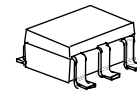


DRIVER-AMPLIFIER GaAs MMIC

■GENERAL DESCRIPTION

NJG1308F is a GaAs MMIC Driver-Amplifier for 800MHz-1.9 GHz band of Cellular phone System. It features a low current consumption and a high gain. Small MTP6 package is adopted.

■PACKAGE OUTLINE

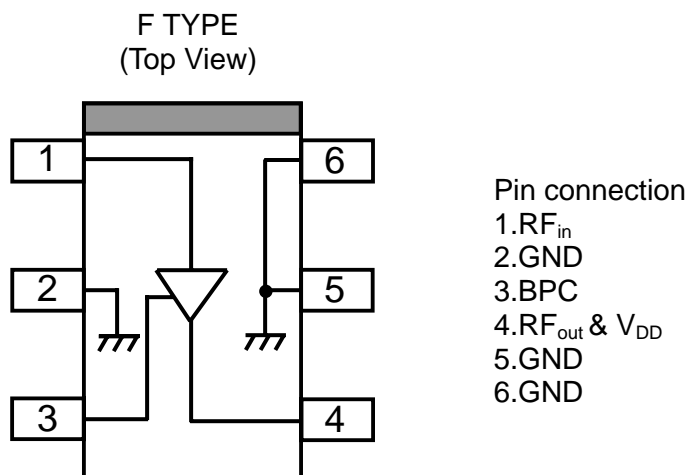


NJG1308F

■FEATURES

- Low supply voltage operation +3.0V typ.
- Low current consumption 15mA typ. @ $P_{out}=+8dBm$
- High gain 18dB typ. @ $f=938MHz$
- 16dB @ $f=1441MHz$
- 14dB @ $f=1900MHz$
- Pout at 1dB Gain Compression point +12dBm typ. @ $f=938MHz$
- +11dBm typ. @ $f=1441/1900MHz$
- Package MTP6

■PIN CONFIGURATION



Note: is a package orientation mark.

NJG1308F

■ABSOLUTE MAXIMUM RATINGS

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

| PARAMETER | SYMBOL | CONDITIONS | RATINGS | UNITS |
|-----------------------|-----------|--------------------|----------|--------------------|
| Drain Voltage | V_{DD} | | 6 | V |
| Input Power | P_{in} | $V_{DD}=3\text{V}$ | 15 | dBm |
| Power Dissipation | P_D | | 300 | mW |
| Operating Temperature | T_{opr} | | -40~+85 | $^{\circ}\text{C}$ |
| Storage Temperature | T_{stg} | | -55~+150 | $^{\circ}\text{C}$ |

■ELECTRICAL CHARACTERISTICS 1(Application circuit 1)

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

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|------------|--|-----|-----|-----|-------|
| Operating Frequency | Freq | $V_{DD}=3.0\text{V}$ | 915 | 938 | 960 | MHz |
| Drain Voltage | V_{DD} | | 2.7 | 3.0 | 5.0 | V |
| Operating Current | I_{DD} | $V_{DD}=3.0\text{V}$, $P_{out}=+8\text{dBm}$ | - | 15 | 21 | mA |
| Small Signal Gain | Gain | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | 15 | 18 | 21 | dB |
| Gain Flatness | G_{flat} | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | - | 0.5 | - | dB |
| Pout at 1dB Gain Compression point | P_{-1dB} | $V_{DD}=3.0\text{V}$ | - | +12 | - | dBm |
| Adjacent Channel Leakage Power (PDC Regulation) | P_{acp} | $V_{DD}=3.0\text{V}$, $P_{out}=+8\text{dBm}$ offset=50kHz $P_{in}; \pi/4$ DQPSK | - | -60 | - | dBc |
| Input VSWR | $VSWR_i$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |
| Output VSWR | $VSWR_o$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |

■ELECTRICAL CHARACTERISTICS 2 (Application circuit 2)

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

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|------------|--|------|------|------|-------|
| Operating Frequency | freq | $V_{DD}=3.0\text{V}$ | 1429 | 1441 | 1453 | MHz |
| Drain Voltage | V_{DD} | | 2.7 | 3.0 | 5.0 | V |
| Operating Current | I_{DD} | $V_{DD}=3.0\text{V}$, $P_{out}=+8\text{dBm}$ | - | 15 | 21 | mA |
| Small Signal Gain | Gain | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | 13 | 16 | 19 | dB |
| Gain Flatness | G_{flat} | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | - | 0.5 | - | dB |
| Pout at 1dB Gain Compression point | P_{-1dB} | $V_{DD}=3.0\text{V}$ | - | +11 | - | dBm |
| Adjacent Channel Leakage Power (PDC Regulation) | P_{acp} | $V_{DD}=3.0\text{V}$, $P_{out}=+8\text{dBm}$ offset=50kHz $P_{in}; \pi/4$ DQPSK | - | -60 | - | dBc |
| Input VSWR | $VSWR_i$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |
| Output VSWR | $VSWR_o$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |

■ELECTRICAL CHARACTERISTICS 3 (Application circuit 3)

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

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|------------|--|------|------|------|-------|
| Operating Frequency | freq | $V_{DD}=3.0\text{V}$ | 1890 | 1900 | 1920 | MHz |
| Drain Voltage | V_{DD} | | 2.7 | 3.0 | 5.0 | V |
| Operating Current | I_{DD} | $V_{DD}=3.0\text{V}$, $P_{out}=+8\text{dBm}$ | - | 15 | 21 | mA |
| Small Signal Gain | Gain | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | 11 | 14 | 17 | dB |
| Gain Flatness | G_{flat} | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | - | 0.5 | - | dB |
| Pout at 1dB Gain Compression point | P_{-1dB} | $V_{DD}=3.0\text{V}$ | - | +11 | - | dBm |
| Adjacent Channel Leakage Power (PHS Regulation) | P_{acp} | $V_{DD}=3.0\text{V}$, $P_{out}=+8\text{dBm}$ offset=600kHz P_{in} ; $\pi/4$ DQPSK | - | -60 | - | dBc |
| Input VSWR | $VSWR_i$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |
| Output VSWR | $VSWR_o$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |

■ELECTRICAL CHARACTERISTICS 4 (Application circuit 4)

