

BGA7124

400 MHz to 2700 MHz 0.25 W high linearity silicon amplifier

Rev. 3 — 9 September 2010

Product data sheet

1. Product profile

1.1 General description

The BGA7124 MMIC is a one-stage amplifier, available in a low-cost leadless surface-mount package. It delivers 25 dBm output power at 1 dB gain compression and superior performance up to 2700 MHz. Its power saving features include easy quiescent current adjustment enabling class-AB operation and logic-level shutdown control to reduce the supply current to 4 μ A.

1.2 Features and benefits

- 400 MHz to 2700 MHz frequency operating range
- 16 dB small signal gain at 2 GHz
- 25 dBm output power at 1 dB gain compression
- Integrated active biasing
- External matching allows broad application optimization of the electrical performance
- 3.3 V or 5 V single supply operation
- All pins ESD protected

1.3 Applications

- Wireless infrastructure (base station, repeater, backhaul systems)
- Broadband CPE/MoCA
- Industrial applications
- E-metering
- Satellite Master Antenna TV (SMATV)
- WLAN/ISM/RFID

1.4 Quick reference data

Table 1. Quick reference data

Input and output impedances matched to 50 Ω , $\overline{SHDN} = HIGH$ (shutdown disabled). Typical values at $V_{CC} = 5$ V; $I_{CC} = 130$ mA; $T_{case} = 25$ $^{\circ}$ C; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|---------------------------------------|------------------|----------|------|------|------|
| I_{CC} | supply current | $V_{CC} = 5.0$ V | [1] 50 | - | 170 | mA |
| f | frequency | | [2] 400 | - | 2700 | MHz |
| G_p | power gain | f = 2140 MHz | 14.5 | 16 | 17.5 | dB |
| $P_{L(1dB)}$ | output power at 1 dB gain compression | f = 2140 MHz | 23.5 | 24.5 | - | dBm |
| $IP3_O$ | output third-order intercept point | f = 2140 MHz | [3] 34.5 | 37.5 | - | dBm |

[1] The supply current is adjustable; see [Section 8.1 "Supply current adjustment"](#).

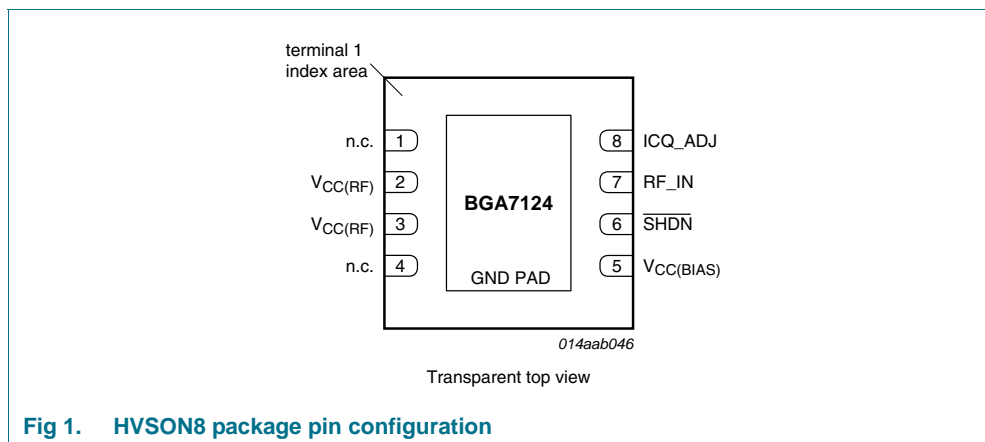
[2] Operation outside this range is possible but not guaranteed.

[3] $P_L = 11$ dBm per tone; spacing = 1 MHz.



2. Pinning information

2.1 Pinning



2.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|------------------------|---------|---|
| n.c. | 1, 4 | not connected |
| V _{CC} (RF) | 2, 3 | RF output for the power amplifier and DC supply input for the RF transistor collector [1] |
| V _{CC} (BIAS) | 5 | bias supply voltage [2] |
| SHDN | 6 | shutdown control function enabled/disabled |
| RF_IN | 7 | RF input for the power amplifier [1] |
| ICQ_ADJ | 8 | quiescent collector current adjustment controlled by an external resistor |
| GND | GND pad | RF and DC ground [3] |

[1] This pin is DC-coupled and requires an external DC-blocking capacitor.

[2] RF decoupled.

[3] The center metal base of the SOT908-1 also functions as heatsink for the power amplifier.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|---------|---|----------|
| | Name | Description | |
| BGA7124 | HVSON8 | plastic thermal enhanced very thin small outline package; no leads; 8 terminals; body 3 × 3 × 0.85 mm | SOT908-1 |

6. Limiting values

Table 5. Limiting values

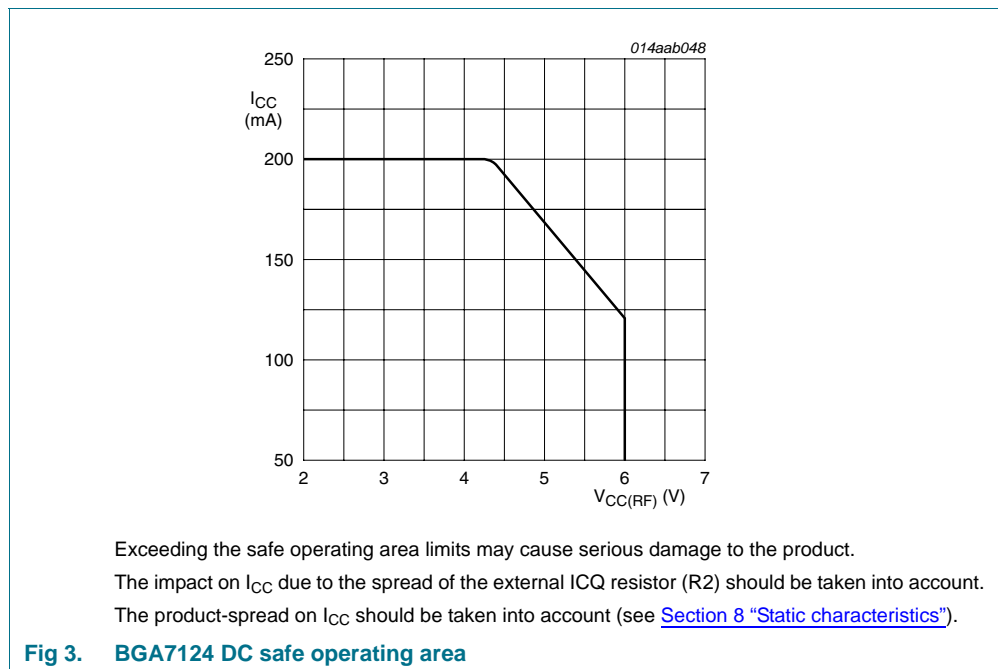
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|----------------|---------------------------------|--|-----------|----------------|------|
| $V_{CC(RF)}$ | RF supply voltage | | [1] - | 6.0 | V |
| $V_{CC(BIAS)}$ | bias supply voltage | | [1] - | 6.0 | V |
| I_{CC} | supply current | | [1][2] 50 | 200 | mA |
| $V_{ctrl(sd)}$ | shutdown control voltage | | [3] 0.0 | $V_{CC(BIAS)}$ | V |
| $P_{i(RF)}$ | RF input power | | - | 20 | dBm |
| T_{case} | case temperature | | -40 | +85 | °C |
| T_j | junction temperature | | - | 150 | °C |
| V_{ESD} | electrostatic discharge voltage | Human Body Model (HBM); According JEDEC standard 22-A114E | - | 2000 | V |
| | | Charged Device Model (CDM); According JEDEC standard 22-C101B | - | 500 | V |

[1] See [Figure 3](#) for safe operating area.

[2] The supply current is adjustable; see [Section 8.1 "Supply current adjustment"](#).

[3] If $V_{ctrl(sd)}$ exceeds $V_{CC(BIAS)}$, the internal ESD circuit can be damaged. To prevent this, it is recommended that the $I_{ctrl(sd)}$ is limited to 20 mA. If the SHDN function is not used, the SHDN pin should be connected to the $V_{CC(BIAS)}$ pin.



7. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Max | Unit |
|----------------|---|---|--------|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | $T_{case} = 85\text{ °C}$; $V_{CC} = 5\text{ V}$; $I_{CC} = 130\text{ mA}$ | [1] 32 | - | K/W |

[1] defined as thermal resistance from junction to GND paddle.

8. Static characteristics

Table 7. Characteristics

Input and output impedances matched to 50 Ω , pin $\overline{SHDN} = HIGH$ (shutdown disabled). Typical values at $V_{CC} = 3.3\text{ V}$ or $V_{CC} = 5\text{ V}$; $T_{case} = 25\text{ °C}$; unless otherwise specified.

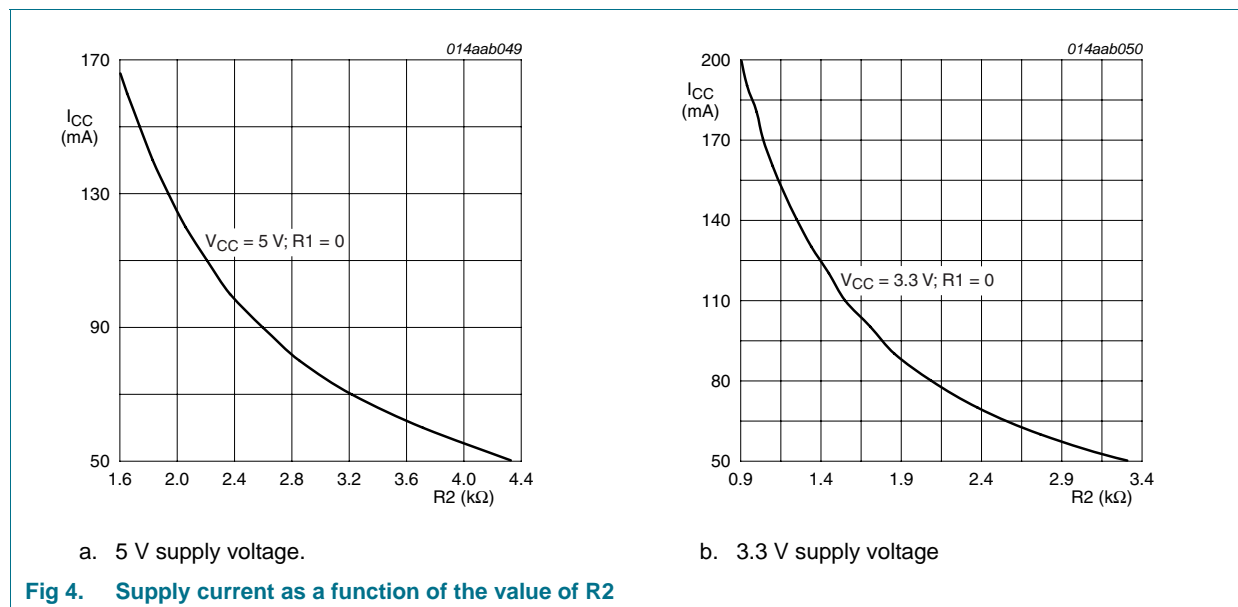
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|---|--|---------|-----|-----|---------|
| I_{CC} | supply current | $V_{CC} = 3.3\text{ V}$ | [1] 50 | - | 200 | mA |
| | | $R1 = 0\ \Omega$; $R2 = 1330\ \Omega$ | [2] 115 | 130 | 145 | mA |
| | | $R1 = 2.2\ \Omega$; $R2 = 1070\ \Omega$ | [2] 135 | 160 | 185 | mA |
| | | $V_{CC} = 5.0\text{ V}$ | [1] 50 | - | 170 | mA |
| | | $R1 = 0\ \Omega$; $R2 = 1960\ \Omega$ | [2] 110 | 130 | 150 | mA |
| | | $R1 = 2.2\ \Omega$; $R2 = 1650\ \Omega$ | [2] 125 | 150 | 175 | mA |
| | during shutdown; pin $\overline{SHDN} = LOW$ (shutdown enabled) | | - | 4 | 6 | μA |

[1] The supply current is adjustable; see [Section 8.1 "Supply current adjustment"](#).

[2] See [Section 12 "Application information"](#).

8.1 Supply current adjustment

The supply current can be adjusted by changing the value of external ICQ resistor (R2); (see [Figure 4](#)).



9. Dynamic characteristics

Table 8. Characteristics at V_{CC} = 5 V

Input and output impedances matched to 50 Ω, pin \overline{SHDN} = HIGH (shutdown disabled). Typical values at V_{CC} = 5 V; I_{CC} = 130 mA; T_{case} = 25 °C; see [Section 12 “Application information”](#); unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------|---------------------------------------|-------------------|----------|------|------|------|
| f | frequency | | [1] 400 | - | 2700 | MHz |
| G _p | power gain | for small signals | | | | |
| | | f = 940 MHz | - | 22.7 | - | dB |
| | | f = 1960 MHz | - | 16.4 | - | dB |
| | | f = 2140 MHz | 14.5 | 16.0 | 17.5 | dB |
| | | f = 2445 MHz | [2] - | 14.2 | - | dB |
| P _{L(1dB)} | output power at 1 dB gain compression | f = 940 MHz | - | 25.0 | - | dBm |
| | | f = 1960 MHz | - | 24.5 | - | dBm |
| | | f = 2140 MHz | 23.5 | 24.5 | - | dBm |
| | | f = 2445 MHz | [2] - | 23.5 | - | dBm |
| IP _{3O} | output third-order intercept point | f = 940 MHz | [3] - | 38.5 | - | dBm |
| | | f = 1960 MHz | [3] - | 38.0 | - | dBm |
| | | f = 2140 MHz | [3] 34.5 | 37.5 | - | dBm |
| | | f = 2445 MHz | [2][3] - | 36.0 | - | dBm |
| NF | noise figure | f = 940 MHz | [4] - | 5.2 | - | dB |
| | | f = 1960 MHz | [4] - | 4.6 | - | dB |
| | | f = 2140 MHz | [4] - | 4.8 | 6.5 | dB |
| | | f = 2445 MHz | [2][4] - | 5.4 | - | dB |

Table 8. Characteristics at $V_{CC} = 5\text{ V}$...continued

Input and output impedances matched to $50\ \Omega$, pin $\overline{\text{SHDN}} = \text{HIGH}$ (shutdown disabled). Typical values at $V_{CC} = 5\text{ V}$; $I_{CC} = 130\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$; see [Section 12 "Application information"](#); unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------|--------------------|--------------|-----|-----|-----|------|
| RL _{in} | input return loss | f = 940 MHz | - | -15 | - | dB |
| | | f = 1960 MHz | - | -11 | - | dB |
| | | f = 2140 MHz | - | -17 | - | dB |
| | | f = 2445 MHz | [2] | -13 | - | dB |
| RL _{out} | output return loss | f = 940 MHz | - | -8 | - | dB |
| | | f = 1960 MHz | - | -12 | - | dB |
| | | f = 2140 MHz | - | -15 | - | dB |
| | | f = 2445 MHz | [2] | -25 | - | dB |

[1] Operation outside this range is possible but not guaranteed.

