5G, the next-generation of mobile broadband, is driving tremendous increases in data throughput for mobile applications by introducing carrier aggregation, massive MIMO, advanced modulation, and high bandwidth channels in the mmWave spectrum. Increasing data throughput adds complexity to baseband, infrastructure, and application processor technologies. To address this complexity and meet time-to-market deadlines, SoC-level designers are integrating new, innovative IP for processing, interfaces, analog, and security. Synopsys' DesignWare® IP portfolio provides trusted solutions from high-speed analog front-ends (AFEs), proven interface IP, security IP, and efficient processing capabilities to meet the demands of the most advanced 5G chipset designs.

5G is expanding cellular mobile technologies to new applications, including the billions of low-power Internet of Things (IoT) devices, and to advanced autonomous driving technologies, as well as future concepts such as Tactile Internet. These applications require sensor, memory, and chip-to-chip interfaces, processing capabilities, and low-power wireless IP solutions that deliver low-latency capabilities with high reliability.

5G MOBILE

5G is targeting speeds that compete with existing cable home broadband solutions. 3GPP has released new specifications that focus on upgrades to new mmWave bands with higher bandwidths, additional channel aggregation, and massive antenna arrays to address the high-speed requirements. To accommodate this, high-throughput SoCs and the IP solutions used in them must consider several key design requirements.

Complex Baseband Processing

5G SoCs need processing solutions that are efficient across several different workloads required in baseband solutions. Synopsys provides optimized processors, such as the ARC EV6x and DSP-enhanced ARC HS processors, that increase work completed per cycle, reducing energy consumed by these complex solutions. For custom baseband processing designs Synopsys' ASIP Designer tool enables customers to build a processor that is optimized for their unique design requirements.

High-Speed AFE

To reach the 10Gbps capabilities required, the analog front-end IP in next-generation 5G chipsets must support GHz channel bandwidth and 256QAM. The Synopsys DesignWare Data Converter IP portfolio including the state-of-the-art AFE IP, delivers very high-speed (up to several Giga Samples Per Second (GSPS)), high-resolution RFADCs and RFDACs that support a diverse set of modulation/demodulation implementations based on direct RF, zero-IF, or heterodyne architectures. These AFEs can be configured to support different MIMO arrangements, and can efficiently process the largest of the 5G channel and carrier aggregation needs. Available in the most advanced FinFET technologies, the AFEs offer a compact and low-power solution for direct RF conversion, ready for integration into the SoC for BOM-optimized implementations. With hundreds of mobile implementations for cellular RF, including 4G/LTE and WiFi, the Synopsys AFE solutions are established and trusted.

Interface IP

With the added complexities 5G introduces, SoC developers require additional expertise and resources. Therefore, designers more than ever are relying on the DesignWare IP portfolio of interface IP, enabling critical in-house resources to focus on their product differentiation and meet the demands of 5G.

In addition to standards-based single controller and PHY interface IP, Synopsys provides configurable, pre-verified DesignWare Interface IP subsystems. These IP subsystems deliver complete, complex functions that are ready to integrate into your SoC as-is or to be customized by your team or ours. The IP subsystems include single controller and PHY integrations, a combination of multiple protocols, or complete subsystems with processors and the software stack.

Available in the most advanced FinFET technologies, Synopsys offers the latest standards in MIPI, USB, LPDDR, DDR, PCIe, high speed Multi-Protocol PHYs, and more. Specific to 5G installations, the Synopsys

Security

Security is paramount to deter a host of threats ranging from amateur online hackers to government sponsored efforts. To deter these threats, designs need to have a secure enclave that is designed from the ground up, where software and hardware experti03.6e gr 62v

	High-performance, low-power, and area-efficient IP for cost-effective integration into SoCs proven in thousands of designs.
	Compliant with the latest HDMI 2.1 specification with HDCP 2.3 Content Protection.
	Concurrent wireless connectivity supporting the latest Bluetooth 5.1, Bluetooth Mesh, and future Bluetooth low energy Audio capabilities; operation minimizes process voltages for extended battery life; features on-chip transceiver matching network, which reduces the cost of external components and simplifies board design.
	Hardware Security Modules are standard components for mobile chipsets as the trend for embedded / integrated SIM capabilities are implemented.

	Combined CPU+DSP architecture and multicore control operations; efficient interfacing to hardware accelerators.
	Complete machine learning processing solutions ideal for 5G self-organizing networks.
	Industry-leading tool to develop baseband processors. Deploys task-optimized processing solutions with hardware parallelism and custom datapaths while retaining programmability. Ideal to for custom application optimization.
	Can be configured to support different MIMO arrangements and can efficiently process the largest of the 5G channel and carrier aggregation needs.
	Supports the latest DDR5/4 standards with data rates up to 4800 Mbps.
	PHY and controller support a range of Ethernet data rates up to 400G; support time-sensitive networking (TSN).
	Multi-Protocol High-Speed SerDes PHY delivers high-quality signal integrity and advanced power management capabilities for PCIe, CCIX, JESD204, Ethernet, CPRI and more.
	5G Encryption/Decryption Acceleration is required to handle the new high-speed bandwidths. Broad support for regional approved ciphers, hashes, and MAC algorithms enable flexible solutions for next gen SoCs.
