

## DATA SHEET



# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC8211TK

## SiGe LOW NOISE AMPLIFIER FOR GPS/MOBILE COMMUNICATIONS

### DESCRIPTION

The  $\mu$ PC8211TK is a silicon germanium (SiGe) monolithic integrated circuit designed as a low noise amplifier for GPS and mobile communications.

The package is 6-pin lead-less minimold, suitable for surface mount.

This IC is manufactured using our 50 GHz  $f_{\max}$  UHS2 (Ultra High Speed Process) SiGe bipolar process.

### ★ FEATURES

- Low noise : NF = 1.3 dB TYP. @  $V_{CC} = 3.0$  V
- High gain : GP = 18.5 dB TYP. @  $V_{CC} = 3.0$  V
- Low current consumption : ICC = 3.5 mA TYP. @  $V_{CC} = 3.0$  V
- Gain 1 dB compression output power :  $P_{O(1\text{ dB})} = -6.0$  dBm @  $V_{CC} = 3.0$  V
- Built-in power-save function
- High-density surface mounting : 6-pin lead-less minimold package (1.5 × 1.3 × 0.55 mm)

### APPLICATION

- Low noise amplifier for GPS and mobile communications

### ORDERING INFORMATION

| Part Number       | Order Number        | Package                                                          | Marking | Supplying Form                                                                                                                                               |
|-------------------|---------------------|------------------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\mu$ PC8211TK-E2 | $\mu$ PC8211TK-E2-A | 6-pin lead-less minimold<br>(1511 PKG) (Pb-Free) <sup>Note</sup> | 6G      | <ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 1, 6 face the perforation side of the tape</li><li>• Qty 5 kpcs/reel</li></ul> |

**Note** With regards to terminal solder (the solder contains lead) plated products (conventionally plated), contact your nearby sales office.

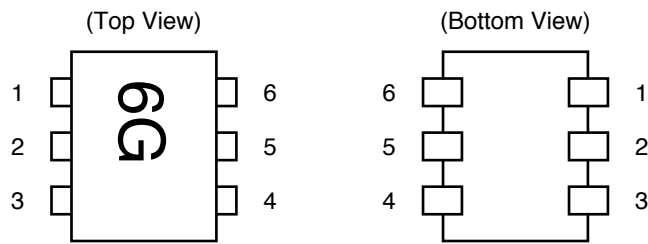
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PC8211TK-A

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

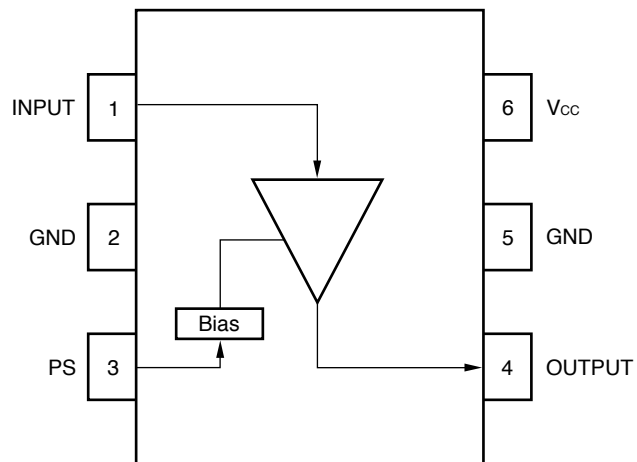
The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

## PIN CONNECTIONS



| Pin No. | Pin Name        |
|---------|-----------------|
| 1       | INPUT           |
| 2       | GND             |
| 3       | PS              |
| 4       | OUTPUT          |
| 5       | GND             |
| 6       | V <sub>cc</sub> |

