CEL

GaAs INTEGRATED CIRCUIT

μPG2250T5N

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_{DD}1, 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_{DD}1, 2, 3 = 1.8 V, V_{cont} = 1.8 V, P_{out} = +19 dBm
  : I_{DD} = 170 mA TYP. @ V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 1.8 V, P_{out} = +24 dBm
- Output power : P_{out} = +20.0 dBm TYP. @ V_{DD}1, 2, 3 = 1.8 V, V_{cont} = 1.8 V, P_{in} = –5 dBm
  : P_{out} = +25.0 dBm TYP. @ V_{DD}1, 2, 3 = 3.0 V, V_{cont} = 1.8 V, P_{in} = –5 dBm
- Gain control range : GCR = 60 dB TYP. @ V_{DD}1, 2, 3 = 1.8 V, V_{cont} = 0 to 1.8 V, P_{in} = –5 dBm
- High efficiency : PAE = 55% TYP. @ V_{DD}1, 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 × 1.5 × 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	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPG2250T5N-A

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

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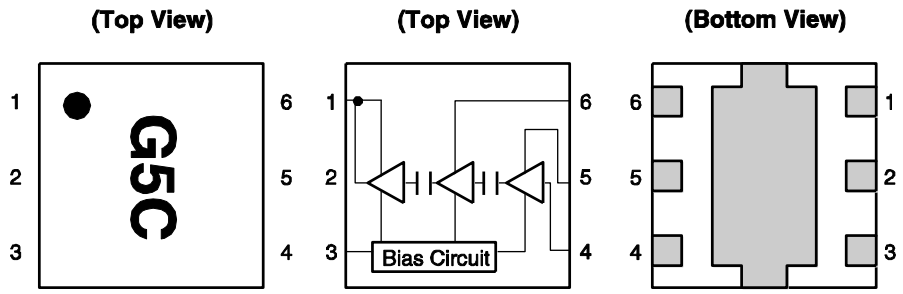
The mark <R> shows major revised points.

The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	OUTPUT/V_{DD}3
2	N.C.
3	V_{cont}
4	INPUT
5	V_{DD}1
6	V_{DD}2

Remark Exposed pad : GND

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD}1, 2, 3	5.0	V
Control Voltage	V_{cont}	2.4	V
Circuit Current	I_{DD}	250	mA
Control Current	I_{cont}	5	mA
Input Power	P_{in}	+5	dBm
Power Dissipation	P_D	400 Note	mW
Operating Ambient Temperature	T_A	−40 to +85	°C
Storage Temperature	T_{stg}	−55 to +150	°C

