

MECGaNX27

8.5 to 10.2 GHz GaN HEMT Power Amplifier



MICROWAVE ELECTRONICS FOR COMMUNICATIONS



Main Features

- 0.25 μ m 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: $V_d = 30V$, $I_d = 1A$, $V_g = -2.85V$
(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 0.25 μ m 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 Ω 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

Main Characteristics

Test Conditions: $T_{\text{base_plate}} = 25^{\circ}\text{C}$, $V_d = 30\text{ V}$, $I_{dq} = 1\text{ A}$, Pulse Width = $50\ \mu\text{s}$, Duty Cycle = 15%

Parameter	Min	Typ	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 @ $P_{\text{out}}=P_{\text{sat}}$	35		38	%
Gain @ $P_{\text{out}}=P_{\text{sat}}$	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

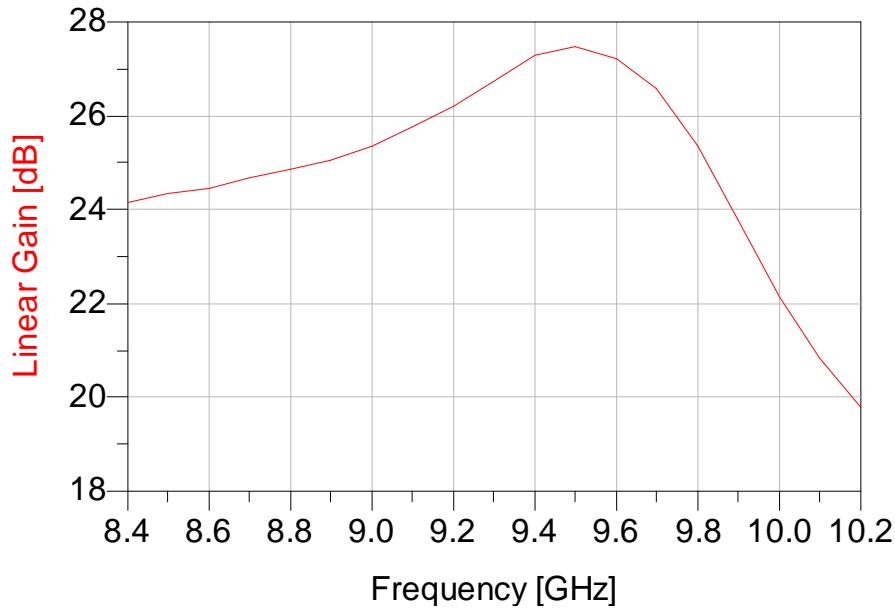
* Performances described in this document are based on preliminary on-jig characterization.
More details and new parameter will be carried out by the ongoing test campaign.

