



## Product user manual

**Project Name:** M18QM

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**Author:** Wistron NeWeb Corporation

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**Revision:** 2.0

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**Revision Date:** 2021/01/14

## Contact Information

|                           |   |
|---------------------------|---|
| Technical Support website | <a href="https://SupportIoT.wnc.com.tw">https://SupportIoT.wnc.com.tw</a> |
| Company Website           | <a href="http://www.wnc.com.tw">www.wnc.com.tw</a>                        |

## Revision History

| Rev. # | Author | Summary of Changes           | Date       |
|--------|--------|------------------------------|------------|
| 1.0    | WNC    | First release                | 2020/12/23 |
| 2.0    | WNC    | Update Safety Recommendation | 2021/1/14  |
|        |        |                              |            |
|        |        |                              |            |
|        |        |                              |            |
|        |        |                              |            |

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# 1. Introduction

The M18QM module is LTE modem which incorporate an application CPU subsystem and peripheral interfaces and functions uniquely designed to address the power/performance/cost requirements of IoT and M2M applications. The CPU is based on Qualcomm's MDM architecture which offers OFDMA-related software based signal processing capabilities that significantly exceed traditional communications ARM cores. M18QM module provides a variety of interfaces including USB 2.0, SGMII, SPI, UART, PCM, I2C, UIM & SDIO.

## 1.1. Abbreviation

Table 1. Abbreviation

| Abbreviation | Definition   |
|--------------|--|
| AC           | Alternating Current  |
| DC           | Direct Current   |
| ETSI         | European Telecommunications Standards Institute  |
| GND          | Ground   |
| GPS          | Global Positioning System  |
| GNSS         | Any single or combined satellite navigation system (GPS, GLONASS and combined GPS/GLONASS) |
| GPIO         | General Purpose Input Output   |
| I/O          | Input/Output   |
| IoT          | Internet of Things   |
| I2C          | Inter-Integrated Circuit   |
| LGA          | Land Grid Array  |
| LTE          | Long Term Evolution  |
| Mbps         | Megabits per second  |
| MIPS         | Millions of Instructions Per Second  |
| N/A          | Not/Applicable   |
| OS           | Operating System   |
| PC           | Personal Computer  |
| PCM          | Pulse Code Modulation  |

|              |   |
|--------------|---|
| <b>PIN</b>   | Personal Identification Number              |
| <b>SIM</b>   | Subscriber Identity Module                  |
| <b>SMA</b>   | Surface Mount Antenna                       |
| <b>SPI</b>   | Serial Peripheral Interface                 |
| <b>UART</b>  | Universal Asynchronous Receiver-Transmitter |
| <b>UIM</b>   | User Identity Module                        |
| <b>USB</b>   | Universal Serial Bus                        |
| <b>Vref</b>  | Voltage reference                           |
| <b>WCDMA</b> | Wideband Code Division Multiple Access      |
| <b>WNC</b>   | Wistron NeWeb Corporation                   |

## 1.2. Features

This section lists main features of M18QM module support. For wireless technology and band support information among different modules, please refer to table2 for detail information.

Table 2. M18QM module overview

| Module | Category | LTE             | WCDMA | GNSS | Temperature Grade |
|--------|----------|-----------------|-------|------|-------------------|
|        |          | B2/4/5/12/66/71 |       |      |                   |
| M18QM  | 4        | √               | X     | √    | Industrial        |

Note: 1.Refer to section6.6 for more information about industrial grade.

2.“√” indicates supporting. “×” indicates not supporting.

**Feature list:**

- LTE 3GPP release 10 without Carrier Aggregation
- M18QM: 3GPP, LTE Cat. 4 with 150/50 Mbps for DL/UL
- Supports LTE B2/4/5/12/66/71
- GPS & GLONASS
- Ultra-high-performance Cortex A7 microprocessor
- Modem subsystem (MSS)
- Resource and power management (RPM) subsystem
- Optimized for M2M and IoT markets
- Interfaces
  - HS USB 2.0 with integrated PHY
  - SGMII interface
  - Dual UART interfaces (4 bit and 2 bit) for data transfer and diagnostic tools
  - SDC1/First SPI interface
  - I2C/Second SPI interface
  - USIM interface
  - GPIOs
  - ADC
  - PCM/I2S
  - JTAG interface

### 1.3. Environmental Specifications and Certifications

#### 1.3.1. Environmental Specifications

The environmental specifications for both operating and storage conditions are defined in the Table below.

| Condition                            | Temperature Range | Remark   |
|--------------------------------------|-------------------|--|
| Normal operating temperature range   | -20 °C to 60 °C   | Fully functional and in compliance with 3GPP specifications                                  |
| Extended operating temperature range | -40 °C to 85 °C   | RF performance may be affected outside the normal range, but the module will still function. |
| Storage                              | -40 °C to 85 °C   |  |

Table 3. Temperature range

Note: All temperatures above refer to ambient temperatures.



**1.3.2. Certifications**

The M18QM module is certified to be compliant with PTCRB, FCC, IC,T-Mobile TA.

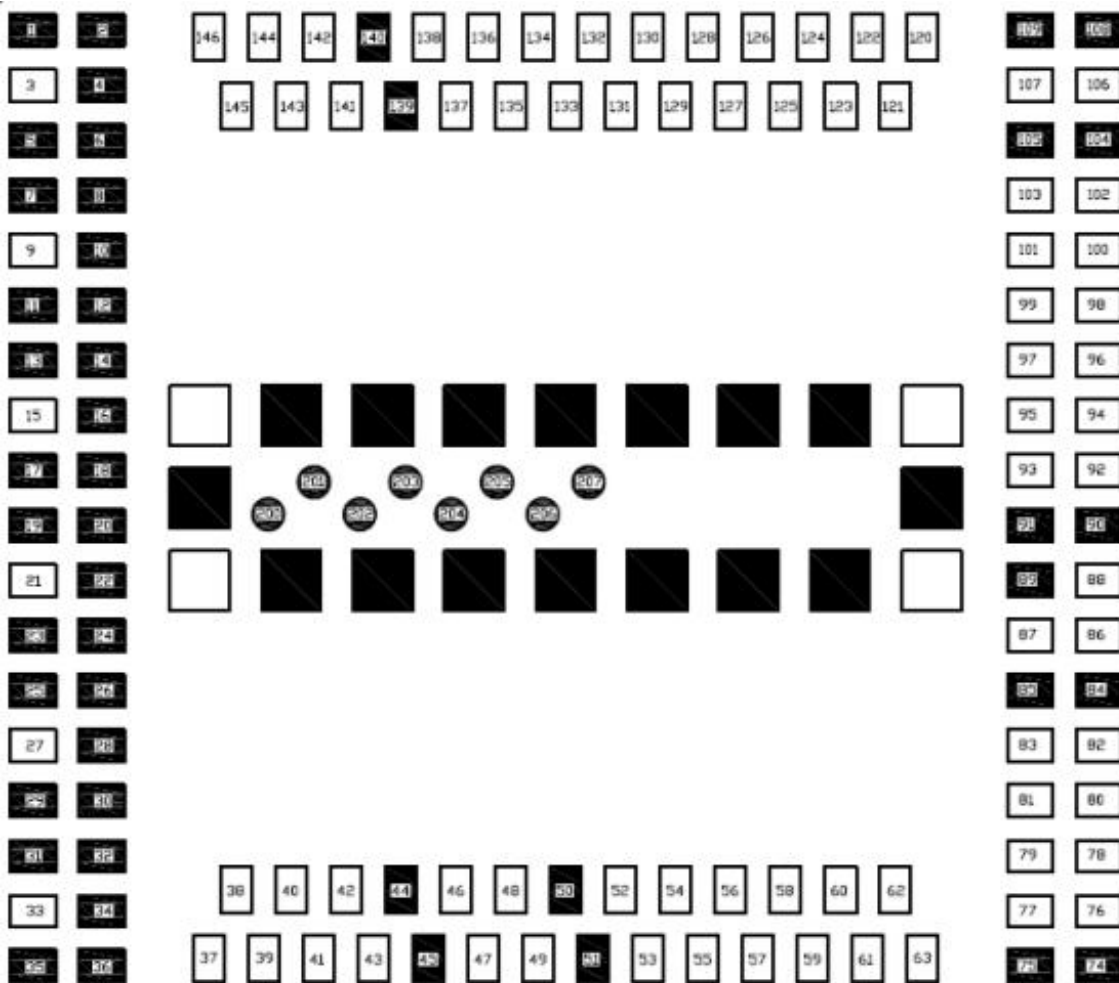
**1.3.3. Green Product Compliance**

RoHS (2011/65/EU)

