

## GaAs MMIC DBS 4 x 2 IF SWITCH MATRIX

## FEATURES

- HIGH ISOLATION : ISL = 38 dB TYP. @ f = 0.95 to 2.15 GHz, V<sub>CONT</sub> = +5.0 V/0 V
- CONTROL VOLTAGE : V<sub>CONT (H)</sub> = +4.5 to +5.5 V (+5.0 V TYP.)  
: V<sub>CONT (L)</sub> = -0.5 to +0.5 V (0 V TYP.)
- LOW INSERTION LOSS : L<sub>INS</sub> = 6.0 dB TYP. @ f = 0.95 to 2.15 GHz, V<sub>CONT</sub> = +5.0 V/0 V, Z<sub>O</sub> = 50  $\Omega$
- 20-PIN 4 x 4 mm SQUARE MICRO LEAD PACKAGE (20-pin plastic QFN (0.5 mm pitch))

## APPLICATIONS

- Direct Broadcast Satellite (DBS)
- Switch Box
- 4 x 2 switch matrix to L, S band applications

## ORDERING INFORMATION

| Part Number      | Package                              | Marking | Supplying Form  |
|------------------|--------------------------------------|---------|---|
| $\mu$ PG2053K-E3 | 20-pin plastic QFN<br>(0.5 mm pitch) | G2053   | <ul style="list-style-type: none"><li>• Embossed tape 12 mm wide</li><li>• Pin 1 to 5 face the perforation side of the tape</li><li>• Qty 3 kpcs/reel</li></ul> |

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

Part number for sample order:  $\mu$ PG2053K

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

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)**

| Parameter                     | Symbol                  | Ratings           | Unit |
|-------------------------------|-------------------------|-------------------|------|
| Supply Voltage                | V <sub>DD</sub>         | −1.0 to +6.0      | V    |
| Control Voltage               | V <sub>CONT1 to 4</sub> | −1.0 to +6.0      | V    |
| Total Power Dissipation       | P <sub>tot</sub>        | 2 <sup>Note</sup> | W    |
| Input Power                   | P <sub>in</sub>         | +10               | dBm  |
| Operating Ambient Temperature | T <sub>A</sub>          | −40 to +85        | °C   |
| Storage Temperature           | T <sub>stg</sub>        | −65 to +150       | °C   |

**Note** Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T<sub>A</sub> = +85°C

**RECOMMENDED OPERATING CONDITIONS (T<sub>A</sub> = +25°C)**

| Parameter           | Symbol                | MIN. | TYP. | MAX. | Unit |
|---------------------|-----------------------|------|------|------|------|
| Supply Voltage      | V <sub>DD</sub>       | +4.5 | +5.0 | +5.5 | V    |
| Control Voltage (H) | V <sub>CONT (H)</sub> | +4.5 | +5.0 | +5.5 | V    |
| Control Voltage (L) | V <sub>CONT (L)</sub> | −0.5 | 0    | +0.5 | V    |

**ELECTRICAL CHARACTERISTICS**

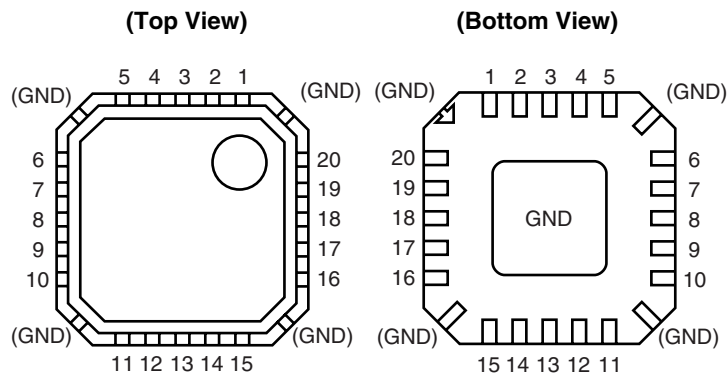
(T<sub>A</sub> = +25°C, V<sub>DD</sub> = +5.0 V, V<sub>CONT</sub> = +5.0 V/0 V, P<sub>in</sub> = 0 dBm, Z<sub>o</sub> = 50 Ω, each port, unless otherwise specified)