Typical Measured Performances

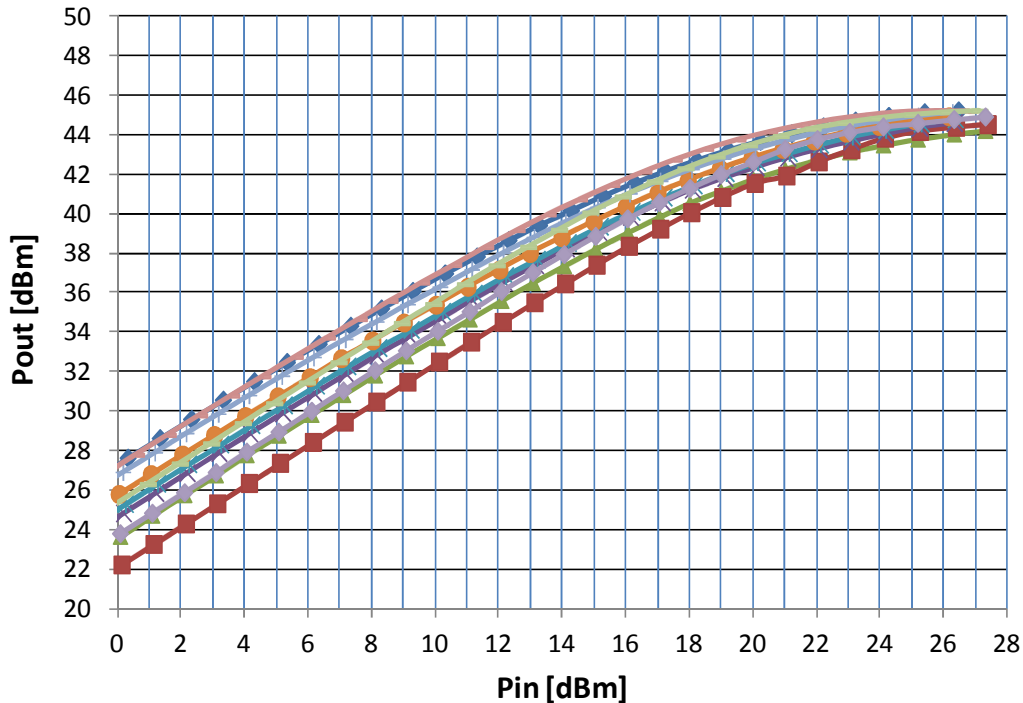
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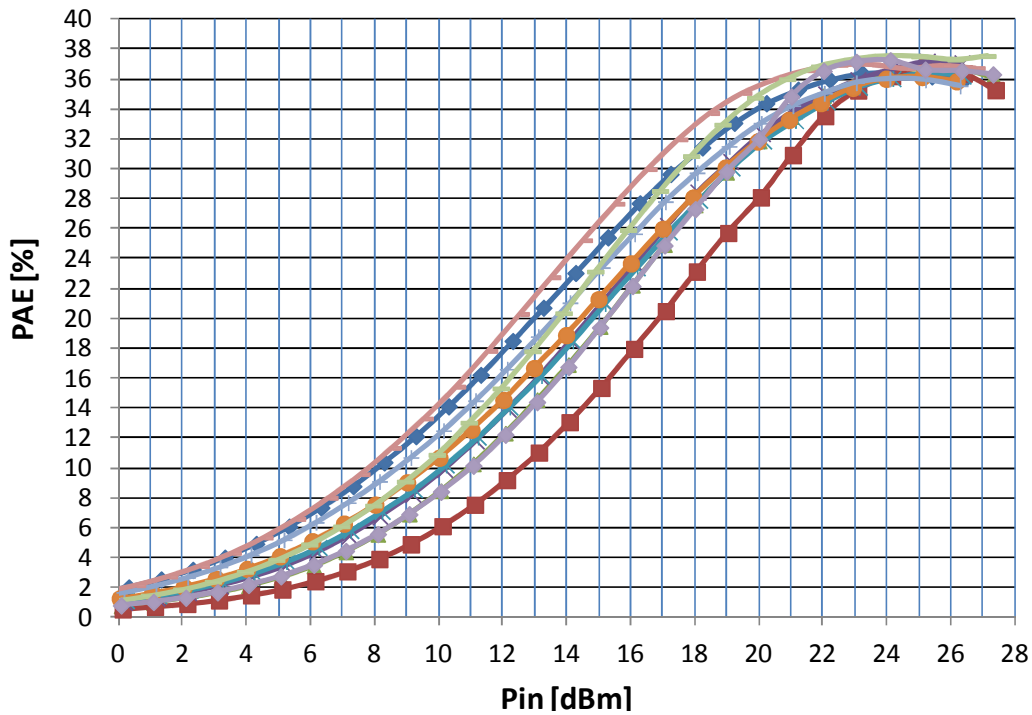
Linear Gain Vs. Frequency



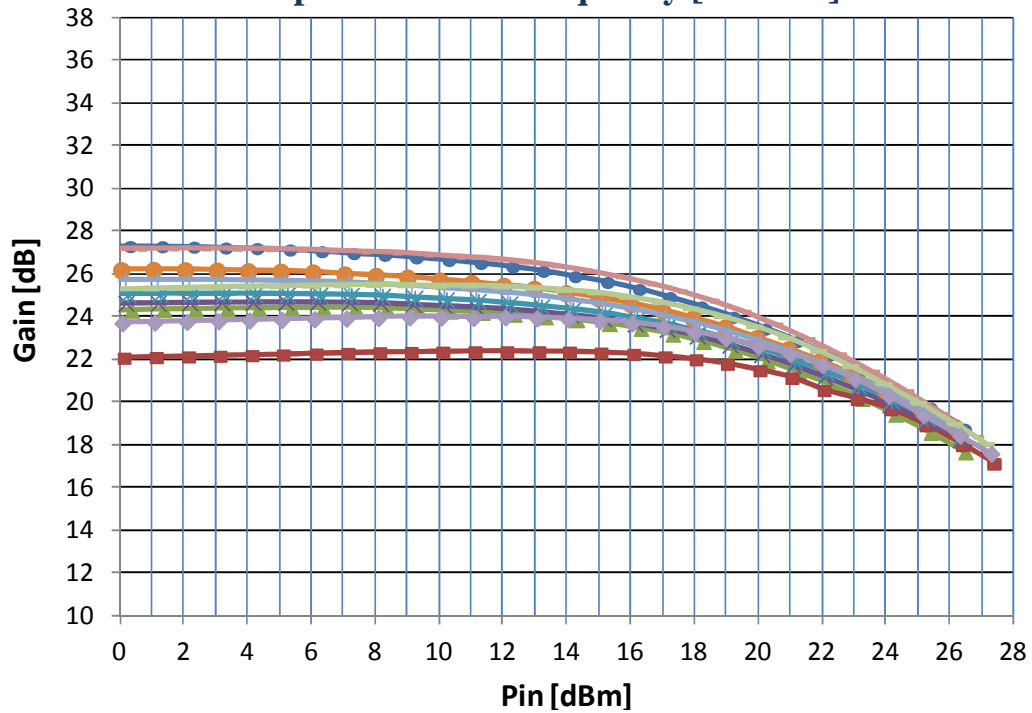
Output Power Vs. Input Power @ Frequency [8.5-10.2]GHz



