Revision A00

Module Pin Compatible Application Note

Date: 2017-02-14

About the Document

Revision History

Revision	Date	Author	Description
A00	2017-02-14	Yingjie	First Release

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Content

Attention

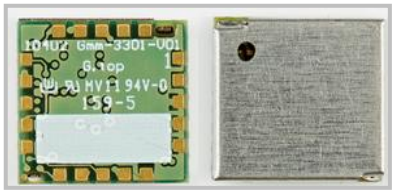
This application note provides the necessary guidelines to successfully design pin compatible model on customer system.

Module description

This application note covers the following receiver modules:

- FireFly Series: Firefly X1 (Gmm-3301)
- Titan Series :Titan X1 (Gms-3302)

Stand Alone Module



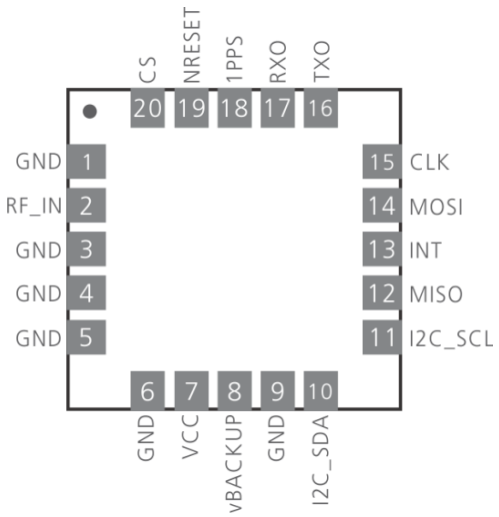
Firefly X1(Gmm-3301)

Built-in Patch Antenna Module

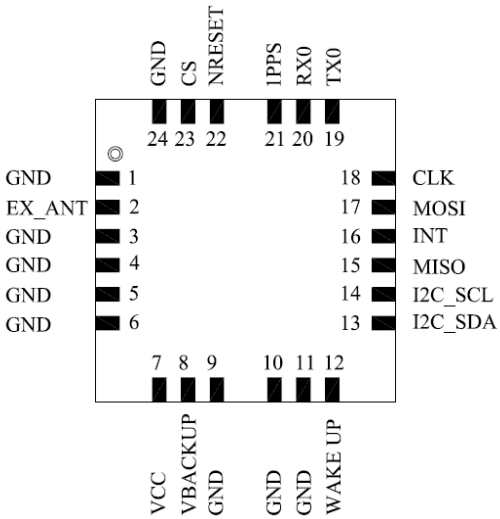
Titan X1(Gms-3302)

1 Pin Configuration

Firefly X1 (Gmm-3301)



Titan X1(Gms-3302)

