1. Description

- The M7103 is a Bi-Directional Amplifier MMIC integrated amplifier, SPDT switch and digital control circuit, fabricated on GaAs p-HEMT MMIC process. It operates over 7-13GHz, the OP-1dB of Rx is 23dBm with 11dB gain and 6dB noise figure, the PSAT of Tx is 21.5dBm with 16dB gain.

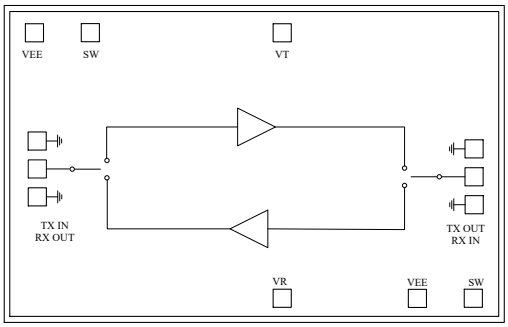


Figure 1. M7103 Functional Block Diagram

2. Applications

- TX/RX Modules
- Telecommunications
- Radar
- Defense

3. Features

- Frequency Range: 7-13GHz
- T_X Small Signal Gain: 16dB
- T_X S11/S22: -10dB/-15dB
- T_X Saturated Output Power: 21.5dBm
- T_X Quiescent Current: 110mA
- T_X Saturated Dynamic Current: 140 mA
- R_X Small Signal Gain: 11dB
- R_X S11/S22: -13dB/-15Db
- R_X Noise Figure: 6dB
- R_X Output P_{-1dB}: 23dBm
- R_X Quiescent Current: 180mA
- R_X Dynamic Current at OP_{-1dB}: 220mA
- Dimensions: 3.0 x 2.0 x 0.1mm

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	7-13GHz	Units
T_X Small Signal Gain	16	dB
T_X Saturated Output Power	21.5	dBm
T_X Quiescent Current	110	mA
TX Saturated Dynamic Current (P_{IN}=7dBm)	140	mA
R_X Small Signal Gain	11	dB
R_X Noise Figure	6	dB
R_X Output P_{-1dB}	23	dBm
R_X Quiescent Current	180	mA
R_X Dynamic Current at OP_{-1dB}	220	mA

Table of Contents

No.	Contents	Page
1	Description	1
2	Applications	1
3	Features	1
4	Brief Typical Performance	1
5	Recommended Operating Conditions	3
6	RF Characteristics	3
7	Typical Performance Curve	4
8	Outline Dimensions	6
9	Assembly Information	7
10	Handling Precautions	7
11	Contact Information	8
12	Disclaimer	8

5. Recommended Operating Conditions

Table 2. Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
Operating Temperature Range	-55	25	85	°C
Supply Voltage, VEE	-	-5	-	V
T_X / R_X Control Voltage, SW	-	0/5	-	V
R_X Supply Voltage, VR	-	5	-	V
T_X Supply Voltage, VT	-	5	-	V

6. RF Characteristics (T_C = 25˚C)

Table 3. RF Characteristics[1]

Parameter	Symbol	Min.	Typ.	Max.	Units
T_X Small Signal Gain	S21_T_X	15.8	16	18	dB
T_X S11	S11_T_X	-18	-12	-10	dB
T_X S22	S22_T_X	-25	-20	-15	dB
T_X Saturated Output Power	P_{SAT}_T_X	21	21.5	22	dBm
T_X Power Gain	Gain_T_X	14	14.5	15	dB
T_X Quiescent Current	I_{DQ}_T_X	100	110	120	mA
T_X Dynamic Current at P_{SAT}	I_d_T_X	120	140	150	mA
R_X Small Signal Gain	S21_R_X	10.5	11	11.5	dB
R_X S11	S11_R_X	-25	-20	-13	dB
R_X S22	S22_R_X	-22	-18	-15	dB
R_X Noise Figure	NF	5	6	6.2	dB
R_X Output P_{-1dB}	OP_{-1dB}_R_X	22	23	24	dBm
R_X P_{-1dB} Power Gain	Gain_R_X	9	10	11	dB
R_X Quiescent Current	I_{DQ}_R_X	130	180	190	mA
R_X Dynamic Current at OP_{-1dB}	I_d_R_X	200	220	240	mA

