

# CCARD Product overview

---

CCARD is a Qualcomm Technologies, Inc. (QTI) reference design for automotive telematics platforms, commonly referred to in the automotive industry as a telematics control unit (TCU). The CCARD's primary goal is to tap into the use cases that leverage high-speed wide area networking (WAN) connectivity from an automobile.

CCARD will be provided to Tier 1 customers and OEMs as a telematics reference design and software development platform.

Central to the CCARD is the MDM9250-6 system on a chip, Qualcomm® Snapdragon™ X16 LTE modem. The CCARD is designed with a suitable RF front end that can reach 1 Gbps connectivity. Such high-speed connectivity opens up various applications to in-car systems.

The CCARD's core objective is to achieve a near commercial-grade TCU that OEM customers can directly leverage. This platform also enhances the software development process with access to peripheral debug ports, a serial console interface, and a USB debug port. An outcome of this reference design is:

- RF front-end (RFFE) design and performance that is optimized with the MDM9250-6 chipset
- RF design that supports  $4 \times 4$  MIMO, 4 downlink carrier aggregation and 2 uplink carrier aggregation
- A compact system on module of  $40 \times 40$  mm that includes an RFFE and the MDM9250-6 chipset.

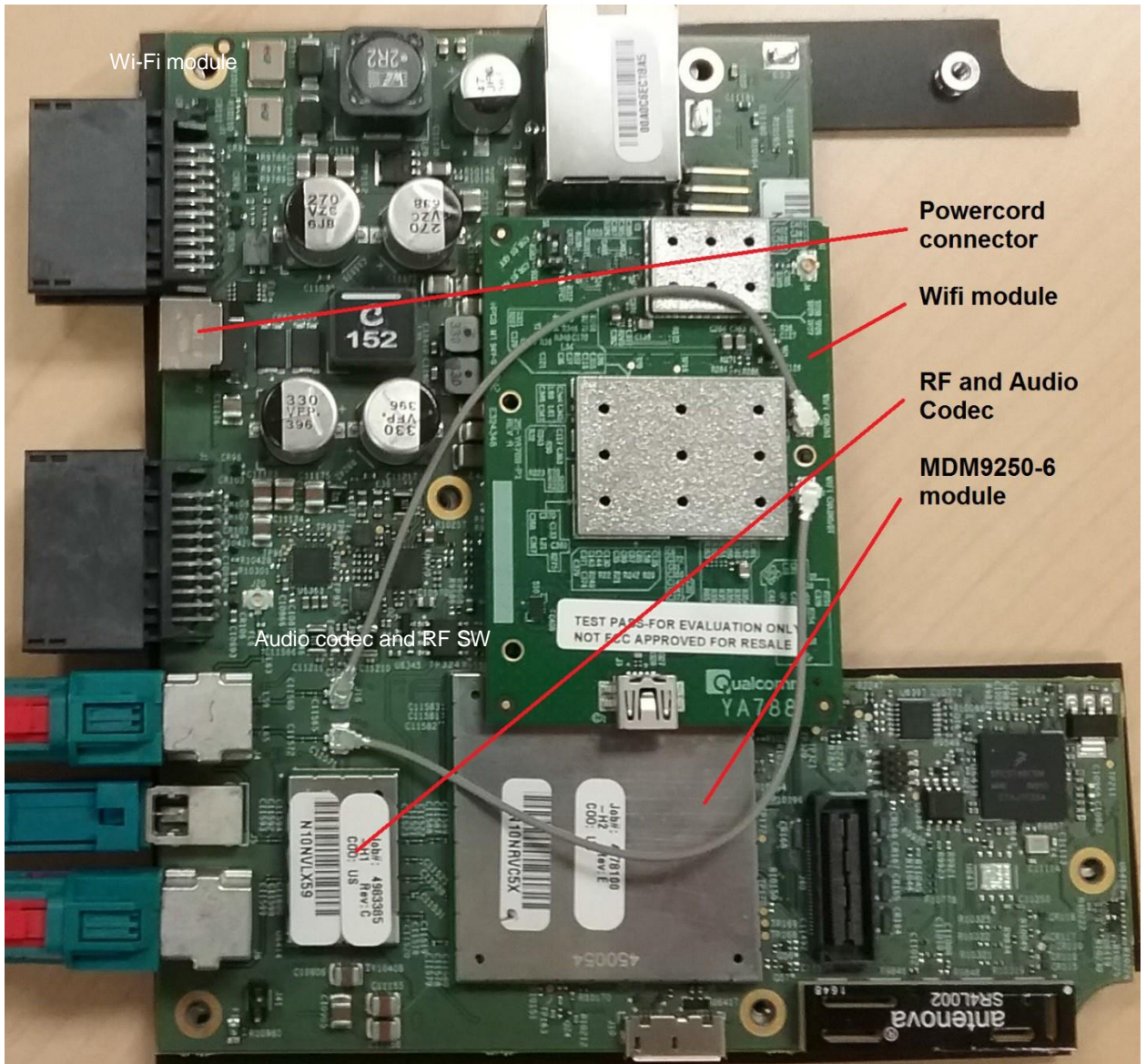


Figure 2-1 CCARD top view

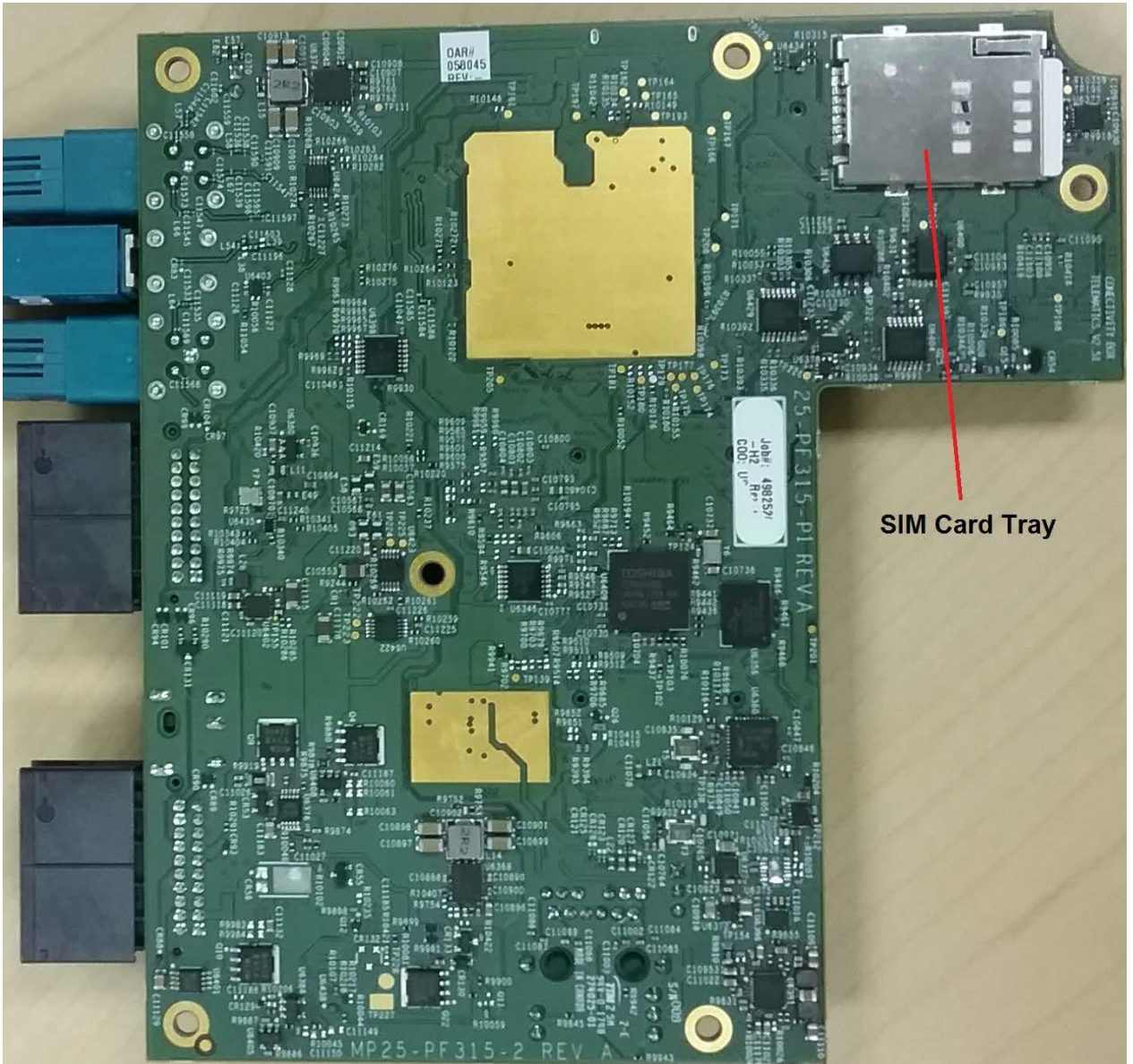


Figure 2-2 CCARD bottom view

## Features

A quick summary of the CCARD features includes:

- Gigabit LTE modem that can achieve TCP/IP connectivity to the Internet.
- CAN/LIN connectivity with vehicle CAN bus allows hybrid use cases; this offers the opportunity to build trusted services and remote access to the vehicle.
- Hotspot WLAN services for users in the vehicle; operation at dual bands 2.4 GHz and 5 GHz; capable of 802.11ac high-speed connectivity.
- Connectivity over a gigabit Ethernet interface, enabling an in-car LAN and a gateway to the Internet. This provides the opportunity to form a network with in-vehicle infotainment (IVI), rear-seat entertainment systems, and other control systems.
- Location services engine – Global Navigation Satellite System (GNSS) compounded by a dead reckoning engine to assist with the navigation and the vehicle tracking system. The design also includes an onboard six-axis gyroscope and accelerometer to enhance the position tracking.
- Bluetooth connectivity and Automotive Audio Bus (A2B) for the audio bus, enabling voice and music interfaces.
- Bluetooth LE (LE) connectivity for keyless entry.
- Onboard audio codec to facilitate eCall.
- Onboard antenna switch matrix to detect a broken antenna and switch to available ones. There is also an onboard antenna as a fallback.

Table 2-1 lists band support.

**Table 2-1 CCARD WAN module NA and RoW variants**

Variant	Supported bands
NA	WCDMA: 2, 4, and 5
	LTE: 2/25, 4/66, 5/26, 7, 12/17, 13, 28A, 29, and 30 (Rx only)
	GSM: 850, PCS 1900
	4 × 4 MIMO: 2, 4/66, 7, and 30
RoW	WCDMA: 1, 3, 5/26, and 8
