8 to 12GHz / 25dB / 12W GaAs Power Amplifier

DATA SHEET **VWA 5000042 AA**

General Description

The **VWA5000042AA** is a 3 Stages analog High Power MMIC amplifier operating in the frequency range 8 to 12GHz.

The device is a cascaded 3 stages amplifier designed in 0.25µm pHEMT process. The device is capable of 12W output power at Psat, and provides 25dB of large gain from 8 to 12GHz with less than 1dB of Gain variation. The design has been optimized to provide high efficiency, supply current is 4.5A with V_D= +8.5V, when delivering 12W output power.

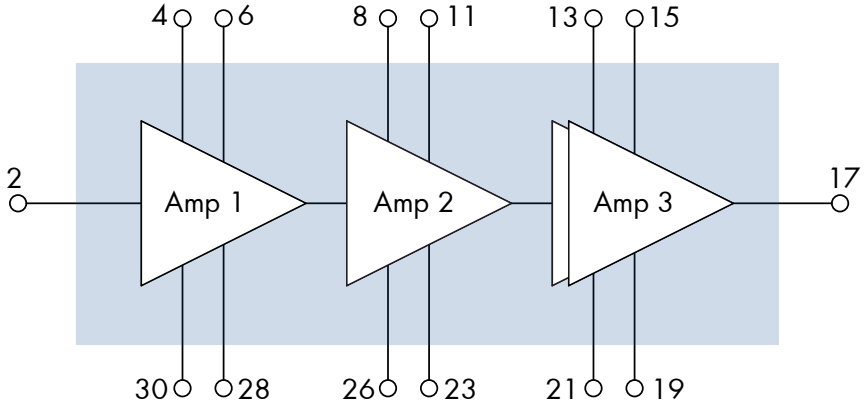
Features

- 3 stages High Power pHEMT GaAs MMIC
- Wide band: 8 to 12GHz
- High Output P_{SAT}: 12W
- High P_{1dB} > +40dBm
- High large signal gain: 25dB typical
- 50Ω, AC coupled RF input and output
- Power supply: 4.5A @ +8.5V; V_G= -0.7V
- Chip size: 4.5 x 3.9 x 0.10mm

Applications

- X band High Power amplifier
- Broadband communication
- Radar
- Test and measurement

Pins Assignement & Functional Block Diagram



Symbol	Pad N°
RF In	2
V_{G1}	4/30
V_{G2}	8/26
V_{D1}	6/28
V_{D2}	11/23
V_{G3}	13/21
V_{D3}	15/19
RF Out	17

Electrical Specifications (Pulsed mode / Test Under Probes)

Test conditions unless otherwise noted:

- Tamb.= +25°C
- Pulsed mode (Pulse width: 10µs, Duty cycle:10%)
- V_D= V_{D1}= V_{D2}= V_{D2}= +8V
- $V_{G=}$ V_{G1}= V_{G2}= V_{G3}= -0.7V

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	8		12	Ghz
G	Power gain		25		dB
ΔG	Gain flatness from 8 to 12GHz		+/-0.7		dB
S11	Input VSWR		-10		dB
S22	Output VSWR		-10		dB
P_{SAT}	Saturated output power		+40.8		dBm
P1dB	Output power @ 1 dB compression		40		dBm
I_{DQ}	Drain quiescent current		3.7		A
I_D Sat	Saturated drain current		4.0	4.6	A
PAE	Power added efficiency		35		%
	Small Signal Gain on 8-10GHz		27		dB
	Small Signal Gain on 10-12GHz		23		dB
	Pout Temperature Coefficient {-40 C/+70 C, Pin =+18dBm}			0.01	dB/°C
	Small Signal Gain Temperature Coefficient {-40 C/+70 C}		-0.032		dB/°C

Environmental parameters

Symbol	Parameter	Min	Max	Unit
Tst	Storage temperrature	-55	+85	°C
Top	Operating temperature	-40	+85	°C

Absolute Maximum Ratings

- Pulsed mode (Pulse width: 10µs, Duty cycle:10%)

Symbol	Parameter	Min	Max	Unit
V_D	Drain voltage		9	V
V_G	Gate voltage		-0.7	V
Pin	RF input power		+23	dBm
I_D	Drain bias current ($I_D = I_{D1} + I_{D2}$)		4	A
	Soldering temperature (10 seconds max.)		290	°C
Tj	Junction temperature		+150	°C

