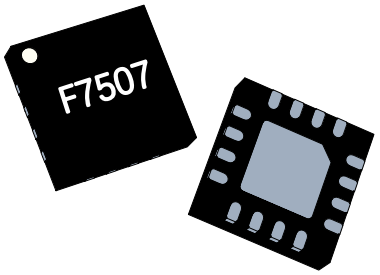
1. Description

- The F7507 is a high-power, high-gain, high-efficiency power amplifier. The device is manufactured with an advanced GaAs HBT process. It is designed for general purpose radio application in standard sub-bands from 100MHz to 1300MHz. It can be easily matched externally to obtain optimum power and efficiency for certain applications.
- The F7507 is packaged in a thermally enhanced, ultrasmall, micro lead frame package.



F7507-PDS-F01

Figure 1. F7507 Package Outline

2. Applications

- Wi-SUN
- RFID
- Industrial IOT
- WiFi-Halow
- Automatic Meter Readers

3. Features[1]

- Operating Frequency: 100-1300MHz
- Output Power (P1dB): 32.8dBm
- Gain, Small Signal: 32dB
- Operating Voltage/Current: 5V/140mA
- Package: QFN 3mm x 3mm x 0.75mm

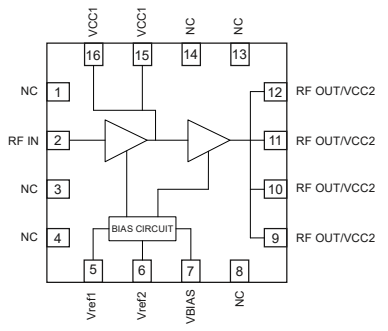
[1] Measured in Raytron DEMO @ 915MHz

4. Brief Typical Performance

Table 1. Brief Typical Performance (VCC1=VCC2=VBIAS=5V, T_C=25℃, 50Ω system)

Parameter	Typical Value				Units
Frequency	433	470	868	915	MHz
Small Signal Gain	31.5	32.6	32.5	32	dB
Output P1dB	32.8	32.8	32.6	32.8	dBm
Output P_{SAT}	33.8	33.8	33	33.3	dBm

5. Block Diagram



F7507-PDS-F02

Figure 2. F7507 Block Diagram TOP View

Table of Contents

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6. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Operating Voltage	V_{CC}	5.5	V
Input Power	P_{IN}	30	dBm
Storage Temperature Range	T_{STG}	- 55 ~ +125	°C
Operating Junction Temperature	T_J	150	°C

7. Recommended Operating Conditions

Table 3. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature Range	-	-40	25	105	°C
Supply Voltage Range	VCC1/VCC2	3.3	5.0	5.25	V
Bias Control Voltage	VBIAS	-	5	-	V
Reference Voltage	Vref1/Vref2	-	5	-	V
Power Control Voltage: High power mode	Vref1/Vref2	-	5	-	V
Power Control Voltage: Standby mode		-	0	0.1	V
Current in Standby Mode	-	-	-	10	uA
Operating Frequency	-	100	-	1300	MHz

8. Performance

8.1 Performance(400-470MHz)

8.1.1 Electronic Characteristics(400-470MHz)

Table 4. Electrical Characteristics (VCC1=VCC2=VBIAS=5V, I_{CQ}=200mA, T_C=25℃, 50Ω system)

Parameter	Typical Value		Units
Frequency	433	470	MHz
Gain	31.5	32.6	dB
Input Return Loss	-8.9	-9.7	dB
Output Return Loss	-4.0	-5.0	dB
Output P1dB	32.8	32.8	dBm
Output P_{SAT}	33.8	33.8	dBm
ICC@P_{SAT}	820	820	mA
PAE@P_{SAT}	58.5	58.5	%

