

General Description

The VM088Q is a packaged power amplifier developed on 250nm GaN/SiC process and is internally matched through 50Ω RF accesses. It can provide an output power up to 20W and associated power added efficiency of 30% in pulsed mode.

The VM088Q is offered a plastic 48 leads 7x7 QFN designed to a surface mount design board.

The VM088Q integrates the VWA5000088AB VectraWave HPA.

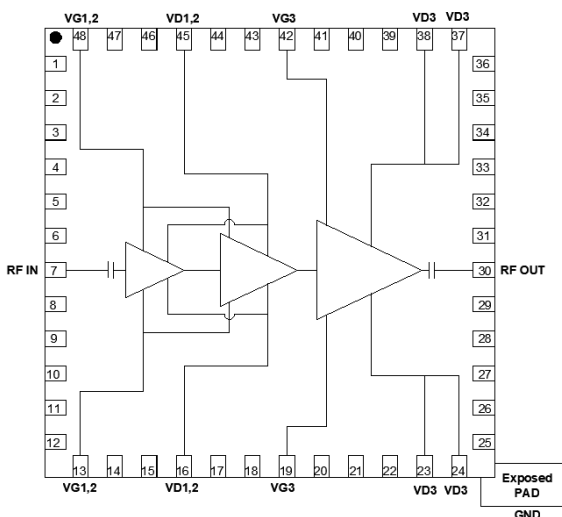
Typical Features

- Operating frequency range: 8 to 10.5 GHz
- Output Power : >46dBm @Pin=23dBm
- PAE : 35% @Pin=23dBm
- Linear Gain: 29dB
- DC bias: $V_D=+28V$, $I_{DQ}=350mA$ ($V_G=-2.35V$ Typ.)
- Plastic QFN : 7mm x 7mm 48 leads

Applications

- Radar
- Test and Measurement

Functional Block Diagram & Pin Assignment



Function	Pin Number	Function	Pin Number
NC	1 to 6	NC	25 to 29
RF _{IN}	7	RF _{OUT}	43
NC	8 to 12	NC	31 to 36
V _{G1,2}	13	V _{D3}	37,38
NC	14,15	NC	39 to 41
V _{D1,2}	16	V _{G3}	42
NC	17,18	NC	43,44
V _{G3}	19	V _{D1,2}	45
NC	20 to 22	NC	46,47
V _{D3}	23,24	V _{G1,2}	48

Electrical Specifications

Test conditions: unless otherwise noted

- $T_{amb.} = +25^{\circ}C$
- $V_D = +28V$
- $I_{DQ} = 350mA$ ($V_G = -2.35V$ Typ.)
- Pulsed mode : pulse width: 30 μs , Duty Cycle=10%

Symbol	Parameter	Min	Typ	Max	Unit
F	Frequency range	8		10.5	GHz
G	Linear gain		29		dB
S11	Input return loss		-8.5		dB
S22	Output return loss		-9.5		dB
Pout	Output power @Pin=23dBm		46		dBm
PAE	Associated Power Added Efficiency @Pin=23dBm		34		%
I_D	Associated drain current @Pin=23dBm		4.3		A
V_D	Drain voltage		28		V

Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V_D	Drain voltage	28	V
I_{DQ}	Drain quiescent current	350	mA
V_G	Gate voltage	-2.35 (Typ.)	V

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_D	Drain bias voltage	35	V
I_D	Drain bias current	8	A
V_G	Gate bias voltage	-10 to -2	V
Pin	Maximum peak input power overdrive	30	dBm
T_j	Junction Temperature	225	$^{\circ}C$
T_a	Operating temperature range	-40/+85	$^{\circ}C$
T_{stg}	Storage temperature range	-55/+150	$^{\circ}C$

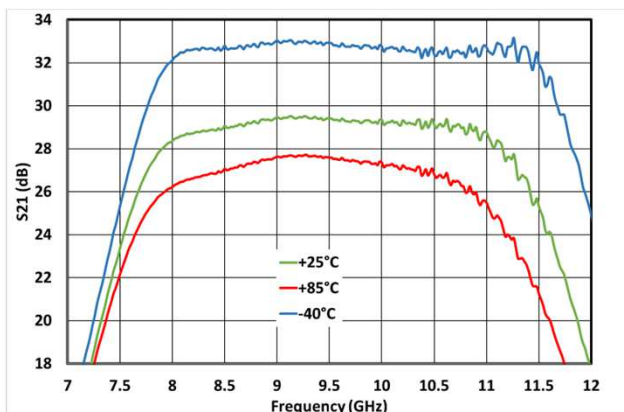
Operation of this device above any these parameters may cause permanent damage.

