

BGU7005

SiGe:C Low Noise Amplifier MMIC for GPS, GLONASS, Galileo and Compass

Rev. 6 — 18 January 2017

Product data sheet

1. Product profile

1.1 General description

The BGU7005 is, also known as the GPS1101M, a Low Noise Amplifier (LNA) for GNSS receiver applications in a plastic leadless 6-pin, extremely small SOT886 package. The BGU7005 requires only one external matching inductor and one external decoupling capacitor.

The BGU7005 adapts itself to the changing environment resulting from co-habitation of different radio systems in modern cellular handsets. It has been designed for low power consumption and optimal performance when jamming signals from co-existing cellular transmitters are present. At low jamming power levels it delivers 16.5 dB gain at a noise figure of 0.85 dB. During high jamming power levels, resulting for example from a cellular transmit burst, it temporarily increases its bias current to improve sensitivity.

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features and benefits

- Covers full GNSS L1 band, from 1559 MHz to 1610 MHz
- Noise figure (NF) = 0.85 dB
- Gain 16.5 dB
- High input 1 dB compression point $P_{i(1dB)}$ of -11 dBm
- High out of band $IP3_i$ of 9 dBm
- Supply voltage 1.5 V to 3.1 V
- Power-down mode current consumption < 1 μ A
- Optimized performance at low supply current of 4.5 mA
- Integrated matching for the output
- Requires only one input matching inductor and one supply decoupling capacitor
- Input and output DC decoupled
- ESD protection on all pins (HBM > 2 kV)
- Integrated temperature stabilized bias for easy design
- Small 6-pin leadless package 1 mm \times 1.45 mm \times 0.5 mm
- 110 GHz transit frequency - SiGe:C technology



1.3 Applications

- LNA for GPS, GLONASS, Galileo and Compass (BeiDou) in smart phones, feature phones, tablet PCs, Personal Navigation Devices, Digital Still Cameras, Digital Video Cameras, RF Front End modules, complete GPS chipset modules and theft protection (laptop, ATM).

1.4 Quick reference data

Table 1. Quick reference data

$f = 1559\text{ MHz to }1610\text{ MHz}$; $V_{CC} = 1.8\text{ V}$; $P_i < -40\text{ dBm}$; $T_{amb} = 25\text{ }^\circ\text{C}$; input matched to $50\ \Omega$ using a 5.6 nH inductor; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|------------------|--------------------------------------|------------------------------------|-----|------|------|------|-----|
| V_{CC} | supply voltage | RF input AC coupled | 1.5 | - | 3.1 | V | |
| I_{CC} | supply current | $V_{ENABLE} \geq 0.8\text{ V}$ | | | | | |
| | | $P_i < -40\text{ dBm}$ | 3.2 | 4.5 | 5.7 | mA | |
| | | $P_i = -20\text{ dBm}$ | 8.1 | 11.6 | 14.4 | mA | |
| G_p | power gain | $P_i < -40\text{ dBm}$, no jammer | 14 | 16.5 | 19 | dB | |
| | | $P_i = -20\text{ dBm}$, no jammer | 15 | 17.5 | 20 | dB | |
| NF | noise figure | $P_i < -40\text{ dBm}$, no jammer | [1] | - | 0.85 | 1.2 | dB |
| | | $P_i < -40\text{ dBm}$, no jammer | [2] | - | 0.9 | 1.3 | dB |
| | | $P_i = -20\text{ dBm}$, no jammer | - | 1.2 | 1.6 | dB | |
| $P_{i(1dB)}$ | input power at 1 dB gain compression | $f = 1575\text{ MHz}$ | | | | | |
| | | $V_{CC} = 1.5\text{ V}$ | -15 | -12 | - | dBm | |
| | | $V_{CC} = 1.8\text{ V}$ | -14 | -11 | - | dBm | |
| | | $V_{CC} = 2.85\text{ V}$ | -11 | -8 | - | dBm | |
| IP3 _i | input third-order intercept point | $f = 1.575\text{ GHz}$ | | | | | |
| | | $V_{CC} = 1.5\text{ V}$ | [3] | 5 | 8 | - | dBm |
| | | $V_{CC} = 1.8\text{ V}$ | [3] | 5 | 9 | - | dBm |
| | | $V_{CC} = 2.85\text{ V}$ | [3] | 5 | 12 | - | dBm |

[1] PCB losses are subtracted.

[2] Including PCB losses.

[3] $f_1 = 1713\text{ MHz}$; $f_2 = 1851\text{ MHz}$; $P_1 = P_2 = -30\text{ dBm}$.

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-------------|--------------------|----------------|
| 1 | GND | | |
| 2 | GND | | |
| 3 | RF_IN | | |
| 4 | V_{CC} | | |
| 5 | ENABLE | | |
| 6 | RF_OUT | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|---------|---|---------|
| | Name | Description | |
| BGU7005 | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BGU7005 | AC |

5. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|---------------|---------------------------------|--|--------|------|------|---|
| V_{CC} | supply voltage | RF input AC coupled | -0.5 | 5.0 | V | |
| V_{ENABLE} | voltage on pin ENABLE | $V_{ENABLE} < V_{CC} + 0.6$ | [2] | -0.5 | 5.0 | V |
| V_{RF_IN} | voltage on pin RF_IN | DC; $V_{RF_IN} < V_{CC} + 0.6$ | [2][3] | -0.5 | 5.0 | V |
| V_{RF_OUT} | voltage on pin RF_OUT | DC; $V_{RF_OUT} < V_{CC} + 0.6$ | [2][3] | -0.5 | 5.0 | V |
| P_i | input power | | - | 0 | dBm | |
| P_{tot} | total power dissipation | $T_{sp} \leq 130$ °C | [1] | 55 | mW | |
| T_{stg} | storage temperature | | -65 | 150 | °C | |
| T_j | junction temperature | | - | 150 | °C | |
| V_{ESD} | electrostatic discharge voltage | Human Body Model (HBM); According JEDEC standard 22-A114E | - | 4 | kV | |
| | | Charged Device Model (CDM); According JEDEC standard 22-C101B | - | 1 | kV | |

[1] T_{sp} is the temperature at the soldering point of the emitter lead.

[2] Warning: due to internal ESD diode protection, the applied DC voltage should not exceed $V_{CC} + 0.6$ and shall not exceed 5.0 V in order to avoid excess current.

[3] The RF input and RF output are AC coupled through internal DC blocking capacitor.

6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|----------------|--|------------|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | 225 | K/W |

