

μPG2214TB

Data Sheet
R09DS0050EJ0400
Rev.4.00
Sep 10, 2012

GaAs Integrated Circuit for 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.

<R> ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPG2214TB-E4	6-pin super minimold (2012) (Pb-Free)	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.

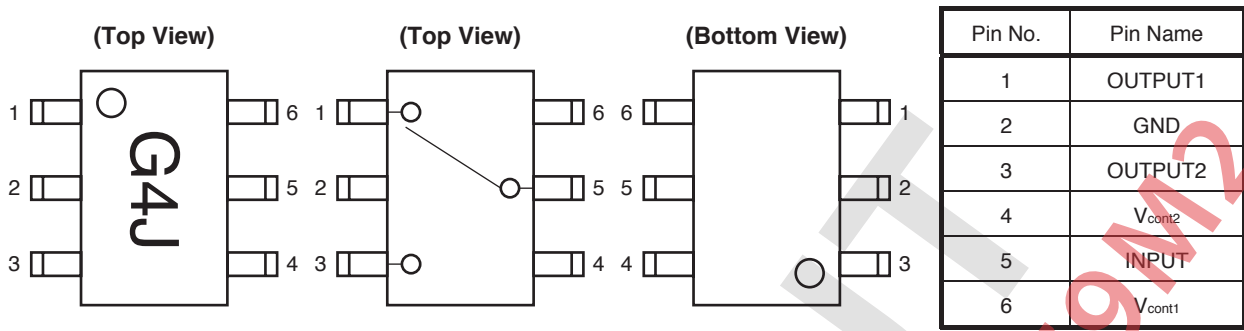
Part number for sample order: μPG2214TB-A

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

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



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 Input Power ^{Note 2}	P _{in} (0.1 dB)	f = 2.0/2.5 GHz	+21.0	+23.0	–	dBm
		f = 0.5 to 3.0 GHz	–	+23.0	–	dBm
1 dB Loss Compression Input Power ^{Note 3}	P _{in} (1 dB)	f = 0.5 to 3.0 GHz	–	+27.0	–	dBm
2nd Harmonics	2f _o	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 _o	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

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

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 6	$L_{\text{ins}6}$	$f = 0.05$ to 0.5 GHz ^{Note 1}	–	0.25	0.50	dB
Insertion Loss 7	$L_{\text{ins}7}$	$f = 0.5$ to 1.0 GHz	–	0.25	0.50	dB
Insertion Loss 8	$L_{\text{ins}8}$	$f = 1.0$ to 2.0 GHz	–	0.30	0.55	dB
Insertion Loss 9	$L_{\text{ins}9}$	$f = 2.0$ to 2.5 GHz	–	0.35	0.60	dB
Insertion Loss 10	$L_{\text{ins}10}$	$f = 2.5$ 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	$RL_{\text{in}3}$	$f = 0.05$ to 3.0 GHz ^{Note 1}	15	20	–	dB
Output Return Loss 3	$RL_{\text{out}3}$	$f = 0.05$ to 3.0 GHz ^{Note 1}	15	20	–	dB
0.1 dB Loss Compression Input Power ^{Note 2}	$P_{\text{in}(0.1\text{ dB})}$	$f = 2.0/2.5\text{ GHz}$	+14.0	+17.0	–	dBm
		$f = 0.5$ to 3.0 GHz	–	+17.0	–	dBm
1 dB Loss Compression Input Power ^{Note 3}	$P_{\text{in}(1\text{ dB})}$	$f = 0.5$ to 3.0 GHz	–	+20.0	–	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

