DATA SHEET

NEC

GaAs INTEGRATED CIRCUIT
μPG2022T5G

GaAs MMIC SPDT HIGH POWER SWITCH FROM 4.8 TO 5.85 GHz

DESCRIPTION

The μPG2022T5G is a GaAs FET MMIC SPDT (Single Pole Double Throw) high power switch. The device can operate from 4.8 to 5.85 GHz, having the low insertion loss. It housed in a 6-pin plastic SON package.

FEATURES

- Operating frequency : f = 4.8 to 5.85 GHz
- Low insertion loss : L_{INS} = 0.8 dB TYP. @ f = 4.9 GHz
  : L_{INS} = 0.7 dB TYP. @ f = 5.2 GHz
  : L_{INS} = 0.8 dB TYP. @ f = 5.8 GHz
- Handling power : $P_{in\ (0.1\ dB)}$ = +31 dBm TYP. @ f = 4.8 to 5.85 GHz
- Control voltage : V_{cont} = +2.8 V/0 V
- High isolation : ISL1 (between OUTPUT1 and OUTPUT2) = 22 dB TYP. @ f = 5.2 GHz
  : ISL2 (between INPUT and OUTPUT) = 23 dB TYP. @ f = 5.2 GHz
- Input/output return loss : RL_{in}/RL_{out} = 10 dB MIN. @ f = 4.8 to 5.85 GHz
- Switch control speed : 20 ns @ t_{RISE}/t_{FALL} (10/90% RF)
- 6-pin plastic SON package (2.0 × 3.0 × 0.75 mm)

APPLICATION

- 5 GHz band wireless LAN

★ ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2022T5G-E1	μPG2022T5G-E1-A	6-pin plastic SON (Pb-Free)	G4H	• Embossed tape 8 mm wide • Pin 1 indicates pull-out direction of tape • Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPG2022T5G

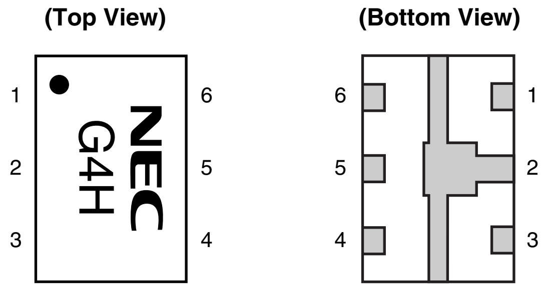
Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

Document No. PG10472EJ02V0DS (2nd edition)
Date Published May 2005 CP(K)
Printed in Japan

The mark ★ shows major revised points.

PIN CONNECTIONS



Pin No.	Pin Name
1	OUTPUT1
2	GND
3	OUTPUT2
4	V_{cont2}
5	INPUT
6	V_{cont1}

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

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	$V_{cont1, 2}$	–6.0 to +6.0 Note	V
Input Power	P_{in}	+36	dBm
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Note $| V_{cont1} - V_{cont2} | \leq 6.0$ V

RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	$V_{cont (H)}$	2.7	2.8	3.3	V
Switch Control Voltage (L)	$V_{cont (L)}$	–0.2	0	0.2	V
Operating Frequency	f	4.8	–	5.85	GHz
Operating Ambient Temperature	T_A	–40	+25	+85	°C

