

## L1 band satellite navigation RF front-end low noise amplifier chip

# AT2659

### 1. Overview

AT2659 is a low noise amplifier (LNA) chip with high gain and low noise figure.

Supports L1 band multi-mode global satellite positioning, which can be applied to GPS, Beidou II, Galileo, Glonass

The chip is manufactured using advanced SiGe technology and adopts a 1.5 mm × 1 mm × 0.78 mm 6-pin DFN package.

### application

Automatic navigation

Location-enabled mobile devices

Personal Navigator

Mobile phone with integrated GPS

Notebook/PAD

Underwater navigation

Aviation equipment

## Main Features

--Support multiple satellite navigation systems in L1 frequency band, including Beidou, GPS, GALILEO, GLONASS, etc.

--Typical noise figure: 0.80dB;

--Typical power gain: 21.5dB;

--Typical input P1dB: -14dBm;

--Working frequency: 1550MHz ~ 1615MHz;

--Current consumption: 4.3mA;

- Wide supply voltage range: 1.4V ~ 3.6V;

- 2.5KV HBM ESD pin protection circuit;

--Internally integrated 50Ω output matching circuit;

--Simple peripheral circuit

## 2. Pinout, Function and Typical Application Block Diagram

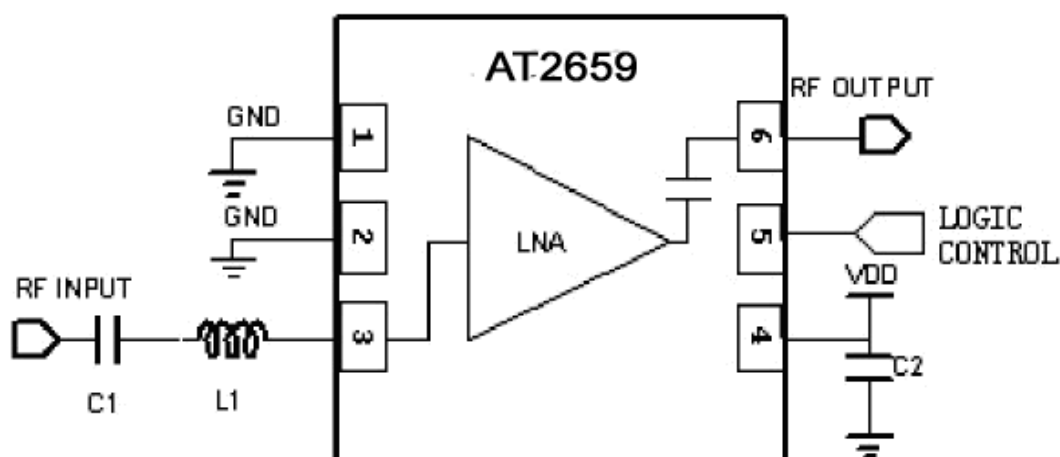


Figure 1. Typical application block diagram

Pins	name	Function
1, 2	GND	Grounding
3	RFIN	RF Input
4	VDD	power supply
5	$\overline{\text{SHDN}}$	Working (high level), sleeping (low level),
6	RFOUT	RF Output

Table 1. Pin Description

Component number	describe
C1	LNA input DC blocking capacitor, 470pF
C2	Power supply bypass capacitor, 33 nF
L1	LNA input matching inductor 6.8 nH

Table 2. Peripheral Component Description

### 3. DC electrical characteristics

parameter	condition	Minimum	Typical Value	Maximum	unit
Supply voltage		1.4	3.0	3.6	V
Supply Current	$\overline{\text{SHDN}} = 1$		4.3		mA
	$\overline{\text{SHDN}} = 0$		2	4	uA
Digital input logic high		1.1			V

Digital input logic low				0.4	V
RFIN DC bias voltage	$\overline{\text{SHDN}} = 1$		0.83		V

#### 4.AC electrical characteristics: Table 1 (center frequency 1575.42 MHz, 2.85V supply voltage)

parameter	condition	Minimum	Typical Value	Maximum	unit
Operating frequency		1550	1575.42	1615	MHz
Power Gain			21.5		dB
Noise Figure			0.80		dB
Input return loss	L1:6.8nH		15		dB
Output return loss			15		dB
Reverse Isolation			30		
Input IP3	Note 1		- 5		dBm
Input P1dB			- 14		dBm

Note 1: Two input signals with deviations from the center frequency (1575.42MHz) of 5MHz and 10MHz are used.

