VMC-9628RV1
User Manual

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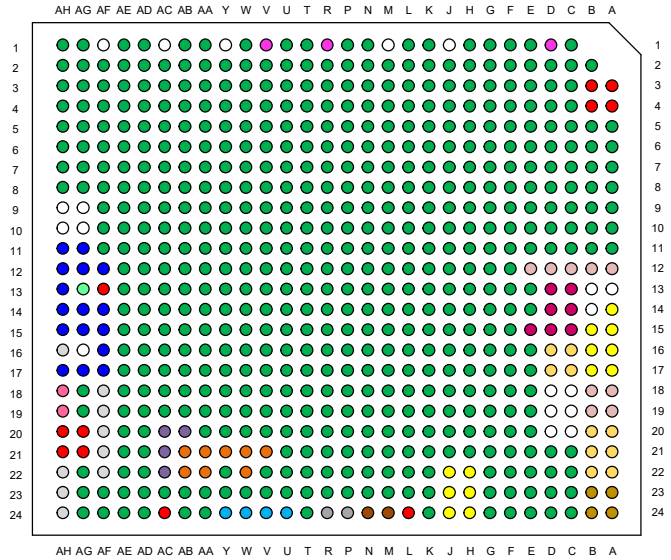
Owner while current:	
Retention period:	

1 General features

The VMC-9628RV1 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 Module Pin Definitions

2.2.1 I/O Connector Pin Assignments



Category	Color	Category	Color
GND		I2C	
Power		SPI	
RF ANT		UIM	
USB		JTAG	
SGMII		GPIO	
I2S		HSIC	
ADC		1PPS	
SDC		Others	
UART		NC	

Figure 1: VMC-9628RV1 Pin-out (Top View)

2.2.2 PIN DEFINITION

The following table is pin definitions of VMC-9628. The table describes the function, type, and for each pin. The description of types is defining as below.

- I: Input
- O: Output
- I/O: Can be configure to input or output
- B: Bidirectional
- P: Power

LGA Pin	VMC-9628 Pin Definition	Function	Pad Type	Voltage Level	Functional Description

A3	RF_PWR	Power Input	I	3.8V	Power input of RF circuit
A4	RF_PWR	Power Input	I	3.8V	Power input of RF circuit
A5	GND	GND	-	-	Ground
A6	GND	GND	-	-	Ground
A7	GND	GND	-	-	Ground
A8	GND	GND	-	-	Ground
A9	GND	GND	-	-	Ground
A10	GND	GND	-	-	Ground
A11	GND	GND	-	-	Ground
A12	MI2S1_D1/ PCM1_DOUT	I2S	B/O	1.8V	MI2S1 data 1/ PCM1 data out
A13	NC	-	-	-	No connection
A14	SD_CARD_DET_N	SDIO	I	1.8V	Secure digital card detection
A15	SDC2_DATA3	SDIO	B	1.8V/ 2.85V	Secure digital controller 2 data bit 3
A16	SDC2_DATA1	SDIO	B	1.8V/ 2.85V	Secure digital controller 2 data bit 1
A17	SDC2_CMD	SDIO	B	1.8V/ 2.85V	Secure digital controller 2 command
A18	MI2S2_SCLK/ PCM2_CLK	I2S	B	1.8V	MI2S2 clock/ PCM2 clock
A19	MI2S2_D0/ PCM2_DIN	I2S	B/I	1.8V	MI2S2 Data 0/ PCM2 data in
A20	COEX_UART_TX/ FAST_BOOT_SELECT2	UART/ Boot	B/I	1.8V	LTE transmitter sync for coexistence with UART/ Fast boot select bit 2
A21	UART1_RX	UART	I	1.8V	UART1, receive data
A22	UART1_RFR	UART	O	1.8V	UART1, ready for frame
A23	USB_HS_DP	USB	B	-	USB high-speed data - plus
A24	USB_HS_DM	USB	B	-	USB high-speed data - minus
B2	GND	GND	-	-	Ground
B3	RF_PWR	Power Input	I	3.8V	Power input of RF circuit
B4	RF_PWR	Power Input	I	3.8V	Power input of RF circuit
B5	GND	GND	-	-	Ground
B6	GND	GND	-	-	Ground
B7	GND	GND	-	-	Ground
B8	GND	GND	-	-	Ground
B9	GND	GND	-	-	Ground
B10	GND	GND	-	-	Ground
B11	GND	GND	-	-	Ground

B12	MI2S1_WS/ PCM1_SYNC	I2S	B	1.8V	MI2S1 word select/ PCM1 frame sync
B13	NC	-	-	-	No connection
B14	NC	-	-	-	No connection
B15	SDC2_CLK	SDIO	B	1.8V/ 2.85V	Secure digital controller 2 clock
B16	SDC2_DATA2	SDIO	B	1.8V/ 2.85V	Secure digital controller 2 data bit 2
B17	SDC2_DATA0	SDIO	B	1.8V/ 2.85V	Secure digital controller 2 data bit 0
B18	MI2S2_D1/ PCM2_DOUT	I2S	B/O	1.8V	MI2S2 Data/ PCM2 data out
B19	MI2S2_WS/ PCM2_SYNC	I2S	B	1.8V	MI2S2 word select/ PCM2 sync
B20	COEX_UART_RX/ FORCED_USB_BOOT	UART/ Boot	I	1.8V	LTE receiver sync for coexistence with UART/ Force USB boot control
B21	UART1_TX	UART	O	1.8V	UART1, transmit data
B22	UART1_CTS	UART	I	1.8V	UART1, clear to send
B23	MDM_VBUS_DET	USB	I	1.8V	USB VBUS detection
B24	USB_HS_ID	USB	I		USB high-speed data - ID
C1	GND	GND	-	-	Ground
C2	GND	GND	-	-	Ground
C3	GND	GND	-	-	Ground
C4	GND	GND	-	-	Ground
C5	GND	GND	-	-	Ground
C6	GND	GND	-	-	Ground
C7	GND	GND	-	-	Ground
C8	GND	GND	-	-	Ground
C9	GND	GND	-	-	Ground
C10	GND	GND	-	-	Ground
C11	GND	GND	-	-	Ground
C12	MI2S1_D0/ PCM1_DIN	I2S	B/I	1.8V	MI2S1 Data 0/ PCM1 data in
C13	MDM_JTAG_TMS	JTAG	B	1.8V	JTAG mode select input
C14	MDM_JTAG_TRST_N	JTAG	I	1.8V	JTAG reset
C15	MDM_JTAG_TDI	JTAG	I	1.8V	JTAG data input
C16	UART2_RFR	UART2	O	1.8V	UART2, ready for frame
C17	UART2_CTS	UART2	I	1.8V	UART2, clear to send
C18	NC	-	-	-	No connection
C19	NC	-	-	-	No connection
C20	NC	-	-	-	No connection

