NEC

GaAs INTEGRATED CIRCUIT

μPG2035T5F

GaAs MMIC DPDT SWITCH FOR 2.4 GHz AND 5 GHz DUALBAND WIRELESS LAN

DESCRIPTION

The μPG2035T5F is a GaAs MMIC DPDT switch for 2.4 GHz and 5 GHz dualband wireless LAN. High isolation and dualband operations suit to dualband wireless LAN system.

FEATURES

- Operating frequency : f = 2.4 to 2.5 GHz and 4.9 to 6.0 GHz
- Low insertion loss : $L_{INS}1$ = 0.8 dB TYP. @ f = 2.4 to 2.5 GHz
  : $L_{INS}2$ = 1.2 dB TYP. @ f = 4.9 to 6.0 GHz
- Handling power : $P_{in\ (1\ dB)}$ = +31 dBm TYP. @ f = 2.4 to 2.5 GHz
  : +30 dBm TYP. @ f = 4.9 to 6.0 GHz
- Control voltage : V_{cont} = +3.0 V/0 V (Two control type)
- High isolation : ISL1 (INPUT to OUTPUT) = 34 dB TYP. @ f = 2.4 to 2.5 GHz
  : ISL2 (INPUT to OUTPUT) = 33 dB TYP. @ f = 4.9 to 6.0 GHz
  : ISL3 (TX to RX, ANT1 to ANT2) = 24 dB TYP. @ f = 2.4 to 2.5 GHz
  : ISL4 (TX to RX, ANT1 to ANT2) = 22 dB TYP. @ f = 4.9 to 6.0 GHz
- Input/output return loss : RL_{in}/RL_{out} = 15 dB TYP.
- Switching speed : 50 ns @ t_{RISE}/t_{FALL} (10/90% RF)
- 12-pin plastic QFN package (3.0 × 3.0 × 0.75 mm)

APPLICATION

- 2.4 GHz and 5 GHz dualband wireless LAN: IEEE802.11a+b/g

★ ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2035T5F-E2	μPG2035T5F-E2-A	12-pin plastic QFN (Pb-Free)	2035	• Embossed tape 8 mm wide • Pin 1 indicates roll-in direction of tape • Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPG2035T5F

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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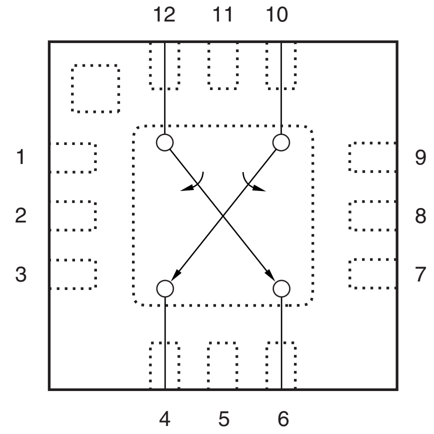
The mark ★ shows major revised points.

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

(Top View)



Pin No.	Pin Name	Description
1	NC	Ground
2	NC	Ground
3	V_{cont1}	Control 1
4	ANT1	Antenna Port 1
5	NC	Ground
6	ANT2	Antenna Port 2
7	V_{cont2}	Control 2
8	NC	Ground
9	NC	Ground
10	RX	Receive Port
11	NC	Ground
12	TX	Transmit Port
EXPOSED PAD	GND	Ground

Remark NC is functionally non-connection pin but actually grounding is recommended.

TRUTH TABLE

V_{cont1}	V_{cont2}	ANT1-RX	ANT1-TX	ANT2-TX	ANT2-RX
2.7 to 5.0 V	0 ± 0.2 V	ON	OFF	ON	OFF
0 ± 0.2 V	2.7 to 5.0 V	OFF	ON	OFF	ON

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V_{cont}	–6.0 to +6.0 Note 1	V
Input Power	P_{in}	+36	dBm
Total Power Dissipation	P_{tot}	0.15 Note 2	W
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Notes 1. $| V_{cont1} - V_{cont2} | \leq 6.0$ V

2. Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C

RECOMMENDED OPERATING RANGE (T_A = +25°C)

