**Document:** **User Manual / Functional Description**

**Project:** **Continental-WLC-CEM00**

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## VERSIONS LIST

| Version | Date | Author | Comment, Description |
|---|---|---|---|
| V1 | 04/01/2016 | Juvenal Alarcon Ramos | Creation |
| V2 | 07/01/2016 | Juvenal Alarcon Ramos | Reviewed |
| V3 | 08/04/2019 | Juvenal Alarcon Ramos | Reviewed |

## RELATED DOCUMENTS

| Document | Version | Date | Author | Comment, Description |
|---|---|---|---|---|
| | | | | |
| | | | | |

## ABBREVIATION REGISTER

| Abbreviation | Description |
|---|---|
| CW | Continuous Wave |
| LF | Low Frequency |
| RF | Radio Frequency |
| WPC | Wireless Power Consortium |
| | |
| | |
| | |
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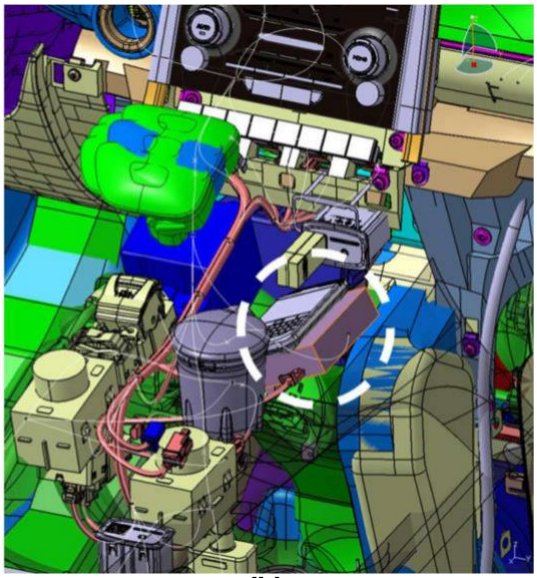
| | |
| | |

VERSIONS LIST ..... 2
RELATED DOCUMENTS ..... 2
ABBREVIATION REGISTER ..... 2
1 SYSTEM DESCRIPTION ..... 4
1.1 WPC ..... 4
1.1.1 System Overview ..... 4
1.1.2 Wireless Power Charger Block Diagram ..... 5
1.1.3 Wireless Power Charger Description ..... 6
1.1.4 WPC modes ..... 7
1.1.4.1 Ping mode ..... 7
1.1.4.2 Charging mode ..... 7
1.1.5 WPC parameters ..... 8
2 BILL OF MATERIAL ..... 8
3 SCHEMATIC ..... 8
4 ASSEMBLY PLAN ..... 8
5 PCB LAYOUT ..... 9
5.1 PCB BOARD ..... 9
6 SAFETY INFORMATION ..... 11
6.1 HOUSING MATERIALS INFORMATION ..... 11
6.2 PINS FOR CONNECTORS MATERIAL INFORMATION ..... 11
6.3 PCB BOARD ..... 11
6.4 CONTROL UNIT INFORMATION ..... 11
6.5 INFORMATION TO THE USER ..... 11

# 1 SYSTEM DESCRIPTION

**Continental Wireless Power Charger is developed for automotive applications under the name Continental-WLC-CEM00.**

**Continental-WLC- CEM00 charger is shown in Fig. 1a and their implementation within a vehicle is depicted in Fig. 1b.**



**(a)** **(b)**

**Fig. 1 : (a) WLC charger; (b) WLC automotive implementation.**

## 1.1 WPC

**WPC charger uses Qi standard of Wireless Power Consortium (WPC) for enabling wireless charging from a base station unit to mobile device. The power transfer method is based on near field magnetic induction between coils.**

