1. Description

- The M3513C is a small-size 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. External DC blocking capacitors and DC feeding inductors are required.

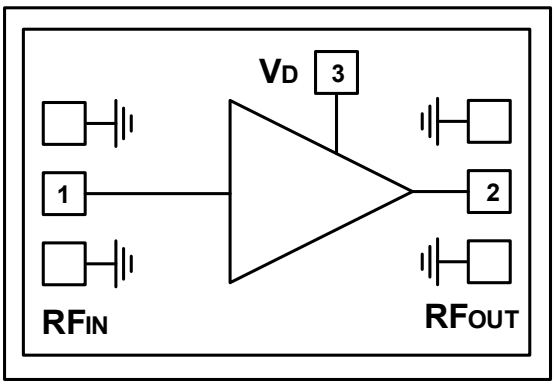


Figure 1. M3513C Functional Block Diagram

2. Applications

- Base station infrastructure
- Portable Wireless
- MMDS & Wireless LAN
- CATV & DBS

3. Features[1]

- Frequency Range: 0.35-3GHz
- Typical Gain: 29dB
- Noise Figure: 0.9dB
- Output P_{-1dB}: 20dBm
- OIP3: 33dBm @ P_{IN}=-20dBm
- Single Positive Supply: +5V (I_{DQ}=100mA)
- 50Ohm Matched Input/Output
- Die Size: 1.0 x 1.0 x 0.1mm

1. EVB Test

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	0.35-3GHz	Units
Small-Signal Gain	29	dB
Noise Figure	0.9	dB
Input Return Loss	-17	dB
Output Return Loss	-12	dB
Output P_{-1dB}	20	dBm
Output IP3 @ P_{IN}=-20dBm	33	dBm

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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	85	°C
Supply Voltage, V_D	-	5	-	V
Quiescent Current, I_{DQ}	96	100	104	mA

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

Table 4. RF Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Small-Signal Gain	Gain	28	29	30	dB
Noise Figure	NF	0.75	0.9	1.0	dB
Input Return Loss	RL_{IN}	-20	-17	-15	dB
Output Return Loss	RL_{OUT}	-16	-12	-	dB
Output Power for 1dB Compression	OP_{-1dB}	18.5	20	20.5	dBm
Output IP3 @ P_{IN}=-20dBm	OIP3	32	33	33.6	dBm

• Typical performance at these conditions: Temp=25°C, V_D=5V, 50 Ohm system.

