ICPB1020 | Discrete Power GaN HEMT 100 Watt

ICONIC RF
a Microchip company

Features

- Frequency Range DC-14GHz
- 51.5dBm Nominal P_{3dB} Pulsed
- Maximum PAE at 6GHz of 71%
- 18dB Linear Gain at 6GHz
- Drain Bias 28V
- Technology: GaN on SiC
- Lead-free and RoHS compliant
- Chip Dimensions: 0.82 x 4.56 x 0.10mm

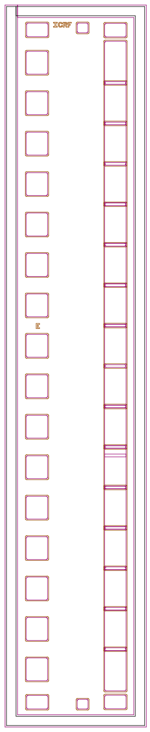
Applications

- Aerospace & Defense
- Broadband Wireless

Description

The ICPB1020 is a GaN on SiC discrete HEMT that operates from DC-14GHz. The design is optimized for power and efficiency using field plate technology.

Image



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}	dB	51.6	51.6	51.6	51.6
Bias Current	mA	400	400	400	400
PAE @ P_{3dB}	%	77.7	71.4	64.4	55.7
Gain @ P_{3dB}	dB	21	15	10.1	7.4

Recommended operating conditions

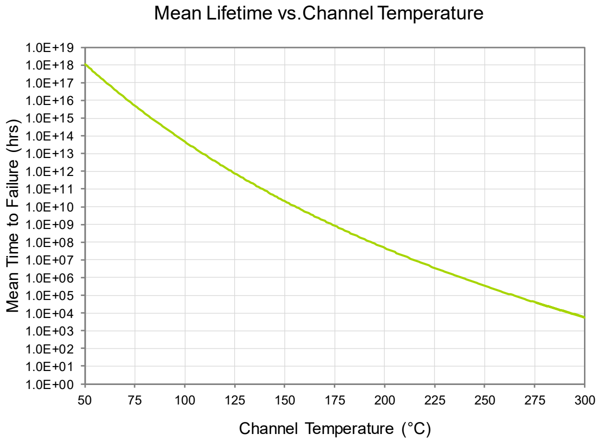
Parameter	Value
Drain Voltage (V_{DG})	12-32 V
Drain Quiescent Current (I_D)	0.4-1A
Drain current RF Drive (I_D)	8A
Gate Voltage (V_G)	-3V
Power Dissipation (CW)	112W
Channel Temperature (Max)	225°C