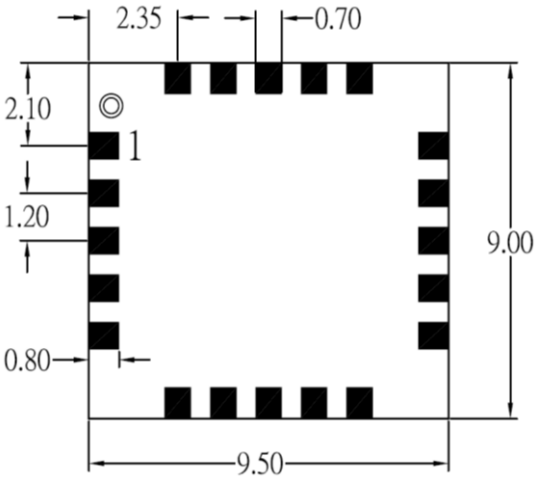


2 Pin Assignment Comparison Table

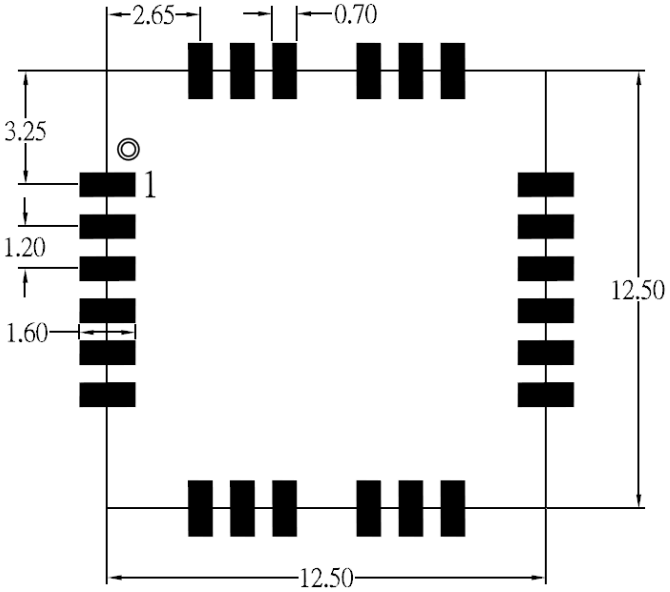
Pin	Firefly X1	Pin	Titan X1
1	GND	1	GND
2	RF_IN	2	EX_ANT
3	GND	3	GND
4	GND	4	GND
5	GND	5	GND
6	GND	6	GND
7	VCC	7	VCC
8	VBACKUP	8	VBACKUP
9	GND	9	GND
		10	GND
		11	GND
		12	WAKE UP
10	I2C_SDA	13	I2C_SDA
11	I2C_SCL	14	I2C_SCL
12	MISO	15	MISO
13	INT	16	INT
14	MOSI	17	MOSI
15	CLK	18	CLK
16	TX0	19	TX0
17	RX0	20	RX0
18	1PPS	21	1PPS
19	NRESET	22	NRESET
20	CS	23	CS
		24	GND

3 Built-in Co-layout Model

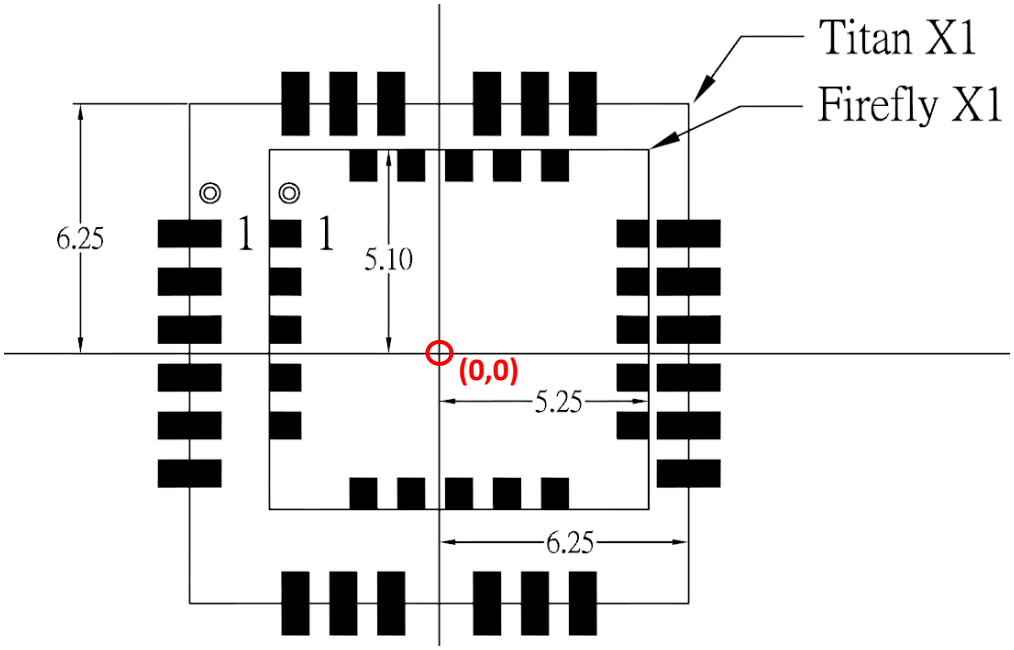
Firefly X1 (Gmm-3301)



