Vectrawave
RF & Millimeter Wave MMIC Design

8 to 12GHz - 19dB - 1.0dB NF
Single bias Low Noise Amplifier

VM134Q

General Description

The VM134Q is a single bias Low Noise Amplifier designed to operate from 8 to 12GHz.

The device is packaged in a 3x3 mm 16 lead Plastic Surface Mount Package (ROHS).
This component uses VM134D Vectrawave MMIC.

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.

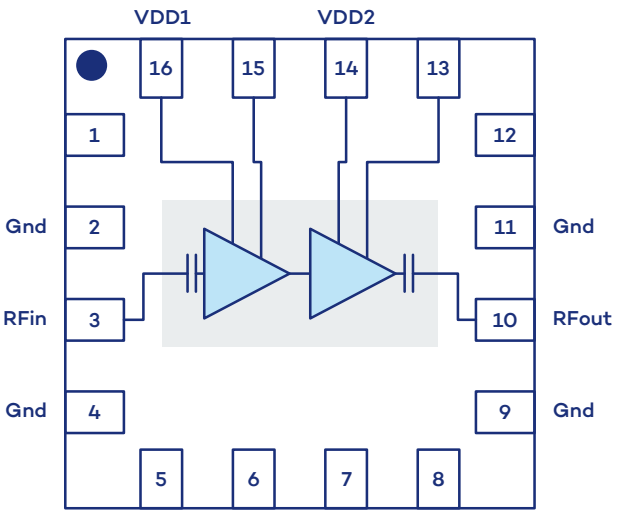
Features

Frequency range	**8 – 12GHz**
Gain	**19dB**
Noise figure	**1.0dB**
Gain flatness	**+/-0.5dB**
Input return loss	**-10dB (Typical)**
Output return loss	**-12dB (Typical)**
Power supply	**30mA @ +3V**
Package	**QFN 3 x 3mm, 16 Lead**

Applications

- Radar
- Test and measurement
- Telecommunications

Pins Assignement & Functional Block Diagram



Function	Pin number
NC	1/5/6/7/8/12/13/15
Gnd	2/4/9/11
RF in	3
RF out	10
V_{DD2}	14
V_{DD1}	16

Electrical Specifications

Test conditions: unless otherwise noted
- T_{amb} = +25°C
- $I_{DD} = I_{DD1} + I_{DD2}$ = 30mA
- $V_{DD} = V_{DD1} = V_{DD2}$ = +3V

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	8		12	GHz
G	Linear gain		19		dB
ΔG	Small signal gain flatness		+/-0.5		dB
NF	Noise Figure		1.0		dB
OP1dB	Output power @1dB compression		7		dBm
Psat	Saturated Output Power		9		dBm
S11	Input return loss		-10		dB
S22	Output return loss		-12		dB
V_{DD1_2}	Operating supply voltage		+3		V
IDD	Supply current		30		mA

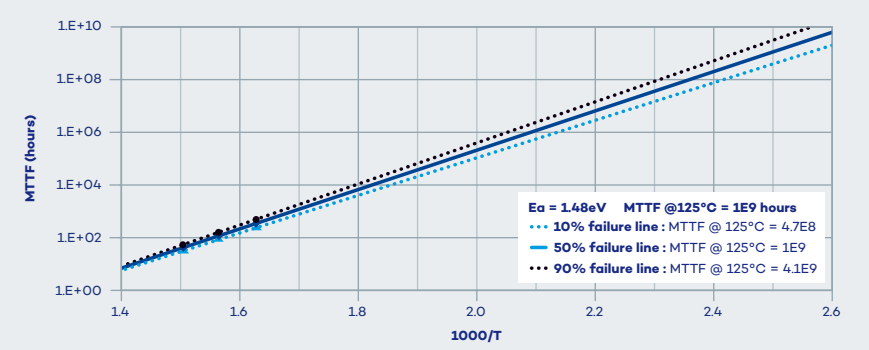
Absolute Maximum Ratings

Symbol	Parameter	Values	Unit
V_{DD1_2}	Drain voltage	+4	V
Pin	CW Input Power	+10	dBm
Tstg	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)

