Freescale Semiconductor Device Data.

CATV Distribution Amplifier Modules.

DL209
Rev. 2
2/2005

Launched by Motorola
freescale semiconductor

CATV Distribution Amplifier Modules Device Data

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CATV Distribution Amplifier Modules Device Data

Foreword

This publication includes technical information and specifications for Freescale Semiconductor's broadband linear amplifier modules designed for general purpose and CATV distribution applications. The products use silicon bipolar or gallium arsenide device technologies as the foundation for building complete module solutions.

Selector Guides by product family are provided at the beginning of the book to enable quick comparisons of performance characteristics and to aid you in identifying devices that meet your functional performance requirements of frequency, gain, linearity and output capability.

All devices are listed in alphanumeric order in the *Data Sheet Device Index* of this book. Just turn to the appropriate page for technical details of the known device. Complete device specifications are provided in the form of *Data Sheets* which are categorized by product type into two chapters for easy reference.

Applications assistance is only a phone call away — call the nearest Freescale Semiconductor Sales office or 1-800-521-6274. Please refer to our section on *Access On-line Data* so that you will always have easy access to the most current information available on Freescale's RF General Purpose Linear Amplifiers and CATV Distribution Amplifier Modules product portfolio.

DATA CLASSIFICATION

Product Preview

This heading on a data sheet indicates that the device is in the formative stages or in design (under development). The disclaimer at the bottom of the first page reads: "This document contains information on a product under development. Freescale Semiconductor reserves the right to change or discontinue this product without notice."

Fully Released

A fully released data sheet contains neither a classification heading nor a disclaimer at the bottom of the first page. This document contains information on a product in full production. Guaranteed limits will not be changed without written notice to your local Freescale Semiconductor Sales Office.

The information in this book has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies.

Access Data On-Line!

Available online are Part Number Search, Parametric Search, the Product Library, Documentation Library, Tools Library, Application sites, Product sites, Technical Helpline, Technical Training and Where to Buy at the following URL:
http://www.freescale.com.

See the RF and IF Product site at http://www.freescale.com/rf for specific RF General Purpose Linear Amplifiers and CATV Distribution Amplifier Modules product support information for:

- Data sheets
- Applications notes
- Engineering bulletins
- Selector guides
- Packaging information
- Press releases
- Events

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Printed literature can be obtained from the Literature Centers upon request. For those items that incur a cost, the U.S. Literature Center will accept Master Card and Visa.

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DATA SHEET DEVICE INDEX

Chapter One

CATV Distribution Amplifier Modules and RF General Purpose Linear Amplifiers Selector Guide

As a leading supplier of semiconductor products, Freescale has a broad RF portfolio of Class A, broadband linear amplifiers for general purpose and CATV distribution applications. Using silicon bipolar and gallium arsenide technologies, Freescale is committed to the development of new products and expansion of its product offerings to meet the ever-increasing global demands for higher performance and lower system costs.

How to Use This Selector Guide

Freescale's RF broadband linear products are divided into RF general purpose linear amplifier modules and CATV distribution amplifier modules. The CATV products are further segmented into forward and reverse path applications. Within the two CATV groups, the products are listed by frequency band and power dissipation and then by preamplifier and power doubler (post amplifier) applications.

Applications Assistance

Applications assistance is only a phone call away — call the nearest Semiconductor Sales office or 1-800-521-6274.

Access Data On-Line!

Use the Internet to access semiconductor product data at http://www.freescale.com/rf. This website provides you with instant access to part number search, parametric search, product summary pages, data sheets, selector guide information, application information, package outlines, on-line technical support and much more.

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RF General Purpose Linear Amplifiers

Leveraging Freescale Semiconductor's extensive GaAs capabilities and a near half-century of RF power device experience, Freescale introduces a new RF General Purpose Amplifier (GPA) portfolio. GPAs are small-signal, broadband amplifiers based on either common-emitter (HBT), common-source (HFET or MESFET), or Darlington techniques. While popular uses include drivers or pre-drivers in base stations and buffer amplifiers in mixer applications, their inherent characteristics make them suitable for virtually any situation in which RF gain is required.

Freescale Semiconductor RF general purpose linear amplifiers are designed to address a broad range of general purpose RF and IF applications where linearity and dynamic range are essential.

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RF General Purpose Linear Amplifiers

These devices have been optimized for 50 ohm applications and are designed for multi-purpose applications where linearity and dynamic range are of primary concern.

Table 1. General Purpose Linear Amplifiers — Class A — InGaP HBT

Product	Frequency Band MHz	V_{CC} (Typ) Volts	I_{CC} (Typ) mA	Small Signal Gain (Typ) @ 900 MHz dB	P_{1dB} (Typ) @ 900 MHz dBm	3rd Order Intercept (Typ) dBm	NF (Typ) @ 900 MHz dB	Pkg/Style
MMG3001NT1[18f]	40-3600	5.6	58	20	18.5	32	4.1	1514/1
MMG3002NT1[18f]	40-3600	5.2	110	20	21	37.5	4.2	1514/1
MMG3003NT1[18f]	40-3600	6.2	180	20	24.1	40.5	4	1514/1
MMG3004NT1[46b]	400-2400	5	260	15.5*	27*	43*	4	1543/-
MMG3005NT1[46b]	400-2400	5	500	15*	30*	45*	5.5	1543/-
MMG3006NT1[46c]	400-2400	5	800	14*	33*	50*	5	1543/-
MMG3007NT1[46a]	DC-6000	5	48	20	15	29	4	1514/1
MMG3008NT1[46a]	DC-6000	5	37	18.5	12	26	4	1514/1
MMG3009NT1[46a]	DC-6000	5	58	15	18	32	4	1514/1
MMG3010NT1[46a]	DC-6000	5	48	15	15	29	4	1514/1
MMG3011NT1[46a]	DC-6000	5	37	15	12	26	4	1514/1
MMG3012NT1[46a]	40-3600	5	70	19	18	32	3.8	1514/1
MMG3013NT1[46a]	40-3600	5	90	20	21	36	4	1514/1
MMG3014NT1[46a]	40-3600	5	180	20	24	40	4	1514/1
MMH3101NT1[46b]	40-2400	5	150	15	21.5	41	1.7	1514/1
				*@ 2140 MHz	*@ 2140 MHz	*@ 2140 MHz		

Table 2. General Purpose Linear Amplifiers — Class A — Silicon Bipolar

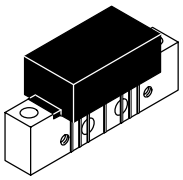
Product	Frequency Band MHz	V_{CC} (Typ) Volts	I_{CC} (Typ) mA	Gain (Typ) @ 100 MHz dB	Gain Flatness (Typ) dB	P_{1dB} (Typ) @ 200 MHz dBm	3rd Order Intercept (Typ) dBm	NF (Typ) @ 200 MHz dB	Pkg/Style
MHW1345	10 - 200	24	310	34.5	1.0	28	44	3.8	1302/1

Note: Possible replacement for CA2830C.

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units; p) R5 = 50 units.

[46]To be introduced: a) 1Q05; b) 2Q05; c) 3Q05

RF General Purpose Linear Amplifier Packages

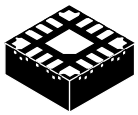


CASE 1302
STYLE 1

SCALE 1:2

CASE 1514
STYLE 1
PLASTIC
(SOT-89)

SCALE 2:1



CASE 1543
PLASTIC
(PQFN 5x5)

SCALE 2:1

CATV Distribution Amplifier Modules

Freescale Semiconductor Hybrids are manufactured using the latest CATV generation technology which has set new standards for CATV system performance and reliability. These hybrids have been optimized to provide premium performance in all CATV systems up to 152 channels. Additions to our CATV product family include 40-870 MHz high output gallium arsenide (GaAs) power doublers as well as low distortion, low power consumption reverse amplifiers.

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CATV Distribution Amplifier Modules

Freescale Semiconductor Hybrids are manufactured using the latest generation technology which has set new standards for CATV system performance and reliability. These hybrids have been optimized to provide premium performance in all CATV systems up to 152 channels.

Forward Amplifier Modules

40-1000 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 152 CH	Cross Modulation dBc 152 CH	DC Current mA Typ	Noise Figure @ 1000 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW9182B	18.5	152	+38	-63[40]	-61	-61	210	7.5	714Y/1
MHW9242A	23.2	152	+38	-61[40]	-58	-59	318	8.0	1302/1

40-870 MHz High Output Hybrids, V_{CC} = 24 Vdc, Class A — GaAs

Product	Hybrid Gain (Nom) @ 870 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 132 CH	Cross Modulation dBc 132 CH	DC Current mA Typ	Noise Figure @ 870 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW9146	14.3	132	+44	-60[36]	-60	-55	245	5.5	1302/1
MHW9186	18.5	132	+44	-60[36]	-58	-52	250	5.0	1302/1
MHW9186A★	18.5	132	+44	-60[36]	-58	-52	250	6.0	1302/1
MHW9206	20.2	132	+44	-59[36]	-57	-51	245	4.5	1302/1
MHW9236	23.8	132	+44	-60[36]	-60	-50	255	6.5	1302/1
MHW9276	27.9	132	+44	-60[36]	-60	-53	250	6.5	1302/1
Power Doublers									
MHW8188A	20.3	112	+48	-64[34]	-58*	-56*	425	4.5 (Typ)	1302/1
MHW9188A	20.3	132	+48	-62[34]	-56	-55	425	5.0	1302/1
MHW9189A	20.3	132	+48	-62[34]	-56	-55	425	5.0	1302/2
MHW8207A	21.3	112	+48	-62[34]	-57*	-55*	425	4.5 (Typ)	1302/2
MHW9207A	21.3	132	+48	-62[34]	-56	-55	425	5.0	1302/2
MHW8227A	22.1	112	+48	-64[34]	-58*	-56*	425	4.5 (Typ)	1302/1
MHW9227A	22.1	132	+48	-62[34]	-56	-55	425	4.5	1302/1
MHW8247A	24.9	112	+48	-62[34]	-57*	-55*	440	6.0 (Typ)	1302/1
MHW9247A	24.9	132	+48	-62[34]	-56	-54	440	7.0	1302/1
MHW8267A	27.6	112	+48	-62[34]	-57*	-55*	440	6.0 (Typ)	1302/1
MHW9267A	27.6	132	+48	-60[34]	-56	-54	440	7.0	1302/1
					*112 CH	*112 CH			

[34]Composite 2nd Order; V_{out} = +48 dBmV/ch

[36]Composite 2nd Order; V_{out} = +44 dBmV/ch

[40]Composite 2nd Order; V_{out} = +38 dBmV/ch

★New Product

CATV Distribution: Forward Amplifier Modules (continued)

40-870 MHz High Output MMIC, V_{CC} = 24 Vdc, Class A — GaAs

Product	Hybrid Gain (Nom) @ 870 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 132 CH	Cross Modulation dBc 132 CH	DC Current mA Typ	Noise Figure @ 870 MHz dB Max	Pkg/ Style
Preamplifiers									
MMG1001R2[18e]	19	132	+44	-58	-56	-52	250	5.0	978/—
MMG1001T1[18f]	19	132	+44	-58	-56	-52	250	5.0	978/—
Power Doublers									
MMG2001T1[18f]	21	132	+48	-60	-54	-53	425	4.5	978/—

40-870 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 870 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 128 CH	Cross Modulation dBc 128 CH	DC Current mA Typ	Noise Figure @ 870 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW8272A	27.7	128	+38	-64[40]	-64	-62	310	7.0	1302/1
MHW8312[46b]	31.3	128	+40	-53[39]	-54	-56	325	7.0	1302/1
MHW8342	35.5	132	+44	-44[36]	-46*	-50*	325	6.5	1302/1
					*132 CH	*132 CH			

40-860 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 128 CH	Cross Modulation FM = 55 MHz dBc 128 CH	DC Current mA Typ	Noise Figure @ 860 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW8182B	18.5	128	+38	-64[40]	-66	-65	220	7.5	714Y/1
MHW8222B	21.9	128	+38	-60[40]	-64	-63	220	7.0	1302/1
MHW8242A	24	128	+38	-62[40]	-64	-62	318	7.5	1302/1

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units; p) R5 = 50 units.

[36]Composite 2nd Order; V_{out} = +44 dBmV/ch

[39]Composite 2nd Order; V_{out} = +40 dBmV/ch

[40]Composite 2nd Order; V_{out} = +38 dBmV/ch

[46]To be introduced: a) 1Q05; b) 2Q05; c) 3Q05

CATV Distribution: Forward Amplifier Modules (continued)

40-860 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar (continued)

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	Maximum Distortion Specifications: 2nd Order Test dBc	Maximum Distortion Specifications: Composite Triple Beat dBc 128 CH	Maximum Distortion Specifications: Cross Modulation FM = 55 MHz dBc 128 CH	DC Current mA Typ	Noise Figure @ 860 MHz dB Max	Pkg/ Style
Power Doublers									
MHW8185L[21]	18.5	128	+40	-62[39]	-63	-64	365	8.5*	714Y/1
MHW8185	18.8	128	+40	-62[39]	-64	-64	400	8.0	714Y/1
MHW8205L[22]	19.5	128	+40	-60[39]	-63	-64	365	8.5*	714Y/1
MHW8205	19.8	128	+40	-60[39]	-63	-64	400	8.0	714Y/1

*@ 870 MHz

40-750 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	Maximum Distortion Specifications: 2nd Order Test dBc	Maximum Distortion Specifications: Composite Triple Beat dBc 110 CH	Maximum Distortion Specifications: Cross Modulation FM = 55 MHz dBc 110 CH	DC Current mA Typ	Noise Figure @ 750 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW7182B	18.5	110	+40	-63[39]	-66	-64	220	6.5	714Y/1
MHW7222B	21.9	110	+40	-60[39]	-61	-60	220	6.5	1302/1
MHW7242A	24	110	+40	-62[39]	-63	-61	318	7.0	1302/1
MHW7272A	27.2	110	+40	-64[39]	-64	-60	310	6.5	1302/1
MHW7292A	29	110	+40	-60[39]	-60	-60	310	6.5*	1302/1
MHW7312 [46b]	31.3	112	+42	-55[45]	-55*	-56*	325	6.5	1302/1
MHW7342	34	112	+44	-50[36]	-50	-53	325	6.0	1302/1
					*112 CH	*112 CH		*@ 770 MHz	
Power Doublers									
MHW7185CL	18.5	110	+44	-64[36]	-61	-63	370	7.5	714Y/1
MHW7185C	18.8	110	+44	-64[36]	-62	-63	400	7.5	714Y/1
MHW7205CL	19.5	110	+44	-63[36]	-61	-62	365	7.5	714Y/1
MHW7205C	19.8	110	+44	-63[36]	-61	-62	400	7.5	714Y/1

40-550 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	Maximum Distortion Specifications: 2nd Order Test dBc	Maximum Distortion Specifications: Composite Triple Beat dBc 77 CH	Maximum Distortion Specifications: Cross Modulation FM = 55 MHz dBc 77 CH	DC Current mA Typ	Noise Figure @ 550 MHz dB Max	Pkg/ Style
Forward Amplifiers									
MHW6342T	34.5	77	+44	-57[36]	-57	-57	310	6.5	1302/1

[21]Low DC Current Version of MHW8185; Typical I_{CC} @ Vdc = 24 V is 365 mA.

[22]Low DC Current Version of MHW8205; Typical I_{CC} @ Vdc = 24 V is 365 mA.

[36]Composite 2nd Order; V_{out} = +44 dBmV/ch

[39]Composite 2nd Order; V_{out} = +40 dBmV/ch

[45]Composite 2nd order; V_{out} = +42 dBmV/ch

[46]To be introduced: a) 1Q05; b) 2Q05; c) 3Q05

Reverse Amplifier Modules

5 - 200 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 10 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc: 22 CH	Composite Triple Beat dBc: 26 CH	Cross Modulation dBc: 22 CH	Cross Modulation dBc: 26 CH	DC Current mA Typ	Noise Figure @ 175 MHz dB Max	Pkg/ Style
MHW1244	24	22, 26	+50	-72[30]	-68	-67.5[19]	-61	-61[19]	210	5.0	1302/1
MHW1346	35*	22, 26	+50	-72[31]*	-68	-70[19]	-60	-63[19]	325	5.0*	1302/1

*5 MHz *22 CH *@ 200 MHz

Low Current Amplifiers — 5 - 200 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc: 6 CH	2nd Order Test dBc: 10 CH	Composite Triple Beat dBc: 6 CH	Composite Triple Beat dBc: 10 CH	Cross Modulation dBc: 6 CH	Cross Modulation dBc: 10 CH	DC Current mA Typ	Noise Figure @ 200 MHz dB Max	Pkg/ Style
MHW1223LA	22.7	6,10	+50	-68	-65	-75	-66	-65	-60	95	7.0	1302/1
MHW1253LA	25.5	6,10	+50	-68	-66	-75	-66	-65	-61	95	6.5	1302/1
MHW1303LA	30.8	6,10	+50	-68	-65	-74	-64	-64	-58	95	5.7	1302/1

Low Current Amplifiers — 5 - 150 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc: 6 CH	2nd Order Test dBc: 10 CH	Composite Triple Beat dBc: 6 CH	Composite Triple Beat dBc: 10 CH	Cross Modulation dBc: 6 CH	Cross Modulation dBc: 10 CH	DC Current mA Typ	Noise Figure @ 150 MHz dB Max	Pkg/ Style
MHW1353LA	35.2	6,10	+50	-68	-65	-73	-62	-63	-57	95	5.4	1302/1

Low Current Amplifiers — 5 - 65 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc: 6 CH	2nd Order Test dBc: 10 CH	Composite Triple Beat dBc: 6 CH	Composite Triple Beat dBc: 10 CH	Cross Modulation dBc: 6 CH	Cross Modulation dBc: 10 CH	DC Current mA Typ	Noise Figure @ 65 MHz dB Max	Pkg/ Style
MHW1224LA	22.7	6,10	+50	-68	-65	-75	-66	-65	-60	95	7.0	1302/1
MHW1254LA	25.5	6,10	+50	-68	-66	-75	-66	-65	-61	95	6.5	1302/1
MHW1304LA	30.8	6,10	+50	-68	-65	-74	-64	-64	-58	95	5.7	1302/1
MHW1354LA	35.2	6,10	+50	-68	-65	-73	-62	-63	-57	95	5.4	1302/1

[19]Typical

[30]Channels 2 and A @ 7

[31]26 Ch. Composite Second Order Test

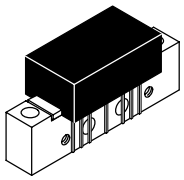
CATV Distribution: Reverse Amplifier Modules (continued)

Low Current Amplifiers — 5-50 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications				DC Current mA Typ	Noise Figure @ 50 MHz dB Max	Pkg/ Style
			Output Level dBmV/CH	2nd Order Test[30] dBc	Composite Triple Beat dBc 3 CH	Cross Modulation dBc 4 CH			
MHW1254L	25	4	+50	-70	-70	-62	115	4.5	1302/1

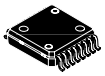
[30]Channels 2 and A @ 7

CATV Distribution Amplifier Module Packages



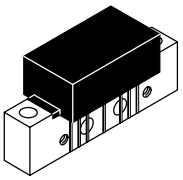
CASE 714Y
STYLE 1

SCALE 1:2



CASE 978
PLASTIC
(PFP-16)

SCALE 1:1



CASE 1302
STYLE 1, 2

SCALE 1:2

Chapter Two

RF General Purpose Linear Amplifiers - Data Sheets

General Purpose Linear Amplifier Module

MHW1345

10-200 MHz
34.5 dB
800 mW
GENERAL PURPOSE
LINEAR AMPLIFIER MODULE

Features

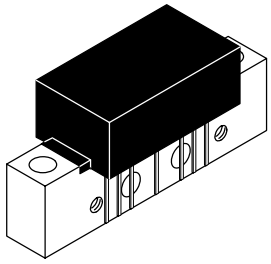
- 34.5 dB Typical Gain @ 100 MHz
- Silicon Bipolar Technology
- Class A Operation
- Typical ITO = +44 dBm @ 200 MHz
- Unconditionally Stable Under All Load Conditions

Applications

- Driver Amplifier in 50 Ohm Systems Requiring High Linearity
- Instrumentation Amplifiers
- Return Path Amplifier on CATV Systems Operating in the 10 to 200 MHz Frequency Range
- Possible Replacement for CA2830C

Description

- 24 Vdc Supply, 10 to 200 MHz, General Purpose Linear Amplifier Module



CASE 1302-01, STYLE 1

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	28	Vdc
RF Power Input	P_{in}	+5	dBm
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (T_C = 25°C, V_{CC} = 24 V, 50 Ω system unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency Range	BW	10	—	200	MHz
Gain Flatness (f = 10 - 200 MHz)	G_F	—	±0.5	±1	dB
Power Gain (f = 100 MHz)	G_p	33.5	34.5	35.5	dB
Noise Figure, Broadband (f = 200 MHz)	NF	—	3.8	4.5	dB
Power Output — 1 dB Compression (f = 10 - 200 MHz)	P_{1dB}	630	800	—	mW
Power Output — 1 dB Compression (f = 10 - 200 MHz, V_{CC} = 28 V)	P_{1dB}	1000	1260	—	mW
Third Order Intercept (See Figure 2, f_1 = 200 MHz)	ITO	43	44	—	dBm
Input/Output VSWR (f = 10 - 200 MHz)	VSWR	—	1.5:1	2:1	—
Second Harmonic Distortion (Tone at 100 mW, f_{2H} = 150 MHz)	d_{so}	—	- 60	- 50	dB
Peak Envelope Power (Two Tone Distortion Test — See Figure 2) (f = 10 - 200 MHz @ - 32 dB IMD)	PEP	600	800	—	mW
Supply Current	I_{CC}	270	310	330	mA

Table 3. S-Parameters (Biased at 24 Volts, T = 25°C Z_o = 50Ω)

Frequency (MHz)	S11		S21		S12		S22	
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang
10	-19.3	45.5	34.6	-0.6	-47.0	2.3	-14.5	76.8
50	-15.6	35.0	34.2	-56.7	-47.5	-30.3	-12.6	45.0
100	-13.2	34.4	33.9	-114	-47.9	-62.9	-10.8	10.7
200	-11.1	30.1	33.5	134	-48.3	-128	-14.9	-42.6

Magnitude in dB, Phase Angle in degrees.

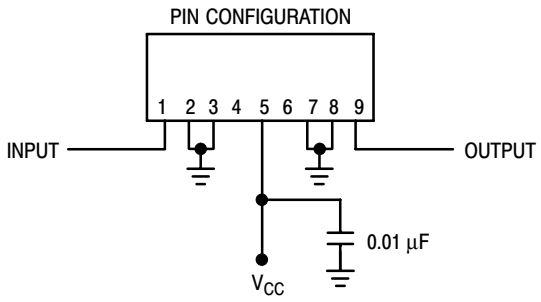
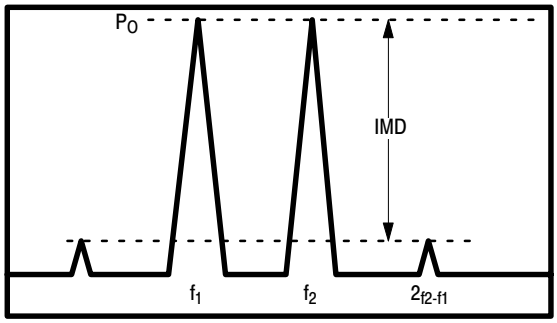


Figure 1. External Connections



$$ITO = P_O + \frac{IMD}{2} @ IMD > 60dB$$

PEP = 4X P_O @ IMD = -32dB

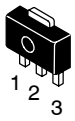
Figure 2. Intermodulation Test

Heterojunction Bipolar Transistor Technology (InGaP HBT)

Broadband High Linearity Amplifier

MMG3001NT1

40 - 3600 MHz, 20 dB
18.5 dBm
InGaP HBT



CASE 1514-01, STYLE 1
SOT-89
PLASTIC

The MMG3001NT1 is a General Purpose Amplifier that is internally input and output matched. It is designed for a broad range of Class A, small-signal, high linearity, general purpose applications. It is suitable for applications with frequencies from 40 to 3600 MHz such as Cellular, PCS, BWA, WLL, PHS, CATV, VHF, UHF, UMTS and general small-signal RF.

Features

- Frequency: 40-3600 MHz
- P1dB: 18.5 dBm
- Power Gain: 20 dB
- Third Order Output Intercept Point: 32 dBm
- Single Voltage Supply
- Internally Matched to 50 Ohms
- Low Cost SOT-89 Surface Mount Package
- Pb-Free Leads
- In Tape and Reel. T1 Suffix = 1000 Units per 12 mm, 7 inch Reel.

Table 1. Typical Performance (1)

Characteristic	Symbol	900 MHz	2140 MHz	3500 MHz	Unit
Power Gain (S21)	G_p	20	18	16	dB
Input Return Loss (S11)	IRL	-25	-25	-19	dB
Output Return Loss (S22)	ORL	-22	-18	-17	dB
Power Output @1dB Compression	P1db	18.5	18	15.5	dBm
Third Order Output Intercept Point	IP3	32	31	28.5	dBm

1. V_{CC} = 5.6 Vdc, T_C = 25°C, 50 ohm system

Table 2. Maximum Ratings

Rating	Symbol	Value	Unit
Supply Voltage (2)	V_{CC}	7	V
Supply Current (2)	I_{CC}	300	mA
RF Input Power	P_{in}	10	dBm
Storage Temperature Range	T_{stg}	-65 to +150	°C
Junction Temperature (3)	T_J	150	°C

2. Voltage and current applied to device.
3. For reliable operation, the junction temperature should not exceed 150°C.

Table 3. Thermal Characteristics (V_{CC} = 5.6 Vdc, I_{CC} = 58 mA, T_C = 25°C)

Characteristic	Symbol	Value (4)	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	92.0	°C/W

4. Refer to AN1955/D, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.

Table 4. Electrical Characteristics (V_{CC}= 5.6 Vdc, 900 MHz, T_C = 25°C, 50 ohm system)

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain (S21)	G_p	18	20	—	dB
Input Return Loss (S11)	IRL	—	-25	—	dB
Output Return Loss (S22)	ORL	—	-18	—	dB
Power Output @ 1dB Compression	P1dB	—	18.5	—	dBm
Third Order Output Intercept Point	IP3	—	32	—	dBm
Noise Figure	NF	—	4.1	—	dB
Supply Current (1)	I_{CC}	40	58	75	mA
Supply Voltage (1)	V_{CC}	—	5.6	—	V

1. For reliable operation, the junction temperature should not exceed 150°C.

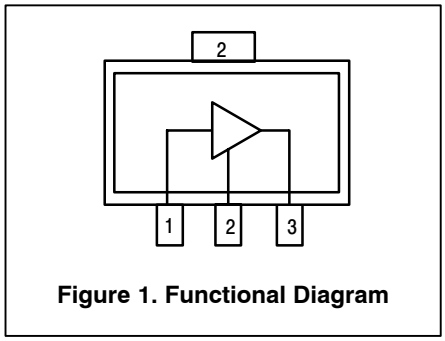


Figure 1. Functional Diagram

Table 5. Functional Pin Description

Pin Number	Pin Function
1	RF_{in}
2	Ground
3	RF_{out}/DC Supply

Table 6. ESD Protection Characteristics

Test Conditions/Test Methodology	Class
Human Body Model (per JESD 22-A114)	0 (Minimum)
Machine Model (per EIA/JESD 22-A115)	A (Minimum)
Charge Device Model (per JESD 22-C101)	IV (Minimum)

Table 7. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	1	260	°C

50 OHM TYPICAL CHARACTERISTICS

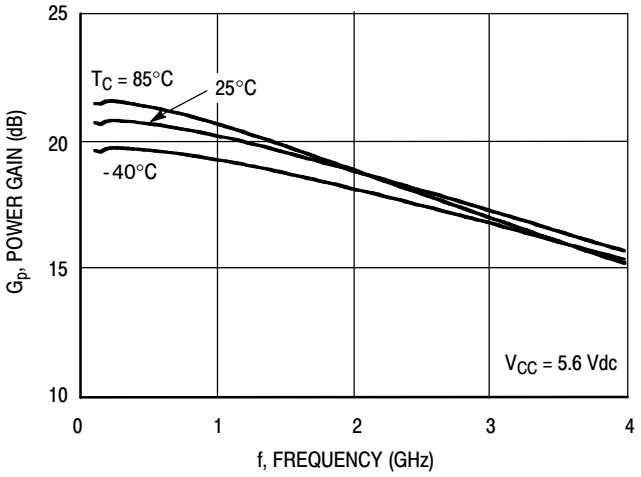


Figure 2. Unmatched Power Gain (S21) versus Frequency

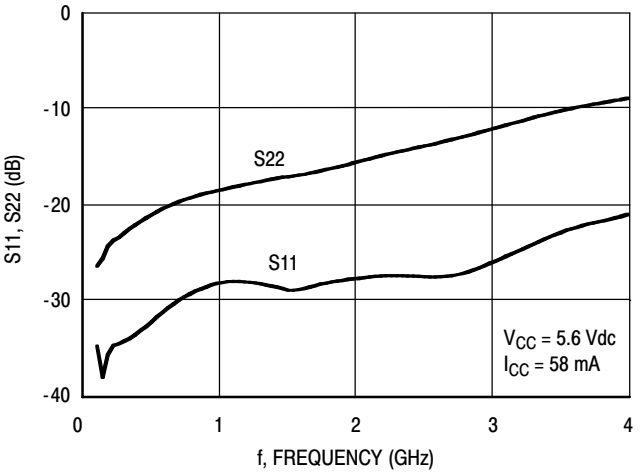


Figure 3. Unmatched Input/Output Return Loss versus Frequency

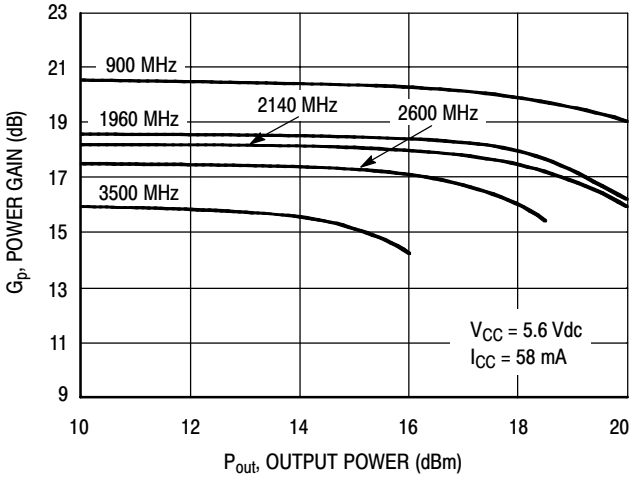


Figure 4. Power Gain versus Output Power

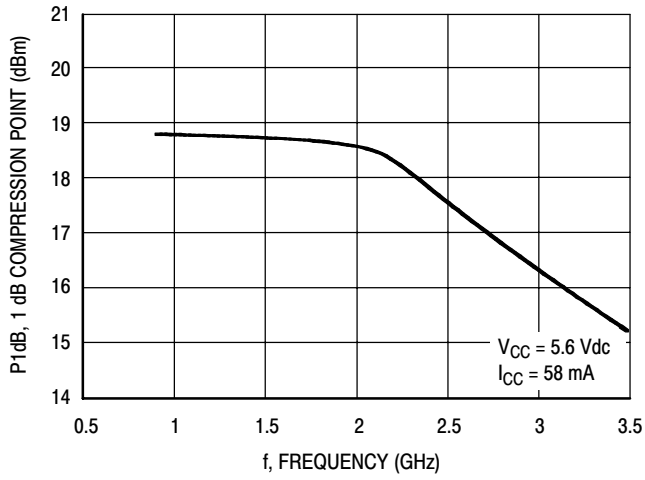


Figure 5. P1dB versus Frequency

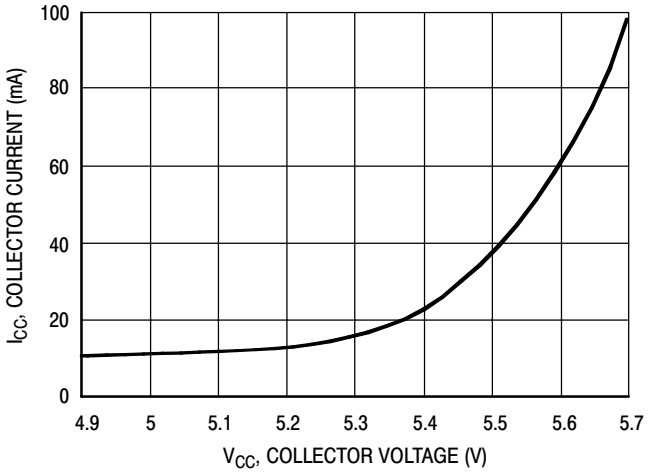


Figure 6. Collector Current versus Collector Voltage

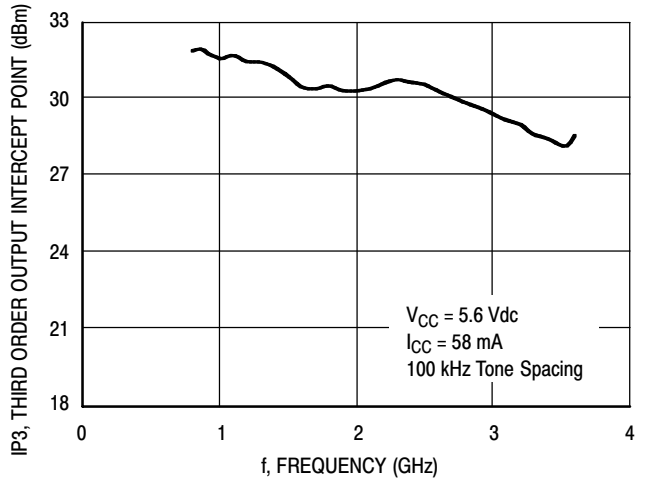


Figure 7. Third Order Output Intercept Point versus Frequency

50 OHM TYPICAL CHARACTERISTICS

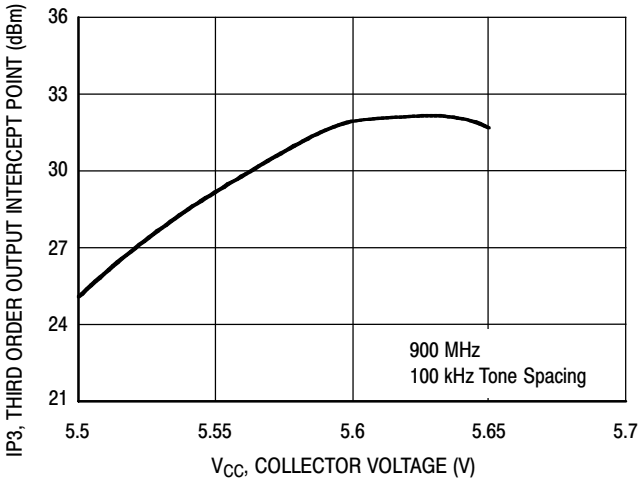


Figure 8. Third Order Output Intercept Point versus Collector Voltage

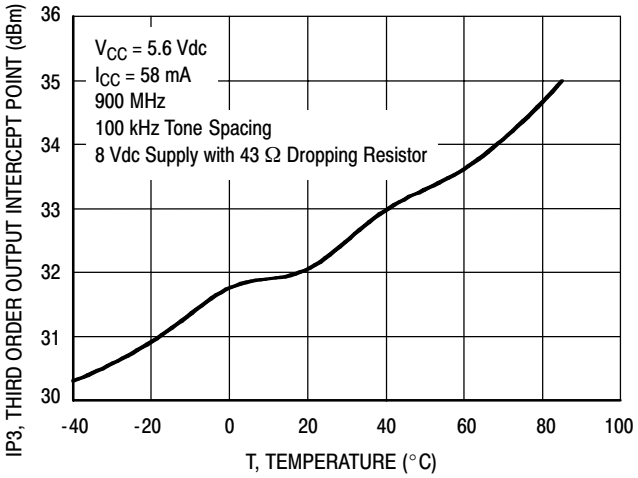


Figure 9. Third Order Output Intercept Point versus Case Temperature

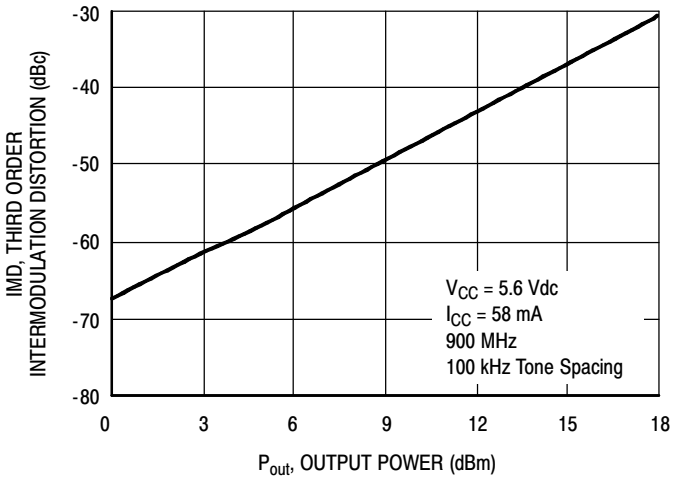
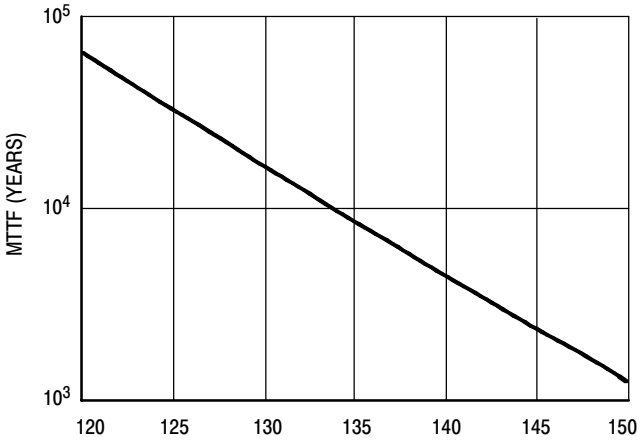


