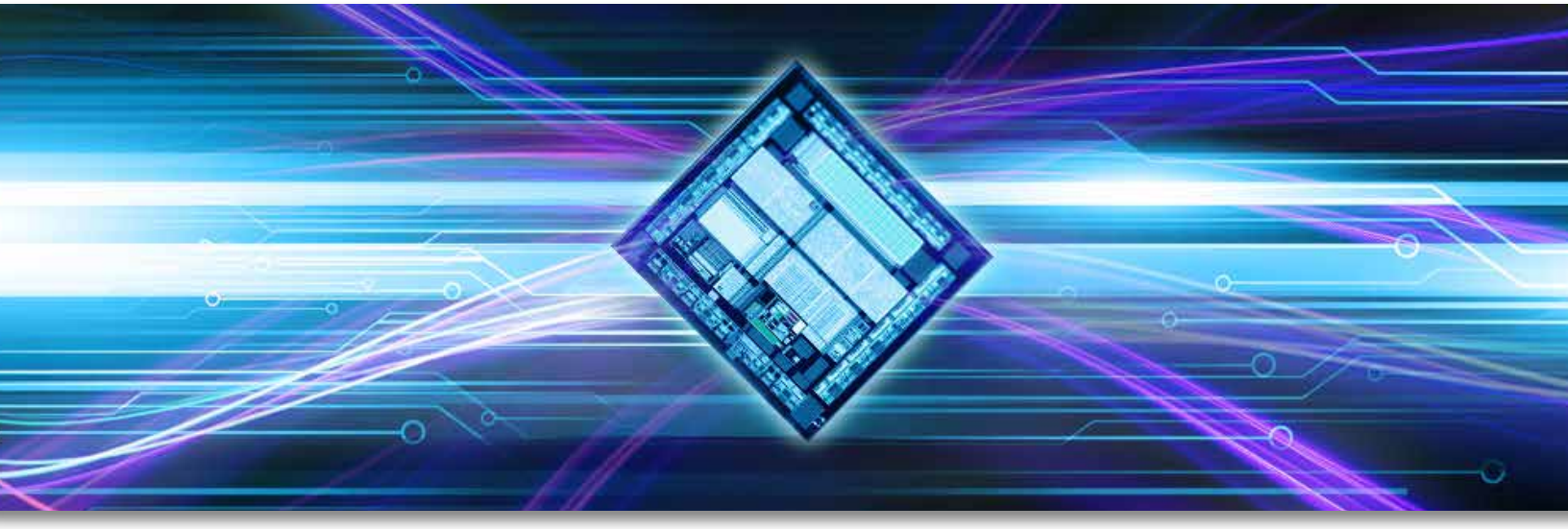
SYNOPSYS®
Silicon to Software™



DesignWare IP Portfolio

Synopsys is a leading provider of high-quality, silicon-proven IP solutions for SoC designs. The broad DesignWare IP portfolio includes logic libraries, embedded memories, embedded test, analog IP, interface IP, security IP, embedded processors and subsystems.

To accelerate prototyping, software development and IP integration, Synopsys' IP Accelerated initiative offers IP prototyping kits, IP software development kits and IP subsystems for rapid integration of IP into SoCs.

Synopsys' extensive investment in IP quality, comprehensive technical support and robust IP development methodology enables designers to reduce integration risk and accelerate time-to-market.

www.synopsys.com/designware

Broad IP Portfolio

Interface IP

USB	Process Technologies								Controllers/Features	Verification IP
	65nm	55nm	40/ 45nm	28nm	20nm	14/16nm FinFET	10nm FinFET	7nm FinFET		
USB 3.1						✓			DRD, Device, Host	✓+ test suites
USB-C 3.1/DP 1.3						✓	✓	in dev	Device, Host, Transmit	✓+ test suites
USB 3.0	✓	✓	✓	✓	✓	✓			DRD, Device, Host / OTG, SSIC, HSIC	✓+ test suites
USB-C 3.0				✓		✓			Device, Host	✓+ test suites
USB 2.0	✓	✓	✓	✓	✓	✓	✓	in dev	Device, Host, HSIC, OTG	✓+ test suites
USB-C 2.0	✓	✓	✓	✓	✓	✓	✓	in dev	Device, Host	✓+ test suites
HSIC			✓	✓	✓	✓	✓		Device, Host	✓+ test suites

