



# TAOGLAS®



# Datasheet

GNSS Front End Module covering  
L1+B1+G1/L2/L5+L-band

Part No:  
TFM.120A

## Description

Surface mount GNSS front-end module covering L1+B1+G1/L2/L5+L-band

## Features:

Two-stage LNA providing >25 dB Gain across all bands

Low Noise Figure: <3.25 dB in low bands and <3.0 dB in high bands

Vin = +1.8 to +5.5 VDC

Easy to integrate surface-mount

Dimensions: 25mm x 25mm x 4.75mm

RoHS & Reach Compliant

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## Changelog

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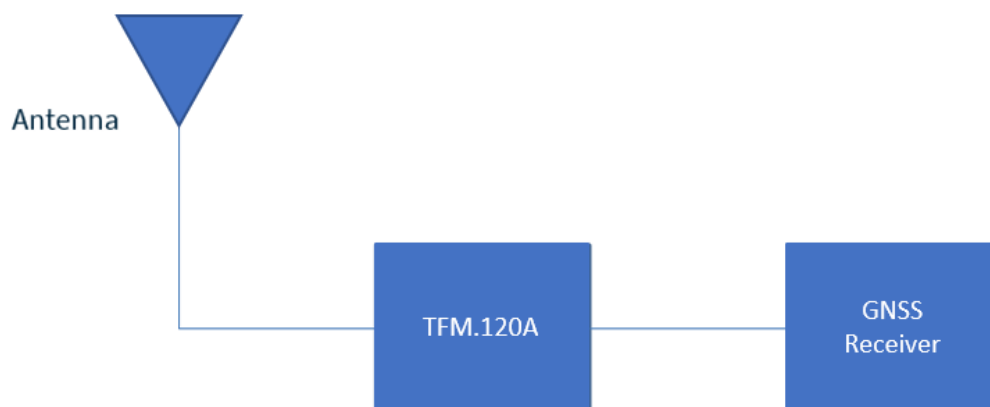
# 1. Introduction



The Taoglas TFM.120A is a surface-mount GNSS front-end which covers L1+B1+G1/L2/L5+L-band for multi-band high-precision applications that require the full spectrum of GNSS constellations. The module features a SAW/LNA/SAW/LNA topology in both the low and high band signal paths 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 module integration. Many organizations don't have the RF expertise to effectively design such a solution. The TFM.120A captures the required additional RF circuits in modular form, allowing the designer to simply place the TFM.120A 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.



## 2. Specification

Electrical						
Frequency (MHz)	1197	1227	1249	1559	1575.42	1606
Noise Figure (dB)*	2.43	1.94	2.12	2.15	2.10	2.12
Gain (dB)	28	29	28	27	27	26
Group Delay (ns)	9.5	8.7	7.8	9.7	9.6	10.4
Input P1dB (dBm)	-31.0	-27.4	-27.1	-24.4	-24.3	-23.2
Input Return Loss (dB)	-9.3	-10.9	-12.0	-16.6	-26.1	-11.5
Output Return Loss	-7.8	-9.4	-8.7	-21.1	-20.0	-20.9
Vin	+1.8 to +5.5 VDC					
Typical Current (@1.8V)	7.5 – 9.0mA					

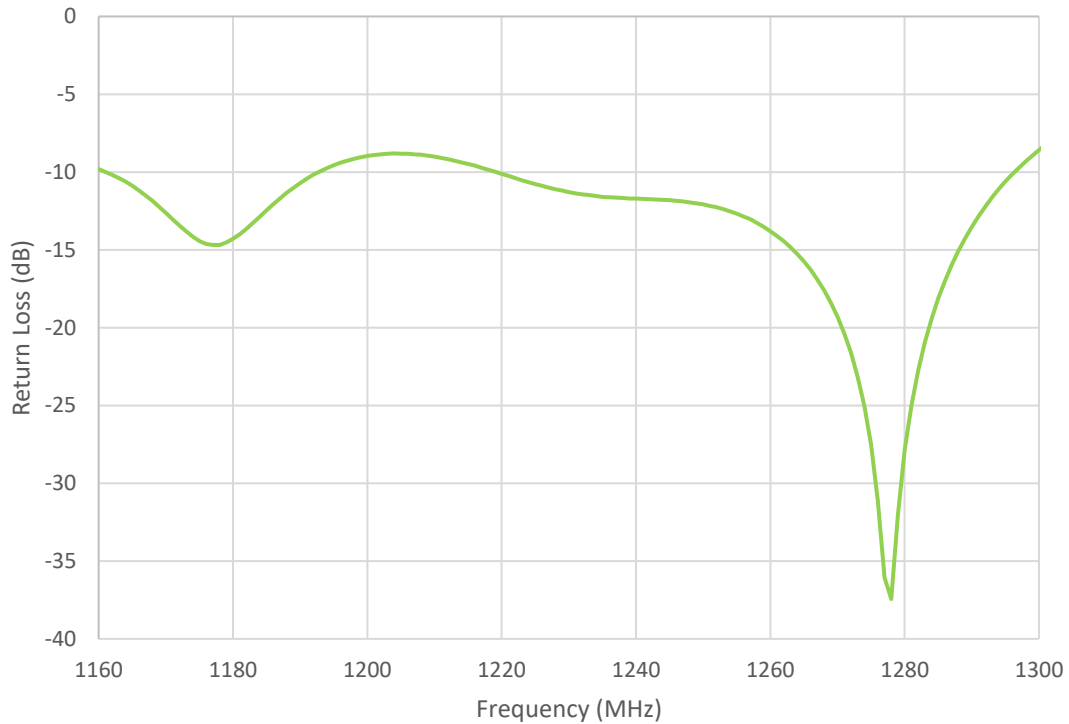
\*Note: Tested on evaluation board. Board losses removed.

Mechanical	
Height	2.75 mm max.
Planar Dimension	25 mm x 25 mm
Weight	2g

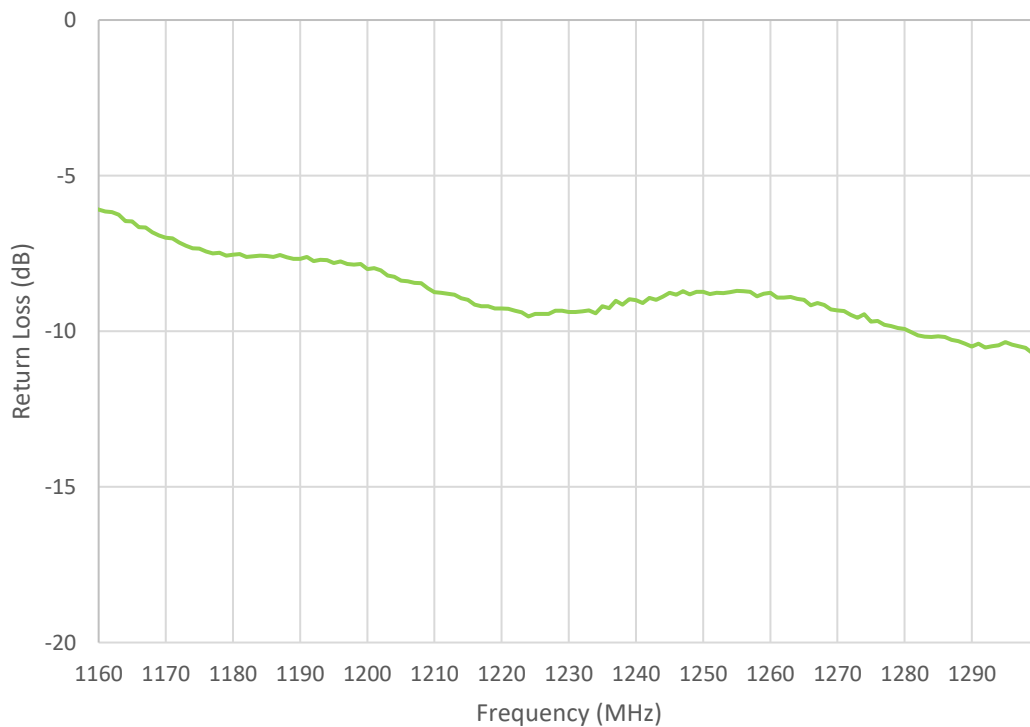
Environmental	
Temperature Range	-40°C to 85°C
RoHS Compliant	Yes
REACH Compliant	Yes