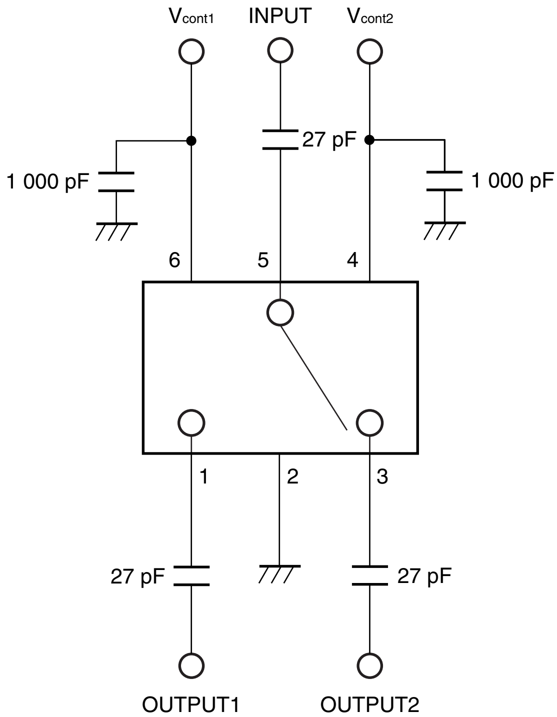
ELECTRICAL CHARACTERISTICS
(T_A = +25°C, V_{cont} = 2.8 V/0 V, Z_O = 50 Ω, DC block capacitor = 27 pF, each port, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	L_{INS}	f = 4.9 GHz	–	0.8	1.1	dB
		f = 5.2 GHz	–	0.7	1.1	dB
		f = 5.8 GHz	–	0.8	1.1	dB
Isolation 1 (between OUTPUT1 and OUTPUT2)	ISL1	f = 4.9 GHz	13	18	–	dB
		f = 5.2 GHz	15	22	–	dB
		f = 5.8 GHz	15	20	–	dB
Input Return Loss	RL_{in}	f = 4.9 GHz	10	22	–	dB
		f = 5.2 GHz	10	29	–	dB
		f = 5.8 GHz	10	19	–	dB
Output Return Loss	RL_{out}	f = 4.9 GHz	10	21	–	dB
		f = 5.2 GHz	10	29	–	dB
		f = 5.8 GHz	10	20	–	dB
0.1 dB Gain Compression Input Power	$P_{in\ (0.1\ dB)}$	f = 4.8 to 5.85 GHz	30	31	–	dBm
Switch Control Speed	t_{SW}	t_{RISE}/t_{FALL} (10/90% RF)	–	20	–	ns
Switch Control Current	I_{cont}		–	0.5	1	μA

STANDARD CHARACTERISTICS FOR REFERENCE
(T_A = +25°C, V_{cont} = 2.8 V/0 V, Z_O = 50 Ω, DC block capacitor = 27 pF, each port, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Isolation 2 (between INPUT and OUTPUT)	ISL2	f = 4.9 GHz	–	18	–	dB
		f = 5.2 GHz	–	23	–	dB
		f = 5.8 GHz	–	21	–	dB

EVALUATION CIRCUIT



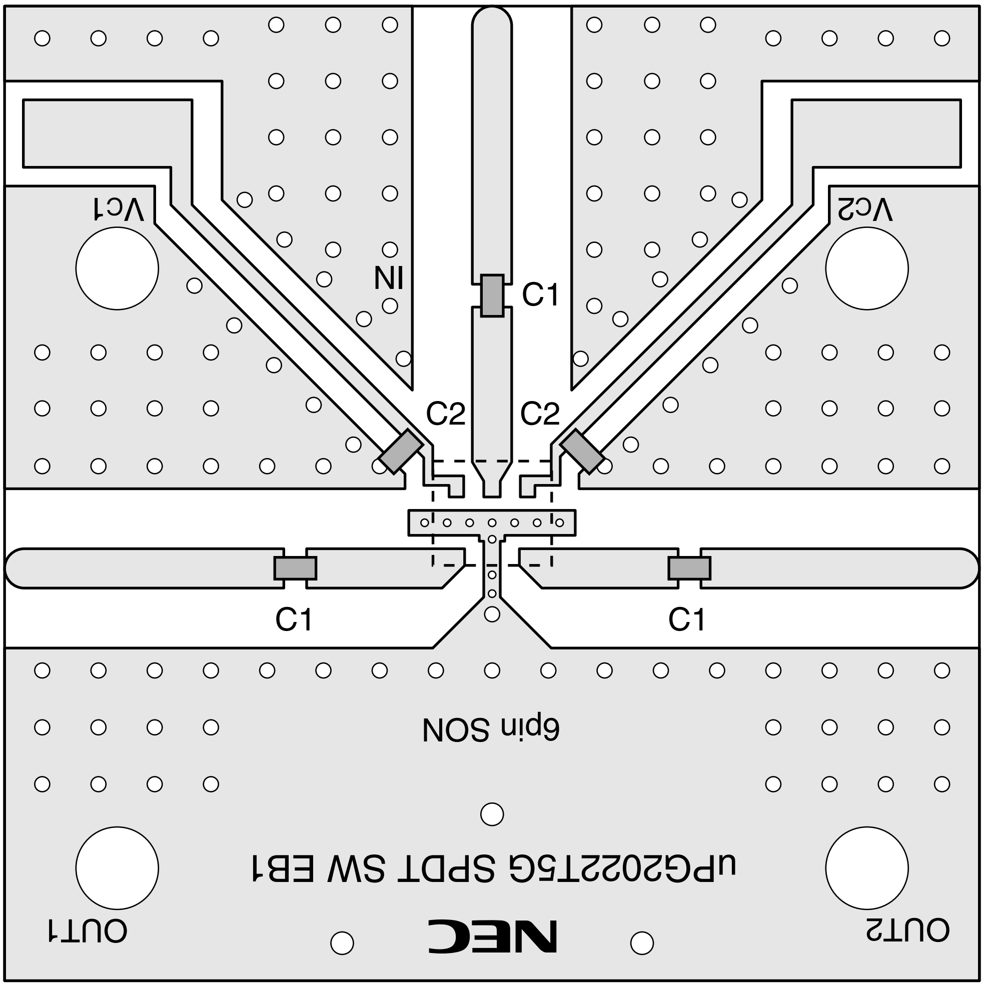
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE

		V_{cont1}	
		$V_{cont (H)}$	$V_{cont (L)}$
V_{cont2}	$V_{cont (H)}$	**Note** INPUT, OUTPUT1, OUTPUT2	INPUT, OUTPUT1, OUTPUT2
	$V_{cont (L)}$	INPUT, OUTPUT1, OUTPUT2	**Note** INPUT, OUTPUT1, OUTPUT2

Note In case of V_{cont1} = V_{cont2} = High or V_{cont1} = V_{cont2} = Low, (that is same control voltage for both pins), input signal of INPUT (Pin 5) is output from OUTPUT1 (Pin 1) and OUTPUT2 (Pin 3).

★ ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

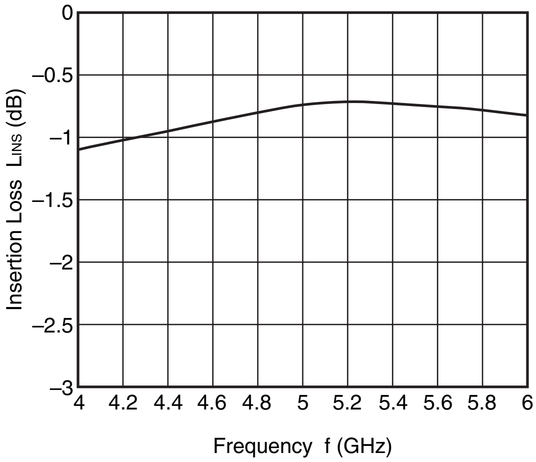


USING THE NEC EVALUATION BOARD

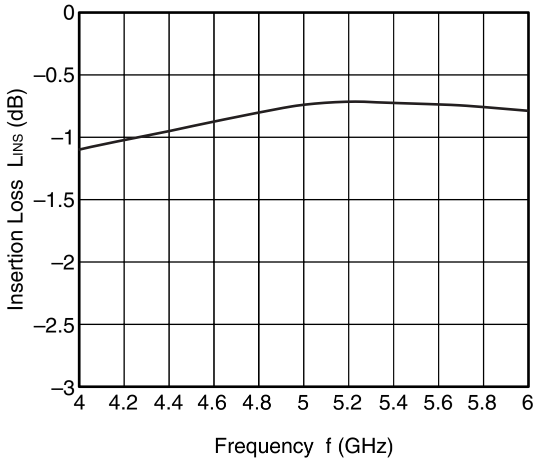
Symbol	Form	Rating	Part Number	Manufacturer
C1	Chip Capacitor	27 pF	GRM36CH270K50	muRata
C2	Chip Capacitor	1 000 pF	GRM36B102K50	muRata
–	PC Terminal	–	A2-2PA-2.54DSA	Hirose
–	RF Connector	–	142-0721-821	Johnson
–	PWB	–	RO4003 (t = 0.51 mm)	Rogers

★ TYPICAL CHARACTERISTICS (T_A = +25°C, V_{cont} = 2.8 V/0 V, Z_O = 50 Ω, DC block capacitor = 27 pF using test fixture, unless otherwise specified)

