

D Band: 140-164GHz Compact Transmitter

2023-4-25

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

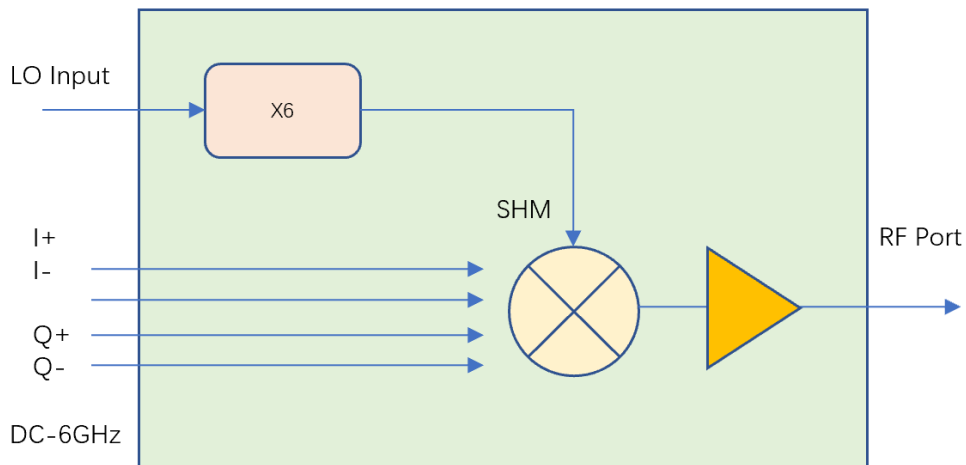
Feature

- ✓ 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)		X6	
6XLO Range		70-82GHz	
Mixer Type		Sub-harmonics Mixer	
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.





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Mechanical Information

Parameter	Description
RF Port	WR-06
LO Port	SMA Female
IF Port	SMA Female
Case Material (Note)	Copper
Finish	Gold Plated
Weight	270g
Dimension	See outline

Note: Aluminium for lighter weight is available according to request

Absolute Maximum Ratings Table

Parameter	Value
IF Power	+7dBm
LO Port	+15dBm
Power Supply	+7V
Operating Temperature	0 to +50C
Storage Temperature	-45 to +85C

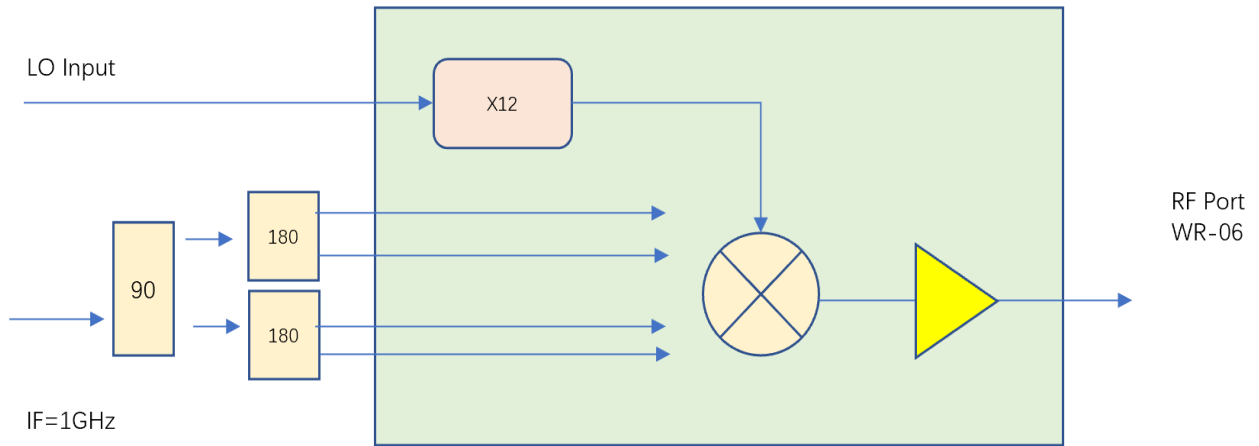
Notes:

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.

