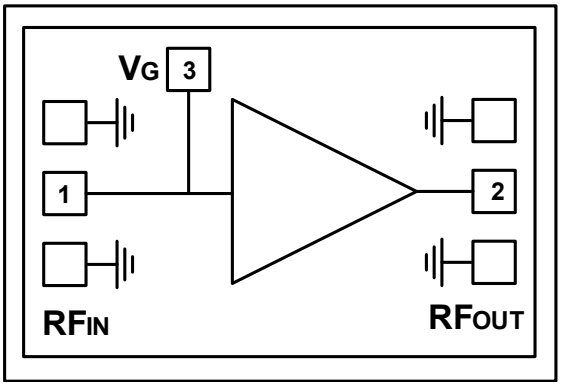
1. Description

- The M3515A is a small-size wideband gain block using GaAs MMIC technology offering high OIP3 and lower noise over a broad frequency and provides good input and output return loss without the need for external matching components. The M3515A has two working modes: high power consumption and low power consumption through the VG pad. External DC blocking capacitors and DC feeding inductors are required.



M3515A-PDS-F01

Figure 1. M3515A Functional Block Diagram

2. Applications

- Base station infrastructure
- Portable Wireless

3. Features[1]

- Frequency Range: 0.05-6GHz
- Typical Gain: 18dB
- Noise Figure: 1.2dB
- Output P1dB: 19.5dBm @64mA
- OIP3: 32dBm @ P_{IN}=-20dBm I_{DQ}=64mA
- OIP3: 29dBm @ P_{IN}=-20dBm I_{DQ}=40mA
- Power Supply: +5V 64mA @ VG pad not connected; +5V 40mA @ VG grounded
- 50Ohm Matched Input/Output
- Die Size: 1.0 x 0.8 x 0.1mm

[1] EVB Test

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	VG not connected	VG grounded	Units
Freq	0.05-6	0.05-6	GHz
Gain	18	17.5	dB
Noise Figure	1.2	1.2	dB
Input Return Loss	-15	-12	dB
Output Return Loss	-12	-10	dB
Output P1dB	19.5	19	dBm
Saturated output power	20	20	dBm
Output IP3 at P_{IN}=-20dBm	32	29	dBm
Supply Current	64	40	mA

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	Outline Dimensions	9
10	Assembly Information	10
11	Handling Precautions	11
12	Contact Information	11
13	Disclaimer	11

5. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Operating Voltage Range	V_D	0 ~ +8	V
Maximum Input Power	P_{IN}	20	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
Supply Voltage, V_D	4.5	5	5.5	V
Quiescent Current, I_{DQ1} @ VG NC	62	64	66	mA
Quiescent Current, I_{DQ2} @ VG GND	39	40	42	mA

- Not connected: NC; grounded: GND

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

Table 4. RF Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Frequency	Freq.	0.05	-	6	GHz
Small-Signal Gain @ VG NC	$Gain_1$	17	18	18.5	dB
Small-Signal Gain @ VG GND	$Gain_2$	16	17.5	18	dB
Noise Figure	NF	-	1.2	1.35	dB
Input Return Loss	IN RL	-25	-18	-10	dB
Output Return Loss	OUT RL	-25	-15	-10	dB
Reverse Isolation	ISO	-	22	-	dB
Output Power for 1dB Compression	OP1dB	18	19.5	19.8	dBm
Saturated Output Power	PSAT	19.5	20	20.2	dBm
Output IP3 @ P_{IN}=-20dBm I_{DQ}=64mA	OIP3	30	32	34	dBm
Output IP3 @ P_{IN}=-20dBm I_{DQ}=40mA	OIP3	28	29	32	dBm
Supply Current @ VG NC	I_{D1}	62	64	66	mA
Supply Current @ VG GND	I_{D2}	39	40	42	mA

- Not connected: NC; grounded: GND
- Typical performance at these conditions: Temp=25°C, V_D=5V, 50Ω system.
- The operating frequency is affected by the values of the DC blocking capacitors and DC feeding inductors.

