



# TAOGLAS®



# Datasheet

## Multiband GNSS Front End

**Part No:**  
TFM.110A

### Description

Surface Mount GNSS Front End Active Electronics  
Covering the full Multiband GNSS Spectrum excluding the L-Bands

### Features:

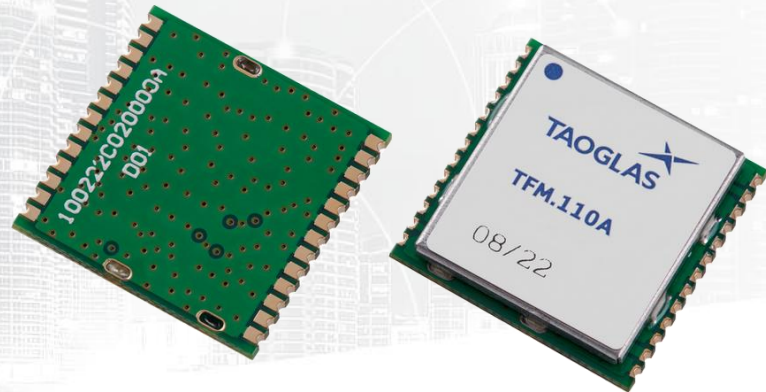
- Two-stage LNA providing >25 dB Gain across all bands
- Low Noise Figure: <3.5 dB in low bands and <4.0 dB in high bands
- Vin = +1.8 to +5.5 VDC
- Easy to integrate surface-mount
- Dimensions: 15 x 15 x 2.7 mm
- RoHS & Reach Compliant

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# 1. Introduction



The Taoglas TFM.110A is a surface-mount active electronics GNSS front end which covers L1/L2/L5 for multiband multi-constellation high-precision applications. The TFM.110A features a SAW/LNA/SAW/LNA topology in the signal path to prevent unwanted out-of-band interference from overdriving the GNSS LNAs or receiver. The SAW filters have been carefully selected and placed to provide excellent out-of-band rejection while also maintaining low noise figure.

Many currently available dual-band GNSS receivers require additional RF circuits between the antenna and the receiver to properly set the overall system noise figure. This requires additional development time for an otherwise simple integration. Many organizations don't have the RF expertise to effectively design such a solution. The TFM.110 captures the required additional RF circuits in modular form, allowing the designer to simply place the TFM.110 between their GNSS antenna and GNSS receiver.

The TFM.110 offers > 25 dB gain across all applicable bands while maintaining a high Input P1dB of -25 dBm or better. Noise Figure is < 3.5 dB in the low bands and < 4.0 dB in the high bands. A wide input voltage of +1.8 to +5.5 VDC allows for easy integration in most GNSS systems.

#### TFM.110A Features & Benefits:

- Ease-of-integration – Single-package solution combines impedance matching, filter efficiency and low noise design for easy, drop-in use with any antenna or GNSS receiver
- Low-noise System Design – Integrated pre-filters deliver exceptional out-of-band rejection across multiple band configurations and neighboring interference to properly set noise figure
- Dual-gain Stage Architecture – Cascaded LNAs, pre-filters and optimized impedance matching deliver sufficient gain to the GNSS receiver without signal-to-noise overload
- Low-profile Form Factor – Small footprint and low-profile design saves valuable real estate without the need for external components and routing
- Accelerated Development Cycles – 2+ years of development by antenna and RF design experts, delivering the highest levels of integration, manufacturability and robustness in a single package

For further information, please contact your regional Taoglas customer support team.

## 2. Specification

Electrical									
Frequency (MHz)	1166	1176	1186	1197	1227	1249	1559	1575.42	1606
Noise Figure (dB)*	2.9	2.7	2.6	2.5	3.1	3.1	3.3	3.1	3.6
Gain (dB)	29	30	30	31	30	31	27	26	25
Group Delay (ns)	22	20	18	19	17	23	16	16	23
Input P1dB (dBm)	-23	-24	-24	-24	-22	-23	-18	-18	-17
Input Return Loss (dB)	-10	-11	-12	-13	-11	-14	-11	-11	-13
Output Return Loss	-9	-9	-10	-14	-14	-17	-24	-31	-25
Vin	+1.8 to +5.5 VDC								
Typical Current (@1.8V)	7.5 – 9.0mA								

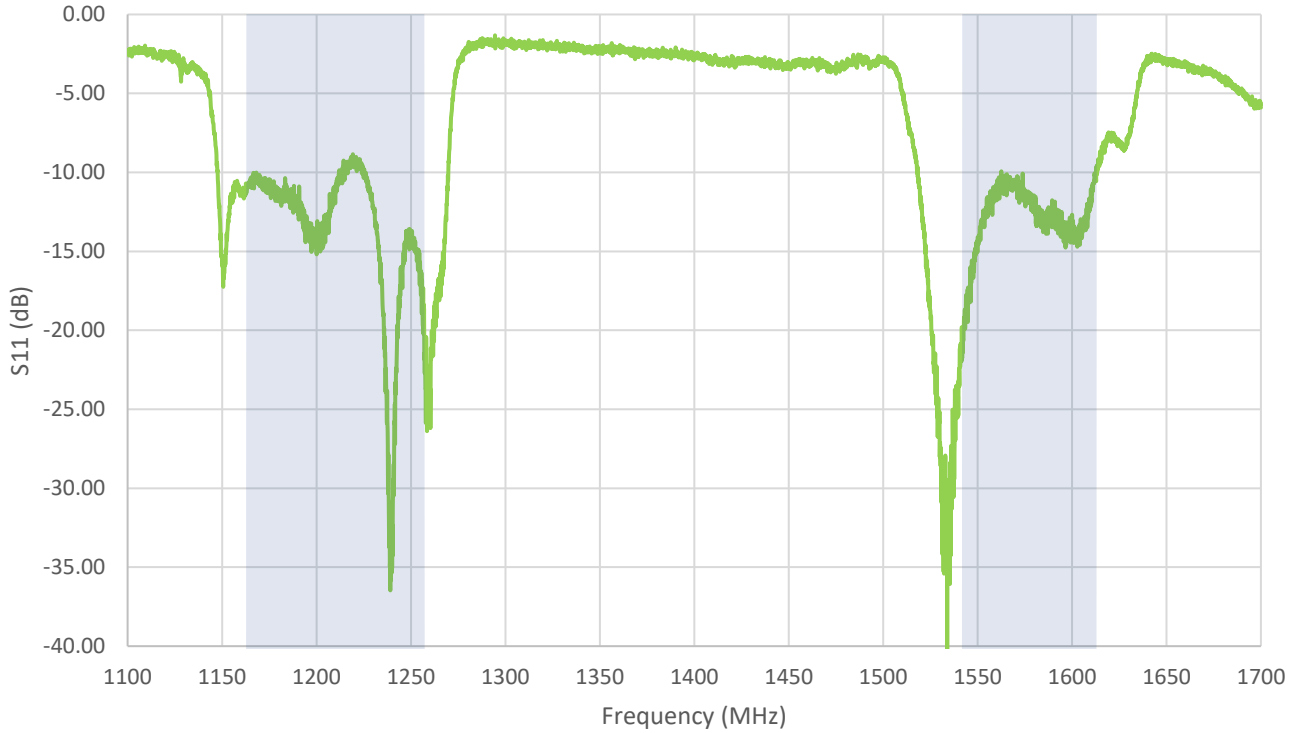
\*Note: Tested on evaluation board. Board losses removed.

