

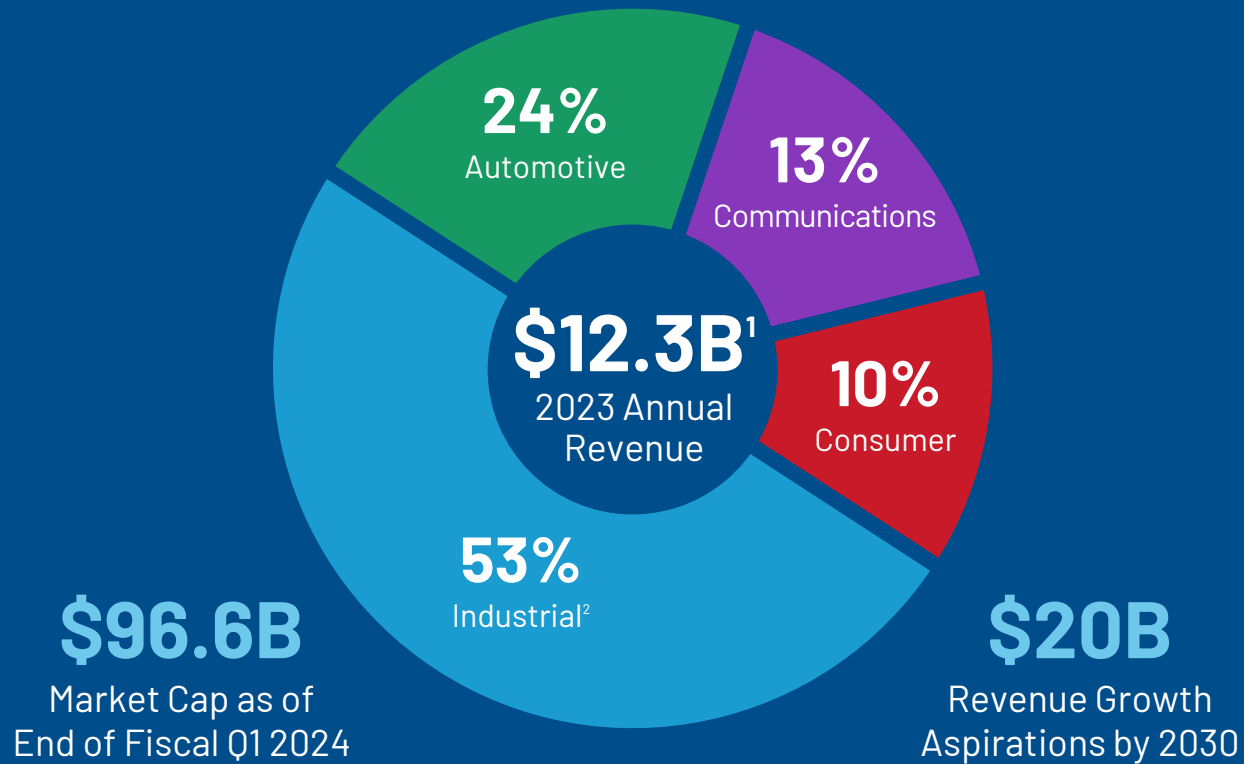


AHEAD OF WHAT'S POSSIBLE™

ADI solution for RF test instruments

Eric Cai

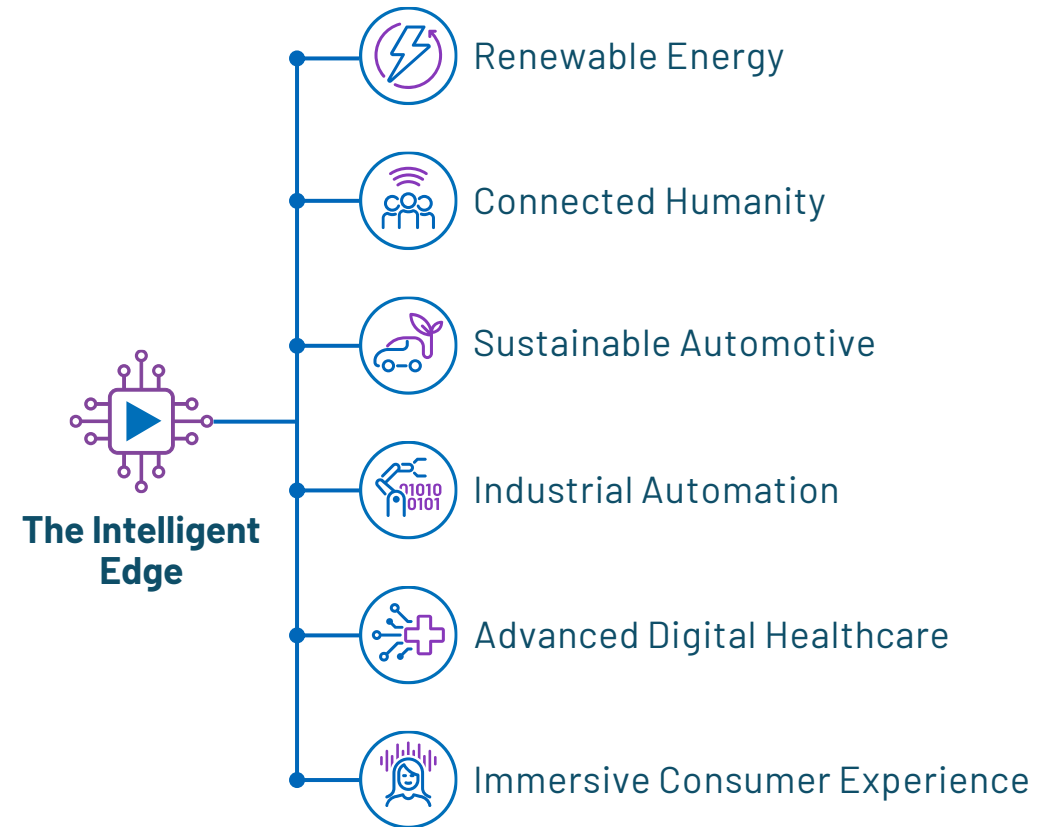
Industry-Leading Financial Profile with Scale, Scope, and Diversity



1. Information as of end of fiscal year 2023

2. Industrial automation, healthcare, aerospace, instrumentation and measurement, and energy management

Creating Solutions that Improve Lives and the World



R&D and Field Deployed Measurement



CHALLENGES

- ▶ Higher working voltages and switching speeds
- ▶ New battery chemistries
- ▶ Increasing measurement throughput
- ▶ Ever higher speeds and wider bandwidths

COMS

5G (low/mid/mmW) deployment, 6G research, Terabit optical links

Automotive

Advanced digital twins – HIL
RF/mmW for ADAS test
Accelerating battery manufacturing

Key ADI Technologies

Power

High efficiency instrumentation,
High margin attach

Precision with speed

Bolt & Bullseye platforms

HS Mixed Signal

5G, 6G Signal generation