Figure 10. Third Order Intermodulation versus Output Power



NOTE: The MTTF is calculated with V_{CC} = 5.6 Vdc, I_{CC} = 58 mA

Figure 11. MTTF versus Junction Temperature

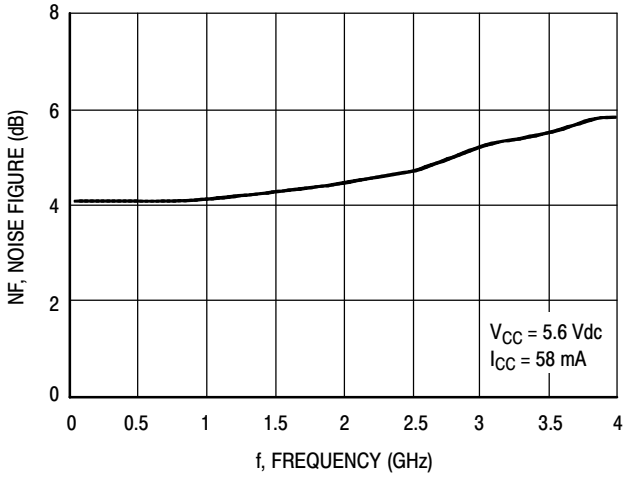


Figure 12. Noise Figure versus Frequency

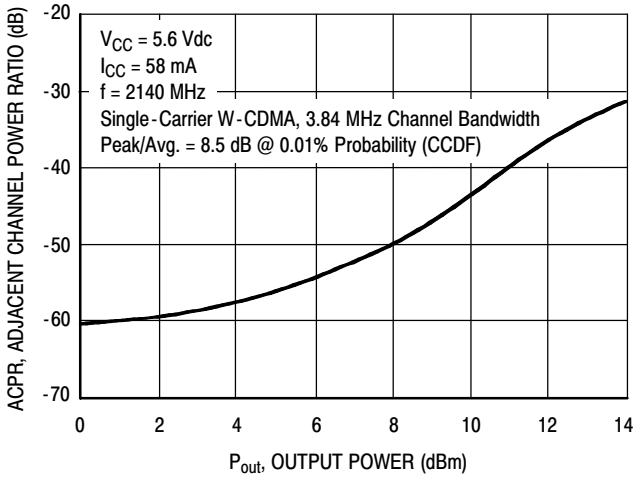
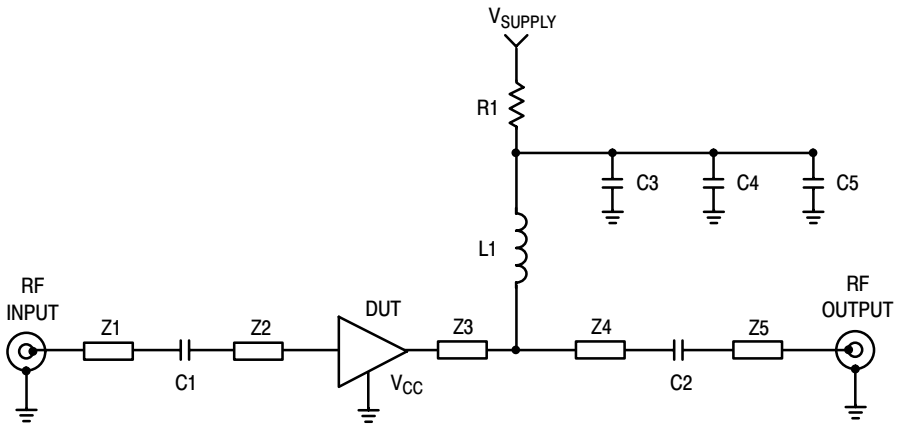


Figure 13. Single-Carrier W-CDMA Adjacent Channel Power Ratio versus Output Power

50 OHM APPLICATION CIRCUIT: 40-800 MHz



Z1, Z5	0.347″ x 0.058″ Microstrip	Z4	0.403″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1
Z3	0.172″ x 0.058″ Microstrip		

Figure 14. 50 Ohm Test Circuit Schematic

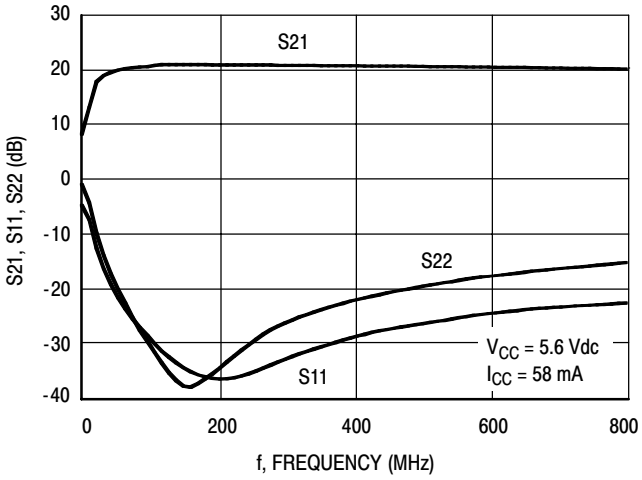
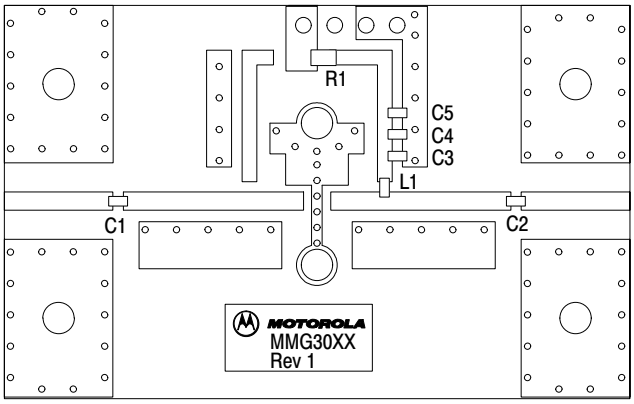


Figure 15. S21, S11 and S22 versus Frequency



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 16. 50 Ohm Test Circuit Component Layout

Table 8. 50 Ohm Test Circuit Component Designations and Values

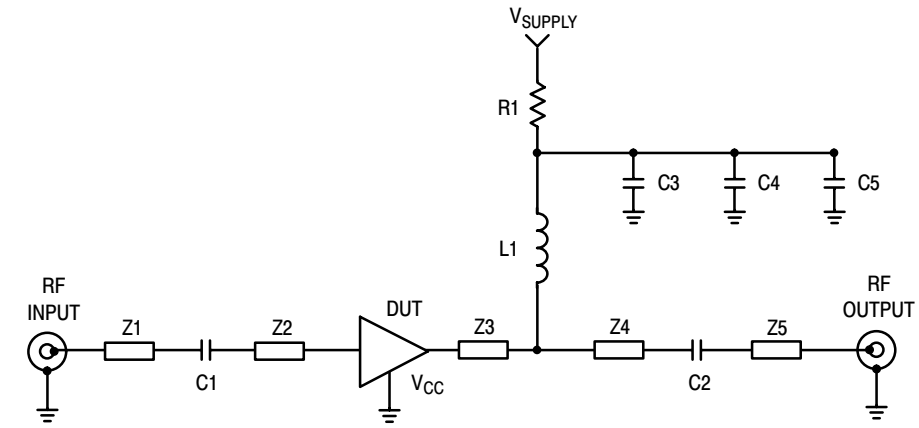
Part	Description	Part Number	Manufacturer
C1, C2, C3	0.01 μF Chip Capacitors	0603A103JAT2A	AVX
C4	1000 pF Chip Capacitor	0603A102JAT2A	AVX
C5	47 pF Chip Capacitor	0805K470JBT	AVX
L1	470 nH Chip Inductor	BK2125HM471	Taiyo Yuden
R1	8.2 Ω Chip Resistor	KMT3B2B-7	KOA Speer

Table 9. Supply Voltage versus R1 Values

Supply Voltage	6	7	8	9	10	11	12	V
R1 Value	6.9	24	41	59	76	93	110	Ω

Note: To provide V_{CC} = 5.6 Vdc and I_{CC} = 58 mA at the device.

50 OHM APPLICATION CIRCUIT: 800-3600 MHz



Z1, Z5	0.347″ x 0.058″ Microstrip	Z4	0.403″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1
Z3	0.172″ x 0.058″ Microstrip		

Figure 17. 50 Ohm Test Circuit Schematic

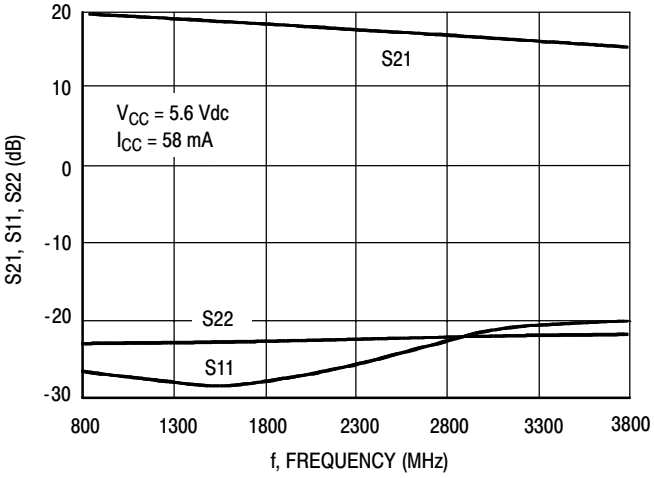


Figure 18. S21, S11 and S22 versus Frequency

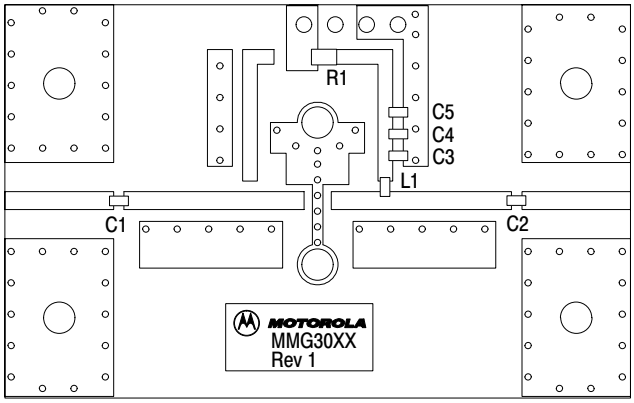


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Figure 19. 50 Ohm Test Circuit Component Layout

Table 10. 50 Ohm Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2	39 pF Chip Capacitors	0805K470JBT	AVX
C3	0.01 μF Chip Capacitor	0603A103JAT2A	AVX
C4	1000 pF Chip Capacitor	0603A102JAT2A	AVX
C5	47 pF Chip Capacitor	0805K470JBT	AVX
L1	56 nH Chip Inductor	HK160856NJ-T	Taiyo Yuden
R1	8.2 Ω Chip Resistor	KMT3B2B-7	KOA Speer

50 OHM TYPICAL CHARACTERISTICS

Table 11. Class A Common Emitter S-Parameters at V_{CC} = 5.6 Vdc, I_{CC} = 58 mA, T_C = 25°C

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
0.1	0.01837	0.158	10.80154	176.164	0.06918	0.196	0.04789	11.134
0.15	0.00937	-92.445	10.61985	173.508	0.06785	-0.796	0.05071	-49.334
0.2	0.02263	96.518	11.06276	170.083	0.07095	-2.253	0.07322	-17.196
0.25	0.02049	101.715	10.97614	167.952	0.07046	-2.513	0.06689	-28.31
0.3	0.02015	91.299	10.93416	165.552	0.07052	-2.899	0.07111	-35.935
0.35	0.01939	77.961	10.89886	163.145	0.07044	-3.499	0.07696	-41.106
0.4	0.0212	71.36	10.85777	160.903	0.07055	-3.885	0.08093	-47.831
0.45	0.02169	63.516	10.81348	158.599	0.07053	-4.455	0.08609	-52.772
0.5	0.02447	55.112	10.76682	156.269	0.07056	-4.766	0.09084	-57.016
0.55	0.02643	49.889	10.71841	154.026	0.07058	-5.297	0.09479	-60.897
0.6	0.02857	47.303	10.67367	151.767	0.07057	-5.783	0.09752	-65.139
0.65	0.03094	43.937	10.61782	149.477	0.07066	-6.195	0.1016	-69.112
0.7	0.03356	42.055	10.56473	147.215	0.07064	-6.702	0.10489	-72.747
0.75	0.03495	40.001	10.50489	144.98	0.07073	-7.082	0.10746	-76.469
0.8	0.03599	38.298	10.44613	142.748	0.07084	-7.625	0.11046	-80.336
0.85	0.03675	36.713	10.38955	140.536	0.07089	-8.108	0.11345	-84.309
0.9	0.0378	34.449	10.32195	138.333	0.07106	-8.539	0.11524	-88.629
0.95	0.04014	35.697	10.26867	136.075	0.07101	-8.95	0.11712	-93.045
1	0.03975	34.93	10.19351	133.939	0.07128	-9.497	0.11971	-97.401
1.05	0.04101	35.048	10.13374	131.742	0.07142	-10.015	0.12057	-101.389
1.1	0.0413	34.972	10.05555	129.606	0.07148	-10.588	0.12293	-106.494
1.15	0.04078	36.31	9.98381	127.42	0.07156	-10.989	0.12475	-111.339
1.2	0.04045	38.732	9.90685	125.299	0.07171	-11.51	0.12702	-115.996
1.25	0.04005	39.914	9.83535	123.178	0.07179	-12.025	0.12882	-120.553
1.3	0.03952	43.011	9.76304	121.077	0.07197	-12.554	0.13202	-125.245
1.35	0.03786	44.538	9.68157	118.951	0.07208	-13.057	0.13502	-129.596
1.4	0.03796	46.354	9.60628	116.874	0.07224	-13.606	0.13836	-133.849
1.45	0.03675	48.792	9.52474	114.777	0.07243	-14.151	0.14227	-138.332
1.5	0.03229	27.259	9.45514	112.739	0.07269	-14.685	0.13499	-140.027
1.55	0.03309	25.231	9.36984	110.697	0.0728	-15.204	0.13808	-143.203
1.6	0.03475	23.271	9.29518	108.724	0.07296	-15.823	0.14111	-146.041
1.65	0.0367	22.494	9.2159	106.764	0.07327	-16.372	0.14376	-149.267
1.7	0.03803	21.485	9.15729	104.763	0.07341	-16.955	0.14728	-152.506
1.75	0.03976	21.793	9.07502	102.811	0.07361	-17.538	0.14882	-155.031
1.8	0.04035	21.332	9.00137	100.821	0.07373	-18.047	0.15301	-157.889
1.85	0.04093	21.941	8.92666	98.873	0.07383	-18.59	0.15553	-160.786
1.9	0.0409	20.661	8.84934	96.931	0.07407	-19.216	0.1587	-163.24
1.95	0.04127	17.824	8.75854	95.008	0.07433	-19.75	0.1617	-165.666
2	0.04055	20.129	8.69148	93.046	0.07451	-20.324	0.1659	-168.355
2.05	0.04148	18.841	8.6161	91.185	0.07482	-20.966	0.16929	-170.838
2.1	0.04198	18.596	8.5446	89.293	0.07498	-21.435	0.17351	-173.6
2.15	0.04249	18.599	8.47505	87.398	0.07512	-22.217	0.17715	-176.054
2.2	0.04309	19.388	8.39794	85.501	0.07543	-22.79	0.18032	-178.865
2.25	0.04316	19.789	8.32788	83.624	0.0756	-23.41	0.18422	178.51
2.3	0.04326	21.542	8.24837	81.777	0.07591	-24.034	0.1871	175.803
2.35	0.04285	23.93	8.17883	79.926	0.0761	-24.632	0.19081	173.166

Table 11. Class A Common Emitter S-Parameters at V_{CC} = 5.6 Vdc, I_{CC} = 58 mA, T_C = 25°C (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
2.4	0.0428	25.661	8.10402	78.094	0.07638	-25.226	0.19358	170.371
2.45	0.04222	28.349	8.0349	76.296	0.07665	-25.841	0.19769	167.872
2.5	0.04157	30.594	7.96381	74.438	0.07693	-26.474	0.20079	164.997
2.55	0.04062	32.718	7.89112	72.648	0.07715	-27.199	0.20422	162.204
2.6	0.04117	35.498	7.83503	70.815	0.07744	-27.904	0.20869	159.371
2.65	0.0407	39.668	7.76263	69.011	0.07768	-28.528	0.21293	156.39
2.7	0.04099	40.736	7.68838	67.13	0.07806	-29.281	0.21614	153.567
2.75	0.04248	44.129	7.62088	65.378	0.07826	-29.943	0.22114	150.373
2.8	0.04329	47.509	7.55264	63.561	0.0785	-30.741	0.226	147.517
2.85	0.04466	51.043	7.48275	61.767	0.07867	-31.392	0.23048	144.417
2.9	0.04661	53.041	7.41535	60.019	0.07893	-32.182	0.23581	141.675
2.95	0.04876	57.415	7.34593	58.235	0.07915	-32.903	0.24106	138.661
3	0.04991	59.701	7.28251	56.493	0.07945	-33.641	0.24698	136.002
3.05	0.05208	61.593	7.21536	54.703	0.07976	-34.4	0.25213	133.272
3.1	0.05426	64.102	7.1502	52.913	0.07989	-35.181	0.25854	130.712
3.15	0.05536	65.235	7.08162	51.15	0.08017	-35.962	0.26426	128.119
3.2	0.05758	65.884	7.01653	49.405	0.08027	-36.771	0.27078	125.669
3.25	0.06021	66.564	6.94732	47.655	0.08054	-37.539	0.27729	123.284
3.3	0.06243	66.702	6.88222	45.916	0.08071	-38.36	0.28468	120.844
3.35	0.06498	65.787	6.81808	44.235	0.08097	-39.051	0.29005	118.633
3.4	0.06832	65.869	6.75612	42.521	0.08112	-39.867	0.29718	116.391
3.45	0.07049	65.731	6.69433	40.809	0.08128	-40.621	0.3026	114.187
3.5	0.07294	65.097	6.63494	39.085	0.08144	-41.453	0.30819	112.291
3.55	0.07565	65.299	6.57111	37.382	0.08171	-42.369	0.31389	110.431
3.6	0.07682	64.978	6.51018	35.707	0.08186	-43.091	0.31878	108.662

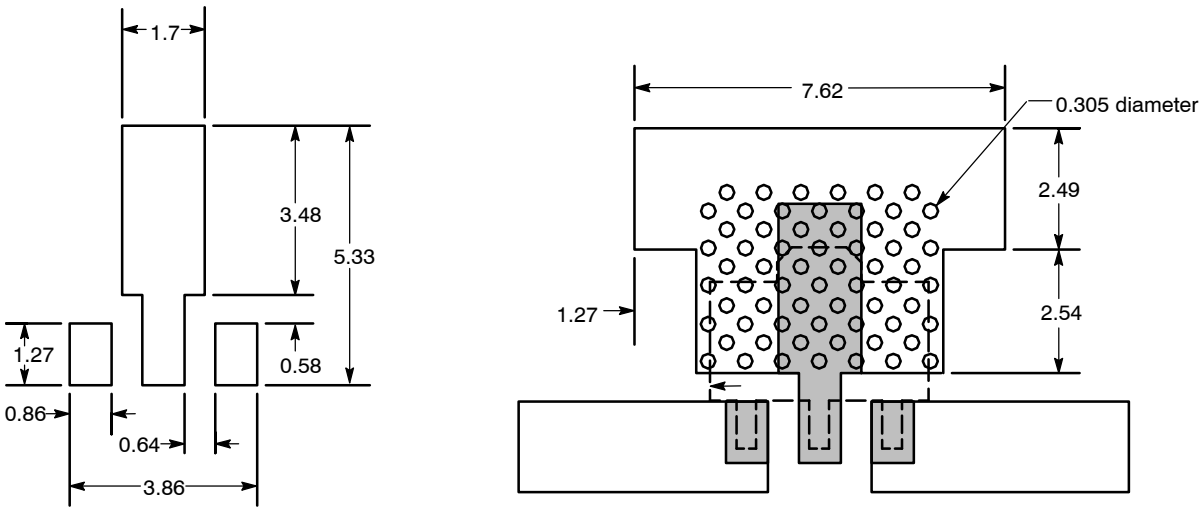


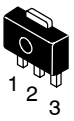
Figure 20. Recommended Mounting Configuration

Heterojunction Bipolar Transistor Technology (InGaP HBT)

Broadband High Linearity Amplifier

MMG3002NT1

40-3600 MHz, 20 dB
21 dBm
InGaP HBT



CASE 1514-01, STYLE 1
SOT-89
PLASTIC

The MMG3002NT1 is a General Purpose Amplifier that is internally input and output matched. It is designed for a broad range of Class A, small-signal, high linearity, general purpose applications. It is suitable for applications with frequencies from 40 to 3600 MHz such as Cellular, PCS, BWA, WLL, PHS, CATV, VHF, UHF, UMTS and general small-signal RF.

Features

- Frequency: 40-3600 MHz
- P1dB: 21 dBm
- Power Gain: 20 dB
- Third Order Output Intercept Point: 37.5 dBm
- Single Voltage Supply
- Internally Matched to 50 Ohms
- Low Cost SOT-89 Surface Mount Package
- Pb-Free Leads
- In Tape and Reel. T1 Suffix = 1000 Units per 12 mm, 7 inch Reel.

Table 1. Typical Performance (1)

Characteristic	Symbol	900 MHz	2140 MHz	3500 MHz	Unit
Power Gain (S21)	G_p	20	18	14.5	dB
Input Return Loss (S11)	IRL	-16	-26	-16	dB
Output Return Loss (S22)	ORL	-12	-8	-11	dB
Power Output @ 1dB Compression	P1db	21	21	18.5	dBm
Third Order Output Intercept Point	IP3	37.5	36	32	dBm

1. V_{CC} = 5.2 Vdc, T_C = 25°C, 50 ohm system

Table 2. Maximum Ratings

Rating	Symbol	Value	Unit
Supply Voltage (2)	V_{CC}	7	V
Supply Current (2)	I_{CC}	400	mA
RF Input Power	P_{in}	12	dBm
Storage Temperature Range	T_{stg}	-65 to +150	°C
Junction Temperature (3)	T_J	150	°C

2. Voltage and current applied to device.
3. For reliable operation, the junction temperature should not exceed 150°C.

Table 3. Thermal Characteristics (V_{CC} = 5.2 Vdc, I_{CC} = 110 mA, T_C = 25°C)

Characteristic	Symbol	Value (4)	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	46.5	°C/W

4. Refer to AN1955/D, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.

Table 4. Electrical Characteristics (V_{CC} = 5.2 Vdc, 900 MHz, T_C = 25°C, 50 ohm system, in Freescale Application Circuit)

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain (S21)	G_p	19.3	20	—	dB
Input Return Loss (S11)	IRL	—	-16	—	dB
Output Return Loss (S22)	ORL	—	-12	—	dB
Power Output @ 1dB Compression	P1dB	—	21	—	dBm
Third Order Output Intercept Point	IP3	—	37.5	—	dBm
Noise Figure	NF	—	4.2	—	dB
Supply Current (1)	I_{CC}	95	110	125	mA
Supply Voltage (1)	V_{CC}	—	5.2	—	V

1. For reliable operation, the junction temperature should not exceed 150°C.

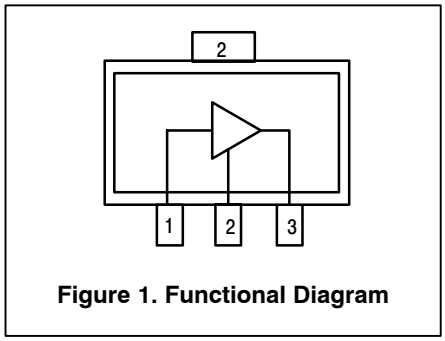


Figure 1. Functional Diagram

Table 5. Functional Pin Description

Pin Number	Pin Function
1	RF_{in}
2	Ground
3	RF_{out}/DC Supply

Table 6. ESD Protection Characteristics

Test Conditions/Test Methodology	Class
Human Body Model (per JESD 22-A114)	1B (Minimum)
Machine Model (per EIA/JESD 22-A115)	A (Minimum)
Charge Device Model (per JESD 22-C101)	IV (Minimum)

Table 7. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	1	260	°C

50 OHM TYPICAL CHARACTERISTICS

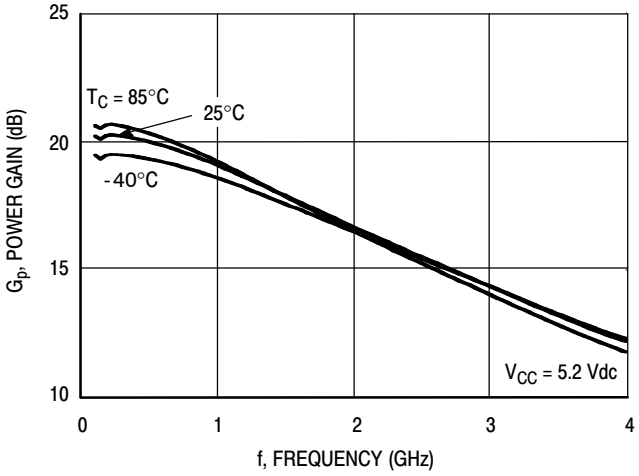


Figure 2. Unmatched Power Gain (S21) versus Frequency

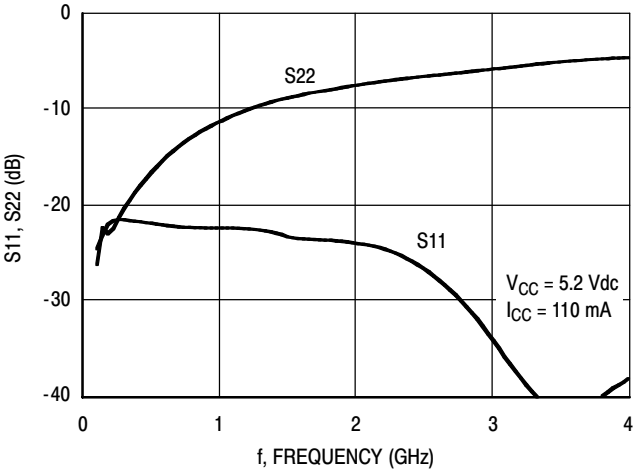


Figure 3. Unmatched Input/Output Return Loss versus Frequency

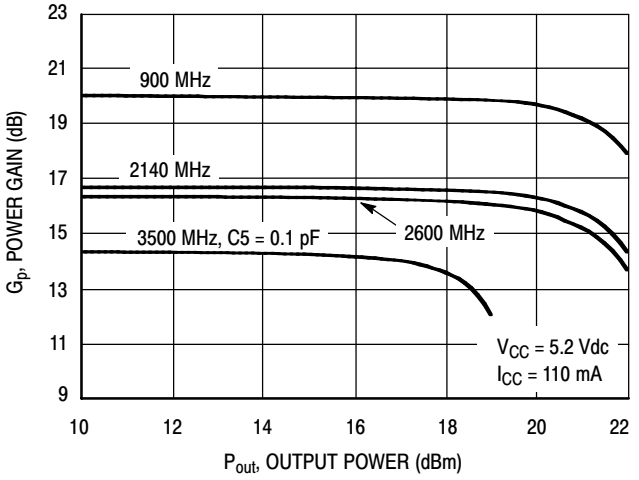


Figure 4. Power Gain versus Output Power

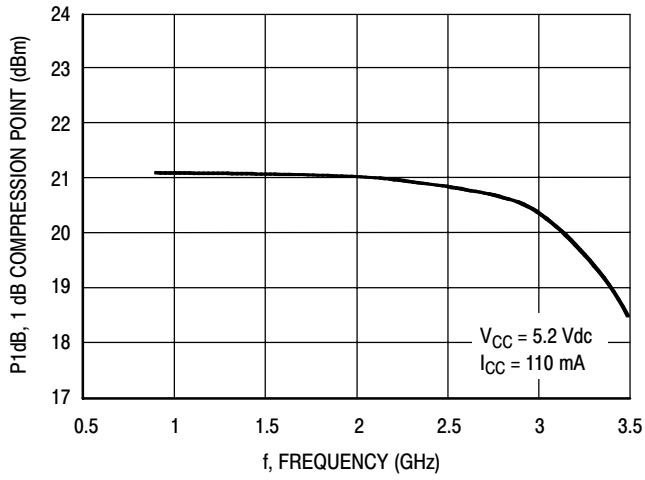


Figure 5. P1dB versus Frequency

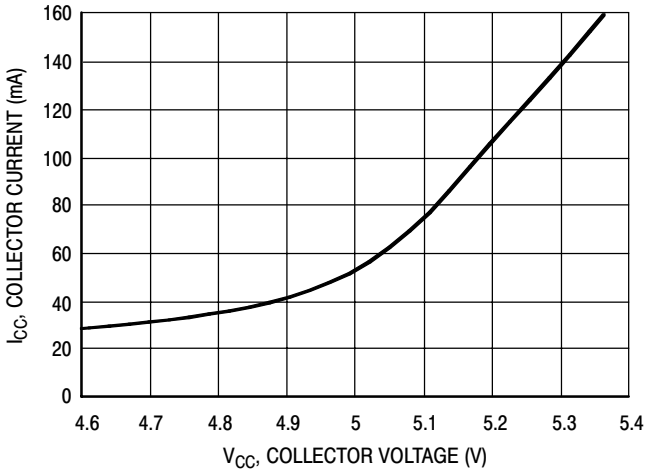


Figure 6. Collector Current versus Collector Voltage

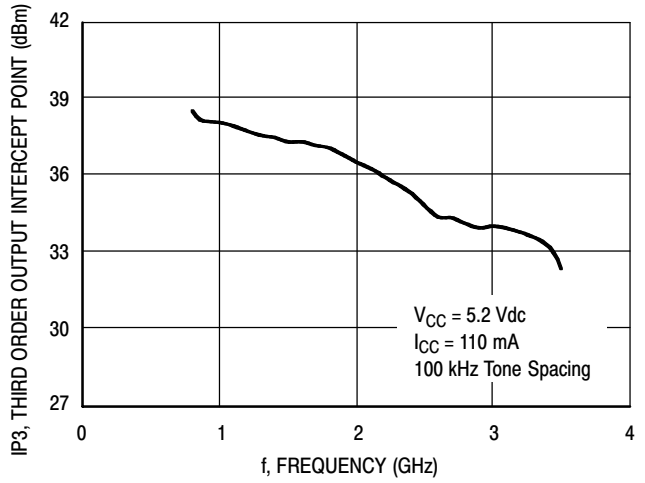


Figure 7. Third Order Output Intercept Point versus Frequency

50 OHM TYPICAL CHARACTERISTICS

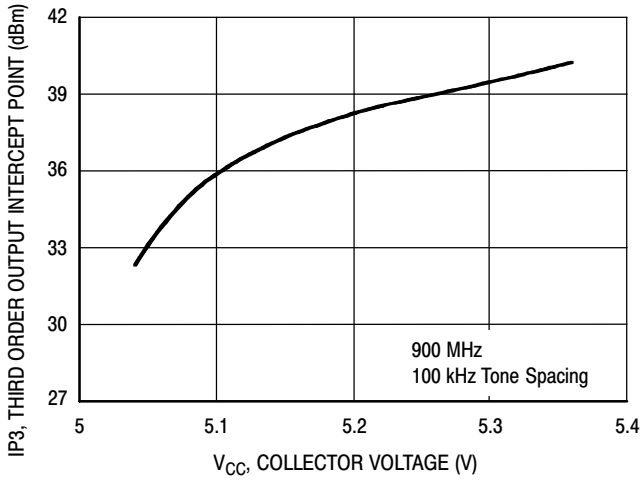


Figure 8. Third Order Output Intercept Point versus Collector Voltage

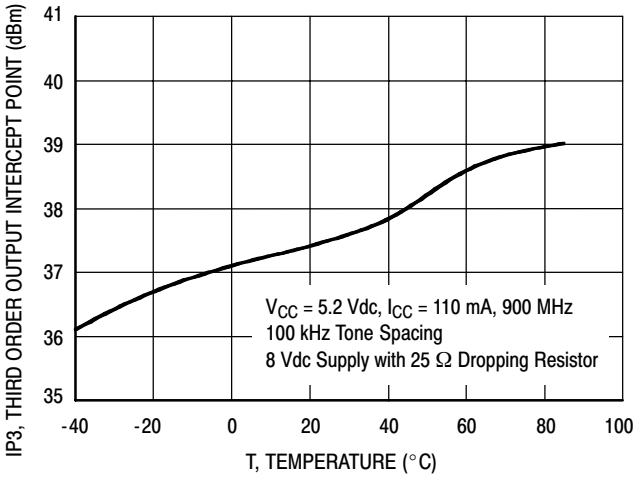


Figure 9. Third Order Output Intercept Point versus Case Temperature

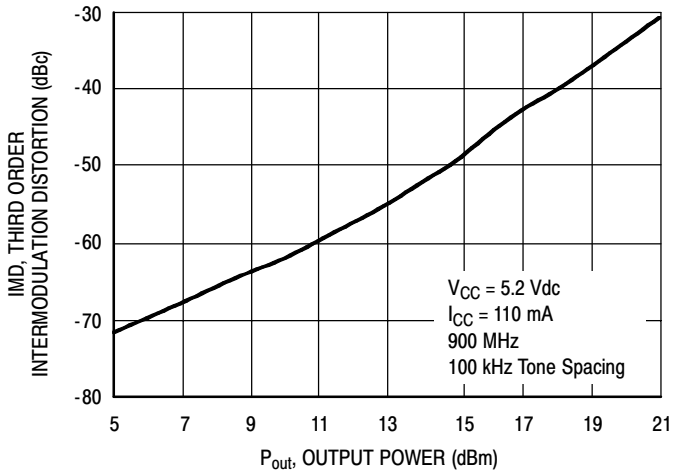
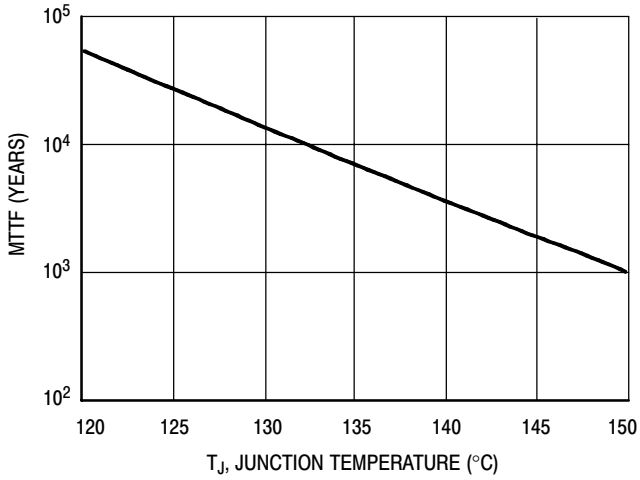


