

GaAs INTEGRATED CIRCUIT

μ PG2106TB, μ PG2110TB

L-BAND PA DRIVER AMPLIFIER

DESCRIPTION

The μ PG2106TB and μ PG2110TB are GaAs MMIC for PA driver amplifier with variable gain function which were developed for PDC (Personal Digital Cellular in Japan) and another L-band application. The device can operate with 3.0 V, having the high gain and low distortion. The μ PG2106TB is for 800 MHz band application, and the μ PG2110TB is for 1.5 GHz band application.

FEATURES

- Low operation voltage : $V_{DD1} = V_{DD2} = 3.0$ V
- f_{RF} : 889 to 960 MHz, 1429 to 1453 MHz @ $P_{out} = +8$ dBm
- Low distortion : $P_{adj1} = -60$ dBc TYP. @ $V_{DD} = 3.0$ V, $P_{out} = +8$ dBm, $V_{AGC} = 2.5$ V
External input and output matching
- Low operation current : $I_{DD} = 25$ mA TYP. @ $V_{DD} = 3.0$ V, $P_{out} = +8$ dBm, $V_{AGC} = 2.5$ V
External input and output matching
- Variable gain control function : $\Delta G = 40$ dB TYP. @ $V_{AGC} = 0.5$ to 2.5 V
External input and output matching
- 6-pin super minimold package

APPLICATION

- Digital Cellular : PDC, IS-136 etc.

ORDERING INFORMATION (PLAN)

Part Number	Package	Supplying Form
μ PG2106TB-E3 μ PG2110TB-E3	6-pin super minimold	Carrier tape width is 8 mm. Qty 3 kp/reel.

Remark To order evaluation samples, please contact your local NEC sales office. (Part number for sample order: μ PG2106TB, μ PG2110TB)

ABSOLUTE MAXIMUM RATINGS ($T_A = +25$ °C)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD1}, V_{DD2}	6.0	V
AGC Control Voltage	V_{AGC}	6.0	V
Input Power	P_{in}	-8	dBm
Total Power Dissipation	P_{tot}	140 ^{Note}	mW
Operating Ambient Temperature	T_A	-30 to +90	°C
Storage Temperature	T_{stg}	-35 to +150	°C

Note Mounted on a $50 \times 50 \times 1.6$ mm double copper clad epoxy glass PWB, $T_A = +85$ °C

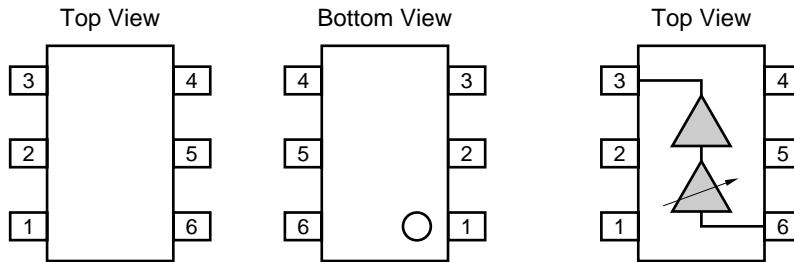
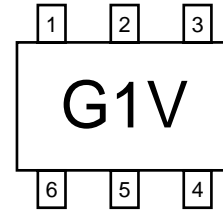
Caution The IC must be handled with care to prevent static discharge because its circuit composed of GaAs HJ-FET.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

[μPG2106TB]

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

Pin No.	Connection	Pin No.	Connection
1	V _{DD1}	4	V _{AGC}
2	GND	5	GND
3	V _{DD2} & OUT	6	IN



RECOMMENDED OPERATING CONDITIONS (T_A = +25 °C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{DD1} , V _{DD2}	+2.7	+3.0	+3.3	V
Input Power	P _{in}	–	–18	–10	dBm
AGC Control Voltage	V _{AGC}	0	–	2.5	V

