

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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**Phase-out/Discontinued**

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

**DESCRIPTION**

The μPG2250T5N 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  
 :  $I_{DD} = 170$  mA TYP. @  $V_{DD1, 2, 3} = 3.0$  V,  $V_{cont} = 1.8$  V,  $P_{out} = +24$  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  
 :  $P_{out} = +25.0$  dBm TYP. @  $V_{DD1, 2, 3} = 3.0$  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
μPG2250T5N-E2	μPG2250T5N-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>

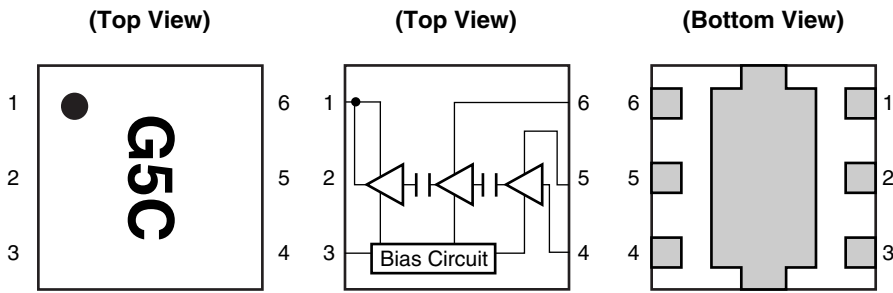
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order: μPG2250T5N

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

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**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

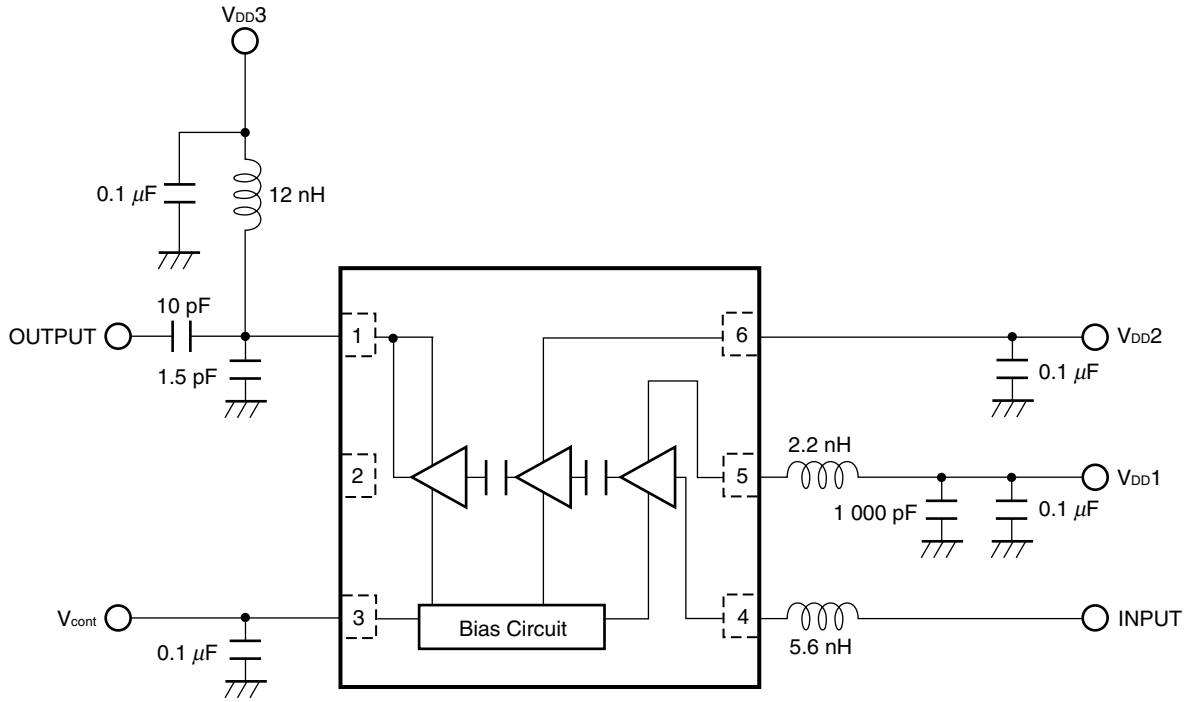
**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)**

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, V<sub>cont</sub> = 1.8 V, f = 2 450 MHz, external input and output matching, unless otherwise specified)**