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

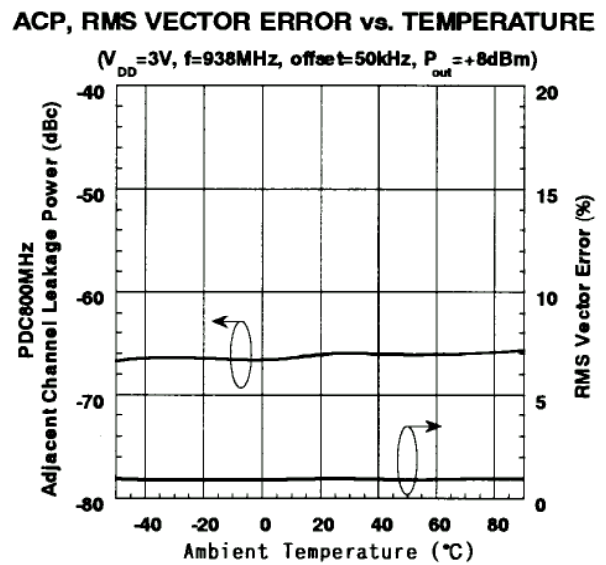
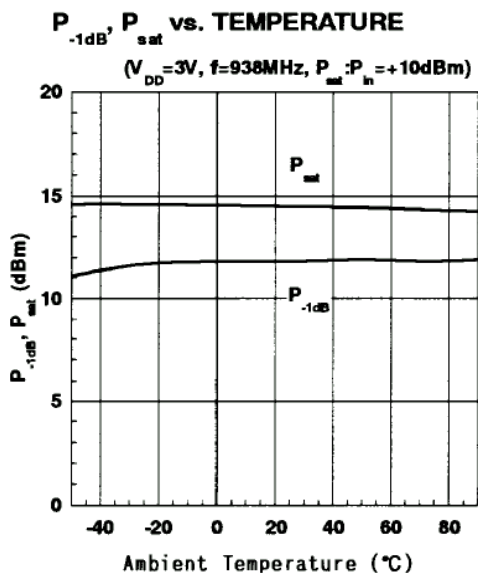
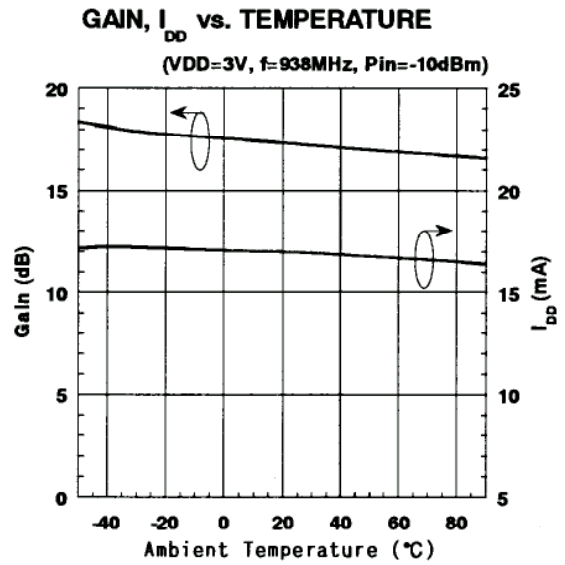
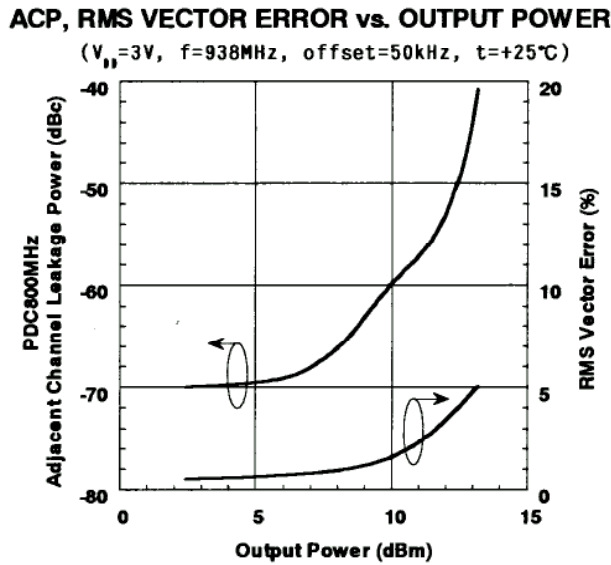
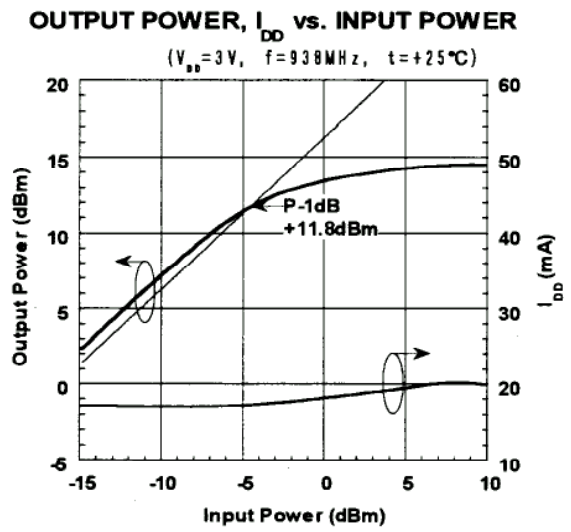
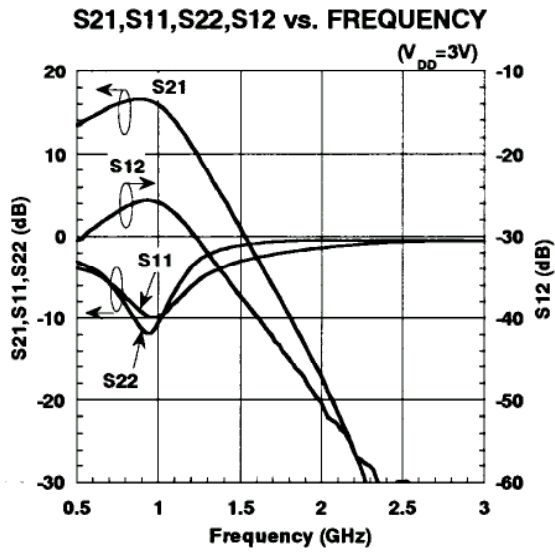
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------------------|------------|---|------|------|------|-------|
| Operating Frequency | freq | $V_{DD}=3.0\text{V}$ | 1750 | 1765 | 1780 | MHz |
| Supply Voltage | V_{DD} | | 2.7 | 3.0 | 5.0 | V |
| Operating Current | I_{DD} | $V_{DD}=3.0\text{V}$, $P_{out}=+8\text{dBm}$ | - | 15 | - | mA |
| Power Gain | Gain | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | - | 14 | - | dB |
| Gain Flatness | G_{flat} | $V_{DD}=3.0\text{V}$, $P_{in}=-10\text{dBm}$ | - | 0.5 | - | dB |
| Pout at 1dB Compression point | P_{-1db} | $V_{DD}=3.0\text{V}$ | - | +11 | - | dBm |
| Input VSWR | $VSWR_i$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |
| Output VSWR | $VSWR_o$ | $V_{DD}=3.0\text{V}$ | - | 1.5 | - | |

