AN11090

50 Ohm FM LNA for embedded Antenna in Portable applications with BGU6102

Rev. 1.0 — 23 November 2011 Application note

Document information

Info	Content
Keywords	BGU6102, LNA, FM, embedded Antenna
Abstract	The document provides circuit, layout, BOM and performance information on FM band using BGU6102

Revision history

Rev	Date	Description
1.0	20111123	Initial document

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1. Introduction

„Music" as mobile value proposition has become increasingly popular in recent years. Transferring MP3 from the PC and playing on the mobile is now common, eased by decline in memory prices. This trend has re-ignited interest in FM Radio on Mobile as people want to keep up with the news, listen to new music, in addition to playing their MP3 collection.

With NXP„s FM LNA"s consumers can listen to FM Radio on their mobile phone speaker. The LNA"s amplify the weak signal solving impedance mismatch between embedded antennas and the FM Radio receiver.

2. Application Circuit

The FM LNA application circuit is built with BGU6102 (LNA MMIC). It needs 8 (11 components used in the EVB) external components for matching, biasing and decoupling. An optional external ESD protection diode can be used to improve the system"s ESD performance. The layout has also additional foot prints for 0402 components, those are reserved for different applications or ESD protection and matching purposes.

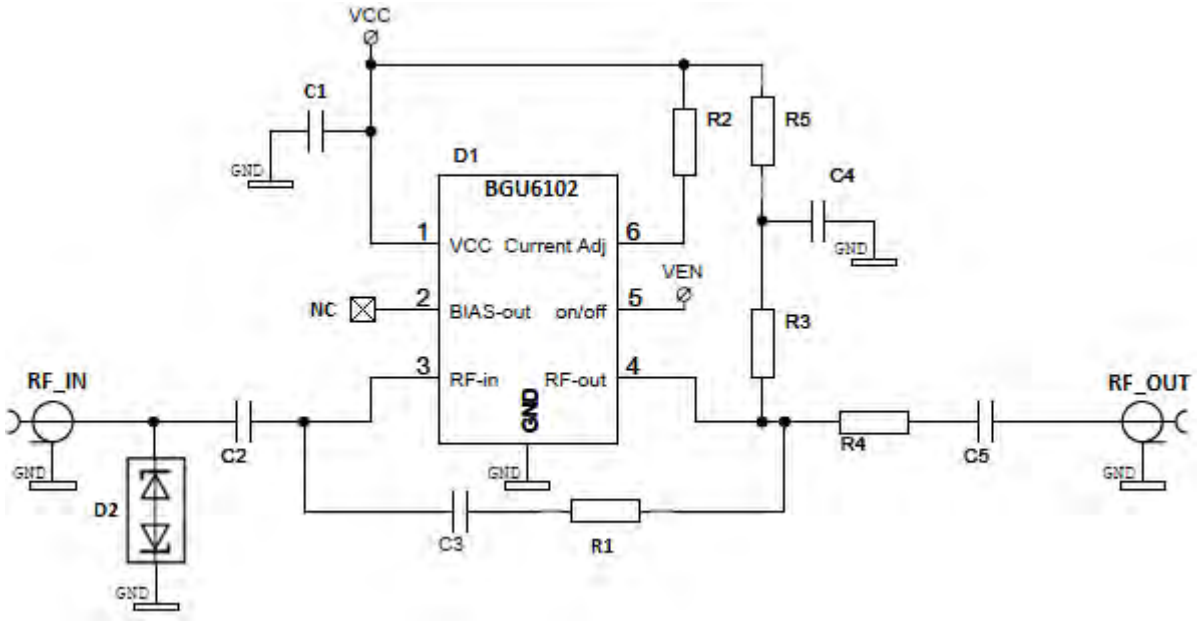

Fig 1. 50 Ohm FM LNA schematic

2.1 Components

Table 1. Bill of materials

Component	Position on Layout	Value	Unit	Type	Remark
C1, C4	Z10, Z15	47	nF	MurataGRM1555	DC decoupling (C1 is not necessary)
C2, C3, C5	Z3, Z8, Z21	330	pF	MurataGRM1555	DC blocking
R1	Z9	680	Ω	various	Feedback / Matching
R2	Z11	15	kΩ	various	Bias setting
R3	Z14	180	Ω	various	Stability / Matching
R4	Z20	10	Ω	various	Stability
R5	Z16	0	Ω	various	Jumper
D1	D1			BGU6102	
D2	Z1			PESD5V0F1BL	ESD Diode (optional)
	Z2, Z4, Z5, Z6, Z7, Z12, Z13, Z17, Z18, Z19	NC			Not connected Reserved for ESD & matching

