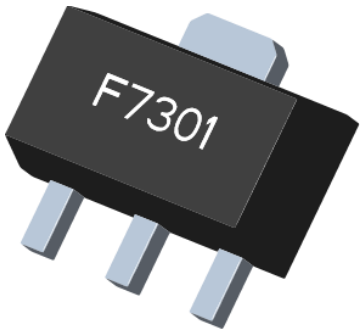
1. Description

- The F7301 is a high linearity driver amplifier in a low-cost, surface mount package. The F7301 delivers high performance across a broad range of frequency with 29.3dBm P1dB while only consuming 270mA quiescent current.
- The F7301 has an overvoltage protection function. When the power supply voltage exceeds a certain value, the protection function is turned on.



F7301-PDS-F01

Figure 1. F7301 Package Outline

2. Applications

- Data Link Communication
- Radar
- Private Communication Network

3. Features[1]

- Operating Frequency: 400-4000MHz
- Output Power (P1dB): 29.3dBm
- Small Signal Gain: 17.1dB
- Operating Voltage/Current: 5V/270mA
- Package: SOT-89

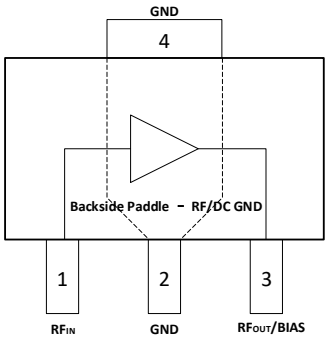
[1] Measured in Infiwave DEMO @1800MHz

4. Brief Typical Performance

Table 1. Brief Typical Performance (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value						Units
Frequency	900	1500	1800	2600	3100	4100	MHz
Gain, Small Signal	20.5	18.5	17.1	14.7	11.5	10.4	dB
Output P1dB	28.9	29.1	29.3	29.5	28.7	29.9	dBm
Output P_{SAT}	31.0	30.5	31.4	30.6	30.0	30.8	dBm

5. Block Diagram



F7301-PDS-F02

Figure 2. F7301 Block Diagram TOP View

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7	Recommended Operating Conditions	3
8	Performance	3
9	Package Outline	17
10	Handling Precautions	18
11	Contact Information	19
12	Disclaimer	19

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	Min.	Typ.	Max.	Units
Operating Temperature Range	-40	25	105	°C
Operating Voltage	4.75	5.0	5.25	V
Operating Frequency	400	-	4000	MHz

8. Performance

8.1 Performance(860-960MHz)

8.1.1 Electrical Characteristics (860-960MHz, T_C=25°C)

Table 4. Electrical Characteristics (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value			Units
Frequency	860	900	960	MHz
Gain	20.8	20.5	20.1	dB
Input Return Loss	8.8	8.7	9.1	dB
Output Return Loss	8.1	7.4	9.4	dB
Output P1dB	28.5	28.9	29.2	dBm
Output P_{SAT}	30.8	31.0	31.1	dBm

8.1.2 Performance Plots (860-960MHz)

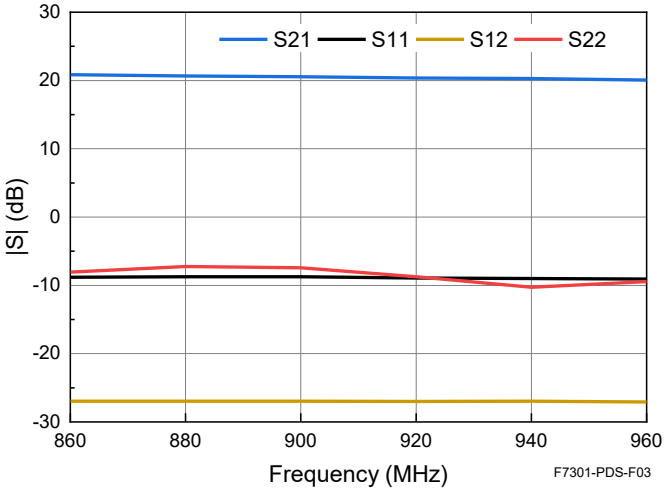


Figure 3. Small Signal S-Parameters vs. Freq.(860-960MHz)