Figure 10. Third Order Intermodulation versus Output Power



NOTE: The MTTF is calculated with V_{CC} = 5.2 Vdc, I_{CC} = 110 mA

Figure 11. MTTF versus Junction Temperature

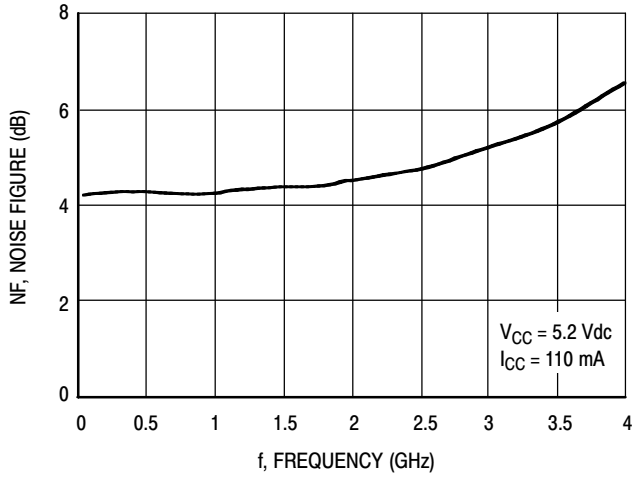


Figure 12. Noise Figure versus Frequency

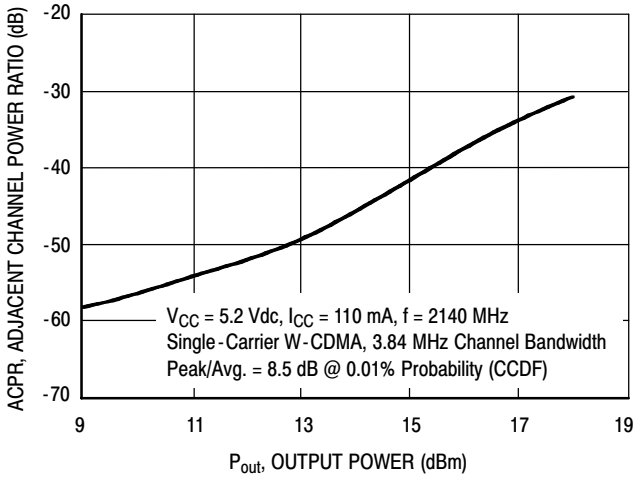
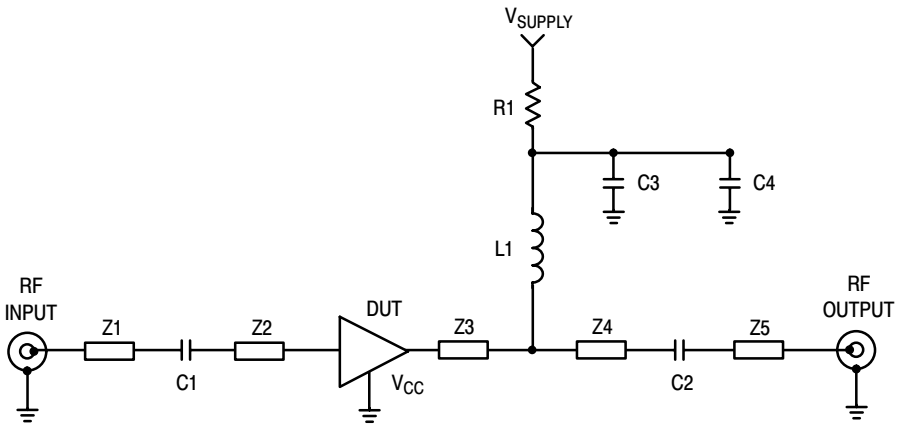


Figure 13. Single-Carrier W-CDMA Adjacent Channel Power Ratio versus Output Power

50 OHM APPLICATION CIRCUIT: 40-800 MHz



Z1, Z5	0.347″ x 0.058″ Microstrip	Z4	0.403″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1
Z3	0.172″ x 0.058″ Microstrip		

Figure 14. 50 Ohm Test Circuit Schematic

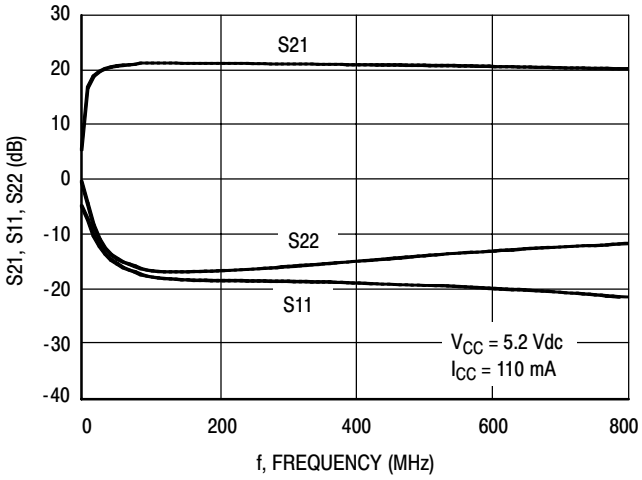
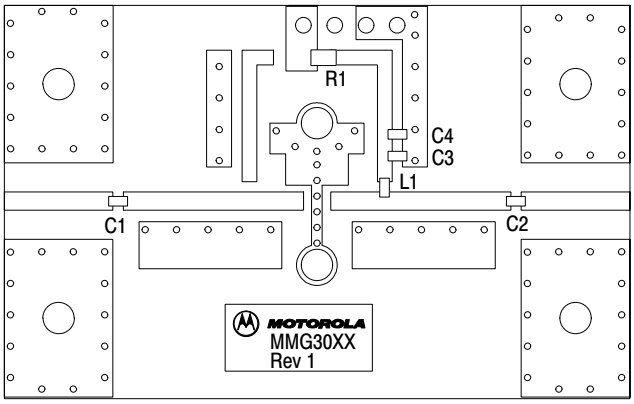


Figure 15. S21, S11 and S22 versus Frequency



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 16. 50 Ohm Test Circuit Component Layout

Table 8. 50 Ohm Test Circuit Component Designations and Values

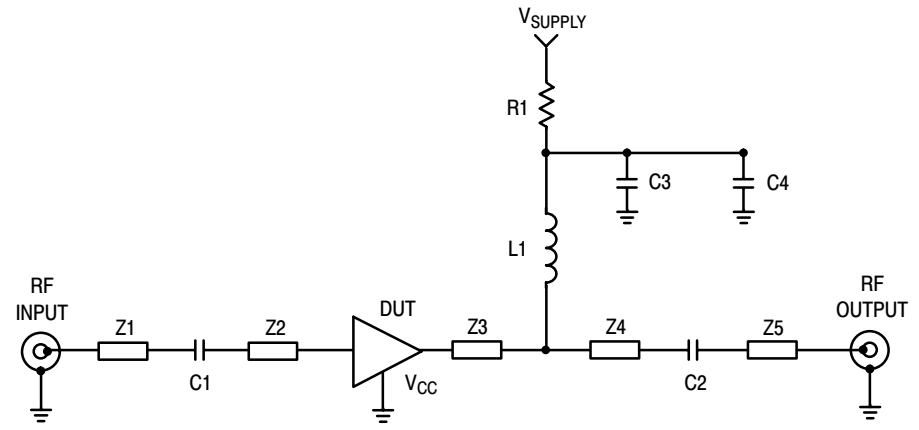
Part	Description	Part Number	Manufacturer
C1, C2	0.01 μF Chip Capacitors	0603A103JAT2A	AVX
C3	0.1 μF Chip Capacitor	0603A102JAT2A	AVX
C4	1 μF Chip Capacitor	0603A105JAT2A	AVX
L1	470 nH Chip Inductor	BK2125HM471	Taiyo Yuden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

Table 9. Supply Voltage versus R1 Values

Supply Voltage	6	7	8	9	10	11	12	V
R1 Value	7.3	16	25	35	44	53	62	Ω

Note: To provide V_{CC} = 5.2 Vdc and I_{CC} = 110 mA at the device.

50 OHM APPLICATION CIRCUIT: 800 - 3400 MHz



Z1, Z5	0.347″ x 0.058″ Microstrip	Z4	0.403″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1
Z3	0.172″ x 0.058″ Microstrip		

Figure 17. 50 Ohm Test Circuit Schematic

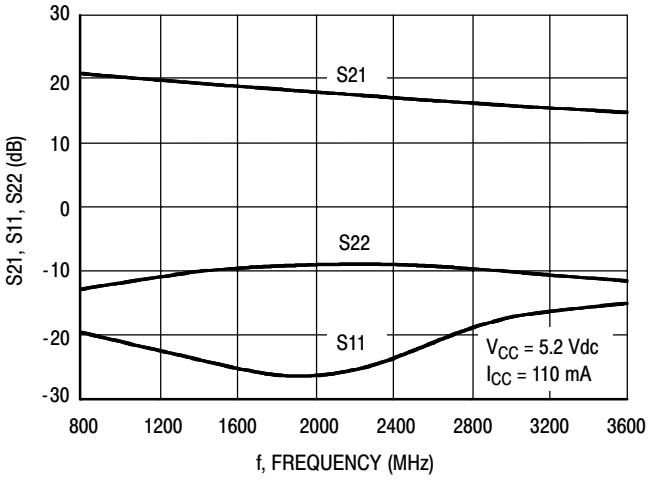
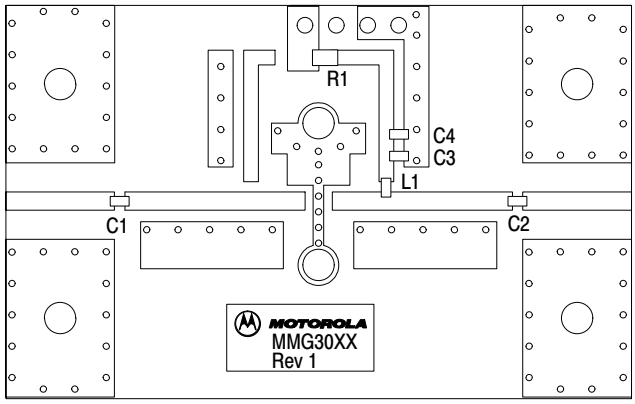


Figure 18. S21, S11 and S22 versus Frequency



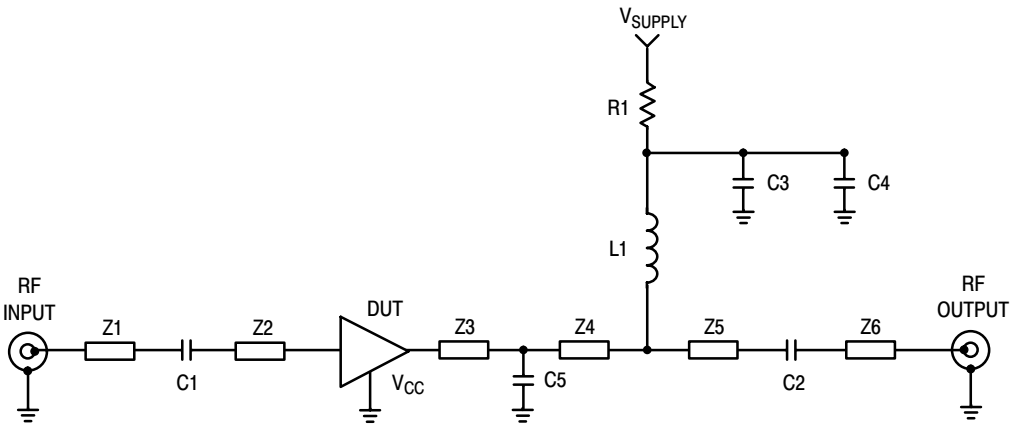
Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 19. 50 Ohm Test Circuit Component Layout

Table 10. 50 Ohm Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2	150 pF Chip Capacitors	0603A151JAT2A	AVX
C3	0.1 μF Chip Capacitor	0603A102JAT2A	AVX
C4	1 μF Chip Capacitor	0603A105JAT2A	AVX
L1	56 nH Chip Inductor	HK160856NJ-T	Taiyo Yuden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

50 OHM APPLICATION CIRCUIT: 3.4 - 3.6 GHz



Z1, Z6	0.347″ x 0.058″ Microstrip	Z4	0.085″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	Z5	0.404″ x 0.058″ Microstrip
Z3	0.086″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1

Figure 20. 50 Ohm Test Circuit Schematic

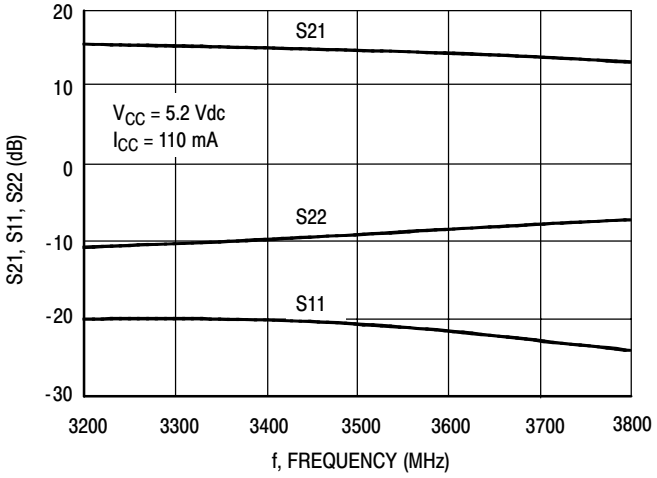
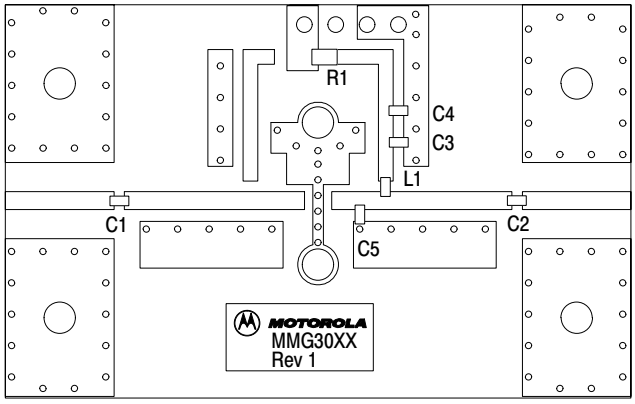


Figure 21. S21, S11 and S22 versus Frequency



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 22. 50 Ohm Test Circuit Component Layout

Table 11. 50 Ohm Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2	150 pF Chip Capacitors	0603A151JAT2A	AVX
C3	0.1 μF Chip Capacitor	0603A102JAT2A	AVX
C4	1 μF Chip Capacitor	0603A105JAT2A	AVX
C5 (1)	0.1 pF Chip Capacitor for 3400 - 3600 MHz	06035J0R1BBT	AVX
L1	39 nH Chip Inductor	HK160839NJ - T	Taiyo Yuden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

1. Tuning capacitor: Capacitor value and location on the transmission line are varied for different frequencies.

50 OHM TYPICAL CHARACTERISTICS

Table 12. Class A Common Emitter S-Parameters at V_{CC} = 5.2 Vdc, I_{CC} = 110 mA, T_C = 25°C

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
0.1	0.05966	176.181	10.25158	174.805	0.07235	-0.722	0.04946	-167.612
0.15	0.07228	-178.627	9.96687	171.111	0.07071	-1.821	0.0953	-129.396
0.2	0.09041	151.476	10.46556	167.719	0.07464	-3.053	0.05913	-124.668
0.25	0.0909	149.96	10.36837	164.949	0.07424	-3.553	0.08015	-125.378
0.3	0.08882	145.472	10.30366	162.017	0.07406	-4.277	0.09694	-122.814
0.35	0.08508	140.833	10.2505	158.995	0.07407	-4.934	0.11062	-121.876
0.4	0.08377	136.078	10.17971	156.158	0.07405	-5.7	0.12723	-122.007
0.45	0.08191	131.492	10.10383	153.293	0.07365	-6.307	0.14156	-122.555
0.5	0.07982	125.857	10.02536	150.437	0.07358	-7.037	0.15558	-123.436
0.55	0.07776	120.816	9.94165	147.642	0.07346	-7.676	0.1685	-124.8
0.6	0.0773	115.435	9.85596	144.898	0.07336	-8.2	0.18177	-126.796
0.65	0.07677	110.371	9.76098	142.109	0.07321	-8.911	0.19472	-128.506
0.7	0.07664	104.874	9.6623	139.374	0.07301	-9.464	0.20662	-130.47
0.75	0.07628	100.112	9.56168	136.692	0.0729	-10.069	0.21833	-132.663
0.8	0.07619	95.73	9.45426	134.024	0.07275	-10.618	0.22977	-134.835
0.85	0.07601	91.72	9.34921	131.391	0.07273	-11.184	0.24125	-137.084
0.9	0.07567	87.313	9.23967	128.792	0.07257	-11.821	0.25232	-139.685
0.95	0.07642	83.036	9.13144	126.149	0.07238	-12.312	0.26303	-142.257
1	0.07619	80.021	9.01205	123.659	0.07228	-12.88	0.27394	-144.736
1.05	0.07666	76.201	8.90327	121.137	0.07218	-13.474	0.28332	-147.346
1.1	0.07678	73.008	8.78013	118.657	0.07202	-13.93	0.29417	-150.042
1.15	0.07673	70.68	8.66342	116.191	0.0719	-14.519	0.30394	-152.767
1.2	0.07674	68.773	8.53991	113.779	0.07178	-15.062	0.31393	-155.358
1.25	0.07628	66.216	8.42251	111.392	0.07176	-15.551	0.32286	-157.992
1.3	0.07618	64.635	8.30514	109.034	0.07164	-16.115	0.33259	-160.483
1.35	0.07454	62.959	8.18109	106.673	0.07149	-16.539	0.34127	-162.981
1.4	0.07373	60.65	8.06498	104.367	0.07152	-17.114	0.34972	-165.377
1.45	0.0724	59.062	7.94403	102.073	0.07137	-17.565	0.35931	-167.823
1.5	0.06466	48.656	7.85198	99.72	0.0715	-18.187	0.35762	-170.82
1.55	0.0646	44.563	7.73641	97.503	0.07167	-18.755	0.36484	-172.845
1.6	0.06495	39.856	7.63068	95.372	0.07161	-19.217	0.37158	-174.751
1.65	0.0657	35.953	7.52257	93.247	0.07165	-19.614	0.37821	-176.697
1.7	0.06599	31.949	7.43591	91.089	0.07171	-20.239	0.38558	-178.85
1.75	0.0666	28.693	7.31976	88.981	0.07168	-20.731	0.39036	179.588
1.8	0.06649	25.448	7.22121	86.872	0.07176	-21.241	0.39732	177.775
1.85	0.06637	22.687	7.11782	84.83	0.07181	-21.685	0.40211	175.992
1.9	0.06563	19.369	7.01794	82.771	0.07188	-22.233	0.40749	174.294
1.95	0.06514	15.516	6.91688	80.824	0.07197	-22.678	0.41306	172.684
2	0.0641	13.294	6.82126	78.739	0.07217	-23.218	0.41825	170.97
2.05	0.06323	9.843	6.72865	76.797	0.07214	-23.632	0.42367	169.372
2.1	0.06288	6.976	6.63794	74.849	0.07234	-24.15	0.42905	167.644
2.15	0.06195	4.218	6.55483	72.888	0.07244	-24.689	0.43442	166.014
2.2	0.06084	2.075	6.46275	70.939	0.07265	-25.273	0.43857	164.274
2.25	0.05942	-0.3	6.37821	69.013	0.07275	-25.755	0.44419	162.598
2.3	0.05808	-2.187	6.29055	67.098	0.07295	-26.316	0.44756	160.879
2.35	0.05526	-4.038	6.20851	65.179	0.07318	-26.813	0.45231	159.11

Table 12. Class A Common Emitter S-Parameters at V_{CC} = 5.2 Vdc, I_{CC} = 110 mA, T_C = 25°C (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
2.4	0.05338	-6.096	6.12256	63.315	0.07337	-27.387	0.45571	157.425
2.45	0.05054	-7.643	6.04461	61.45	0.07359	-27.903	0.46063	155.679
2.5	0.04768	-10.036	5.96594	59.564	0.07386	-28.462	0.46419	153.884
2.55	0.04494	-12.811	5.88833	57.733	0.07416	-29.19	0.4681	152.005
2.6	0.04239	-14.731	5.81782	55.868	0.07435	-29.754	0.47249	150.142
2.65	0.0393	-16.676	5.74121	53.98	0.07445	-30.312	0.47601	148.126
2.7	0.03707	-20.889	5.66538	52.04	0.0748	-31.053	0.47991	146.214
2.75	0.0346	-21.7	5.59155	50.247	0.07499	-31.654	0.48371	144.147
2.8	0.03163	-24.056	5.51967	48.401	0.07519	-32.344	0.48777	142.183
2.85	0.02869	-26.756	5.44631	46.54	0.0754	-33.048	0.49144	140.072
2.9	0.02667	-28.324	5.37422	44.74	0.07563	-33.749	0.4961	138.081
2.95	0.02324	-29.457	5.30336	42.914	0.07577	-34.431	0.50017	136.001
3	0.02069	-34.403	5.23613	41.138	0.07596	-35.209	0.5054	133.872
3.05	0.01861	-37.625	5.16698	39.322	0.07624	-35.917	0.50901	131.91
3.1	0.01563	-41.101	5.09908	37.495	0.07648	-36.648	0.51431	129.855
3.15	0.01407	-49.967	5.03148	35.696	0.0766	-37.389	0.51844	127.844
3.2	0.01296	-54.052	4.96452	33.935	0.07684	-38.12	0.52333	125.818
3.25	0.01129	-59.44	4.89769	32.159	0.07708	-38.894	0.52814	123.86
3.3	0.01031	-67.904	4.83271	30.407	0.07721	-39.663	0.53368	121.891
3.35	0.00977	-71.657	4.76883	28.702	0.07742	-40.479	0.53765	120.096
3.4	0.00821	-77.779	4.707	26.984	0.07764	-41.116	0.54299	118.206
3.45	0.0076	-90.054	4.64886	25.288	0.07774	-41.964	0.54702	116.357
3.5	0.0074	-97.151	4.59041	23.575	0.07797	-42.707	0.55121	114.75
3.55	0.00666	-114.876	4.5319	21.885	0.07819	-43.538	0.55593	113.11
3.6	0.00749	-127.171	4.47455	20.231	0.07843	-44.293	0.55935	111.522

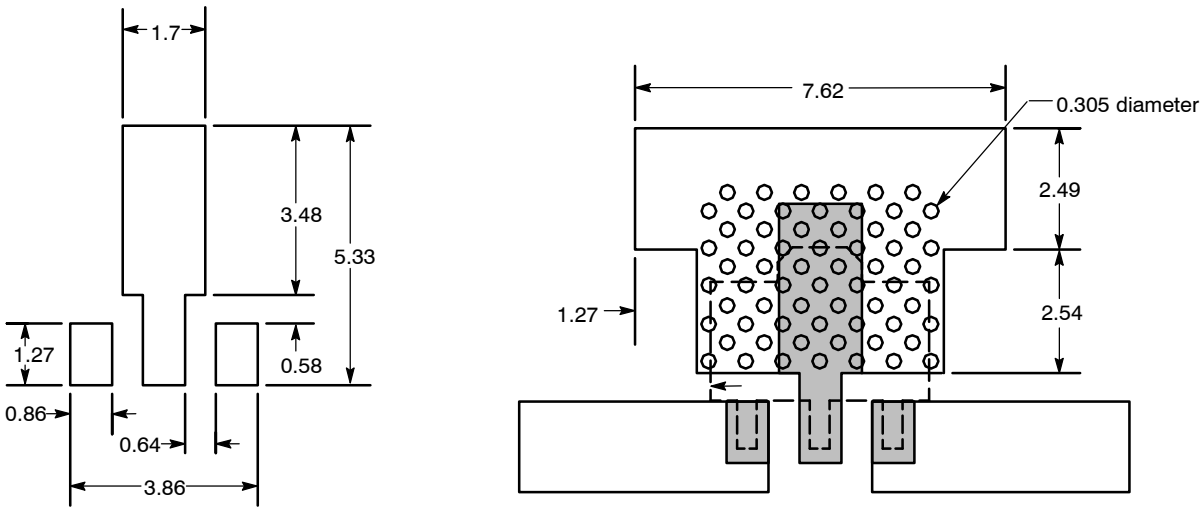


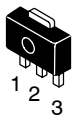
Figure 23. Recommended Mounting Configuration

Heterojunction Bipolar Transistor Technology (InGaP HBT)

Broadband High Linearity Amplifier

MMG3003NT1

40-3600 MHz, 20 dB
24 dBm
InGaP HBT



CASE 1514-01, STYLE 1
SOT-89
PLASTIC

The MMG3003NT1 is a General Purpose Amplifier that is internally input matched and internally output prematched. It is designed for a broad range of Class A, small-signal, high linearity, general purpose applications. It is suitable for applications with frequencies from 40 to 3600 MHz such as Cellular, PCS, BWA, WLL, PHS, CATV, VHF, UHF, UMTS and general small-signal RF.

Features

- Frequency: 40-3600 MHz
- P1dB: 24 dBm
- Power Gain: 20 dB
- Third Order Output Intercept Point: 40.5 dBm
- Single Voltage Supply
- Internally Matched to 50 Ohms
- Low Cost SOT-89 Surface Mount Package
- Pb-Free Leads
- In Tape and Reel. T1 Suffix = 1000 Units per 12 mm, 7 inch Reel.

Table 1. Typical Performance (1)

Characteristic	Symbol	900 MHz	2140 MHz	3500 MHz	Unit
Power Gain (S21)	G_p	20	16.9	12	dB
Input Return Loss (S11)	IRL	-15	-14.1	-11.2	dB
Output Return Loss (S22)	ORL	-9.3	-14.5	-10.2	dB
Power Output @1dB Compression	P1db	24.1	23.3	20.5	dBm
Third Order Output Intercept Point	IP3	40.5	40	37	dBm

1. V_{CC} = 6.2 Vdc, T_C = 25°C, 50 ohm system

Table 2. Maximum Ratings

Rating	Symbol	Value	Unit
Supply Voltage (2)	V_{CC}	7	V
Supply Current (2)	I_{CC}	400	mA
RF Input Power	P_{in}	15	dBm
Storage Temperature Range	T_{stg}	-65 to +150	°C
Junction Temperature (3)	T_J	150	°C

2. Voltage and current applied to device.
3. For reliable operation, the junction temperature should not exceed 150°C.

Table 3. Thermal Characteristics (V_{CC} = 6.2 Vdc, I_{CC} = 180 mA, T_C = 25°C)

Characteristic	Symbol	Value (4)	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	31.6	°C/W

4. Refer to AN1955/D, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.

Table 4. Electrical Characteristics (V_{CC} = 6.2 Vdc, 900 MHz, T_C = 25°C, 50 ohm system, in Freescale Application Circuit)

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain (S21)	G_p	19.3	20	—	dB
Input Return Loss (S11)	IRL	—	-15	—	dB
Output Return Loss (S22)	ORL	—	-9.3	—	dB
Power Output @ 1dB Compression	P1dB	—	24	—	dBm
Third Order Output Intercept Point	IP3	—	40.5	—	dBm
Noise Figure	NF	—	4	—	dB
Supply Current (1)	I_{CC}	160	180	205	mA
Supply Voltage (1)	V_{CC}	—	6.2	—	V

1. For reliable operation, the junction temperature should not exceed 150°C.

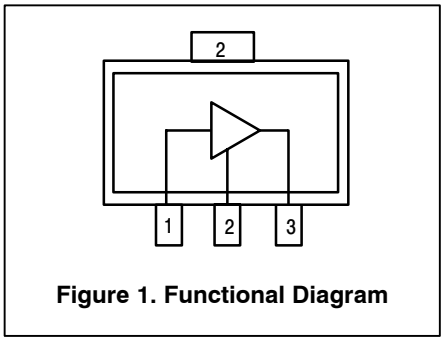


Figure 1. Functional Diagram

Table 5. Functional Pin Description

Pin Number	Pin Function
1	RF_{in}
2	Ground
3	RF_{out}/DC Supply

Table 6. ESD Protection Characteristics

Test Conditions/Test Methodology	Class
Human Body Model (per JESD 22-A114)	1B (Minimum)
Machine Model (per EIA/JESD 22-A115)	A (Minimum)
Charge Device Model (per JESD 22-C101)	IV (Minimum)

Table 7. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	1	260	°C

50 OHM TYPICAL CHARACTERISTICS

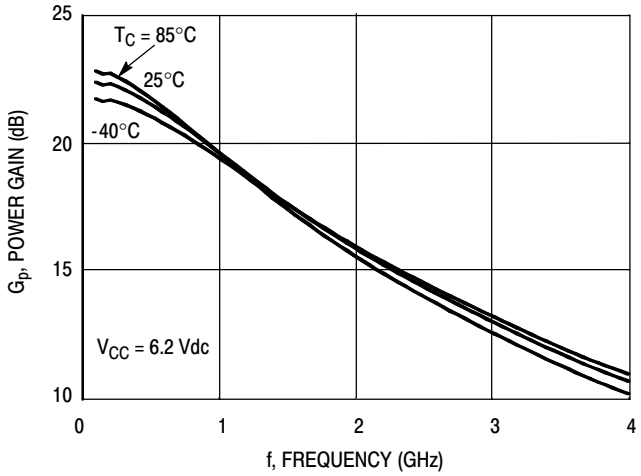


Figure 2. Unmatched Power Gain (S21) versus Frequency

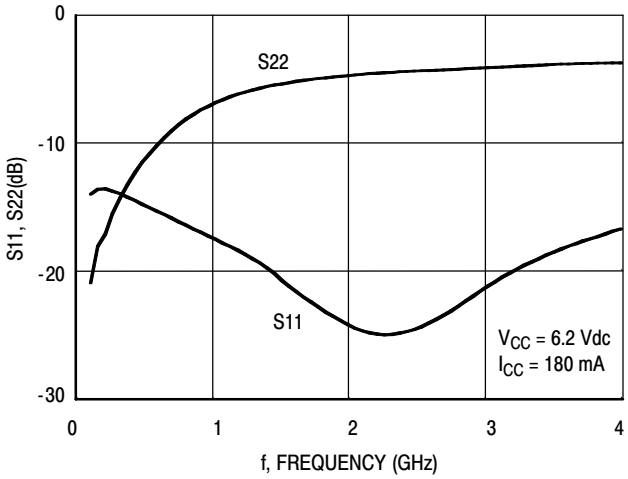


Figure 3. Unmatched Input/Output Return Loss versus Frequency

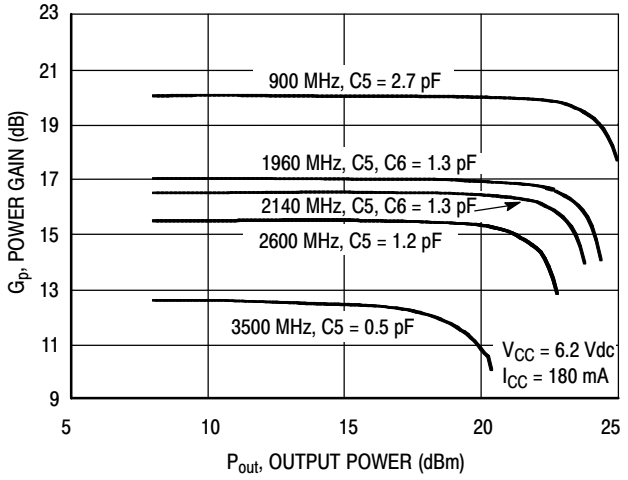


Figure 4. Power Gain versus Output Power

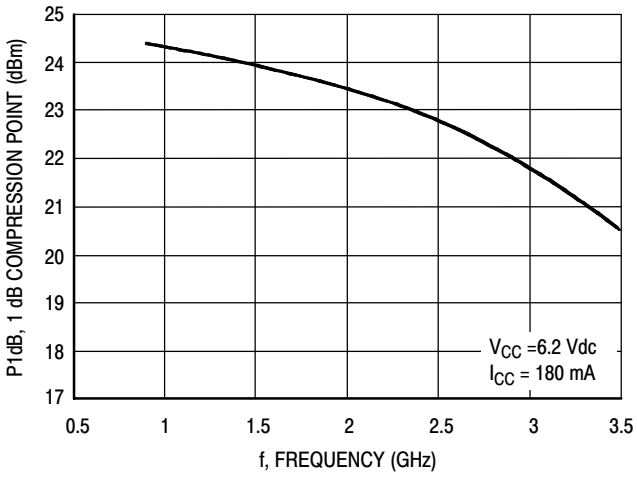


Figure 5. P1dB versus Frequency

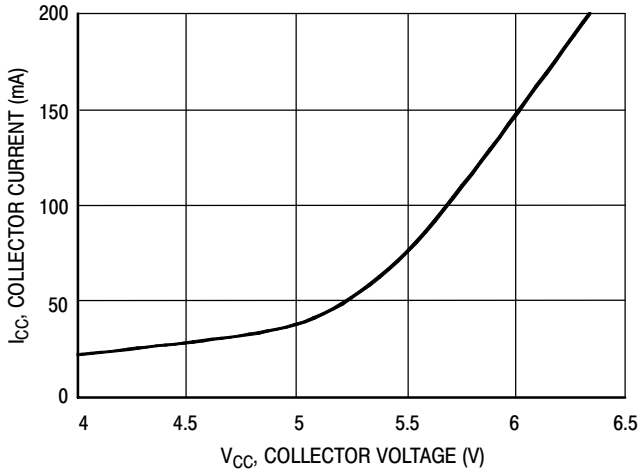


Figure 6. Collector Current versus Collector Voltage

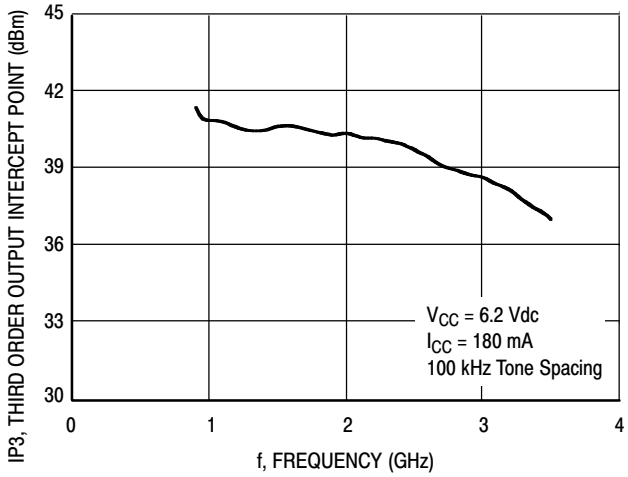


Figure 7. Third Order Output Intercept Point versus Frequency

50 OHM TYPICAL CHARACTERISTICS

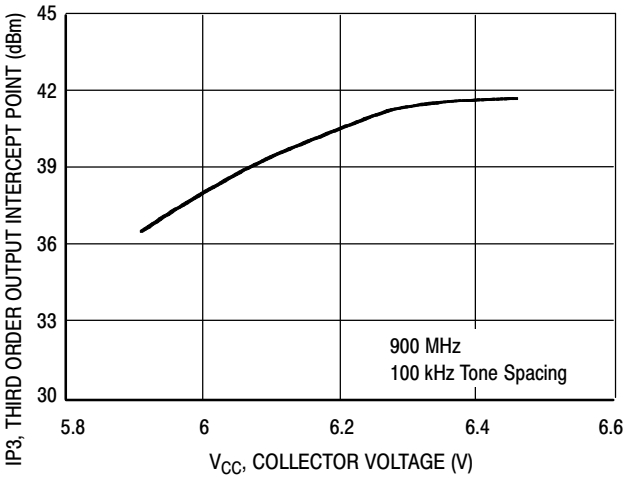


Figure 8. Third Order Output Intercept Point versus Collector Voltage

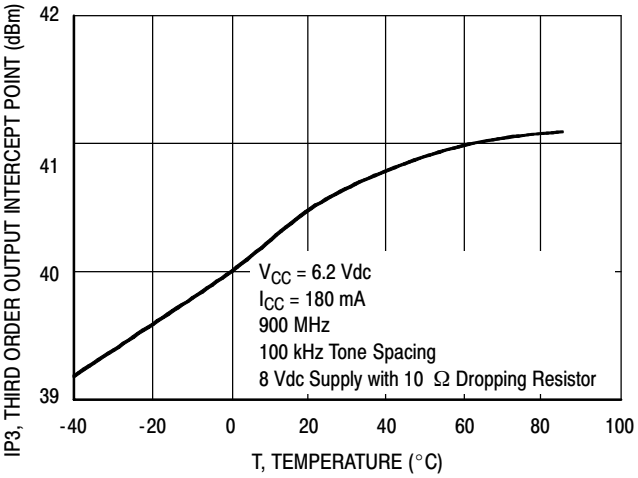


Figure 9. Third Order Output Intercept Point versus Case Temperature

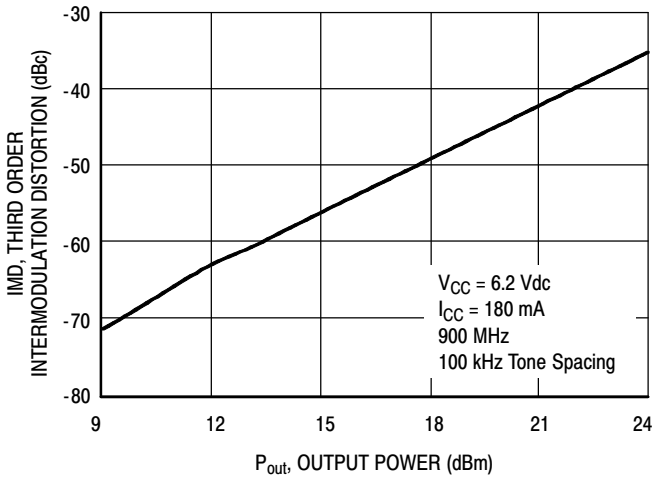
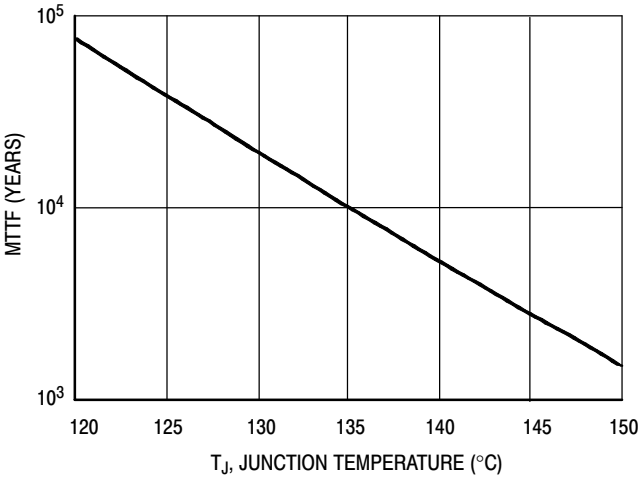


