

## DESCRIPTION

The XA2214 is a GaAs MMIC for L, S-band SPDT (Single Pole Double Throw) switch which was developed for mobile phone and another L, S-band application.

This device can operate 2 control switching by control voltage 1.8 to 5.3 V. This device can operate frequency from 0.05 to 3.0 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin super minimold package. And this package is able to high-density surface mounting.

## FEATURES

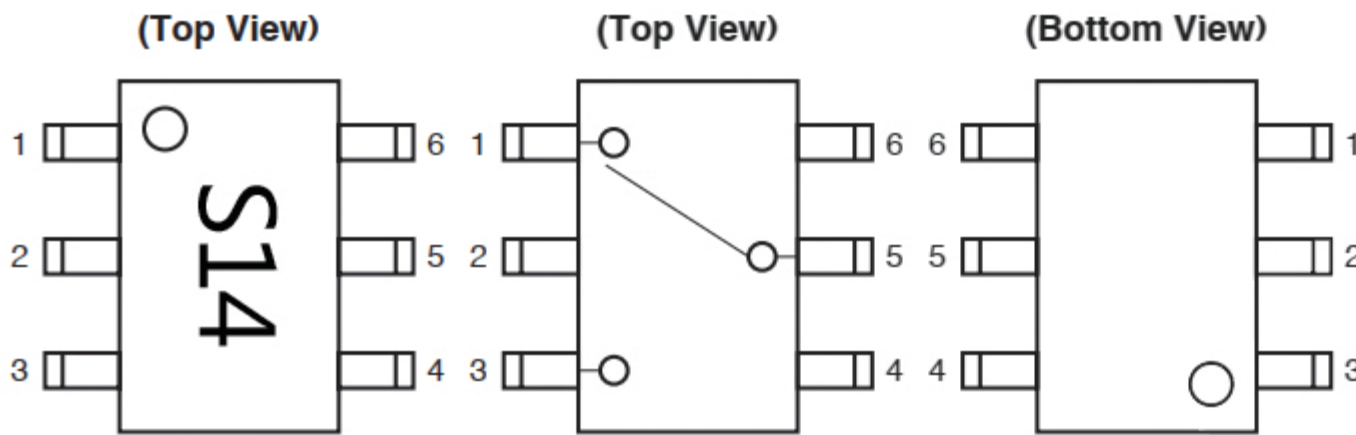
- Switch control voltage :  $V_{\text{cont (H)}} = 1.8 \text{ to } 5.3 \text{ V (3.0 V TYP.)}$   
:  $V_{\text{cont (L)}} = -0.2 \text{ to } +0.2 \text{ V (0 V TYP.)}$
- Low insertion loss :  $L_{\text{ins1}} = 0.25 \text{ dB TYP. @ } f = 0.05 \text{ to } 0.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins2}} = 0.25 \text{ dB TYP. @ } f = 0.5 \text{ to } 1.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins3}} = 0.30 \text{ dB TYP. @ } f = 1.0 \text{ to } 2.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins4}} = 0.35 \text{ dB TYP. @ } f = 2.0 \text{ to } 2.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins5}} = 0.35 \text{ dB TYP. @ } f = 2.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$
- High isolation :  $ISL1 = 32 \text{ dB TYP. @ } f = 0.05 \text{ to } 0.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL2 = 28 \text{ dB TYP. @ } f = 0.5 \text{ to } 1.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL3 = 27 \text{ dB TYP. @ } f = 1.0 \text{ to } 2.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL4 = 26 \text{ dB TYP. @ } f = 2.0 \text{ to } 2.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL5 = 24 \text{ dB TYP. @ } f = 2.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$
- Handling power :  $P_{\text{in (1 dB)}} = +27.0 \text{ dBm TYP. @ } f = 0.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $P_{\text{in (1 dB)}} = +20.0 \text{ dBm TYP. @ } f = 0.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 1.8 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$

## APPLICATIONS

- L, S-band digital cellular or cordless telephone
- W-LAN, WLL and Bluetooth<sup>™</sup> etc.