Typical Performance – Small Signal / Board Measurement

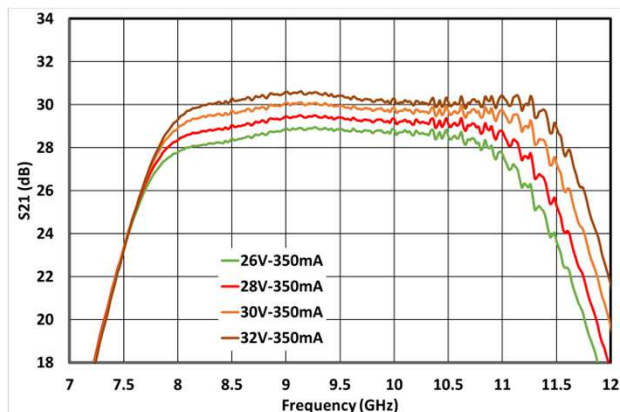
Test conditions: unless otherwise specified

- $V_D = +28V$
- Reference plane: connector access
- $I_{DQ} = 350mA$ ($V_G = -2.35V$ Typ.)
- $P_{in} = -20dBm$

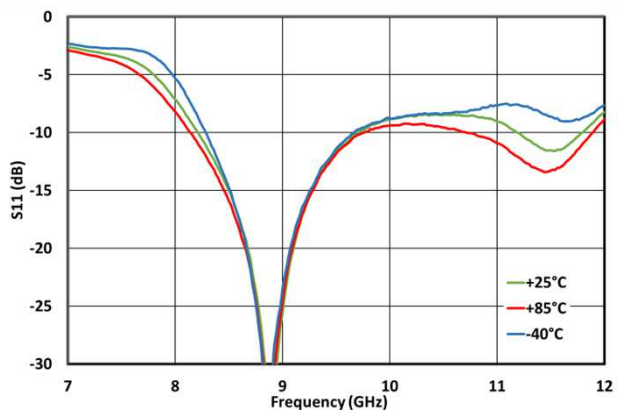
GAIN VS FREQUENCY VS TEMPERATURE



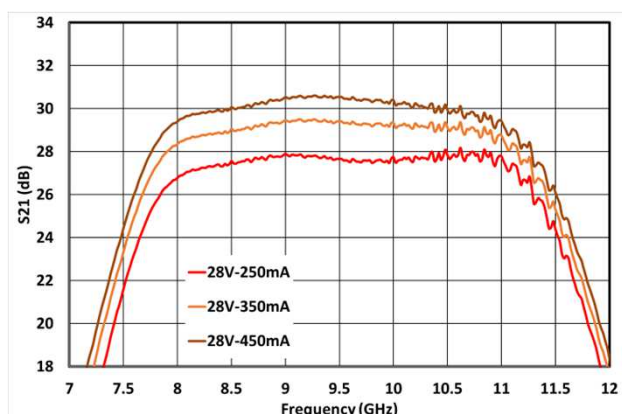
GAIN VS FREQUENCY VS V_D



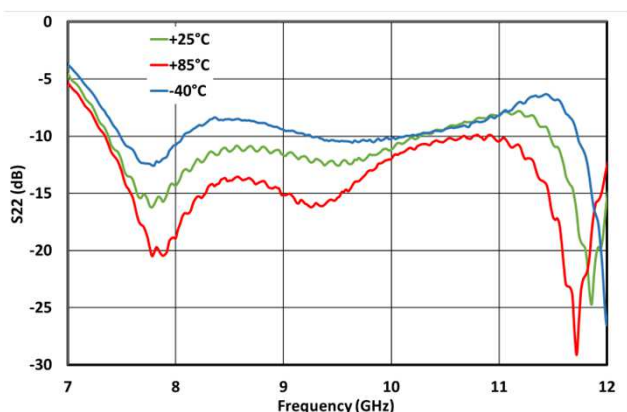
INPUT RETURN LOSS VS FREQUENCY VS TEMPERATURE



GAIN VS FREQUENCY VS I_{DQ}



OUTPUT RETURN LOSS VS FREQUENCY VS TEMPERATURE

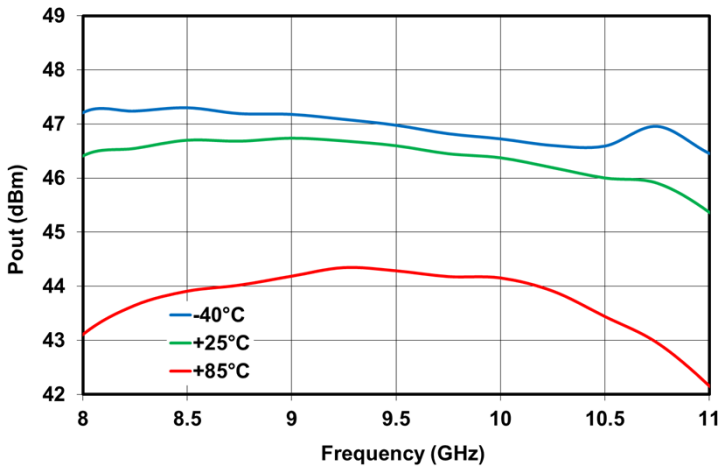


Typical Performance - Large Signal / Board Measurement

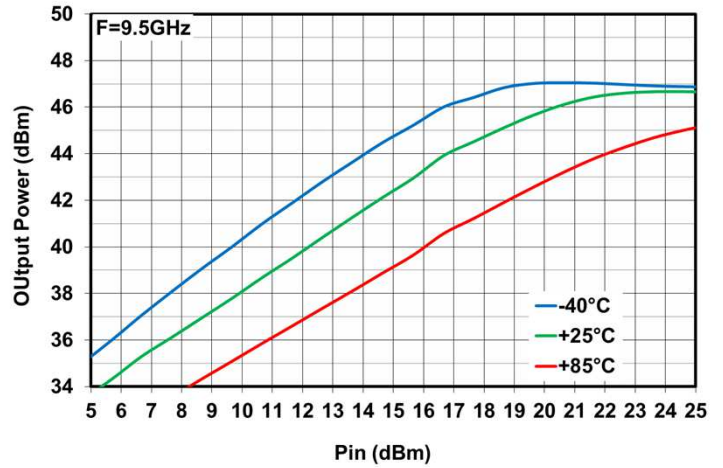
Test conditions: unless otherwise specified