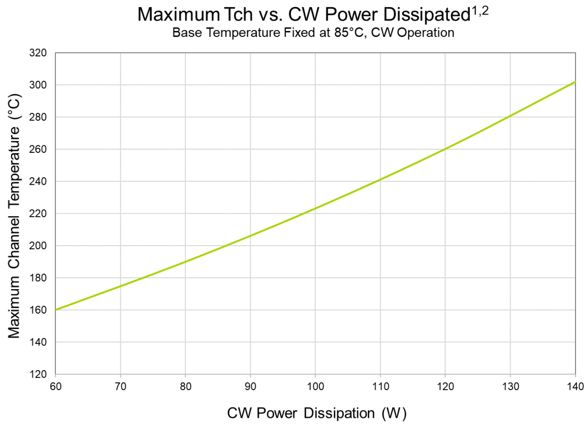
Absolute Maximum Ratings

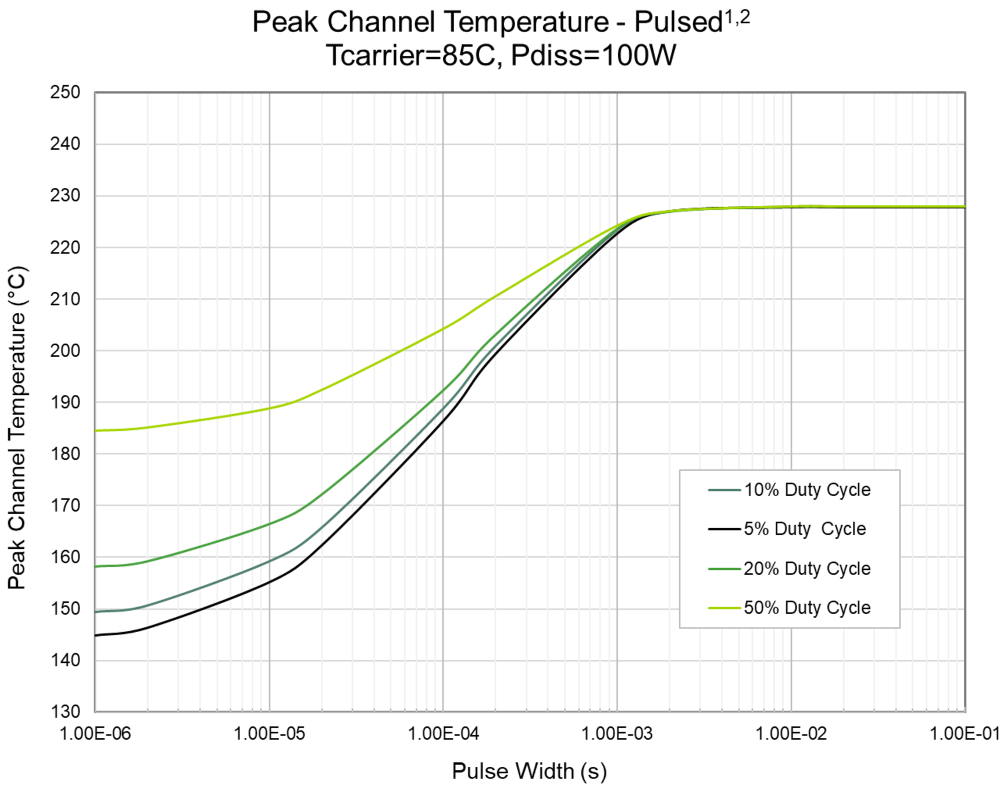
Parameter	Absolute Maximum
Drain to Gate Voltage (V_{DG})	80 V
Gate Voltage Range (V_G)	-20V to 0V
Gate Current (I_G)	-20 to 60mA
Power Dissipation (CW)	128W
CW Input Power	+43dBm
Channel Temperature	275°C
Storage Temperature	-65°C to +150°C