	LTE: 1, 3, 5/18/19/26, 7, 8, 20, 28A/28B, 32, 34, 38/41, 39, and 40
	GSM: GSM 850, GSM 900, DCS 1800, and PCS 1900
	4 × 4 MIMO: 1, 3, 7, 38, 39, 40, and 41

Table 2-2 summarizes the CCARD features.

**Table 2-2 CCARD features**

Category	Feature	Compliance
WAN modem	LTE (Cat 16) 1 Gb/second	Yes
Digital audio	Support (A2B) for up to four microphones	Hardware in place. To be implemented by software.
100Base-T1 OABR	BroadR-Reach 100Base-T1 PHY	Yes
1000Base-T Ethernet	1 Gbps Ethernet over RJ-45	Yes
Bluetooth 4.2	BT4.2 classic and low energy	Yes
Operating voltage	12 V DC supply, 3 V battery	Yes
Backup battery	Battery	No battery included in CCARD package. Recommend only using 12 V DC input as power supply
LIN interface	LIN interface	Hardware in place. No software support.
CAN interface	CAN interface	Yes
Antenna switch matrix	ANT0/1/2/3 plus compensator input	No software support. Set to default configuration in software.
Backup antenna	Backup antenna	Antenna on board but not tested.
Wi-Fi	2.4 G/5 G support via 802.11g/n/ac 2 x 2	No DBS support
SIM	External SIM reader	Yes
Data calls	Data traffic from/to Internet	Yes
Antenna technology	4 x 4 MIMO	Yes
Voice calls	EU eCall, ERA/GLONASS call, breakdown call, service call, POI call, and customer call with customer SIM	Only eCALL is tested.
Mechanical dimension	Length/width dimensions of WAN module to be 40 x 40 mm	Yes
Wi-Fi tethering	Supports WAN tethering via Wi-Fi	Not tested
WWAN radio enablement	4DLCA, 2ULCA	Yes
Inter LAN communication	Supports routing between Ethernet and Wi-Fi clients via L2TP tunneling	Yes