Mechanical	
Height	2.76mm
Planar Dimension	15.50 x 15.50mm

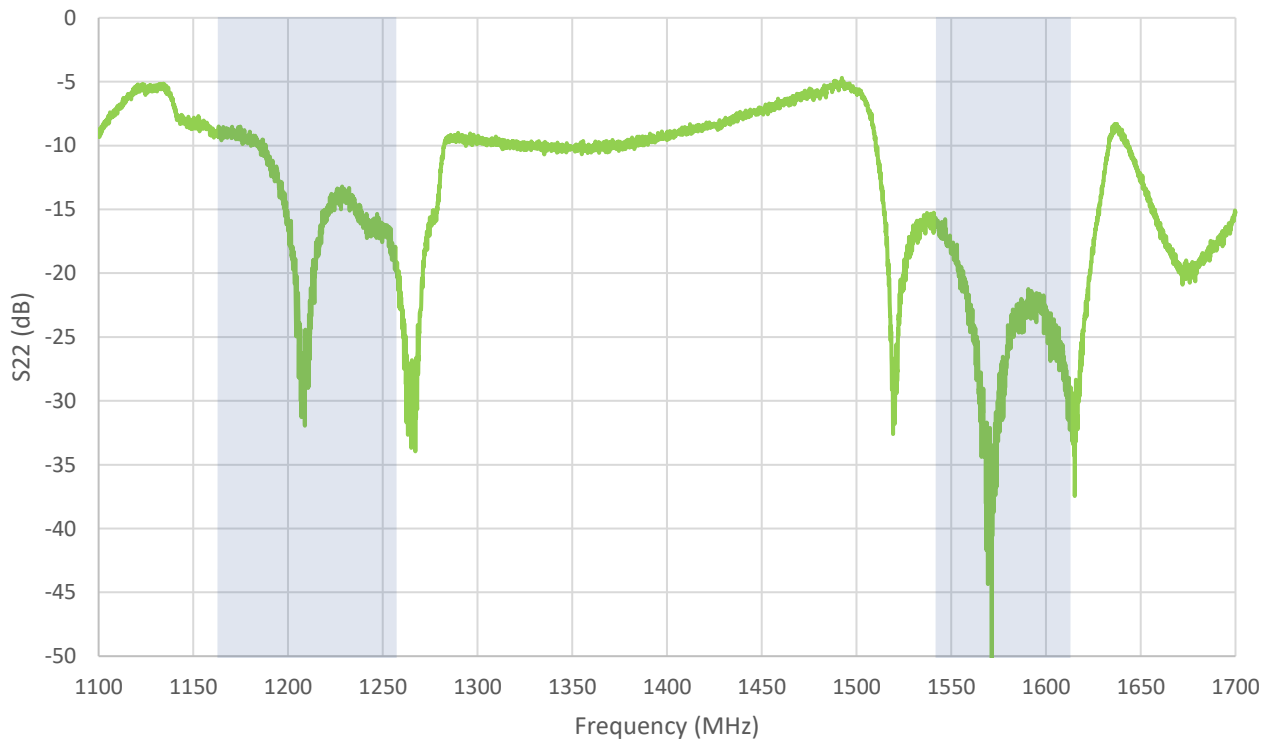
Environmental	
Temperature Range	-40°C to 85°C
RoHS Compliant	Yes
REACH Compliant	Yes

