| PROTOCOL | Simulation VIP | Emulation/FPGA Transactor VIP | Formal Assertion VIP | Post-Silicon Validation VIP |
|---|---|---|---|---|
| PCIe | ✓ | ✓ | | |
| PMBus | ✓ | | | ✓ |
| PSI5 | ✓ | | | |
| QSPI | ✓ | | | |
| RapidIO | ✓ | ✓ | | |
| RLDRAM | ✓ | | | |
| RoCE | ✓ | | | |
| RoE | ✓ | | | |
| SAE J1850 | ✓ | | | |
| Safe-By-Wire Plus | ✓ | | | |
| SAS | ✓ | | | |
| SATA | ✓ | ✓ | | |
| SD Express | ✓ | | | |
| SDIO 8.0 + UHS | ✓ | | | |
| SDRAM | ✓ | | | |
| SENT (SAE J2716) | ✓ | | | |
| Serial Flash | ✓ | | | |
| Serial NOR Flash | ✓ | | | |
| SFPDP | ✓ | | | |
| SGPIO | ✓ | | | |
| SIM Card | ✓ | | | |
| SLVS-EC | ✓ | | | |
| SmartCard (IEC7816) | ✓ | | | |
| SMBus | ✓ | | | ✓ |
| SMPTE Serial Data Interface (SDI) | ✓ | | | |
| SpaceFibre | ✓ | | | |
| SpaceWire | ✓ | | | |
| SPDIF | ✓ | | | |
| SPI | ✓ | ✓ | ✓ | ✓ |
| SRAM | ✓ | | | |
| SR-IOV | ✓ | | | |
| SVID | ✓ | | | |
| SWD | ✓ | | | |
| SWP | ✓ | | | |
| TCAM | ✓ | ✓ | | |
| TileLink | ✓ | | ✓ | |
| TS5 (Thermal Sensor) | ✓ | | | |
| UALink | ✓ | | | |
| UART | ✓ | ✓ | ✓ | |
| UAS | ✓ | | | |
| UCIe | ✓ | | | |
| UFS | ✓ | | | |
| Ultra Ethernet | ✓ | | | |
| USB 1.x/2.x | ✓ | | | |
| USB 3.x | ✓ | | | |
| USB 4.x | ✓ | | | |
| USB PD | ✓ | | | |
| USB Type-C | ✓ | | | |
| USIM | ✓ | | | |
| VByOne | ✓ | ✓ | | |
| XMBus | ✓ | | | |
| xSPI | ✓ | | | |

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**Other Regions:** Please see website

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# Product Directory

## Design IP

- Controller IP for SoC, ASIC, and FPGA Designs
- Highly Configurable with Rapid Customization
- Optional ASIL Compliance for Safety-Critical Applications

## Verification IP

- Broad Protocol Coverage with Latest Spec Support
- Tool Independent – Compatible with All EDA Vendors
- Supports Diverse Methodologies and Languages

## Why SmartDV?

- 500+ IP & VIP Products Across Legacy and Emerging Standards
- Trusted by Top-Tier Semiconductor Companies Worldwide
- Expert Integration Support & Flexible Licensing Options

IP **Your** Way

# Design IP

AES
AFDX 1G End-System
AFDX 1G MAC
AFDX 1G Switch
AHB Arbiter
AHB Decoder
AHB Multilayer Interconnect
AHB to APB Bridge
AHB to AXI Bridge
APB Multilayer Interconnect
APB to AHB Bridge
APB to AXI Bridge
Arinc 429 Controller
Arinc 825 Controller
Automotive Ethernet MAC
Automotive Ethernet PCS
Automotive Ethernet TSN MAC
Automotive SerDes (ASA) PCS
AVB MAC
AVSBus Master
AVSBus Slave
AXI Multilayer Interconnect
AXI to AHB Bridge
AXI to APB Bridge
AXI to UCIe Bridge
Camera Link HS Camera
Camera Link HS Frame Grabber
Camera Parallel Interface (CPI) Receiver
Camera Parallel Interface (CPI) Transmitter
CAN Controller
CHI to UCIe Bridge
Configuration-over-Ethernet (COE)
CPRI Controller
CXL 1.x Controller
CXL 2.0 Controller
CXL 3.x Controller
CXL to UCIe Bridge
CXP Host
CXPI Master
CXPI Slave
CXS to UCIe Bridge
DDR3/3L Controller
DDR4 Controller
DDR5 Controller
DisplayPort 1.x Receiver
DisplayPort 1.x Transmitter
DisplayPort 2.x Receiver
DisplayPort 2.x Transmitter
DMA Controller with AHB
DMA Controller with AXI

