To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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GaAs INTEGRATED CIRCUIT

μPG2005TB

L-BAND SINGLE CONTROL SPDT SWITCH

DESCRIPTION

The μPG2005TB is an L-band SPDT (Single Pole Double Throw) GaAs FET switch which was developed for digital cellular or cordless telephone application. The device can operate from 0.5 to 2.5 GHz, having the low insertion loss and high isolation by 2.8 V single bias control.

FEATURES

- Low insertion loss: L_{INS} = 0.3 dB TYP. @V_{CONT} = 2.8 V / 0 V, V_{DD} = 2.8 V, f = 1 GHz
  L_{INS} = 0.4 dB TYP. @V_{CONT} = 2.8 V / 0 V, V_{DD} = 2.8 V, f = 2.5 GHz
- High isolation: ISL = 29 dB TYP. @V_{CONT} = 2.8 V / 0 V, V_{DD} = 2.8 V, f = 2 GHz
  ISL = 25 dB TYP. @V_{CONT} = 2.8 V / 0 V, V_{DD} = 2.8 V, f = 2.5 GHz
- 6-pin super minimold package (Size: 2.0 × 1.25 × 0.9 mm)

APPLICATIONS

- L-band digital cellular or cordless telephone
- Bluetooth, W-LAN and WLL applications

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPG2005TB-E3	6-pin super minimold	G2H	• Embossed tape 8 mm wide • Pin 1, 2, 3 face the tape perforation side • Qty 3kpcs / reel

Remark To order evaluation samples, please contact your local NEC sales office.
Part number for sample order: μPG2005TB

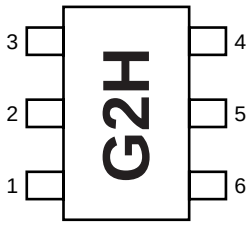
Caution The IC must be handled with care to prevent static discharge because its circuit composed of GaAs HJ-FET.

Document No. P15522EJ1V0DS00 (1st edition)
Date Published May 2001 NS CP(K)
Printed in Japan

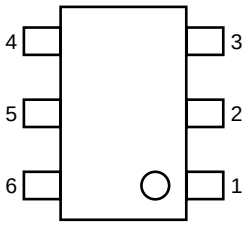
PIN CONNECTIONS

Pin No.	Connection	Pin No.	Connection
1	OUT1	4	V_{CONT}
2	GND	5	IN
3	OUT2	6	V_{DD}

(Top View)



(Bottom View)



ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Control Voltage	V_{CONT}	+6.0	V
Supply Voltage	V_{DD}	+6.0	V
Input Power	P_{in}	22	dBm
Total Power Dissipation	P_{tot}	0.15	W
Operating Temperature	T_{opt}	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

RECOMMENDED OPERATING CONDITIONS (T_A = +25°C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Control Voltage (High)	$V_{CONT(H)}$	2.7	2.8	3.0	V
Control Voltage (Low)	$V_{CONT(L)}$	0	0	0.2	V
Supply Voltage	V_{DD}	2.7	2.8	3.0	V

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, T_A = +25°C, V_{CONT} = 2.8 V / 0 V, V_{DD} = 2.8 V, Z_O = 50 Ω, Off chip DC blocking capacitors value; 51 pF)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	L_{INS}	f = 0.5 to 1.0 GHz	–	0.30	0.55	dB
		f = 2.0 GHz	–	0.35	0.60	dB
		f = 2.5 GHz	–	0.40	0.65	dB
Isolation	ISL	f = 0.5 to 2.0 GHz	25	29	–	dB
		f = 2.5 GHz	20	25	–	dB
Input Return Loss	RL_{in}	f = 1.0 to 2.5 GHz	16	21	–	dB
Output Return Loss	RL_{out}	f = 1.0 to 2.5 GHz	16	21	–	dB
Input Power at 1 dB Compression Point [Note]	$P_{in(1dB)}$	f = 2.0 GHz	12	16	–	dBm
Input Power at 0.1 dB Compression Point [Note]	$P_{in(0.1dB)}$	f = 2.0 GHz	–	12	–	dBm
Switching Speed	t_{SW}		–	20	–	ns
Supply Current	I_{DD}	V_{DD} = 2.8 V, RF Non	–	47	80	μA
Control Current	I_{CONT}	V_{CONT} = 2.8 V, RF Non	–	0.5	10	μA

Note $P_{in(1dB)}$ or $P_{in(0.1dB)}$ are measured the input power level when the insertion loss increase more 1 dB or 0.1 dB than that of linear range. All other characteristics are measured in linear range.

