FC20 Series&FC10 Compatible Design

Wi-Fi&BT Module Series

Rev. FC20_Series&FC10_Compatible_Design_V1.0

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About the Document

History

Revision	Date	Author	Description
1.0	2016-11-14	Power JIN	Initial

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1 Introduction

Quectel FC20 series module contains FC20 and FC20-N variants which are compatible with FC10.

This document briefly describes the compatible design between FC20 series and FC10 modules, which can help you easily migrate from FC10 to FC20/FC20-N in your design and manufacturing.

2 General Descriptions

2.1. Product Description

The following tables show the general information comparison between FC20 series and FC10 modules.

Table 1: Module Functions

Module	Wi-Fi	BT
FC20	2.4GHz and 5GHz	4.1 *
FC20-N	2.4GHz	Not Supported
FC10	2.4GHz	Not Supported

FC20 series and FC10 modules are designed as compatible products. Customers can choose a proper model according to specific application demands. With the help of the compatible design guideline, customers can migrate from FC10 to FC20 series modules smoothly during the product design and manufacturing.

NOTE

* means the function for FC20 module is still under development.

Table 2: Module General Information

Module Name	Picture	Packaging	Dimensions	Description
FC20		38 LCC pads + 14 LGA pads	16.6 × 13 × 2.1mm	Wi-Fi&BT module
FC20-N		38 LCC pads + 14 LGA pads	16.6 × 13 × 2.1mm	Wi-Fi module
FC10		24 LCC pads	16.6 × 13 × 2.1mm	Wi-Fi module

2.2. Features Overview

The following table is a comparison between the general features of FC20 series and FC10 modules.

Table 3: Features Overview

Feature	FC20	FC20-N	FC10
Power Supply	Main supply voltage: 3.3V I/O Interface supply voltage: 1.8V	Main supply voltage: 3.3V I/O Interface supply voltage: 1.8V	Main supply voltage: 3.3V I/O Interface supply voltage: 1.8V
WLAN Technology	802.11a/b/g/n/ac	802.11b/g/n	802.11b/g/n
BT Technology	BT 4.1 *	Not supported	Not supported
Best-in-class Coexistence	WLAN/BT coexistence LTE-BT coexistence LTE-WLAN coexistence	LTE-WLAN coexistence	LTE-WLAN coexistence
SDIO	SDIO 3.0	SDIO 3.0	SDIO 2.0

Antenna Interface	Wi-Fi&BT antenna, 50Ω	Wi-Fi antenna, 50Ω	Wi-Fi antenna, 50Ω
Dimensions	(16.6±0.15)×(13±0.15)×(2.1±0.2)mm	(16.6±0.15)×(13±0.15)×(2.1±0.2)mm	(16.6±0.15)×(13±0.15)×(2.1±0.2)mm
Weight	About 0.81g	About 0.81g	About 0.63g
Packaging	LCC+LGA	LCC+LGA	LCC
Operation Temperature Range [1)]	-35°C ~ +75°C	-35°C ~ +75°C	-35°C ~ +75°C
Extended Temperature Range [2)]	-40°C ~ +85°C	-40°C ~ +85°C	-40°C ~ +85°C

NOTES

1. [1)] Within operation temperature range, the module is IEEE compliant.
2. [2)] Within extended temperature range, the module remains the ability for data transmission. There is no unrecoverable malfunction. There are also no effects on radio spectrum and no harm to radio network. Only one or more parameters like P_{out} might reduce in their value and exceed the specified tolerances. When the temperature returns to the normal operating temperature levels, the module will meet IEEE compliant again.
3. * means the function for FC20 module is still under development.

2.3. Pin Assignment

The following is the pin assignment comparison between FC20 series and FC10 modules.