8. Typical Performance Curve

■ Small-signal Characteristics Curve

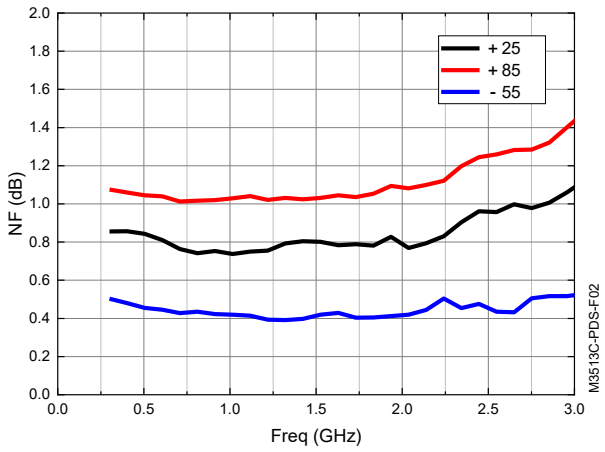


Figure 2. Noise Figure Characteristics

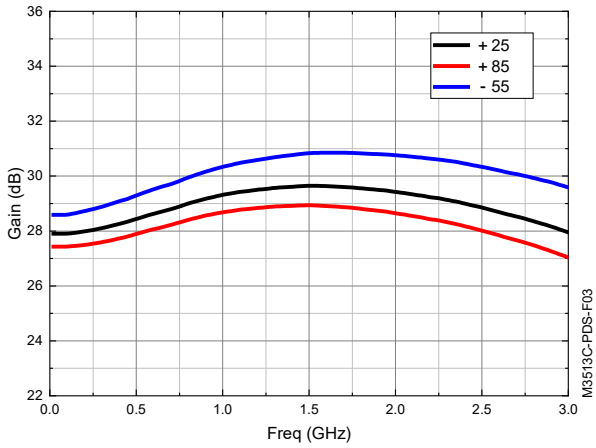


Figure 3. Small-signal Gain Characteristics

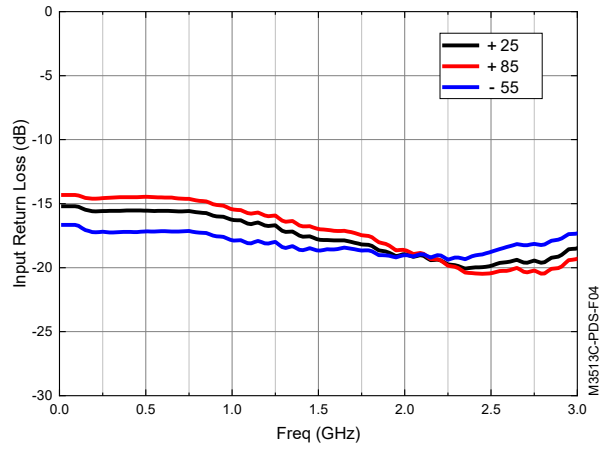


Figure 4. Input Return Loss Characteristics

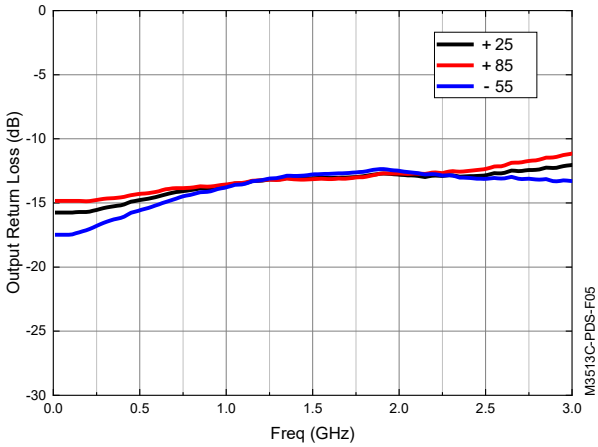


Figure 5. Output Return Loss Characteristics

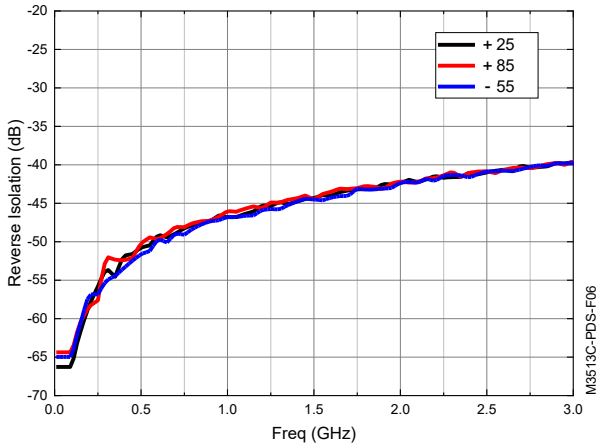


Figure 6. Reverse Isolation Characteristics

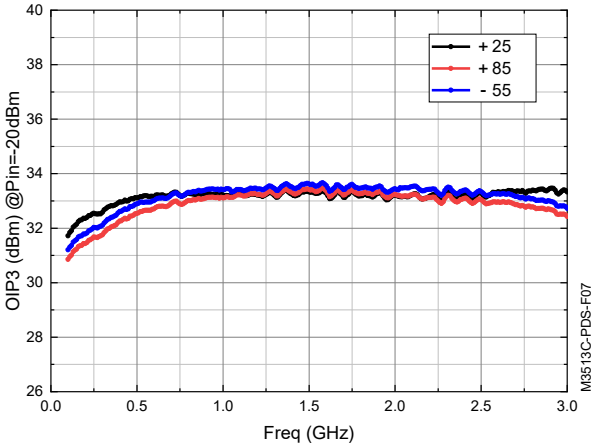


Figure 7. OIP3 Characteristics

■ Power Characteristics Curve

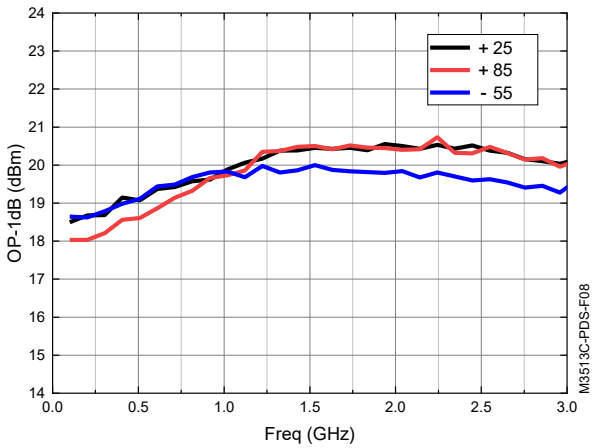


Figure 8. OP1dB Characteristics

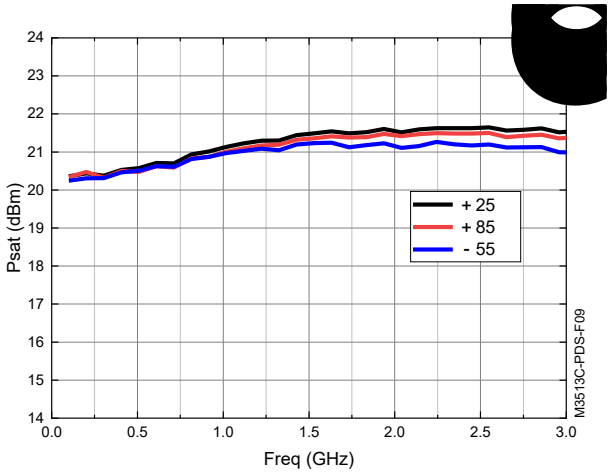
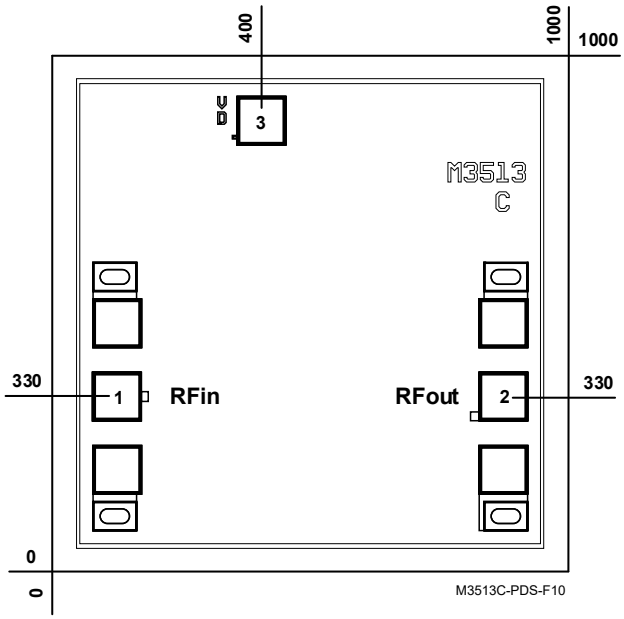


