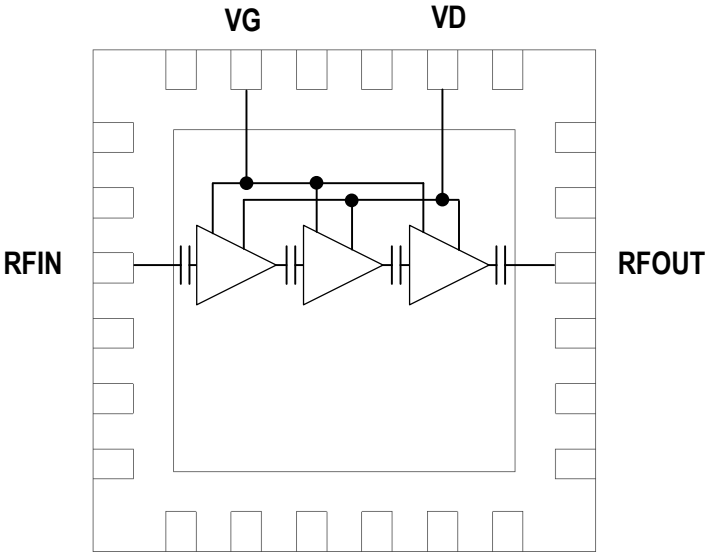
Product Features

- Frequency Range: 8.0-11 GHz
- Large Signal Gain: 23.6 dB
- Output Power (P_{IN}= 15 dBm): 38.6 dBm
- PAE (P_{IN}= 15 dBm): 45%
- Small Signal Gain: 33.8 dB
- Input Return Loss: > 10 dB
- Output Return Loss: > 8.3 dB
- Recommended Bias: V_D = 24 V, I_{DQ} = 110 mA
- Package Dimensions: 5.0×5.0x1.0 mm

Performance is typical at room temperature. Please reference electrical specification table and data plots for more details.

5 mm × 5 mm QFN package

Functional Block Diagram



Description

The HR070XQ3 is a fully integrated 3-stage power amplifier MMIC designed for radar applications, covering frequency range from 8.0 GHz to 11.0 GHz. The device delivers saturated output power of 5 W and has more than 42% drain efficiency with operating drain voltage of 24 V.

Applications

- Satcom
- Commercial and Military Radar
- Communications

DC Characteristics

PARAMETER	SYMBOL	VALUE	UNIT
Drain Voltage	V_D	24	V
Drain Quiescent Current	I_{DQ}	110	mA
Typical Gate Voltage	V_G	-1.82	V
Operating Temperature Range		-40 to 85	°C

1. Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.
2. Gate voltage shown are typical, can be adjusted to set required drain current.

Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN VALUE	MAX VALUE	UNIT
Drain Voltage	V_D	-	29.5	V
Drain Current	I_{DQ}	-	900	mA
Gate Voltage	V_G	-5	0	V
Gate Current	I_G	-	10	mA
TX Input Power(@ 85°C, Pulse, 50 Ohm)		-	21	dBm
Mounting Temperature		-55	150	°C

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied. Extended application of Absolute Maximum Rating conditions may reduce device reliability.

Electrical Specifications

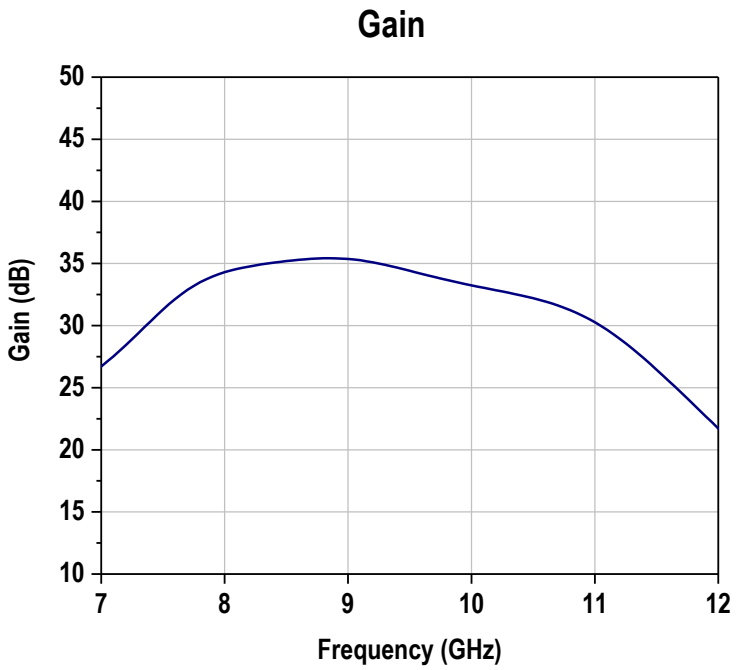
Test conditions unless otherwise noted: VD = 24 V, IDQ = 210 mA
Data de-embedded to device reference plane, 25 °C.

