SIM8202G_M2 Antenna Port Mapping and Deign Guide

NR Module

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Date	Version	Description of change	Author
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2020-12-29	1.01	1. Modify section 4.1 2. Modify section 4.3	Zhong Yibo

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1 Introduction

This document describes the SIM8202G_M2 5G module antenna port mapping and Antenna design guide to customer to refer.

2 Definitions, symbols and abbreviations

Table 1: Abbreviations and description

Abbreviations	Description
LB	Low Frequency Band[1]
MHB	Middle and High Frequency Band[2]
UHB	Ultra High Frequency Band[3]
LAA	Limited Access Authorization[4]
TRX	Transmit and Receive signal
DRX	The Diversity Receive signal
UL-MIMO	Uplink- Multiple Input Multiple Output
DL-MIMO	Downlink- Multiple Input Multiple Output
GNSS	Global Navigation Satellite System

※ NOTE

[1] Frequency is from 600MHz to 960MHz, such as LTE B5/B8/B12/B20/B28 and so on;
[2] Frequency is from 1710MHz to 2690MHz, such as LTE B1/B2/B3/B7/B25/ B38/B40/B41 and so on;
[3] Frequency is from 3300MHz to 4200MHz, such as LTE B42 B43 B48;
[4] Frequency is from 5150MHz to 5925MHz, such as LTE B46;

3 Antenna Interfaces

Figure1: Antenna interfaces

4 Antenna Port Mapping and Design Guide

Antenna port mapping

SIM8202G_M2 is designed with 4 antennas, module and antenna connector is shown in figure1. the Bands and the Antenna port mapping is shown in table1.

4.1.1 Full function with 4 antennas

In this design, it can reach the maximum performance of SIM8202G_M2——4*4 DL-MIMO——that data rate of NR SA mode is 2Gbps (DL) and 500Mbps(UL), data rate of NR NSA mode is 2.4Gbps(DL) and 700Mbps(UL), data rate of TDD/FDD LTE is 1Gbps (DL) and 200Mbps (UL).

Table 2: Frequency bands and antenna ports mapping

支持功能和频段 \ 天线端口			ANT0	ANT1	ANT2	ANT3
3G/4G/5G 4G 5G 5G	LB/MHB UHB n41 n77/n78/n79	TRX DIV UL/DL-MIMO1 DIV	✓			
3G/4G/5G 4G 4G 5G	MHB UHB LAA n41/n77/n78/n79	DL-MIMO1 DL-MIMO2 DIV DL-MIMO2		✓		
3G/4G/5G 4G 4G 5G 5G GNSS	MHB UHB LAA n41 n77/n78/n79	DL-MIMO2 DL-MIMO1 PRX DIV DL-MIMO1			✓	
3G/4G/5G	LB/MHB	DIV				✓

4G	UHB	TRX				
5G	n41/n77/n78/n79	TRX				

※ NOTE

1. 4G LB only support 2*2 DL-MIMO.
2. n41 can support 2*2 UL-MIMO.

4.1.2 Antenna Reduction with 2 Antennas

In this design, it can support the base function of SIM8202G_M2, but with performance and function reduction:

1. no GNSS.
2. 5G n77/n78/n79: reduce two paths of DL, data rate becomes 1Gbps (DL), 500Mbps (UL).
3. 5G n41: reduce two paths of DL, data rate becomes 1Gbps (DL), 1Gbps (UL).
4. 4G MHB: reduce two paths of DL, data rate becomes 500Mbps (DL), 200Mbps (UL).

Table 3: Frequency bands and antenna ports mapping with 2 antennas

BANDS FUNCTIONS / ANTENNAS			ANT0	ANT1	ANT2	ANT3
3G/4G/5G	LB/MHB	TRX				
4G	UHB	DIV	✓			
5G	n41	DL-MIMO1				
5G	n77/n78/n79	DIV				
3G/4G/5G	MHB	DL-MIMO1				
4G	UHB	DL-MIMO2		✓		
4G	LAA	DIV				
5G	n41/n77/n78/n79	DL-MIMO2				
3G/4G/5G	MHB	DL-MIMO2				
4G	UHB	DL-MIMO1				
4G	LAA	PRX			✓	
5G	n41	DIV				
5G	n77/n78/n79	DL-MIMO1				
GNSS						
3G/4G/5G	LB/MHB	DIV				
4G	UHB	TRX				✓
5G	n41/n77/n78/n79	TRX				

※ NOTE

In the red show the mandatory bands for CM/CU/CT, which needs ANT0 /ANT3, so in the light black show the bands that can be reduced with base function.

Reference Design

The space isolation of each antenna should be larger than 15dB. The isolation between LTE and 5GNR an tennas is at least 20dB for the ENDC or UL-MIMO combo which two antennas transmit simultaneously.

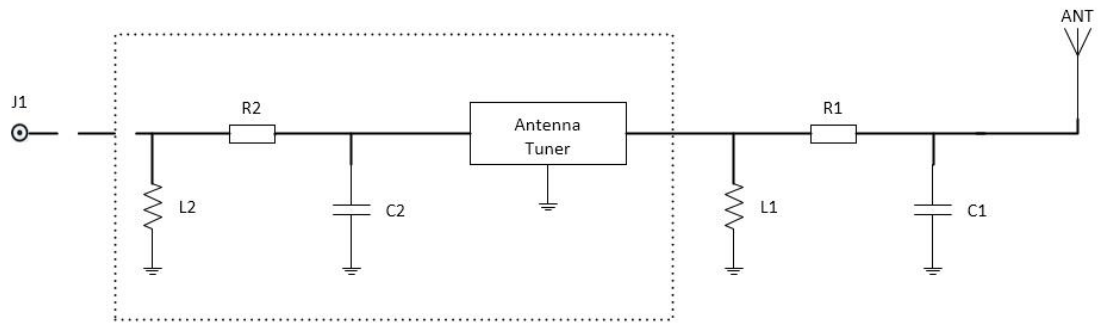

Figure2: Antenna refence design

J1 is the coaxial cable connection. For most of customers, above match-components (R1/R2,L1/L2,C1/C2 and Tuner) are not needed to meet the requirements. But for the high-level requirements or some bad antenna design conditions, it is recommended. What's more, antenna tuner design in the dotted line may be considered for some customers to enhance the low frequency band performance.

