

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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

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## GaAs HBT INTEGRATED CIRCUIT

# μPG2301T5L

### POWER AMPLIFIER FOR Bluetooth™ Class 1

#### DESCRIPTION

The μPG2301T5L is GaAs HBT MMIC for power amplifier which were developed for Bluetooth Class 1.

This device realizes high efficiency, high gain and high output power by using InGaP HBT. This device is housed in a 12-pin plastic TSQFN package. And this package is able to high-density surface mounting.

#### FEATURES

- Operation frequency :  $f_{opt} = 2\ 400$  to  $2\ 500$  MHz (2 450 MHz TYP.)
- Supply voltage :  $V_{CC1}, 2 = V_{bias} = 2.7$  to  $3.6$  V (3.3 V TYP.)
- Control voltage :  $V_{cont} = 0$  to  $3.6$  V (2.5 V TYP.)  
:  $V_{enable} = 0$  to  $3.1$  V (2.9 V TYP.)
- Circuit current :  $I_{CC} = 120$  mA TYP. @  $V_{CC1}, 2 = V_{bias} = 3.3$  V,  $V_{cont} = 2.5$  V,  $V_{enable} = 2.9$  V,  
 $P_{in} = +4$  dBm
- Maximum power :  $P_{out (MAX.)} = +23$  dBm TYP. @  $V_{CC1}, 2 = V_{bias} = 3.3$  V,  $V_{cont} = 2.5$  V,  $V_{enable} = 2.9$  V,  
 $P_{in} = +4$  dBm
- Gain Control Range : GCR = 23 dB TYP. @  $V_{CC1}, 2 = V_{bias} = 3.3$  V,  $V_{cont} = 0$  to  $2.5$  V,  $V_{enable} = 2.9$  V,  
 $P_{in} = +4$  dBm
- Power gain : GP = 23 dB TYP. (Reference value)
- High efficiency : PAE = 50% TYP. (Reference value)
- Shut down function
- High-density surface mounting : 12-pin plastic TSQFN package ( $2.0 \times 2.0 \times 0.37$  mm)

#### APPLICATIONS

- Power Amplifier for Bluetooth Class 1 etc.

#### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2301T5L-E2	μPG2301T5L-E2-A	12-pin plastic TSQFN (Pb-Free) <sup>Note</sup>	2301	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 10, 11, 12 face the perforation side of the tape</li> <li>• Qty 3 kpcs/reel</li> </ul>

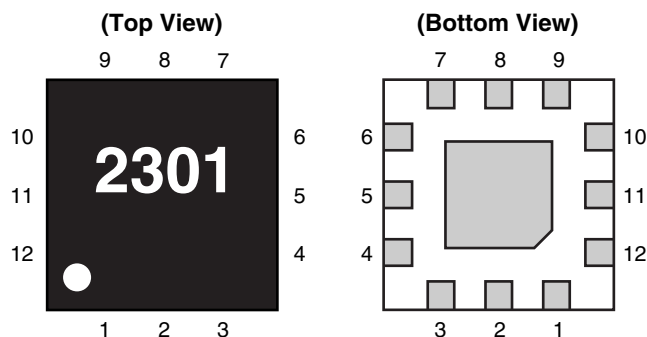
**Note** With regards to terminal solder (the solder contains lead) plated products (conventionally plated), contact your nearby sales office.

**Remark** To order evaluation samples, contact your nearby sales office.  
Part number for sample order: μPG2301T5L

**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



Pin No.	Pin Name
1	GND (NC)
2	GND
3	OUT/V <sub>cc2</sub>
4	GND (NC)
5	V <sub>enable</sub>
6	V <sub>bias</sub>
7	V <sub>cc1</sub>
8	GND
9	IN
10	GND (NC)
11	V <sub>cont</sub>
12	GND (NC)

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>cc1, 2</sub>	5.5	V
	V <sub>bias</sub>		
Control Voltage	V <sub>cont</sub>	3.6	V
	V <sub>enable</sub>		
Circuit Current	I <sub>cc</sub>	400	mA
Control Current	I <sub>cont</sub>	0.5	mA
	I <sub>enable</sub>		
Power Dissipation	P <sub>D</sub>	700 <sup>Note</sup>	mW
Operating Ambient Temperature	T <sub>A</sub>	−40 to +85	°C
Storage Temperature	T <sub>stg</sub>	−55 to +150	°C
Input Power	P <sub>in</sub>	+10	dBm

**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)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f <sub>opt</sub>	2 400	2 450	2 500	MHz
Supply Voltage	V <sub>cc1, 2</sub>	2.7	3.3	3.6	V
	V <sub>bias</sub>				
Control Voltage	V <sub>cont</sub>	0	2.5	3.6	V
	V <sub>enable</sub>	0	2.9	3.1	

# **ELECTRICAL CHARACTERISTICS**

(T<sub>A</sub> = +25°C, V<sub>CC1</sub>, 2 = V<sub>bias</sub> = 3.3 V, f = 2 450 MHz, External input and output matching, unless otherwise specified)

