

BGD704

750 MHz, 20 dB gain power doubler amplifier

Rev. 8 — 28 September 2010

Product data sheet

1. Product profile

1.1 General description

Hybrid amplifier module in a SOT115J package operating with a voltage supply of 24 V (DC).

CAUTION



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

1.2 Features and benefits

- Excellent linearity
- Extremely low noise
- Silicon nitride passivation
- Rugged construction
- Gold metallization ensures excellent reliability

1.3 Applications

- CATV systems in the frequency range of 40 MHz to 750 MHz

1.4 Quick reference data

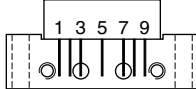
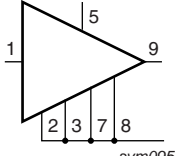
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|--------------------------------|-----------------------|------|-----|------|------|
| G_p | power gain | $f = 50 \text{ MHz}$ | 19.5 | 20 | 20.5 | dB |
| | | $f = 750 \text{ MHz}$ | 20 | 21 | - | dB |
| I_{tot} | total current consumption (DC) | $V_B = 24 \text{ V}$ | - | 425 | 435 | mA |



2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-----------------|--|---|
| 1 | input |  |  |
| 2 | common | | |
| 3 | common | | |
| 5 | +V _B | | |
| 7 | common | | |
| 8 | common | | |
| 9 | output | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| BGD704 | - | rectangular single-ended package; aluminium flange; 2 vertical mounting holes; 2 × 6-32 UNC and 2 extra horizontal mounting holes; 7 gold-plated in-line leads | SOT115J |

4. Limiting values

Table 4. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|-------------------------------------|------------|-----|------|------|
| V _i | RF input voltage | | - | 65 | dBmV |
| T _{stg} | storage temperature | | -40 | +100 | °C |
| T _{mb} | mounting base operating temperature | | -20 | +100 | °C |

5. Characteristics

Table 5. Characteristics

Bandwidth 40 MHz to 750 MHz; V_B = 24 V; T_{mb} = 35 °C; Z_S = Z_L = 75 Ω.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|--------------------------------|------------------------|------|------|------|------|
| G _p | power gain | f = 50 MHz | 19.5 | 20 | 20.5 | dB |
| | | f = 750 MHz | 20 | 21 | - | dB |
| SL | slope cable equivalent | f = 40 MHz to 750 MHz | 0 | 1 | 2 | dB |
| FL | flatness of frequency response | f = 40 MHz to 750 MHz | - | ±0.2 | ±0.5 | dB |
| S ₁₁ | input return losses | f = 40 MHz to 80 MHz | 20 | 31 | - | dB |
| | | f = 80 MHz to 160 MHz | 19 | 29 | - | dB |
| | | f = 160 MHz to 320 MHz | 18 | 25 | - | dB |
| | | f = 320 MHz to 640 MHz | 17 | 21 | - | dB |
| | | f = 640 MHz to 750 MHz | 16 | 21 | - | dB |

Table 5. Characteristics ...continued

Bandwidth 40 MHz to 750 MHz; $V_B = 24\text{ V}$; $T_{mb} = 35\text{ °C}$; $Z_S = Z_L = 75\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|-----------------------------------|---|----------|------|-----|------|
| S ₂₂ | output return losses | f = 40 MHz to 80 MHz | 20 | 26 | - | dB |
| | | f = 80 MHz to 160 MHz | 19 | 27 | - | dB |
| | | f = 160 MHz to 320 MHz | 18 | 26 | - | dB |
| | | f = 320 MHz to 640 MHz | 17 | 24 | - | dB |
| | | f = 640 MHz to 750 MHz | 16 | 23 | - | dB |
| S ₂₁ | phase response | f = 50 MHz | -45 | - | +45 | deg |
| CTB | composite triple beat | 110 channels flat; V _o = 44 dBmV; measured at 745.25 MHz | - | -58 | -57 | dB |
| X _{mod} | cross modulation | 110 channels flat; V _o = 44 dBmV; measured at 55.25 MHz | - | -63 | -61 | dB |
| CSO | composite second order distortion | 110 channels flat; V _o = 44 dBmV; measured at 746.5 MHz | - | -61 | -56 | dB |
| d ₂ | second order distortion | | [1] - | -75 | -66 | dB |
| V _o | output voltage | d _{im} = -60 dB | [2] 60.5 | 63.5 | - | dBmV |
| F | noise figure | f = 50 MHz | - | 4.5 | 5 | dB |
| | | f = 450 MHz | - | - | 6.5 | dB |
| | | f = 550 MHz | - | - | 7 | dB |
| | | f = 600 MHz | - | - | 7 | dB |
| | | f = 750 MHz | - | 6.5 | 8.5 | dB |
| I _{tot} | total current consumption (DC) | | [3] - | 425 | 435 | mA |

