# Function Modules (3U and 6U VPX, VME, PCIe and cPCI)

Pre-Integrated Smart Function Modules NAI's library of 100+ pre-integrated Smart Function Modules delivers the industry's most configurable, high-density I/O solutions, designed to meet virtually any I/O requirement. Each module integrates dedicated ARM and FPGA intelligence, enabling:

- Configurability and programmability for versatile system integration
- Health monitoring for enhanced reliability
- User application capabilities to optimize edge performance

By leveraging these independent, field-proven modules, you can configure Multifunction I/O, Single Board Computers (SBCs), or Rugged Systems to meet your mission needs—while significantly reducing design, development, and qualification time and cost.

**Available Modules**

| Communication Modules | | |
|---|---|---|
| Function | Module | Description |
| ARINC | AR1 | 12 Ch. ARINC 429/575, TX or RX |
| | AR2 | 1 Ch. ARINC 568 (TX or RX) and 1 Ch. ARINC 579 (TX or RX) |
| CANBus | CB1 | 8 Ch. CANBus, CAN 2.0 A/B Protocol |
| | CB2 | 8 Ch. CANBus, J1939 Protocol |
| | CB3 | 8 Ch. CANBus, CAN 2.0 A/B Protocol or J1939 Protocol, programmable |
| | CB8 | 8 Ch. CANBus, CAN 2.0 A/B or CAN FD (ARINC 825-4) |
| EBR-1553 | FTR | 1 Ch. EBR-1553 (MMSI, SAE AS5652 BC/MT/RT) |
| | FTS | 2 CH. EBR-1553 (MMSI, SAE AS5652 BC/MT/RT) |
| Ethernet | EM2 | 2-Port 10/100/1000BASE-T Ethernet NIC, Intel® E610, PCIe I/F to processor (local or off-board host) |
| | ES2 | 16-Port 10/100/1000BASE-T, managed switch, with L2/L3 Layer support 4x 10 Gb Fiber Optic option, 2x wide module |
| IEEE-1394b | FW1 / FW2 | 2 Ch. x 3-Port each Ch. Firewire transceiver, w/ 20-meter TLIM (or Detect) I/F |
| | FW3 | 3 Nodes configured as 2 Nodes with 3-Ports each and 1 Node with 2-Ports, AS5643 |
| MIL-STD-1553 | FTA / FTB / FTC | 1, 2 and 4 Ch. MIL-STD-1553, Dual Redundant, XFMR-coupled, assisted mode capable with local offload-processing |
| | FTD / FTE / FTE | 1, 2 and 4 Ch. MIL-STD-1553, Dual Redundant, direct-coupled assisted mode capable with local offload-processing |
| MIL-STD-1760 | FTJ | 1 Ch. MIL-STD-1553 / MIL-STD-1760, XFMR-coupled |
| | FTK | 2 Ch. MIL-STD-1553 / MIL-STD-1760, XFMR-coupled |
| Serial | SC3 | 8 Ch. ASYNC or 4 Ch. SYNC Serial Communications RS-232/422/485 or GPIO, non-isolated |
| | SC5 | 4 Ch. RS-232/422/485 communications, isolated per channel and from SYS GND |
| | SC6 | 4 Ch. RS-232/422/485 communications, individual SYS GND provided per channel (non-isolated) |
| | SCD | 4 Ch. RS-232/422/485/423 (MIL-STD-188C) communications, isolated per channel and from SYS GND |
| | SCE | 4 Ch. RS-232/422/485/423 (MIL-STD-188C) communications, individual SYS GND provided per channel (non-isolated) |
| Time-Sensitive Network (TSN) | TN1 | TSN Ethernet End Point (PCIe); Single Channel w/ dual-redundant 10/100/1000BASE-T Ports (triple redundant capability pending) |
| | TS1 | TSN Ethernet Switch; 16-Port 10/100/1000BASE-T, TSN support, 2x wide module |

