1 to 20GHz / 16dB / 27dBm Medium Power Amplifier

DATA SHEET **VWA 5000056 AA**

General Description

The **VWA5000056AA** is a power distributed amplifier designed on a 0.15µm pHEMT process. The devices is capable of more than +27dBm of output power at saturation regime, and provides more than 15dB of gain from 1 to 20GHz with less than 1dB of flatness with an excellent group delay between 6-18GHz in typical application. The design has been optimized to provide high efficiency, supply current is as low as 290mA with Vd= +8V.

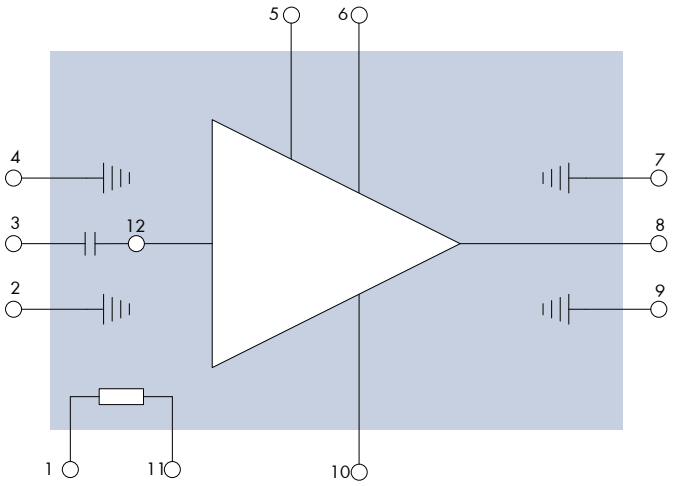
Features

- Distributed amplifier pHEMT GaAs MMIC
- Wide band: 1 to 20GHz.
- Flat group delay
- 50ΩRF Single ended input and output
- AC coupled In, DC coupled Out
- High Output Psat > +26dBm
- Large signal gain: 16dB
- Power supply: 290mA @ +8V
- Chip size: 3 x 1.3 x 0.1 (mm)

Applications

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

Pins Assignement & Functional Block Diagram



Symbol	Pad N°
RF In	2
V_{G2}	5
V_{D_LOAD}	6
V_D & RF Out	8
V_G	10
RA	1
RB	11
CA	12

Electrical Specifications

Test conditions unless otherwise noted:

- Tamb.= +25°C
- V_{G2}= +3V
- V_D= +8V
- V_{G1} adjusted between -1V and 0V to obtain Drain current I_D= 290mA

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	1		20	GHz
G	Small signal gain	15	16		dB
ΔG	Small signal gain flatness		+/-1		dB
NF	Noise figure (@10GHz)			3.5	dB
TOI	Simulated TOI		30		dBm
S11	Input return loss		-12		dB
S22	Output return loss		-12		dB
P1dB	Output P1 dB		24		dBm
P_{SAT}	Saturated output power		27		dBm
I_D	Supply current		290		mA

Absolute Maximum Rating

Symbol	Parameter	Min	Max	Unit
V_D	Positive External DC bias voltage		9	V
V_{G1}	Gate voltage first stage	-2.5		V
V_{G2}	Gate control input access for second stage	-1	V_D/2	V
Pin max	RF input power (In)		18	dBm
Pcw	Continuous power dissipation (@ 85 C)		3.3	W
Tst	Storage temperature	-55	+85	°C
Top	Operating temperature	-40	+85	°C

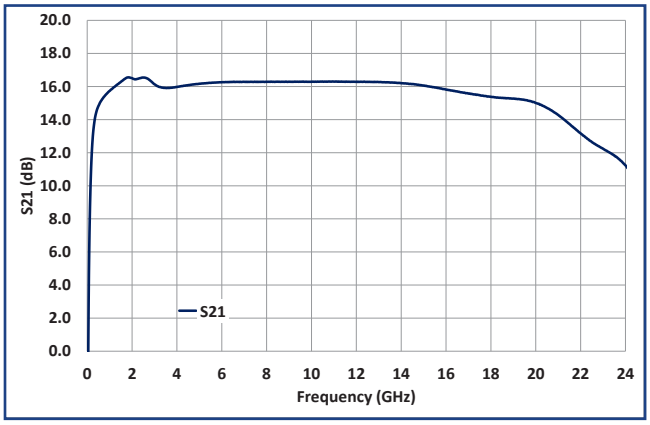
Operation of this device above any of these parameters may cause permanent damage.