8. Typical Performance Curve

■ Characteristics Curve @ VG NC, High Frequency Bias

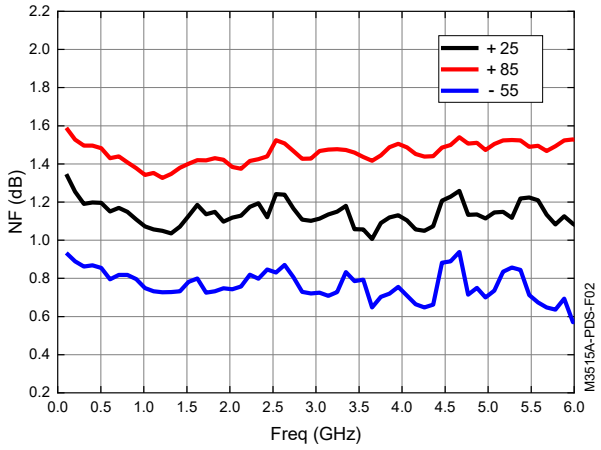


Figure 2. Noise Figure Characteristics

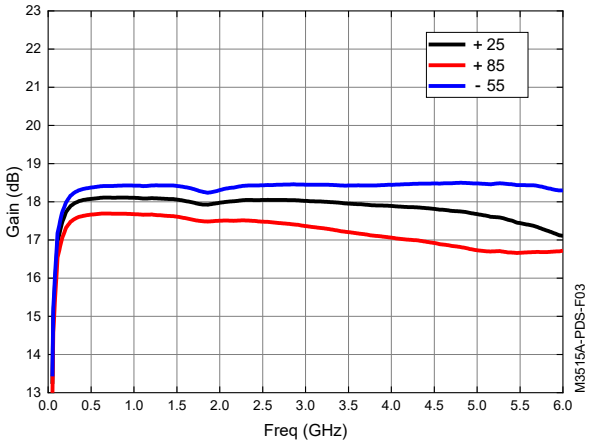


Figure 3. Small-signal Gain Characteristics

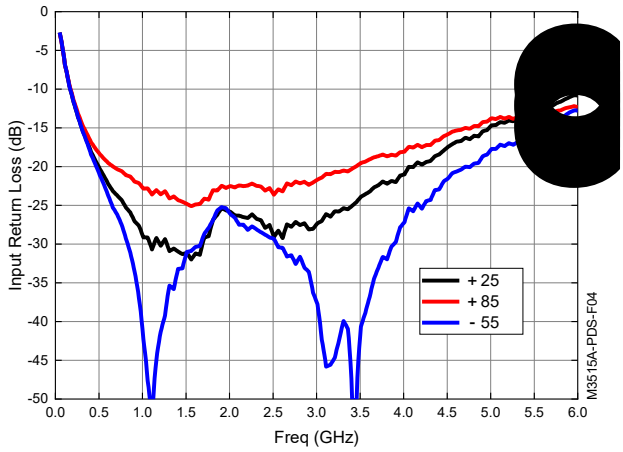


Figure 4. Input Return Loss Characteristics

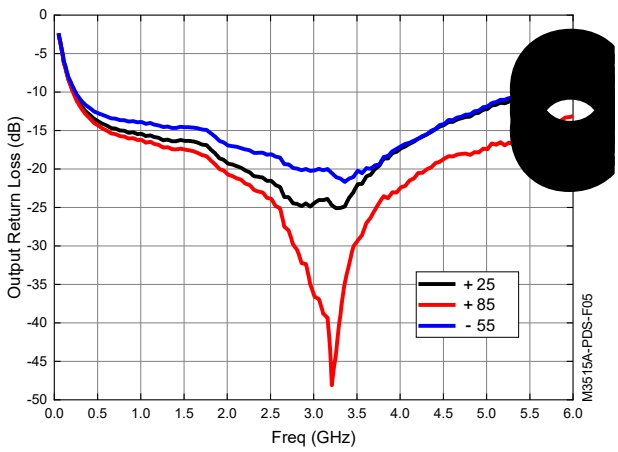


Figure 5. Output Return Loss Characteristics

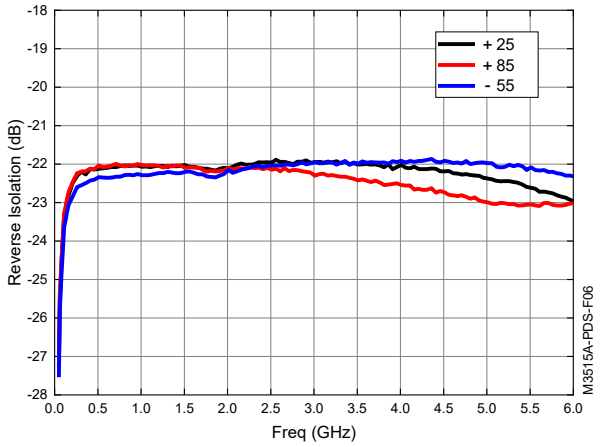


