

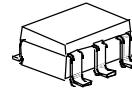
1.9GHz BAND MIXER GaAs MMIC

■GENERAL DESCRIPTION

NJG1553BF is a GaAs MMIC MIXER IC with built-in local amplifier for 1.9GHz PCS applications.

This mixer features high conversion gain, low noise figure and low distortion.

■PACKAGE OUTLINE

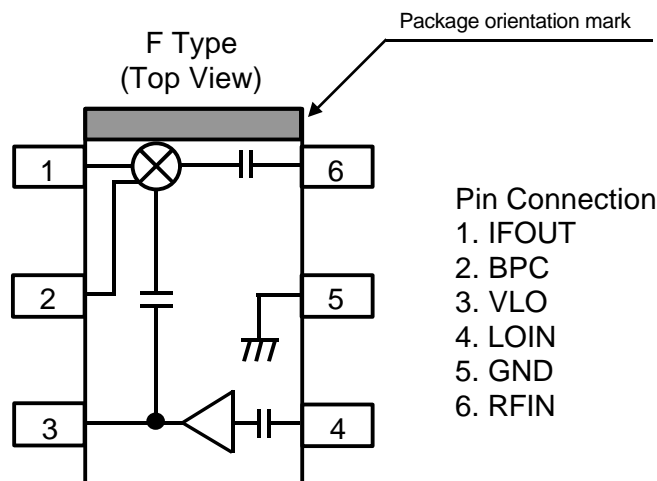


NJG1553BF

■FEATURES

- | | |
|--------------------------|---|
| ●Low Voltage Operation | +2.7V |
| ●Low Current Consumption | 7.0mA |
| ●High Conversion Gain | 11dB typ. @ $f_{RF}=1960\text{MHz}$, $P_{RF}=-30\text{dBm}$ $f_{LO}=2090\text{MHz}$, $P_{LO}=-10\text{dBm}$ |
| ●Low noise figure | 7dB typ. @ $f_{RF}=1960\text{MHz}$, $f_{LO}=2090\text{MHz}$, $P_{LO}=-10\text{dBm}$ |
| ●High Input IP3 | -1dBm typ. @ $f_{RF1}=1960.0\text{MHz}$, $f_{RF2}=1960.1\text{MHz}$, $P_{RF}=-30\text{dBm}$ $f_{LO}=2090\text{MHz}$, $P_{LO}=-10\text{dBm}$ |
| ●Small package | MTP6 (Mount Size: 2.8x2.9x1.2mm) |

■PIN CONFIGURATION



NOTE: Please note that any information on this catalog will be subject to change.

NJG1553BF

■ABSOLUTE MAXIMUM RATINGS

($T_a=25^{\circ}\text{C}$, $Z_s=Z_l=50\Omega$)

| PARAMETER | SYMBOL | CONDITIONS | RATINGS | UNITS |
|---------------------------|-------------------|--|----------|--------------------|
| Mixer Supply Voltage | V_{MIX} | | 6.5 | V |
| Local amp. Supply Voltage | V_{LO} | | 6.5 | V |
| Mixer RF Input Power | P_{RFIN} | $V_{\text{MIX}}=V_{\text{LO}}=2.7\text{V}$ | 10 | dBm |
| Mixer LO Input Power | P_{LOIN} | $V_{\text{MIX}}=V_{\text{LO}}=2.7\text{V}$ | 10 | dBm |
| Power Dissipation | P_{D} | | 150 | mW |
| Operating Temperature | T_{opr} | | -30~+85 | $^{\circ}\text{C}$ |
| Storage Temperature | T_{stg} | | -40~+150 | $^{\circ}\text{C}$ |

■RECOMMENDED OPERATING RANGE

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------------|------------------|------------|-----|-----|-----|-------|
| Supply Voltage Mixer | V_{MIX} | | 2.5 | 2.7 | 5.8 | V |
| Supply Voltage Local Amp. | V_{LO} | | 2.5 | 2.7 | 5.8 | V |

■ELECTRICAL CHARACTERISTICS (DC CHARACTERISTICS)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------|------------------|---|-----|-----|-----|-------|
| Mixer Current | I_{MIX} | $P_{\text{RF}}=\text{OFF}$, $P_{\text{LO}}=\text{OFF}$ | - | 5.0 | 7.0 | mA |
| Local Amp. Current | I_{LO} | $P_{\text{RF}}=\text{OFF}$, $P_{\text{LO}}=\text{OFF}$ | - | 2.0 | 3.2 | mA |