7. Characteristics

Table 7. Characteristics

$f = 1559\text{ MHz to }1610\text{ MHz}$; $V_{CC} = 1.8\text{ V}$; $V_{ENABLE} \geq 0.8\text{ V}$; $P_i < -40\text{ dBm}$; $T_{amb} = 25\text{ }^\circ\text{C}$; input matched to $50\ \Omega$ using a 5.6 nH inductor; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|------------|---------------------|---|-------------------|------|------|------------------|----|
| V_{CC} | supply voltage | RF input AC coupled | 1.5 | - | 3.1 | V | |
| I_{CC} | supply current | $V_{ENABLE} \geq 0.8\text{ V}$ | | | | | |
| | | $P_i < -40\text{ dBm}$ | 3.2 | 4.5 | 5.7 | mA | |
| | | $P_i = -20\text{ dBm}$ | 8.1 | 11.6 | 14.4 | mA | |
| | | $V_{ENABLE} \leq 0.35\text{ V}$ | - | - | 1 | μA | |
| T_{amb} | ambient temperature | | -40 | +25 | +85 | $^\circ\text{C}$ | |
| G_p | power gain | $T_{amb} = 25\text{ }^\circ\text{C}$ | | | | | |
| | | $P_i < -40\text{ dBm}$, no jammer | 14 | 16.5 | 19 | dB | |
| | | $P_i = -20\text{ dBm}$, no jammer | 15 | 17.5 | 20 | dB | |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 850\text{ MHz}$ | 15 | 17.5 | 20 | dB | |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 1850\text{ MHz}$ | 15 | 17.5 | 20 | dB | |
| | | $-40\text{ }^\circ\text{C} \leq T_{amb} \leq +85\text{ }^\circ\text{C}$ | | | | | |
| | | $P_i < -40\text{ dBm}$, no jammer | 13 | - | 20 | dB | |
| | | $P_i = -20\text{ dBm}$, no jammer | 14 | - | 21 | dB | |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 850\text{ MHz}$ | 14 | - | 21 | dB | |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 1850\text{ MHz}$ | 14 | - | 21 | dB | |
| RL_{in} | input return loss | $P_i < -40\text{ dBm}$ | 5 | 8 | - | dB | |
| | | $P_i = -20\text{ dBm}$ | 6 | 10 | - | dB | |
| RL_{out} | output return loss | $P_i < -40\text{ dBm}$ | 10 | 20 | - | dB | |
| | | $P_i = -20\text{ dBm}$ | 10 | 14 | - | dB | |
| ISL | isolation | | 20 | 23 | - | dB | |
| NF | noise figure | $T_{amb} = 25\text{ }^\circ\text{C}$ | | | | | |
| | | $P_i < -40\text{ dBm}$, no jammer | 1 | - | 0.85 | 1.2 | dB |
| | | $P_i < -40\text{ dBm}$, no jammer | 2 | - | 0.9 | 1.3 | dB |
| | | $P_i = -20\text{ dBm}$, no jammer | - | - | 1.2 | 1.6 | dB |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 850\text{ MHz}$ | - | - | 1.1 | 1.5 | dB |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 1850\text{ MHz}$ | - | - | 1.3 | 1.7 | dB |
| | | $-40\text{ }^\circ\text{C} \leq T_{amb} \leq +85\text{ }^\circ\text{C}$ | | | | | |
| | | $P_i < -40\text{ dBm}$, no jammer | - | - | 1.7 | dB | |
| | | $P_i = -20\text{ dBm}$, no jammer | - | - | 1.9 | dB | |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 850\text{ MHz}$ | - | - | 1.8 | dB | |
| | | $P_{jam} = -20\text{ dBm}$; $f_{jam} = 1850\text{ MHz}$ | - | - | 2.0 | dB | |

Table 7. Characteristics ...continued

$f = 1559 \text{ MHz to } 1610 \text{ MHz}$; $V_{CC} = 1.8 \text{ V}$; $V_{ENABLE} \geq 0.8 \text{ V}$; $P_i < -40 \text{ dBm}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; input matched to $50 \text{ } \Omega$ using a 5.6 nH inductor; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|--------------|--------------------------------------|---|-----|-----|-----|-----------------|-----|
| $P_{i(1dB)}$ | input power at 1 dB gain compression | $f = 1575 \text{ MHz}$ | | | | | |
| | | $V_{CC} = 1.5 \text{ V}$ | -15 | -12 | - | dBm | |
| | | $V_{CC} = 1.8 \text{ V}$ | -14 | -11 | - | dBm | |
| | | $V_{CC} = 2.85 \text{ V}$ | -11 | -8 | - | dBm | |
| | | $f = 806 \text{ MHz to } 928 \text{ MHz}$ | | | | | |
| | | $V_{CC} = 1.5 \text{ V}$ | [3] | -15 | -12 | - | dBm |
| | | $V_{CC} = 1.8 \text{ V}$ | [3] | -14 | -11 | - | dBm |
| | | $V_{CC} = 2.85 \text{ V}$ | [3] | -14 | -11 | - | dBm |
| | | $f = 1612 \text{ MHz to } 1909 \text{ MHz}$ | | | | | |
| $IP3_i$ | input third-order intercept point | $f = 1.575 \text{ GHz}$ | | | | | |
| | | $V_{CC} = 1.5 \text{ V}$ | [4] | 5 | 8 | - | dBm |
| | | $V_{CC} = 1.8 \text{ V}$ | [4] | 5 | 9 | - | dBm |
| | | $V_{CC} = 2.85 \text{ V}$ | [4] | 5 | 12 | - | dBm |
| t_{on} | turn-on time | | [5] | - | - | 2 μs | |
| t_{off} | turn-off time | | [5] | - | - | 1 μs | |
| K | Rollett stability factor | | 1 | - | - | | |

- [1] PCB losses are subtracted.
- [2] Including PCB losses.
- [3] Out of band.
- [4] $f_1 = 1713 \text{ MHz}$; $f_2 = 1851 \text{ MHz}$; $P_1 = P_2 = -30 \text{ dBm}$.
- [5] Within 10 % of the final gain.

Table 8. ENABLE (pin 5)

$-40 \text{ }^\circ\text{C} \leq T_{amb} \leq +85 \text{ }^\circ\text{C}$; $1.5 \text{ V} \leq V_{CC} \leq 3.1 \text{ V}$

| $V_{ENABLE} \text{ (V)}$ | State |
|--------------------------|-------|
| ≤ 0.35 | OFF |
| ≥ 0.8 | ON |

8. Application information

8.1 GNSS LNA

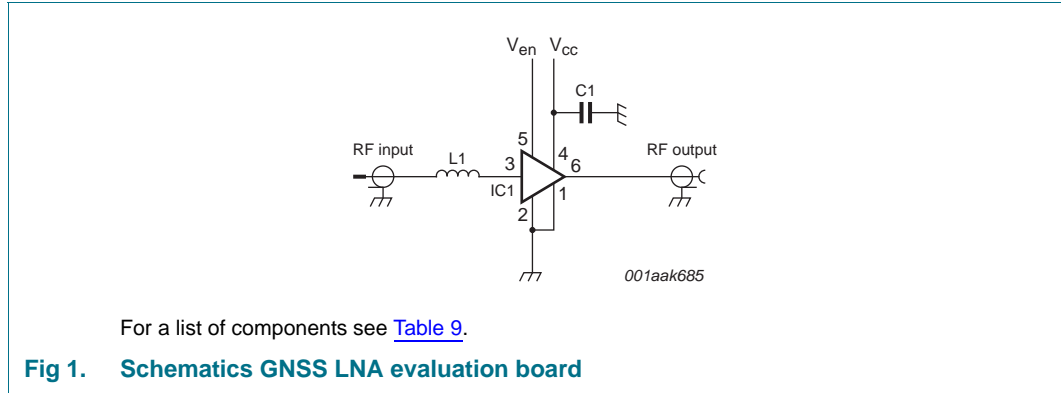
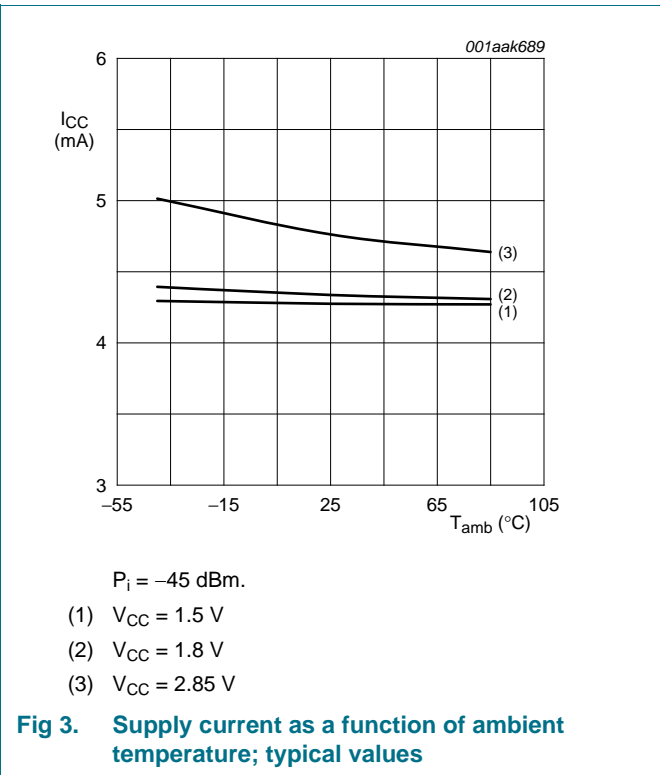
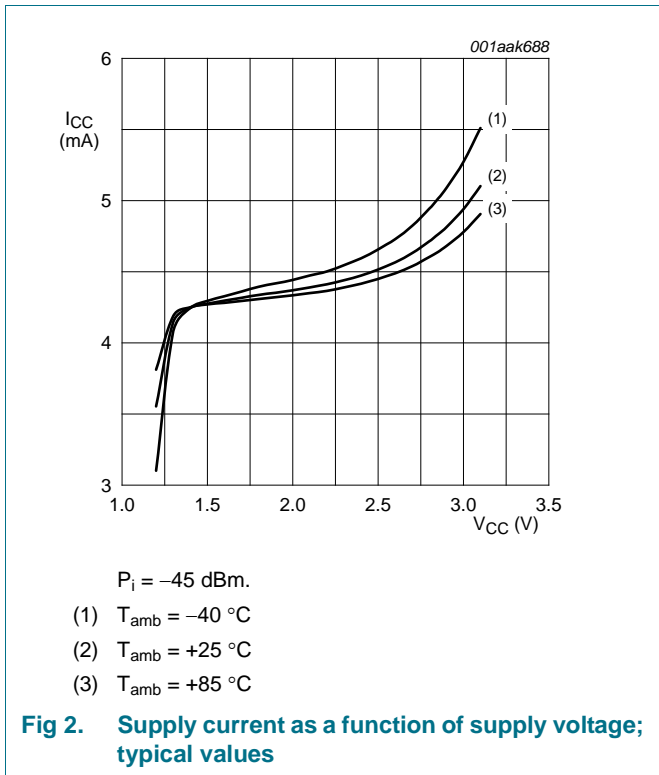
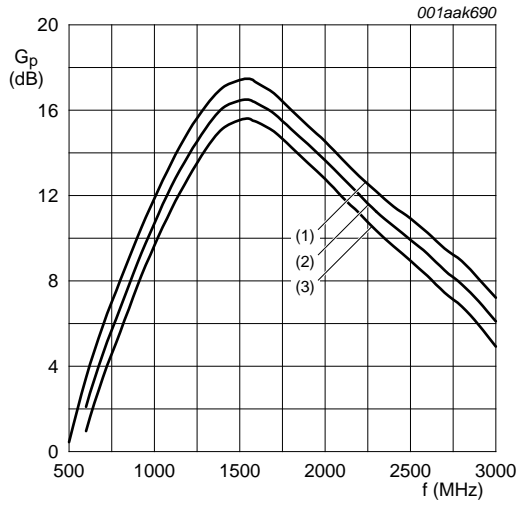


