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AND9693/D

DAB L-Band Amplifier Using the NSVF4017SG4

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APPLICATION NOTE

Overview

This application note explains about ON Semiconductor NSVF4017SG4 which is used as a Low Noise Amplifier (LNA) for DAB (Digital Audio Broadcast).

The NSVF4017SG4 is a silicon bipolar transistor best suited for high−frequency applications which is assembled in the 4−pin surface mount package.

For information about the performance, please refer to the datasheet of this product.

Since the evaluation board is adjusted to achieve optimal performance in L−band (1452 MHz to 1492 MHz), the product can provide 15.5 dB gain and 1.54 dB noise figure.

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

Please note that the losses of the PCB and the SMA connector are not excluded from the noise figure.

Table 1. SUMMARY OF DATA

Ta = 25°C, Input Power = −40 dBm

Parameter	Symbol	Condition	Result			Unit
DC Voltage	Vcc		2.6	2.8	3.0	V
DC Current	Icc		8.5	9.4	10.3	mA
Gain	Gp1	f = 1452 MHz	15.5	15.6	15.8	dB
	Gp2	f = 1472 MHz	15.4	15.5	15.7	dB
	Gp3	f = 1492 MHz	15.3	15.4	15.5	dB
Noise Figure	NF1	f = 1452 MHz	–	1.52	–	dB
	NF2	f = 1472 MHz	–	1.54	–	dB
	NF3	f = 1492 MHz	–	1.62	–	dB
Input Return Loss	RLin1	f = 1452 MHz	11.7	12.1	12.6	dB
	RLin2	f = 1472 MHz	11.6	11.9	12.2	dB
	RLin3	f = 1492 MHz	11.4	11.5	11.6	dB
Output Return Loss	RLout1	f = 1452 MHz	11.0	11.3	11.7	dB
	RLout2	f = 1472 MHz	12.0	12.5	12.9	dB
	RLout3	f = 1492 MHz	12.9	13.5	13.9	dB
Isolation	ISL1	f = 1452 MHz	19.9	20.5	20.7	dB
	ISL2	f = 1472 MHz	19.9	20.3	20.6	dB
	ISL3	f = 1492 MHz	19.9	20.3	20.6	dB
Gain 1 dB Compression Input Power	Pin1dB	f = 1472 MHz	–	−10	–	dBm
Input 3rd Order Intercept Point	IIP3	f1 = 1472 MHz f2 = 1473 MHz Pin = −30 dBm	–	0	–	dBm

