Wistron NeWeb Corp.

VMC-QSA515M NA User Manual

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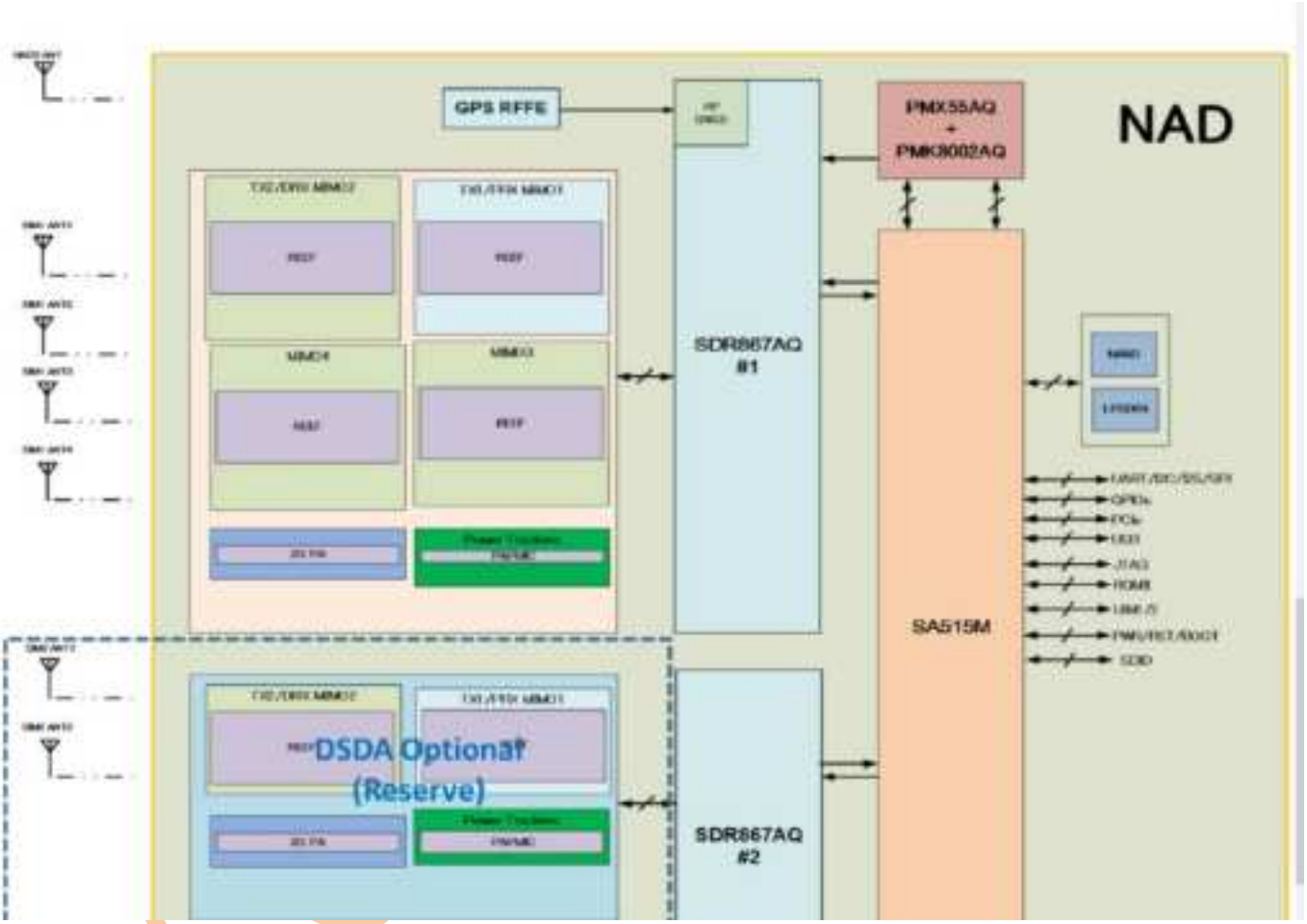
Retention period:	Until Next Release

Revision	Revision Date	Revised By	Description
0.1	2022/7/28	Allen Shih	

1 General features

The VMC-QSA515M is automotive grade LTE module with LGA pins and targeted for automotive application that is the Machine to Machine (M2M) market including TCU (Telematics Control unit), AMM (Automatic Metering Management), tracking system, etc.