### INTERNAL BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS**

| Parameter                     | Symbol           | Test Conditions                    | Ratings                      | Unit |
|-------------------------------|------------------|------------------------------------|------------------------------|------|
| Supply Voltage                | V <sub>CC</sub>  | T <sub>A</sub> = +25°C             | 4.0                          | V    |
| Power-Saving Voltage          | V <sub>PS</sub>  |                                    | −0.3 to V <sub>CC</sub> +0.3 | V    |
| Power Dissipation of Package  | P <sub>D</sub>   | T <sub>A</sub> = +85°C <b>Note</b> | 232                          | mW   |
| Operating Ambient Temperature | T <sub>A</sub>   |                                    | −40 to +85                   | °C   |
| Storage Temperature           | T <sub>stg</sub> |                                    | −55 to +150                  | °C   |
| Input Power                   | P <sub>in</sub>  |                                    | +10                          | dBm  |

**Note** Mounted on double-side copper-clad 50 × 50 × 1.6 mm epoxy glass PWB

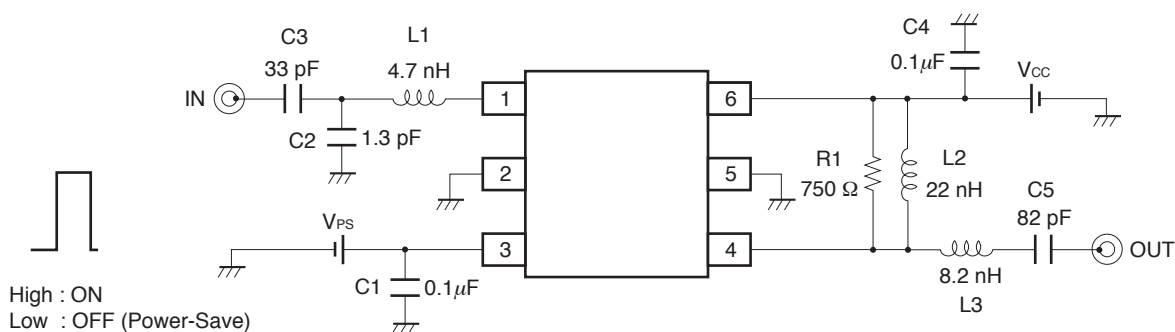
**RECOMMENDED OPERATING RANGE**

| Parameter                     | Symbol          | MIN. | TYP.  | MAX. | Unit |
|-------------------------------|-----------------|------|-------|------|------|
| Supply Voltage                | V <sub>CC</sub> | 2.7  | 3.0   | 3.3  | V    |
| Operating Ambient Temperature | T <sub>A</sub>  | −25  | +25   | +85  | °C   |
| Operating Frequency Range     | f <sub>in</sub> | –    | 1 575 | –    | MHz  |

★ **ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = 3.0\text{ V}$ ,  $V_{PS} = 3.0\text{ V}$ ,  $f_{in} = 1\,575\text{ MHz}$ , unless otherwise specified)

| Parameter                                  | Symbol               | Test Conditions               | MIN. | TYP. | MAX. | Unit          |
|--------------------------------------------|----------------------|-------------------------------|------|------|------|---------------|
| Circuit Current                            | $I_{CC}$             | No Signal                     | 2.5  | 3.5  | 4.5  | mA            |
|                                            |                      | At Power-Saving Mode          | –    | –    | 1    | $\mu\text{A}$ |
| Power Gain                                 | $G_P$                |                               | 15.5 | 18.5 | 21.5 | dB            |
| Noise Figure                               | NF                   |                               | –    | 1.3  | 1.5  | dB            |
| Input 3rd Order Distortion Intercept Point | $IIP_3$              |                               | –    | –12  | –    | dBm           |
| Input Return Loss                          | $RL_{in}$            |                               | 6.0  | 7.5  | –    | dB            |
| Output Return Loss                         | $RL_{out}$           |                               | 10   | 14.5 | –    | dB            |
| Isolation                                  | ISL                  |                               | –    | 33.5 | –    | dB            |
| Rising Voltage From Power-Saving Mode      | $V_{PSon}$           |                               | 2.2  | –    | –    | V             |
| Falling Voltage From Power-Saving Mode     | $V_{PSoff}$          |                               | –    | –    | 0.8  | V             |
| Gain Flatness                              | Flat                 | $f_{RF} = \pm 2.5\text{ MHz}$ | –    | –    | 0.5  | dB            |
| Gain 1 dB Compression Output Power         | $P_{O(1\text{ dB})}$ |                               | –    | –6.0 | –    | dBm           |
| Output Power                               | $P_O$                | $P_{in} = -10\text{ dBm}$     | –1.5 | +2.0 | –    | dBm           |

