

### VM017D

#### • General Description

The VM017D is a low noise amplifier MMIC die operating in the frequency range 7 to 13GHz.

The device has a typical noise figure of 1.6dB with a typical gain of 19dB.

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

#### • Features

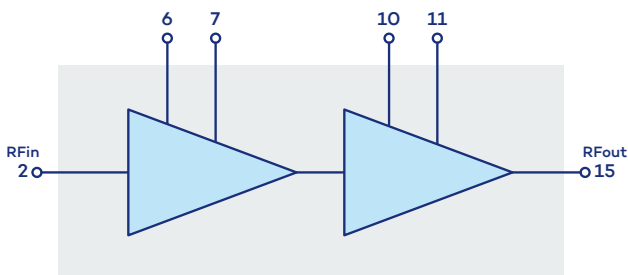
Low Noise pHEMT GaAs Amplifier

Noise Figure	<b>1.6dB</b>
Wide band	<b>7 – 13GHz</b>
Gain	<b>19dB</b>
Gain Flatness	<b>+/- 1dB</b>
Input Return Loss	<b>-12dB</b>
Output Return Loss	<b>-12dB</b>
Power supply	<b>70mA @+5V</b>
Chip size	<b>1.6 x 1.1 x 0.1 (mm)</b>

#### • Applications

- Telecommunications
- Radar Meteo / Survey

#### • Pins Assignment & Functional Block Diagram



Function	Pin number
RF in	2
V <sub>G1</sub>	6
V <sub>D1</sub>	7
V <sub>G2</sub>	10
V <sub>D2</sub>	11
RF out	15

• **Electrical Specifications**

Test conditions: unless otherwise noted

- $T_{amb} = +25^{\circ}C$
- $V_D = +5V$
- $V_G = +5V$

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	7		13	GHz
NF	Noise Figure		1.6		dB
G	Small signal gain		19		dB
$\Delta G$	Small signal gain flatness		+/-1		dB
S11	Input return loss		-12		dB
S22	Output return loss		-12		dB
P1dBc	Output power @1dB compression		10		dBm
$I_{TOTAL}$	Total Drain current		70		mA

• **Environmental parameters**

Symbol	Parameter	Min	Max	Unit
Tst	Storage temperature	-55	+150	$^{\circ}C$
Top	Operating temperature	-40	+85	$^{\circ}C$

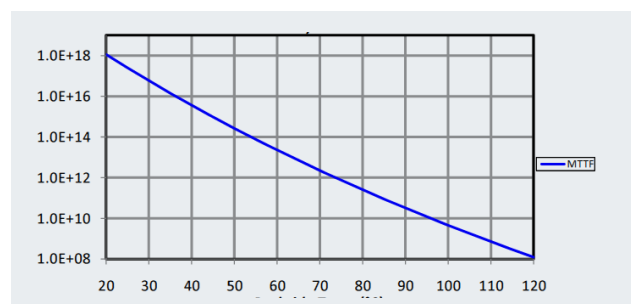
• **Absolute Maximum Ratings**

Symbol	Parameter	Min	Max	Unit
$V_D$	Drain voltage		6	V
$V_G$	Gate voltage		6	V
$I_{TOTAL}$	Supply current		90	mA
Pin	CW input power		+20	dBm
Tprocess	Soldering temperature		300	$^{\circ}C$

Operation above any of these parameters may cause permanent damages. Care should be taken to avoid supply transient and over voltage.

• **MTTF**

The values shown here are calculated, only to be used as a guideline and represent reliability information under  $V_D = +5V$

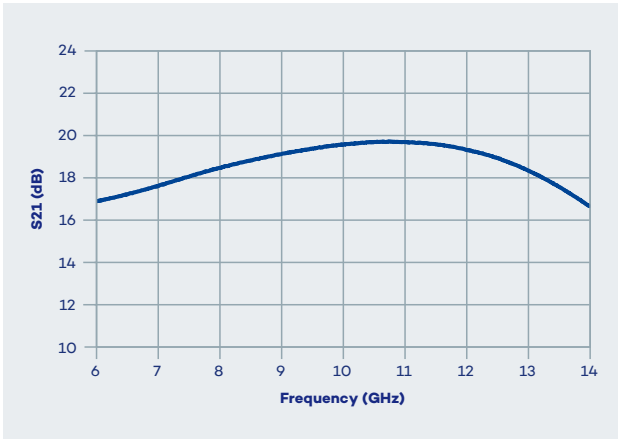


• **Typical Performance**  
(Test Under Probes)