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

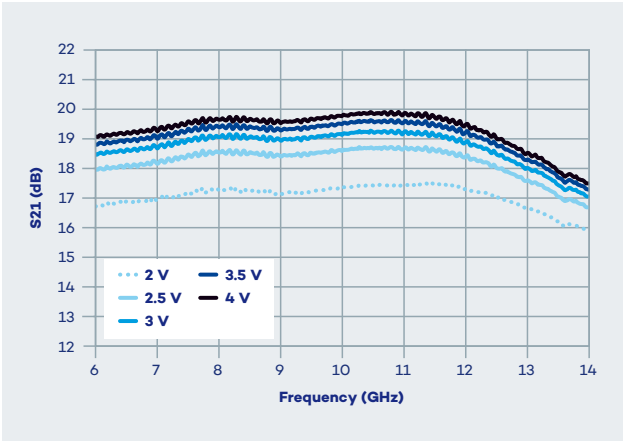


The values shown here are calculated, only to be used as a guideline and represent reliability information under Vds = +5V and drain current of 267mA/mm.

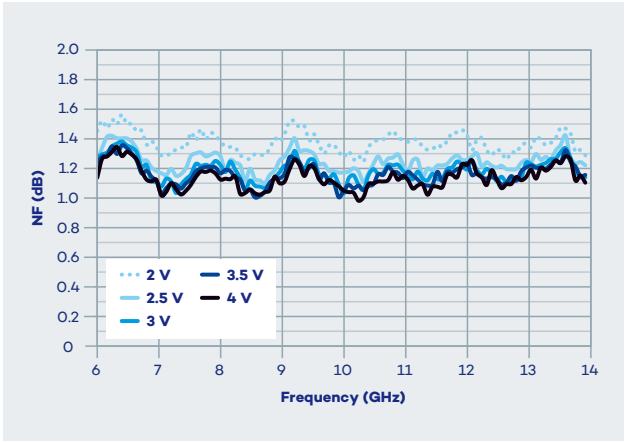
Typical Performance
(Board Measurements)

Test conditions: unless otherwise noted
- Reference plane: Component access
- T_{amb} = +25°C

