

BFP740ESD

Low Noise Amplifier for Wireless
LAN 2.4GHz Application

Application Note AN295

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Page	Subjects (major changes since last revision)

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1 Introduction

The BFP740ESD is a SiGe:C transistor manufactured in the highly reliable SiGe:C technology. It offers 2kV Human Body Model ESD robustness due to the integrated protection circuit, and is capable of working under up to 21dBm RF input power. It offers a low noise figure (minimum value 0.65dB@2.4GHz) and high gain (25.5dB typ.@2.4GHz) for up to 6GHz.

In the 2.4GHz ISM frequency band, the international Wireless LAN standards 802.11 b/g/n is among the major applications. When BFP740ESD is used as low noise amplifier for the 2.4GHz Wireless LAN application, it offers a noise figure of 0.74dB only, and provides a high gain of 18.9dB.

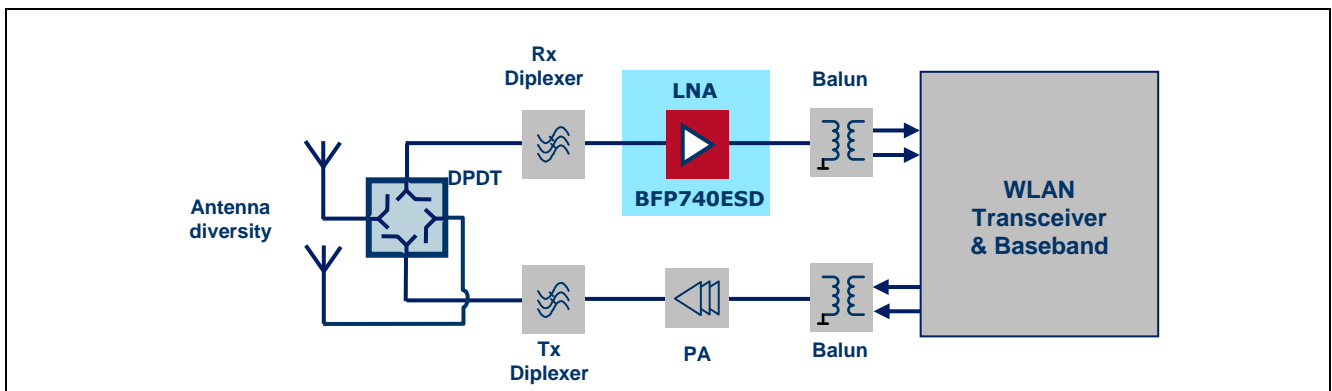


Figure 1 Block diagram

2 Application Circuit

2.1 Schematic Diagram

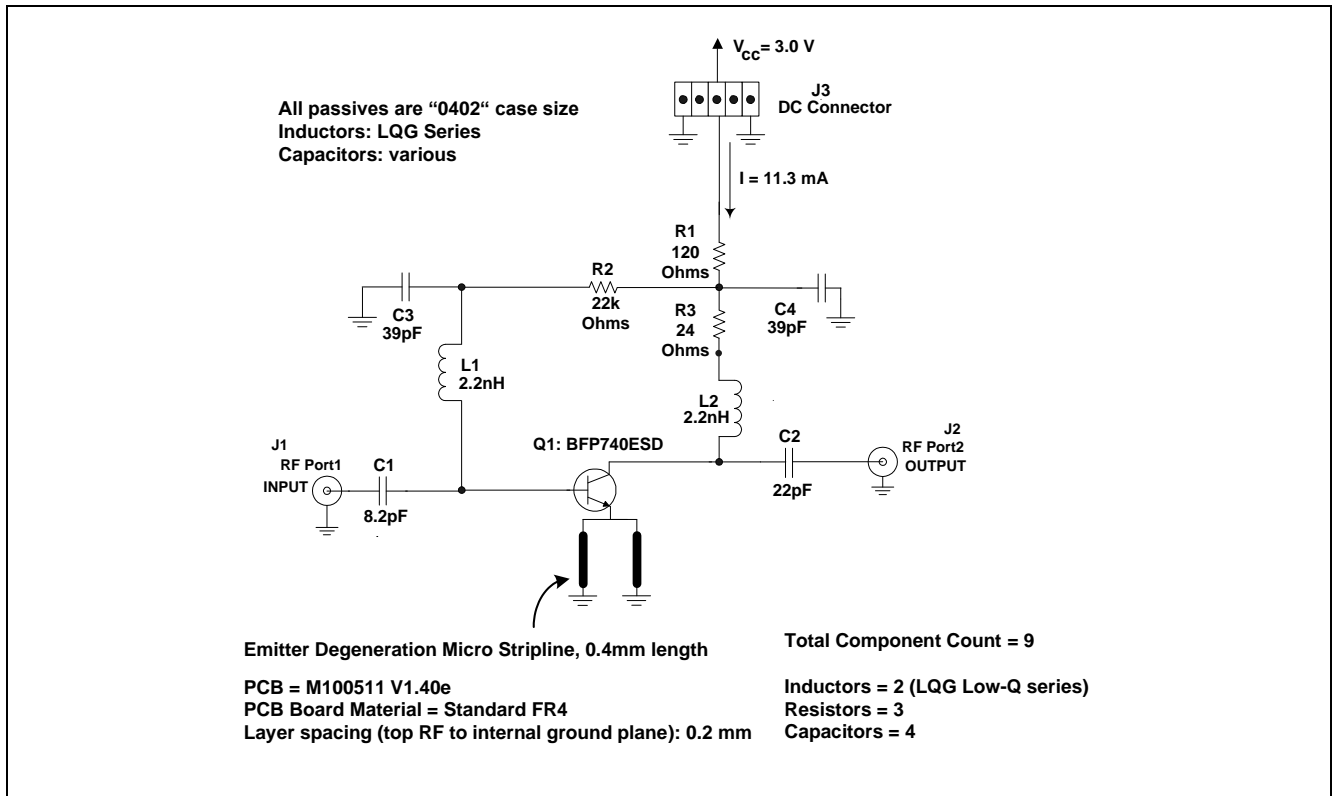
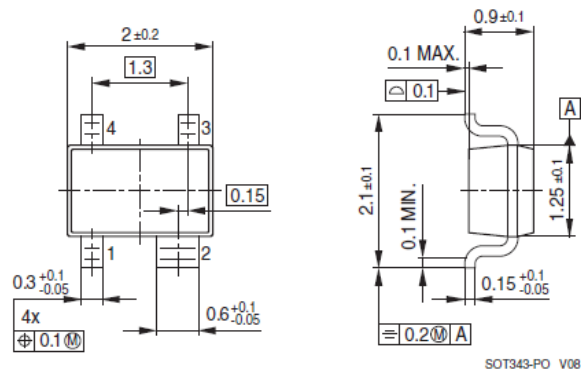


Figure 2 BFP740ESD Application Circuit

Table 1 Bill-of-Materials

Symbol	Value	Unit	Package	Manufacturer	Comment
C1	8.2	pF	0402	Various	Input matching
C2	22	pF	0402	Various	Output matching
C3	39	pF	0402	Various	RF decoupling / blocking capacitor
C4	39	pF	0402	Various	RF decoupling / blocking capacitor
R1	120	Ω	0402	Various	DC biasing
R2	22	kΩ	0402	Various	DC biasing
R3	24	Ω	0402	Various	DC biasing
L1	2.2	nH	0402	Murata LQG15A	Input matching
L2	2.2	nH	0402	Murata LQG15A	Output matching
Q1	BFP740ESD		SOT343	Infineon	Transistor LNA in SOT343 package

Table 2 **Package drawing for SOT343 package**



3 Typical Measurement Results

Table 3 shows typical measurement results of the application circuit shown in Figure 2. The values given in these tables include losses of the board and the SMA connectors if not otherwise stated.

