

AN11034

High Ohmic FM LNA for embedded Antenna in Portable applications with BGU7003W

Rev. 1.0 — 15 July 2011

Application note

Document information

Info	Content
Keywords	BGU7003W, LNA, FM, embedded Antenna
Abstract	The document provides circuit, layout, BOM and performance information on FM band using BGU7003W



Revision history

Rev	Date	Description
1.0	20110715	Initial document

Contact information

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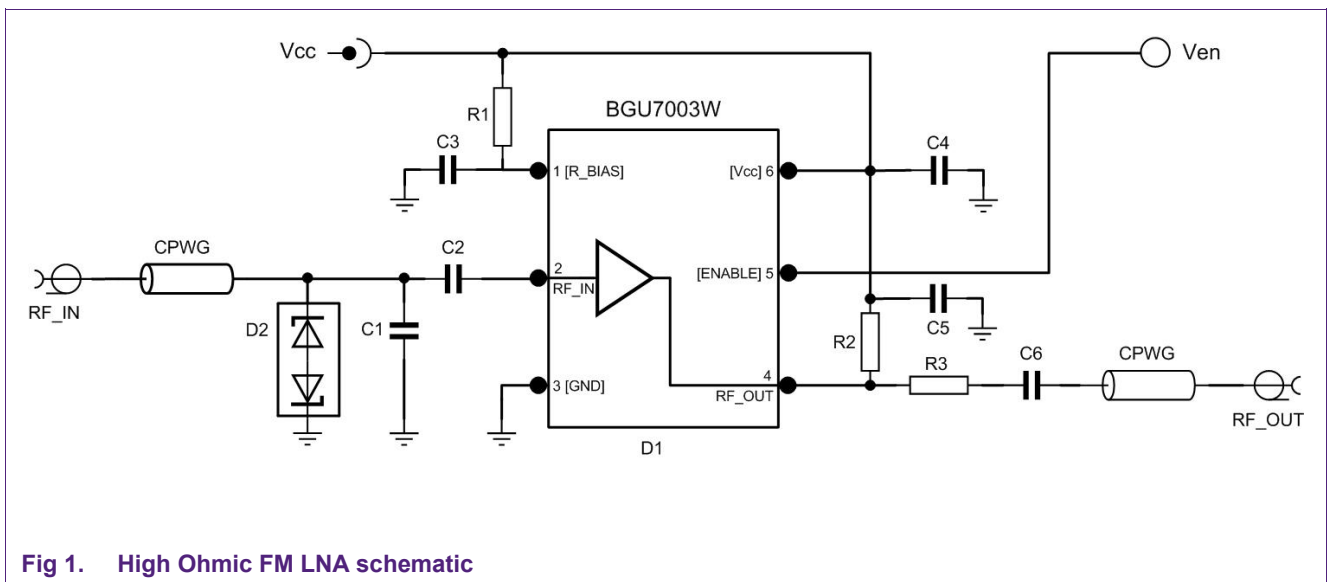
1. Introduction

„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. They 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 BGU7003W (LNA MMIC). It needs 8 (9 components used in the EVB) external components for matching, biasing and decoupling. The layout has also additional foot print for 0402 components, those are reserved for different applications or ESD protection and matching purpose.



2.1 Components

Table 1. Bill of materials

Component	Position on Layout	Value	Unit	Type	Remark
C1	Z3	0.56	pF	MurataGRM1555	Stability (in case of using D2, C1 is not necessary)
C2, C6	Z4, Z15	330	pF	MurataGRM1555	DC blocking
C3, C5, C4	Z6, Z9, Z20	47	nF		DC decoupling (C4 is not necessary)
R1	Z7	6.8	kΩ		Bias setting
R2	Z11	56	Ω		Stability / Matching
R3	Z13	10	Ω		Stability
	Z1, Z16, Z19, Z21	0	Ω		Jumper Reserved for ESD & matching
	Z5, Z8, Z10, Z12, Z14, Z17, Z18,	NC			Not connected Reserved for ESD & matching
D1	D1			BGU7003W	
D2	Z2			PESD5V0F1BL	ESD Diode (optional)