- $V_D = +28V$
- $I_{DQ} = 350mA$ ($V_G = -2.35V$ Typ.)
- Reference plane: die access
- $P_{in} = 23dBm$
- Pulsed mode : pulse width: $30\mu s$, Duty Cycle=10%

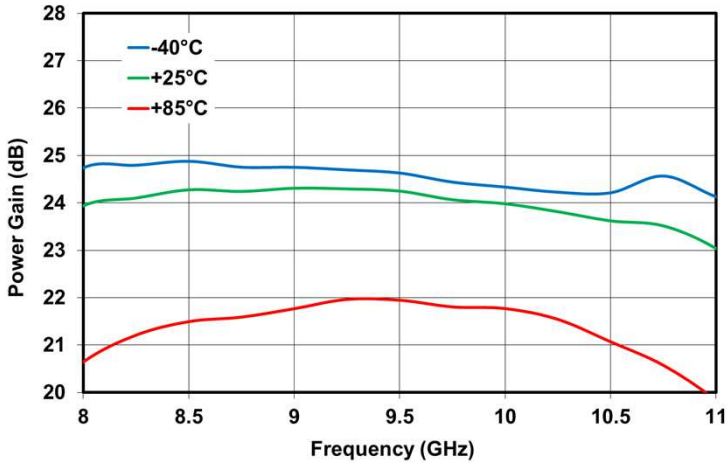
OUTPUT POWER VS FREQUENCY VS TEMPERATURE



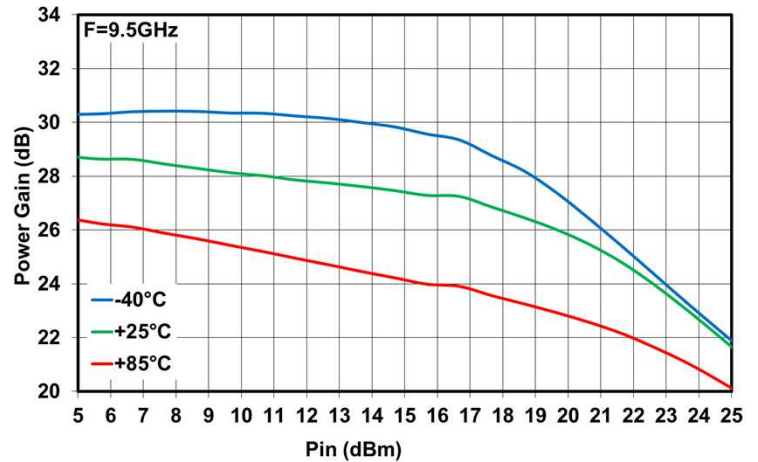
OUTPUT POWER VS INPUT POWER VS TEMPERATURE



