To our customers,

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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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RENESAS

# GaAs INTEGRATED CIRCUIT

# μPG508B

## 13 GHz DIVIDE-BY-4 PRESCALER



### DESCRIPTION

μPG508B is a GaAs divide-by-4 prescaler capable of operating up to 13 GHz. It is designed as the prescaler in the frequency synthesizers of microwave applications systems and measurement equipment. The μPG508B is a dynamic frequency divider and uses the BFL (Buffered FET Logic) circuit as the basic circuit.

### FEATURES

- Wide operating frequency range $f_{in}$ = 8 to 13 GHz @$T_A$ = 25 °C
- Low phase Noise
- Hermetically sealed package assuers high reliability

### ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|---|---|
| μPG508B | K-12, 8 PIN CERAMIC |

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

| | | | |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ - $V_{SS1}$ *1 | +5 | V |
| Supply Voltage | $V_{SS2}$ - $V_{SS1}$ *1 | –5 | V |
| Input Power | $P_{in}$ | +13 | dBm |
| Total Power Dissipation | $P_{tot}$ | 1.5*2 | W |
| Operating Case Temperature Range | $T_C$ | –65 to +125 | °C |
| Storage Temperature | $T_{stg}$ | –65 to +175 | °C |

***1** $V_{SS1}$ = 0 V

***2** $T_C \leq 125$ °C

### RECOMMENDED OPERATING CONDITIONS ($T_A$ = 25 °C)

| | | | |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ - $V_{SS1}$ | 3.8±0.2 | V |
| Supply Voltage | $V_{SS1}$ - $V_{SS2}$ | 2.2±0.1 | V |

Document No. P12384EJ2V0DS00 (2nd edition)
(Previous No. ID-3143)
Date Published February 1997 N
Printed in Japan

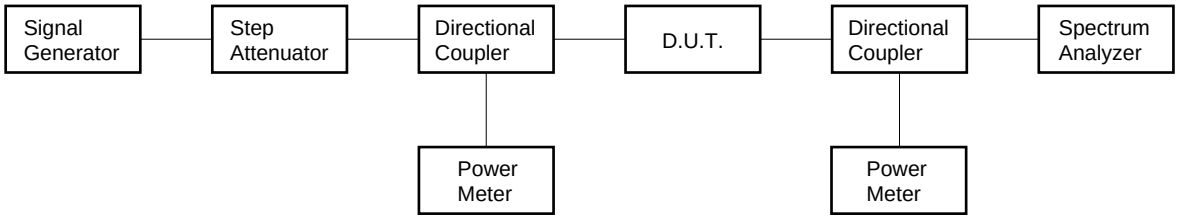
**ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C, $V_{DD}$ = +3.8 V, $V_{SS1}$ = 0 V, $V_{SS2}$ = –2.2 V)**

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Supply Current | $I_{DD}$ | | 100 | 140 | mA | |
| Supply Current | $I_{SS1}$ | | 33 | 44 | mA | |
| Supply Current | $I_{SS2}$ | | 67 | 96 | mA | |
| Upper Limit of Input Frequency | $f_{in(u)}$ | 13 | | | GHz | $P_{in}$ = +6 dBm |
| Lower Limit of Input Frequency | $f_{in(l)}$ | | | 8 | GHz | $P_{in}$ = +6 dBm |
| Input Power | $P_{in}$ | +6 | | +10 | dBm | $f_{in}$ = 8 to 13 GHz |
| Output Power | $P_{out}$ | 0 | +2 | | dBm | $f_{in}$ = 13 GHz |

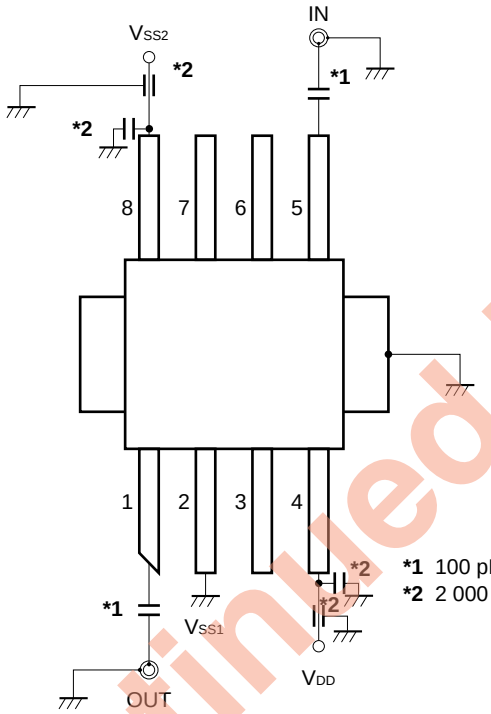
**ELECTRICAL CHARACTERISTICS ($T_A$ = –25 to +75 °C, $V_{DD}$ = +3.8 V, $V_{SS1}$ = 0 V, $V_{SS2}$ = –2.2 V)**

