1. Description

- The M3505Q is a low noise amplifier fabricated on GaAs p-HEMT MMIC process in a 3.0mm x 3.0mm QFN package. It operates over 7-13GHz and provides 27dB gain with 2.5dB positive slope and achieves 0.8dB noise figure when 5V power supplied. It can be biased from a single positive power supply of 5V or 3.3V.



M3505Q-PDS-F01

Figure 1. M3505Q Functional Block Diagram

2. Applications

- Precision Guidance
- RX Modules

3. Features

- Frequency: 7-13GHz
- Typical Gain: 27dB @5V; 24dB @3.3V
- Noise Figure: 0.8dB @5V; 1.0dB @3.3V
- Input/Output Return Loss: -10dB/-15dB
- Output P_{-1dB}: 10dBm @5V; 4dBm @3.3V
- IMD3 @P_{IN}=-25dBm: -35dBc
- Single Positive Supply: +5V /+3.3V
- 50Ohm Matched Input/Output
- Package Size: 3.00 x 3.00 x 0.75mm

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	7-13GHz	Units
Small-Signal Gain @5V	27	dB
Small-Signal Gain @3.3V	25	dB
Noise Figure @5V	0.8	dB
Noise Figure @3.3V	1.0	dB
Input Return Loss	-10	dB
Output Return Loss	-15	dB
Output P_{-1dB} @5V	11	dBm
Output P_{-1dB} @3.3V	5	dBm
IMD3 @P_{IN}=-25dBm	-35	dBc

Table of Contents

No.	Contents	Page
1	Description	1
2	Applications	1
3	Features	1
4	Brief Typical Performance	1
5	Absolute Maximum Ratings	3
6	Recommended Operating Conditions	3
7	RF Characteristics	3
8	Typical Performance Curve	4
9	Package Outline	6
10	Application Circuit	7
11	Recommended Solder Temperature Profile	8
12	Handling Precautions	8
13	Contact Information	8
14	Disclaimer	9

5. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Operating Voltage Range	V_D	0 ~ +7	V
Maximum Input Power	P_{IN}	22	dBm
Storage Temperature Range	T_{STG}	- 55 ~ 150	°C

6. Recommended Operating Conditions

Table 3. Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
Operating Temperature Range	-55	25	125	°C
Quiescent Current, I_{DQ} @5V	-	24	-	mA
Quiescent Current, I_{DQ} @3.3V	-	12	-	mA

7. RF Characteristics (V_D=5V/3.3V, T_C = 25˚C)

Table 4. RF Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Frequency	Freq.	7	-	13	GHz
Small-Signal Gain @5V	Gain	26.2	27	29	dB
Small-Signal Gain @3.3V	Gain	24.2	25	26.2	dB
Noise Figure @5V	NF	-	0.8	-	dB
Noise Figure @3.3V	NF	-	1.0	-	dB
Input Return Loss	IN RL	-15	-10	-	dB
Output Return Loss	OUT RL	-	-15	-12	dB
Output Power for 1dB Compression @5V	OP1dB	10	11	-	dBm
Output Power for 1dB Compression @3.3V	OP1dB	4	5	-	dBm
Third-order Intermodulation @P_{IN}=-25dBm	IMD3	-	-35	-	dBc

• Typical performance at these conditions: Temp=25°C, V_D=5V, P_{IN}=-25dBm, 50Ohm system.

8. Typical Performance Curve

■ Characteristics Curve @5V

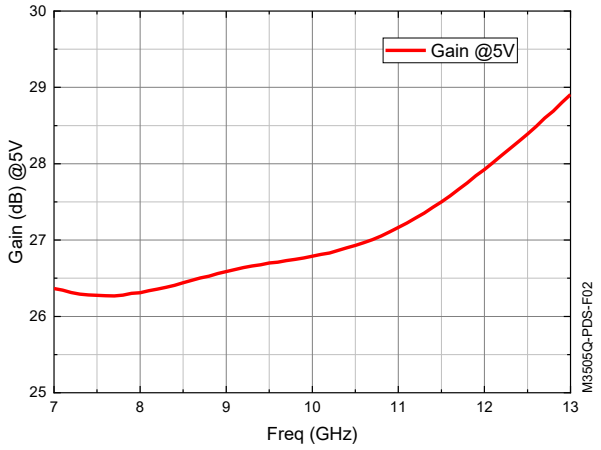


Figure 2. Small-signal Gain Characteristics (De-Embedding)

