

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
μPG2214TB

L, S-BAND SPDT SWITCH

DESCRIPTION

The μPG2214TB is a GaAs MMIC for L, S-band SPDT (Single Pole Double Throw) switch which was developed for mobile phone and another L, S-band application.

This device can operate 2 control switching by control voltage 1.8 to 5.3 V. This device can operate frequency from 0.05 to 3.0 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin super minimold package. And this package is able to high-density surface mounting.

FEATURES

- Switch control voltage : $V_{cont(H)} = 1.8$ to 5.3 V (3.0 V TYP.)
: $V_{cont(L)} = -0.2$ to $+0.2$ V (0 V TYP.)
- Low insertion loss : $L_{ins1} = 0.25$ dB TYP. @ $f = 0.05$ to 0.5 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $L_{ins2} = 0.25$ dB TYP. @ $f = 0.5$ to 1.0 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $L_{ins3} = 0.30$ dB TYP. @ $f = 1.0$ to 2.0 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $L_{ins4} = 0.35$ dB TYP. @ $f = 2.0$ to 2.5 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $L_{ins5} = 0.35$ dB TYP. @ $f = 2.5$ to 3.0 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
- High isolation : $ISL1 = 32$ dB TYP. @ $f = 0.05$ to 0.5 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $ISL2 = 28$ dB TYP. @ $f = 0.5$ to 1.0 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $ISL3 = 27$ dB TYP. @ $f = 1.0$ to 2.0 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $ISL4 = 26$ dB TYP. @ $f = 2.0$ to 2.5 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $ISL5 = 24$ dB TYP. @ $f = 2.5$ to 3.0 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
- Handling power : $P_{in(1dB)} = +27.0$ dBm TYP. @ $f = 0.5$ to 3.0 GHz, $V_{cont(H)} = 3.0$ V, $V_{cont(L)} = 0$ V
: $P_{in(1dB)} = +20.0$ dBm TYP. @ $f = 0.5$ to 3.0 GHz, $V_{cont(H)} = 1.8$ V, $V_{cont(L)} = 0$ V
- High-density surface mounting : 6-pin super minimold package ($2.0 \times 1.25 \times 0.9$ mm)

APPLICATIONS

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

★ **ORDERING INFORMATION**

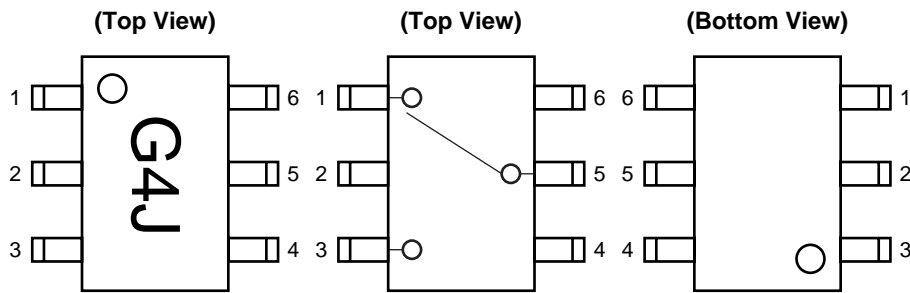
Part Number	Package	Marking	Supplying Form
μPG2214TB-E4	6-pin super minimold (2012)	G4J	<ul style="list-style-type: none"> • Embossed tape 8 mm wide • Pin 4, 5, 6 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPG2214TB

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	OUTPUT1
2	GND
3	OUTPUT2
4	V _{cont2}
5	INPUT
6	V _{cont1}

TRUTH TABLE

V _{cont1}	V _{cont2}	INPUT-OUTPUT1	INPUT-OUTPUT2
Low	High	ON	OFF
High	Low	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}	+30	dBm
Operating Ambient Temperature	T _A	-45 to +85	°C
Storage Temperature	T _{stg}	-55 to +150	°C

Note |V_{cont1} - V_{cont2}| ≤ 6.0 V

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

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	V _{cont (H)}	1.8	3.0	5.3	V
Switch Control Voltage (L)	V _{cont (L)}	-0.2	0	0.2	V