Typical Performance (Test under probes)

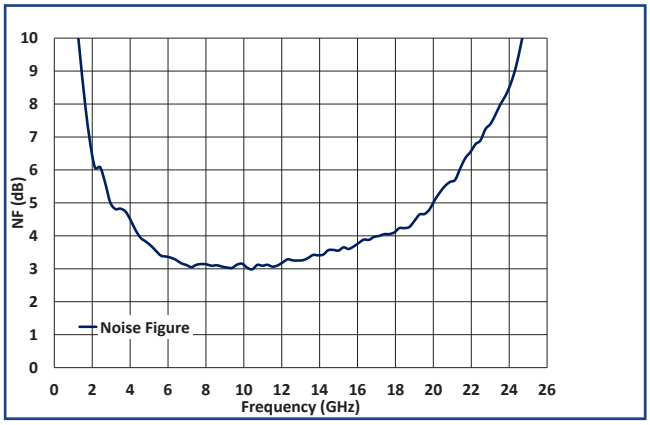
Test conditions unless otherwise noted:

- Tamb.= +25°C
- V_D= +8V
- V_{G1}= adjusted between -1V and 0V to obtain I_D= 290mA (without RF Input Signal) (Typically V_{G1}= -0.2V)
- I_D= 290mA
- V_{G2}= +3V

