iWave Global

eBook

RFSoC Solutions from iWave

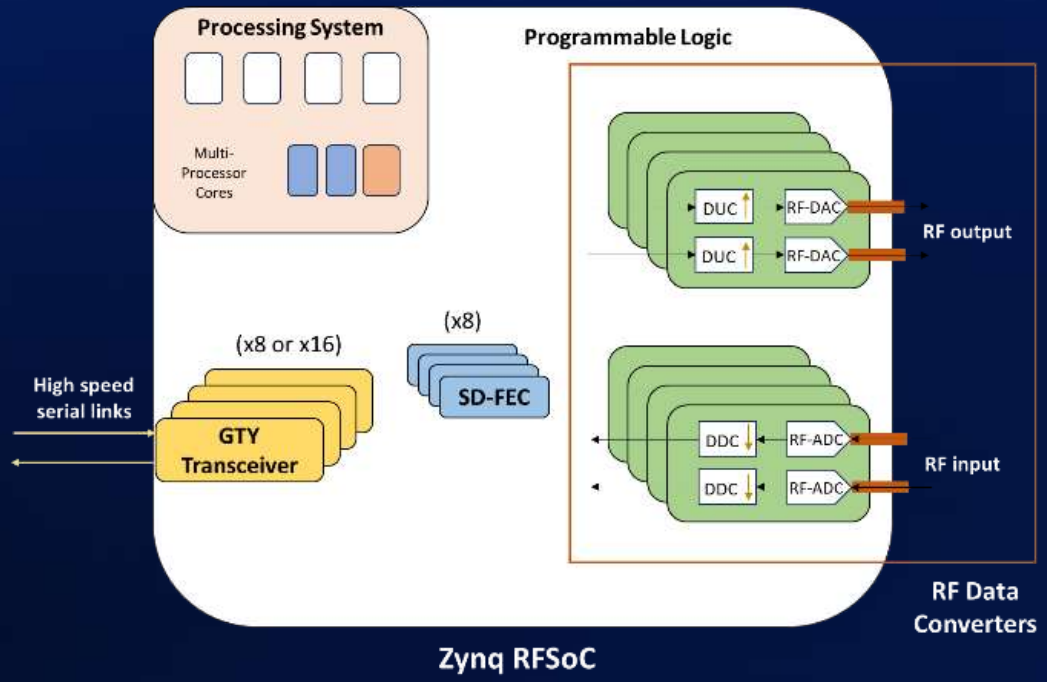
Powering SDR, EW, Radar, Wireless & Computing Solutions

What is RFSoC?

The Zynq™ UltraScale+™ RFSoC is a heterogeneous compute architecture that includes a full Arm processing subsystem, FPGA fabric, and complete analog/digital programmability across the RF signal chain.

This monolithic integration streamlines design complexity and enhances performance, making it ideal for applications where size, power, and throughput are critical

The SoC provides a complete, single chip software-defined radio platform for diverse applications, and the ability to produce radio variants as market dynamics evolve.

