WLC1115 MP-A11 15-W wireless power transmitter (REF_WLC_TX15W_C1) user guide

About this document

Scope and purpose

This document is a user guide for the WLC1115 MP-A11 15-W wireless power transmitter reference solution (REF_WLC_TX15W_C1). It is a Qi 1.3.2 certified solution (Qi Id: **12383**) and supports up to 15-W charging. The reference board demonstrates the capabilities and features of the Infineon WLC1115 wireless charging transmitter controller. WLC1115 is a highly integrated wireless power transmitter with an integrated USB Type-C Power Delivery (PD) controller, certified for USB PD 3.1 specification (USB-IF TID: 7531).

You can see the relevant sections based on your requirement:

- **Introduction** – Provides basic information on the reference board, including details about the interfaces.
- **WLC1115 software tool** – Provides an overview of the Wireless Charging Configuration Utility software.
- **WLC1115 wireless power transmitter system design** – Explains the reference board architecture and system design details.
- **Reference board operation** – Describes operating the reference board as a wireless power transmitter, configuring the system-level parameters, downloading the firmware, and capturing the debug log.

Intended audience

The document is intended for the users of WLC1115 15-W wireless power transmitter reference board (REF_WLC_TX15W_C1).

Related documents

[1] Product webpage:

- **Wireless charging ICs**

[2] Reference board webpage:

- **REF_WLC_TX15W_C1 wireless charging (WLC) MP A11 power transmitter**

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Safety information

The REF_WLC_TX15W_C1 reference board is intended for use as an evaluation platform for hardware or software in a laboratory environment. The board is an open-system design, which does not include a shielded enclosure. Due to this reason, the board may cause interference to other electrical or electronic devices in close proximity. In such cases, take adequate preventive measures. Also, do not use this board near any medical equipment or RF devices.

Attaching additional wiring to this product or modifying the product operation from the factory default may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures must be taken.

The REF_WLC_TX15W_C1 reference board contains ESD-sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment, which can cause a discharge without detection. Permanent damage may occur to devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused REF_WLC_TX15W_C1 reference boards in the protective shipping package.

General safety instructions

ESD protection

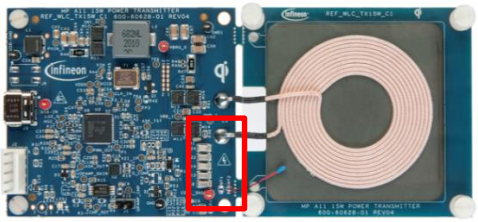
ESD can damage boards and associated components. Infineon recommends that the user perform procedures only at an ESD workstation. If an ESD workstation is unavailable, use appropriate ESD protection by wearing an antistatic wrist strap attached to the chassis ground (any unpainted metal surface) on the board when handling parts.

Handling boards

The boards provided with the REF_WLC_TX15W_C1 reference board are sensitive to ESD. When removed from the casing, this applies to the boards supplied with a plastic casing. Hold the boards only by the edges. Place it on a grounded, static-free surface after removing a board from the box/casing. Use a conductive foam pad, if available. Do not slide the board over any surface.

Do's and don'ts

- Do not touch the inverter output area marked below while the reference board is in use. The components in this area may operate at a voltage higher than 30 V.



- Keep the coil area of the reference board clear from any metallic debris.
- Monitor the coil interface's surface temperature during prolonged usage.
- Ensure that there are no foreign metallic objects on REF_WLC_TX15W_C1 board's charging interface surface soon after the phone/receiver is placed to avoid mis-calibration and overheating.

1 Introduction

This document is a user guide for the WLC1115 MP-A11 15-W wireless power transmitter reference solution (REF_WLC_TX15W_C1). This solution consists of the reference board, firmware, and software utility called as the Wireless Charging Configuration Utility.

Infineon's WLC1115 based 15-W wireless power transmitter reference board REF_WLC_TX15W_C1 is a highly integrated, Qi compliant transmitter design with an MP-A11 type transmitter coil. The REF_WLC_TX15W_C1 board works with WPC-certified wireless receivers by taking power from a type-C PD adapter. The input voltage will be automatically configured to 9-V, 15-V or 20-V based on load power requirements of receiver and PD capability. A two-switch buck regulator topology, powered by PD input, is used to provide the regulated input voltage to the full-bridge inverter, driving the resonance tank (resonance capacitor and transmitter coil).

The WLC1115 can support variable inverter input voltage control and variable WPC operating frequencies control for inverter to optimize operation with WPC receivers. For the MP-A11 transmitter coil, variable inverter input voltage control is used by the WLC1115. WLC1115 has integrated gate drivers for the buck and inverter power supplies necessary for wireless transmitter applications. WLC1115 supports a wide input voltage range and offers many programmable features for creating distinct wireless transmitter solutions.

Visit the product webpage **[1]** to understand the capabilities of the WLC1115 controller in more detail.

Note: Infineon offers Qi v1.3.2 EPP certified reference solution with several configurable parameters via the Wireless Charging Configuration Utility for system-specific enhancements. However, the end product Qi certification is the product manufacturer's responsibility.

1.1 Contents

The WLC1115 15-W wireless power transmitter reference board package contains the following:

- WLC1115 15-W wireless power transmitter reference board (REF_WLC_TX15W_C1) (1 no.)
- USB-C power adapter (1 no.)
- USB Type-C cable (1 no.)
- Qi-compatible receiver (1 no.)
- Host Programming Interface (HPI) dongle for programming/debugging (1 no.)
- USB micro-B cable (1 no.)
- Quick start guide (1 no.)
- Jumper wires (4 nos.)

The following items may be required for evaluating the wireless power transmitter capabilities of the reference board. Note that these are not included in the reference board package.

- Qi- compatible phone
- Windows PC running Windows OS 10 or higher to run the Wireless Charging Configuration Utility

1.2 Downloading the kit documents and hardware design files

The documents and the hardware design files for REF_WLC_TX15W_C1 can be downloaded from the REF_WLC_TX15W_C1 reference board webpage **[2]**. The documents include a quick start guide, test report and user guide (this document). The hardware design files package include schematic, BOM, and layout files.

1.3 Board details

The key interfaces of the WLC1115 15W Tx reference board are marked in **Figure 1**.