■ELECTRICAL CHARACTERISTICS (AC CHARACTERISTICS)

($V_{\text{MIX}}=V_{\text{LO}}=2.7\text{V}$, $f_{\text{RF}}=1960\text{MHz}$, $f_{\text{LO}}=2090\text{MHz}$, $f_{\text{IF}}=130\text{MHz}$, $P_{\text{RF}}=-30\text{dBm}$, $P_{\text{LO}}=-10\text{dBm}$, $T_a=25^{\circ}\text{C}$,
 $Z_s=Z_l=50\Omega$, Measuring Test Circuit)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------------------|----------------|---|------|------|------|-------|
| Operating RF Frequency | freq | | 1930 | 1960 | 1990 | MHz |
| Conversion Gain | G_{C} | | 9 | 11 | - | dB |
| Input 3rd Order Intercept Point | IIP3 | $f_{\text{RF}}=1960.0+1960.1\text{MHz}$ | - | -1 | - | dBm |
| Noise Figure | NF | | - | 7.0 | 8.5 | dB |

■ TERMINAL EXPLANATION

| PIN No. | SYMBOL | DESCRIPTIONS |
|---------|--------|--|
| 1 | IFOUT | IF signal output terminal of mixer. External matching circuit is required. Please connect mixer power supply through inductor (L6, L7) as shown in test circuit. Please place bypass capacitors (C6, C7, C8) close to C2. |
| 2 | BPC | Bypass capacitor terminal of mixer. |
| 3 | VLO | Local amplifier power supply terminal. Please place R1 and L5 close to this terminal as shown in test circuit, and place bypass capacitors (C3, C4) close to R1 and L5. |
| 4 | LOIN | Local power input terminal of local amplifier. External matching circuit is required. |
| 5 | GND | Ground terminal (0V). Please place grounding VIAs as close as possible. |
| 6 | RFIN | RF signal input terminal of mixer. External matching circuit is required. |

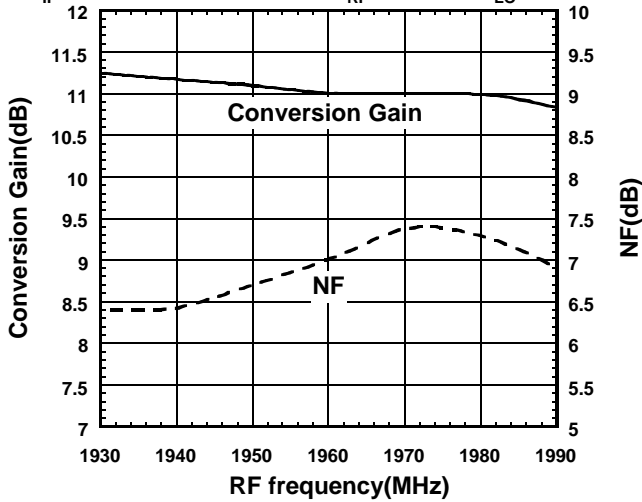
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TYPICAL CHARACTERISTICS

Conversion Gain, NF vs. RF frequency

$$V_{MIX} = V_{LO} = 2.7V, I_{MIX} = 5.0mA, I_{LO} = 1.9mA,$$

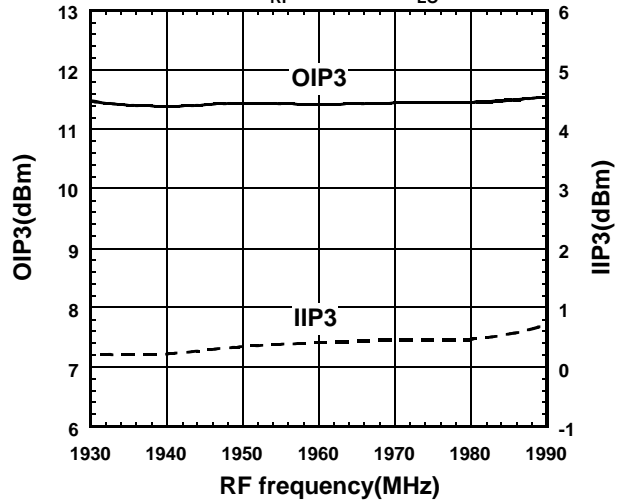
$$f_{IF} = 130MHz, \text{Upper LOCAL}, P_{RF} = -30dBm, P_{LO} = -10dBm$$



