Low Noise Amplifier

8 to 12GHz - 19dB - 1.0dB NF Die Single Bias

DATA SHEET **VWA 5001134 AA**

General Description

The **VWA 5001134 AA** is a low noise amplifier MMIC operating in the frequency range 8 to 12GHz.

The device has a linear gain of 19dB and a typical noise figure of 1.0dB. Typical operating supply current is only 30mA with a supply voltage at +3V.

It is manufactured on a PHEMT Technology and is especially suited for radar and for telecommunication applications.

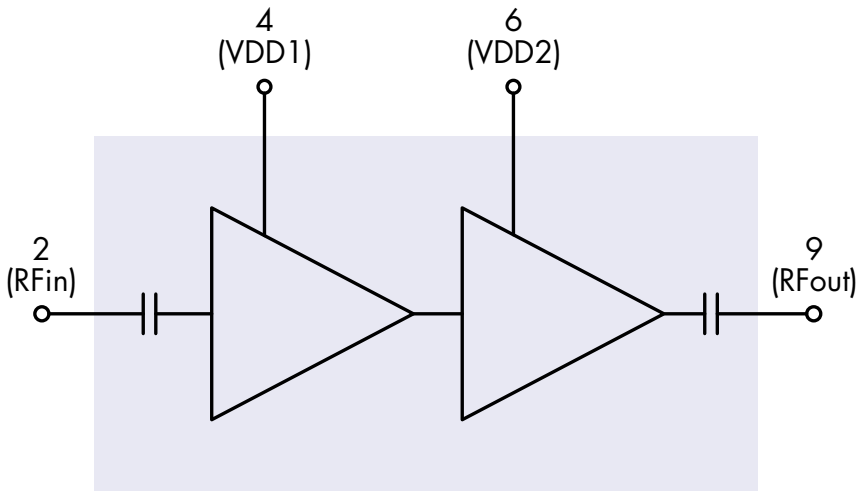
Features

- Operating frequency range: 8 to 12GHz
- Gain: 19dB
- Noise figure: 1.0dB
- Gain Flatness: +/- 0.7dB
- Input Return Loss: -10dB typ.
- Output Return Loss: -12dB typ.
- Power supply: 30mA @ +3V
- Die Size: 1.4 x 1.4 x 0.1mm

Applications

- **Radar**
- **Test and measurement**
- **Telecommunications**

Functional Block Diagram & Pins Assignment



Pin number	Function
2	RF in
4	VDD1
6	VDD2
9	RF out

Electrical Specifications

Test conditions unless otherwise noted:

• IDD = IDD1 + IDD2 = 30mA • VDD = VDD1 = VDD2 = +3V • T_{amb} = +25°C

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	8		12	GHz
G	Linear gain		19		dB
ΔG	Small signal gain flatness		+/-0.7		dB
NF	Noise Figure		1.0		dB
OP1dB	Output power at 1dB compression		7		dBm
Psat	Saturated Output Power		9		dBm
S11	Input Return loss		-10		dB
S22	Output Return loss		-12		dB
VDD1_2	Operating supply voltage		+3		V
IDD	Supply current		30		mA

Absolute Maximum Ratings

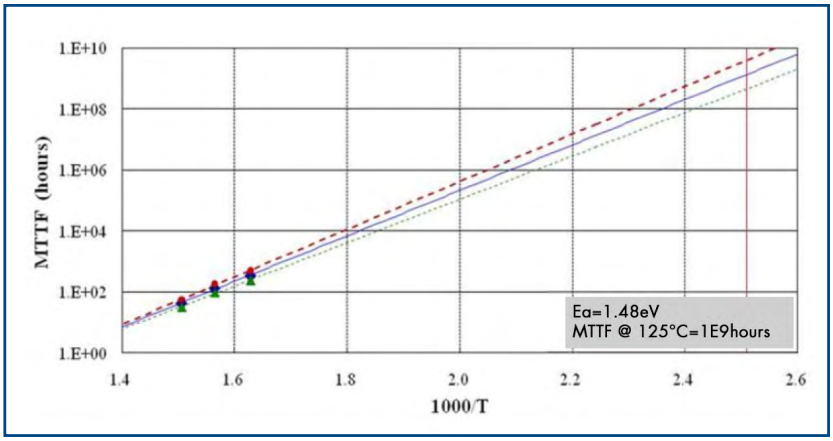
Symbol	Maximum Ratings	Min	Max	Unit
VDD1_2	Drain voltage		+4	V
Pin	CW Input Power		+10	dBm
Tst	Storage temperature	-55	+125	°C
Top	Operating temperature	-40	+85	°C
Tch	Channel temperature		+150	°C

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

MTTF (Provided by Foundry)

The values shown here are calculated, only to be used as a guideline and represent reliability information under Vds=+5V and drain current of 267mA/mm.