Figure 10. Third Order Intermodulation versus Output Power



NOTE: The MTTF is calculated with I_{CC} = 180 mA

Figure 11. MTTF versus Junction Temperature

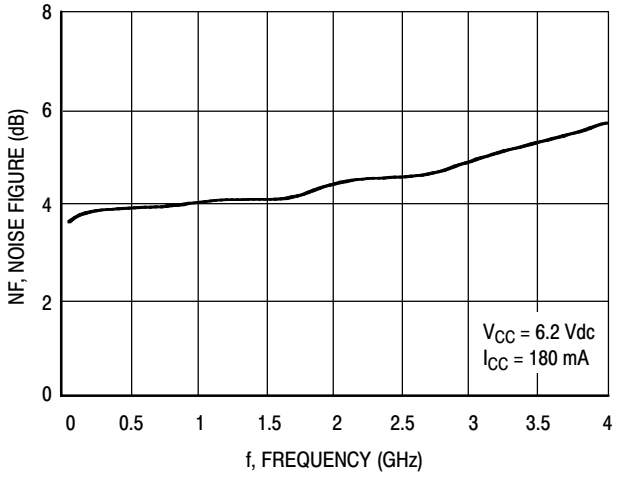


Figure 12. Noise Figure versus Frequency

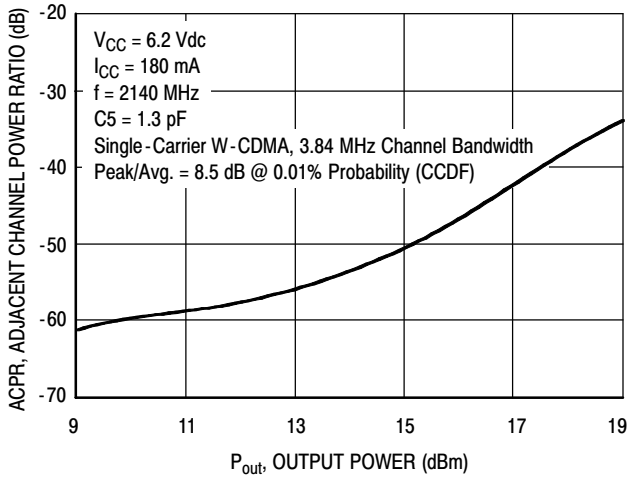
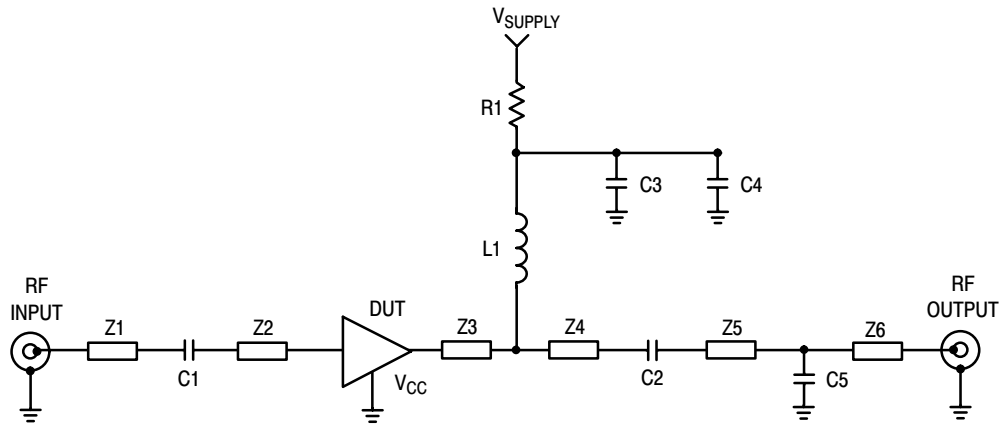


Figure 13. Single-Carrier W-CDMA Adjacent Channel Power Ratio versus Output Power

50 OHM APPLICATION CIRCUIT: 40 - 800 MHz



Z1	0.347″ x 0.058″ Microstrip	Z5	0.286″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	Z6	0.061″ x 0.058″ Microstrip
Z3	0.172″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1
Z4	0.403″ x 0.058″ Microstrip		

Figure 14. 50 Ohm Test Circuit Schematic

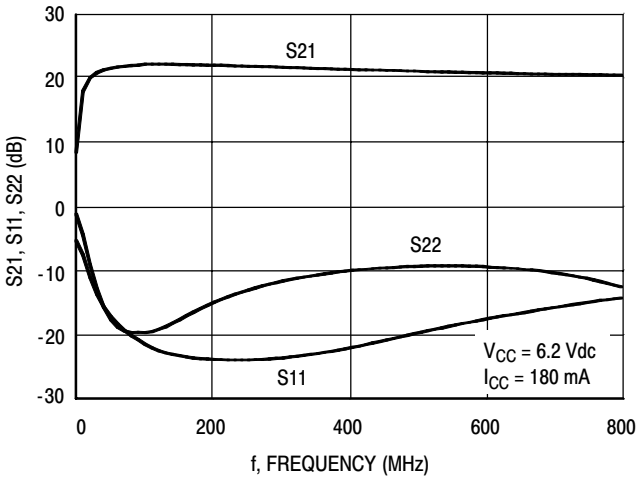
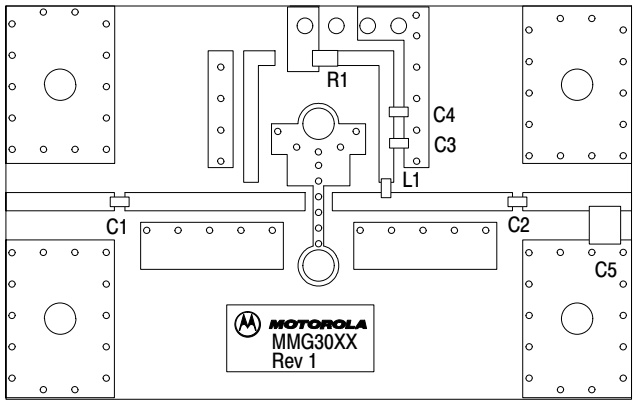


Figure 15. S21, S11 and S22 versus Frequency



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 16. 50 Ohm Test Circuit Component Layout

Table 8. 50 Ohm Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2, C4	0.01 μF Chip Capacitors	0603A103JAT2A	AVX
C3	68 pF Chip Capacitor	0805K680JBT	AVX
C5 (1)	2.7 pF Chip Capacitor for 40 - 800 MHz	12105J2R7BBT	AVX
L1	470 nH Chip Inductor	BK2125HM471	Taiyo Uden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

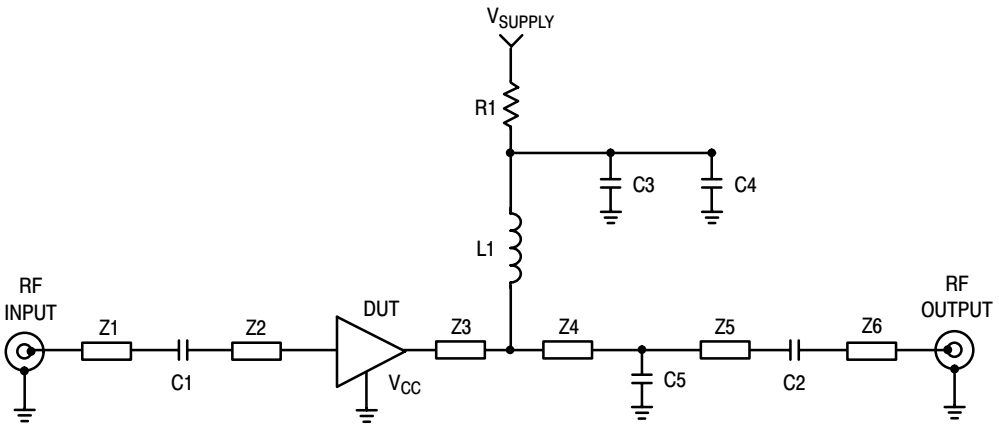
1. Tuning capacitor: Capacitor value and location on the transmission line are varied for different frequencies.

Table 9. Supply Voltage versus R1 Values

Supply Voltage	7	8	9	10	11	12	V
R1 Value	4.4	10	15.6	21	27	32	Ω

Note: To provide V_{CC} = 6.2 Vdc and I_{CC} = 180 mA at the device.

50 OHM APPLICATION CIRCUIT: 800 - 1100 MHz



Z1, Z6	0.347″ x 0.058″ Microstrip	Z4	0.333″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	Z5	0.07″ x 0.058″ Microstrip
Z3	0.172″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1

Figure 17. 50 Ohm Test Circuit Schematic

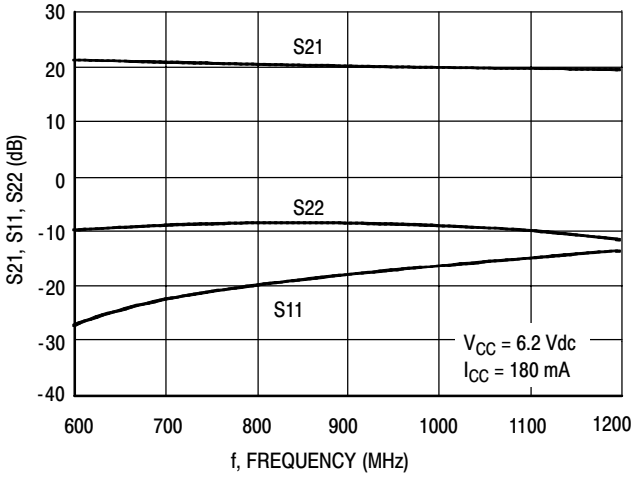


Figure 18. S21, S11 and S22 versus Frequency

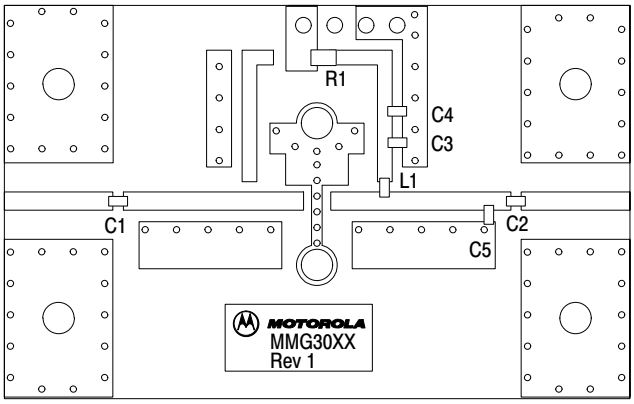


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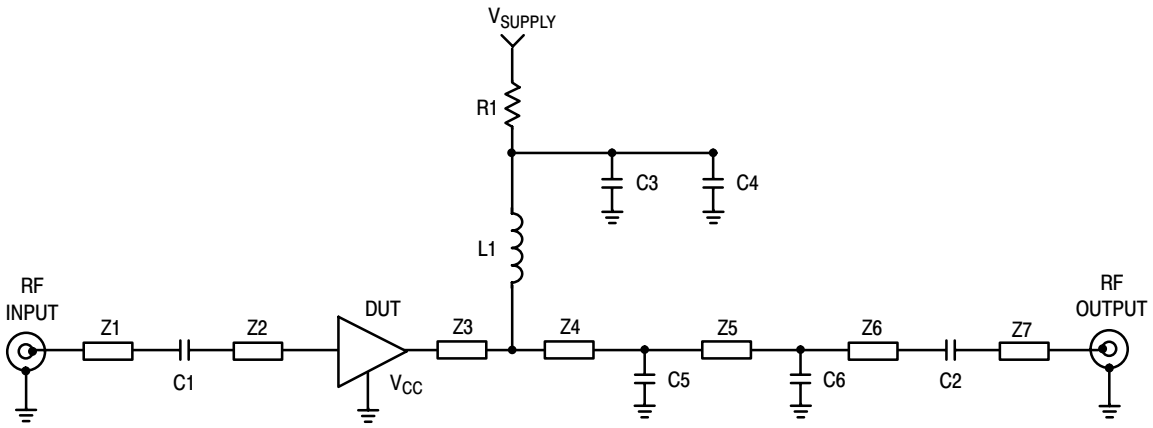
Figure 19. 50 Ohm Test Circuit Component Layout

Table 10. 50 Ohm Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2	47 pF Chip Capacitors	0805K470JBT	AVX
C3	68 pF Chip Capacitor	0805K680JBT	AVX
C4	0.01 μF Chip Capacitor	0603A103JAT2A	AVX
C5 (1)	2.7 pF Chip Capacitor for 800 - 1100 MHz	06035J2R7BBT	AVX
L1	22 nH Chip Inductor	HK160822NJ - T	Taiyo Uden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

1. Tuning capacitor: Capacitor value and location on the transmission line are varied for different frequencies.

50 OHM APPLICATION CIRCUIT: 1800 - 2400 MHz



Z1, Z7	0.347″ x 0.058″ Microstrip	Z5	0.062″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	Z6	0.466″ x 0.058″ Microstrip
Z3	0.172″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1
Z4	0.047″ x 0.058″ Microstrip		

Figure 20. 50 Ohm Test Circuit Schematic

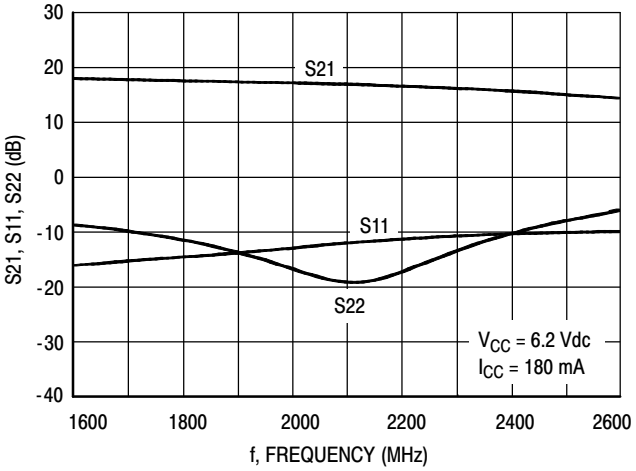
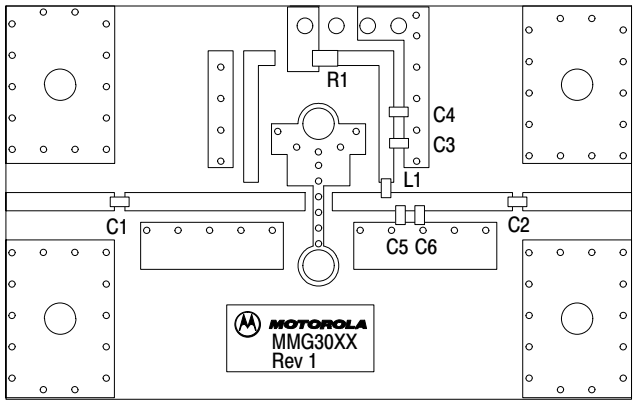


Figure 21. S21, S11 and S22 versus Frequency



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

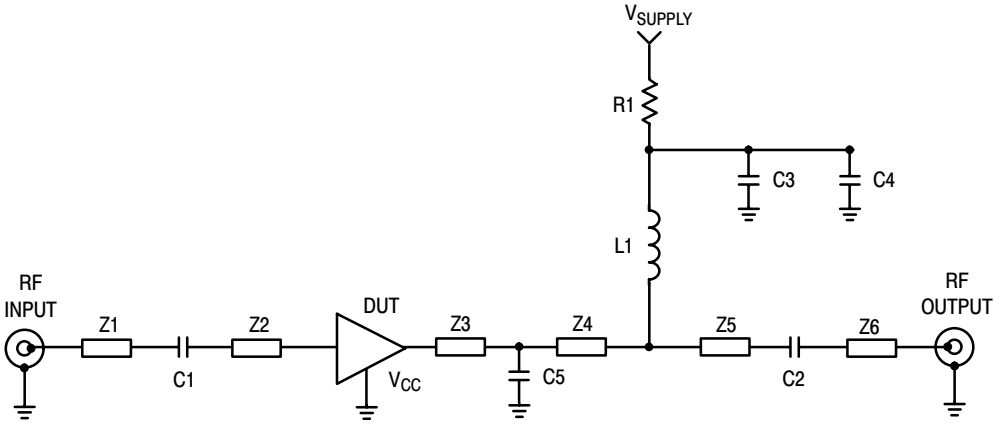
Figure 22. 50 Ohm Test Circuit Component Layout

Table 11. 50 Ohm Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2	47 pF Chip Capacitors	0805K470JBT	AVX
C3	68 pF Chip Capacitor	0805K680JBT	AVX
C4	0.01 μF Chip Capacitor	0603A103JAT2A	AVX
C5 (1)	1.2 pF Chip Capacitor for 1800 - 2400 MHz	06035J1R2BBT	AVX
C6 (1)	0.1 pF Chip Capacitor for 1800 - 2400 MHz	06035J0R1BBT	AVX
L1	22 nH Chip Inductor	HK160822NJ - T	Taiyo Uden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

1. Tuning capacitor: Capacitor value and location on the transmission line are varied for different frequencies.

50 OHM APPLICATION CIRCUIT: 2500 - 2700 MHz



Z1, Z6	0.347″ x 0.058″ Microstrip	Z4	0.085″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	Z5	0.404″ x 0.058″ Microstrip
Z3	0.086″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1

Figure 23. 50 Ohm Test Circuit Schematic

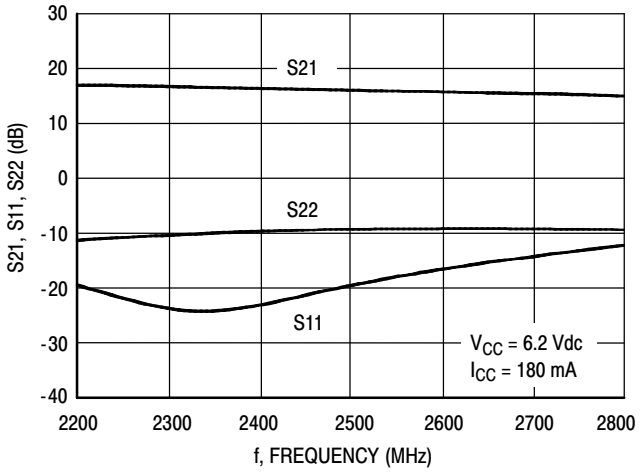
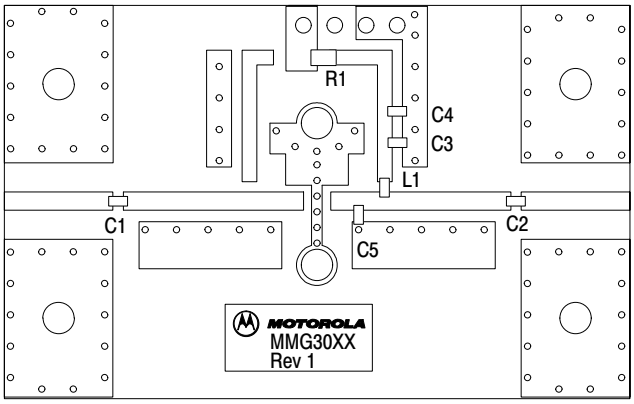


Figure 24. S21, S11 and S22 versus Frequency



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

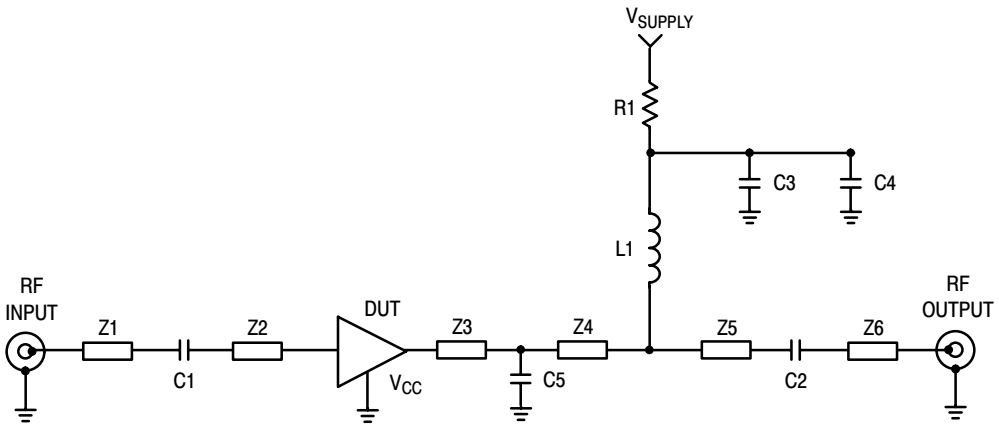
Figure 25. 50 Ohm Test Circuit Component Layout

Table 12. 50 Ohm Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2	2.2 pF Chip Capacitors	0603A5J2R2BBT	AVX
C3	68 pF Chip Capacitor	0805K680JBT	AVX
C4	0.01 μF Chip Capacitor	0603A103JAT2A	AVX
C5 (1)	1.2 pF Chip Capacitor for 2500 - 2700 MHz	06035J1R2BBT	AVX
L1	39 nH Chip Inductor	HK160839NJ - T	Taiyo Uden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

1. Tuning capacitor: Capacitor value and location on the transmission line are varied for different frequencies.

50 OHM APPLICATION CIRCUIT: 3400 - 3600 MHz



Z1, Z6	0.347″ x 0.058″ Microstrip	Z4	0.085″ x 0.058″ Microstrip
Z2	0.575″ x 0.058″ Microstrip	Z5	0.404″ x 0.058″ Microstrip
Z3	0.086″ x 0.058″ Microstrip	PCB	Getek Grade ML200C, 0.031″, ε_r = 4.1

Figure 26. 50 OhmTest Circuit Schematic

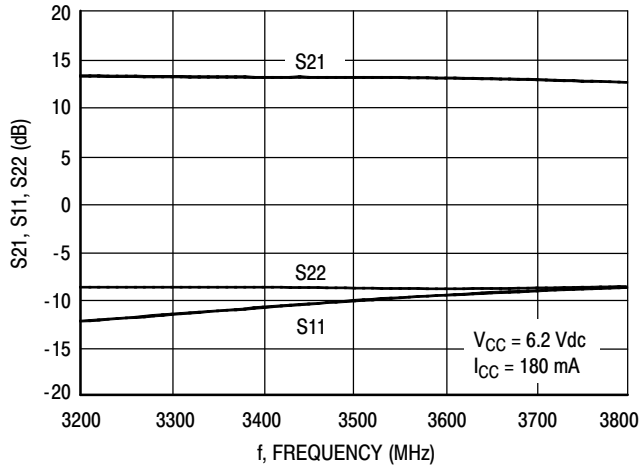
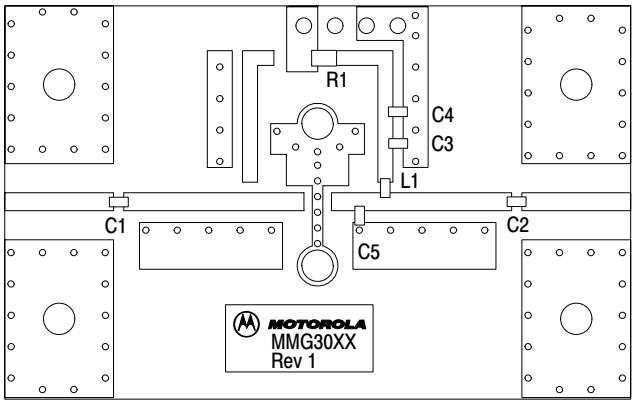


Figure 27. S21, S11 and S22 versus Frequency



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 28. 50 Ohm Test Circuit Component Layout

Table 13. 50 OhmTest Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2	2.2 pF Chip Capacitors	0603A5J2R2BBT	AVX
C3	68 pF Chip Capacitor	0805K680JBT	AVX
C4	0.01 μF Chip Capacitor	0603A103JAT2A	AVX
C5 (1)	0.5 pF Chip Capacitor for 3400 - 3600 MHz	06035J0R5BBT	AVX
L1	39 nH Chip Inductor	HK160839NJ - T	Taiyo Uden
R1	7.5 Ω Chip Resistor	RK73B2AT7R5J	KOA Speer

1. Tuning capacitor: Capacitor value and location on the transmission line are varied for different frequencies.

50 OHM TYPICAL CHARACTERISTICS

Table 14. Class A Common Emitter S-Parameters at V_{CC} = 6.2 Vdc, I_{CC} = 180 mA, T_C = 25°C

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
0.1	0.141	178.297	12.985	173.850 0	0.057	0.785 0	0.087	-167.704
0.15	0.153	175.556	12.654	168.9	0.057	-0.913	0.136	-137.479
0.2	0.155	160.177	13.067	164.046	0.059	-2.423	0.125	-131.397
0.25	0.152	159.068	12.851	160.334	0.058	-2.897	0.159	-130.233
0.3	0.147	156.309	12.685	156.518	0.058	-3.227	0.187	-128.649
0.35	0.139	153.853	12.519	152.664	0.058	-3.971	0.212	-128.651
0.4	0.135	150.838	12.327	149.087	0.057	-4.471	0.239	-129.263
0.45	0.129	148.378	12.124	145.521	0.057	-4.799	0.263	-130.237
0.5	0.123	145.160	11.915	142.009	0.057	-5.285	0.285	-131.637
0.55	0.117	142.332	11.694	138.634	0.057	-5.623	0.306	-133.294
0.6	0.112	139.364	11.470	135.366	0.057	-6.012	0.326	-135.284
0.65	0.106	136.769	11.238	132.093	0.057	-6.295	0.345	-137.146
0.7	0.101	133.592	11.004	128.948	0.057	-6.705	0.362	-139.07
0.75	0.096	131.187	10.770	125.882	0.057	-7.044	0.378	-141.171
0.8	0.090	128.979	10.532	122.88	0.056	-7.277	0.394	-143.273
0.85	0.086	126.711	10.298	119.942	0.056	-7.495	0.408	-145.372
0.9	0.081	124.541	10.066	117.117	0.056	-7.847	0.422	-147.618
0.95	0.076	122.189	9.841	114.276	0.056	-8.05	0.435	-149.849
1	0.073	121.191	9.611	111.625	0.056	-8.311	0.447	-151.947
1.05	0.069	119.451	9.393	108.992	0.056	-8.582	0.458	-154.142
1.1	0.065	118.827	9.170	106.412	0.056	-8.89	0.470	-156.289
1.15	0.062	118.851	8.957	103.879	0.056	-9.079	0.480	-158.481
1.2	0.059	118.882	8.742	101.417	0.056	-9.405	0.490	-160.544
1.25	0.056	119.703	8.541	99.039	0.056	-9.615	0.498	-162.608
1.3	0.054	120.919	8.340	96.664	0.056	-9.805	0.507	-164.561
1.35	0.051	123.223	8.143	94.364	0.056	-10.198	0.515	-166.501
1.4	0.048	125.019	7.957	92.107	0.056	-10.536	0.522	-168.351
1.45	0.046	128.063	7.774	89.892	0.056	-10.724	0.530	-170.229
1.5	0.033	135.869	7.640	87.599	0.057	-11.197	0.529	-172.918
1.55	0.030	139.127	7.475	85.482	0.057	-11.434	0.536	-174.487
1.6	0.027	142.585	7.322	83.442	0.057	-11.649	0.541	-175.93
1.65	0.024	146.640	7.170	81.444	0.057	-11.993	0.546	-177.394
1.7	0.023	152.580	7.040	79.397	0.058	-12.335	0.552	-179.018
1.75	0.021	158.266	6.890	77.439	0.058	-12.616	0.555	179.899
1.8	0.021	166.196	6.756	75.477	0.058	-12.879	0.560	178.582
1.85	0.022	171.633	6.621	73.576	0.058	-13.16	0.563	177.318
1.9	0.023	177.431	6.495	71.695	0.058	-13.445	0.566	176.139
1.95	0.025	-176.142	6.371	69.952	0.059	-13.806	0.570	175.08
2	0.027	-173.137	6.251	67.988	0.059	-14.176	0.573	173.812
2.05	0.029	-170.367	6.135	66.175	0.059	-14.413	0.577	172.704
2.1	0.031	-168.467	6.025	64.385	0.060	-14.882	0.580	171.566
2.15	0.033	-168.388	5.921	62.595	0.060	-15.338	0.583	170.426
2.2	0.036	-169.515	5.815	60.823	0.060	-15.659	0.586	169.283
2.25	0.039	-170.197	5.716	59.079	0.061	-16.136	0.589	168.164
2.3	0.042	-171.944	5.618	57.331	0.061	-16.513	0.591	167.003
2.35	0.045	-173.747	5.525	55.573	0.061	-16.98	0.593	165.803

Table 14. Class A Common Emitter S-Parameters at V_{CC} = 6.2 Vdc, I_{CC} = 180 mA, T_C = 25°C (continued)

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	$\|S_{11}\|$	$\angle\phi$	$\|S_{21}\|$	$\angle\phi$	$\|S_{12}\|$	$\angle\phi$	$\|S_{22}\|$	$\angle\phi$
2.4	0.048	-175.268	5.431	53.848	0.062	-17.435	0.595	164.669
2.45	0.052	-177.409	5.345	52.136	0.062	-17.955	0.597	163.447
2.5	0.056	-178.703	5.258	50.405	0.062	-18.404	0.598	162.182
2.55	0.060	179.650	5.173	48.736	0.063	-19.004	0.600	160.854
2.6	0.063	177.705	5.096	47.012	0.063	-19.505	0.602	159.516
2.65	0.067	175.894	5.015	45.266	0.063	-20.1	0.603	158.1
2.7	0.071	174.932	4.938	43.452	0.064	-20.75	0.605	156.649
2.75	0.074	172.453	4.861	41.831	0.064	-21.297	0.607	155.174
2.8	0.079	170.595	4.788	40.113	0.065	-21.999	0.609	153.675
2.85	0.083	168.962	4.715	38.402	0.065	-22.577	0.610	152.104
2.9	0.087	167.373	4.643	36.711	0.065	-23.239	0.612	150.539
2.95	0.091	165.543	4.573	35.036	0.066	-23.942	0.614	148.941
3	0.095	164.513	4.506	33.356	0.066	-24.652	0.616	147.251
3.05	0.099	163.309	4.438	31.684	0.066	-25.269	0.618	145.747
3.1	0.103	162.077	4.373	29.98	0.067	-26.085	0.620	144.105
3.15	0.107	161.249	4.308	28.307	0.067	-26.717	0.622	142.483
3.2	0.110	160.222	4.244	26.653	0.067	-27.483	0.624	140.894
3.25	0.114	159.057	4.182	25.007	0.068	-28.223	0.626	139.31
3.3	0.117	158.018	4.121	23.381	0.068	-29.013	0.629	137.737
3.35	0.119	156.94	4.061	21.791	0.068	-29.779	0.631	136.267
3.4	0.122	155.757	4.004	20.196	0.069	-30.535	0.633	134.76
3.45	0.126	154.754	3.949	18.618	0.069	-31.29	0.635	6
3.5	0.12826	153.898	3.895	17.049	0.06938	-31.957	0.6367	131.951
3.55	0.13168	152.875	3.84045	15.491	0.06971	-32.814	0.6392	130.655
3.6	0.13497	152.157	3.78882	13.97	0.07016	-33.474	0.64031	129.412

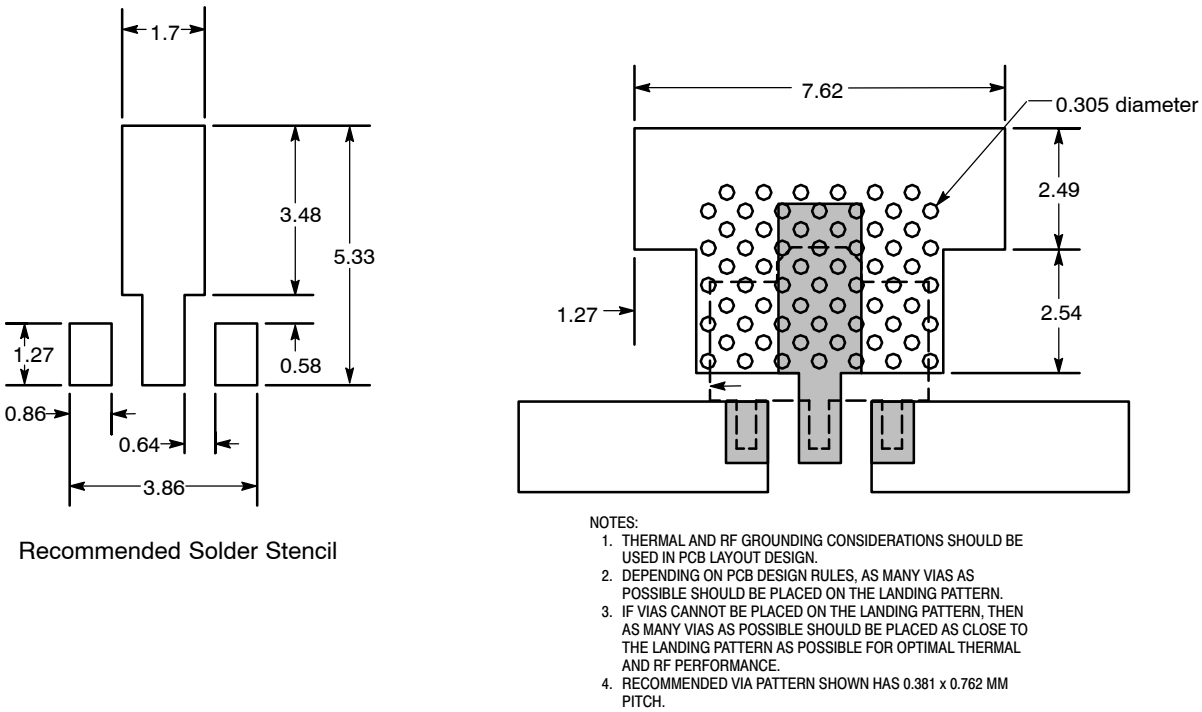


Figure 29. Recommended Mounting Configuration

Chapter Three

CATV Distribution Amplifier Modules - Data Sheets

Rev. 1, 10/2002

CATV Amplifier Module

MHW1223LA

5-200 MHz, 22.7 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE

Features

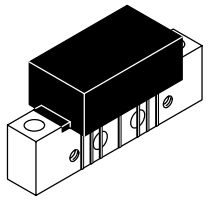
- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 200 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-, Mid- and High-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 200 MHz, CATV Reverse Amplifier Module



CASE 1302-01, STYLE 1

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	200	MHz
Power Gain	(f = 5 MHz)	G_p	22.1	22.7	23.5	dB
Slope	(5-200 MHz)	S	- 0.2	—	0.7	dB
Gain Flatness (Peak To Valley)	(5-200 MHz)	G_F	—	—	0.4	dB
Return Loss — Input/Output		IRL/ORL				dB
	(@ f = 5-150 MHz)		20	—	—	
	(@ f = 150-200 MHz)		18	—	—	
Composite Second Order						dBc
(V_{out} = +50 dBmV per Ch., Worst Case)						
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 72	- 65	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

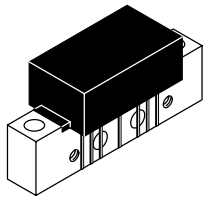
Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	- 69	- 65	
10-Channel FLAT	XMD_{10}	—	- 63	- 60	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	- 78	- 75	
10-Channel FLAT	CTB_{10}	—	- 69	- 66	
Noise Figure (f = 5-200 MHz)	NF	—	6.3	7	dB
DC Current	I_{DC}	85	95	110	mA

Rev. 1, 10/2002

CATV Amplifier Module

MHW1224LA

5-65 MHz, 22.7 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 65 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 65 MHz, CATV Reverse Amplifier Module

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	65	MHz
Power Gain	(f = 5 MHz)	G_p	22.1	22.7	23.2	dB
Slope	(5-65 MHz)	S	- 0.2	—	0.5	dB
Gain Flatness (Peak To Valley)	(5-65 MHz)	G_F	—	—	0.4	dB
Return Loss — Input/Output	(@ f = 5-65 MHz)	IRL/ORL	20	—	—	dB
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 72	- 65	

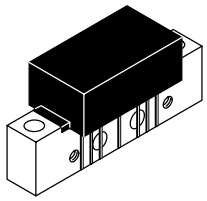
Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	- 69	- 65	
10-Channel FLAT	XMD_{10}	—	- 63	- 60	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	- 78	- 75	
10-Channel FLAT	CTB_{10}	—	- 69	- 66	
Noise Figure (f = 5-65 MHz)	NF	—	6.3	7	dB
DC Current	I_{DC}	85	95	110	mA

CATV Amplifier Module

MHW1244

5 - 200 MHz, 24.0 dB
26 - CHANNEL
CATV HIGH - SPLIT
REVERSE AMPLIFIER



CASE 1302 - 01, STYLE 1

Features

- Specified for 12 - , 22 - and 26 - Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 200 MHz Frequency Range
- Designed for Broadband Applications Requiring Low Distortion Characteristics
- Specified for Use as a Return Path Amplifier for Low - , Mid - and High - Split 2 - Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 200 MHz, CATV Reverse Amplifier

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+65	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system)

Characteristic	Symbol	MHW1244	Units
Power Gain @ 10 MHz	G_p	24.0 ± 0.5	dB
Frequency Range (Response/Return Loss) (1)	BW	5.0 - 200	MHz
Cable Slope Equivalent (5.0 - 200 MHz)	S	- 0.2 Min/+ 0.8 Max	dB
Gain Flatness (5.0 - 200 MHz)	G_F	±0.2 Max	dB
Input/Output Return Loss (5.0 - 200 MHz) (1)	IRL/ORL	18.0 Min	dB
Cross Modulation Distortion @ +50 dBmV per ch. 12 - Channel FLAT (5.0 - 120 MHz) 22 - Channel FLAT (5.0 - 175 MHz) (2) (3) 26 - Channel FLAT (5.0 - 200 MHz)	 XMD_{12} XMD_{22} XMD_{26}	 - 66 Typ - 61 Max - 61 Typ	 dBc dBc dBc

1. Response and return loss characteristics are tested and guaranteed for the full 5.0 - 200 MHz frequency range.
2. Freescale 100% distortion and noise figure testing is performed over the 5.0 - 175 MHz frequency range. Cross modulation and composite triple beat testing are with 22 - channel loading; Video carriers used are:

T7 - T13	7.0 - 43.0 MHz	7 - Channels
2 - 6	55.25 - 83.25 MHz	5 - Channels
A - 7	121.25 - 175.25 MHz	10 - Channels

3. Video carriers used for 12 - Channel typical performances are T7 - 6; For 26 - Channel typical performance, Channels 8, 9, 10 and 11 are added to the 22 - Channel carriers listed above.