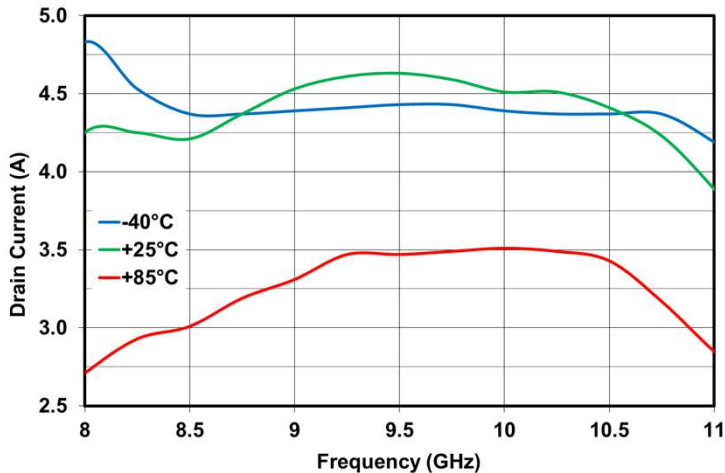
POWER GAIN VS FREQUENCY VS TEMPERATURE



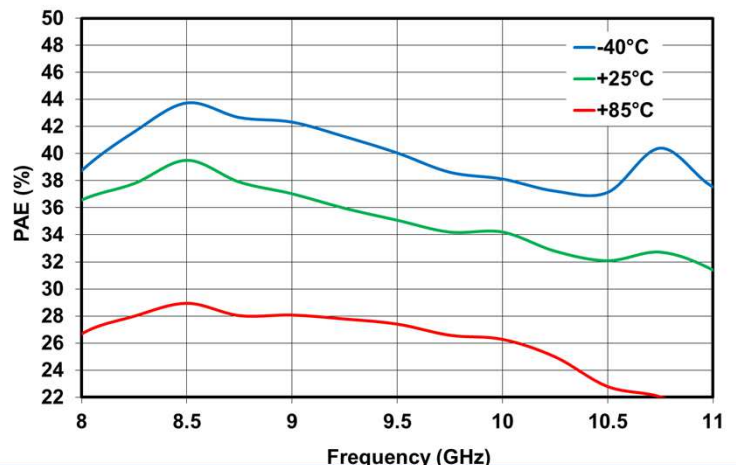
GAIN VS INPUT POWER VS TEMPERATURE



DRAIN CURRENT VS FREQUENCY VS TEMPERATURE



PAE VS FREQUENCY VS TEMPERATURE

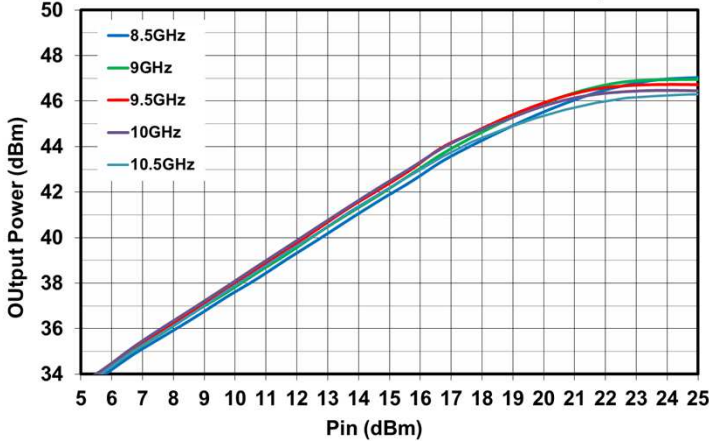


Typical Performance - Large Signal / Board Measurement

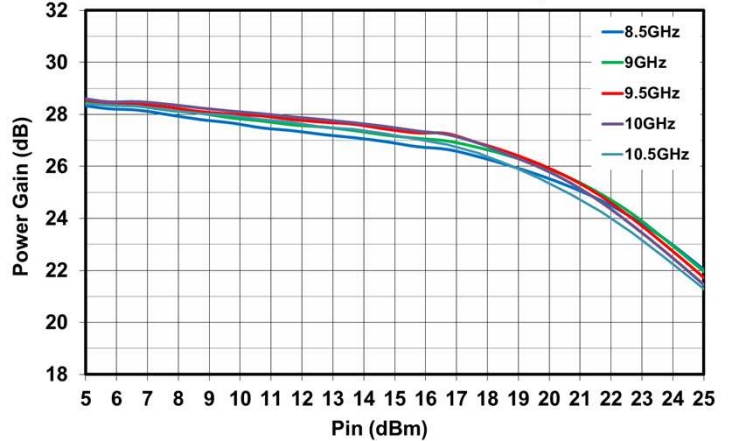
Test conditions: unless otherwise specified

- $V_D = +28V$
- $I_{DQ} = 350mA$ ($V_G = -2.35V$ Typ.)
- Reference plane: die access
- $T_{amb} = +25^\circ C$
- Pulsed mode : pulse width: $30\mu s$, Duty Cycle=10%

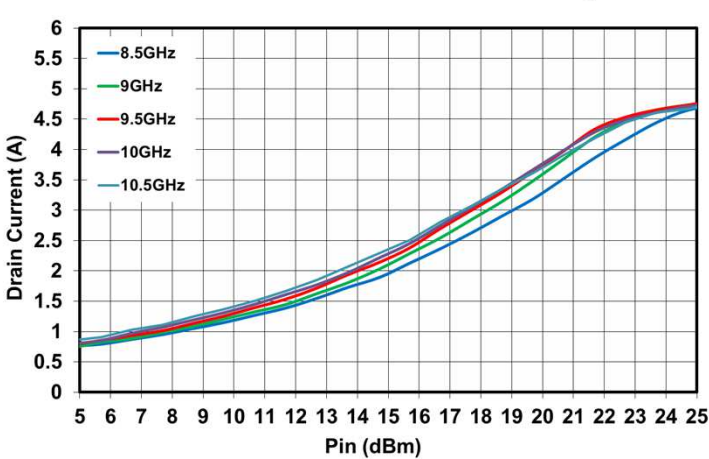
OUTPUT POWER VS INPUT POWER VS FREQUENCY



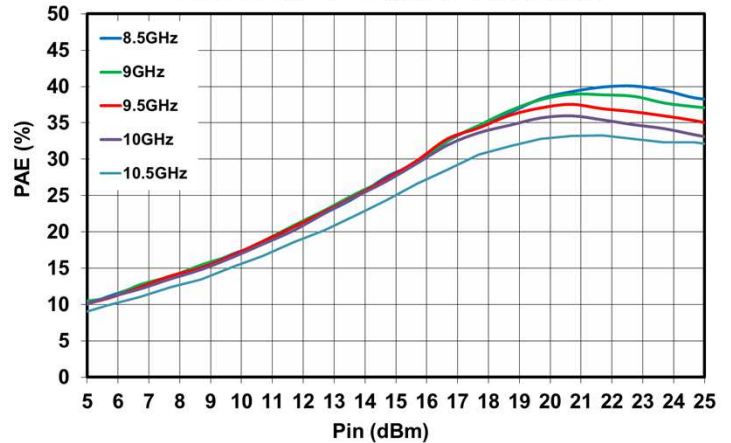
GAIN VS INPUT POWER VS FREQUENCY



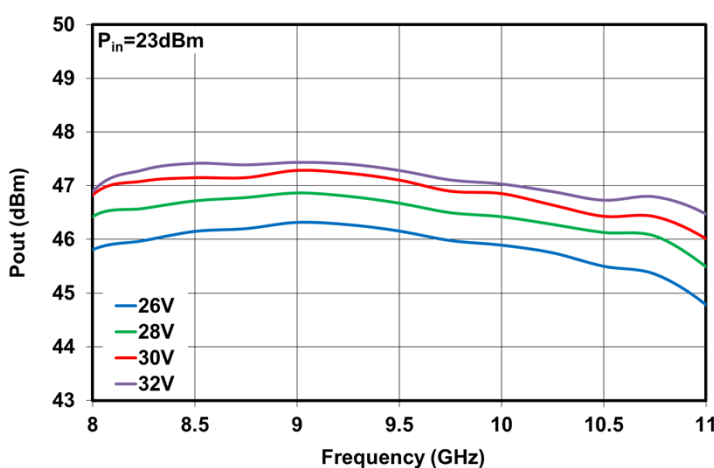
DRAIN CURRENT VS INPUT POWER VS FREQUENCY