# High-level architecture

Figure 2-3 illustrates the high-level architecture of the CCARD hardware. The WAN card is an LGA module with the MDM9250-6 system on chip, power management IC, memory (NAND + LPDDR2), WTR5975 RF transceiver, and RF front end.

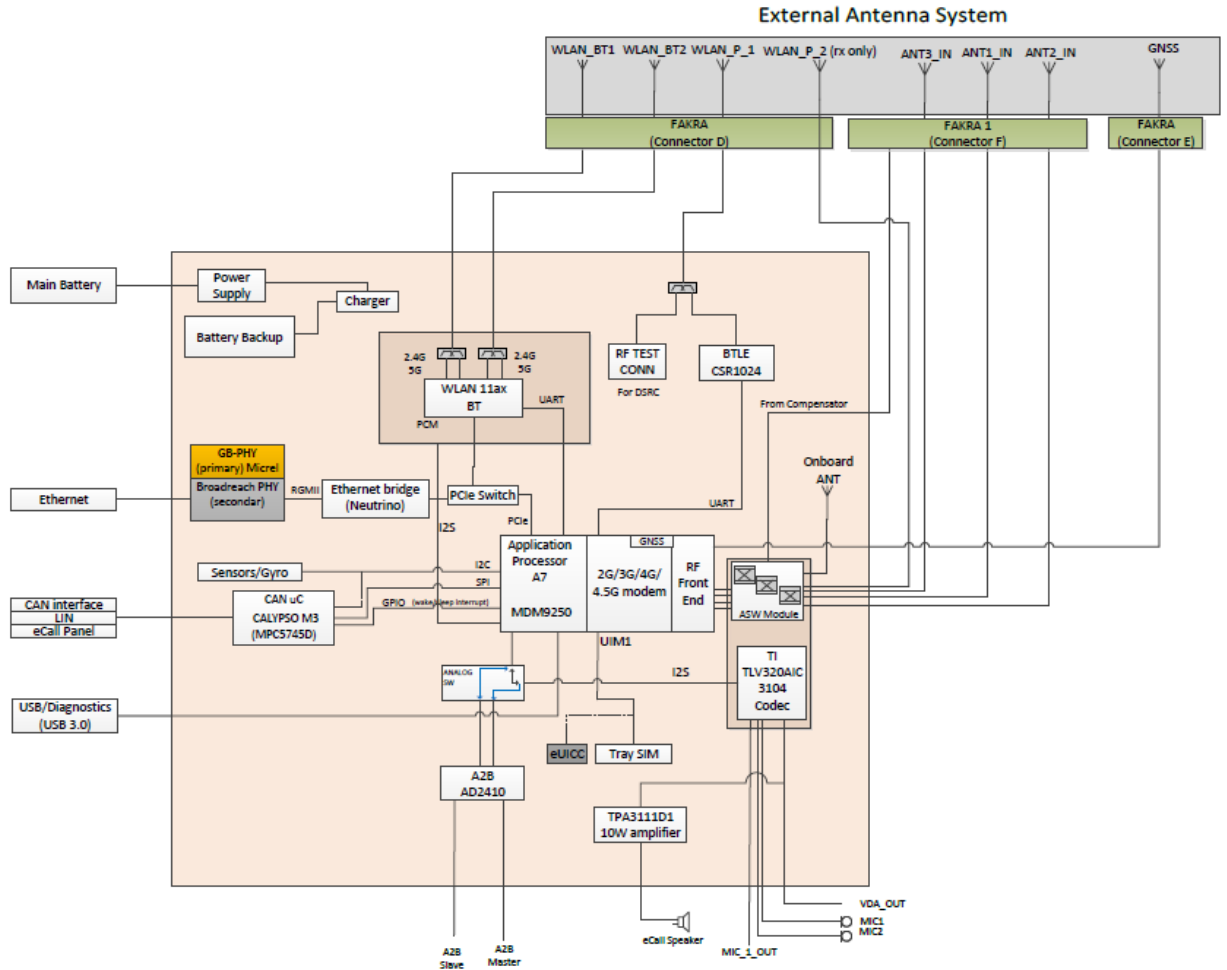
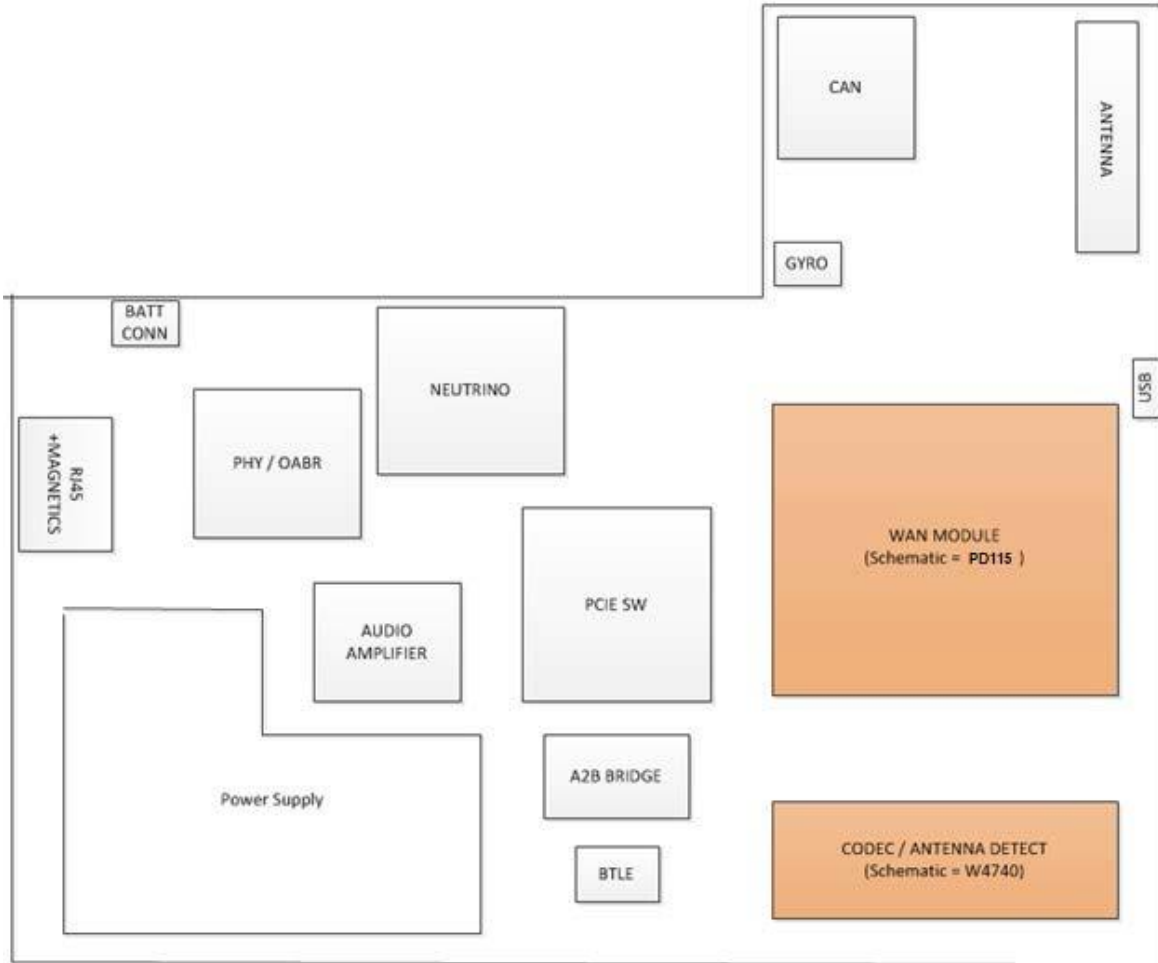