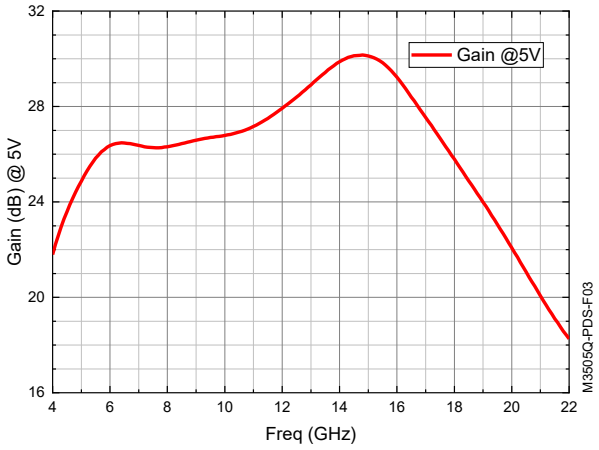


Figure 3. Small-signal Gain Characteristics (De-Embedding)

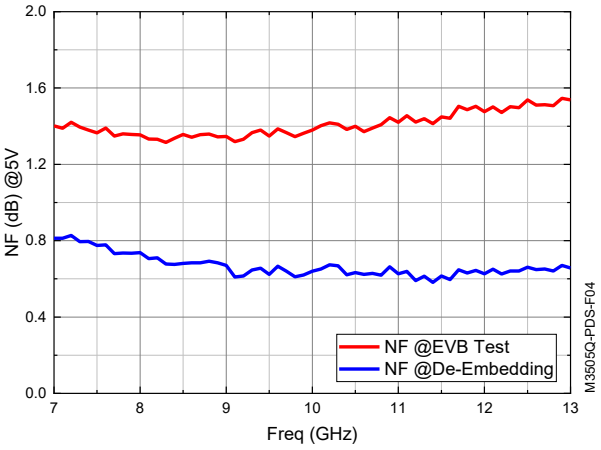


Figure 4. Noise Figure Characteristics

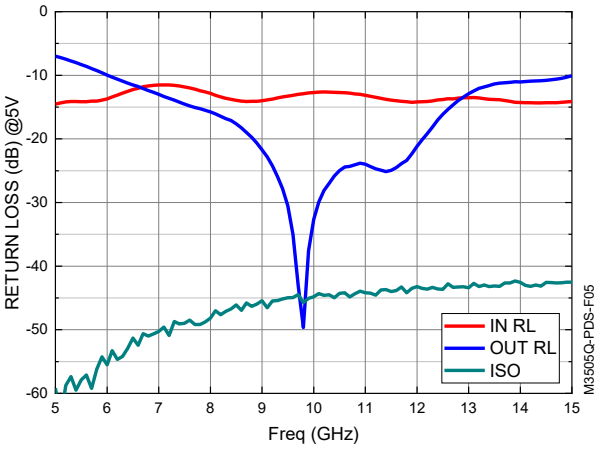


Figure 5. Input\Output Return Loss Characteristics (De-Embedding)

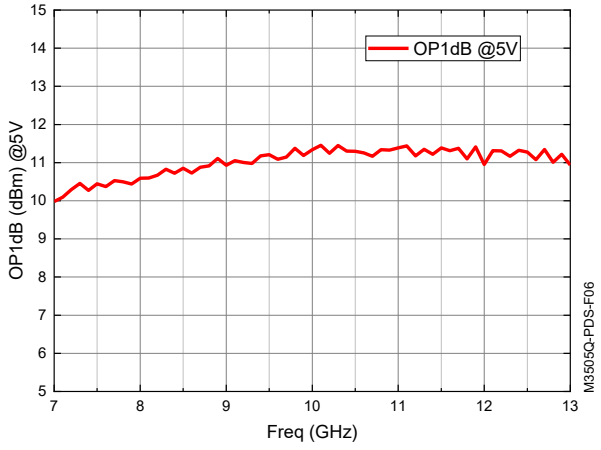


Figure 6. OP-1dB Characteristics (De-Embedding)

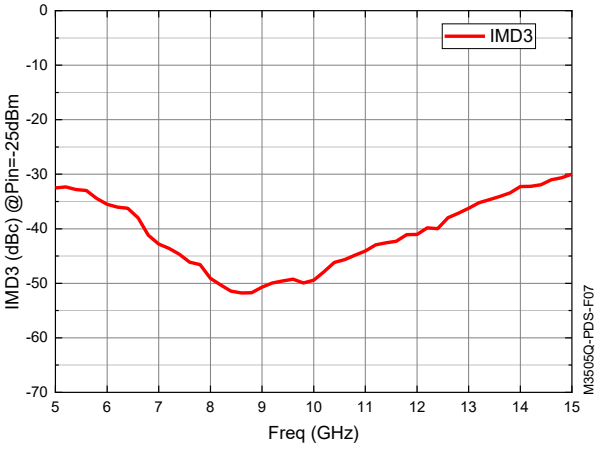


Figure 7. IMD3 Characteristics (De-Embedding)