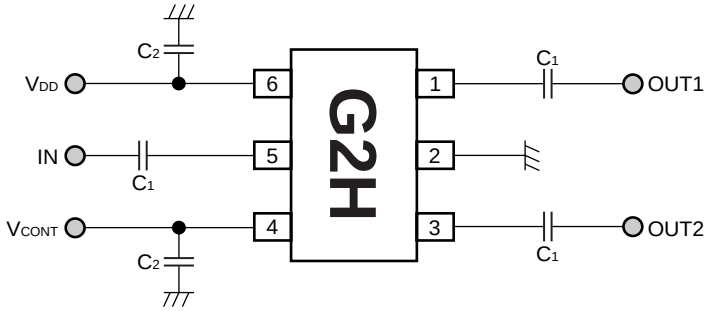
Cautions 1. When the μPG2005TB is used it is necessary to use DC blocking capacitors for No. 1 (OUT1), No.3 (OUT2) and No.5 (IN). The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, band width, switching speed and the condition with actual board of your system.

The range of recommended DC blocking capacitor value is less than 100 pF.

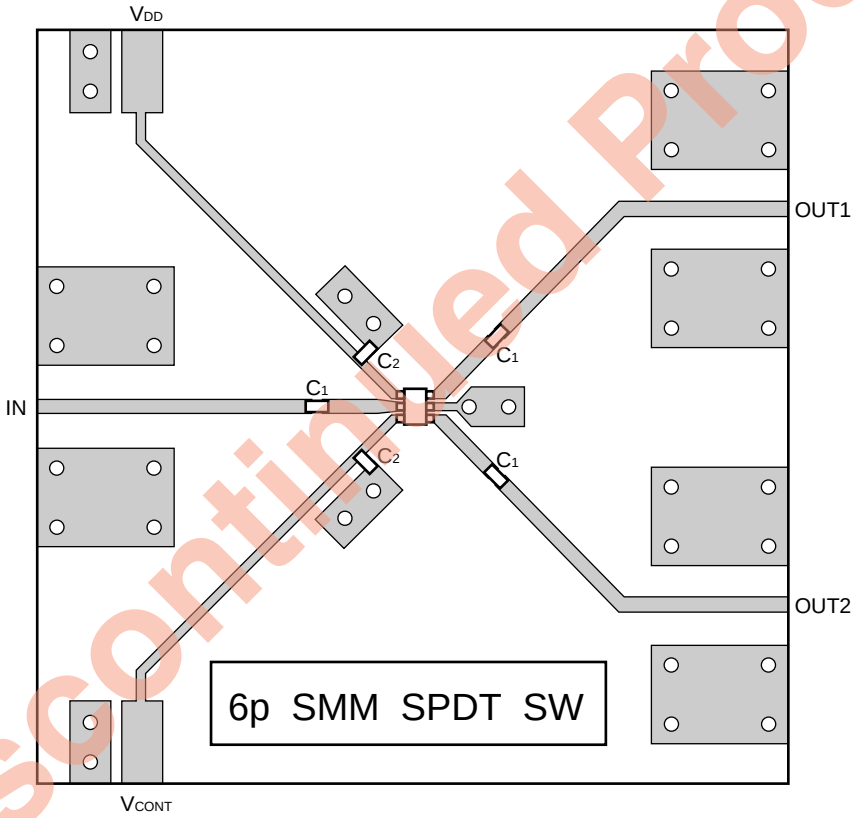
2. The distance between IC's GND pin and ground pattern of substrate should be as shorter as possible to avoid parasitic parameters.

TEST CIRCUIT

V_{CONT} = 2.8 V / 0 V, V_{DD} = 2.8 V, off chip DC blocking capacitors value C_1 = 51 pF, C_2 = 1 000 pF (Bypass), using NEC standard evaluation board.



