



### Description

ICONICRF's ICP1040P is a 2 stage MMIC power amplifier in 6mm package, fabricated using GaN on SiC technology. ICP1040P operates from 7.9-11GHz with 41dBm output power, 40% typical PAE and 22dB small signal gain. ICP1040P is well suited to commercial and defense applications.

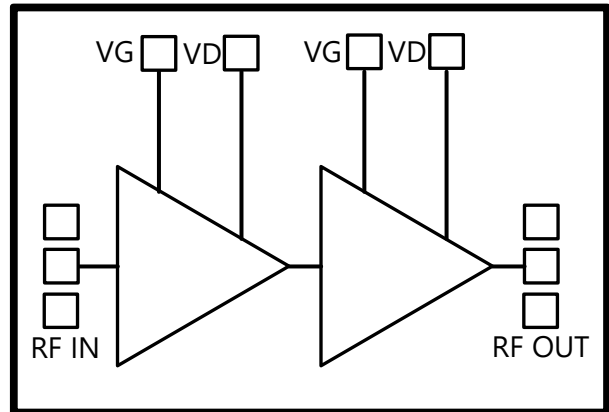
### Features

- Frequency Range: 7.9 - 11GHz
- Pout: 40 dBm Pulsed (100uS,10%)
- PAE: 40%
- Small Signal Gain: 22 dB
- Bias: VD=24V IDQ=100mA
- Integrated Power Detector
- Technology: GaN on SiC
- Lead-free and RoHS compliant
- Package: 6mm x 6mm QFN

### Applications

- Commercial Radar
- Satellite Communications
- Aerospace & Defense

### Image



Electrical Specifications | Test conditions unless otherwise stated |  $V_D=28V$ ,  $I_{DQ}=100mA$ ,  $T_A=25^\circ C$ , Pulsed 100uS / 10%

Parameter	Conditions	Min	Typ	Max	Units
Frequency		7.9		11	GHz
Output Power @ $P_{sat}$	$P_{IN}=24dBm$		40		dBm
PAE @ $P_{sat}$	$P_{IN}=24dBm$		40		%
Small Signal Gain			22		dB
Input Return Loss			10		dB
Output Return Loss			6		dB
$I_{DQ}$			100		mA
$V_{GS}$			-2.42		V
$I_D$ drive	$P_{OUT}=41dBm$		1100		mA

### Absolute Maximum Ratings

Parameter	Absolute Maximum
Drain Voltage ( $V_D$ )	30.0V
Gate Voltage Range ( $V_G$ )	-5 to 0V
Gate Current ( $I_G$ )	5mA
Drain Current (CW) $T_A=25^\circ C$	2.0A
CW Input Power 50ohm, $T_A=25^\circ C$	+20dBm
Channel Temperature	275°C
Storage Temperature	-65°C to +150°C

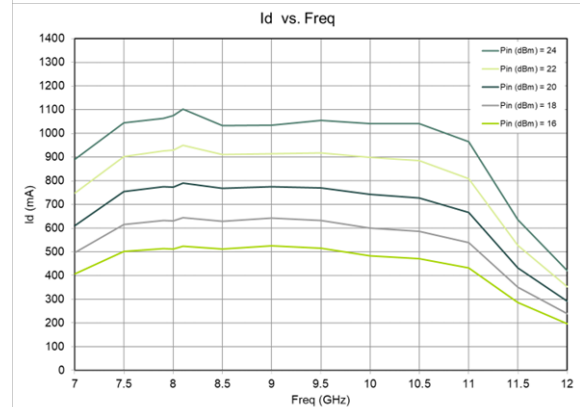
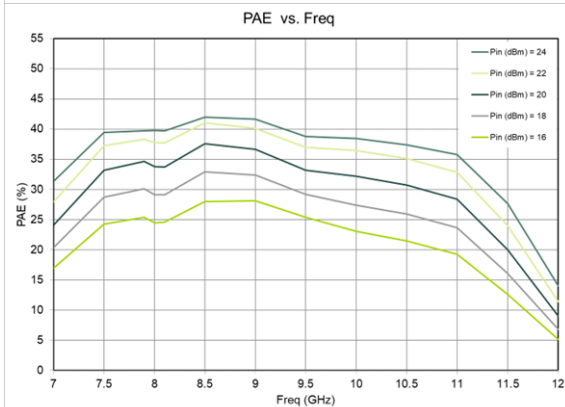
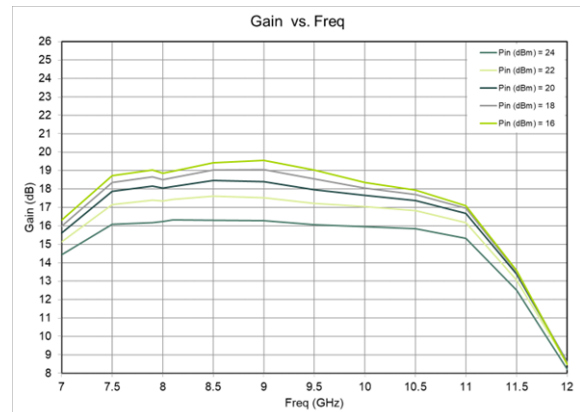
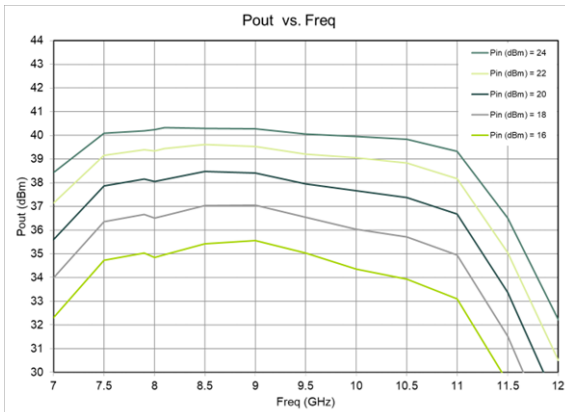
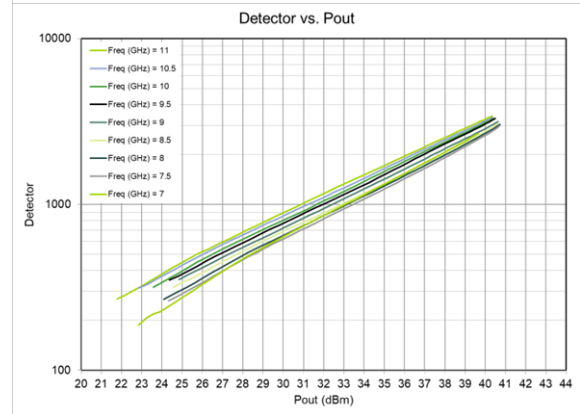
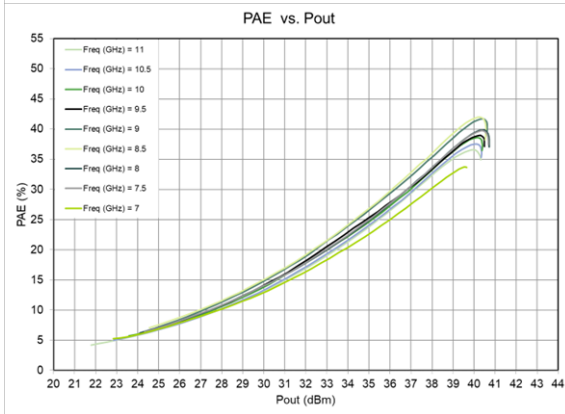
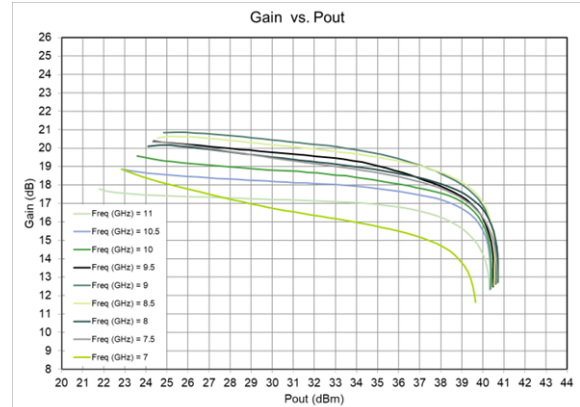
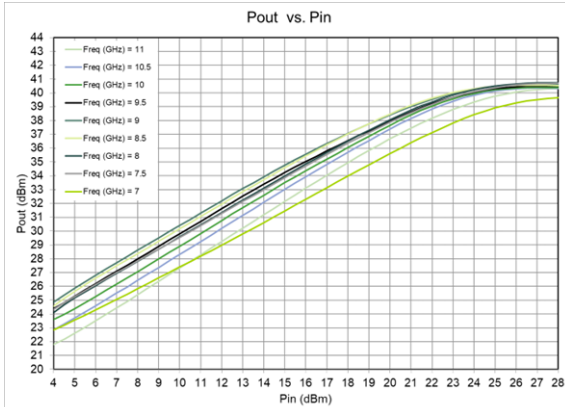
Exceeding any one or combination of these limits may cause permanent damage to this device. ICONIC RF does not recommend sustained operation near these survivability limits.

### Ordering Information

Part No.	Description
ICP1040-1-350I	6x6mm 40ld QFN Package
ICP1040-2-501U	Evaluation Board with SMA connectors