8.1.3 Application Circuit (860-960MHz)

■ Schematic

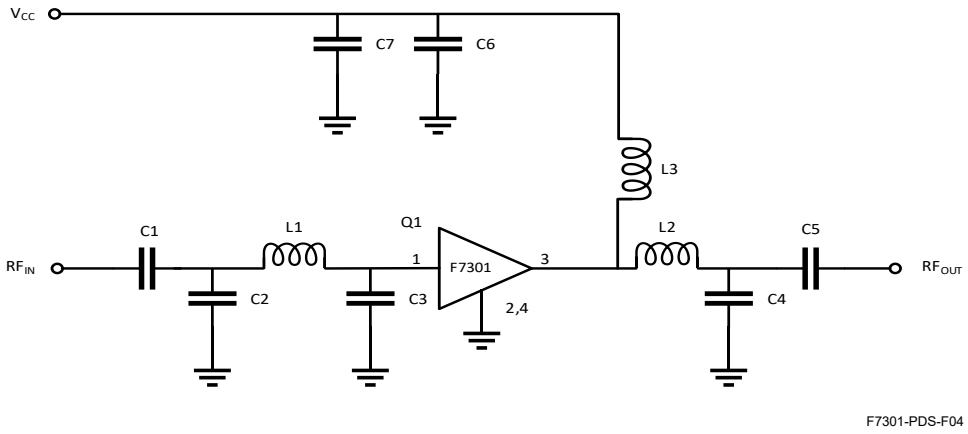


Figure 4. F7301 Circuit Schematic

■ Layout

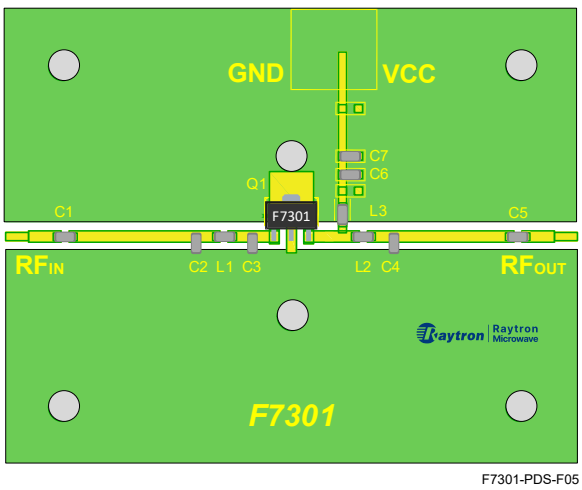


Figure 5. F7301 Evaluation Board

Table 5. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7301 Amplifier, SOT-89 pkg.	Raytron	F7301
C1 C5	220.0pF	0603 Capacitor	Murata	GCM1885C2A221JA16D
C2	5.6pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E5R6BB12
C3	18.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E180GB12
C4	5.6pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E5R6BB12
C6	100.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E101GB12
C7	2.2uF	0603 Capacitor	Various	N/A
L1	4.3nH	High Q 0603 Inductor	Murata	LQW18AN4N3C80D
L2	2.2nH	High Q 0603 Inductor	Murata	LQW18AN2N2C80D
L3	30nH	High Q 0603 Inductor	Murata	LQW18AN30NG80D

Table 6. TL Distance

TL	Value	Description
TL1	1.02mm	Distance between F7301 Pin 1 to C3 (right edge)
TL2	2.87mm	Distance between F7301 Pin 1 to L1 (right edge)
TL3	6.23mm	Distance between F7301 Pin 1 to C2 (right edge)
TL4	3.30mm	Distance between F7301 Pin 3 to L2 (left edge)
TL5	6.78mm	Distance between F7301 Pin 3 to C4 (left edge)

8.2 Performance(950-1450MHz)

8.2.1 Electrical Characteristics(950-1450MHz, T_C=25°C)

Table 7. Electrical Characteristics (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value			Units
Frequency	950	1200	1450	MHz
Gain	17.8	18.3	17.7	dB
Input Return Loss	4.0	8.3	18.4	dB
Output Return Loss	13.7	7.7	6.8	dB
Output P1dB	28.7	29.1	29.5	dBm
Output P_{SAT}	29.9	31.8	31.8	dBm

8.2.2 Performance Plots(950-1450MHz)

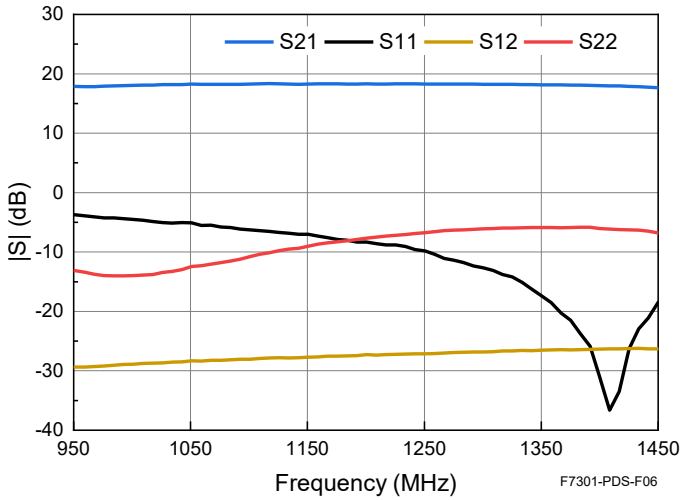


Figure 6. Small Signal S-Parameters vs. Freq.(950-1450MHz)

