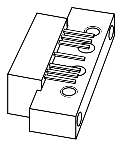


BGD902

860 MHz, 18.5 dB gain power doubler amplifier

Rev. 07 — 8 March 2005 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

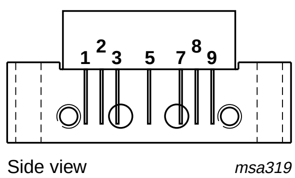
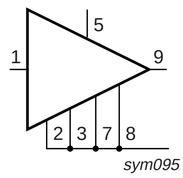
Table 1: Quick reference data

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		

PHILIPS

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
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	24	-	dB
		f = 80 MHz to 160 MHz	22	26	-	dB
		f = 160 MHz to 320 MHz	22	28	-	dB
		f = 320 MHz to 640 MHz	19	22	-	dB
		f = 640 MHz to 900 MHz	18	21	-	dB
s_{22}	output return losses	f = 40 MHz to 80 MHz	25	32	-	dB
		f = 80 MHz to 160 MHz	25	33	-	dB
		f = 160 MHz to 320 MHz	21	29	-	dB
		f = 320 MHz to 750 MHz	20	25	-	dB
		f = 750 MHz to 900 MHz	19	22	-	dB
s_{21}	phase response	f = 50 MHz	–45	-	+45	deg

Table 5: Characteristics *...continued*

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
CTB	composite triple beat	49 chs flat; V_o = 47 dBmV; f_m = 859.25 MHz		-	−68.5	−67	dB
		77 chs flat; V_o = 44 dBmV; f_m = 547.25 MHz		-	−70	−68	dB
		110 chs flat; V_o = 44 dBmV; f_m = 745.25 MHz		-	−63.5	−62	dB
		129 chs flat; V_o = 44 dBmV; f_m = 859.25 MHz		-	−60	−58	dB
		110 chs; f_m = 400 MHz; V_o = 49 dBmV at 550 MHz	[1]	-	−64	−62	dB
		129 chs; f_m = 650 MHz; V_o = 49.5 dBmV at 860 MHz	[2]	-	−58.5	−56.5	dB
X_{mod}	cross modulation	49 chs flat; V_o = 47 dBmV; f_m = 55.25 MHz		-	−66.5	−64	dB
		77 chs flat; V_o = 44 dBmV; f_m = 55.25 MHz		-	−69.5	−67	dB
		110 chs flat; V_o = 44 dBmV; f_m = 55.25 MHz		-	−66	−63.5	dB
		129 chs flat; V_o = 44 dBmV; f_m = 55.25 MHz		-	−64.5	−62	dB
		110 chs; f_m = 400 MHz; V_o = 49 dBmV at 550 MHz	[1]	-	−63	−60	dB
		129 chs; f_m = 860 MHz; V_o = 49.5 dBmV at 860 MHz	[2]	-	−61	−58	dB
CSO	composite second order distortion	49 chs flat; V_o = 47 dBmV; f_m = 860.5 MHz		-	−65	−62	dB
		77 chs flat; V_o = 44 dBmV; f_m = 548.5 MHz		-	−72	−67	dB
		110 chs flat; V_o = 44 dBmV; f_m = 746.5 MHz		-	−65	−60	dB
		129 chs flat; V_o = 44 dBmV; f_m = 860.5 MHz		-	−61	−58	dB
		110 chs; f_m = 250 MHz; V_o = 49 dBmV at 550 MHz	[1]	-	−67	−63	dB
		129 chs; f_m = 250 MHz; V_o = 49.5 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 MHz		48.5	49.5	-	dBmV
		CSO compression = 1 dB; 129 chs flat; f = 860.5 MHz		50	53	-	dBmV
F	noise figure	f = 50 MHz		-	4.5	5	dB
		f = 550 MHz		-	5	5.5	dB
		f = 750 MHz		-	5.5	6.5	dB
		f = 900 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 MHz; V_p = 44 dBmV; f_q = 805.25 MHz; V_q = 44 dBmV; measured at $f_p + f_q$ = 860.5 MHz.

[4] 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.