## 2. Electrical Specifications

### 2.1. Host interface pin assignments

#### 2.1.1. LGA Pad Diagram



- Signal pad
- Ground pad
- Ground slug
- Optional Ground Slug
- Optional Custom JTAG
- + □ = Pad 208

Figure 1. LGA pad diagram (top view)

**2.1.2. Pin Assignments**

I/O type description:

- AO : Analog Output
- AI : Analog Input
- DO : Digital Output
- DI : Digital Input

Table 4. Pin interface family

| Interface Family                | Signal      | Description                 | I/O   |
|---------------------------------|-------------|-----------------------------|-------|
| <b>RF Interfaces</b>            |             |                             |       |
|                                 | RF_2        | Diversity antenna           | AI    |
|                                 | RF_GNSS     | Reserved for GNSS receiver  | AI    |
|                                 | RF_1        | Main Antenna                | AI/AO |
| <b>User Identity Module</b>     |             |                             |       |
|                                 | UIM_VCC     | Power source for UIM        | AO    |
|                                 | UIM_DATA    | Data in/out                 | DI/DO |
|                                 | UIM_CLK     | Clock signal                | DO    |
|                                 | UIM_RESET   | Reset signal                | DO    |
|                                 | UIM_DETECT  | UIM Detect signal           | DI/DO |
| <b>Data Interfaces- USB 2.0</b> |             |                             |       |
|                                 | USB_HS_DP   | USB Data Positive           | DI/DO |
|                                 | USB Detect  | USB Detect                  | DI    |
|                                 | USB_HS_DM   | USB Data Negative           | DI/DO |
| <b>Data Interfaces- SGMII</b>   |             |                             |       |
|                                 | SGMII_RX_P  | SGMII receive - plus        | DI    |
|                                 | SGMII_RX_M  | SGMII receive - minus       | DI    |
|                                 | SGMII_TX_P  | SGMII transmit - plus       | DO    |
|                                 | SGMII_TX_M  | SGMII transmit - minus      | DO    |
|                                 | SGMII_MDIO  | SGMII Management data       | DI/DO |
|                                 | SGMII_MDC   | SGMII Management data clock | DI/DO |
| <b>Data Interfaces- UART1</b>   |             |                             |       |
|                                 | UART1_CTS_N | Clear To Send for UART 1    | DI    |
|                                 | UART1_RFR_N | Ready for receive for UART1 | DO    |

|  |                             |       |
|--|-----------------------------|-------|
| UART1_RX                                   | Receive for UART 1          | DI    |
| UART1_TX                                   | Transmit for UART 1         | DO    |
| <b>Data Interfaces- UART2</b>              |                             |       |
| UART2_RX                                   | Receive for UART 2          | DI    |
| UART2_TX                                   | Transmit for UART 2         | DO    |
| <b>Data Interfaces- I2C/2nd_SPI</b>        |                             |       |
| I2C_SDA                                    | Data in/out                 | DI/DO |
| 2nd_SPI_EN_1                               | 2nd_SPI chip select         | DO    |
| I2C_SCL                                    | Clock signal                | DO    |
| 2nd_SPI_CLK                                | 2nd_SPI serial clock        | DO    |
| SPI_MOSI                                   | 2nd_SPI master out slave in | DO    |
| NC   | NC                          | -     |
| SPI_MISO                                   | 2nd_SPI master in slave out | DI    |
| <b>Data Interfaces- SDC1/1st_SPI</b>       |                             |       |
| SDC1_DATA_3                                | SDC1_DATA_3                 | DI/DO |
| 1st_SPI_MOSI                               | 1st_SPI master out slave in | DO    |
| SDC1_DATA_2                                | SDC1_DATA_2                 | DI/DO |
| 1st_SPI_MISO                               | 1st_SPI master in slave out | DI    |
| SDC1_DATA_1                                | SDC1_DATA_1                 | DI/DO |
| 1st_SPI_EN_1                               | 1st_SPI chip select         | DO    |
| SDC1_DATA_0                                | SDC1_DATA_0                 | DI/DO |
| 1st_SPI_CLK                                | 1st_SPI serial clock        | DO    |
| SDC1_CMD                                   | SDC1_CMD                    | DI/DO |
| SDC1_CLK                                   | SDC1_CLK                    | DO    |
| <b>Module Control and State Interfaces</b> |                             |       |
| WWAN_STATE                                 | Wireless WAN Radio State    | DO    |
| POWER_ON                                   | Power On the module         | DI    |
| WAKEUP_OUT                                 | Module wakes up host        | DO    |
| WAKEUP_IN                                  | Host wakes up module        | DI    |
| RESET                                      | Reset the module            | DI    |
| <b>Power and Ground</b>                    |                             |       |
| VREF                                       | Voltage Reference Output    | AO    |
| VCC  | Main Power                  | AI    |
| GND  | GND                         | AI    |
| <b>General Purpose</b>                     |                             |       |
| GPIO                                       | Digital I/O                 | DI/DO |

|                              |                       |                         |       |
|------------------------------|-----------------------|-------------------------|-------|
|                              | ADC_CONVENTOR         | ADC_CONVENTOR           | AI    |
| <b>AUDIO- PCM/I2S</b>        |                       |                         |       |
|                              | PCM_DIN               | PCM_DIN                 | DI    |
|                              | I2S_DATA0             | I2S_DATA0               | DI/DO |
|                              | PCM_DOUT              | PCM_DOUT                | DO    |
|                              | I2S_DATA1             | I2S_DATA1               | DI/DO |
|                              | PCM_CLK               | PCM_CLK                 | DO    |
|                              | I2S_SCK               | I2S_SCK                 | DO    |
|                              | PCM_SYNC              | PCM_SYNC                | DO    |
|                              | I2S_WS                | I2S_WS                  | DO    |
| <b>RFU- RFU</b>              |                       |                         |       |
|                              | RFU                   | Reserved For Future Use | -     |
| <b>Debug- JTAG</b>           |                       |                         |       |
|                              | JTAG_SRST_N           | JTAG reset for debug    | DI    |
|                              | JTAG_TCK              | JTAG clock input        | DI    |
|                              | JTAG_TDI              | JTAG data input         | DI    |
|                              | JTAG_TDO              | JTAG data output        | DO    |
|                              | JTAG_TMS              | JTAG mode select input  | DI    |
|                              | JTAG_TRST_N           | JTAG reset              | DO    |
|                              | PS_HOLD               | PS_HOLD                 | DI    |
| <b>Debug- Force_USB_BOOT</b> |                       |                         |       |
|                              | Force_USB_BOOT_CONFIG | Force USB BOOT CONFIG   | DI    |

Table 5. Pin Assignments

| Pin No. | Modem mode | Host Mode | Voltage Level (V) |      |      |
|---------|------------|-----------|-------------------|------|------|
|         |            |           | Min.              | Typ. | Max. |
| 1       | GND        | GND       | -                 | 0    | -    |
| 2       | GND        | GND       | -                 | 0    | -    |
| 3       | NC         | NC        | -                 | -    | -    |
| 4       | GND        | GND       | -                 | 0    | -    |
| 5       | GND        | GND       | -                 | 0    | -    |
| 6       | GND        | GND       | -                 | 0    | -    |
| 7       | GND        | GND       | -                 | 0    | -    |
| 8       | GND        | GND       | -                 | 0    | -    |
| 9       | RF_GNSS    | RF_GNSS   | -                 | -    | -    |
| 10      | GND        | GND       | -                 | 0    | -    |

