DC to 70GHz / 8dB Gain / 12dBm P_{SAT} Wideband Distributed Amplifier

DATA SHEET **VWA 5000083 AA**

General Description

The **VWA5000083AA** is a distributed amplifier designed on a 0.15µm pHEMT process.

The device is capable of more than +10dBm of output power at saturation regime, up to 50GHz. And more than +7dBm of output power at 1 dB of gain compression, up to 50GHz. It provides more than 8dB of linear gain from DC to 70GHz. The design integrates a V_D internal access that's allow the user to bias the Drain access through the Drain resistor load helping to avoid external Bias-T structure. The supply current is as low as 75mA when operating with V_D= +5V.

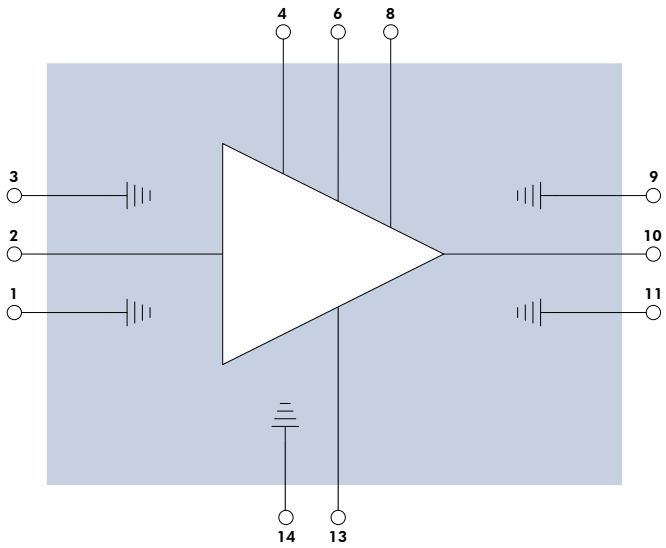
Features

- Wideband Distributed amplifier pHEMT GaAs MMIC
- Wide band: DC to 70GHz.
- Internal Resistive Drain Biasing System
- Flat group delay.
- 50ΩRF Single ended input and output
- DC coupled In, DC coupled Out
- P_{1dB} >+9dBm DC to 44GHz
- High output P_{SAT} >+12dBm DC to 44GHz
- Small signal gain: >8dB DC to 70GHz
- Nominal Power Supply: 75mA @ +5V
- Chip size: 1.516 x 1.328 x 0.1 (mm)

Applications

- Wide band MZM Driver (NRZ), PAMX, QPSK)
- Radar / ECM / ECCM
- Test and measurement
- Broadband / datalink communication

Pins Assignement & Functional Block Diagram



Symbol	Pad N°
RF In	2
V_D	4
V_{G2}	6
V_{B2}	8
RF Out	10
V_{G1_A}	13
GND	1/3/9/11/14

Electrical Specifications (Test Under Probes)

Test conditions unless otherwise noted :

- Tamb.= +25°C
- V_D = +5V
- I_D= 75mA
- V_{G1_A}= 0V
- V_{G2} linked to V_{B2}: Pad 6 linked to Pad 8

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	DC		70	Ghz
G	Small signal gain		8.5		dB
+ ΔG	Positive gain slope (DC to 67GHz)		0.03		dB/GHz
ΔG	Small signal gain flatness (based on +G)		+/–1		dB
S11	Input return loss		-12		dB
S22	Output return loss		-12		dB
NF	Noise figure (1 to 26.5GHz)		4.5		dB
P1dB	Output P1dB (DC to 44GHz)	8	10		dBm
P_{SAT}	Saturated output power (DC to 44GHz)	12	13		dBm

Recommended Operating Conditions

Symbol	Parameter	Values	Unit
V_D	Drain bias voltage	+5	V
I_D	Drain bias current	75	mA
V_{G2}	Gate bias voltage	linked to V_{B2}	V

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_D	Drain bias voltage	9	V
V_{G2}	Gain bias voltage	V_D/2	V
Pin	Maximum peak input power overdrive	16	dBm
Tj	Junction temperature	150	°C
P_{DISS}	Power dissipation	0.6	W
Ta	Operating temperature range	-40/+85	°C
Tstf	Storage temperature range	-45/+125	°C