C21	GND	GND	-	-	Ground
C22	GND	GND	-	-	Ground
C23	GND	GND	-	-	Ground
C24	GND	GND	-	-	Ground
D1	ANT_PTRX1	ANT	B	-	Primary cellular signal input/output
D2	GND	GND	-	-	Ground
D3	GND	GND	-	-	Ground
D4	GND	GND	-	-	Ground
D5	GND	GND	-	-	Ground
D6	GND	GND	-	-	Ground
D7	GND	GND	-	-	Ground
D8	GND	GND	-	-	Ground
D9	GND	GND	-	-	Ground
D10	GND	GND	-	-	Ground
D11	GND	GND	-	-	Ground
D12	MI2S1_SCLK/ PCM1_CLK	I2S	B	1.8V	MI2S1 data clock/ PCM1 clock
D13	MDM_JTAG_SRST_N	JTAG	I	1.8V	JTAG reset for debug
D14	MDM_JTAG_TCK	JTAG	I	1.8V	JTAG clock input
D15	MDM_JTAG_TDO	JTAG	O	1.8V	JTAG data output
D16	UART2_RX	UART2	I	1.8V	UART2, receive data
D17	UART2_TX	UART2	O	1.8V	UART2, transmit data
D18	NC	-	-	-	No connection
D19	NC	-	-	-	No connection
D20	NC	-	-	-	No connection
D21	GND	GND	-	-	Ground
D22	GND	GND	-	-	Ground
D23	GND	GND	-	-	Ground
D24	GND	GND	-	-	Ground
E1	GND	GND	-	-	Ground
E2	GND	GND	-	-	Ground
E3	GND	GND	-	-	Ground
E4	GND	GND	-	-	Ground
E5	GND	GND	-	-	Ground
E6	GND	GND	-	-	Ground
E7	GND	GND	-	-	Ground
E8	GND	GND	-	-	Ground
E9	GND	GND	-	-	Ground

E10	GND	GND	-	-	Ground
E11	GND	GND	-	-	Ground
E12	MDM_MCLK	I2S	O	1.8V	Audio Master clock
E13	GND	GND	-	-	Ground
E14	GND	GND	-	-	Ground
E15	MDM_JTAG_PS_HOLD	JTAG	O	1.8V	Power supply hold signal to PMIC
E16	GND	GND	-	-	Ground
E17	GND	GND	-	-	Ground
E18	GND	GND	-	-	Ground
E19	GND	GND	-	-	Ground
E20	GND	GND	-	-	Ground
E21	GND	GND	-	-	Ground
E22	GND	GND	-	-	Ground
E23	GND	GND	-	-	Ground
E24	GND	GND	-	-	Ground
F1	GND	GND	-	-	Ground
F2	GND	GND	-	-	Ground
F3	GND	GND	-	-	Ground
F4	GND	GND	-	-	Ground
F5	GND	GND	-	-	Ground
F6	GND	GND	-	-	Ground
F7	GND	GND	-	-	Ground
F8	GND	GND	-	-	Ground
F9	GND	GND	-	-	Ground
F10	GND	GND	-	-	Ground
F11	GND	GND	-	-	Ground
F12	GND	GND	-	-	Ground
F13	GND	GND	-	-	Ground
F14	GND	GND	-	-	Ground
F15	GND	GND	-	-	Ground
F16	GND	GND	-	-	Ground
F17	GND	GND	-	-	Ground
F18	GND	GND	-	-	Ground
F19	GND	GND	-	-	Ground
F20	GND	GND	-	-	Ground
F21	GND	GND	-	-	Ground
F22	GND	GND	-	-	Ground
F23	GND	GND	-	-	Ground

F24	GND	GND	-	-	Ground
G1	GND	GND	-	-	Ground
G2	GND	GND	-	-	Ground
G3	GND	GND	-	-	Ground
G4	GND	GND	-	-	Ground
G5	GND	GND	-	-	Ground
G6	GND	GND	-	-	Ground
G7	GND	GND	-	-	Ground
G8	GND	GND	-	-	Ground
G9	GND	GND	-	-	Ground
G10	GND	GND	-	-	Ground
G11	GND	GND	-	-	Ground
G12	GND	GND	-	-	Ground
G13	GND	GND	-	-	Ground
G14	GND	GND	-	-	Ground
G15	GND	GND	-	-	Ground
G16	GND	GND	-	-	Ground
G17	GND	GND	-	-	Ground
G18	GND	GND	-	-	Ground
G19	GND	GND	-	-	Ground
G20	GND	GND	-	-	Ground
G21	GND	GND	-	-	Ground
G22	GND	GND	-	-	Ground
G23	GND	GND	-	-	Ground
G24	GND	GND	-	-	Ground
H1	GND	GND	-	-	Ground
H2	GND	GND	-	-	Ground
H3	GND	GND	-	-	Ground
H4	GND	GND	-	-	Ground
H5	GND	GND	-	-	Ground
H6	GND	GND	-	-	Ground
H7	GND	GND	-	-	Ground
H8	GND	GND	-	-	Ground
H9	GND	GND	-	-	Ground
H10	GND	GND	-	-	Ground
H11	GND	GND	-	-	Ground
H12	GND	GND	-	-	Ground
H13	GND	GND	-	-	Ground