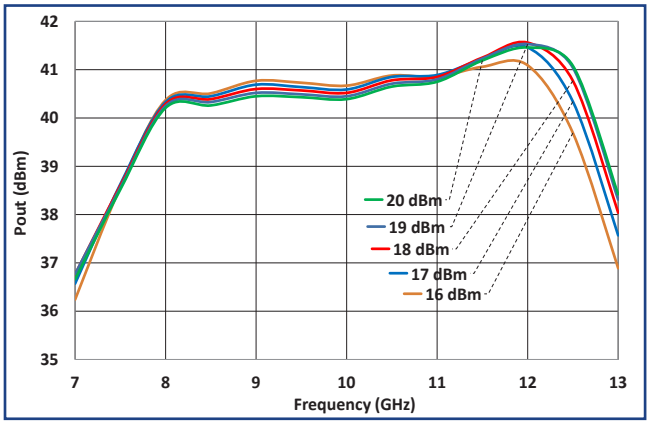
Care should be taken to avoid supply transient and over voltage. Over voltage above the maximum specified in absolute maximum rating section may cause permanent damage to the device.

Typical performances (Test under Probes)

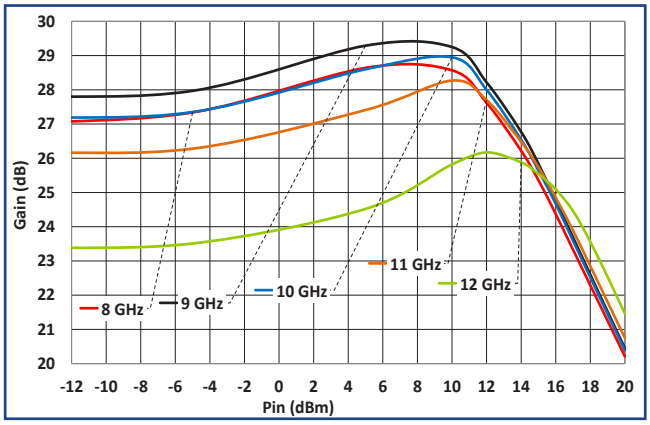
Test conditions unless otherwise noted:

- Tamb.= +25°C
- V_D= V_{D1}= V_{D2}= V_{D3}= +8V
- Pulsed mode (Pulse width: 10µs, duty cycle:10%)
- I_D= 4.5A max
- V_G= V_{G1}= V_{G2}= V_{G3}= -0.7V

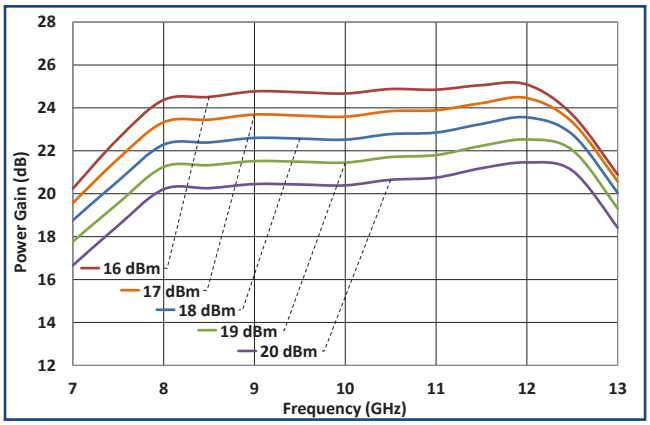
Ouput Power vs Frequency



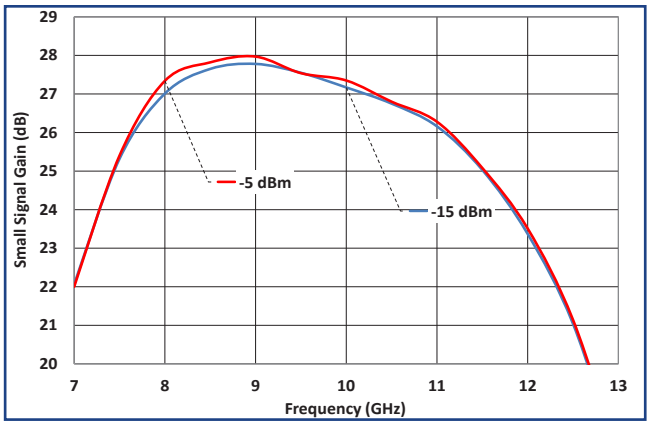
Gain vs Input Power for various Frequency