Table 9. List of components

For schematics see [Figure 1](#).

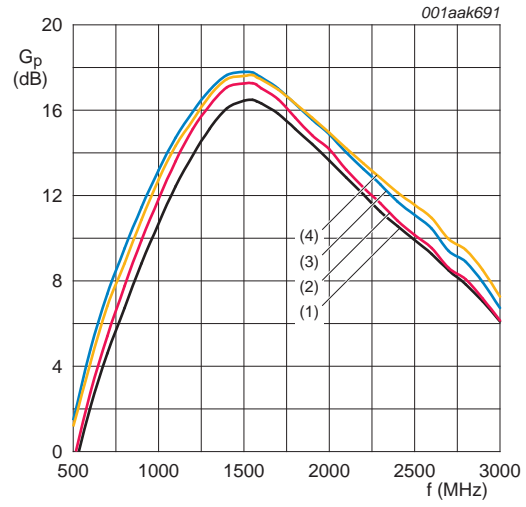
| Component | Description | Value | Supplier | Remarks |
|-----------|--------------------------------|--------|---------------|---------|
| C1 | decoupling capacitor | 1 nF | various | |
| IC1 | BGU7005 | - | NXP | |
| L1 | high quality matching inductor | 5.6 nH | Murata LQW15A | |





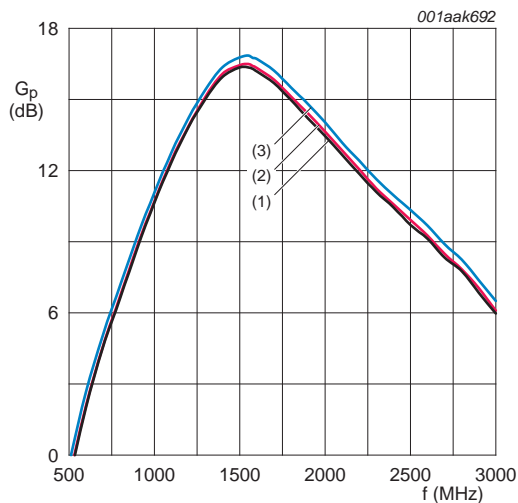
$V_{CC} = 1.8\text{ V}; P_i = -45\text{ dBm}$.
 (1) $T_{amb} = -40\text{ }^\circ\text{C}$
 (2) $T_{amb} = +25\text{ }^\circ\text{C}$
 (3) $T_{amb} = +85\text{ }^\circ\text{C}$

Fig 4. Power gain as a function of frequency; typical values



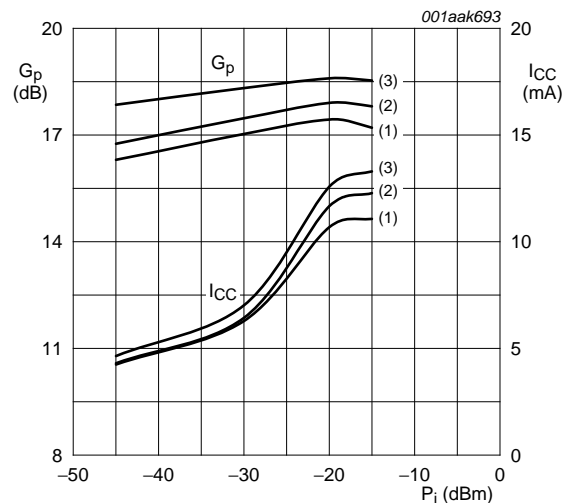
$V_{CC} = 1.8\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$.
 (1) $P_i = -45\text{ dBm}$
 (2) $P_i = -30\text{ dBm}$
 (3) $P_i = -20\text{ dBm}$
 (4) $P_i = -15\text{ dBm}$

Fig 5. Power gain as a function of frequency; typical values



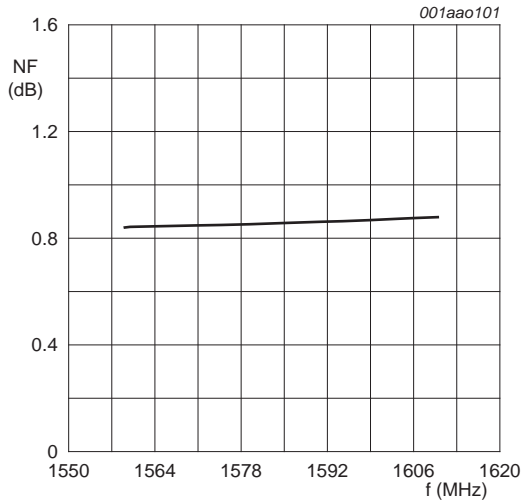
$P_i = -45\text{ dBm}; T_{amb} = 25\text{ }^\circ\text{C}$.
 (1) $V_{CC} = 1.5\text{ V}$
 (2) $V_{CC} = 1.8\text{ V}$
 (3) $V_{CC} = 2.85\text{ V}$