ELECTRICAL CHARACTERISTICS

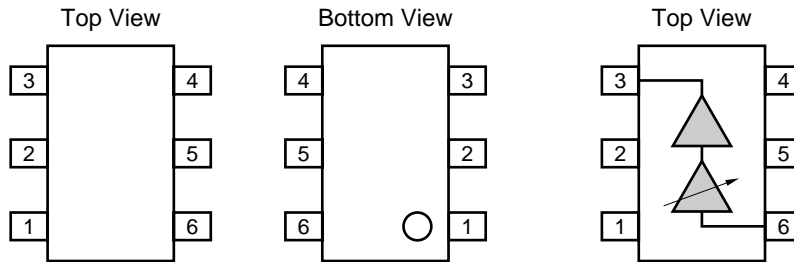
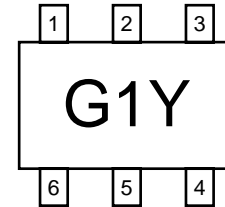
(Unless otherwise specified, T_A = +25 °C, V_{DD1} = V_{DD2} = +3.0 V, π/4DQPSK modulated signal input, External input and output matching)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Operating Frequency	f		889	–	960	MHz
Power Gain	G _p	P _{in} = –18 dBm, V _{AGC} = 2.5 V	26	30	–	dB
Total Current	I _{DD}	P _{out} = +8 dBm, V _{AGC} = 2.5 V	–	25	35	mA
Adjacent Channel Power Leakage 1	P _{adj1}	P _{out} = +8 dBm, V _{AGC} = 2.5 V Δf = ±50 kHz, 21 kHz Band Width	–	–60	–55	dBc
Adjacent Channel Power Leakage 2	P _{adj2}	P _{out} = +8 dBm, V _{AGC} = 2.5 V Δf = ±100 kHz, 21 kHz Band Width	–	–70	–65	
Variable Gain Range	ΔG	P _{in} = –18 dBm, V _{AGC} = 0.5 to 2.5 V	35	40	–	dB
AGC Control Current	I _{AGC}	V _{AGC} = 0.5 to 2.5 V	–	200	500	μA

[μPG2110TB]

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

Pin No.	Connection	Pin No.	Connection
1	V _{DD1}	4	V _{AGC}
2	GND	5	GND
3	V _{DD2} & OUT	6	IN



RECOMMENDED OPERATING CONDITIONS (T_A = +25 °C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{DD1} , V _{DD2}	+2.7	+3.0	+3.3	V
Input Power	P _{in}	–	–18	–10	dBm
AGC Control Voltage	V _{AGC}	0	–	2.5	V

