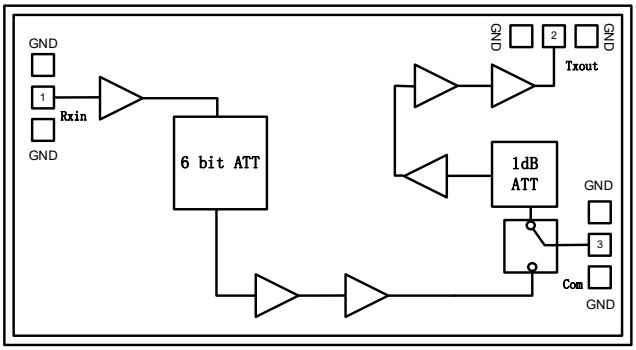
1. Description

- The M7136 is a Multi-Function MMIC integrated Bi-Directional Amplifier and 6 bit attenuator. It operates over 10-19.5 GHz.



M7136-PDS-F01

Figure 1. M7136 Functional Block Diagram

2. Applications

- T/R Modules

3. Features[1]

- Frequency Range: 10-19.5GHz
- T_X Small Signal Gain: 23.5dB
- T_X S11/S22: -11dB
- T_X Saturated Output Power: 20.5dBm
- T_X Quiescent Current: 120mA
- R_X Small Signal Gain: 16.0dB
- R_X S11/S22: -11dB
- R_X Output P_{-1dB}: 15.5dBm
- R_X Quiescent Current: 80mA
- Attenuation Range: 0-31.5dB
- Attenuation Step: 0.5dB
- RMS Attenuation Error: 0.4dB
- RMS Relative Phase:3 degree
- Die Size: 4.3 x 1.8 x 0.1mm

[1] On-wafer Test

4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	10-19.5 GHz	Units
T_X Small Signal Gain	23.5	dB
T_X Saturated Output Power	20.5	dBm
T_X Quiescent Current	120	mA
R_X Small Signal Gain	16.0	dB
R_X Output P-1dB	15.5	dBm
R_X Quiescent Current	80	mA
Attenuation Range	0-31.5	dB
Attenuation Step	0.5	dB
RMS Attenuation Error	0.4	dB
RMS Relative Phase	3	degree

Table of Contents

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

5. Recommended Operating Conditions

Table 2. Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
Operating Temperature Range	-55	25	125	°C
Control Voltage, S1-S2	-	0/-5	-	V
Control Voltage, V1-V10	-	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

Parameter	Symbol	Min.	Typ.	Max.	Units
T_X Small Signal Gain	$S21_T_X$	23.5	25	16	dB
T_X S11	$S11_T_X$	-	-15	-11	dB
T_X S22	$S22_T_X$	-	-15	-11	dB
T_X Saturated Output Power	$P_{SAT}_T_X$	20.5	21	21.5	dBm
T_X Quiescent Current	$I_{DQ}_T_X$	-	120	-	mA
R_X Small Signal Gain	$S21_R_X$	16	18	18.5	dB
R_X S11	$S11_R_X$	-	-15	-11	dB
R_X S22	$S22_R_X$	-	-15	-11	dB
R_X Output P_{-1dB}	$OP_{-1dB}_R_X$	15.5	16.5	18.5	dBm
R_X Quiescent Current	$I_{DQ}_R_X$	-	80	-	mA
R_X NF	NF_R_X	4.5	5.5	6.5	dB
RMS Attenuation Error	RMSA	-	0.4	-	dB
RMS Relative Phase	RMSP	-	3	-	degree