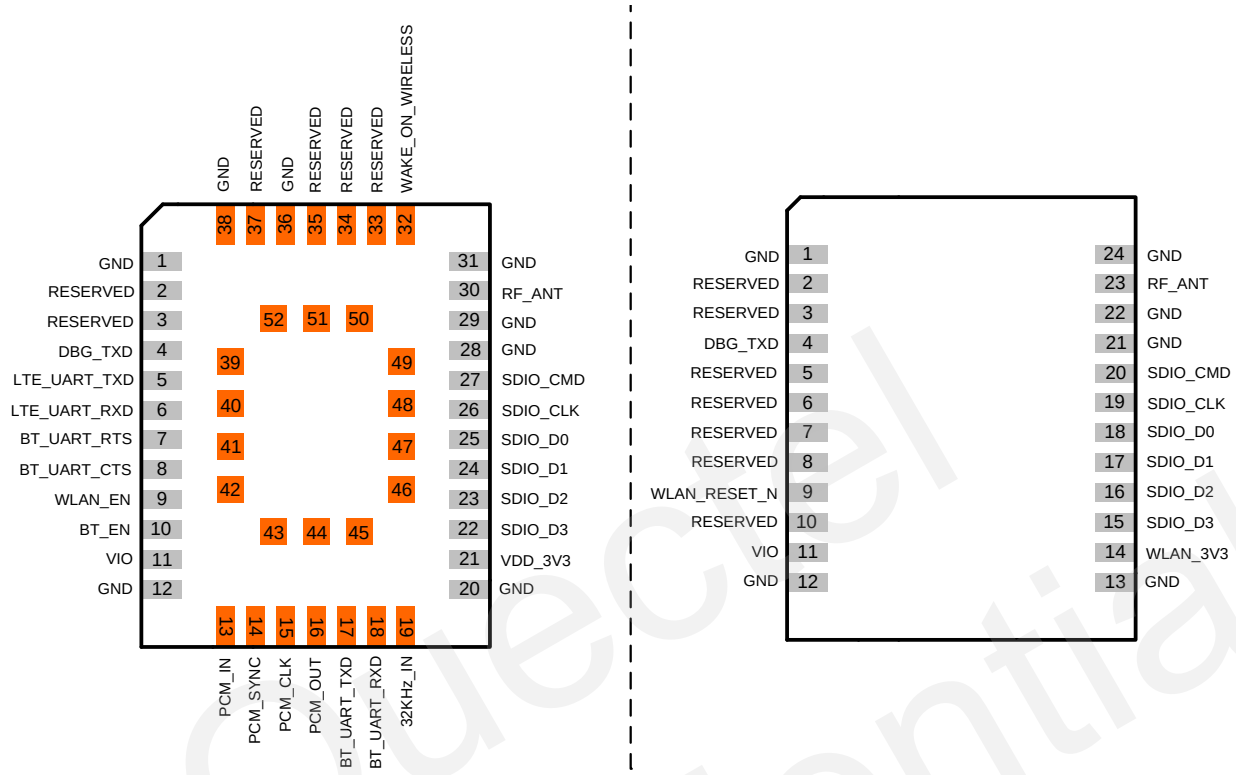

Figure 1: Pins Assignment Comparison between FC20 Series and FC10 Modules

NOTE

The orange pins are the additional pins of FC20 series as compared with FC10.

3 Pin Description

This chapter describes the pin definition of FC20 series and FC10 modules.

Table 4: I/O Parameters Definition

Symbol	Description
AI	Analog Input
DI	Digital Input
DO	Digital Output
IO	Bidirectional
OD	Open Drain
PI	Power Input

The following table shows the comparison of pins between FC20 series and FC10 modules.