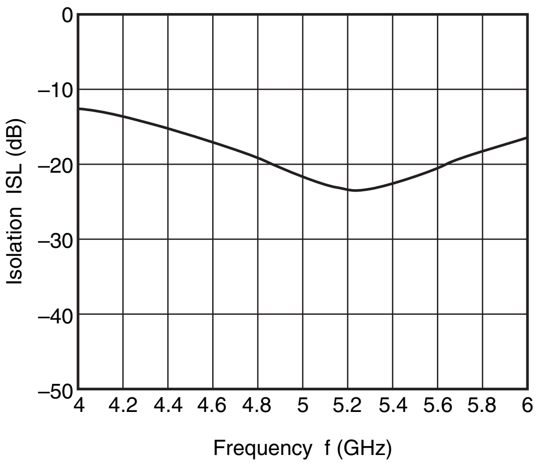
INPUT-OUTPUT1 INSERTION LOSS vs. FREQUENCY
(When INPUT-OUTPUT1 is ON)



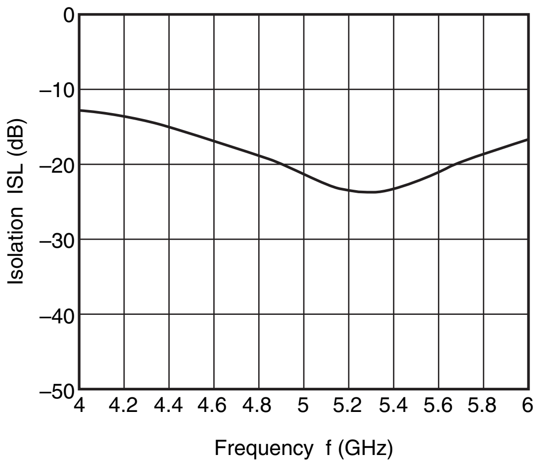
INPUT-OUTPUT2 INSERTION LOSS vs. FREQUENCY
(When INPUT-OUTPUT2 is ON)



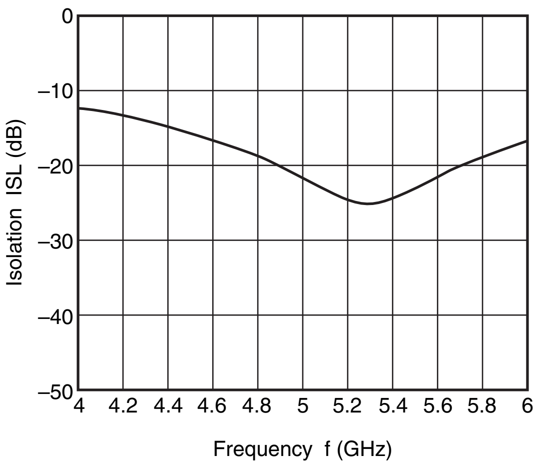
OUTPUT1-OUTPUT2 ISOLATION vs. FREQUENCY
(When INPUT-OUTPUT1 is ON)



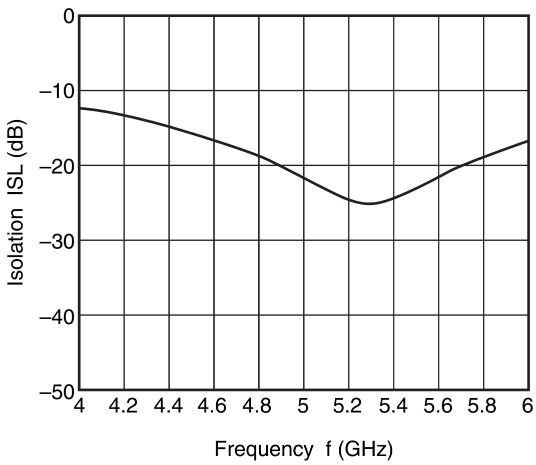
OUTPUT1-OUTPUT2 ISOLATION vs. FREQUENCY
(When INPUT-OUTPUT2 is ON)



INPUT-OUTPUT2 ISOLATION vs. FREQUENCY
(When INPUT-OUTPUT1 is ON)