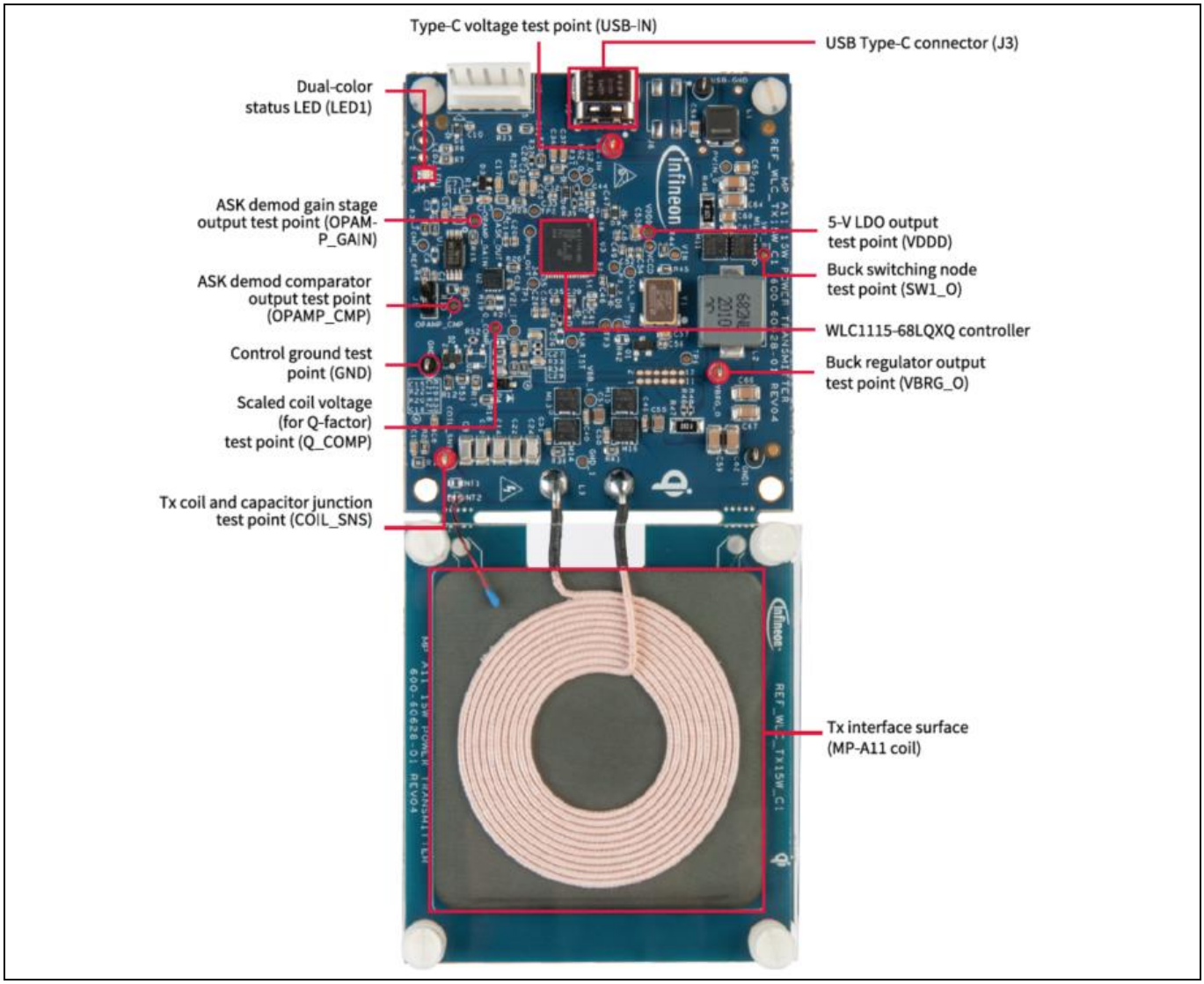


Figure 1 `REF_WLC_TX15W_C1` board interfaces

2 WLC1115 software tool

2.1 Wireless Charging Configuration Utility

The WLC1115 controller is a fully programmable controller allowing users to configure the firmware parameters and store them in its internal flash memory. The Wireless Charging Configuration Utility is a Microsoft Windows application developed by Infineon to guide the WLC11115 user through the process of configuring and programming the WLC11115 device. The utility allows users to:

1. To read the firmware configuration data from the `REF_WLC_TX15W_C1` reference board and modify it or create a new configuration from the scratch.
2. Program the resulting configuration data onto the target WLC1 device or program the complete firmware.

WLC1115 controller supports programming over I2C and CC interfaces. Usage of the Wireless Charging Configuration Utility requires the HPI dongle hardware, which is included in the reference design package.

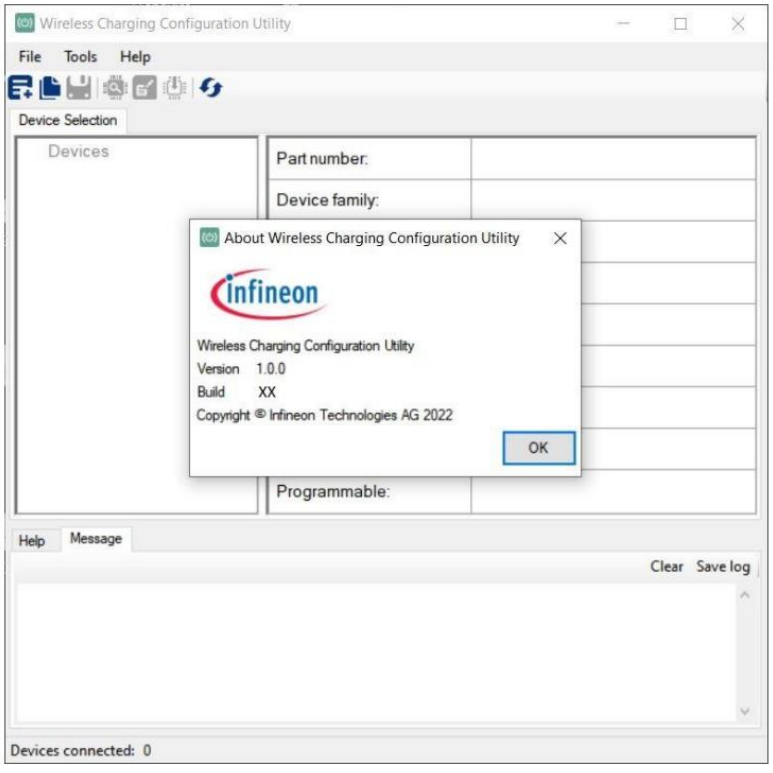


Figure 2 Wireless Charging Configuration Utility

Visit the product webpage [1] to download the latest version of Wireless Charging Configuration Utility.

3 WLC1115 wireless power transmitter system design

The WLC1115 wireless transmitter unit supports wireless charging of Qi compliant wireless receivers and phones. The transmitter supports BPP and EPP types wireless receivers and complies with the 1.3.2 version of the Qi specficiation.

The interconnection of `REF_WLC_TX15W_C1` with source and receivers is shown in **Figure 3**. The recommended DC input source configurations are listed in **Table 1**.

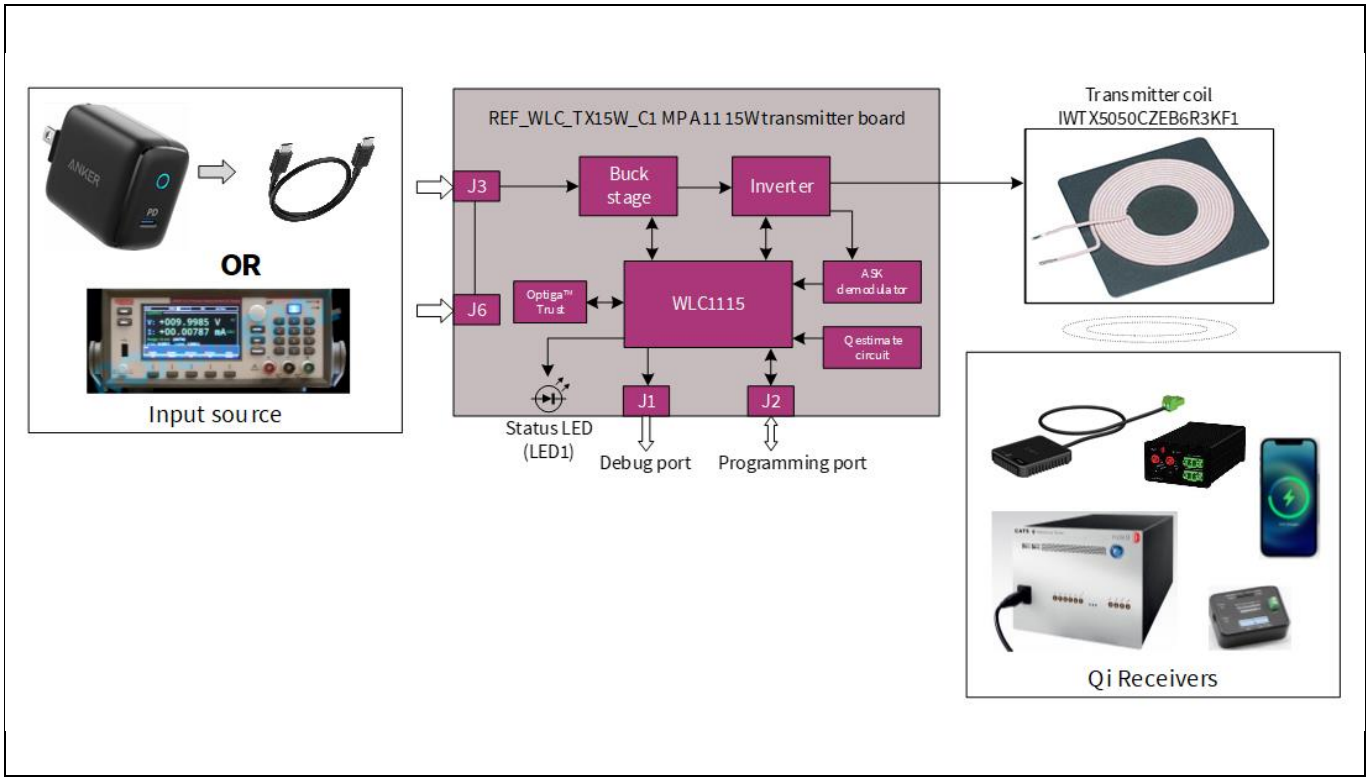


Figure 3 WLC1115 kit interconnection

Table 1 Input source for the EVK

DC input source	`REF_WLC_TX15W_C1` requirement
USB Type-C and PD	9 V, 3 A 15 V, 2 A 20 V, 1.5 A
DC power supply	Variable DC voltage type 9 V to 20 V, 3 A output capacity
USB PD legacy charging protocols, such as QC 2.0/3.0 and AFC	USB Type-C connector; 9 V to 12 V

Note:

1. *The kit is configured to operate with USB PD input by default. Contact Infineon **Technical support** to get the firmware that supports DC input or QC/AFC adaptor based operation.*
2. *The dc power supply polarity should not be reversed.*
3. *Customers should acquire their own licensing for QC/AFC support.*

3.1 REF_WLC_TX15W_C1 MP A11 15W power transmitter board

The `REF_WLC_TX15W_C1` MP A11 15-W transmitter board implements the power stage and control of wireless power transfer system. The transmitter board architecture is shown in **Figure 4**.

