### 8.5 to 10.2 GHz GaN HEMT Power Amplifier





#### **Main Features**

- 0.25µm GaN HEMT Technology
- 8.5 10.2 GHz full performances Frequency Range
- 27W Output Power @ Pin 27 dBm
- 36% PAE @ Pin 27 dBm
- 24 dB Small Signal Gain
- Bias: Vd = 30V, Id = 1A, Vg = -2.85V

  (Typ.)
- Chip Size: 5.5 x 4.0 x 0.1 mm

#### **Product Description**

**MECGaNX27** is a GaN HEMT based High Power Amplifier designed by MEC for X-Band applications and fabricated on 0.25μm GaN on SiC process.

The MECGaNX27 provides more than 27 W of saturated output power in the frequency range from 8.5 GHz to 10.2 GHz with a PAE higher than 35% and 24 dB of small signal Gain.

The MECGaNX27 is fully matched to 50  $\Omega$  with DC decoupling capacitors on both Input and Output ports. Bond Pad are gold plated for compatibility with thermo-compression bonding process.

#### **Applications**

- Radar
- Telecom

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#### **Main Characteristics**

Test Conditions:  $T_{base\_plate} = 25$ °C, Vd = 30 V, Idq = 1 A,  $Pulse Width = 50 \mu s$ , Duty Cycle = 15%

Parameter	Min	Тур	Max	Unit
Operating frequency	8.5		10.2	GHz
Small Signal Gain	21	24	27	dB
Input Return Loss	7	10		dB
Output Return Loss	8	10		dB
Saturated Output Power	44.5		45.2	dBm
Power Added Efficiency @ Pout=Psat	35		38	%
Gain @ Pout=Psat	17		19	
Drain Supply Voltage		30		V
Supply Quiescent Drain Current		1		A
Supply Drain Current	2.0		3.0	A
Gate Voltage		-2.85		V

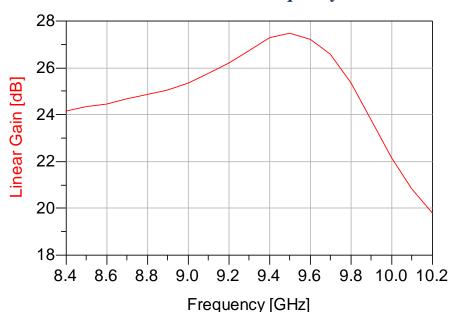
<sup>\*</sup> Performances described in this document are based on preliminary on-jig characterization. More details and new parameter will be carried out by the ongoing test campaign.

### **Typical Measured Performances**

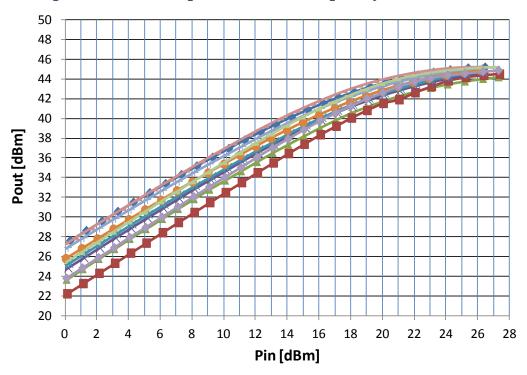
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#### Linear Gain Vs. Frequency



#### Output Power Vs. Input Power @ Frequency [8.5-10.2]GHz

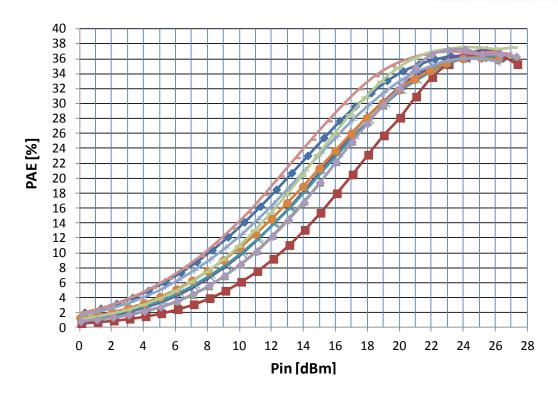


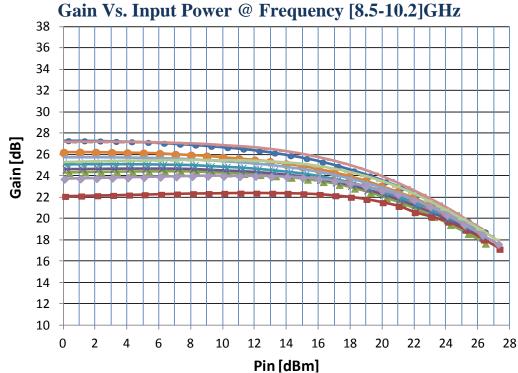
PAE Vs. Input Power @ Frequency [8.5-10.2]GHz

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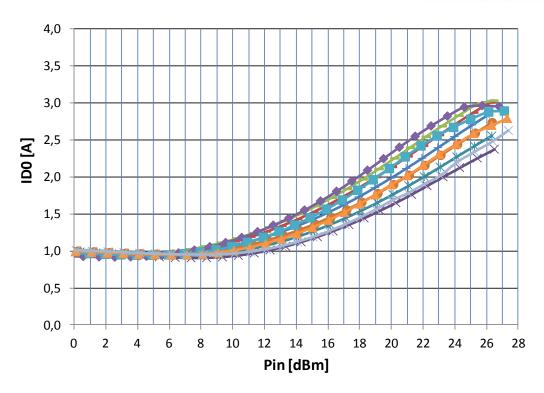


