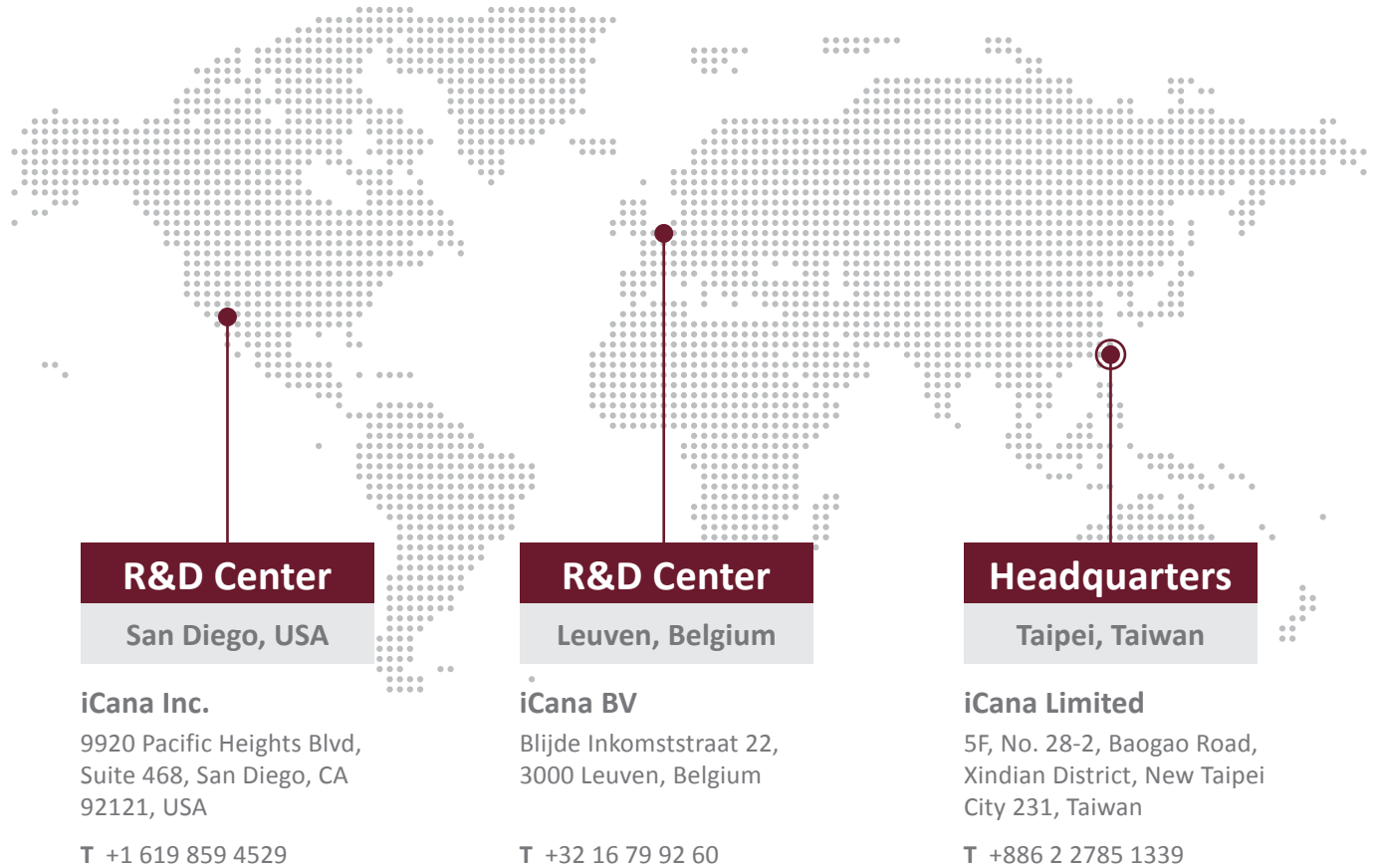


icarra

RF Components for
**Wireless
Infrastructure**

Q2 2023

iCana's Global Support Network



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About iCana

iCana is a fabless semiconductor component supplier specializing in design and manufacturing of RF components for wireless communication. Our primary markets are 5G NR FR1 and FR2 infrastructure together with automotive connectivity. By managing the end-to-end process from IC design through qualification and mass production, we are committed to providing unrivaled performance, quality and reliability. Headquartered in Taiwan, we have additional R&D centers located in Belgium and the United States.

Partnership

We understand that partnership and collaboration are key to unlocking the value and benefits of the 5G era and beyond. For this reason, iCana is collaborating in multiple initiatives and with multiple industrial global partners in different areas of the complex 5G ecosystem. In this way, iCana can co-deliver solutions for complex challenges.

Contact us at sales@icana-rf.com if you would like to further explore opportunities for working and creating value together.