PCI Express	Process Technologies								Controllers	Configurations	Verification IP
	65nm	55nm	40/ 45nm	28nm	20nm	14/16nm FinFET	10nm FinFET	7nm FinFET			
PCIe 4.0				✓		✓		in dev	Endpoint, Root Port, Dual Mode, Switch	x1, x2, x4, x8, x16	✓+ test suites
PCIe 3.1				✓		✓	✓	in dev	Endpoint, Root Port, Dual Mode, Switch	x1, x2, x4, x8, x16	✓+ test suites
PCIe 2.1	✓	✓	✓	✓	✓	✓		in dev	Endpoint, Root Port, Dual Mode, Switch	x1, x2, x4, x8, x16	✓+ test suites
PCIe 1.1	✓	✓	✓	✓	✓	✓			Endpoint, Root Port, Dual Mode, Switch	x1, x2, x4, x8, x16	✓+ test suites
M-PCIe Gear1/2/3				✓					Endpoint, Root Port, Dual Mode, Switch	x1, x2, x4, x8, x16	

DDR	Process Technologies								Controllers	Platform Architect Support	Verification IP
	65nm	55nm	40/ 45nm	28nm	20nm	14/16nm FinFET	10nm FinFET	7nm FinFET			
LPDDR5								in dev			
LPDDR4				✓		✓	in dev	in dev	Protocol controller, Memory controller	✓	✓
LPDDR4X				in dev		in dev		in dev			
LPDDR3			✓	✓		✓	in dev		Protocol controller, Memory controller	✓	✓
LPDDR2	✓		✓	✓					Protocol controller, Memory controller	✓	✓
DDR5								in dev			
DDR4				✓		✓	in dev	in dev	Protocol controller, Memory controller	✓	✓
DDR3	✓	✓	✓	✓		✓	in dev		Protocol controller, Memory controller	✓	✓
DDR2	✓	✓	✓	✓					Protocol controller, Memory controller	✓	✓

MIPI	Process Technologies								Controllers	Verification IP
	65nm	55nm	40/ 45nm	28nm	20nm	14/16nm FinFET	10nm FinFET	7nm FinFET		
D-PHY			✓	✓	✓	✓		in dev	✓	✓+ test suites
M-PHY				✓		✓	✓	in dev	✓	✓+ test suites
CSI-2									✓	✓+ test suites
DSI									✓	✓+ test suites
UniPro									✓	✓+ test suites
I3C									✓	✓+ test suites

HDMI	Process Technologies								Controllers	Verification IP
	65nm	55nm	40/ 45nm	28nm	20nm	14/16nm FinFET				
HDMI 2.0			✓	✓		✓			✓	✓
HDMI 1.4	✓	✓	✓	✓					✓	✓
MHL 2.2			✓	✓					✓	✓

Ethernet	Process Technologies							PCS	Controllers	Verification IP
	65nm	55nm	40/45nm	28nm	20nm	14/16nm FinFET	7nmFinFET			
RXAUI/Double XAUI (6.25 G)				✓		✓	in dev	✓	✓	✓+ test suites
10GBASE-KR, 10GBASE-KX4, 1000BASE-KX, Energy Efficient Ethernet				✓		✓	in dev	✓	✓	✓+ test suites
40GBASE-KR4, 40GBASE-CR4, XLAUI				✓		✓	in dev	✓	✓	✓+ test suites
100GBASE-CR10, CAUI				✓		✓	in dev		✓	✓+ test suites
SGMII				✓		✓	in dev	✓	✓	✓+ test suites
QSGMII				✓		✓	in dev		✓	✓+ test suites
XFI, SFI (SFF-8431)				✓		✓	in dev	✓	✓	✓+ test suites
GMII/MII, RGMII, RTBI, TBI, SMII, RMII, RevMII, XGMII, XLGMII									✓	✓+ test suites
IEEE 802.3, IEEE 1588-2008, IEEE 802.1Q									✓	✓+ test suites
25G/50G Ethernet Consortium & IEEE Specifications						in dev	in dev	✓	✓	✓+ test suites
2.5G/5.0G USXGMII						in dev	in dev	✓	✓	✓+ test suites
Additional Enterprise Protocols										
OIF CEI-6G/11G				✓		✓	in dev			
CPRI, OBSI, JESD204 A/B				✓		✓	in dev			✓
SRIO				✓		✓	in dev			