Drain Current Vs. Input Power @ Frequency [8.5-10.2]GHz

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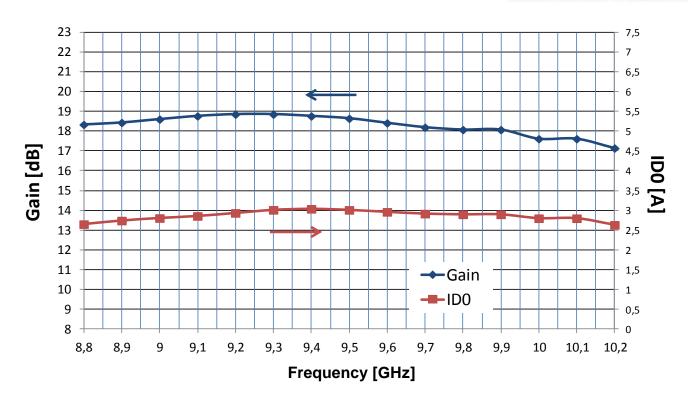


#### Saturated Output Power and PAE @ Pin=27dBm Vs. Frequency 47 50 49 46 48 47 45 46 44 44 43 43 42 41 Pout [dBm] 42 40 39 41 37 36 40 35 39 34 33 38 32 **→**Pout 37 30 29 -PAE 36 28 35 9,4 9,5 9,6 9,7 8,8 8,9 9,1 9,2 9,3 9,8 9,9 10,1 Frequency [GHz]

Gain and Drain Current @ Psat, Pin=27dBm Vs. Frequency - 5/9 -

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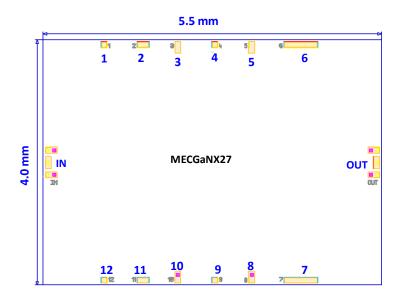




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### **Bond Pad Configuration**



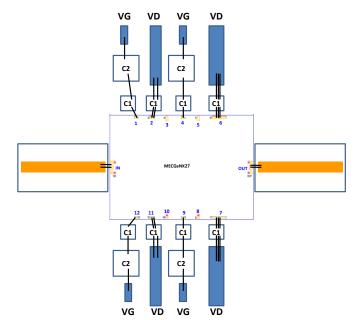
- A tolerance of  $\pm$  35  $\mu$ m has to be considered for chip dimensions
- Chip Thickness is  $100 \mu m \pm 10 \mu m$
- RF Pads [IN, OUT] =  $100 \mu m \times 200 \mu m$
- DC Pads  $[1, 3, 4, 5, 8, 9, 10, 12] = 100 \mu m \times 100 \mu m$
- DC Pads  $[2, 11] = 200 \mu m \times 100 \mu m$
- DC Pads  $[6, 7] = 550 \mu m \times 100 \mu m$

Bond Pad #	Symbol	Description	
IN	RFin	Input RF Port	
OUT	RFout	Output RF Port	
1, 4, 9, 12	Vg	Gate Negative Supply Voltage	
2, 6, 7, 11	Vd	Drain Positive Supply Voltage	
3, 5, 8, 10	GND	Ground Pads – Not Connected	

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#### **Assembly Recommendations**



Bond Pad#	Connection	External Components		
IN and OUT	2 Bonding Wires L_bond = 0.3nH			
1, 4, 9, 12 - <b>Vg</b>	L_bond ≤ 1 nH	C1 = 100 pF/10V C2 = 10 nF/10V		
2, 11 - <b>Vd</b>	2 Bonding Wires L_bond ≤ 1nH	$\frac{\textbf{Pulsed mode}}{\text{C1} = 100 \text{pF/50V}}$		
6, 7 - <b>Vd</b>	3 Bonding Wires L_bond ≤ 1nH	<u>CW mode:</u> C1 = 100pF/50V C2 = 10nF/50V		

- Eutectic Die bond using AuSn (80/20) solder is recommended.
- Great care must be used for thermal dimensioning.
- The backside of the die is the Source (ground) contact.
- Thermosonic ball or wedge bonding are the preferred connection methods.
- Gold wire must be used for connections.

#### **Bias Procedure**

#### **Bias-Up**

- 1. Vg set to -5 V.
- 2. Vd set to +30 V.
- 3. Adjust Vg until quiescent Id is 1 A (Vg = -2.85 V Typical).
- 4. Apply RF signal.

#### **Bias-Down**

- 1. Turn off RF signal.
- 2. Reduce Vg to -5 V (Id $0 \approx 0$  mA).
- 3. Set Vd to 0 V.
- 4. Set Vg to 0 V.

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#### **Contact Information**

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#### **Notice**

The furbished information is believed to be reliable. However, performances and specifications contained herein are based on preliminary characterizations and then susceptible to possible variations. On the basis of customer requirements the product can be tested and characterized in specific operating conditions and, if needed, tuned to meet custom specifications.

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