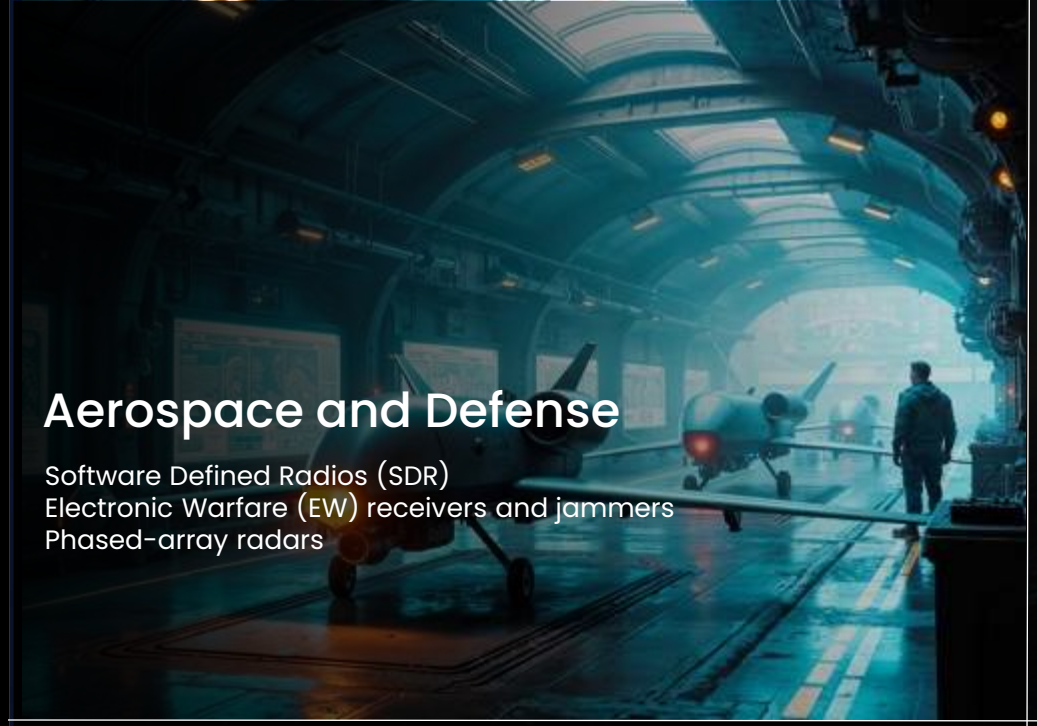


Why RFSoC?

- Integration of RF Analog
- High-speed ADCs and DACs with built-in front-end signal conditioning and optimized hardened DSP blocks
- Integrated high-speed transceivers supporting multi-gigabit serial communication over standard interfaces
- Dedicated hardened IP blocks for Forward Error Correction (FEC)

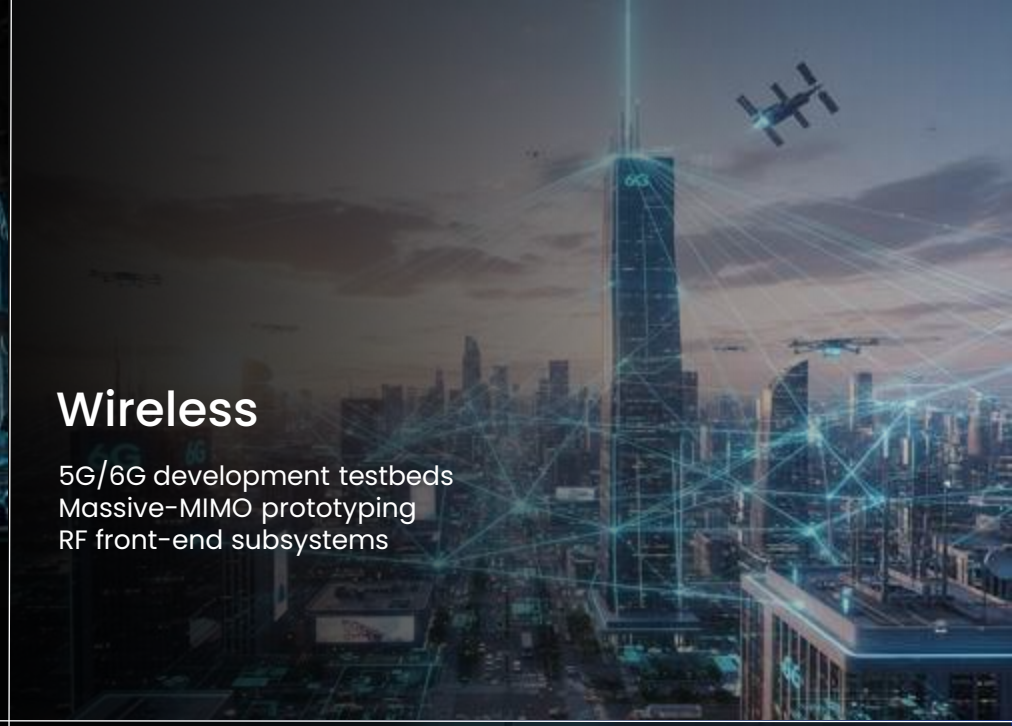
iWave Global

RFSoC Applications



Aerospace and Defense

Software Defined Radios (SDR)
Electronic Warfare (EW) receivers and jammers
Phased-array radars



Wireless

5G/6G development testbeds
Massive-MIMO prototyping
RF front-end subsystems

Space and Satellite

Communication gateways
Wideband channelizers
Ground station RF processing

Industrial

High-speed data acquisition
RF instrumentation
Quantum computing control systems

iWave Global

RFSoC System on Module

What & Why ?

