

# DATA SHEET



## GaAs INTEGRATED CIRCUIT $\mu$ PG2009TB

### L-BAND HIGH POWER SPDT SWITCH

#### DESCRIPTION

The  $\mu$ PG2009TB 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 500 MHz to 2.5 GHz, having the low insertion loss and high isolation by 2.8 V control voltage.

#### FEATURES

- Low insertion loss :  $L_{INS} = 0.25$  dB TYP. @  $V_{cont1/2} = 2.8$  V/0 V,  $f = 1.0$  GHz  
 $L_{INS} = 0.30$  dB TYP. @  $V_{cont1/2} = 2.8$  V/0 V,  $f = 2.0$  GHz
- High isolation :  $ISL = 28$  dB TYP. @  $V_{cont1/2} = 2.8$  V/0 V,  $f = 2.0$  GHz
- High power :  $P_{in(0.1dB)} = 34$  dBm TYP. @  $V_{cont1/2} = 2.8$  V/0 V,  $f = 1.0$  GHz
- 6-pin super minimold package (2.0 × 1.25 × 0.9 mm)

#### APPLICATION

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

#### ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
$\mu$ PG2009TB-E3	6-pin super minimold	G2U	<ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 1, 2, 3 face the perforation side of the tape</li><li>• Qty 3 kpcs/reel</li></ul>

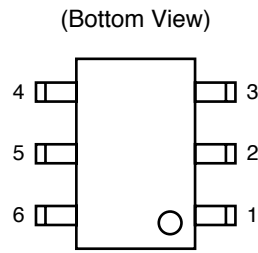
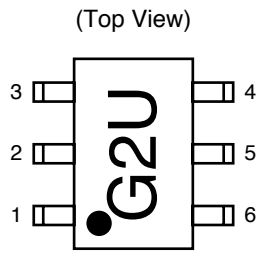
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PG2009TB-A

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

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★ PIN CONNECTIONS



Pin No.	Pin Name
1	OUT1
2	GND
3	OUT2
4	V <sub>cont2</sub>
5	IN
6	V <sub>cont1</sub>

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

Parameter	Symbol	Ratings	Unit
Control Voltage 1, 2	V <sub>cont1, 2</sub>	-6.0 to +6.0 <sup>Note</sup>	V
Input Power	P <sub>in</sub>	+36	dBm
Total Power Dissipation	P <sub>tot</sub>	0.15	W
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)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Control Voltage (High)	V <sub>cont(H)</sub>	+2.7	+2.8	+3.0	V
Control Voltage (Low)	V <sub>cont(L)</sub>	-0.2	0	+0.2	V

**ELECTRICAL CHARACTERISTICS**

( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont1}} = 2.8\text{ V}$ ,  $V_{\text{cont2}} = 0\text{ V}$  or  $V_{\text{cont1}} = 0\text{ V}$ ,  $V_{\text{cont2}} = 2.8\text{ V}$ ,  $Z_o = 50\ \Omega$ , Off chip DC blocking capacitors value; 56 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	$L_{\text{INS}}$	f = 0.5 to 1.0 GHz	-	0.25	0.45	dB
		f = 2.0 GHz	-	0.30	0.50	dB
		f = 2.5 GHz	-	0.40	-	dB
Isolation	$ISL$	f = 0.5 to 2.0 GHz	24	28	-	dB
		f = 2.5 GHz	-	25	-	dB
Input Return Loss	$RL_{\text{in}}$	f = 0.5 to 2.5 GHz	15	20	-	dB
Output Return Loss	$RL_{\text{out}}$	f = 0.5 to 2.5 GHz	15	20	-	dB
Input Power at 0.1 dB Compression Point <sup>Note</sup>	$P_{\text{in}(0.1\text{ dB})}$	f = 1.0 GHz, $V_{\text{cont}} = 2.8\text{ V/0 V}$	32.5	34	-	dBm
2nd Harmonics	2f <sub>0</sub>	f = 1.0 GHz, $V_{\text{cont}} = 2.8\text{ V/0 V}$ , $P_{\text{in}} = 30.5\text{ dBm}$	65	75	-	dBc
3rd Harmonics	3f <sub>0</sub>	f = 1.0 GHz, $V_{\text{cont}} = 2.8\text{ V/0 V}$ , $P_{\text{in}} = 30.5\text{ dBm}$	65	75	-	dBc
Switching Speed	$t_{\text{sw}}$		-	150	-	ns
Control Current	$I_{\text{cont}}$	$V_{\text{cont}} = 2.8\text{ V/0 V}$ , RF Non	-	1	50	μA

