

The background features a city skyline at sunset, with a bridge and water in the foreground. Overlaid on the image are various digital elements: a large '5G' logo in the upper center, a network globe in the upper right, and a network globe in the lower right. Vertical text on the left side includes the 'icarpa' logo and several phone numbers: 7233652894, 304919, 563409863290, and 563409863290. The overall color palette is a mix of warm sunset tones and cool blue digital tones.

icarpa

Wireless Infrastructure

# Introduction to 5G Market

## Small Cells and mMIMO Base Stations

Q3 2022

# Location, Markets and Expertise

## Multi-technology semiconductor development

- III-V GaAs and GaN semiconductor technologies
- Silicon CMOS/SOI/SiGe integrated circuit design

## World-class OSAT partnerships

- Foundry, package, assembly, and test services

## Multiple co-operation initiatives

- Co-operation with KU Leuven University, Belgium
- Small Cell Forum member, worked successfully on 5G FR1 reference design and now on C-V2X and Small cells



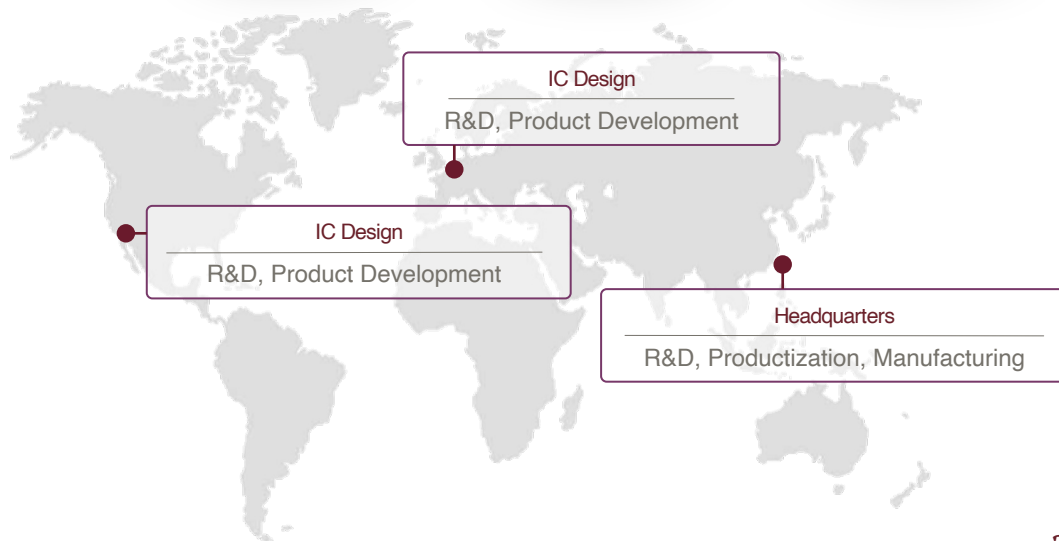
Infrastructure



Automotive



Consumer



# Wireless Infrastructure market of the future

## Rich ecosystem of multiple technologies and solutions.

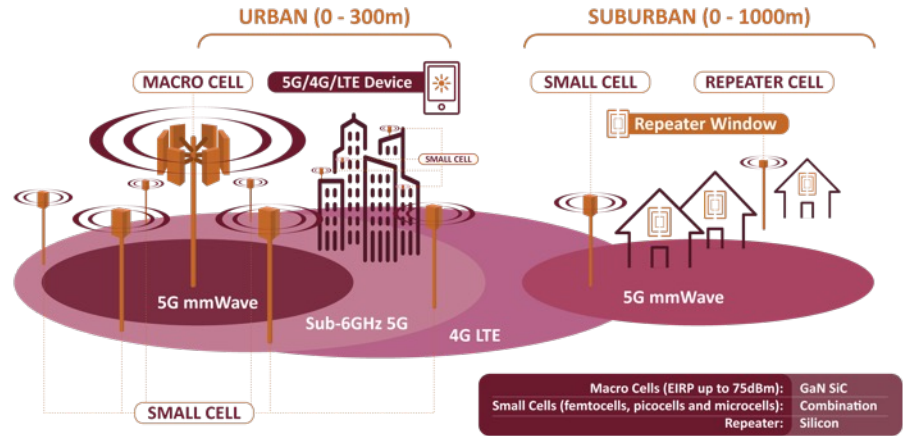
- Macro and Small cells
- 4G/LTE
- 5G NR Sub-6 GHz
- 5G NR mmWave

## Small cells will get more relevance with 5G

- Network densification
- Higher output capacity
- Private networks and Neutral hosts