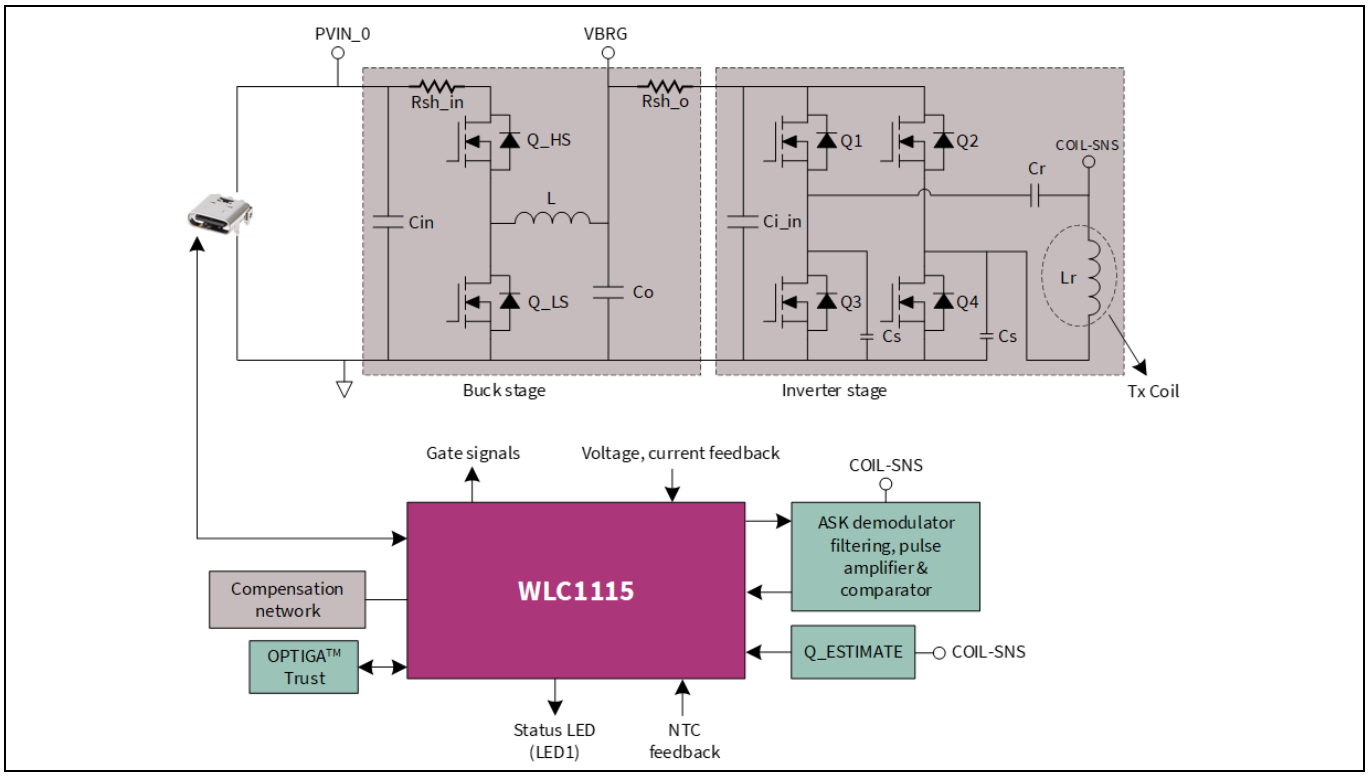


Figure 4 `REF_WLC_TX15W_C1` power transmitter reference board architecture

The following are key features of the reference board:

1. Qi 1.3.2 compliance
2. Robust ASK and FSK in-band communication between transmitter and receiver
3. Integrated foreign object detection based on system parameters like Q-factor and power loss
4. Type-C PD Input with PD compliance
5. Wide input voltage ranges from 4.5 V to 24 V
6. Integrated buck converter gate drive and control, operating at a switching frequency of 400 kHz
7. Integrated gate drive for full-bridge inverter operating at 127.7 kHz switching frequency
8. MP-A11 coil with variable Inverter input voltage control
9. Peak efficiency of greater than 83% at full load with WRM483265-10F5-12V-G

The reference board contains the following key sections:

1. **Input connector** – The board can be powered using a USB-C power adapter over the USB Type-C connector (J3). There is also an option for a DC power supply connection (J6). See **Appendix A** to understand the procedure for powering the reference board using a DC supply. Contact Infineon **Technical support** to enable the operation of the reference board using QC/AFC adaptor.
2. **Buck stage** – The buck power stage regulates VBRG voltage to control the power to the receiver. The buck stage operates at a 400-kHz frequency in forced continuous conduction mode (FCCM). The VBRG is regulated from 3-V to 18-V based on receiver type and load. Based on the VBRG value, the USB PD contract (PVIN_0) dynamically varies between 9-V, 15-V, and 20-V during power delivery to optimize efficiency. When there is no receiver on the interface surface, the USB PD contract is set to 5-V.

3. **Inverter stage** – The full-bridge inverter (Q1 to Q4) is operated at a fixed frequency of 127.7-kHz to drive the resonant tank formed by the transmitter coil (Lr) and resonant capacitors (Cr). The coil voltage feedback (COIL-SNS) is used for Q-factor estimation and ASK demodulator circuits.
4. **Transmitter coil assembly** – The transmitter coil is MP-A11 type with specifications per Qi standards. The coil is mounted on a separate coil PCB. An acrylic sheet forms the interface surface of the transmitter. The coil mounting adhesive, spacers, and acrylic thickness are selected such that the distance between coil top surface to interface surface is approximately 3.35-mm (Qi specification – 3.5 ± 1 mm). See **Figure 5** for coil assembly details.

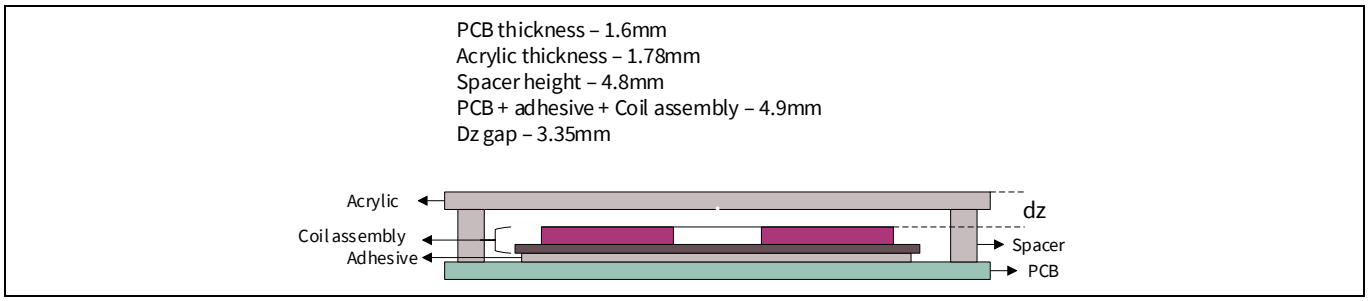


Figure 5 MP A11 transmitter coil assembly

5. **WLC1115-68LQXQ** – The WLC1115 is a single controller unit to control the transmitter coil and USB-PD interface. The WLC1115 simplifies the transmitter board architecture with inbuilt gate drivers for buck and inverter stage, inbuilt LDO for logic and core power, and more features. With an on-chip 32-bit Arm® Cortex®-M0 processor, 128-kB flash, 16-kB RAM, and 32-kB ROM, the firmware supporting the complete Qi and USB PD state machine logic can be programmed onto WLC1115.
6. **ASK demodulator** – The ASK demodulator is based on coil voltage and bridge current. The demodulated signal from both paths is processed through a dual opamp-based gain stage and a comparator (U1) and decoded by the WLC1115 controller.
7. **SLS32AIA020U3USON10** – The authentication requirements for the Qi 1.3.2 is realized using a security controller from Infineon. The OPTIGA™ Trust comes with full system integration for the cost-effective and seamless authentication deployment, and it is interfaced to WLC1115 over I2C.
8. **Q-factor estimation** – The Q-factor estimation from coil voltage is performed by WLC1115 through the signal at Q_COMP. The coil voltage is processed through a blocking capacitor, voltage divider, and clamping diode to feed to the WLC1115 controller for Q-factor estimation.
9. **Status indication** – The firmware indicates the various system states or events using the dual-color (red and blue) status LED (LED1). See Reference board operation to understand more details.

3.1.1 Board connectors

The transmitter board has power and signal connectors for operation and monitoring the wireless power transfer. The function of each connector is listed in **Figure 6**.

Table 2 `REF_WLC_TX15W_C1` board connectors

Connector	Type	Description
J3	Power	USB Type-C connector for DC input through a USB-C power adaptor or QC/AFC type AC/DC adaptor * This connector is also used to download configuration data/firmware from the Wireless Configuration Utility through HPI dongle over the Type-C CC lines. For more information, see section **4.2**.
J6	Power	SMD connector option for DC input through a variable DC power supply *
J1	Signal	Debug serial port. Connect to an HPI dongle (which is provided as part of the reference board package) to view system status on a PC using a terminal emulator software (Tera Term, Putty, and so on). The data is sent at 1-M baud rate.
J2	Signal	SWD connector. This connector is used to download configuration data/firmware from Wireless Configuration Utility through an HPI dongle over I2C lines. For more information, see section **4.2**.
L3	Power	Terminals for transmitter coil connection.

* Do not power the transmitter board from both J3 and J6 simultaneously.