Circuit Design

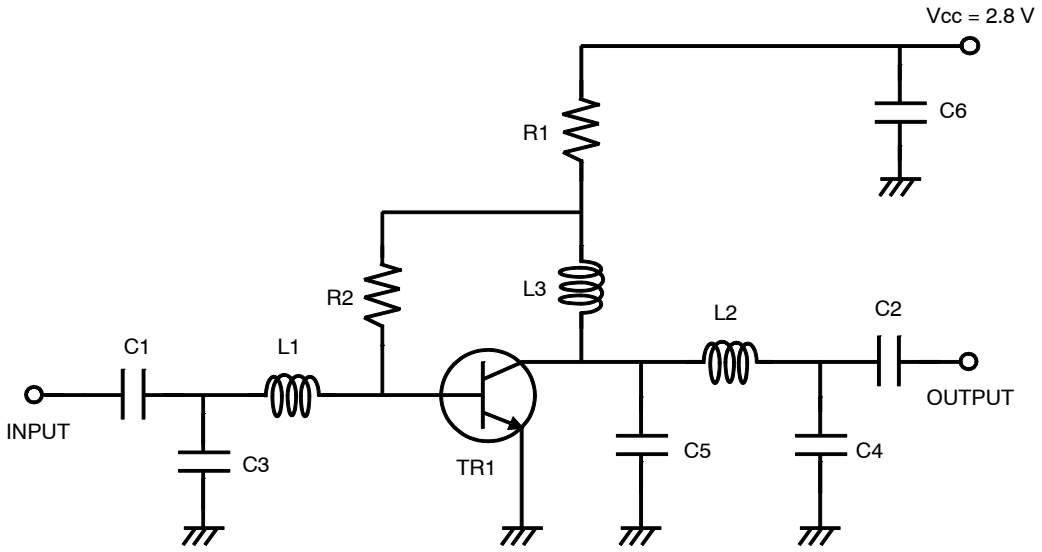

Figure 1. Circuit Design

Evaluation Board

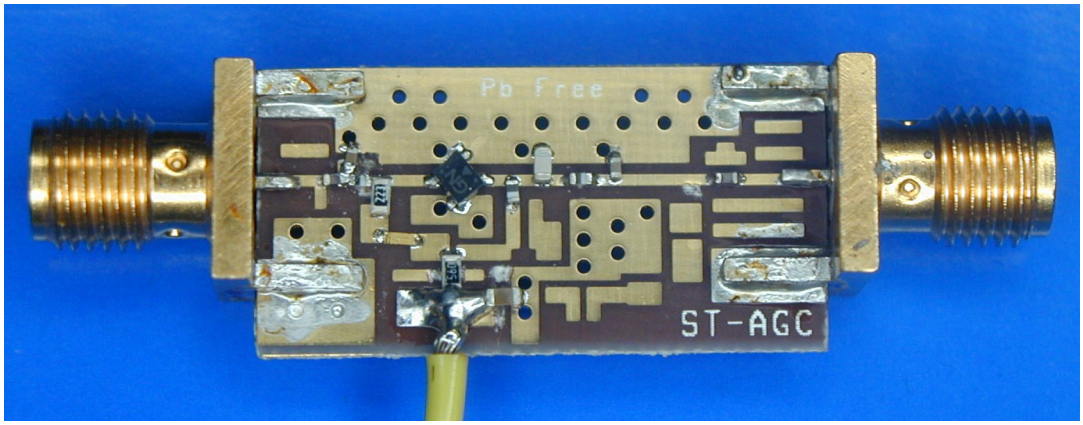

Figure 2. Evaluation Board

Table 2. BILL OF MATERIALS

Item	Symbol	Value	Manufacturer	Size
Bip−Tr	TR1	NSVF4017SG4	ON Semiconductor	SC82FL
Capacitor	C1, C2	100 pF	TAIYOYUDEN	1005
	C3, C4	3 pF	TAIYOYUDEN	1005
	C5	1.6 pF	Murata GQM1884C2A1R6CB01	1608
	C6	0.1 uF	TAIYOYUDEN	1608
Resistor	R1	56 Ω	Various	1608
	R2	22 kΩ	Various	1608
Inductor	L1	1.8 nH	TOKO LL1005−FHL1N8S	1005
	L2	3.9 nH	TOKO LL1005−FHL3N9S	1005
	L3	33 nH	TOKO LL1005−FHL33NJ	1005
Material	−	FR4	−	24.5 x 12.7 mm

