20 W (43 dBm), 8 GHz to 11.5 GHz, GaN Power Amplifier

Preliminary Data Sheet

ADPA1122AEHZ

FEATURES

High output power: 43 dBm typical at P_{IN} = 20 dBm
High small signal gain: 33 dB typical
High power gain: 23 dB typical at P_{IN} = 20 dBm
Frequency range: 8 GHz to 11.5 GHz
High power added efficiency: 45% typical at P_{IN} = 20 dBm
Supply voltage: V_{DDx} = 28 V at 200 mA
18 Lead 7x7 mm SMT Package: 49 mm^2

APPLICATIONS

Weather radars
Marine radars
Military radars

FUNCTIONAL BLOCK DIAGRAM

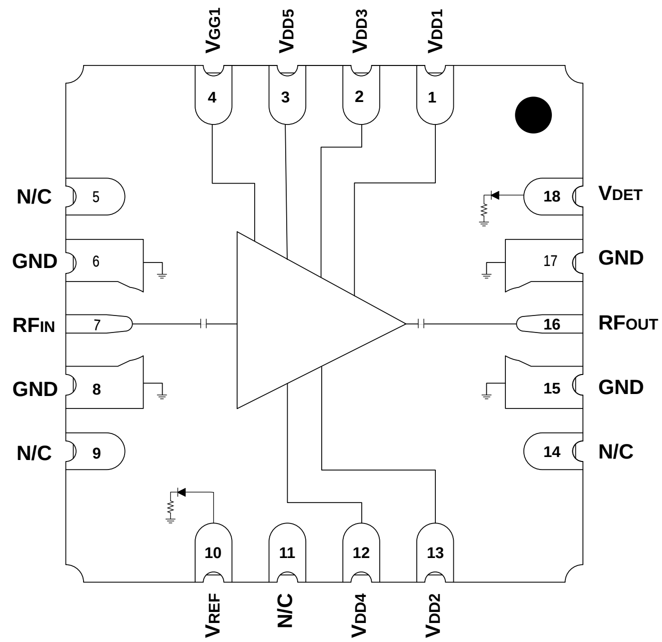

Figure 1.

GENERAL DESCRIPTION

The ADPA1122AEHZ is a gallium nitride (GaN), power amplifier, delivering 20 W (43 dBm) with more than 40% power added efficiency (PAE) across a bandwidth of 8 GHz to 11.5 GHz.

The ADPA1122AEHZ is ideal for pulsed applications, such as wireless weather, marine, and military radar applications.

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

T_A = 25°C, V_{DD1}, V_{DD2}, V_{DD3} = 28 V, target quiescent current (I_{DQ}) = 200 mA, drain bias pulse width = 100 µs, 10% duty cycle, and the frequency range = 8 GHz to 11.5 GHz, unless otherwise noted.

Table 1.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
FREQUENCY RANGE		8		11.5	GHz	
GAIN						
Small Signal			33		dB	
Small Signal Flatness			1		dB	
Power Gain			23		dB	Input power (P_{IN}) = 20 dBm
			22		dB	P_{IN} = 21 dBm
RETURN LOSS						
Input			20		dB	
Output			15		dB	
POWER						
Output Power	P_{OUT}		43		dBm	P_{IN} = 23 dBm
			43		dBm	P_{IN} = 21 dBm
Power Added Efficiency	PAE		45		%	P_{IN} = 20 dBm
			49		%	P_{IN} = 21 dBm
TARGET QUIESCENT CURRENT	I_{DQ}		200		mA	Adjust the V_{GG} between −3.5 V and – 2.0 V to achieve an I_{DQ} = 200 mA typical, V_{GG} = −2.6 V typical to achieve I_{DQ} = 200 mA