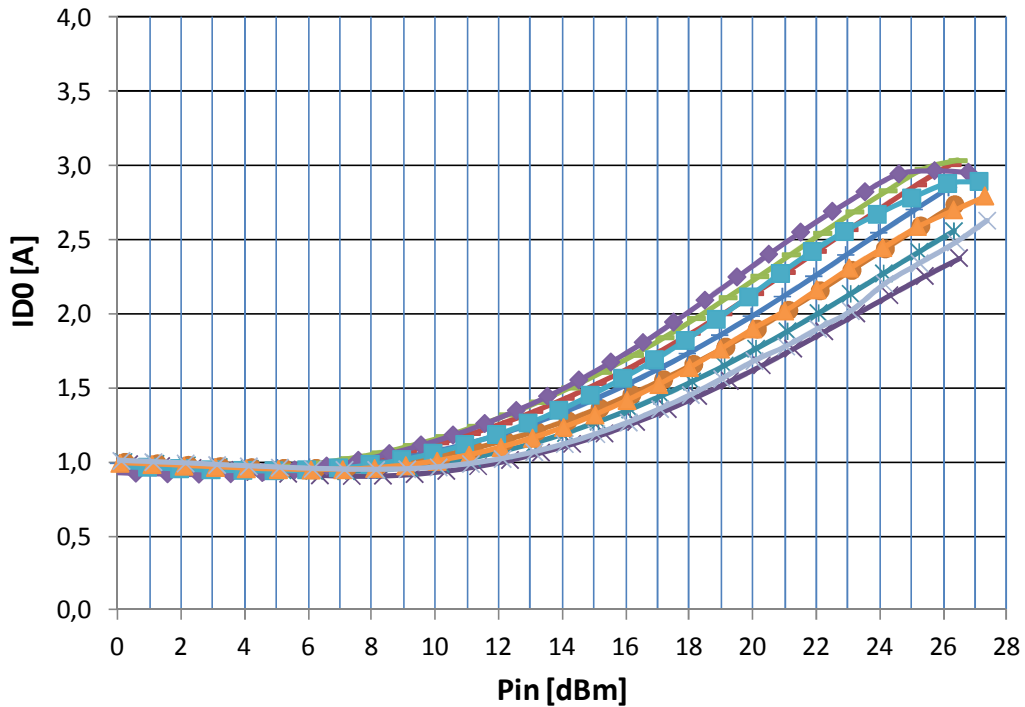
PAE Vs. Input Power @ Frequency [8.5-10.2]GHz