7. Typical Performance Curve

■ Small-signal Characteristics Curve

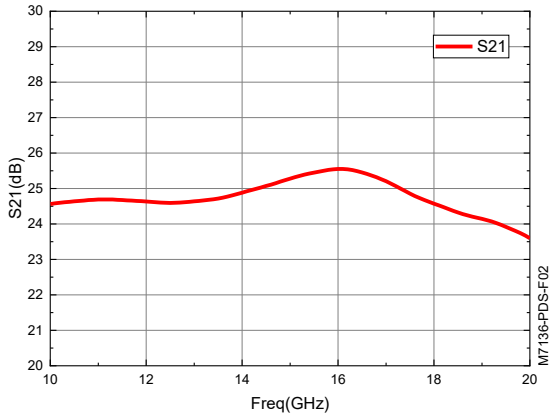


Figure 2. T_X Small-Signal Gain Characteristics

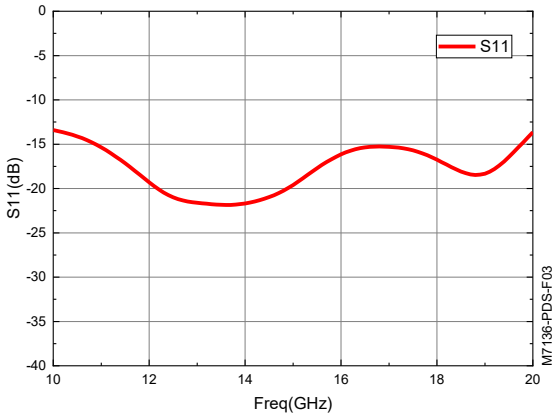


Figure 3. T_X Small-Signal S11 Characteristics

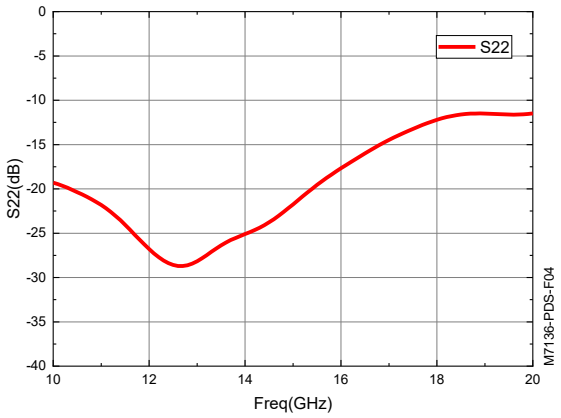


Figure 4. T_X Small-Signal S22 Characteristics

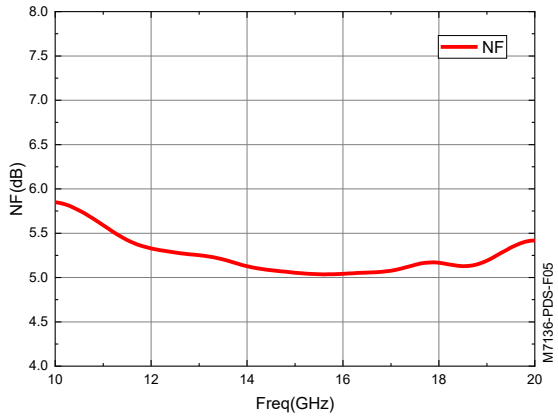


Figure 5. T_X NF Characteristics

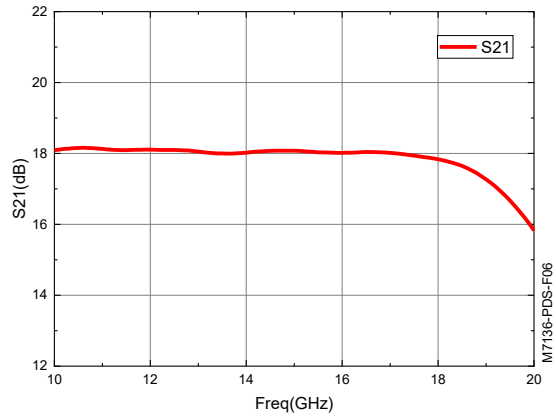


Figure 6. R_X Small-Signal Gain Characteristics