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

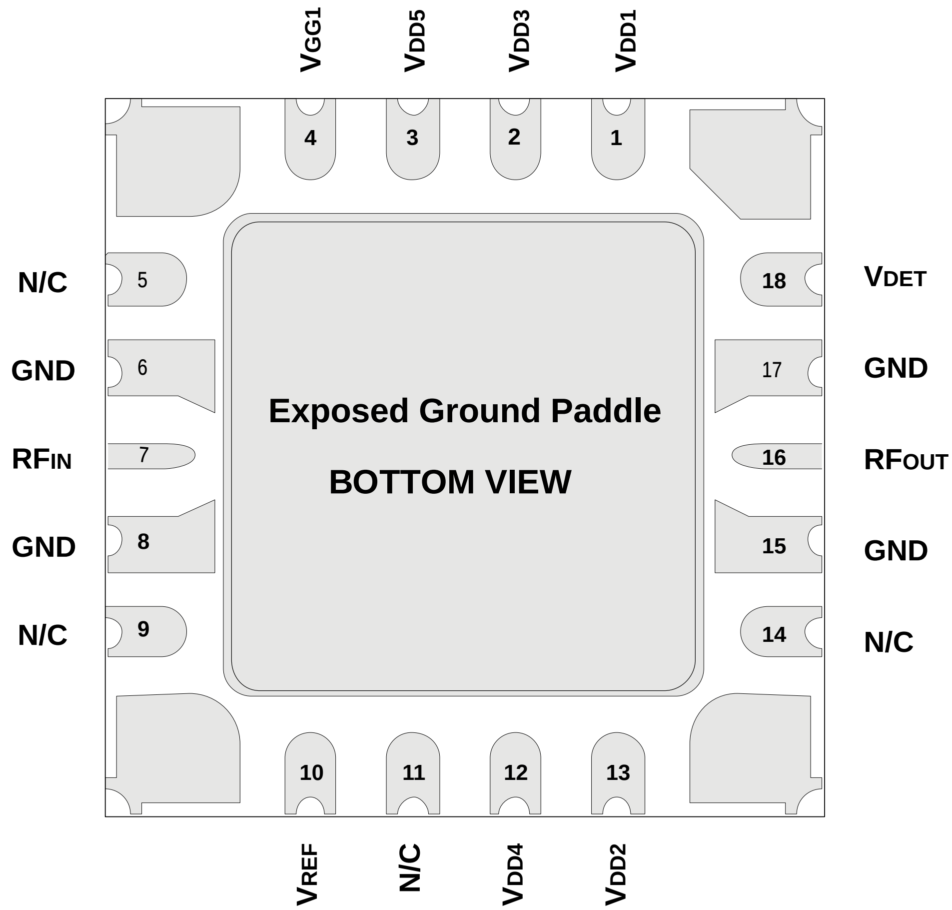

Figure 2. Pin Configuration

Table 2. Pin Function Descriptions

Pin No.	Mnemonic	Description
5, 9, 11, 14	NIC	No Internal Connection. These pins must be connected to RF and dc ground.
6, 8, 15, 17	GND	Ground. These pins must be connected to RF and dc ground. See Figure 3 for the GND interface schematic.
10	V_{REF}	Reference Diode for Temperature Compensation of V_{DET} RF Output Power Measurements. See Figure 9 for the V_{REF} interface schematic.
18	V_{DET}	Detector Diode to Measure RF Output Power. Output power detection via this pin requires the application of a dc bias voltage through an external series resistor. Used in combination with the V_{REF} pin, the difference voltage ($V_{REF} – V_{DET}$) is a temperature compensated dc voltage that is proportional to the RF output power. See Figure 8 for the interface schematic.
7	RFIN	RF Input. This pin is ac-coupled and matched to 50 Ω. See Figure 4 for the RFIN interface schematic.
4	V_{GG1}	Gate Control Voltage Pin. See Figure 5 for the V_{GG2} interface schematic.
1, 2, 3, 12, 13	V_{DD1}, V_{DD2}, $V_{DD3,}$ V_{DD4}, V_{DD5},	Drain Bias Pins for the Amplifier. See Figure 7 for the V_{DD1}, V_{DD2}, $V_{DD3,}$ V_{DD4}, V_{DD5} interface schematic.
16	RFOUT	RF Output. This pin is ac-coupled and matched to 50 Ω. See Figure 6 for the RFOUT interface schematic.
	EPAD	Exposed Pad. The exposed pad must be connected to RF and dc ground.