2 Block diagram



3 Mechanical design

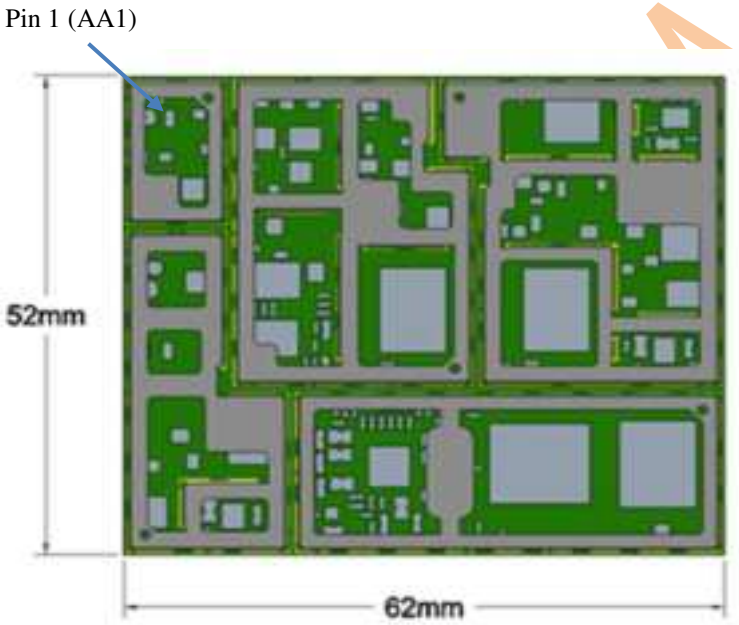


Figure 1. Top view of SA515M

Figure 2. Side view of SA515M (Without pre-tinning)

4 RF specification

4.1 RF Performance

The RF transmitter/receiver is fully compliant with the applicable standards. LTE typical sensitivity performance is to combine primary and diversity antennas at 25°C.

4.2 RF Transmitter Output Power

The maximum output power at the NAD antenna port at room temperature:

Tune-up power	Min	Typ	Max	Unit
LTE Max. Output Power				
B2 (1850-1910MHz TX)	20.3	23	25.7	dBm
B4 (1710-1755MHz TX)	20.3	23	25.7	dBm
B5 (824-849MHz TX)	20.3	23	25.7	dBm
B7 (2500-2570MHz TX)	20.3	23	25.7	dBm
B12 (699-716MHz TX)	20.3	23	25.7	dBm
B13 (777-787MHz TX)	20.3	23	25.7	dBm
B14(788-798MHz TX)	20.3	23	25.7	dBm
B17(704-716MHz TX)	20.3	23	25.7	dBm
B25(1850-1915MHz TX)	20.3	23	25.7	dBm
B26(814-849MHz TX)	20.3	23	25.7	dBm
B41(2469-2690MHz TX)	20.3	23	25.7	dBm
B66(1710-1780MHz TX)	20.3	23	25.7	dBm
B71(663-698MHz TX)	20.3	23	25.7	dBm
UMTS Max. Output Power				
B2 (1850-1910MHz Tx)	20.3	23	25.7	dBm
B4 (1710-1755MHz Tx)	20.3	23	25.7	dBm
B5 (824-849MHz Tx)	20.3	23	25.7	dBm
5G SA Max. Output Power				
n2 (1850-1910MHz TX)	20	23	26	dBm
n5 (824-849MHz TX)	20	23	26	dBm
n25(1850-1915MHz TX)	20	23	26	dBm
n41(2469-2690MHz TX)	20	23	26	dBm
n41(2469-2690MHz TX) PC2	22	26	29	dBm
n66(1710-1780MHz TX)	20	23	26	dBm
n71 (663-698MHz TX)	20	23	26	dBm
n77 (3300-4200MHz TX)	19	23	26	dBm
n77 (3300-4200MHz TX) PC2	22	26	29	dBm
n78(3300-3800MHz TX)	19	23	26	dBm
n78(3300-3800MHz TX) PC2	22	26	29	dBm

