RaptorLink 64X50 SOSA Ethernet Switch
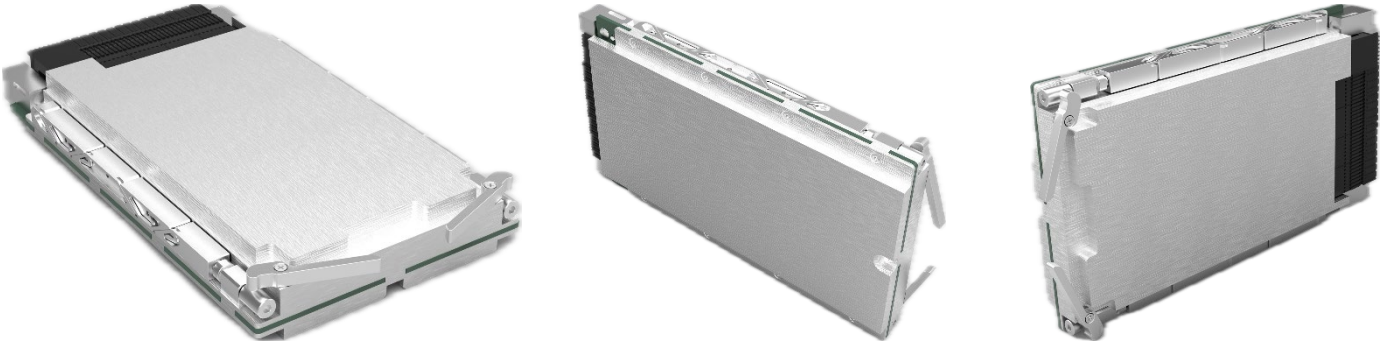
Next Generation 64-Channel 50G 3U VITA-91 and
Legacy VPX SOSA Aligned Ethernet Switch Modules

PDS - 370

DESCRIPTION

SUMMARY

Amphenol's next-generation 3U VPX Ethernet switch, the RaptorLink 64X50, is SOSA-aligned and features VITA-91 connectivity, offering double density with support for speeds of up to 50G per lane on the backplane. The switch operates with 64 individual channels, supporting speeds of 1G, 10G, and 25G in NRZ mode, and 50G in PAM-4 mode. Additionally, it supports multiple ganged protocols, including 40Gx4, 50Gx2, and 100Gx4 in NRZ mode, and up to 400Gx8 in PAM-4 mode. This makes the Ethernet switch highly adaptable for future backplane architectures. All boards are built with Amphenol MIL-HD2 SOSA/VITA 91 and/or R-VPX Evolution series connectors which have datasheets available readily.

Management is handled by two on-board quad-core ARM processors, each with ample memory for complex networking applications. The switch includes a full suite of SOSA-aligned IPMI status functions for various chassis manager requirements. In summary, the RaptorLink 64X50 integrates two managed 32-channel, 50G Ethernet switches into a single, 3U SOSA-aligned, VITA-91 VPX board.

Several versions of the RaptorLink switch are available with 50G PAM-4 and NRZ connectivity configurations. Each model includes a comprehensive management software suite with features such as MACsec, Time-Sensitive Networking (TSN), and a 60-second boot time. The switches are offered in the following configurations:

- Dual 64x50G switch – SOSA aligned VITA-91 double density and speed connectors
- Single 32x50G switch – SOSA aligned VITA-91 double density and speed connectors
- Single 40x50G switch – SOSA aligned VITA-91 double density and speed connectors
- Additionally, a single 32x50G switch is available with legacy RVPX SOSA-aligned connectors.

To meet the demands of applications requiring low power consumption and fast boot times (under 10 seconds), several configurations of the switch are available with up to 25G NRZ speeds and lightweight management software. These options include:

- Dual 64x25G switch – SOSA aligned VITA-91 double density and speed connectors
- Single 32x25G switch – SOSA aligned VITA-91 double density and speed connectors
- Single 32x25G switch (with legacy RVPX SOSA-aligned connectors)

Along with the switch and processing infrastructure available in many different configurations, the RaptorLink 64X60 has a VITA46.11 Tier 1 compliant IPMI solution for sensor, link state, health, BIT, and other reporting to chassis managers. It also supports redundant IPMB interfaces and IPMB fast modes.