2.2 PCB Layout

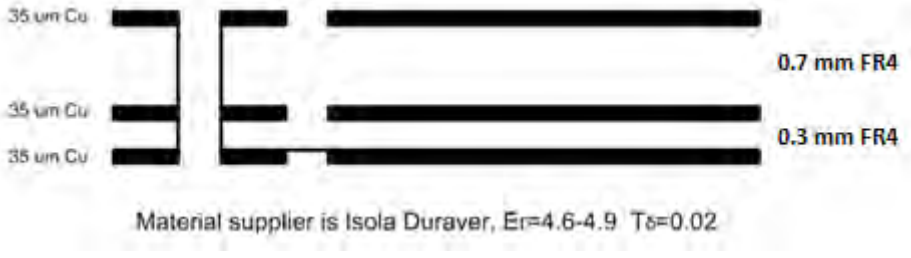

Fig 2. PCB material stack

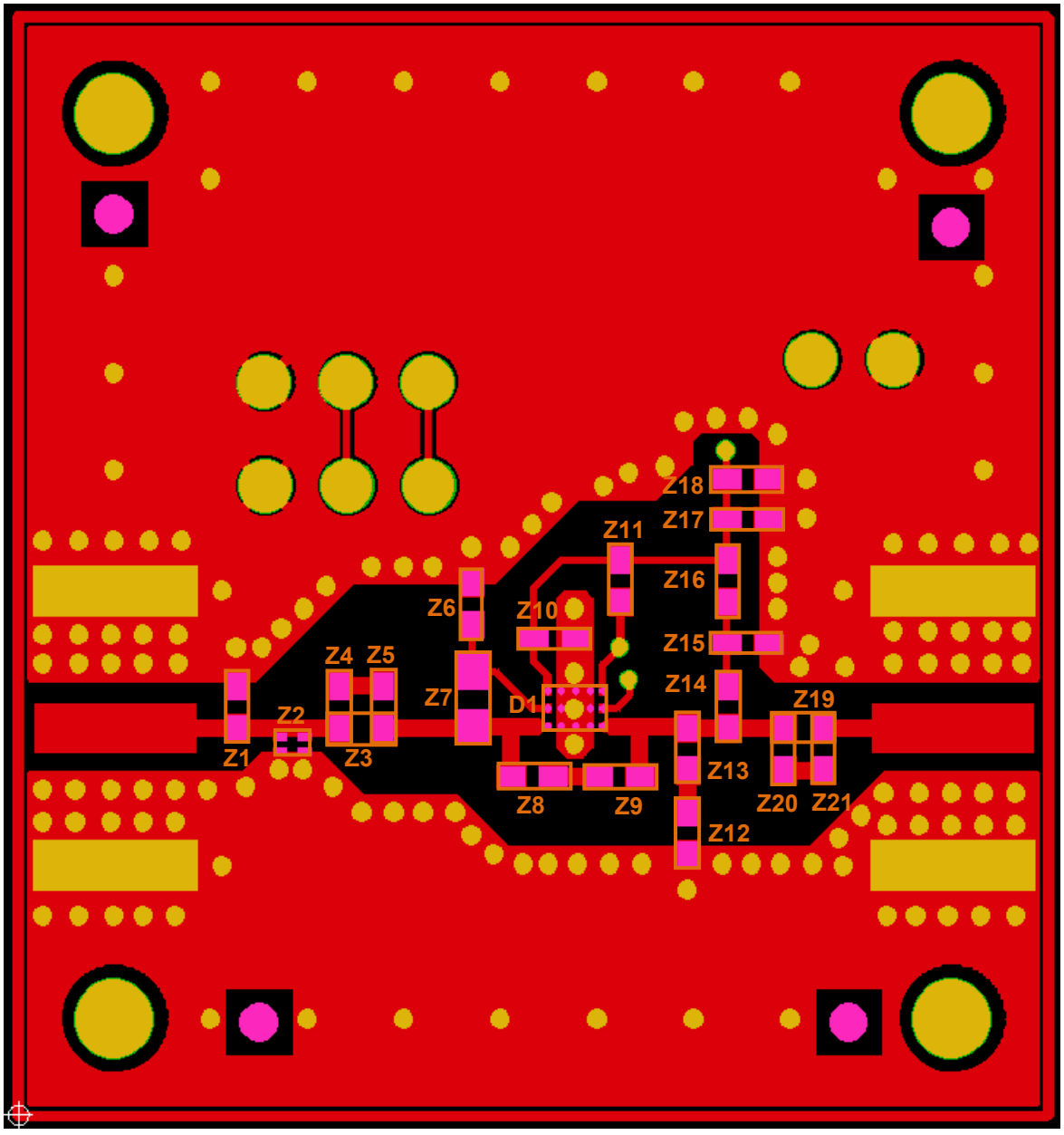

Fig 3. Layout and assembly

3. Measurement results

3.1 Measurement results

Table 2. Typical measurement results measured on the evaluation board

Tamb = 25 °C; Vcc = Ven = 2.8 V; $I_{CC(tot)}$ = 4.3 mA [1]; f = 100 MHz; $Z_S = Z_L$ = 50 Ω unless otherwise specified. All measurements are done with SMA-connectors as reference plane.

Parameter	Symbol	Value	Unit	Remark
supply voltage	Vcc	2.8	V	
supply current	Icc [1]	4.3	mA	
noise figure	NF	1.3	dB	
insertion power gain	$\lvert S21 \rvert^2$	15	dB	
input return loss	RL_{in}	10	dB	
output return loss	RL_{out}	14	dB	
input power at 1 dB gain compression	$P_{i(1dB)}$	-20	dBm	
output power at 1 dB gain compression	$P_{o(1dB)}$	-6	dBm	
input third-order intercept point	$IP3_I$ [2]	-12	dBm	
output third-order intercept point	$IP3_O$ [2]	3	dBm	

[1] $I_{CC(tot)} = I_{CC} + I_{RF\_OUT} + I_{R\_BIAS}$

[2] The third order intercept point is measured at -30 dBm per tone at RF_IN (f_1 = 100 MHz; f_2 = 100.2 MHz)

3.2 Graphs

All the measurements have been done on the application board. The reference planes for the measurements are the SMA-connectors on the application board.