ELECTRICAL CHARACTERISTICS

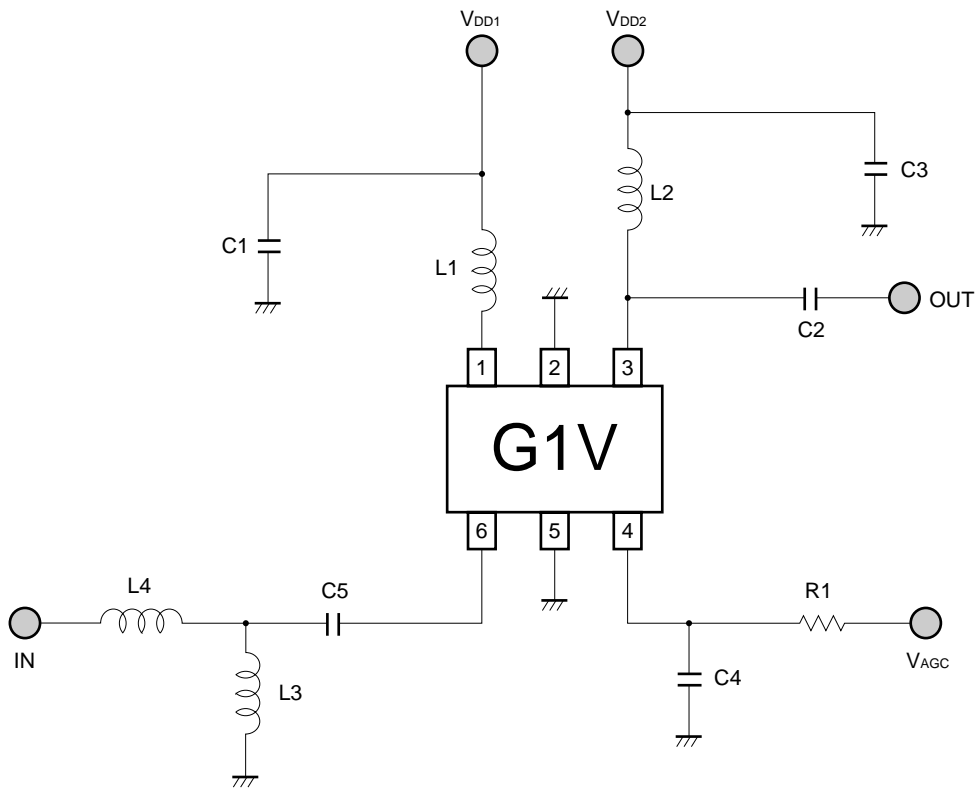
(Unless otherwise specified, T_A = +25 °C, V_{DD1} = V_{DD2} = +3.0 V, π/4DQPSK modulated signal input, External input and output matching)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Operating Frequency	f		1429	–	1453	MHz
Power Gain	G _p	P _{in} = –18 dBm, V _{AGC} = 2.5 V	24	27	–	dB
Total Current	I _{DD}	P _{out} = +8 dBm, V _{AGC} = 2.5 V	–	25	35	mA
Adjacent Channel Power Leakage 1	P _{adj1}	P _{out} = +8 dBm, V _{AGC} = 2.5 V Δf = ±50 kHz, 21 kHz Band Width	–	–60	–55	dBc
Adjacent Channel Power Leakage 2	P _{adj2}	P _{out} = +8 dBm, V _{AGC} = 2.5 V Δf = ±100 kHz, 21 kHz Band Width	–	–70	–65	dBc
Variable Gain Range	ΔG	P _{in} = –18 dBm, V _{AGC} = 0.5 to 2.5 V	35	40	–	dB
AGC Control Current	I _{AGC}	V _{AGC} = 0.5 to 2.5 V	–	200	500	μA

[μPG2106TB]

EVALUATION CIRCUIT (Preliminary)