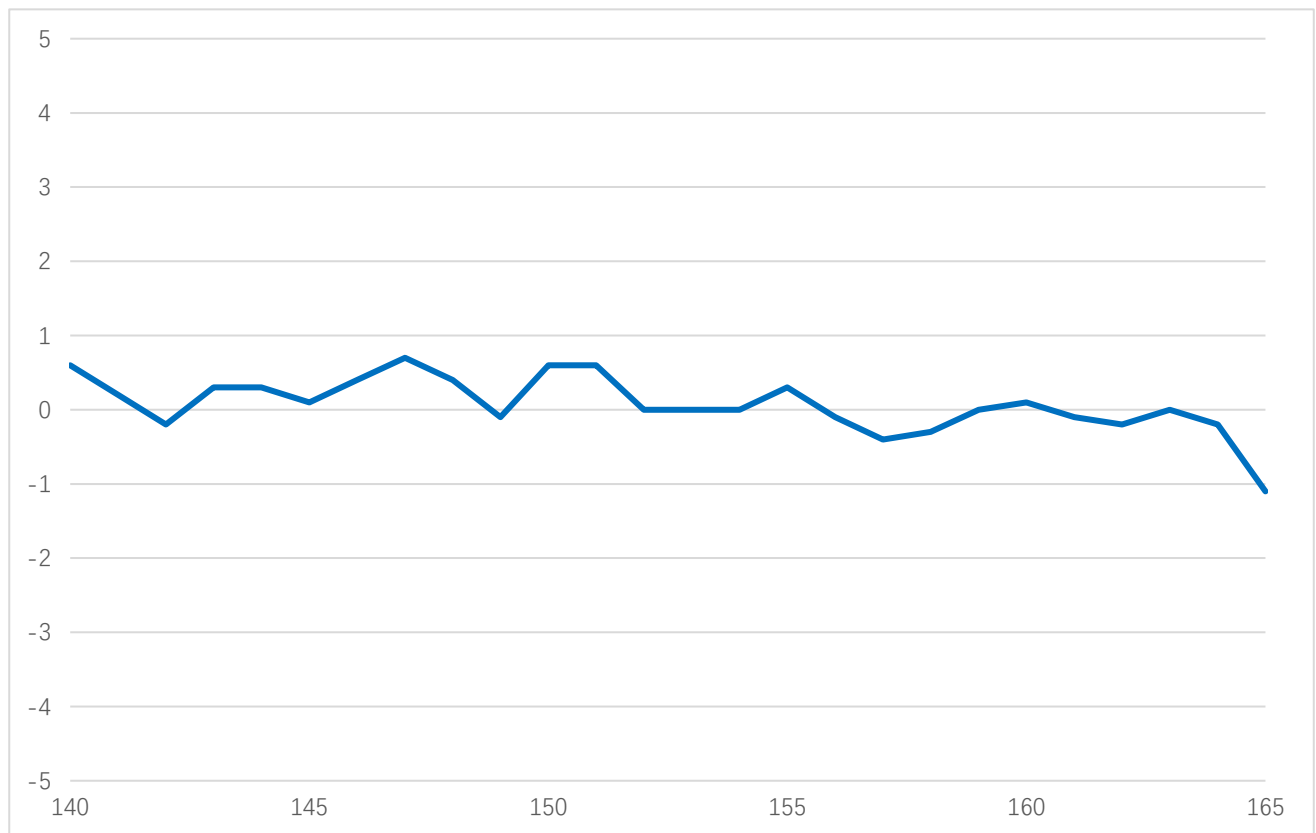


Test Data (25C)