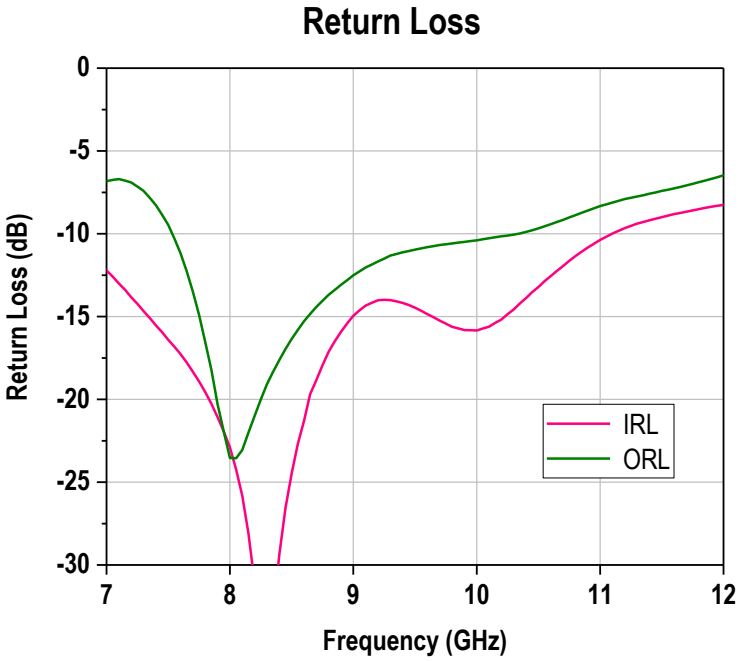
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Frequency	f	8.0		11.0	GHz
Small Signal Gain	G		33.8		dB
Large Signal Gain*	LG		23.6		dB
Input Return Loss	IRL		14		dB
Output Return Loss	ORL		11		dB
Output Power*	Psat		38.6		dBm
PAE*	PAE		45		%

*Pin = 15 dBm, PW 100 μs / DC 10% pulsed CW signal

Small Signal Performance

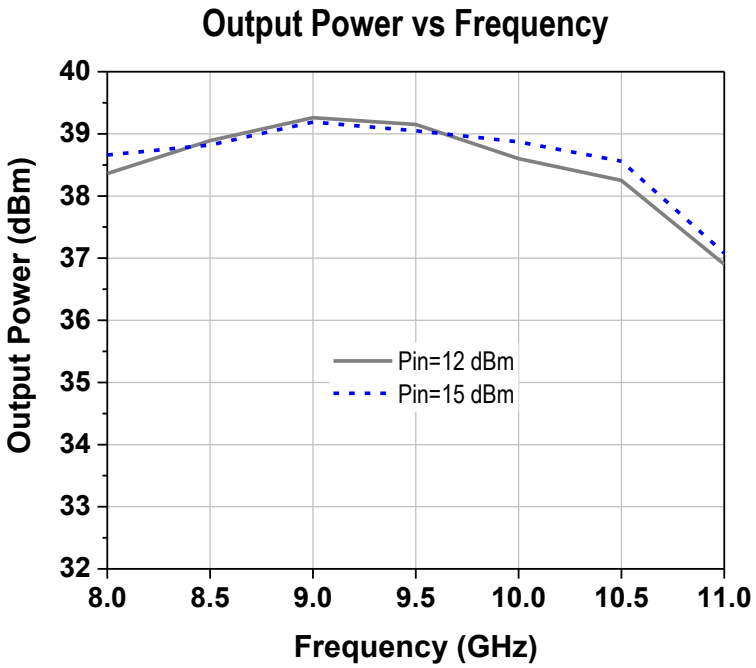
Test Conditions unless otherwise stated: VD = 24 V, IDQ = 110 mA, 25 °C