RF/mmW Signal Chains

Embedded Digital Processing and Control

High Voltage & ISO

Edison & Everest Platforms

Technology focus area

ADI RF & Microwave Technology Supports Full Signal Chain Sell

Frequency Generation

Clocks & Synthesizers

Low Jitter (<25 fs rms)

Higher Fundamental
Frequency (26.5 GHz)

PLL

Low Jitter with High
FOM (-234 dBc)

Higher Integration

RF & Optical Power Detection

RF Sampling

Wider Bandwidth
(4000MHz IF)

Higher Sampling
Rates (>10Gsps)

Optical

Higher Dynamic
Range (140 dB)

Shorter Response

Frequency Conversion & Tunable Filters

Mixers

Ultra Wideband
(67GHz+)

Lower Conversion
Loss

Filters

Multi Octave (30MHz-
32GHz)

Switches, Attenuators & Beamformers

High Switch/Atten
Frequency (70GHz+)

Lower Loss Switching
(<1dB) & High-Power
Handling (>80W)

Wider Multi-Octave
Operating Bandwidths

COMM's Mkt.
Beamforming from
8 to 48 GHz

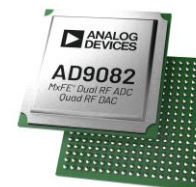
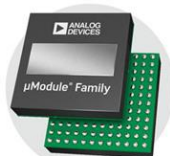
RF Amplifiers

