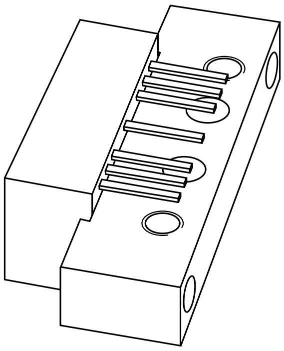
DISCRETE SEMICONDUCTORS

DATA SHEET



CGD914; CGD914MI

860 MHz, 20 dB gain power doubler amplifier

Product specification
Supersedes data of 2000 Jul 25

2001 Nov 01

860 MHz, 20 dB gain power doubler amplifier

CGD914; CGD914MI

FEATURES

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

APPLICATIONS

- CATV systems operating in the 40 to 870 MHz frequency range.

DESCRIPTION

Hybrid amplifier module in a SOT115J package operating at a voltage supply of 24 V (DC), employing both GaAs and Si dies. Both modules are electrically identical, only the pinning is different.

PINNING - SOT115J

PIN	DESCRIPTION	
	CGD914	CGD914MI
1	input	output
2 and 3	common	common
5	+V_B	+V_B
7 and 8	common	common
9	output	input

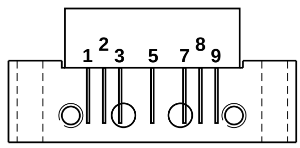


Fig.1 Simplified outline.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 45 MHz	19.75	20.25	dB
		f = 870 MHz	20.2	21.5	dB
I_{tot}	total current consumption (DC)	V_B = 24 V	345	375	mA

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	supply voltage	–	30	V
V_i	RF input voltage	–	–	
	single tone	–	70	dBmV
	132 channels flat	–	45	dBmV
T_{stg}	storage temperature	–40	+100	°C
T_{mb}	operating mounting base temperature	–20	+100	°C

CHARACTERISTICS

Bandwidth 45 to 870 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 = 45 MHz	19.75	20	20.25	dB
		f = 870 MHz	20.2	21	21.5	dB
SL	slope straight line	f = 45 to 870 MHz	0.2	1	1.5	dB
FL	flatness straight line	f = 45 to 100 MHz	–0.25	–	+0.25	dB
		f = 100 to 800 MHz	–0.6	–	+0.4	dB
		f = 800 to 870 MHz	–0.45	–	+0.2	dB
	flatness narrow band	in each 6 MHz segment	–	–	±0.1	dB
s_{11}	input return losses	f = 40 to 80 MHz	20	–	–	dB
		f = 80 to 160 MHz	20	–	–	dB
		f = 160 to 320 MHz	18	–	–	dB
		f = 320 to 550 MHz	16	–	–	dB
		f = 550 to 650 MHz	15	–	–	dB
		f = 650 to 750 MHz	14	–	–	dB
		f = 750 to 870 MHz	14	–	–	dB
		f = 870 to 914 MHz	10	–	–	dB
s_{22}	output return losses	f = 40 to 80 MHz	21	–	–	dB
		f = 80 to 160 MHz	21	–	–	dB
		f = 160 to 320 MHz	20	–	–	dB
		f = 320 to 550 MHz	19	–	–	dB
		f = 550 to 650 MHz	18	–	–	dB
		f = 650 to 750 MHz	17	–	–	dB
		f = 750 to 870 MHz	16	–	–	dB
		f = 870 to 914 MHz	14	–	–	dB
s_{21}	phase response	f = 50 MHz	–45	–	+45	deg
s_{12}	reverse isolation	RF_{out} to RF_{in}	–	–	22	dB
CTB	composite triple beat	79 chs; f_m = 445.25 MHz; note 1	–	–	–76	dB
		112 chs; f_m = 649.25 MHz; note 2	–	–	–64	dB
		132 chs; f_m = 745.25 MHz; note 3	–	–	–55	dB
		79 chs flat; V_o = 44 dBmV; f_m = 547.25 MHz	–	–	–73	dB
		112 chs flat; V_o = 44 dBmV; f_m = 745.25 MHz	–	–	–64	dB
		132 chs flat; V_o = 44 dBmV; f_m = 745.25 MHz	–	–	–60	dB
X_{mod}	cross modulation	79 chs; f_m = 55.25 MHz; note 1	–	–	–70	dB
		112 chs; f_m = 55.25 MHz; note 2	–	–	–62	dB
		132 chs; f_m = 55.25 MHz; note 3	–	–	–57	dB
		79 chs flat; V_o = 44 dBmV; f_m = 55.25 MHz	–	–	–69	dB
		112 chs flat; V_o = 44 dBmV; f_m = 55.25 MHz	–	–	–65	dB
		132 chs flat; V_o = 44 dBmV; f_m = 55.25 MHz	–	–	–63	dB

