

DATA SHEET

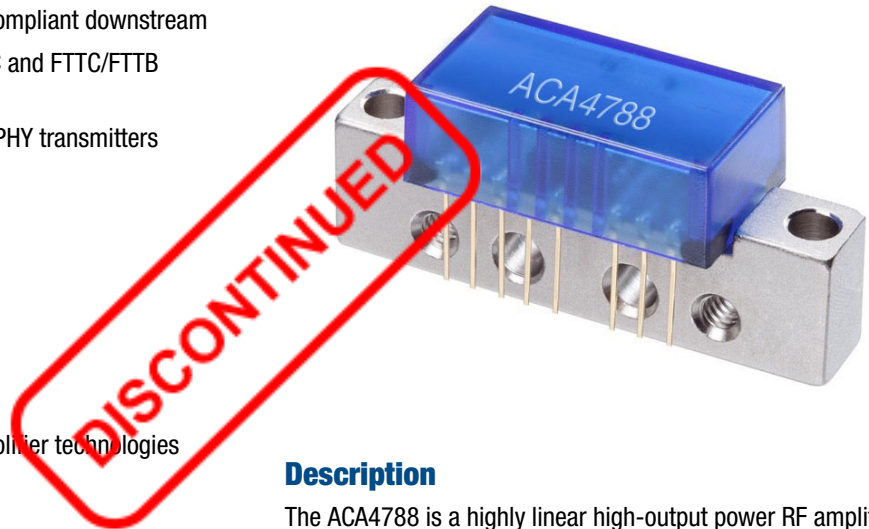
# ACA4788: 1218 MHz High-Output GaN CATV Power-Doubler Amplifier

## Applications

- DOCSIS® and Euro DOCSIS® 3.1 (D3.1) compliant downstream
- Final stage RF amplifier for node + 0 HFC and FTTC/FTTB networks
- Output stage RF amplifier for D-CCAP/D-PHY transmitters

## Features

- 50 to 1218 MHz frequency range
- 23 dB gain @ 1218 MHz
- >+76.6 dBmV total composite power
- Single +24 Vdc power supply input
- Advanced GaAs pHEMT driver + GaN amplifier technologies
- Halogen free/RoHS compliant



## Description

The ACA4788 is a highly linear high-output power RF amplifier module in the industry standard SOT-115J package. Designed for deep fiber node CATV infrastructure applications, the module consists of two parallel amplifiers in cascade, forming a power doubler optimized for low distortion, high output power, and very high TCP.

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

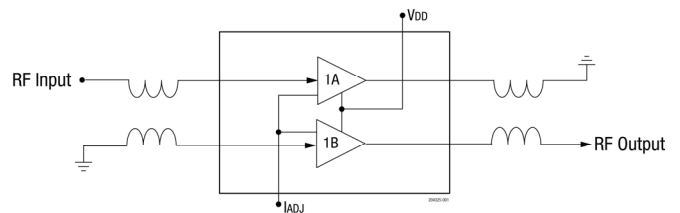


Figure 1. ACA4788 Functional Block Diagram

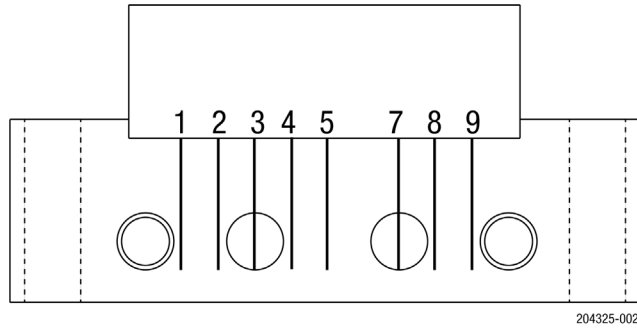


Figure 2. ACA4788 Pinout (Side View)

Table 1. ACA4788 Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RFIN	RF input	5	VDD	24 V supply
2	GND	Ground	7	GND	Ground
3	GND	Ground	8	GND	Ground
4	IADJ	Current adjust	9	RFOUT	RF output

### Electrical and Mechanical Specifications

The absolute maximum ratings of the ACA4788 are provided in Table 2.

The recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

Table 2. ACA4788 Absolute Maximum Ratings<sup>1</sup>

Parameter	Symbol	Min	Typ	Max	Units
Supply voltage	VDD		+24	+28	V
RF power at input, single tone	P <sub>IN</sub>			75	dBmV
Operating mounting base temperature	T <sub>MB</sub>	-30		+100	°C
Storage temperature	T <sub>STG</sub>	-40		+100	°C

<sup>1</sup> Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

**ESD HANDLING:** Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.

Table 3. ACA4788 Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units
RF input/output frequency	f	50		1218	MHz
Supply voltage	V <sub>DD</sub>		+24		V <sub>DC</sub>
Case temperature	T <sub>C</sub>	-30		+100	°C
Supply current	I <sub>DD</sub>		760		mA

**Table 4. Electrical Specifications**

(T<sub>A</sub> = +25 °C, V<sub>DD</sub> = +24 V<sub>DC</sub>, I<sub>DD</sub> = 760 mA, f = 50 to 1218 MHz, 75 Ω System)

Parameter	Symbol	Min	Typ	Max	Unit	Comments
Gain (1218 MHz) <sup>3</sup>		22.5	23	24	dB	f = 1218 MHz
Cable equivalent slope <sup>3</sup>			1.25		dB	f = 50 to 1218 MHz
Gain flatness to 1218 MHz <sup>2,3</sup>			±0.5		dB	
Noise figure	NF		4		dB	
Composite triple beat <sup>1</sup>	CTB		-76	-73	dBc	
Composite second order <sup>1</sup>	CSO		-80	-74	dBc	
Cross modulation <sup>1</sup>	XMOD		-70		dBc	
Composite intermodulation noise <sup>1</sup>	CIN		-57	-55	dBc	
Composite carrier to noise ratio <sup>1</sup>	CCNR		57		dB	
Total composite power <sup>4</sup>	TCP		76.6		dBmV	
Modulation error ratio <sup>4</sup>	MER		40		dB	
Bit error rate <sup>4</sup>	BER			1e-7	Bits/second	
Input return loss <sup>3</sup>	IRL		-17	-15	dB	
Output return loss <sup>3</sup>	ORL		-18	-16	dB	
Supply current recommended operating range			760	780	mA	Pin 4 = no connection

Notes: All specifications as measured on evaluation assembly.

<sup>1</sup> Parts measured with 77 NTSC analog channels plus 111 equivalent digital SC-256-QAM channels to 1218 MHz, +63 dBmV output power and 22 dB tilt referenced to 1218 MHz.

<sup>2</sup> Peak deviation from a straight line between gain value at 50 MHz and 1218 MHz.

<sup>3</sup> Measured in the application circuit.

<sup>4</sup> +61 dBmV output power referenced to 1218 MHz, 190 QAM channels, 22 dB tilt.

### Current Reduction Using Pin 4

The ACA4788 may be operated over a wide range of supply current to obtain the desired performance with reduced power consumption. A resistance placed between pin 4 and ground (GND), as shown in Figures 3 and 4, reduces the supply current. The relationship between the supply current and the resistance is plotted in Figure 5. Refer to Table 5 for a list of selected discrete resistor values and the resultant  $I_{DD}$  and  $P_{DISS}$ .

The supply current remains at its maximum recommended operating value (see Table 5) when pin 4 is unterminated or N/C. The magnitude of S21 (gain) changes by 0.2 dB or less if the supply current is 700 mA or greater. Figures 6 and 7 depict the comparative MER and BER performance resulting from reductions in  $I_{DD}$ .