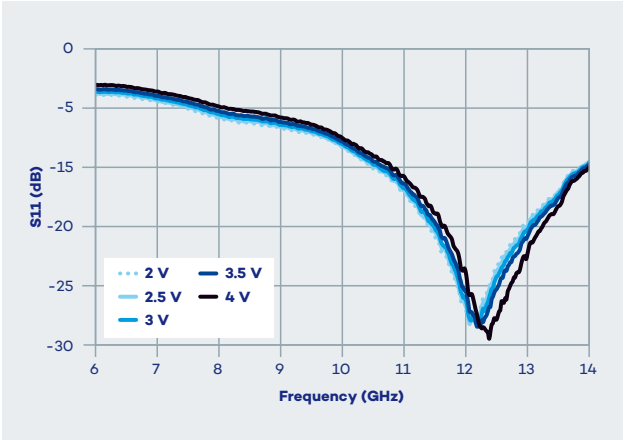
Small Signal Gain vs V_{DD}



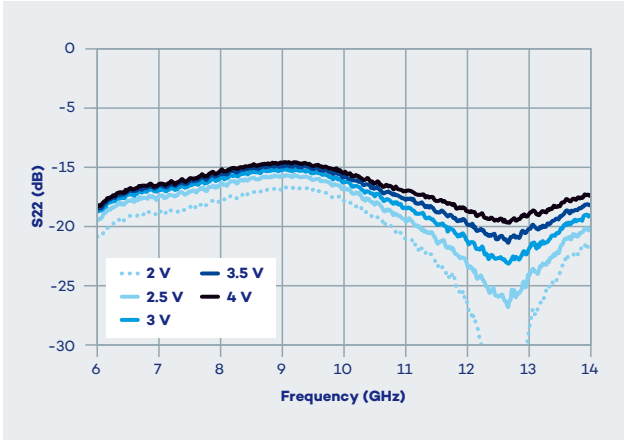
Noise Figure vs V_{DD}



Input Return Loss vs V_{DD}



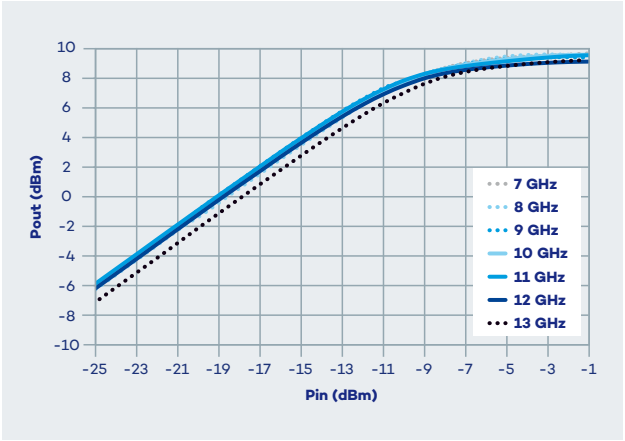
Output Return Loss vs V_{DD}



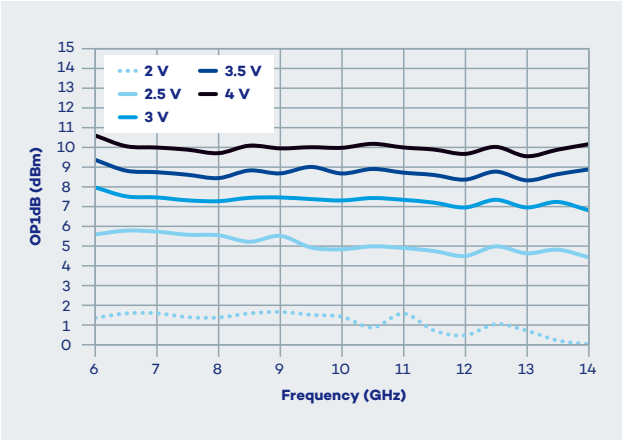
Typical Performance
(Board Measurements)

Test conditions: unless otherwise noted
- Reference plane: Component access
- T_{amb} = +25°C
- I_{DD} = 30mA
- V_{DD} = +3V

