

## General Description

The **VWA500053AA** is a double distributed amplifier designed on a 0.15µm pHEMT process.

Each amplification lines are 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 44GHz with a positive slope of +0.0375dB/GHz, up to 40GHz. This device can provide up to 11 dB gain up to 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 140mA when operating with V<sub>D</sub>= +5V.

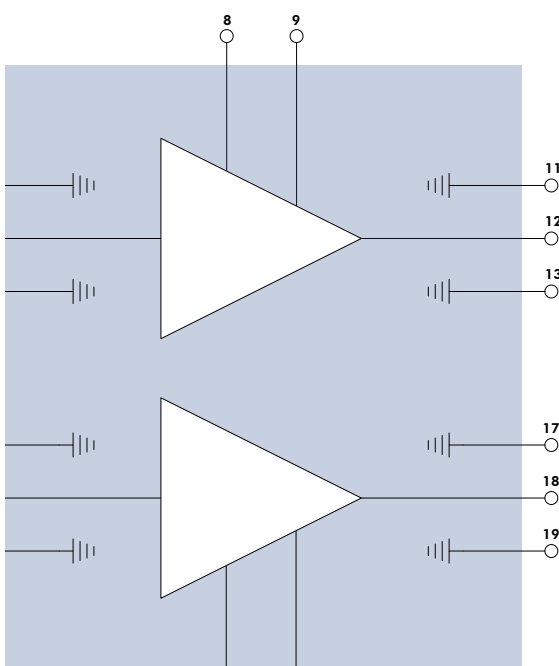
## Features

- Wideband Distributed amplifier pHEMT GaAs MMIC
- Wide band: DC to 46GHz.
- Flat group delay & differential GD<1,5ps.
- 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 40GHz
- Small signal gain: >12dB from DC to 40GHz
- Power supply: 140mA @ +5V
- Chip size: 2.29 X 2.97 X 0.1mm

## Applications

- Wide Band Amplifier
- Radar / ECM / ECCM
- Test and measurement
- Broadband / datalink communication

## Pins Assignment & Functional Block Diagram



Symbol	Pad N°
RF In Line 2	2
RF In Line 1	6
V <sub>G2</sub> Line 1	8
V <sub>D_LOAD</sub> Line1	9
V <sub>D</sub> & RF Out Line 1	12
V <sub>D</sub> & RF Out Line 2	18
V <sub>D_LOAD</sub> Line2	21
V <sub>G2</sub> Line 2	22
GND	1/3/5/7/11/13/17/19

## Electrical Specifications ( Test Under Probes )

**Test conditions unless otherwise noted:**

- Tamb.= +25°C
- V<sub>D</sub> = +5V
- I<sub>D</sub> = 140mA
- V<sub>G2</sub> = +1.5V

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	DC		40	Ghz
G	Small signal gain		12.5		dB
ΔG	Average gain positive slope		+0.0375		dB/Ghz
ΔG	Small signal gain flatness		+/-1		dB
S11	Input return loss		-10	-7	dB
S22	Output return loss		-15		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
V <sub>D</sub>	Drain supply voltage		5		V
I <sub>D</sub>	Drain current		140		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
P <sub>in</sub>	RF input power		18	dBm
P <sub>cw</sub>	Continuous power dissipation		4	W
T process	Temperature process max 20 seconds		325	°C

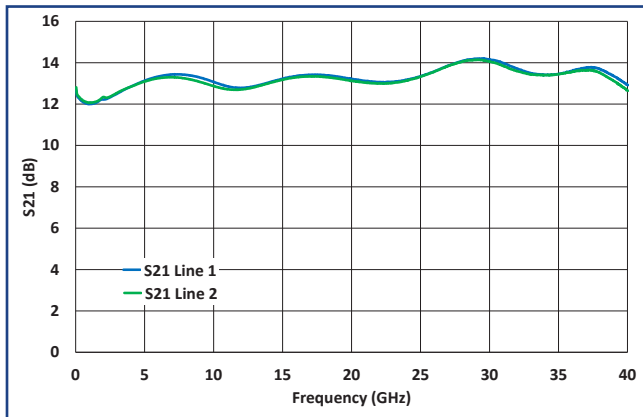
Operation of this device above any of these parameters may cause permanent damage.

