27 to 32GHz, 1.3dB NF, 26dB Low Noise Amplifier

DATA SHEET PRELIMINARY VM205Q

General Description

The VM205Q is 3 stage Low-Noise amplifier MMIC operating in the frequency range 27 to 32 GHz.
The device is packaged in a 4x4 mm 24 lead Plastic Surface Mount Package (ROHS). This component uses VM205D Vectrawave die.
The device has a linear gain of 26 dB and a typical noise figure of 1.3 dB. Output RF power is 20 dBm for a biasing current of 78 mA at 3.5V supply voltage.
It is manufactured with a 100nm pHEMT GaAs process and is especially suited for radar and for telecommunication applications.

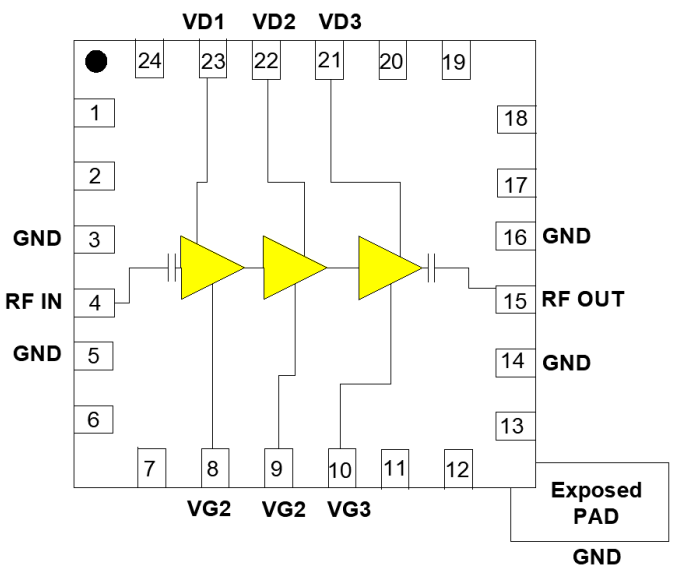
Typical Features

- Operating frequency range: 24 to 30 GHz
- Gain: 26 dB
- Noise figure: 1.3 dB
- P1dB = 20dBm - Psat= 21dBm
- Gain Flatness: +/- 1 dB
- Input Return Loss: -8 dB typ.
- Output Return Loss: -10 dB typ.
- Power supply: 78 mA @ V_D=+3.5 V, V_G=-0.58V typ.
- Package Used: QFN 4x4 mm 24 Lead

Applications

- Radar
- Test and Measurement
- Telecommunications

Functional Block Diagram



Function	Pin Number
NC	1,2,6,7,11,12,13, 17,18,19,20,24
GND	3,5,14,16, exposed pad
RFIN	4
V_{G1}	8
V_{G2}	9
V_{G3}	10
RFOUT	15
V_{D3}	21
V_{D2}	22
V_{D1}	23

Electrical Specifications

Operating conditions unless otherwise noted:

- $V_D=V_{D1}=V_{D2}=V_{D3}$=+3.5V
- $V_G=V_{G1}=V_{G2}=V_{G3}$=-0.58V
- $I_D=I_{D1}+I_{D2}+I_{D3}$=78mA
- Tamb.= 25 ° C

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	27		32	GHz
G	Linear gain		26		dB
P1dB	Output power at 1dB gain compression		20		dBm
Psat	Output saturated power		21		dBm
NF	Noise Figure		1.3		dB
PAE	Power Added Efficiency		26		%
S11	Input Return loss	-8	-10		dB
S22	Output Return loss		-12		dB
$V_{D1\_2\_3}$	Operating supply voltage		+3.5		V
I_D	Supply current		78		mA
$V_{G1\_2\_3}$	Gate voltage	-0.6	-0.58	-0.4	V

Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
V_D	Drain voltage		+8	V
I_D	Supply Current	0	190	mA
V_G	Gate Voltage	-2	0	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.

