

D Band: 140-164GHz Compact Transmitter

2022-7-14

LO with X12 Amplified Frequency Multiplier Chain



Description:

AT-DTX-140164 is compact D Band Tx with RF frequency from 140-164GHz. LO link is with x12 amplified multiplier chain with input of 11.6-13.65GHz. IF inputs with I+/I- Q+/Q- is IQ port and can range from DC to 6GHz.

The Tx Module has high image rejection, low input/output return loss and flat conversion response. It's suitable for D band point to point communication, instrumentation, sensing, security and high resolution imaging applications.

For more information, please visit www.atmicrowave.com

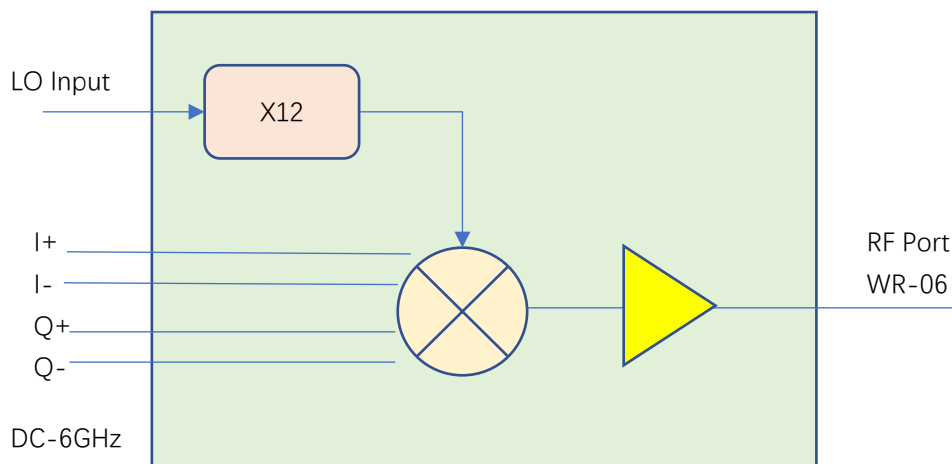
Feature

- ✓ RF: 140-164GHz
- ✓ LO: 11.6-13.65GHz with X12 Multiplier
- ✓ IF: DC-6GHz
- ✓ RF Output Pout: 0dBm
- ✓ Low LO power requirement

Application

- ✓ D band Imaging
- ✓ FOD (Foreigner Objects Debris)
- ✓ Test Equipment
- ✓ ROF (RF Over Fiber)
- ✓ Radar System

Diagram Block





AT-DTX-140164

140-164GHz D Band Transmitter

Electrical Specifications:

Parameter	Min	Typical	Max
RF		140-164 GHz	
LO		11.6-13.65 GHz	
LO Multiplier Factor		X12	
LO Driver	+3dBm	+5 dBm	+10
LO AMC (Amplified Multiplier Chain)		X12	
IF Range		DC-6 GHz	
IF Input P1dB		-5dBm/ch	
IF to RF Gain		0 dB	
RF Output Psat		0dBm	
Band Side Rejection Without calibration (Note1)		-12dBc	
12XLO Power Leakage to RF Port Without calibration (Note2)		-10dBm See plot	
Power Supply		+5V/ 240mA	
Temp Spec		25C	

Note 1:

- Adjust I/Q Balance for better band side rejection.
- AT Microwave doesn't test the balance calibration at present.

Note 2:

- Apply DC offset to I+/I-, Q+/Q- for better LO cancellation;
- Normally less than +/-150mV. Never over +/-300mV or the IQ Mixer will be damaged.
- Different dc offset value required for different frequencies.
- DC offset will vary from unit to unit;
- AT Microwave doesn't guarantee the improved value for the LO cancellation.

Notes:

1. Datasheet may be changed according to update of MMIC, Raw materials , process, and so on.
2. This data is only for reference, not for guaranteed specifications.
3. Please contact AT Microwave team to make sure you have the most current data.