$V_{DD1} = V_{DD2} = +3.0\text{ V}$, $f = 925\text{ MHz}$



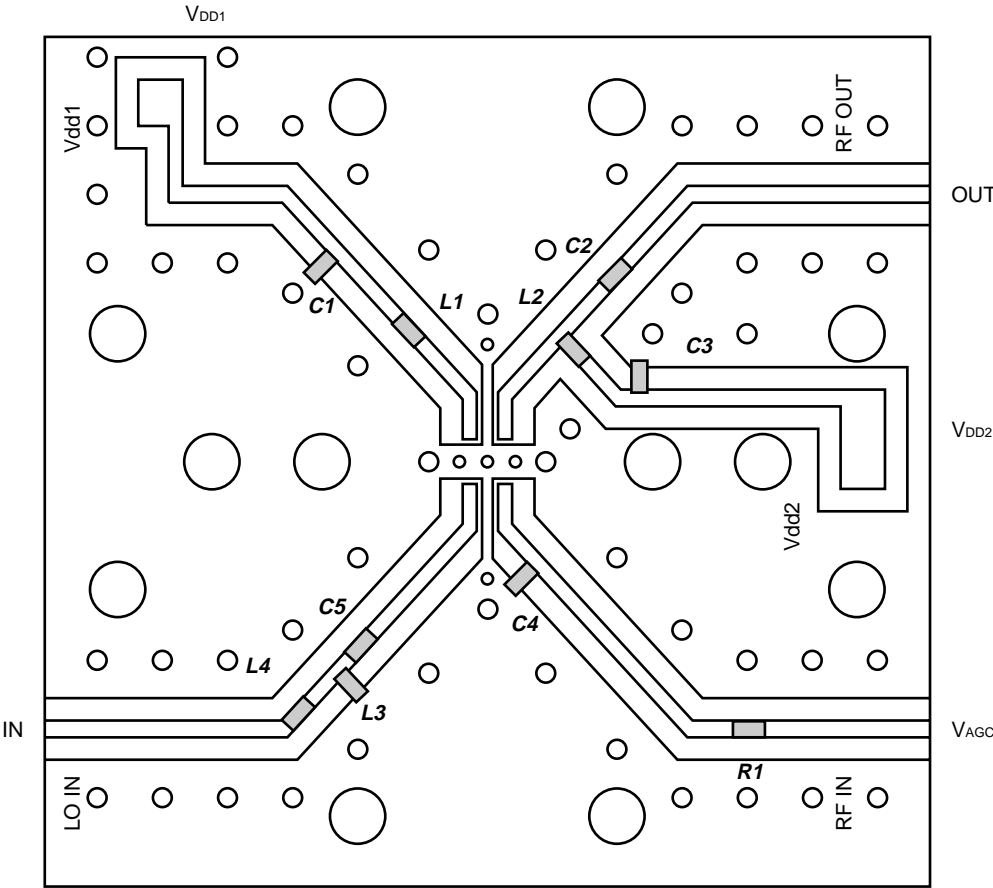
Using the NEC Evaluation Board (Preliminary)

Symbol	Value
C1, C3	1 000 pF
C2	100 pF
C4	27 pF
C5	2 pF
L1	10 nH
L2	39 nH
L3	27 nH
L4	33 nH
R1	1 kΩ

[μ PG2106TB]

EVALUATION BOARD

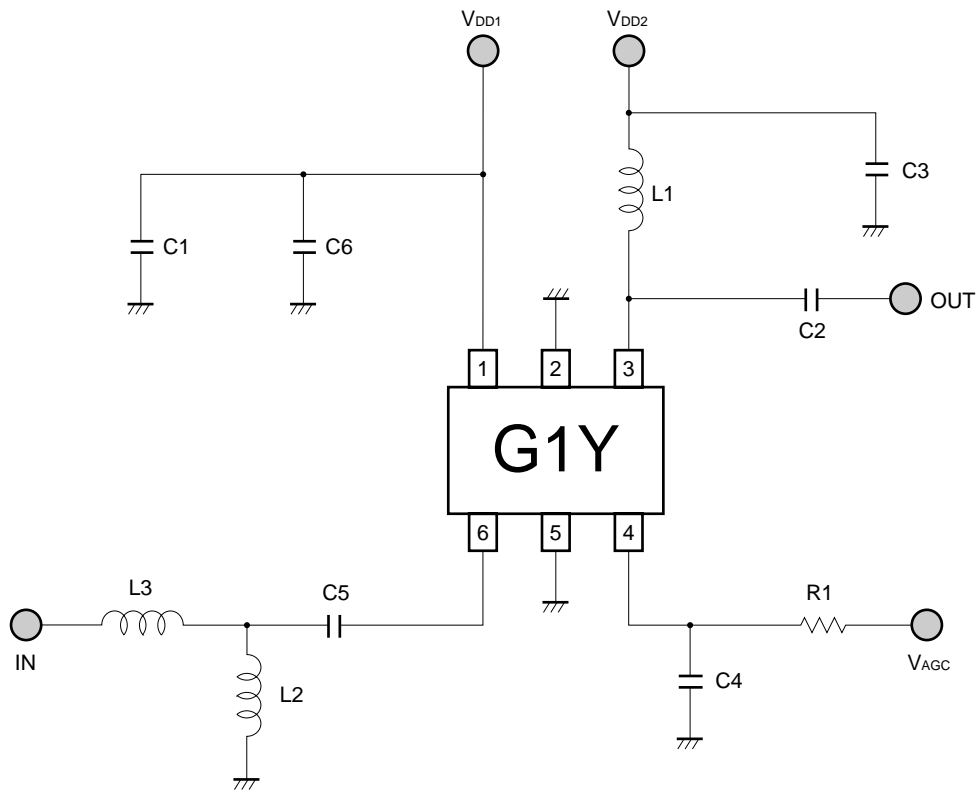
Epoxy glass: $\epsilon = 4.6$, $t = 0.4$ mm, Board Dimension: 38 x 40 mm