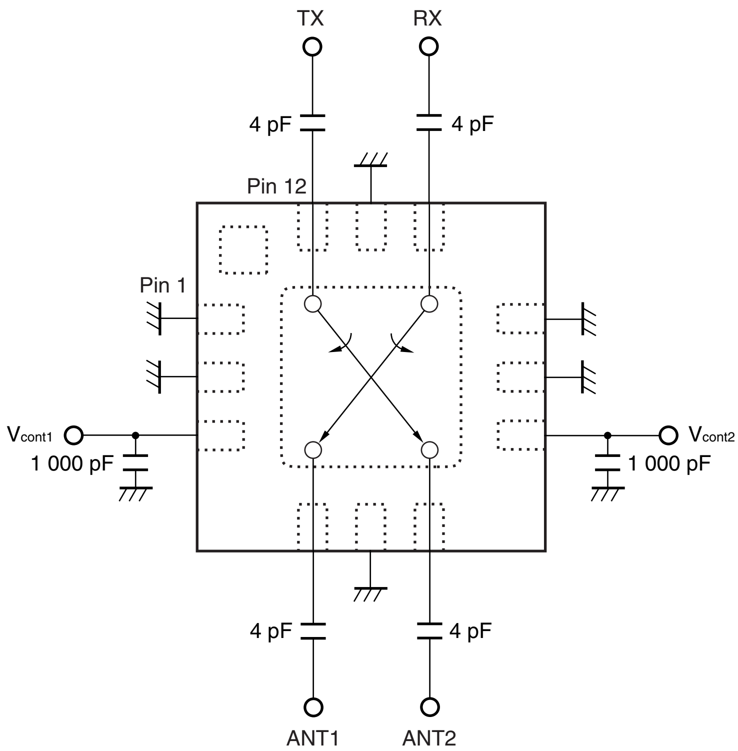
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency 1	f1	2.4	–	2.5	GHz
Operating Frequency 2	f2	4.9	–	6.0	GHz
Switch Control Voltage (H)	$V_{cont (H)}$	2.7	3.0	5.0	V
Switch Control Voltage (L)	$V_{cont (L)}$	–0.2	0	0.2	V

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{cont} = 3.0 V/0 V, Z_O = 50 Ω, DC block capacitor = 4 pF, each port, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{INS}1$	f = 2.4 to 2.5 GHz	–	0.8	1.0	dB
Insertion Loss 2	$L_{INS}2$	f = 4.9 to 6.0 GHz	–	1.2	1.4	dB
Isolation 1 (INPUT to OUTPUT)	ISL1	f = 2.4 to 2.5 GHz	25	34	–	dB
Isolation 2 (INPUT to OUTPUT)	ISL2	f = 4.9 to 6.0 GHz	25	33	–	dB
Isolation 3 (TX to RX, ANT1 to ANT2)	ISL3	f = 2.4 to 2.5 GHz	17	24	–	dB
Isolation 4 (TX to RX, ANT1 to ANT2)	ISL4	f = 4.9 to 6.0 GHz	17	22	–	dB
Input and Output Return Loss 1	RL1	f = 2.4 to 2.5 GHz	–	15	–	dB
Input and Output Return Loss 2	RL2	f = 4.9 to 6.0 GHz	–	15	–	dB
Switch Control Current 1	$I_{cont}1$	f = 2.4 to 2.5 GHz	–	0.7	1.5	μA
Switch Control Current 2	$I_{cont}2$	f = 4.9 to 6.0 GHz	–	0.7	1.5	μA
1 dB Gain Compression Input Power	$P_{in (1 dB)}$	f = 2.4 to 2.5 GHz	–	31	–	dBm
		f = 4.9 to 6.0 GHz	–	30	–	
3rd Order Distortion Input Intercept Point 1	IIP_31	f = 2.4 to 2.5 GHz	–	45	–	dBm
3rd Order Distortion Input Intercept Point 2	IIP_32	f = 4.9 to 6.0 GHz	–	45	–	dBm
Switch Control Speed 1	$t_{SW}1$	f = 2.4 to 2.5 GHz, t_{RISE}/t_{FALL} (10/90% RF)	–	50	–	ns
Switch Control Speed 2	$t_{SW}2$	f = 4.9 to 6.0 GHz, t_{RISE}/t_{FALL} (10/90% RF)	–	50	–	ns

