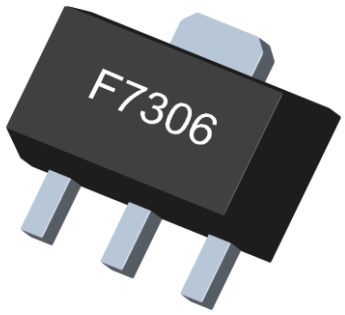
1. Description

- The F7306 is a high-performance wideband low phase noise amplifier for wireless application. The active bias circuity provides stable current over temperature and process variations.
- The F7306 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.



F7306-PDS-F01

Figure 1. F7306 Package Outline

2. Applications

- Data Link Communication
- Radar
- Small Cell
- Private Communication Network
- Anti-drone Defense System
- Avionics and Test Instrumentation

3. Features[1]

- Operating Frequency: 0.03-12GHz
- Output Power (P1dB): 19.4dBm
- Gain, Small Signal: 19.0dB
- Operating Voltage: 5V
- Package: SOT-89

1. Measured in Raytron DEMO @1900MHz

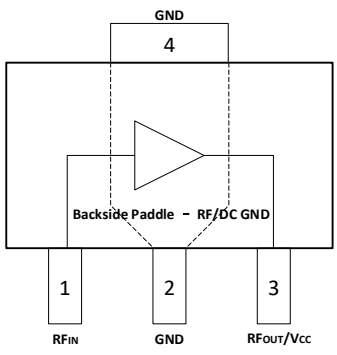
4. Brief Typical Performance

Table 1. Brief Typical Performance (0.5-12GHz, V_{CC}=5V, L1=7.5nH, I_{CQ}=80mA)

Parameter	Typical Value										Units
Frequency	0.5	0.9	1.9	2.6	3.5	4.9	5.8	8	10	12	GHz
Gain, Small Signal	18.3	18.9	19.0	19.1	18.9	18.3	18.1	17.9	16.6	12.7	dB
Output P1dB	16.9	18.8	19.4	19.4	19.6	20.1	19.1	17.3	12.8	9.5	dBm
Output P_{SAT}	19.5	20.3	20.6	20.9	21.2	21.1	20.6	18.7	17.4	14.5	dBm
Output IP3[1]	28.3	35.4	38	36.2	35.5	34.2	28.5	23.8	19.3	17	dBm

1. Input signal: 2-tone, P_{OUT}=0dBm/tone, Δf=1MHz

5. Block Diagram



F7306-PDS-F02

Figure 2. F7306 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}	24	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	-	5.0	5.5	V
Operating Frequency	30	-	12000	MHz

8. Electrical Characteristics (T_C = 25˚C)

Table 4. Electrical Characteristics (V_{CC}=5V, L1=4.7uH, I_{CQ}=70mA, T_C=25℃, 50Ω test system)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency	-	30	-	1000	MHz
Small Signal Gain	30MHz	-	22.7	-	dB
	100MHz	-	21	-	dB
	300MHz	-	20.5	-	dB
	500MHz	-	20.2	-	dB
	800MHz	-	19.9	-	dB
	1000MHz	-	19.7	-	dB
Input Return Loss	500MHz	-	16.4	-	dB
Output Return Loss	500MHz	-	14.5	-	dB
Output P1dB	30MHz	-	17.4	-	dBm
	100MHz	-	17.9	-	dBm
	300MHz	-	18.8	-	dBm
	500MHz	-	18.8	-	dBm
	800MHz	-	18.4	-	dBm
	1000MHz	-	18.2	-	dBm
Output IP3 P_{OUT}=0dBm/tone, Δf=1MHz	30MHz	-	30.8	-	dBm
	100MHz	-	30.5	-	dBm
	300MHz	-	32.5	-	dBm
	500MHz	-	32.2	-	dBm
	800MHz	-	30.5	-	dBm
	1000MHz	-	30.4	-	dBm
Device Operating Current	-	-	70	-	mA