[2] $I_{CC} = 150\text{ mA}$; see [Section 12 "Application information"](#).

[3] $P_L = 11\text{ dBm}$ per tone; spacing = 1 MHz.

[4] Defined at $P_i = -40\text{ dBm}$; small signal conditions.

Table 9. Characteristics at $V_{CC} = 3.3$ V

Input and output impedances matched to 50Ω , pin $\overline{SHDN} = HIGH$ (shutdown disabled). Typical values at $V_{CC} = 3.3$ V; $I_{CC} = 130$ mA; $T_{case} = 25$ °C, see [Section 12 "Application information"](#); unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|--------------|---------------------------------------|-------------------|---------|------|------|------|-----|
| f | frequency | | [1] 400 | - | 2700 | MHz | |
| G_p | power gain | for small signals | | | | | |
| | | f = 940 MHz | - | 22.5 | - | dB | |
| | | f = 2445 MHz | [2] | - | 13.8 | - | dB |
| $P_{L(1dB)}$ | output power at 1 dB gain compression | f = 940 MHz | - | 23.5 | - | dBm | |
| | | f = 2445 MHz | [2] | - | 22.0 | - | dBm |
| IP_{3O} | output third-order intercept point | f = 940 MHz | [3] | - | 36.4 | - | dBm |
| | | f = 2445 MHz | [2][3] | - | 35.2 | - | dBm |
| NF | noise figure | f = 940 MHz | [4] | - | 5.5 | - | dB |
| | | f = 2445 MHz | [2][4] | - | 5.5 | - | dB |
| RL_{in} | input return loss | f = 940 MHz | - | -15 | - | dB | |
| | | f = 2445 MHz | [2] | - | -10 | - | dB |
| RL_{out} | output return loss | f = 940 MHz | - | -9 | - | dB | |
| | | f = 2445 MHz | [2] | - | -25 | - | dB |

[1] Operation outside this range is possible but not guaranteed.

[2] $I_{CC} = 160$ mA; see [Section 12 "Application information"](#).

[3] $P_L = 11$ dBm per tone; spacing = 1 MHz.

[4] Defined at $P_1 = -40$ dBm; small signal conditions.

9.1 Scattering parameters

Table 10. Scattering parameters at 5 V, MMIC only

$V_{CC} = 5\text{ V}$; $I_{CC} = 130\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$.

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|---------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|
| | Magnitude (ratio) | Angle (degree) | Magnitude (ratio) | Angle (degree) | Magnitude (ratio) | Angle (degree) | Magnitude (ratio) | Angle (degree) |
| 400 | 0.85 | 161.56 | 22.94 | 82.35 | 0.01 | 17.02 | 0.46 | -156.50 |
| 500 | 0.90 | 159.44 | 11.82 | 82.58 | 0.01 | 27.08 | 0.63 | 176.13 |
| 600 | 0.90 | 152.15 | 9.98 | 73.86 | 0.01 | 24.10 | 0.64 | 169.61 |
| 700 | 0.89 | 145.75 | 8.59 | 66.00 | 0.01 | 21.41 | 0.64 | 164.34 |
| 800 | 0.88 | 139.33 | 7.55 | 58.86 | 0.02 | 18.47 | 0.65 | 159.29 |
| 900 | 0.87 | 133.19 | 6.74 | 51.66 | 0.02 | 14.00 | 0.65 | 154.44 |
| 1000 | 0.87 | 127.07 | 6.14 | 45.11 | 0.02 | 11.25 | 0.65 | 149.58 |
| 1100 | 0.87 | 120.67 | 5.61 | 38.20 | 0.02 | 7.99 | 0.65 | 144.25 |
| 1200 | 0.87 | 114.18 | 5.19 | 31.60 | 0.02 | 4.20 | 0.64 | 139.60 |
| 1300 | 0.86 | 107.68 | 4.82 | 25.08 | 0.02 | 0.31 | 0.64 | 134.85 |
| 1400 | 0.86 | 100.86 | 4.51 | 18.49 | 0.02 | -4.01 | 0.63 | 130.13 |
| 1500 | 0.86 | 94.14 | 4.23 | 11.74 | 0.02 | -8.65 | 0.63 | 125.02 |
| 1600 | 0.86 | 87.48 | 3.99 | 5.25 | 0.03 | -13.15 | 0.63 | 120.13 |
| 1700 | 0.86 | 80.83 | 3.77 | -1.50 | 0.03 | -18.16 | 0.62 | 114.98 |
| 1800 | 0.86 | 74.14 | 3.56 | -8.13 | 0.03 | -23.28 | 0.62 | 109.78 |
| 1900 | 0.86 | 67.39 | 3.37 | -14.94 | 0.03 | -28.54 | 0.62 | 104.46 |
| 2000 | 0.86 | 60.70 | 3.19 | -21.68 | 0.03 | -33.68 | 0.63 | 99.01 |
| 2100 | 0.86 | 53.97 | 3.02 | -28.68 | 0.03 | -39.37 | 0.63 | 93.58 |
| 2200 | 0.86 | 47.78 | 2.85 | -35.14 | 0.03 | -44.84 | 0.63 | 88.17 |
| 2300 | 0.86 | 41.57 | 2.69 | -41.70 | 0.03 | -50.27 | 0.64 | 83.06 |
| 2400 | 0.86 | 35.43 | 2.54 | -48.11 | 0.03 | -55.62 | 0.64 | 78.10 |
| 2500 | 0.86 | 29.74 | 2.39 | -54.19 | 0.04 | -60.71 | 0.65 | 73.31 |
| 2600 | 0.86 | 24.79 | 2.27 | -60.06 | 0.04 | -65.48 | 0.65 | 68.64 |
| 2700 | 0.85 | 19.58 | 2.15 | -66.14 | 0.04 | -70.66 | 0.66 | 64.16 |

Table 11. Scattering parameters at 3.3 V, MMIC only $V_{CC} = 3.3\text{ V}$; $I_{CC} = 130\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$.

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|---------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|
| | Magnitude (ratio) | Angle (degree) | Magnitude (ratio) | Angle (degree) | Magnitude (ratio) | Angle (degree) | Magnitude (ratio) | Angle (degree) |
| 400 | 0.84 | 161.94 | 21.25 | 73.81 | 0.01 | 17.66 | 0.57 | -154.41 |
| 500 | 0.91 | 159.25 | 11.56 | 79.01 | 0.01 | 28.15 | 0.65 | 178.05 |
| 600 | 0.90 | 151.98 | 9.67 | 70.71 | 0.01 | 24.80 | 0.66 | 171.32 |
| 700 | 0.90 | 145.57 | 8.29 | 63.37 | 0.01 | 21.89 | 0.66 | 165.59 |
| 800 | 0.89 | 139.18 | 7.26 | 56.54 | 0.02 | 19.04 | 0.66 | 160.37 |
| 900 | 0.88 | 132.87 | 6.48 | 49.74 | 0.02 | 15.35 | 0.66 | 155.28 |
| 1000 | 0.88 | 126.78 | 5.90 | 43.30 | 0.02 | 11.89 | 0.66 | 150.23 |
| 1100 | 0.87 | 120.46 | 5.39 | 36.53 | 0.02 | 8.33 | 0.66 | 144.88 |
| 1200 | 0.87 | 113.94 | 4.97 | 30.05 | 0.02 | 4.50 | 0.65 | 140.03 |
| 1300 | 0.87 | 107.48 | 4.62 | 23.62 | 0.02 | 0.35 | 0.65 | 135.35 |
| 1400 | 0.87 | 100.69 | 4.32 | 17.15 | 0.02 | -3.92 | 0.64 | 130.48 |
| 1500 | 0.86 | 93.93 | 4.05 | 10.48 | 0.02 | -8.62 | 0.64 | 125.46 |
| 1600 | 0.86 | 87.28 | 3.81 | 4.05 | 0.03 | -13.28 | 0.64 | 120.31 |
| 1700 | 0.86 | 80.71 | 3.61 | -2.66 | 0.03 | -18.26 | 0.64 | 115.13 |
| 1800 | 0.86 | 74.00 | 3.40 | -9.21 | 0.03 | -23.51 | 0.64 | 109.99 |
| 1900 | 0.86 | 67.27 | 3.22 | -15.97 | 0.03 | -28.87 | 0.63 | 104.66 |
| 2000 | 0.86 | 60.64 | 3.05 | -22.71 | 0.03 | -34.22 | 0.64 | 99.36 |
| 2100 | 0.86 | 53.84 | 2.89 | -29.68 | 0.03 | -39.95 | 0.64 | 93.93 |
| 2200 | 0.86 | 47.60 | 2.72 | -36.12 | 0.03 | -45.44 | 0.64 | 88.55 |
| 2300 | 0.86 | 41.43 | 2.57 | -42.66 | 0.03 | -51.06 | 0.65 | 83.38 |
| 2400 | 0.86 | 35.35 | 2.42 | -49.01 | 0.04 | -56.53 | 0.65 | 78.44 |
| 2500 | 0.85 | 29.64 | 2.28 | -55.12 | 0.04 | -61.72 | 0.66 | 73.56 |
| 2600 | 0.85 | 24.72 | 2.16 | -60.91 | 0.04 | -66.76 | 0.66 | 68.80 |
| 2700 | 0.85 | 19.59 | 2.04 | -66.91 | 0.04 | -71.84 | 0.67 | 64.30 |

10. Reliability information

Table 12. Reliability

| Life test | Conditions | Intrinsic failure rate |
|-----------|--|------------------------|
| HTOL | According JESD85; confidence level 60 %; $T_j = 55\text{ }^{\circ}\text{C}$; activation energy = 0.7 eV; acceleration factor determined according Arrhenius | 4 |

11. Moisture sensitivity

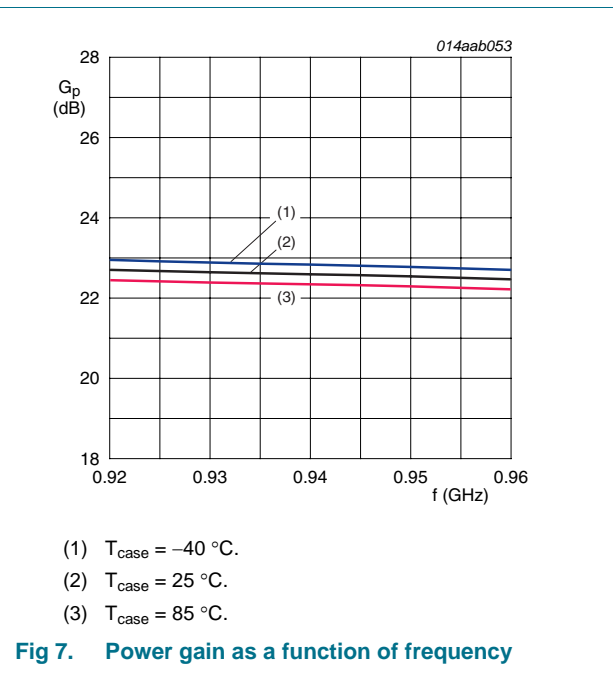
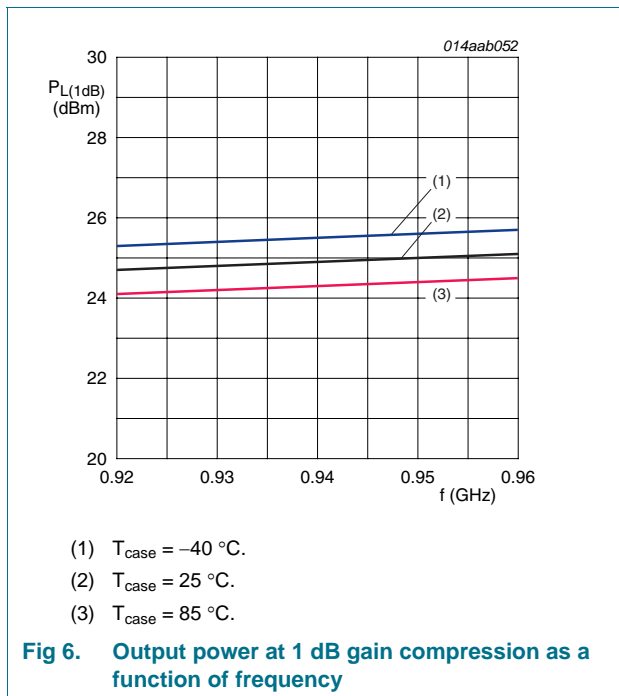
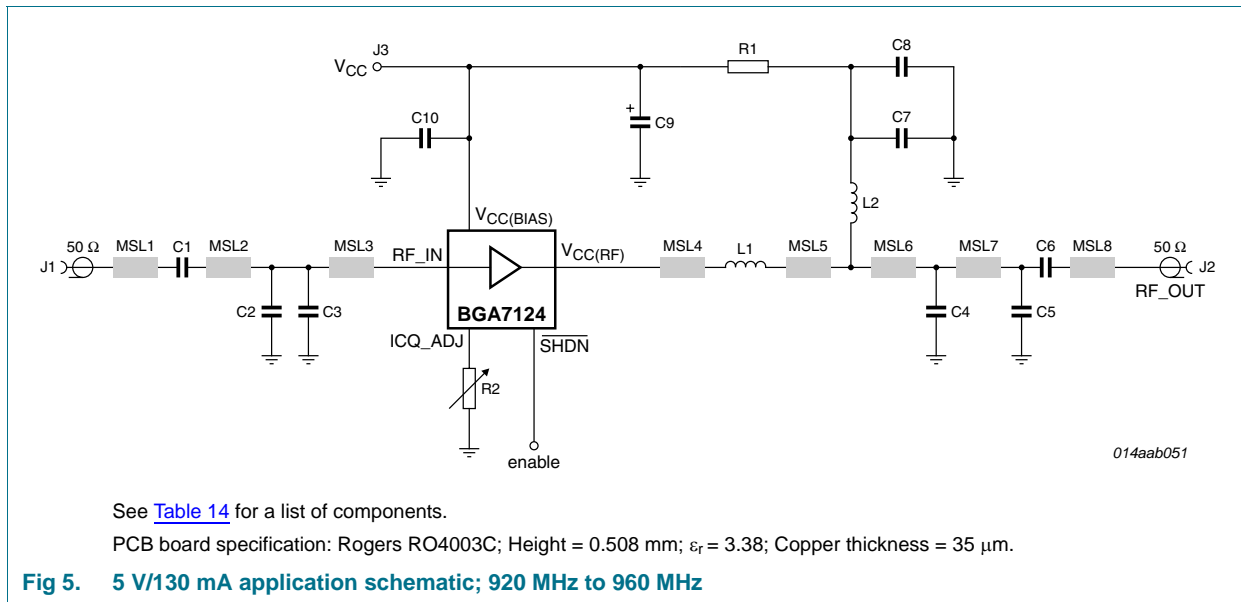
Table 13. Moisture sensitivity level

