

Product Overview

ICONICRF's ICP0543P is a 2 stage power amplifier, 50 ohm matched with integrated DC blocking capacitors packaged in a plastic QFN. Fabricated using a GaN on SiC process, the ICP0543P operates from 5-6 GHz with 43 dBm output power and 44% PAE. ICP0543P is well suited to both commercial and defense applications.

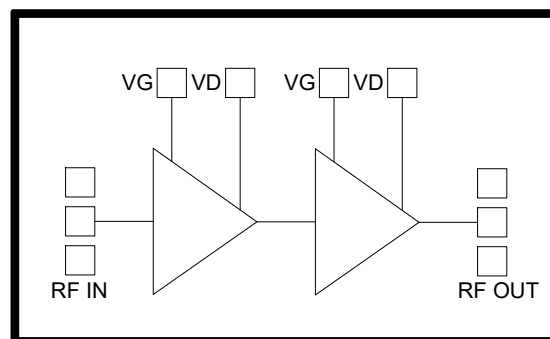
Key Features

- **Frequency Range: 5-6GHz**
- **P_{out}: 43dBm @P_{in}=24dBm**
- **PAE: 44%**
- **Small Signal Gain: 24dB**
- **Bias: V_D=28V I_{DQ}=150mA**
- **Technology: GaN on SiC**
- **Lead-free and RoHS compliant**
- **Package Dimensions: 6mm x 6mm**

Applications

- Communications Systems
- Radar
- Satcom
- Aerospace & Defense

Functional Block Diagram



Electrical Specifications

Parameter	Min.	Typ.	Max.	Units	Conditions ⁽¹⁾
Frequency	5		6	GHz	
Output Power		43		dBm	P _{in} = 24dBm
Power Added Efficiency, PAE		44		%	P _{in} = 24dBm
Small Signal Gain, S ₂₁		24		dB	
Input Return Loss		11		dB	
Output Return Loss		6		dB	

Note: (1) Test conditions unless otherwise stated V_D = 28V, I_{DQ}=150mA, T_A = 25°C, Pulsed 10% (100μs/1ms)

Table of Contents

Product Overview.....	1
1. Electrical Specification.....	3
1.1. Absolute Maximum Ratings.....	3
1.2. Small Signal Performance.....	3
1.3. Large Signal Performance.....	4
2. Mechanical Drawing.....	8
3. Application Circuit.....	9
4. Evaluation Board.....	10
5. Other considerations.....	11
6. Ordering, Shipping, and Handling.....	12
Microchip Information.....	13
The Microchip Website.....	13
Product Change Notification Service.....	13
Customer Support.....	13
Microchip Devices Code Protection Feature.....	13
Legal Notice.....	13
Trademarks.....	14
Quality Management System.....	15
Worldwide Sales and Service.....	16

1. Electrical Specification

1.1 Absolute Maximum Ratings

Parameter	Absolute Maximum
Drain Voltage (V_D)	40V
CW Input Power 50 Ω , $T_A=25^\circ\text{C}$	+30dBm
Channel Temperature	275 $^\circ\text{C}$
Storage Temperature	-65 $^\circ\text{C}$ to +150 $^\circ\text{C}$

Note:

Exceeding any one or combination of these limits may cause permanent damage to this device.

Microchip Technology Inc. does not recommend sustained operation near these survivability limits.

1.2 Small Signal Performance

Typical Power Data over Temperature

Test conditions: $V_D=28\text{V}$, $I_{DQ}=150\text{mA}$

Figure 1-1. S_{21} vs Freq

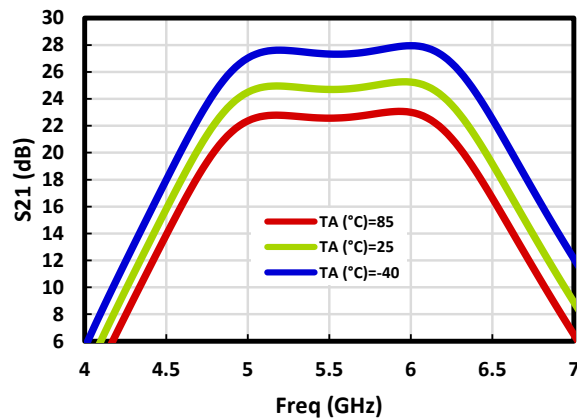


Figure 1-2. S_{11} vs Freq

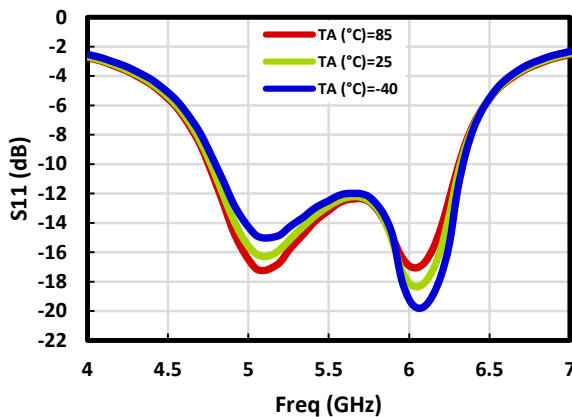
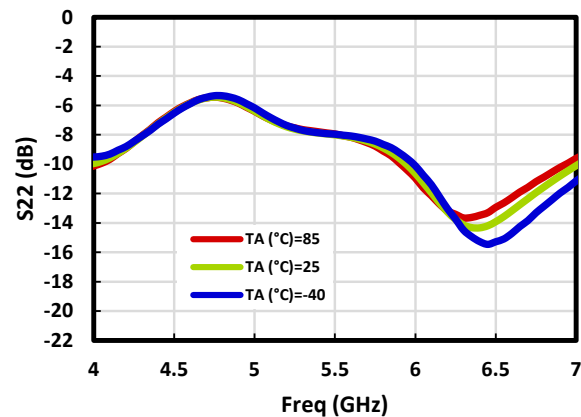