4.3 RF Receiver Sensitivity

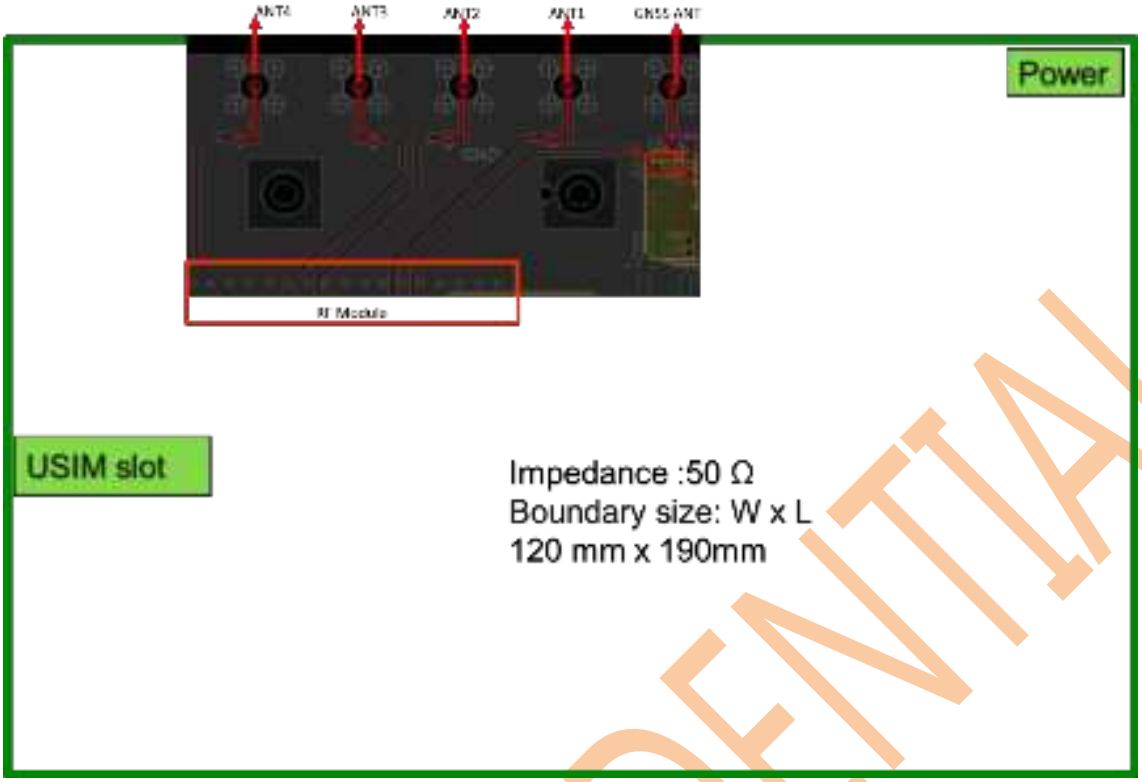
The receiver sensitivity at the NAD antenna port at room temperature:

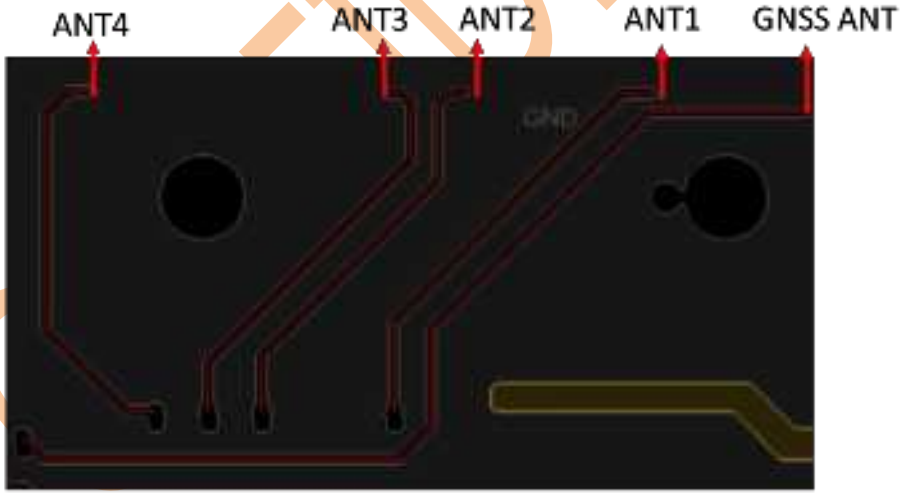
- GSM bands: 3GPP TS 51.010-1 Section 14.2
- WCDMA bands: 3GPP TS 34.121-1 Section 6.2
- LTE bands: 3GPP TS GPP 36.521 Section 7.3
- 5G NR bands: 3GPP TS GPP 38.521 Section 7.3
- C-V2X bands: 3GPP TS GPP 36.521 Section 7.3G
- GNSS bands: -162 dBm

(Measured with external GPS LNA (total gain including cable loss: 14 < Gain < 17; NF < 1.5dB). The VMC-QSA515M design support eLNA by default, it needs to design eLNA on TCU level or active GPS antenna.)

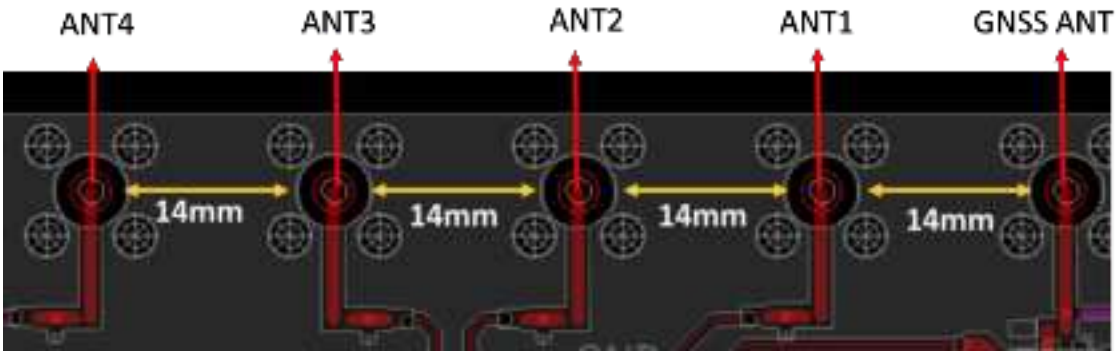
5 Evaluation Kit

6 Antenna design trace





- Dielectric constant: 3.9@1GHz , 4@10GHz
- Impedance: 50ohm
- GNSS=> W:0.22mm, L:78.6mm
- ANT1=> W:0.22mm, L:34.2mm
- ANT2=> W:0.22mm, L:32.1mm
- ANT3=> W:0.22mm, L:32.5mm
- ANT4=> W:0.22mm, L:32.4mm



 # Antenna connectors: SMA

Test procedure:

The printed board will be followed testing procedures as blow:

1. Using the X-ray to check any RF copper trace is damaged.
2. Using the open/short equipment to make sure trace/ground plan/via holes are correct.
3. Using “TDR” equipment to make sure the RF trace impedance is 50 ohm.
4. Using network analyzer to measure dielectric constant for printed board.
5. Will follow the production test procedure as above(item#1~4) for each board.