| Test methodology | Class |
|------------------|-------|
| JESD-22-A113 | 1 |

12. Application information

12.1 5 V applications

12.1.1 920 MHz to 960 MHz



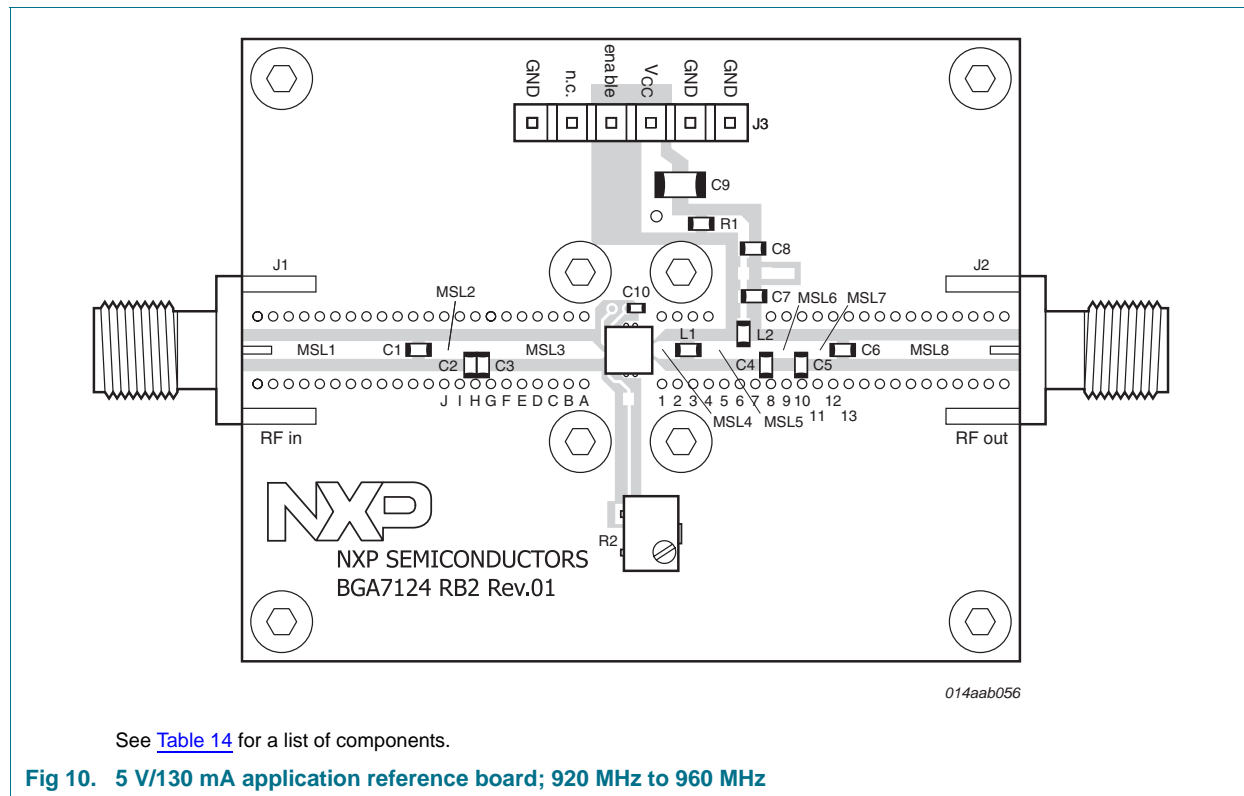
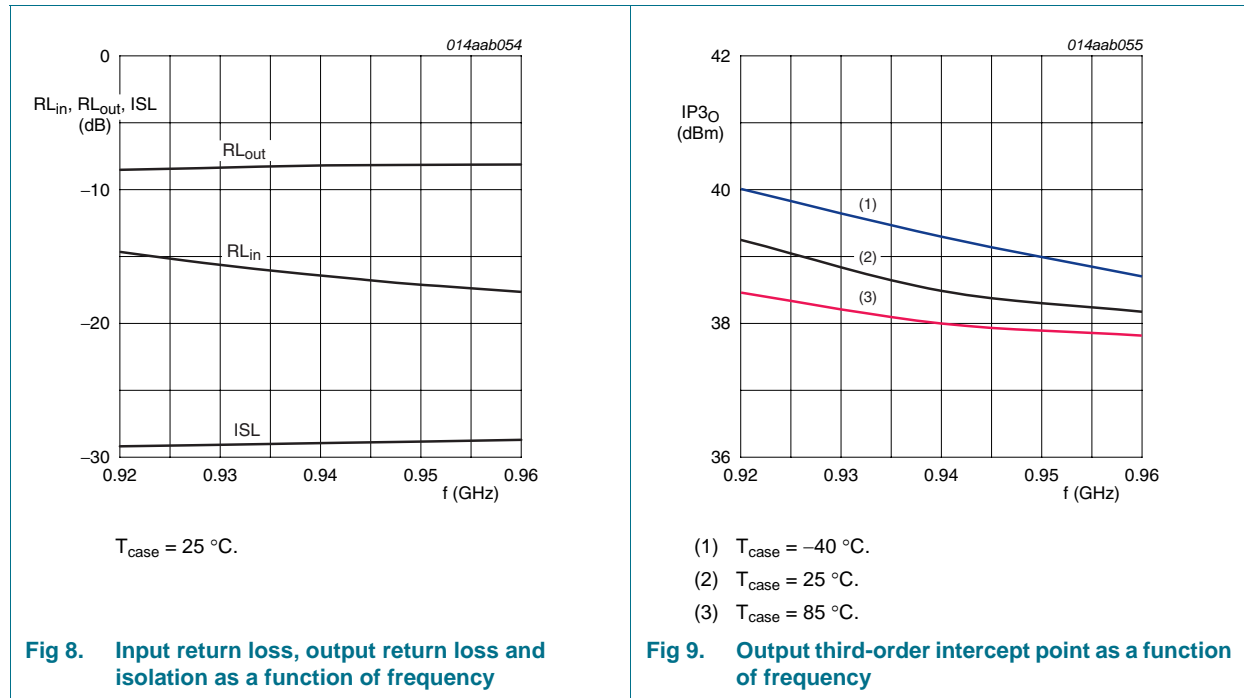


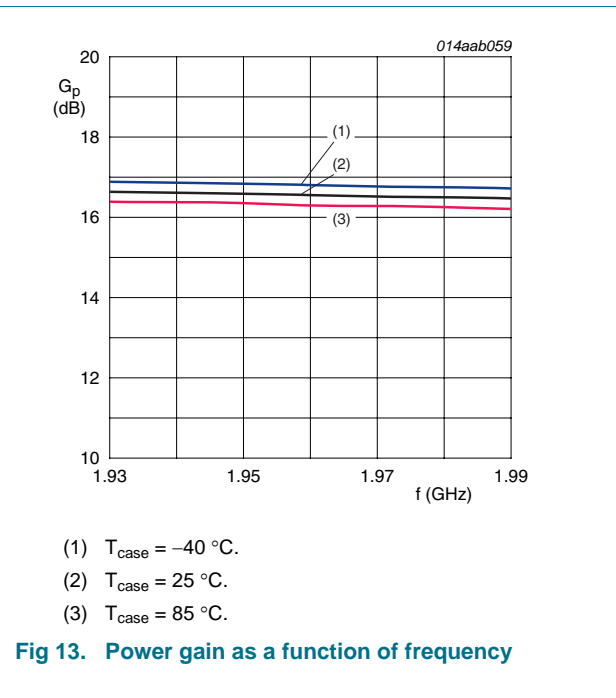
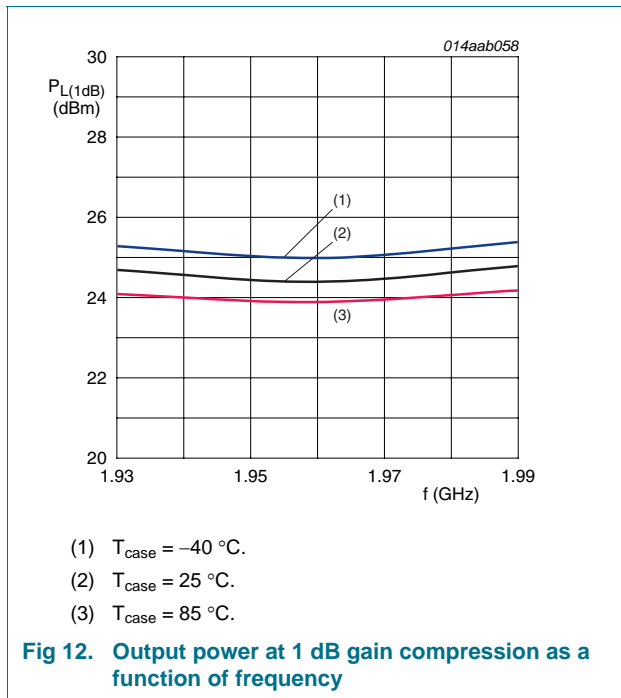
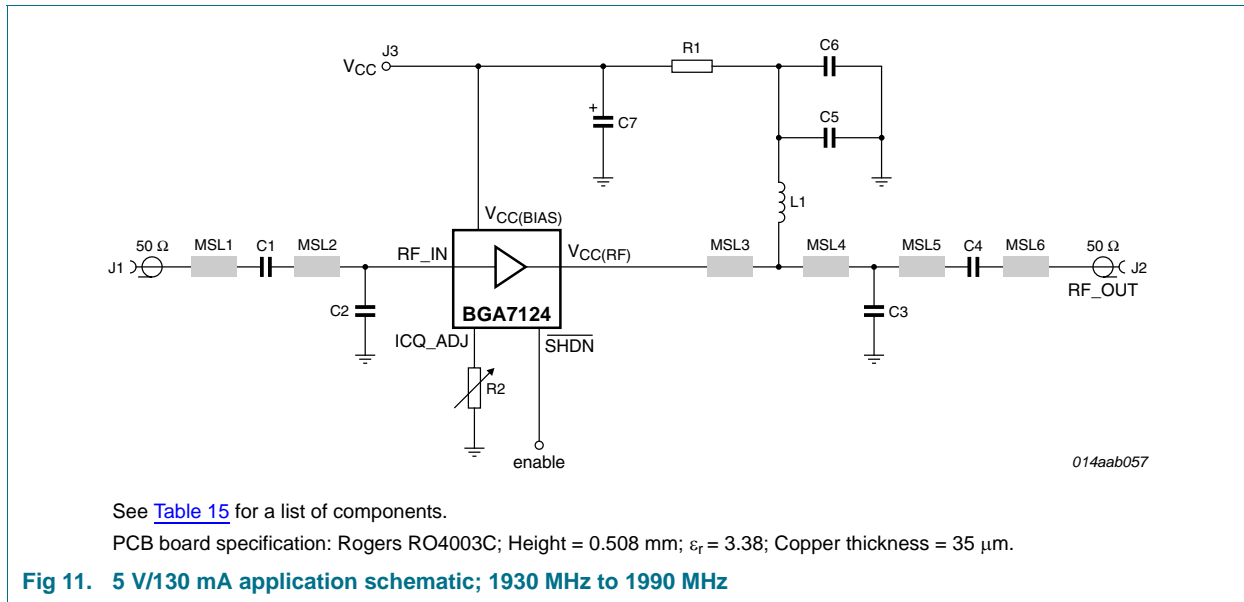
Table 14. 5 V/130 mA application list of components; 920 MHz to 960 MHz

See [Figure 5](#) and [Figure 10](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm .

| Component | Description | Value | Function | Remarks |
|---------------------|-----------------------|---|------------------|---------------------------------------|
| C1, C6 | capacitor | 68 pF | DC blocking | Murata GRM1885C1H680JA01D |
| C2, C3 | capacitor | 3.3 pF | input match | Murata GRM1885C1H3R3CZ01D |
| C4 | capacitor | 3.9 pF | output match | Murata GRM1885C1H3R9CZ01D |
| C5 | capacitor | 1.0 pF | output match | Murata GRM1885C1H1R0CZ01D |
| C7 | capacitor | 68 pF | RF decoupling | Murata GRM1885C1H680JA01D |
| C8 | capacitor | 100 nF | DC decoupling | AVX 0603YC104KAT2A |
| C9 | capacitor | 10 μF | DC decoupling | AVX 1206ZG106ZAT2A |
| C10 | capacitor | 12 pF | noise decoupling | Murata GRM1555C1H120JZ01D |
| J1, J2 | RF connector | SMA | | Emerson Network Power 142-0701-841 |
| J3 | DC connector | 6-pins | | MOLEX |
| L1 | inductor | 2.2 nH | output match | Tyco electronics 36501J2N2JTDG |
| L2 | inductor | 22 nH | DC feed | Tyco electronics 36501J022JTDG |
| MSL1 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 10.95 mm | input match | |
| MSL2 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 2.95 mm | input match | |
| MSL3 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 7.75 mm | input match | |
| MSL4 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 23.4 mm | output match | |
| MSL5 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 2.2 mm | output match | |
| MSL6 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 3.15 mm | output match | |
| MSL7 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 2.3 mm | output match | |
| MSL8 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 10.95 mm | output match | |
| R1 | resistor | 0 Ω | | Multicomp MC 0.063W 0603 0R |
| R2 | resistor (trimmer) | 2 k Ω | bias adjustment | Bourns 3214W-1-202E |

[1] MSL1 to MSL8 dimensions specified as Width (W), Spacing (S) and Length (L).