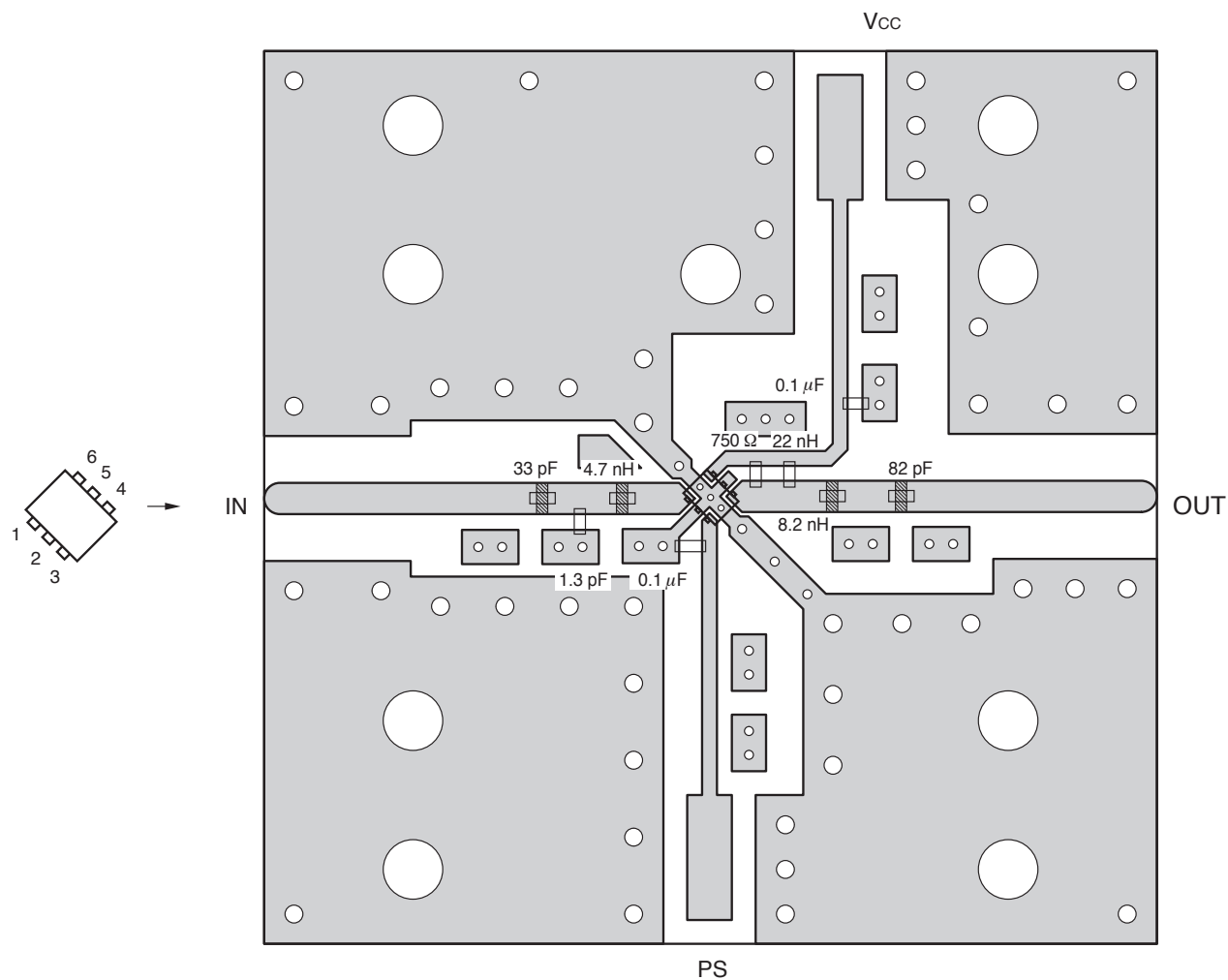
★ **TEST CIRCUIT**



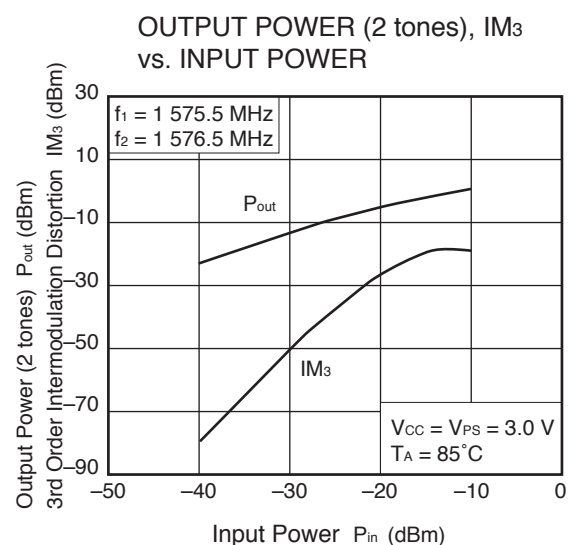
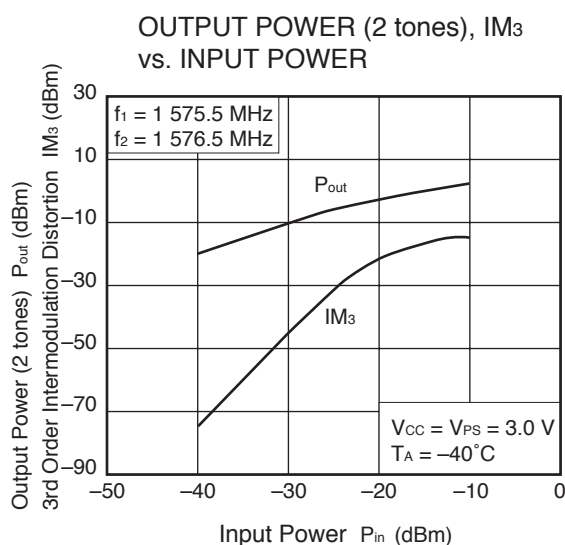
