SilverWings™ Product Brief

4x4 Low Power All-in-one Transceiver

General Description

SilverWings is a versatile all-in-one transceiver product based on Digital-IF conversion technology designed for a diverse set of applications including wireless radios, satellite communication, repeaters, Fixed-wireless access devices, user equipment's, medical devices, and instrumentation. SilverWings is specially differentiated due to its innovative conversion methodology that allows multiple programmable Analog and Digital stages to achieve the maximum performance with minimum power consumption and integration complexity. Thus, it's a perfect product for any wireless or wired communication use cases with many desired operating frequency, bandwidths and specification including 5G base stations, massive MIMO radio units, small cells, private networks, repeaters, and user equipment's.

Key attributes of SilverWings includes:

- **Versatility:** The innovative design of this solution enables customization of the system based on desired frequency of operation, bandwidth, and required system specifications. The multi-stage Analog and Digital up-conversion and down-conversion facilitate a programmable and flexible system design.
- **Ultra-low power usage:** Arctic's designs are inherently focused on minimizing power consumption of the circuits. Therefore, the SilverWings architecture can incorporate multiple functionalities to achieve maximum performance while maintaining ultra-low power consumption.
- **Seamless integration:** The Digital-IF conversion methodology leads to eliminating the need to perform complex calibration steps that compensates for IQ imbalance and LO leakage. Therefore, transceiver integration is as seamless as possible and there is no requirement for time consuming and difficult imbalance estimation and correction methods. This is due to the utilization of IF frequency prior to digital sampling and ability to integrate digital multi-channel up-conversion and down-conversion as part of the low power consumption transceiver design.
- **Integration:** Complete set of functionalities necessary to perform full up conversion and down conversion from digital to RF and RF to digital. Additionally, RF gain stage that enable Automatic Gain Control (AGC) are included on the receiver side to combat interference while Digital Pre-Distortion (DPD) is included on the transmit side to combat external Power Amplifier non-linearity. Thus, SilverWings is a true all-in-one RF to digital transceiver for various applications and use cases.

A key benefit of SilverWings is an **improved power efficiency of 70% over existing solutions.** This is done through extensive innovation in architecture design,

sophisticated analog circuit design, high level of digital integration, and a clear focus on low power circuit design. This low power consumption approach leads to lower cost in radio design for enterprise and telco base station providers. The fully integrated DPD actuators along with Arctic SilverLinear™ DPD algorithm also enables high-efficiency PA utilization ultimately leading to lower power consumption. In the meantime, the innovative method for observation path eliminates the dependency on JESD lanes further reducing power consumption of the solution.

Another key benefit is providing hardware design flexibility by offering **Sub-6GHz and mmWave convergence**. This product has a novel design that leads to a single pluggable chip converging sub-6GHz and 6GHz including CBRS (Citizens Broadband Radio Service) LTE band with mmWave IF transceiver solution.