Core Components

- Zynq™ UltraScale+™ RFSoC FPGA

Memory & Storage

- Up to 16GB DDR4 RAM for PS with ECC
- Up to 16GB DDR4 RAM for PL
- Up to 128GB eMMC Flash
- 256MB QSPI Flash and EEPROM

Connectivity

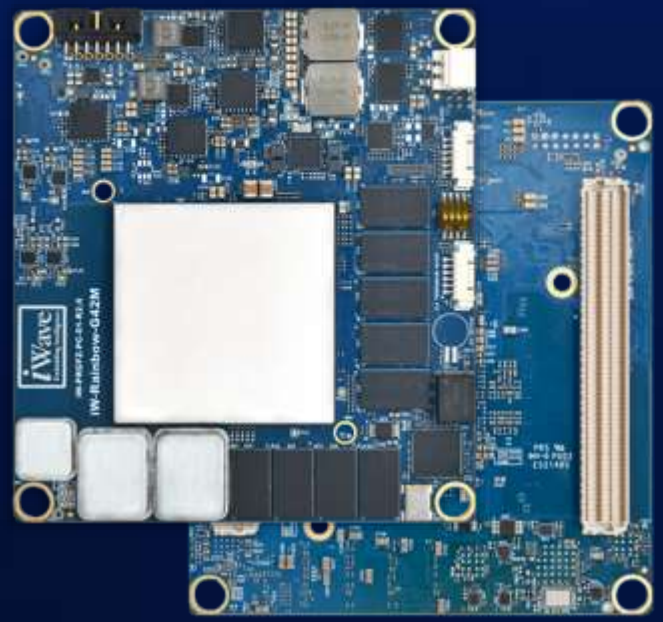
- 2 x 400 pin B2B Connectors
- 16 x PL GTY transceivers up to 28.21Gbps
- 4 x PS GTR transceivers up to 6Gbps
- Supports PCIe Gen3 x 8 / Gen4 x 16
- Gigabit Ethernet, CAN, SD

On-Module Clocking & Synchronization

- Analog SYSREF, PL-SYSREF, PL Clock for the synchronization
- Ultra-low-noise RF PLLs
- Network synchronizer clocks
- External 10MHz clock support for MTS

Power & Thermal

- Low-noise regulators for best RF performance
- Rugged Mechanical enclosure with thermal solution



Why consider RFSoC System on Module?

- SoM takes care of power sequencing, signal integrity, and high-speed layout reducing system design complexity
- Qualified and Validated Solution
- Accelerate your time to market with reduced risk
- Scalability and Modularity across Product Family
- Production Ready
- Product Lifecycle Management taken care by iWave

iWave Global

RFSoC Boards & Solutions

System on Modules

An extensive portfolio of Sytem on Modules across the RFSoC product family ensuring the right product fit as per your requirements. The System on Modules are all pre-qualified, validated and production ready.

3U VPX and PCIe Cards

RFSoC based COTS modules for the aerospace, defense, networking and storage applications. The portfoilio of PCIe Cards and 3U VPX Cards are availabe across different FPGA variants.

Custom Design

iWave enables customers with custom carrier card and system design. iWave carries RF ODM expertise to enable your products from ideation to production.

iWave Global

RFSoC Solutions Roadmap

Performance

SOM
ZU49/ZU39/ZU29DR

ADC & DAC
RFSoC PCIe Card
ZU49/ZU39/ZU29DR

3U VPX
ZU48/47/43/28/27/25DR

SOM
ZU48/47/43/28/27/25DR

ADC & DAC
RFSoC PCIe Card
ZU48/47/43/28/27/25DR

3U VPX
ZU49/ZU39/ZU29DR

3U VPX*
ZU67/65/64/63DR

ADC & DAC *
RFSoC PCIe Card
ZU67/65/64/63DR

SOM *
Versal™ RF

SOM *
ZU49DR-ML

SOM *
ZU67/65/64/63DR

System on Module Portfolio

iG-G42M

ZU49/ZU39/ZU29DR

- 16 x ADC channels up to 2.5Gsps
- 16 x DAC channels up to 10Gsps

iG-G42M-ML

XQ - ZU49DR

- 8 x ADC channels up to 5Gsps
- 8 x DAC channels up to 10Gsps

iG-G60M

ZU48/47/43/28/27/25DR

- 8 x ADC channels up to 5Gsps
- 8 x DAC channels up to 10Gsps

iG-G79M

ZU67/65/64/63DR

- 8 x ADC Channels up to 5.9Gsps
- 8 x DAC Channels up to 10Gsps

iG-G80M

Versal™ RF Series

- 16/8 ADC Channels up to 8/32Gsps
- 16 DAC Channel support up to 16Gsps

iWave Global

Versal™ RF

COMING SOON

Processing System (PS)

- Dual® Arm® Cortex-A72 @1.65GHz
- Dual Arm Cortex-R5F @800MHz

Programming Logic (PL)

- Up to 2,473.8K Logic cells & 1,130.88K LUTs
- GTM2 High Speed Transceivers x 20 @112 Gbps

AI Engine (AIE)