NJG1308F

■ TERMINAL INFORMATION

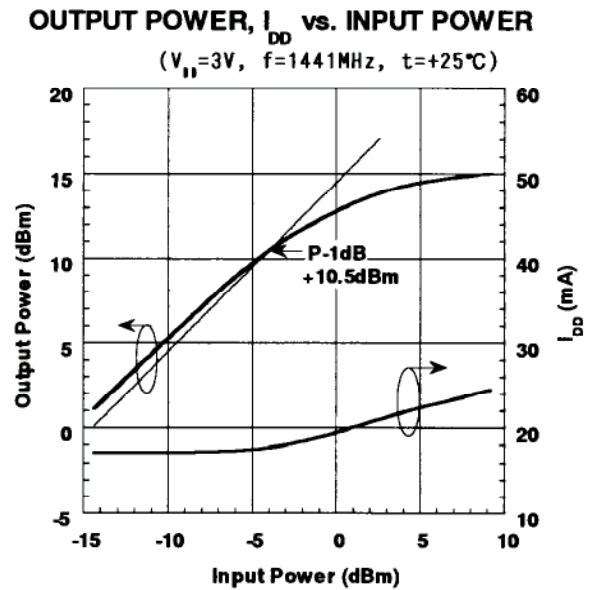
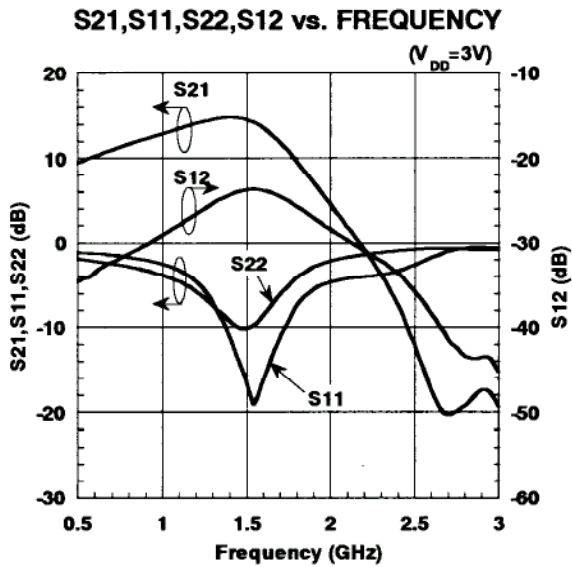
| No. | SYMBOL | DESCRIPTIONS |
|-----|-------------------------------------|---|
| 1 | RF _{in} | RF signal input terminal of driver amplifier. |
| 2 | GND | Ground terminal. |
| 3 | BPC | Source electrode terminal of driver amplifier. The operating current is chosen by a resistor connected between this terminal and ground. |
| 4 | RF _{out} & V _{DD} | RF signal output terminal of driver amplifier. Please use choke coil for power supply of driver amplifier at this terminal. |
| 5 | GND | Ground terminal. |
| 6 | GND | Ground terminal. |

TYPICAL CHARACTERISTICS 1 (Application circuit 1)

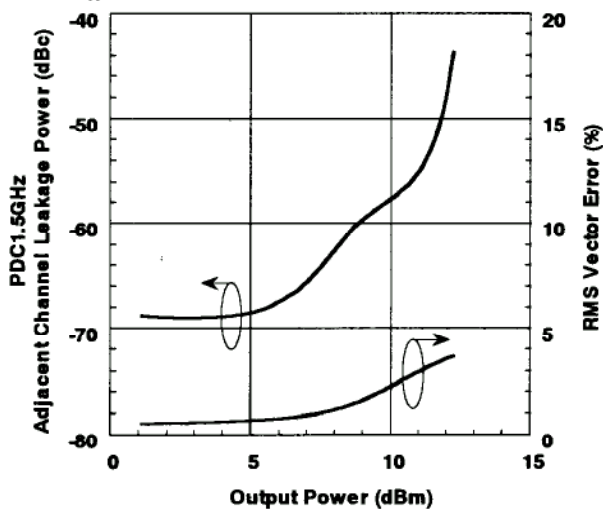


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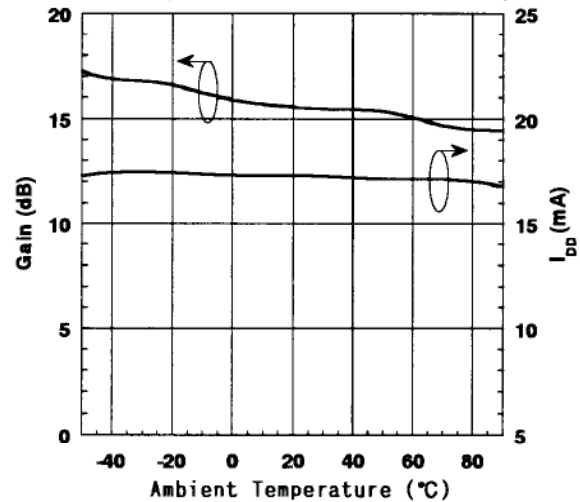
TYPICAL CHARACTERISTICS 2 (Application circuit 2)