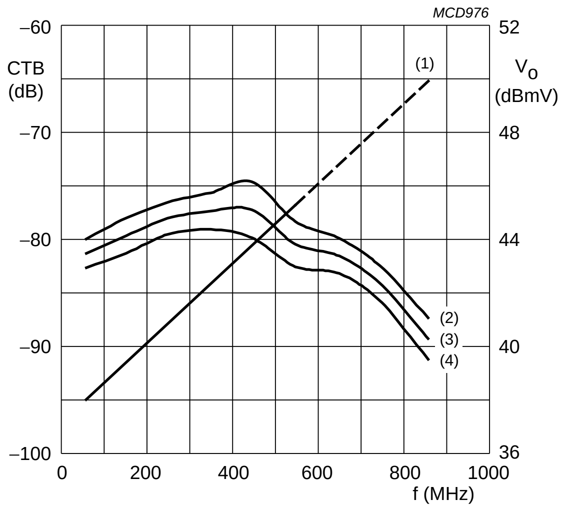
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
CSO Sum	composite second order distortion (sum)	79 chs; f_m = 446.5 MHz; note 1	–	–	–71	dB
		112 chs; f_m = 746.5 MHz; note 2	–	–	–60	dB
		132 chs; f_m = 860.5 MHz; note 3	–	–	–56	dB
		79 chs flat; V_o = 44 dBmV; f_m = 548.5 MHz	–	–	–63	dB
		112 chs flat; V_o = 44 dBmV; f_m = 746.5 MHz	–	–	–54	dB
		132 chs flat; V_o = 44 dBmV; f_m = 860.5 MHz	–	–	–49	dB
CSO Diff	composite second order distortion (diff)	79 chs; f_m = 150 MHz; note 1	–	–	–59	dB
		112 chs; f_m = 150 MHz; note 2	–	–	–53	dB
		132 chs; f_m = 150 MHz; note 3	–	–	–48	dB
		79 chs flat; V_o = 44 dBmV; f_m = 150 MHz	–	–	–60	dB
		112 chs flat; V_o = 44 dBmV; f_m = 150 MHz	–	–	–59	dB
		132 chs flat; V_o = 44 dBmV; f_m = 150 MHz	–	–	–57	dB
NF	noise figure	f = 50 MHz	–	2.5	3	dB
		f = 550 MHz	–	2.5	3	dB
		f = 750 MHz	–	2.6	3.5	dB
		f = 870 MHz	–	3	3.5	dB
d_2	second order distortion	note 4	–	–	–60	dB
		note 5	–	–	–54	dB
		note 6	–	–	–50	dB
V_o	output voltage	d_{im} = –60 dB; note 7	69	–	–	dBmV
		d_{im} = –60 dB; note 8	66	–	–	dBmV
		d_{im} = –60 dB; note 9	63	–	–	dBmV
I_{tot}	total current consumption (DC)	note 10	345	360	375	mA

Notes

1. V_o = 38 dBmV at 54 MHz; Tilt = 7.3 dB (55 to 547 MHz) extrapolated to 12 dB at 870 MHz.
2. V_o = 38 dBmV at 54 MHz; Tilt = 10.2 dB (55 to 745 MHz) extrapolated to 12 dB at 870 MHz.
3. V_o = 38 dBmV at 54 MHz; Tilt = 12 dB (55 to 865 MHz).
4. f_p = 55.25 MHz; V_p = 60 dBmV; f_q = 493.25 MHz; V_q = 60 dBmV; measured at $f_p + f_q$ = 548.5 MHz.
5. f_p = 55.25 MHz; V_p = 60 dBmV; f_q = 691.25 MHz; V_q = 60 dBmV; measured at $f_p + f_q$ = 746.5 MHz.
6. f_p = 55.25 MHz; V_p = 60 dBmV; f_q = 805.25 MHz; V_q = 60 dBmV; measured at $f_p + f_q$ = 860.5 MHz.
7. 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.
8. 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.
9. 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.
10. The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

860 MHz, 20 dB gain power doubler amplifier

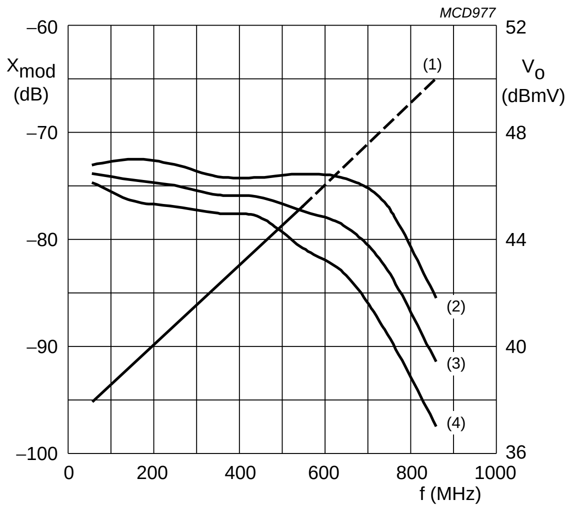
CGD914; CGD914MI



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs; tilt = 7.3 dB (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