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system) **(continued)**

Characteristic	Symbol	MHW1244	Units
Composite Triple Beat Distortion @ +50 dBmV per ch. 22-Channel FLAT (5.0 - 175 MHz) (2) 26-Channel FLAT (5.0 - 200 MHz) (3)	 CTB_{22} CTB_{26}	 - 68 Max - 67.5 Typ	 dBc dBc
Individual Triple Beat Distortion @ +50 dBmV per ch. Mid-Split (5.0 - 120 MHz) T11, T12 and CH2 @ 123.25 MHz High-Split (5.0 - 175 MHz) T13, CH2 and CH5 @ 175.5 MHz	 TB_3 TB_3	 - 87 Typ - 84 Typ	 dBc dBc
Second Order Distortion @ +50 dBmV per ch. High-Split (5.0 - 175 MHz) CH2, CHA @ 176.5 MHz	IMD	- 72 Max	dBc
Noise Figure High-Split (5.0 - 175 MHz) (2)	NF	5.0 Max	dB
DC Current	I_{DC}	210 Typ/240 Max	mAdc

1. Response and return loss characteristics are tested and guaranteed for the full 5.0 - 200 MHz frequency range.
2. Freescale 100% distortion and noise figure testing is performed over the 5.0 - 175 MHz frequency range. Cross modulation and composite triple beat testing are with 22-channel loading; Video carriers used are:

T7 - T13	7.0 - 43.0 MHz	7-Channels
2 - 6	55.25 - 83.25 MHz	5-Channels
A - 7	121.25 - 175.25 MHz	10-Channels

3. Video carriers used for 12-Channel typical performances are T7 - 6; For 26-Channel typical performance, Channels 8, 9, 10 and 11 are added to the 22-Channel carriers listed above.

Rev. 2, 10/2002

CATV Amplifier Module

MHW1253LA

5-200 MHz, 25.5 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE

Features

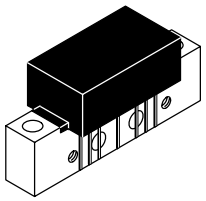
- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 200 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-, Mid- and High-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 200 MHz, CATV Reverse Amplifier Module



CASE 1302-01, STYLE 1

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	200	MHz
Power Gain	(f = 5 MHz)	G_p	25	25.5	26	dB
Slope	(5-200 MHz)	S	- 0.2	—	0.7	dB
Gain Flatness (Peak To Valley)	(5-200 MHz)	G_F	—	—	0.4	dB
Return Loss — Input/Output		IRL/ORL				dB
	(@ f = 5-150 MHz)		20	—	—	
	(@ f = 150-200 MHz)		18	—	—	
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 71	- 66	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

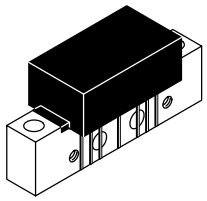
Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	- 69	- 65	
10-Channel FLAT	XMD_{10}	—	- 64	- 61	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	- 78	- 75	
10-Channel FLAT	CTB_{10}	—	- 69	- 66	
Noise Figure (f = 5-200 MHz)	NF	—	5.8	6.5	dB
DC Current	I_{DC}	85	95	110	mA

Rev. 2, 10/2002

CATV Amplifier Module

MHW1254L

50 MHz, 25 dB, 4-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 4-Channel Loading
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 50 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 50 MHz, CATV Reverse Amplifier Module

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{IN}	+70	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 ohm system, unless otherwise noted)

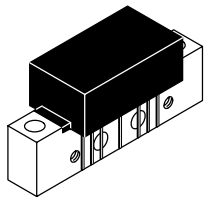
Characteristic		Symbol	Min	Max	Unit
Bandwidth		BW	5.0	50	MHz
Power Gain	(f = 5.0 MHz)	G_p	24.3	25.8	dB
Return Loss	(@ f = 5.0-50 MHz)	RL	20	—	dB
Second Order Distortion	(V_{out} = +50 dBmV/ch)	IMD	—	-70	dBc
Cross Modulation	(V_{out} = +50 dBmV/ch)	XMD_4	—	-62	dBc
Triple Beat Distortion	(V_{out} = +50 dBmV/ch)	TB_3	—	-70	dBc
Noise Figure	(f = 50 MHz)	NF	—	4.5	dB
DC Current		IDC	100	135	mA

Rev. 2, 10/2002

CATV Amplifier Module

MHW1254LA

5-65 MHz, 25.5 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 65 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 65 MHz, CATV Reverse Amplifier Module

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	65	MHz
Power Gain	(f = 5 MHz)	G_p	25	25.5	26	dB
Slope	(5-65 MHz)	S	- 0.2	—	0.5	dB
Gain Flatness (Peak To Valley)	(5-65 MHz)	G_F	—	—	0.4	dB
Return Loss — Input/Output	(@ f = 5-65 MHz)	IRL/ORL	20	—	—	dB
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 71	- 66	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	-69	-65	
10-Channel FLAT	XMD_{10}	—	-64	-61	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	-78	-75	
10-Channel FLAT	CTB_{10}	—	-69	-66	
Noise Figure (f = 5-65 MHz)	NF	—	5.8	6.5	dB
DC Current	I_{DC}	85	95	110	mA

Rev. 1, 10/2002

CATV Amplifier Module

MHW1303LA

5-200 MHz, 30.8 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE

Features

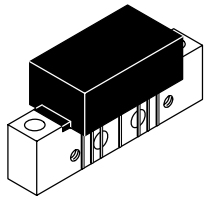
- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 200 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-, Mid- and High-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 200 MHz, CATV Reverse Amplifier Module



CASE 1302-01, STYLE 1

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	200	MHz
Power Gain	(f = 5 MHz)	G_p	30	30.8	31.2	dB
Slope	(5-200 MHz)	S	0	—	1.0	dB
Gain Flatness (Peak To Valley)	(5-200 MHz)	G_F	—	—	0.7	dB
Return Loss — Input/Output		IRL/ORL				dB
	(@ f = 5-65 MHz)		20	—	—	
	(@ f = 65-200 MHz)		18	—	—	
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 70	- 65	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	-67	-64	
10-Channel FLAT	XMD_{10}	—	-61	-58	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	-76	-74	
10-Channel FLAT	CTB_{10}	—	-67	-64	
Noise Figure (f = 5-200 MHz)	NF	—	5	5.7	dB
DC Current	I_{DC}	85	95	110	mA

Rev. 2, 10/2002

CATV Amplifier Module

MHW1304LA

5-65 MHz, 30.8 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE

Features

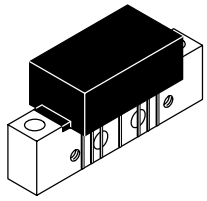
- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 65 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 65 MHz, CATV Reverse Amplifier Module



CASE 1302-01, STYLE 1

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	65	MHz
Power Gain	(f = 5 MHz)	G_p	30	30.8	31.2	dB
Slope	(5-65 MHz)	S	- 0.2	—	0.5	dB
Gain Flatness (Peak To Valley)	(5-65 MHz)	G_F	—	—	0.5	dB
Return Loss — Input/Output	(@ f = 5-65 MHz)	IRL/ORL	20	—	—	dB
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 70	- 65	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

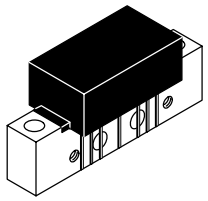
Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	-67	-64	
10-Channel FLAT	XMD_{10}	—	-61	-58	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	-76	-74	
10-Channel FLAT	CTB_{10}	—	-67	-64	
Noise Figure (f = 5-65 MHz)	NF	—	5	5.7	dB
DC Current	I_{DC}	85	95	110	mA

Rev. 0, 1/2004

CATV Amplifier Module

MHW1346

**5-200 MHz, 35 dB GAIN
26-CHANNEL
CATV HIGH-SPLIT
REVERSE AMPLIFIER
MODULE**



CASE 1302-01, STYLE 1

Features

- Specified for 22- and 26-Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 200 MHz Frequency Range
- Designed for Broadband Applications Requiring Low Distortion Characteristics
- Specified for Use as a Return Path Amplifier for Low-, Mid- and High-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 200 MHz, CATV Reverse Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+65	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	200	MHz
Power Gain	(f = 5 MHz)	G_p	34.5	35	35.8	dB
Slope	(5-200 MHz)	S	0	—	1.0	dB
Gain Flatness (Peak To Valley)	(5-200 MHz)	G_F	—	0.6	1	dB
Return Loss — Input/Output		IRL/ORL				dB
	(@ f = 5-65 MHz)		20	24	—	
	(@ f = 65-200 MHz)		16	20	—	
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
5-175 MHz	22-Channel FLAT	CSO_{22}	—	-76	-72	
5-200 MHz	26-Channel FLAT	CSO_{26}	—	-75	—	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
22-Channel FLAT	XMD_{22}	—	-64	-60	
26-Channel FLAT	XMD_{26}	—	-63	—	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
5-175 MHz, 22-Channel FLAT	CTB_{22}	—	-72	-68	
5-200 MHz, 26-Channel FLAT	CTB_{26}	—	-70	—	
Noise Figure (f = 200 MHz)	NF	—	3.5	5	dB
DC Current	I_{DC}	310	325	350	mA

Rev. 1, 10/2002

CATV Amplifier Module

MHW1353LA

5-150 MHz, 35.2 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE

Features

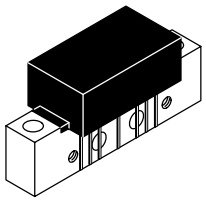
- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 150 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-, Mid- and High-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 150 MHz, CATV Reverse Amplifier Module



CASE 1302-01, STYLE 1

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	150	MHz
Power Gain	(f = 5 MHz)	G_p	34.5	35.2	35.7	dB
Slope	(5-150 MHz)	S	0	—	1	dB
Gain Flatness (Peak To Valley)	(5-150 MHz)	G_F	—	—	0.7	dB
Return Loss — Input/Output		IRL/ORL				dB
	(@ f = 5-65 MHz)		20	—	—	
	(@ f = 65-150 MHz)		18	—	—	
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 69	- 65	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

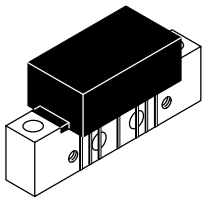
Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	-66	-63	
10-Channel FLAT	XMD_{10}	—	-60	-57	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	-75	-73	
10-Channel FLAT	CTB_{10}	—	-65	-62	
Noise Figure (f = 5-150 MHz)	NF	—	4.4	5.4	dB
DC Current	I_{DC}	85	95	110	mA

Rev. 3, 10/2002

CATV Amplifier Module

MHW1354LA

5-65 MHz, 35.2 dB, 10-CHANNEL CATV LOW CURRENT AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 6- and 10-Channel Loading
- Excellent Distortion Performance
- Low Power Consumption
- Capable of Handling Multiple Channels in the Return Path with Good Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 5 to 65 MHz Frequency Range
- Specified for Use as a Return Path Amplifier for Low-Split 2-Way Cable TV Systems

Description

- 24 Vdc Supply, 5 to 65 MHz, CATV Reverse Amplifier Module

Table 1. Maximum Ratings

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+60	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Bandwidth	All	BW	5	—	65	MHz
Power Gain	(f = 5 MHz)	G_p	34.5	35.2	35.7	dB
Slope	(5-65 MHz)	S	- 0.2	—	0.5	dB
Gain Flatness (Peak To Valley)	(5-65 MHz)	G_F	—	—	0.5	dB
Return Loss — Input/Output	(@ f = 5-65 MHz)	IRL/ORL	20	—	—	dB
Composite Second Order (V_{out} = +50 dBmV per Ch., Worst Case)						dBc
	6-Channel FLAT	CSO_6	—	- 73	- 68	
	10-Channel FLAT	CSO_{10}	—	- 69	- 65	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = 30°C, 75 Ω system, unless otherwise noted) **(continued)**

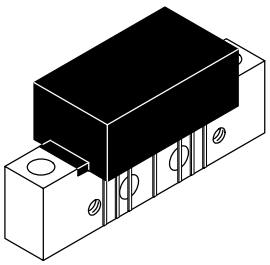
Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	XMD_6	—	-66	-63	
10-Channel FLAT	XMD_{10}	—	-60	-57	
Composite Triple Beat (V_{out} = +50 dBmV per Ch., Worst Case)					dBc
6-Channel FLAT	CTB_6	—	-75	-73	
10-Channel FLAT	CTB_{10}	—	-65	-62	
Noise Figure (f = 5-65 MHz)	NF	—	4.4	5.4	dB
DC Current	I_{DC}	85	95	110	mA

Rev. 4, 10/2002

CATV Amplifier Module

MHW6342T

550 MHz
35.2 dB GAIN
77-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 77-Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 550 MHz Frequency Range
- Single Module High Gain Line Amplifier in Cable TV Distribution System

Description

- 24 Vdc Supply, 40 to 550 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	550	MHz
Power Gain	50 MHz 550 MHz	G_p	33.5 34.5	34.5 35.2	35.5 —	dB
Slope		S	0	0.7	2	dB
Gain Flatness (Peak To Valley)		G_F	—	0.3	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms)	40 - 550 MHz 450 - 550 MHz	IRL/ORL	18 16	— —	— —	dB
Second Order Intermodulation Distortion (V_{out} = +46 dBmV per ch., Ch 2, M13, M22) (V_{out} = +44 dBmV per ch., Ch 2, M30, M39)		IMD	 — —	 - 80 - 74	 — —	dBc
Cross Modulation Distortion (V_{out} = +46 dBmV per ch.) (V_{out} = +44 dBmV per ch.)	 60-Channel FLAT 77-Channel FLAT	 XMD_{60} XMD_{77}	 — —	 - 62 - 63	 — - 57	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

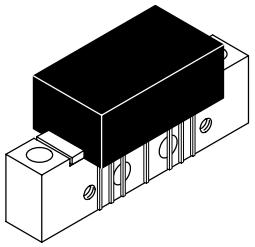
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Triple Beat						dBc
(V_{out} = +46 dBmV per ch.)	60-Channel FLAT	CTB_{60}	—	-64	—	
(V_{out} = +44 dBmV per ch.)	77-Channel FLAT	CTB_{77}	—	-63	-57	
Composite Second Order						dBc
(V_{out} = +46 dBmV/ch, 60-Channel FLAT)		CSO_{60}	—	-70	—	
(V_{out} = +44 dBmV/ch, 77-Channel FLAT)		CSO_{77}	—	-65	-57	
Noise Figure	550 MHz	NF	—	5.5	6.5	dB
DC Current		I_{DC}	—	310	340	mA

Rev. 2, 3/2003

CATV Amplifier Module

MHW7182B

750 MHz
19 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77- and 110-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	18 18.2	18.5 19	19 20	dB
Slope	40 - 750 MHz	S	0	0.4	1	dB
Gain Flatness (40 - 750 MHz, Peak to Valley)		G_F	—	0.3	0.6	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.005	 dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 110-Channel FLAT 77-Channel FLAT	 CSO_{110} CSO_{77}	 — —	 -70 -70	 -63 -64	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

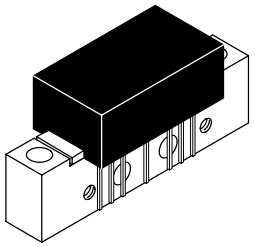
Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +40 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	-66	-64	
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	77-Channel FLAT	XMD_{77}	—	-61	-59	
Composite Triple Beat						dBc
(V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-68	-66	
(V_{out} = +44 dBmV/ch., Worst Case)	77-Channel FLAT	CTB_{77}	—	-66	-64	
Noise Figure	50 MHz	NF	—	4.0	5.0	dB
	550 MHz		—	4.5	—	
	750 MHz		—	5.0	6.5	
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	180	220	240	mA

Rev. 7, 3/2003

CATV Amplifier Module

MHW7185C

750 MHz
19.4 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77- and 110-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	18.3 19	18.8 19.4	19.3 20	dB
Slope	40 - 750 MHz	S	0	0.4	1.0	dB
Gain Flatness (40 - 750 MHz, Peak to Valley)		G_F	—	0.3	0.6	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 19 —	 — —	 — 0.006	 dB dB/MHz
Composite Second Order (V_{out} = +44 dBmV/ch., Worst Case)	 110-Channel FLAT 77-Channel FLAT	 CSO_{110} CSO_{77}	 — —	 -72 -80	 -64 -68	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +44 dBmV/ch., FM = 55 MHz)	 110-Channel FLAT 77-Channel FLAT	 XMD_{110} XMD_{77}	 — —	 -66 -70	 -63 -68	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

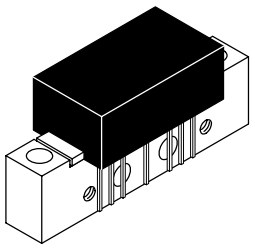
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Triple Beat (V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-64	-62	dBc
	77-Channel FLAT	CTB_{77}	—	-71	-69	
Noise Figure	50 MHz	NF	—	5.0	6.0	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.2	7.5	
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	365	400	435	mA

Rev. 2, 3/2003

CATV Amplifier Module

MHW7185CL

750 MHz
19.2 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77- and 110-Channel Loading
- Lower DC Current Requirements
- Excellent Distortion Performance
- Excellent DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Amplifier Requiring Lower Power Dissipation While Maintaining Excellent Output Performance

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	18 18.7	18.5 19.2	19 19.7	dB
Slope	40 - 750 MHz	S	0.3	0.6	1.3	dB
Gain Flatness (40 - 750 MHz, Peak to Valley)		G_F	—	0.3	0.6	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.007	 dB dB/MHz
Composite Second Order (V_{out} = +44 dBmV/ch., Worst Case)	 110-Channel FLAT 77-Channel FLAT	 CSO_{110} CSO_{77}	 — —	 -70 -83	 -64 -68	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +44 dBmV/ch., FM = 55 MHz)	 110-Channel FLAT 77-Channel FLAT	 XMD_{110} XMD_{77}	 — —	 -66 -69	 -63 -67	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

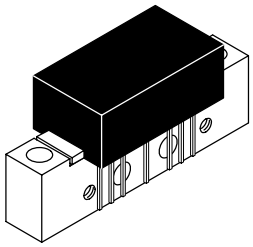
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Triple Beat (V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-63.5	-61	dBc
	77-Channel FLAT	CTB_{77}	—	-70	-68	
Noise Figure	50 MHz	NF	—	5.3	6.2	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.5	7.5	
DC Current (V_{DC} = 24 V, T_C = -20 to +100°C)		I_{DC}	345	370	385	mA

Rev. 7, 3/2003

CATV Amplifier Module

MHW7205C

750 MHz
20.2 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77- and 110-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	19.3 20	19.8 20.2	20.3 21	dB
Slope	40 - 750 MHz	S	0	0.4	1.0	dB
Gain Flatness (40 - 750 MHz, Peak to Valley)		G_F	—	0.3	0.6	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 19 —	 — —	 — 0.006	 dB dB/MHz
Composite Second Order (V_{out} = +44 dBmV/ch., Worst Case)	 110-Channel FLAT 77-Channel FLAT	 CSO_{110} CSO_{77}	 — —	 -70 -80	 -63 -68	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +44 dBmV/ch., FM = 55 MHz)	 110-Channel FLAT 77-Channel FLAT	 XMD_{110} XMD_{77}	 — —	 -67 -70	 -62 -68	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

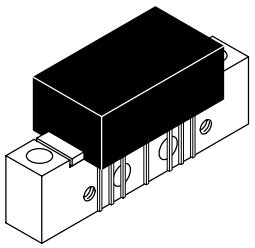
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Triple Beat (V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-63	-61	dBc
	77-Channel FLAT	CTB_{77}	—	-71	-69	
Noise Figure	50 MHz	NF	—	5.0	6.0	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.2	7.5	
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	365	400	435	mA

Rev. 2, 10/2003

CATV Amplifier Module

MHW7205CL

750 MHz
20 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77- and 110-Channel Loading
- Lower DC Current Requirements
- Excellent Distortion Performance
- Excellent DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Amplifier Requiring Lower Power Dissipation While Maintaining Excellent Output Performance

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	19 19.7	19.5 20	20 21.2	dB
Slope	40 - 750 MHz	S	0.2	0.5	1.7	dB
Gain Flatness (40 - 750 MHz, Peak to Valley)		G_F	—	0.3	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.007	 dB dB/MHz
Composite Second Order (V_{out} = +44 dBmV/ch., Worst Case)	 110-Channel FLAT 77-Channel FLAT	 CSO_{110} CSO_{77}	 — —	 -69 -80	 -63 -67	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +44 dBmV/ch., FM = 55 MHz)	 110-Channel FLAT 77-Channel FLAT	 XMD_{110} XMD_{77}	 — —	 -65 -69	 -62 -66	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

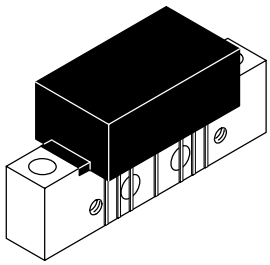
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Triple Beat (V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-63	-61	dBc
	77-Channel FLAT	CTB_{77}	—	-70	-68	
Noise Figure	50 MHz	NF	—	5.0	6.2	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.2	7.5	
DC Current (V_{DC} = 24 V, T_C = -20 to +100°C)		I_{DC}	345	365	385	mA

Rev. 3, 10/2002

CATV Amplifier Module

MHW7222B

750 MHz
22.7 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 77- and 110-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+70	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	f = 50 MHz f = 750 MHz	G_p	21.4 22.2	21.9 22.7	22.4 23.2	dB
Slope (f = 40 - 750 MHz)		S	0.2	0.7	1.2	—
Gain Flatness (Peak To Valley)	(f = 40 - 750 MHz)	G_F	—	0.4	0.6	—
Input/Output Return Loss @ f = 40 MHz		IRL/ORL	20	25	—	dB
Derate Return Loss @ f > 40 MHz		RLD	—	—	0.006	dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch; 110 Channels) (V_{out} = +44 dBmV/ch; 77 Channels)		 CSO_{110} CSO_{77}	 — —	 - 67 - 67	 - 60 - 60	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

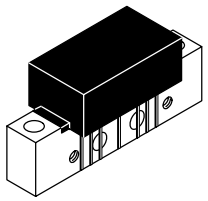
Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion (V_{out} = +40 dBmV/ch, 110-Channel @ Fm = 55.25 MHz) (V_{out} = +44 dBmV/ch, 77-Channel @ Fm = 55.25 MHz)	 XMD_{110} XMD_{77}	 — —	 - 63 - 59	 - 60 - 56	dBc
Composite Triple Beat (V_{out} = +40 dBmV/ch, 110-Channels, Worst Case) (V_{out} = +44 dBmV/ch, 77-Channels, Worst Case)	 CTB_{110} CTB_{77}	 — —	 - 64 - 65	 - 61 - 62	dBc
Noise Figure f = 50 MHz f = 750 MHz	NF	— —	3.7 5	4.5 6.5	dB
DC Current	I_{DC}	180	220	240	mA

Rev. 3, 10/2002

CATV Amplifier Module

MHW7242A

750 MHz
24.7 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 77- and 110-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	23.2 24	24 24.7	24.8 26	dB
Slope	40 - 750 MHz	S	0	0.6	1.5	dB
Gain Flatness (40 - 750 MHz, Peak To Valley)		G_F	—	0.4	0.6	dB
Return Loss — Input/Output (Z_o = 75 Ohms)	@ 40 MHz @ f > 40 MHz (Derate)	IRL/ORL	20 —	— —	— 0.007	dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 110-Channel FLAT 77-Channel FLAT	 CSO_{110} CSO_{77}	 — —	 - 69 - 78	 - 62 —	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

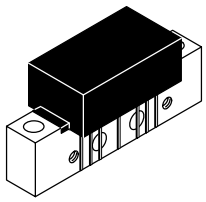
Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +40 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	- 63	- 61	
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	77-Channel FLAT	XMD_{77}	—	- 58	—	
Composite Triple Beat						dBc
(V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	- 67	- 63	
(V_{out} = +44 dBmV/ch., Worst Case)	77-Channel FLAT	CTB_{77}	—	- 64	—	
Noise Figure	50 MHz	NF	—	4.8	5.5	dB
	750 MHz		—	5.5	7	
DC Current		I_{DC}	280	318	350	mA

Rev. 1, 10/2002

CATV Amplifier Module

MHW7272A

750 MHz
27.7 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 110-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

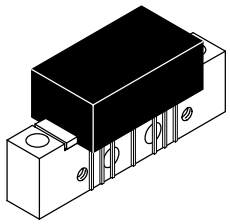
Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	26.2 27	27.2 27.7	27.8 29	dB
Slope	40 - 750 MHz	S	0	0.7	1.5	dB
Gain Flatness (40 - 750 MHz, Peak to Valley)		G_F	—	0.4	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms)	@ 40 MHz @ f > 40 MHz (Derate)	IRL/ORL	20 —	— —	— 0.007	dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CSO_{110}	—	- 70	- 64	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +40 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	- 63	- 60	dBc
Composite Triple Beat (V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	- 68	- 64	dBc
Noise Figure	50 MHz 750 MHz	NF	— —	— 5.5	5.5 6.5	dB
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	280	310	350	mA

CATV Amplifier Module

MHW7292A

**770 MHz, 29.8 dB GAIN
110-CHANNEL
CATV AMPLIFIER MODULE**



CASE 1302-01, STYLE 1

Features

- Specified for 110-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 770 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 770 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

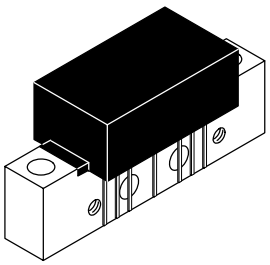
Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	770	MHz
Power Gain	50 MHz 770 MHz	G_p	28.2 29	29 29.8	29.8 31	dB
Slope	40 - 770 MHz	S	0	0.7	2	dB
Gain Flatness (40 - 750 MHz, Peak to Valley)		G_F	—	0.4	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms)	@ 40 MHz @ f > 40 MHz (Derate)	IRL/ORL	20 —	— —	— 0.007	dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CSO_{110}	—	- 70	- 60	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +40 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	- 62	- 60	dBc
Composite Triple Beat (V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	- 62	- 60	dBc
Noise Figure	50 MHz 770 MHz	NF	— —	— 5.5	5.5 6.5	dB
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	280	310	350	mA

Rev. 1, 11/2003

CATV Amplifier Module

MHW7342

750 MHz
35.2 dB GAIN
112-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for up to 112-Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 750 MHz Frequency Range
- Single Module High Gain Line Amplifier in Cable TV Distribution System

Description

- 24 Vdc Supply, 40 to 750 MHz, CATV High Gain Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	750	MHz
Power Gain	50 MHz 750 MHz	G_p	33.2 33.8	34 35.2	34.8 36	dB
Slope	40 - 750 MHz	S	0.3	1.2	2.25	dB
Gain Flatness (Peak To Valley)		G_F	—	0.3	0.8	dB
Return Loss — Input (Z_o = 75 Ohms)	 40-80 MHz 80-320 MHz 320-640 MHz 640-750 MHz	IRL	 22 18 16 14	 28 25 22 19	 — — — —	dB
Return Loss — Output (Z_o = 75 Ohms)	 40-80 MHz 80-240 MHz 240-640 MHz 640-750 MHz	ORL	 22 19 17 15	 28 25 22 22	 — — — —	dB

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

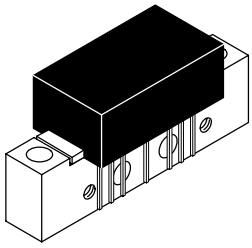
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-65	-57	
(V_{out} = +44 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-55	-50	
Cross Modulation Distortion						dBc
(V_{out} = +44 dBmV, FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-63	-60	
(V_{out} = +44 dBmV, FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-56	-53	
Composite Triple Beat						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-64	-62	
(V_{out} = +44 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-54	-52	
Noise Figure	50 MHz	NF	—	3.5	4.5	dB
	550 MHz		—	4.5	—	
	750 MHz		—	5	6	
DC Current		I_{DC}	310	325	350	mA

Rev. 2, 3/2003

CATV Amplifier Module

MHW8182B

860 MHz
19.1 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77-, 110- and 128-Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 860 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 860 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	860	MHz
Power Gain	50 MHz 860 MHz	G_p	18 18.2	18.5 19.1	19 20.5	dB
Slope	40 - 860 MHz	S	0	0.7	2.5	dB
Gain Flatness (40 - 860 MHz, Peak to Valley)		G_F	—	0.3	0.6	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.005	 dB dB/MHz
Composite Second Order (V_{out} = +38 dBmV/ch., Worst Case) (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 128-Channel FLAT 110-Channel FLAT 77-Channel FLAT	 CSO_{128} CSO_{110} CSO_{77}	 — — —	 -71 -70 -70	 -64 -63 -64	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

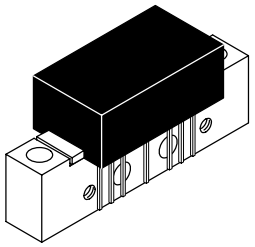
Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +38 dBmV/ch., FM = 55 MHz)	128-Channel FLAT	XMD_{128}	—	-68	-65	
(V_{out} = +40 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	-66	-64	
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	77-Channel FLAT	XMD_{77}	—	-61	-59	
Composite Triple Beat						dBc
(V_{out} = +38 dBmV/ch., Worst Case)	128-Channel FLAT	CTB_{128}	—	-69	-66	
(V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-68	-66	
(V_{out} = +44 dBmV/ch., Worst Case)	77-Channel FLAT	CTB_{77}	—	-66	-64	
Noise Figure	50 MHz	NF	—	4.0	5.0	dB
	550 MHz		—	4.5	—	
	750 MHz		—	5.0	6.5	
	860 MHz		—	5.5	7.5	
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	180	220	240	mA

Rev. 6, 3/2003

CATV Amplifier Module

MHW8185

860 MHz
19.4 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77-, 110- and 128-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 860 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 40 to 860 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	860	MHz
Power Gain	50 MHz 860 MHz	G_p	18.3 19	18.8 19.4	19.3 20.5	dB
Slope	40 - 860 MHz	S	0	.5	1.5	dB
Gain Flatness (40 - 860 MHz, Peak to Valley)		G_F	—	0.3	1.0	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 19 —	 — —	 — 0.006	 dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 128-Channel FLAT 110-Channel FLAT 77-Channel FLAT	 CSO_{128} CSO_{110} CSO_{77}	 — — —	 -70 -72 -80	 - 62 - 64 - 68	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +40 dBmV/ch., FM = 55 MHz) (V_{out} = +44 dBmV/ch., FM = 55 MHz)	 128-Channel FLAT 110-Channel FLAT 77-Channel FLAT	 XMD_{128} XMD_{110} XMD_{77}	 — — —	 -72 -67 -70	 - 64 - 63 - 68	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