SATA	Process Technologies							Controllers	Verification IP
	65nm	55nm	40/45nm	28nm	20nm	14/16nm FinFET	7nm FinFET		
SATA 6G	✓	✓	✓	✓		✓	in dev	Host, Device	✓+ test suites
SATA 3G	✓	✓	✓	✓		✓	in dev	Host, Device	✓+ test suites

Bluetooth Low Energy	Process Technologies						Link Layer (HW, FW)
	180nm	110nm	55nm	40/45nm	28nm	14/16nm FinFET	
PHY	✓	✓	✓	✓			
Link Layer							✓

Mobile Storage	Process Technologies				Controllers	Verification IP
	28nm	14/16nm FinFET	10nm FinFET	7nm FinFET		
UFS					✓	✓+ test suites
UniPro					✓	✓+ test suites
M-PHY	✓	✓	✓	in dev	✓	✓+ test suites
eMMC		✓			✓	✓+ test suites
SD		✓			✓	✓
SDIO		✓			✓	✓

AMBA	Synthesizable IP	Verification IP
AXI 3 and AXI 4 bus fabric, bridges, and infrastructure IP	✓	✓+ test suites
AHB and AXI DMA controllers	✓	✓+ test suites
AMBA peripherals (SSI for SPI/xSPI bus, I²C, I2S, UART)	✓	✓+ test suites
Timers, interrupt controllers, GPIOs, interconnect metrics	✓	

Datapath IP	Synthesizable IP	Simulation Models (C++, Verilog)	Verification Models
Floating point functions	✓	✓	✓
Fixed point functions	✓	✓	✓
Trigonometric functions	✓	✓	✓

Security	Synthesizable IP	Software
Cryptography IP	✓	✓
Security Protocol Accelerators	✓	✓
Secure Modules with HW Root of Trust	✓	✓
Content Protection IP	✓	✓

Memories and Logic Libraries

Embedded Memories	Process Technologies					
	65nm	55nm	40/45nm	28nm	14/16nm FinFET	7nm FinFET
HD Single Port SRAM, HD Dual Port SRAM	✓	✓	✓	✓	✓	in dev
HD 1P RF, HD 2P RF	✓	✓	✓	✓	✓	in dev
HD ROM	✓	✓	✓	✓	✓	in dev
HS Single Port SRAM	✓	✓	✓	✓	✓	in dev
HS Dual Port SRAM	✓	✓	✓	✓	✓	
HS 1P RF (Cache)	✓	✓	✓	✓	✓	in dev
HS Asynchronous 2-Port Register File			✓	✓	✓	
UHD 1P RF						in dev
UHD 2P RF	✓	✓	✓	✓	✓	in dev
UHD 2P SRAM				✓	✓	in dev
STAR Embedded Test and Repair	✓	✓	✓	✓	✓	in dev
STAR Hierarchical Test	✓	✓	✓	✓	✓	in dev

Logic Libraries	Process Technologies					
	65nm	55nm	40/45nm	28nm	14/16nm FinFET	7nm FinFET
HS Library	✓	✓	✓	✓	✓	in dev
HS Multi-channel			✓	✓	✓	in dev
HS POK	✓	✓	✓	✓	✓	in dev
HD Library	✓	✓	✓	✓	✓	in dev
HD Multi-channel			✓	✓	✓	in dev
HD POK	✓	✓	✓	✓	✓	in dev
UHD Library, UHD POK	✓	✓	✓	✓	✓	in dev
UHD Multi-channel			✓	✓	✓	in dev
Ultra-low leakage (thick oxide)			✓			
HPC Design Kit			✓	✓	✓	in dev