- AI Engine Tiles up to 126
- AI Data Memory up to 32Mb

High Performance Memory

- 32bit, 4GB LPDDR5X from PS
- 32bit, 4GB LPDDR5X from PL
- 2 x Dual Channel (2x16bit) 4GB
- LPDDR5X from PL

Storage

- 32GB eMMC Flash, 2Kb EEPROM
- 256MB (8bit) OSPI Flash or 256MB (4bit)
- QSPI flash from PS

FPGA

- Versal™ RF Family with VSVA2488 Package
- Compatible with VR1952/1902/1652/1602 devices

ADC / DAC

- 16/8 x ADC Channels up to 8/32Gsps
- 16 x DAC Channels up to 16Gsps

2 x 400pin Board to Board Connectors

- X5IO Bank IOs – up to 64LVDS/128SE
- HD Bank IOs – up to 11DIFF/22SE

High-Speed Transceivers

- PCIe x4 Gen5 through GTYP Transceivers
- 20/10 GTM2 High Speed Transceivers
- (Up to 56Gbps/112Gbps)
- or 12 GTYP High Speed Transceivers(Up to 32Gbps)

General

- Power Input: 12V through B2B Connector2
- BSP Support: Linux BSP: Yocto 2025.1 or higher

iWave Global

Unique Features of RFSoC SOM

iWave extends AMD RFSoC capabilities with production-ready engineering features that reduce risk and accelerate deployment.

On-SOM Ultra-Low-Noise RF PLLs

- ✓ Clocking for ADC/DAC
- ✓ SYSREF and PL clocks
- ✓ 10MHz sync input for MTS
- ✓ Reduces carrier board RF complexity

On-SOM Network Synchronizer

- ✓ Reference clocks for PL & GTY
- ✓ Supports PTP & SyncE
- ✓ 1PPS IN/OUT for system-level sync

Ultra-Low-Noise Power Design

- ✓ Dedicated RF power rails
- ✓ Improved SFDR & SNR
- ✓ Better direct-RF sampling accuracy

MTS Support with Pin Compatible SOM

- ✓ Sub-100ps alignment
- ✓ Coherent sampling across multiple boards
- ✓ External 10MHz in clock support for synchronization

iWave Global

PCIe Cards

iG-G42P

ZU49/ZU39/ZU29DR

- 16 x ADC channels up to 2.5Gsps
- 16 x DAC channels up to 10Gsps
- RF Length Match for iG-G42M ZU49DR (To support MTS) with iG-G42P carrier card

iG-G60P

ZU48/47/43/28/27/25DR

- 8 x ADC channels up to 5Gsps
- 8 x DAC channels up to 10Gsps
- RF Length Match for iG-G60M ZU48/47/43DR (To support MTS) with iG-G42P carrier card

iG-G79P

ZU67/ZU65/ZU64/ZU63DR

- 8 x ADC channels up to 5Gsps
- 8 x DAC channels up to 10Gsps
- Integrated DFE IP Block

PCIe ADC/DAC Cards for Quick Evaluation

Single carrier card enabling scalability across the family

Multi-tile, Multi board sync support

iWave Global

RFSoC 3U VPX Card

SOSA
Sensor Open Systems Architecture

iG-G42V

ZU49/ZU39/ZU29DR

- 16 x ADC channels | up to 2.5Gsps
- 16 x DAC channels | up to 10Gsps

iG-G60V

ZU49/ZU39/ZU29DR

- 8 DAC channels | 30 MHz–6 GHz | up to 9.85Gsps
- 8 ADC channels | 30 MHz–6 GHz | up to 5Gsps

iG-G79V

ZU67/ZU65/ZU64/ZU63DR

- 8 x ADC channels | up to 2.95Gsps and 2 x ADC channels | up to 5.9Gsps
- 8 x DAC channels | up to 10Gsps

VITA 67.3 NanoRF Optical Hybrid Ferrule with 10 RF Channels and 100G Optical

Module Profile : MOD3p-PAY-1F1U1S1S1U1U4F1J-16.6.13-n

Slot Profile : SLT3p-PAY-1F1U1S1S1U1U4F1J-14.6.13-n

Also Supports other SLT3 slot profiles

iWave Global

RF Expertise

iWave Global

Comprehensive RF System Design

- Expertise in designing high-speed, high-density Carrier Boards tailored for RFSoC modules
- Support for **JESD204B/C, SFP+, QSFP**, and high-speed data interfaces
- Precision in signal integrity, impedance control, and power distribution

ADC/DAC Integration Expertise

- Proven experience integrating **direct-RF ADCs/DAC** integration with Xilinx RFSoC architecture
- Optimized clock tree design with **low-jitter PLLs** and synthesizers
- Support for **wideband RF signal** capture and generation
- Implementation of **Multi-Tile Synchronization (MTS)** for phase alignment across multiple tiles
- Capability **for Multi-Board Sync** to align RF signals across multiple RFSoC devices