Figure 6. Reverse Isolation Characteristics

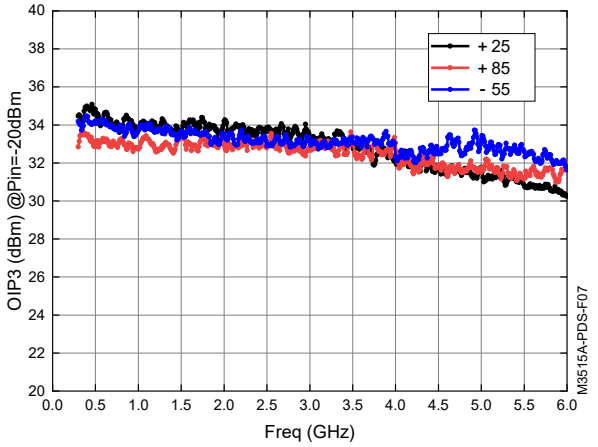


Figure 7. OIP3 Characteristics

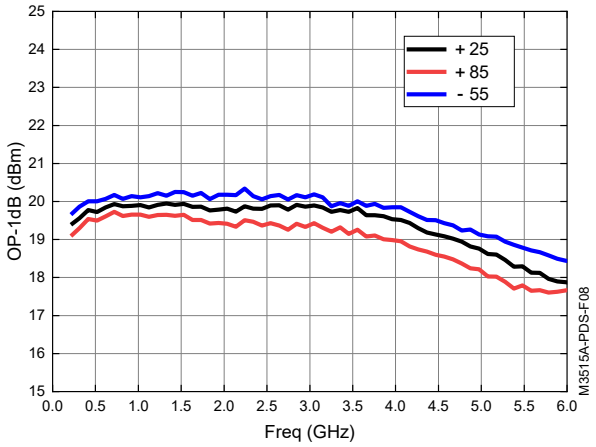


Figure 8. OP1dB Characteristics

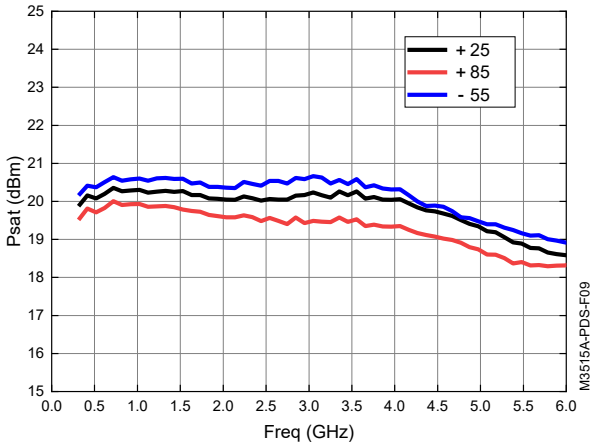


Figure 9. PSAT Characteristics

■ Characteristics Curve @ VG GND, High Frequency Bias

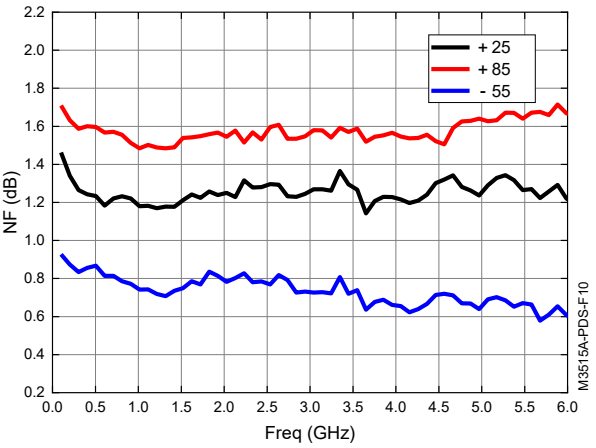


Figure 10. Noise Figure Characteristics

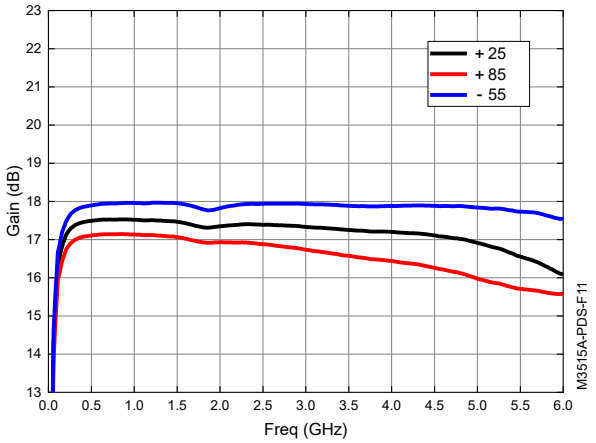


Figure 11. Small-signal Gain Characteristics