Table 5: Pins Comparison between FC20 Series and FC10 Modules

FC20 Series				FC10			
Pin No.	Pin Name	I/O	Power Domain	Pin No.	Pin Name	I/O	Power Domain
1	GND	-	Ground	1	GND	-	Ground
2	RESEVERD	-	-	2	RESEVERD	-	-
3	RESERVED	-	-	3	RESERVED	-	-
4	DBG_TXD	DO	VIO	4	DBG_TXD	DO	VIO
5	LTE_UART_TXD [1)]	DO	VIO	5	RESEVERD	-	-
6	LTE_UART_RXD [1)]	DI	VIO	6	RESEVERD	-	-

7	BT_UART_RTS [1)]	DO	VIO	7	RESEVERD	-	-
8	BT_UART_CTS [1)]	DI	VIO	8	RESERVED	-	-
9	WLAN_EN	DI	VIO	9	WLAN_RESET_N	DI	VIO
10	BT_EN [1)]	DI	VIO	10	RESERVED	-	-
11	VIO	PI	1.8V	11	VIO	PI	1.8V
12	GND	-	Ground	12	GND	-	Ground
20	GND	-	Ground	13	GND	-	Ground
21	VDD_3V3	PI	3.3V	14	WLAN_3V3	PI	3.3V
22	SDIO_D3	IO	VIO	15	SDIO_D3	IO	VIO
23	SDIO_D2	IO	VIO	16	SDIO_D2	IO	VIO
24	SDIO_D1	IO	VIO	17	SDIO_D1	IO	VIO
25	SDIO_D0	IO	VIO	18	SDIO_D0	IO	VIO
26	SDIO_CLK	DI	VIO	19	SDIO_CLK	DI	VIO
27	SDIO_CMD	IO	VIO	20	SDIO_CMD	IO	VIO
28	GND	-	Ground	21	GND	-	Ground
29	GND	-	Ground	22	GND	-	Ground
30	RF_ANT	IO	-	23	RF_ANT	IO	-
31	GND	-	Ground	24	GND	-	Ground
13	PCM_IN [1)]	DI	VIO				
14	PCM_SYNC [1)]	DI	VIO				
15	PCM_CLK [1)]	DI	VIO				
16	PCM_OUT [1)]	DO	VIO				
17	BT_UART_TXD [1)]	DO	VIO				
18	BT_UART_RXD [1)]	DI	VIO				
19	32KHz_IN	DI	-				

32	WAKE_ON_WIRELESS	OD	VIO
33	RESERVED	-	-
34	RESERVED	-	-
35	RESERVED	-	-
36	GND	-	Ground
37	RESERVED	-	-
38	GND	-	Ground
41, 42, 46, 47	RESERVED	-	-
39, 40, 43~45, 48~52	GND	-	Ground

NOTES

1. [1)] Keep the pin open for FC20-N.
2. Keep all reserved and unused pins unconnected.
3. All GND pins should be connected to ground.
4. The orange pins are the additional pins of FC20 series as compared with FC10.

4 Hardware Reference Design

4.1. Power Supply

The main power supply of FC20 series and FC10 modules ranges from 3.14V to 3.46V, and the typical value is 3.3V. The I/O interface supply voltage ranges from 1.71V to 1.89V, and the typical value is 1.8V.

The I/O interfaces of FC20 series and FC10 modules can be powered by EC20 R2.0/EC21/EC25 and EC20 modules, respectively. Attention should be paid to the range of main power source to make sure the input voltage will never drop below 3.14V or exceed 3.46V.

The following figure shows a reference design for a 5V input power source. The designed output for the power supply is 3.3V and the maximum load current is 1A. C3 is a bypass capacitor of about 100μF with low ESR. R2 and C5 form a delay circuit which is used to ensure the voltage stability of VDD3V3. PM_ENABLE should be connected to EC20 R2.0/EC21/EC25 for FC20 series, and EC20 for FC10.