### 3. FEM Characteristics

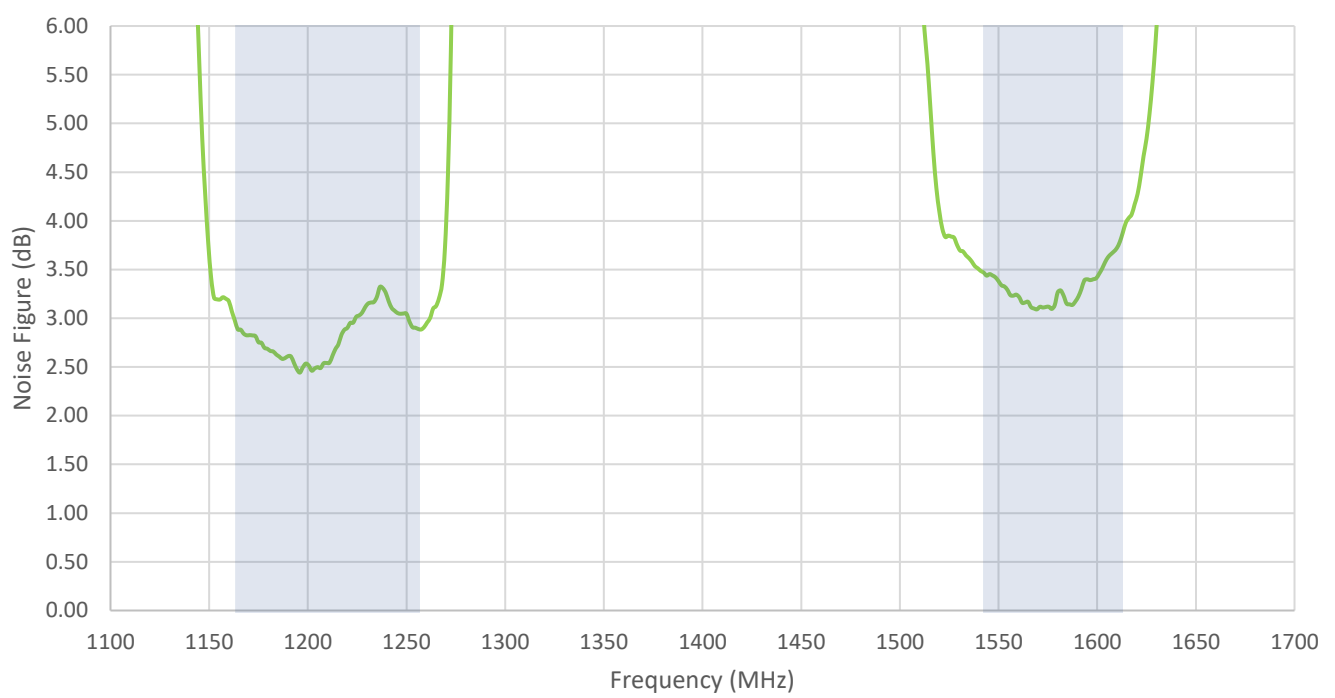
#### 3.1 Input Return Loss



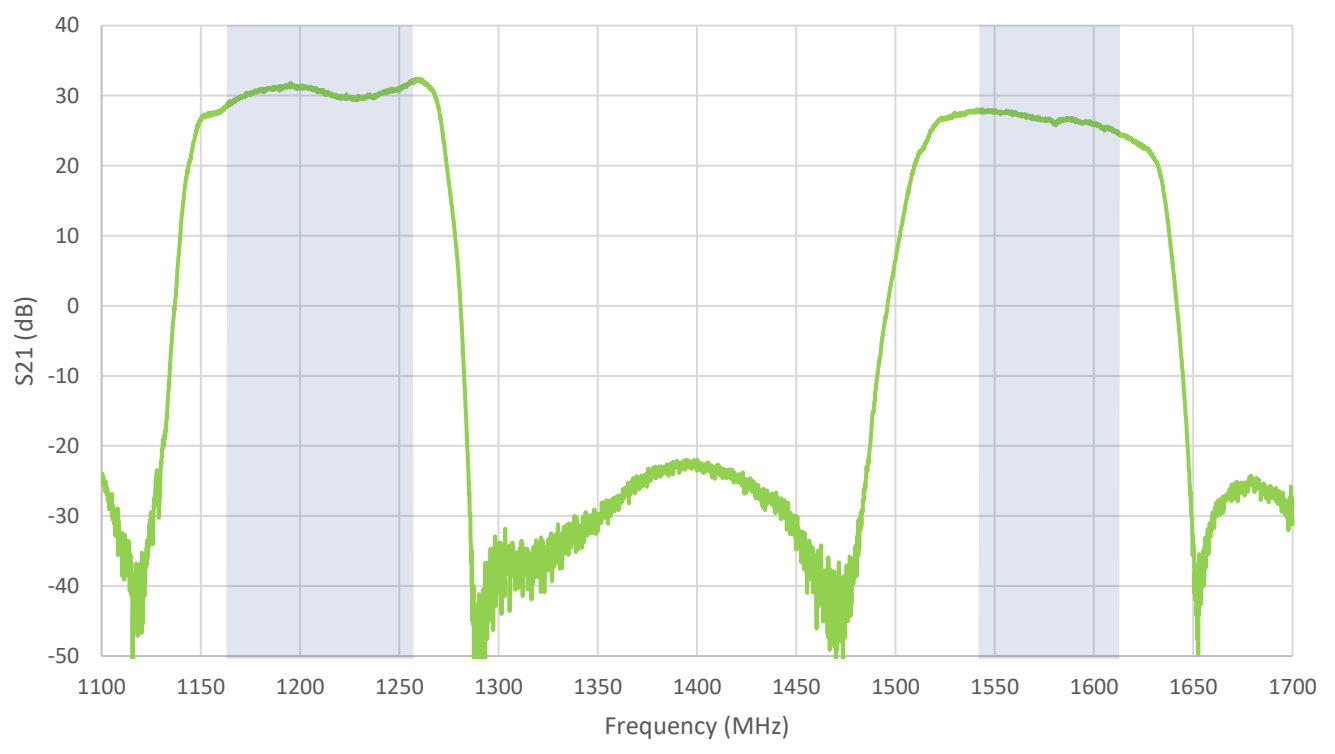
#### 3.2 Output Return Loss



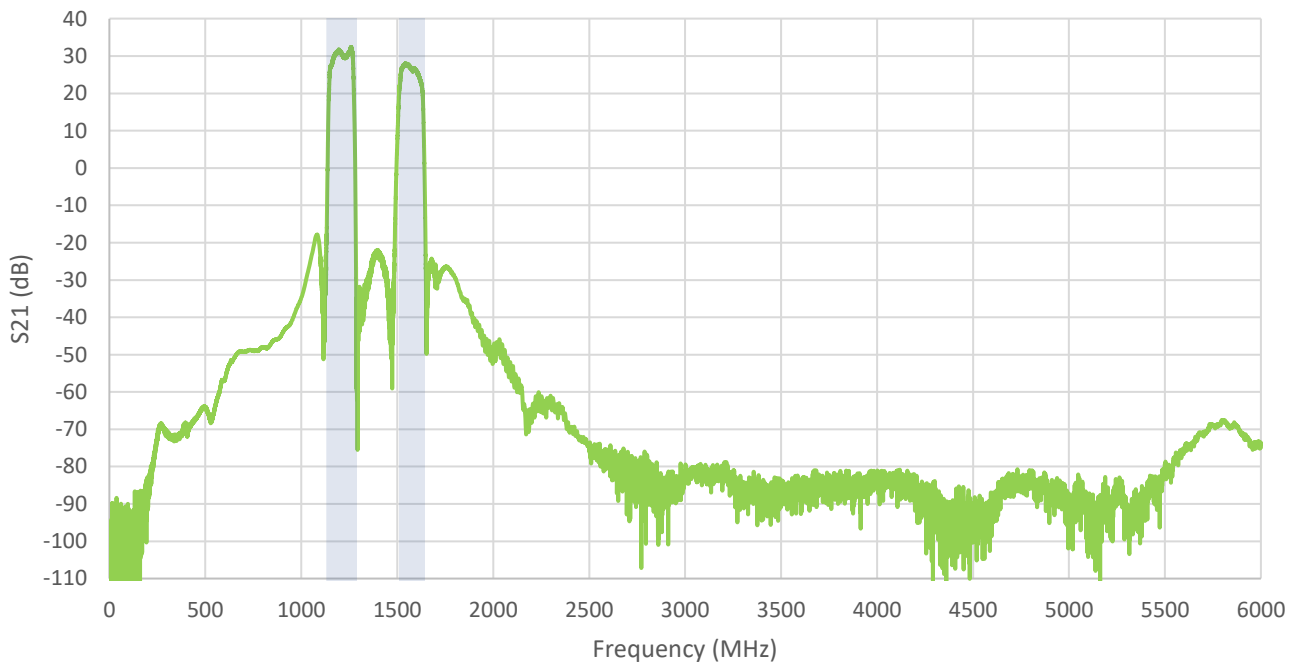
### 3.3 Noise Figure



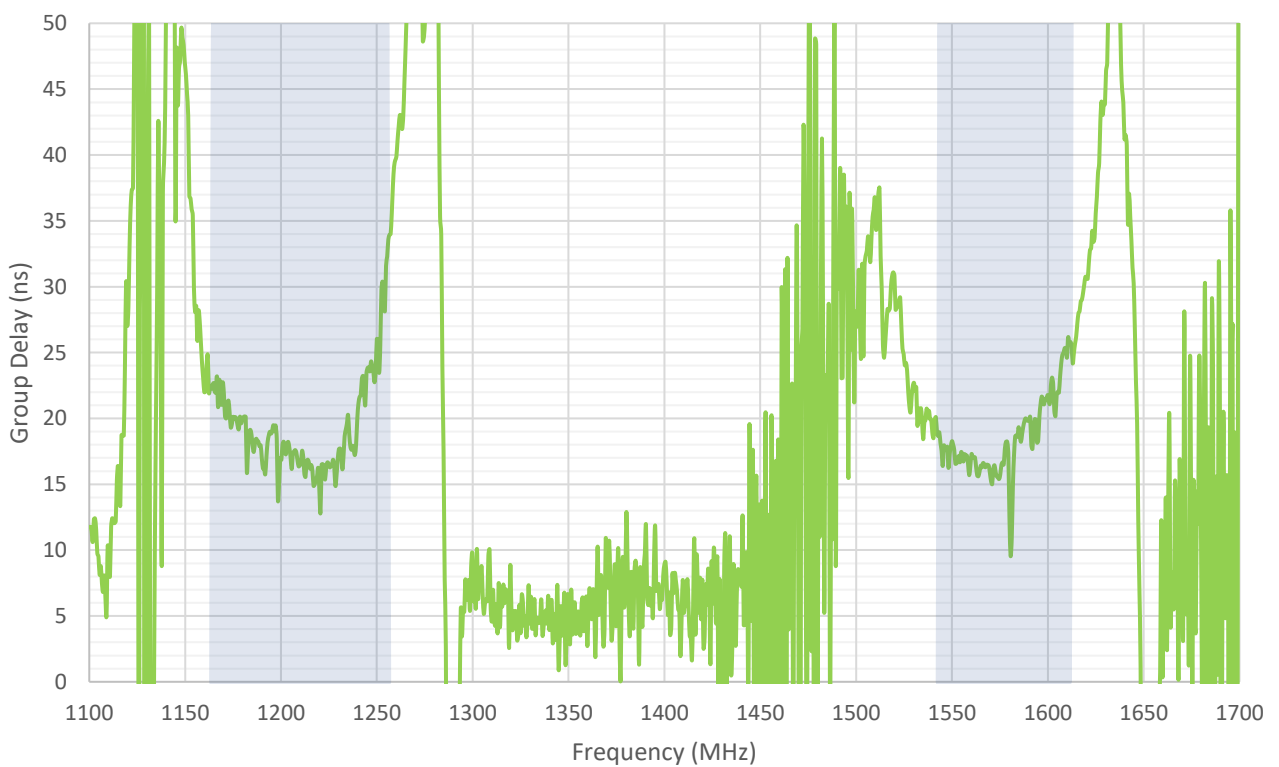
### 3.4 In-Band Gain



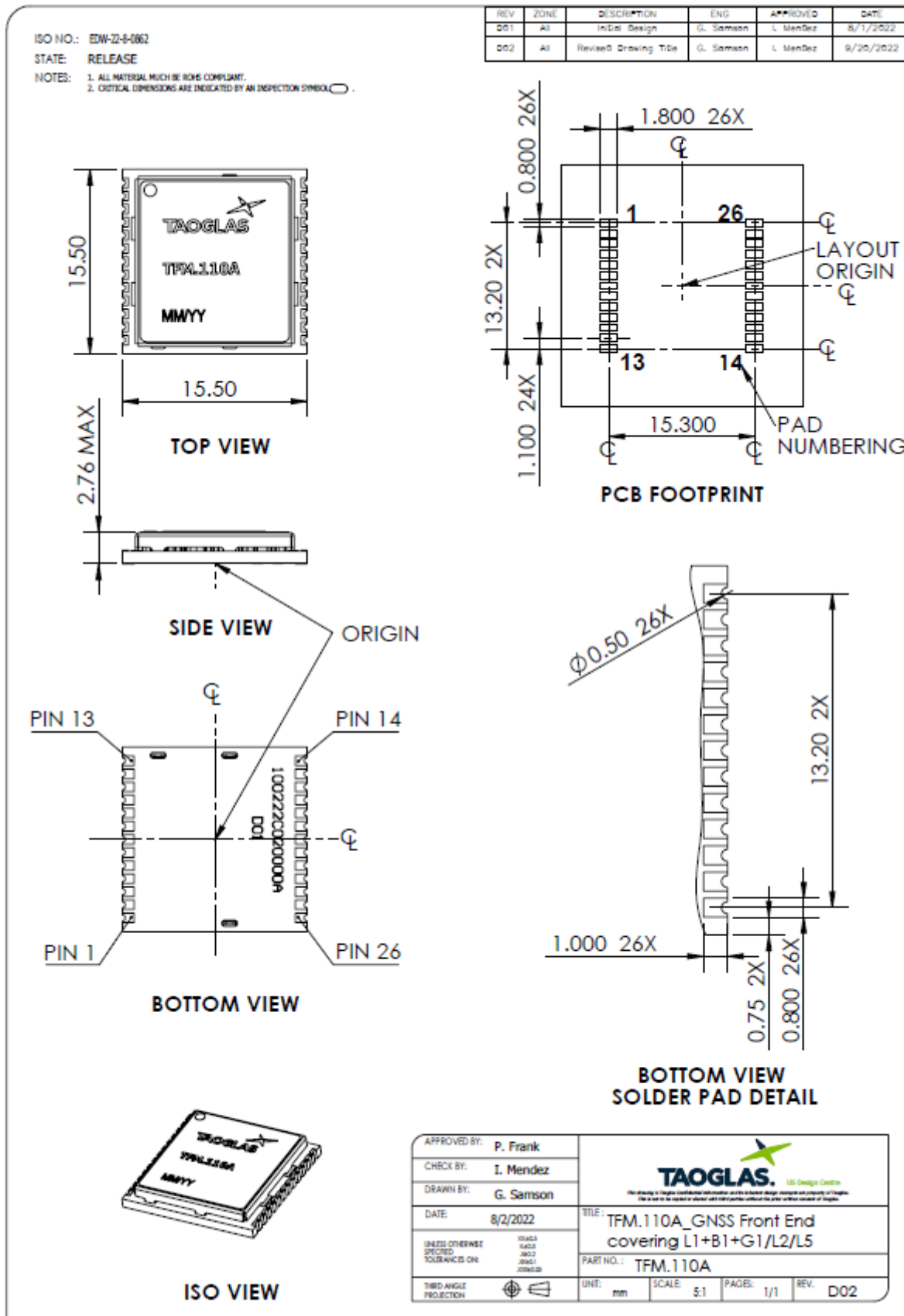
### 3.5 Wideband Gain



### 3.6 Group Delay



# 4. Mechanical Drawing



APPROVED BY: P. Frank  
 CHECK BY: I. Mendez  
 DRAWN BY: G. Samson  
 DATE: 8/2/2022  
 UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:  