Production & System-Level Support

- **Turnkey Production Services** including SoM + Carrier + Enclosure + Testing
- DFM (Design for Manufacturing) and DFT (Design for Test) best practices followed
- **Ruggedization and MIL-grade validation** for Aerospace & Defense customers
- Product Longevity Support of up to **15+ Years**

Software Features

- Yocto-based Linux distribution with Vivado support for seamless system bring-up.
- Optimized baremetal examples for DMA and BRAM-based data movement and testing.
- BRAM test applications integrated with Linux BSP for rapid evaluation and validation
- Newly added PYNQ support for rapid prototyping, Python-based control, and educational workflows.
- Successfully validated Multi-Board Multi Tile Synchronization
- Fully tested PCIe Gen3/Gen4 endpoint functionality using XDMA drivers for high-speed host data transfer.

iWave Global

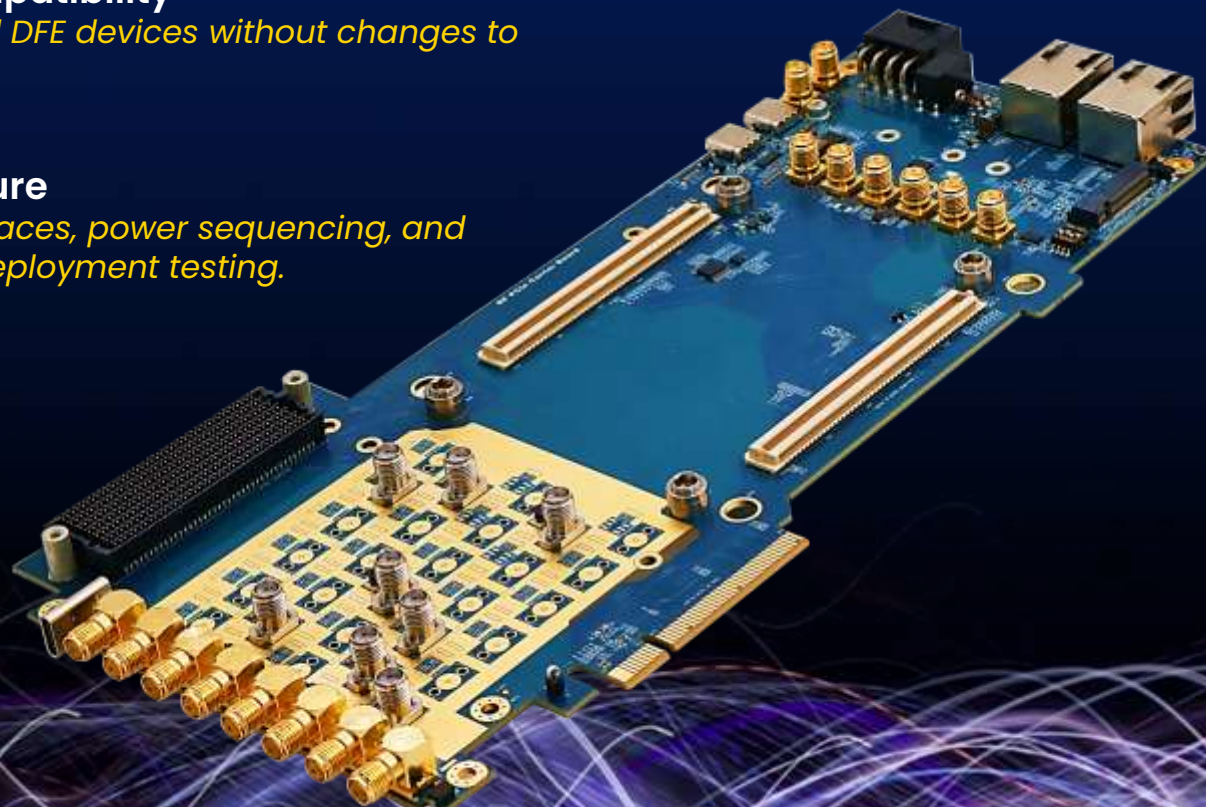
Evaluation Kits

Single, unified evaluation platform that supports all iWave RFSoC SoMs
Eliminating the need to purchase separate EVKs for each module

Multi-channel high-speed RF ADCs/DACs
Enabling direct RF sampling and wideband signal generation.

