

## 1.8 V, POWER AMPLIFIER FOR Bluetooth™ Class 1

### DESCRIPTION

The  $\mu$ PG2250T5N is a GaAs MMIC for power amplifier which was developed for Bluetooth Class 1.

This device realizes high efficiency, high gain and high output power.

This device is housed in a 6-pin plastic TSON (Thin Small Out-line Non-leaded) package. And this package is able to high-density surface mounting.

### FEATURES

- Operating frequency :  $f_{opt} = 2\ 400$  to  $2\ 500$  MHz (2 450 MHz TYP.)
- Supply voltage :  $V_{DD1, 2, 3} = 1.5$  to  $3.5$  V (1.8 V TYP.)
- Control voltage :  $V_{cont} = 1.5$  to  $2.1$  V (1.8 V TYP.)
- Circuit current :  $I_{DD} = 100$  mA TYP. @  $V_{DD1, 2, 3} = 1.8$  V,  $V_{cont} = 1.8$  V,  $P_{out} = +19$  dBm
- Output power :  $P_{out} = +20.0$  dBm TYP. @  $V_{DD1, 2, 3} = 1.8$  V,  $V_{cont} = 1.8$  V,  $P_{in} = -5$  dBm
- Gain control range : GCR = 60 dB TYP. @  $V_{DD1, 2, 3} = 1.8$  V,  $V_{cont} = 0$  to  $1.8$  V,  $P_{in} = -5$  dBm
- High efficiency : PAE = 55% TYP. @  $V_{DD1, 2, 3} = 1.8$  V,  $V_{cont} = 1.8$  V,  $P_{in} = -5$  dBm
- High-density surface mounting : 6-pin plastic TSON package ( $1.5 \times 1.5 \times 0.37$  mm)

### APPLICATION

- Power Amplifier for Bluetooth Class 1

### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
$\mu$ PG2250T5N-E2	$\mu$ PG2250T5N-E2-A	6-pin plastic TSON (Pb-Free)	G5C	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 1, 6 face the perforation side of the tape</li> <li>• Qty 3 kpcs/reel</li> </ul>

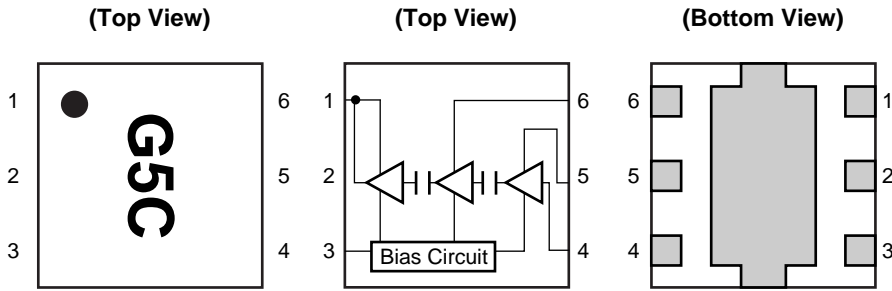
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PG2250T5N-A

**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.

**PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM**



Pin No.	Pin Name
1	OUTPUT/V <sub>DD3</sub>
2	N.C.
3	V <sub>cont</sub>
4	INPUT
5	V <sub>DD1</sub>
6	V <sub>DD2</sub>

**Remark** Exposed pad : GND

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>DD1, 2, 3</sub>	5.0	V
Control Voltage	V <sub>cont</sub>	2.4	V
Circuit Current	I <sub>DD</sub>	250	mA
Control Current	I <sub>cont</sub>	5	mA
Input Power	P <sub>in</sub>	+5	dBm
Power Dissipation	P <sub>D</sub>	400 <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

