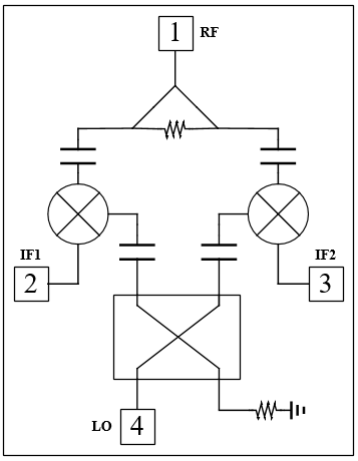
Product Overview

The ASM6002 is a compact I/Q MMIC mixer which can be used as either an Image Reject Mixer or a Single Sideband Up converter. The chip utilizes two standard double balanced mixer cells and a 90 degree hybrid fabricated in a GaAs process. All data shown below is taken with the chip mounted in a 50 Ohm test fixture and includes the effects of 1 mil diameter and 20 mil length bond wires on each port. A low frequency quadrature hybrid was used to produce a 0.1 GHz IF output. This product is a much smaller alternative to hybrid style Image Reject Mixers and Single Sideband Up converter assemblies.

Key Features

1. Fully Integrated, High Performance I/Q Mixer
2. RF/LO Bandwidth: 7.5 GHz to 11.5 GHz
3. Wide IF Bandwidth: DC to 1.6 GHz
4. Image Rejection: 25 dB
5. LO to RF Isolation: 40 dB
6. High Input IP3: +25 dBm
7. 50 Ohm Matched Input/output
8. Die Size: 2.8 x 1.4 x 0.1 mm

Functional Block Diagram



Applications

1. Point-to-Point and Point-to-Multi-Point Radio
2. VSAT

Absolute Maximum Rating

RF/IF Input	+33 dBm
LO Drive	+33 dBm
Channel Temperature	175 °C
Continuous Pdiss(T = 85 °C)	0.55 W
Thermal Resistance (channel to ground pad)	55 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

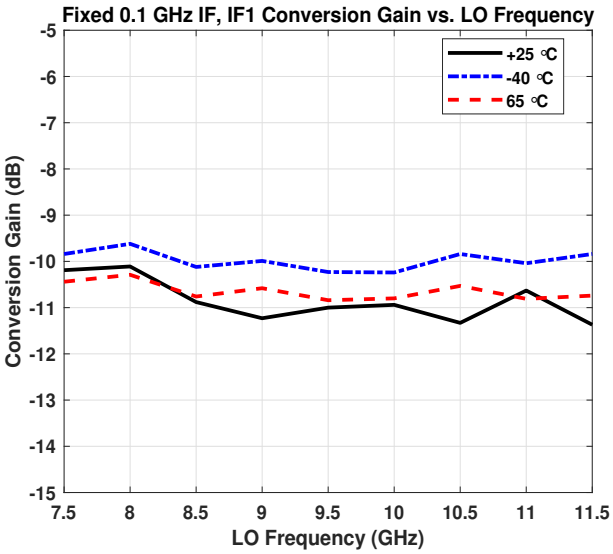

ELECTROSTATIC SENSITIVE DEVICE OBSERVE HANDLING PRECAUTIONS

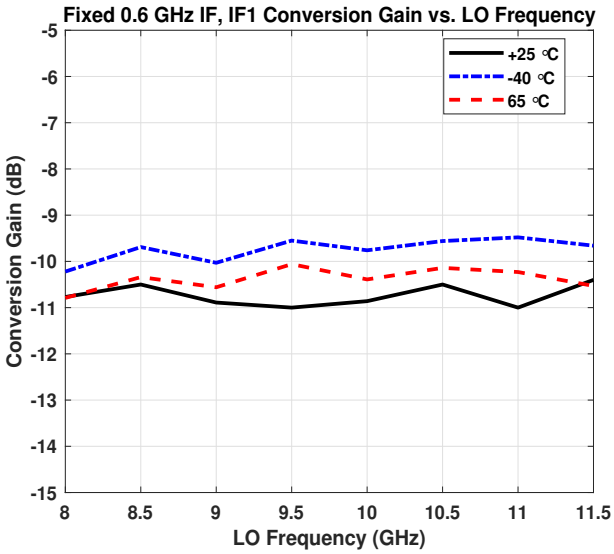
Electrical Specifications

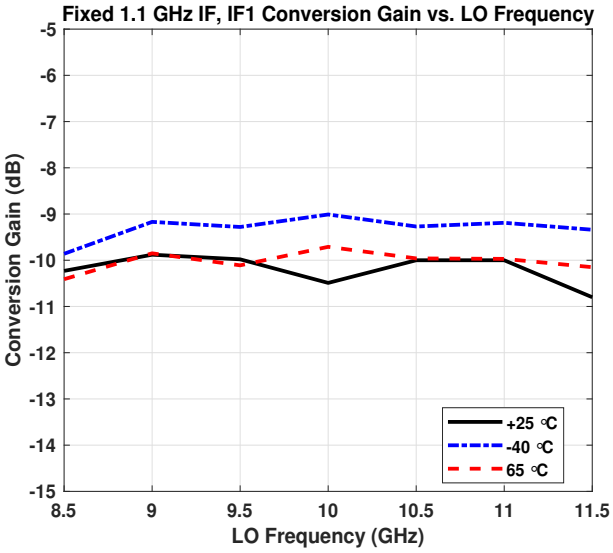
Parameter	Min.	Typ.	Max.	Units
Frequency Range, RF/LO	-	7.5 – 11.5	-	GHz
Frequency Range, IF	-	DC – 1.6	-	GHz
Conversion Loss (As IRM)	-	7.5	9.5	dB
Image Rejection	18	23	-	dB
1 dB Compression (Input)	-	20	-	dBm
LO to RF Isolation	35	40	-	dB
LO to IF Isolation	25	30	-	dB
IP3 (Input)	-	25	-	dBm
Amplitude Balance	-	0.5	-	dB
Phase Balance	-	5	-	Deg

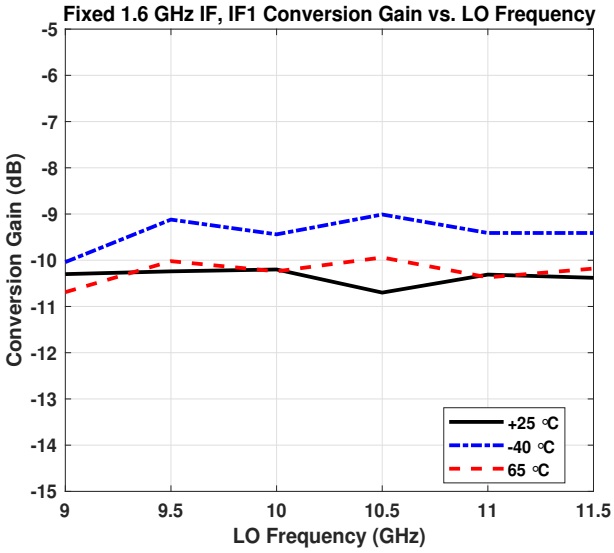
Test conditions unless otherwise noted:TA=+25° C, LO=+21dBm

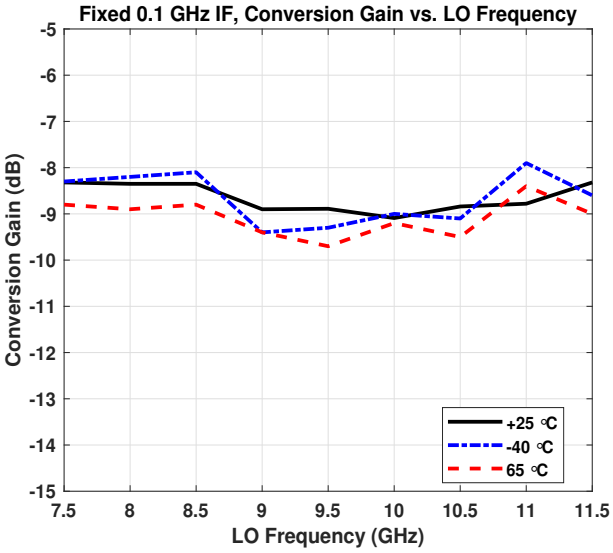
Quadrature Channel Data Taken Without IF Hybrid











* Conversion Gain data taken with external IF hybrid

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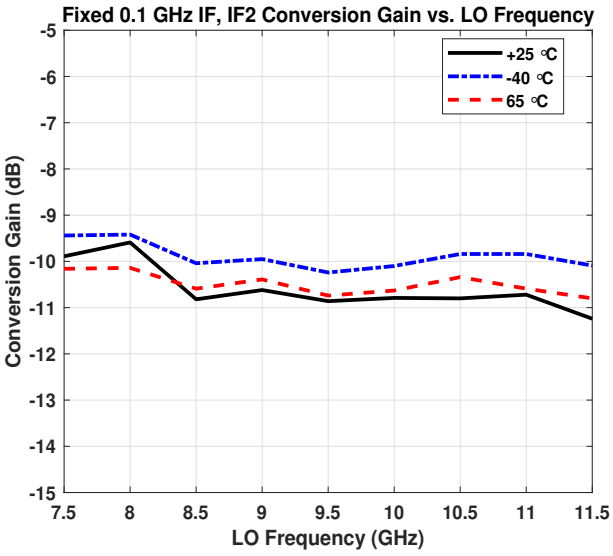