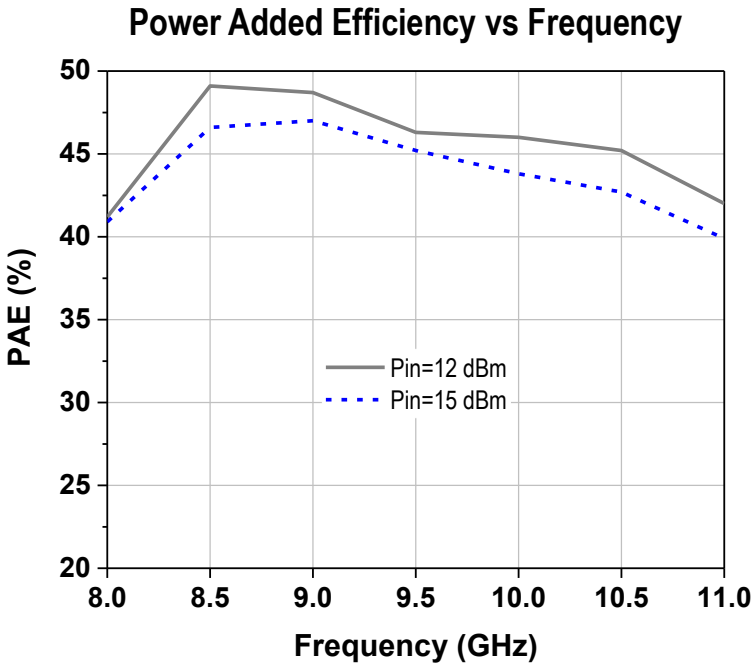




Large Signal Performance

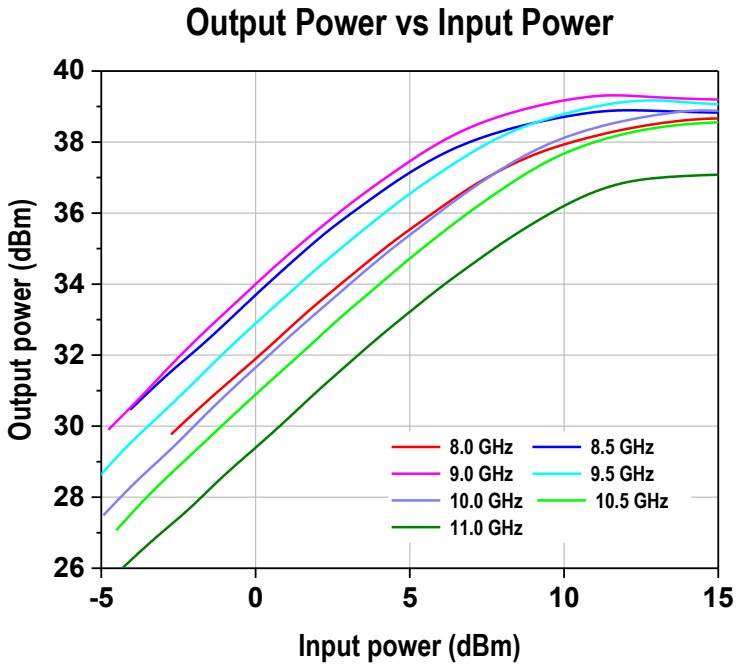
Test Conditions unless otherwise stated: VD = 24 V, IDQ = 110 mA, 25 °C
Pulse Mode, PW = 100 us, DC = 10%, 25 °C