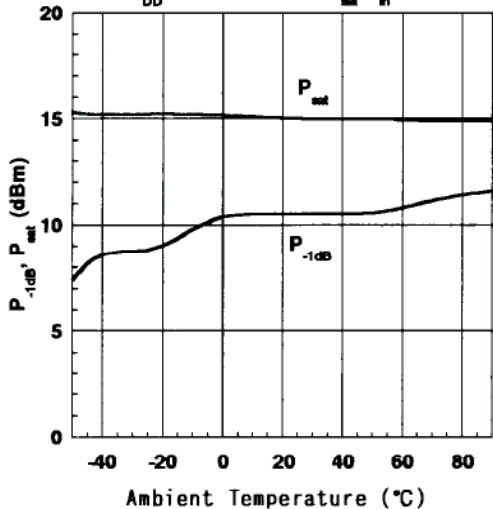
ACP, RMS VECTOR ERROR vs. OUTPUT POWER
($V_{DD}=3V, f=1441MHz, offset=50kHz, t=+25^{\circ}C$)



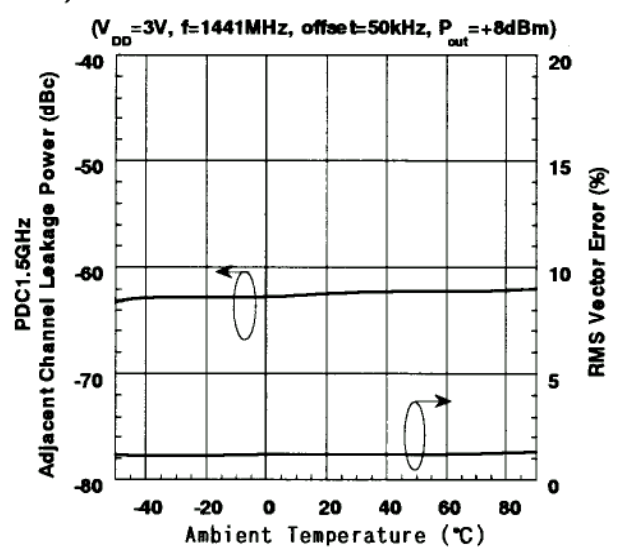
GAIN, I_{DD} vs. TEMPERATURE
($V_{DD}=3V, f=1441MHz, P_{in}=-10dBm$)



P_{-1dB}, P_{sat} vs. TEMPERATURE
($V_{DD}=3V, f=1441MHz, P_{out}-P_{in}=+10dBm$)

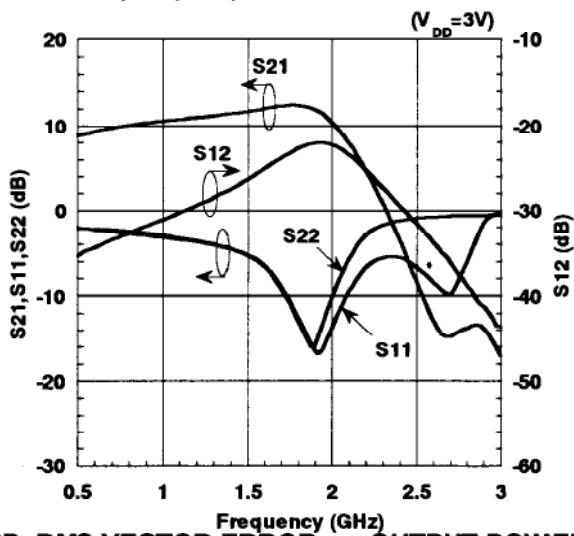


ACP, RMS VECTOR ERROR vs. TEMPERATURE
($V_{DD}=3V, f=1441MHz, offset=50kHz, P_{out}=+8dBm$)

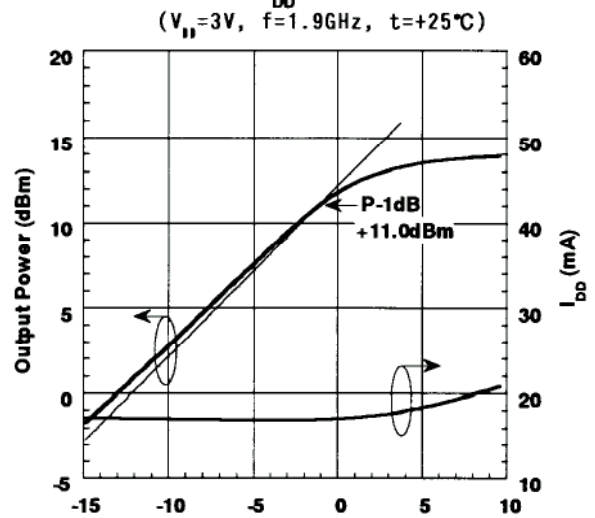


TYPICAL CHARACTERISTICS 3 (Application circuit 3)