OIP3, IIP3 vs. RF frequency

$$V_{MIX} = V_{LO} = 2.7V, I_{MIX} = 5.0mA, I_{LO} = 1.9mA,$$

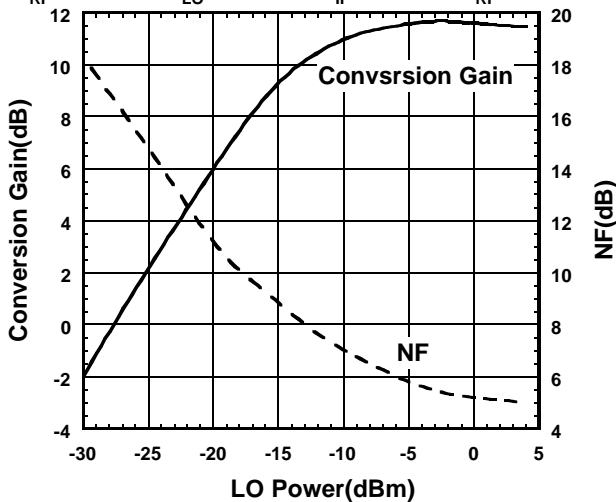
$$\text{Upper LOCAL}, P_{RF} = -30dBm, P_{LO} = -10dBm$$



Conversion Gain, NF vs. LO Power

$$V_{MIX} = V_{LO} = 2.7V, I_{MIX} = 5.0mA, I_{LO} = 1.9mA,$$

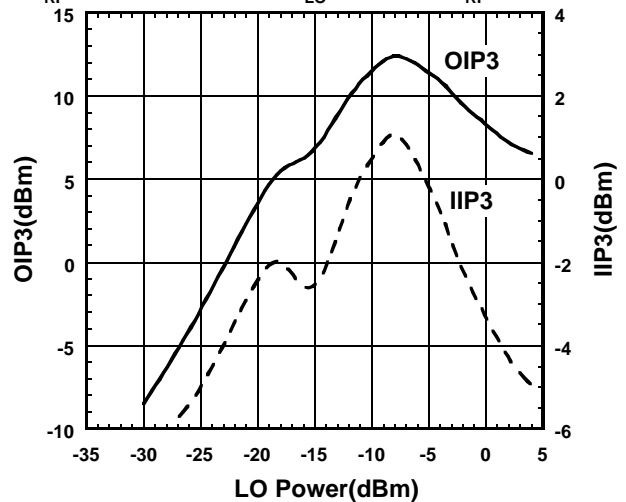
$$f_{RF} = 1960MHz, f_{LO} = 2090MHz, f_{IF} = 130MHz, P_{RF} = -30dBm$$



OIP3, IIP3 vs. LO Power

$$V_{MIX} = V_{LO} = 2.7V, I_{MIX} = 5.0mA, I_{LO} = 1.9mA,$$

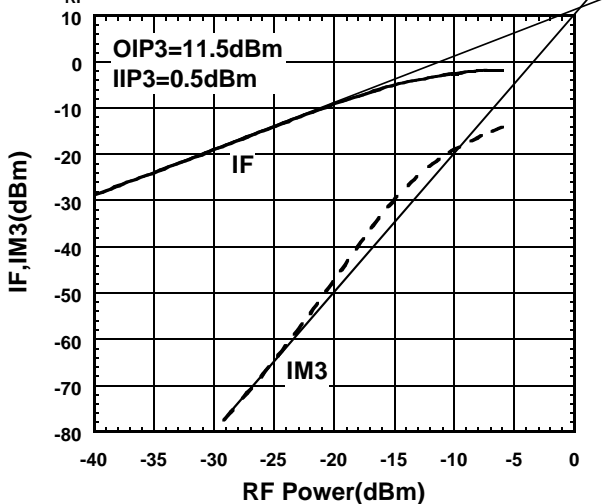
$$f_{RF} = 1960.0+1960.1MHz, f_{LO} = 2090MHz, P_{RF} = -30dBm$$



