1. Description

- The M7101 is a Bi-Directional Amplifier MMIC integrated Bi-Directional Amplifier, SPDT Switch and Digital Control Circuit, which is fabricated on GaAs p-HEMT MMIC process. It operates over 5-13GHz, the OP-1dB of Rx is 19dBm with 8dB gain and 3.5dB noise figure, the OP-1dB of Tx is 19dBm with 18dB gain.

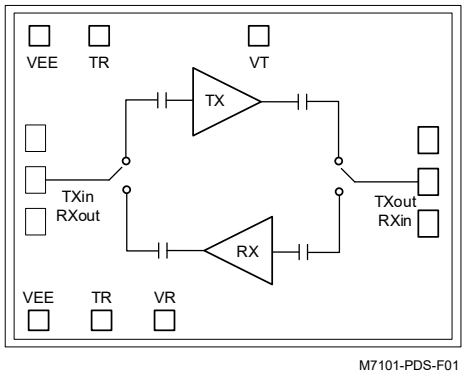


Figure 1. M7101 Functional Block Diagram

2. Applications

- TX/RX Modules
- Telecommunications
- Radar
- Defense

3. Features

- Frequency Range: 5-13GHz
- Tx Small Signal Gain: 19dB
- Tx Output P-1dB: 19dBm
- Tx Power Gain: 18dB
- Tx Quiescent Current: 95mA
- Tx Dynamic Current at OP-1dB: 100mA
- Rx Small Signal Gain: 9dB
- Rx S11/S22: -8dB
- Rx Output P-1dB: 19dBm
- Rx Power Gain: 8dB
- Rx Quiescent Current: 60mA
- Rx Dynamic Current at OP-1dB: 70mA
- Rx Noise Figure: 3.5dB
- Die Size: 2.0 x 2.0 x 0.1mm

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	5-13GHz	Units
Tx Small Signal Gain	19	dB
Tx Output P-1dB	19	dBm
Tx Quiescent Current	96	mA
Tx Dynamic Current at OP-1dB	100	mA
Rx Small Signal Gain	9	dB
Rx Noise Figure	3.5	dB
Rx Output P-1dB	19	dBm
Rx Quiescent Current	60	mA
Rx Dynamic Current at OP-1dB	70	mA

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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, TR	-	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	-	19	-	dB
T_X S11	S11_T_X	-	-9	-	dB
T_X S22	S22_T_X	-	-10	-	dB
T_X Output P_{-1dB}	OP_{-1dB}_T_X	-	19	-	dBm
T_X P_{-1dB} Power Gain	Gain_T_X	-	18	-	dB
T_X Quiescent Current	I_{DQ}_T_X	-	96	-	mA
T_X Dynamic Current at OP_{-1dB}	I_d_T_X	-	100	-	mA
R_X Small Signal Gain	S21_R_X	-	9	-	dB
R_X S11	S11_R_X	-	-8	-	dB
R_X S22	S22_R_X	-	-10	-	dB
R_X Noise Figure	NF	-	3.5	-	dB
R_X Output P_{-1dB}	OP_{-1dB}_R_X		19	-	dBm
R_X P_{-1dB} Power Gain	Gain_R_X	-	8	-	dB
R_X Quiescent Current	I_{DQ}_R_X	-	60	-	mA
R_X Dynamic Current at OP_{-1dB}	I_d_R_X	-	70	-	mA

