

# WCT-15WAUTOS2x Qi WIRELESS CHARGING TRANSMITTER FAMILY

Designed with respect to Automotive and AUTOSAR using MWCT2xxxS MCU family

## OVERVIEW

The MWCT2xxxS MCU along with feature packed AUTOSAR based SW enablement and BOM cost optimized HW is driving power transfer and control functions of a wireless charging transmitter system with possibility to include CAN-FD connectivity. The transmitter system supports 15W multi-device multi-coil topologies allowing maximum flexibility for automotive applications. The system is also automotive-optimized and AUTOSAR ready with respect to minimal CPU utilization and SW architecture (non-blocking delays, no busy waiting, non-blocking initialization of modules, no IRQ approach for critical functionalities).

## FEATURES

- Compliant with Wireless Power Consortium (WPC) Qi1.3.x/Qi2.x.x specification
- AUTOSAR SW compliant
- Follows Automotive SW requirements
- On-chip digital demodulation
- Transfer efficiency greater than 70%
- FOD performance beyond Qi specification
- Supports all 15-watt multi-coil types
- Low active RUN power
- SPI, UART, I<sup>2</sup>C communication interfaces
- Run-time autocalibration
- CAN-FD/LIN support
- Meets AEC-Q100 (Grade 2) guidelines



## ADVANCED FEATURES

### MAGNITUDE AND PHASE DETECTOR (MPD) FOR DIGITAL DEMODULATION (DDM)

The Magnitude and Phase Detector (MPD) is a combination of Magnitude Detector and Phase detector for optimal ASK demodulation. Such an embodiment strongly increases overall performance of the Transmitter in terms of greater active charging area, interoperability, stable decoding of ASK as well as cost reduction.

### TRUE RMS ESTIMATOR

Used for V<sub>ct</sub> RMS value estimation and then for Transmitter Coil Current calculation based on the measured V<sub>ct</sub> with high accuracy up to ±1% for FOD.

### FREE RUNNING FSK (FRF)

The FRF used for the FSK communication is implemented using the MCU peripherals independently on the IRQs. Thus, the FSK communication is not affected by any other external event and correct communication is ensured during every circumstances.

### Qi1.3.x/QI2.x.x ON-CHIP AUTHENTICATION

Support of Qi authentication using the MWCT2xxxS MCU with HSE firmware capabilities and no need to have extra secure element or IC. SW enablement for certification insertion to the MCU is available.

### NFC CARD PROTECTION

NFC card protection using the external NFC element (typically NXP NCF3321) is implemented beyond the Qi specification to ensure safe operation.

### LOW POWER OBJECT DETECTION (LPOD)

Stand-by power consumption is one of the essential parameters of the transmitter. The LPOD is done using external NFC element and significantly reduces the power consumption. The wireless charging functionalities can be disabled until an object is detected using the LPOD.

### BUILT-IN TEST (BIT) EQUIPMENT

Ensures safe operation of the transmitter as it validates board parameters such as Qlc, frequencies, voltages, currents, stability of implemented features, and others during the board autocalibration procedure and can easily detect defect on the board.

### MULTI DIGITAL PING (MDP)

The optimized patented method for detecting of the wireless charging devices with low coupling factor, low Q-factor value, devices with magnets around the receiver coil, and Qi non-compliant devices is claimed. Active charging are of such devices (e.g. phones with magnets) is strongly increased.

### SINGLE ANALOG-TO-DIGITAL CONVERTER (ADC) MEASUREMENT STRATEGY

Complete measurements of all quantities necessary for correct functionality such as voltages, currents, temperatures, and sampling of coil current with frequency of 127/360 kHz is done using one ADC by automatic mechanism. The second ADC is spare for the customer usage.

### TARGET APPLICATIONS

- Qi mobile phone charging (up to 15W)
- Apple Fast Charge for iPhone®
- Samsung® Fast Charge

### DEVELOPMENT TOOLS

S32 Design Studio IDE® 3.4 and 3.5 development studio for microcontrollers.

Elektrobit Tresos Studio® is a classic AUTOSAR tooling that provides complete MCU basic software configuration and integration in one single environment.

Real-Time Drivers (RTD) 2.0.x, 3.0.x, and 4.0.x are a new and innovative drivers set supporting real-time software on AUTOSAR® applications targeting Arm®.

Cortex®-M cores and ISO 26262 compliance for all RTD, providing full IP and features by creating a rich ecosystem, considering Complex Device Drivers (CDD) and a wide range of standard drivers.

NXP FreeMASTER Graphical User Interface (GUI) tool allows quick configuration and optimization of wireless charging transmitter solutions.

A Console application using UART communication is implemented in order to monitor bi-directional communication between transmitter and receiver, monitor state of the transmitter, measured quantities, and help to debug the system.

### NXP SUPPORT

NXP provides all the necessary hardware documentation: schematics, layout and assembly files, as well as a complete BOM. We also provide a firmware example project with a certified library that contains all the necessary wireless charging control blocks. Users access the library via an API which lets them interact with parameters and settings contained in the firmware, providing maximum control to the users. Customers can use a ready-to-use binary file from NXP or build an application around the library object file.



## MCU PACKAGE OPTIONS AND APPLICATIONS

| MCU       | PACKAGE     | FLASH SIZE | AUTOSAR | RAM SIZE                  | APPLICATION                                                                                                                                                                       |
|-----------|-------------|------------|---------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MWCT2014S | 48-pin LQFP | 512 KB     | X       | 112 KB (incl. 96 KB TCM)  | <ul style="list-style-type: none"> <li>Single device charger, no complete AUTOSAR environment -&gt; limited Flash memory</li> </ul>                                               |
|           | 100-HD QFP  |            |         |                           |                                                                                                                                                                                   |
| MWCT2015S | 100-HD QFP  | 1 MB       | ✓/X     | 128 KB (incl. 96 KB TCM)  | <ul style="list-style-type: none"> <li>Single device EPP charger, complete AUTOSAR environment;</li> <li>Single device MPP charger no complete AUTOSAR environment</li> </ul>     |
| MWCT2016S | 100-HD QFP  | 2 MB       | ✓       | 192 KB (incl. 96 KB TCM)  | <ul style="list-style-type: none"> <li>Single device EPP/MPP charger, complete AUTOSAR environment</li> <li>Multi device EPP charger, complete AutoSAR environment</li> </ul>     |
|           | 172-HD QFP  |            |         |                           |                                                                                                                                                                                   |
| MWCT2D16S | 100-HD QFP  | 2 MB       | ✓       | 256 KB (incl. 192 KB TCM) | <ul style="list-style-type: none"> <li>Single device EPP/MPP charger, complete AUTOSAR environment</li> <li>Multi device EPP/MPP charger, complete AUTOSAR environment</li> </ul> |
|           | 172-HD QFP  |            |         |                           |                                                                                                                                                                                   |
| MWCT2D17S | 172-HD QFP  | 4 MB       | ✓       | 512 KB (incl. 192KB TCM)  | <ul style="list-style-type: none"> <li>Single device EPP/MPP charger, complete AUTOSAR environment</li> <li>Multi device EPP/MPP charger, complete AUTOSAR environment</li> </ul> |