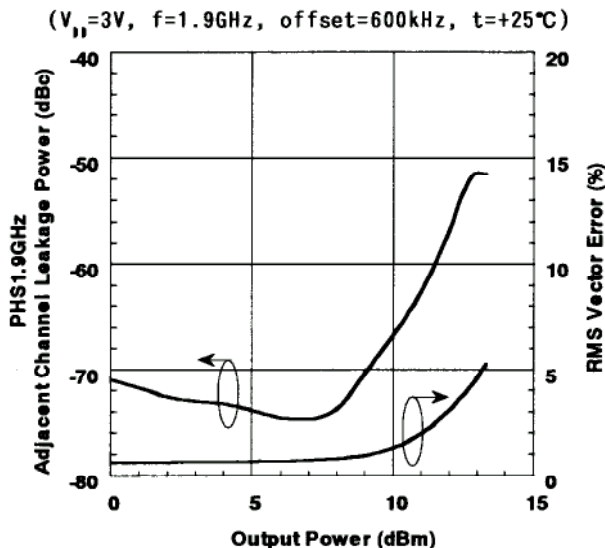
S21,S11,S22,S12 vs. FREQUENCY



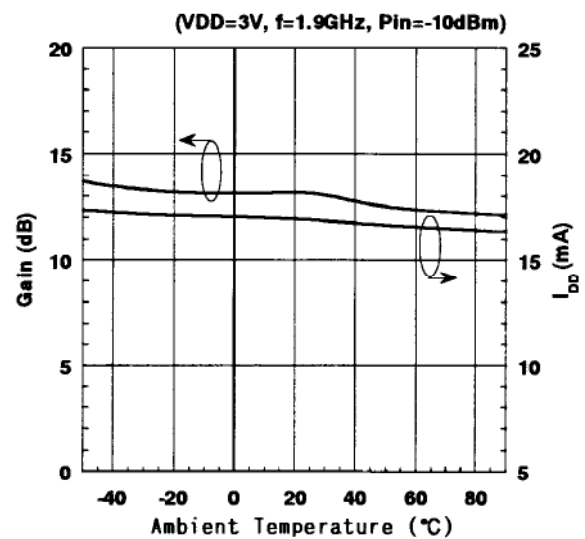
OUTPUT POWER, I_{DD} vs. INPUT POWER



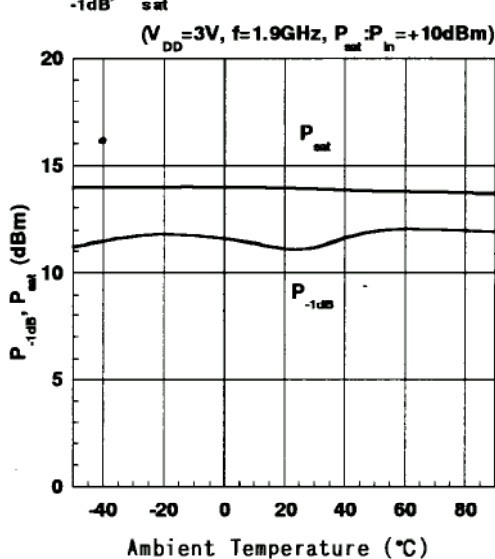
ACP, RMS VECTOR ERROR vs. OUTPUT POWER



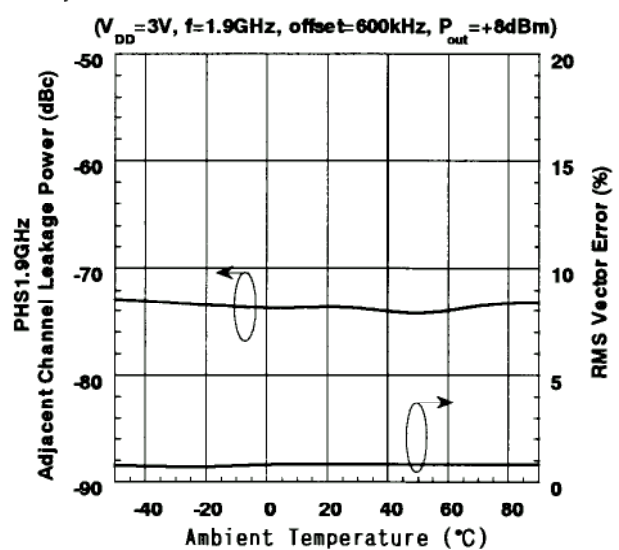
GAIN, I_{DD} vs. TEMPERATURE



P_{-1dB}, P_{sat} vs. TEMPERATURE

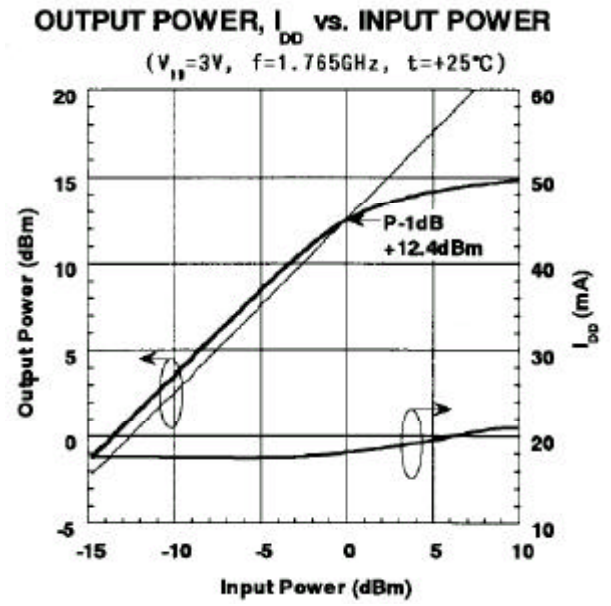
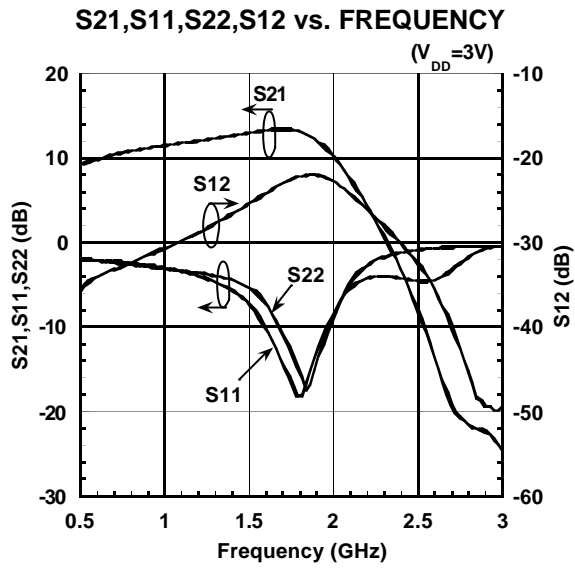


ACP, RMS VECTOR ERROR vs. TEMPERATURE



NJG1308F

TYPICAL CHARACTERISTICS 4 (Application circuit 4)