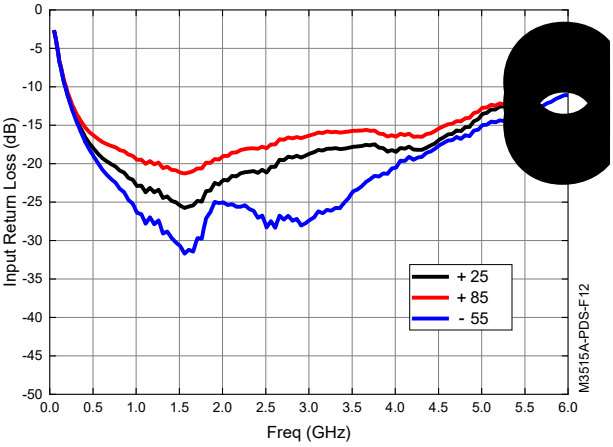


Figure 12. Input Return Loss Characteristics

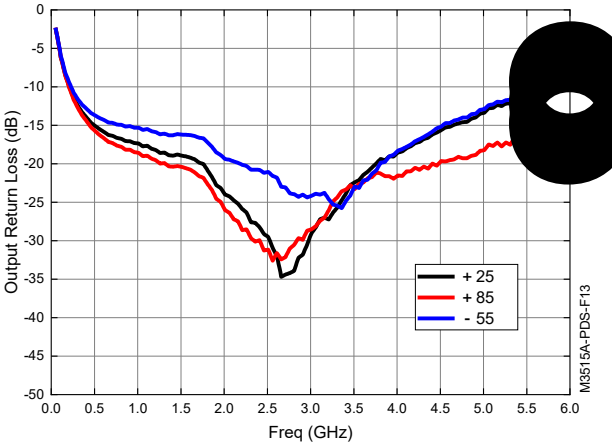


Figure 13. Output Return Loss Characteristics

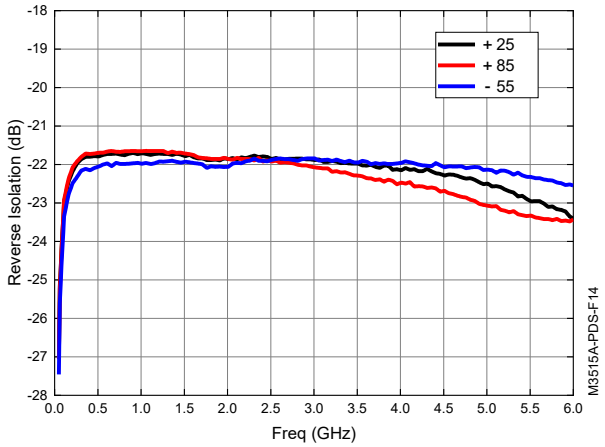


Figure 14. Reverse Isolation Characteristics

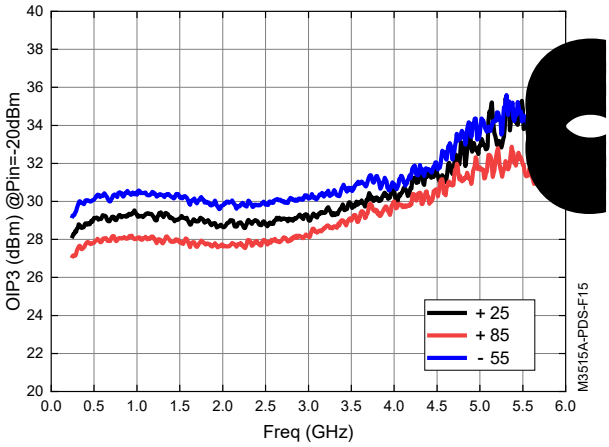


Figure 15. OIP3 Characteristics

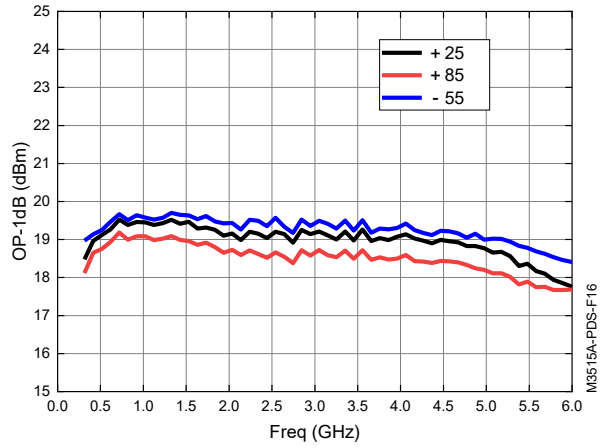


Figure 16. OP1dB Characteristics

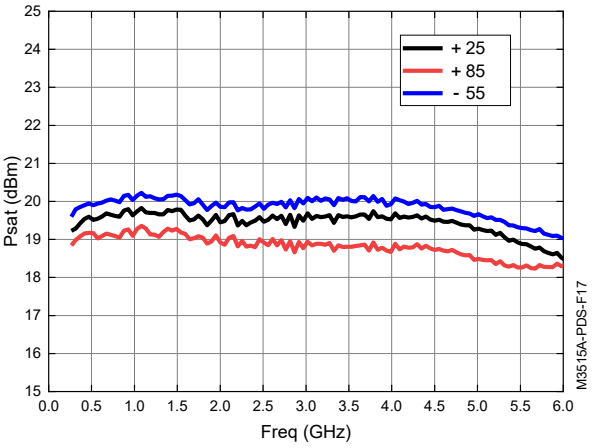


Figure 17. PSAT Characteristics