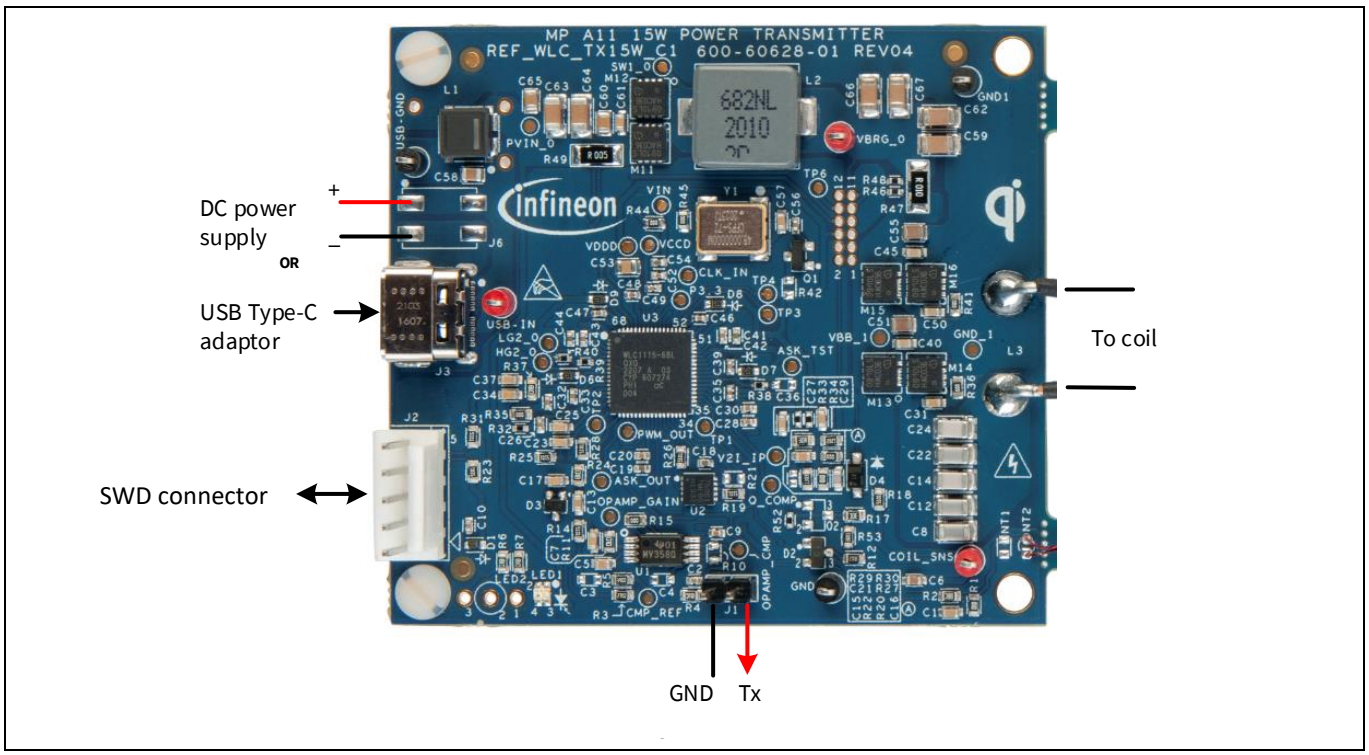


Figure 6 `REF_WLC_TX15W_C1` power transmitter board power and signal connections

3.1.2 Test points

The test points in the REF_WLC_TX15W_C1 MP A11 power transmitter board assist in monitoring and debugging of the wireless power transfer system. The list of test points and their functionality is covered in **Table 3**.

Table 3 List of test points on REF_WLC_TX15W_C1

Test point name	Section	Descritpion
USB-IN	Power	Input power positive rail
USB-GND	Power	Input power ground rail
PVIN_0	Power – Buck	Input positive rail to buck converter after common mode choke
VBRG_0	Power – Buck	Buck stage output
SW1_0	Power – Buck	Buck stage switching node
HG1_0	Signal – Buck	Buck stage high side MOSFET (M11) gate signal
LG1_0	Signal – Buck	Buck stage low side MOSFET (M12) gate signal
VBB_1	Power – Inverter	Buck stage output after the buck output current sense resistor
COIL_SNS	Power – Inverter	Coil voltage; Transmitter coil and resonant capacitor junction point
PWM_OUT	Signal – Inverter	Inverter stage PWM signal
HG1_1	Signal – Inverter	Inverter bank 1 high side MOSFET (M15) gate signal
LG1_1	Signal – Inverter	Inverter bank 1 low side MOSFET (M16) gate signal
HG2_1	Signal – Inverter	Inverter bank 2 high side MOSFET (M13) gate signal
LG2_1	Signal – Inverter	Inverter bank 2 high side MOSFET (M14) gate signal
Q_COMP	Signal – Q-factor	Scaled coil voltage (For Q-factor measurement)
ASK_OUT	Signal – ASK demodulator	ASK demodulator output from WLC1115 to amplification stage
OPAMP_GAIN	Signal – ASK demodulator	ASK demodulator gain stage amplifier output
CMP_REF	Signal – ASK demodulator	ASK demodulator comparator reference signal
OPAMP_CMP	Signal – ASK demodulator	ASK demodulator comparator output; digital signal to WLC1115
VIN	Power – WLC1115	Power input to WLC1115
VDDD	Power – WLC1115	WLC1115 internal 5-V LDO output
VCCD	Power – WLC1115	WLC1115 internal 1.8 V core LDO output
CLK_IN	Signal – WLC1115	Clock signal from externa oscillator (Applicable for operation with external oscillator only)
Q_COMP	Signal – WLC1115	Signal used by WLC1115 for Q-factor estimation
GND1, GND2	Power	Power side ground points
GND	Signal	Control side ground point

Note: For more information, see the reference board's schematic.

4 Reference board operation

This section explains the wireless charging operation, configuring or updating the firmware parameters, and programming the updated configuration data to the WLC1115-68LQXQ IC.

4.1 Wireless charging operation

4.1.1 Hardware connection

1. Connect the USB-C power adapter to the USB Type-C connector (J3) of the reference board.
2. Confirm that the status LED (LED1) blinks five times in blue and red. Now the board is ready for use.

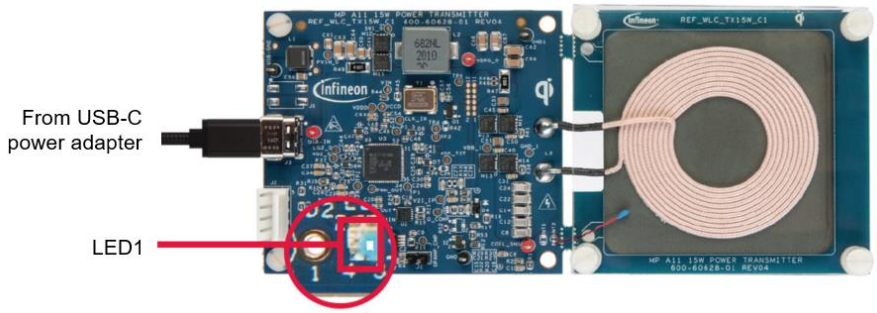


Figure 7 Powering the WLC reference board

3. Place the (phone or receiver) to be charged on the Tx interface surface of the reference board, as shown in **Figure 8**. The status LED (LED1) glows blue when charging is in progress.
4. Observe that the status LED turns OFF when the phone/receiver is removed from the Tx interface surface or once the phone is fully charged (100%).

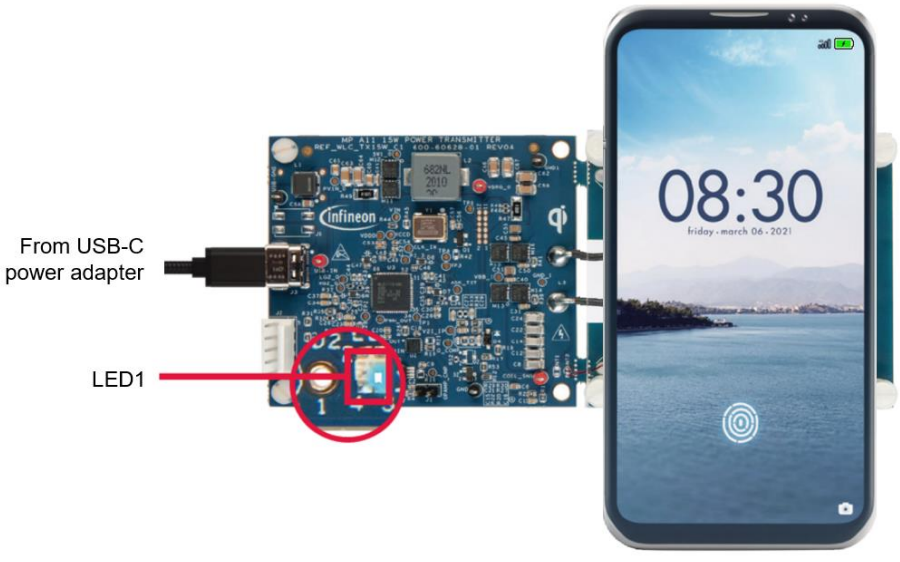


Figure 8 Powering the WLC reference board

Note: The status LED will continue to glow blue if the phone remains in trickle charging mode after the battery is fully charged.

