

# 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

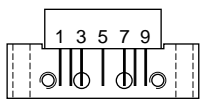
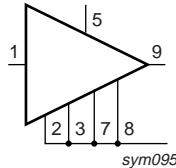
Table 1. Quick reference data

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;  $V_B = 24\text{ V}$ ;  $T_{mb} = 35\text{ }^\circ\text{C}$ ;  $Z_S = Z_L = 75\text{ }\Omega$ .

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).

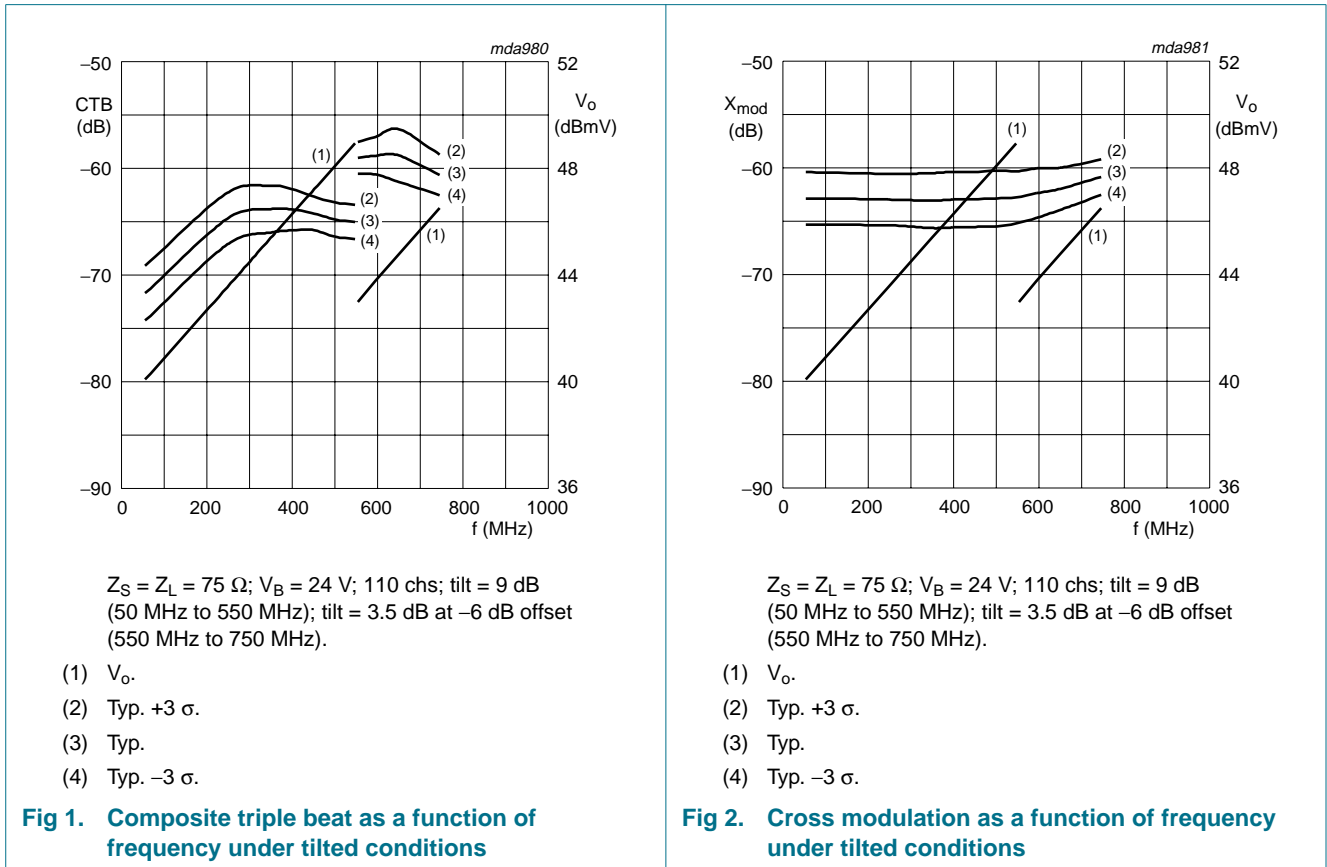
[2] Tilt = 12.5 dB (50 MHz to 860 MHz).

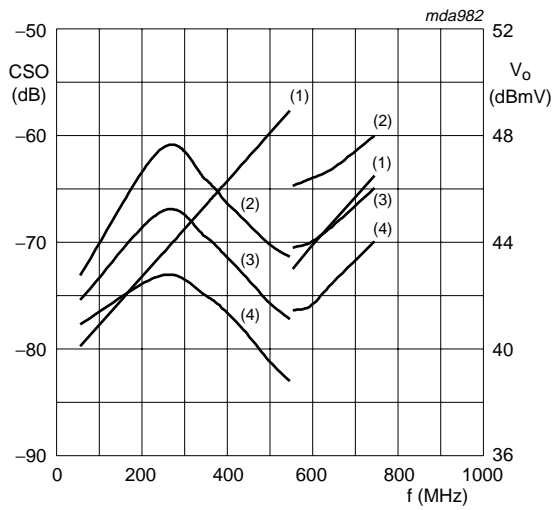
[3]  $f_p = 55.25\text{ MHz}$ ;  $V_p = 44\text{ dBmV}$ ;  $f_q = 805.25\text{ MHz}$ ;  $V_q = 44\text{ dBmV}$ ; measured at  $f_p + f_q = 860.5\text{ MHz}$ .