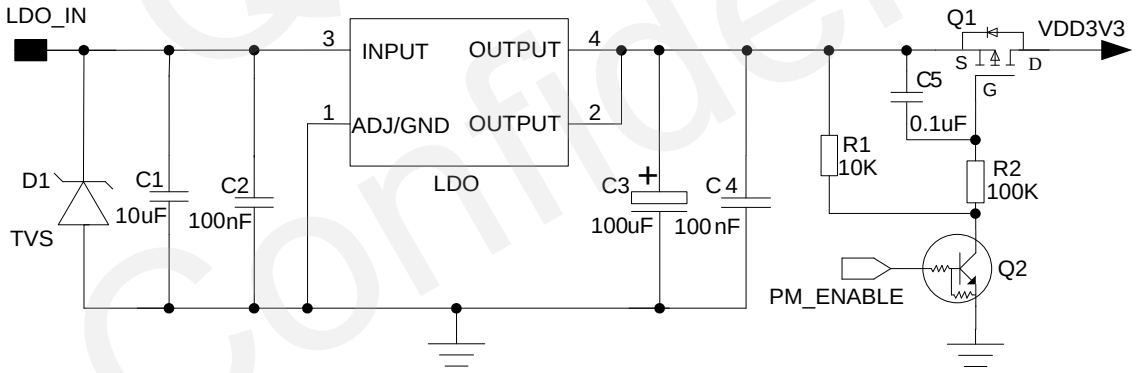

Figure 2: Reference Circuit of VDD3V3

4.2. WLAN Application

FC20 series and FC10 modules support SDIO interface for WLAN. FC10 is typically used together with EC20, while FC20 series is usually used together with EC20 R2.0, EC21 and EC25.

The following figure shows the SDIO interface connection of FC10.

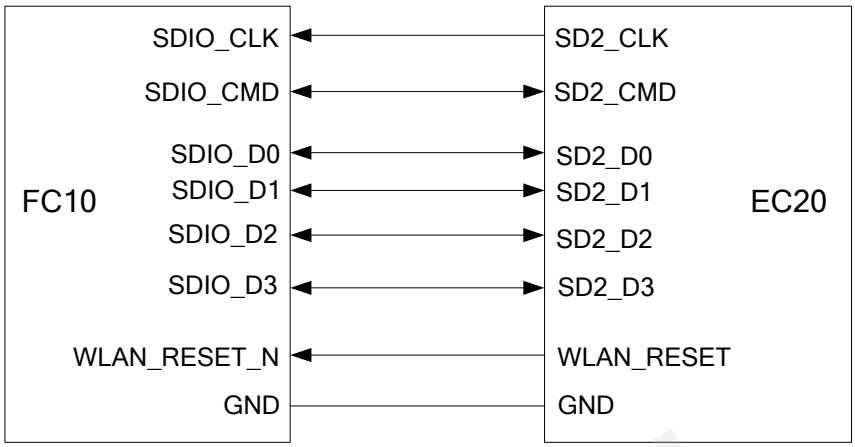

Figure 3: SDIO Interface Connection of FC10

The following figure shows the SDIO interface connection of FC20 series.

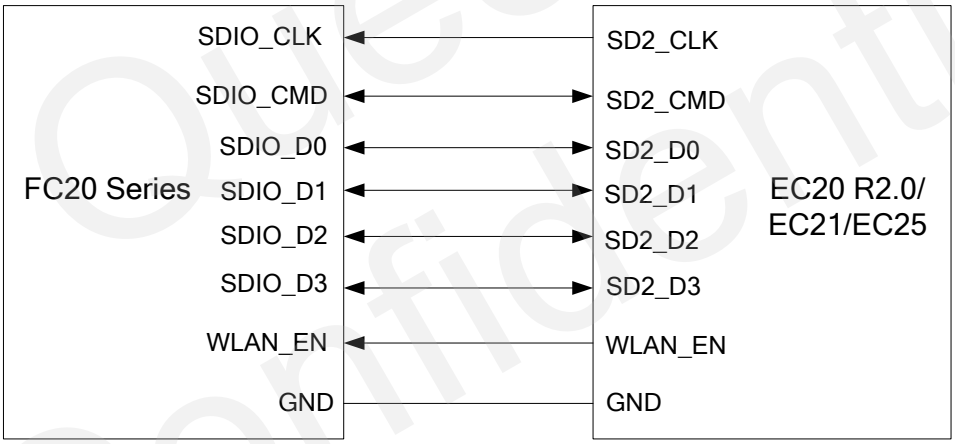

Figure 4: SDIO Interface Connection of FC20 Series

In order to ensure the performance of SDIO, please comply with the following principles:

- SDIO signals are very high-speed signals. Please prevent crosstalk between them and other sensitive signals.
- Keep SDIO traces as parallel as possible in the same layer. Make sure SDIO lines are guarded by ground vias and not crossed.
- Do not route SDIO signal traces under crystals, oscillators, magnetic devices or RF signal traces.
- The pull-up resistor on SDIO_D2 line must be mounted.
- Keep SDIO traces as short as possible with equal length, and keep the impedance as 50Ω.
- The spacing to all other signals is greater than 2 times of the line width.