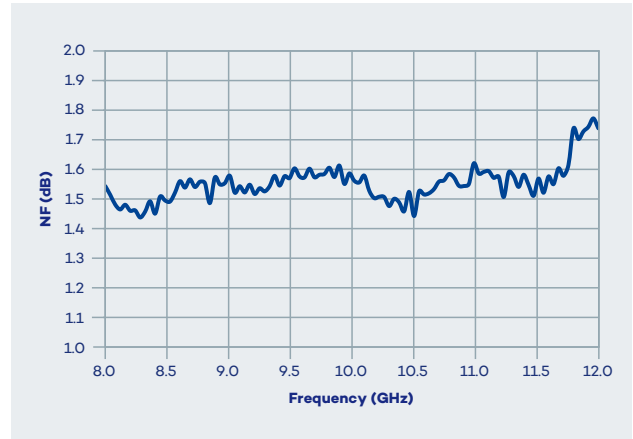
Test conditions: unless otherwise noted

- $T_{amb} = +25^{\circ}\text{C}$
- $V_D = +5\text{V}$
- $V_G = +5\text{V}$
- $I_D = 70\text{mA}$
- $I_G = 70\text{mA}$

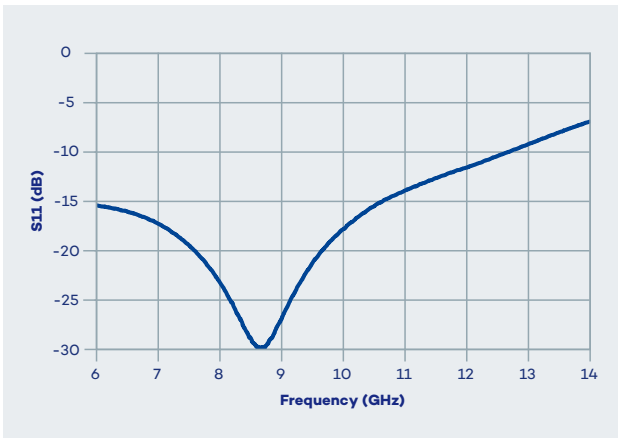
**Small Signal Gain**



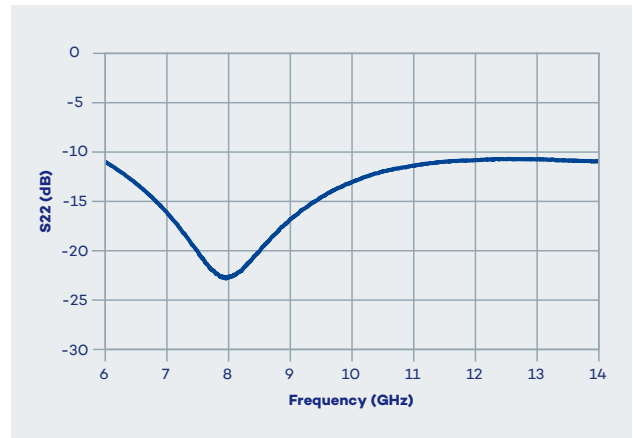
**Noise Figure**



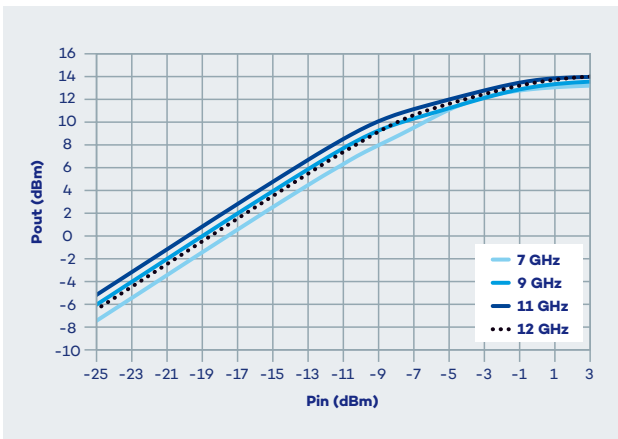
**Input Return Loss**



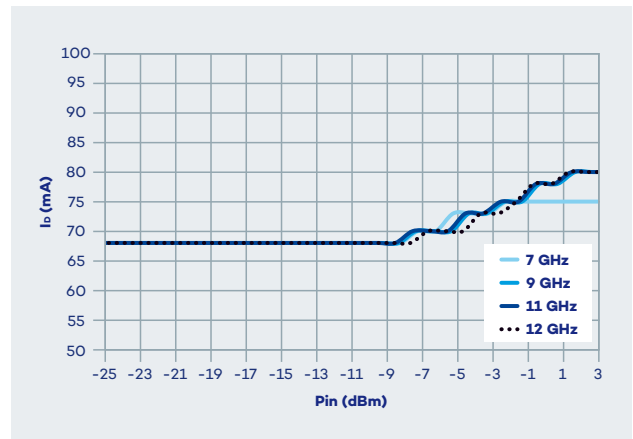
**Output Return Loss**



**Output Power vs Input Power vs Frequency**

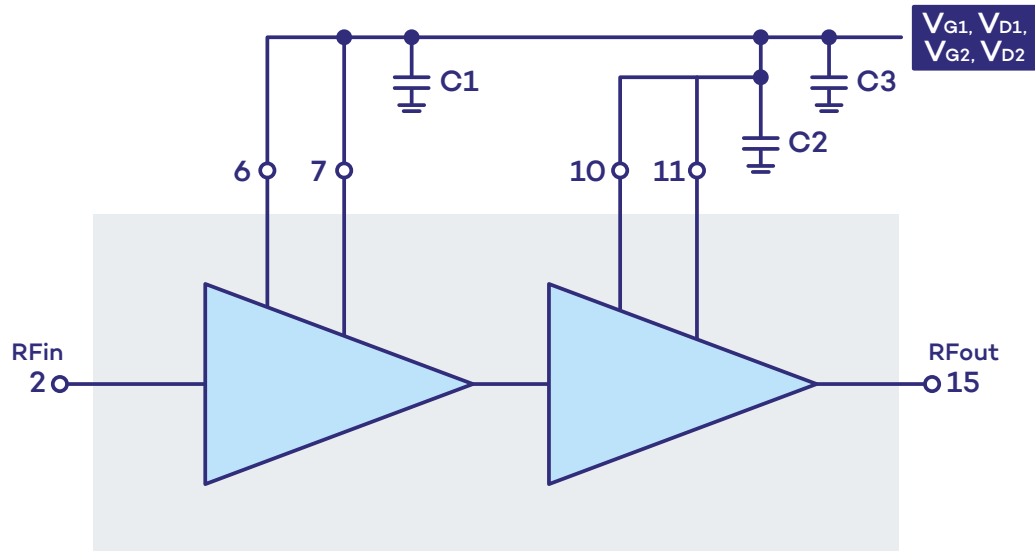


**Drain Current vs Input Power vs Frequency**



## • Application circuit

- C1 to C2 = 100pF MIM capacitor (close to the die)
- C3 = 1 $\mu$ F
- RF in and RF out : 2 gold wires  
(wedges 25 $\mu$ m, length < 300 $\mu$ m)



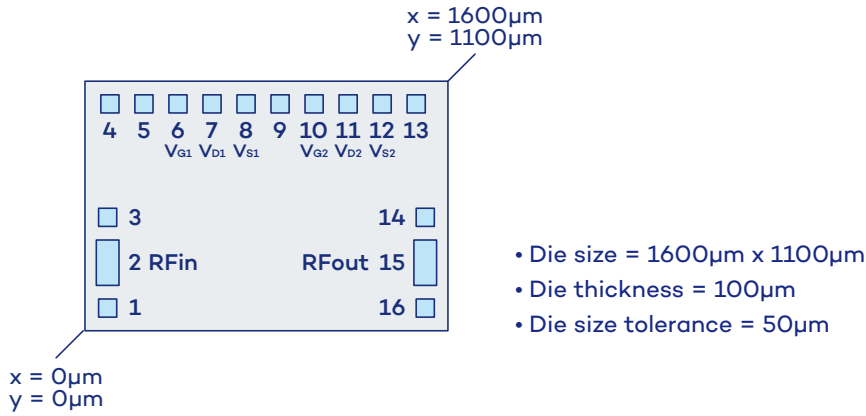
## • Bias-up procedure

1. Apply  $V_{D1}$ ,  $V_{D2}$ ,  $V_{G1}$  and  $V_{G2} = +5V$
2. Optionnal :  $V_{G1}$  and  $V_{G2}$  can be tuned between 0V and +5V
3. Turn on RF signal

## • Bias-down procedure

1. Turn off RF signal
2. Apply  $V_{D1}$ ,  $V_{D2}$ ,  $V_{G1}$  and  $V_{G2} = 0V$

• Die Layout & Pin Out



