

The RF Line
**Gallium Arsenide
CATV Integrated Amplifier Module**

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- In Tape and Reel. R2 Suffix = 1,500 Units per 16 mm, 13 inch Reel.

Applications

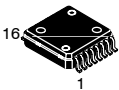
- CATV Systems Operating in the 40 to 870 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Output Stage Amplifier on Applications Requiring Low Power Dissipation and High Output Performance
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply or 12 Vdc Supply with Bias Change, 40 to 870 MHz, CATV Integrated Forward Amplifier Module

MMG1001R2

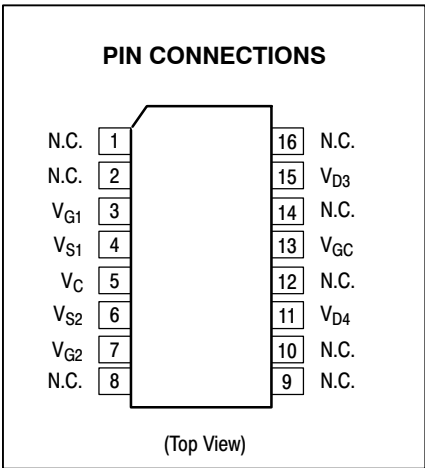
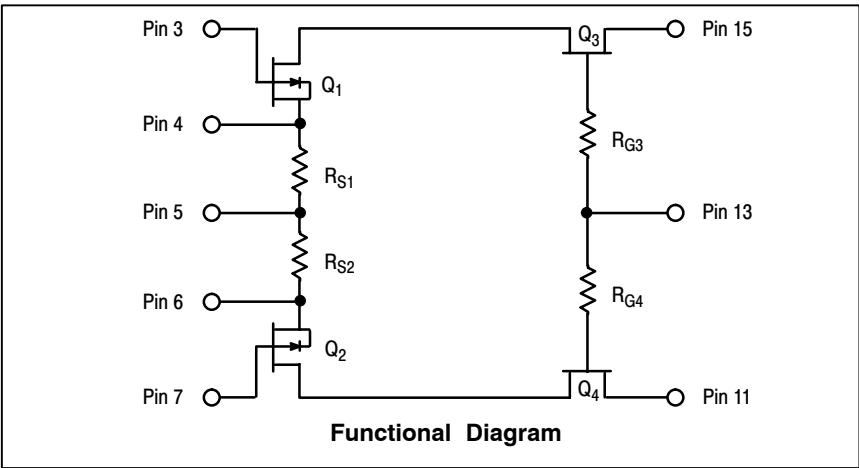
**870 MHz
19 dB GAIN
132-CHANNEL
CATV INTEGRATED AMPLIFIER
MODULE**



**CASE 978-03
PFP-16**

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+65	dBmV
DC Supply Voltage 24 V Application 12 V Application	V_{CC}	+26 +14	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C



NOTE: MMG1001R2 Moisture Sensitivity Level (MSL) = 3.

ESD PROTECTION CHARACTERISTICS

Test Conditions	Class
Human Body Model	1 (minimum)
Machine Model	M1 (minimum)
Charge Device Model	C5 (minimum)