Table 3 Electrical Characteristics (at room temperature)

Parameter	Symbol	Value	Unit	Comment/Test Condition
Frequency Range	Freq	2440	MHz	
DC Voltage	Vcc	3.0	V	
DC Current	Icc	11.3	mA	
Gain	G	18.9	dB	
Noise Figure	NF	0.74	dB	PCB and SMA connector losses of 0.11 dB subtracted
Input Return Loss	RLin	10.4	dB	
Output Return Loss	RLout	11.0	dB	
Reverse Isolation	IRev	26.2	dB	
Input P1dB	IP1dB	-12.9	dBm	
Output P1dB	OP1dB	5.0	dBm	
Input IP3	IIP3	-4.9	dBm	$f_1 = 2440 \text{ MHz}, f_2 = 2441 \text{ MHz},$ Pin = -25 dBm
Output IP3	OIP3	+ 14.0	dBm	$f_1 = 2440 \text{ MHz}, f_2 = 2441 \text{ MHz},$ Pin = -25 dBm
Stability	K	> 1	--	Unconditionally stable from 0 to 10GHz

4 Measured Graphs

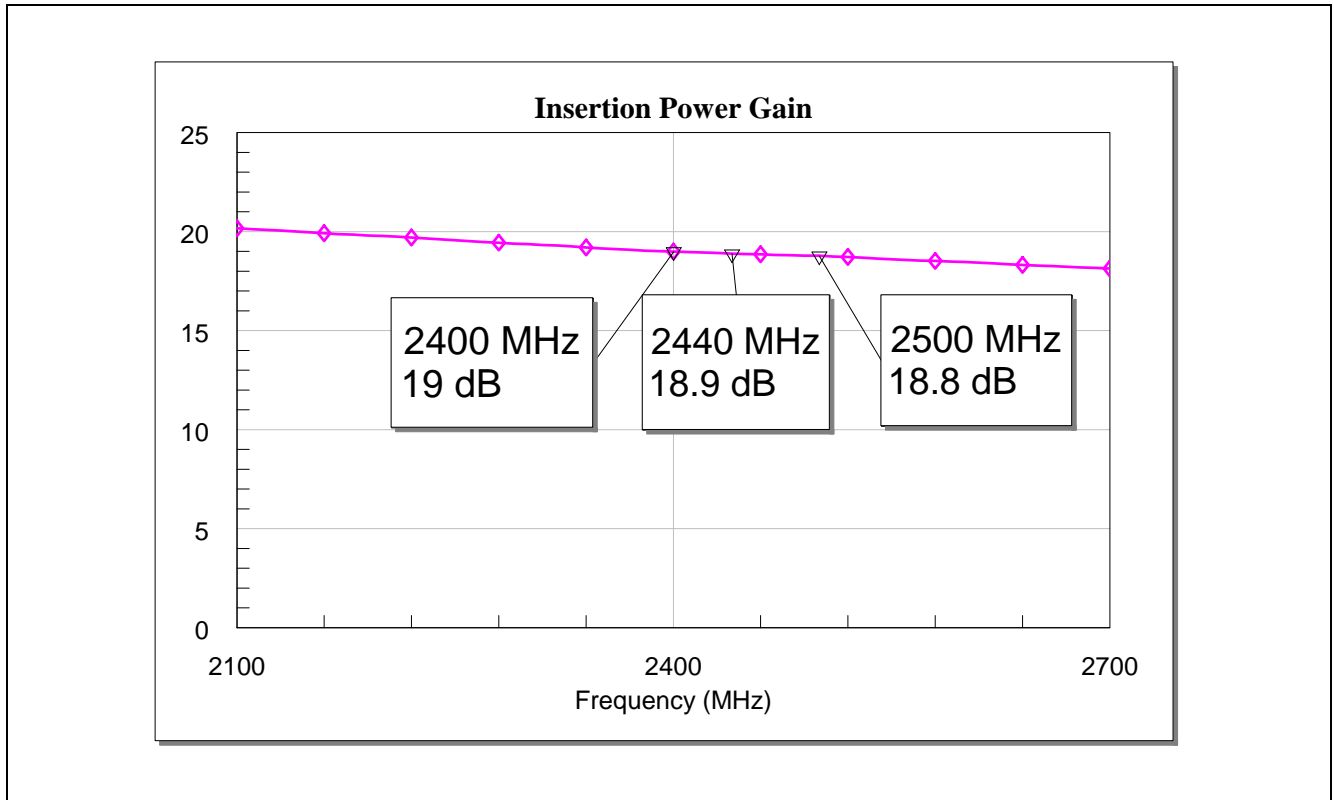


Figure 3 Narrowband Insertion gain of BFP740ESD for WLAN 2.4GHz Application

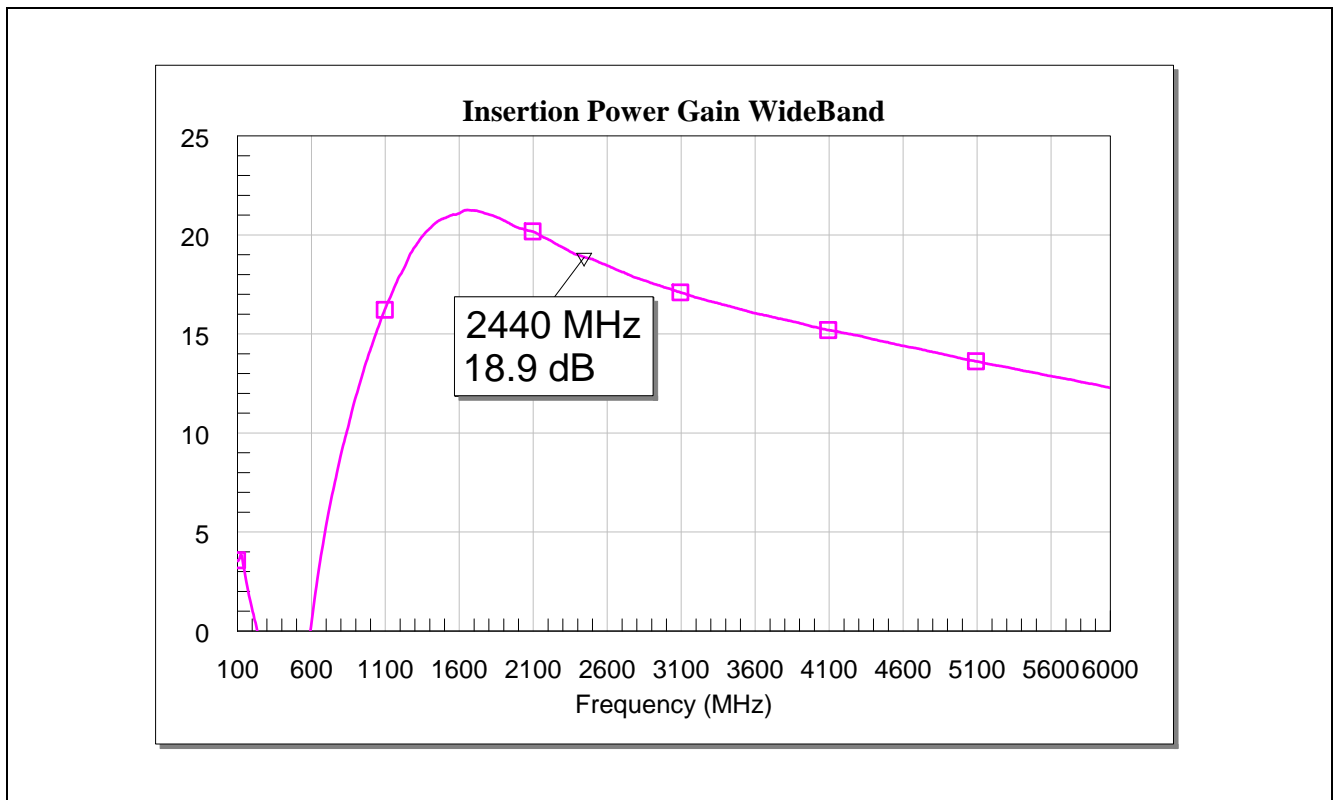