Pad number	X (µm)	Pad center Y (µm)	Size (µm x µm)	Name	Function
1	100	100	80 x 80	Gnd	
2	100	300	100 x 200	RFin	RF Input
3	100	500	80 x 80	Gnd	
4	110	1000	80 x 80	Gnd	
5	260	1000	80 x 80	Gnd	
6	410	1000	80 x 80	V <sub>G1</sub>	Gate Bias
7	560	1000	80 x 80	V <sub>D1</sub>	Drain Bias
8	710	1000	80 x 80	V <sub>S1</sub>	
9	860	1000	80 x 80	Gnd	
10	1010	1000	80 x 80	V <sub>G2</sub>	Gate Bias
11	1160	1000	80 x 80	V <sub>D2</sub>	Drain Bias
12	1310	1000	80 x 80	V <sub>S2</sub>	
13	1460	1000	80 x 80	Gnd	
14	1500	500	80 x 80	Gnd	
15	1500	300	100 x 200	RFout	
16	1500	100	80 x 80	Gnd	Drain Bias

• Die bottom must be connected to ground (RF and DC)

## • Ordering information

Product Code	Parameter
VM017D	7 to 13GHz - 19dB Low Noise Amplifier

## • Associated Material

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

## • Product Compliance Information

### Solderability

Use only AuSn (80/20) solder and limit exposure to temperature above 300 °C during 3-4 minutes, maximum.

### ESD Sensitivity 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 (C15H12Br4O2) 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

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