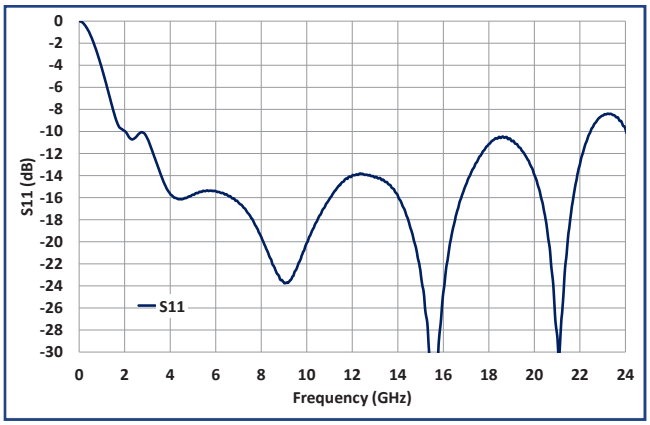
Small Signal Gain



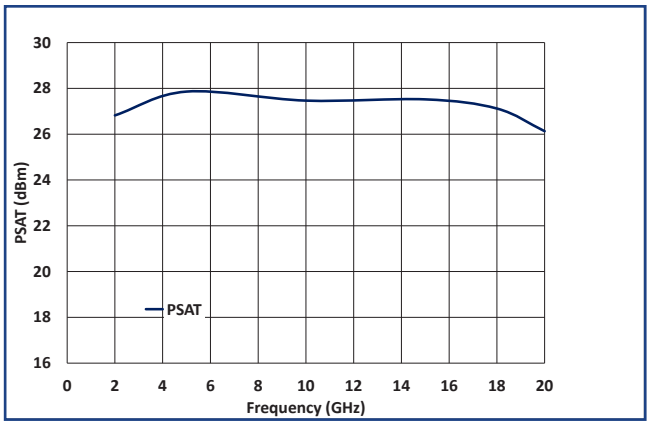
Noise Figure



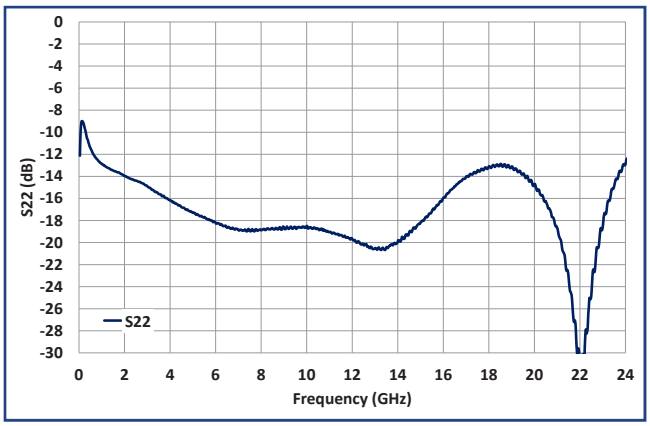
Input Return Loss



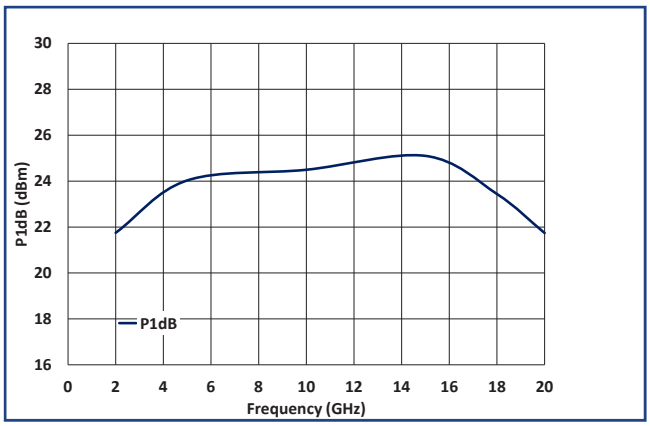
Saturated Output Power



Output Return Loss



Output P1dB

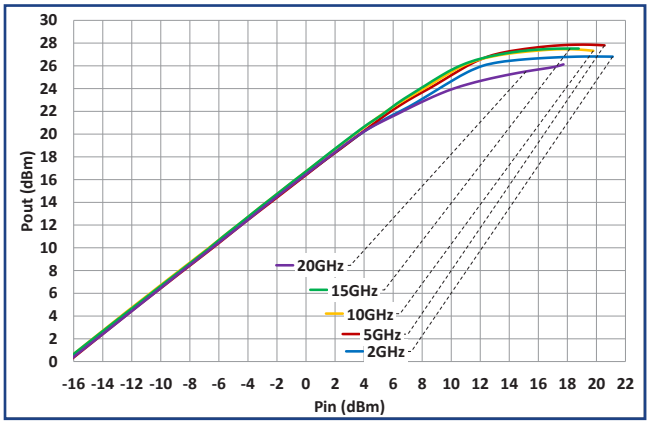


Typical Performance (Test under probes)

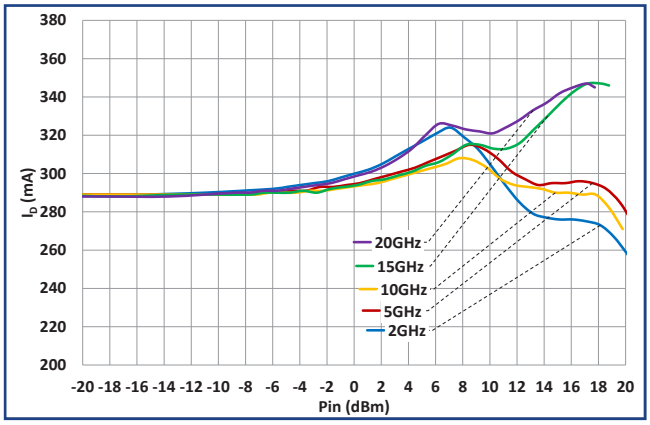
Test conditions unless otherwise noted:

- Tamb.= +25°C
- I_D= 290mA
- V_D= +8V
- V_{G2}= +3V
- V_{G1}= adjusted between -1V and 0V to obtain I_D= 290mA (without RF Input Signal) (Typically V_{G1}= -0.2V)

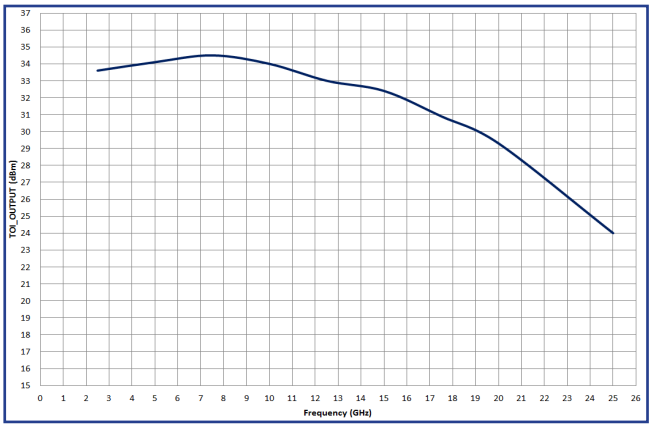
Output Power vs Input Power for various Frequency



