

## General Description

The VWA 500052 AA is a distributed amplifier designed on a 0.15µm pHEMT process. The device is capable of more than +21dBm of output power at saturation regime, up to 40GHz, and more than +17dBm of output power at 1 dB of gain compression, up to 34GHz. It provides more than 12dB of linear gain from DC to 44 GHz with a positive slope through 40GHz. This device can provide up to 11 dB gain up through 50GHz when operating with V<sub>D</sub>=+ 6V, with an excellent group delay. The Design has been optimized to provide high efficiency. The supply current is as low as 170mA when operating with V<sub>D</sub>=+6V.

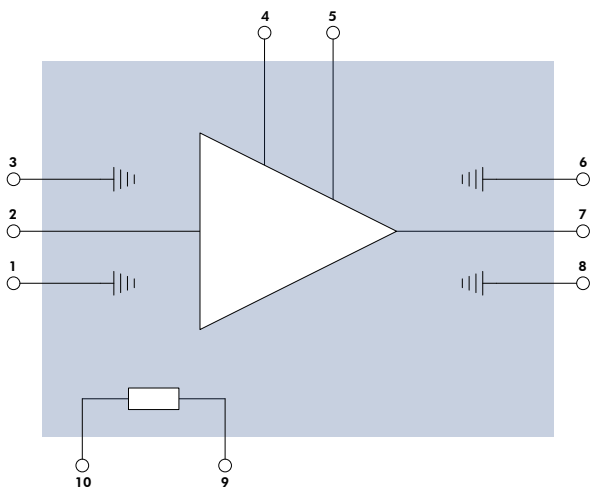
## Features

- Wideband Distributed amplifier pHEMT GaAs MMIC
- Wideband: DC to 44GHz.
- Flat group delay
- 50ΩRF Single ended input and output
- DC coupled IN, DC coupled Out
- P<sub>1dB</sub> : +17dBm DC to 34GHz
- P<sub>SAT</sub> >+21dBm DC to 40 GHz
- Small signal gain : >12dB from 2 to 40GHz
- Power supply : 170mA @ +6V
- Chip size : 2.29 x 1.28 x 0.1mm

## Applications

- Wide Band Amplifier
- Radar / ECM / ECCM
- Test and measurement
- Telecommunication format NRZ, PAM4, 56GBPS
- Broadband / datalink communication

## Pins Assignment & Functional Block Diagram



Symbol	Pad N°
RF In	2
V <sub>G2</sub>	4
V <sub>D</sub> Load	5
V <sub>D</sub> & RF Out	7
V <sub>G1_A</sub>	9
V <sub>G1_B</sub>	10

## Electrical Specifications ( Test Under Probes )

**Test conditions unless otherwise noted :**

- Tamb.= +25°C
- V<sub>D</sub> = +6V
- I<sub>D</sub> = 170mA
- V<sub>G2</sub> = +2.5V

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency Range	DC		40	Ghz
NF	Noise figure			4	dB
G	Small signal gain		12.5		dB
ΔG	Average gain positive slope		+0.0375		dB
S11	Input return loss		-10	-7	dB
S22	Output return loss		-18		dB
P <sub>1dB</sub>	Output P <sub>1dB</sub> from DC to 34GHz	17	18		dBm
P <sub>SAT</sub>	Saturated output power		21		dBm
I <sub>D</sub>	Drain Current		170		mA

## Environmental parameters

Symbol	Parameter	Values	Unit
Top	Operating temperature range	-40/+85	°C
Tstg	Storage temperature range	-55/+85	°C

## Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
V <sub>D</sub>	Drain bias Voltage		+9	V
V <sub>G2</sub>	Gate control input access for second stage	-1	V <sub>D</sub> /2	V
P <sub>in</sub>	RF input power		18	dBm
P <sub>cw</sub>	Continuous power dissipation		2	W
T process	Temperature process max 20 secondes		325	°C

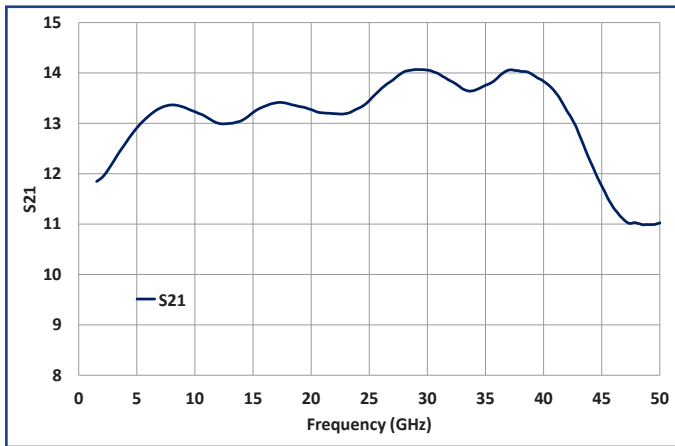
Operation of this device above any of these parameters may cause permanent damage.