Scalable Multi-Generation SoM Compatibility
Supports migration from Gen1 to Gen3 and DFE devices without changes to the carrier board

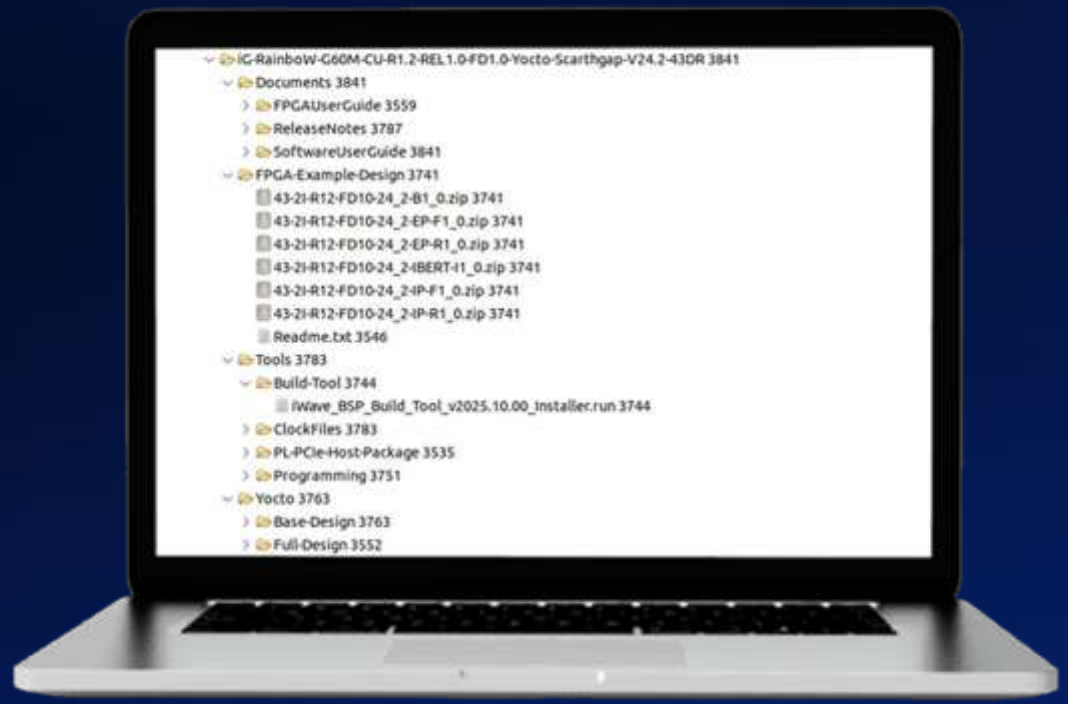
Production-Ready Carrier Architecture
Includes high-speed FMC/expansion interfaces, power sequencing, and thermal-optimized layout for real-world deployment testing.



iWave Global

Deliverables

- **iWave BSP build tool is provided to automate the Yocto build process.**
  - GUI interface support
  - One click Initializing the host environment
  - Option to select different AMD SoC
- **FPGA designs**
  - MTS design(multi-board)
  - BRAM+PCIe based Design
  - RF Analyzer Design
  - Ibert Design
  - Base Design(PS only)
- BSP upgraded periodically
- Dedicated support channel



