DPDT SWITCH GaAs MMIC

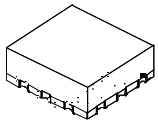
■ GENERAL DESCRIPTION

The NJG1617K11 is a DPDT switch MMIC which features low insertion loss, high isolation, wide frequency range (0.1 to 6GHz) and low operating voltage from 2.7V.

Thin switch is suited for wireless LAN IEEE 802.11b/802.11g (2.4GHz band) and IEEE 802.11a (5GHz band).

The industrial standard QFN12-11 package is applied.

■ PACKAGE OUTLINE

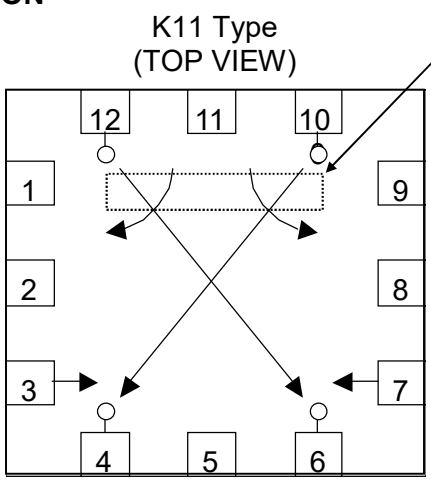


NJG1617K11

■ FEATURES

● Low voltage operation	+2.7~+5.0V
● Pin at 0.2dB compression point	+32dBm typ. @f=6.0GHz, V_{CTL}=+3.0V
● Low insertion loss	0.7dB typ. @f=2.5GHz 0.75dB typ. @f=6.0GHz
● High isolation	30dB typ. @f=2.5GHz 25dB typ. @f=6.0GHz
● Ultra small & ultra thin package	QFN12-11 (Package size: 3.0x3.0x0.75mm)

■ PIN CONFIGURATION



Pin connection

1.GND	7.VCTL2
2.GND	8.GND
3.VCTL1	9.GND
4.ANT1	10.RX
5.GND	11.GND
6.ANT2	12.TX

■ TRUTH TABLE

Control Voltage: "H"=$V_{CTL\ (H)}$, "L"=$V_{CTL\ (L)}$

PASS	CONTROL SIGNAL	
	VCTL1	VCTL2
ANT1-TX ANT2-RX	L	H
ANT1-RX ANT2-TX	H	L

NOTE: Please note that any data or drawing in this catalog is subject to change.

■ ABSOLUTE MAXIMUM RATINGS

(T_a=+25°C)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
RF Input Power	P_{IN}	VCTL=0V/+3.0V	+33	dBm
Control Voltage	V_{CTL}	VCTL terminal	+7.5	V
Operating Temp.	T_{opr}		-40~+85	°C
Storage Temp.	T_{stg}		-55~+150	°C

■ ELECTRICAL CHARACTERISTICS

(General conditions: T_a=+25°C, Z_s=Z_l=50Ω, $V_{CTL\ (L)}$=0V, $V_{CTL\ (H)}$=+3.0V)

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Control Voltage (LOW)	$V_{CTL\ (L)}$		-0.2	-	0.2	V
Control Voltage (HIGH)	$V_{CTL\ (H)}$		2.7	3.0	5.0	V
Control Current	I_{CTL}	f=5.25GHz	-	0.5	5.0	μA
Insertion Loss 1	LOSS1	f=2.5GHz,Pin=20dBm	-	0.7	0.9	dB
Insertion Loss 2	LOSS2	f=6.0GHz,Pin=20dBm	-	0.75	1.0	dB
Isolation 1	ISL1	f=2.5GHz,Pin=20dBm TX,RX-ANT1,ANT2	25	30	-	dB
Isolation 2	ISL2	f=6.0GHz ,Pin=20dBm TX,RX-ANT1,ANT2	20	25	-	dB
Pin at 0.2dB Compression Point	$P_{-0.2dB}$	f=5.25GHz	29	32	-	dBm
VSWR	VSWR	f=0.1~6.0GHz	-	1.2	1.5	
Switching Time	T_{SW}	f=0.1~6.0GHz	-	20	100	ns