 DIMENSIONS IN MILLIMETERS  
 DECIMALS: 0.050  
 FRACTIONS: 1/100  
 THIRD ANGLE PROJECTION

**TAOGLAS** US Design Centre  
Providing a higher standard of precision and better design services on a global scale. We are here to help you succeed and thrive together without ever losing sight of quality.

TITLE: TFM.110A\_GNSS Front End covering L1+B1+G1/L2/L5  
 PART NO.: TFM.110A  
 UNIT: mm SCALE: 5:1 PAGE: 1/1 REV: D02



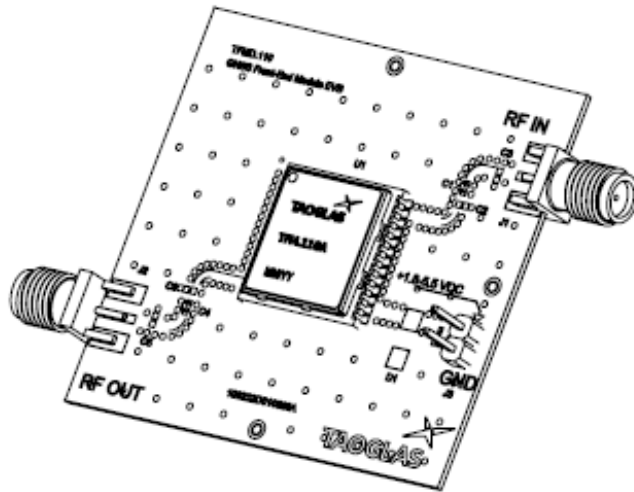
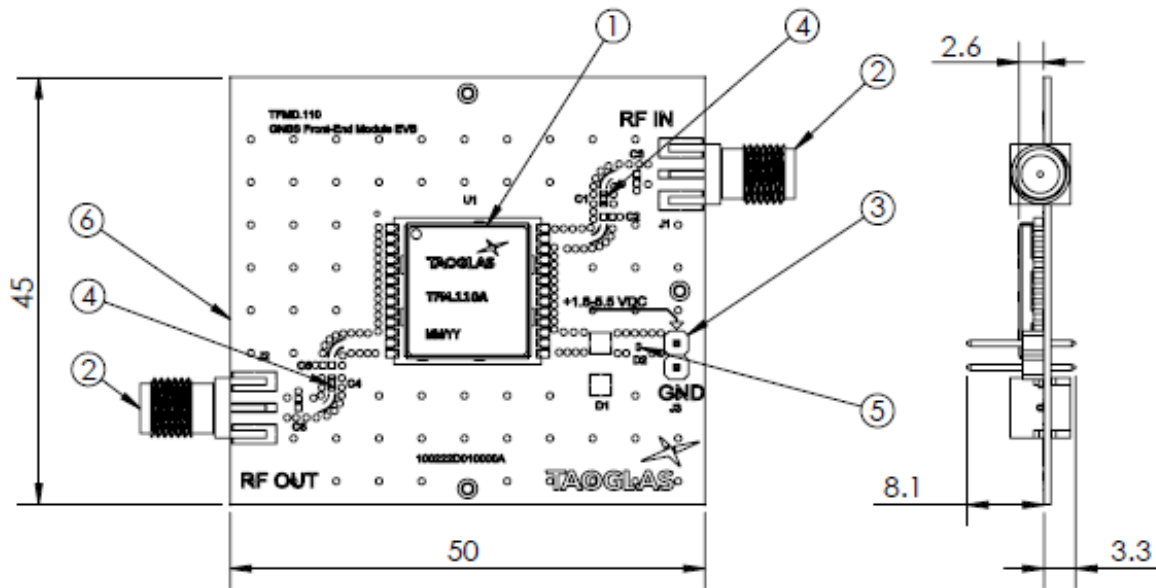
# 5. Eval Board Mechanical Drawing