Figure 4 Wideband power gain of BFP740ESD for WLAN 2.4GHz Application

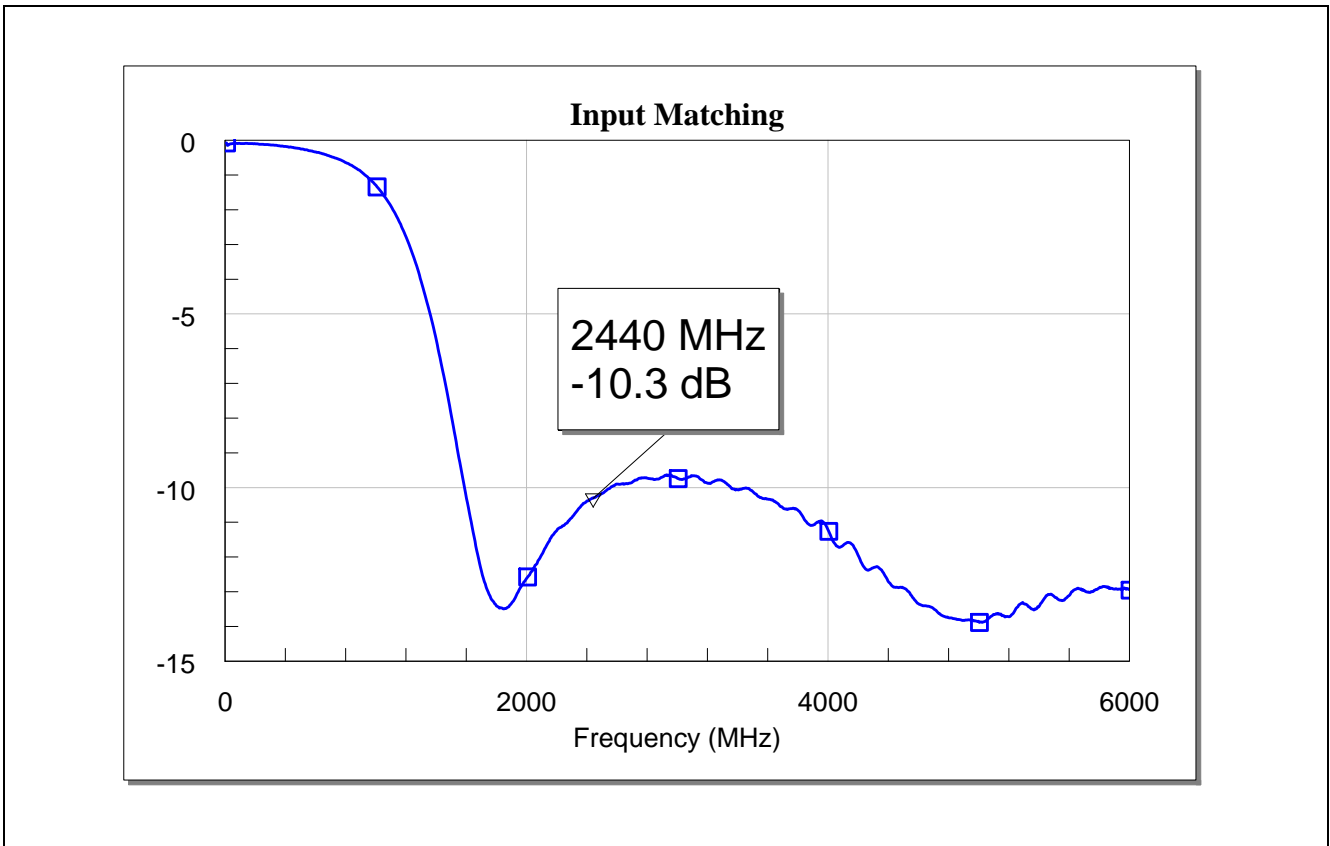


Figure 5 Input Matching of BFP740ESD for WLAN 2.4GHz Application

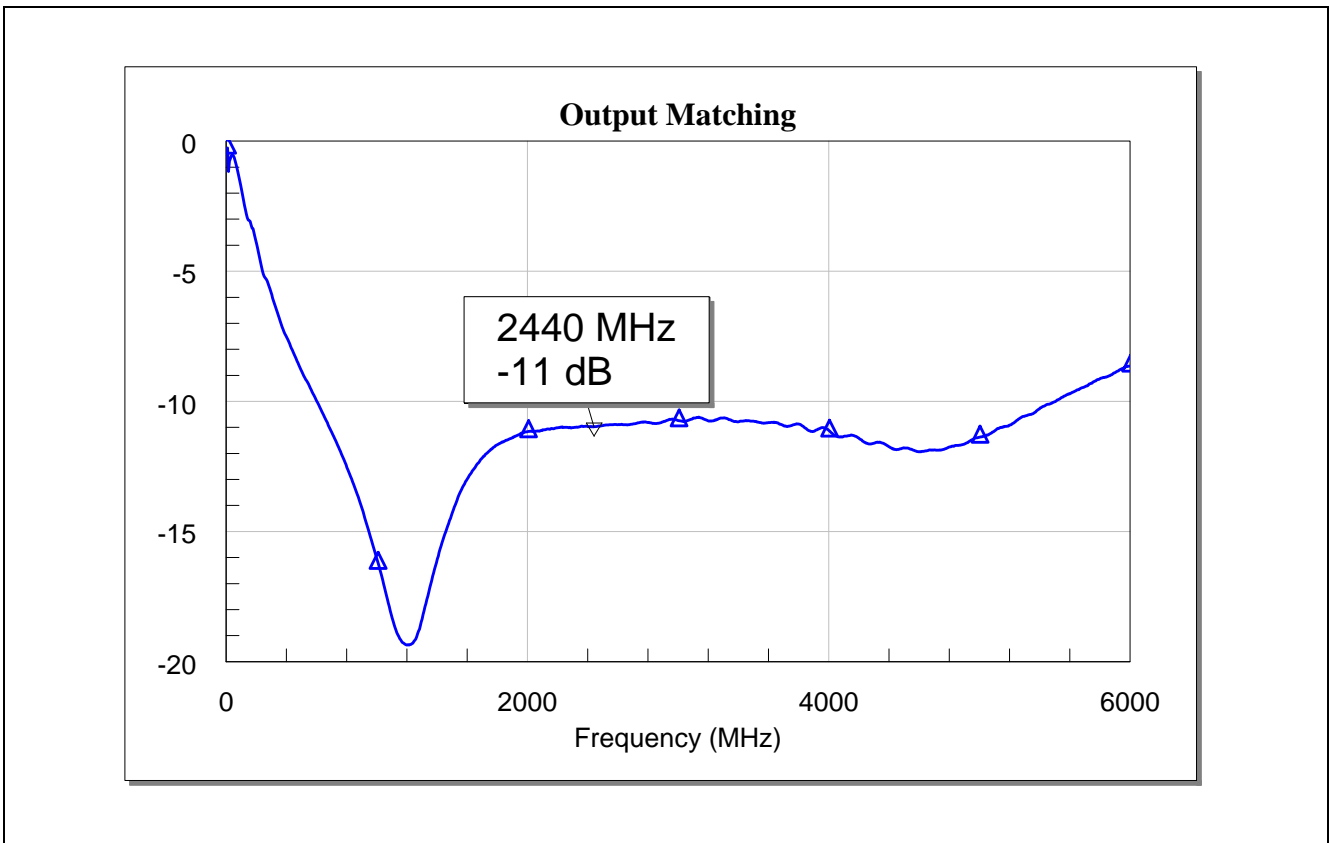


Figure 6 Output Matching of BFP740ESD for WLAN 2.4GHz Application

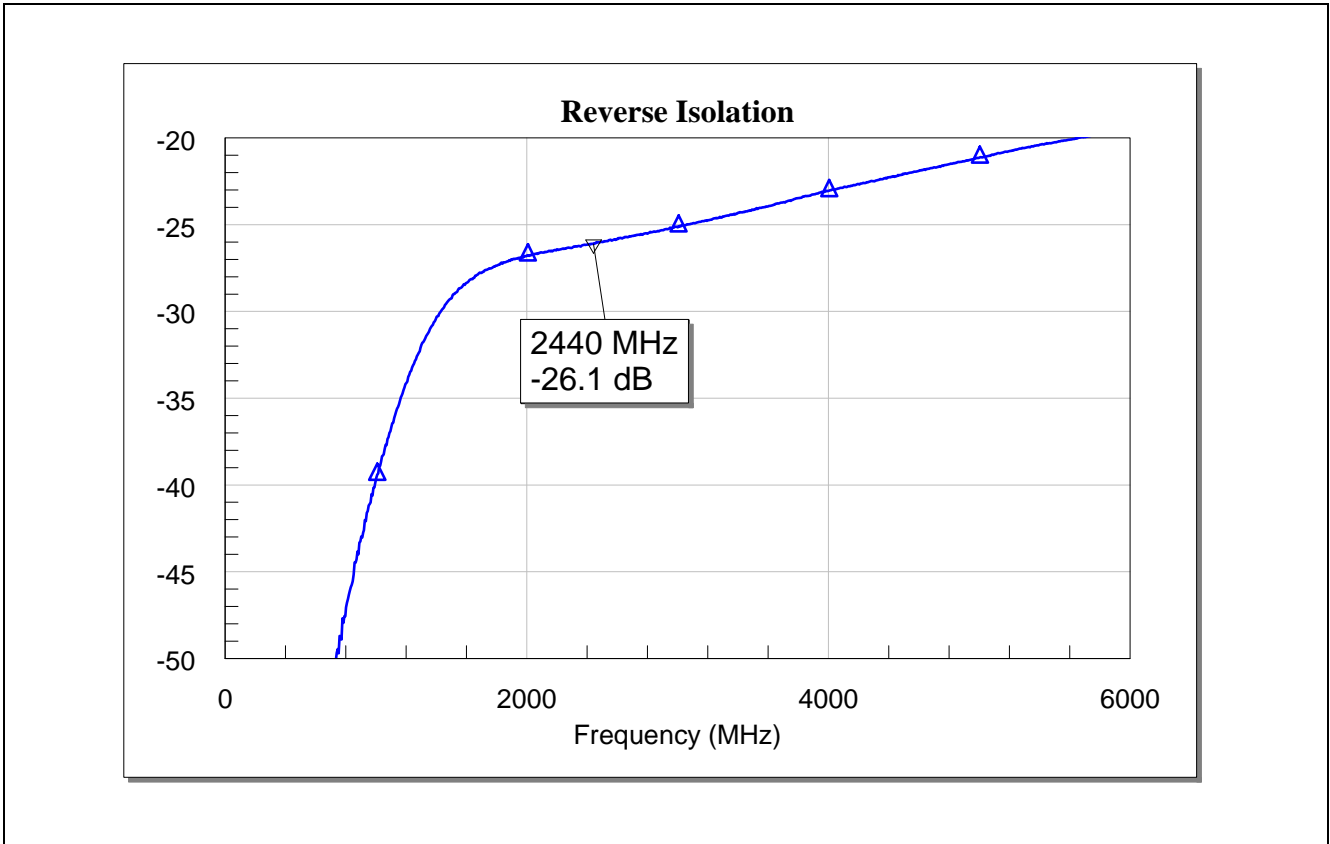


Figure 7 Reverse Isolation of BFP740ESD for WLAN 2.4GHz Application

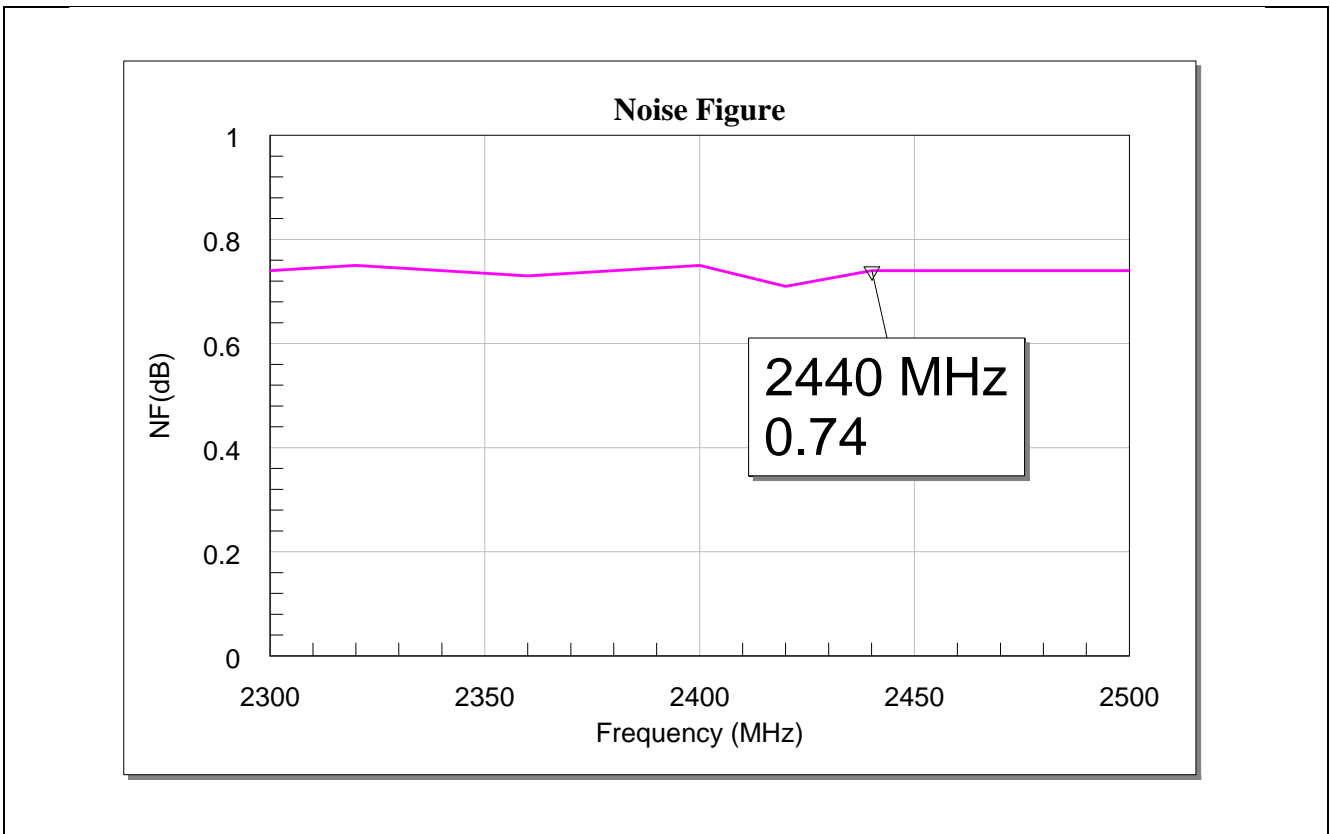