| Parameter                             | Symbol            | Test Conditions   | MIN. | TYP. | MAX. | Unit |
|---------------------------------------|-------------------|---|------|------|------|------|
| Insertion Loss                        | L <sub>INS</sub>  | f = 0.95 to 2.15 GHz                                      | −    | 6.0  | 8.0  | dB   |
| Insertion Loss Flatness               | ΔL <sub>INS</sub> | L <sub>INS</sub> (0.95 GHz) − L <sub>INS</sub> (2.15 GHz) | −    | 0.5  | 1.5  | dB   |
| Isolation D/U-ratio <sup>Note 1</sup> | ISL               | f = 0.95 to 2.15 GHz                                      | 35   | 38   | −    | dB   |
| Output Return Loss                    | RL <sub>out</sub> | f = 0.95 to 2.15 GHz                                      | 10   | 15   | −    | dB   |
| Control Current <sup>Note 2</sup>     | I <sub>CONT</sub> | V <sub>CONT</sub> = +5.0 V/0 V, non-RF                    | −    | −    | 0.5  | mA   |
| Supply Current                        | I <sub>DD</sub>   | V <sub>CONT</sub> = +5.0 V/0 V, non-RF                    | −    | −    | 2.0  | mA   |

**Notes 1.** Isolation D/U-ratio = |(Signal leakage (off-state)) − (Insertion loss (on-state))|

**2.** Per 1 control pin

PIN CONNECTIONS



**Remark** N.C. : Non Connection

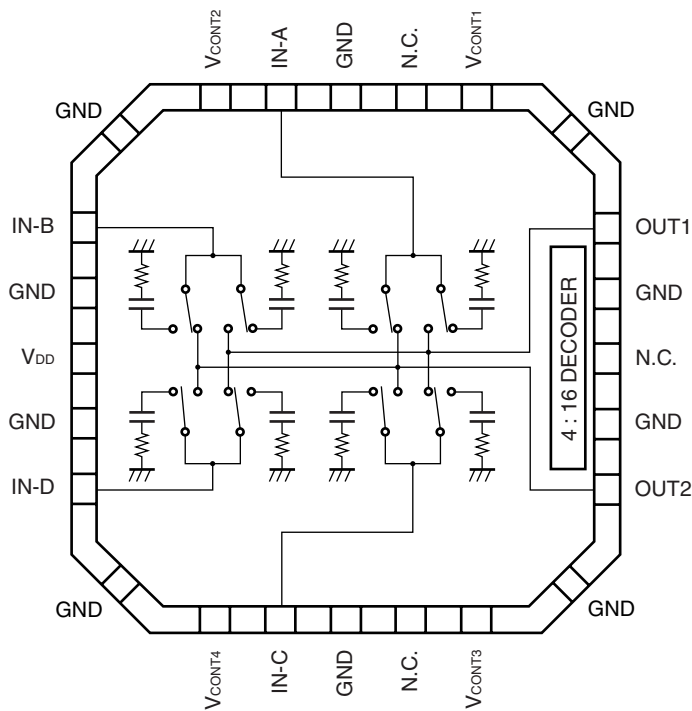
| Pin No. | Pin Name           | Pin No. | Pin Name           |
|---------|--------------------|---------|--------------------|
| 1       | V <sub>CONT1</sub> | 11      | V <sub>CONT4</sub> |
| 2       | N.C.               | 12      | IN-C               |
| 3       | GND                | 13      | GND                |
| 4       | IN-A               | 14      | N.C.               |
| 5       | V <sub>CONT2</sub> | 15      | V <sub>CONT3</sub> |
| 6       | IN-B               | 16      | OUT2               |
| 7       | GND                | 17      | GND                |
| 8       | V <sub>DD</sub>    | 18      | N.C.               |
| 9       | GND                | 19      | GND                |
| 10      | IN-D               | 20      | OUT1               |