[1] f_p = 55.25 MHz; V_p = 44 dBmV; f_q = 691.25 MHz; V_q = 44 dBmV; measured at f_p + f_q = 746.5 MHz.

[2] Measure according to DIN45004B; f_p = 740.25 MHz; V_p = V_o; f_q = 747.25 MHz; V_q = V_o - 6 dB; f_r = 749.25 MHz; V_r = V_o - 6 dB; measured at f_p + f_q - f_r = 738.25 MHz.

[3] The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

Table 6. Characteristics

Bandwidth 40 MHz to 600 MHz; $V_B = 24\text{ V}$; $T_{mb} = 35\text{ °C}$; $Z_S = Z_L = 75\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|--------------------------------|------------------------|------|------|------|------|
| G _p | power gain | f = 50 MHz | 19.5 | 20 | 20.5 | dB |
| | | f = 600 MHz | 20 | 20.7 | - | dB |
| SL | slope cable equivalent | f = 40 MHz to 600 MHz | 0 | - | 2 | dB |
| FL | flatness of frequency response | f = 40 MHz to 600 MHz | - | - | ±0.3 | dB |
| S ₁₁ | input return losses | f = 40 MHz to 80 MHz | 20 | 31 | - | dB |
| | | f = 80 MHz to 160 MHz | 19 | 29 | - | dB |
| | | f = 160 MHz to 320 MHz | 18 | 25 | - | dB |
| | | f = 320 MHz to 600 MHz | 17 | 21 | - | dB |
| S ₂₂ | output return losses | f = 40 MHz to 80 MHz | 20 | 26 | - | dB |
| | | f = 80 MHz to 160 MHz | 19 | 27 | - | dB |
| | | f = 160 MHz to 320 MHz | 18 | 26 | - | dB |
| | | f = 320 MHz to 600 MHz | 17 | 24 | - | dB |
| S ₂₁ | phase response | f = 50 MHz | -45 | - | +45 | deg |

Table 6. Characteristics ...continued

Bandwidth 40 MHz to 600 MHz; $V_B = 24\text{ V}$; $T_{mb} = 35\text{ °C}$; $Z_S = Z_L = 75\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-----------------------------------|---|-----|-----|-----|--------|
| CTB | composite triple beat | 85 channels flat; $V_o = 44\text{ dBmV}$; measured at 595.25 MHz | - | -65 | -64 | dB |
| X_{mod} | cross modulation | 85 channels flat; $V_o = 44\text{ dBmV}$; measured at 55.25 MHz | - | -65 | -64 | dB |
| CSO | composite second order distortion | 85 channels flat; $V_o = 44\text{ dBmV}$; measured at 596.5 MHz | - | -66 | -58 | dB |
| d_2 | second order distortion | | [1] | - | -68 | dB |
| V_o | output voltage | $d_{im} = -60\text{ dB}$ | [2] | 63 | - | dBmV |
| F | noise figure | see Table 5 | - | - | - | dBmV |
| I_{tot} | total current consumption (DC) | | [3] | - | 425 | 435 mA |

[1] $f_p = 55.25\text{ MHz}$; $V_p = 44\text{ dBmV}$; $f_q = 541.25\text{ MHz}$; $V_q = 44\text{ dBmV}$; measured at $f_p + f_q = 596.5\text{ MHz}$.