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	6.6	°C/W

ELECTRICAL CHARACTERISTICS FOR 24 V APPLICATION ($V_{CC} = 24$ Vdc, $T_C = +30^\circ\text{C}$, 75 Ω system unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency Range	BW	40	—	870	MHz
Power Gain 50 MHz 870 MHz	G_p	— —	18 19	— —	dB
Slope 40 - 870 MHz	S	—	0.6	—	dB
Gain Flatness (40 - 870 MHz, Peak to Valley)	G_F	—	0.5	—	dB
Input Return Loss ($Z_0 = 75$ Ohms) f = 40-160 MHz f = 161-450 MHz f = 451-870 MHz	IRL	— — —	21 19 22	— — —	dB
Output Return Loss ($Z_0 = 75$ Ohms) f = 40-400 MHz f = 401-870 MHz	ORL	— —	22 17	— —	dB
Composite Second Order ($V_{out} = +44$ dBmV/ch., Worst Case) 132-Channel FLAT ($V_{out} = +46$ dBmV/ch., Worst Case) 112-Channel FLAT ($V_{out} = +48$ dBmV/ch., Worst Case) 79-Channel FLAT	CSO_{132} CSO_{112} CSO_{79}	— — —	-65 -65 -71	-58 -59 -62	dBc
Cross Modulation Distortion @ Ch 2 ($V_{out} = +44$ dBmV/ch., FM = 55 MHz) 132-Channel FLAT ($V_{out} = +46$ dBmV/ch., FM = 55 MHz) 112-Channel FLAT ($V_{out} = +48$ dBmV/ch., FM = 55 MHz) 79-Channel FLAT	XMD_{132} XMD_{112} XMD_{79}	— — —	-64 -63 -62	-52 -52 -52	dBc
Composite Triple Beat ($V_{out} = +44$ dBmV/ch., Worst Case) 132-Channel FLAT ($V_{out} = +46$ dBmV/ch., Worst Case) 112-Channel FLAT ($V_{out} = +48$ dBmV/ch., Worst Case) 79-Channel FLAT	CTB_{132} CTB_{112} CTB_{79}	— — —	-63 -64 -65	-56 -56 -58	dBc
Noise Figure 50 MHz 870 MHz	NF	— —	4 4	5.0 5.0	dB
DC Current ($V_{DC} = 24$ V, $T_C = -20^\circ$ to $+100^\circ\text{C}$)	I_{DC}	230	250	265	mA

(continued)

ELECTRICAL CHARACTERISTICS FOR 12 V APPLICATION ($V_{CC} = 12 \text{ Vdc}$, $T_C = +30^\circ\text{C}$, 75Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	50 MHz 870 MHz	G_p	— —	18 19	— —	dB
Slope	40 - 870 MHz	S	—	0.6	—	dB
Gain Flatness (40 - 870 MHz, Peak to Valley)		G_F	—	0.5	—	dB
Input Return Loss ($Z_o = 75 \text{ Ohms}$)	f = 40-160 MHz f = 161-450 MHz f = 451-870 MHz	IRL	— — —	21 19 19	— — —	dB
Output Return Loss ($Z_o = 75 \text{ Ohms}$)	f = 40-400 MHz f = 401-750 MHz f = 751-870 MHz	ORL	— — —	19 17 15	— — —	dB
Composite Second Order ($V_{out} = +42 \text{ dBmV/ch.}$, Worst Case) ($V_{out} = +42 \text{ dBmV/ch.}$, Worst Case)	112-Channel FLAT 79-Channel FLAT	CSO_{112} CSO_{79}	— —	-65 -71	— —	dBc
Cross Modulation Distortion @ Ch 2 ($V_{out} = +42 \text{ dBmV/ch.}$, FM = 55 MHz) ($V_{out} = +42 \text{ dBmV/ch.}$, FM = 55 MHz)	112-Channel FLAT 79-Channel FLAT	XMD_{112} XMD_{79}	— —	-63 -62	— —	dBc
Composite Triple Beat ($V_{out} = +42 \text{ dBmV/ch.}$, Worst Case) ($V_{out} = +42 \text{ dBmV/ch.}$, Worst Case)	112-Channel FLAT 79-Channel FLAT	CTB_{112} CTB_{79}	— —	-64 -65	— —	dBc
Noise Figure	50 MHz 870 MHz	NF	— —	4 4	5.0 5.0	dB
DC Current ($V_{DC} = 12 \text{ V}$, $T_C = -20^\circ$ to $+100^\circ\text{C}$)		I_{DC}	190	210	225	mA