eCPRI Controller
eDP Receiver
eDP Transmitter
eMMC Device
eMMC Host
eSPI Master
eSPI Slave
eSPI Slave to LPC Bridge
Ethernet 1.6T PCS
Ethernet 1000BASE-T1 PCS
Ethernet 100BASE-T1 PCS
Ethernet 100G PCS
Ethernet 10BASE-T1L PCS
Ethernet 10BASE-T1S PCS
Ethernet 10G PCS
Ethernet 10GBASE-T1 PCS
Ethernet 1G PCS
Ethernet 2.5G PCS
Ethernet 2.5GBASE-T1 PCS
Ethernet 200G PCS
Ethernet 25G PCS
Ethernet 400G PCS
Ethernet 40G PCS
Ethernet 50G PCS
Ethernet 5GBASE-T1 PCS
Ethernet 800G PCS
Ethernet Cyclic FEC
Ethernet Multi-Gig MAC (2.5G–800G)
Ethernet Switch (Advanced)
Ethernet Switch (L2 only)
Ethernet Tri-Speed MAC (10M/100M/1G)
Ethernet TSN MAC
Ethernet TSN Switch
FlexRay Controller
GPIO Controller
H.264 Decoder
H.264 Encoder
H.265 Decoder
H.265 Encoder
HBM2 Controller
HBM3 Controller
HDCP 1.x Receiver
HDCP 1.x Transmitter
HDCP 2.x Receiver
HDCP 2.x Transmitter
HDMI eARC Receiver
HDMI eARC Transmitter
HDMI Sink
HDMI Source
Hexa SPI Master
I2C Master
I2C Slave
I2C Slave To AHB Bridge
I2C Slave To AXI Bridge

I2S Controller
I2S/PDM/TDM Controller
IEC7816 Master
IEC7816 Slave
IEEE 1149.7 Compact TAP
IEEE 1149.7 DTS Adapter
Interrupt Controller
JESD204 Cyclic FEC
JESD204B/C Receiver
JESD204B/C Transmitter
JESD204D Receiver
JESD204D Transmitter
JESD207 BBIC
JESD207 RFIC
JTAG Master
JTAG Slave
JTAG Slave To AHB Bridge
JTAG Slave To APB Bridge
JTAG Slave To AXI Bridge
LIN Controller
LPC Device
LPC Host
LPDDR3 Controller
LPDDR4 Controller
LPDDR5 Controller
LPDDR6 Controller
Microsecond Channel (MSC) Device
Microsecond Channel (MSC) Master
MIL STD 1553 Controller
MIPI A-PHY PCS
MIPI ASPMI Slave
MIPI BIF Master
MIPI BIF Slave
MIPI CSI-2 Receiver
MIPI CSI-2 Transmitter
MIPI Debug for I3C Target
MIPI DSI-2 Receiver
MIPI DSI-2 Transmitter
MIPI I3C Master
MIPI I3C Slave
MIPI I3C Slave to AHB Bridge
MIPI I3C Slave to AXI Bridge
MIPI I3C SMaster
MIPI RFFE Master
MIPI RFFE Slave
MIPI RFFE SPI I2C Slave
MIPI RFFE to SPI Slave
MIPI SoundWire I3S Manager
MIPI SoundWire I3S Peripheral
MIPI SoundWire Manager
MIPI SoundWire Peripheral
MIPI SPMI Master
MIPI SPMI Slave