### 1.1.1 System Overview

**The structure of wireless power transfer proposed in Fig. 2 shows an overview of the system with two kinds of distinguished devices: Base station and Mobile device.**
**Power transmitter comprises two main functional units, namely a power conversion unit and a Communications & Control unit for delivering, controlling and regulating the transferred power. Power receiver comprises a power pick up unit and a communications & control unit for achieving power requirements and charging the device battery.**

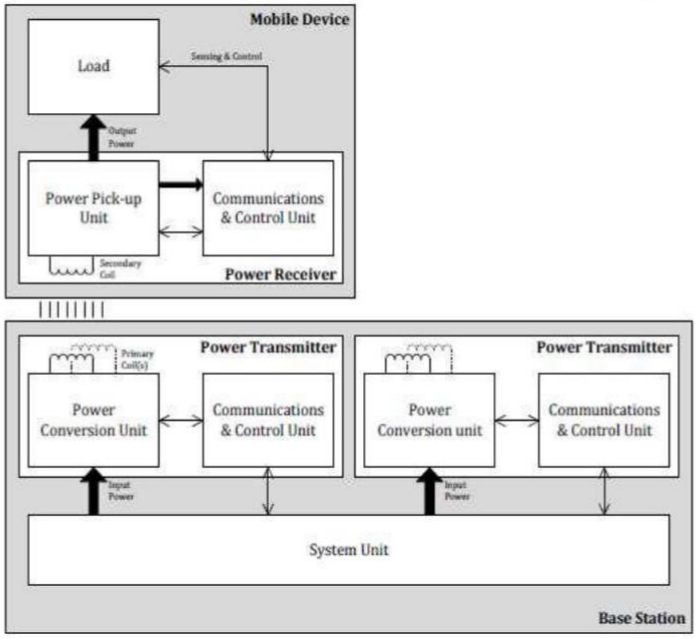



**Fig. 2 : Wireless power transfer structure**

### 1.1.2 Wireless Power Charger Block Diagram

**The block diagram is shown below.**

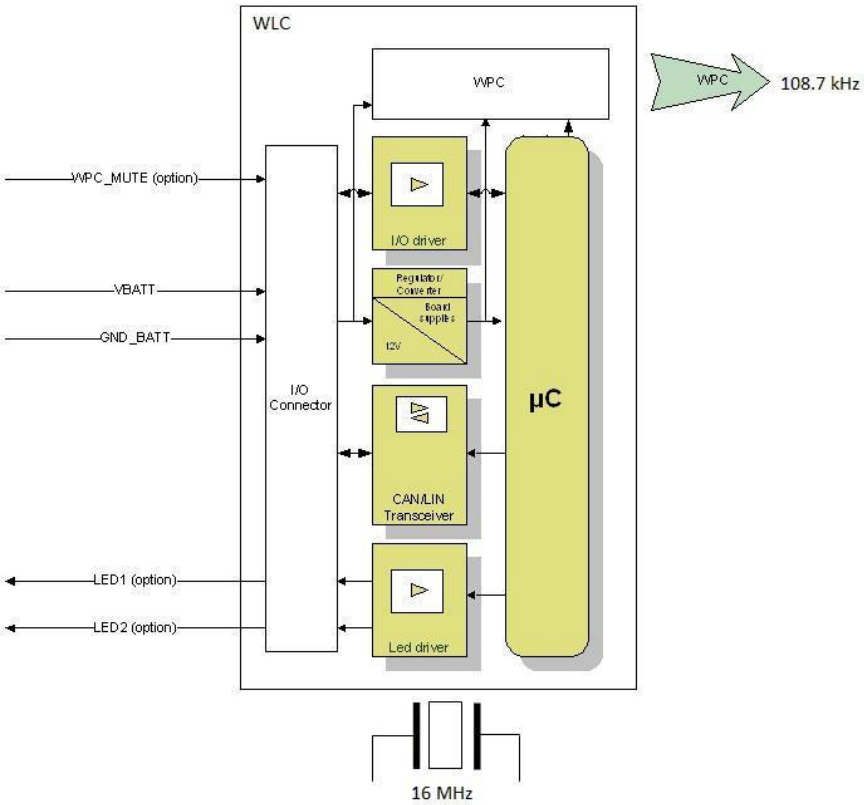
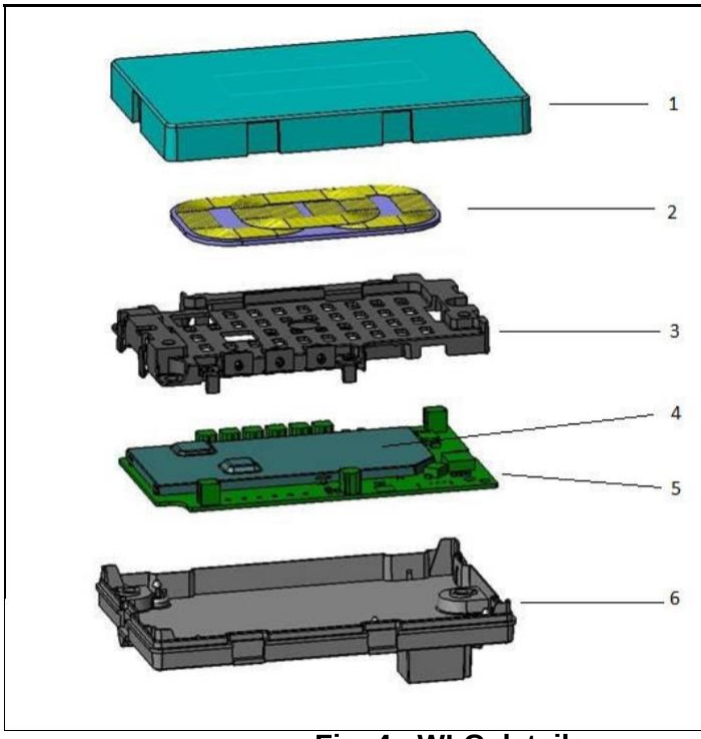



**Fig. 3 : Continental-WLC-CEM00 block diagram**

### 1.1.3 Wireless Power Charger Description

**The WLC charger is mainly composed of 6 parts as depicted in Fig.4.**




| N° | Description |
|---|---|
| 1 | Phone Housing |
| 2 | WPC coil + Ferrite sheet |
| 3 | Central frame |
| 4 | Shielding |
| 5 | PCB board |
| 6 | Cover plate |

**Fig. 4 : WLC details**

**A manufactured product view is shown in Fig. 5.**


**(a)** **(b)**

**Fig. 5 : Manufactured WLC. (a) Top view and (b) bottom view.**

### 1.1.4 WPC modes

**According to the Qi standard, a simple operational description of wireless power transfer can be summarized in two operational modes. The first mode with a defined burst sequence allows the base station to detect the mobile device Qi compliant. The second mode allows the power transfer from the base station to the mobile device. More details of each operational mode are presented below:**

#### 1.1.4.1 Ping mode

**In this mode, Continental-WLC-CEM00 charger transmits a short time carrier signal with a specific pattern in order to detect a mobile device Qi compliant onto its surface. When a mobile device is placed on the base station, the identification and the collection of configuration information is done without changing the operating point of the base station. Based on the configuration information received from the mobile device, the base station creates a power transfer contract containing the maximum power that the mobile device intends to provide at its output. The Fig. 6 depicts the time pattern of "Ping mode". The pattern is composed of short carrier bursts during 30ms spaced of 200ms between them and followed by three long carrier burst of 90ms spaced of 10ms. This pattern is repeated until that a mobile device is detected and identified.**

