# HA22012

GaAs MMIC
Low Noise Amplifier for Micro Wave Application

HITACHI

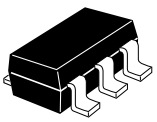
ADE-207-217 (Z)
1st. Edition
July 1996

## Features

- Suitable for low noise amplifier of PHS (1.9 GHz)
- Low voltage and low current operation (3V, 3mA typ.)
- Low noise (1.9 dB typ.)
- High power gain (13.5 dB typ.)
- Built–in input and output matching circuits (50Ω)
- Small surface mount package (MPAK–5)

## Outline

MPAK—5



Hitachi semiconductor

## Absolute Maximum Ratings (Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Supply voltage | Vdd | 5 | V |
| Maximum current | Idd | 6 | mA |
| Power dissipation | Pd | 100 | mW |
| Channel temperature | Tch | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |
| Operation temperature | Topr | –20 to +70 | °C |

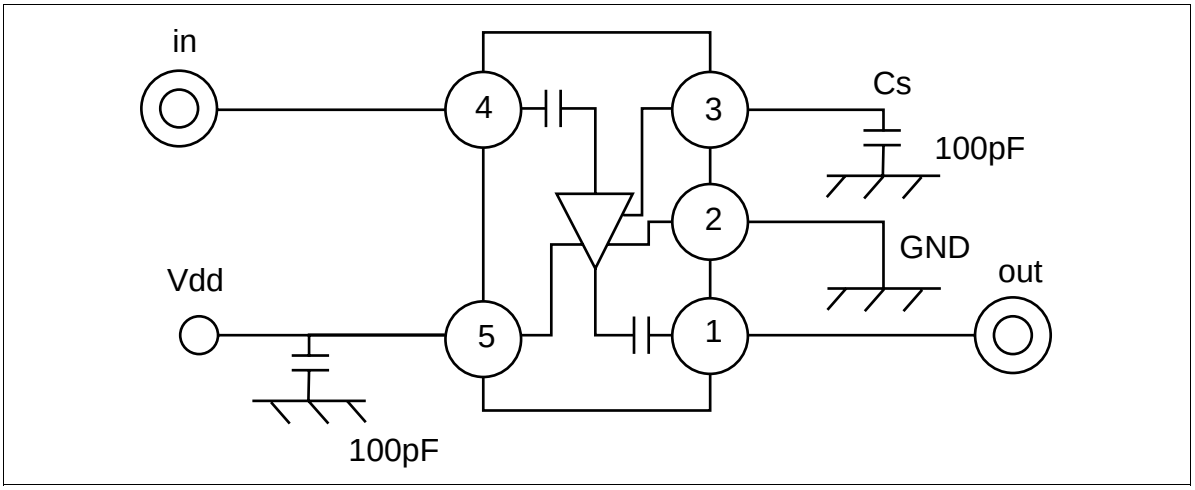
## Electrical Characteristics (Ta = 25°C, Vdd = 3V)

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions | Pin |
|---|---|---|---|---|---|---|---|
| Quiescent current | Idd | 1.5 | 3 | 5.5 | mA | No signal | |
| Power gain | PG | 11.5 | 13.5 | 16 | dB | f = 1.9 GHz | |
| Noise figure | NF | — | 1.9 | 2.5 | dB | f = 1.9 GHz | |