## Typical Performances (Test Under Probes)

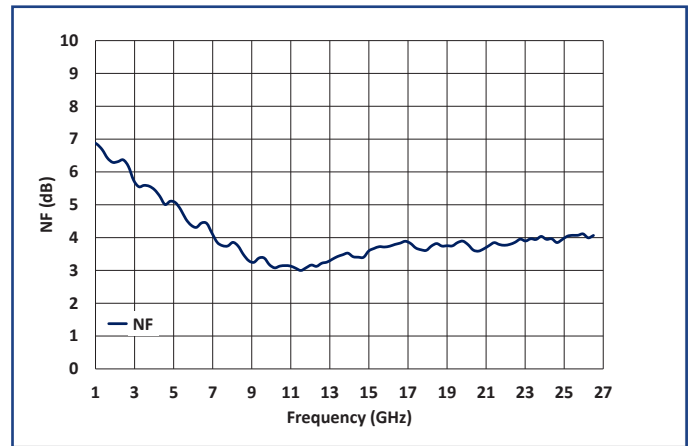
Test conditions unless otherwise noted :

- $T_{amb.} = +25^{\circ}C$
- $V_D = +6V$
- $I_D = 170mA$
- $V_{G2} = +2.5V$

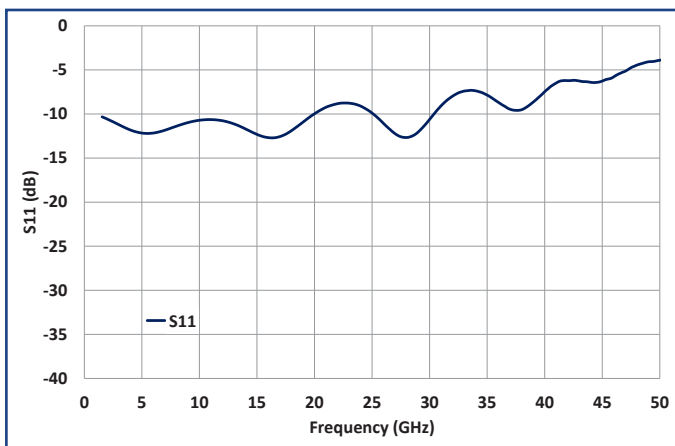
**S21 (dB)**



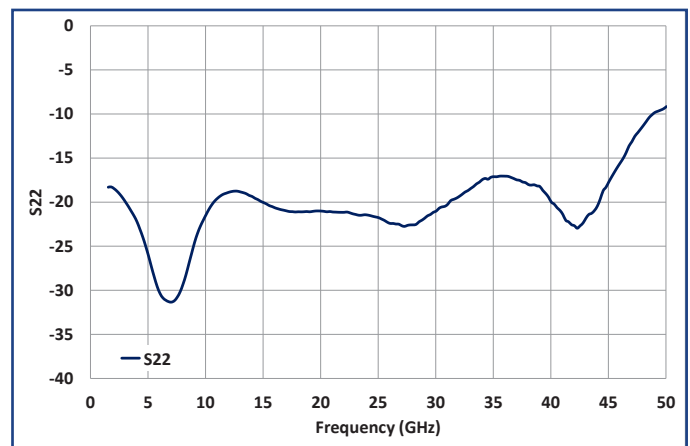
**Noise Figure (dB)**



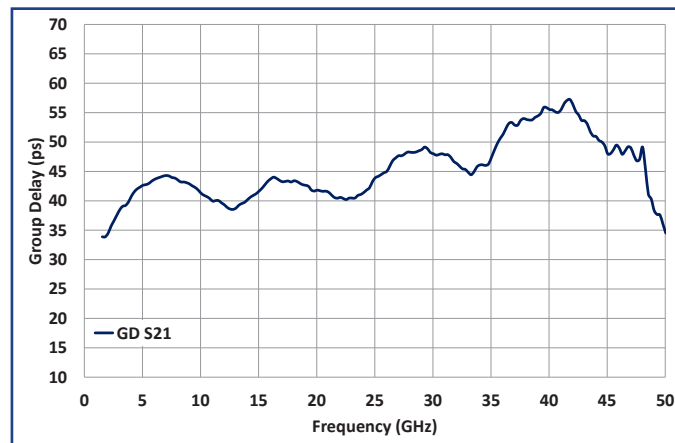
**S11 (dB)**



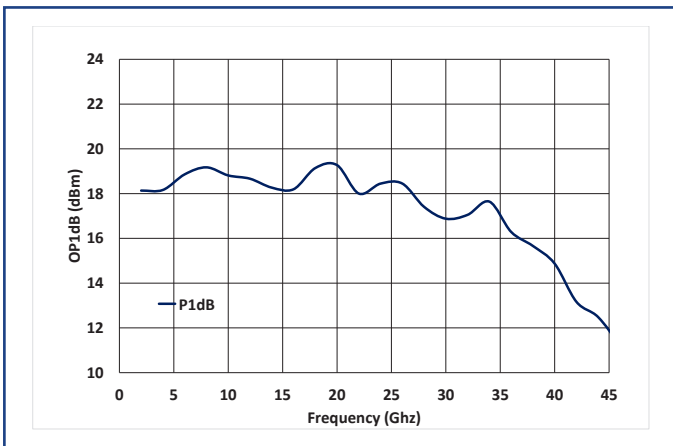
**S22 (dB)**



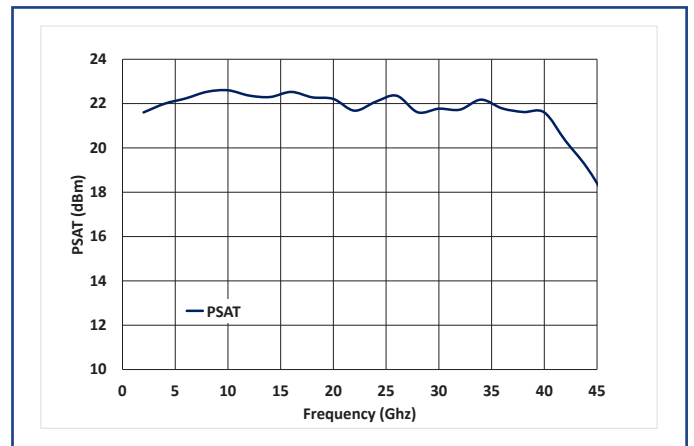