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Mechanical Information

Parameter	Description
RF Port	WR-06
LO Port	SMA Female
IF Port	SMA Female
Weight	To be added
Dimension	See outline

Absolute Maximum Ratings Table

Parameter	Value
IF Power/ch	+7dBm
LO Port	+15dBm
Power Supply	+9V
Operating Temperature	0 to +50C
Storage Temperature	-65 to +150C

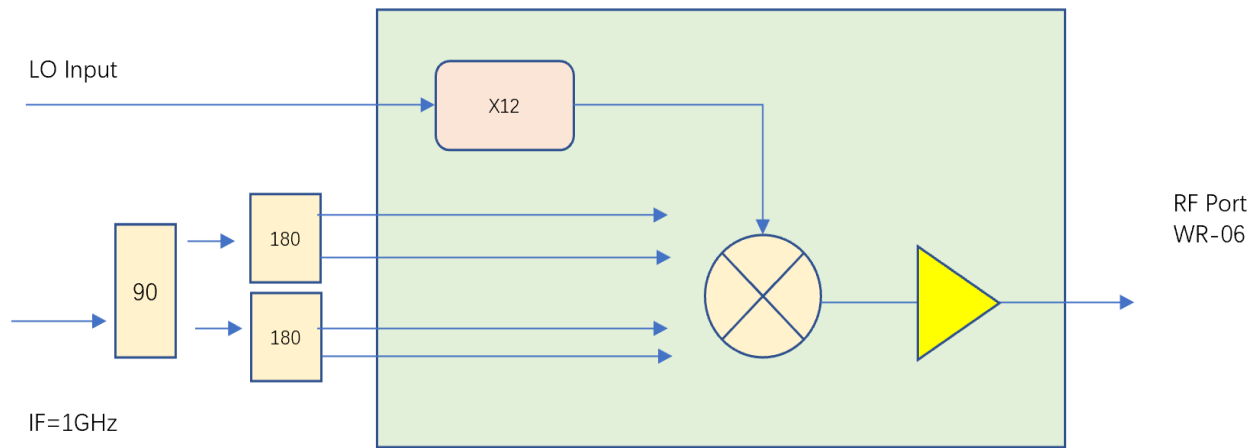
Test Condition

Parameter	Description
IF Frequency	1GHz
IF Input Power	0dBm/Ch
RF Frequency	RF=LO+IF
LO Power	+5dBm

