BFR380F

High Linearity Low Noise Amplifier for ISDB-T Application

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Previous Revision: No previous revision

Page	Subjects (major changes since last revision)

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Last Trademarks Update 2011-11-11

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1 Overview

Device: BFR380F

Application: High Linearity LNA for ISDB-T Application

PCB Marking: M111118 2.0mm EDG

2 Summary of Measurement Results

Table 1 Summary of Measurement Results

Parameter	Symbol	Value		Unit	Note/Test Condition
DC Voltage	Vcc	4.5		V	
DC Current	Icc	22.0		mA	
Frequency Range	Freq	430	770	MHz	
Gain	G	16.1	13.9	dB	
Noise Figure	NF	1.6	1.4	dB	SMA and PCB losses substracted
Input Return Loss	RLin	9.9	11.8	dB	
Output Return Loss	RLout	10.8	16.4	dB	
Reverse Isolation	IRev	25.2	20.2	dB	
Input P1dB	IP1dB	-7.2	-2.9	dBm	
Output P1dB	OP1dB	7.9	9.9	dBm	
Input IP3	IIP3	10.0	12.9	dBm	
Output IP3	OIP3	26.0	26.8	dBm	f1=431 MHz, Δf=1 MHz, Pin= -25 dBm f1=768 MHz, Δf=1 MHz, Pin= -25 dBm
Stability	k	>1		--	Stability measured from 10MHz to 10GHz

3 Description

This report presents the measurement results of BFR380F as low noise amplifier for ISDB-T application.

ISDB-T (**Integrated Services Digital Broadcasting**) is the Japanese digital video and audio broadcasting standard. It adopts the frequency range of 430MHz to 770MHz in the UHF (**Ultra-high Frequency**) band.

In this application note, the BFR380F is used to design an application circuit with requirements of Supply voltage Vcc < 5V, Supply current Icc < 25mA, Noise Figure NF < 2 dB, and Input Third Order Intercept Point (IIP3) of +10dBm.

The circuit as shown in Figure 1 has achieved input and output matching of over 10dB, gain of 13.8-16.0dB, and reverse isolation of >25dB in the 430-770MHz band. The noise figure is 1.4 - 1.6dB. This circuit is unconditionally stable from 10MHz to 10GHz.

At the frequency of 430 MHz, using two tones spaced of 1MHz, the input third intercept point reaches +10.0dBm. Besides, the measured input 1dB compression point is -7.2 dBm. At the frequency of 770MHz, the input third intercept point is +12.9dBm, and input 1dB compression point is -2.9dBm.

4 Schematics

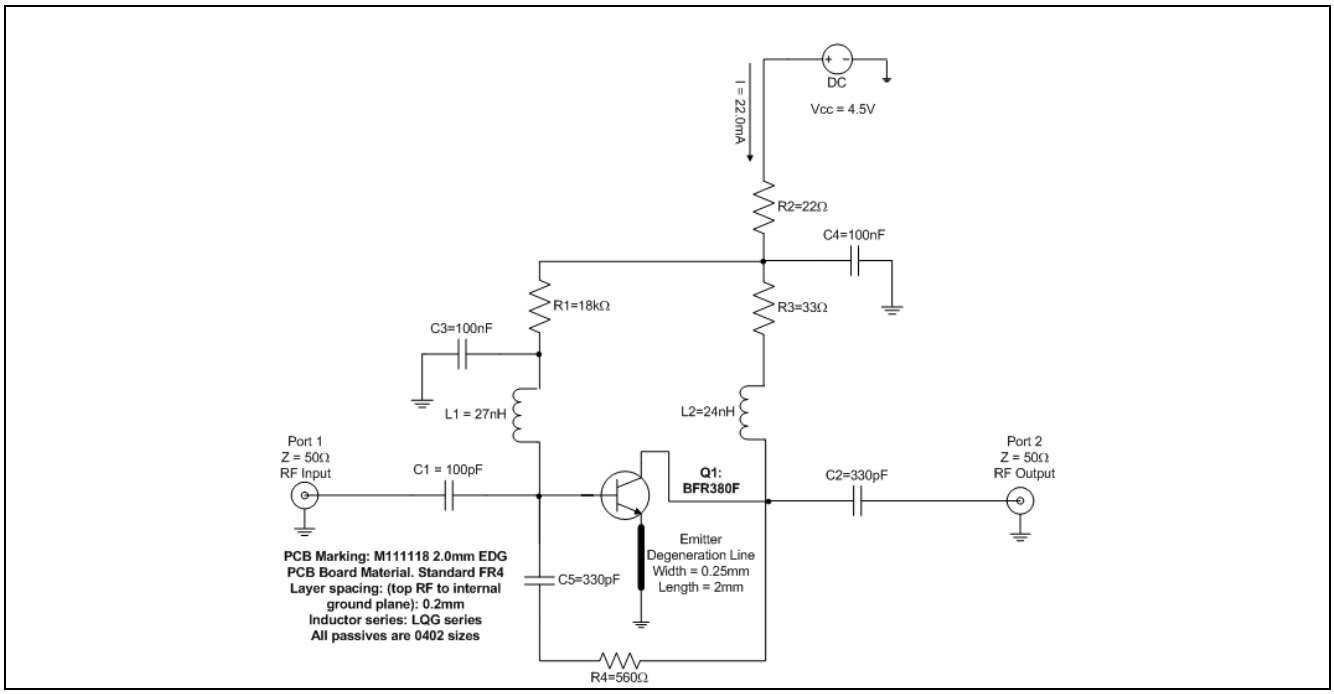

Figure 1 Schematic Diagram of the used Circuit

Table 2 Bill-of-Materials

Symbol	Value	Unit	Size	Manufacturer	Comment
C1	100	pF	0402	Various	Input DC block, input matching
C2	330	pF	0402	Various	Output DC block, output matching
C3	100	nF	0402	Various	RF decoupling / blocking cap
C4	100	nF	0402	Various	RF decoupling / blocking cap
C5	330	pF	0402	Various	Negative feedback
L1	27	nH	0402	LQG series	Input matching and bias to the Base
L2	24	nH	0402	LQG series	Output matching and bias to the Collector
R1	18	kΩ	0402	Various	Base biasing
R2	22	Ω	0402	Various	DC biasing
R3	33	Ω	0402	Various	DC biasing (provides DC negative feedback to stabilize DC operating point over temperature variation, transistor h_{FE} variation, etc.)
R4	560	Ω	0402	Various	Negative feedback
Q1	BFR380F		TSFP3	Infineon Technologies	Silicon RF Transistor