Power Gain

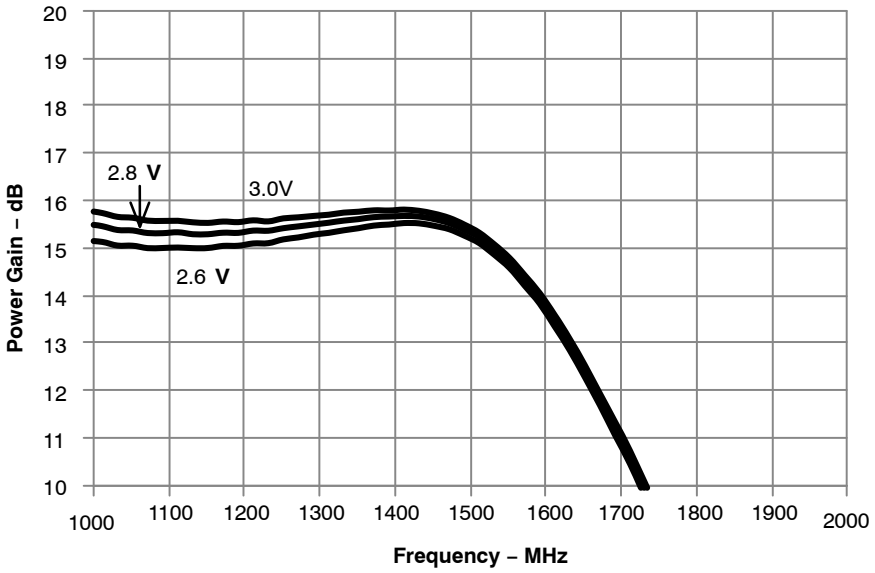

Figure 3. Power Gain

Isolation

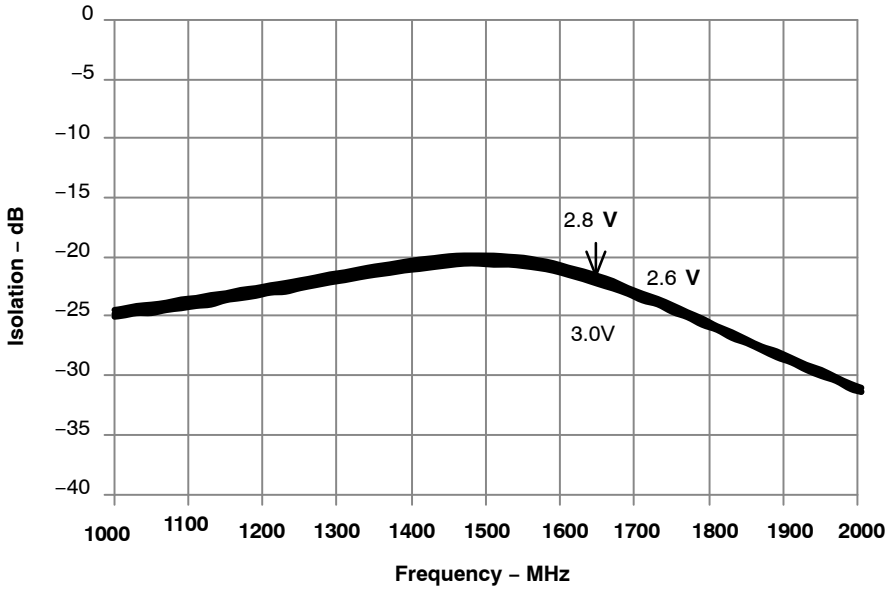

Figure 4. Isolation

Input Return Loss

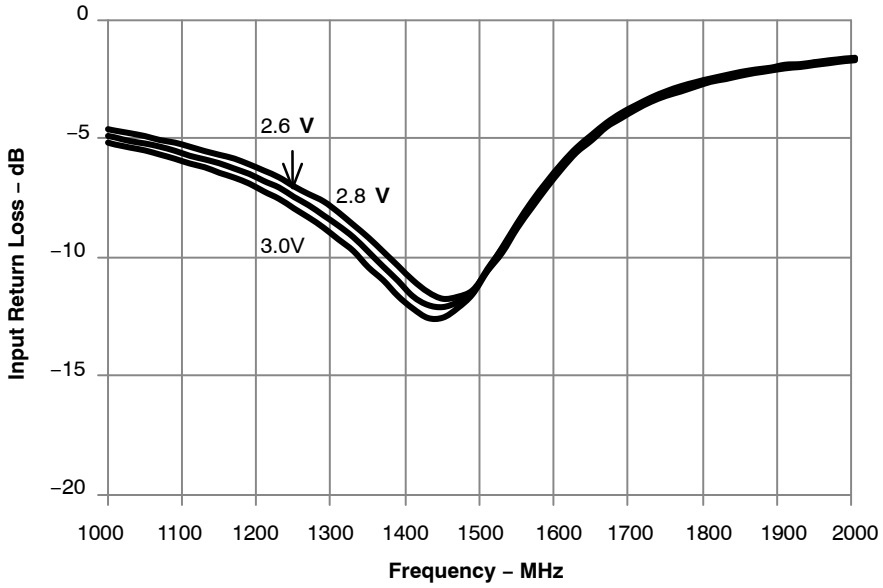

Figure 5. Input Return Loss

Output Return Loss