## 3. FEM Low Band Characteristics

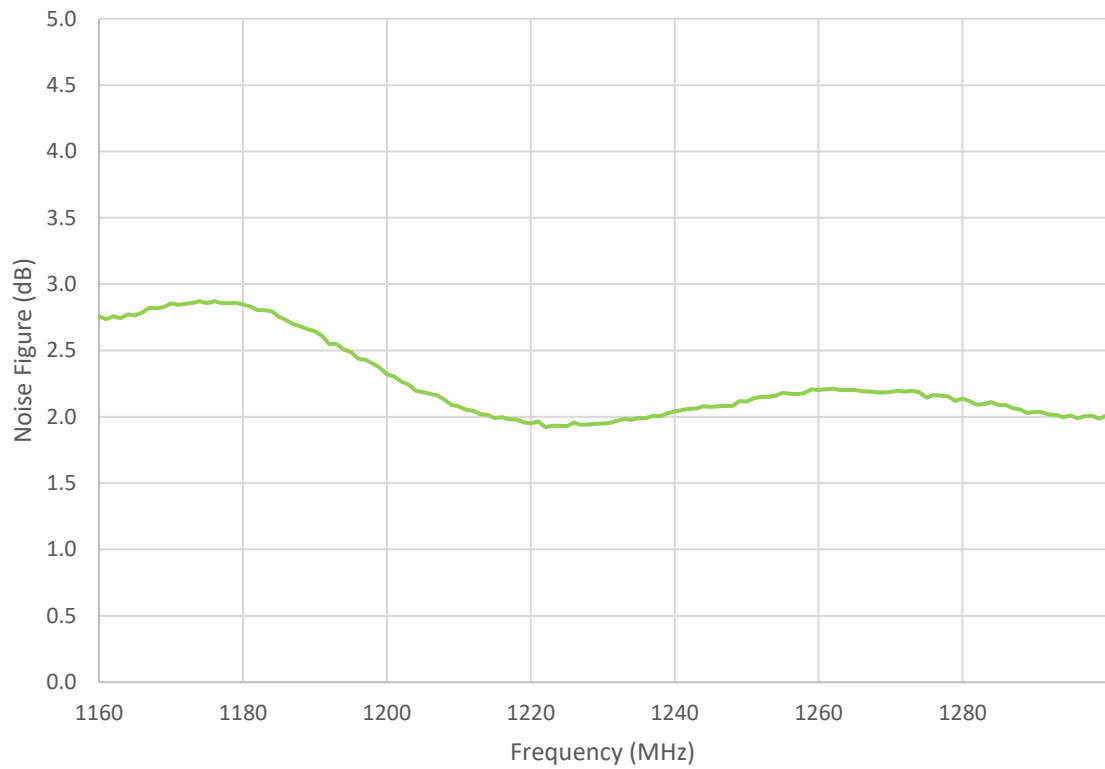
### 3.1 Low Band Input Return Loss



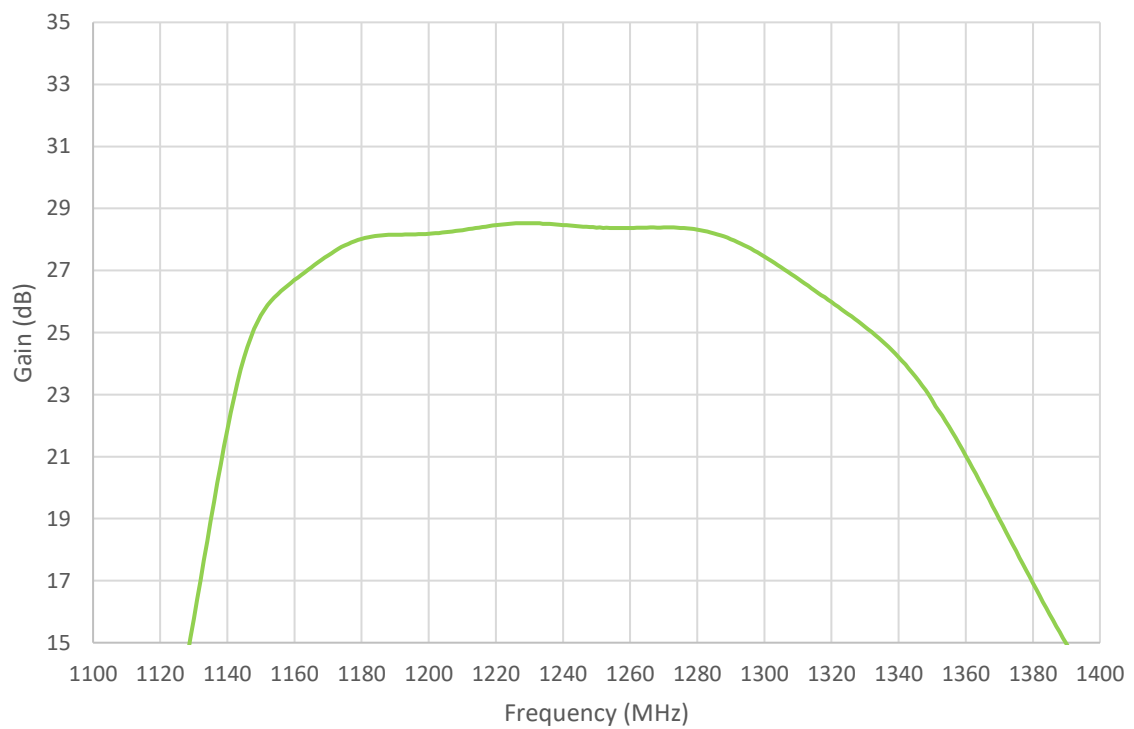
### 3.2 Low Band Output Return Loss



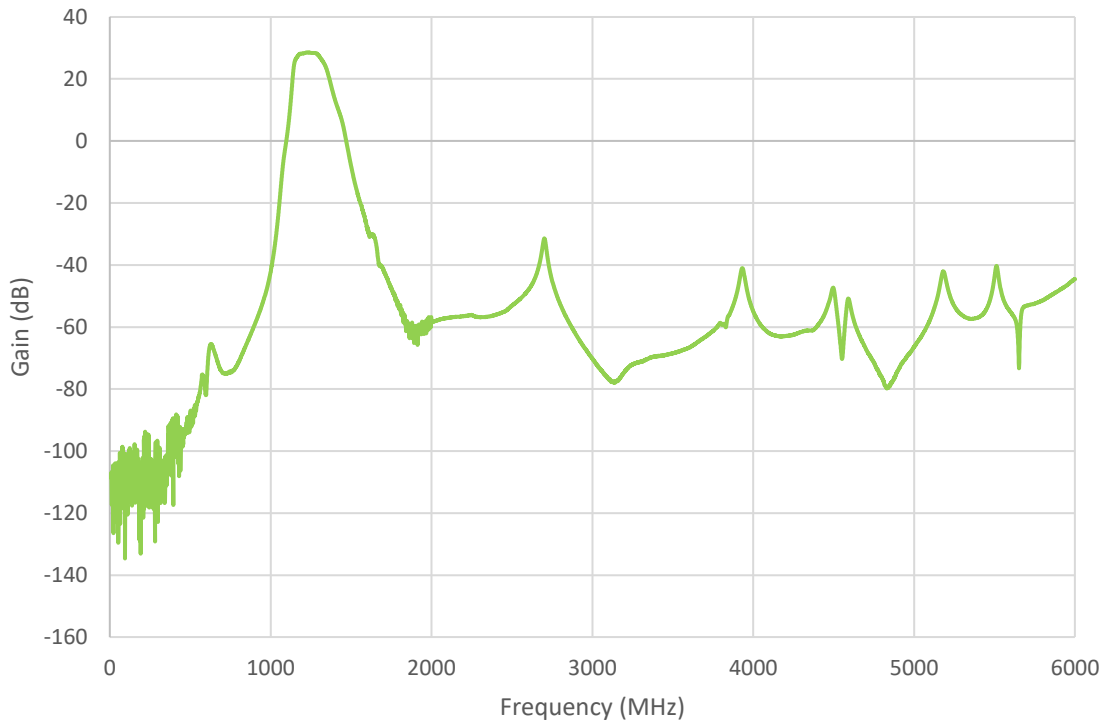