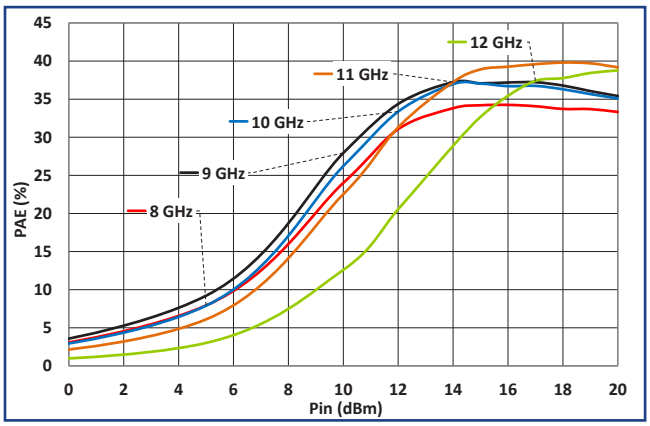
Power Gain Vs Frequency for variousInput Power



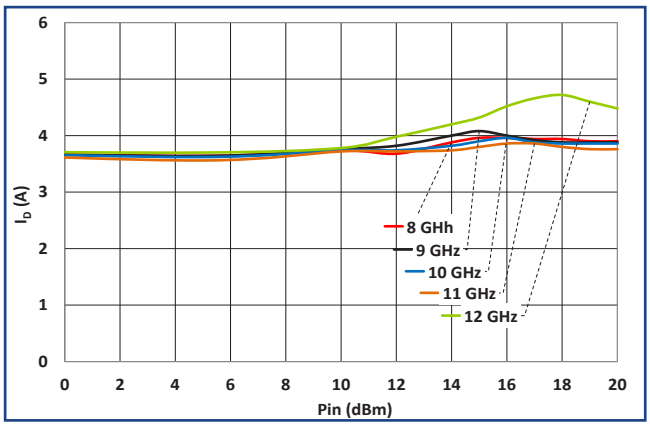
Small Gain vs Frequency



PAE vs Input Power for various Frequency



I_D vs Input Power for various Frequency

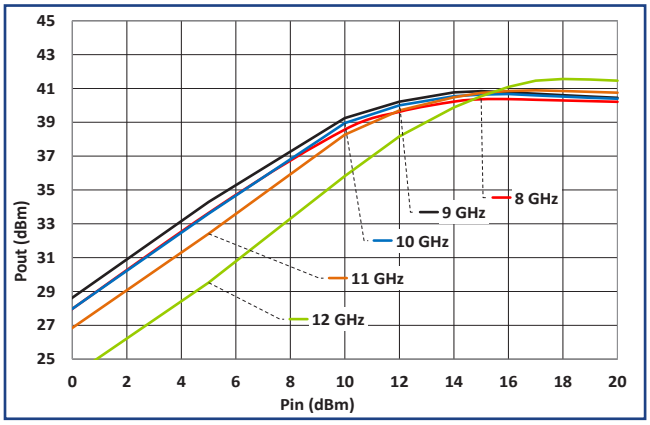


Typical performances (Test under Probes)

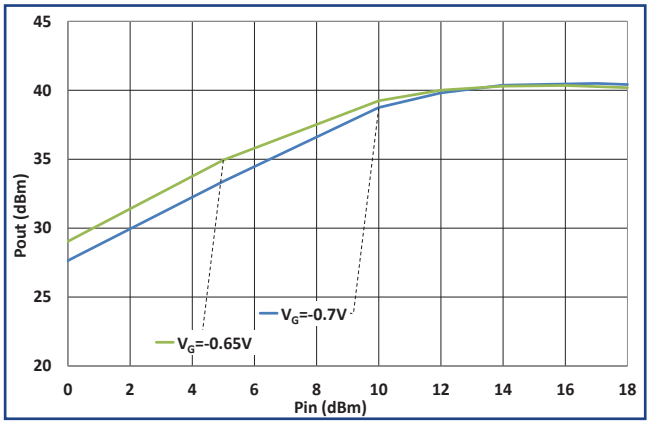
Test conditions unless otherwise noted:

- Tamb.= +25°C
- V_D= V_{D1}= V_{D2}= V_{D3} = +8V
- Pulsed mode (Pulse width: 10µs, duty cycle:10%)
- I_D= 4.5A max
- V_G= V_{G1}= V_{G2}= V_{G3}= -0.7V

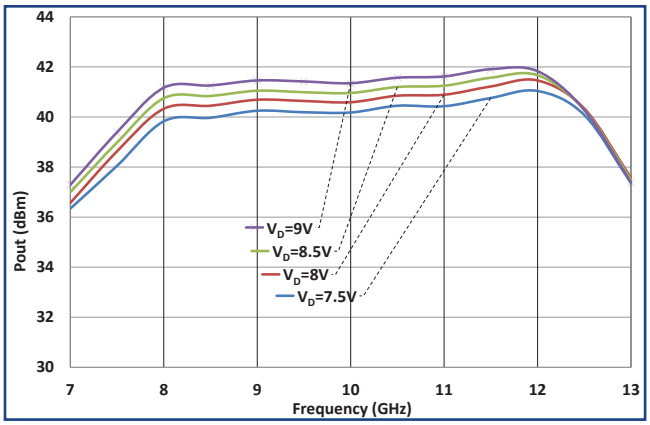
Ouput Power vs Input Power for various Frequency



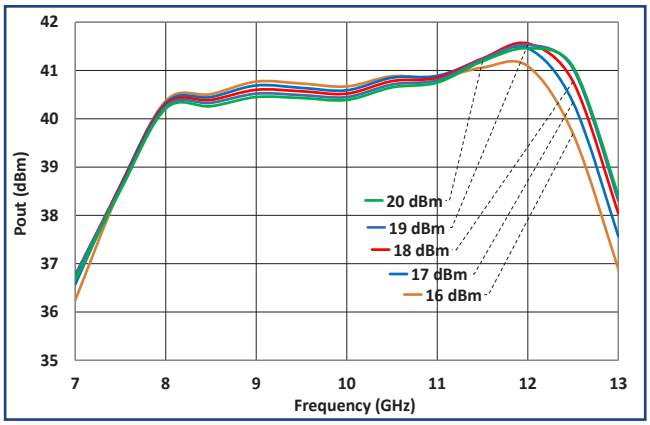
Ouput Power vs Input Power for various V_G



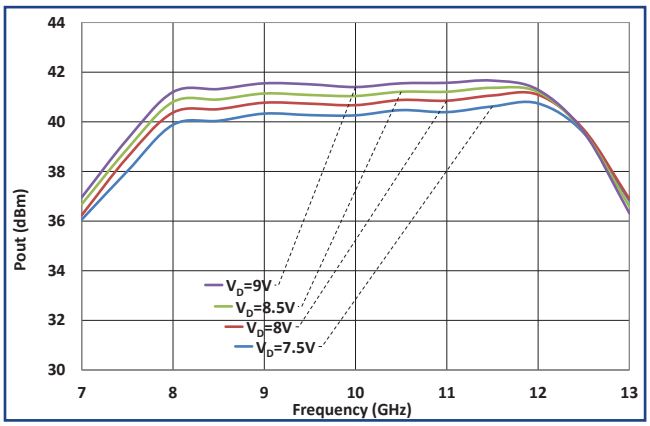
Output Power vs Frequency @17dBm for various V_D



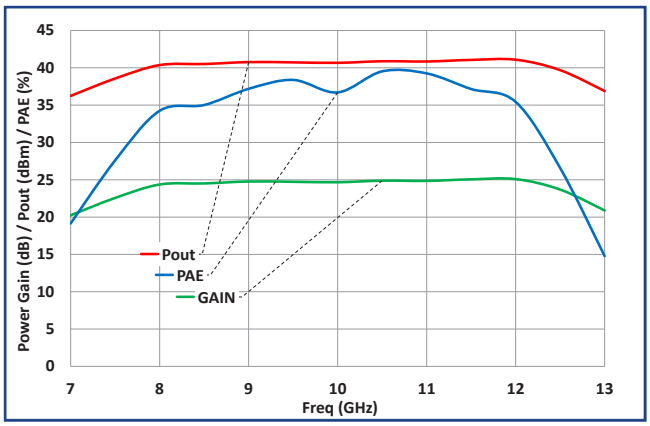
Output Power vs Frequency for various Input Power



