

# 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

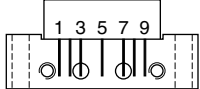
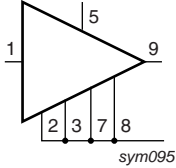
Table 1. Quick reference data

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
$I_{\text{tot}}$	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 <sub>B</sub>		
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 <sub>i</sub>	RF input voltage		-	65	dBmV
T <sub>stg</sub>	storage temperature		-40	+100	°C
T <sub>mb</sub>	mounting base operating temperature		-20	+100	°C

## 5. Characteristics

**Table 5. Characteristics**

*Bandwidth 40 MHz to 750 MHz; V<sub>B</sub> = 24 V; T<sub>mb</sub> = 35 °C; Z<sub>S</sub> = Z<sub>L</sub> = 75 Ω.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G <sub>p</sub>	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 <sub>11</sub>	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 <sub>22</sub>	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 <sub>21</sub>	phase response	f = 50 MHz	-45	-	+45	deg
CTB	composite triple beat	110 channels flat; V <sub>o</sub> = 44 dBmV; measured at 745.25 MHz	-	-58	-57	dB
X <sub>mod</sub>	cross modulation	110 channels flat; V <sub>o</sub> = 44 dBmV; measured at 55.25 MHz	-	-63	-61	dB
CSO	composite second order distortion	110 channels flat; V <sub>o</sub> = 44 dBmV; measured at 746.5 MHz	-	-61	-56	dB
d <sub>2</sub>	second order distortion		[1] -	-75	-66	dB
V <sub>o</sub>	output voltage	d <sub>im</sub> = -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 <sub>tot</sub>	total current consumption (DC)		[3] -	425	435	mA

[1] f<sub>p</sub> = 55.25 MHz; V<sub>p</sub> = 44 dBmV; f<sub>q</sub> = 691.25 MHz; V<sub>q</sub> = 44 dBmV; measured at f<sub>p</sub> + f<sub>q</sub> = 746.5 MHz.

[2] Measure according to DIN45004B; f<sub>p</sub> = 740.25 MHz; V<sub>p</sub> = V<sub>o</sub>; f<sub>q</sub> = 747.25 MHz; V<sub>q</sub> = V<sub>o</sub> - 6 dB; f<sub>r</sub> = 749.25 MHz; V<sub>r</sub> = V<sub>o</sub> - 6 dB; measured at f<sub>p</sub> + f<sub>q</sub> - f<sub>r</sub> = 738.25 MHz.

[3] The module normally operates at V<sub>B</sub> = 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 <sub>p</sub>	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 <sub>11</sub>	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 <sub>22</sub>	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 <sub>21</sub>	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 <a href="#">Table 5</a>	-	-	-	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	$f = 40\text{ MHz to }550\text{ MHz}$	-	-	$\pm 0.3$	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 <a href="#">Table 5</a>	-	-	-	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;  $Z_S = Z_L = 75 \Omega$ .

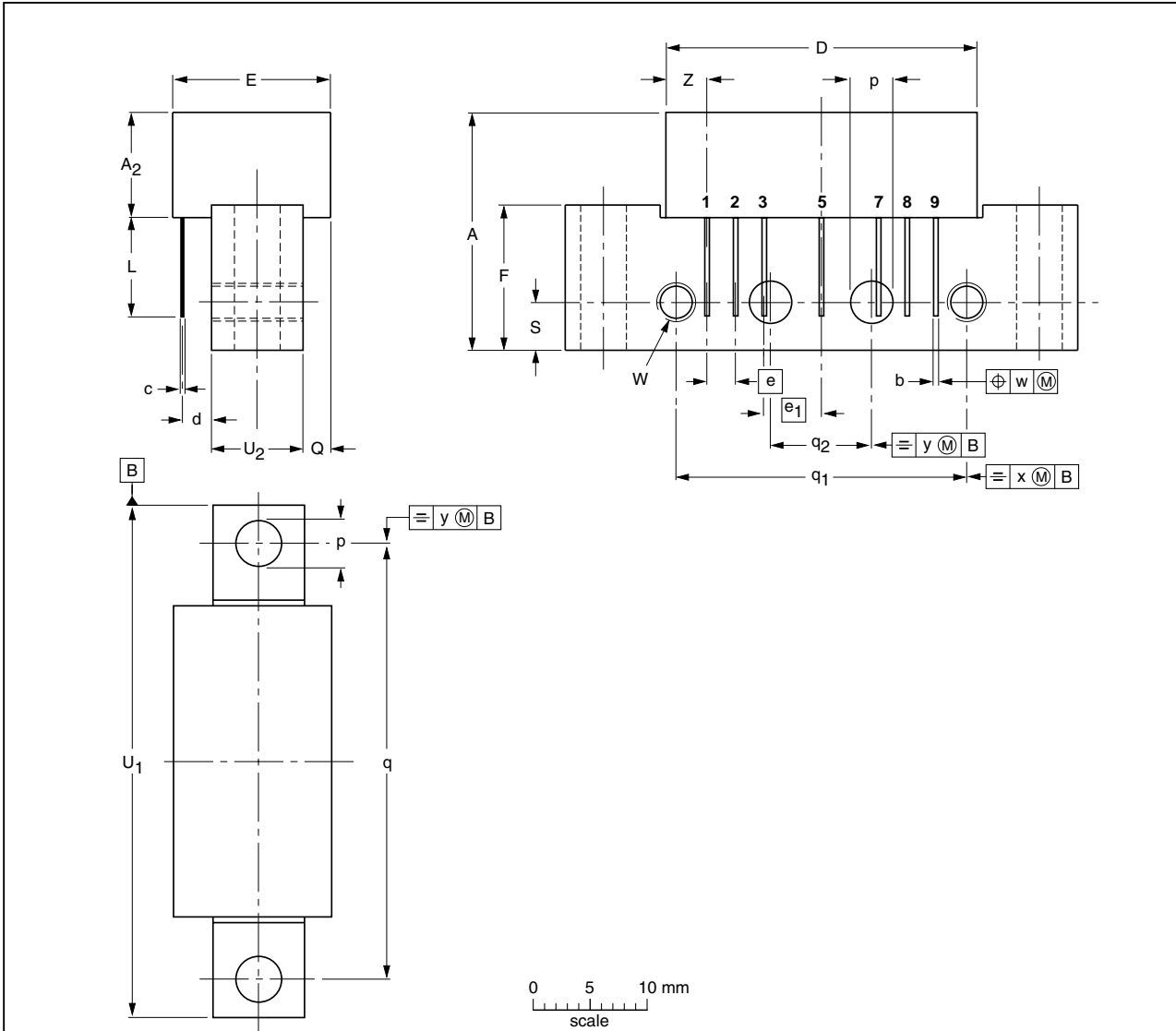
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
G <sub>p</sub>	power gain	f = 50 MHz	19.5	20	20.5	dB	
		f = 450 MHz	20	20.6	-	dB	
SL	slope cable equivalent	f = 40 MHz to 450 MHz	0	-	2	dB	
FL	flatness of frequency response	f = 40 MHz to 450 MHz	-	-	±0.3	dB	
S <sub>11</sub>	input return losses	f = 40 MHz 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 <sub>22</sub>	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 <sub>21</sub>	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 <sub>mod</sub>	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 <sub>2</sub>	second order distortion		[1]	-	-	-73	dB
V <sub>o</sub>	output voltage	d <sub>im</sub> = -60 dB	[2]	66	-	-	dBmV
F	noise figure	see <a href="#">Table 5</a>	-	-	-	dB	
I <sub>tot</sub>	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 <sub>2</sub> max.	b	c	D max.	d	E max.	e	e <sub>1</sub>	F	L min.	p	Q max.	q	q <sub>1</sub>	q <sub>2</sub>	S	U <sub>1</sub>	U <sub>2</sub>	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"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• Package outline drawings have been updated to the latest version.</li> </ul>		
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 <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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