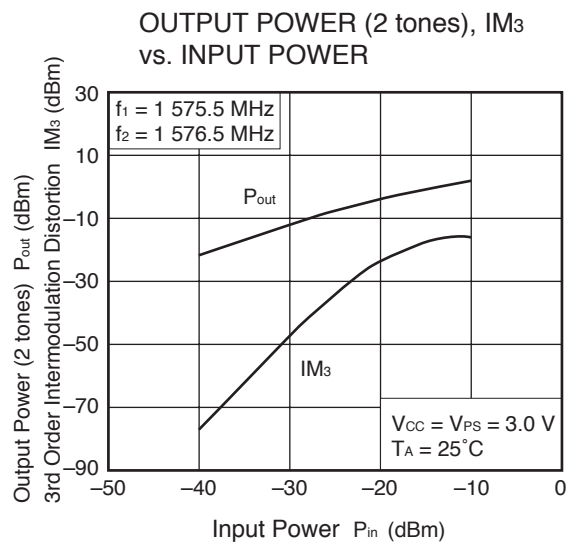
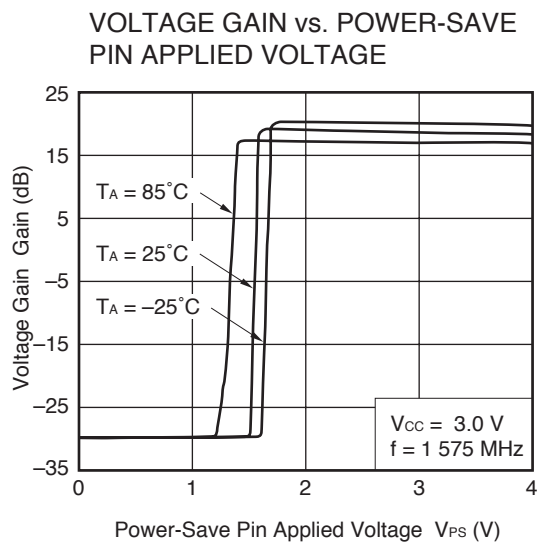
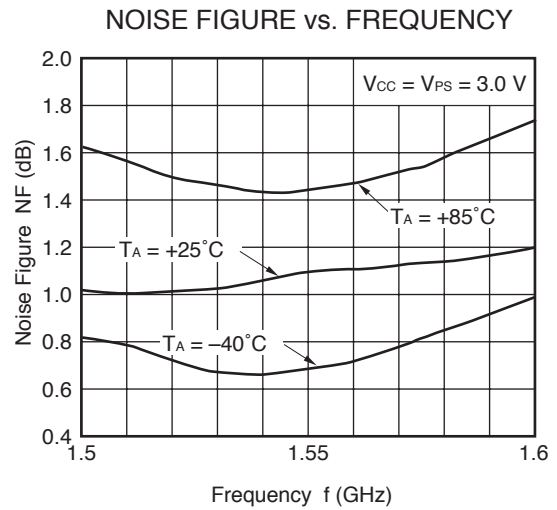
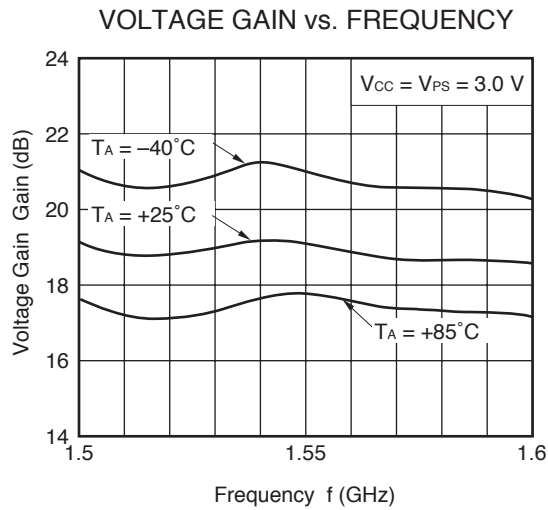
**COMPONENTS OF TEST CIRCUIT FOR MEASURING ELECTRICAL CHARACTERISTICS**