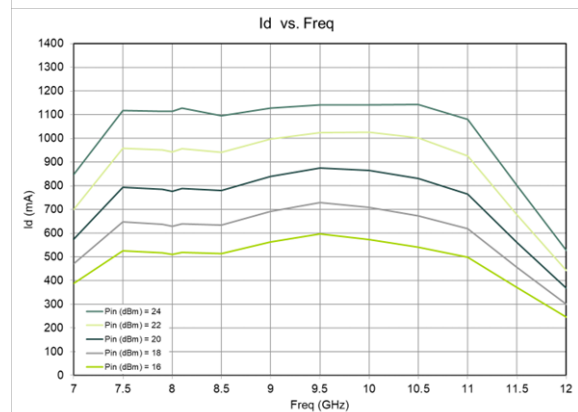
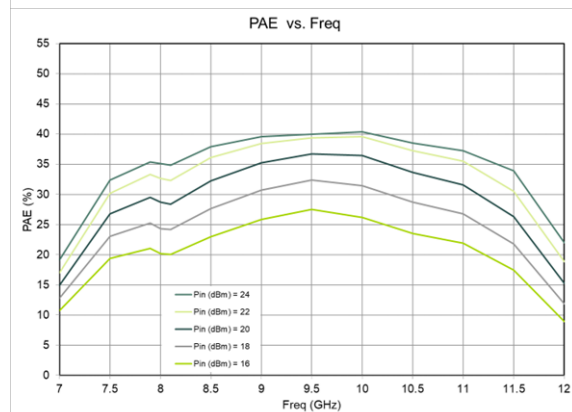
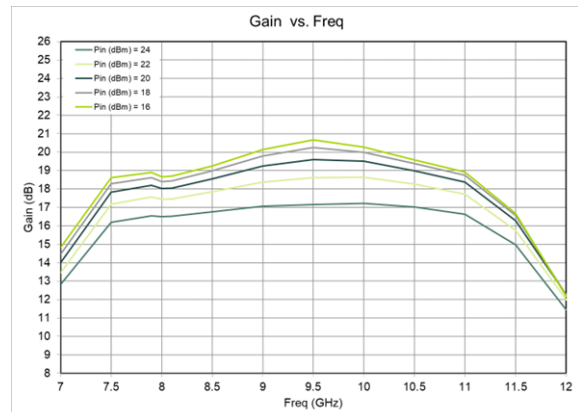
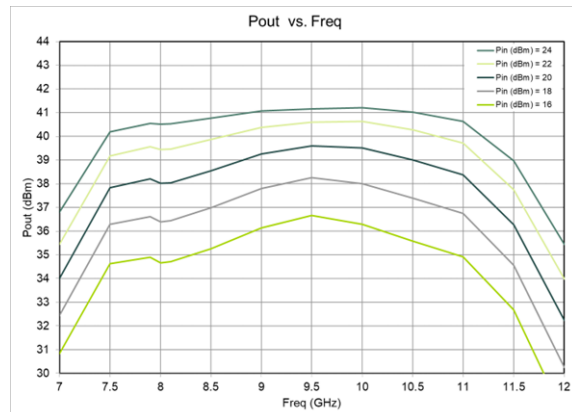
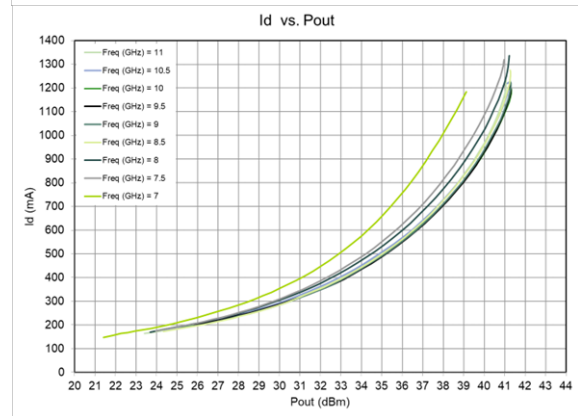
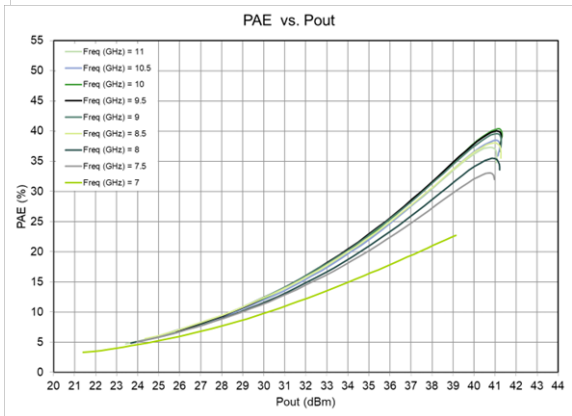
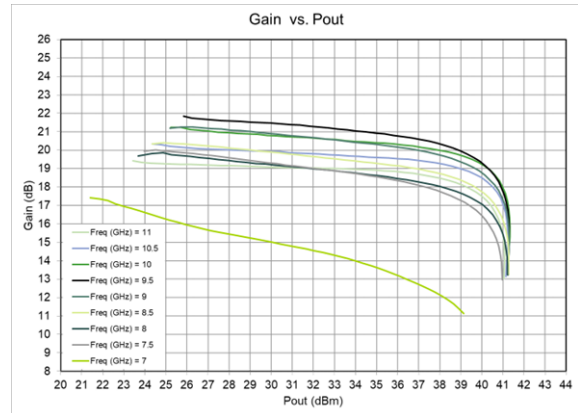
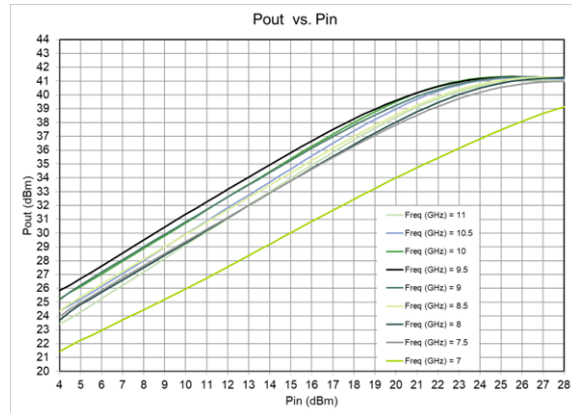


**Power Performance** | Test conditions unless otherwise stated |  $V_D=24V$ ,  $I_{DQ}=100mA$ , Pulse = 100us / 10%,  $T_A=25C$



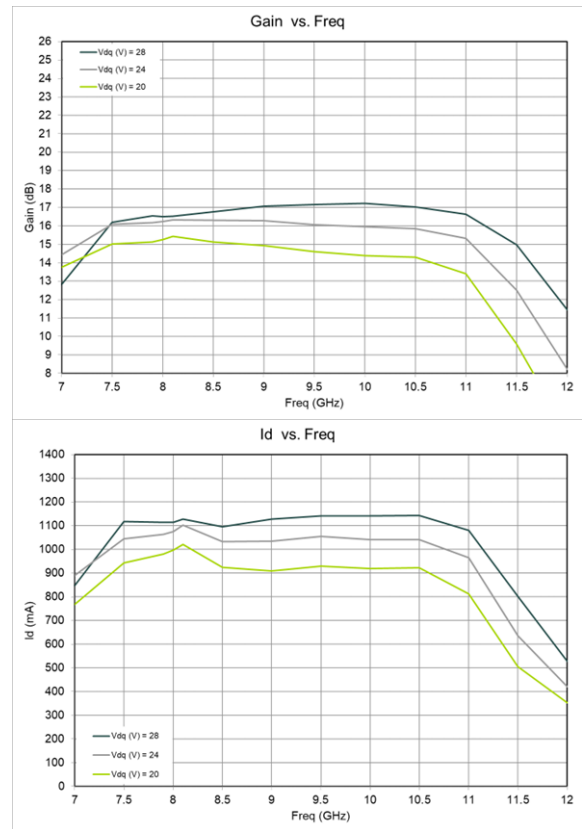
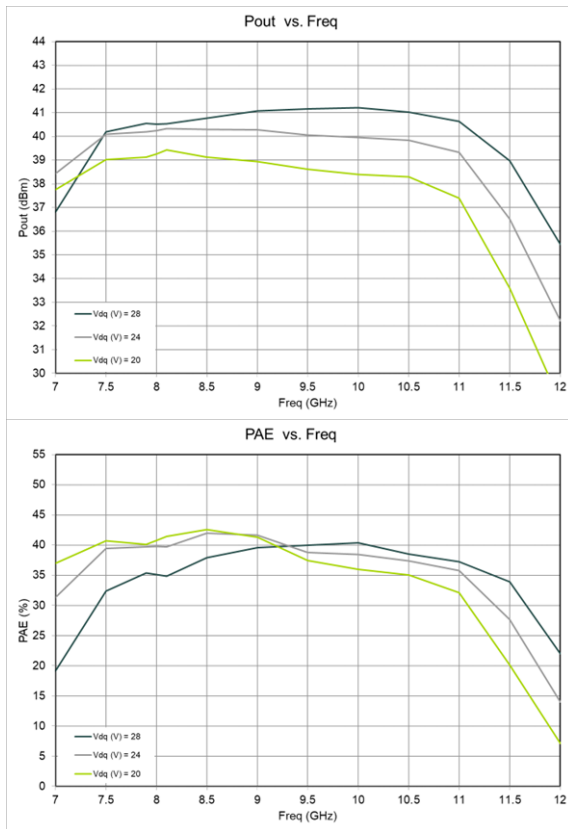


**Power Performance** | Test conditions unless otherwise stated |  $V_D=28V$ ,  $I_{DQ}=100mA$ , Pulse = 100us / 10%,  $T_A=25C$

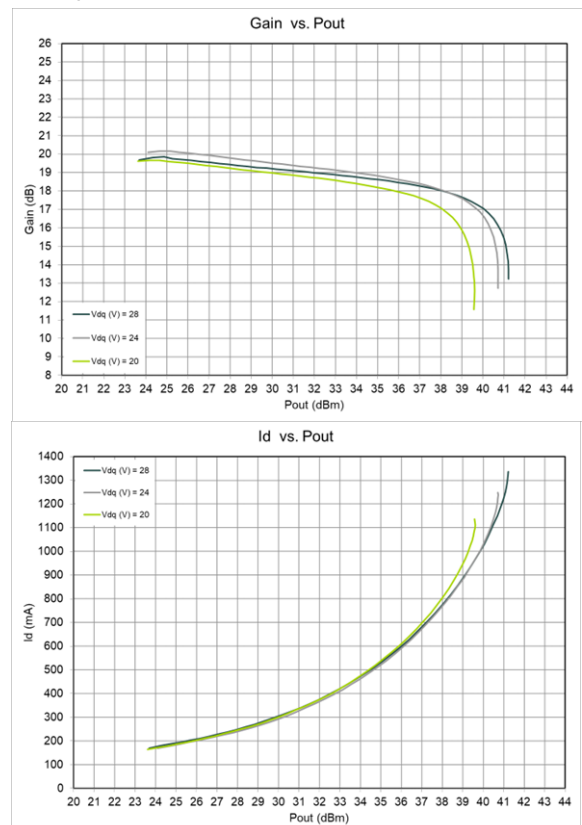
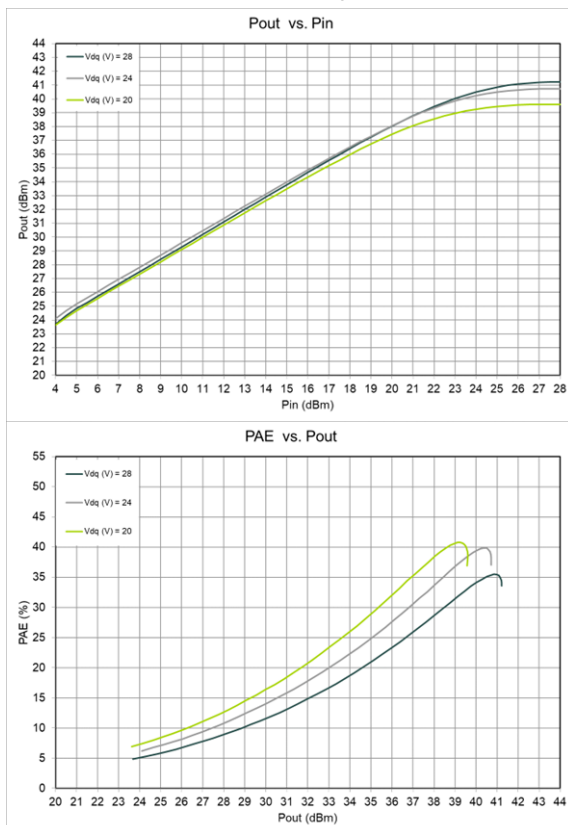




### Power Performance | Test conditions unless otherwise stated | $P_{IN}=24\text{dBm}$ , $I_{DQ}=100\text{mA}$ , Pulse = 100us / 10%, $T_A=25\text{C}$

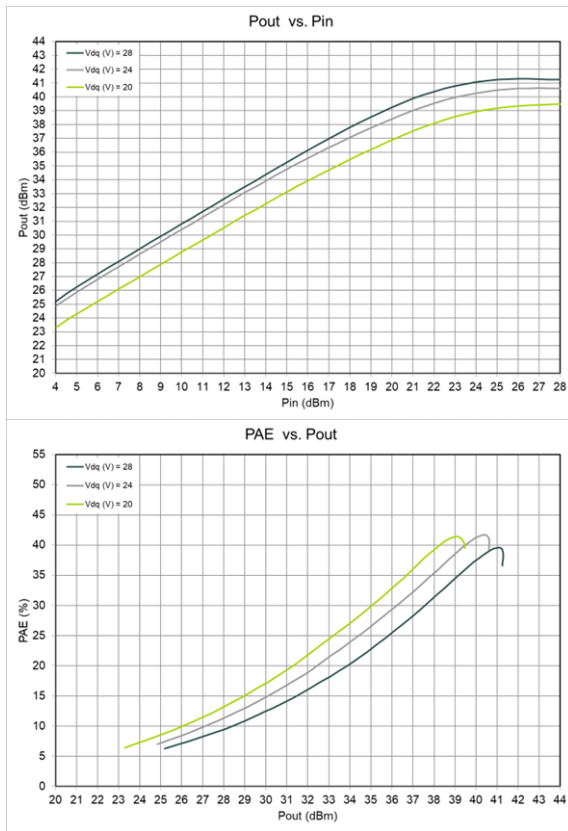


### Power Performance, Pulsed | Test conditions unless otherwise stated | Freq=8GHz, $I_{DQ}=100\text{mA}$ , Pulse = 100us / 10%, $T_A=25\text{C}$