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## PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



## TRUTH TABLE

V <sub>cont1</sub>	V <sub>cont2</sub>	INPUT-OUTPUT1	INPUT-OUTPUT2
Low	High	ON	OFF
High	Low	OFF	ON

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V <sub>cont</sub>	+6.0 <sup>Note</sup>	V
Input Power	P <sub>In</sub>	+30	dBm
Operating Ambient Temperature	T <sub>A</sub>	-45 to +85	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

**Note** V<sub>cont1</sub> - V<sub>cont2</sub> ≤ 6.0 V

## RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	V <sub>cont (H)</sub>	1.8	3.0	5.3	V
Switch Control Voltage (L)	V <sub>cont (L)</sub>	-0.2	0	0.2	V

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## ELECTRICAL CHARACTERISTICS

( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont (H)}} = 3.0\text{ V}$ ,  $V_{\text{cont (L)}} = 0\text{ V}$ , DC cut capacitors = 100 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{\text{ins1}}$	$f = 0.05\text{ to }0.5\text{ GHz}$ <sup>Note 1</sup>	–	0.25	0.45	dB
Insertion Loss 2	$L_{\text{ins2}}$	$f = 0.5\text{ to }1.0\text{ GHz}$	–	0.25	0.45	dB
Insertion Loss 3	$L_{\text{ins3}}$	$f = 1.0\text{ to }2.0\text{ GHz}$	–	0.30	0.50	dB
Insertion Loss 4	$L_{\text{ins4}}$	$f = 2.0\text{ to }2.5\text{ GHz}$	–	0.35	0.55	dB
Insertion Loss 5	$L_{\text{ins5}}$	$f = 2.5\text{ to }3.0\text{ GHz}$	–	0.35	0.60	dB
Isolation 1	ISL1	$f = 0.05\text{ to }0.5\text{ GHz}$ <sup>Note 1</sup>	29	32	–	dB
Isolation 2	ISL2	$f = 0.5\text{ to }1.0\text{ GHz}$	25	28	–	dB
Isolation 3	ISL3	$f = 1.0\text{ to }2.0\text{ GHz}$	24	27	–	dB
Isolation 4	ISL4	$f = 2.0\text{ to }2.5\text{ GHz}$	23	26	–	dB
Isolation 5	ISL5	$f = 2.5\text{ to }3.0\text{ GHz}$	21	24	–	dB
Input Return Loss 1	$RL_{\text{in1}}$	$f = 0.05\text{ to }0.5\text{ GHz}$ <sup>Note 1</sup>	15	20	–	dB
Input Return Loss 2	$RL_{\text{in2}}$	$f = 0.5\text{ to }3.0\text{ GHz}$	15	20	–	dB
Output Return Loss 1	$RL_{\text{out1}}$	$f = 0.05\text{ to }0.5\text{ GHz}$ <sup>Note 1</sup>	15	20	–	dB
Output Return Loss 2	$RL_{\text{out2}}$	$f = 0.5\text{ to }3.0\text{ GHz}$	15	20	–	dB
0.1 dB Loss Compression	$P_{\text{in (0.1 dB)}}$	$f = 2.0/2.5\text{ GHz}$	+21.0	+23.0	–	dBm
Input Power <sup>Note 2</sup>		$f = 0.5\text{ to }3.0\text{ GHz}$	–	+23.0	–	dBm
1 dB Loss Compression	$P_{\text{in (1 dB)}}$	$f = 0.5\text{ to }3.0\text{ GHz}$	–	+27.0	–	dBm
Input Power <sup>Note 3</sup>						
2nd Harmonics	$2f_0$	$f = 2.0\text{ GHz}$ , $P_{\text{in}} = +15\text{ dBm}$	–	–55	–47	dBc
		$f = 2.5\text{ GHz}$ , $P_{\text{in}} = +15\text{ dBm}$	–	–55	–47	dBc
3rd Harmonics	$3f_0$	$f = 2.0\text{ GHz}$ , $P_{\text{in}} = +15\text{ dBm}$	–	–55	–47	dBc
		$f = 2.5\text{ GHz}$ , $P_{\text{in}} = +15\text{ dBm}$	–	–55	–47	dBc
Intermodulation Intercept Point	IIP <sub>3</sub>	$f = 0.5\text{ to }3.0\text{ GHz}$ , 2 tone, $P_{\text{in}} = +16\text{ dBm}$ , 5 MHz spicing	–	+58	–	dBm
Switch Control Current	$I_{\text{cont}}$		–	4	20	$\mu\text{A}$
Switch Control Speed	$t_{\text{sw}}$	50% CTL to 90/10% RF	–	20	200	ns

**Notes 1.** DC cut capacitors = 1 000 pF at  $f = 0.05\text{ to }0.5\text{ GHz}$

**2.**  $P_{\text{in (0.1 dB)}}$  is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

**3.**  $P_{\text{in (1 dB)}}$  is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

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## ELECTRICAL CHARACTERISTICS

( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont (H)}} = 1.8\text{ V}$ ,  $V_{\text{cont (L)}} = 0\text{ V}$ , DC cut capacitors = 100 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 6	$L_{\text{ins6}}$	$f = 0.05\text{ to }0.5\text{ GHz}$ <sup>Note 1</sup>	–	0.25	0.50	dB
Insertion Loss 7	$L_{\text{ins7}}$	$f = 0.5\text{ to }1.0\text{ GHz}$	–	0.25	0.50	dB
Insertion Loss 8	$L_{\text{ins8}}$	$f = 1.0\text{ to }2.0\text{ GHz}$	–	0.30	0.55	dB
Insertion Loss 9	$L_{\text{ins9}}$	$f = 2.0\text{ to }2.5\text{ GHz}$	–	0.35	0.60	dB
Insertion Loss 10	$L_{\text{ins10}}$	$f = 2.5\text{ to }3.0\text{ GHz}$	–	0.35	0.65	dB
Isolation 6	ISL6	$f = 0.05\text{ to }0.5\text{ GHz}$ <sup>Note 1</sup>	27	30	–	dB
Isolation 7	ISL7	$f = 0.5\text{ to }2.0\text{ GHz}$	23	27	–	dB
Isolation 8	ISL8	$f = 2.0\text{ to }2.5\text{ GHz}$	21	25	–	dB
Isolation 9	ISL9	$f = 2.5\text{ to }3.0\text{ GHz}$	20	24	–	dB
Input Return Loss 3	$RL_{\text{in3}}$	$f = 0.05\text{ to }3.0\text{ GHz}$ <sup>Note 1</sup>	15	20	–	dB
Output Return Loss 3	$RL_{\text{out3}}$	$f = 0.05\text{ to }3.0\text{ GHz}$ <sup>Note 1</sup>	15	20	–	dB
0.1 dB Loss Compression Input Power <sup>Note 2</sup>	$P_{\text{in (0.1 dB)}}$	$f = 2.0/2.5\text{ GHz}$	+14.0	+17.0	–	dBm
		$f = 0.5\text{ to }3.0\text{ GHz}$	–	+17.0	–	dBm
1 dB Loss Compression Input Power <sup>Note 3</sup>	$P_{\text{in (1 dB)}}$	$f = 0.5\text{ to }3.0\text{ GHz}$	–	+20.0	–	dBm
Switch Control Current	$I_{\text{cont}}$		–	4	20	$\mu\text{A}$
Switch Control Speed	$t_{\text{sw}}$	50% CTL to 90/10% RF	–	20	200	ns