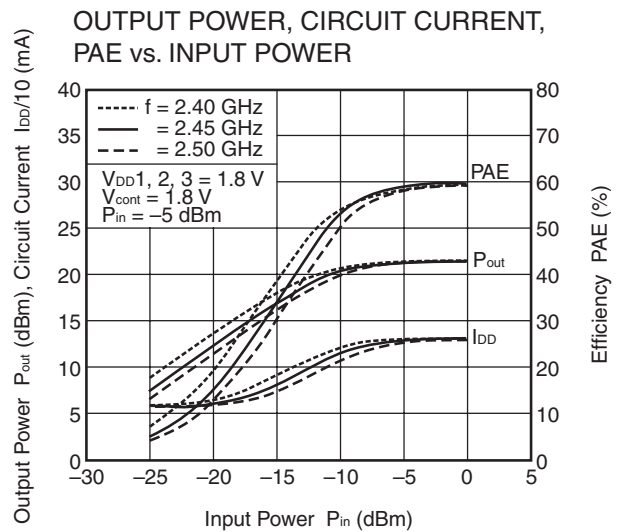
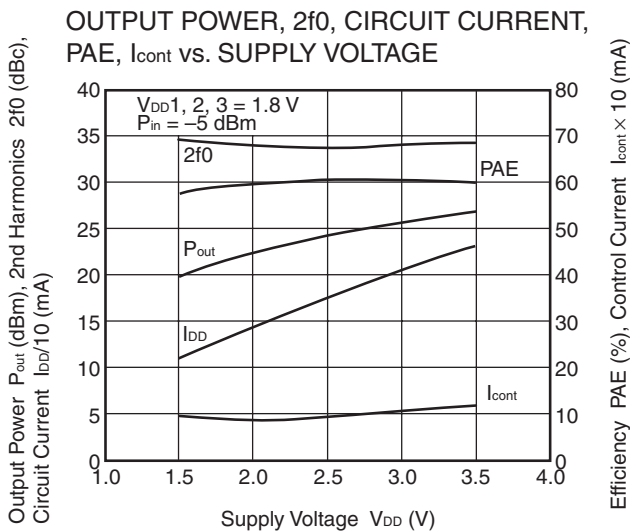
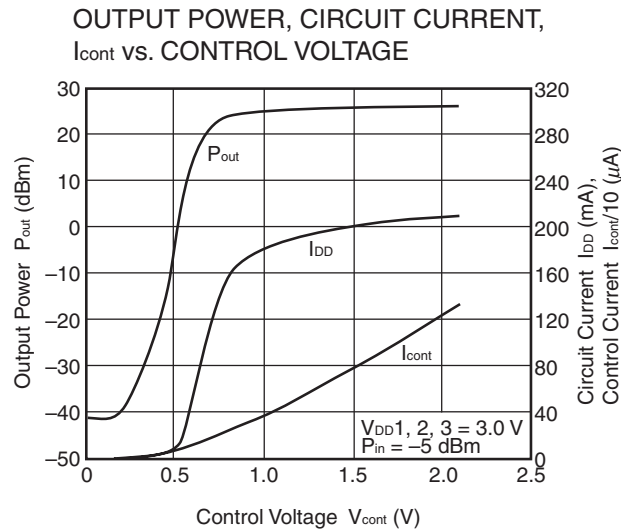
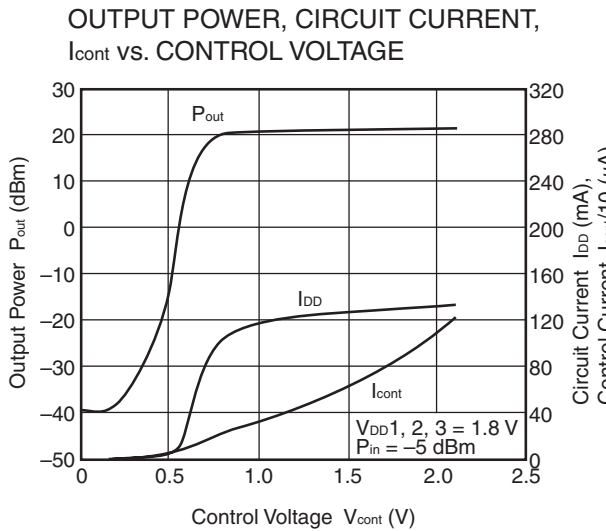
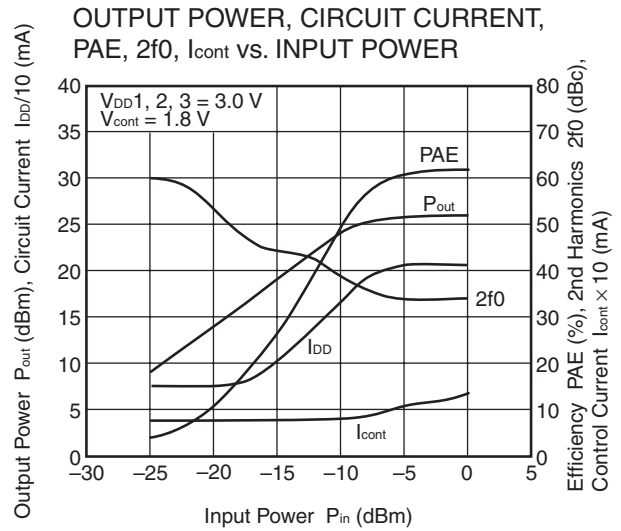
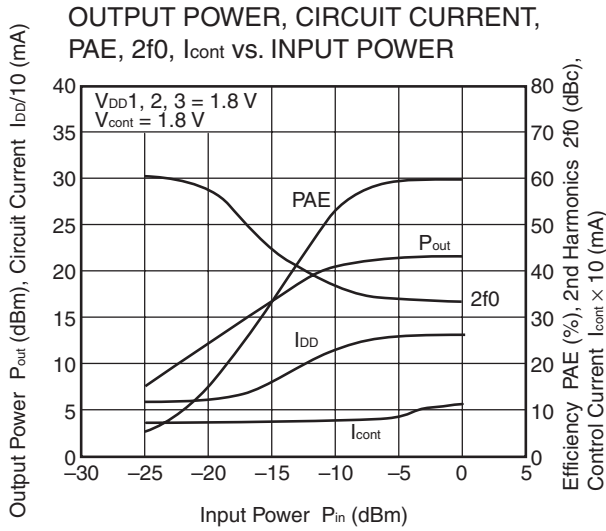
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I <sub>DD</sub>	P <sub>out</sub> = +19 dBm	–	100	130	mA
		V <sub>DD1,2,3</sub> = 3.0 V, P <sub>out</sub> = +24 dBm	–	170	–	mA
Control Current	I <sub>cont</sub>	P <sub>out</sub> = +19 dBm	–	–	3	mA
Shut Down Current	I <sub>shut down</sub>	V <sub>cont</sub> = 0 V, RF None	–	–	5	μA
Output Power 1	P <sub>out1</sub>	P <sub>in</sub> = –5 dBm	+19	+20	–	dBm
		V <sub>DD1,2,3</sub> = 3.0 V, P <sub>in</sub> = –5 dBm	–	+25	–	dBm
Output Power 2	P <sub>out2</sub>	V <sub>cont</sub> = 0 V, P <sub>in</sub> = –5 dBm	–	–40	–	dBm
Gain Control Range	GCR	V <sub>cont</sub> = 0 to 1.8 V, P <sub>in</sub> = –5 dBm	–	60	–	dB
Efficiency	PAE	P <sub>in</sub> = –5 dBm	–	55	–	%
2nd Harmonics	2f <sub>0</sub>	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.

