

BGA751N7

SiGe Bipolar 3G/3.5G/4G Single-Band LNA

Data Sheet

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BGA751N7 SiGe Bipolar 3G/3.5G/4G Single-Band LNA

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| Page | Subjects (major changes since last revision) |
|------|--|
| 37 | Footprint recommendation drawing added |
| 38 | Marking pattern drawing updated |
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| | |

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1 Features

Main features:

- Gain: 16 / -8 dB in high / low gain mode (f.e. at 850MHz)
- Noise figure: 1.05 dB in high gain mode (f.e. at 850MHz)
- Supply current: 3.3 / 0.5 mA in high / low gain mode
- Standby mode (< 2 μ A typ.)
- Output internally matched to 50 Ω
- Inputs pre-matched to 50 Ω
- 2 kV HBM ESD protection
- Low external component count
- Small leadless TSNP-7-1 package (2.0 x 1.3 x 0.39 mm)
- Pb-free (RoHS compliant) package



Description

The BGA751N7 is a low current single-band low noise amplifier MMIC for 3G, 3.5G and 4G. The LNA is based upon Infineon's proprietary and cost-effective SiGe:C technology and comes in a low profile TSNP-7-1 leadless green package. Because the matching is off chip, the RFpath can be easily converted into a 700MHz to 1150MHz path by optimizing the input and output matching network. This document specifies the electrical parameters, pinout, application circuit and packaging of the chip.



| Product Name | Package | Chip | Marking |
|--------------|----------|-------|---------|
| BGA751N7 | TSNP-7-1 | T1533 | B5 |

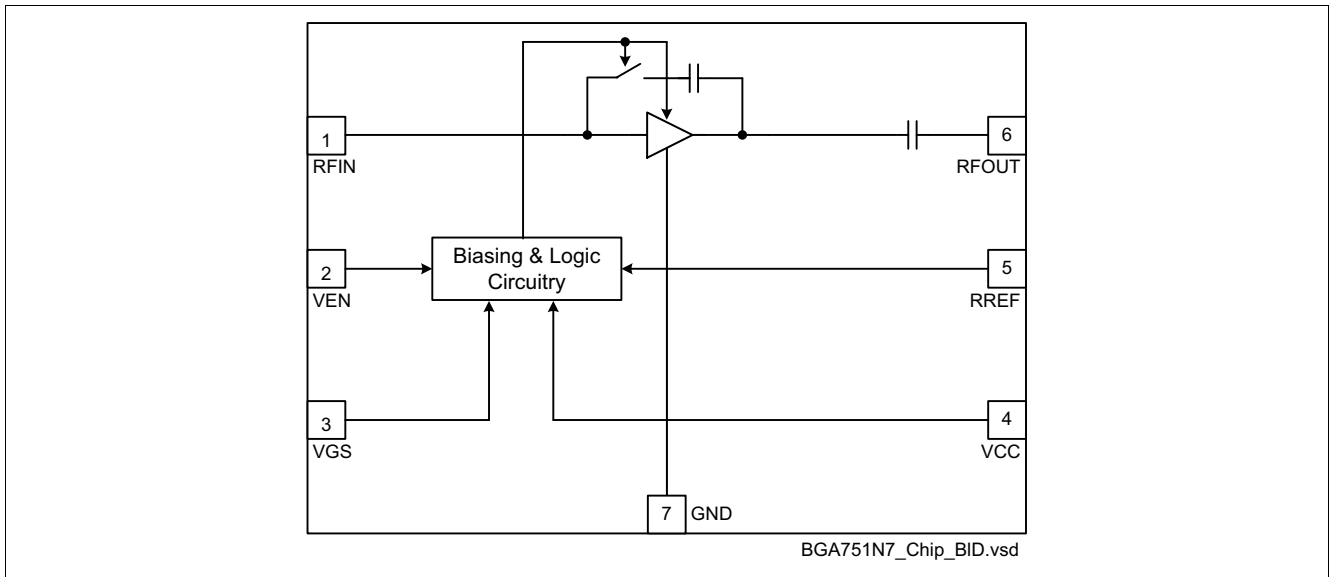


Figure 1 Block Diagram of Single-Band LNA

2 Electrical Characteristics

2.1 Absolute Maximum Ratings

Table 1 Absolute Maximum Ratings

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---------------------------|------------|--------|------|--------------|------|--------------------------------|
| | | Min. | Typ. | Max. | | |
| Supply voltage | V_{CC} | -0.3 | – | 3.6 | V | – |
| Supply current | I_{CC} | – | – | 10 | mA | – |
| Pin voltage | V_{PIN} | -0.3 | – | $V_{CC}+0.3$ | V | All pins except RF input pins. |
| Pin voltage RF Input Pins | V_{RFIN} | -0.3 | – | 0.9 | V | – |
| RF input power | P_{RFIN} | – | – | 4 | dBm | – |
| Junction temperature | T_j | – | – | 150 | °C | – |
| Ambient temperature range | T_A | -30 | – | 85 | °C | – |
| Storage temperature range | T_{stg} | -65 | – | 150 | °C | – |

Attention: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

2.2 Thermal Resistance

Table 2 Thermal Resistance

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|------------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Thermal resistance junction to soldering point | R_{thJS} | – | 150 | – | K/W | – |

2.3 ESD Integrity

Table 3 ESD Integrity

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--------------------------------|---------------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| ESD hardness HBM ¹⁾ | $V_{ESD-HBM}$ | – | 2000 | – | V | All pins |

1) According to JESD22-A114

2.4 DC Characteristics

Table 4 DC Characteristics, $T_A = 25\text{ °C}$

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|-------------------------------|-------------|--------|------|------|---------------|--|
| | | Min. | Typ. | Max. | | |
| Supply voltage | V_{CC} | 2.6 | 2.8 | 3.0 | V | – |
| Supply current high gain mode | I_{CCHG} | – | 3.3 | – | mA | Typical value without reference resistor |
| Supply current low gain mode | I_{CCLG} | – | 0.5 | – | mA | |
| Supply current standby mode | I_{CCOFF} | – | 0.1 | 2.0 | μA | – |
| Logic level high | V_{HI} | 1.4 | 2.8 | – | V | All logic pins |
| Logic level low | V_{LO} | -0.2 | 0.0 | 0.5 | V | |
| Logic currents | I_{LO} | – | – | 0.1 | μA | All logic pins |
| | I_{HI} | – | 5.0 | 6.0 | μA | |

2.5 Gain Mode Select Truth Table

Table 5 Truth Table

| Control Voltage | | State | |
|-----------------|-----|-----------------------|-----|
| | | All Bands | |
| VEN | VGS | HG | LG |
| H | L | OFF | ON |
| H | H | ON | OFF |
| L | L | STANDBY ¹⁾ | |
| L | H | | |

1) In order to achieve minimum standby current it is encouraged to apply logic low-level at the VGS pin in standby mode although this is not mandatory. Details see section 2.4.

2.6 Switching Times

Table 6 Typical switching times; $T_A = -30 \dots 85\text{ °C}$

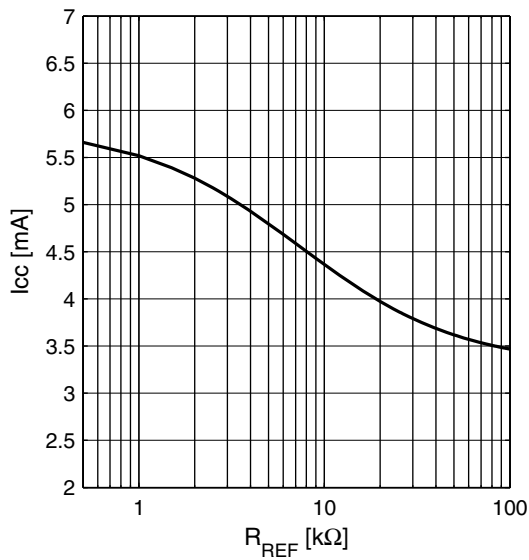
| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------|----------|--------|------|------|---------------|-----------------------------------|
| | | Min. | Typ. | Max. | | |
| Settling time gainstep | t_{GS} | – | 1 | – | μs | Switching LG \leftrightarrow HG |

2.7 Supply Current Characteristics

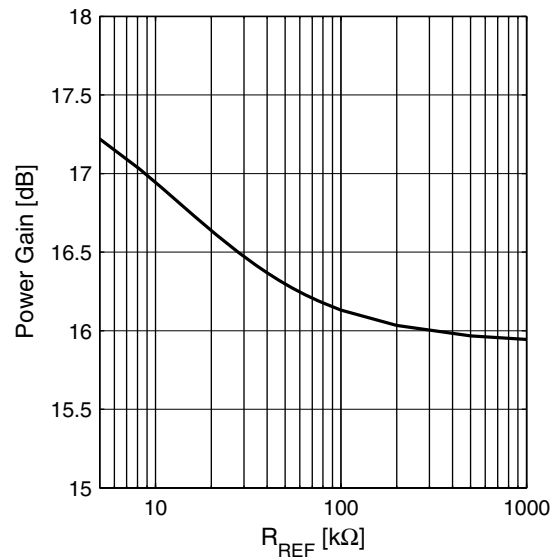
Supply current and Power gain high gain mode versus reference resistor R_{REF} (low gain mode supply current is independent of reference resistor).

Note: In order to achieve higher gain an external reference resistor can be soldered between RREF (Pin 5) and ground (see Figure 3.4 on Page 32).

Supply Current $I_{CC} = f(R_{REF})$
 $V_{CC} = 2.8 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$



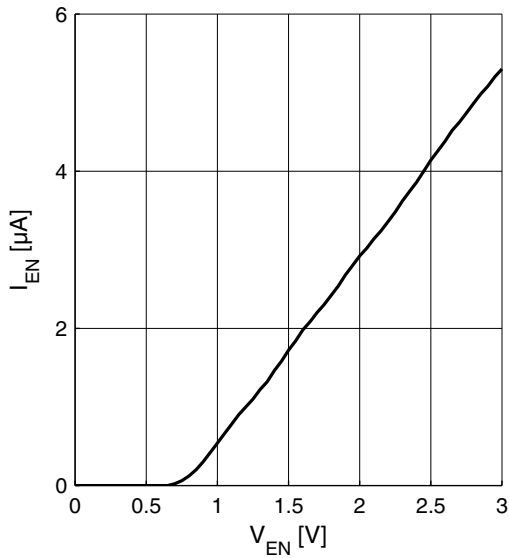
Power Gain $|S_{21}| = f(R_{REF})$
 $V_{CC} = 2.8 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$



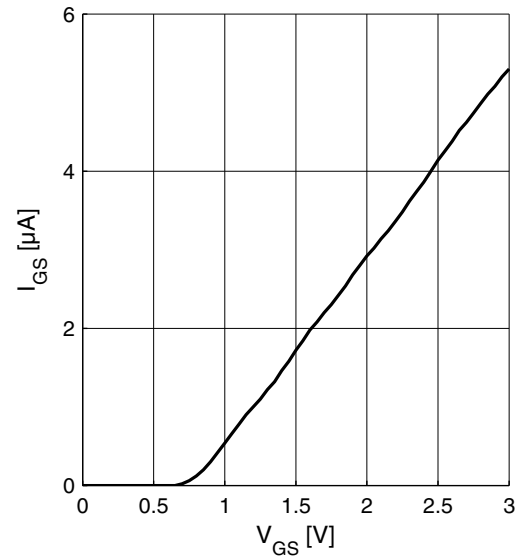
2.8 Logic Signal Characteristics

Current consumption of logic inputs VEN, VGS

Logic Current $I_{EN} = f(V_{EN})$
 $V_{CC} = 2.8 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$



Logic Current $I_{GS} = f(V_{GS})$
 $V_{CC} = 2.8 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$