Drain Current vs Input Power for various Frequency



SIMULATED Output Third Order Intercept point



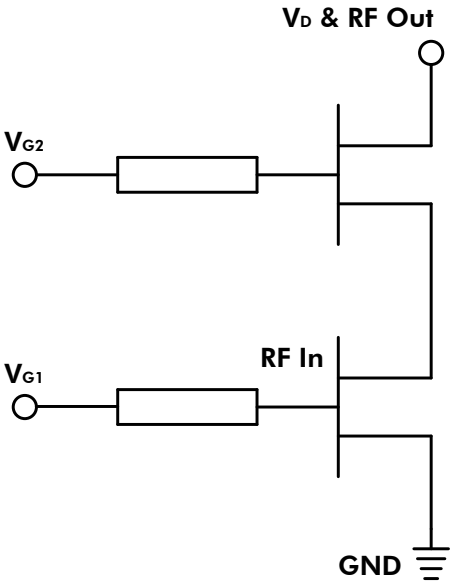
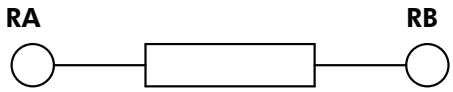
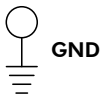
Die Layout

Pinout and Bonding Pad Coordinates

Die Pin Out				
Pad	**X (µm)**	**Y (µm)**	**Size (µm x µm)**	**Function**
1	99	118	75x75	RA
2	99	250	75x75	GND
3	99	400	75x75	RF Input
4	99	549	75x75	GND
5	111	787	80x100	V_{G2}
6	137	1202	100x150	V_{D_LOAD}
7	2922	1215	75x75	GND
8	2922	1065	75x75	RF Output
9	2922	915	75x75	GND
10	2909	294	100x150	V_{G1}
11	292	118	75x75	RB
12	371	400	75x75	CA

Die thickness = 100µm
Die bottom must be connected to ground (RF and DC)

Access Description

Pin Number	Name	Description	Electrical interface
3	RF In	RF Amplifier input, this access is AC coupled and internally matched to 50Ω.	
5	V_{G2}	Gate control input access for second stage distributed amplifier structure. Apply +3V for nominal biasing conditions.	
10	V_{G1}	Gate control input access for first stage distributed amplifier structure. Adjust VG1 to obtain the desired Drain current (~-0.2V for nominal biasing conditions)	
6	V_{D_LOAD}	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.	
8	RF Out	RF Amplifier output, this access is DC coupled and internally matched to 50Ω. It is also used to feed the drain current (I_D), by using a wide bandwidth external Bias-T structure.	
1	RA	Embedded resistor for low frequencies applications. Unused for nominal biasing conditions.	
11	RB	Embedded resistor for low frequencies applications. Unused for nominal biasing conditions.	
Die Bottom	GND	Die must be connected to RF and DC Ground	

Biasing procedure

Switch on

1. Set V_{G1} to -1V
2. Set V_D to +8V
3. Set VG2 to +3V
4. Increase V_{G1} to obtain ID = 290mA (typically V_G = -0.2V)
5. Turn RF Input ON

