ICPB1010 | Discrete Power GaN HEMT 50 Watt

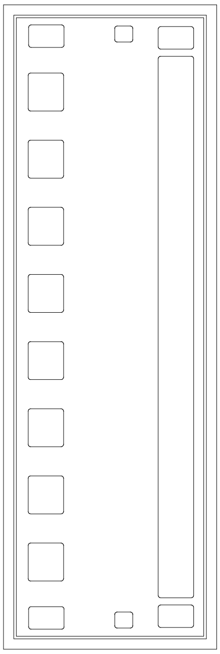
ICONIC RF

a MICROCHIP company

Features

- Frequency Range DC-14GHz
- 48.5dBm Nominal P_{3dB} Pulsed
- Maximum PAE at 6GHz of 72%
- 17.8dB Linear Gain at 6GHz
- Drain Bias 28V
- Technology: GaN on SiC
- Lead-free and RoHS compliant
- Chip Dimensions: 0.824 x 2.495 x 0.10mm

Image



Applications

- Aerospace & Defense
- Broadband Wireless

Description

The ICPB1010 is a GaN on SiC discrete HEMT that operates from DC-14GHz. The design is optimized for power and efficiency using field plate technology.

RF Performance | Simulated Conditions unless otherwise stated | T_A=25°C, V_D=28V, Pulse width =100uS, Duty cycle = 10%

Parameter	Units	Typical			
Frequency	GHz	3	6	10	14
Output Power P_{3dB}	dBm	48.3	48.5	48.5	48.6
Bias Current	mA	200	200	200	200
PAE @ P_{3dB}	%	74.6	72	65	55.8
Gain @ P_{3dB}	dB	19.8	14.8	9.7	6.1

Recommended operating conditions

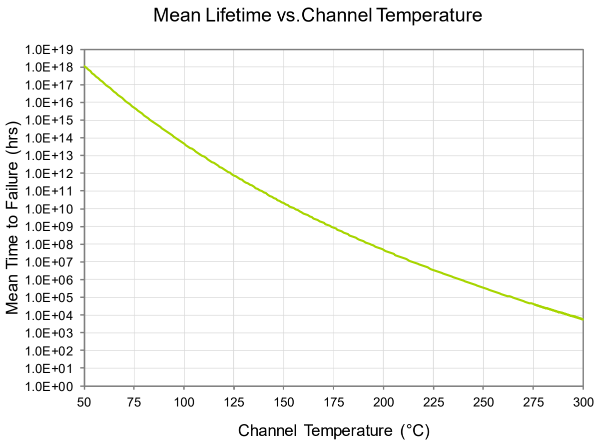
Parameter	Value
Drain Voltage (V_{DG})	12-32 V
Drain Quiescent Current (I_D)	0.2-0.5A
Drain current RF Drive (I_D)	4A
Gate Voltage (V_G)	-2.6V
Power Dissipation (CW)	56W
Channel Temperature (Max)	225°C