Fig 6. Power gain as a function of frequency; typical values



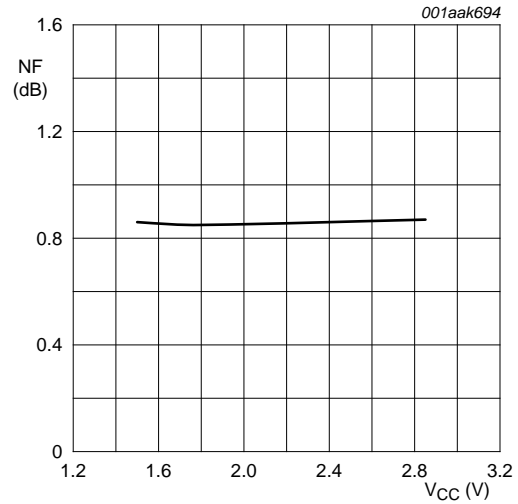
$T_{amb} = 25\text{ }^\circ\text{C}; f = 1575\text{ MHz}$.
 (1) $V_{CC} = 1.5\text{ V}$
 (2) $V_{CC} = 1.8\text{ V}$
 (3) $V_{CC} = 2.85\text{ V}$

Fig 7. Power gain as a function of input power; typical values



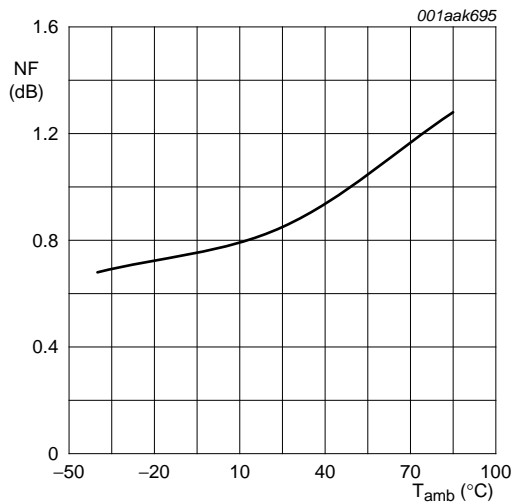
$f = 1575 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; no jammer.

Fig 8. Noise figure as a function of frequency; typical values



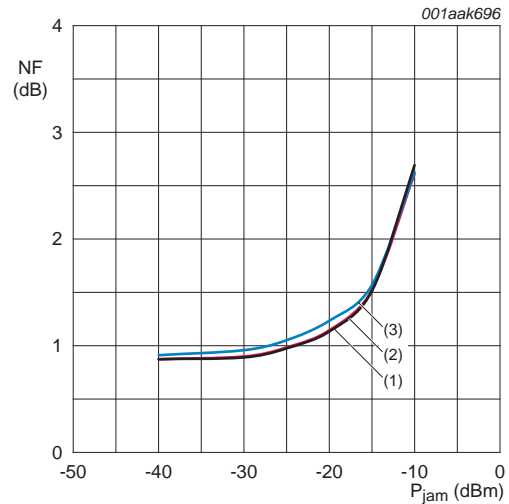
$f = 1575 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; no jammer.

Fig 9. Noise figure as a function of supply voltage; typical values



$f = 1575 \text{ MHz}$; $V_{\text{CC}} = 1.8 \text{ V}$; no jammer.

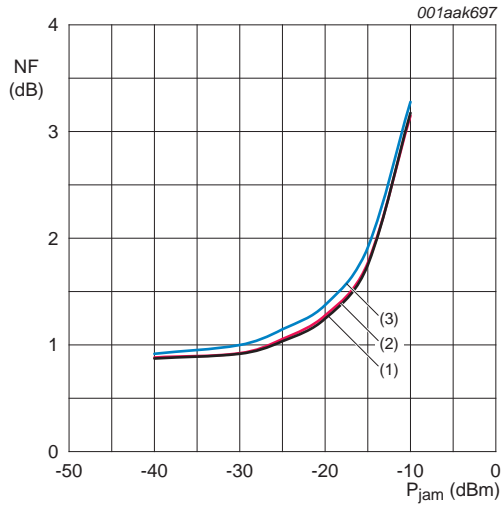
Fig 10. Noise figure as a function of ambient temperature; typical values



$f_{\text{jam}} = 850 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; $f = 1575 \text{ MHz}$.

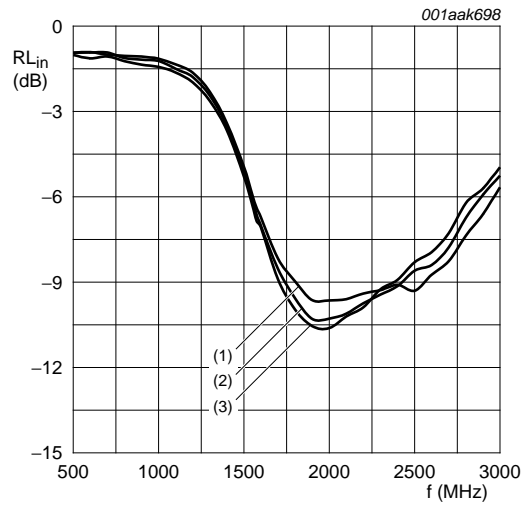
- (1) $V_{\text{CC}} = 1.5 \text{ V}$
- (2) $V_{\text{CC}} = 1.8 \text{ V}$
- (3) $V_{\text{CC}} = 2.85 \text{ V}$

Fig 11. Noise figure as a function of jamming power; typical values



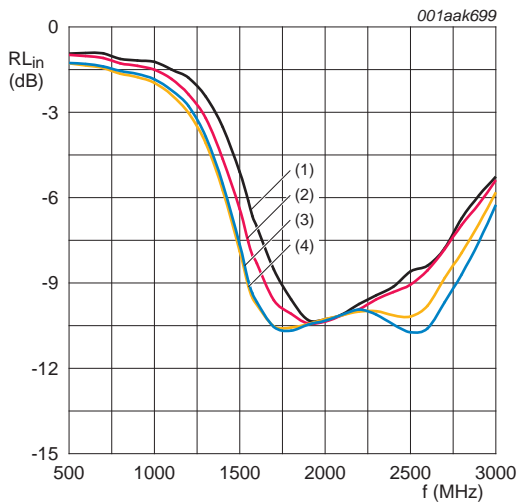
$f_{jam} = 1850 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}; f = 1575 \text{ MHz}.$
 (1) $V_{CC} = 1.5 \text{ V}$
 (2) $V_{CC} = 1.8 \text{ V}$
 (3) $V_{CC} = 2.85 \text{ V}$

Fig 12. Noise figure as a function of jamming power; typical values



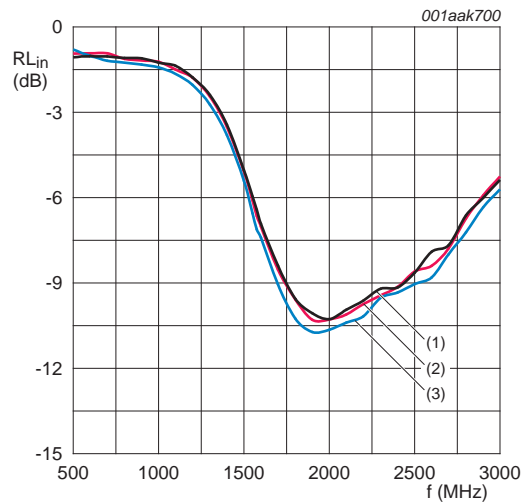
$V_{CC} = 1.8 \text{ V}; P_i = -45 \text{ dBm}.$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = +25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = +85 \text{ }^\circ\text{C}$

Fig 13. Input return loss as a function of frequency; typical values



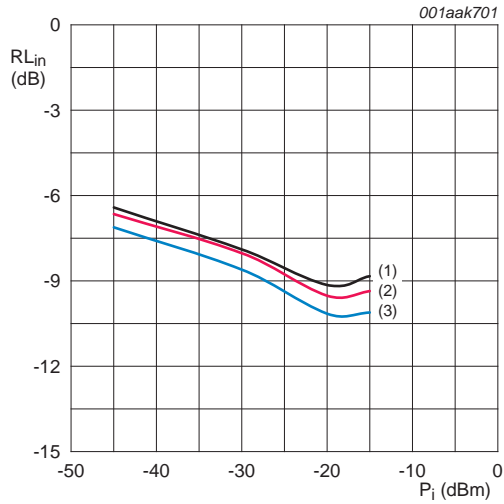
$V_{CC} = 1.8 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}.$
 (1) $P_i = -45 \text{ dBm}$
 (2) $P_i = -30 \text{ dBm}$
 (3) $P_i = -20 \text{ dBm}$
 (4) $P_i = -15 \text{ dBm}$