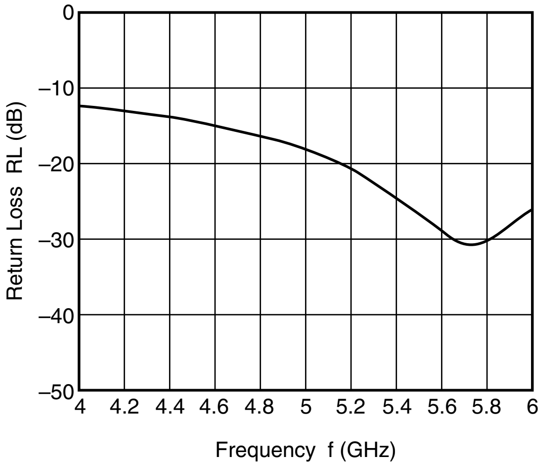


INPUT-OUTPUT1 ISOLATION vs. FREQUENCY
(When INPUT-OUTPUT2 is ON)

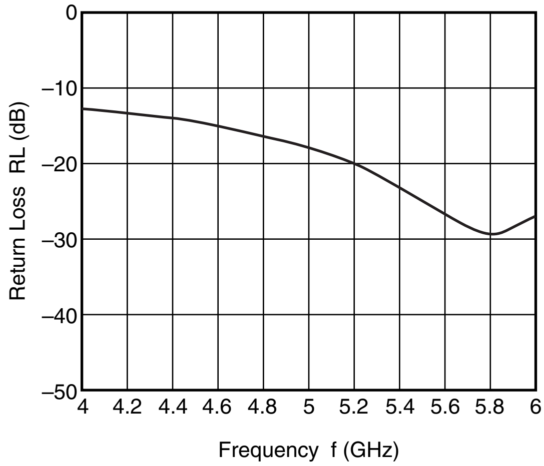


Remark The graphs indicate nominal characteristics.

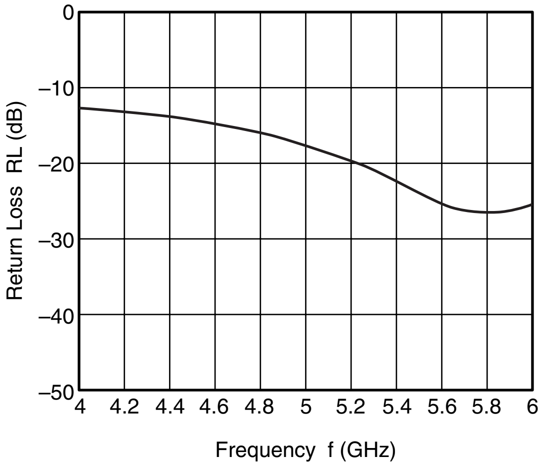
INPUT RETURN LOSS vs. FREQUENCY
(When INPUT-OUTPUT1 is ON)



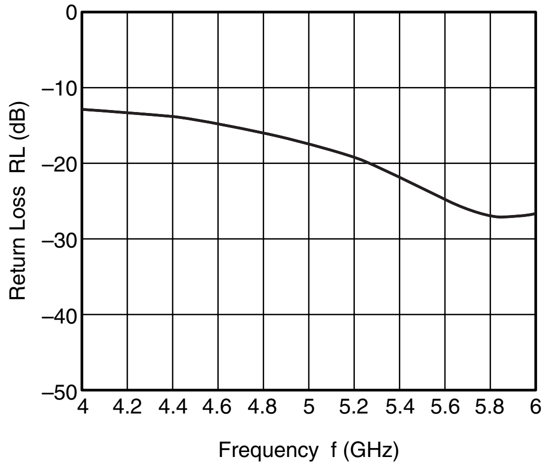
INPUT RETURN LOSS vs. FREQUENCY
(When INPUT-OUTPUT2 is ON)



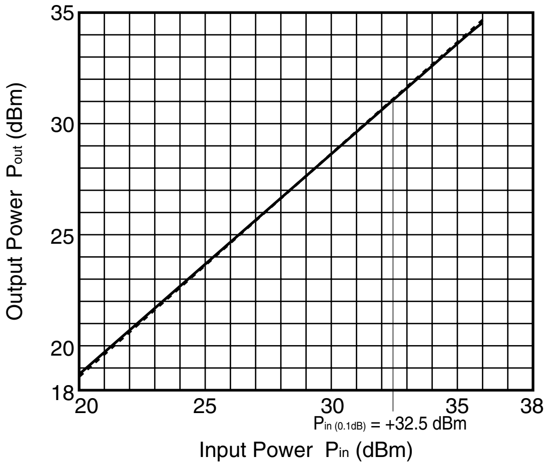
OUTPUT1 RETURN LOSS vs. FREQUENCY
(When INPUT-OUTPUT1 is ON)