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{cont} (H) = 3.0 V, V_{cont} (L) = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	L _{ins1}	f = 0.05 to 0.5 GHz ^{Note 1}	–	0.25	0.45	dB
Insertion Loss 2	L _{ins2}	f = 0.5 to 1.0 GHz	–	0.25	0.45	dB
Insertion Loss 3	L _{ins3}	f = 1.0 to 2.0 GHz	–	0.30	0.50	dB
Insertion Loss 4	L _{ins4}	f = 2.0 to 2.5 GHz	–	0.35	0.55	dB
Insertion Loss 5	L _{ins5}	f = 2.5 to 3.0 GHz	–	0.35	0.60	dB
Isolation 1	ISL1	f = 0.05 to 0.5 GHz ^{Note 1}	29	32	–	dB
Isolation 2	ISL2	f = 0.5 to 1.0 GHz	25	28	–	dB
Isolation 3	ISL3	f = 1.0 to 2.0 GHz	24	27	–	dB
Isolation 4	ISL4	f = 2.0 to 2.5 GHz	23	26	–	dB
Isolation 5	ISL5	f = 2.5 to 3.0 GHz	21	24	–	dB
Input Return Loss 1	RL _{in1}	f = 0.05 to 0.5 GHz ^{Note 1}	15	20	–	dB
Input Return Loss 2	RL _{in2}	f = 0.5 to 3.0 GHz	15	20	–	dB
Output Return Loss 1	RL _{out1}	f = 0.05 to 0.5 GHz ^{Note 1}	15	20	–	dB
Output Return Loss 2	RL _{out2}	f = 0.5 to 3.0 GHz	15	20	–	dB
0.1 dB Loss Compression	P _{in (0.1 dB)}	f = 2.0/2.5 GHz	+21.0	+23.0	–	dBm
Input Power ^{Note 2}		f = 0.5 to 3.0 GHz	–	+23.0	–	dBm
1 dB Loss Compression	P _{in (1 dB)}	f = 0.5 to 3.0 GHz	–	+27.0	–	dBm
Input Power ^{Note 3}						
2nd Harmonics	2f ₀	f = 2.0 GHz, P _{in} = +15 dBm	–	–55	–47	dBc
		f = 2.5 GHz, P _{in} = +15 dBm	–	–55	–47	dBc
3rd Harmonics	3f ₀	f = 2.0 GHz, P _{in} = +15 dBm	–	–55	–47	dBc
		f = 2.5 GHz, P _{in} = +15 dBm	–	–55	–47	dBc
Intermodulation Intercept Point	IIP ₃	f = 0.5 to 3.0 GHz, 2 tone, P _{in} = +16 dBm, 5 MHz spicing	–	+58	–	dBm
Switch Control Current	I _{cont}		–	4	20	μA
Switch Control Speed	t _{sw}	50% CTL to 90/10% RF	–	20	200	ns

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

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

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

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{cont} (H) = 1.8 V, V_{cont} (L) = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 6	L _{ins6}	f = 0.05 to 0.5 GHz ^{Note 1}	–	0.25	0.50	dB
Insertion Loss 7	L _{ins7}	f = 0.5 to 1.0 GHz	–	0.25	0.50	dB
Insertion Loss 8	L _{ins8}	f = 1.0 to 2.0 GHz	–	0.30	0.55	dB
Insertion Loss 9	L _{ins9}	f = 2.0 to 2.5 GHz	–	0.35	0.60	dB
Insertion Loss 10	L _{ins10}	f = 2.5 to 3.0 GHz	–	0.35	0.65	dB
Isolation 6	ISL6	f = 0.05 to 0.5 GHz ^{Note 1}	27	30	–	dB
Isolation 7	ISL7	f = 0.5 to 2.0 GHz	23	27	–	dB
Isolation 8	ISL8	f = 2.0 to 2.5 GHz	21	25	–	dB
Isolation 9	ISL9	f = 2.5 to 3.0 GHz	20	24	–	dB
Input Return Loss 3	RL _{in3}	f = 0.05 to 3.0 GHz ^{Note 1}	15	20	–	dB
Output Return Loss 3	RL _{out3}	f = 0.05 to 3.0 GHz ^{Note 1}	15	20	–	dB
0.1 dB Loss Compression	P _{in (0.1 dB)}	f = 2.0/2.5 GHz	+14.0	+17.0	–	dBm
Input Power ^{Note 2}		f = 0.5 to 3.0 GHz	–	+17.0	–	dBm
1 dB Loss Compression	P _{in (1 dB)}	f = 0.5 to 3.0 GHz	–	+20.0	–	dBm
Input Power ^{Note 3}						
Switch Control Current	I _{cont}		–	4	20	μA
Switch Control Speed	t _{sw}	50% CTL to 90/10% RF	–	20	200	ns