The input signal strength is -40dBm;

#### 5.AC electrical characteristics: Table 2 (center frequency 1561.098 MHz, 3V supply voltage)

parameter	condition	Minimum	Typical Value	Maximum	unit
Operating frequency		1550	1561.098	1615	MHz
Power Gain			20.5		dB
Noise Figure			0.80	0.93	dB
Input return loss	L1:6.8nH		15		dB

Output return loss			15		dB
Reverse Isolation			32		
Input IP3	Note 2		- 5		dBm
Input P1dB			- 14		dBm

Note 2: Two input signals with deviations from the center frequency (1561.098MHz) of 5MHz and 10MHz are used.

The input signal strength is -40dBm;

#### 6.AC electrical characteristics: Table 3 (center frequency 1602 MHz, 3V supply voltage)

parameter	condition	Minimum	Typical Value	Maximum	unit
Operating frequency		1550	1602	1615	MHz
Power Gain			21.5		dB
Noise Figure			0.80	0.93	dB
Input return loss	L1:6.8nH		15		dB
Output return loss			15		dB
Reverse Isolation			31		
Input IP3	Note 3		- 5		dBm
Input P1dB			- 14		dBm

Note 3: Two input signals with deviations from the center frequency (1575.42MHz) of 5MHz and 10MHz are used.

The input signal strength is -40dBm;

## 5. Typical operating characteristics

Typical operating conditions are: evaluation board level test, temperature is 25°C, power supply voltage is 2.85V, input

The signal is the center frequency signal (unless otherwise specified) .