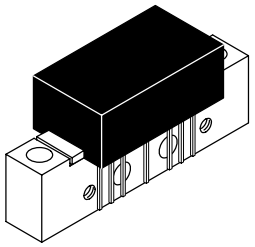
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Triple Beat						dBc
(V_{out} = +40 dBmV/ch., Worst Case)	128-Channel FLAT	CTB_{128}	—	-67	-64	
(V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-64	-62	
	77-Channel FLAT	CTB_{77}	—	-71	-69	
Noise Figure	50 MHz	NF	—	5.0	6.0	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.2	—	
	860 MHz		—	7.0	8.0	
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	365	400	435	mA

Rev. 2, 3/2003

CATV Amplifier Module

MHW8185L

870 MHz
19.4 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77-, 110- and 128-Channel Loading
- Lower DC Current Requirements
- Excellent Distortion Performance
- Excellent DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

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

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°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	18.5 19.4	19 20.5	dB
Slope	40 - 870 MHz	S	0.4	0.9	1.4	dB
Gain Flatness (40 - 870 MHz, Peak-to-Valley)		G_F	—	0.3	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.007	 dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 128-Channel FLAT 110-Channel FLAT 77-Channel FLAT	 CSO_{128} CSO_{110} CSO_{77}	 — — —	 -69 -70 -85	 - 62 - 64 - 68	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

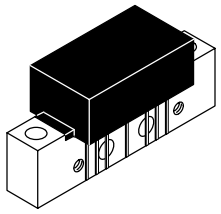
Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +40 dBmV/ch., FM = 55 MHz)	128-Channel FLAT	XMD_{128}	—	-72	-64	
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	-66	-63	
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	77-Channel FLAT	XMD_{77}	—	-69	-67	
Composite Triple Beat						dBc
(V_{out} = +40 dBmV/ch., Worst Case)	128-Channel FLAT	CTB_{128}	—	-66	-63	
(V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-63	-61	
(V_{out} = +44 dBmV/ch., Worst Case)	77-Channel FLAT	CTB_{77}	—	-70	-68	
Noise Figure	50 MHz	NF	—	5.3	6.2	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.6	—	
	870 MHz		—	7.8	8.5	
DC Current (V_{DC} = 24 V, T_C = -20 to +100°C)		I_{DC}	345	365	385	mA

Rev. 0, 10/2003

Gallium Arsenide CATV Amplifier Module

MHW8188A

870 MHz
20.3 dB GAIN
112-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79- and 112-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+75	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	19.7	20.3	20.9	dB
Slope	47-870 MHz	S	0	0.5	1.0	dB
Gain Flatness (47-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-300 MHz		20	—	—	
	301-700 MHz		18	—	—	
	701-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	f > 160 MHz		18	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

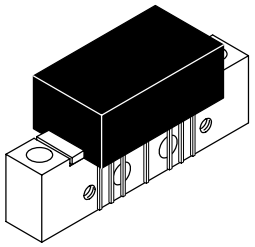
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-64	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-68	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-65	-63	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-69	-67	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-58	-56	
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-61	-59	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-60	-47	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-60	-58	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	-64	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-57	-55	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-63	-61	
Noise Figure	50 MHz	NF	—	4.5	—	dB
	550 MHz		—	4.5	—	
	750 MHz		—	4.5	—	
	870 MHz		—	4.5	—	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

Rev. 6, 3/2003

CATV Amplifier Module

MHW8205

860 MHz
20.2 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77-, 110- and 128-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 860 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems

Description

- 24 Vdc Supply, 40 to 860 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	860	MHz
Power Gain	50 MHz 860 MHz	G_p	19.3 20	19.8 20.2	20.3 21.5	dB
Slope	40 - 860 MHz	S	0	.4	1.5	dB
Gain Flatness (40 - 860 MHz, Peak to Valley)		G_F	—	0.3	1.0	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 19 —	 — —	 — 0.006	 dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 128-Channel FLAT 110-Channel FLAT 77-Channel FLAT	 CSO_{128} CSO_{110} CSO_{77}	 — — —	 -69 -70 -80	 - 60 - 63 - 68	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

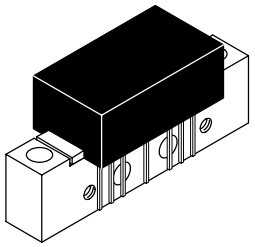
Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +40 dBmV/ch., FM = 55 MHz)	128-Channel FLAT	XMD_{128}	—	-72	-64	
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	-67	-62	
	77-Channel FLAT	XMD_{77}	—	-71	-68	
Composite Triple Beat						dBc
(V_{out} = +40 dBmV/ch., Worst Case)	128-Channel FLAT	CTB_{128}	—	-66	-63	
(V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-63	-61	
	77-Channel FLAT	CTB_{77}	—	-71	-69	
Noise Figure	50 MHz	NF	—	5.0	6.0	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.2	—	
	860 MHz		—	7.0	8.0	
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	365	400	435	mA

Rev. 2, 3/2003

CATV Amplifier Module

MHW8205L

870 MHz
20.4 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 77-, 110- and 128-Channel Loading
- Lower DC Current Requirements
- Excellent Distortion Performance
- Excellent DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

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

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°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	19 19.8	19.5 20.4	20 21.3	dB
Slope	40 - 870 MHz	S	0.2	0.8	1.7	dB
Gain Flatness (40 - 870 MHz, Peak to Valley)		G_F	—	0.5	1.0	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.007	 dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 128-Channel FLAT 110-Channel FLAT 77-Channel FLAT	 CSO_{128} CSO_{110} CSO_{77}	 — — —	 -69 -70 -80	 - 60 - 63 - 67	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

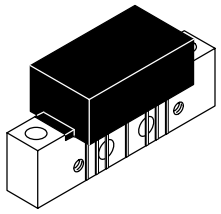
Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +40 dBmV/ch., FM = 55 MHz)	128-Channel FLAT	XMD_{128}	—	-72	-64	
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	-65	-62	
	77-Channel FLAT	XMD_{77}	—	-69	-66	
Composite Triple Beat						dBc
(V_{out} = +40 dBmV/ch., Worst Case)	128-Channel FLAT	CTB_{128}	—	-66	-63	
(V_{out} = +44 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-63	-61	
	77-Channel FLAT	CTB_{77}	—	-70	-68	
Noise Figure	50 MHz	NF	—	5.0	6.2	dB
	550 MHz		—	5.8	—	
	750 MHz		—	6.2	—	
	870 MHz		—	7.7	8.5	
DC Current (V_{DC} = 24 V, T_C = -20°C to +100°C)		I_{DC}	345	365	385	mA

Rev. 0, 1/2004

Gallium Arsenide CATV Amplifier Module

MHW8207A

870 MHz
21.3 dB GAIN
112-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79- and 112-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	20.6	21.3	22	dB
Slope	47-870 MHz	S	0	0.5	1.2	dB
Gain Flatness (47-870 MHz, Peak-to-Valley)		—	—	—	0.7	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-300 MHz		20	—	—	
	301-700 MHz		18	—	—	
	701-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	161-700 MHz		18	—	—	
	701-870 MHz		16	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-68	-66	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-69	-67	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-59	-57	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-52	-50	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-60	-47	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-59	-57	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	-64	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-57	-55	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-63	-61	
Noise Figure	50 MHz	NF	—	4.5	—	dB
	550 MHz		—	4.5	—	
	750 MHz		—	4.5	—	
	870 MHz		—	4.5	—	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

Rev. 3, 10/2002

CATV Amplifier Module

MHW8222B

860 MHz
22.7 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE

Features

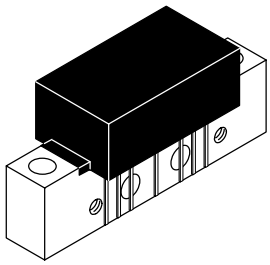
- Specified for 77-, 110- and 128-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 860 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 860 MHz, CATV Forward Amplifier Module



CASE 1302-01, STYLE 1

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	+28	Vdc
RF Input Voltage (Single Tone)	V_{in}	+70	dBmV
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	860	MHz
Power Gain	f = 50 MHz f = 860 MHz	G_p	21.4 21.8	21.9 22.7	22.4 24	dB
Slope (f = 40 - 860 MHz)		S	0.1	0.8	1.5	—
Gain Flatness (Peak To Valley)	(f = 40 - 860 MHz)	G_F	—	0.4	0.6	—
Input/Output Return Loss @ f = 40 MHz		IRL/ORL	20	24	—	dB
Derate Return Loss @ f > 40 MHz		RLD	—	—	0.009	dB/MHz
Composite Second Order (V_{out} = +38 dBmV/ch; 128 Channels) (V_{out} = +40 dBmV/ch; 110 Channels) (V_{out} = +44 dBmV/ch; 77 Channels)		 CSO_{128} CSO_{110} CSO_{77}	 — — —	 - 68 - 64 - 65	 - 60 - 61 - 62	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

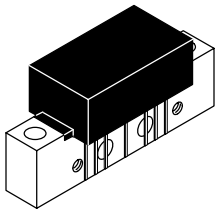
Characteristic	Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion					dBc
(V_{out} = +38 dBmV/ch, 128-Channel @ Fm = 55.25 MHz)	XMD_{128}	—	- 65	- 63	
(V_{out} = +40 dBmV/ch, 110-Channel @ Fm = 55.25 MHz)	XMD_{110}	—	- 63	- 60	
(V_{out} = +44 dBmV/ch, 77-Channel @ Fm = 55.25 MHz)	XMD_{77}	—	- 59	- 56	
Composite Triple Beat					dBc
(V_{out} = +38 dBmV/ch, 128-Channels, Worst Case)	CTB_{128}	—	- 66	- 64	
(V_{out} = +40 dBmV/ch, 110-Channels, Worst Case)	CTB_{110}	—	- 64	- 61	
(V_{out} = +44 dBmV/ch, 77-Channels, Worst Case)	CTB_{77}	—	- 65	- 62	
Noise Figure f = 50 MHz	NF	—	3.7	4.5	dB
f = 750 MHz		—	5	6.5	
f = 860 MHz		—	5.6	7	
DC Current	I_{DC}	180	220	240	mA

Rev. 0, 12/2003

Gallium Arsenide CATV Amplifier Module

MHW8227A

870 MHz
22.1 dB GAIN
112-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79- and 112-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	200	200	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	21.5	22.1	22.7	dB
Slope	47-870 MHz	S	0	0.5	1.2	dB
Gain Flatness (47-870 MHz, Peak-to-Valley)		—	—	—	0.7	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-300 MHz		20	—	—	
	301-700 MHz		18	—	—	
	701-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	161-700 MHz		18	—	—	
	701-870 MHz		16	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

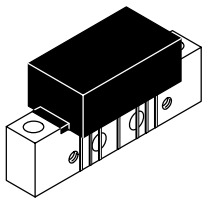
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-64	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-68	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-65	-63	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-69	-67	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-58	-56	
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-61	-59	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-60	-47	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-60	-58	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	-64	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-57	-55	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-63	-61	
Noise Figure	50 MHz	NF	—	4.5	—	dB
	550 MHz		—	4.5	—	
	750 MHz		—	4.5	—	
	870 MHz		—	4.5	—	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

Rev. 4, 10/2002

CATV Amplifier Module

MHW8242A

860 MHz
25 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 77- and 128-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 860 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 860 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

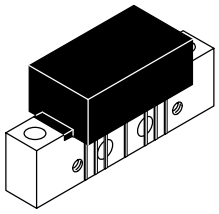
Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	860	MHz
Power Gain	50 MHz 860 MHz	G_p	23.2 24	24 25	24.8 26	dB
Slope	40 - 860 MHz	S	0	0.8	1.8	dB
Gain Flatness (40 - 860 MHz, Peak To Valley)		G_F	—	0.4	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms)	@ 40 MHz @ f > 40 MHz (Derate)	IRL/ORL	20 —	— —	— 0.007	dB dB/MHz
Composite Second Order (V_{out} = +38 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 128-Channel FLAT 77-Channel FLAT	 CSO_{128} CSO_{77}	 — —	 - 69 - 78	 - 62 —	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +38 dBmV/ch., FM = 55 MHz) (V_{out} = +44 dBmV/ch., FM = 55 MHz)	 128-Channel FLAT 77-Channel FLAT	 XMD_{128} XMD_{77}	 — —	 - 65 - 58	 - 62 —	dBc
Composite Triple Beat (V_{out} = +38 dBmV/ch., Worst Case) (V_{out} = +44 dBmV/ch., Worst Case)	 128-Channel FLAT 77-Channel FLAT	 CTB_{128} CTB_{77}	 — —	 - 68 - 64	 - 64 —	dBc
Noise Figure	50 MHz 860 MHz	NF	— —	4.8 5.8	5.5 7.5	dB
DC Current		I_{DC}	280	318	350	mA

Gallium Arsenide CATV Amplifier Module

MHW8247A

870 MHz
24.9 dB GAIN
112-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79- and 112-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	24.4	24.9	25.4	dB
Slope	47-870 MHz	S	0	0.6	1.2	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	—	0.7	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	161-700 MHz		18	—	—	
	701-870 MHz		16	—	—	

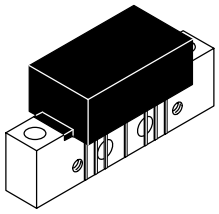
Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-68	-66	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 12db Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 12db Tilt	CSO_{79}	—	-69	-67	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-59	-57	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 12db Tilt	XMD_{112}	—	-52	-50	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 12db Tilt	XMD_{79}	—	-55	-53	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-59	-57	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	-64	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 12db Tilt	CTB_{112}	—	-57	-55	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 12db Tilt	CTB_{79}	—	-63	-61	
Noise Figure	50 MHz	NF	—	5.5	—	dB
	550 MHz		—	5.5	—	
	750 MHz		—	5.8	—	
	870 MHz		—	6.0	—	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	420	440	460	mA

Gallium Arsenide CATV Amplifier Module

MHW8267A

870 MHz
27.6 dB GAIN
112-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79- and 112-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	200	200	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	870 MHz	G_p	27	27.6	28.2	dB
Slope	47-870 MHz	S	0	0.7	1.4	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	—	0.7	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	

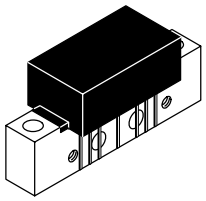
Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

Characteristic		Symbol	Min	Typ	Max	Unit
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	f > 160-700 MHz		18	—	—	
	f > 701-870 MHz		16	—	—	
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-68	-66	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12db Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12db Tilt	CSO_{79}	—	-69	-67	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-59	-57	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12db Tilt	XMD_{112}	—	-52	-50	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12db Tilt	XMD_{79}	—	-55	-52	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-59	-57	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	-64	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12db Tilt	CTB_{112}	—	-57	-55	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12db Tilt	CTB_{79}	—	-62	-60	
Noise Figure	50 MHz	NF	—	5.5	—	dB
	550 MHz		—	5.5	—	
	750 MHz		—	5.8	—	
	870 MHz		—	6.0	—	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	440	460	mA

CATV Amplifier Module

MHW8272A

870 MHz
27.7 dB GAIN
128-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 128-Channel Loading
- Excellent Distortion Performance
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

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
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

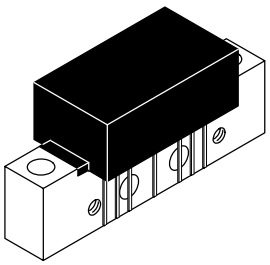
Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	50 MHz 870 MHz	G_p	26.2 27	27.2 27.7	27.8 29.5	dB
Slope	40 - 870 MHz	S	0	0.6	2	dB
Gain Flatness (40 - 870 MHz, Peak to Valley)		G_F	—	0.4	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.007	 dB dB/MHz
Composite Second Order (V_{out} = +38 dBmV/ch., Worst Case)	128-Channel FLAT	CSO_{128}	—	-69	- 64	dBc
Cross Modulation Distortion @ Ch 2 (V_{out} = +38 dBmV/ch., FM = 55 MHz)	128-Channel FLAT	XMD_{128}	—	-65	- 62	dBc
Composite Triple Beat (V_{out} = +38 dBmV/ch., Worst Case)	128-Channel FLAT	CTB_{128}	—	-69	- 64	dBc
Noise Figure	50 MHz 870 MHz	NF	— —	— 6.0	5.5 7.0	dB
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	280	310	350	mA

Rev. 0, 5/2004

CATV Amplifier Module

MHW8342

870 MHz
35.5 dB GAIN
132-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for up to 132-Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 870 MHz Frequency Range
- Single Module High Gain Line Amplifier in Cable TV Distribution System

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV High Gain Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	- 20 to +100	°C
Storage Temperature Range	T_{stg}	- 40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°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	33.2 34	34 35.5	34.8 37	dB
Slope	40 - 870 MHz	S	0.5	1.5	2.75	dB
Gain Flatness (Peak To Valley)		G_F	—	0.3	0.8	dB
Return Loss — Input (Z_o = 75 Ohms)	 40-80 MHz 80-320 MHz 320-640 MHz 640-870 MHz	IRL	 22 18 16 14	 28 25 22 19	 — — — —	dB
Return Loss — Output (Z_o = 75 Ohms)	 40-80 MHz 80-240 MHz 240-640 MHz 640-870 MHz	ORL	 22 19 17 15	 28 25 22 22	 — — — —	dB

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

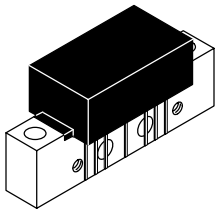
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-65	-60	
(V_{out} = +44 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-55	-50	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-48	-44	
Cross Modulation Distortion						dBc
(V_{out} = +44 dBmV, FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-63	-60	
(V_{out} = +44 dBmV, FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-56	-52	
(V_{out} = +44 dBmV, FM = 55.25 MHz)	132-Channel FLAT	XMD_{132}	—	-56	-50	
Composite Triple Beat						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-64	-62	
(V_{out} = +44 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-54	-51	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-50	-46	
Noise Figure	50 MHz	NF	—	3.5	4.5	dB
	550 MHz		—	4.5	—	
	870 MHz		—	5.5	6.5	
DC Current		I_{DC}	310	325	350	mA

Rev. 1, 2/2003

Gallium Arsenide CATV Amplifier Module

MHW9146

870 MHz
14.3 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

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

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, 40 to 870 MHz, CATV GaAs Forward Amplifier Module

Table 1. Maximum Ratings

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

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	200	200	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	870 MHz	G_p	13.8	14.3	14.8	dB
Slope	40-870 MHz	S	0	0.4	1.0	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	40-500 MHz		20	—	—	
	f > 501 MHz		18	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	40-160 MHz		20	—	—	
	f > 160 MHz		18	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-68	-64	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-63	-60	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-63	-60	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-60	-55	
(V_{out} = +46 dBmV/ch., FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-60	-55	
(V_{out} = +44 dBmV/ch., FM = 55.25 MHz)	132-Channel FLAT	XMD_{132}	—	-60	-55	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-64	-60	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-64	-60	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-64	-60	
Noise Figure	50 MHz	NF	—	4.4	5.5	dB
	550 MHz		—	3.8	—	
	750 MHz		—	4.0	—	
	870 MHz		—	4.3	5.5	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	230	245	260	mA

Note: This device requires an external 0.01 μF DC blocking capacitor connected to the output pin (Pin 9) as indicated in Figure 1.

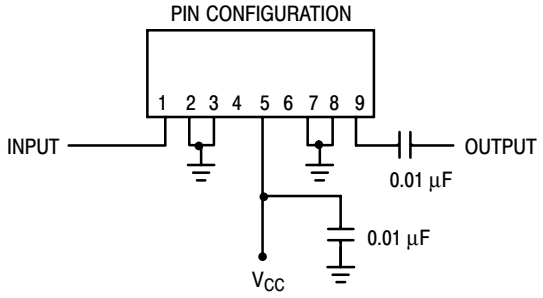


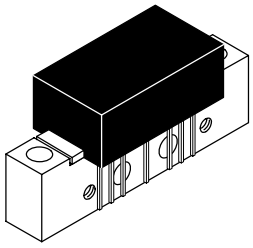
Figure 1. External Connections

Rev. 2, 3/2003

CATV Amplifier Module

MHW9182B

1000 MHz
19.4 dB GAIN
152-CHANNEL
CATV AMPLIFIER MODULE



CASE 714Y-04, STYLE 1

Features

- Specified for 110- and 152-Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 1000 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 1000 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	1000	MHz
Power Gain	50 MHz 1000 MHz	G_p	18 18.7	18.5 19.4	19 20.7	dB
Slope	40 - 1000 MHz	S	0.4	0.9	1.4	dB
Gain Flatness (40 - 1000 MHz, Peak to Valley)		G_F	—	0.4	0.8	dB
Return Loss — Input/Output (Z_o = 75 Ohms) @ 40 MHz @ f > 40 MHz (Derate)		IRL/ORL	 20 —	 — —	 — 0.006	 dB dB/MHz
Composite Second Order (V_{out} = +40 dBmV/ch., Worst Case) (V_{out} = +38 dBmV/ch., Worst Case)	 110-Channel FLAT 152-Channel FLAT	 CSO_{110} CSO_{152}	 — —	 70 -69	 - 63 - 63	dBc

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

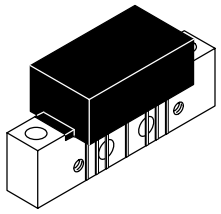
Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +40 dBmV/ch., FM = 55 MHz)	110-Channel FLAT	XMD_{110}	—	-66	-64	
(V_{out} = +38 dBmV/ch., FM = 55 MHz)	152-Channel FLAT	XMD_{152}	—	-65	-61	
Composite Triple Beat						dBc
(V_{out} = +40 dBmV/ch., Worst Case)	110-Channel FLAT	CTB_{110}	—	-68	-66	
(V_{out} = +38 dBmV/ch., Worst Case)	152-Channel FLAT	CTB_{152}	—	-64	-61	
Noise Figure	50 MHz	NF	—	4.0	5.0	dB
	550 MHz		—	4.5	—	
	860 MHz		—	5.5	—	
	1000 MHz		—	6.0	7.5	
DC Current (V_{DC} = 24 V, T_C = 30°C)		I_{DC}	180	210	240	mA

Rev. 1, 10/2002

Gallium Arsenide CATV Amplifier Module

MHW9186

870 MHz
18.5 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

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

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, 40 to 870 MHz, CATV GaAs Forward Amplifier Module

Table 1. Maximum Ratings

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

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°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	17.5 18	18 18.5	18.5 19.5	dB
Slope	40-870 MHz	S	0.2	0.6	1.2	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	0.3	0.8	dB
Return Loss — Input (Z_o = 75 Ohms)	 40-200 MHz 200-600 MHz 600-870 MHz	IRL	 20 19 18	 — — —	 — — —	dB
Return Loss — Output (Z_o = 75 Ohms)	 40-200 MHz 200-600 MHz 600-870 MHz	ORL	 20 19 18	 — — —	 — — —	dB

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) (**continued)**

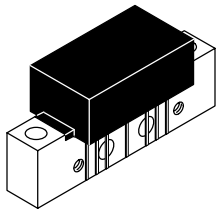
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-67	-60	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-65	-61	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-72	-64	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-58	-52	
(V_{out} = +46 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-58	-52	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-58	-52	
Composite Triple Beat						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-62	-58	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-61	-58	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-64	-60	
Noise Figure	50 MHz	NF	—	4	5.0	dB
	870 MHz		—	3.7	5.0	
DC Current (V_{DC} = 24 V, T_C = -20° to +100°C)		I_{DC}	230	250	265	mA

Rev. 0, 8/2004

Gallium Arsenide CATV Amplifier Module

MHW9186A

870 MHz
18.5 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

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
- Improved Ruggedness

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, 40 to 870 MHz, CATV GaAs Forward Amplifier Module

Table 1. Maximum Ratings

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

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	870 MHz	G_p	18	18.5	19.5	dB
Slope	40-870 MHz	S	0.1	0.6	1.2	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	0.3	0.8	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	40-200 MHz		20	—	—	
	200-600 MHz		19	—	—	
	600-870 MHz		18	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	40-200 MHz		20	—	—	
	200-600 MHz		19	—	—	
	600-870 MHz		18	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

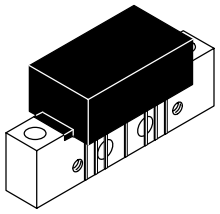
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-67	-60	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-65	-61	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-72	-64	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +44 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-58	-52	
(V_{out} = +46 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-58	-52	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-58	-52	
Composite Triple Beat						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-62	-58	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-61	-58	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-64	-60	
Noise Figure	50 MHz	NF	—	4.6	6.0	dB
	870 MHz		—	3.7	6.0	
DC Current (V_{DC} = 24 V, T_C = -20° to +100°C)		I_{DC}	230	250	265	mA

Rev. 0, 10/2003

Gallium Arsenide CATV Amplifier Module

MHW9188A

870 MHz
20.3 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+75	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	19.7	20.3	20.9	dB
Slope	47-870 MHz	S	0	0.5	1.0	dB
Gain Flatness (47-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	f > 160 MHz		18	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

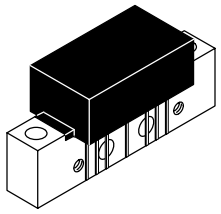
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-64	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-68	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-65	-63	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CSO_{112}	—	-63	-61	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-69	-67	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CSO_{79}	—	-74	-72	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CSO_{79}	—	-73	-71	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-59	-57	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-62	-60	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	XMD_{112}	—	-55	-53	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	XMD_{112}	—	-58	-56	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-60	-47	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	XMD_{79}	—	-62	-60	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	XMD_{79}	—	-67	-65	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-58	-56	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-62	-60	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–68	-66	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-60	-58	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CTB_{112}	—	-61	-59	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CTB_{112}	—	-64	-62	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-66	-64	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CTB_{79}	—	-71	-69	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CTB_{79}	—	-74	-72	
Noise Figure	50 MHz	NF	—	4.0	5.0	dB
	550 MHz		—	4.0	5.0	
	750 MHz		—	4.0	5.0	
	870 MHz		—	4.0	5.0	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

Rev. 0, 1/2004

Gallium Arsenide CATV Amplifier Module

MHW9189A

870 MHz
20.3 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 2

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+75	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	19.7	20.3	20.9	dB
Slope	47-870 MHz	S	0	0.5	1.0	dB
Gain Flatness (47-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	f > 160 MHz		18	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

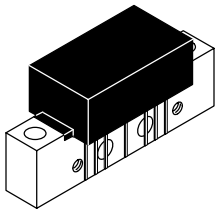
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-64	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-68	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-65	-63	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CSO_{112}	—	-63	-61	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-69	-67	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CSO_{79}	—	-74	-72	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CSO_{79}	—	-73	-71	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-59	-57	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-62	-60	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	XMD_{112}	—	-55	-53	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	XMD_{112}	—	-58	-56	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-60	-47	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	XMD_{79}	—	-62	-60	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	XMD_{79}	—	-67	-65	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-58	-56	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-62	-60	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–68	-66	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-60	-58	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CTB_{112}	—	-61	-59	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CTB_{112}	—	-64	-62	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-66	-64	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CTB_{79}	—	-71	-69	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CTB_{79}	—	-74	-72	
Noise Figure	50 MHz	NF	—	4.0	5.0	dB
	550 MHz		—	4.0	5.0	
	750 MHz		—	4.0	5.0	
	870 MHz		—	4.0	5.0	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

Rev. 1, 10/2002

Gallium Arsenide CATV Amplifier Module

MHW9206

870 MHz
20.2 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

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

Applications

- CATV Systems Operating in the 47 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, 47 to 870 MHz, CATV GaAs Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	19.6	20.2	20.8	dB
Slope	47-870 MHz	S	0.4	0.8	1.4	dB
Gain Flatness (47-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input/Output		IRL/ORL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		19	—	—	
	751-870 MHz		18	—	—	
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-66	-63	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-62	-59	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-63	-59	

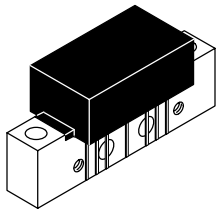
Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

Characteristic		Symbol	Min	Typ	Max	Unit
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-55	-51	
(V_{out} = +46 dBmV/ch., FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-55	-51	
(V_{out} = +44 dBmV/ch., FM = 55.25 MHz)	132-Channel FLAT	XMD_{132}	—	-57	-51	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-62	-60	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-60	-57	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-60	-57	
Noise Figure	50 MHz	NF	—	3.8	4.5	dB
	870 MHz		—	4	4.5	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	230	245	260	mA

Gallium Arsenide CATV Amplifier Module

MHW9207A

870 MHz
21.3 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+75	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	20.6	21.3	22	dB
Slope	47-870 MHz	S	0	0.5	1.0	dB
Gain Flatness (47-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	f > 160 MHz		18	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

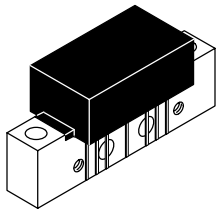
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-64	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-68	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-65	-63	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CSO_{112}	—	-63	-61	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-69	-67	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CSO_{79}	—	-74	-72	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CSO_{79}	—	-73	-71	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-59	-57	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-62	-60	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	XMD_{112}	—	-55	-53	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	XMD_{112}	—	-58	-56	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-60	-47	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	XMD_{79}	—	-62	-60	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	XMD_{79}	—	-67	-65	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-58	-56	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-62	-60	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–68	-66	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-57	-55	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CTB_{112}	—	-58	-56	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CTB_{112}	—	-60	-58	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-63	-61	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CTB_{79}	—	-65	-63	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CTB_{79}	—	-69	-67	
Noise Figure	50 MHz	NF	—	4.0	5.0	dB
	550 MHz		—	4.0	5.0	
	750 MHz		—	4.0	5.0	
	870 MHz		—	4.0	5.0	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

Rev. 0, 11/2003

Gallium Arsenide CATV Amplifier Module

MHW9227A

870 MHz
22.1 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	200	200	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	47	—	870	MHz
Power Gain	870 MHz	G_p	21.5	22.1	22.7	dB
Slope	47-870 MHz	S	0	0.5	1.0	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		—	—	—	0.7	dB
Return Loss — Input/Output		IRL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

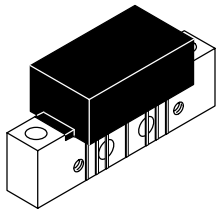
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-64	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-68	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-65	-63	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CSO_{112}	—	-63	-61	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-69	-67	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CSO_{79}	—	-74	-72	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CSO_{79}	—	-73	-71	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-59	-57	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-62	-60	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	XMD_{112}	—	-55	-53	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	XMD_{112}	—	-58	-56	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-60	-47	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	XMD_{79}	—	-62	-60	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	XMD_{79}	—	-67	-65	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-58	-56	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-62	-60	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	-64	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-57	-55	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CTB_{112}	—	-58	-56	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CTB_{112}	—	-60	-58	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-63	-61	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CTB_{79}	—	-65	-63	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CTB_{79}	—	-69	-67	
Noise Figure	50 MHz	NF	—	4.0	4.5	dB
	550 MHz		—	4.0	4.5	
	750 MHz		—	4.0	4.5	
	870 MHz		—	4.0	4.5	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

Rev. 3, 4/2003

Gallium Arsenide CATV Amplifier Module

MHW9236

870 MHz
23.8 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Integrated ESD Protection Diodes
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions

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
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV GaAs Forward Amplifier Module

Table 1. Maximum Ratings

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

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	200	200	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	870 MHz	G_p	23	23.8	24.3	dB
Slope	40-870 MHz	S	0	0.55	1.2	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	—	0.8	dB
Return Loss — Input (Z_o = 75 Ohms)	40-500 MHz f > 500 MHz	IRL	 20 18	 — —	 — —	dB

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

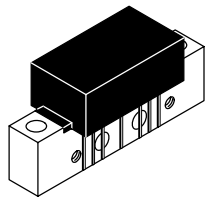
Characteristic		Symbol	Min	Typ	Max	Unit
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	40-300 MHz		20	—	—	
	301-750 MHz		19	—	—	
	f > 750 MHz		16			
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-66	-63	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-64	-60	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-64	-60	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-57	-50	
(V_{out} = +46 dBmV/ch., FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-57	-50	
(V_{out} = +44 dBmV/ch., FM = 55.25 MHz)	132-Channel FLAT	XMD_{132}	—	-57	-50	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-66	-60	
(V_{out} = +46 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-66	-60	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-68	-60	
Noise Figure	50 MHz	NF	—	5.0	6.0	dB
	550 MHz		—	5.0	—	
	750 MHz		—	5.0	—	
	870 MHz		—	5.3	6.5	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	240	255	270	mA

Rev. 2, 10/2002

CATV Amplifier Module

MHW9242A

1000 MHz
24 dB GAIN
152-CHANNEL
CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 77-, 110-, 128- and 152-Channel Loading
- Excellent Distortion Performance
- Superior Gain, Return Loss and DC Current Stability over Temperature
- Silicon Bipolar Transistor Technology
- Unconditionally Stable Under All Load Conditions

Applications

- CATV Systems Operating in the 40 to 1000 MHz Frequency Range
- Input Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications
- Output Stage Amplifier on Applications Requiring Low Power Dissipation

Description

- 24 Vdc Supply, 40 to 1000 MHz, CATV Forward Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+55	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	1000	MHz
Power Gain	50 MHz 1000 MHz	G_p	23.2 24	— —	24.8 26	dB
Slope	40 - 1000 MHz	S	0	—	2.5	dB
Gain Flatness (40 - 1000 MHz, Peak-to-Valley)		G_F	—	—	1.0	dB
Return Loss — Input/Output (Z_o = 75 Ohms)	@ 40 MHz @ f > 40 MHz (Derate)	IRL/ORL	20 —	— —	— 0.01	dB dB/MHz
Composite Second Order						dBc
(V_{out} = +38 dBmV/ch; Worst Case)	152-Channel FLAT	CSO_{152}	—	-66	-61	
(V_{out} = +38 dBmV/ch; Worst Case)	128-Channel FLAT	CSO_{128}	—	-69	—	
(V_{out} = +40 dBmV/ch;Worst Case)	110-Channel FLAT	CSO_{110}	—	-69	—	
(V_{out} = +44 dBmV/ch; Worst Case)	77-Channel FLAT	CSO_{77}	—	-78	—	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +38 dBmV/ch., FM= 55 MHz)	152-Channel FLAT	XMD_{152}	—	-62	-59	
(V_{out} = +38 dBmV/ch, FM = 55.25 MHz)	128-Channel FLAT	XMD_{128}	—	-65	—	
(V_{out} = +40 dBmV/ch, FM = 55.25 MHz)	110-Channel FLAT	XMD_{110}	—	-63	—	
(V_{out} = +44 dBmV/ch, FM = 55.25 MHz)	77-Channel FLAT	XMD_{77}	—	-58	—	

Table 2. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

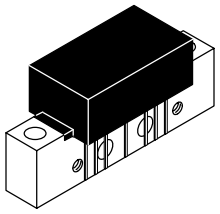
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Triple Beat						dBc
(V_{out} = +38 dBmV/ch., Worst Case)	152-Channel FLAT	CTB_{152}	—	- 64	- 58	
(V_{out} = +38 dBmV/ch, Worst Case)	128-Channel FLAT	CTB_{128}	—	- 68	—	
(V_{out} = +40 dBmV/ch, Worst Case)	110-Channel FLAT	CTB_{110}	—	- 67	—	
(V_{out} = +44 dBmV/ch, Worst Case)	77-Channel FLAT	CTB_{77}	—	- 64	—	
Noise Figure	f = 50 MHz	NF	—	4.8	5.5	dB
	f = 750 MHz		—	5.5	7.0	
	f = 860 MHz		—	5.8	7.5	
	f = 1000 MHz		—	—	8.0	
DC Current		I_{DC}	280	318	350	mA

Rev. 0, 1/2004

Gallium Arsenide CATV Amplifier Module

MHW9247A

870 MHz
24.9 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+28	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	300	300	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	870 MHz	G_p	24.4	24.9	25.4	dB
Slope	40-870 MHz	S	0	0.5	1.0	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	40-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	40-160 MHz		20	—	—	
	f > 160 MHz		18	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