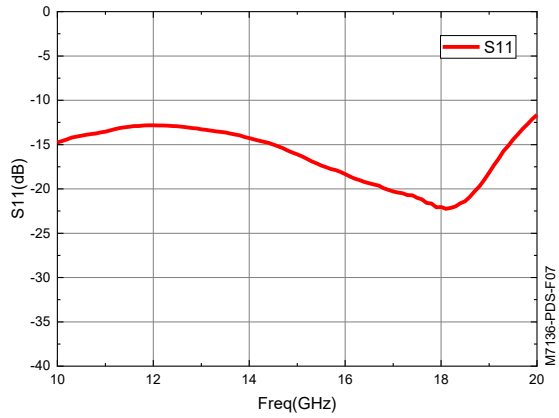


Figure 7. R_X Small-Signal S11 Characteristics

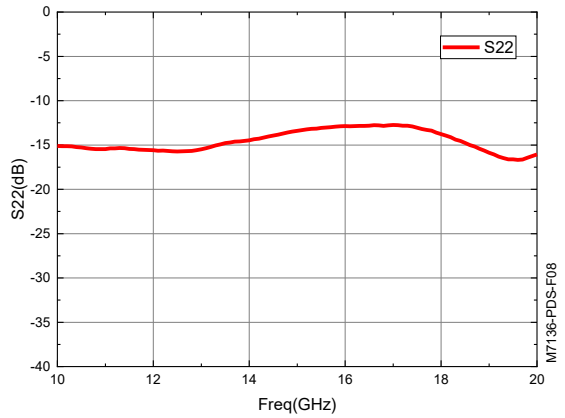


Figure 8. Rx Small-Signal S22 Characteristics

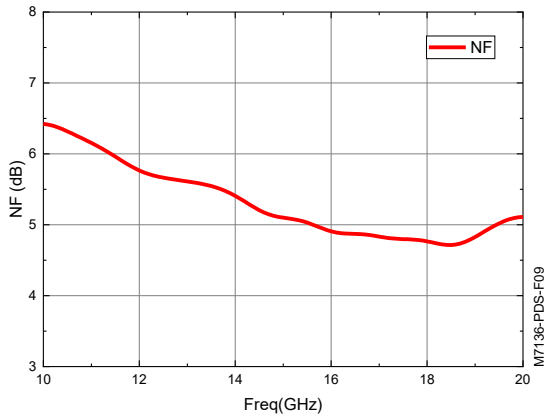


Figure 9. RX Small-Signal NF Characteristics

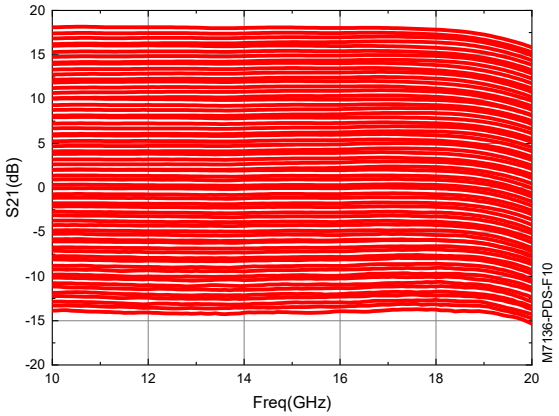


Figure 10. Rx Full-State S21 Characteristics

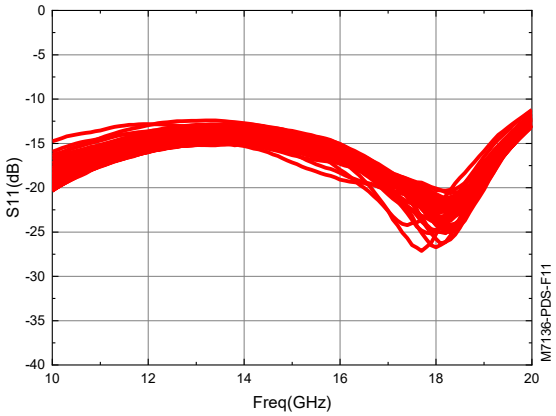


Figure 11. Rx Full-State S11 Characteristics

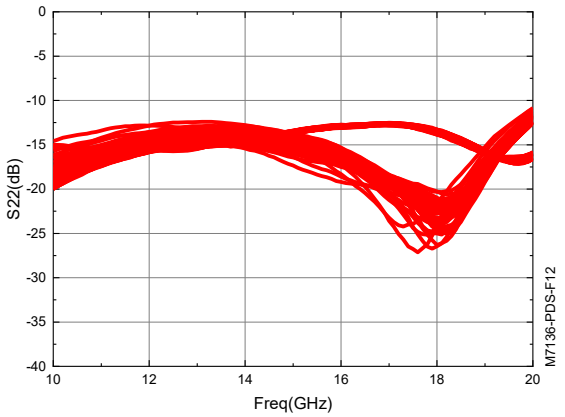


