Power Amplifier

2 to 18GHz - 10W GaN/SiC

DATA SHEET **VWA 5001165 AA**

General Description

The **VWA5001165AA** is a Microwave Monolithic Integrated Circuit (MMIC) designed in HEMT (High Electron Mobility Transistor) structure for operating frequency range from 2 to 18GHz.

The MMIC is developed on a 250nm GaN/SiC process and is internally matched for 50Ω RF accesses.

It provides an output power of 10W, and associated Power Added Efficiency of 22% typical in Continuous Wave (CW) mode.

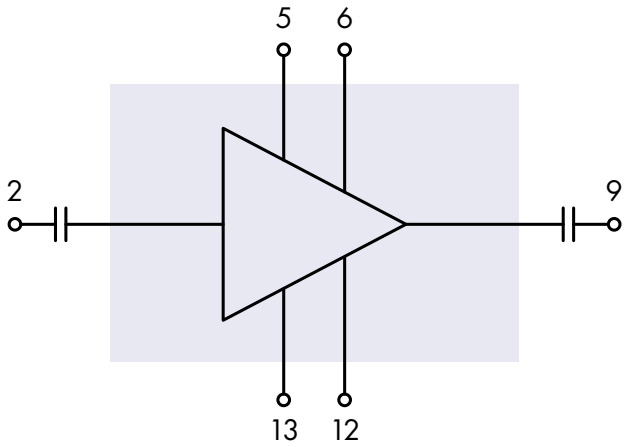
Features

- Operating frequency range: 2 to 18GHz
- Output Power: 40dBm @Pin= 24dBm
- PAE: 22% @Pin= 24dBm
- Linear Gain: 20dB
- DC bias: V_D= +28V, I_{DQ}= 1000mA, V_G= -2.2V (Typical)
- Chip size: 2.5 x 4.8 x 0.1mm

Applications

- **Radar**
- **Military**
- **Telecommunications**

Functional Block Diagram & Pins Assignment



Pin number	Function
2	RF in
9	RF out
5	VD1
6	VD2
13	VG1
12	VG2

Electrical Specifications

Test conditions unless otherwise noted:

- ID = 1000mA
- VD = 28V
- T_{amb} = +25°C
- Post-layout simulation
- VG = -2.2V Typical

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	2		18	GHz
BW	Operating Bandwidth		16		GHz
G	Small signal gain		20		dB
S11	Input Return loss		10		dB
S22	Output Return loss		10		dB
P_{OUT}	Output power (Pin=24dBm)		40		dBm
PAE	Power Added Efficiency (Pin=24dBm)		22		%
I_D	Drain current (Pin=24dBm)		4		A
V_D	Drain voltage		28		V
P1dB	P1dB compression		NA		A
ΔG	Small signal gain temperature coefficient		NA		dB/°C

Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V_D	Quiescent drain voltage	28	V
I_{DQ}	Quiescent drain current	1000	mA
V_G	Quiescent gate voltage	-2.2	V

Absolute Maximum Ratings

Symbol	Maximum Ratings	Min	Unit
V_D	Drain voltage	35	V
I_D	Maximum saturated drain current	5	A
V_G	Gain voltage	-10 to 0	V
P_{DISS}	Power dissipated (Tcarrier=85°C) mean in pulsed mode	90	W
P_{IN}	Maximum input power	25	dBm
Tj	Junction temperature	225	°C
Ta	Operating temperature	-40/+85	°C
Tstg	Storage temperature	-55/150	°C

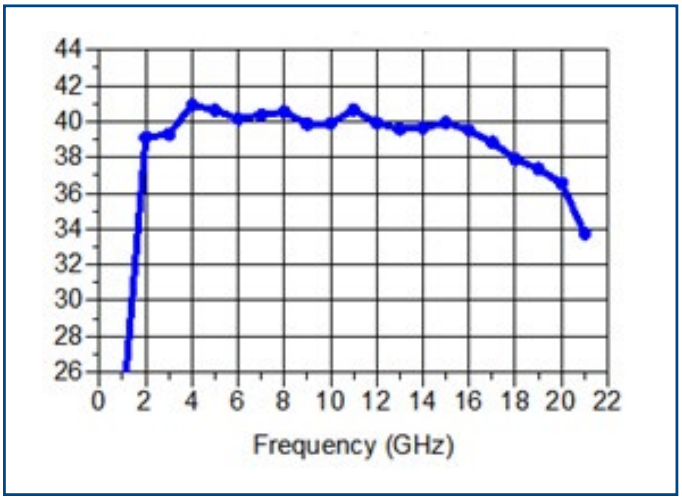
Operation of this device above any of these parameters may cause permanent damage.