**Notes 1.** DC cut capacitors = 1 000 pF at  $f = 0.05\text{ to }0.5\text{ GHz}$

**2.**  $P_{\text{in (0.1 dB)}}$  is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

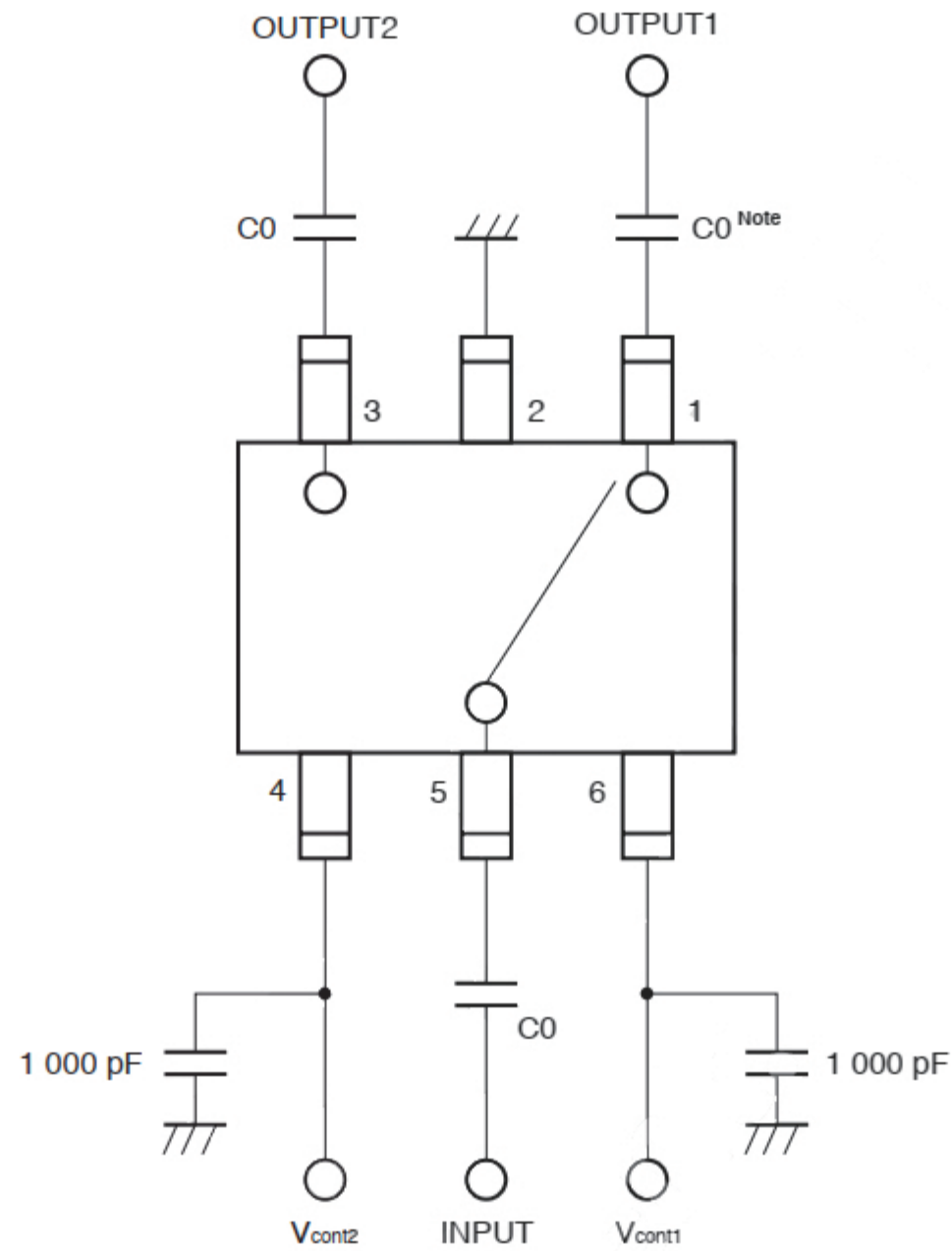
**3.**  $P_{\text{in (1 dB)}}$  is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

**Caution** This device is used it is necessary to use DC cut capacitors.

The value of DC cut capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system. The range of recommended DC cut capacitor value is less than 100 pF.

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## EVALUATION CIRCUIT



**Note** C0 : 0.05 to 0.5 GHz 1 000 pF  
: 0.5 to 3.0 GHz 100 pF

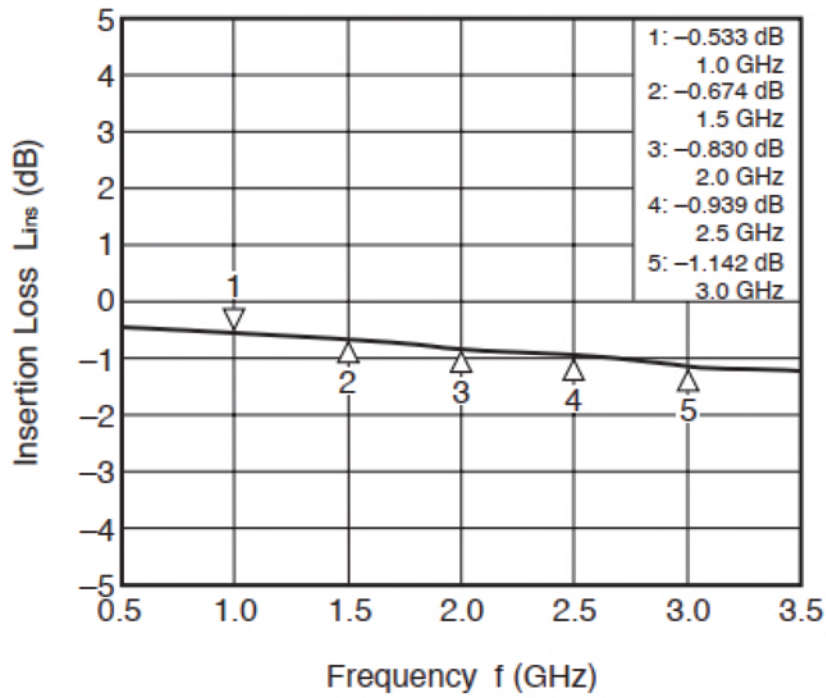
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