■ TERMINAL INFORMATION

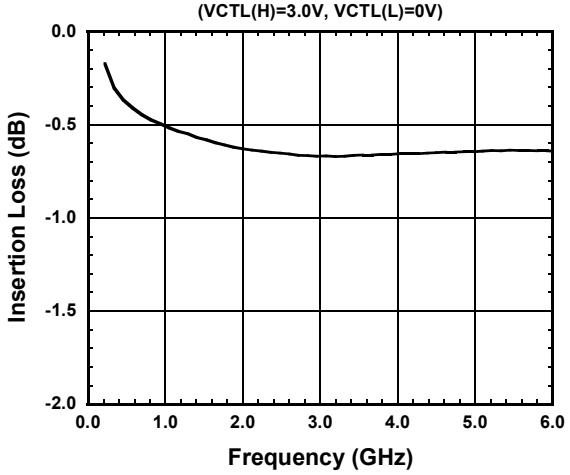
No.	SYMBOL	DESCRIPTION
3	VCTL1	Control signal input terminal. This terminal is set to High-Level (+2.7~+5.0V) or Low-Level (-0.2~+0.2V).
4	ANT1	Antenna port. An external capacitor is required to block DC voltage.
6	ANT2	Antenna port. An external capacitor is required to block DC voltage.
7	VCTL2	Control signal input terminal. This terminal is set to High-Level (+2.7~+5.0V) or Low-Level (-0.2~+0.2V).
10	RX	RF receiving port. An external capacitor is required to block DC voltage.
12	TX	RF transmitting port. An external capacitor is required to block DC voltage.
1,2,5,8, 9,11	GND	Ground terminal. Please connect this terminal with ground plane as close as possible for excellent RF performance.

■ ELECTRICAL CHARACTERISTICS

(With application circuit, Losses of Blocking Capacitor, and external circuit are excluded)

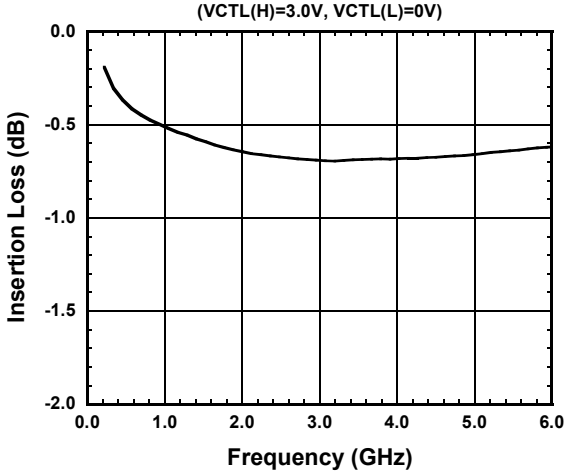
TX-ANT1 Insertion Loss vs. Frequency

(VCTL(H)=3.0V, VCTL(L)=0V)



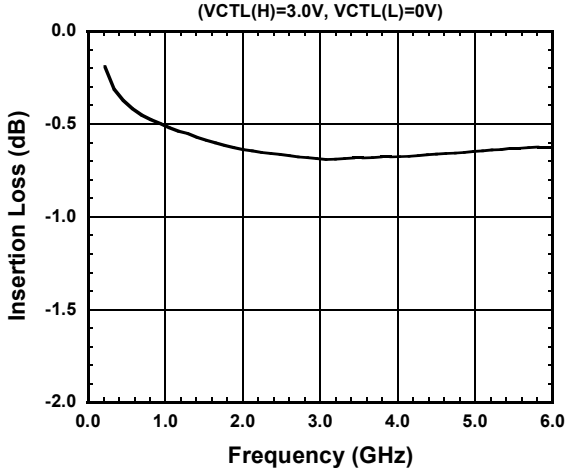
TX-ANT2 Insertion Loss vs. Frequency

(VCTL(H)=3.0V, VCTL(L)=0V)



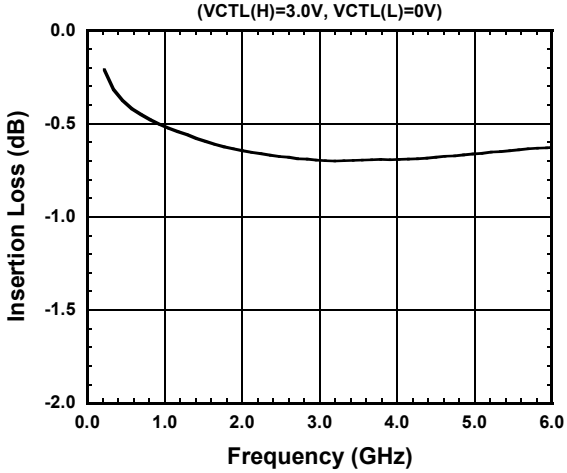
RX-ANT1 Insertion Loss vs. Frequency

(VCTL(H)=3.0V, VCTL(L)=0V)