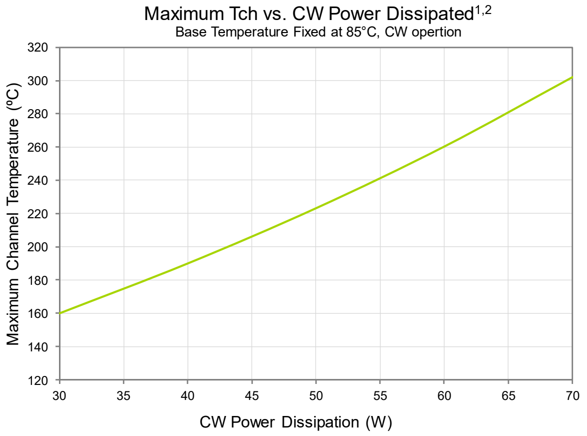
Absolute Maximum Ratings

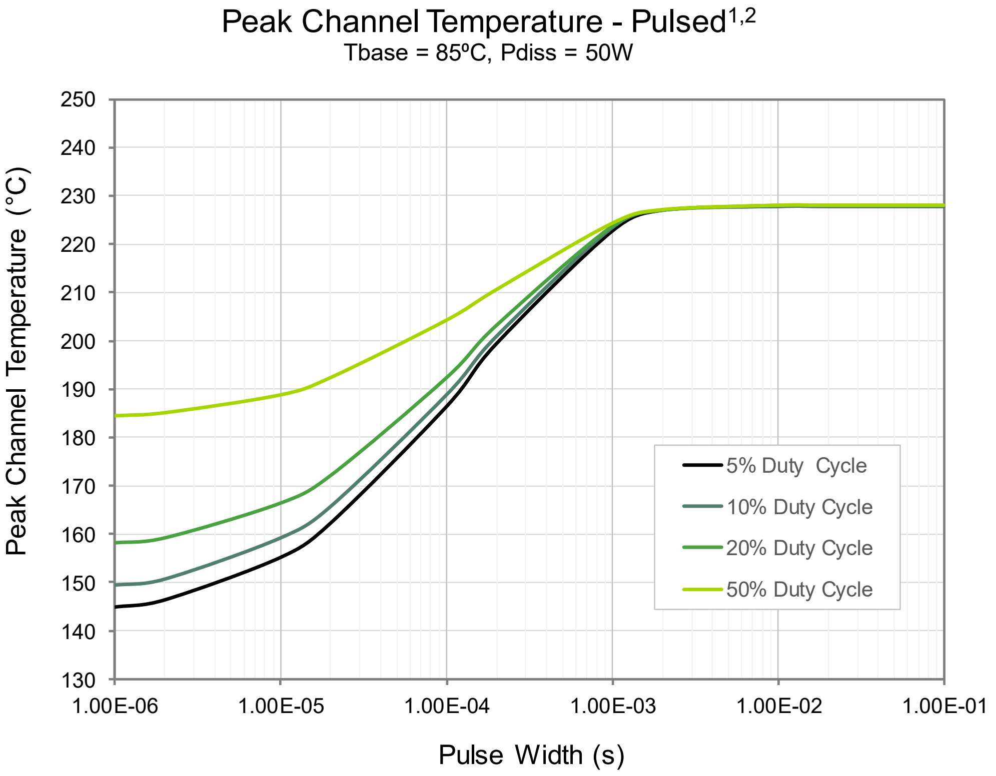
Parameter	Absolute Maximum
Drain to Gate Voltage (V_{DG})	80 V
Gate Voltage Range (V_G)	-20V to 0V
Gate Current (I_G)	-10 to 30mA
Power Dissipation (CW)	63W
CW Input Power	+40dBm
Channel Temperature	275°C
Storage Temperature	-65°C to +150°C

Exceeding any one or combination of these limits may cause permanent damage to this device.
ICONIC RF does not recommend sustained operation near these survivability limits.

