AND9600/D

DAB L-band Amplifier using the NSVF4015SG4

ON Semiconductor®

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APPLICATION NOTE

Overview

This application note explains about ON Semiconductor's NSVF4015SG4 which is used as a Low Noise Amplifier (LNA) for DAB (Digital Audio Broadcast).

The NSVF4015SG4 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.

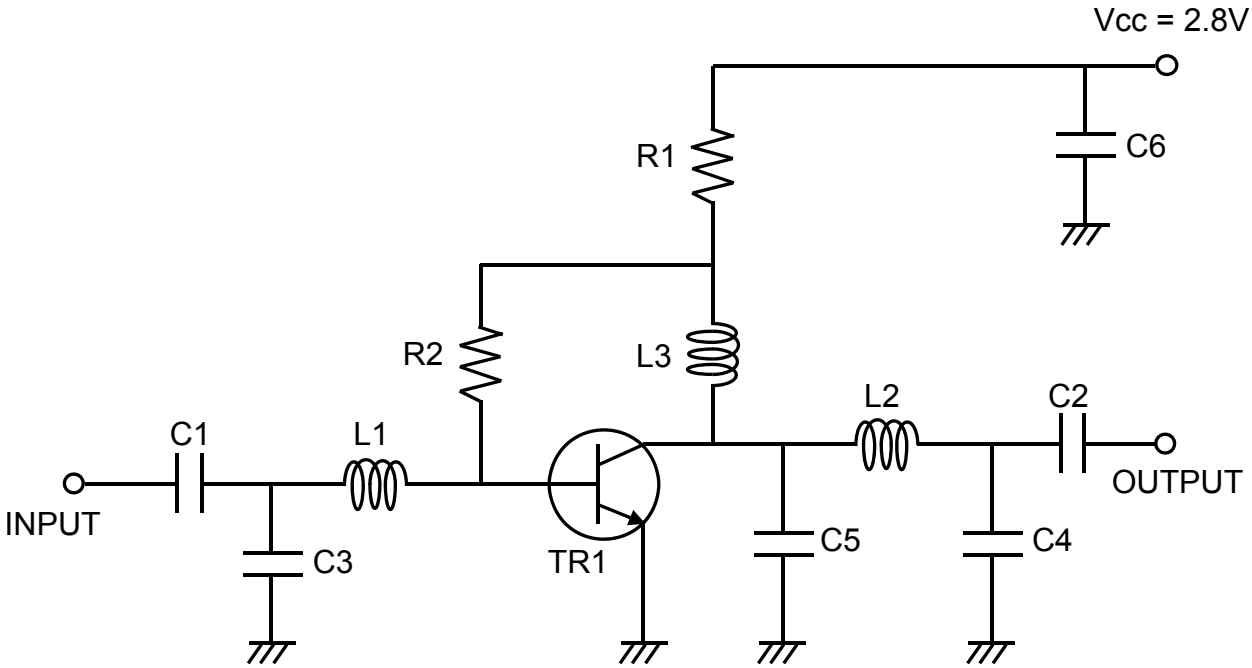
A standard material FR4 is used for the printed circuit board (PCB).
Please note that the losses of the PCB and the SMA connector are not excluded from the noise figure.