8.1.2 Performance Plot(400-470MHz)

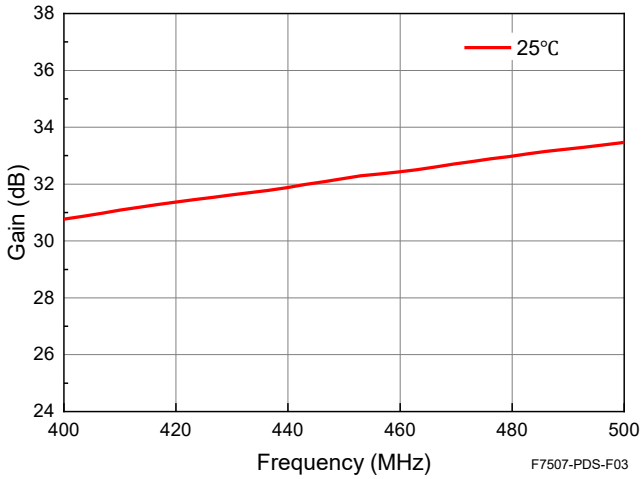


Figure 3. Gain vs. Freq. (400-470MHz)

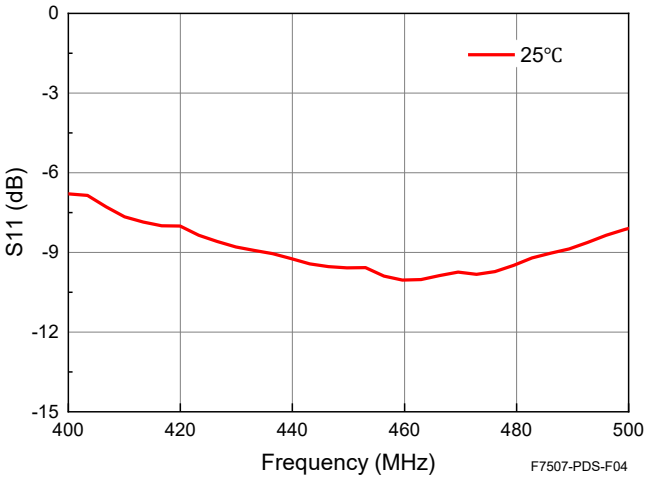


Figure 4. S11 vs. Freq. (400-470MHz)

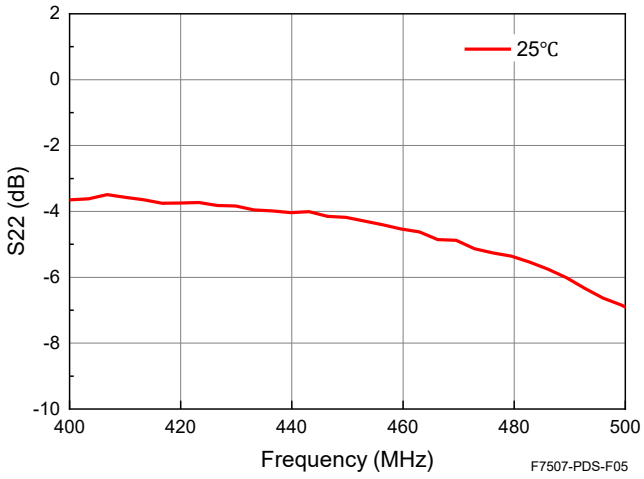


Figure 5. S22 vs. Freq. (400-470MHz)

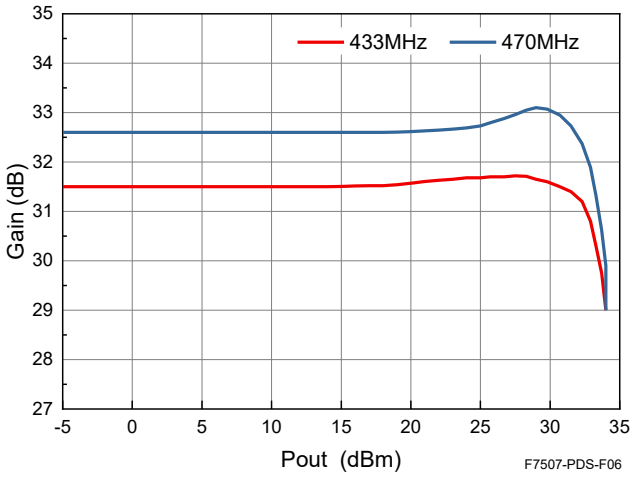


Figure 6. Gain vs. P_{out}. (400-470MHz)