■ Characteristics Curve @3.3V

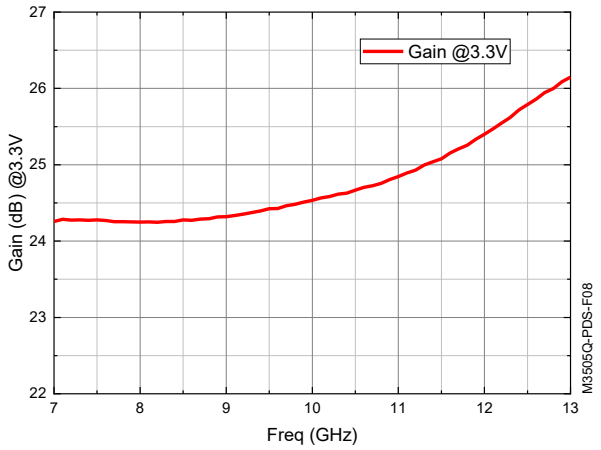


Figure 8. Small-signal Gain Characteristics (De-Embedding)

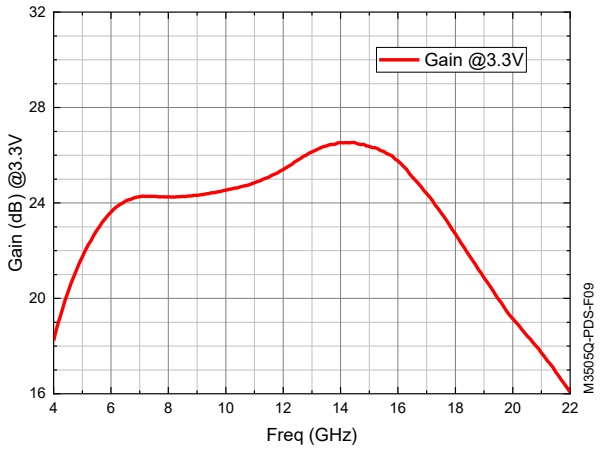


Figure 9. Small-signal Gain Characteristics (De-Embedding)

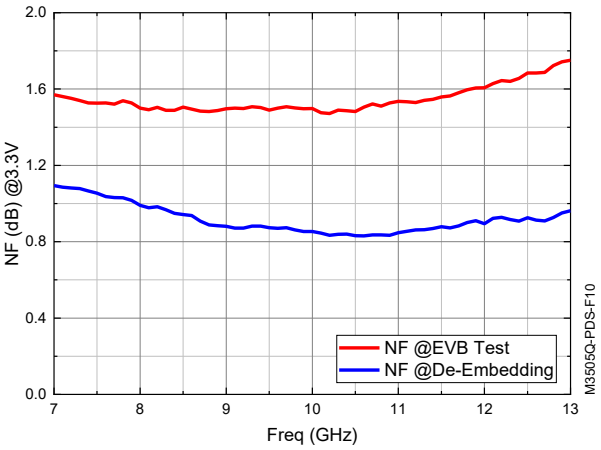


Figure 10. Noise Figure Characteristics

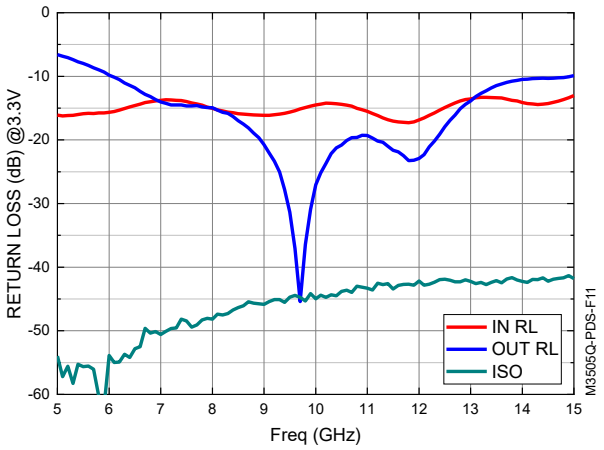


Figure 11. Input\Output Return Loss Characteristics (De-Embedding)