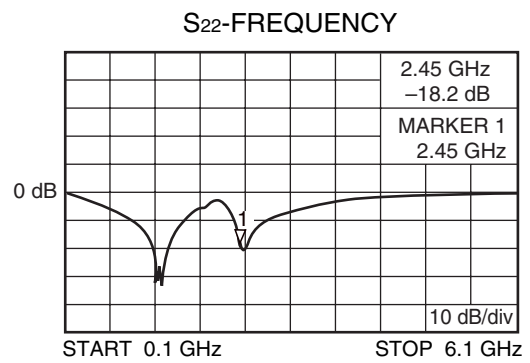
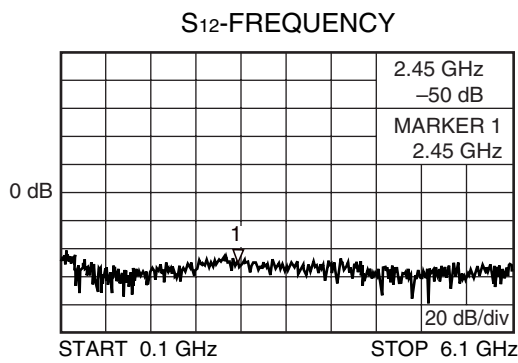
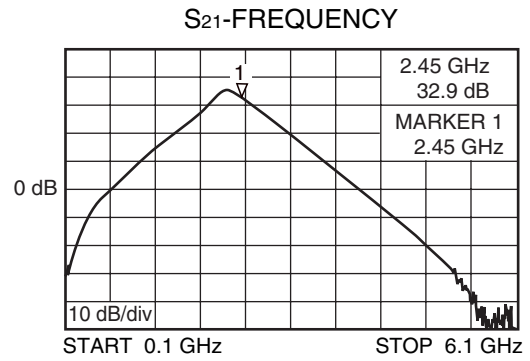
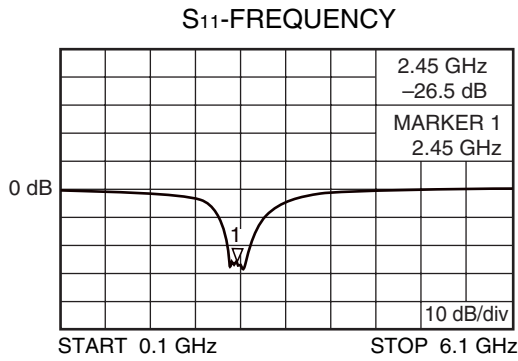
**TYPICAL CHARACTERISTICS (TA = +25°C, f = 2 450 MHz, with external input and output matching circuits, unless otherwise specified)**