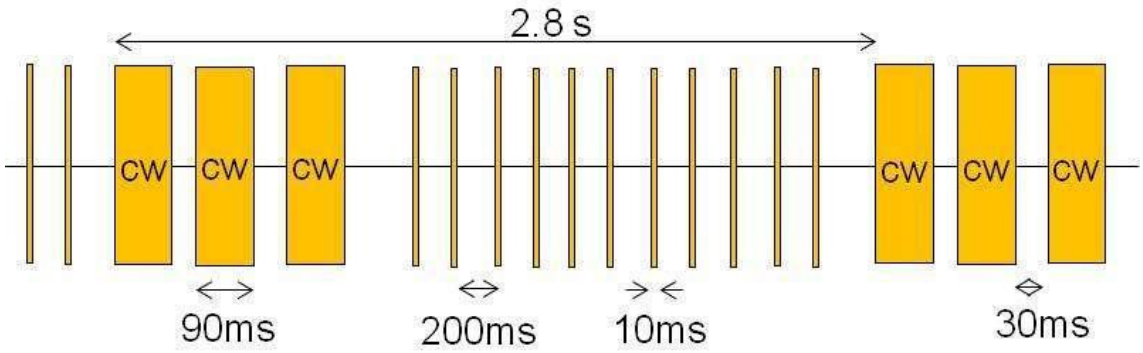



**Fig.6 : Schematic of time pattern of "Ping mode".**

#### 1.1.4.2 Charging mode

**After passing through the "Ping mode", the power transfer starts. In this mode, the base station sends the carrier at a given level defined in the power contract in "Ping mode". The base station controls the power transfer to the mobile device, in response to control data that it receives from the latter. The power transfer is done until the mobile device decides to stop the charge. Figure 7 shows the pattern of "Charging mode".**

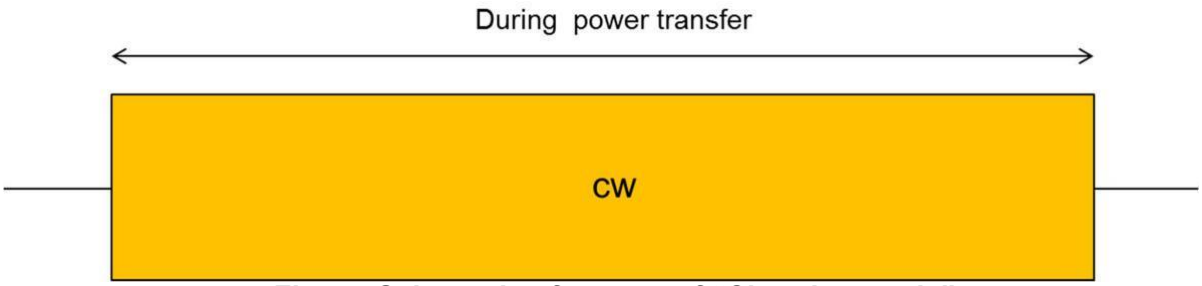



**Fig. 7 : Schematic of pattern of "Charging mode".**

### 1.1.5 WPC parameters

**Bellow in table 1, the technical parameters of the Continental-WLC-CEM00 charger are specified:**

| Parameters | Values |
|---|---|
| Carrier frequency | 108.7 kHz |
| Frequency shift | +-2 KHz |
| Supply voltage | 13.5V lead acid vehicle battery |
| Voltage supply range | 8V < Vbat < 16V |
| Operating temperature range | -20°C < Temp* < 40°C |
| Output Power on Power receiver | Max. 5W |
| WPC chipset brand | Discrete components designed |
| WPC litz coil information | A13 type according to Qi standard |
| WPC litz coil gain @ 108.7kHz | -113.9dBi |

**Table 1: WPC technical parameters.**

***Internal temperature regulation in order to protect user from over temperature. It could occur at high ambient temperature by reducing the output power of WPC receiver.**

**The rated output power on power receiver is Max. 5W power transfer. The receiver manages the wireless charger in order to guarantee stable 5W on the load.**