## Phased arrays will be widely adopted

- Especially to solve the mmWave technical challenges

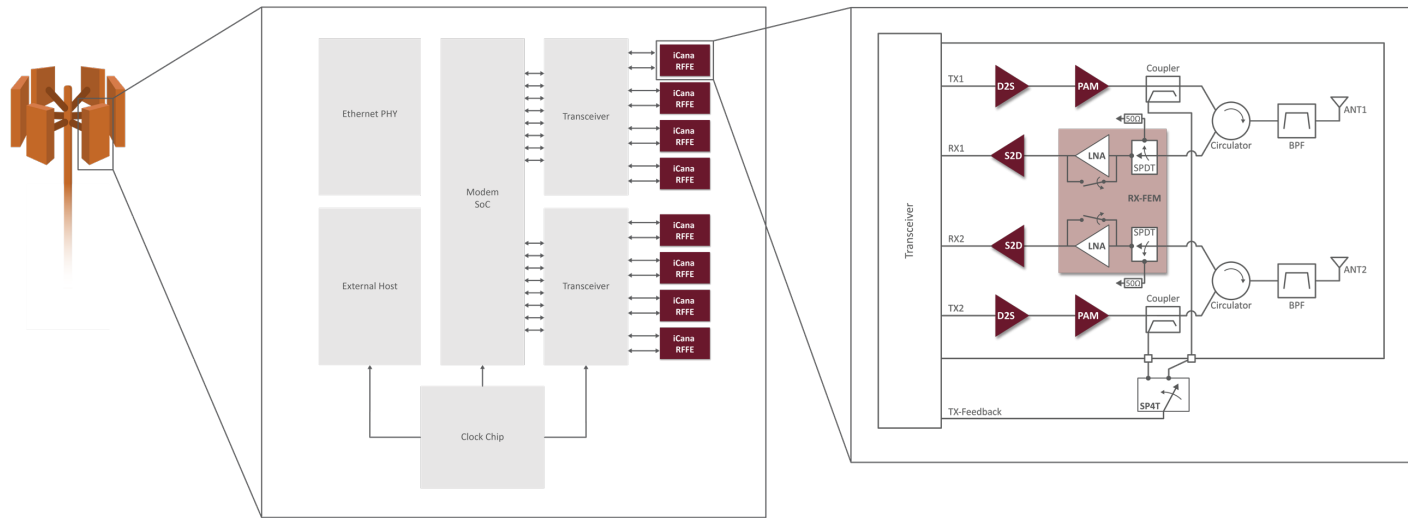


iCana delivers both III-V and Silicon component solutions for small cells and mMIMO.

Small Cells enable Mobile Network Operators to deploy sites in strategic locations offering smaller coverage with higher capacities, using licensed and unlicensed wireless spectrum.

# 5G FR1 Infrastructure

# Product Overview – Small Cells and mMIMO RF Components



## Infrastructure Products

### Differential Amplifiers Interfacing Transceiver

- Single-to-Differential Amplifiers (S2D)
- Differential-to-Single Amplifiers (D2S)

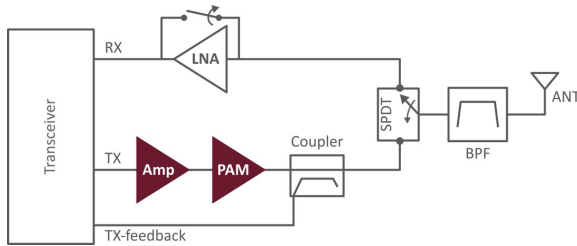
### Dual-Channel Receiver front-End Modules

- Rx-FEM

### High-Efficiency Power Amplifier Modules(PAM)

- 4W
- 8W
- 20W

# 5G FR1 Power Amplifier Modules for Small Cells

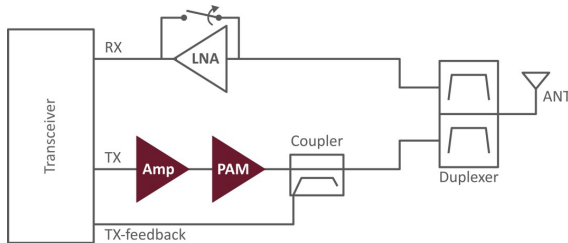


**TDD block diagram**

Peak Power PAM	Average Power PAM	Average Power Small Cell	Status
4W	28 dBm (0.65 W)	24 dBm (0.25 W)	Customer Samples
8W	31 dBm (1.25 W)	27 dBm (0.5 W)	Development
20W	34dBm (2.5 W)	30 dBm (1 W)	Development

## ⊙ Key product features:

- 50  $\Omega$  in/out
- Multiple power levels to cover all range of small cells.
- High efficiency
- Excellent linearity ACLR
- Covers all most important 3GPP 5G NR bands
- Pin-to-pin family compatibility