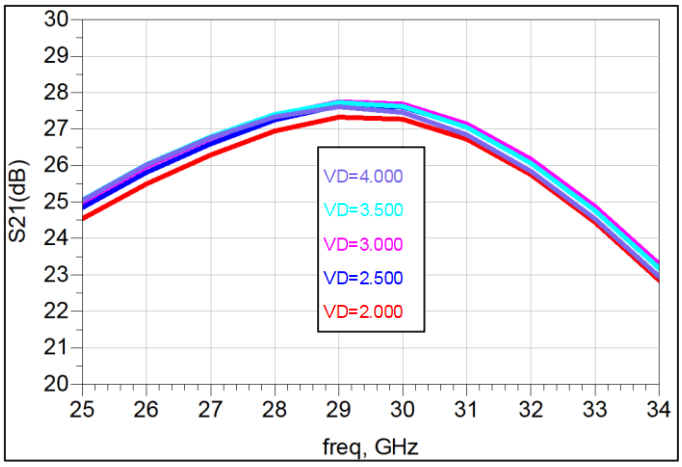
Typical Performance (Post-layout Simulations)

Small signal performances Versus Drain Voltage

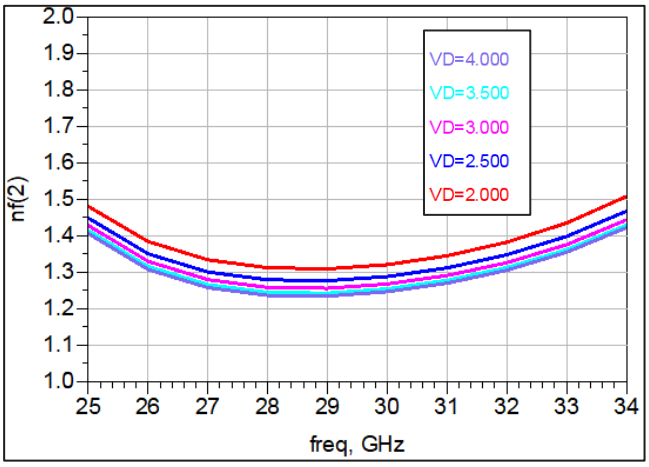
Simulation conditions unless otherwise noted:

- $V_D=V_{D1}=V_{D2}=V_{D3}$=+3.5V
- $V_G=V_{G1}=V_{G2}=V_{G3}$=-0.58V
- $I_D=I_{D1}+I_{D2}+I_{D3}$=78mA
- Tamb.= 25 ° C

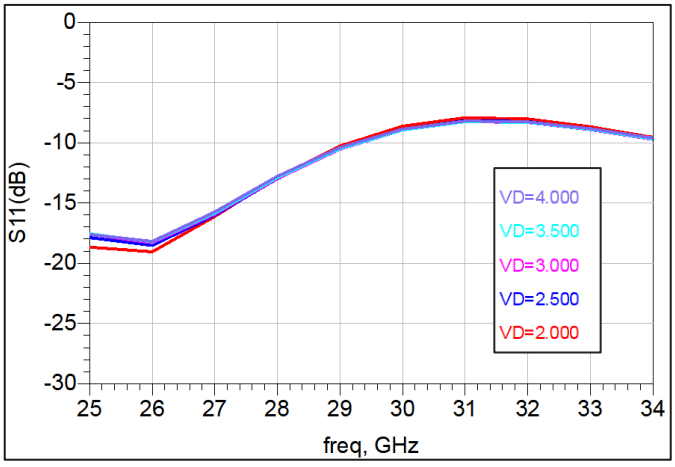
Small Signal Gain(dB)



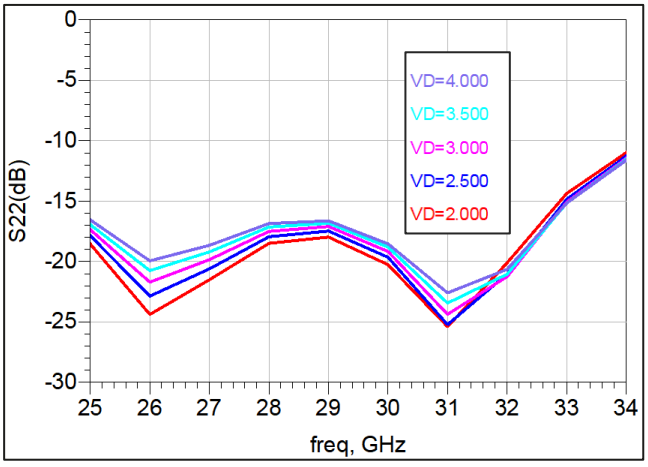
Noise Figure(dB)



Input Return Loss(dB)