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



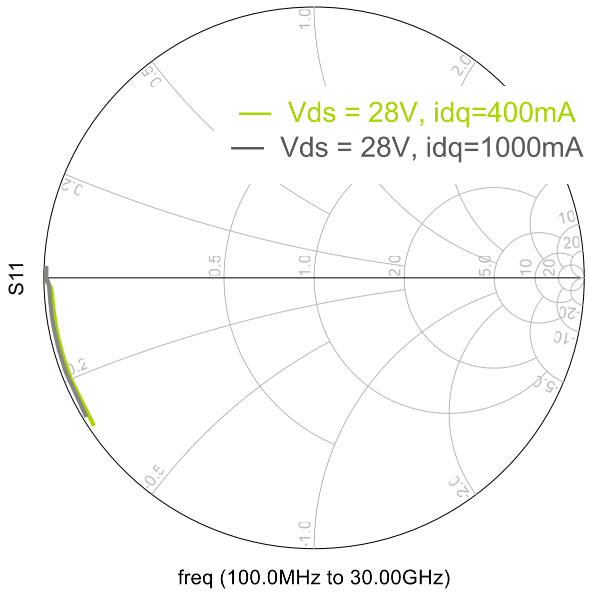


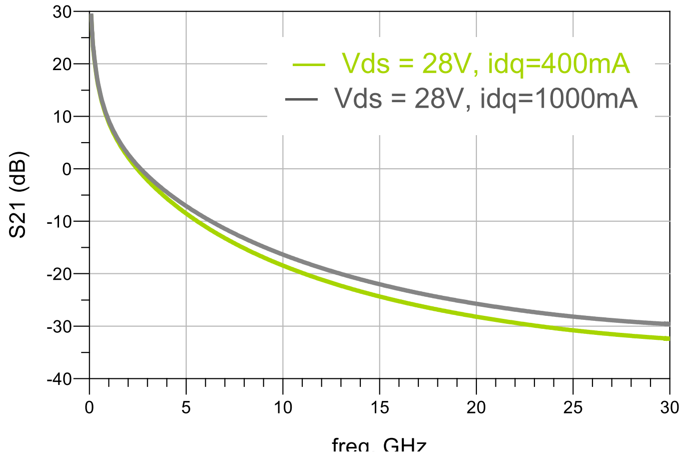


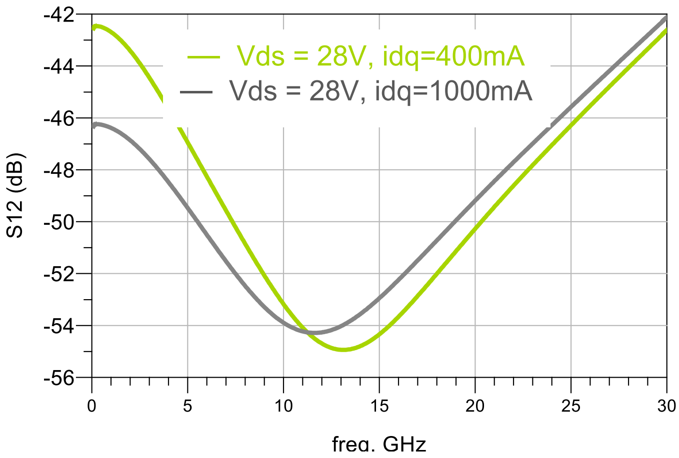
Notes

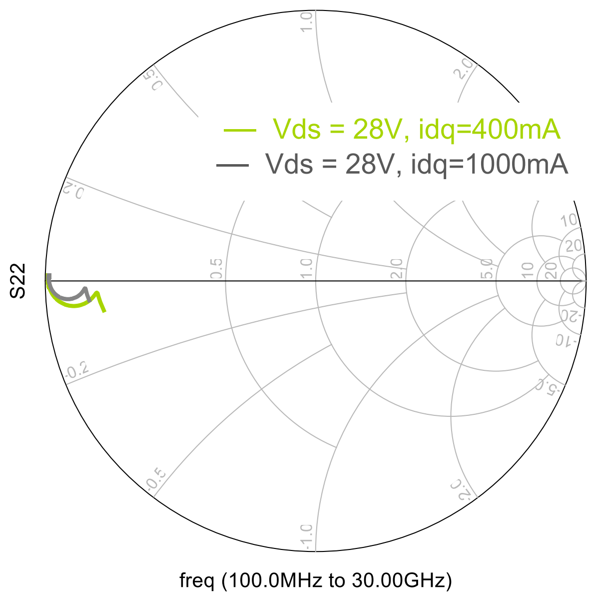
1. Assumes silver sintered epoxy attach (15um thick) and mounted on CuMo carrier
2. Base temperature is assumed at the top of the CuMo carrier

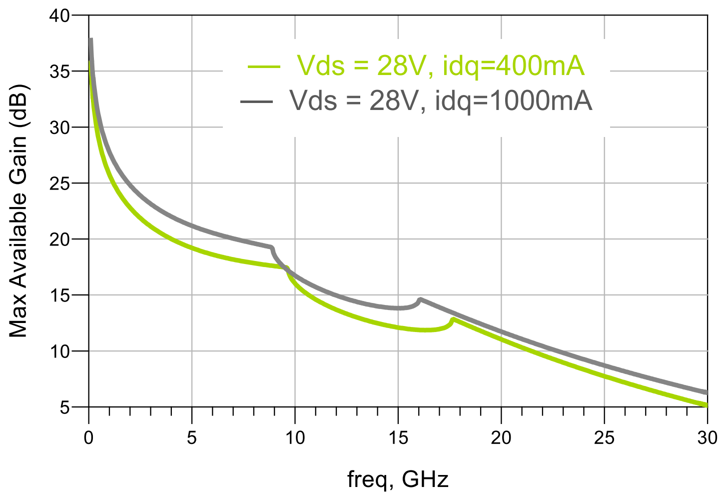
Model S-parameters | T_A = 25ºC





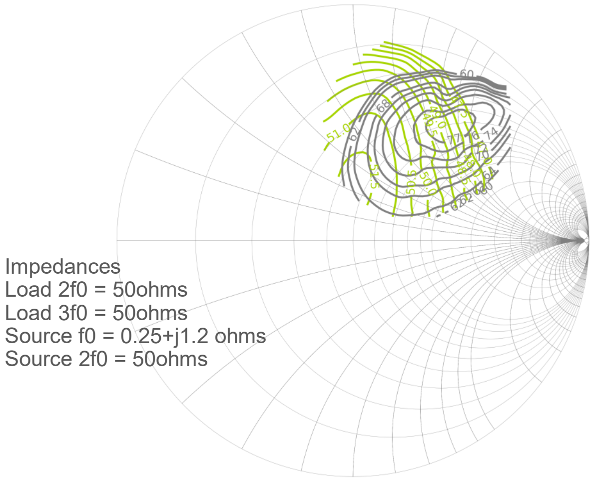






Model Load Pull Data 3GHz

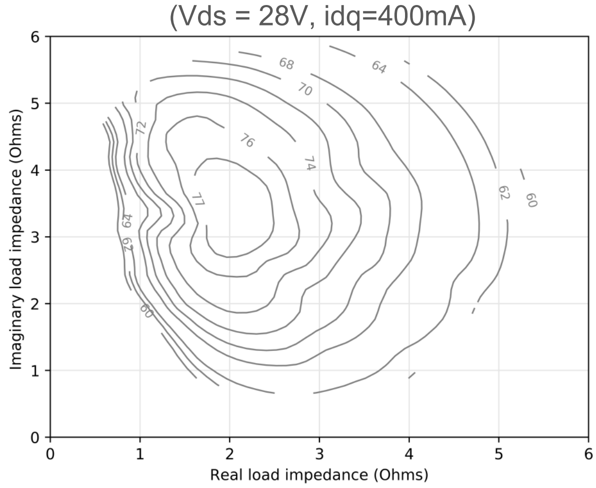
P3dB Output Power and PAE contours
(Vds = 28V, idq=400mA, Z0=2ohms)