|    |                 |                 |     |     |     |
|----|-----------------|-----------------|-----|-----|-----|
| 11 | GND             | GND             | -   | 0   | -   |
| 12 | GND             | GND             | -   | 0   | -   |
| 13 | GND             | GND             | -   | 0   | -   |
| 14 | GND             | GND             | -   | 0   | -   |
| 15 | RF_1            | RF_1            | -   | -   | -   |
| 16 | GND             | GND             | -   | 0   | -   |
| 17 | GND             | GND             | -   | 0   | -   |
| 18 | GND             | GND             | -   | 0   | -   |
| 19 | GND             | GND             | -   | 0   | -   |
| 20 | GND             | GND             | -   | 0   | -   |
| 21 | RF_2            | RF_2            | -   | -   | -   |
| 22 | GND             | GND             | -   | 0   | -   |
| 23 | GND             | GND             | -   | 0   | -   |
| 24 | GND             | GND             | -   | 0   | -   |
| 25 | GND             | GND             | -   | 0   | -   |
| 26 | GND             | GND             | -   | 0   | -   |
| 27 | NC              | NC              | -   | -   | -   |
| 28 | GND             | GND             | -   | 0   | -   |
| 29 | GND             | GND             | -   | 0   | -   |
| 30 | GND             | GND             | -   | 0   | -   |
| 31 | GND             | GND             | -   | 0   | -   |
| 32 | GND             | GND             | -   | 0   | -   |
| 33 | NC              | NC              | -   | -   | -   |
| 34 | GND             | GND             | -   | 0   | -   |
| 35 | GND             | GND             | -   | 0   | -   |
| 36 | GND             | GND             | -   | 0   | -   |
| 37 | VCC1            | VCC1            | 3.3 | 3.8 | 4.2 |
| 38 | VCC2            | VCC2            | 3.3 | 3.8 | 4.2 |
| 39 | VCC3            | VCC3            | 3.3 | 3.8 | 4.2 |
| 40 | VCC4            | VCC4            | 3.3 | 3.8 | 4.2 |
| 41 | VCC5            | VCC5            | 3.3 | 3.8 | 4.2 |
| 42 | VCC6            | VCC6            | 3.3 | 3.8 | 4.2 |
| 43 | NC              | NC              | -   | -   | -   |
| 44 | GND             | GND             | -   | 0   | -   |
| 45 | GND             | GND             | -   | 0   | -   |
| 46 | PCM_SYNC/GPIO46 | PCM_SYNC/GPIO46 | 1.7 | 1.8 | 1.9 |

|    |                                   |                                   |     |     |     |
|----|-----------------------------------|-----------------------------------|-----|-----|-----|
| 47 | PCM_DIN/GPIO47                    | PCM_DIN/GPIO47                    | 1.7 | 1.8 | 1.9 |
| 48 | PCM_DOUT/GPIO48                   | PCM_DOUT/GPIO48                   | 1.7 | 1.8 | 1.9 |
| 49 | PCM_CLK/GPIO49                    | PCM_CLK/GPIO49                    | 1.7 | 1.8 | 1.9 |
| 50 | GND                               | GND                               | -   | 0   | -   |
| 51 | GND                               | GND                               | -   | 0   | -   |
| 52 | GPIO01/Force USB<br>BOOT Config*4 | GPIO01/Force USB<br>BOOT Config*4 | 1.7 | 1.8 | 1.9 |
| 53 | GPIO02                            | GPIO02                            | 1.7 | 1.8 | 1.9 |
| 54 | GPIO03                            | GPIO03                            | 1.7 | 1.8 | 1.9 |
| 55 | GPIO04                            | GPIO04                            | 1.7 | 1.8 | 1.9 |
| 56 | NC                                | SGMII_TX_P*1                      | -   | -   | -   |
| 57 | NC                                | SGMII_TX_M*1                      | -   | -   | -   |
| 58 | NC                                | SGMII_RX_P*1                      | -   | -   | -   |
| 59 | NC                                | SGMII_RX_M*1                      | -   | -   | -   |
| 60 | I2C_SDA                           | I2C_SDA/<br>2nd_SPI_EN_1          | 1.7 | 1.8 | 1.9 |
| 61 | I2C_SCL                           | I2C_SCL/<br>2nd_SPI_CLK           | 1.7 | 1.8 | 1.9 |
| 62 | NC                                | 2nd_SPI_MOSI                      | 1.7 | 1.8 | 1.9 |
| 63 | NC                                | 2nd_SPI_MISO                      | 1.7 | 1.8 | 1.9 |
| 74 | GND                               | GND                               | -   | 0   | -   |
| 75 | GND                               | GND                               | -   | 0   | -   |
| 76 | RFFE1_DATA                        | RFFE1_DATA                        | -   | -   | -   |
| 77 | RFFE1_CLK                         | RFFE1_CLK                         | -   | -   | -   |
| 78 | NC                                | NC                                | -   | -   | -   |
| 79 | NC                                | NC                                | -   | -   | -   |
| 80 | UART1_CTS (UART 1)                | UART1_CTS (UART 1)                | 1.7 | 1.8 | 1.9 |
| 81 | UART1_RTS (UART 1)                | UART1_RTS (UART 1)                | 1.7 | 1.8 | 1.9 |
| 82 | UART1_RX (UART 1)                 | UART1_RX (UART 1)                 | 1.7 | 1.8 | 1.9 |
| 83 | UART1_TX (UART 1)                 | UART1_TX (UART 1)                 | 1.7 | 1.8 | 1.9 |
| 84 | GND                               | GND                               | -   | 0   | -   |
| 85 | GND                               | GND                               | -   | 0   | -   |
| 86 | USB_Dp*2                          | USB_Dp*2                          | -   | -   | -   |
| 87 | USB Detect*3                      | USB Detect*3                      | 1.7 | 1.8 | 1.9 |
| 88 | USB_Dn*2                          | USB_Dn*2                          | -   | -   | -   |
| 89 | GND                               | GND                               | -   | 0   | -   |

|            |                   |                               |     |     |     |
|------------|-------------------|-------------------------------|-----|-----|-----|
| <b>90</b>  | GND               | GND                           | -   | 0   | -   |
| <b>91</b>  | GND               | GND                           | -   | 0   | -   |
| <b>92</b>  | NC                | GPIO92                        | 1.7 | 1.8 | 1.9 |
| <b>93</b>  | GPIO93            | GPIO93                        | 1.7 | 1.8 | 1.9 |
| <b>94</b>  | GPIO94            | GPIO94                        | 1.7 | 1.8 | 1.9 |
| <b>95</b>  | GPIO95            | GPIO95                        | 1.7 | 1.8 | 1.9 |
| <b>96</b>  | GPIO96            | GPIO96                        | 1.7 | 1.8 | 1.9 |
| <b>97</b>  | GPIO97            | GPIO97                        | 1.7 | 1.8 | 1.9 |
| <b>98</b>  | NC                | GPIO98                        | 1.7 | 1.8 | 1.9 |
| <b>99</b>  | NC                | NC                            | -   | -   | -   |
| <b>100</b> | NC                | NC                            | -   | -   | -   |
| <b>101</b> | NC                | GPIO101                       | 1.7 | 1.8 | 1.9 |
| <b>102</b> | NC                | GPIO102                       | 1.7 | 1.8 | 1.9 |
| <b>103</b> | NC                | EPHY_RST_N                    | 1.7 | 1.8 | 1.9 |
| <b>104</b> | GND               | GND                           | -   | 0   | -   |
| <b>105</b> | GND               | GND                           | -   | 0   | -   |
| <b>106</b> | UART2_RX (UART 2) | UART2_RX (UART 2)             | 1.7 | 1.8 | 1.9 |
| <b>107</b> | UART2_TX (UART 2) | UART2_TX (UART 2)             | 1.7 | 1.8 | 1.9 |
| <b>108</b> | GND               | GND                           | -   | 0   | -   |
| <b>109</b> | GND               | GND                           | -   | 0   | -   |
| <b>120</b> | NC                | SGMII_MDC* <sup>1</sup>       | -   | -   | -   |
| <b>121</b> | NC                | SGMII_MDIO* <sup>1</sup>      | -   | -   | -   |
| <b>122</b> | AD Converter      | AD Converter                  | 0.1 | -   | 1.7 |
| <b>123</b> | NC                | SDC1_CMD                      | 1.7 | 1.8 | 1.9 |
| <b>124</b> | NC                | SDC1_CLK                      | 1.7 | 1.8 | 1.9 |
| <b>125</b> | 1st_SPI_MOSI      | SDC1_DATA_3/<br>1st_SPIM_MOSI | 1.7 | 1.8 | 1.9 |
| <b>126</b> | 1st_SPI_MISO      | SDC1_DATA_2/<br>1st_SPIM_MISO | 1.7 | 1.8 | 1.9 |
| <b>127</b> | 1st_SPI_EN_1      | SDC1_DATA_1/<br>1st_SPIM_EN_1 | 1.7 | 1.8 | 1.9 |
| <b>128</b> | 1st_SPI_CLK       | SDC1_DATA_0/<br>1st_SPIM_CLK  | 1.7 | 1.8 | 1.9 |
| <b>129</b> | GPIO05            | GPIO05                        | 1.7 | 1.8 | 1.9 |
| <b>130</b> | GPIO06            | GPIO06                        | 1.7 | 1.8 | 1.9 |
| <b>131</b> | GPIO07            | GPIO07                        | 1.7 | 1.8 | 1.9 |



