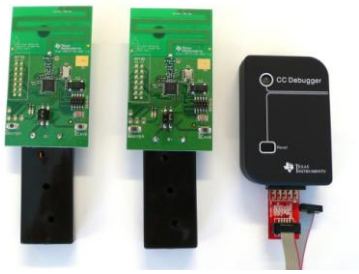
CC1110 Mini Development Kit 868-915 MHz Quick Start Guide

1 Kit Contents



2 x SmartRFCC1110-868 target boards
1 x CC Debugger
1 x 10- pin flat cable with 2x5 2.54 mm connector
1 x 10-pin flat cable with 2x5 1.27 mm connector
1 x Converter board 2.54 mm – 1.27 mm connector
1 x Mini USB cable
Batteries
CD with Evaluation Version of the IAR EW8051
Documentation

Caution! The kit contains ESD sensitive components. Handle with care to prevent permanent damage. To minimize risk of injury, avoid touching components during operation if symbolized as hot.

The hardware in this kit is FCC/IC certified and complies with ETSI/R&TTE over temperature from 0 to +35°C.

2 Running the Preprogrammed Link Test

2.1 Introduction

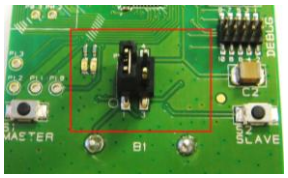
The CC1110 on the SmartRFCC1110 target board is preprogrammed with a link test which operates at 868.3 MHz, and uses GFSK modulation and a bit rate of 2.4 kbps.

The link test runs a point-to-point communication between a Slave and a Master node based on the SimpliciTI 1.1.0 protocol.

First the Master and Slave nodes must be configured as described in the following sections. The two nodes will then establish a link. When this link is established, the Master starts to periodically send packets to the Slave. Between each transmission, the Master goes to receive mode and waits 250 ms for an acknowledgement packet from the Slave. The Slave node is in receive mode waiting for packets from the Master. For each received packet, the Slave automatically responds with an acknowledgement packet.

2.2 Powering the boards

Place 2 AAA batteries in the battery holders placed on the bottom side of each of the SmartRFCC1110-868 boards. Place the jumper on the power selection connector P1 between pin 1 and pin 2 on each board.



Applying power to the SmartRFCC1110-868 starts the preprogrammed link test on the CC1110 and the two LEDs on the board are on for 1 s.
Warning! To minimize risk of personal injury or property damage, never use rechargeable batteries to power the board. Do not leave the board powered when unattended.

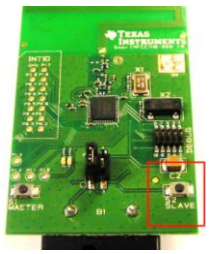
2.3 Configure the Master Node

Press the S1/MASTER button that is placed on the left hand side of the board. When this button is pushed, the two LEDs on this board will blink rapidly. The Master now waits for a Slave node to establish a link.

Note that the boards only respond to the first button push. To reconfigure the board, the board must be reset, see point 2.9 in this manual.

2.4 Configure the Slave Node

On the other board, press the S2/SLAVE button that is placed on the right side of the board. When the button has been pushed, the two LEDs on this board will blink very slowly until a link with a Master node is established. Note that establishing the link may finish in less than 1 s depending on the environment.



It is important to keep distance (more than 1 meter) between the two nodes when they are trying to establish the link to avoid saturation. This is because full output power (12 dBm) is used for this communication between the nodes.

2.5 The LEDs on the Master Node

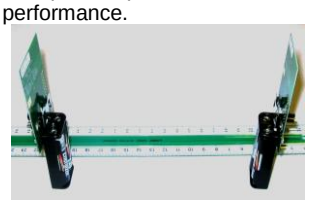
LEDs	State
Both LEDs blink rapidly	The Master is trying to establish a link with a Slave
Green LED on for 0.5 s	The Master has received an ACK to a packet sent, link ok
Red LED on for 0.5 s	The Master has not received an ACK to the last 3 packets sent
Red LED on for 3 s	If the Master does not receive ACKs from the SLAVE in ~70 s, the Master will stop to send packets to save power. Press S1/MASTER to resume the link test
Red LED on for 5 s	For test only: When the link is established, pressing the S2/SLAVE button turns the red LED on for 5 s

2.6 The LEDs on the Slave node

LEDs	State
Both LEDs blink slowly	The Slave is trying to establish a link with a Master
Red LED on continuously	The link between the Slave and Master is established and the Slave is in RX waiting for packets from the Master
Green LED on for 0.5 s while red LED on continuously	The Slave has received a packet from the Master and sent an ACK, link ok

2.7 Antenna Performance

The PCB antenna length on the SmartRFCC1110-868 is tuned for optimal performance with two AAA batteries present in the battery holder. As this antenna is directive, see DN024 www.ti.com/lit/swra227, it is important to place the two nodes so that the arrow in the silk print next to the antenna on both boards points upwards towards the sky for optimal performance.