8.2.3 Application Circuit (950-1450MHz)

■ Schematic

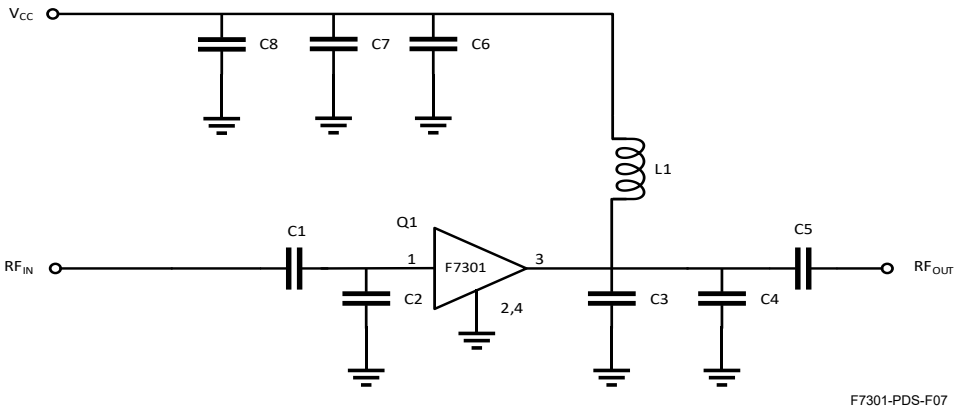


Figure 7. F7301 Circuit Schematic

■ Layout

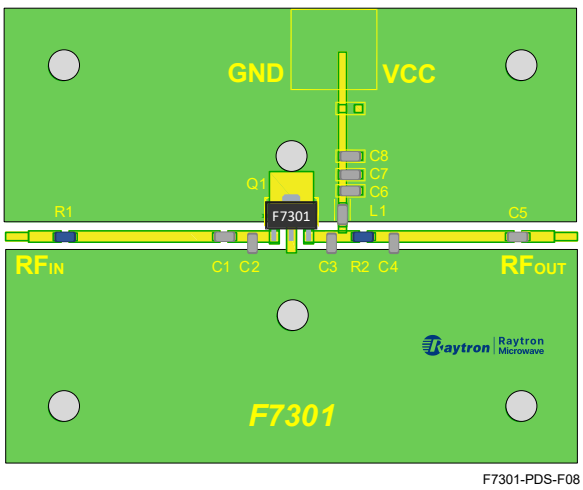


Figure 8. F7301 Evaluation Board

Table 8. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7301 Amplifier, SOT-89 pkg.	Raytron	F7301
R1 R2	0Ω	0603 Resistor	Various	N/A
C1	10.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E100GB12
C2	5.1pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E5R1BB12
C3	5.6pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E5R6BB12
C4	1.8pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E1R8BB12
C5 C6	100.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E101GB12
C7	0.1uF	0603 Capacitor	Various	N/A
C8	2.2uF	0603 Capacitor	Various	N/A
L1	30nH	High Q 0603 Inductor	Murata	LQW18AN30NG80D

Table 9. TL Distance

TL	Value	Description
TL1	1.02mm	Distance between F7301 Pin 1 to C2 (right edge)
TL2	2.87mm	Distance between F7301 Pin 1 to C1 (right edge)
TL3	1.02mm	Distance between F7301 Pin 3 to C3 (left edge)
TL4	6.78mm	Distance between F7301 Pin 3 to C4 (left edge)
TL5	16.82mm	Distance between F7301 Pin 3 to C5 (left edge)

8.3 Performance(1300-1500MHz)

8.3.1 Electrical Characteristics(1300-1500MHz, T_C=25°C)

Table 10. Electrical Characteristics (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value			Units
Frequency	1300	1400	1500	MHz
Gain	18.6	18.7	18.5	dB
Input Return Loss	7.6	12.2	18.3	dB
Output Return Loss	14.6	12.2	12.5	dB
Output P1dB	29.2	29.3	29.1	dBm
Output P_{SAT}	30.5	30.6	30.5	dBm

8.3.2 Performance Plots(1300-1500MHz)

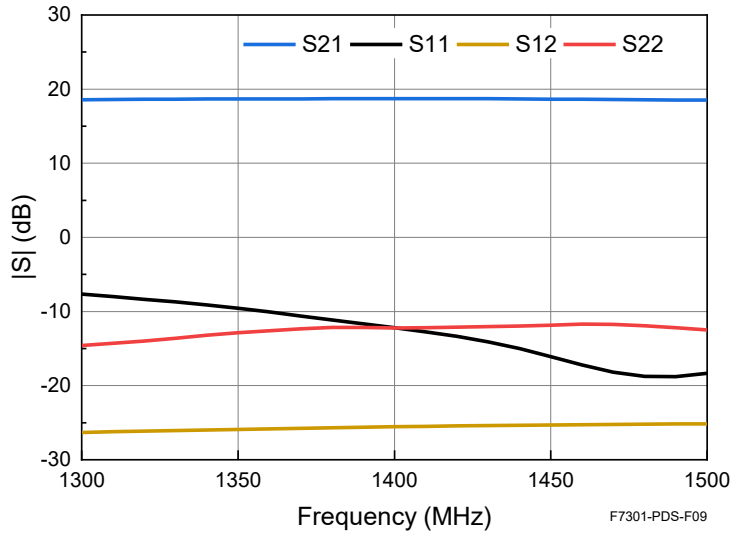


Figure 9. Small Signal S-Parameters vs. Freq.(1300-1500MHz)