4.3. BT Application *

BT function, which is used for audio application, is only supported by FC20 module. Please keep these pins open on FC20-N.

The following figure shows the BT interface connection with EC20 R2.0, EC21 and EC25.

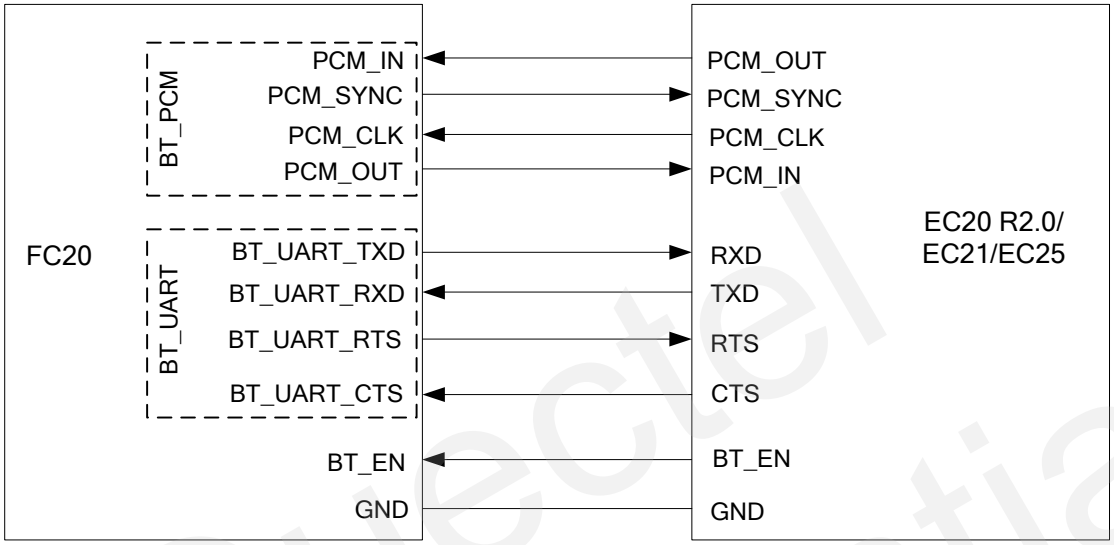

Figure 5: Reference Circuit of BT Application of FC20

NOTE

* means the function for FC20 module is still under development.

4.4. Antenna Interface

FC20 series and FC10 modules have the same antenna interface. For better RF performance, a π-type matching circuit is recommended to be reserved. The following figure shows a reference circuit design.

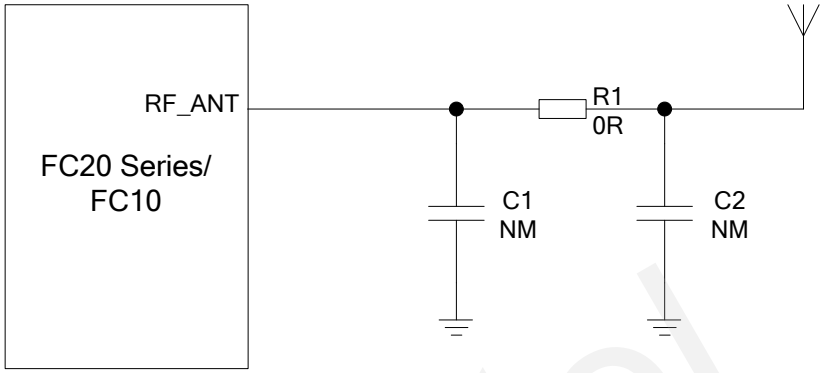

Figure 6: Reference Circuit Design of Antenna Interface

5 Recommended Footprint

The following figure is a recommended footprint which is compatible with both FC20 series and FC10 modules.