**Remark** The graphs indicate nominal characteristics.

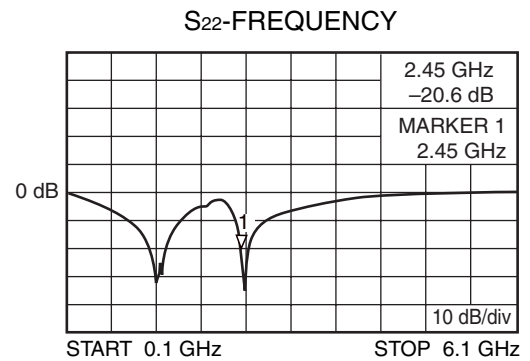
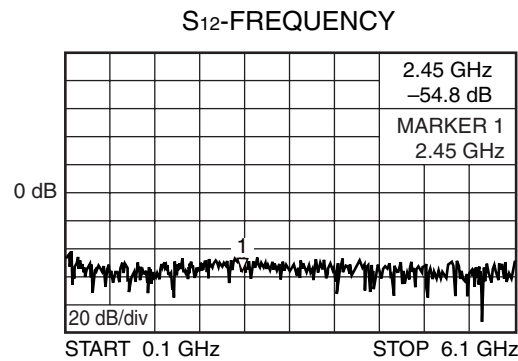
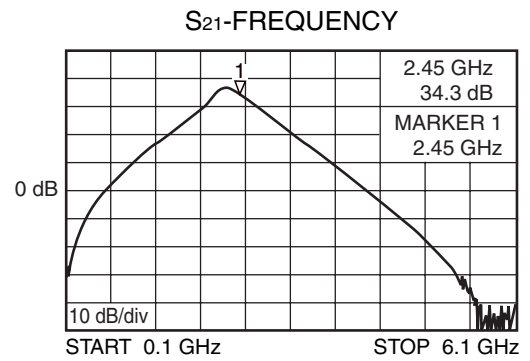
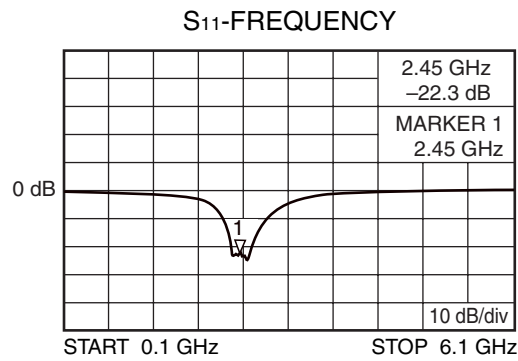
**S-PARAMETERS 1**

Condition :  $f = 0.1$  to  $6.1$  GHz,  $P_{in} = -30$  dBm,  $V_{cont} = 1.8$  V,  $V_{DD1} = V_{DD2} = V_{DD3} = 1.8$  V



**S-PARAMETERS 2**

Condition :  $f = 0.1$  to  $6.1$  GHz,  $P_{in} = -30$  dBm,  $V_{cont} = 1.8$  V,  $V_{DD1} = V_{DD2} = V_{DD3} = 3.0$  V