MIPI SPMI Slave to AHB Bridge
MIPI SPMI Slave to AXI Bridge
MIPI SPMI Slave to DMA Bridge
MIPI SPP Master
MIPI SPP Slave
MIPI STP Master
MIPI STP Slave
MIPI TWP Master
MIPI TWP Slave
MIPI UniPro 1.x Controller
MIPI UniPro 2.x Controller
MIPI UniPro 3.x Controller
NFC Card
NFC Controller
Octal SPI Master
One-Wire Interface Controller
PCIe 2.1 Controller
PCIe 3.1 Controller
PCIe 4.0 Controller
PCIe 5.0 Controller
PCIe 6.0 Controller
PCIe to UCIe Bridge
PCM Controller
PCM-to-PDM Converter
PDM Controller
PDM-to-PCM Converter
PMBus Master
PMBus Slave
PSI5 Controller
PWM Controller
QSPI Master
RapidIO EndPoint Controller
RapidIO Switch
RS-FEC (198,194)
RS-FEC (254,250)
RS-FEC (255,251)
RS-FEC (528,514)
RS-FEC (544,514)
RTC
SAE J1850 Controller
SAE J2716 Controller
SAE J2716 Sensor
SAS Initiator
SAS Target
SATA Device
SATA Host
SBWP Master
SBWP Slave
SDIO Device
SDIO Host
Serial Flash Controller

SGPIO Initiator
SGPIO Target
SHA
Single-Wire Interface Controller
SLVS-EC Receiver
SMBus Master
SMBus Slave
SPDIF Receiver
SPDIF Transmitter
SPI Master
SPI Slave
SPI Slave to AHB Bridge
SPI Slave to AXI Bridge
Super IO
SVI3 Master
SVI3 Slave
SVID Master
SVID Slave
Timer
UART Controller
UCIe 1.x PCS
UCIe 2.x PCS
UFS 2.x Device
UFS 2.x Host
UFS 3.x Device
UFS 3.x Host
UFS 4.x Device
UFS 4.x Host
UFS 5.x Device
UFS 5.x Host
USB 1.x Device
USB 2.x Device
USB 2.x Host
USB 2.x Hub
USB 2.x OTG
USB 3.x Device
USB 3.x Host
USB 3.x Hub
USB 3.x OTG
USB 4.x Controller
USB 4.x Router
USB PD
USB Type-C
USIM Master
V-By-One Receiver
V-By-One Transmitter
VESA DSC Decoder
VESA DSC Encoder
Virtual GPIO
Watchdog Timer
xSPI Master

# Verification IP

Additional IP is in constant development.
For a specific product not found in this directory,
please email **info@smartdvtech.com.**