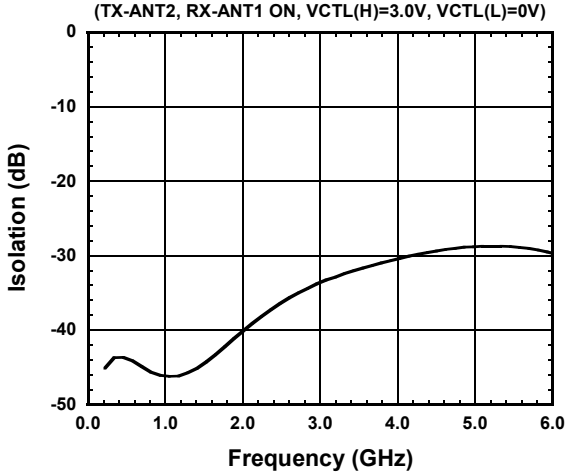
RX-ANT2 Insertion Loss vs. Frequency

(VCTL(H)=3.0V, VCTL(L)=0V)



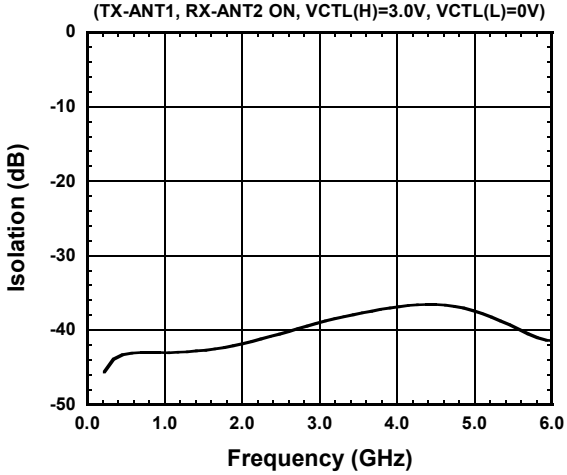
TX-ANT1 Isolation vs. Frequency

(TX-ANT2, RX-ANT1 ON, VCTL(H)=3.0V, VCTL(L)=0V)



TX-ANT2 Isolation vs. Frequency

(TX-ANT1, RX-ANT2 ON, VCTL(H)=3.0V, VCTL(L)=0V)

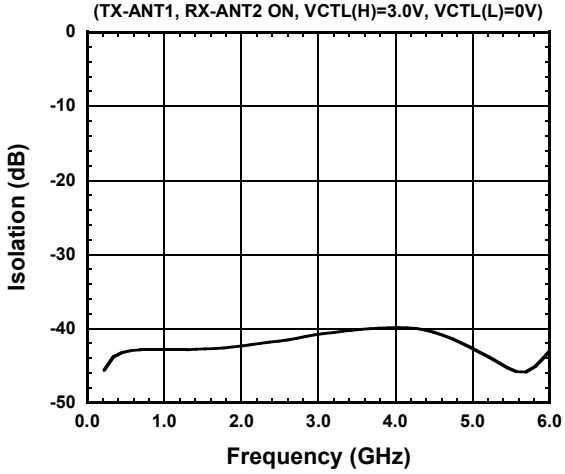


■ ELECTRICAL CHARACTERISTICS

(With application circuit, Losses of Blocking Capacitor, and external circuit are excluded)

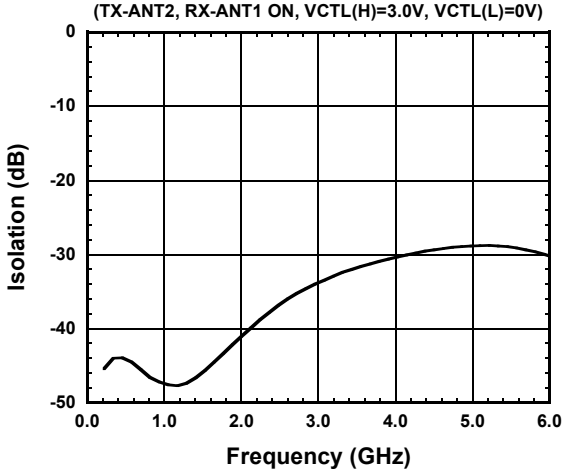
RX-ANT1 Isolation vs. Frequency

(TX-ANT1, RX-ANT2 ON, VCTL(H)=3.0V, VCTL(L)=0V)



