Performance of SPDT RF Switch NSG1001MX, NSVG1001MX

AND90145/D

Overview

This device is single pole dual throw (SPDT) type RF antenna switch MMIC. It has low insertion loss and high isolation. This is designed for wireless communication applications such as WLAN and V2X.

It adopts a small surface mount package and it is also suitable for portable devices such as smart phones and automotive antennas. NSG1001MX is for consumer Application and NSVG1001MX is for Automotive Application.

NSG1001MX / NSVG1001MX Features

- Broadband Frequency Range 0.1 to 8.5 Ghz
- Capable of 1.6 V Operation
- Low Insertion Loss / High Isolation / Middle Power
- Small and Thin−Sized Package − 1.0 x 1.0 x 0.43 mm
- Wettable Flank Package for Optimal Automated Optical Inspection (AOI)
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

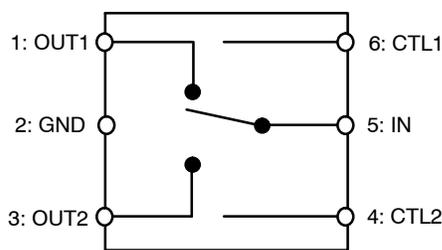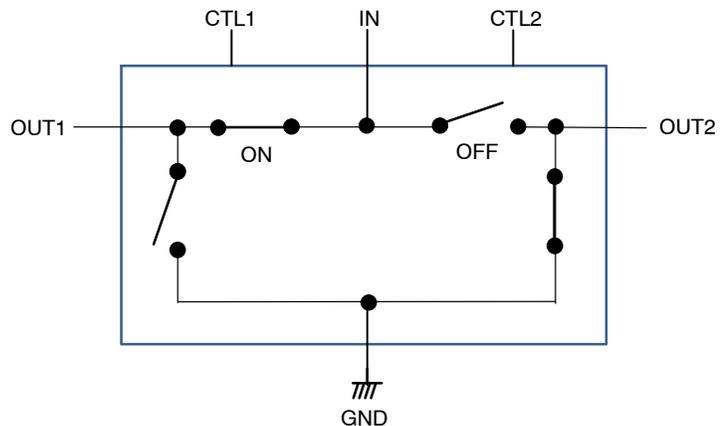### Pin Configuration and Electrical Connection

Figure 1. Pin Connection

Figure 2. Electrical Connection

TRUTH TABLE

On Path	V_{CTL1}	V_{CTL2}
IN − OUT1	Low	High
IN − OUT2	High	Low

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Application Board

RF microstrip line is designed with 50 Ω.
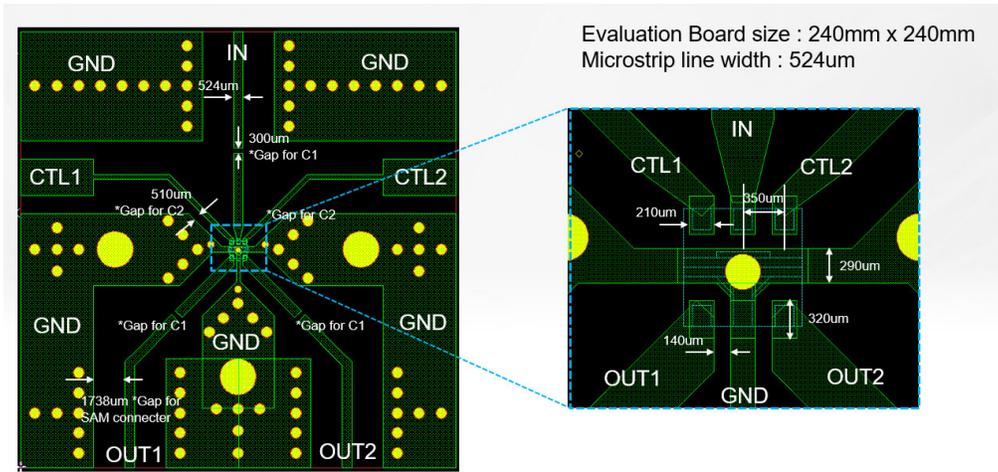
Figure 3. Application Board

BILL OF MATERIALS

Item	Symbol	Value	Manufacturer	Size
DC Cut Capacitor	C1	5 pF	Various	0603
Bypass Capacitor	C2	1 pF	Various	1005

