Auto Gain Control using the NSVP264SDSF3, NSVR351SDSA3 and NCV2904

AND9612/D

Overview

This application note explains about an Auto Gain Control (AGC) for FM Radio Frequency using **onsemi**'s NSVP264SDSF3, NSVR351SDSA3 and NCV2904.

NSVP264SDSF3 is a dual type PIN diode 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.

NSVR351SDSA3 is a dual type silicon schottky barrier diode 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.

NCV2904 is a Single Supply Dual Operational Amplifiers which is assembled in the 8−pin surface mount package. For information about the performance, please refer to the datasheet of this product.

The evaluation board is adjusted to achieve the most suitable performance on FM Radio Frequency (90 MHz).

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 Power level.

Evaluation Board

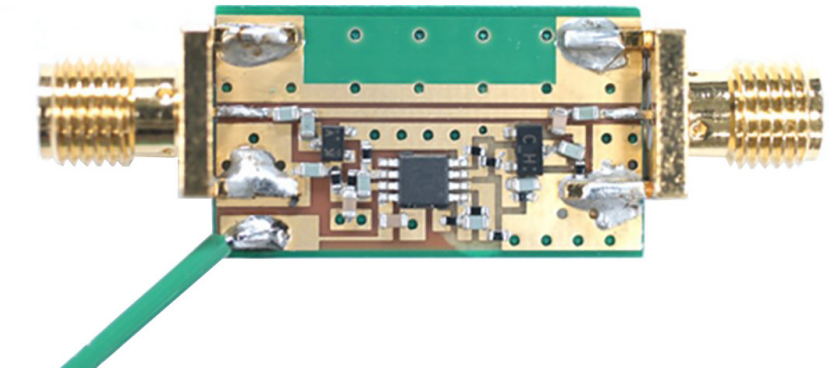

Figure 1. Evaluation Board

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SUMMARY OF DATA

Parameter		Symbol	Result				Unit
Ta = 25°C, CIRCUIT VOLATGE = 5.0 V, f = 70 MHz							
	Input Power	Pin	−20.0	−10.0	0.0	10.0	dBm
R = 3.9 kΩ	Output Power	Pout	−19.99	−10.00	−1.98	−0.89	mA
	Power Gain	PG	−0.14	−0.14	−2.16	−11.09	dBm
	Circuit Current	I_{CC}	0.39	0.44	0.56	1.34	dBm
R = 820 Ω	Output Power	Pout	−20.00	−10.13	−7.77	−6.71	mA
	Power Gain	PG	−0.14	−0.26	−7.95	−16.91	dBm
	Circuit Current	I_{CC}	0.42	0.47	0.90	3.10	dBm
Ta = 25°C, CIRCUIT VOLATGE = 5.0 V, f = 90 MHz							
	Input Power	Pin	−20.0	−10.0	0.0	10.0	dBm
R = 3.9 kΩ	Output Power	Pout	−20.07	−10.08	−3.76	−2.84	mA
	Power Gain	PG	−0.17	−0.17	−3.89	−13.00	dBm
	Circuit Current	I_{CC}	0.38	0.44	0.65	1.60	dBm
R = 820 Ω	Output Power	Pout	−20.07	−10.96	−9.65	−8.66	mA
	Power Gain	PG	−0.16	−1.05	−9.78	−18.82	dBm
	Circuit Current	I_{CC}	0.43	0.51	1.09	3.58	dBm
Ta = 25°C, CIRCUIT VOLATGE = 5.0 V, f = 108 MHz							
	Input Power	Pin	−20.0	−10.0	0.0	10.0	dBm
R = 3.9 kΩ	Output Power	Pout	−20.13	−10.14	−5.04	−4.18	mA
	Power Gain	PG	−0.20	−0.21	−5.15	−14.31	dBm
	Circuit Current	I_{CC}	0.40	0.45	0.71	1.83	dBm
R = 820 Ω	Output Power	Pout	−20.14	−12.06	−11.04	−10.00	mA
	Power Gain	PG	−0.21	−2.12	−11.15	−20.13	dBm
	Circuit Current	I_{CC}	0.44	0.55	1.23	4.09	dBm