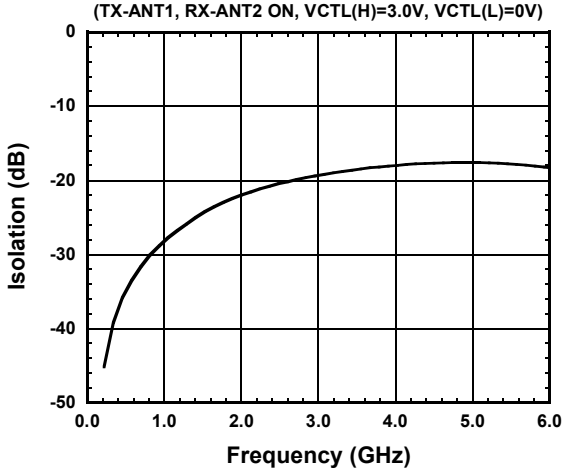
RX-ANT2 Isolation vs. Frequency

(TX-ANT2, RX-ANT1 ON, VCTL(H)=3.0V, VCTL(L)=0V)



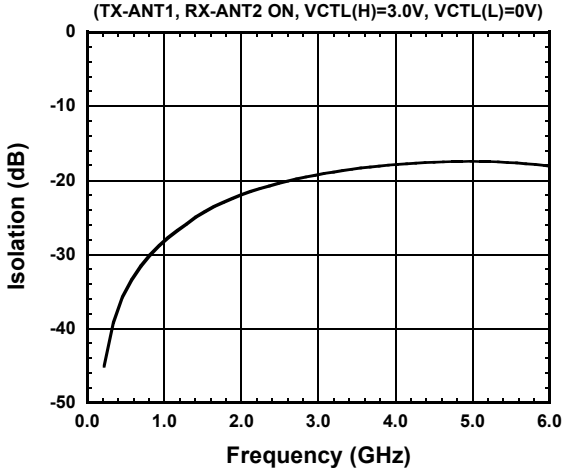
TX-RX Isolation vs. Frequency

(TX-ANT1, RX-ANT2 ON, VCTL(H)=3.0V, VCTL(L)=0V)



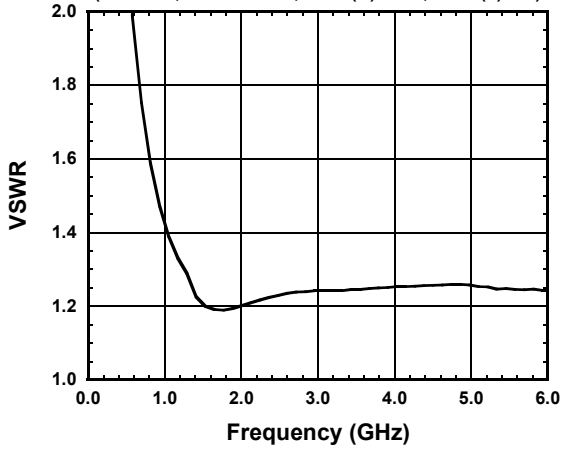
ANT1-ANT2 Isolation vs. Frequency

(TX-ANT1, RX-ANT2 ON, VCTL(H)=3.0V, VCTL(L)=0V)



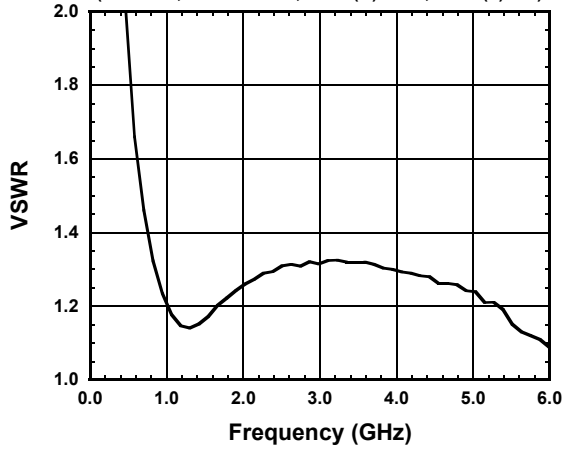
TX Port VSWR vs. Frequency

(TX-ANT1, RX-ANT2 ON, VCTL(H)=3.0V, VCTL(L)=0V)