ISO NO.: EDW-22-8-0863

STATE: RELEASE

NOTES:  
 1. ALL MATERIAL MUST BE ROHS COMPLIANT.  
 2. USE THIS DRAWING TOGETHER WITH THE CORRESPONDING 3D CAD DATABASE FILE TO FULLY DESCRIBE THE PART.  
 3. CRITICAL DIMENSIONS ARE INDICATED BY AN INSPECTION SYMBOL  $\square$ .

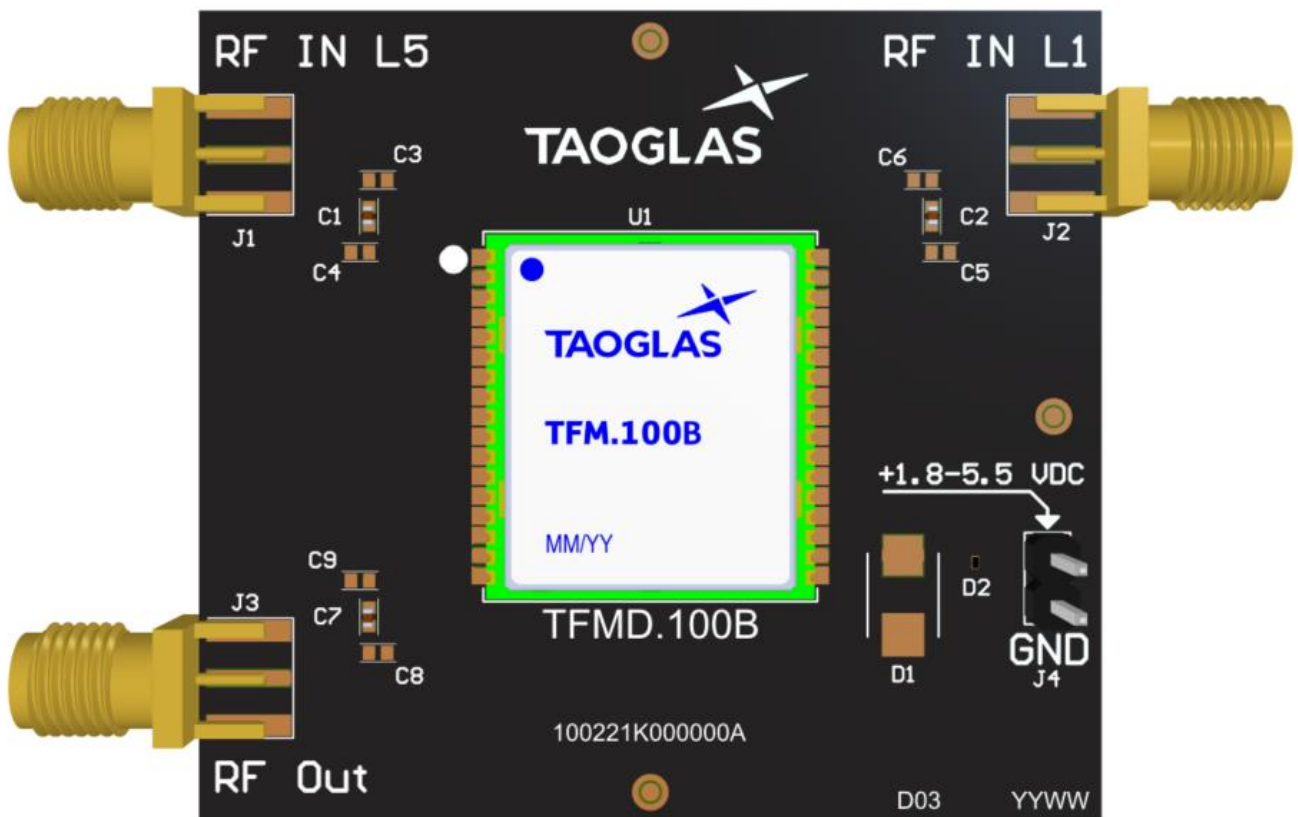
REV	ZONE	DESCRIPTION	ENG	APPROVED	DATE
D01	All	Initial Release	G. Samson	I. Mendez	8/2/2022
D02	All	Revised Drawing Title	G. Samson	I. Mendez	9/20/2022



	Name	Material	Designator	QTY
1	TA94L50A GNSS Front End	NA	U1	1
2	Conn SMA Jack STR 50 Ohm Edge Mtg	Brass	J1, J2	2
3	Conn Header Vert 3 POS 2.54 mm	Brass/Plastic	J3	1
4	Cap, Cer 1000 pF 50V COG/NPO 0402	Ceramic	C1, C4	2
5	TVS Diode 5.5WV 7.5Vc WLL-2-3	NA	D1	1
6	Eval Board PCB	FR4	NA	1

APPROVED BY: P. Frank	 The design is highly confidential and must be used for internal design purposes only. It is not to be used for other purposes without the prior written consent of Taoglas.
CHECK BY: I. Mendez	
DRAWN BY: G. Samson	
DATE: 8/2/2022	
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	TITLE: GNSS Front End Eval Bd covering L1+B1+G1/L2/L5
THIRD ANGLE PROJECTION	PART NO.: TFMD.110A
	UNIT: mm SCALE: 1:1 PAGE: 1/1 REV: D02