# XA2214-S14 SOT363

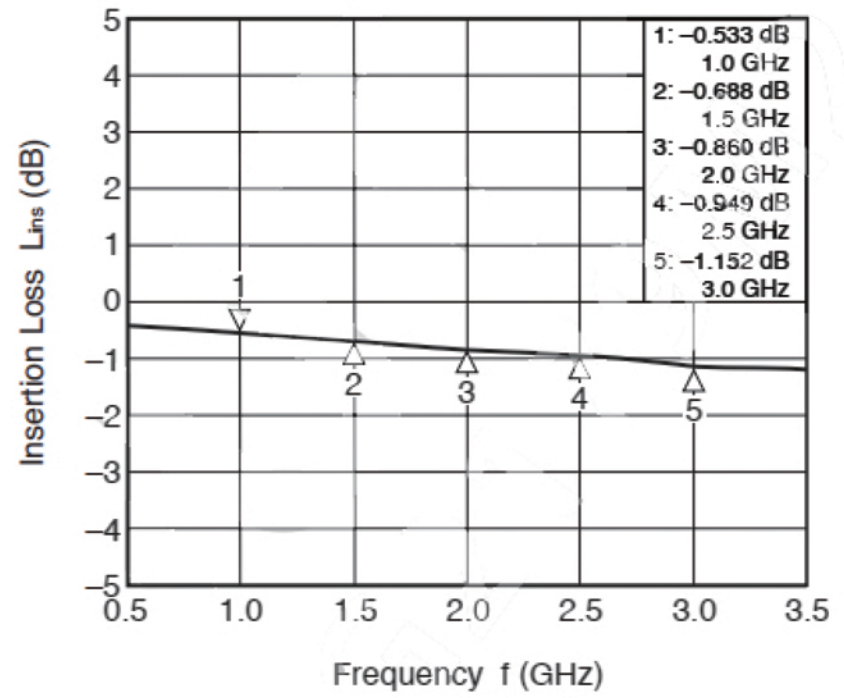
## TYPICAL CHARACTERISTICS

( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont (H)}} = 3.0\text{ V}$ ,  $V_{\text{cont (L)}} = 0\text{ V}$ , DC cut capacitors = 100 pF, unless otherwise specified)

INPUT-OUTPUT1  
INSERTION LOSS vs. FREQUENCY



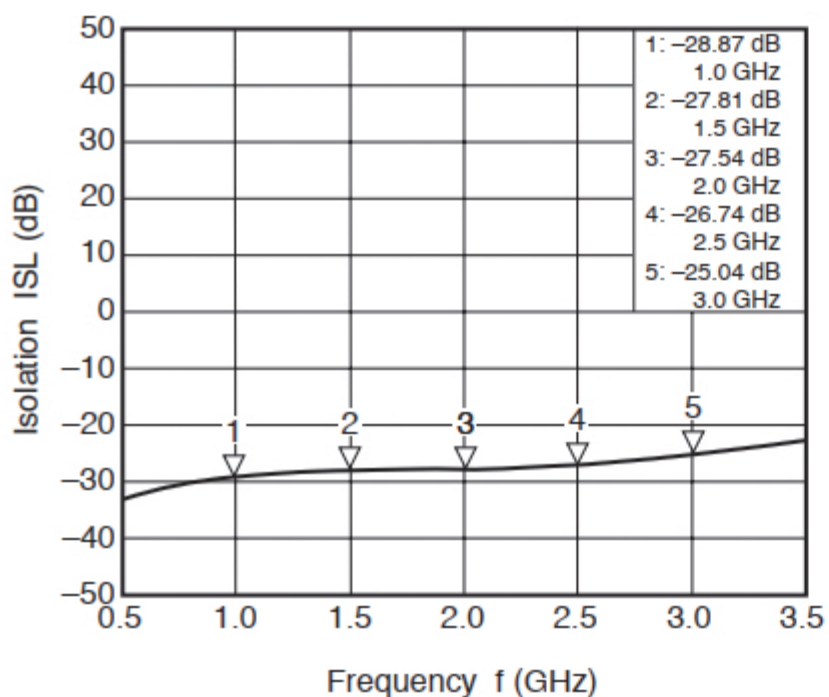
INPUT-OUTPUT2  
INSERTION LOSS vs. FREQUENCY