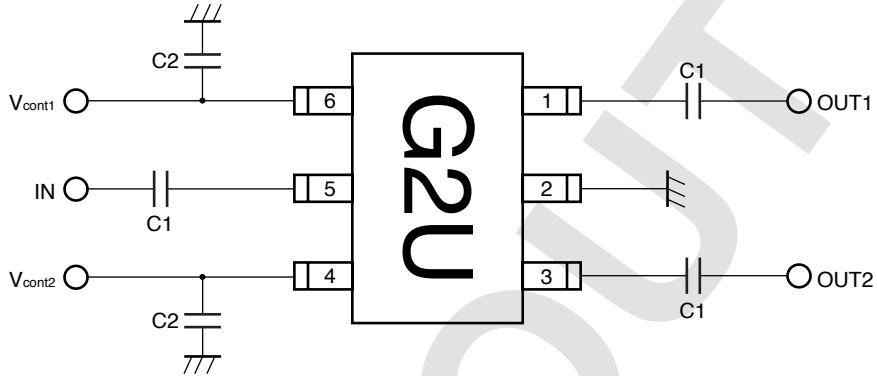
**Note**  $P_{\text{in}(0.1\text{ dB})}$  are measured the input power level when the insertion loss increase more 0.1 than that of linear range. All other characteristics are measured in linear range.

**Caution** When the μPG2009TB 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, bandwidth, switching speed and the condition with actual board of your system.

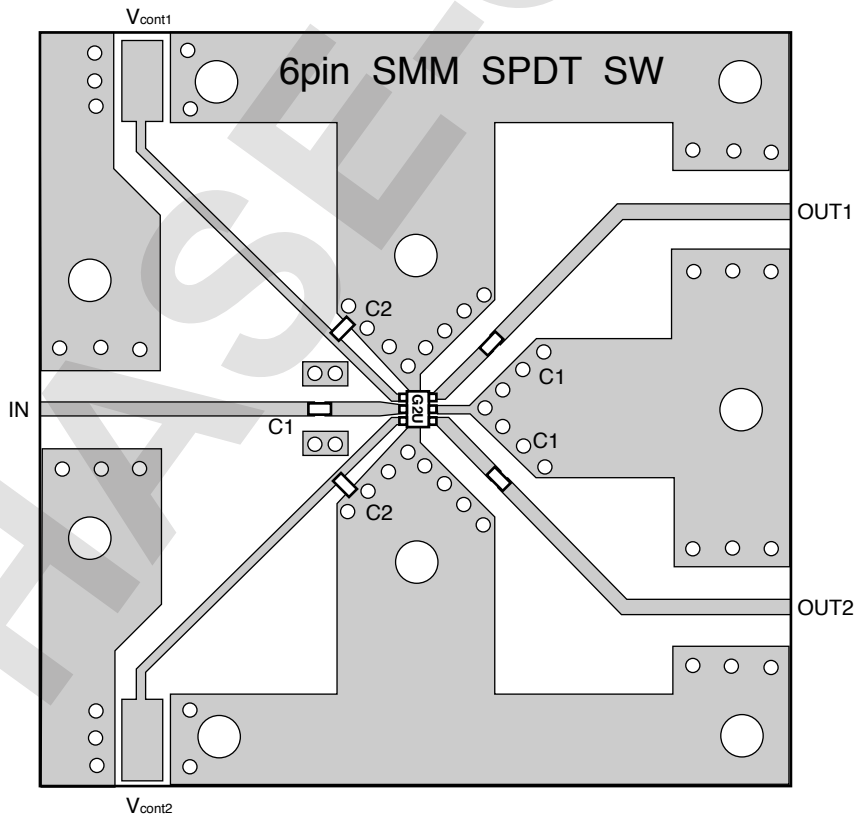
The range of recommended DC blocking capacitor value is less than 100 pF.

**EVALUATION CIRCUIT**

$V_{cont1} = 2.8\text{ V}$ ,  $V_{cont2} = 0\text{ V}$  or  $V_{cont2} = 0\text{ V}$ ,  $V_{cont1} = 2.8\text{ V}$ , off chip DC blocking capacitors value  $C1 = 56\text{ pF}$ ,  $C2 = 1\text{ 000 pF}$  (Bypass), using the standard evaluation board.