Figure 1-3. S_{22} vs Freq



1.3 Large Signal Performance

Typical Pulsed Power Data

Test conditions: $V_D=28V$, $I_{DQ}=150mA$, $T_A=25^\circ C$, Pulsed 10% (100 μs /1ms)

Figure 1-4. P_{out} vs. P_{in}

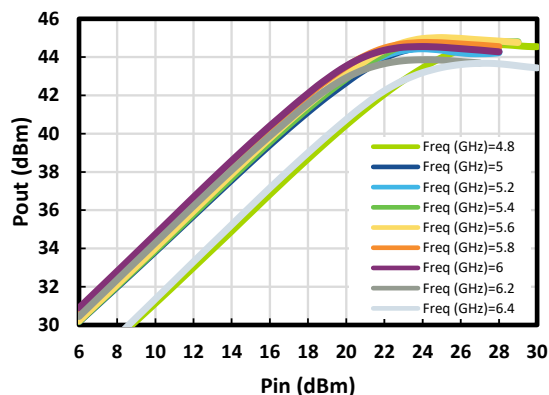


Figure 1-5. Gain vs. P_{out}

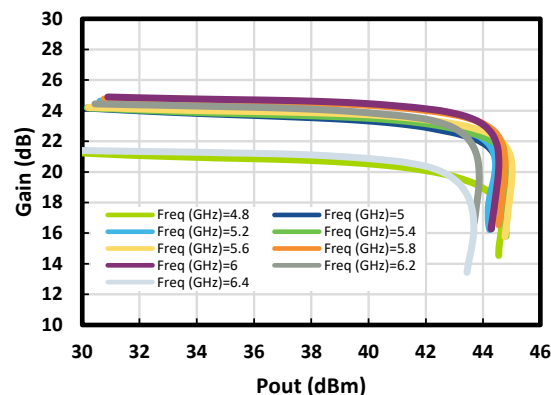


Figure 1-6. PAE vs. P_{out}

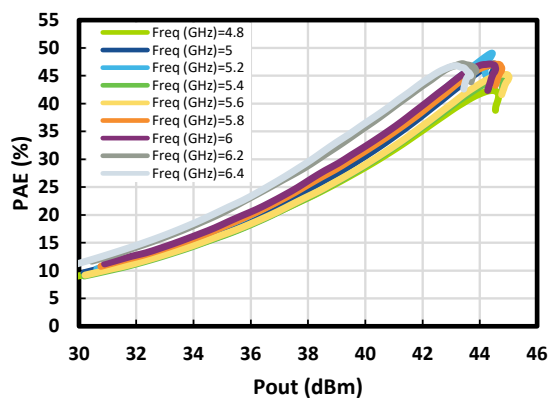


Figure 1-7. I_D vs. P_{out}

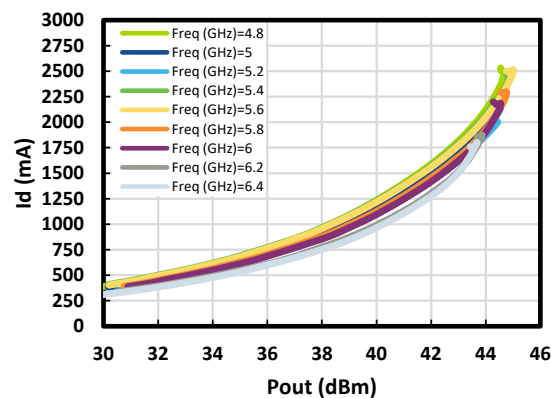


Figure 1-8. P_{out} vs. Freq.

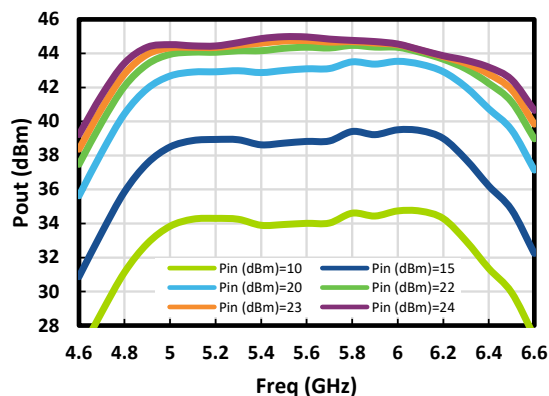
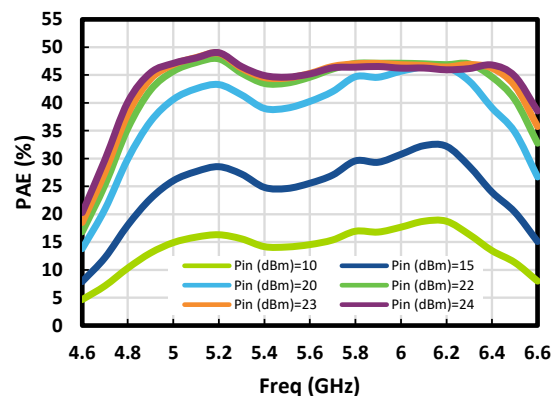


Figure 1-9. PAE vs. Freq.