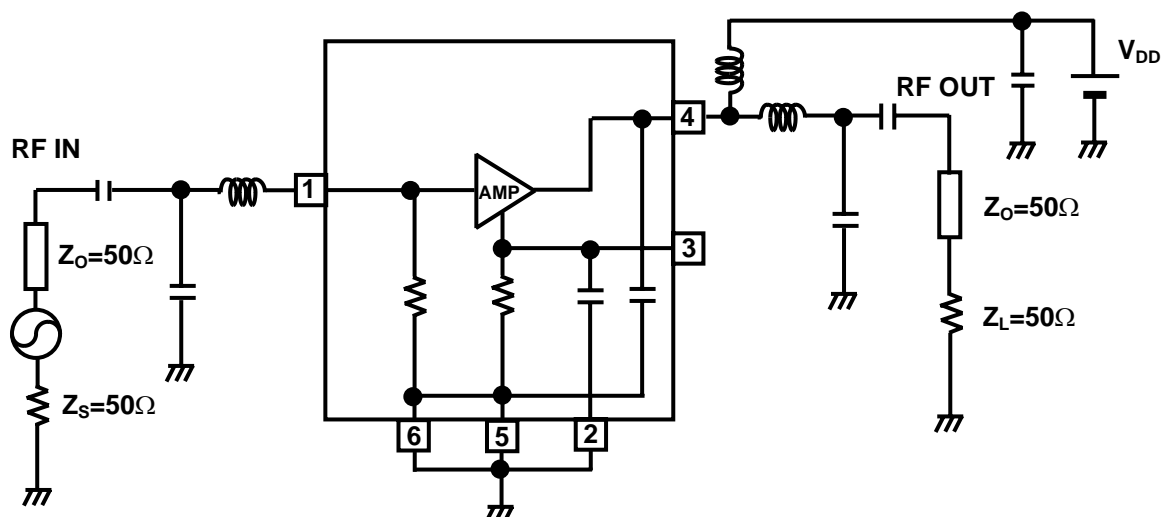


■ TYPICAL CHARACTERISTICS

Scattering Parameters ($V_{DD}=3V$)

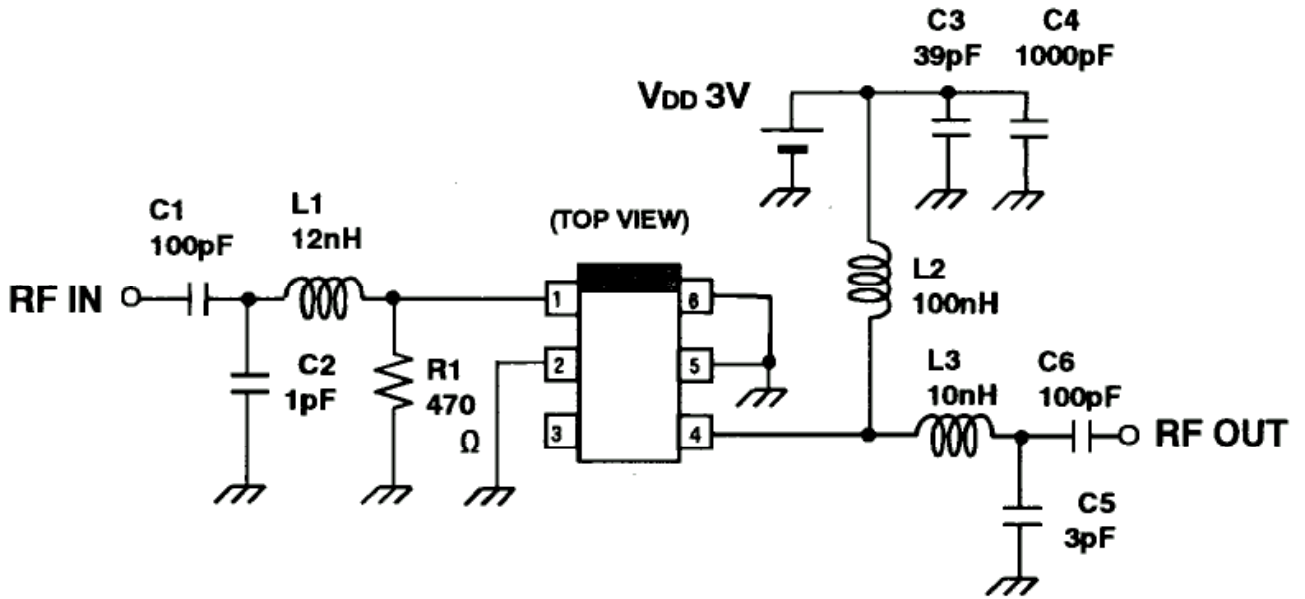
| Freq. (GHz) | S 11 | | S 21 | | S 12 | | S 22 | |
|----------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|
| | mag (U) | ang (deg) | mag (U) | ang (deg) | mag (U) | ang (deg) | mag (U) | ang (deg) |
| 0.50 | 0.865 | -26.1 | 4.892 | 174.0 | 0.029 | 52.0 | 0.718 | -56.5 |
| 0.60 | 0.853 | -32.2 | 5.060 | 163.2 | 0.030 | 48.7 | 0.681 | -63.4 |
| 0.70 | 0.834 | -38.2 | 5.093 | 152.9 | 0.033 | 46.2 | 0.648 | -69.6 |
| 0.80 | 0.810 | -43.7 | 5.046 | 143.5 | 0.035 | 46.4 | 0.626 | -74.9 |
| 0.90 | 0.788 | -48.5 | 4.974 | 134.5 | 0.036 | 44.5 | 0.603 | -78.8 |
| 1.00 | 0.757 | -52.8 | 4.801 | 126.4 | 0.038 | 43.5 | 0.590 | -82.4 |
| 1.10 | 0.729 | -56.7 | 4.650 | 118.6 | 0.039 | 42.7 | 0.580 | -85.6 |
| 1.20 | 0.700 | -60.3 | 4.457 | 111.5 | 0.041 | 44.0 | 0.579 | -88.8 |
| 1.30 | 0.672 | -63.1 | 4.271 | 104.6 | 0.043 | 43.3 | 0.577 | -90.9 |
| 1.40 | 0.645 | -65.6 | 4.083 | 98.0 | 0.045 | 44.6 | 0.581 | -93.6 |
| 1.50 | 0.618 | -67.7 | 3.893 | 91.3 | 0.046 | 44.0 | 0.588 | -96.0 |
| 1.60 | 0.589 | -69.0 | 3.687 | 85.2 | 0.049 | 43.8 | 0.597 | -98.5 |
| 1.70 | 0.563 | -69.7 | 3.509 | 79.3 | 0.051 | 42.4 | 0.612 | -100.8 |
| 1.80 | 0.541 | -69.8 | 3.317 | 72.9 | 0.055 | 40.3 | 0.630 | -103.7 |
| 1.90 | 0.519 | -69.6 | 3.122 | 66.5 | 0.058 | 38.3 | 0.650 | -106.9 |
| 2.00 | 0.502 | -67.9 | 2.904 | 60.0 | 0.060 | 35.8 | 0.671 | -110.2 |
| 2.10 | 0.489 | -65.9 | 2.696 | 53.6 | 0.063 | 31.4 | 0.700 | -114.5 |
| 2.20 | 0.490 | -62.3 | 2.432 | 46.6 | 0.065 | 25.7 | 0.728 | -119.5 |
| 2.30 | 0.502 | -58.9 | 2.150 | 39.1 | 0.065 | 17.4 | 0.764 | -125.8 |
| 2.40 | 0.536 | -55.6 | 1.814 | 31.9 | 0.066 | 8.5 | 0.795 | -132.8 |
| 2.50 | 0.592 | -53.5 | 1.409 | 24.6 | 0.062 | -5.9 | 0.828 | -142.1 |
| 2.60 | 0.669 | -53.8 | 0.933 | 21.3 | 0.056 | -24.0 | 0.846 | -153.2 |
| 2.70 | 0.760 | -56.9 | 0.461 | 41.1 | 0.050 | -54.3 | 0.842 | -166.5 |
| 2.80 | 0.851 | -62.8 | 0.575 | 106.1 | 0.048 | -96.7 | 0.800 | 178.6 |
| 2.90 | 0.920 | -70.6 | 1.154 | 113.3 | 0.060 | -140.4 | 0.731 | 161.6 |
| 3.00 | 0.951 | -79.2 | 1.703 | 105.2 | 0.081 | -172.8 | 0.624 | 144.2 |