5 Measured Graphs

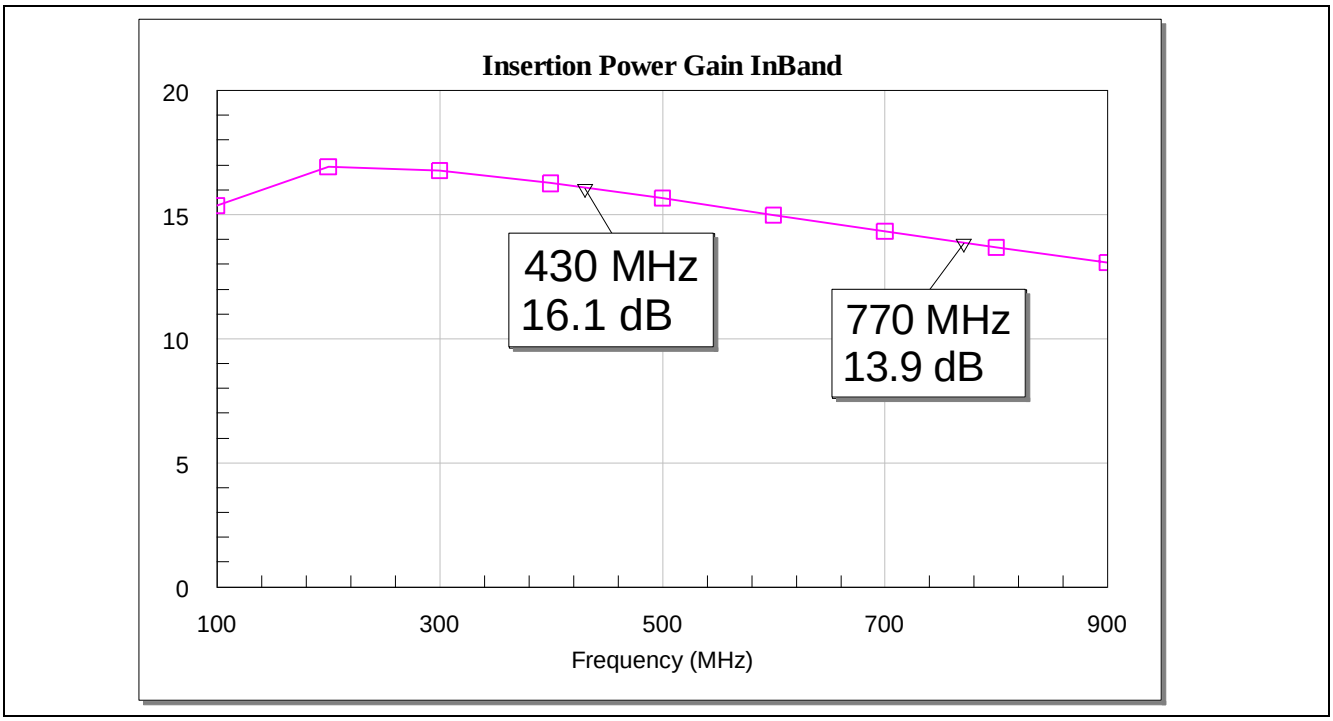

Figure 2 Insertion Power Gain of the 430-770 MHz ISDB-T LNA using BFR380F

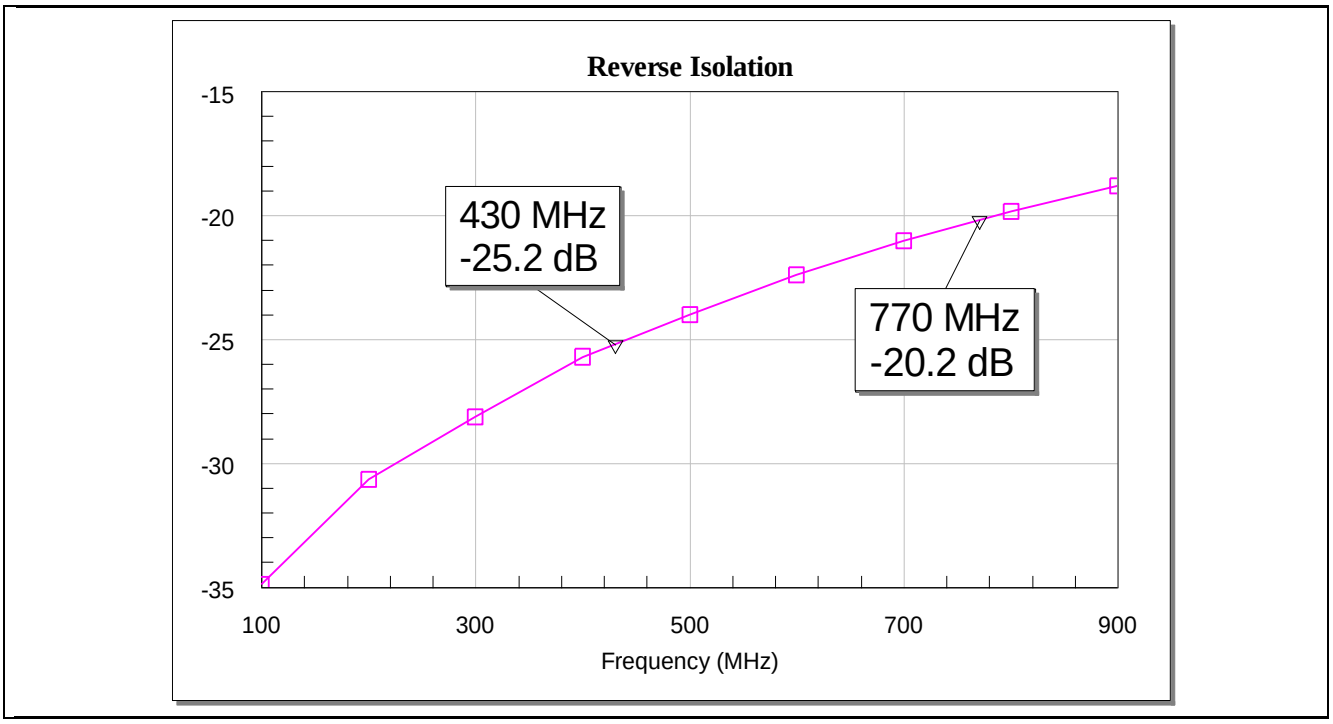

Figure 3 Reverse Isolation of the the 430-770 MHz ISDB-T LNA using BFR380F