[1]. Test condition: CW Test

7. Typical Performance Curve

■ Small-signal Characteristics Curve

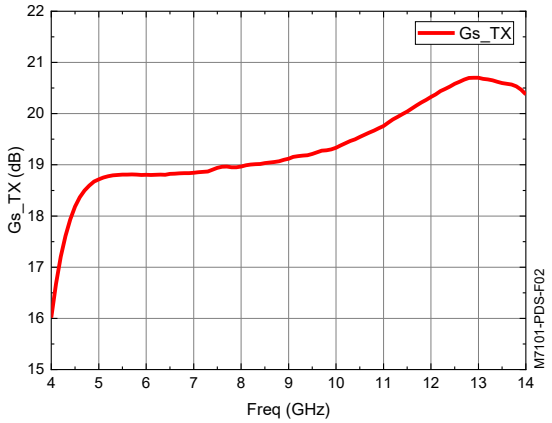


Figure 2. T_X Small-signal Gain Characteristics

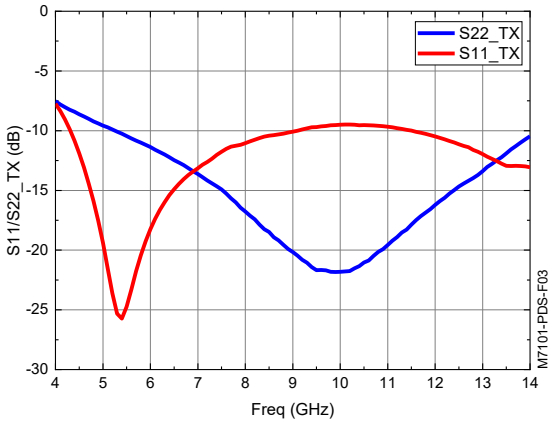


Figure 3. T_X Small-signal S11/S22 Characteristics

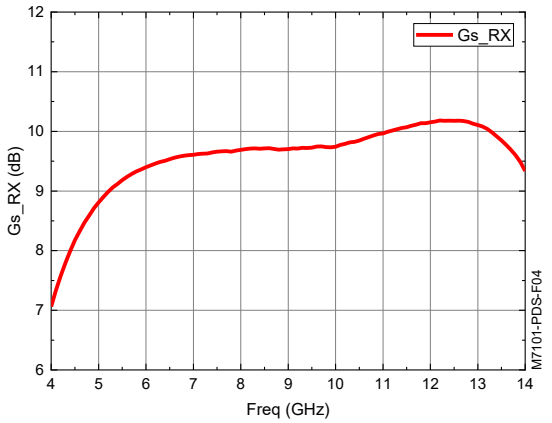


Figure 4. R_X Small-signal Gain Characteristics

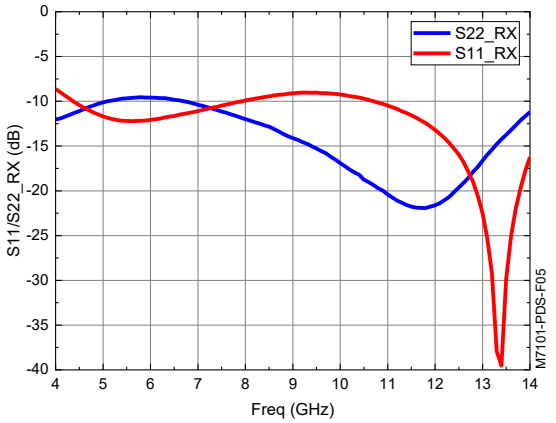


Figure 5. R_X Small-signal S11/S22 Characteristics

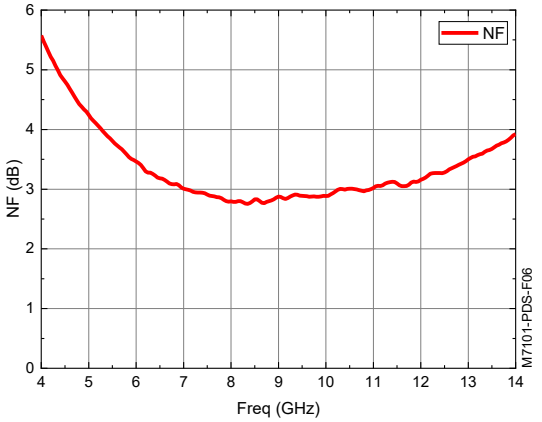


Figure 6. R_X NF Characteristics

■ Power Characteristic Curve (25℃)