12.1.2 1930 MHz to 1990 MHz



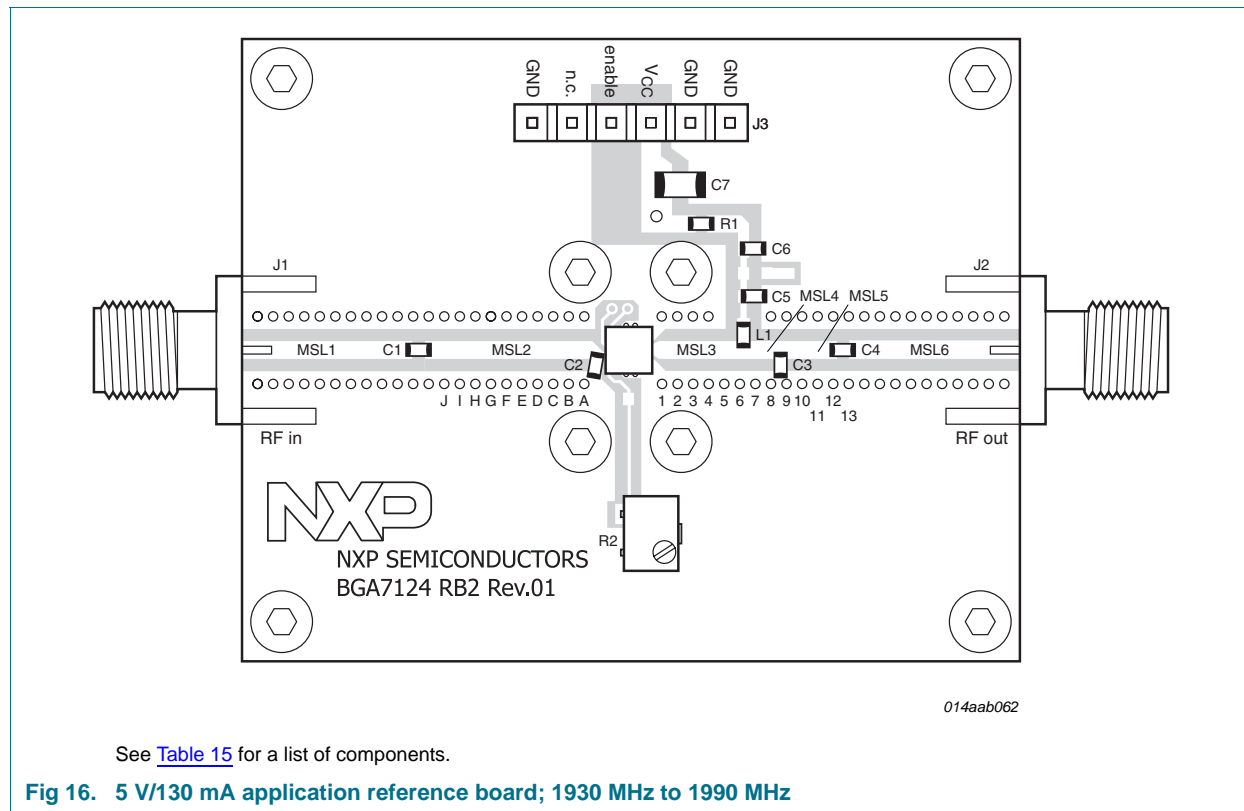
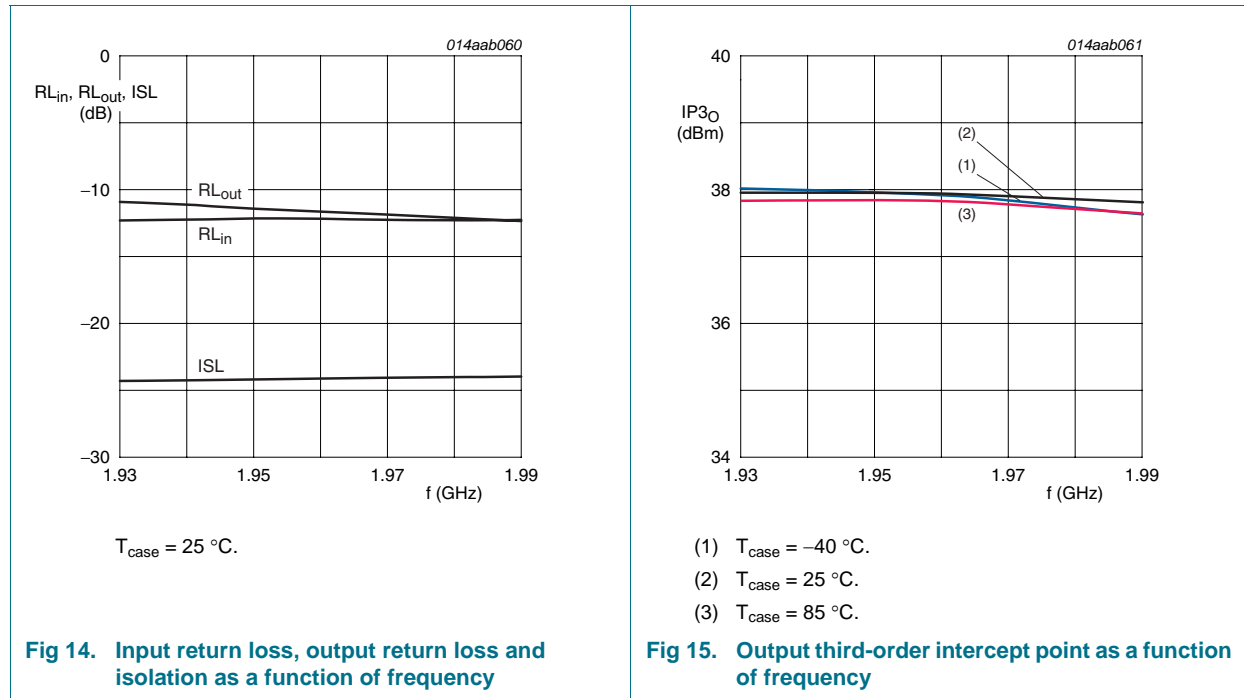


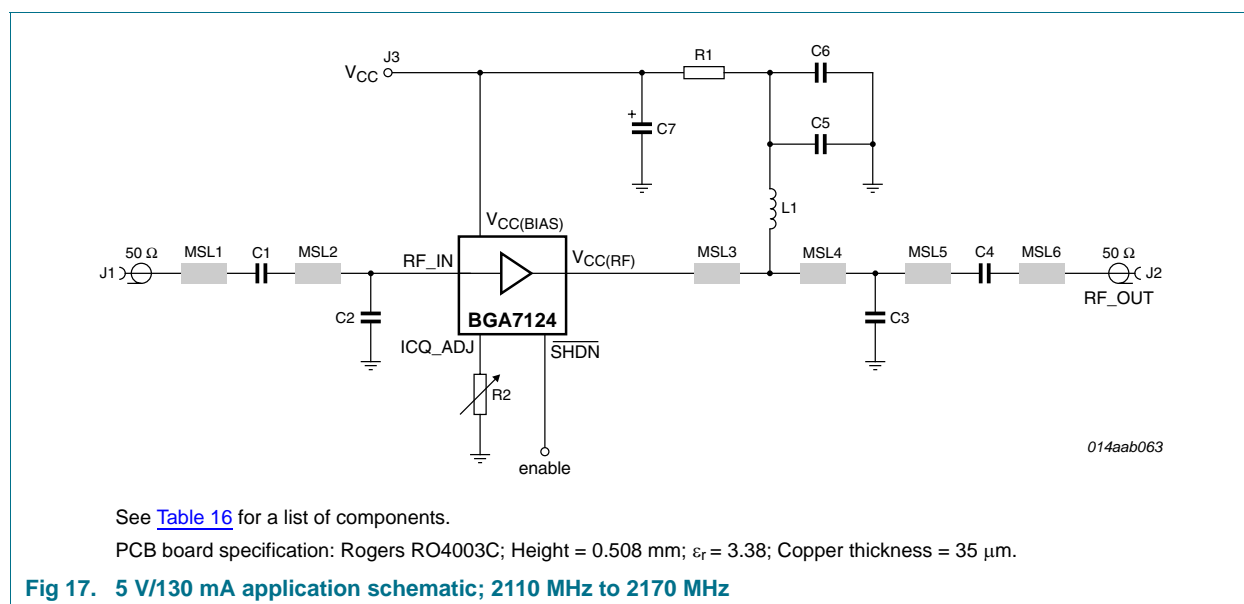
Table 15. 5 V/130 mA application list of components; 1930 MHz to 1990 MHz

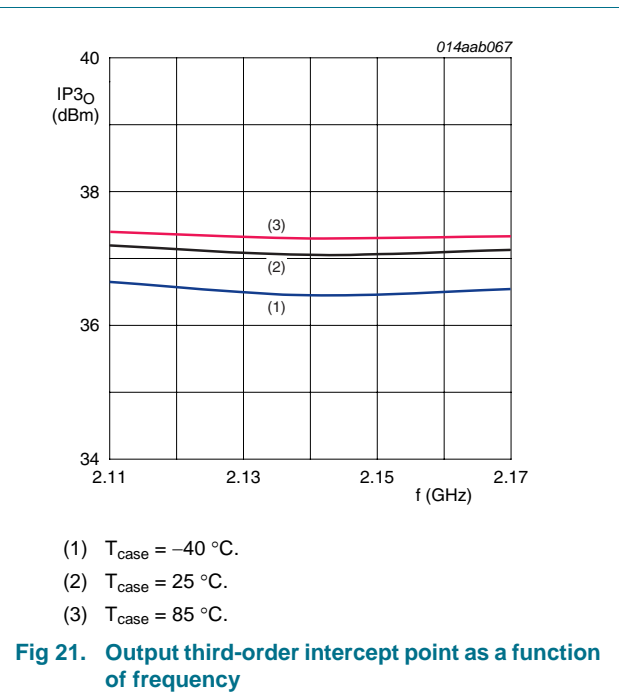
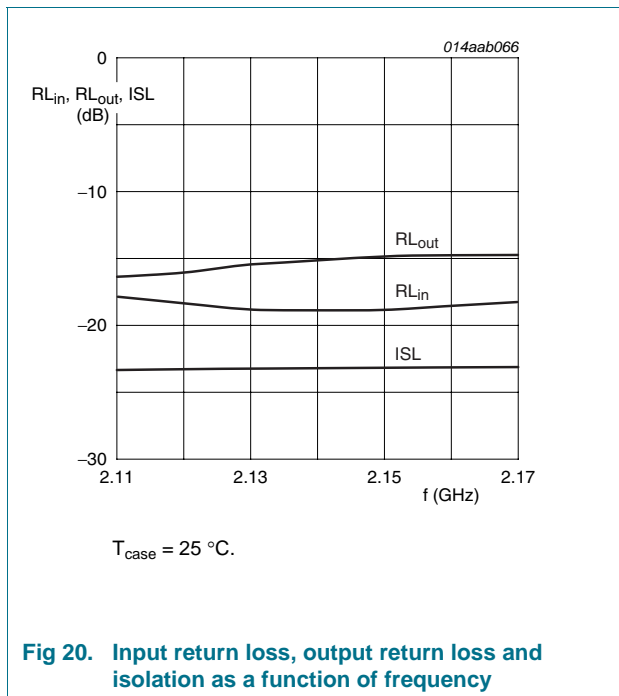
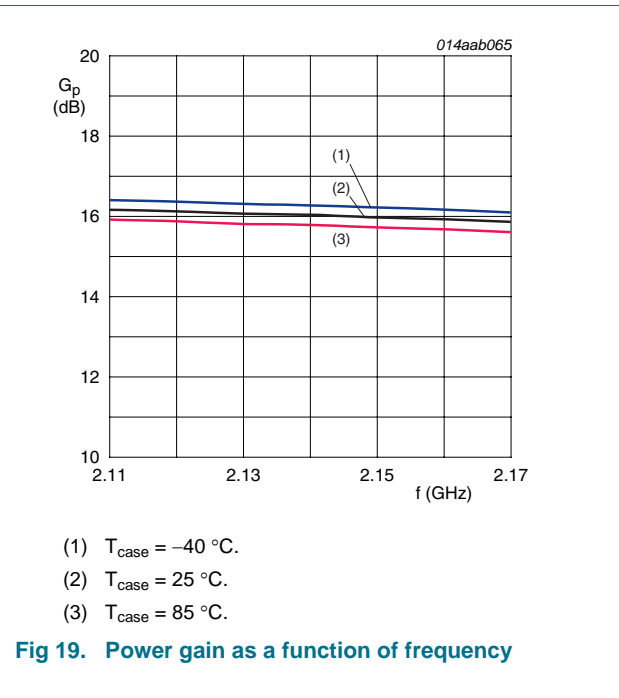
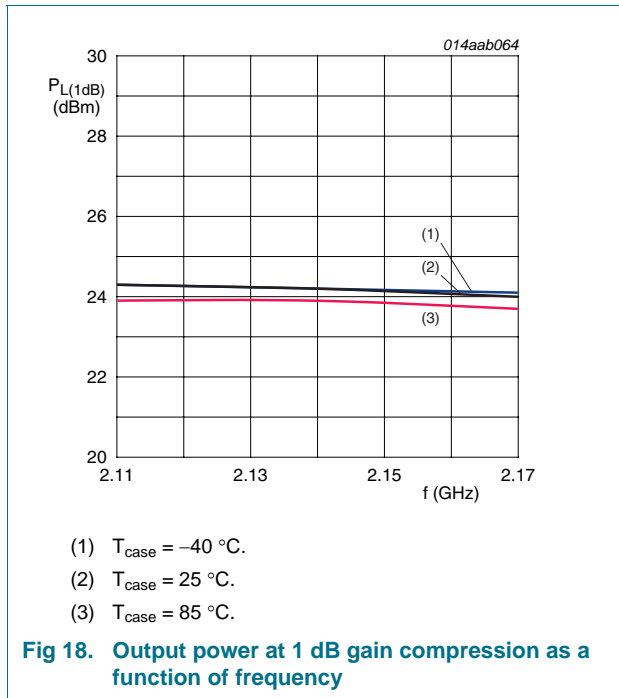
See [Figure 11](#) and [Figure 16](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