Figure 2-3 CCARD block diagram



**Figure 2-4 CCARD board layout top view**

## Main components

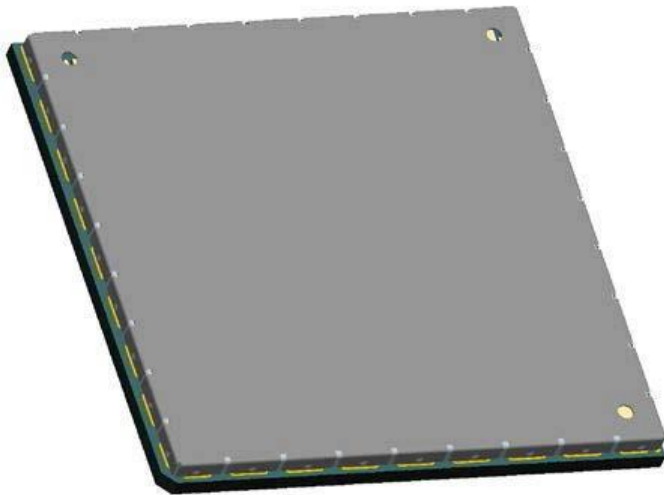
The following is a list of major components in the CCARD board:

- Chipset
  - MDM9250-6
  - PMD9655
  - WTR5975
  - LPDDR2/NAND MCP: MT29RZ4B2DZZHHWD-18I.84F (512 MB NAND + 256 MB LPDDR2)
  - Single, full-size SIM card slot
- Wireless connectivity:
  - QCA6574AU daughtercard (YA788-010)
    - WLAN: 5 GHz 802.11ac 2 × 2, 2.4 GHz 802.11n
    - Bluetooth 4.2 + Bluetooth LE

- Bluetooth LE stand-alone: CSR1024
- A2B digital audio: AD2410WCCSZ
- eCall Audio codec (TLV320AIC3104IRHBT) and RF Antenna switch card
- NXP Calypso MPC5746C with CAN/LIN controllers
- External connectors
  - Two 4-way FAKRA antenna connectors (WAN, WLAN/Bluetooth, and Bluetooth LE)
  - Single FAKRA antenna connector (GPS)
  - Gigabit Ethernet PHY RJ-45 jack
  - Automotive 20-pin audio connector for eCall speaker/microphone and A2B
  - Automotive 20-pin connector for CAN, OPEN Alliance BroadR-Reach (OABR) PHY, and 12 V power
  - Micro USB 3.0 port
  - Power barrel connector for 12 V supply input (2.0 mm ID, 5.50 mm OD)
  - Battery connector (3-pin) for LiFePo backup battery