Output Power vs Frequency @16dBm for various V_D



Ouput Power / Power Gain / PAE vs Frequency

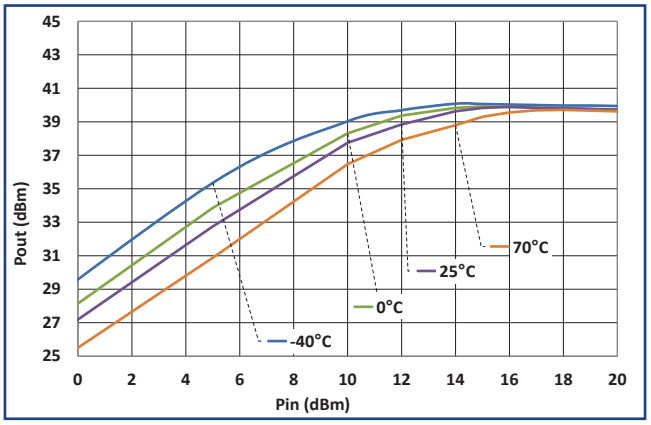


Typical performances (Board measurements)

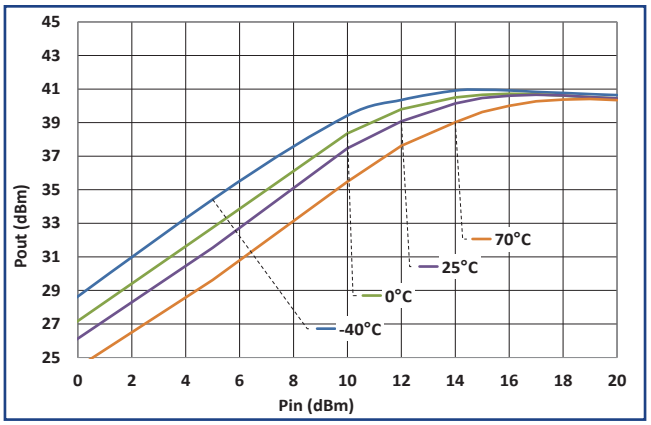
Test conditions unless otherwise noted :

- Tamb.= +25°C - using heating cooler
- V_D= V_{D1}= V_{D2}= V_{D3}= +8.5V
- Pulsed mode (Pulse width: 10µs, duty cycle:10%)
- I_D= 4.5A max
- V_G= V_{G1}= V_{G2}= V_{G3}= -0.7V

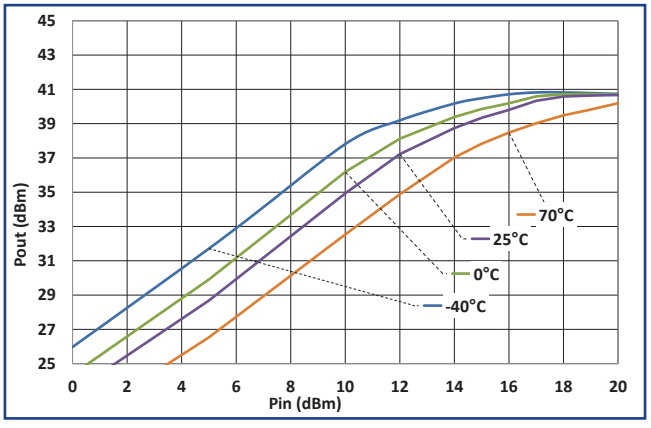
Ouput Power vs Input Power for various Temperature @ 8GHz



Ouput Power vs Input Power for various Temperature @ 10GHz



Ouput Power vs Input Power for various Temperature @ 12GHz

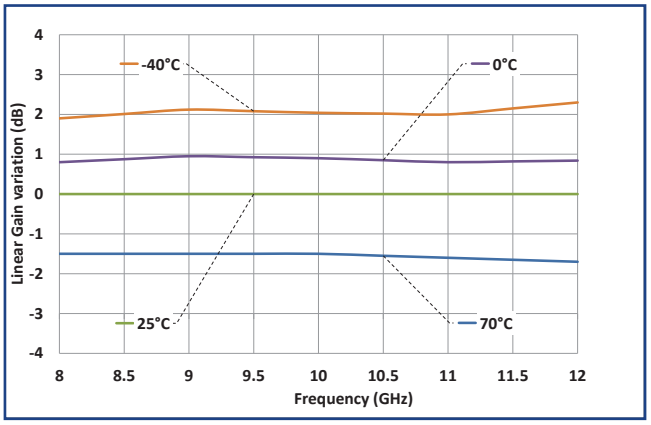


Typical performances (Board measurements)