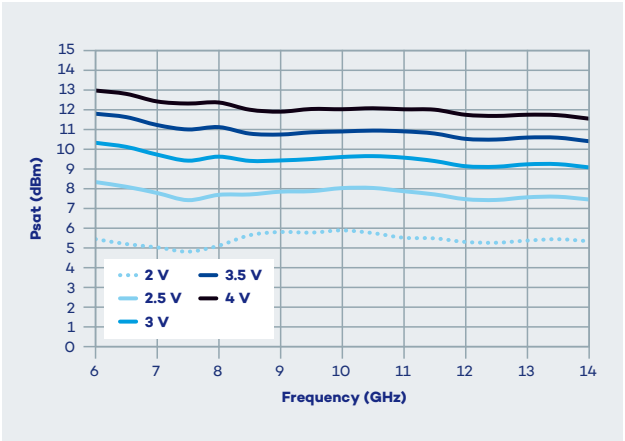
Pout vs Pin vs Frequency



P1dB vs Frequency vs V_{DD}



P_{SAT} vs Frequency vs V_{DD}

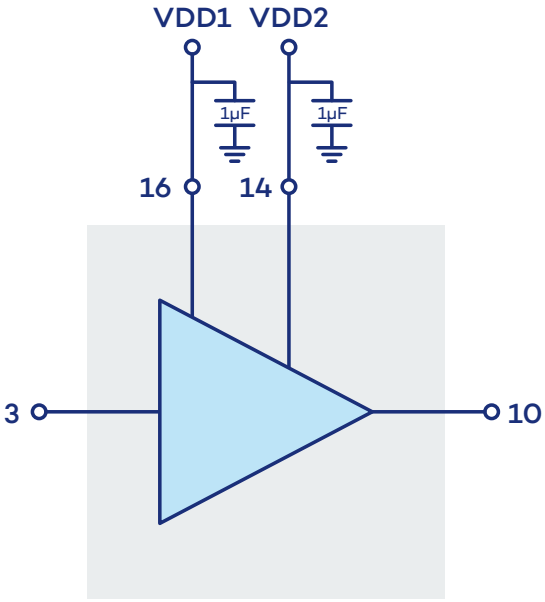


V_{DD} vs I_{DD}

V_{DD}	I_{DD}
2.0V	23.5mA
2.5V	27.0mA
3.0V	30.0mA
3.5V	34.0mA
4.0V	38.0mA

Application circuit

1 µF SMD Capacitors as close as possible to the QFN.



Bias-up procedure

1. Apply V_{DD1} = +3V
2. Apply V_{DD2} = +3V
3. Turn on RF signal

Bias-down procedure

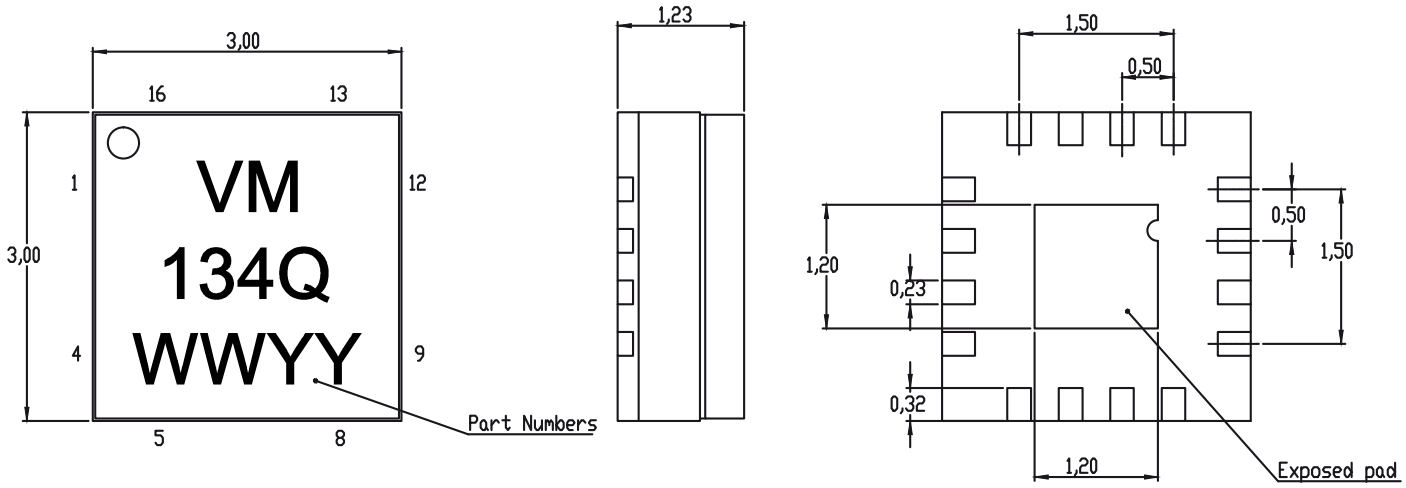
1. Turn off RF signal
2. Reduce V_{DD2} to 0V
3. Reduce V_{DD1} to 0V

