

# DOCSIS®4.0 Upstream Amplifier



## Key Features

- Provides push-pull amplifier performance as a 75 Ohm Single-Ended I/O amplifier IC (no baluns required)
- Extended Spectrum DOCSIS® Upstream PHY Compliance from 5 to 684 MHz
- Typical Gain = 18.0 dB  $\pm$ 1.0 dB (108 to 684 MHz)
- OIP3  $>$ +38 dBm (500 MHz); OIP2  $>$ +60 dBm (500 MHz)
- $\geq$ 45 dB MER (DOCSIS® 3.1 OFDM), 5 to 684 MHz, FLAT, uncorrected
- RF Output to +30 dBmV (5 to 684 MHz); Total Composite Power  $\approx$  +46 dBmV
- Single Power Supply Input (+8.5 Vdc)
- Operating Current = 250 mA Typical (Pdiss  $\approx$  2.1 Wdc)
- Advanced GaAs Amplifier Technology
- QFN-16 3 x 3 x 0.80 mm SMT Package

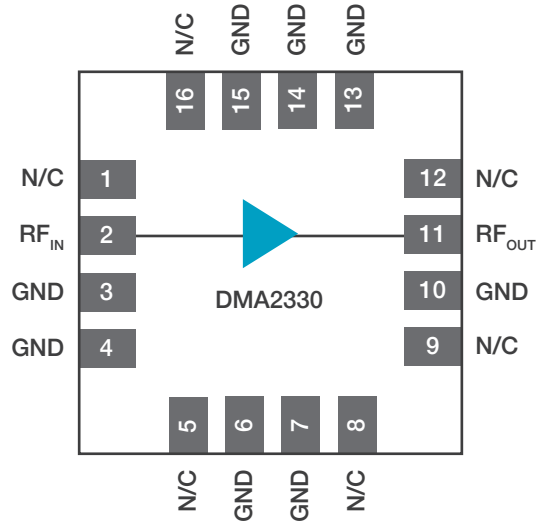
## Applications

- DOCSIS® 3.1 Full Duplex (FDX) Consumer Premises Equipment (CPE) from 108 to 684 MHz
- DOCSIS®3.1 FDX Capable Gateways, Routers, Servers, Computing Devices, Displays
- DOCSIS® 4.0 HFC/FTTx/RFoG Network Downstream 5 to 684 MHz
- DOCSIS® Set-Top-Gateway (DSG), Home/SOHO Wireless Gateway Router
- Extended Spectrum DOCSIS® Downstream from 5 to 684 MHz

## Product Description

The DMA2330 is a high-linearity RF amplifier IC designed for exceptionally wide bandwidth (BW), flat gain over BW, and artifact-free amplification of multi-carrier modulated signals. Employing an amplifier die manufactured on an advanced GaAs process, this linear CATV amplifier is a single-ended, ultra-linear amplifier ideal for high data rate broadband systems. Designed for use as an easily cascaded 75  $\Omega$  gain block, its gain flatness of  $\pm$ 1 dB from 5 MHz to 684 MHz combined with an OIP2 at 500 MHz of  $>$ +60 dBm, make this part ideal for upstream Extended Spectrum DOCSIS® and FDX transmitter applications. No baluns are required and the part is available in a no exposed leads, small outline, low profile SMT package.

## Functional Block Diagram



## Package Pin Out

Pin Number	Description	Notes
1	No Connect (N/C)	
2	RF Input	75 $\Omega$ Single-Ended 50 $\Omega$ Single-Ended (OPTIONAL)
3	Ground	
4	Ground	
5	No Connect (N/C)	
6	Ground	
7	Ground	
8	No Connect (N/C)	
9	No Connect (N/C)	
10	Ground	
11	RF Output	75 $\Omega$ Single-Ended 50 $\Omega$ Single-Ended (OPTIONAL)
12	No Connect (N/C)	
13	Ground	
14	Ground	
15	Ground	
16	No Connect (N/C)	

### Absolute Minimum and Maximum Ratings

Parameter	Min	Max	Units
Supply	0	+15	Vdc
RF Power at the Input	-	+7	dBm
Case Operating Temperature Range, T <sub>c</sub>	-40	+110	°C
Storage Temperature	-65	+150	°C
Soldering Temperature	-	+260	°C
Soldering Time	-	5	seconds

Stresses more than the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

### Operating Ranges

Parameter	Min	Typ	Max	Units
RF Input/Output Frequency	5		684	MHz
Supply Voltage	+8	+8.5	+9	V <sub>DC</sub>
Case Temperature, T <sub>c</sub>	-40	-	+100	°C

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical Specification.

## Electrical Specifications

(Ta = +25 °C, Vdd = +8.5 VDC, f = as stated below, 75 Ω Input/Output)

Parameter	Min	Typ	Max	Units	Comments
Gain	17	18	19	dB	See Note 1: 5 to 684 MHz
Gain Flatness	-	-	± 1	dB	F = 5 to 684 MHz
Noise Figure (NF)	-	3.5	-	dB	F = 15 to 684 MHz
Input Return Loss (IRL)	-	-18	-	dB	F = 15 to 684 MHz
Output Return Loss (ORL)	-	-15	-	dB	F = 15 to 684 MHz
Tx Modulation Error Ratio (MER)	-45	-	-	dB	See Note 2, 5 to 684 MHz, FLAT, uncorrected
IIP3	-	+20	-	dBm	F = 500 MHz
OIP3	-	+38	-	dBm	F = 500 MHz
OIP2	-	+60	-	dBm	See Note 1; F = 500 MHz
OP1dB	-	+25	-	dBm	; ±0.5 dBm; F = 500 MHz
Supply Current	-	250	325	mA	@ +8 Vdc

Notes: All specifications as measured using Duet evaluation assembly.