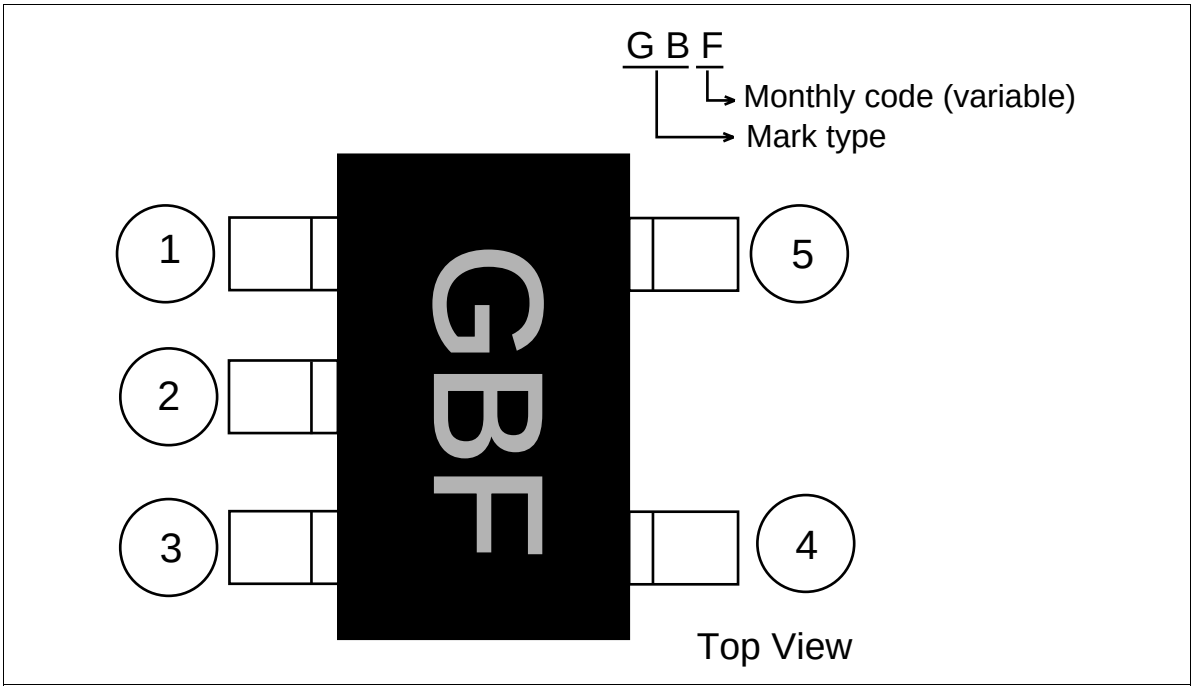
## Typical Performance (Ta = 25°C, Vdd = 3V)

| Item | Symbol | Typ | Unit | Test Conditions | Pin |
|---|---|---|---|---|---|
| VSWR (input) | VSWR in | 1.6 | — | f = 1.9 GHz | 4 |
| VSWR (output) | VSWR out | 1.6 | — | f = 1.9 GHz | 1 |
| 3rd order intermodulation distortion | IM3 | 58 | dB | f = 1.9 GHz, UD = 1.9006 Ghz<br>Pin = –30 dBm | |

## Block Diagram

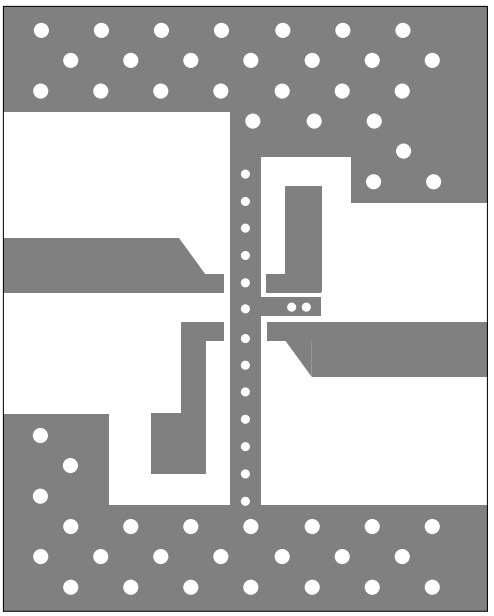


## Pin Arrangement




| Pin No. | Pin name | Function |
|---|---|---|
| 1 | RF out | RF output |
| 2 | GND | Ground |
| 3 | Cs | Bypath capacitor (>100 pF) |
| 4 | RF in | RF input |
| 5 | Vdd | Power supply |