Table 4 describes the status LED indications for various system states.

Table 4 System states and status LED indications

System state	Status LED indication
Idle state	No LED indication
Qi digital ping phase	Blinks blue
Power delivery in progress	Glows blue
Power delivery/charge complete	No LED indication
Foreign object (FO) detected	Glows red until FO is removed
Fault during power transfer	Glows red until the fault is cleared
Aburpt end of power transfer (EPT) initiated by the receiver	Blinks red

*Note: The `REF_WLC_TX15W_C1` reference board with factory default firmware may exhibit timeout bound retry of Qi power contract under extremely noisy ASK modulated signal conditions with some phones/receivers. Such behavior does not affect wireless charging performance. See the REF_WLC_TX15W_C1 reference board's test report to get more details about the phone charging cycle, ASK demodulation, and Qi 1.3.2 compliance test results. This report can be downloaded from the `REF_WLC_TX15W_C1` reference board webpage **[2]**.*

See **Table 5** for troubleshooting the potential issues faced while operating the WLC 15W Tx reference board.

Table 5 Troubleshooting of the WLC 15W Tx reference board operation

#	Issue	Possible cause	Fix
1	The phone is not charging when placed on the interface surface of the WLC reference board.	The phone may not be a Qi-certified phone.	Check with the phone manufacturer on the Qi certification. Get a Qi-certified phone.
2	The phone is charging at slow rate.	The phone may not support Qi's EPP capability.	Check with the phone manufacturer on support for EPP capability. Get a phone which can support EPP to charge at 15 W.

Note: The `REF_WLC_TX15W_C1` reference board is by default loaded with a firmware that supports USB PD based power input. However, the reference board can be powered using a DC supply, requiring a different firmware. See Appendix A to understand the procedure for powering the WLC1115 referecne board using DC input.

4.2 Configuring and downloading the firmware

WLC1115 IC is a programmable controller which supports downloading the updated/modified configuration data and the firmware over USB CC or I2C communication.

4.2.1 USB CC communication-based set-up

Figure 9 describes the set-up to download configuration data or firmware over the USB CC interface of the WLC1115 controller.

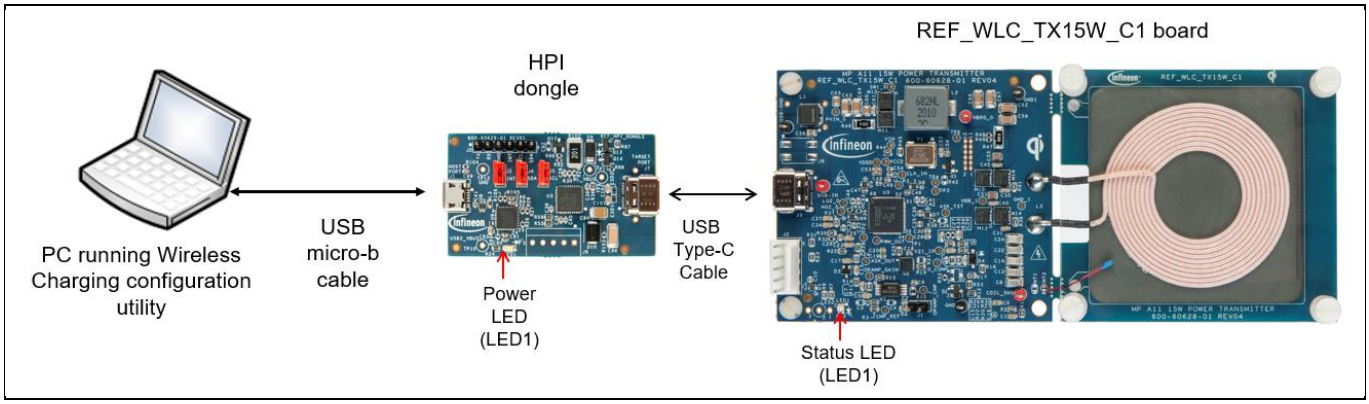


Figure 9 USB CC communication-based set-up

Execute the following procedure to create the set-up:

1. Connect the HPI dongle to the reference board using the USB Type-C cable.
2. Connect the HPI dongle to the PC using a USB micro-B cable.
3. The Power LED (LED1) on HPI Dongle glows blue, and the status LED (LED1) on the WLC1115 reference board blinks in blue and red five times.
4. Now the set-up is ready for use by the Wireless Charging Configuration Utility.

4.2.2 I2C communication-based set-up

Figure 10 describes the set-up to download configuration data or firmware over the I2C interface of the WLC1115 controller.

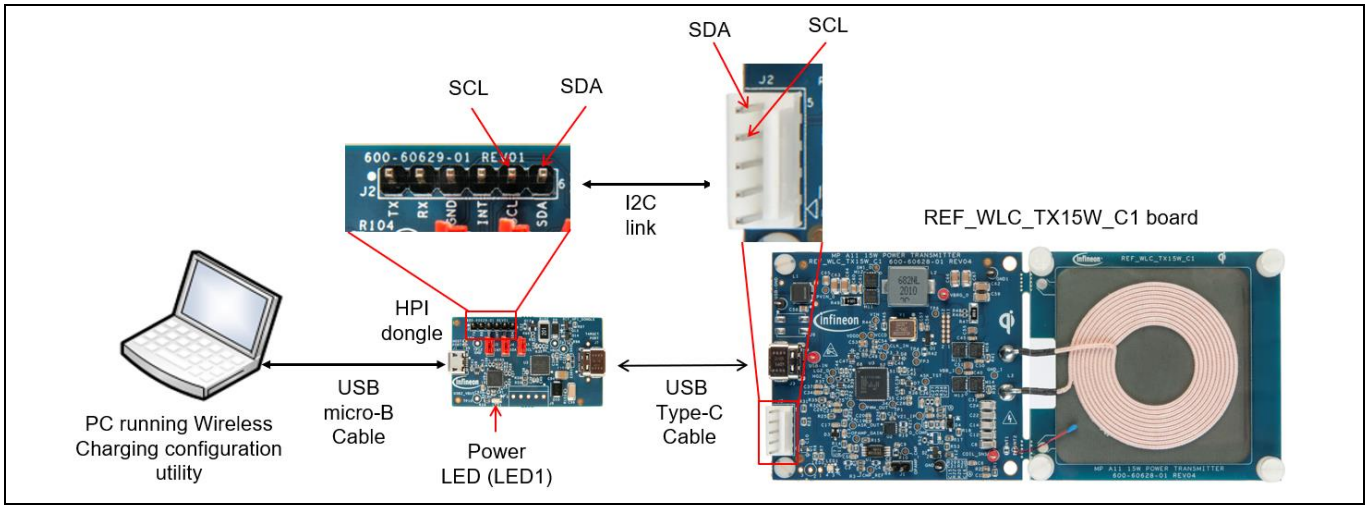


Figure 10 I2C communication-based set-up

Execute the following procedure to create the set-up:

1. Establish an I2C connection between the WLC1115 reference board and HPI dongle by connecting the two jumper wires.

a) Connect a jumper wire between SCL pin of HPI dongle (pin no. 5 of J2 header) and HPI_I2C_SCL pin of WLC1115 reference board (pin no. 4 of J2 header).

b) Connect a jumper wire between SDA pin of HPI dongle (pin no. 6 of J2 header) and HPI_I2C_SCL pin of WLC1115 reference board (pin no. 5 of J2 header).

2. Connect the HPI dongle to the PC using a USB micro-B cable.
3. The Power LED (LED1) on HPI Dongle glows blue.
4. Connect the HPI dongle to the reference board using the USB Type-C cable. The status LED (LED1) on the WLC1115 reference board blinks in blue and red five times.
5. Now the set-up is ready for use by the Wireless Charging Configuration Utility.

See the Wireless Charging Utility user guide to understand the procedure to configure the various firmware parameters and the procedure to download the configuration or firmware. The user guide can be accessed from the Help menu of the utility.

4.3 Capturing debug logs on the WLC reference board

This section explains the procedure to capture the debug logs sent on the serial port of the `REF_WLC_TX15W_C1` reference board at various stages of the operation. This feature helps to understand the internal operation of the firmware in addition to the Status LED indication available on the board.

Prerequisites:

- Ensure that the following items as part of the `REF_WLC_TX15W_C1` package are available:
  - `REF_WLC_TX15W_C1` board (Rev 04 and above)
  - HPI Dongle (Rev 02 and above)
  - USB Type-C cable
  - USB Micro-B cable
  - Jumper wires
- Get a Windows-based PC to run a serial port-based data logging tool, such as Tera Term
- To capture the debug log, do the following steps:

1. Install data logging software on the PC.

- Download a data logging tool, such as Tera Term, and install it on the PC.