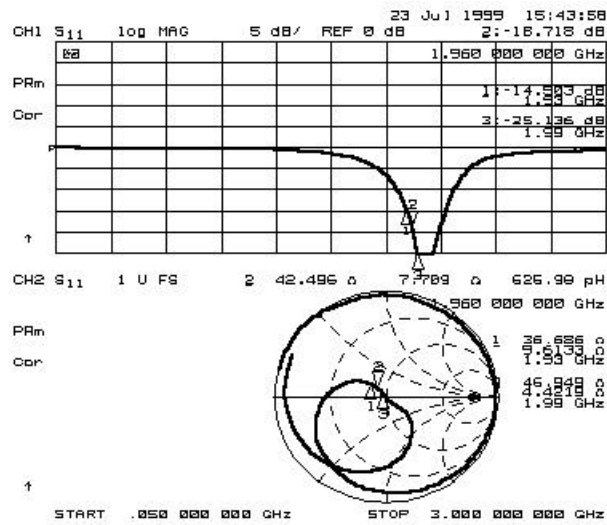
IF, IM3 vs. RF Power

$$V_{MIX} = V_{LO} = 2.7V, I_{MIX} = 5.0mA, I_{LO} = 1.9mA,$$

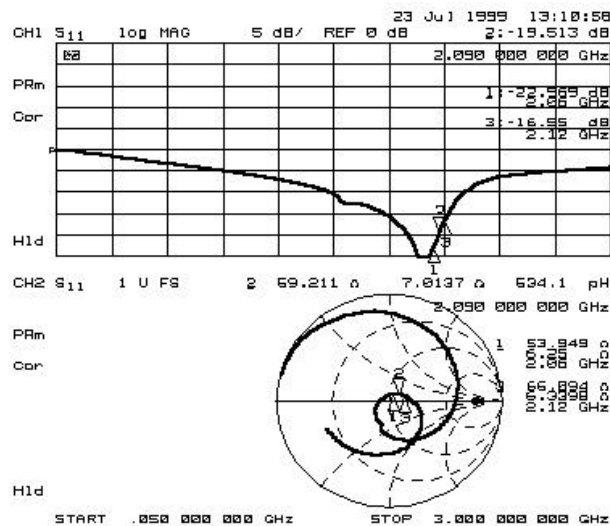
$$f_{RF} = 1960.0+1960.1MHz, f_{LO} = 2090MHz, P_{LO} = -10dBm$$