Block Diagram

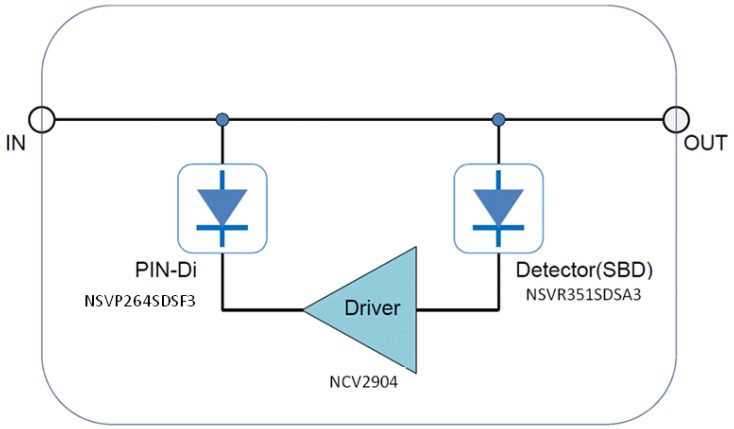

Figure 2. Block Diagram

Circuit Design

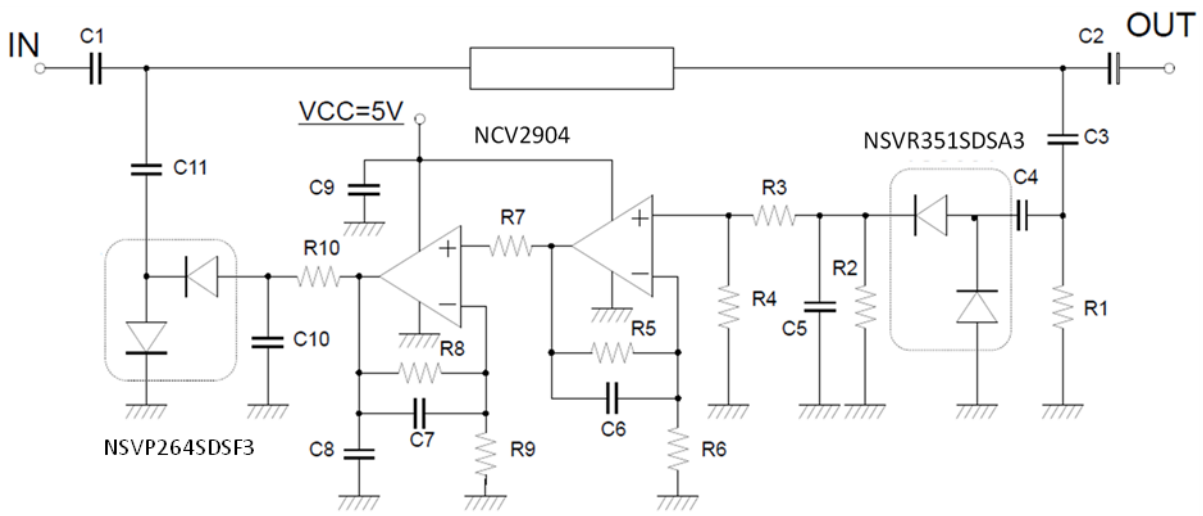

Figure 3. Circuit Design

BILL OF MATERIALS

Part	Ref.	Size	Specification	Manufacturer
PIN−Di	–	MCP	NSVP264SDSF3	**onsemi**
Driver	–	Micro8	NCV2904	**onsemi**
Detector	–	CP	NSVR351SDSA3	**onsemi**
Resistor	R1	1005	68 Ω	Various
	R2	1005	470 kΩ	Various
	R3	1005	1.2 kΩ	Various
	R4	1005	82 kΩ	Various
	R5	1005	33 kΩ	Various
	R6	1005	3.9 kΩ / 820 Ω	Various
	R7	1005	220 Ω	Various
	R8	1005	47 kΩ	Various
	R9	1005	3.9 kΩ	Various
	R10	1005	68 Ω	Various
Capacitor	C1, C2	1005	1000 pF	TAIYOYUDEN
	C3	1005	4 pF	TAIYOYUDEN
	C4 to C7	1005	1000 pF	TAIYOYUDEN
	C8, C9	1608	0.1 μF	ROHM MCH182CN104KK
	C10, C11	1005	1000 pF	TAIYOYUDEN
Material	–	25.4 × 12.7 mm	FR4	