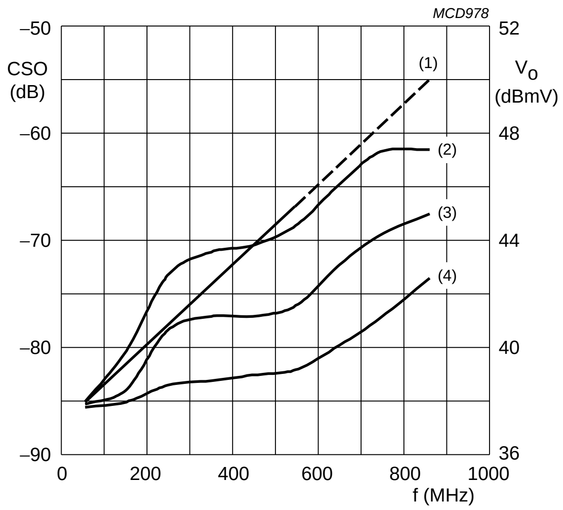
Fig.2 Composite triple beat as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs; tilt = 7.3 dB (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

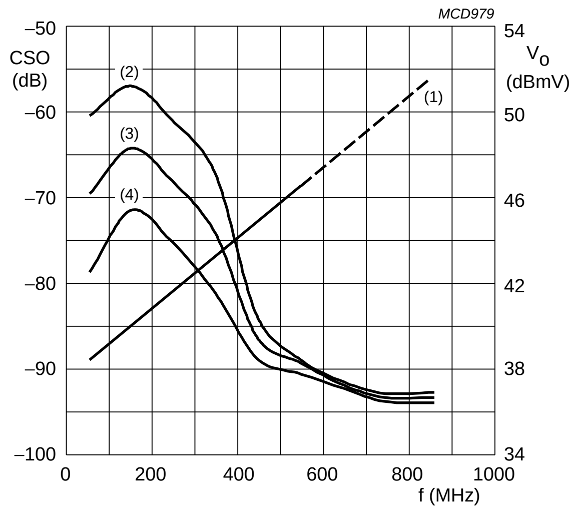
Fig.3 Cross modulation as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs; tilt = 7.3 dB (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

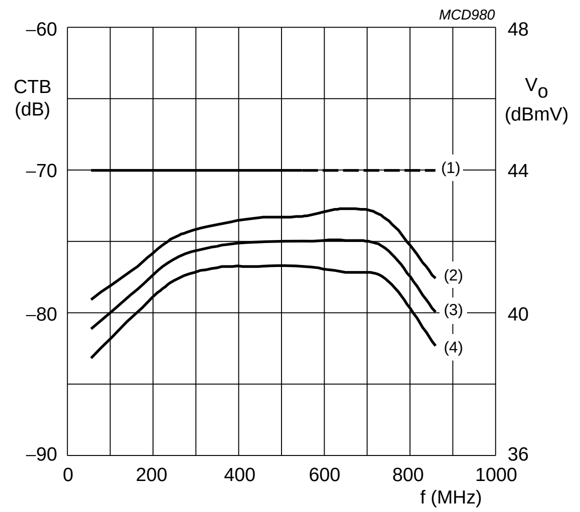
Fig.4 Composite second order distortion (sum) as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs; tilt = 7.3 dB (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

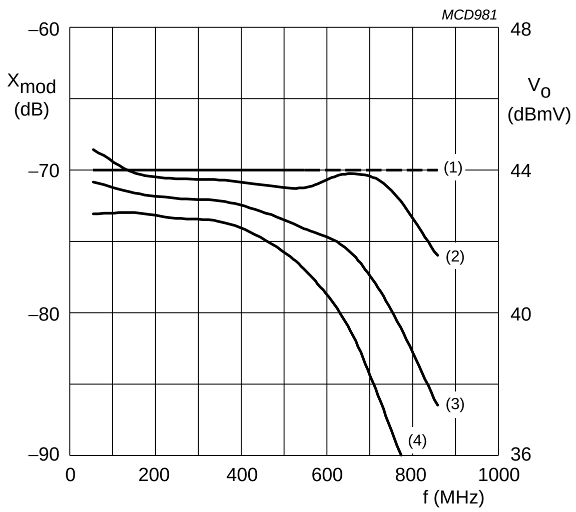
Fig.5 Composite second order distortion (diff) as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs flat (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