H14	GND	GND	-	-	Ground
H15	GND	GND	-	-	Ground
H16	GND	GND	-	-	Ground
H17	GND	GND	-	-	Ground
H18	GND	GND	-	-	Ground
H19	GND	GND	-	-	Ground
H20	GND	GND	-	-	Ground
H21	GND	GND	-	-	Ground
H22	SDC1_DATA2	SDIO	B	1.8V	Secure digital controller 1 data bit 2
H23	SDC1_DATA0	SDIO	B	1.8V	Secure digital controller 1 data bit 0
H24	SDC1_DATA3	SDIO	B	1.8V	Secure digital controller 1 data bit 3
J1	NC	-	-	-	No connection
J2	GND	GND	-	-	Ground
J3	GND	GND	-	-	Ground
J4	GND	GND	-	-	Ground
J5	GND	GND	-	-	Ground
J6	GND	GND	-	-	Ground
J7	GND	GND	-	-	Ground
J8	GND	GND	-	-	Ground
J9	GND	GND	-	-	Ground
J10	GND	GND	-	-	Ground
J11	GND	GND	-	-	Ground
J12	GND	GND	-	-	Ground
J13	GND	GND	-	-	Ground
J14	GND	GND	-	-	Ground
J15	GND	GND	-	-	Ground
J16	GND	GND	-	-	Ground
J17	GND	GND	-	-	Ground
J18	GND	GND	-	-	Ground
J19	GND	GND	-	-	Ground
J20	GND	GND	-	-	Ground
J21	GND	GND	-	-	Ground
J22	SDC1_CLK	SDIO	B	1.8V	Secure digital controller 1 clock
J23	SDC1_DATA1	SDIO	B	1.8V	Secure digital controller 1 data bit 1
J24	SDC1_CMD	SDIO	B	1.8V	Secure digital controller 1 command
K1	GND	GND	-	-	Ground

K2	GND	GND	-	-	Ground
K3	GND	GND	-	-	Ground
K4	GND	GND	-	-	Ground
K5	GND	GND	-	-	Ground
K6	GND	GND	-	-	Ground
K7	GND	GND	-	-	Ground
K8	GND	GND	-	-	Ground
K9	GND	GND	-	-	Ground
K10	GND	GND	-	-	Ground
K11	GND	GND	-	-	Ground
K12	GND	GND	-	-	Ground
K13	GND	GND	-	-	Ground
K14	GND	GND	-	-	Ground
K15	GND	GND	-	-	Ground
K16	GND	GND	-	-	Ground
K17	GND	GND	-	-	Ground
K18	GND	GND	-	-	Ground
K19	GND	GND	-	-	Ground
K20	GND	GND	-	-	Ground
K21	GND	GND	-	-	Ground
K22	GND	GND	-	-	Ground
K23	GND	GND	-	-	Ground
K24	GND	GND	-	-	Ground
L1	GND	GND	-	-	Ground
L2	GND	GND	-	-	Ground
L3	GND	GND	-	-	Ground
L4	GND	GND	-	-	Ground
L5	GND	GND	-	-	Ground
L6	GND	GND	-	-	Ground
L7	GND	GND	-	-	Ground
L8	GND	GND	-	-	Ground
L9	GND	GND	-	-	Ground
L10	GND	GND	-	-	Ground
L11	GND	GND	-	-	Ground
L12	GND	GND	-	-	Ground
L13	GND	GND	-	-	Ground
L14	GND	GND	-	-	Ground
L15	GND	GND	-	-	Ground

L16	GND	GND	-	-	Ground
L17	GND	GND	-	-	Ground
L18	GND	GND	-	-	Ground
L19	GND	GND	-	-	Ground
L20	GND	GND	-	-	Ground
L21	GND	GND	-	-	Ground
L22	GND	GND	-	-	Ground
L23	GND	GND	-	-	Ground
L24	VREG_L11_1P8	Power Output	O	1.8V	Linear regulator L11 output
M1	NC	-	-	-	No connection
M2	GND	GND	-	-	Ground
M3	GND	GND	-	-	Ground
M4	GND	GND	-	-	Ground
M5	GND	GND	-	-	Ground
M6	GND	GND	-	-	Ground
M7	GND	GND	-	-	Ground
M8	GND	GND	-	-	Ground
M9	GND	GND	-	-	Ground
M10	GND	GND	-	-	Ground
M11	GND	GND	-	-	Ground
M12	GND	GND	-	-	Ground
M13	GND	GND	-	-	Ground
M14	GND	GND	-	-	Ground
M15	GND	GND	-	-	Ground
M16	GND	GND	-	-	Ground
M17	GND	GND	-	-	Ground
M18	GND	GND	-	-	Ground
M19	GND	GND	-	-	Ground
M20	GND	GND	-	-	Ground
M21	GND	GND	-	-	Ground
M22	GND	GND	-	-	Ground
M23	GND	GND	-	-	Ground
M24	I2C_SCL	I2C	B	1.8V	I2C clock
N1	GND	GND	-	-	Ground
N2	GND	GND	-	-	Ground
N3	GND	GND	-	-	Ground
N4	GND	GND	-	-	Ground