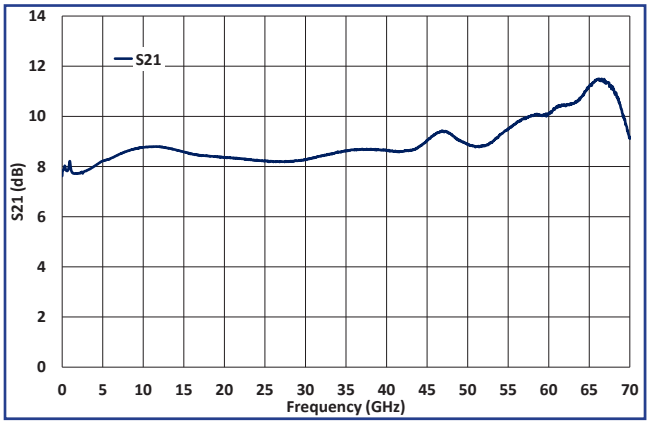
Operation of this device above any of these parameters may cause permanent damage.

Typical Performances (Test Under Probes)

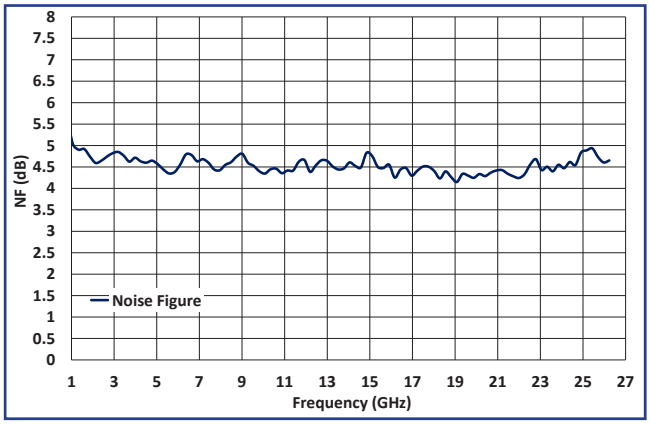
Test conditions unless otherwise noted :

- Tamb.= +25°C
- V_D = +5V
- Pin = -20dBm
- I_D= 75mA
- V_{G1_A}= 0V
- V_{G2} linked to V_{B2}: Pad 6 linked to Pad 8