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

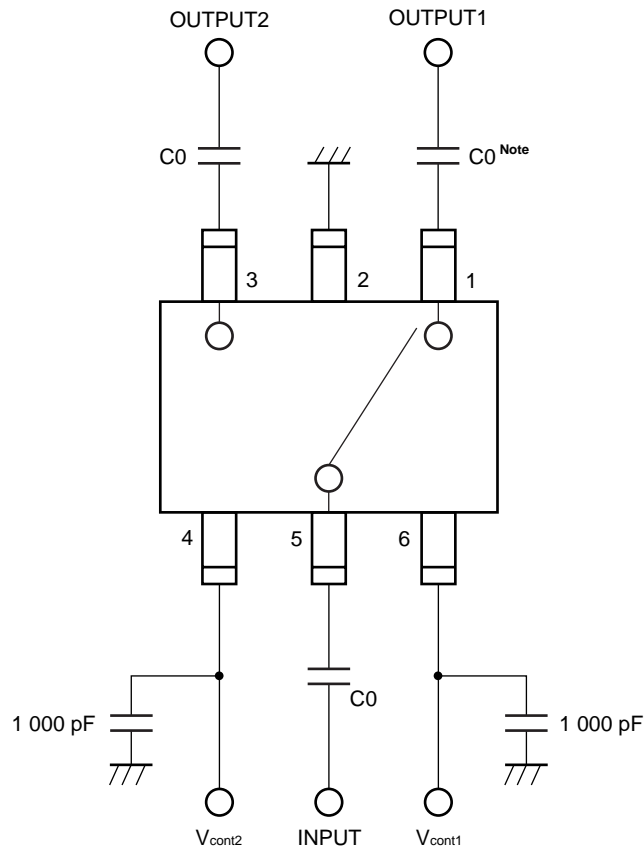
2. P_{in (0.1 dB)} is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

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

Caution This device is used it is necessary to use DC cut capacitors.

The value of DC cut 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 cut capacitor value is less than 100 pF.