2.8 Range testing

The preprogrammed link test is well suited for range testing. Place the Slave in an open field and bring the Master a known distance away. Use the LED signaling to decide the link quality.

Note that the environment, antenna, etc greatly affect the range, see DN018 www.ti.com/lit/swra169.

2.9 Resetting the board

The recommended reset sequence is:

- Remove jumper on P1 completely
- Push one of the buttons to discharge the large capacitor on the power line. If this capacitor is not discharged, the SmartRFCC1110-868 boards may continue to run the current application until the capacitor is discharged. This may take several seconds.
- Replace the jumper on P1 to power the board again

3 Using the CC Debugger with the Development Kit

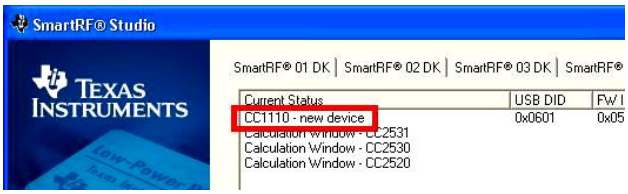
3.1 The CC Debugger

The CC Debugger connects to the PC via a mini USB and uses the DEBUG interface to communicate with the radio. The tool can be used for:

- Programming the flash and debugging an application running on the CC1110. The PC tools available for these purposes are the SmartRF Flash Programmer from Texas Instruments and IAR Embedded Workbench for 8051 from IAR Systems.
- Testing the radio performance of CC1110 using SmartRF Studio.

For more details, please refer to the CC Debugger User's Guide www.ti.com/lit/swru197 and the CC1110 & CC2510 Mini Development Kit User's Guide www.ti.com/lit/swru236.

3.2 SmartRF Studio

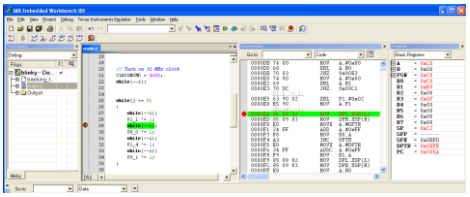


SmartRF Studio can be used for RF testing, evaluation of CC1110 and to find optimal register settings. It is available on www.ti.com/smartrfstudio.

3.3 Flash Programmer

The Flash Programmer application, available on the kit web page http://focus.ti.com/docs/toolsw/folders/print/flash-programmer.html can be used to program Intel HEX files, read the contents of CC1110 flash, and several other operations.

3.4 IAR Embedded Workbench



To develop software, program and debug the CC1110, the IAR Embedded Workbench for 8051 is recommended. An evaluation version of IAR EW8051 is included in the kit. This free evaluation version and a free code size limited version, can be downloaded from the web, see www.iar.com/ew8051.

A. Available Software and User's Guides

CC1110 & CC2510 Mini DK Software Example User's Guide and Source Code
Source and documentation for the link test for the SmartRFCC1110 target board www.ti.com/lit/zip/swrc133 and www.ti.com/lit/swru237

CC1110 & CC2510 Mini Development Kit User's Guide
More documentation and details on the use of the SmartRFCC1110 target board www.ti.com/lit/swru236

CC1110, CC2510 Basic Software Examples
Source code for other, simple examples for the CC1110 www.ti.com/lit/zip/swrc117

SimpliciTI™ Network Protocol
An RF protocol targeting simple, small RF networks www.ti.com/simpliciti

B. More information

The Low Power RF Online Community www.ti.com/lprf-forum has forums, blogs and videos. Use the forums to find information, application and design notes, FAQs, or to discuss and get help with your design.

On the Texas Instruments' Low-Power RF web site www.ti.com/lprf, you will find all our latest products, news and events updates, and much more.

The TI LPRF eNewsletter keeps you up to date on e.g. new products, application notes, software and events. Sign up at www.ti.com/lprfnewsletter.

We hope you will enjoy working with the CC1110 Mini Development Kit and associated Low-Power RF products from Texas Instruments.

Note that there should only be one active power source at any one time.

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

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REGULATORY COMPLIANCE INFORMATION

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 this Product 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.

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http://www.tij.co.jp

EVALUATION BOARD/KIT/MODULE (EVM)
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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.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

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