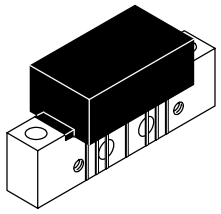
Characteristic		Symbol	Min	Typ	Max	Unit
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-64	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-68	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 12db Tilt	CSO_{112}	—	-66	-64	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 13.5db Tilt	CSO_{112}	—	-67	-65	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 17db Tilt	CSO_{112}	—	-68	-66	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 12db Tilt	CSO_{79}	—	-71	-69	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 13.5db Tilt	CSO_{79}	—	-74	-72	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 17db Tilt	CSO_{79}	—	-74	-72	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-56	-54	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-58	-56	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-60	-58	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 12db Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 13.5db Tilt	XMD_{112}	—	-54	-52	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 17db Tilt	XMD_{112}	—	-55	-53	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 12db Tilt	XMD_{79}	—	-55	-53	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 13.5db Tilt	XMD_{79}	—	-58	-56	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 17db Tilt	XMD_{79}	—	-61	-59	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-58	-56	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-61	-59	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–68	-66	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 12db Tilt	CTB_{112}	—	-58	-56	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 13.5db Tilt	CTB_{112}	—	-59	-57	
(V_{out} = +56 dBmV @ 870 Mhz Equiv)	112-Channel, 17db Tilt	CTB_{112}	—	-61	-59	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 12db Tilt	CTB_{79}	—	-64	-62	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 13.5db Tilt	CTB_{79}	—	-67	-65	
(V_{out} = +58 dBmV @ 870 Mhz Equiv)	79-Channel, 17db Tilt	CTB_{79}	—	-69	-67	
Noise Figure	50 MHz	NF	—	5.5	7.0	dB
	550 MHz		—	5.5	7.0	
	750 MHz		—	5.8	7.0	
	870 MHz		—	6.0	7.0	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	420	440	460	mA

Rev. 0, 1/2004

Gallium Arsenide CATV Amplifier Module

MHW9267A

870 MHz
27.6 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- Output Port Ring Wave Protection

Applications

- CATV Systems Operating in the 47 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 47 to 870 MHz, CATV GaAs Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	200	200	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	870 MHz	G_p	27	27.6	28.2	dB
Slope	47-870 MHz	S	0	0.7	1.4	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	—	0.5	dB
Return Loss — Input		IRL				dB
(Z_o = 75 Ohms)	47-500 MHz		20	—	—	
	501-750 MHz		18	—	—	
	751-870 MHz		16	—	—	

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted) **(continued)**

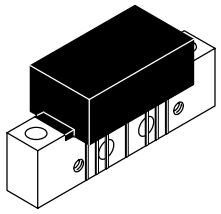
Characteristic		Symbol	Min	Typ	Max	Unit
Return Loss — Output		ORL				dB
(Z_o = 75 Ohms)	47-160 MHz		20	—	—	
	f > 160 MHz		18	—	—	
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-62	-60	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-64	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-68	-66	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12db Tilt	CSO_{112}	—	-64	-62	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5db Tilt	CSO_{112}	—	-65	-63	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17db Tilt	CSO_{112}	—	-66	-64	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12db Tilt	CSO_{79}	—	-69	-67	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5db Tilt	CSO_{79}	—	-71	-69	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17db Tilt	CSO_{79}	—	-72	-70	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-56	-54	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-58	-56	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-60	-58	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12db Tilt	XMD_{112}	—	-52	-50	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5db Tilt	XMD_{112}	—	-53	-51	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17db Tilt	XMD_{112}	—	-55	-53	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12db Tilt	XMD_{79}	—	-55	-52	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5db Tilt	XMD_{79}	—	-58	-56	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17db Tilt	XMD_{79}	—	-61	-59	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-58	-56	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-61	-59	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	-64	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12db Tilt	CTB_{112}	—	-58	-56	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5db Tilt	CTB_{112}	—	-59	-57	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17db Tilt	CTB_{112}	—	-61	-59	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12db Tilt	CTB_{79}	—	-62	-60	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5db Tilt	CTB_{79}	—	-64	-62	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17db Tilt	CTB_{79}	—	-67	-65	
Noise Figure	50 MHz	NF	—	5.5	7.0	dB
	550 MHz		—	5.5	7.0	
	750 MHz		—	5.8	7.0	
	870 MHz		—	6.0	7.0	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	440	460	mA

Rev. 1, 2/2003

Gallium Arsenide CATV Amplifier Module

MHW9276

870 MHz
27.9 dB GAIN
132-CHANNEL
GaAs CATV AMPLIFIER MODULE



CASE 1302-01, STYLE 1

Features

- 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Integrated ESD Protection Diodes
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions

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
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV GaAs Forward Amplifier Module

Table 1. Maximum Ratings

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

Table 2. ESD Maximum Ratings

Rating	Input Value	Output Value	Unit
Surge Voltage per IEC 1000-4-5	200	200	V
Human Body Model per Mil. Std. 1686	2	2	kV

Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain	870 MHz	G_p	27	27.9	28.5	dB
Slope	40-870 MHz	S	0.4	0.95	1.4	dB
Gain Flatness (40-870 MHz, Peak-to-Valley)		G_F	—	—	0.8	dB

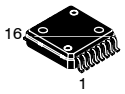
Table 3. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

Characteristic		Symbol	Min	Typ	Max	Unit
Input Return Loss (Z_o = 75 Ohms)		IRL				dB
	40-200 MHz		20	—	—	
	201-600 MHz		19	—	—	
	601-870 MHz		18			
Output Return Loss (Z_o = 75 Ohms)		ORL				dB
	40-200 MHz		20	—	—	
	201-600 MHz		18	—	—	
	601-870 MHz		18			
Composite Second Order						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-70	-64	
(V_{out} = +44 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-66	-62	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-66	-60	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +44 dBmV/ch., FM = 55.25 MHz)	79-Channel FLAT	XMD_{79}	—	-60	-53	
(V_{out} = +44 dBmV/ch., FM = 55.25 MHz)	112-Channel FLAT	XMD_{112}	—	-60	-53	
(V_{out} = +44 dBmV/ch., FM = 55.25 MHz)	132-Channel FLAT	XMD_{132}	—	-60	-53	
Composite Triple Beat						dBc
(V_{out} = +44 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	-71	-65	
(V_{out} = +44 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-68	-61	
(V_{out} = +44 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-66	-60	
Noise Figure	50 MHz	NF	—	5.0	5.5	dB
	550 MHz		—	5.0	—	
	750 MHz		—	5.0	—	
	870 MHz		—	5.0	6.5	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	235	250	265	mA

Gallium Arsenide CATV Integrated Amplifier Module

MMG1001R2
MMG1001T1

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



CASE 978-03
PFP-16

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. T1 Suffix = 1,000 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

Table 1. 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

Table 2. Thermal Characteristics

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

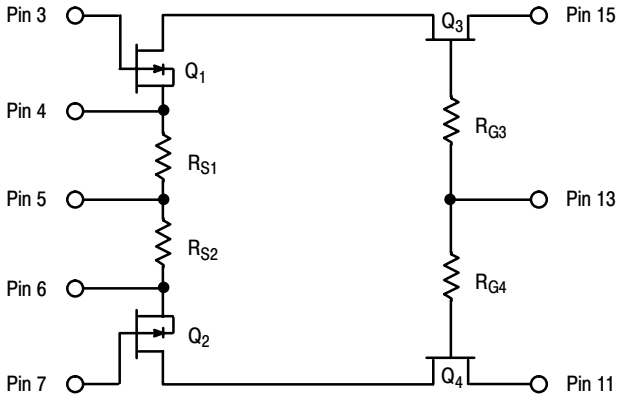
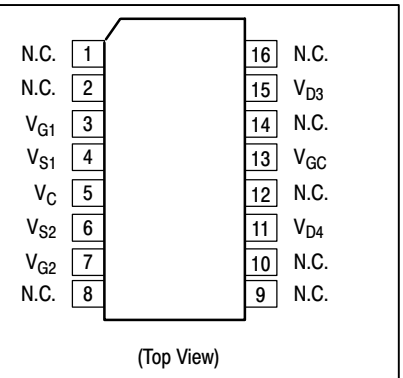


Figure 1. Functional Diagram



(Top View)

Note: Exposed backside flag is source terminal for transistors.

Figure 2. Pin Connections

Table 3. ESD Protection Characteristics

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

Table 4. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	3	260	°C

Table 5. Electrical Characteristics for 24 V Application (V_{CC} = 24 Vdc, T_C = +30°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_o = 75 Ohms) f = 40-160 MHz f = 161-450 MHz f = 451-870 MHz		IRL	— —	21 19 22	— — —	dB
Output Return Loss (Z_o = 75 Ohms) f = 40-400 MHz f = 401-870 MHz		ORL	— —	22 17	— —	dB
Composite Second Order (V_{out} = +44 dBmV/ch., Worst Case) (V_{out} = +46 dBmV/ch., Worst Case) (V_{out} = +48 dBmV/ch., Worst Case)	 132-Channel FLAT 112-Channel FLAT 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) (V_{out} = +46 dBmV/ch., FM = 55 MHz) (V_{out} = +48 dBmV/ch., FM = 55 MHz)	 132-Channel FLAT 112-Channel FLAT 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) (V_{out} = +46 dBmV/ch., Worst Case) (V_{out} = +48 dBmV/ch., Worst Case)	 132-Channel FLAT 112-Channel FLAT 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° to +100°C)		I_{DC}	230	250	265	mA

(continued)

Table 4. Electrical Characteristics for 12 V Application (V_{CC} = 12 Vdc, T_C = +30°C, 75 Ω system unless otherwise noted) **(continued)**

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 Ohms) f = 40 - 160 MHz f = 161 - 450 MHz f = 451 - 870 MHz		IRL	 — —	 21 19 19	 — — —	dB
Output Return Loss (Z_o = 75 Ohms) f = 40 - 400 MHz f = 401 - 750 MHz f = 751 - 870 MHz		ORL	 — — —	 19 17 15	 — — —	dB
Composite Second Order (V_{out} = +42 dBmV/ch., Worst Case) (V_{out} = +42 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 dBmV/ch., FM = 55 MHz) (V_{out} = +42 dBmV/ch., FM = 55 MHz)	 112 - Channel FLAT 79 - Channel FLAT	 XMD_{112} XMD_{79}	 — —	 -63 -62	 — —	dBc
Composite Triple Beat (V_{out} = +42 dBmV/ch., Worst Case) (V_{out} = +42 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 V, T_C = -20° to +100°C)		I_{DC}	190	210	225	mA

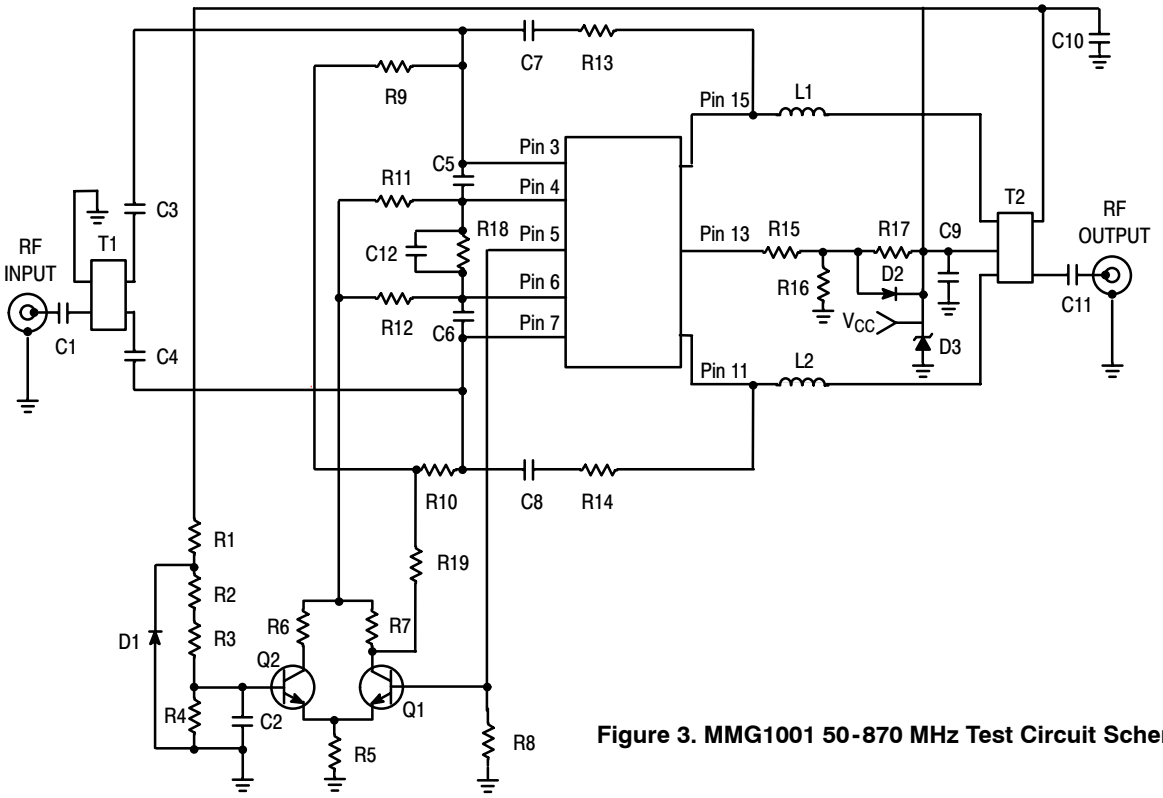
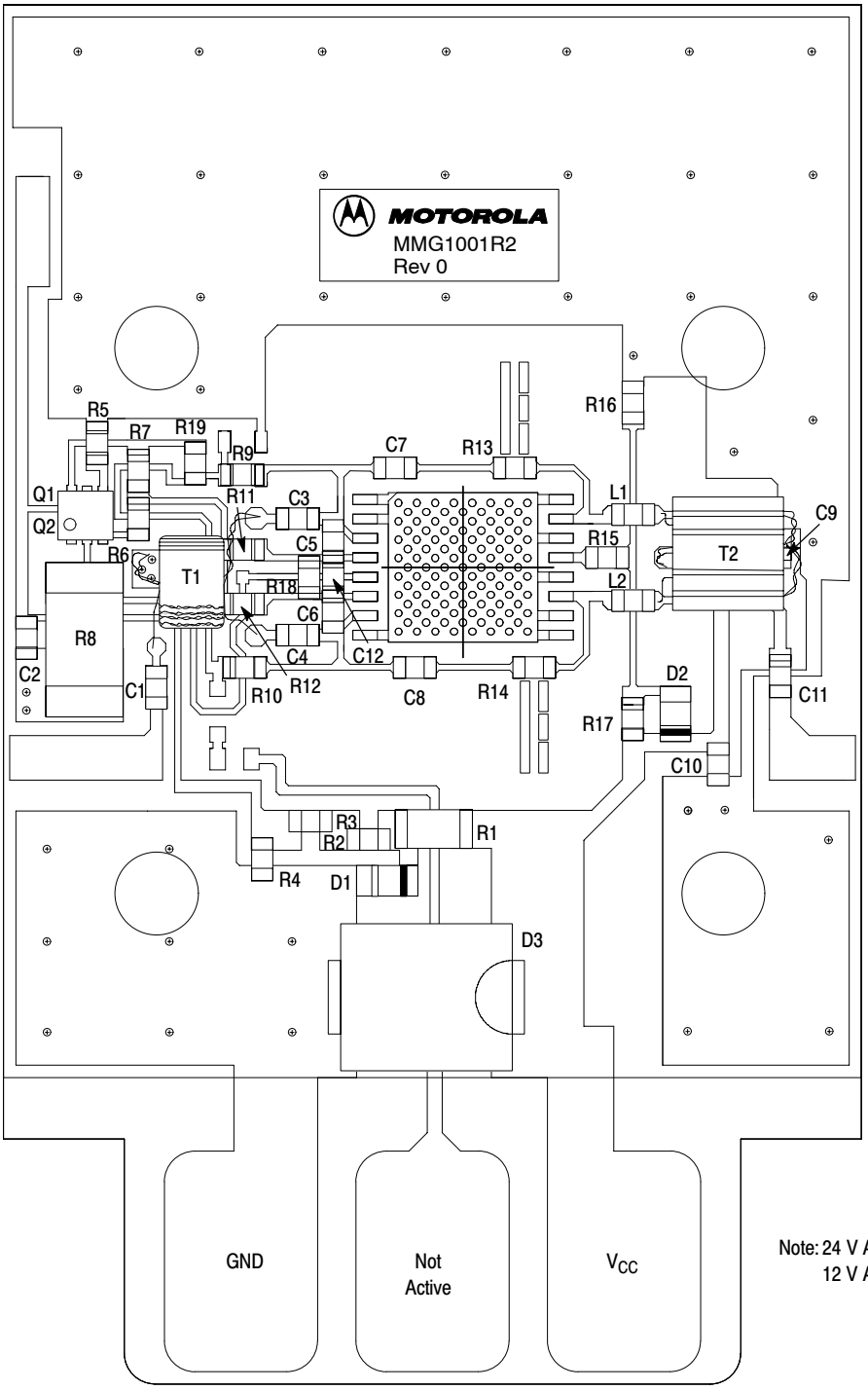


Figure 3. MMG1001 50-870 MHz Test Circuit Schematic

Table 6. MMG1001 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 μF Chip Capacitors (0603)	0.01 μF 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 kΩ, 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 kΩ Chip Resistor (0603)	1.5 kΩ 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 kΩ Chip Resistor (0603)	2.7 kΩ Chip Resistor (0603)
R17	6.2 kΩ Chip Resistor (0603)	6.2 kΩ 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, 77PC016E068
T2	Output Transformer, Mot/77PC016E061	Output Transformer, 77PC016E061
PCB	FR4, 62 mil, ε_r = 4.81	FR4, 62 mil, ε_r = 4.81



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 4. MMG1001 50-870 MHz Test Circuit Component Layout

TYPICAL CHARACTERISTICS FOR 24 V APPLICATION

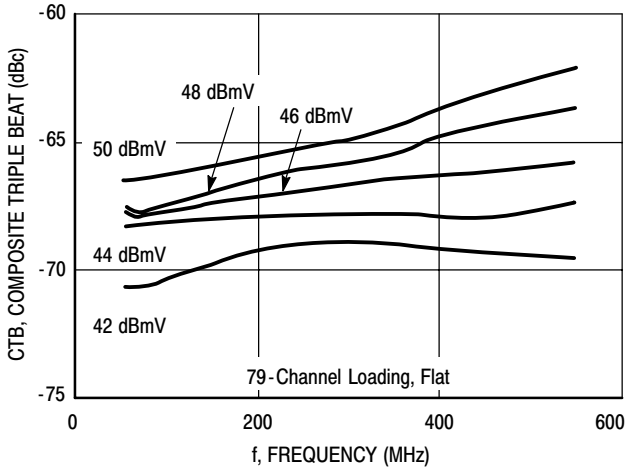


Figure 5. Composite Triple Beat versus Frequency

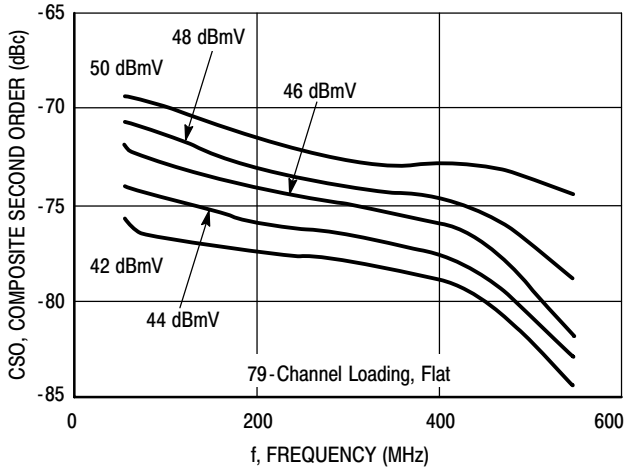


Figure 6. Composite Second Order versus Frequency

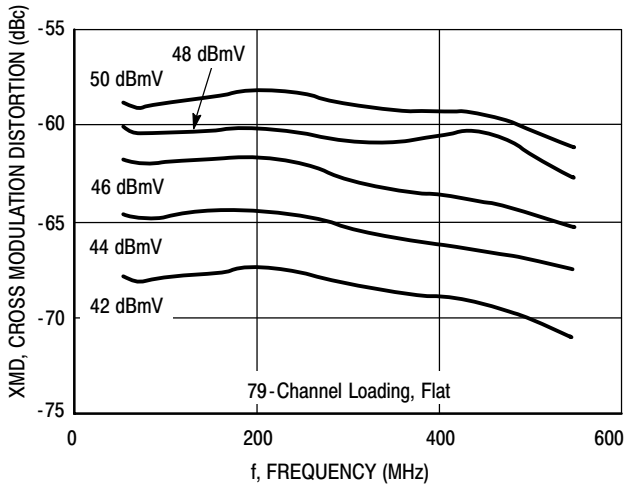
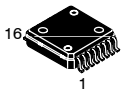


Figure 7. Cross Modulation Distortion versus Frequency

Gallium Arsenide CATV Integrated Amplifier Module

MMG2001T1

870 MHz
19.5 dB GAIN
132-CHANNEL
CATV INTEGRATED AMPLIFIER MODULE



CASE 978-03
PFP-16

Features

- Specified for 79-, 112- and 132-Channel Loading
- Excellent Distortion Performance
- Higher Output Capability
- Built-in Input Diode Protection
- GaAs FET Transistor Technology
- Unconditionally Stable Under All Load Conditions
- In Tape and Reel. T1 Suffix = 1,000 Units per 16 mm, 13 inch Reel.

Applications

- CATV Systems Operating in the 40 to 870 MHz Frequency Range
- Output Stage Amplifier in Optical Nodes, Line Extenders and Trunk Distribution Amplifiers for CATV Systems
- Driver Amplifier in Linear General Purpose Applications

Description

- 24 Vdc Supply, 40 to 870 MHz, CATV Integrated Forward Power Doubler Amplifier Module

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
RF Voltage Input (Single Tone)	V_{in}	+70	dBmV
DC Supply Voltage	V_{CC}	+26	Vdc
Operating Case Temperature Range	T_C	-20 to +100	°C
Storage Temperature Range	T_{stg}	-40 to +100	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	4.7	°C/W

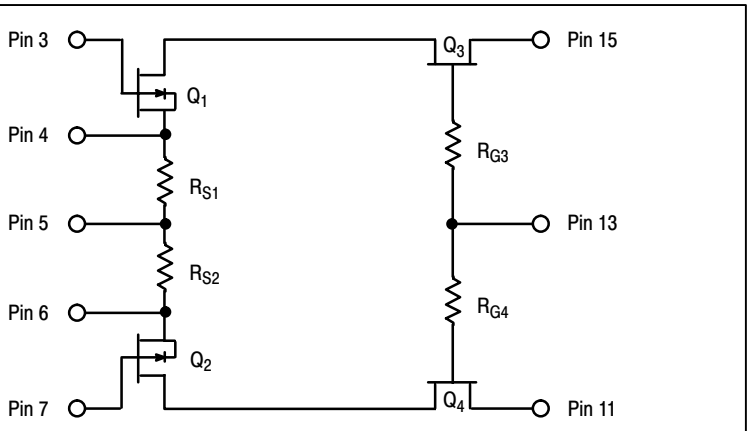
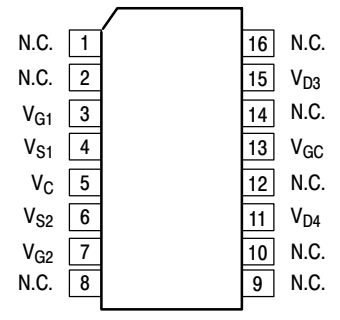


Figure 1. Functional Diagram



(Top View)

Note: Exposed backside flag is source terminal for transistors.

Figure 2. Pin Connections

Table 3. ESD Protection Characteristics

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

Table 4. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	3	260	°C

Table 5. Electrical Characteristics (V_{CC} = 24 Vdc, T_C = +45°C, 75 Ω system unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Frequency Range		BW	40	—	870	MHz
Power Gain		G_p				dB
	40 MHz		—	19	—	
	870 MHz		—	21	—	
Slope	40 - 870 MHz	S	—	0.8	—	dB
Gain Flatness (40 - 870 MHz, Peak to Valley)		G_F	—	0.5	—	dB
Input Return Loss (Z_o = 75 Ohms)	f = 40-160 MHz	IRL	—	21	—	dB
	f = 161-450 MHz		—	19	—	
	f = 451-870 MHz			22	—	
Output Return Loss (Z_o = 75 Ohms)	f = 40-400 MHz	ORL	—	22	—	dB
	f = 401-870 MHz		—	17	—	
Composite Second Order						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CSO_{132}	—	-68	-60	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CSO_{112}	—	-70	-62	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CSO_{79}	—	-74	-66	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CSO_{112}	—	-63	—	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CSO_{112}	—	-62	—	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CSO_{112}	—	-61	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CSO_{79}	—	-67	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CSO_{79}	—	-72	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CSO_{79}	—	-71	—	
Cross Modulation Distortion @ Ch 2						dBc
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	132-Channel FLAT	XMD_{132}	—	-55	-53	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	112-Channel FLAT	XMD_{112}	—	-57	-55	
(V_{out} = +48 dBmV/ch., FM = 55 MHz)	79-Channel FLAT	XMD_{79}	—	-60	-58	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	XMD_{112}	—	-51	—	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	XMD_{112}	—	-53	—	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	XMD_{112}	—	-56	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	XMD_{79}	—	-58	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	XMD_{79}	—	-60	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	XMD_{79}	—	-65	—	
Composite Triple Beat						dBc
(V_{out} = +48 dBmV/ch., Worst Case)	132-Channel FLAT	CTB_{132}	—	-56	-54	
(V_{out} = +48 dBmV/ch., Worst Case)	112-Channel FLAT	CTB_{112}	—	-60	-58	
(V_{out} = +48 dBmV/ch., Worst Case)	79-Channel FLAT	CTB_{79}	—	–66	–64	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 12 dB Tilt	CTB_{112}	—	-58	—	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 13.5 dB Tilt	CTB_{112}	—	-59	—	
(V_{out} = +56 dBmV @ 870 MHz Equiv)	112-Channel, 17 dB Tilt	CTB_{112}	—	-62	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 12 dB Tilt	CTB_{79}	—	-64	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 13.5 dB Tilt	CTB_{79}	—	-69	—	
(V_{out} = +58 dBmV @ 870 MHz Equiv)	79-Channel, 17 dB Tilt	CTB_{79}	—	-72	—	
Noise Figure	50 MHz	NF	—	4.0	4.5	dB
	550 MHz		—	4.0	4.5	
	750 MHz		—	4.0	4.5	
	870 MHz		—	4.0	4.5	
DC Current (V_{DC} = 24 V, T_C = 45°C)		I_{DC}	410	425	440	mA

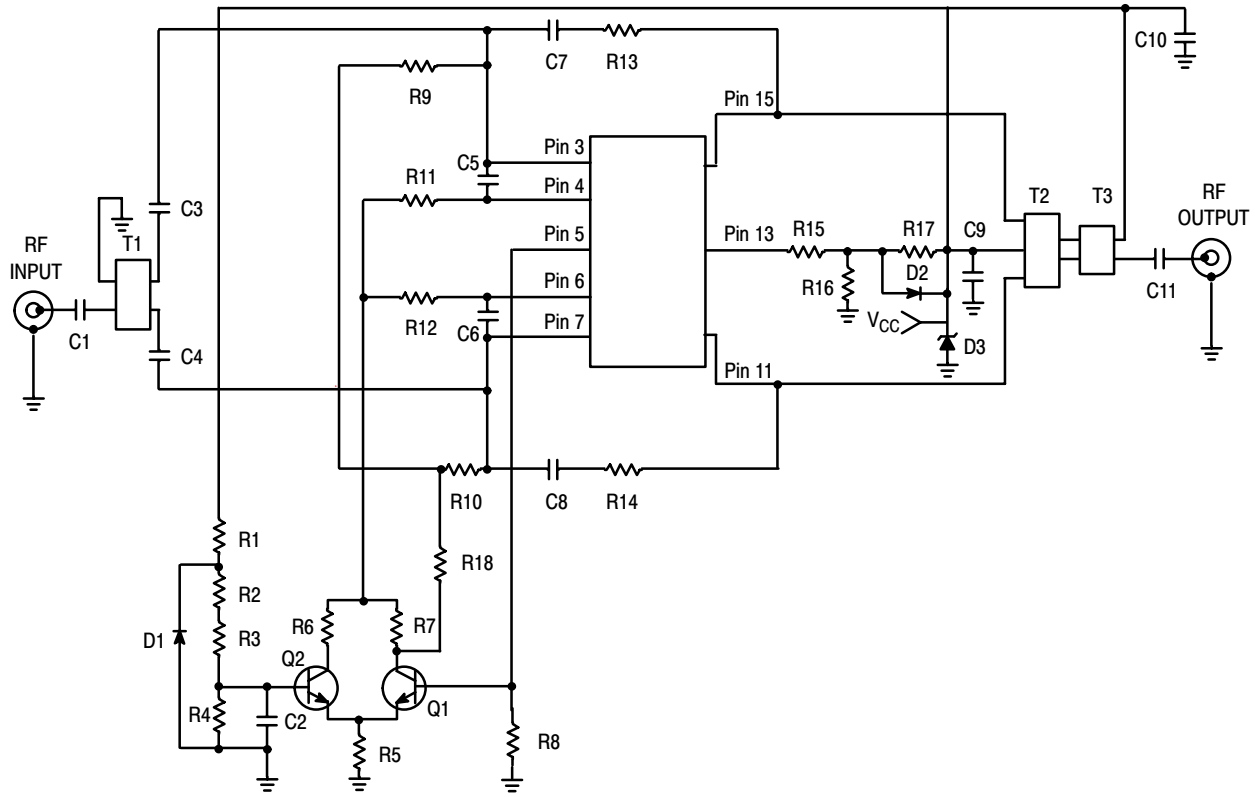
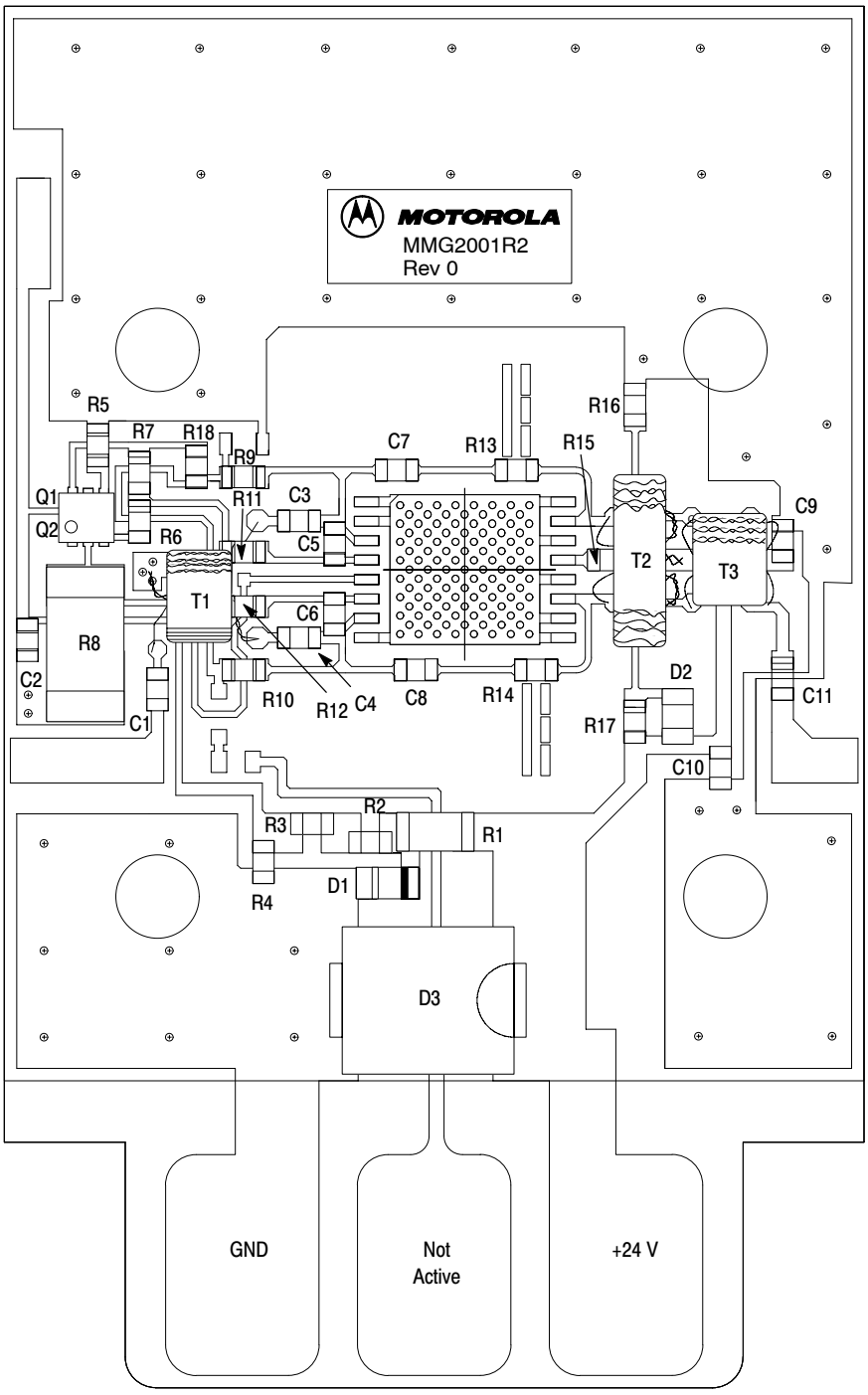


Figure 3. MMG2001T1 50-870 MHz Test Circuit Schematic

Table 6. MMG2001T1 50-870 MHz Test Circuit Component Designations and Values

Designation	Description
C1, C7, C8, C11	220 pF Chip Capacitors (0603)
C2, C3, C4, C9, C10	0.01 μF Chip Capacitors (0603)
C5, C6	1.8 pF Chip Capacitors (0603)
D1	5.1 V Zener Diode, On/MM3Z5V1T1
D2	27 V Zener Diode, On/MM3Z27VT1
D3	Transient Voltage Suppressor, On/1.5k27A/1.5SMC27AT3
Q1, Q2	Dual Transistors Package, On/MBT3904DW1T1
R1	2.2 kΩ, 1/4 W Chip Resistor (1206)
R2	680 Ω Chip Resistor (0603)
R3	180 Ω Chip Resistor (0603)
R4	1600 Ω Chip Resistor (0603)
R5	820 Ω Chip Resistor (0603)
R6	120 Ω Chip Resistor (0603)
R7	1.5 kΩ Chip Resistor (0603)
R8	8 Ω, 1 W Chip Resistor (2512)
R9, R10, R15	470 Ω Chip Resistors (0603)
R11, R12	18 Ω Chip Resistors (0603)
R13, R14	680 Ω Chip Resistors (0603)
R16	2.4 kΩ Chip Resistor (0603)
R17	6.2 kΩ Chip Resistor (0603)
R18	0 Ω Chip Resistor (0603)
T1	Input Transformer, 77PC016E080
T2	Output Transformer, 77PC016E071
T3	Output Transformer, 77PC016E072
PCB	FR4, 62 mil, ε_r = 4.81



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 4. MMG2001T1 50-870 MHz Test Circuit Component Layout

TYPICAL CHARACTERISTICS

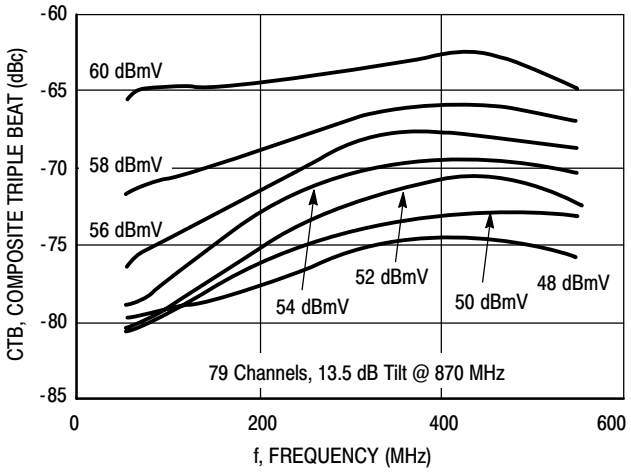


Figure 5. Composite Triple Beat versus Frequency

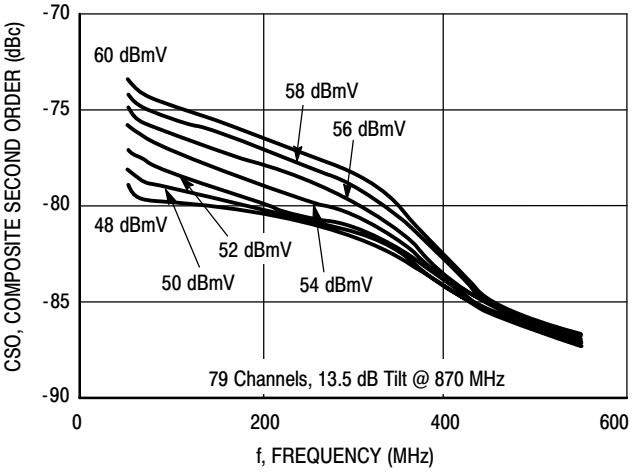


Figure 6. Composite Second Order versus Frequency

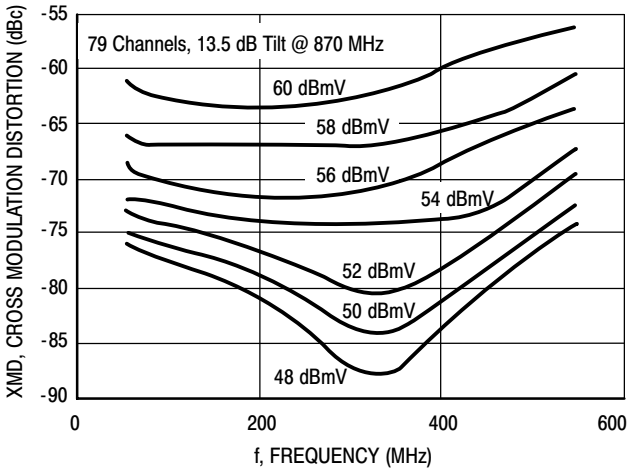


Figure 7. Cross Modulation Distortion versus Frequency

Chapter Four
Packaging Information

Tape and Reel

Freescale Semiconductor offers the convenience of Tape and Reel packaging for our growing family of standard integrated circuit products. Reels are available to support the requirements of both first and second generation pick-and-place equipment. The packaging fully conforms to the latest EIA-481A specification. The antistatic embossed tape provides a secure cavity, sealed with a peel-back cover tape.