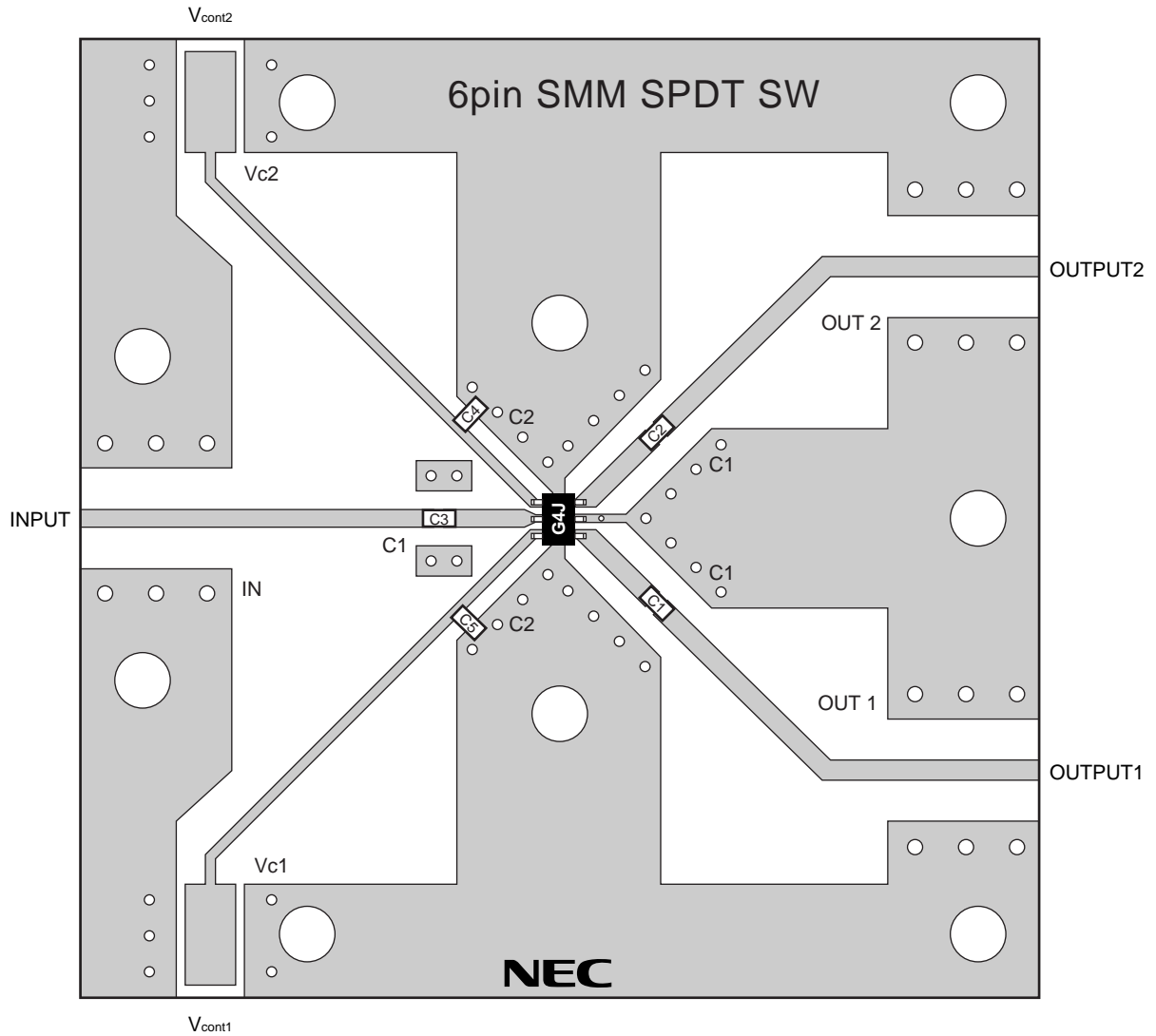
EVALUATION CIRCUIT



Note C0 : 0.05 to 0.5 GHz 1 000 pF
 : 0.5 to 3.0 GHz 100 pF

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

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

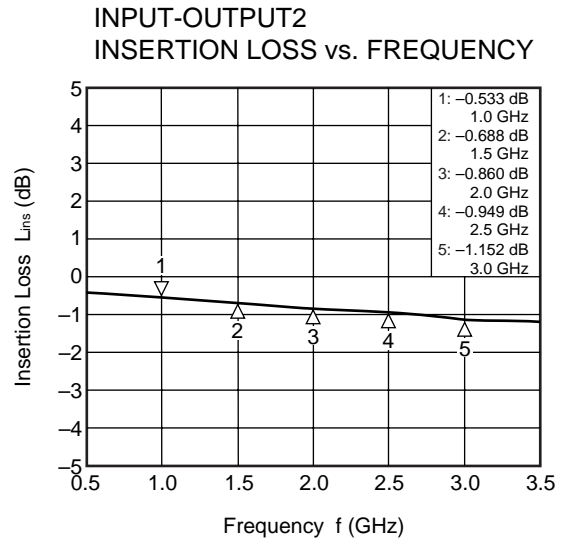
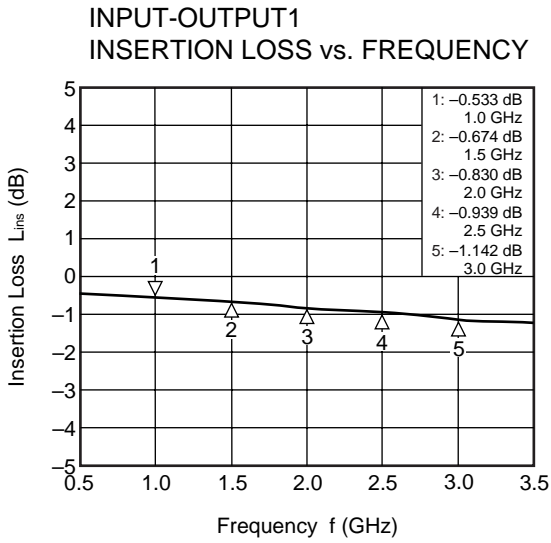