FEATURES

- Dual 32-channel Ethernet switch chips, capable of speeds up to 50G PAM-4 and NRZ speeds up to 25G.
- Support for multiple speeds: 1G, 10G, 25G, 40G, 50G, 100G, and 400G (PAM-4 and NRZ formats).
- Layer 2 and Layer 3 network management capabilities, including support for time-sensitive networking (TSN), MACsec, and advanced routing applications.
- Dedicated management interfaces via dual RS-232 and 1GBase-T.
- SOSA-aligned 12V power input with a full IPMI controller for chassis management.
- Powered by dual quad-core ARM CPUs with DDR4-SDRAM, flash memory, and EEPROM.
- Linux OS with comprehensive network management software.
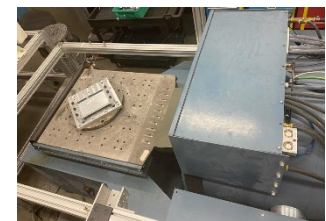
RUGGEDIZATION

- Fully ruggedized to withstand extreme environmental and EMI/EMP conditions.
- Interfaces for power diagnostics and more.
- Meets the following environmental specifications:
- Operating Temperature: -40°C to 85°C while operating.
- Storage Temperature: -55°C to 125°C.
- Humidity: 0-100% non-condensing humidity during operation.
- Vibration: 10g peak, 5-2,000 Hz sine vibration, and 40 G peak shock cycles.
- Altitude: -1,500 to 60,000 ft with rapid depressurization.
- EMC: Designed to comply with MIL-STD-461E.

ORDERING INFORMATION

PART NUMBER TABLE – VITA91 SOSA VARIANTS

CF-02W300-12X	Dual Switch – 64 channels @ 50G	Managed	150 Watts	~60 second boot
CF-02W300-13X	Single Switch – 32 channels @ 50G	Managed	75 Watts	~60 second boot
CF-02W300-14X	Signal Meshed Switch – 40 channels @ 50G	Managed	150 Watts	~60 second boot
CF-02W300-15X	Dual Switch – 64 channels @ 10G/25G	Light Mgmt	50 Watts	~10 second boot
CF-02W300-16X	Single Switch – 32 channels @ 10G/25G	Light Mgmt	25 Watts	~10 second boot

- Channel as defined as AC coupled CML SERDES Tx+/- and Rx+/- pair meant for backplane operation
- Media converters and other protocol variants are available upon request
- 'X' variants are conduction-cooled; For air-cooled variants, replace the 'X' with a 'V'

PART NUMBER TABLE – LEGACY RVPX SOSA VARIANTS

CF-02W300-17X	Single Switch – 32 channels @ 50G	Managed	75 Watts	~60 second boot
CF-02W300-18X	Single Switch – 32 channels @ 10G/25G	Light Mgmt	25 Watts	~10 second boot

- Channel as defined as AC coupled CML SERDES Tx+/- and Rx+/- pair meant for backplane operation
- Media converters and other protocol variants are available upon request
- 'X' variants are conduction-cooled; For air-cooled variants, replace the 'X' with a 'V'

PART NUMBER TABLE – REAR TRANSITION MODULES

CF-02W300-12R	SOSA V91 Variant	Breakout RTM with up to 64 channels 25G fiber optics on MTPs
CF-020400-603R	Legacy RVPX SOSA Variant	Breakout RTM with up to 32 channels 25G fiber optics on MTPs