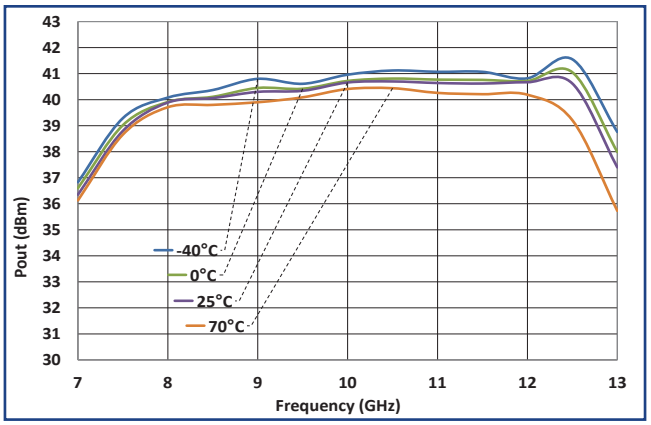
Test conditions unless otherwise noted:

- Tamb.= +25°C - using heating cooler
- V_D= V_{D1}= V_{D2}= V_{D3}= +8.5V
- Pulsed mode (Pulse width: 10µs, duty cycle:10%)
- I_D= 4.5A max
- V_G= V_{G1}= V_{G2}= V_{G3}= -0.7V

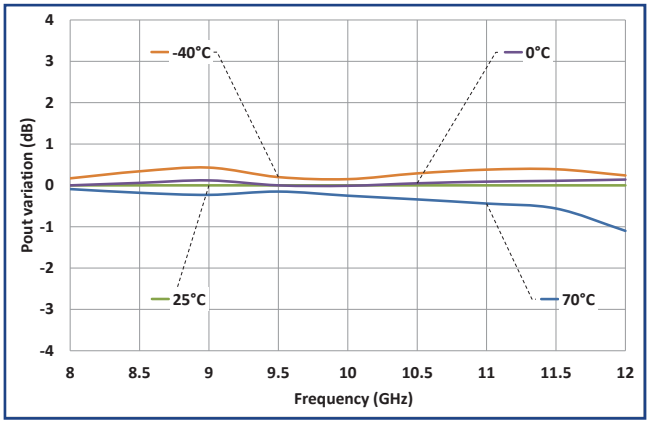
Linear Gain Variation vs Frequency for various Temperature