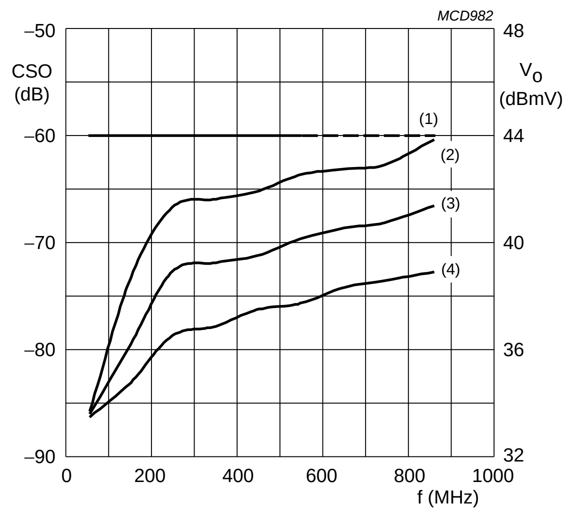
Fig.6 Composite triple beat as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs flat (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

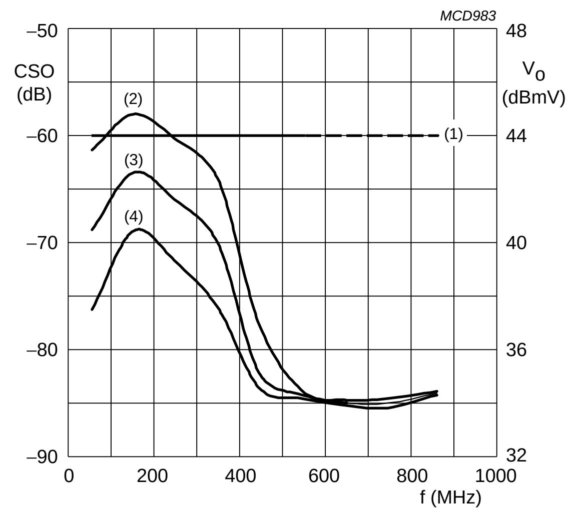
Fig.7 Cross modulation as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs flat (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

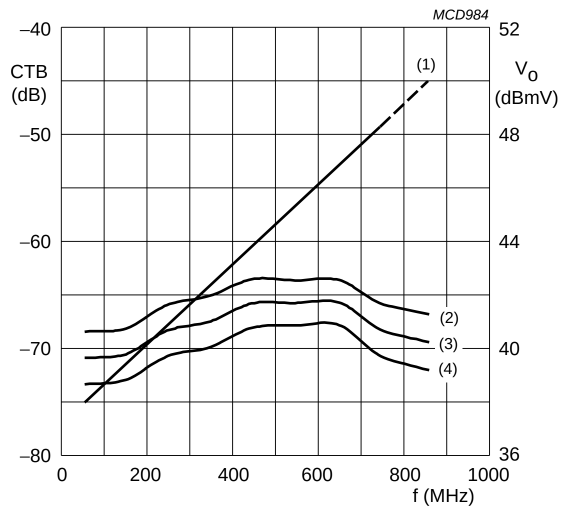
Fig.8 Composite second order distortion (sum) as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 79 chs flat (50 to 550 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

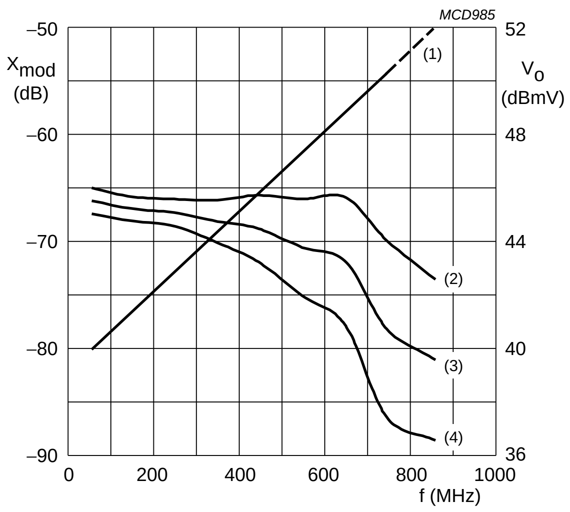
Fig.9 Composite second order distortion (diff) as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs; tilt = 10.2 dB (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

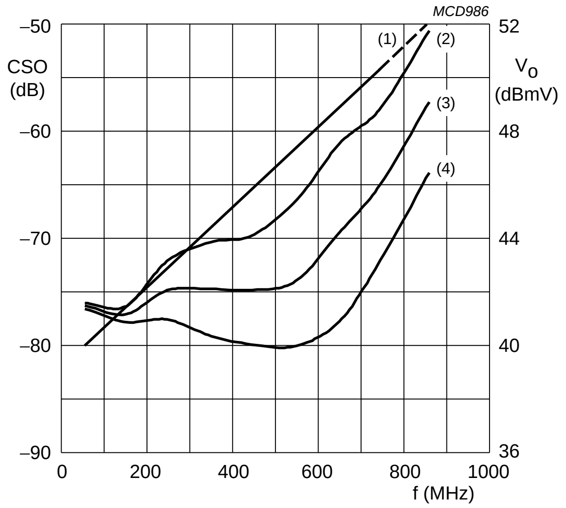
Fig.10 Composite triple beat as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs; tilt = 10.2 dB (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