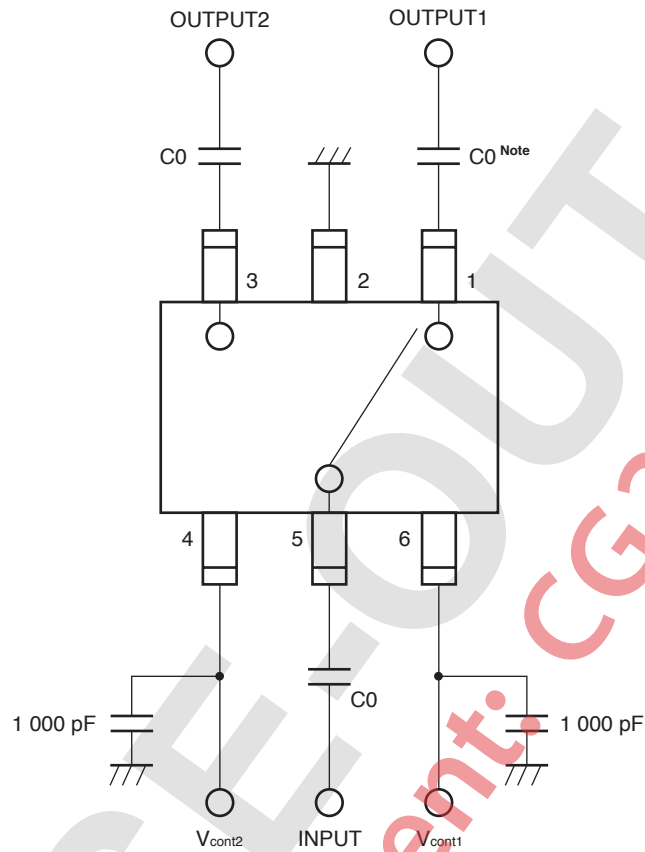
2. $P_{\text{in}(0.1\text{ dB})}$ is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

3. $P_{\text{in}(1\text{ dB})}$ 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.