[1]. Test condition: CW Test

7. Typical Performance Curve

■ Small-signal Characteristics Curve

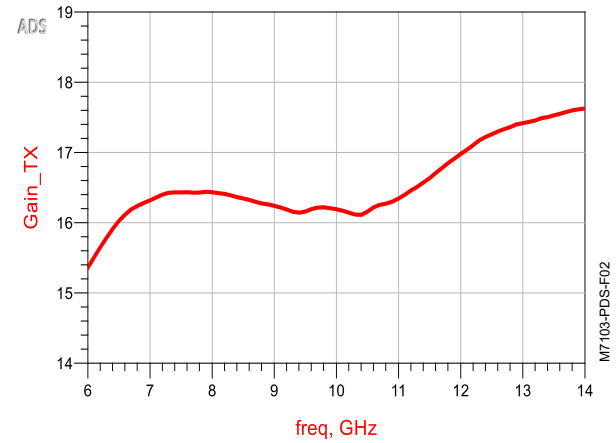


Figure 2. T_X Small-signal Gain Characteristics

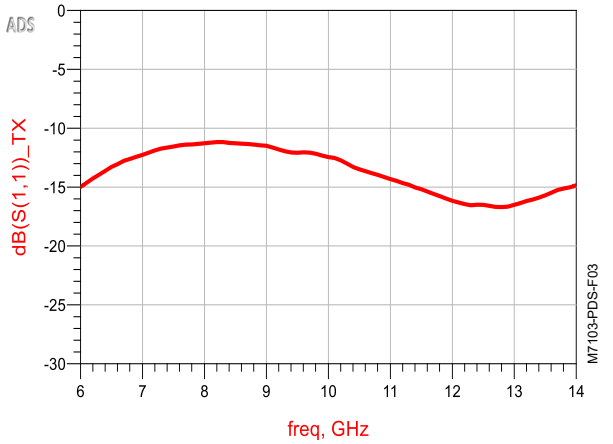


Figure 3. T_X Small-signal S11 Characteristics

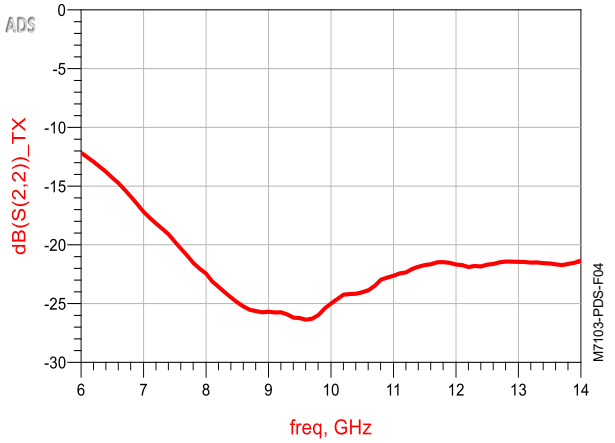


Figure 4. T_X Small-signal S22 Characteristics

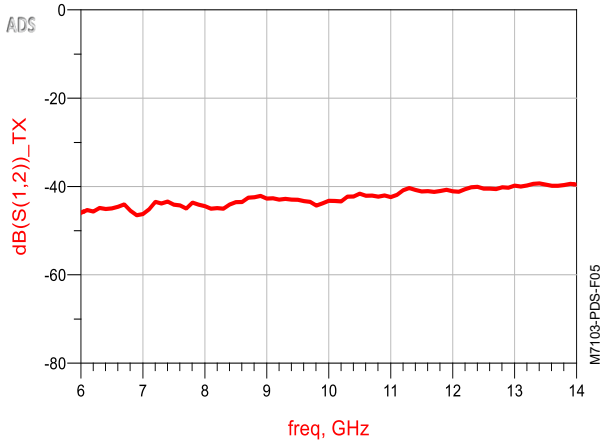


Figure 5. T_X Small-signal S12 Characteristics