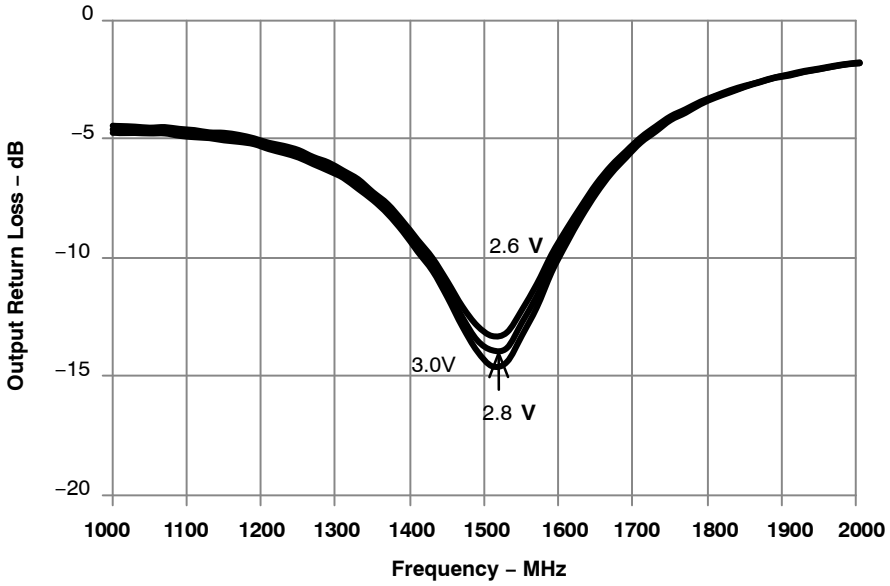

Figure 6. Output Return Loss

Noise Figure

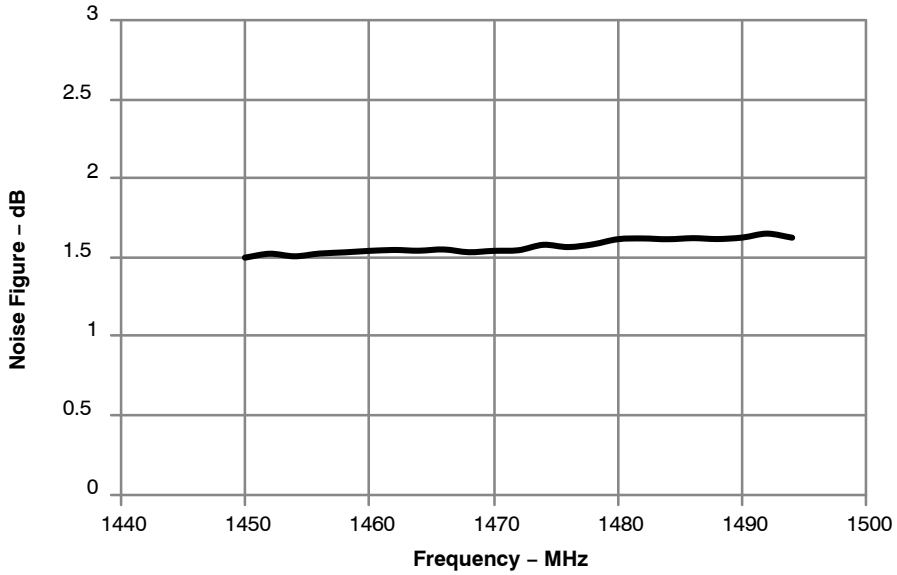

Figure 7. Noise Figure

S11, S21, S12, S22 Wide Span

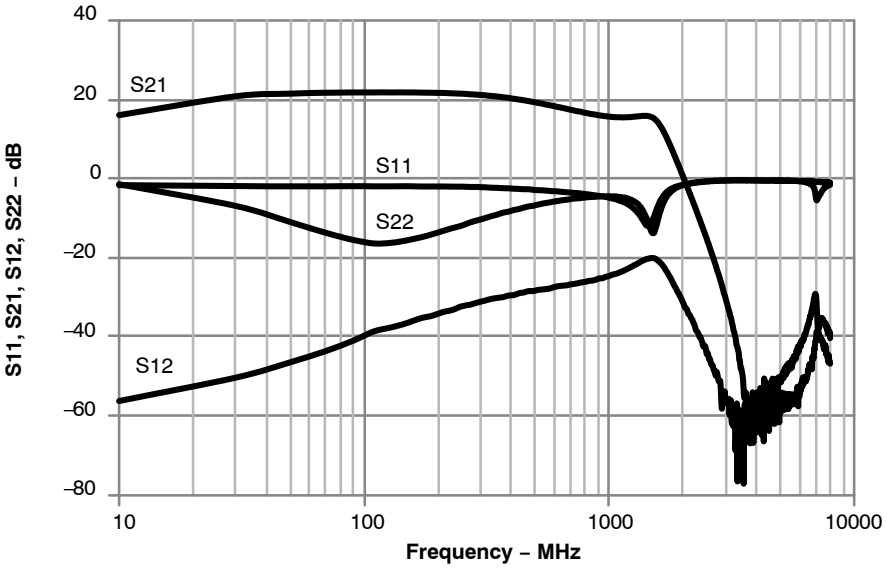

Figure 8. S11, S21, S12, S22 Wide Span

Smith Chart Input Return Loss