Figure 9. PSAT Characteristics

9. Outline Dimensions



- Dimensions shown in micrometre

Figure 10. M3513C 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. 50Ω. DC blocking capacitor is required.
3	V_D	Supply Voltage. External bypass capacitors are required, refer to Figure 11.

10. Assembly Information

■ Assembly Diagram

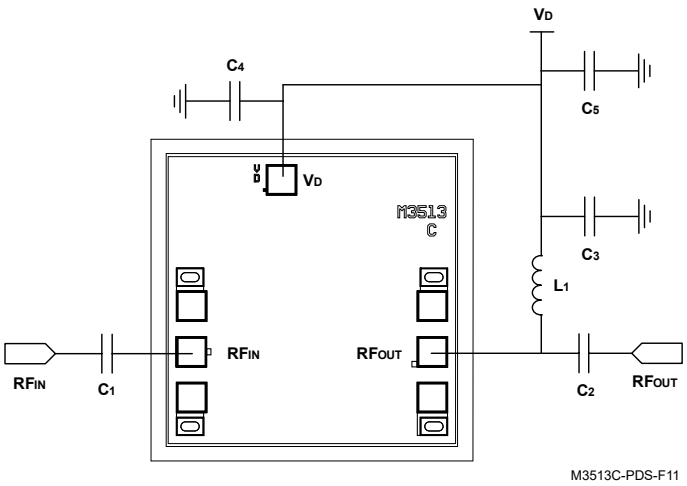


Figure 11. M3513C Assembly Diagram

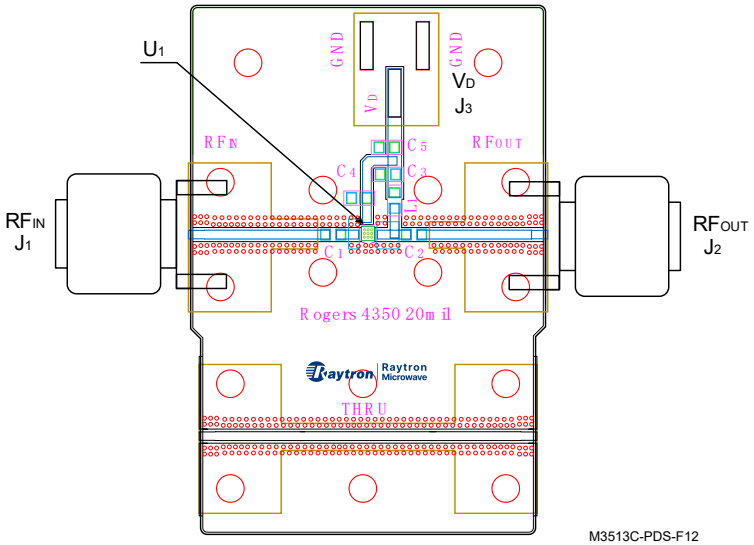


Figure 12. M3513C Evaluation PCB

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.
C_1 C_2 C_3	-	1nF, 0603 Pkg.
C_4	-	10nF, 0603 Pkg.
C_5	-	100nF, 0603 Pkg.
L_1	-	900nH, 0603 Pkg.
U_1	M3513C	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

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