|     |                          |                          |         |         |         |
|-----|--------------------------|--------------------------|---------|---------|---------|
| 132 | GPIO08                   | EPHY_INT_N/GPIO08        | 1.7     | 1.8     | 1.9     |
| 133 | UIM_VCC                  | UIM_VCC                  | 1.7/2.7 | 1.8/3.0 | 1.9/3.3 |
| 134 | UIM_DATA                 | UIM_DATA                 | 1.7/2.7 | 1.8/3.0 | 1.9/3.3 |
| 135 | UIM_CLK                  | UIM_CLK                  | 1.7/2.7 | 1.8/3.0 | 1.9/3.3 |
| 136 | UIM_RESET                | UIM_RESET                | 1.7/2.7 | 1.8/3.0 | 1.9/3.3 |
| 137 | UIM_DETECT               | UIM_DETECT               | 1.7     | 1.8     | 1.9     |
| 138 | NC                       | NC                       | -       | -       | -       |
| 139 | GND                      | GND                      | -       | 0       | -       |
| 140 | GND                      | GND                      | -       | 0       | -       |
| 141 | WWAN_STATE               | WWAN_STATE               | 1.7     | 1.8     | 1.9     |
| 142 | POWER_ON                 | POWER_ON                 | 1.7     | 1.8     | 1.9     |
| 143 | WAKEUP_OUT* <sup>5</sup> | WAKEUP_OUT* <sup>5</sup> | 1.7     | 1.8     | 1.9     |
| 144 | WAKEUP_IN                | WAKEUP_IN                | 1.7     | 1.8     | 1.9     |
| 145 | RESET                    | RESET                    | 1.7     | 1.8     | 1.9     |
| 146 | VREF                     | VREF                     | 1.7     | 1.8     | 1.9     |
| 200 | JTAG_SRST_N              | JTAG_SRST_N              | 1.7     | 1.8     | 1.9     |
| 201 | JTAG TCK                 | JTAG TCK                 | 1.7     | 1.8     | 1.9     |
| 202 | JTAG TDI                 | JTAG TDI                 | 1.7     | 1.8     | 1.9     |
| 203 | JTAG TDO                 | JTAG TDO                 | 1.7     | 1.8     | 1.9     |
| 204 | JTAG_TMS                 | JTAG_TMS                 | 1.7     | 1.8     | 1.9     |
| 205 | JTAG TRST_N              | JTAG TRST_N              | 1.7     | 1.8     | 1.9     |
| 206 | PS_HOLD                  | PS_HOLD                  | 1.7     | 1.8     | 1.9     |
| 207 | NC                       | NC                       | -       | -       | -       |

## Notes:

- \*1. Refer to SGMII standard for more electronic characteristics.
- \*2. Refer to section 2.3, for more information please check USB2.0 standard
- \*3. Pull pin87 USB detect to VREF with a 100k resistor to enable module USB, pull pin87 low to disable module USB, CPU USB PHY consumes some current when USB is enabled.
- \*4. Do not pull pin52 to high before the system boot process is complete.
- \*5. Do not pull pin143 WAKEUP\_OUT to high; otherwise boot will fail.
- \*6. Leave unused pins floating
- \*7. Reserve test points on pin52/86/88/106/107 for debug purpose if possible.

\*8. If voltage level of digital I/O from the other side is not compatible with module, level shifter is recommended to transfer the voltage level to 1.8V.

Table 6. Digital I/O characteristics

| Parameter         |  | Comments                      | Min                       | Max                       | Unit |
|-------------------|--|-------------------------------|---------------------------|---------------------------|------|
| V <sub>IH</sub>   | High-level input voltage               | CMOS/Schmitt                  | 0.65 * V <sub>DD_Px</sub> | –                         | V    |
| V <sub>IL</sub>   | Low-level input voltage                | CMOS/Schmitt                  | –                         | 0.35 * V <sub>DD_Px</sub> | V    |
| V <sub>OH</sub>   | High-level output voltage              | CMOS, at rated drive strength | V <sub>DD_Px</sub> - 0.45 |                           | V    |
| V <sub>OL</sub>   | Low-level output voltage               | CMOS, at rated drive strength | –                         | 0.45                      | V    |
| R <sub>P</sub>    | Pull resistance                        | Pullup and pulldown           | 55                        | 390                       | kΩ   |
| R <sub>K</sub>    | Keeper resistance                      |                               | 30                        | 150                       | kΩ   |
| I <sub>IH</sub>   | Input high leakage current             | No pulldown                   | –                         | 1                         | μA   |
| I <sub>IL</sub>   | Input low leakage current <sup>4</sup> | No pullup                     | -1                        | –                         | μA   |
| V <sub>SHYS</sub> | Schmitt hysteresis voltage             |                               | 100                       | –                         | mV   |
| C <sub>I/O</sub>  | I/O capacitance                        |                               | –                         | 5                         | pF   |

Below is the I/O default setting table to describe the level. It's recommended to follow the pulling High or Low to choose a suitable GPIO for application.

PU: Pull Up.

PD: Pull Down

NP: Non-Pull

Table 7. I/O default setting table

| Pin No. | Signal Name             | Type   | Default setting in Normal mode |
|---------|-------------------------|--------|--------------------------------|
| 46      | PCM_SYNC/GPIO46         | DI /DO | PD                             |
| 47      | PCM_IN/GPIO47           | DI /DO | PD                             |
| 48      | PCM_OUT/GPIO48          | DI /DO | PD                             |
| 49      | PCM_CLK/GPIO49          | DI /DO | PD                             |
| 52      | GPIO01                  | DI/DO  | PD                             |
| 53      | GPIO02                  | DI/DO  | PD                             |
| 54      | GPIO03                  | DI/DO  | PD                             |
| 55      | GPIO04                  | DI/DO  | PD                             |
| 60      | I2C_SCL/<br>2nd_SPI_CLK | DI/DO  | PD                             |
| 61      | I2C_SDA/                | DI/DO  | PD                             |

| 2nd_SPI_EN_1 |                   |       |    |
|--------------|-------------------|-------|----|
| <b>62</b>    | 2nd_SPI_MOSI      | DI/DO | PD |
| <b>63</b>    | 2nd_SPI_MISO      | DI/DO | PD |
| <b>80</b>    | UART1_CTS (UART1) | DI/DO | PD |
| <b>81</b>    | UART1_RTS (UART1) | DI/DO | PD |
| <b>82</b>    | UART1_RX (UART1)  | DI/DO | PD |
| <b>83</b>    | UART1_TX (UART1)  | DI/DO | PD |
| <b>92</b>    | GPIO92            | DI/DO | PD |
| <b>93</b>    | GPIO93            | DO    | NP |
| <b>94</b>    | GPIO94            | DI/DO | PD |
| <b>95</b>    | GPIO95            | DI/DO | PD |
| <b>96</b>    | GPIO96            | DI/DO | PD |
| <b>97</b>    | GPIO97            | DI/DO | PD |
| <b>98</b>    | GPIO98            | DI/DO | PU |
| <b>101</b>   | GPIO101           | DI/DO | PD |
| <b>102</b>   | GPIO102           | DI/DO | PD |
| <b>103</b>   | GPIO103           | DI/DO | PD |
| <b>106</b>   | UART2_RX (UART2)  | DI/DO | PD |
| <b>107</b>   | UART2_TX (UART2)  | DI/DO | PD |
| <b>120</b>   | GPIO120           | DI/DO | PD |
| <b>123</b>   | GPIO123           | DI/DO | PD |
| <b>124</b>   | GPIO124           | DI/DO | NP |
| <b>125</b>   | SPIM_MOSI         | DI/DO | PD |
| <b>126</b>   | SPIM_MISO         | DI/DO | PD |
| <b>127</b>   | SPIM_EN           | DI/DO | PD |
| <b>128</b>   | SPIM_CLK          | DI/DO | PD |
| <b>129</b>   | GPIO05            | DI/DO | PD |
| <b>130</b>   | GPIO06            | DI/DO | PD |
| <b>131</b>   | GPIO07            | DI/DO | PU |
| <b>132</b>   | GPIO08            | DI/DO | PD |
| <b>141</b>   | WWAN_STATE        | DI/DO | PD |
| <b>143</b>   | WAKEUP_OUT        | DI/DO | PD |

## 3. Electrical Specifications

### 3.1. Power supply

LTE module power input is VCC. The internal power chipset will transfer VCC to other power level.