8.3.3 Application Circuit (1300-1500MHz)

■ Schematic

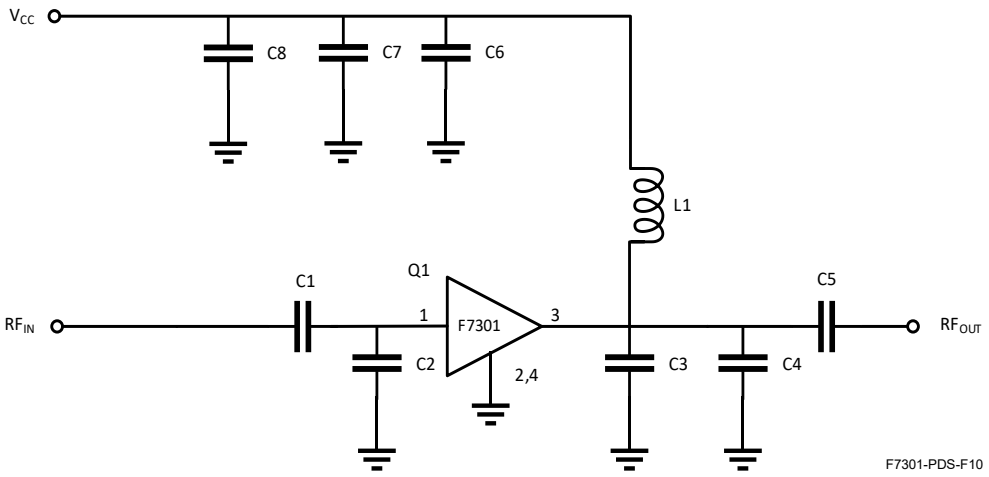


Figure 10. F7301 Circuit Schematic

■ Layout

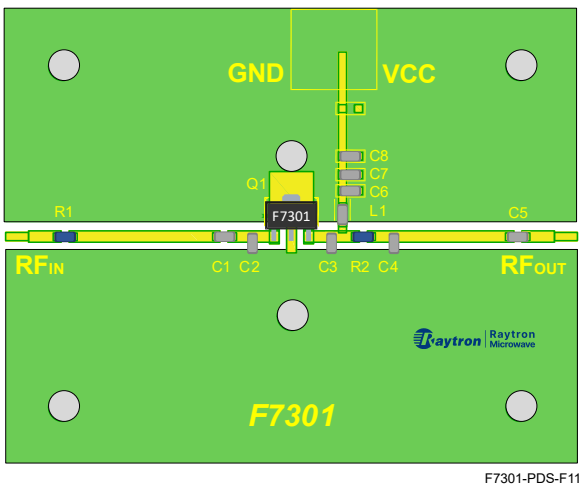


Figure 11. F7301 Evaluation Board

Table 11. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7301 Amplifier, SOT-89 pkg.	Raytron	F7301
R1 R2	0Ω	0603 Resistor	Various	N/A
C1	3.6pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E3R6BB12
C2	3.9pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E3R9BB12
C3	3.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E3R0BB12
C4	2.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E2R0BB12
C5 C6	100.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E101GB12
C7	0.1uF	0603 Capacitor	Various	N/A
C8	2.2uF	0603 Capacitor	Various	N/A
L1	30nH	High Q 0603 Inductor	Murata	LQW18AN30NG80D

Table 12. TL Distance

TL	Value	Description
TL1	1.02mm	Distance between F7301 Pin 1 to C2 (right edge)
TL2	2.87mm	Distance between F7301 Pin 1 to C1 (right edge)
TL3	1.02mm	Distance between F7301 Pin 3 to C3 (left edge)
TL4	6.78mm	Distance between F7301 Pin 3 to C4 (left edge)
TL5	16.82mm	Distance between F7301 Pin 3 to C5 (left edge)

8.4 Performance(1300-1800MHz)

8.4.1 Electrical Characteristics(1300-1800MHz, T_C=25°C)

Table 13. Electrical Characteristics (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value			Units
Frequency	1300	1550	1800	MHz
Gain	17.5	17.6	17.1	dB
Input Return Loss	5.8	8.9	15	dB
Output Return Loss	11	7.1	8.2	dB
Output P1dB	29.3	28	29.3	dBm
Output P_{SAT}	31.5	31.3	31.4	dBm

8.4.2 Performance Plots(1300-1800MHz)

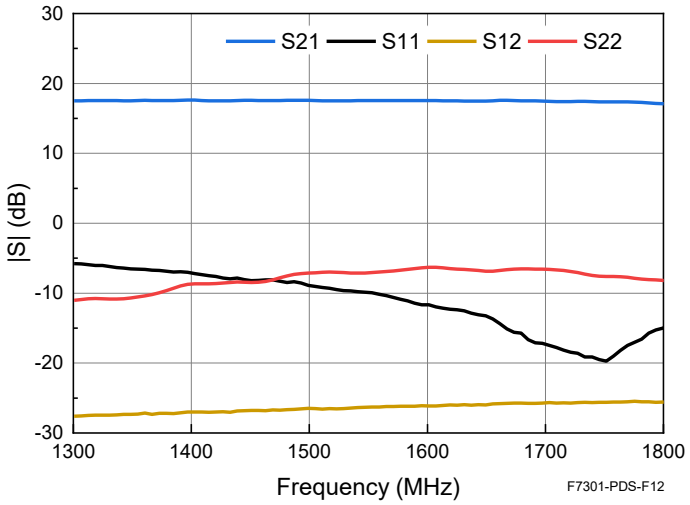


Figure 12. Small Signal S-Parameters vs. Freq.(1300-1800MHz)