Non-Volatile Memory	Process Technologies						Bit Counts	Typical Applications	Endurance (Write cycles)
	180/152nm	130/110nm	90nm	65nm	55nm	40nm			
Medium Density NVM	✓	in dev					16 to 256k	Consumer, industrial	Up to 10,000
Multiple-Time Programmable (MTP) EEPROM	✓	✓	✓	✓	✓	✓	128 to 8k	Consumer, industrial, automotive	Up to 1,000,000
MTP Ultra Low-Power NVM	✓	in dev					128 to 4k	Consumer, industrial	Up to 100,000
Few-Time Programmable Trim NVM	✓	✓					64 to 2k	Consumer, industrial, automotive	Up to 10,000

Analog IP

Data Converters	Process Technologies							Bits	MSPS	Channel Configuration
	180nm	130nm	90nm	65nm	55nm	40nm	28nm			
>100 MHz ADCs	✓	✓	✓	✓	✓	✓	✓	10, 12	110 to 320	Single, Dual
40-100 MHz ADCs	✓	✓	✓	✓	✓	✓	✓	10, 12	40 to 100	Single, Dual
4-40 MHz ADCs	✓	✓	✓	✓	✓	✓	✓	8, 10, 12	5 to 25	Single, Dual
<4 MHz ADCs	✓	✓	✓	✓	✓	✓		10, 12, 14, 16	1 to 2	Single
Communications DACs	✓	✓	✓	✓		✓	✓	10, 12	80 to 640	Single, Dual
Auxiliary DACs		✓		✓		✓	✓	8, 11, 12	20	Single
Video DACs	✓	✓	✓	✓		✓	✓	10	170 to 300	1 to 6

Audio Analog Codecs	Process Technologies						Bits	Dynamic Range	Sampling Rate
	130nm	90nm	65nm	55nm	40nm	28nm			
Advanced Audio Analog Codecs			✓	✓	✓		24	96dB	8 to 192kHz
Premium Audio Analog Codecs						✓	24	96dB	8 to 192kHz

IP Accelerated Initiative

To accelerate prototyping, software development and integration of interface IP into SoCs, Synopsys' IP Accelerated initiative augments Synopsys' broad portfolio of silicon-proven DesignWare® IP with IP Prototyping Kits, IP software development kits and IP subsystems.

IP Prototyping Kits and Software Development Kits								
Protocol/Standard	IP Prototyping with ARC SDP		IP Prototyping Kit with PCIe Connection to PC		IP Prototyping Kit with ARM Juno Development Board		IP Virtualizer Development Kit	Hybrid IP Prototyping Kit
	HAPS-DX	HAPS-80	HAPS-DX	HAPS-80	HAPS-DX	HAPS-80		
USB 3.1 Host			✓				✓	
USB 3.1 Device			✓				✓	
USB 3.1 Dual-Role Device							✓	
USB 3.0 Host	✓		✓		✓		✓	✓
USB 3.0 Device	✓		✓				✓	✓
USB 3.0 Dual-Role Device			✓				✓	
USB 3.0 OTG			✓					
USB 2.0 OTG			✓				✓	
USB 2.0 Host							✓	
PCIe 4.0 Endpoint			✓	✓				
PCIe 4.0 Root Complex	✓							
PCIe 3.1 Endpoint	✓		✓	✓			✓	
PCIe 3.1 Root Complex	✓						✓	✓
PCIe 3.1 Dual Mode							✓	
PCIe 2.1 Endpoint			✓	✓			✓	
DDR 4/3/2	✓	✓					✓	
LPDDR 4/3/2	✓							
HDMI 2.0 TX	✓		✓					
HDMI 2.0 RX	✓							
Ethernet QoS			✓					
Ethernet XGMAC			✓				✓	
Ethernet GMAC							✓	
JEDEC UFS Host	✓	✓	✓				✓	✓
MIPI CSI-2 Host	✓							
MIPI CSI-2 Device	✓							
MIPI DSI Host	✓							
I3C Master	✓							
SATA 6G Host			✓				✓	
SATA 6G Device	✓		✓				✓	