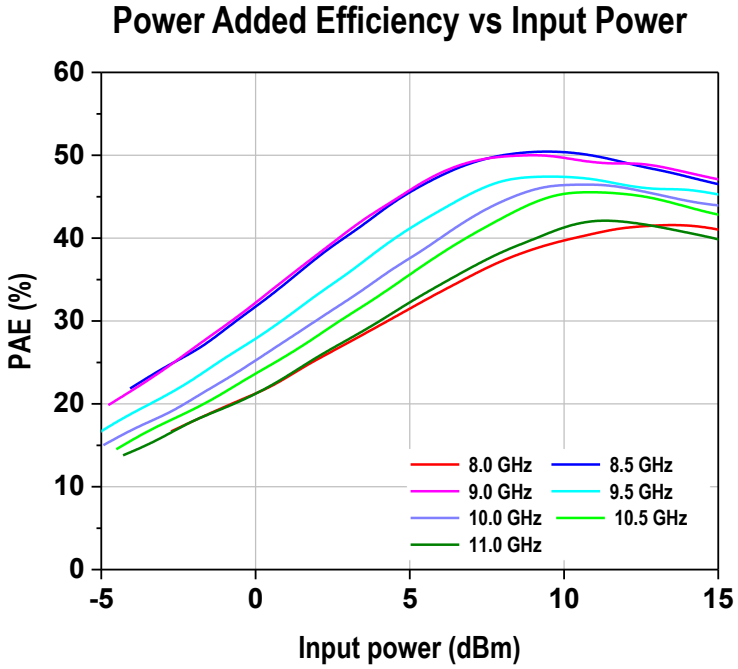




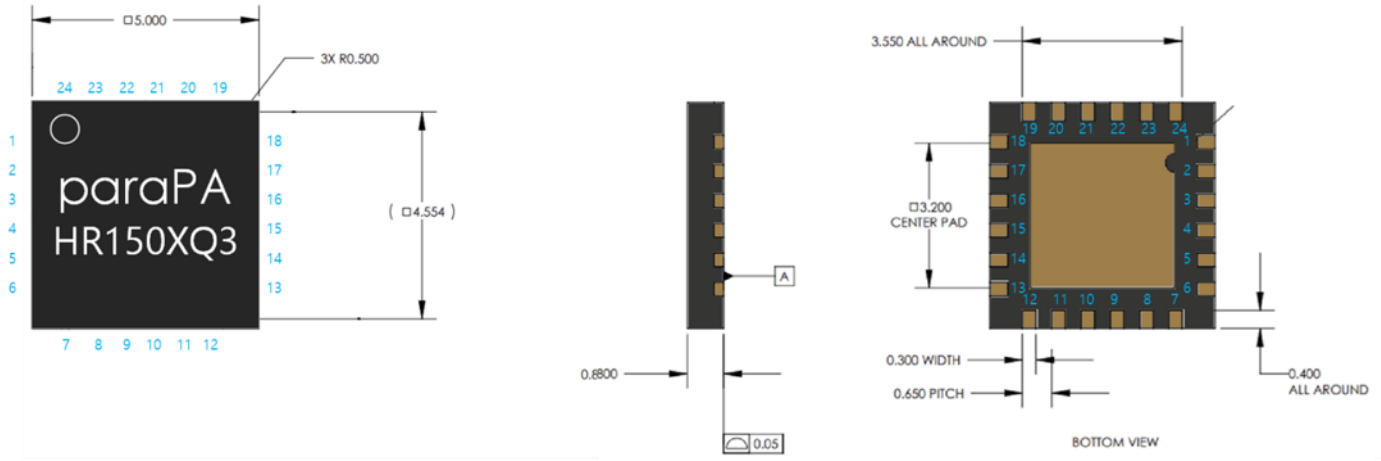
Power Sweep

Test Conditions unless otherwise stated: VD = 24 V, IDQ = 110 mA, 25 °C
Pulse Mode, PW = 100 us, DC = 10%, 25 °C