2.9 Measured RF Characteristics 700 MHz Band

Table 7 Typical Characteristics 700 MHz Band, $T_A = 25\text{ °C}$, $V_{CC} = 2.8\text{ V}$, $R_{REF} = 5.6\text{ k}\Omega$ ¹⁾²⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|--------------|--------|------|------|------|------------------------------|
| | | Min. | Typ. | Max. | | |
| Pass band range | | 700 | | 750 | MHz | F.e. band 12 and 17 |
| Current consumption | I_{CCHG} | – | 4.8 | – | mA | High gain mode |
| | I_{CCLG} | – | 0.50 | – | mA | Low gain mode |
| Gain | S_{21HG} | – | 15.3 | – | dB | High gain mode |
| | S_{21LG} | – | -9.9 | – | dB | Low gain mode |
| Reverse isolation | S_{12HG} | – | -40 | – | dB | High gain mode |
| | S_{12LG} | – | -9.9 | – | dB | Low gain mode |
| Noise figure | NF_{HG} | – | 1.1 | – | dB | High gain mode |
| | NF_{LG} | – | 9.9 | – | dB | Low gain mode |
| Input return loss | S_{11HG} | – | -13 | – | dB | 50 Ω , high gain mode |
| | S_{11LG} | – | -14 | – | dB | 50 Ω , low gain mode |
| Output return loss | S_{22HG} | – | -27 | – | dB | 50 Ω , high gain mode |
| | S_{22LG} | – | -19 | – | dB | 50 Ω , low gain mode |
| Stability factor | k | – | >2.2 | – | | DC to 8 GHz; all gain modes |
| Input compression point | IP_{1dBHG} | – | -7 | – | dBm | High gain mode |
| | IP_{1dBLG} | – | -12 | – | dBm | Low gain mode |
| Inband IIP3 $f_1 - f_2 = 1\text{ MHz}$ | $IIP3_{HG}$ | – | -8 | – | dBm | High gain mode |
| | $IIP3_{LG}$ | – | -2 | – | dBm | Low gain mode |

1) Performance based on application circuit in Figure 3.1 on Page 29

2) Guaranteed by device design; not tested in production

2.10 Measured RF Characteristics 750 MHz Band

Table 8 Typical Characteristics 750 MHz Band, $T_A = 25\text{ °C}$, $V_{CC} = 2.8\text{ V}$, $R_{REF} = 5.6\text{ k}\Omega$ ¹⁾²⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|--------------|--------|------|------|------|------------------------------|
| | | Min. | Typ. | Max. | | |
| Pass band range | | 740 | | 790 | MHz | F.e. band 13 and 14 |
| Current consumption | I_{CCHG} | – | 4.8 | – | mA | High gain mode |
| | I_{CCLG} | – | 0.50 | – | mA | Low gain mode |
| Gain | S_{21HG} | – | 15.5 | – | dB | High gain mode |
| | S_{21LG} | – | -9.8 | – | dB | Low gain mode |
| Reverse isolation | S_{12HG} | – | -39 | – | dB | High gain mode |
| | S_{12LG} | – | -9.8 | – | dB | Low gain mode |
| Noise figure | NF_{HG} | – | 1.1 | – | dB | High gain mode |
| | NF_{LG} | – | 9.8 | – | dB | Low gain mode |
| Input return loss | S_{11HG} | – | -15 | – | dB | 50 Ω , high gain mode |
| | S_{11LG} | – | -12 | – | dB | 50 Ω , low gain mode |
| Output return loss | S_{22HG} | – | -15 | – | dB | 50 Ω , high gain mode |
| | S_{22LG} | – | -20 | – | dB | 50 Ω , low gain mode |
| Stability factor | k | – | >2.3 | – | | DC to 8 GHz; all gain modes |
| Input compression point | IP_{1dBHG} | – | -7 | – | dBm | High gain mode |
| | IP_{1dBLG} | – | -11 | – | dBm | Low gain mode |
| Inband IIP3 $f_1 - f_2 = 1\text{ MHz}$ | $IIP3_{HG}$ | – | -7 | – | dBm | High gain mode |
| | $IIP3_{LG}$ | – | -2 | – | dBm | Low gain mode |

1) Performance based on application circuit in Figure 3.2 on Page 30

2) Guaranteed by device design; not tested in production

2.11 Measured RF Characteristics 800 MHz Band

Table 9 Typical Characteristics 800 MHz Band, $T_A = 25\text{ °C}$, $V_{CC} = 2.8\text{ V}$, $R_{REF} = 5.6\text{ k}\Omega$ ¹⁾²⁾

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|--------------|--------|------|------|------|------------------------------|
| | | Min. | Typ. | Max. | | |
| Pass band range | | 790 | | 840 | MHz | F.e. band 20 |
| Current consumption | I_{CCHG} | – | 4.8 | – | mA | High gain mode |
| | I_{CCLG} | – | 0.50 | – | mA | Low gain mode |
| Gain | S_{21HG} | – | 15.9 | – | dB | High gain mode |
| | S_{21LG} | – | -8.4 | – | dB | Low gain mode |
| Reverse isolation | S_{12HG} | – | -38 | – | dB | High gain mode |
| | S_{12LG} | – | -8.4 | – | dB | Low gain mode |
| Noise figure | NF_{HG} | – | 1.0 | – | dB | High gain mode |
| | NF_{LG} | – | 8.4 | – | dB | Low gain mode |
| Input return loss | S_{11HG} | – | -16 | – | dB | 50 Ω , high gain mode |
| | S_{11LG} | – | -11 | – | dB | 50 Ω , low gain mode |
| Output return loss | S_{22HG} | – | -13 | – | dB | 50 Ω , high gain mode |
| | S_{22LG} | – | -27 | – | dB | 50 Ω , low gain mode |
| Stability factor | k | – | >2.3 | – | | DC to 8 GHz; all gain modes |
| Input compression point | IP_{1dBHG} | – | -6 | – | dBm | High gain mode |
| | IP_{1dBLG} | – | -10 | – | dBm | Low gain mode |
| Inband IIP3 $f_1 - f_2 = 1\text{ MHz}$ | $IIP3_{HG}$ | – | -8 | – | dBm | High gain mode |
| | $IIP3_{LG}$ | – | -1 | – | dBm | Low gain mode |

1) Performance based on application circuit in Figure 3.3 on Page 31

2) Guaranteed by device design; not tested in production

2.12 Measured RF Characteristics 880 MHz Band

Table 10 Typical Characteristics 880 MHz Band, $T_A = 25\text{ °C}$, $V_{CC} = 2.8\text{ V}^{1)}$, $R_{REF} = n/c$

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|--------------|--------|------|------|------|------------------------------|
| | | Min. | Typ. | Max. | | |
| Pass band range | | 840 | – | 900 | MHz | F.e. band 5 and 6 |
| Current consumption | I_{CCHG} | – | 3.3 | – | mA | High gain mode |
| | I_{CCLG} | – | 0.5 | – | mA | Low gain mode |
| Gain | S_{21HG} | – | 15.8 | – | dB | High gain mode |
| | S_{21LG} | – | -7.7 | – | dB | Low gain mode |
| Reverse Isolation ²⁾ | S_{12HG} | – | -36 | – | dB | High gain mode |
| | S_{12LG} | – | -8.0 | – | dB | Low gain mode |
| Noise figure | NF_{HG} | – | 1.05 | – | dB | High gain mode |
| | NF_{LG} | – | 7.9 | – | dB | Low gain mode |
| Input return loss ²⁾ | S_{11HG} | – | -21 | – | dB | 50 Ω , high gain mode |
| | S_{11LG} | – | -13 | – | dB | 50 Ω , low gain mode |
| Output return loss ²⁾ | S_{22HG} | – | -21 | – | dB | 50 Ω , high gain mode |
| | S_{22LG} | – | -13 | – | dB | 50 Ω , low gain mode |
| Stability factor ³⁾ | k | – | >2.3 | – | | DC to 8 GHz; all gain modes |
| Input compression point ²⁾ | IP_{1dBHG} | – | -5 | – | dBm | High gain mode |
| | IP_{1dBLG} | – | -8 | – | dBm | Low gain mode |
| Inband IIP3 ²⁾ $f_1 - f_2 = 1\text{ MHz}$ | $IIP3_{HG}$ | – | -7 | – | dBm | High gain mode |
| | $IIP3_{LG}$ | – | 1 | – | dBm | Low gain mode |

1) Performance based on application circuit in Figure 3.4 on Page 32

2) Verification based on AQL; random production test.

3) Guaranteed by device design; not tested in production.

2.13 Measured RF Characteristics 900 MHz band

Table 11 Typical Characteristics 900 MHz Band, $T_A = 25\text{ °C}$, $V_{CC} = 2.8\text{ V}^{1)2)}$, $R_{REF} = n/c$

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|--------------|--------|------|------|------|------------------------------|
| | | Min. | Typ. | Max. | | |
| Pass band range | | 900 | – | 1040 | MHz | F.e. band 8 |
| Current consumption | I_{CCHG} | – | 3.3 | – | mA | High gain mode |
| | I_{CCLG} | – | 0.5 | – | mA | Low gain mode |
| Gain | S_{21HG} | – | 15.5 | – | dB | High gain mode |
| | S_{21LG} | – | -7.2 | – | dB | Low gain mode |
| Reverse Isolation | S_{12HG} | – | -36 | – | dB | High gain mode |
| | S_{12LG} | – | -7.0 | – | dB | Low gain mode |
| Noise figure | NF_{HG} | – | 1.15 | – | dB | High gain mode |
| | NF_{LG} | – | 7.7 | – | dB | Low gain mode |
| Input return loss | S_{11HG} | – | -12 | – | dB | 50 Ω , high gain mode |
| | S_{11LG} | – | -15 | – | dB | 50 Ω , low gain mode |
| Output return loss | S_{22HG} | – | -12 | – | dB | 50 Ω , high gain mode |
| | S_{22LG} | – | -12 | – | dB | 50 Ω , low gain mode |
| Stability factor | k | – | >2.3 | – | | DC to 8 GHz; all gain modes |
| Input compression point | IP_{1dBHG} | – | -4 | – | dBm | High gain mode |
| | IP_{1dBLG} | – | -5 | – | dBm | Low gain mode |
| Inband IIP3 $f_1 - f_2 = 1\text{ MHz}$ | $IIP3_{HG}$ | – | -6 | – | dBm | High gain mode |
| | $IIP3_{LG}$ | – | 1 | – | dBm | Low gain mode |

1) Performance based on application circuit in Figure 3.5 on Page 33

2) Guaranteed by device design; not tested in production.

2.14 Measured RF Characteristics 1100 MHz band

Table 12 Typical Characteristics 1100 MHz Band, $T_A = 25\text{ °C}$, $V_{CC} = 2.8\text{ V}^{1)2)}$, $R_{REF} = 8.2\text{ k}\Omega$

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|--------------|--------|------|------|------|------------------------------|
| | | Min. | Typ. | Max. | | |
| Pass band range | | 1040 | – | 1150 | MHz | – |
| Current consumption | I_{CCHG} | – | 4.3 | – | mA | High gain mode |
| | I_{CCLG} | – | 0.5 | – | mA | Low gain mode |
| Gain | S_{21HG} | – | 16.2 | – | dB | High gain mode |
| | S_{21LG} | – | -7.0 | – | dB | Low gain mode |
| Reverse Isolation | S_{12HG} | – | -36 | – | dB | High gain mode |
| | S_{12LG} | – | -7.0 | – | dB | Low gain mode |
| Noise figure | NF_{HG} | – | 1.2 | – | dB | High gain mode |
| | NF_{LG} | – | 7.0 | – | dB | Low gain mode |
| Input return loss | S_{11HG} | – | -15 | – | dB | 50 Ω , high gain mode |
| | S_{11LG} | – | -10 | – | dB | 50 Ω , low gain mode |
| Output return loss | S_{22HG} | – | -15 | – | dB | 50 Ω , high gain mode |
| | S_{22LG} | – | -11 | – | dB | 50 Ω , low gain mode |
| Stability factor | k | – | >2.3 | – | | DC to 8 GHz; all gain modes |
| Input compression point | IP_{1dBHG} | – | -5 | – | dBm | High gain mode |
| | IP_{1dBLG} | – | -2 | – | dBm | Low gain mode |
| Inband IIP3 $f_1 - f_2 = 1\text{ MHz}$ | $IIP3_{HG}$ | – | -3 | – | dBm | High gain mode |
| | $IIP3_{LG}$ | – | 3 | – | | Low gain mode |

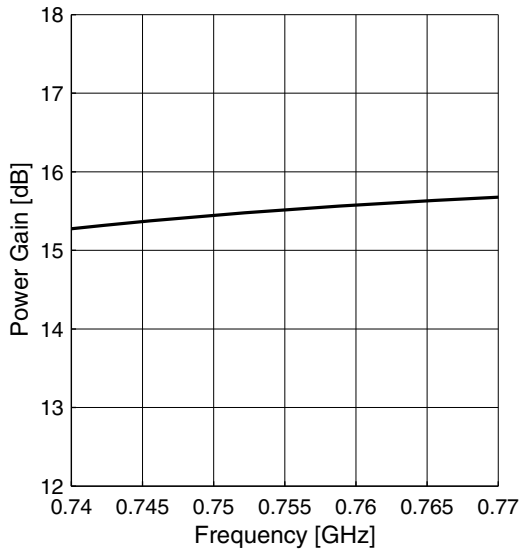
1) Performance based on application circuit in Figure 3.6 on Page 34

2) Guaranteed by device design; not tested in production.