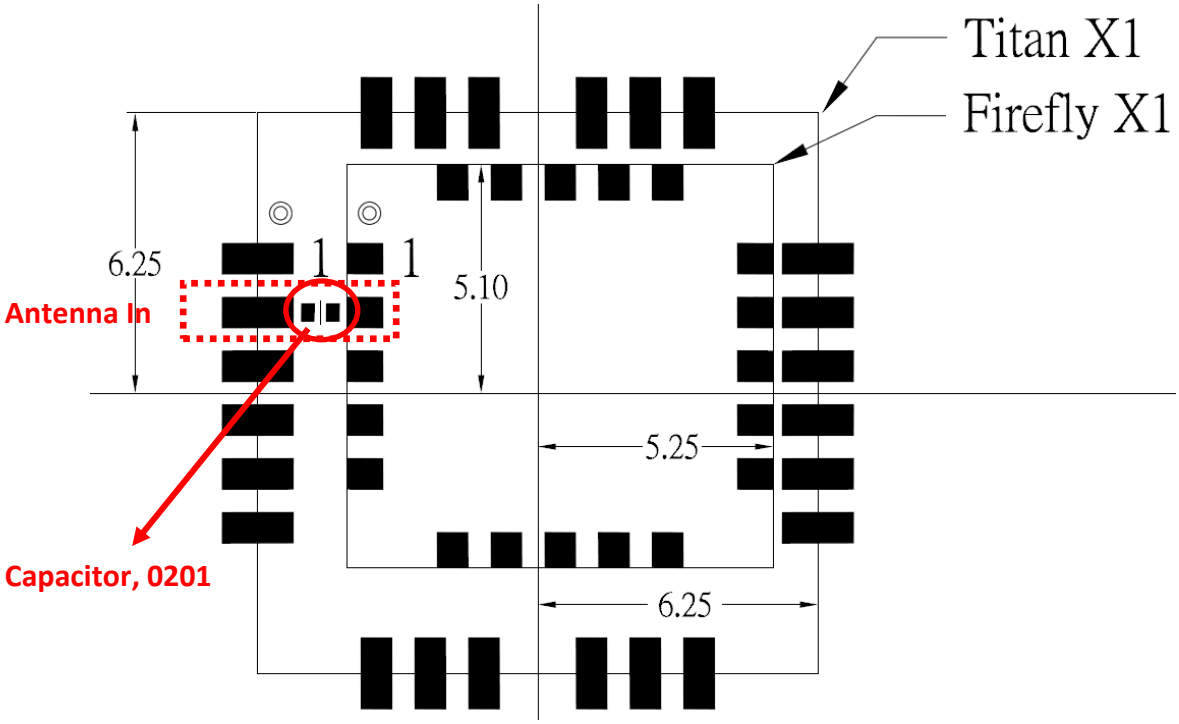
Titan X1(Gms-3302)



Co-layout(TitanX1 & Firefly X1)