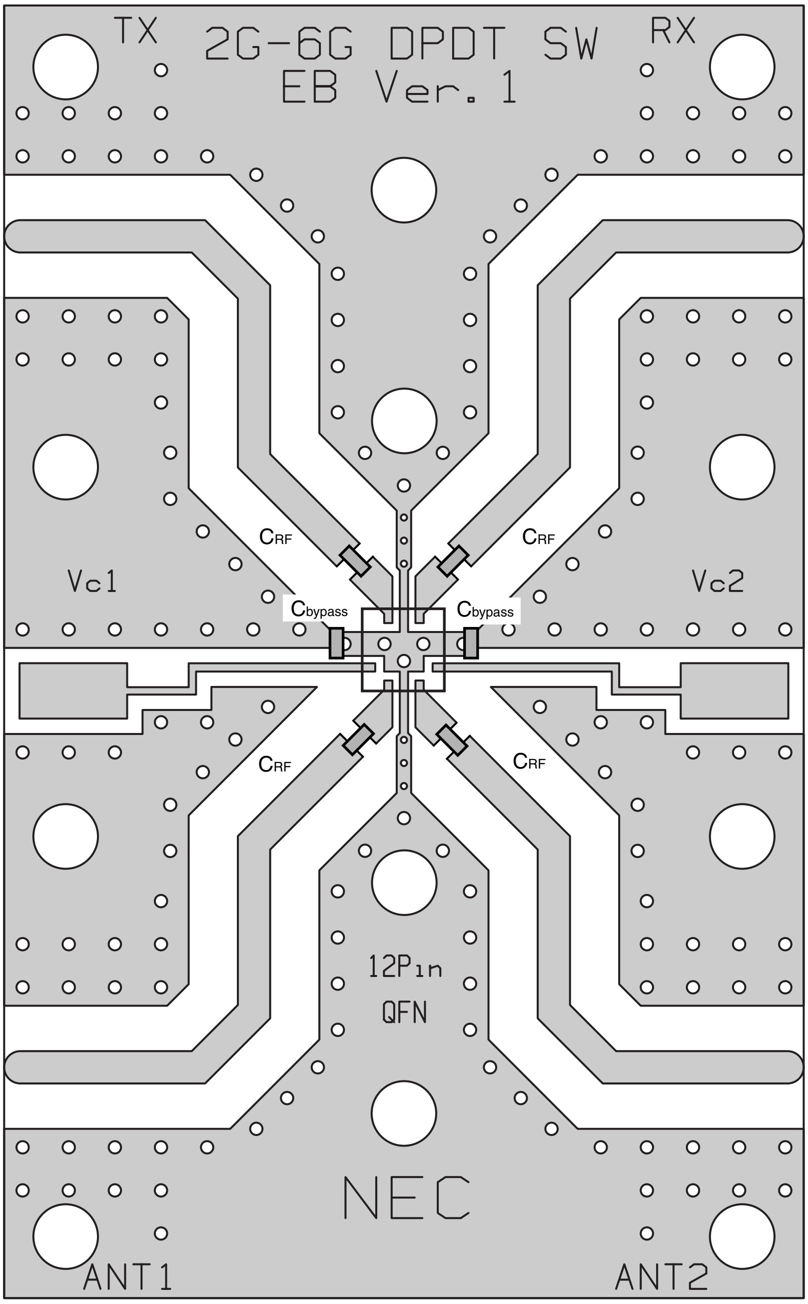
EVALUATION CIRCUIT

(Top View)