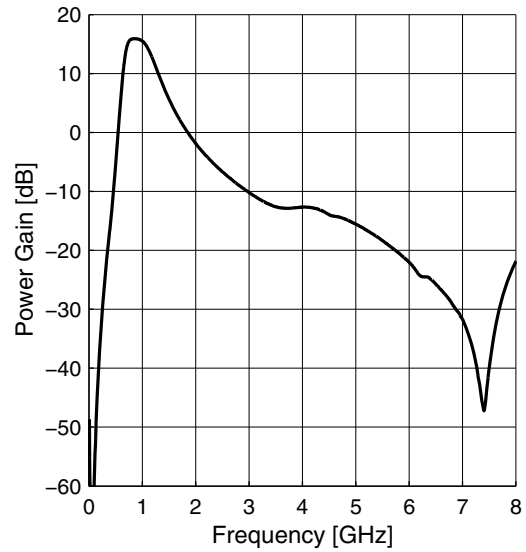
2.15 Measured Performance Band 13 Application High Gain Mode vs. Frequency

$T_A = 25\text{ }^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $V_{GS} = 2.8\text{ V}$, $V_{EN} = 2.8\text{ V}$, $R_{REF} = 5.6\text{ k}\Omega$

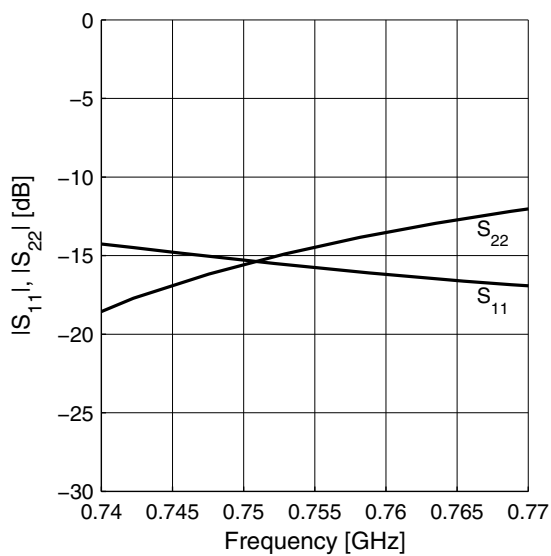
Power Gain $|S_{21}| = f(f)$



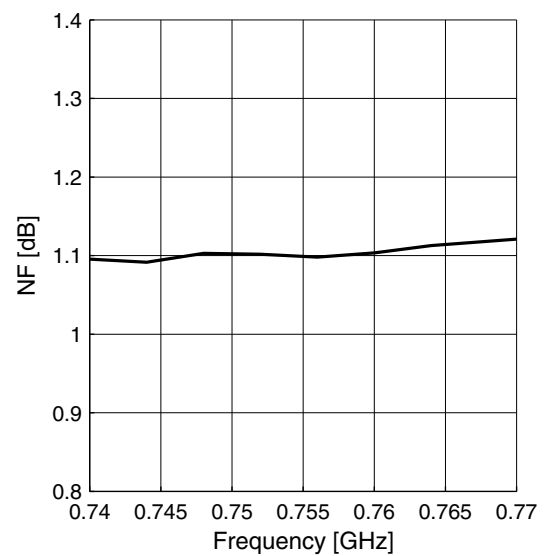
Power Gain wideband $|S_{21}| = f(f)$



Matching $|S_{11}| = f(f)$, $|S_{22}| = f(f)$



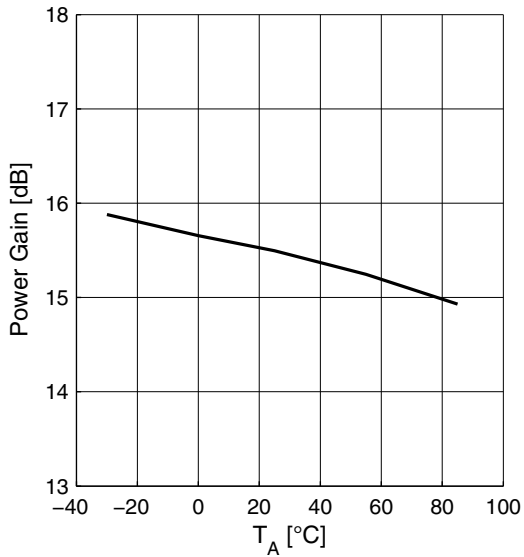
Noise Figure $NF = f(f)$



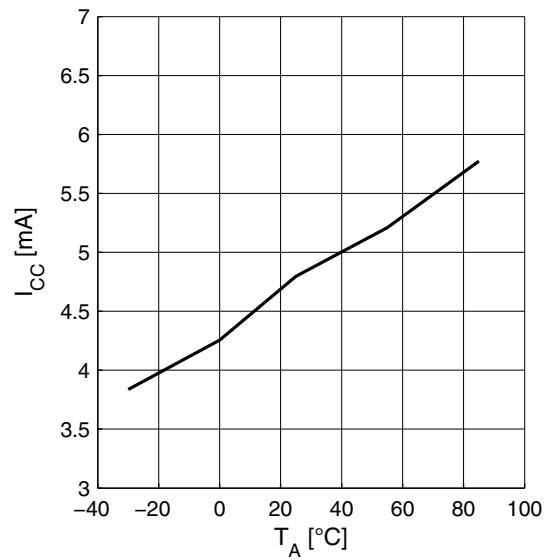
2.16 Measured Performance Band 13 Application High Gain Mode vs. Temperature

$V_{CC} = 2.8\text{ V}$, $V_{GS} = 2.8\text{ V}$, $V_{EN} = 2.8\text{ V}$, $f = 750\text{ MHz}$, $R_{REF} = 5.6\text{ k}\Omega$

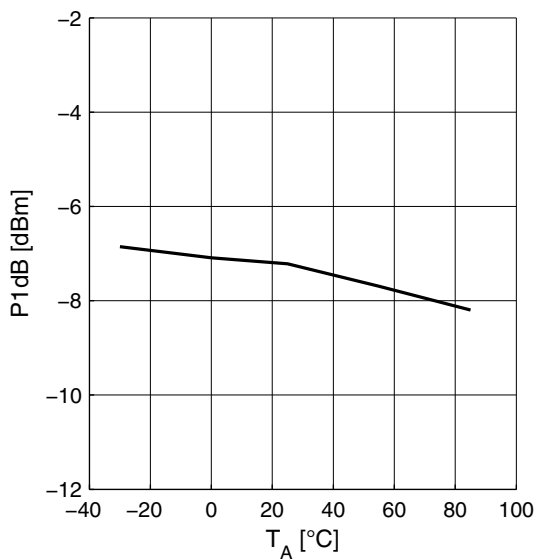
Power Gain $|S_{21}| = f(T_A)$



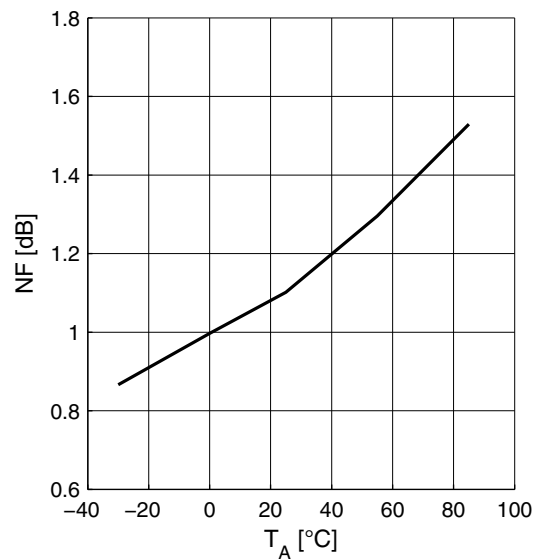
Supply Current $I_{CC} = f(T_A)$



Input Compression $P1dB = f(T_A)$



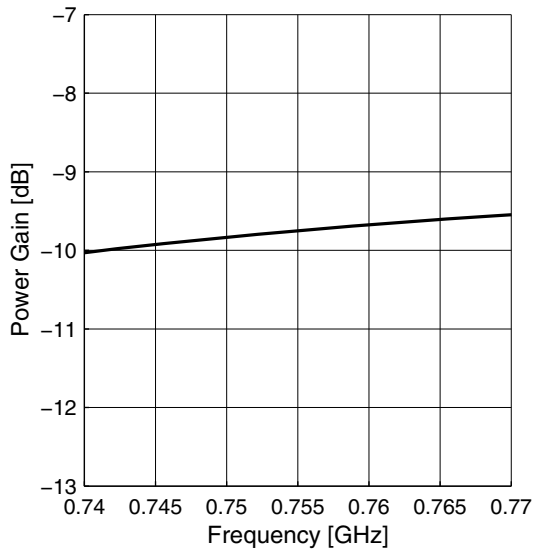
Noise Figure $NF = f(T_A)$



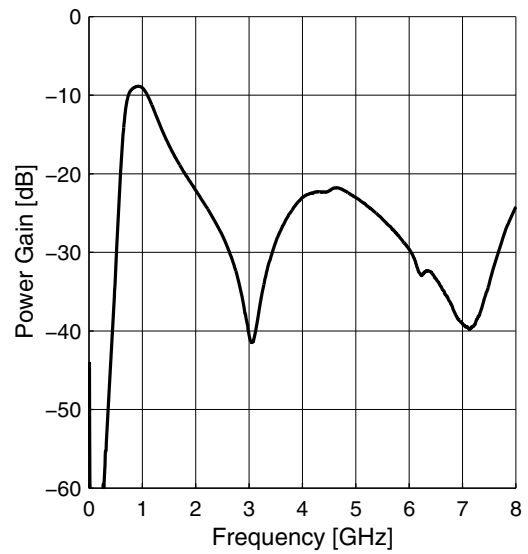
2.17 Measured Performance Band 13 Application Low Gain Mode vs. Frequency

$T_A = 25\text{ }^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $V_{GS} = 0\text{ V}$, $V_{EN} = 2.8\text{ V}$, $R_{REF} = 5.6\text{ k}\Omega$