TRUTH TABLE

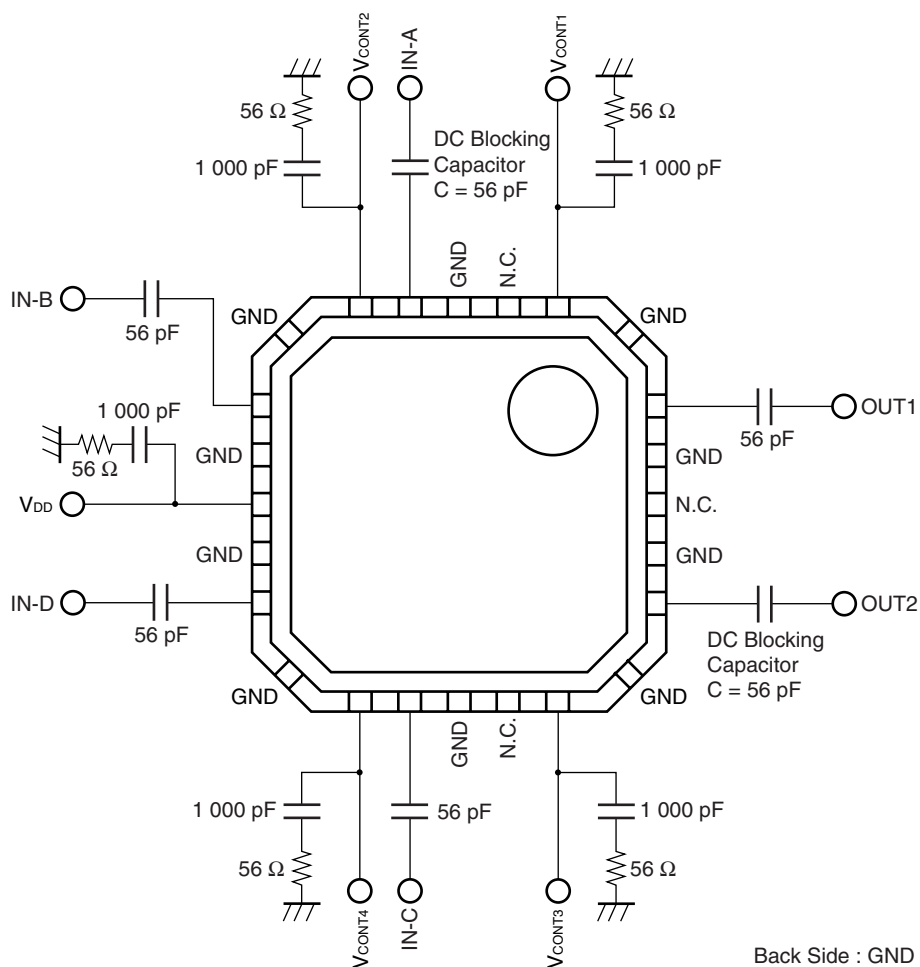
| State | ON CHANNEL |      | CONTROL PINS       |                    |                    |                    |
|-------|------------|------|--------------------|--------------------|--------------------|--------------------|
|       | OUT1       | OUT2 | V <sub>CONT1</sub> | V <sub>CONT2</sub> | V <sub>CONT3</sub> | V <sub>CONT4</sub> |
| 1     | IN-A       | IN-A | Low                | Low                | Low                | Low                |
| 2     |            | IN-B | Low                | Low                | Low                | High               |
| 3     |            | IN-C | Low                | Low                | High               | Low                |
| 4     |            | IN-D | Low                | Low                | High               | High               |
| 5     | IN-B       | IN-A | Low                | High               | Low                | Low                |
| 6     |            | IN-B | Low                | High               | Low                | High               |
| 7     |            | IN-C | Low                | High               | High               | Low                |
| 8     |            | IN-D | Low                | High               | High               | High               |
| 9     | IN-C       | IN-A | High               | Low                | Low                | Low                |
| 10    |            | IN-B | High               | Low                | Low                | High               |
| 11    |            | IN-C | High               | Low                | High               | Low                |
| 12    |            | IN-D | High               | Low                | High               | High               |
| 13    | IN-D       | IN-A | High               | High               | Low                | Low                |
| 14    |            | IN-B | High               | High               | Low                | High               |
| 15    |            | IN-C | High               | High               | High               | Low                |
| 16    |            | IN-D | High               | High               | High               | High               |

Remark High : +5 Vdc, Low : 0 Vdc.