## Typical Performances (Test Under Probes)

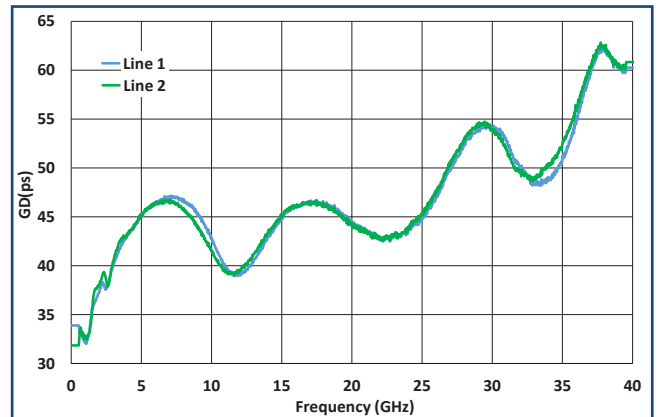
**Test conditions unless otherwise noted:**

- $T_{amb.} = +25^{\circ}C$
- $V_D = +5V$
- $I_D = 140mA$
- $V_{G2} = +1.5V$

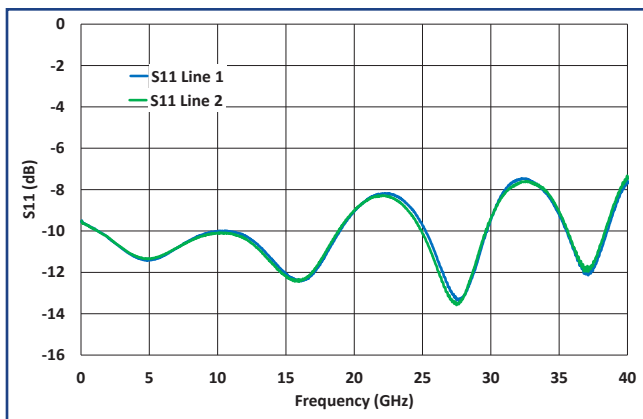
**Small Signal Gain**



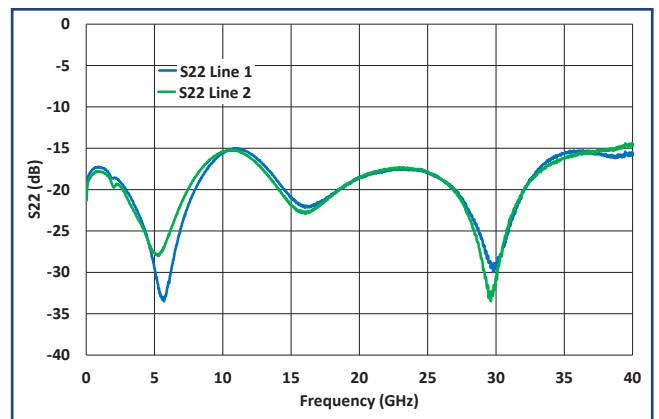
**Group Delay**



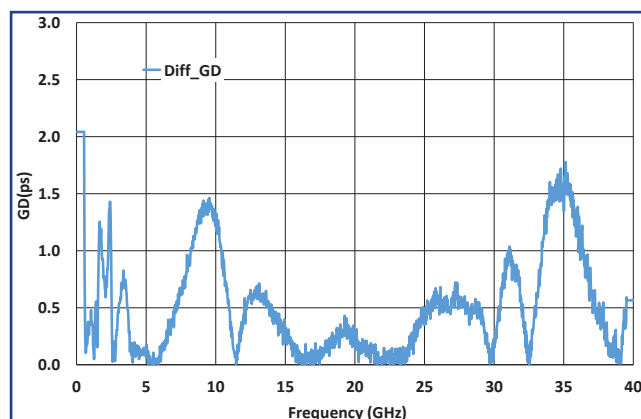
**Input Return Loss**



**Output Return Loss**



**Group Delay difference between Line 1 & Line 2**

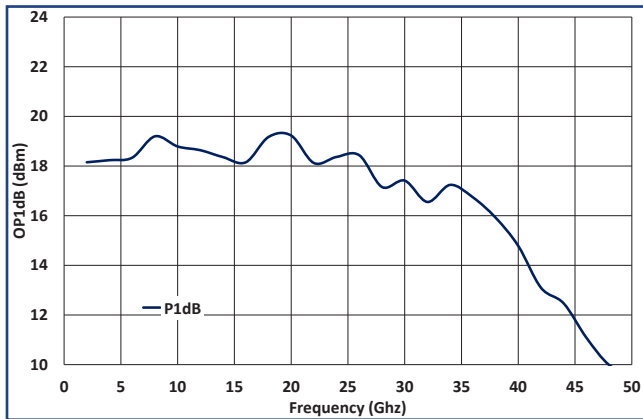


## Typical Performances (Test Under Probes)

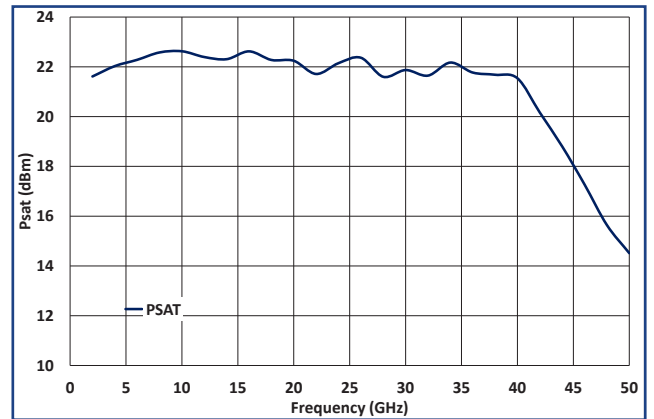
**Test conditions unless otherwise noted:**