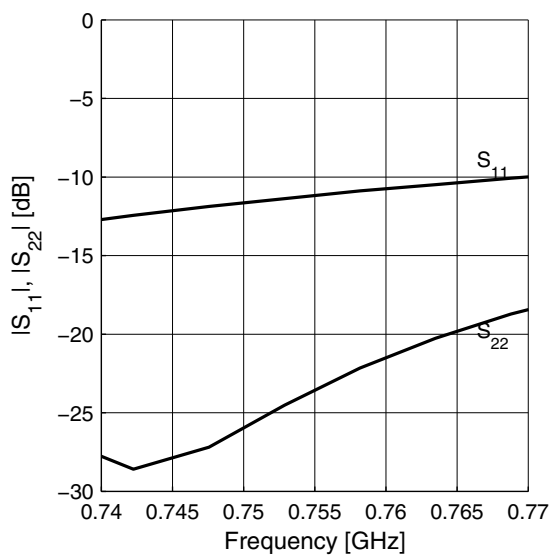
Power Gain $|S_{21}| = f(f)$



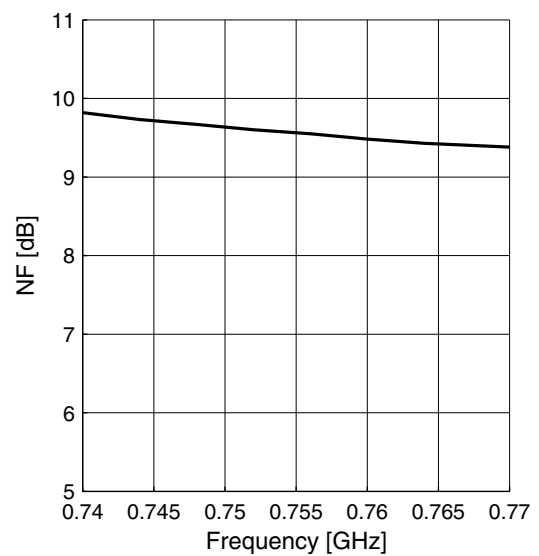
Power Gain wideband $|S_{21}| = f(f)$



Matching $|S_{11}| = f(f)$, $|S_{22}| = f(f)$



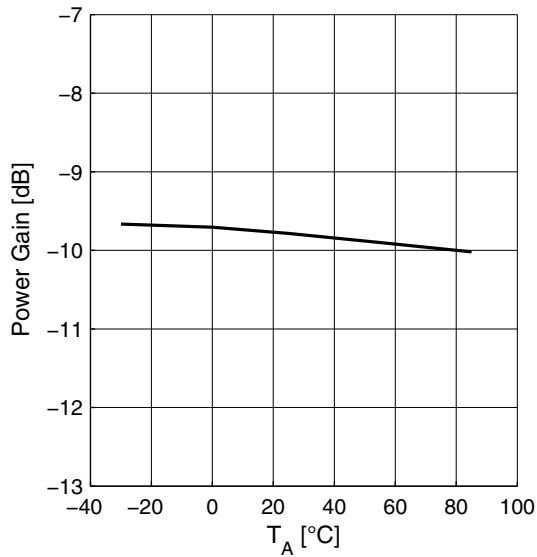
Noise Figure $NF = f(f)$



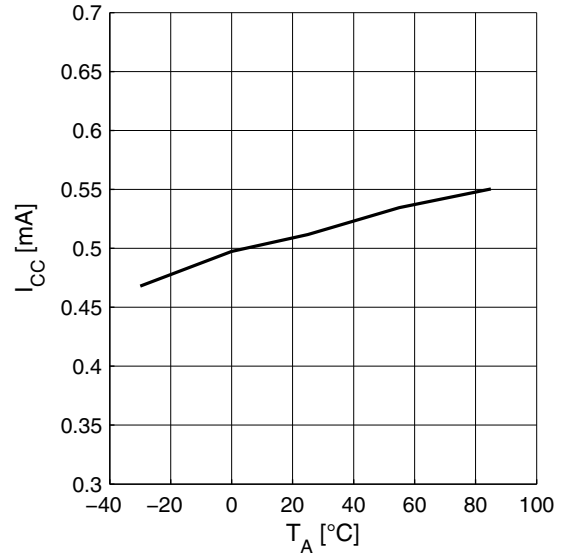
2.18 Measured Performance Band 13 Application Low Gain Mode vs. Temperature

$V_{CC} = 2.8\text{ V}$, $V_{GS} = 0\text{ V}$, $V_{EN} = 2.8\text{ V}$, $f = 750\text{ MHz}$, $R_{REF} = 5.6\text{ k}\Omega$

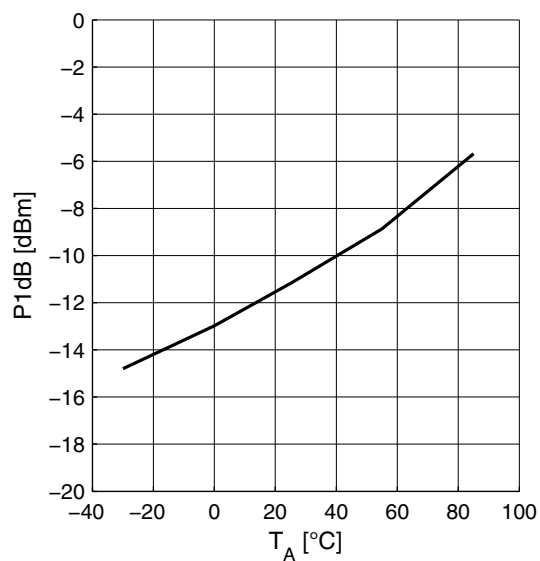
Power Gain $|S_{21}| = f(T_A)$



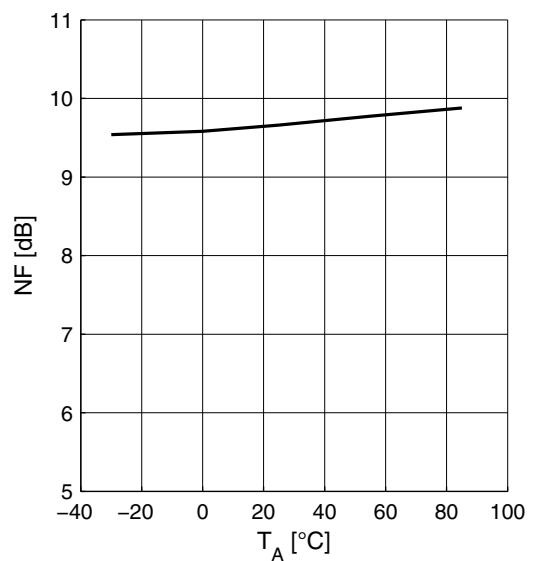
Supply Current $I_{CC} = f(T_A)$



Input Compression $P1dB = f(T_A)$



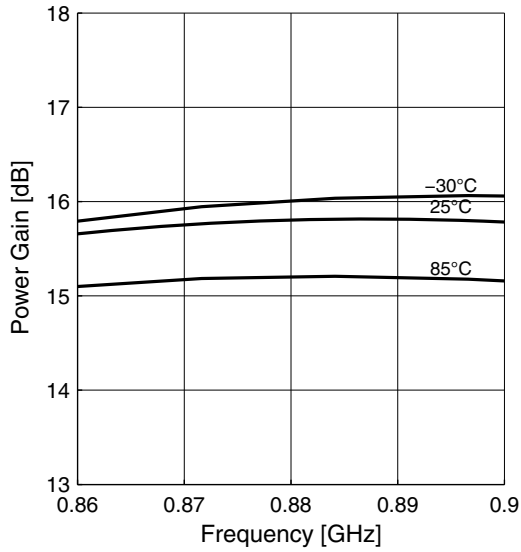
Noise Figure $NF = f(T_A)$



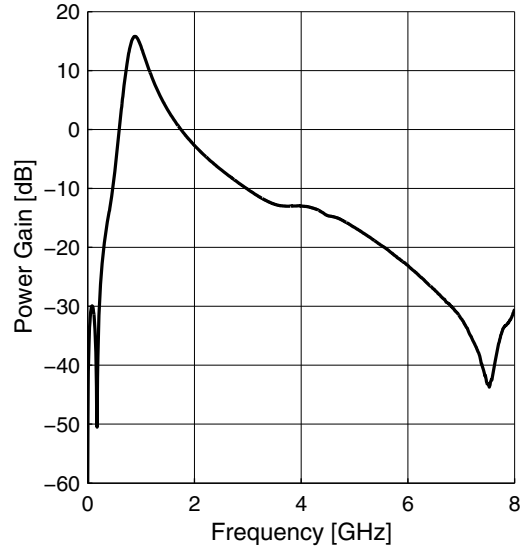
2.19 Measured Performance Band 5 Application High Gain Mode vs. Frequency

$T_A = 25\text{ }^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $V_{GS} = 2.8\text{ V}$, $V_{EN} = 2.8\text{ V}$, $R_{REF} = n/c$

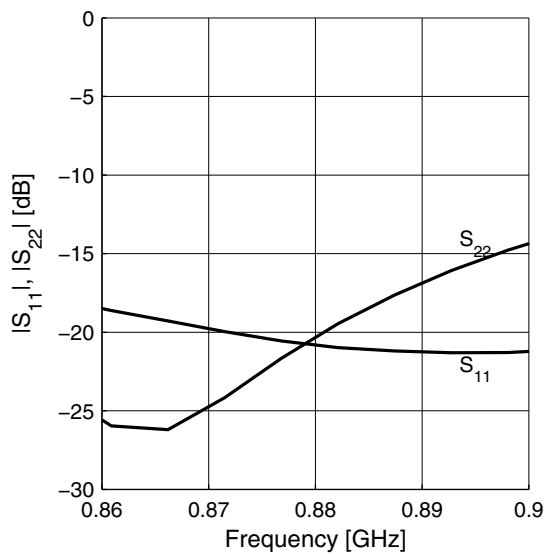
Power Gain $|S_{21}| = f(f)$



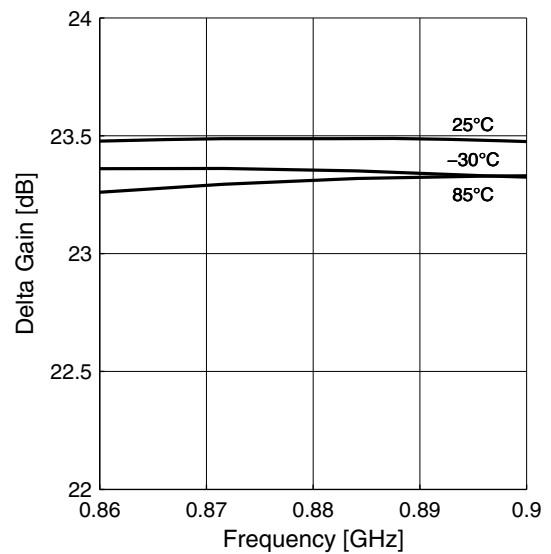
Power Gain wideband $|S_{21}| = f(f)$



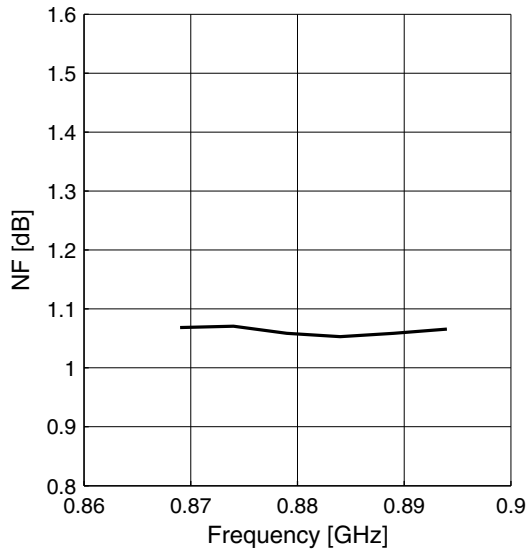
Matching $|S_{11}| = f(f)$, $|S_{22}| = f(f)$



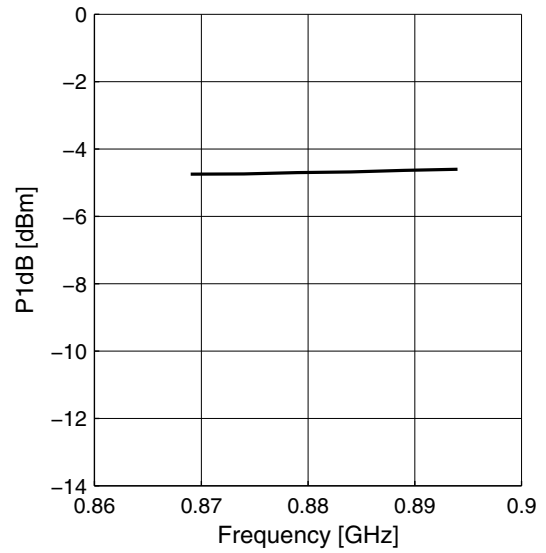
Gainstep HG-LG $\Delta S_{21} = f(f)$



Noise Figure $NF = f(f)$



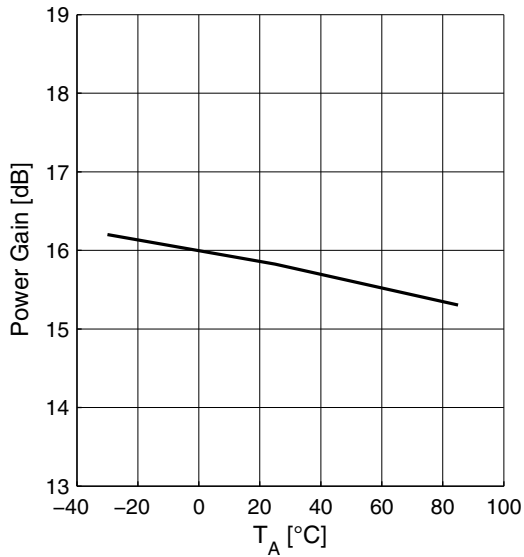
Input Compression $P1dB = f(f)$



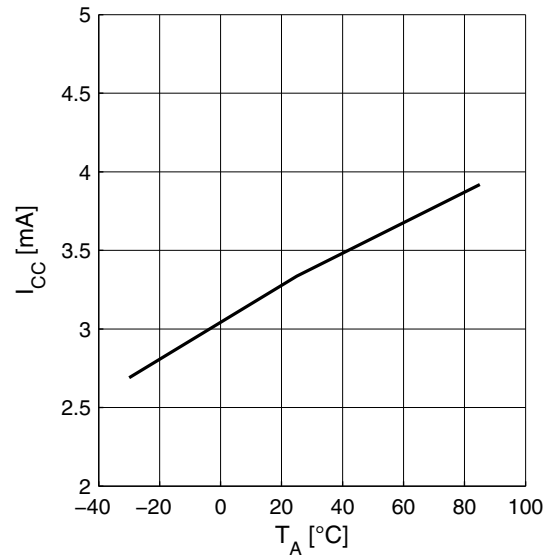
2.20 Measured Performance Band 5 Application High Gain Mode vs. Temperature