Thermal and Reliability



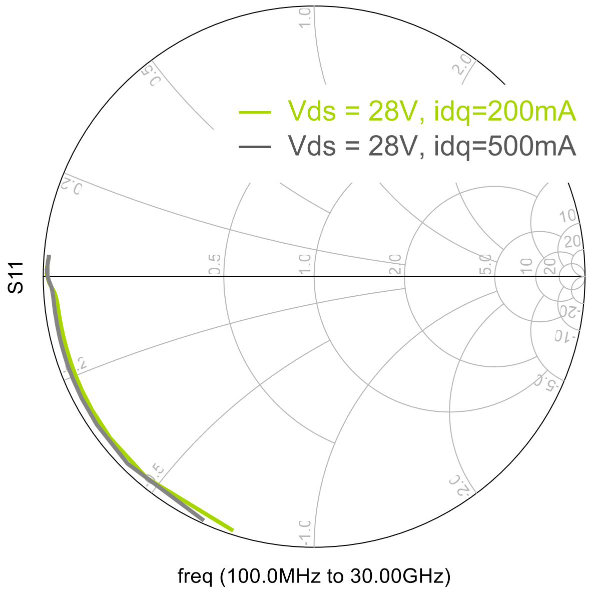


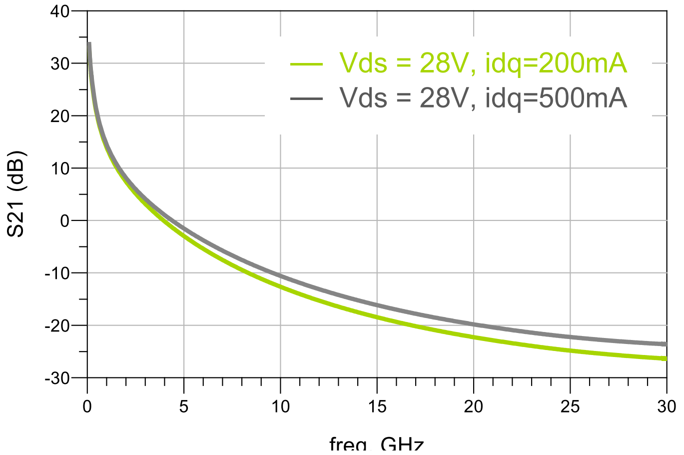


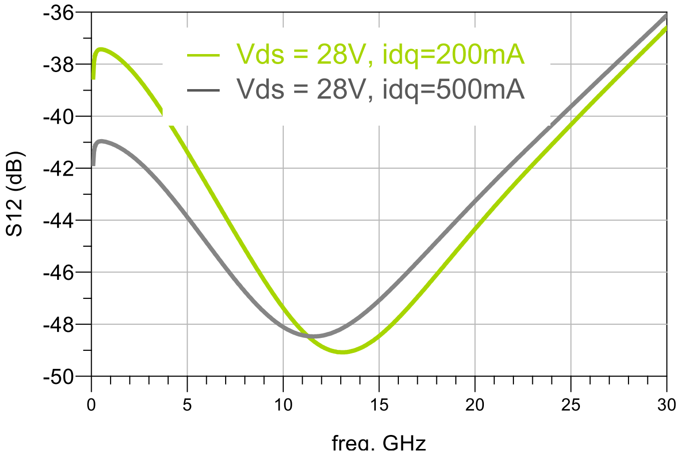
Notes

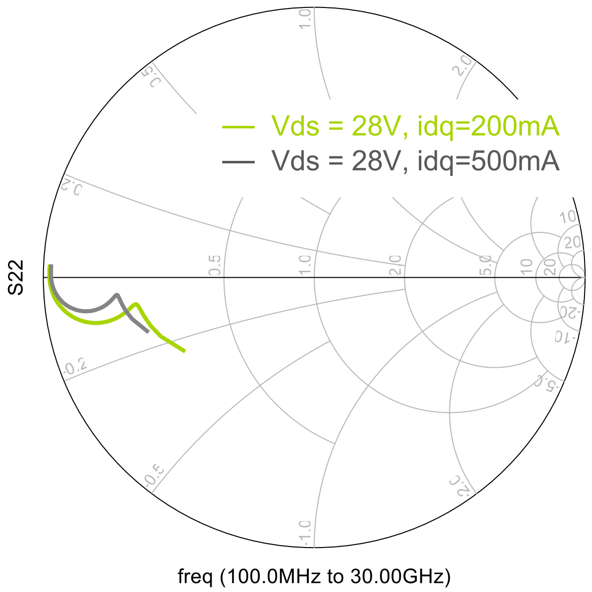
1. Assumes silver sintered epoxy attach (15um thick) and mounted on CuMo carrier
2. Base temperature is assumed at the top of the CuMo carrier

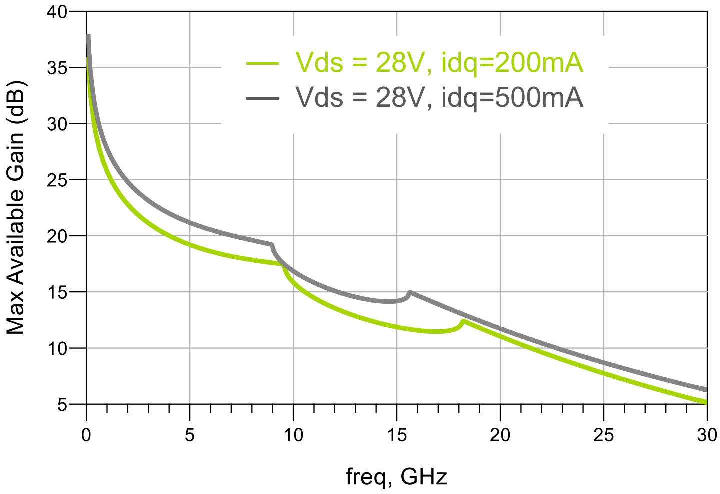
Model S-parameters | T_A = 25ºC





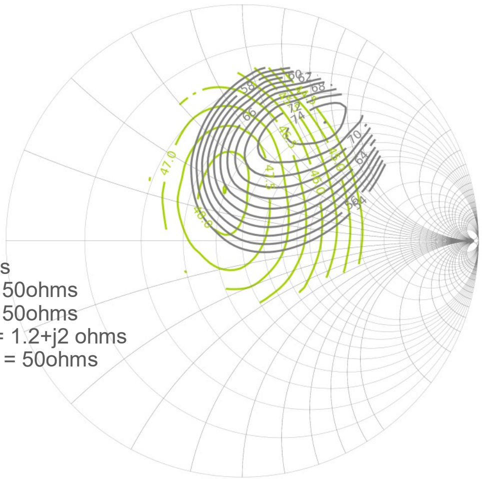






Model Load Pull Data 3GHz

P3dB Output Power and PAE contours
(Vds = 28V, idq=200mA, Z0=5ohms)