■ Characteristics Curve @ VG NC, Low Frequency Bias

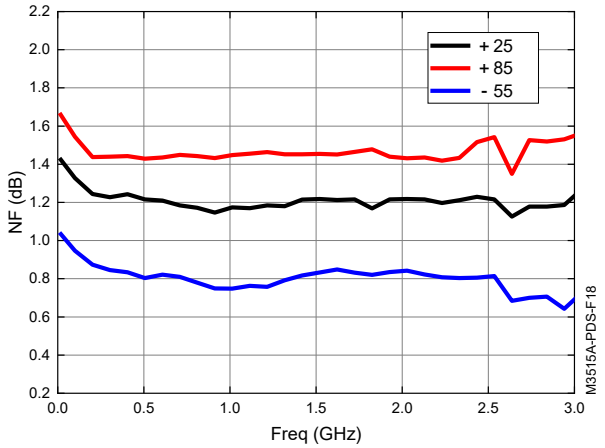


Figure 18. Noise Figure Characteristics

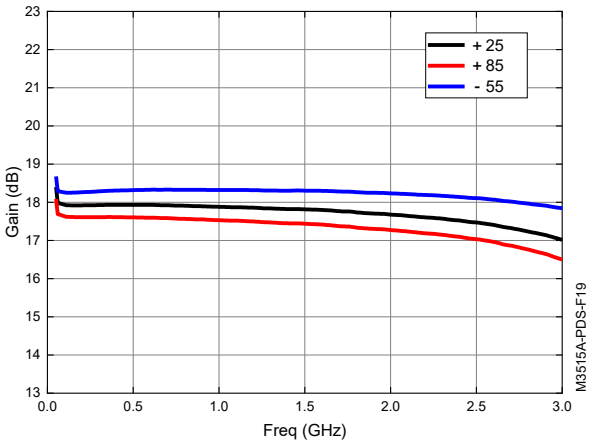


Figure 19. Small-signal Gain Characteristics

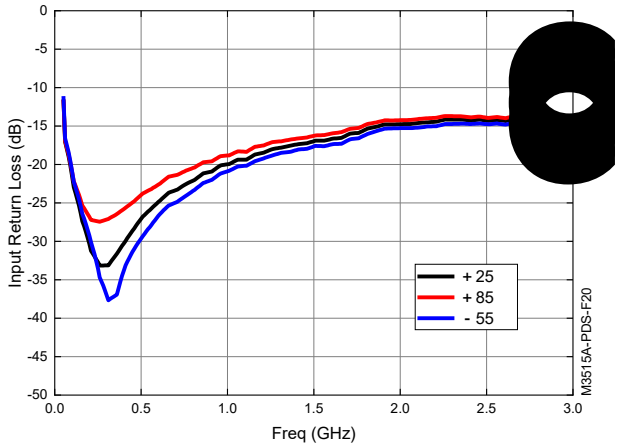


Figure 20. Input Return Loss Characteristics

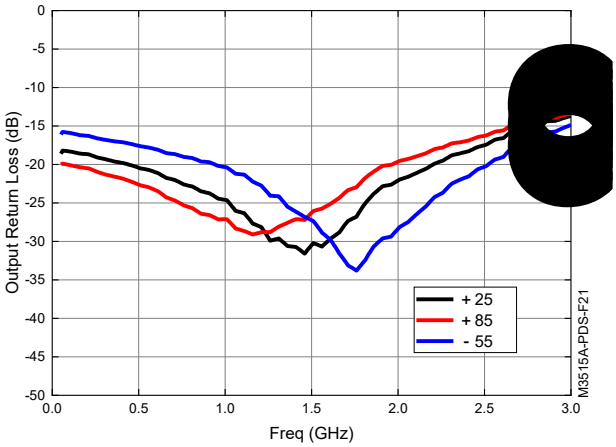


Figure 21. Output Return Loss Characteristics

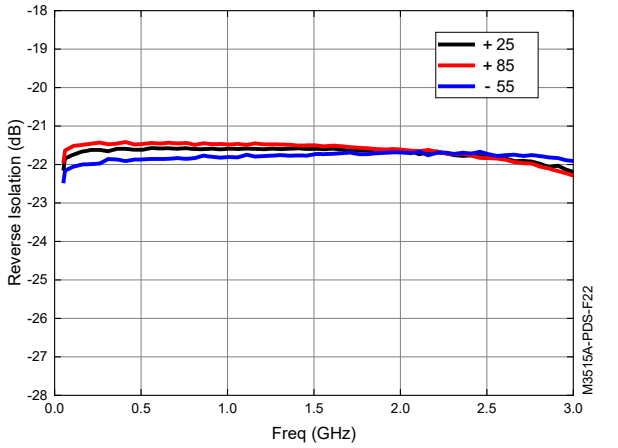


Figure 22. Reverse Isolation Characteristics