Typical Pulsed Power Data over T_A Conditions

Test conditions: $V_D=28V$, $I_{DQ}=150mA$, Pulsed 10% (100 μs /1ms)

Figure 1-10. P_{out} vs. P_{in} , Freq=5GHz

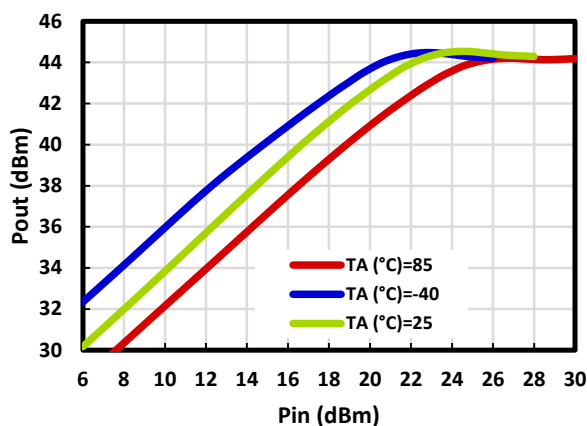


Figure 1-11. P_{out} vs. P_{in} , Freq=5.3GHz

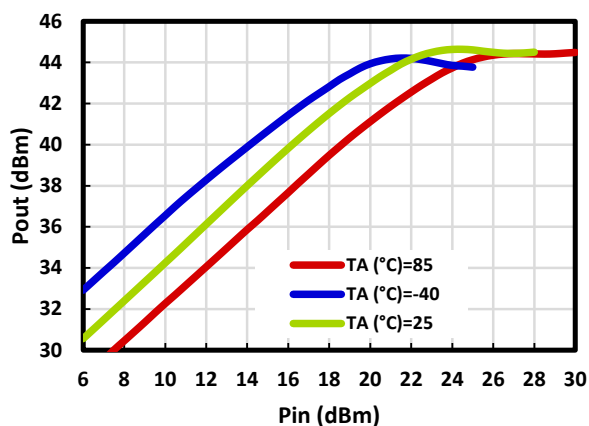


Figure 1-12. P_{out} vs. P_{in} , Freq=5.6GHz

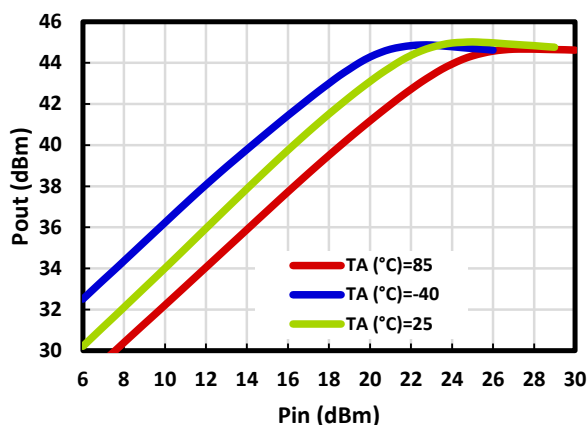


Figure 1-13. P_{out} vs. P_{in} , Freq=6GHz

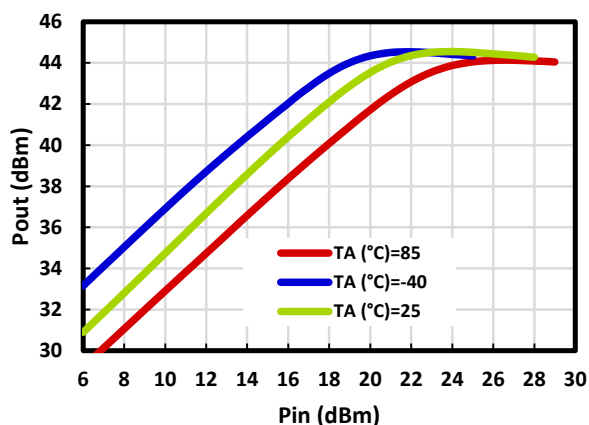


Figure 1-14. P_{out} vs. Freq.