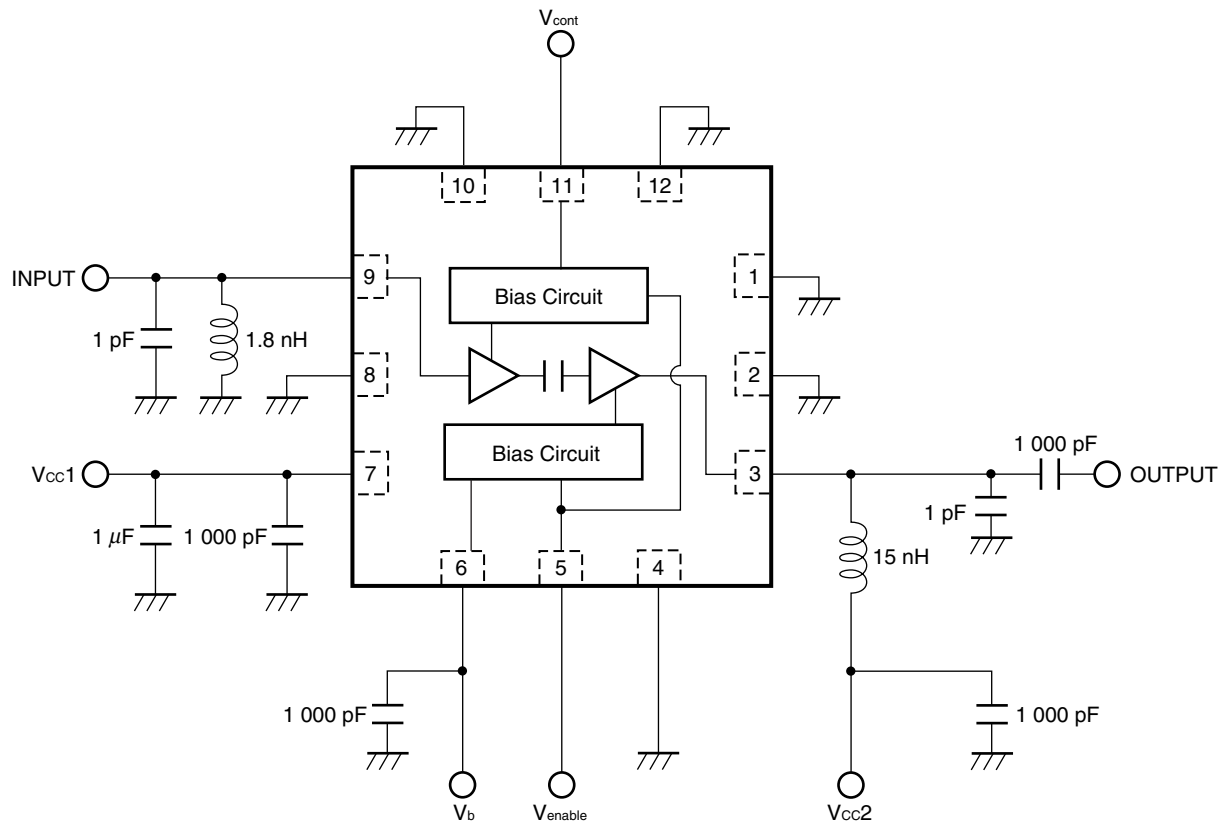
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I <sub>CC</sub>	V <sub>cont</sub> = 2.5 V, V <sub>enable</sub> = 2.9 V, P <sub>in</sub> = +4 dBm	110	120	130	mA
Shut Down Current	I <sub>shut down</sub>	V <sub>cont</sub> = 2.5 V, V <sub>enable</sub> = 0 V, P <sub>in</sub> = +4 dBm	–	0.1	1.0	μA
Output Power 1	P <sub>out1</sub>	V <sub>cont</sub> = 2.5 V, V <sub>enable</sub> = 2.9 V, P <sub>in</sub> = +4 dBm	+21	+23	+24.5	dBm
Output Power 2	P <sub>out2</sub>	V <sub>cont</sub> = 0 V, V <sub>enable</sub> = 2.9 V, P <sub>in</sub> = +4 dBm	–	0	+1	dBm
Gain Control Range	GCR	V <sub>cont</sub> = 0 to 2.5 V, V <sub>enable</sub> = 2.9 V, P <sub>in</sub> = +4 dBm	20	23	–	dB

# **STANDARD CHARACTERISTICS FOR REFERENCE**

(T<sub>A</sub> = +25°C, V<sub>CC1</sub>, 2 = V<sub>bias</sub> = 3.3 V, f = 2 450 MHz, External input and output matching, unless otherwise specified)

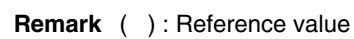
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Efficiency	PAE	V <sub>cont</sub> = 2.5 V, V <sub>enable</sub> = 2.9 V, P <sub>in</sub> = +4 dBm	–	50	–	%
Power Gain1	G <sub>P1</sub>	V <sub>cont</sub> = 2.5 V, V <sub>enable</sub> = 2.9 V, P <sub>in</sub> = –5 dBm	–	23	–	dB
Power Gain2	G <sub>P2</sub>	V <sub>cont</sub> = 2.5 V, V <sub>enable</sub> = 2.9 V, P <sub>in</sub> = +4 dBm	–	19	–	dB

**EVALUATION CIRCUIT ( $V_{cc1, 2} = V_{bias} = 3.3$  V,  $f = 2\ 450$  MHz)**



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

### 12-PIN PLASTIC TSQFN (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
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 (terminal 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

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► For further information, please contact

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