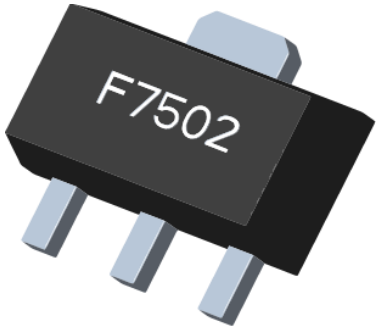
1. Description

- The F7502 is a wideband GaAs low phase noise amplifier for wireless application. It is internally integrated with an active bias circuity and can provide stable current over temperature and process variation.
- The F7502 is a high linearity gain block for application that require small in size with minimal number of external components. It is internally matched to 50Ω at input and output.



F7502-PDS--F01

Figure 1. F7502 Package Outline

2. Applications

- PA Driver Amplifier
- 2G/3G/4G LTE/5G NR systems
- Cellular, PCS, GSM, UMTS
- Wideband Instrumentation
- Wireless Data, Satellite Terminals

3. Features[1]

- Operating Frequency: 10-6000MHz
- Output Power (P1dB): 16.2dBm
- Small Signal Gain: 15.3dB
- Operating Voltage: 5V
- Package: SOT-89

1. Measured in Raytron DEMO @1000MHz

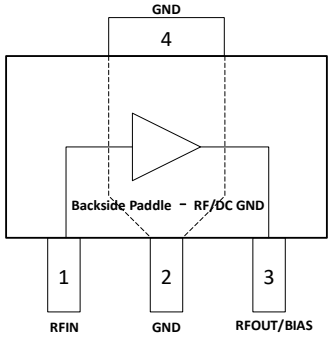
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	1000MHz	Units
Small Signal Gain[1]	15.3	dB
Output P1dB[2]	16.2	dBm
Output IP3[3]	31.3	dBm

1. V_{CC}=5V, I_{CQ}=50mA,Temp=25℃, 50Ω test system
2. Input signal: CW
3. Input signal: 2-tone, P_{OUT}=0dBm/tone, Δf=1MHz

5. Block Diagram



F7502-PDS-F02

Figure 2. F7502 Block Diagram TOP View

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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}	25	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	Min.	Typ.	Max.	Units
Operating Temperature Range	-50	25	105	°C
Operating Voltage	-	5.0	5.5	V
Operating Frequency	50	-	6000	MHz

8. Electrical Characteristics (T_C = 25°C)

Table 4. Electrical Characteristics (V_{CC}=5V, L1=51nH, I_{CQ}=50mA, T_C=25℃, 50Ω test system)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency	-	500	-	6000	MHz
Small Signal Gain	500MHz	-	15.2	-	dB
	1000MHz	-	15.3	-	dB
	2000MHz	-	15.0	-	dB
	3000MHz	-	14.7	-	dB
	4000MHz	-	14.1	-	dB
	5000MHz	-	13.3	-	dB
Input Return Loss	1000MHz	-	17.2	-	dB
Output Return Loss	1000MHz	-	19.0	-	dB
Output P1dB	500MHz	-	16.1	-	dBm
	1000MHz	-	16.2	-	dBm
	2000MHz	-	15.1	-	dBm
	3000MHz	-	13.0	-	dBm
	4000MHz	-	10.9	-	dBm
Output IP3 P_{OUT}=0dBm/tone, Δf=1MHz	500MHz	-	32.1	-	dBm
	1000MHz	-	31.4	-	dBm
	2000MHz	-	28.0	-	dBm
	3000MHz	-	24.3	-	dBm
	4000MHz	-	21.1	-	dBm
Device Operating Current	-	-	50	-	mA

Table 5. Electrical Characteristics (V_{CC}=5V, L1=330nH, I_{CQ}=48mA, T_C=25℃, 50Ω test system)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency	-	100	-	2000	MHz
Small Signal Gain	100MHz	-	15.4	-	dB
	500MHz	-	15.4	-	dB
	1000MHz	-	15.3	-	dB
	1500MHz	-	15.2	-	dB
	2000MHz	-	14.8	-	dB
Input Return Loss	1000MHz	-	17.9	-	dB
Output Return Loss	1000MHz	-	21.4	-	dB
Output P1dB	100MHz	-	15.3	-	dBm
	500MHz	-	15.6	-	dBm
	1000MHz	-	15.3	-	dBm
	1500MHz	-	14.8	-	dBm
	2000MHz	-	14.0	-	dBm
Output IP3 P_{OUT}=0dBm/tone, Δf=1MHz	100MHz	-	29.4	-	dBm
	500MHz	-	30.7	-	dBm
	1000MHz	-	30.0	-	dBm
	1500MHz	-	28.6	-	dBm
	2000MHz	-	26.7	-	dBm
Device Operating Current	-	-	48	-	mA