Fig 14. Input return loss as a function of frequency; typical values



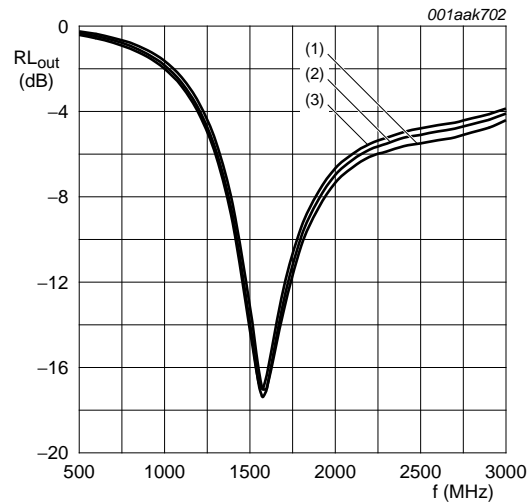
$P_i = -45 \text{ dBm}; T_{amb} = 25 \text{ }^\circ\text{C}.$
 (1) $V_{CC} = 1.5 \text{ V}$
 (2) $V_{CC} = 1.8 \text{ V}$
 (3) $V_{CC} = 2.85 \text{ V}$

Fig 15. Input return loss as a function of frequency; typical values



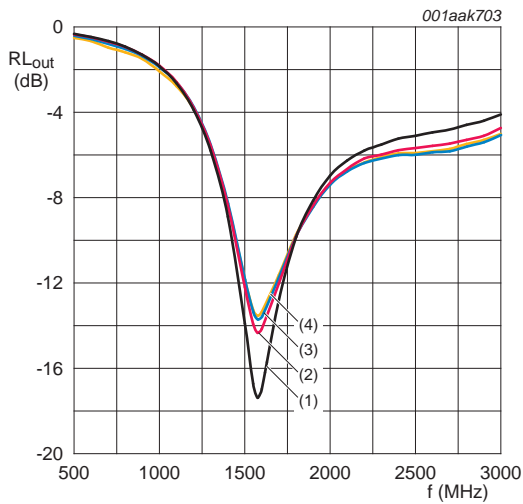
- $T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 1575\text{ MHz}$.
- (1) $V_{CC} = 1.5\text{ V}$
 - (2) $V_{CC} = 1.8\text{ V}$
 - (3) $V_{CC} = 2.85\text{ V}$

Fig 16. Input return loss as a function of input power; typical values



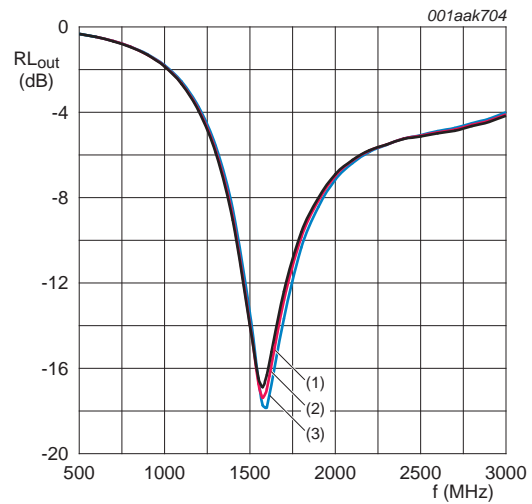
- $V_{CC} = 1.8\text{ V}$; $P_i = -45\text{ dBm}$.
- (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = +25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = +85\text{ }^{\circ}\text{C}$

Fig 17. Output return loss as a function of frequency; typical values



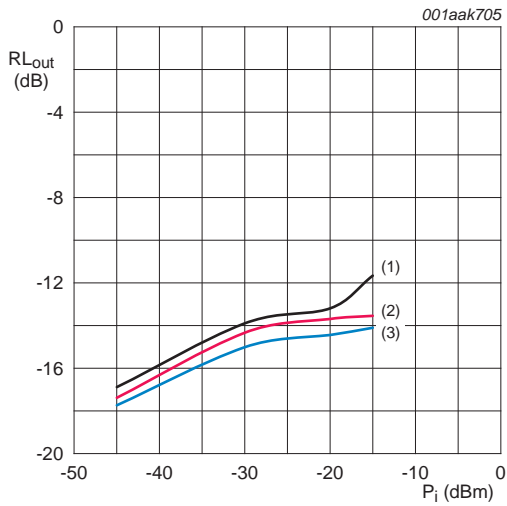
- $V_{CC} = 1.8\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.
- (1) $P_i = -45\text{ dBm}$
 - (2) $P_i = -30\text{ dBm}$
 - (3) $P_i = -20\text{ dBm}$
 - (4) $P_i = -15\text{ dBm}$

Fig 18. Output return loss as a function of frequency; typical values



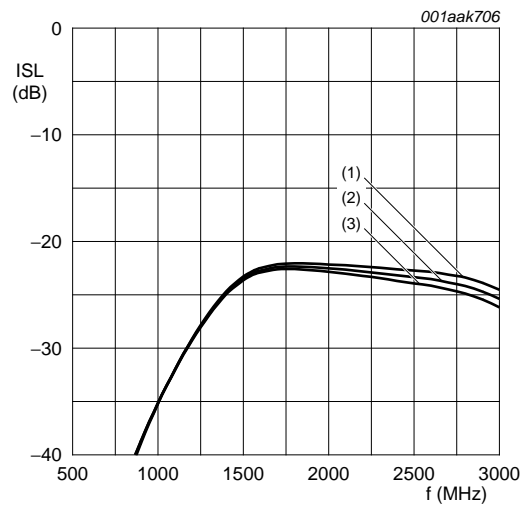
- $P_i = -45\text{ dBm}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.
- (1) $V_{CC} = 1.5\text{ V}$
 - (2) $V_{CC} = 1.8\text{ V}$
 - (3) $V_{CC} = 2.85\text{ V}$

Fig 19. Output return loss as a function of frequency; typical values



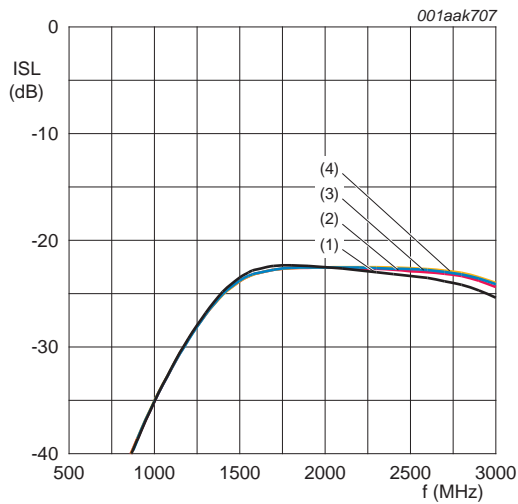
$T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 1575\text{ MHz}$.
 (1) $V_{CC} = 1.5\text{ V}$
 (2) $V_{CC} = 1.8\text{ V}$
 (3) $V_{CC} = 2.85\text{ V}$