Typical performances (Large signal / post-layout simulation)

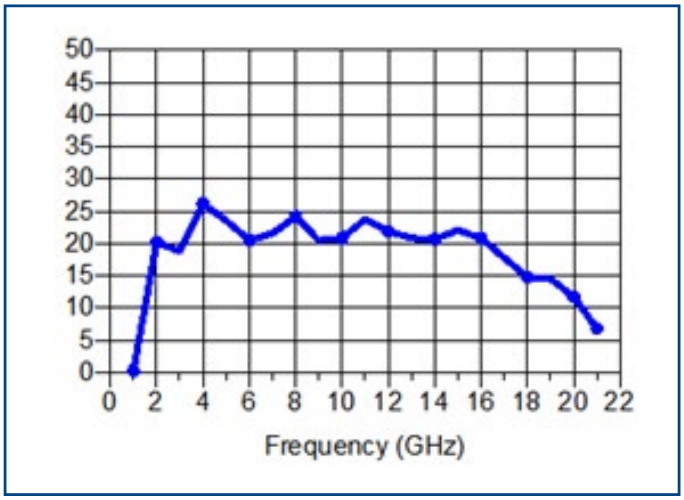
Simulated conditions:

- VD = 28V
- VG = -2.2V Typical
- I_{DQ} = 1.0A
- RF Pin = +24dBm
- RF bondings 0.1nH at RFin / RFout

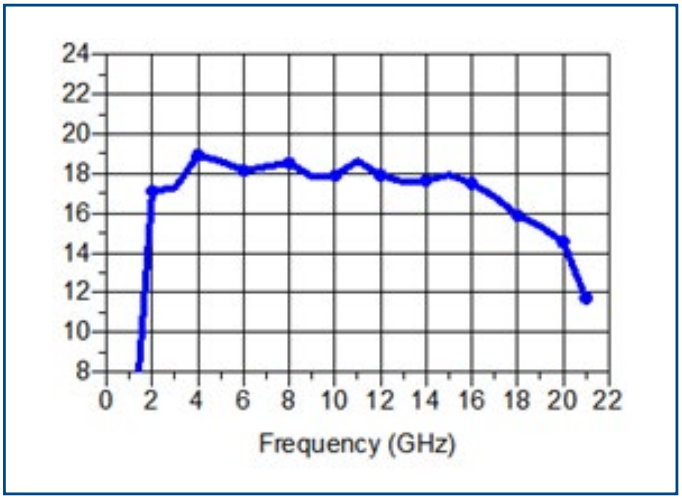
Pout (dBm)



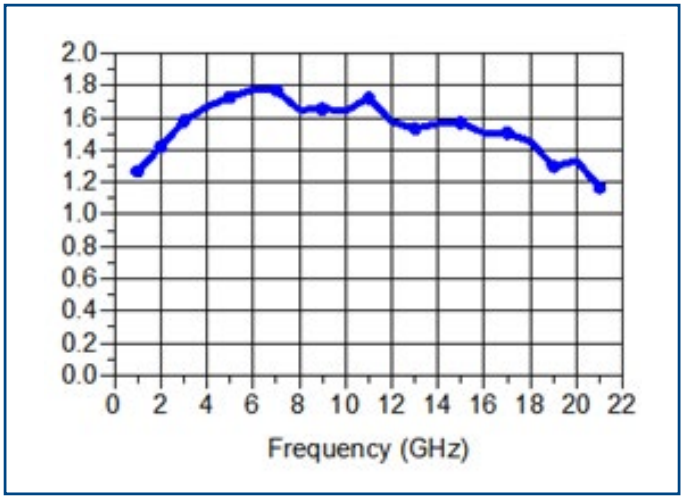
PAE (%)



Power Gain (dB)



IDD (A)



Typical performances (Small signal / post-layout simulation)