**Group Delay (ps)**



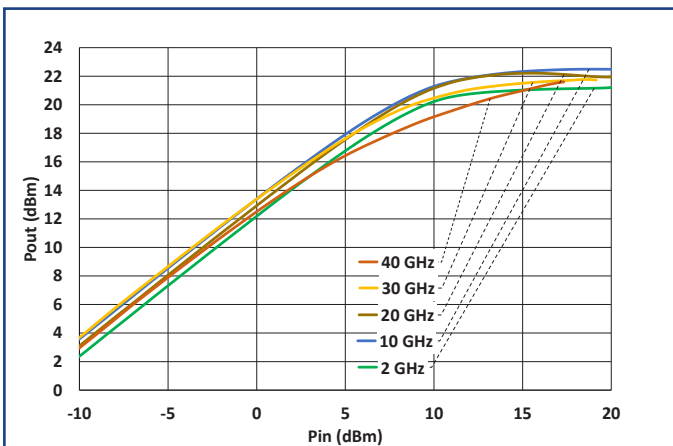
**P<sub>1dB</sub> (dBm)**



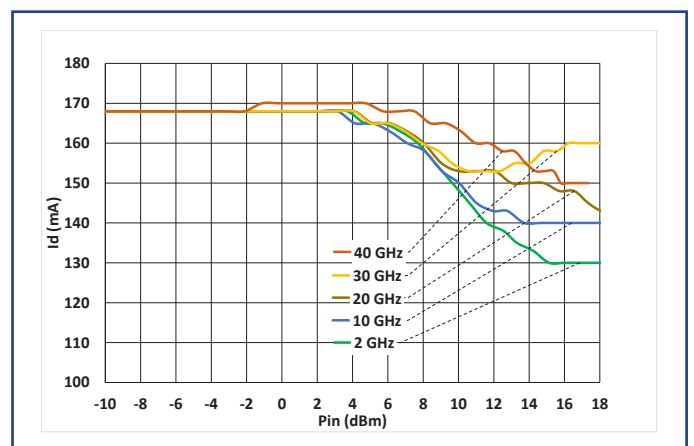
**P<sub>SAT</sub> (dBm)**



**Output Power VS Input Power for various Frequency**



**Drain Current VS Input Power for various Frequency**



## Biasing procedure

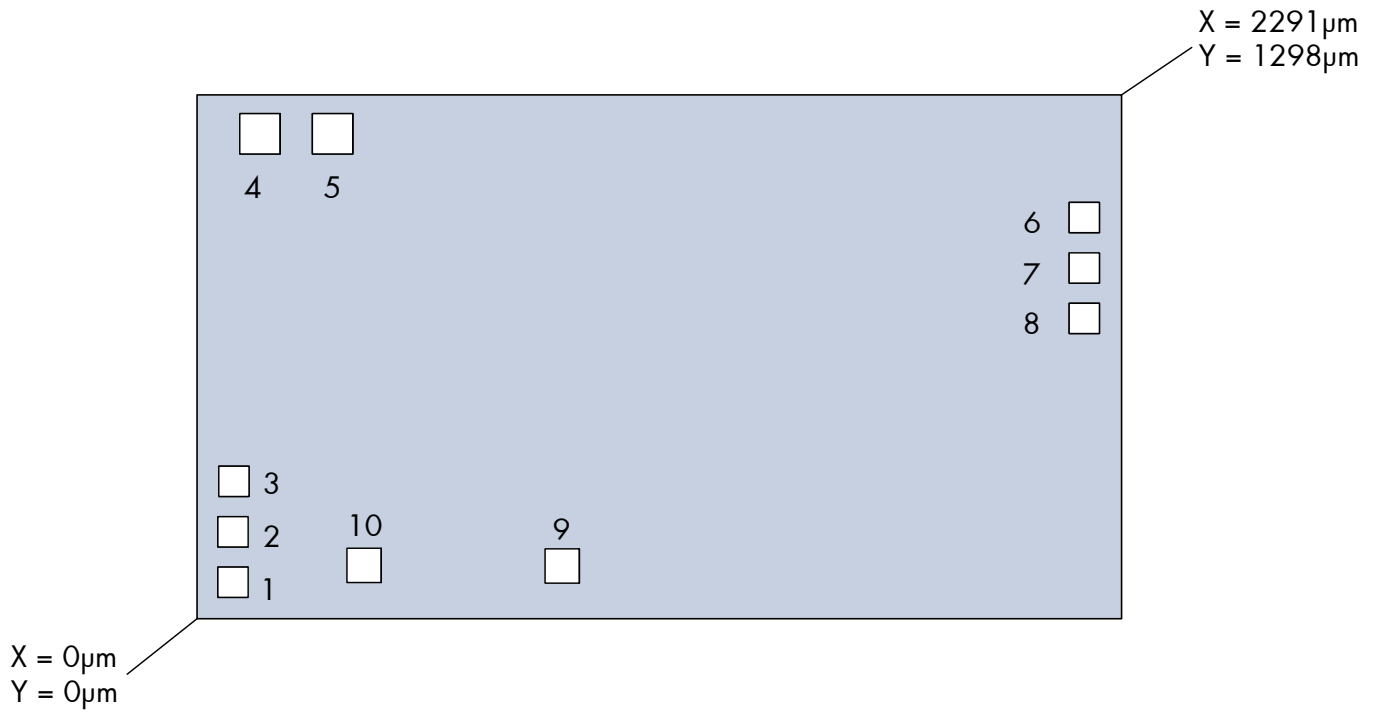
### Switch on

1. Set  $V_D$  to +6V
2. Set  $V_{G2}$  to +2.5V
3. Turn RF Input ON

### Switch off

1. Turn RF Input OFF
2. Decrease  $V_{G2}$  to 0V
3. Decrease  $V_D$  to 0V

## Die Layout



## Pinout and Bonding Pad Coordinates

Die Pin Out				
Pad	X (µm)	Y (µm)	Size (µm x µm)	Function
1	89	90	75x75	Gnd
2	89	215	75x75	RF In
3	91	340	75x75	Gnd
4	158	1201	100x100	V <sub>G2</sub>
5	336	1201	100x100	V <sub>D_LOAD</sub>
6	2198	994	75x75	GND
7	2198	869	75x75	RF Out
8	2198	744	75x75	Gnd
9	905	131	100x100	V <sub>G1_A</sub>
10	415	131	100x100	V <sub>G1_B</sub>