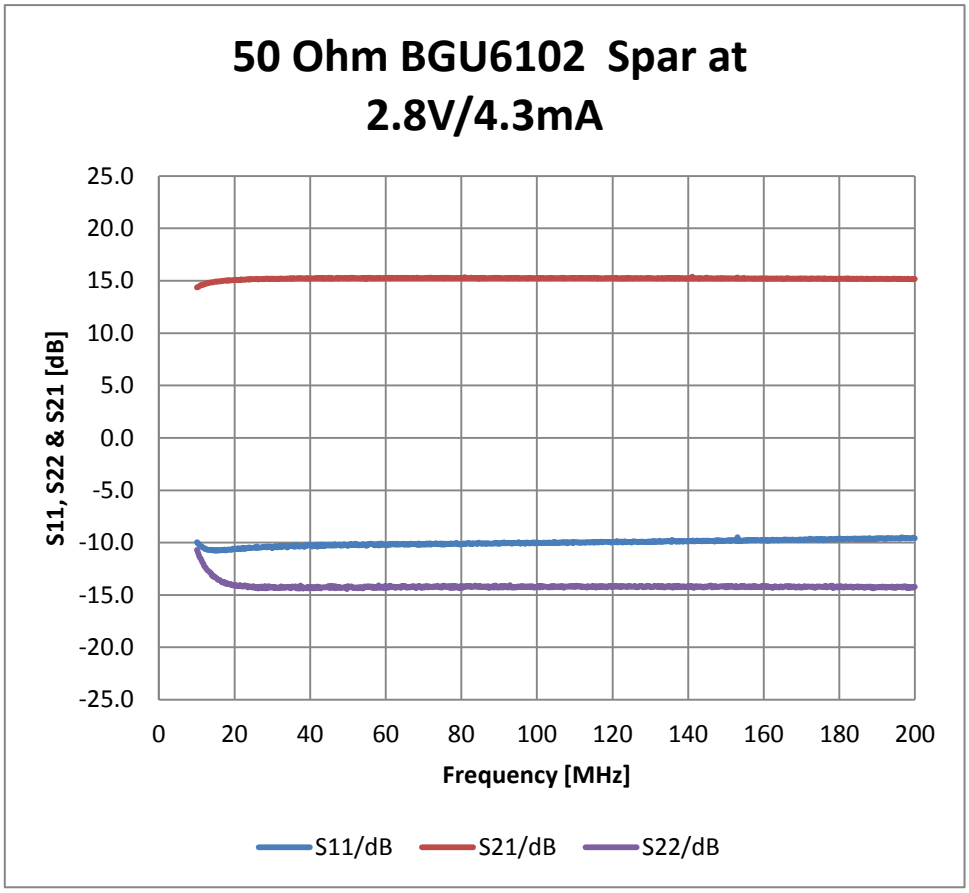

Fig 4. Gain, Input and Output Matching

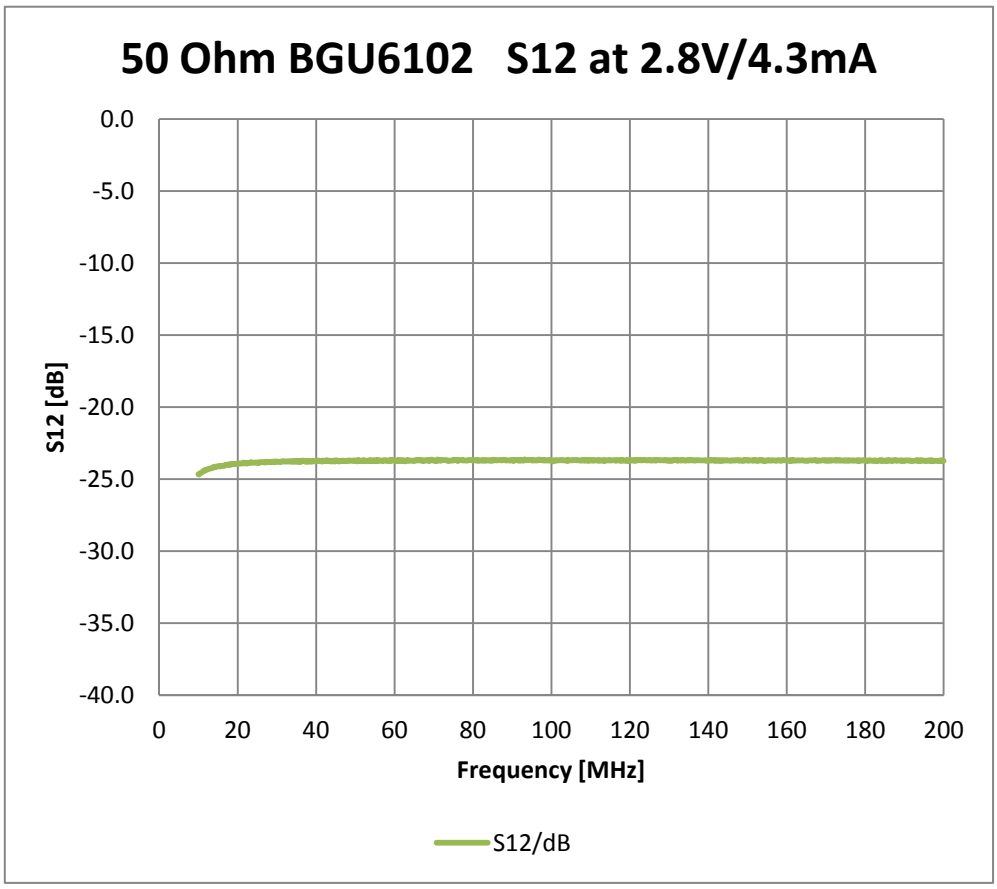

