



5G Module Design Guide

Antenna Tuner

V1.2

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Applicable Model

No.	Applicable Model	Description
1	Qualcomm 5G platform products	NA
2	MTK-T300 platform products	NA

Change History

V1.2 (2024-12-02)	Added MTK-T300 platform products to Applicable Model.
V1.1 (2021-12-01)	Changed the version number to two digits. Updated Applicable Model to all Qualcomm 5G platform products.
V1.0.1 (2020-06-03)	Updated tuner models supported by MIPI interface.
V1.0.0 (2020-04-16)	Initial version.

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1 Introduction

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This document will introduce the guidance about antenna tuner design of FIBOCOM 5G module, which will help customers know FIBOCOM technical support and quickly import the antenna tuner.

2 Antenna Tuner Selection

The module does not have the antenna tuner switch built-in, and only provides interface for antenna tuner switch control. When designing the antenna tuner switch, customers need to refer to the definition of the interfaces of the tuner switch from the hardware guide of this module, and select the type of antenna tuner switch that can be supported by the module.

The following table lists two control interfaces for Qualcomm products: MIPI and GPIO.

Table 1. Qualcomm product control interfaces

Type	Pin Name	I/O	Reset Value	Pin Description	Type
MIPI	RFFE_SCLK	O	PD	MIPI interface clock signal, only for antenna tuner	CMOS 1.8V
	RFFE_SDATA	I/O	PD	MIPI interface clock signal, only for antenna tuner	CMOS 1.8V
GPIO	ANTCTL1	O	PD	Antenna matching and adjustment, Bit1	CMOS 1.8V
	ANTCTL2	O	PD	Antenna matching and adjustment, Bit2	CMOS 1.8V
	ANTCTL3	O	PD	Antenna matching and adjustment, Bit3	CMOS 1.8V

The following table lists two control interfaces for MTK-T300 products: MIPI and GPIO. One set of MIPI can also be used as two GPIOs.

Table 2. MTK-T300 product control interfaces

Type	Pin Name	I/O	Reset Value	Pin Description
MIPI	RFFE_CLK	O	PD	MIPI interface clock signal, only for antenna tuner
	RFFE_DATA	I/O	PD	MIPI interface clock signal, only for antenna tuner
GPIO	GRFC1	O	PD	GPIO interface clock signal, only for antenna tuner

2.1 Antenna Tuner Switch Selection for MIPI Interface

- Qualcomm platform: Before selecting a tuner switch for the MIPI interface, the customer shall confirm with tuner vendor about the specific model and whether the tuner can support clock frequency 38.4 MHz and then design a tuner diagram following the reference design of the selected tuner. Currently, the module only supports tuners from Qualcomm, like QAT5515.
- MTK-T300 platform: Before selecting a tuner switch for the MIPI interface, the customer shall confirm

with tuner vendor about the specific model and whether the tuner can support clock frequency 26 MHz and then design a tuner diagram following the reference design of the selected tuner.

2.2 Antenna Tuner Switch Selection for GPIO Interface

Before selecting a tuner switch for the GPIO interface, the customer shall confirm with tuner vendor about the specific model and whether the tuner can support the Qualcomm/MTK-T300 platform and then design a tuner diagram following the reference design of the selected tuner.

The following figure shows the tuner models of Infineon (Qualcomm platform).

Part Number	Type	V_{RFmax}^* (V)	R_{ON} (Ω)	C_{OFF} (fF)	Frequency (GHz)	Control	Size (mm ²)	Status
BGSA11GN10	2xSPST	36	1.0	250	0.1 – 6.0	2 GPIO	1.1 x 1.5	MP
BGSA12GN10	SPDT	36	1.6	120	0.1 – 6.0	2 GPIO	1.1 x 1.5	MP
BGSA12UGL8	SPDT	40	0.6	270	0.4 – 6.0	2 GPIO	1.1 x 1.1	MP
BGSA14GN10	SP4T	36	1.6	120	0.1 – 6.0	2 GPIO	1.1 x 1.5	MP
BGSA142GN12	SP4T	72	1.75	110	0.4 – 6.0	3 GPIO	1.5 x 1.5	MP

Figure 1. Reference tuner selection

3 Debug Support

The customer must provide the following information for Fibocom to provide technical support:

- Model and specifications of antenna tuner switch
- Schematic diagram
- Frequency band distribution of the antenna tuner switch port, used for configuring the RF driver. Please refer to the following table for the format.

FIBOCOM updates the RF driver according to the configuration provided by the customer for customer verification.

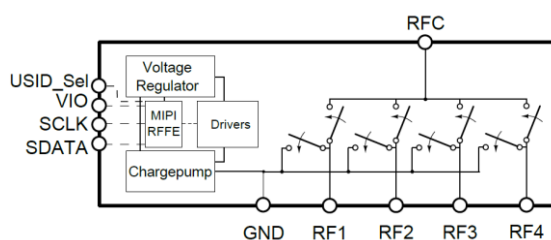


Figure 2. Tuner ports

Port	Band Distribution
RF1	B1/2/3
RF2	B5/8
RF3	B20/28
RF4	B41
GND	N77/78/79