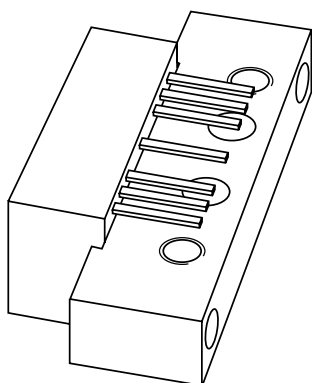


# DATA SHEET



## **BGD704N** CATV amplifier module

Product specification  
File under Discrete Semiconductors, SC16

1998 Feb 02

## CATV amplifier module

## BGD704N

## FEATURES

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

## APPLICATIONS

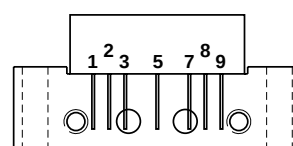
- CATV systems in the frequency range of 40 to 750 MHz.

## DESCRIPTION

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

## PINNING - SOT115J

| PIN        | DESCRIPTION     |
|------------|-----------------|
| 1          | input           |
| 2, 3, 7, 8 | common          |
| 5          | +V <sub>B</sub> |
| 9          | output          |



Side view

MSA319

Fig.1 Simplified outline.

## QUICK REFERENCE DATA

| SYMBOL           | PARAMETER                      | CONDITIONS            | MIN. | MAX. | UNIT |
|------------------|--------------------------------|-----------------------|------|------|------|
| G <sub>p</sub>   | power gain                     | f = 50 MHz            | 19.5 | 20.5 | dB   |
|                  |                                | f = 750 MHz           | 20   | —    | dB   |
| I <sub>tot</sub> | total current consumption (DC) | V <sub>B</sub> = 24 V | —    | 435  | mA   |

## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL           | PARAMETER                           | MIN. | MAX. | UNIT |
|------------------|-------------------------------------|------|------|------|
| V <sub>i</sub>   | RF input voltage                    | —    | 65   | dBmV |
| T <sub>stg</sub> | storage temperature                 | −40  | +100 | °C   |
| T <sub>mb</sub>  | operating mounting base temperature | −20  | +100 | °C   |

## CATV amplifier module

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## CHARACTERISTICS

**Table 1** Bandwidth 40 to 750 MHz;  $V_B = 24$  V;  $T_{mb} = 35$  °C;  $Z_S = Z_L = 75$   $\Omega$ 

| SYMBOL    | PARAMETER                         | CONDITIONS                                                    | MIN. | MAX.       | UNIT |
|-----------|-----------------------------------|---------------------------------------------------------------|------|------------|------|
| $G_p$     | power gain                        | $f = 50$ MHz                                                  | 19.5 | 20.5       | dB   |
|           |                                   | $f = 750$ MHz                                                 | 20   | –          | dB   |
| SL        | slope cable equivalent            | $f = 40$ to 750 MHz                                           | 0    | 2          | dB   |
| FL        | flatness of frequency response    | $f = 40$ to 750 MHz                                           | –    | $\pm 0.25$ | dB   |
| $S_{11}$  | input return losses               | $f = 40$ to 80 MHz                                            | 20   | –          | dB   |
|           |                                   | $f = 80$ to 160 MHz                                           | 19   | –          | dB   |
|           |                                   | $f = 160$ to 320 MHz                                          | 18   | –          | dB   |
|           |                                   | $f = 320$ to 640 MHz                                          | 17   | –          | dB   |
|           |                                   | $f = 640$ to 750 MHz                                          | 16   | –          | dB   |
| $S_{22}$  | output return losses              | $f = 40$ to 80 MHz                                            | 20   | –          | dB   |
|           |                                   | $f = 80$ to 160 MHz                                           | 19   | –          | dB   |
|           |                                   | $f = 160$ to 320 MHz                                          | 18   | –          | dB   |
|           |                                   | $f = 320$ to 640 MHz                                          | 17   | –          | dB   |
|           |                                   | $f = 640$ to 750 MHz                                          | 16   | –          | dB   |
| $S_{21}$  | phase response                    | $f = 50$ MHz                                                  | –45  | +45        | deg  |
| CTB       | composite triple beat             | 110 channels flat; $V_o = 44$ dBmV;<br>measured at 745.25 MHz | –    | –57        | dB   |
| $X_{mod}$ | cross modulation                  | 110 channels flat; $V_o = 44$ dBmV;<br>measured at 55.25 MHz  | –    | –61        | dB   |
| CSO       | composite second order distortion | 110 channels flat; $V_o = 44$ dBmV;<br>measured at 746.5 MHz  | –    | –56        | dB   |
| $d_2$     | second order distortion           | note 1                                                        | –    | –66        | dB   |
| $V_o$     | output voltage                    | $d_{im} = -60$ dB; note 2                                     | 60.5 | –          | dBmV |
| F         | noise figure                      | $f = 50$ MHz                                                  | –    | 5          | dB   |
|           |                                   | $f = 450$ MHz                                                 | –    | 6.5        | dB   |
|           |                                   | $f = 550$ MHz                                                 | –    | 7          | dB   |
|           |                                   | $f = 600$ MHz                                                 | –    | 7          | dB   |
|           |                                   | $f = 750$ MHz                                                 | –    | 8.5        | dB   |
| $I_{tot}$ | total current consumption (DC)    | note 3                                                        | –    | 435        | mA   |