| PROTOCOL | Simulation VIP | Emulation/FPGA Transactor VIP | Formal Assertion VIP | Post-Silicon Validation VIP |
|---|---|---|---|---|
| AMBA ACE | ✓ | | ✓ | |
| AMBA AHB | ✓ | ✓ | ✓ | |
| AMBA APB | ✓ | ✓ | ✓ | |
| AMBA ATB | ✓ | | ✓ | |
| AMBA AXI | ✓ | ✓ | ✓ | |
| AMBA AXI-Stream | ✓ | | | |
| AMBA CHI | ✓ | ✓ | ✓ | |
| AMBA CXS | ✓ | | | |
| AMBA DTI | ✓ | | | |
| AMBA LPI | ✓ | | | |
| ARINC 419 | ✓ | | | |
| ARINC 429 | ✓ | | | |
| ARINC 664 | ✓ | | | |
| ARINC 818 | ✓ | | | |
| ARINC 825 | ✓ | | | |
| Automotive SerDes (ASA) | ✓ | | | |
| Avalon | ✓ | ✓ | ✓ | |
| AVSBus | ✓ | ✓ | | |
| BISS | ✓ | | | |
| Camera Link HS | ✓ | | | |
| Camera Parallel Interface (CPI) | ✓ | | | |
| CAN | ✓ | | | |
| CAN-XL | ✓ | | | |
| cJTAG (IEEE 1149.7) | ✓ | | | |
| CPRI | ✓ | ✓ | | |
| CXL | ✓ | | | |
| CXPI | ✓ | | | |
| DDR3 (3DS + DIMM + DFI) | ✓ | | | |
| DDR4 (3DS + DIMM + DB + RCD + DFI) | ✓ | | | |
| DDR5 (DIMM + NVRAM + DFI) | ✓ | | | |
| DDR6 | ✓ | | | |
| DisplayPort | ✓ | | | |
| eCPRI | ✓ | | | |
| eDP | ✓ | | | |
| eMMC | ✓ | | | |
| eSPI | ✓ | ✓ | | ✓ |
| Ethernet – Up to 800G | ✓ | ✓ | | |
| Ethernet AVB | ✓ | | | |
| Ethernet BASE-T | ✓ | | | |
| Ethernet FlexE | ✓ | | | |
| Ethernet TSN | ✓ | | | |
| eUSB | ✓ | | | |
| FlexRay | ✓ | | | |
| GCI | ✓ | | | |
| GDDR5/5x | ✓ | | | |
| GDDR6 | ✓ | | | |
| GDDR7 | ✓ | | | |
| HBM | ✓ | | ✓ | |
| HBM2 | ✓ | | | |
| HBM3 | ✓ | | | |
| HBM4 | ✓ | | | |
| HDMI | ✓ | | | |
| HMC | ✓ | | | |
| HyperBus | ✓ | | | |
| HyperFlash | ✓ | | | |
| I2C | ✓ | ✓ | ✓ | ✓ |
| I2S/PDM/TDM | ✓ | | | |
| Interlaken | ✓ | ✓ | | |
| IPMB | ✓ | | | |
| IPSec | ✓ | | | |
| JESD204 | ✓ | | | |
| JESD207 | ✓ | | | |
| JESD403 (SidebandBus) | ✓ | | | |
| JTAG | ✓ | ✓ | ✓ | |
| LIN | ✓ | | | |
| LPC | ✓ | | | |
| LPDDR3 | ✓ | | ✓ | |
| LPDDR4/4x with DFI | ✓ | | ✓ | |
| LPDDR5/5x with DFI | ✓ | | ✓ | |
| LPDDR6 | ✓ | | | |
| LVDS | ✓ | | | |
| Microsecond Channel (MSC) | ✓ | | | |
| Microwire | ✓ | | | |
| MIL STD 1553 | ✓ | | | |
| MIL STD 1773 | ✓ | | | |
| MIPI APHY | ✓ | | | |
| MIPI BIF | ✓ | | | |
| MIPI CPHY | ✓ | | | |
| MIPI CSI-2 | ✓ | | | |
| MIPI DBI | ✓ | | | |
| MIPI Debug | ✓ | ✓ | | |
| MIPI DPHY | ✓ | | | |
| MIPI DPI | ✓ | | | |
| MIPI DSI | ✓ | | | |
| MIPI DSI-2 | ✓ | | | |
| MIPI GbD USB | ✓ | | | |
| MIPI HSI | ✓ | | | |
| MIPI HTI | ✓ | | | |
| MIPI I3C | ✓ | ✓ | | ✓ |
| MIPI LLI | ✓ | | | |
| MIPI MPHY | ✓ | | | |
| MIPI RFFE | ✓ | ✓ | | ✓ |
| MIPI SoundWire | ✓ | ✓ | | ✓ |
| MIPI SoundWire I3S | ✓ | | | |
| MIPI SPMI | ✓ | ✓ | | ✓ |
| MIPI SPP | ✓ | ✓ | | |
| MIPI STP | ✓ | ✓ | | |
| MIPI TWP | ✓ | ✓ | | |
| MIPI UniPro | ✓ | | | |
| mPCIe | ✓ | | | |
| MRAM | ✓ | | | |
| NAND Flash | ✓ | | | |
| NFC | ✓ | ✓ | | |
| NVMe | ✓ | | | |
| OCP | ✓ | | ✓ | |
| Octal SPI | ✓ | | | |
| Open NAND Flash Interface (ONFI) | ✓ | | | |
| OpenCAPI | ✓ | | | |
| OpenGMSL | ✓ | | | |
| ORAN | ✓ | | | |
| Parallel NOR Flash | ✓ | | | |
| PCI | ✓ | | | |