8.1.3 Application Circuit (400-470MHz)

■ Schematic

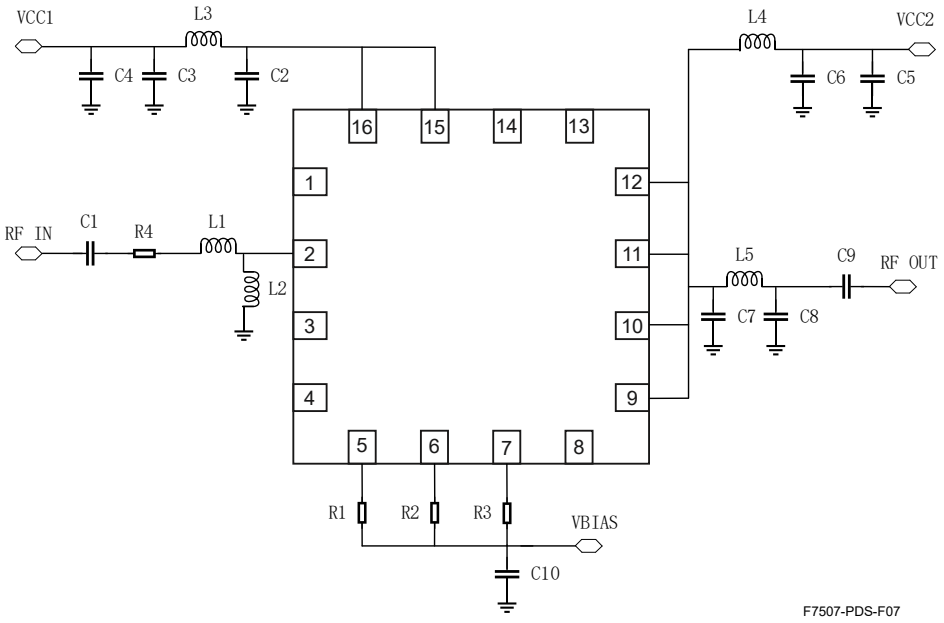


Figure 7. F7507 Circuit Schematic

■ Layout

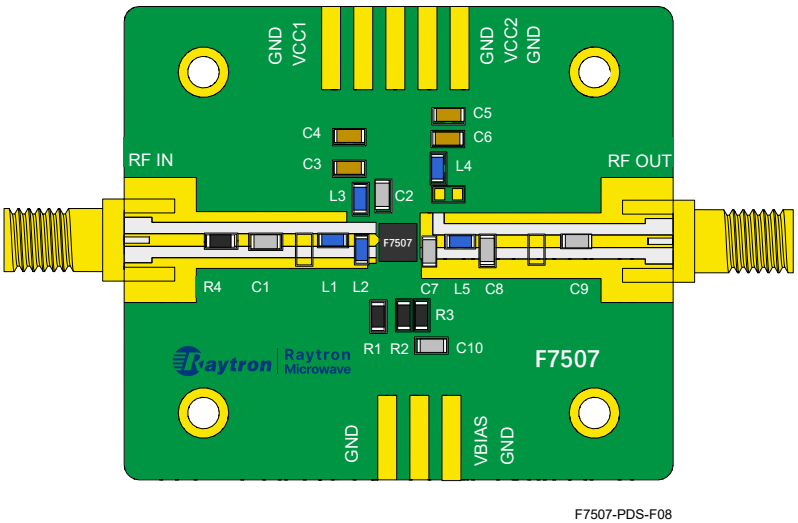


Figure 8. F7507 Evaluation Board

Table 5. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7507 Amplifier, QFN 3x3-16pin.	Raytron	F7507
C1, C9	220pF	C0G 250V 0603 Capacitor	Murata	GCM1885C2A221JA16D
C3, C6	22nF	C0G 250V 0603 Capacitor	Various	N/A
C4, C5	2.2uF	C0G 250V 0603 Capacitor	Various	N/A
C7	30pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E300GB12
C8	18pF	High Q 0603 Inductor	Murata	GQM1875C2E180GB12
L1	18nH	1High Q 0603 Inductor	Murata	LQW18AN18NG80D
L2	51nH	High Q 0603 Inductor	Murata	LQW18AN51NG80D
L3	6.0nH	High Q 0603 Inductor	Murata	LQW18AN6N0C80D
L4	5.6nH	High Q 0603 Inductor	Murata	LQW18AN5N6C80D
L5	4.3nH	High Q 0603 Inductor	Murata	LQW18AN4N3C80D
R1	3.3kΩ	0603 Resistor	Various	N/A
R2	2kΩ	0603 Resistor	Various	N/A
R3	0Ω	0603 Resistor	Various	N/A
R4	10Ω	0603 Resistor	Various	N/A

Table 6. TL Distance

TL	Value	Description
TL1	1.02mm	Distance between F7507 Pin 2 to L2 (right edge)
