

# ZigBee Light Link Development Kit Quick Start Guide

## Opening the box and setting up a ZLL network in 3 simple steps

### 1. Kit Contents



- 3 x Zlight2 LED boards
- 1 x Remote control
- 3 x micro-USB cables
- Documentation

### 2. Regulatory Information

The Zlight2 boards and the Remote control are FCC- and IC certified and are tested/compliant with ETSI/R&TTE over temperature from 0 to +35°C. The Remote control has an on-board inverted F PCB antenna while the Zlight2 has an on-board half wave dipole PCB antenna.

FCC/IC Regulatory Compliance  
FCC Part 15 Class A Compliant  
IC ICES-003 Class A Compliant



**Caution!** The kit contains ESD sensitive components. Handle with care to prevent permanent damage.

### 3. Purpose of the Kit

The CC2531 ZigBee Light Link (ZLL) development kit is intended for customers who would like to evaluate ZLL lighting control for LED light products, and develop simple applications and demonstrators based on this standard.

The kit contains everything needed to set up a ZLL network and control the lights individually or as a group. It's also possible to extend the kit with more HW to allow cloud based control solutions such as Ninja blocks (<http://www.ninjablocks.com/>). Information about this can be found by following the links supplied at the end of the document.

### 4. Power Options

The Zlight2 boards are powered through the USB connector. It is recommended that they are powered from a dedicated USB power supply capable of supplying at least 800mA and max 5.5V.

The Remote control is powered by a 3V CR2025 battery (included). Do not use other battery types.

### 5. Powering the Boards (Step 1)

- Connect the Zlight2 boards to your USB power supply using the supplied cables.
- Insert the CR2025 battery into the remote control

**Do not leave the Zlight2 boards powered when not in use or unattended.**

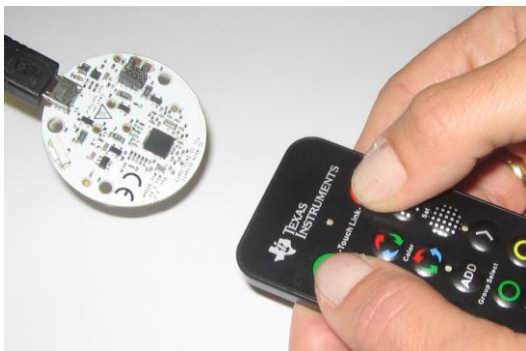
### 6. Starting the Network (Step 2)

In ZLL, the process of pairing a new lamp with a remote control is called touch linking.

Touch link the first Zlight2 board by holding the remote control close and simultaneously pressing the "on" and "off" buttons. Release both buttons. After a few seconds, the Zlight2 will flash, and the remote control will give a short beep.(continued)

### Starting the Network (cont.)

Continue by Touch linking the remaining 2 Zlight2 boards, one at a time. Note that if the two buttons are pressed with too much time difference, the "on" or "off" command will be sent to the previously touch linked Zlight2 instead of initiating a new Touch link command. Try again.



**Touch link the Zlight2 boards by holding the remote control close and simultaneously pressing the "on" and "off" buttons**

### 7. Operating the Zlight2 (Step 3)



**Caution!** To minimize the risk of fire or equipment damage, make sure that ambient temperature air is allowed to circulate freely around the Zlight2 board when operating. Avoid touching components during operation if symbolized as hot. A thermal shutdown routine is implemented in the included firmware running on the lights. Always make sure that this routine is implemented if you flash your own firmware. The easiest way to do that is to base it on ZStack-Lighting-1.0.2 or later releases from Texas Instruments.



**Caution! DO NOT STARE DIRECTLY INTO LED LIGHT SOURCE.** Intense light sources have a high secondary exposure potential due to their blinding effect. A temporary reduction in visual acuity and afterimages can occur, leading to irritation, annoyance, visual impairment, and even accidents, depending on the situation. Always consider the use of light filtering/darkening protective eyewear and be fully aware of surrounding laboratory type set-ups when viewing intense light sources to minimize/eliminate such risks in order to avoid accidents related to temporary blindness.

### Operating the Zlight2 (cont.)

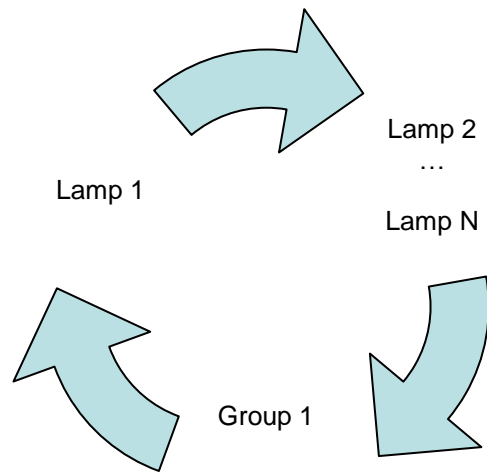


<b>RISK GROUP 2</b>
<b>CAUTION</b> Possible hazardous optical radiation emitted from this product. Do not stare at operating lamp. Maybe harmful to eyes.

