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AM Radio Amplifier with Filter Using the NSVJ3557SA3

Application Note

Overview

This application note explains about ON Semiconductor's NSVJ3557SA3 which is used as a Low Noise Amplifier (LNA) for AM Radio.

The NSVJ3557SA3 is a silicon junction field effect transistor best suited for high-frequency applications which is assembled in the 3-pin surface mount package. For information about the performance, please refer to the datasheet of this product.

The evaluation board is adjusted to provide +9.5dB gain in AM band (520 to 1720 kHz) and reduce gain to -80dB in FM band (76 to 108 MHz).

A standard material FR4 is used for the printed circuit board (PCB).



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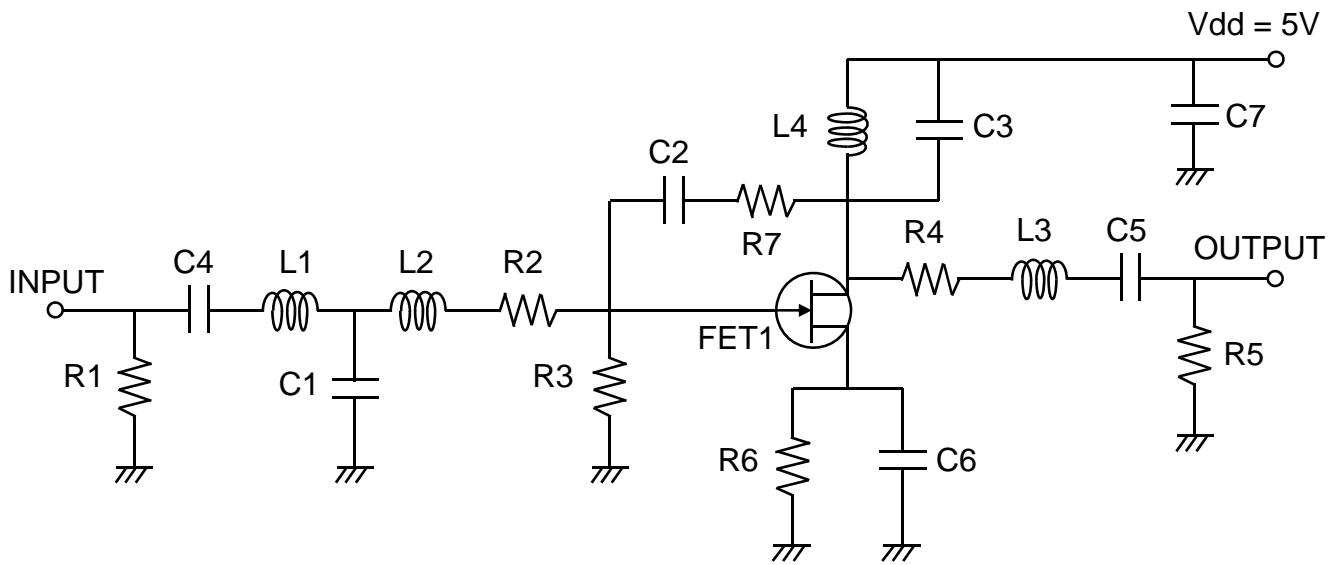
■ Summary of Performance