$T_A = 25\text{ }^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $V_{GS} = 2.8\text{ V}$, $V_{EN} = 2.8\text{ V}$, $f = 800\text{ MHz}$, $R_{REF} = n/c$

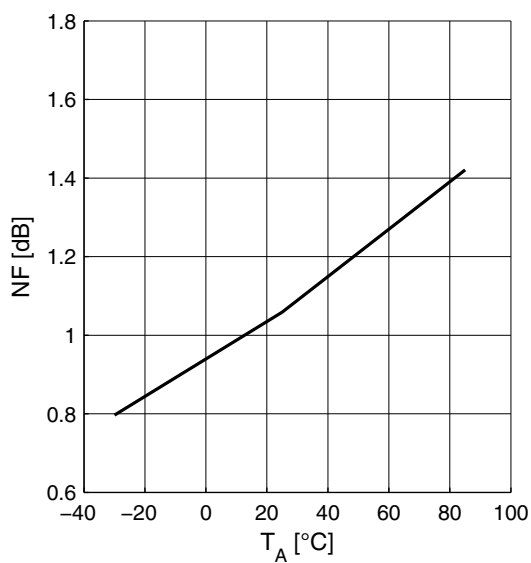
Power Gain $|S_{21}| = f(T_A)$



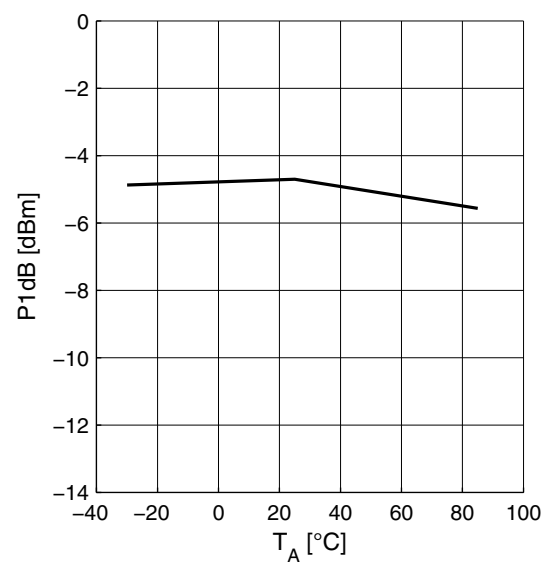
Supply Current $I_{CC} = f(T_A)$



Noise Figure $NF = f(T_A)$



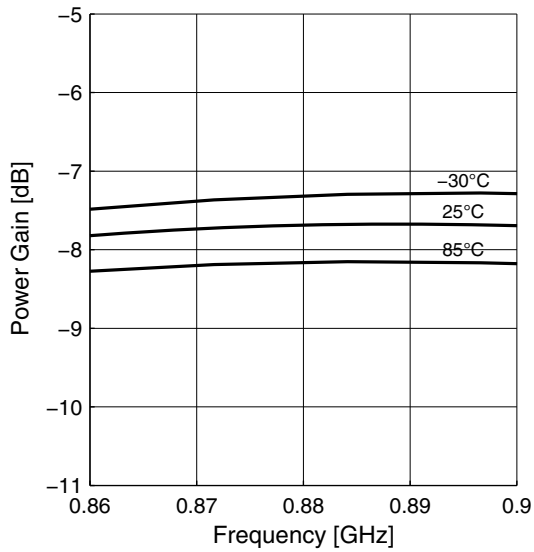
Input Compression $P1dB = f(T_A)$



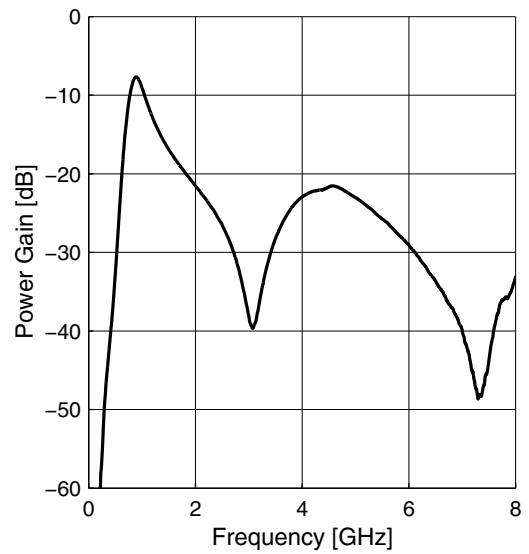
2.21 Measured Performance Band 5 Application Low Gain Mode vs. Frequency

$T_A = 25\text{ }^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $V_{GS} = 0\text{ V}$, $V_{EN} = 2.8\text{ V}$, $R_{REF} = n/c$

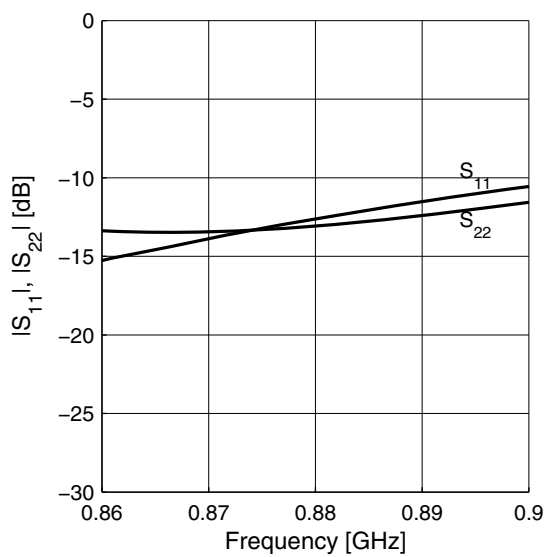
Power Gain $|S_{21}| = f(f)$



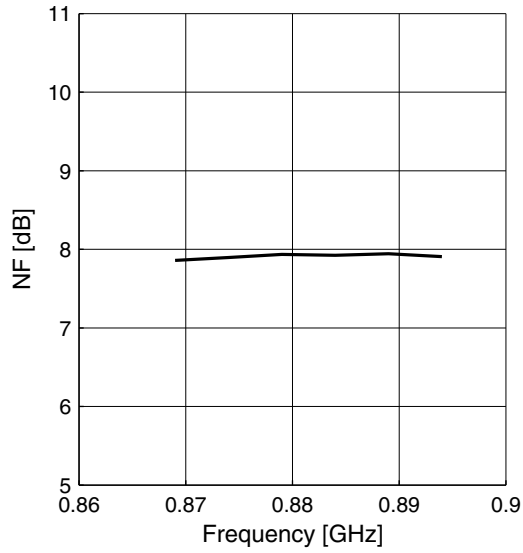
Power Gain wideband $|S_{21}| = f(f)$



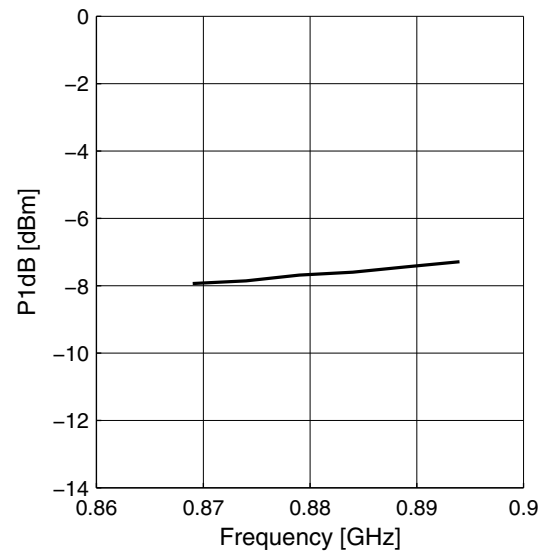
Matching $|S_{11}| = f(f)$, $|S_{22}| = f(f)$



Noise Figure $NF = f(f)$



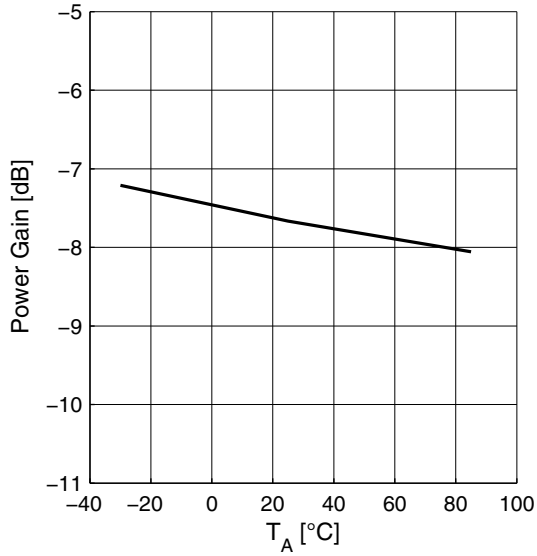
Input Compression $P1dB = f(f)$



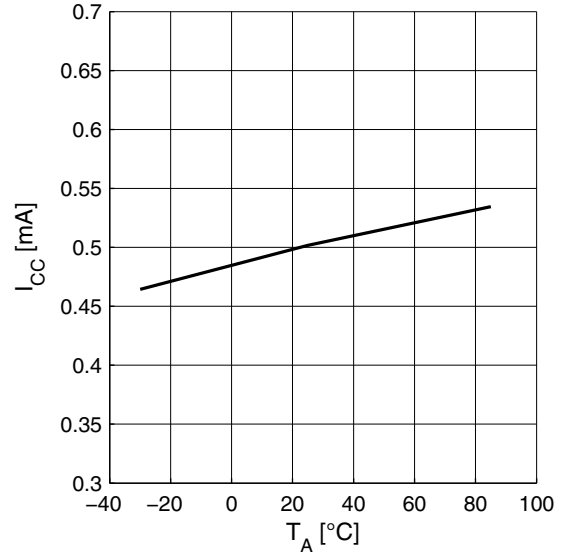
2.22 Measured Performance Band 5 Application Low Gain Mode vs. Temperature

$T_A = 25\text{ }^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $V_{GS} = 0\text{ V}$, $V_{EN} = 2.8\text{ V}$, $f = 800\text{ MHz}$, $R_{REF} = n/c$