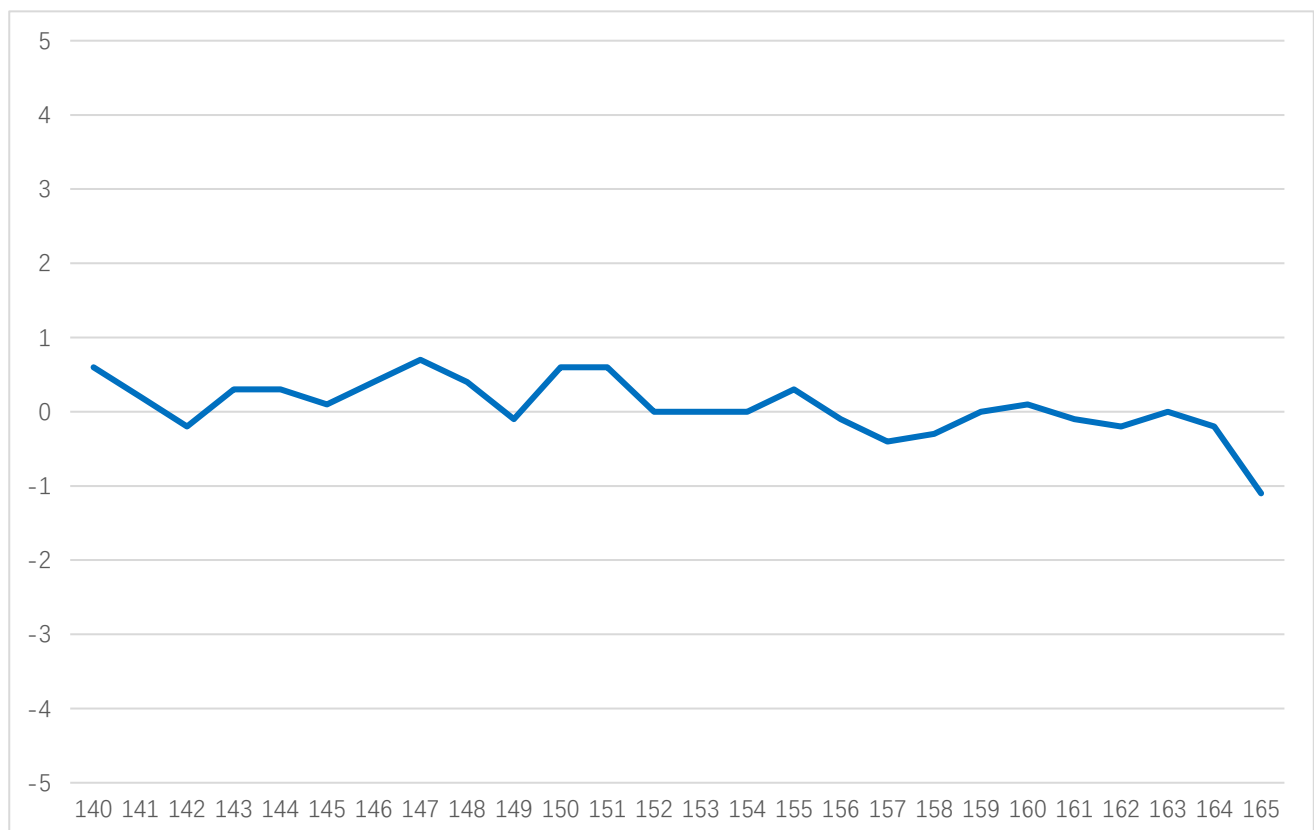


Test Data (25C)

Please note that test data will vary slightly from unit to unit.