Ta = 25°C, Input Power = -40 dBm, Zo = 50 Ω

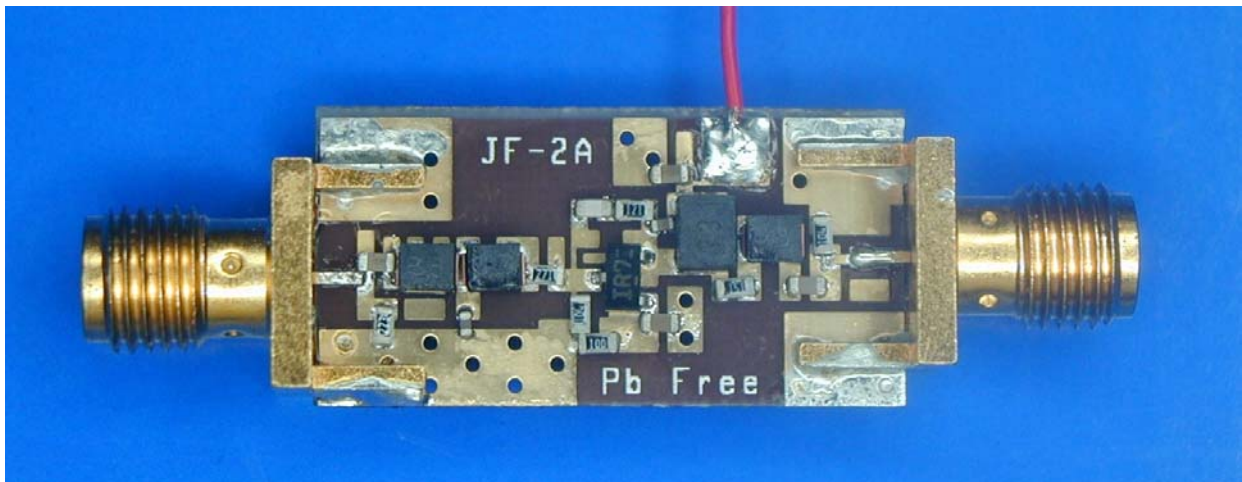
Parameter	Symbol	Condition	Result	Unit
DC Voltage	Vdd		5.0	V
DC Current	Idd		16.8	mA
Power Gain	Gp1	f = 520 kHz	9.42	dB
		f = 1120 kHz	9.70	
		f = 1720 kHz	9.51	
	Gp2	f = 76 MHz	-89.0	
		f = 90 MHz	-91.0	
		f = 108 MHz	-88.3	
Input Return Loss	RLin	f = 520 kHz	-0.03	dB
		f = 1120 kHz	-0.22	
		f = 1720 kHz	-0.55	
Output Return Loss	RLout	f = 520 kHz	-0.35	dB
		f = 1120 kHz	-0.66	
		f = 1720 kHz	-1.35	
Isolation	ISL	f = 520 kHz	-46.3	dB
		f = 1120 kHz	-39.8	
		f = 1720 kHz	-36.1	

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■Circuit Diagram



■Evaluation Board



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■Bill of Materials

Item	Symbol	Value	Manufacture	Size
J-FET	FET1	NSVJ3557SA3	ON Semiconductor	SC-59
Capacitor	C1	10 pF	Murata GRM155	1005
	C2	12 pF	Murata GQM188	1608
	C3	120 pF	Murata GRM155	1005
	C4,C5,C6,C7	0.1 uF	ROHM MCH182CN	1608
Resistor	R1	22 k Ω	Various	1608
	R2	270 Ω	Various	1608
	R3	100 k Ω	Various	1608
	R4	150 Ω	Various	1608
	R5	100 k Ω	Various	1608
	R6	10 Ω	Various	1608
	R7	120 Ω	Various	1608
Inductor	L1,L2,L3	3.3 uH	TDK NLV25T	2520
	L4	330 uH	TDK NLCV32T	3225
Material		FR-4		25 x 13 mm