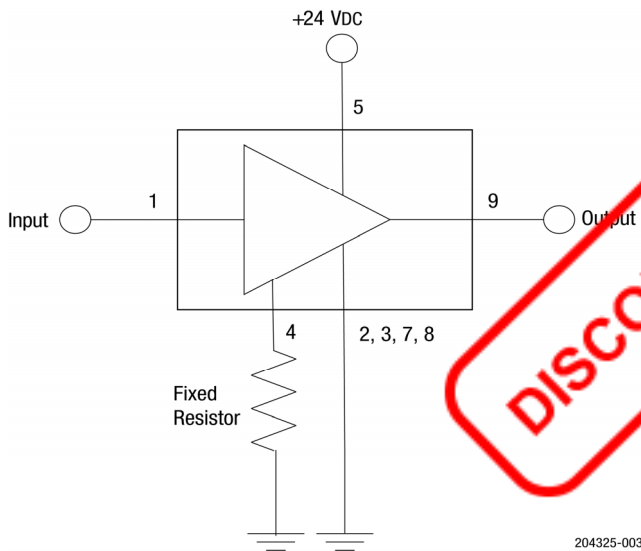


Figure 3. Fixed Resistor

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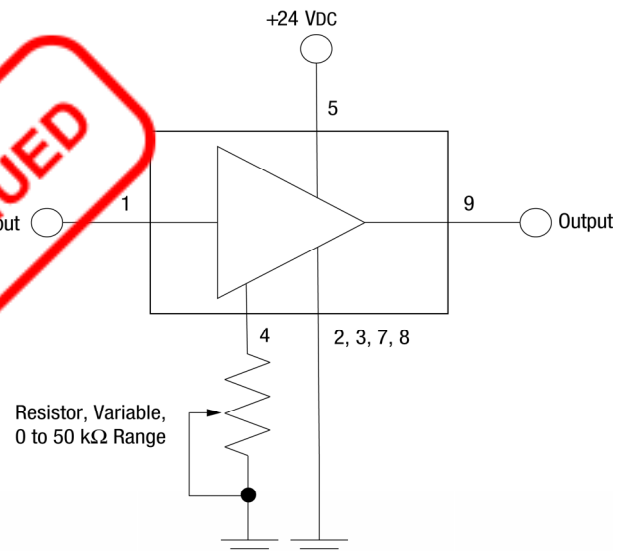
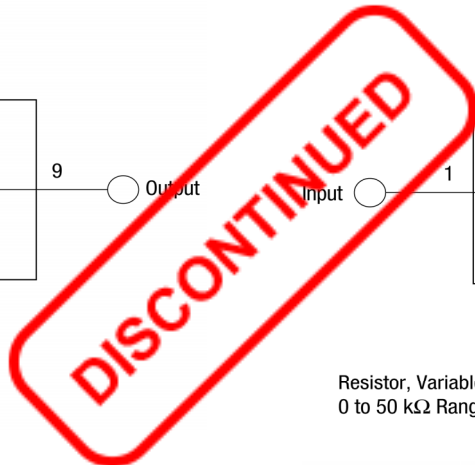


Figure 4. Variable Resistor (Range: 0 to 50 kΩ)

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Table 5.  $I_{DD}/P_{DISS}$  vs Pin 4 Resistor

Vcc = +24Vdc		
Pin 4 Resistor (ohms)	$I_{DD}$ (mA)	$P_{DISS}$ (W)
Open	760	18.2
29k	750	18.0
5.0k	700	16.8
2.4k	650	15.6
1.5k	600	14.4
1.0k	550	13.2