Table 5. Electrical Characteristics (V_{CC}=5V, L1=7.5nH, I_{CQ}=80mA, T_C=25℃, 50Ω system)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency	-	500	-	12000	MHz
Small Signal Gain	500MHz	-	18.3	-	dB
	900MHz	-	18.9	-	dB
	1900MHz	-	19.0	-	dB
	2600MHz	-	19.1	-	dB
	3500MHz	-	18.9	-	dB
	4900MHz	-	18.3	-	dB
	5800MHz	-	18.1	-	dB
	8000MHz	-	17.9	-	dB
	10000MHz	-	16.6	-	dB
	12000MHz	-	12.7	-	dB
Input Return Loss	2600MHz	-	23	-	dB
Output Return Loss	2600MHz	-	14	-	dB
Output P1dB	500MHz		16.9		dBm
	900MHz	-	18.8	-	dBm
	1900MHz	-	19.4	-	dBm
	2600MHz	-	19.4	-	dBm
	3500MHz	-	19.6	-	dBm
	4900MHz	-	20.1	-	dBm
	5800MHz	-	19.1	-	dBm
	8000MHz	-	17.3	-	dBm
	10000MHz	-	12.8	-	dBm
	12000MHz	-	9.5	-	dBm
Output IP3 P_{OUT}=0dBm/tone, Δf=1MHz	500MHz	-	28.3	-	dBm
	900MHz	-	35.4	-	dBm
	1900MHz	-	38.0	-	dBm
	2600MHz	-	36.2	-	dBm
	3500MHz	-	35.5	-	dBm
	4900MHz	-	34.2	-	dBm
	5800MHz	-	28.5	-	dBm
	8000MHz	-	23.8	-	dBm
	10000MHz	-	19.3	-	dBm
	12000MHz	-	17.0	-	dBm
ACPR @ +5dBm P_{OUT}	20MHz LTE E-TM1.1,8.5dB PAPR 2600MHz	-	-	-	dBc
	100MHz 5G NR, 10.5dB PAPR 2600MHz	-	-	-	dBc
Operating Current	-	-	80	-	mA

9. Phase Noise

Table 6. Phase Noise

Offset Frequency (Hz)			1K	10K	100K	1M
Phase Noise(dBc/Hz)[1]	RFfreq=100MHz	Source	-165	-180	-184	-184
		F7306	-162	-167	-167	-168
	RFfreq=500MHz	Source	-151	-165	-170	-170
		F7306	-150	-163	-166	-166
	RFfreq=2000MHz	Source	-139	-149	-156	-161
		F7306	-138	-148	-154	-163

[1] Test Condition: P_{OUT}=17dBm, L1=330nH

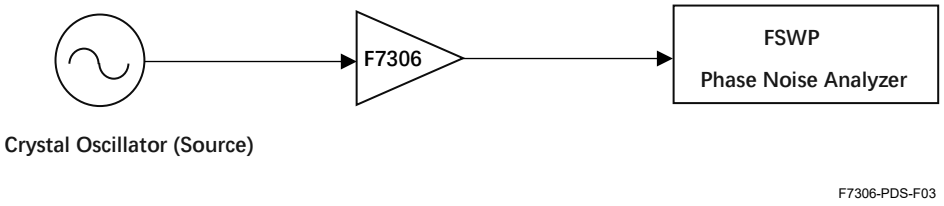


Figure 3. Phase Noise Testing Method

10. Typical Performance

■ Typical Performance (0.03-1GHz, V_{CC}=5V, L1=4.7uH, I_{CQ}=70mA)

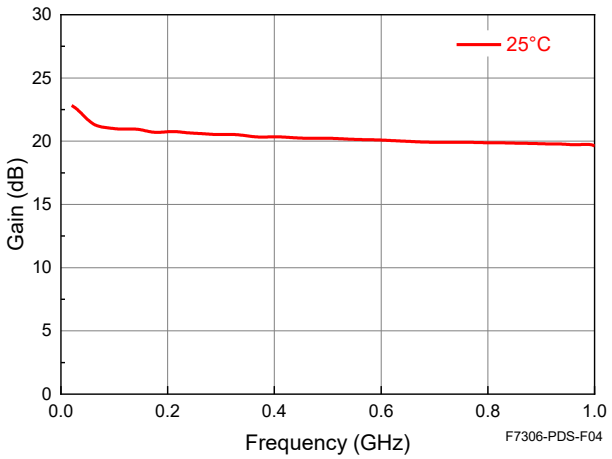


Figure 4. Gain vs. Freq.(0.03-1GHz)