4 Antenna_IN (adding capacitor)

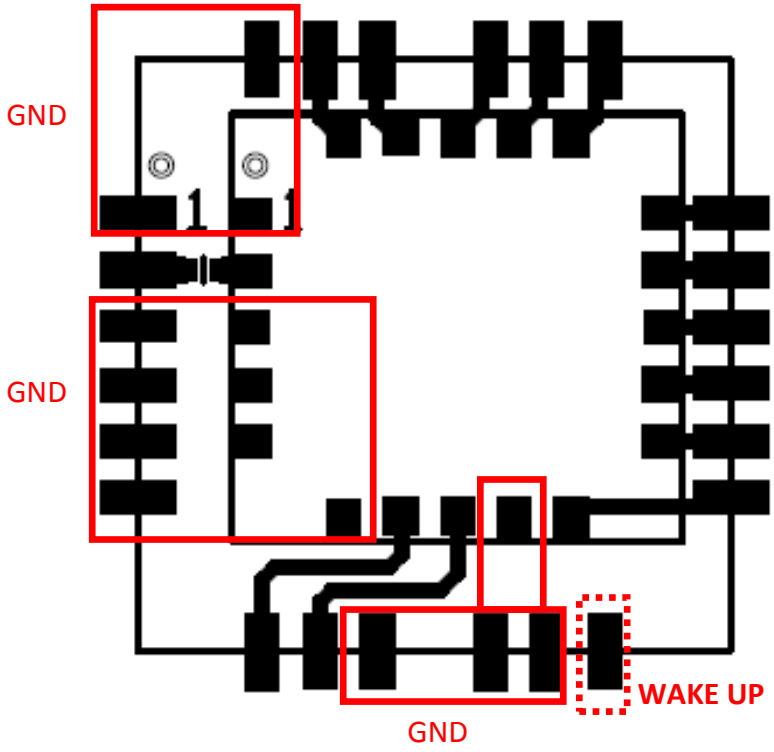


Co-layout(TitanX1 & Firefly X1)

Place a capacitor 0201 pad between Titan X1_Pin 2 and Firefly X1_Pin 2 to avoid signal interference.

	Firefly X1	Titan X1
Capacitor, 18pF/0201	✓ Needed. Mount it on the PCB	X Capacitor not needed
Pad	✓	✓

5 PCB Layout Example



Co-layout(TitanX1 & Firefly X1)

The referable trace length is about 0.3mm and the trace on pin 2 needs to be shorter to avoid signal interference.

6 RF Trace Design Note

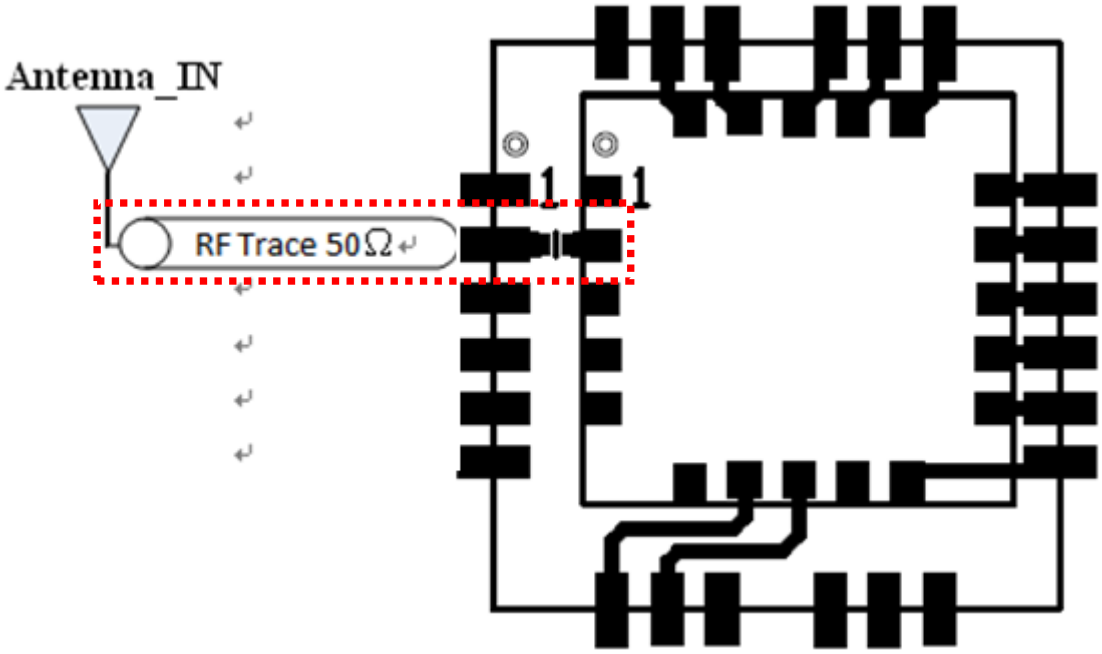
A. In general, a 50Ω antenna will work fine with GNSS module. Connect the antenna to the pin 2 with a 50Ω impedance trace.

B. Pleases keep the antenna far away from potential sources of noise such as switching power supply, high speed digital logics or radar wave guide.