N5	GND	GND	-	-	Ground
N6	GND	GND	-	-	Ground
N7	GND	GND	-	-	Ground
N8	GND	GND	-	-	Ground
N9	GND	GND	-	-	Ground
N10	GND	GND	-	-	Ground
N11	GND	GND	-	-	Ground
N12	GND	GND	-	-	Ground
N13	GND	GND	-	-	Ground
N14	GND	GND	-	-	Ground
N15	GND	GND	-	-	Ground
N16	GND	GND	-	-	Ground
N17	GND	GND	-	-	Ground
N18	GND	GND	-	-	Ground
N19	GND	GND	-	-	Ground
N20	GND	GND	-	-	Ground
N21	GND	GND	-	-	Ground
N22	GND	GND	-	-	Ground
N23	GND	GND	-	-	Ground
N24	I2C_SDA	I2C	B	1.8V	I2C data
P1	GND	GND	-	-	Ground
P2	GND	GND	-	-	Ground
P3	GND	GND	-	-	Ground
P4	GND	GND	-	-	Ground
P5	GND	GND	-	-	Ground
P6	GND	GND	-	-	Ground
P7	GND	GND	-	-	Ground
P8	GND	GND	-	-	Ground
P9	GND	GND	-	-	Ground
P10	GND	GND	-	-	Ground
P11	GND	GND	-	-	Ground
P12	GND	GND	-	-	Ground
P13	GND	GND	-	-	Ground
P14	GND	GND	-	-	Ground
P15	GND	GND	-	-	Ground
P16	GND	GND	-	-	Ground
P17	GND	GND	-	-	Ground
P18	GND	GND	-	-	Ground

P19	GND	GND	-	-	Ground
P20	GND	GND	-	-	Ground
P21	GND	GND	-	-	Ground
P22	GND	GND	-	-	Ground
P23	GND	GND	-	-	Ground
P24	HSIC_STROBE	HSIC	B	1.2V	HSIC strobe
R1	ANT_DRX1	ANT	I	-	Diversity cellular signal input
R2	GND	GND	-	-	Ground
R3	GND	GND	-	-	Ground
R4	GND	GND	-	-	Ground
R5	GND	GND	-	-	Ground
R6	GND	GND	-	-	Ground
R7	GND	GND	-	-	Ground
R8	GND	GND	-	-	Ground
R9	GND	GND	-	-	Ground
R10	GND	GND	-	-	Ground
R11	GND	GND	-	-	Ground
R12	GND	GND	-	-	Ground
R13	GND	GND	-	-	Ground
R14	GND	GND	-	-	Ground
R15	GND	GND	-	-	Ground
R16	GND	GND	-	-	Ground
R17	GND	GND	-	-	Ground
R18	GND	GND	-	-	Ground
R19	GND	GND	-	-	Ground
R20	GND	GND	-	-	Ground
R21	GND	GND	-	-	Ground
R22	GND	GND	-	-	Ground
R23	GND	GND	-	-	Ground
R24	HSIC_DATA	HSIC	B	1.2V	HSIC data
T1	GND	GND	-	-	Ground
T2	GND	GND	-	-	Ground
T3	GND	GND	-	-	Ground
T4	GND	GND	-	-	Ground
T5	GND	GND	-	-	Ground
T6	GND	GND	-	-	Ground
T7	GND	GND	-	-	Ground
T8	GND	GND	-	-	Ground

T9	GND	GND	-	-	Ground
T10	GND	GND	-	-	Ground
T11	GND	GND	-	-	Ground
T12	GND	GND	-	-	Ground
T13	GND	GND	-	-	Ground
T14	GND	GND	-	-	Ground
T15	GND	GND	-	-	Ground
T16	GND	GND	-	-	Ground
T17	GND	GND	-	-	Ground
T18	GND	GND	-	-	Ground
T19	GND	GND	-	-	Ground
T20	GND	GND	-	-	Ground
T21	GND	GND	-	-	Ground
T22	GND	GND	-	-	Ground
T23	GND	GND	-	-	Ground
T24	GND	GND	-	-	Ground
U1	GND	GND	-	-	Ground
U2	GND	GND	-	-	Ground
U3	GND	GND	-	-	Ground
U4	GND	GND	-	-	Ground
U5	GND	GND	-	-	Ground
U6	GND	GND	-	-	Ground
U7	GND	GND	-	-	Ground
U8	GND	GND	-	-	Ground
U9	GND	GND	-	-	Ground
U10	GND	GND	-	-	Ground
U11	GND	GND	-	-	Ground
U12	GND	GND	-	-	Ground
U13	GND	GND	-	-	Ground
U14	GND	GND	-	-	Ground
U15	GND	GND	-	-	Ground
U16	GND	GND	-	-	Ground
U17	GND	GND	-	-	Ground
U18	GND	GND	-	-	Ground
U19	GND	GND	-	-	Ground
U20	GND	GND	-	-	Ground
U21	GND	GND	-	-	Ground
U22	GND	GND	-	-	Ground