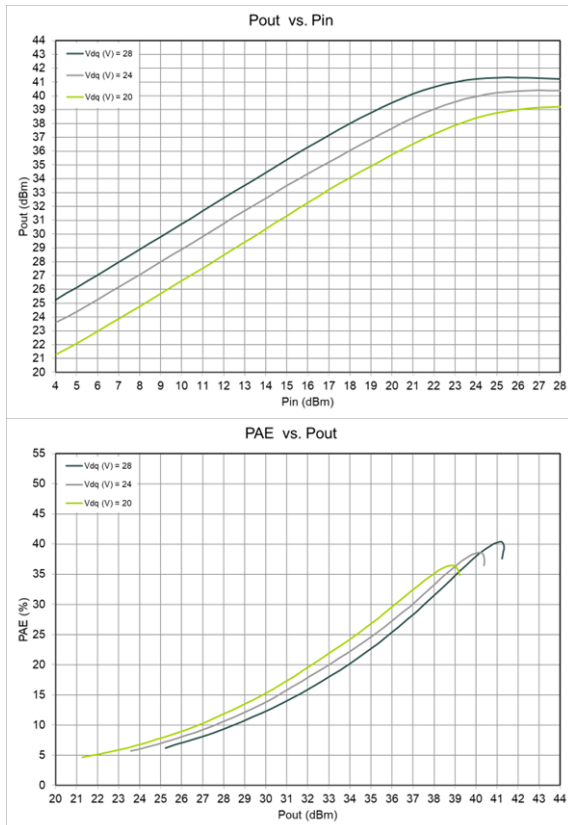




### Power Performance | Test conditions unless otherwise stated | Freq=9GHz, $I_{DQ}=100mA$ , Pulse = 100us / 10%, $T_A=25C$

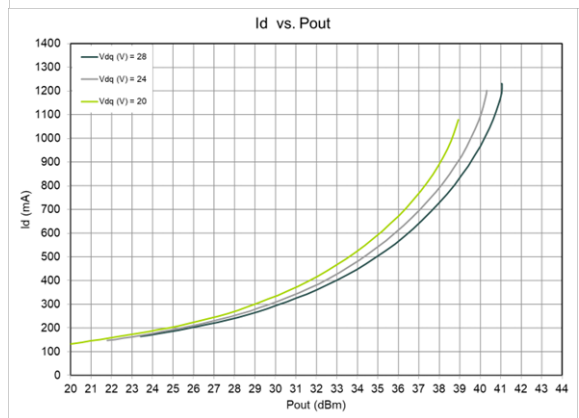
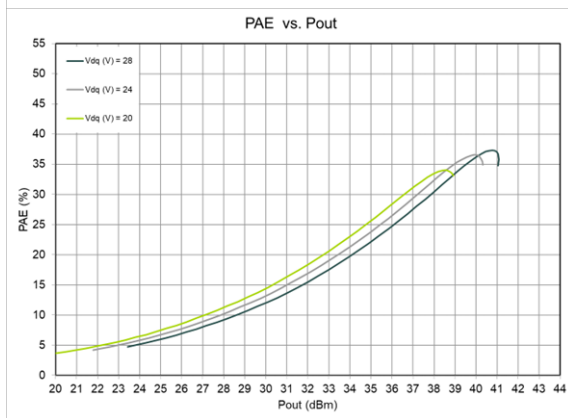
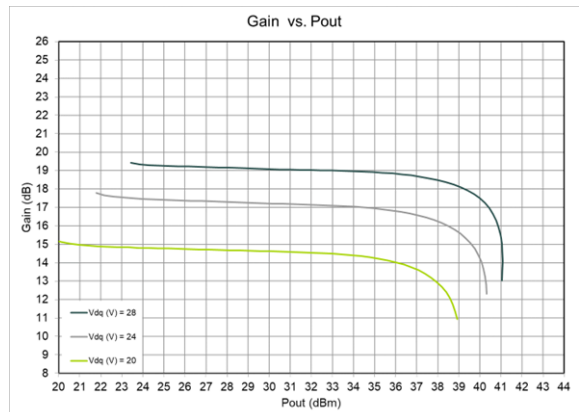
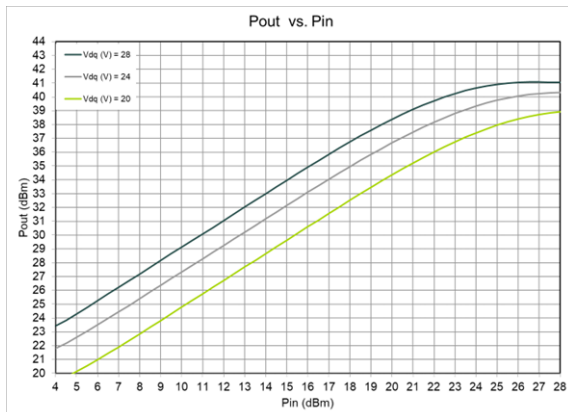


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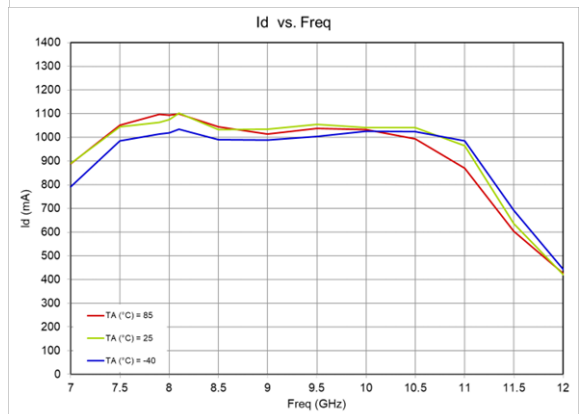
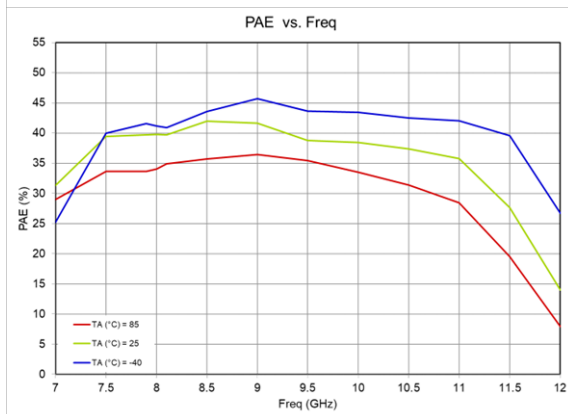
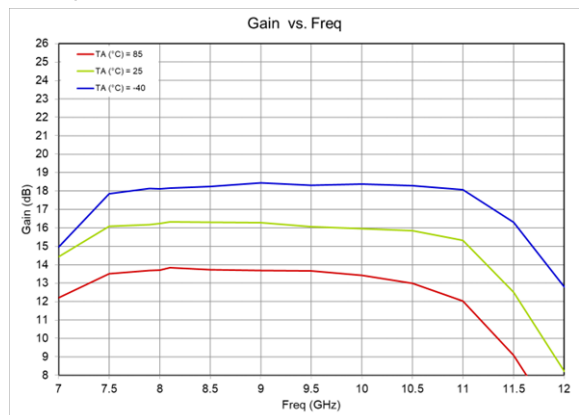
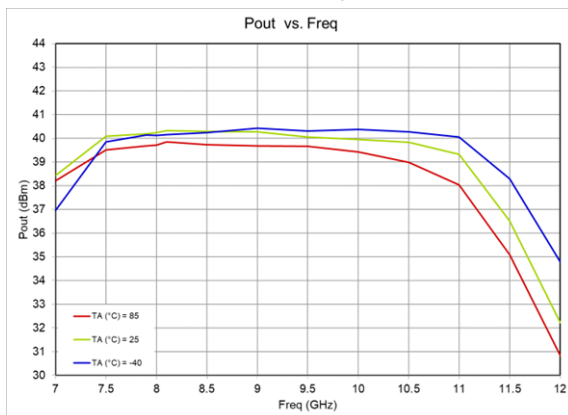




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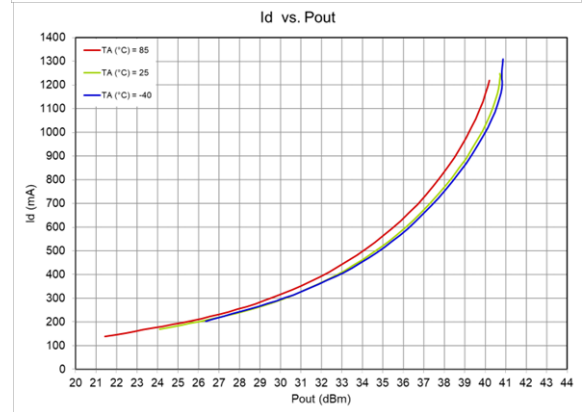
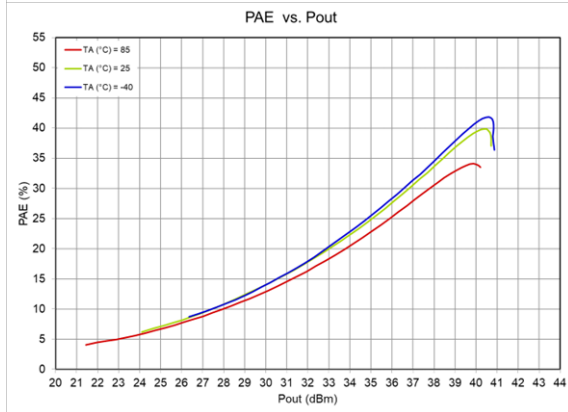
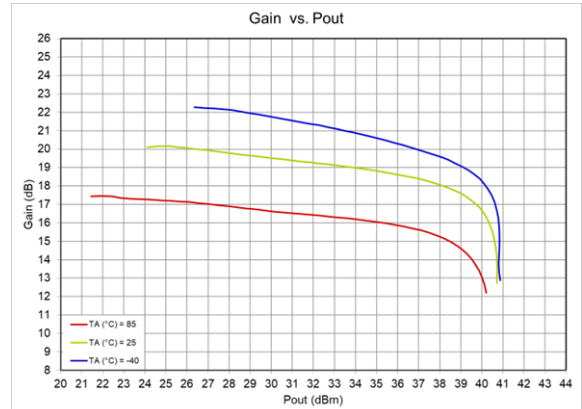
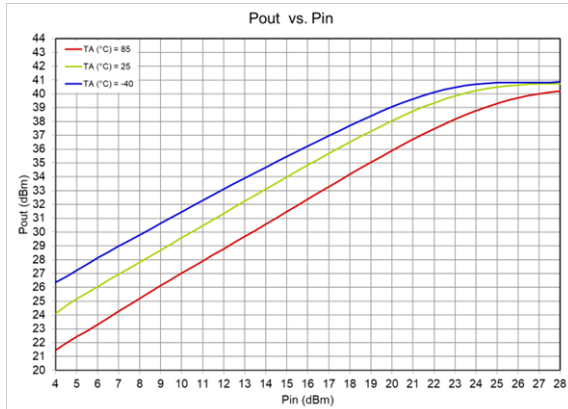


### Power Performance, Pulsed | Test conditions unless otherwise stated | P<sub>IN</sub>=24dBm, I<sub>DQ</sub>=100mA, Pulse = 100us / 10%, T<sub>A</sub>=25C

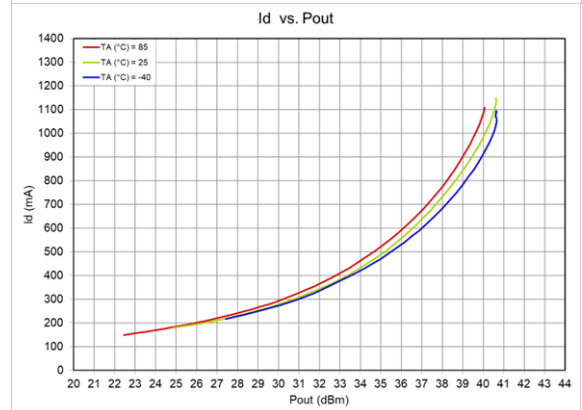
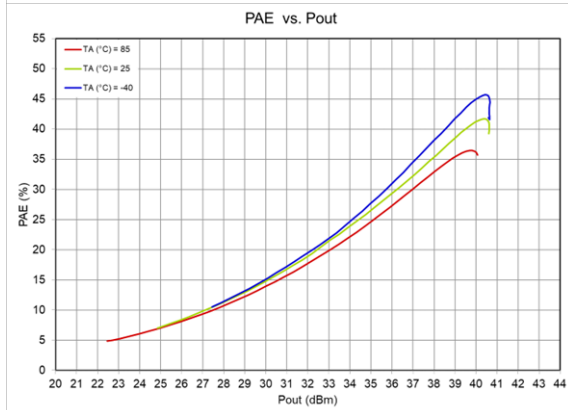
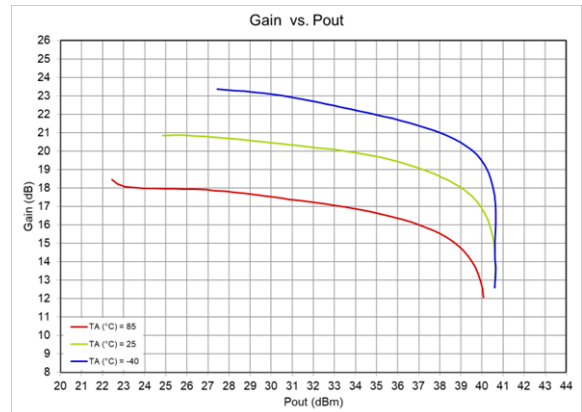
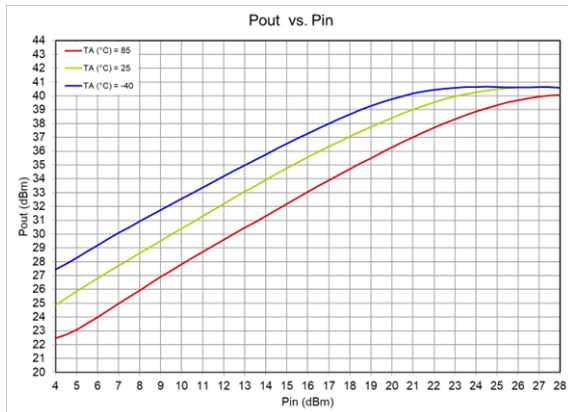