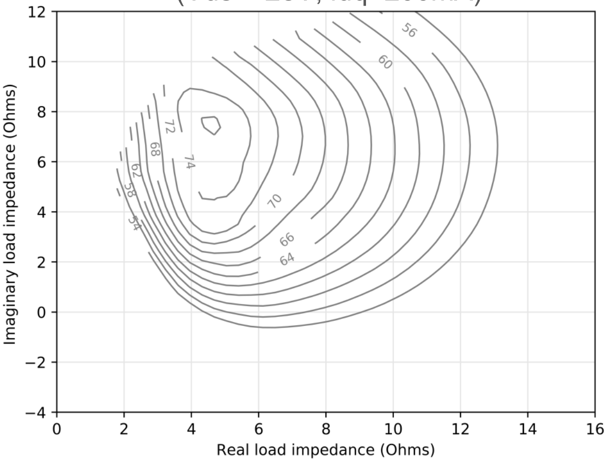


Max PAE = 74.5%
at Zload = 4.3+j7 ohms

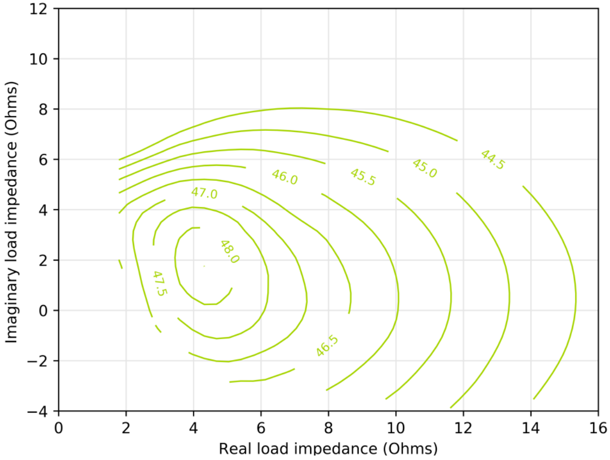
Max Power = 48.3dBm
at Zload = 4.2+j1.8 ohms

Impedances
Load 2f0 = 50ohms
Load 3f0 = 50ohms
Source f0 = 1.2+j2 ohms
Source 2f0 = 50ohms

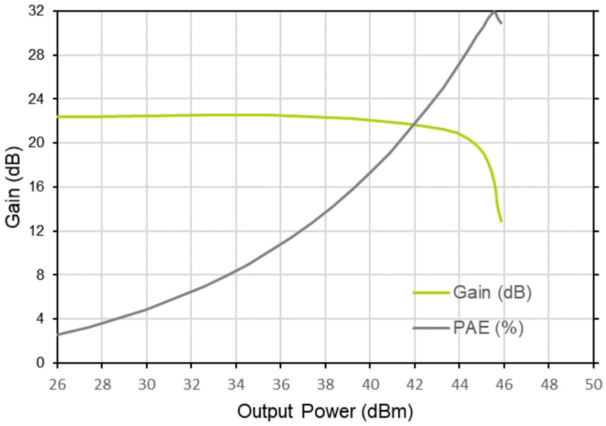
P3dB PAE contours
(Vds = 28V, idq=200mA)



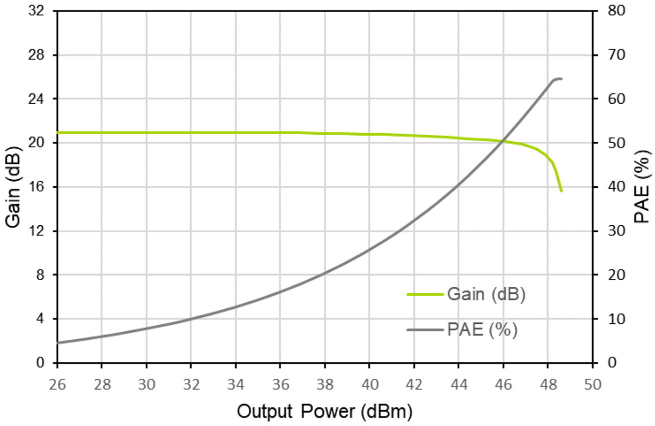
P3dB Output Power contours
(Vds = 28V, idq=200mA)



Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max PAE tune)

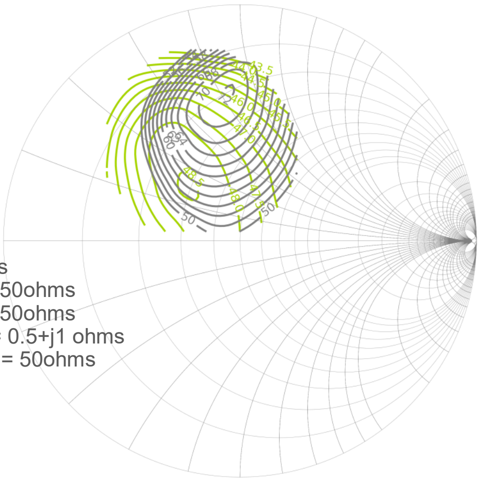


Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max Power tune)



Model Load Pull Data 6GHz

P3dB Output Power and PAE contours
(Vds = 28V, idq=200mA, Z0=5ohms)