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Supply Current | $I_{DD}$ | | 100 | | mA | |
| Supply Current | $I_{SS1}$ | | 33 | | mA | |
| Supply Current | $I_{SS2}$ | | 67 | | mA | |
| Upper Limit of Input Frequency | $f_{in(u)}$ | 12.2 | | | GHz | $P_{in}$ = +6 dBm |
| Lower Limit of Input Frequency | $f_{in(l)}$ | | | 8.2 | GHz | $P_{in}$ = +6 dBm |
| Input Power | $P_{in}$ | +6 | | +10 | dBm | $f_{in}$ = 8.5 to 12.2 GHz |
| Output Power | $P_{out}$ | –1 | +1 | | dBm | $f_{in}$ = 12.2 GHz |

## TEST CIRCUIT BLOCK DIAGRAM

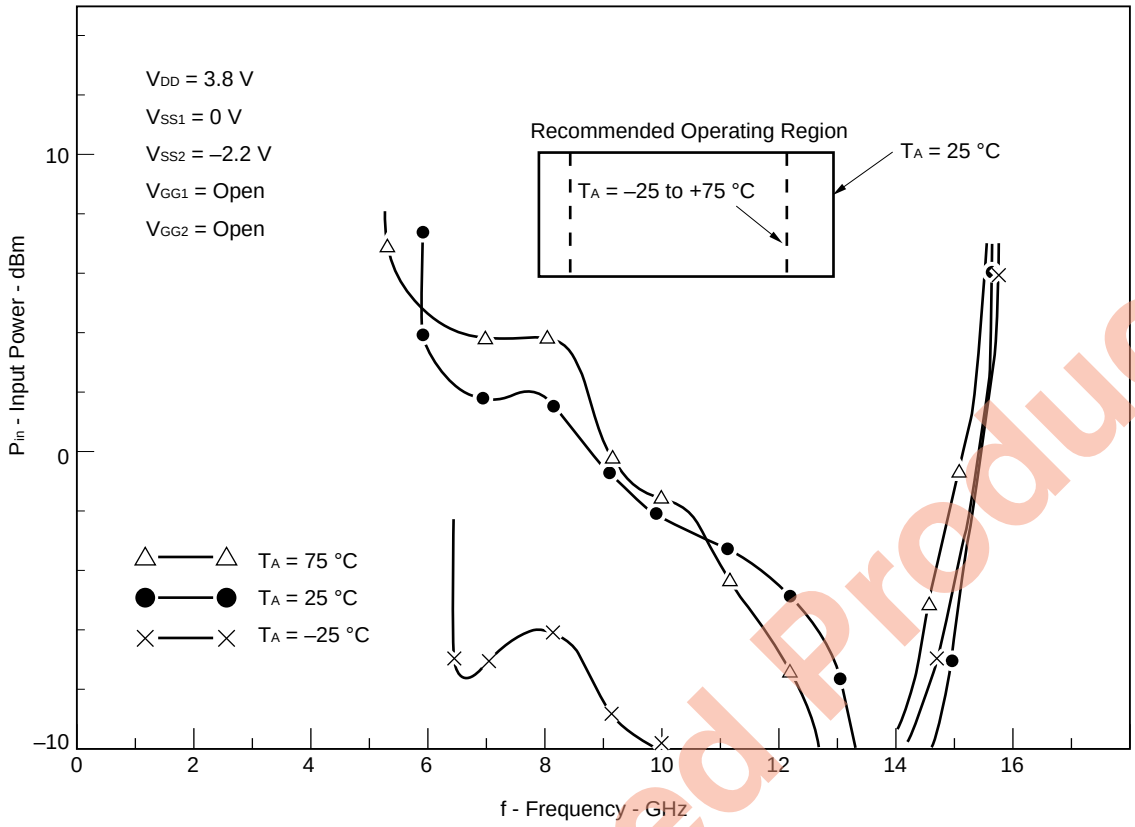


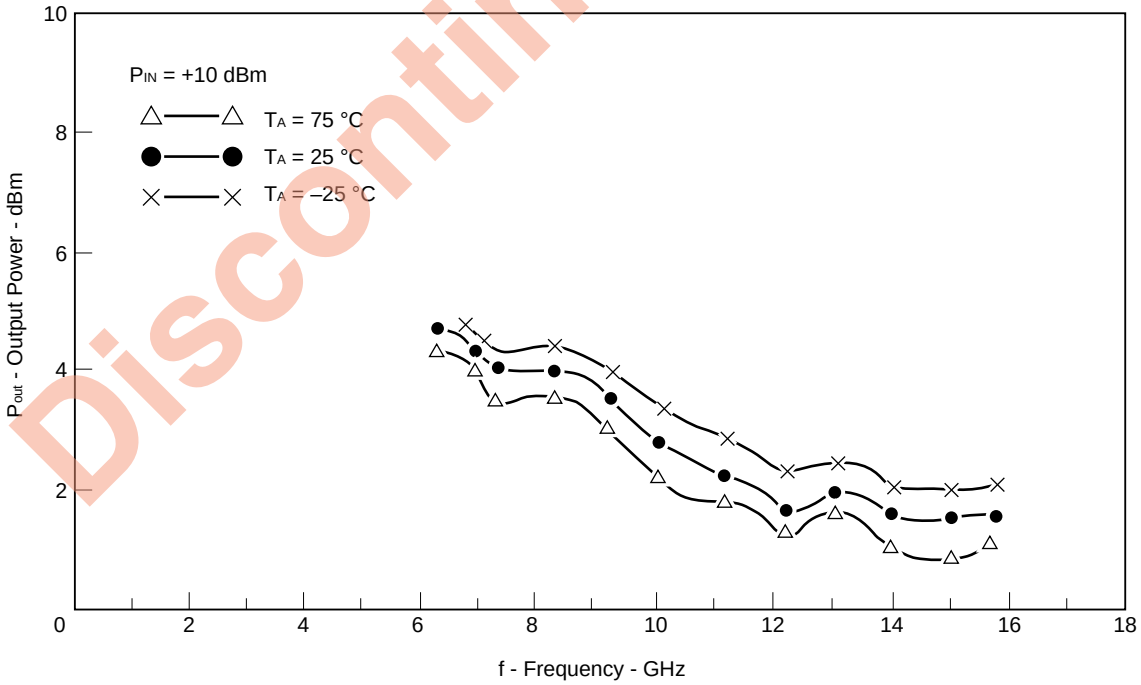

## TEST CIRCUIT



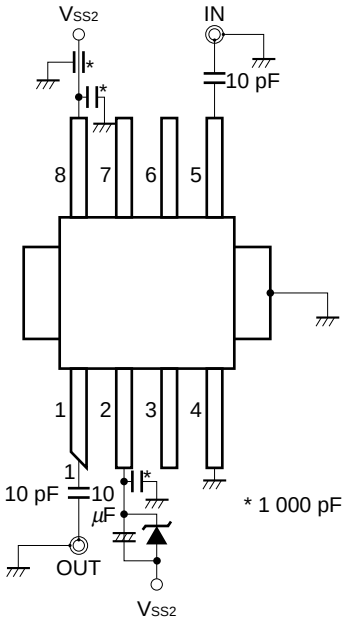

***1*** 100 pF (USE RF CAPACITOR)
***2*** 2 000 pF

## TYPICAL CHARACTERISTICS



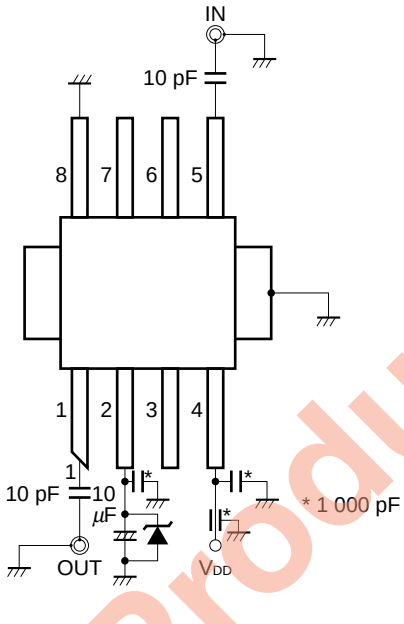



## SINGLE BIAS SUPPLY




$V_{DD}$ = GND
$V_{SS2}$ = –6.0 V