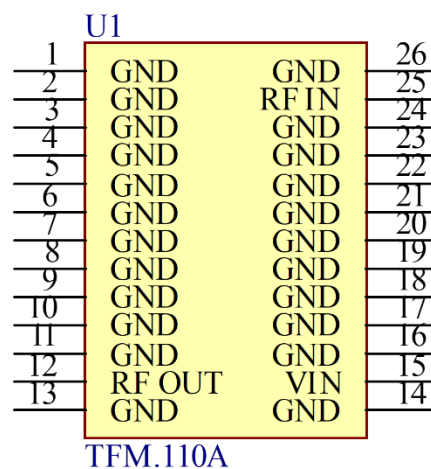
## 6. Module Integration



## 6.1 Schematic Symbol and Pin Definitions

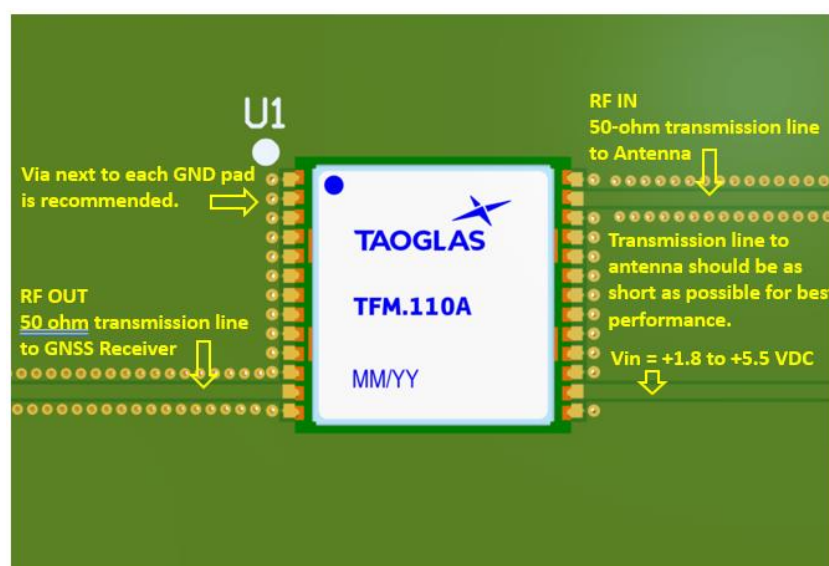
The circuit symbol for the TFM.110A is shown below. The front-end module has 26 pins as indicated below.

Pin	Description
1-11, 13-14, 16-24, 26	Ground
12	Signal Output
15	Voltage Input
25	Signal Input



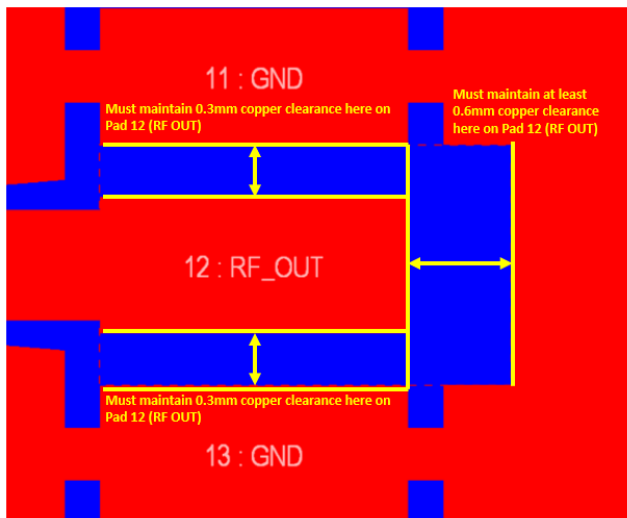
## 6.2 Module Integration

The TFM.110A should be placed as close to the signal input and output as possible to shorten the length of the transmission lines. The RF IN/OUT traces must maintain a 50 Ohm transmission line. A Pi Matching Network is recommended for the RF IN transmission line, the values and components for the matching circuit will depend on the tuning needed. Ground vias should be placed beside each ground pad and the DC Voltage input should be between +1.8 & +5.5 VDC. It's recommended that the DC Voltage input should be coupled with a 100pF Capacitor.

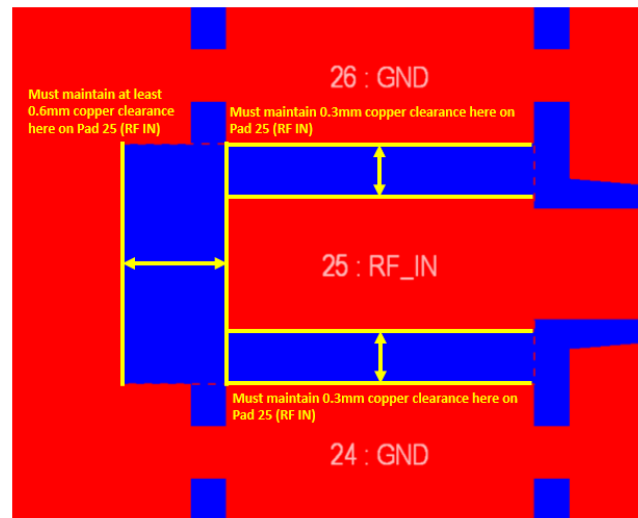


## 6.3 PCB Clearance

The footprint and clearance on the PCB must comply with the front-end module's specification. The PCB layout shown in the diagram below demonstrates the TFM.110A clearance area for Pin 12 (RF OUT Pad) & Pin 25 (RF IN Pad). The copper keep out area only applies to the same layer the TFM110.A was placed.



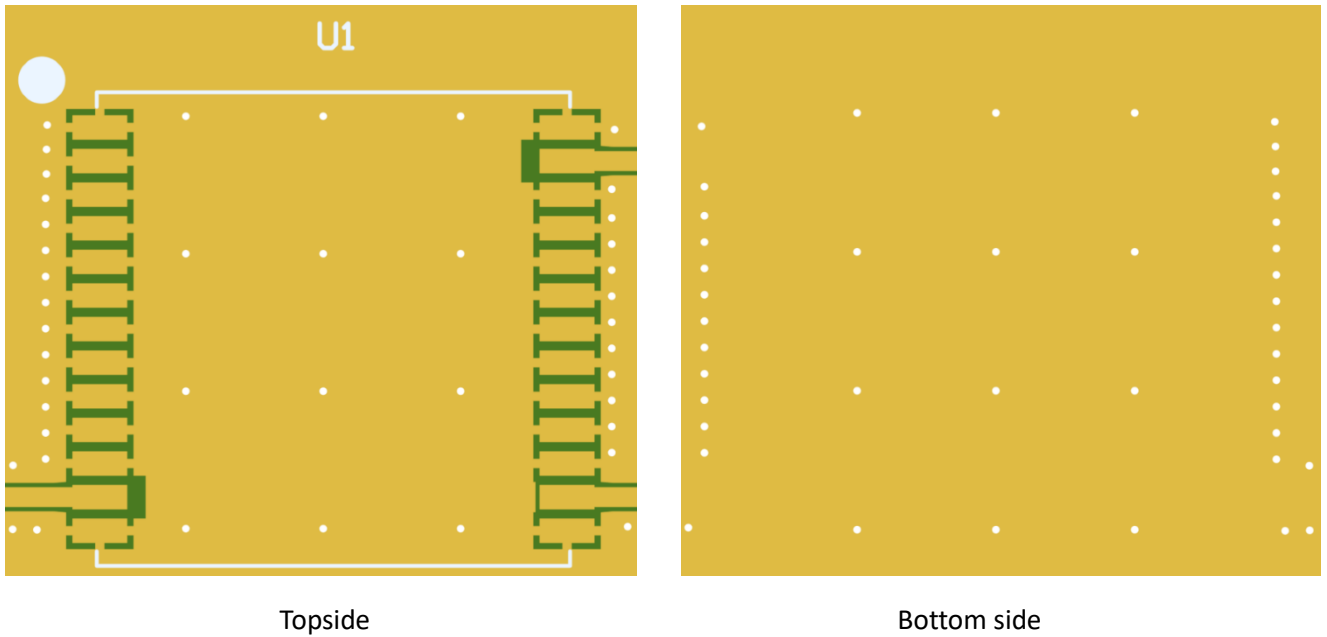
Pin 12 (RF OUT PAD)