EVALUATION BOARD



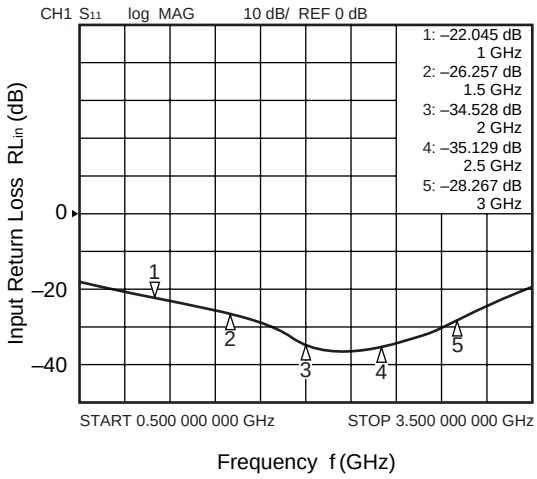
TRUTH TABLE OF SWITCHING BY CONDITION OF VOLTAGE

V_{CONT}	IN–OUT1	IN–OUT2
Low	OFF	ON
High	ON	OFF

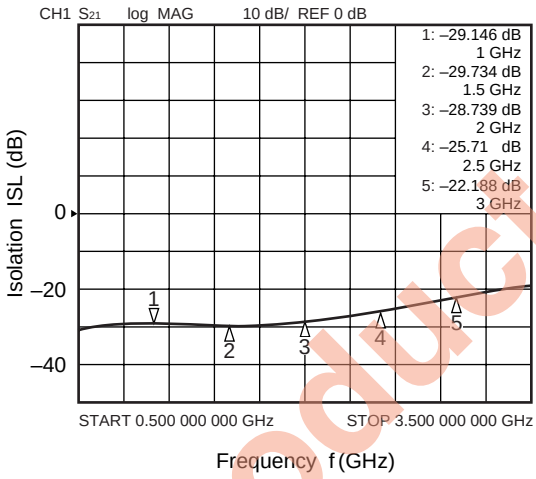
TYPICAL CHARACTERISTICS

TEST CONDITION: V_{CONT} = 2.8 V, V_{DD} = 2.8 V, P_{in} = 0 dBm, OUT2 side is 50 Ω termination