Test Set up



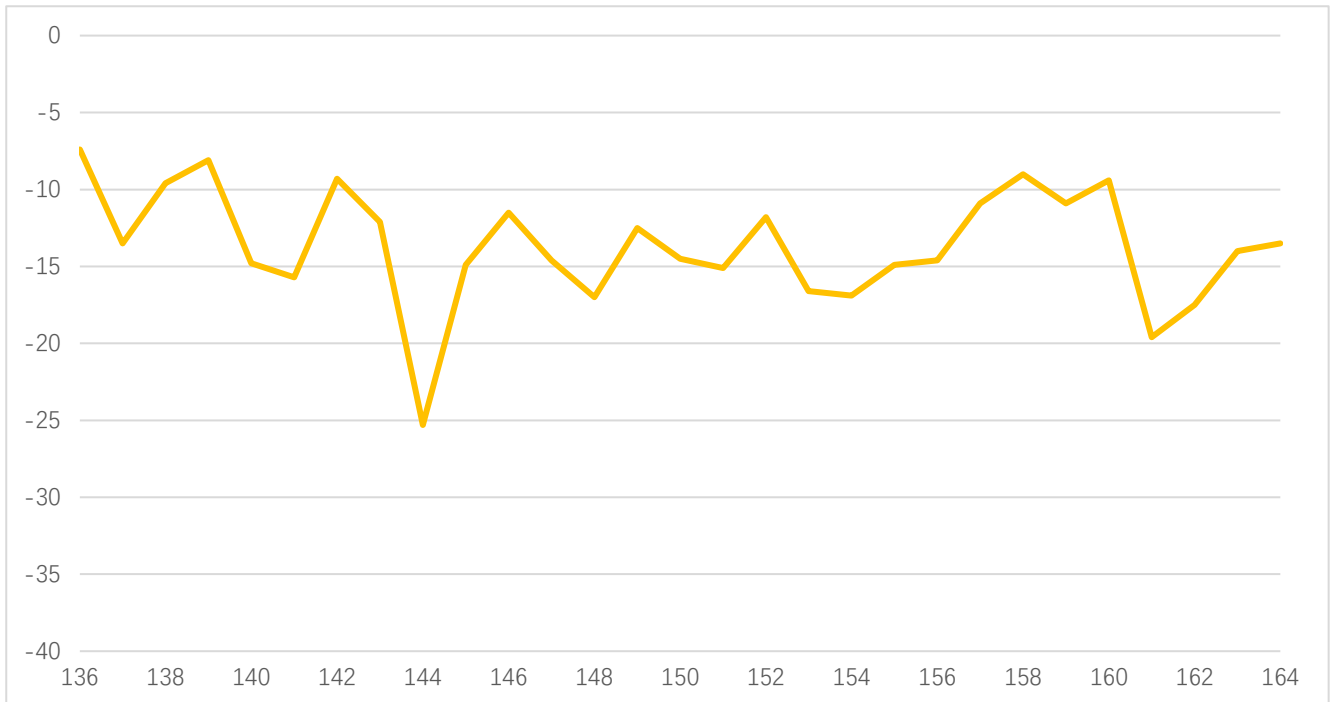
Pout vs Frequency, IF Input=0dBm/Ch



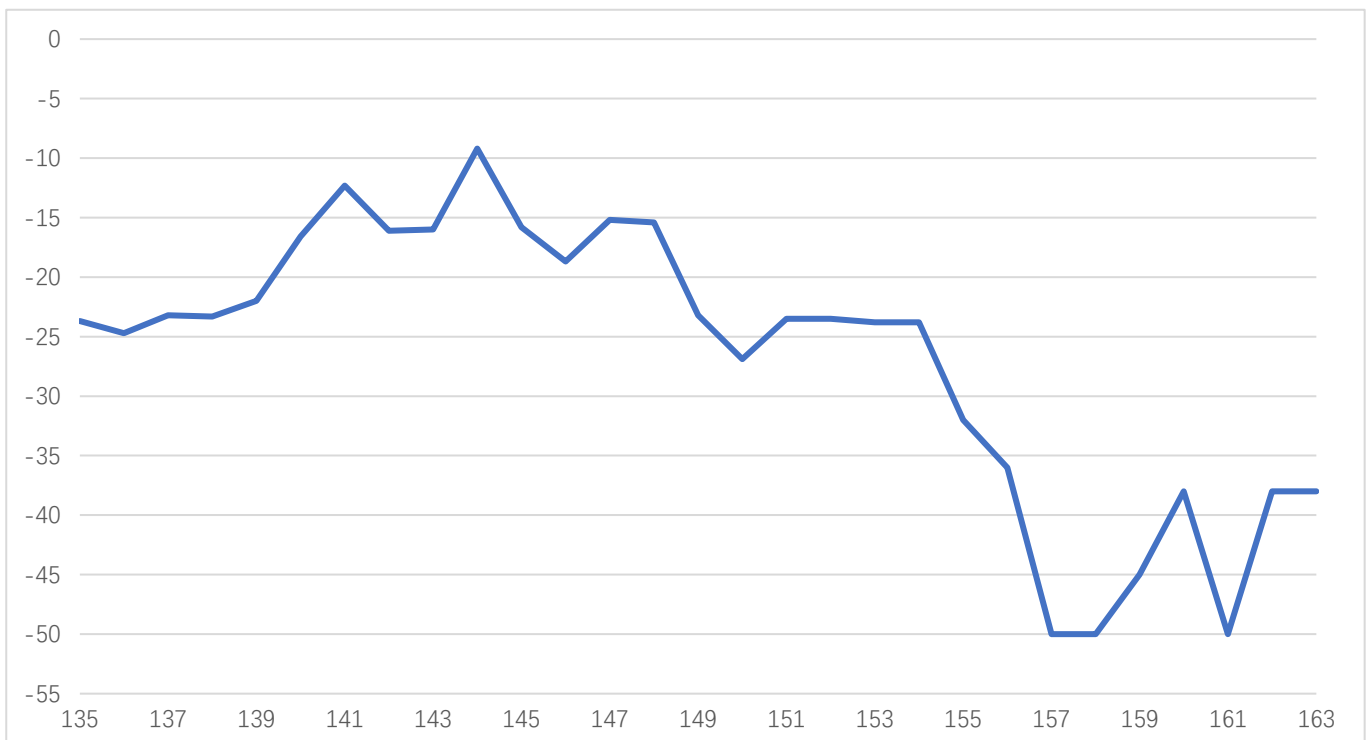


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Low side band (LO-IF) Rejection vs RF Frequency (LO+IF)