Table 8. Power supply voltage level

| Power | Pin Name     | Pads          | Description       | Voltage Level (V) |      |      |
|-------|--------------|---------------|-------------------|-------------------|------|------|
|       |              |               |                   | Min.              | Typ. | Max. |
| VCC   | VCC1 to VCC6 | Nos. 37 to 42 | Main Power Supply | 3.3               | 3.8  | 4.2  |

The M18QM includes an integrated power manager enabling single and direct voltage supply from the battery, reducing the overall bill of materials. The typical voltage 3.8V is recommended.

### 3.2. RF Specification

#### 3.2.1. Band support

Table 9. Band support

| Band        | Uplink (MHz) | Downlink (MHz) |
|-------------|--------------|----------------|
| LTE Band 2  | 1,850–1,910  | 1,930–1,990    |
| LTE Band 4  | 1,710–1,755  | 2,110–2,155    |
| LTE Band 5  | 824–849      | 869–894        |
| LTE Band 12 | 699–716      | 729–746        |
| LTE Band 66 | 1710 – 1780  | 2110 – 2200    |
| LTE Band 71 | 663 – 698    | 617-652        |

**3.2.2. Bandwidth support**

Table 10. Bandwidth support

| Band        | Bandwidth |       |       |        |        |        |
|-------------|-----------|-------|-------|--------|--------|--------|
|             | 1.4 MHz   | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| LTE Band 2  | ✓         | ✓     | ✓     | ✓      | ✓      | ✓      |
| LTE Band 4  | ✓         | ✓     | ✓     | ✓      | ✓      | ✓      |
| LTE Band 5  | ✓         | ✓     | ✓     | ✓      | -      | -      |
| LTE Band 12 | ✓         | ✓     | ✓     | ✓      | -      | -      |
| LTE Band 66 | ✓         | ✓     | ✓     | ✓      | ✓      | ✓      |
| LTE Band 71 | -         | -     | ✓     | ✓      | ✓      | ✓      |

**3.2.3. RF Transmit Specification**

Table 11. Conductive Tx output power

| Band        | Items         | Parameter          | Unit | Min. | Typ. | Max. |
|-------------|---------------|--------------------|------|------|------|------|
| LTE Band 2  | Max. TX Power | 10 MHz 12 RBs/QPSK | dBm  | 20.3 | 23   | 25.7 |
| LTE Band 4  | Max. TX Power | 10 MHz 12 RBs/QPSK | dBm  | 20.3 | 23   | 25.7 |
| LTE Band 5  | Max. TX Power | 10 MHz 12 RBs/QPSK | dBm  | 20.3 | 23   | 25.7 |
| LTE Band 12 | Max. TX Power | 10 MHz 12 RBs/QPSK | dBm  | 20.3 | 23   | 25.7 |
| LTE Band 66 | Max. TX Power | 10 MHz 12 RBs/QPSK | dBm  | 20.3 | 23   | 25.7 |
| LTE Band 71 | Max. TX Power | 10 MHz 12 RBs/QPSK | dBm  | 20.3 | 23   | 25.7 |

Note: 1.The RF Transmit Specification is defined at the LGA pad.

2. M18QM meets 3GPP TS 36.521-1test standard.

**3.2.4. RF Receiver Specification**

Table 12. Conductive Rx sensitivity-3GPP

| Band       | Items          | Parameter          | Unit | Typ. | 3GPP standard limit |
|------------|----------------|--------------------|------|------|---------------------|
| LTE Band 2 | RX Sensitivity | 10 MHz with 50 RBs | dBm  |      | -94.3               |
| LTE Band 4 | RX Sensitivity | 10 MHz with 50 RBs | dBm  |      | -96.3               |

|                    |                |                    |     |       |
|--------------------|----------------|--------------------|-----|-------|
| <b>LTE Band 5</b>  | RX Sensitivity | 10 MHz with 50 RBs | dBm | -94.3 |
| <b>LTE Band 12</b> | RX Sensitivity | 10 MHz with 50 RBs | dBm | -93.3 |
| <b>LTE Band 66</b> | RX Sensitivity | 10 MHz with 50 RBs | dBm | -95.8 |
| <b>LTE Band 71</b> | RX Sensitivity | 10 MHz with 50 RBs | dBm | -93.5 |

Note: 1. The RF Receiver Specification is defined at the LGA pad.  
2. Meet 3GPP TS 36.521-1 test standard.

### 3.2.5. GNSS receiver specifications

Two GNSS SAW filter, LNA need to be used between the module and antenna.

## 4. Software Interface

### 4.1. Support tools

The M18QM module is compatible with the following support tools:

- WNC M18QM Series Connection Manager (WNCCM)

### 4.2. USB interface

The M18QM module supports 3GPP standard AT commands and proprietary AT commands; the MAL Manager SDK is also supported for Linux platforms.

## 5. Mechanical and Environmental Certifications

### 5.1. PCBA Form Factor

M18QM module dimension as below:  
 31.32 mm (typ.) × 23.5 mm (typ.) × 2.35 mm (typ.)