**EVALUATION BOARD**

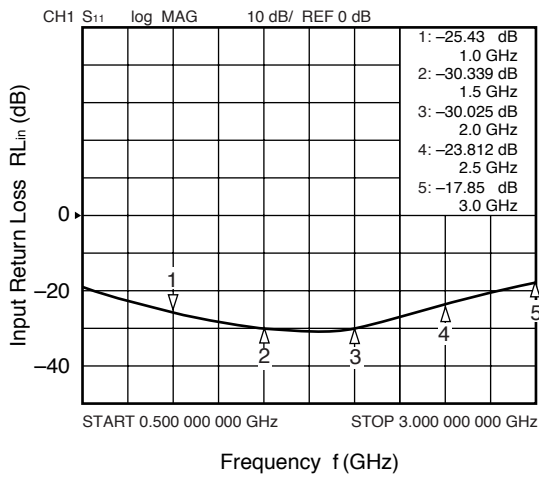


**TRUTH TABLE**

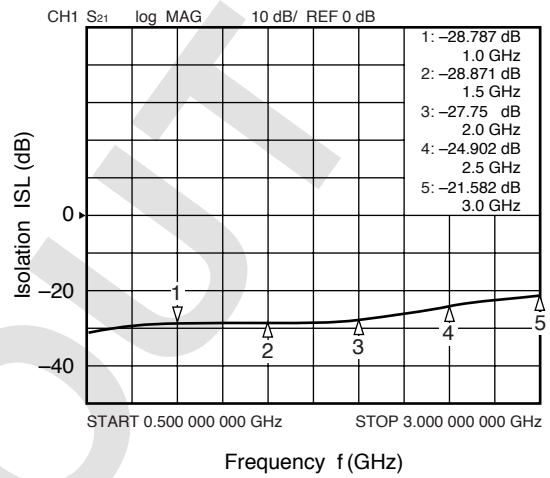
$V_{cont1}$	$V_{cont2}$	IN-OUT1	IN-OUT2
Low	High	OFF	ON
High	Low	ON	OFF

**TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, V<sub>cont1/2</sub> = 2.8 V/0 V, P<sub>in</sub> = 0 dBm, OUT2 side is 50 Ω termination, unless otherwise specified)**

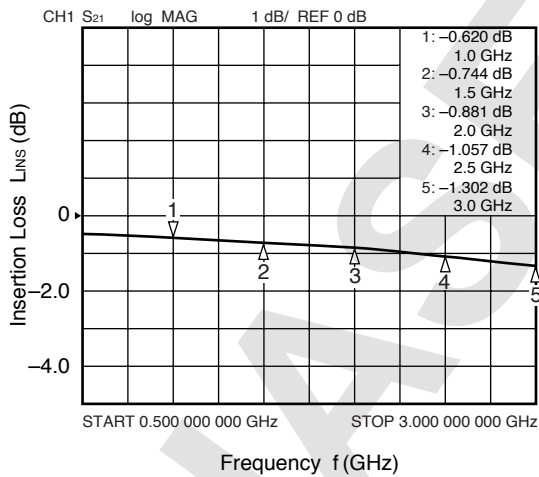
**INPUT RETURN LOSS vs. FREQUENCY**



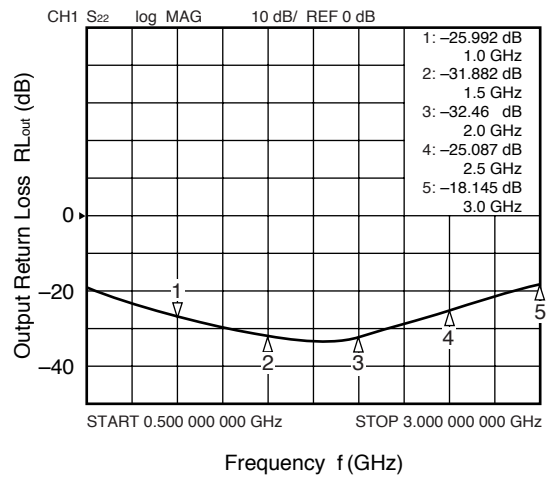
**ISOLATION vs. FREQUENCY**



**INSERTION LOSS vs. FREQUENCY**



**OUTPUT RETURN LOSS vs. FREQUENCY**



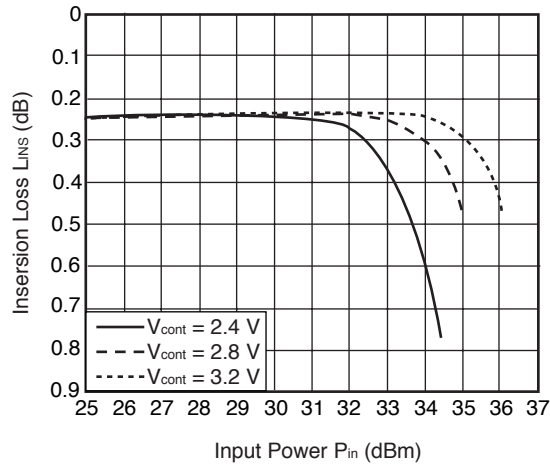
**Caution** These characteristics values include the losses of the evaluation board.