[μPG2110TB]

EVALUATION CIRCUIT (Preliminary)

$V_{DD1} = V_{DD2} = +3.0\text{ V}$, $f = 1441\text{ MHz}$



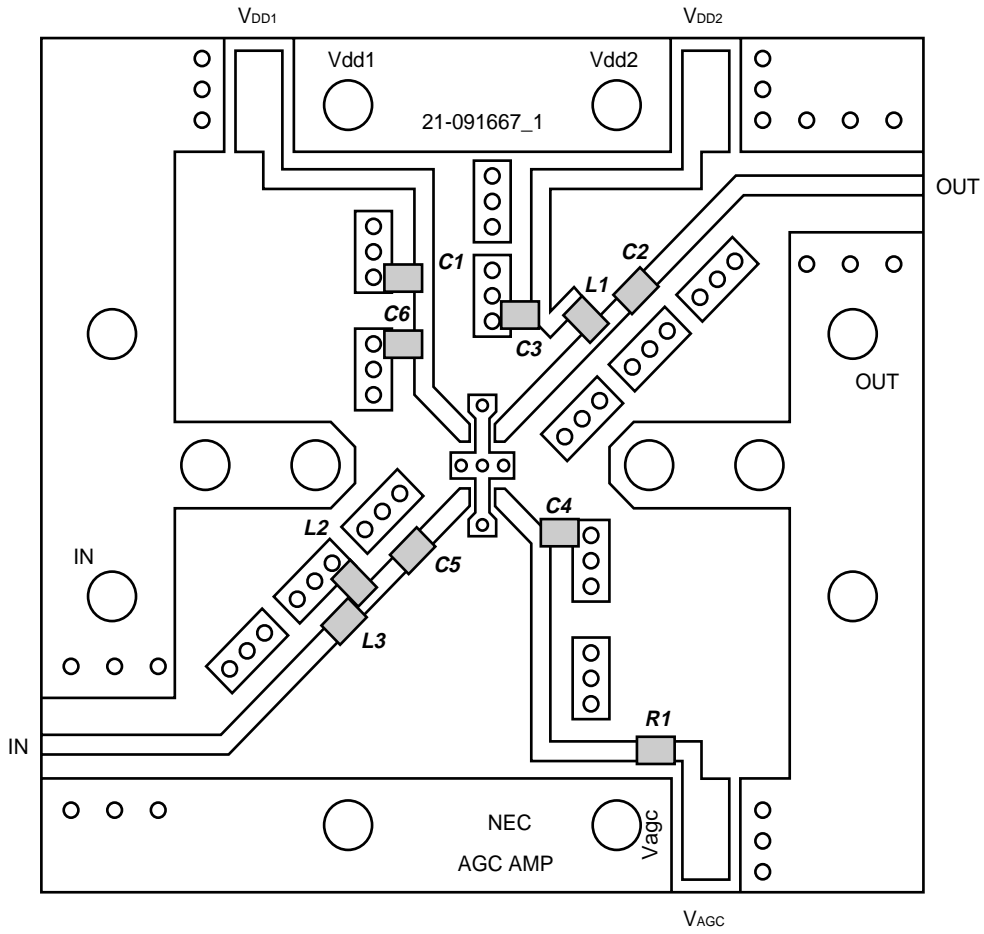
Using the NEC Evaluation Board (Preliminary)

Symbol	Value
C1, C3, C5	1 000 pF
C2	1.5 pF
C4	3 pF
C6	2 pF
L1	2.7 nH
L2, L3	8.2 nH
R1	1 kΩ