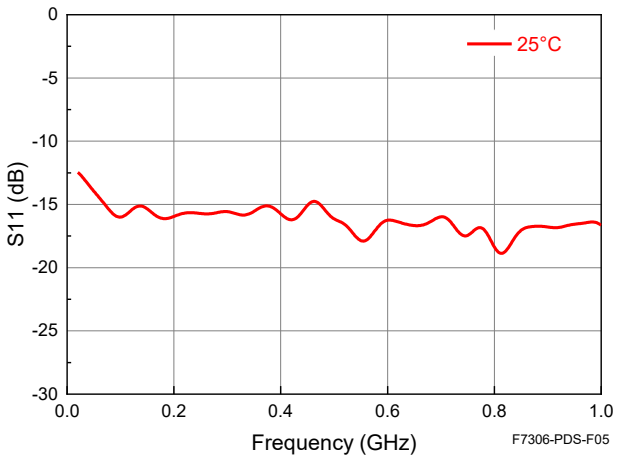


Figure 5. S11 vs. Freq.(0.03-1GHz)

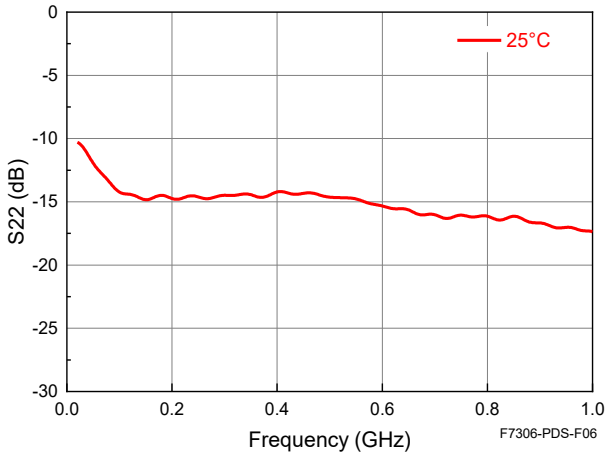


Figure 6. S22 vs. Freq.(0.03-1GHz)

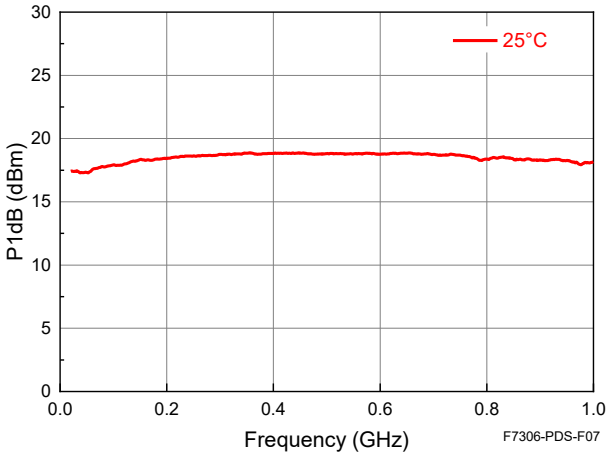


Figure 7. P1dB vs. Freq.(0.03-1GHz)

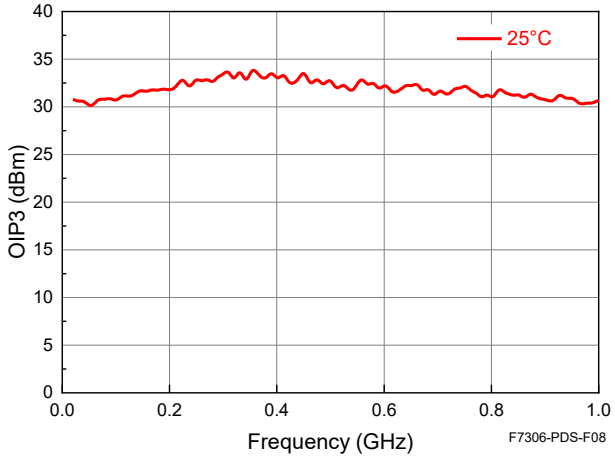


Figure 8. OIP3 vs. Freq.(0.03-1GHz)