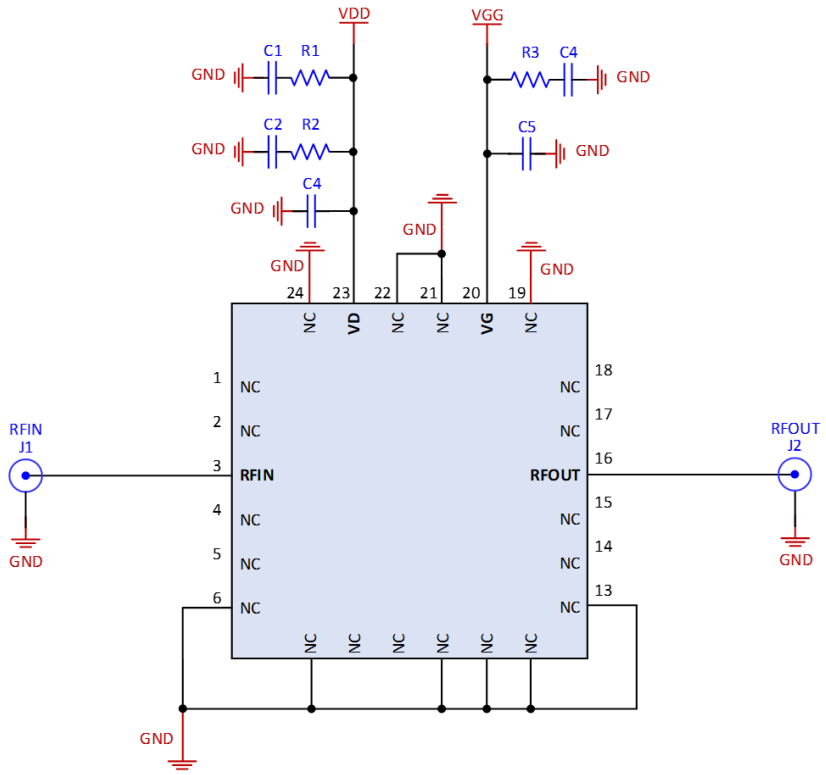
Mechanical Drawing & Pad Description



Dimensions in mm

Pin Number	Label	Description
Bottom Pad	GND	GROUND
3	RFIN	RF input. 50 Ω, DC blocked, pad connected to ground
16	RFOUT	RF output. 50 Ω, DC blocked, pad connected to ground
20	VD	Drain voltage. Bypass network required
23	VG	Gate voltage. Bypass network required
1, 2, 4-15, 17-19, 21, 22, 24	N/C	No Internal Connections. Connection to PCB ground recommended