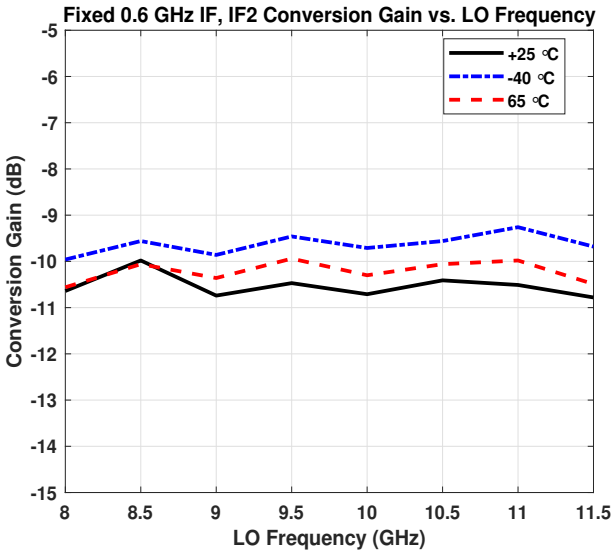

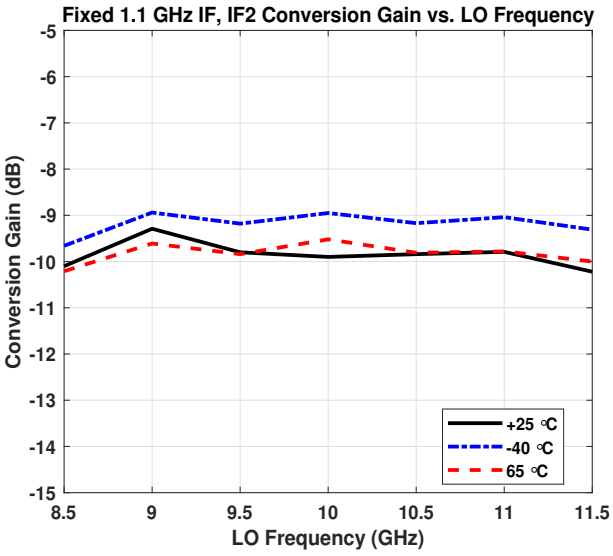

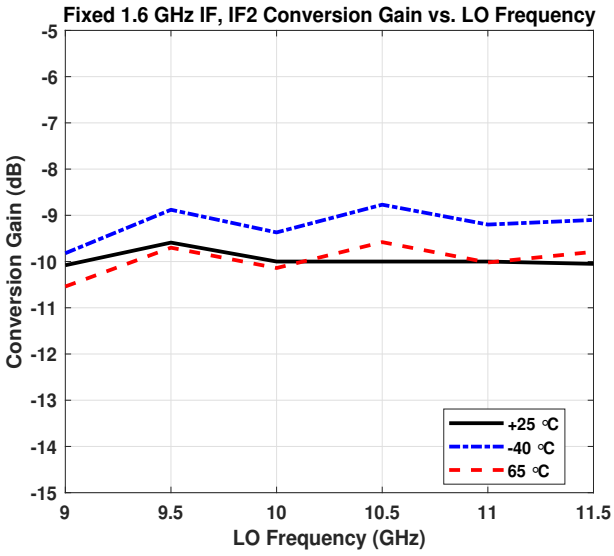

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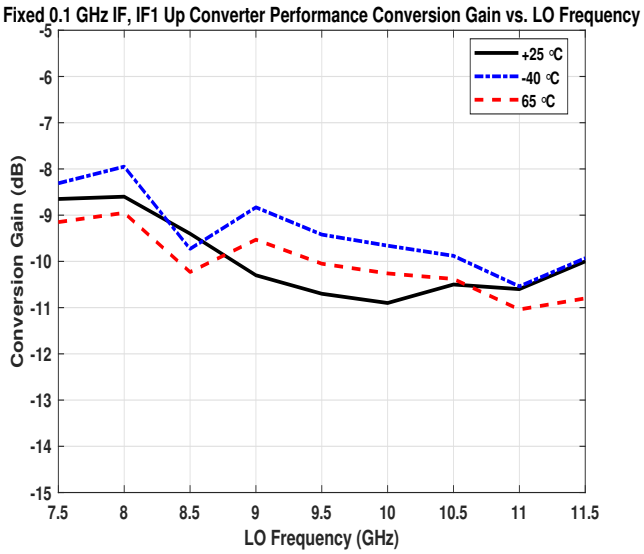

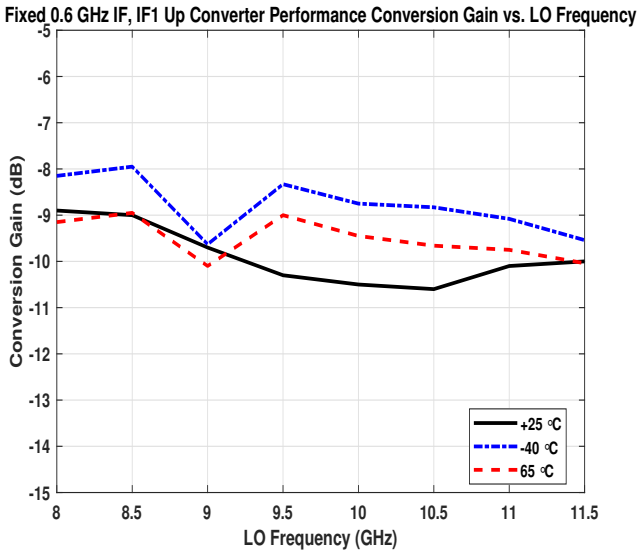

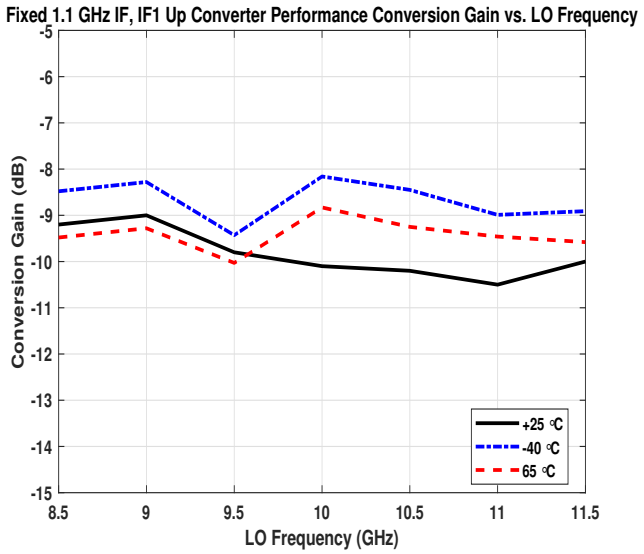

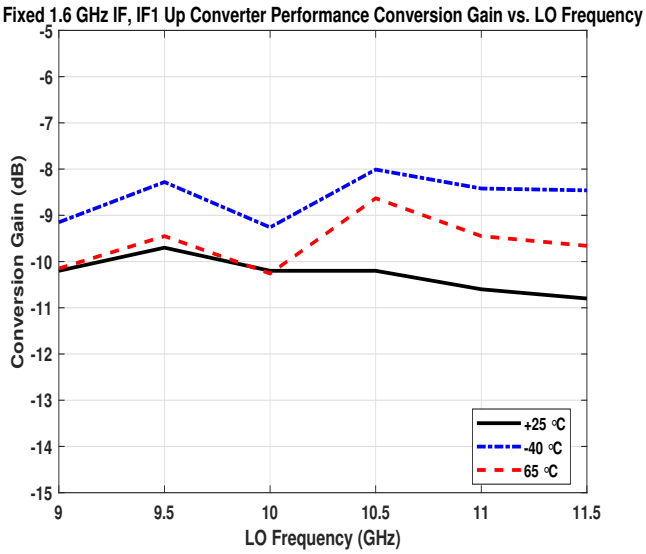

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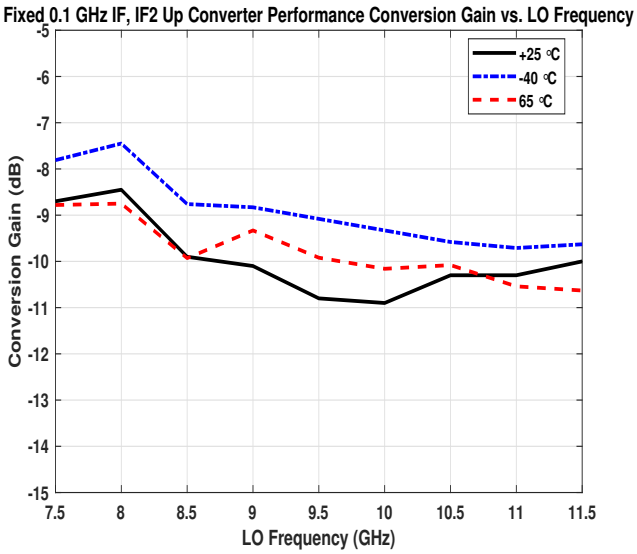

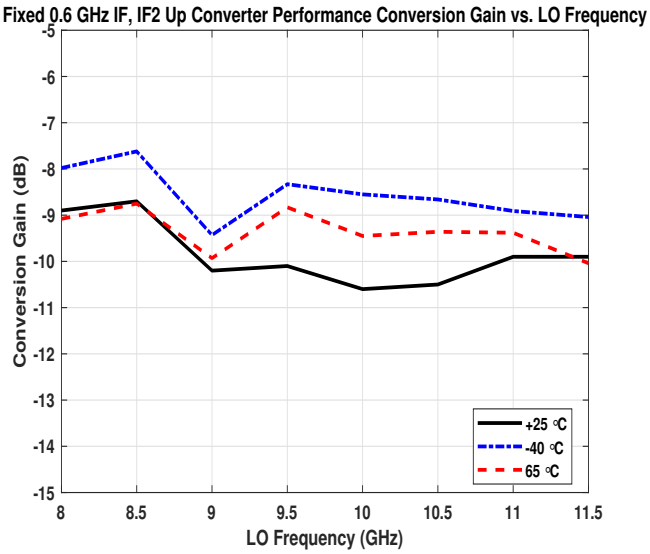

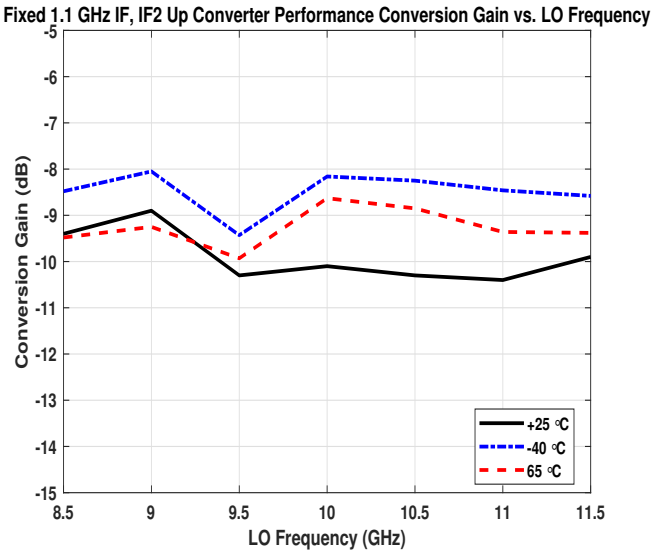

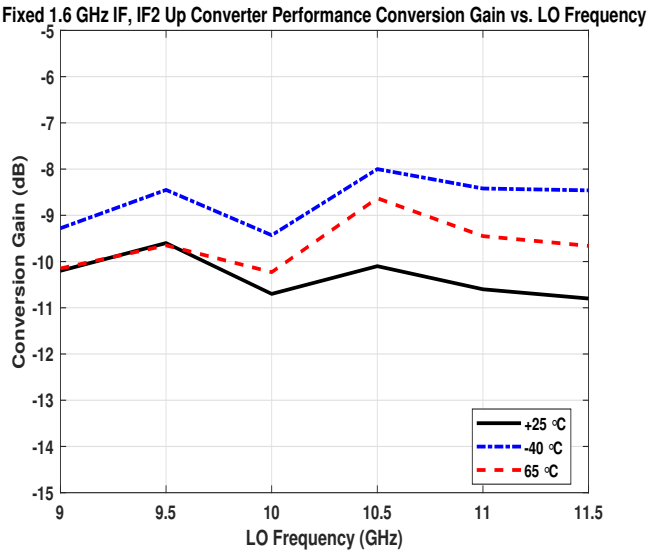

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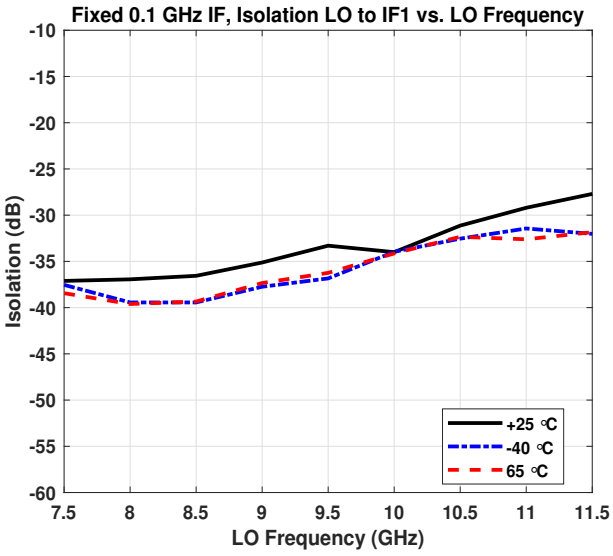