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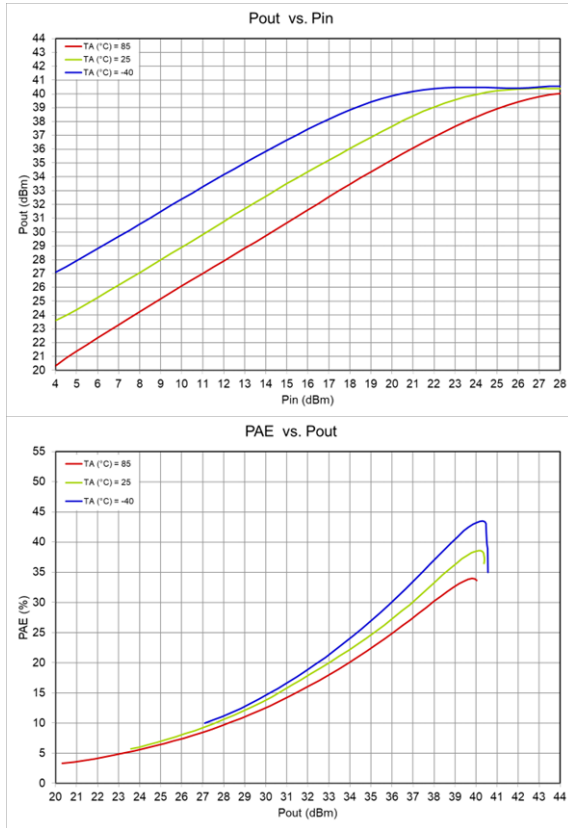


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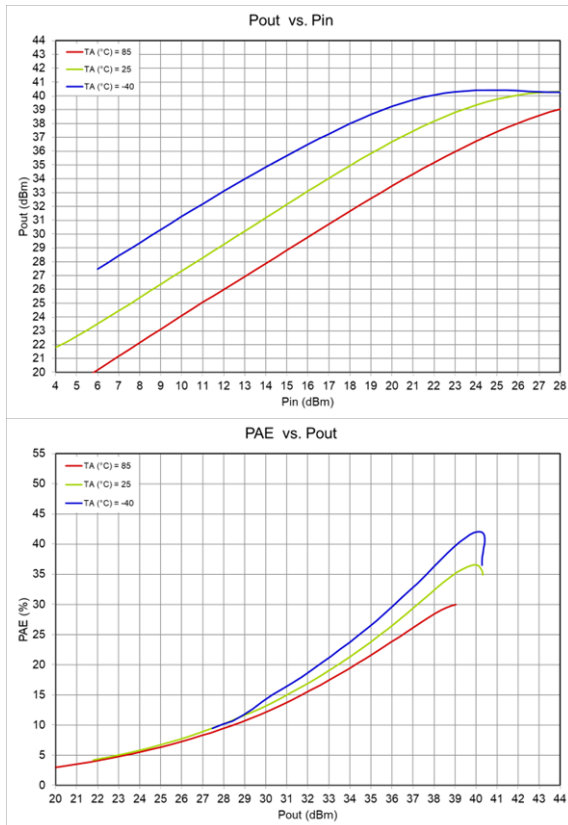




### Power Performance | Test conditions unless otherwise stated | Freq=10GHz, $V_D=24V$ , $I_{DQ}=100mA$ , Pulse = 100us / 10%



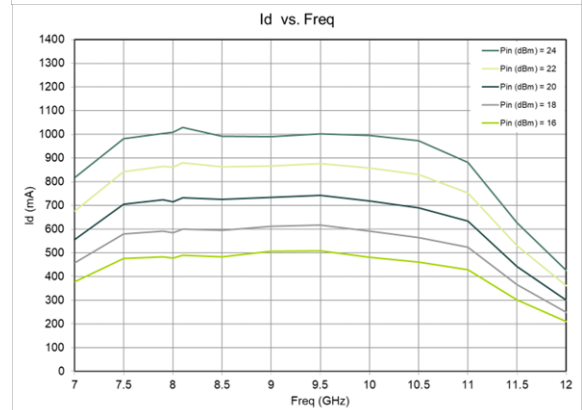
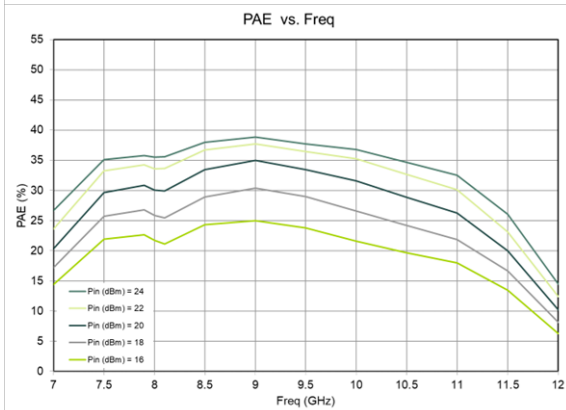
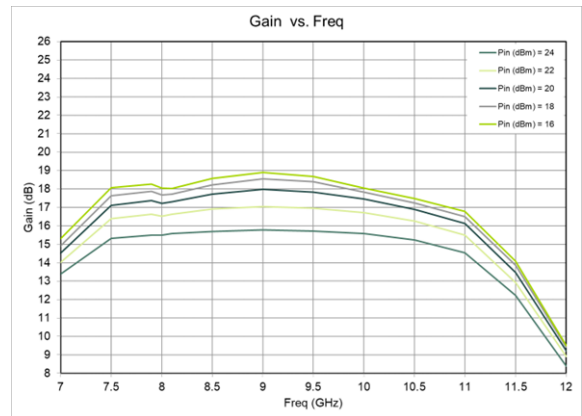
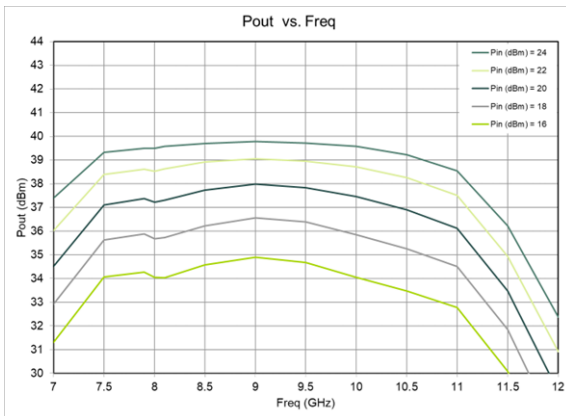
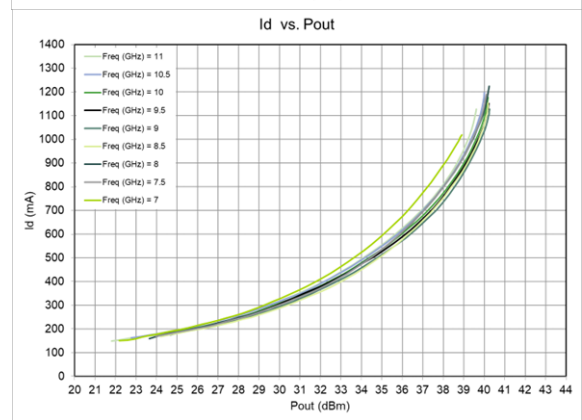
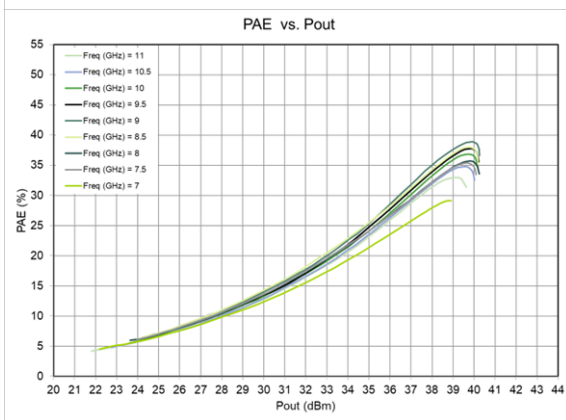
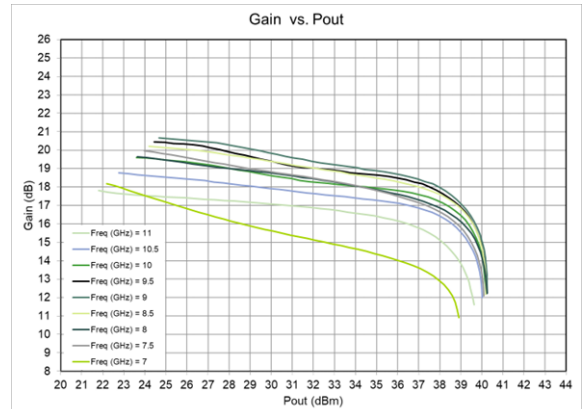
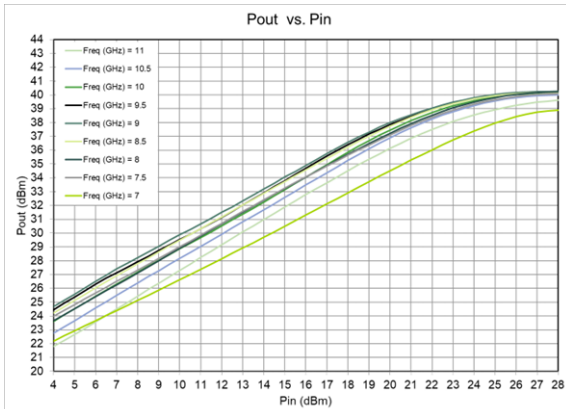
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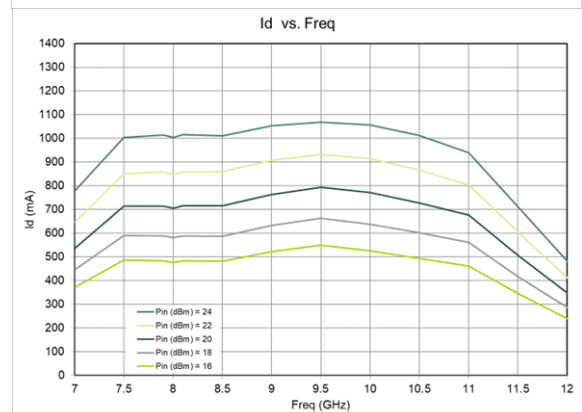
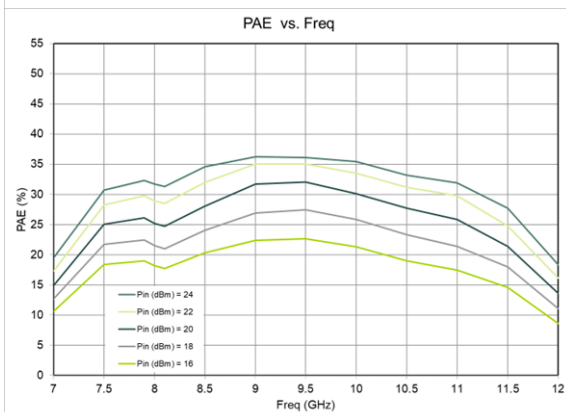
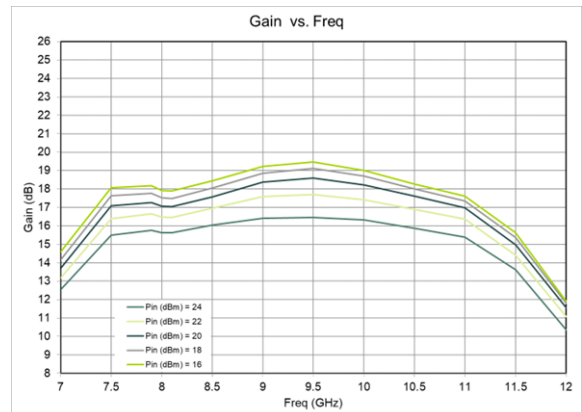
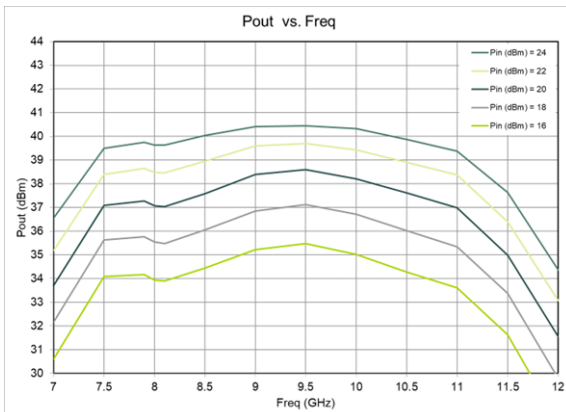
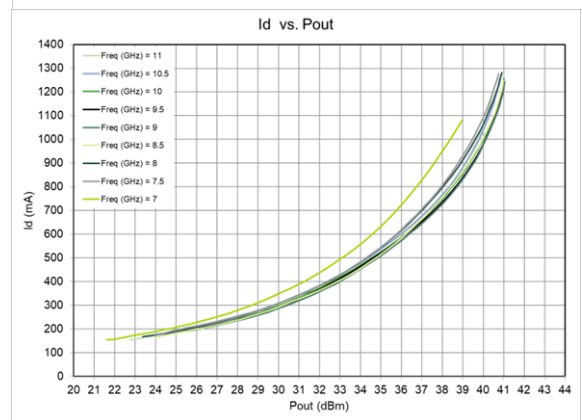
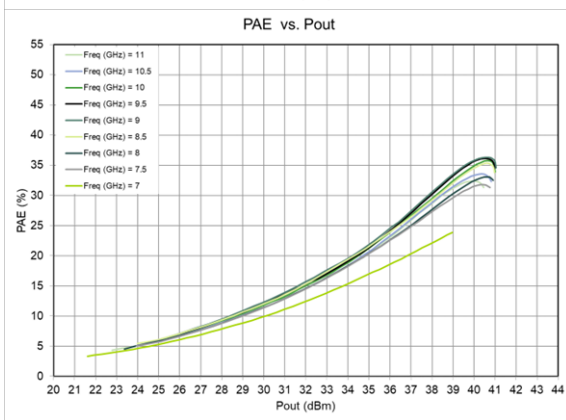
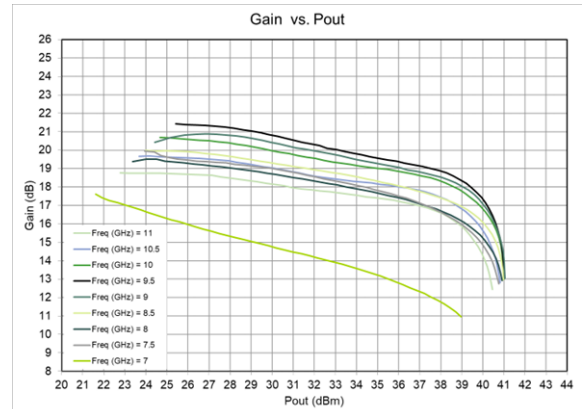
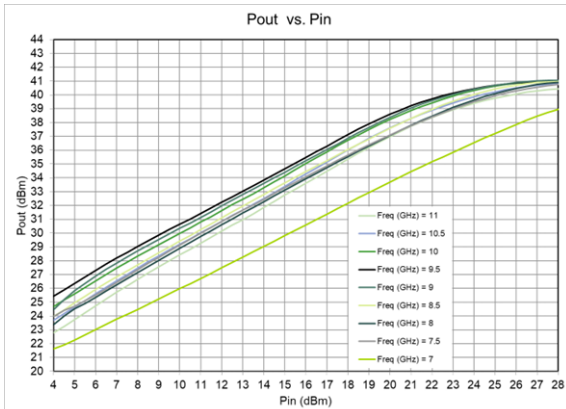