### 3.3 Low Band Noise Figure



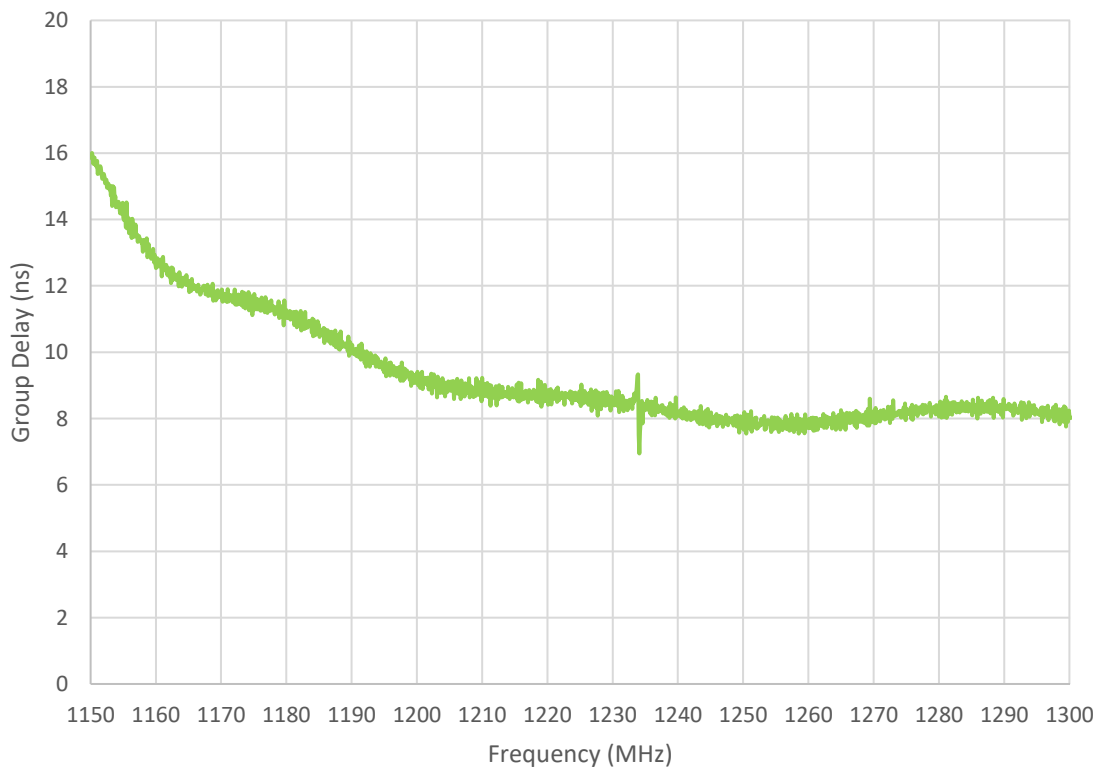
### 3.4 Low Band Gain



### 3.5 Low Band Gain and Attenuation

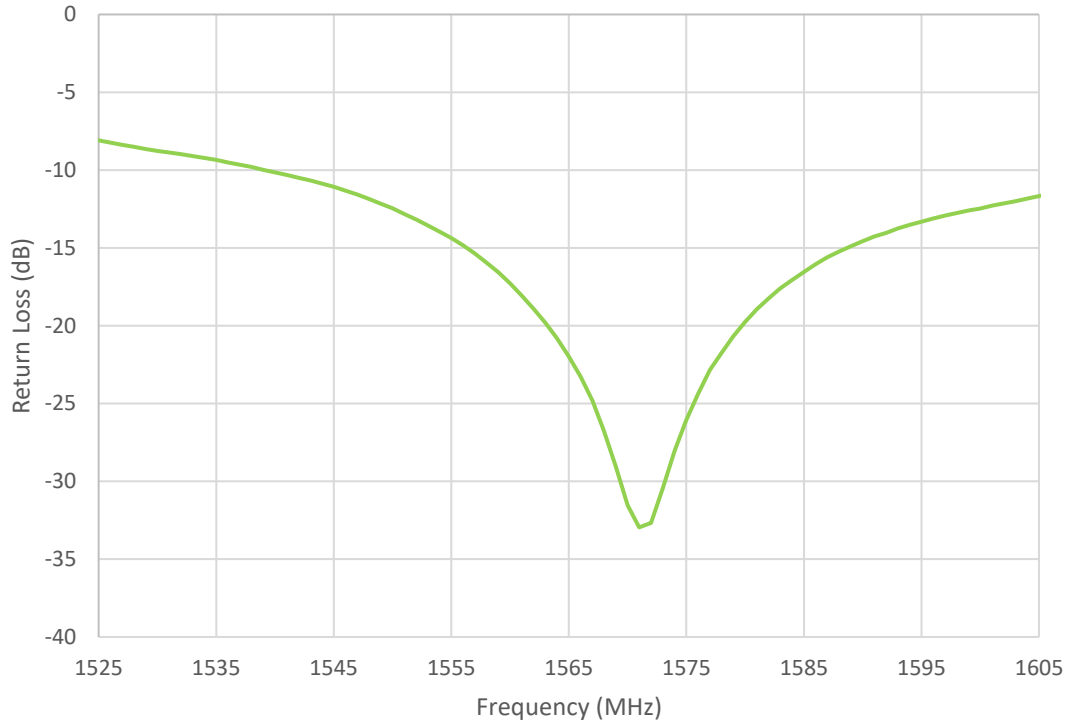


### 3.6 Low Band Group Delay

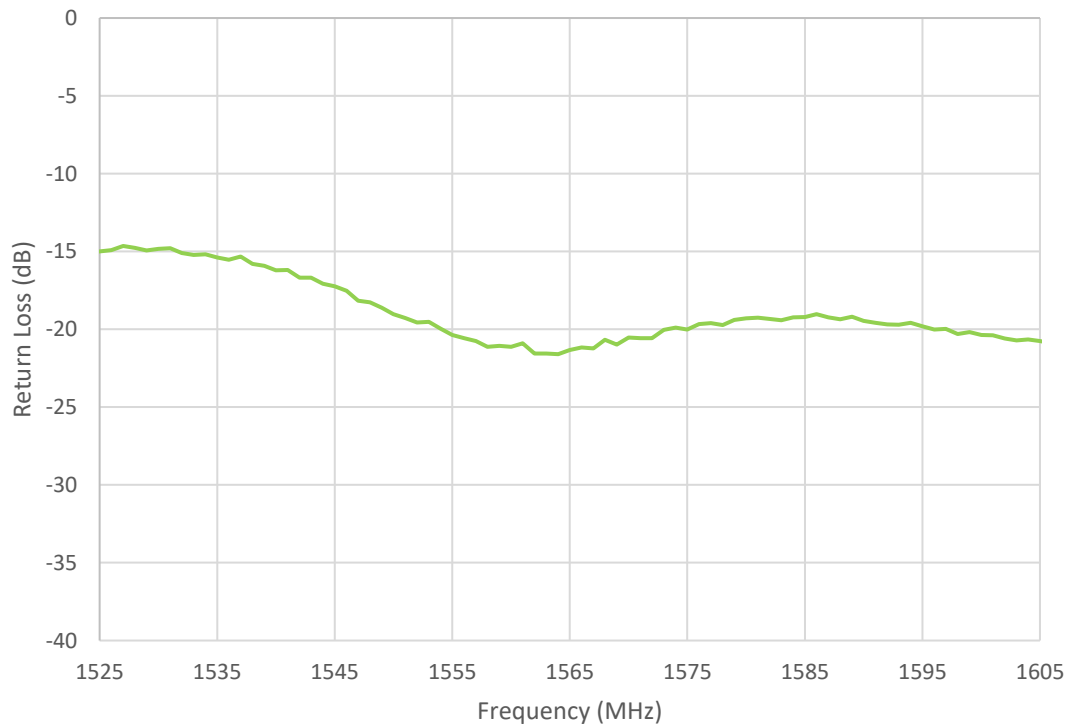