- Other variants are available upon request and these are meant to be utilized with commercial chassis components sold by Amphenol and listed in the accessories section of this datasheet
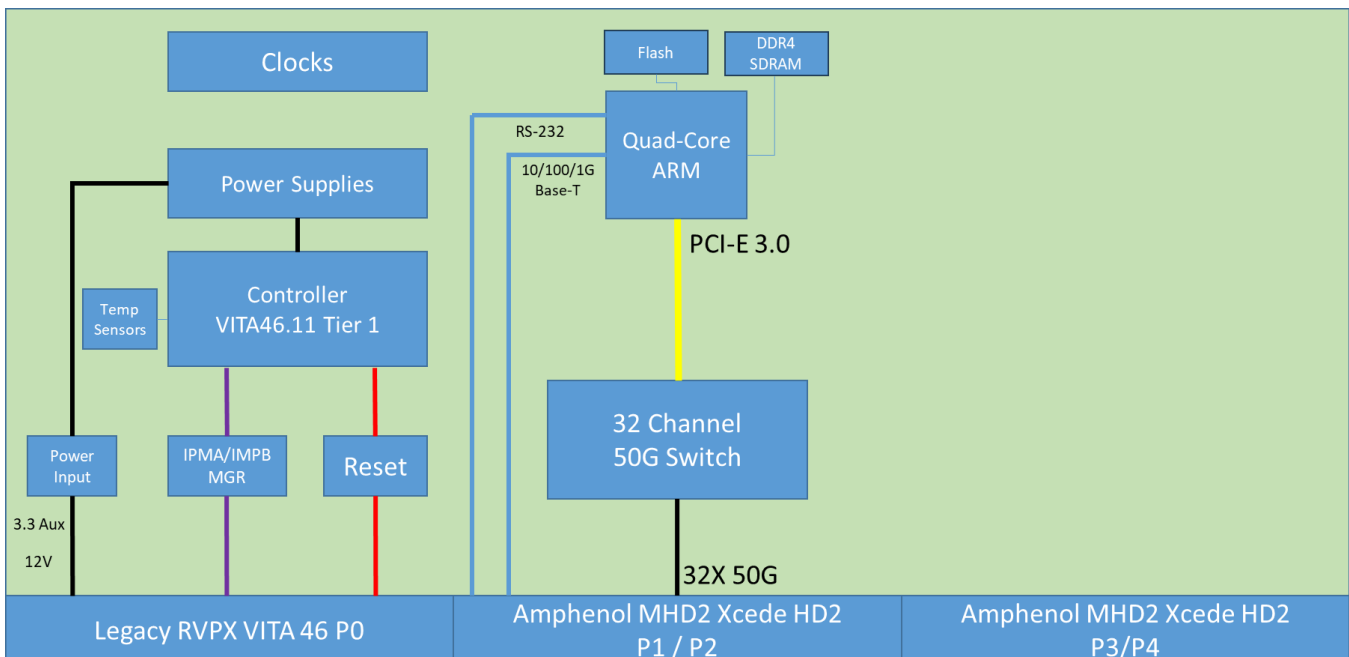
BLOCK DIAGRAMS