FUNCTIONAL DIAGRAM



**EVALUATION CIRCUIT ( $V_{DD} = +5.0\text{ V}$ ,  $V_{CONT} = +5.0\text{ V/0 V}$ ,  $Z_o = 50\ \Omega$ )**

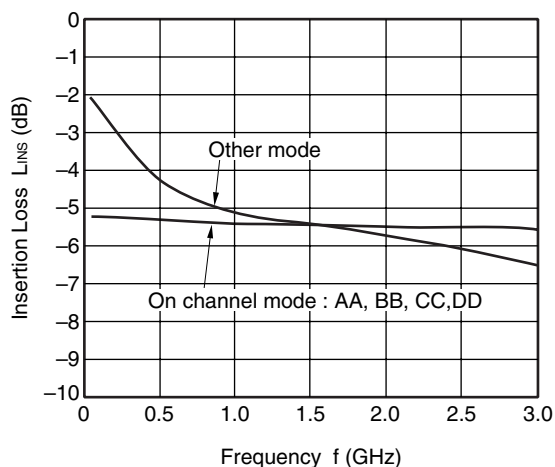


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

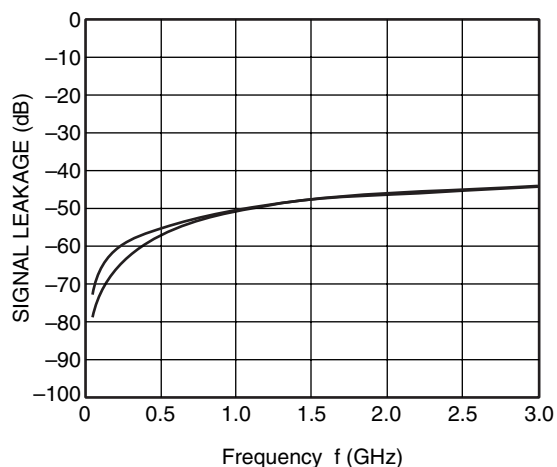
# TYPICAL CHARACTERISTICS

( $T_A = +25^{\circ}\text{C}$ ,  $V_{DD} = +5.0\text{ V}$ ,  $V_{CONT} = +5.0\text{ V/0 V}$ ,  $P_{in} = 0\text{ dBm}$ ,  $Z_o = 50\ \Omega$ , unless otherwise specified)