8.4.3 Application Circuit (1300-1800MHz)

■ Schematic

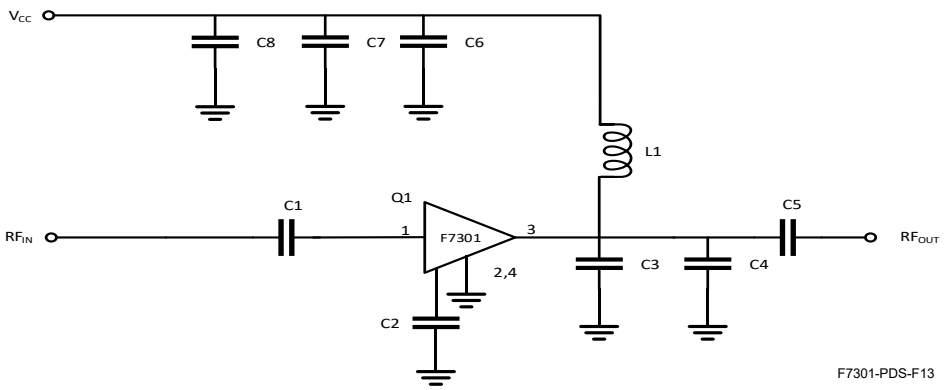


Figure 13. F7301 Circuit Schematic

■ Layout

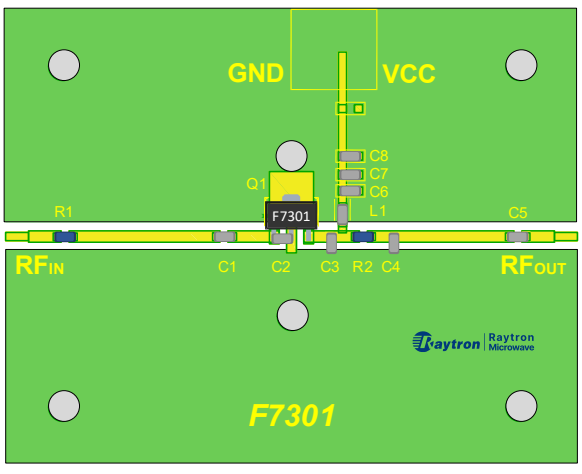


Figure 14. F7301 Evaluation Board

Table 14. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7301 Amplifier, SOT-89 pkg.	Raytron	F7301
R1 R2	0Ω	0603 Resistor	Various	N/A
C1	10.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E100GB12
C2	4.7pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E4R7BB12
C3	4.3pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E4R3BB12
C4	0.8pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER80BB12
C5	51.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E510GB12
C6	24.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E240GB12
C7	0.1uF	0603 Capacitor	Various	N/A
C8	2.2uF	0603 Capacitor	Various	N/A
L1	30nH	High Q 0603 Inductor	Murata	LQW18AN30NG80D

Table 15. TL Distance

TL	Value	Description
TL1	0.5mm	Distance between F7301 Pin 1 to C2 (right edge)
TL2	2.87mm	Distance between F7301 Pin 1 to C1 (right edge)
TL3	1.02mm	Distance between F7301 Pin 3 to C3 (left edge)
TL4	6.78mm	Distance between F7301 Pin 3 to C4 (left edge)
TL5	16.82mm	Distance between F7301 Pin 3 to C5 (left edge)

8.5 Performance(2500-2700MHz)

8.5.1 Electrical Characteristics (2500-2700MHz, T_C=25°C)

Table 16. Electrical Characteristics (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value			Units
Frequency	2500	2600	2700	MHz
Gain	14.4	14.7	14.2	dB
Input Return Loss	9.5	18	13.6	dB
Output Return Loss	13	11.7	14.4	dB
Output P1dB	29.1	29.5	29.4	dBm
Output P_{SAT}	30.3	30.6	30.6	dBm

8.5.2 Performance Plots (2500-2700MHz)

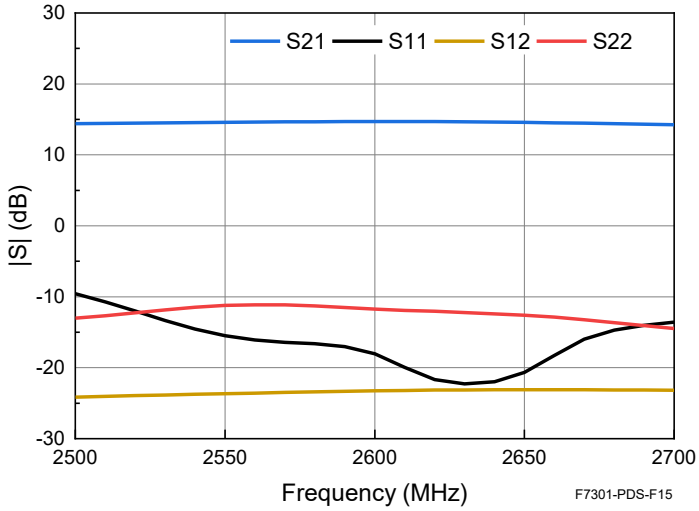


Figure 15. Small Signal S-Parameters vs. Freq.(2500-2700MHz)