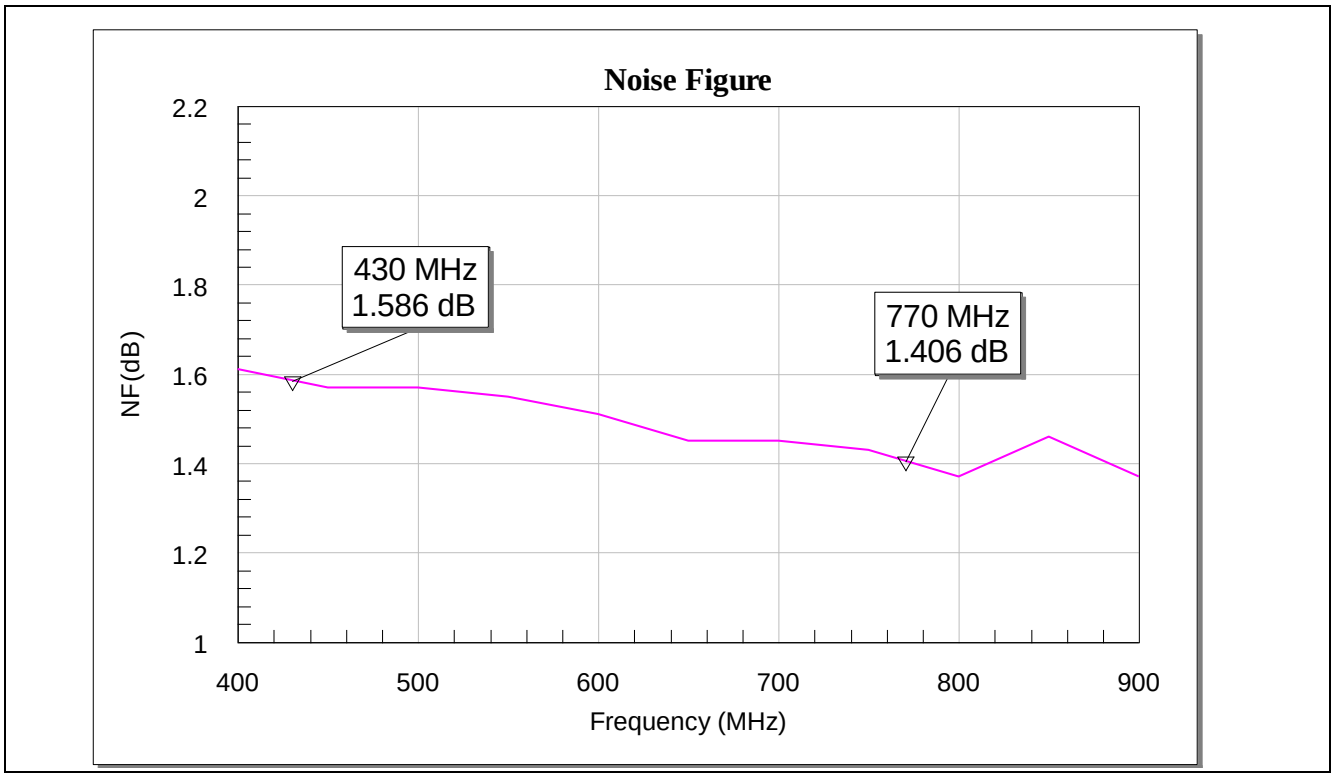

Figure 4 Noise Figure of the the 430-770 MHz ISDB-T LNA using BFR380F

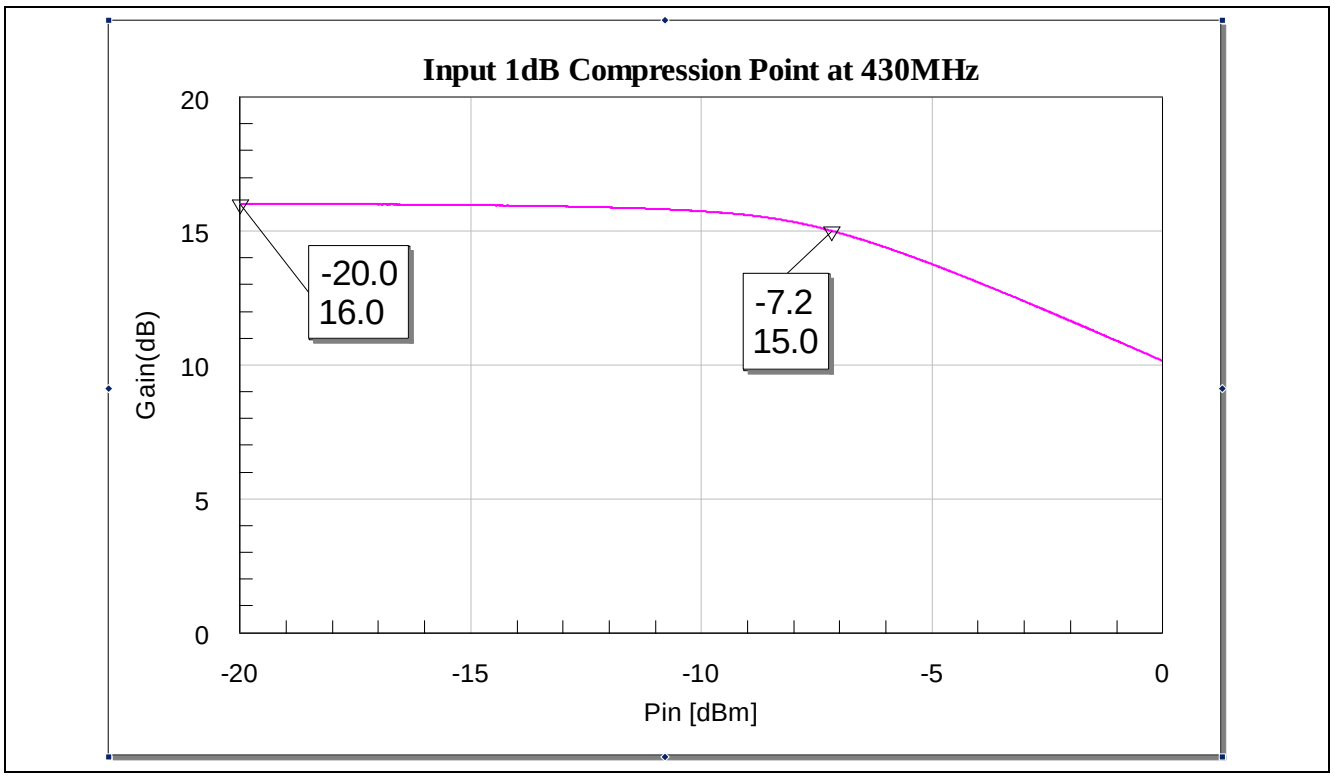

Figure 5 Input 1dB compression point of the ISDB-T LNA using BFR380F at 430MHz

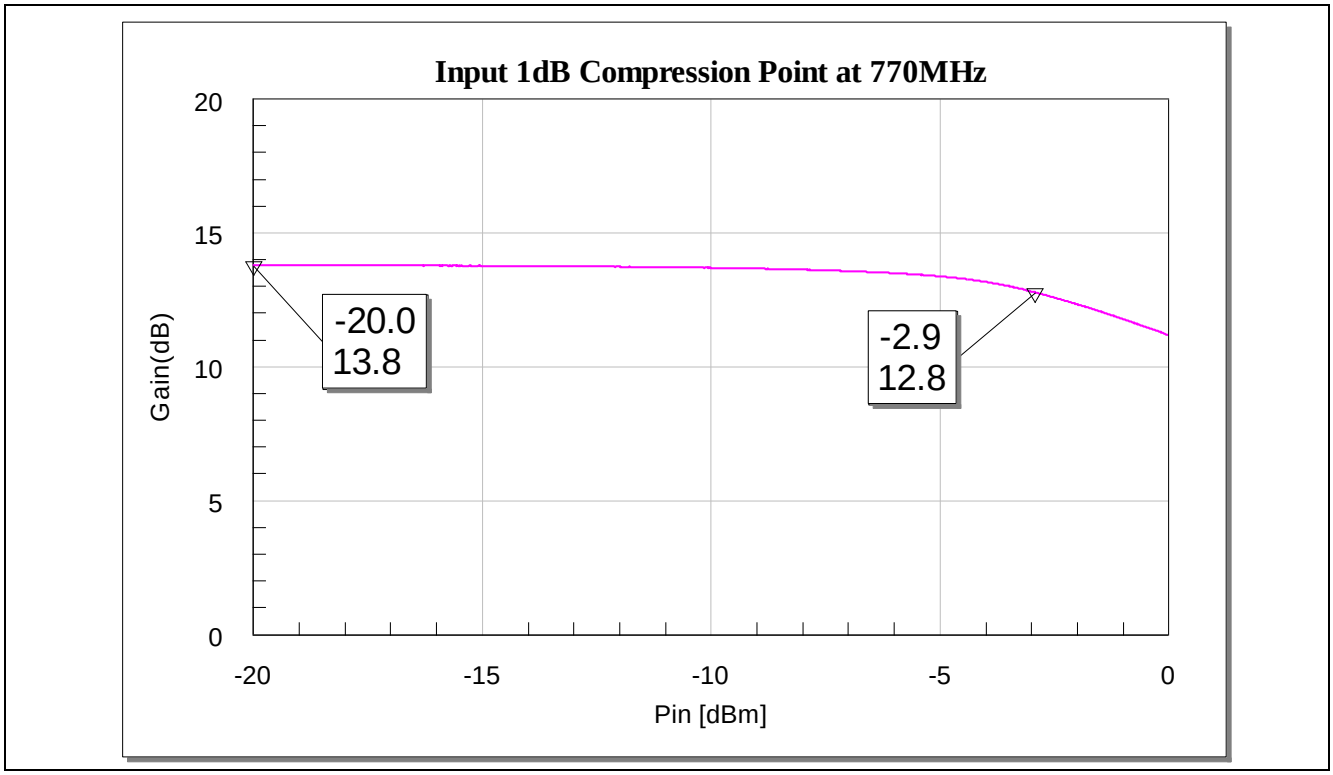