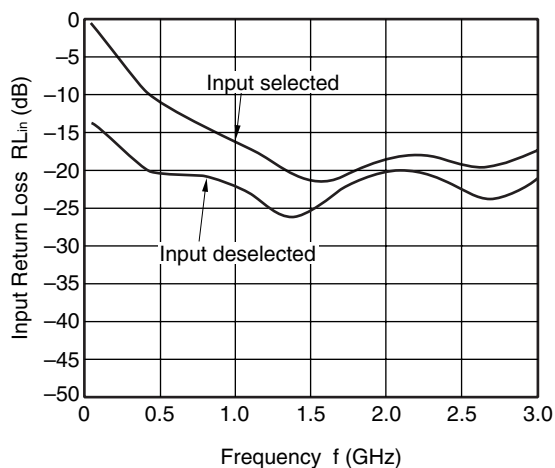
INSERTION LOSS vs. FREQUENCY



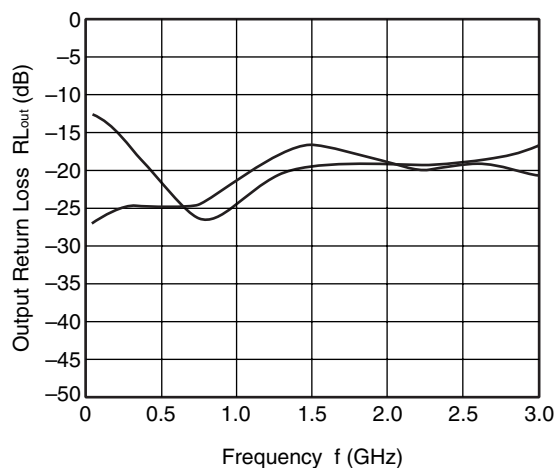
SIGNAL LEAKAGE vs. FREQUENCY



INPUT RETURN LOSS vs. FREQUENCY

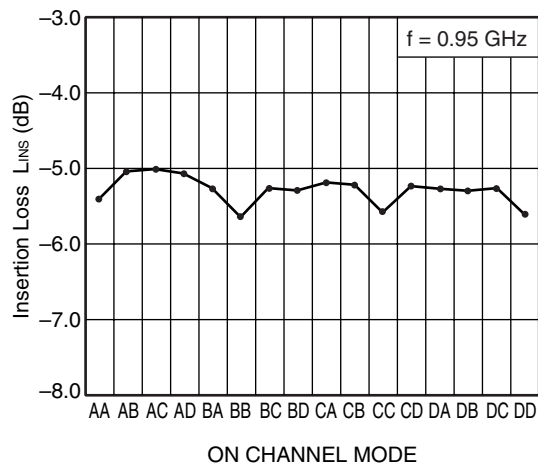


OUTPUT RETURN LOSS vs. FREQUENCY

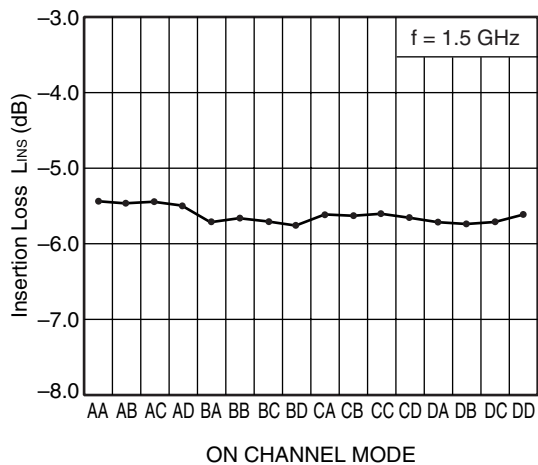


**Remark** The graphs indicate nominal characteristics.

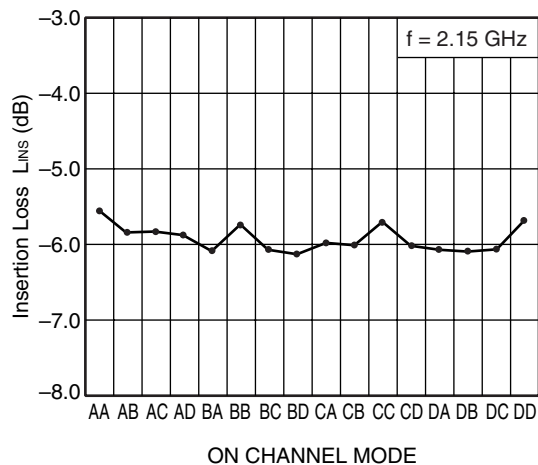
INSERTION LOSS  
vs. ON CHANNEL MODE



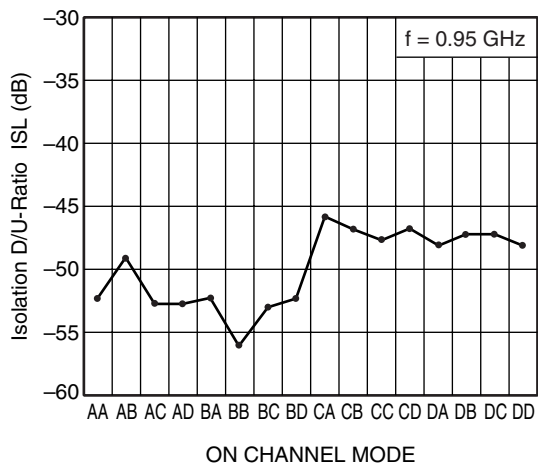
INSERTION LOSS  
vs. ON CHANNEL MODE



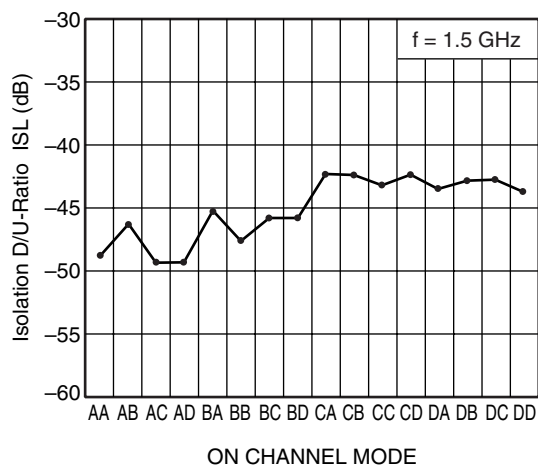
INSERTION LOSS  
vs. ON CHANNEL MODE



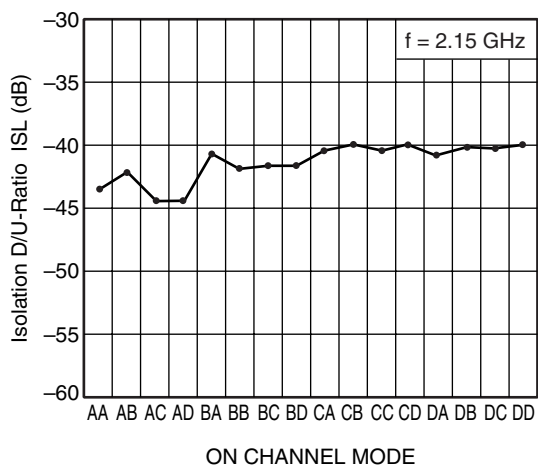
ISOLATION D/U-RATIO  
vs. ON CHANNEL MODE