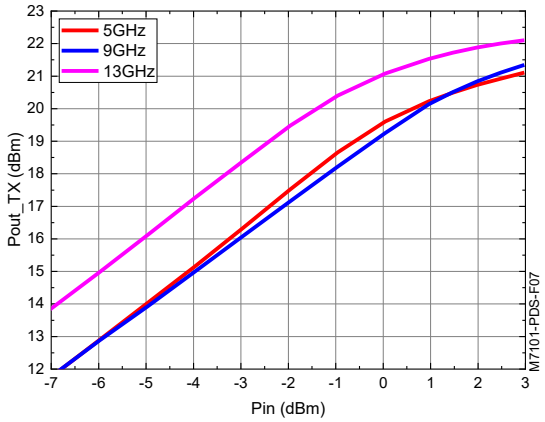


Figure 7. Tx Output Power Characteristics

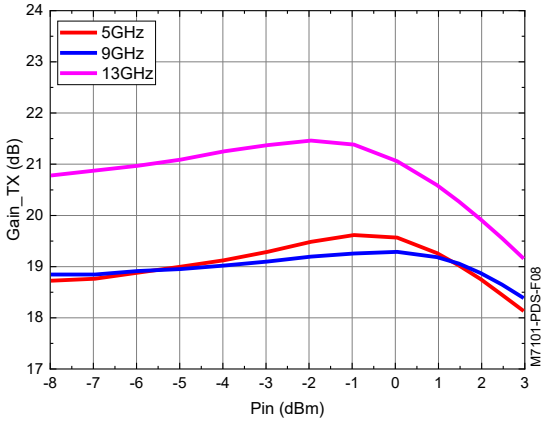


Figure 8. Tx Power Gain Characteristics

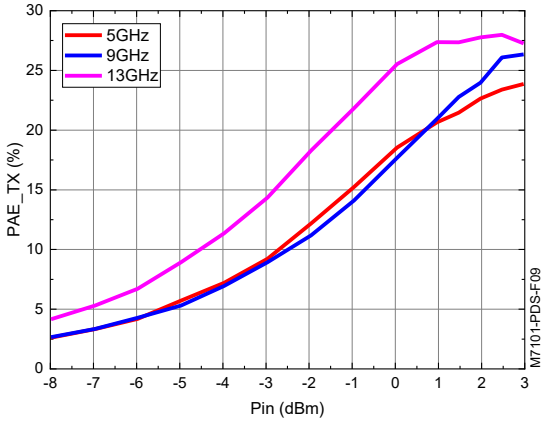


Figure 9. Tx PAE Characteristics

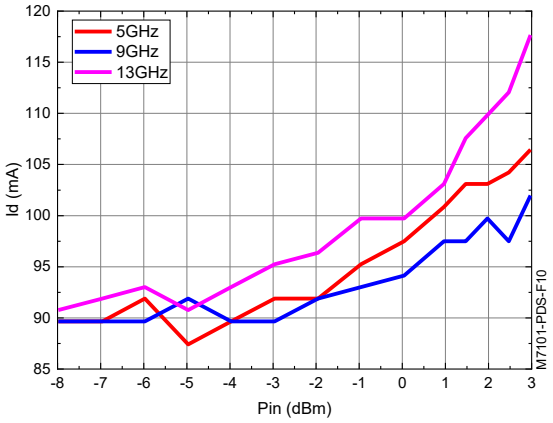


Figure 10. Tx Dynamic Current at OP-1dB Characteristics

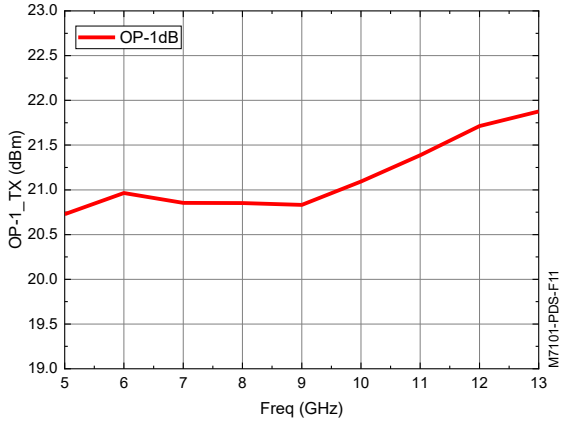


Figure 11. Tx OP-1dB Characteristics

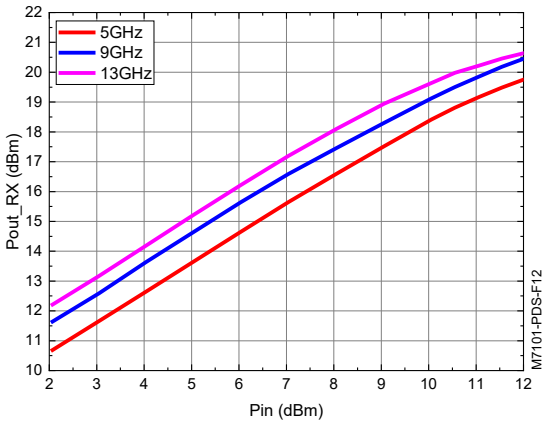


Figure 12. R_X Output Power Characteristics