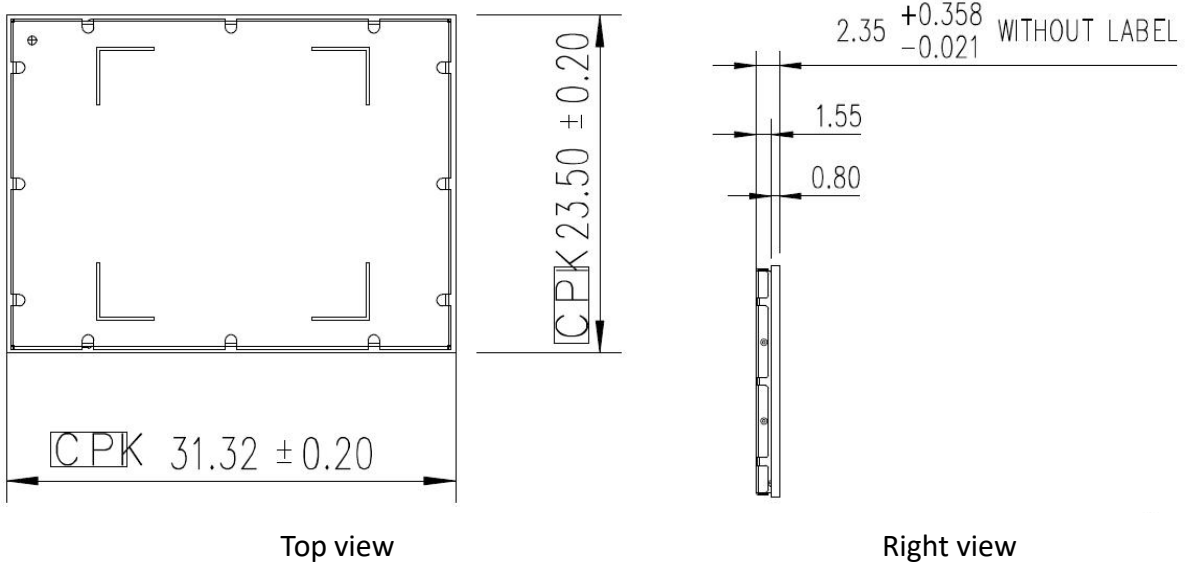


Figure 2. PCBA dimension

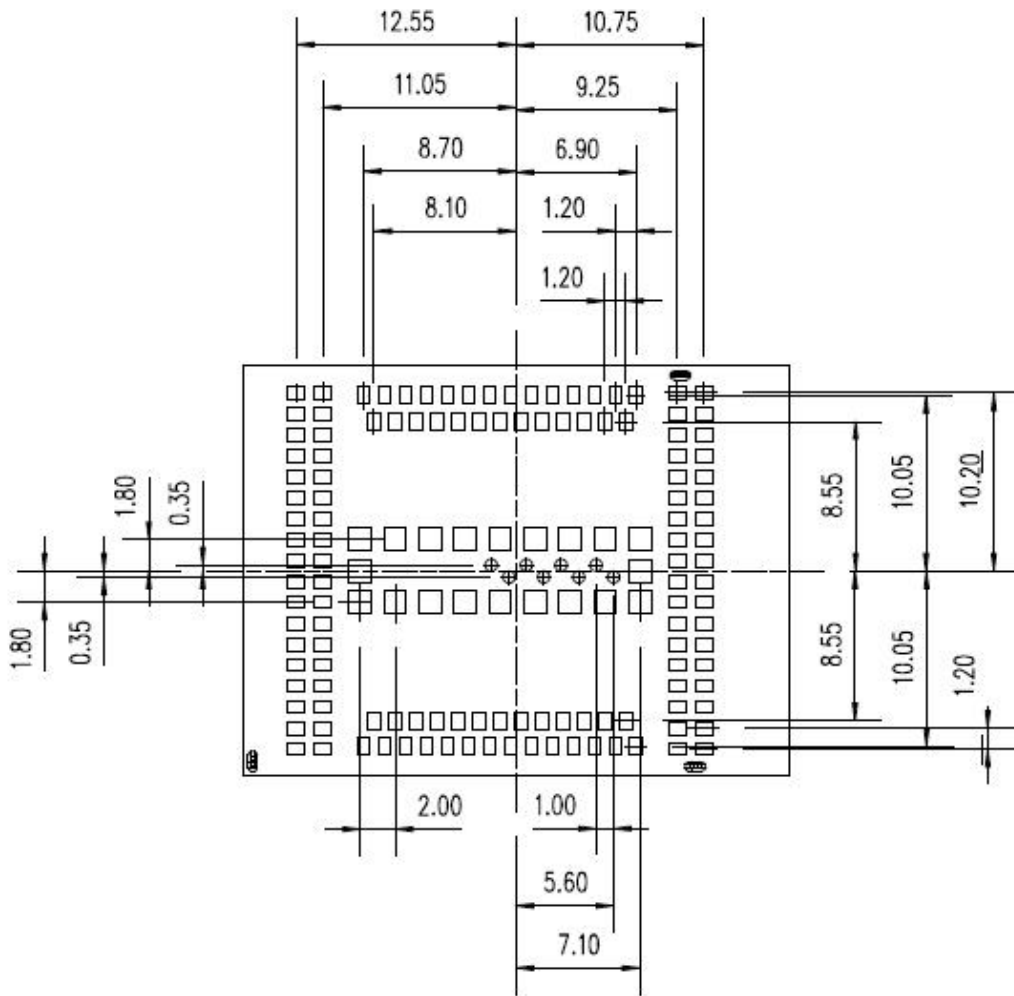


Figure 3. Pad dimension(Bottom view)



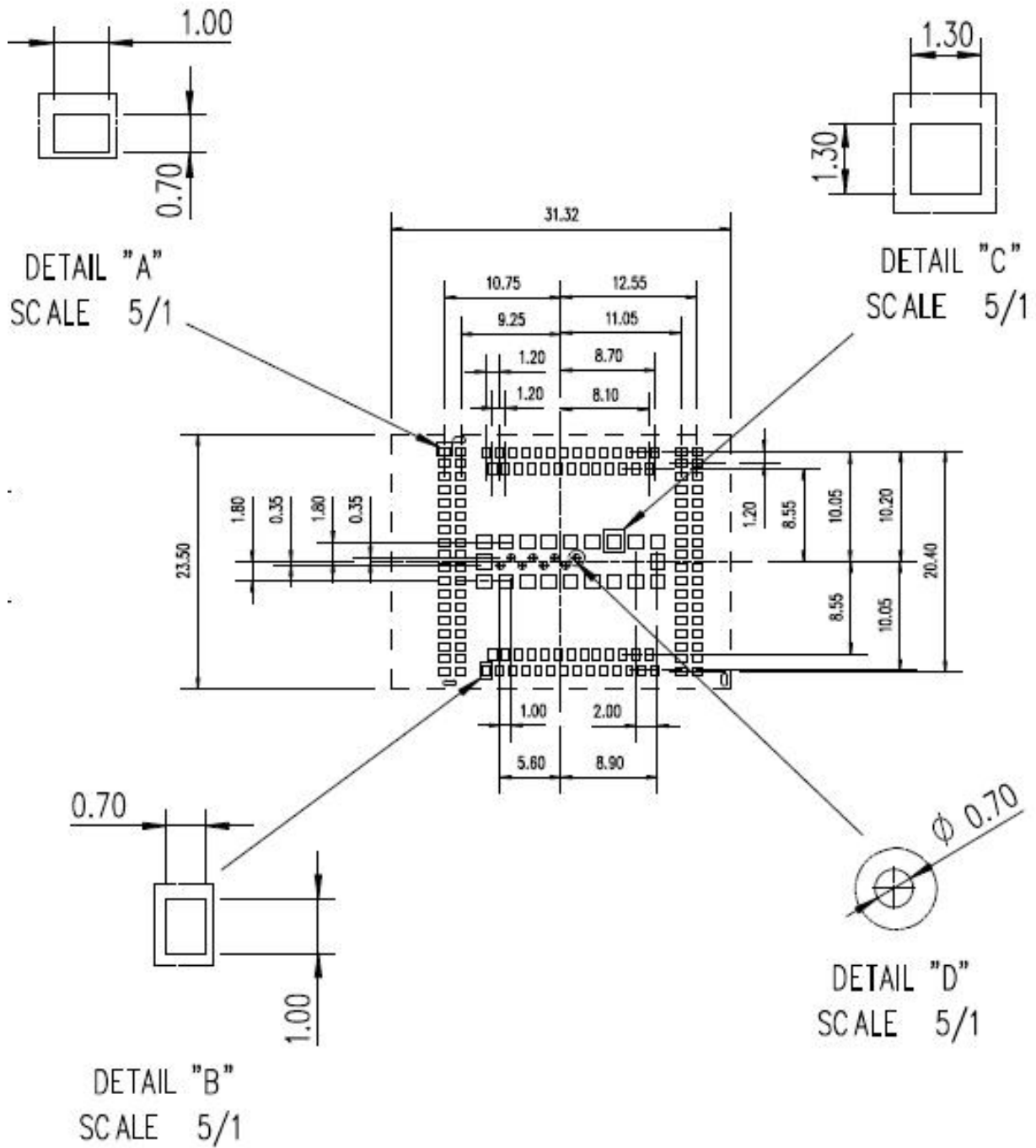


Figure 4. PCB footprint suggestion

## 6. Design Guide

### 6.1. Power supply

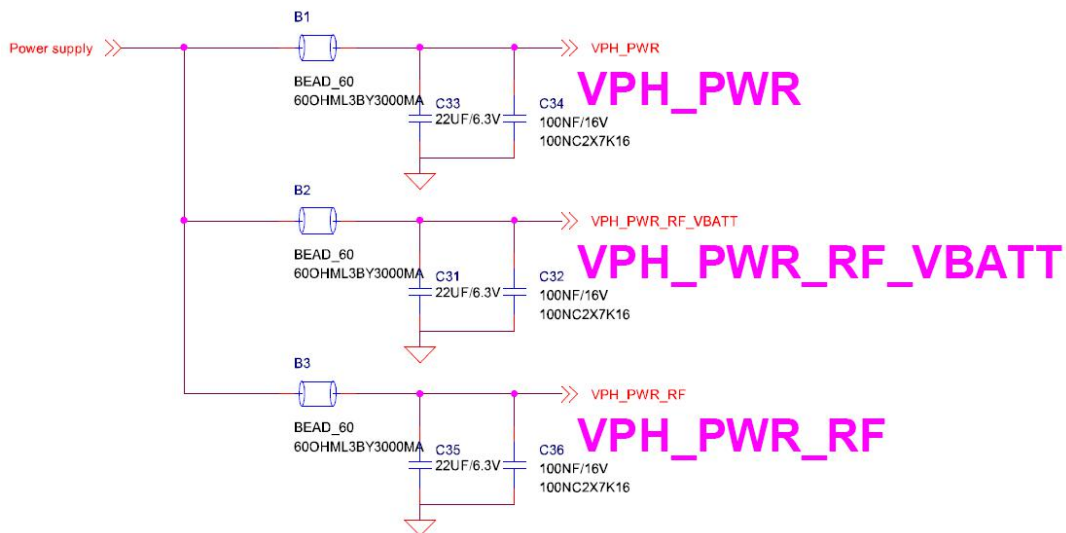
LTE module power input is VCC. The internal power chipset will transfer VCC to other power level.