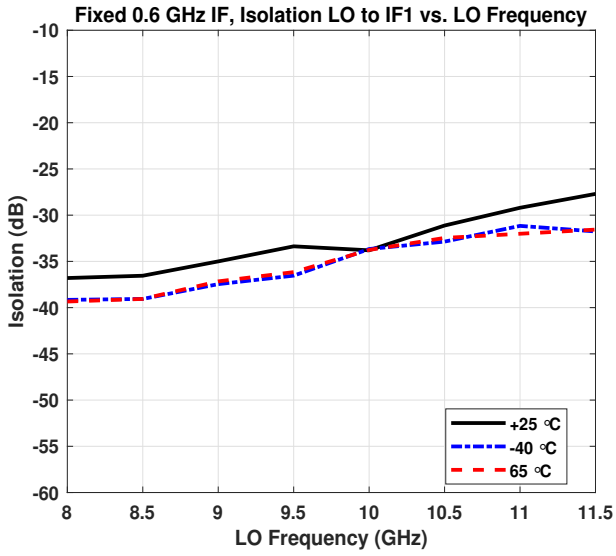

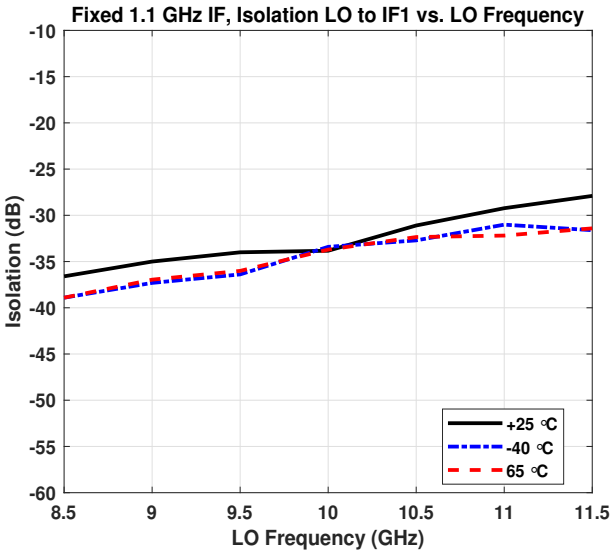

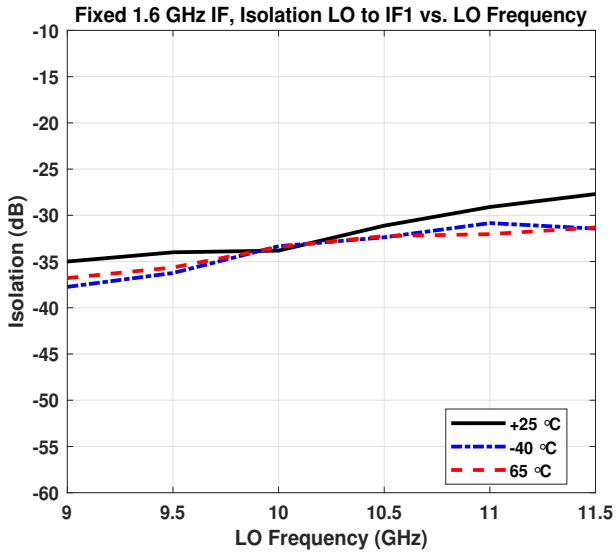

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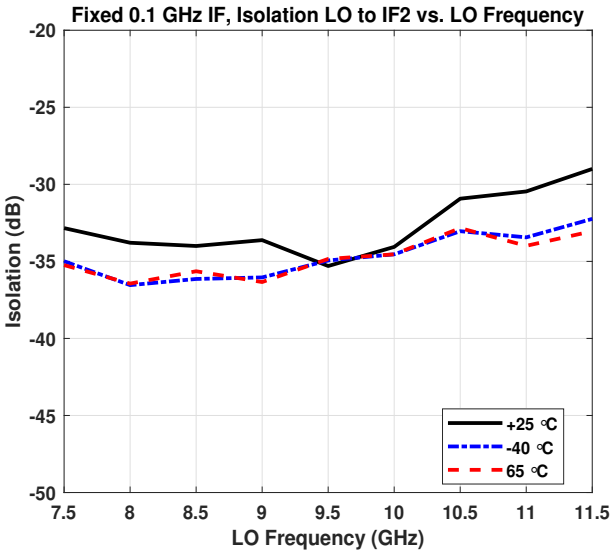

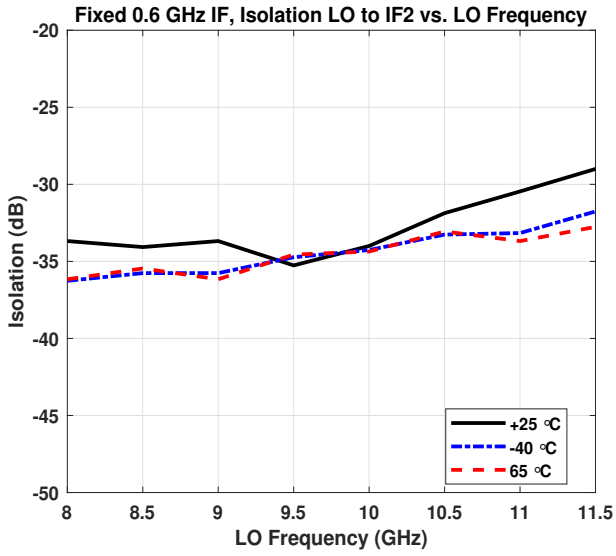

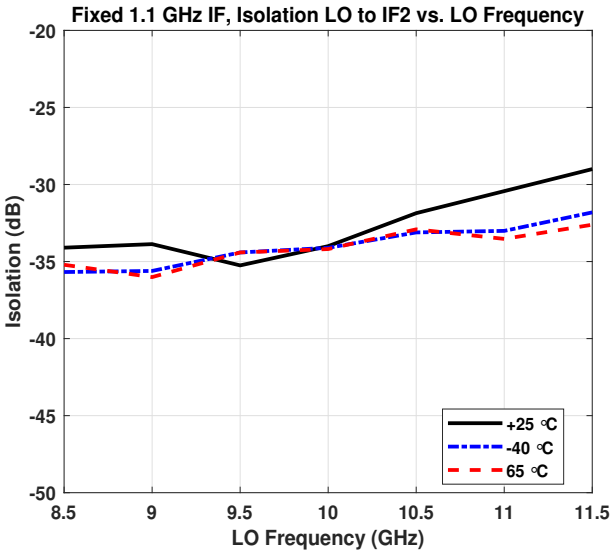

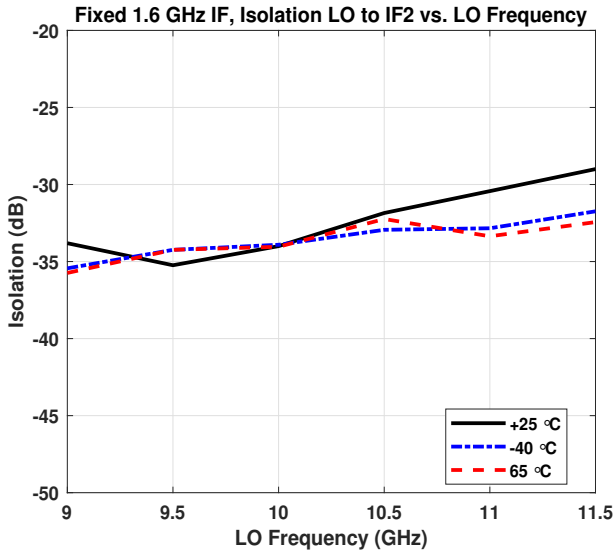

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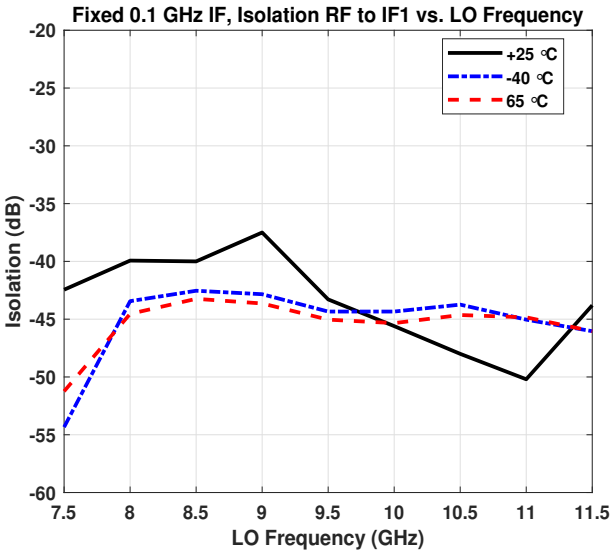