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



Test Set up



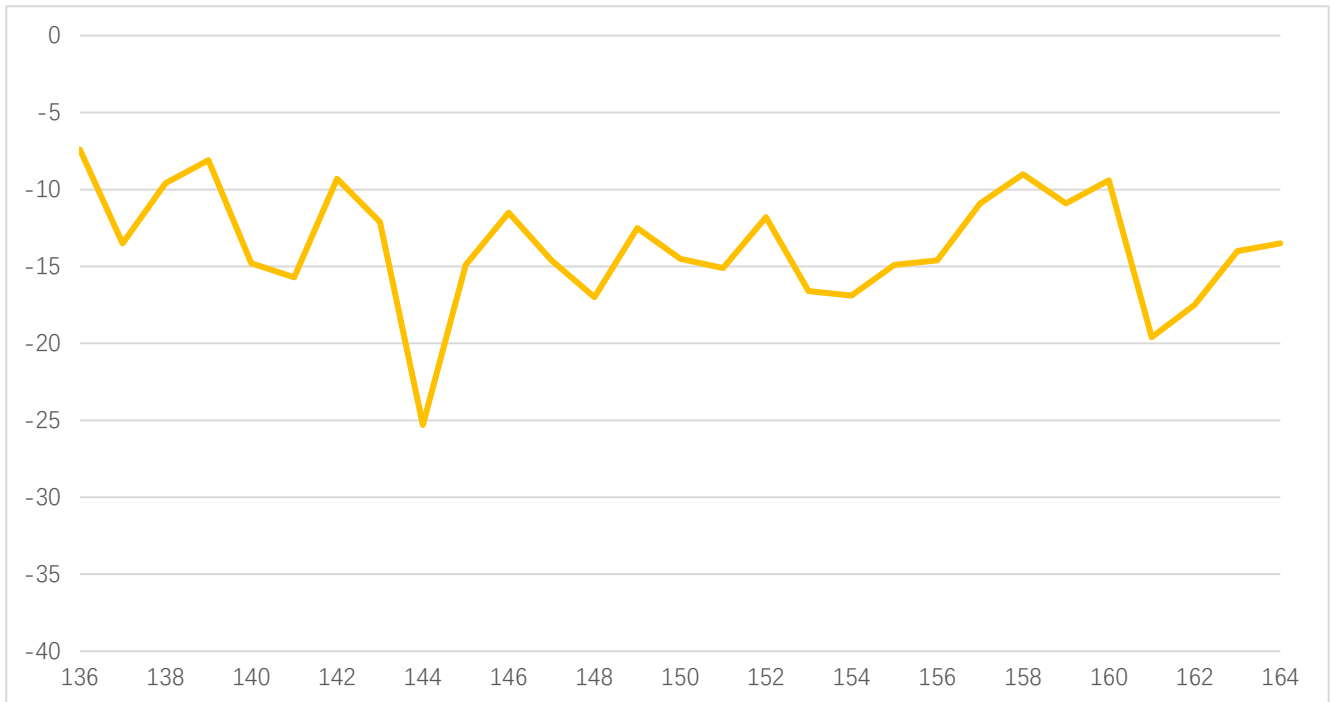
Pout vs Frequency, IF Input=0dBm/Ch



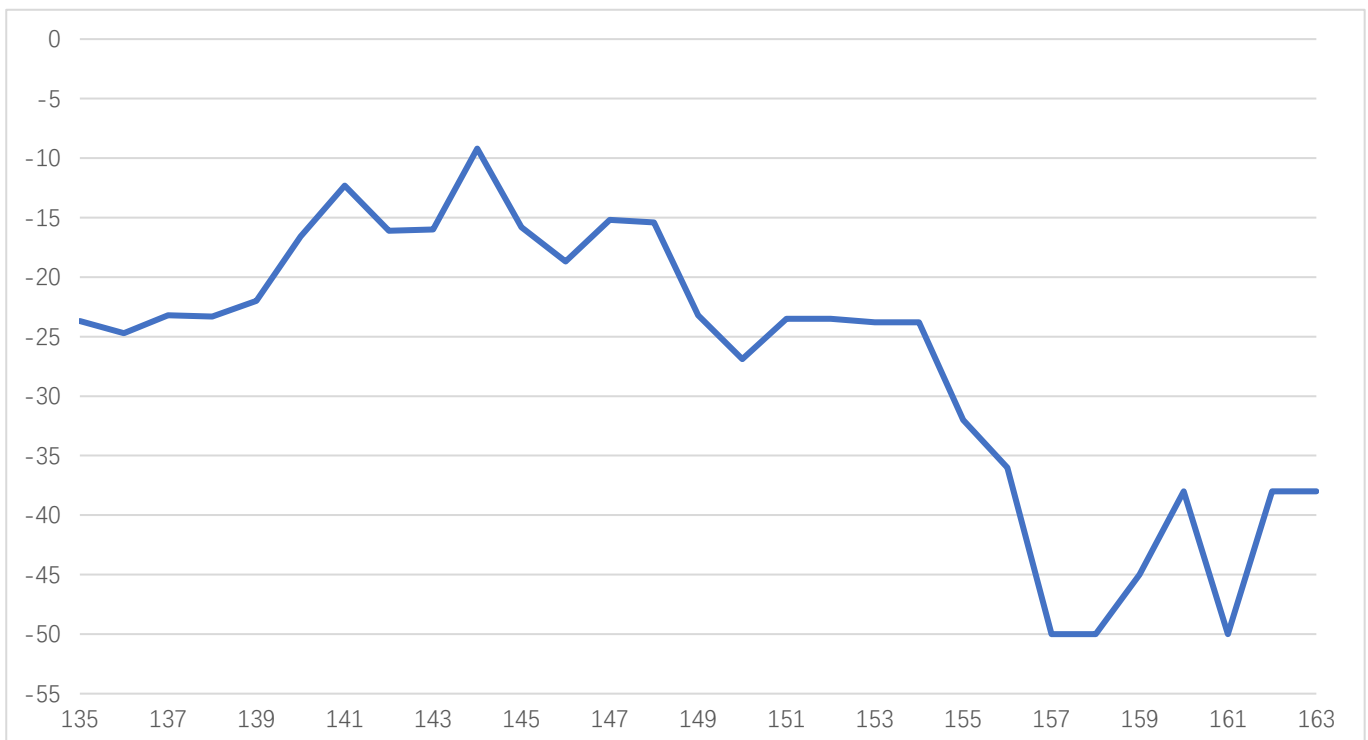