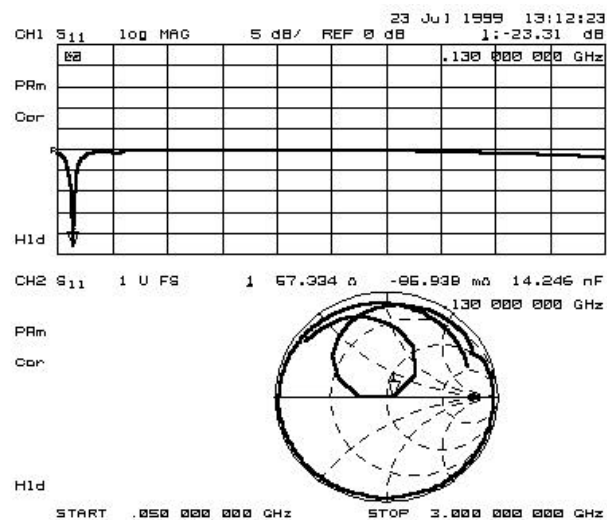
TYPICAL CHARACTERISTICS



RFIN port Impedance



LOIN port Impedance



IFOUT port Impedance

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APPLICATION CIRCUIT

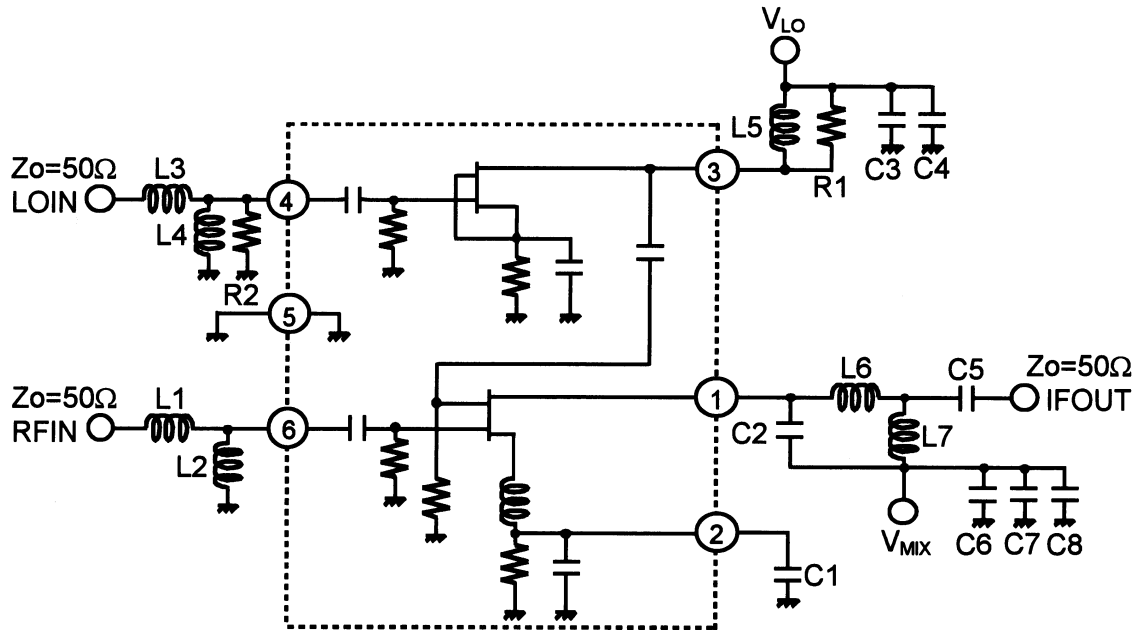
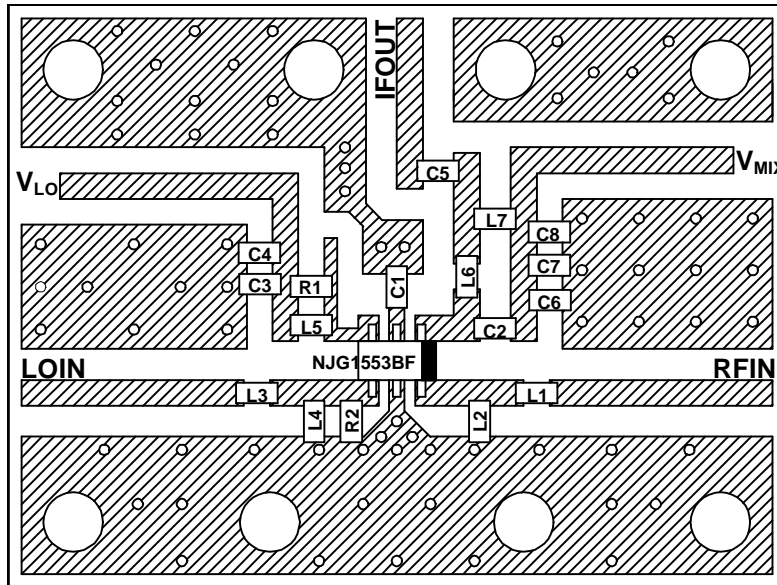


Table: The parts used in the circuit above

| PART ID | PCS BAND | | Remarks |
|---------|--|---------------------|---------|
| | Upper LOCAL | | |
| | f _{LO} =2090MHz f _F =130MHz | | |
| L1 | 8.2nH | TAIYO-YUDEN(HK1608) | |
| L2 | 8.2nH | TAIYO-YUDEN(HK1608) | |
| L3 | 3.9nH | TAIYO-YUDEN(HK1608) | |
| L4 | 10nH | TAIYO-YUDEN(HK1608) | |
| L5 | 4.7nH | TAIYO-YUDEN(HK1608) | |
| L6 | 100nH | TAIYO-YUDEN(HK1608) | |
| L7 | 56nH | TAIYO-YUDEN(HK1608) | |
| C1 | 1000pF | MURATA(GRM39) | |
| C2 | 10pF | MURATA(GRM39) | |
| C3 | 10pF | MURATA(GRM39) | |
| C4 | 100pF | MURATA(GRM39) | |
| C5 | 1000pF | MURATA(GRM39) | |
| C6 | 10pF | MURATA(GRM39) | |
| C7 | 100pF | MURATA(GRM39) | |
| C8 | 1000pF | MURATA(GRM39) | |
| R1 | 180Ω | 1608 Size | |
| R2 | 82Ω | 1608 Size | |

