evaluation Kit hardware and software 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 hard- 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	2
2	Kit Description	2
2.1.	Overview	2
2.2.	Power Supply	2
2.3.	Interface and Setting Options	3
2.4.	Demo Mode	4
2.5.	Manual Mode	4
2.6.	Schematic Diagram	5
3	Ordering Information	6
4	Related Documents	6
5	Glossary	6
6	Document Revision History	6

List of Figures

Figure 2.1	ZLED7022KIT-E1 Evaluation Board (Top View)	3
Figure 2.2	ZLED7022KIT-E1 Schematic Diagram	5

List of Tables

Table 2.1	Current Output Settings	4
-----------	-------------------------------	---

1 Kit Contents

The ZLED7022KIT-E1 Evaluation Kit consists of the following parts:

- ZLED7022-E1 Evaluation Board VX.x
- USB cable male 2xA / male Mini-B
- Five ZLED7022 samples, UTQFN package (2mm×2mm)
- *ZLED7022KIT-E1 Evaluation Kit Start-up Information*
- *Kit Disclaimer*

The ZLED7022KIT-E1 Evaluation Kit is fully assembled and ready for immediate operation.

2 Kit Description

2.1. Overview

The ZLED7022KIT-E1 Evaluation Kit provides a quick and easy method for evaluating the ZLED7022 within its basic application circuit. An on-board generator demonstrates the ZLED7022's Pulse Count Control (PCC) digital brightness control feature. Reading the *ZLED7022 Data Sheet* before using the Evaluation Kit is recommended for understanding the operation of the ZLED7022 and the Evaluation Board.

The ZLED7022 is a low-noise, constant-frequency charge pump DC/DC converter that can drive up to six LED channels, providing a programmable constant current level ranging from 1.8mA to 20mA per LED channel. The ZLED7022's current sinks can operate in parallel for driving higher current LEDs as well. The ZLED7022's low dropout current sinks are capable of driving most types of LEDs with forward voltages as high as 4.7V at full current with a VCC input supply of 2.8V to 5.5V.

The Evaluation Board contains a standard 5-pin terminal connector to allow the user to easily interface with the microcontroller and the ZLED7022 to evaluate its functions, features, and performance. The Evaluation Board also has two push-buttons to send commands and change the operation mode of the ZLED7022.

Figure 2.1 shows the top view of the populated kit PCB.