**Power Performance** | Test conditions unless otherwise stated |  $V_D=24V$ ,  $I_{DQ}=100mA$ , CW,  $T_A=25C$



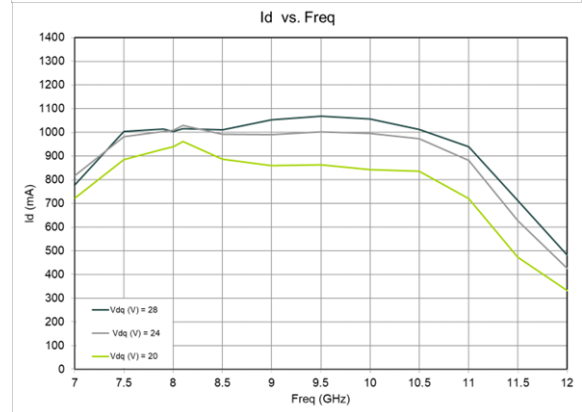
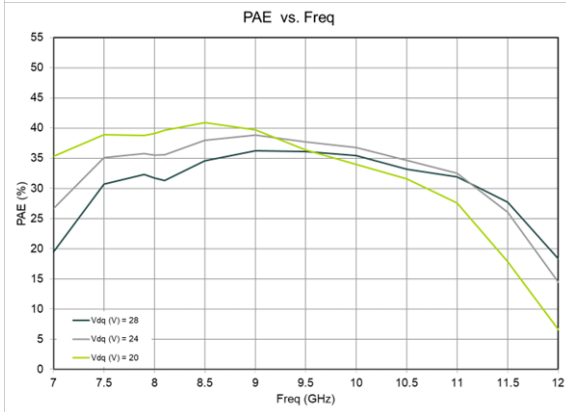
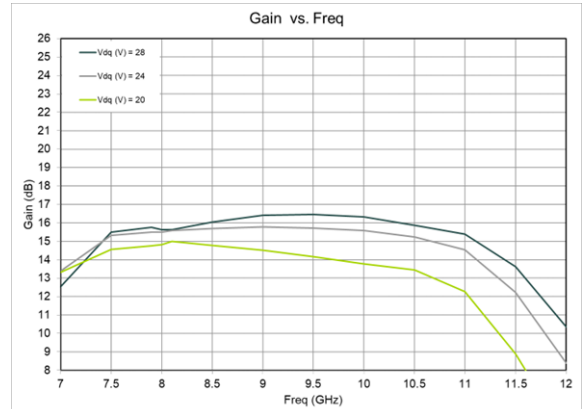
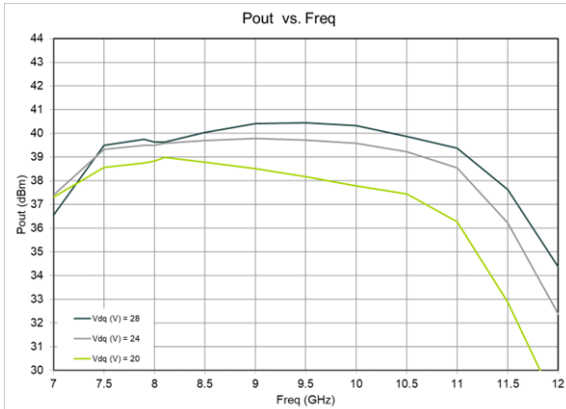


**Power Performance** | Test conditions unless otherwise stated |  $V_D=28V$ ,  $I_{DQ}=100mA$ , CW,  $T_A=25C$

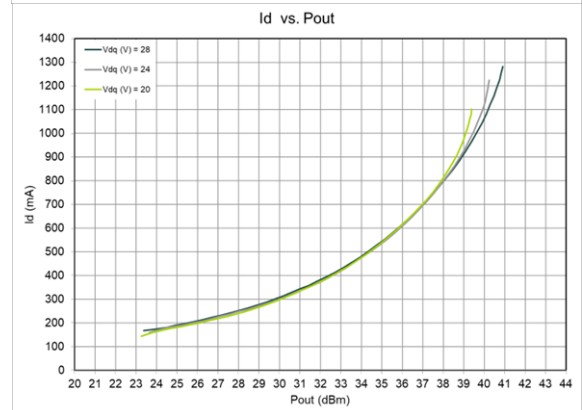
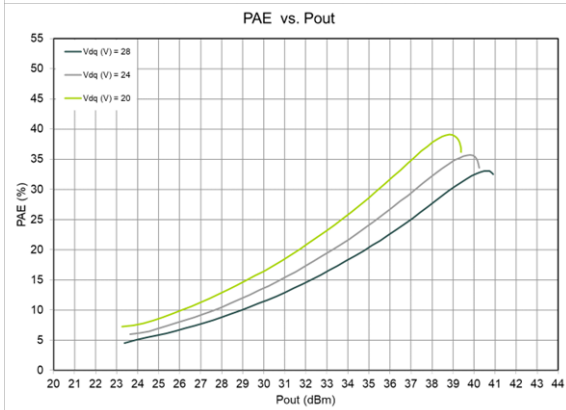
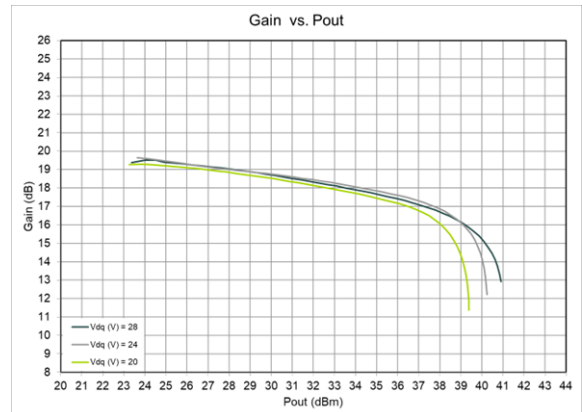
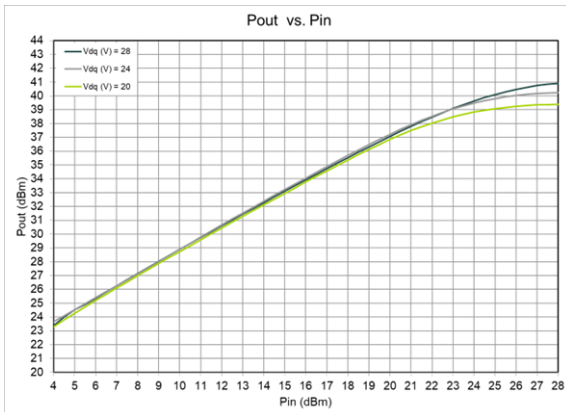




### Power Performance | Test conditions unless otherwise stated | $P_{IN}=24\text{dBm}$ , $I_{DQ}=100\text{mA}$ , CW, $T_A=25\text{C}$