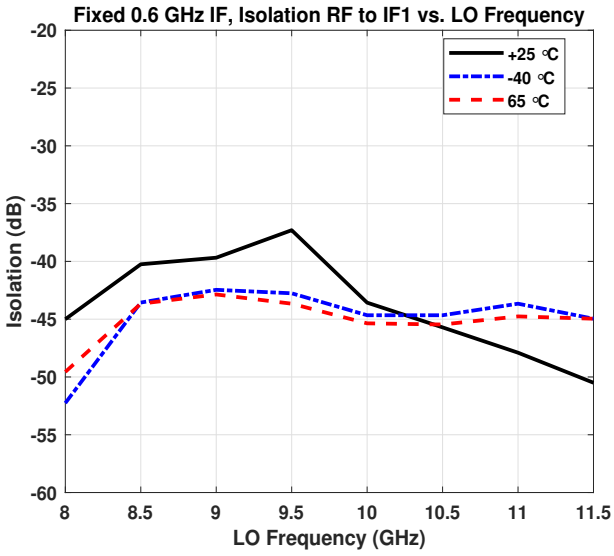

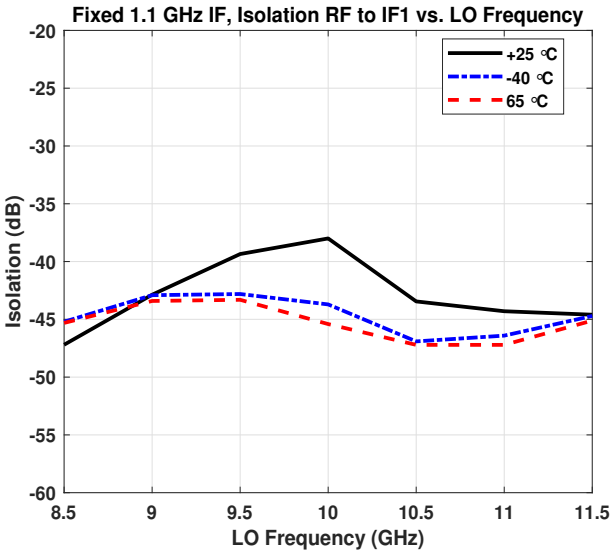

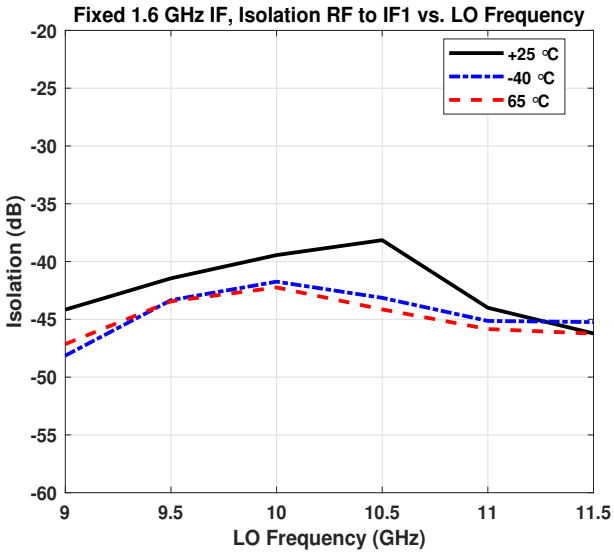

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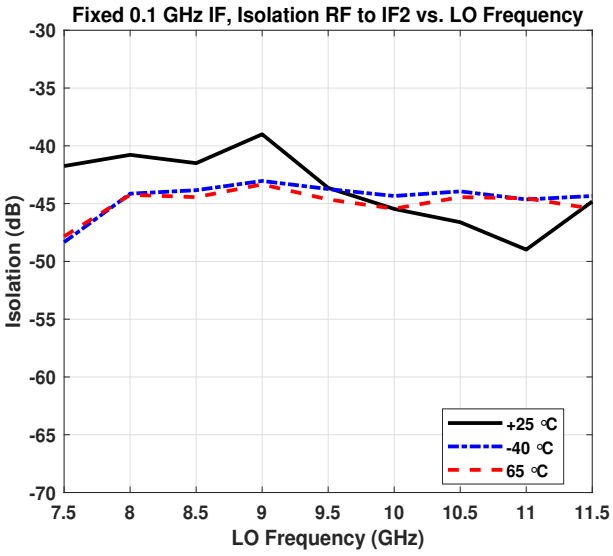

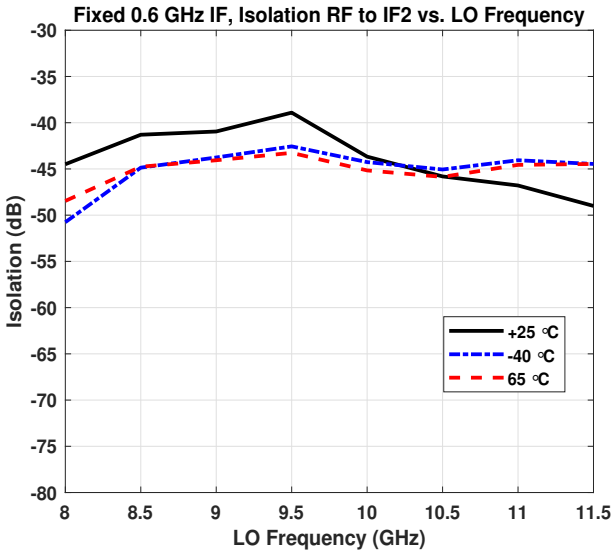

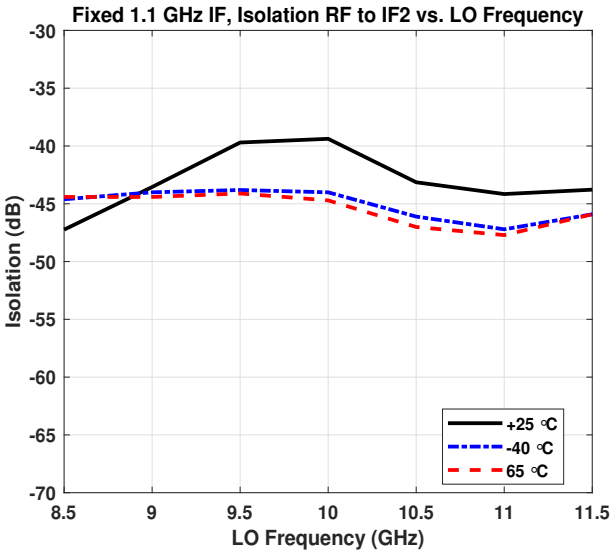

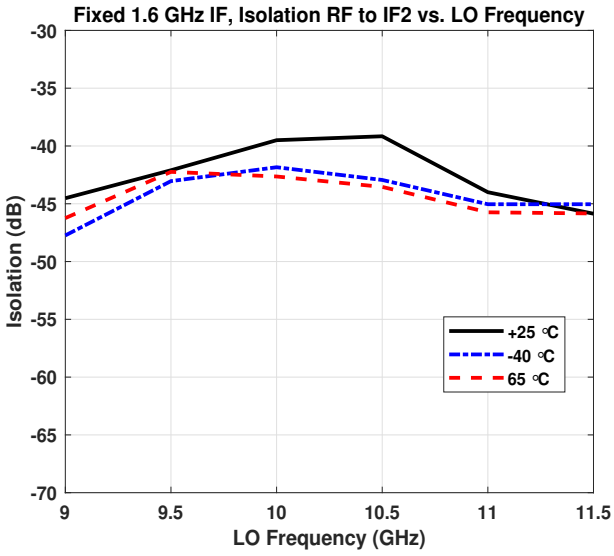

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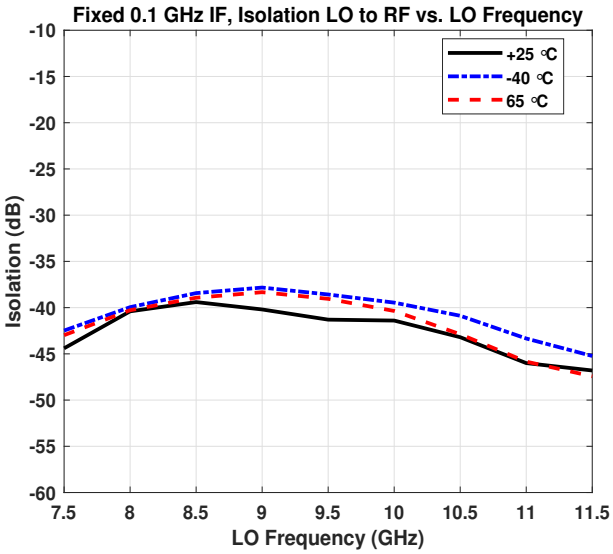

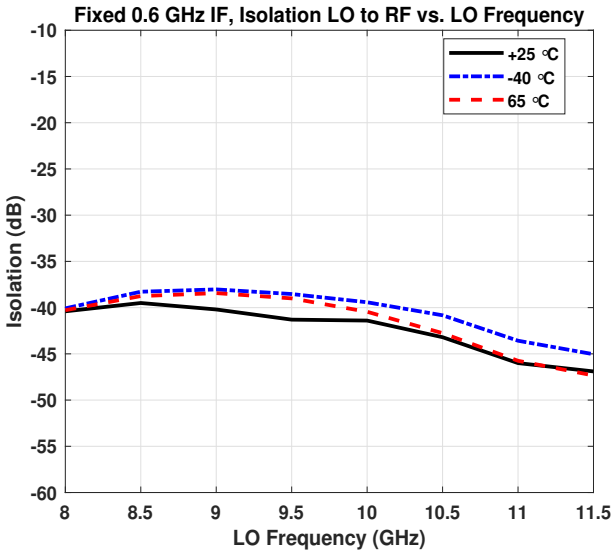

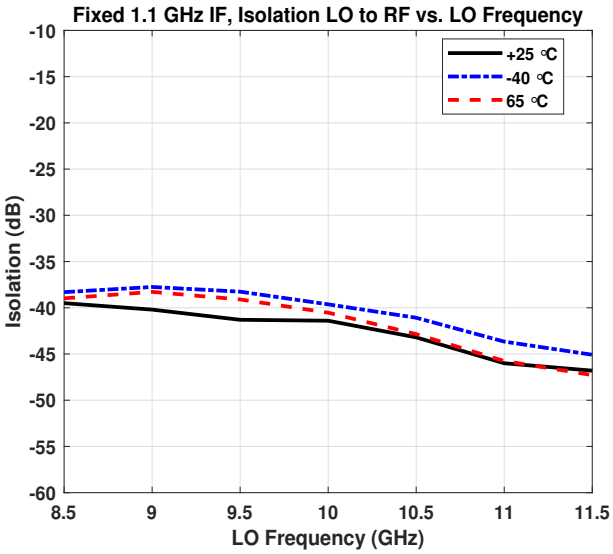

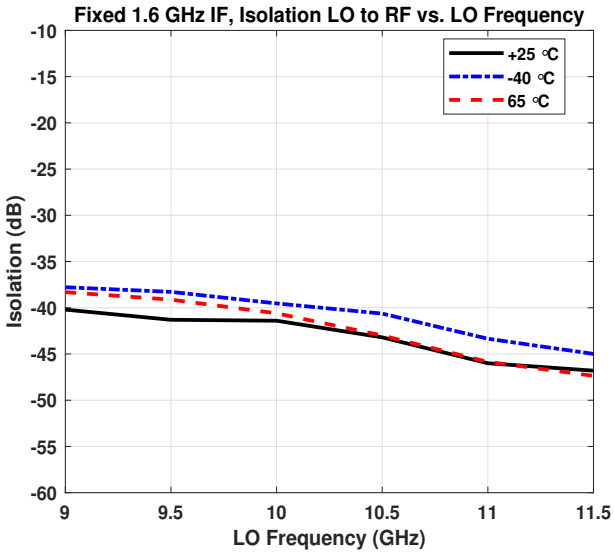

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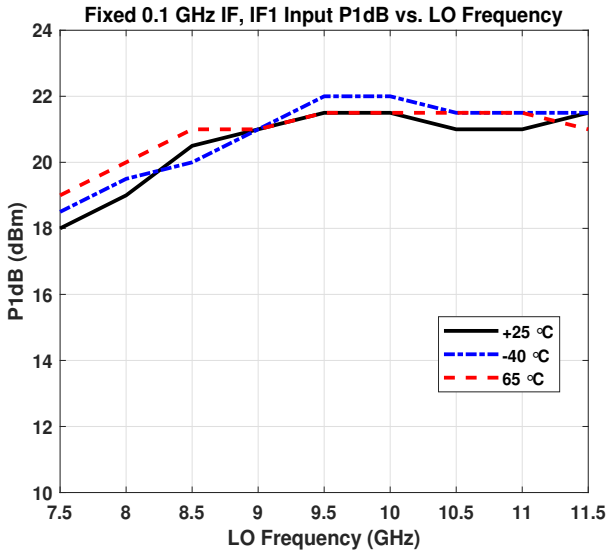