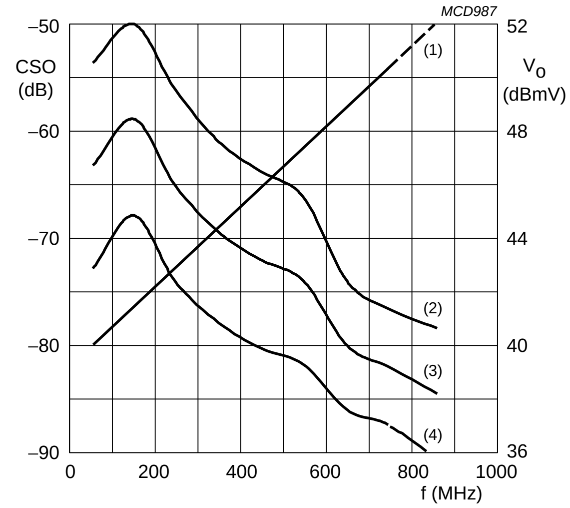
Fig.11 Cross modulation as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs; tilt = 10.2 dB (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

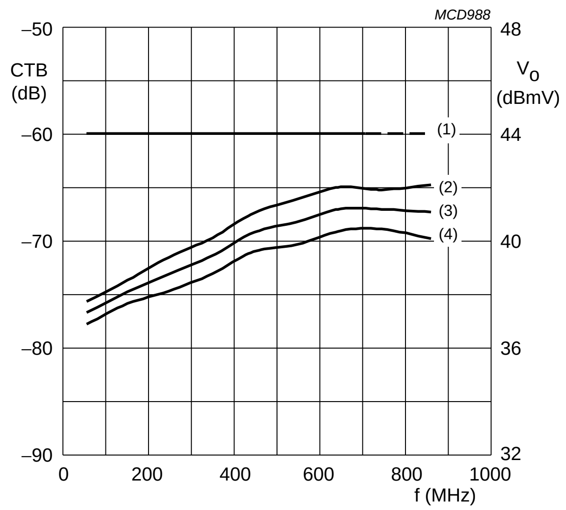
Fig.12 Composite second order distortion (sum) as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs; tilt = 10.2 dB (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

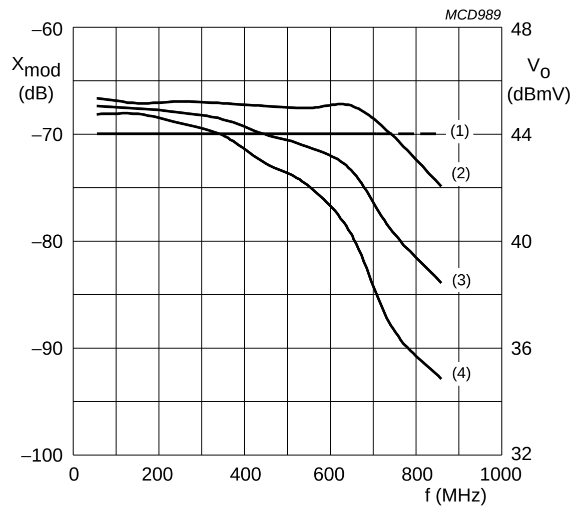
Fig.13 Composite second order distortion (diff) as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs flat (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

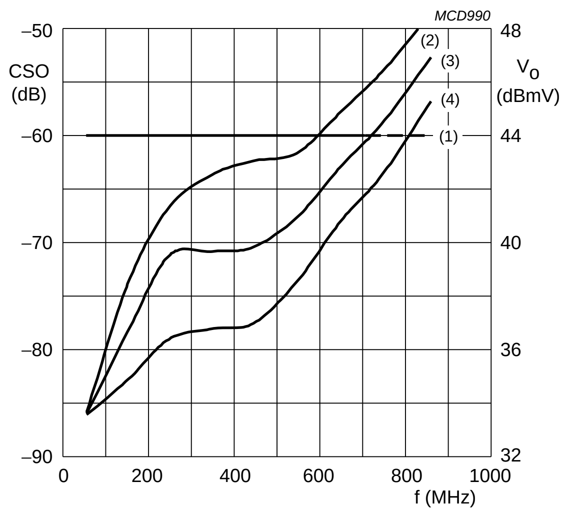
Fig.14 Composite triple beat as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs flat (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