Pin – Pout

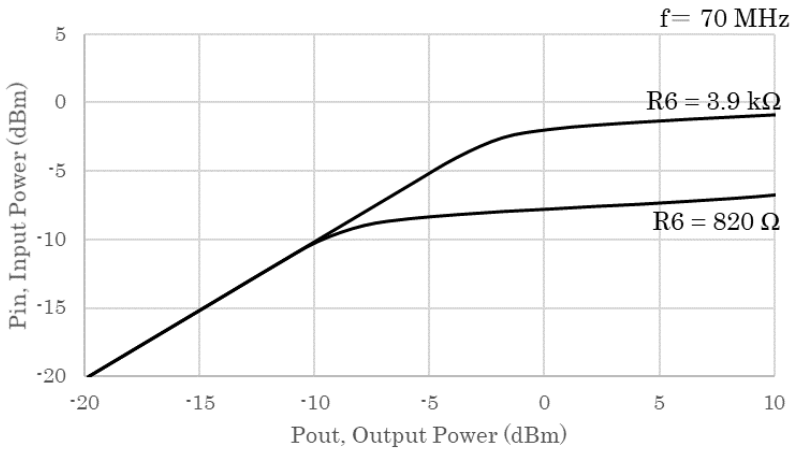

Figure 4. Pin – Pout (f = 70 MHz)

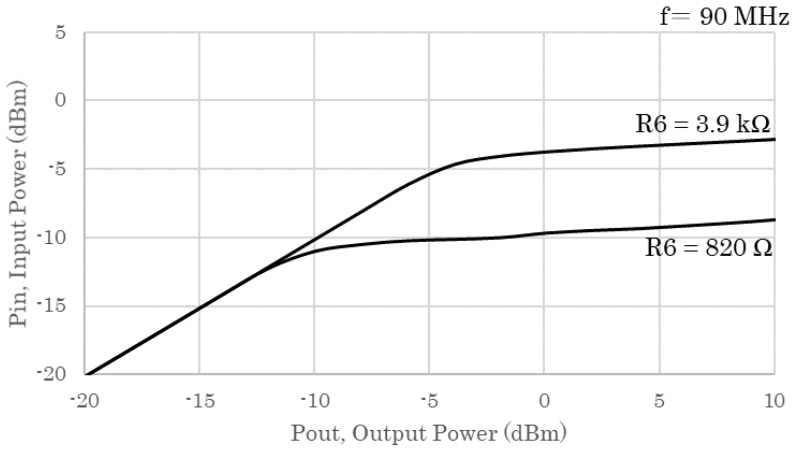

Figure 5. Pin – Pout (f = 90 MHz)

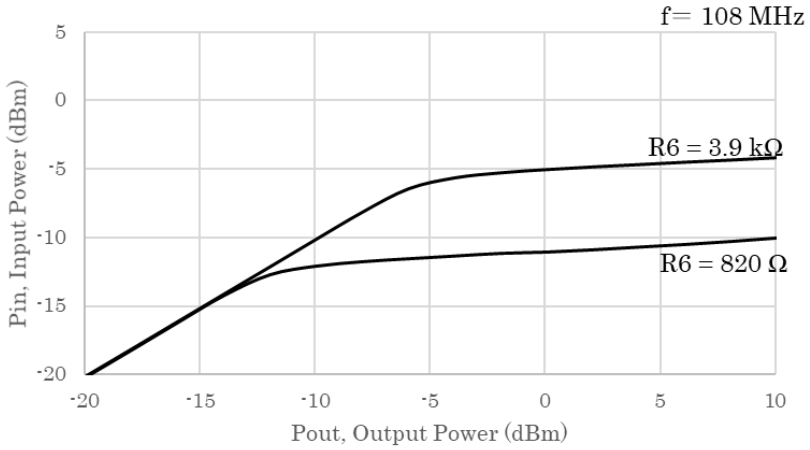

Figure 6. Pin – Pout (f = 108 MHz)