AM Radio Amplifier with Filter Using the NSVJ3557SA3

■ Measurement Results

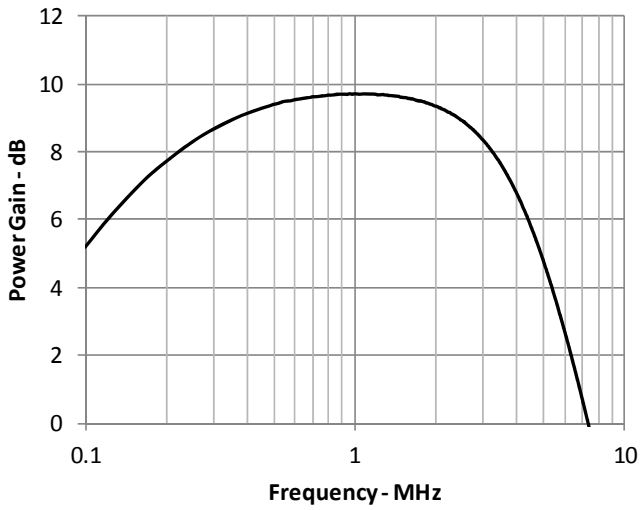


Figure 1 Power Gain vs. Frequency

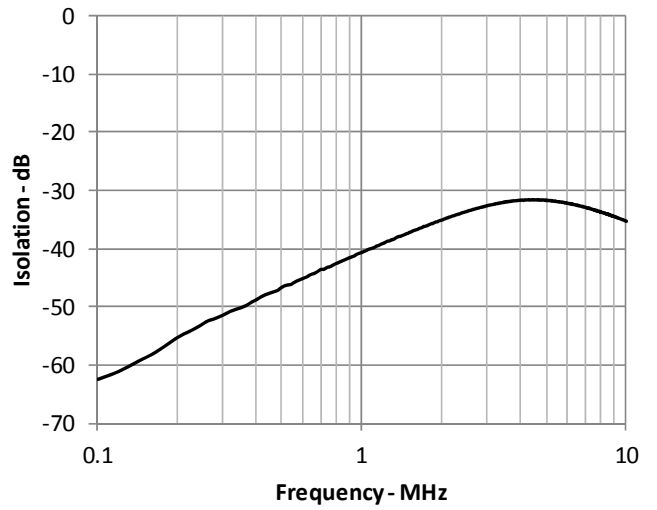


Figure 2 Isolation vs. Frequency

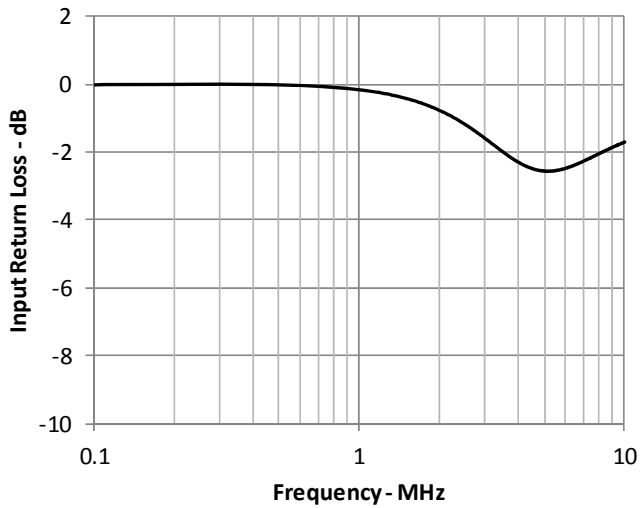


Figure 3 Input Return Loss vs. Frequency

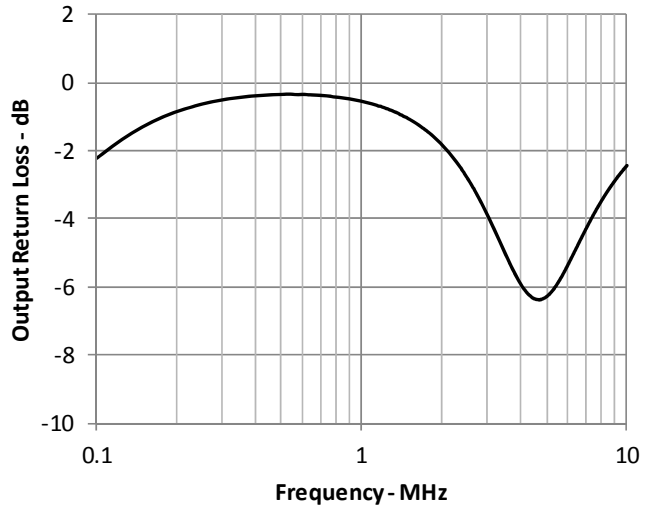


Figure 4 Output Return Loss vs. Frequency