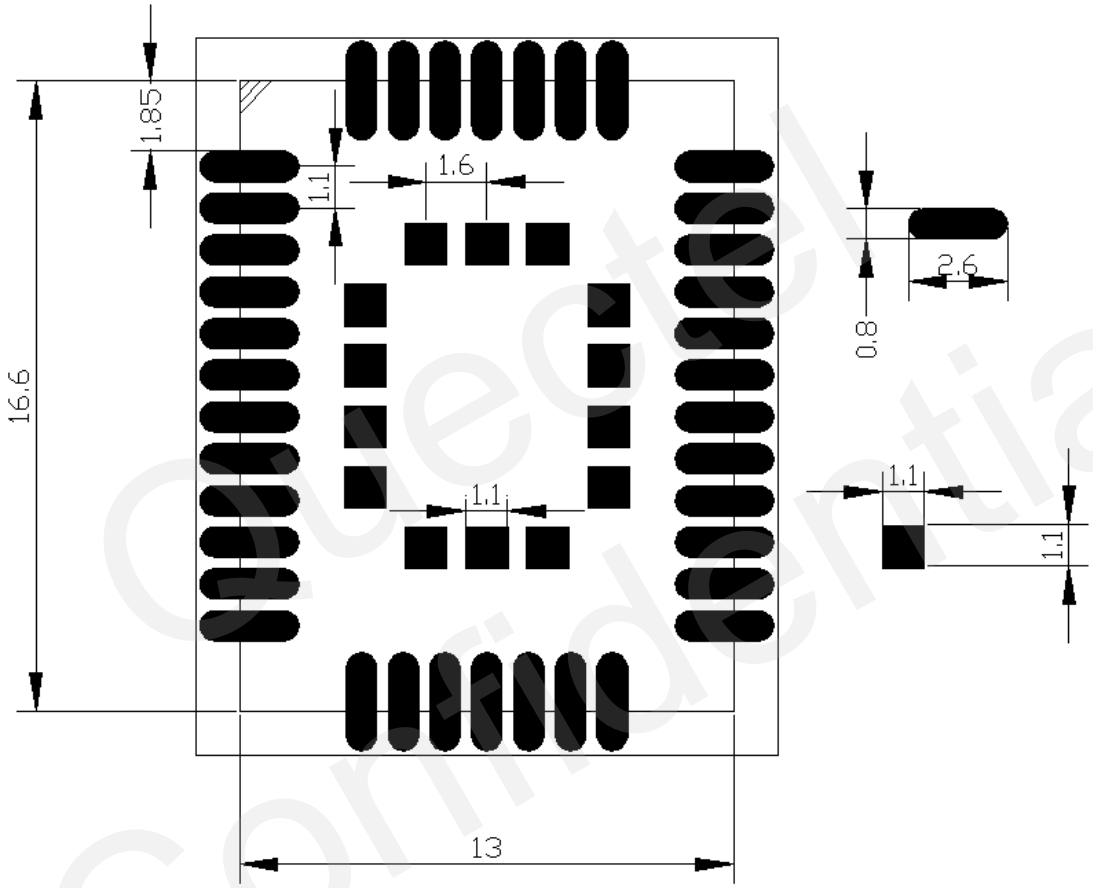

Figure 7: Recommended Footprint for FC20 Series and FC10 (Unit: mm)

The recommended stencil design for FC20 series and FC10 is shown as below. To ensure module soldering quality, the stencil thickness for these modules is recommended to be 0.18mm.