CF-02W300-12X – Dual Switch – 64 channels @ 50G; Managed; 150 Watts; ~60 second boot
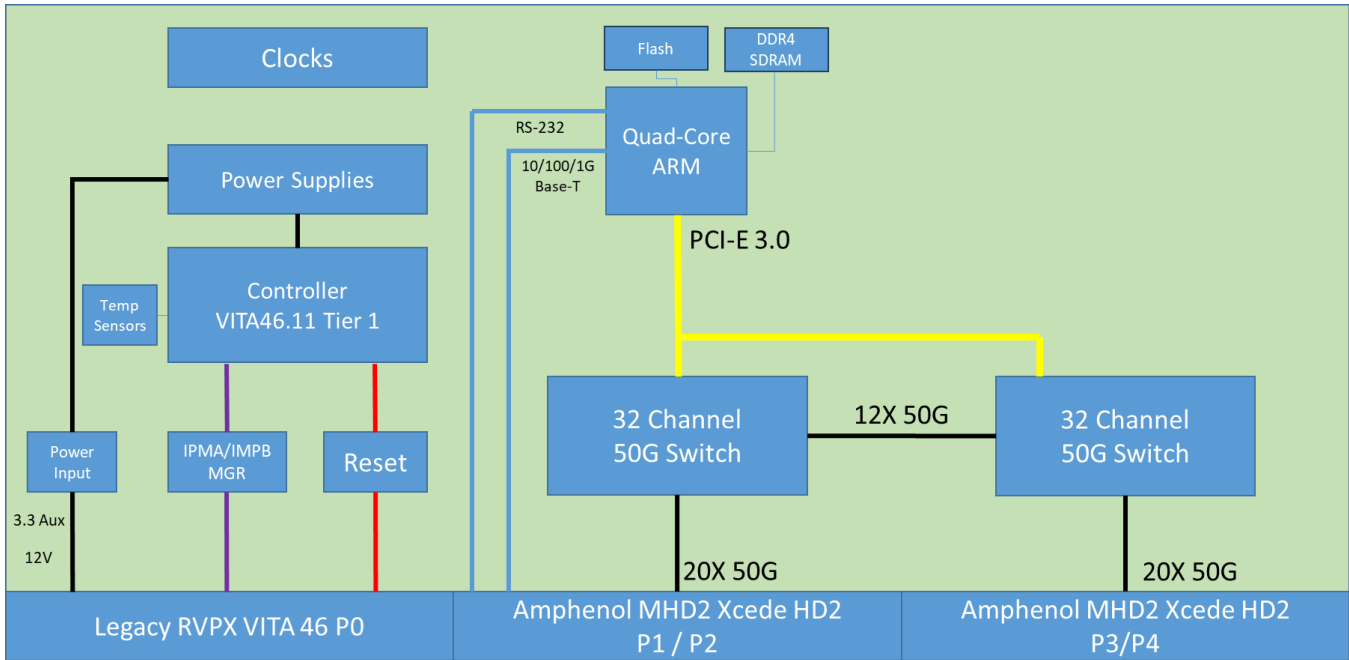
VITA91 SOSA VARIANT