iWave Global

Case Study

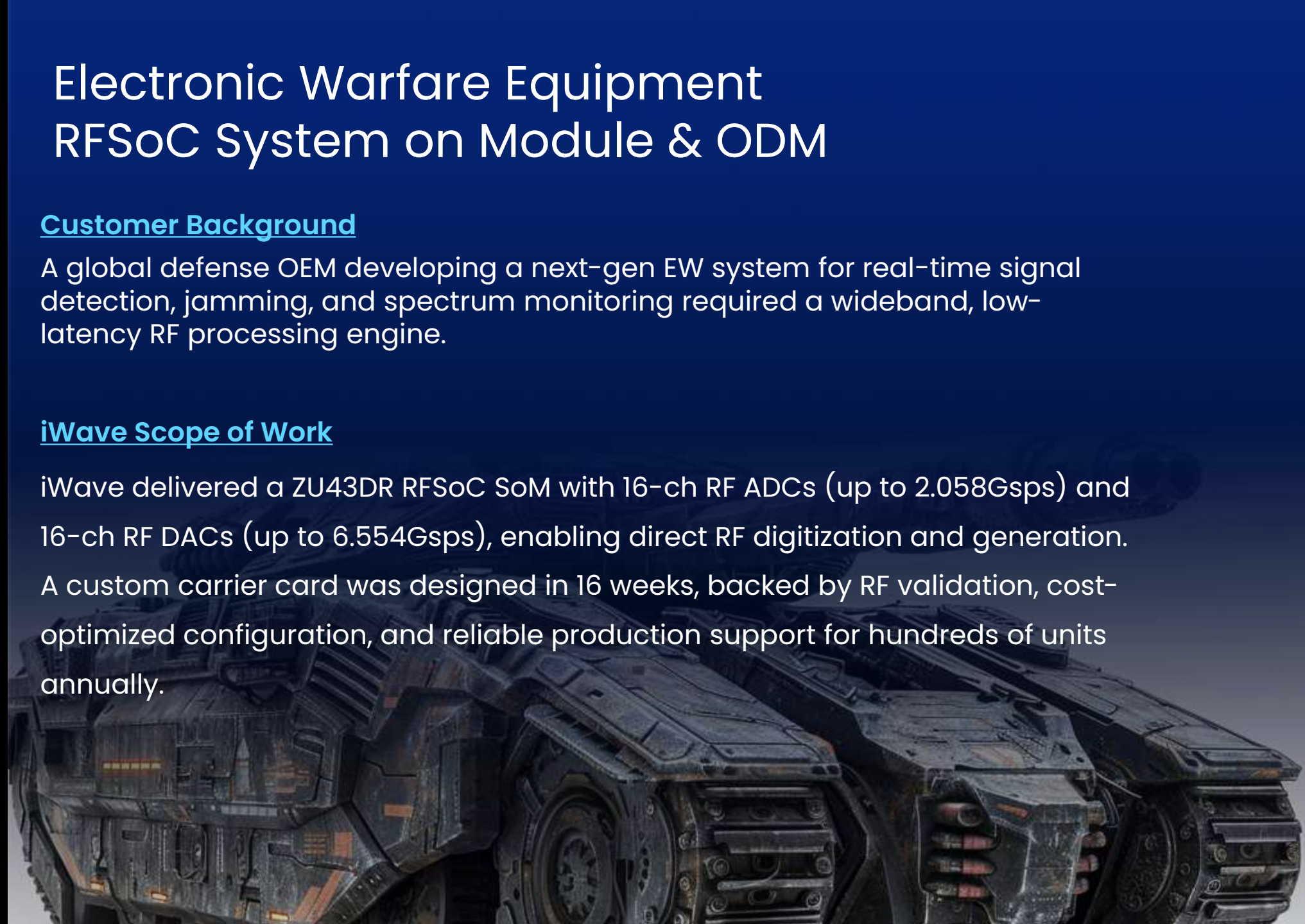
Electronic Warfare Equipment
RFSoC System on Module & ODM

Customer Background

A global defense OEM developing a next-gen EW system for real-time signal detection, jamming, and spectrum monitoring required a wideband, low-latency RF processing engine.

iWave Scope of Work

iWave delivered a ZU43DR RFSoC SoM with 16-ch RF ADCs (up to 2.058Gsps) and 16-ch RF DACs (up to 6.554Gsps), enabling direct RF digitization and generation. A custom carrier card was designed in 16 weeks, backed by RF validation, cost-optimized configuration, and reliable production support for hundreds of units annually.