| Analog and Digital I/O Modules | | |
|---|---|---|
| **Function** | **Module** | **Description** |
| A/D Converter | AD1 | 12 Ch. ± 1.25 to ± 10.0 VDC FSR; 256 kHz (max), 24-bit Sigma-Delta |
| | AD2 | 12 Ch. ± 1.25 to ± 100.0 VDC FSR; 256 kHz (max), 24-bit Sigma-Delta |
| | AD3 | 12 Ch. ± 25 mA FSR; 256 kHz (max), 24-bit Sigma-Delta |
| | AD4 | 16 Ch. ± 1.25 to ± 10.0 VDC FSR or ± 25 mA; 16-bit SAR, 8 Ch. x 2 A/D multiplexed, 400 kHz (aggregate per A/D) |
| | AD5 | 16 Ch. ± 6.25 to ± 50.0 VDC FSR; 16-bit SAR, 8 Ch. x 2 A/D multiplexed, 400 kHz (aggregate per A/D) |
| | AD6 | 16 Ch. ± 12.5 to ± 100.0 VDC FSR; 16-bit SAR, 8 Ch. x 2 A/D multiplexed, 400 kHz (aggregate per A/D) |
| | ADE | 16 Ch. ± 10 VDC FSR; 200 kHz (max), 16-bit SAR |
| | ADF | 16 Ch. ± 100 VDC FSR; 200 kHz (max), 16-bit SAR |
| D/A Converter | DA1 | 12 Ch. ± 10 VDC or ± 25 mA / Ch. |
| | DA2 | 16 Ch. ± 10 VDC at 10 mA max / Ch. |
| | DA3 | 4 Ch. ± 40 VDC or ± 100 mA / Ch. |
| | DA4 | 4 Ch. ± 20 VDC at 100 mA max / Ch. |
| | DA5 | 4 Ch. D/A, high-voltage/high-current half-bridge (2 Ch. full-bridge) external VCC sourced outputs |
| Chip Detect & Fuzz Burn | CD1 | 6 Ch. Chip Detect programmable resistance thresholds to 100 kohm controlled charge 0.25-2.30 J Fuzz Burn circuit |
| I/O Differential | DF1 | 16 Ch. RS-422/485 I/O transceiver |
| | DF2 | 16 Ch. RS-422/485 I/O transceiver, enhanced |
| I/O Discrete | DT1 | 24 Ch. Discrete I/O, 0-60 VDC, 500 mA / Ch. max |
| | DT2 | 16 Ch. Discrete-switch, ± 80 V, 625 mA / Ch. max, isolated |
| | DT3 | 4 Ch. Discrete-switch, 65 V, 2A / Ch. as half-bridge configuration, ext. VCC or 2 CH. ± 65 V, 2A / Ch. as full-bridge configuration, ext. VCC |
| | DT4 | 24 Ch. Discrete I/O, 0-60 VDC, 500 mA / Ch. max, enhanced operation |
| | DT5 | 16 Ch. Discrete-switch, ± 80 V, 625 mA / Ch. max, enhanced operation |
| I/O Relay | RY1 | 4 Ch. SPDT, 220 VDC / 250 VAC, 2 A, 60 W / 62.5 VA max, non-latching |
| | RY2 | 4 Ch. SPDT, 220 VDC / 250 VAC, 2 A, 60 W / 62.5 VA max, latching |
| I/O TTL / CMOS | TL1 | 24 Ch. 3.3 V / 5 V tolerant, high-speed, programmable |
| | TL2 | 24 Ch. 3.3 V / 5 V tolerant, high-speed, programmable, enhanced |
| | TL3 - TL8 | 24 Ch. 3.3 V / 5 V tolerant, multiple strapping options |
| Variable Reluctance | VR1 | 8 Ch. 100 V Input, Variable Reluctance Pulse Counter and Measurement Interface |