# 2 Bill of material

**See external supporting document:**

- **2015-07-29_BOM_PES_Var_WLC_APPLI.pdf**

# 3 Schematic

**See external supporting document:**

- **20016173_PCB_BA0_AC_SCMVA_SchDrwVar.pdf**

# 4 Assembly plan

**See external supporting document:**

- **2015-07-29_SchDrw_Var_WLC-APPLI.pdf**

# 5 PCB layout

## 5.1 Pcb board

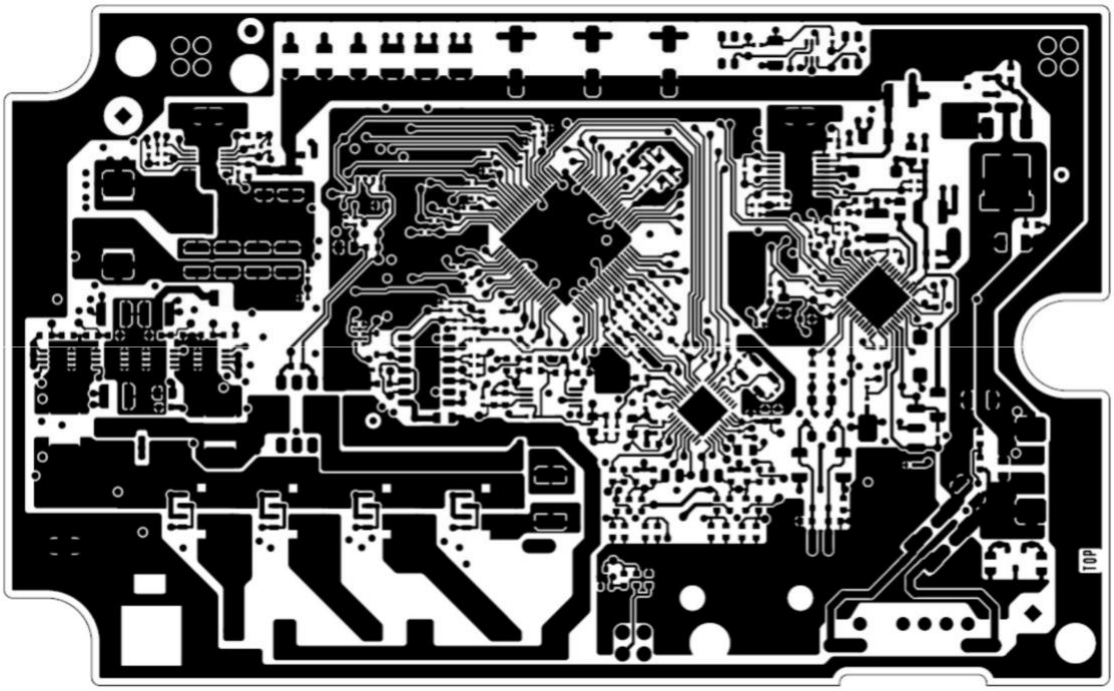



**Fig. 8: Top layer 1.**

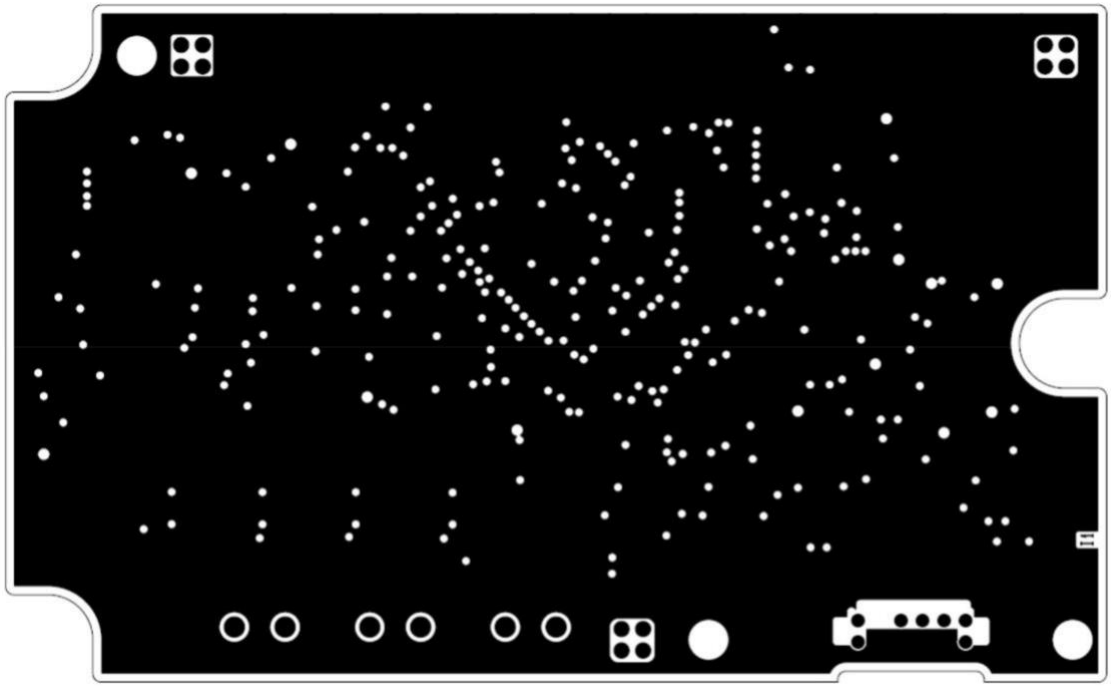


**Fig. 9: Layer 2.**

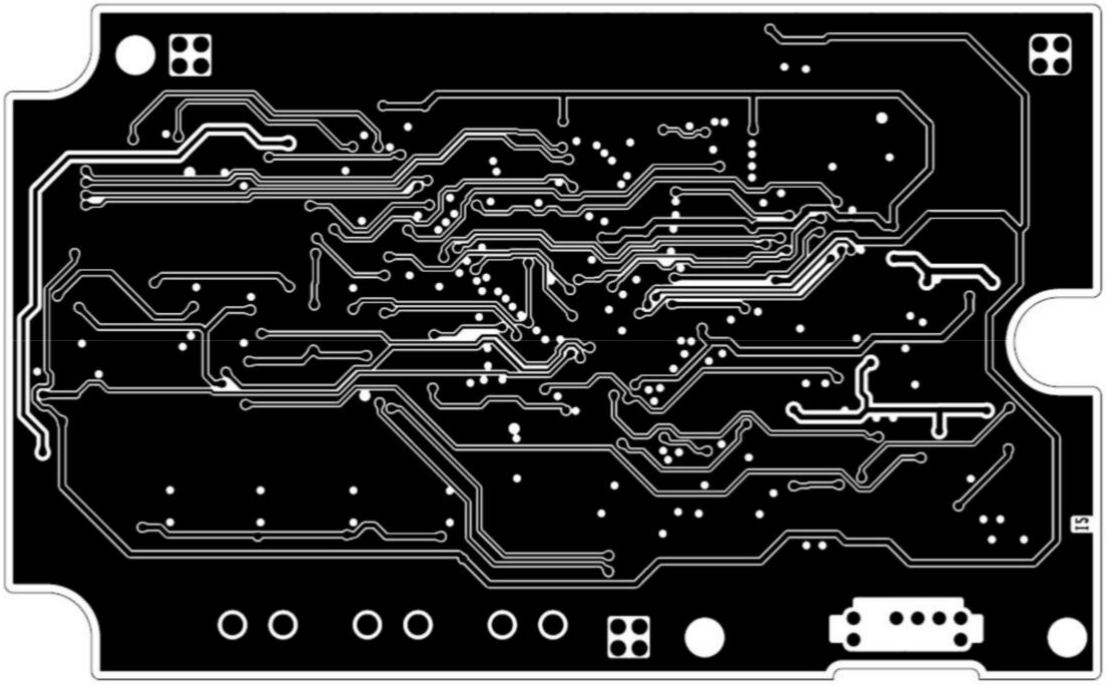


**Fig. 10: Layer 3.**

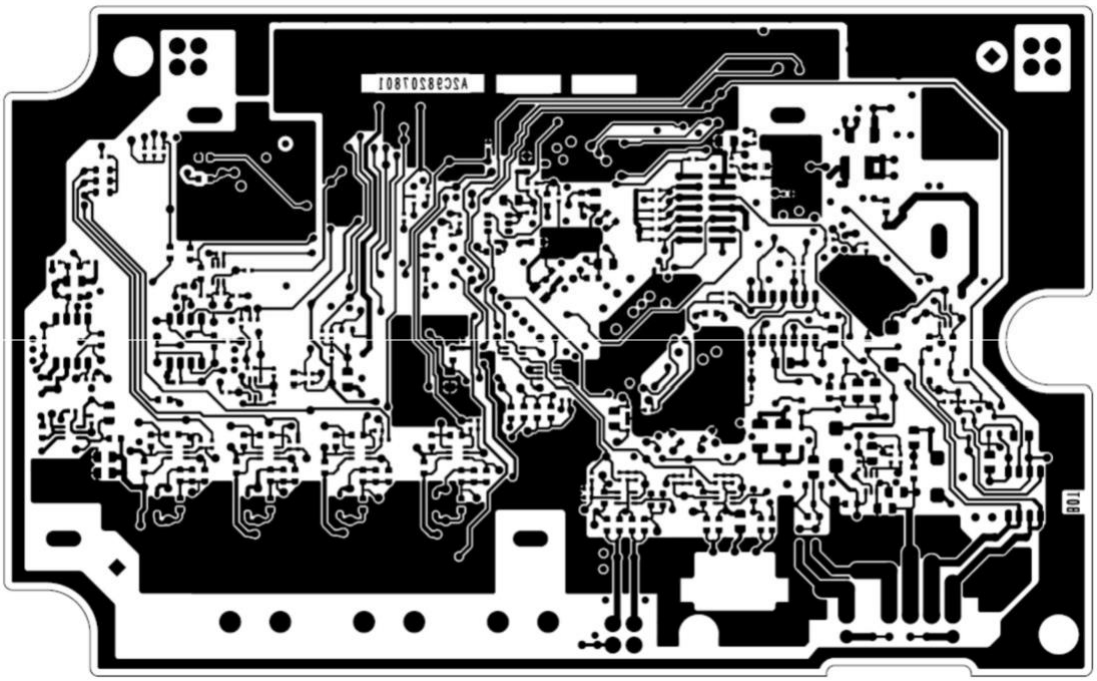


**Fig. 11: Bottom layer 4.**

# 6 Safety information

## 6.1 Housing materials information

**All the plastic materials of the "Continental-WLC-CEM00" are HB class under the UL94 specification.**

**The Cover Plate: PP T40 (Polypropylene with 40% of talcum)**
**The Central Frame: PBT (Polybutylene terephthalate)**
**The Phone Housing: ABS**

## 6.2 Pins for connectors material information

**Material: CuSn6**

## 6.3 Pcb board

**Manufacturer: Ellington & KCE**
**Material: FR4 EM825**
**Flammability class: UL94 V0**

## 6.4 Control unit information

**Current is not delivered by WPC. The wireless charger deliver magnetic field, not current.**

**No fuse is included inside the wireless charger or required to be externally used.**

## 6.5 Information to the user

This device complies with Part 18 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.

**CAUTION TO USERS**
Changes or modifications not expressly approved by the party responsible for compliance could void the user`s authority to operate the equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 18 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.