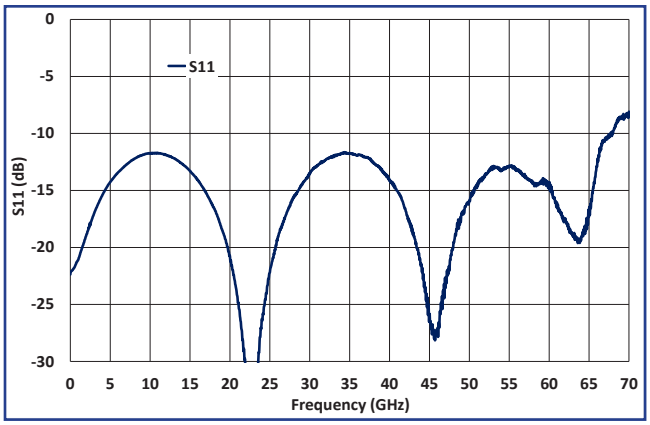
Small Signal Gain



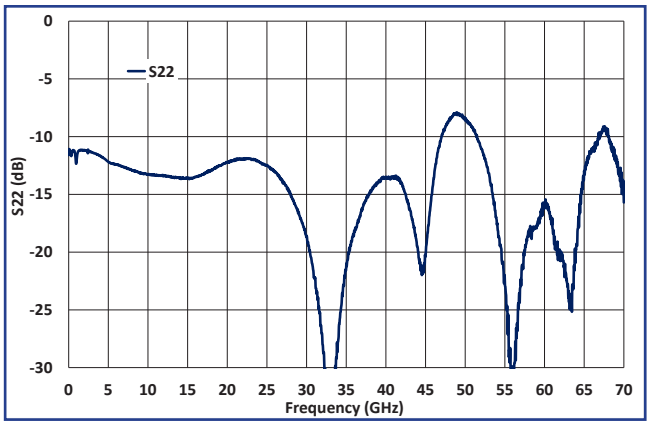
Noise Figure



Input Return Loss



Output Return Loss

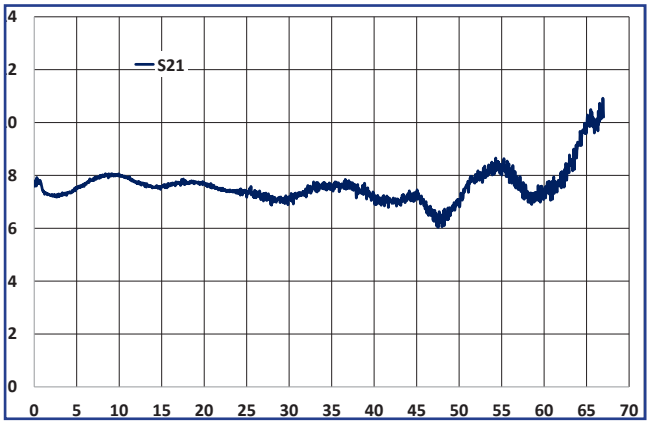


Typical Performances (Small signal / connectorized module)

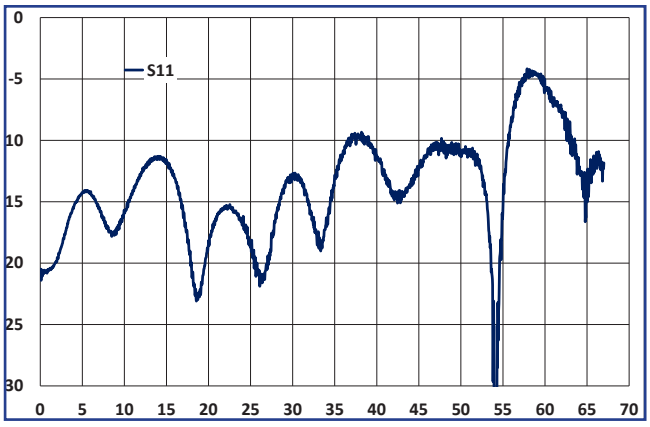
Connectorized module description: VWA0000980AA is a VWA5000083AA die integrated in a V connector package.

- Tamb.= +25°C
- V_D = +5V
- V_{G2} external= 1.2V
- I_D= 70mA
- V_{G1_A}= 0V
- Reference plane: V connector

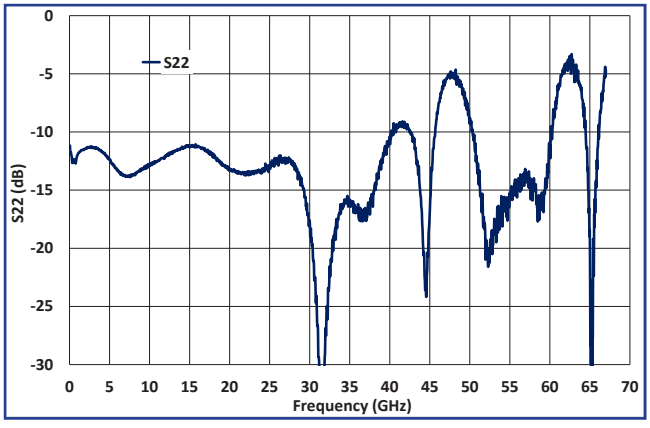
Small Signal Gain



Input Return Loss



Output Return Loss

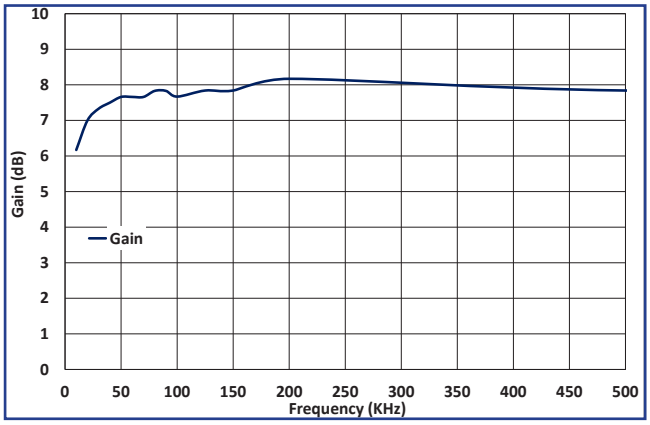


Typical Performances (Low frequencies / connectorized module)

Connectorized module description: VWA0000980AA is a VWA5000083AA die integrated in a V connector package.