Figure 6 Input 1dB compression point of the ISDB-T LNA using BFR380F at 770MHz

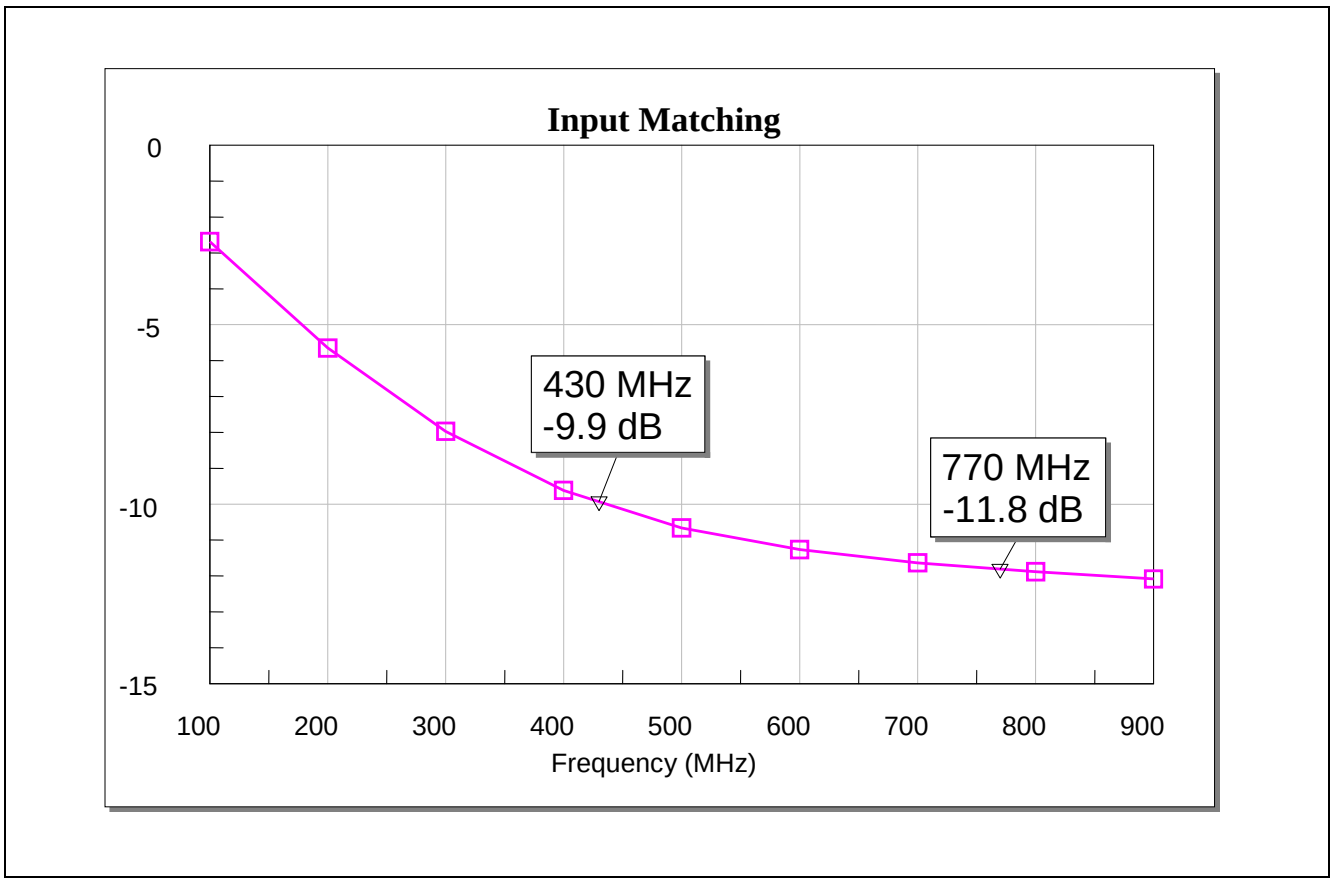

Figure 7 Input Matching of the 430-770 MHz ISDB-T LNA using BFR380F

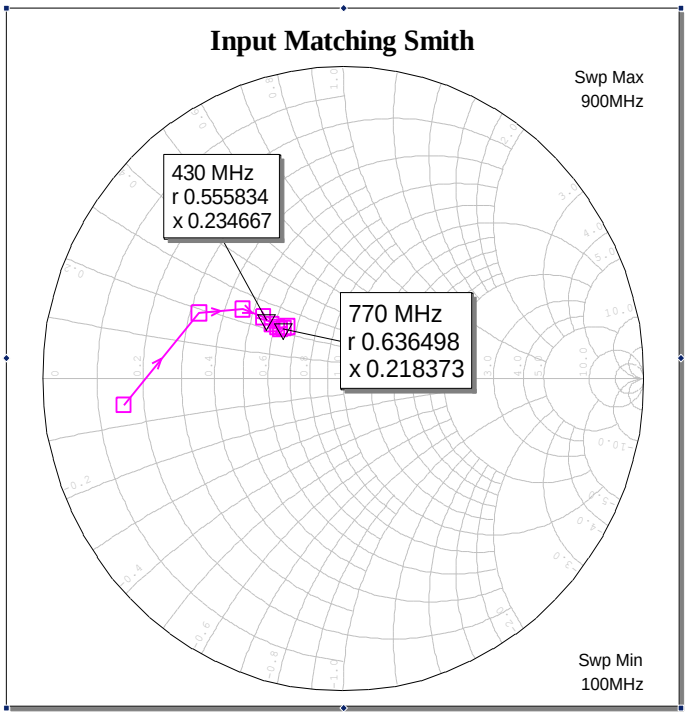

Figure 8 Input Matching of the 430-770 MHz ISDB-T LNA using BFR380F (Smith Chart)