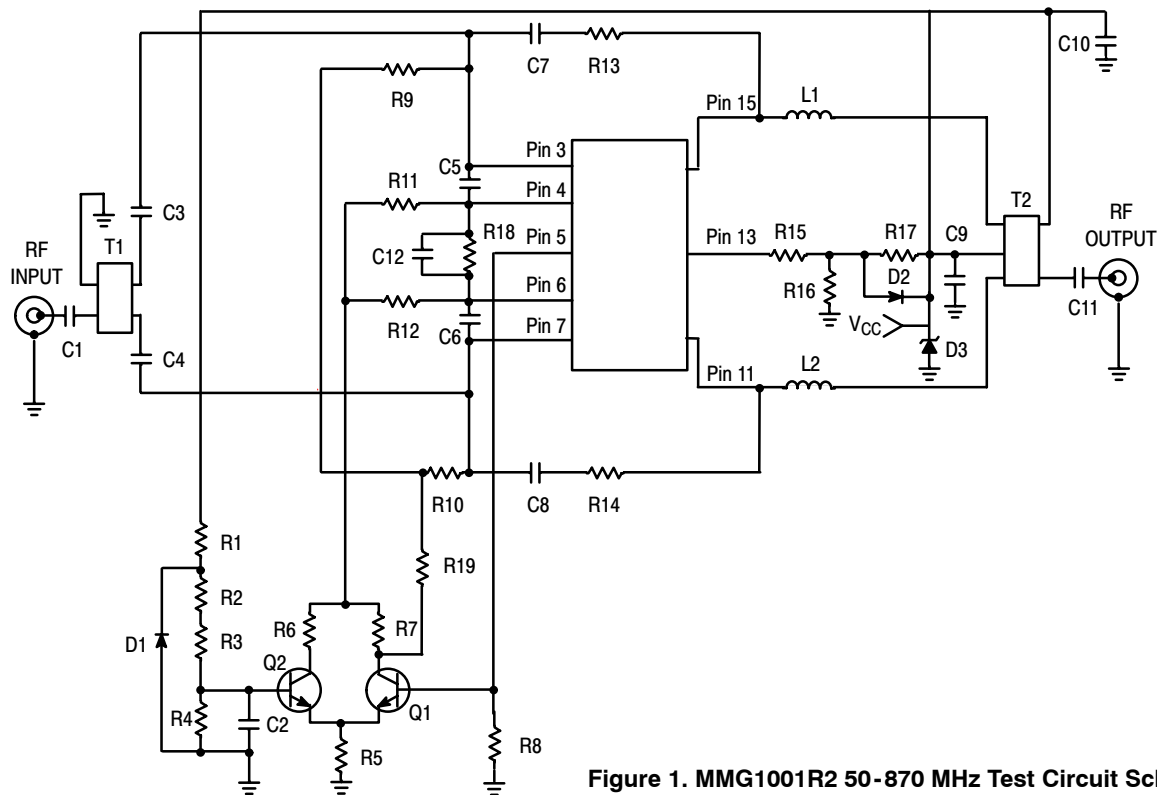


Figure 1. MMG1001R2 50-870 MHz Test Circuit Schematic

Table 1. MMG1001R2 50-870 MHz Test Circuit Component Designations and Values

Designation	Description (24 V Application)	Description (12 V Application)
C1, C7, C8, C11	220 pF Chip Capacitors (0603)	220 pF Chip Capacitors (0603)
C2, C3, C4, C9, C10	0.01 μ F Chip Capacitors (0603)	0.01 μ F Chip Capacitors (0603)
C5, C6	1.8 pF Chip Capacitors (0603)	1.8 pF Chip Capacitors (0603)
C12	5.6 pF Chip Capacitor (0603)	5.6 pF Chip Capacitor (0603)
D1	5.1 V Zener Diode, On/MM3Z5V1T1	5.1 V Zener Diode, On/MM3Z5V1T1
D2	27 V Zener Diode, On/MM3Z27VT1	27 V Zener Diode, On/MM3Z27VT1
D3	Transient Voltage Suppressor, On/1.5k27A/1.5SMC27AT3	Transient Voltage Suppressor, On/1.5k27A/1.5SMC27AT3
L1, L2	22 nH Chip Inductors (0603)	22 nH Chip Inductors (0603)
Q1, Q2	Dual Transistors Package, On/MBT3904DW1T1	Dual Transistors Package, On/MBT3904DW1T1
R1	2.2 k Ω , 1/4 W Chip Resistor (1206)	820 Ω , 1/4 W Chip Resistor (1206)
R2	560 Ω Chip Resistor (0603)	560 Ω Chip Resistor (0603)
R3	82 Ω Chip Resistor (0603)	40 Ω Chip Resistor (0603)
R4	820 Ω Chip Resistors (0603)	150 Ω Chip Resistors (0603)
R5	820 Ω Chip Resistors (0603)	100 Ω Chip Resistors (0603)
R6	120 Ω Chip Resistor (0603)	120 Ω Chip Resistor (0603)
R7	1.5 k Ω Chip Resistor (0603)	1.5 k Ω Chip Resistor (0603)
R8	12 Ω , 1 W Chip Resistor (2512)	4.8 Ω , 1 W Chip Resistor (2512)
R9, R10, R15	470 Ω Chip Resistors (0603)	470 Ω Chip Resistors (0603)
R11, R12	18 Ω Chip Resistors (0603)	18 Ω Chip Resistors (0603)
R13, R14	910 Ω Chip Resistors (0603)	910 Ω Chip Resistors (0603)
R16	2 k Ω Chip Resistor (0603)	2.7 k Ω Chip Resistor (0603)
R17	6.2 k Ω Chip Resistor (0603)	6.2 k Ω Chip Resistor (0603)
R18	15 Ω Chip Resistor (0603)	15 Ω Chip Resistor (0603)
R19	0 Ω Chip Resistor (0603)	0 Ω Chip Resistor (0603)
T1	Input Transformer, Mot/77PC016E068	Input Transformer, Mot/77PC016E068
T2	Output Transformer, Mot/77PC016E061	Output Transformer, Mot/77PC016E061
PCB	FR4, 62 mil, $\epsilon_r = 4.81$	FR4, 62 mil, $\epsilon_r = 4.81$