- Tamb.= +25°C
- V_D = +5V
- V_{G2} external= 1.2V
- I_D= 70mA
- V_{G1_A}= 0V
- Reference plane: V connector

Gain vs Frequency

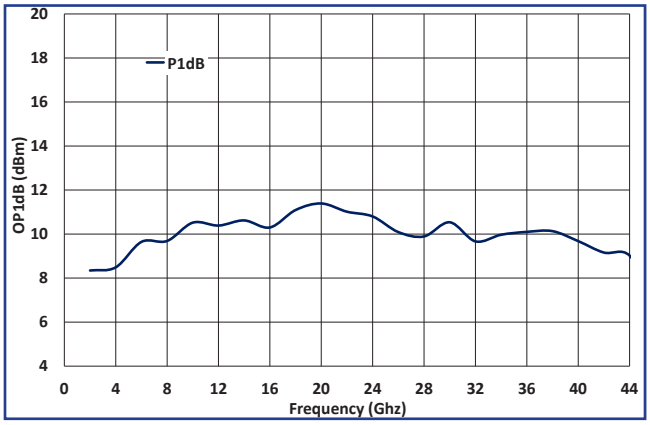


Typical Performances (Power measurement / connectorized module)

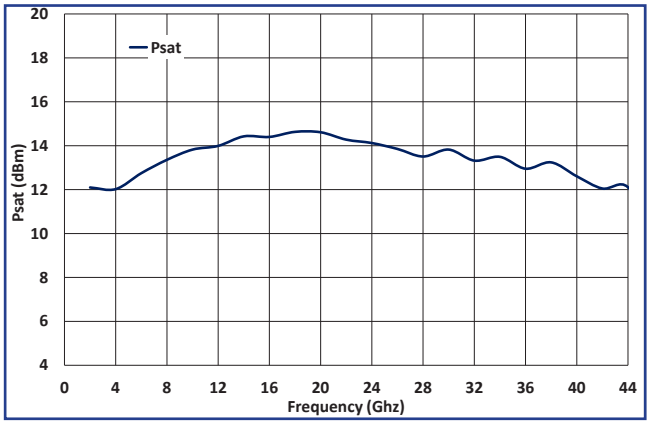
Connectorized module description: VWA0000980AA is a VWA5000083AA die integrated in a V connector package.

- Tamb.= +25°C
- V_D = +5V
- V_{G2} external= 1.2V
- I_D= 70mA
- V_{G1_A}= 0V
- Reference plane: V connector