Higher Frequency
(95 GHz)

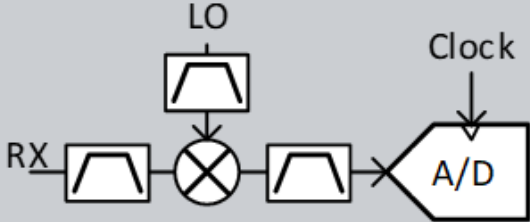
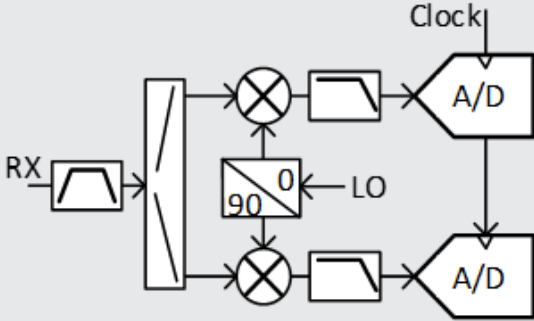
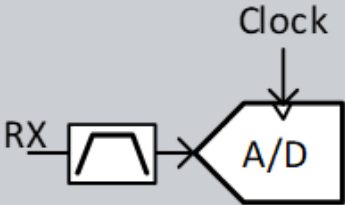
Wider Bandwidth

Higher Power

Integrated Switch &
Amplifier Functions in
Single Package (SIP)

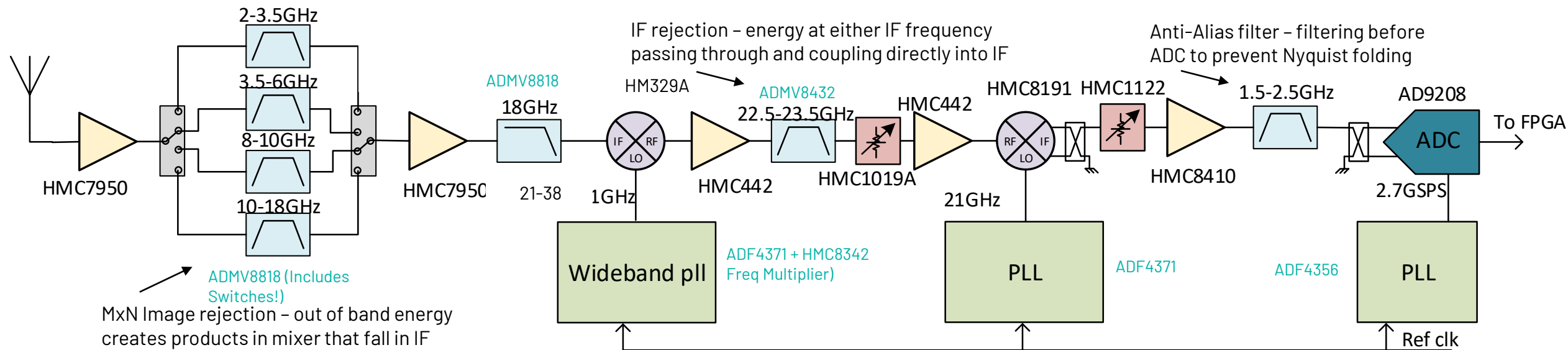


RF Architectures

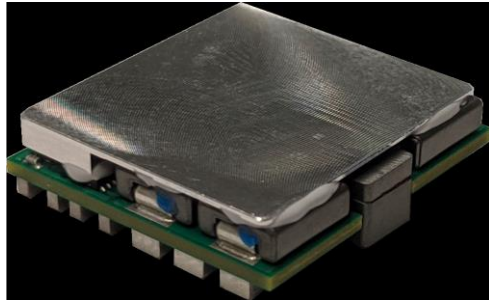
Type	Configuration	Benefits	Challenges
Heterodyne		• Proven/Trusted • High Performance • Optimum Spurious • High Dynamic Range • EMI Immunity	• SWaP (Size, Weight, Power) • Many Filters (some cannot be integrated) • Image Rejection
Direct Conversion (Zero IF)		• Maximum A/D BW • Simplest WB option • Low Cost & Power Consumption • Less Filtering (mostly integrated on chip) • LO Leakage • Image Rejection	• Image Rejection -IQ Imbalance • In-band IF harmonics • LO Radiation (centered in band) • EMI Immunity (IP2) • DC and 1/f noise
Direct Sampling		• No Mixing • Practical at L/S Band	• A/D Input BW • Gain not distributed across Frequency • Requires High Speed Sampling Data Converters