RECOMMENDED PCB DESIGN

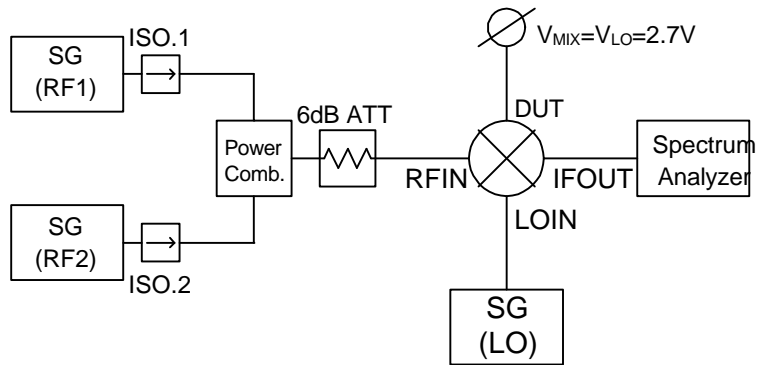


PCB: FR-4 t=0.5mm
 Microstrip Line Width=1mm
 PCB Size: 22.5x30.0mm

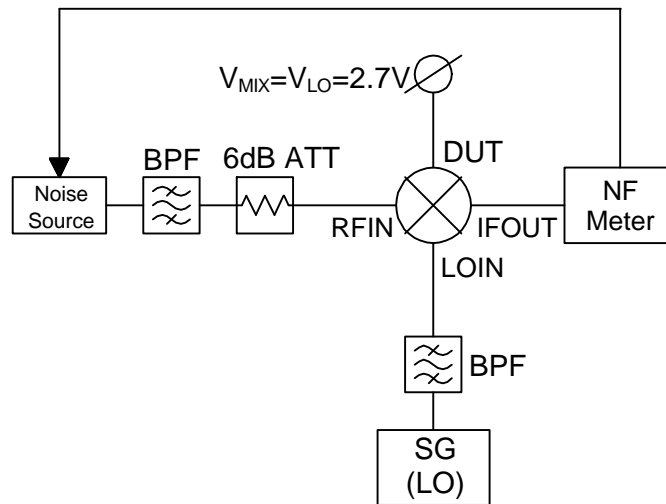
PRECAUTIONS

- [1] Please place a inductor L1 at about 3.5mm distance from RFIN terminal (Pin #6).
- [2] Please place a inductor L3 at about 3.5mm distance from LOIN terminal (Pin #4).
- [3] Please place a capacitor C1 close to by-pass capacitor terminal (Pin #2).
- [4] Please place capacitors C6, C7, C8 close to C2.
- [5] Please place capacitors C3, C4 close to R1 and L5.

MEASURING BLOCK DIAGRAM

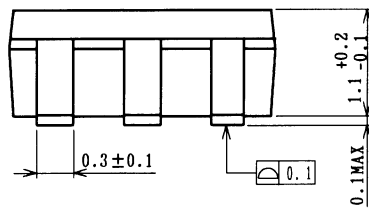
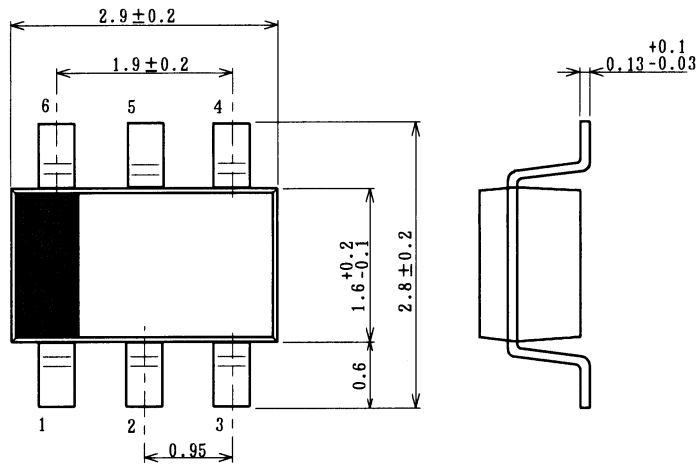


IF, IM3 Measuring Block Diagram



Noise Figure Measuring Block Diagram

■PACKAGE OUTLINE (MTP6)



| | |
|---------------------|------------------|
| Lead material | : Copper |
| Lead surface finish | : Solder plating |
| Molding material | : Epoxy resin |
| Unit | : mm |
| Weight | : 14mg |

Cautions on using this product

This product contains Gallium-Arsenide (GaAs) which is a harmful material.

- Do NOT eat or put into mouth.
- Do NOT dispose in fire or break up this product.
- Do NOT chemically make gas or powder with this product.
- To waste this product, please obey the relating law of your country.

[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

This product may be damaged with electric static discharge (ESD) or spike voltage. Please handle with care to avoid these damages.