To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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GaAs INTEGRATED CIRCUIT

μPG2408TK

0.05 to 3.0 GHz SPDT SWITCH

DESCRIPTION

The μPG2408TK is a GaAs MMIC for L, S-band SPDT (Single Pole Double Throw) switch for 2.4 GHz wireless LAN, mobile phone and other L, S-band applications.

This device operates with dual control switching voltages of 2.5 to 5.3 V. This device can operate at frequencies from 0.05 to 3.0 GHz, with low insertion loss and high isolation.

This device is housed in a 6-pin lead-less minimold package (1511 PKG) and 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} = 0.40 dB TYP. @ f = 1.0 GHz
  : L_{ins} = 0.50 dB TYP. @ f = 2.5 GHz
- High isolation : ISL = 27 dB TYP. @ f = 1.0 GHz
  : ISL = 18 dB TYP. @ f = 2.5 GHz
- Handling power : $P_{in\ (0.1\ dB)}$ = +29.0 dBm TYP. @ f = 0.5 to 3.0 GHz
- High-density surface mounting : 6-pin lead-less minimold package (1.5 × 1.1 × 0.55 mm)

APPLICATIONS

- L, S-band digital cellular or cordless telephone
- W-LAN, WLL and Bluetooth™ etc.

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2408TK-E2	μPG2408TK-E2-A	6-pin lead-less minimold (1511 PKG) (Pb-Free)	G5X	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 5 kpcs/reel

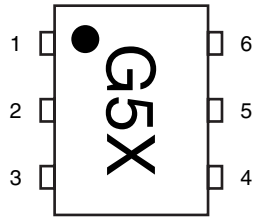
Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPG2408TK

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.

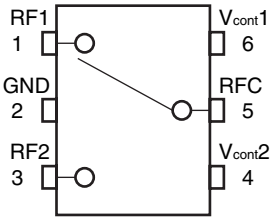
Document No. PG10771EJ01V0DS (1st edition)
Date Published July 2009 NS
Printed in Japan

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

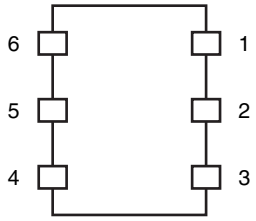
(Top View)



(Top View)



(Bottom View)



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

SW TRUTH TABLE

ON Path	V_{cont1}	$V_{cont}2$
RFC-RF1	Low	High
RFC-RF2	High	Low

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}	+33.0	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	−	3.0	GHz
Switch Control Voltage (H)	$V_{cont\ (H)}$	2.5	3.0	5.3	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, DC blocking capacitors = 56 pF, unless otherwise specified)

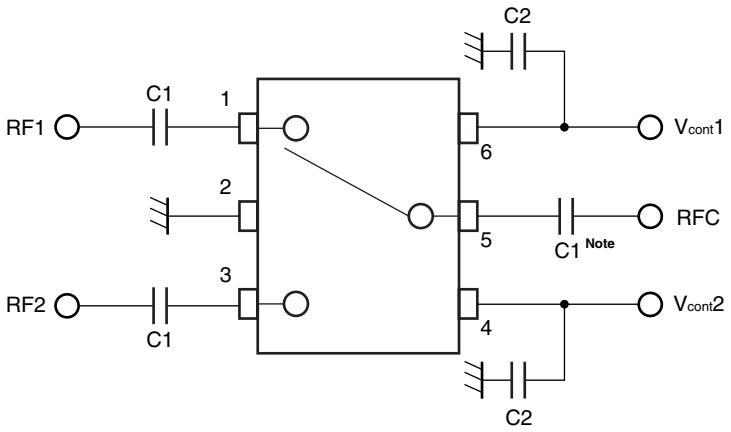
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 0.05 to 0.5 GHz Note 1	–	0.40	0.55	dB
Insertion Loss 2	$L_{ins}2$	f = 0.5 to 1.0 GHz	–	0.40	0.55	dB
Insertion Loss 3	$L_{ins}3$	f = 1.0 to 2.0 GHz	–	0.48	0.63	dB
Insertion Loss 4	$L_{ins}4$	f = 2.0 to 2.5 GHz	–	0.50	0.65	dB
Insertion Loss 5	$L_{ins}5$	f = 2.5 to 3.0 GHz	–	0.56	0.70	dB
Isolation 1	ISL1	f = 0.05 to 0.5 GHz Note 1	24	27	–	dB
Isolation 2	ISL2	f = 0.5 to 1.0 GHz	24	27	–	dB
Isolation 3	ISL3	f = 1.0 to 2.0 GHz	16	19	–	dB
Isolation 4	ISL4	f = 2.0 to 2.5 GHz	15	18	–	dB
Isolation 5	ISL5	f = 2.5 to 3.0 GHz	14	17	–	dB
Input Return Loss 1	$RL_{in}1$	f = 0.05 to 0.5 GHz Note 1	15	20	–	dB
Input Return Loss 2	$RL_{in}2$	f = 0.5 to 3.0 GHz	15	20	–	dB
Output Return Loss 1	$RL_{out}1$	f = 0.05 to 0.5 GHz Note 1	15	20	–	dB
Output Return Loss 2	$RL_{out}2$	f = 0.5 to 3.0 GHz	15	20	–	dB
0.1 dB Loss Compression Input Power Note 2	$P_{in\ (0.1\ dB)}$	f = 2.0/2.5 GHz	+27.0	+29.0	–	dBm
		f = 0.5 to 3.0 GHz	–	+29.0	–	dBm
Input 3rd Order Intercept Point	IIP_3	f = 0.5 to 3.0 GHz, 2 tone, 5 MHz spicing	–	+60	–	dBm
Switch Control Current	I_{cont}	No RF input	–	0.3	20	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	50	500	ns

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

2. $P_{in\ (0.1\ dB)}$ is the measured input power level when the insertion loss increases 0.1 dB more than that of 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. The range of recommended DC blocking capacitor value is less than 100 pF for frequencies above 0.5 GHz, and 1 000pF for frequencies above 0.5 GHz.

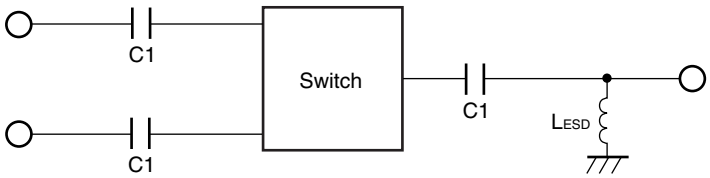
EVALUATION CIRCUIT



Note C1 : 0.05 to 0.5 GHz 1 000 pF
: 0.5 to 3.0 GHz 56 pF
C2 : 1 000 pF

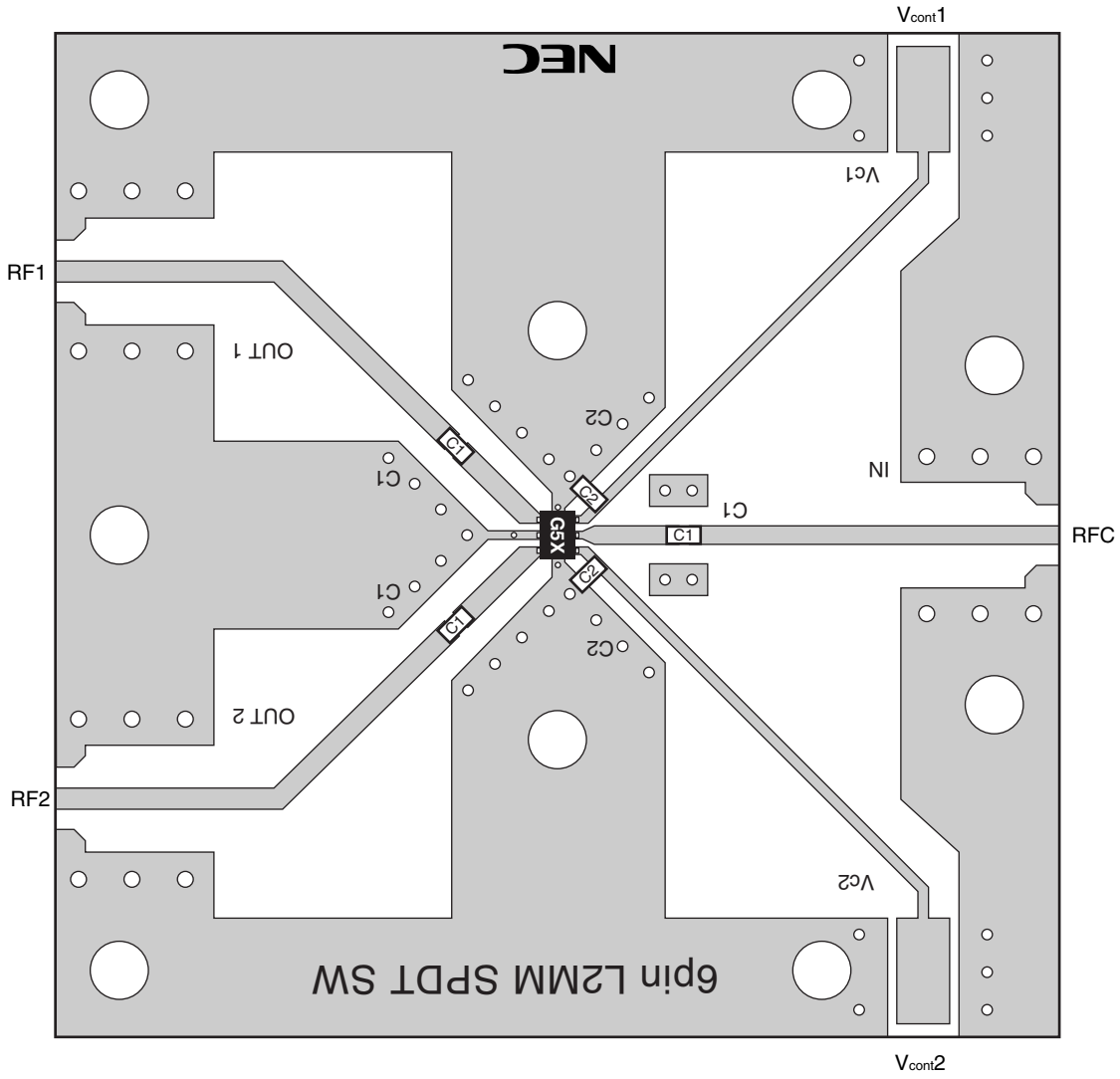
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

APPLICATION INFORMATION



- LESD provides a means to increase the ESD protection on a specific RF port, typically the port attached to the antenna.
- 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.

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

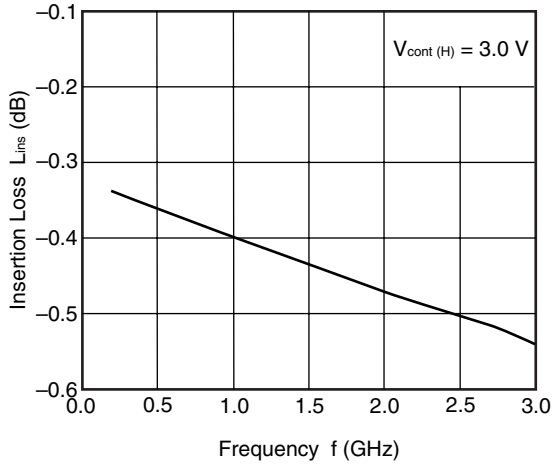


USING THE NEC EVALUATION BOARD

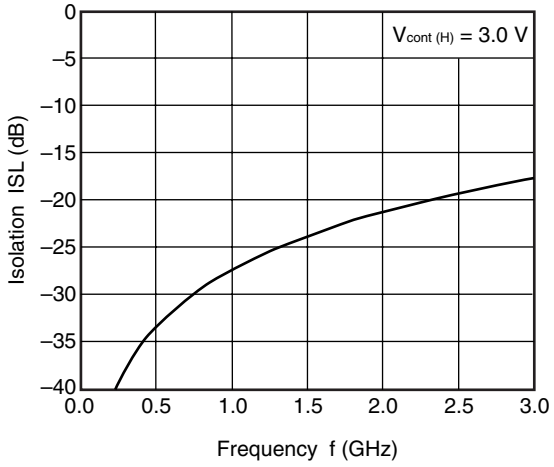
Symbol	Test Conditions	Values
C1	f = 0.05 to 0.5 GHz	1 000 pF
	f = 0.5 to 3.0 GHz	56 pF
C2		1 000 pF

TYPICAL CHARACTERISTICS (T_A = +25°C, DC blocking capacitors = 56 pF, unless otherwise specified)

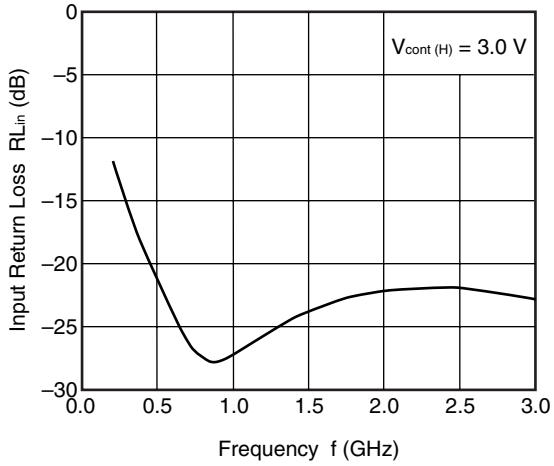
RFC-RF1/RF2
INSERTION LOSS vs. FREQUENCY



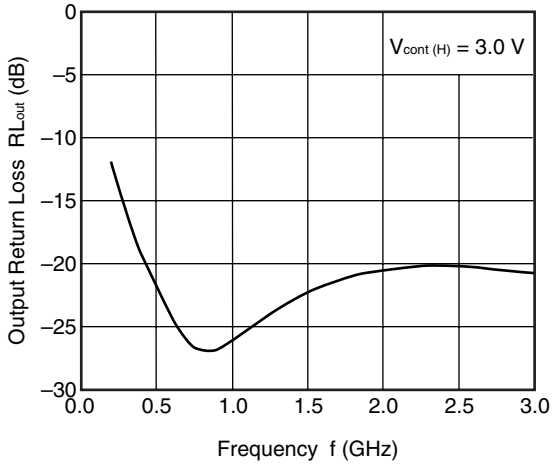
RFC-RF1/RF2
ISOLATION vs. FREQUENCY



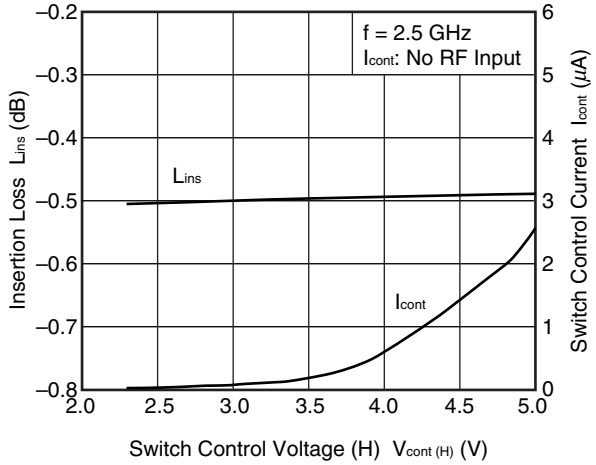
RFC-RF1/RF2
INPUT RETURN LOSS vs. FREQUENCY



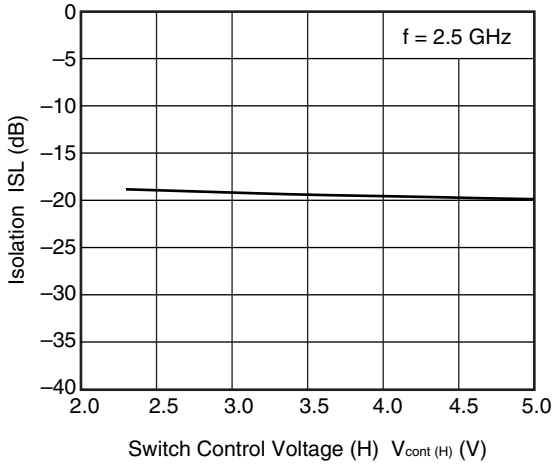
RFC-RF1/RF2
OUTPUT RETURN LOSS vs. FREQUENCY



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

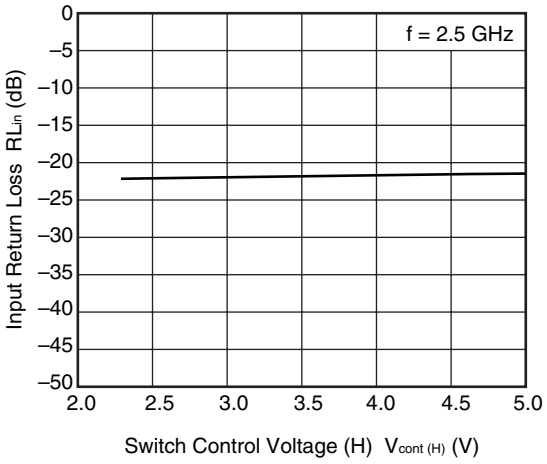


RFC-RF1/RF2 ISOLATION vs.
SWITCH CONTROL VOLTAGE (H)

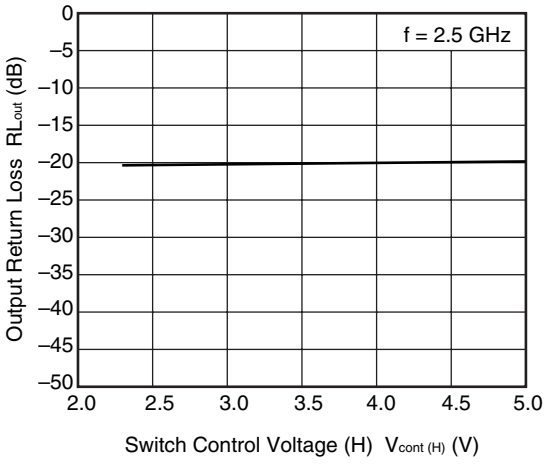


Remark The graphs indicate nominal characteristics.

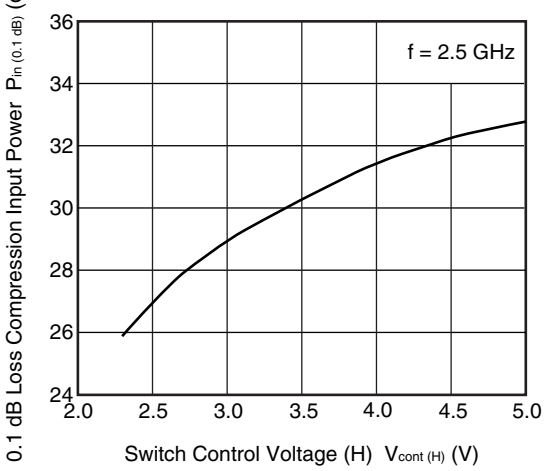
RFC-RF1/RF2 INPUT RETURN LOSS vs. SWITCH CONTROL VOLTAGE (H)



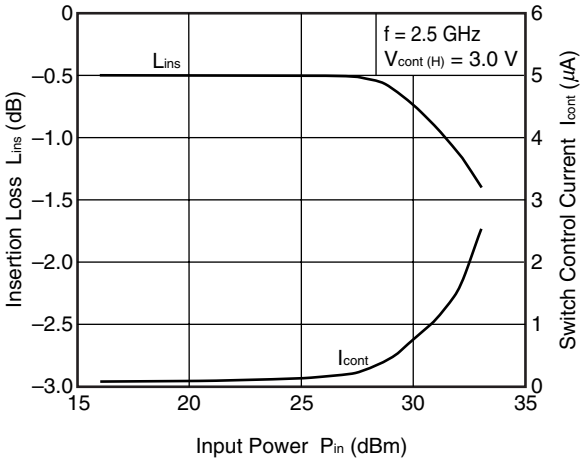
RFC-RF1/RF2 OUTPUT RETURN LOSS vs. SWITCH CONTROL VOLTAGE (H)



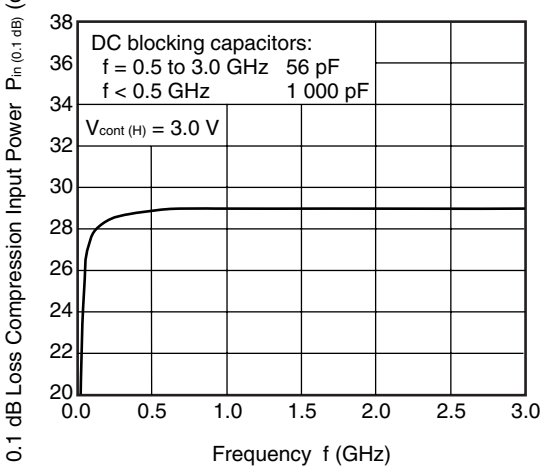
RFC-RF1/RF2 Pin (0.1 dB) vs. SWITCH CONTROL VOLTAGE (H)



RFC-RF1/RF2 INSERTION LOSS, Icont vs. INPUT POWER



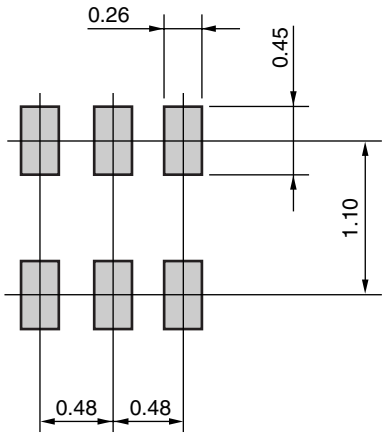
RFC-RF1/RF2 Pin (0.1 dB) vs. FREQUENCY



Remark The graphs indicate nominal characteristics.

MOUNTING PAD LAYOUT DIMENSIONS

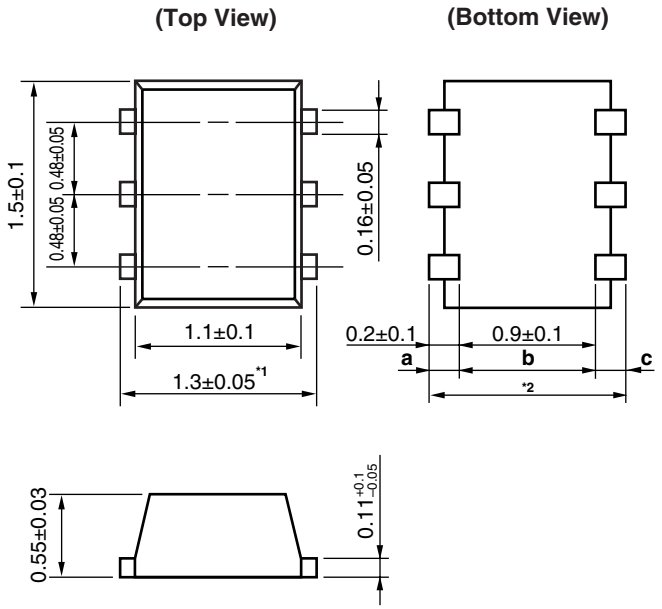
6-PIN LEAD-LESS MINIMOLD (1511 PKG) (UNIT: mm)



Remark The mounting pad layout 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 LEAD-LESS MINIMOLD (1511 PKG) (UNIT: mm)



Remark Dimension*1 is bigger than dimension*2 (dimension*2 = **a** + **b** + **c**).

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).

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M8E0904E

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