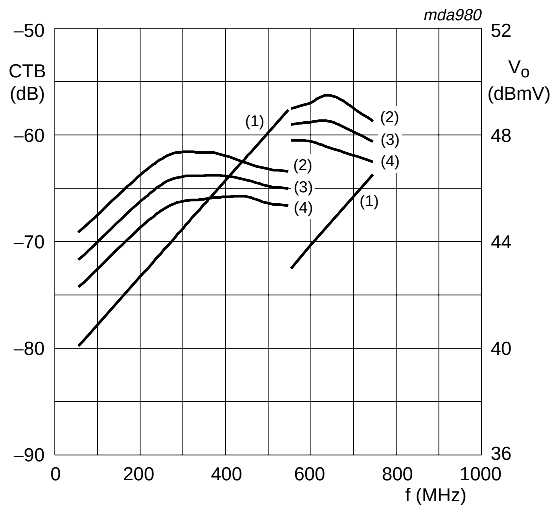
[5] f_p = 55.25 MHz; V_p = 44 dBmV; f_q = 493.25 MHz; V_q = 44 dBmV; measured at $f_p + f_q$ = 548.5 MHz.

[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 Ω; V_B = 24 V; 110 chs; tilt = 9 dB (50 MHz to 550 MHz); tilt = 3.5 dB at –6 dB offset (550 MHz to 750 MHz).

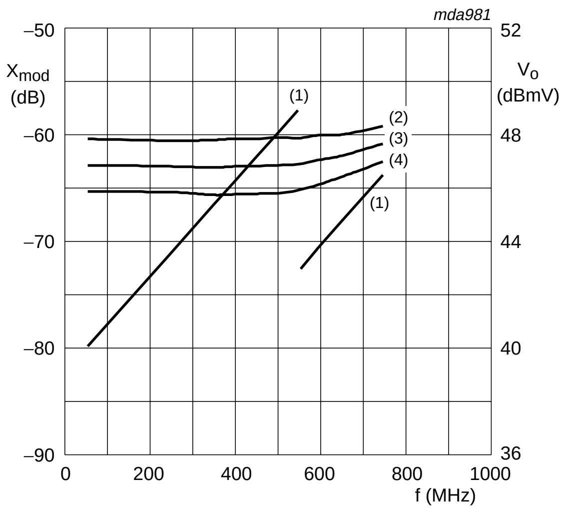
(1) V_o.

(2) Typ. +3 σ.

(3) Typ.

(4) Typ. –3 σ.

Fig 1. Composite triple beat as a function of frequency under tilted conditions



$Z_S = Z_L$ = 75 Ω; V_B = 24 V; 110 chs; tilt = 9 dB (50 MHz to 550 MHz); tilt = 3.5 dB at –6 dB offset (550 MHz to 750 MHz).

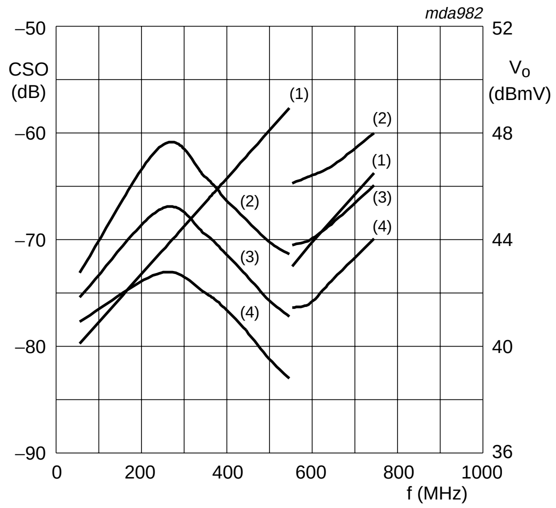
(1) V_o.

(2) Typ. +3 σ.

(3) Typ.

(4) Typ. –3 σ.

Fig 2. Cross modulation as a function of frequency under tilted conditions



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

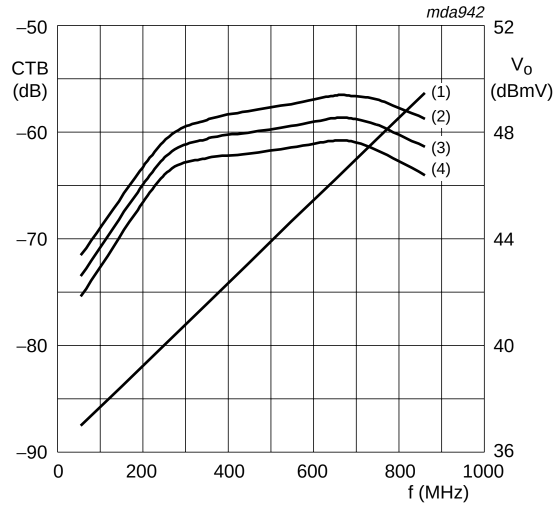
(1) V_o.

(2) Typ. +3 σ.

(3) Typ.

(4) Typ. –3 σ.