[μ PG2110TB]

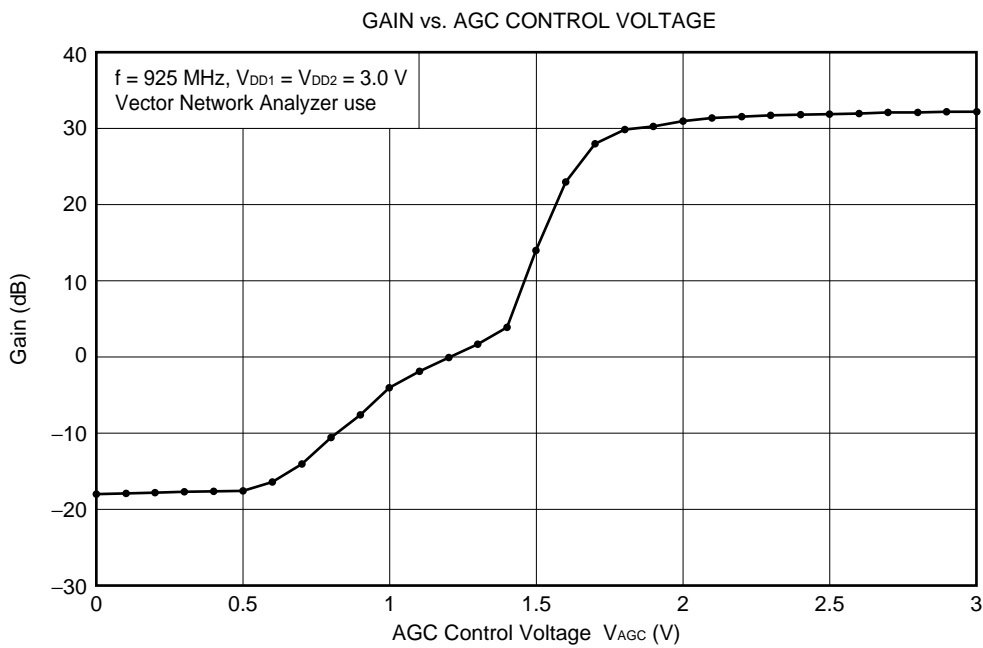
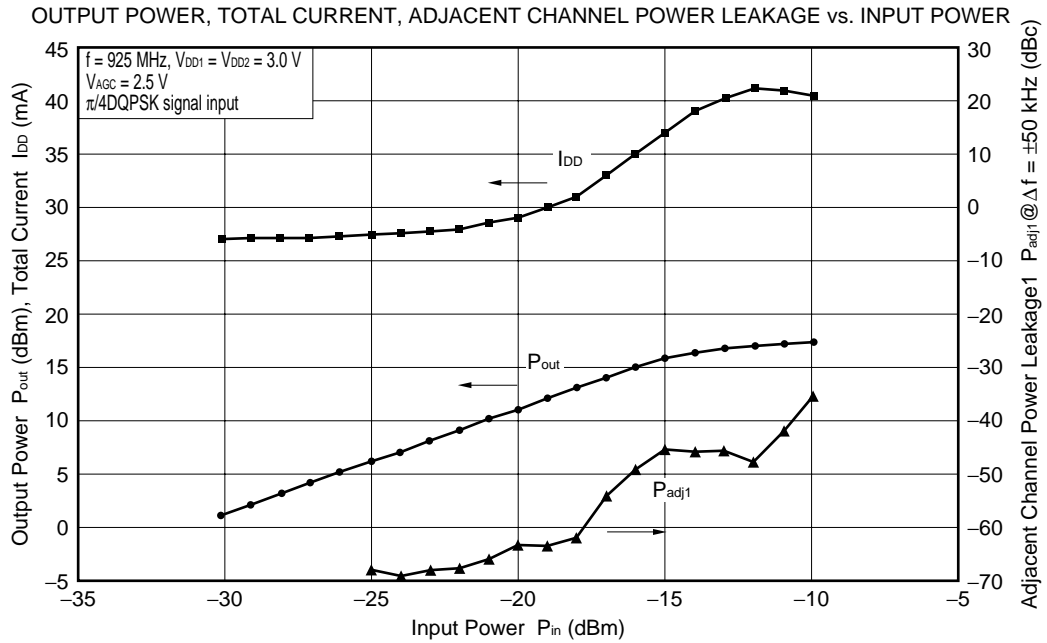
EVALUATION BOARD