Wireless Infrastructure

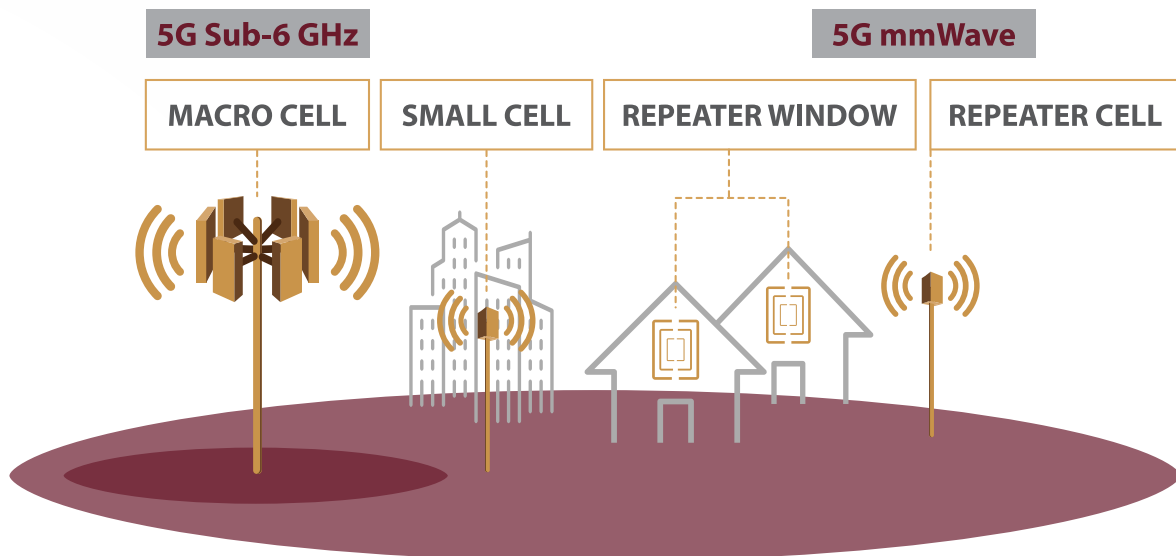
At iCana, we are dedicated to providing cutting-edge RF components with the design flexibility engineers need to create robust, efficient 5G networks. Our components offer wide bandwidth, high power efficiency and high linearity, making them ideal for use in a range of applications covering all major 5G frequency bands of 5G NR FR1 (Sub-6 GHz) and FR2 (mmWave).

5G Sub-6 GHz

Our products cover all the active RF components used in small cell front-end design including Power Amplifiers, Differential Gain Amplifiers, Switches, and Receiver Front-End Modules. We deliver reference designs of our full FR1 RF Front-End with key transceiver and baseband partners.

5G mmWave

Our Beamforming ICs and Up/Down Converters are highly integrated and cost-effective solutions. They are designed to meet the demands of future complex wireless infrastructures.