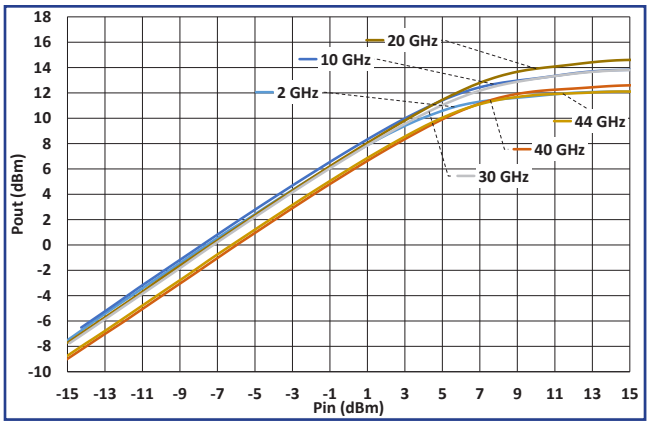
Ouput P1dB



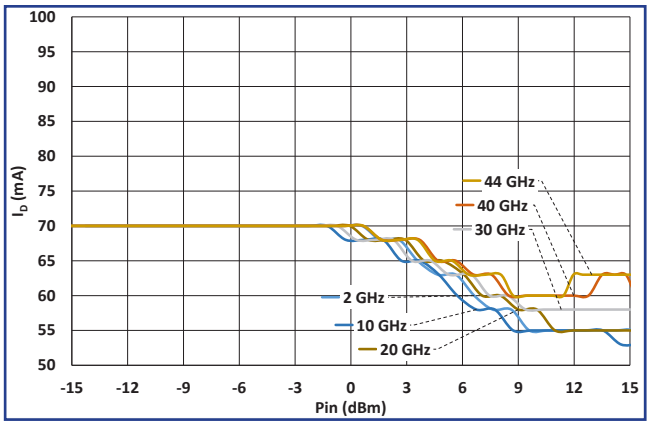
Saturated Output Power



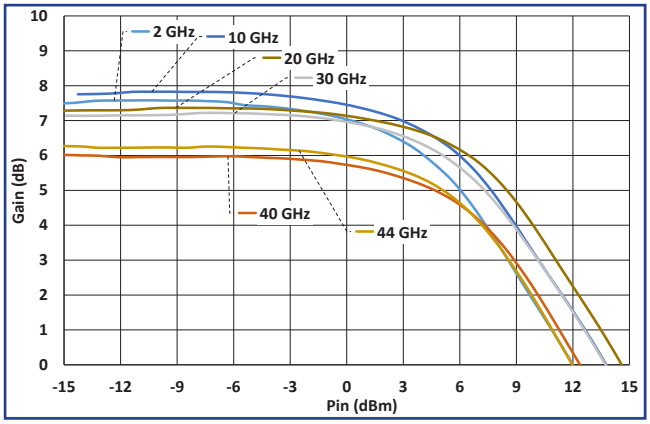
Output Power vs Input Power for various Frequency



Drain Current vs Input Power for various Frequency



Power Gain vs Input Power for various Frequency



Biasing procedure

Switch on

1. Apply V_D= +5V
2. Apply V_{G2}= +1.4V
(Ignore this step if V_{G2} linked to V_{B2})
3. Apply RF signal

Switch off

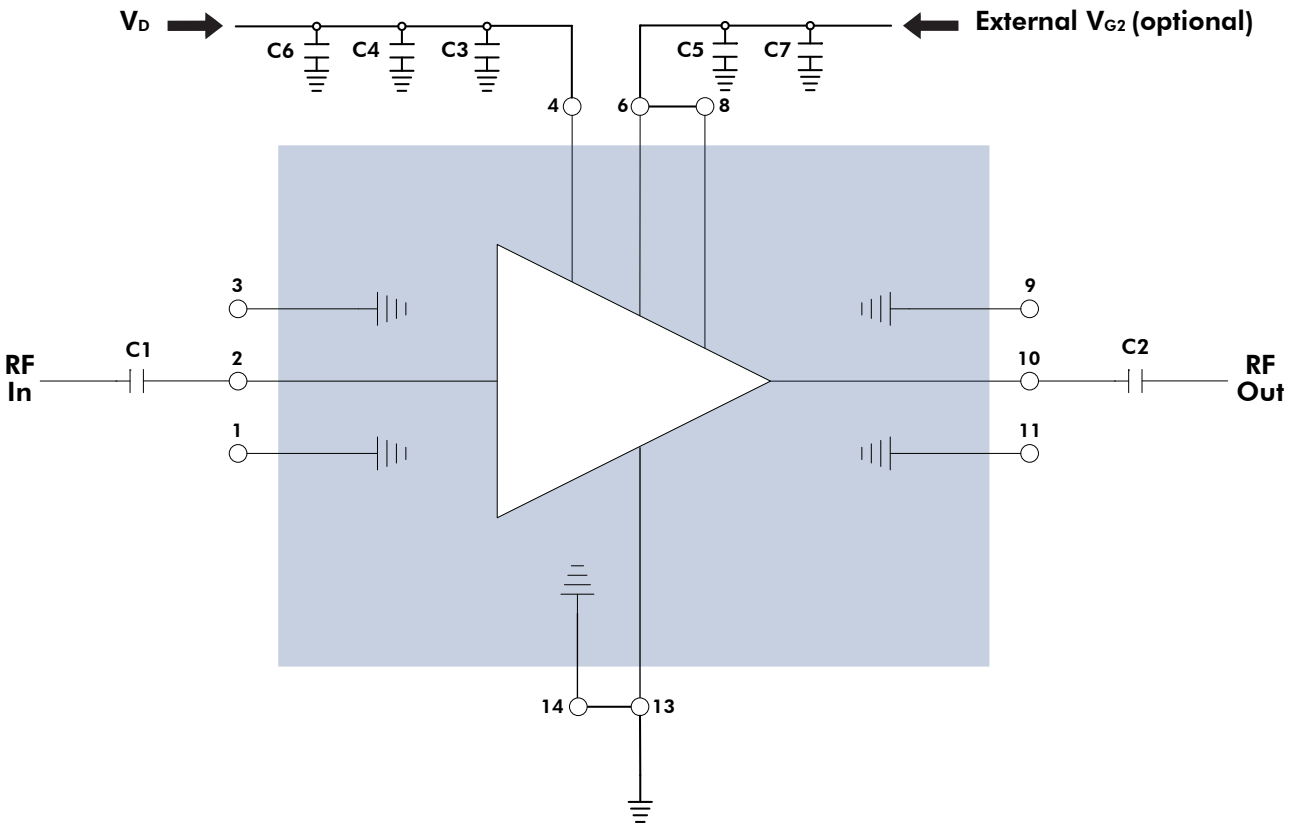
1. Turn off RF signal
2. Reduce V_{G2} to 0V
(Ignore this step if V_{G2} linked to V_{B2})
3. Reduce V_D to 0V
4. Turn off power supply

