RENESAS

DATA SHEET

GaAs INTEGRATED CIRCUIT

μPG2409T6X

HIGH POWER SPDT SWITCH FOR WiMAX™

DESCRIPTION

The μPG2409T6X is a GaAs MMIC high power SPDT (Single Pole Double Throw) switch which were designed for WiMAX.

This device can operate frequency from 0.05 to 6.0 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin plastic TSON (Thin Small Out-line Non-leaded) (T6X) package. And this package is suitable for high-density surface mounting.

FEATURES

- Switch control voltage : $V_{cont\ (H)}$ = 3.0 V TYP.
  : $V_{cont\ (L)}$ = 0 V TYP.
- Low insertion loss : L_{ins} = 0.45 dB TYP. @ f = 2.5 GHz
  : L_{ins} = 0.55 dB TYP. @ f = 3.8 GHz
  : L_{ins} = 0.65 dB TYP. @ f = 6.0 GHz
- High isolation : ISL = 30 dB TYP. @ f = 2.5 GHz
  : ISL = 30 dB TYP. @ f = 3.8 GHz
  : ISL = 27 dB TYP. @ f = 6.0 GHz
- Handling power : $P_{in\ (1\ dB)}$ = +36.0 dBm TYP. @ f = 0.05 to 6.0 GHz
- High-density surface mounting : 6-pin plastic TSON (T6X) package (1.5 × 1.5 × 0.37 mm)

APPLICATIONS

- WiMAX and wireless LAN (IEEE802.11a/b/g/n)

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2409T6X-E2	μPG2409T6X-E2-A	6-pin plastic TSON (T6X) (Pb-Free)	G5R	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPG2409T6X

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.

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Date Published July 2009 NS
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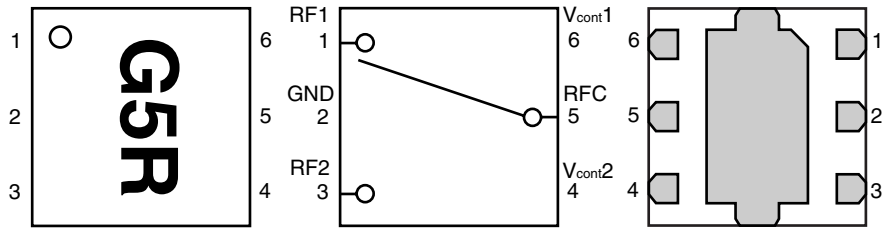
PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

(Top View) (Top View) (Bottom View)



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

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

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}	+36	dBm
Operating Ambient Temperature	T_A	−45 to +85	°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	0.05	−	6.0	GHz
Switch Control Voltage (H)	$V_{cont\ (H)}$	2.7	3.0	3.3	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

(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 = 0.05 to 0.5 GHz Note 1	–	0.35	–	dB
Insertion Loss 2	$L_{ins}2$	f = 0.5 to 2.0 GHz Note 2	–	0.40	0.65	dB
Insertion Loss 3	$L_{ins}3$	f = 2.0 to 2.5 GHz	–	0.45	0.70	dB
Insertion Loss 4	$L_{ins}4$	f = 2.5 to 3.8 GHz	–	0.55	0.80	dB
Insertion Loss 5	$L_{ins}5$	f = 3.8 to 6.0 GHz	–	0.65	0.90	dB
Isolation 1	ISL1	f = 0.05 to 0.5 GHz Note 1	–	30	–	dB
Isolation 2	ISL2	f = 0.5 to 2.0 GHz Note 2	25	30	–	dB
Isolation 3	ISL3	f = 2.0 to 2.5 GHz	25	30	–	dB
Isolation 4	ISL4	f = 2.5 to 3.8 GHz	25	30	–	dB
Isolation 5	ISL5	f = 3.8 to 6.0 GHz	22	27	–	dB
Return Loss 1	RL1	f = 0.05 to 0.5 GHz Note 1	–	20	–	dB
Return Loss 2	RL2	f = 0.5 to 2.0 GHz Note 2	15	20	–	dB
Return Loss 3	RL3	f = 2.0 to 2.5 GHz	15	20	–	dB
Return Loss 4	RL4	f = 2.5 to 6.0 GHz	10	15	–	dB
0.1 dB Loss Compression Input Power Note 3	$P_{in\ (0.1\ dB)}$	f = 0.5 to 6.0 GHz Note 2	–	+34.0	–	dBm
1 dB Loss Compression Input Power Note 4	$P_{in\ (1\ dB)}$	f = 0.05 to 0.5 GHz Note 1	–	+36.0	–	dBm
		f = 0.5 to 6.0 GHz Note 2	+34.0	+36.0	–	dBm
2nd Harmonics	$2f_0$	f = 2.5 GHz, P_{in} = +30 dBm	–	70	–	dBc
3rd Harmonics	$3f_0$	f = 2.5 GHz, P_{in} = +30 dBm	–	70	–	dBc
Input 3rd Order Intercept Point	IIP_3	f = 2.5 GHz	–	+60	–	dBm
Switch Control Current	I_{cont}	No RF input	–	0.1	10	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	100	250	ns

Notes 1. DC blocking capacitors = 1 000 pF at f = 0.05 to 0.5 GHz

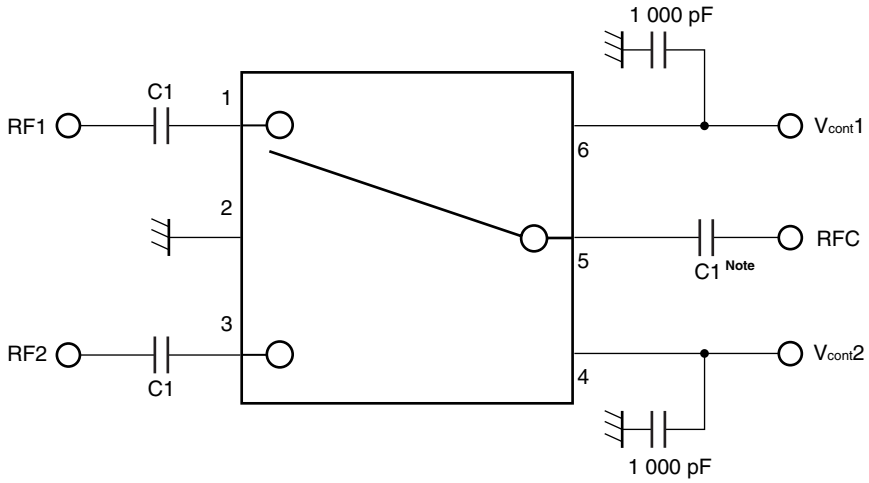
2. DC blocking capacitors = 56 pF at f = 0.5 to 2.0 GHz

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

4. $P_{in\ (1\ dB)}$ 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.

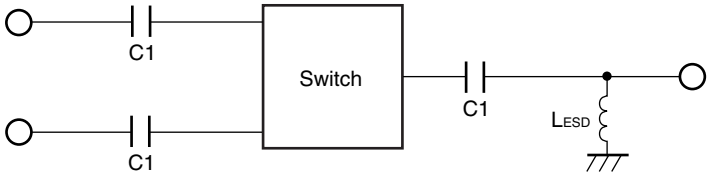
EVALUATION CIRCUIT



Note C1 : 0.05 to 0.5 GHz 1 000 pF
: 0.5 to 2.0 GHz 56 pF
: 2.0 to 6.0 GHz 8 pF

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

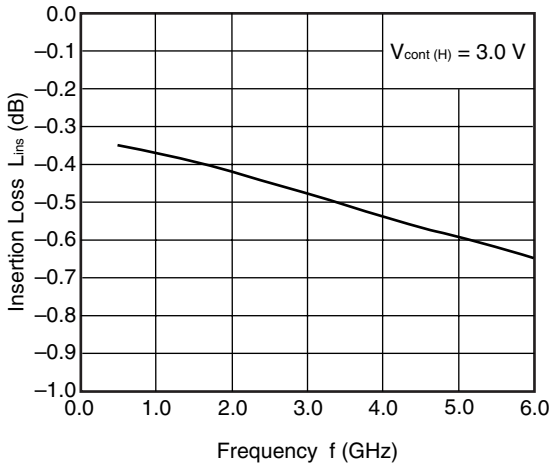
APPLICATION INFORMATION



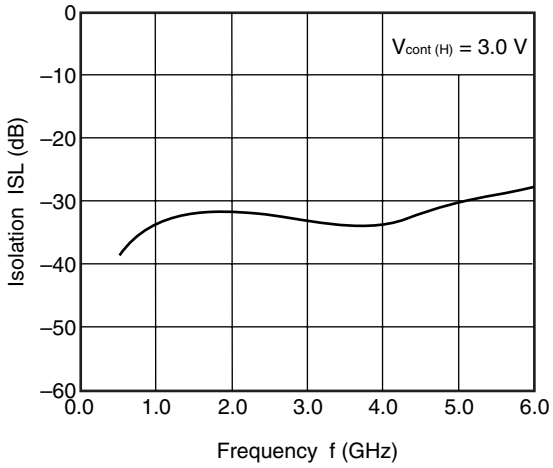
- C1 are DC blocking capacitors external to the device.
  The value may be tailored to provide specific electrical responses.
- The RF ground connections should be kept as short as possible and connected to directly to a good RF ground for best performance.
- L_{ESD} provides a means to increase the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

TYPICAL CHARACTERISTICS (T_A = +25°C, DC blocking capacitors = 8 pF, unless otherwise specified)

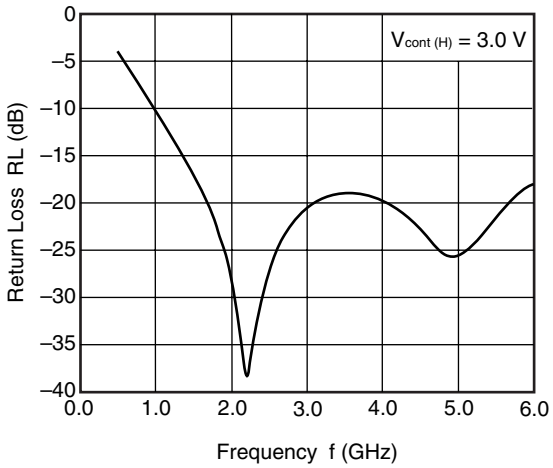
RFC-RF1/RF2
INSERTION LOSS vs. FREQUENCY



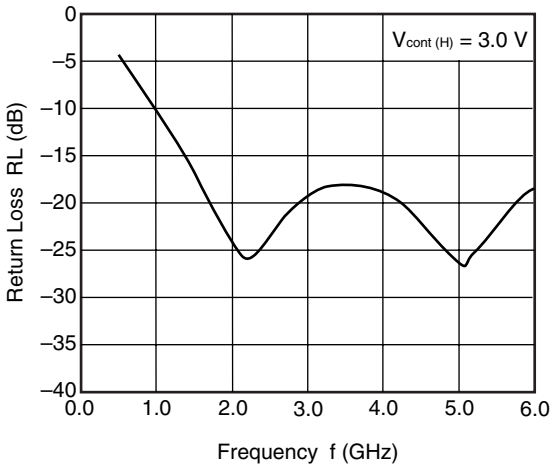
RFC-RF1/RF2
ISOLATION vs. FREQUENCY



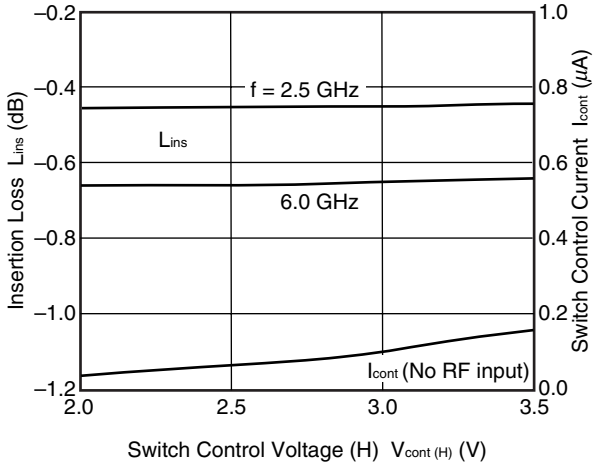
RFC RETURN LOSS vs. FREQUENCY



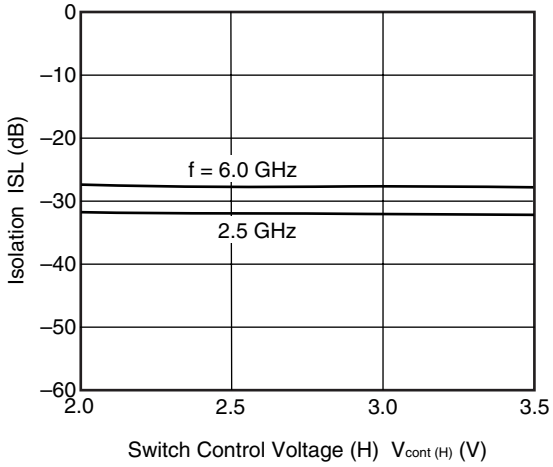
RF1/RF2 RETURN LOSS vs. FREQUENCY



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

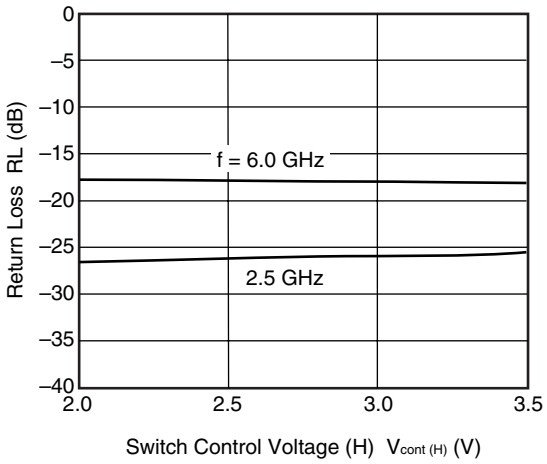


RFC-RF1/RF2 ISOLATION vs.
SWITCH CONTROL VOLTAGE (H)

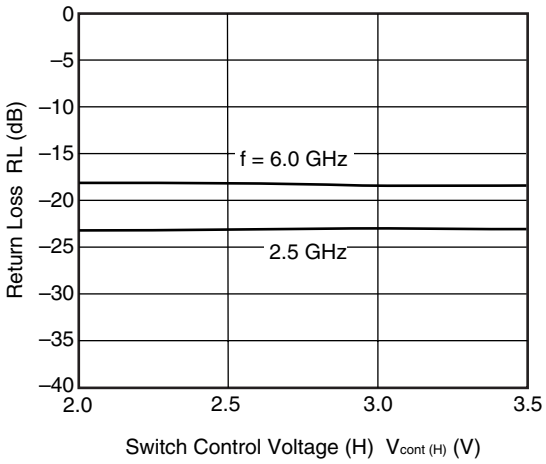


Remark The graphs indicate nominal characteristics.

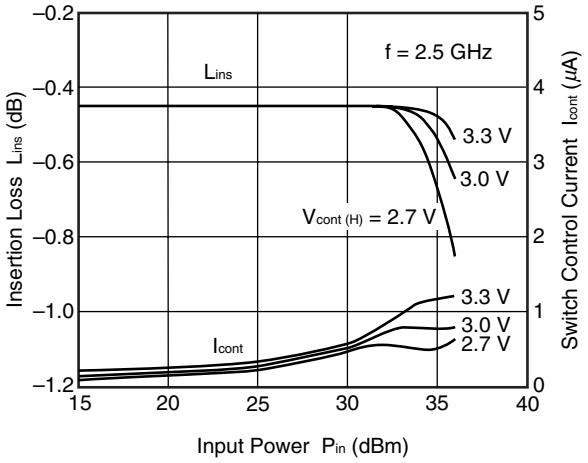
RFC RETURN LOSS vs.
SWITCH CONTROL VOLTAGE (H)



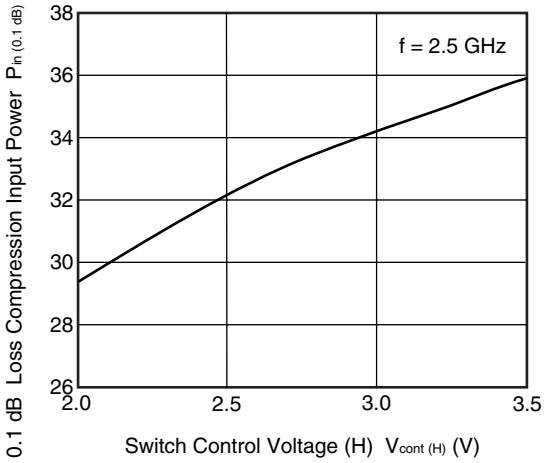
RF1/RF2 RETURN LOSS vs.
SWITCH CONTROL VOLTAGE (H)



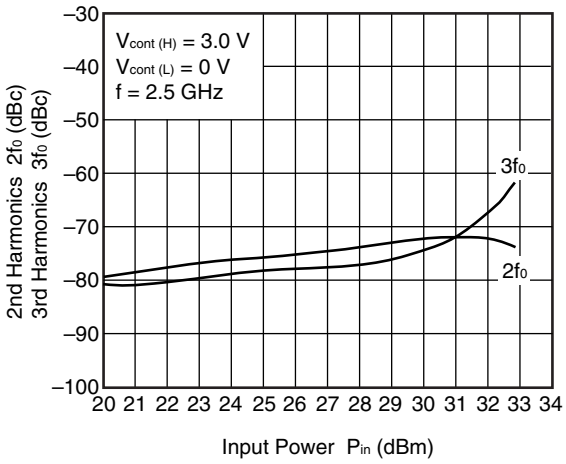
RFC-RF1/RF2 INSERTION LOSS,
I_{cont} vs. INPUT POWER



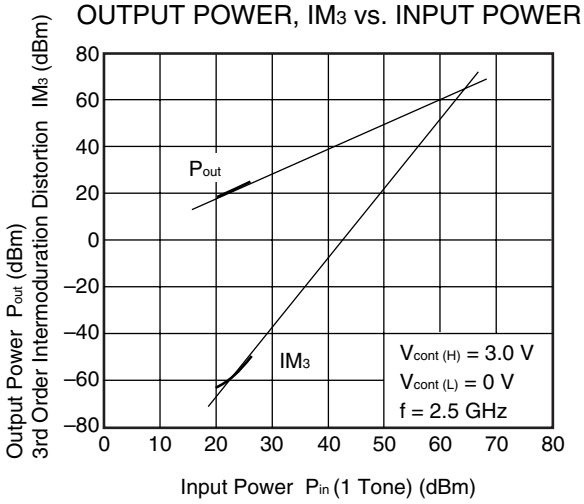
RFC-RF1/RF2 $P_{in\ (0.1\ dB)}$ vs.
SWITCH CONTROL VOLTAGE (H)



RFC-RF1/RF2
$2f_0$, $3f_0$ vs. INPUT POWER



RFC-RF1/RF2
OUTPUT POWER, IM_3 vs. INPUT POWER

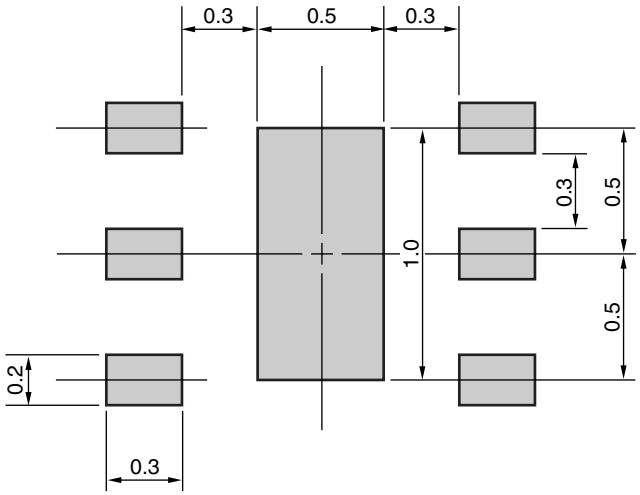


Remark The graphs indicate nominal characteristics.

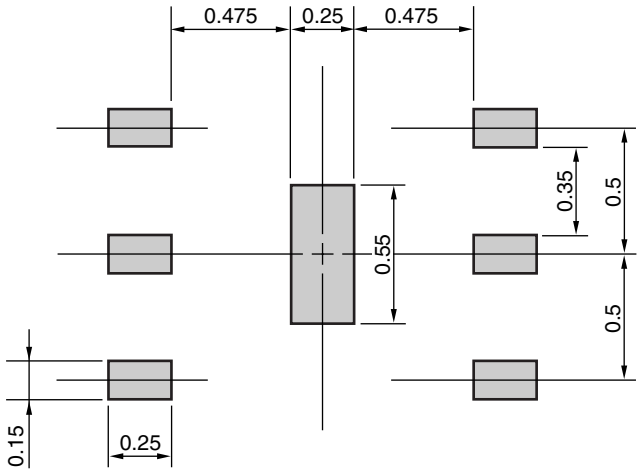
MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)

MOUNTING PAD



SOLDER MASK

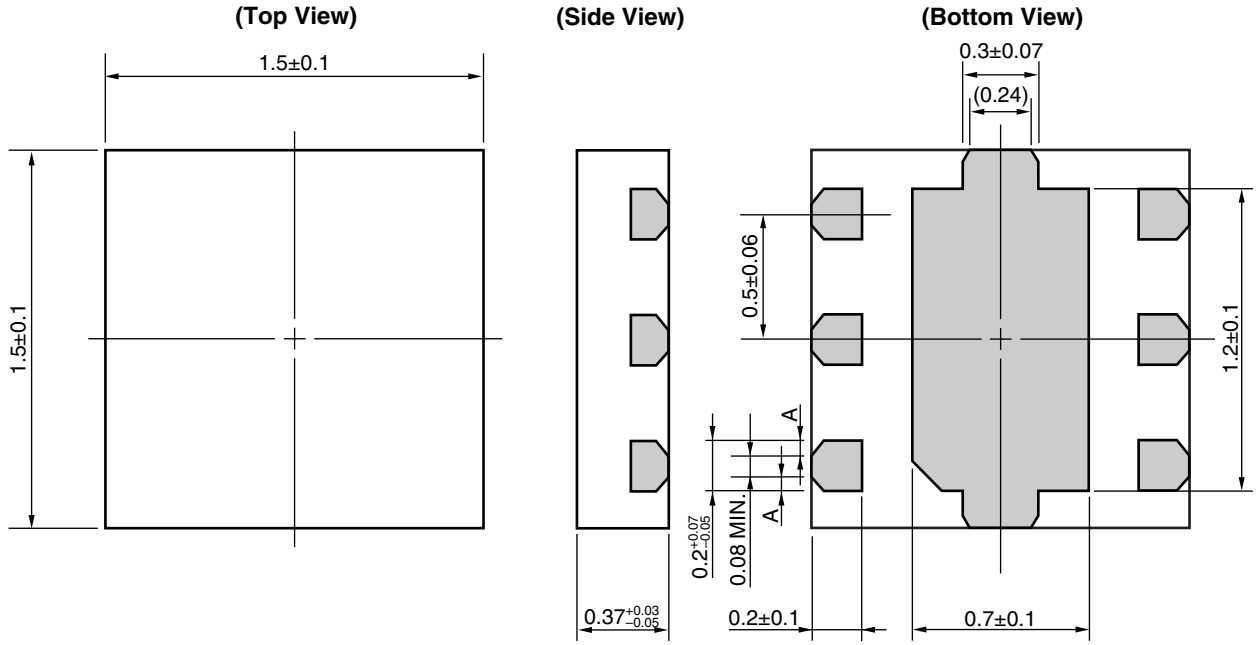


Solder thickness : 0.08 mm

Remark The mounting pad and solder mask layouts in this document is 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 TSON (T6X) (UNIT: mm)



Remark A>0

( ) : Reference value

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).

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M8E0904E

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April 1st, 2010
Renesas Electronics Corporation

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