After trace production, please verify all RF trace impedance with a vector network analyzer and mare sure the trace impedance is with 50+/- 2ohm.

7 WARNING STATEMENT

RF Exposure Information
This device has been tested and meets applicable limits for Radio Frequency (RF) exposure. This equipment should be installed and operated to ensure a minimum of 20 cm spacing to any person at all times.

8 DECLARATION OF CONFORMITY

OEM/Integrators Installation Manual

Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.
2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations
4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s).

End Product Labeling

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: NKR-VMC-QSA515MNA”
“Contains IC: 4441A-QSA515MNA “
The grantee's FCC ID/IC ID can be used only when all FCC/IC compliance requirements are met.

Antenna Installation

(1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
(2) The transmitter module may not be co-located with any other transmitter or antenna.
(3) To comply with FCC/IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile exposure condition must not exceed:

Standalone Condition:

- 4.4 dBi in WCDMA band 2
- 4.0 dBi in WCDMA band 4
- 2.0 dBi in WCDMA band 5
- 4.4 dBi in LTE band 2

- 4.0 dBi in LTE band 4
- 2.0 dBi in LTE band 5
- 2.3 dBi in LTE band 7
- 2.0 dBi in LTE band 12
- 2.3 dBi in LTE band 13
- 2.3 dBi in LTE band 14
- 2.0 dBi in LTE band 17
- 4.4 dBi in LTE band 25
- 2.0 dBi in LTE band 26
- 2.3 dBi in LTE band 41
- 4.0 dBi in LTE band 66
- 1.3 dBi in LTE band 71
- 4.4 dBi in 5G NR n2
- 2.0 dBi in 5G NR n5
- 4.4 dBi in 5G NR n25
- 2.3 dBi in 5G NR n41 PC3
- 2.3 dBi in 5G NR n41 PC2
- 4.0 dBi in 5G NR n66
- 1.3 dBi in 5G NR n71
- 1.0 dBi in 5G NR n77_PC3
- 1.0 dBi in 5G NR n77_PC2
- 1.0 dBi in 5G NR n78_PC3
- 1.0 dBi in 5G NR n78_PC2

Assuming collocated with an ordinary WLAN transmitter with 5 dBi antenna gain

- 3.9 dBi in WCDMA band 2
- 3.6 dBi in WCDMA band 4
- 1.5 dBi in WCDMA band 5
- 3.9 dBi in LTE band 2
- 3.6 dBi in LTE band 4
- 1.5 dBi in LTE band 5
- 1.7 dBi in LTE band 7
- 1.0 dBi in LTE band 12
- 1.3 dBi in LTE band 13
- 1.4 dBi in LTE band 14
- 1.0 dBi in LTE band 17
- 3.9 dBi in LTE band 25
- 1.5 dBi in LTE band 26
- 1.7 dBi in LTE band 41
- 3.6 dBi in LTE band 66
- 0.8 dBi in LTE band 71
- 3.9 dBi in 5G NR n2
- 1.5 dBi in 5G NR n5
- 3.9 dBi in 5G NR n25
- 1.7 dBi in 5G NR n41 PC3
- 1.7 dBi in 5G NR n41 PC2
- 3.6 dBi in 5G NR n66

- 0.8 dBi in 5G NR n71
- 1.0 dBi in 5G NR n77_PC3
- 1.0 dBi in 5G NR n77_PC2
- 1.0 dBi in 5G NR n78_PC3
- 1.0 dBi in 5G NR n78_PC2

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and the FCC ID/IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC/IC authorization.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Federal Communication Commission Interference Statement

This device complies with Part 15 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.
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 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 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de

licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) L'appareil ne doit pas produire de brouillage;
(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3(B)/ NMB-3(B)

Radiation Exposure Statement

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements FCC/IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.