Power Amplifier

8 to 11GHz - 50W GaN/SiC

DATA SHEET **VWA 5001164 AA**

General Description

The **VWA5001164AA** is a Microwave Monolithic Integrated Circuit (MMIC) designed in HEMT (High Electron Mobility Transistor) structure for operating frequency range from 8 to 11GHz.

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

It provides an output power of 50W, and associated Power Added Efficiency of 38%.

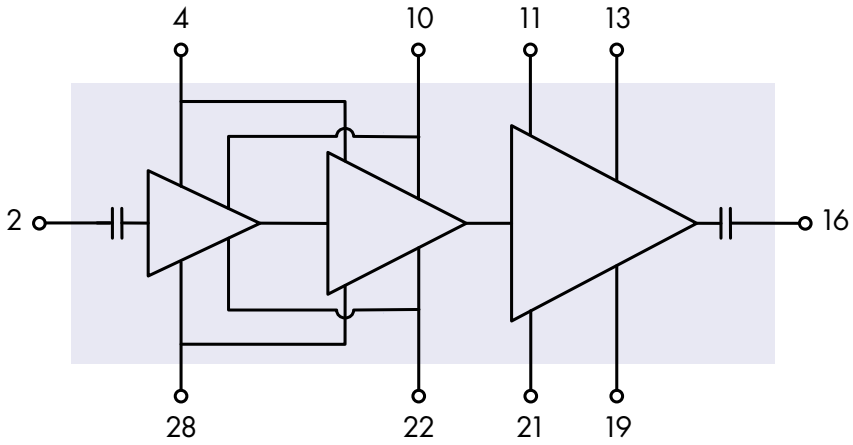
Features

- Operating frequency range: 8 to 11GHz
- Output Power: 47dBm @Pin = 26dBm
- PAE: 38% @Pin = 26dBm
- Linear Gain: 29dB
- DC bias: V_D = +28V, I_{DQ} = 550mA, V_G = -2.4V (Typical)
- Chip size: 5 x 4.8 x 0.1mm

Applications

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

Functional Block Diagram & Pins Assignment



Function	Pin number
RF in	2
VG1/2_N / VG1/2_S	4 / 28
VD1/2_N / VD1/2_S	10 / 22
VG3_N / VG3_S	11 / 21
VD3_N / VD3_S	13 / 19
RF out	16

Electrical Specifications

Test conditions unless otherwise noted:

- I_{DQ} = 550mA
- VD = 28V
- VG = -2.4V Typical
- Pulse-mode (Pulse width= 30µs,Duty cycle=10%)
- T_{amb} = +25°C

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	8		11	GHz
BW	Operating Bandwidth		3		GHz
G	Small signal gain		29		dB
S11	Input Return loss		10		dB
S22	Output Return loss		10		dB
P_{OUT}	Output power (Pin=26dBm)		47		dBm
PAE	Power Added Efficiency (Pin=26dBm)		38		%
I_D	Drain current (Pin=26dBm)		6		A
V_D	Drain voltage		28		V
P1dB	P1dB compression		NA		dBm
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	550	mA
V_G	Quiescent gate voltage	-2.4	V

Absolute Maximum Ratings

Symbol	Maximum Ratings	Min	Unit
V_D	Drain voltage	35	V
I_D	Maximum saturated drain current	7	A
V_G	Gain voltage	-10 to -2	V
P_{DISS}	Power dissipated (Tcarrier=85°C) mean in pulsed mode	NA	W
P_{IN}	Maximum input power	30	dBm
Tj	Junction temperature	225	°C
Ta	Operating temperature	-40/+85	°C
Tstg	Storage temperature	-55/150	°C

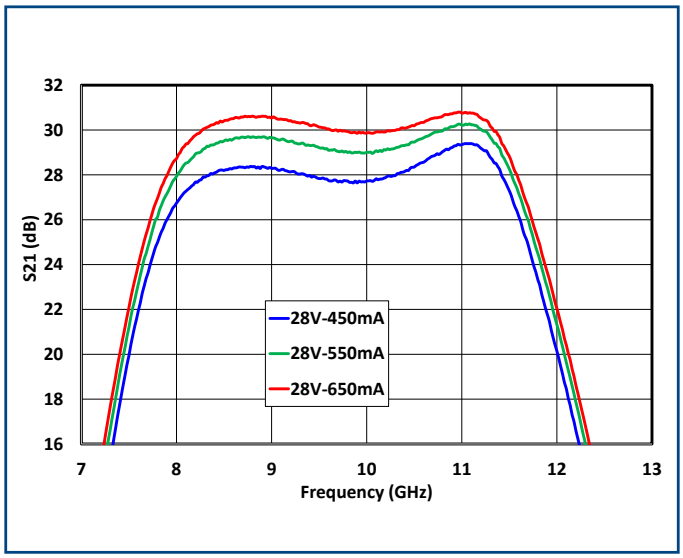
Operation of this device above any of these parameters may cause permanent damage.