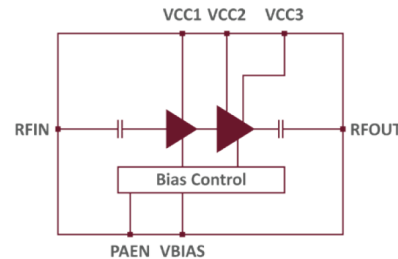
**FDD block diagram**

# 5G FR1 4W RF PAM

Part Number	Frequency
ARQSP1819-4	1.8-1.9 GHz
ARQSP2122-4	2.1-2.2 GHz
ARQSP2324-4	2.3-2.4 GHz
ARQSP2527-4	2.5-2.7 GHz
ARQSP3336-4	3.3-3.6 GHz
ARQSP3742-4	3.7-4.2 GHz
ARQSP4450-4	4.4-5.0 GHz

## Key product features:

- 50  $\Omega$  in/out
- 5V operation (GaAs)
- 5x5 mm<sup>2</sup> package
- Pin-to-pin family compatible

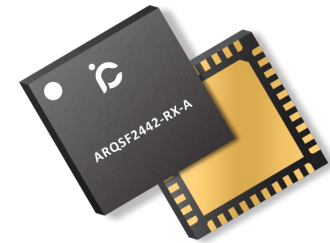
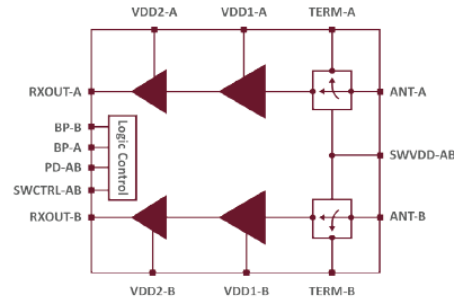


# 5G FR1 Dual Rx FEM

Part Number	Frequency
ARQSF2442-RX-A	2.4-4.2 GHz
ARQSF3753-RX-A	3.7-5.3 GHz

## Key product line features:

- 2 driver stages with one bypass
- Excellent power handling
- Low insertion loss
- Fast switching time
- 6x6 mm<sup>2</sup> package





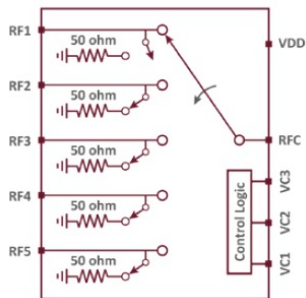
# 5G FR1 Switch

Part Number	Frequency
ICASS1050-5T	1-5 GHz
ICASS1050-4T	1-5 GHz

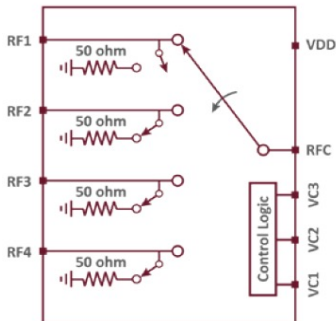
## Key product line features:

- Excellent Isolation
- High Linearity
- Low Insertion Loss
- Fast Switching Time
- 4x4 mm<sup>2</sup> Package

### SP5T



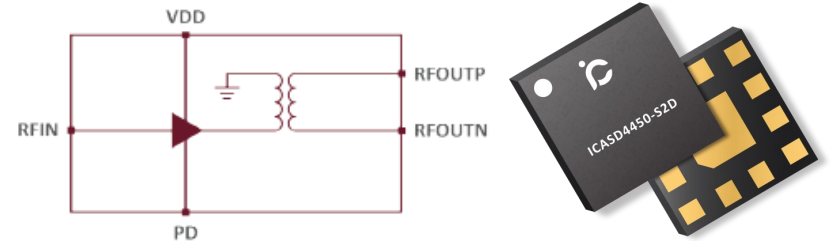
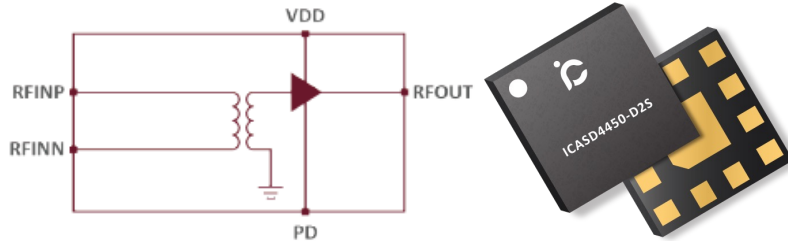
### SP4T



# 5G FR1 D2S/S2D Gain Differential Amplifier

Part Number	Frequency
ICASD1721-D2S	1.7-2.1 GHz
ICASD2328-D2S	2.3-2.8 GHz
ICASD3338-D2S	3.3-3.8 GHz
ICASD4450-D2S	4.4-5.0 GHz

Part Number	Frequency
ICASD1721-S2D	1.7-2.1 GHz
ICASD2328-S2D	2.3-2.8 GHz
ICASD3338-S2D	3.3-3.8 GHz
ICASD4450-S2D	4.4-5.0 GHz