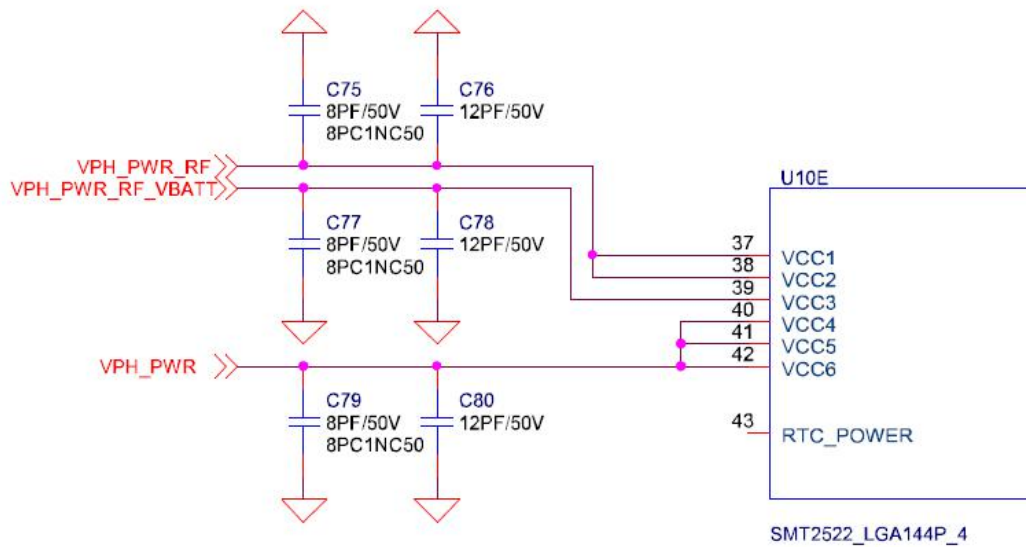
Table 13. Power supply voltage level

| Power | Pin Name     | Pads          | Description       | Voltage Level (V) |      |      |
|-------|--------------|---------------|-------------------|-------------------|------|------|
|       |              |               |                   | Min.              | Typ. | Max. |
| VCC   | VCC1 to VCC6 | Nos. 37 to 42 | Main Power Supply | 3.3               | 3.8  | 4.2  |

The M18QM Series include an integrated power manager enabling single and direct voltage supply from the battery, reducing the overall bill of materials. The typical voltage 3.8V is recommended.

**Schematic suggestion:** Must to separate module power supply to three paths to keep power clean as below for TX spurious performance. The VPH\_PWR is for Baseband and RF transceiver, the VPH\_PWR\_RF\_VBATT is for RF PA, the VPH\_PWR\_RF\_VBATT is for RF PA control circuit.





**Layout Suggestion:** The 22μF, 0.1uF, 12pF and 8pF capacitors are required to place near VCC pins as close as possible. Each power trace should possess sufficient line width to withstand its respective current listed in the table below:

| Net Name       | Current Value |
|----------------|---------------|
| VCC(1–2) total | 2A            |
| VCC(3) total   | 100mA         |
| VCC(4–6) total | 1A            |
| UIM_VCC        | 150 mA        |
| VREF           | 300 mA        |

## 6.2. RF connections

The M18QM module has three RF pads; developers must connect them via 50 Ω traces to the main board.

ANT0\_TRX pad (Pin15) – Primary RX/TX path

ANT1\_DRX pad (Pin21) – Diversity path

ANT\_GNSS pad (Pin9) – GNSS path

It is recommended that grounds not be present under the surface of the RF pads in the layout. Details are included below. Layer2 has the same keep out size as Layer1

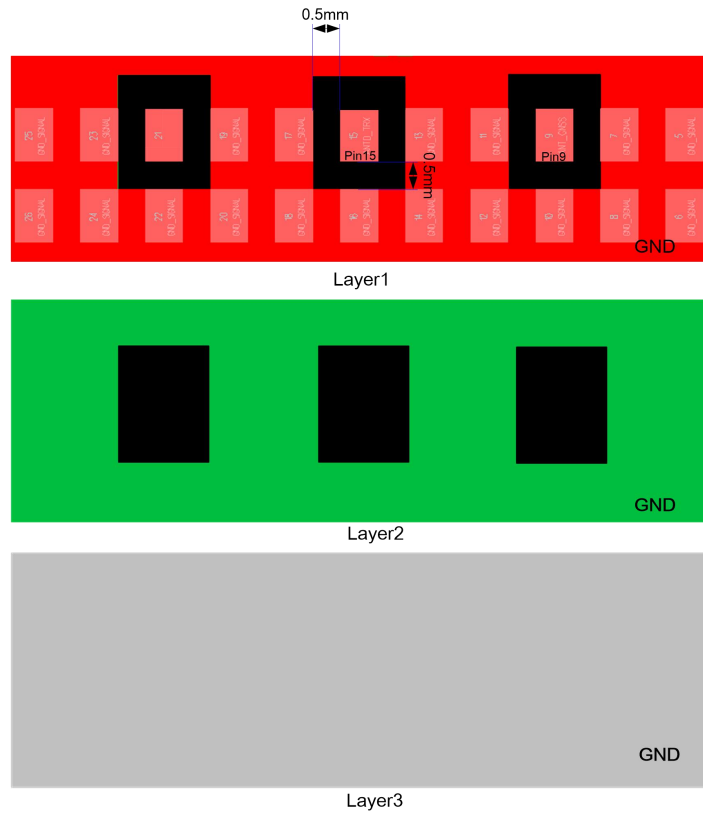
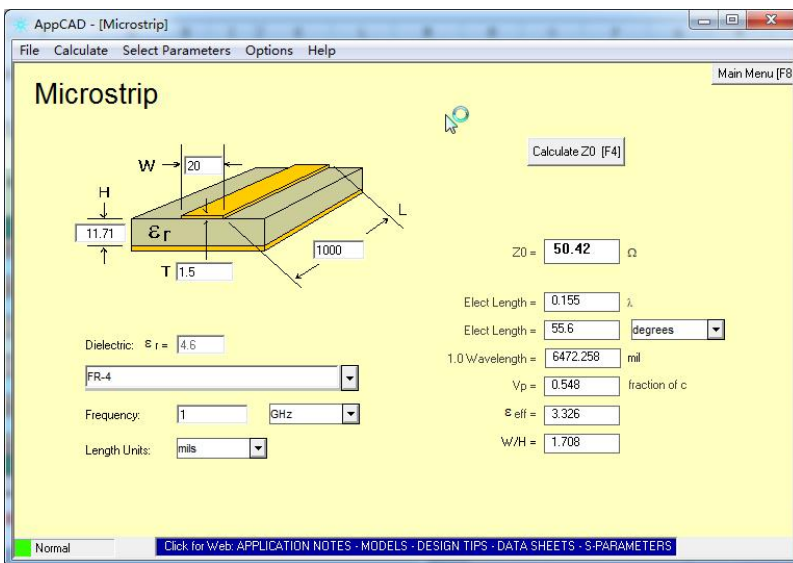


Figure 5. RF pad layout suggestion

The characteristic impedance depends on the dielectric of PCB, the track width and the ground plane spacing. Microstrip type is required. The detail simulation as below.



The RF trace of the test board which was used in the FCC test is defined as below.



### 6.3. Interference and sensitivity

This section includes tips to assist developers in identifying the interference that may affect M18QM module when used in systems.

- Interference from other wireless devices
  - Harmonics, inter-modulated signal generated from wireless devices that fall in RX ranges of the modules, may result in degraded RX performance.
  - It is highly recommended to check RX performance of entire systems within the shielding environment.
- Interference from host interface
  - High-speed signal-switching elements in systems can easily couple noise into the module (Ex.: DDR memory, LCD modules, DC-DC converter, PCM signal).
- Methods to avoid sources of interference
  - Antenna location is important; we recommend directing the antenna away from high-speed switching signals. Furthermore, the trace from the module to the antenna should be as short as possible and must be shielded by complete grounding.
  - The M18QM modules are well shielded; the high-speed elements (Ex.: DDR memory, LCD modules, DC-DC converter, PCM signal) on a system should have shielding reserved during the early stages of development.
- trace impedance for connection external shall be 50 ohms.
- trace should be kept as short as possible and avoid possible nearby unwanted signal pick up and transmitted by the antenna.
- System integrator should verify if unwanted radiated signal still complies with the relevant rule(s) requirements.