2.2 PCB Layout

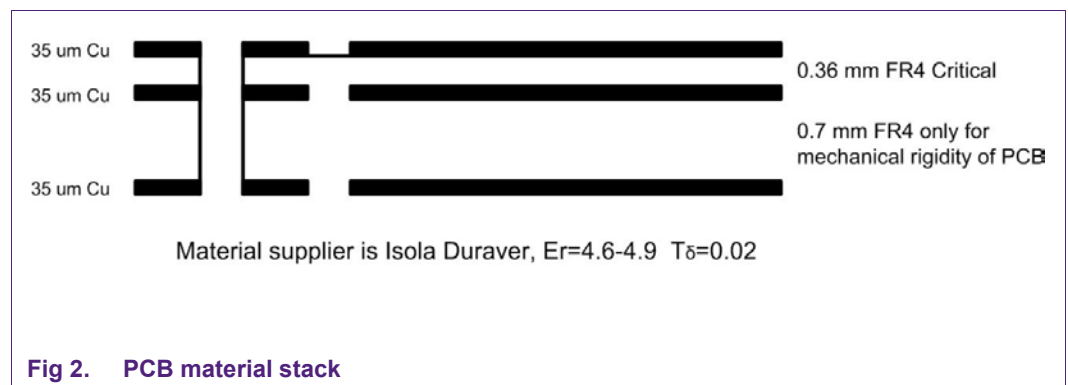


Fig 2. PCB material stack

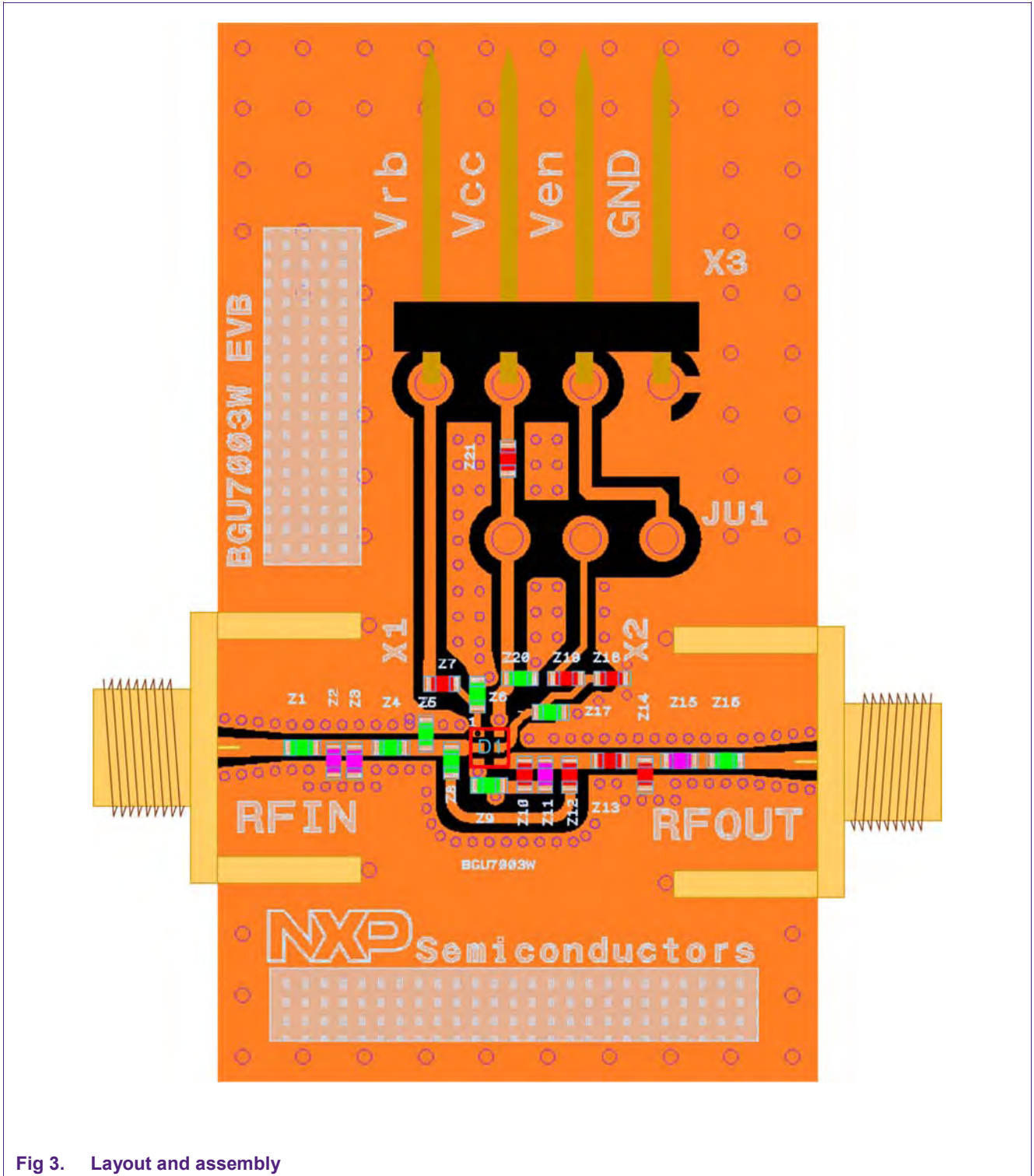


Fig 3. Layout and assembly

3. Measurement results

3.1 Measurement results

Table 2. Typical measurement results measured on the evaluation board

$T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{cc} = V_{en} = V_{rb} = 2.85\text{ V}$; $I_{CC(tot)} = 3.2\text{ mA}$ ^[1]; $f = 100\text{ MHz}$; $Z_S = Z_L = 50\text{ }\Omega$ unless otherwise specified. All measurements are done with SMA-connectors as reference plane.

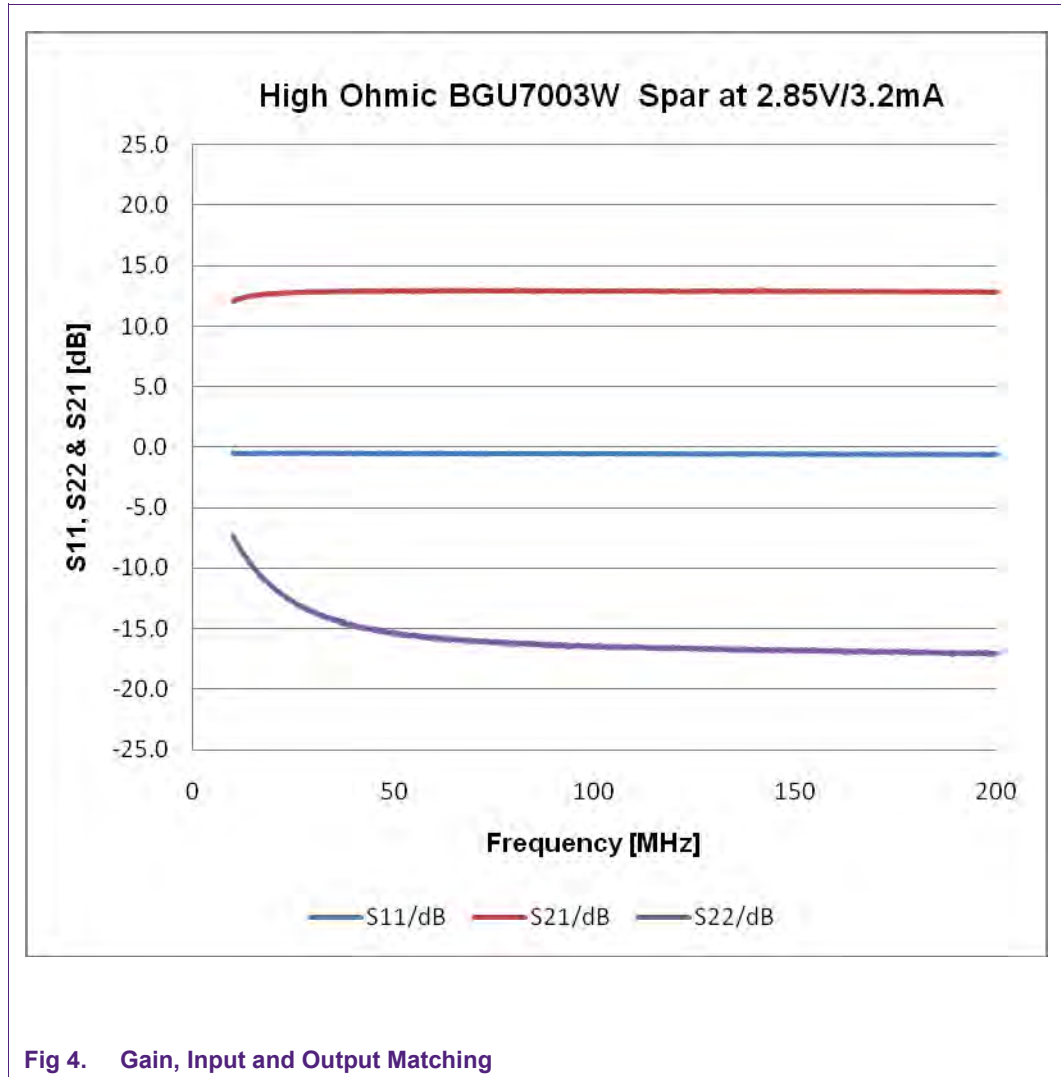
Parameter	Symbol	Value	Unit	Remark
supply voltage	V _{cc}	2.85	V	
supply current	I _{CC(tot)} ^[1]	3.2	mA	
noise figure	NF	1.2	dB	
insertion power gain	S ₂₁ ²	13	dB	
input return loss	RL _{in}	0.5	dB	
output return loss	RL _{out}	16.5	dB	
input power at 1 dB gain compression	P _{i(1dB)}	-23	dBm	
output power at 1 dB gain compression	P _{o(1dB)}	-11	dBm	
input third-order intercept point	IP _{3i} ^[2]	-15	dBm	
output third-order intercept point	IP _{3o} ^[2]	-2	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 ($f_1 = 100\text{ MHz}$; $f_2 = 100.2\text{ MHz}$)