INTERFACE SCHEMATICS

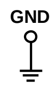

Figure 3. GND Interface Schematic

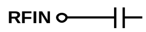

Figure 4. RFIN Interface Schematic

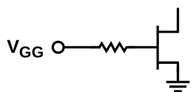

Figure 5. V_{GG} Interface Schematic

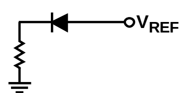

Figure 9. V_{REF} Interface Schematic

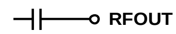

Figure 6. RFOUT Interface Schematic

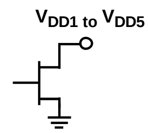

Figure 7. $V_{DD1\ to}$ V_{DD3} Interface Schematic

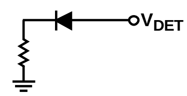

Figure 8. V_{DET} Interface Schematic

TYPICAL PERFORMANCE CHARACTERISTICS

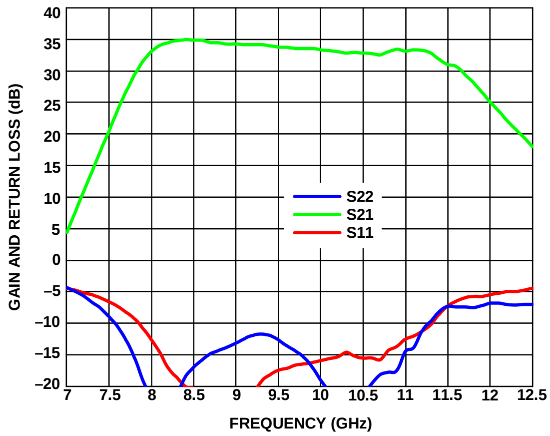

Figure 10. Gain and Return Loss vs. Frequency

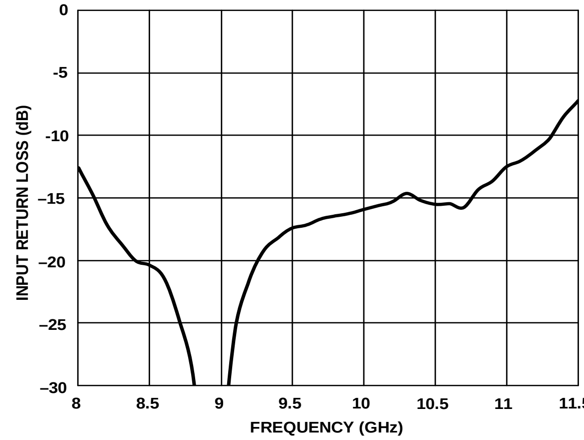