Note Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C

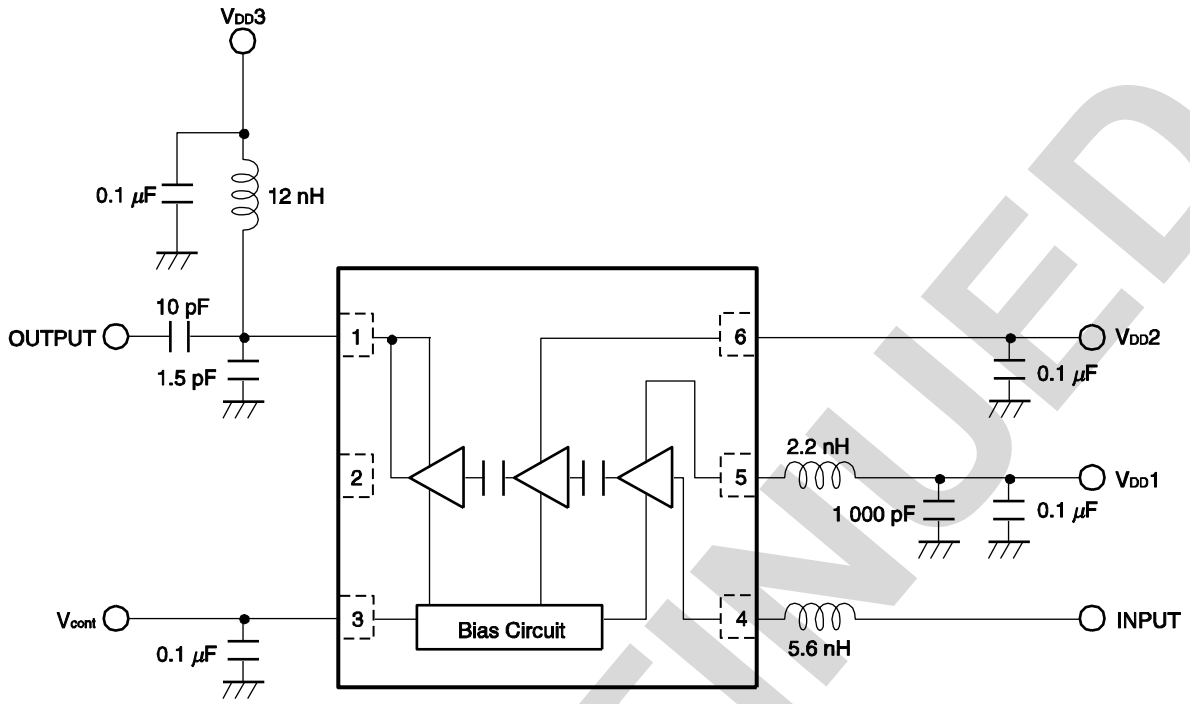
RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f_{opt}	2 400	2 450	2 500	MHz
Supply Voltage	V_{DD}1, 2, 3	1.5	1.8	3.5	V
Control Voltage	V_{cont}	1.5	1.8	2.1	V

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{DD}1, 2, 3 = 1.8 V, V_{cont} = 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_{DD}	P_{out} = +19 dBm	–	100	130	mA
		V_{DD}1,2,3 = 3.0 V, P_{out} = +24 dBm	–	170	–	mA
Control Current	I_{cont}	P_{out} = +19 dBm	–	–	3	mA
Shut Down Current	$I_{shut\ down}$	V_{cont} = 0 V, RF None	–	–	5	μA
Output Power 1	P_{out}1	P_{in} = –5 dBm	+19	+20	–	dBm
		V_{DD}1,2,3 = 3.0 V, P_{in} = –5 dBm	–	+25	–	dBm
Output Power 2	P_{out}2	V_{cont} = 0 V, P_{in} = –5 dBm	–	–40	–	dBm
Gain Control Range	GCR	V_{cont} = 0 to 1.8 V, P_{in} = –5 dBm	–	60	–	dB
Efficiency	PAE	P_{in} = –5 dBm	–	55	–	%
2nd Harmonics	2f0	P_{in} = –5 dBm	–	35	–	dBc