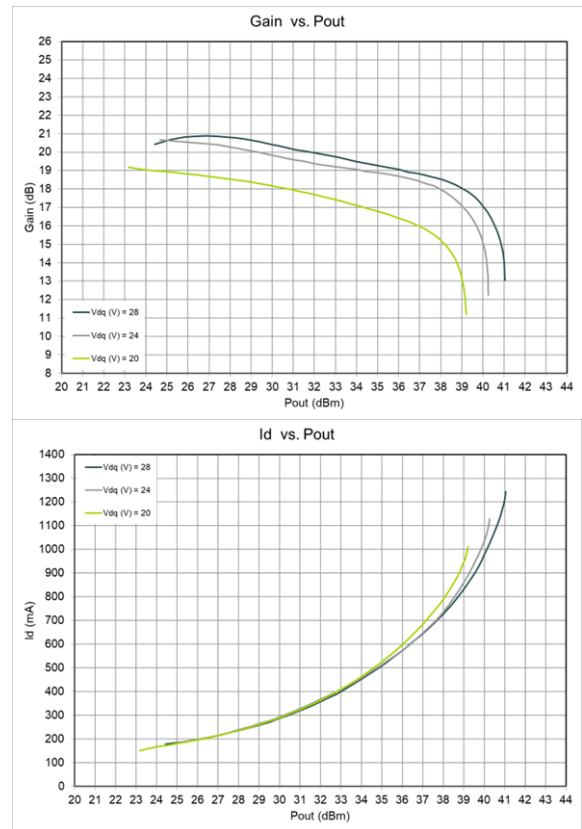
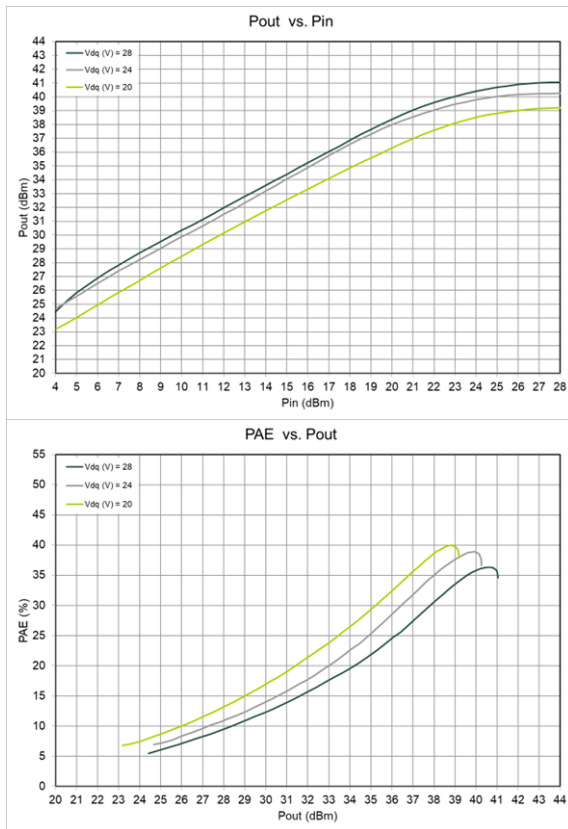


### Power Performance, Pulsed | Test conditions unless otherwise stated | Freq=8GHz, $I_{DQ}=100\text{mA}$ , CW, $T_A=25\text{C}$

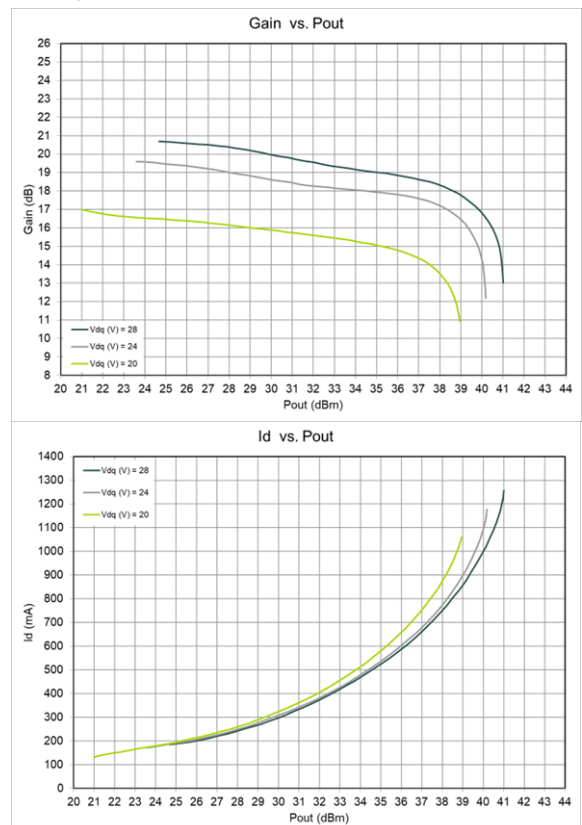
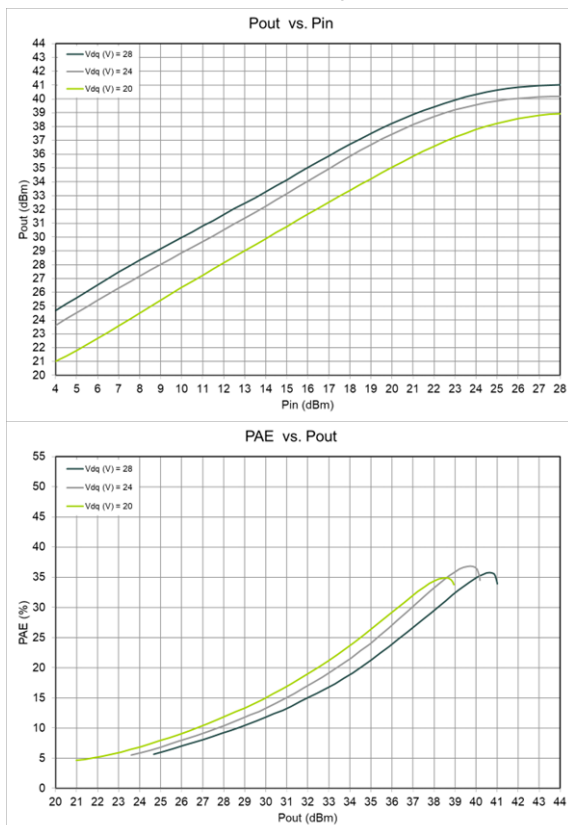




### Power Performance | Test conditions unless otherwise stated | Freq=9GHz, $I_{DQ}=100mA$ , CW, $T_A=25C$

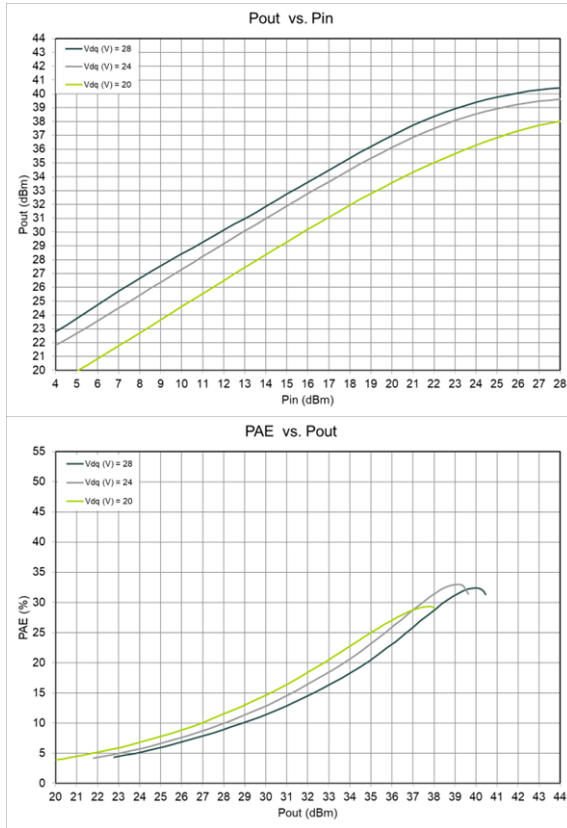


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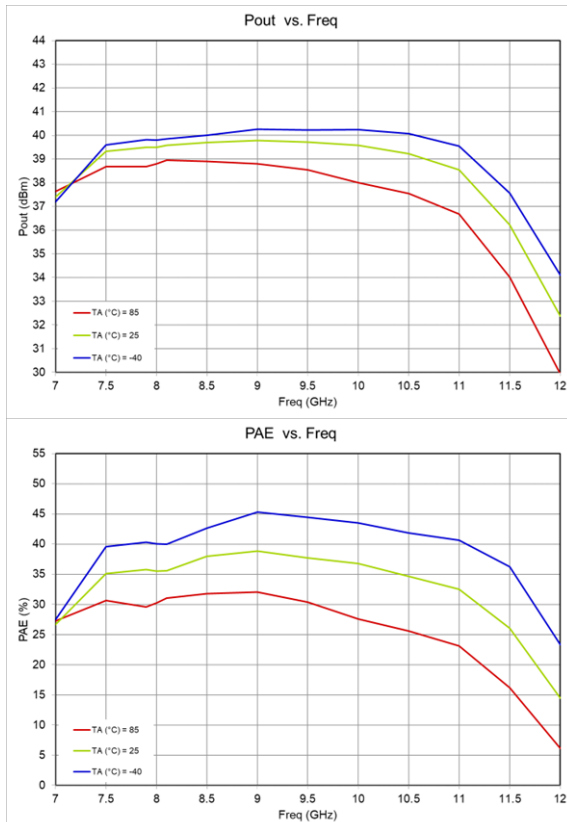




### Power Performance | Test conditions unless otherwise stated | Freq=11GHz, $I_{DQ}=100\text{mA}$ , CW, $T_A=25\text{C}$

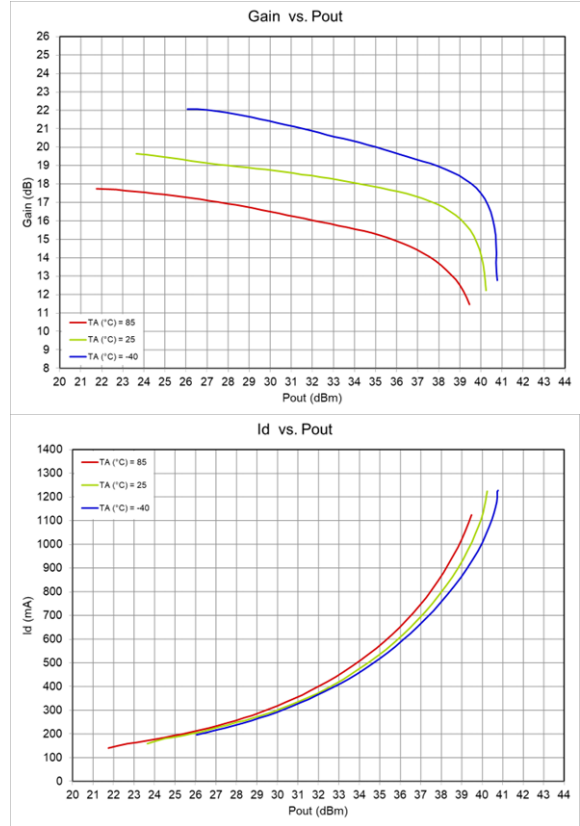
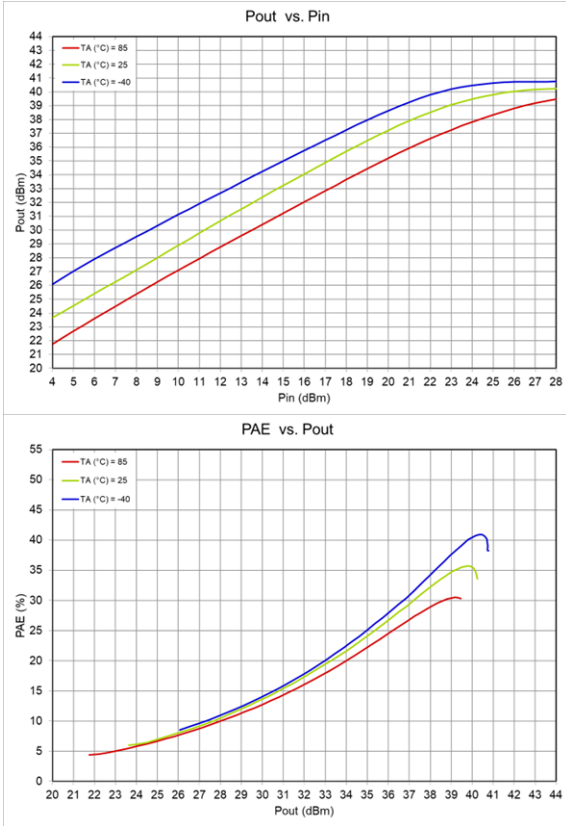