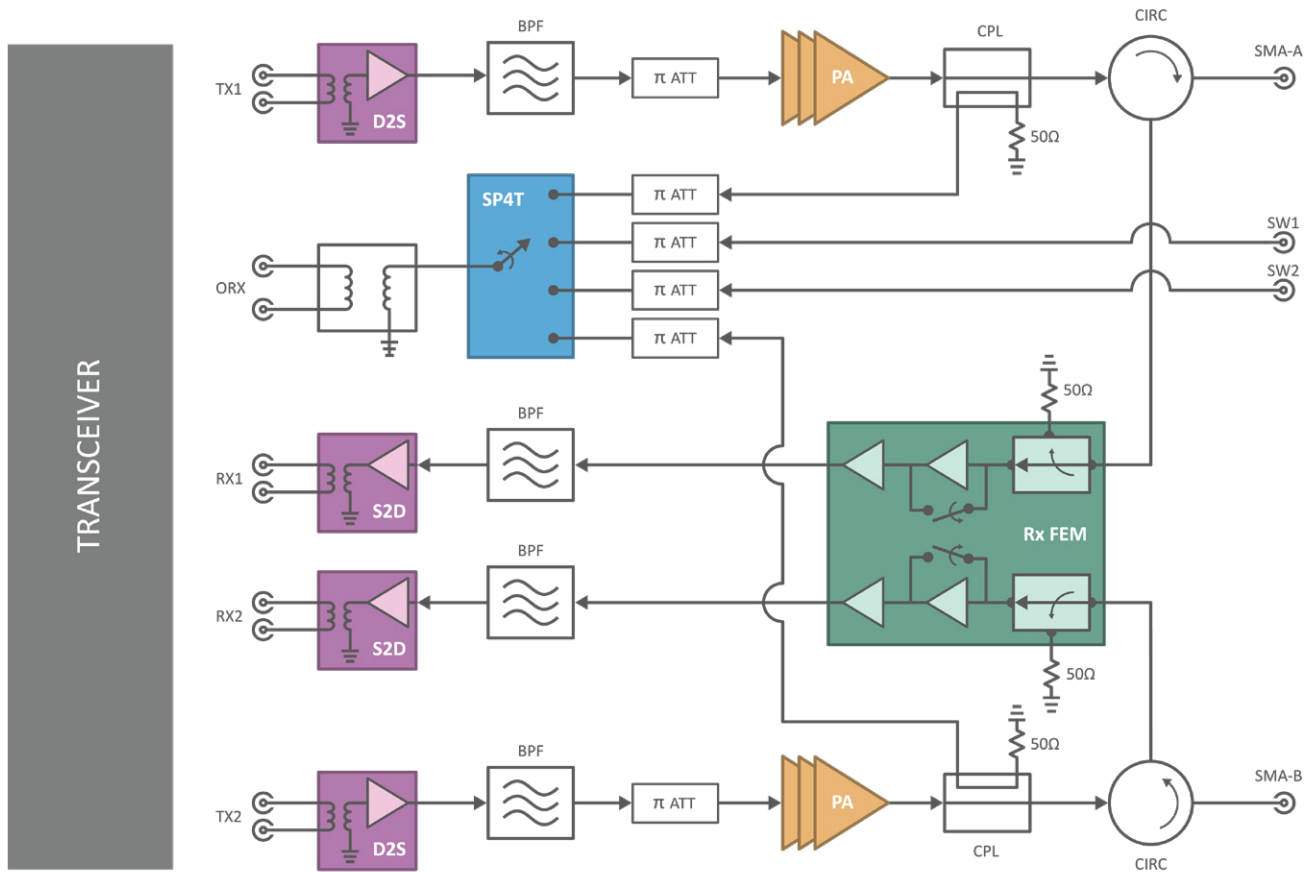


5G NR FR1 RF Front-End Solution



5G NR FR1 RF Front-End Solution







iCana's product range for Sub-6 GHz is comprised of High-Efficiency Power Amplifiers, Differential Gain Amplifiers, Switches, and Receiver Front-End Modules.



- High-efficiency PA's working with DPD to amplify and linearize the signal
- Differential Gain Amplifiers interfacing directly with the transceiver
- Receiver Front-End Module provides low noise amplification for receive chain
- RF SP4T controls the DPD feedback path

Solutions for 5G NR FR1 Bands

iCana offers a wide range of 5G NR FR1 solutions from 4 W, 8 W, 20 W High-Efficiency Power Amplifiers, Differential Gain Amplifiers, Dual-Channel Receiver Front-End Module and Switches.

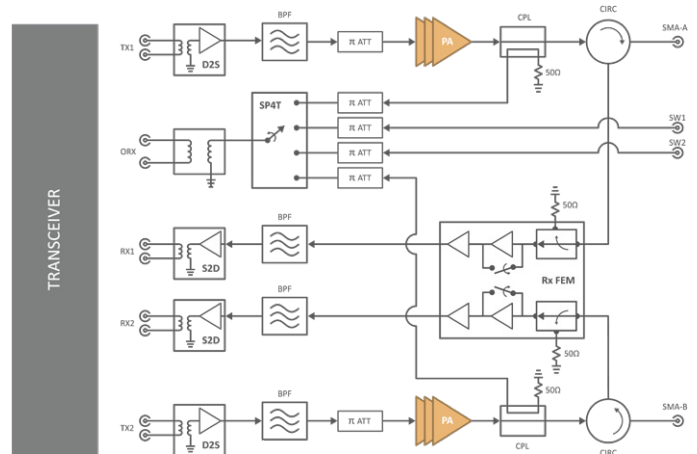
	n3	n1	n40	n7/n41
 4 W Power Amplifier	ARQSP1819-4	ARQSP2122-4	ARQSP2324-4	ARQSP2527-4
 8 W Power Amplifier				
 20 W Power Amplifier				
 Gain Amplifier	ICASD1721-D2S		ICASD2328-D2S	
	ICASD1721-S2D		ICASD2328-S2D	
 Receiver FEM	ARQSF1828-RX-A			ARQSF2442-RX-A
 Switch				ICASS1050-4T (SP4T)
				ICASS1050-5T (SP5T)

n77		n78		n79			
ARQSP3336-4		ARQSP3437-4		ARQSP3742-4		ARQSP4450-4	4 W Power Amplifier
ICASP3338-8		ICASP3742-8		ICASP4450-8			8 W Power Amplifier
ICASP3338-20		ICASP3742-20		ICASP4450-20			20 W Power Amplifier
ICASD3338-D2S		ICASD3338-S2D		ICASD4450-D2S		ICASD4450-S2D	Gain Amplifier
				ARQSF3753-RX-A			Receiver FEM
		ARQSF2442-RX-A					
ICASS1050-4T (SP4T)							Switch
ICASS1050-5T (SP5T)							

Power Amplifier

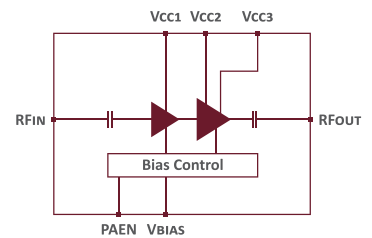
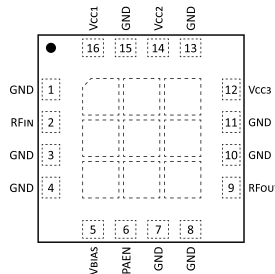
5G NR FR1

- **Average output power of 28, 30 or 35 dBm**
Targeted for indoor and outdoor small-cells design from 24 dBm (0.25 W) to 33 dBm (2 W) at the antenna port
- **Complies 3GPP standard**
Achieves excellent PAE and ACLR of -50 dBc with commercially available DPD linearization platforms
- **Extremely rugged**
Withstands output VSWR mismatch of up to 10:1 to deliver safe continuous operation
- **Fully matched 50 Ω input and output**
Pin-to-pin compatible with major PA component suppliers promoting easy replaceability and supplier diversity