## 4. FEM High Band Characteristics

### 4.1 High Band Input Return Loss

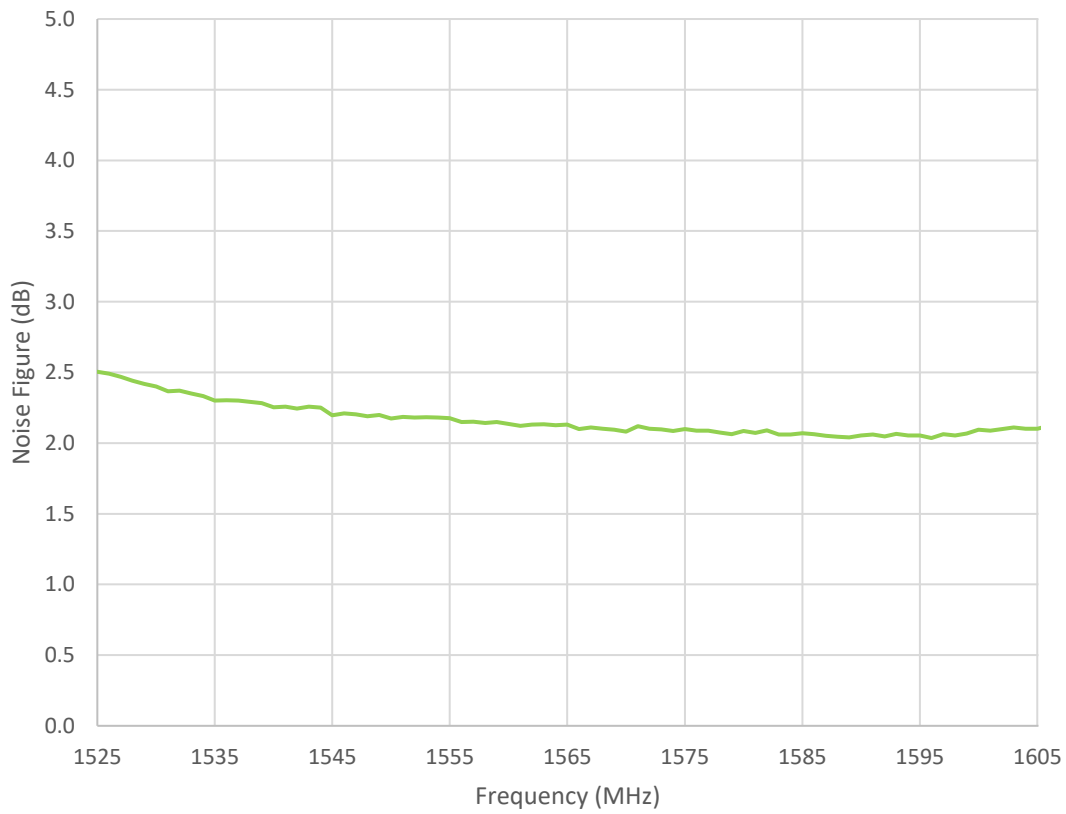


### 4.2 High Band Output Return Loss

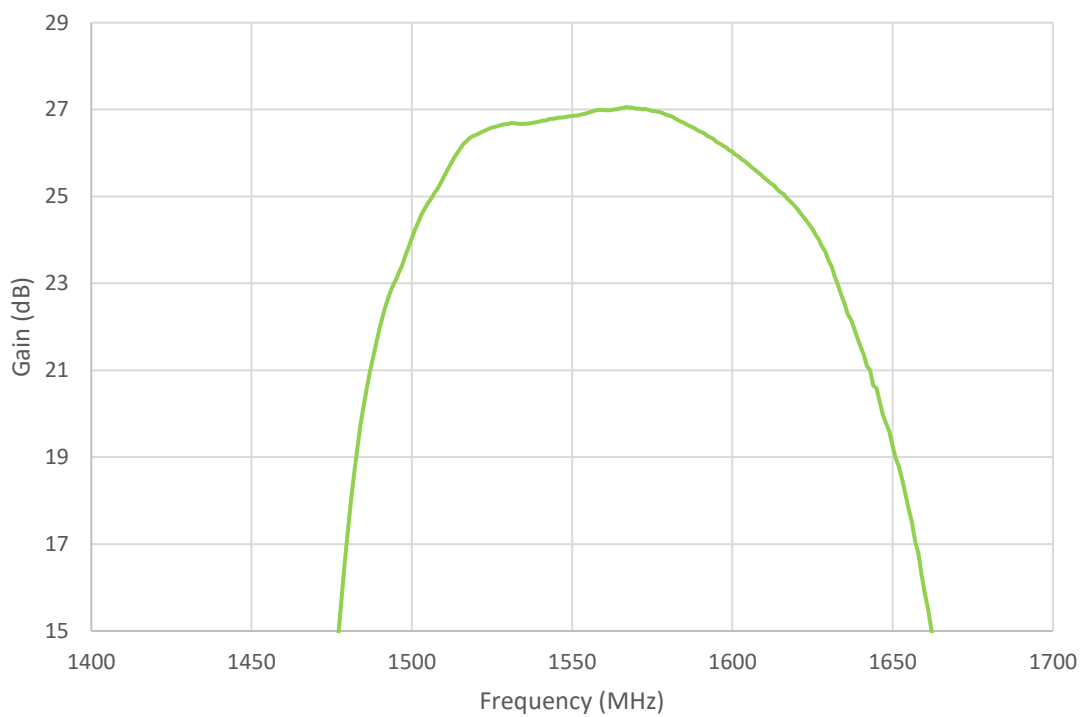




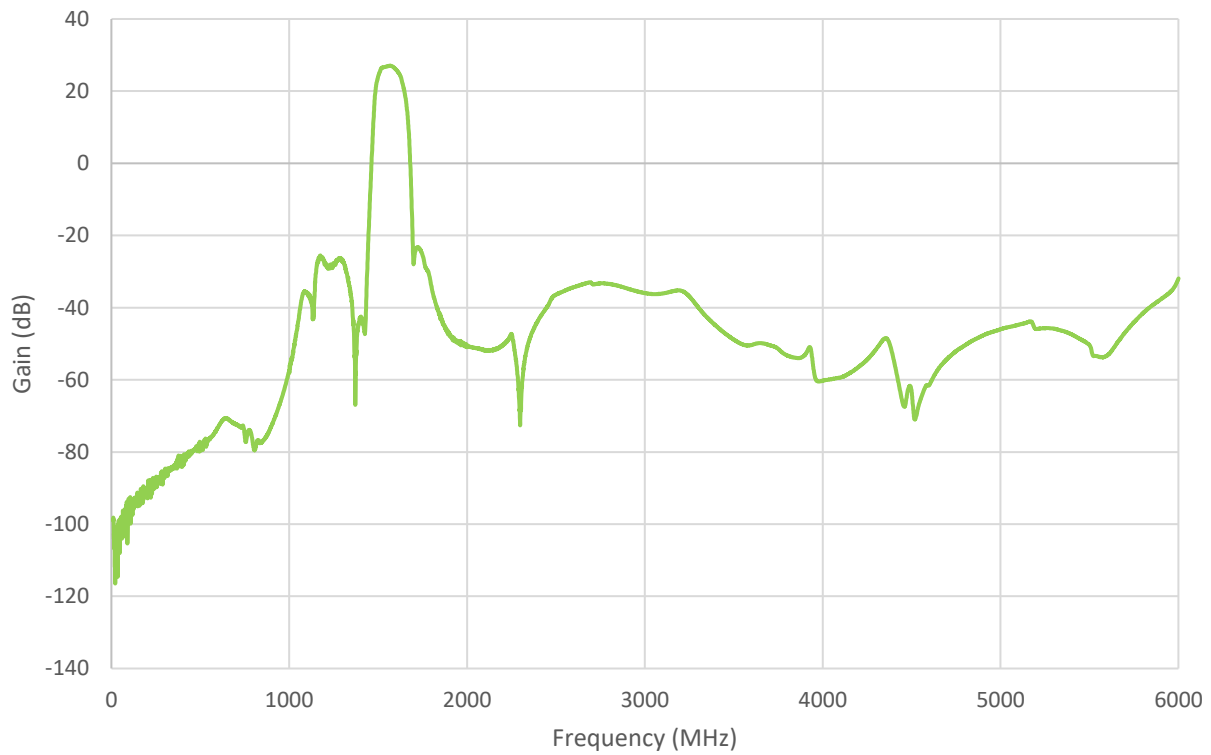
### 4.3 High Band Noise Figure



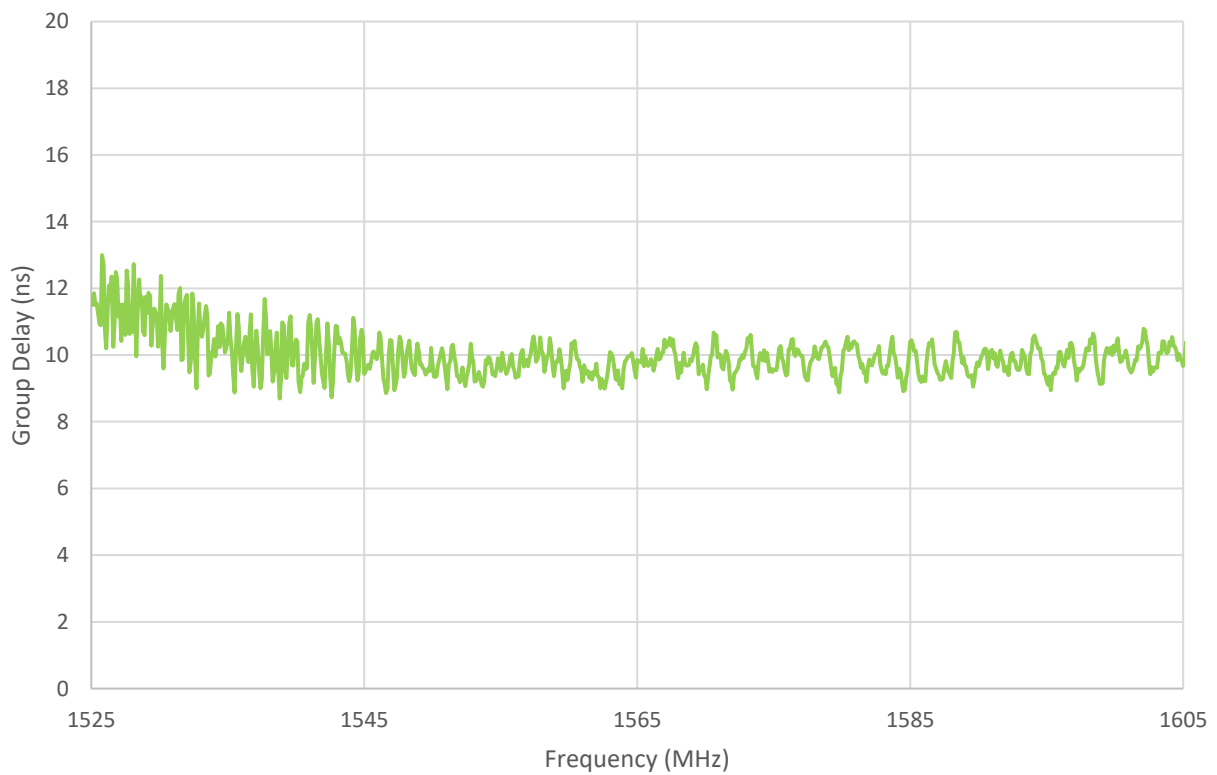