iWave Global

Case Study

Photonic Computing
RFSoC System on Module & ODM

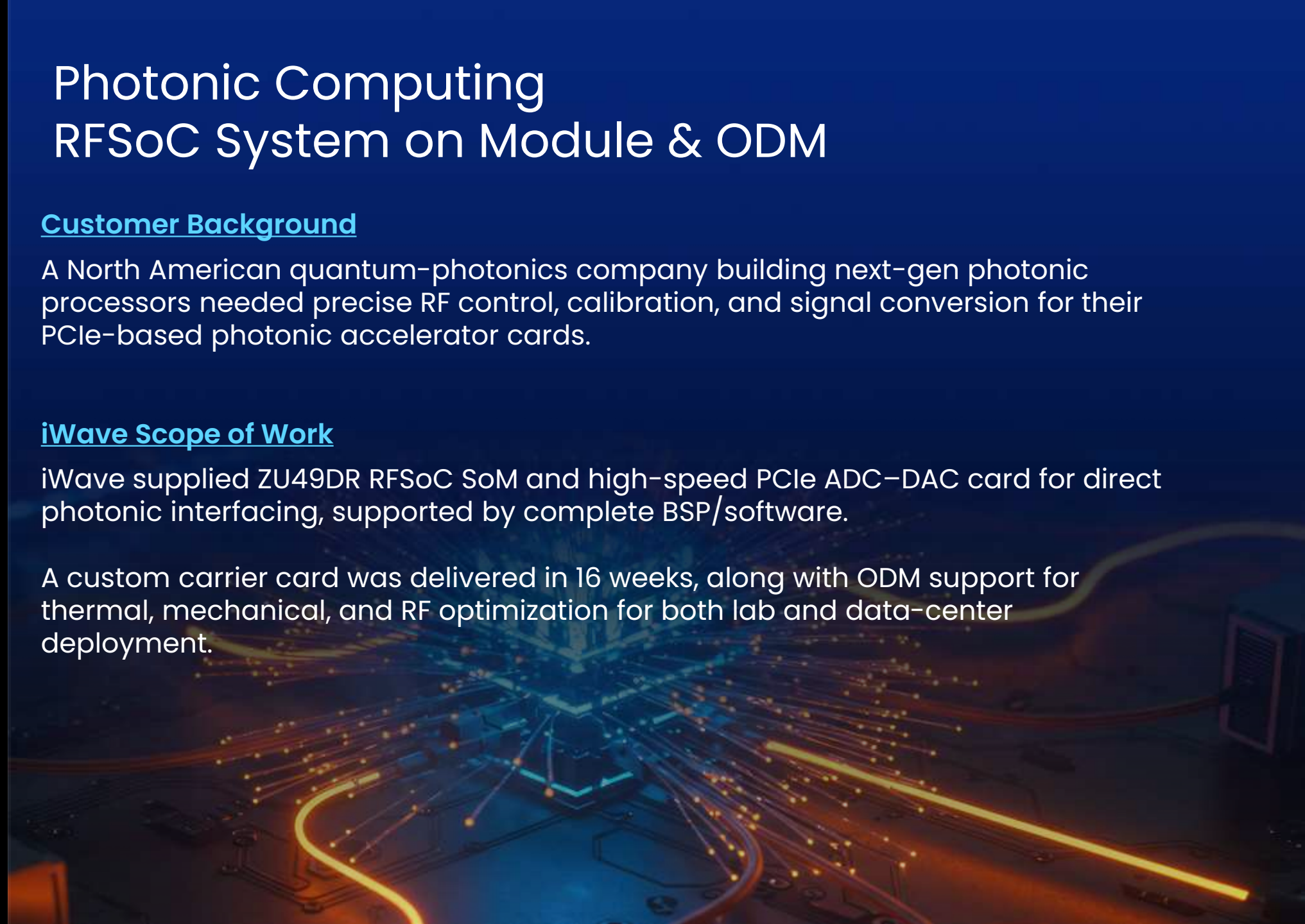
Customer Background

A North American quantum-photonics company building next-gen photonic processors needed precise RF control, calibration, and signal conversion for their PCIe-based photonic accelerator cards.

iWave Scope of Work

iWave supplied ZU49DR RFSoC SoM and high-speed PCIe ADC–DAC card for direct photonic interfacing, supported by complete BSP/software.

A custom carrier card was delivered in 16 weeks, along with ODM support for thermal, mechanical, and RF optimization for both lab and data-center deployment.



iWave Global

Case Study

Radio Telescope RFSoC System on Module

Customer Background

A leading research institute developing next-gen radio telescope arrays for deep-space and multi-frequency astronomical observations.

iWave Scope of Work

iWave's ZU67DR RFSoC platform enabled wideband RF sampling with high-speed ADC/DACs, real-time processing using integrated FPGA+ARM, and reduced system power through consolidated RF clocking. SyncE/PTP support ensured accurate array-level synchronization for coherent astronomical signal detection.

iWave Global

Resources

Technical Articles

- Article - Designing Software Defined Radio (SDR) with RFSoC SoM
- Article – Achieving Deterministic Phase alignment in Multi-Tile RFSoC Systems
- Article – Implementation of PYNQ on AMD Zynq UltraScale+
- Article – RFSoC System on Module for Satellite Communication and Aerospace

Videos

- Overview Video: Explore iWave's Zynq UltraScale+ RFSoC SoMs & 3U VPX Cards
- Overview Video: RFSoC System on Module from iWave and it's Key Features
- Demo: DAC to ADC Loopback using RF Analyzer on ZU49DR RFSoC Evaluation Kit from iwave | Part 2
- Unboxing ZU49DR RFSoC SoM Evaluation Kit from iWave | Part 1
- Demo: Achieving Multi-Board MTS Synchronization with ZU49DR RFSoC SoM

Case Studies

- Case Study - Radio Telescope using ZU49/ZU39/ZU29DR Zynq UltraScale+ RFSoC SoM
- Case Study – Electronic Warfare using Zynq UltraScale+ RFSoC System on Modules

iWave Global

Thank You

We are here to
Accelerate Embedded Innovation

mktg@iwave-global.com

INDIA | USA | GERMANY | EUROPE | TAIWAN | KOREA | JAPAN | DUBAI