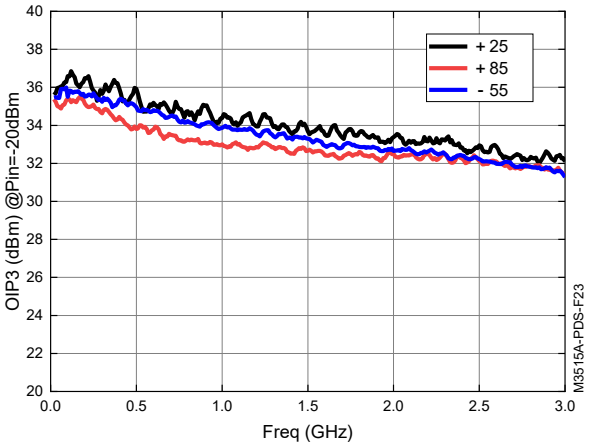


Figure 23. OIP3 Characteristics

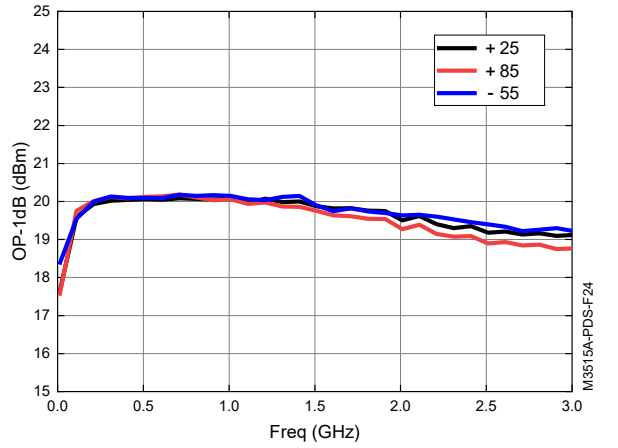


Figure 24. OP1dB Characteristics

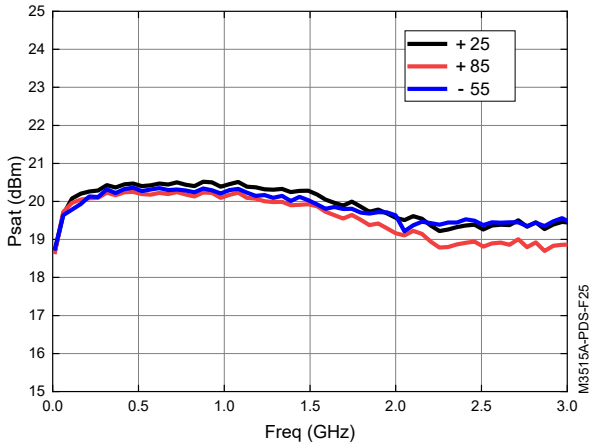


Figure 25. PSAT Characteristics

■ Characteristics Curve @ VG GND, Low Frequency Bias

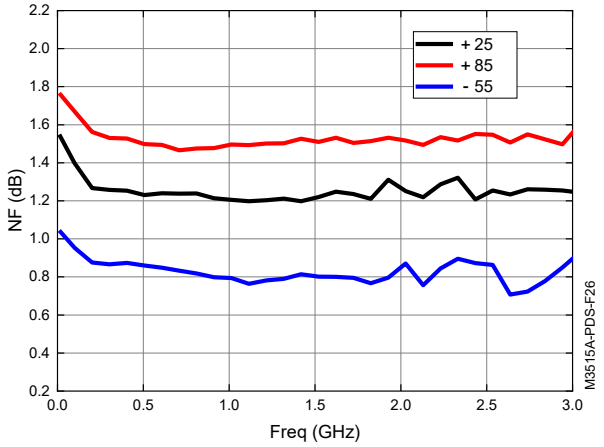


Figure 26. Noise Figure Characteristics

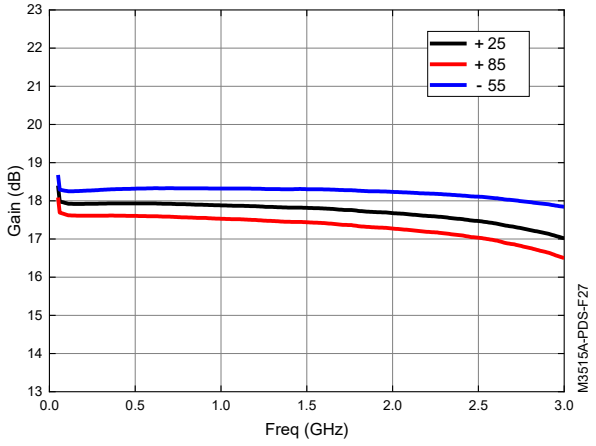


Figure 27. Small-signal Gain Characteristics