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

★ ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

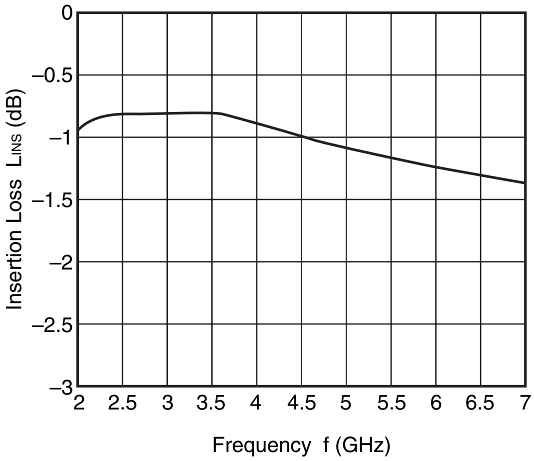


USING THE NEC EVALUATION BOARD

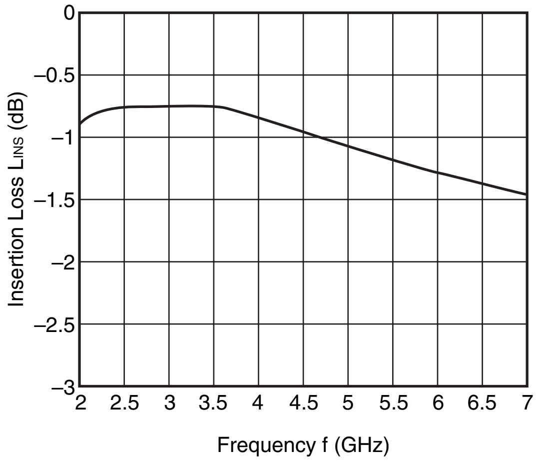
Symbol	Form	Rating	Part Number	Manufacturer
C_{RF}	Chip Capacitor	4 pF	GRM1552C1H4R0CZ01B	muRata
C_{bypass}	Chip Capacitor	1 000 pF	GRM155B11H102KA01B	muRata
–	PC Terminal	–	A2-2PA-2.54DSA	Hirose
–	RF Connector	–	142-0721-821	Johnson
–	PWB	–	RO4003 (t = 0.51 mm)	Rogers

★ TYPICAL CHARACTERISTICS (T_A = +25°C, V_{cont} = 3.0 V/0 V, Z_O = 50 Ω, DC block capacitor = 4 pF using test fixture, unless otherwise specified)

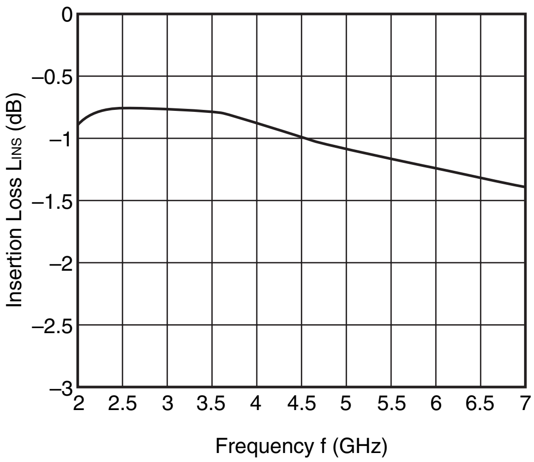
TX-ANT1 INSERTION LOSS vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)



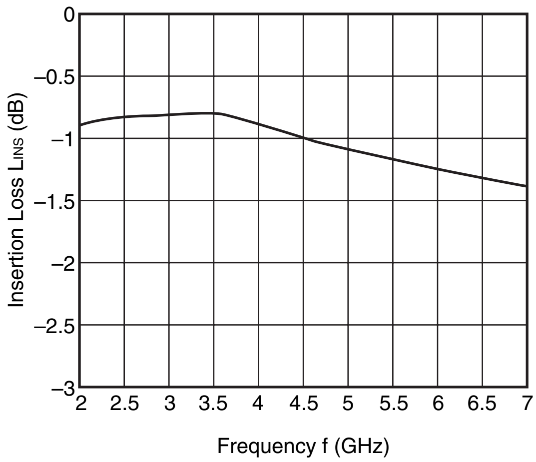
ANT1-RX INSERTION LOSS vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)



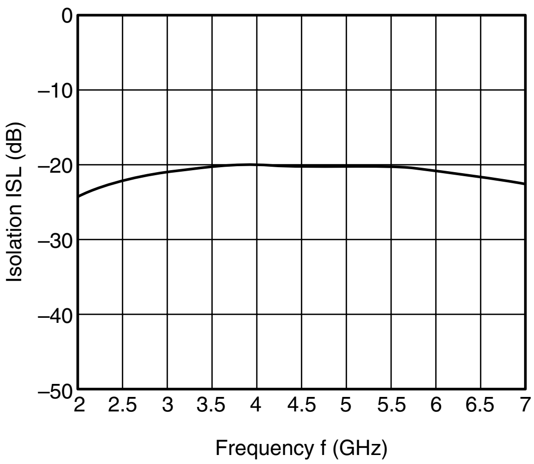
TX-ANT2 INSERTION LOSS vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)



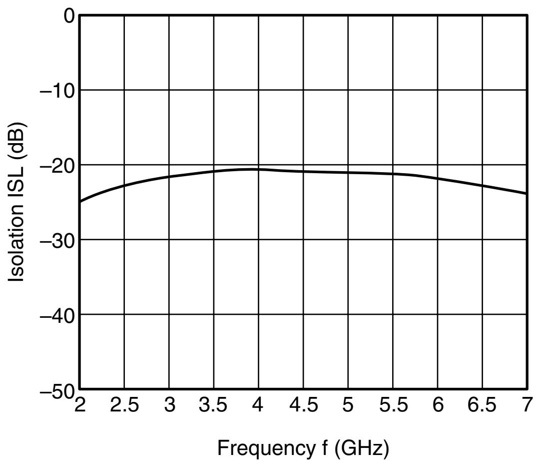
ANT2-RX INSERTION LOSS vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)