Fig 5. Isolation

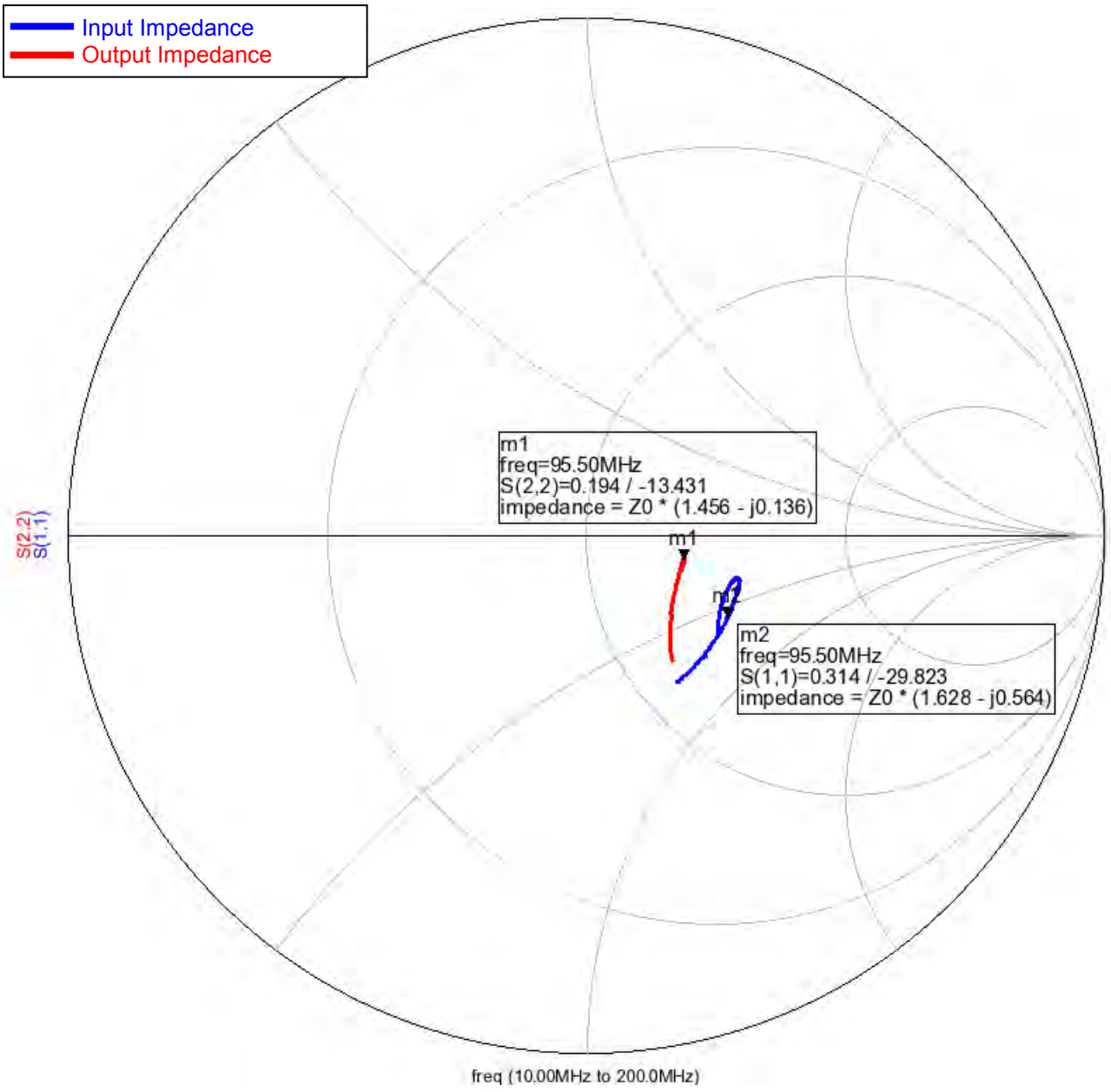

Fig 6. Input and Output Impedance