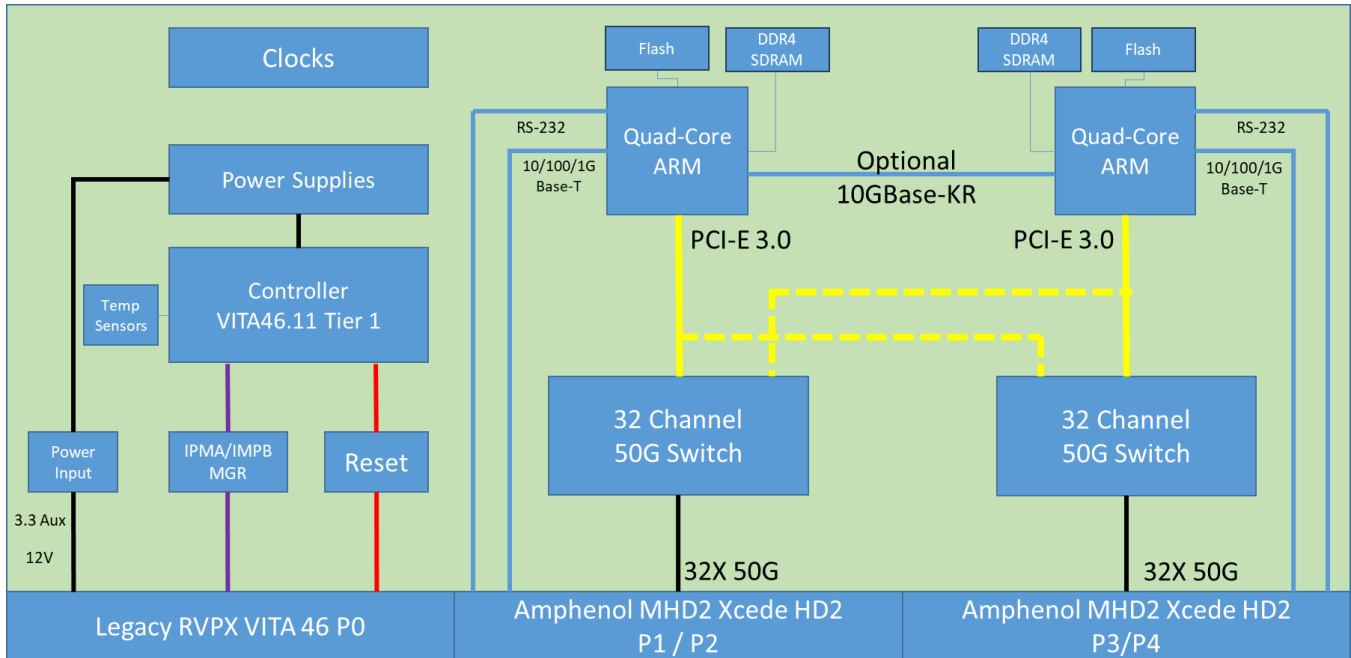
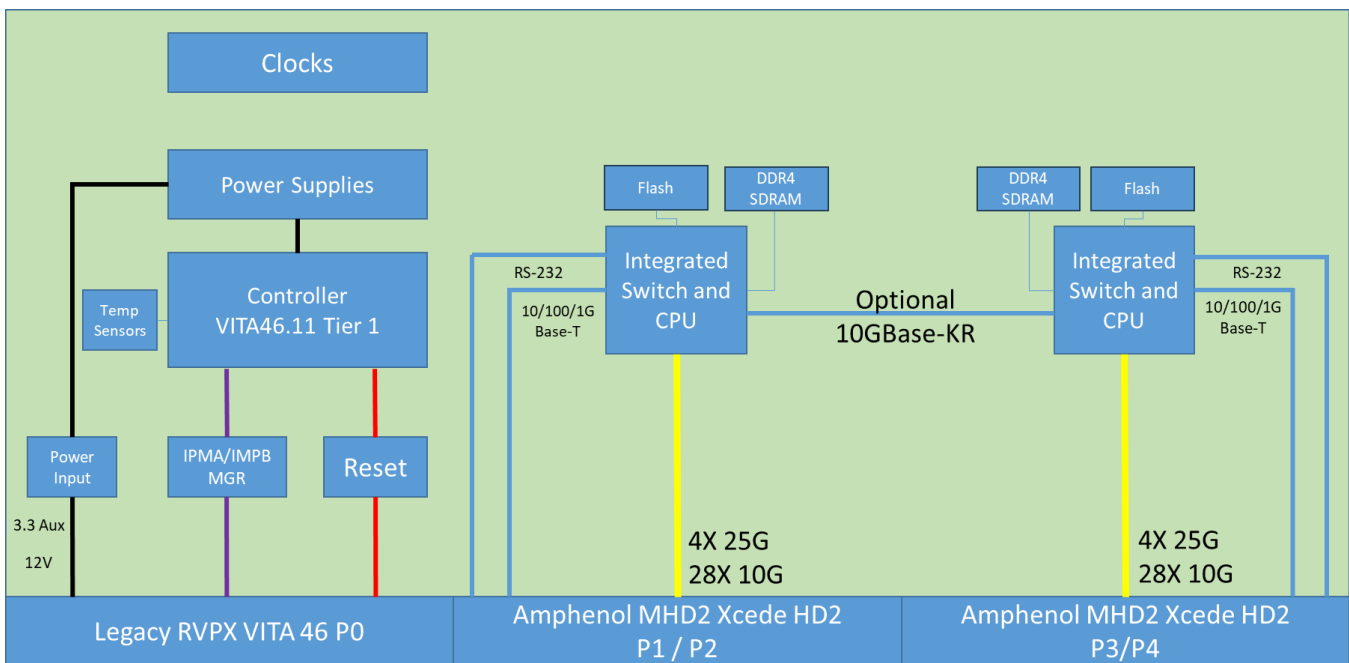## CF-02W300-13X – Dual Switch – 64 channels @ 50G; Managed; 150 Watts; ~60 second boot

