

# DATA SHEET

# NEC

# GaAs INTEGRATED CIRCUIT $\mu$ PG2012TB

## L-BAND SPDT SWITCH

### DESCRIPTION

The  $\mu$ PG2012TB is a GaAs MMIC for L-band SPDT (Single Pole Double Throw) switch which were developed for mobile phone and another L-band application.

This device can operate frequency from 0.5 GHz to 2.5 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin super minimold package. And this package is able to high-density surface mounting.

### FEATURES

- Supply voltage :  $V_{DD} = 2.7$  to  $3.0$  V (2.8 V TYP.)
- Switch control voltage :  $V_{cont(H)} = 2.7$  to  $3.0$  V (2.8 V TYP.)  
:  $V_{cont(L)} = -0.2$  to  $+0.2$  V (0 V TYP.)
- Low insertion loss :  $L_{INS1} = 0.27$  dB TYP. @  $f = 0.5$  to  $1.0$  GHz,  $V_{DD} = 2.8$  V,  $V_{cont} = 2.8$  V/0 V  
:  $L_{INS2} = 0.30$  dB TYP. @  $f = 2.0$  GHz,  $V_{DD} = 2.8$  V,  $V_{cont} = 2.8$  V/0 V  
:  $L_{INS3} = 0.30$  dB TYP. @  $f = 2.5$  GHz,  $V_{DD} = 2.8$  V,  $V_{cont} = 2.8$  V/0 V (Reference value)
- High isolation :  $ISL1 = 28$  dB TYP. @  $f = 0.5$  to  $2.0$  GHz,  $V_{DD} = 2.8$  V,  $V_{cont} = 2.8$  V/0 V  
:  $ISL2 = 25$  dB TYP. @  $f = 2.5$  GHz,  $V_{DD} = 2.8$  V,  $V_{cont} = 2.8$  V/0 V (Reference value)
- High-density surface mounting : 6-pin super minimold package ( $2.0 \times 1.25 \times 0.9$  mm)

### APPLICATIONS

- L-band digital cellular or cordless telephone
- PCS, W-LAN, WLL and Bluetooth™ etc.

### ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
$\mu$ PG2012TB-E3	6-pin super minimold	G3A	<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>

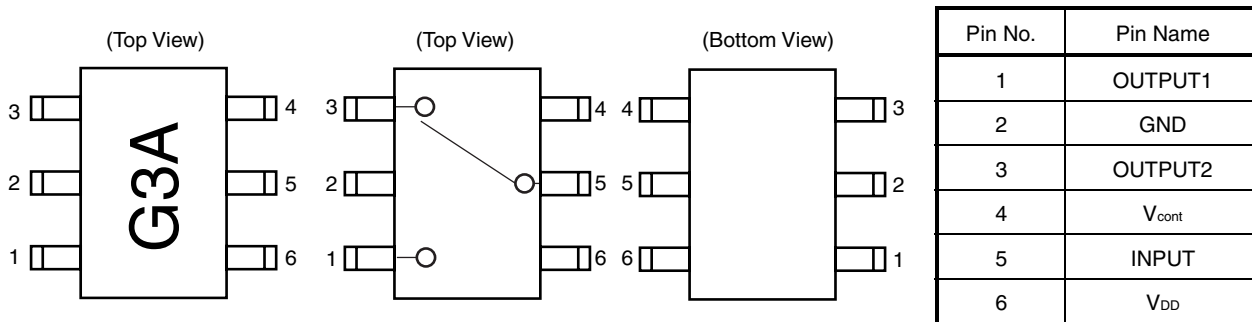
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PG2012TB

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

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

**PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM**



**TRUTH TABLE**

V <sub>cont</sub>	INPUT-OUTPUT1	INPUT-OUTPUT2
Low	OFF	ON
High	ON	OFF

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>DD</sub>	+6.0	V
Switch Control Voltage	V <sub>cont</sub>	+6.0	V
Input Power	P <sub>in</sub>	+26	dBm
Power Dissipation	P <sub>D</sub>	150 <sup>Note</sup>	mW
Operating Ambient Temperature	T <sub>A</sub>	-45 to +85	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