[2] Measured according to DIN45004B; $f_p = 590.25\text{ MHz}$; $V_p = V_o$; $f_q = 597.25\text{ MHz}$; $V_q = V_o - 6\text{ dB}$; $f_r = 599.25\text{ MHz}$; $V_r = V_o - 6\text{ dB}$; measured at $f_p + f_q - f_r = 588.25\text{ MHz}$.

[3] The module normally operates at $V_B = 24\text{ V}$, but is able to withstand supply transients up to 30 V.

Table 7. Characteristics

Bandwidth 40 MHz to 550 MHz; $V_B = 24\text{ V}$; $T_{mb} = 35\text{ °C}$; $Z_S = Z_L = 75\ \Omega$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-----------------------------------|---|------|------|-----------|--------|
| G_p | power gain | $f = 50\text{ MHz}$ | 19.5 | 20 | 20.5 | dB |
| | | $f = 550\text{ MHz}$ | 20 | 20.6 | - | dB |
| SL | slope cable equivalent | $f = 40\text{ MHz to }550\text{ MHz}$ | 0 | - | 2 | dB |
| FL | flatness of frequency response | $f = 40\text{ MHz to }550\text{ MHz}$ | - | - | ± 0.3 | dB |
| S_{11} | input return losses | $f = 40\text{ MHz to }80\text{ MHz}$ | 20 | 31 | - | dB |
| | | $f = 80\text{ MHz to }160\text{ MHz}$ | 19 | 29 | - | dB |
| | | $f = 160\text{ MHz to }320\text{ MHz}$ | 18 | 25 | - | dB |
| | | $f = 320\text{ MHz to }550\text{ MHz}$ | 17 | 21 | - | dB |
| S_{22} | output return losses | $f = 40\text{ MHz to }80\text{ MHz}$ | 20 | 26 | - | dB |
| | | $f = 80\text{ MHz to }160\text{ MHz}$ | 19 | 27 | - | dB |
| | | $f = 160\text{ MHz to }320\text{ MHz}$ | 18 | 26 | - | dB |
| | | $f = 320\text{ MHz to }550\text{ MHz}$ | 17 | 24 | - | dB |
| S_{21} | phase response | $f = 50\text{ MHz}$ | -45 | - | +45 | deg |
| CTB | composite triple beat | 77 channels flat; $V_o = 44\text{ dBmV}$; measured at 547.25 MHz | - | -67 | -66 | dB |
| X_{mod} | cross modulation | 77 channels flat; $V_o = 44\text{ dBmV}$; measured at 55.25 MHz | - | -67 | -66 | dB |
| CSO | composite second order distortion | 77 channels flat; $V_o = 44\text{ dBmV}$; measured at 548.5 MHz | - | -67 | -60 | dB |
| d_2 | second order distortion | | [1] | - | -70 | dB |
| V_o | output voltage | $d_{im} = -60\text{ dB}$ | [2] | 63.5 | - | dBmV |
| F | noise figure | see Table 5 | - | - | - | dB |
| I_{tot} | total current consumption (DC) | | [3] | - | 425 | 435 mA |

[1] $f_p = 55.25\text{ MHz}$; $V_p = 44\text{ dBmV}$; $f_q = 493.25\text{ MHz}$; $V_q = 44\text{ dBmV}$; measured at $f_p + f_q = 548.5\text{ MHz}$.

- [2] Measure according to DIN45004B; $f_p = 540.25$ MHz; $V_p = V_o$; $f_q = 547.25$ MHz; $V_q = V_o - 6$ dB; $f_r = 549.25$ MHz; $V_r = V_o - 6$ dB; measured at $f_p + f_q - f_r = 538.25$ MHz.
- [3] The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

Table 8. Characteristics

Bandwidth 40 MHz to 450 MHz; $V_B = 24$ V; $T_{mb} = 35$ °C; $Z_S = Z_L = 75 \Omega$.