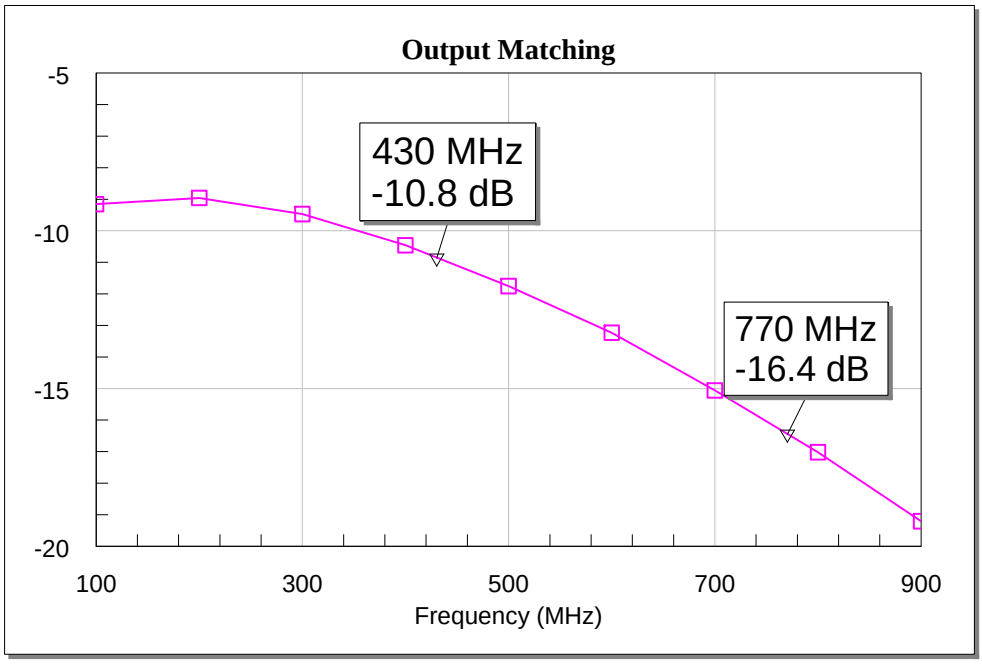

Figure 9 Output Matching of the 430-770 MHz ISDB-T LNA using BFR380F

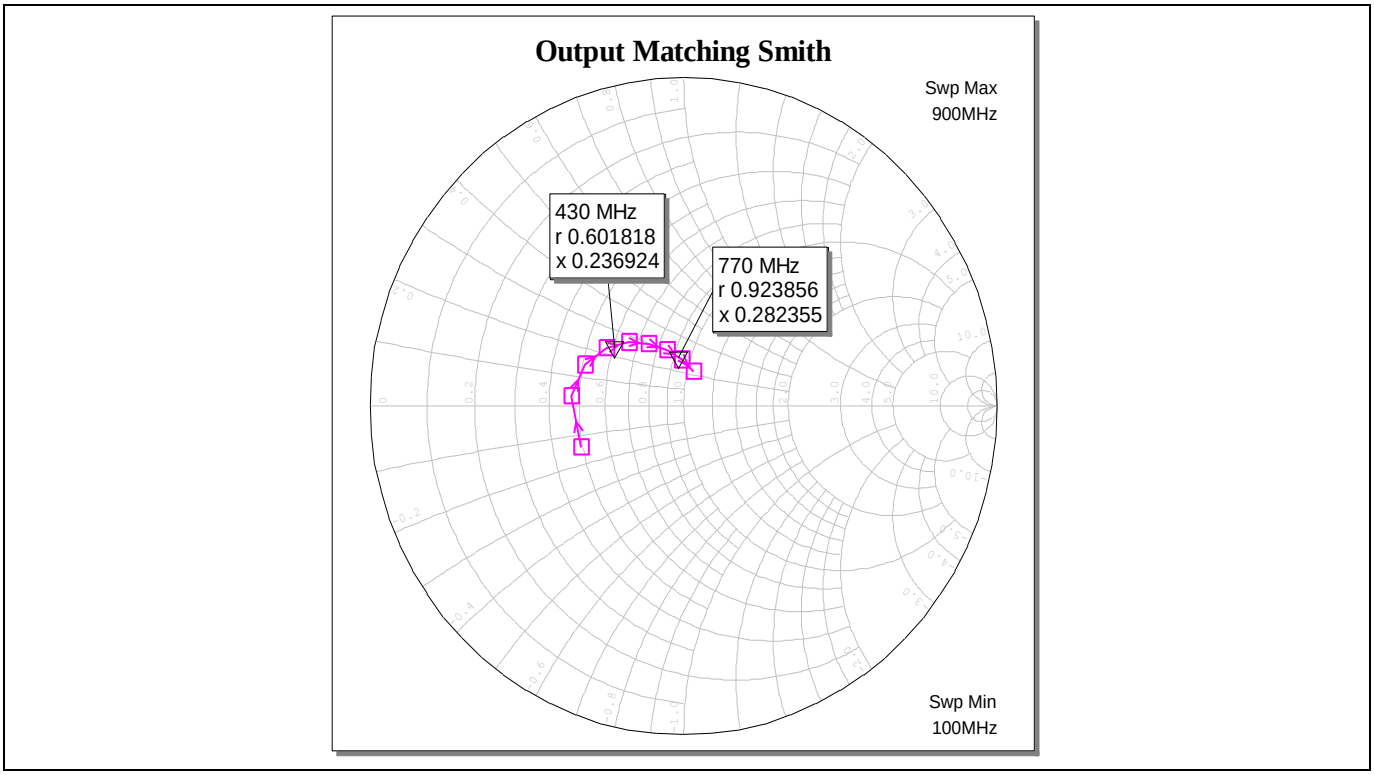

Figure 10 Output Matching of the 430-770 MHz ISDB-T LNA using BFR380F (Smith Chart)