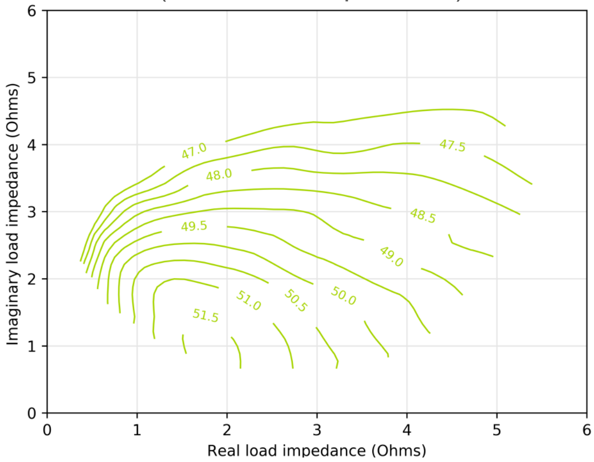
Max PAE = 77.7%
at Zload = 2.2+j3.2 ohms

Max Power = 51.6dBm
at Zload = 1.8+j0.9 ohms

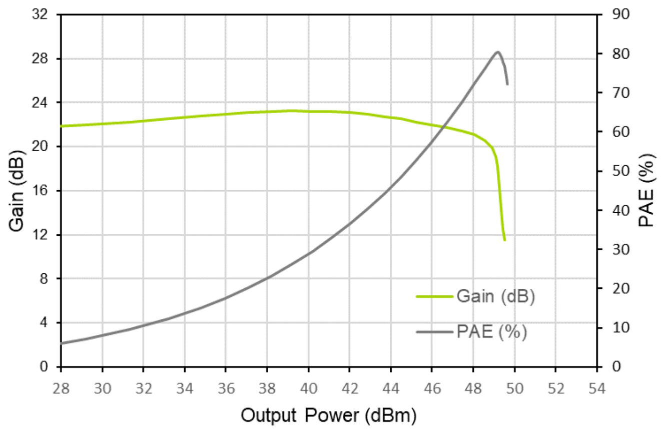
P3dB PAE contours
(Vds = 28V, idq=400mA)



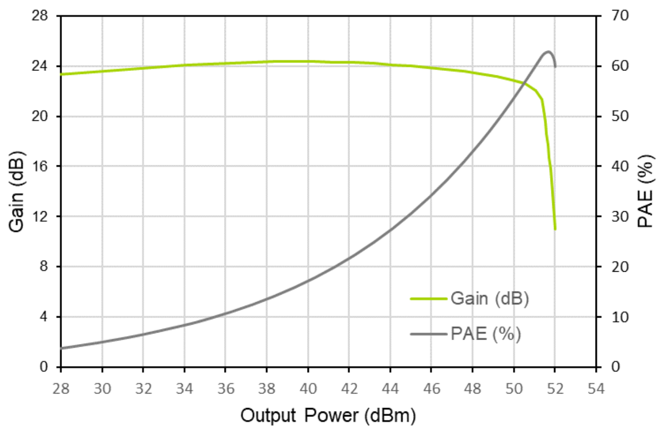
P3dB Output Power contours
(Vds = 28V, idq=400mA)



Gain and PAE vs Output Power
(Vds=28V, idq=400mA, Max PAE tune)

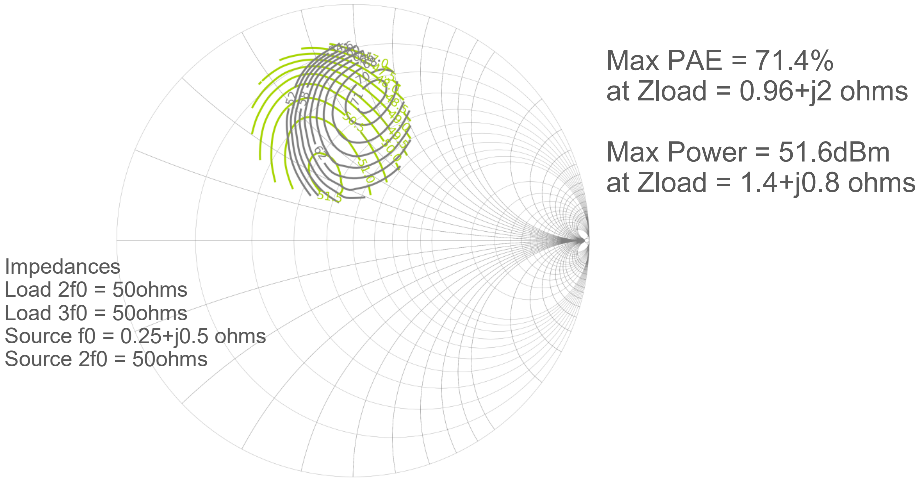


Gain and PAE vs Output Power
(Vds=28V, idq=400mA, Max Power tune)