Table 7. Brief Typical Performance (30-1000MHz, V_{CC}=5V, L1=4.7uH, I_{CQ}=70mA)

Parameter	Typical Vaule						Units
Frequency	30	100	300	500	800	1000	MHz
Small Signal Gain	22.7	21	20.5	20.2	19.9	19.7	dB
Input Return Loss	12.4	15.9	15.8	16.4	17.2	16.2	dB
Output Return Loss	10.6	14.8	14.4	14.5	15.8	17.2	dB
Output P1dB	17.4	17.9	18.8	18.8	18.4	18.2	dBm
Output IP3[1]	30.8	30.5	32.5	32.2	30.5	30.4	dBm

■ Typical Performance (0.5-12GHz, V_{CC}=5V, L1=7.5nH, I_{CQ}=80mA)

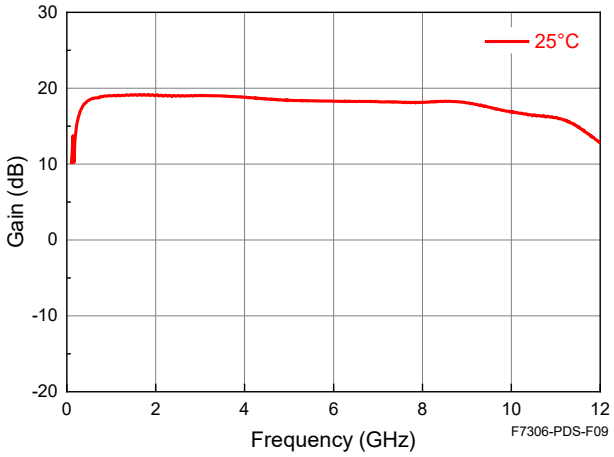


Figure 9. Gain vs. Freq.(0.5-12GHz)

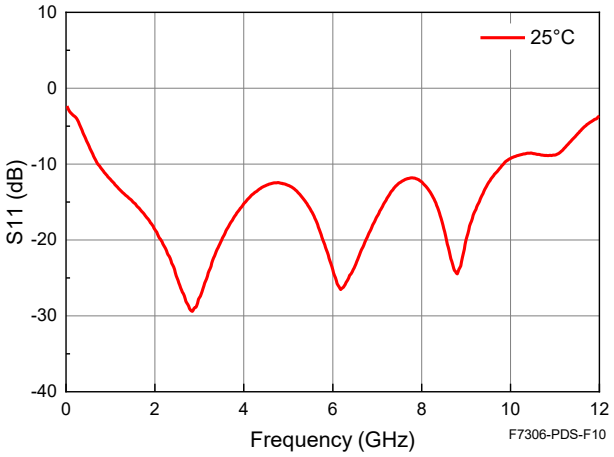


Figure 10. S11 vs. Freq.(0.5-12GHz)

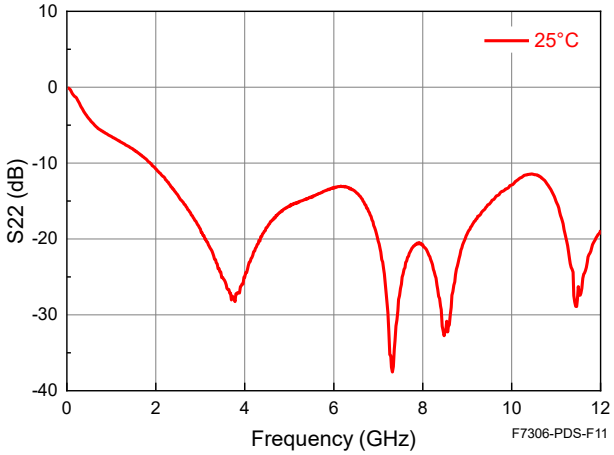


Figure 11. S22 vs. Freq.(0.5-12GHz)