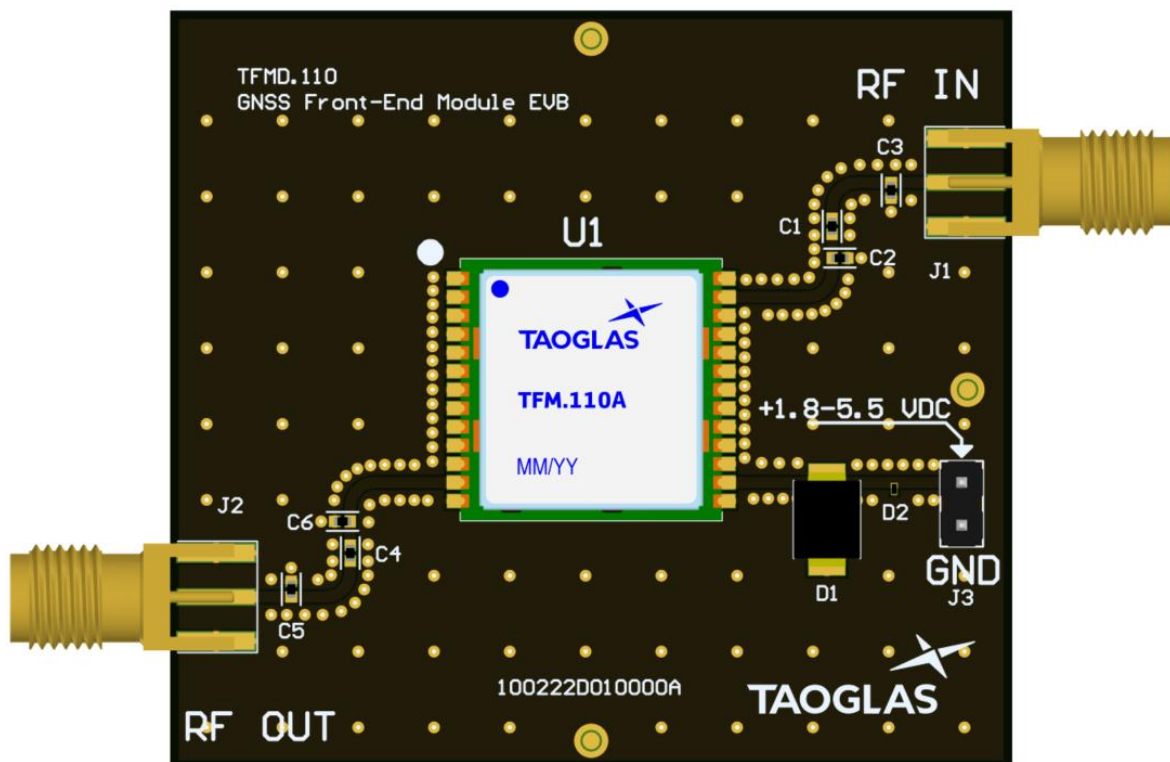
Pin 25 (RF IN PAD)

## 6.4 PCB Layout

The footprint and clearance on the PCB must comply with the front-end module's specification. The PCB layout shown in the diagram below demonstrates the TFM.110A footprint.

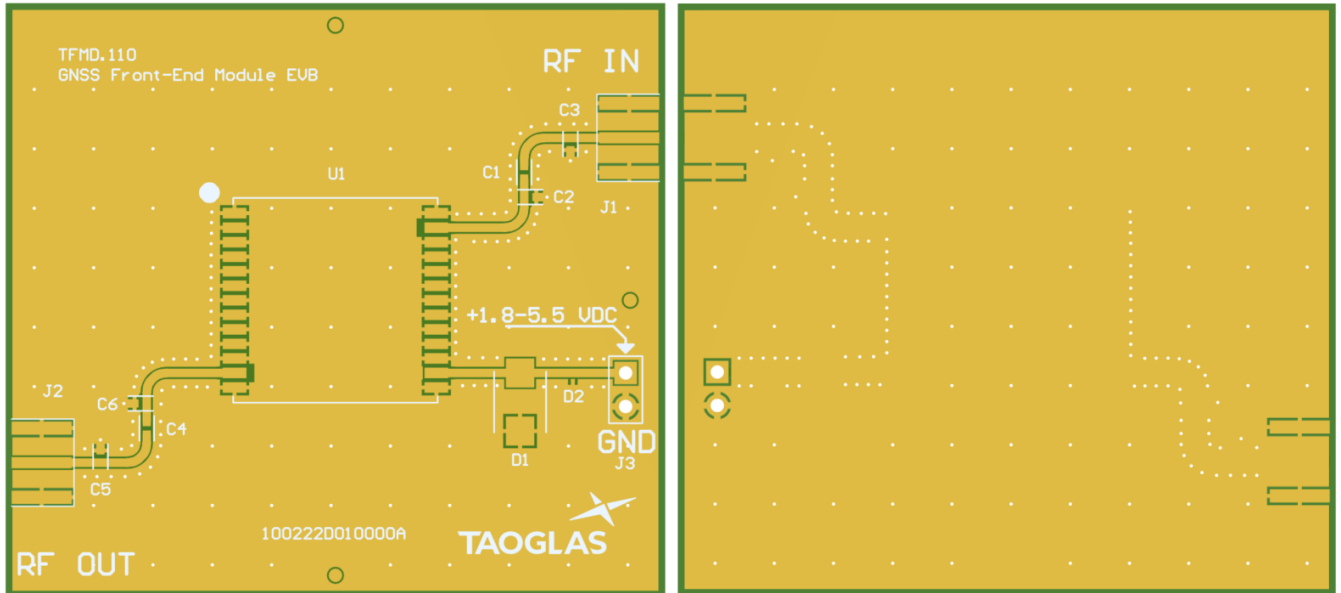


## 6.5 Evaluation Board



## 6.6 Demonstration Board Layout

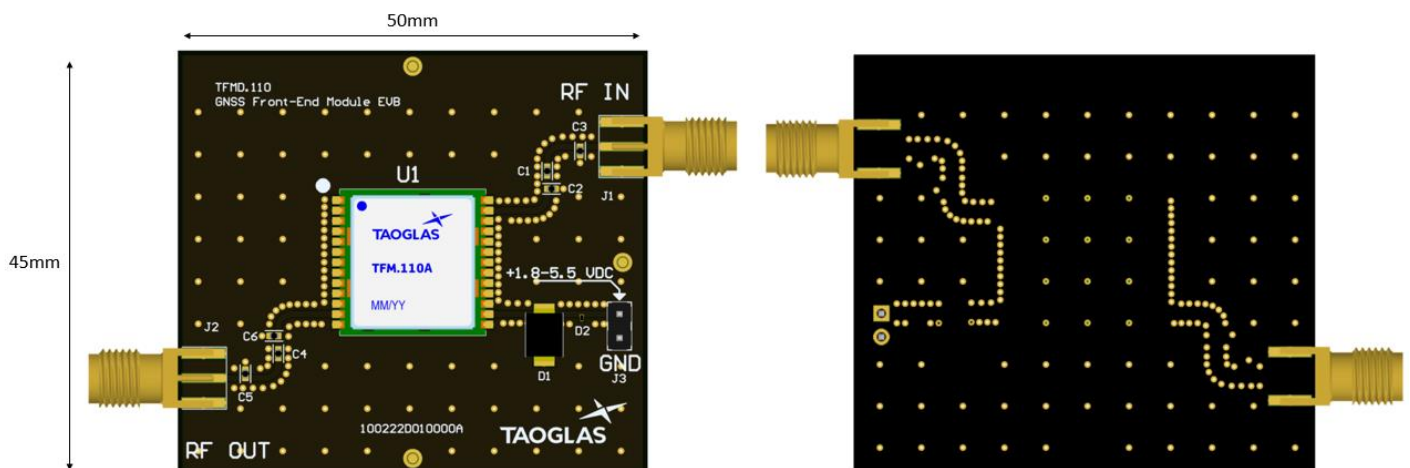
The footprint and clearance on the PCB must comply with the front-end module's specification. The PCB layout shown in the diagram below demonstrates the TFM.110A footprint.