1. Measured in application circuit.
2. Measured IAW Data-Over-Cable Service Interface Specifications (DOCSIS®) Downstream RF Interface Specification, CM-SP-DRFI-116-170111 and CM-SP-PHYv3.1-115-180926.

## Multi-Carrier Distortion Data

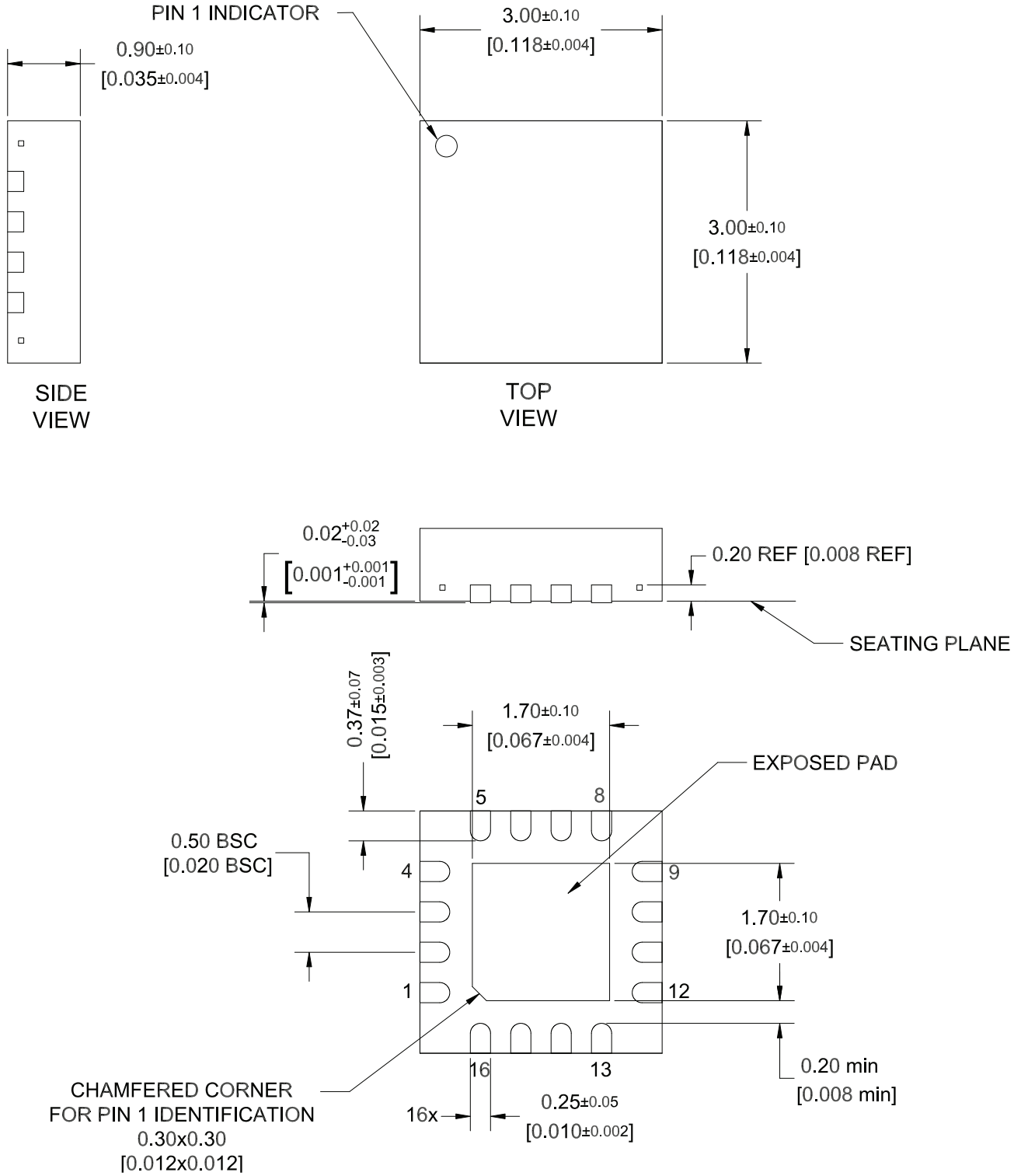
(Typical at +24 °C Ambient Temperature)

XMOD	CTB	CSO+	CSO-	Unit	Notes
≤ -75	-78	-76	-80	dBc	@288.25 MHz 100 channels PAL-D FLAT; +10 dBmV/ch RFin

## Calculated Total Composite Power (TCP) Calculations

Level at Reference Channel =	Reference Channel Frequency =	Slope, 55.25 to Top Channel =	Top Channel Frequency =	Digital Above Frequency =	Relative Level of Digital	Total Composite Power (TCP)
dBmV	MHz	dB	MHz	MHz	dB	dBmV
30	684	10	684	55.25	0	46.1

Package Dimensions



### Ordering Information

Order Number	Temperature Range	Package Description	Component Packaging
DMA2330P0	-40 to +85 °C	3 x 3 x 0.8 mm SMT QFN-16	Gel Pak, 1 to 100 each
DMA2330V0	-40 to +85 °C	3 x 3 x 0.8 mm SMT QFN-16	1500 each, T&R
DMA2330PCBA	-40 to +85 °C	75 Ω I/O Evaluation Board (EVB) with F-Type PCB Edge Connectors	EVB Kit with five (5) piece IC sample ESD bag

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