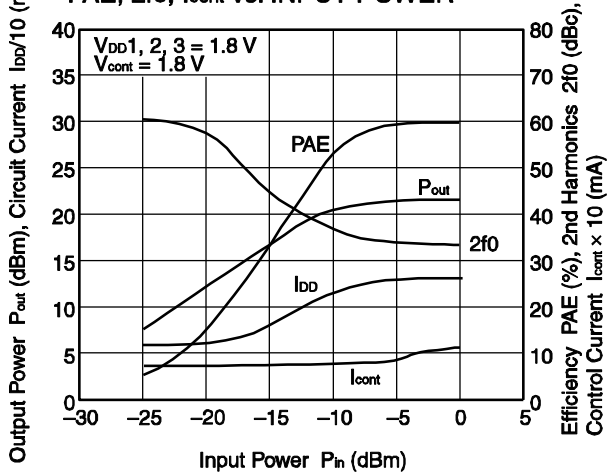
EVALUATION CIRCUIT



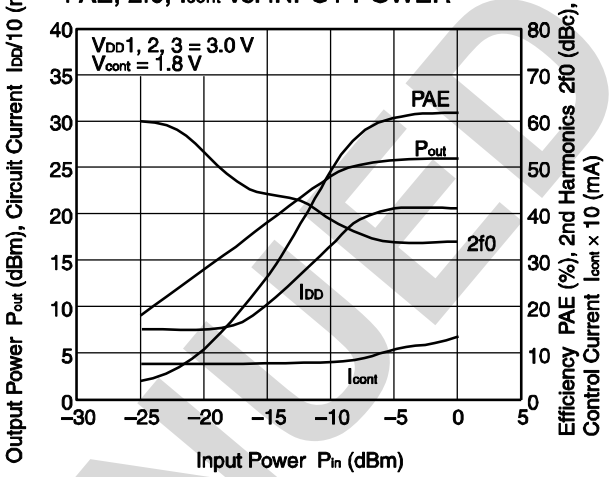
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

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

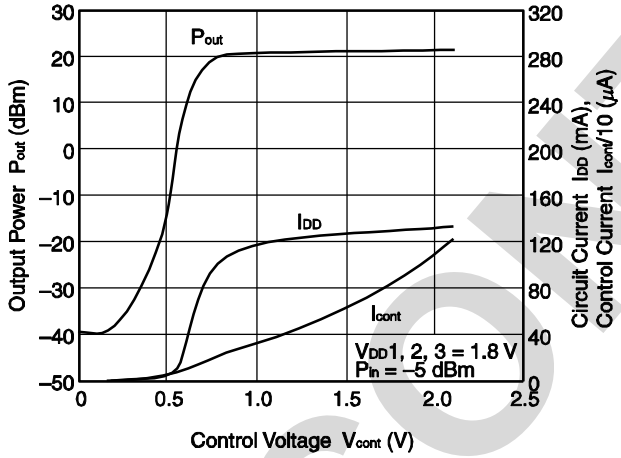
OUTPUT POWER, CIRCUIT CURRENT, PAE, 2f0, I_{cont} vs. INPUT POWER



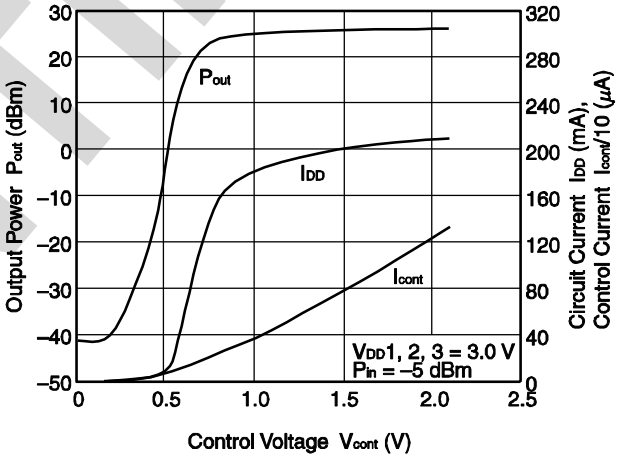
OUTPUT POWER, CIRCUIT CURRENT, PAE, 2f0, I_{cont} vs. INPUT POWER



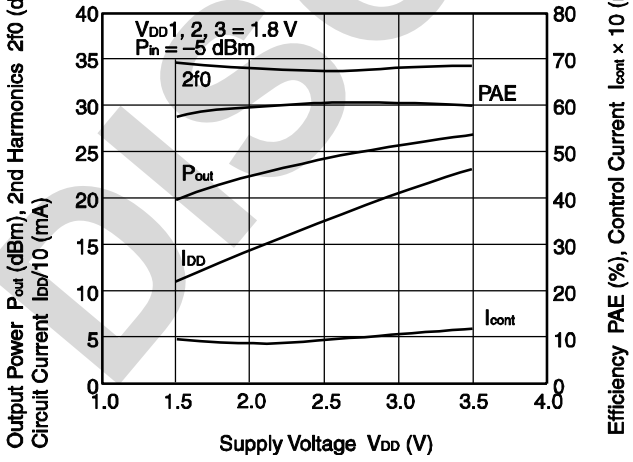
OUTPUT POWER, CIRCUIT CURRENT, I_{cont} vs. CONTROL VOLTAGE