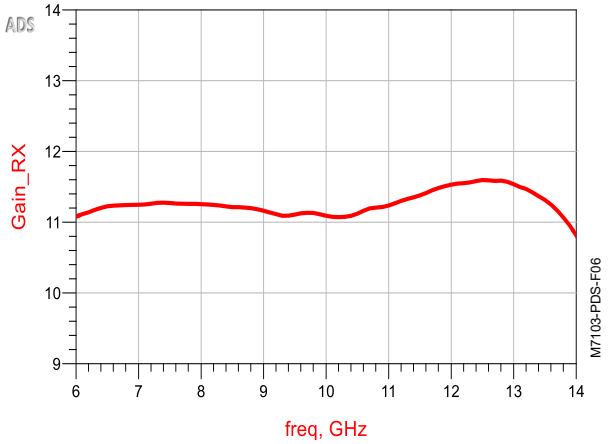


Figure 6. R_X Small-signal Gain Characteristics

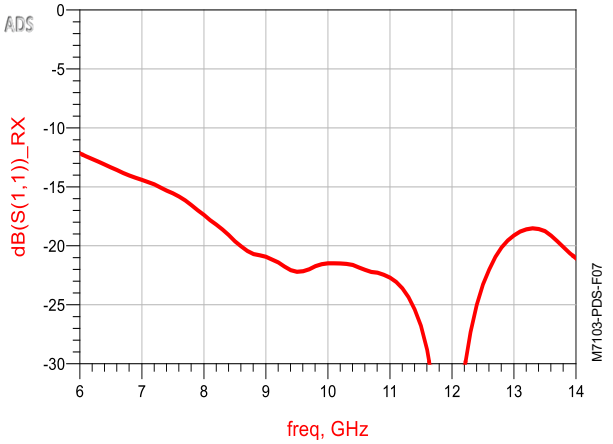


Figure 7. R_X Small-signal S11 Characteristics

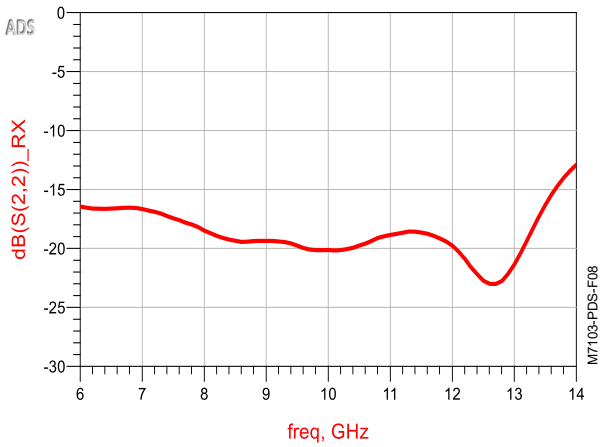


Figure 8. R_X Small-signal S22 Characteristics

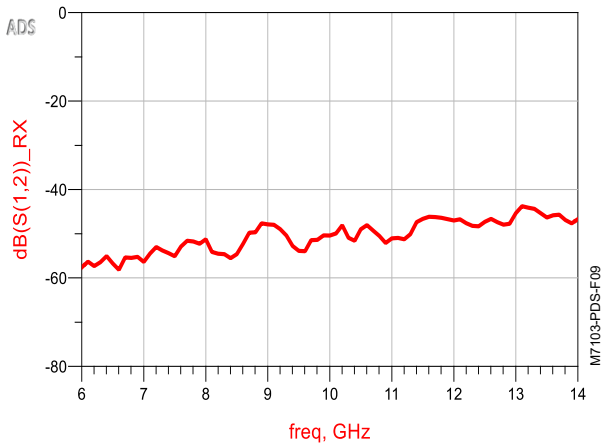


Figure 9. R_X Small-signal S12 Characteristics

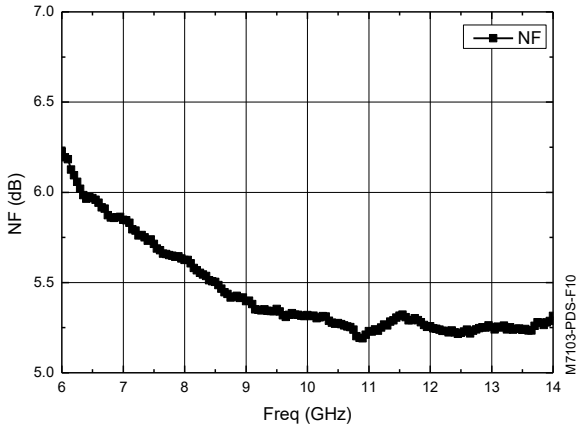


Figure 10. R_X NF Characteristics

■ Power Characteristic Curve (25℃)