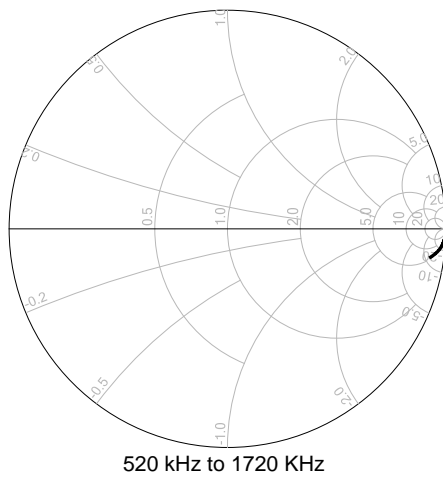


Figure 5 Smith Chart S11

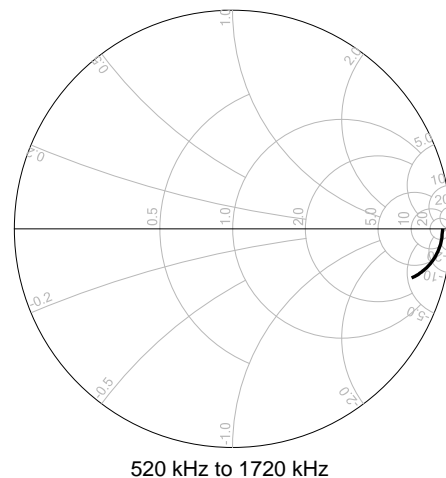


Figure 6 Smith Chart S22

AM Radio Amplifier with Filter Using the NSVJ3557SA3

■ Measurement Results

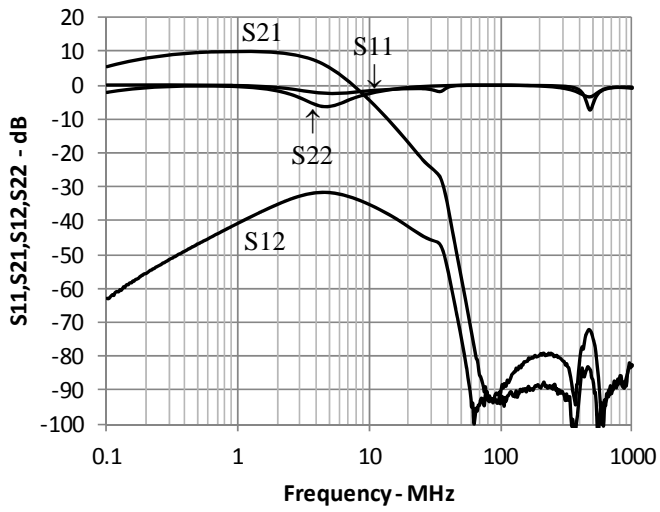


Figure 7 S11,S21,S12,S22 Wide Span

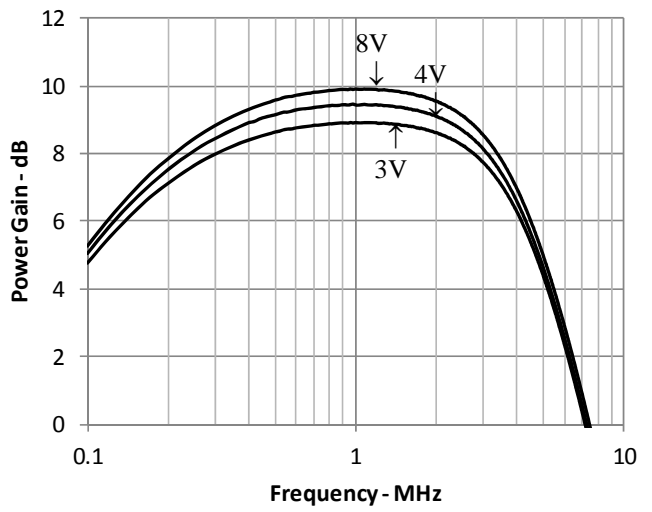


Figure 8 Voltage Dependency

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