Figure 8 Noise Figure of BFP740ESD for WLAN 2.4GHz Application

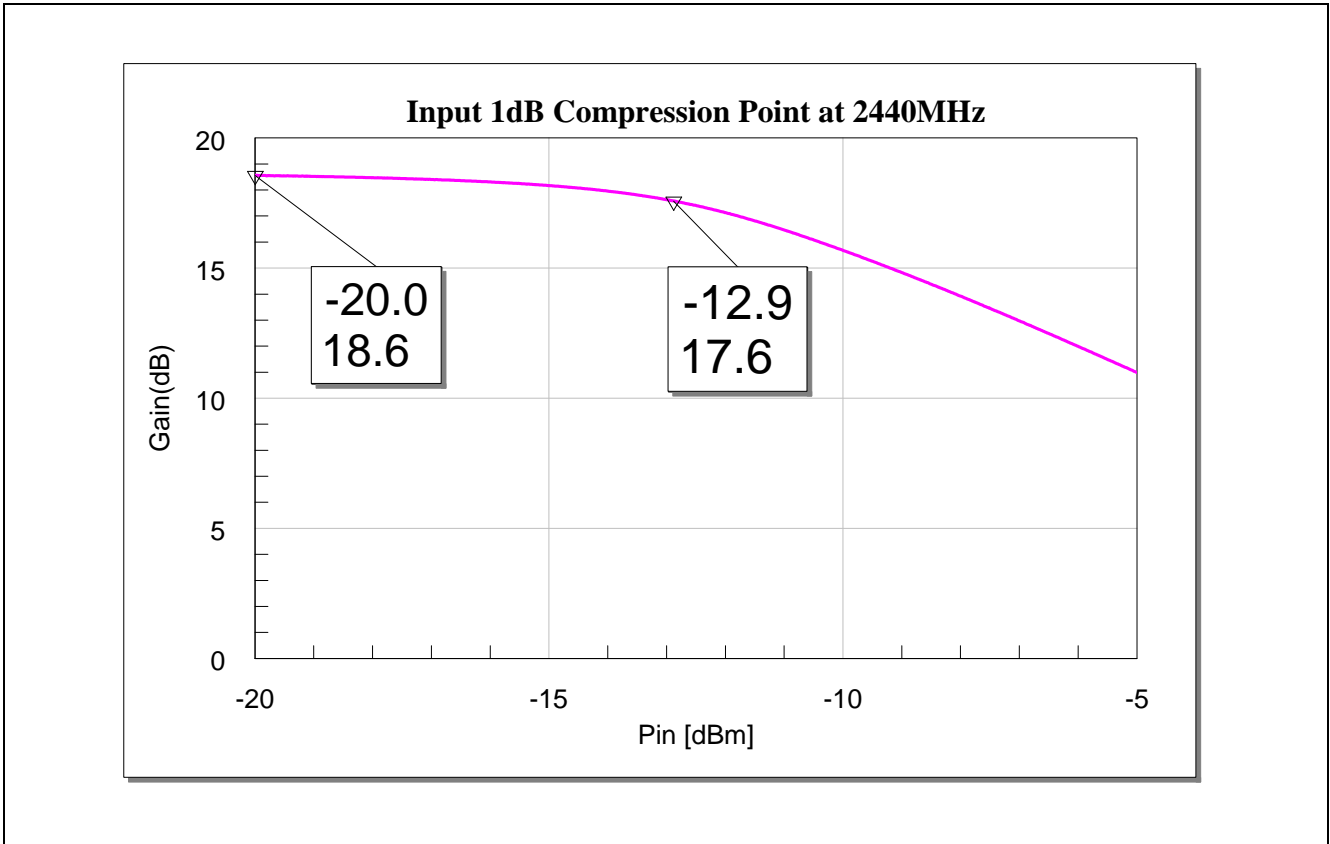


Figure 9 Input 1 dB compression point of BFP740ESD for WLAN 2.4GHz Application

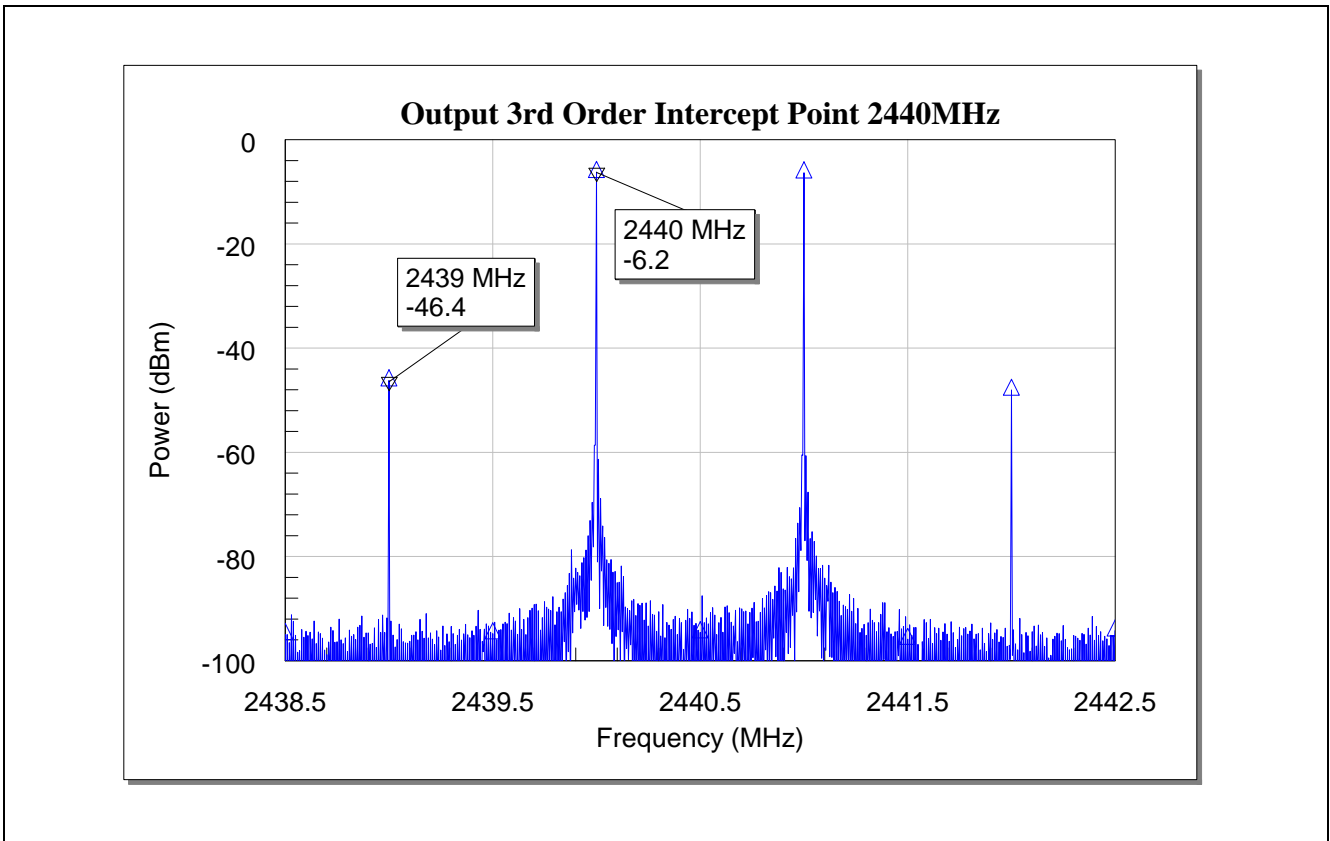


Figure 10 Output Third Order Interpoint (OIP3) of BFP740ESD for WLAN 2.4GHz Application

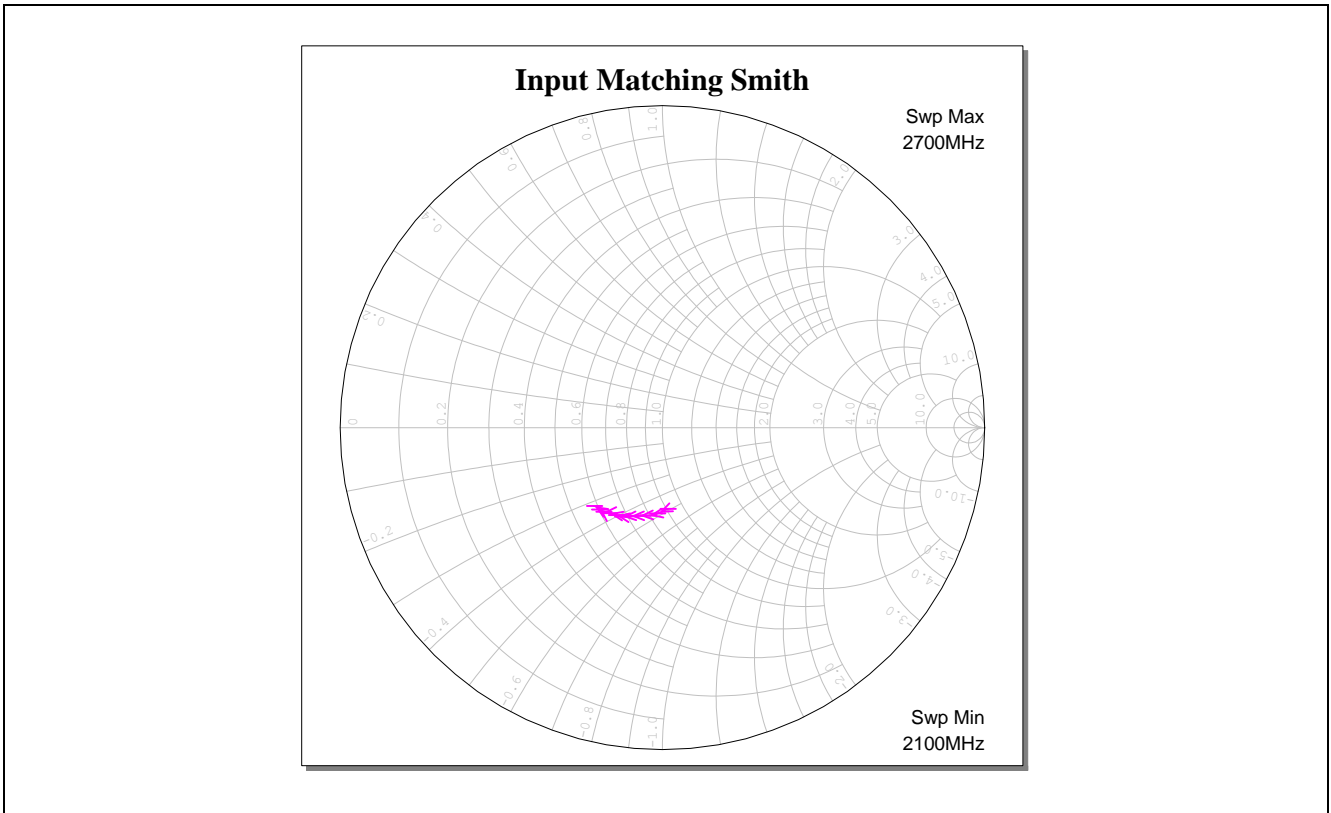


Figure 11 Input matching of BFP740ESD for WLAN 2.4GHz Application in the Smith Chart