4 W High-Efficiency Power Amplifiers

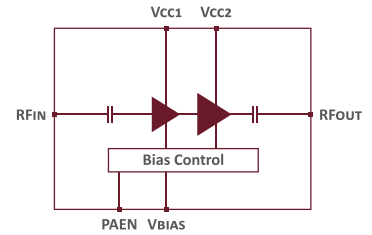
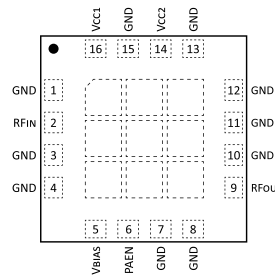
- Transmit path
- 28 dBm average output power targeted for 0.25 W at antenna port
- -50 dBc ACLR with DPD
- 50 Ω in/out
- 5 V operation
- 5x5 mm² package
- Pin-to-pin compatible family including compatibility with iCana 8 W PA



Part Number	Frequency	Band	Gain (dB)	Psat (dBm)	PAE (%)
ARQSP1819-4	1.8-1.9 GHz	n3, n39	39.5	36	30
ARQSP2122-4	2.1-2.2 GHz	n1	38	36.2	32
ARQSP2324-4	2.3-2.4 GHz	n30, n40	40	35.4	31
ARQSP2527-4	2.5-2.7 GHz	n7, n38, n41	37	36	30
ARQSP3336-4	3.3-3.6 GHz	n77, n78	38.1	35.2	21.2
ARQSP3437-4	3.4-3.7 GHz	n48 (CBRS), n77, n78	37.6	35.4	23.9
ARQSP3742-4	3.7-4.2 GHz	n77	38	35.5	22
ARQSP4450-4	4.4-5.0 GHz	n79	32.7	34.6	22.8

8 W High-Efficiency Power Amplifiers

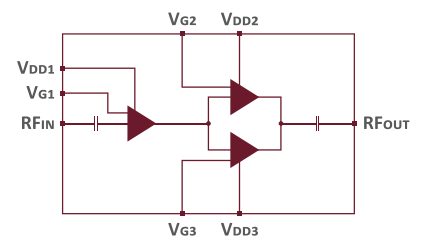
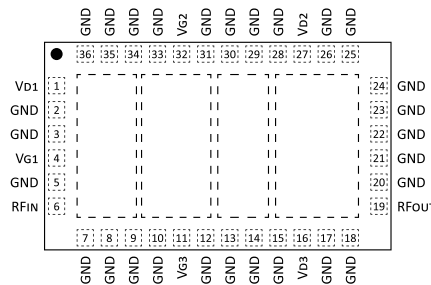
- Transmit path
- 30 dBm average output power targeted for 0.25 – 0.5 W at antenna port
- -50 dBc ACLR with DPD
- 50 Ω in/out
- 5 V + 12 V operation
- 5x5 mm² package
- Pin-to-pin compatible family including compatibility with iCana 4 W PA



Part Number	Frequency	Band	Gain (dB)	Psat (dBm)	PAE (%)
ICASP3338-8	3.3-3.8 GHz	n48 (CBRS), n77, n78	37	39.5	27
ICASP3742-8	3.7-4.2 GHz	n77	35	39	25
ICASP4450-8	4.4-5.0 GHz	n79	33	39	23

20 W High-Efficiency Power Amplifiers

- Transmit path
- 35 dBm average output power targeted for 1 – 2 W at antenna port
- -50 dBc ACLR after DPD
- 50 Ω in/out
- 28 V operation
- 6x10 mm² package
- Pin-to-pin compatible family

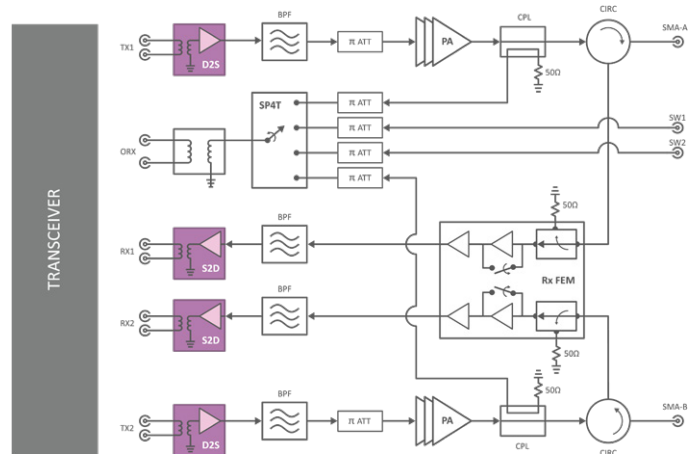


Part Number	Frequency	Band	Gain (dB)	Psat (dBm)	PAE (%)
ICASP3338-20	3.3-3.8 GHz	n48 (CBRS), n77, n78	28	44	30
ICASP3742-20	3.7-4.2 GHz	n77	28	43.5	32
ICASP4450-20	4.4-5.0 GHz	n79	28	43.5	32