| Symbol                          | Form           | Rating            | Part Number        | Maker  |
|---------------------------------|----------------|-------------------|--------------------|--------|
| C <sub>1</sub> , C <sub>4</sub> | Chip Capacitor | 0.1 $\mu\text{F}$ | GRM36              | Murata |
| C <sub>2</sub>                  | Chip Capacitor | 1.3 pF            | GRM36              | Murata |
| C <sub>3</sub>                  | Chip Capacitor | 33 pF             | GRM36              | Murata |
| C <sub>5</sub>                  | Chip Capacitor | 82 pF             | GRM36              | Murata |
| R <sub>1</sub>                  | Resistor       | 750 $\Omega$      | RR0816             | Susumu |
| L <sub>1</sub>                  | Inductor       | 4.7 nH            | TFL0510            | Susumu |
| L <sub>2</sub>                  | Inductor       | 22 nH             | TFL0816 or TFL0510 | Susumu |
| L <sub>3</sub>                  | Inductor       | 8.2 nH            | TFL0510            | Susumu |

## ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

**Notes**

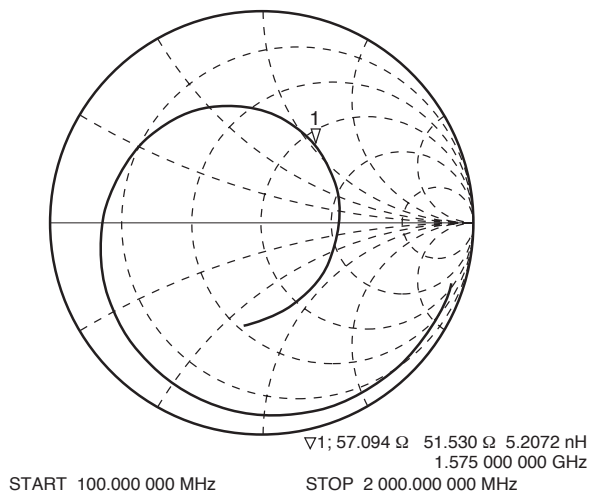
1. 30 × 30 × 0.51 mm double-side copper-clad hydrocarbon ceramic woven glass PWB (Rogers: R04003,  $\epsilon_r = 3.38$ ).
2. Back side: GND pattern
3. Au plated on pattern
4.  represents cutout
5. : Through holes

**TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)**

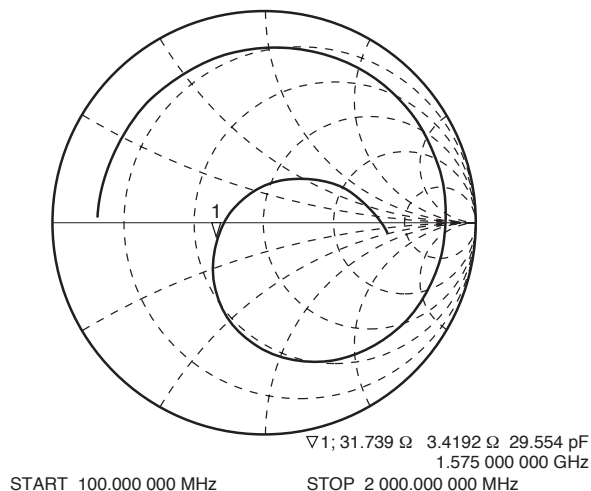
**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS ( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = V_{PS} = 3.0\text{ V}$ , monitored at connector on board)**