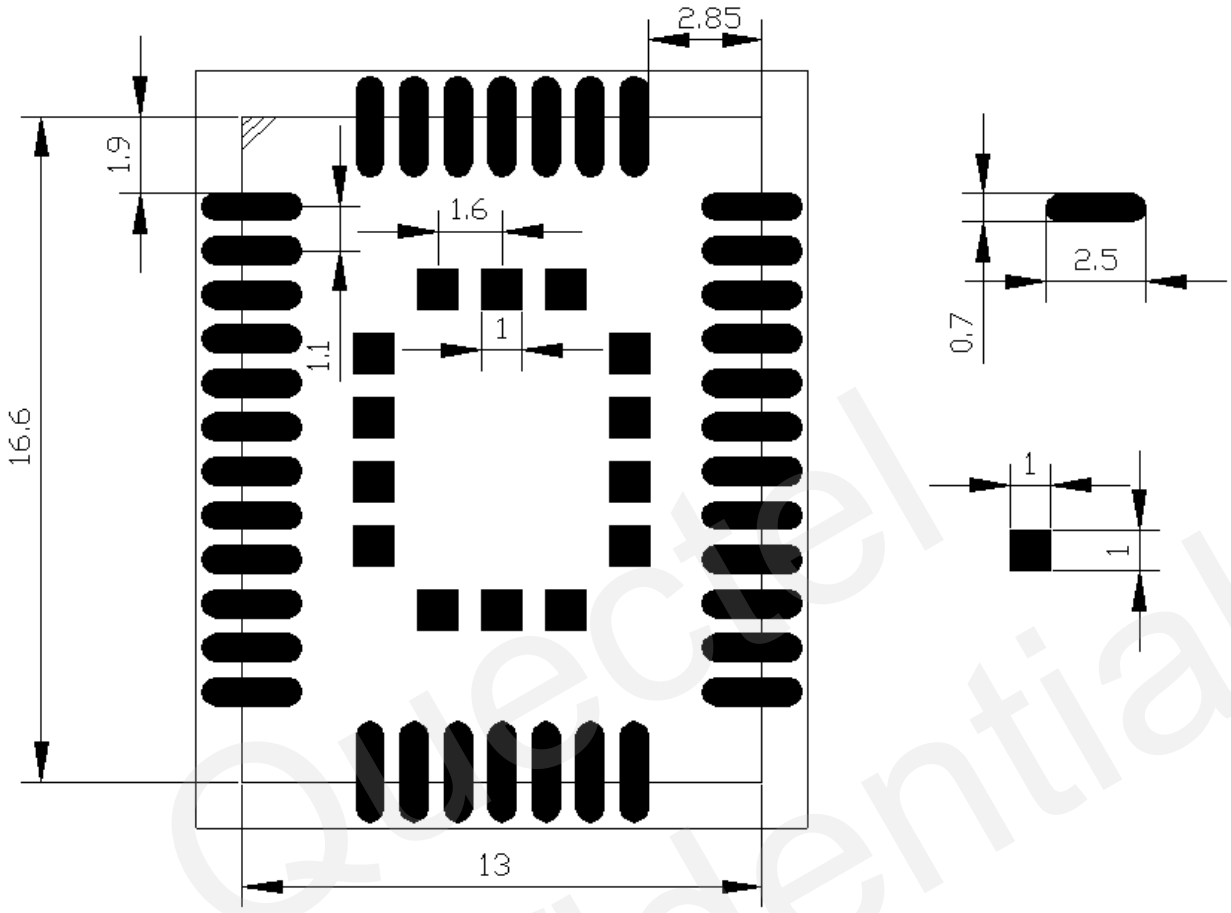

Figure 8: Recommended Stencil for FC20 Series and FC10 (Unit: mm)

NOTES

1. For easy maintenance of the module, please keep about 3mm between the module and other components in host PCB.
2. Keep the RESERVED pins unconnected.

The following figure shows the sketch map of installation between FC20 series and FC10 modules.