Case Dimensions

Note that the packaging availability for each device type is indicated on the individual data sheets and in the Selector Guide. All of the outline dimensions for the packages are given in this section.

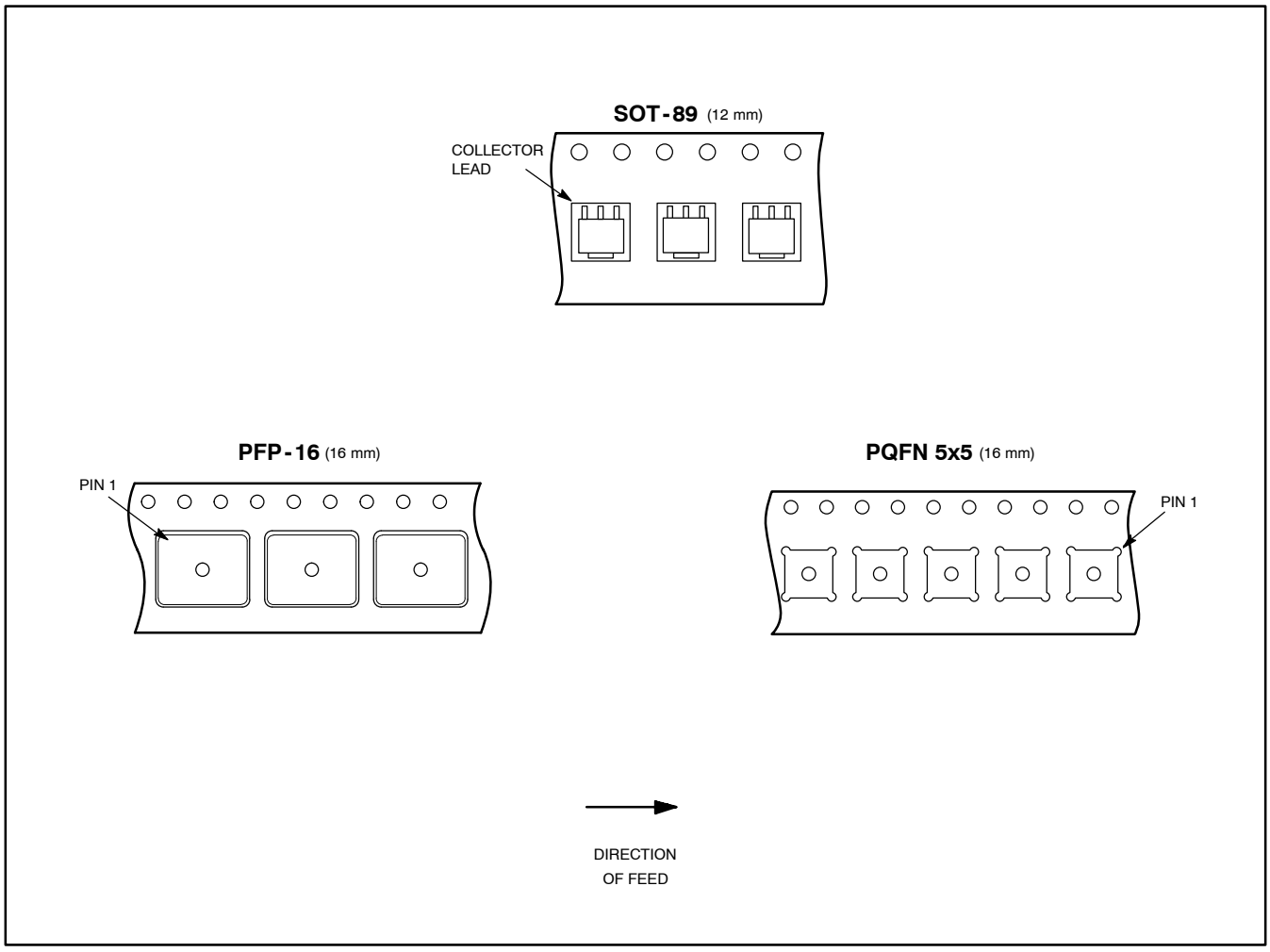
Table of Contents

Tape and Reel Specifications

Embossed Tape and Reel is used to facilitate automatic pick and place equipment feed requirements. The tape is used as the shipping container for various products and requires a minimum of handling. The antistatic/conductive tape provides a secure cavity for the product when sealed with the “peel-back” cover tape.

- Two Reel Sizes Available (7″ and 13″)
- Used for Automatic Pick and Place Feed Systems
- Minimizes Product Handling
- EIA 481, -1, -2
- SOT-89 in 12 mm Tape
- PFP-16, PQFN 5x5 in 16 mm Tape

Use the standard device title and add the required suffix as listed in the option table on the following page. Note that the individual reels have a finite number of devices depending on the type of product contained in the tape. Also note the minimum lot size is one full reel for each line item, and orders are required to be in increments of the single reel quantity.

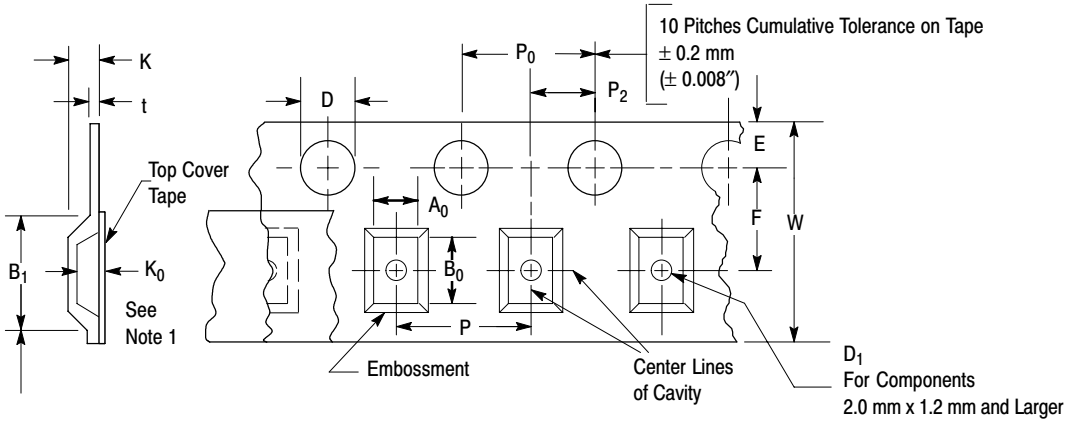


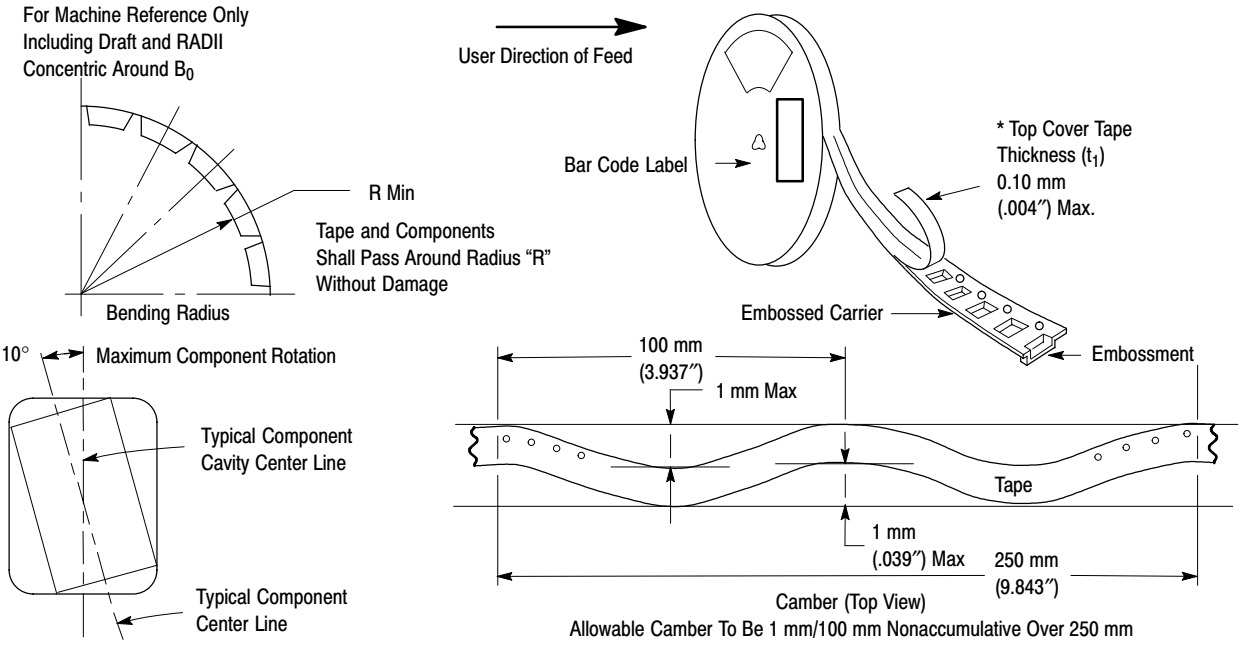
EMBOSSED TAPE AND REEL ORDERING INFORMATION

Package	Tape Width (mm)	Pitch mm (inch)	Reel Size mm (inch)	Devices Per Reel and Minimum Order Quantity	Device Suffix
PFP-16	16	12.0 ± 0.1 (.472 ± .004)	330 (13)	1,500	R2
PQFN 5x5 (1543)	16	8.0 ± 0.1 (.315 ± .004)	330 (13)	1,000	T1
SOT-89 (1514)	12	8.0 ± 0.1 (.315 ± .004)	178 (7)	1,000	T1

EMBOSSED TAPE AND REEL DATA FOR DISCRETES

CARRIER TAPE SPECIFICATIONS





DIMENSIONS

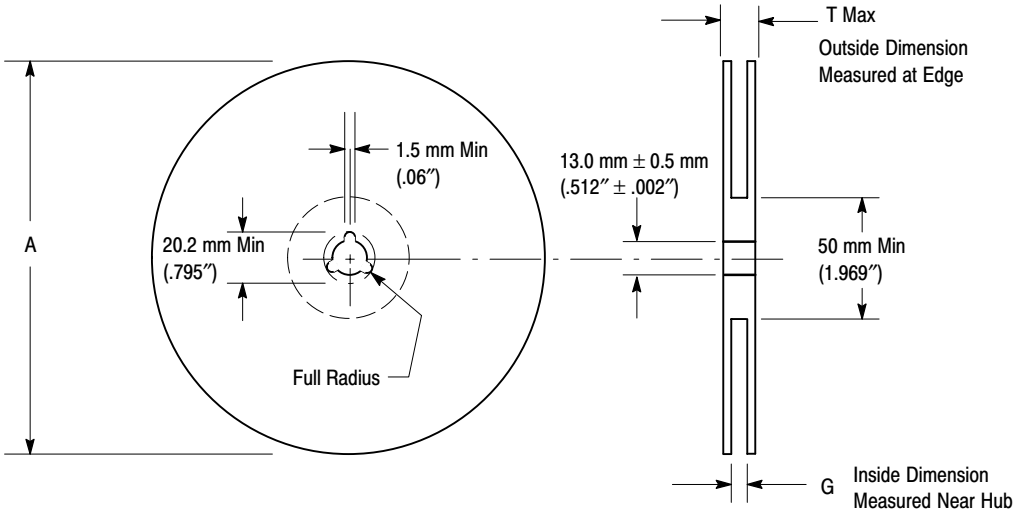
Tape Size	B_1 Max	D	D_1	E_1	F	K	P_0	P_2	R Min	t Max	W Max
12 mm	5.1 mm (.201″) SOT-89	1.5+0.1 mm -0.0 (.059+.004″ -0.0)	1.7 mm Min (.068″) SOT-89	1.75±0.1 mm (.069±.004″)	5.5±0.05 mm (.217±.002″)	1.9 mm Max (.076″) SOT-89	4.0±0.1 mm (.157±.004″)	2.0±0.5 mm (.079±.002″)	30 mm (1.18″)	0.30 mm (.012″)	12±.2 mm (.470±.008″) SOT-89
16 mm	12.1 mm (.476″)		1.5 mm Min (.060″)		7.5±0.10 mm (.295±.004″)	7.9 mm Max (.311″)		2.0±0.1 mm (.079±.004″)		0.4 mm (.016″)	16±.3 mm (.642±.008″)
	6.1 mm (.241″) PQFN 5x5					2.8 mm Max (.110″) PQFN 5x5	4.0±0.2 mm (.157±.001″) PQFN 5x5	2.0±0.5 mm (.079±.002″) PQFN 5x5		0.30 mm (.012″) PQFN 5x5	

Metric dimensions govern — English are in parentheses for reference only.

NOTE 1: A_0, B_0, and K_0 are determined by component size. The clearance between the components and the cavity must be within .05 mm min. to .50 mm max., the component cannot rotate more than 10° within the determined cavity.

NOTE 2: Pitch information is contained in the Embossed Tape and Reel Ordering Information on pg. NO TAG.

EMBOSSED TAPE AND REEL DATA FOR DISCRETES



Size	A Max	G	T Max
12 mm	330 mm (12.992″)	12.4 mm + 2.0 mm, - 0.0 (.49″ + .079″, - 0.00)	18.4 mm (.72″)
12 mm SOT-89	178 mm (7″)	13.5 mm (.53″)	16.5 mm (.65″)
16 mm PQFN 5x5	360 mm (14.173″)	16.4 mm + 2.0 mm, - 0.0 (.646″ + .078″, - 0.00)	22.4 mm (.882″)

Reel Dimensions

Metric Dimensions Govern — English are in parentheses for reference only

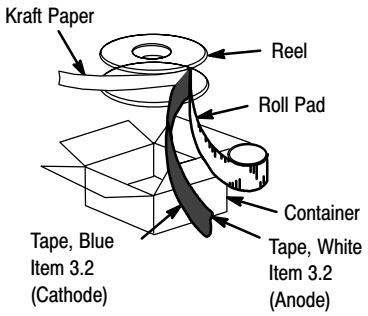


Figure 1. Reel Packing

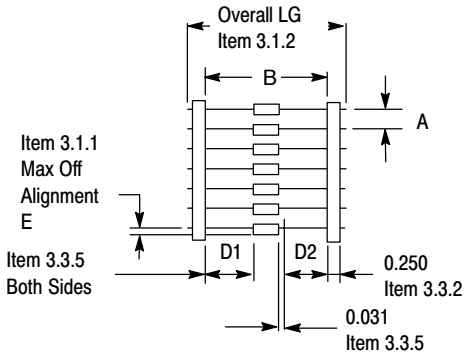


Figure 2. Component Spacing

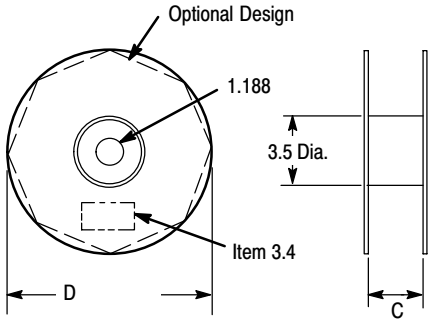
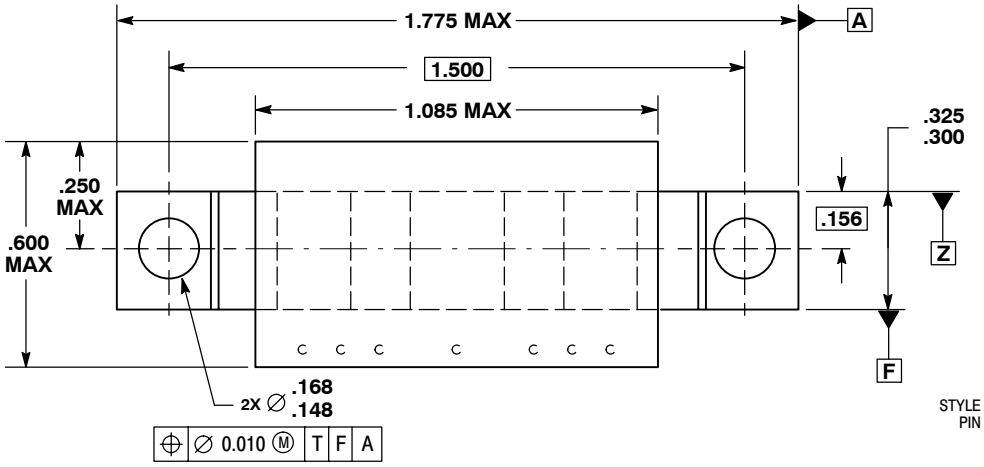
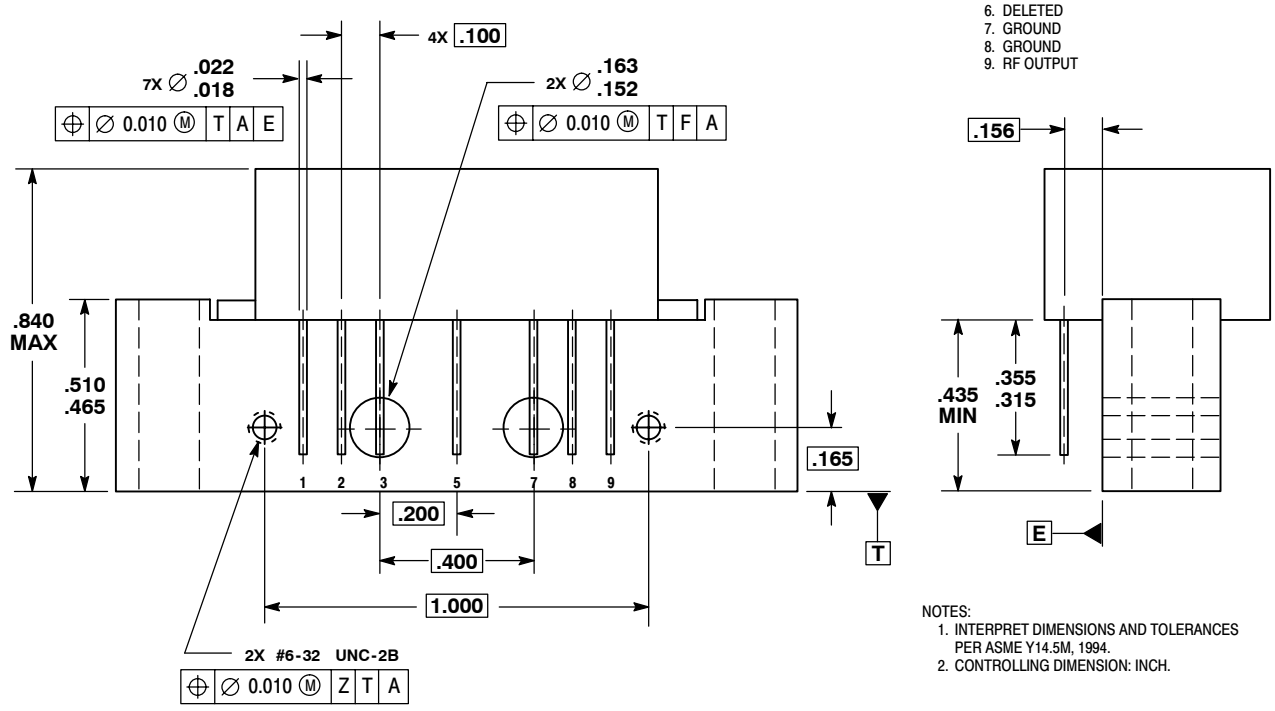


Figure 3. Reel Dimensions

Case Dimensions



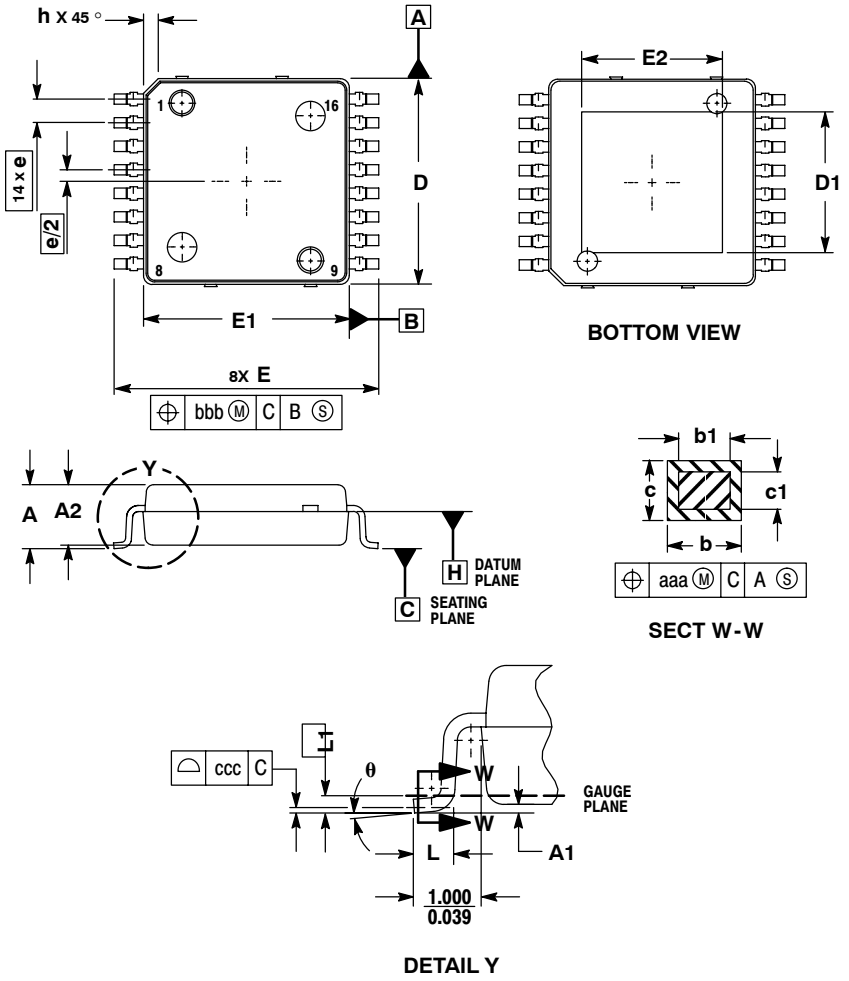
STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
4. DELETED
5. VDC
6. DELETED
7. GROUND
8. GROUND
9. RF OUTPUT



NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

CASE 714Y-04
ISSUE E

CASE DIMENSIONS (continued)

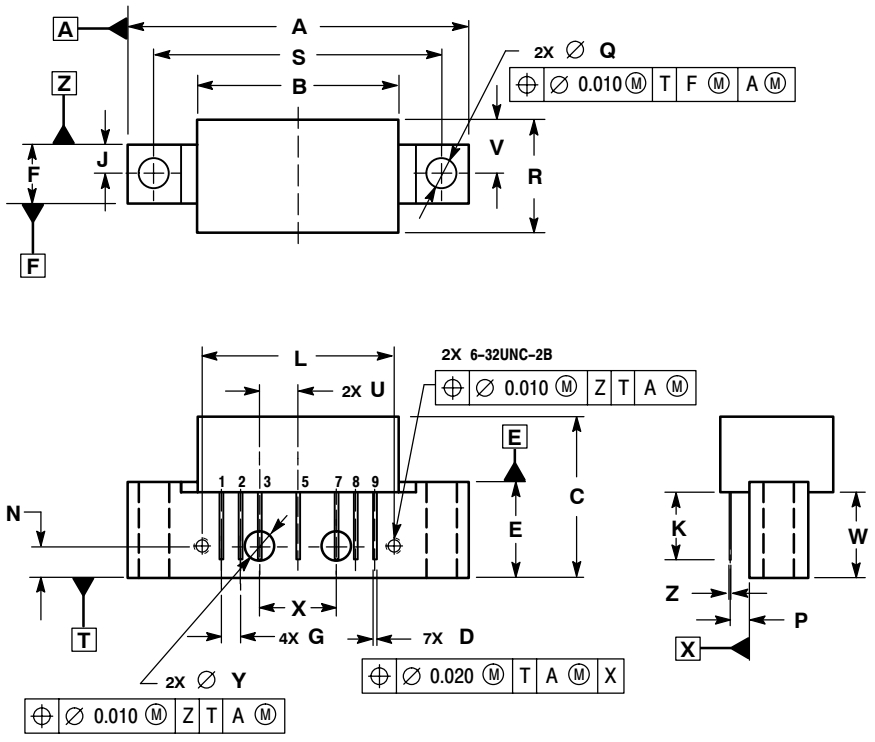


NOTES:
1. CONTROLLING DIMENSION: MILLIMETER.
2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 PER SIDE. DIMENSIONS D AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS 0.127 TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-.

	MILLIMETERS	
DIM	MIN	MAX
A	2.000	2.300
A1	0.025	0.100
A2	1.950	2.100
D	6.950	7.100
D1	4.372	5.180
E	8.850	9.150
E1	6.950	7.100
E2	4.372	5.180
L	0.466	0.720
L1	0.250 BSC	
b	0.300	0.432
b1	0.300	0.375
c	0.180	0.279
c1	0.180	0.230
e	0.800 BSC	
h	---	0.600
θ	0 °	7 °
aaa	0.200	
bbb	0.200	
ccc	0.100	

CASE 978-03
ISSUE B
PFP-16
PLASTIC

CASE DIMENSIONS (continued)



CASE 1302-01
ISSUE B

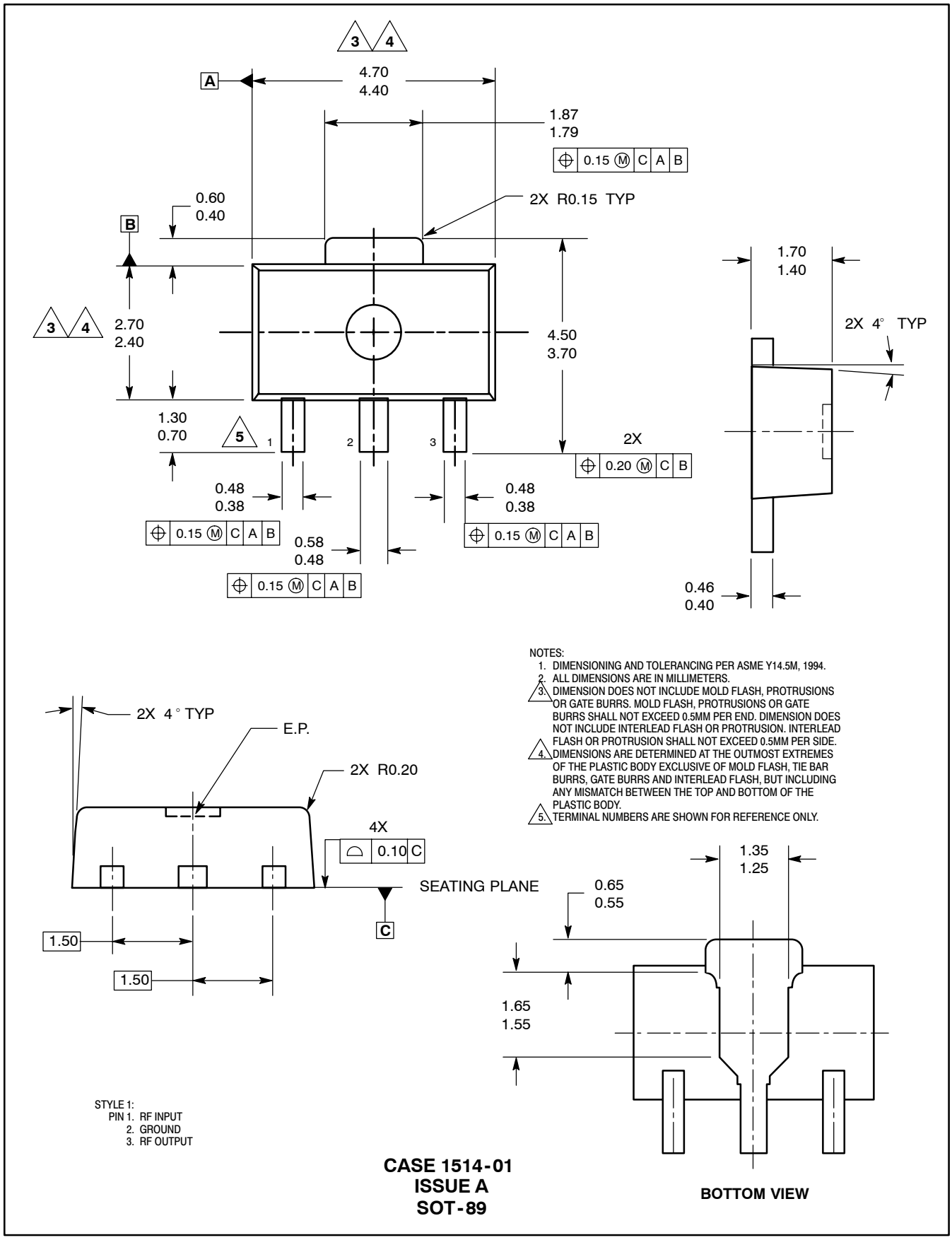
NOTES:
1. DIMENSIONS ARE IN INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	---	1.775	---	45.085
B	---	1.085	---	27.559
C	---	0.840	---	21.336
D	0.015	0.021	0.381	0.533
E	0.465	0.510	11.811	12.954
F	0.300	0.325	7.62	8.255
G	0.100 BSC		2.540 BSC	
J	0.156 BSC		3.962 BSC	
K	0.315	0.355	8.001	9.017
L	1.000 BSC		25.400 BSC	
N	0.165 BSC		4.191 BSC	
P	0.100 BSC		2.540 BSC	
Q	0.148	0.168	3.759	4.267
R	---	0.600	---	15.24
S	1.500 BSC		38.100 BSC	
U	0.200 BSC		5.080 BSC	
V	---	0.250	---	6.350
W	0.435	---	11.049	---
X	0.400 BSC		10.160 BSC	
Y	0.152	0.163	3.861	4.140
Z	0.009	0.011	0.229	0.279

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
4. DELETED
5. VDC
6. DELETED
7. GROUND
8. GROUND
9. RF OUTPUT

STYLE 2:
PIN 1. RF OUTPUT
2. GROUND
3. GROUND
4. DELETED
5. VDC
6. DELETED
7. GROUND
8. GROUND
9. RF INPUT

CASE DIMENSIONS (continued)



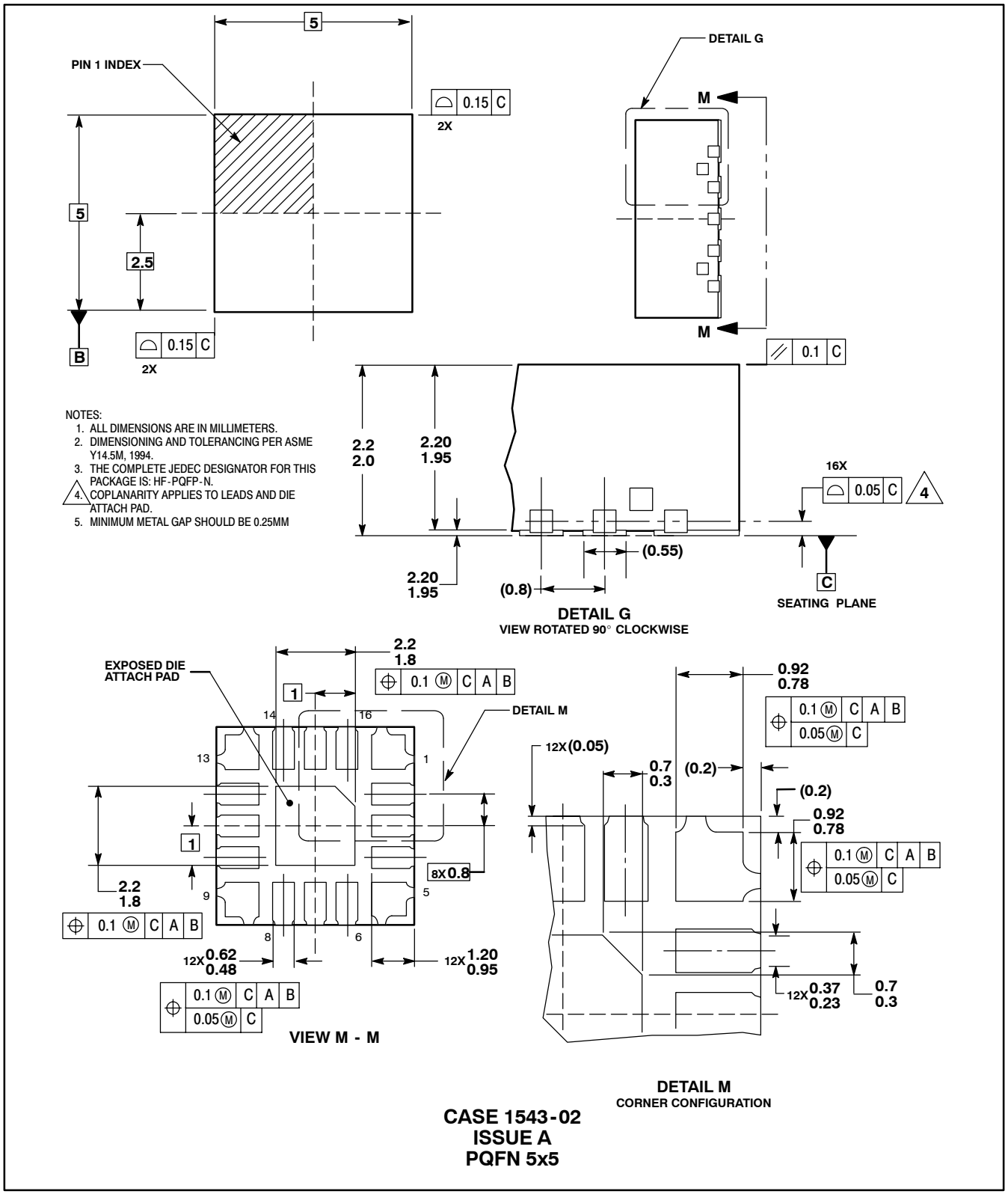
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5MM PER END. DIMENSION DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5MM PER SIDE.
4. DIMENSIONS ARE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. RF OUTPUT

CASE 1514-01
ISSUE A
SOT-89

BOTTOM VIEW

CASE DIMENSIONS (continued)



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