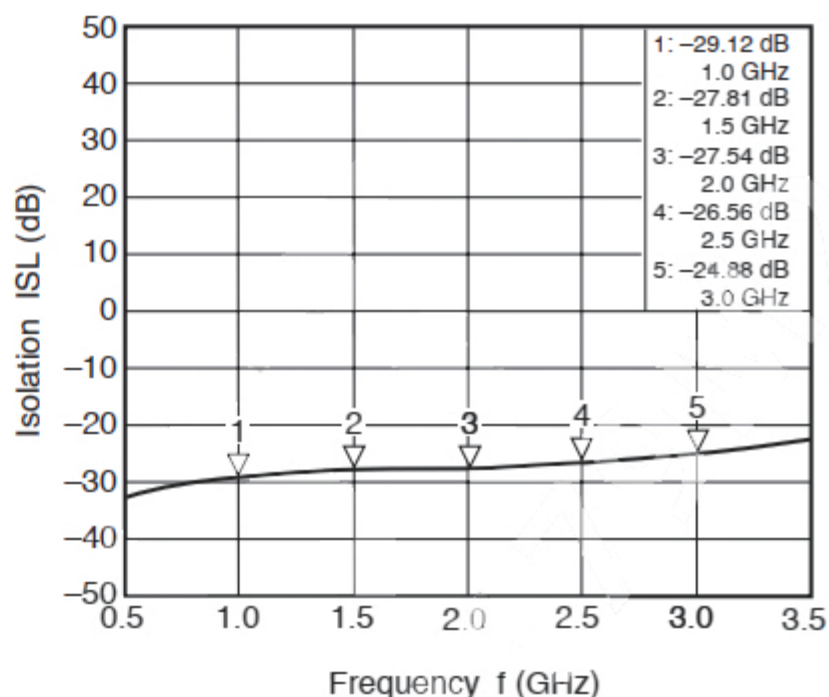
**Remark** The graphs indicate nominal characteristics.

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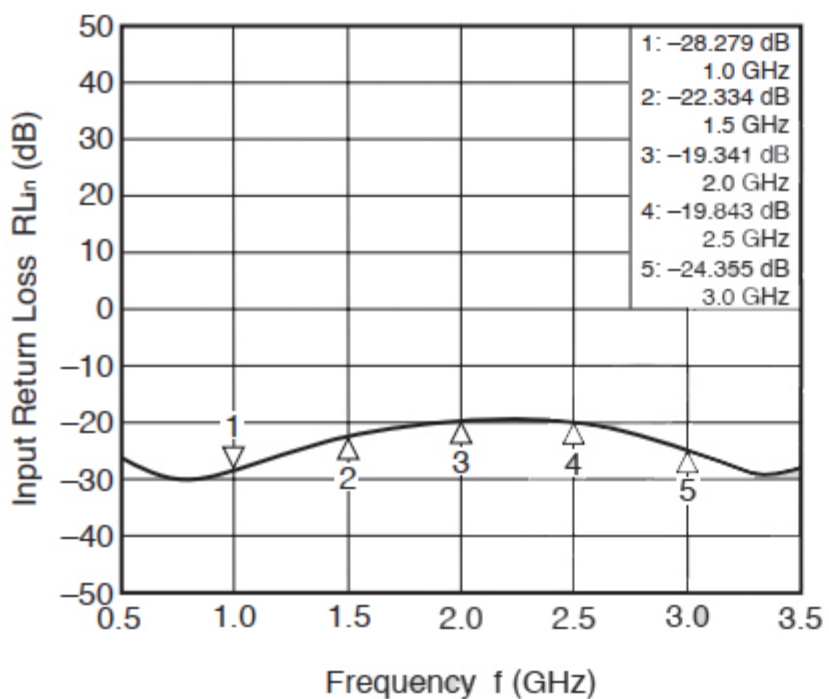
INPUT-OUTPUT1  
ISOLATION vs. FREQUENCY