[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.

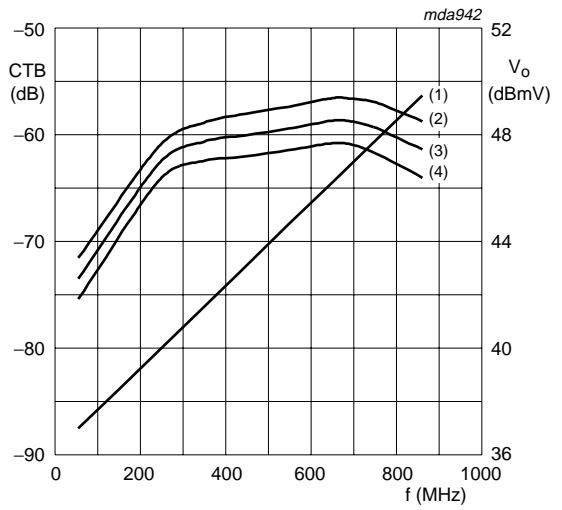




$Z_S = Z_L = 75 \Omega$ ;  $V_B = 24 \text{ V}$ ; 110 chs; tilt = 9 dB (50 MHz to 550 MHz); tilt = 3.5 dB at -6 dB offset (550 MHz to 750 MHz).

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

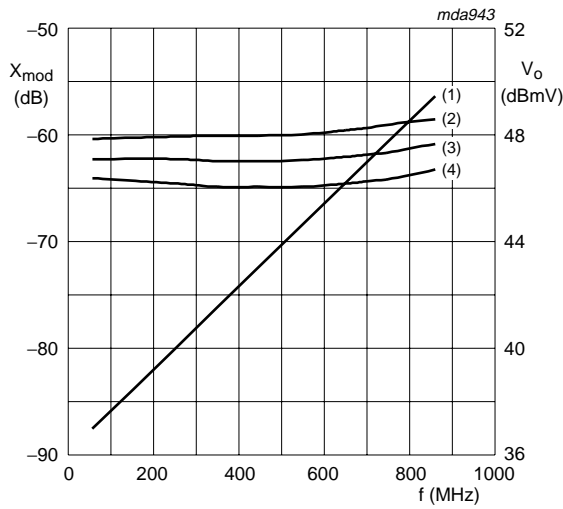
**Fig 3. Composite second order distortion as a function of frequency under tilted conditions**



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

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

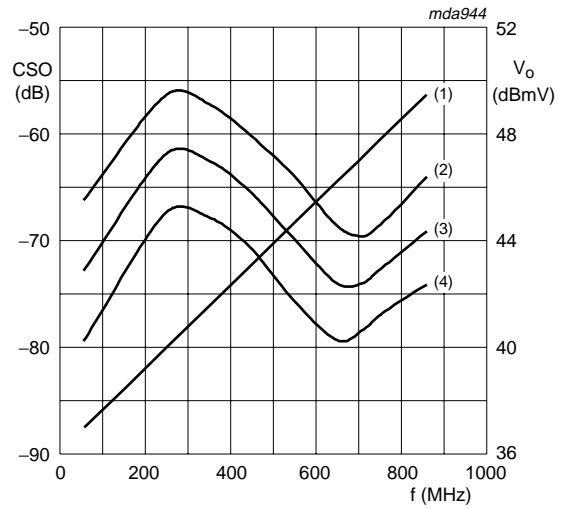
**Fig 4. Composite triple beat as a function of frequency under tilted conditions**



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

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

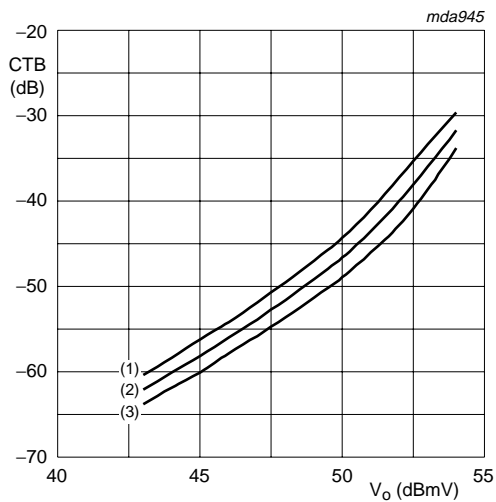
**Fig 5. Cross modulation as a function of frequency under tilted conditions**