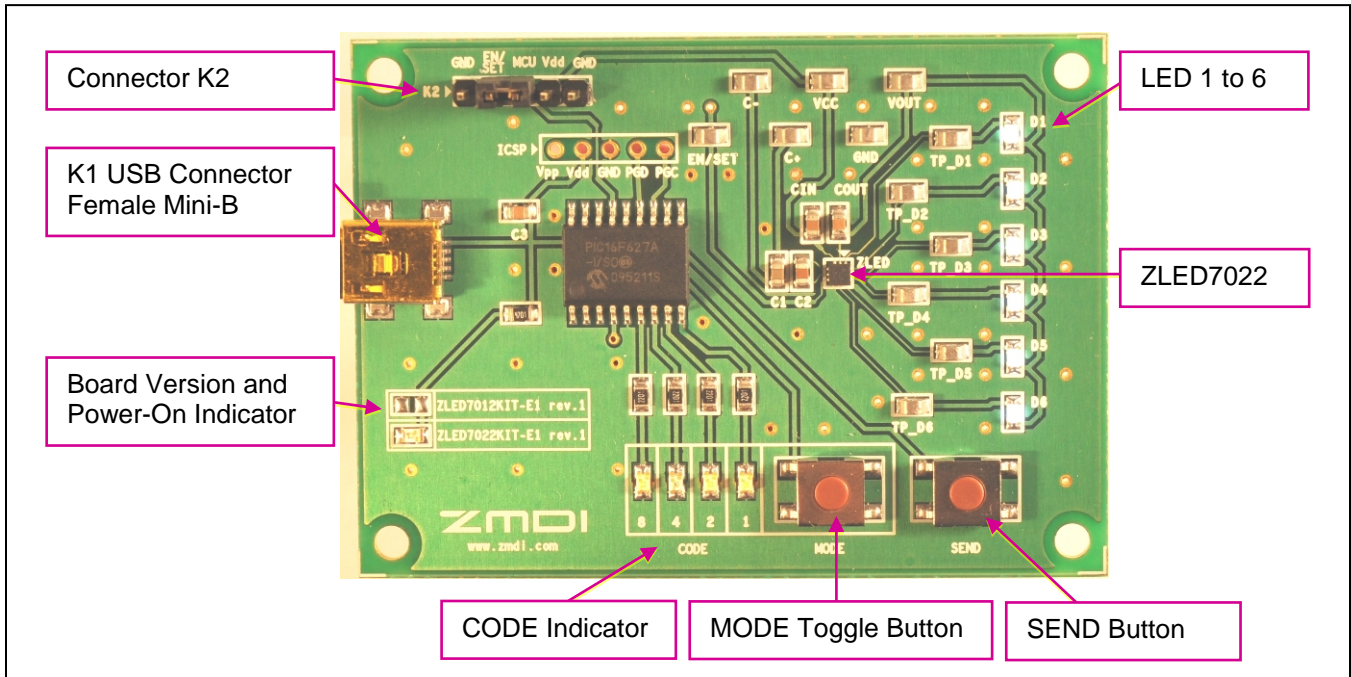
2.2. Power Supply

For easy operation with a 5V supply, the on-board female USB Mini-B connector K1 can be connected via the enclosed cable to a USB A connector of a PC or USB power supply. Since the maximum supply current can reach about 140mA at the highest brightness level, the cable provides two type A connectors (Y cable) in order to not exceed the USB unit load of 100mA.

To operate the kit over the whole supply voltage range of 2.8V to 5.5V, an external power supply can be connected to the Vdd and GND pins of the K2 header.

Since the product family members ZLED7012 and ZLED7022 use the same kit PCB differing only in the number of current channels, the red power indicator LED D11 (for the ZLED7012KIT-E1 Evaluation Kit) or D12 (for the ZLED7022KIT-E1 Evaluation Kit) will automatically point to the valid kit type when power is attached.

Figure 2.1 ZLED7022KIT-E1 Evaluation Board (Top View)



2.3. Interface and Setting Options

K1 – Female USB Mini-B connector for USB power supply. Data pins are not connected.

K2 – Header with the following pins:

- 1 – GND Ground. Sets the ZLED7022 to the low current shut-down mode when connected to pin 2 for longer than 500ms.
- 2 – EN/SET PCC programming input of the ZLED7022.
Can be connected to an external pulse generator or to pin 3 to use the on-board pulse generator or to pin 1 to set ZLED7022 to the low-current shut-down mode.
- 3 – MCU Pulse code sequence output of the microcomputer.
- 4 – Vdd External supply voltage of 2.8V to 5.5V.
- 5 – GND Ground.

ICSP – Contact pads of the microcomputer programming interface.

MODE button – Toggles the PCC pulse count number.

SEND button – Programs the PCC pulse count number to the ZLED7022.

CODE indicator LEDs – Indicates preset PCC pulse count number in hex code.

Test pins – Provide access to all I/Os of the ZLED7022.

LEDs D1 to D6 – Driven by ZLED7022’s outputs D0 to D5.

(Note the difference in denotation for LED numbers between the ZLED7022 and the Evaluation Board LEDs.)

2.4. Demo Mode

To run the demo mode, the EN/SET and MCU pins of the header K2 must be connected by a jumper (the factory-default jumper position on delivery). After the power-on and the microcomputer initialization are completed, the CODE LEDs indicate the number 0xF with all four yellow LEDs glowing. Starting with the highest current level, the pulse count is continuously incremented by the microcomputer and programmed into the ZLED7022 after a hold time of about 0.5 seconds on each brightness level. The firmware of the microcomputer generates programming pulses of about 20 μ s duration.

2.5. Manual Mode

When the jumper connects the EN/SET and MCU pins on K2, consecutively pressing the MODE button will toggle the PCC pulse count to the corresponding hex code in the μ C. This number is displayed by the CODE indicator LEDs. After the desired value is reached, pressing the SEND button programs the preset pulse sequence into the ZLED7022 and changes the current level according to Table 2.1.

Entering 0x0 causes the μ C to hold the EN/SET signal at low potential for more than 500ms, which switches the ZLED7022 into the shut-off mode. Entering 0xF restarts the demo mode.