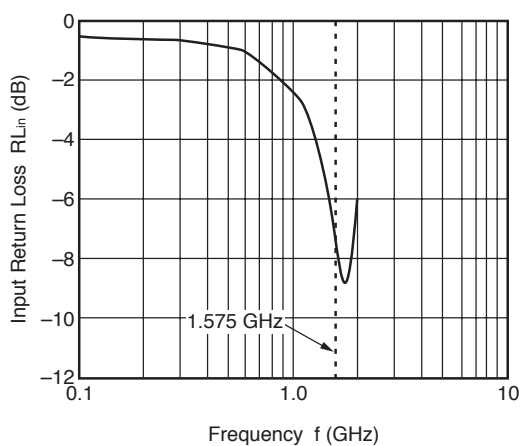
S<sub>11</sub>-FREQUENCY



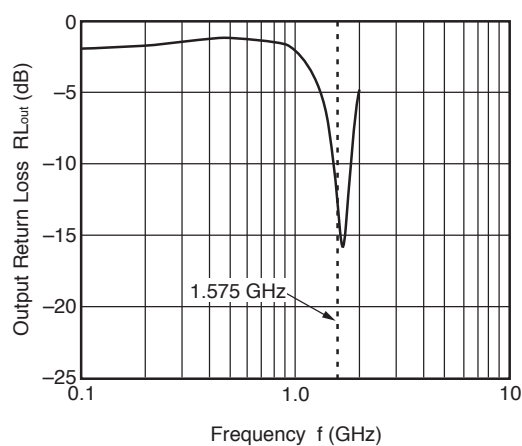
S<sub>22</sub>-FREQUENCY



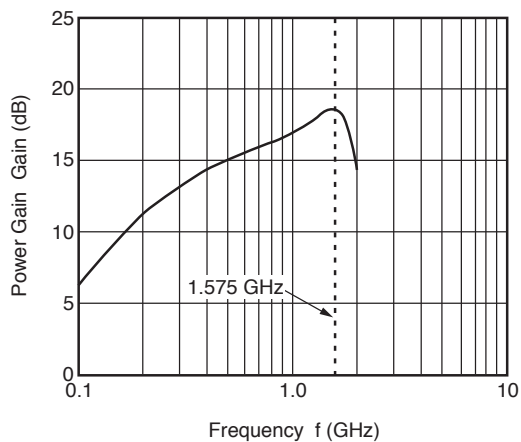
INPUT RETURN LOSS vs. FREQUENCY



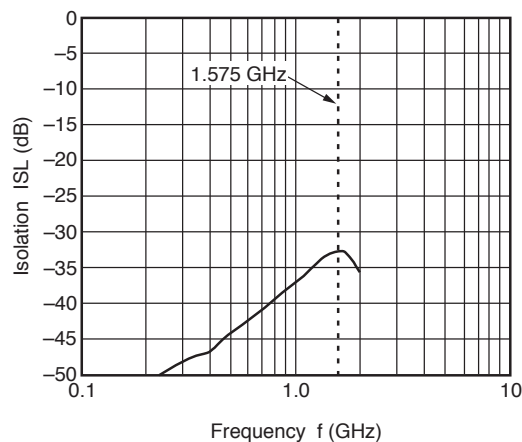
OUTPUT RETURN LOSS vs. FREQUENCY



POWER GAIN vs. FREQUENCY



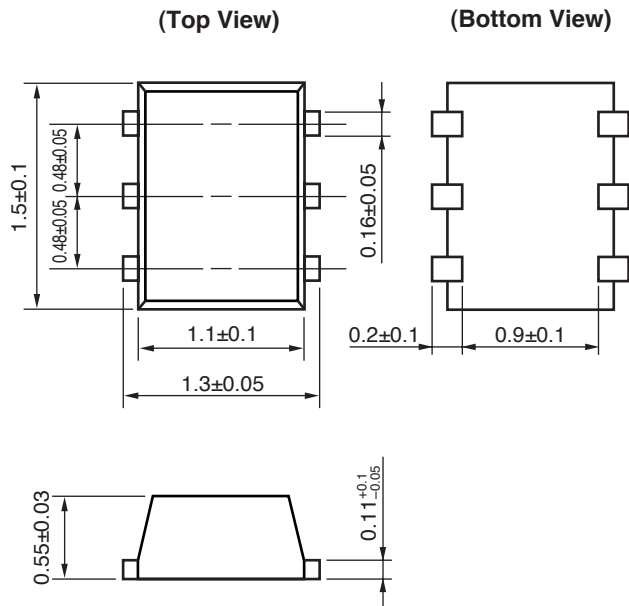
ISOLATION vs. FREQUENCY



**Remark** The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

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



Remark ( ) : Reference value

**NOTES ON CORRECT USE**

- (1) Observe precautions for handling because of electro-static sensitive devices.
- (2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation).  
All the ground terminals must be connected together with wide ground pattern to decrease impedance difference.
- (3) The bypass capacitor should be attached to V<sub>cc</sub> line.

**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<br>Time at peak temperature : 10 seconds or less<br>Time at temperature of 220°C or higher : 60 seconds or less<br>Preheating time at 120 to 180°C : 120±30 seconds<br>Maximum number of reflow processes : 3 times<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below | IR260            |
| Wave Soldering   | Peak temperature (molten solder temperature) : 260°C or below<br>Time at peak temperature : 10 seconds or less<br>Preheating temperature (package surface temperature) : 120°C or below<br>Maximum number of flow processes : 1 time<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below                                                | WS260            |
| Partial Heating  | Peak temperature (terminal temperature) : 350°C or below<br>Soldering time (per side of device) : 3 seconds or less<br>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).

# AMEYA360

## Components Supply Platform

Authorized Distribution Brand :



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