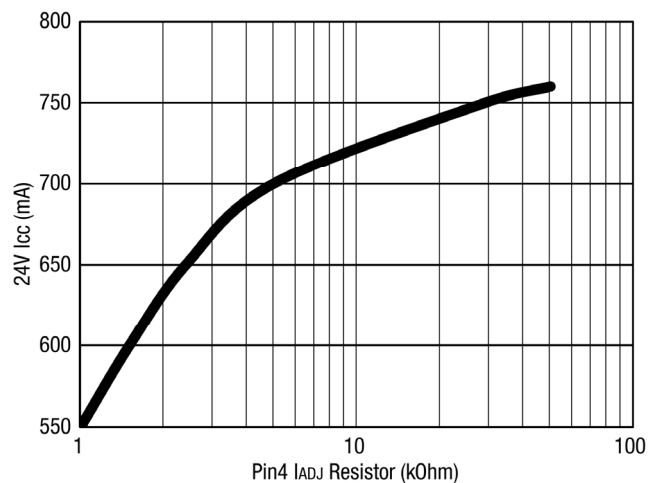


Figure 5. 24 V  $I_{DD}$  vs Pin 4  $I_{ADJ}$  Resistor

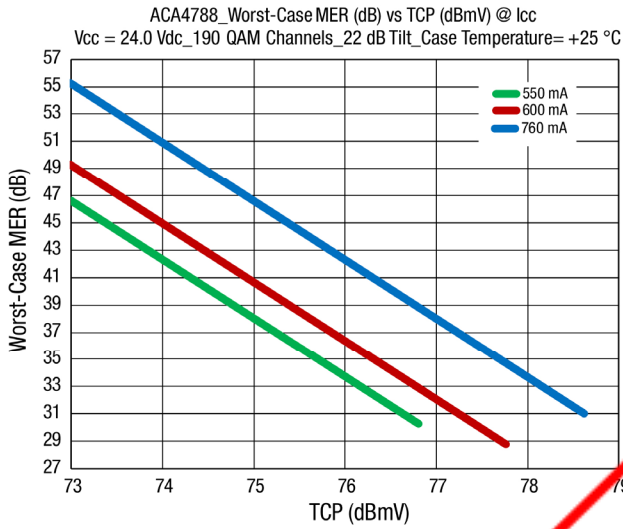


Figure 6. Typical MER Performance at Reduced I<sub>cc</sub>

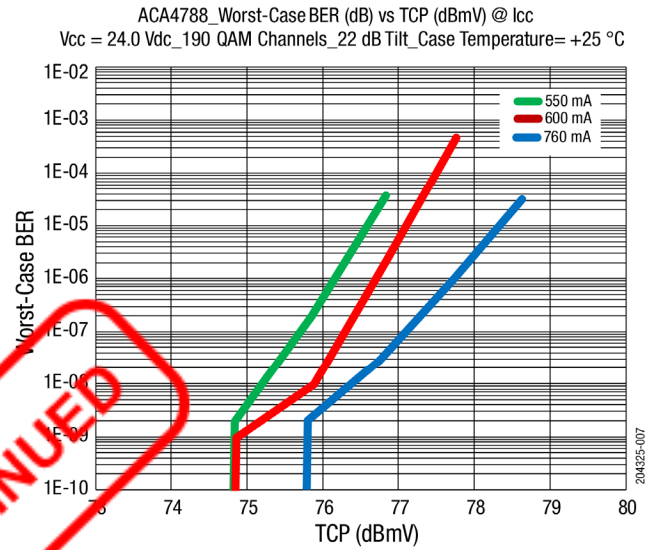


Figure 7. Typical BER Performance at Reduced I<sub>cc</sub>



### Package Dimensions

The ACA4788 is packaged in a standard SOT-115J design. Figure 8 shows the typical part marking. Figure 9 shows the package dimensions.

### Package and Handling Information

The ACA4788 is packaged and shipped in boxes containing plastic anti-static trays indented to accommodate individual units. Each shipping box contains 100 units.