VITA91 SOSA VARIANT

Amphenol
MILITARY HIGH SPEED

CF-02W300-14X – Single Meshed Switch – 40 Channels @ 50G
VITA91 SOSA VARIANT

Clocks

Power Supplies

Temp Sensors

Controller VITA46.11 Tier 1

Power Input

IPMA/IMPB MGR

Reset

3.3 Aux

12V

Flash

DDR4 SDRAM

RS-232

10/100/1G Base-T

Quad-Core ARM

PCI-E 3.0

32 Channel 50G Switch

12X 50G

32 Channel 50G Switch

20X 50G

20X 50G

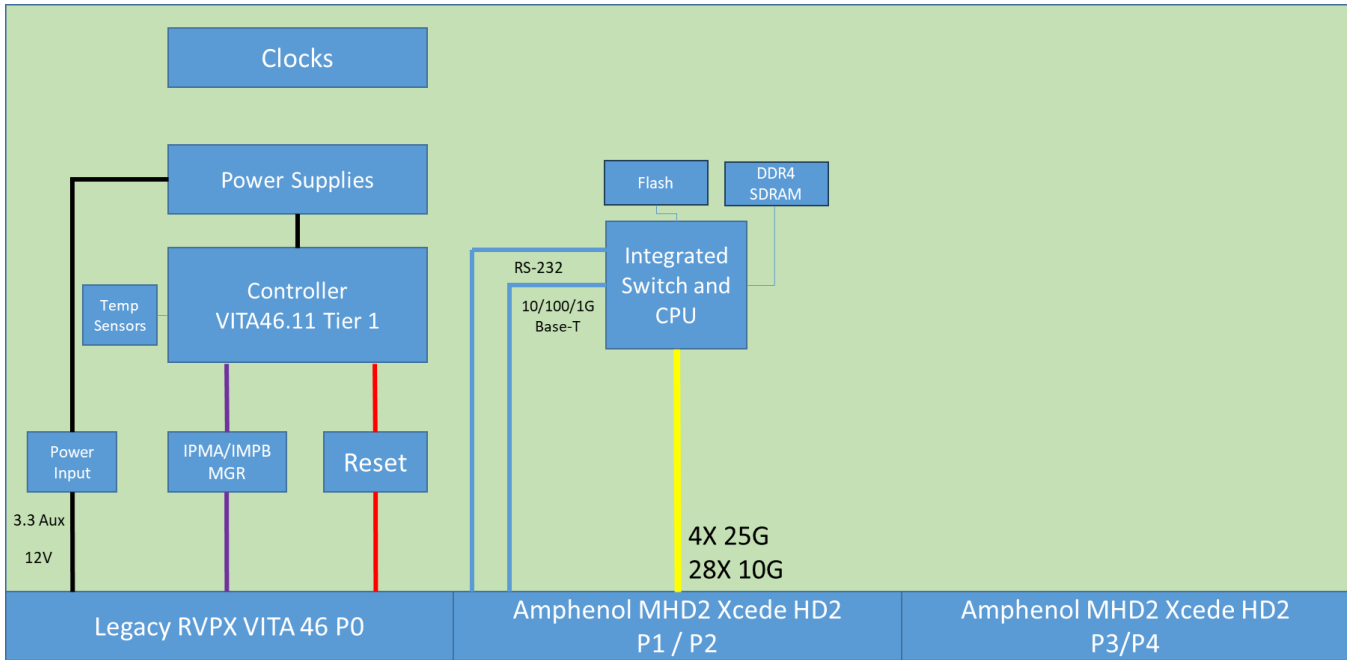Legacy RVPX VITA 46 P0

Amphenol MHD2 Xcede HD2 P1 / P2

Amphenol MHD2 Xcede HD2 P3/P4

CF-02W300-15X – Dual Switch – 64 channels @ 10G/25G; Light Management; 50 Watts; ~10 second boot
VITA91 SOSA VARIANT

Clocks

Power Supplies

Temp Sensors
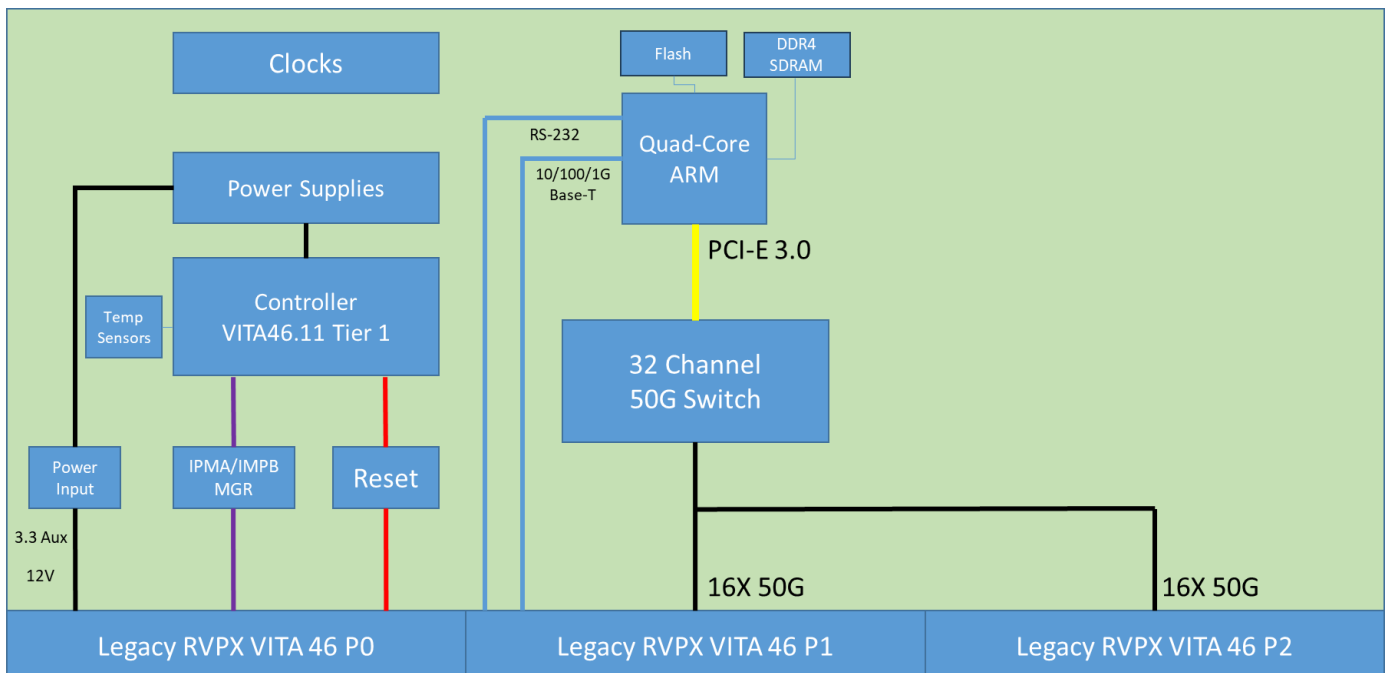
Controller VITA46.11 Tier 1

