



MANUAL

2000 W

DEVELOPMENT KIT

Wireless Power Transfer
Extended Medium Power Solution

Order Code 760308EMP

200 W Development Kit – Extended Medium Power Solution for Wireless Power Transfer

Transmitter Board and Receiver Board

Abstract

Infineon and Würth Elektronik eiSos (WE) offer this wireless power development kit (order code 760308EMP) to demonstrate the advantages of wireless power and to give developers the opportunity to test and integrate a wireless power solution into their application. This manual describes the setup and basic usage of this development kit. Please note that this development kit is intended to be operated in a research and development environment under supervision of qualified technicians or engineers for test and measurement purposes. This development kit is not designed to fulfill requirements for CE compliance.

Description of Featured Products

The BSO70N08LS5 is a logic level OptiMOS™ 5 power MOSFET for the synchronous rectification (SR) application which has the right RDS-on level for this 200 W kit in a very compact 3.3 x 3.3 mm SMD package. The IR1161L is a high speed SR control IC. The space saving SOT-23 package improves efficiency up to 2% over conventional secondary side diode rectification. Its minimum on time feature is adjustable to pair with a variety of Infineon MOSFET selections. The XMC1302, an ARM® Cortex®-M0 up to 48 MHz, is the number one choice for your high performance, smart and safe wireless charging application. The 760308102142 Wireless Power Transfer Coil has a high Q-factor for a high power transfer efficiency. The 171032401 step-down converter is easy to use, small-sized and suited for a wide range of applications. The 860160578032 are long-life electrolytic capacitors with a low ESR. For further details, please also consult the relevant product datasheets at www.infineon.com and www.we-online.com.

Key Specification

- Mains power input voltage 100 – 240 V_{AC}
- Regulated input voltage 24 V_{DC}
- Maximum transmitted power 200 W
- Output voltage 19 – 20 V
- Maximum coil distance 10 mm

Features

- Plug & Play Wireless Power Development Kit
- Wireless power transfer system up to 200 W
- Complete solution consisting of TX and RX
- Flexible and modular approach for fast integration of wireless power in your product design
- Data transfer between receiver and transmitter board
- Manual and automatic output voltage control
- IoT sensor I²C interface
- Visit www.we-online.com/wirelesspower/200WKit for details



More information:

www.we-online.com/wirelesspower/200WKit



Figure 1: Wireless power transfer system with transmitter board, coils and receiver board.

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1. Introduction

This manual is valid for development kit version 1.0. It provides guidelines to quickly setup the hardware for fast and easy evaluation of the wireless charging system and the featured key components. For further details and updates about the used parts, please consult the relevant product datasheets and general information at www.we-online.com/wirelesspower/200WKit, also for downloading the latest version of this document and additional useful information such as application notes, Gerber files, schematics, bill of materials, firmware etc.

2. Hardware Description

2.1 Block diagram

The development kit consists of the following components:

- Transmitter board Demonstration of charging pad function using MCU, discrete full bridge and TX coil
- Receiver board Demonstration of wireless power receiver inside a mobile device using synchronous rectification and RX coil
- Power supply Wide input range mains power supply with different adapters for international use

A block diagram of the development kit is depicted in figure 2. The transmitter design corresponds to a proprietary wireless power transfer design using an XMC1302-T038X0064 to control the wireless power transfer. The necessary 24 V_{DC} input voltage is provided with the included mains adapters.

WARNING

Before switching on the system, the enclosed load resistor must be connected to the output of the receiver, as the operation without any load could destroy the system. For further use we recommend the usage of an adjustable load (see chapter 6, step 2).