■ PIN CONNECTIONS AND FUNCTIONAL BLOCK DIAGRAM

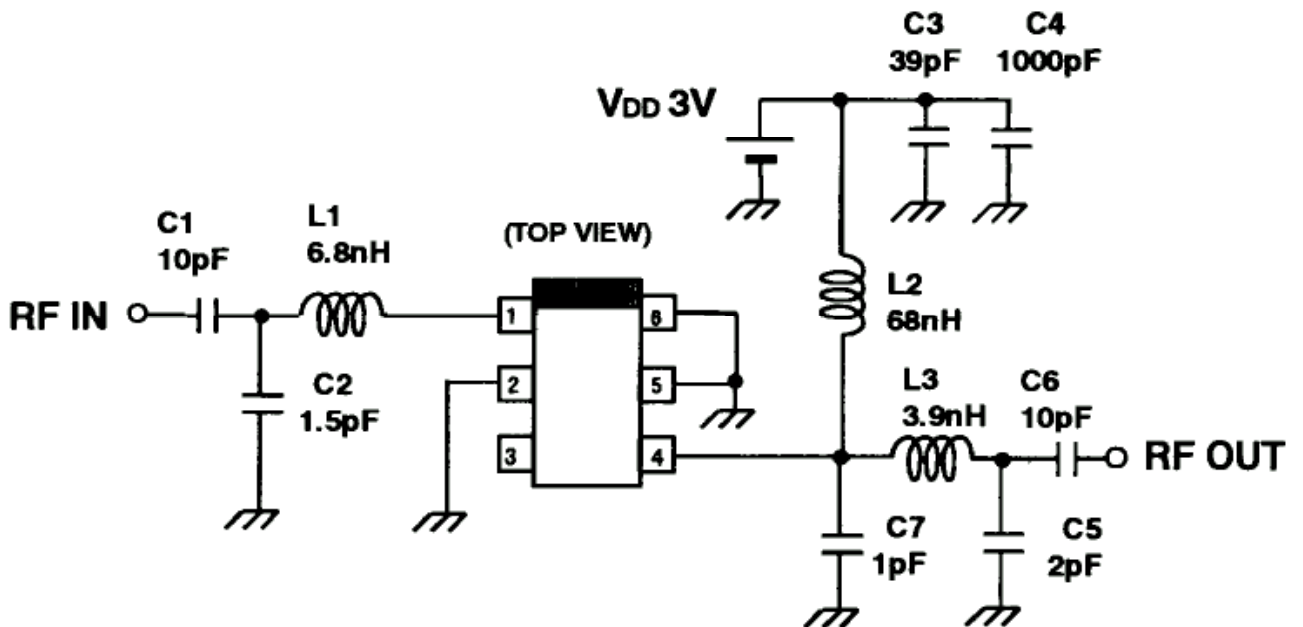


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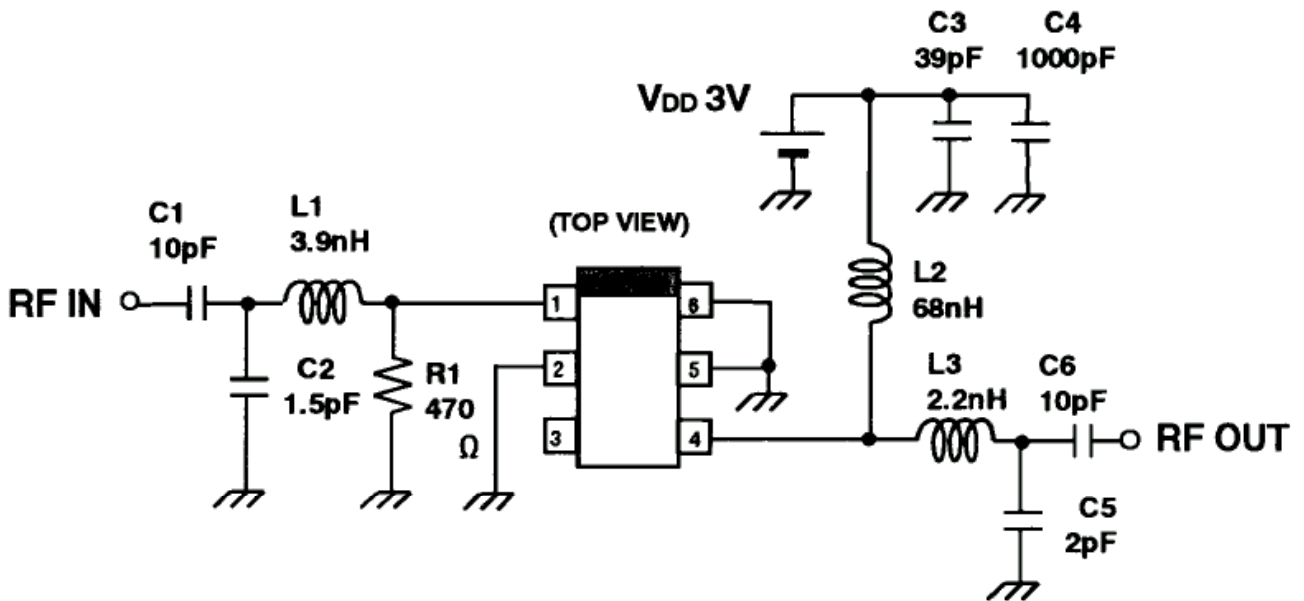
APPLICATION CIRCUIT 1