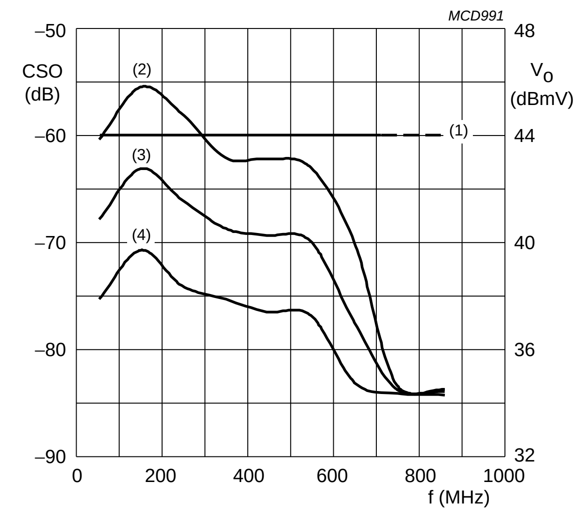
Fig.15 Cross modulation as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs flat (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

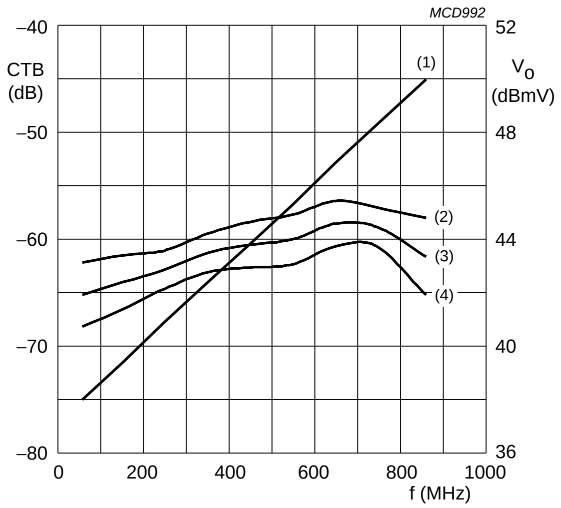
Fig.16 Composite second order distortion (sum) as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 112 chs; flat (50 to 750 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

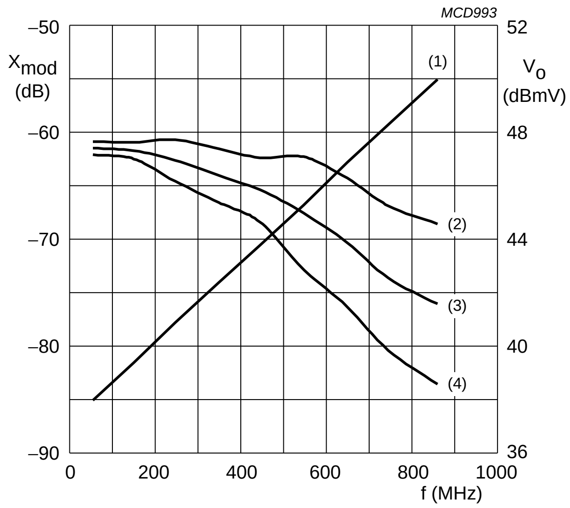
Fig.17 Composite second order distortion (diff) as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs; tilt = 12 dB (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

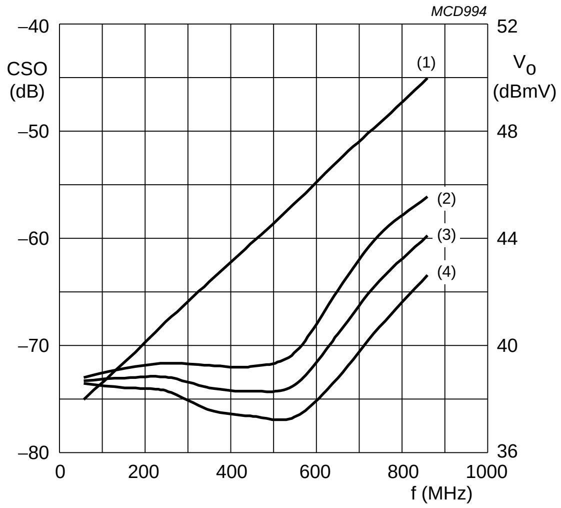
Fig.18 Composite triple beat as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs; tilt = 12 dB (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