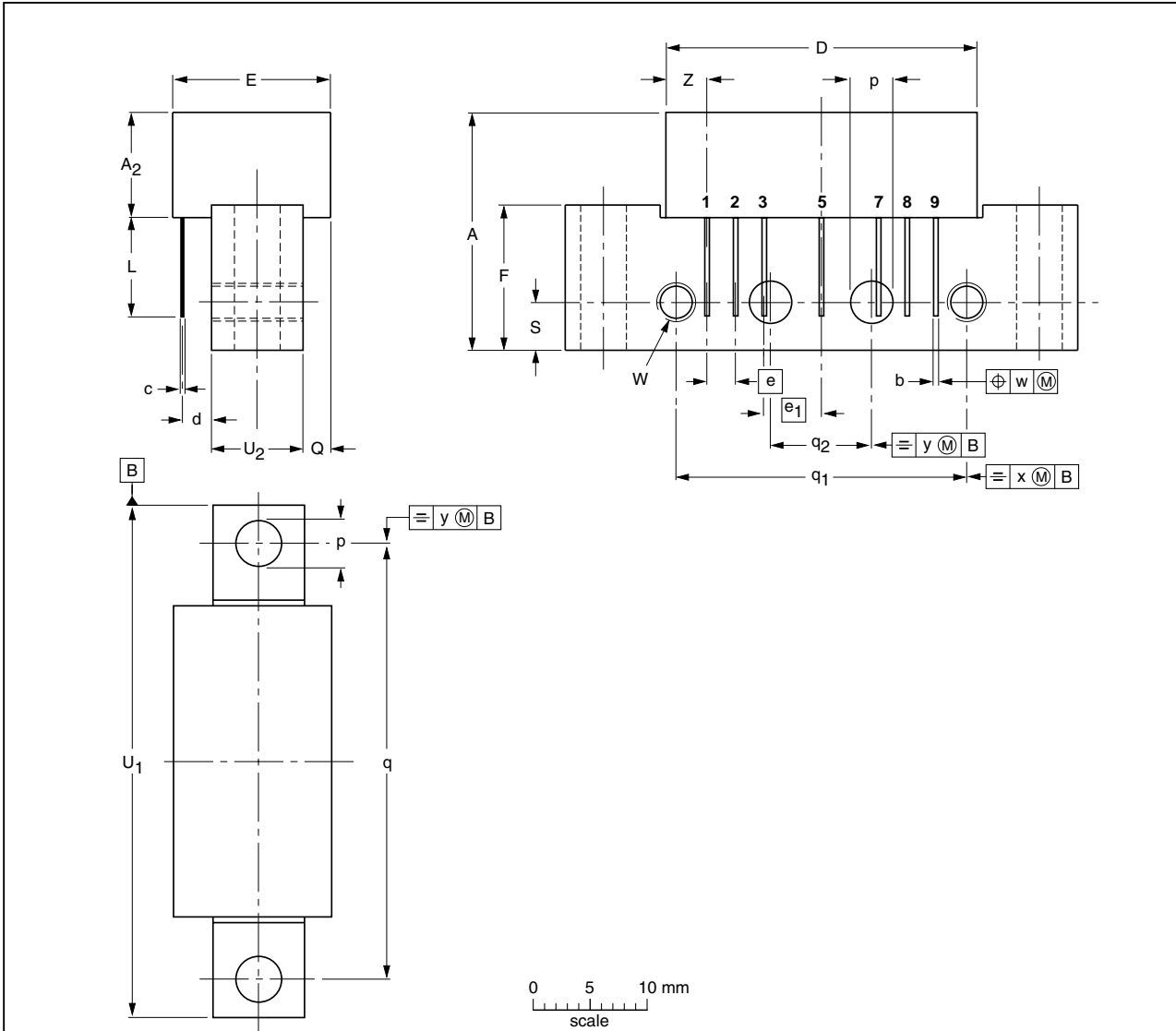
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|------------------|-----------------------------------|---|------|------|------|------|------|
| G _p | power gain | f = 50 MHz | 19.5 | 20 | 20.5 | dB | |
| | | f = 450 MHz | 20 | 20.6 | - | dB | |
| SL | slope cable equivalent | f = 40 MHz to 450 MHz | 0 | - | 2 | dB | |
| FL | flatness of frequency response | f = 40 MHz to 450 MHz | - | - | ±0.3 | dB | |
| S ₁₁ | input return losses | f = 40 MHz to 80 MHz | 20 | 31 | - | dB | |
| | | f = 80 MHz to 160 MHz | 19 | 29 | - | dB | |
| | | f = 160 MHz to 320 MHz | 18 | 25 | - | dB | |
| | | f = 320 MHz to 450 MHz | 17 | 21 | - | dB | |
| S ₂₂ | output return losses | f = 40 MHz to 80 MHz | 20 | 26 | - | dB | |
| | | f = 80 MHz to 160 MHz | 19 | 27 | - | dB | |
| | | f = 160 MHz to 320 MHz | 18 | 26 | - | dB | |
| | | f = 320 MHz to 450 MHz | 17 | 24 | - | dB | |
| S ₂₁ | phase response | f = 50 MHz | -45 | - | +45 | deg | |
| CTB | composite triple beat | 60 channels flat; $V_o = 46$ dBmV; measured at 445.25 MHz | - | - | -67 | dB | |
| X _{mod} | cross modulation | 60 channels flat; $V_o = 46$ dBmV; measured at 55.25 MHz | - | - | -64 | dB | |
| CSO | composite second order distortion | 60 channels flat; $V_o = 46$ dBmV; measured at 446.5 MHz | - | - | -63 | dB | |
| d ₂ | second order distortion | | [1] | - | - | -73 | dB |
| V _o | output voltage | d _{im} = -60 dB | [2] | 66 | - | - | dBmV |
| F | noise figure | see Table 5 | - | - | - | dB | |
| I _{tot} | total current consumption (DC) | | [3] | - | 425 | 435 | mA |