Die thickness = 100µm

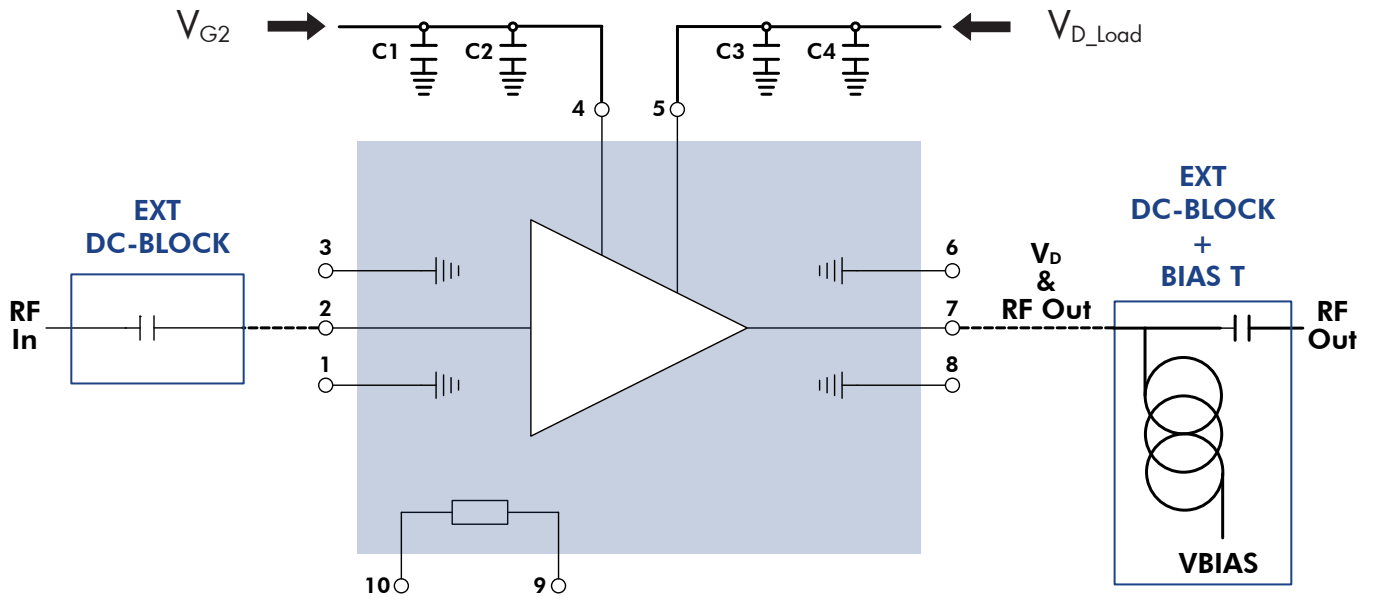
Die bottom must be connected to ground (RF and DC)

**Access Description**

Pin Number	Name	Description	Electrical interface
2	RF In	RF Amplifier input, this access is AC coupled and internally matched to 50Ohms.	
4	V <sub>G2</sub>	Gate control input access for second stage distributed amplifier structure. Apply +2.5V for nominal biasing conditions.	
5	V <sub>D_Load</sub>	Drain termination load decoupling access. For lower frequency applications, this access can be connected to a MIM 100pF or 1000pF capacitor, with a low inductance connection.	
7	RF Out	RF Amplifier output, this access is DC coupled and internally matched to 50Ohms. It is also used to feed the drain current (I <sub>D</sub> ), by using a wide bandwidth external Bias-T structure.	
9	V <sub>G1_A</sub>	Gate control input access for first stage distributed amplifier structure. Unused for nominal biasing conditions.	
10	V <sub>G1_B</sub>	Gate control output access for first stage distributed amplifier structure. Unused for nominal biasing conditions.	
Die Bottom	GND	Die must be connected to RF and DC Ground	

## Application Circuit

- C1, C4 = 1µF
- C2, C3 = 1µF capacitors are MIM type and must be placed as close as possible to the die access.



## Ordering Information

Product Code	Definition
VWA 5000052AA	DC To 44GHz / 12dB Gain / 21dBm P <sub>SAT</sub>

## Associated Material

Material	Status
Die Evaluation Board (die EVB)	Contact factory
Packaged die Evaluation Board (packaged die EVB)	Contact factory
Mechanical files (DXF)	Contact factory
Measuments 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 Sensitiv 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 (C15H12Br4O2) Free
- PFOS Free
- SVHC Free

## Contact Information

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

Email sales :  
 Email contact :

Tel sales :  
 Tel contact :

Represented by .....