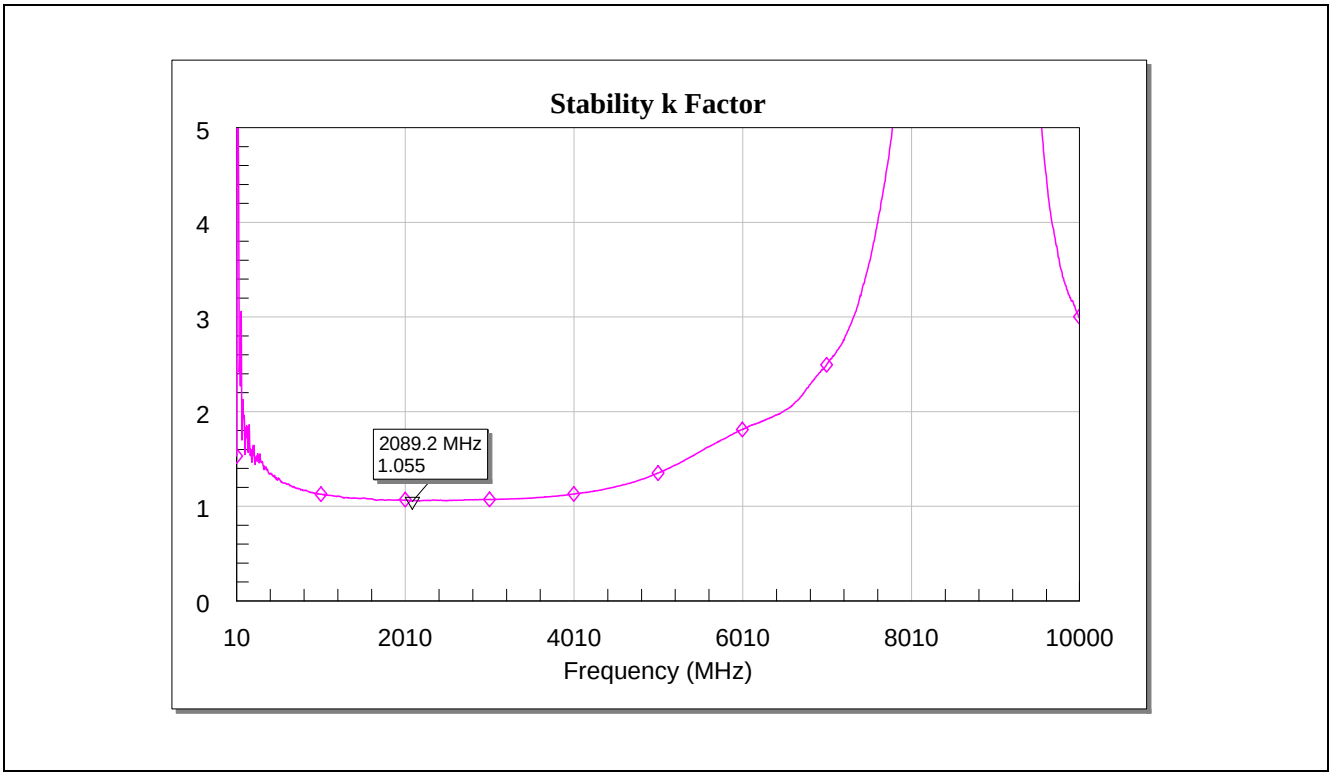

Figure 11 Wideband Stability K Factor of the 430-770 MHz ISDB-T LNA using BFR380F

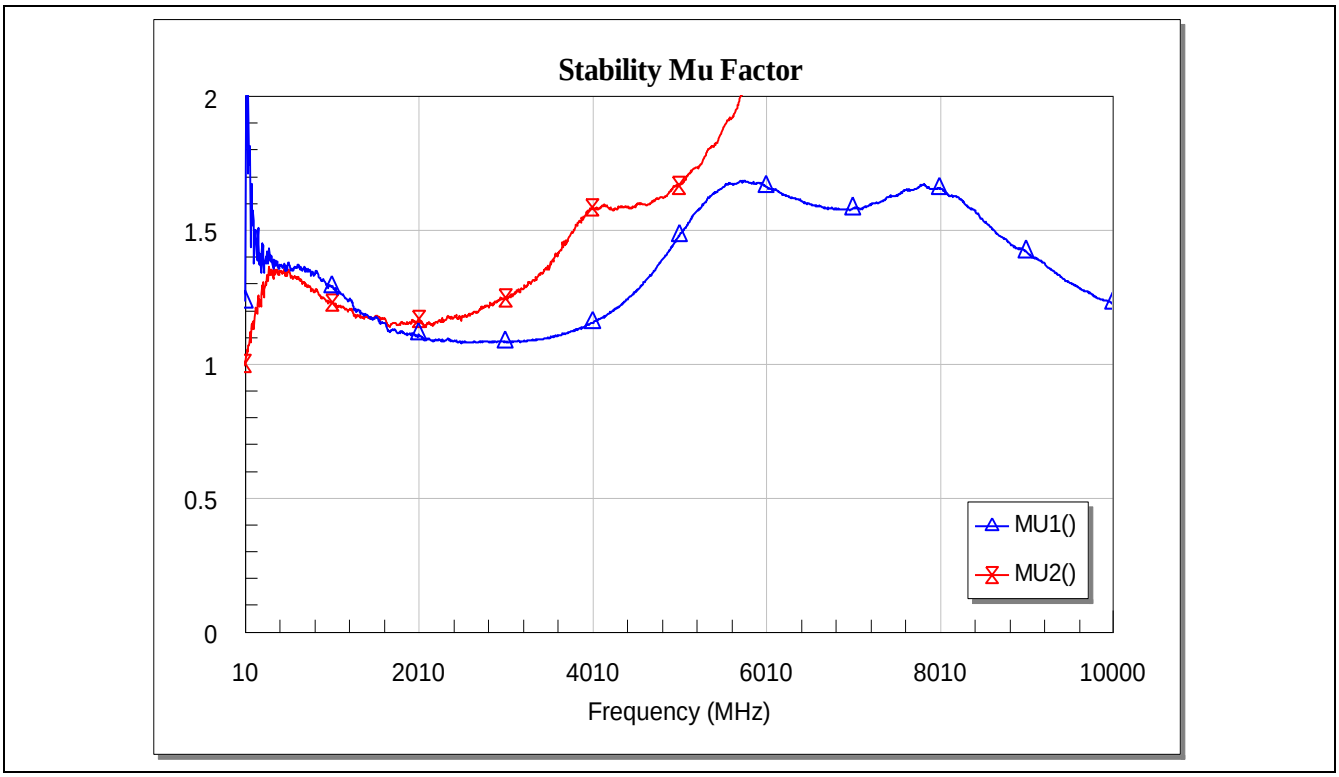

Figure 12 Wideband Stability Mu Factor of the 430-770 MHz ISDB-T LNA using BFR380F