SMALL SIGNAL CHARACTERISTICS

Parameter	Unit	Freq	Vctl = 1.65 V		Vctl = 1.70 V		Vctl = 1.80 V		Vctl = 2.70 V	
			IN–OUT1	IN–OUT2	IN–OUT1	IN–OUT2	IN–OUT1	IN–OUT2	IN–OUT1	IN–OUT2
Return Loss	dB	2.5 GHz	−29.0	−29.6	−29.0	−29.6	−29.0	−29.5	−29.1	−29.6
		6.0 GHz	−25.2	−22.8	−25.3	−22.8	−25.5	−22.9	−26.3	−23.6
		8.5 GHz	−18.9	−20.5	−18.9	−20.6	−19.1	−20.8	−19.7	−21.5
Insertion Loss	dB	2.5 GHz	−0.38	−0.38	−0.39	−0.39	−0.38	−0.38	−0.39	−0.39
		6.0 GHz	−0.44	−0.46	−0.44	−0.46	−0.45	−0.47	−0.43	−0.45
		8.5 GHz	−0.62	−0.60	−0.62	−0.60	−0.61	−0.60	−0.59	−0.59
Isolation	dB	2.5 GHz	−30.6	−30.5	−30.7	−30.5	−30.8	−30.7	−31.2	−31.1
		6.0 GHz	−29.8	−29.3	−29.9	−29.4	−29.8	−29.4	−30.2	−29.6
		8.5 GHz	−20.3	−20.3	−20.4	−20.4	−20.5	−20.4	−20.7	−20.6
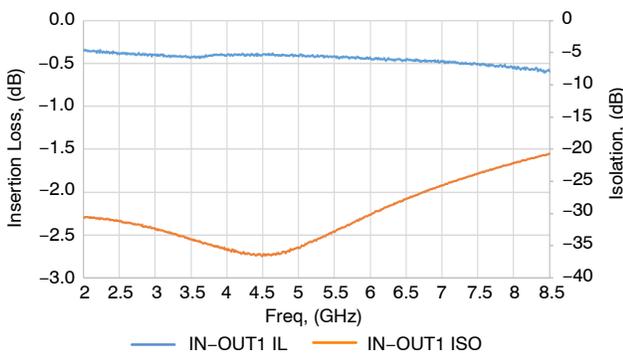
Figure 4. IN–OUT1 Vctl1 = 0 V, Vctl2 = 2.7 V
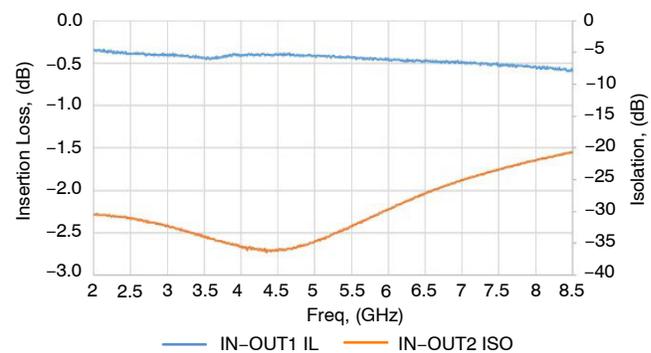
Figure 5. IN–OUT2 Vctl1 = 2.7 V, Vctl2 = 0 V
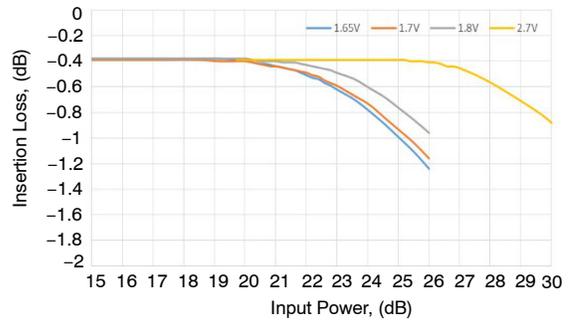
Power Compression
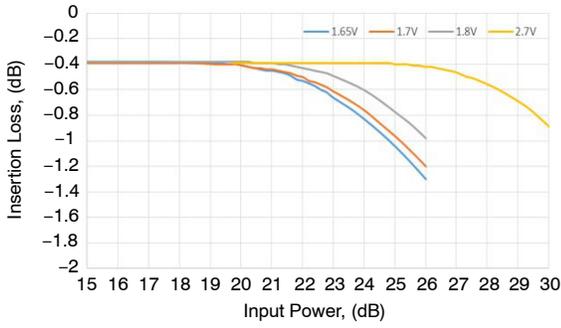
Figure 6. IN−OUT1 at 2.5 GHz