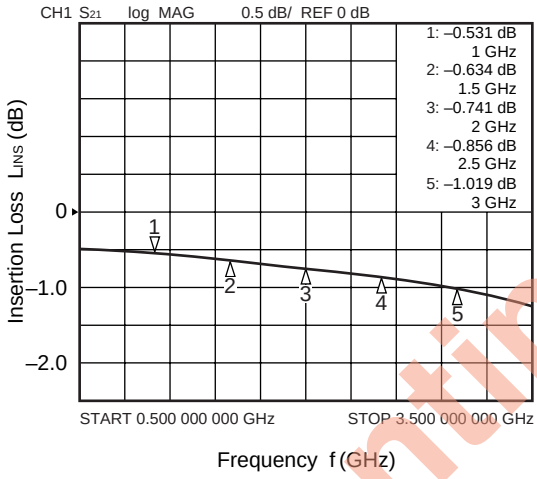
INPUT RETURN LOSS vs. FREQUENCY



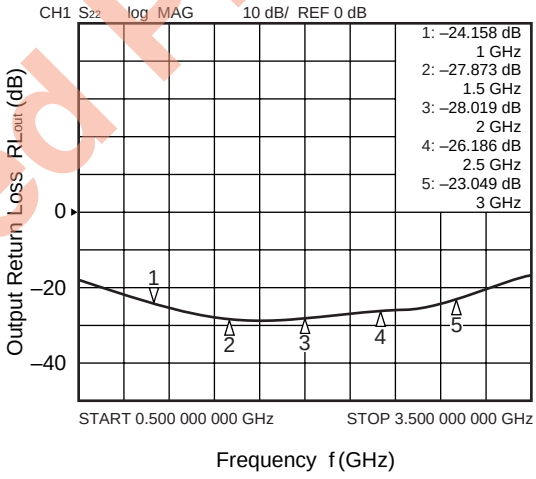
ISOLATION vs. FREQUENCY



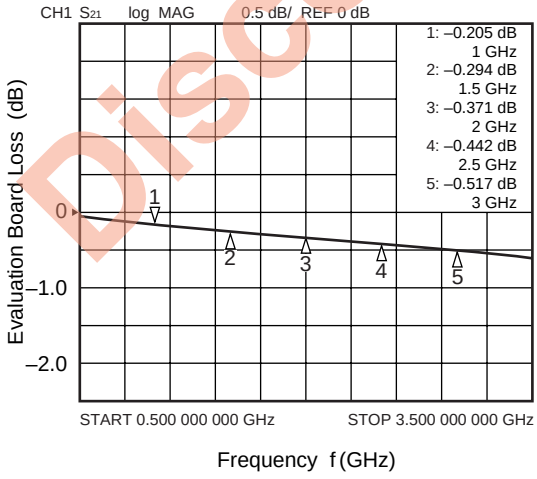
INSERTION LOSS vs. FREQUENCY



OUTPUT RETURN LOSS vs. FREQUENCY



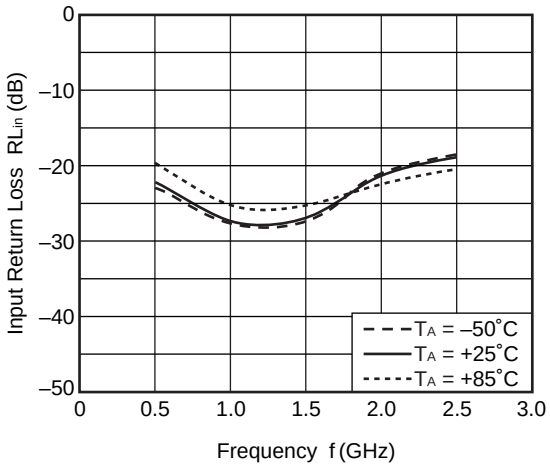
EVALUATION BOARD LOSS vs. FREQUENCY



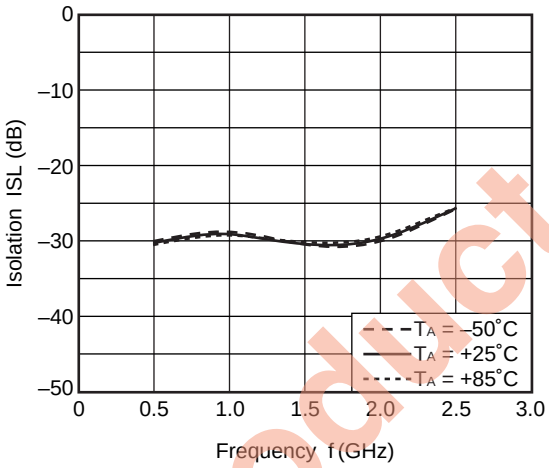
TYPICAL CHARACTERISTICS (Temperature dependency of each frequency characteristics)

TEST CONDITION: V_{CONT} = 2.8 V, V_{DD} = 2.8 V, P_{in} = 0 dBm, OUT2 side is 50 Ω termination