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

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

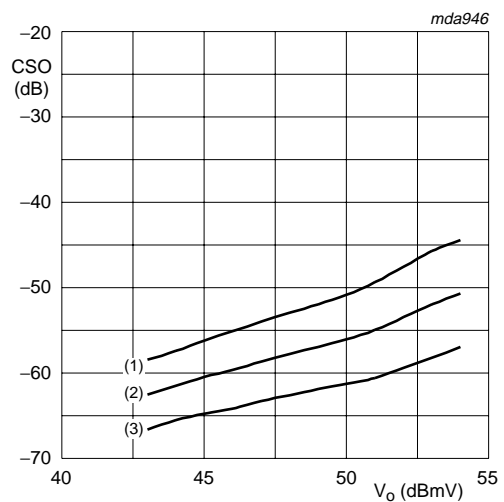
**Fig 6. Composite second order distortion as a function of frequency under tilted conditions**



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

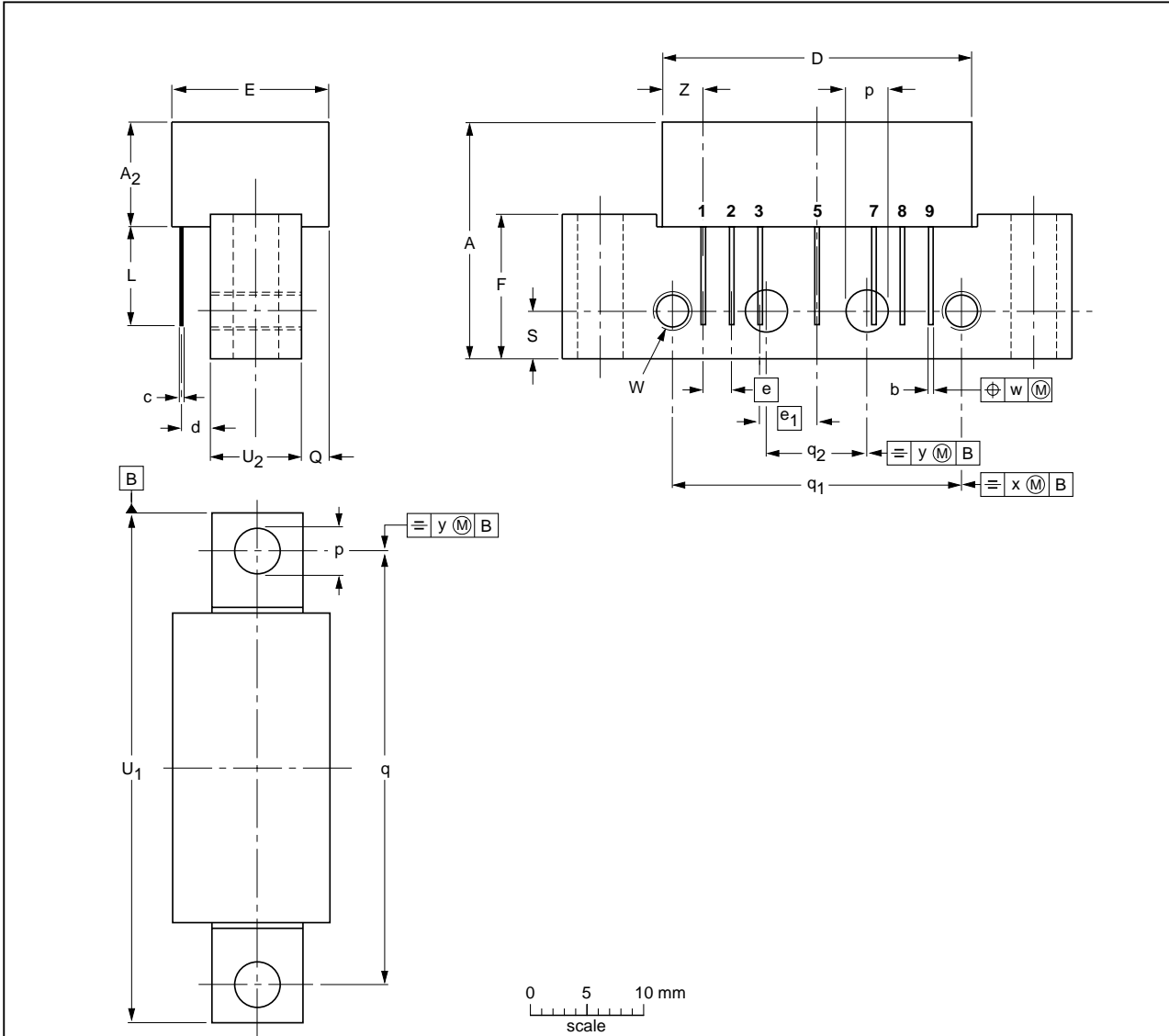
- (1) Typ. +3  $\sigma$ .
- (2) Typ.
- (3) Typ. -3  $\sigma$ .

**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".

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