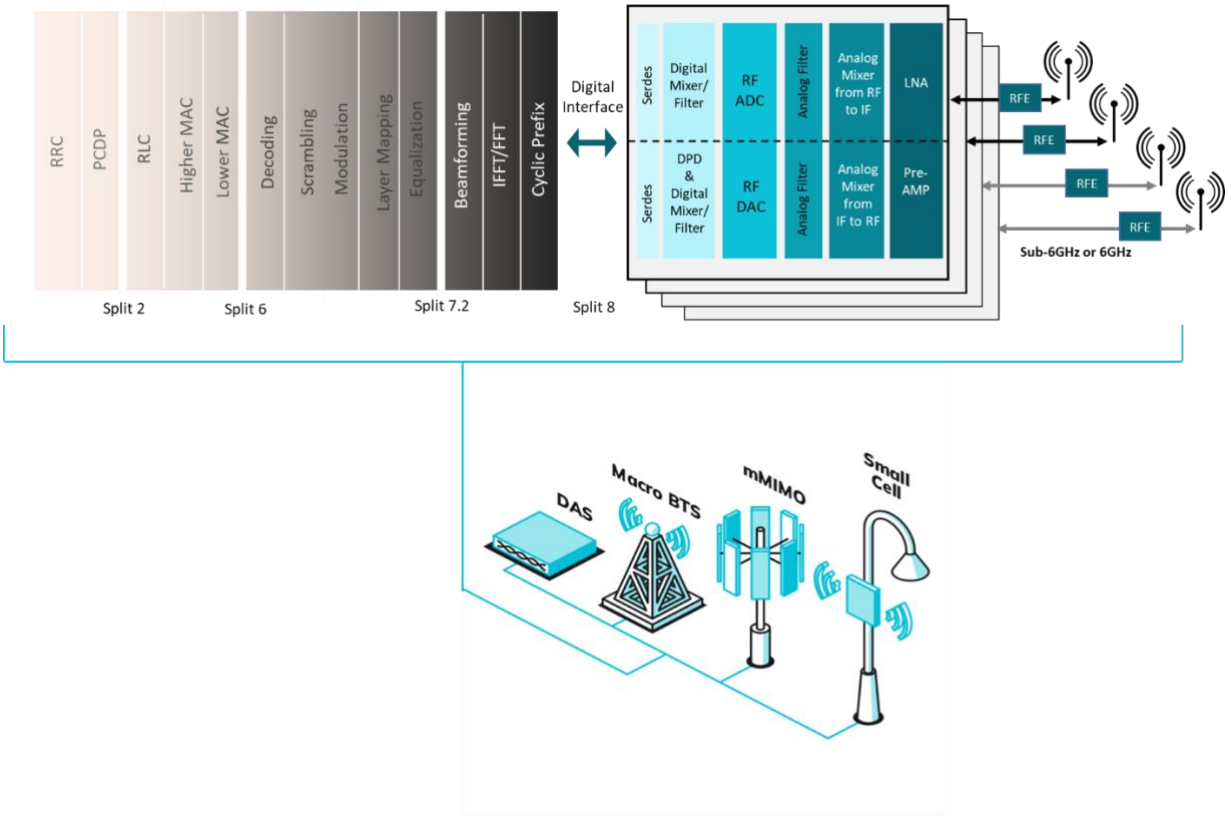
Features

- Digital-IF receive conversion and High-IF transmit conversion technology
- Quad Tx/Rx with 2 Observation paths
- Each path with 4 Wide-band RF inputs covering RF ranges of 600MHz to 7.2GHz per path: Port 1: 600MHz-965MHz, Port 2: 1400MHz-2700MHz, Port 3: 3300MHz-5200MHz, Port 4: 5000MHz-7125MHz.
- Fully integrated **DPD actuators** with Long Term memory effects
- Programmable transmit BW support: 20MHz/40MHz/80MHz/100MHz/200MHz/400MHz/800MHz BW, 0.6GHz-7.2GHz RF IN
- Max transmit of 800MHz, linearizing up to 200MHz of FR1 IBW.
- 12 fully integrated phased-lock loops (PLLs). Two PLLs for receive path Analog and Digital operation, second and third PLLs for transmit path Analog and Digital operation, and fifth PLL for Serdes operation and sixth PLL for observation path operation. These are all duplicated for an independent 2-time 2x2 operation
- in a multi-band scenario.
- TDD and FDD modes
- Max receive FR1 IBW of 200MHz, Max FR2 IBW of 400MHz
- Integrated RX RF gain enabling **Automatic Gain Control** of 72dB
- Max Observation BW of 800MHz
- Programmable receive BW support: 20MHz/40MHz/80MHz/100MHz/200MHz/400MHz BW, 0.6GHz-7.2GHz RF IN
- **Digital interface to the Baseband based** on JESD204B standard (8 JESD lanes, 4 Tx, 4 Rx) 9.8-12Gbps rate
- Ideal for sub-6G or mmWave applications
- Digital multi-CC down conversion and multi-CC up conversion plus associated filtering and tone removal
- 5 Carrier Channel support in both TX and RX: avoids large bandwidth transfer between modem and Transceiver and enables wide-band PA applications. (CBRS + C-band)

- Digital IF methodology eliminates IQ imbalance image in the band and the need for complicated calibration of IQ correction filter.
- High-IF transmit path eliminates IQ imbalance image in the band and LO leakage, eliminates the need for complicated calibration of IQ correction filter and DC offset correction methodologies.
- 800MS/s to 3GS/s ADC and 4GS/s DAC
- **Power consumption without DPD: (1.8W TDD 80-20)** & (3.8W FDD) & (2.1W TDD 50-50)

Use Case

Sub_6GHz, 6GHz Use Case



About Arctic Semiconductor

Arctic Semiconductor is a leading provider of low power, cost-effective chipsets and systems to be used in wireless radios, satellite communication, IoT, Industry 4.0, automotive, medical equipment, instrumentation, and user devices. The company's cutting-edge technology includes wide-band RF Front end, high precision high-speed data converters, and digital processing and Serdes all integrated in extremely low power with small form factor silicon to be used by the fast-growing markets of the future. Arctic's commercialized chipsets for 5G transceiver and satellite communication markets are the product of years of design and development and the company holds more than 40 patents. To learn more, visit www.arcticsemiconductor.com.