TX-RX ISOLATION vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)

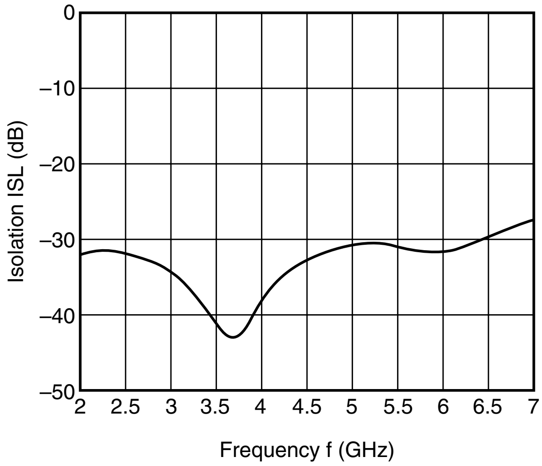


TX-RX ISOLATION vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)

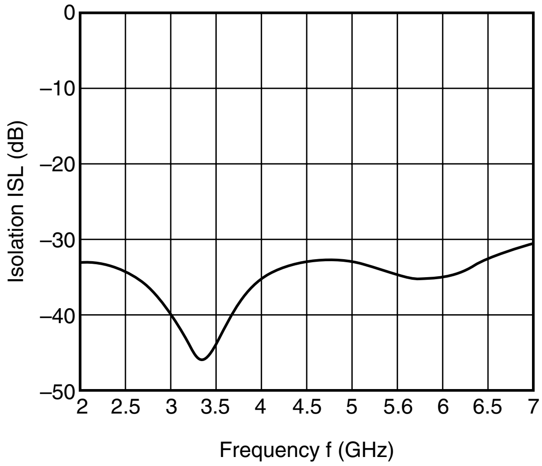


Remark The graphs indicate nominal characteristics.

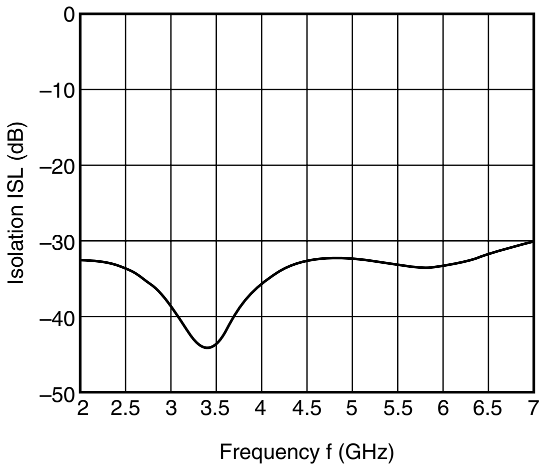
TX-ANT1 ISOLATION vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)



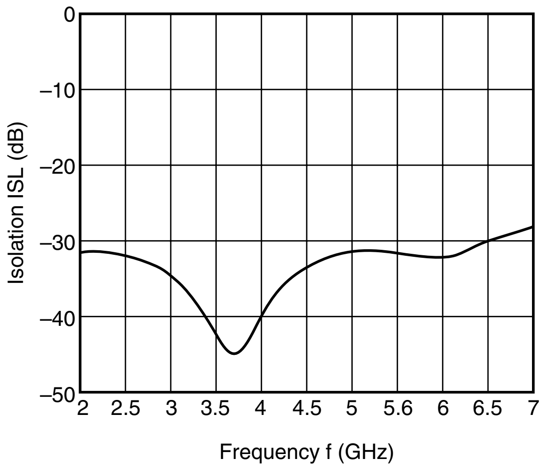
ANT1-RX ISOLATION vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)



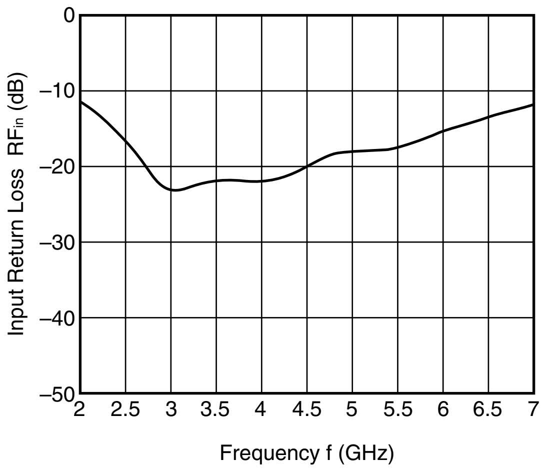
TX-ANT2 ISOLATION vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)