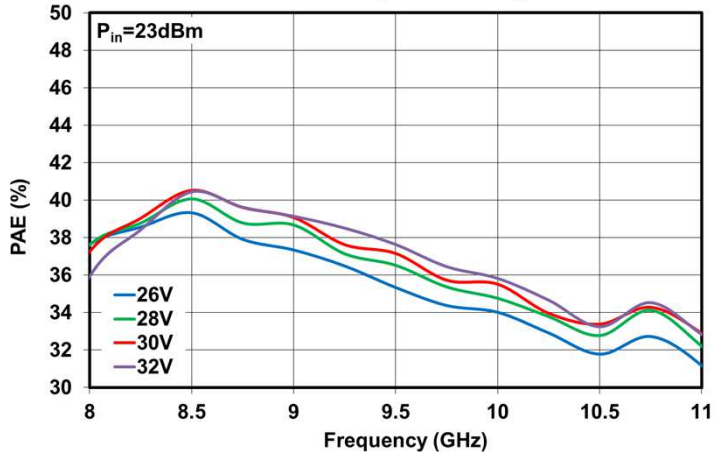
PAE VS INPUT POWER VS FREQUENCY



OUTPUT POWER VS FREQUENCY VS V_D



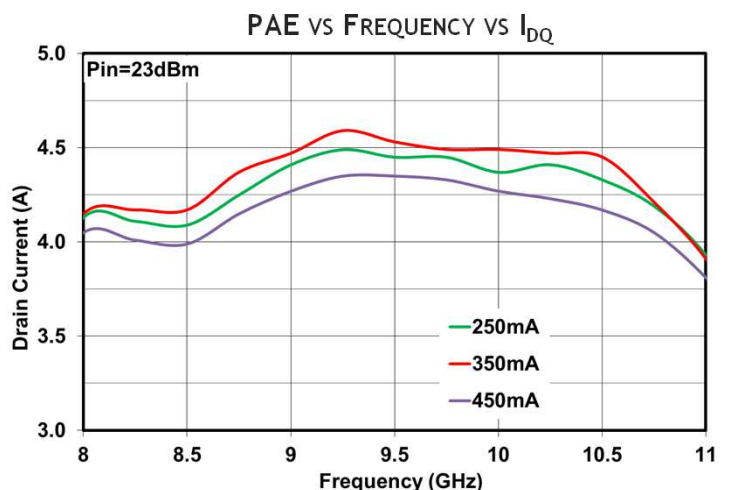
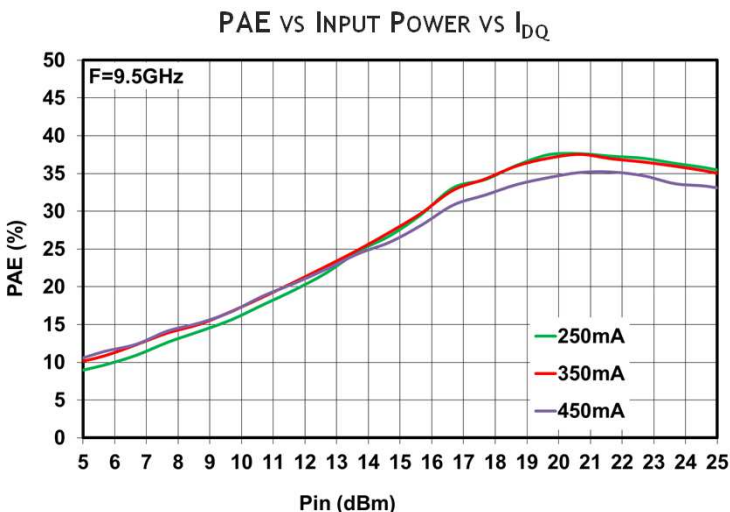
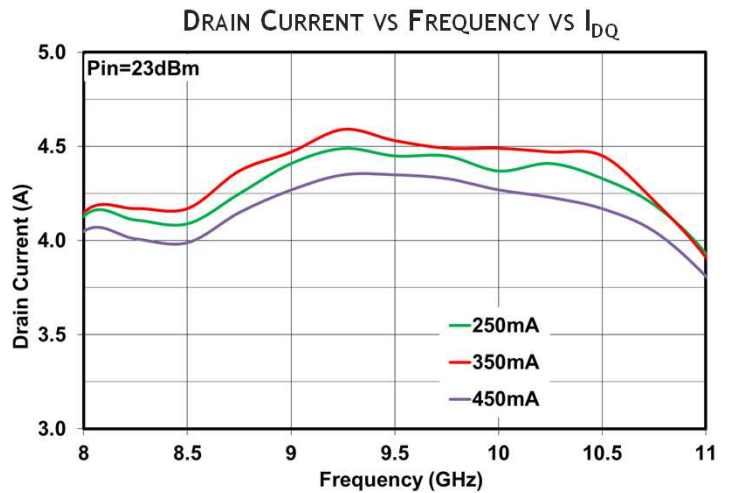