| Position, Timing, Measurement and Simulation Modules | | |
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| **Function** | **Module** | **Description** |
| Accelerometer | AM1 | 4 Ch. 2-12 V Exc., 2.5 Hz-38.4 kHz, w/ FFT algorithm |
| AC Excitation / Reference | AC1 | 2 Ch. 2-28 Vrms (LV), 47 Hz-20 kHz (max range) |
| | AC2 | 2 Ch. 28-115 Vrms (HV), 47 Hz-2.5 kHz (max range) |
| Dig-to-SYN / RSL Dig-to-L(R)VDT | DSx / DRx / DLx | 3 or 2 Ch. at 0.5 VA, 2.2 VA, 2-90 Vrms / 2-115 Vexc at 47 Hz - 20 kHz (Multi-range inputs / frequency; reference module detailed specifications) |
| GPS | GP2 | Multi-Ch. (satellite) GPS and IRIG Receiver or Source; 1x wide module, uBlox Neo GPS engine |
| IRIG | RG1 | 1 Ch. receiver or source, multi-mode digital and analog w/ master timer |
| L(R)VDT-to-Digital | LD1 - 5 | 4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, (47 Hz-20 kHz Freq. and 2-90 Vrms ranges, reference detailed specifications) |
| Pulse Timer | PT1 | 2 Ch. Inputs, 1 PPS or 10 MHz and 8 Ch. outputs, TTL, RS-422 and 0-12 V SE (50-ohm load capable) |
| Strain Gage | SG1 | 4 Ch. Strain Gage, full, 1/2 or 1/4 bridge measurement |
| SYN/RSL-to-Digital | SD1 | 4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, 47 Hz-1 Hz Freq |
| | SD2 | 4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, 1 kHz-5 kHz Freq |
| | SD3 | 4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, 5 kHz-10 kHz Freq |
| | SD4 | 4 Ch. 28-28 Vrms Input, 2-115 Vrms Exc, 10 kHz-20 kHz Freq |
| | SD5 | 4 Ch. 28-90 Vrms Input, 2-115 Vrms Exc, 47 Hz-1 kHz Freq |
| Thermocouple & RTD (Measure) | TC1 | 8 Ch. Thermocouple, J, K, T, E, N, B, R, S, and Low-voltage A/D |
| | RT1 | 8 Ch. RTD (2, 3 or 4 wire), standard PT-type to 4 kohm |
| | TR1 | 8 Ch. RTD (RT1-type) or Thermocouple (TC1-type), program per Ch. |

| Combination and Specialty Modules | | |
|---|---|---|
| **Function** | **Module** | **Description** |
| Combination | CM2 | 8 Ch. ARINC 429 (AR1-type) and 12 Ch. Discrete (DT4-type) |
| | CM5 | 2 Ch. MIL-STD-1553 and 8 Ch. ARINC 429/575 |
| | CM8 | 2 Ch. MIL-STD-1553 and 12 Ch. Discrete I/O |
| | CME | 8 Ch. A/D (ADE-type) and 8 Ch. D/A (DA2-type) |
| | CMF | 8 Ch. A/D (ADF-type) and 8 Ch. D/A (DA2-type) |
| | CMH | 5 Ch. Serial Comms: 1 Ch. RS-232 ASYNC w/flow (TX/RX/CTS/RTS), 4 Ch. RS-422/485 ASYNC (TX ± / RX ±) and 6 Ch. Differential RS-422/485 I/O (DF1-type) |
| Flash | FM8 | 1 TB SSD, SATA II, TLC, -40° C to +85° C |
| | FM9 | 2 TB SSD, SATA II, TLC, -40° C to 85° C |
| Chassis Management | CH1 | 1 Ch. Chassis Manager (ChM) Interface, IPMB (redundant A/B) Chassis Interface, 1 x 10/100/1000BASE-T connection, 1 x 10/100/1000BASE-X connection for System Manager Interface, ChM Debug/Console USB-UART, RS-232 w/ ChM Console Command Line Interface (CLI), multi-channel GPIO discrete signals. |