Power Input

IPMA/IMPB MGR

Reset

3.3 Aux

12V

Flash

DDR4 SDRAM

RS-232

10/100/1G Base-T

Integrated Switch and CPU

Optional 10GBase-KR

DDR4 SDRAM

Flash

Integrated Switch and CPU

RS-232

10/100/1G Base-T

4X 25G

28X 10G

4X 25G

28X 10G

Legacy RVPX VITA 46 P0

Amphenol MHD2 Xcede HD2 P1 / P2

Amphenol MHD2 Xcede HD2 P3/P4

![Amphenol MILITARY HIGH SPEED]

CF-02W300-16X – Single Switch – 32 channels @ 10G/25G; Light Management; 25 Watts; ~10 second boot
VITA91 SOSA VARIANT

```
Clocks

Power Supplies                          Flash        DDR4 SDRAM

Temp                                     Integrated
Sensors        Controller        RS-232   Switch and
               VITA46.11 Tier 1  10/100/1G   CPU
                                 Base-T

Power    IPMA/IMPB    Reset
Input    MGR

3.3 Aux                                  4X 25G
12V                                      28X 10G

Legacy RVPX VITA 46 P0   Amphenol MHD2 Xcede HD2   Amphenol MHD2 Xcede HD2
                              P1 / P2                    P3/P4
```

CF-02W300-17X – Single Switch – 32 channels @ 50G; Managed; 75 Watts; ~60 second boot
LEGACY RVPX SOSA VARIANT

```
Clocks                              Flash        DDR4 SDRAM

Power Supplies          RS-232       Quad-Core
                        10/100/1G      ARM
Temp      Controller     Base-T
Sensors   VITA46.11 Tier 1           PCI-E 3.0

Power    IPMA/IMPB    Reset          32 Channel
Input    MGR                         50G Switch

3.3 Aux
12V                       16X 50G              16X 50G

Legacy RVPX VITA 46 P0   Legacy RVPX VITA 46 P1   Legacy RVPX VITA 46 P2
```