Typical performances (Small signal / Board measurements)

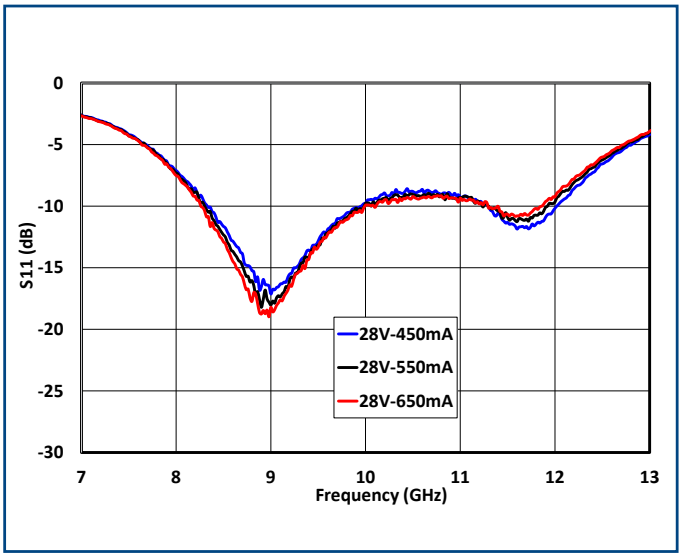
Test conditions unless otherwise noted:

- VD = 28V Typ.
- I_{DQ} = 550mA
- Pin = -20dBm
- Reference plane : Connector access
- T_{amb} = +25°C

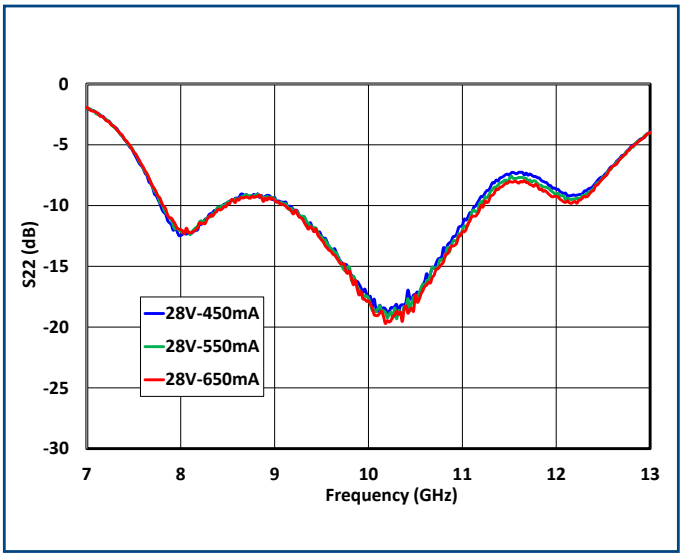
Gain vs. Frequency vs. I_{DQ}



Input Return Loss vs. Freq vs. I_{DQ}



Output Return Loss vs. Freq vs. I_{DQ}

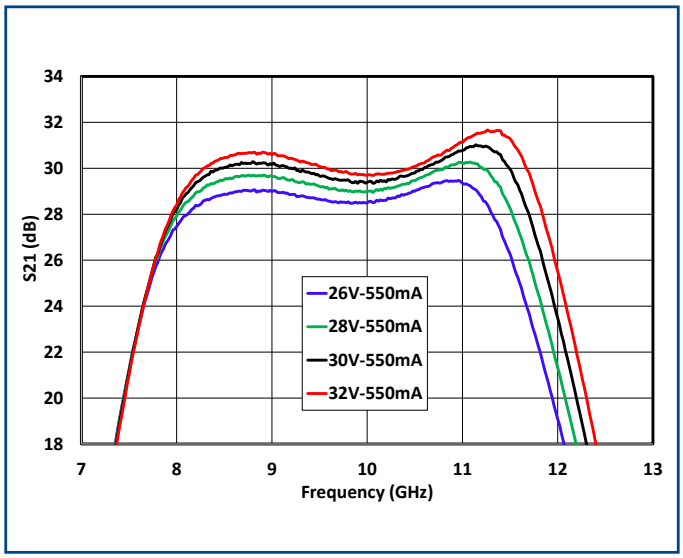


Typical performances (Small signal / Board measurements)

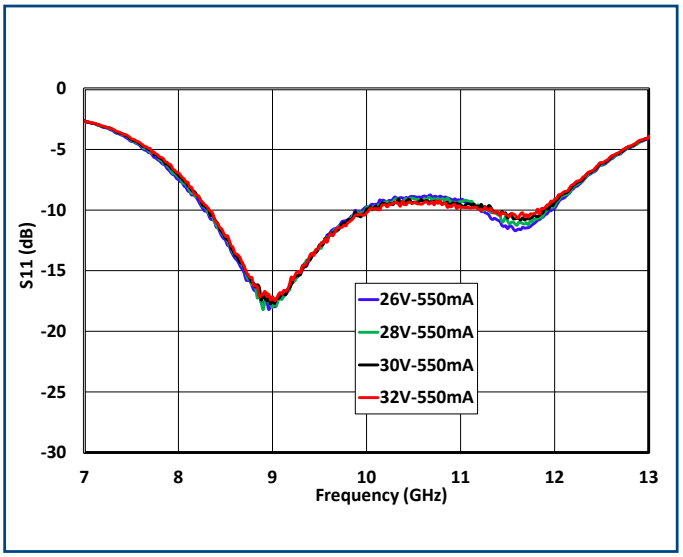
Test conditions unless otherwise noted:

- VD = 28V Typ.
- I_{DQ} = 550mA
- Pin = -20dBm
- Reference plane : Connector access
- T_{amb} = +25°C