### 4.4 High Band Gain



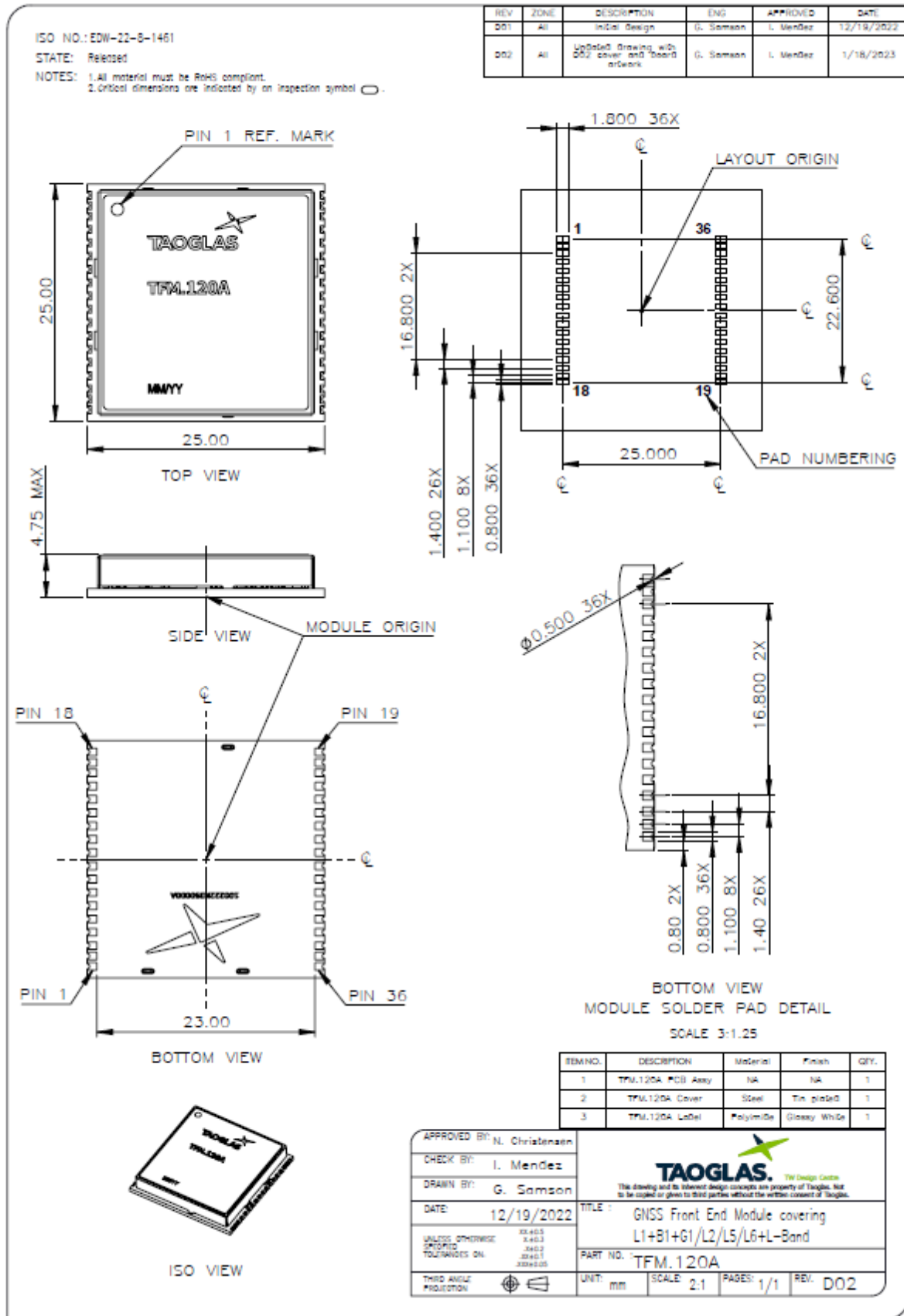
## 4.5 High Band Gain and Attenuation



## 4.6 High Band Group Delay



# 5. Mechanical Drawing



# 6. Eval Board Mechanical Drawing

ISO NO.: EDW-23-8-0062

STATE: RELEASED

NOTES:

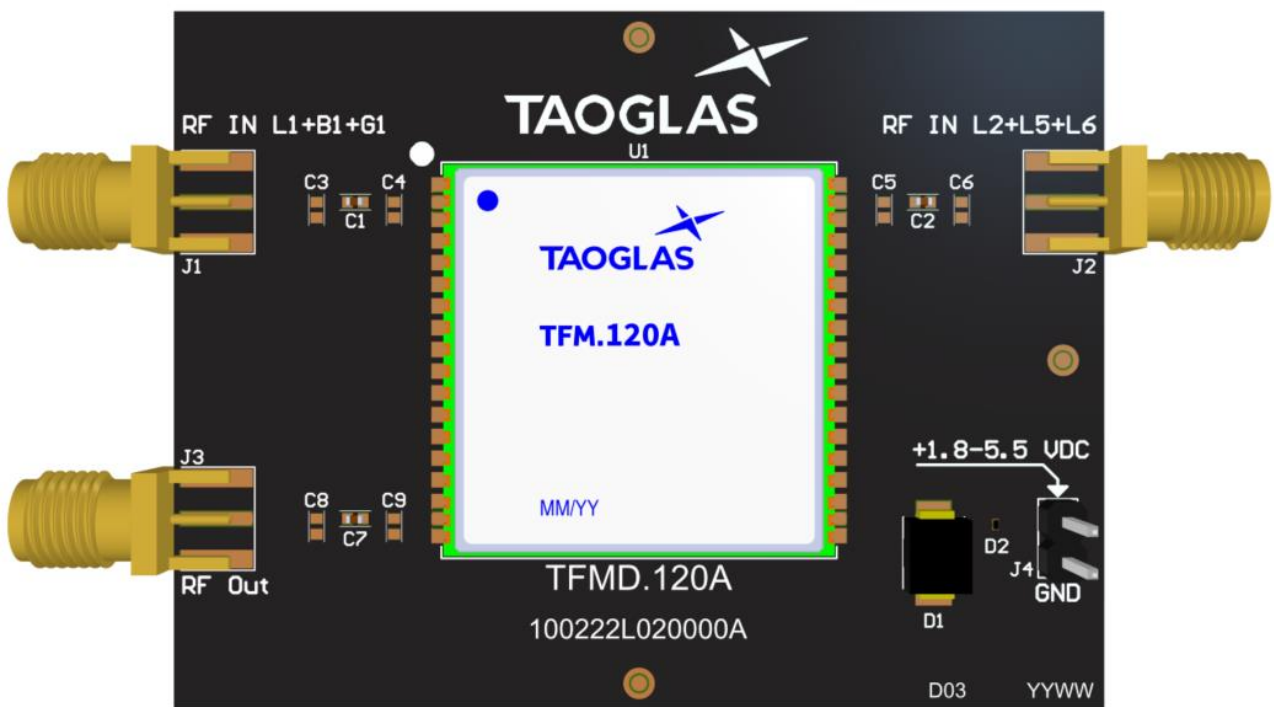
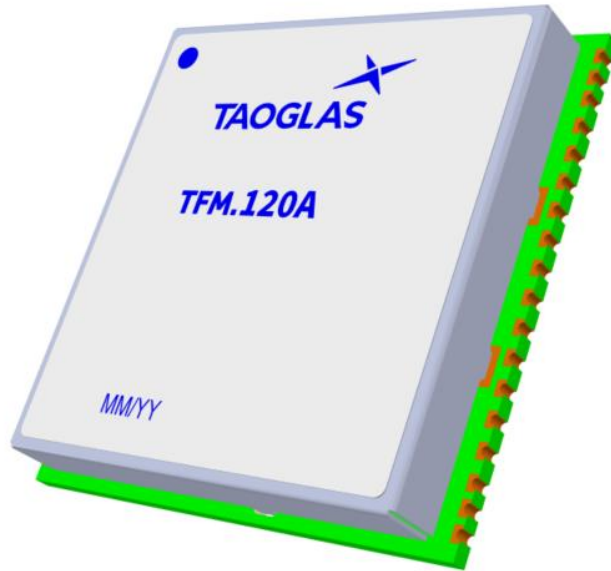
1. ALL MATERIAL MUST BE ROHS COMPLIANT.
2. USE THIS DRAWING TOGETHER WITH THE CORRESPONDING 3D CAD DATABASE FILE TO FULLY DESCRIBE THE PART.
3. CRITICAL DIMENSIONS ARE INDICATED BY AN INSPECTION SYMBOL  $\ominus$ .

REV	ZONE	DESCRIPTION	ENG	APPROVED	DATE
D01	All	Initial Design	G. Samson	I. Mendez	1/4/2022

ITEM NO.	DESCRIPTION	MATERIAL	DESIGNATOR	QTY.
1	TVS DIODE 5.5VWM 7.5VC WLL-2-3	CERAMIC	D1	1
2	CERAMIC CAP 0402 1000pf	CERAMIC	C1, C2, C7	3
3	CONN HEADER VERT 2POS	BRASS/PLASTIC	J4	1
4	CONN SMA JACK STR 50OHM EDGE MNT	BRASS	J1, J2, J3	3
5	TFM.120A GNSS EVALUATION BOARD	FR4	NA	1
6	TFM.120A GNSS FRONT END MODULE	NA	U1	1

APPROVED BY:	N. Christensen		
CHECK BY:	I. Mendez		
DRAWN BY:	G. Samson		
DATE:	1/4/2022	TITLE:	GNSS FRONT END MODULE EVALUATION BOARD COVERING L1+B1+G1/L2/L5/L6+L-BAND
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	DIMENSIONS: 0.125mm ANGLES: 0.125mm HOLES: 0.125mm DRILLING: 0.125mm	PART NO.:	TFMD.120A
THIRD ANGLE PROJECTION		UNIT:	mm
		SCALE:	1:1
		PAGE:	1/1
		REV:	D01

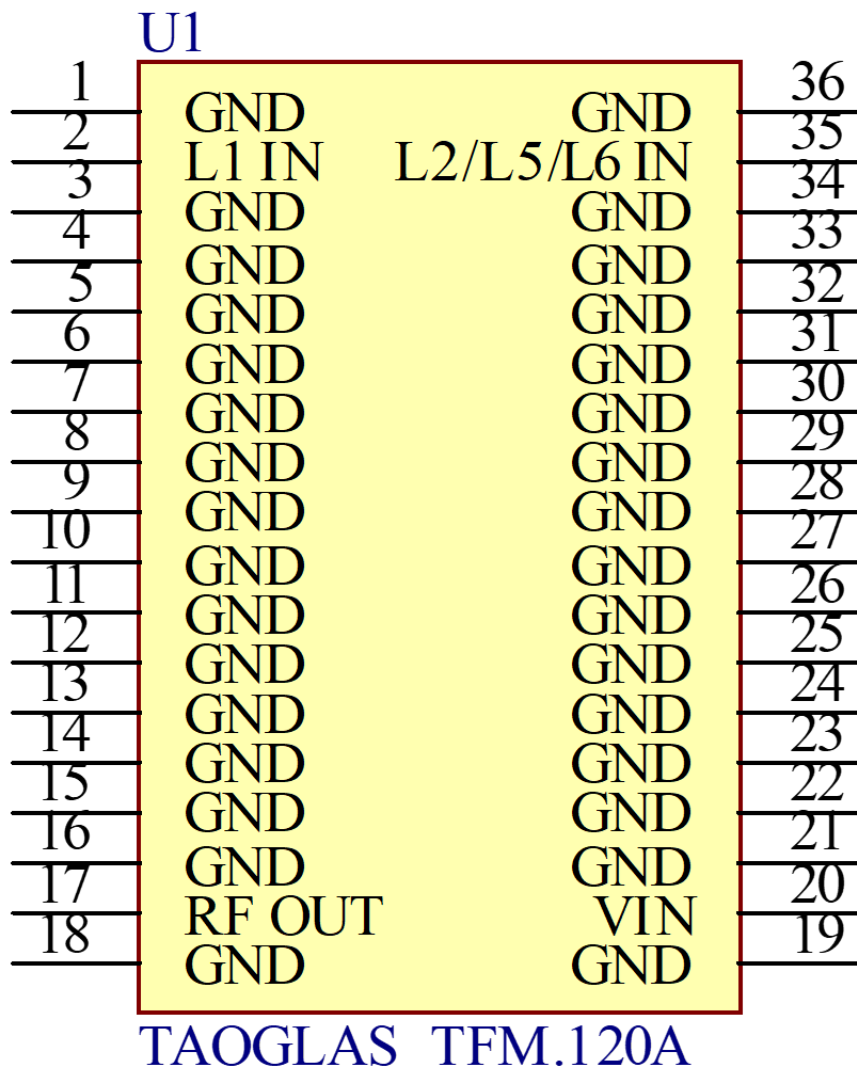
## 7. Module Integration



## 7.1 Schematic Symbol and Pin Definitions

The circuit symbol for the TFM.120A is shown below. The front-end module has 36 pins as indicated below.