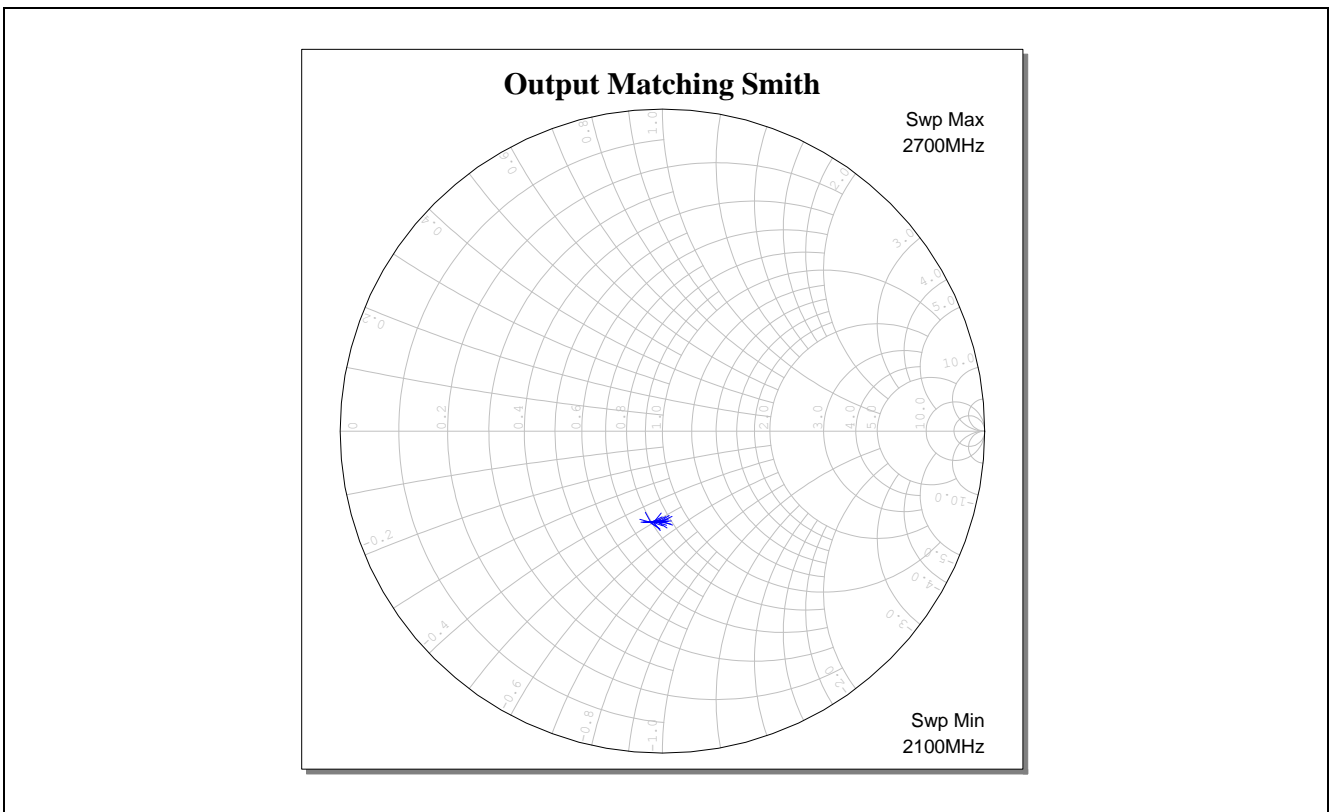


Figure 12 Output matching of BFP740ESD for WLAN 2.4GHz Application in the Smith Chart