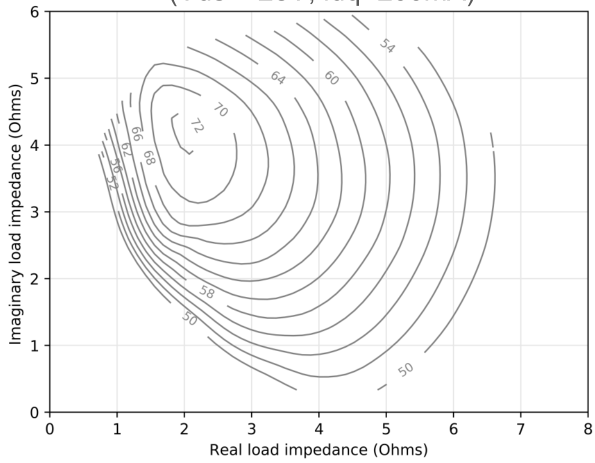


Max PAE = 72%
at Zload = 2.1+j4.2 ohms

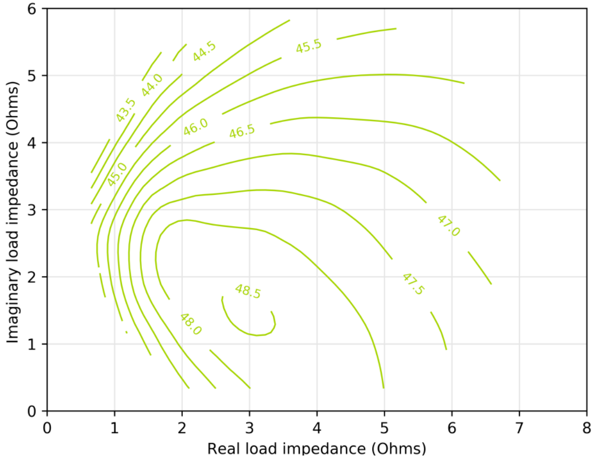
Max Power = 48.5dBm
at Zload = 3+j1.4 ohms

Impedances
Load 2f0 = 50ohms
Load 3f0 = 50ohms
Source f0 = 0.5+j1 ohms
Source 2f0 = 50ohms

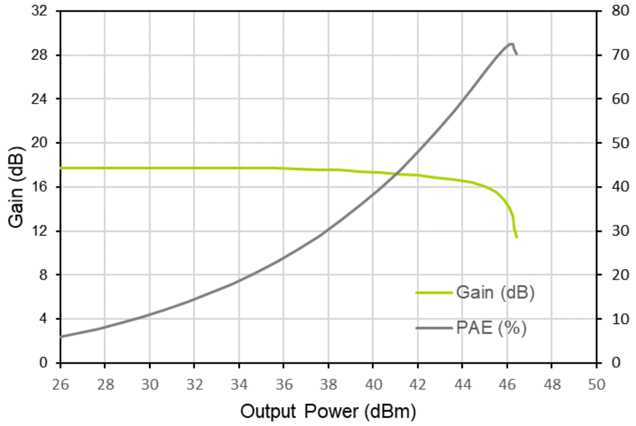
P3dB PAE contours
(Vds = 28V, idq=200mA)



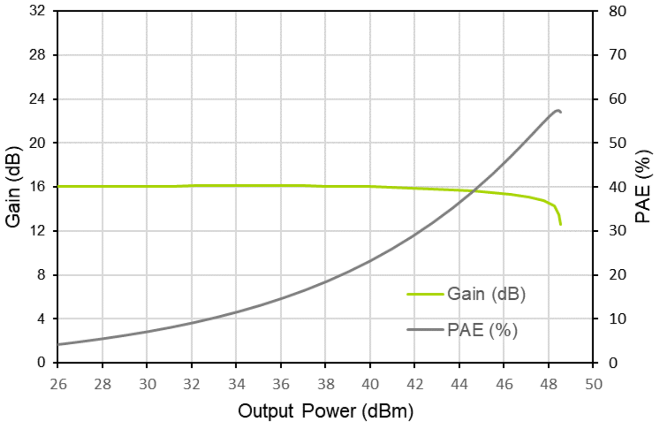
P3dB Output Power contours
(Vds = 28V, idq=200mA)



Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max PAE tune)