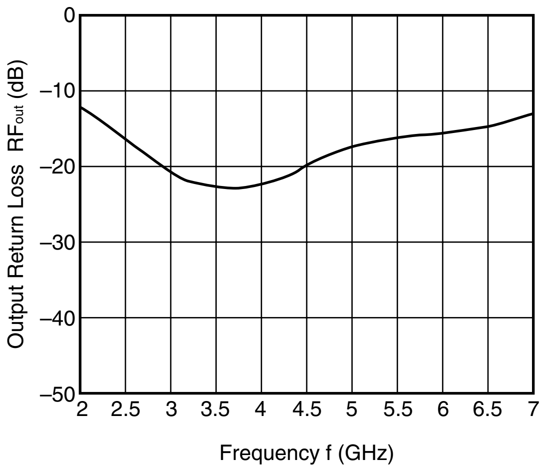
ANT2-RX ISOLATION vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)



TX-ANT1 INPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)

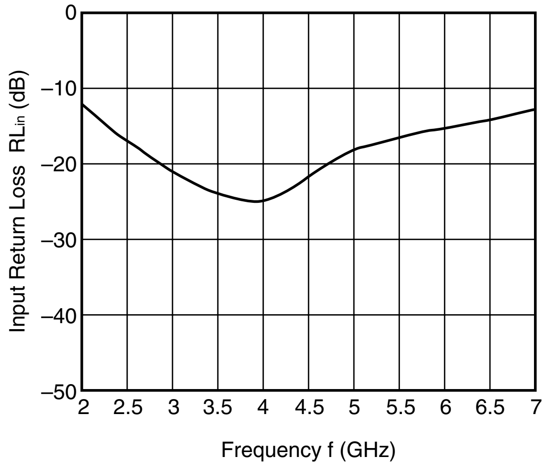


ANT1-RX OUTPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)

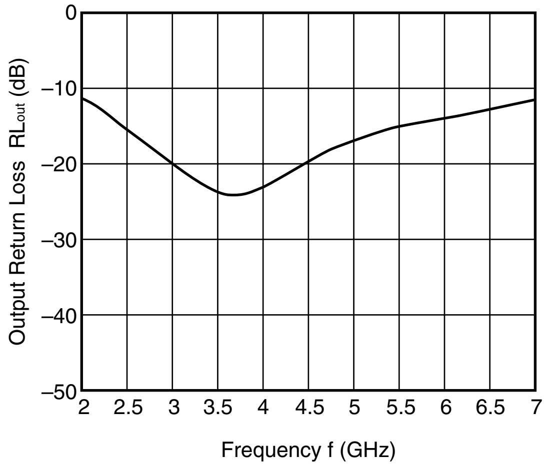


Remark The graphs indicate nominal characteristics.

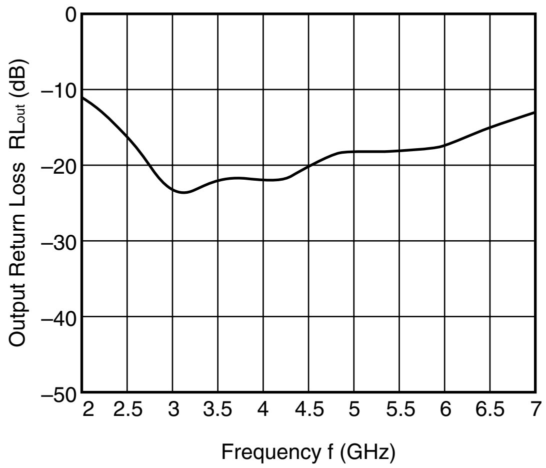
TX-ANT2 INPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)



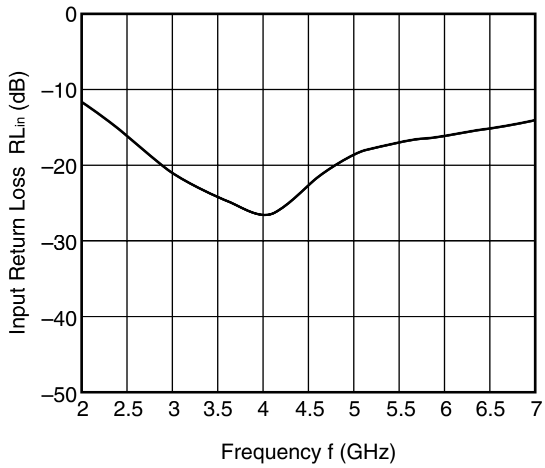
ANT2-RX OUTPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)