**Note** Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T<sub>A</sub> = +85°C

**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)**

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

**ELECTRICAL CHARACTERISTICS**

(T<sub>A</sub> = +25°C, V<sub>DD</sub> = 2.8 V, V<sub>cont</sub> = 2.8 V/0 V, DC cut capacitors = 56 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss1	L <sub>INS1</sub>	f = 0.5 to 1.0 GHz	–	0.27	0.50	dB
Insertion Loss2	L <sub>INS2</sub>	f = 2.0 GHz	–	0.30	0.50	dB
Isolation1	ISL1	f = 0.5 to 2.0 GHz	24	28	–	dB
Input Return Loss	RL <sub>in</sub>	f = 0.5 to 2.5 GHz	15	20	–	dB
Output Return Loss	RL <sub>out</sub>	f = 0.5 to 2.5 GHz	15	20	–	dB
0.1 dB Gain Compression Input Power <sup>Note</sup>	P <sub>in(0.1 dB)</sub>	f = 2.0 GHz	+17.5	+20.5	–	dBm
Supply Current	I <sub>DD</sub>		–	50	100	μA
Switching Control Current	I <sub>cont</sub>		–	4	20	μA

**Note** P<sub>in(0.1dB)</sub> is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

**STANDARD CHARACTERISTICS FOR REFERENCE**

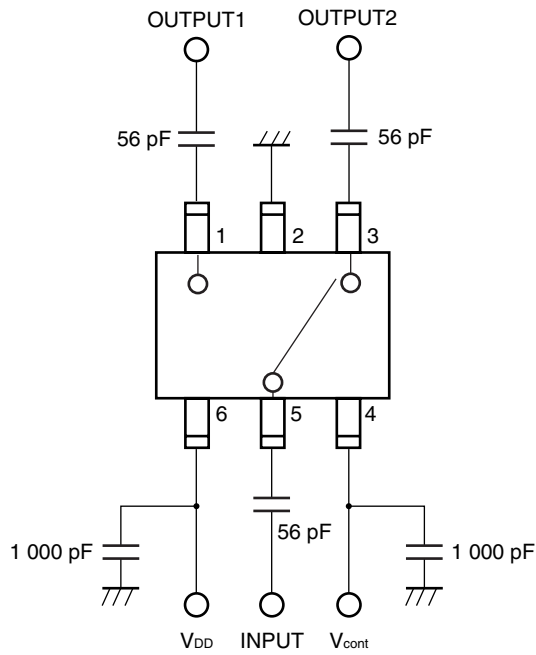
(T<sub>A</sub> = +25°C, V<sub>DD</sub> = 2.8 V, V<sub>cont</sub> = 2.8 V/0 V, DC cut capacitors = 56 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss3	L <sub>INS3</sub>	f = 2.5 GHz	–	0.30	–	dB
Isolation2	ISL2	f = 2.5 GHz	–	25	–	dB
1 dB Gain Compression Input Power <sup>Note</sup>	P <sub>in(1 dB)</sub>	f = 2.0 GHz	–	+24.0	–	dBm
Switching Control Speed	t <sub>sw</sub>		–	300	–	ns

**Note** P<sub>in(1dB)</sub> is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

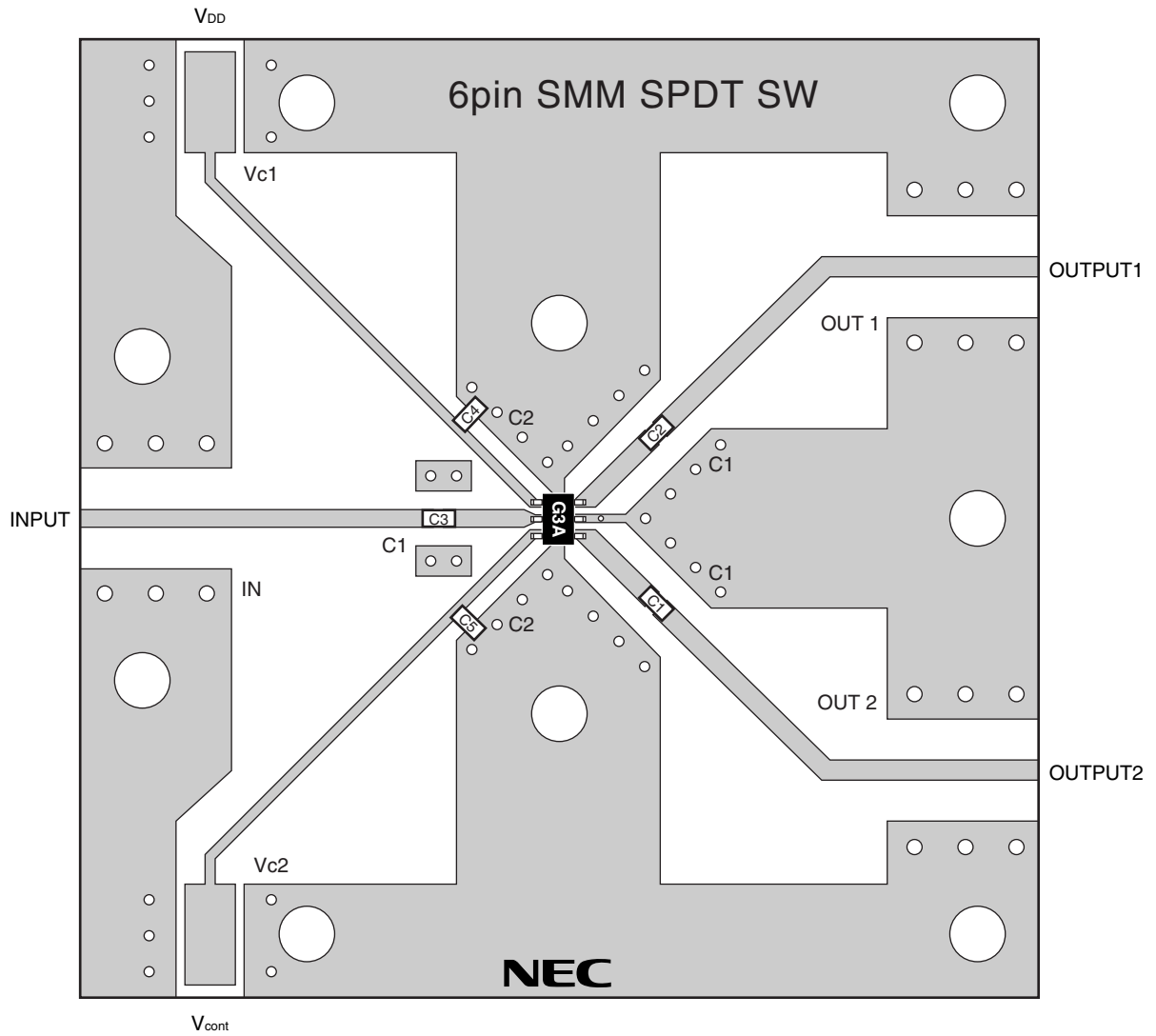
**Caution** This device is used it is necessary to use DC cut capacitors. The value of DC cut capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system. The range of recommended DC cut capacitor value is less than 100 pF.