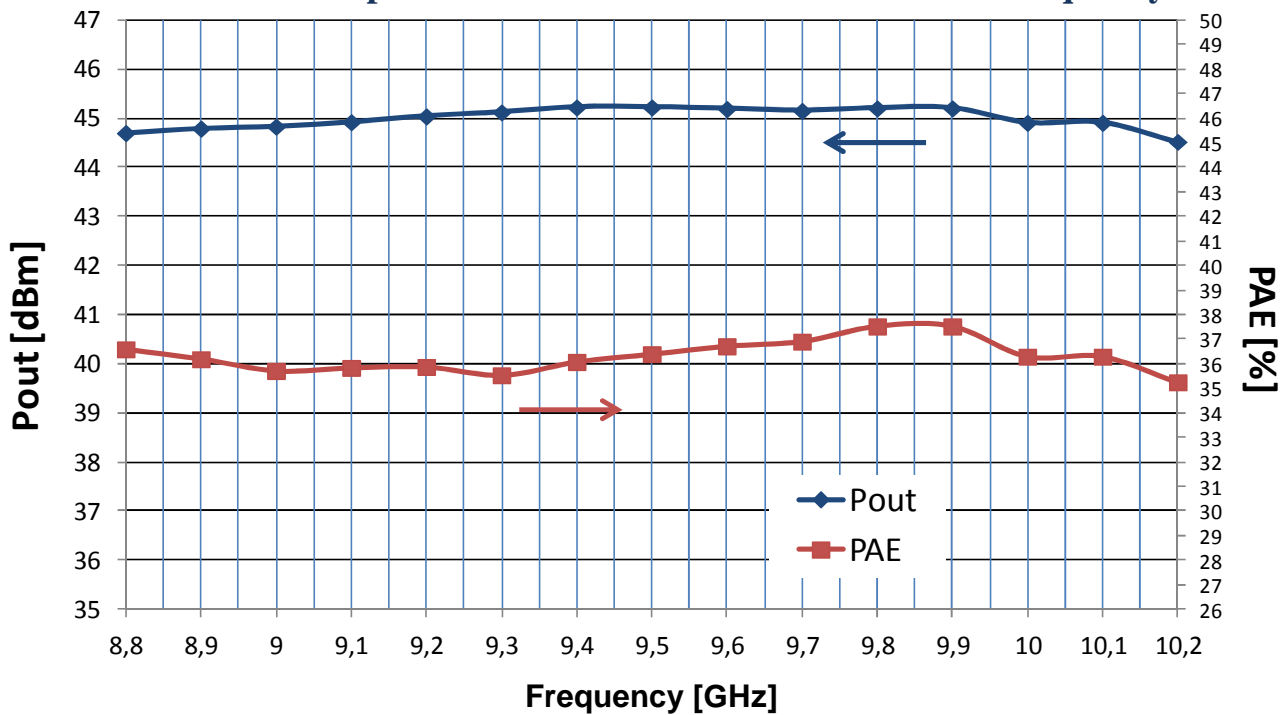
Gain Vs. Input Power @ Frequency [8.5-10.2]GHz