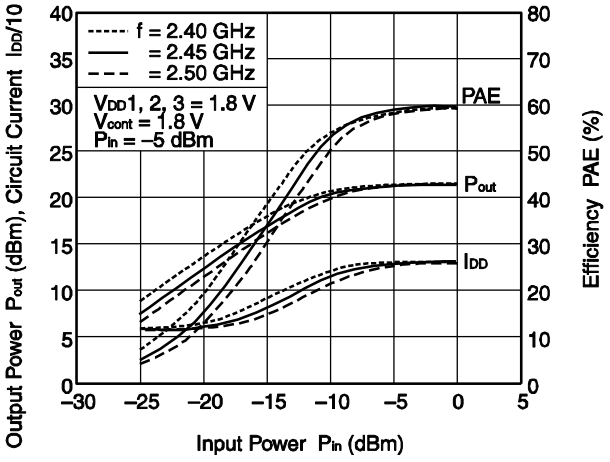
OUTPUT POWER, CIRCUIT CURRENT, I_{cont} vs. CONTROL VOLTAGE



OUTPUT POWER, 2f0, CIRCUIT CURRENT, PAE, I_{cont} vs. SUPPLY VOLTAGE



OUTPUT POWER, CIRCUIT CURRENT, PAE vs. INPUT POWER

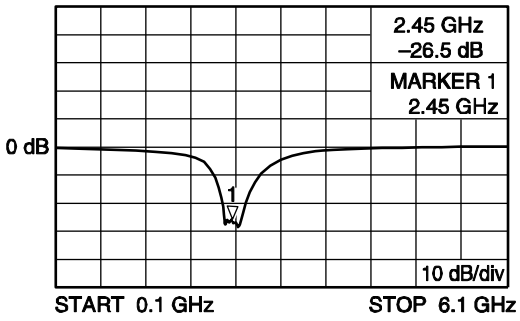


Remark The graphs indicate nominal characteristics.

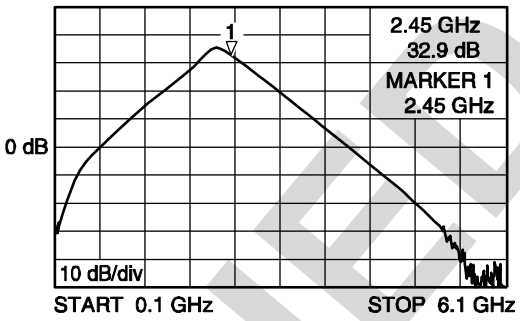
S-PARAMETERS 1

Condition : f = 0.1 to 6.1 GHz, P_{in} = –30 dBm, V_{cont} = 1.8 V, $V_{DD}1 = V_{DD}2 = V_{DD}3$ = 1.8 V