**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)**

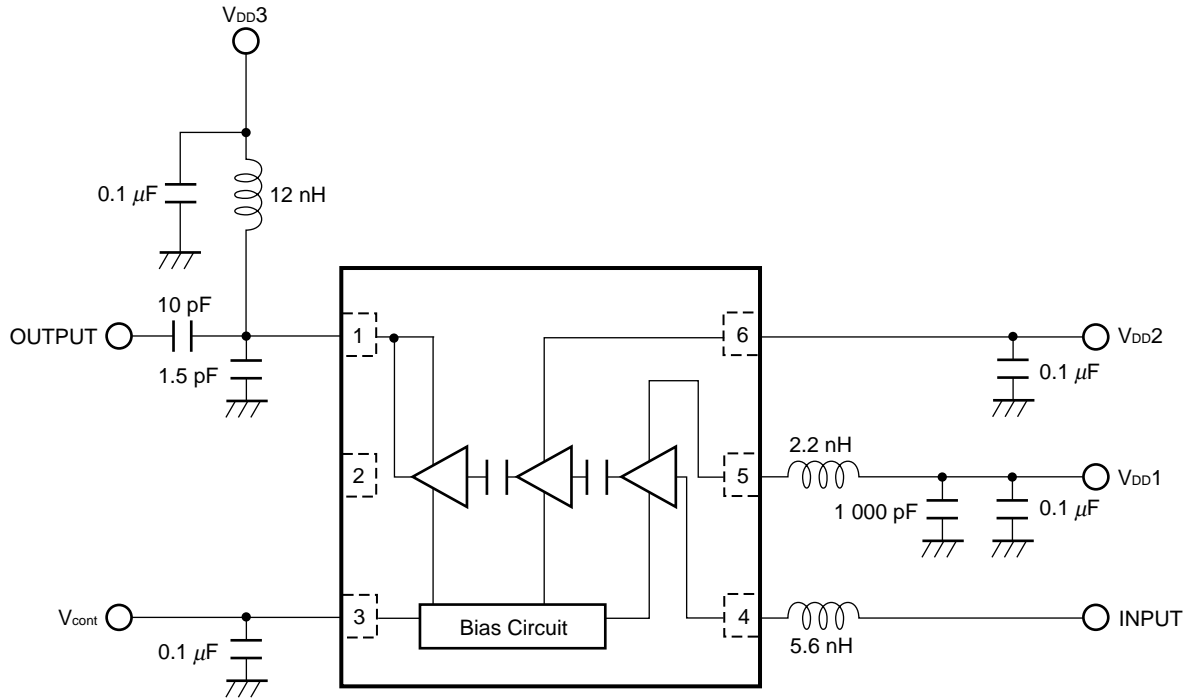
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f <sub>opt</sub>	2 400	2 450	2 500	MHz
Supply Voltage	V <sub>DD1, 2, 3</sub>	1.5	1.8	3.5	V
Control Voltage	V <sub>cont</sub>	1.5	1.8	2.1	V

**ELECTRICAL CHARACTERISTICS**

**(T<sub>A</sub> = +25°C, V<sub>DD1, 2, 3</sub> = 1.8 V, f = 2 450 MHz, P<sub>out</sub> = +19 dBm, external input and output matching, unless otherwise specified)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I <sub>DD</sub>	V <sub>cont</sub> = 1.8 V, P <sub>out</sub> = +19 dBm	–	100	130	mA
Control Current	I <sub>cont</sub>	V <sub>cont</sub> = 1.8 V, P <sub>out</sub> = +19 dBm	–	–	3	mA
Shut Down Current	I <sub>shut down</sub>	V <sub>cont</sub> = 0 V, RF None	–	–	5	μA
Output Power 1	P <sub>out1</sub>	V <sub>cont</sub> = 1.8 V, P <sub>in</sub> = –5 dBm	+19.0	+20.0	–	dBm
Output Power 2	P <sub>out2</sub>	V <sub>cont</sub> = 0 V, P <sub>in</sub> = –5 dBm	–	–40.0	–	dBm
Gain Control Range	GCR	V <sub>cont</sub> = 0 to 1.8 V, P <sub>in</sub> = –5 dBm	–	60	–	dB
Efficiency	PAE	V <sub>cont</sub> = 1.8 V, P <sub>in</sub> = –5 dBm	–	55	–	%
2nd Harmonics	2f <sub>o</sub>	V <sub>cont</sub> = 1.8 V, P <sub>in</sub> = –5 dBm	–	35	–	dBc