USING THE NEC EVALUATION BOARD

Symbol	Values
C1, C2, C3	100 pF
C4, C5	1 000 pF

★ TYPICAL CHARACTERISTICS

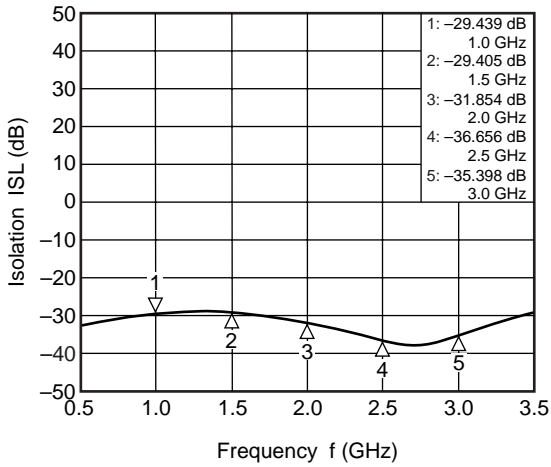
(TA = +25°C, Vcont (H) = 3.0 V, Vcont (L) = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)



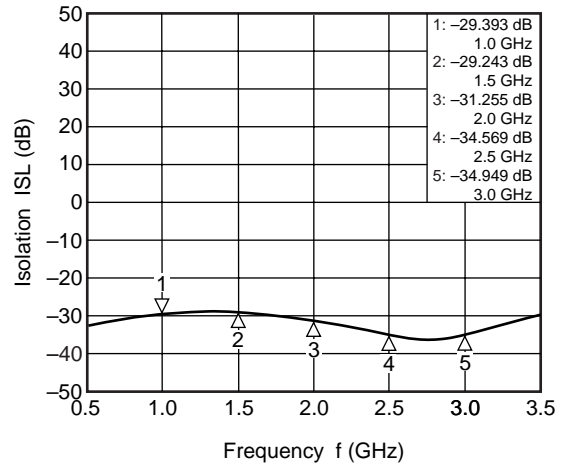
Remark The graphs indicate nominal characteristics.

Caution These characteristics values include the losses of the NEC evaluation board.

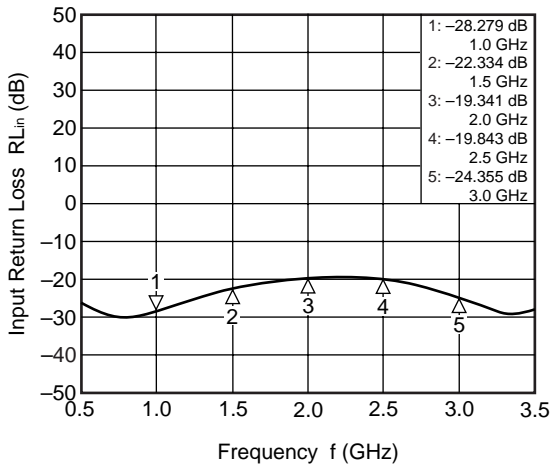
INPUT-OUTPUT1
ISOLATION vs. FREQUENCY



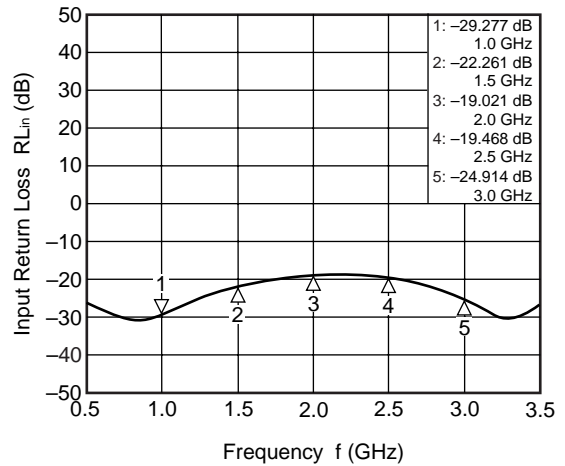
INPUT-OUTPUT2
ISOLATION vs. FREQUENCY



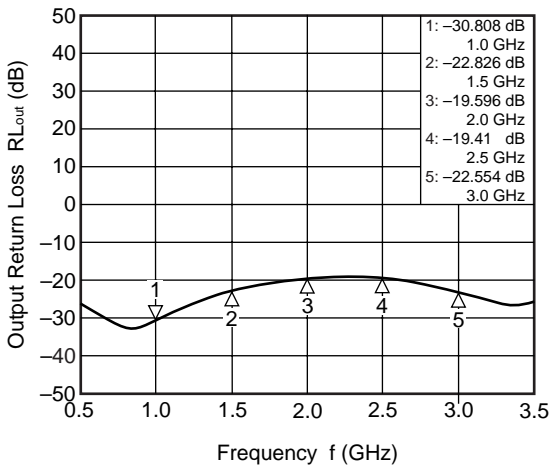
INPUT-OUTPUT1
INPUT RETURN LOSS vs. FREQUENCY