| Component | Description | Value | Function | Remarks |
|---------------------|--------------------|-----------------------------|-----------------|------------------------------------|
| C1, C4 | capacitor | 15 pF | DC blocking | Murata GRM1885C1H150JA01D |
| C2 | capacitor | 2.2 pF | input match | Murata GRM1885C1H2R2CZ01D |
| C3 | capacitor | 1.2 pF | output match | Murata GRM1885C1H1R2CZ01D |
| C5 | capacitor | 15 pF | RF decoupling | Murata GRM1885C1H150JA01D |
| C6 | capacitor | 100 nF | DC decoupling | AVX 0603YC104KAT2A |
| C7 | capacitor | 10 μF | DC decoupling | AVX 1206ZG106ZAT2A |
| J1, J2 | RF connector | SMA | | Emerson Network Power 142-0701-841 |
| J3 | DC connector | 6-pins | | MOLEX |
| L1 | inductor | 22 nH | DC feed | Tyco electronics 36501J022JTDG |
| MSL1 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | input match | |
| MSL2 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.8 mm | input match | |
| MSL3 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 5.8 mm | output match | |
| MSL4 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 2.2 mm | output match | |
| MSL5 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 3.7 mm | output match | |
| MSL6 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | output match | |
| R1 | resistor | 0 Ω | | Multicomp MC 0.063W 0603 0R |
| R2 | resistor (trimmer) | 2 kΩ | bias adjustment | Bourns 3214W-1-202E |

[1] MSL1 to MSL6 dimensions specified as Width (W), Spacing (S) and Length (L).

12.1.3 2110 MHz to 2170 MHz





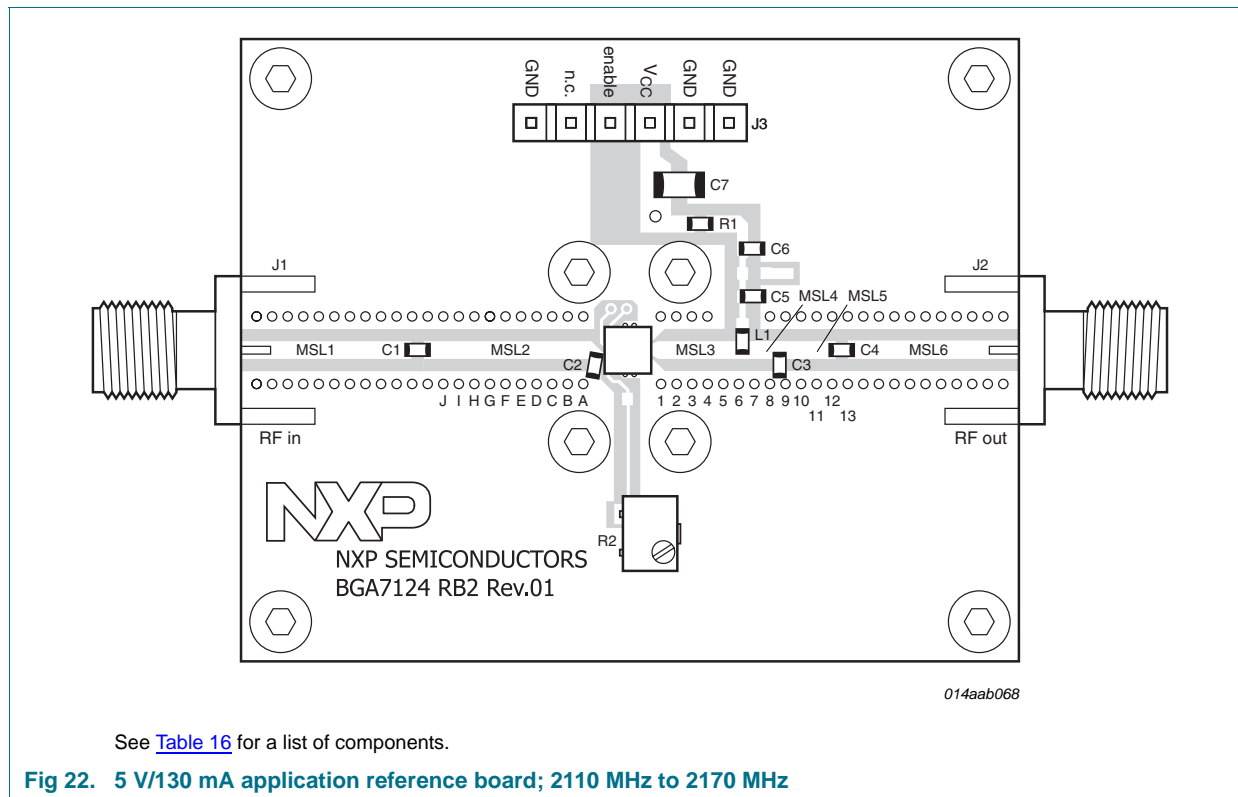


Table 16. 5 V/130 mA application list of components; 2110 MHz to 2170 MHz

See [Figure 17](#) and [Figure 22](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

| Component | Description | Value | Function | Remarks |
|---------------------|-----------------|-----------------------------|---------------|------------------------------------|
| C1, C4 | capacitor | 15 pF | DC blocking | Murata GRM1885C1H150JA01D |
| C2 | capacitor | 2.7 pF | input match | Murata GRM1885C1H2R7CZ01D |
| C3 | capacitor | 1.5 pF | output match | Murata GRM1885C1H1R5CZ01D |
| C5 | capacitor | 15 pF | RF decoupling | Murata GRM1885C1H150JA01D |
| C6 | capacitor | 100 nF | DC decoupling | AVX 0603YC104KAT2A |
| C7 | capacitor | 10 μF | DC decoupling | AVX 1206ZG106ZAT2A |
| J1, J2 | RF connector | SMA | | Emerson Network Power 142-0701-841 |
| J3 | DC connector | 6-pins | | MOLEX |
| L1 | inductor | 22 nH | DC feed | Tyco electronics 36501J022JTDG |
| MSL1 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | input match | |
| MSL2 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.8 mm | input match | |
| MSL3 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 5.8 mm | output match | |
| MSL4 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 2.5 mm | output match | |
| MSL5 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 3.5 mm | output match | |

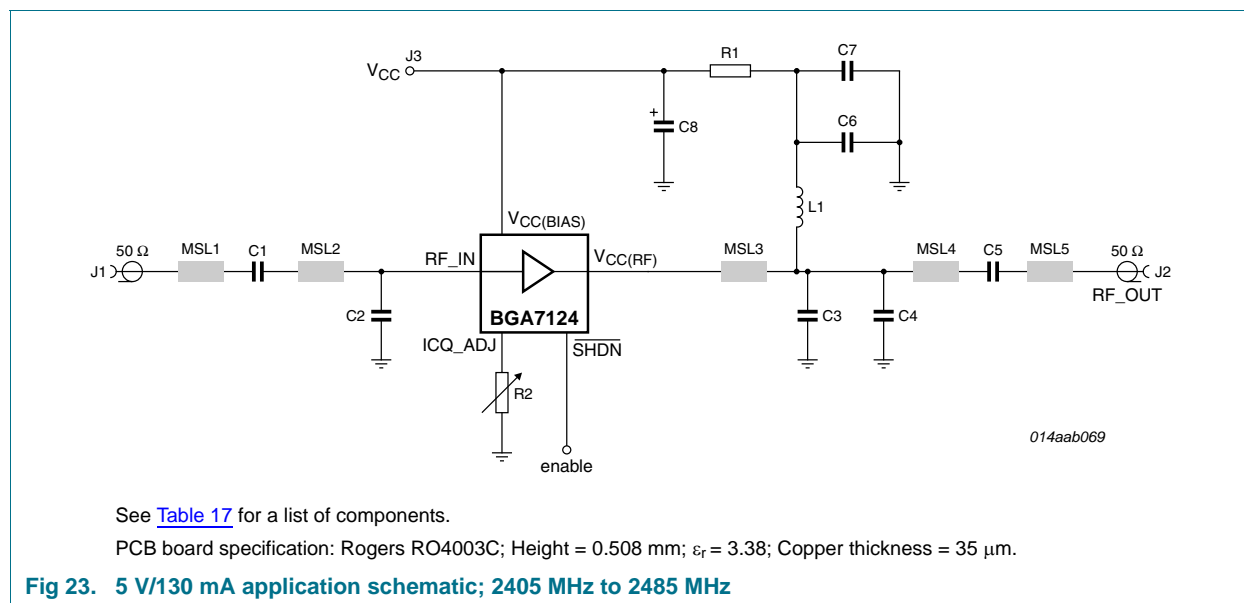
Table 16. 5 V/130 mA application list of components; 2110 MHz to 2170 MHz ...continued

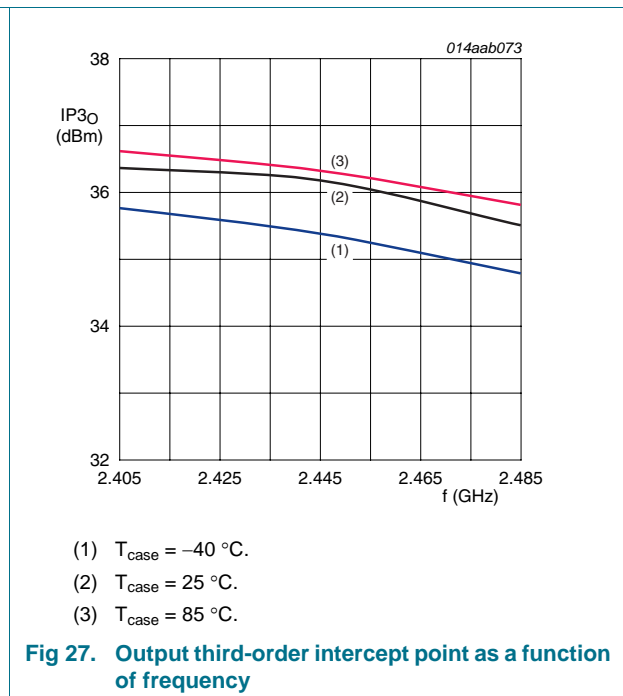
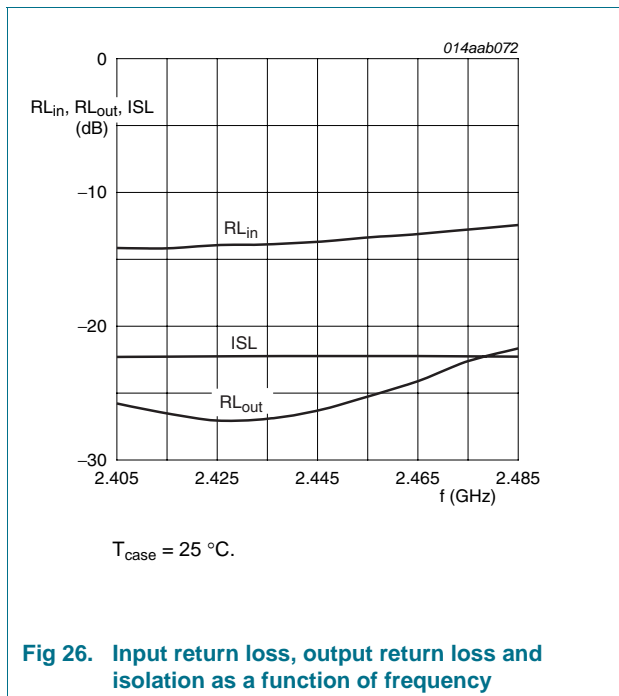
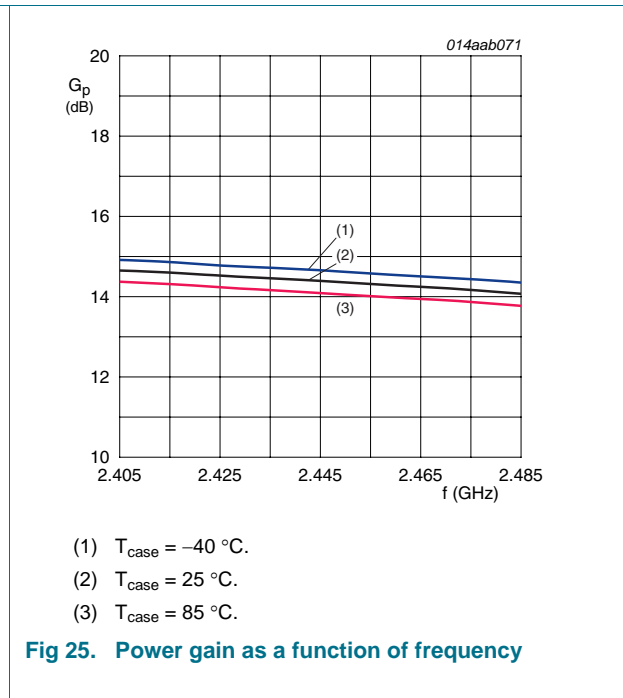
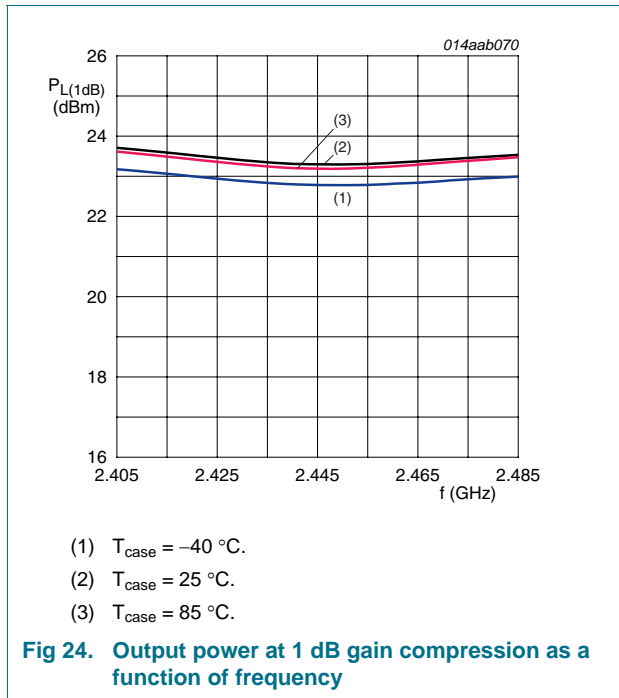
See [Figure 17](#) and [Figure 22](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