- Do not stare at operating LEDs –
  - (Risk Group 1 (RG1) @ 0.9m)
- Per IEC 62471 ed 1.0: 2006-07 ("Photobiological Safety of Lamps and Lamp Systems") this product has been classified in Risk Group 2. Products classified as Risk Group 2 do not pose a hazard due to the aversion response to very bright light sources or due to thermal discomfort. It should be noted that INTENTIONALLY staring at the lamp for extended lengths of time from short distances could lead to a potential risk of eye damage due to a retinal blue-light hazard. In order to reduce the potential of exposure to a retinal blue-light hazard, the operator must avoid any direct view of the LEDs while in operation, from a distance of 0.9m, or closer.

## Operating the Zlight2 (cont.)

Once connected to the ZLL network through touch linking, the Zlight2s can be controlled with the remote control. The remote control will always address a target, which can be an individual lamp, or a group of lamps.



Use the < > buttons to select target

## Operating the Zlight2 (cont.)

When more than one lamp is on the network, repeatedly pressing the < or > button on the remote will cycle through all the individual lights, and group 1, in a circular manner (> cycles clockwise and < cycles counter-clockwise).

The next command will be sent to the last selected target. Group 1 consists of all the lamps on the network. The lamps will blink to identify when they are selected. Select group 1 by pressing the left or right arrow button until all the lamps blink simultaneously to identify.

You can now control Level, Color and Saturation on all the lamps. The on/off commands will also be sent to the whole network (Group 1).

Level up: Increase intensity  
Level down: Decrease intensity  
Color (Hue) up: Change colour  
Color (Hue) down: Change colour  
Sat up: Increase saturation ("more color")  
Sat down: Decrease saturation ("more white")

Note: Changing the Color (Hue) will not produce a visible change in the light if the Saturation is set to minimum, i.e. white light.

## 8. Next Steps

For more advanced use and colour control, go to the TI ZigBee Light Link wiki page by following the link found at the end of this document.

## Additional Tools and Links

### CC debugger

The CC debugger is a tool that allows you to flash and debug the Zlight2 using SmartRF Flash Programmer or IAR Embedded Workbench. It connects to a USB port on your PC and to the debug header on the Zlight2 board.

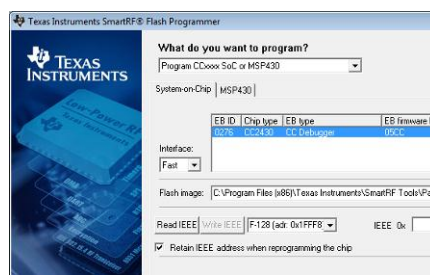
### CC2531 USB dongle

The CC2531 USB dongle plugs into a Linux or Windows host and can serve as a gateway for cloud based lighting control.



### SmartRF Flash Programmer

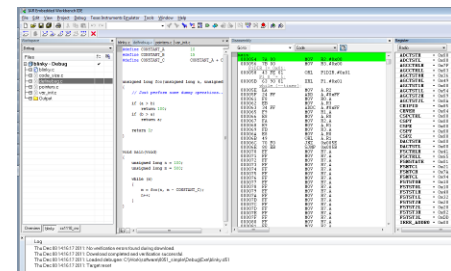
Texas Instruments has a simple tool which can be used to program and flash the Zlight2.



SmartRF Flash Programmer can be downloaded from [www.ti.com/tool/flash-programmer](http://www.ti.com/tool/flash-programmer)

### IAR Embedded Workbench

To develop software, program, and debug the Zlight2, you should use IAR Embedded Workbench for 8051.



More information on IAR EW8051, including a free evaluation version download, can be found at [www.iar.com/ew8051](http://www.iar.com/ew8051).

### Useful Links

TI ZigBee Light Link wiki page:  
[http://processors.wiki.ti.com/index.php/ZStack-Lighting-1.0.1\\_Kit](http://processors.wiki.ti.com/index.php/ZStack-Lighting-1.0.1_Kit)

### Useful Links

Kit Product Page  
<http://www.ti.com/tool/cc2530zdk-zll>

CC2531 User's Guide  
<http://www.ti.com/lit/swru191>

For additional help, visit the TI E2E Forum  
[www.ti.com/lprf-forum](http://www.ti.com/lprf-forum)

The Zlight2 lights supplied in this kit are powered by OSRON LEDs from Osram. Please visit the LED Light for you web site to learn more about LED lighting and ZigBee Light Link wireless control examples.

<http://www.ledlightforyou.com/Partners/Highlights/en-ZigBee-Lighting-Control.php>



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As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

### General Statement for EVMs including a radio

*User Power/Frequency Use Obligations:* This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

### For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

#### Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### **FCC Interference Statement for Class B EVM devices**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **For EVMs annotated as IC – INDUSTRY CANADA Compliant**

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### **Concerning EVMs including radio transmitters**

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

### **Concerning EVMs including detachable antennas**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

### **Concernant les EVMs avec appareils radio**

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### **Concernant les EVMs avec antennes détachables**

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

## **【Important Notice for Users of EVMs for RF Products in Japan】**

**This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan**

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

**Texas Instruments Japan Limited**  
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**For Feasibility Evaluation Only, in Laboratory/Development Environments.** Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

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