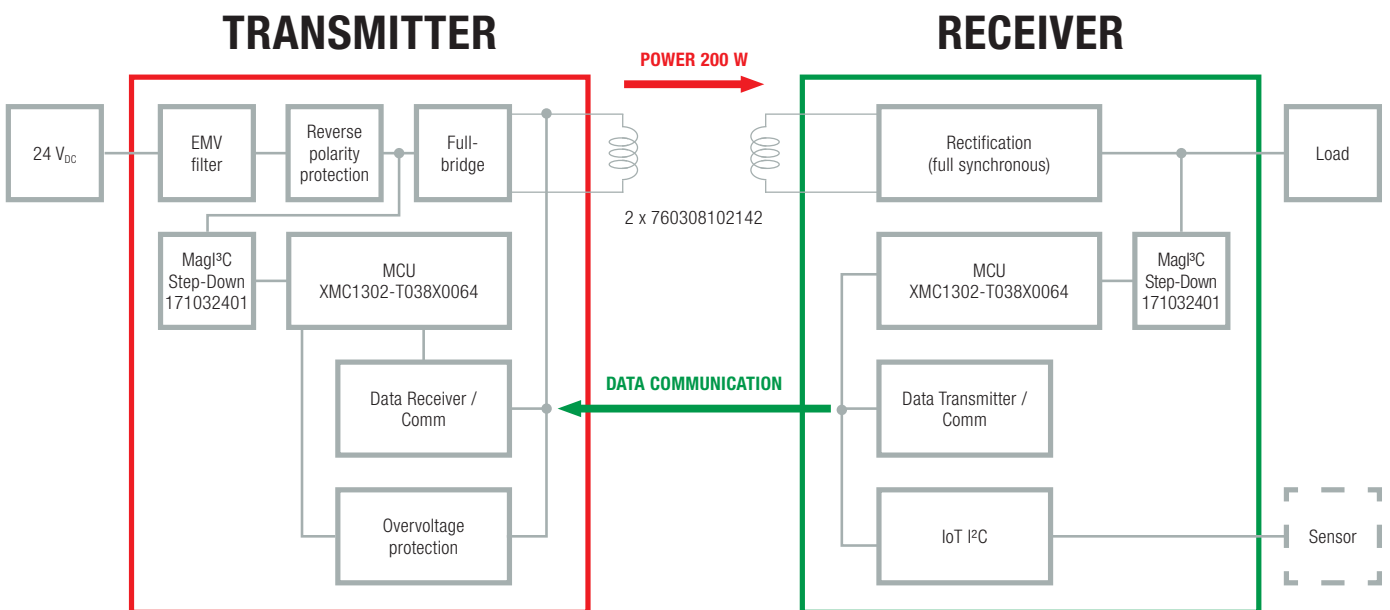


Figure 2: Development kit block diagram



The transmitter board contains the EMI-filter, reverse voltage protection, full bridge, resonant tank and the control circuit. The power transfer is fully digitally controlled by an XMC1302 series microcontroller. The control signals for the full bridge are generated by the MCU and can be controlled in automatic mode or manual mode. In manual mode the switching frequency can be changed with the encoder. This can be used to change the output voltage or for optimizing the efficiency.

The receiver board integrates all necessary functions to act as a wireless power receiver such as full synchronous rectification, modulator and a WE Mag³C Power Module. The modulator is used for data transfer. It is controlled by the MCU to send data from receiver side to transmitter side. The receiver is equipped with an I²C interface that can be used to interface to sensors. The sensor interface has its own adjustable power supply.

2.2 Key components

The purpose of the development kit is the evaluation of the key components used to realize the wireless power system. Table 1 gives an overview of the different ICs and coils. For more detailed information about these devices please refer to the individual web pages and datasheets.

Manufacturer	Product Family	Part Number	Used in
Infineon	OptiMOST™ 5 Transistor	BSZ070N08LS5	RX board
Infineon	Synchronous Rectifier Controller	IR1161L	RX board
Infineon	ARM® Cortex®-M0 Microcontroller	XMC1302-T038X0064 AB	TX and RX board
Würth Elektronik eiSos	Wireless Power Coil	760308102142	TX and RX board
Würth Elektronik eiSos	Mag ³ C Power Module	171032401	TX and RX board
Würth Elektronik eiSos	WCAP-ATLL Aluminum Electrolytic Capacitor	860160578032	RX board

Table 1: Key components used in the development kit

2.3 Design advice

- The switching frequency has to be higher than the resonant frequency of the resonant tank, otherwise the output voltage can reach a very high level.
- The voltage in the resonant tank can be high. For this purpose the voltage rating of the resonant tank capacitors have to be considered.
- Please keep in mind that when changing the output voltage the efficiency will drop. As a consequence the temperature on some parts will rise.

2.4 Schematic, Gerber Files, Bill of Materials and Firmware

Please visit www.we-online.com/wirelesspower/200WKit for downloading the latest production data consisting of the schematics, assembly data, Gerber files, bill of materials (BOMs) and firmware files for all boards of this development kit.

For firmware development and debugging the external tool XMC Link from Infineon is required. More details can be found on www.infineon.com.