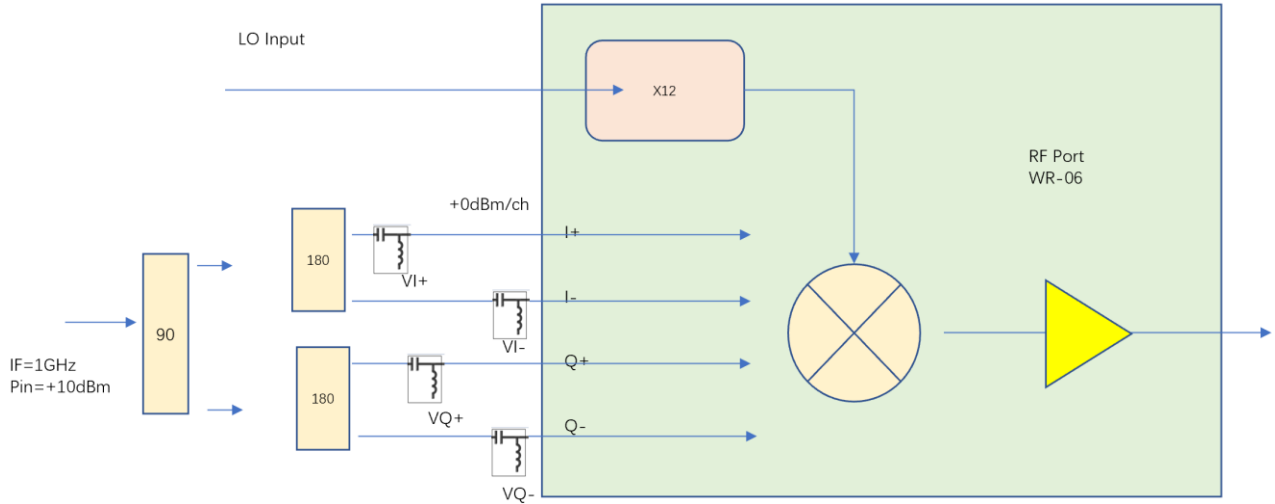
12XLO Leakage to RF Port, dBm vs LO Frequency

Power test from spectrum analyzer by down-converter module

I+/I-, Q+/Q- dc offset required for better 12XLO Leakage.

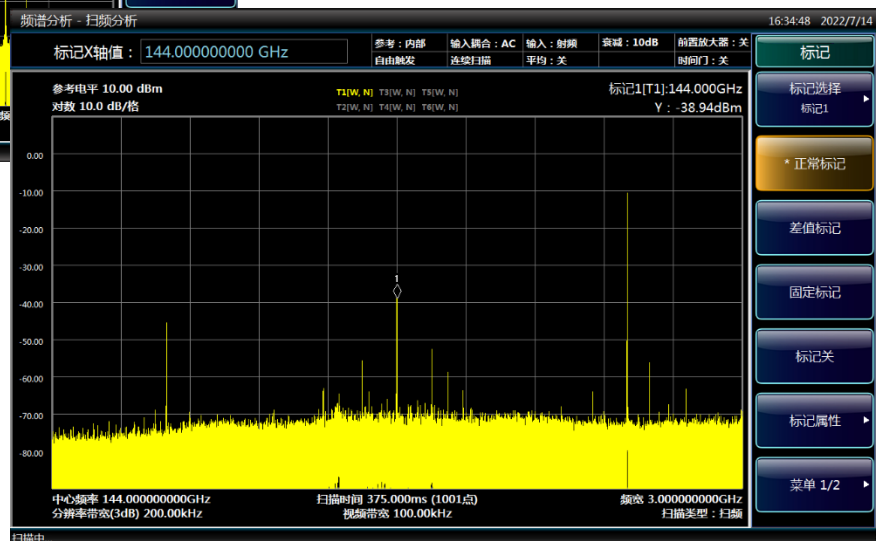
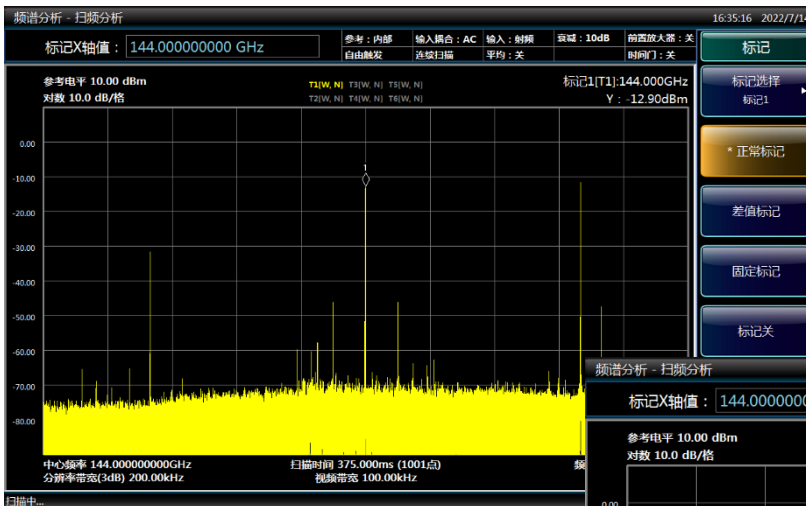