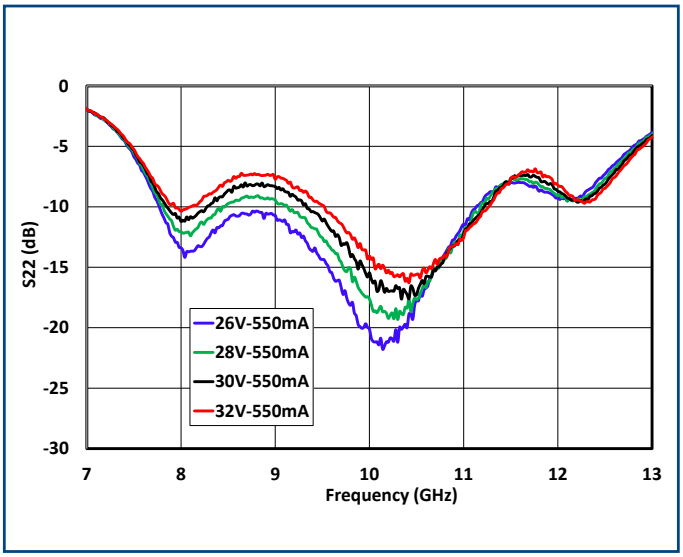
Gain vs. Frequency vs. V_D



Input Return Loss vs. Freq vs. V_D



Output Return Loss vs. Freq vs. V_D

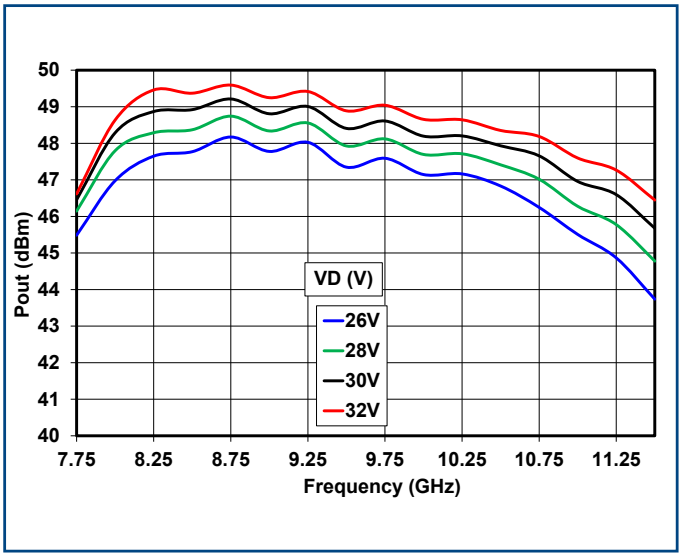


Typical performances (Large signal / Board measurements)

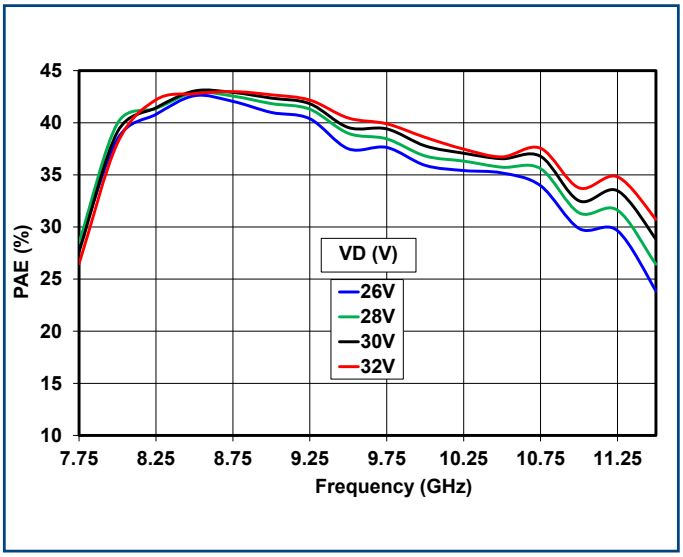
Test conditions unless otherwise noted:

- VD = 28V
- Pin = 26dBm
- T_{amb} = +25°C
- I_{DQ} = 550mA
- Pulse-mode (Pulse width = 30µs, Duty cycle =10%)
- Reference plane : Die access