Table 6. Electrical Characteristics (V_{CC}=5V, L1=4.7uH, I_{CQ}=45mA, T_C=25℃, 50Ω test system)

Parameter	Conditions	Min	Typ	Max	Units
Frequency	-	20	-	1200	MHz
Small Signal Gain	20MHz	-	15.7	-	dB
	100MHz	-	15.7	-	dB
	500MHz	-	15.5	-	dB
	1200MHz	-	14.7	-	dB
Input Return Loss	500MHz	-	19	-	dB
Output Return Loss	500MHz	-	20.6	-	dB
Output P1dB	20MHz	-	15.6	-	dBm
	100MHz	-	15.6	-	dBm
	500MHz	-	15.5	-	dBm
	1200MHz	-	13.5	-	dBm
Output IP3 P_{OUT}=0dBm/tone, Δf=1MHz	20MHz	-	29.8	-	dBm
	100MHz	-	30.3	-	dBm
	500MHz	-	30.5	-	dBm
	1200MHz	-	27.5	-	dBm
Device Operating Current	-	-	45	-	mA

9. Typical Performance

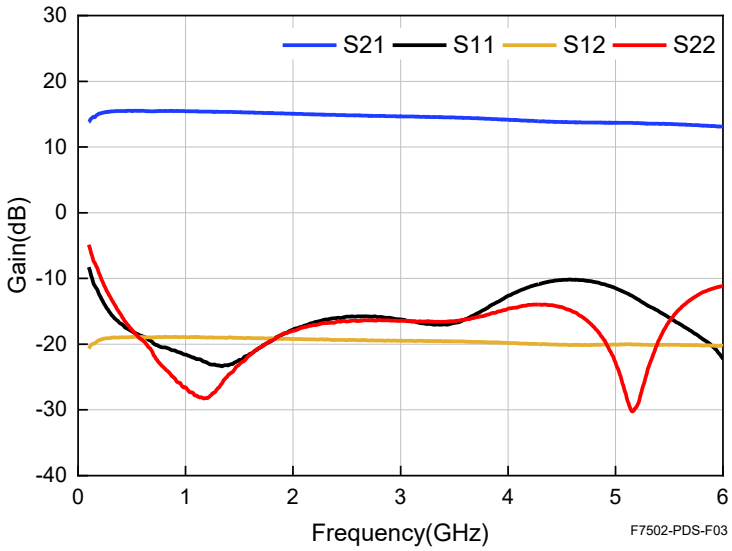


Figure 3. Small Signal S-Parameters vs. Freq.(500-6000MHz)

10. Package Outline

■ Pin Layout

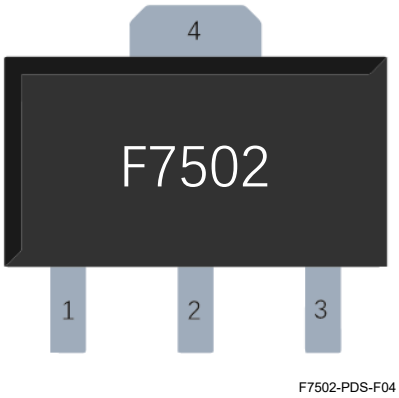


Figure 4. F7502 Pin Layout

Table 7. Pin Description

Pin	Symbol	Description
1	RF_{IN}	RF Input. External DC Block capacitor required.
3	RF_{OUT}/BIAS	RF Output and DC supply input. External DC Block capacitor required.
2/4	GND	RF/DC ground