0.15µm Low noise pHEMT
(PL15-10) / MTTF Test Arrhenius Plot



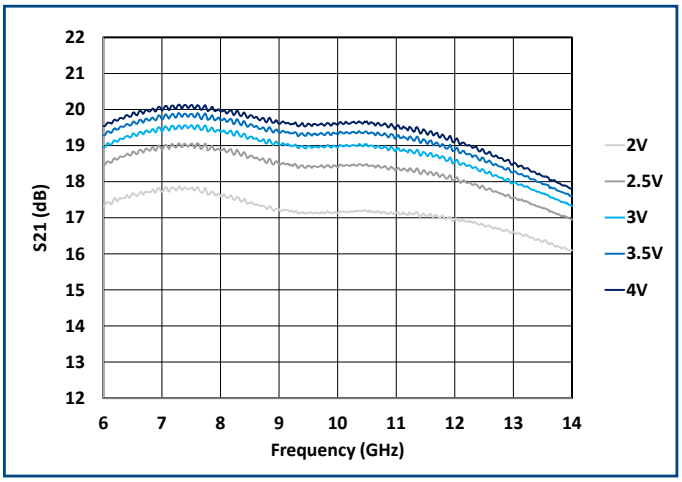
10% failure line : MTTF @ 125C=4.7E8
50% failure line : MTTF @ 125C=1E9
90% failure line : MTTF @ 125C=4.1E9

Typical performances (Board measurements)

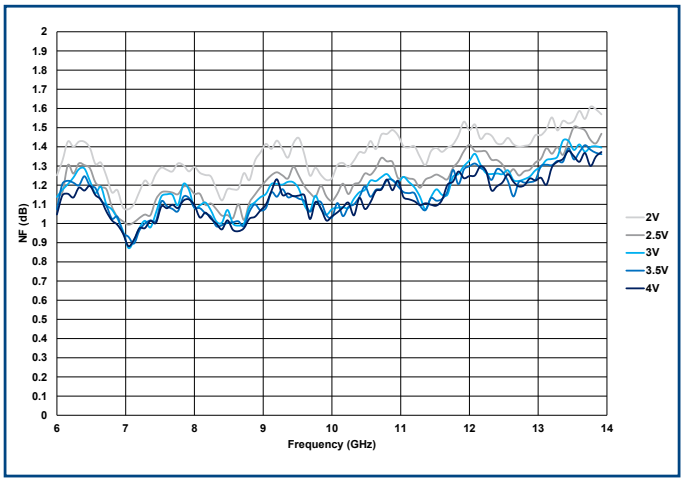
Measurement conditions otherwise noted:

- Tamb = +25°C
- VDD = VDD1 = VDD2 = +3V
- Typically, IDD = IDD1 + IDD2 = 30mA

Small signal Gain (dB)