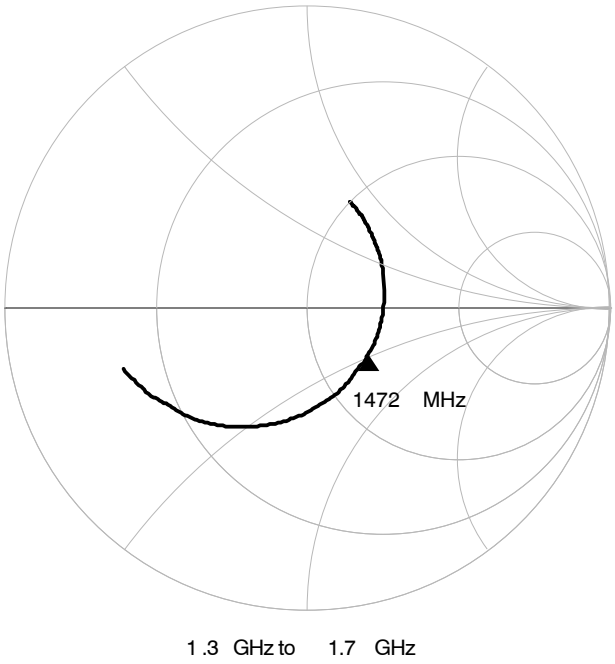

Figure 9. Smith Chart Input Return Loss

Smith Chart Output Return Loss

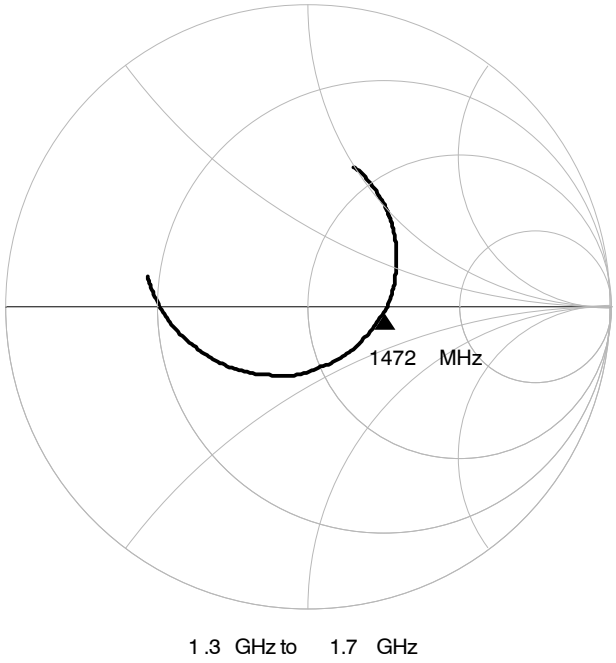

Figure 10. Smith Chart Output Return Loss

Gain 1 dB Compression Point

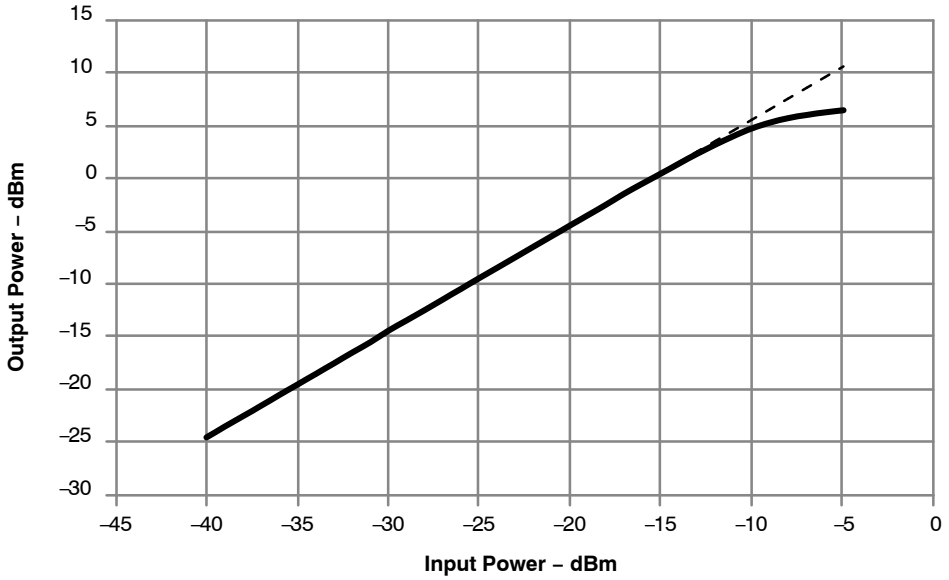