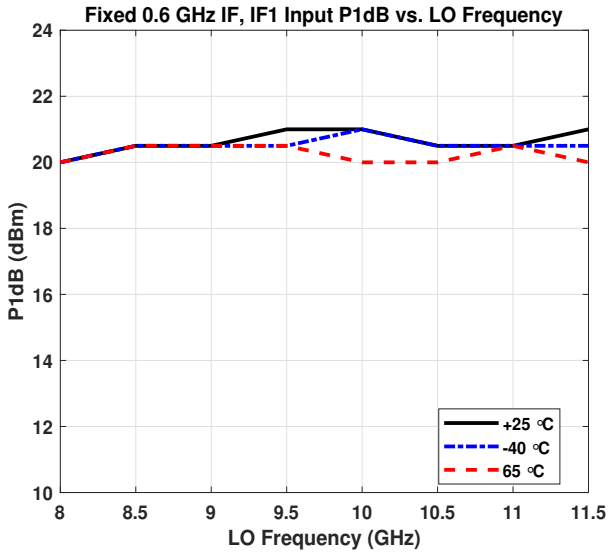

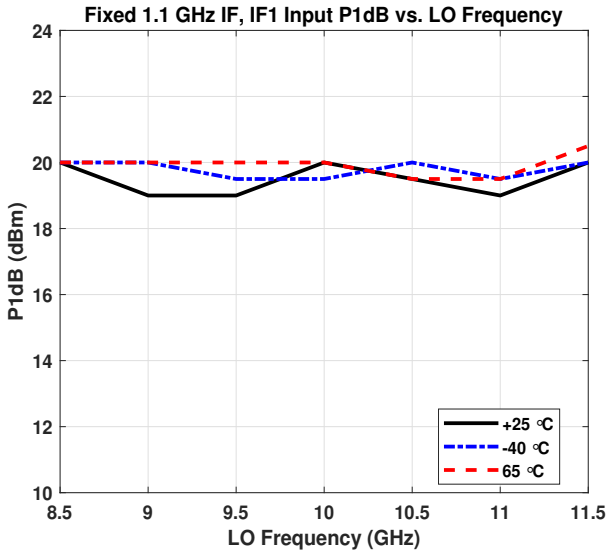

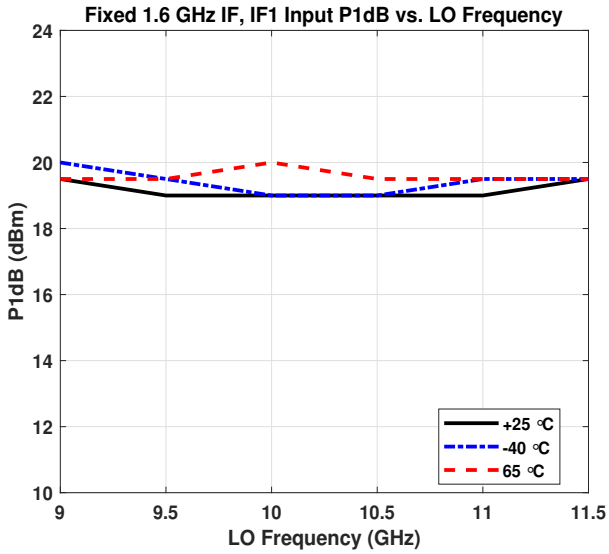

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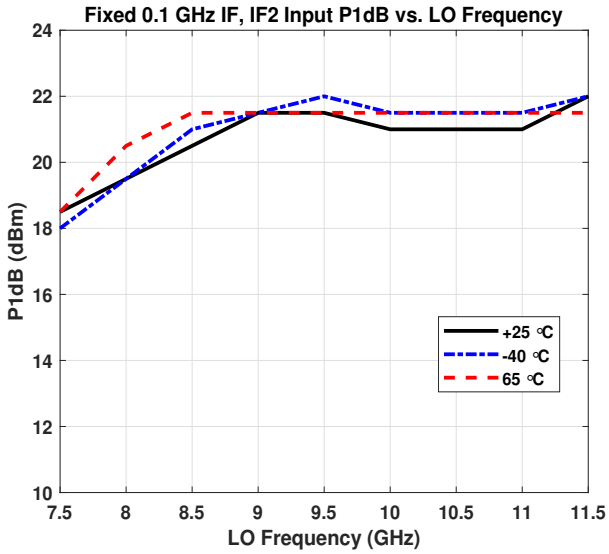

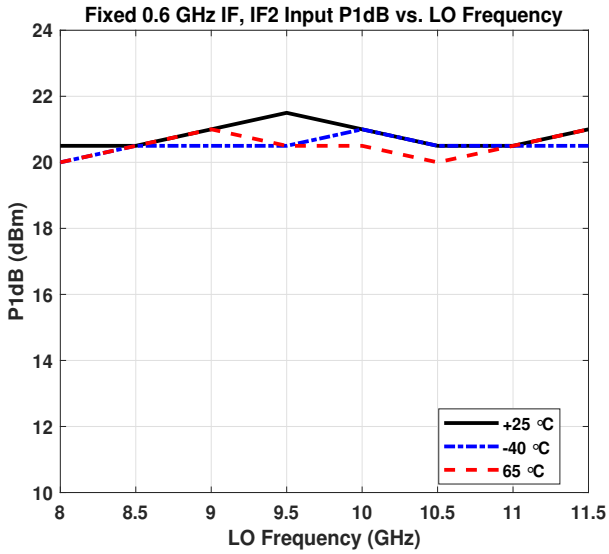

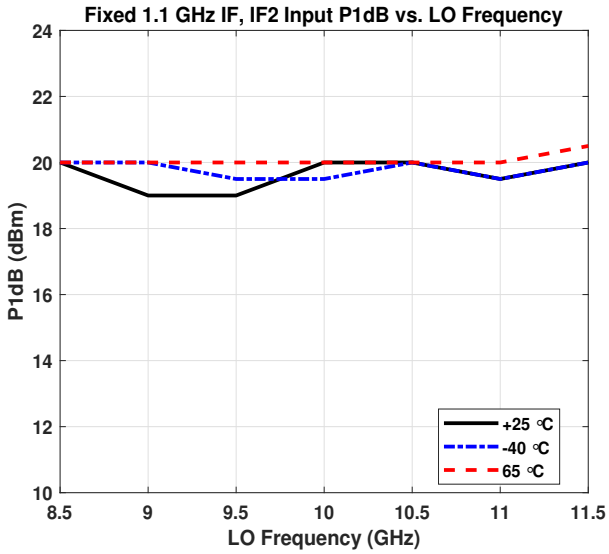

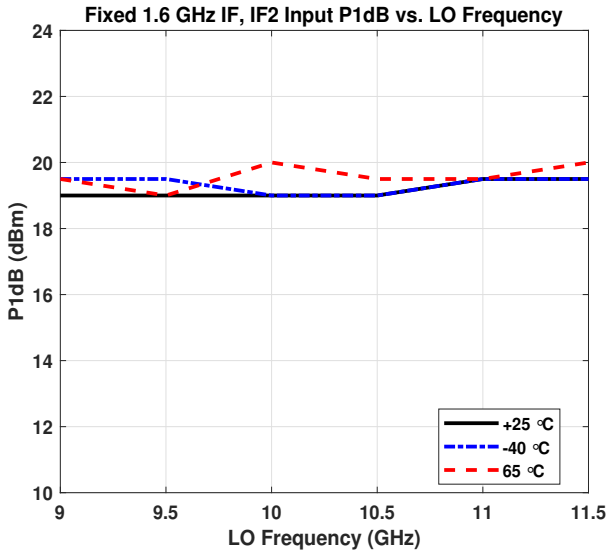

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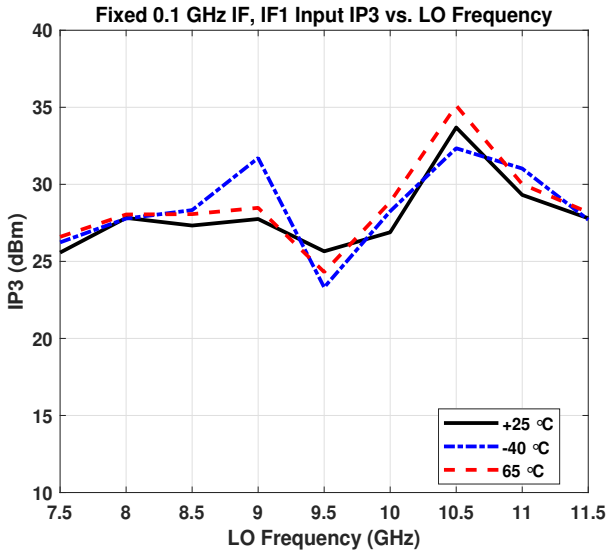