Gain Amplifier

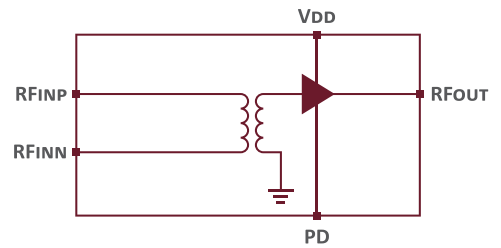
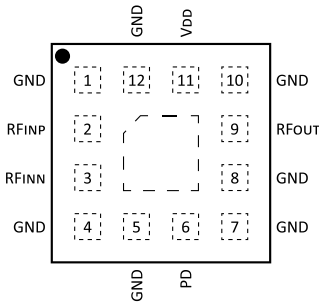
5G NR FR1

- **Differential to single-ended**
Active balun to convert differential signal from transceiver to single-ended signal with high gain and linearity to drive the PA
- **Single-ended to differential**
Active balun to convert single-ended signal from Receiver FEM to differential signal for feeding into transceiver with high gain and low NF
- **Small footprint**
Removes the need of passive components for signal conversion. Reduces component footprint, board size and BOM cost



Differential to Single-Ended Gain Amplifiers

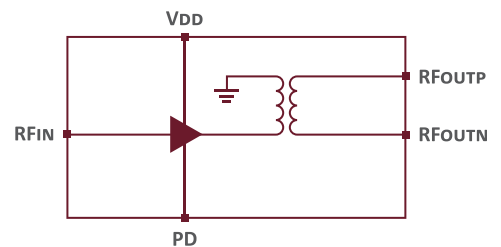
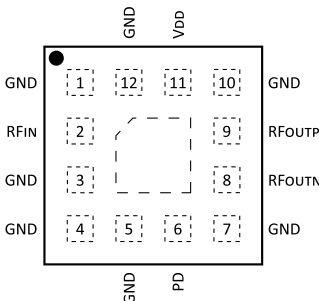
- Transmit path
- 100 Ω in / 50 Ω out
- No external choke inductor needed
- High gain and linearity
- 5 V operation
- 2x2 mm² package
- Pin-to-pin compatible family



Part Number	Frequency	Band	Gain (dB)	OP1dB (dBm)	OIP3 (dBm)
ICASD1721-D2S	1.7-2.1 GHz	n1, n2, n3, n25, n39	18.5	19	30
ICASD2328-D2S	2.3-2.8 GHz	n7, n30, n38, n40, n41	18.3	19	32
ICASD3338-D2S	3.3-3.8 GHz	n48 (CBRS), n77, n78	17.5	18	34
ICASD4450-D2S	4.4-5.0 GHz	n79	16.5	17	33

Single-Ended to Differential Gain Amplifiers

- Receive path
- 50 Ω in / 100 Ω out
- No external choke inductor needed
- High gain and low noise figure
- 5 V operation
- 2x2 mm² package
- Pin-to-pin compatible family

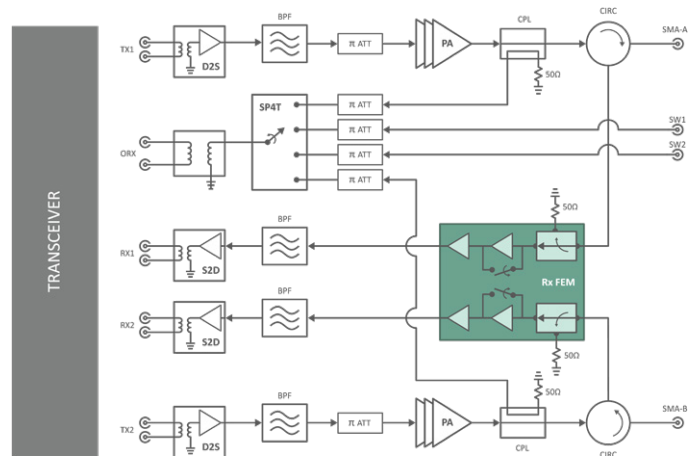


Part Number	Frequency	Band	Gain (dB)	OIP3 (dBm)	NF (dB)
ICASD1721-S2D	1.7-2.1 GHz	n1, n2, n3, n25, n39	19	30	1.5
ICASD2328-S2D	2.3-2.8 GHz	n7, n30, n38, n40, n41	19	33	1.6
ICASD3338-S2D	3.3-3.8 GHz	n48 (CBRS), n77, n78	18.8	33	1.8
ICASD4450-S2D	4.4-5.0 GHz	n79	18	27	2

Receiver FEM

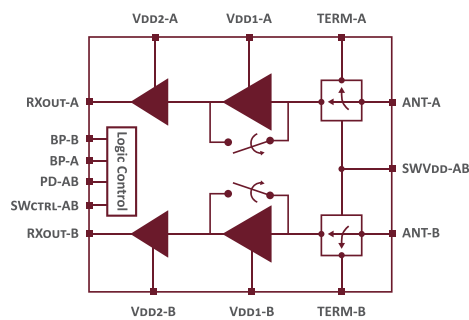
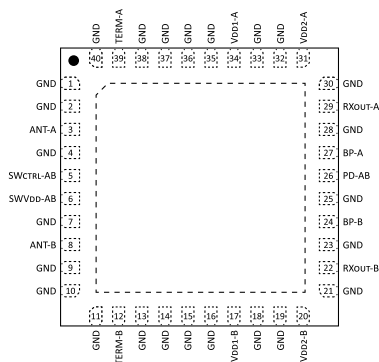
5G NR FR1