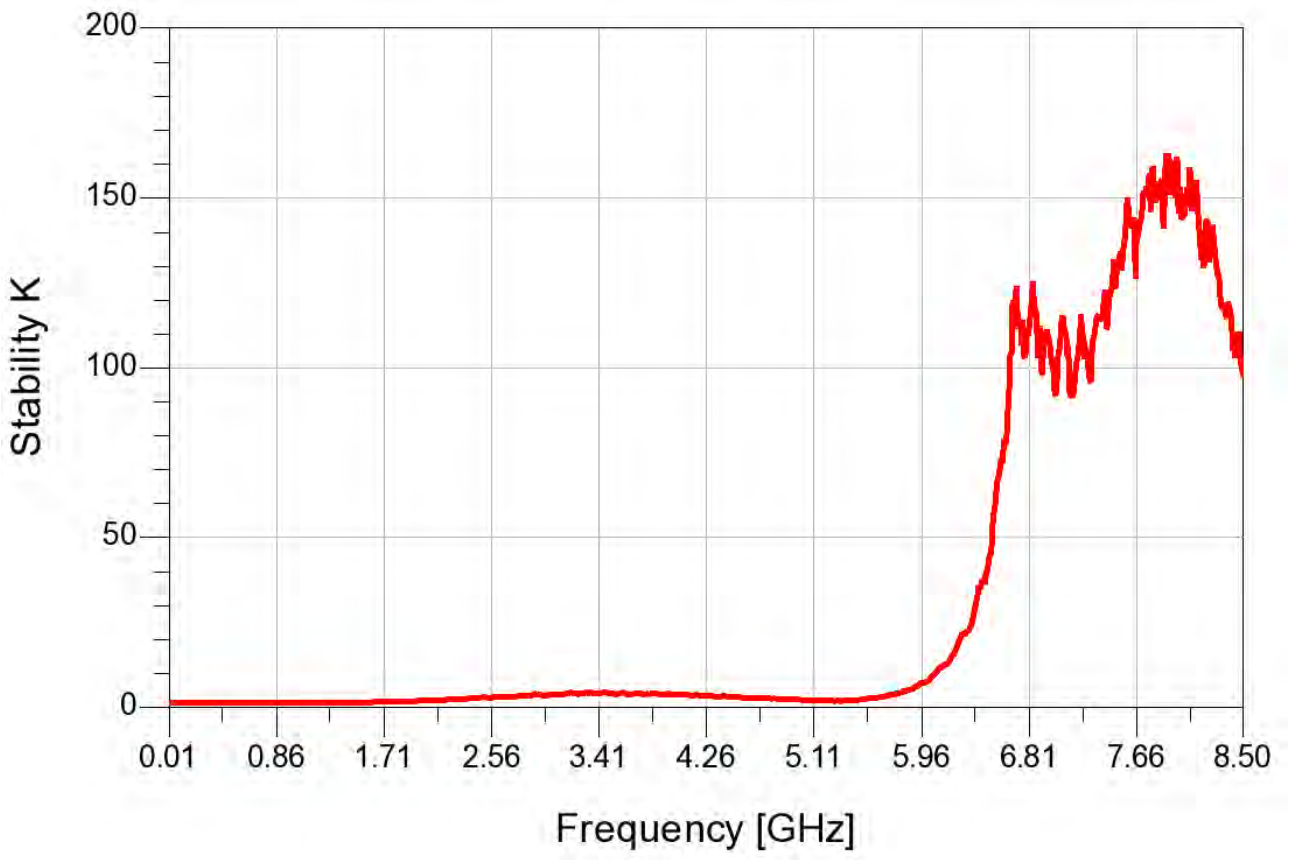

Fig 7. Stability

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