EVALUATION CIRCUIT ( $V_{DD} = 2.8\text{ V}$ ,  $V_{cont} = 2.8\text{ V}/0\text{ V}$ , DC cut capacitors = 56 pF)



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

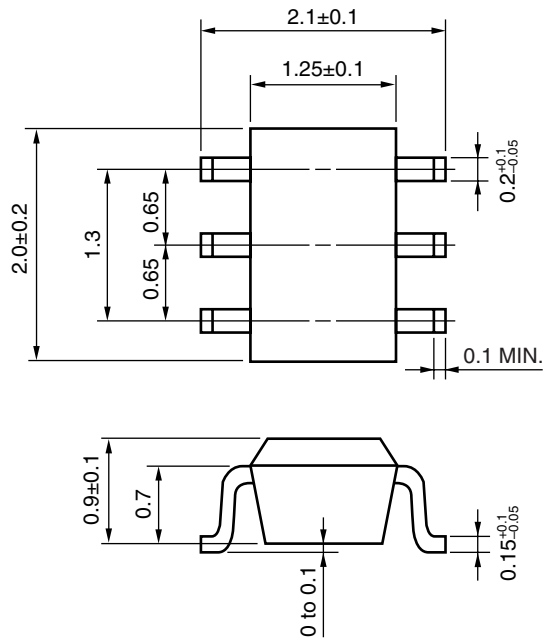


USING THE NEC EVALUATION BOARD

Symbol	Values
C1, C2, C3	56 pF
C4, C5	1 000 pF

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).**

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M8E 00.4-0110



**SAFETY INFORMATION ON THIS PRODUCT**

<p><b>Caution</b></p>	<p>GaAs Products</p>	<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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► **Business issue**

**NEC Compound Semiconductor Devices, Ltd.**

5th Sales Group, Sales Division TEL: +81-3-3798-6372 FAX: +81-3-3798-6783 E-mail: salesinfo@csd-nec.com

**NEC Compound Semiconductor Devices Hong Kong Limited**

Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309  
 Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859  
 Korea Branch Office TEL: +82-2-528-0301 FAX: +82-2-528-0302

**NEC Electronics (Europe) GmbH** <http://www.ee.nec.de/>

TEL: +49-211-6503-01 FAX: +49-211-6503-487

**California Eastern Laboratories, Inc.** <http://www.cel.com/>

TEL: +1-408-988-3500 FAX: +1-408-988-0279

► **Technical issue**

**NEC Compound Semiconductor Devices, Ltd.** <http://www.csd-nec.com/>

Sales Engineering Group, Sales Division  
 E-mail: techinfo@csd-nec.com FAX: +81-44-435-1918