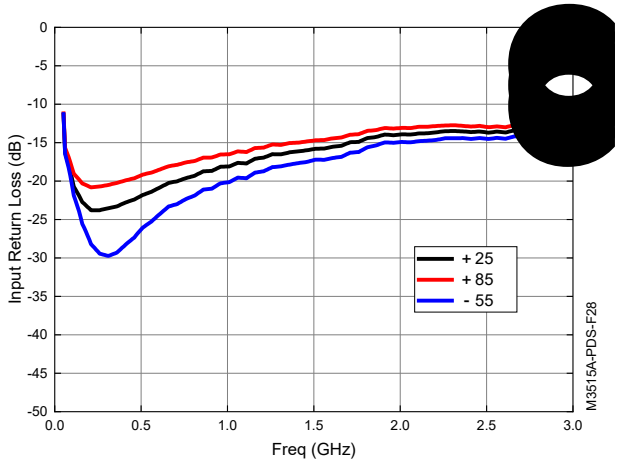


Figure 28. Input Return Loss Characteristics

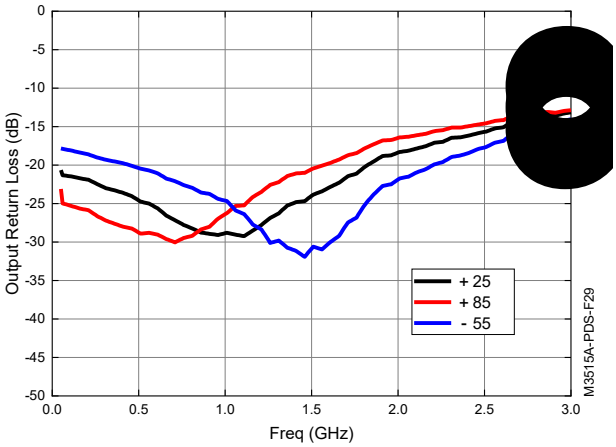


Figure 29. Output Return Loss Characteristics

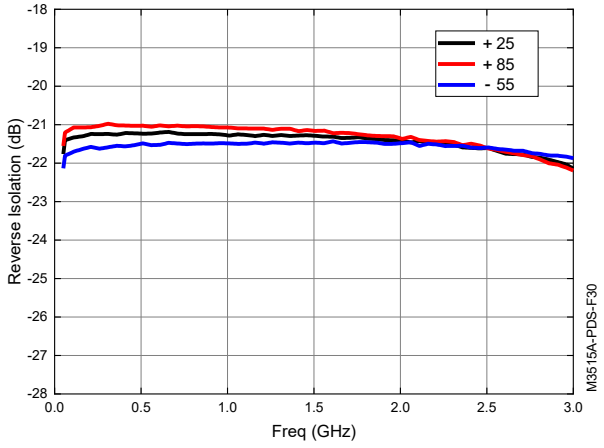


Figure 30. Reverse Isolation Characteristics

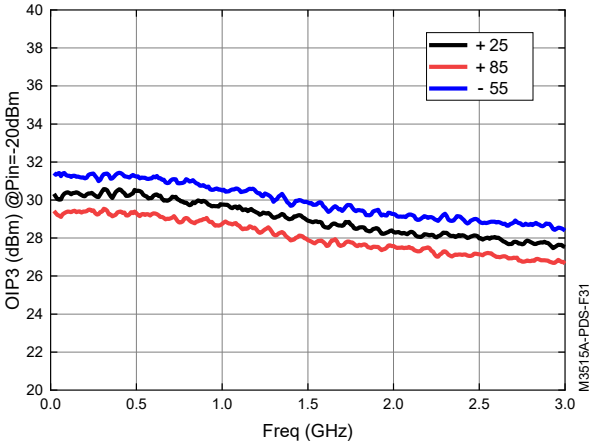


Figure 31. OIP3 Characteristics

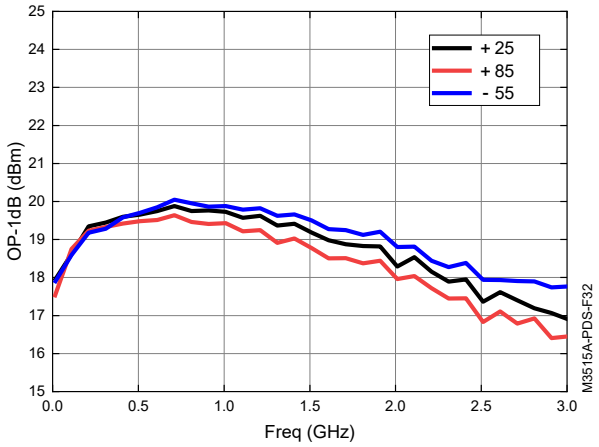


Figure 32. OP1dB Characteristics

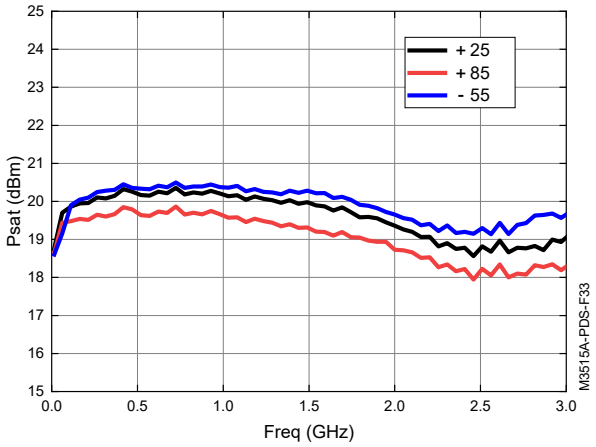
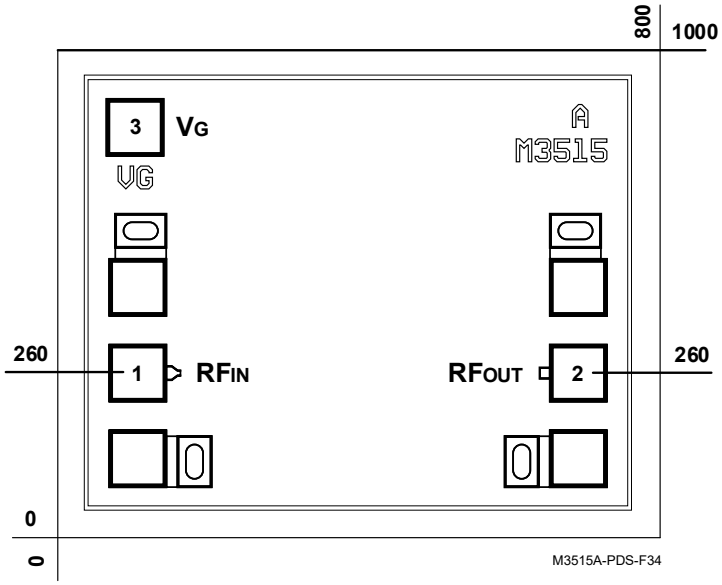