3.2 Graphs

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



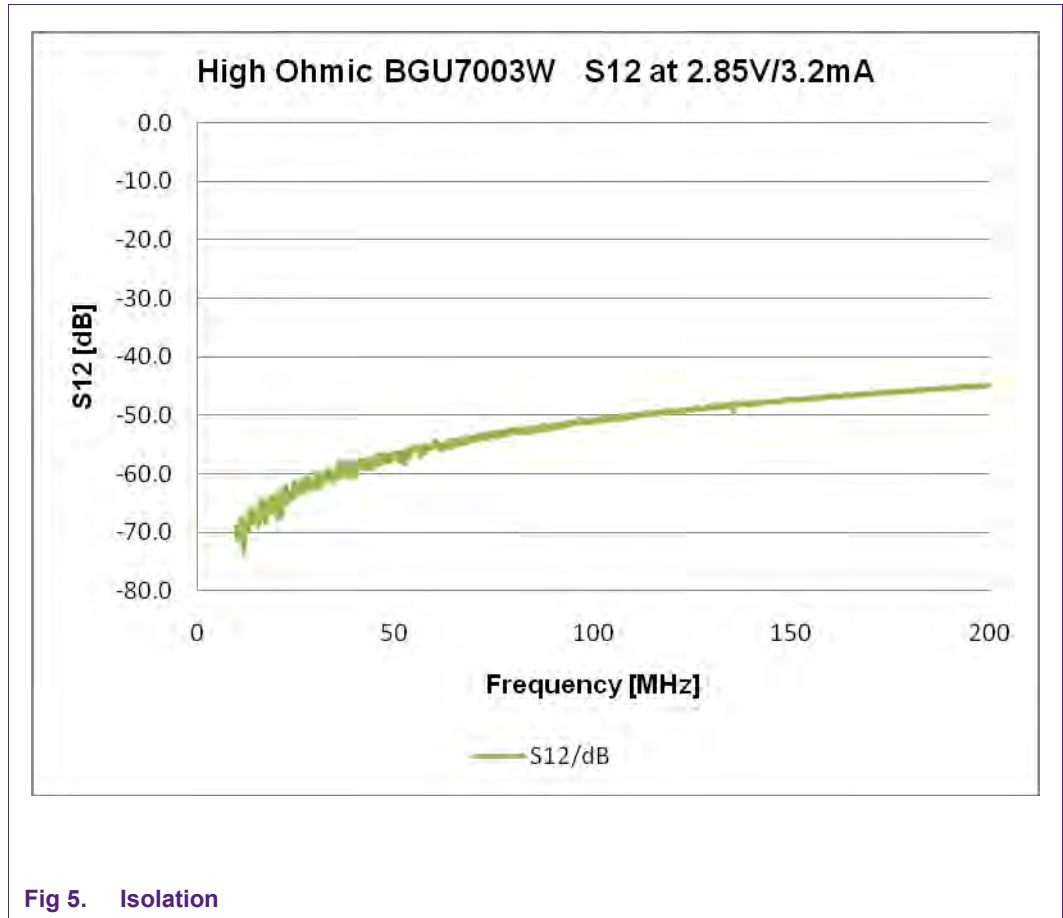