※ NOTE

Customer should submit request to SIMcom for tuner support if needed.

RF Plug Recommendation

When selecting antenna, customer should pay attention to the match between the antenna connector and the rf connector of the module. SIM8202G_M2 uses IPEX connectors, size is 2.0mm*2.0mm*0.6mm, model is 20449-001E-03. The size and specification are as below.

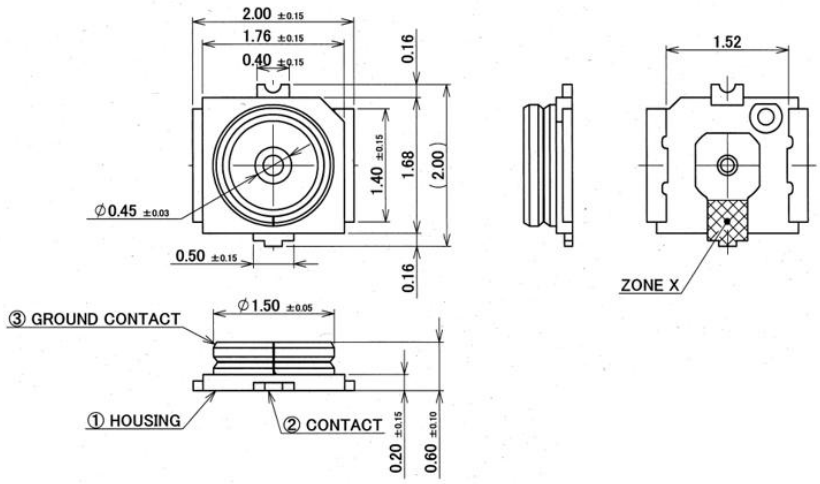

Figure3: 3D view of 20449-001E-03

The recommended coaxial model to match is Murata's MXHJD3HJ1000. The size and specification are as below.

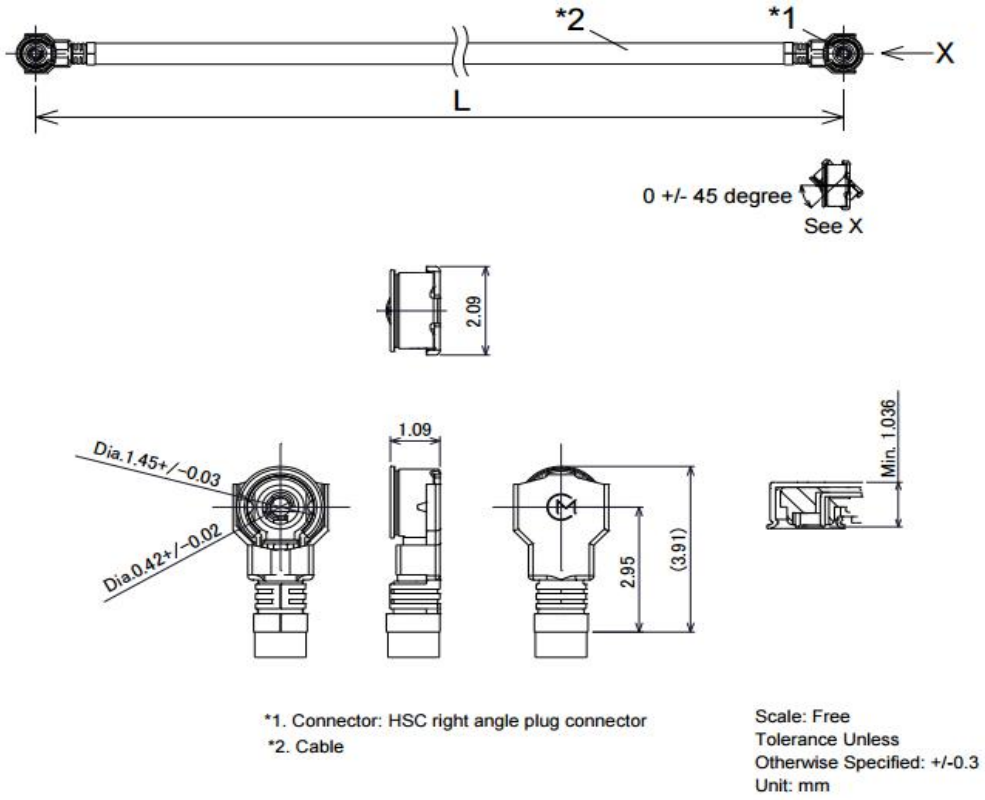

Figure4: D view of MXHJD3HJ1000

5 Requirements to Antenna

Table 4: Antenna requirements

Antenna Class	Antenna Requirements
GNSS	frequency：1166.22MHz~1228.62MHz/1559MHz~1609MHz Polarization：RHCP or Linear VSWR：<2 Passive antenna Gain: >0dBi Active antenna noise: <1.5dBi Active antenna gain: >0dBi Active antenna LNA gain: <17dB
WCDMA/LTE/NR_Sub6	VSWR：<2 Efficiency：>50% Input/output impedance：50Ω Cable Loss：<1dB