Fill In Wideband RX Super Heterodyne Signal Chain

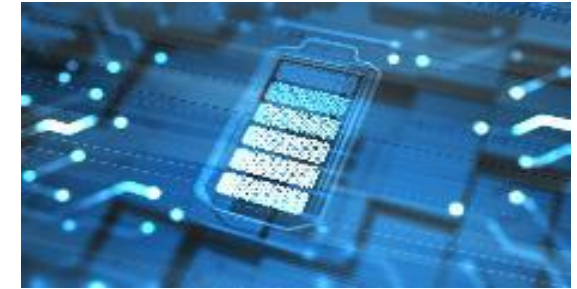
- Populate rest of signal chain with frequency appropriate amplifiers, switches, filters, mixers, PLL/VCO
- Add any desired features such as digital step attenuators
 - Can be used for gain leveling and Automatic Gain Control (AGC)



Industry Leading power Technologies



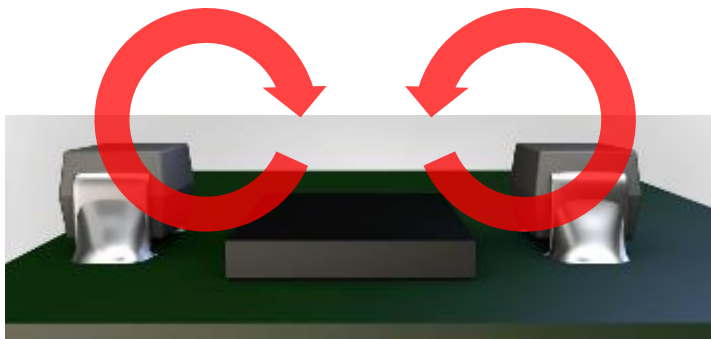
μModules



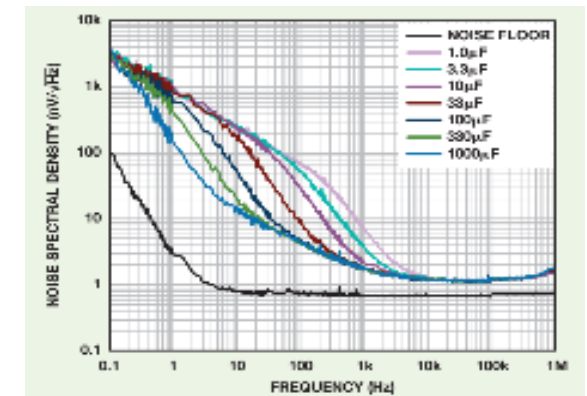
nanoPower



LTSpice & tools



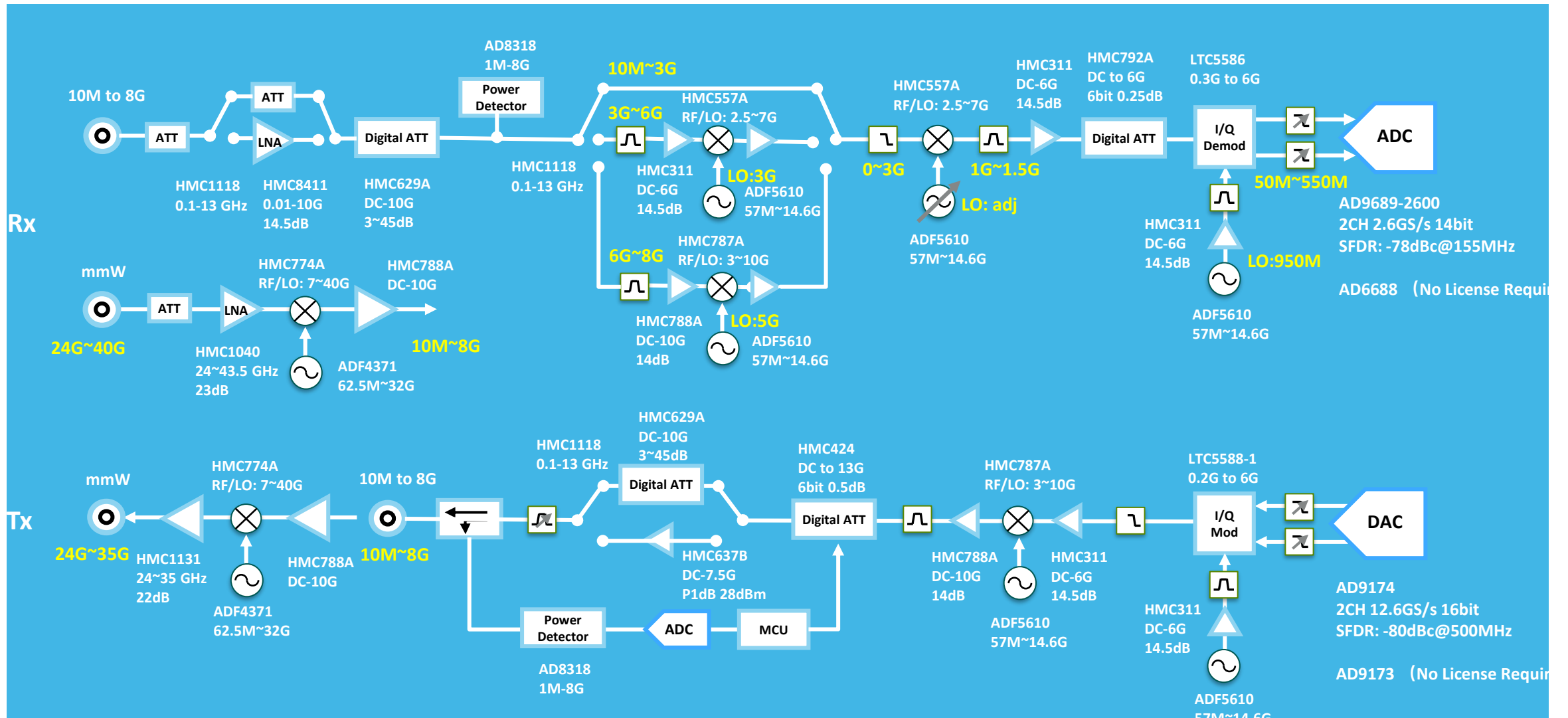
Silent Switcher® 3



Ultralow Noise LDOs

ADI products and solutions in RF instruments