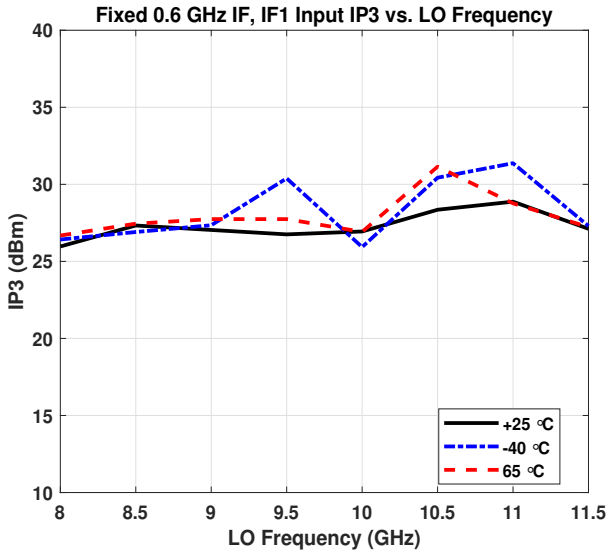

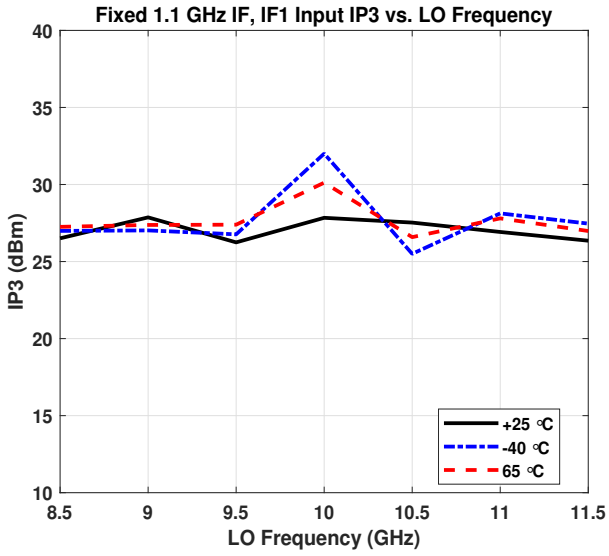

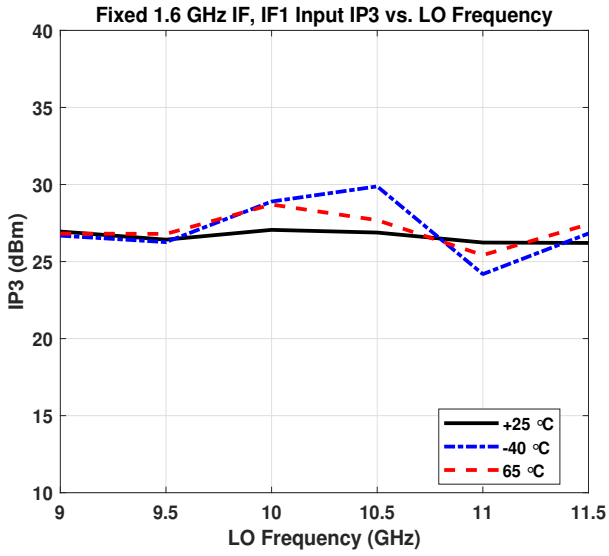

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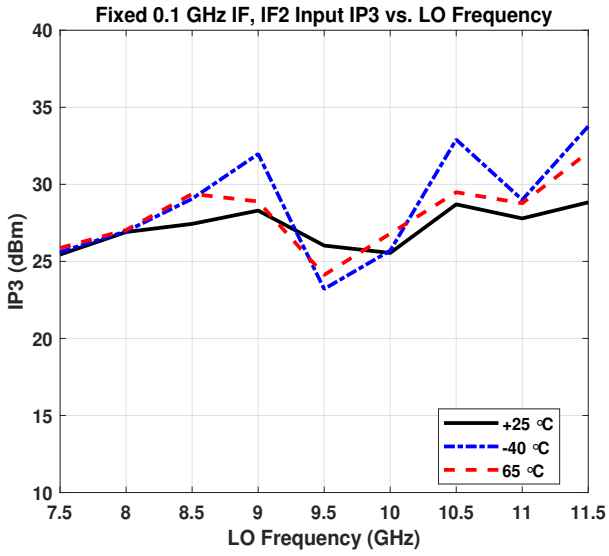

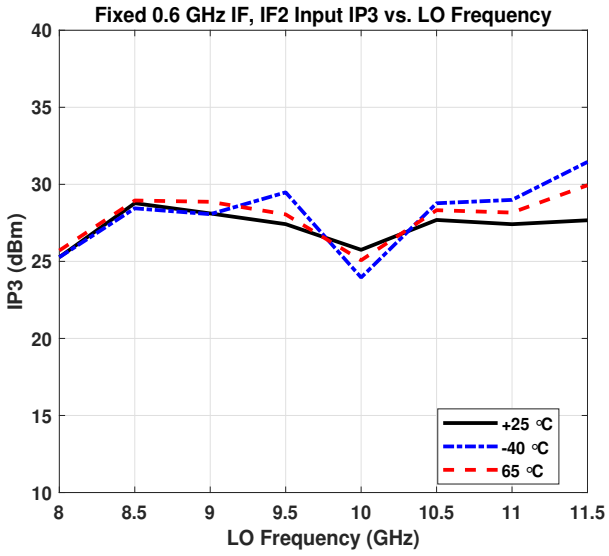

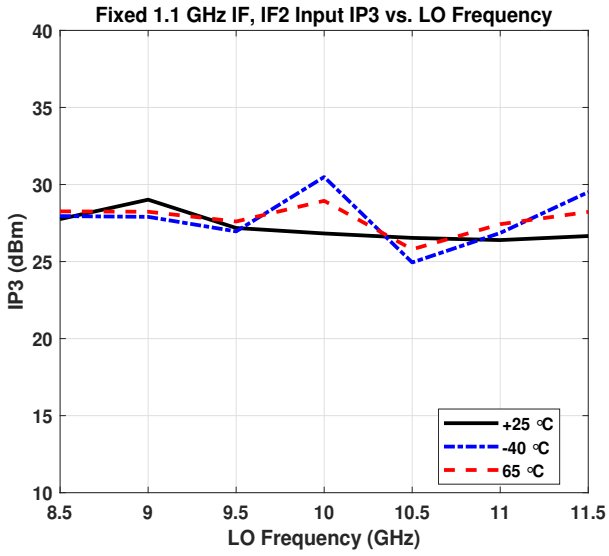

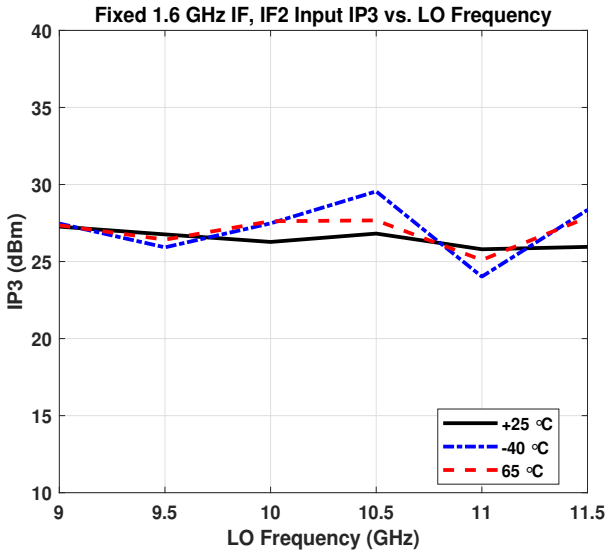

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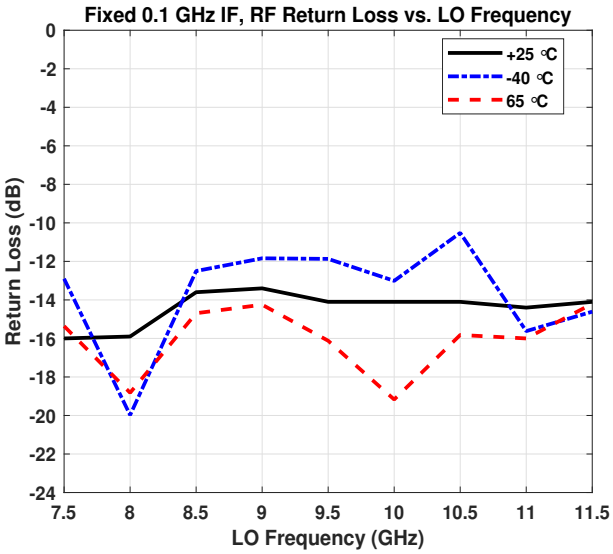
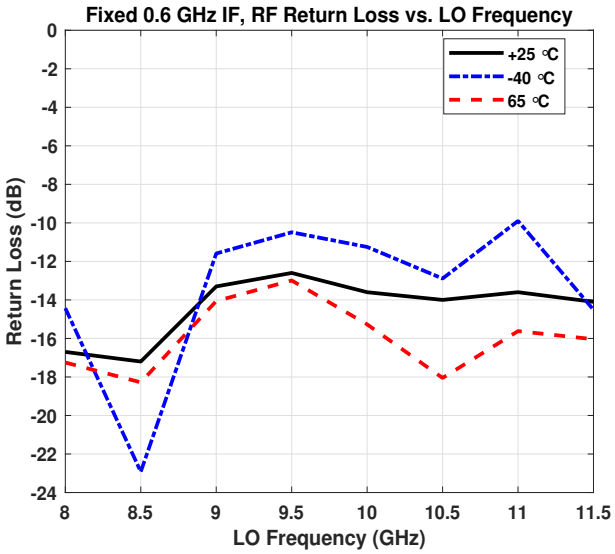
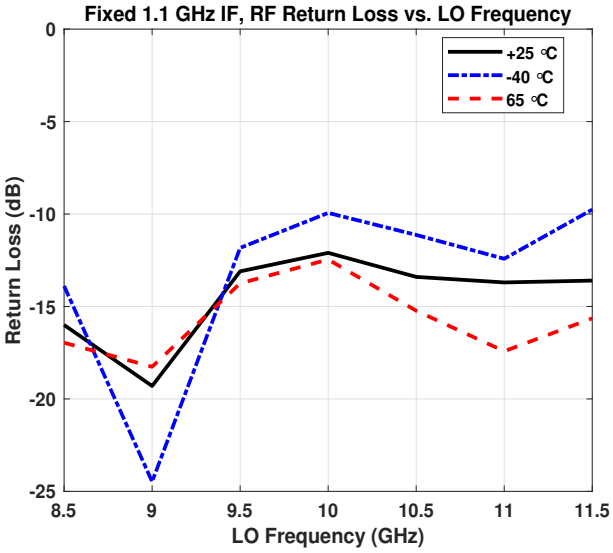
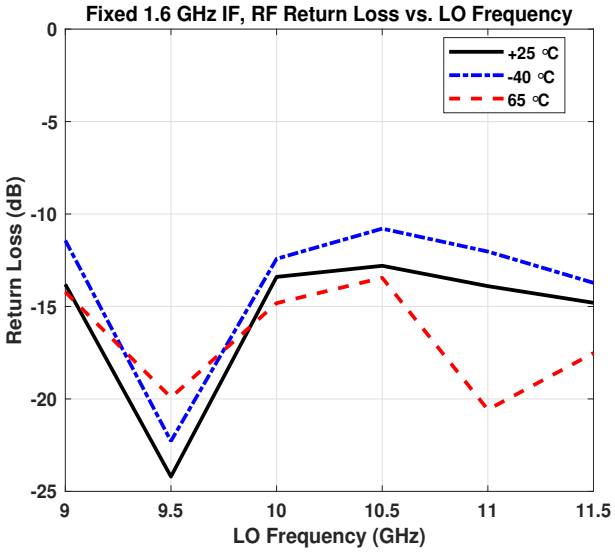
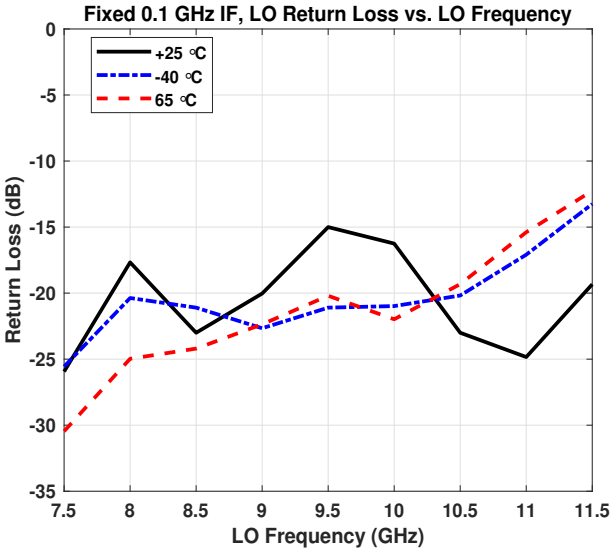