Fig 5. Isolation

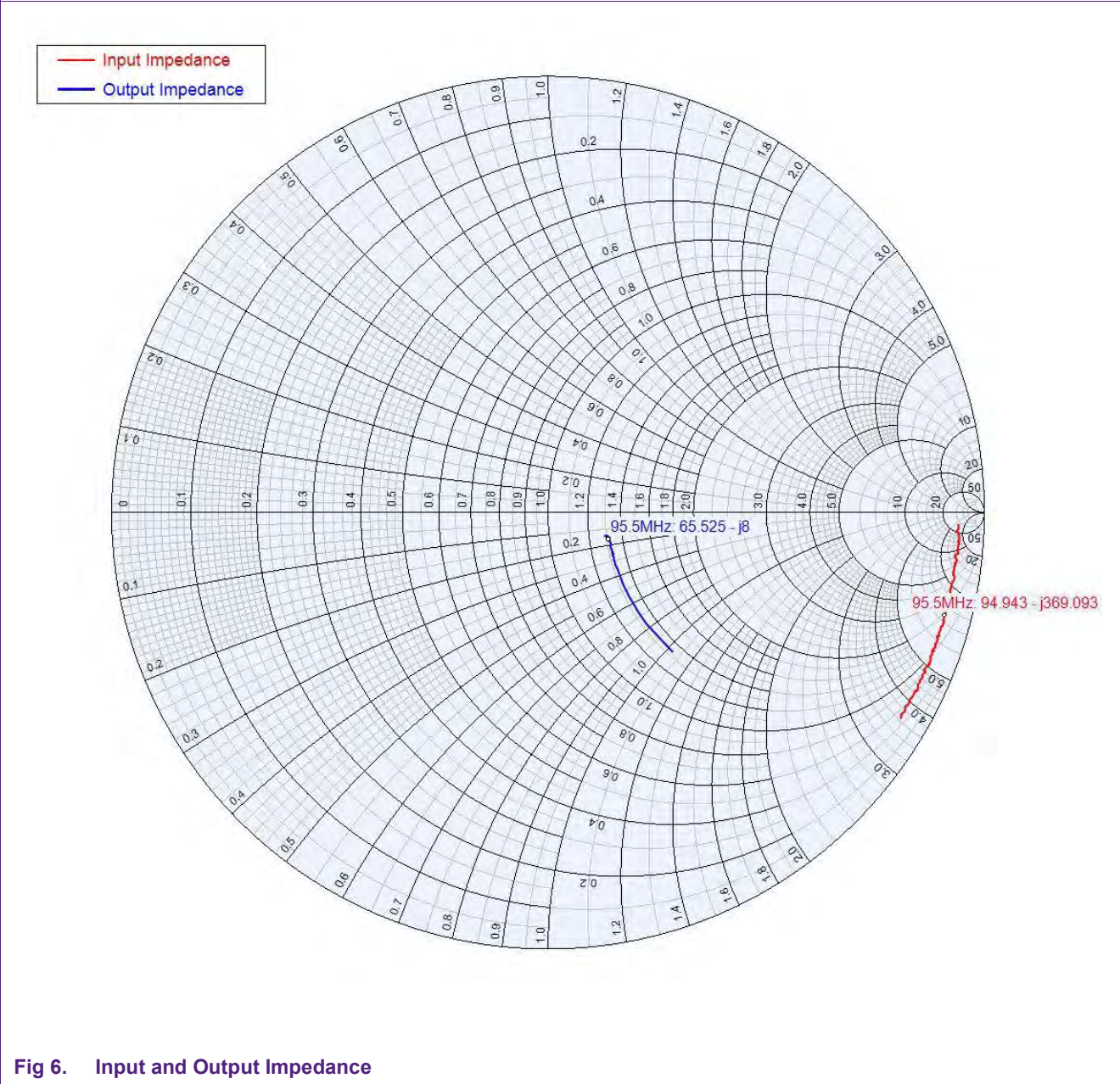


Fig 6. Input and Output Impedance