Fig 20. Output return loss as a function of input power; typical values



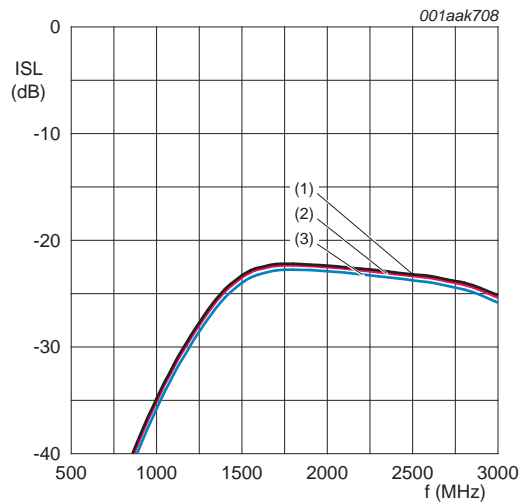
$V_{CC} = 1.8\text{ V}$; $P_i = -45\text{ dBm}$.
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = +25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = +85\text{ }^{\circ}\text{C}$

Fig 21. Isolation as a function of frequency; typical values



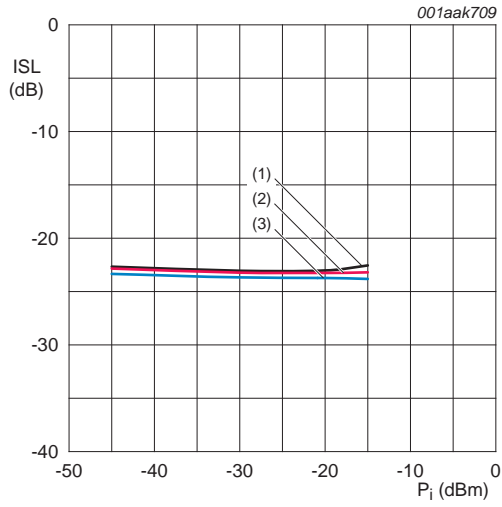
$V_{CC} = 1.8\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.
 (1) $P_i = -45\text{ dBm}$
 (2) $P_i = -30\text{ dBm}$
 (3) $P_i = -20\text{ dBm}$
 (4) $P_i = -15\text{ dBm}$

Fig 22. Isolation as a function of frequency; typical values



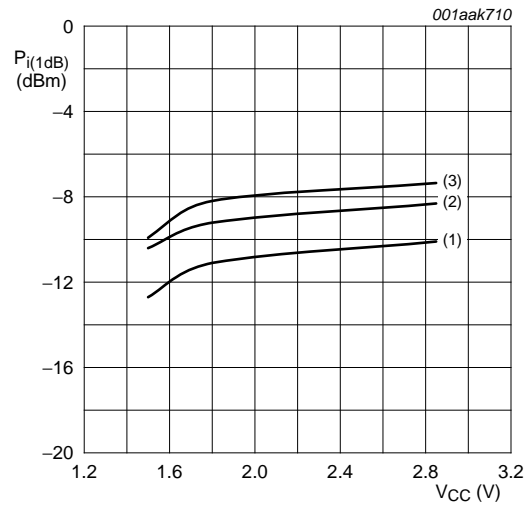
$P_i = -45\text{ dBm}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.
 (1) $V_{CC} = 1.5\text{ V}$
 (2) $V_{CC} = 1.8\text{ V}$
 (3) $V_{CC} = 2.85\text{ V}$

Fig 23. Isolation as a function of frequency; typical values



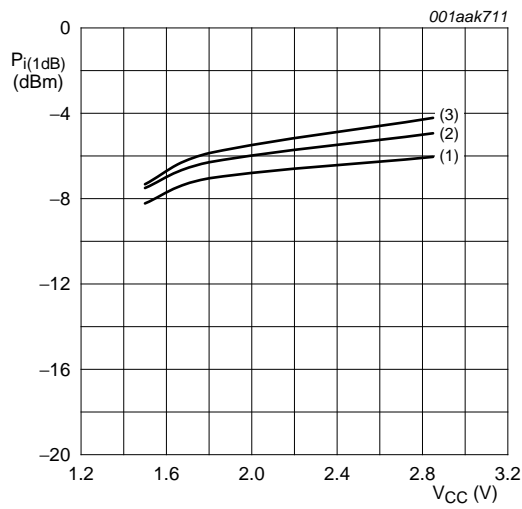
$T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 1575\text{ MHz}$.
 (1) $V_{CC} = 1.5\text{ V}$
 (2) $V_{CC} = 1.8\text{ V}$
 (3) $V_{CC} = 2.85\text{ V}$

Fig 24. Isolation as a function of input power; typical values



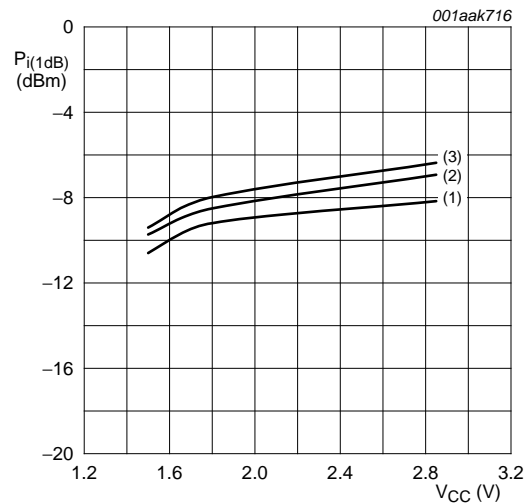
$f = 850\text{ MHz}$.
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = +25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = +85\text{ }^{\circ}\text{C}$

Fig 25. Input power at 1 dB gain compression as a function of supply voltage; typical values