Power Gain

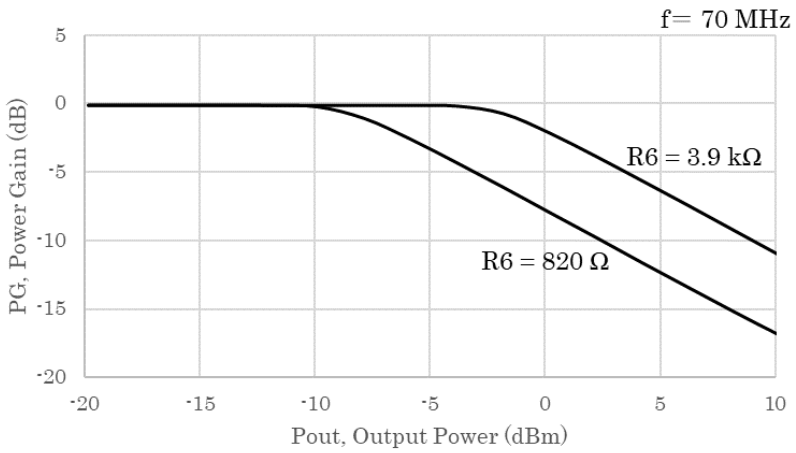

Figure 7. Pin – PG (f = 70 MHz)

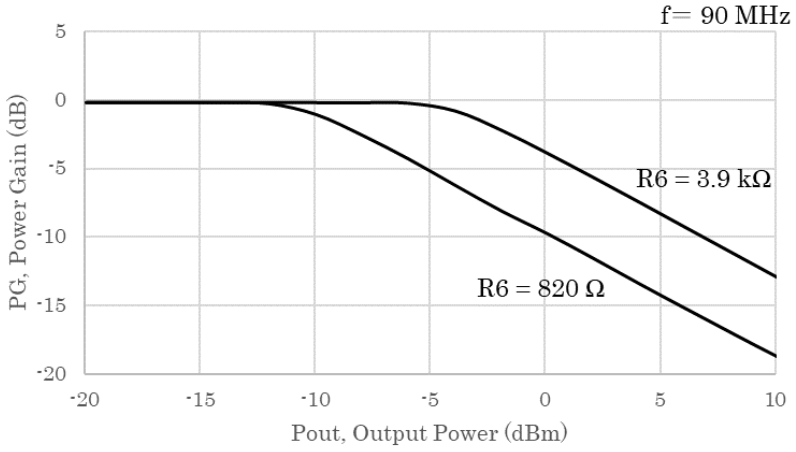

Figure 8. Pin – PG (f = 90 MHz)

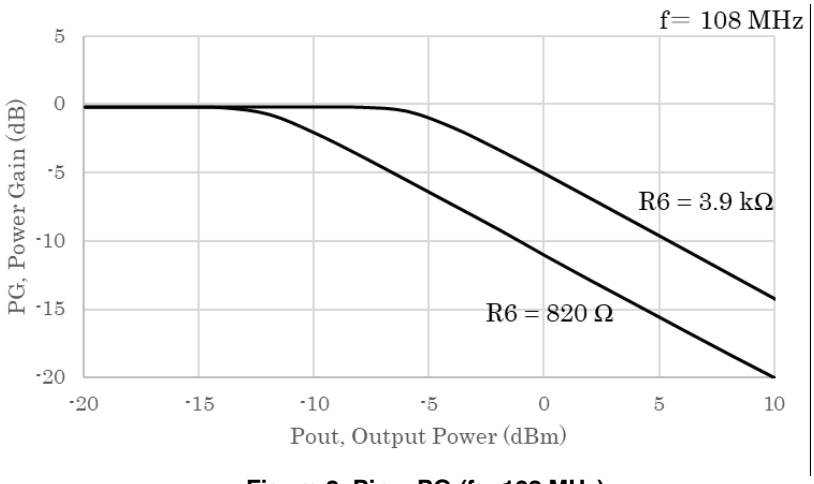

Figure 9. Pin – PG (f = 108 MHz)