Output Return Loss(dB)



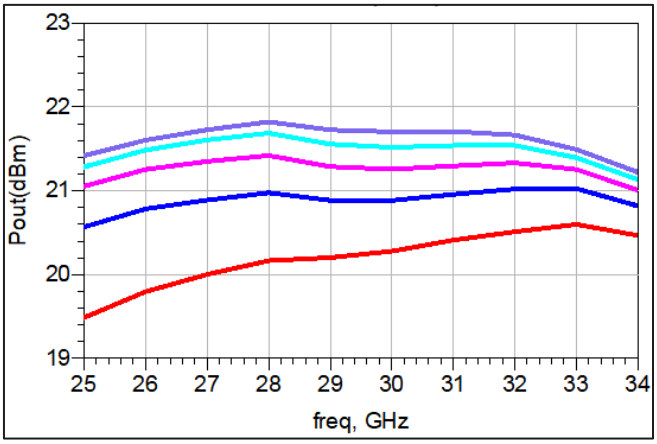
Typical Performance (Post-layout Simulations)

Small signal performances Versus Gain Compression Level

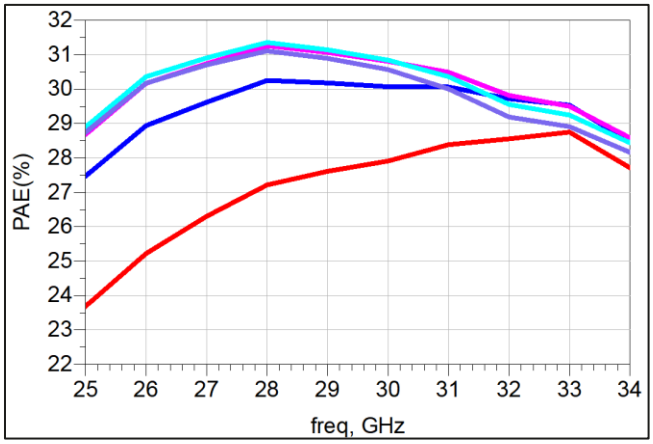
Simulation conditions unless otherwise noted:

- $V_D=V_{D1}=V_{D2}=V_{D3}=+3.5V$
- $V_G=V_{G1}=V_{G2}=V_{G3}=-0.58V$
- $I_D=I_{D1}+I_{D2}+I_{D3}=78mA$
- Tamb.= 25 ° C

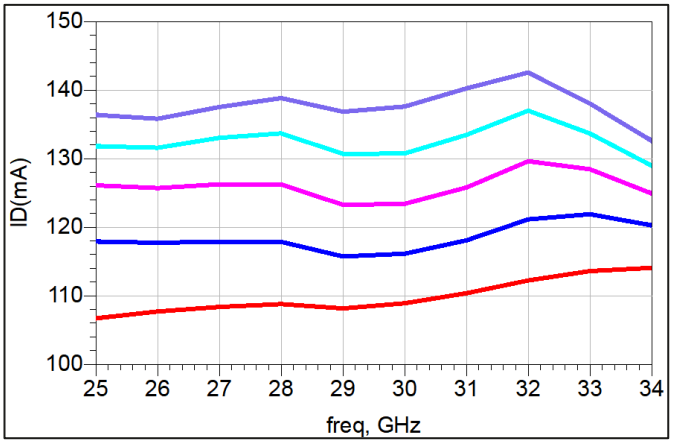
Output Power(dBm)



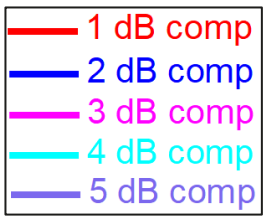
Power Added Efficiency(%)



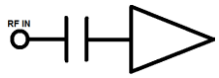
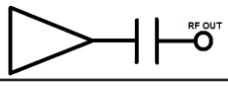
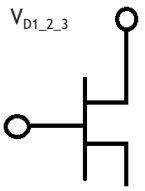
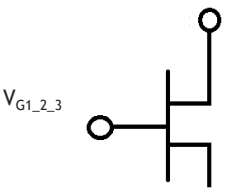
Drain Current(mA)