IP Subsystems				
ARC Processor IP Subsystems	Supported ARC Processors	Hardware Accelerators	Integrated Peripherals	Included Software
Data Fusion IP Subsystem	EM5D, EM7D, EM9D, EM11D	✓	SPI, I²C, UART, ADC I/F, APB I/F, GPIO	DSP library, peripheral I/O drivers (bare metal)
Sensor & Control IP Subsystem	EM4, EM6	✓	SPI, I²C, PWM, UART, ADC I/F, DAC I/F, APB I/F, GPIO	DSP library, motor control library, peripheral I/O drivers (bare metal)
SoundWave Audio Subsystem	AS211SFX, AS221BD	✓	I²S, S/PDIF, analog codec I/F, reset, clock management	Multi-core media framework, MM MQX audio post-processing software
Interface IP Subsystems	**Supported Protocols**	**Multiprotocol Support**	**Integrated Logic**	**Included Scripts**
IP Protocol-Specific Subsystems	USB, PCIe, DDR, Ethernet, HDMI, MIPI	✓	AMBA or native bus, clock management, reset, DMA, interrupts, memory, power management, debug & test logic	Configuration scripts, test environment, test scripts, implementation scripts

Accelerate Development of Performance-Efficient SoCs

Synopsys' DesignWare ARC Processors are a family of 32-bit CPUs that SoC designers can optimize for a wide range of uses, from deeply embedded to high-performance host applications in a variety of market segments. Designers can differentiate their products by using patented configuration technology to tailor each ARC processor instance to meet specific performance, power and area requirements. The DesignWare ARC processors are also extendable, allowing designers to add their own custom instructions that dramatically increase performance. Synopsys' ARC processors have been used by over 200 customers worldwide who collectively ship more than 1.7 billion ARC-based chips annually.

All DesignWare ARC processors utilize a 16-/32-bit ISA that provides excellent performance and code density for embedded and host SoC applications. The RISC microprocessors are synthesizable and can be implemented in any foundry or process, and are supported by a complete suite of development tools.

DesignWare ARC processors are supported by a broad ecosystem of commercial and open source tools, operating systems and middleware. This includes offerings from leading industry vendors who are members of the ARC Access Program as well as a comprehensive suite of free and open source software available through the embARC Open Software Platform.

Processor IP							
ARC 32-bit Processors	**Max CCM Size**	**Cache Size**	**L1 Coherency**	**L2 Cache**	**MMU**	**Floating Point**	**Trace**
HS34, HS34x2, HS34x4	16MB					✓	✓
HS36, HS36x2, HS36x4	16MB	64K	✓			✓	✓
HS38, HS38x2, HS38x4	16MB	64K	✓	8MB	✓	✓	✓
ARC 32-bit Processors	**Max CCM Size**	**Cache Size**	**DSP**	**MPU**	**MMU**	**Floating Point**	**Trace**
EM4	2MB			✓		✓	✓
EM6	2MB	32K		✓		✓	✓
EM5D	2MB		✓	✓		✓	✓
EM7D	2MB	32K	✓	✓		✓	✓
EM9D	2MB		✓	✓		✓	✓
EM11D	2MB	32K	✓	✓		✓	✓
EM4SI	2MB			✓		✓	✓
EM5DSI	2MB		✓	✓		✓	✓
SEM110	2MB			✓		✓	
SEM120D	2MB		✓	✓		✓	
605 LE	512KB			✓			
710D	512KB		✓	✓		✓	✓
725D	512KB	64K	✓	✓		✓	✓
770D	512KB	64K	✓	✓	✓	✓	✓
610D	512KB		✓	✓		✓	✓
625D	512KB	32K	✓	✓		✓	✓
AS211SFX	512KB	32K	✓	✓		✓	✓
AS221BD (dual-core)	512KB ea core	32K ea core	✓	✓		✓	✓
DesignWare EV Processors	**CNN Engine (MACs)**	**Vision MACs**	**DMA**	**32-bit Scalar**	**512-bit Vector DSP**	**L1 Cache Coherency**	**FPU**
EV52	64	64	✓	2		✓	✓
EV54	64	64	✓	4		✓	✓
EV61	880	944	✓	1	1		✓
EV62	880	1008	✓	2	2	✓	✓
EV64	880	1136	✓	4	4	✓	✓

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For more information on DesignWare IP, visit http://www.synopsys.com/designware. Follow us on Twitter at http://twitter.com/designware_ip.

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