Pin	Description
1, 3-15, 17-18, 20-32, 34	Ground
2	L1 Input
17	Signal Output
20	Voltage Input
35	L2/L2/L6 Input



## 7.2 Module Integration

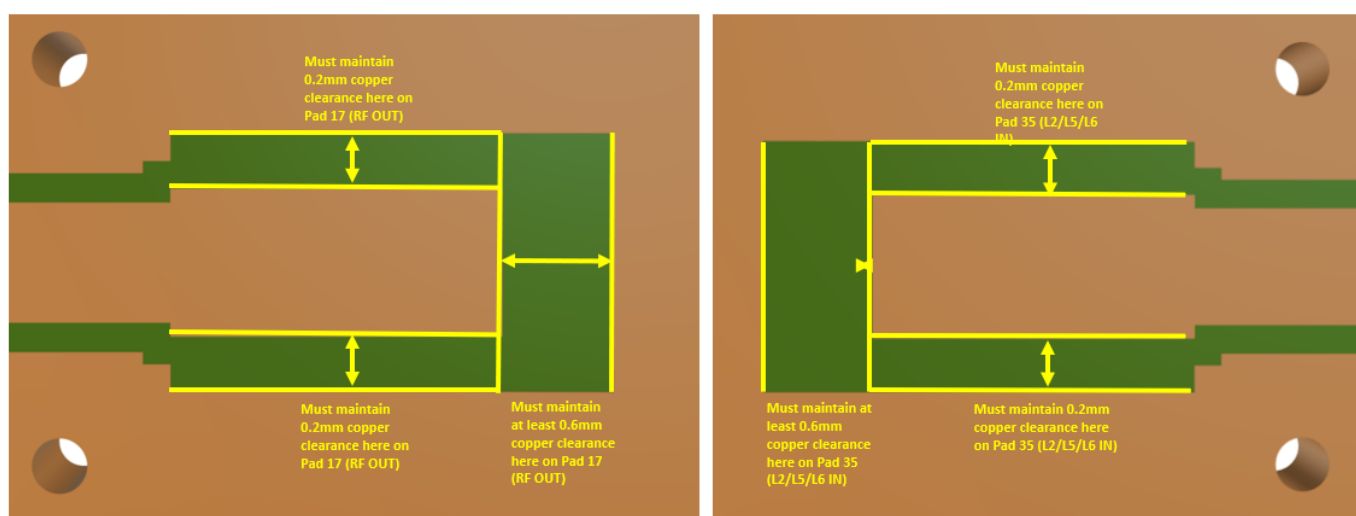
The TFM.120A should be placed as close to the signal input and output as possible to shorten the length of the transmission lines. The RF IN/OUT traces must maintain a 50 Ohm transmission line. A Pi Matching Network is recommended for the RF IN transmission lines, the values and components for the matching 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 and an ESD Diode.



Top Side w/o Solder Mask

## 7.3 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.120A clearance area for Pin 17 (RF OUT Pad) & Pin 35 (L2/L5/L6 IN Pad). This clearance also applies to Pin 2 (L1 IN Pad). The copper keep out area only applies to the same layer the TFM.120A was placed.

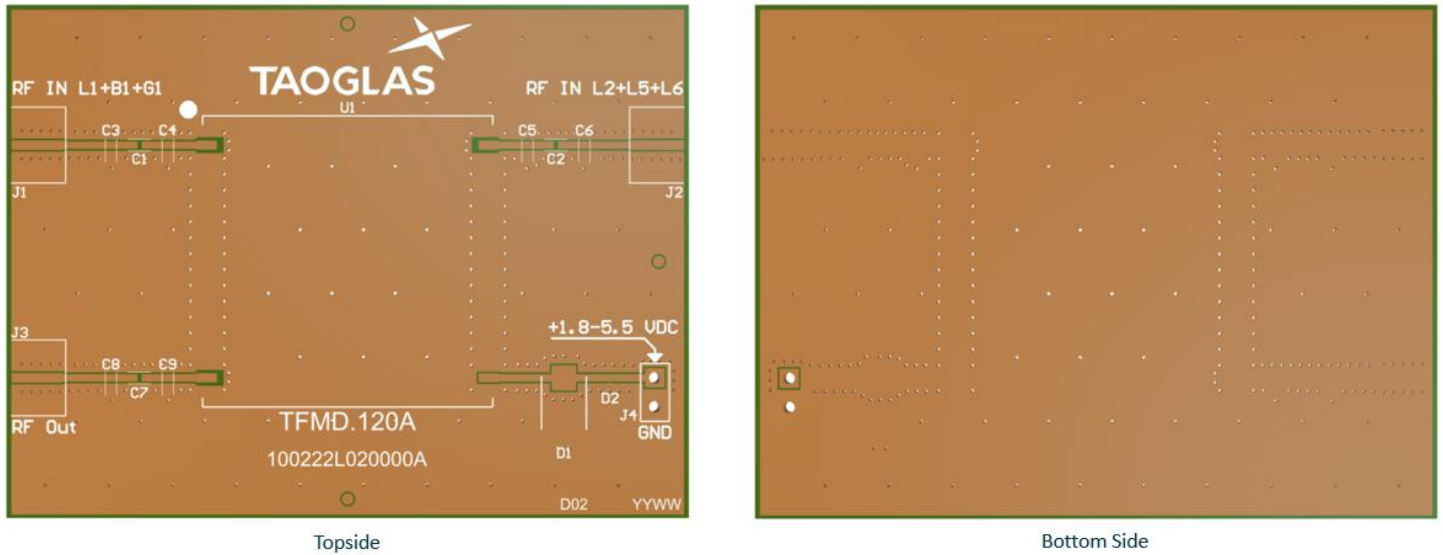


Pin 16 (RF OUT Pad)