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Low side band (LO-IF) Rejection vs RF Frequency (LO+IF)



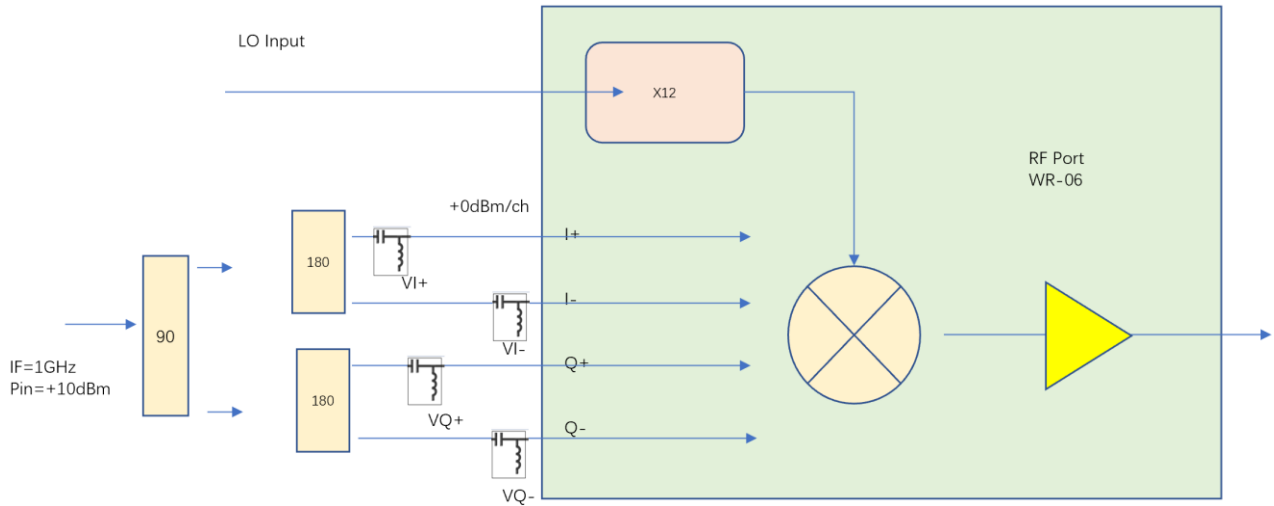
12XLO Leakage to RF Port, dBm vs LO Frequency