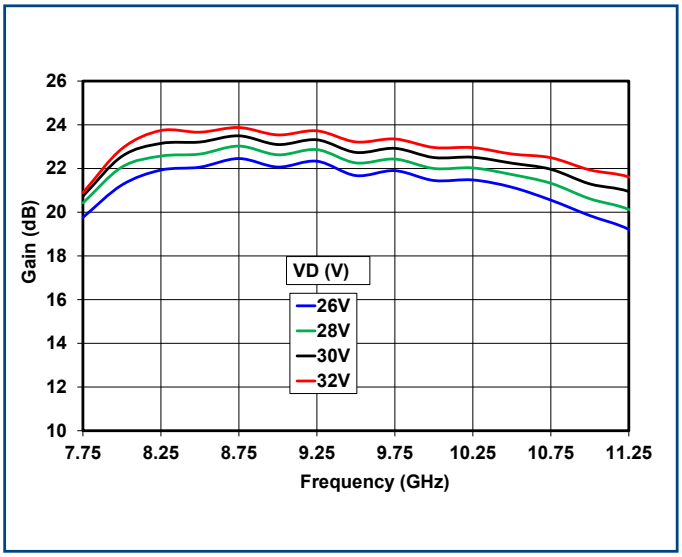
Pout vs. Frequency vs. V_D



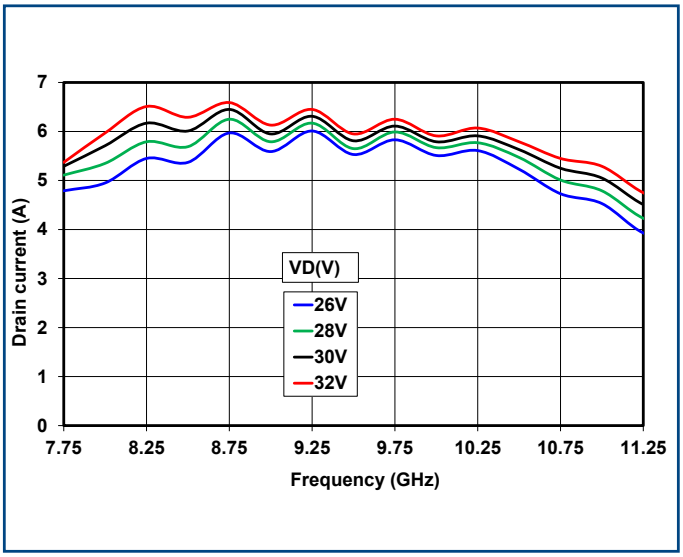
PAE vs. Frequency vs. V_D



Gain vs. Frequency vs. V_D



Drain Current vs. Frequency vs. V_D

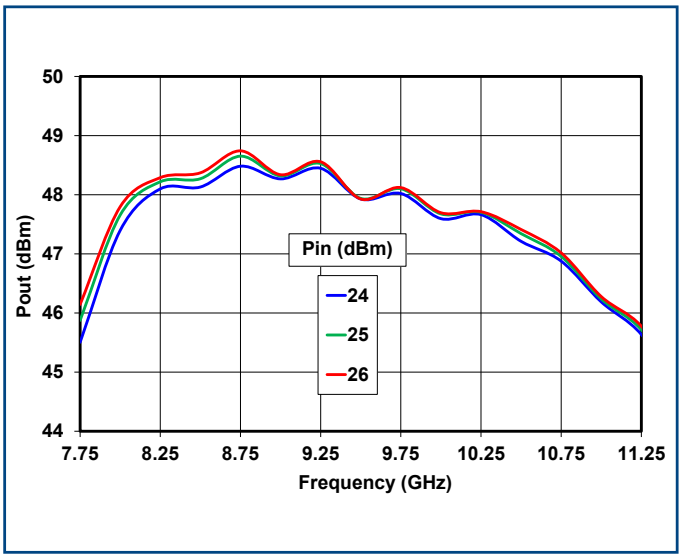


Typical performances (Large signal / Board measurements)

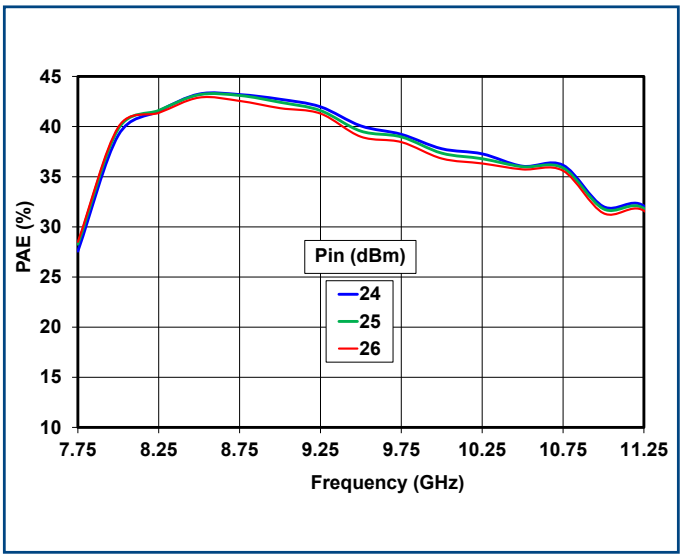
Test conditions unless otherwise noted:

- VD = 28V
- I_{DQ} = 550mA
- T_{amb} = +25°C
- Pulse-mode (Pulse width = 30µs, Duty cycle =10%)
- Reference plane : Die access