■ Summary of Data

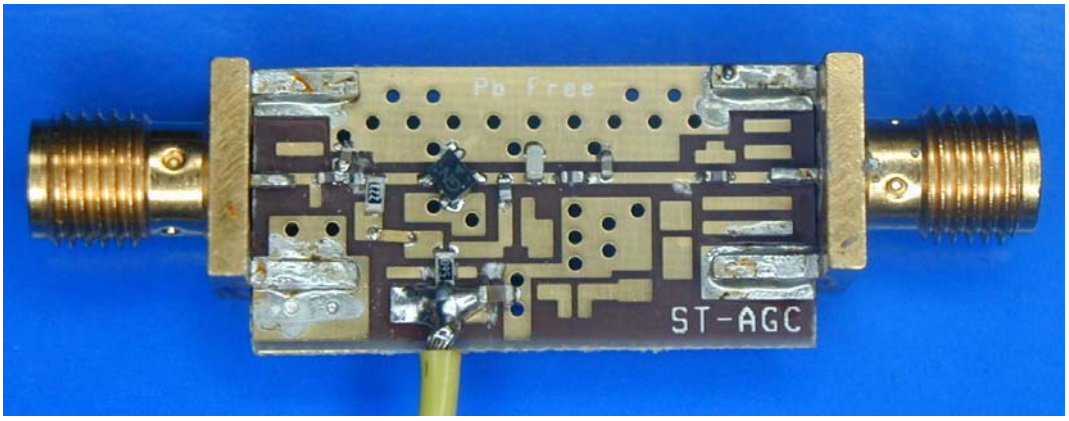
Ta = 25°C, Input Power = −40 dBm

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



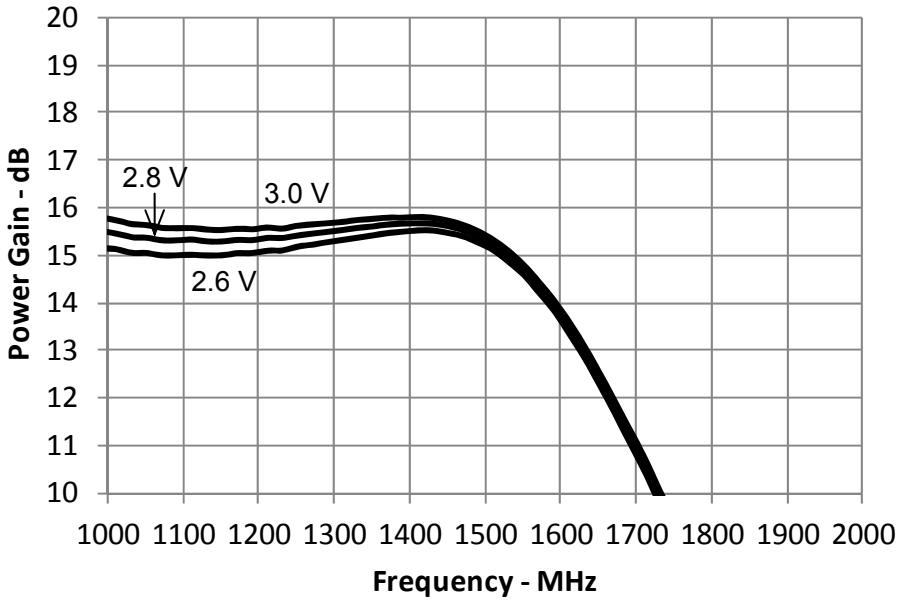
■Evaluation Board



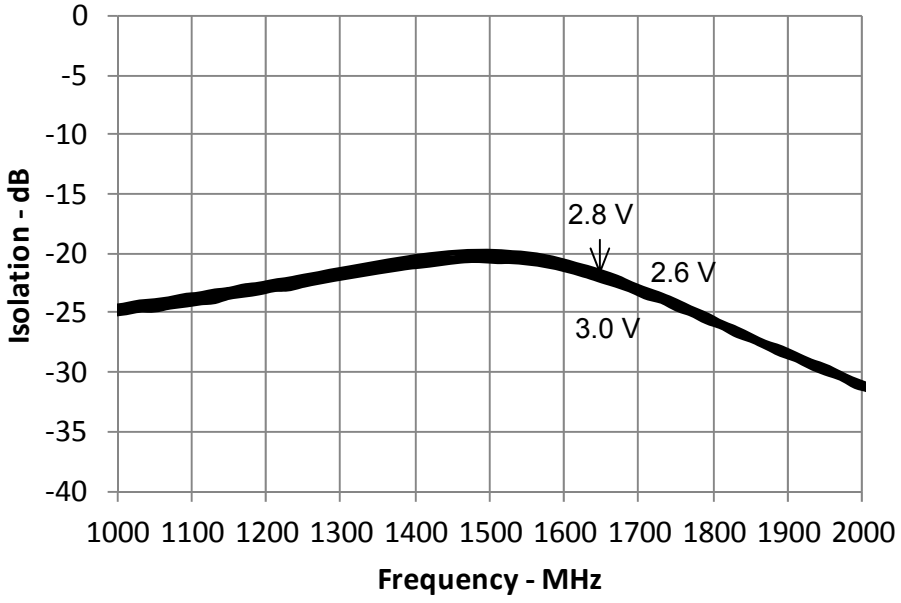
■ Bill of Materials

Item	Symbol	Value	Manufacturer	Size
Bip-Tr	TR1	NSVF4015SG4	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 μF	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