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

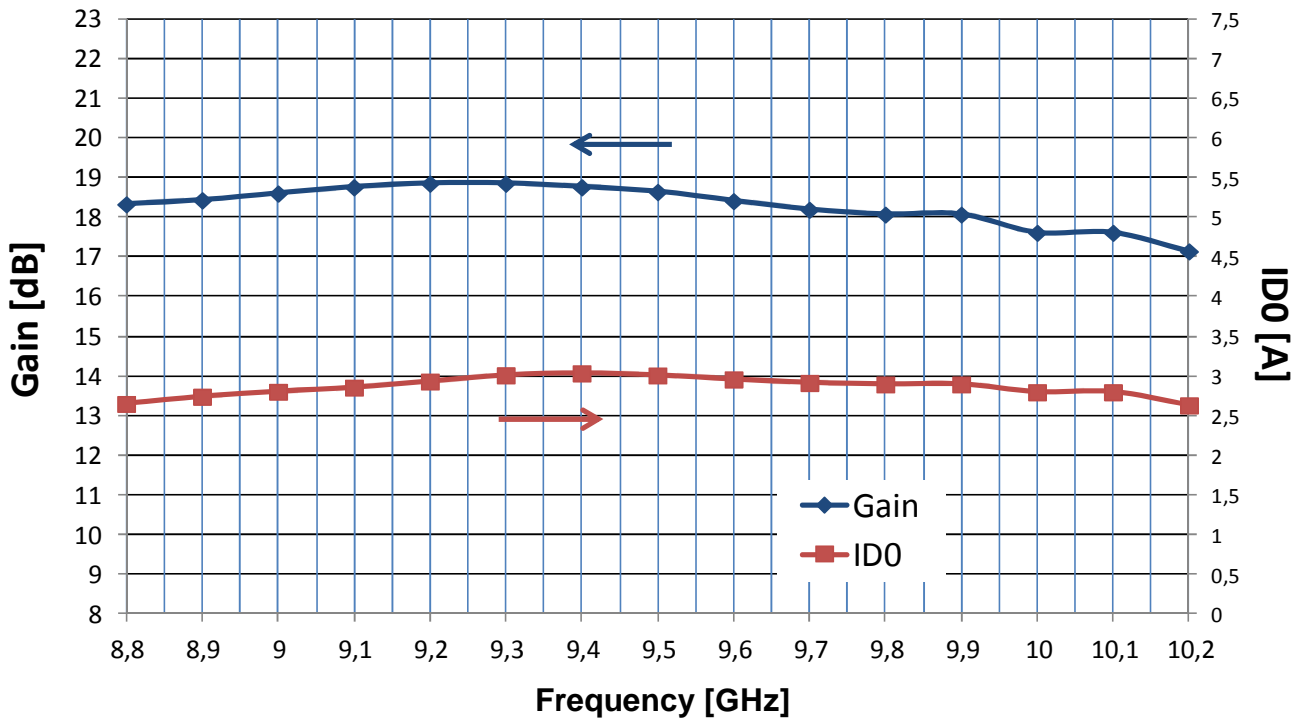


Saturated Output Power and PAE @ Pin=27dBm Vs. Frequency

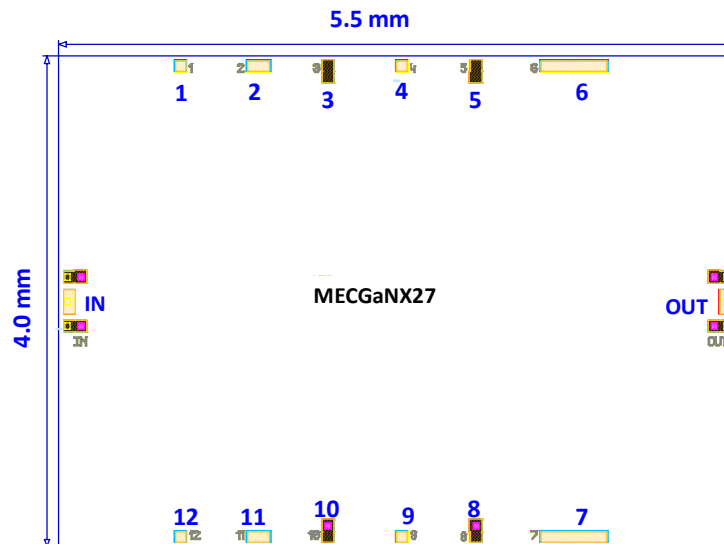


Gain and Drain Current @ Psat, Pin=27dBm Vs. Frequency

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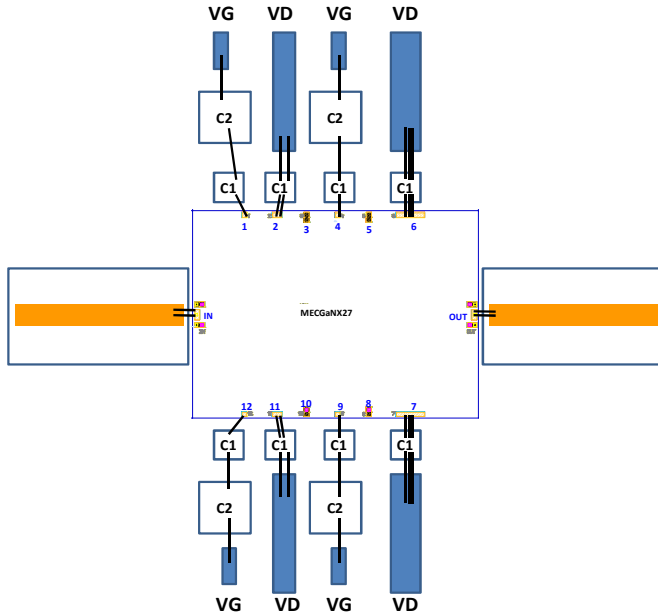
Bond Pad Configuration



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

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

Assembly Recommendations



Bond Pad #	Connection	External Components
IN and OUT	2 Bonding Wires $L_{\text{bond}} = 0.3\text{nH}$	
1, 4, 9, 12 - Vg	$L_{\text{bond}} \leq 1\text{ nH}$	C1 = 100pF/10V C2 = 10nF/10V
2, 11 - Vd	2 Bonding Wires $L_{\text{bond}} \leq 1\text{nH}$	Pulsed mode C1 = 100pF/50V
6, 7 - Vd	3 Bonding Wires $L_{\text{bond}} \leq 1\text{nH}$	CW mode: 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 ($I_{d0} \approx 0\text{ mA}$).
3. Set Vd to 0 V.
4. Set Vg to 0 V.

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Notice

The furnished 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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