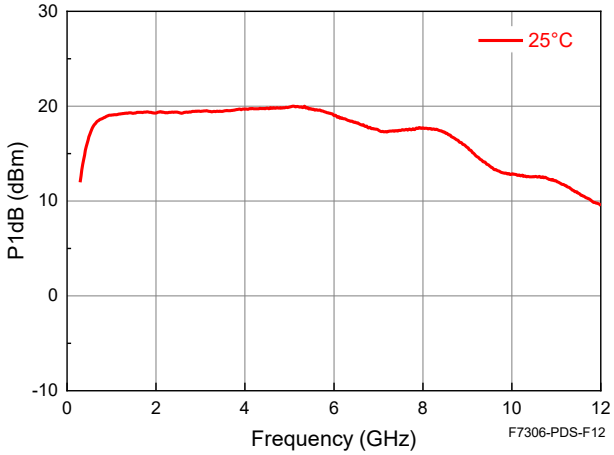


Figure 12. P1dB vs. Freq.(0.5-12GHz)

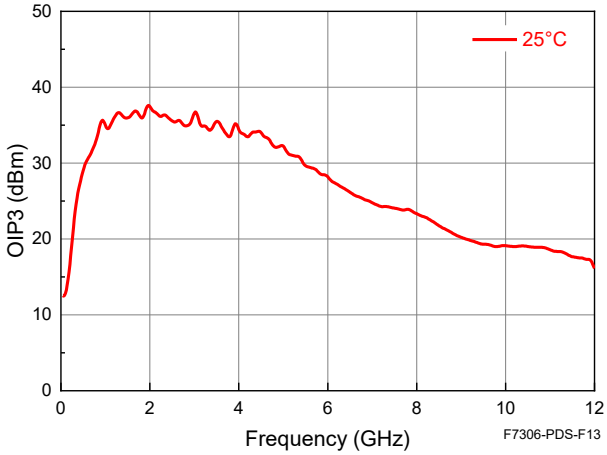


Figure 13. OIP3 vs. Freq. (0.5-12GHz)

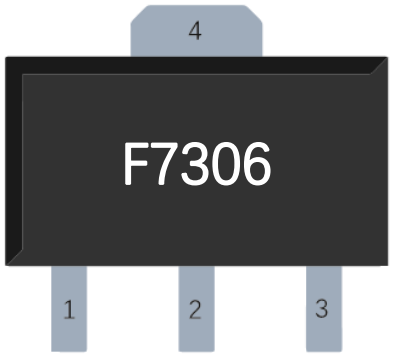
Table 8. Brief Typical Performance (0.5-12GHz, V_{CC}=5V, L1=7.5nH, I_{CQ}=80mA)

Parameter	Typical Value										Units
Frequency	0.5	0.9	1.9	2.6	3.5	4.9	5.8	8	10	12	GHz
Gain, Small Signal	18.3	18.9	19.0	19.1	18.9	18.3	18.1	17.9	16.6	12.7	dB
Input Return Loss	7.4	11.0	21.4	26.6	22.5	11.3	25.6	12.5	9.4	4.5	dB
Output Return Loss	4.0	6.3	11.0	14.2	20.8	13.3	12.8	20.3	13.3	18.8	dB
Output P1dB	16.9	18.8	19.4	19.4	19.6	20.1	19.1	17.3	12.8	9.5	dBm
Output P_{SAT}	19.5	20.3	20.6	20.9	21.2	21.1	20.6	18.7	17.4	14.5	dBm
Output IP3[1]	28.3	35.4	38.0	36.2	35.5	34.2	28.5	23.8	19.3	17.0	dBm