C. The 50Ω trace must be kept as short as possible to reduce the chance of noise generating from air and PCB. A simple direct-line trace is most recommended.

D. If needed, place a matching circuit between antenna and the GNSS module. Please consult with the module and antenna maker for the design of matching circuit.

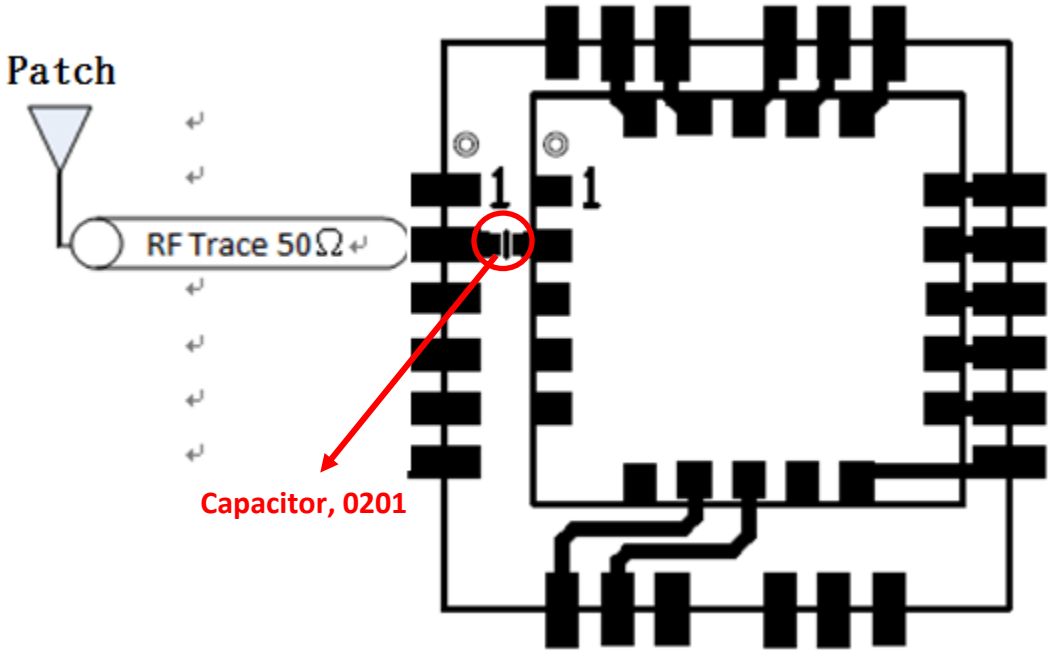
E. For 50 Ω matching, please refer to **"50 Ω Antenna Matching"** in Appendix.



Co-layout(TitanX1 & Firefly X1)