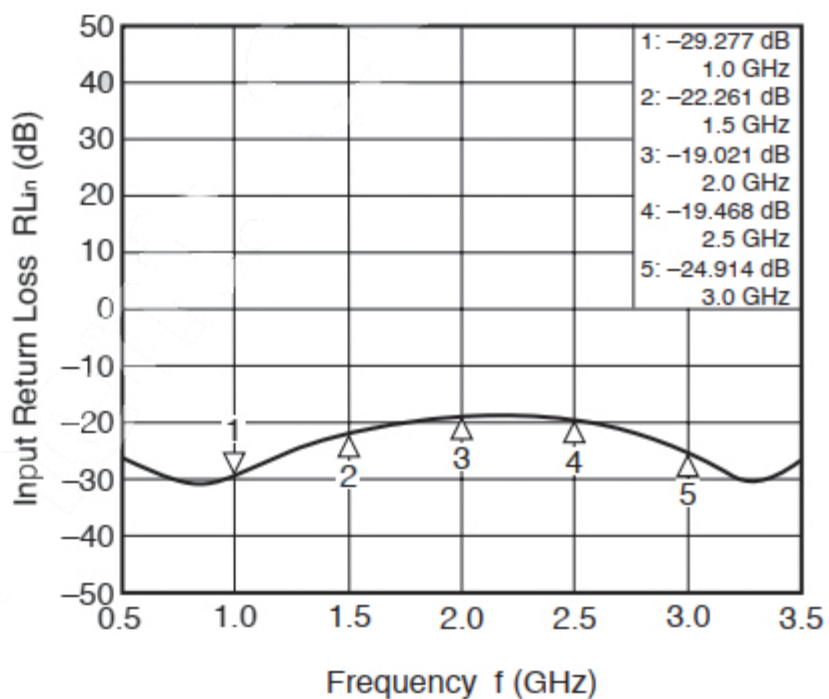
INPUT-OUTPUT2  
ISOLATION vs. FREQUENCY



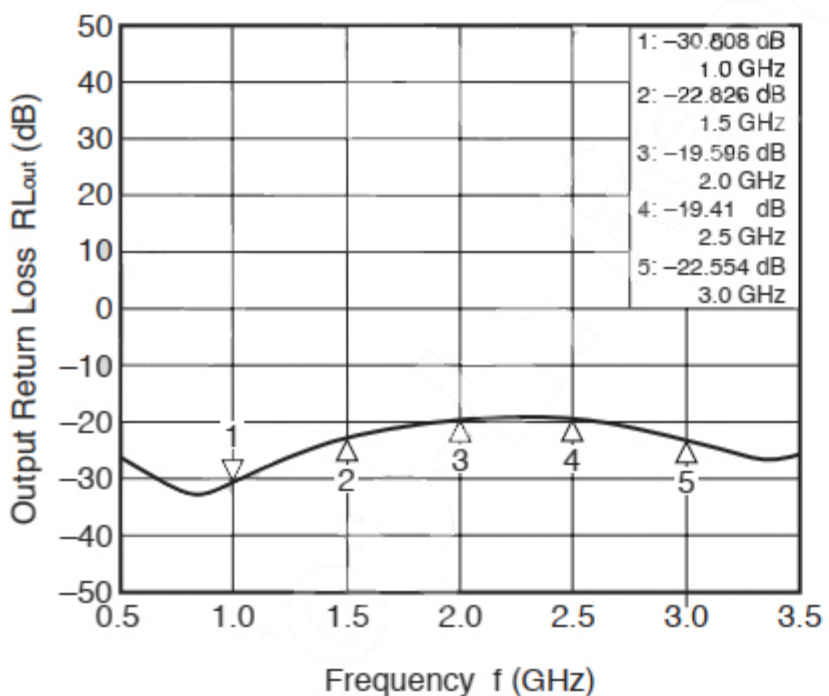
INPUT-OUTPUT1  
INPUT RETURN LOSS vs. FREQUENCY



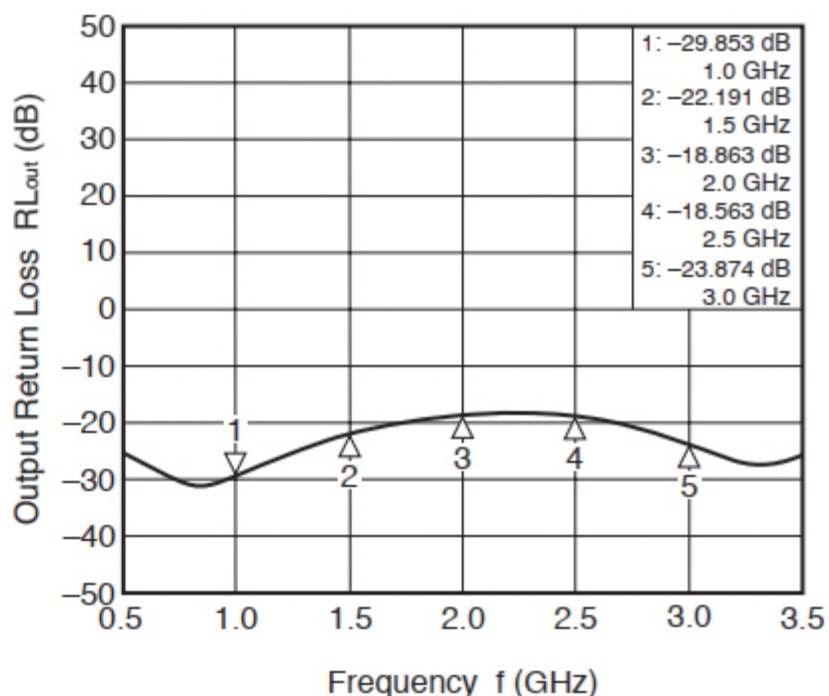
INPUT-OUTPUT2  
INPUT RETURN LOSS vs. FREQUENCY