TL2	2.8mm	Distance between F7507 Pin 2 to L1 (right edge)
TL3	8.25mm	Distance between F7507 Pin 2 to C1 (right edge)
TL4	11.65mm	Distance between F7507 Pin 2 to R4 (right edge)
TL5	1.02mm	Distance between F7507 Pin 11 to C7 (left edge)
TL6	2.7mm	Distance between F7507 Pin 11 to L5 (left edge)
TL7	5.8mm	Distance between F7507 Pin 11 to C8 (left edge)
TL8	11.82mm	Distance between F7507 Pin 11 to C9 (left edge)

8.2 Performance(850-970MHz)

8.2.1 Electronic Characteristics(850-970MHz)

Table 7. Electrical Characteristics (VCC1=VCC2=VBIAS=5V, I_{CQ}=140mA, T_C=25℃, 50Ω system)

Parameter	Typical Value			Units
Frequency	868	915	960	MHz
Gain	32.5	32	31	dB
Input Return Loss	-22	-12.4	-7.8	dB
Output Return Loss	-10.2	-12.1	-11.5	dB
Output P1dB	32.6	32.8	32.4	dBm
Output P_{SAT}	33	33.3	33	dBm
ICC@P_{SAT}	920	970	980	mA
PAE@P_{SAT}	43.3	44	40.6	%

8.2.2 Performance Plot(850-970MHz)

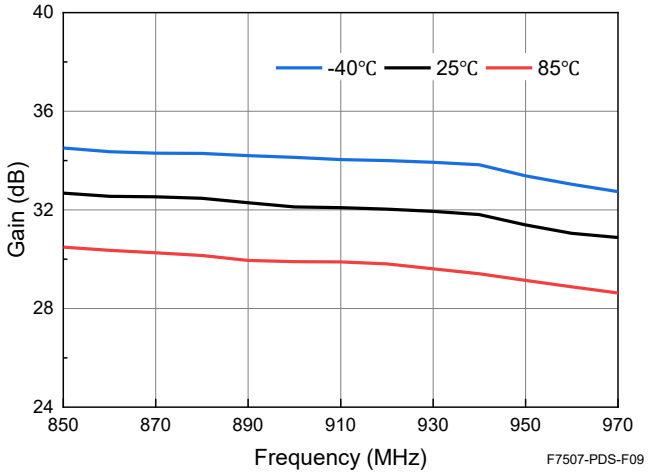


Figure 9. Gain vs. Freq. (850-970MHz)

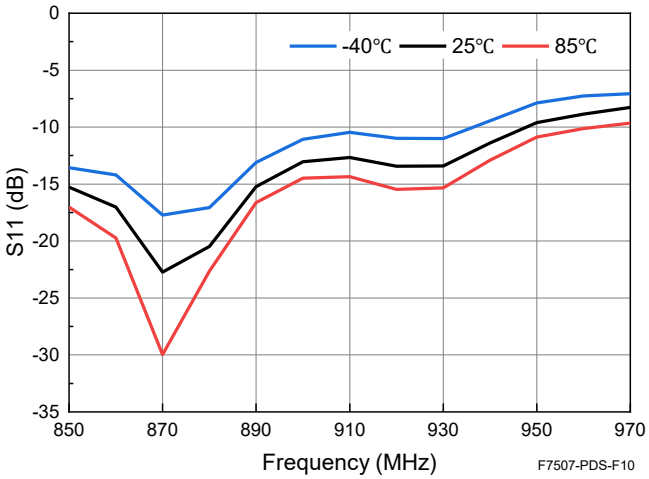


Figure 10. S11 vs. Freq. (850-970MHz)