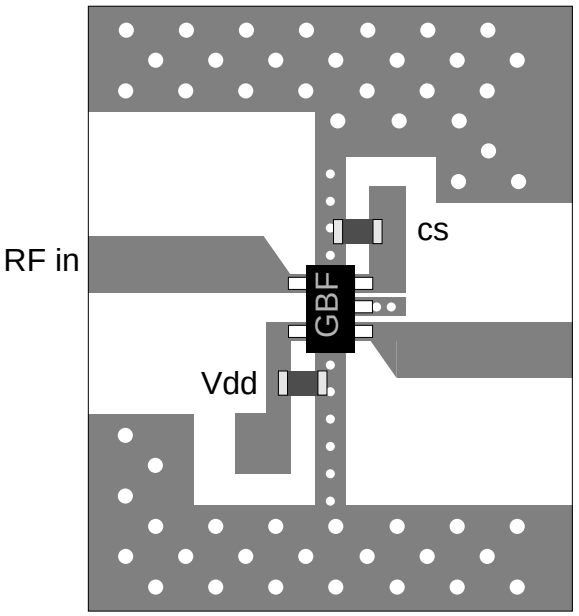
## Pattern Layout



scale 4/1

○ :ϕ0.5mm
∘ :ϕ0.3mm

Front Side view of PCB Pattern




scale 4/1

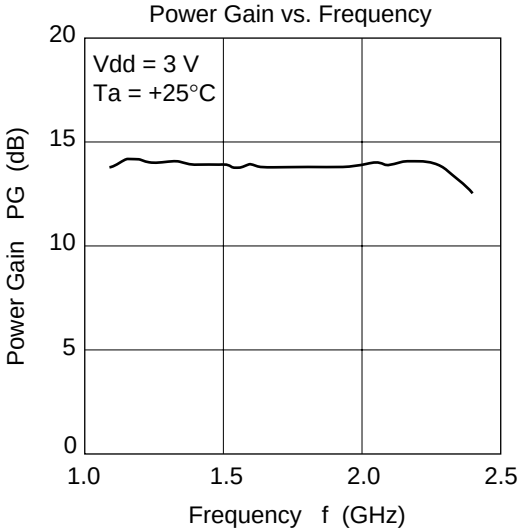
: Capacitor (100pF)