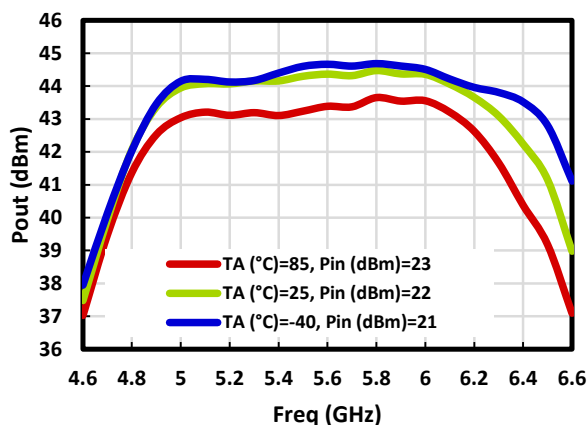
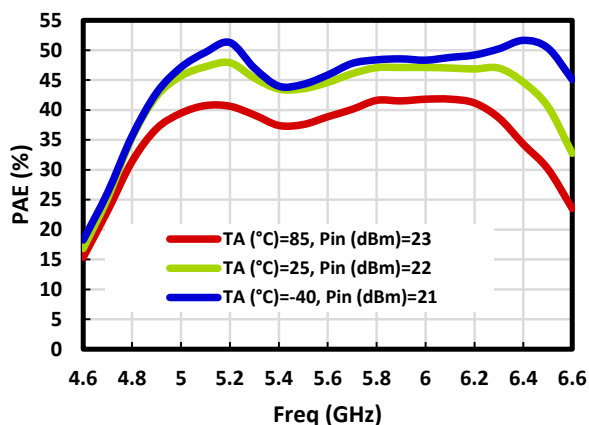


Figure 1-15. PAE vs. Freq.



Typical CW Power Data

Test conditions: $V_D=28V$, $I_{DQ}=150mA$, CW

Figure 1-16. P_{out} vs. P_{in}

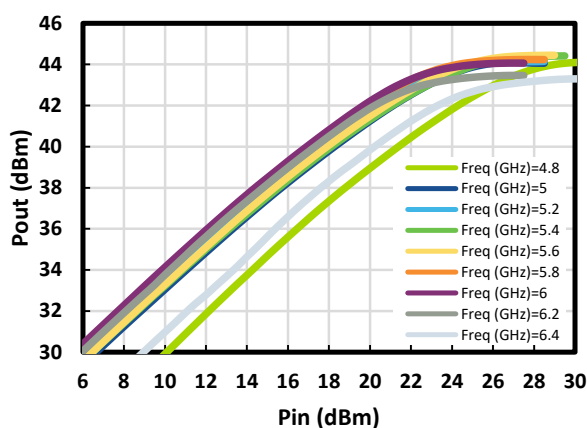


Figure 1-17. Gain vs. P_{out}

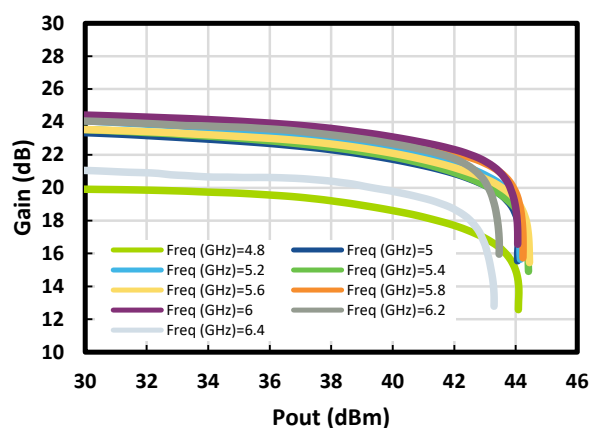


Figure 1-18. PAE vs. P_{out}

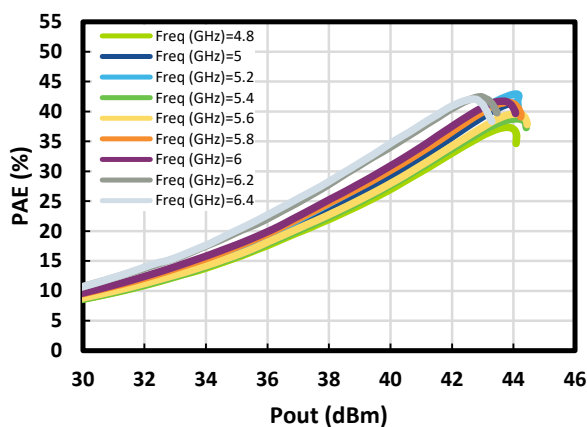


Figure 1-19. I_D vs. P_{out}

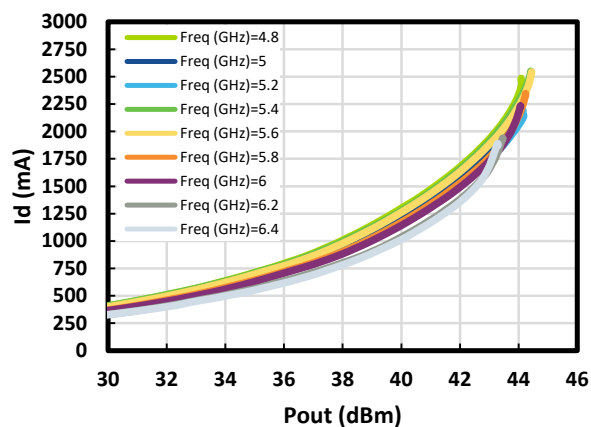


Figure 1-20. P_{out} vs. Freq.