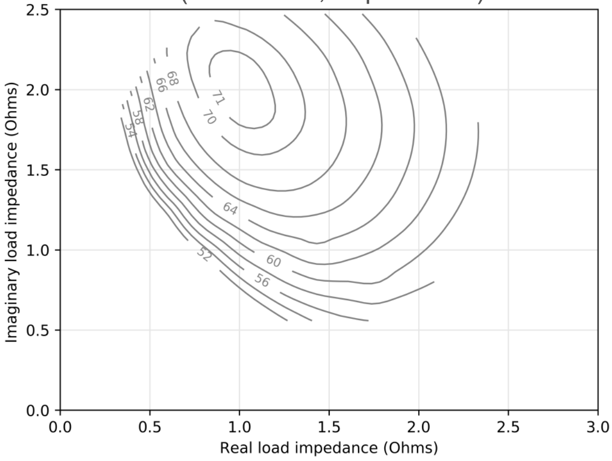


Model Load Pull Data 6GHz

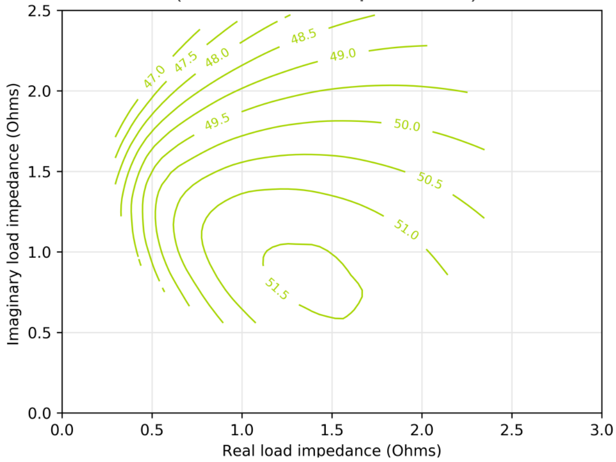
P3dB Output Power and PAE contours
(Vds = 28V, idq=400mA, Z0=2ohms)



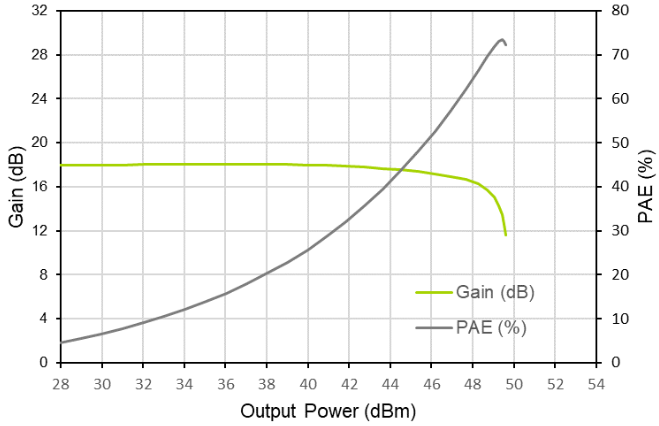
P3dB PAE contours
(Vds = 28V, idq=400mA)



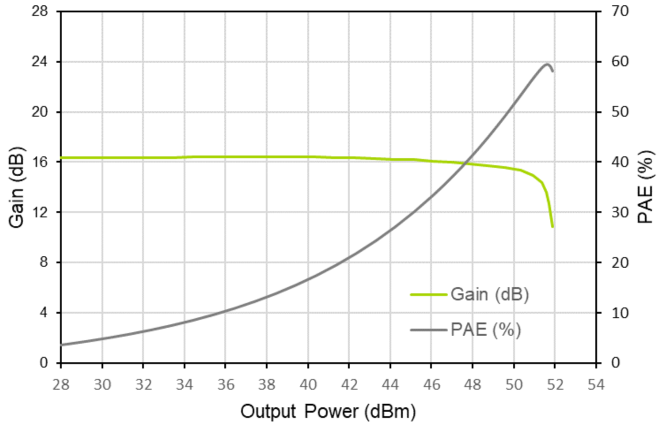
P3dB Output Power contours
(Vds = 28V, idq=400mA)