Gain Compression levels

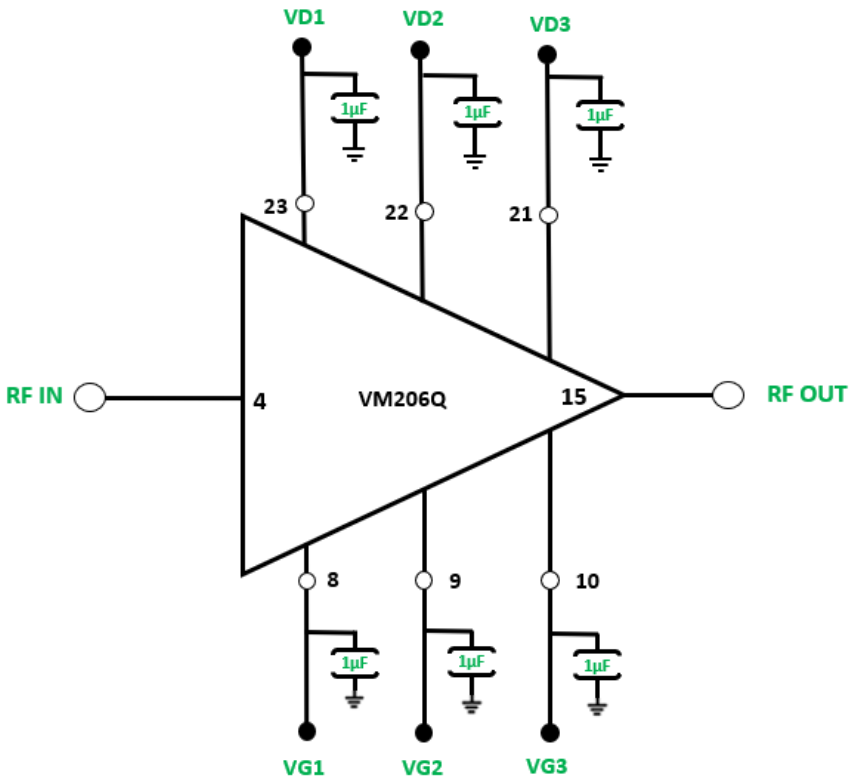


Pin Description

Pin number	Name	Description	Electrical interface
2	RFIN	AC coupled, amplifier input access. Internally matched 50 Ohms.	
11	RFOUT	AC coupled amplifier output access. Internally matched 50 Ohms.	
4, 6, 9	V_{D1}, V_{D2}, V_{D3}	1st, 2nd and 3rd stage drain biasing access	
17, 16, 13	V_{G1}, V_{G2}, V_{G3}	1st, 2nd and 3rd stage gate biasing access	
Die Bottom	GND	Die Bottom must be connected to RF and DC Ground	

Pin Description

- µF SMD Capacitors as close as possible to the QFN



Biasing Procedure

Switch On

1. Set V_{G1}, V_{G2} and V_{G3} to -1V,
2. Set V_{D1},V_{D2} and V_{D3} to +3.5V,
3. Increase V_{G1}, V_{G2} and V_{G3} to obtain I_D= 78 mA (V_G =-0.5V Typ.),
4. Turn ON RFIN

Switch Off

1. Turn OFF RFIN
2. Decrease V_{G1}, V_{G2} and V_{G3} to -1V,
3. Decrease V_{D1},V_{D2} and V_{D3} to 0V,
4. Set V_{G1}, V_{G2} and V_{G3} to 0V .

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Ordering Information

Product Code	Definition
VM205Q	27 to 32 GHz, 1.3dB NF, 26dB Low Noise Amplifier in QFN 4x4 24 leads

Associated Material

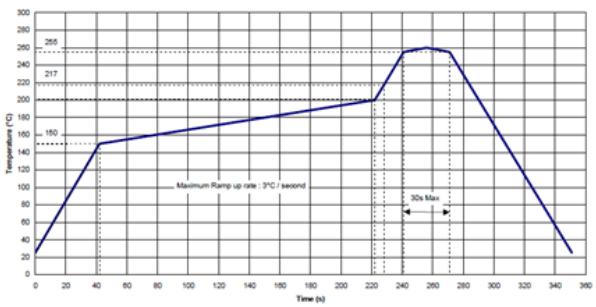
Evaluation Board	Contact factory
Mechanical files (DXF)	Contact factory

Product Compliance information

Solderability :

Solder Stencil thickness : 127µm
Solder : SAC 305 (ROHS)
Temperature profile example:

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:

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