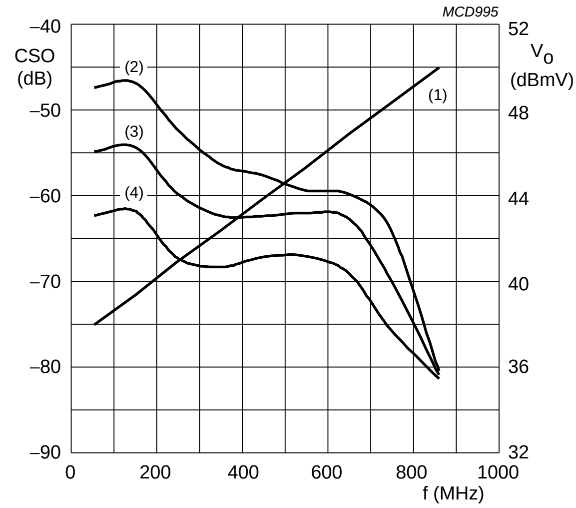
Fig.19 Cross modulation as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs; tilt = 12 dB (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

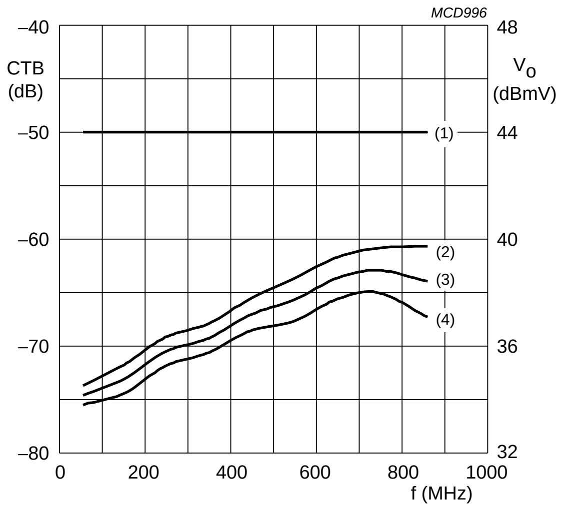
Fig.20 Composite second order distortion (sum) as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs; tilt = 12 dB (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

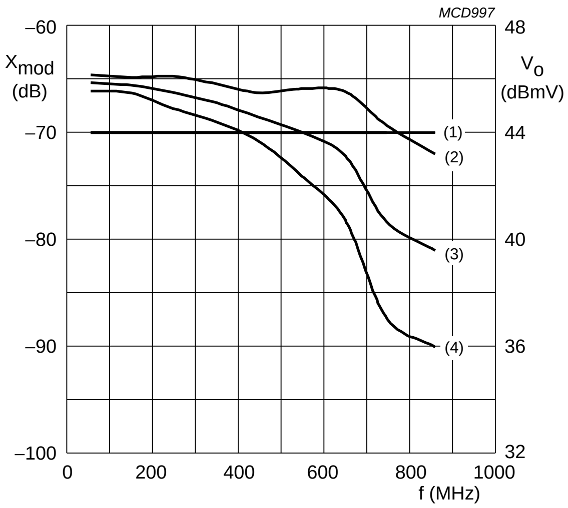
Fig.21 Composite second order distortion (diff) as a function of frequency under tilted conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs flat (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

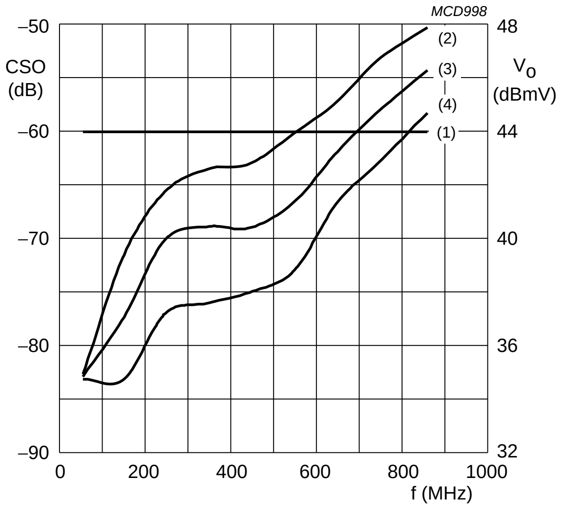
Fig.22 Composite triple beat as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs flat (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

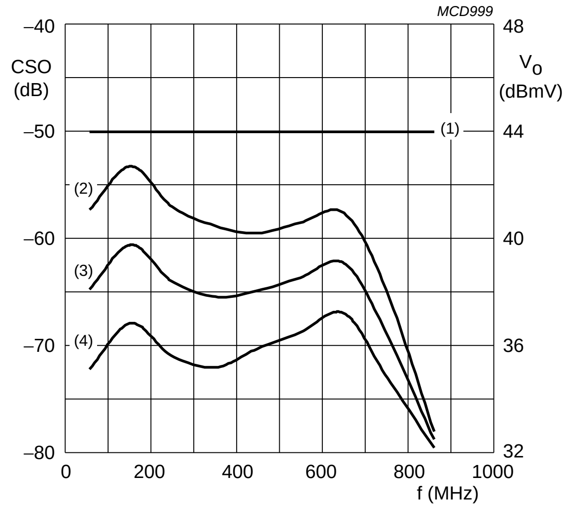
Fig.23 Cross modulation as a function of frequency under flat conditions.