ISOLATION D/U-RATIO  
vs. ON CHANNEL MODE

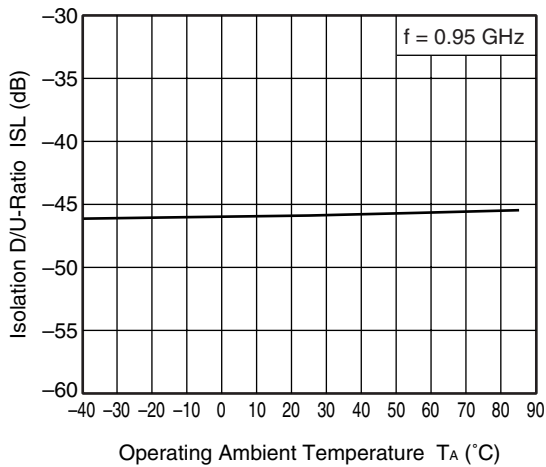


ISOLATION D/U-RATIO  
vs. ON CHANNEL MODE

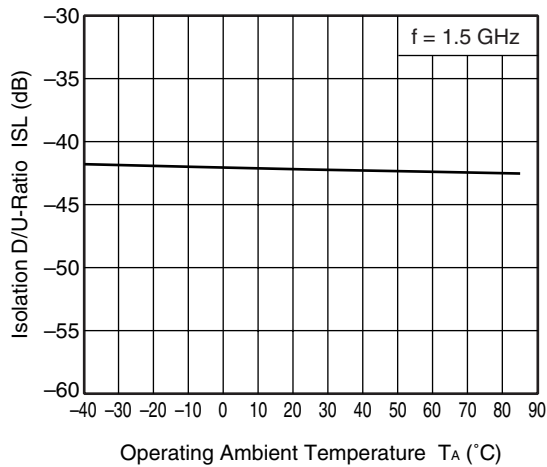


**Remark** The graphs indicate nominal characteristics.

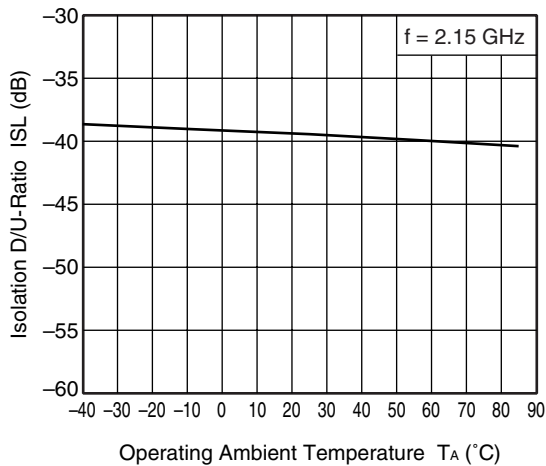
ISOLATION D/U-RATIO vs. OPERATING AMBIENT TEMPERATURE



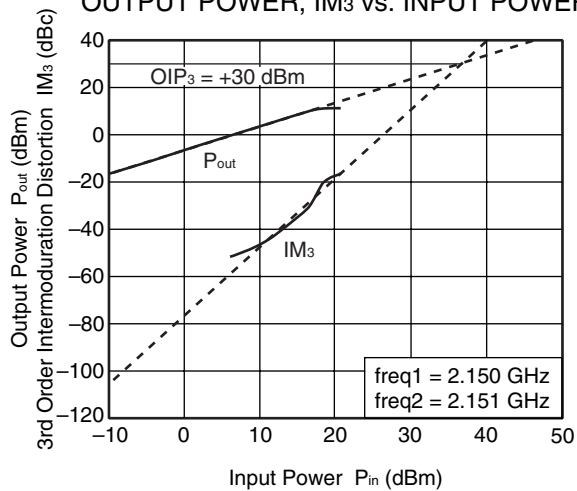
ISOLATION D/U-RATIO vs. OPERATING AMBIENT TEMPERATURE