## Single Board Computers

| Single Board Computers | | | | | |
|---|---|---|---|---|---|
| **Form Factor** | **Model** | **Processor** | **Function Slots** | **SDRAM / On-board NVM SATA Flash** | **Features/Options** |
| 3U OpenVPX SOSA™-aligned (1.0" Pitch / 5 HP) | 68ARM3 | Xilinx Zynq UltraScale+™ SoC with Dual/Quad-Core ARM® Cortex®-A53 MPCore™ @ 1.3 GHz | 2 | 64GB DDR4 / 32GB | 4x GPIO (TTL) standard, 1x 422/485 or 2x RS-232 Ports, RS-232 Maintenance Port, USB 2.0 and USB 3.1, NT Bridge, IPMC |
| | 68ARM4 | NXP® LX2 Processor Family to 2.2 GHz w/ 8, 12 or 16 ARM® Cortex®-A72 CPU Cores | 2 | 32GB DDR4 w/ ECC / 512 GB | 4 x1 or 1 x4 PCIe Data Plane and 4 x1 and 1 x4 PCIe Expansion Plane, 1x I²C or IPMC , 7x TTL GPIO (4 std and 3 optional), 1x 1000Base-T, 2x 10GBase-KR (1G-KX), 1 x USB 3.1 Gen 1 and 1 x USB 2.0, 1x RS-232 (debug-console), 1x SATA, cybersecurity support |
| | 68INT6 | Intel® Core™ i7 11th Gen (Tiger Lake) to 2.8 GHz w/ 4 Cores | 2 | 32GB DDR4 w/ In-Band ECC / 512 GB | 4 x1 or 1 x4 PCIe Data Plane and 4 x1 and 1 x4 PCIe Expansion Plane, IPMC , 4x TTL GPIO, 1x 1000Base-T, 2x 10GBase-KR (1G-KX), 1 x USB 3.1 Gen 1 and 1 x USB 2.0, 1 x 422/485 or 2 x RS-232 Ports (debug-console), 1x SATA, cybersecurity support, Video Display Port |
| | 68INT6H | Intel® Xeon® W Processor (Tiger Lake) to 2.6 GHz w/ 8 Cores | 2 | 32GB DDR4 w/ ECC / 512 GB | 4 x1 or 1 x4 PCIe Data Plane and 4 x1 and 1 x4 PCIe Expansion Plane, IPMC , 4x TTL GPIO, 1x 1000Base-T, 2x 10GBase-KR (1G-KX), 1 x USB 3.1 Gen 1 and 1 x USB 2.0, 1 x 422/485 or 2 x RS-232 Ports (debug-console), 1x SATA, cybersecurity support, Video Display Port |
| 3U OpenVPX (1.0" Pitch / 5 HP) | 68ARM2 | Xilinx UltraScale+™ ARM® Cortex®-A53 Dual / Quad Core | 3 | 8 GB DDR4 w/ ECC / 32 GB | 6 x1 PCIe, 1x I²C or SATA II (external), 8x TTL (or 6x TTL and I²C), 2x 1000Base-T or -KX, 2x USB 2.0, 1x RS-232 (debug-console), IPMC, 1x SATA, 2x 1000Base-T or -KX, cybersecurity support |
| | 68PPC3 | NXP® PowerPC™ QorIQ® T2080 Quad-Core | 2 | 8 GB DDR3 w/ ECC / 32GB | 4 x1 or 1 x4 PCIe Data Plane and 4 x1 and 1 x4 PCIe Expansion Plane, 2x 1000Base-KX, 1x 10/100/1000Base-T, 4x TTL GPIO, 1x USB 3.0 and 1x USB 2.0, 1x I²C, RS-232 Port, SATA II, cybersecurity support |
| 3U OpenVPX (0.80" Pitch / 4 HP) | 68PPC2 | NXP® QorIQ® T2080 | 2 | 8 GB DDR3 / 32 GB | 4 x1 or 1 x4 PCIe, 1x I²C or SATA II (external), 4x TTL, 2x 1000Base-T or -KX, 2x USB 3.0, 1x RS-232 (debug-console), IPMC, 1x SATA, 2x 1000Base-T or -KX |
| | 68INT5 | Intel® Xeon® E-2276ME | 1 | 16 GB DDR4 w/ ECC / 32 GB | 4 x1 or 1 x4 PCIe, 1x PCIe (module slot), SATA II (external), 1x HDMI, 2x 1000Base-T or -KX, 1x USB 3.0, 1x RS-232 (debug-console), IPMC, 1x SATA, 2x 1000Base-T or -KX |
| 3U cPCI (0.80" Pitch / 4 HP) | 75ARM1 | Xilinx 7015 ARM® Cortex®-A9 | 3 | 512 MB DDR3 / 32 GB | cPCI (master or slave), 2x 1000Base-T, 2x USB 2.0, 1x I²C, 1x RS-232 (debug-console), 2x 1000Base-T |
| | 75INT6 | Intel® Core® i7-1185GRE Processor (Tiger Lake) to 2.8 GHz w/ 4 Cores | 1 | 16 GB DDR4 / 256 GB | Full cPCI controller, Watchdog-timer with separate clock source, Rear I/O includes: 2x 10/100/1000Base-T, 2x USB 2.0, Display Port, 3x TTL-GPIO, 2x RS-232 (standard UART or either-or for console redirect), Enhanced Security options (supports up to FIPS level-3 w/ BBRAM) |
| 6U VME (0.80" Pitch / 4 HP) | 64ARM1 | Xilinx 7015 ARM® Cortex®-A9 | 6 | 512 MB DDR3 / 32 GB | VME64x (master or slave), 1x I²C, 2x 1000Base-T, 1x USB 2.0, 1x RS-232 (debug-console), 2x 1000Base-T |