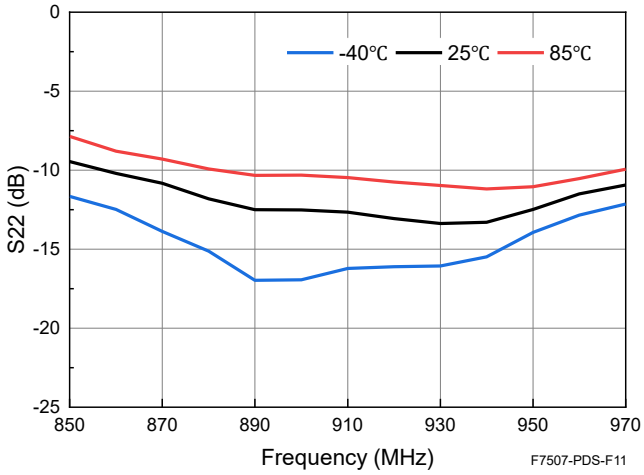


Figure 11. S22 vs. Freq. (850-970MHz)

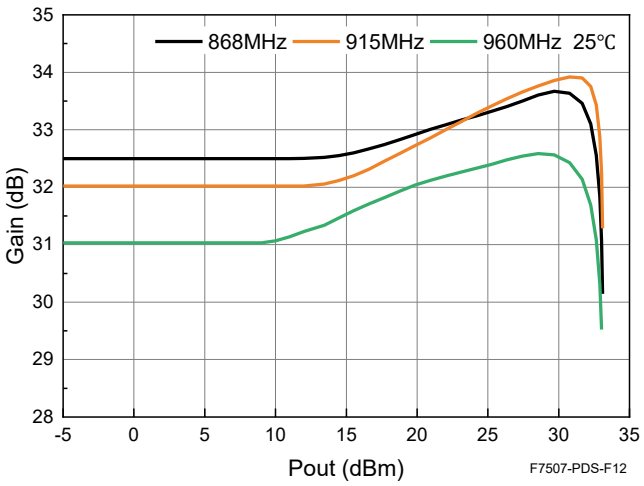


Figure 12. Gain vs. P_{OUT}. (850-970MHz)