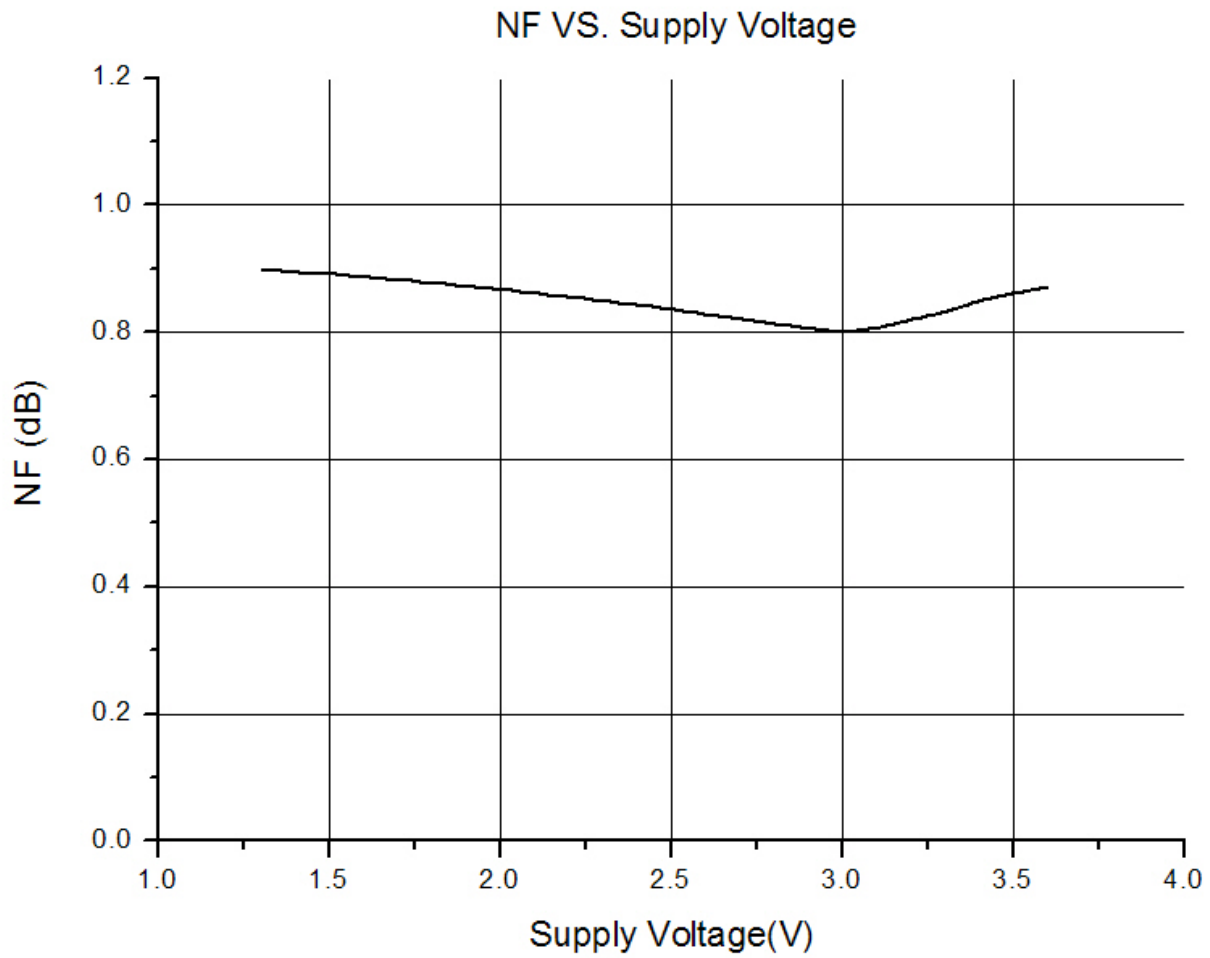


Figure 1. Noise figure vs. supply voltage curve

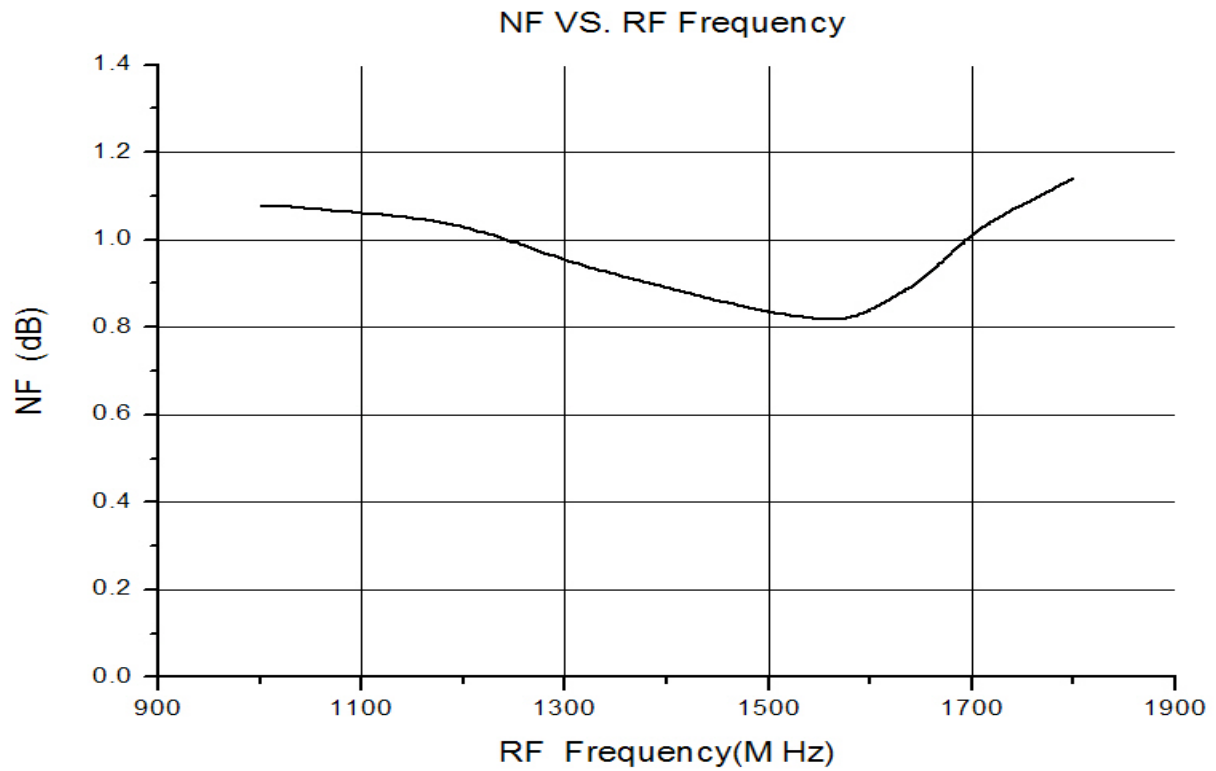


Figure 2. Noise figure vs. operating frequency