Please note that there will be no support for the firmware since it is only a basic functionality software which is meant for demo purposes only.

3. Development kit setup and operating hints

3.1 Warnings

- This development kit must only be operated by trained professionals.
- This development kit should be operated in a well ventilated environment and, if used inside a case, the case should not be covered.
- This development kit should be placed on a stable, flat, non-conductive surface in use and should not be contacted by conductive items.

- All peripherals used with the development kit should comply with relevant standards for the country of use and be marked accordingly to ensure that safety and performance requirements are met.
- All cables or connectors used must offer adequate insulation and operation in order that the requirements of the relevant performance and safety are met.
- The connection of incompatible devices to the development kit can cause serious damage to the unit.

- Avoid handling the printed circuit board while it is powered. Only handle by the edges to minimize the risk of electrostatic discharge damage
- Do not short any outputs to each other, to the supply or to GND
- Do not operate the development kit outside its specified ratings
- Take care to monitor the PCB and IC temperatures in particular when operating with high power loads and do not exceed the absolute maximum ratings of all components

WARNING

The AC voltage in the resonant tank may reach voltage up to 250 V_{pp} under certain conditions. Therefore, it is covered by acryl glass to ensure human safety. Nevertheless take care not to touch the PCB by bare hand and use the required level of isolation when probing test points on the PCB.

3.2 Instructions for safe use

- Do not expose the development kit to water, moisture or place on a conductive surface whilst in operation
- Take care whilst handling to avoid mechanical or electrical damage to the printed circuit board and components

3.3 Power supply

Apply one of the included mains plugs (North America / Japan, Great Britain, Central Europe) to the power supply connector and connect the AC plug to mains. Connect the DC plug of the mains adapter to J4 of the transmitter board. In case another power supply is used please make sure to comply with the electrical characteristics as the provided mains adapter (see table 2). Take care not to reverse polarize the applied voltage.

Parameter	Specification
Input voltage	100 – 240 V _{AC} , 50/60 Hz, 2.5 A _{MAX}
Output voltage	24 V _{DC}
Output Current rating	6.25 A