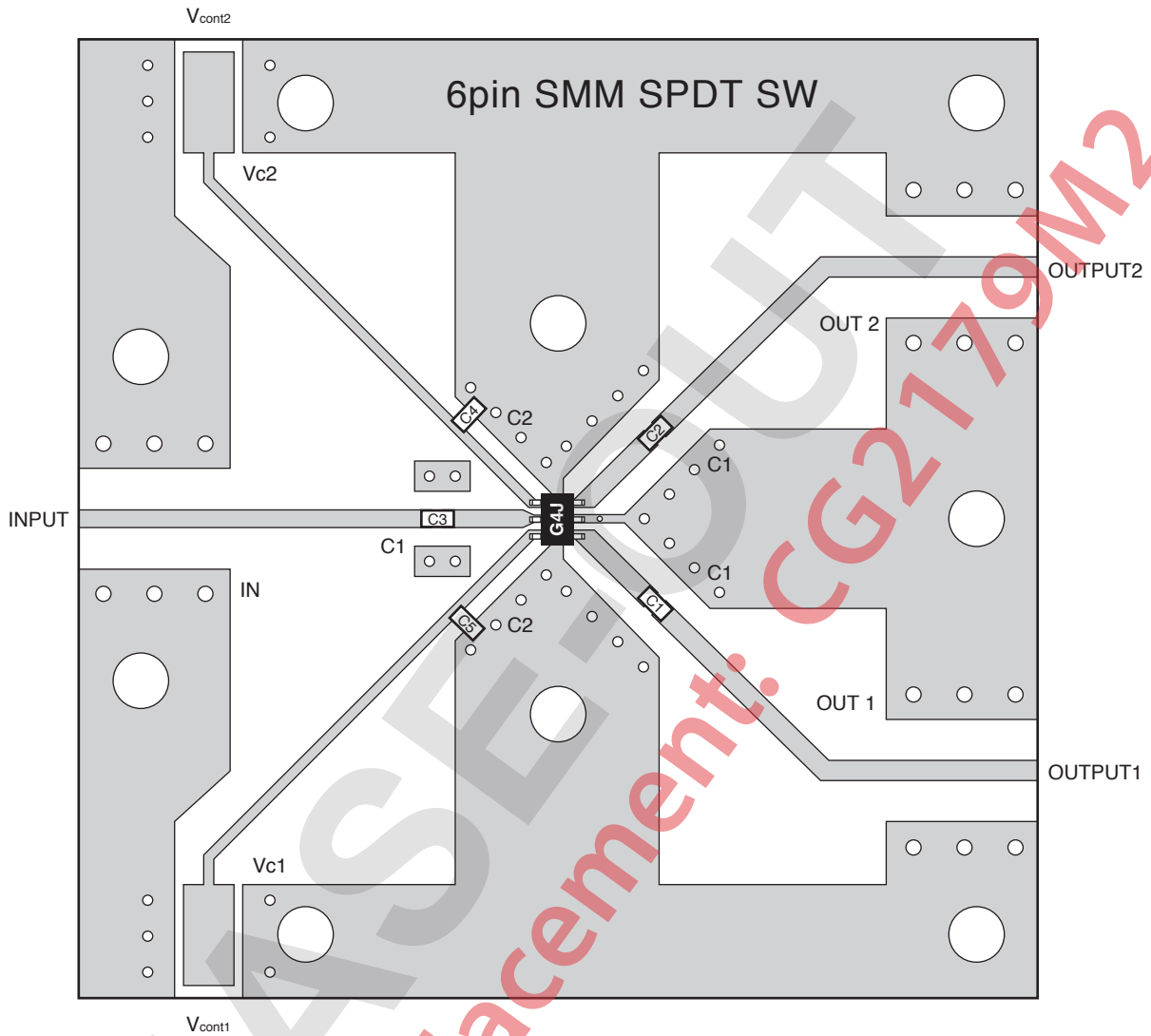
EVALUATION CIRCUIT



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.

<R> ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



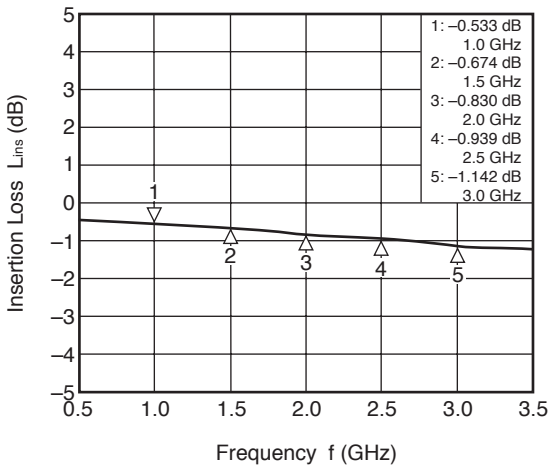
USING THE NEC EVALUATION BOARD

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

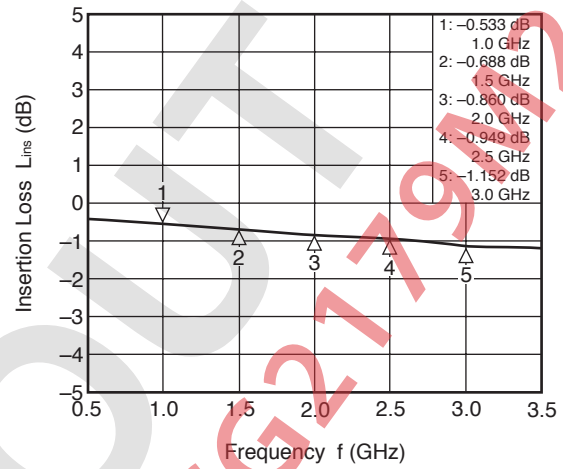
TYPICAL CHARACTERISTICS

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

INPUT-OUTPUT1
INSERTION LOSS vs. FREQUENCY



INPUT-OUTPUT2
INSERTION LOSS vs. FREQUENCY

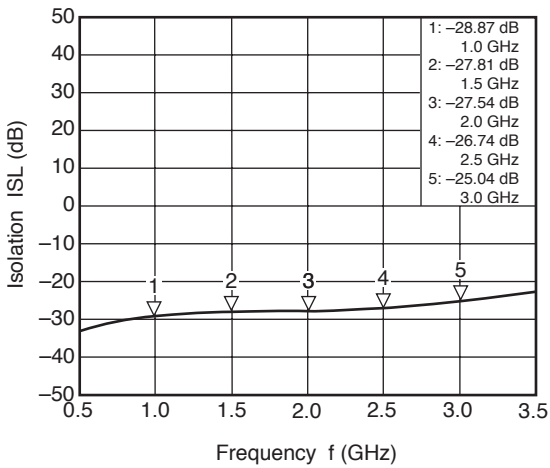


Remark The graphs indicate nominal characteristics.

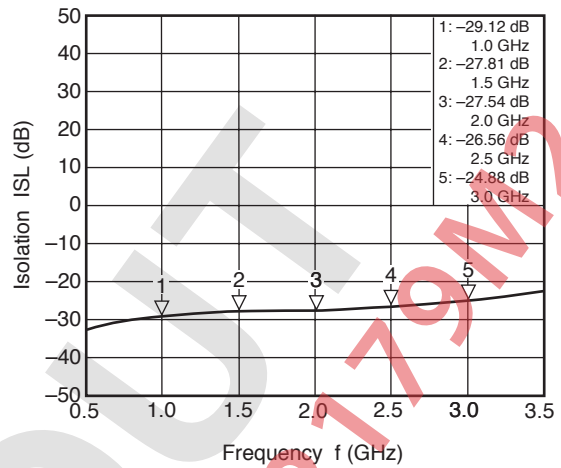
Caution These characteristics values include the losses of the NEC evaluation board.