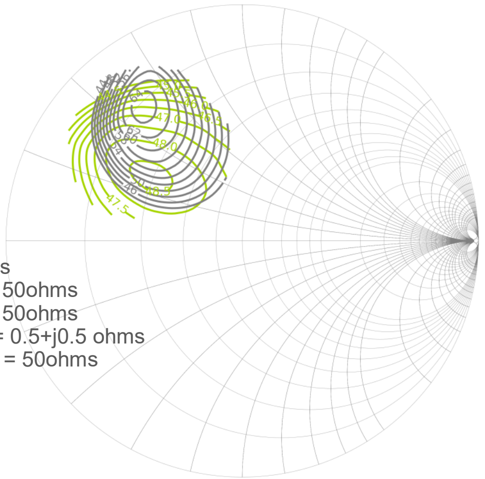


Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max Power tune)



Model Load Pull Data 10GHz

P3dB Output Power and PAE contours
(Vds = 28V, idq=200mA, Z0=5ohms)

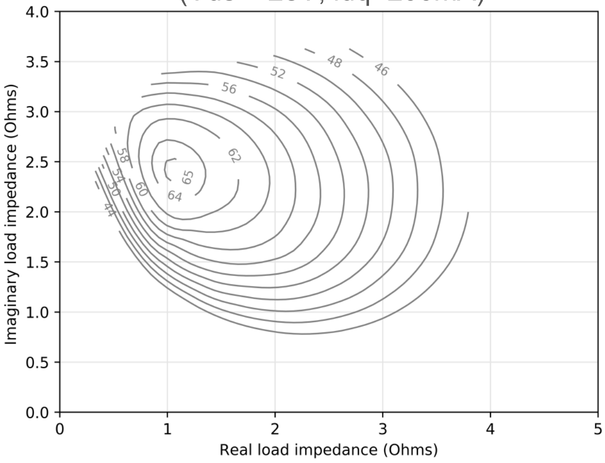


Max PAE = 65%
at Zload = 1.1+j2.4 ohms

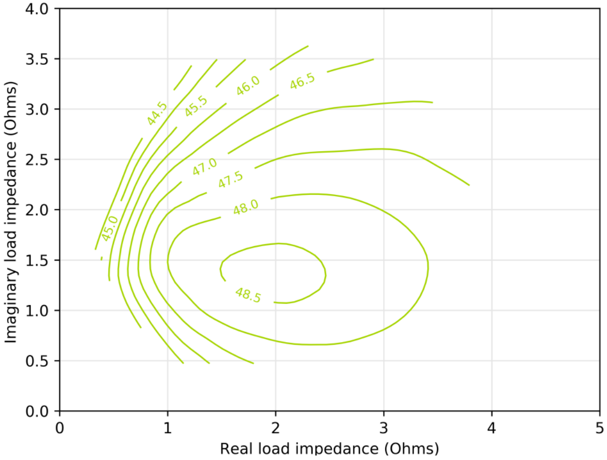
Max Power = 48.6dBm
at Zload = 2+j1.4 ohms

Impedances
Load 2f0 = 50ohms
Load 3f0 = 50ohms
Source f0 = 0.5+j0.5 ohms
Source 2f0 = 50ohms

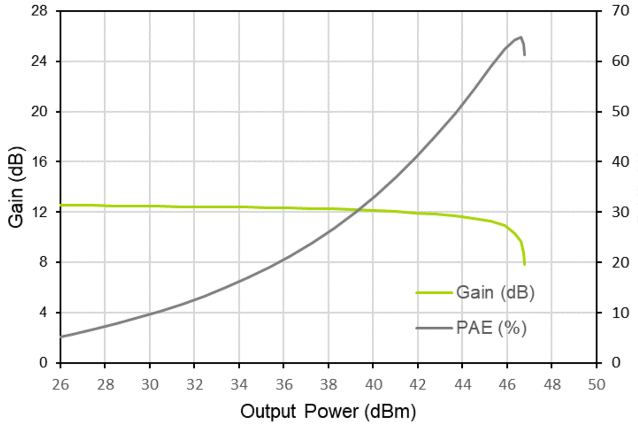
P3dB PAE contours
(Vds = 28V, idq=200mA)



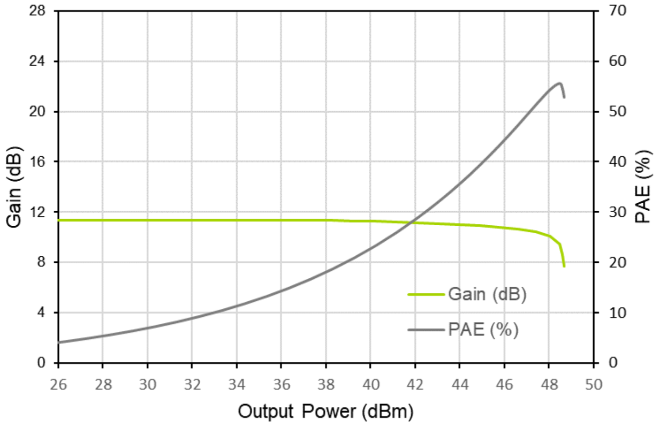
P3dB Output Power contours
(Vds = 28V, idq=200mA)



Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max PAE tune)

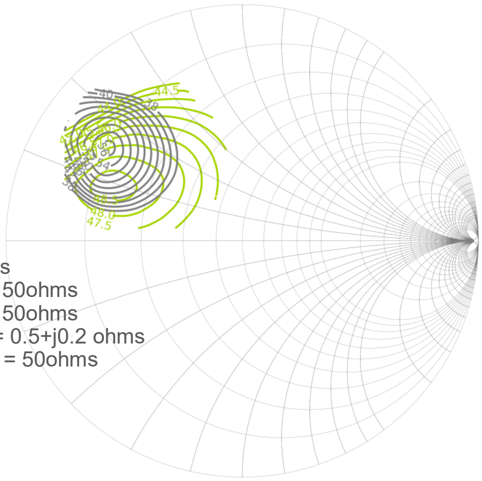


Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max Power tune)



Model Load Pull Data 14GHz

P3dB Output Power and PAE contours
(Vds = 28V, idq=200mA, Z0=5ohms)

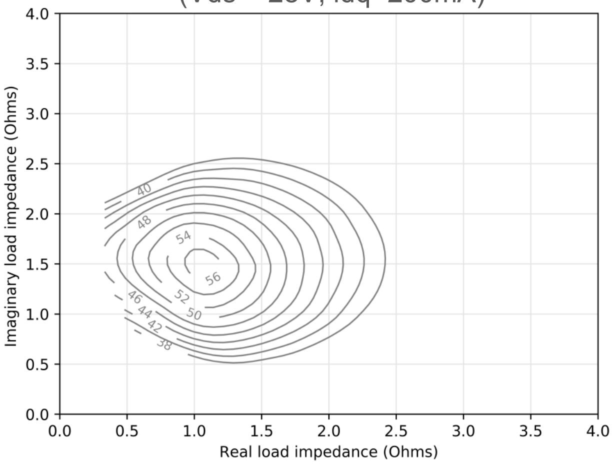


Max PAE = 55.8%
at Zload = 1+j1.4 ohms

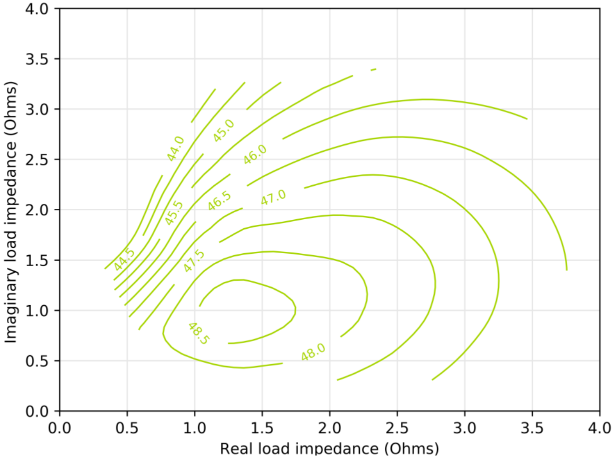
Max Power = 48.6dBm
at Zload = 1.15+j0.85 ohms

Impedances
Load 2f0 = 50ohms
Load 3f0 = 50ohms
Source f0 = 0.5+j0.2 ohms
Source 2f0 = 50ohms

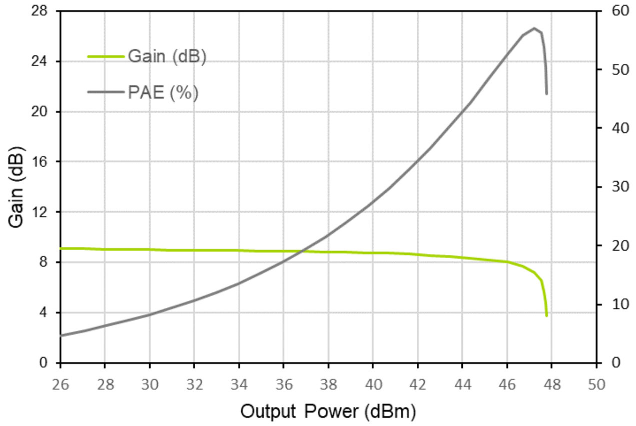
P3dB PAE contours
(Vds = 28V, idq=200mA)