| Component | Description | Value | Function | Remarks |
|---------------------|-----------------------|-----------------------------|--------------------|-----------------------------|
| MSL6 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | output match | |
| R1 | resistor | 0 Ω | | Multicomp MC 0.063W 0603 0R |
| R2 | resistor (trimmer) | 2 kΩ | bias adjustment | Bourns 3214W-1-202E |

[1] MSL1 to MSL6 dimensions specified as Width (W), Spacing (S) and Length (L).

12.1.4 2405 MHz to 2485 MHz





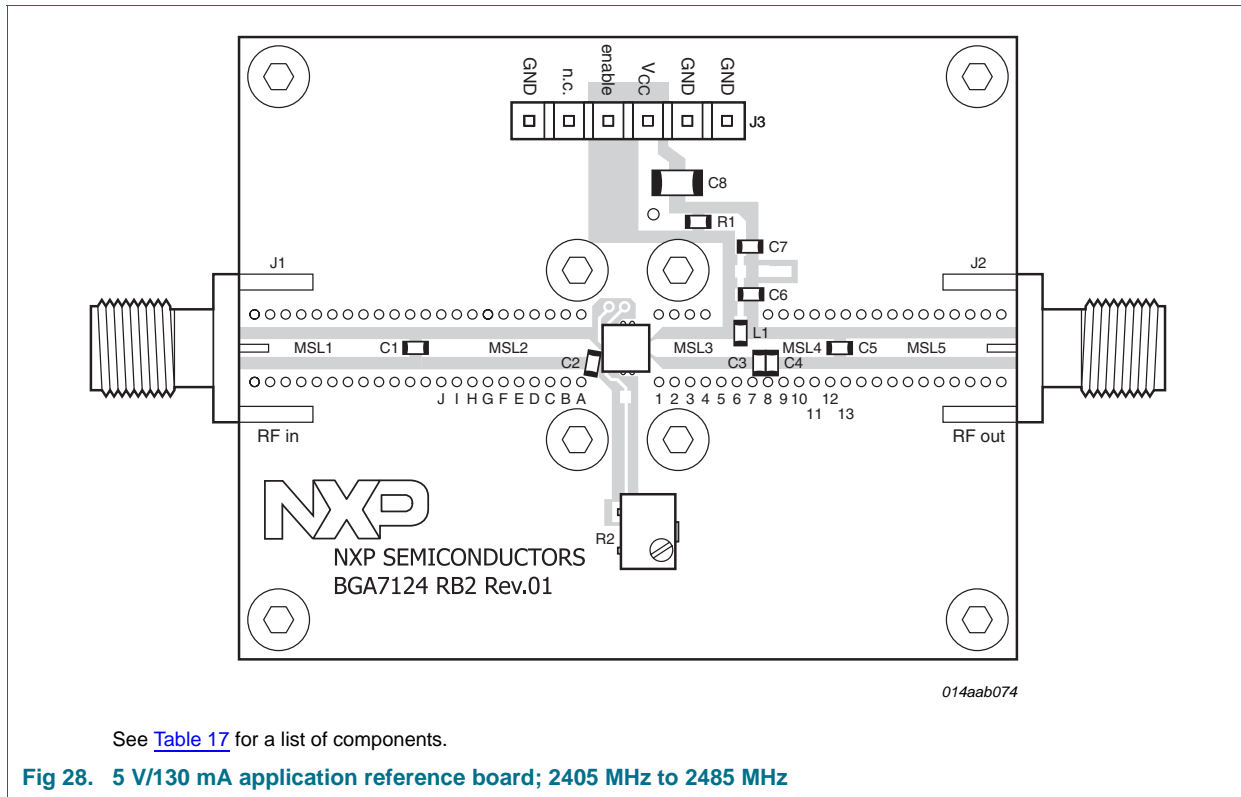


Table 17. 5 V/130 mA application list of components; 2405 MHz to 2485 MHz

See [Figure 23](#) and [Figure 28](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm .

| Component | Description | Value | Function | Remarks |
|---------------------|-----------------|---|---------------|---------------------------------------|
| C1, C5 | capacitor | 12 pF | DC blocking | Murata GRM1885C1H120JA01D |
| C2 | capacitor | 2.2 pF | input match | Murata GRM1885C1H2R2CZ01D |
| C3 | capacitor | 0.82 pF | output match | Murata GRM1885C1HR82CZ01D |
| C4 | capacitor | 0.68 pF | output match | Murata GRM1885C1HR68CZ01D |
| C6 | capacitor | 12 pF | RF decoupling | Murata GRM1885C1H120JA01D |
| C7 | capacitor | 100 nF | DC decoupling | AVX 0603YC104KAT2A |
| C8 | capacitor | 10 μF | DC decoupling | AVX 1206ZG106ZAT2A |
| J1, J2 | RF connector | SMA | | Emerson Network Power 142-0701-841 |
| J3 | DC connector | 6-pins | | MOLEX |
| L1 | inductor | 22 nH | DC feed | Tyco electronics 36501J022JTDG |
| MSL1 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 10.95 mm | input match | |
| MSL2 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 10.8 mm | input match | |
| MSL3 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 7.3 mm | output match | |
| MSL4 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 4.3 mm | output match | |

Table 17. 5 V/130 mA application list of components; 2405 MHz to 2485 MHz ...continued

See Figure 23 and Figure 28 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

| Component | Description | Value | Function | Remarks |
|-----------|--------------------|-----------------------------|-----------------|------------------------------|
| MSL5[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | output match | |
| R1 | resistor | 2.2 Ω | | Multicomp MC 0.063W 0603 2R2 |
| R2 | resistor (trimmer) | 2 kΩ | bias adjustment | Bourns 3214W-1-202E |

[1] MSL1 to MSL5 dimensions specified as Width (W), Spacing (S) and Length (L).

12.2 3.3 V applications

12.2.1 920 MHz to 960 MHz

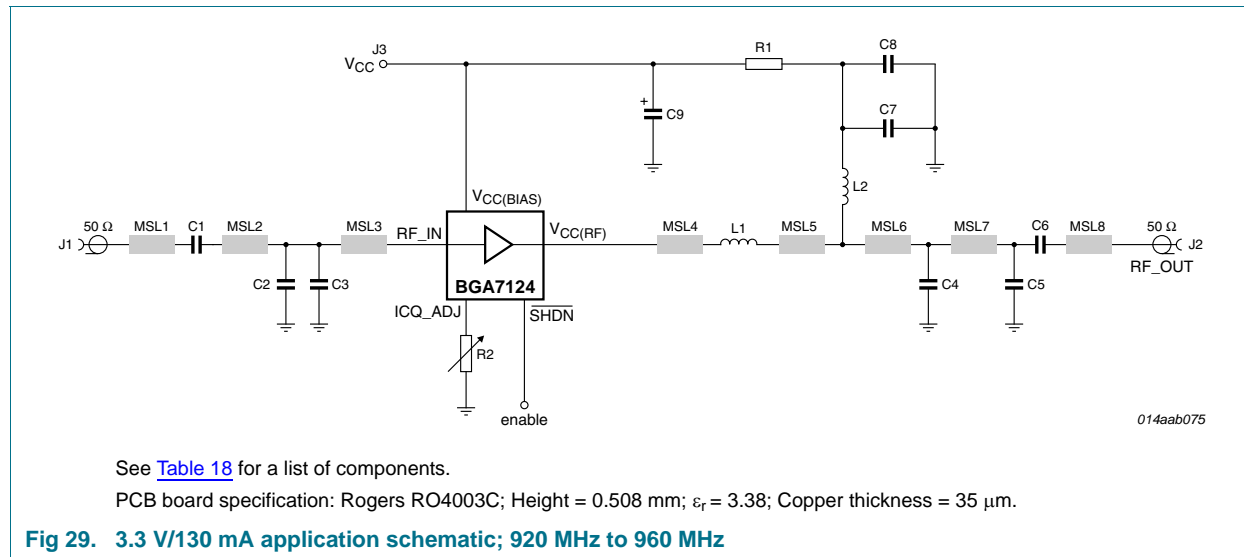
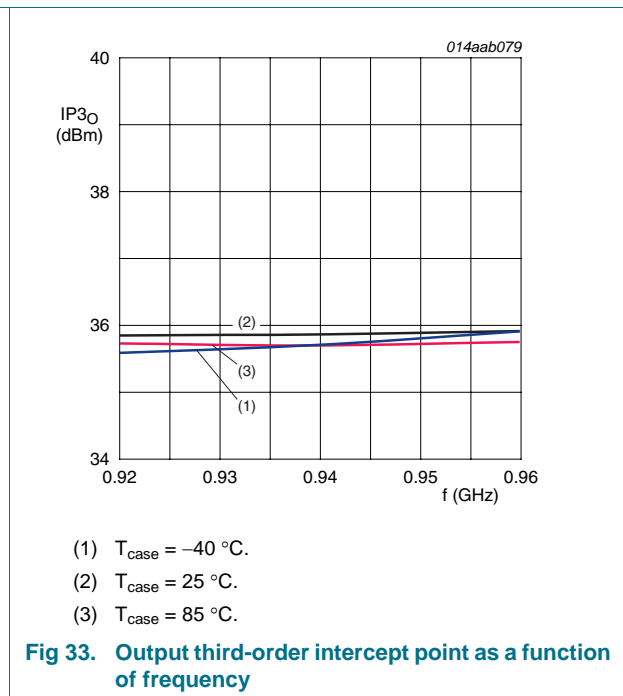
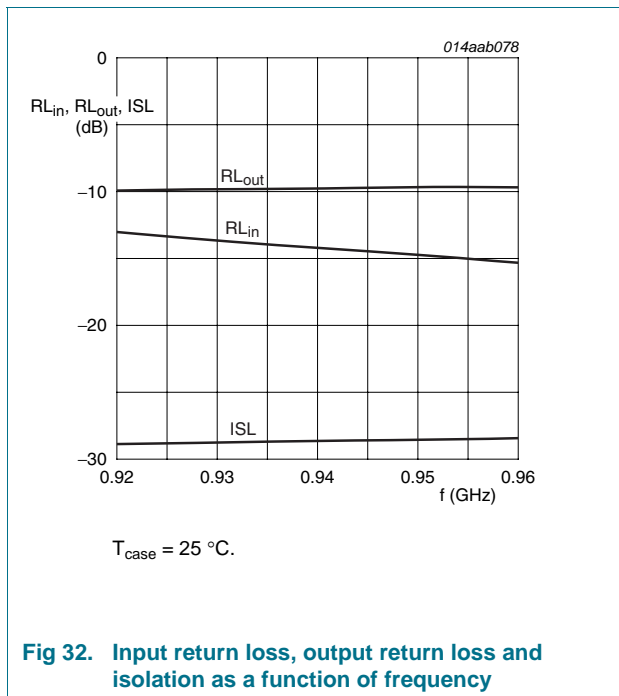
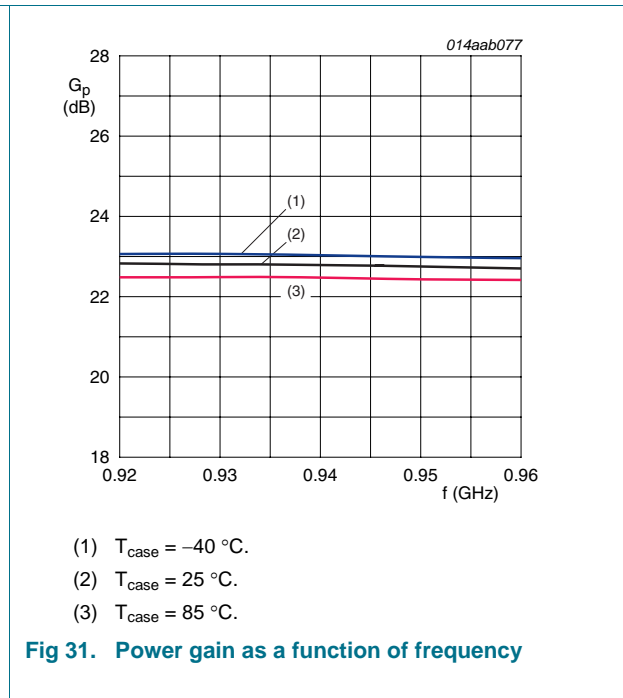
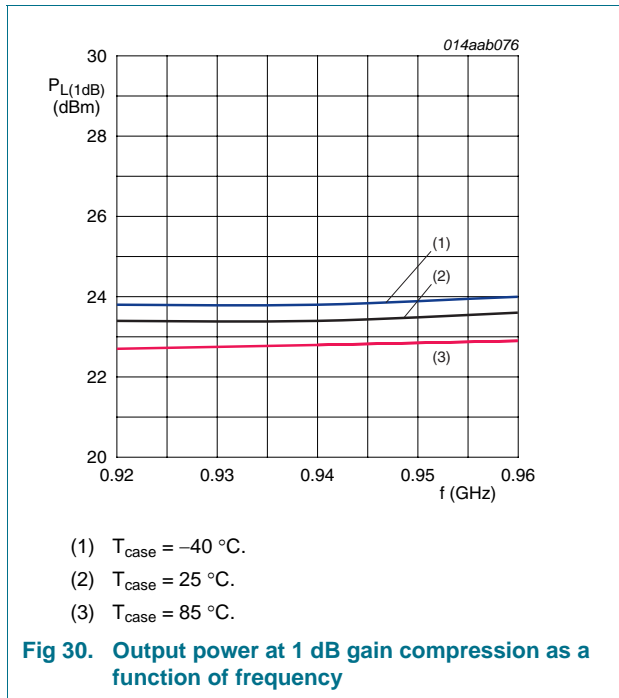