- Dual-channel FEM**
 2 gain modes with low NF for 2T2R configurations. Reduces the overall board size and BOM cost
- Channel isolation**
 Provides a channel isolation of 40 dB at a small footprint
- High power handling**
 Handles signals up to 41 dBm average power making it an ideal choice for use even in outdoor base stations and mMIMO system
- Fully matched 50 Ω input and output**
 Pin-to-pin compatible FEM product line



Dual-Channel Receiver Front-End Module

- Receive path
- Each channel consists of a SPDT switch and a two-stage LNA with bypass
- High Gain (HG) and Low Gain (LG) mode
- 50 Ω in/out
- 5 V operation with 1.8/3.3 V control
- 6x6 mm² package
- Pin-to-pin compatible family

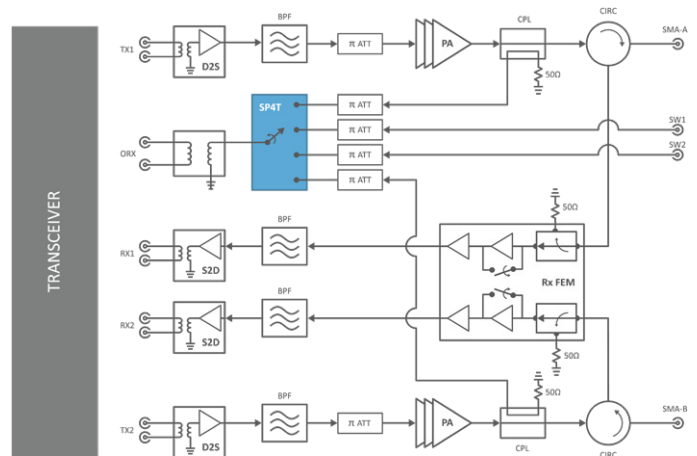


Part Number	Frequency	Band	Gain (dB)		OIP3 (dBm)		NF (dB)	
			HG	LG	HG	LG	HG	LG
ARQSF1828-RX-A	1.8-2.8 GHz	n1, n2, n3, n7, n25, n30, n38, n39, n41	38	18	33	27	1.5	1.4
ARQSF2442-RX-A	2.4-4.2 GHz	n7, n38, n41, n48 (CBRS), n53, n77, n78	37	16.5	34	25	1.4	1.3
ARQSF3753-RX-A	3.7-5.3 GHz	n77, n79	37	16	29.5	28.5	1.5	1.4

Switch

5G NR FR1

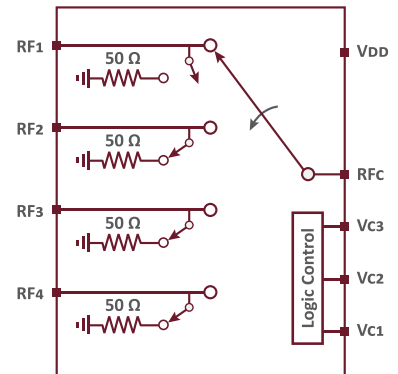
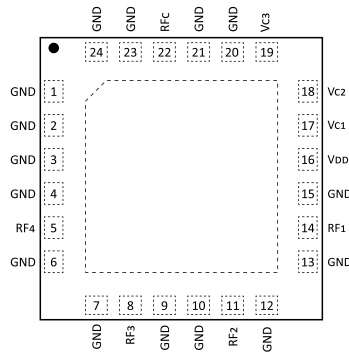
- Major 3GPP band coverage**
 Covers major Sub-6 GHz 3GPP bands with frequency range of 1 to 5 GHz
- High performance**
 Exhibits a low insertion loss, excellent isolation, and fast switching rates. Can handle signals of power level up to 33 dBm, suitable for use in outdoor base stations
- Supports up to 4T4R**
 SP4T capable of supporting up to 4 coupled PA output signals to the observation receiver path of transceiver for performing DPD linearization
- Fully matched 50 Ω input and output**
 Pin-to-pin compatible product line



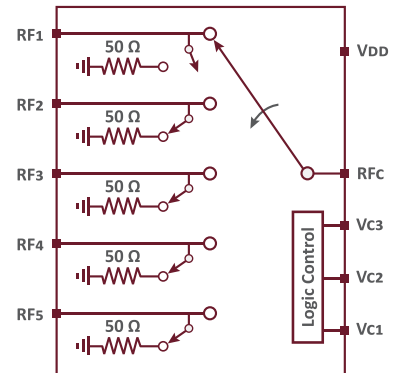
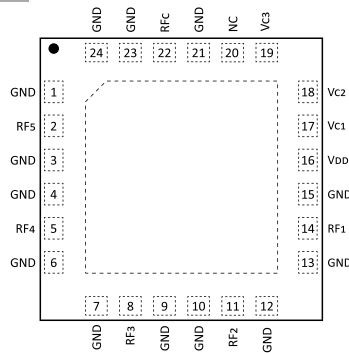
SP4T / SP5T Switches