■ Mechanical Drawing

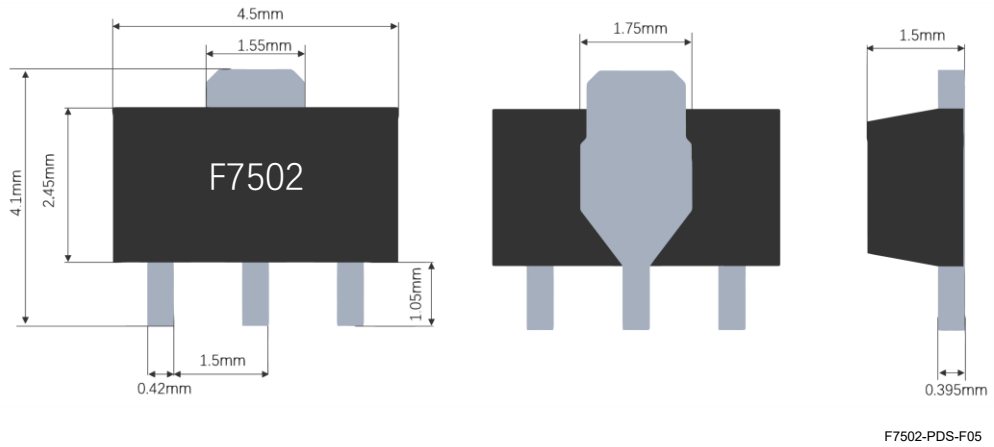


Figure 5. F7502 Mechanical Drawing

11. Application Circuit

■ Schematic

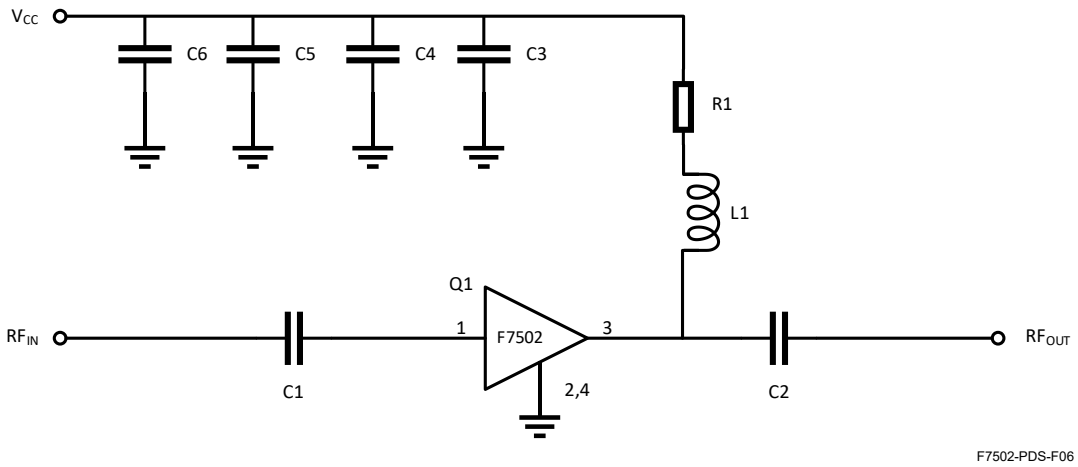


Figure 6. F7502 Application Circuit Schematic

■ Layout

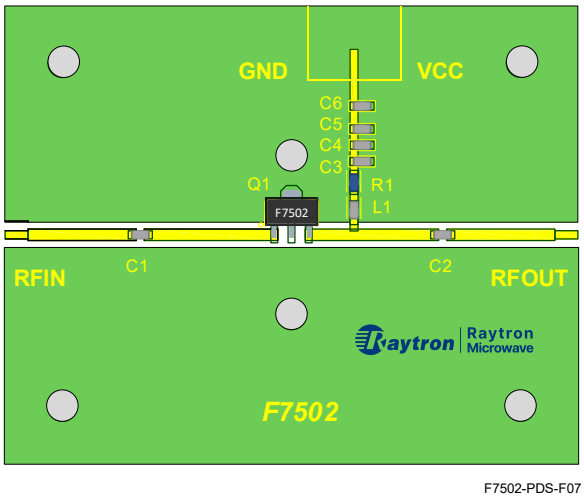


Figure 7. F7502 Application Circuit Layout

Table 8. Bill of Materials (20-1200MHz)

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7302 Amplifier, SOT-89 pkg.	Raytron	F7302
C1	2.2uF	0603 Capacitor	Various	N/A
C2	2.2uF	0603 Capacitor	Various	N/A
C3	10.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E100GB12
C4	1.0nF	0603 Capacitor	Various	N/A
C5	2.2uF	0603 Capacitor	Various	N/A
C6	N/A	N/A	N/A	N/A
L1	4.7uH	1008 Inductance	Murata	LQW2UAS4R7J00L
R1	22.0Ω	1/4W 0603 Resistor	Various	N/A

Table 9. Bill of Materials (100-2000MHz)

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7302 Amplifier, SOT-89 pkg.	Raytron	F7302
C1	1.0nF	0603 Capacitor	Various	N/A
C2	1.0nF	0603 Capacitor	Various	N/A
C3	10.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E100GB12
C4	1.0nF	0603 Capacitor	Various	N/A
C5	2.2uF	0603 Capacitor	Various	N/A
C6	N/A	N/A	N/A	N/A
L1	330.0nH	High Q 0603 Inductance	Murata	LQW18ANR33G80D
R1	22.0Ω	1/4W 0603 Resistor	Various	N/A

Table 10. Bill of Materials (500-6000MHz)

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7302 Amplifier, SOT-89 pkg.	Raytron	F7302
C1	1.0nF	0603 Capacitor	Various	N/A
C2	1.0nF	0603 Capacitor	Various	N/A
C3	10.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E100GB12
C4	1.0nF	0603 Capacitor	Various	N/A
C5	2.2uF	0603 Capacitor	Various	N/A
C6	N/A	N/A	N/A	N/A
L1	51.0nH	High Q 0603 Inductance	Murata	LQW18AN51NG80D
R1	22.0Ω	1/4W 0603 Resistor	Various	N/A

12. Handling Cautions

■ ESD Caution

Table 11. ESD/MSL Rating

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1C	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.



13. 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

14. Disclaimer

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