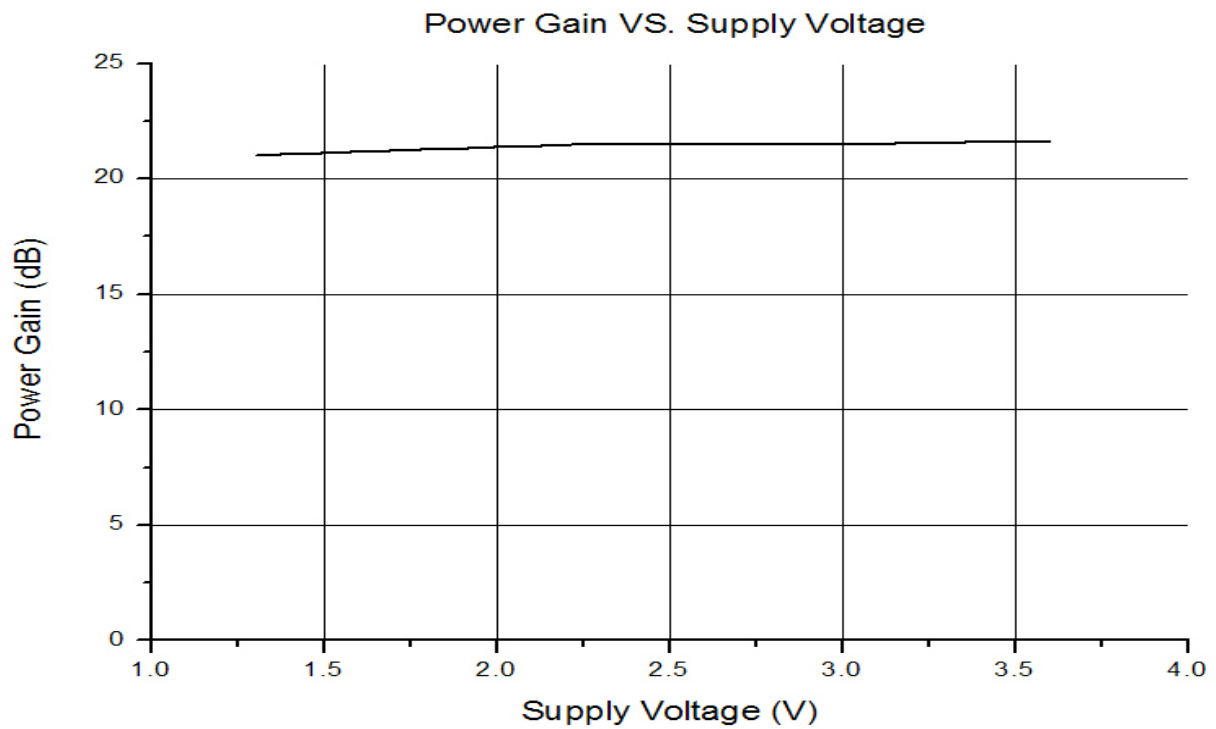


Figure 3. Power gain vs. supply voltage curve

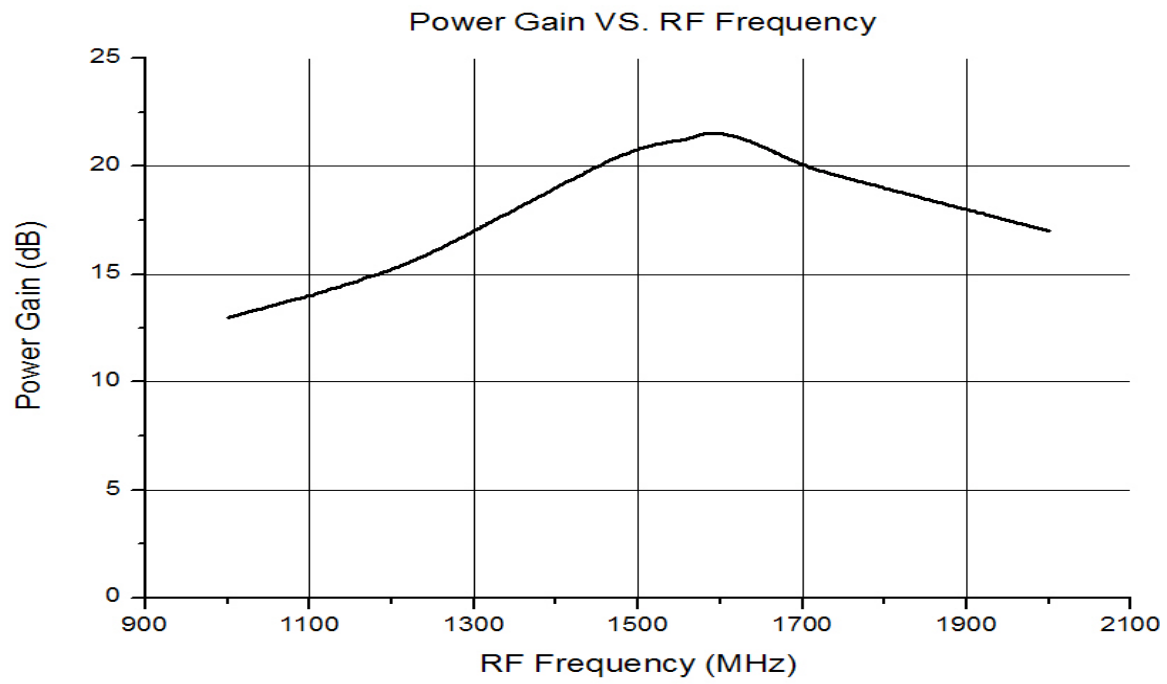


Figure 4. Power gain vs. operating frequency curve