2. Enable debug log in the firmware.

a) Download the Wireless Charging Utility package from Infineon's WLC product webpage **[1]** and install it on the PC.

b) Create the USB CC communication-based (**Figure 9**) or I2C communication-based (**Figure 10**) hardware set-up to configure the firmware using Wireless Charging Configuration Utility.

c) Open the **Wireless Charging Configuration Utility** from the **Start** menu in Windows.

d) Confirm that the reference board is selected under the **Device Selection** tab, as shown in **Figure 11**.

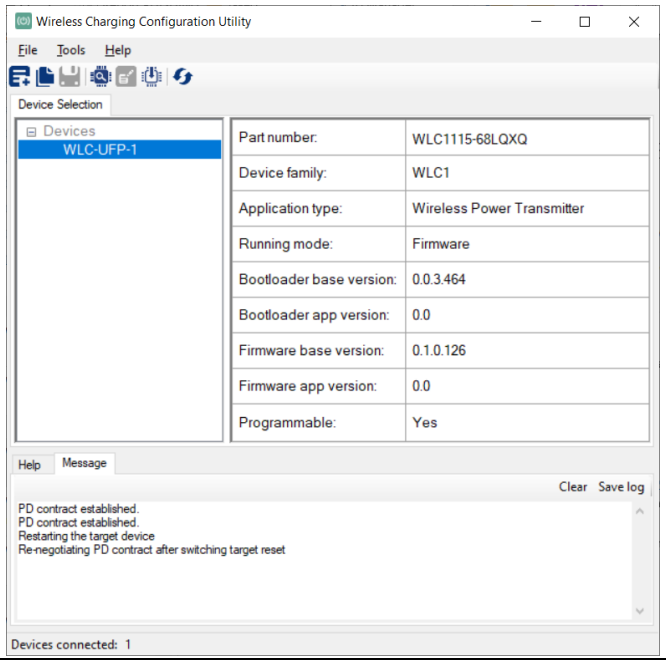


Figure 11 Selective device in Wireless Charging Configuration Utility

e) Click **Tools > Read from Device** or select the **Read from Device** option from the home panel. This enables the user to read the configuration from the device.

f) The debug log can be enabled by configuring the following parameters in the transmitter “Profile” page in the Wireless Charging Configuration Utility (see **Figure 12**).

- Enable **Critical log enable**.
- Enable **Message log enable**.
- Set **Debug log** to **Level 1**.

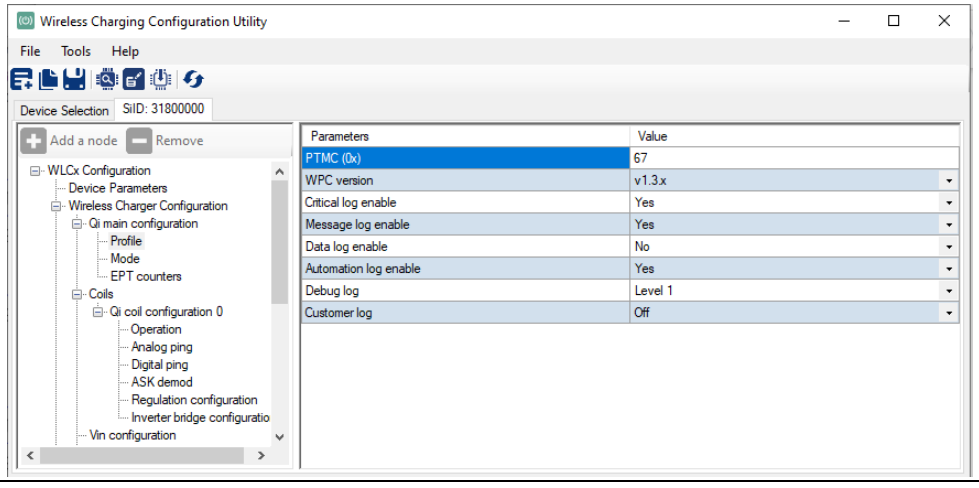


Figure 12 Profile page settings for enabling debug log

g) Select the device in the **Device Selection** tab and select **Tools > Configure Device** or click on the **configure device** icon present on the home panel. Save the updated configuration to a file.

h) In the **Configure Device** dialog box, specify the path of the updated configuration file and click **Program,** as shown in **Figure 13**.

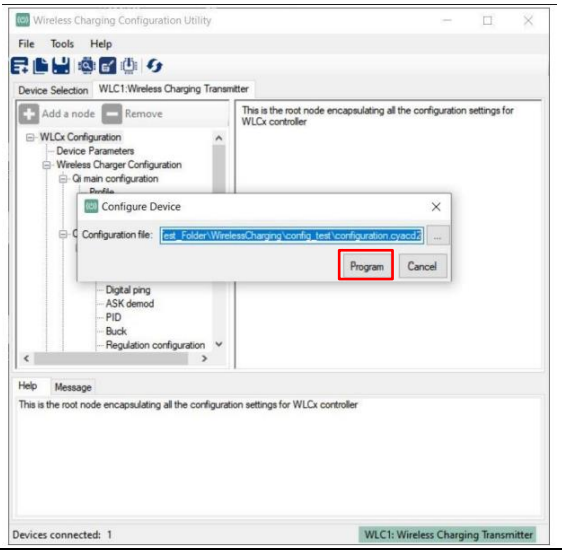


Figure 13 Device configuration dialog

Wait until the updated configuration file gets downloaded, as shown in **Figure 14**.

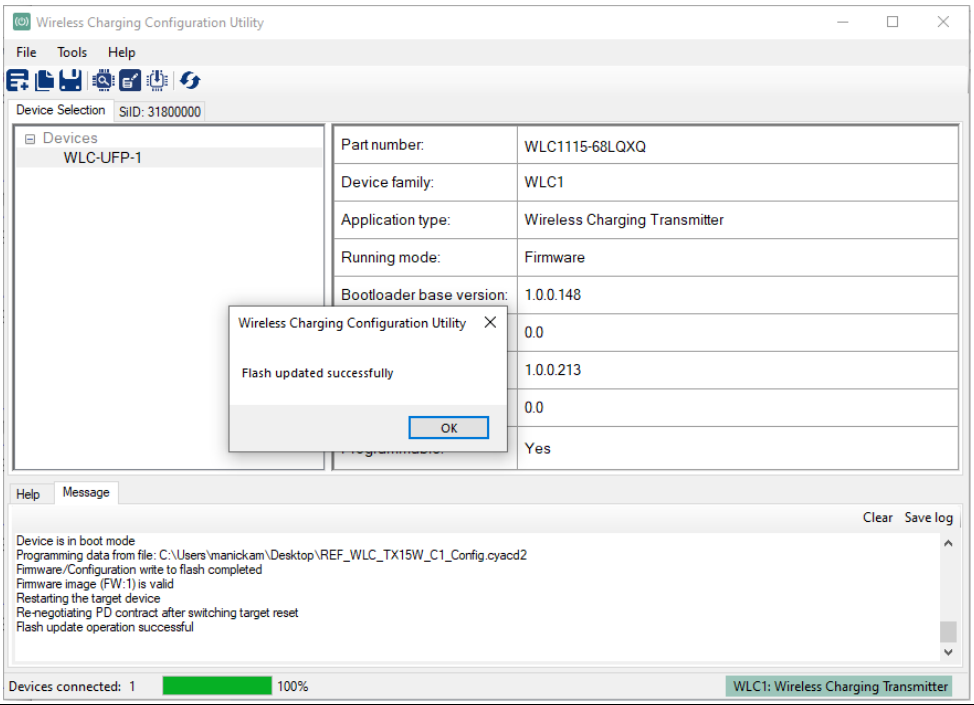


Figure 14 Successful download of configuration file

i) Dismantle the hardware set-up.

3. Debug log capture set-up.

a) Do the following connections using jumper wires to establish a serial connection between the `REF_WLC_TX15W_C1` board and the HPI dongle:

- Connect a jumper wire between the UART_Tx pin of J1 of `REF_WLC_TX15W_C1` board and Rx pin of J2 header on HPI dongle board.
- Connect a jumper wire between the GND pin of J1 of the `REF_WLC_TX15W_C1` board and the GND pin of the J2 header on the HPI dongle board.

b) Connect `REF_WLC_TX15W_C1`, HPI dongle, and PC as shown in **Figure 15**.