- Observation path
- Excellent isolation
- Low VSWR during hot switching
- High linearity & low insertion loss
- Fast switching time
- Absorptive design with high linearity & low insertion loss
- 50 Ω in/out
- 4x4 mm² package
- Pin-to-pin compatible family

SP4T



SP5T



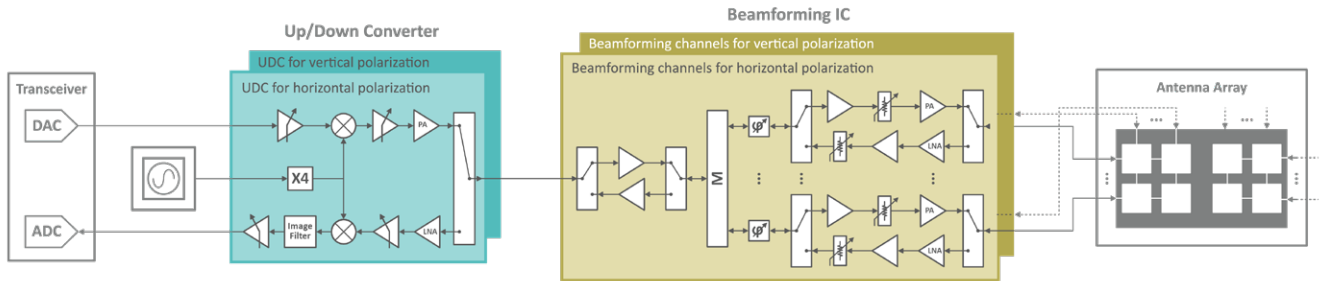
Part Number	Frequency	Band	Insertion Loss (dB)	Return Loss (dB)	Isolation (dB)
ICASS1050-4T	1-5 GHz	All	0.7	20	40
ICASS1050-5T	1-5 GHz	All	0.7	20	40

5G NR FR2 RF Front-End Solution



5G NR FR2 RF Front-End Solution

Moving towards mmWave in 5G is crucial to accommodate the ever-increasing data rate and massive connectivity. For mmWave applications, iCana delivers Beamforming ICs and Up/Down Converters.

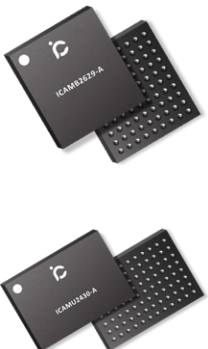


Dual-Channel Up/Down Converter integrating up/down conversion for both horizontal and vertical polarization

Beamforming IC to steer the antenna array in both horizontal and vertical polarization

Solutions for 5G NR FR2 Bands

iCana's 5G NR FR2 products, Beamforming ICs and Up/Down Converters, cover the key 5G mmWave frequency bands in deployment.

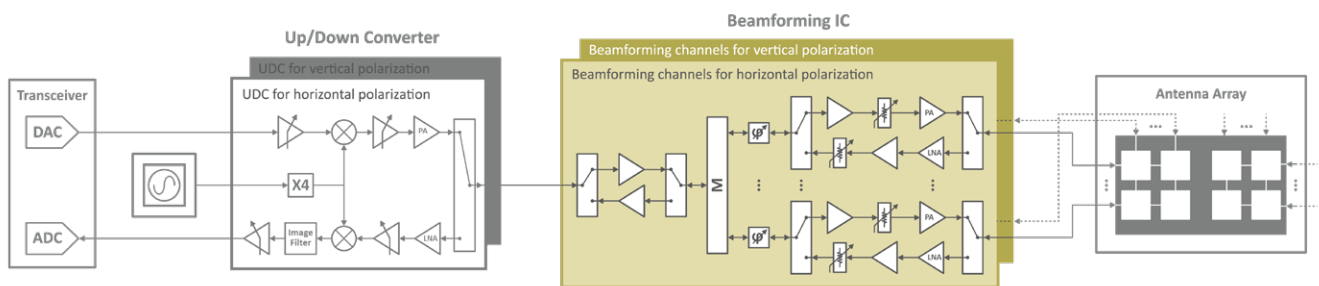


	26 & 28 GHz		39 & 41 GHz	
	n258	n257 & n261	n260	n259
Beamforming IC	ICAMB2427-A	ICAMB2629-A	ICAMB3743-A	
Up/Down Converter	ICAMU2430-A		ICAMU3743-A	

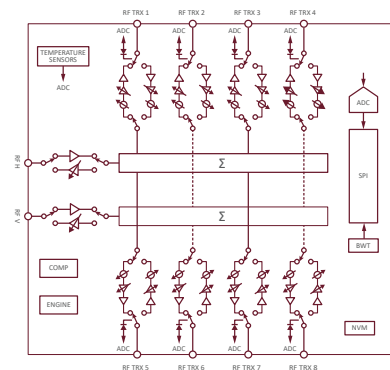
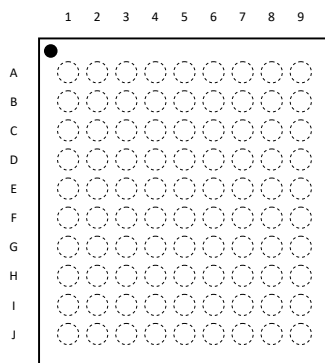
Beamforming IC