ANT1 Port VSWR vs. Frequency

(TX-ANT2, RX-ANT1 ON, VCTL(H)=3.0V, VCTL(L)=0V)

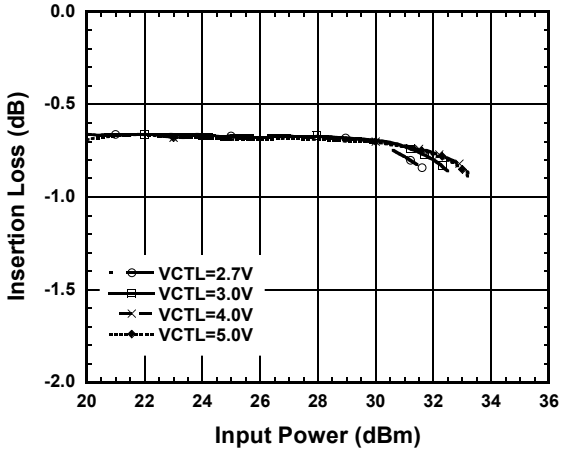


■ ELECTRICAL CHARACTERISTICS

(With application circuit, Losses of Blocking Capacitor, and external circuit are excluded)

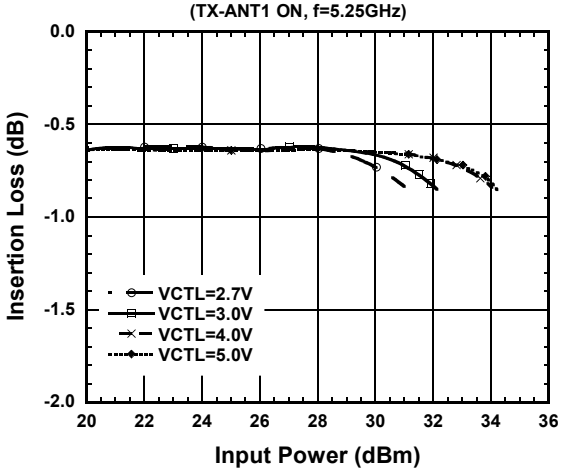
Insertion Loss vs. Input Power

(TX-ANT1 ON, f=2.5GHz)



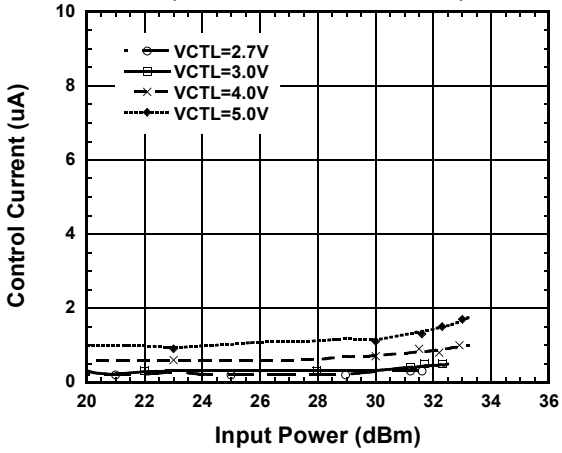
Insertion Loss vs. Input Power

(TX-ANT1 ON, f=5.25GHz)



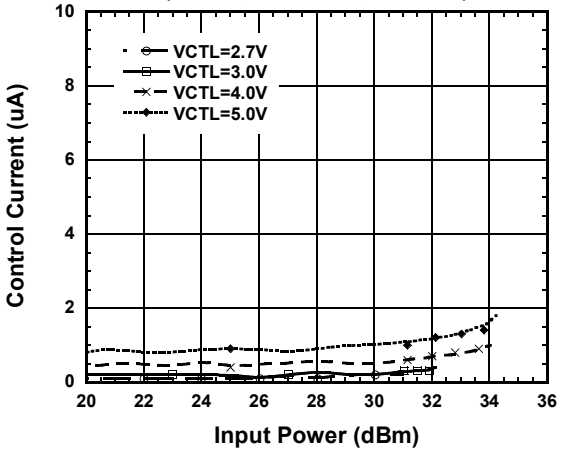
ICTL vs. Input Power

(TX-ANT1, RX-ANT2 ON, f=2.5GHz)