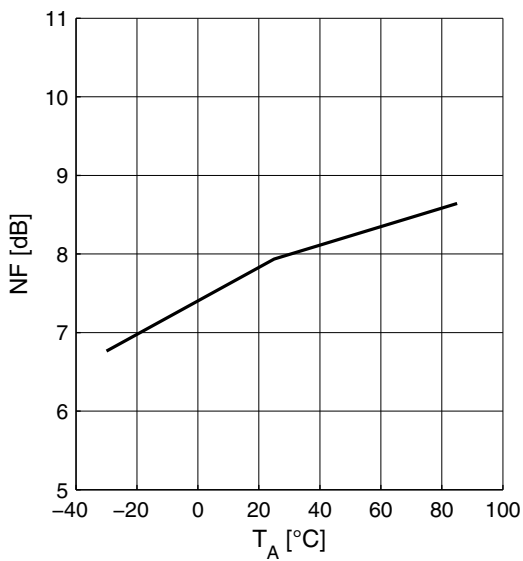
Power Gain $|S_{21}| = f(T_A)$



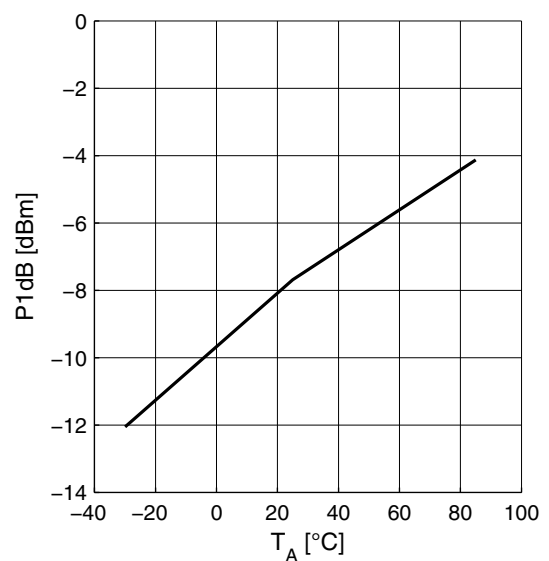
Supply Current $I_{CC} = f(T_A)$



Noise Figure $NF = f(T_A)$



Input Compression $P1dB = f(T_A)$



3 Application Circuit and Block Diagram

3.1 700 MHz Band Application Circuit Schematic

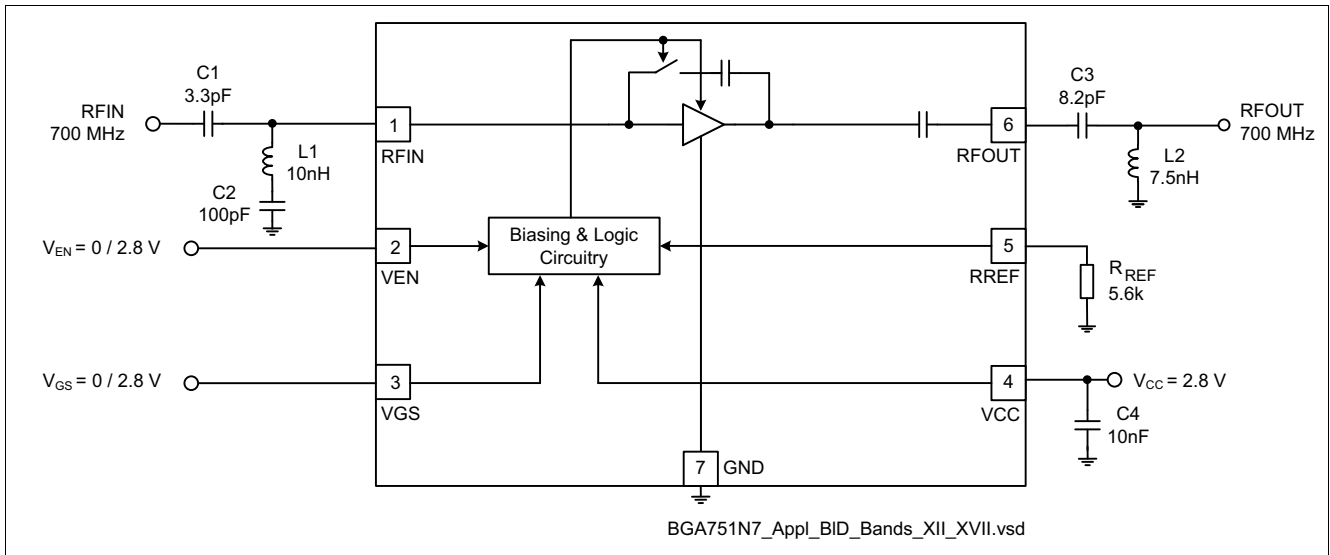


Figure 2 Application Circuit with Chip Outline (top view)

Note: Package paddle (Pin 7) has to be RF grounded.

Table 13 Parts List

| Part Number | Part Type | Manufacturer | Size | Comment |
|-------------|----------------|--------------|------|---------------------------|
| L1 ... L2 | Chip inductor | Various | 0402 | Wirewound, $Q \approx 50$ |
| C1 ... C4 | Chip capacitor | Various | 0402 | |
| RREF | Chip resistor | Various | 0402 | |

3.2 750 MHz Band Application Circuit Schematic

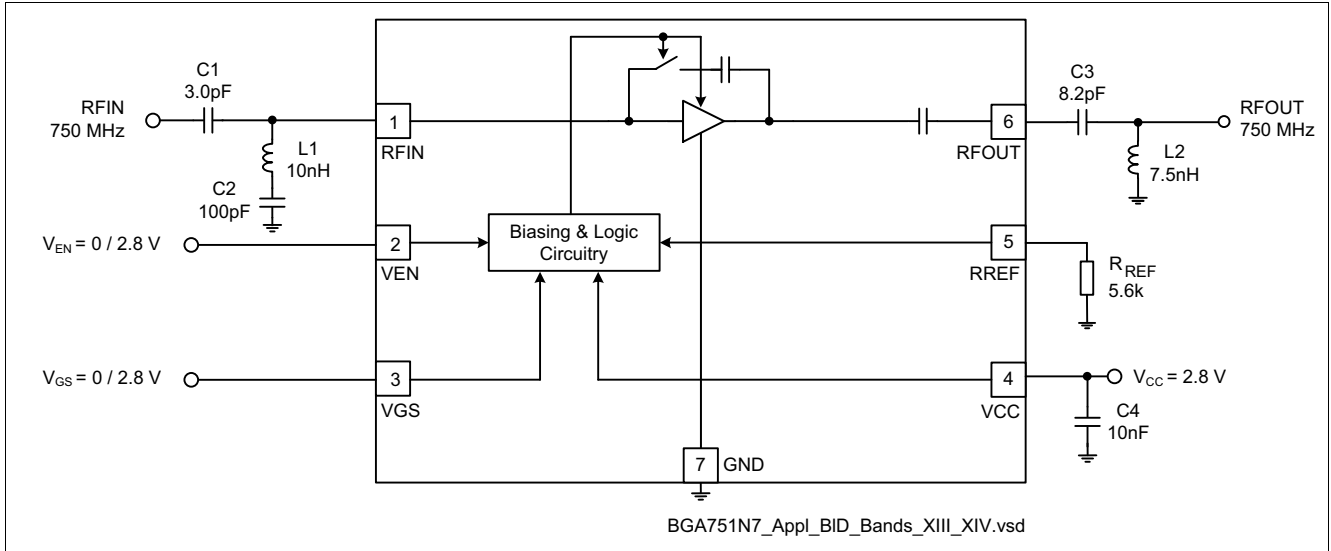


Figure 3 Application Circuit with Chip Outline (top view)

Note: Package paddle (Pin 7) has to be RF grounded.

Table 14 Parts List

| Part Number | Part Type | Manufacturer | Size | Comment |
|-------------|----------------|--------------|------|---------------------------|
| L1 ... L2 | Chip inductor | Various | 0402 | Wirewound, $Q \approx 50$ |
| C1 ... C4 | Chip capacitor | Various | 0402 | |
| RREF | Chip resistor | Various | 0402 | |

3.3 800 MHz Band Application Circuit Schematic

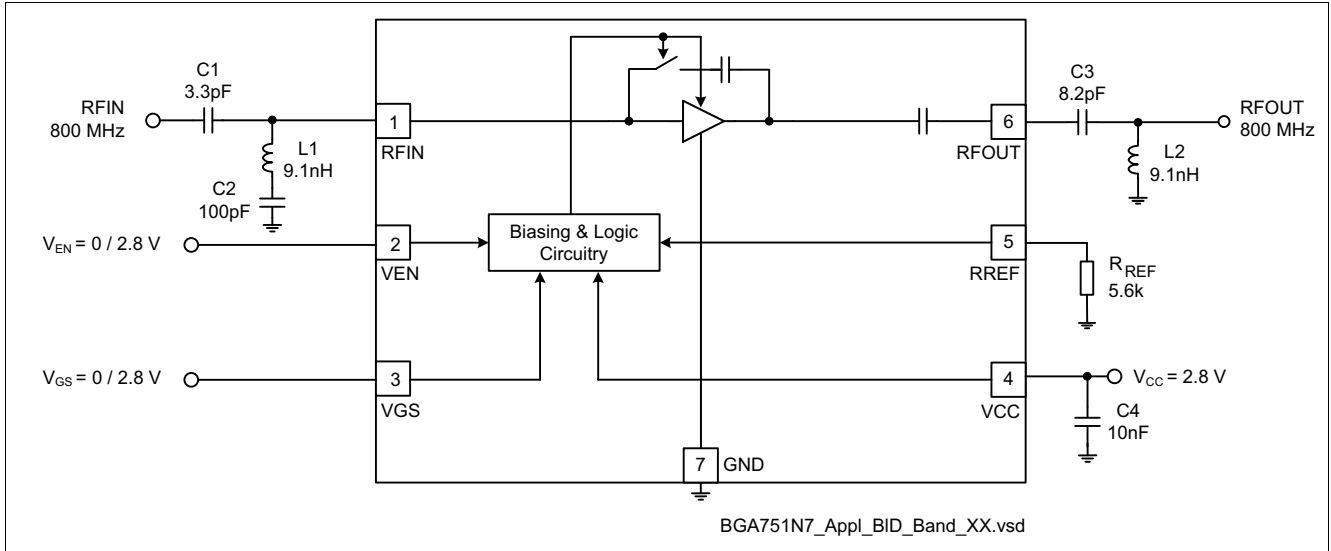


Figure 4 Application Circuit with Chip Outline (top view)

Note: Package paddle (Pin 7) has to be RF grounded.

Table 15 Parts List

| Part Number | Part Type | Manufacturer | Size | Comment |
|-------------|----------------|--------------|------|---------------------------|
| L1 ... L2 | Chip inductor | Various | 0402 | Wirewound, $Q \approx 50$ |
| C1 ... C4 | Chip capacitor | Various | 0402 | |
| RREF | Chip resistor | Various | 0402 | |

3.4 880 MHz Band Application Circuit Schematic

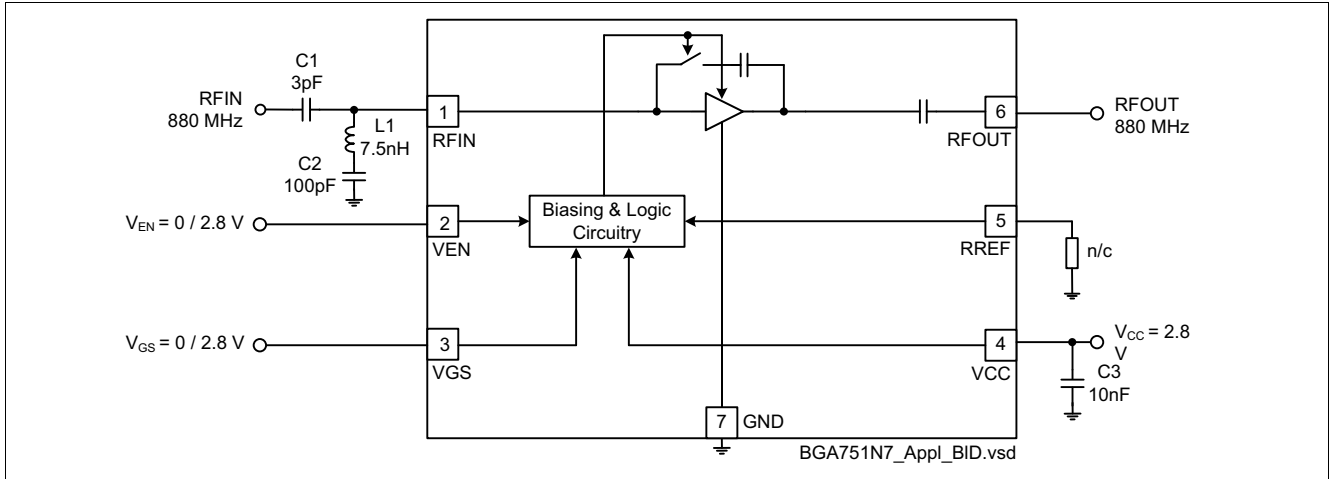


Figure 5 Application Circuit with Chip Outline (top view)

Note: Package paddle (Pin 7) has to be RF grounded.