- [1] $f_p = 55.25$ MHz; $V_p = 44$ dBmV; $f_q = 391.25$ MHz; $V_q = 46$ dBmV; measured at $f_p + f_q = 446.5$ MHz.
- [2] Measured according to DIN45004B; $f_p = 440.25$ MHz; $V_p = V_o$; $f_q = 447.25$ MHz; $V_q = V_o - 6$ dB; $f_r = 449.25$ MHz; $V_r = V_o - 6$ dB; measured at $f_p + f_q - f_r = 438.25$ MHz.
- [3] The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

6. Package outline

Rectangular single-ended package; aluminium flange; 2 vertical mounting holes; 2 x 6-32 UNC and 2 extra horizontal mounting holes; 7 gold-plated in-line leads

SOT115J



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₂ max. | b | c | D max. | d | E max. | e | e ₁ | F | L min. | p | Q max. | q | q ₁ | q ₂ | S | U ₁ | U ₂ | W | w | x | y | Z max. |
|------|--------|---------------------|--------------|------|--------|--------------|--------|------|----------------|------|--------|--------------|--------|------|----------------|----------------|-----|----------------|----------------|-------------|------|-----|-----|--------|
| mm | 20.8 | 9.5 | 0.51 0.38 | 0.25 | 27.2 | 2.04 2.54 | 13.75 | 2.54 | 5.08 | 12.7 | 8.8 | 4.15 3.85 | 2.4 | 38.1 | 25.4 | 10.2 | 4.2 | 44.75 44.25 | 8.2 7.8 | 6-32 UNC | 0.25 | 0.7 | 0.1 | 3.8 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|-------|--|---------------------|------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT115J | | | | | | -04-02-04- 10-06-18 |

Fig 1. Package outline SOT115J

7. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------------------|--------------|--|---------------|------------|
| BGD704 v.8 | 20100928 | Product data sheet | - | BGD704 v.7 |
| Modifications: | | <ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Package outline drawings have been updated to the latest version. | | |
| BGD704 v.7 (9397 750 14776) | 20050401 | Product data sheet | - | BGD704 v.6 |
| BGD704 v.6 (9397 750 09027) | 20011102 | Product specification | - | BGD704 v.5 |
| BGD704 v.5 (9397 750 08846) | 20011029 | Product specification | - | BGD704 v.4 |
| BGD704 v.4 (9397 750 05295) | 19990322 | Product specification | - | BGD704 v.3 |
| BGD704 v.3 (9397 750 01971) | 19970402 | Product specification | - | BGD704 v.2 |
| BGD704 v.2 (9397 750 01392) | 19961220 | Product specification | - | - |

8. Legal information

8.1 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. |
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[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: 28 September 2010

Document identifier: BGD704

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