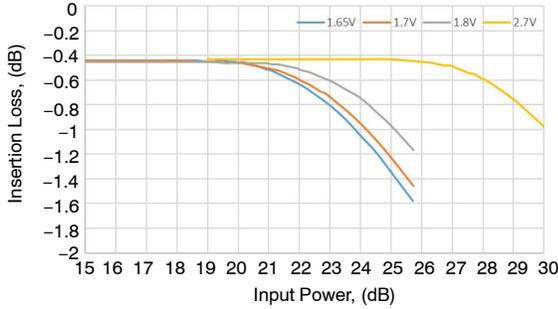Figure 7. IN−OUT2 at 2.5 GHz

Figure 8. IN−OUT1 at 6.0 GHz
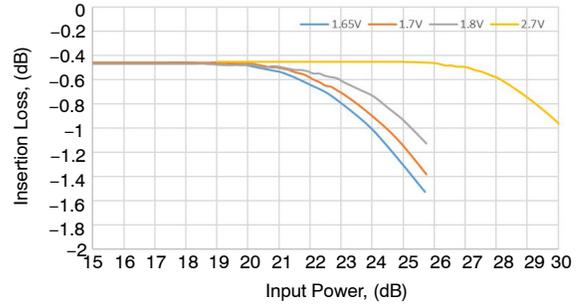
Figure 9. IN−OUT2 at 6.0 GHz

Parameter	Unit	Freq	Vctl = 1.65 V		Vctl = 1.70 V		Vctl = 1.80 V		Vctl = 2.70 V	
			IN−OUT1	IN−OUT2	IN−OUT1	IN−OUT2	IN−OUT1	IN−OUT2	IN−OUT1	IN−OUT2
Pin 0.1 dB	dBm	2.5 GHz	21.5	21.7	21.8	22.0	22.9	22.9	27.3	27.3
		6.0 GHz	21.3	21.2	21.5	21.8	22.5	22.5	27.4	27.7
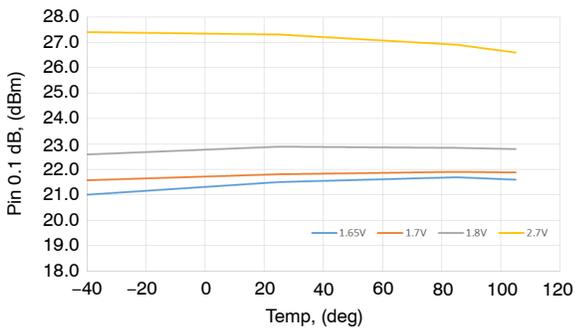
Figure 10. IN−OUT1 Pin 0.1 dB vs. Temp 2.5 GHz
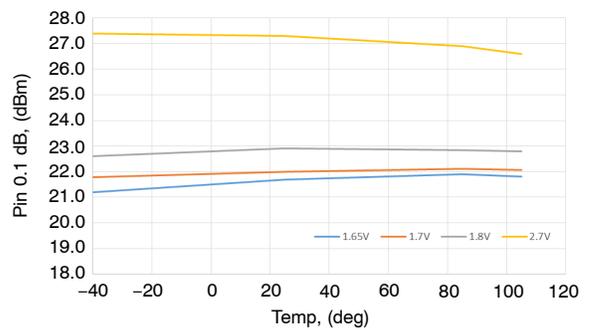
Figure 11. IN−OUT2 Pin 0.1 dB vs. Temp 2.5 GHz
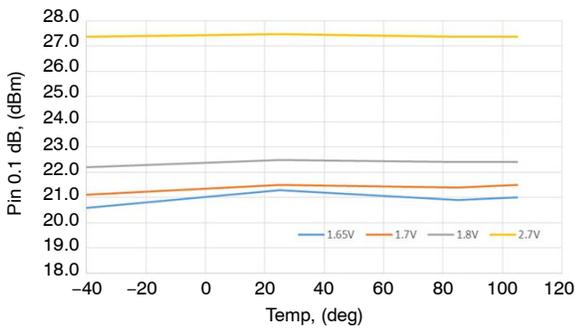
Figure 12. IN−OUT1 Pin 0.1 dB vs. Temp 6.0 GHz
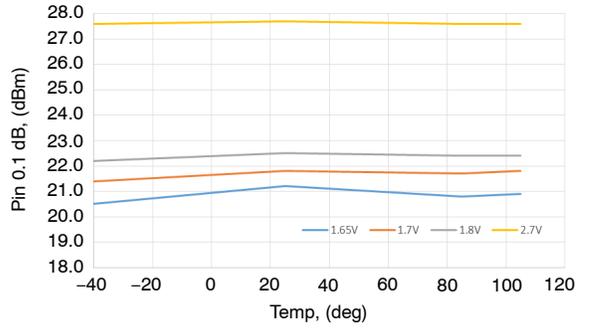
Figure 13. IN−OUT2 Pin 0.1 dB vs. Temp 6.0 GHz