Table 16 Parts List

| Part Number | Part Type | Manufacturer | Size | Comment |
|-------------|----------------|--------------|------|---------------------------|
| L1 | Chip inductor | Various | 0402 | Wirewound, $Q \approx 50$ |
| C1 ... C3 | Chip capacitor | Various | 0402 | |

3.5 900 MHz Band Application Circuit Schematic

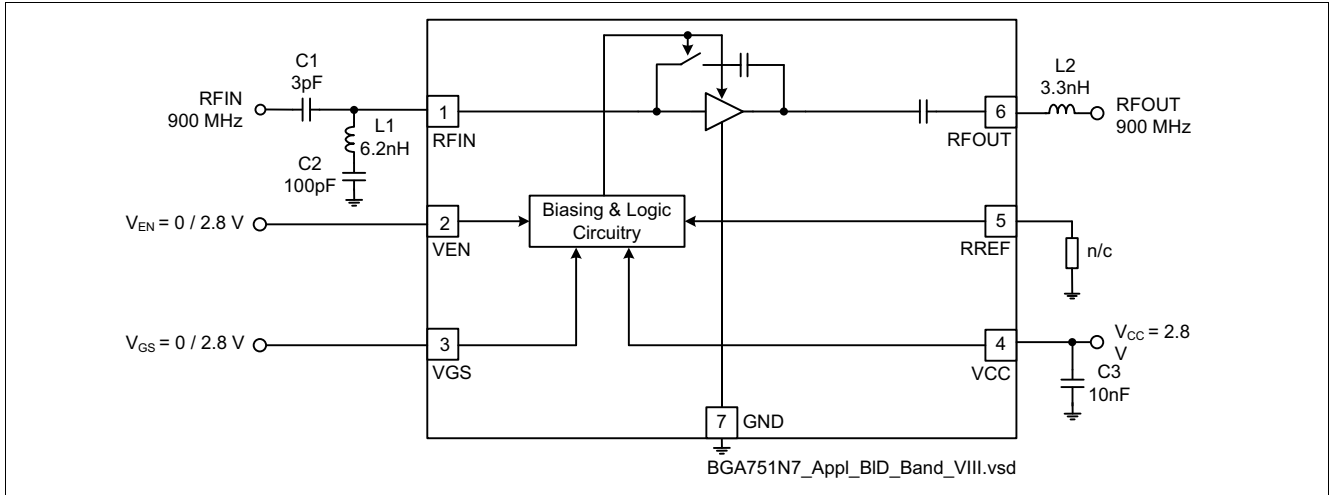


Figure 6 Application Circuit with Chip Outline (top view)

Note: Package paddle (Pin 7) has to be RF grounded.

Table 17 Parts List

| Part Number | Part Type | Manufacturer | Size | Comment |
|-------------|----------------|--------------|------|---------------------------|
| L1, L2 | Chip inductor | Various | 0402 | Wirewound, $Q \approx 50$ |
| C1 ... C3 | Chip capacitor | Various | 0402 | |

3.6 1100 MHz Band Application Circuit Schematic

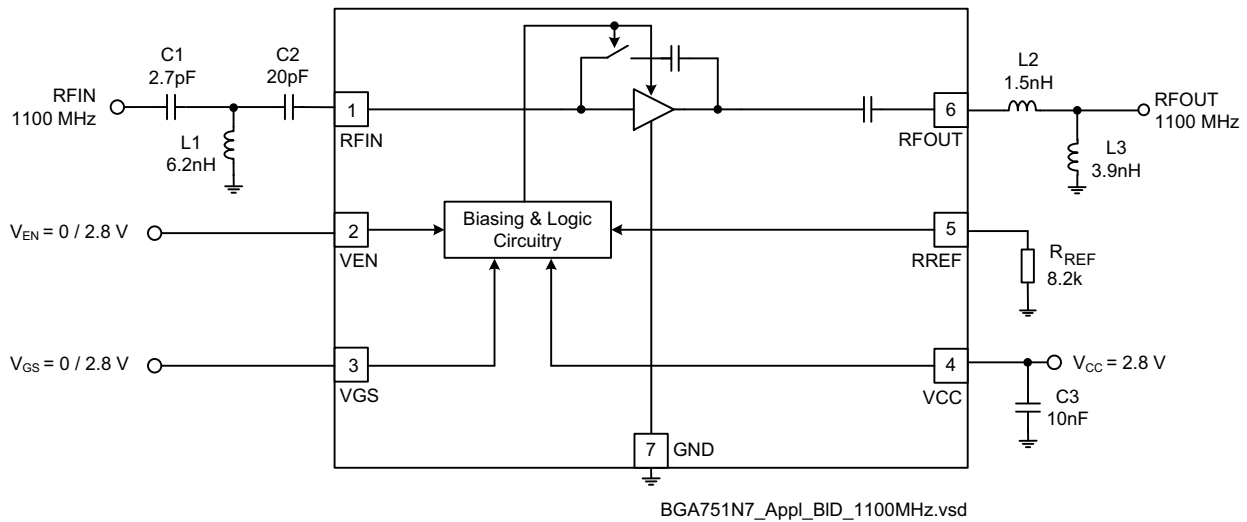


Figure 7 Application Circuit with Chip Outline (top view)

Note: Package paddle (Pin 7) has to be RF grounded.

Table 18 Parts List

| Part Number | Part Type | Manufacturer | Size | Comment |
|-------------|----------------|--------------|------|-------------------|
| L1 ... L3 | Chip inductor | Various | 0402 | Wirewound, Q ≈ 50 |
| C1 ... C3 | Chip capacitor | Various | 0402 | |
| RREF | Chip resistor | Various | 0402 | |

3.7 Pin Definition

Table 19 Pin Definition and Function

| Pin Number | Symbol | Function |
|------------|--------|---|
| 1 | RFIN | LNA input |
| 2 | VEN | Band select control |
| 3 | VGS | Gain step control |
| 4 | VCC | Supply voltage |
| 5 | RREF | Bias current reference resistor (high gain mode) |
| 6 | RFOUT | LNA output |
| 7 | GND | Package paddle; ground connection for LNA and control circuitry |

3.8 Application Board

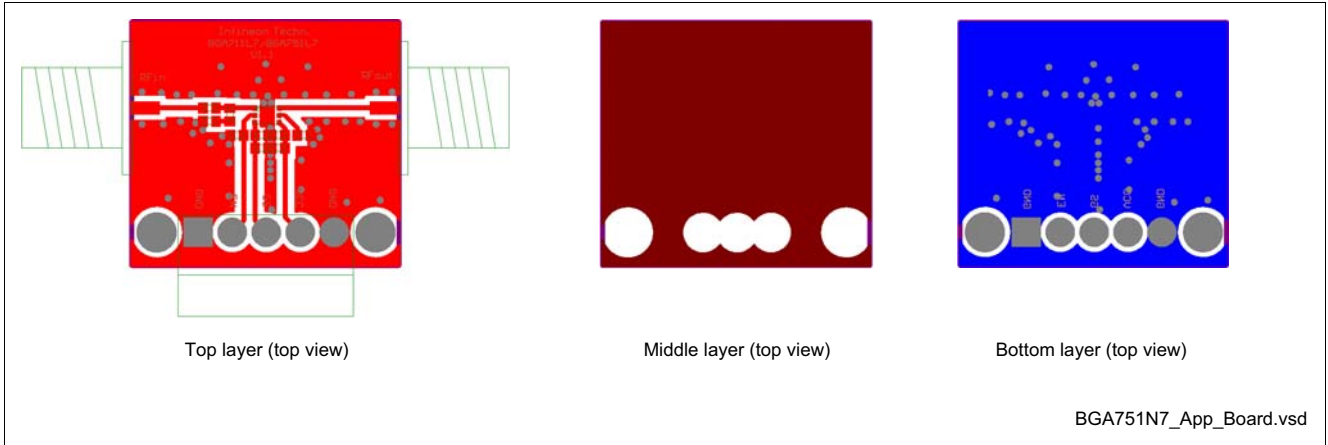


Figure 8 Application Board Layout on 3-layer FR4

Note: Top layer thickness: 0.2 mm, bottom layer thickness: 0.8 mm, 17 mm Cu metallization, gold plated. Board size: 21 x 19mm.

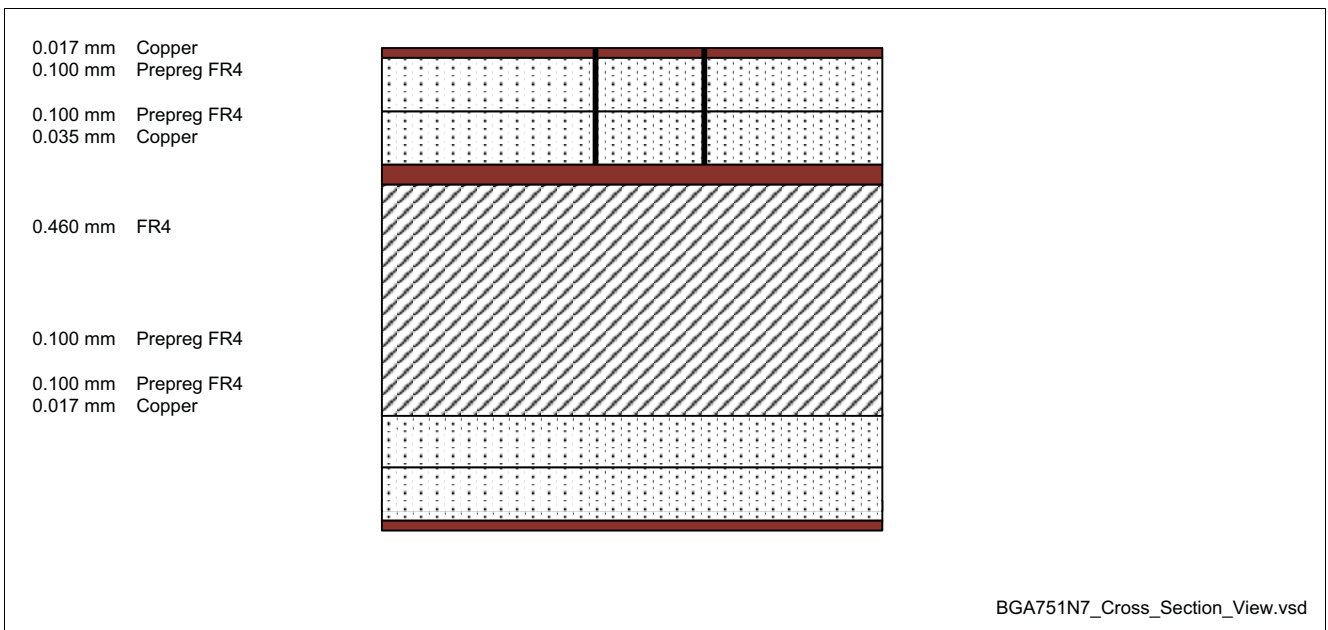


Figure 9 Cross-Section view of Application Board

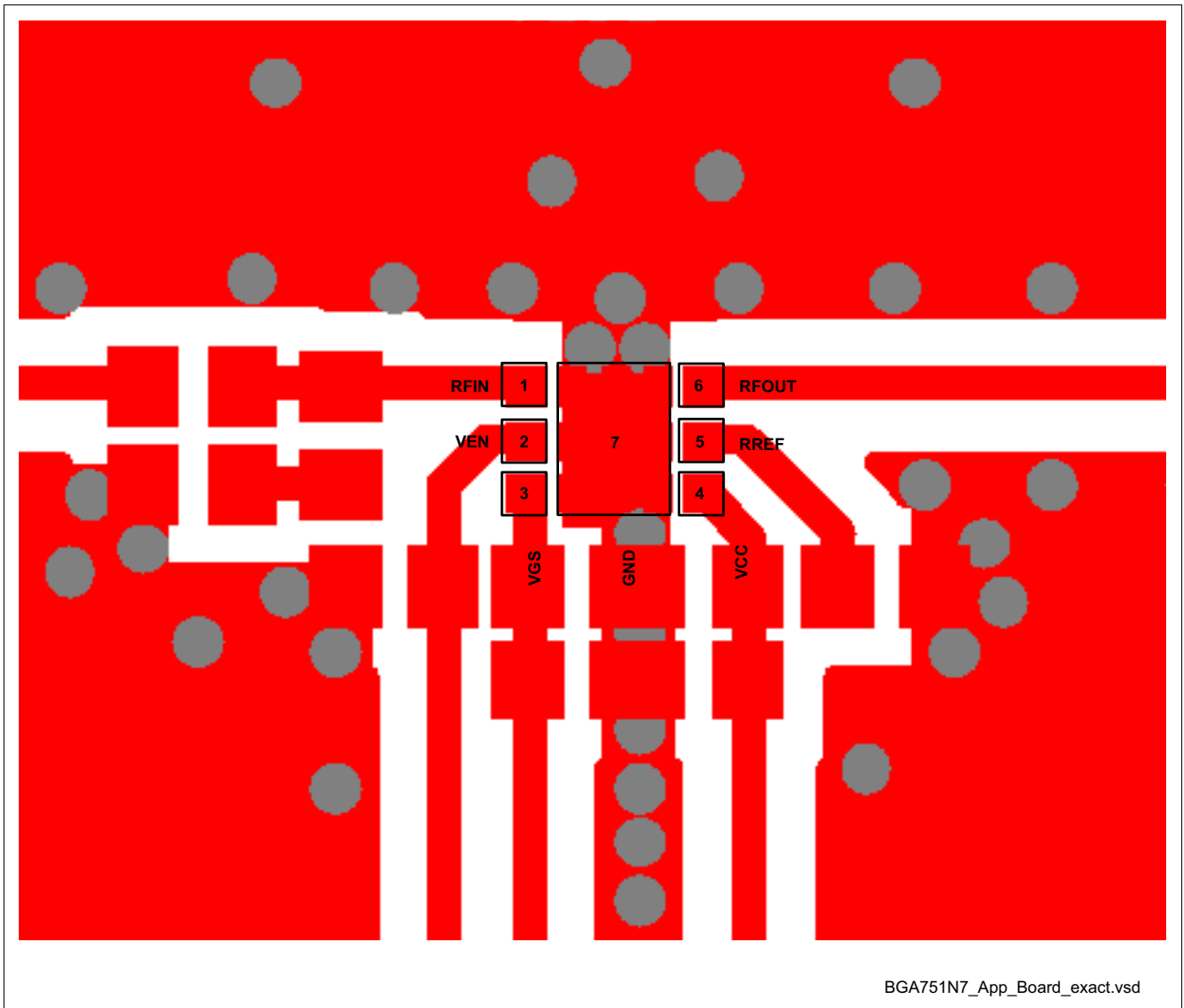


Figure 10 Detail of Application Board Layout

Note: In order to achieve the same performance as given in this datasheet please follow the suggested PCB-layout as closely as possible. The position of the GND vias is critical for RF performance.