Table 2: Mains adapter specification



Figure 3: Included power supply with 3 different mains adapter plugs

4. Transmitter board

Parameter	Specification
Input voltage	24 V _{DC}
Input current	Max. 10 A

Table 3: Transmitter module specification

5. Receiver board

Parameter	Specification
Output voltage	Max. 24 V _{DC}
Output current	Max. 10 A

Table 4: Receiver module specification

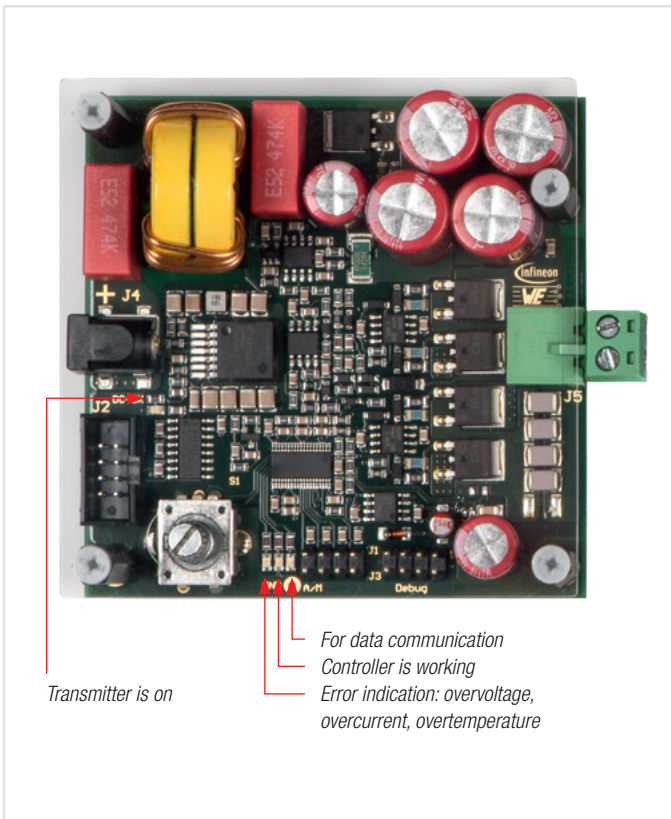


Figure 4: Transmitter board with status LEDs

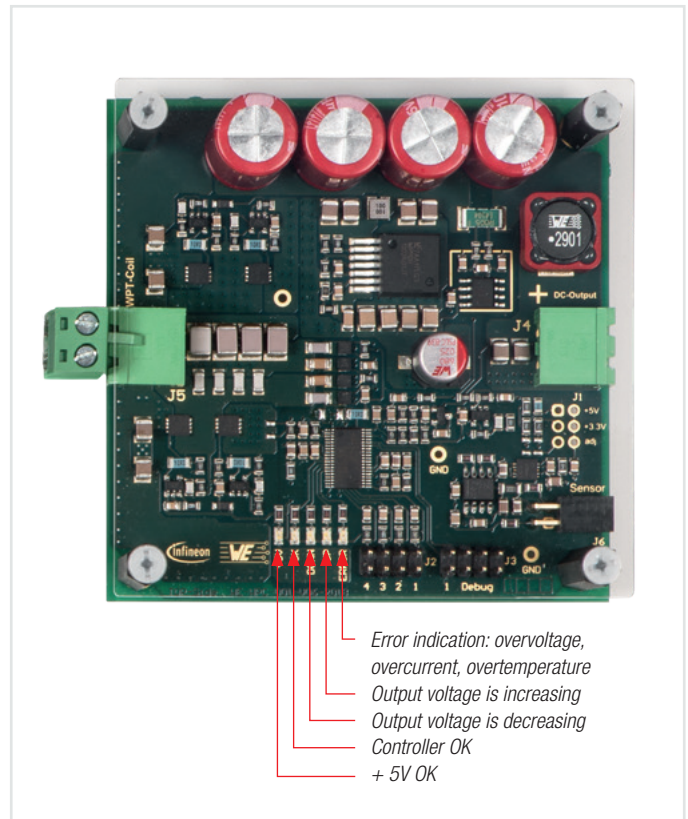


Figure 5: Receiver board with status LEDs

On the transmitter board the error indication (red LED on) shows a fault condition and the energy transfer stops.

On the receiver board the error indication (red LED on) warns of a fault condition, but the energy transfer continues.

6. Step by step installation guide for 200 W development kit

Step 1: Install software tools

Install DAVE™

DAVE™ is a free and powerful Eclipse-based development platform for XMC™ software development.

DAVE™ includes GCC compiler from GNU, DAVE™ code engine for automatic code generation and GDB debugger from GNU. DAVE™ offers pre-defined and tested SW components -DAVE™ APPs- and XMC™ Lib-Low Level Drivers (LLDs) – that accelerate the application software creation.

To install DAVE™ follow these steps:

- Download and execute the latest version of DAVE™ installation file from www.infineon.com/DAVE
- Follow the installation guidelines that are included in the download package

Note:

Both transmitter and receiver boards are pre-flashed with the firmware. Please visit our webpage www.we-online.com/wirelesspower/200WKit to download the latest firmware version.

Step 2: Power up setup

Make sure a load is connected to J4 on the receiver board and is adjusted to 0.1 - 1 A before switching on the power supply unit. Connect the transmitter coil to J5 on the transmitter board and the receiver coil to J5 on the receiver board (see figure 6).

Additionally a display board can be connected to the RS232 interface (J2) of the transmitter board and a sensor with I²C interface to J6 of the receiver board.

Step 3: Automatic and manual operation mode

By default, in automatic mode, the development kit automatically adjusts the frequency in the range of 110 – 150 kHz to deliver an output voltage of 19 – 20 V. In manual mode the switching frequency can be adjusted between 100 kHz to 205 kHz referring to a coil distance of 6 mm. This function can be used to optimize the system performance or to test different wireless power coils. For this, a jumper has to be added on position A/M on J1 (see figure 7). Please make sure that the output voltage does not exceed 40 V at the receiver output when turning the incremental encoder (S1) in manual mode. A higher output voltage could lead to a destruction of the receiver board.