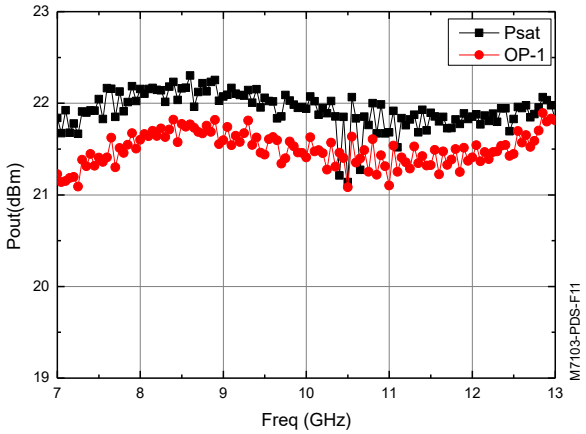


Figure 11. T_X OP_{-1dB} and P_{SAT} Characteristics

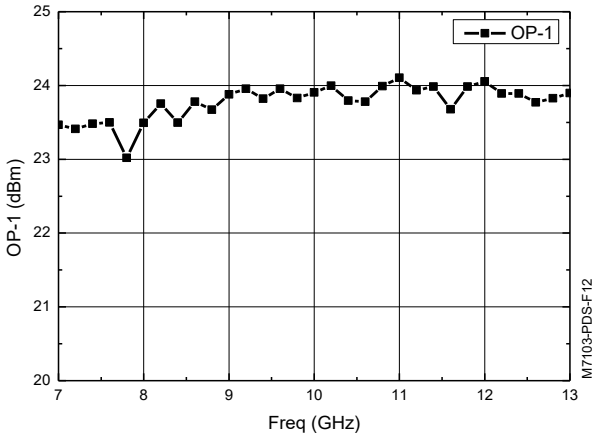


Figure 12. R_X OP_{-1dB} Characteristics

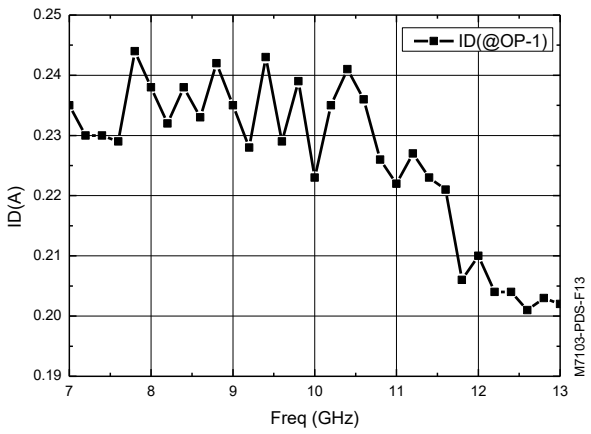
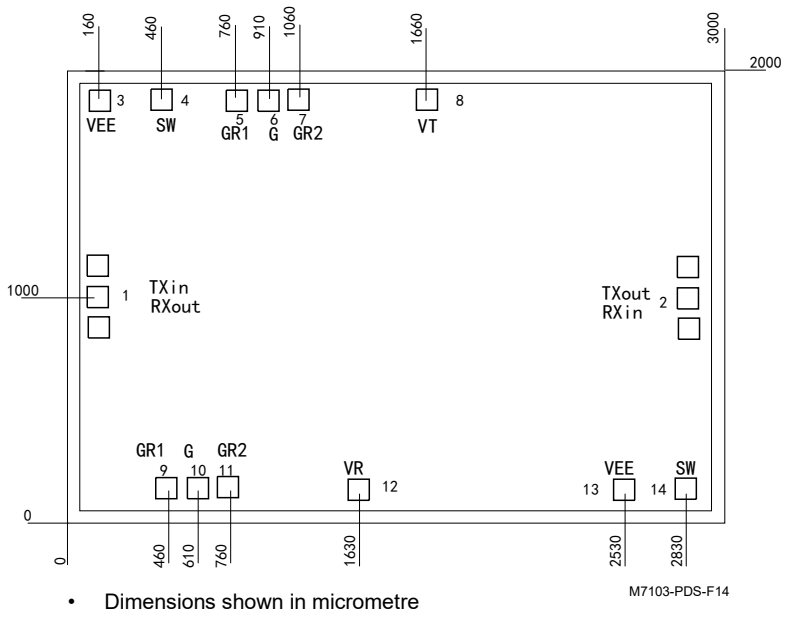


Figure 13. R_X Dynamic Current at OP_{-1dB} Characteristics

8. Outline Dimensions



- Dimensions shown in micrometre

Figure 14. M7103 Outline Dimensions

Table 4. Pad Description

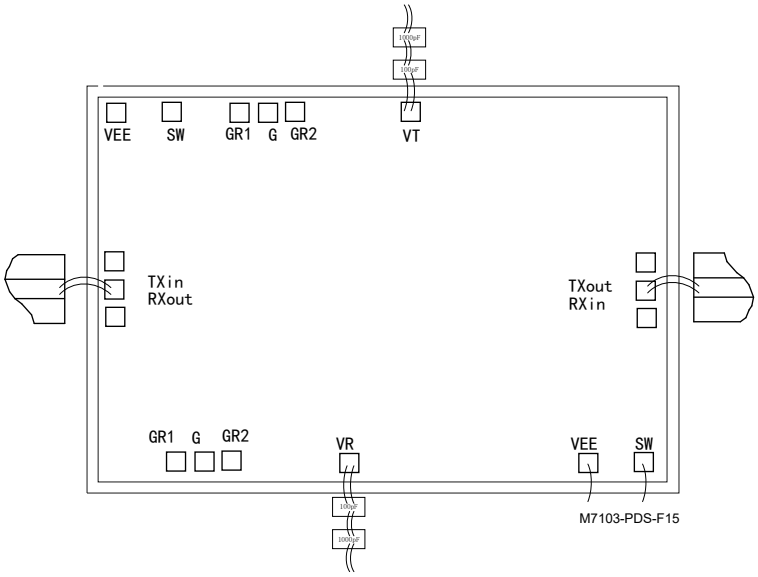
Pad	Symbol	Description
1	TXin/RXout	T_X Input / R_X Output
2	TXout/RXin	T_X Output / R_X Input
3/13	VEE	Supply Voltage (Arbitrary pad can be selected)
4/14	SW	T_X / R_X Control Voltage (Arbitrary pad can be selected)
5/9	GR1	Attenuation Bit 0.5dB, Enabled When Bond-wire to GND
7/11	GR2	Attenuation Bit 1dB, Enabled When Bond-wire to GND
8	VT	T_X Supply Voltage
12	VR	R_X Supply Voltage

Table 5. Truth Table

VEE	SW	VT	VR	Channel Selection
-5	5	5	0	T_X Channel
-5	0	0	5	R_X Channel

9. Assembly Information

■ Assembly Diagram



- For VEE/SW arbitrary pad can be selected

Figure 15. M7103 Assembly Diagram

- **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.

10. 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.



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

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.