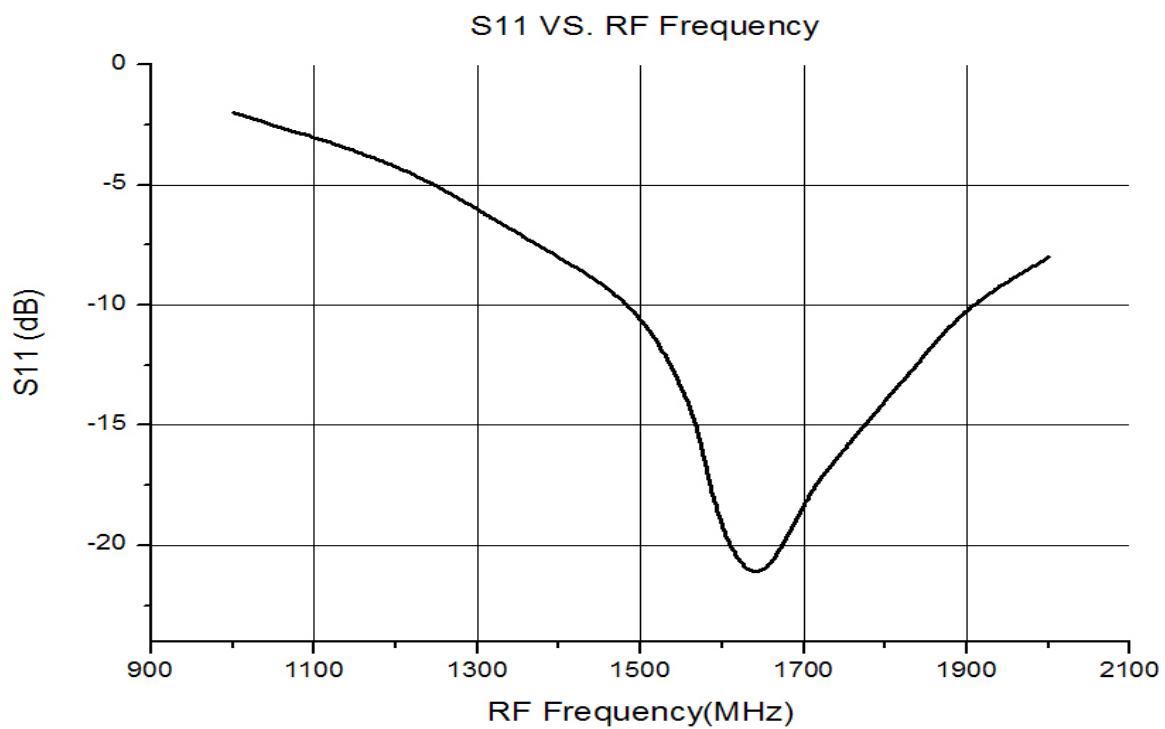


Figure 5. Input return loss vs. operating frequency



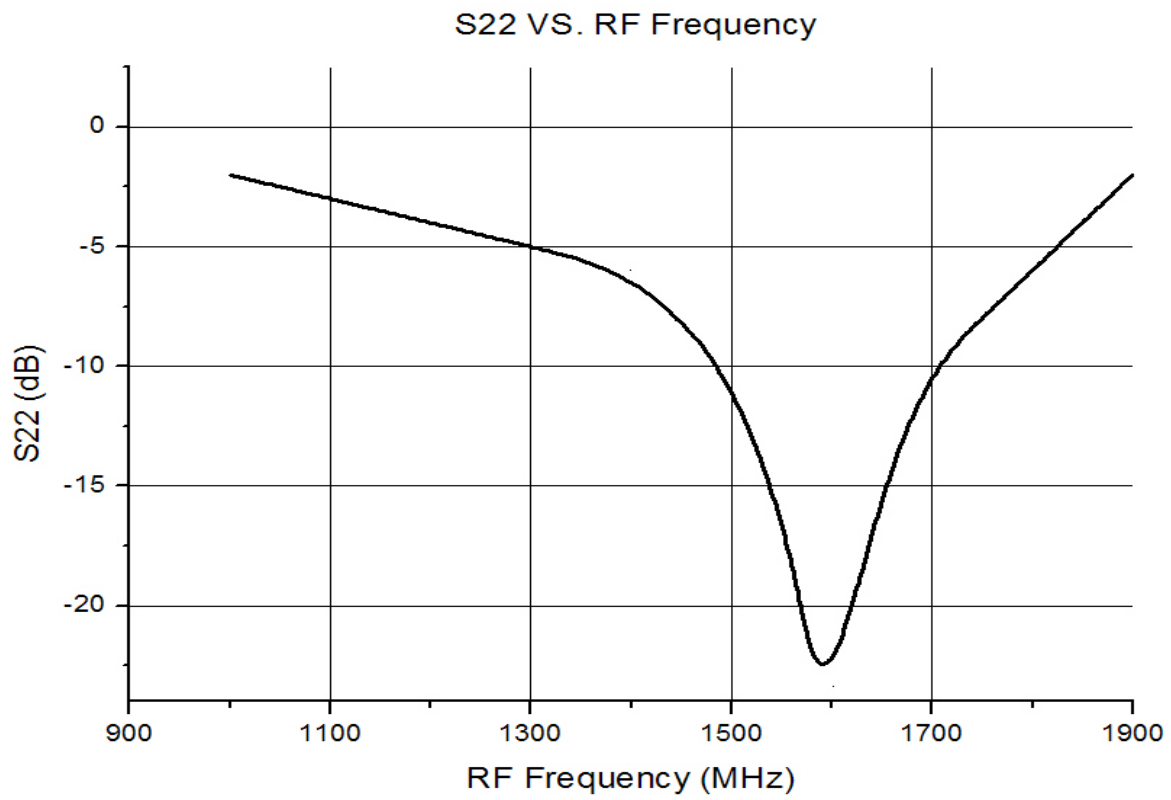
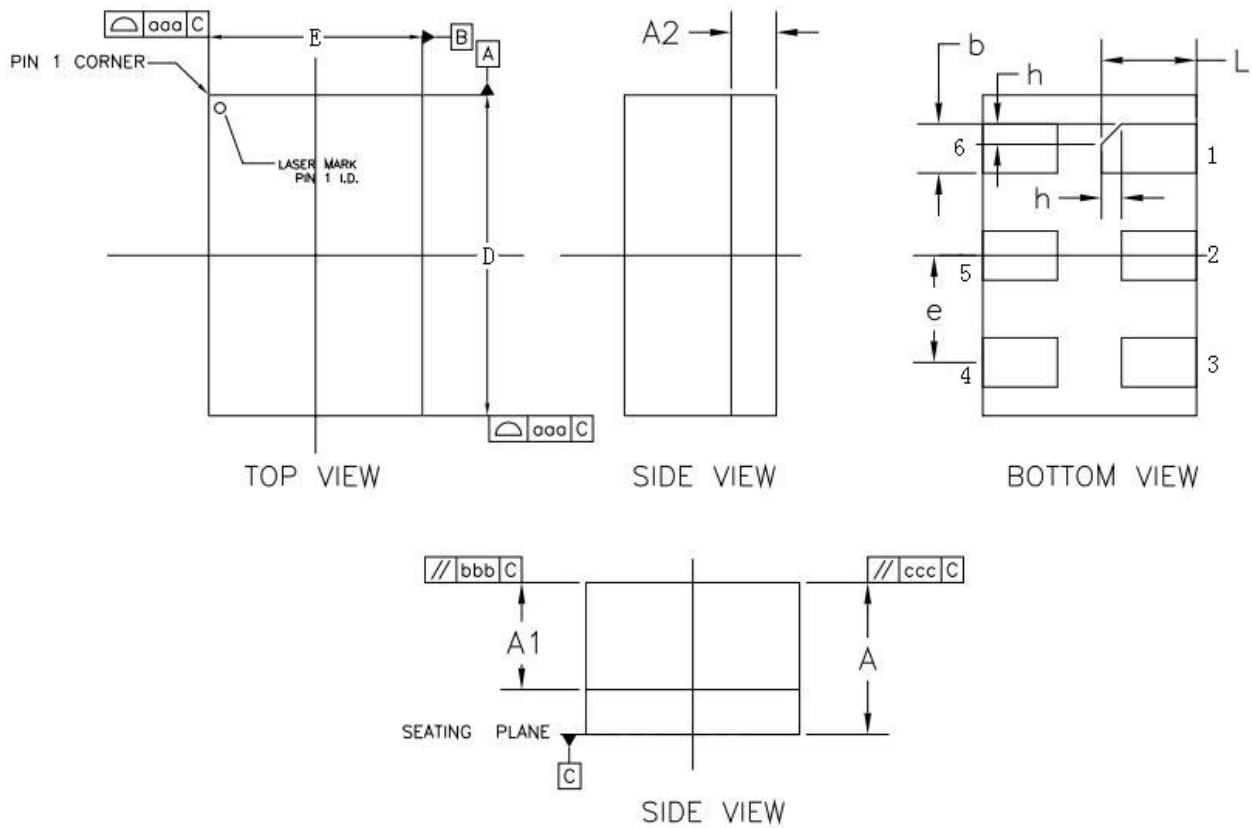


Figure 6. Output return loss vs. operating frequency curve

## 6. Packaging description



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	---	---	0.80
A2	0.17	0.21	0.25
A1	0.50 BASIC		
D	1.40	1.50	1.60
E	0.90	1.00	1.10
b	0.18	0.23	0.28
e	0.45	0.50	0.55
L	0.345	0.445	0.545
h	0.045	0.095	0.145
aaa	0.15		
bbb	0.25		
ccc	0.20		