Figure 11. Gain 1 dB Compression Point

Input 3rd Order Intercept Point

f1 = 1452 MHz, f2 = 1492 MHz, Pin = −30 dBm

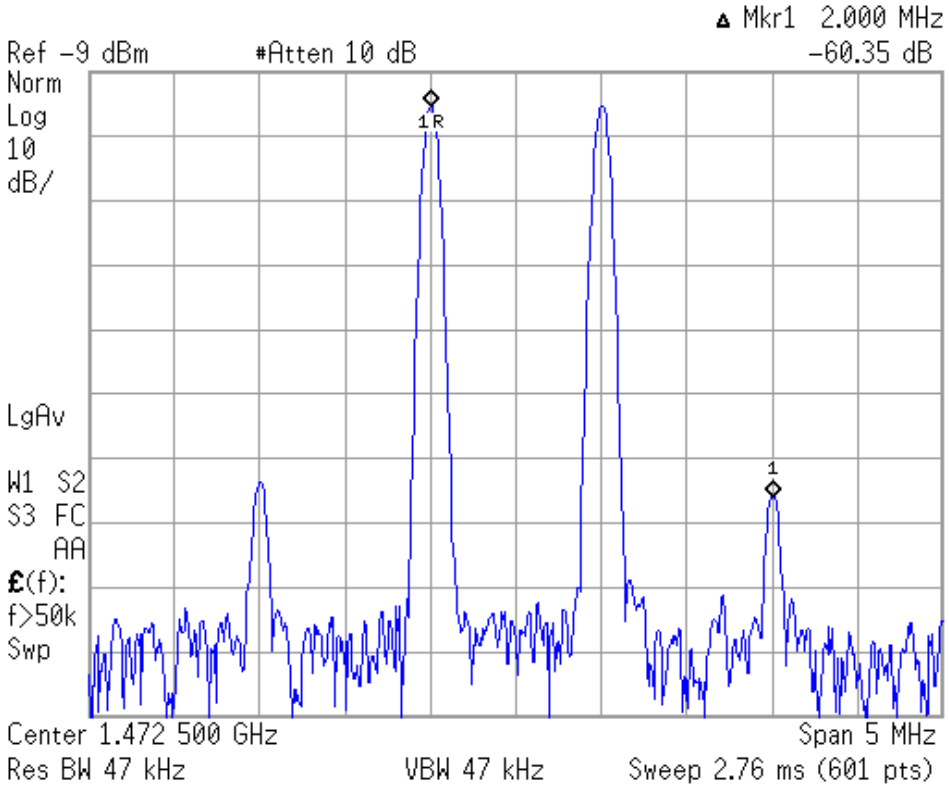

Figure 12. Input 3rd Order Intercept Point

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