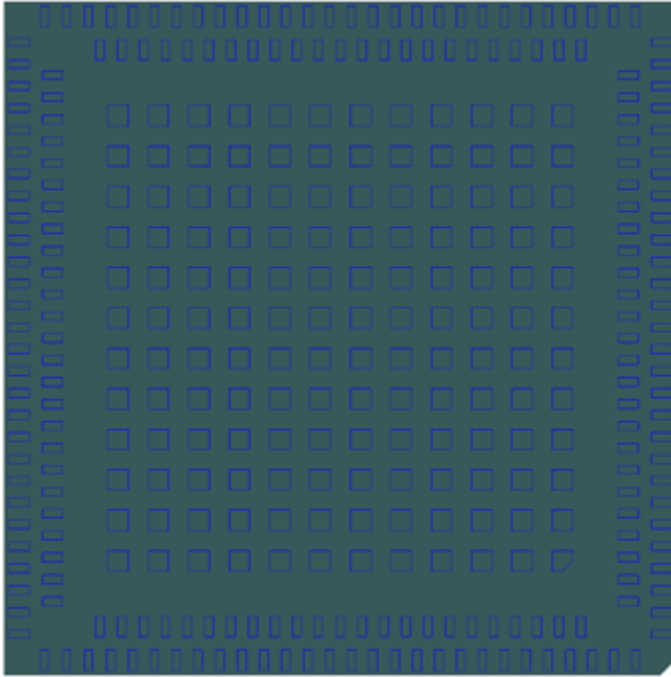
## Mechanical description

The WAN module is 40 × 40 mm.



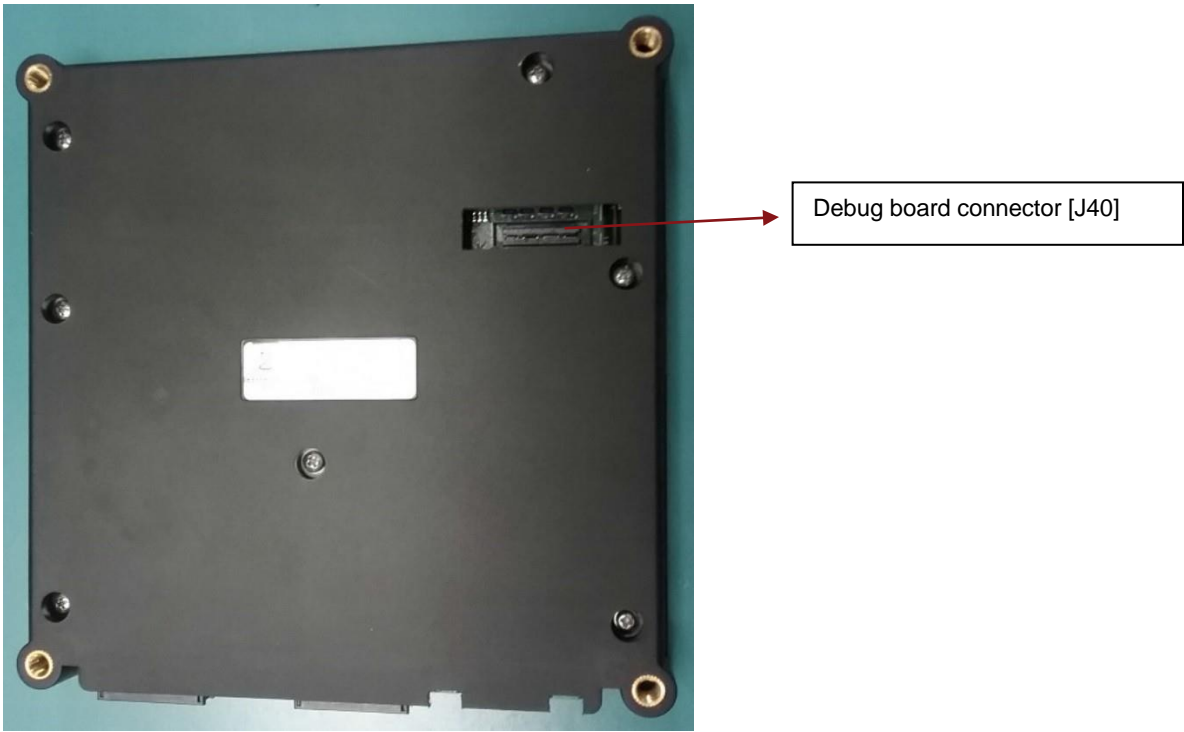
**Figure 2-5 Top side of WAN module**





**Figure 2-6 Bottom side of WAN module**

The mechanical size of the CCARD box is 147 mm × 147 mm × 22 mm.