Input Power vs Frequency for various Temperature

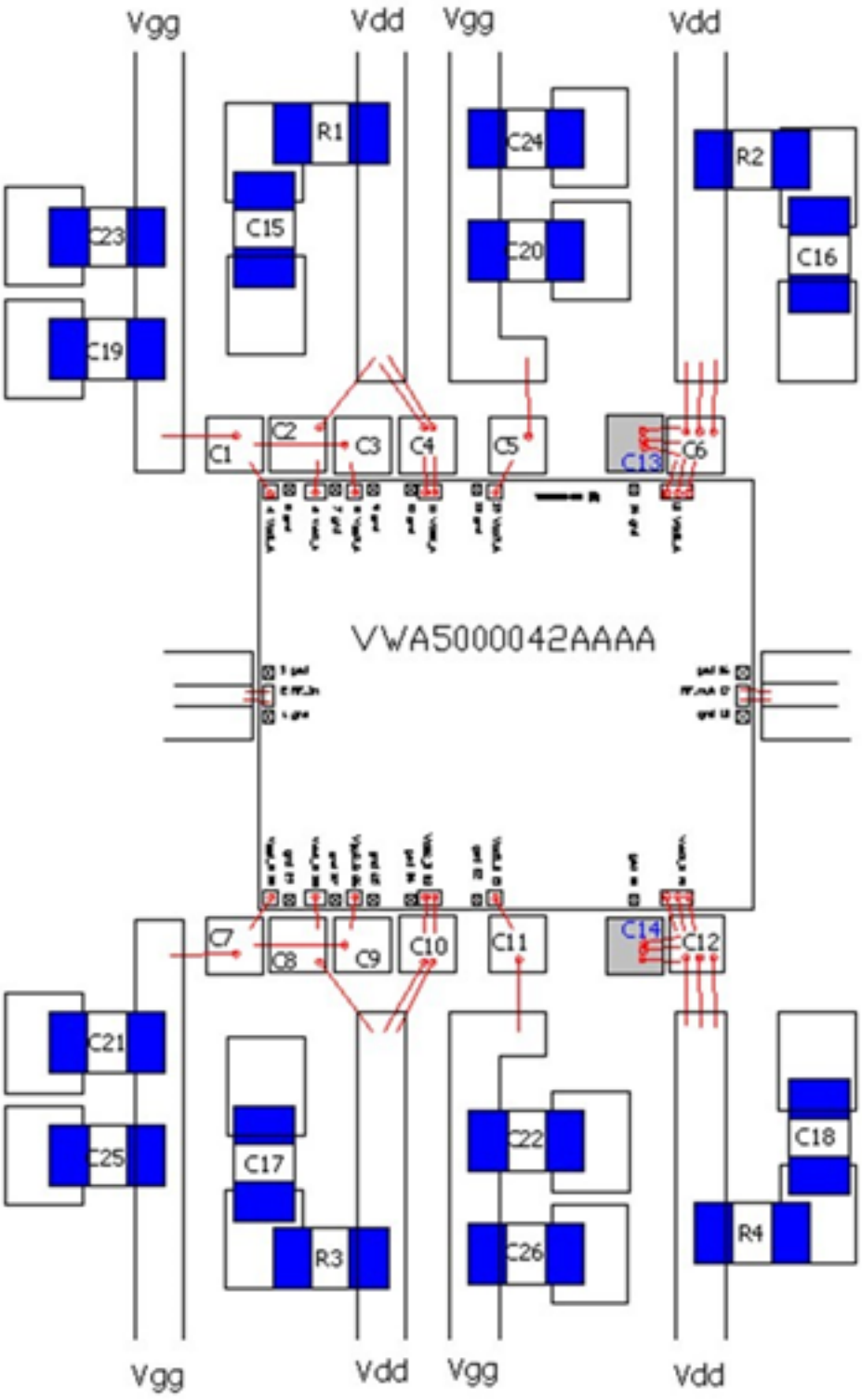


Inpout Power Variation vs Frequency for various Temperature



Application Circuit

- C19 and C22 = 10nF
- C23 and 26 = 1µF
- C1 to C12 = 100pF MIM capacitor close to the die
- C13 and C14 = 10nF MIM capacitor close to the die
- C15 and C18 = 220nF
- R1 to R4 = 11Ω