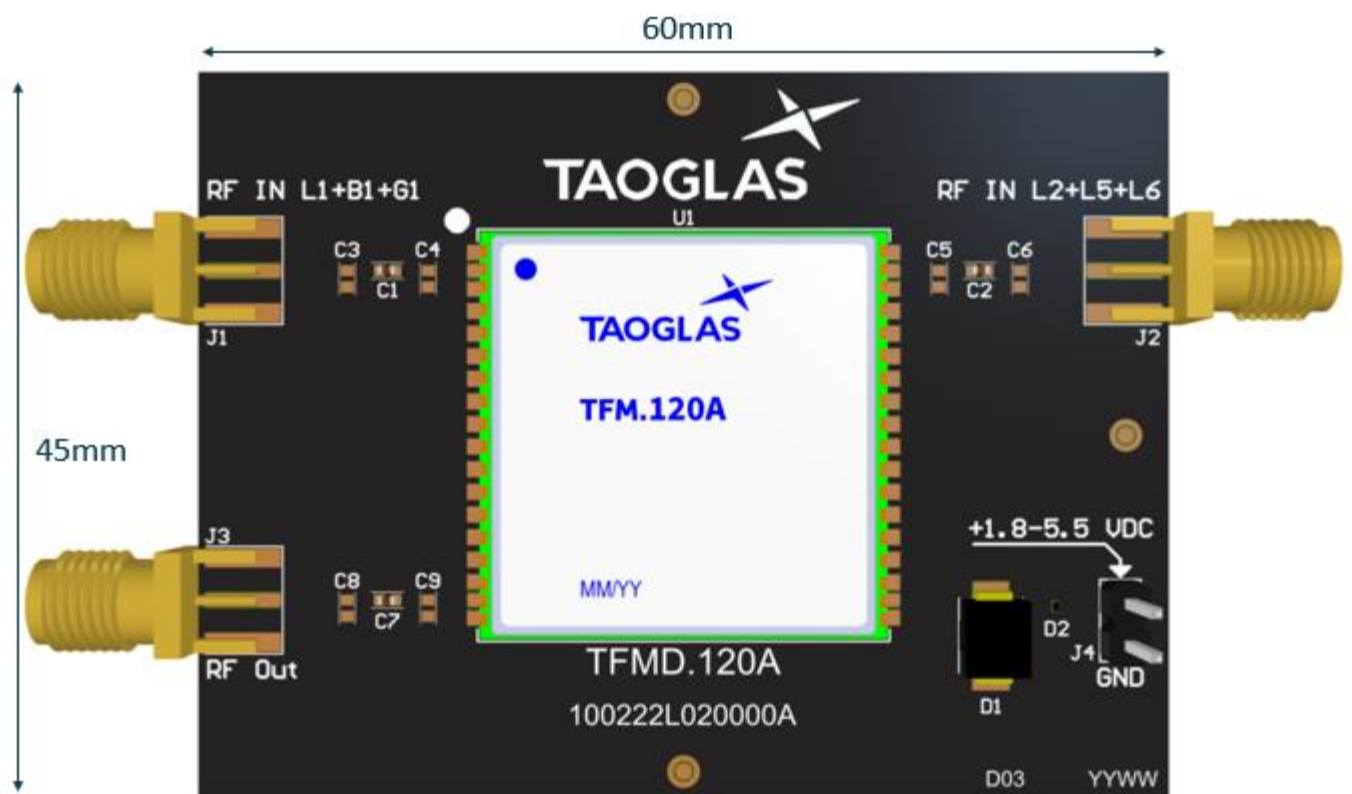
Pin 35 (L2/L5/L6 IN Pad)

## 7.4 PCB Layout

The footprint and clearance on the PCB must comply with the module specification. The PCB layout shown in the diagram below demonstrates the module footprint.



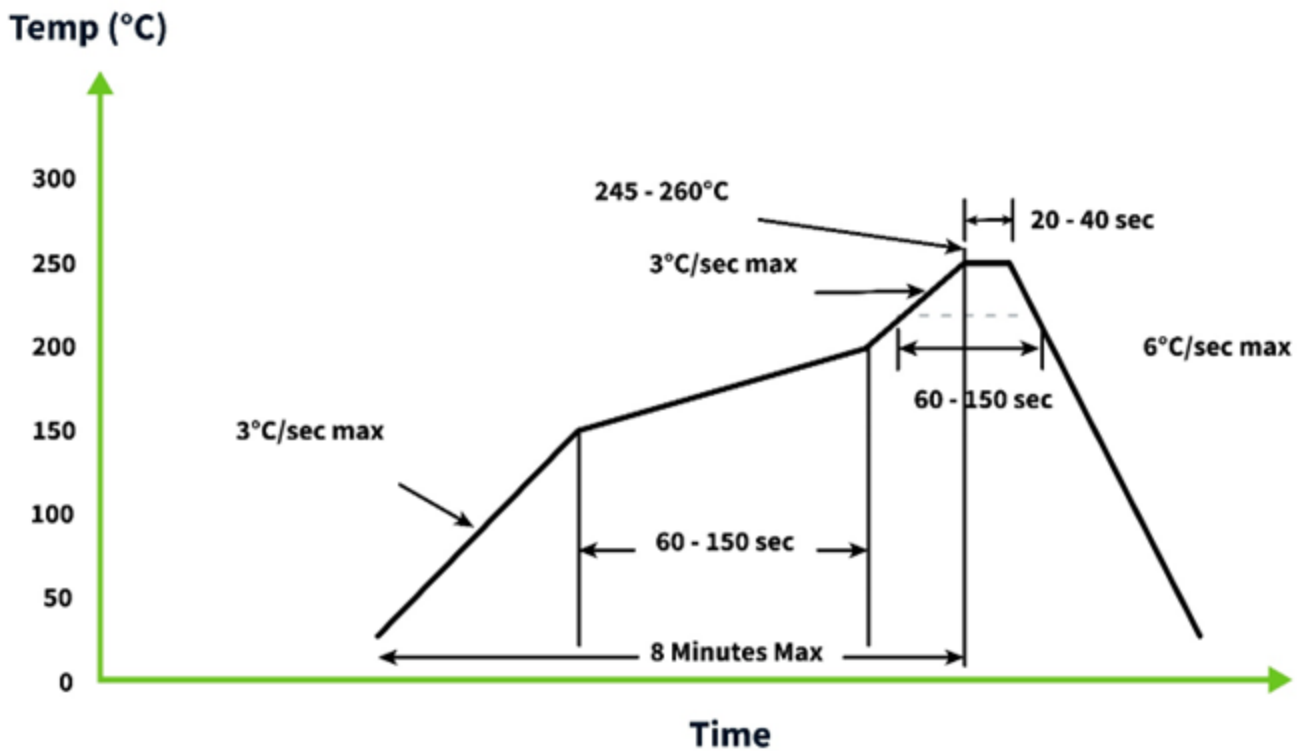
## 7.5 Evaluation Board





## 8. Solder Recommendations

The TFM.120A can be assembled by following the recommended soldering temperatures as follows:



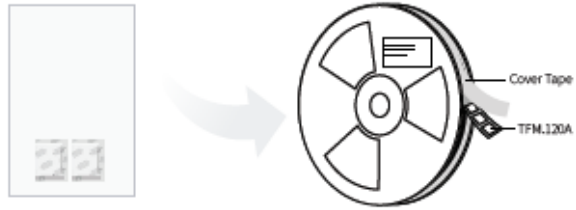
Smaller components are typically mounted on the first pass, however, we do advise mounting the TFM.120A when placing larger components on the board during subsequent reflows.

## 9. Packaging

350 PCS / Reel  
SPQ Label



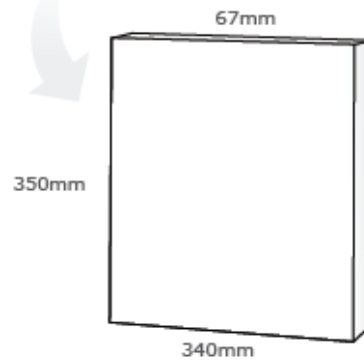
350 PCS / Vacuum bag  
2 PCS / 3g Desiccant  
1 PCS / Humidity test paper  
SPQ Label



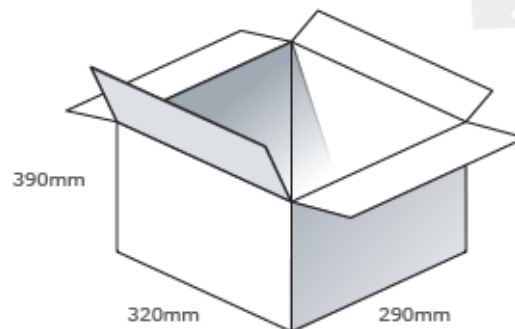
Caution Label  
Product Label  
SPQ Label



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



1050 PCS / Carton  
Carton(mm): 390x320x290  
Weight (Kg): 7  
Carton Label



Changelog for the datasheet

**SPE-23-8-172 – TFM.120A**

**Revision: B (Current Version)**

Date:	2023-09-04
Notes:	Updated solder reflow recommendations and electrical specification table
Author:	Cesar Sousa

**Previous Revisions**

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

Date:	2023-05-08
Notes:	Initial Release
Author:	Gary West



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