[1] Input signal: 2-tone, P_{OUT}=0dBm/tone, Δf=1MHz

11. Package Outline

■ Pin Layout



F7306-PDS-F14

Figure 14. F7306 Pin Layout

Table 9. 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

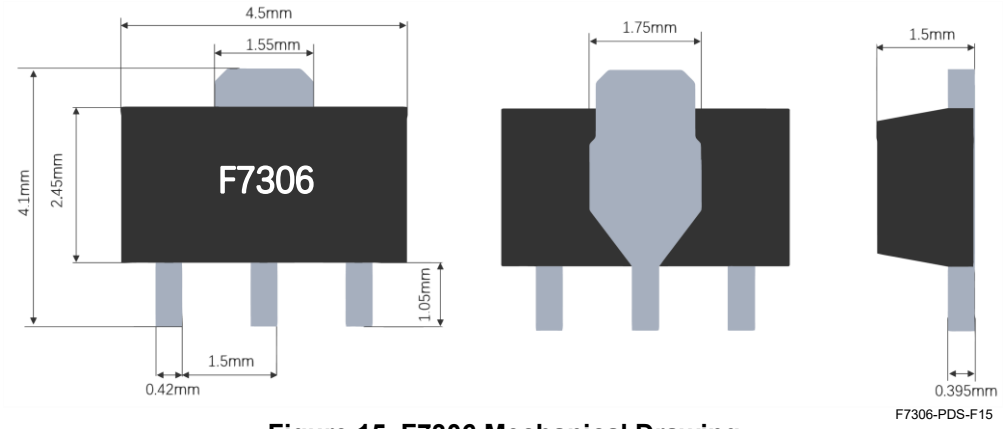


Figure 15. F7306 Mechanical Drawing

12. Application Circuit

■ Schematic

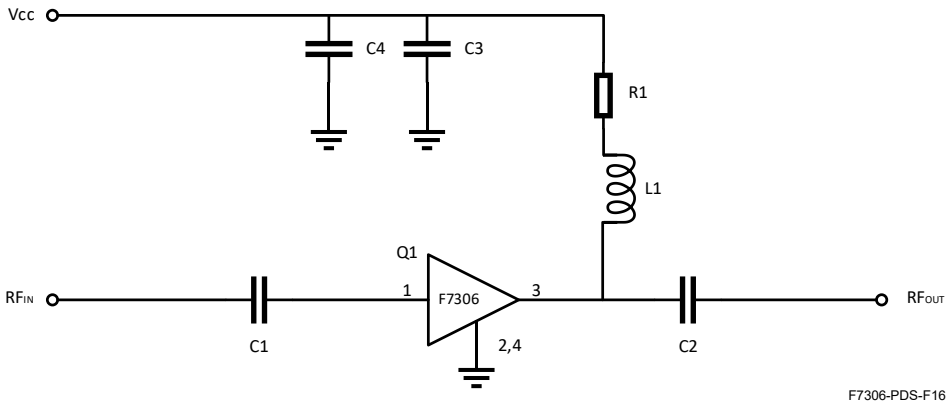


Figure 16. F7306 Application Circuit Schematic

■ Layout

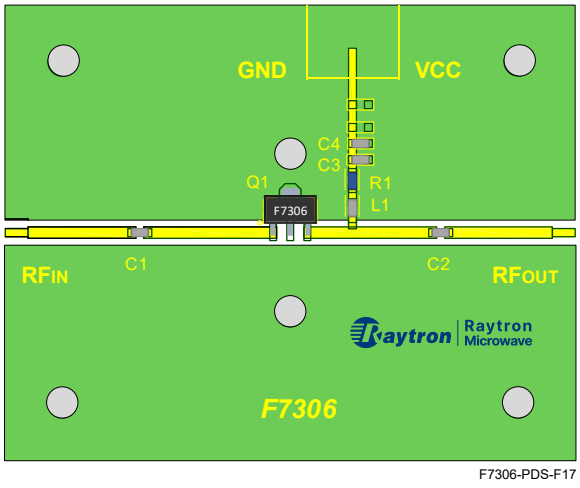


Figure 17. F7306 Application Circuit Layout

Table 10. Bill of Materials (30-1000MHz)

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7306 Amplifier, SOT-89 pkg.	Raytron	F7306
C1,C2	2.2uF	0603 Capacitor	Murata	GRM188Z71E225KE43D
C3	1nF	0603 Capacitor	Murata	GRM1885C1H102JA01D
C4	1uF	0603 Capacitor	Various	N/A
L1	4.7uH	1008 Inductance	Murata	LQW2UAS4R7J00L
R1	0Ω	1/4W 0603 Resistor	Various	N/A

Table 11. Bill of Materials (0.5-12GHz)

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
Q1	N/A	F7306 Amplifier, SOT-89 pkg.	Raytron	F7306
C1,C2,C3	1nF	0603 Capacitor	Murata	GRM1885C1H102JA01D
C4	1uF	0603 Capacitor	Various	N/A
L1	7.5nH	High Q 0603 Inductance	Murata	LQW18AN7N5C80D
R1	0Ω	1/4W 0603 Resistor	Various	N/A

13. 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	IPCJEDEC 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.



14. 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

15. Disclaimer

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