Power test from spectrum analyzer by down-converter module

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



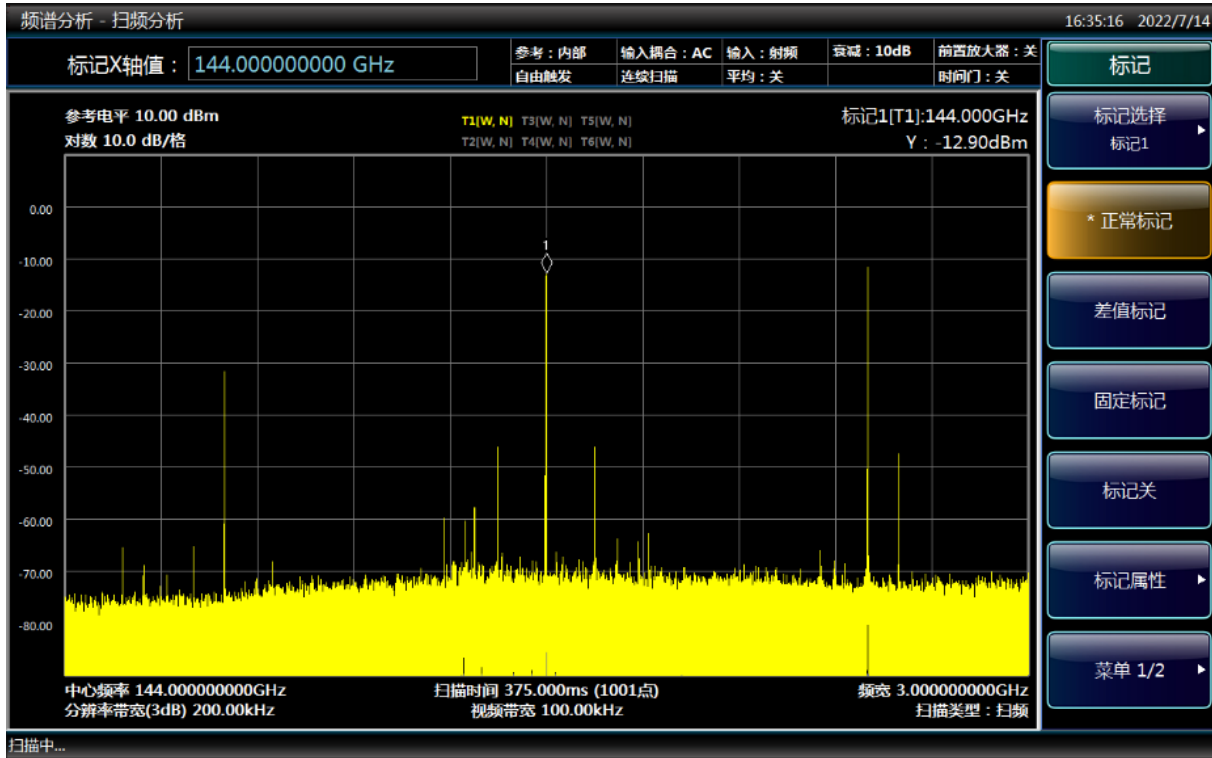
DC Offset test for LO cancellation



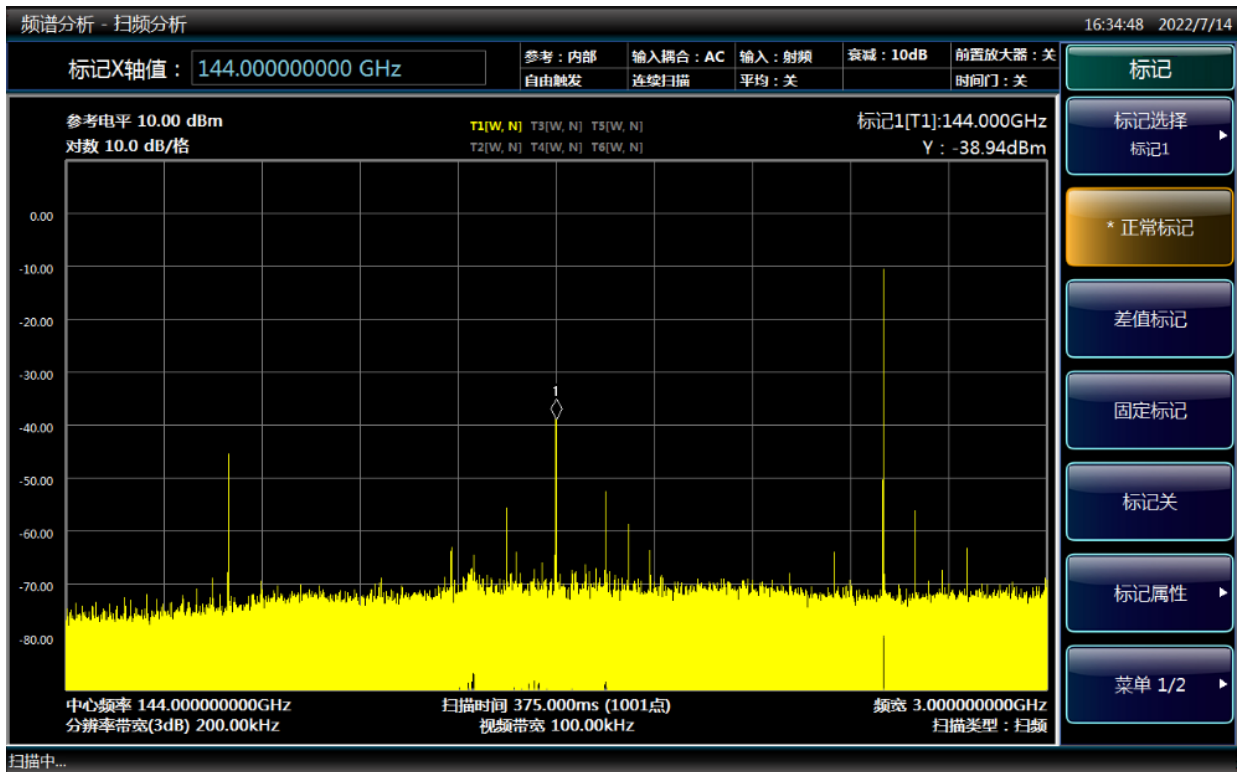
LO Cancellation test set-up

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





LO leakage=-12.9dBm before calibration