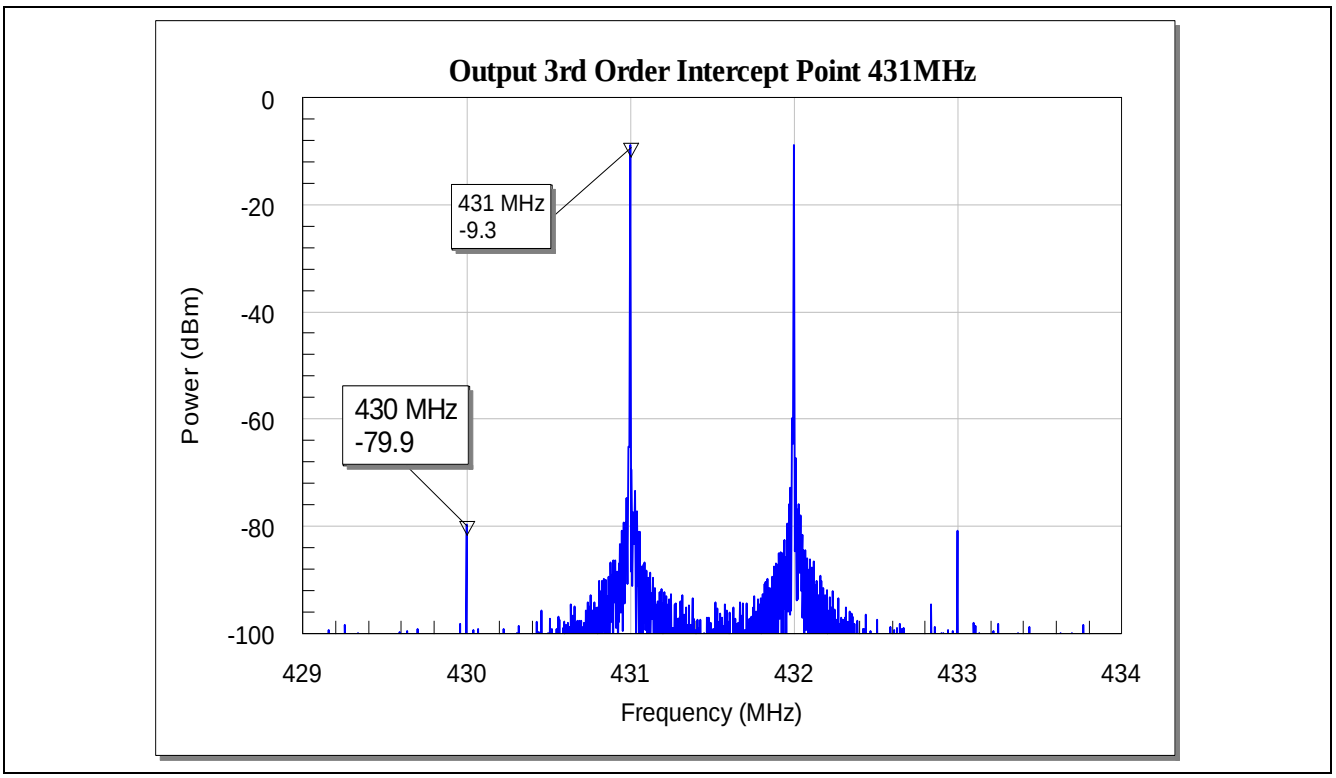

Figure 13 Output 3rd Order Intercept Point of the ISDB-T LNA using BFR380F at 431MHz

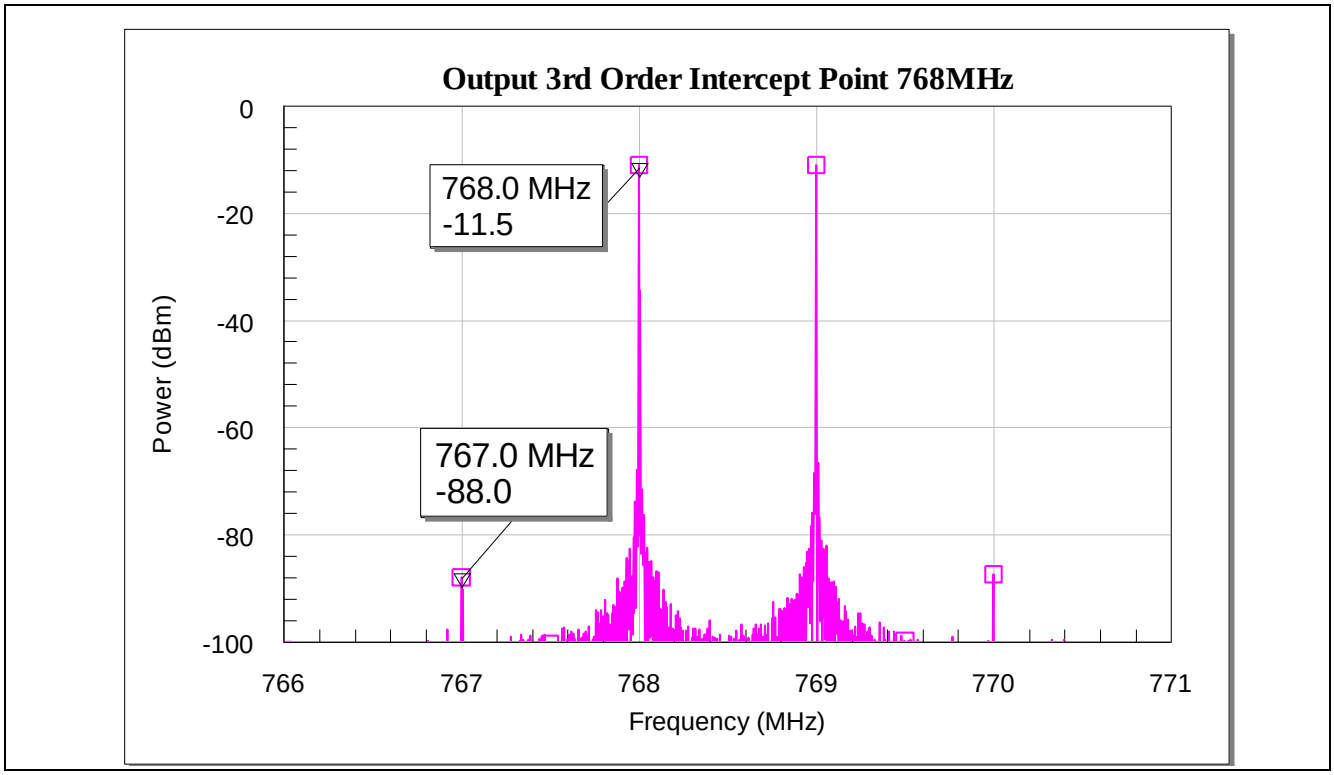

Figure 14 Output 3rd Order Intercept Point of the ISDB-T LNA using BFR380F at 768MHz