8.2.3 Application Circuit (850-970MHz)

■ Schematic

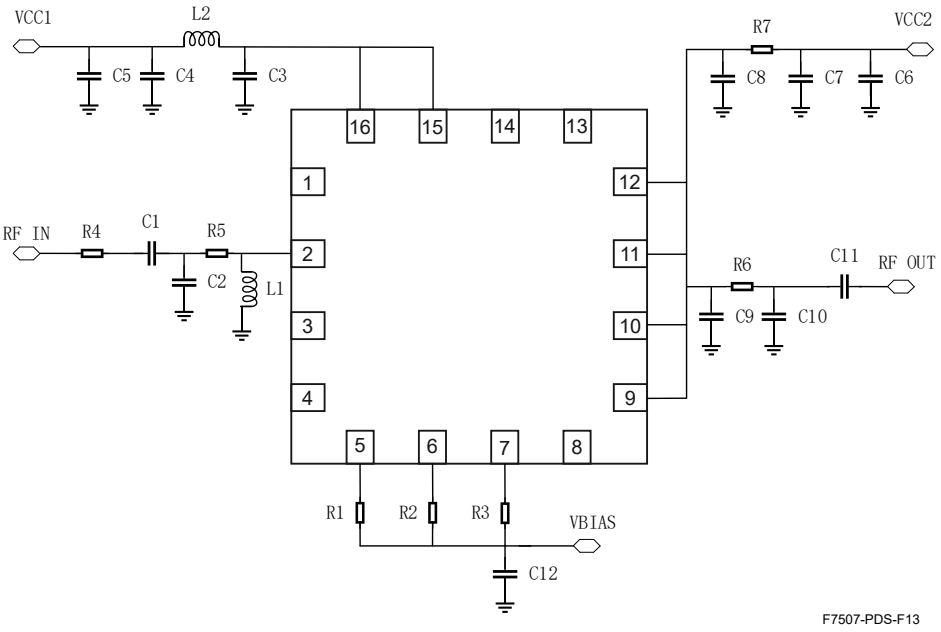


Figure 13. F7507 Circuit Schematic

■ Layout

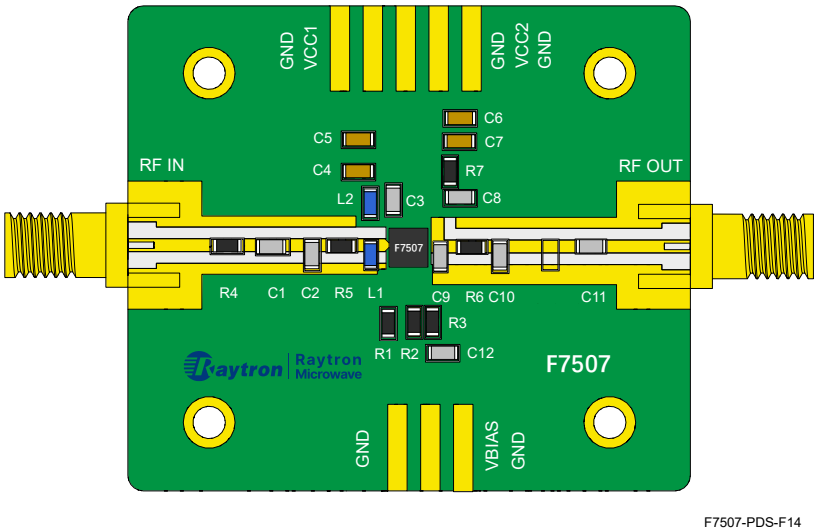


Figure 14. F7507 Evaluation Board

Table 8. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7507 Amplifier, QFN 3x3-16pin.	Raytron	F7507
C1, C11	220pF	C0G 250V 0603 Capacitor	Murata	GCM1885C2A221JA16D
C2	5.1pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E5R1BB12
C3	2pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E2R0BB12
C4, C7	22nF	C0G 250V 0603 Capacitor	Various	N/A
C5, C6	2.2uF	C0G 250V 0603 Capacitor	Various	N/A
C8, C9	3pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E3R0BB12
C11	11pF	High Q 0603 Inductor	Murata	GQM1875C2E110GB12
L1	3.9nH	High Q 0603 Inductor	Murata	LQW18AN3N9C80D
L2	15nH	High Q 0603 Inductor	Murata	LQW18AN15NG80D
R1	3.9kΩ	0603 Resistor	Various	N/A
R2	3.3kΩ	0603 Resistor	Various	N/A
R3, R5, R7	0Ω	0603 Resistor	Various	N/A
R4	10Ω	0603 Resistor	Various	N/A

Table 9. TL Distance

TL	Value	Description
TL1	1.02mm	Distance between F7507 Pin 2 to L1 (right edge)
TL2	2.8mm	Distance between F7507 Pin 2 to R5 (right edge)
TL3	5.9mm	Distance between F7507 Pin 2 to C2 (right edge)
TL4	8.25mm	Distance between F7507 Pin 2 to C1 (right edge)
TL5	11.65mm	Distance between F7507 Pin 2 to R4 (right edge)
TL6	1.02mm	Distance between F7507 Pin 11 to C9 (left edge)
TL7	2.7mm	Distance between F7507 Pin 11 to R6 (left edge)
TL8	5.8mm	Distance between F7507 Pin 11 to C10 (left edge)
TL9	11.82mm	Distance between F7507 Pin 11 to C11 (left edge)