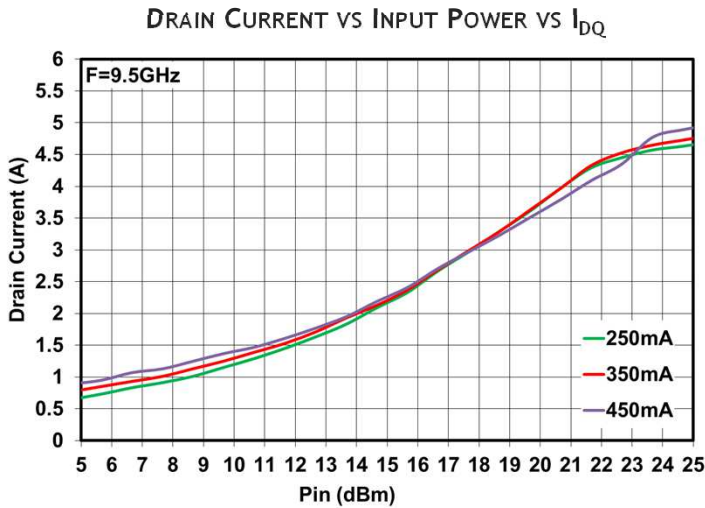
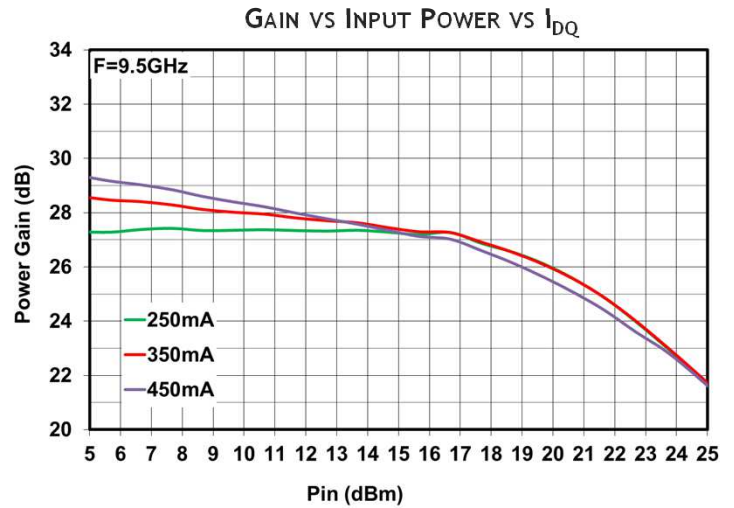
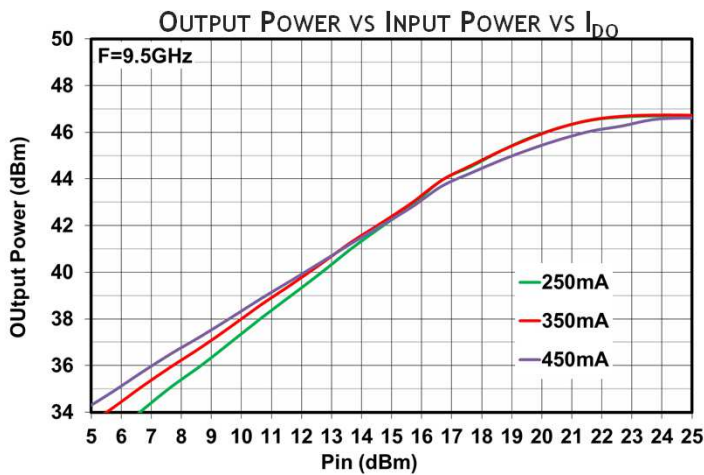
PAE VS FREQUENCY VS V_D



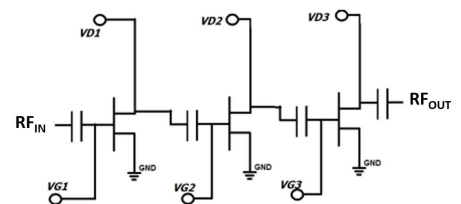
Typical Performance - Large Signal / Board Measurement