8.5.3 Application Circuit (2500-2700MHz)

■ Schematic

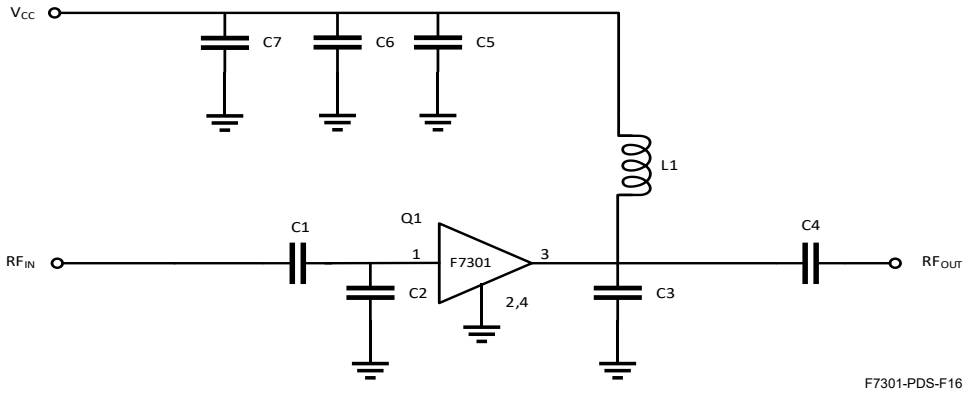


Figure 16. F7301 Circuit Schematic

■ Layout

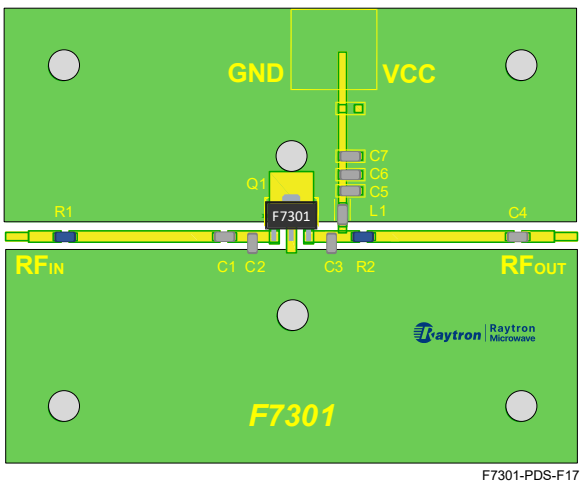


Figure 17. F7301 Evaluation Board

Table 17. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7301 Amplifier, SOT-89 pkg.	Raytron	F7301
R1 R2	0Ω	0603 Resistor	Various	N/A
C1	0.6pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER60BB12
C2	0.7pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER70BB12
C3	2.4pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E2R4BB12
C4	12.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E120GB12
C5	24.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E240GB12
C6	0.1uF	0603 Capacitor	Various	N/A
C7	2.2uF	0603 Capacitor	Various	N/A
L1	18nH	High Q 0603 Inductor	Murata	LQW18AN18NG80D

Table 18. TL Distance

TL	Value	Description
TL1	1.02mm	Distance between F7301 Pin 1 to C2 (right edge)
TL2	2.87mm	Distance between F7301 Pin 1 to C1 (right edge)
TL3	1.02mm	Distance between F7301 Pin 3 to C3 (left edge)
TL4	16.82mm	Distance between F7301 Pin 3 to C4 (left edge)

8.6 Performance(2700-3500MHz)

8.6.1 Electrical Characteristics (2700-3500MHz, T_C=25°C)

Table 19. Electrical Characteristics (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value					Units
Frequency	2700	2900	3100	3300	3500	MHz
Gain	10.2	11.3	11.5	11.1	10.1	dB
Input Return Loss	5	4.1	4.8	4.6	6.2	dB
Output Return Loss	15.8	20.7	31.4	19.9	12.1	dB
Output P1dB	28	29	28.7	28.2	27.6	dBm
Output P_{SAT}	29.4	30.1	29.9	29.5	28.8	dBm

8.6.2 Performance Plots (2700-3500MHz)

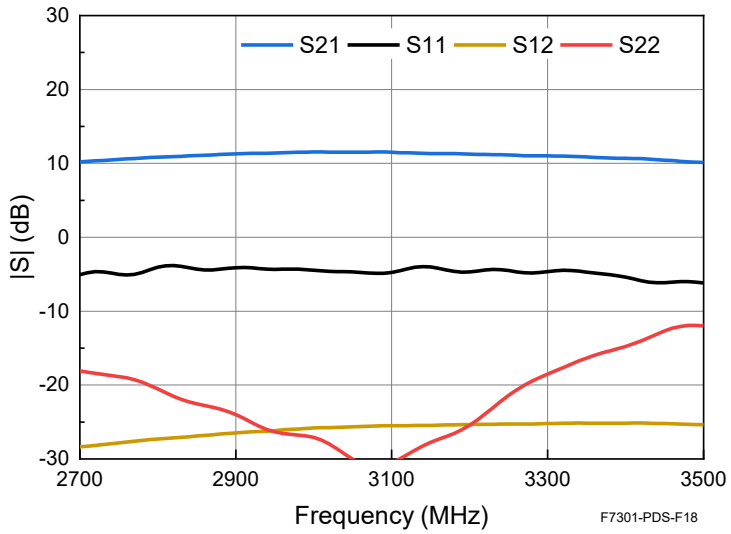


Figure 18. Small Signal S-Parameters vs. Freq.(2700-3500MHz)