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.

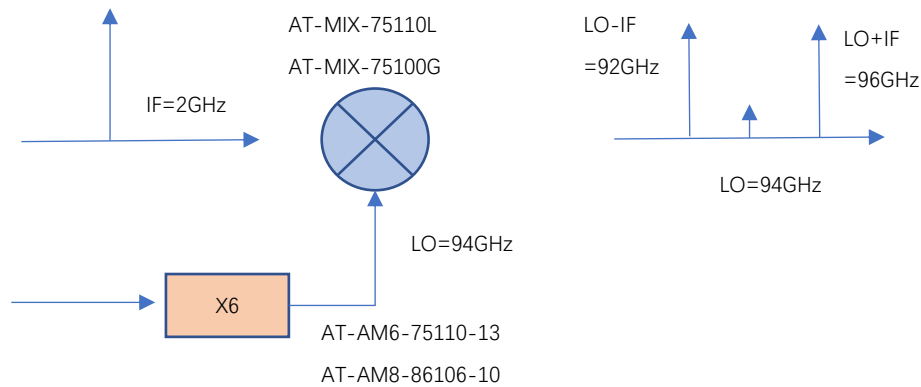


Figure A: General Balance Mixer with Both High and Low Side Output

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.

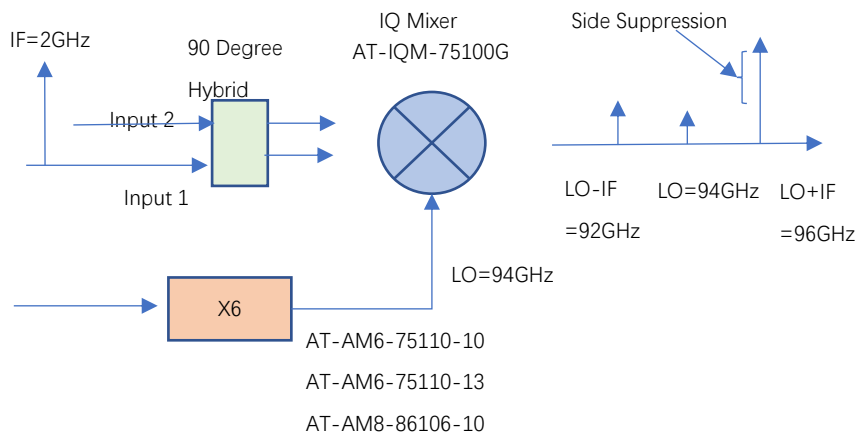


Figure B: IQ Mixer works as side suppression mixer



Dimension (mm)