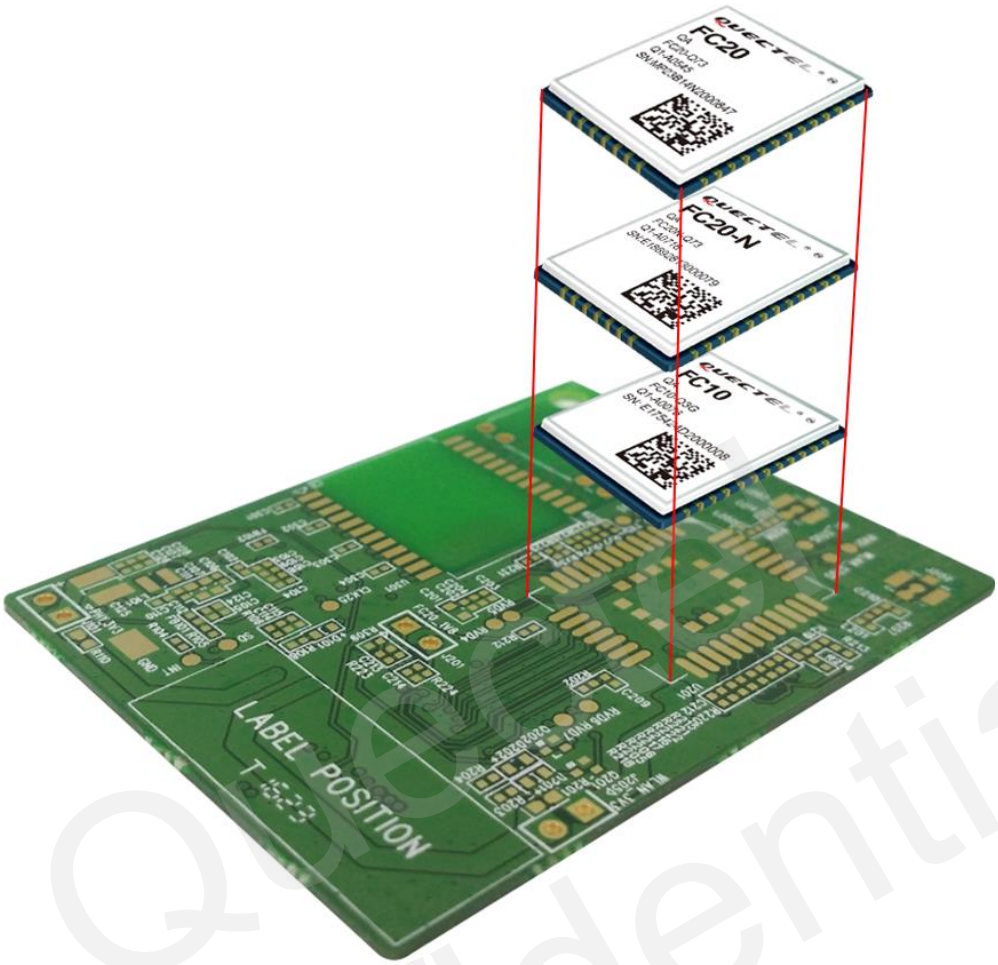

Figure 9: Installation Sketch Map between FC20 Series and FC10 Modules

6 Appendix A

Table 6: Related Documents

SN	Document Name	Remark
[1]	Quectel_FC10_Hardware_Design	FC10 Hardware Design
[2]	Quectel_FC10&EC20_Reference_Design	FC10 & EC20 Reference Design
[3]	Quectel_FC20_Series_Hardware_Design	FC20 Series Hardware Design
[4]	Quectel_EC25_Reference_Design	EC25 Reference Design
[5]	Quectel_EC21_Reference_Design	EC21 reference design
[6]	Quectel_EC20_R2.0_Reference_Design	EC20 R2.0 reference design

Table 7: Terms and Abbreviations

Abbreviation	Description
BT	Bluetooth
ESR	Equivalent Series Resistance
I/O	Input/Output
LCC	Leadless Chip Carrier
LGA	Land Grid Array
LTE	Long Term Evolution
RF	Radio Frequency
SDIO	Secure Digital Input and Output
Wi-Fi	Wireless-Fidelity
WLAN	Wireless Local Area Networks