Application Circuit



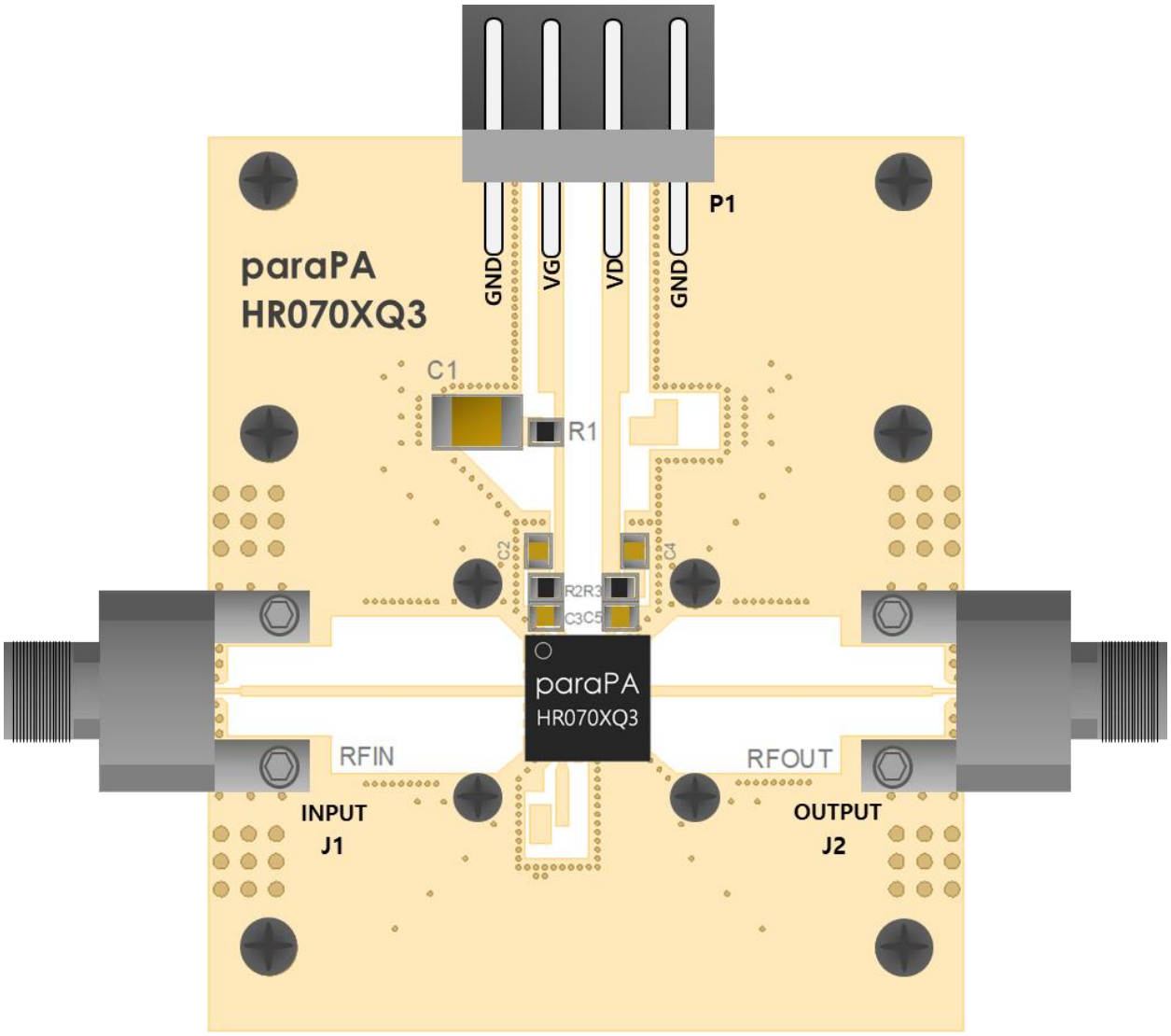
Bias-up Procedure

1. Set I_D limit to 900 mA, I_G limit to 10 mA
2. Apply -4 V to V_G
3. Apply +24 V to V_D; ensure I_{DQ} is approx. 0mA
4. Adjust V_G until I_{DQ} = 110 mA
5. Turn on RF supply

Bias-down Procedure

1. Turn off RF signal
2. Reduce V_G to −4 V; ensure IDQ is approx. 0 mA
3. Set V_D to 0 V
4. Turn off V_D supply
5. Turn off V_G supply

HR070XQ3 Evaluation Board



RF Layer is 0.008" thick Rogers Corp. RO4003C (εr = 3.35). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the With-wave end launch connector NE02FS001.

Ref. Des.	Component	Value	Manuf.	Part Number
C1	SMT Cap.	10 uF, 1206 size, 10%, X5R, 50 V	Various	
C2, C4	SMT Cap.	0.1 uF, 0402 size, 10%, X7R, 50 V	Various	
C3, C5	SMT Cap.	1 nF, 0402 size, 10%, X7R, 50 V	Various	
R1	SMT Res.	0 Ohm, 0402 size, 0.1 W, 50 V	Various	
R2, R3	SMT Res.	10 Ohm, 0402 size, 1%, 0.625 W, 50 V	Various	
J1, J2	RF Connectors		With-wave	NE02FS001

Electrostatic Discharge (ESD) Classifications

PARAMETER	SYMBOL	CLASS	TEST METHODOLOGY
Human body model	HBM	TBD	TBD
Charge device model	CDM	TBD	TBD

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