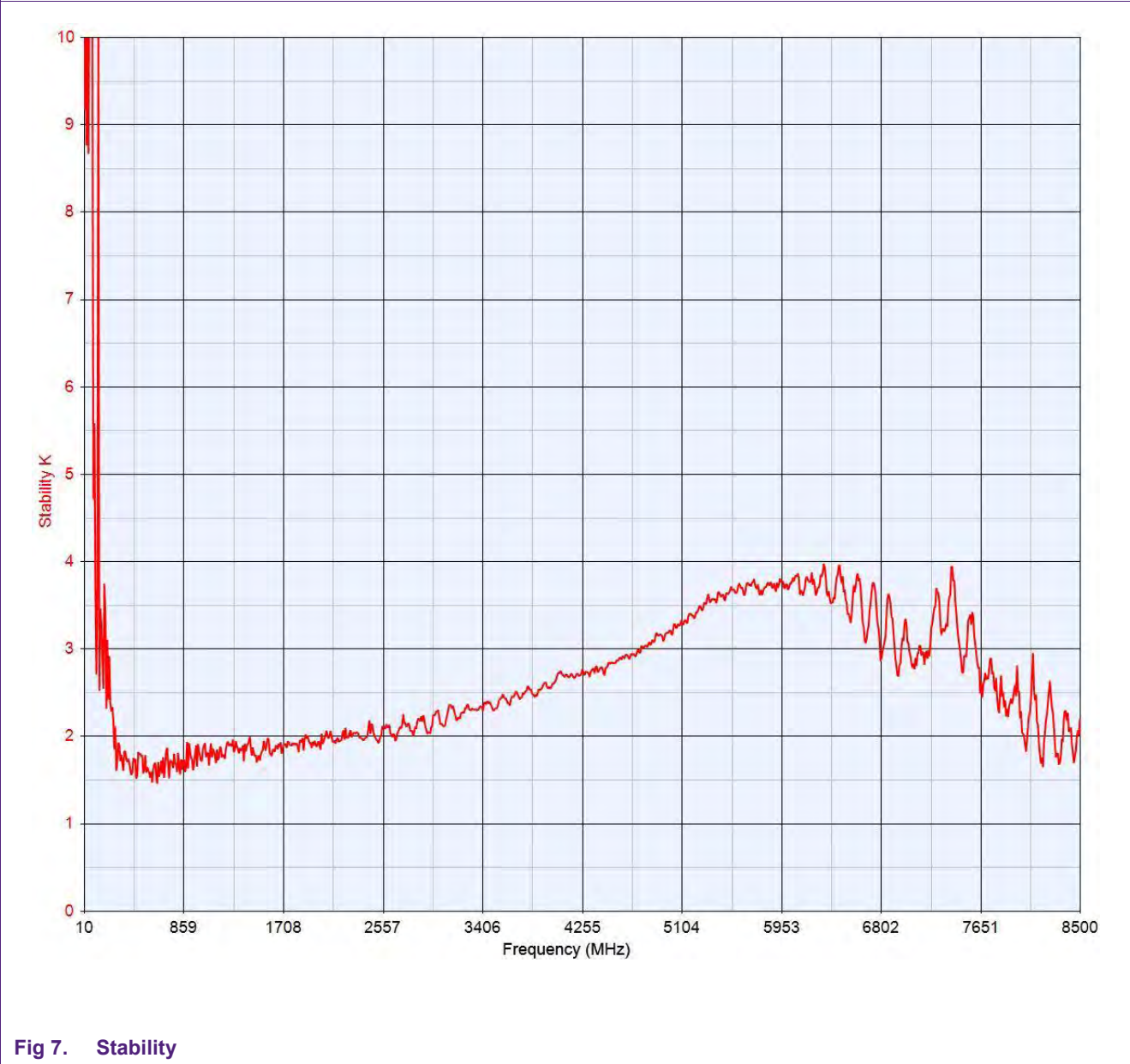


Fig 7. Stability

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