Circuit Current

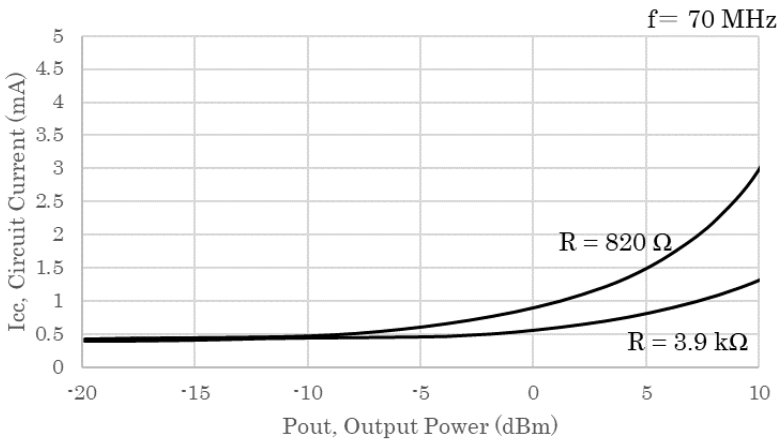

Figure 10. Pin – I_{CC} (f = 70 MHz)

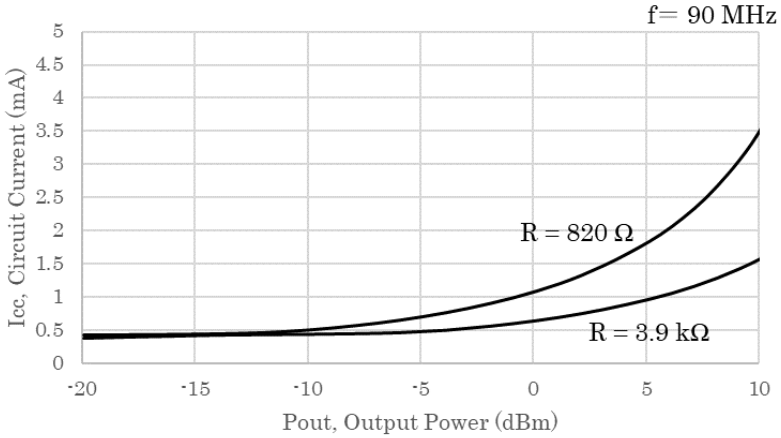

Figure 11. Pin – I_{CC} (f = 90 MHz)

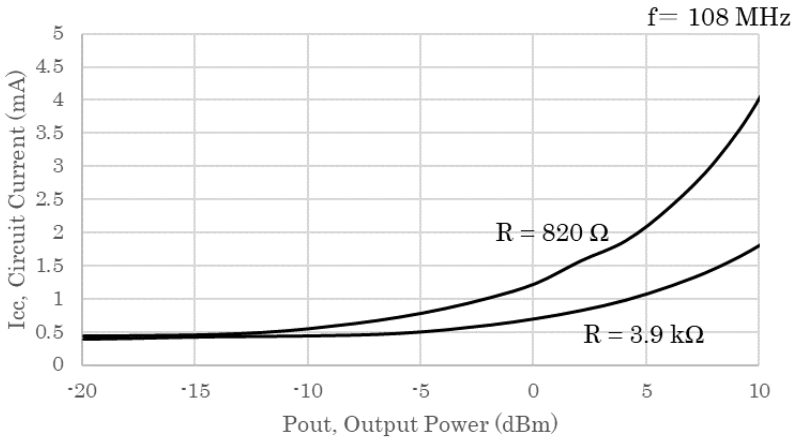

Figure 12. Pin – I_{CC} (f = 108 MHz)

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