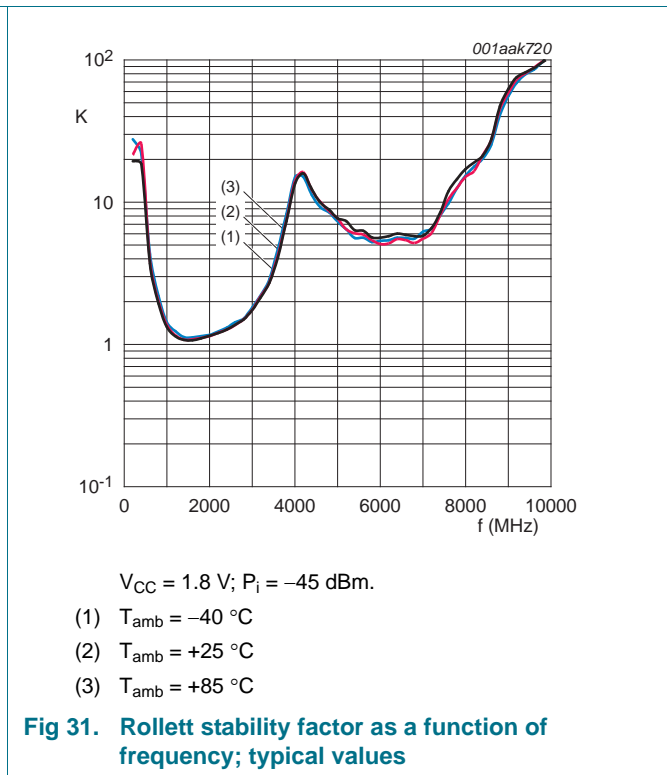
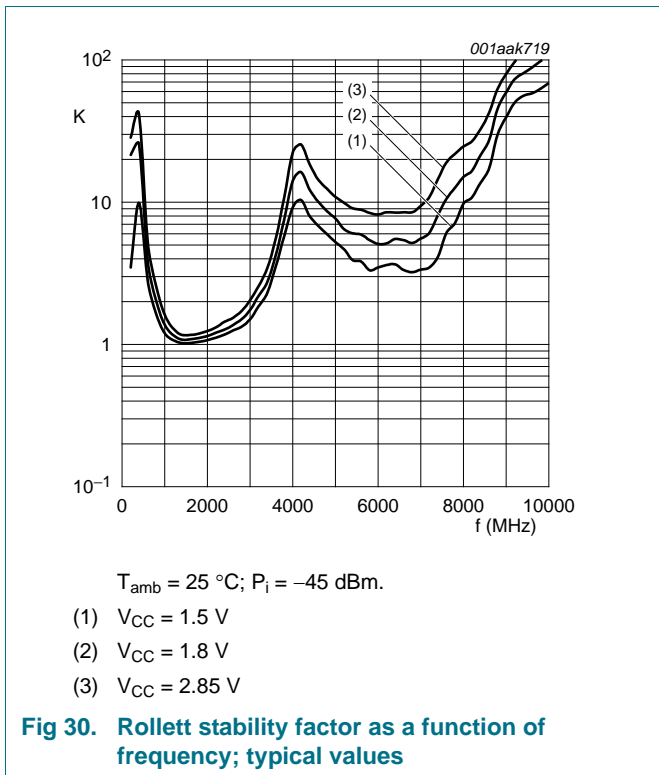
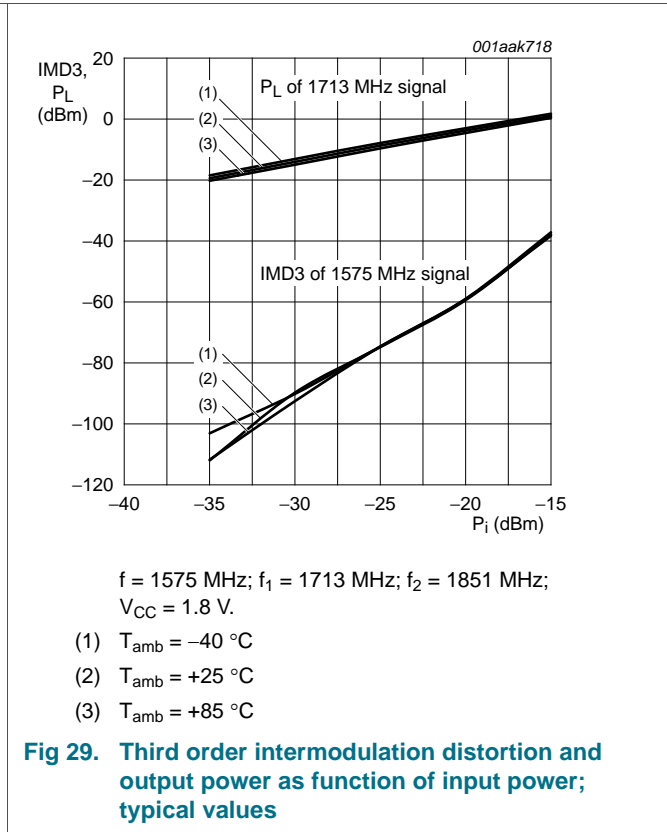
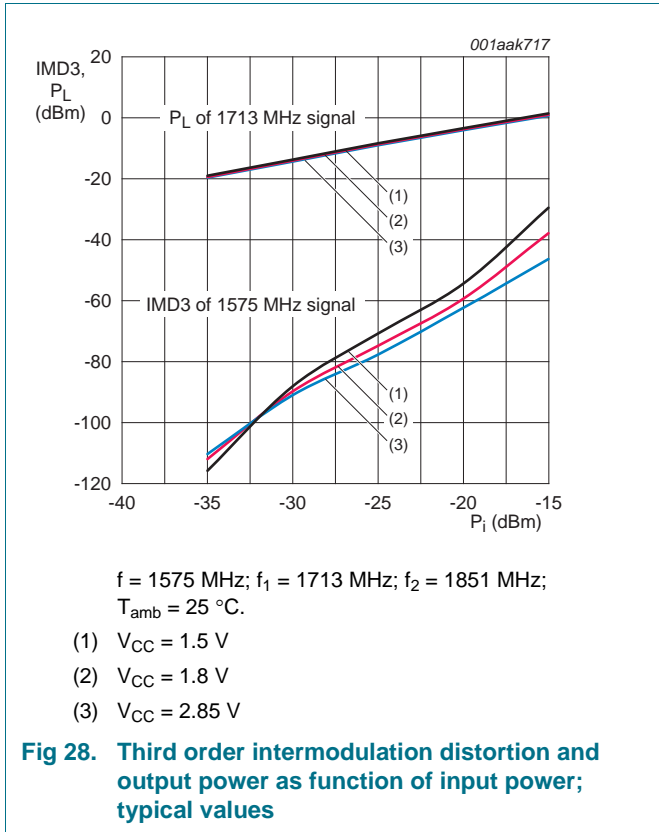
$f = 1850\text{ MHz}$.
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = +25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = +85\text{ }^{\circ}\text{C}$

Fig 26. Input power at 1 dB gain compression as a function of supply voltage; typical values



$f = 1575\text{ MHz}$.
 (1) $T_{amb} = -40\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = +25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = +85\text{ }^{\circ}\text{C}$

Fig 27. Input power at 1 dB gain compression as a function of supply voltage; typical values



8.2 GPS front-end

The GPS LNA is typically used in a GPS front-end. A GPS front-end application circuit and its characteristics is provided here.

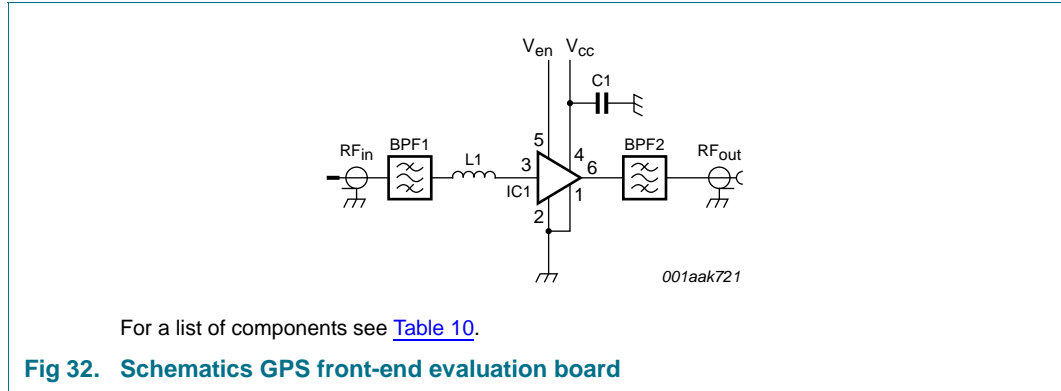


Table 10. List of components

For schematics see [Figure 32](#).

| Component | Description | Value | Supplier | Remarks |
|------------|--------------------------------|--------|------------------------|---|
| BPF1, BPF2 | GPS SAW filter | - | Murata SAFEA1G57KE0F00 | Alternatives from Epcos: <ul style="list-style-type: none"> • B9444 Alternatives from Murata: <ul style="list-style-type: none"> • SAFEA1G57KH0F00 • SAFEA1G57KB0F00 Alternatives from Fujitsu: <ul style="list-style-type: none"> • FAR-F6KA-1G5754-L4AA • FAR-F6KA-1G5754-L4AJ |
| C1 | decoupling capacitor | 1 nF | Various | |
| IC1 | BGU7005 | - | NXP | |
| L1 | high quality matching inductor | 5.6 nH | Murata LQW15A | |

8.3 Characteristics GPS front-end

Table 11. Characteristics GPS front-end

$f = 1575 \text{ MHz}$; $V_{CC} = 1.8 \text{ V}$; $V_{ENABLE} \geq 0.8 \text{ V}$; power at LNA input $P_i < -40 \text{ dBm}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; input and output matched to $50 \text{ } \Omega$; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------|---------------------|--|-----|-----|------|------------------|
| V_{CC} | supply voltage | RF input AC coupled | 1.5 | - | 2.85 | V |
| I_{CC} | supply current | | - | 4.5 | - | mA |
| T_{amb} | ambient temperature | | -40 | +25 | +85 | $^\circ\text{C}$ |
| G_p | power gain | power at LNA input $P_i < -40 \text{ dBm}$ | [1] | - | 14.5 | dB |
| | | power at LNA input $P_i = -20 \text{ dBm}$ | [1] | - | 15.5 | dB |
| RL_{in} | input return loss | power at LNA input $P_i < -40 \text{ dBm}$ | [1] | - | 8.5 | dB |
| | | power at LNA input $P_i = -20 \text{ dBm}$ | [1] | - | 10.5 | dB |
| RL_{out} | output return loss | power at LNA input $P_i < -40 \text{ dBm}$ | [1] | - | 14.5 | dB |
| | | power at LNA input $P_i = -20 \text{ dBm}$ | [1] | - | 12.5 | dB |