5G Universal Wireless Tester --- ADI 500M BW Sub 8GHz / mmW Signal Chain

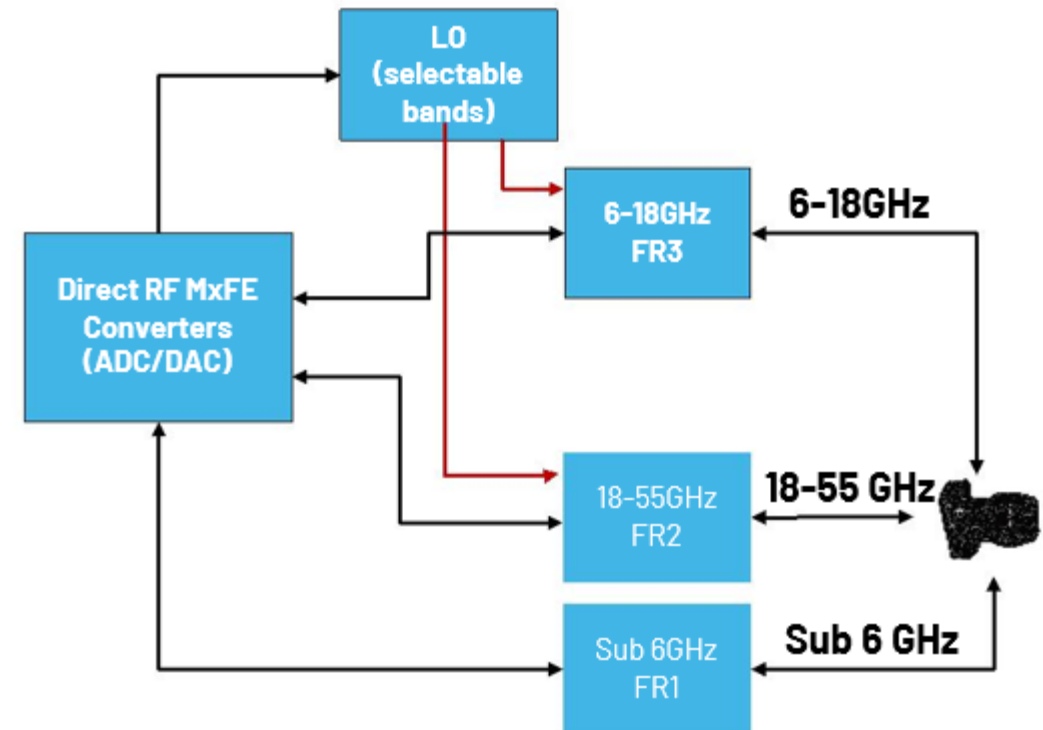


FR3 ref solution

Instrument Grade Millimeter Wave Signal Chain

- ▶ Instrument grade performance for wireless test systems
 - ▶ Supports 5G, 6G, Wi-Fi 7 & 8, UWB
 - ▶ RF carrier frequency up to 55GHz Implemented using 3 RF front ends
- ▶ Instrument Grade EVM < -45dB form Wave frequencies
- ▶ < -50dB for Wi-Fi
- ▶ Single, low phase noise LO generator that supports RF carrier frequencies up to 55GHz -156dBc/Hz (@10MHz offset from 4GHz carrier)
- ▶ Includes RF, LO, clocking, power and Direct RF converters
- ▶ RFFE boards can be used as stand-alone