5 Other Miscellaneous Measurements

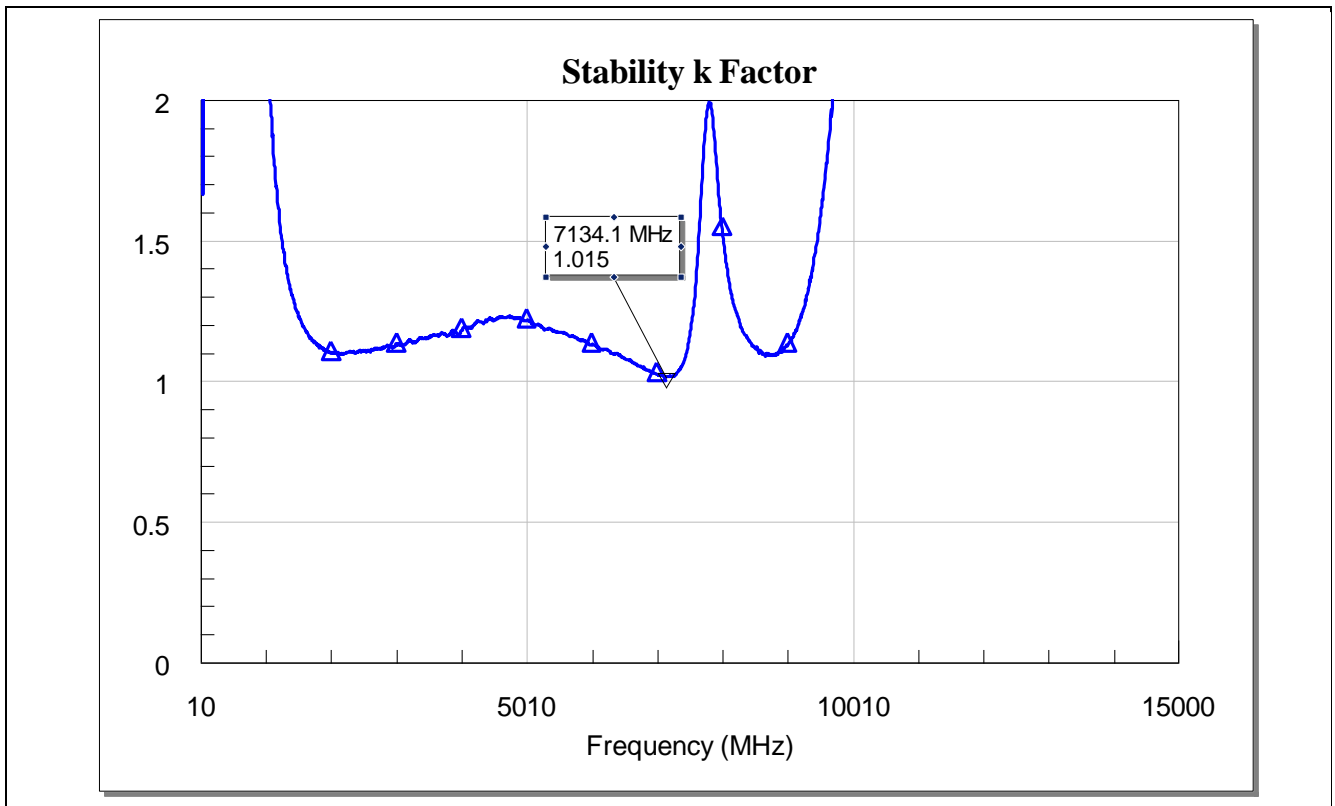


Figure 13 Stability factor k of BFP740ESD circuit for up to 10GHz

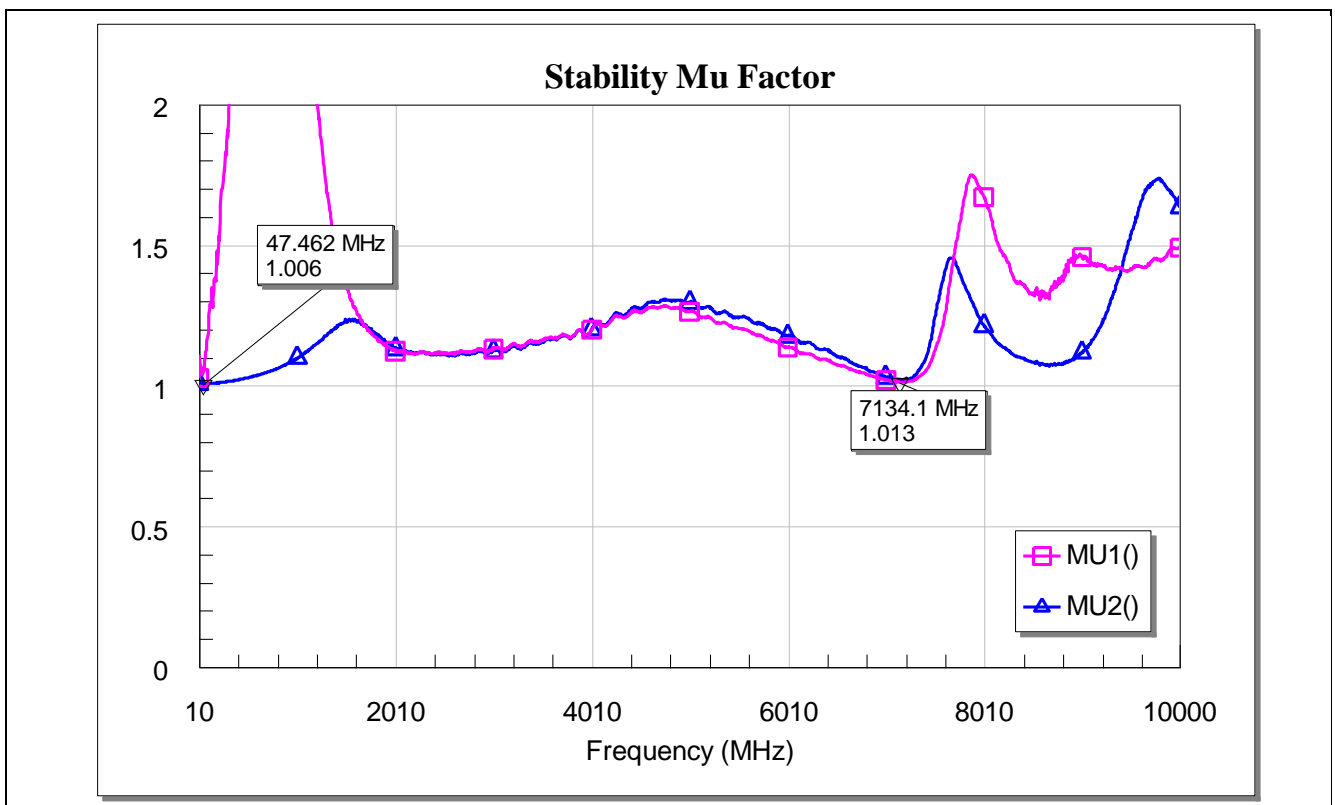


Figure 14 Stability factor μ_1 and μ_2 of BFP740ESD circuit for up to 10GHz

6 Evaluation Board