9. Package Outline

■ Pin Layout

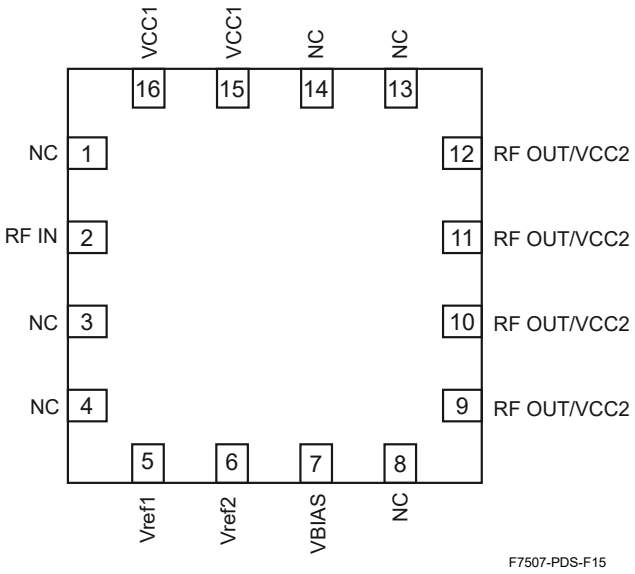


Figure 15. F7507 Pin Layout

Table 10. Pin Description

Pin	Symbol	Description
1/3/4/8/13/14	NC	No electrical connection
2	RF IN	RF Input. Requires external match for optimal performance. External DC Block capacitor required.
5/6	Vref1/Vref2	Reference Voltage into internal active bias current mirror. Also, can be used as on/off control.
7	VBIAS	Control voltage input to bias control circuit.
9/10/11/12	RF OUT/VCC2	RF Output and DC supply input to the second stage. Requires external match for optimal performance. External DC Block capacitor required.
15/16	VCC1	DC supply input to the first stage

■ Mechanical Drawing

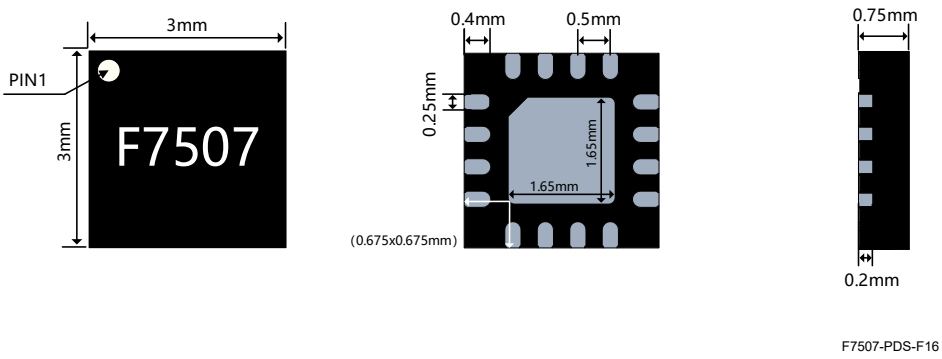


Figure 16. F7507 Mechanical Drawing

10. DEMO Summary

Table 11. DEMO Summary

No.	F7507 DEMO Name	V_{CC} (V)	Freq (MHz)	Linear Gain(dB)	P_{SAT} (dBm)	PAE (%)	Pulse or CW
1	DEMO_A, 1.6W	5	223-235	31.5	32	48	CW
2	DEMO_B, 2.4W	5	400-470	32.8	33.8	58	CW
3	DEMO_C, 1.3W	5	470-800	32.5	31	35	CW
4	DEMO_D, 1.8W	5	560-680	33.5	32.5	52	CW
5	DEMO_E, 2.1W	5	860-960	32	33.3	44	CW
6	DEMO_F, 1.0W	3.3	868-923	30	30	42	CW
7	DEMO_G, 1.6W	5	1050-1250	30	32	40	CW

11. Handling Cautions

- **ESD Caution**

Table 12. ESD/MSL Rating

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1B	ESDA / JEDEC JS-001-2014
ESD – Charged Device Model (CDM)	Class C3	ESDA / JEDEC JS-002-2014
MSL – Moisture Sensitivity Level	Level 3	IPC/JEDEC J-STD-020

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore proper ESD precautions should be taken to avoid performance degradation or loss of functionality.



12. Contact Information

For the latest specifications, additional product information, technical support and sales support, please contact:

- **Email:** RF.support@raytrontek.com
- **Web:** www.raytrontek.com

13. Disclaimer

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