ER=4.8
H=1mm

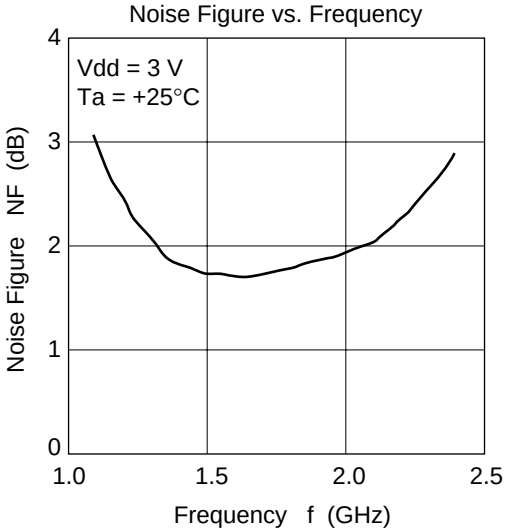
Front Side view of Part Layout

## Main Characteristics

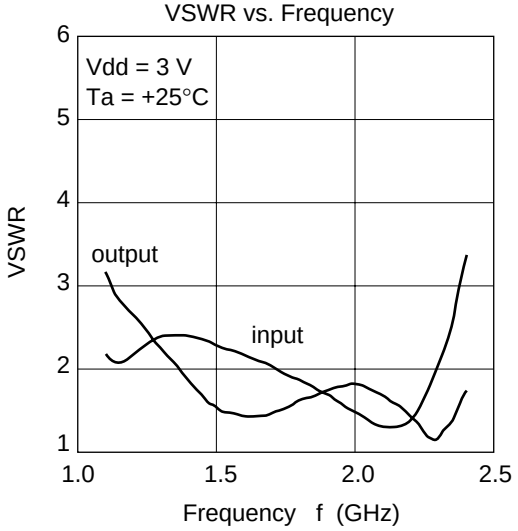
Power Gain vs. Frequency



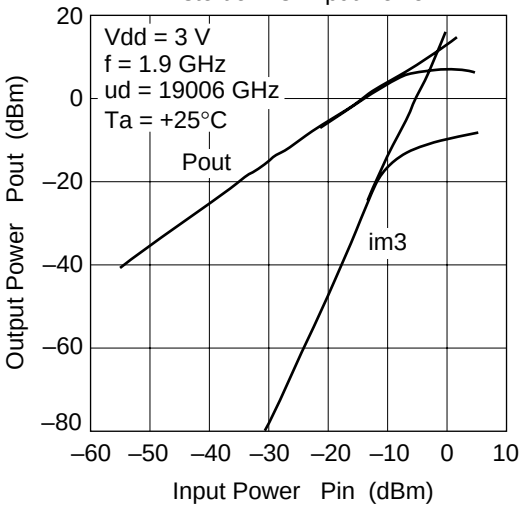

Noise Figure vs. Frequency



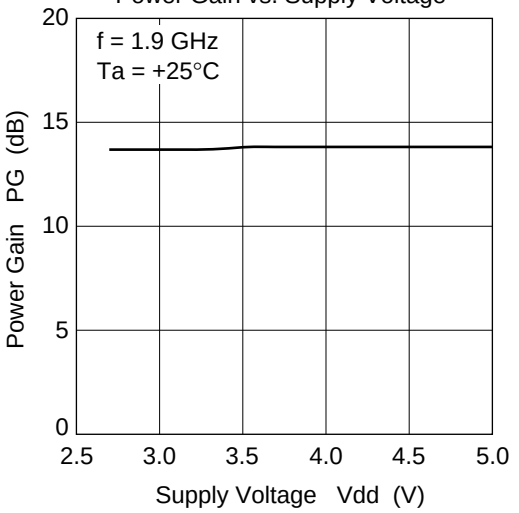

VSWR vs. Frequency



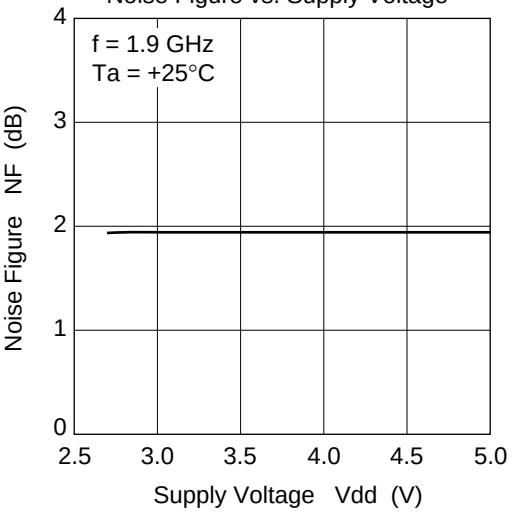

Output Power, 3rd Order Intermodulation Distortion vs. Input Power



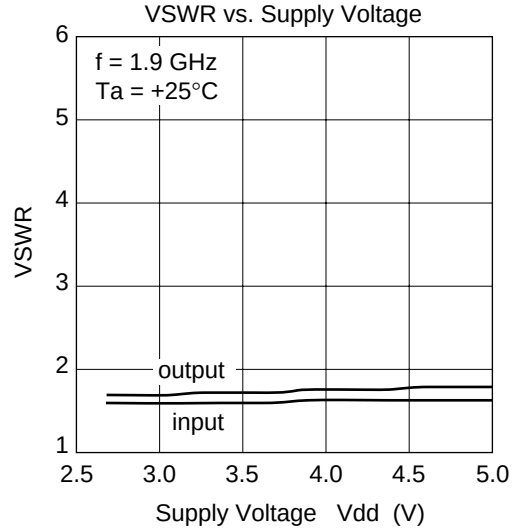
Power Gain vs. Supply Voltage



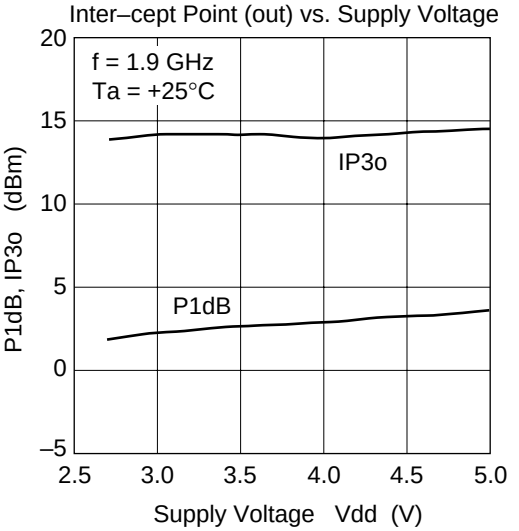