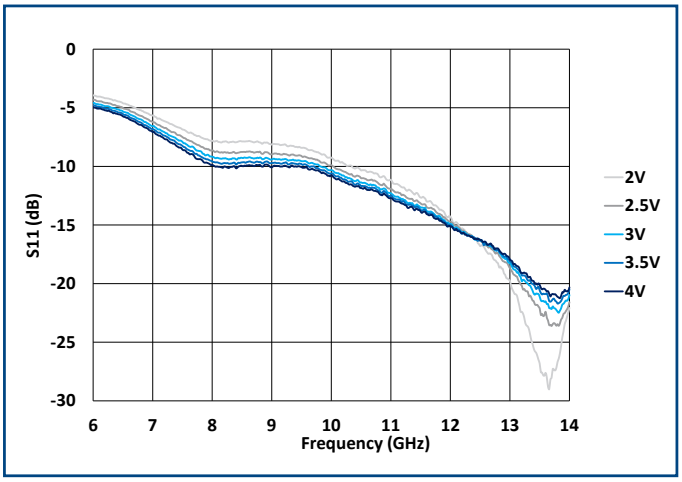


Noise Figure (dB)*

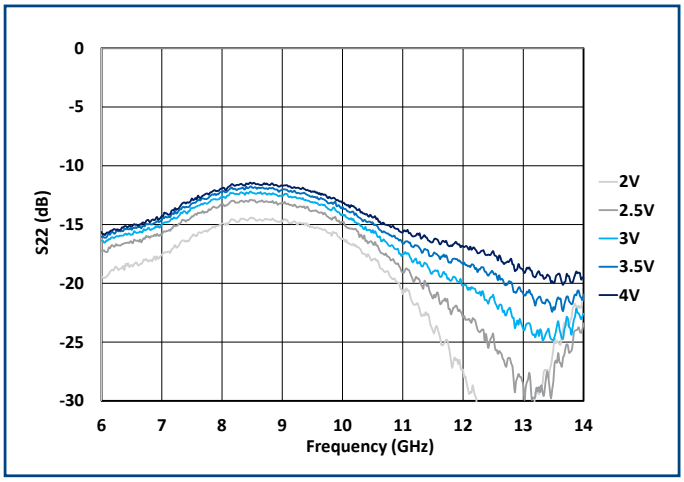


**Measurement accuracy for noise figure is +/- 0.2 dB.*

Input Return Loss (dB)

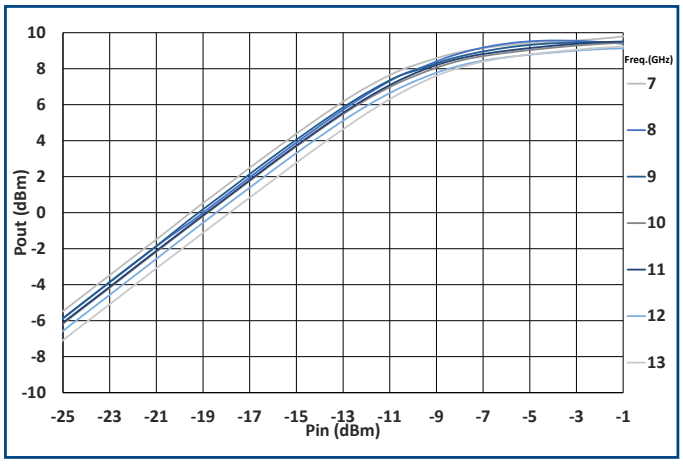


Output Return Loss (dB)

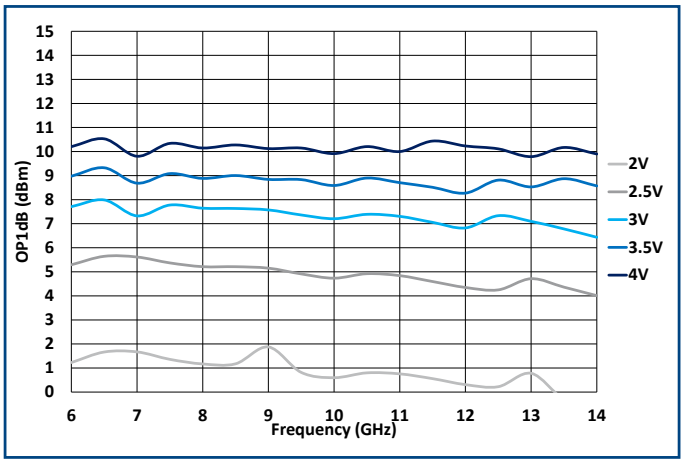


Typical performances (Board measurements)

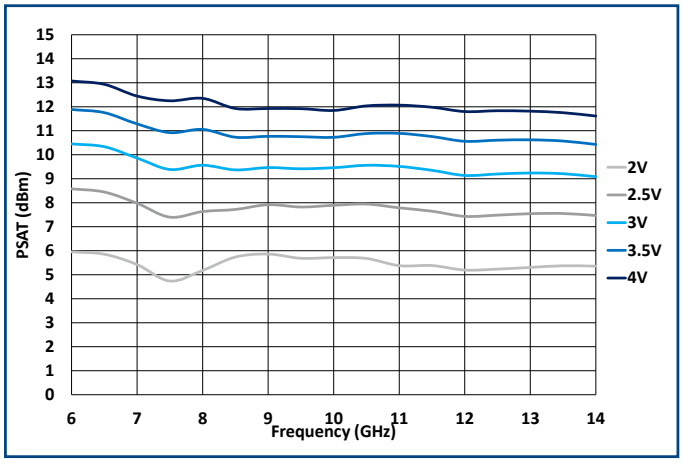
Output power VS Input Power @ VDD = 3V



P1dB vs Frequency



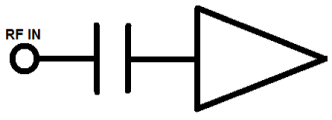
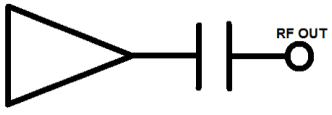
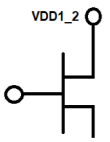
Psat vs Frequency