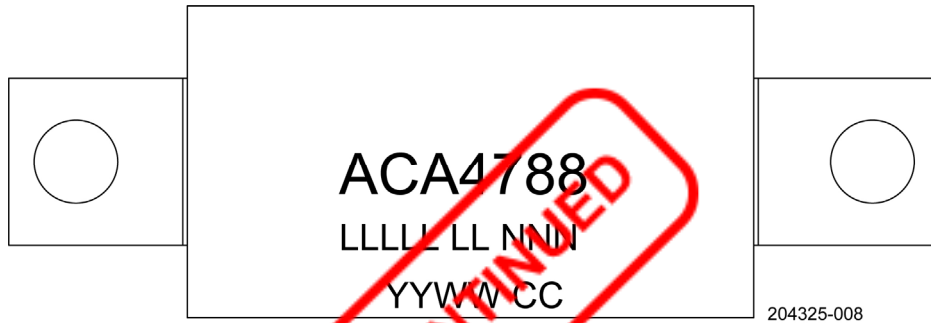


Figure 8. Typical Part Marking

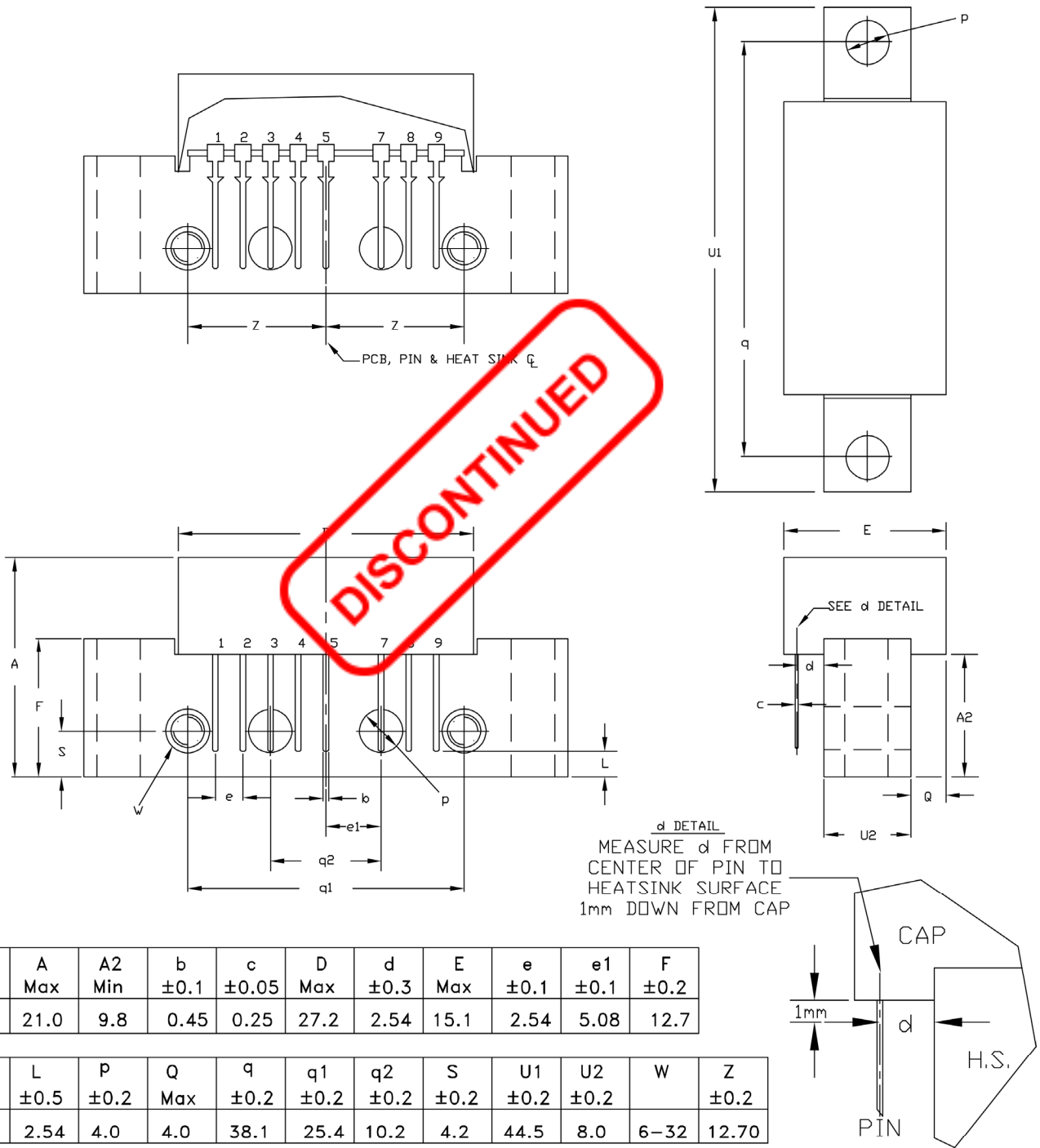


Figure 9. ACA4788 Package Dimensions

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## Ordering Information

Part Number	Product Description	Packaging
ACA4788V0	High-Output GaN CATV Power-Doubler Amplifier	100-piece box



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