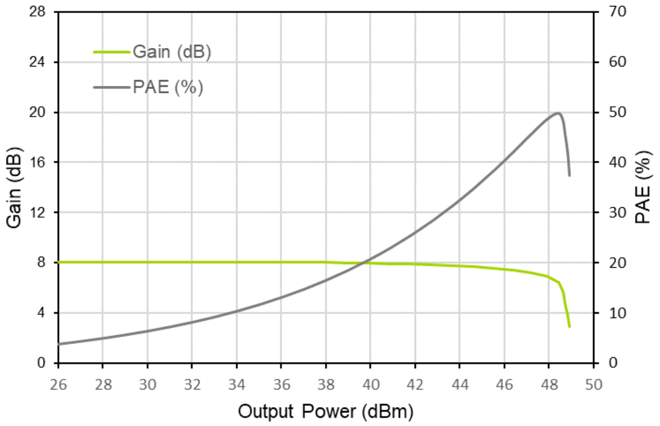
P3dB Output Power contours
(Vds = 28V, idq=200mA)



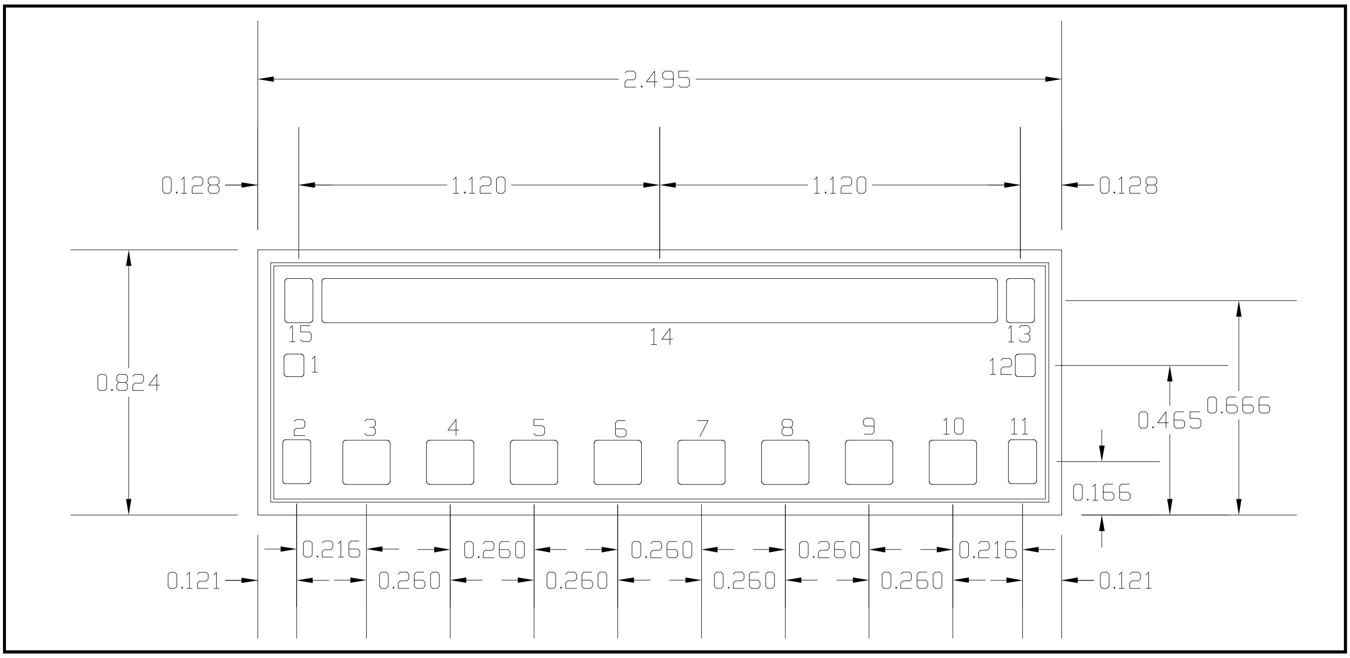
Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max PAE tune)



Gain and PAE vs Output Power
(Vds=28V, idq=200mA, Max Power tune)



Mechanical Drawing



Bond Pads

Pad Number	Description	Dimensions (mm)
1,12	GND	0.062x 0.07
2,11	Gate Resistor	0.087 x 0.137
3-10	Gate	0.137 x 0.147
13,15	Drain Resistors	0.137 x 0.088
14	Drain	2.19 x 0.150
Die Backside	Source	2.495 x 0.824

Bias-Up Procedure

1. Set V_G=-5V
2. Set V_D to 28V
3. Adjust V_G positive until ID quiescent is 200mA
4. Limit I_D to 4A
5. Apply RF Signal

Bias-down Procedure

1. Turn off R_F
2. Turn off V_D, allow drain capacitor to discharge
3. Turn off V_G.

Assembly Guidance

Die attach of component using adhesive

- Vacuum collets are preferred method of pickup
- Silver sintered epoxy is recommended

Interconnect assembly Notes

- Ball Bonding is preferred technique
- Force, time and ultrasonic parameters are critical
- Aluminum wire bonding is not recommended
- Bond Wire diameter of 1.5mil is recommended

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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