U23	GND	GND	-	-	Ground
U24	SGMII_TX_M	Ethernet	O	-	SGMII transmit - minus
V1	ANT_GNSS	ANT	I	-	GNSS signal input
V2	GND	GND	-	-	Ground
V3	GND	GND	-	-	Ground
V4	GND	GND	-	-	Ground
V5	GND	GND	-	-	Ground
V6	GND	GND	-	-	Ground
V7	GND	GND	-	-	Ground
V8	GND	GND	-	-	Ground
V9	GND	GND	-	-	Ground
V10	GND	GND	-	-	Ground
V11	GND	GND	-	-	Ground
V12	GND	GND	-	-	Ground
V13	GND	GND	-	-	Ground
V14	GND	GND	-	-	Ground
V15	GND	GND	-	-	Ground
V16	GND	GND	-	-	Ground
V17	GND	GND	-	-	Ground
V18	GND	GND	-	-	Ground
V19	GND	GND	-	-	Ground
V20	GND	GND	-	-	Ground
V21	UIM2_DATA/ MDIO_CLK	SIM2/ Ethernet	B/O	1.8V/ 2.85V	UIM2 data/ MDIO clock
V22	GND	GND	-	-	Ground
V23	GND	GND	-	-	Ground
V24	SGMII_TX_P	Ethernet	O	-	SGMII transmit - plus
W1	GND	GND	-	-	Ground
W2	GND	GND	-	-	Ground
W3	GND	GND	-	-	Ground
W4	GND	GND	-	-	Ground
W5	GND	GND	-	-	Ground
W6	GND	GND	-	-	Ground
W7	GND	GND	-	-	Ground
W8	GND	GND	-	-	Ground
W9	GND	GND	-	-	Ground
W10	GND	GND	-	-	Ground
W11	GND	GND	-	-	Ground

W12	GND	GND	-	-	Ground
W13	GND	GND	-	-	Ground
W14	GND	GND	-	-	Ground
W15	GND	GND	-	-	Ground
W16	GND	GND	-	-	Ground
W17	GND	GND	-	-	Ground
W18	GND	GND	-	-	Ground
W19	GND	GND	-	-	Ground
W20	GND	GND	-	-	Ground
W21	UIM2_RESET/ ETH_RST_N	SIM2/ Ethernet	O	1.8V/ 2.85V	UIM2 reset/ Ethernet PHY reset
W22	UIM2_CLK/ MDIO_DATA	SIM2/ Ethernet	O/B	1.8V/ 2.85V	UIM2 clock/ MDIO data
W23	GND	GND	-	-	Ground
W24	SGMII_RX_M	Ethernet	I	-	SGMII receive - minus
Y1	NC	-	-	-	No connection
Y2	GND	GND	-	-	Ground
Y3	GND	GND	-	-	Ground
Y4	GND	GND	-	-	Ground
Y5	GND	GND	-	-	Ground
Y6	GND	GND	-	-	Ground
Y7	GND	GND	-	-	Ground
Y8	GND	GND	-	-	Ground
Y9	GND	GND	-	-	Ground
Y10	GND	GND	-	-	Ground
Y11	GND	GND	-	-	Ground
Y12	GND	GND	-	-	Ground
Y13	GND	GND	-	-	Ground
Y14	GND	GND	-	-	Ground
Y15	GND	GND	-	-	Ground
Y16	GND	GND	-	-	Ground
Y17	GND	GND	-	-	Ground
Y18	GND	GND	-	-	Ground
Y19	GND	GND	-	-	Ground
Y20	GND	GND	-	-	Ground
Y21	UIM2_DETECT/ ETH_INT_N	SIM2/ Ethernet	I	1.8V	UIM2 detect/ Ethernet PHY interrupt
Y22	GND	GND	-	-	Ground
Y23	GND	GND	-	-	Ground

Y24	SGMII_RX_P	Ethernet	I	-	SGMII receive - plus
AA1	GND	GND	-	-	Ground
AA2	GND	GND	-	-	Ground
AA3	GND	GND	-	-	Ground
AA4	GND	GND	-	-	Ground
AA5	GND	GND	-	-	Ground
AA6	GND	GND	-	-	Ground
AA7	GND	GND	-	-	Ground
AA8	GND	GND	-	-	Ground
AA9	GND	GND	-	-	Ground
AA10	GND	GND	-	-	Ground
AA11	GND	GND	-	-	Ground
AA12	GND	GND	-	-	Ground
AA13	GND	GND	-	-	Ground
AA14	GND	GND	-	-	Ground
AA15	GND	GND	-	-	Ground
AA16	GND	GND	-	-	Ground
AA17	GND	GND	-	-	Ground
AA18	GND	GND	-	-	Ground
AA19	GND	GND	-	-	Ground
AA20	GND	GND	-	-	Ground
AA21	UIM1_RESET	SIM1	O	1.8V/ 2.85V	UIM1 reset
AA22	UIM1_DETECT	SIM1	I	1.8V	UIM1 detect
AA23	GND	GND	-	-	Ground
AA24	GND	GND	-	-	Ground
AB1	GND	GND	-	-	Ground
AB2	GND	GND	-	-	Ground
AB3	GND	GND	-	-	Ground
AB4	GND	GND	-	-	Ground
AB5	GND	GND	-	-	Ground
AB6	GND	GND	-	-	Ground
AB7	GND	GND	-	-	Ground
AB8	GND	GND	-	-	Ground
AB9	GND	GND	-	-	Ground
AB10	GND	GND	-	-	Ground
AB11	GND	GND	-	-	Ground
AB12	GND	GND	-	-	Ground

AB13	GND	GND	-	-	Ground
AB14	GND	GND	-	-	Ground
AB15	GND	GND	-	-	Ground
AB16	GND	GND	-	-	Ground
AB17	GND	GND	-	-	Ground
AB18	GND	GND	-	-	Ground
AB19	GND	GND	-	-	Ground
AB20	SPI_CLK	SPI	O	1.8V	SPI clock
AB21	UIM1_CLK	SIM1	O	1.8V/ 2.85V	UIM1 clock
AB22	UIM1_DATA	SIM1	B	1.8V/ 2.85V	UIM1 data
AB23	GND	GND	-	-	Ground
AB24	GND	GND	-	-	Ground
AC1	NC	-	-	-	No connection
AC2	GND	GND	-	-	Ground
AC3	GND	GND	-	-	Ground
AC4	GND	GND	-	-	Ground
AC5	GND	GND	-	-	Ground
AC6	GND	GND	-	-	Ground
AC7	GND	GND	-	-	Ground
AC8	GND	GND	-	-	Ground
AC9	GND	GND	-	-	Ground
AC10	GND	GND	-	-	Ground
AC11	GND	GND	-	-	Ground
AC12	GND	GND	-	-	Ground
AC13	GND	GND	-	-	Ground
AC14	GND	GND	-	-	Ground
AC15	GND	GND	-	-	Ground
AC16	GND	GND	-	-	Ground
AC17	GND	GND	-	-	Ground
AC18	GND	GND	-	-	Ground
AC19	GND	GND	-	-	Ground
AC20	SPI_CS_N	SPI	O	1.8V	SPI chip select
AC21	SPI_MOSI	SPI	O	1.8V	SPI master-out slave-in
AC22	SPI_MISO	SPI	I	1.8V	SPI master-in slave-out
AC23	GND	GND	-	-	Ground
AC24	VREG_L6_UIM1	Power Output	O	1.8V/ 2.85V	Linear regulator L6 output, for UIM1 power

