μPG2411T6R

GaAs Integrated Circuit
SPDT Switch for 1 GHz to 8 GHz

R09DS0020EJ0100
Rev.1.00
Apr 25, 2011

DESCRIPTION

The μPG2411T6R is a GaAs MMIC SPDT (Single Pole Double Throw) switch which was designed for 1 GHz to 8 GHz applications, including dual-band wireless LAN.
This device operates with dual control switching voltages of 1.8 to 3.6 V and can operate at frequencies from 1 GHz to 8 GHz, having the low insertion loss and high isolation.
This device is housed in a 6-pin plastic TSSON (Thin Shrink Small Out-line Non-leaded) and is suitable for high-density surface mounting.

FEATURES

- Switch control voltage : $V_{cont (H)}$ = 1.8 to 3.6 V (3.0 V TYP.)
  : $V_{cont (L)}$ = 0 V TYP.
- Low insertion loss : L_{ins} = 0.5 dB TYP. @ f = 2.5 GHz
  : L_{ins} = 0.6 dB TYP. @ f = 6 GHz
- High isolation : ISL = 25 dB TYP. @ f = 2 to 6 GHz
- Handling power : $P_{in (1 dB)}$ = +30.5 dBm TYP. @ $V_{cont (H)}$ = 3.0 V, f = 2.5 GHz and 6 GHz
  : $P_{in (0.1 dB)}$ = +28 dBm TYP. @ $V_{cont (H)}$ = 3.0 V, f = 2.5 GHz and 6 GHz
- High-density surface mounting : 6-pin plastic TSSON package (1.0 × 1.0 × 0.37 mm)

APPLICATIONS

- Wireless LAN (IEEE802.11a/b/g/n), etc.

ORDERING INFORMATION

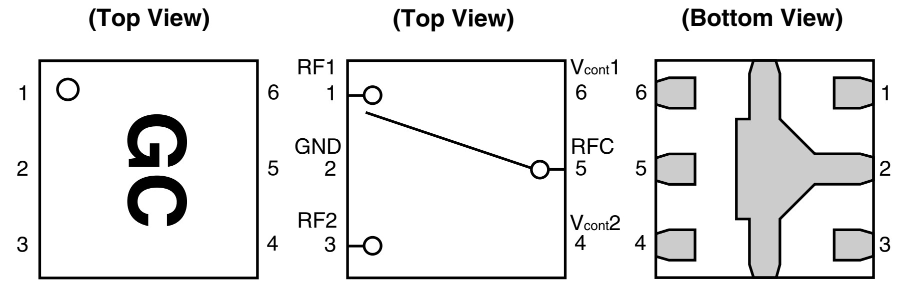
Part Number	Order Number	Package	Marking	Supplying Form
μPG2411T6R-E2	μPG2411T6R-E2-A	6-pin plastic TSSON (Pb-Free)	GC	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 5 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPG2411T6R

CAUTION

Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	RF1
2	GND
3	RF2
4	$V_{cont}2$
5	RFC
6	$V_{cont}1$

Remark Exposed pad : GND

SW TRUTH TABLE

ON Path	$V_{cont}1$	$V_{cont}2$
RFC-RF1	High	Low
RFC-RF2	Low	High

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

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V_{cont}	+6.0 Note	V
Input Power	P_{in}	+31.0	dBm
Power Dissipation	P_D	150	mW
Operating Ambient Temperature	T_A	–40 to +90	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Note: $|V_{cont}1 - V_{cont}2| \leq 6.0$ V

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

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f	1.0	–	8.0	GHz
Switch Control Voltage (H)	$V_{cont\ (H)}$	1.8	3.0	3.6	V
Switch Control Voltage (L)	$V_{cont\ (L)}$	–0.2	0	0.2	V
Control Voltage Difference	$\Delta V_{cont\ (H)}$, $\Delta V_{cont\ (L)}$ Note	–0.1	0	0.1	V

Note: $\Delta V_{cont\ (H)} = V_{cont}1_{\ (H)} - V_{cont}2_{\ (H)}$
$\Delta V_{cont\ (L)} = V_{cont}1_{\ (L)} - V_{cont}2_{\ (L)}$

ELECTRICAL CHARACTERISTICS 1
(T_A = +25°C, $V_{cont (H)}$ = 3.0 V, $V_{cont (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 8 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 1.0 to 2.0 GHz	–	0.50	–	dB
Insertion Loss 2	$L_{ins}2$	f = 2.0 to 2.5 GHz	–	0.50	0.80	dB
Insertion Loss 3	$L_{ins}3$	f = 2.5 to 6.0 GHz	–	0.60	0.90	dB
Insertion Loss 4	$L_{ins}4$	f = 6.0 to 8.0 GHz	–	0.80	–	dB
Isolation 1 (RFC-OFF Port)	ISL1	f = 1.0 to 2.0 GHz	–	27	–	dB
Isolation 2 (RFC-OFF Port)	ISL2	f = 2.0 to 6.0 GHz	21	25	–	dB
Isolation 3 (RFC-OFF Port)	ISL3	f = 6.0 to 8.0 GHz	–	22	–	dB
Isolation 4 (RF1-RF2)	ISL4	f = 1.0 to 2.0 GHz	–	27	–	dB
Isolation 5 (RF1-RF2)	ISL5	f = 2.0 to 6.0 GHz	21	25	–	dB
Isolation 6 (RF1-RF2)	ISL6	f = 6.0 to 8.0 GHz	–	26	–	dB
Return Loss 1	RL1	f = 1.0 to 2.0 GHz	–	20	–	dB
Return Loss 2	RL2	f = 2.0 to 2.5 GHz	17	25	–	dB
Return Loss 3	RL3	f = 2.5 to 4.9 GHz	13	20	–	dB
Return Loss 4	RL4	f = 4.9 to 6.0 GHz	14	22	–	dB
Return Loss 5	RL5	f = 6.0 to 8.0 GHz	–	20	–	dB
0.1 dB Loss Compression Input Power Note1	$P_{in (0.1 dB)}$	f = 2.5 GHz	25	28	–	dBm
		f = 6.0 GHz	25	28	–	dBm
1 dB Loss Compression Input Power Note2	$P_{in (1 dB)}$	f = 2.5 GHz	–	30.5	–	dBm
		f = 6.0 GHz	–	30.5	–	dBm
Input 3rd Order Intercept Point	IIP_3	f = 2.5 GHz	–	50	–	dBm
Switch Control Current	I_{cont}	No RF input	–	0.1	1.0	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	20	100	ns

Notes 1. $P_{in (0.1 dB)}$ is the measured input power level when the insertion loss increases 0.1 dB more than that of the linear range.

2. $P_{in (1 dB)}$ is the measured input power level when the insertion loss increases 1 dB more than that of the linear range.

CAUTION

It is necessary to use DC blocking capacitors with this device.
The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system.

ELECTRICAL CHARACTERISTICS 2
(T_A = +25°C, $V_{cont (H)}$ = 1.8 V, $V_{cont (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 8 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 1.0 to 2.0 GHz	–	0.50	–	dB
Insertion Loss 2	$L_{ins}2$	f = 2.0 to 2.5 GHz	–	0.50	0.80	dB
Insertion Loss 3	$L_{ins}3$	f = 2.5 to 6.0 GHz	–	0.60	0.90	dB
Insertion Loss 4	$L_{ins}4$	f = 6.0 to 8.0 GHz	–	0.80	–	dB
Isolation 1 (RFC-OFF Port)	ISL1	f = 1.0 to 2.0 GHz	–	27	–	dB
Isolation 2 (RFC-OFF Port)	ISL2	f = 2.0 to 6.0 GHz	21	25	–	dB
Isolation 3 (RFC-OFF Port)	ISL3	f = 6.0 to 8.0 GHz	–	22	–	dB
Isolation 4 (RF1-RF2)	ISL4	f = 1.0 to 2.0 GHz	–	27	–	dB
Isolation 5 (RF1-RF2)	ISL5	f = 2.0 to 6.0 GHz	21	25	–	dB
Isolation 6 (RF1-RF2)	ISL6	f = 6.0 to 8.0 GHz	–	26	–	dB
Return Loss 1	RL1	f = 1.0 to 2.0 GHz	–	20	–	dB
Return Loss 2	RL2	f = 2.0 to 2.5 GHz	17	25	–	dB
Return Loss 3	RL3	f = 2.5 to 4.9 GHz	13	20	–	dB
Return Loss 4	RL4	f = 4.9 to 6.0 GHz	14	22	–	dB
Return Loss 5	RL5	f = 6.0 to 8.0 GHz	–	20	–	dB
0.1 dB Loss Compression Input Power Note1	$P_{in (0.1 dB)}$	f = 2.5 GHz	20	23	–	dBm
		f = 6.0 GHz	19	23	–	dBm
1 dB Loss Compression Input Power Note2	$P_{in (1 dB)}$	f = 2.5 GHz	–	28	–	dBm
		f = 6.0 GHz	–	27	–	dBm
Input 3rd Order Intercept Point	IIP_3	f = 2.5 GHz	–	50	–	dBm
Switch Control Current	I_{cont}	No RF input	–	0.1	1.0	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	20	100	ns

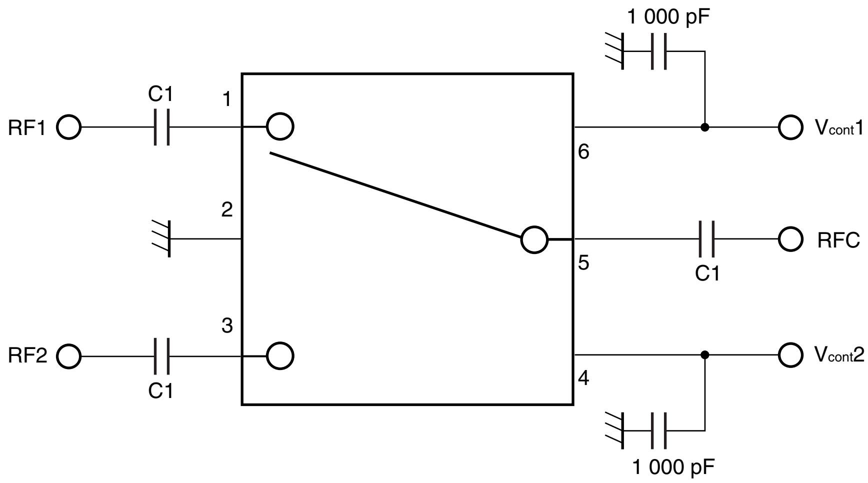
Notes 1. $P_{in (0.1 dB)}$ is the measured input power level when the insertion loss increases 0.1 dB more than that of the linear range.

2. $P_{in (1 dB)}$ is the measured input power level when the insertion loss increases 1 dB more than that of the linear range.

CAUTION

It is necessary to use DC blocking capacitors with this device.
The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system.

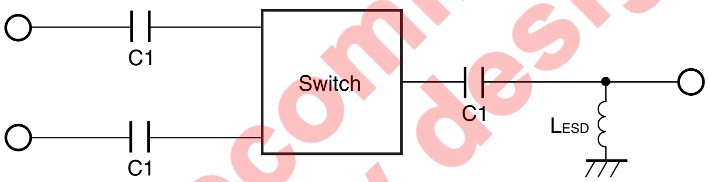
EVALUATION CIRCUIT



Remark C1: 8 pF

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

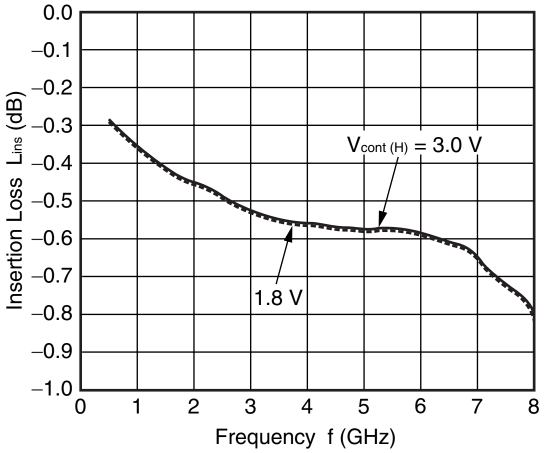
APPLICATION INFORMATION



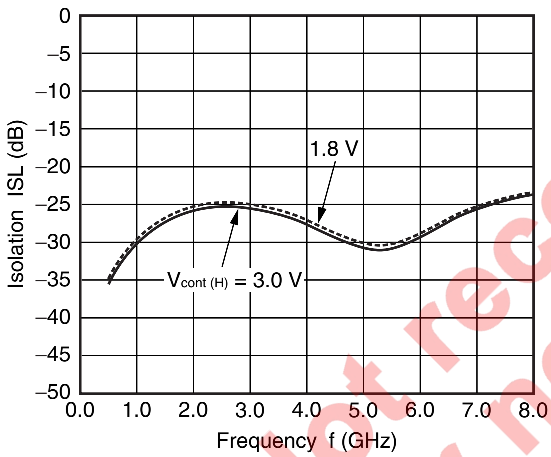
- C1 are DC blocking capacitors external to the device.
  The value may be tailored to provide specific electrical responses.
- The RF ground connections should be kept as short as possible and connected to directly to a good RF ground for best performance.
- L_{ESD} provides a means to increase the ESD protection on a specific RF port, typically the port attached to the antenna.

TYPICAL CHARACTERISTICS (T_A = +25°C, $V_{cont (H)}$ = 3.0 V, $V_{cont (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 8 pF, unless otherwise specified)

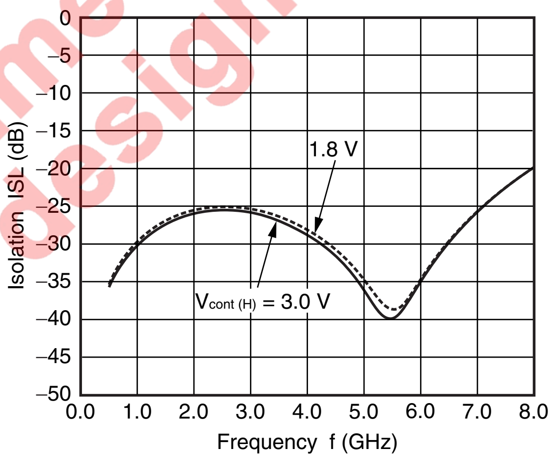
RFC-RF1/RF2
INSERTION LOSS vs. FREQUENCY



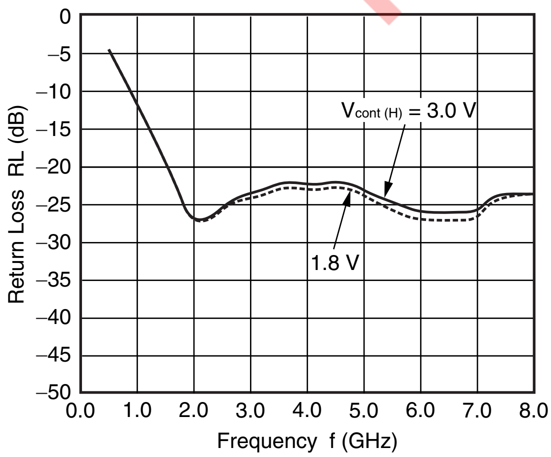
RFC-RF1/RF2
ISOLATION vs. FREQUENCY



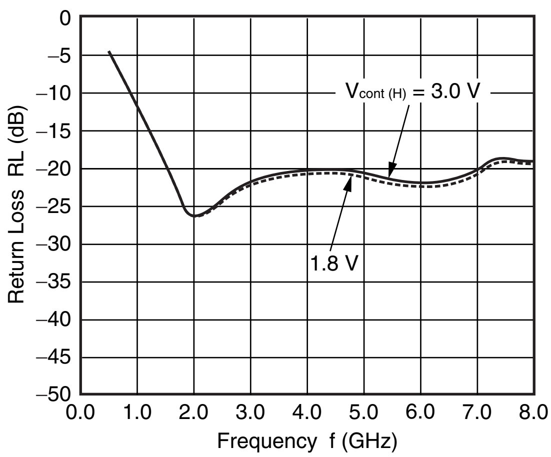
RF1-RF2/RF2-RF1
ISOLATION vs. FREQUENCY



RFC RETURN LOSS vs. FREQUENCY

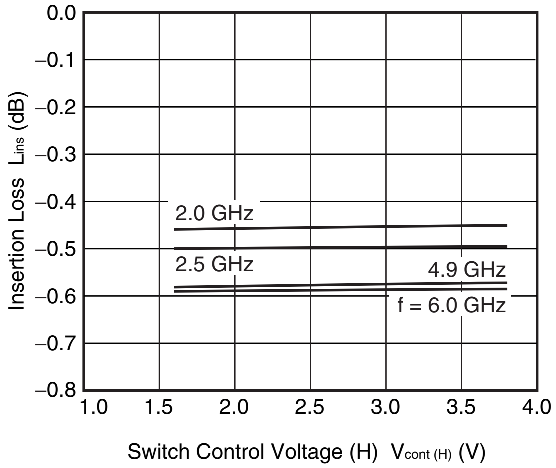


RF1/RF2 RETURN LOSS vs. FREQUENCY

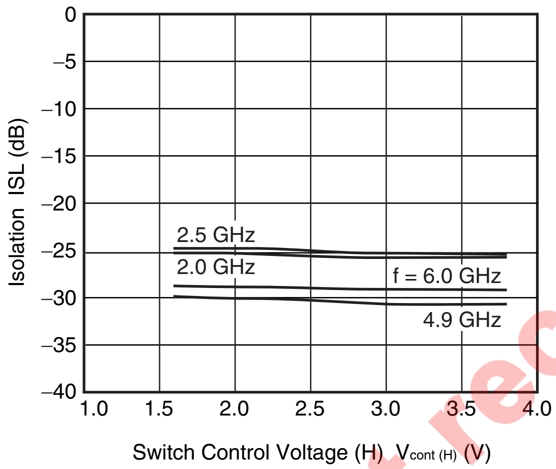


Remark The graphs indicate nominal characteristics.

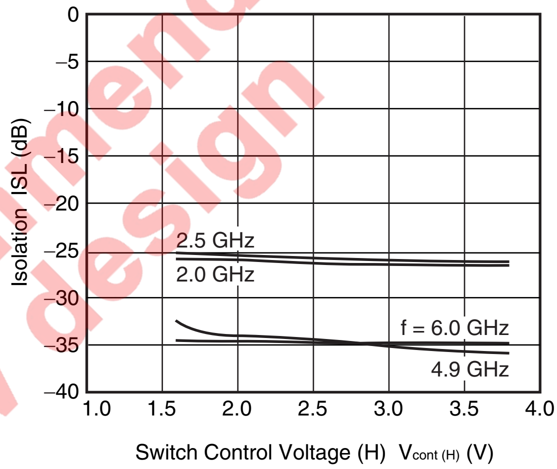
RFC-RF1/RF2 INSERTION LOSS, vs. SWITCH CONTROL VOLTAGE (H)



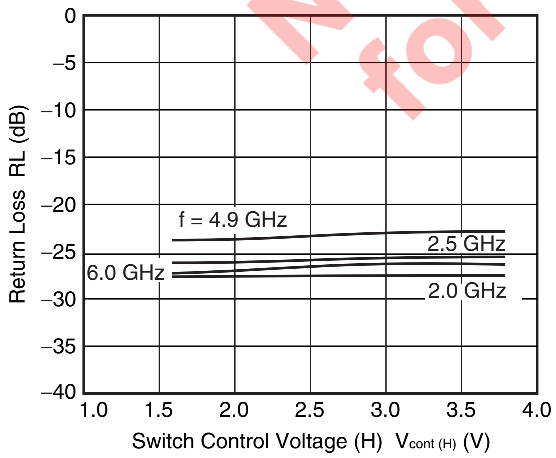
RFC-RF1/RF2 ISOLATION vs. SWITCH CONTROL VOLTAGE (H)



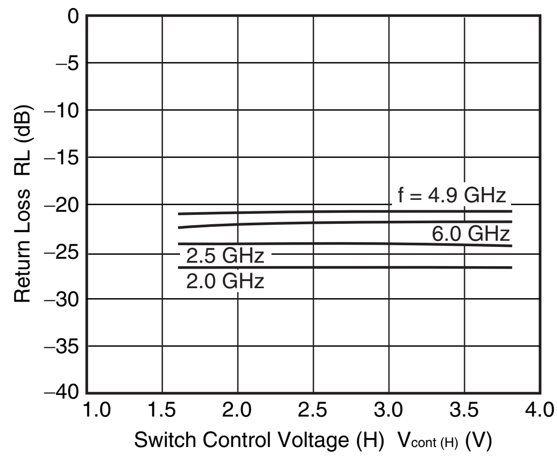
RF1-RF2/RF2-RF1 ISOLATION vs. SWITCH CONTROL VOLTAGE (H)



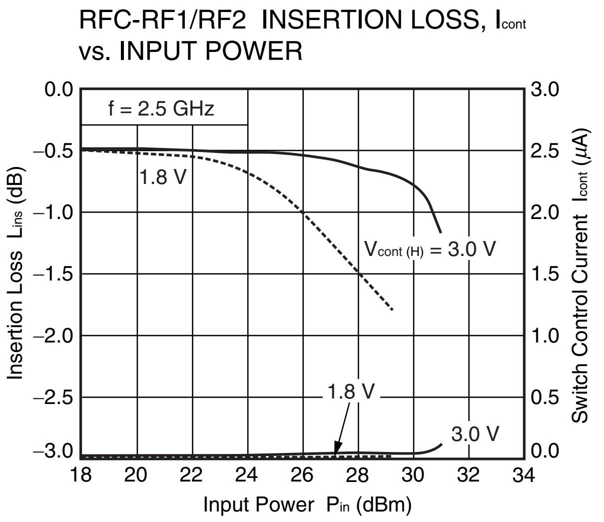
RFC RETURN LOSS vs. SWITCH CONTROL VOLTAGE (H)

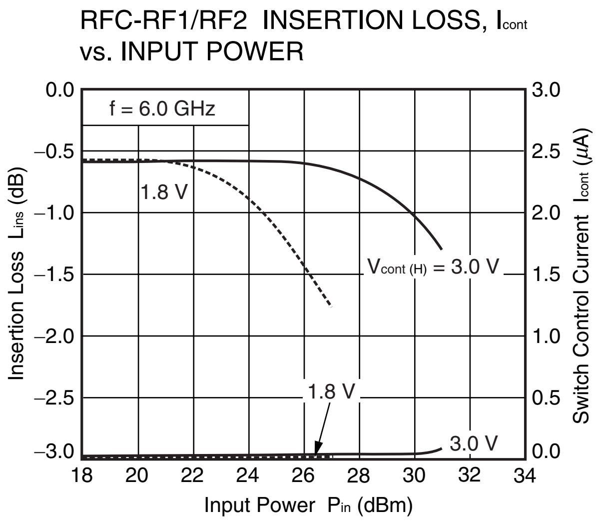


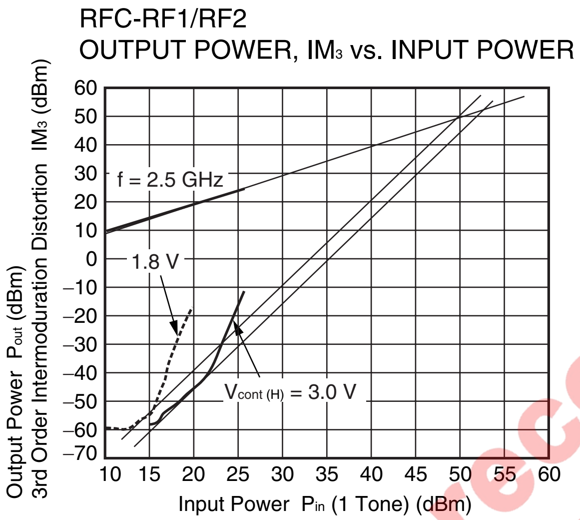
RF1/RF2 RETURN LOSS vs. SWITCH CONTROL VOLTAGE (H)



Remark The graphs indicate nominal characteristics.





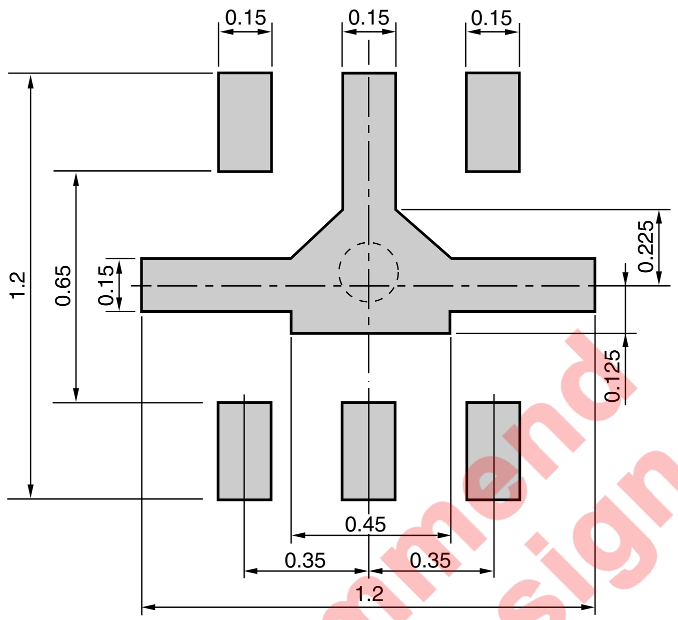


Remark The graphs indicate nominal characteristics.

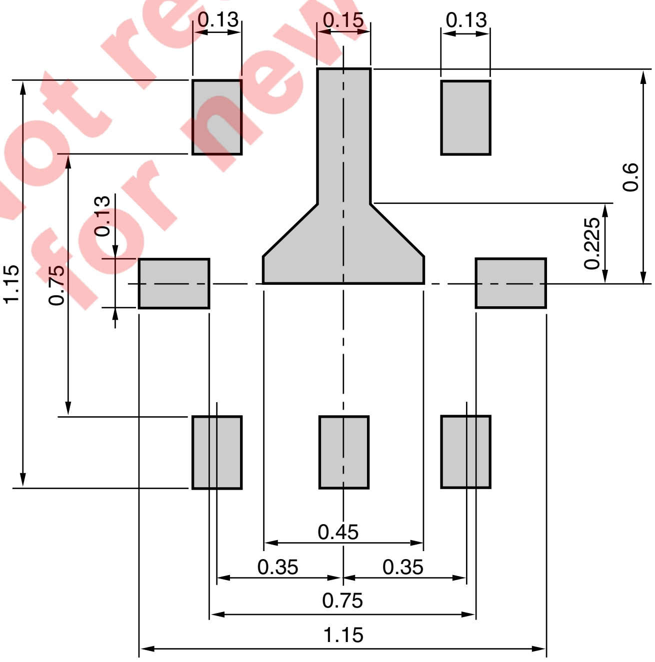
MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

6-PIN PLASTIC TSSON (T6R) (UNIT: mm)

MOUNTING PAD



SOLDER MASK



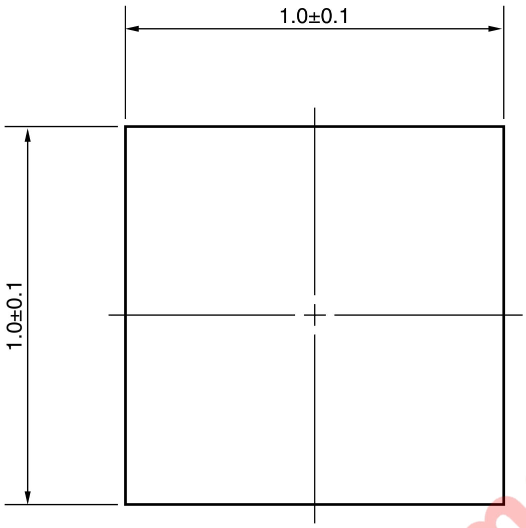
Solder thickness : 0.08 mm

Remark The mounting pad and solder mask layouts in this document are for reference only.
When designing PCB, please consider workability of mounting, solder joint reliability, prevention of solder bridge and so on, in order to optimize the design.

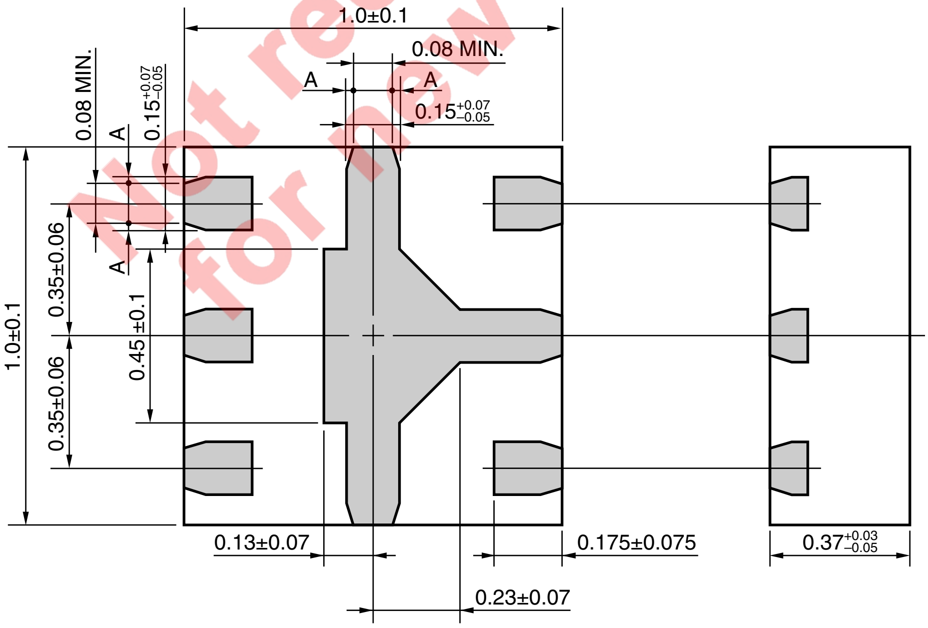
PACKAGE DIMENSIONS

6-PIN PLASTIC TSSON (T6R) (UNIT: mm)

(Top View)



(Bottom View)



Remark A>0

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
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.

Revision History	μPG2411T6R Data Sheet

Rev.	Date	Description	
		Page	Summary
1.00	Apr 25, 2011	–	First edition issued

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

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Colophon 1.0