### Power Performance, Pulsed | Test conditions unless otherwise stated | $P_{IN}=24\text{dBm}$ , $I_{DQ}=100\text{mA}$ , CW, $T_A=25\text{C}$

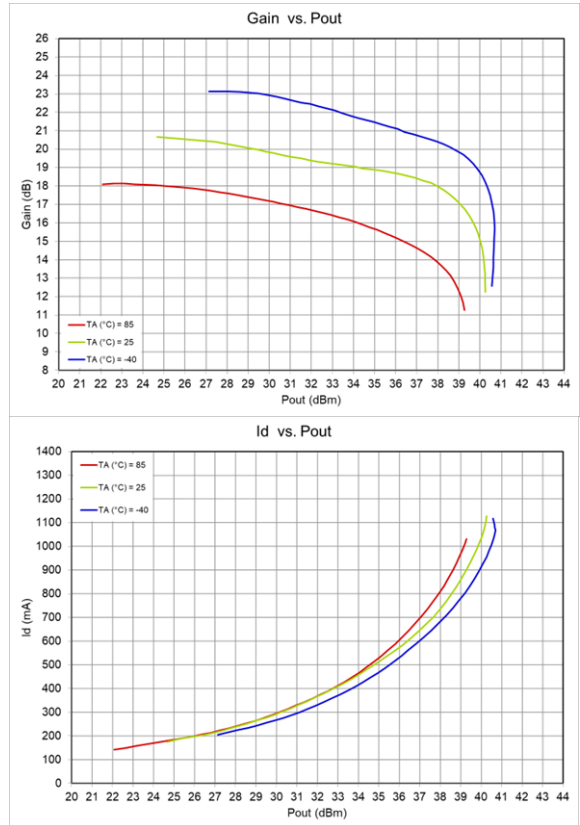
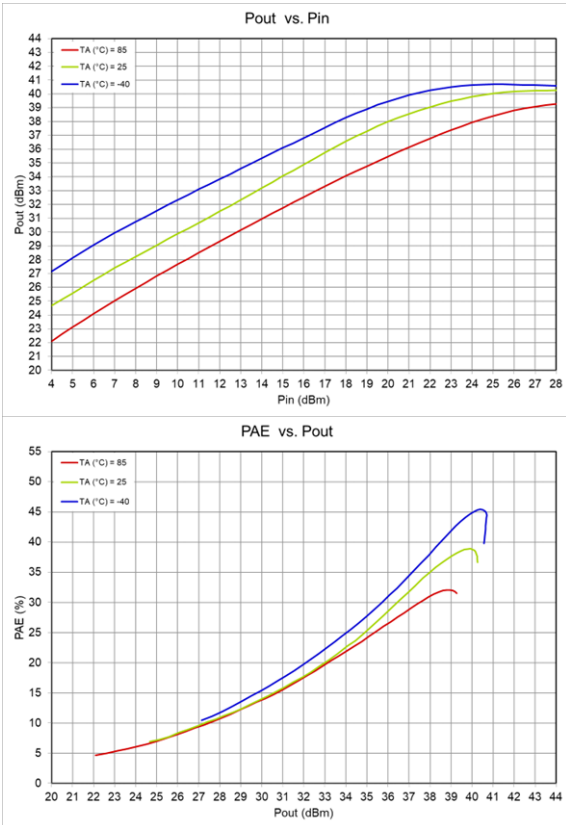




### Power Performance | Test conditions unless otherwise stated | Freq=8GHz, $V_D=24V$ , $I_{DQ}=100mA$ , CW

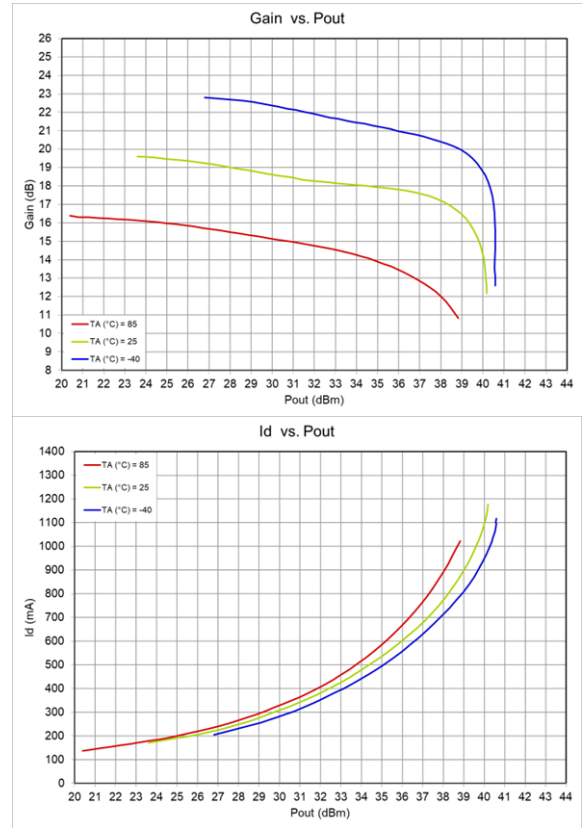
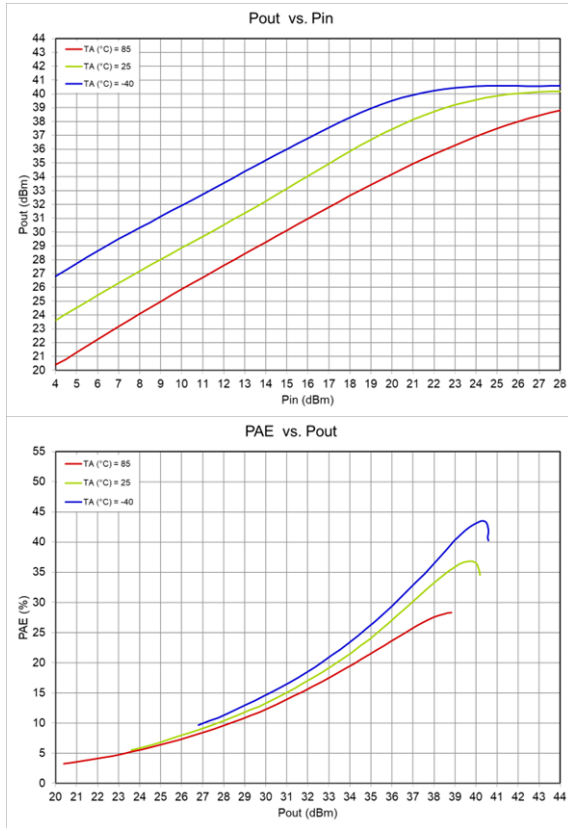


### Power Performance | Test conditions unless otherwise stated | Freq=9GHz, $V_D=24V$ , $I_{DQ}=100mA$ , CW

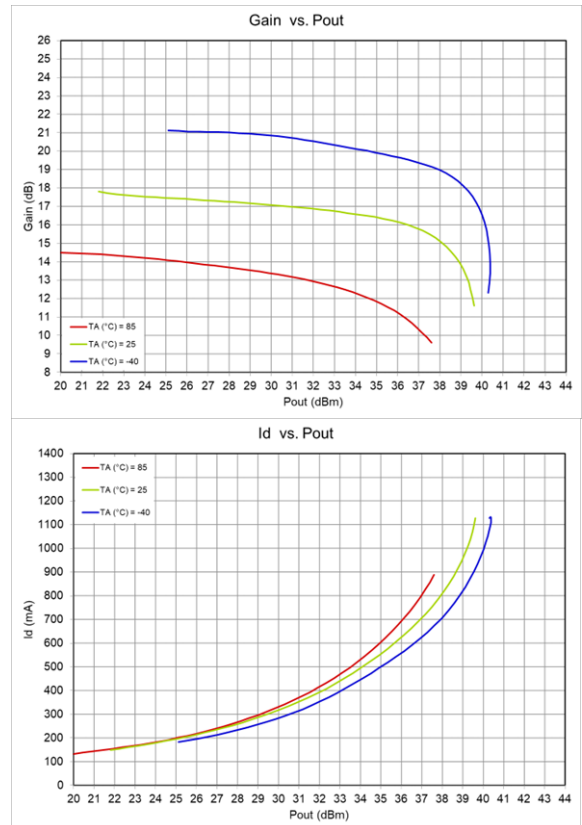
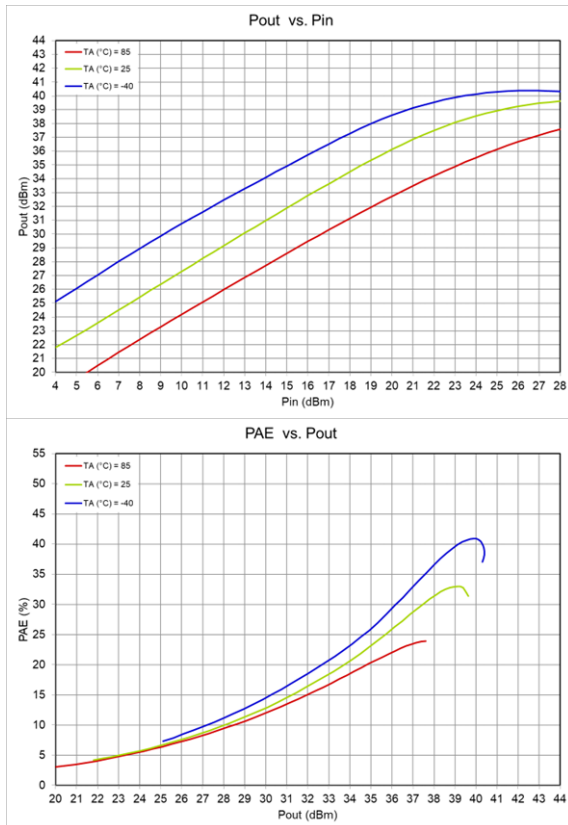




### Power Performance | Test conditions unless otherwise stated | Freq=10GHz, $V_D=24V$ , $I_{DQ}=100mA$ , CW

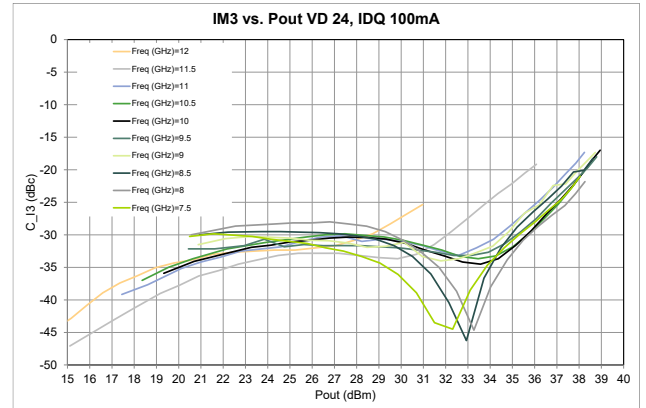
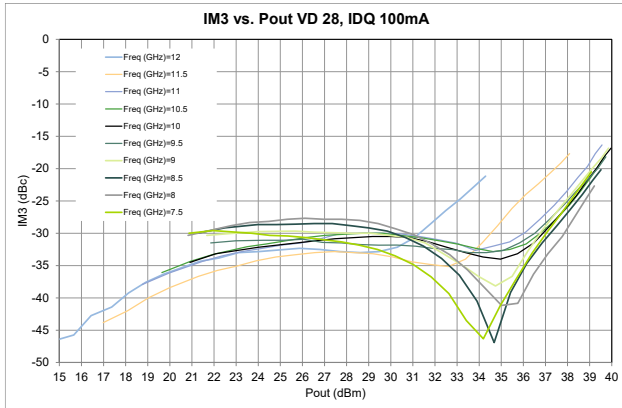