ISOLATION D/U-RATIO vs. OPERATING AMBIENT TEMPERATURE



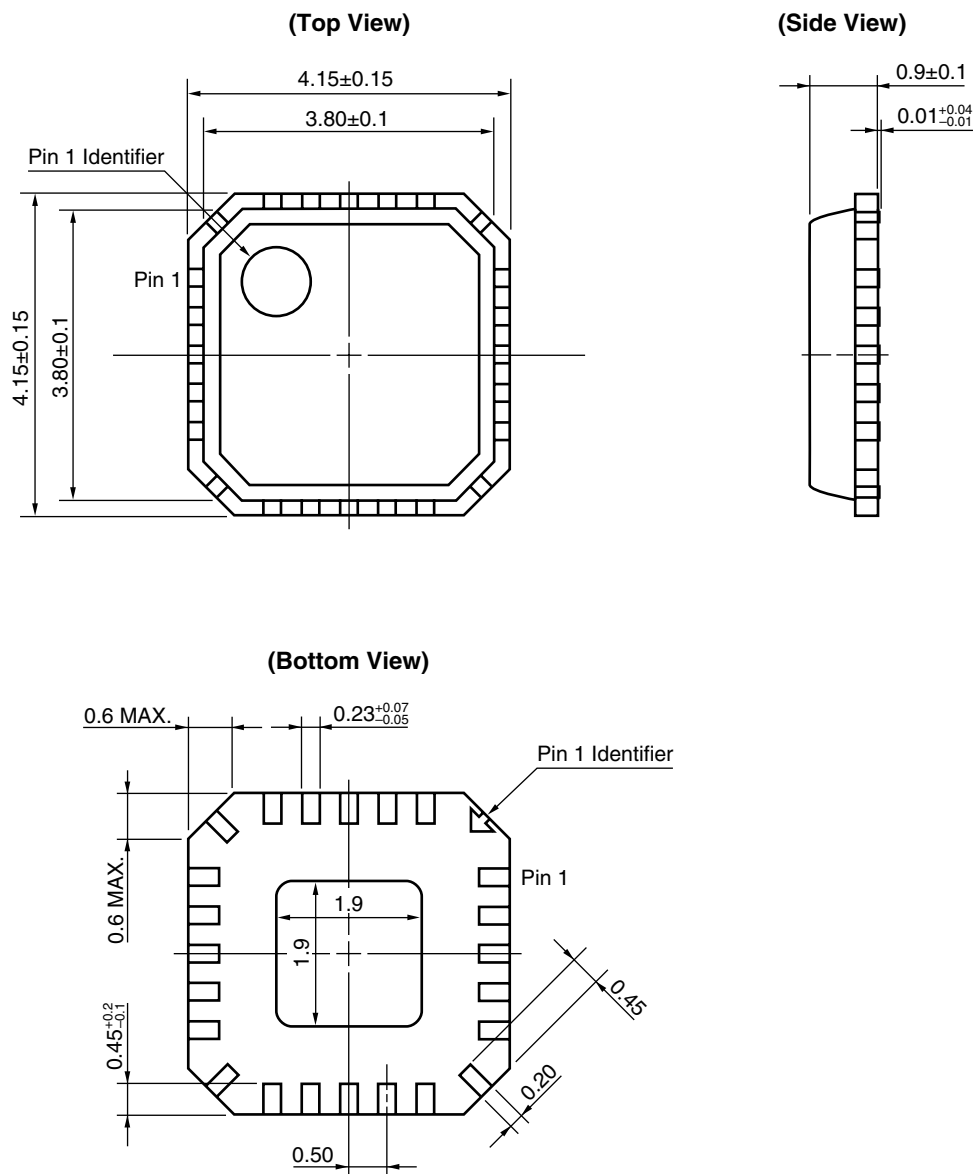
OUTPUT POWER,  $IM_3$  vs. INPUT POWER



**Remark** The graphs indicate nominal characteristics.

# PACKAGE DIMENSIONS

20-PIN 4 × 4 mm SQUARE MICRO LEAD PACKAGE (20-PIN QFN (0.5 mm pitch)) (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<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            |
| Partial Heating  | Peak temperature (pin 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).

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M8E 00.4-0110

|                |               |   |
|----------------|---------------|---|
| <b>Caution</b> | 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"> <li>• 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"> <li>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.</li> <li>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.</li> </ol> </li> <li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li> <li>• Do not lick the product or in any way allow it to enter the mouth.</li> </ul> |
|----------------|---------------|---|

► For further information, please contact

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