Figure 12. Rx Full-State S22 Characteristics

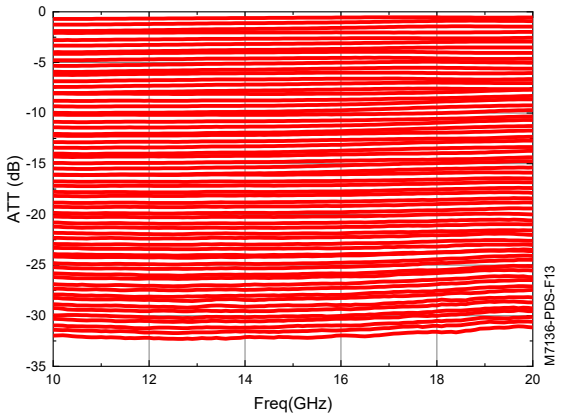


Figure 13. Rx Full-State Attenuation Characteristics

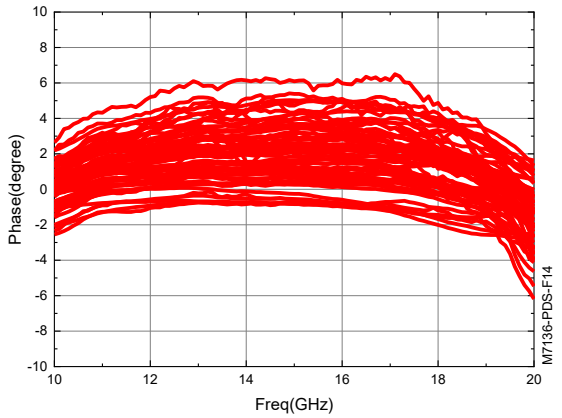


Figure 14 Full State Relative Phase Characteristics

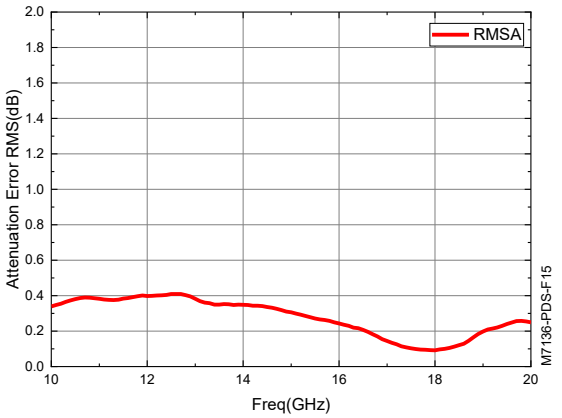


Figure 15. RMS Attenuation Error Characteristics

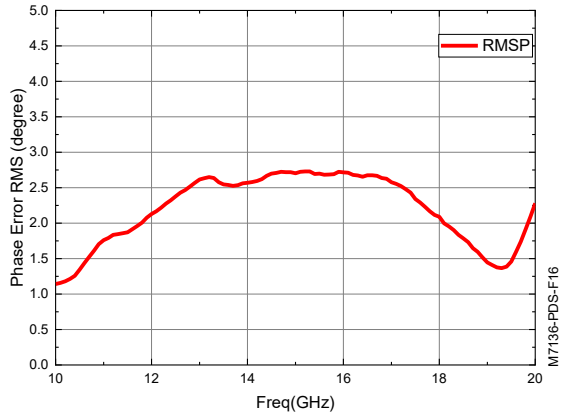


Figure 16. RMS Relative Phase Characteristics

■ Power Characteristic Curve