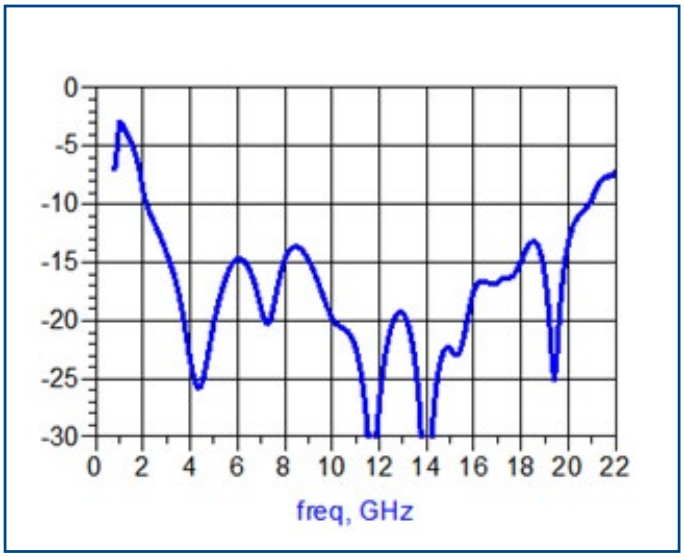
Simulated conditions: At T_{amb} = +25°C

- I_{DQ} = 1.0A
- RF bondings 0.1nH at RFin / RFout

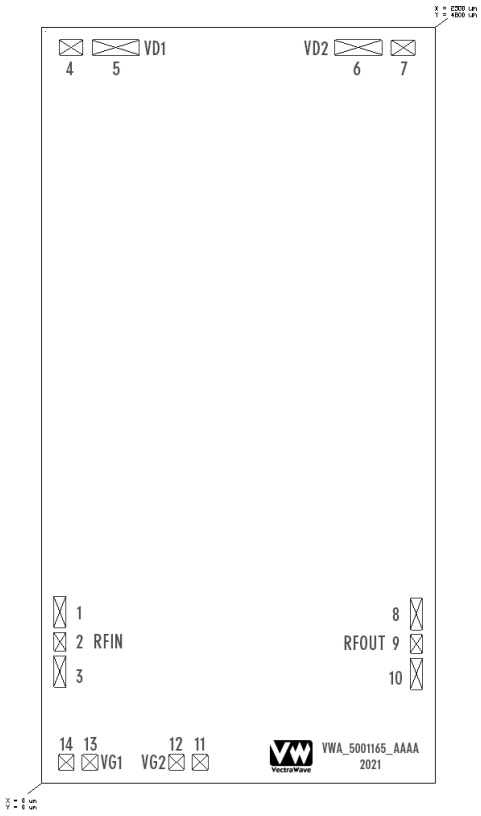
S21 (dB)

S11 (dB)

S22 (dB)