IDD vs VDD

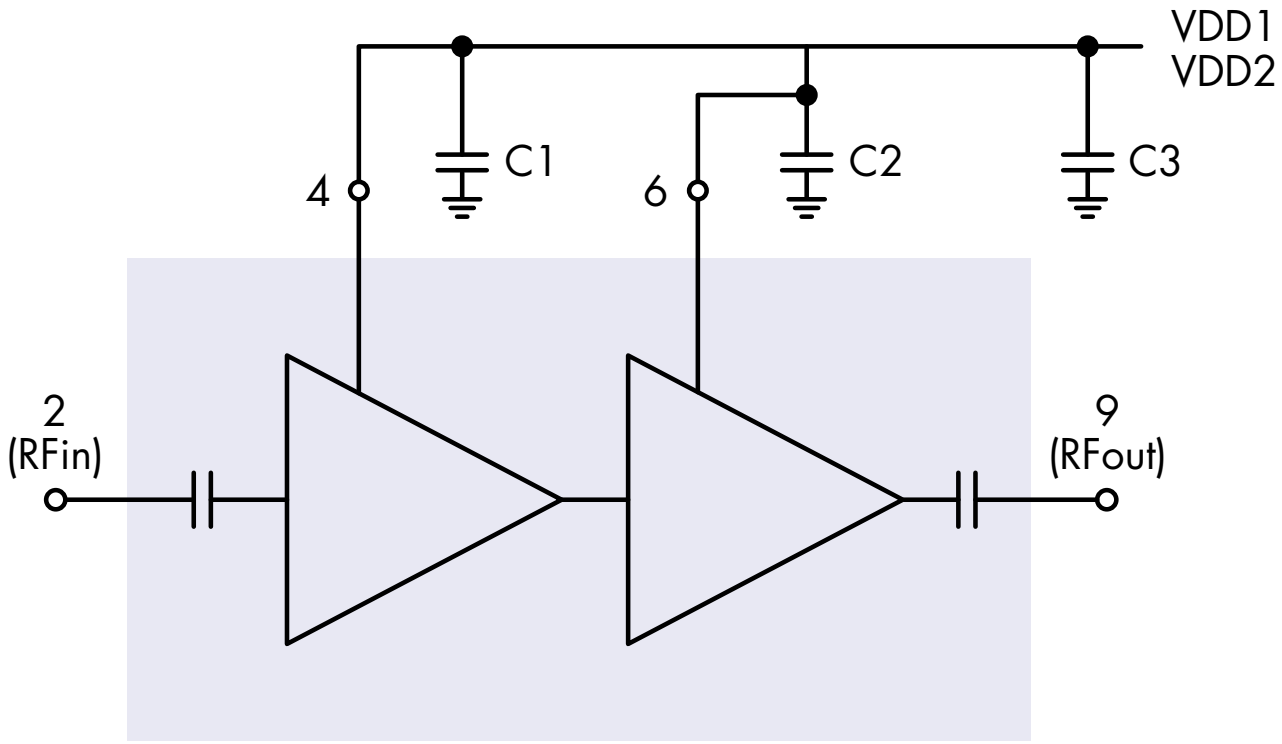
VDD	IDD
2V	23mA
2.5V	27mA
3V	30mA
3.5V	34mA
4V	38mA

Pin description

Pin number	Name	Description	Electrical interface
2	RFin	AC coupled, amplifier input access. Internally matched 50 Ohms.	
9	RFout	AC coupled amplifier output access. Internally matched 50 Ohms.	
4, 6	VDD1, VDD2	1st stage and 2nd stage drain biasing access	
Die bottom	GND	Die Bottom must be connected to RF and DC Ground	

Application circuit

- C1 and C2 = 100 pF MIM capacitor (close to the die)
- C3 = 1 µF SMD capacitor 0402