Table 11. Characteristics GPS front-end ...continued

$f = 1575 \text{ MHz}$; $V_{CC} = 1.8 \text{ V}$; $V_{ENABLE} \geq 0.8 \text{ V}$; power at LNA input $P_i < -40 \text{ dBm}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; input and output matched to $50 \text{ } \Omega$; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|--------------|--------------------------------------|---|-----|-----|------|------|---------------|
| NF | noise figure | power at LNA input $P_i < -40 \text{ dBm}$ | [1] | - | 1.8 | - | dB |
| | | power at LNA input $P_i = -20 \text{ dBm}$ | [1] | - | 1.9 | - | dB |
| $P_{i(1dB)}$ | input power at 1 dB gain compression | $f = 1575 \text{ MHz}$ | | | -8.2 | | dBm |
| | | $f = 806 \text{ MHz to } 928 \text{ MHz}$ | [2] | | 31 | | dBm |
| | | $f = 1612 \text{ MHz to } 1909 \text{ MHz}$ | [2] | | 40 | | dBm |
| $IP3_i$ | input third-order intercept point | | [3] | | 64 | | dBm |
| α | attenuation | $f = 850 \text{ MHz}$ | [4] | 95 | - | - | dBc |
| | | $f = 1850 \text{ MHz}$ | [4] | 90 | - | - | dBc |
| t_{on} | turn-on time | | [5] | - | - | 2 | μs |
| t_{off} | turn-off time | | [5] | - | - | 1 | μs |

[1] Power at GPS front-end input = power at LNA input + attenuation BPF1.

[2] Out of band.

[3] $f_1 = 1713 \text{ MHz}$; $f_2 = 1851 \text{ MHz}$; $P_1 = P_2 = +10 \text{ dBm}$.

[4] Relative to $f = 1575 \text{ MHz}$.

[5] Within 10 % of the final gain.

9. Package outline

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886

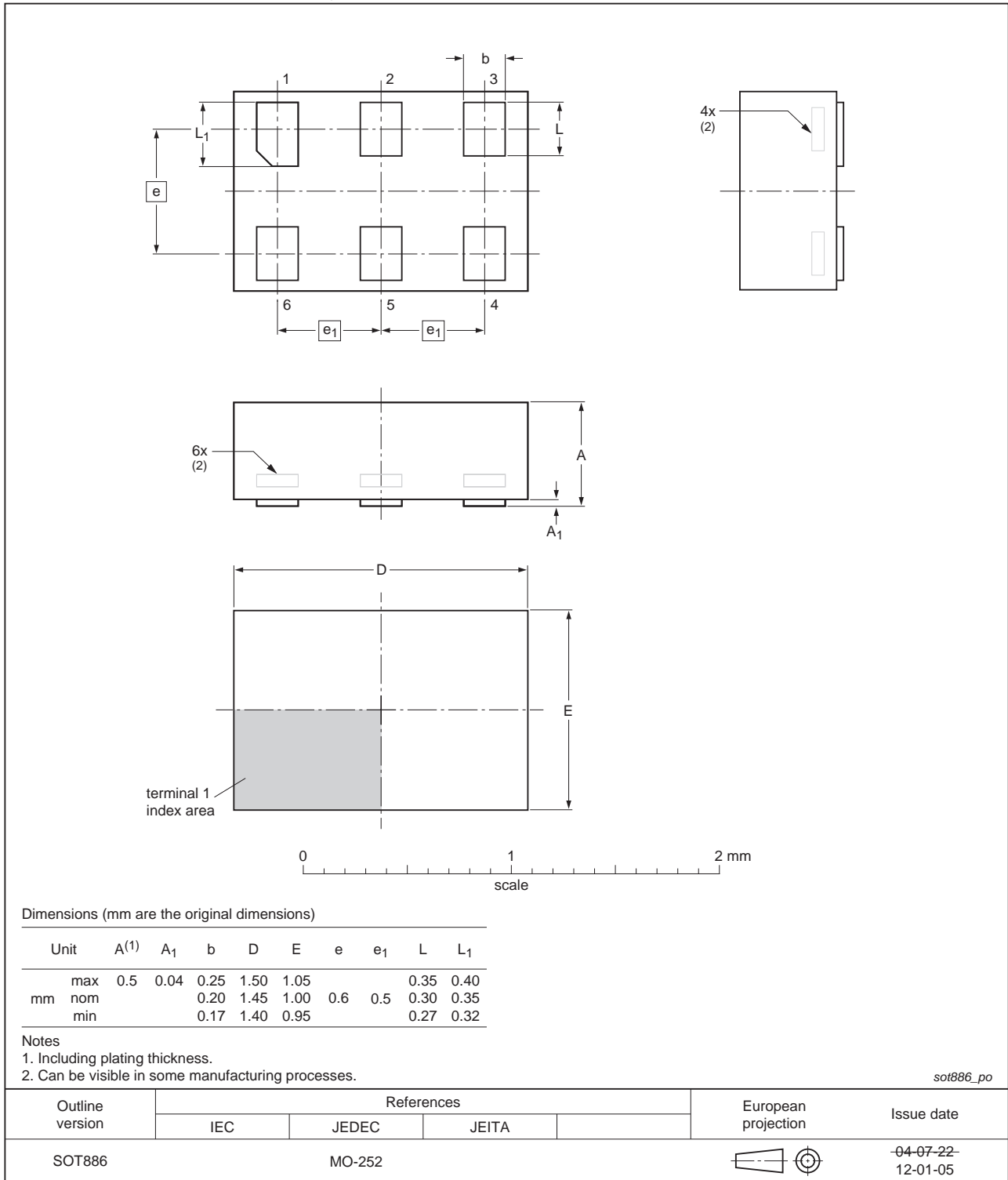


Fig 33. Package outline SOT886 (XSON6)

10. Abbreviations

Table 12. Abbreviations

| Acronym | Description |
|---------|---|
| AC | Alternating Current |
| ATM | Automated Teller Machine (cash dispenser) |
| DC | Direct Current |
| GLONASS | GLObal NAVigation Satellite System |
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning System |
| HBM | Human Body Model |
| MMIC | Monolithic Microwave Integrated Circuit |
| PC | Personal Computer |
| PCB | Printed Circuit Board |
| RF | Radio Frequency |
| SAW | Surface Acoustic Wave |
| SiGe:C | Silicon Germanium Carbon |

11. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--|------------------------|---------------|-------------|
| BGU7005 v.6 | 20170118 | Product data sheet | - | BGU7005 v.5 |
| Modifications: | <ul style="list-style-type: none"> • Section 1: added GPS1101M according to our new naming convention | | | |
| BGU7005 v.5 | <tbd> | Product data sheet | - | BGU7005 v.4 |
| Modifications: | <ul style="list-style-type: none"> • Added 'Compass' to descriptive title • Section 1.2 on page 1: row 6, changed 2.8.5 V to 3.1 V • Section 1.3 on page 2: updated • Table 1 on page 2, Table 7 on page 4 and Table 8 on page 5: changed value V_{CC} from 2.85 V to 3.1 V • Table 5 on page 3: several additions and changes • Figure 8 on page 8 and Figure 9 on page 8: corrected figure titles | | | |
| BGU7005 v.4 | 20110506 | Product data sheet | - | BGU7005 v.3 |
| BGU7005 v.3 | 20100623 | Product data sheet | - | BGU7005_2 |
| BGU7005_2 | 20100304 | Product data sheet | - | BGU7005_1 |
| BGU7005_1 | 20091028 | Preliminary data sheet | - | - |

12. Legal information

12.1 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".

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Date of release: 18 January 2017

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