Application Circuit

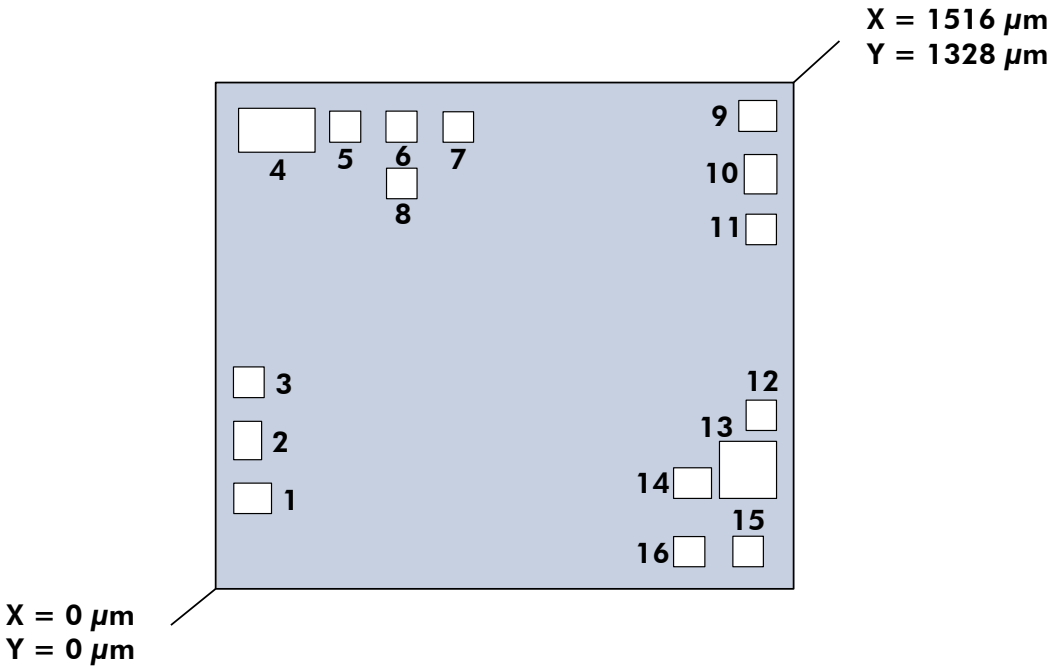
- C1, C2: external DC-BLOCK
- C3 = 150pF
- C4, C5: 1nF
- C6, C7: 1µF
- PAD 6 to PAD 8: wire bond
- PAD 13 to PAD 14: wire bond

C3, C4, C5 should be MIM capacitors and must be placed as close as possible to the die access.

- V_{G2} embedded bias optional: V_{G2} linked to V_{B2}. The PAD 6 must be linked to the PAD 8.
- Otherwise do not connect PAD 6 to PAD 8 . Apply biasing voltage on V_{G2} to PAD 6.



Die Layout



Pinout and Bonding Pad Coordinates

Die Pin Out				
Pad	**X (µm)**	**Y (µm)**	**Size (µm x µm)**	**Function**
1	97	239	100x80	GND
2	84	388	80x100	RF In
3	84	538	80x800	GND
4	160	1203	200x115	V_D
5	340	1203	80x80	V_{B1}
6	488	1211	80x80	V_{G2}
7	636	1211	80x80	Decoupling Cap A
8	488	1063	80x80	V_{B2}
9	1422	1239	100x80	GND
10	1429	1089	80x100	RF Out
11	1431	941	80x80	GND
12	1431	455	80x80	V_LIN
13	1396	311	150x150	V_{G1_A}
14	1251	276	100x80	GND
15	1396	97	80x80	V_{G1_B}
16	1243	97	80x80	Decoupling Cap B

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

Ordering Information

Product Code	Definition
VWA 5000083AA	DC To 70GHz / 8dB Gain / 12dBm P_{SAT}

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

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