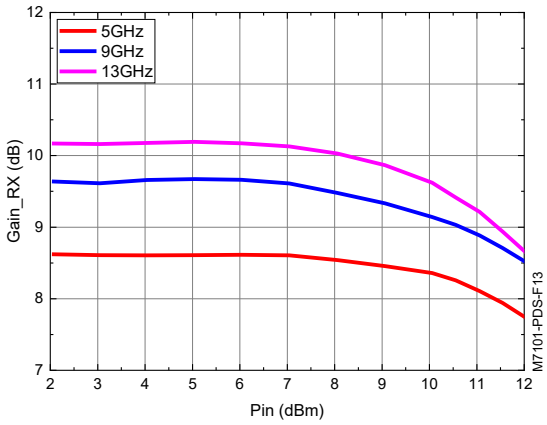


Figure 13. R_X Power Gain Characteristics

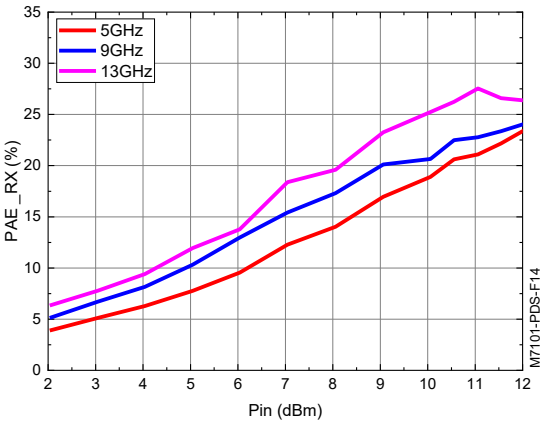


Figure 14. R_X PAE Characteristics

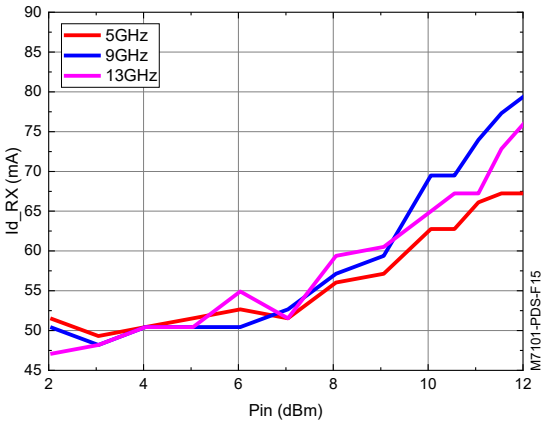


Figure 15. R_X Dynamic Current at OP_{-1dB} Characteristics

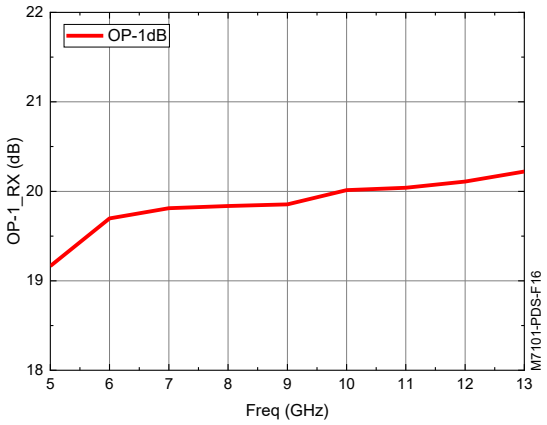
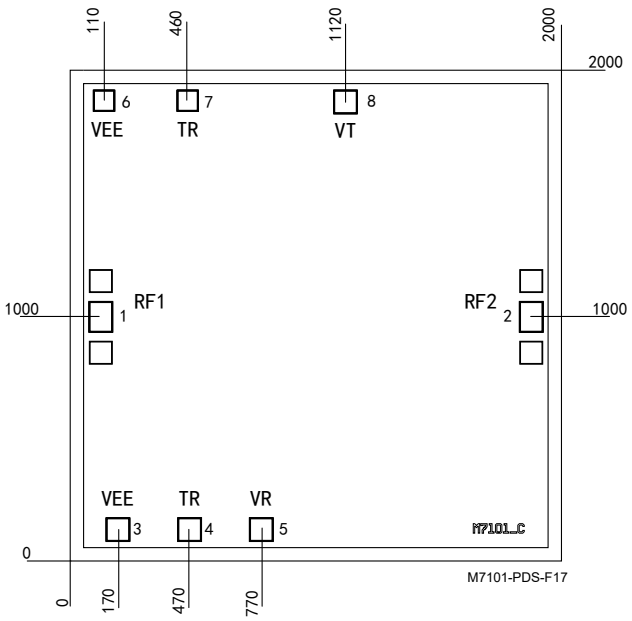


Figure 16. R_X OP_{-1dB} Characteristics

8. Outline Dimensions



- Dimensions shown in micrometre

Figure 17. M7101 Outline Dimensions

Table 4. Pad Description