## Notes

- $f_p = 55.25$  MHz;  $V_p = 44$  dBmV;  
 $f_q = 691.25$  MHz;  $V_q = 44$  dBmV;  
measured at  $f_p + f_q = 746.5$  MHz.
- Measured 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.
- The module normally operates at  $V_B = 24$  V, but is able to withstand supply transients up to 30 V.

## CATV amplifier module

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**Table 2** Bandwidth 40 to 600 MHz;  $V_B = 24$  V;  $T_{mb} = 35$  °C;  $Z_S = Z_L = 75$   $\Omega$ 

| SYMBOL    | PARAMETER                         | CONDITIONS                                                   | MIN. | MAX.      | UNIT |
|-----------|-----------------------------------|--------------------------------------------------------------|------|-----------|------|
| $G_p$     | power gain                        | $f = 50$ MHz                                                 | 19.5 | 20.5      | dB   |
|           |                                   | $f = 600$ MHz                                                | 20   | –         | dB   |
| SL        | slope cable equivalent            | $f = 40$ to 600 MHz                                          | 0    | 2         | dB   |
| FL        | flatness of frequency response    | $f = 40$ to 600 MHz                                          | –    | $\pm 0.2$ | dB   |
| $S_{11}$  | input return losses               | $f = 40$ to 80 MHz                                           | 20   | –         | dB   |
|           |                                   | $f = 80$ to 160 MHz                                          | 19   | –         | dB   |
|           |                                   | $f = 160$ to 320 MHz                                         | 18   | –         | dB   |
|           |                                   | $f = 320$ to 600 MHz                                         | 17   | –         | dB   |
| $S_{22}$  | output return losses              | $f = 40$ to 80 MHz                                           | 20   | –         | dB   |
|           |                                   | $f = 80$ to 160 MHz                                          | 19   | –         | dB   |
|           |                                   | $f = 160$ to 320 MHz                                         | 18   | –         | dB   |
|           |                                   | $f = 320$ to 600 MHz                                         | 17   | –         | dB   |
| $S_{21}$  | phase response                    | $f = 50$ MHz                                                 | –45  | +45       | deg  |
| CTB       | composite triple beat             | 85 channels flat; $V_o = 44$ dBmV;<br>measured at 595.25 MHz | –    | –64       | dB   |
| $X_{mod}$ | cross modulation                  | 85 channels flat; $V_o = 44$ dBmV;<br>measured at 55.25 MHz  | –    | –64       | dB   |
| CSO       | composite second order distortion | 85 channels flat; $V_o = 44$ dBmV;<br>measured at 596.5 MHz  | –    | –58       | dB   |
| $d_2$     | second order distortion           | note 1                                                       | –    | –68       | dB   |
| $V_o$     | output voltage                    | $d_{im} = -60$ dB; note 2                                    | 63   | –         | dBmV |
| F         | noise figure                      | see Table 1                                                  | –    | –         | dB   |
| $I_{tot}$ | total current consumption (DC)    | note 3                                                       | –    | 435       | mA   |

**Notes**

- $f_p = 55.25$  MHz;  $V_p = 44$  dBmV;  
 $f_q = 541.25$  MHz;  $V_q = 44$  dBmV;  
measured at  $f_p + f_q = 596.5$  MHz.
- Measured according to DIN45004B:  
 $f_p = 590.25$  MHz;  $V_p = V_o$ ;  
 $f_q = 597.25$  MHz;  $V_q = V_o - 6$  dB;  
 $f_r = 599.25$  MHz;  $V_r = V_o - 6$  dB;  
measured at  $f_p + f_q - f_r = 588.25$  MHz.
- The module normally operates at  $V_B = 24$  V, but is able to withstand supply transients up to 30 V.

## CATV amplifier module

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**Table 3** Bandwidth 40 to 550 MHz;  $V_B = 24$  V;  $T_{mb} = 35$  °C;  $Z_S = Z_L = 75$   $\Omega$ 

| SYMBOL    | PARAMETER                         | CONDITIONS                                                   | MIN. | MAX.      | UNIT |
|-----------|-----------------------------------|--------------------------------------------------------------|------|-----------|------|
| $G_p$     | power gain                        | $f = 50$ MHz                                                 | 19.5 | 20.5      | dB   |
|           |                                   | $f = 550$ MHz                                                | 20   | –         | dB   |
| SL        | slope cable equivalent            | $f = 40$ to 550 MHz                                          | 0    | 2         | dB   |
| FL        | flatness of frequency response    | $f = 40$ to 550 MHz                                          | –    | $\pm 0.2$ | dB   |
| $S_{11}$  | input return losses               | $f = 40$ to 80 MHz                                           | 20   | –         | dB   |
|           |                                   | $f = 80$ to 160 MHz                                          | 19   | –         | dB   |
|           |                                   | $f = 160$ to 320 MHz                                         | 18   | –         | dB   |
|           |                                   | $f = 320$ to 550 MHz                                         | 17   | –         | dB   |
| $S_{22}$  | output return losses              | $f = 40$ to 80 MHz                                           | 20   | –         | dB   |
|           |                                   | $f = 80$ to 160 MHz                                          | 19   | –         | dB   |
|           |                                   | $f = 160$ to 320 MHz                                         | 18   | –         | dB   |
|           |                                   | $f = 320$ to 550 MHz                                         | 17   | –         | dB   |
| $S_{21}$  | phase response                    | $f = 50$ MHz                                                 | –45  | +45       | deg  |
| CTB       | composite triple beat             | 77 channels flat; $V_o = 44$ dBmV;<br>measured at 547.25 MHz | –    | –66       | dB   |
| $X_{mod}$ | cross modulation                  | 77 channels flat; $V_o = 44$ dBmV;<br>measured at 55.25 MHz  | –    | –66       | dB   |
| CSO       | composite second order distortion | 77 channels flat; $V_o = 44$ dBmV;<br>measured at 548.5 MHz  | –    | –60       | dB   |
| $d_2$     | second order distortion           | note 1                                                       | –    | –70       | dB   |
| $V_o$     | output voltage                    | $d_{im} = -60$ dB; note 2                                    | 63.5 | –         | dBmV |
| F         | noise figure                      | see Table 1                                                  | –    | –         | dB   |
| $I_{tot}$ | total current consumption (DC)    | note 3                                                       | –    | 435       | mA   |

**Notes**

- $f_p = 55.25$  MHz;  $V_p = 44$  dBmV;  
 $f_q = 493.25$  MHz;  $V_q = 44$  dBmV;  
measured at  $f_p + f_q = 548.5$  MHz.
- Measured 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.
- The module normally operates at  $V_B = 24$  V, but is able to withstand supply transients up to 30 V.

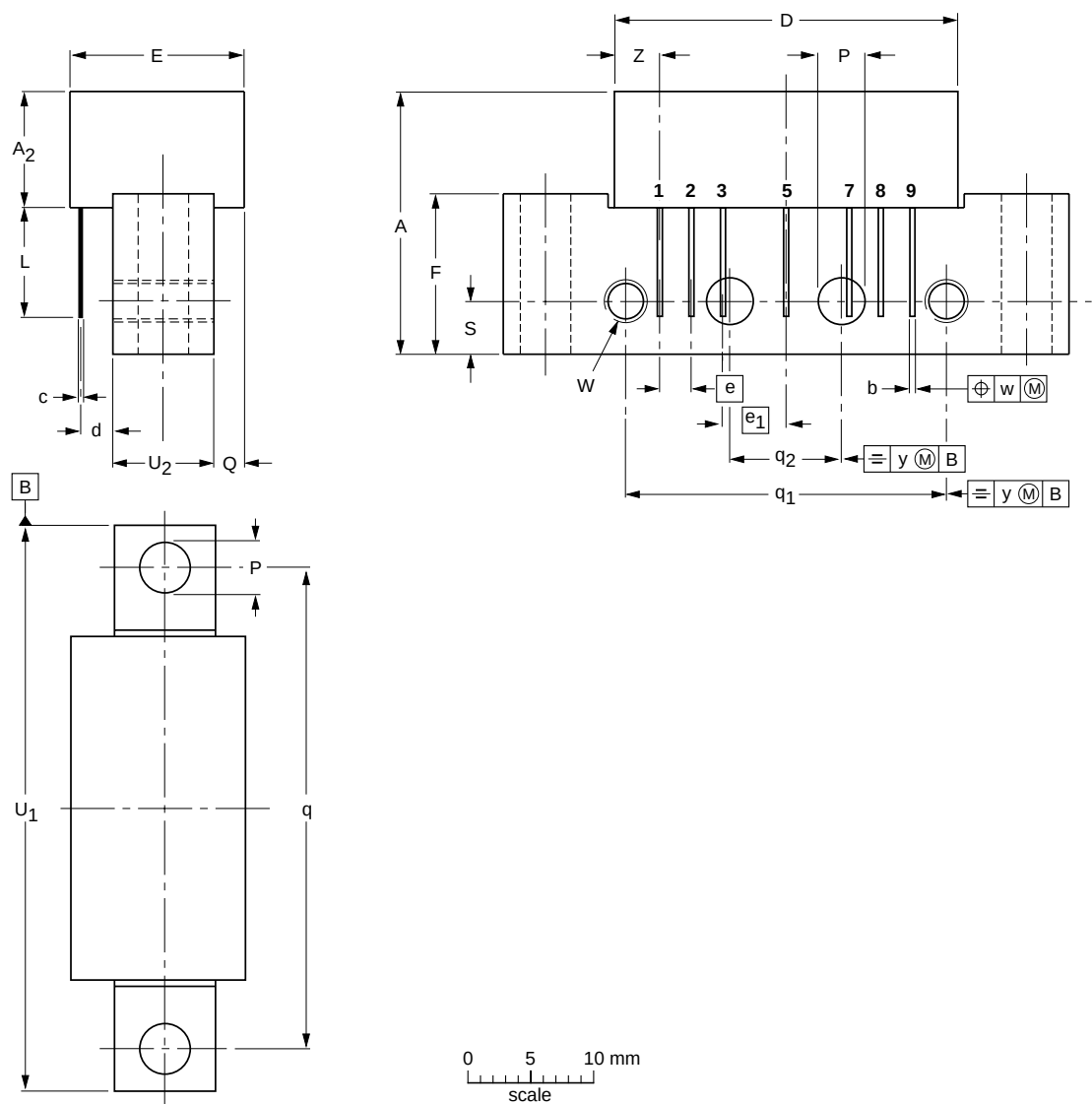
CATV amplifier module

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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<br>max. | A <sub>2</sub><br>max. | b            | c    | D<br>max. | d<br>max. | E<br>max. | e    | e <sub>1</sub> | F    | L<br>min. | Ø P          | Q<br>max. | q    | q <sub>1</sub> | q <sub>2</sub> | S   | U <sub>1</sub><br>max. | U <sub>2</sub> | W           | w    | y   | Z<br>max. |
|------|-----------|------------------------|--------------|------|-----------|-----------|-----------|------|----------------|------|-----------|--------------|-----------|------|----------------|----------------|-----|------------------------|----------------|-------------|------|-----|-----------|
| mm   | 20.8      | 9.1                    | 0.51<br>0.38 | 0.25 | 27.2      | 2.54      | 13.75     | 2.54 | 5.08           | 12.7 | 8.8       | 4.15<br>3.85 | 2.4       | 38.1 | 25.4           | 10.2           | 4.2 | 44.75                  | 8              | 6-32<br>UNC | 0.25 | 0.1 | 3.8       |

| OUTLINE<br>VERSION | REFERENCES |       |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE |
|--------------------|------------|-------|------|--|------------------------|------------|
|                    | IEC        | JEDEC | EIAJ |  |                        |            |
| SOT115J            |            |       |      |  |                        | 97-04-10   |

## CATV amplifier module

BGD704N

**DEFINITIONS**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Data sheet status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                       |
| Objective specification                                                                                                                                                                                                                                                                                                                                                                                                                                   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification                                                                                                                                                                                                                                                                                                                                                                                                                                 | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification                                                                                                                                                                                                                                                                                                                                                                                                                                     | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                       |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |                                                                                       |
| <b>Application information</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                       |                                                                                       |

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