Polyimide: $\epsilon = 4.6$, $t = 0.4$ mm, Board Dimension: 38 x 40 mm

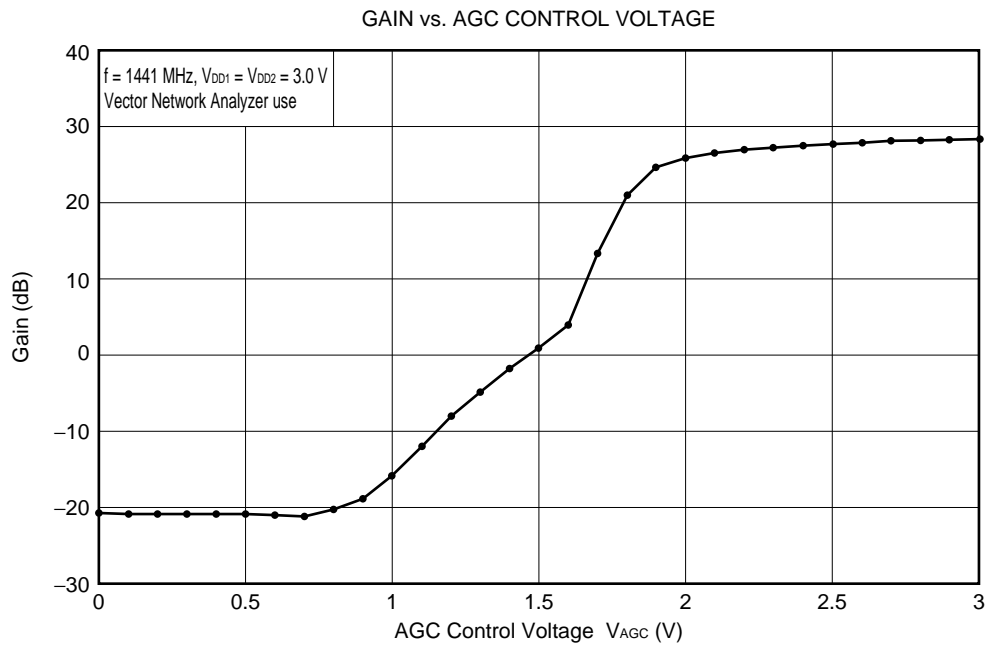
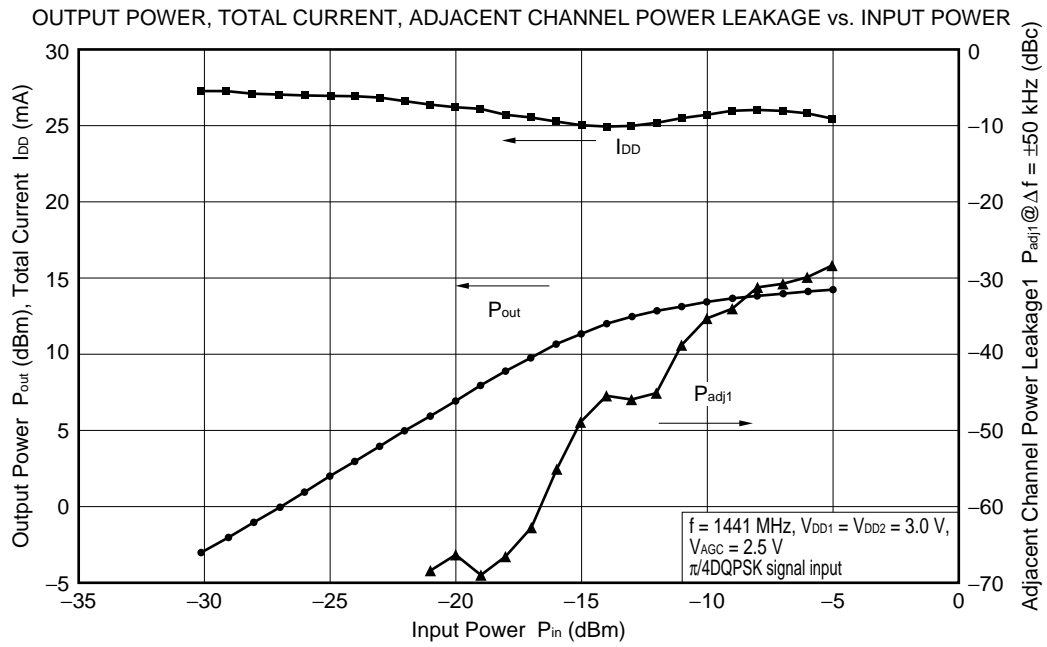