4 Physical Characteristics

4.1 Package Footprint

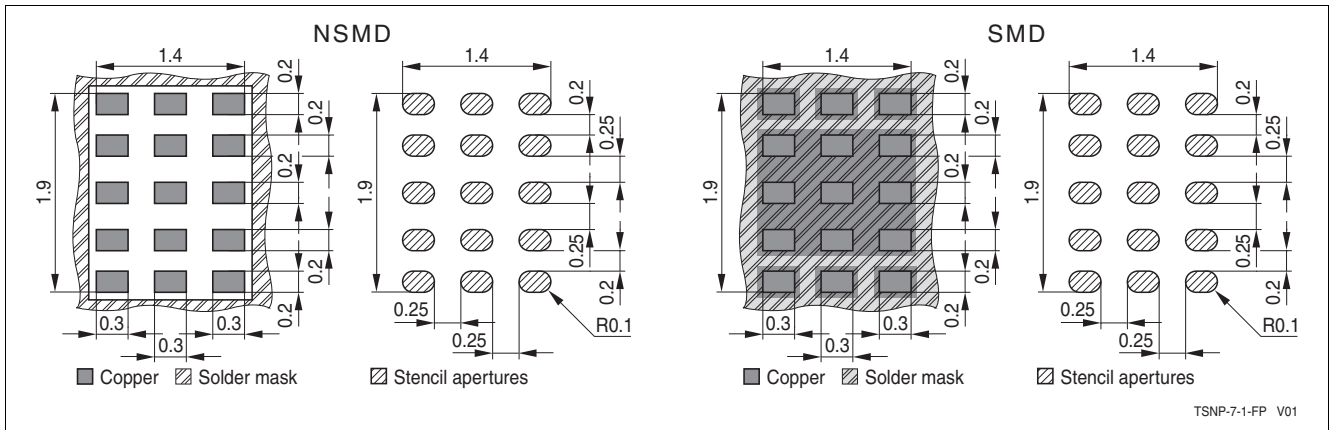


Figure 11 Footprint Recommendation 1 for the TSNP-7-1 Package

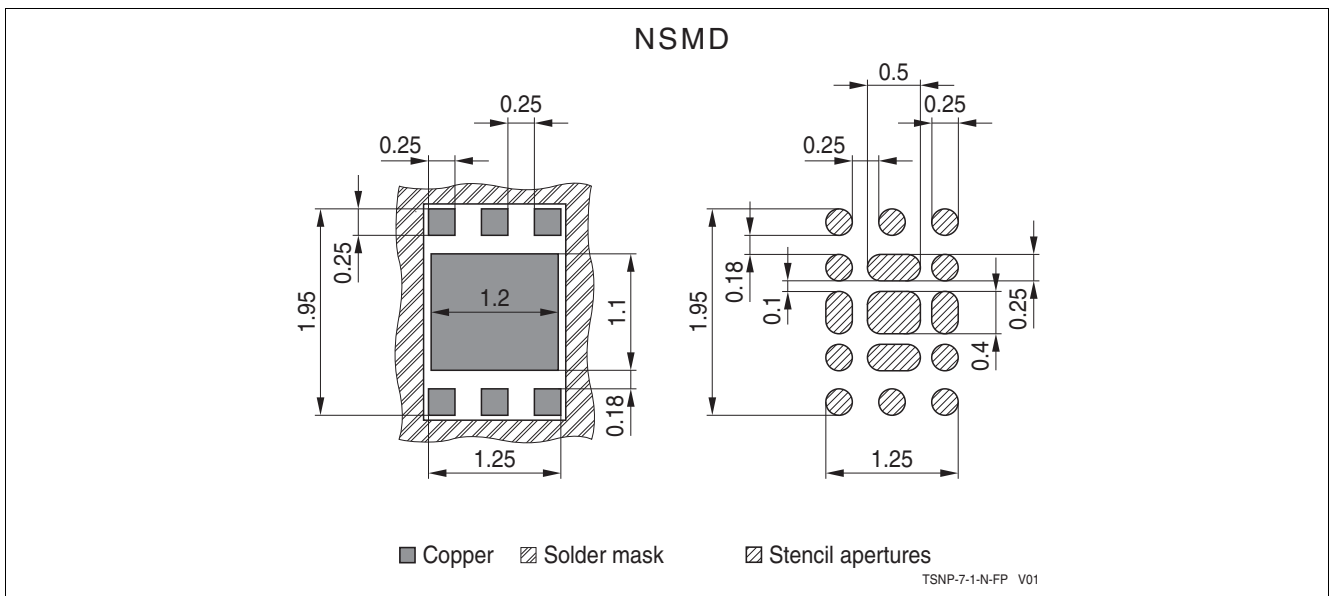


Figure 12 Footprint Recommendation 2 for the TSNP-7-1 Package

4.2 Package Dimensions

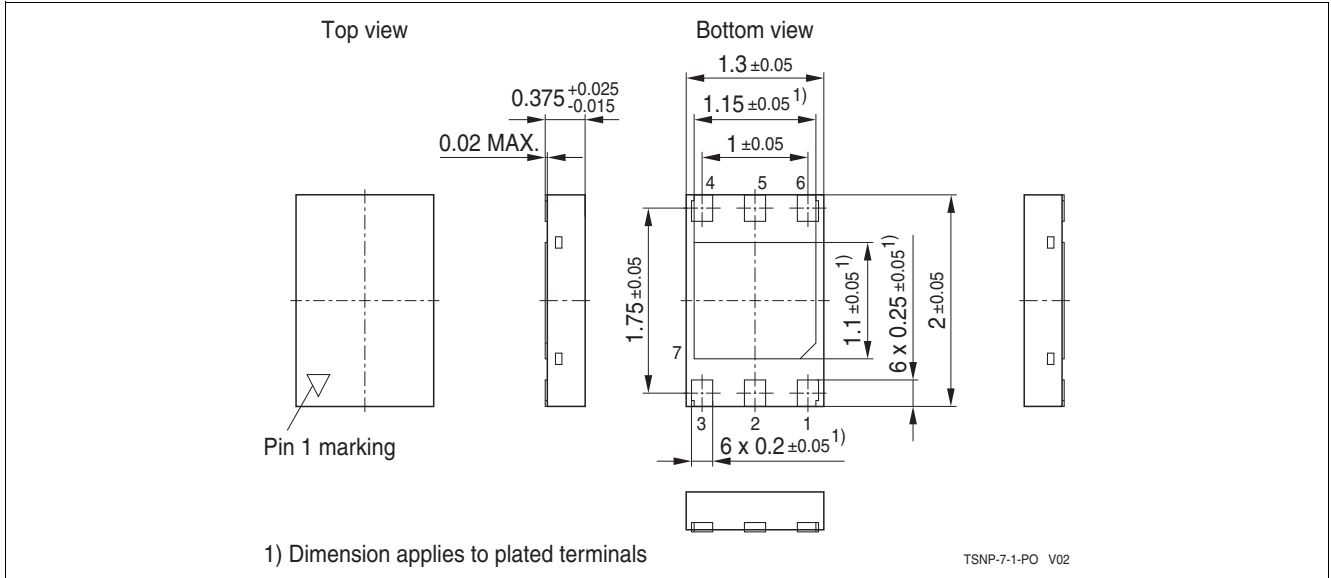


Figure 13 Package Outline (top, side and bottom view)

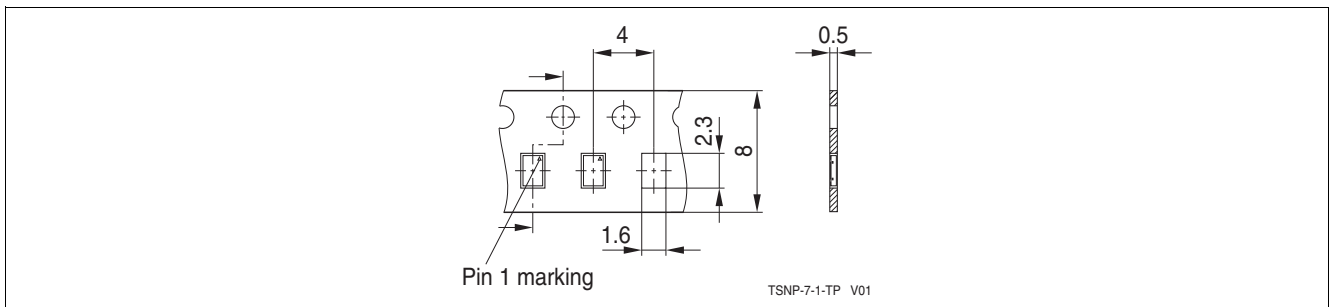


Figure 14 Tape & Reel Dimensions

4.3 Product Marking Pattern

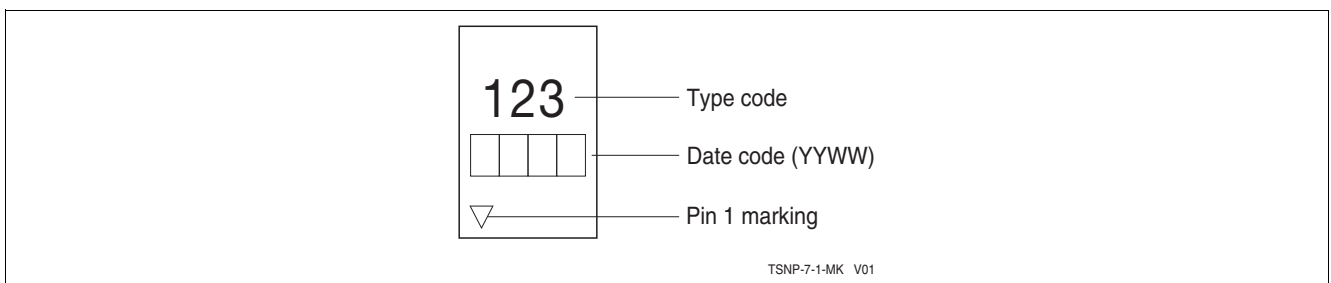


Figure 15 Marking Pattern (top view)

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[HMC8121-SX](#) [HMC-ALH382-SX](#) [HMC-ALH476-SX](#) [SE2433T-R](#) [SMA3101-TL-E](#) [SMA39](#) [A66-1](#) [A66-3](#) [A67-1](#) [LX5535LQ](#) [LX5540LL](#)
[MAAM02350](#) [HMC3653LP3BETR](#) [HMC549MS8GETR](#) [HMC-ALH435-SX](#) [SMA101](#) [SMA32](#) [SMA411](#) [SMA531](#) [SST12LP17E-XX8E](#)
[SST12LP19E-QX6E](#) [WPM0510A](#) [HMC5929LS6TR](#) [HMC5879LS7TR](#) [HMC1126](#) [HMC1087F10](#) [HMC1086](#) [HMC1016](#) [SMA1212](#)
[MAX2689EWS+T](#) [MAAMSS0041TR](#) [MAAM37000-A1G](#) [LTC6430AIUF-15#PBF](#) [CHA5115-QDG](#) [SMA70-2](#) [SMA4011](#) [A231](#) [HMC-](#)
[AUH232](#) [LX5511LQ](#) [LX5511LQ-TR](#) [HMC7441-SX](#) [HMC-ALH310](#)