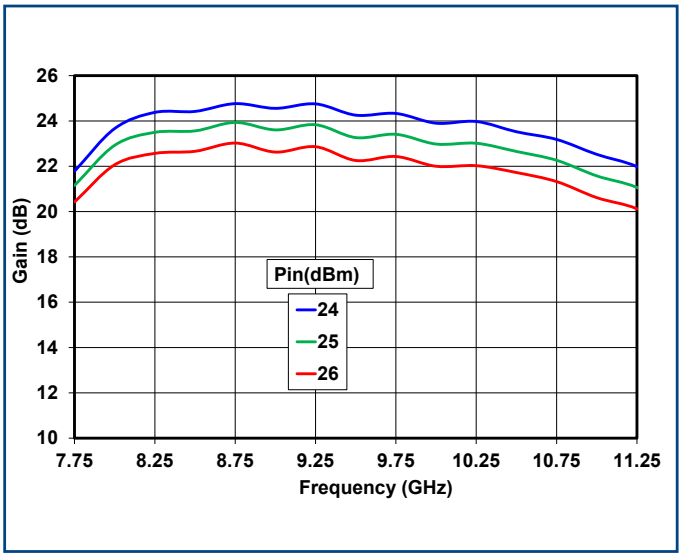
Pout vs. Frequency vs. Pin



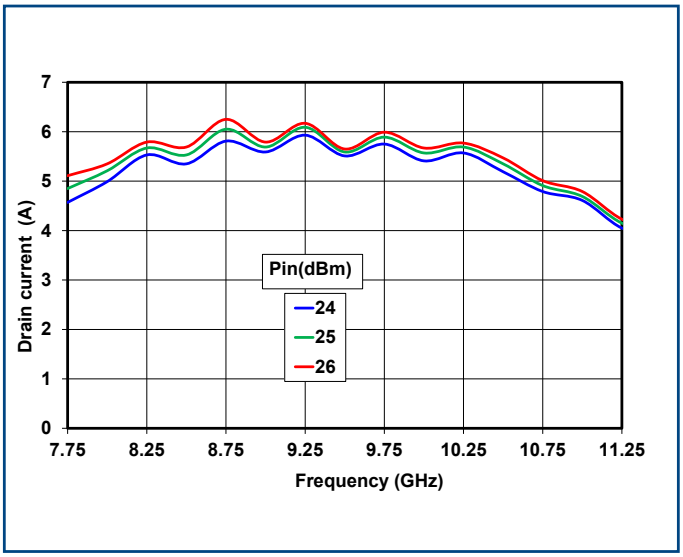
PAE vs. Frequency vs. Pin



Gain vs. Frequency vs. Pin



Drain Current vs. Frequency vs. Pin



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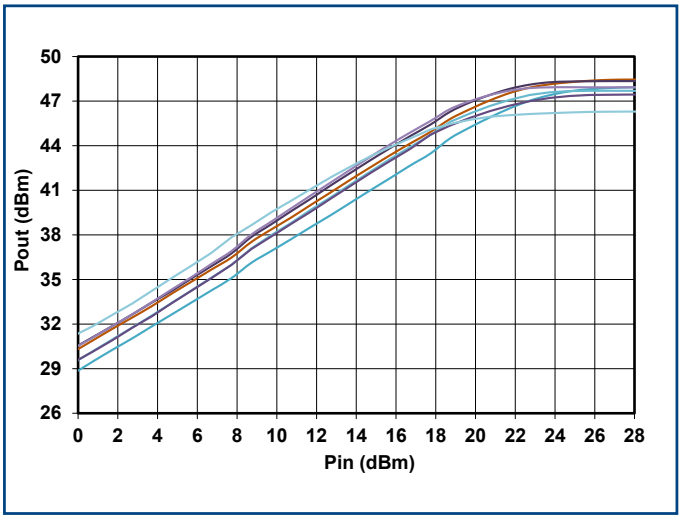
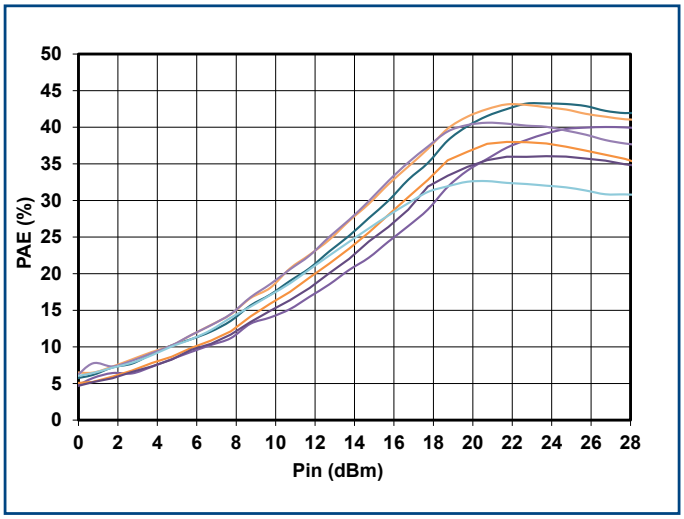
- Pulse-mode (Pulse width = 30µs, Duty cycle =10%)
- Reference plane : Die access