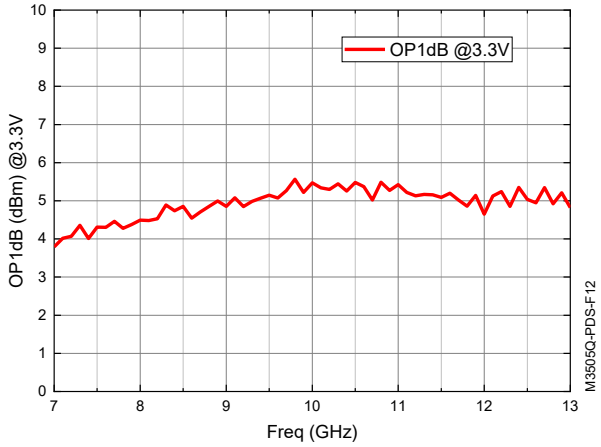


Figure 12. OP-1dB Characteristics (De-Embedding)

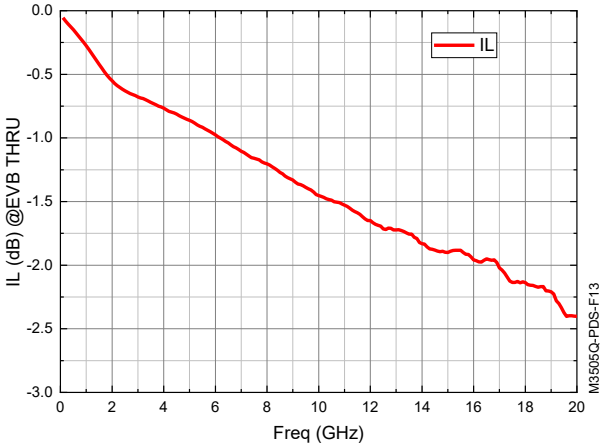
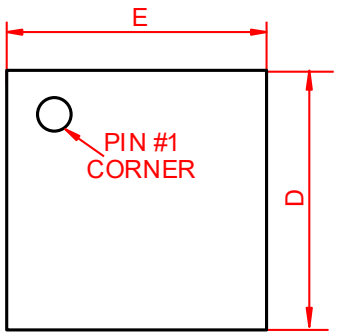
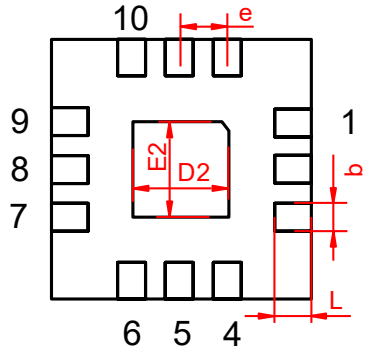


Figure 13. Thru Insertion Loss Characteristics of EVB

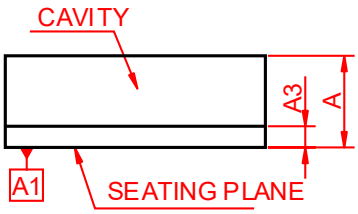
9. Package Outline



Top View



Bottom View



Side View

symbol	Dimension in mm			Dimension in inch		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.32
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	---	0.203	---	---	0.008	---
D	2.95	3.00	3.05	0.116	0.118	0.120
E	2.95	3.00	3.05	0.116	0.118	0.120
D2	1.60	1.65	1.70	0.063	0.065	0.067
E2	1.60	1.65	1.70	0.063	0.065	0.067
b	0.20	0.25	0.30	0.009	0.010	0.011
L	0.35	0.40	0.45	0.014	0.016	0.018
e	---	0.50	---	---	0.02	---

- Dimensions shown in millimetre

M3505Q-PDS-F14

Figure 14. M3505Q Outline Dimensions

Table 5. PIN Description

Pin Number	Symbol	Description
2	RF_{IN}	RF Input. 50Ω. DC blocking capacitor is not required.
8	RF_{OUT}	RF Output. 50Ω. DC blocking capacitor is not required.
11	V_D	Supply Voltage. External bypass capacitors are required, refer to Figure 9.
1, 3, 7, 9	GND	Package bottom must be connected to RF/DC ground
4, 5, 6,10, 12	N/C	This pin is not connected and will not affect any performance