**Remark** The graphs indicate nominal characteristics.

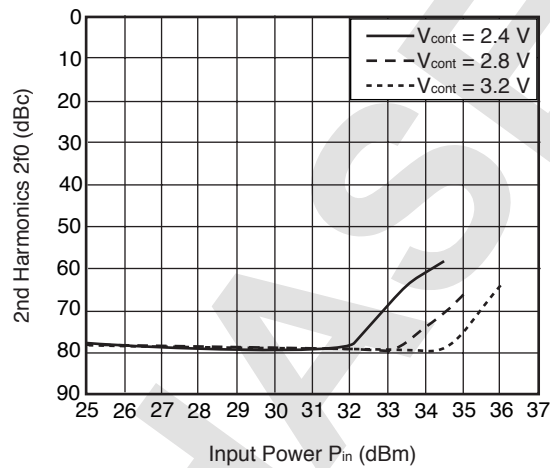
**TYPICAL CHARACTERISTICS**

(f = 2 GHz, OUT2 side is 50 Ω termination, unless otherwise specified)

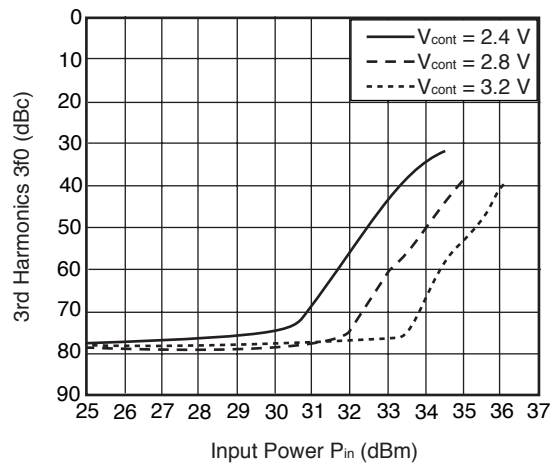
RELATION BETWEEN CONTROL VOLTAGE OF INSERTION LOSS



RELATION BETWEEN CONTROL VOLTAGE OF 2nd HARMONICS



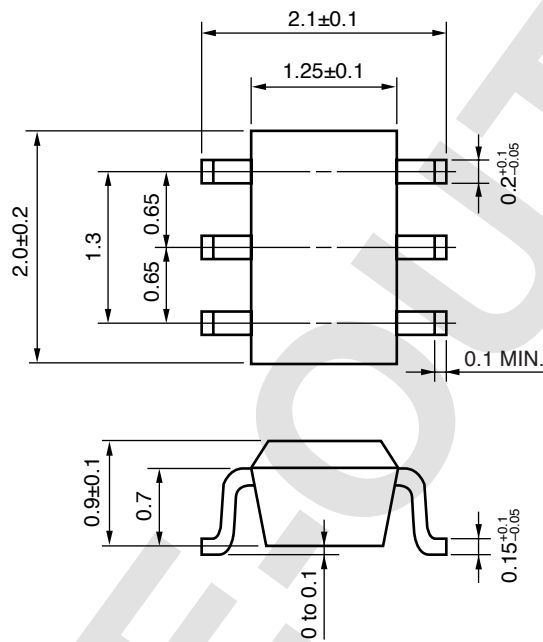
RELATION BETWEEN CONTROL VOLTAGE OF 3rd HARMONICS



**Remark** The graphs indicate nominal characteristics.

**PACKAGE DIMENSIONS**

**6-PIN SUPER MINIMOLD (UNIT: mm)**



**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 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	IR260
VPS	Peak temperature (package surface temperature) : 215°C or below Time at temperature of 200°C or higher : 25 to 40 seconds Preheating time at 120 to 150°C : 30 to 60 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	VP215
Wave Soldering	Peak temperature (molten solder temperature) : 260°C or below 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	WS260
Partial Heating	Peak temperature (pin temperature) : 350°C or below Soldering time (per side of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	HS350

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



**SAFETY INFORMATION ON THIS PRODUCT**

<b>Caution</b>	GaAs Products	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"><li>• Do not destroy or burn the product.</li><li>• Do not cut or cleave off any part of the product.</li><li>• Do not crush or chemically dissolve the product.</li><li>• Do not put the product in the mouth.</li></ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
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