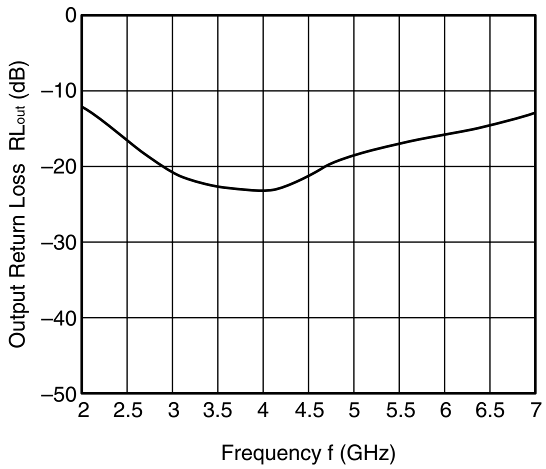
TX-ANT1 OUTPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)



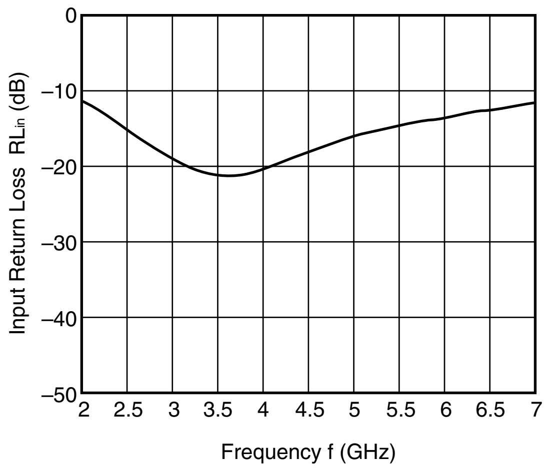
ANT1-RX INPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)



TX-ANT2 OUTPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT2 and ANT1-RX are ON)

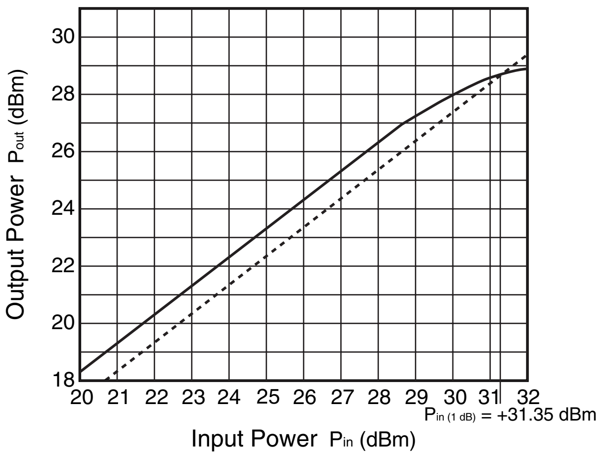


ANT2-RX INPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT1 and ANT2-RX are ON)

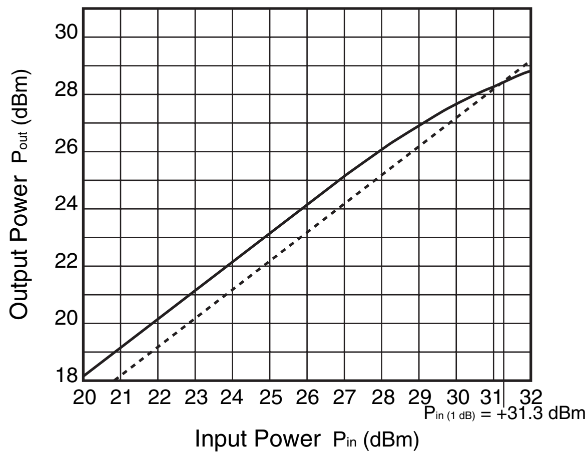


Remark The graphs indicate nominal characteristics.