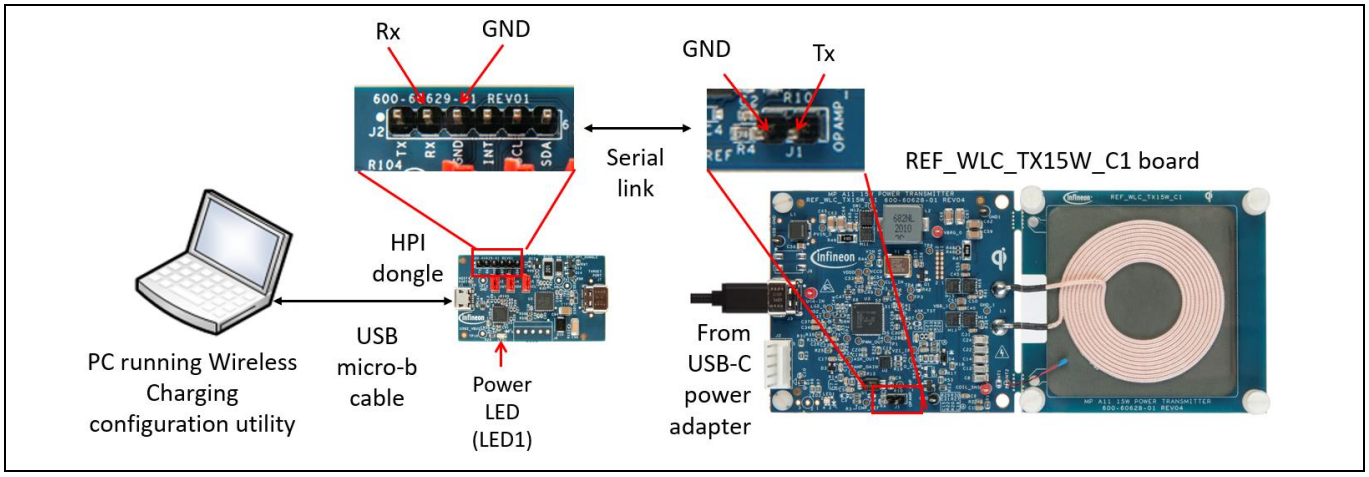


Figure 15 Set-up for capturing debug log

4. Capture debug logs.

a) Open the Tera Term on the Windows PC and select the virtual serial port listed on the Tera Term tool.

b) Set the baud rate to 1000000. Set the remaining settings as default, as shown in **Figure 16**.

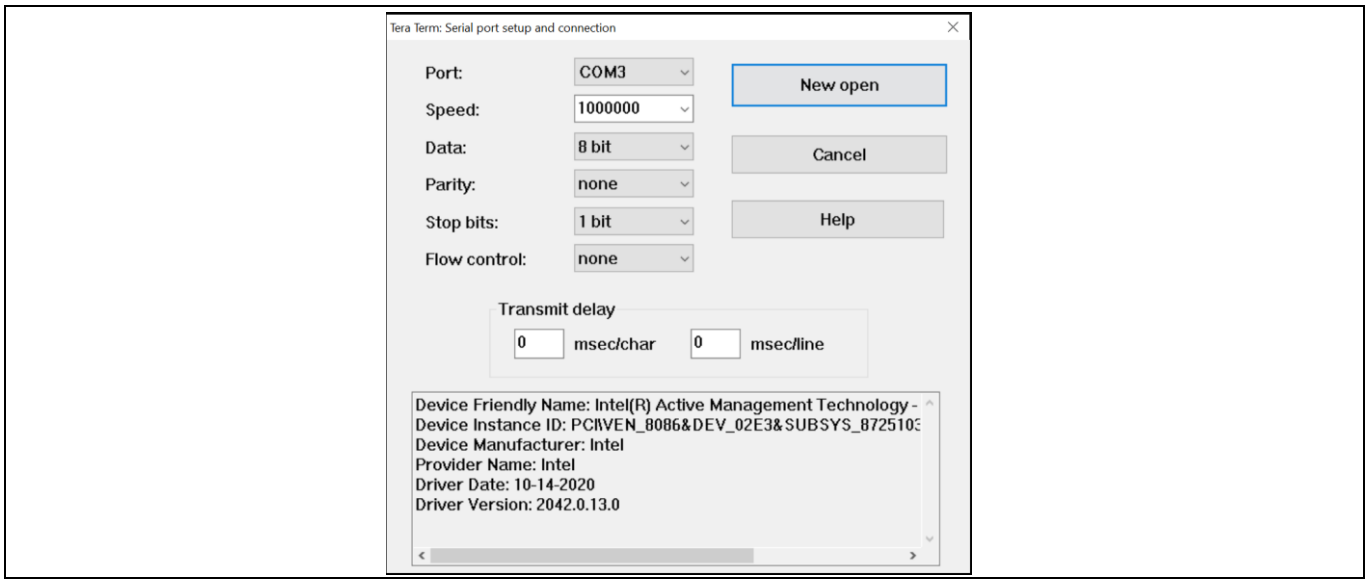


Figure 16 Tera Term settings

c) Supply power to the `REF_WLC_TX15W_C1` board using the USB-C power adapter and recreate the usage condition during which the debug logs need to be captured. The log data is displayed on the Tera Term as shown in **Figure 17**.

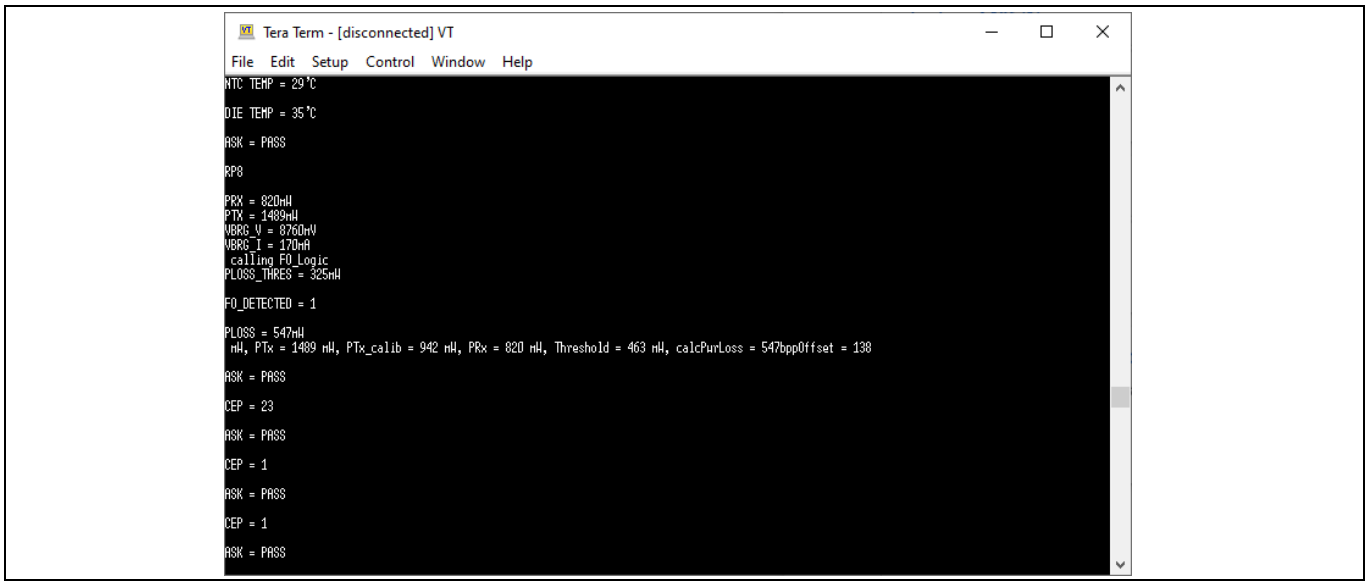


Figure 17 Debug log output

d) Save the log into a file from Tera Term.

e) Contact **Infineon technical support** with the captured log files if additional support is required.

5. Disable debug log in the firmware.

Revert these changes in firmware to default on completion of the process. debug log consumes processor resource, and it is recommended to disable debug log for optimal performance of the WLC power transmitter.

Appendix A: Enabling DC input power based wireless charging operation on the REF_WLC_TX15W_C1 reference board

This section explains the procedure to enable DC input power-based wireless charging operation on the REF_WLC_TX15W_C1 reference board.

Do the following procedure to update the reference board and download the firmware which supports DC input power-based operation, and exercise the wireless charging operation:

Prerequisites:

- Ensure that the following items provided as part of the REF_WLC_TX15W_C1 package are available:
  - REF_WLC_TX15W_C1 board (Rev 04 and above)
  - HPI dongle (Rev 01 and above)
  - Micro-B USB cable
  - USB Type-C cable
- Ensure that the following are available:
  - A Windows-based PC to run the Wireless Charging Configuration Utility. The operating system of Windows 10 or higher is required.
  - The positive terminal of the DC power supply should connect to the red wire, and the GND terminal of the DC bench power supply should connect to the black wire. The recommended gauge of the wire is 16 AWG.
  - Configurable DC bench supply, which can provide 20-V supply and source 3-A of current.
  - A soldering station
- Solder the wires to J6 of the reference board as shown in **Figure 18**.

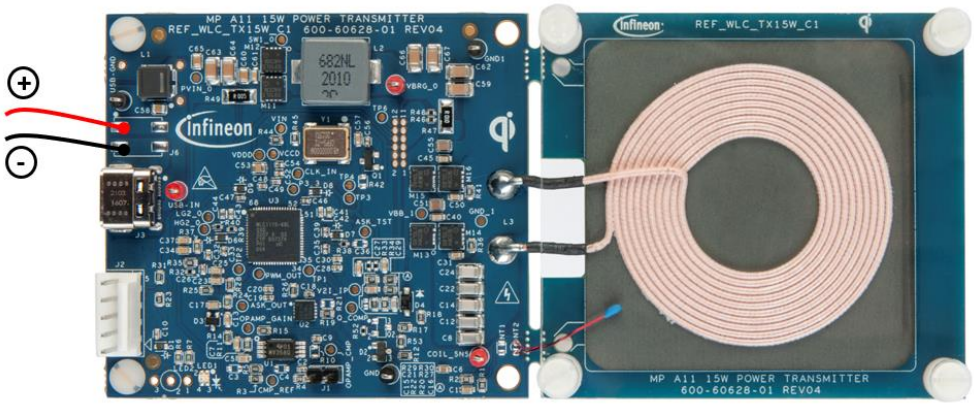


Figure 18 Provision for powering the reference board using bench power supply

Note: The soldering needs to be performed by a qualified technician.