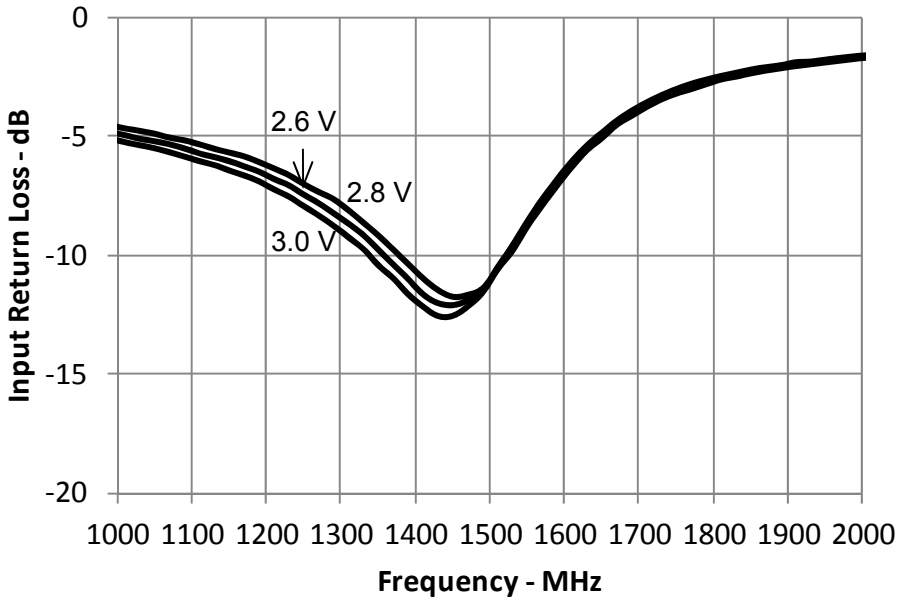
■ Power Gain



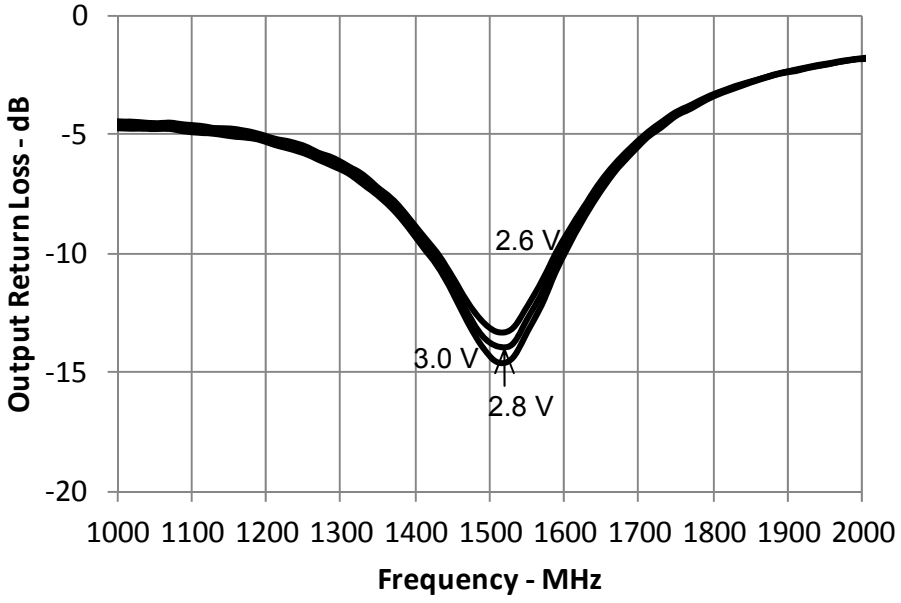
■ Isolation



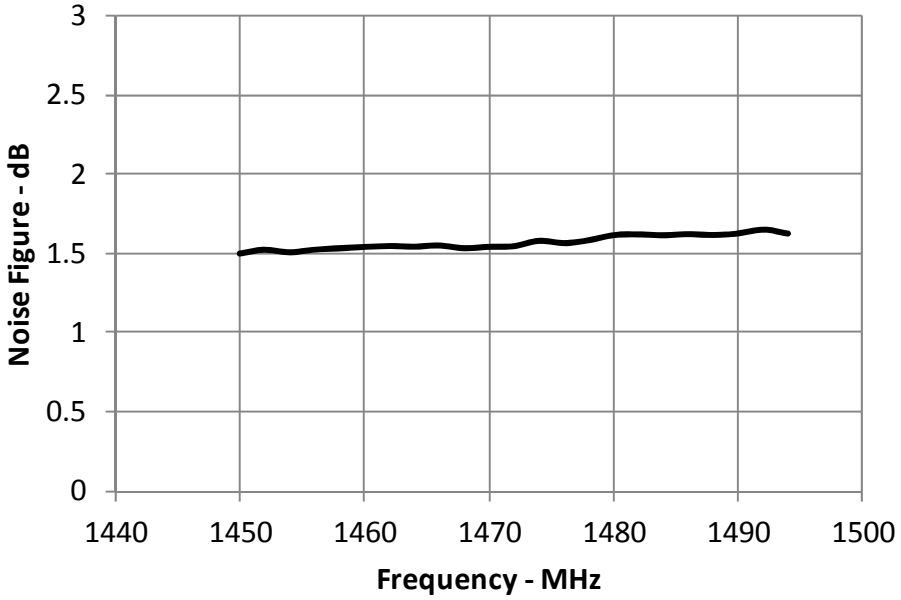
■ Input Return Loss



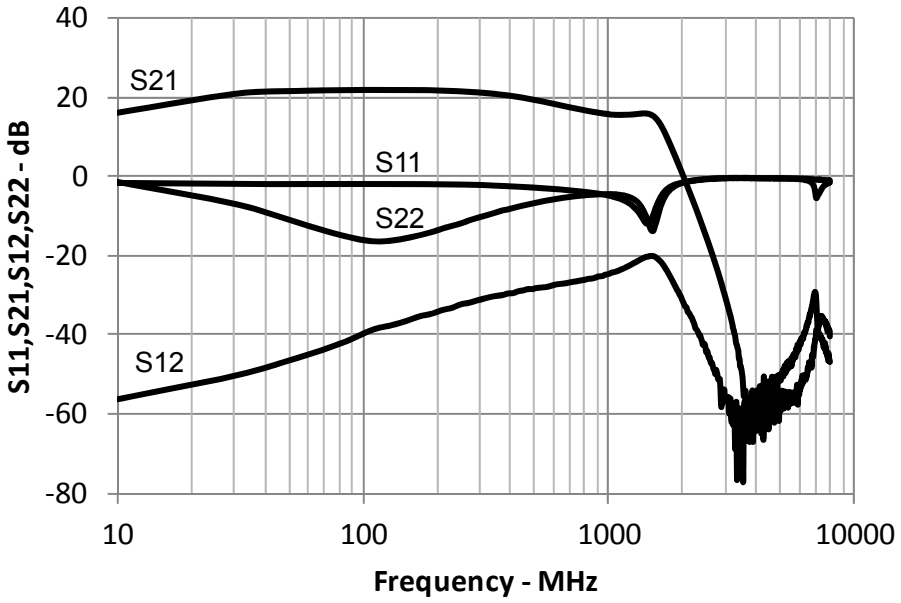