Bias-up procedure

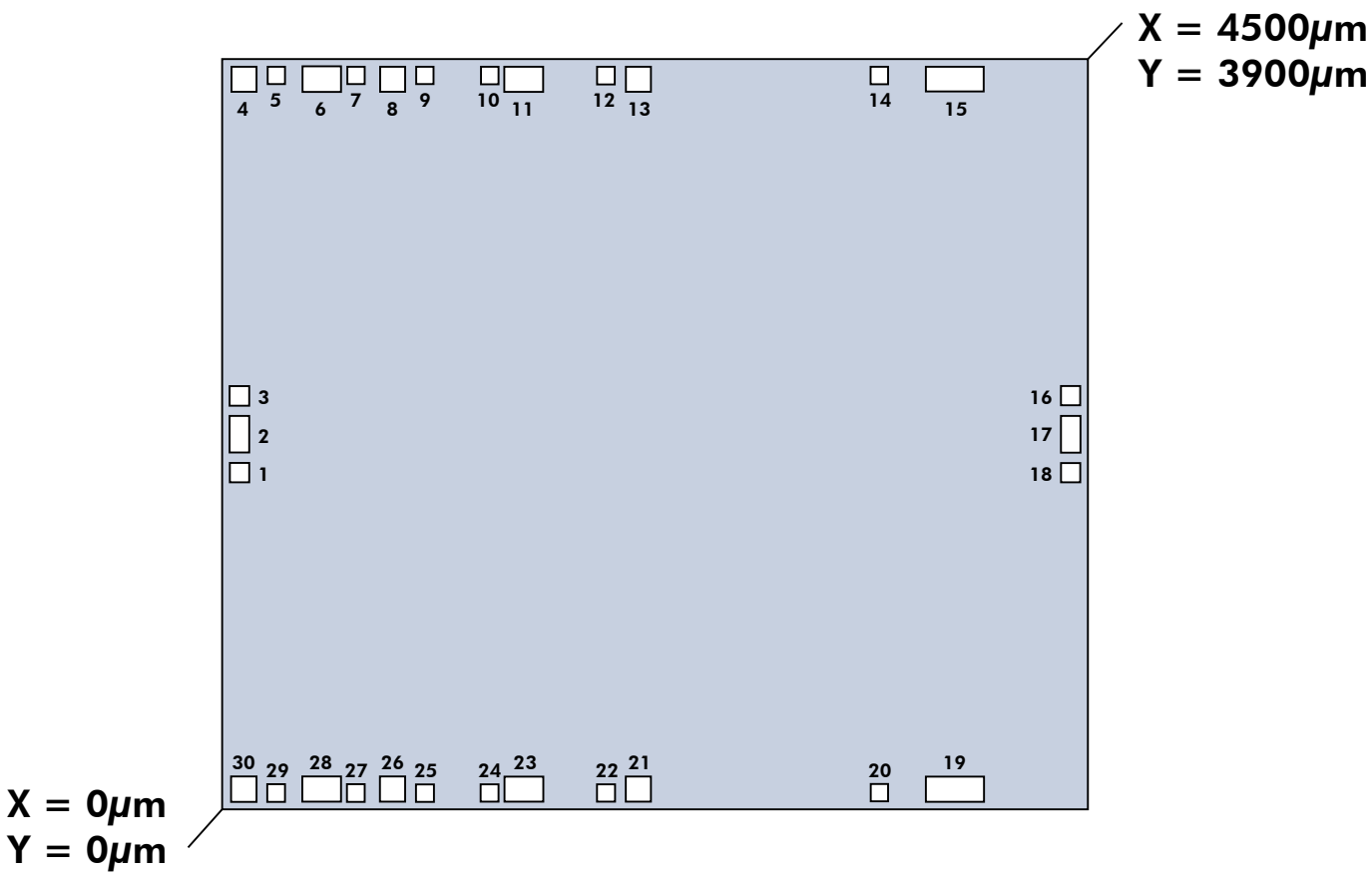
1. Apply V_G= -3V
2. Apply V_D= +8V
3. Adjust V_G= -0.7V
4. Apply RF signal in pulsed mode

Bias-down procedure

1. Turn off RF signal
2. Reduce V_G= -3V
3. Apply V_D= 0V
4. Turn off power supply

Die Layout

The Die is symetrical on the RF axis. The die positionned top view with RF input on the left and RF output on the right show DC accesses on the top labelled north (A) and DC accesses on the bottom labelled south (B). The backside is the ground reference plan.



Pinout and Bonding Pad Coordinates

Die Pin Out				
Pad	**X (µm)**	**Y (µm)**	**Size (µm x µm)**	**Function**
1	90	1750	100x100	GND
2	90	1950	100x190	RF_In
3	90	2150	100x100	GND
4	114	3795	130x130	V_{G1_A}
5	282	3815	90x90	GND
6	518	3795	200x130	V_{D1_A}
7	696	3815	90x90	GND
8	876	3795	130x130	V_{G2_A}
9	1044	3815	90x90	GND
10	1380	3815	90x90	GND
11	1558	3795	200x130	V_{D2_A}
12	1986	3815	90x90	GND
13	2154	3795	130x130	V_{G3_A}
14	3416	3815	90x90	GND
15	3808	3795	300x130	V_{D3_A}
16	4410	2150	90x90	GND
17	4410	1950	100x190	RF_Out
18	4410	1750	90x90	GND
19	3808	105	300x130	V_{D3_B}
20	3416	85	90x90	GND
21	2154	105	130x130	V_{G3_B}
22	1986	85	90x90	GND
23	1558	105	200x130	V_{D2_B}
24	1380	85	90x90	GND
25	1044	85	90x90	GND
26	876	105	130x130	V_{G2_B}
27	696	85	90x90	GND
28	518	105	200x130	V_{D1_B}
29	282	85	90x90	GND
30	114	105	130x130	V_{G1_B}

- Die thickness = 100µm
- Die size tolerance = 50µm

Ordering Information

Product Code	Definition
VWA 5000042 AA	8 to 12 GHz / 25dB / 12W

Associated Material

Material	Status
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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