Die Layout



Die thickness = 100µm
Die size tolerance = 50µm

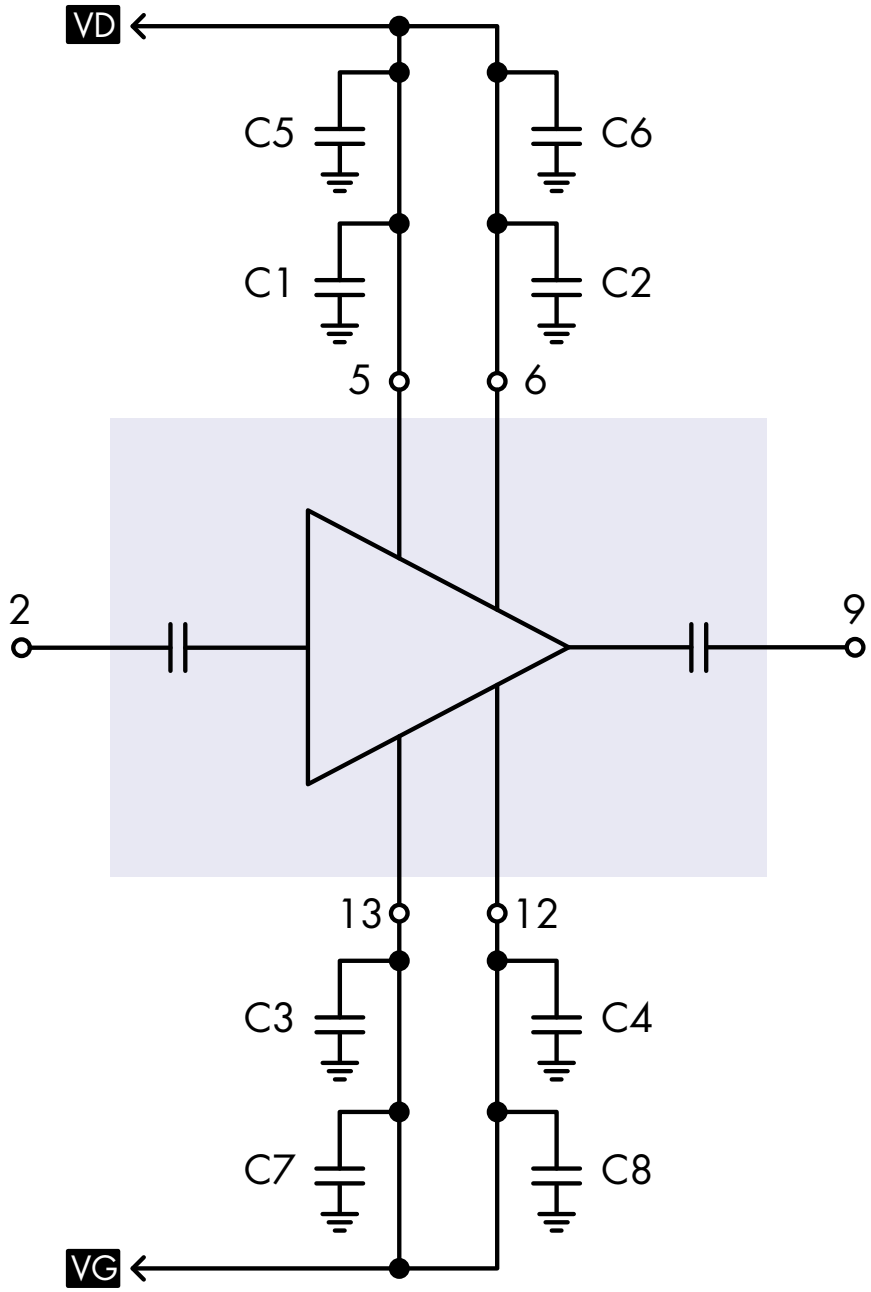
Die bottom must be connected to ground (DC and RF)

Die Pin Out

Pad number	Pad center		Size (µm x µm)	Function		
	X (µm)	Y (µm)		Name	Value	Function
1	117	1087	80 x 200	Gnd		
2	117	897	80 x 120	RFin	RF in	RF Input
3	117	707	80 x 200	Gnd		
4	187	4673	160 x 100	Gnd		
5	472	4673	300 x 100	VD1		Drain Bias
6	2013	4673	300 x 100	VD2		Drain Bias
7	2298	4673	160 x 100	Gnd		
8	2382	1072	80 x 200	Gnd		
9	2382	882	80 x 120	RFout	RF out	RF Output
10	2382	692	80 x 200	Gnd		
11	1008	130	100 x 100	Gnd		
12	858	130	100 x 100	VG2		Gate Bias
13	308	130	100 x 100	VG1		Gate Bias
14	158	130	100 x 100	Gnd		

Application circuit

- C1 C2 C3 C4 = 100 pF Chip Capacitor
- C5 C6 C7 C8 = 100 nF SMD Capacitor



Bias-up procedure

1. Apply VG=-3V
2. Apply VD=+28V
3. Adjust VG to obtain IDQ=1.0A
4. Apply RF signal

Bias-down procedure

1. Turn OFF RF signal
2. Decrease VG to -3V
3. Decrease VD to 0V
4. Increase VG to 0V

Ordering Information

Product Code	Definition
VWA 5001165 AA	2 to 18GHz - 10W GaN/SiC Power Amplifier

Associated Material

Product Code	Definition
Die Evaluation Board (die EVB)	Contact factory
Mechanical files (DXF)	Contact factory
Measurents files (S2P)	Contact factory

Product Compliance Information

Solderability :

Use only AuSn (80/20) solder
and limit exposure to temperature
above 300 °C TO 3-4 minutes, maximum

ESD Sensitivy Rating :

Test : Human Body Model (HBM)
Standard : JEDEC Standard JESD22-A114

CAUTION ! ESD-Sensitive device

RoHS-Compliance :

This part is compliant with EU 2011/65/
EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).
This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C15H12Br402) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about Vectrawave:

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