Intermodulation

f1 = 2400 MHz, f2 = 2401 MHz, Vctl = 2.7 V
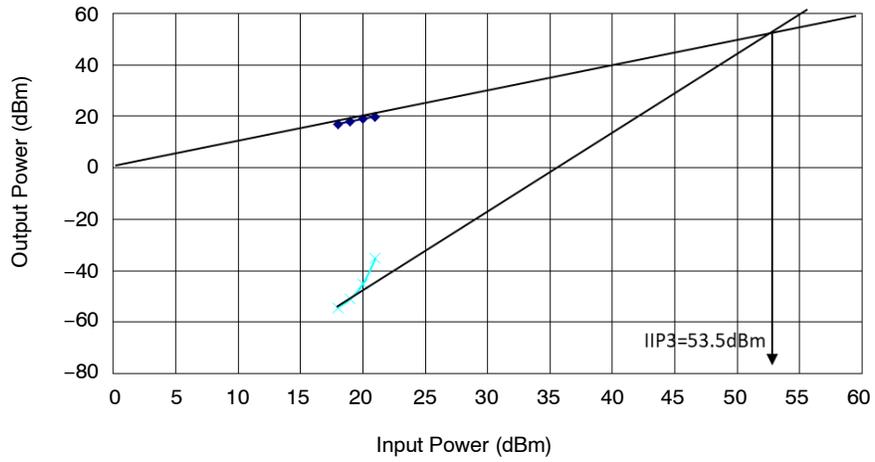
Figure 14. Intermodulation

Switching Time

Freq = 1.0 GHz, Vctl = 1.65 V, 20 ns/Div
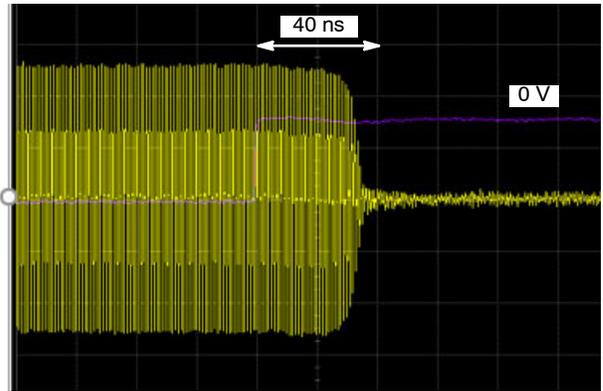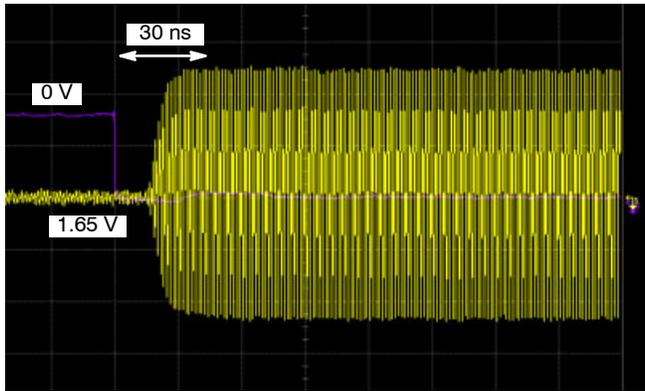
Freq = 1.0 GHz, Vctl = 2.7 V, 20 ns/Div
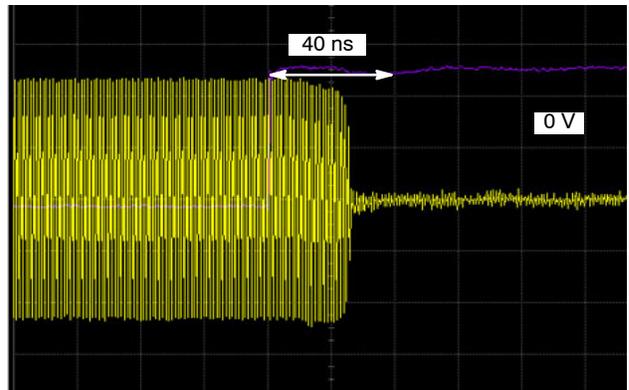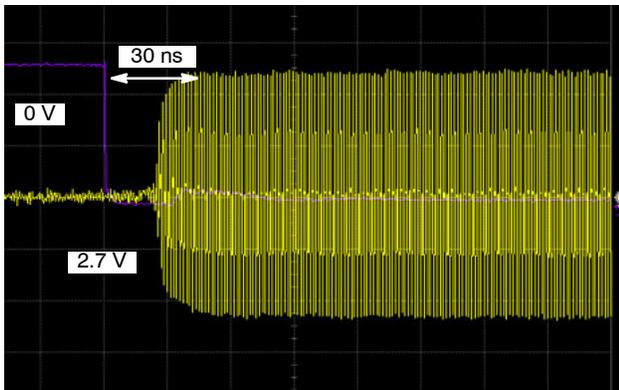
Figure 15. Switching Time

PUBLICATION ORDERING INFORMATION

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