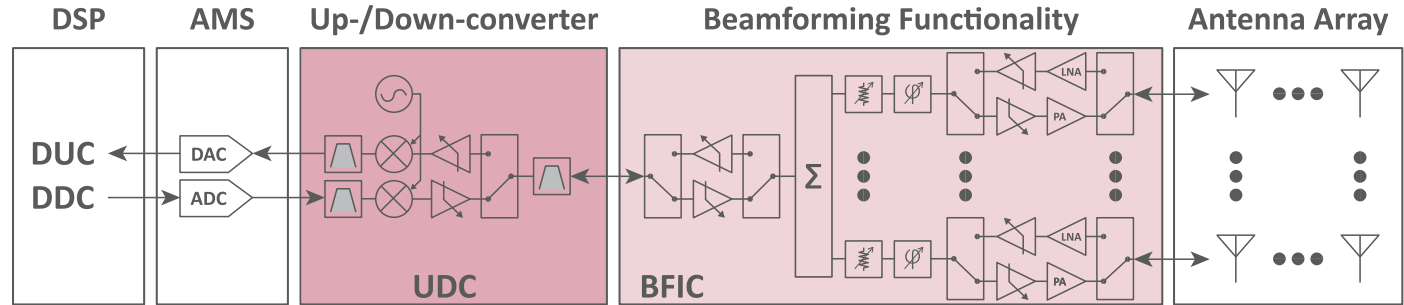
# 5G FR2 Infrastructure

# 5G FR2 Up/Down Converter (UDC)

Part Number	Frequency	Band
ICAMU2430	24-30 GHz	n257, n258, n261
ICAMU3743	37.0-43.5 GHz	n259, n260

## Key features:

- Wide RF frequency range
- Direct conversion and heterodyne conversion in single SoC
- Complex IF operation (IF mode) with optional on-chip hybrid
- DC-offset compensation for the I/Q baseband
- Image rejection and I/Q imbalance optimization
- Accurate phase correction control
- Accurate gain correction control
- Direct conversion of differential baseband I/Q (baseband mode)
- Programmable baseband I/Q common-mode voltage



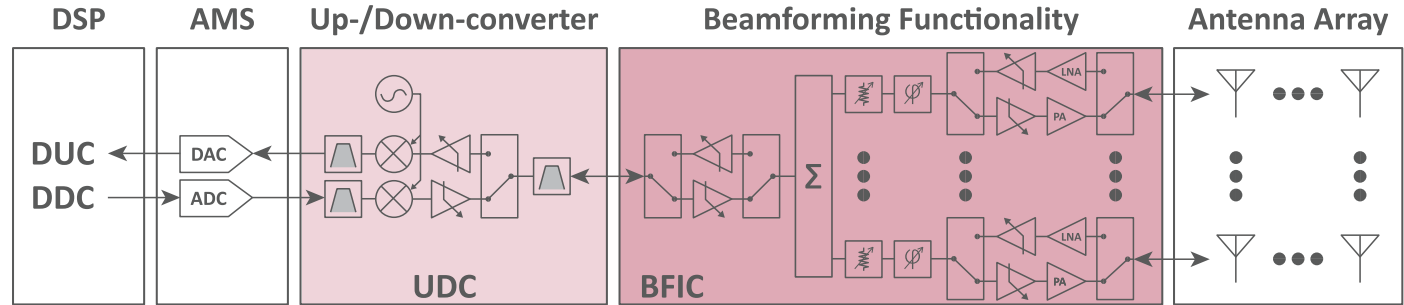
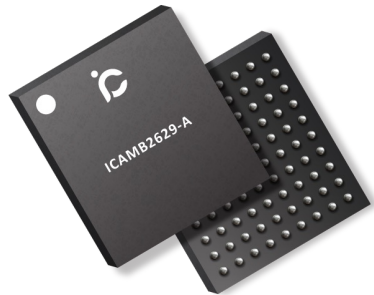
Main function blocks for standard FR2 analog beamforming

# 5G FR2 BFIC

Part Number	Frequency	Band
ICAMB2427-A	24.25-27.5 GHz	n257, n261
ICAMB2629-A	26.5-29.5 GHz	n258
ICAMB3743-A	37.0-42.5 GHz	n259, n260

## Key features:

- 8 configurable transmit and receive channels
- Dual polarization, 4 horizontal and 4 vertical channels
- High linear output power
- Highest gain in industry in TX and RX
- Industry leading amplitude accuracy (0.05dB)
- Best-in-class Phase accuracy
- Supports best-in-class tapering and nulling performance
- AGC-functionality supported
- fast beam scanning
- Fully calibrated and full system calibration enablement



Main function blocks for standard FR2 analog beamforming

# Sales Partners

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