Test conditions: unless otherwise specified

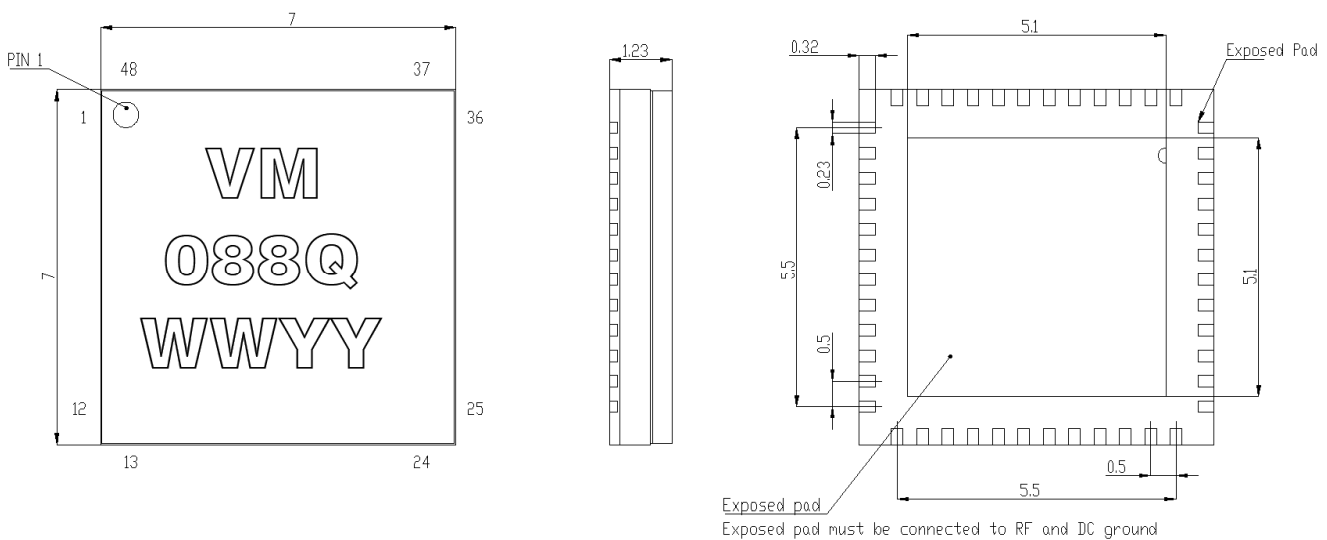
- $V_D = +28V$
- Reference plane: die access
- $T_{amb} = +25^\circ C$
- Pulsed mode : pulse width: $30\mu s$, Duty Cycle=10%



Pin description

Pin Number	Name	Description	Electrical interface
7	RF In	Amplifier input, this access is AC coupled and internally matched to 50 Ω .	
13,19,42,48	$V_{G1,2}, V_{G3}$	HPA Gate biasing input accesses.	
16,23,24,37,38,45	$V_{D1,2}, V_{D3}$	HPA Drain biasing input accesses	
30	RF Out	Amplifier output, this access is AC coupled and internally matched to 50 Ω .	
Exposed pad	GND	Die must be connected to RF and DC Ground	

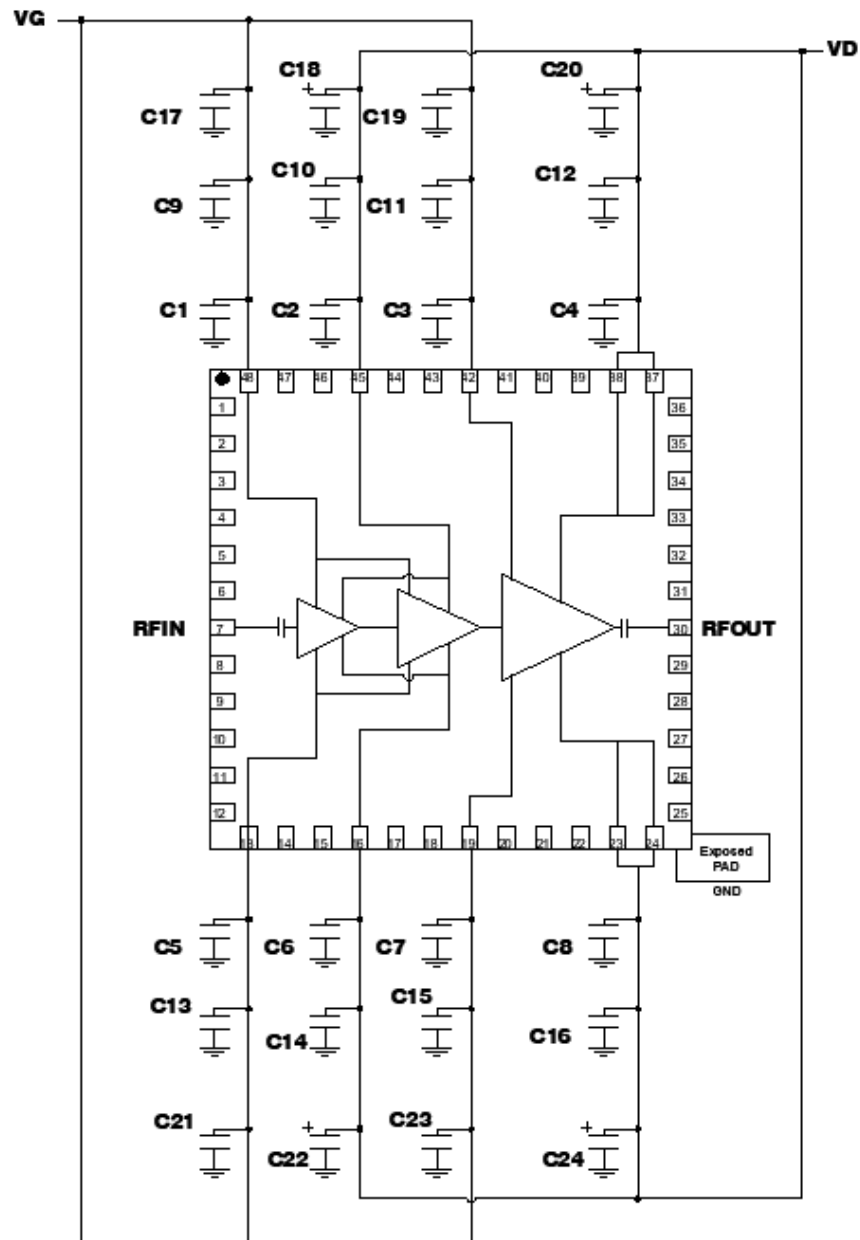
Mechanical drawing



Application Circuit

C1 to C8 = 10nF (50V/0402)
 C9, C11, C13, C14 = 1 μ F (16V/0402)
 C10, C12, C14, C16=1 μ F (50V/0603)