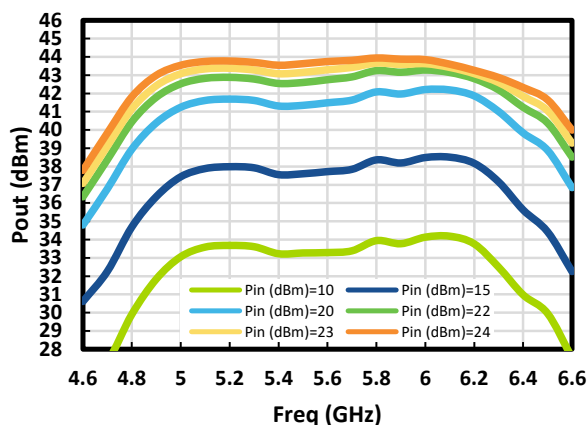
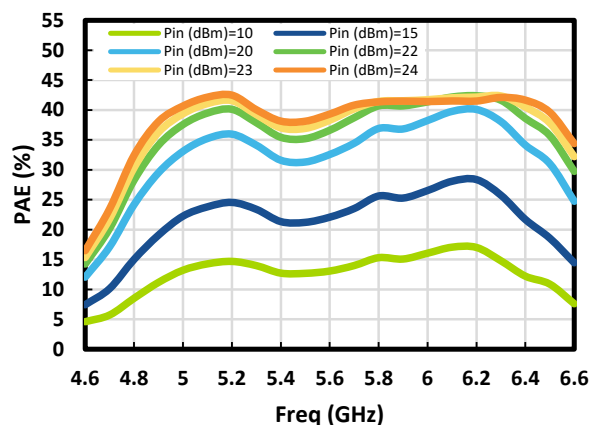


Figure 1-21. PAE vs. Freq.



Typical CW Power Data over T_A Conditions

Test conditions: $V_D=28V$, $I_{DQ}=150mA$, CW

Figure 1-22. P_{out} vs. P_{in} , Freq=5GHz

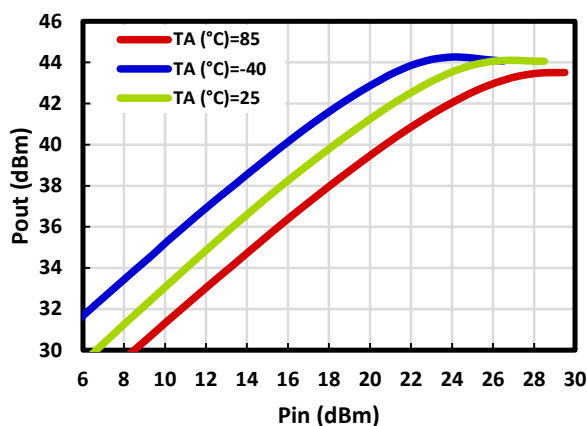


Figure 1-23. P_{out} vs. P_{in} , Freq=5.3GHz

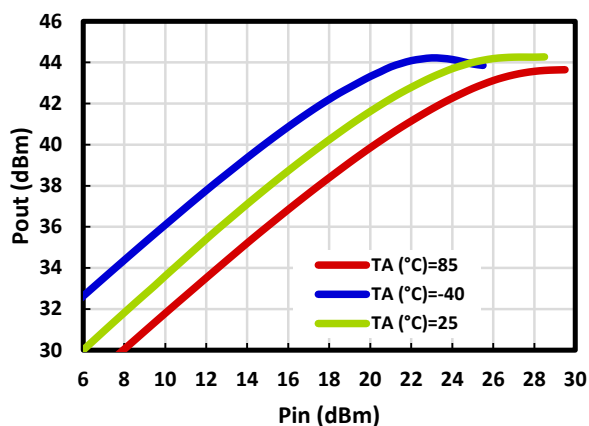


Figure 1-24. P_{out} vs. P_{in} , Freq=5.6GHz

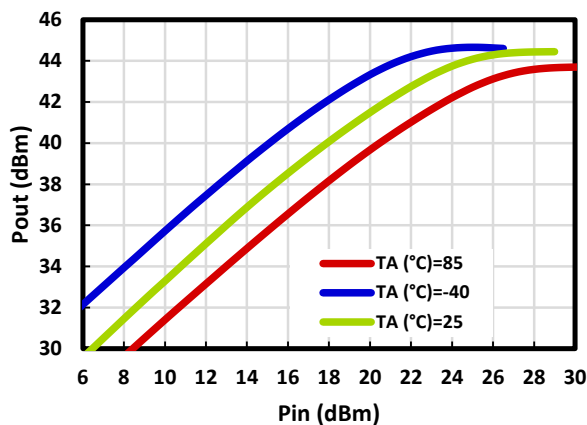


Figure 1-25. P_{out} vs. P_{in} , Freq=6GHz

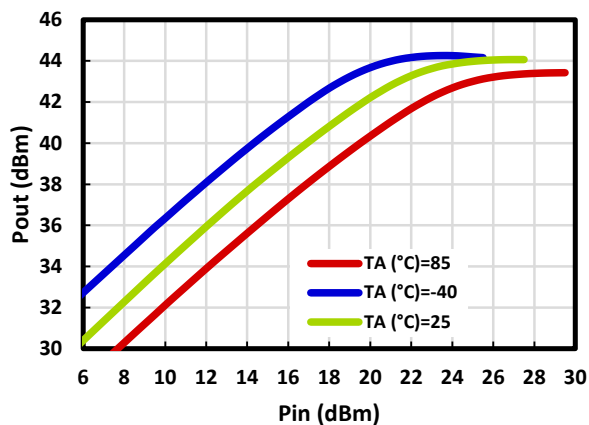


Figure 1-26. P_{out} vs. Freq.