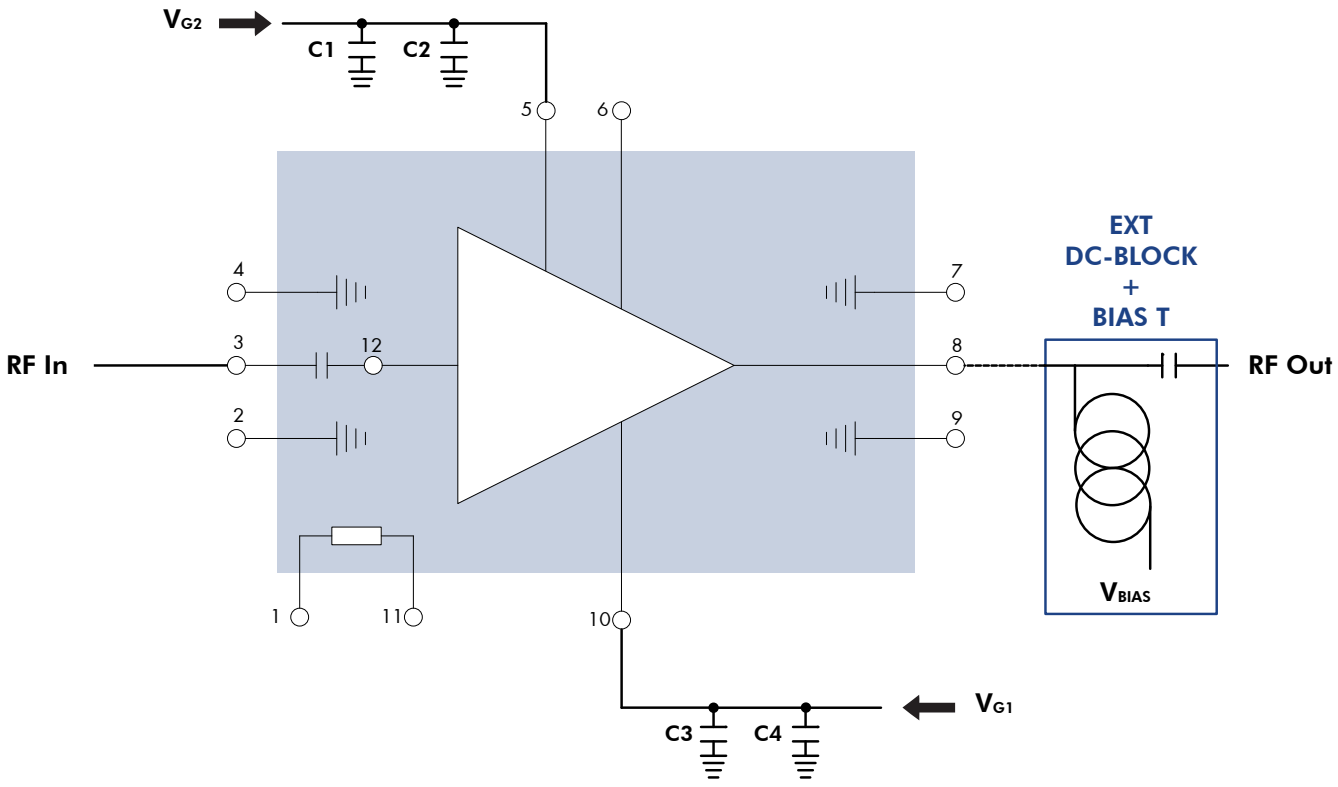
Switch off

1. Turn RF Input OFF
2. Decrease V_{G1} to -1V
3. Set V_{G2} to 0V
4. Set V_D to 0V
5. Set V_{G1} to 0V

- Always apply V_{G1} before applying V_D
- This stress may cause permanent damage on component.