8.6.3 Application Circuit (2700-3500MHz)

■ Schematic

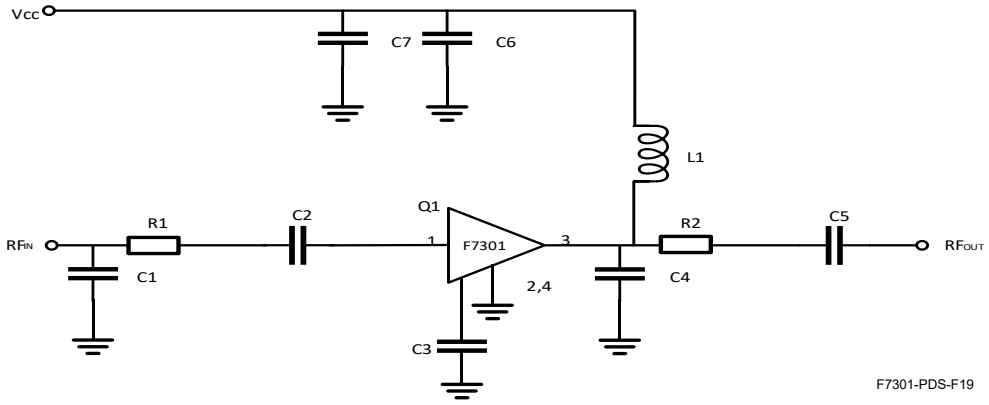


Figure 19. F7301 Circuit Schematic

■ Layout

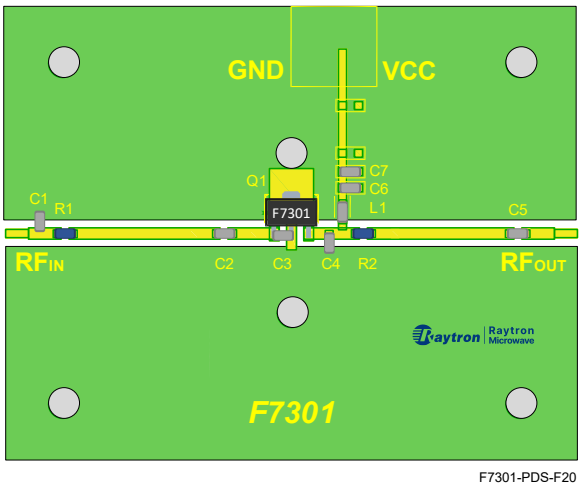


Figure 20. F7301 Evaluation Board

Table 20. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7301 Amplifier, SOT-89 pkg.	Raytron	F7301
R1	5.1Ω	0603 Resistor	Various	Various
R2	0Ω	0603 Resistor	Various	Various
C1	0.5pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER50BB12
C2	0.5pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER50BB12
C3	0.1pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER10BB12
C4	1.2pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E1R2BB12
C5	15.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E150GB12
C6	24.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E240GB12
C7	2.2uF	0603 Capacitor	Various	N/A
L1	30nH	High Q 0603 Inductor	Murata	LQW18AN30NG80D

Table 21. TL Distance

TL	Value	Description
TL1	2.87mm	Distance between F7301 Pin 1 to C2 (right edge)
TL2	0.5mm	Distance between F7301 Pin 1 to C3 (right edge)
TL3	17.66mm	Distance between F7301 Pin 1 to C1 (right edge)
TL4	1.02mm	Distance between F7301 Pin 3 to C4 (left edge)
TL5	16.82mm	Distance between F7301 Pin 3 to C5 (left edge)

8.7 Performance(3700-4100MHz)

8.7.1 Electrical Characteristics (3700-4100MHz, T_C=25°C)

Table 22. Electrical Characteristics (V_{CC}=5V, I_{CQ}=270mA, T_C=25℃, 50Ω system)

Parameter	Typical Value			Units
Frequency	3700	3900	4100	MHz
Gain	11.1	11.3	10.4	dB
Input Return Loss	7.6	10.9	6.3	dB
Output Return Loss	8	8.2	11.2	dB
Output P1dB	28.3	28.8	29.9	dBm
Output P_{SAT}	29.5	30	30.8	dBm

8.7.2 Performance Plots (3700-4100MHz)

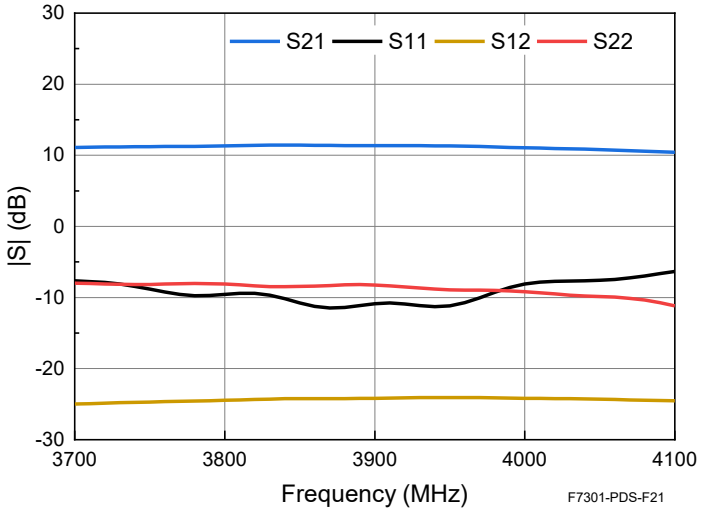


Figure 21. Small Signal S-Parameters vs. Freq.(3700-4100MHz)