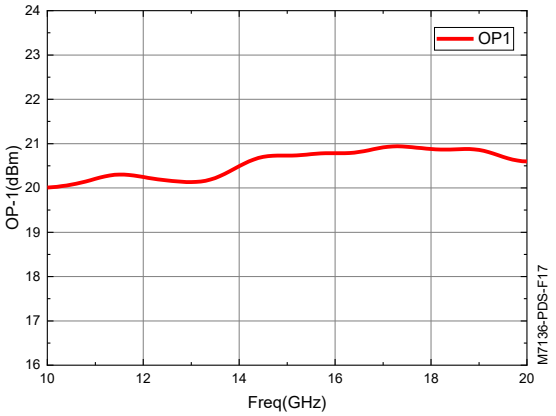


Figure 17. T_X OP_{-1dB} Characteristics

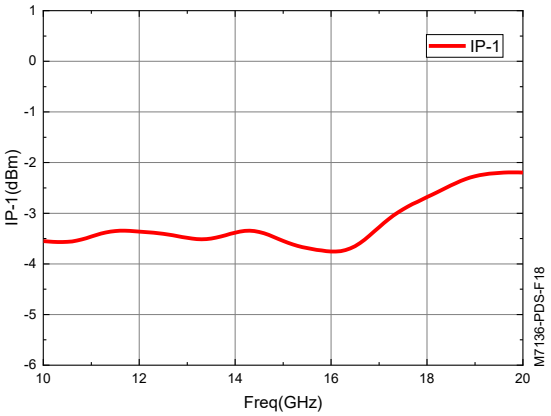


Figure 18. T_X IP_{-1dB} Characteristics

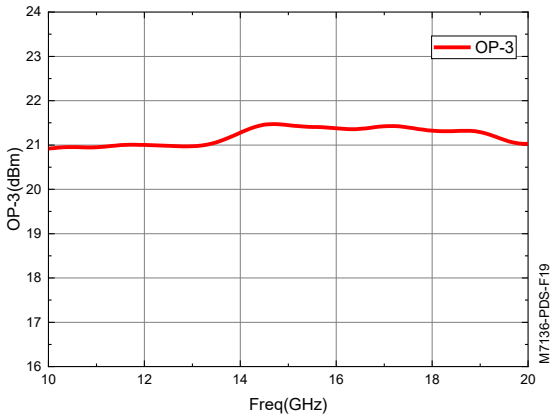


Figure 19. T_X OP_{-3dB} Characteristics

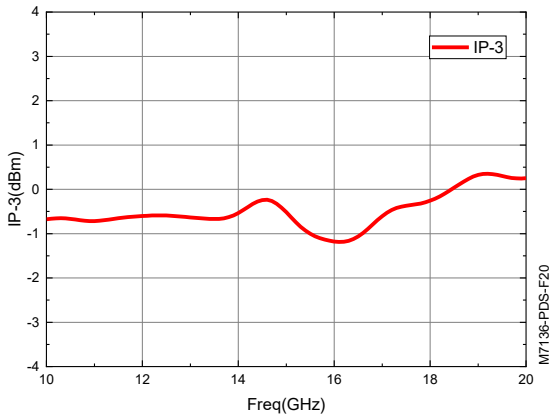


Figure 20. T_X IP_{-3dB} Characteristics

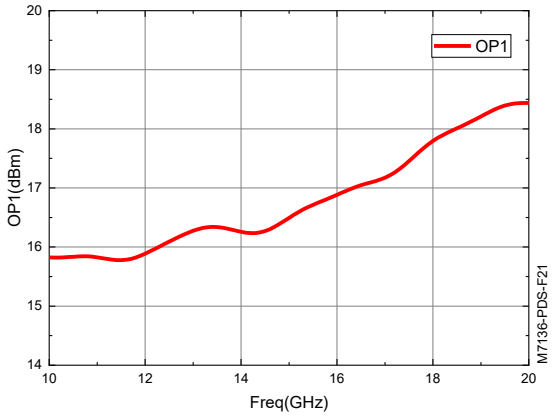


Figure 21. R_X OP_{-1dB} Characteristics

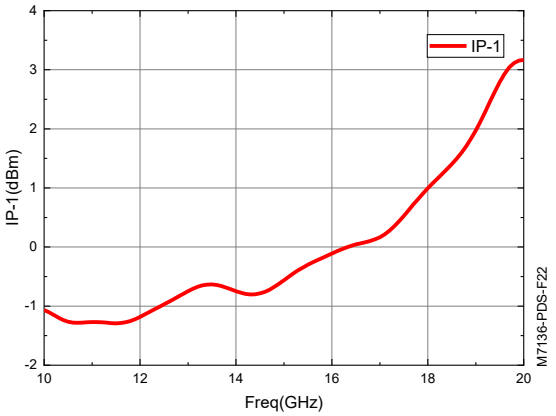
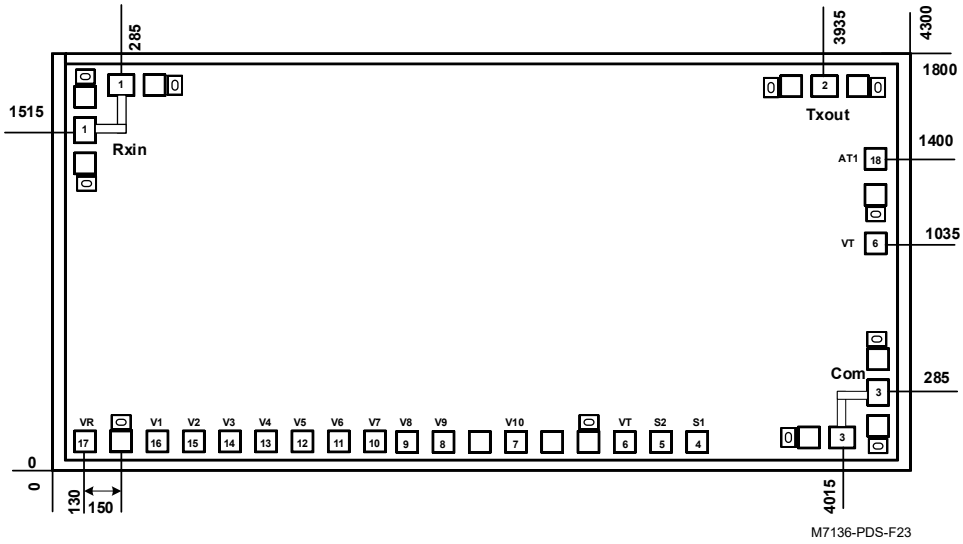