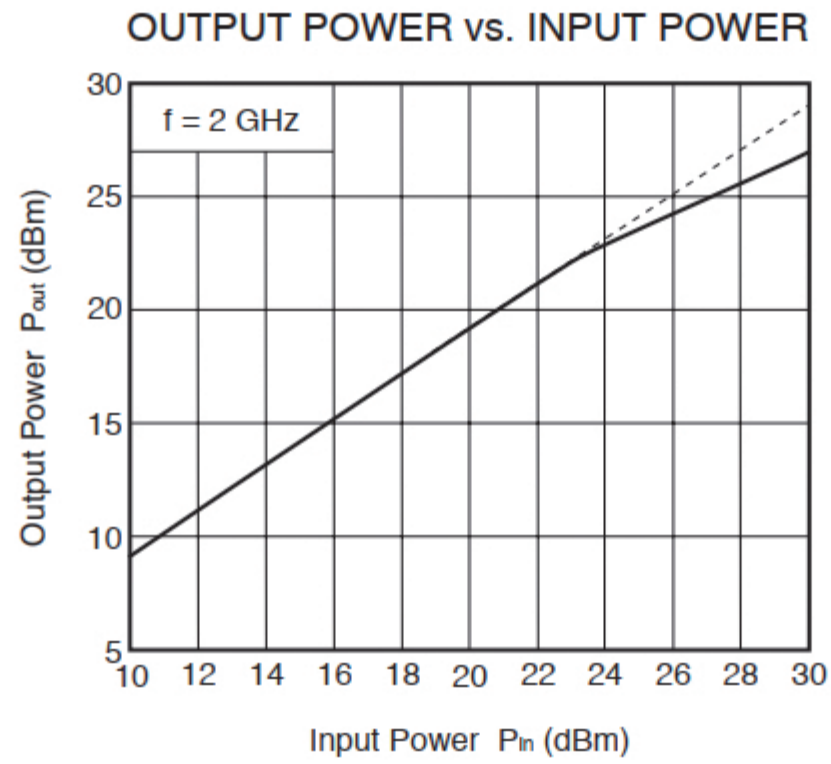
INPUT-OUTPUT1  
OUTPUT RETURN LOSS vs. FREQUENCY



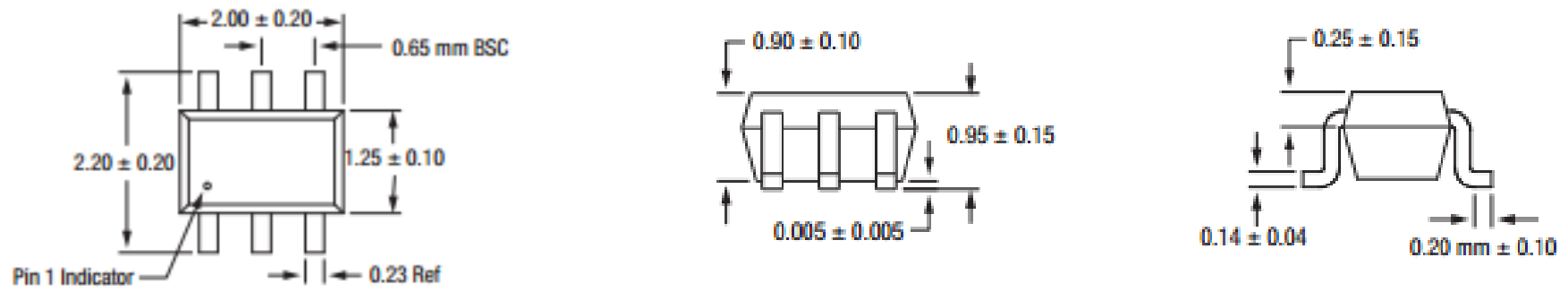
INPUT-OUTPUT2  
OUTPUT RETURN LOSS vs. FREQUENCY



**Remark** The graphs indicate nominal characteristics.



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