6 Evaluation Board and Layout Information

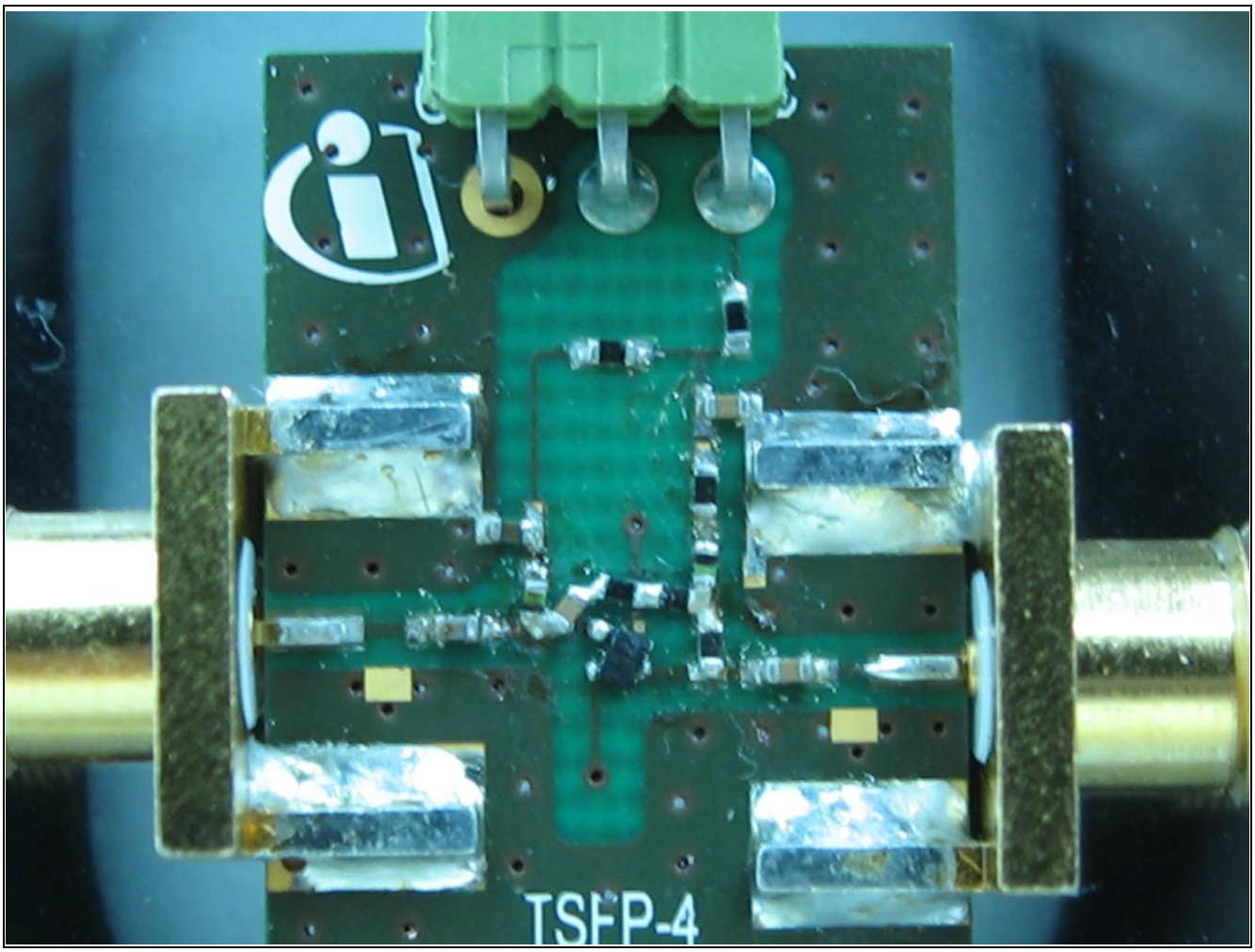

Figure 15 Photo of the BFR380F circuit on the Evaluation Board (PCB Marking M111118)

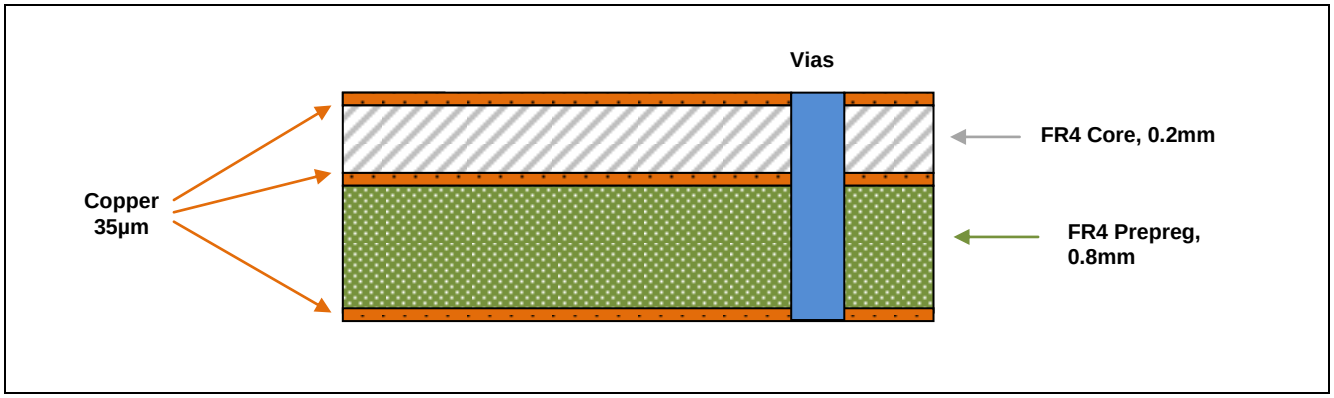

Figure 16 PCB Layer Information

7 Authors

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