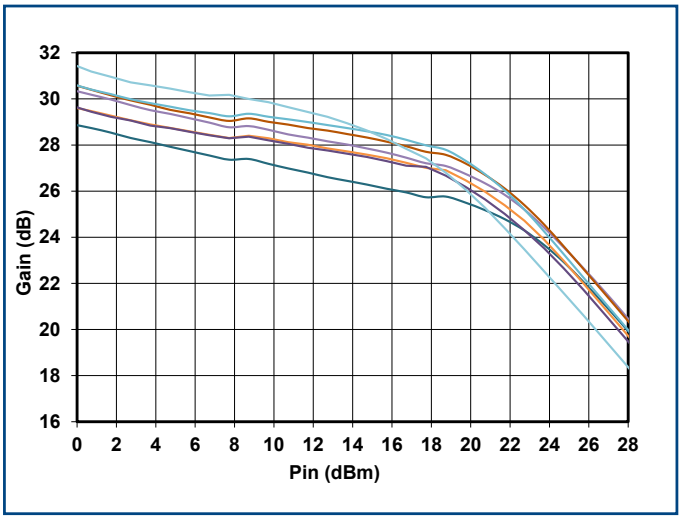
Pout vs. Pin vs. Frequency



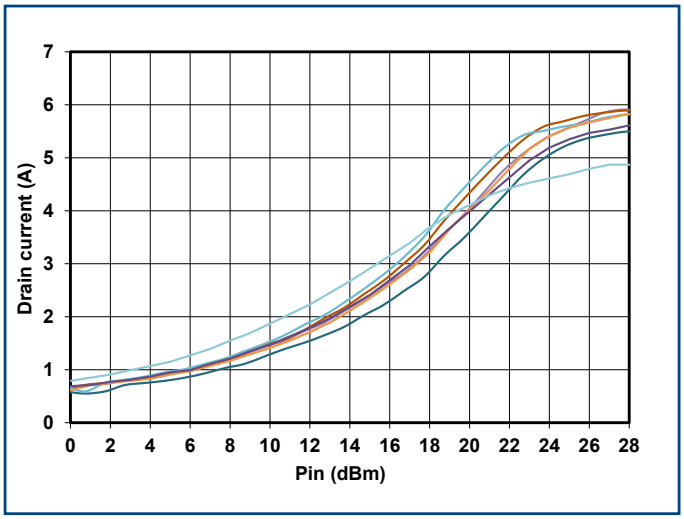
PAE vs. Pin vs. Frequency



Gain vs. Pin vs. Frequency



Drain Current vs. Pin vs. Frequency



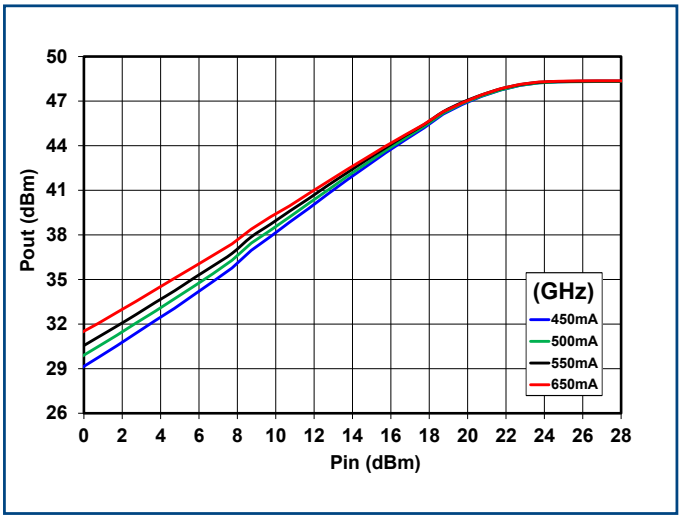
RFfreq = 8 GHz
RFfreq = 8.5 GHz
RFfreq = 9 GHz
RFfreq = 9.5 GHz
RFfreq = 10 GHz
RFfreq = 10.5 GHz
RFfreq = 11 GHz

Typical performances (Large signal / Board measurements)

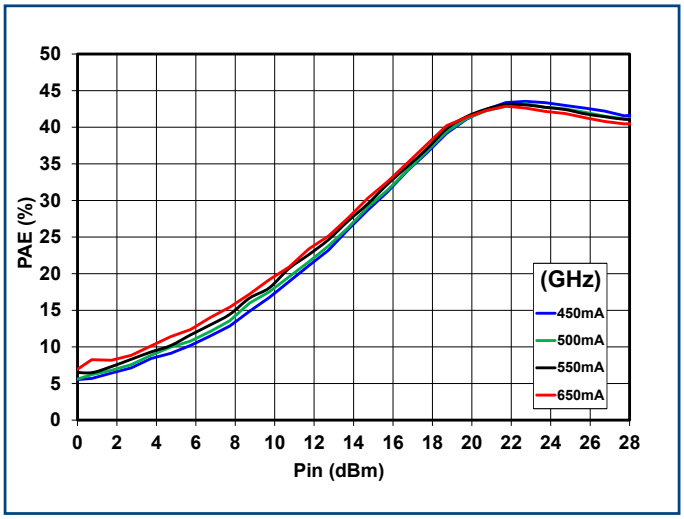
Test conditions unless otherwise noted:

- VD = 28V
- T_{amb} = +25°C
- Reference plane : Die access
- I_{DQ} = 550mA
- Pulse-mode (Pulse width = 30µs, Duty cycle =10%)