Topside

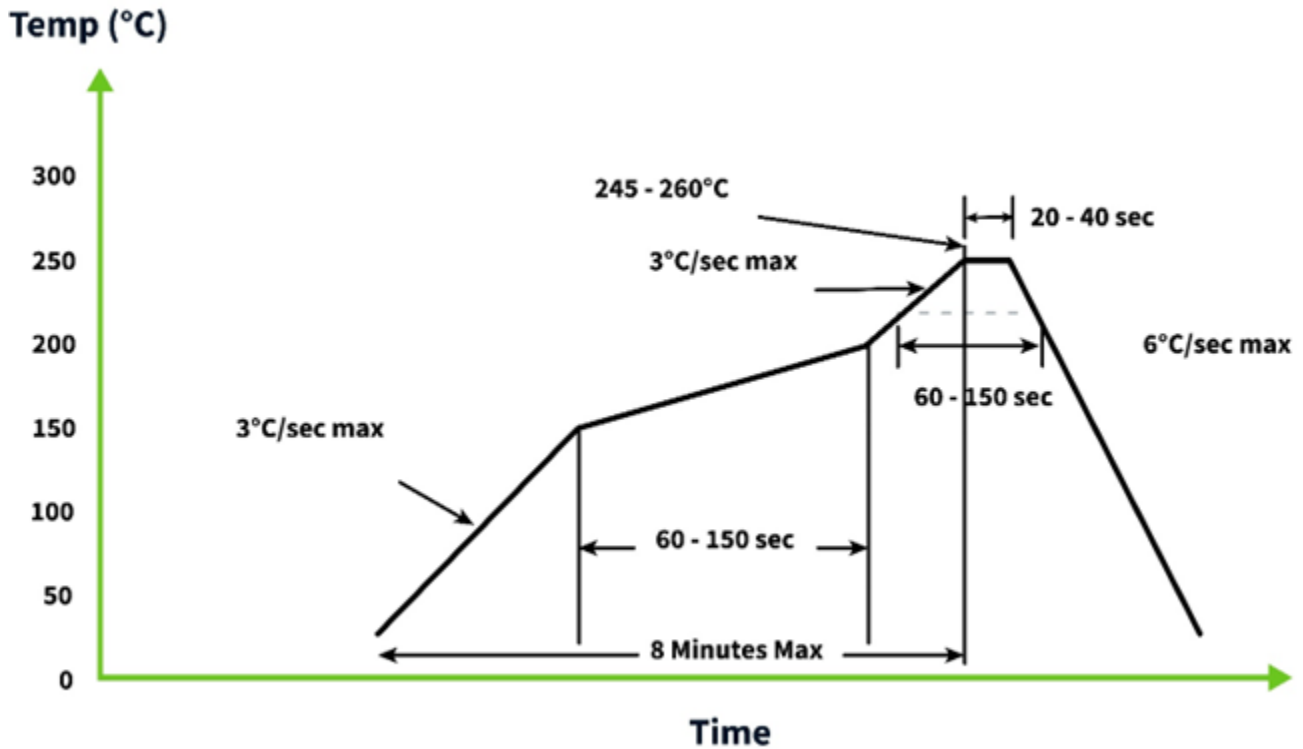
Bottom side

## 6.7 Evaluation Board Dimensions



## 7. Solder Reflow Recommendations

The TFM.110A can be assembled by following the recommended soldering temperatures are as follows:



\*Temperatures listed within a tolerance of +/- 10° C

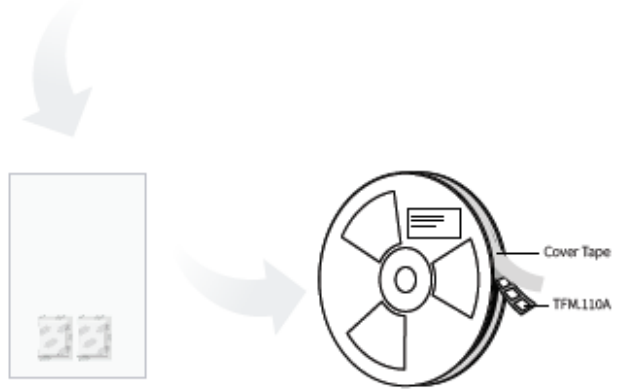
Smaller components are typically mounted on the first pass, however, we do advise mounting the TFM.110A when placing larger components on the board during subsequent reflows.

## 8. Packaging

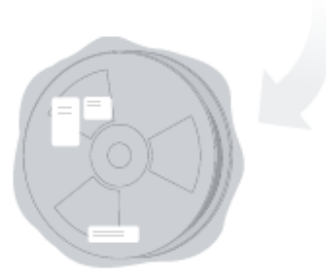
800 PCS / Reel  
SPQ Label



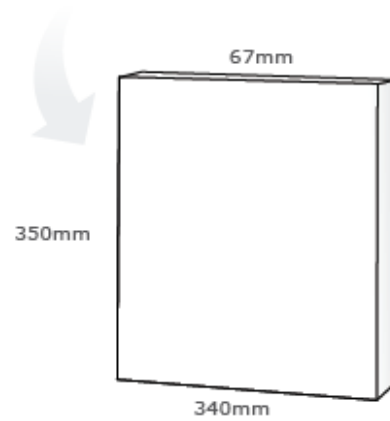
800 PCS / Vacuum bag  
2 PCS / 3g Desiccant  
1 PCS / Humidity test paper  
SPQ Label



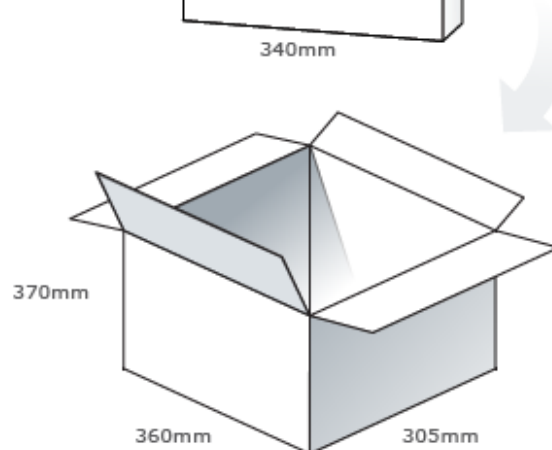
Caution Label  
Product Label  
SPQ Label



1 PCS / Box  
Box(mm): 350x340x67  
Weight (Kg): 2  
SPQ Label



3200 PCS / Carton  
Carton(mm): 370x360x305  
Weight (Kg): 8.8  
Carton Label





Changelog for the datasheet

**SPE-22-8-149 – TFM.110.A**

**Revision: D (Current Version)**

Date:	2023-08-18
Notes:	Added power consumption to spec table
Author:	Gary West

**Previous Revisions**

**Revision: C**

Date:	2023-06-09
Notes:	Updated Module Integration Guide Added Packaging & Solder Reflow Profile
Author:	Gary West

**Revision: B**

Date:	2022-10-28
Notes:	Added antenna integration guide
Author:	Gary West

**Revision: A (Original First Release)**

Date:	2022-09-26
Notes:	Initial Release
Author:	Gary West