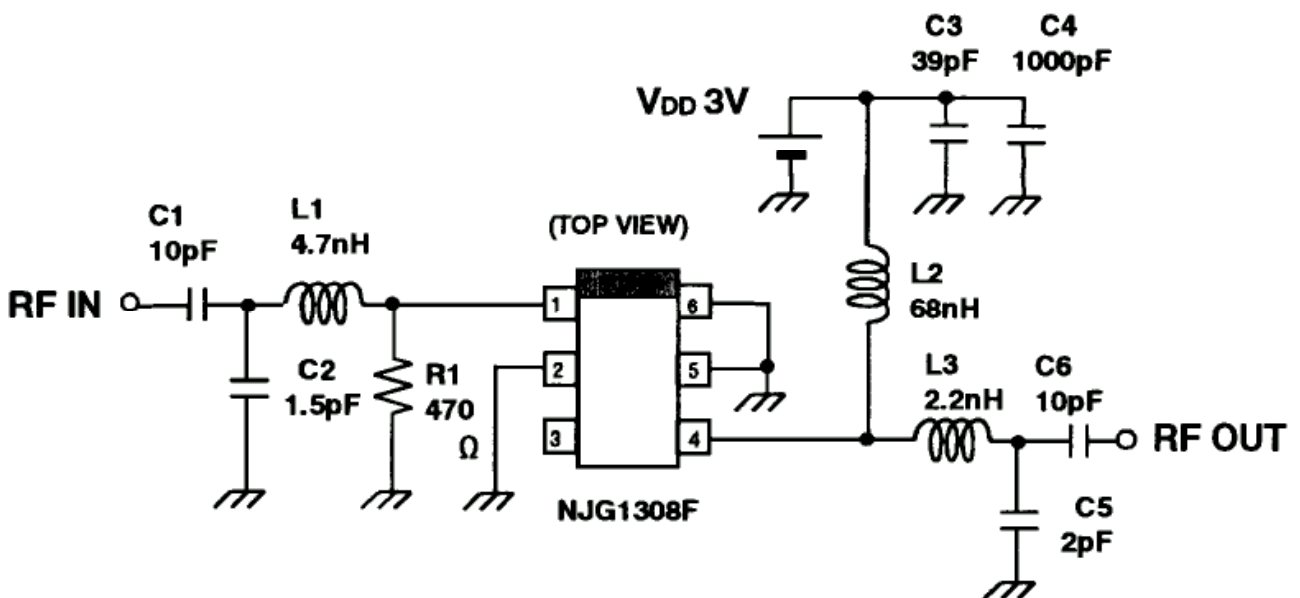
APPLICATION CIRCUIT 2



APPLICATION CIRCUIT 3

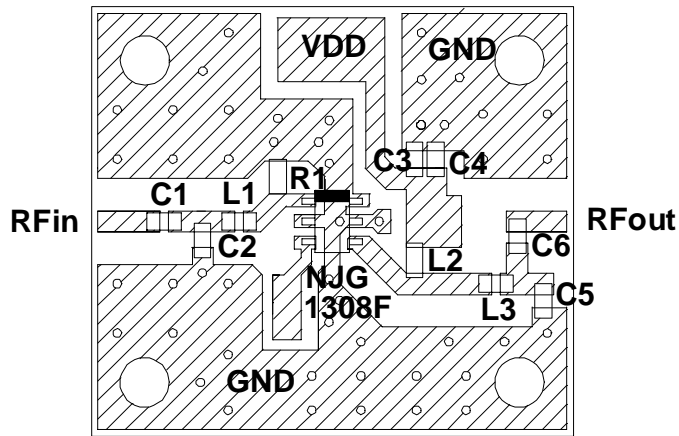


APPLICATION CIRCUIT 4



NJG1308F

RECOMMENDED PCB DESIGN



PCB:FR-4 22.5x20.0mm, t=0.5mm
 MICROSTRIP LINE WIDTH=1.0mm ($Z_0=50\Omega$)
 CHIP SIZE:1608

Notes:

[1] Following chip capacitor should be connected near to each terminal as bypass capacitor.

- (1) C3
- (2) C4

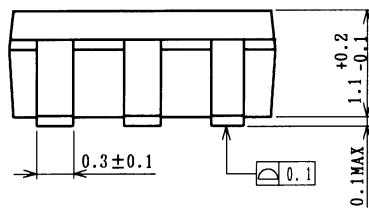
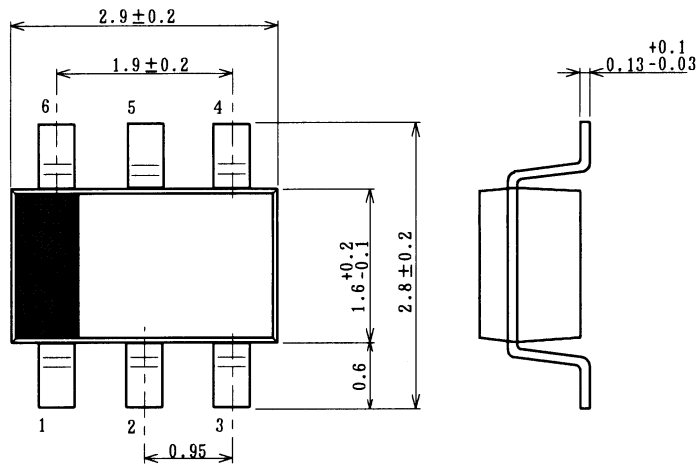
[2] Following chip capacitors are necessary to block DC bias.

- (3) C1
- (4) C6

[3] Chip parts list.

| Parts ID | Comment |
|----------|---------------------------|
| C1~C6 | MURATA GRM39 Series |
| L1~L3 | TAIYO-YUDEN HK1608 Series |

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.