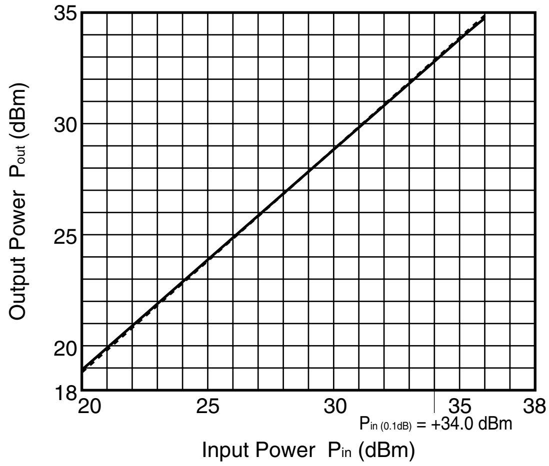
OUTPUT2 RETURN LOSS vs. FREQUENCY
(When INPUT-OUTPUT2 is ON)



OUTPUT POWER vs. INPUT POWER
(f = 4.9 GHz)

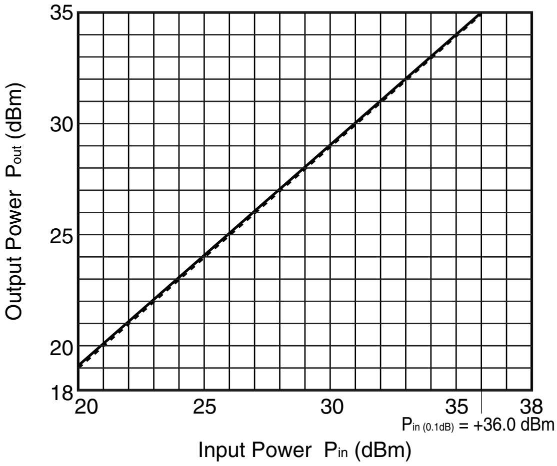


OUTPUT POWER vs. INPUT POWER
(f = 5.2 GHz)



Remark The graphs indicate nominal characteristics.

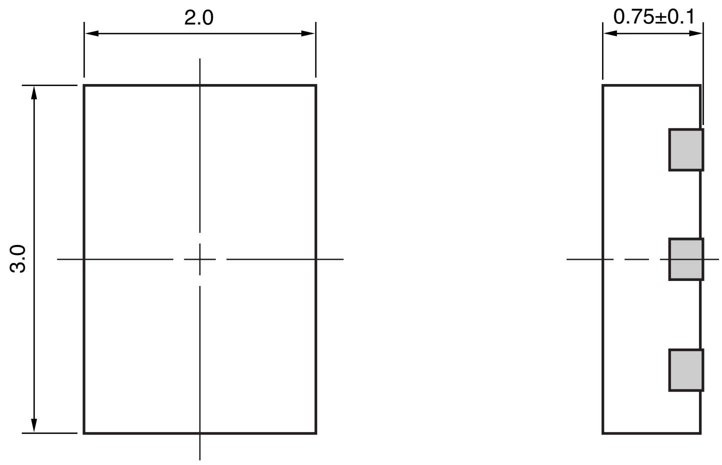
OUTPUT POWER vs. INPUT POWER
(f = 5.8 GHz)



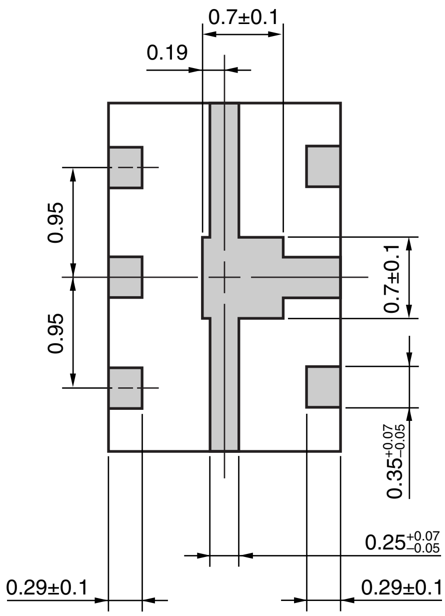
Remark The graph indicates nominal characteristics.

PACKAGE DIMENSIONS

6-PIN PLASTIC SON (UNIT: mm)



(Bottom View)



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

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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