## Multi-Function I/O Board Level Products

| Multifunction I/O Boards | | | | | |
|---|---|---|---|---|---|
| Form Factor | Model | Board Architecture | Function Slots | Ethernet Capable | Features/Options |
| 3U OpenVPX SOSA™-aligned (0.80" Pitch / 4HP) | 68G6 / 68G6P | Xilinx UltraScale+™ ARM® Cortex®-A53 | 3 | 2x 10/100/1000Base-KX or, 2x 10GBase-KR | 68G6: 1 x1 PCIe for motherboard communications, 1x RS-232 (debug-console), IPMC. 68G6P: additionally supports 1 x1 PCIe for direct module communication and CH1 module function. |
| 3U OpenVPX (0.80" Pitch / 4HP) | 68G5 | Xilinx 7015 ARM® Cortex®-A9 | 3 | 2x 1000Base-T or -KX | 1 x1 PCIe, 1x RS-232 (debug-console), IPMC |
| | 68G5P | Xilinx 7015 ARM® Cortex®-A9 | 3 | 2x 1000Base-T or -KX | 1 x1 PCIe for motherboard communications, 1 x1 PCIe, for direct module communication, 1x RS-232 (debug-console), IPMC |
| | 68G5E | Dual Core ARM® Cortex®-A9 | 1 | 12x 1000Base-T or -KX (Up to 16x Option) | 1 x1 PCIe, 1x RS-232 (debug-console), IPMC, 12 Ethernet Switch ports available with smart I/O function option |
| 6U OpenVPX (0.80" Pitch / 4HP) | 67G6 | Xilinx UltraScale+ ARM® Cortex®-A53 | 6 | 2x 1000Base-T or -KX | 2 x1 PCIe for motherboard communications, 2 x1 PCIe for direct module communications, 24x Discrete I/O, IPMC |
| 3U cPCI (0.80" Pitch / 4HP) | 75G5 | Xilinx 7015 ARM® Cortex®-A9 | 3 | 2x 1000Base-T | PCI, 1x I²C 1x RS-232 (debug-console) |
| 6U VME (0.80" Pitch / 4HP) | 64G5 | 2x Xilinx 7015 ARM® Cortex®-A9 | 6 | 2x 1000Base-T | VME64x (bus master or slave), 1x RS-232 (debug-console) |
| PCIe (Full-height, half-size length) | 79G5 | Xilinx 7015 ARM® Cortex®-A9 | 3 | N/A | 1 x1 PCIe, 1x RS-232 (debug-console) |


**For more information Contact TPT KK**

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