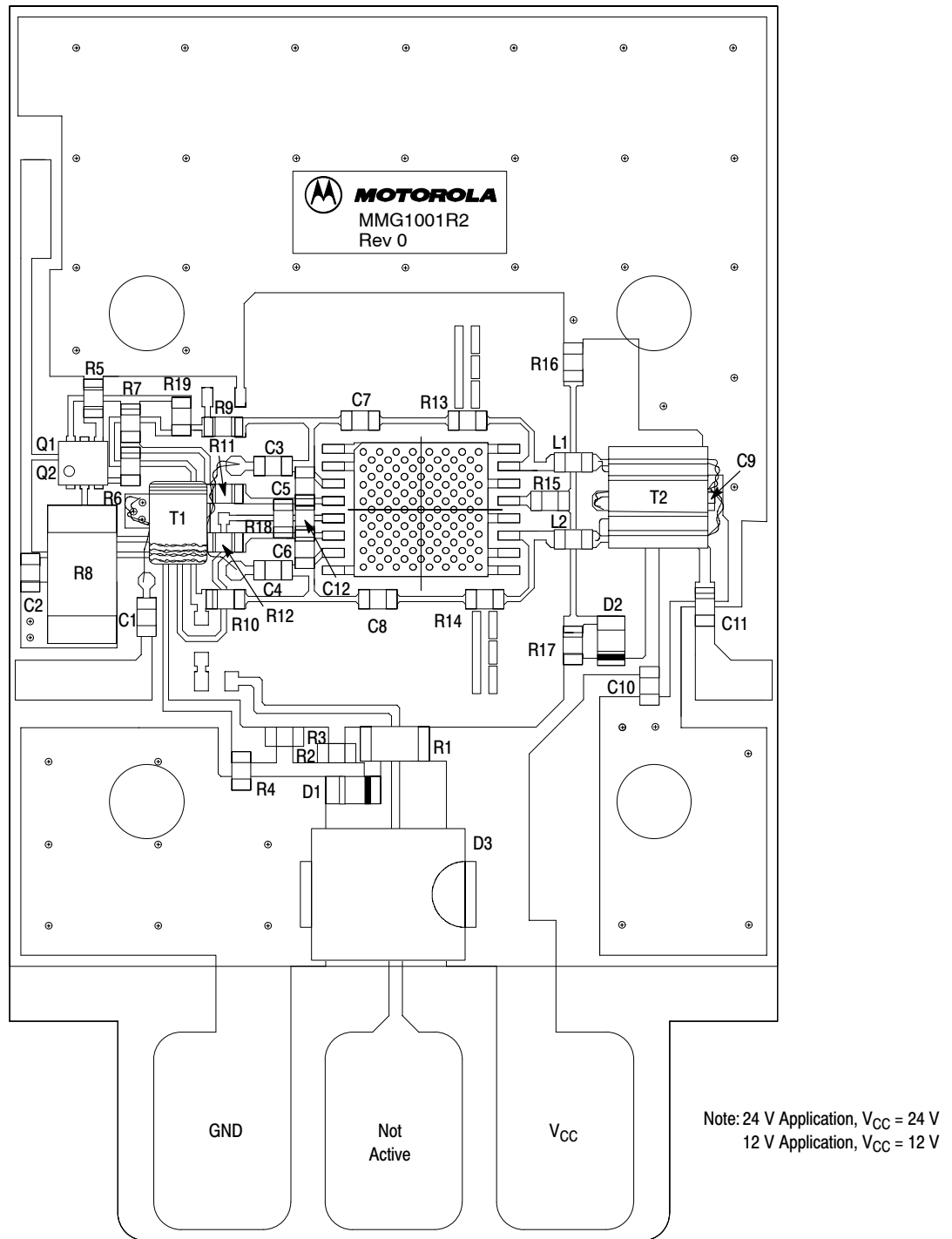


Figure 2. MMG1001R2 50-870 MHz Test Circuit Component Layout

TYPICAL CHARACTERISTICS FOR 24 V APPLICATION

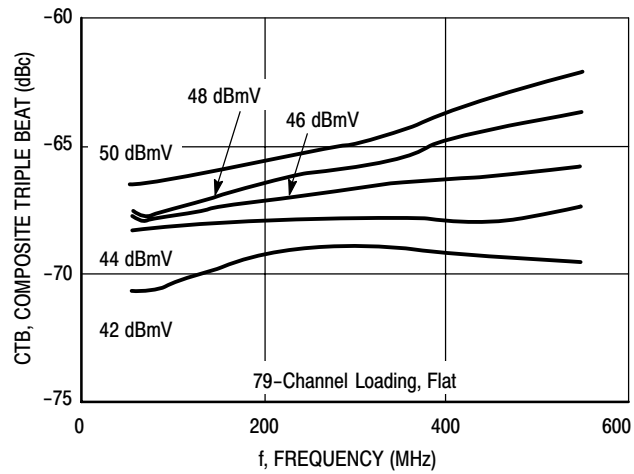