Biasing procedure

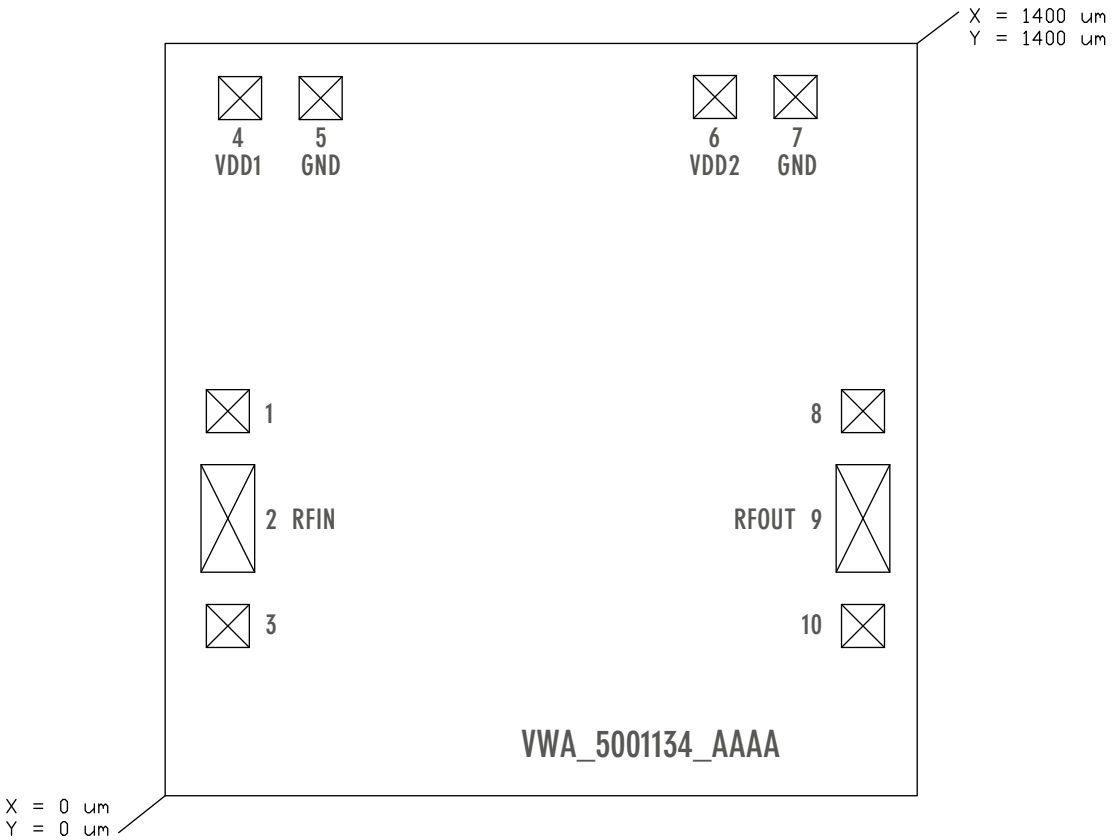
Switch on

1. Set VDD1, VDD2 to +3V
2. Turn RFin ON

Switch off

1. Turn RFin OFF
2. Decrease VDD1, VDD2 to 0V

Die Layout

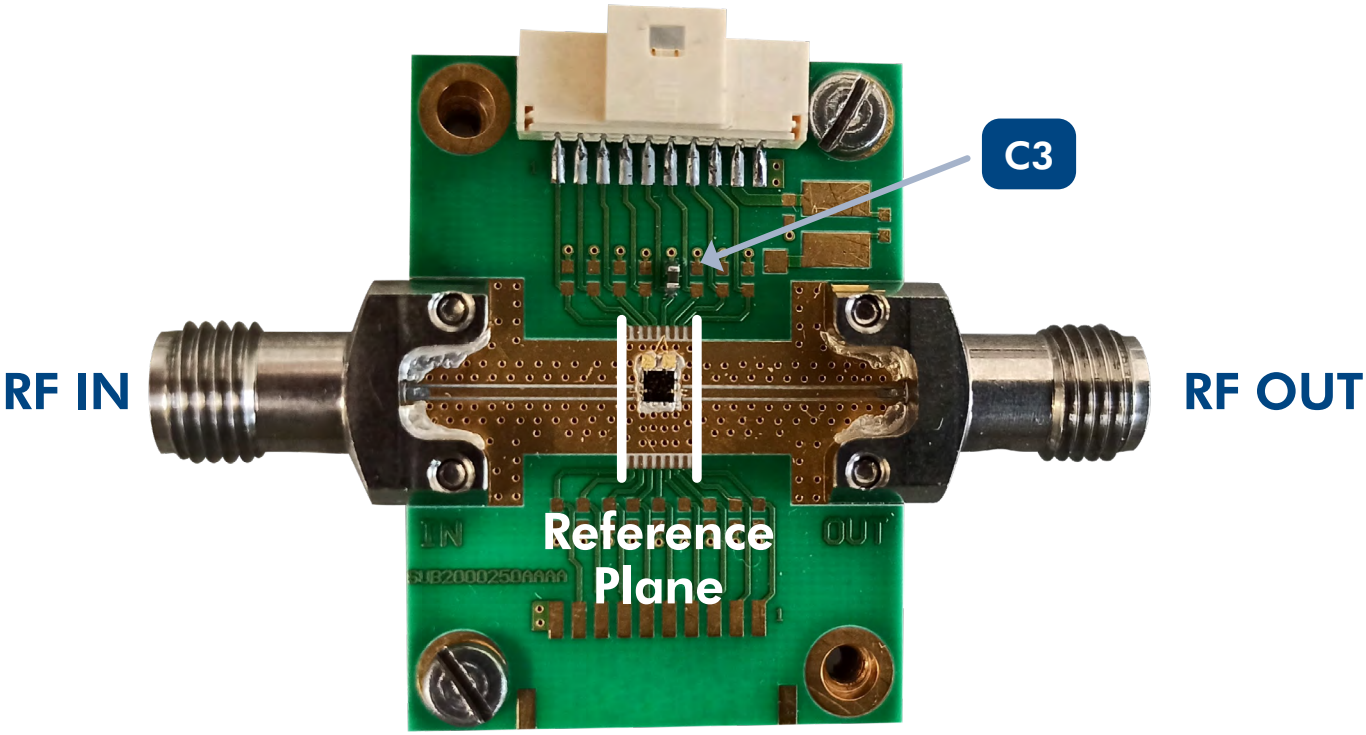


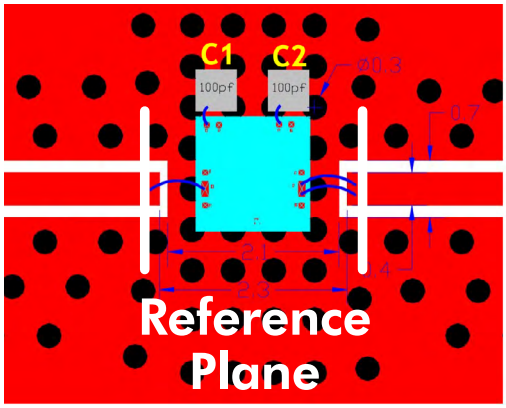
Die thickness = 100µm
Die bottom must be connected to ground (RF and DC)

Die Pinout

Pad number	Pad center		Size (µm x µm)	Name	Function
	X (µm)	Y (µm)			
1	117	716	80 x 80	Gnd	
2	117	516	100 x 200	RFin	RF Input
3	117	316	80 x 80	Gnd	
4	139	1299	80 x 80	VDD1	Drain Bias
5	289	1299	80 x 80	Gnd	
6	1023	1301	80 x 80	VDD2	Drain Bias
7	1173	1301	80 x 80	Gnd	
8	1299	716	80 x 80	Gnd	
9	1298	516	100 x 200	RFout	RF Output
10	1299	316	80 x 80	Gnd	

Board layout





Substrate : RO4350B (Ɛr = 3.48), 0.254mm thickness.

Measurements on connectorized structure. Small signal gain (S21) and Noise figure are de-embedded at reference plane (see drawing above)

Note: Multiple vias should be employed under die to minimize inductance and thermal resistance

- C1, C2: 100pF MIM capacitor
- RF In : 1 Gold Wire (25µm diameter Au)
- RF Out : 2 Gold Wires (25µm diameter Au each)
- C3 : SMD 1µF 0402 capacitor

Ordering Information

Product Code	Definition
VWA 5001134 AA	8 to 12GHz – 19dB – 1.0dB NF Low Noise Amplifier

Associated Material

Product Code	Definition
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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