C17, C19, C21, C23=100 μ F (16V/0805)
 C18, C20, C22, C24=10 μ F (Aluminum /50V)



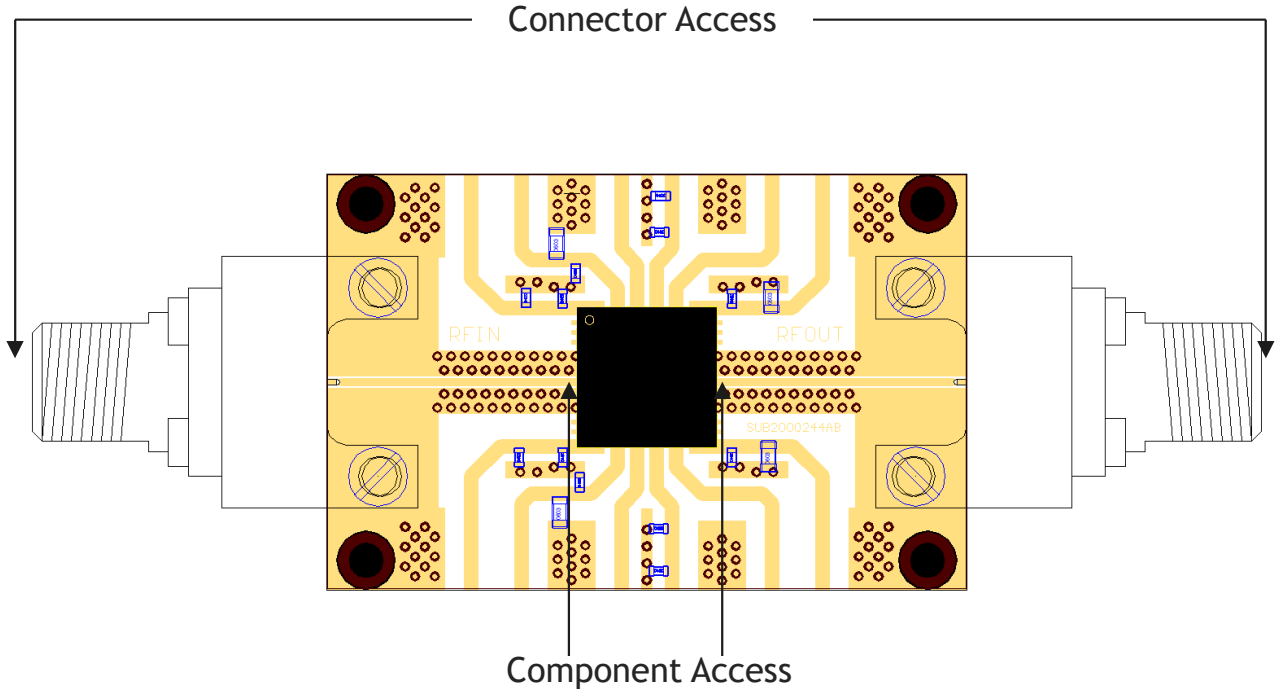
Bias-up procedure

1. Apply $V_G = -3V$
2. Apply $V_D = +28V$
3. Adjust V_G to obtain the specified $I_{DQ} = 350mA$ ($V_G = -2.35V$ Typ.)
4. Apply RF signal in pulsed mode

Bias-down procedure

1. Turn off RF signal
2. Reduce $V_G = -3V$
3. Apply $V_D = 0V$
4. Turn off power supply

Evaluation Board (EVB) Layout Assembly



Ordering Information

Product Code	Definition
VM088Q	8 to 10.5GHz - 40W GaN Power Amplifier QFN 7mmx7mm 48 leads

Associated Material

Evaluation Board	Contact factory
Mechanical files (DXF)	Contact factory

Product Compliance information

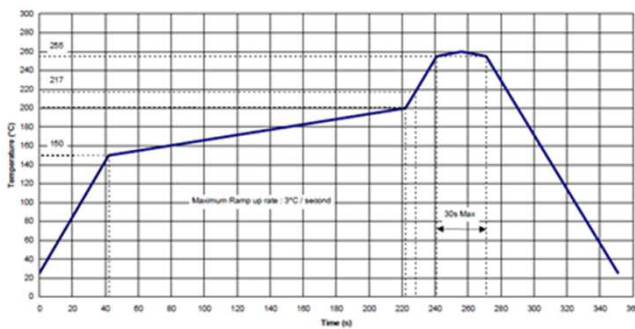
Solderability :

Solder Stencil thickness : 127µm

Solder : SAC 305 (ROHS)

Temperature profile example:

ESD Sensitivity Rating :



Test : Human Body Model (HBM)
Standard : 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).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C15H12Br4O2) Free
- PFOS Free
- SVHC Free

Caution: ESD Sensitive device



Contact Information

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