Figure 3. Composite Triple Beat versus Frequency

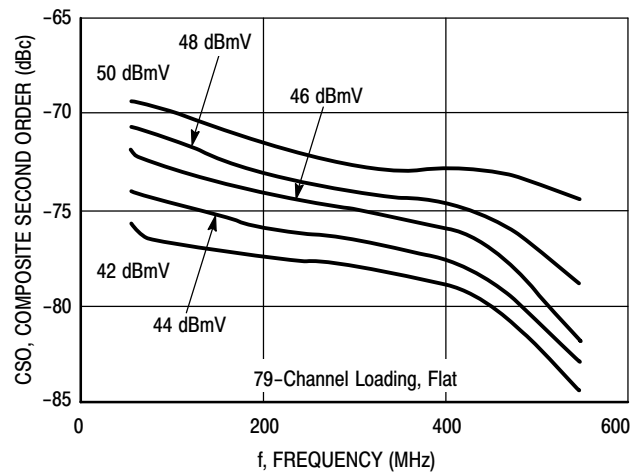


Figure 4. Composite Second Order versus Frequency

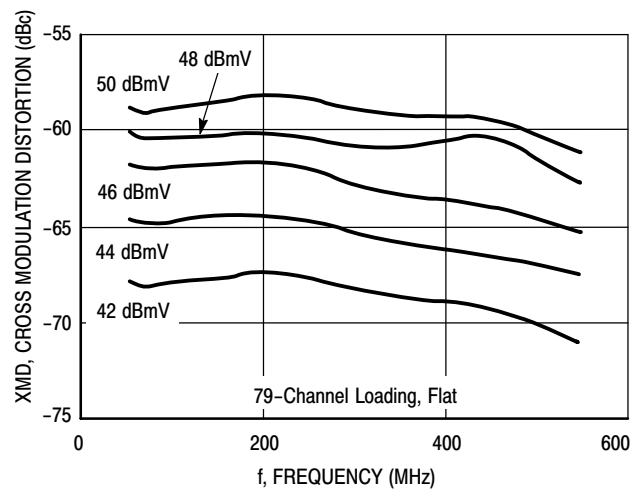