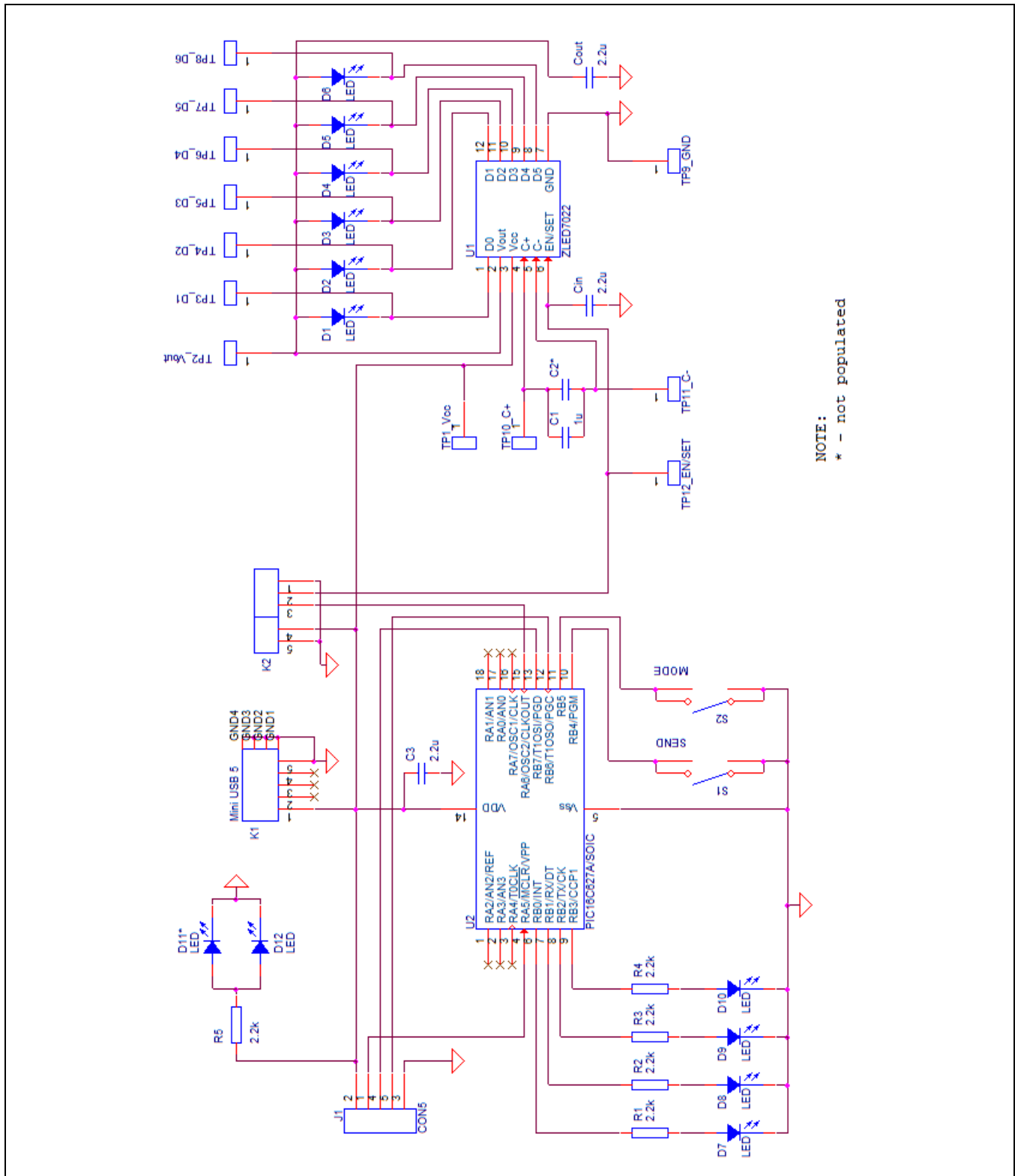
With the jumper on the K2 header removed, an external PCC sequence source can be connected between the EN/SET and GND pins. For signal levels and timing, refer to the data sheet.

Table 2.1 Current Output Settings

PCC Pulse Count	Hex CODE Display	Current Output per Channel (mA)
-	0x0	Causes the μ C to hold the EN/SET input at low potential for longer than 500 ms, which will set the IC into the shut-off mode.
1	0x1	20.0
2	0x2	17.0
3	0x3	14.0
4	0x4	12.0
5	0x5	10.0
6	0x6	8.6
7	0x7	7.0
8	0x8	6.0
9	0x9	5.0
10	0xA	4.2
11	0xB	3.6
12	0xC	3.0
13	0xD	2.4
14	0xE	1.8
-	0xF	Not part of the code range of the ZLED7022. Will cause the μ C to start the demo mode.

2.6. Schematic Diagram

Figure 2.2 ZLED7022KIT-E1 Schematic Diagram



NOTE:
* - not populated

3 Ordering Information

Product Sales Code	Description
ZLED7022KIT-E1	ZLED7022KIT-E1 Evaluation Kit V1.0 incl. USB cable and 5 IC samples

4 Related Documents

Document
ZLED7022 Datasheet

Visit www.IDT.com/ZLED7022 or contact your nearest sales office for the latest version of these documents.

5 Glossary

Term	Description
ICSP	In Circuit Serial Programming
μC	Microcontroller
PCB	Printed Circuit Board
USB	Universal Serial Bus

6 Document Revision History

Revision	Date	Description
1.0	December 7, 2010	Initial release
	April 18, 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)

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/.