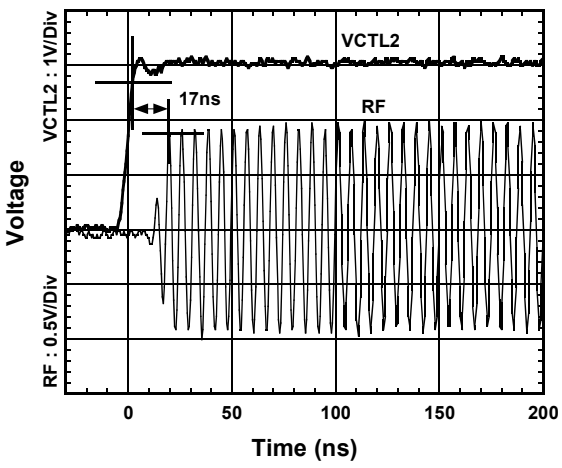
ICTL vs. Input Power

(TX-ANT1, RX-ANT2 ON, f=5.25GHz)

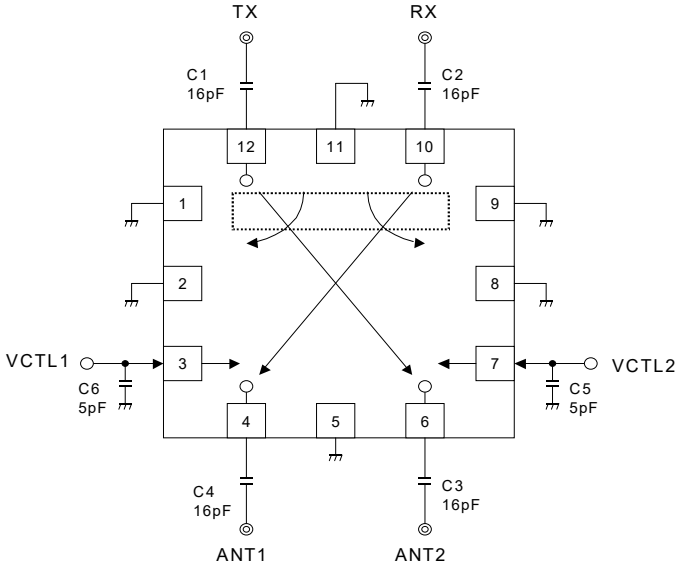


Switching Speed

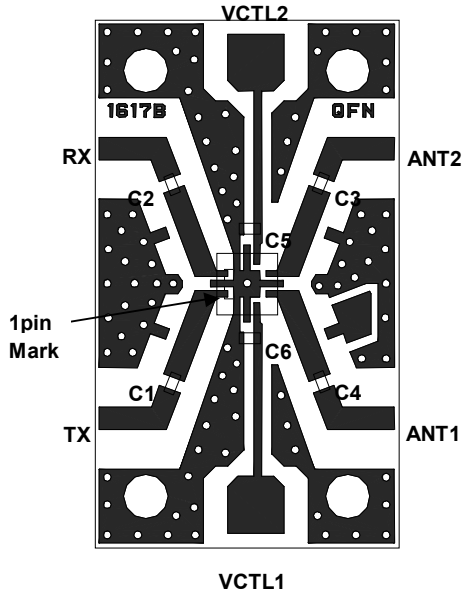
(TX-ANT1 ON, VCTL(H)=3.0V, VCTL(L)=0V)



■ APPLICATION CIRCUIT



■ RECOMMENDED PCB DESIGN



Total Losses of PCB, connector and DC blocking capacitor.

f	PPE	FR-4
2.5GHz	0.20dB	0.31dB
6.0GHz	0.41dB	0.67dB

PCB: PPE, t=0.5mm
Capacitor: size 1005
Strip line Width=1.1mm

PCB: FR4, t=0.5mm
Capacitor: size 1005
Strip line Width=1.0mm

■PARTS LIST

Parts	List 1	List 2	Notes
	0.1~2.0GHz	2.0~6.0GHz	
C1~C4	39pF	16pF	MURATA GRM15
C5~C6	10pF	5pF	MURATA GRM15