AD1	GND	GND	-	-	Ground
AD2	GND	GND	-	-	Ground
AD3	GND	GND	-	-	Ground
AD4	GND	GND	-	-	Ground
AD5	GND	GND	-	-	Ground
AD6	GND	GND	-	-	Ground
AD7	GND	GND	-	-	Ground
AD8	GND	GND	-	-	Ground
AD9	GND	GND	-	-	Ground
AD10	GND	GND	-	-	Ground
AD11	GND	GND	-	-	Ground
AD12	GND	GND	-	-	Ground
AD13	GND	GND	-	-	Ground
AD14	GND	GND	-	-	Ground
AD15	GND	GND	-	-	Ground
AD16	GND	GND	-	-	Ground
AD17	GND	GND	-	-	Ground
AD18	GND	GND	-	-	Ground
AD19	GND	GND	-	-	Ground
AD20	GND	GND	-	-	Ground
AD21	GND	GND	-	-	Ground
AD22	GND	GND	-	-	Ground
AD23	GND	GND	-	-	Ground
AD24	GND	GND	-	-	Ground
AE1	GND	GND	-	-	Ground
AE2	GND	GND	-	-	Ground
AE3	GND	GND	-	-	Ground
AE4	GND	GND	-	-	Ground
AE5	GND	GND	-	-	Ground
AE6	GND	GND	-	-	Ground
AE7	GND	GND	-	-	Ground
AE8	GND	GND	-	-	Ground
AE9	GND	GND	-	-	Ground
AE10	GND	GND	-	-	Ground
AE11	GND	GND	-	-	Ground
AE12	GND	GND	-	-	Ground
AE13	GND	GND	-	-	Ground
AE14	GND	GND	-	-	Ground

AE15	GND	GND	-	-	Ground
AE16	GND	GND	-	-	Ground
AE17	GND	GND	-	-	Ground
AE18	GND	GND	-	-	Ground
AE19	GND	GND	-	-	Ground
AE20	GND	GND	-	-	Ground
AE21	GND	GND	-	-	Ground
AE22	GND	GND	-	-	Ground
AE23	GND	GND	-	-	Ground
AE24	GND	GND	-	-	Ground
AF1	NC	-	-	-	No connection
AF2	GND	GND	-	-	Ground
AF3	GND	GND	-	-	Ground
AF4	GND	GND	-	-	Ground
AF5	GND	GND	-	-	Ground
AF6	GND	GND	-	-	Ground
AF7	GND	GND	-	-	Ground
AF8	GND	GND	-	-	Ground
AF9	GND	GND	-	-	Ground
AF10	GND	GND	-	-	Ground
AF11	GND	GND	-	-	Ground
AF12	GPIO_0	GPIO	B	1.8V	Configurable I/O
AF13	VREG_L5_UIM2	Power Output	O	1.8V/ 2.85V	Linear regulator L5 output, for UIM2 power
AF14	GPIO_1	GPIO	B	1.8V	Configurable I/O
AF15	GPIO_2	GPIO	B	1.8V	Configurable I/O
AF16	GPIO_3	GPIO	B	1.8V	Configurable I/O
AF17	GPIO_4	GPIO	B	1.8V	Configurable I/O
AF18	MODE_1	JTAG	I	1.8V	Mode control bit 1
AF19	MODE_0	JTAG	I	1.8V	Mode control bit 0
AF20	MDM_RESOUT_N	Boot	O	1.8V	Reset output
AF21	FAST_BOOT_SELECT0	Boot	I	1.8V	Fast boot select bit 0
AF22	FAST_BOOT_SELECT1	Boot	I	1.8V	Fast boot select bit 1
AF23	GND	GND	-	-	Ground
AF24	GND	GND	-	-	Ground
AG1	GND	GND	-	-	Ground
AG2	GND	GND	-	-	Ground
AG3	GND	GND	-	-	Ground