Pin description

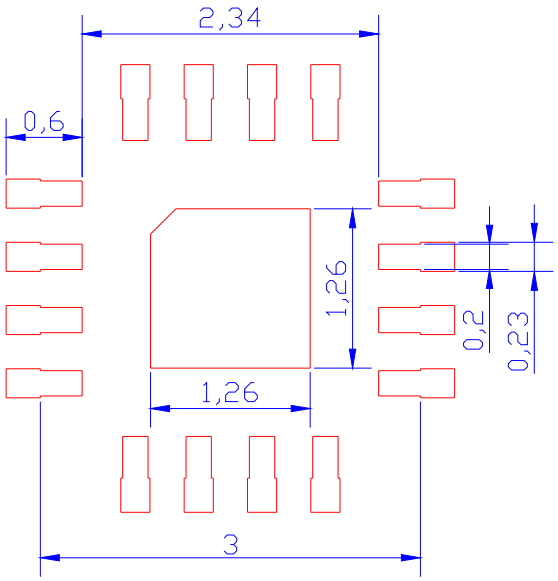
Pin number	Name	Description	Electrical interface
3	RF in	AC coupled, amplifier input access. Internally matched 50Ω.	
10	RF out	AC coupled amplifier output access. Internally matched 50Ω.	
14	V_{DD2}	2nd stage drain biasing access.	
16	V_{DD1}	1st stage drain biasing access.	
Exposed Pad	Gnd	Ground Pad must be connected to RF and DC Ground.	

Mechanical drawing

1QFN exposed PAD must be connected to ground (RF and DC).

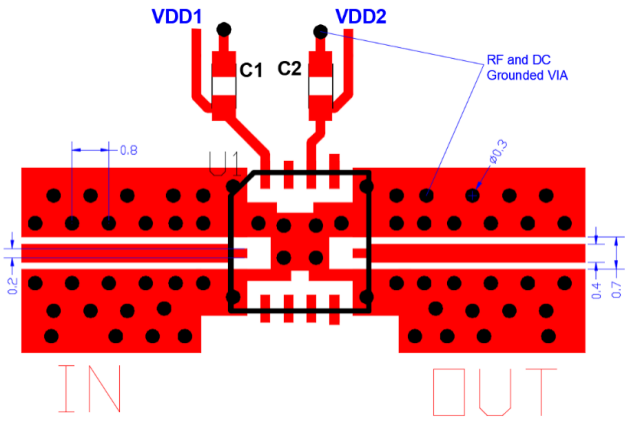


Recommended land pattern



Suggested Board Layout

C1, C2: 0402 1 µF/16V capacitor
Substrate: RO4350B, thickness 0.254mm



Ordering information

Product Code	Parameter
VM134Q	8 to 12GHz - 19dB - 1.0dB NF Single bias Low Noise Amplifier

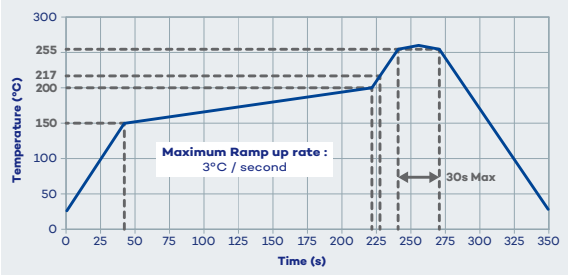
Associated Material

- Packaged die Evaluation Board (packaged die EVB)
- Mechanical files (DXF)
- Measurents files (S2P)

Product Compliance Information

Solderability

Solder Stencil thickness: 127µm
Solder: SAC 305 (ROHS)
Temperature profile example: maximum recommended reflow profile (leadfree)



ESD Sensitivy Rating

Test: Human Body Model (HBM)
Std: JEDEC Standard JESD22-A114

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).

Other 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.com
+33 (0)2 57 63 00 20
sales@vectrawave.com

Vectrawave Device
5, rue de Louis de Broglie
22300 Lannion
France