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



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

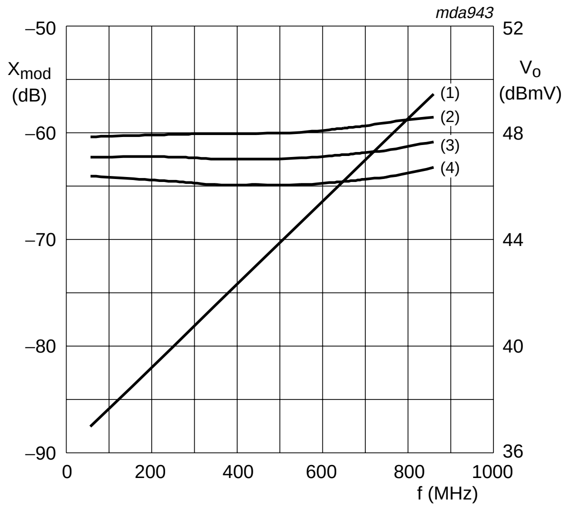
(1) V_o.

(2) Typ. +3 σ.

(3) Typ.

(4) Typ. –3 σ.

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



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

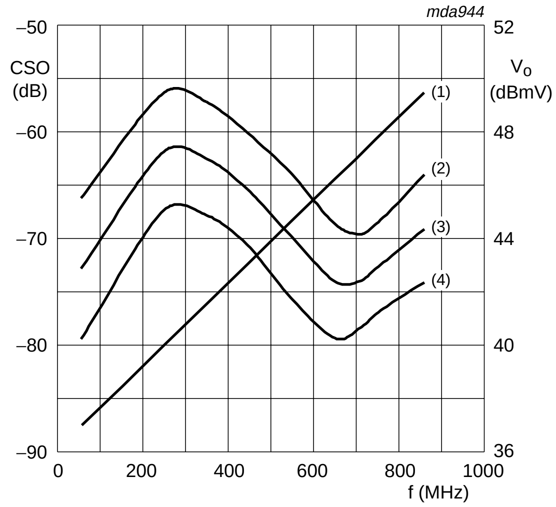
(1) V_o.

(2) Typ. +3 σ.

(3) Typ.

(4) Typ. −3 σ.

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



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

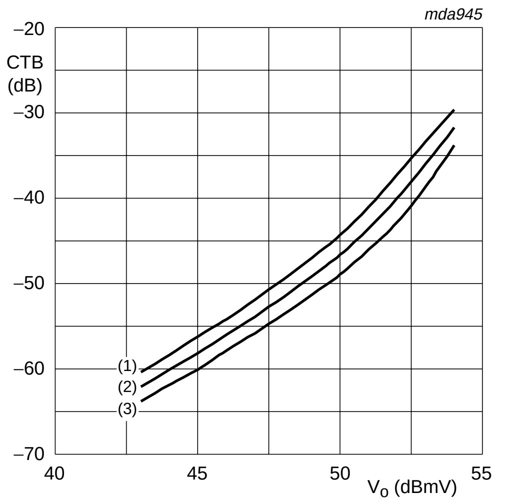
(1) V_o.

(2) Typ. +3 σ.

(3) Typ.

(4) Typ. −3 σ.

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



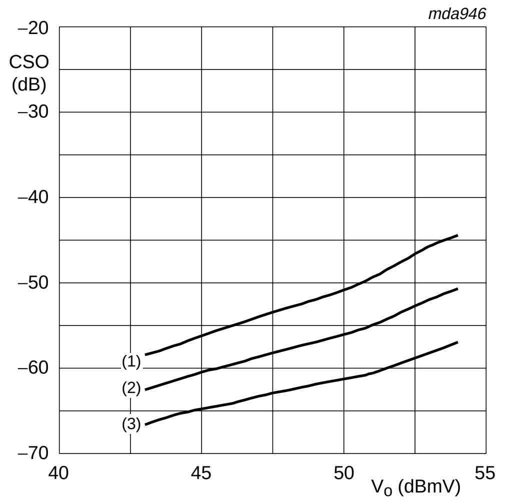
$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 129 chs; $f_m = 859.25$ MHz.

(1) Typ. +3 σ.

(2) Typ.

(3) Typ. −3 σ.

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



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

(1) Typ. +3 σ.