Fig 29. 3.3 V/130 mA application schematic; 920 MHz to 960 MHz



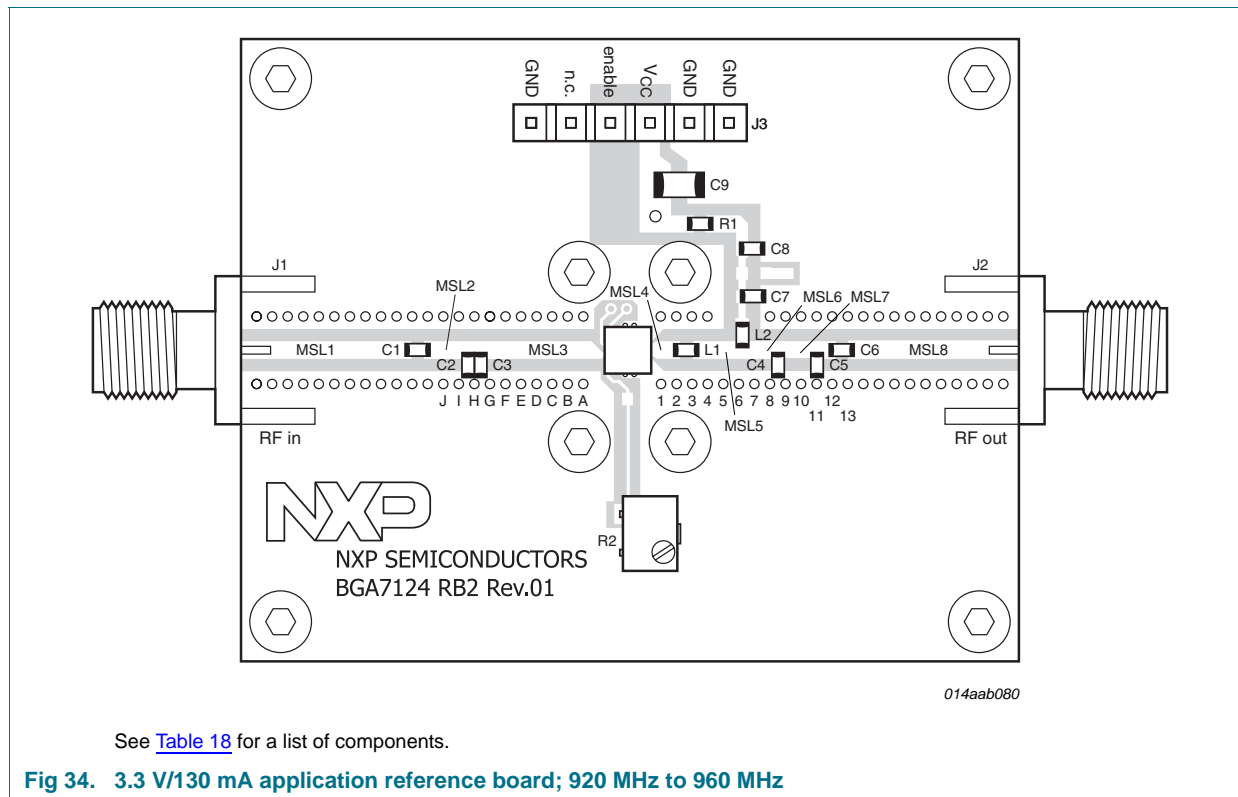


Table 18. 3.3 V/130 mA application list of components; 920 MHz to 960 MHz

See [Figure 29](#) and [Figure 34](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

| Component | Description | Value | Function | Remarks |
|---------------------|-----------------|-----------------------------|---------------|---------------------------------------|
| C1, C6 | capacitor | 68 pF | DC blocking | Murata GRM1885C1H680JA01D |
| C2, C3 | capacitor | 3.3 pF | input match | Murata GRM1885C1H3R3CZ01D |
| C4 | capacitor | 3.9 pF | output match | Murata GRM1885C1H3R9CZ01D |
| C5 | capacitor | 1.0 pF | output match | Murata GRM1885C1H1ROCZ01D |
| C7 | capacitor | 68 pF | RF decoupling | Murata GRM1885C1H680JA01D |
| C8 | capacitor | 100 nF | DC decoupling | AVX 0603YC104KAT2A |
| C9 | capacitor | 10 μF | DC decoupling | AVX 1206ZG106ZAT2A |
| J1, J2 | RF connector | SMA | | Emerson Network Power 142-0701-841 |
| J3 | DC connector | 6-pins | | MOLEX |
| L1 | inductor | 2.2 nH | output match | Tyco electronics 36501J2N2JTDG |
| L2 | inductor | 22 nH | DC feed | Tyco electronics 36501J022JTDG |
| MSL1 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | input match | |
| MSL2 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 2.95 mm | input match | |
| MSL3 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 7.75 mm | input match | |
| MSL4 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 23.4 mm | output match | |
| MSL5 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 2.2 mm | output match | |

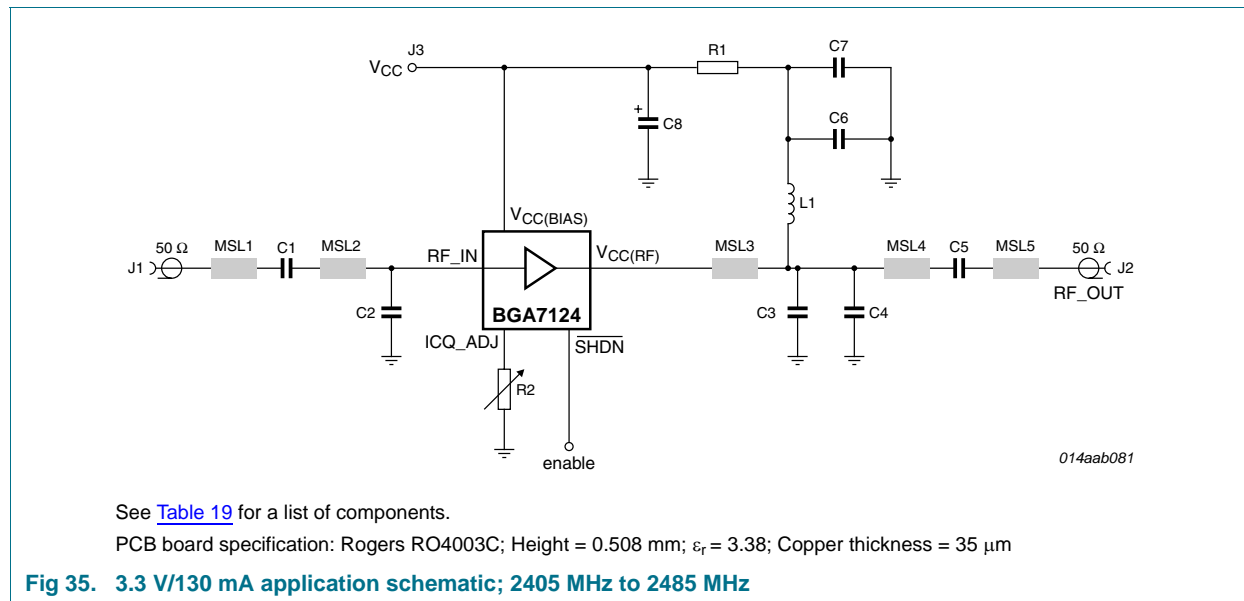
Table 18. 3.3 V/130 mA application list of components; 920 MHz to 960 MHz ...continued

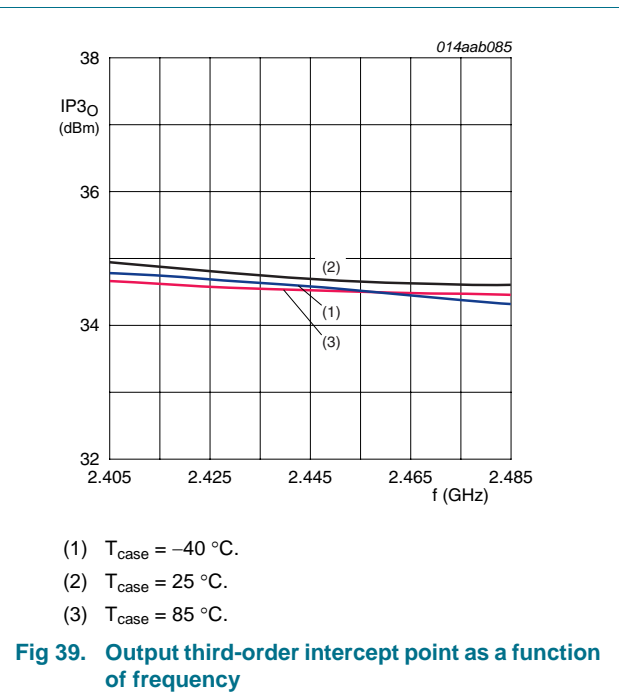
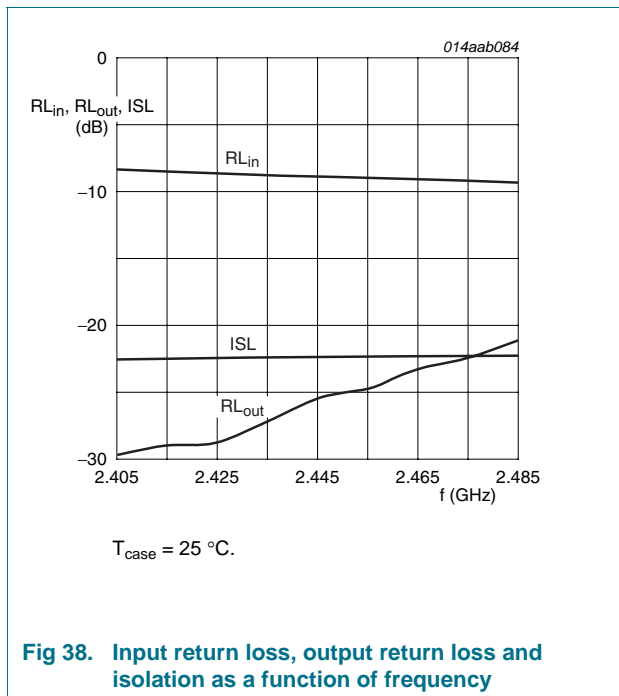
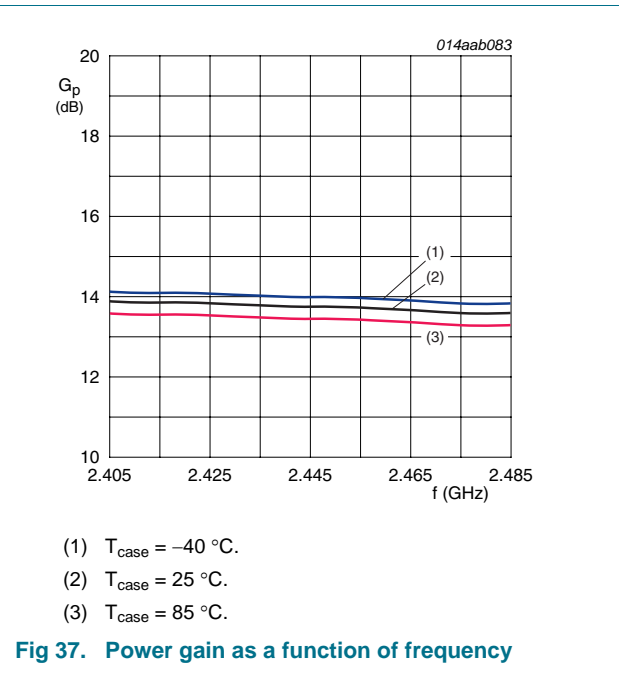
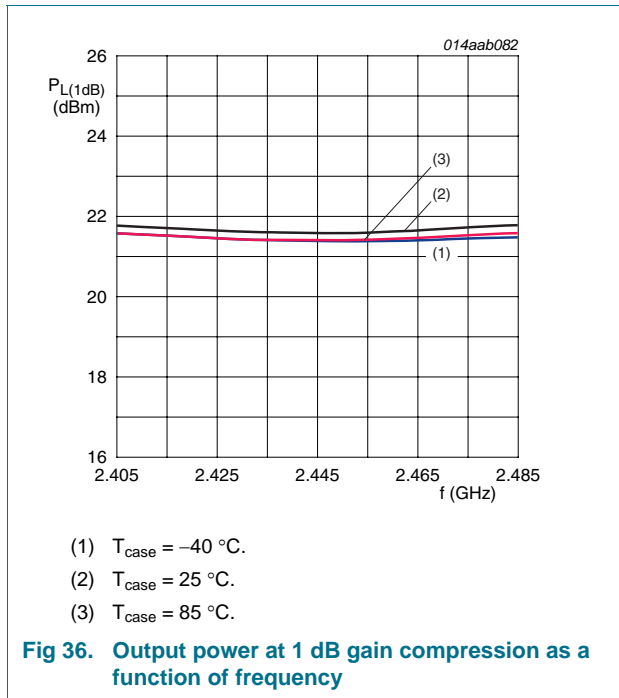
See [Figure 29](#) and [Figure 34](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

| Component | Description | Value | Function | Remarks |
|---------------------|--------------------|-----------------------------|-----------------|-----------------------------|
| MSL6 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 2.4 mm | output match | |
| MSL7 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 2.3 mm | output match | |
| MSL8 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | output match | |
| R1 | resistor | 0 Ω | | Multicomp MC 0.063W 0603 0R |
| R2 | resistor (trimmer) | 2 kΩ | bias adjustment | Bourns 3214W-1-202E |

[1] MSL1 to MSL8 dimensions specified as Width (W), Spacing (S) and Length (L).