- $T_{amb.} = +25^{\circ}C$
- $V_D = +6V$
- $I_D = 165mA$
- $V_{G2} = +2.5V$

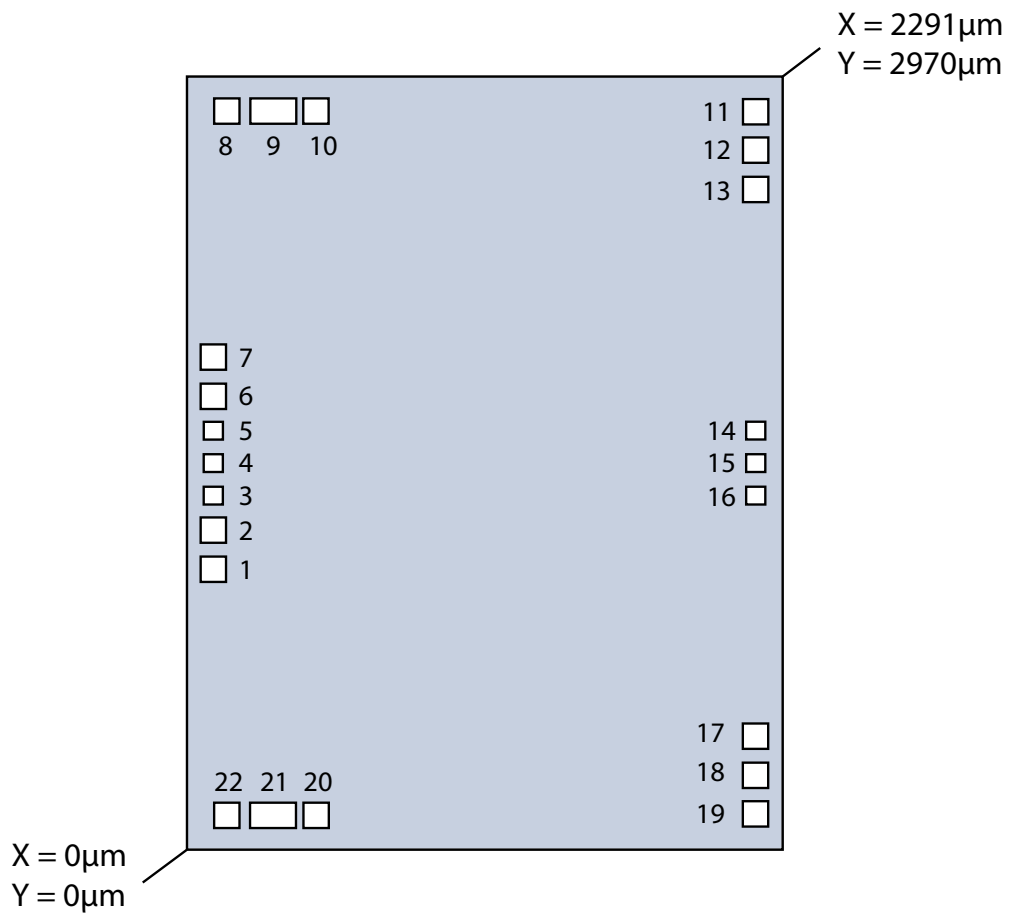
**Output P1dB**



**Saturated Output Power**



## Die Layout



## Pinout and Bonding Pad Coordinates

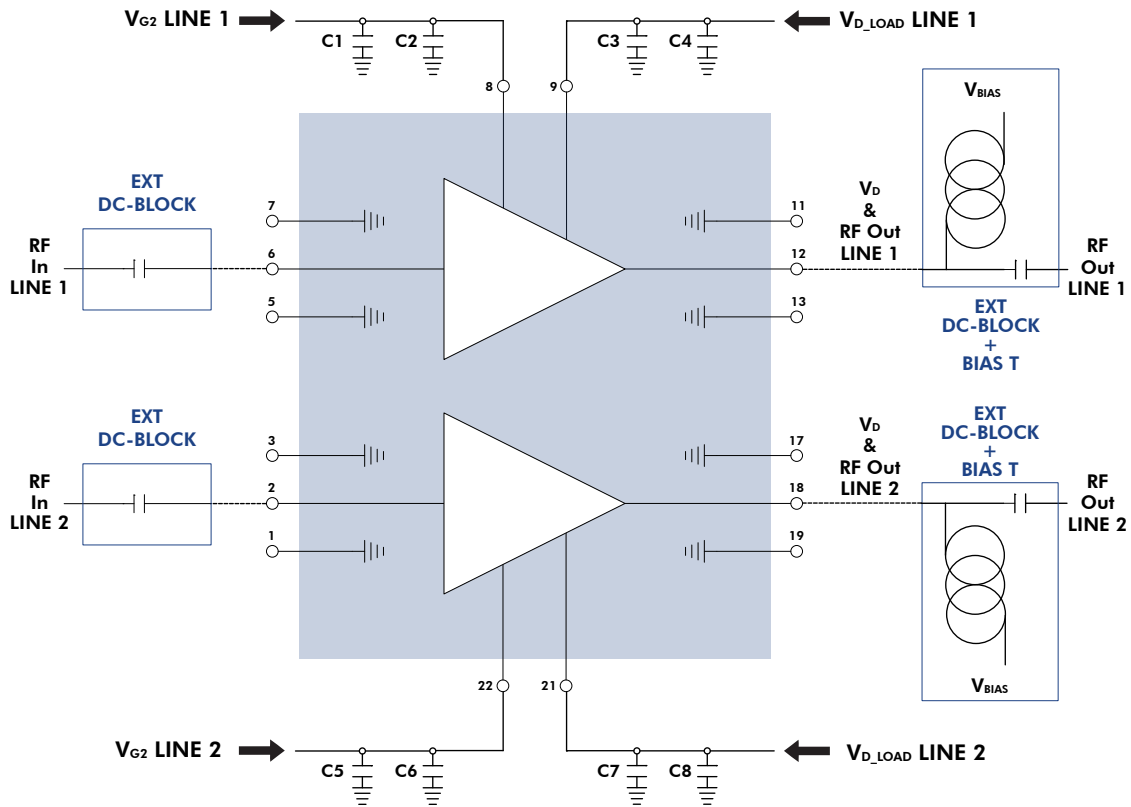
Die Pin Out				
Pad	X ( $\mu\text{m}$ )	Y ( $\mu\text{m}$ )	Size ( $\mu\text{m} \times \mu\text{m}$ )	Function
1	99	1077	100 x 100	GND
2	99	1227	100 x 100	RF In South
3	99	1360	75 x 75	GND
4	99	1485	75 x 75	Transmission Line Input
5	99	1610	75 x 75	GND
6	99	1744	100 x 100	RF In North
7	99	1894	100 x 100	GND
8	150	2840	100 x 100	V <sub>G2</sub> North
9	330	2840	100 x 150	V <sub>D_LOAD</sub> North
10	496	2840	100 x 100	V <sub>G1</sub> North
11	2186	2836	100 x 100	GND
12	2186	2686	100 x 100	RF Out_North
13	2186	2536	100 x 100	GND
14	2186	1610	75 x 75	GND
15	2186	1485	75 x 75	Transmission Line Out
16	2186	1360	75 x 75	GND
17	2186	434	100 x 100	GND
18	2186	284	100 x 100	RF Out South
19	2186	134	100 x 100	GND
20	495	131	100 x 100	V <sub>G1</sub> South
21	329	131	100 x 150	V <sub>D_LOAD</sub> South
22	149	131	100 x 100	V <sub>G2</sub> South