5G NR FR2

iCana's Beamforming ICs are highly integrated cost-effective solutions that deliver high EIRP, which are key enablers for establishing a high data rate communication link at mmWave frequencies. The Beamforming ICs offer industry-leading performance, comprising multiple channels with independent control for each channel in both transmit and receive paths with high tunability and reconfigurability, allowing for optimal configuration of the antenna phased array for the best steering solution. This performance is guaranteed for every Beamforming IC across various operating conditions, thanks to the built-in different digital control circuitry and a large on-chip memory supporting the entire sensor interface monitoring temperature, RF power, and power consumption.



- 8 channels, dual polarization
- High output power: 10 dBm per channel at 3% EVM (5G NR 400 MHz, 64 QAM)
- Wide signal bandwidth up to 800 MHz
- High resolution DVGAs for amplitude control (0.5 dB amplitude step)
- 6-bit phase resolution (5.6° phase step)
- Low noise figure < 4.5 dB
- Industry-leading phase accuracy: RMS phase error < 2°
- Fast beam switching
- Automatic temperature compensation for amplitude and phase
- Self-calibration to reduce array level calibration and improve line yield
- 4.6×5.1 mm² 90-pin BGA package

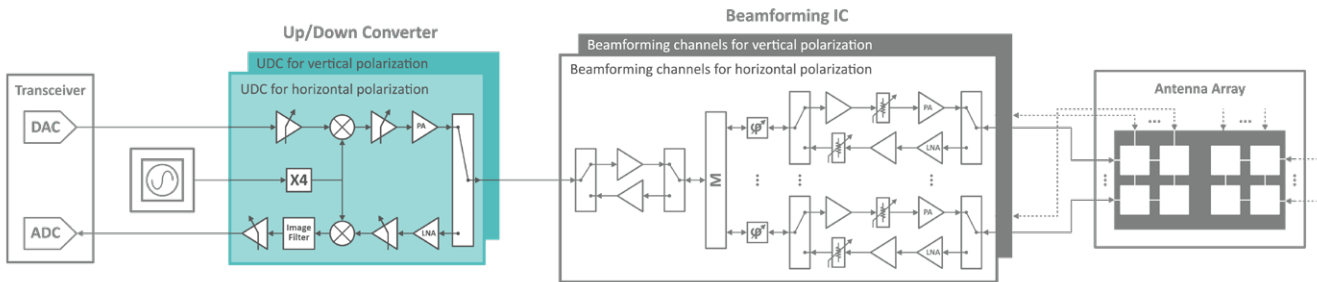


Part Number	Frequency	Band
ICAMB2427-A	24.25-27.5 GHz	n258
ICAMB2629-A	26.5-29.5 GHz	n257, n261
ICAMB3743-A	37.0-42.5 GHz	n259, n260

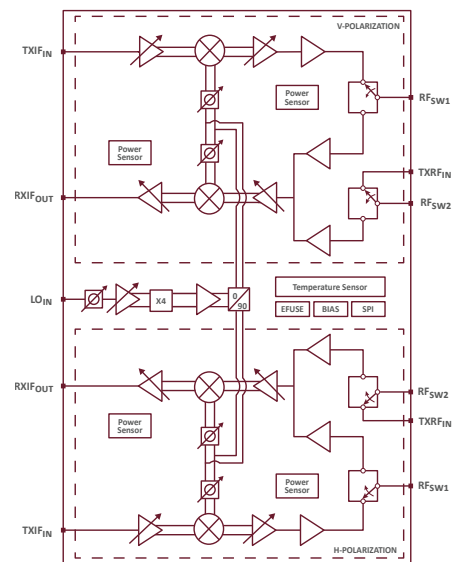
Up/Down Converter

5G NR FR2

The iCana Up/Down Converters are highly integrated silicon frequency-conversion ICs that support 5G phased-array applications. These Up/Down Converters are compatible with the iCana Beamforming ICs and they can be used in combination with their respective products, providing a low-cost, high-performance 5G phased-array system.



- Dual-channel up/down converter with an LO chain using x4 integrated in single chip
- Supports wide RF, IF and oscillator frequency range
- High tunable conversion gain and high linearity
- Excellent amplitude and phase orthogonality
- Automatic temperature compensation for amplitude and phase
- **Upconversion mode:**
 - Fully calibrated for optimal rejection
 - Tunable sideband rejection and carrier feedthrough optimization
- **Downconversion mode:**
 - Fully calibrated for minimal I/Q imbalance
 - Tunable image rejection and I/Q imbalance optimization
- **LO-path:**
 - Tunable LO harmonic rejection filter
 - 360° phase shifting for LO synchronization



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

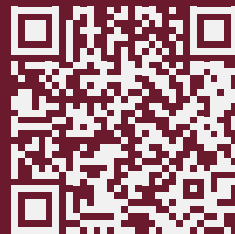
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