Figure 13. Input Return Loss vs. Frequency

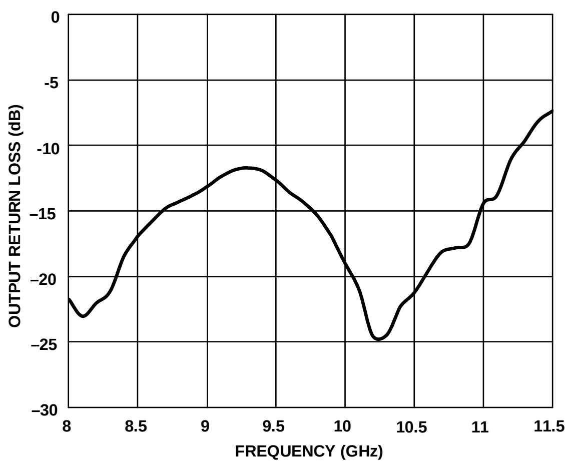

Figure 11. Output Return Loss vs. Frequency

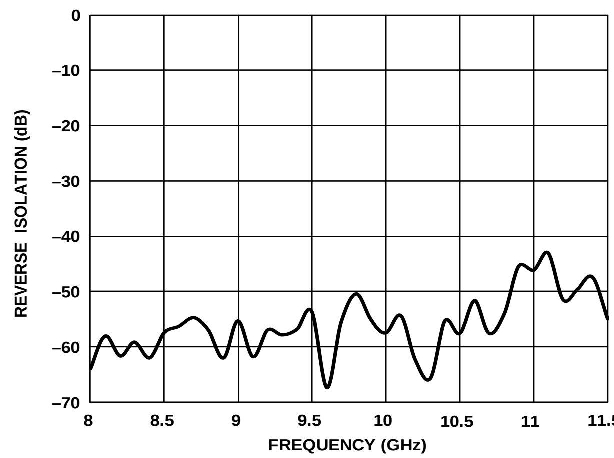

Figure 14. Reverse Isolation vs. Frequency

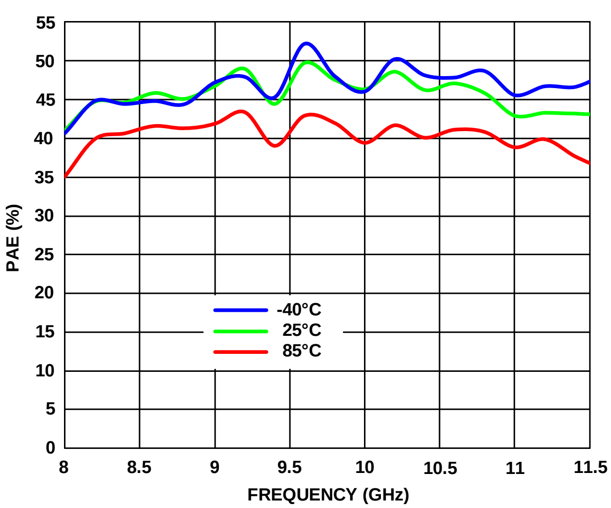

Figure 12. PAE vs. Frequency
Pin = 20dBm

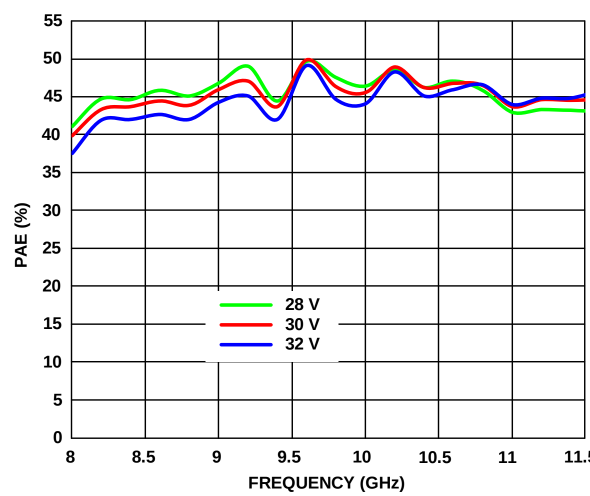

Figure 15. PAE vs. Frequency Over Vdd
Pin = 20dBm

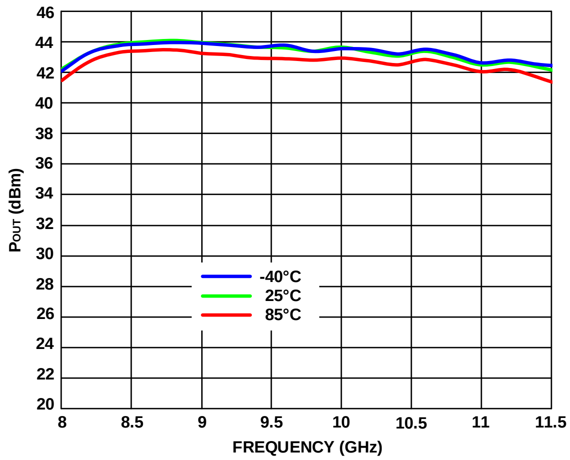

Figure 16. P_{OUT} vs. Frequency

Pin = 23dBm

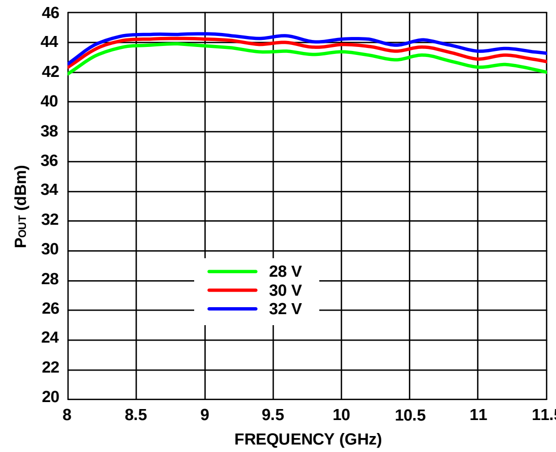

Figure 19. P_{OUT} vs. Frequency Over Vdd

Pin = 20dBm

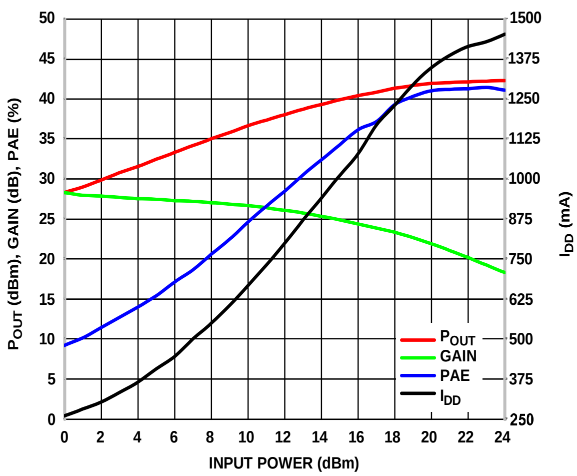

Figure 17. Output Power (P_{OUT}), Gain, PAE, and Total Supply Current (I_{DD}) with RF Power Applied vs. Input Power at 8 GHz