■ Output Return Loss



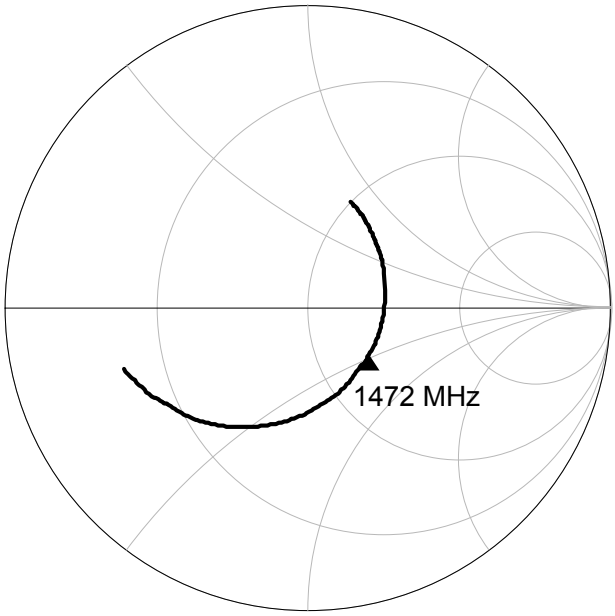
■ Noise Figure



■ S11, S21, S12, S22 Wide Span

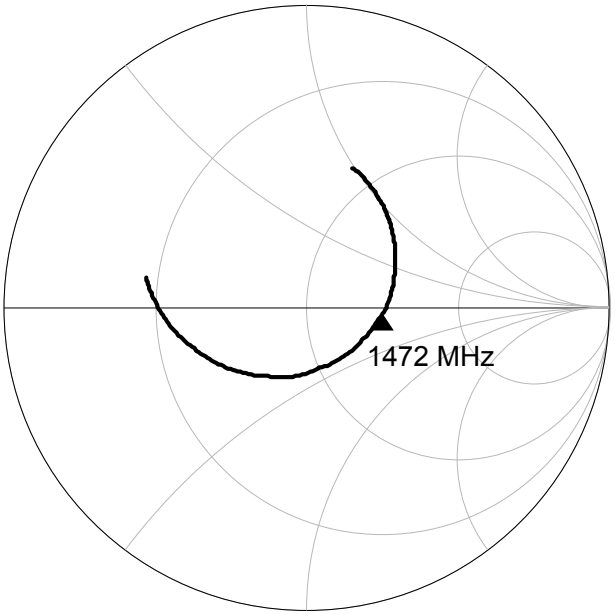


■ Smith Chart
Input Return Loss



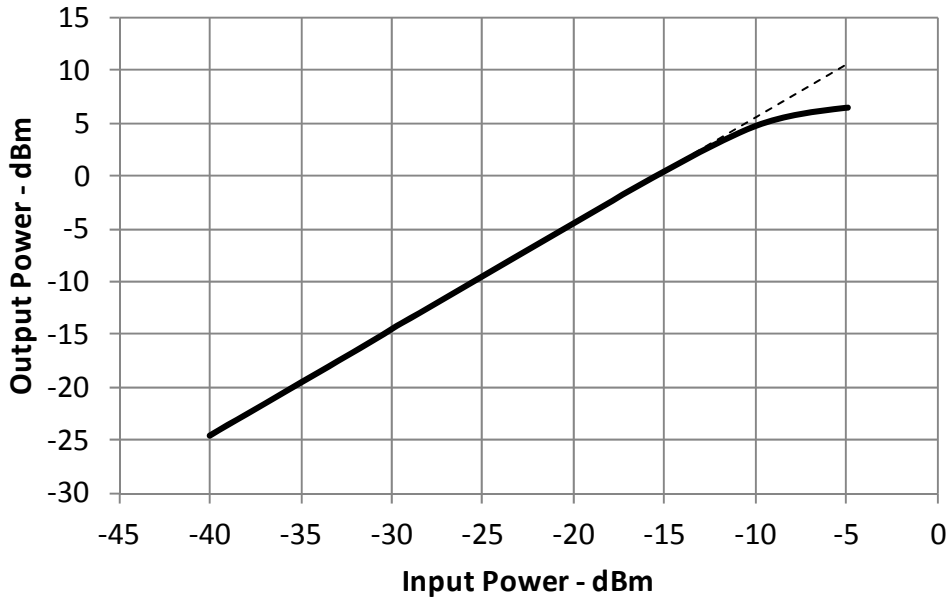
1.3 GHz to 1.7 GHz

■ Smith Chart
Output Return Loss



1.3 GHz to 1.7 GHz

■ Gain 1 dB Compression Point



■Input 3rd Order Intercept Point

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