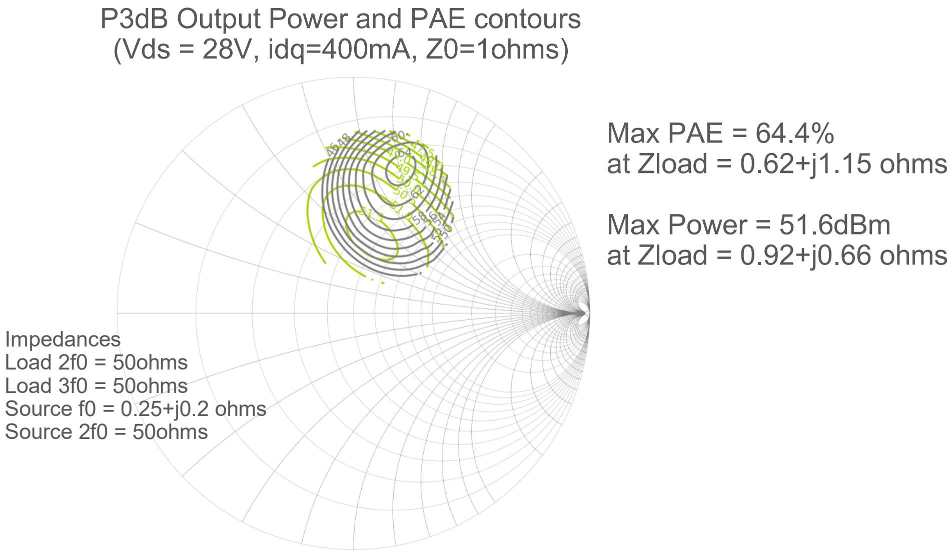
Gain and PAE vs Output Power
(Vds=28V, idq=400mA, Max PAE tune)

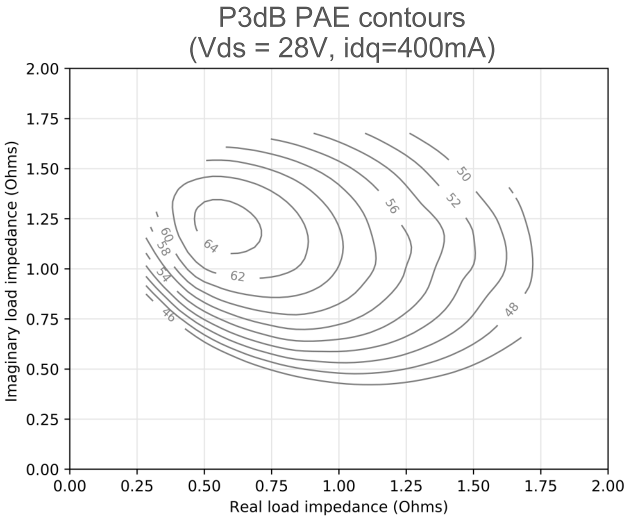


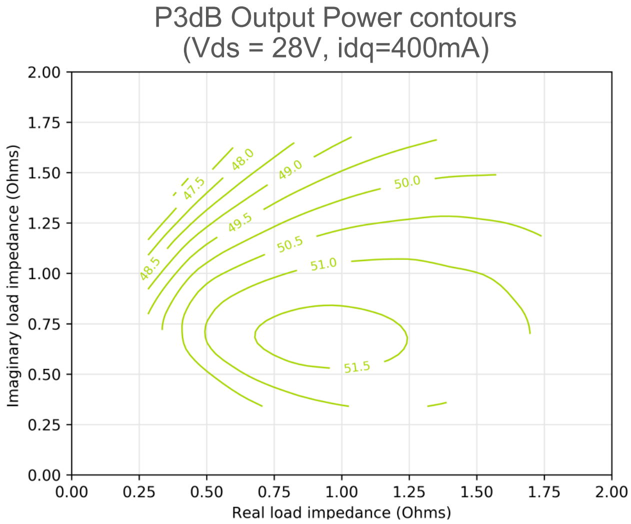
Gain and PAE vs Output Power
(Vds=28V, idq=400mA, Max Power tune)