TYPICAL CHARACTERISTICS

[μ PG2106TB]

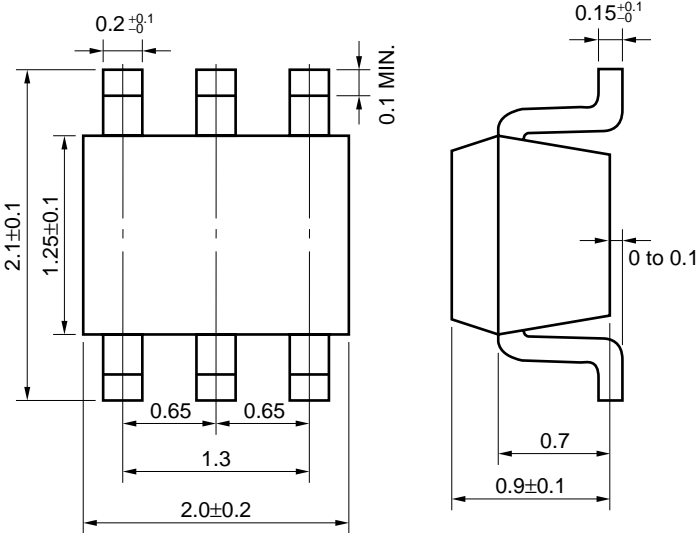


[μ PG2110TB]



PACKAGE DIMENSIONS

6 pin super minimold (Unit: mm)



RECOMMENDED SOLDERING CONDITIONS

This product should be soldered under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235 °C or below Time: 30 seconds or less (at 210 °C) Count: 3, Exposure limit: None ^{Note}	IR35-00-3
VPS	Package peak temperature: 215 °C or below Time: 40 seconds or less (at 200 °C) Count: 3, Exposure limit: None ^{Note}	VP15-00-3
Wave Soldering	Soldering bath temperature: 260 °C or below Time: 10 seconds or less Count: 1, Exposure limit: None ^{Note}	WS60-00-1
Partial Heating	Pin temperature: 300 °C Time: 3 seconds or less (per side of device) Exposure limit: None ^{Note}	—

Note After opening the dry pack, keep it in a place below 25 °C and 65 % RH for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).

CAUTION

The Great Care must be taken in dealing with the devices in this guide.

The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned.

Keep the law concerned and so on, especially in case of removal.

- **The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.**
 - No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.
 - NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.
 - Descriptions of circuits, software, and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software, and information in the design of the customer's equipment shall be done under the full responsibility of the customer. NEC Corporation assumes no responsibility for any losses incurred by the customer or third parties arising from the use of these circuits, software, and information.
 - While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.
 - NEC devices are classified into the following three quality grades:
"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.
 - 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
 - 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)
 - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.
- The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.