$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs flat (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

Fig.24 Composite second order distortion (sum) as a function of frequency under flat conditions.



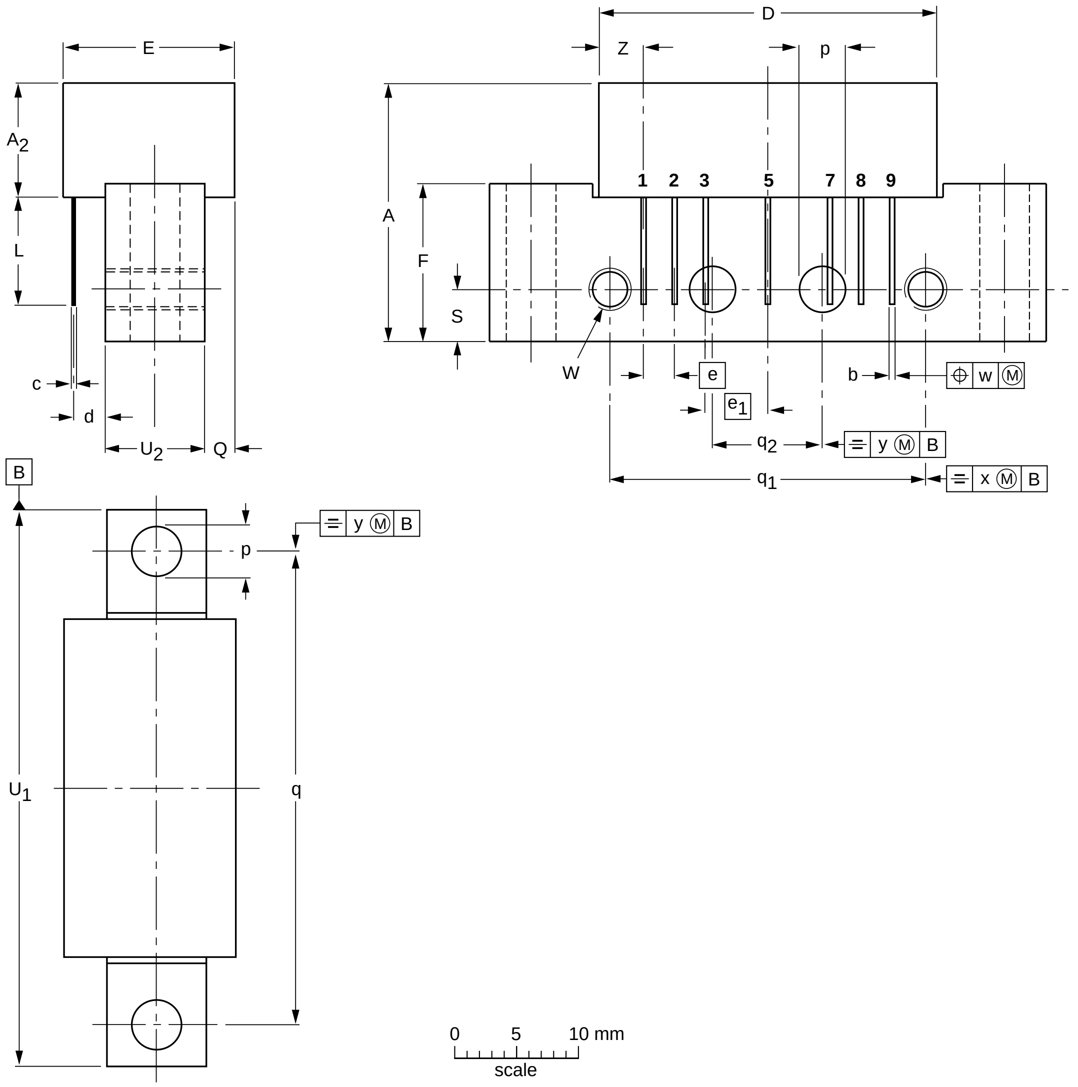
$Z_S = Z_L = 75\ \Omega$; $V_B = 24$ V; 132 chs flat (50 to 870 MHz).

(1) V_o.
(2) Typ. +3 σ.
(3) Typ.
(4) Typ. −3 σ.

Fig.25 Composite second order distortion (diff) as a function of frequency under flat conditions.

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	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	9.5	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			
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DATA SHEET STATUS

DOCUMENT STATUS[(1)]	PRODUCT STATUS[(2)]	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

Notes

1. Please consult the most recently issued document before initiating or completing a design.
2. 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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Customer notification

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

Contact information

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