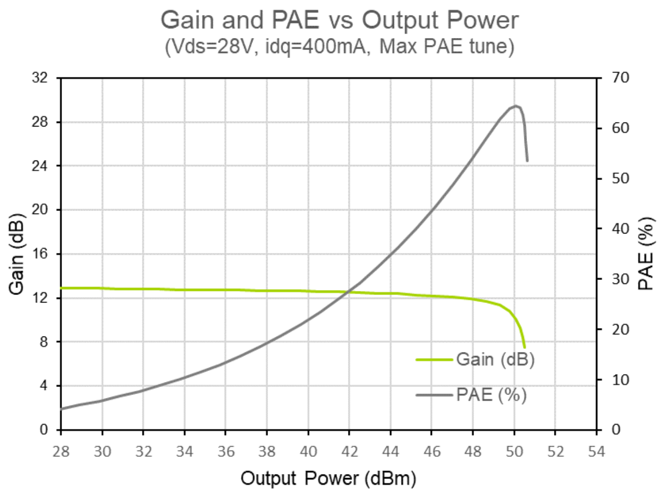


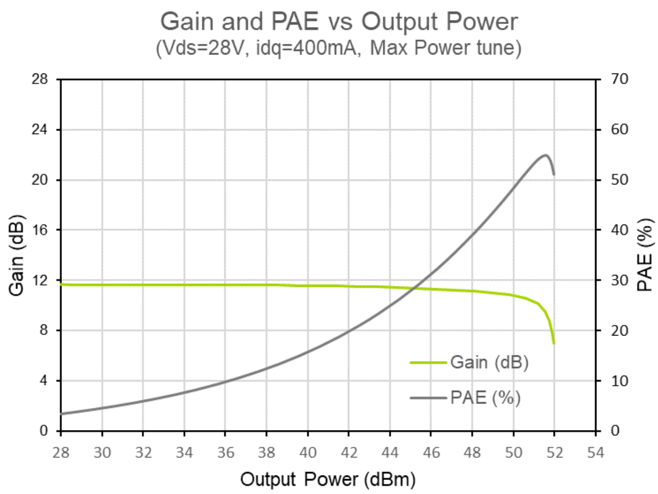
Model Load Pull Data 10GHz





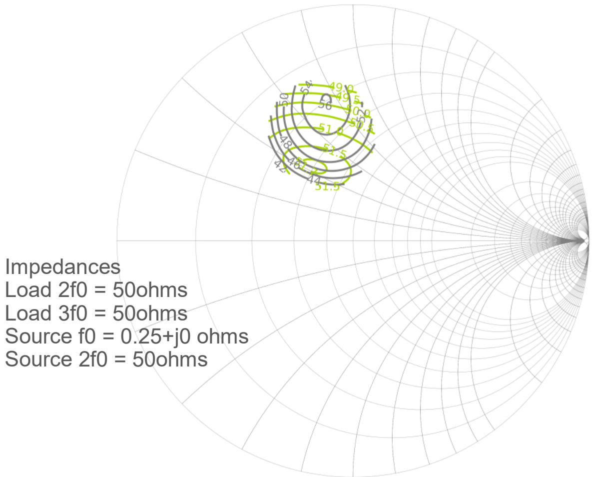






Model Load Pull Data 14GHz

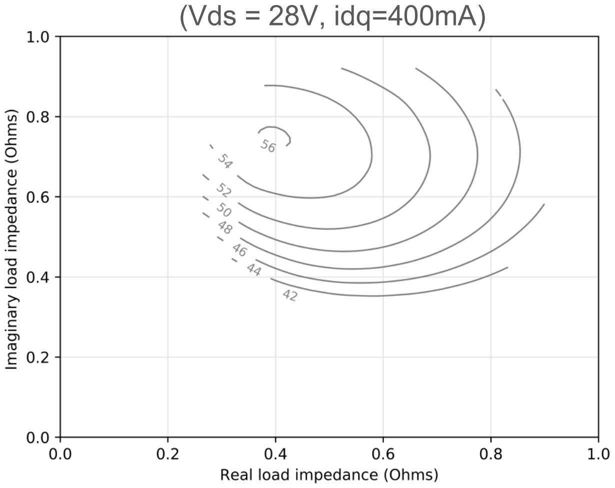
P3dB Output Power and PAE contours
(Vds = 28V, idq=400mA, Z0=1ohms)



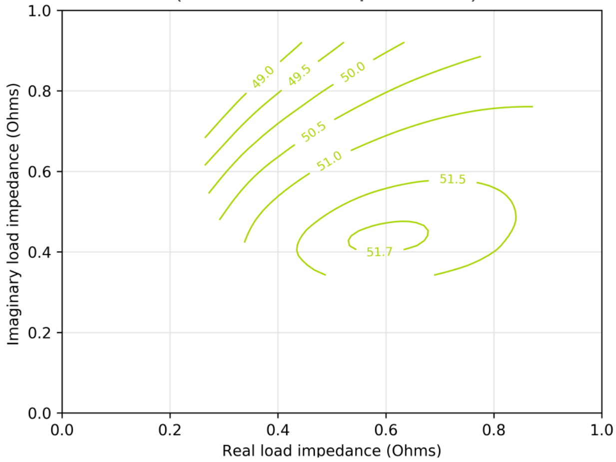
Max PAE = 55.7%
at Zload = 0.4+j0.75 ohms

Max Power = 51.6dBm
at Zload = 0.6+j0.44 ohms

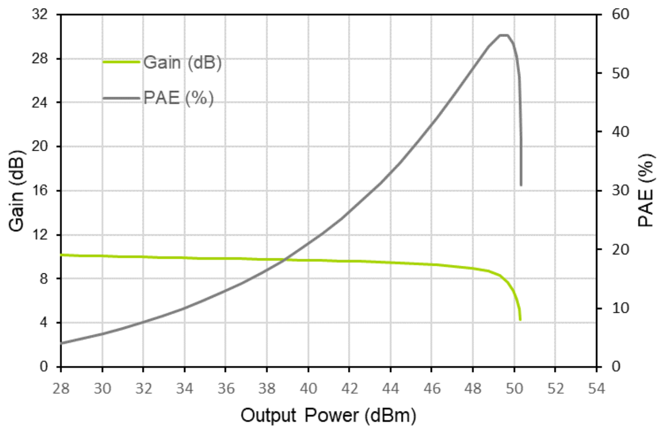
P3dB PAE contours
(Vds = 28V, idq=400mA)