10. Application Circuit

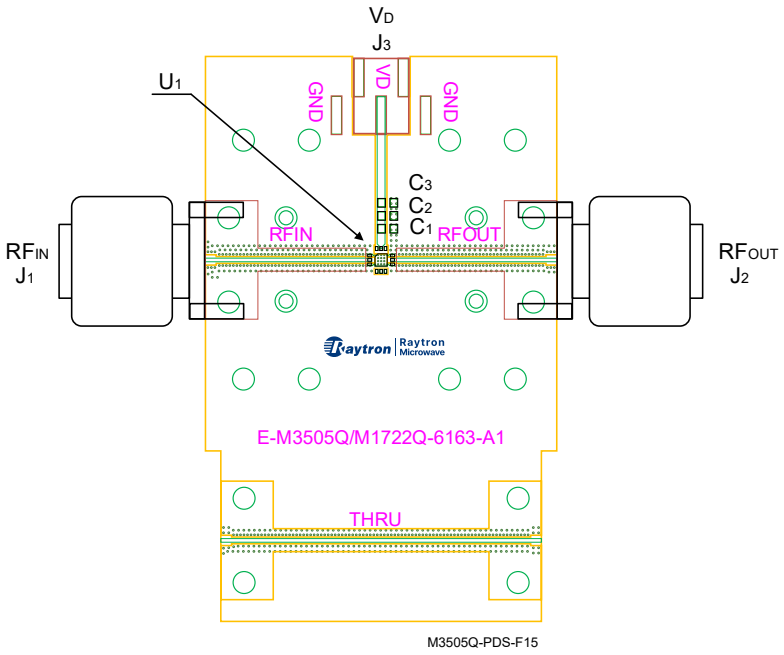


Figure 15. M3505Q Evaluation PCB

Table 6. List of Materials for Evaluation PCB

Item	Symbol	Description
J_1-J_2	RF_{IN}, RF_{OUT}	PCB Mount SMA Connector.
J_3	V_D	Supply Voltage. External bypass capacitors are required.
C_1	-	10nF Capacitor, 0603 Pkg.
C_2	-	4.7uF Capacitor, 0603 Pkg.
C_3	-	10uF Capacitor, 0603 Pkg.
U_1	M3505Q	Low Noise Amplifier in 3.0mm x 3.0mm QFN Package

11. Recommended Solder Temperature Profile

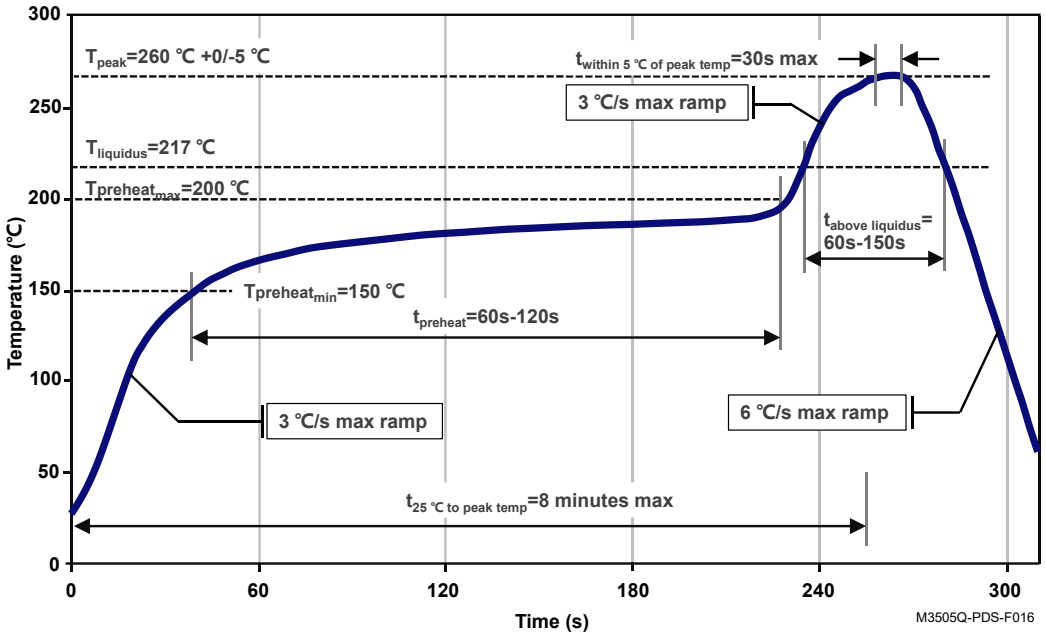


Figure 16. Recommended Solder Temperature Profile

12. Handling Precautions

- **ESD Caution**

  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

The information provided here is believed to be reliable at the time of publication. Raytron reserves the right to make changes to its products, specifications and product descriptions at any time without notice. Raytron assumes no responsibility for the use of this information and all such information should entirely be at the user's own risk. Raytron makes no warranty about the suitability of its products for specific purpose or application and disclaims all liability, including without limitation consequential and incidental damages. Raytron does not authorize or warrant any Raytron products for use in the life support devices or systems.

Raytron Microwave
Copyright @ Raytron Technology Co.,Ltd.