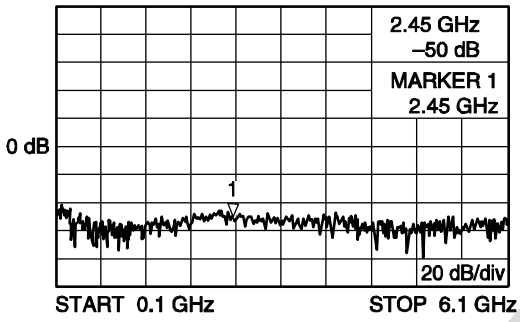
S_{11}-FREQUENCY



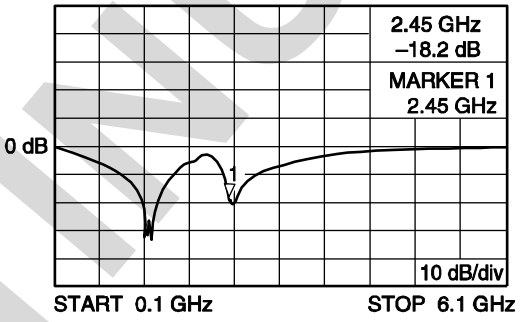
S_{21}-FREQUENCY



S_{12}-FREQUENCY



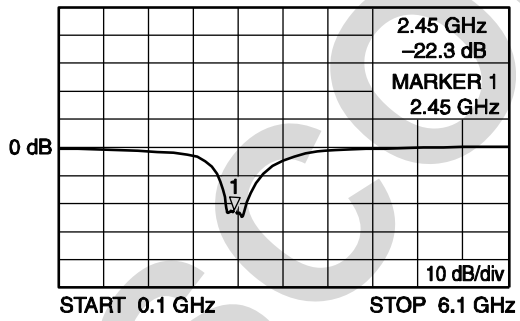
S_{22}-FREQUENCY



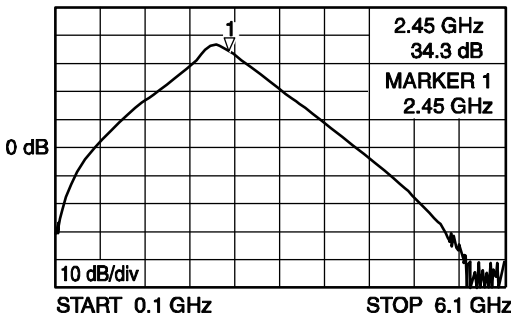
S-PARAMETERS 2

Condition : f = 0.1 to 6.1 GHz, P_{in} = –30 dBm, V_{cont} = 1.8 V, $V_{DD}1 = V_{DD}2 = V_{DD}3$ = 3.0 V

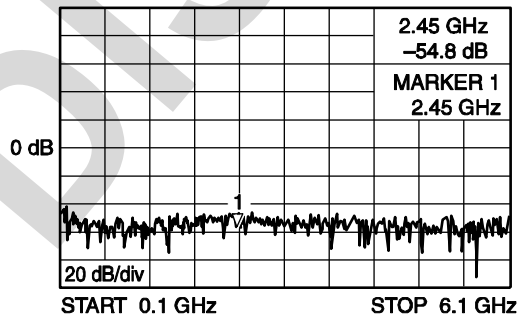
S_{11}-FREQUENCY



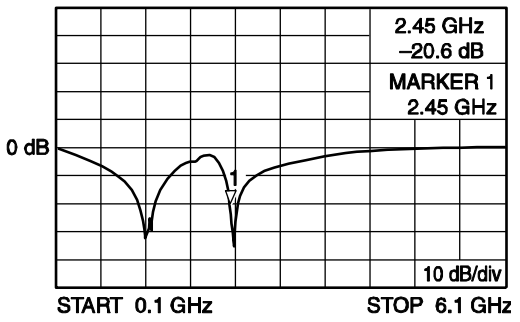
S_{21}-FREQUENCY



S_{12}-FREQUENCY



S_{22}-FREQUENCY

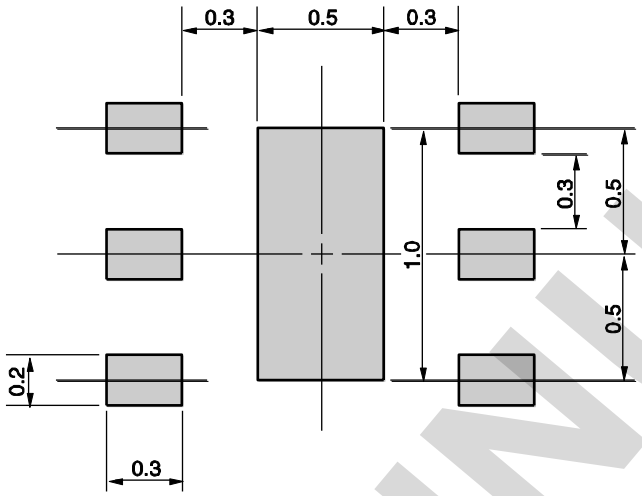


Remark The graphs indicate nominal characteristics.

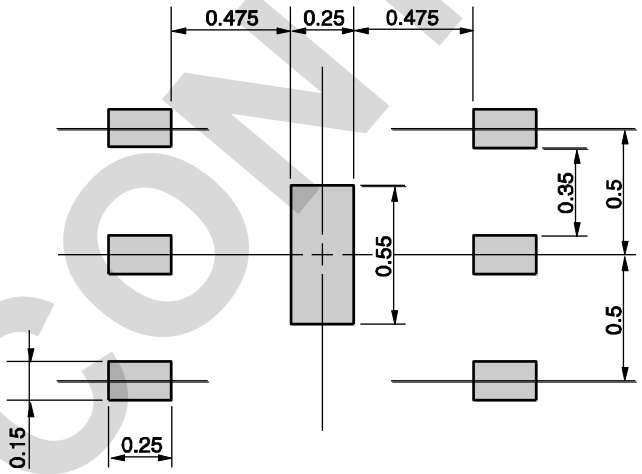
MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)

MOUNTING PAD



SOLDER MASK

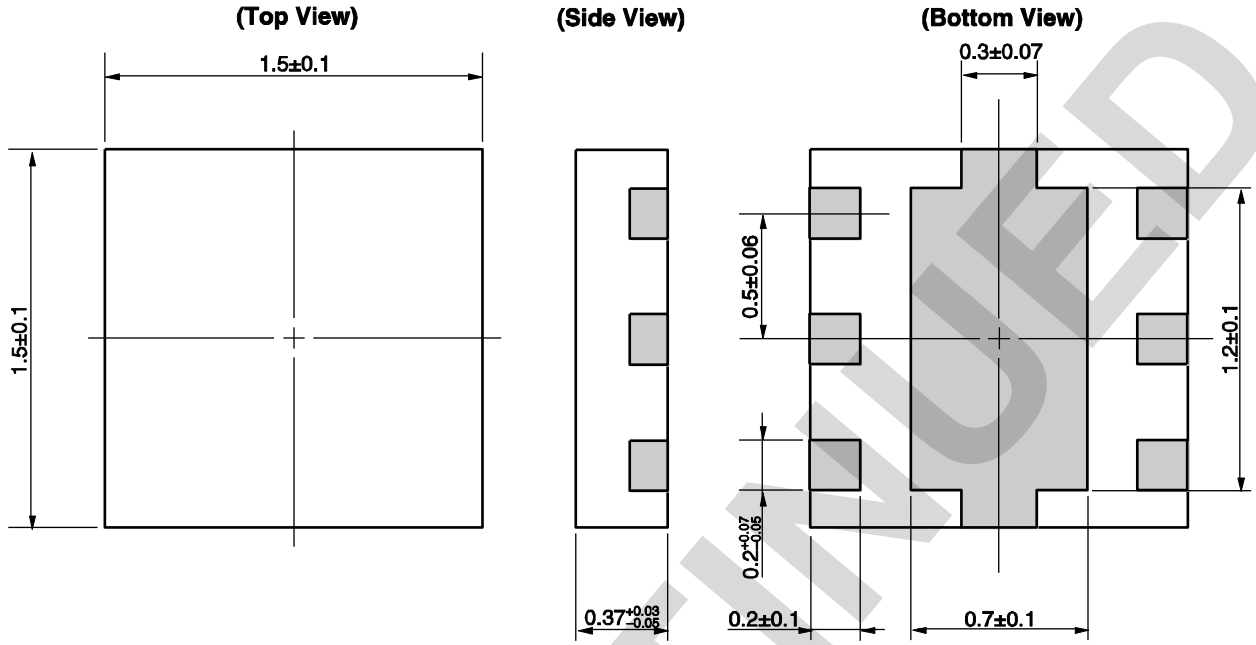


Solder thickness : 0.08 mm

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

<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) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (terminal temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

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

Caution GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.