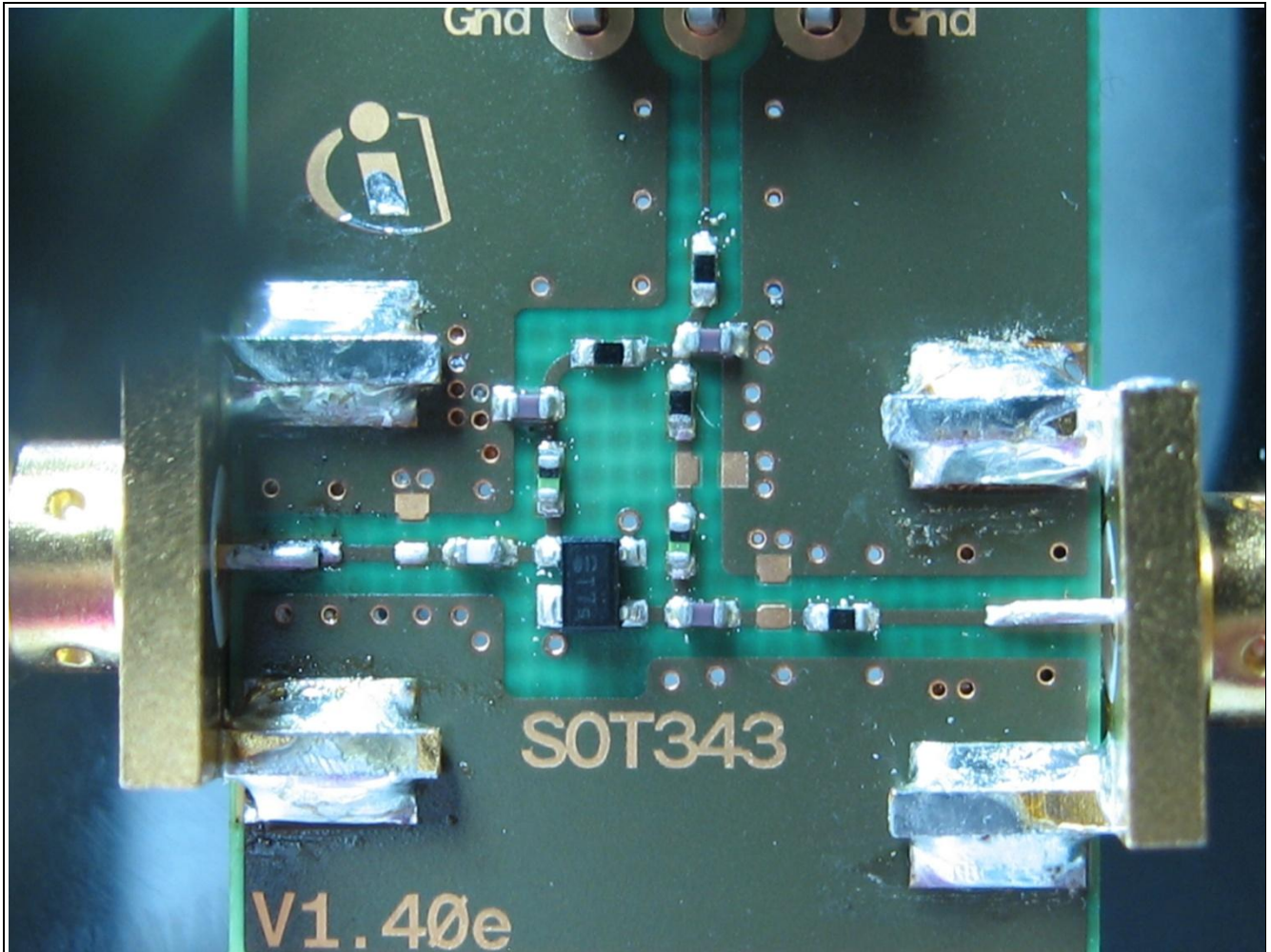


Figure 15 Populated PCB picture of BFP740ESD for WLAN 2.4GHz board (Emitter Degeneration Length 0.4mm)

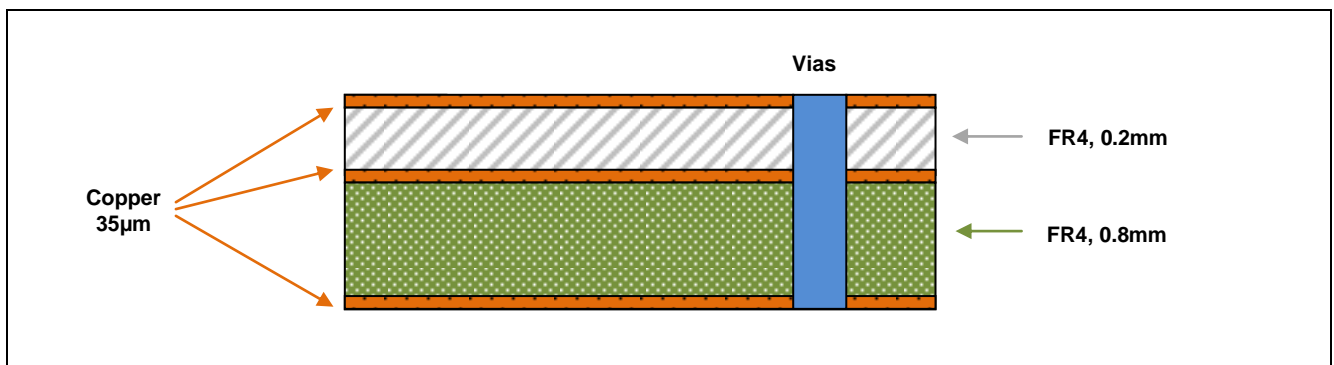


Figure 16 PCB layer stack



7 Author

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