<R>

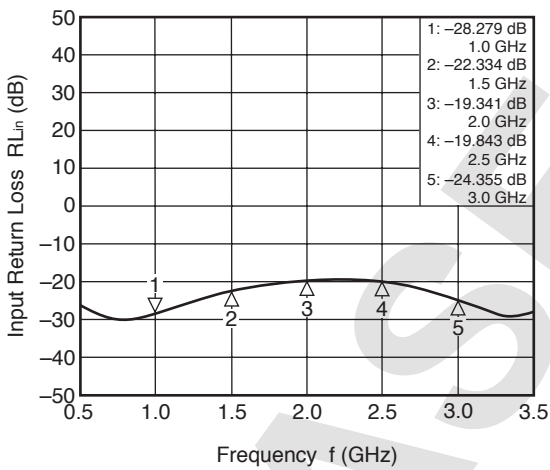
**INPUT-OUTPUT1
ISOLATION vs. FREQUENCY**



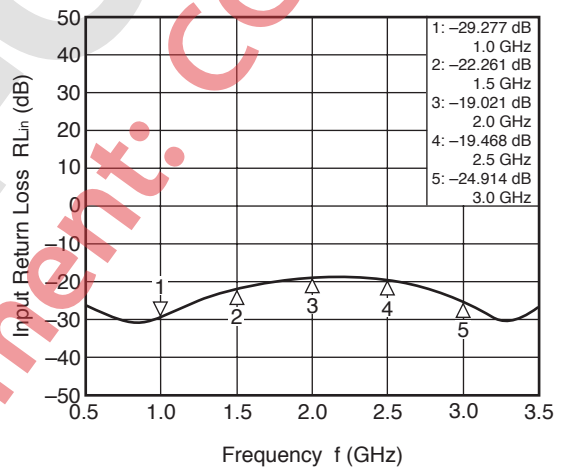
**INPUT-OUTPUT2
ISOLATION vs. FREQUENCY**



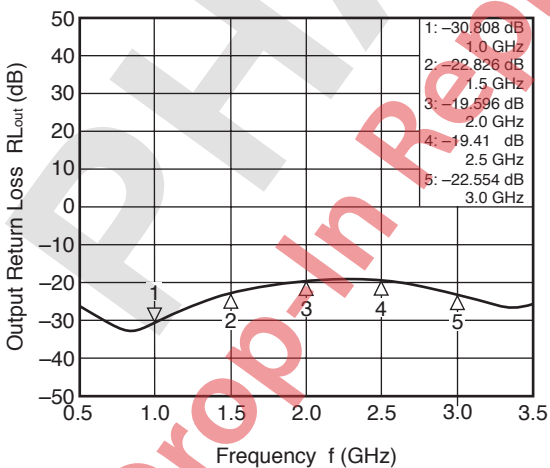
**INPUT-OUTPUT1
INPUT RETURN LOSS vs. FREQUENCY**



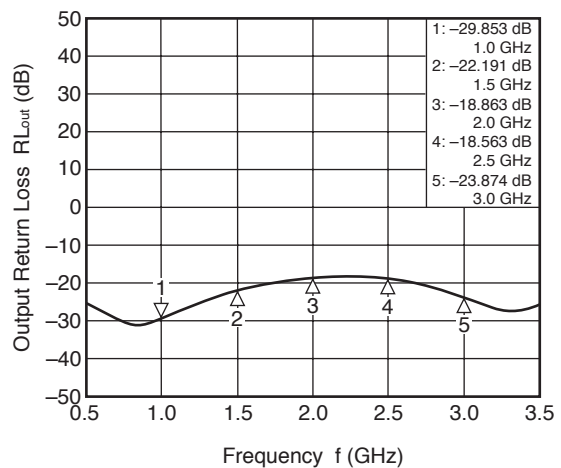
**INPUT-OUTPUT2
INPUT RETURN LOSS vs. FREQUENCY**