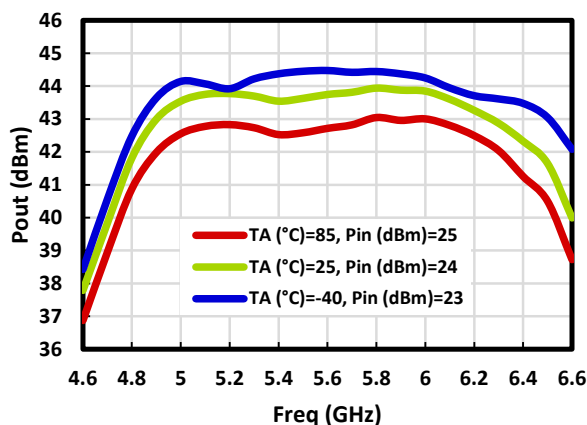
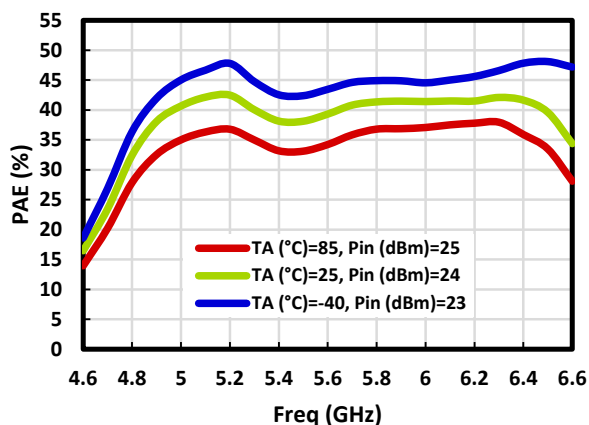
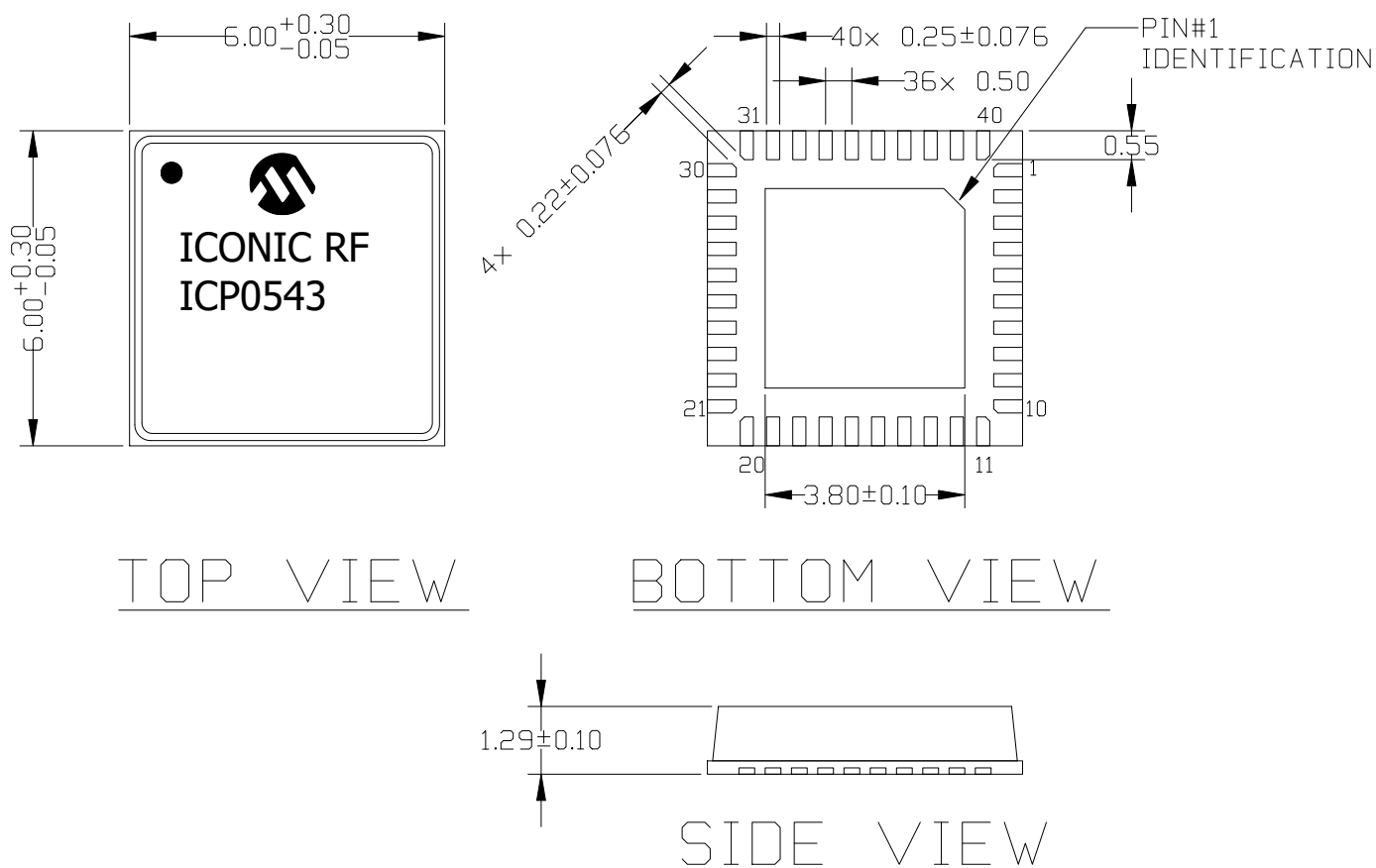