Die thickness = 100 $\mu\text{m}$

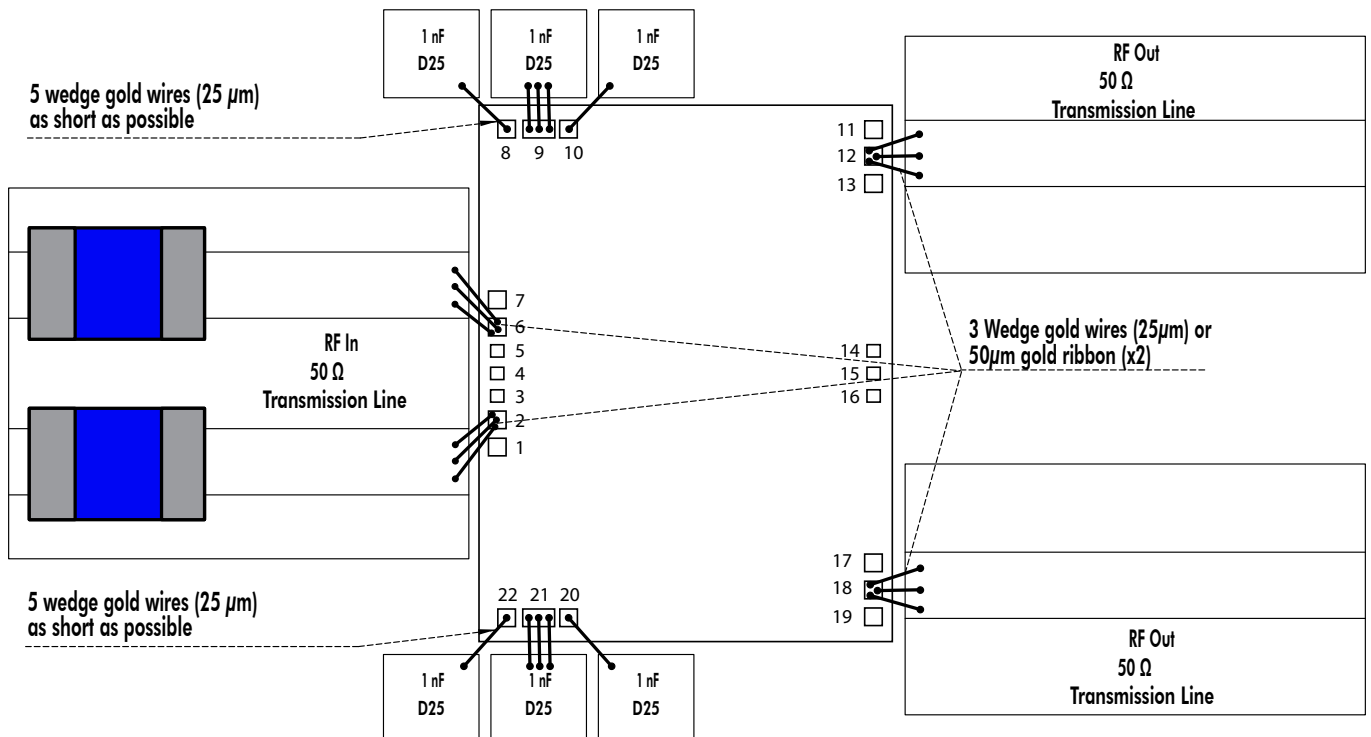
Die bottom must be connected to ground (RF and DC)

## Application Circuit

- C1, C4, C5 and C8: 1  $\mu$ F
- C2, C3, C6 and C7: 1 nF capacitors are MIM type and must be placed as close as possible to the die access.



## Mounting Circuit Proposal



## Ordering Information

Product Code	Definition
VWA 5000053AA	DC To 44GHz / 12dB Gain / 21dBm P <sub>SAT</sub>

## Associated Material

Material	Status
Packaged die	Contact factory
Die Evaluation Board (die EVB)	Contact factory
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Mechanical files (DXF)	Contact factory
Measurements 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 Sensitivity 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:

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