**INPUT-OUTPUT1
OUTPUT RETURN LOSS vs. FREQUENCY**

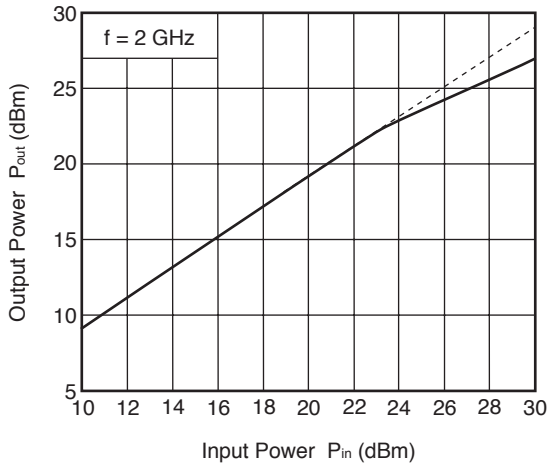


**INPUT-OUTPUT2
OUTPUT RETURN LOSS vs. FREQUENCY**



Remark The graphs indicate nominal characteristics.

OUTPUT POWER vs. INPUT POWER



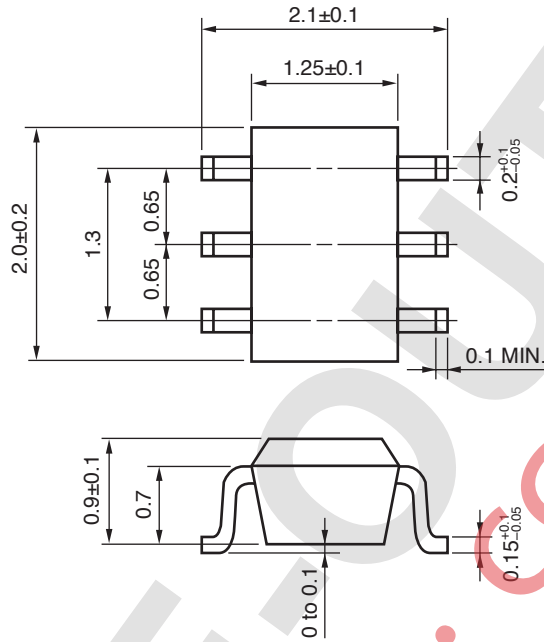
Remark The graph indicate nominal characteristics.

PHASE-OUT

Drop-In Replacement: CG2179M2

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).

Caution GaAs Products	<p>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.</p> <ul style="list-style-type: none">• 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.<ol style="list-style-type: none">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	μPG2214TB Data Sheet
-------------------------	-----------------------------

Rev.	Date	Description	
		Page	Summary
1.00	Mar 10, 2004	–	First edition issued
2.00	Apr 12, 2004	pp.3,4	Modification of ELECTRICAL CHARACTERISTICS
3.00	Oct 20, 2004	p.1	Modification of ORDERING INFORMATION
		pp.7 to 9	Addition of TYPICAL CHARACTERISTICS
4.00	Sep 10, 2012	p.1	Modification of ORDERING INFORMATION
		p.6	Modification of ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD
		p.8	Modification of TYPICAL CHARACTERISTICS

PHASE-OUT
Drop-In Replacement: CG2179M2

All trademarks and registered trademarks are the property of their respective owners.

NOTICE

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. California Eastern Laboratories and Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
2. California Eastern Laboratories has used reasonable care in preparing the information included in this document, but California Eastern Laboratories does not warrant that such information is error free. California Eastern Laboratories and Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
3. California Eastern Laboratories and Renesas Electronics do not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of California Eastern Laboratories or Renesas Electronics or others.
4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. California Eastern Laboratories and Renesas Electronics assume no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc. "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc. Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. California Eastern Laboratories and Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by California Eastern Laboratories or Renesas Electronics.
6. You should use the Renesas Electronics products described in this document within the range specified by California Eastern Laboratories, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. California Eastern Laboratories shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
8. Please contact a California Eastern Laboratories sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. California Eastern Laboratories and Renesas Electronics assume no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
10. It is the responsibility of the buyer or distributor of California Eastern Laboratories, who distributes, disposes of, or otherwise places the Renesas Electronics product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, California Eastern Laboratories and Renesas Electronics assume no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of California Eastern Laboratories.
12. Please contact a California Eastern Laboratories sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

NOTE 1: "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

NOTE 2: "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

NOTE 3: Products and product information are subject to change without notice.

CEL Headquarters • 4590 Patrick Henry Drive, Santa Clara, CA 95054 • Phone (408) 919-2500 • www.cel.com

For a complete list of sales offices, representatives and distributors,
Please visit our website: www.cel.com/contactus