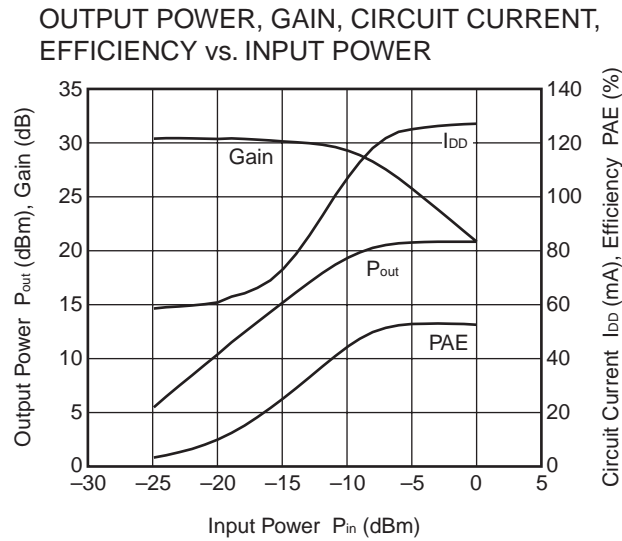
EVALUATION CIRCUIT



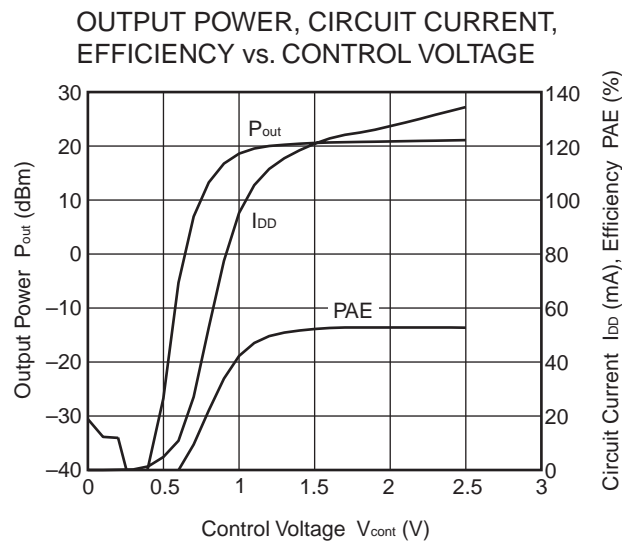
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

**TYPICAL CHARACTERISTICS (TA = +25°C, unless otherwise specified)**

Condition : f = 2 450 MHz, V<sub>DD1</sub> = V<sub>DD2</sub> = V<sub>DD3</sub> = V<sub>cont</sub> = 1.8 V, with external input and output matching circuits



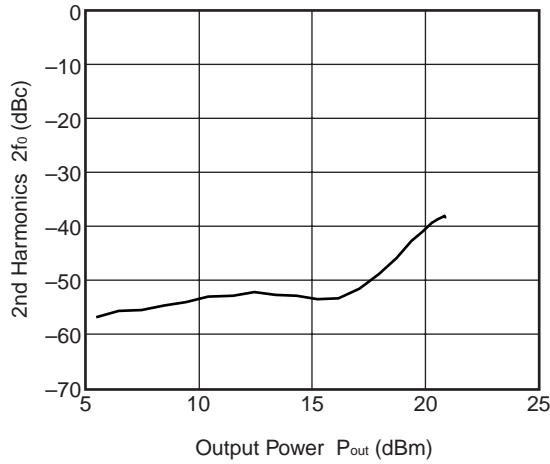
Condition : f = 2 450 MHz, V<sub>DD1</sub> = V<sub>DD2</sub> = V<sub>DD3</sub> = V<sub>cont</sub> = 1.8 V, P<sub>in</sub> = -5 dBm, with external input and output matching circuits



**Remark** The graphs indicate nominal characteristics.

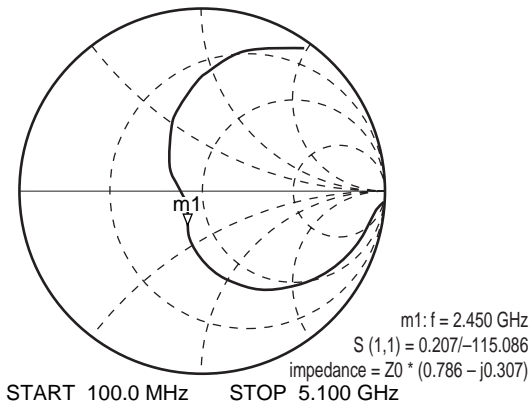
Condition :  $f = 2\,450\text{ MHz}$ ,  $V_{DD1} = V_{DD2} = V_{DD3} = V_{cont} = 1.8\text{ V}$ , with external input and output matching circuits