Figure 22. R_X IP_{-1dB} Characteristics

8. Outline Dimensions



- Dimensions shown in micrometre

Figure 23. M7136 Outline Dimensions

Table 4. Pad Description

Pad	Symbol	Description
1	Rxin	Rx Input (Arbitrary pad can be selected)
2	Txout	Tx Output
83	Com	Rx Output/ Tx Input (Arbitrary pad can be selected)
4-5	S1-S2	Control Voltage of Tx State and Rx state
6	VT	Tx Supply Voltage(Arbitrary pad can be selected)
7-16	V1-V10	Control Voltage of 6bit ATT
17	VR	Rx Supply Voltage
18	AT1	1dB ATT，Attenuation is realized by bonding wire to ground

Table 5. Truth Table

		S1	S2	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
Tx		0	-5	-	-	-	-	-	-	-	-	-	-
Rx	0dB	-5	0	0	-5	0	-5	-5	0	-5	0	-5	-5
	0.5dB	-5	0	0	-5	0	-5	0	0	-5	0	-5	-5
	1dB	-5	0	0	-5	0	-5	-5	0	-5	0	-5	0
	2dB	-5	0	0	-5	0	-5	-5	0	-5	-5	0	-5
	4dB	-5	0	0	-5	0	-5	-5	-5	0	0	-5	-5
	8dB	-5	0	0	-5	-5	0	-5	0	-5	0	-5	-5
	16dB	-5	0	-5	0	0	-5	-5	0	-5	0	-5	-5
	31.5dB	-5	0	-5	0	-5	0	0	-5	0	-5	0	0

9. Assembly Information

■ Assembly Diagram

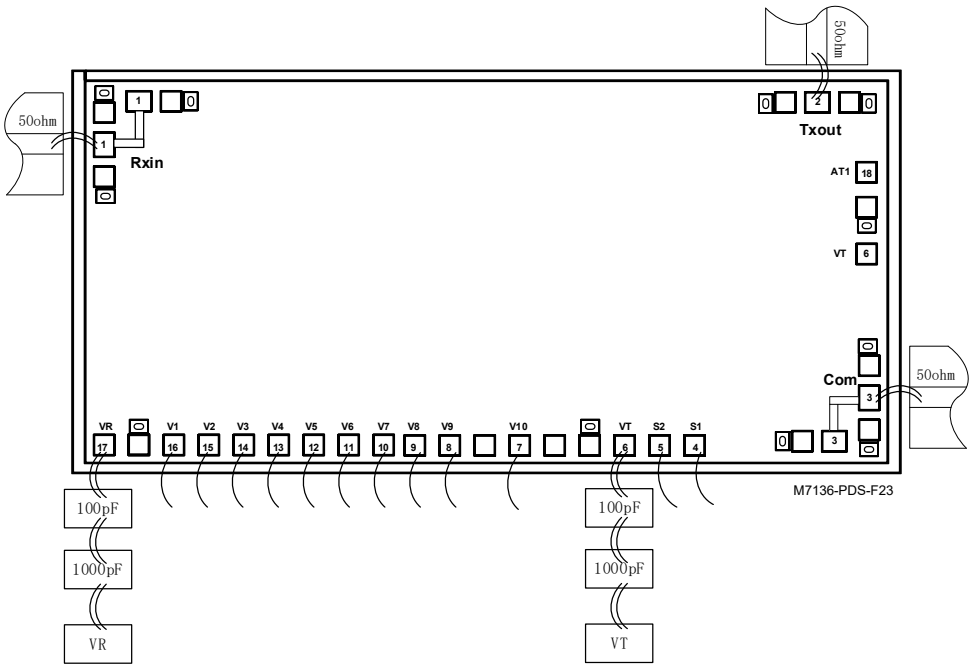


Figure 23. M7136 Assembly Diagram

- **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.