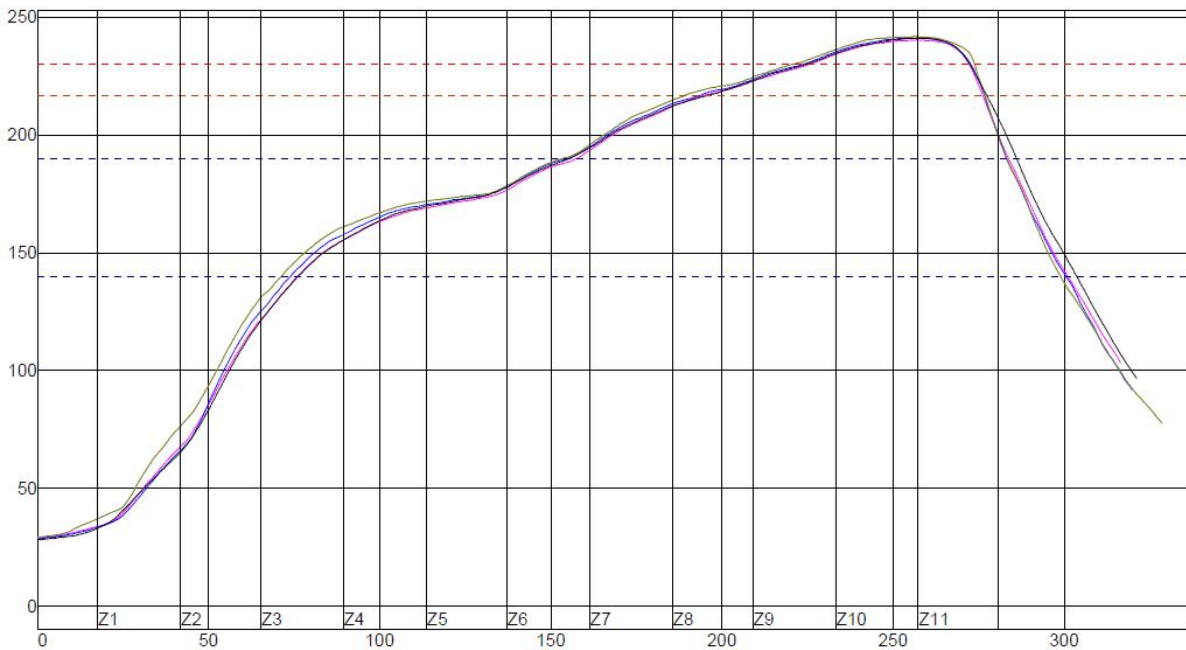


**Caution:** DDR bus, LCD bus, DC-DC switching and PCM signals are easily to influence the WWAN and GNSS receiver performance, these signals must to be routed in the inner layer of the PCB and far away from the WWAN and GNSS receiver path.

## 6.4. Reflow

This section details the recommended reflow profile when the module is mounted onto other boards.

| Temp. Region        | 1            | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
|---------------------|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Upper temp. region  | 160          | 170 | 180 | 180 | 180 | 205 | 225 | 230 | 240 | 250 | 245 |
| Lower temp. region  | 160          | 170 | 180 | 180 | 180 | 205 | 225 | 230 | 240 | 250 | 245 |
| Conveyer band speed | 90 cm/minute |     |     |     |     |     |     |     |     |     |     |



| PWI = 48%              | U10-1 | T1-2  | J3-3  | U42-4 | Temp. Difference |
|------------------------|-------|-------|-------|-------|------------------|
| Preheat from 140–190°C |       |       |       |       |                  |
|                        | 81.48 | 81.13 | 81.94 | 79.07 | 2.87             |

|                              |        |        |        |        |      |
|------------------------------|--------|--------|--------|--------|------|
|                              | -34%   | -36%   | -32%   | -48%   |      |
| <b>Melt-out Time/230°C</b>   |        |        |        |        |      |
|                              | 46.91  | 49.26  | 53.50  | 48.18  | 6.59 |
|                              | -31%   | -7%    | 35%    | -18%   |      |
| <b>Max Temp</b>              |        |        |        |        |      |
|                              | 240.40 | 241.34 | 241.84 | 241.32 | 1.44 |
|                              | 4%     | 13%    | 18%    | 13%    |      |
| <b>Total Time/217°C</b>      |        |        |        |        |      |
|                              | 81.18  | 82.95  | 87.61  | 81.24  | 6.43 |
|                              | -15%   | -8%    | 10%    | -15%   |      |
| <b>Gradient1 (100–150°C)</b> |        |        |        |        |      |
|                              | 1.88   | 1.91   | 1.87   | 1.86   | 0.05 |
|                              | 25%    | 28%    | 25%    | 24%    |      |

Process limit:

| <b>Solder Paste</b>  | <b>Lead-free</b> |             |             |
|--|------------------|-------------|-------------|
| <b>Profile feature</b>   | <b>Min.</b>      | <b>Max.</b> | <b>Unit</b> |
| <b>Gradient1 (Target = 1.5) (100 °C–150 °C)<br/>(Time period = 20 s)</b> | 0                | 3           | °C/S        |
| <b>Preheat time from 140 °C to 190 °C</b>                                | 70               | 105         | S           |
| <b>Time maintained above 230 °C</b>                                      | 40               | 60          | S           |
| <b>Peak package body temperature</b>                                     | 230              | 250         | °C          |
| <b>Time maintained above 217 °C</b>                                      | 60               | 110         | S           |

## 7. Labeling

Figure26 shows label drawing of M18QM module.





Figure 6. Label drawing

## 8. Safety Recommendation

### 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, 24, 27.

### 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

Not applicable.

### 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 antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

| For GPS & Glonass |             |                     |                        |              |                |
|-------------------|-------------|---------------------|------------------------|--------------|----------------|
| Antenna No.       | Band        | Frequency Range     | Antenna Net Gain (dBi) | Antenna Type | Connector Type |
| 1                 | GPS&Glonass | 1574MHz~1606MHz     | 2.24                   | Dipole       | SMA            |
| For LTE           |             |                     |                        |              |                |
| Antenna No.       | Band        | Frequency Range     | Antenna Net Gain (dBi) | Antenna Type | Connector Type |
| 2                 | LTE Band 2  | 1850 MHz – 1910 MHz | 1.56                   | Dipole       | SMA            |
|                   | LTE Band 4  | 1710 MHz – 1755 MHz | 1.62                   | Dipole       | SMA            |
|                   | LTE Band 5  | 824 MHz – 849 MHz   | 3.2                    | Dipole       | SMA            |
|                   | LTE Band 12 | 699 MHz – 716 MHz   | 1.49                   | Dipole       | SMA            |
|                   | LTE Band 66 | 1710 MHz – 1780 MHz | 1.62                   | Dipole       | SMA            |
|                   | LTE Band 71 | 663 MHz – 698 MHz   | 1.37                   | Dipole       | SMA            |

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: “Contains FCC ID: **NKRM18QM**”. 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.

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.

**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

#### **Industry Canada statement:**

This device complies with ISED's licence-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

#### **Radiation Exposure Statement:**

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

#### **Déclaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed and operated with greater than 20cm between the antenna and users, and

2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as **2** 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.

**Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

1) L'antenne doit être installé et exploité avec plus de 20 cm entre l'antenne et les utilisateurs, et

2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les **2** conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

**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 Canada authorization is no longer considered valid and the IC 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 Canada authorization.

**NOTE IMPORTANTE:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed and operated with greater than 20cm between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 4441A-M18QM".

**Plaque signalétique du produit final**

Ce module émetteur est autorisé uniquement pour une utilisation dans un appareil où l'antenne peut être installée et utilisée à plus de 20 cm entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 4441A-M18QM".

**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.

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.

**Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

This radio transmitter [IC: 4441A-M18QM] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain



greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio [IC: 4441A-M18QM] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

| Manufacturer | Model        | Antenna Type | Max Gain (dBi) | Impedance ( $\Omega$ ) | Remark  |
|--------------|--------------|--------------|----------------|------------------------|---------|
| Master Wave  | 98619ZSAX026 | Dipole       | 2.24           | 50                     | GPS     |
| Wieson       | GY115        |              | 1.56           | 50                     | Band 2  |
|              |              |              | 1.62           | 50                     | Band 4  |
|              |              |              | 3.2            | 50                     | Band 5  |
|              |              |              | 1.49           | 50                     | Band 12 |
|              |              |              | 1.62           | 50                     | Band 66 |
|              |              |              | 1.37           | 50                     | Band71  |