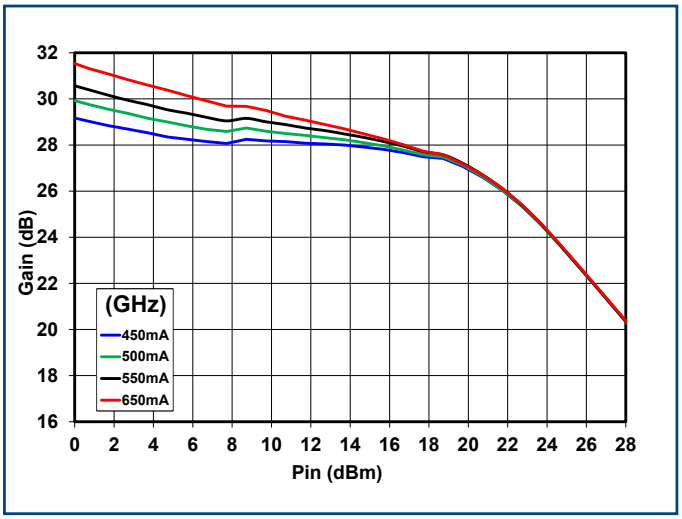
Pout vs. Pin vs. IDQ



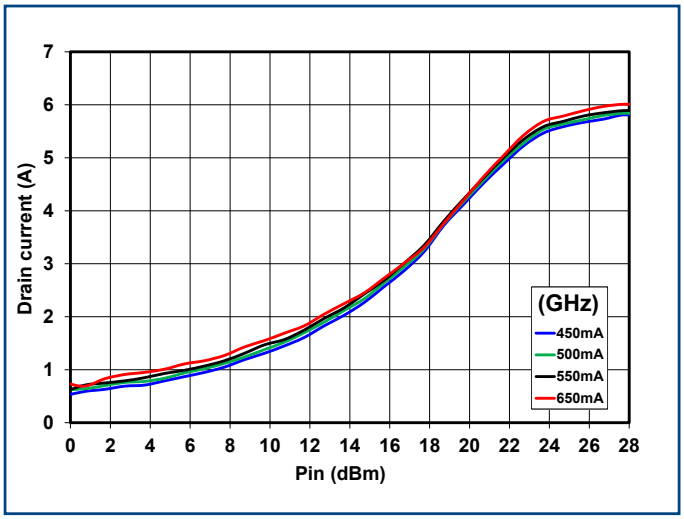
PAE vs . Pin vs. IDQ



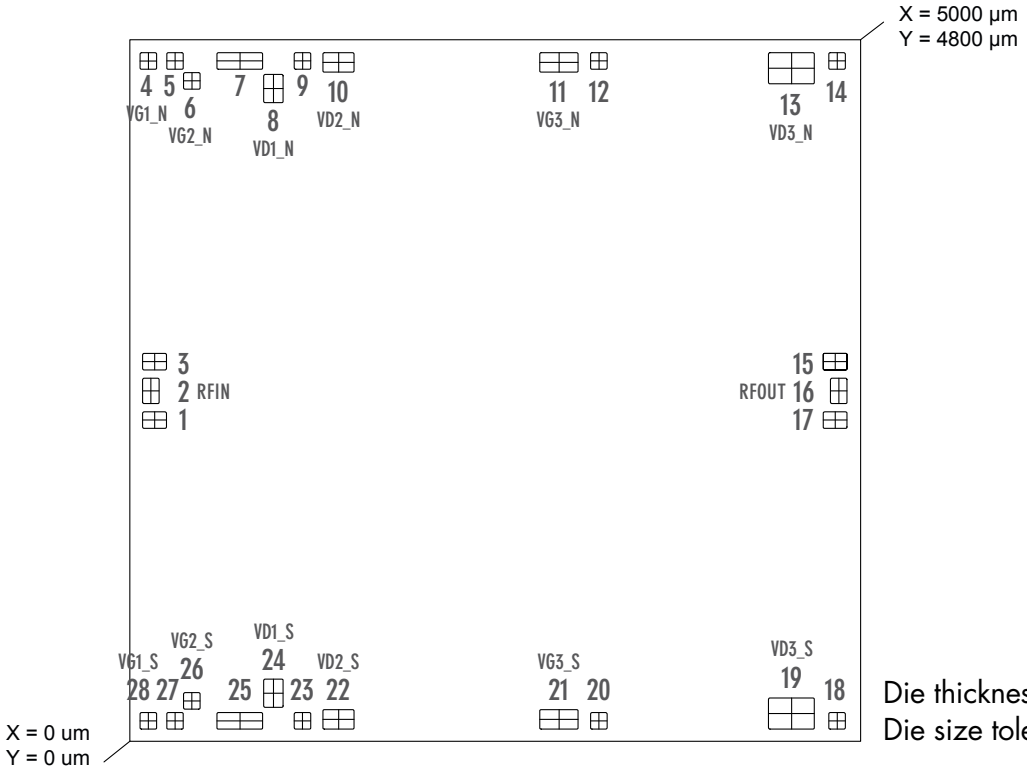
Gain vs. Pin vs. IDQ



Drain Current vs. Pin vs. IDQ



Die Layout & Pin Out

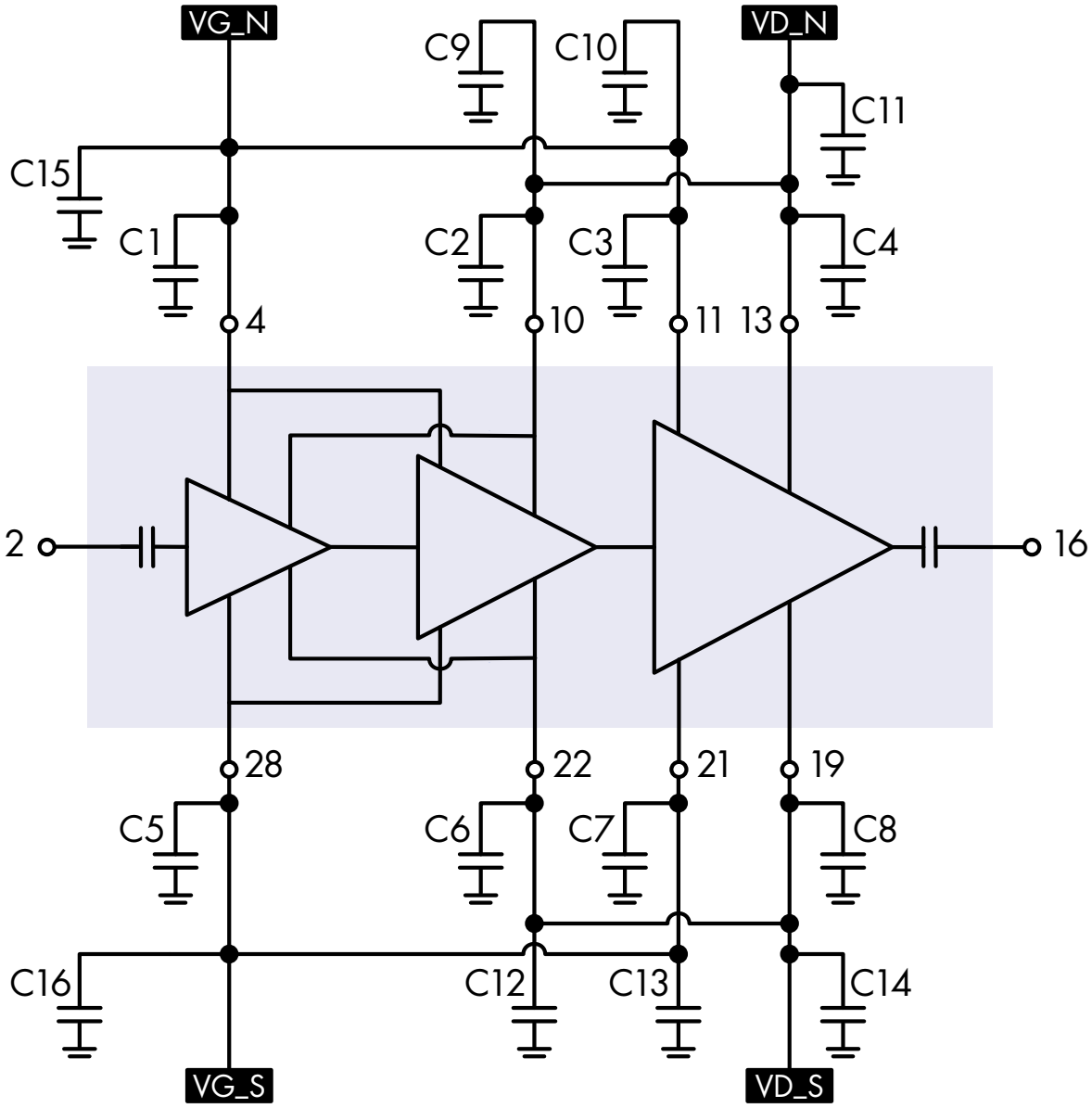


Die thickness = 100µm
Die size tolerance = 50µm

Pad number	Pad center		Size (µm x µm)	Function
	X (µm)	Y (µm)		
1	169.0	2197.5	150 x 100	Gnd
2	144.0	2397.5	100 x 160	Input
3	169.0	2197.5	150 x 100	Gnd
4	126.6	4654.8	100 x 100	VG1_N
5	309.2	4654.8	100 x 100	Gnd
6	424.5	4518.3	100 x 100	VG2_N
7	752.3	4654.8	300 x 100	Extra
8	982.5	4465.9	120 x 180	VD1_N
9	1184.7	4654.8	100 x 100	Gnd
10	1427.6	4654.8	200 x 120	VD2_N
11	2936.0	4654.8	250 x 120	VG3_N
12	3209.2	4654.8	100 x 100	Gnd
13	4526.9	4654.8	300 x 200	VD3_N
14	4839.0	4654.8	100 x 100	Gnd
15	4826.0	2197.5	150 x 100	Gnd
16	4851.0	2397.5	100 x 160	Output
17	4826.0	2197.5	150 x 100	Gnd
18	4839.0	140.2	100 x 100	Gnd
19	4526.9	140.2	300 x 200	VD3_S
20	3209.2	140.2	100 x 100	Gnd
21	2936.0	140.2	250 x 120	VG3_S
22	1427.6	140.2	200 x 120	VD2_S
23	1181.7	140.2	100 x 100	Gnd
24	982.5	329.1	120 x 180	VD1_S
25	752.3	140.2	300 x 100	Extra
26	424.5	276.7	100 x 100	VG2_S
27	309.2	140.2	100 x 100	Gnd
28	126.6	140.2	100 x 100	VG1_S

Application circuit

- C1 to C8 = 1 nF
- C9 to C14 = 10 nF
- C9 to C14 = 1 µF



Bias-up procedure

1. Apply VG = -3V
2. Apply VD = +28V
3. Increase VG to obtain the specificied IDQ = 550 mA
4. Apply RF signal

Bias-down procedure

1. Turn off RF signal
2. Reduce VG to -3V
3. Reduce VD to 0V
4. Turn off power supply

Ordering Information

Product Code	Definition
VWA 5001164 AA	8 to 11GHz - 50W GaN/SiC Power Amplifier in die form

Associated Material

Product Code	Definition
Packaged die	Contact factory
Die Evaluation Board (die EVB)	Contact factory
Packaged die Evaluation Board (packaged 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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