Noise Figure vs. Supply Voltage



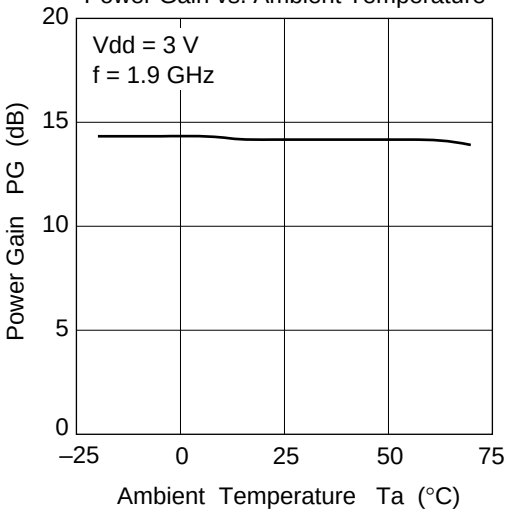

VSWR vs. Supply Voltage



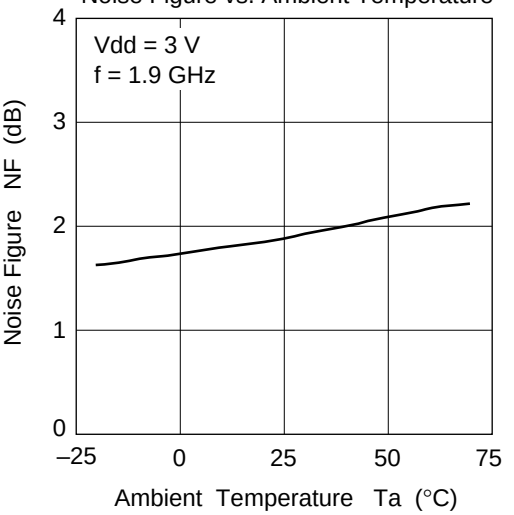

Pout @ 1dB Gain Compression, 3rd Order Inter–cept Point (out) vs. Supply Voltage



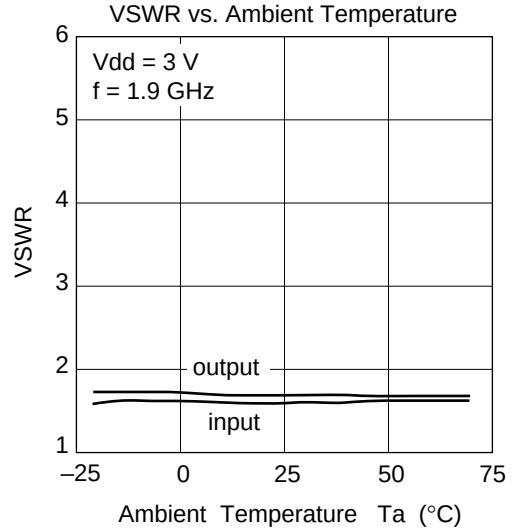
Power Gain vs. Ambient Temperature



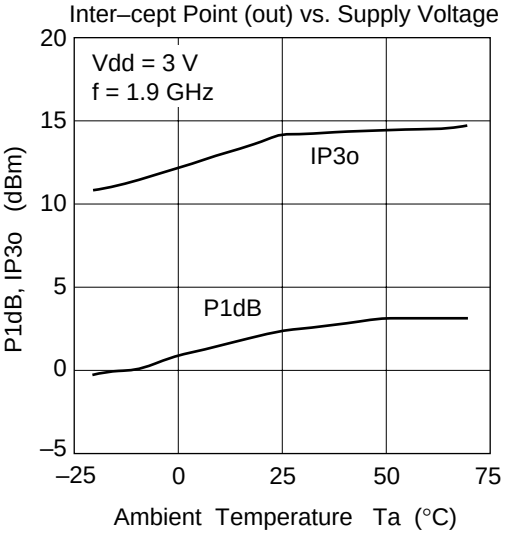

Noise Figure vs. Ambient Temperature

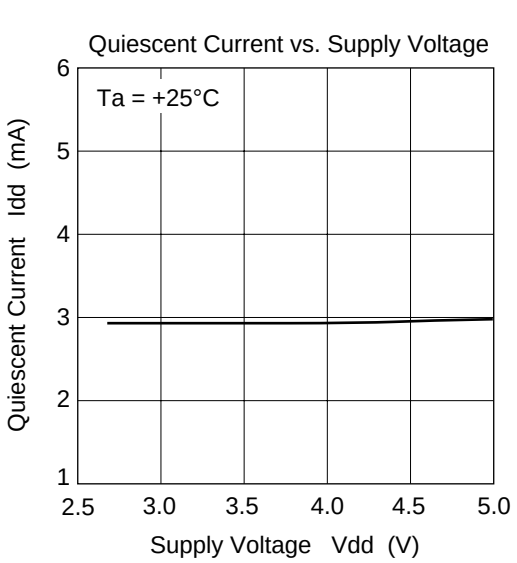


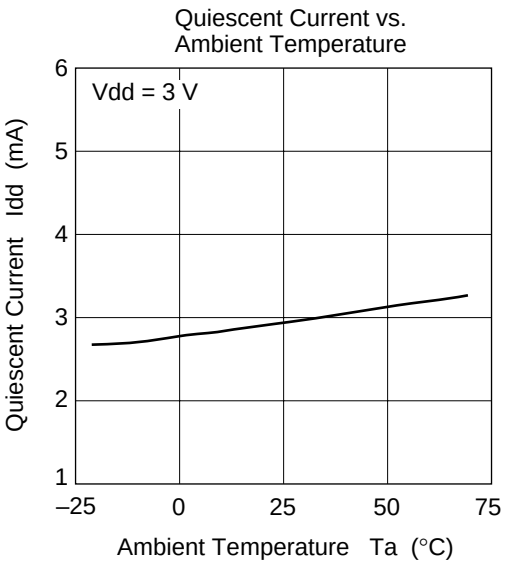

VSWR vs. Ambient Temperature