- Install the software and firmware on the PC.
  - Contact Infineon **Technical support** to get the firmware that supports DC input power-based operation.
- Download the firmware onto the REF_WLC_TX15W_C1 board.

a) Create the USB CC communication-based (**Figure 9**) or I2C communication-based (**Figure 10**) hardware set-up to configure the firmware using Wireless Charging Configuration Utility.

b) Open the **Wireless Charging Configuration Utility** from the **Start** menu in Windows.

c) Confirm that the reference board is selected under the **Device Selection** tab, as shown in **Figure 19**.

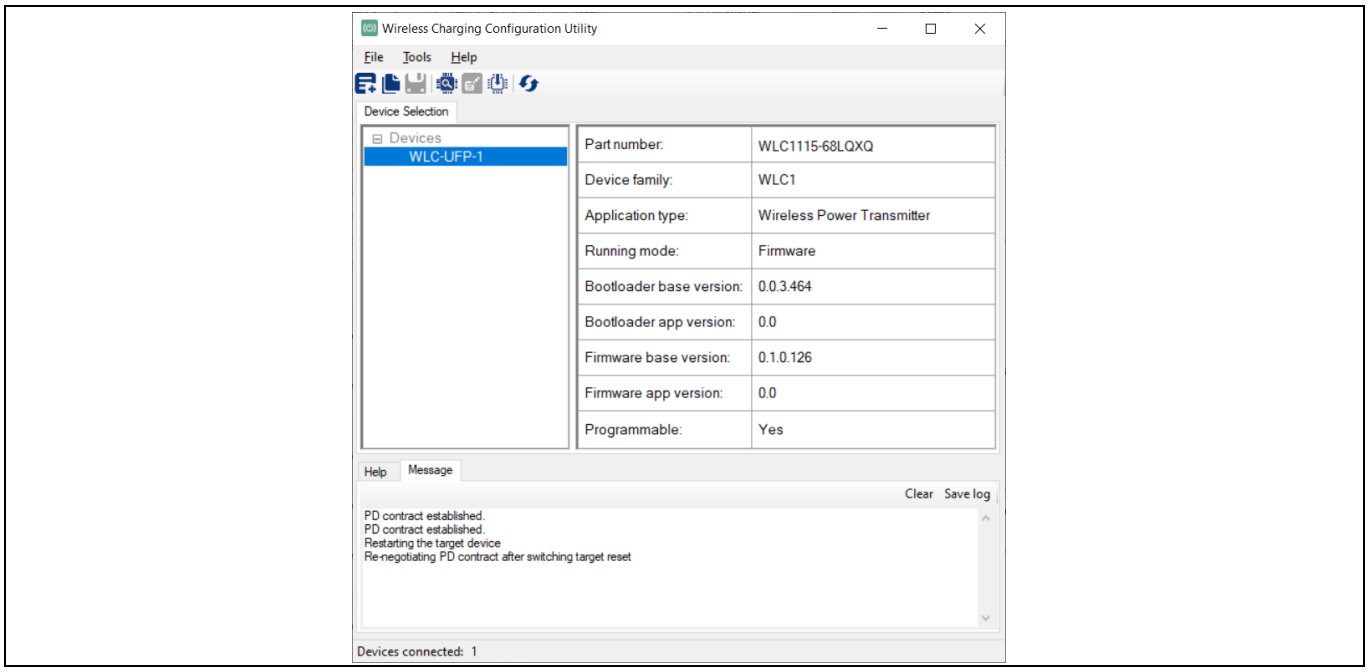


Figure 19 Selecting WLC1115 device in Wireless Charging Configuration Utility

d) Go to **Tools > Firmware Update** or select the **Firmware Update** option from the **Home** panel. Specify the path for the firmware as shown in **Figure 20** and click **Program**.

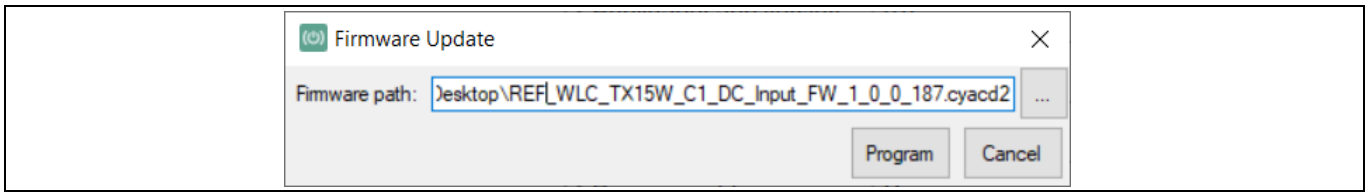


Figure 20 Selecting the firmware supporting DC input-based operation

e) Wait for the firmware download to complete, as shown in **Figure 21**. This operation may take around 1 minute.

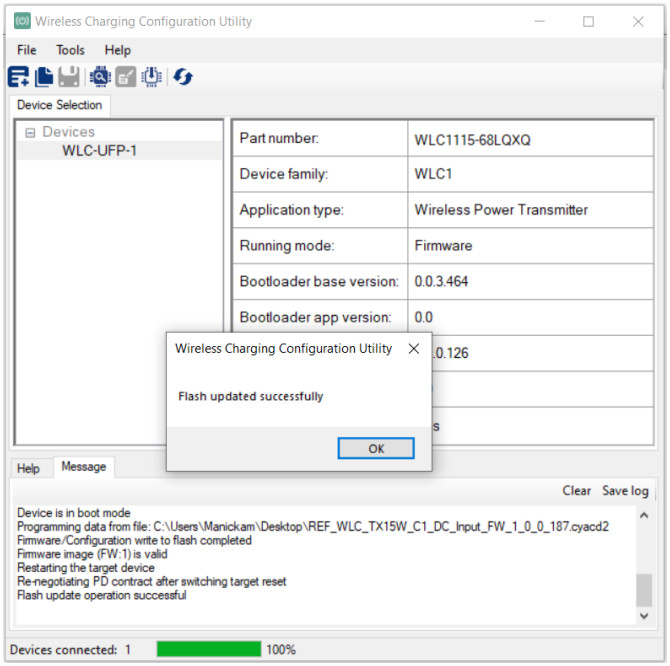


Figure 21 Downloading the firmware supporting DC input-based operation

f) Detach the `REF_WLC_TX15W_C1` board from the programming setup.

- Test the `REF_WLC_TX15W_C1` board with DC input.
  - Provide DC input of 20-V to the `REF_WLC_TX15W_C1` board and test the wireless charging functionality using a Qi-compatible phone/receiver, as shown in **Figure 22.** The status LED indications for various system states listed in **Table 4** are also applicable for the DC input mode of operation.

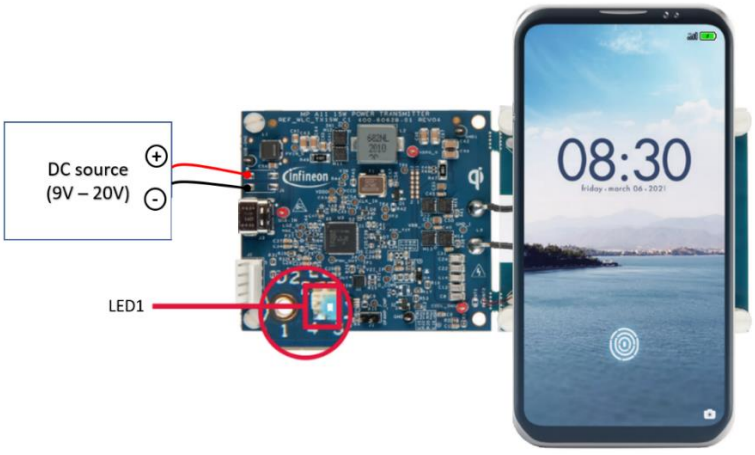


Figure 22 Charging Qi compatible phone/receiver in direct DC input mode of operation

Note: Ensure that the positive and negative terminals of the DC source are connected correctly to the red and black wires soldered on the board, respectively before, turning on the power. Supplying DC power with an improper connection may cause permanent damage to the reference board.

Note: The voltage range supported on the DC input of the board is 9 V to 20 V.

Technical support

If you have any questions, create a support request on the Infineon **Technical support** page.

Revision history

Date	Version	Description
2022-05-10	**	Initial release.
2022-07-15	*A	Updated “Do’s and Don’ts” list in the “Safety Information” section.

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