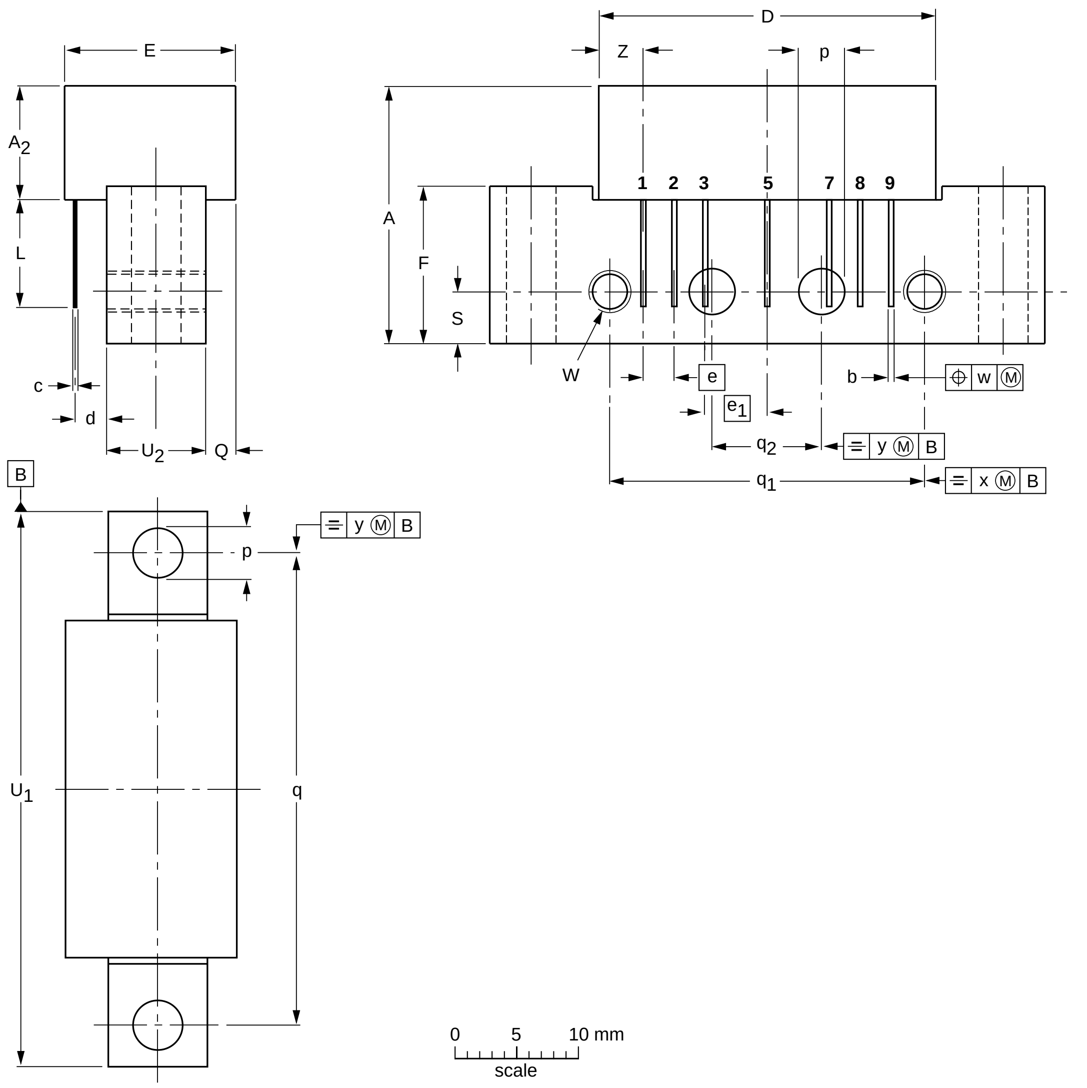
(2) Typ.

(3) Typ. −3 σ.

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_2 max.	b	c	D max.	d max.	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	9.1	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	Doc. number	Supersedes
BGD902_7	20050308	Product data sheet	-	9397 750 14435	BGD902_902MI_6
Modifications:	• The format of this data sheet has been redesigned to comply with the new representation and information standard of Philips Semiconductors. • Module BGD902MI withdrawn				
BGD902_902MI_6	20011102	Product specification	-	9397 750 08853	BGD902_902MI_5
BGD902_902MI_5	19990329	Product specification	-	9397 750 05481	BGD902_N_3 and BGD902MI_N_1
BGD902_N_3	19980709	Preliminary specification	-	9397 750 04076	BGD902_N_2
BGD902_N_2	19980609	Preliminary specification	-	9397 750 03949	BGD902_1
BGD902_1	19980312	Preliminary specification	-	9397 750 03454	-
BGD902MI_N_1	19980831	Preliminary specification	-	-	-

8. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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12. Contents

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