Figure 33. PSAT Characteristics

9. Outline Dimensions



- Dimensions shown in micrometre

Figure 34. M3515A Outline Dimensions

Table 5. Pad Description

Pad	Symbol	Description
1	RF_{IN}	RF Input. 50Ω. DC blocking capacitor is required.
2	RF_{OUT}	RF Output and Power Supply. 50Ω. DC blocking capacitor is required.
3	V_G	Power Consumption Adjustment. High static current when not connected. Low static current when grounded.

10. Assembly Information

■ Assembly Diagram

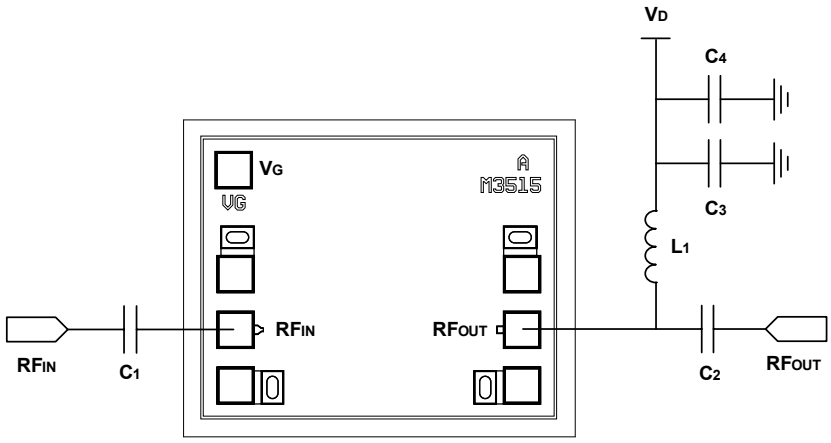
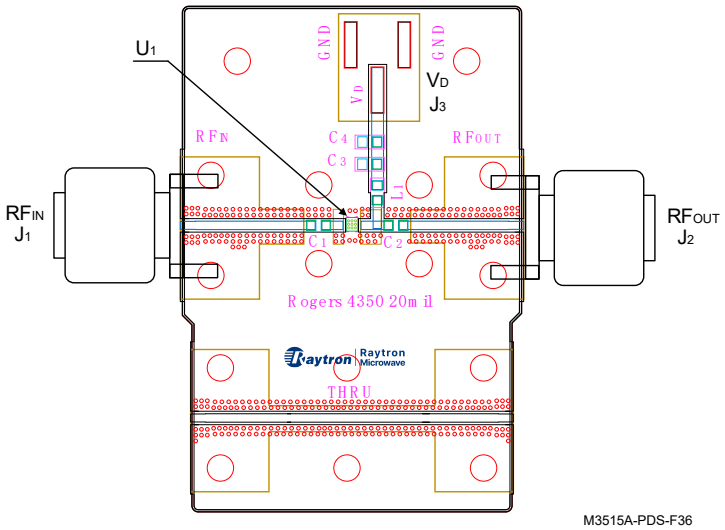


Figure 35. M3515A Assembly Diagram M3515A-PDS-F35



M3515A-PDS-F36

Figure 36. M3515A Evaluation PCB

Table 6. List of Materials for Evaluation PCB

Item	Symbol	Description	50MHz-2GHZ	500MHz-6GHz
J_1-J_2	RF_{IN}, RF_{OUT}	PCB Mount SMA Connector.	-	-
J_3	V_D	Supply Voltage.	-	-
C_1-C_2	-	DC Blocking Capacitor, 0402 Pkg.	1000pF	220pF
L_1	-	DC Feeding Inductor, 0603 Pkg.	900nH	55nH
C_3	-	Decoupling Capacitor, 0603 Pkg.	1nF	1nF
C_4	-	Decoupling Capacitor, 0603 Pkg.	10nF	10nF
U_1	M3515A	Gain Block, Bare Die	-	-

- **Eutectic Die Attach:** It is best to use an 80% Au/20% Sn preform. Do not expose the chip to a temperature greater than 300°C for more than 30sec.
- **Wire Bonding:** RF bonds made with 1mil gold wire are recommended for the RF ports. Keep all bonds as short as possible, less than 0.35mm.

11. Handling Precautions

- **Storage**
  All bare dies ship in either Waffle or Gel Pak, which is an ESD protective container, and then sealed in an ESD protective bag. After opening the sealed ESD protective bag, all dies must be stored in a dry nitrogen environment.
- **Cleanliness**
  Handle the dies in a clean environment. Never use liquid cleaning systems to clean the dies.
- **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.



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

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.