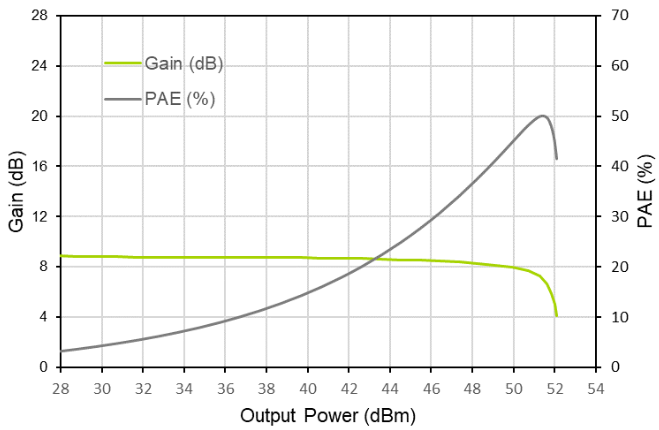
P3dB Output Power contours
(Vds = 28V, idq=400mA)



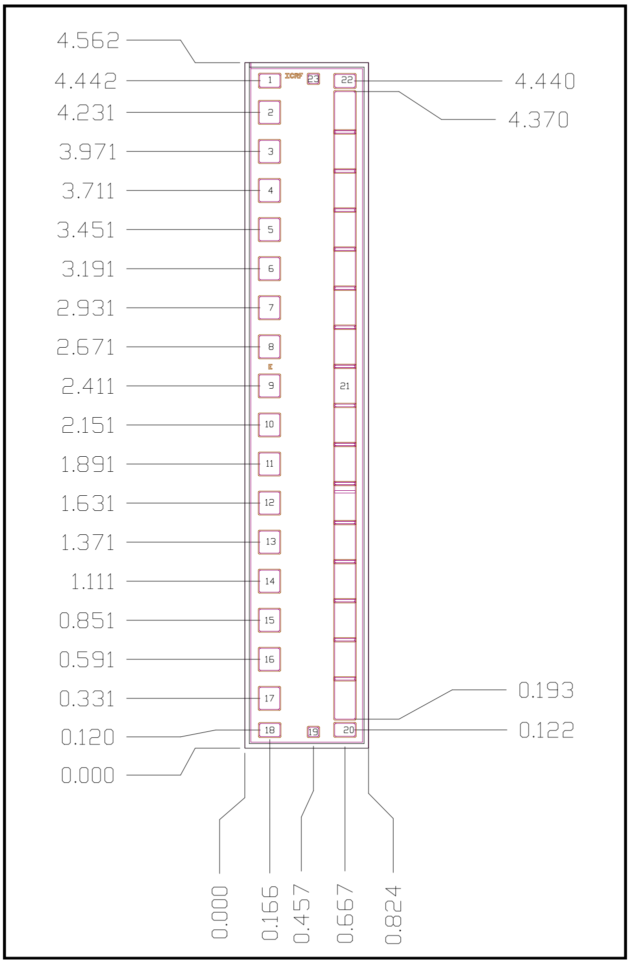
Gain and PAE vs Output Power
(Vds=28V, idq=400mA, Max PAE tune)



Gain and PAE vs Output Power
(Vds=28V, idq=400mA, Max Power tune)



Mechanical Drawing



Bond Pads

Pad Number	Description	Dimensions (mm)
1,18	Gate Resistor	0.137 x 0.870
2-17	Gate	0.137 x 0.147
19, 23	Source	0.07 x 0.062
20,22	Drain Resistor	0.137 x 0.087
21	Drain	4.17 x 0.137
Die Backside	Source	4.562 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 achieved
4. Limit I_D to 8A
5. Apply RF Signal

Bias-down Procedure

1. Turn off RF
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 -Namics H9890-6A, Kyocera CT2700R7S

Die attach of component using Eutectic

- Flux-less gold-tin (AuSn) (80% Au, 20% Sn with a melting point of 280ºC) preform is preferred between the die and attached surface.
- Recommended preform should be approximately 0.0012" thick.
- Die bonder using heated collet with a temperature of 310ºC and die scrubbing should be used to ensure wetting and prevent formation of voids.
- Exposure to extreme temperature should be kept to a minimum.
- The optimum die attach environment is nitrogen atmosphere.

Interconnect assembly Notes

- Ball Bonding and wedge 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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