OUTPUT POWER vs. INPUT POWER
(f = 2.4 GHz)



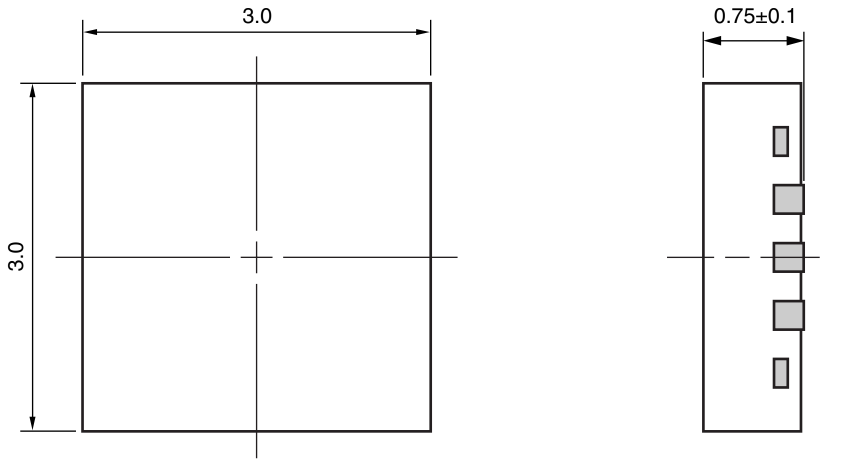
OUTPUT POWER vs. INPUT POWER
(f = 5.8 GHz)



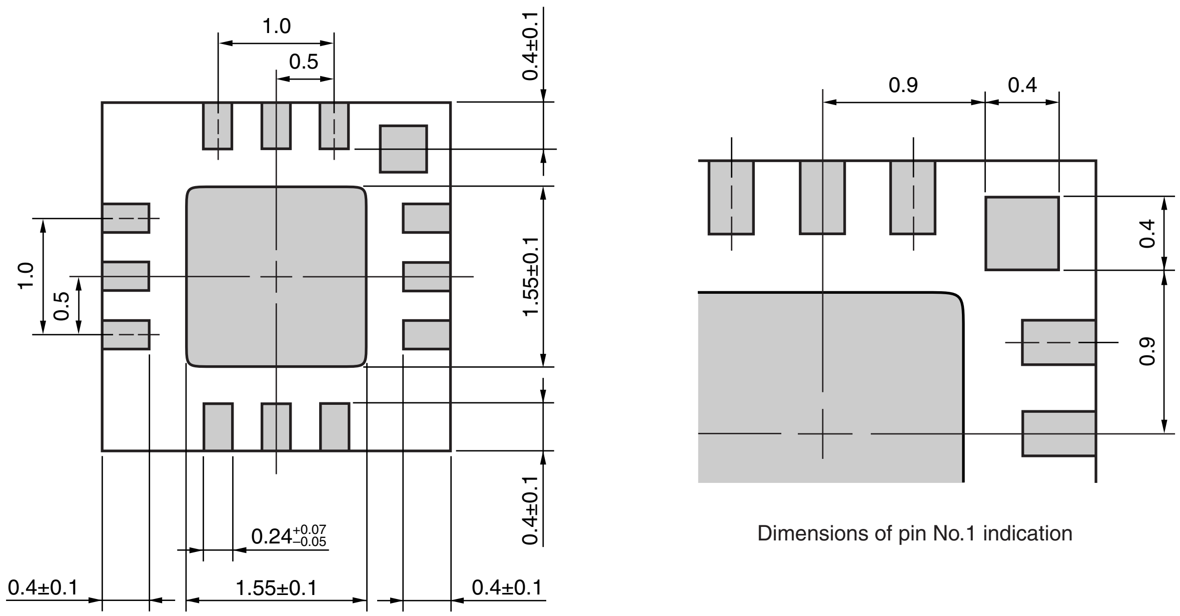
Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

12-PIN PLASTIC QFN (UNIT: mm)



(Bottom View)



Dimensions of pin No.1 indication

★ RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature)	: 260°C or below	IR260
	Time at peak temperature	: 10 seconds or less	
	Time at temperature of 220°C or higher	: 60 seconds or less	
	Preheating time at 120 to 180°C	: 120±30 seconds	
	Maximum number of reflow processes	: 3 times	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	
Wave Soldering	Peak temperature (molten solder temperature)	: 260°C or below	WS260
	Time at peak temperature	: 10 seconds or less	
	Preheating temperature (package surface temperature)	: 120°C or below	
	Maximum number of flow processes	: 1 time	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	
Partial Heating	Peak temperature (pin temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

Caution Do not use different soldering methods together (except for partial heating).

When the product(s) listed in this document is subject to any applicable import or export control laws and regulation of the authority having competent jurisdiction, such product(s) shall not be imported or exported without obtaining the import or export license.

Caution	GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.

▶**For further information, please contact**

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