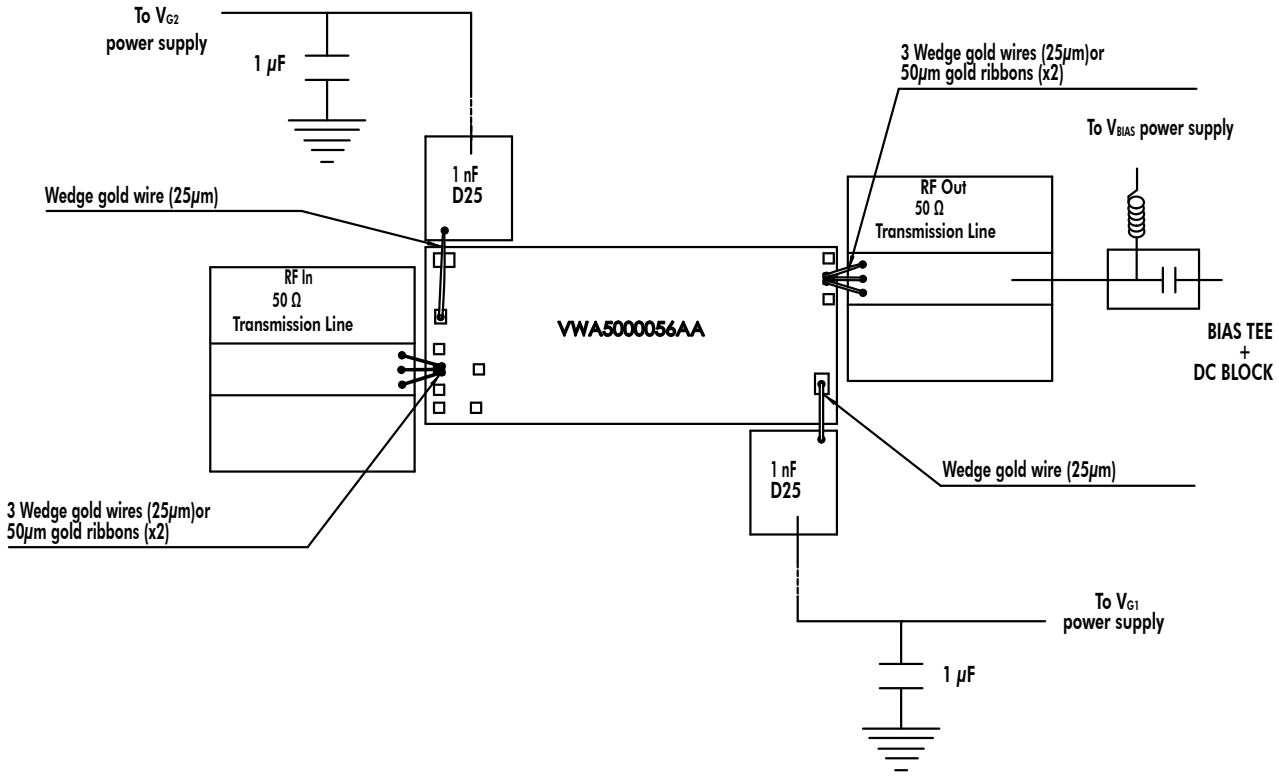
Application Circuit

- C1 and C4: 1µF
- C2 and C3: 1nF capcitors are MIM type and must be placer as close as possible to the die access.

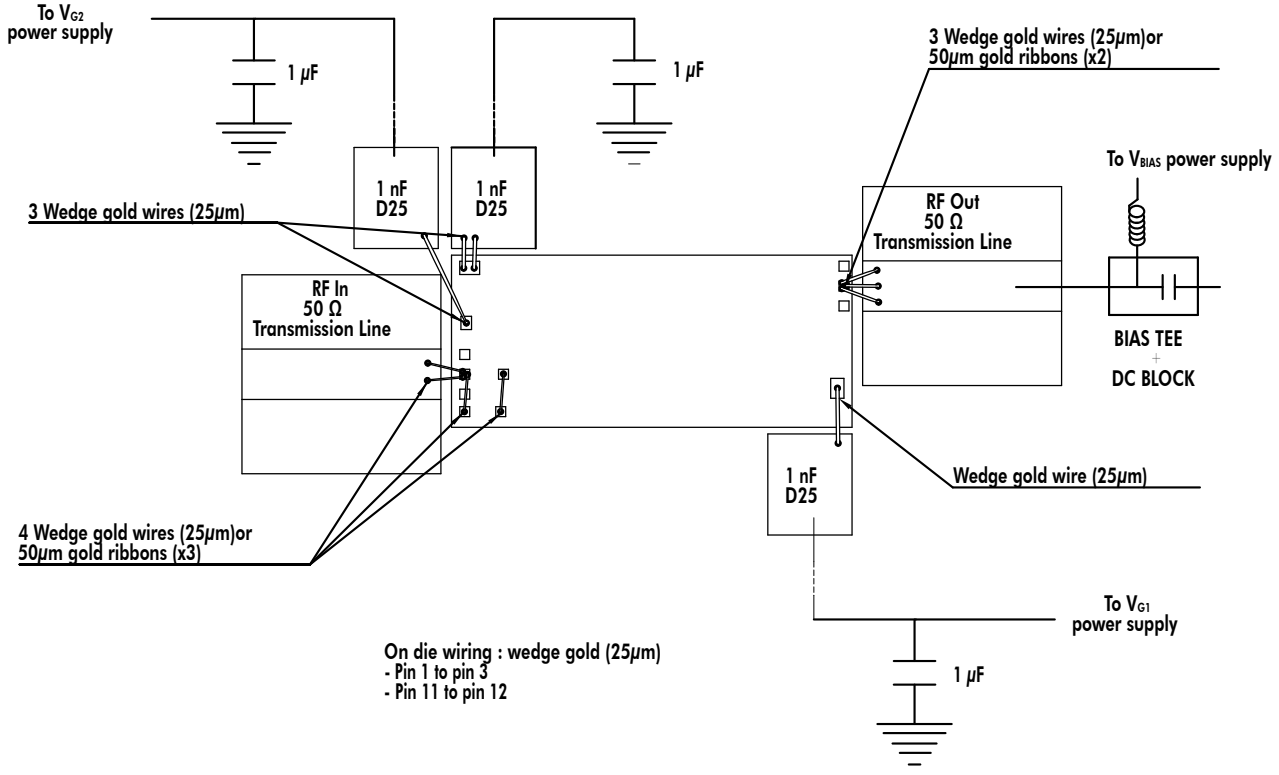


Assembly diagram

Typical application



Low frequency application



Ordering Information

Product Code	Definition
VWA 5000056AA	1 to 20GHz / 16dB / 27dBm

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:

Vectrawave SA
5, rue Louis de Broglie
22 300 Lannion
France

www.vectrawave.com
Email sales: contact_sales@vectrawave.com
Tel sales:+33 (0)2 57 63 00 20

Represented by