DC Offset test for LO cancellation



LO Cancellation test set-up

1. We have the worst 12XLO leakage at 144GHz, Reading -12.9dBm from spectrum analyzer.
2. Apply dc offset to I+/-, Q+/-, by Bias Tee AT-BTL-0018HC1.
3. Adjust the dc offset between +/-150mV, and LO leakage reduces to -38.9dBm, with -27dB improved.



Application Note

Mixer is a three port component with RF, LO and IF ports. Normally, a mixer can be used both up and down converter application. Take up converter for example:

General Balance Mixer

For general balance mixer, $RF = LO \pm IF$. There will be both high end $LO+IF$ and Low End $LO-IF$. Take for example, $IF=2GHz$, $LO=94GHz$, so there will be $92GHz$ and $96GHz$ at RF port with same power level.

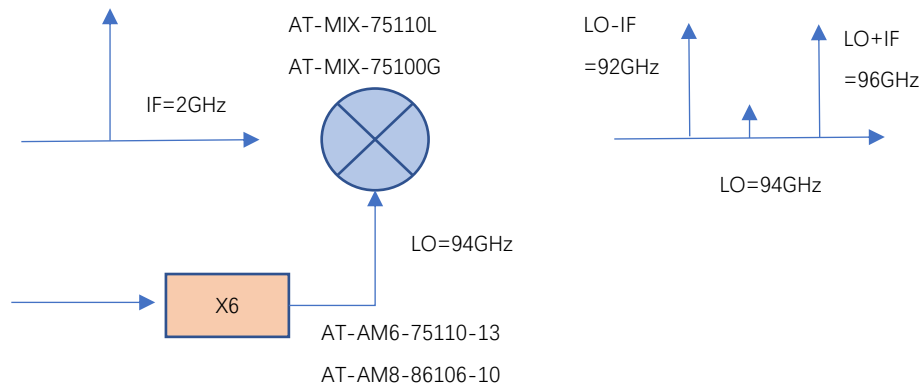


Figure A: General Balance Mixer with Both High and Low Side Output

IQ Mixer used as side suppression Mixer

When $IF=2GHz$, 90 degree hybrid is used at IF port, and IF applies to Input 1 Port of hybrid, you will have high end frequency $RF=LO+IF=96GHz$, while have side suppression (say $-25dBc$) at Low end frequency $92GHz$.

When you need low end frequency $92GHz$, and make side suppression for high end frequency $96GHz$, just applies IF to Input 2 of the hybrid.

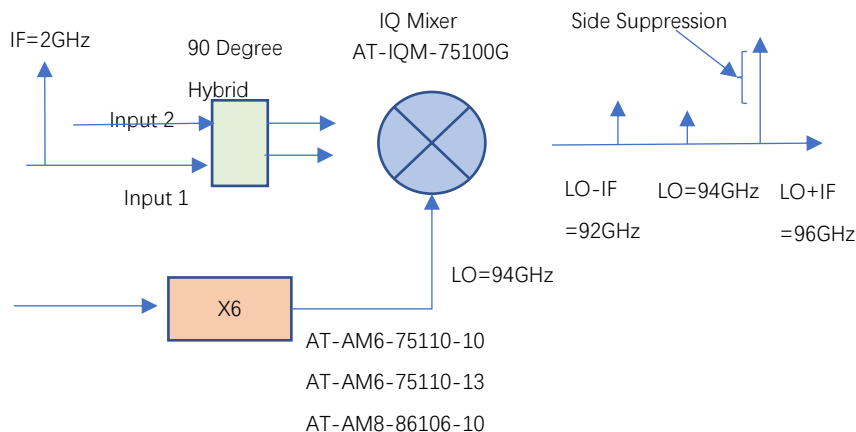


Figure B: IQ Mixer works as side suppression mixer



Dimension (mm)