**Figure 2-7 CCARD box top view**

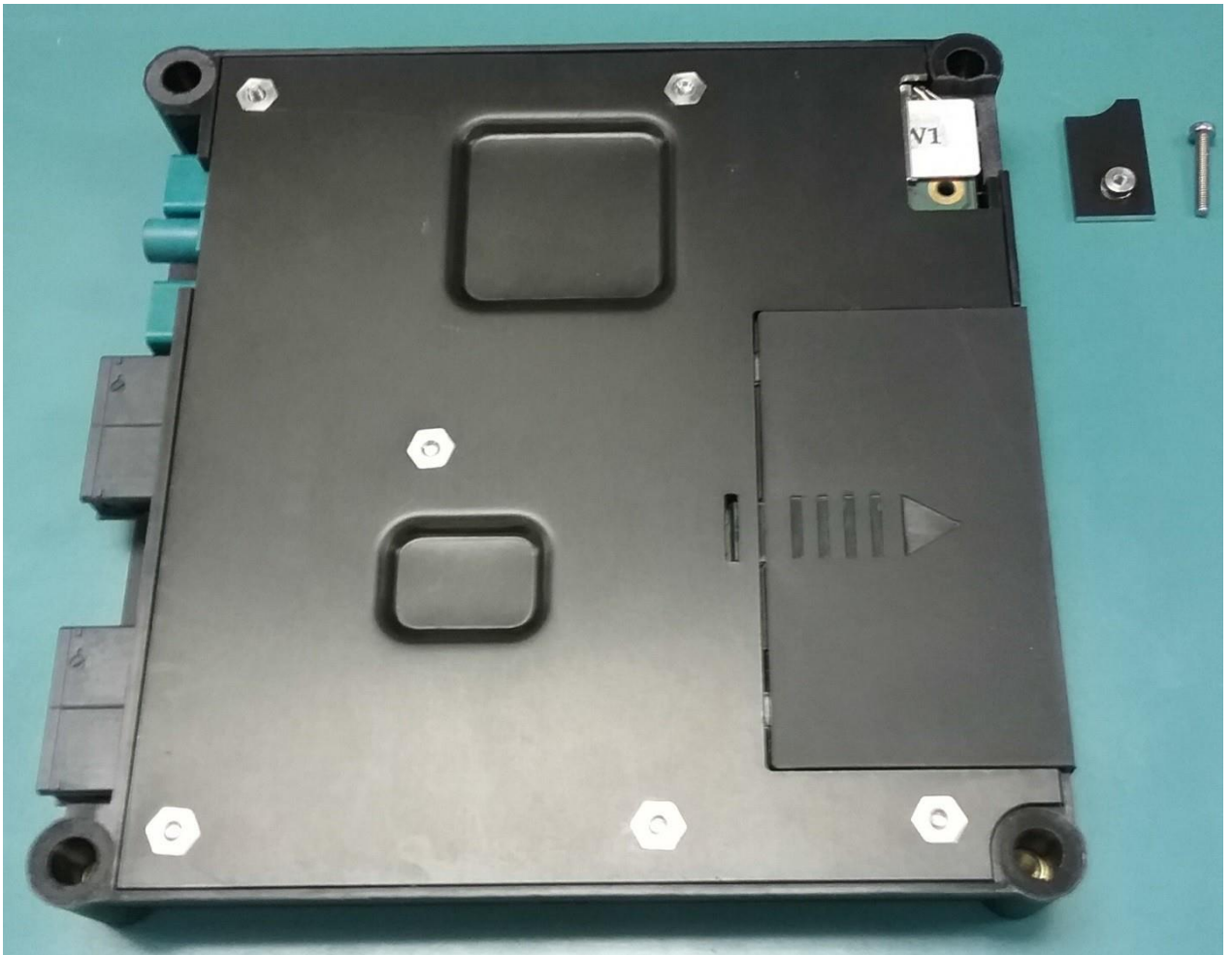


**Figure 2-8 CCARD box bottom view**



**Figure 2-9 CCARD box side views**

Figure 2-10 shows how the UIM card should be inserted to the CCARD box.



**Figure 2-10 CCARD box**