Figure 1-27. PAE vs. Freq.



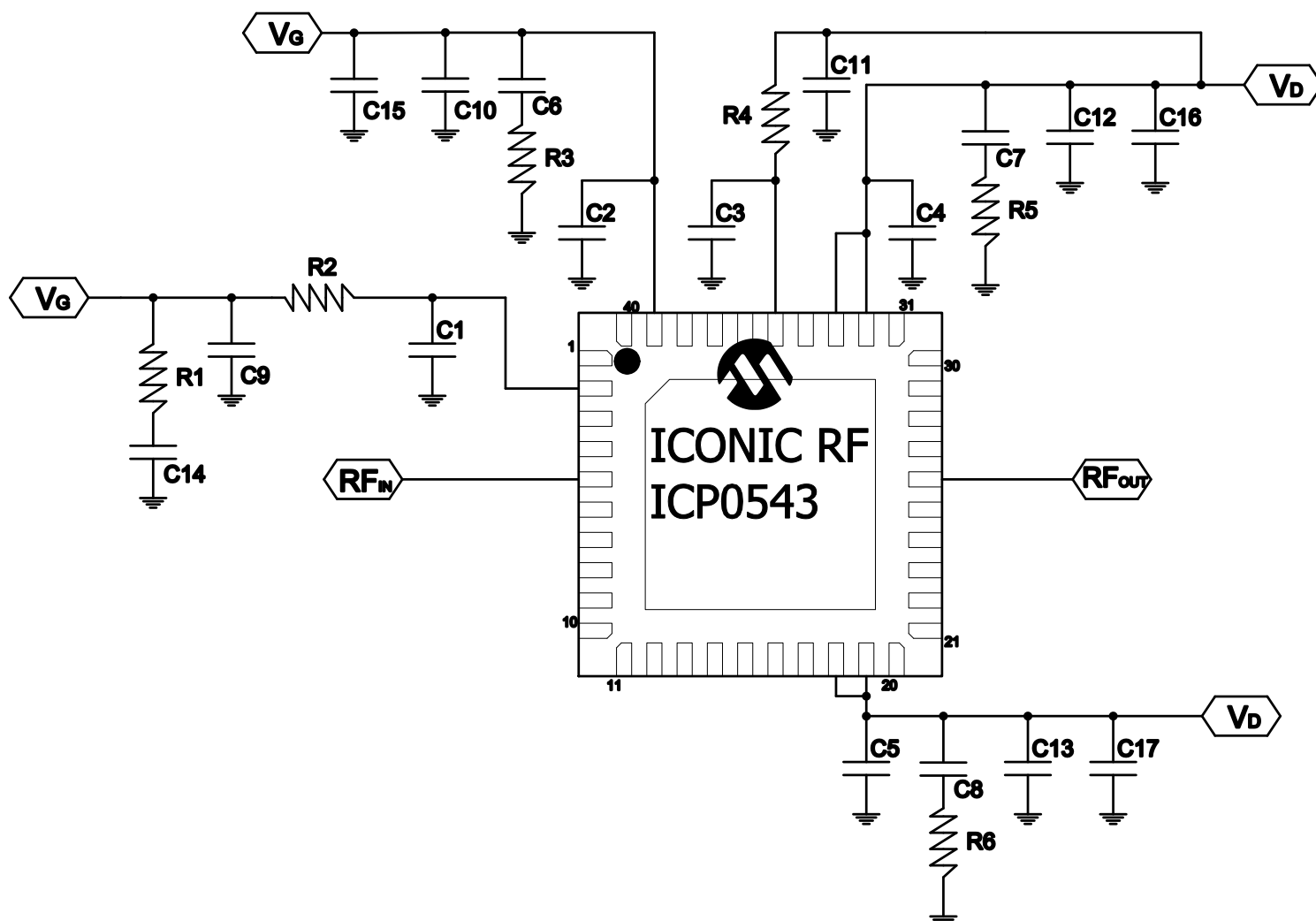
2. Mechanical Drawing



Units: mm

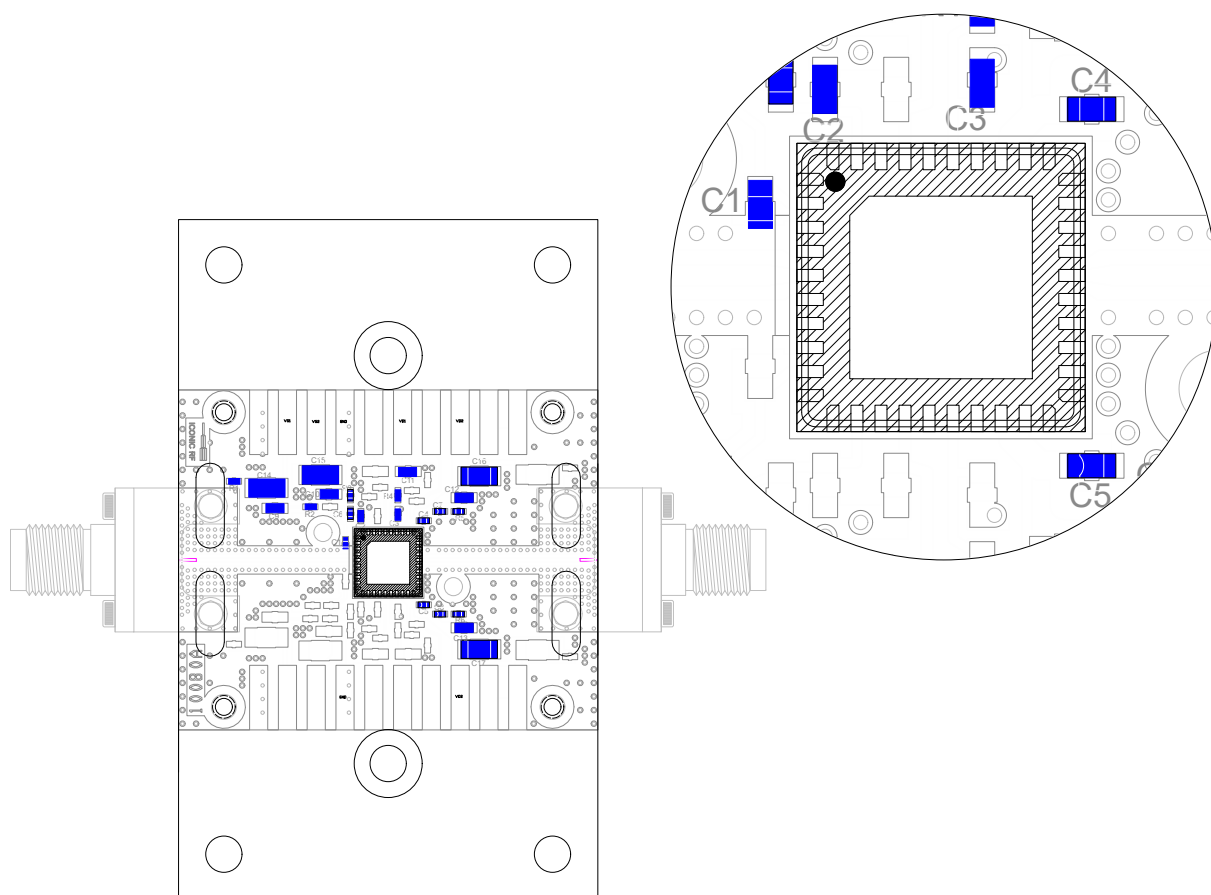
Pin No	Function	Description
1, 3, 7-17, 20-24, 28-31, 34, 36-38, 40	No Connect	Pin can be connected to ground or left open circuit
2, 39	V _G	Gate bias, decoupling and bypass caps required. Bias must be applied to both pins
4, 6, 25, 27, 41	GND	Ground connection
5	R _F IN	50Ω RF input. DC blocked
18, 19, 32, 33, 35	V _D	Drain bias, decoupling and bypass caps required. Bias must be applied to both pins
26	R _F OUT	50Ω RF output. DC blocked

3. Application Circuit



Component ID	Value	Details	Manufacturer Part No.
C1-C5	1nF	1nF Capacitor, 10%, 50V, 0402	Various
C6-C8	100pF	100pF Capacitor, 10%, 50V, 0402	Various
C9-C13	1uF	1uF Capacitor, 10%, 50V, 0603	Various
C14-C17	10uF	10uF Capacitor, 10%, 50V, 1206	Various
R1-R6	00hm	00hm Resistor, 0402	Various

4. Evaluation Board



Evaluation board construction

PCB Construction	Details
Top & Bottom Layer	0.5oz Cu + ENEPIG
Electroless Nickel	3-6µm
Electroless Palladium	0.05-0.3µm
Immersion Gold	0.04-0.06µm

Key Features	Details
Dielectric	RO4003C
Overall Thickness	Approx 0.27mm
VIA Plating Thickness	>15µm

5. Other considerations

Bias-up procedure

1. Set V_G to -5V
2. Set V_D to 28V
3. Adjust V_G positive until I_D quiescent is 450mA
4. Limit I_D to 10A
5. Apply RF signal

Bias-down procedure

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

6. Ordering, Shipping, and Handling

Handling Recommendations

Integrated circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. It is recommended to follow all procedures and guidelines outlined in the Microsemi application note AN01: GaAs MMIC Handling and Die Attach Recommendations.

Ordering Information

For additional ordering information, contact your Microchip sales representative.

Part Number	Description
ICP0543-1-350I	Cavity QFN 40ld package 6mmx6mm
	Evaluation Board with SMA Connectors - ICP0543-2-501U

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