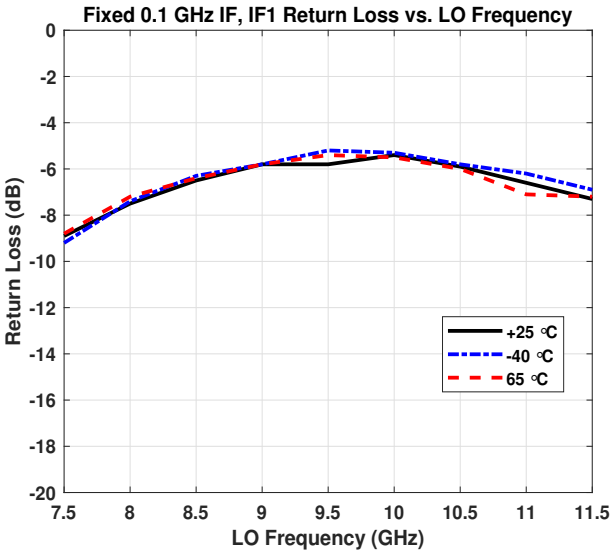


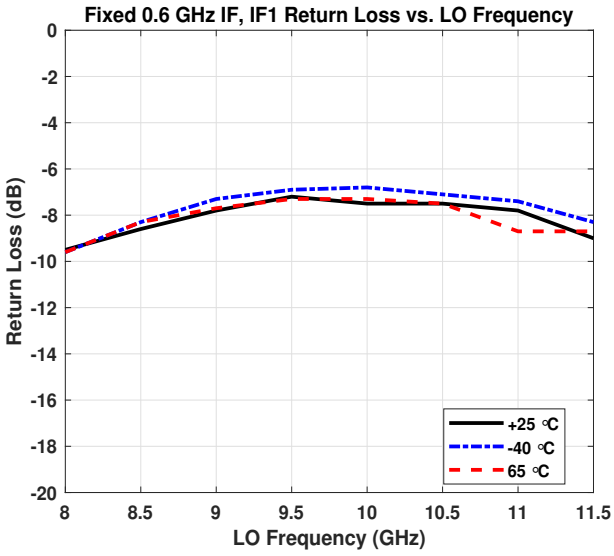


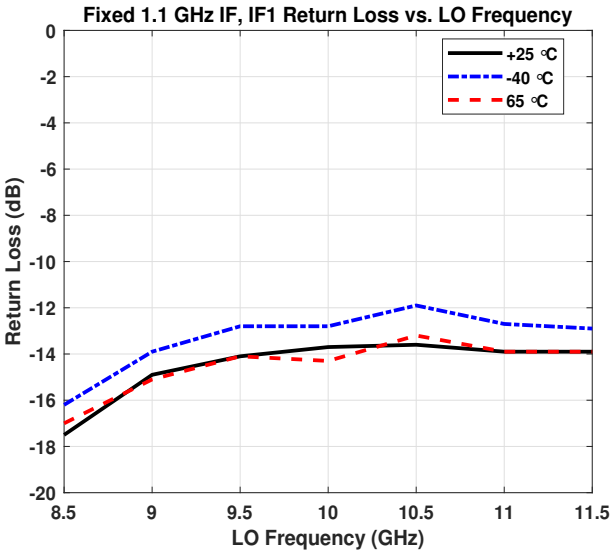


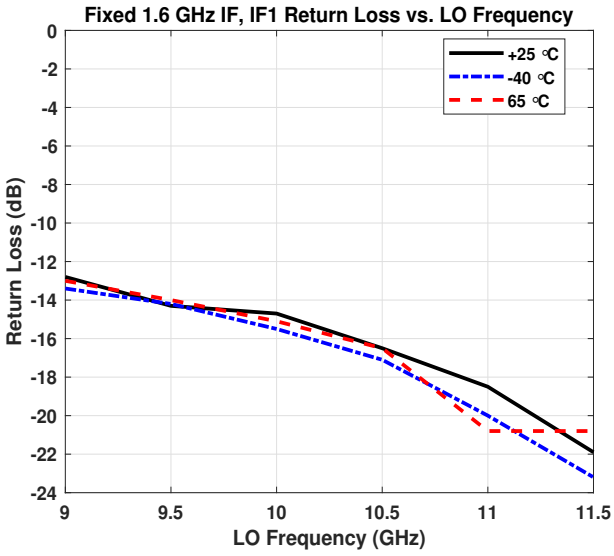


Quadrature Channel Data Taken Without IF Hybrid









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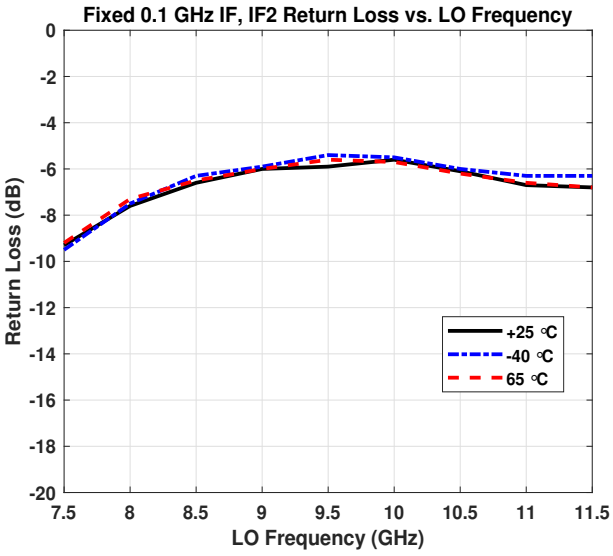
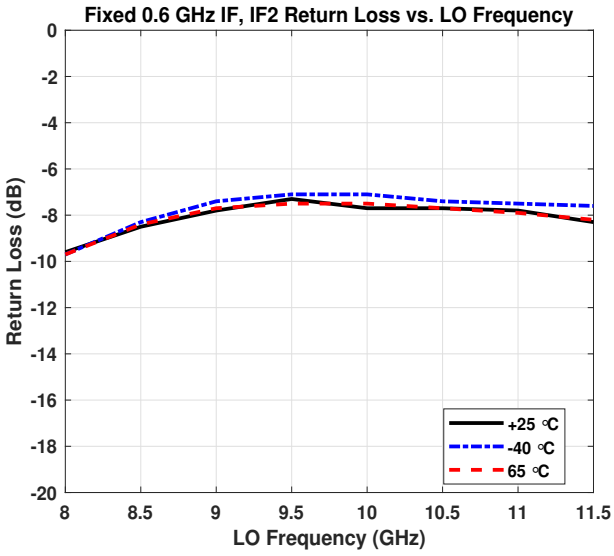
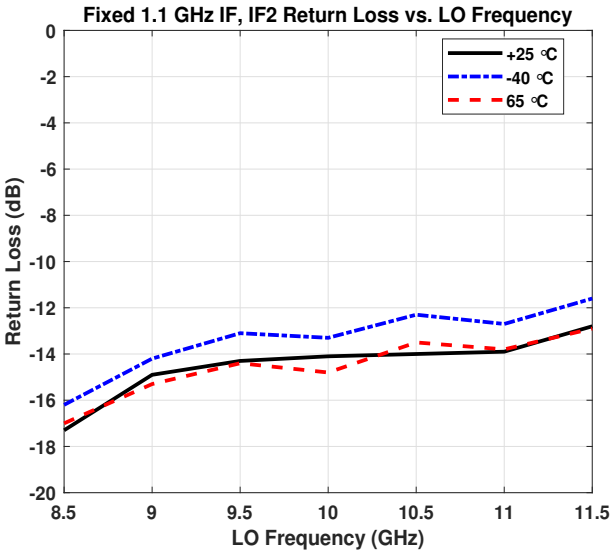
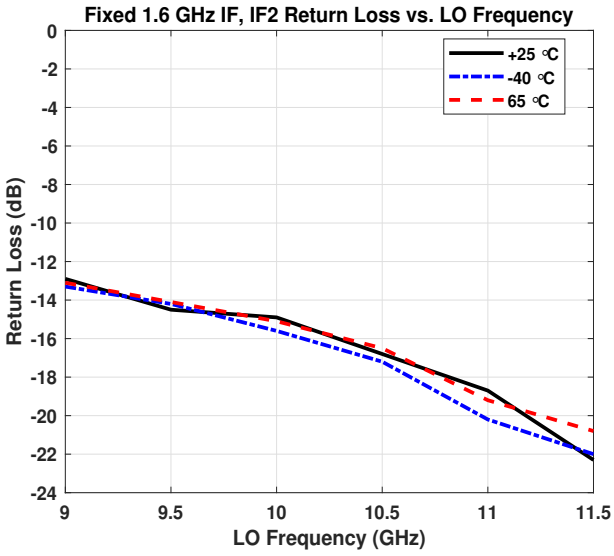
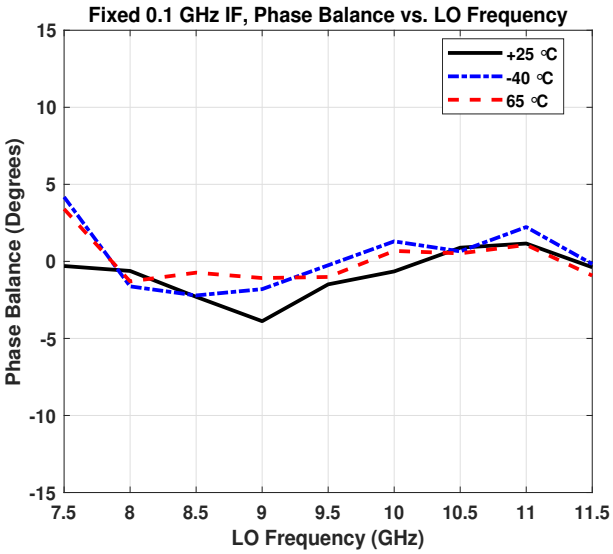