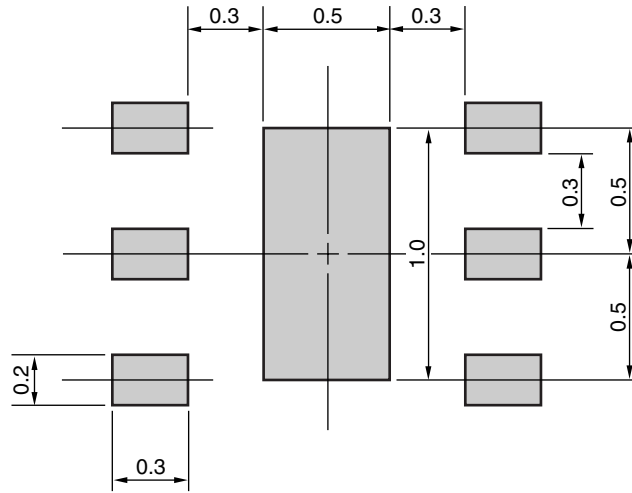
**Remark** The graphs indicate nominal characteristics.



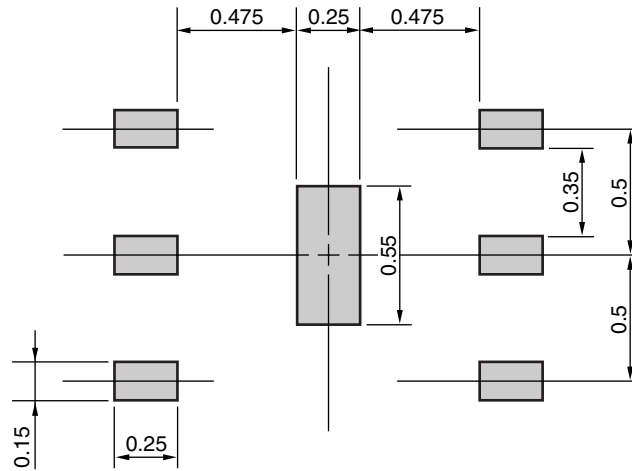
MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)

MOUNTING PAD



SOLDER MASK

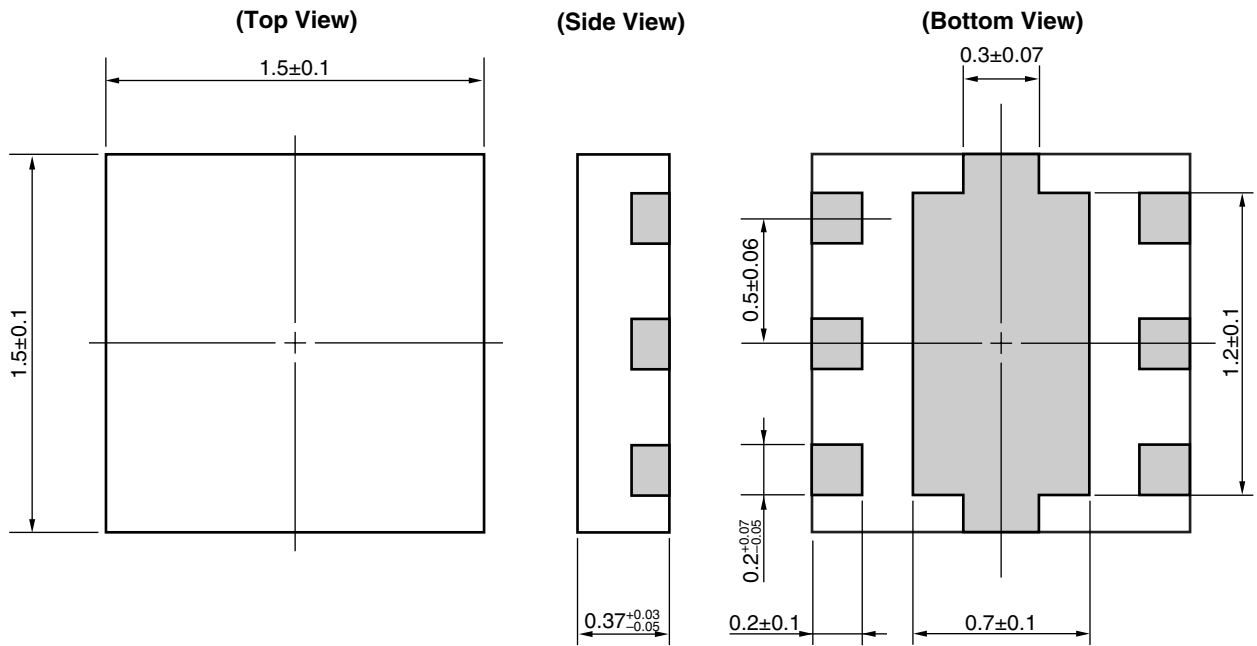


Solder thickness : 0.08 mm

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

<R> 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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