2ND HARMONICS vs. OUTPUT POWER

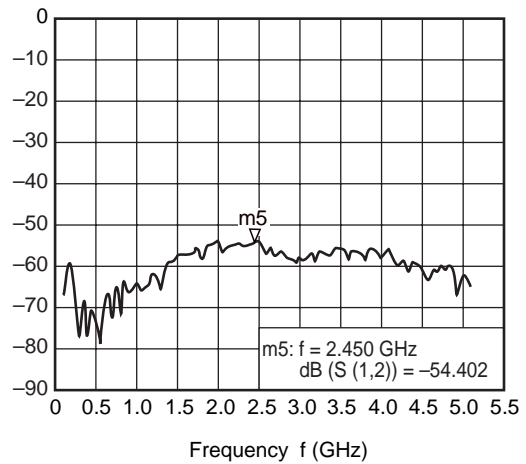


Condition :  $V_{DD1} = V_{DD2} = V_{DD3} = V_{cont} = 1.8\text{ V}$ , with external input and output matching circuits

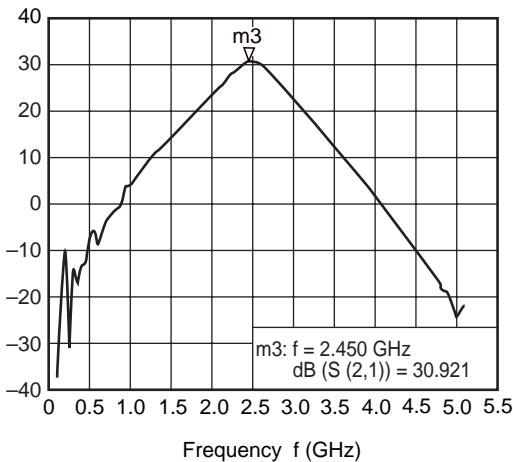
S<sub>11</sub>-FREQUENCY



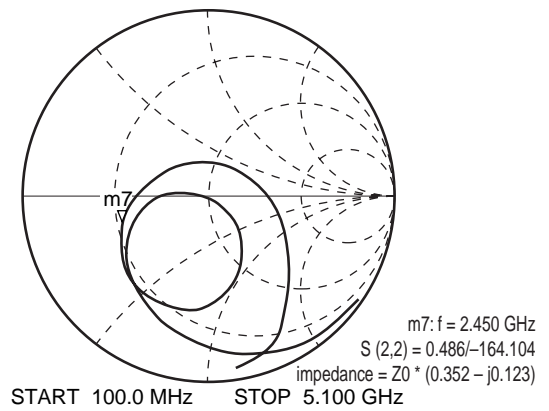
S<sub>11</sub>, S<sub>22</sub>-FREQUENCY