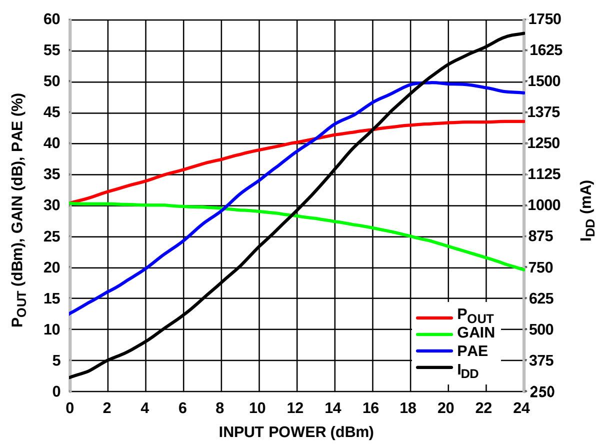

Figure 20. Output Power (P_{OUT}), Gain, PAE, and Total Supply Current (I_{DD}) with RF Power Applied vs. Input Power at 9.5 GHz

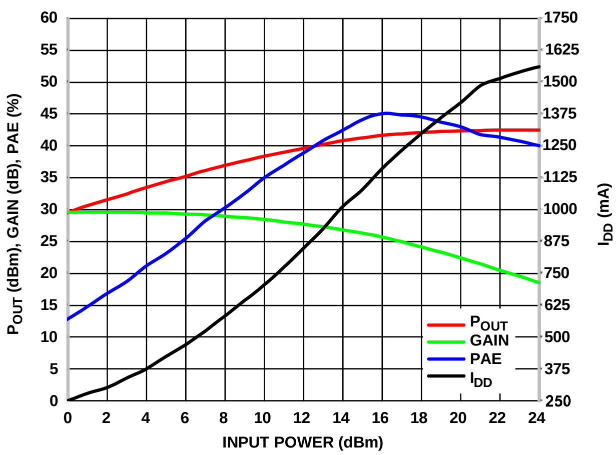

Figure 18. Output Power (P_{OUT}), Gain, PAE, and Total Supply Current (I_{DD}) with RF Power Applied vs. Input Power at 11 GHz

OUTLINE DIMENSIONS

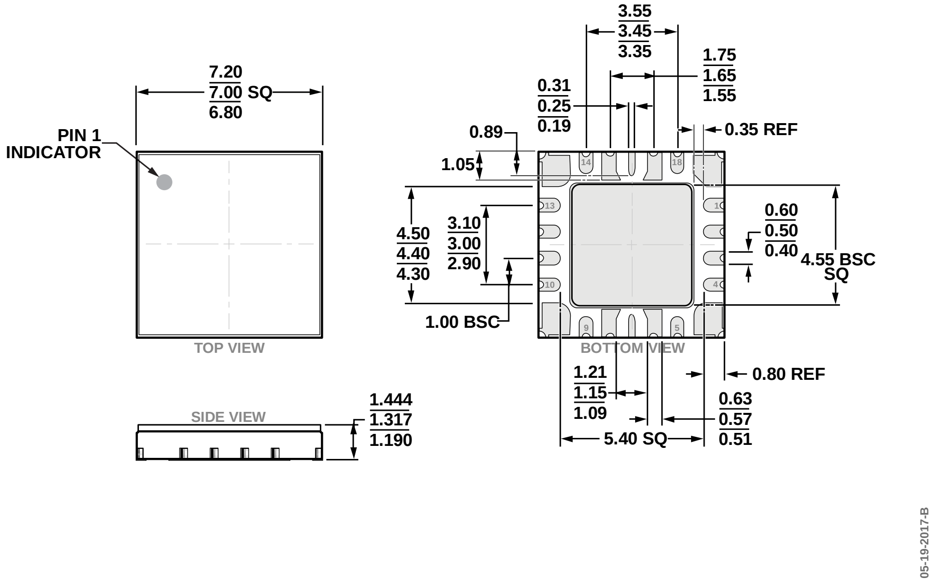

Figure 21. 16-Lead Ceramic Terminal Package [LCC_HS]
7 mm × 7 mm Body and 0.75mm Package Height
(EP-18-1)
Dimensions shown in millimeters

ORDERING GUIDE

Model[1]	Temperature	MSL Rating	Description[2]	Package Option
ADPA1122AEHZ	−40°C to +85°C	3	16-Lead Ceramic Terminal LCC_HS	EP-18-1
ADPA1122AEHZ-R7	−40°C to +85°C	3	16-Lead Ceramic Terminal LCC_HS	EP-18-1
ADPA1122-EVALZ			Evaluation Board	

[1] The ADPA1122AEHZ and ADPA1122AEHZ-R7 are RoHS compliant parts.
[2] The ADPA1122AEHZ and ADPA1122AEHZ-R7 are low stress injection molded plastic and their lead finish is 100% matte Sn.