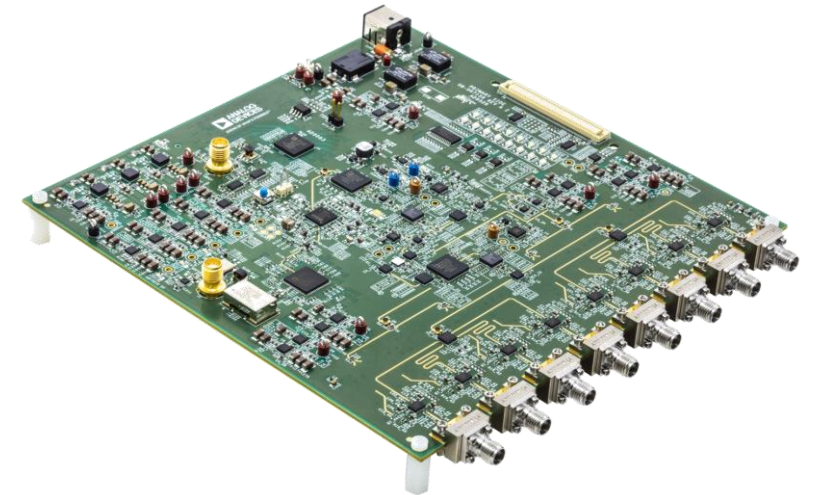
RX Functional Block Diagram



VNA solution

8-Port VNA (Vector Network Analyzer)

- ▶ Wide Bandwidth and Small Solution Size
 - 10MHz to 20GHz
 - 7in x 6.5in board
- ▶ Fully functional for turnkey evaluation
 - Plugs into [Xilinx ZCU102](#) development board
 - Complete [software](#), [firmware](#) and [GUI](#)
- ▶ [Programmable IF Filters](#) and [Amplifiers](#)
- ▶ LO Frequency Multiplier and Divider
 - [6GHz](#) frequency synthesizer as local oscillator to measure [20GHz](#)
- ▶ Offset Frequency Mixer and Divier
 - RF and LO interfaces requires only a [single high frequency source](#)



Thanks