S<sub>21</sub>-FREQUENCY



S<sub>22</sub>-FREQUENCY

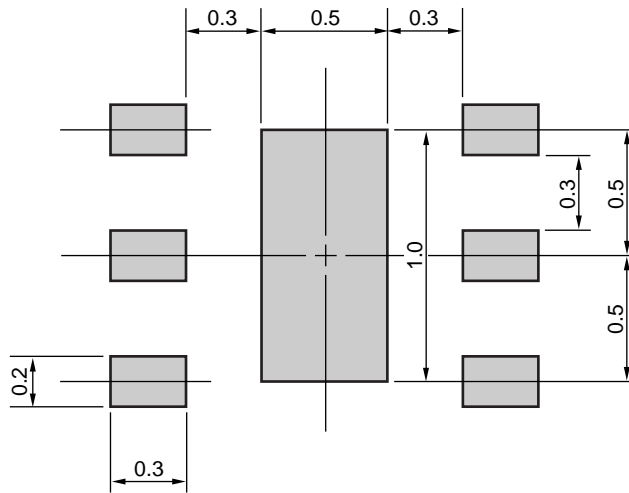


**Remark** The graphs indicate nominal characteristics.

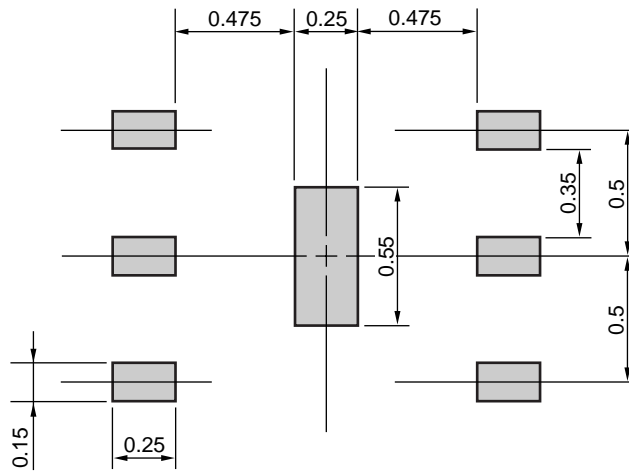
**MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS**

**6-PIN PLASTIC TSON (UNIT: mm)**

**MOUNTING PAD**



**SOLDER MASK**

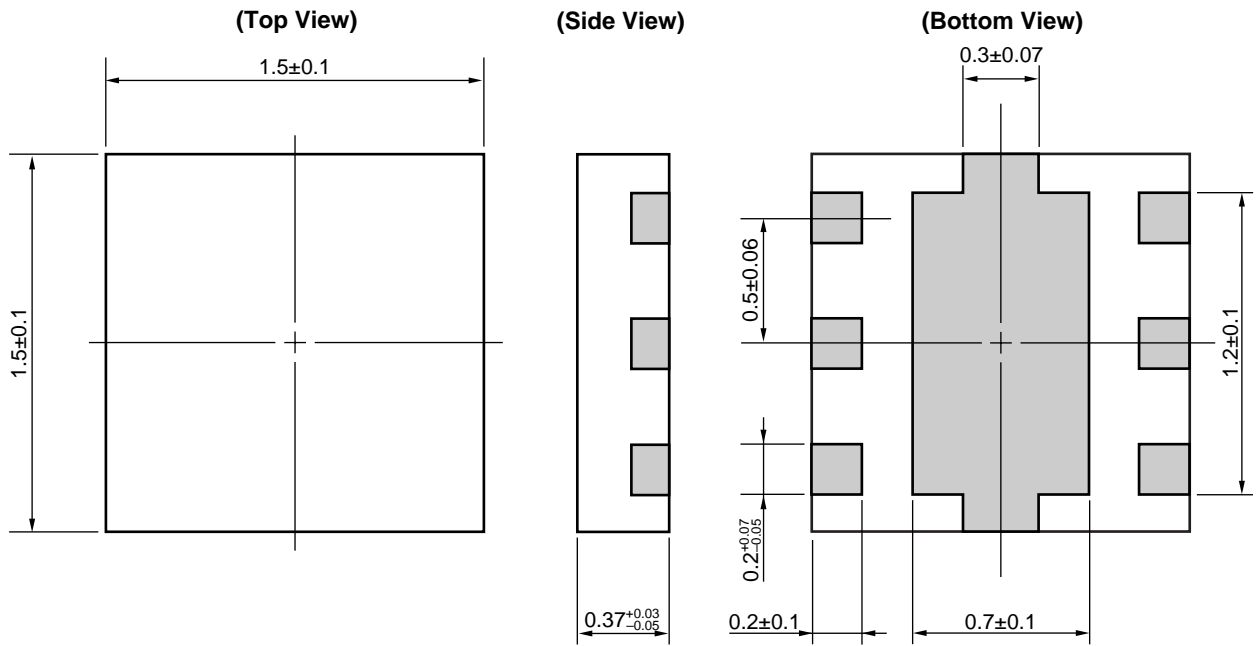


Solder thickness : 0.08 mm

**Remark** The mounting pad and solder mask layouts in this document are for reference only.

**PACKAGE DIMENSIONS**

**6-PIN PLASTIC TSON (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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► For further information, please contact

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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