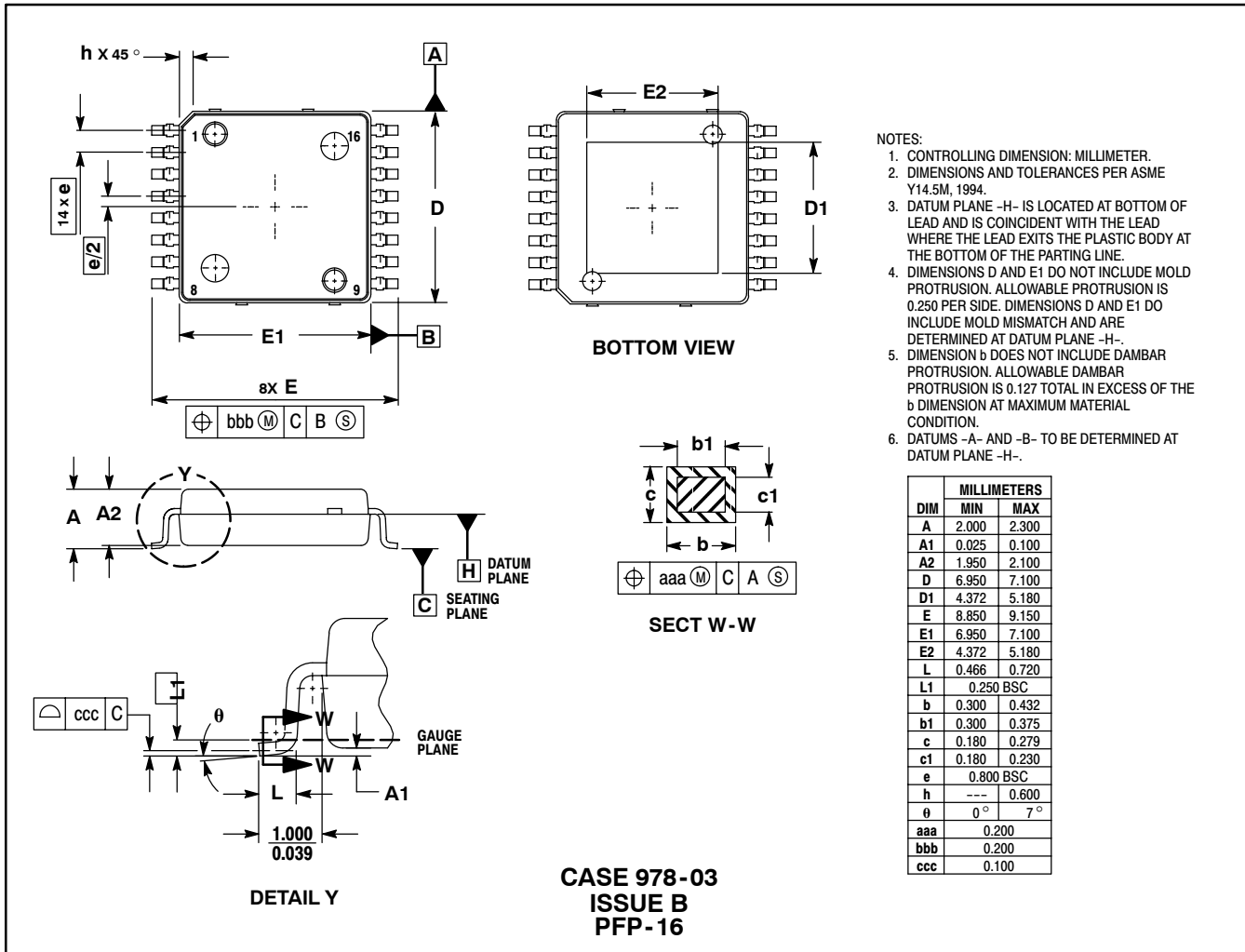


Figure 5. Cross Modulation Distortion versus Frequency

NOTES

PACKAGE DIMENSIONS



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