PRECAUTIONS

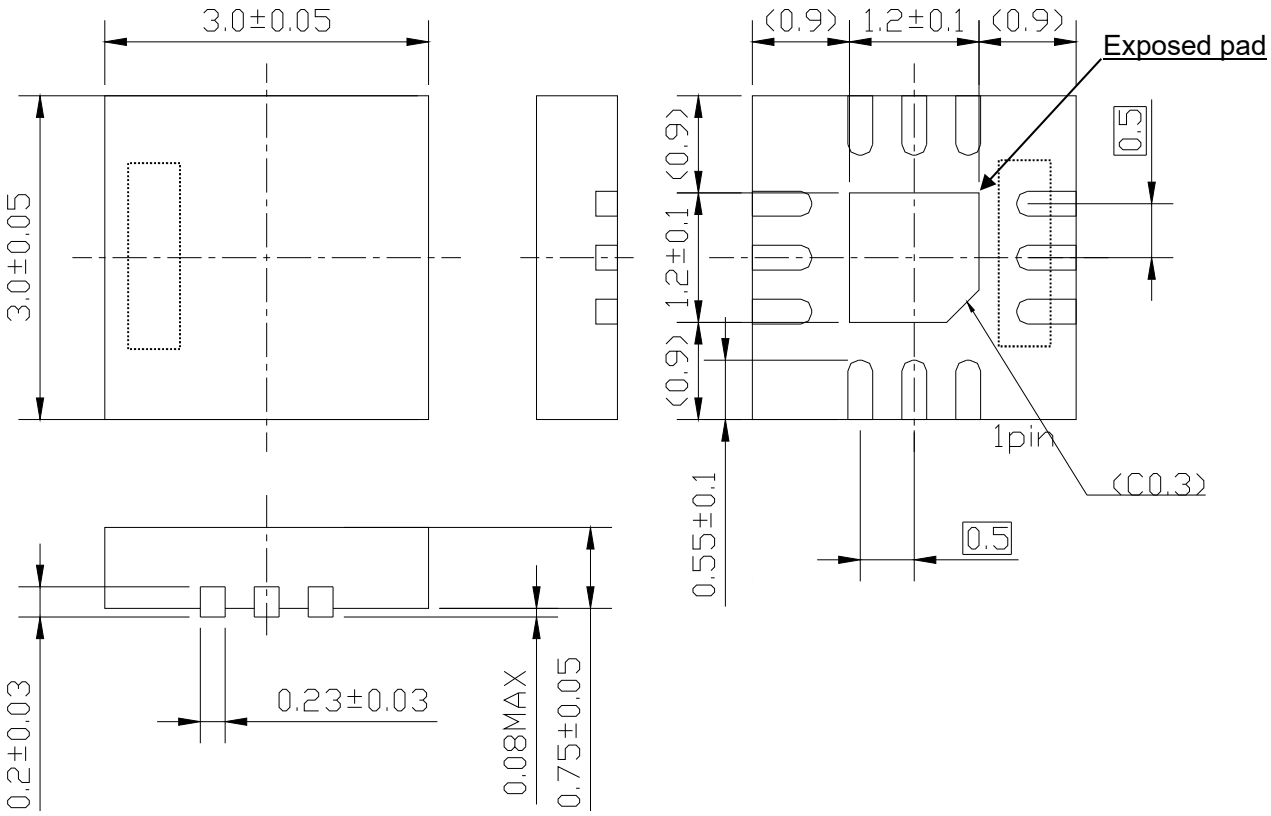
[1]The DC blocking capacitors have to be placed at RF terminal of RX, TX, ANT1 and ANT2.

[2] Please locate bypass capacitors (C5,C6) close to appropriate terminals to reduce stripline influence on RF characteristics.

[3]For good RF performance, the GND terminal must be placed close to ground plane of substrate, and through holes for GND should be placed near by the GND pin connection.

[4]Exposed pad in the bottom must be connected to ground by via holes.

■PACKAGE OUTLINE



TERMINAL TREAT : Bi-Sn
Molding material : Epoxy resin
UNIT : mm
WEIGHT : 20mg

Cautions on using this product

This product contains Gallium-Arsenide (GaAs) which is a harmful material.

- Do NOT eat or put into mouth.
- Do NOT dispose in fire or break up this product.
- Do NOT chemically make gas or powder with this product.
- To waste this product, please obey the relating law of your country.

This product may be damaged with electric static discharge (ESD) or spike voltage. Please handle with care to avoid these damages.

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    - Various Safety Devices
    - Traffic control system
    - Combustion equipment

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8. Quality Warranty
    8-1. Quality Warranty Period
    In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
    8-2. Quality Warranty Remedies
    When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.
    Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
    8-3. Remedies after Quality Warranty Period
    With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.

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