AG4	GND	GND	-	-	Ground
AG5	GND	GND	-	-	Ground
AG6	GND	GND	-	-	Ground
AG7	GND	GND	-	-	Ground
AG8	GND	GND	-	-	Ground
AG9	NC	-	-	-	No connection
AG10	NC	-	-	-	No connection
AG11	GPIO_5	GPIO	B	1.8V	Configurable I/O
AG12	GPIO_6	GPIO	B	1.8V	Configurable I/O
AG13	1PPS	1PPS	O	1.8V	A pulse per second output
AG14	GPIO_7	GPIO	B	1.8V	Configurable I/O
AG15	GPIO_8	GPIO	B	1.8V	Configurable I/O
AG16	NC	-	-	-	No connection
AG17	GPIO_9	GPIO	B	1.8V	Configurable I/O
AG18	GND	GND	-	-	Ground
AG19	GND	GND	-	-	Ground
AG20	VPH_PWR	Power Input	I	3.8V	System power supply input
AG21	VPH_PWR	Power Input	I	3.8V	System power supply input
AG22	GND	GND	-	-	Ground
AG23	GND	GND	-	-	Ground
AG24	GND	GND	-	-	Ground
AH1	GND	GND	-	-	Ground
AH2	GND	GND	-	-	Ground
AH3	GND	GND	-	-	Ground
AH4	GND	GND	-	-	Ground
AH5	GND	GND	-	-	Ground
AH6	GND	GND	-	-	Ground
AH7	GND	GND	-	-	Ground
AH8	GND	GND	-	-	Ground
AH9	NC	-	-	-	No connection
AH10	NC	-	-	-	No connection
AH11	GPIO_10	GPIO	B	1.8V	Configurable I/O
AH12	GPIO_11	GPIO	B	1.8V	Configurable I/O
AH13	GPIO_12	GPIO	B	1.8V	Configurable I/O
AH14	GPIO_13	GPIO	B	1.8V	Configurable I/O
AH15	GPIO_14	GPIO	B	1.8V	Configurable I/O
AH16	WLAN_SLP_CLK	CLOCK	O	1.8V	WLAN sleep clock

AH17	GPIO_15	GPIO	B	1.8V	Configurable I/O
AH18	ADC_1	ADC	I	1.8V	ADC input
AH19	ADC_0	ADC	I	1.8V	ADC input
AH20	VPH_PWR	Power Input	I	3.8V	System power supply input
AH21	VPH_PWR	Power Input	I	3.8V	System power supply input
AH22	RESIN_N	Boot	I	1.8V	Reset input, active low. Internal pull up to 1.8V.
AH23	PON_TRIG	Boot	I	1.8V	Turn on module, active high
AH24	CBL_PWR_N	Boot	I	-	Turn on module, active low.

2.2.3 Wake Up Interrupt Pins

VMC-9628RV1 provides 16 GPIOs and there are six pins which have wake up interrupt function. The wake-up interrupt function is disabled by default

VMC-9628 Pin number	VMC-9628 Pin name	Wake up interrupt function
AF12	GPIO_0	Support
AG11	GPIO_5	Support
AG17	GPIO_9	Support
AH11	GPIO_10	Support
AH12	GPIO_11	Support
AH13	GPIO_12	Support

3 Mechanical design

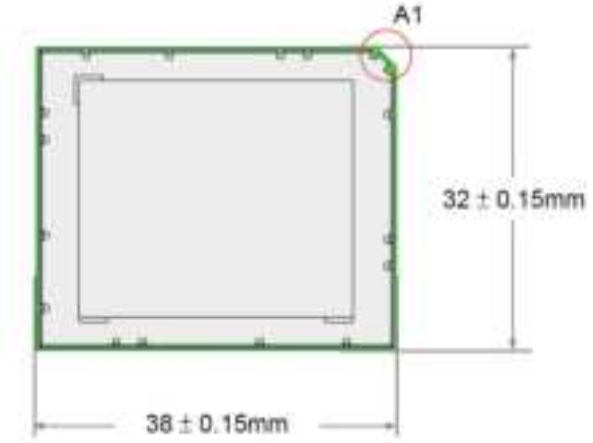


Figure 2: Top view of VMC-9628 module

Figure 3: Side view of VMC-9628 module

3.1 Mounting Information

This section describes how to mount VMC-9628 onto the PCBs, including land pattern and stencil design, soldering conditions. For more information on issues related to SMT module integration see also.

Note: To avoid short circuits between signal tracks on an external application's PCB and various markings at the bottom side of the module, it is recommended not to route the signal tracks on the top layer of an external PCB directly under the module.

3.2 Module Land Pattern

The land pattern and stencil design is for lead-free solder paste and a 120 micron thick stencil. LGA pads' surface is Au by ENIG process. VMC-9628 module can stand 2 times SMT process in customer side.