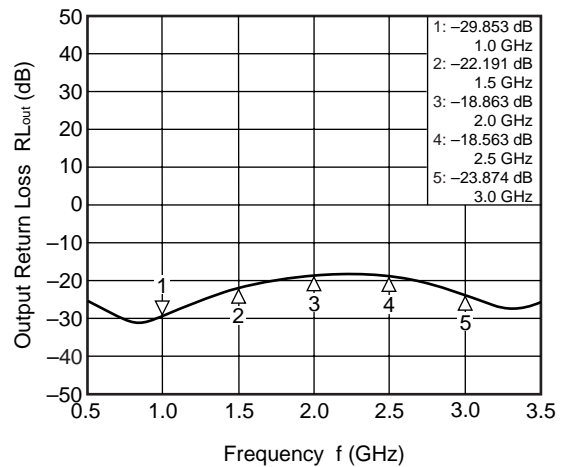
INPUT-OUTPUT2
INPUT RETURN LOSS vs. FREQUENCY



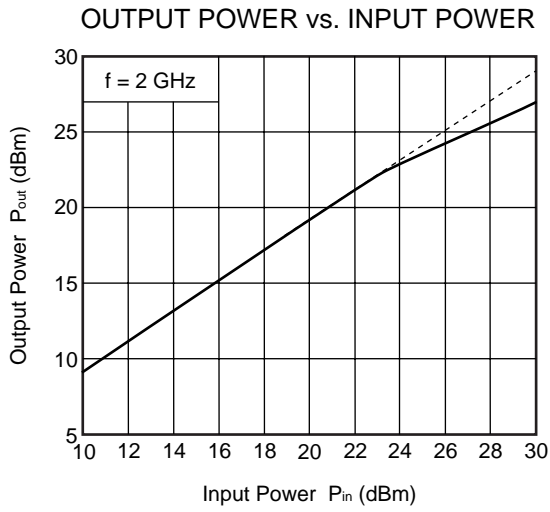
INPUT-OUTPUT1
OUTPUT RETURN LOSS vs. FREQUENCY



INPUT-OUTPUT2
OUTPUT RETURN LOSS vs. FREQUENCY



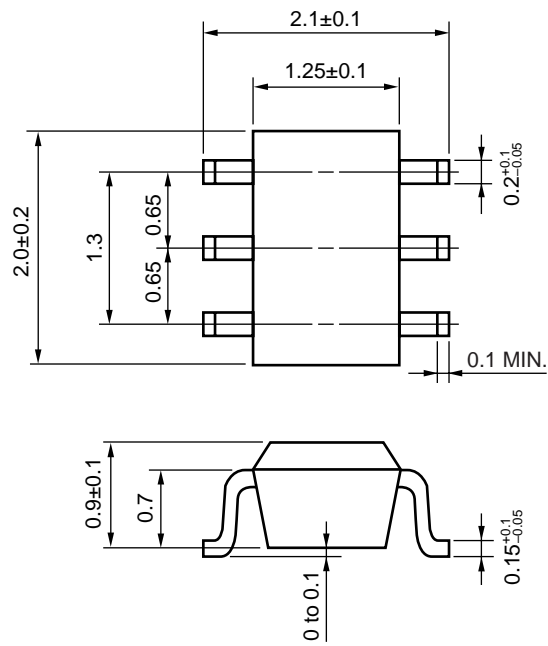
Remark The graphs indicate nominal characteristics.



Remark The graph indicate nominal characteristics.

PACKAGE DIMENSIONS

6-PIN SUPER MINIMOLD (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
VPS	Peak temperature (package surface temperature) : 215°C or below Time at temperature of 200°C or higher : 25 to 40 seconds Preheating time at 120 to 150°C : 30 to 60 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	VP215
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 (pin 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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 "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
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M8E 00.4-0110

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