8.7.3 Application Circuit (3700-4100MHz)

■ Schematic

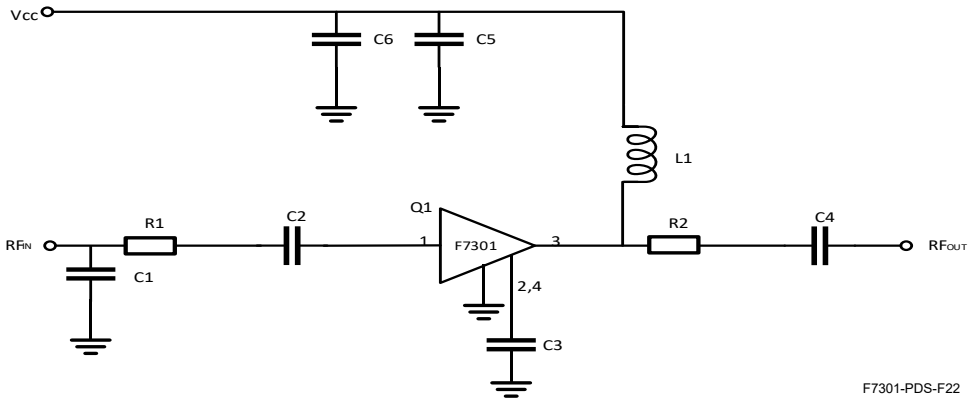


Figure 22. F7301 Circuit Schematic

■ Layout

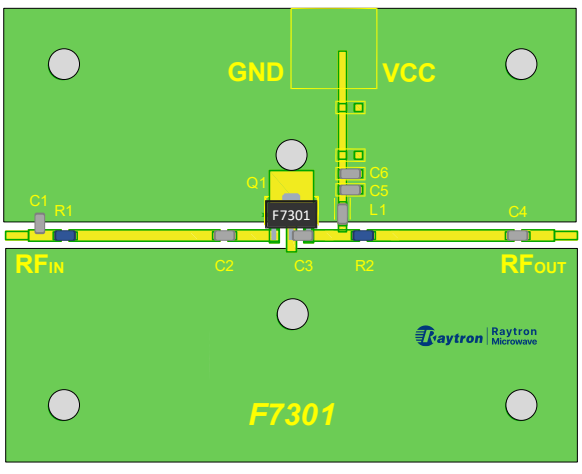


Figure 23. F7301 Evaluation Board

Table 23. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7301 Amplifier, SOT-89 pkg.	Raytron	F7301
R1 R2	0Ω	0603 Resistor	Various	N/A
C1	0.5pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER50BB12
C2	0.3pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER30BB12
C3	0.8pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2ER80BB12
C4	15.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E150GB12
C5	100.0pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E101GB12
C6	2.2uF	0603 Capacitor	Various	N/A
L1	18nH	High Q 0603 Inductor	Murata	LQW18AN18NG80D

Table 24. TL Distance

TL	Value	Description
TL1	2.87mm	Distance between F7301 Pin 1 to C2 (right edge)
TL2	17.66mm	Distance between F7301 Pin 1 to C1 (right edge)
TL3	0.5mm	Distance between F7301 Pin 3 to C3 (left edge)
TL4	16.82mm	Distance between F7301 Pin 3 to C4 (left edge)

9. Package Outline

■ Pin Layout

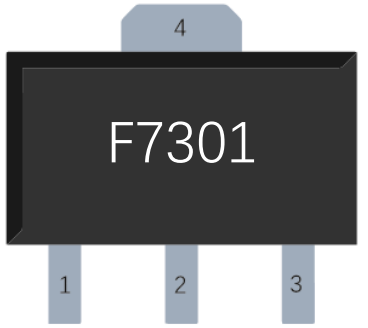


Figure 24. F7301 Pin Layout

Table 25. Pin Description

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

■ Mechanical Drawing

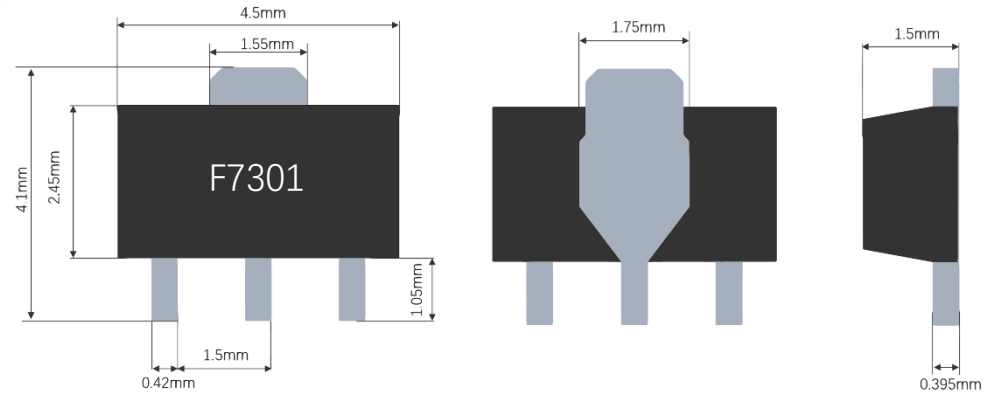


Figure 25. F7301 Mechanical Drawing

10. Handling Precautions

■ ESD Caution

Table 26. ESD/MSL Rating

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 2	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.



11. 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

12. Disclaimer

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