12.2.2 2405 MHz to 2485 MHz





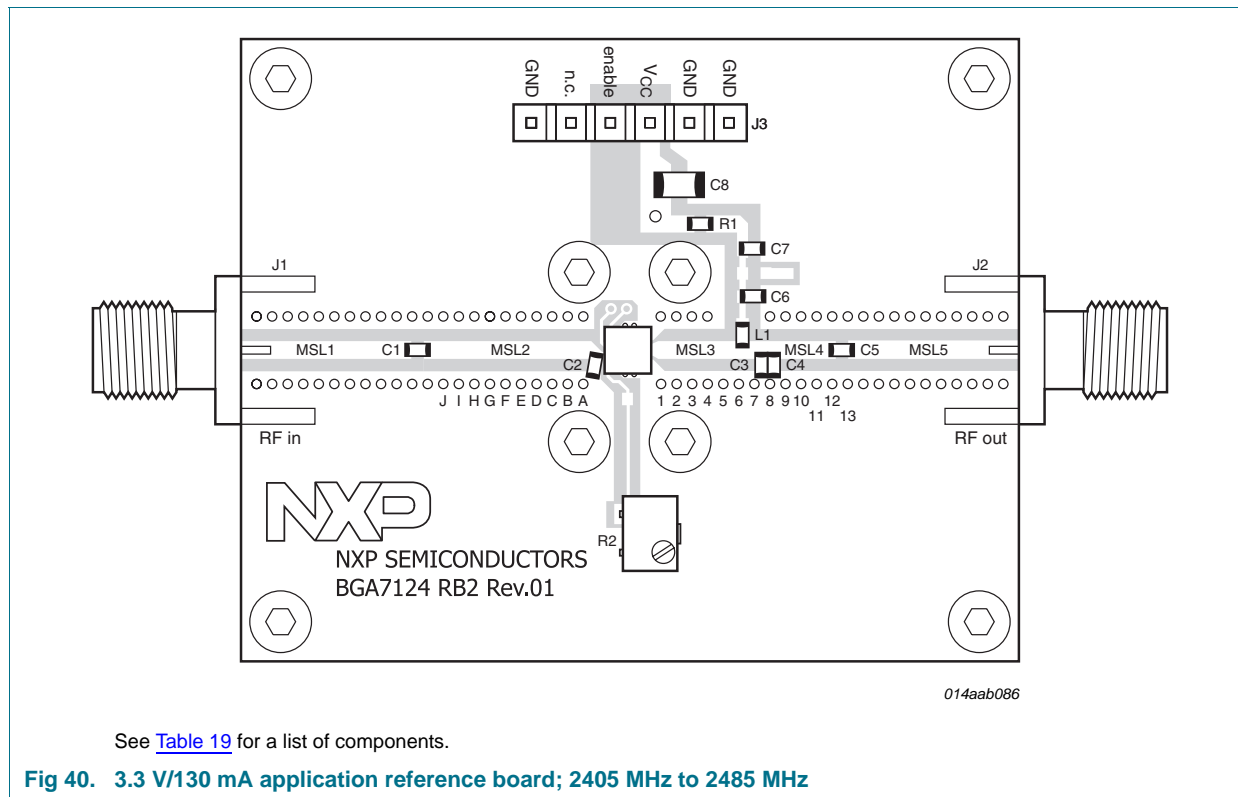


Table 19. 3.3 V/130 mA application list of components; 2405 MHz to 2485 MHz

See [Figure 35](#) and [Figure 40](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm .

| Component | Description | Value | Function | Remarks |
|---------------------|-----------------|---|---------------|---------------------------------------|
| C1, C5 | capacitor | 12 pF | DC blocking | Murata GRM1885C1H120JA01D |
| C2 | capacitor | 2.2 pF | input match | Murata GRM1885C1H2R2CZ01D |
| C3 | capacitor | 0.82 pF | output match | Murata GRM1885C1HR82CZ01D |
| C4 | capacitor | 0.68 pF | output match | Murata GRM1885C1HR68CZ01D |
| C6 | capacitor | 12 pF | RF decoupling | Murata GRM1885C1H120JA01D |
| C7 | capacitor | 100 nF | DC decoupling | AVX 0603YC104KAT2A |
| C8 | capacitor | 10 μF | DC decoupling | AVX 1206ZG106ZAT2A |
| J1, J2 | RF connector | SMA | | Emerson Network Power 142-0701-841 |
| J3 | DC connector | 6-pins | | MOLEX |
| L1 | inductor | 22 nH | DC feed | Tyco electronics 36501J022JTDG |
| MSL1 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 10.95 mm | input match | |
| MSL2 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 10.8 mm | input match | |
| MSL3 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 7.3 mm | output match | |
| MSL4 ^[1] | micro stripline | 1.14 mm \times 0.8 mm \times 4.3 mm | output match | |

Table 19. 3.3 V/130 mA application list of components; 2405 MHz to 2485 MHz ...continued

See [Figure 35](#) and [Figure 40](#) for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

| Component | Description | Value | Function | Remarks |
|---------------------|--------------------|-----------------------------|-----------------|------------------------------|
| MSL5 ^[1] | micro stripline | 1.14 mm × 0.8 mm × 10.95 mm | output match | |
| R1 | resistor | 2.2 Ω | | Multicomp MC 0.063W 0603 2R2 |
| R2 | resistor (trimmer) | 2 kΩ | bias adjustment | Bourns 3214W-1-202E |

[1] MSL1 to MSL5 dimensions specified as Width (W), Spacing (S) and Length (L).

12.3 PCB stack

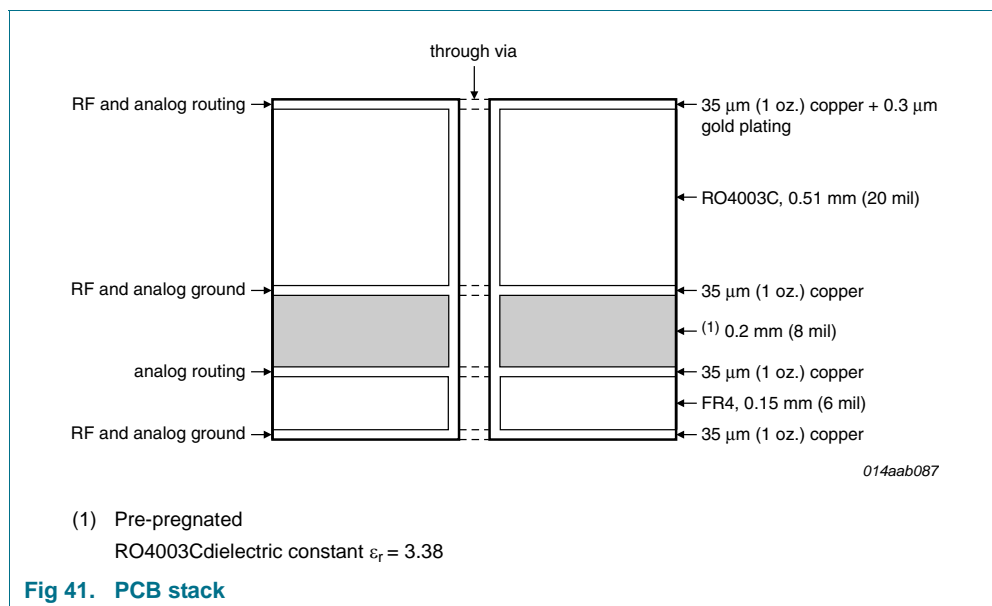


Fig 41. PCB stack

13. Package outline

**HVSON8: plastic thermal enhanced very thin small outline package; no leads;
8 terminals; body 3 x 3 x 0.85 mm**

SOT908-1

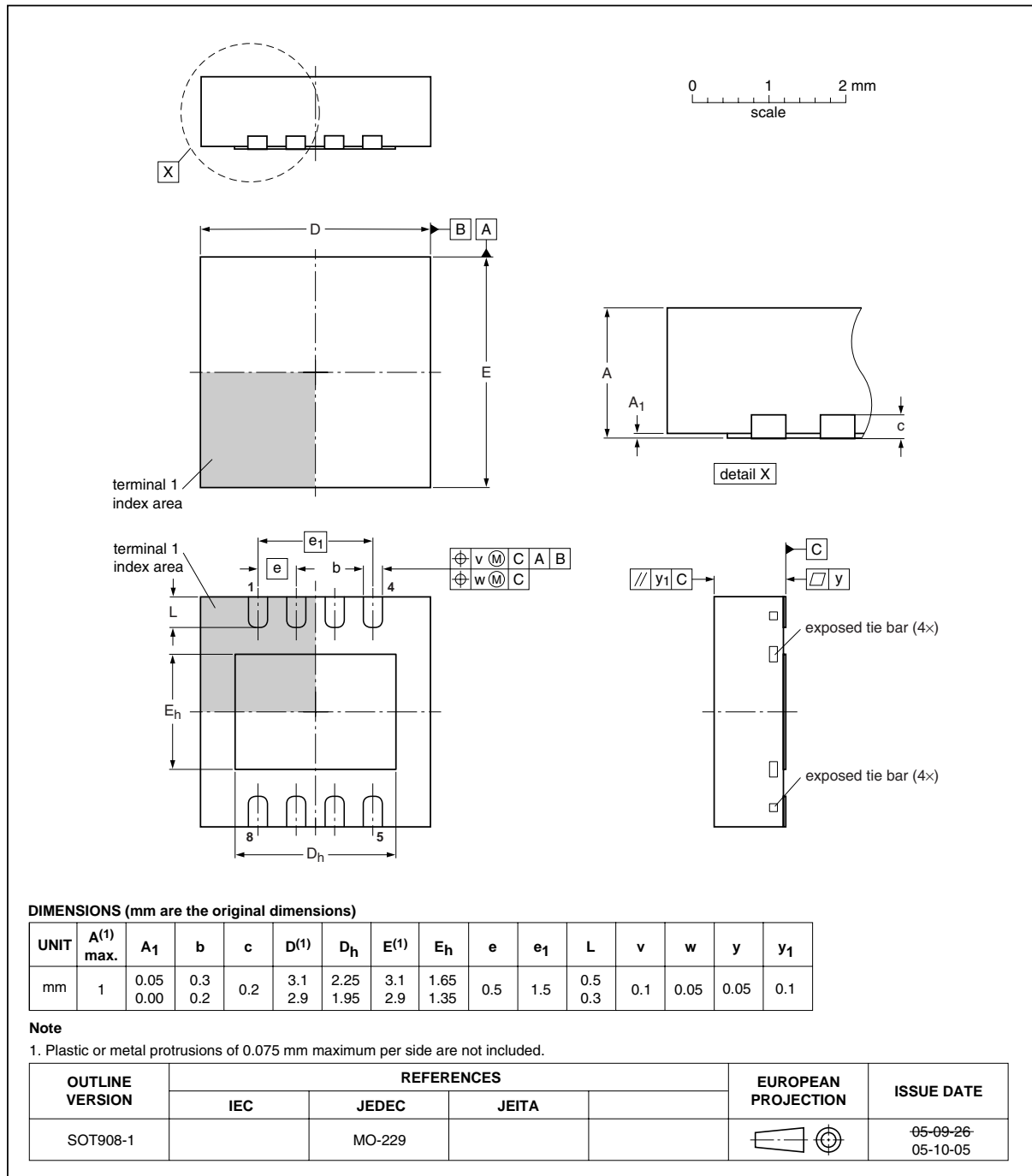


Fig 42. Package outline SOT908-1 (HVSON8)

14. Abbreviations

Table 20. Abbreviations

| Acronym | Description |
|---------|---|
| CPE | Customer-Premises Equipment |
| DC | Direct Current |
| ESD | ElectroStatic Discharge |
| HTOL | High Temperature Operating Life |
| ISM | Industrial, Scientific and Medical |
| MMIC | Monolithic Microwave Integrated Circuit |
| MoCA | Multimedia over Coax Alliance |
| RFID | Radio Frequency IDentification |
| SMA | SubMiniature version A |
| TX | Transmit |
| WLAN | Wireless Local Area Network |

15. Revision history

Table 21. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--------------|---|---------------|-------------|
| BGA7124 v.3 | 20100909 | Product data sheet | - | BGA7124 v.2 |
| Modifications: | | <ul style="list-style-type: none"> • Figure 5 on page 11: MSL symbols have been corrected. • Figure 11 on page 14: MSL symbols have been corrected. • Figure 17 on page 16: MSL symbols have been corrected. • Figure 23 on page 19: MSL symbols have been corrected. • Figure 29 on page 22: MSL symbols have been corrected. • Figure 35 on page 25: MSL symbols have been corrected. | | |
| BGA7124 v.2 | 20100623 | Product data sheet | - | BGA7124 v.1 |
| BGA7124 v.1 | 20100421 | Product data sheet | - | - |

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16.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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