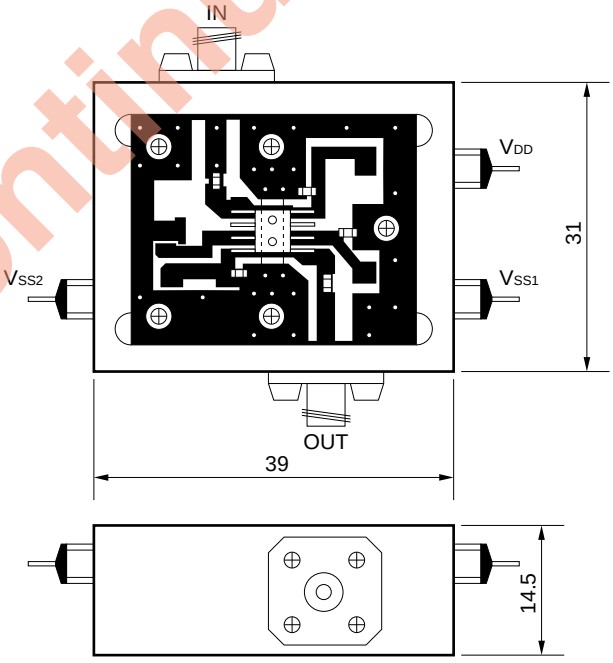
For $V_{SS1}$, the bias voltage of –6.0 V should be applied through 2.2 V zener diode.



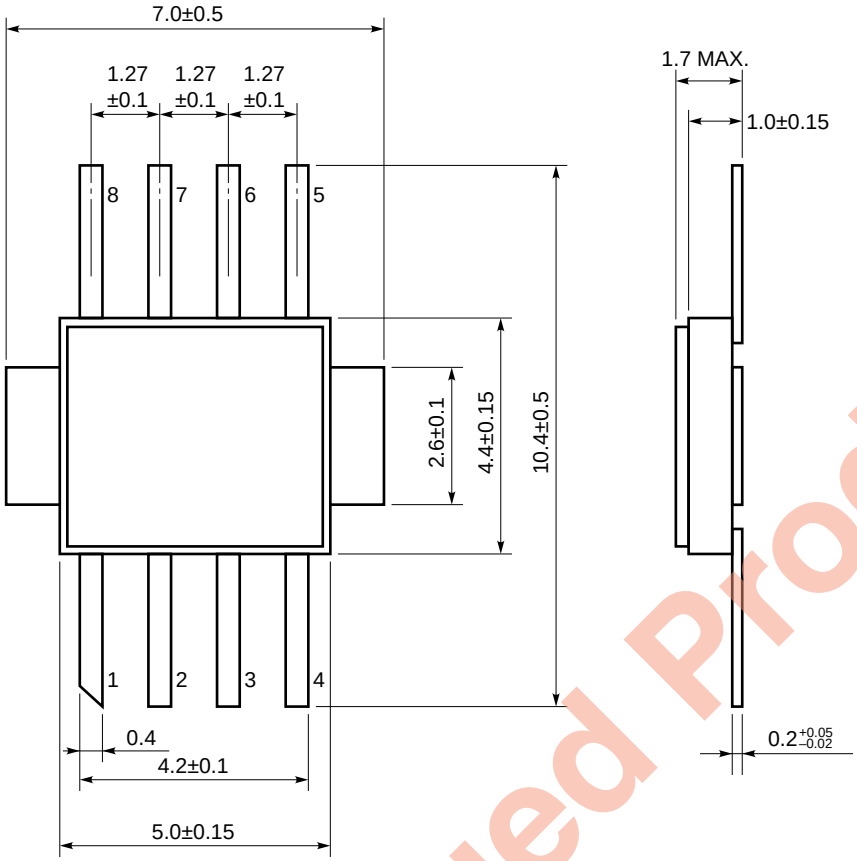

$V_{DD}$ = +6.0 V
$V_{SS2}$ = GND

$V_{SS1}$ should be connected to GND through 2.2 V zener diode.

## TEST JIG DRAWING (Unit: mm)



**PACKAGE DIMENSIONS (Unit: mm)**




1: OUTPUT
2: $V_{SS1}$
3: Non Connection
4: $V_{DD}$
5: INPUT
6: $V_{GG1}$ } (Normally open)
7: $V_{GG2}$ }
8: $V_{SS2}$
FLANGE: GND

## RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

## TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document “SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL” (C10535E).

| Soldering process | Soldering conditions | Symbol |
|---|---|---|
| Partial heating method | Terminal temperature: 260 °C or below,<br>Flow time: 10 seconds or below,<br>Exposure limit*: None | |

* Exposure limit before soldering after dry-pack package is opened.
  Storage conditions: 25 °C and relative humidity at 65 % or less.

**Note** Do not apply more than a single process at once, except for “Partial heating method”.

**PRECAUTION** This IC must be handled with great care to prevent static discharge because its circuitry is composed of GaAs MES FET.

### 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.**

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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.

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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)
- Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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Anti-radioactive design is not implemented in this product.

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