Pout @ 1dB Gain Compression, 3rd Order Inter–cept Point (out) vs. Supply Voltage

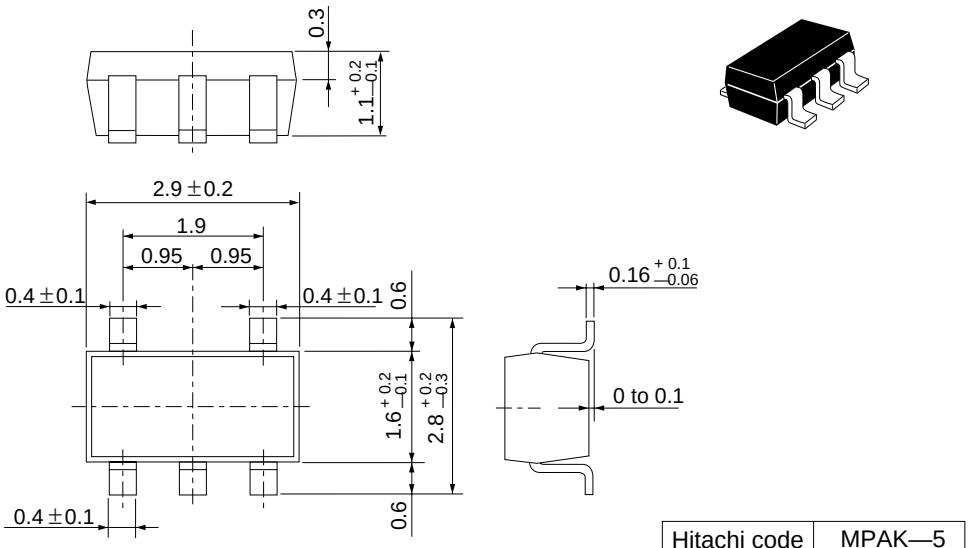



Quiescent Current vs. Supply Voltage
Ta = +25°C
Quiescent Current Idd (mA)
6
5
4
3
2
1
2.5
3.0
3.5
4.0
4.5
5.0
Supply Voltage Vdd (V)


Quiescent Current vs.
Ambient Temperature
Vdd = 3 V
Quiescent Current Idd (mA)
6
5
4
3
2
1
–25
0
25
50
75
Ambient Temperature Ta (°C)

## Package Dimentions

**Unit: mm**




| | |
|---|---|
| Hitachi code | MPAK—5 |
| EIAJ | |
| JEDEC | |

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