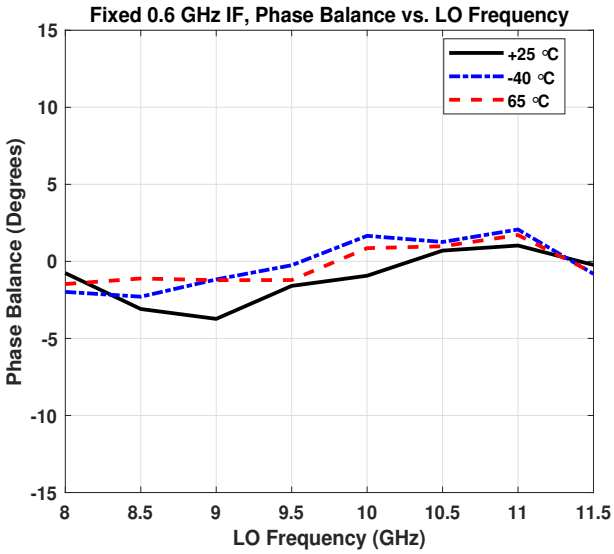


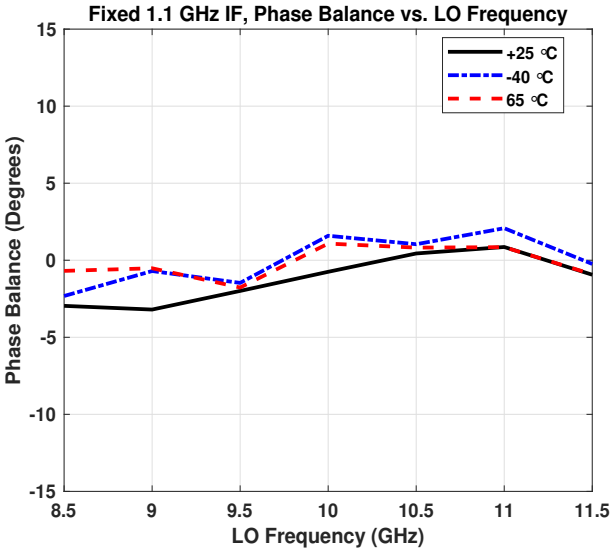


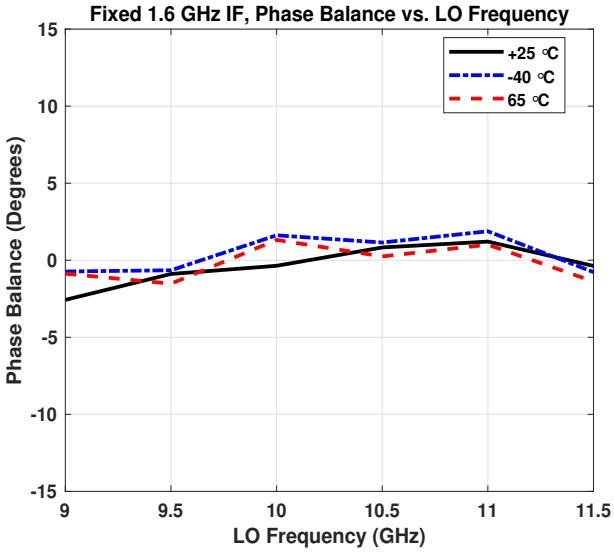


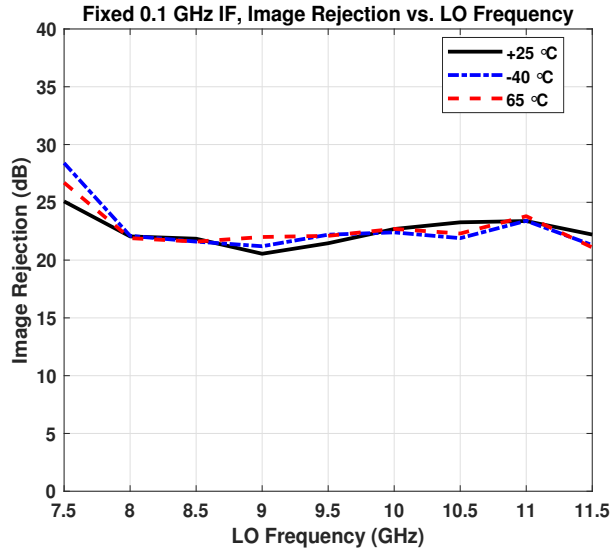
Quadrature Channel Data Taken Without IF Hybrid





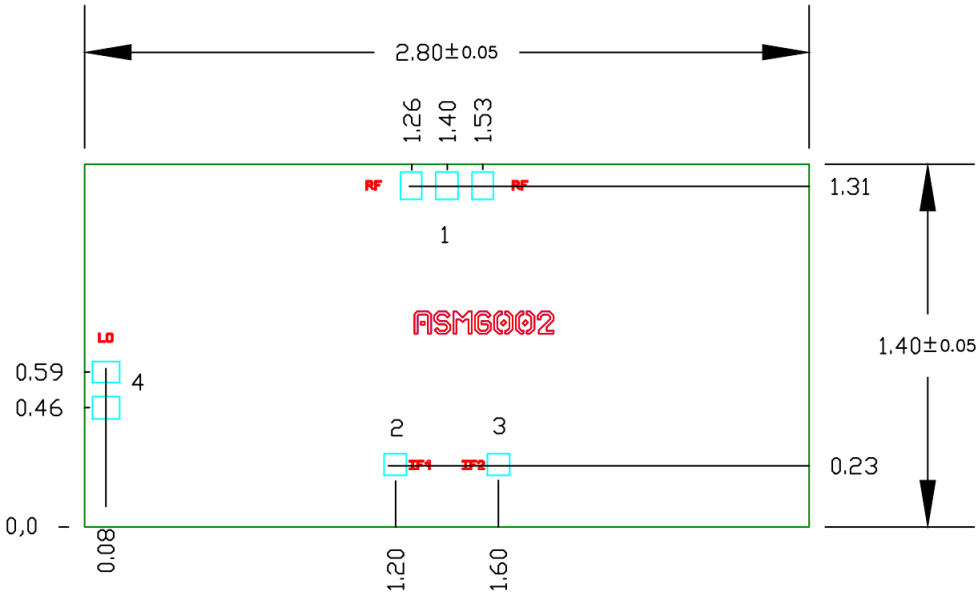






* Image Rejection data taken with external IF Hybrid

Mechanical Information



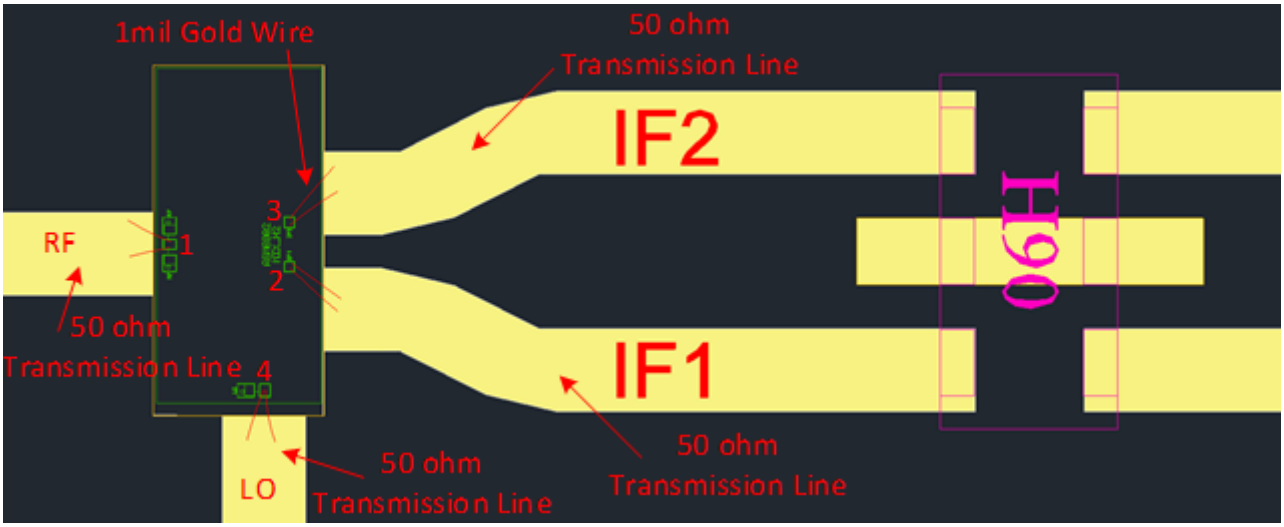
NOTES:

1. ALL DIMENSIONS IN MILLIMETERS
2. DIE THICKNESS IS 100 µm
3. TYPICAL BOND PAD IS 0.01 mm2
4. BACKSIDE METALLIZATION: GOLD
5. BACKSIDE METAL IS GROUND
6. BOND PAD METALLIZATION: GOLD
7. NO CONNECTION REQUIRED FOR UNLABELED BOND PADS
8. Die Size: OVERALL DIE SIZE ±50 µm

Bond Pad Description

1	RF	This pad is AC coupled and matched to 50 Ohm from 7.5 to 11.5 GHz.
4	LO	This pad is AC coupled and matched to 50 Ohm from 7.5 to 11.5 GHz.
2	IF1	This pad is DC coupled. For applications not requiring operating to DC, this port should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. For operation to DC, this pad must not source/sink more than 3mA of current or die non-function and possible die failure will result.
3	IF2	This pad is DC coupled. For applications not requiring operating to DC, this port should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. For operation to DC, this pad must not source/sink more than 3mA of current or die non-function and possible die failure will result.
-	GND	The backside of the die must be connected to RF/DC ground.

Assembly Diagram



Mounting and Bonding Techniques for Millimeter wave GaAs MMICs

The die should be attached directly to the ground plane eutectically or with conductive epoxy. 50 Ohm Microstrip transmission lines on 0.127mm (5 mil) thick alumina thin film substrates are recommended for bringing RF to and from the chip (Figure 1). If 0.254mm (10 mil) thick alumina thin film substrates must be used, the die should be raised 0.150mm (6 mils) so that the surface of the die is coplanar with the surface of the substrate. One way to accomplish this is to attach the 0.102mm (4 mil) thick die to a 0.150mm (6 mil) thick molybdenum heat spreader (moly-tab) which is then attached to the ground plane (Figure 2). Microstrip substrates should be brought as close to the die as possible in order to minimize bond wire length. Typical die-to-substrate spacing is 0.076mm (3 mils)

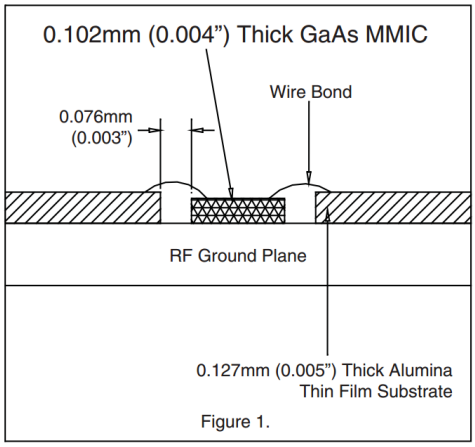


Figure 1.

Handling Precautions

Follow these precautions to avoid permanent damage.
Storage: All bare dies are placed in either Waffle or Gel based ESD protective containers, and then sealed in an ESD protective bag for shipment. Once the sealed ESD protective bag has been opened, all die should be stored in a dry nitrogen environment.
Cleanliness: Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.
Static Sensitivity: Follow ESD precautions to protect against >± 250V ESD strikes.
Transients: Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.
General Handling: Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers.

The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

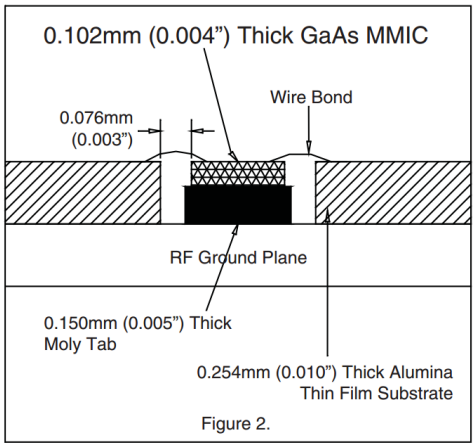


Figure 2.

Mounting

The chip is back-metallized and can be die mounted with AuSn eutectic preforms or with electrically conductive epoxy. The mounting surface should be clean and flat.
Eutectic Die Attach:A 80/20 gold tin preform is recommended with a work surface temperature of 255 °C and a tool temperature of 265 °C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be 290 °C. DO NOT expose the chip to a temperature greater than 320 °C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.
Epoxy Die Attach: Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer's schedule.

Wire Bonding

Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire is recommended. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.5 mm (20 mils).

Contact Information

For the latest specifications, additional product information:
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Email: info@abba-semi.com