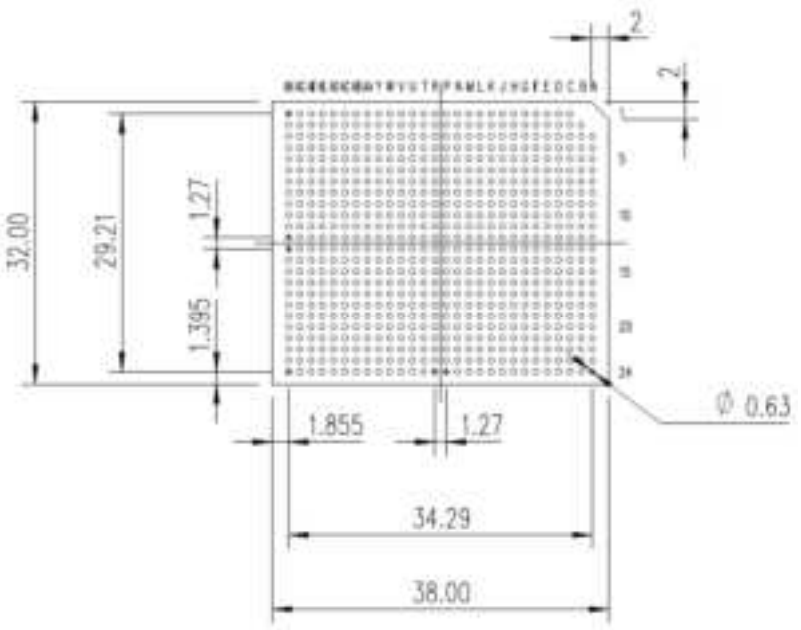


Figure 4: Land Pattern of VMC-9628

3.3 Reflow Profile

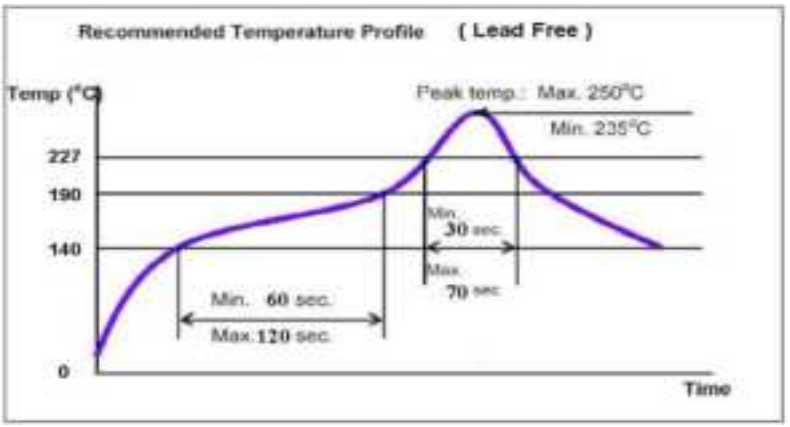


Figure 5: Reflow Profile

Profile Feature	Parameters
Peak Temperature	235-250°C
Reflow Zone (above 227°C or 230°C)	30-70 seconds
Preheat Zone (140-190°C)	60-120 seconds

4 Thermal design

N/A

5 RF specification

5.1 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.

5.2 RF Transmitter Output Power

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

- GSM low bands (900): +33 ±2 dBm
- GSM Hi bands (1800): +30 ±2 dBm
- WCDMA bands: +23 ±2.7 dBm
- LTE bands: +23.0 ±2.7 dBm

***** For most bands. Some exceptions exist, based on 3GPP standard

5.3 RF Receiver Sensitivity

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

- GSM bands (900/1800): 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

***** For most bands. Some exceptions exist, based on 3GPP standard

5.4 TRANSMITTER POWER CLASS

Mode	**Power Class**
LTE	3

WCDMA/HSDPA/HSPA+	2/3
GSM/GPRS(900)	4
GSM/GPRS(1800)	1
EDGE	E2

Table 3-3 Supported Power Classes

5.5 GNSS Performance

Specification	Min	Typ	Max	Units
GNSS CN Ratio*	35	37		dB
Tracking Sensitivity**			-160	dBm

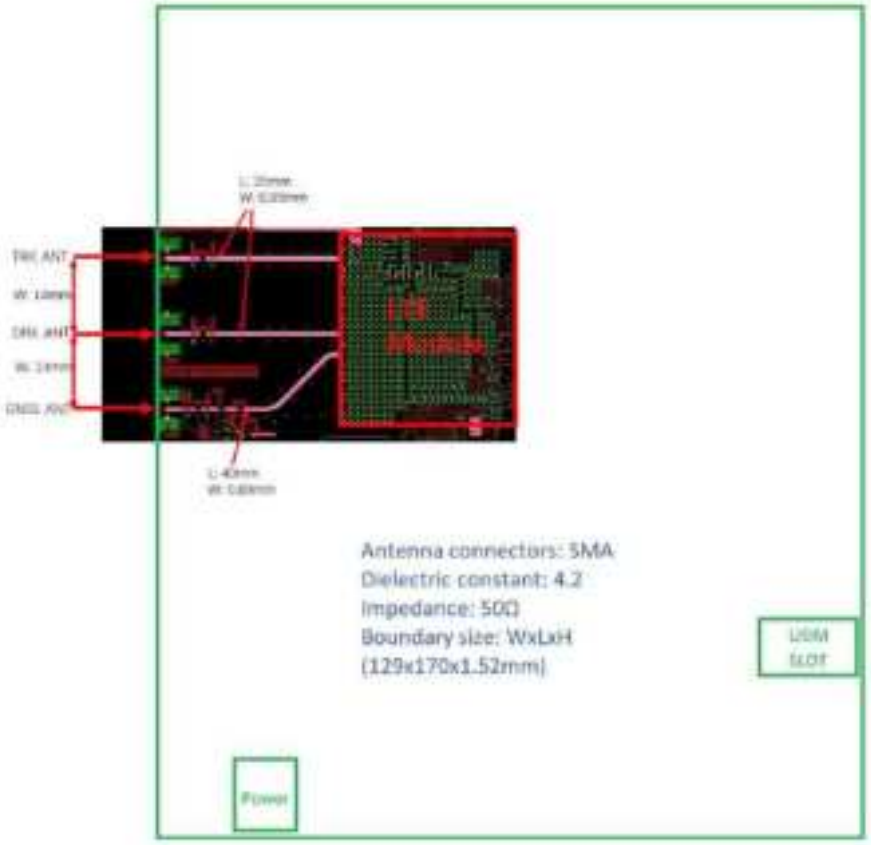
Table 3-4 GNSS performance

* Input signal at -130 dBm

** Demonstrated with a good external LNA (NF 3dB/Gain 20dB)

6 Design application notes

LTE antenna design trace



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

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.

FCC Caution: 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.

Radiation Exposure Statement:

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

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:

KDB 996369 D03 OEM Manual v01 rule sections:

2.2 List of applicable FCC rules

This module has been tested for compliance to FCC Part 22,27,90

2.3 Summarize the specific operational use conditions

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

Please see Section 6 of this manual for requirements regarding the trace design to antenna connectors. Any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

2.6 RF exposure considerations

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

2.7 Antennas

The following antenna(s) have been certified for use with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users. The final host product must comply with §15.212(a)(1)(iv) and §§§ 15.203, 15.204(b), and 15.204(c) regarding the use of a permanently attached antenna prior to shipping

Manufacturer	Model	Connector	Antenna Type	MaxGain (dBi)
WNC	CAF-211	SMA	Dipole	2

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: “Contains FCC ID: NKR-VMC-9628RV1”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

2.9 Information on test modes and additional testing requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

2.10 Additional testing, Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not 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 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.

OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment