

# BGD902

860 MHz, 18.5 dB gain power doubler amplifier

Rev. 08 — 7 June 2007

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features

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

### 1.3 Applications

- CATV systems operating in the 40 MHz to 900 MHz frequency range.

### 1.4 Quick reference data

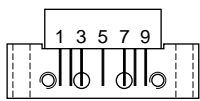
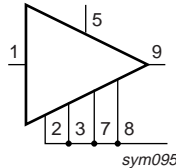
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$f = 50$ MHz	18.2	18.5	18.8	dB
		$f = 900$ MHz	19	19.5	20	dB
$I_{tot}$	total current consumption (DC)	[1]	405	420	435	mA

[1] The module normally operates at  $V_B = 24$  V, but is able to withstand supply transients up to 35 V.

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	input		
2, 3	common		
5	+ $V_B$		
7, 8	common		
9	output		

### 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
BGD902	-	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
$V_B$	supply voltage		-	30	V
$V_i$	RF input voltage		-	70	dBmV
$T_{stg}$	storage temperature		-40	+100	°C
$T_{mb}$	mounting base temperature		-20	+100	°C

### 5. Characteristics

**Table 5. Characteristics**

*Bandwidth 40 MHz to 900 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	18.2	18.5	18.8	dB
		f = 900 MHz	19	19.5	20	dB
SL	slope cable equivalent	f = 40 MHz to 900 MHz	0.4	0.9	1.4	dB
FL	flatness of frequency response	f = 40 MHz to 900 MHz	-	±0.15	±0.3	dB
$S_{11}$	input return losses	f = 40 MHz to 80 MHz	21	23	-	dB
		f = 80 MHz to 160 MHz	22	24	-	dB
		f = 160 MHz to 320 MHz	21	24	-	dB
		f = 320 MHz to 550 MHz	18	23	-	dB
		f = 550 MHz to 650 MHz	17	23	-	dB
		f = 650 MHz to 750 MHz	16	24	-	dB
		f = 750 MHz to 900 MHz	16	26	-	dB
$S_{22}$	output return losses	f = 40 MHz to 80 MHz	25	32	-	dB
		f = 80 MHz to 160 MHz	23	31	-	dB
		f = 160 MHz to 320 MHz	20	29	-	dB
		f = 320 MHz to 550 MHz	20	28	-	dB
		f = 550 MHz to 650 MHz	19	31	-	dB
		f = 650 MHz to 750 MHz	18	29	-	dB
		f = 750 MHz to 900 MHz	17	22	-	dB

**Table 5. Characteristics ...continued**

Bandwidth 40 MHz to 900 MHz;  $V_B = 24\text{ V}$ ;  $T_{mb} = 35\text{ °C}$ ;  $Z_S = Z_L = 75\ \Omega$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$S_{21}$	phase response	$f = 50\text{ MHz}$	-45	-	+45	deg	
CTB	composite triple beat	49 chs flat; $V_o = 47\text{ dBmV}$ ; $f_m = 859.25\text{ MHz}$	-	-68.5	-67	dB	
		77 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 547.25\text{ MHz}$	-	-70	-68	dB	
		110 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 745.25\text{ MHz}$	-	-63.5	-62	dB	
		129 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 859.25\text{ MHz}$	-	-60	-58	dB	
		110 chs; $f_m = 400\text{ MHz}$ ; $V_o = 49\text{ dBmV}$ at 550 MHz	[1]	-	-64	-62	dB
		129 chs; $f_m = 650\text{ MHz}$ ; $V_o = 49.5\text{ dBmV}$ at 860 MHz	[2]	-	-58.5	-56.5	dB
$X_{mod}$	cross modulation	49 chs flat; $V_o = 47\text{ dBmV}$ ; $f_m = 55.25\text{ MHz}$	-	-66.5	-64	dB	
		77 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 55.25\text{ MHz}$	-	-69.5	-67	dB	
		110 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 55.25\text{ MHz}$	-	-66	-63.5	dB	
		129 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 55.25\text{ MHz}$	-	-64.5	-62	dB	
		110 chs; $f_m = 400\text{ MHz}$ ; $V_o = 49\text{ dBmV}$ at 550 MHz	[1]	-	-63	-60	dB
		129 chs; $f_m = 860\text{ MHz}$ ; $V_o = 49.5\text{ dBmV}$ at 860 MHz	[2]	-	-61	-58	dB
CSO	composite second order distortion	49 chs flat; $V_o = 47\text{ dBmV}$ ; $f_m = 860.5\text{ MHz}$	-	-65	-62	dB	
		77 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 548.5\text{ MHz}$	-	-72	-67	dB	
		110 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 746.5\text{ MHz}$	-	-65	-60	dB	
		129 chs flat; $V_o = 44\text{ dBmV}$ ; $f_m = 860.5\text{ MHz}$	-	-61	-58	dB	
		110 chs; $f_m = 250\text{ MHz}$ ; $V_o = 49\text{ dBmV}$ at 550 MHz	[1]	-	-67	-63	dB
		129 chs; $f_m = 250\text{ MHz}$ ; $V_o = 49.5\text{ dBmV}$ at 860 MHz	[2]	-	-62	-58	dB
IMD2	second order distortion		[3]	-	-80	-74	dB
			[4]	-	-83	-77	dB
			[5]	-	-84	-78	dB
$V_o$	output voltage	IMD = -60 dB	[6]	64.5	66	-	dBmV
			[7]	65.5	67	-	dBmV
			[8]	67.5	69	-	dBmV
		CTB compression = 1 dB; 129 chs flat; $f = 859.25\text{ MHz}$		48.5	49.5	-	dBmV
		CSO compression = 1 dB; 129 chs flat; $f = 860.5\text{ MHz}$		50	53	-	dBmV
F	noise figure	$f = 50\text{ MHz}$	-	4.5	5	dB	
		$f = 550\text{ MHz}$	-	5	5.5	dB	
		$f = 750\text{ MHz}$	-	5.5	6.5	dB	
		$f = 900\text{ MHz}$	-	6.5	8	dB	
$I_{tot}$	total current consumption (DC)		[9]	405	420	435	mA

[1] Tilt = 9 dB (50 MHz to 550 MHz); tilt = 3.5 dB at -6 dB offset (550 MHz to 750 MHz).

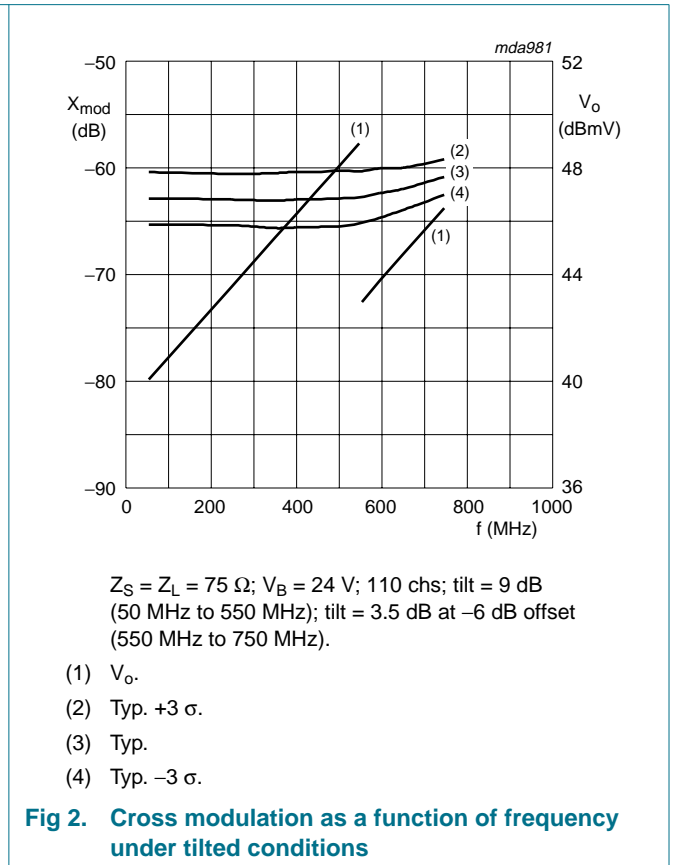
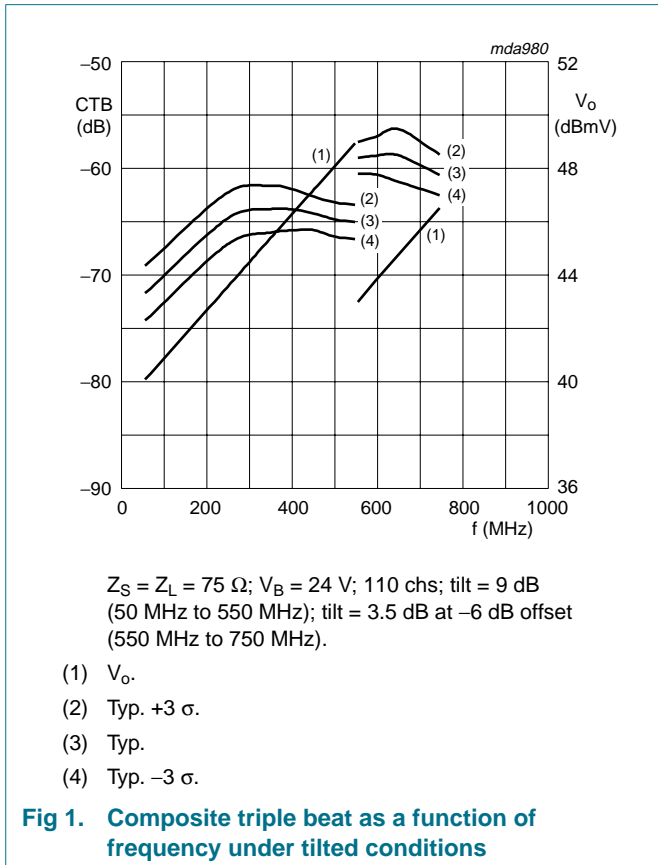
[2] Tilt = 12.5 dB (50 MHz to 860 MHz).

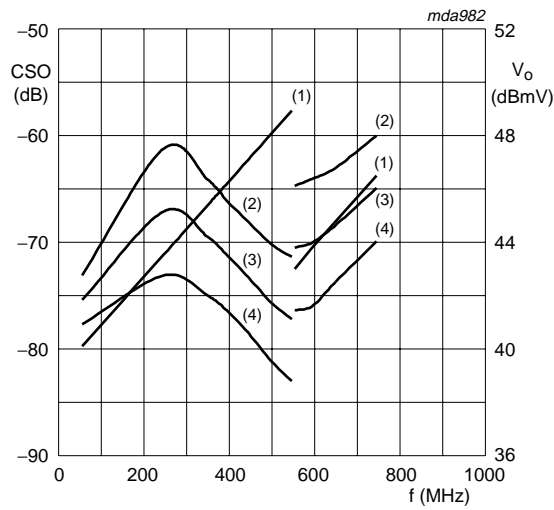
[3]  $f_p = 55.25\text{ MHz}$ ;  $V_p = 44\text{ dBmV}$ ;  $f_q = 805.25\text{ MHz}$ ;  $V_q = 44\text{ dBmV}$ ; measured at  $f_p + f_q = 860.5\text{ MHz}$ .

[4]  $f_p = 55.25\text{ MHz}$ ;  $V_p = 44\text{ dBmV}$ ;  $f_q = 691.25\text{ MHz}$ ;  $V_q = 44\text{ dBmV}$ ; measured at  $f_p + f_q = 746.5\text{ MHz}$ .

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

- [6] Measured according to DIN45004B:  $f_p = 851.25$  MHz;  $V_p = V_o$ ;  $f_q = 858.25$  MHz;  $V_q = V_o - 6$  dB;  $f_r = 860.25$  MHz;  $V_r = V_o - 6$  dB; measured at  $f_p + f_q - f_r = 849.25$  MHz.
- [7] 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.
- [8] 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.
- [9] The module normally operates at  $V_B = 24$  V, but is able to withstand supply transients up to 35 V.

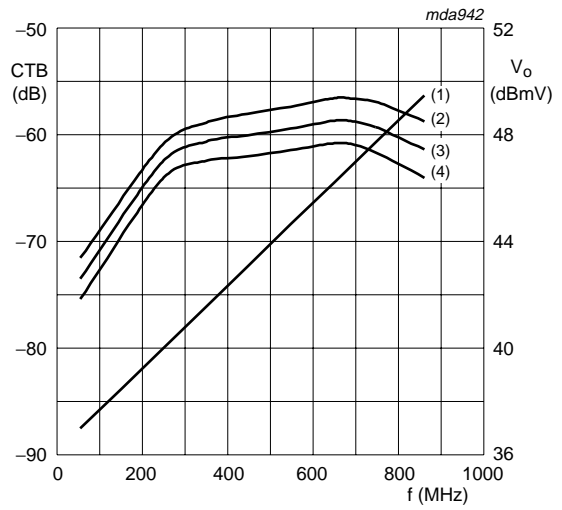




$Z_S = Z_L = 75 \Omega$ ;  $V_B = 24 \text{ V}$ ; 110 chs; tilt = 9 dB (50 MHz to 550 MHz); tilt = 3.5 dB at -6 dB offset (550 MHz to 750 MHz).

- (1)  $V_o$ .
- (2) Typ. +3  $\sigma$ .
- (3) Typ.
- (4) Typ. -3  $\sigma$ .

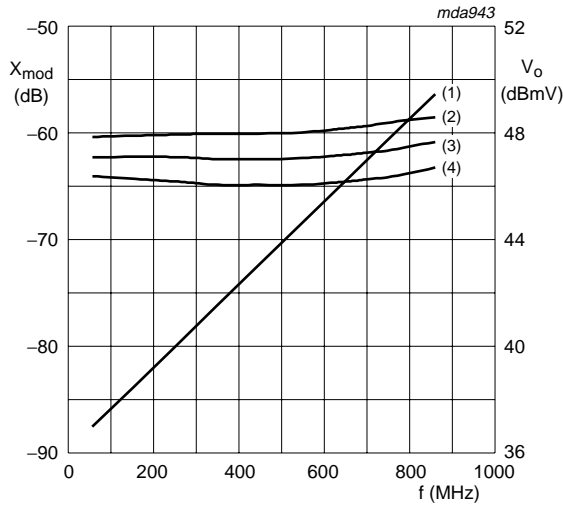
**Fig 3. Composite second order distortion as a function of frequency under tilted conditions**



$Z_S = Z_L = 75 \Omega$ ;  $V_B = 24 \text{ V}$ ; 129 chs; tilt = 12.5 dB (50 MHz to 860 MHz).

- (1)  $V_o$ .
- (2) Typ. +3  $\sigma$ .
- (3) Typ.
- (4) Typ. -3  $\sigma$ .

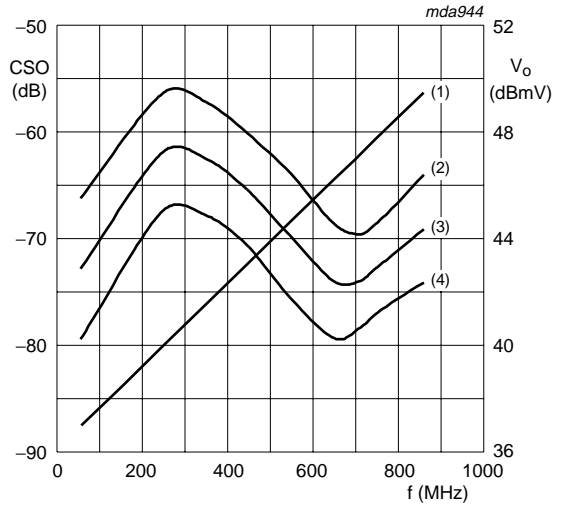
**Fig 4. Composite triple beat as a function of frequency under tilted conditions**



$Z_S = Z_L = 75 \Omega$ ;  $V_B = 24 \text{ V}$ ; 129 chs; tilt = 12.5 dB  
(50 MHz to 860 MHz).

- (1)  $V_o$ .
- (2) Typ. +3  $\sigma$ .
- (3) Typ.
- (4) Typ. -3  $\sigma$ .

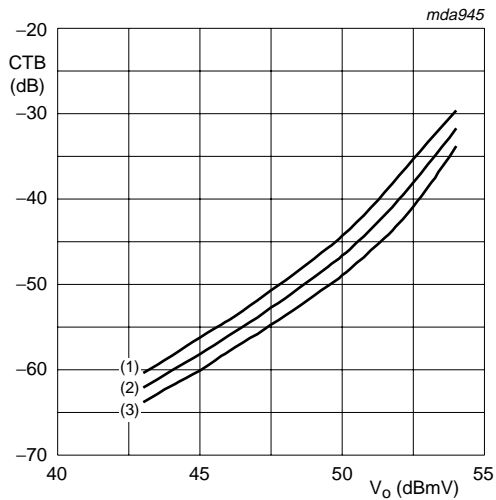
**Fig 5. Cross modulation as a function of frequency under tilted conditions**



$Z_S = Z_L = 75 \Omega$ ;  $V_B = 24 \text{ V}$ ; 129 chs; tilt = 12.5 dB  
(50 MHz to 860 MHz).

- (1)  $V_o$ .
- (2) Typ. +3  $\sigma$ .
- (3) Typ.
- (4) Typ. -3  $\sigma$ .

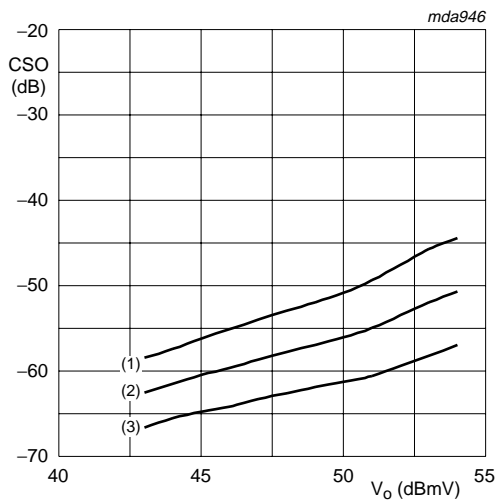
**Fig 6. Composite second order distortion as a function of frequency under tilted conditions**



$Z_S = Z_L = 75 \Omega$ ;  $V_B = 24 \text{ V}$ ; 129 chs;  
 $f_m = 859.25 \text{ MHz}$ .

- (1) Typ. +3  $\sigma$ .
- (2) Typ.
- (3) Typ. -3  $\sigma$ .

**Fig 7. Composite triple beat as a function of output voltage**



$Z_S = Z_L = 75 \Omega$ ;  $V_B = 24 \text{ V}$ ; 129 chs;  $f_m = 860.5 \text{ MHz}$ .

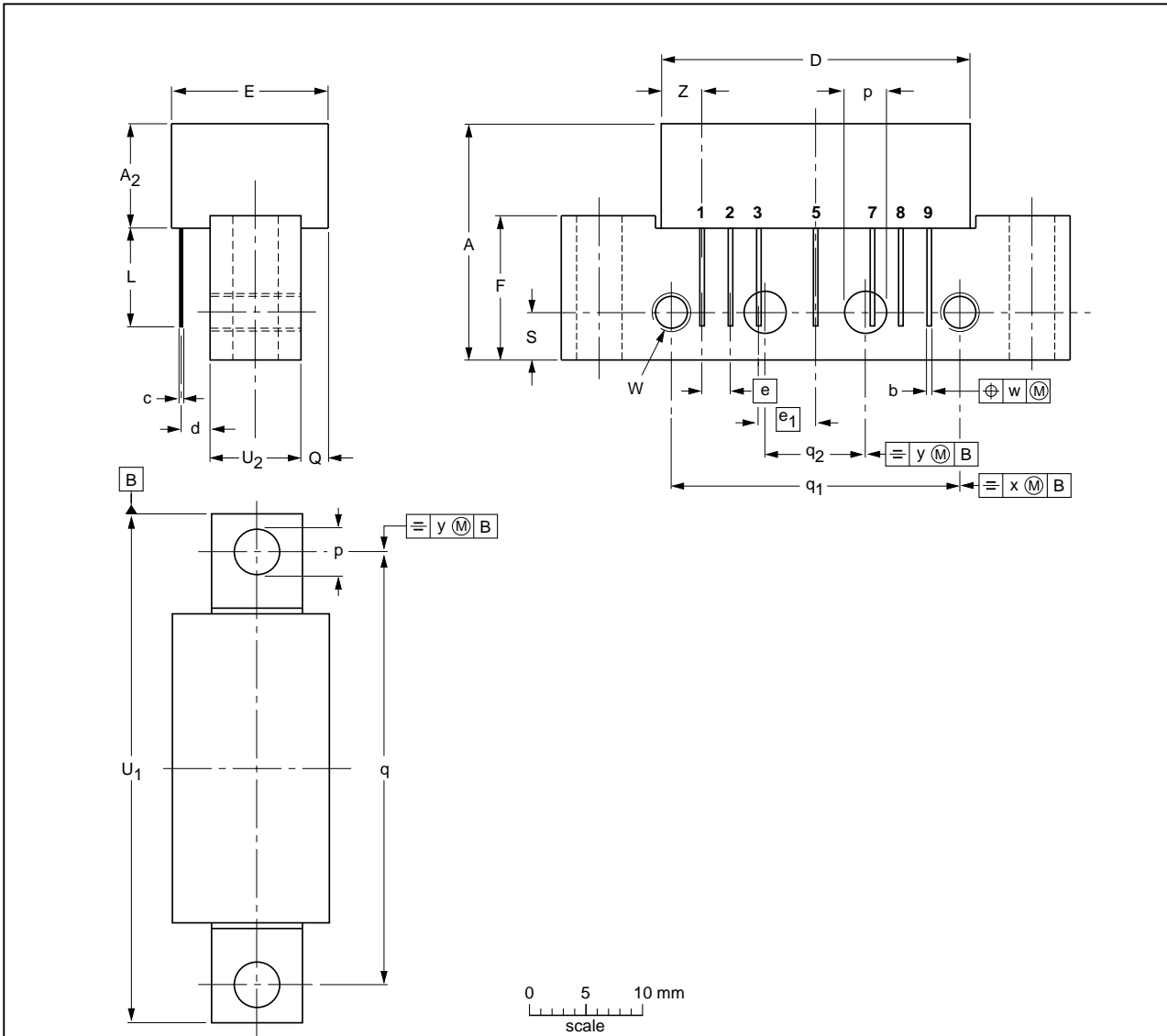
- (1) Typ. +3  $\sigma$ .
- (2) Typ.
- (3) Typ. -3  $\sigma$ .

**Fig 8. Composite second order distortion as a function of output voltage**

**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 max.	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	9.1	0.51 0.38	0.25	27.2	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						-99-02-06 04-02-04

**Fig 9. Package outline SOT115J**

## 7. Revision history

**Table 6. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGD902_8	20070607	Product data sheet		BGD902_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><a href="#">Table 5 "Characteristics"</a>: updated values of <math>s_{11}</math> and <math>s_{22}</math>.</li> </ul>	
BGD902_7	20050308	Product data sheet		BGD902_902MI_6
BGD902_902MI_6	20011102	Product specification		BGD902_902MI_5
BGD902_902MI_5	19990329	Product specification		BGD902_N_3 and BGD902MI_N_1
BGD902_N_3	19980709	Preliminary specification		BGD902_N_2
BGD902_N_2	19980609	Preliminary specification		BGD902_1
BGD902_1	19980312	Preliminary specification		-
BGD902MI_N_1	19980831	Preliminary 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".

[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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Date of release: 7 June 2007

Document identifier: BGD902\_8