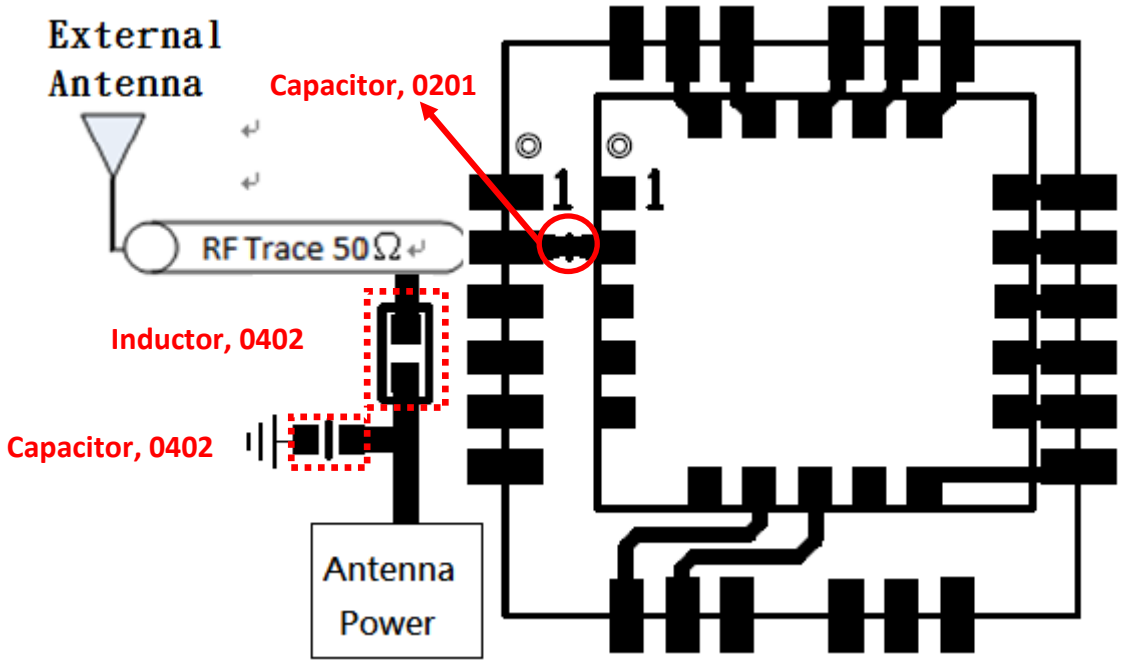
7 Antenna Design Note

7.1 Designing Patch Antenna with GNSS Module



	Firefly X1	Titan X1
Capacitor, 18pF/0201	✓ Needed. Mount it on the PCB	X Capacitor not needed
Patch	Additional; can be customized upon customer's request)	Embedded Patch size:12.5X12.5mm

7.2 External Antenna design with the modules

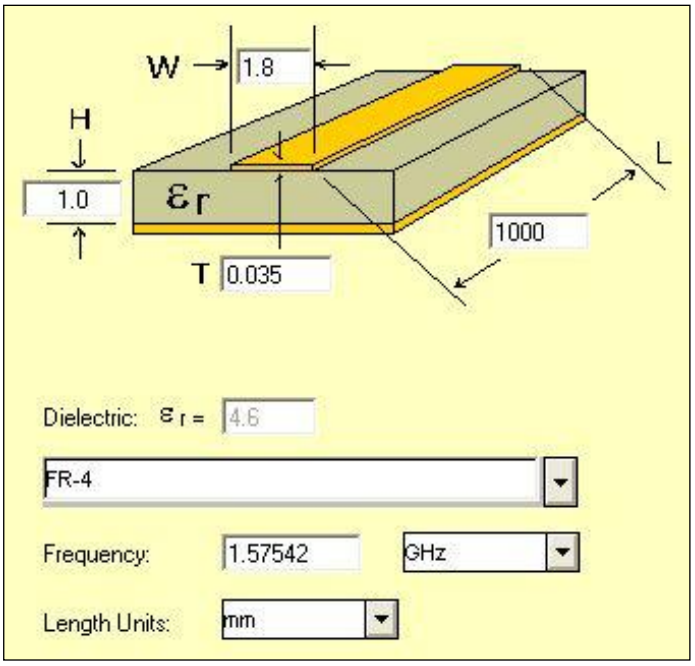


	Firefly X1	Titan X1
Capacitor, 18pF/0201	✓ Needed. Mount it on the PCB	X Capacitor not needed
External Antenna Power	✓ External power supply needed	X The power supply can be provided from VCC.
· **RF Chock for Antenna Power** · **Inductor 0402** · **Capacitor 0402**	· 27nH/0402 · 0.1nF/0402 · Mount it on your PCB	· 27nH/0402 · 0.1nF/0402 · Not needed

8 Appendix: 50 Ω Antenna Matching

We use the software AppCAD to simulate 50 Ω impedance for the RF PCB layout.

RF line width (W)	PCB FR4 Thickness (H)	Dielectric parameter	Copper Thickness an ounce
1.8mm	1mm	4.6	0.035mm



Note:

For multiple-layer layout, place the ground in the 2nd layer to minimize the trace width in specific PCB (such FR4) and impedance.

Some freeware can be adopted to calculate impedance and trace width. Please refer to the website for such software:

http://web.awrcorp.com/Usa/Products/Optional-Products/TX-Line/