Pad	Symbol	Description
1	RF1	T_X Input / R_X Output
2	RF2	T_X Output / R_X Input
3/6	VEE	Supply Voltage (Arbitrary pad can be selected)
4/7	TR	Control Voltage
5	VR	R_X Supply Voltage
8	VT	T_X Supply Voltage

Table 5. Truth Table

VEE	TR	VT	VR	RF1 to RF2	RF2 to RF1
-5	5	5	0	ON	OFF
-5	0	0	5	OFF	ON

9. Assembly Information

■ Assembly Diagram

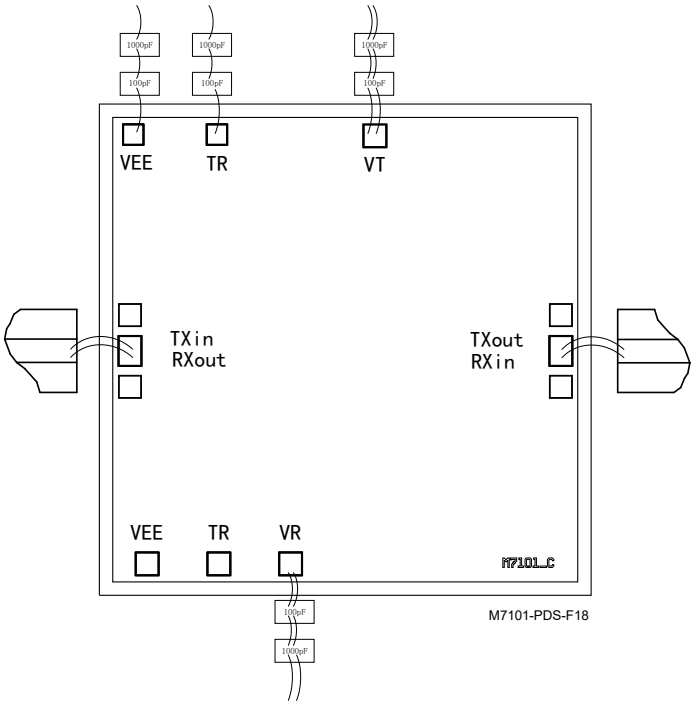


Figure 18. M7101 Assembly Diagram

- **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

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