### Power Performance | Test conditions unless otherwise stated | Freq=11GHz, $V_D=24V$ , $I_{DQ}=100mA$ , CW





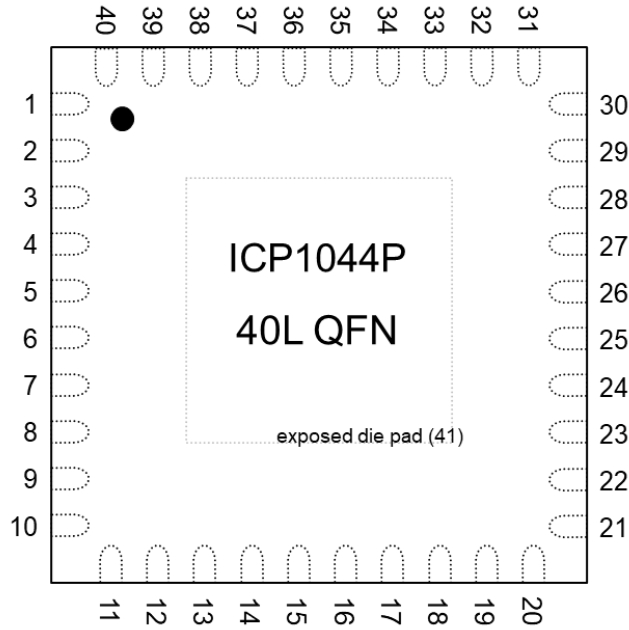
**Linearity Performance** | Test conditions unless otherwise stated |  $V_D=28V, 24V, I_{DQ}=100mA$ , CW Tone Spacing 10MHz







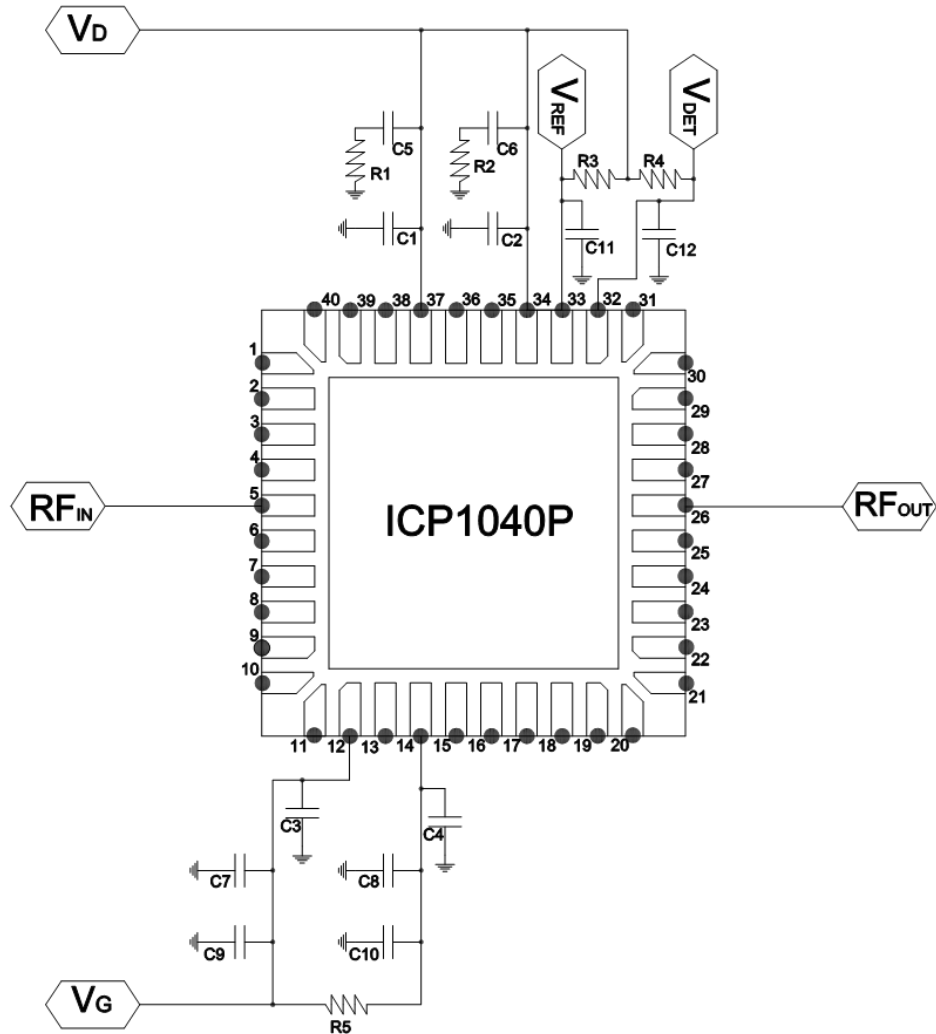
### Pinout



Pad No	Function	Description
1-4, 6-11, 13, 16-25, 29-31, 35, 36, 38-41	GND	Recommend Ground connection from PCB
5	RF IN	RF Input
12	VG1	Gate Bias Stage 1
14	VG2	Gate Bias Stage 2
26	RF OUT	RF Output
32	Vdet	Detector Voltage
33	Vref	Reference Voltage
34	VD2	Drain Bias Stage 2
37	VD1	Drain Bias Stage 1



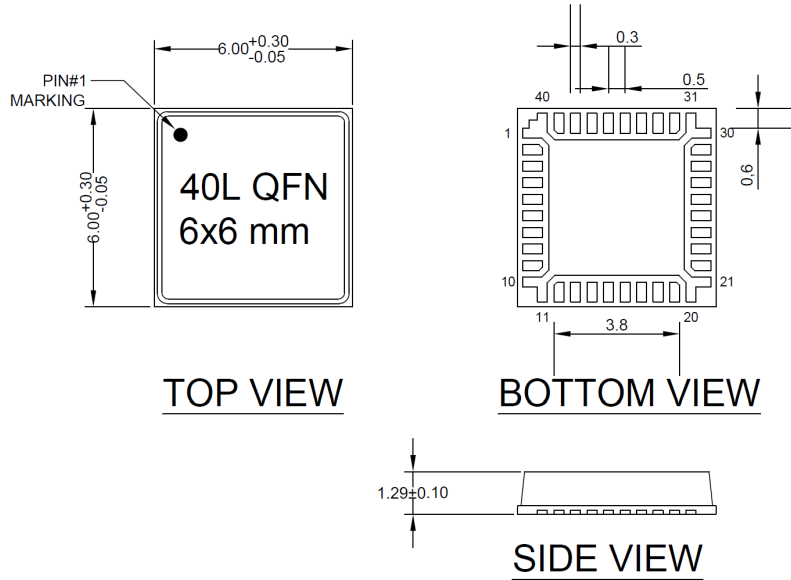
EVB SCHEMATIC



Component ID	Value	Quantity	Description	Manufacture Part No.
C1-C4, C11, C12	1000pF	6	1000pf CAP 0402, C0G, 50V	Various
C5-C8	10nF	4	10nF CAP 0603, C0G, 50V	Various
C9, C10	1µF	2	1µF CAP 0805, C0G, 50V	Various
R1, R2, R5	0Ω	0Ω RES 0402	Various	
R3, R4	100kΩ	2	100kΩ RES 0402	Various

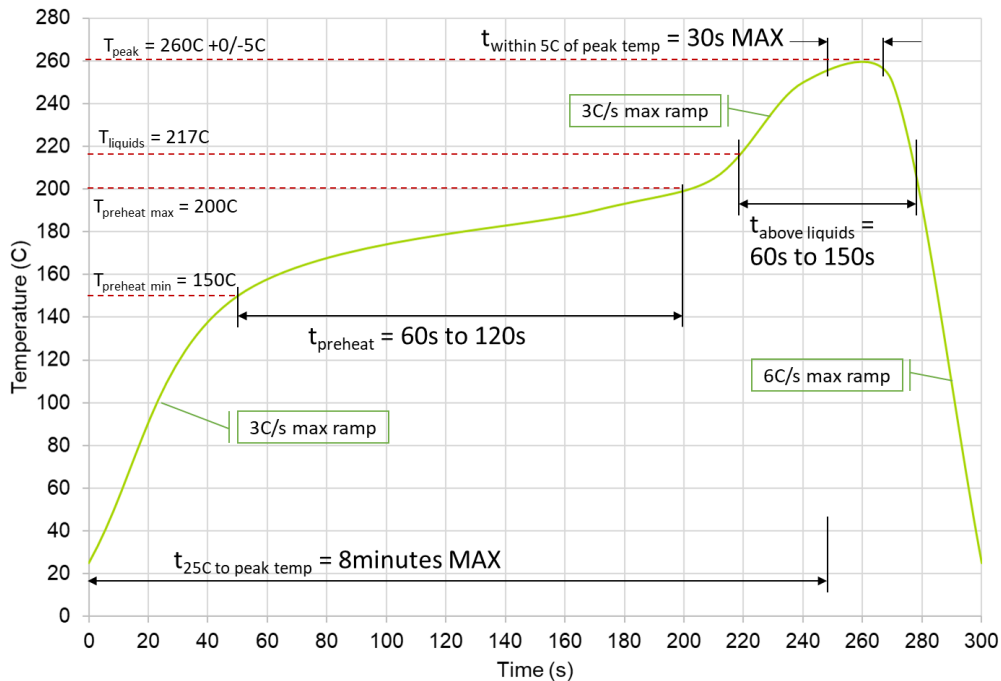


Mechanical Drawing



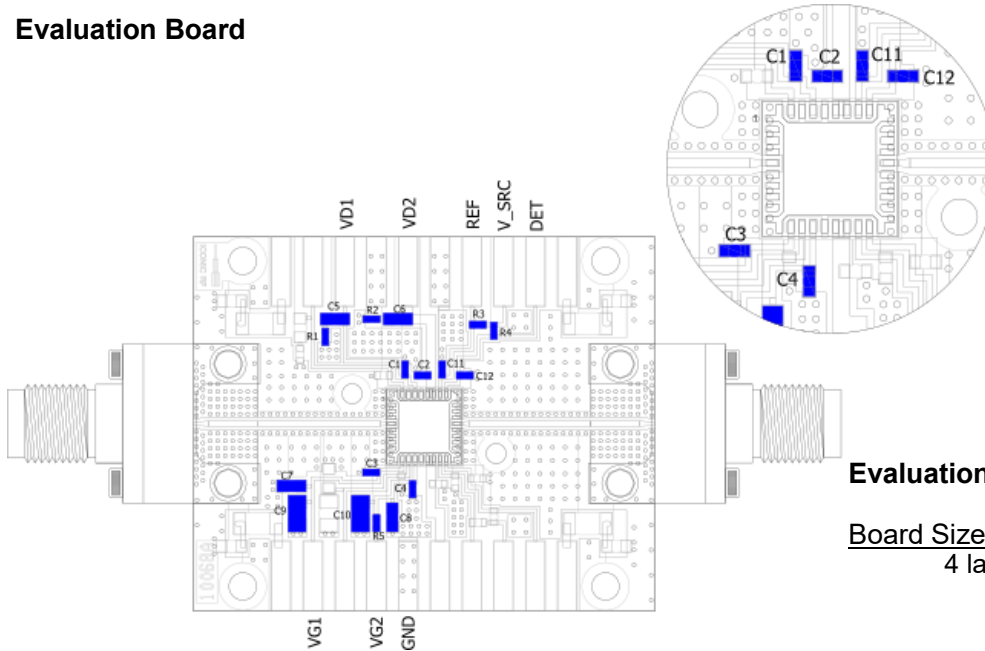
Units: mm

Recommended Soldering Temperature Profile





### Evaluation Board



### Evaluation board construction:

**Board Size:** 37mm X 30mm

**4 layer PCB:**

-1oz Cu, Au finish

RO4003C 10mil

- 0.5oz Cu 370HR 6mil

- 0.5oz Cu 370HR 6mil

- 1oz Cu, Au finish

Solid Copper Coin over plated

Via size 0.3mm plated

**Baseplate:** Solid copper 37mm X 50mm X 10mm, Au plated

Component ID	Value	Quantity	Description	Manufacture Part No.
C1-C4, C11, C12	1000pF	6	1000pf CAP 0402, C0G, 50V	Various
C5-C8	10nF	4	10nF CAP 0603, C0G, 50V	Various
C9, C10	1µF	2	1µF CAP 0805, C0G, 50V	Various
R1, R2, R5	0Ω	3	0Ω RES 0402	Various
R3, R4	100kΩ	2	100kΩ RES 0402	Various

### Bias-Up Procedure

1. Set  $V_G = -5V$
2. Set  $V_D$  to 28V
3. Adjust  $V_G$  positive until  $I_D$  quiescent is 175mA
4. Limit  $I_D$  to 3A
5. Apply RF Signal

### Bias-down Procedure

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

### Solderability

Compatible with the latest version of J-STD-020 Lead free solder.

### 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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