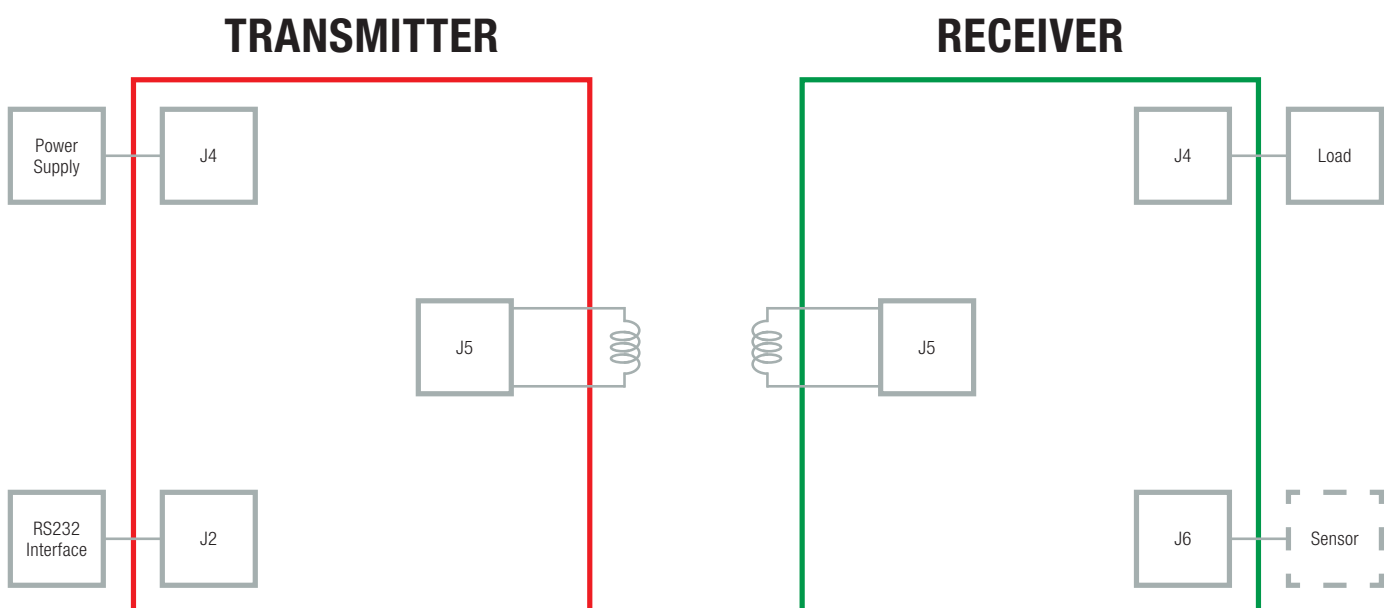


Figure 6: Block diagram for initial setup

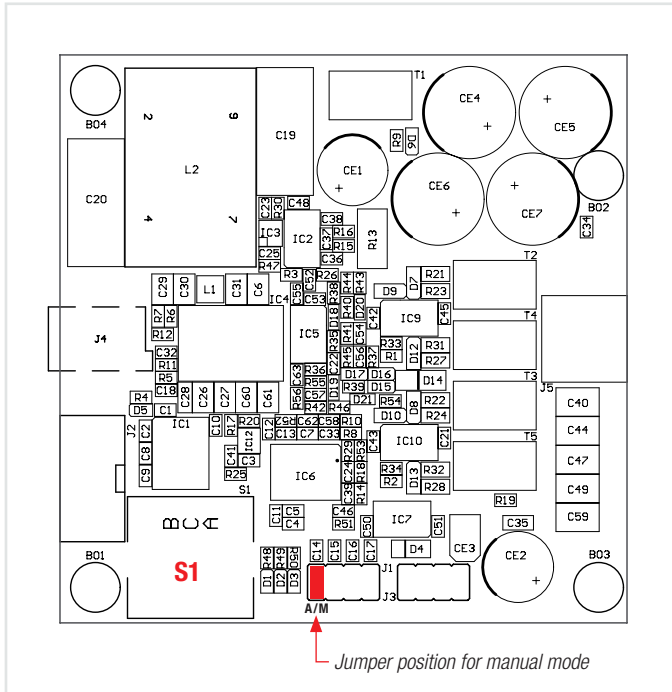


Figure 7: Jumper setting for manual or automatic mode

Step 4: Apply power

When the setup is finished, input power can be applied. The DC-OK LED on the transmitter is on. Now the system is in standby mode. To start/stop the wireless power transfer, press S1 (see figure 7).

7. Customer Support

If any further technical support is required when operating with the development kit, please visit our FAQ site www.we-online.com/200wfaq or contact Würth Elektronik eiSos with your questions.

wirelesspower@we-online.com