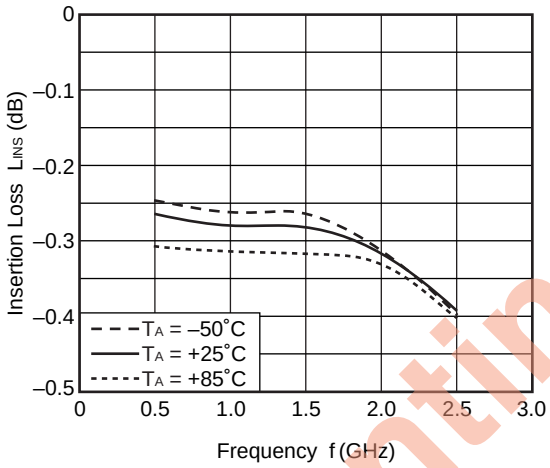
INPUT RETURN LOSS vs. FREQUENCY



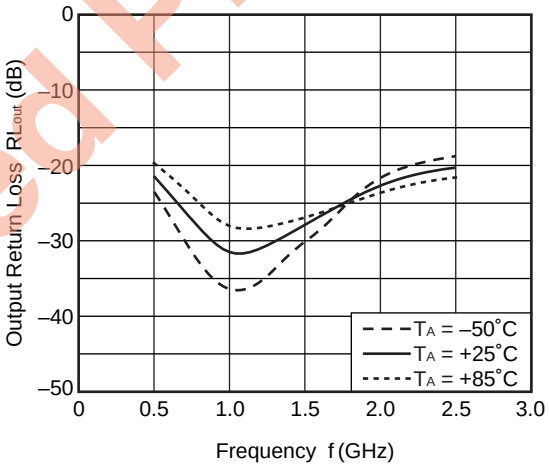
ISOLATION vs. FREQUENCY



INSERTION LOSS vs. FREQUENCY



OUTPUT RETURN LOSS vs. FREQUENCY

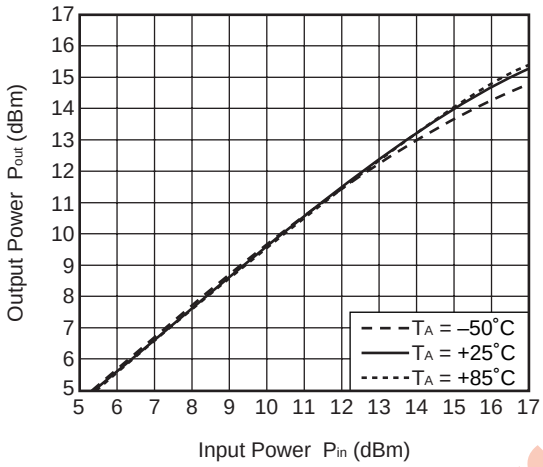


Caution This data is included value evaluation board loss.

TYPICAL CHARACTERISTICS

TEST CONDITION: f = 2 GHz, V_{CONT} = 2.8 V, V_{DD} = 2.8 V, OUT2 side is 50 Ω termination

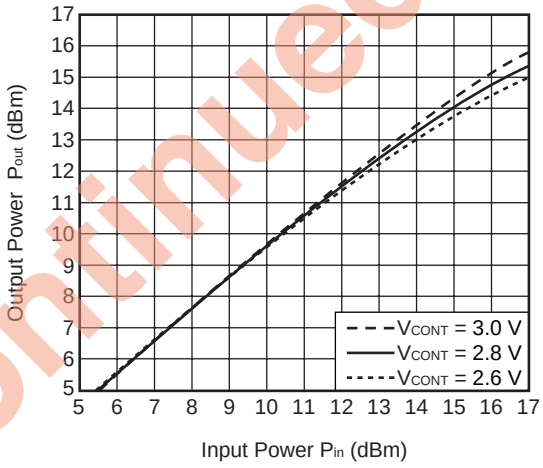
TEMPERATURE CHARACTERISTICS OF INPUT/OUTPUT



TYPICAL CHARACTERISTICS

TEST CONDITION: f = 2 GHz, T_A = +25°C, V_{DD} = 2.6, 2.8, 3.0 V, OUT2 side is 50 Ω termination

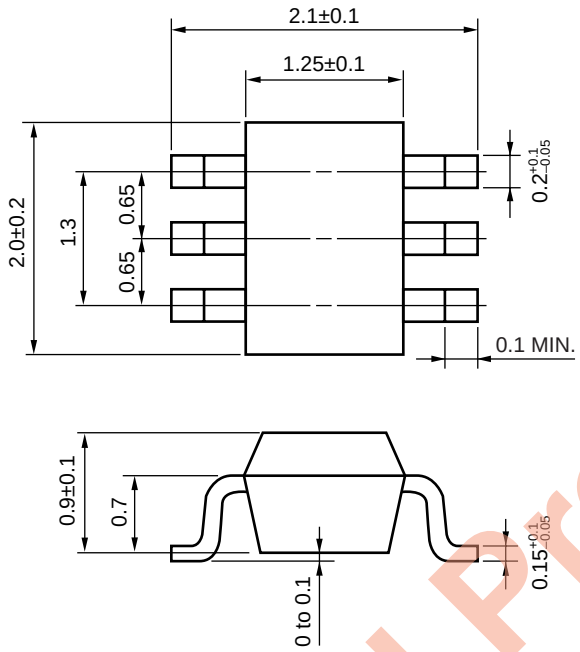
RELATION BETWEEN CONTROL VOLTAGE OF INPUT/OUTPUT



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

6-PIN SUPER MINIMOLD (UNIT: mm)



RECOMMENDED SOLDERING CONDITIONS

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

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235°C or below Time: 30 seconds or less (at 210°C) Count: 3, Exposure limit: None[Note]	IR35-00-3
VPS	Package peak temperature: 215°C or below Time: 40 seconds or less (at 200°C) Count: 3, Exposure limit: None[Note]	VP15-00-3
Wave Soldering	Soldering bath temperature: 260°C or below Time: 10 seconds or less Count: 1, Exposure limit: None[Note]	WS60-00-1
Partial Heating	Pin temperature: 300°C or below Time: 3 seconds or less (per side of device) Exposure limit: None[Note]	–

Note After opening the dry pack, keep it in a place below 25°C and 65% RH for the allowable storage period.

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

For details of recommended soldering conditions for surface mounting, refer to information document **SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E)**.

[MEMO]

SAFETY INFORMATION ON THIS PRODUCT

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  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.
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