CF-02W300-18X – Single Switch – 32 channels @ 25G; Light Management; 25 Watts; ~10 second boot
LEGACY RVPX SOSA VARIANT
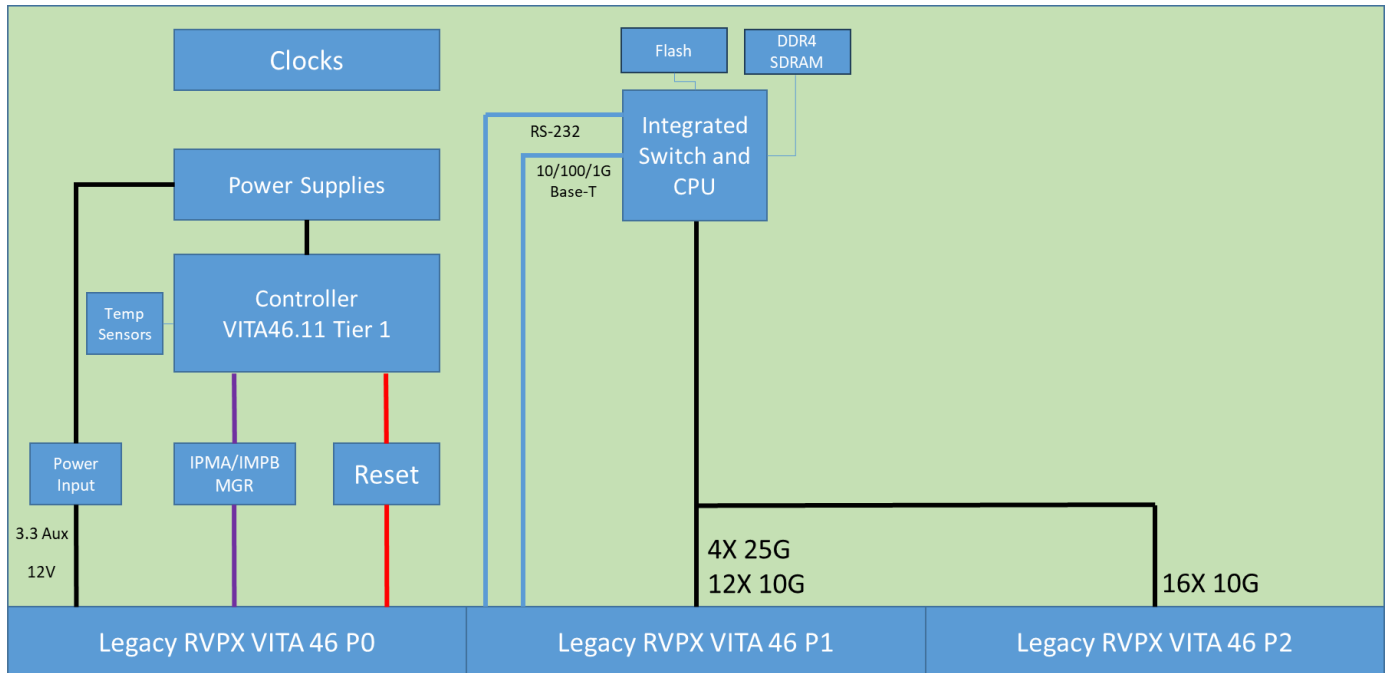
OTHER MECHANICAL CONSIDERATIONS

Frame Components

The primary and secondary frame components are finished in accordance with MIL-DTL-5541 Type II, Class 3 on aluminum alloy. Additional materials and finishes are available upon request.

Extraction Levers

The extraction lever is crafted from 7075-T7351 aluminum alloy and treated with a black anodized finish per MIL-A-8625 Type II, Class 2 specifications.

Wedgelocks

We utilize a variety of wedgelocks per customer requirements, with our standard being the SW5T-475 series from WaveTherm. These wedgelocks are constructed from 6061-T6511 aluminum alloy and black anodized in compliance with MIL-A-8625 Type II, Class 2. They feature 300-series stainless steel fasteners, passivated per AMS2700.

Labeling

Each board is equipped with an identification label, an ESD label, and is protected by a clear overlay.

Board Variants with SOSA VITA91 Connectors

Amphenol has designed these connectors in alignment with The Open Group Sensor Open Systems Architecture™ (SOSA) technical standard, MIL-HD2 provides developers with a readily available, robust open architecture solution for tighter card pitches and chassis designs where space requirements and density are critical. These connectors are available in 3-, 4-, and 6-pair configurations, providing the MIL-embedded market with the highest count of differential pairs available today in a 3U configuration at 56Gb/s PAM 4 speeds. This series was selected by the SOSA Consortium and provides a SOSA aligned solution for nextgen switch and payload card requirements enabling the MIL-embedded market to meet next-gen performance levels while still meeting COTS requirements.

- Highest density with 1.80mm pitch
- 4 diff, 8 column - SOSA aligned configuration
- Data rates scalable to 56Gb/s PAM4 to support system upgrades without costly redesigns
- Proprietary crosstalk reducing technologies
- 15.7mil drill compliant pin allows deeper backdrilling
- Optimized footprints
- Shielded contacts mate before signal contacts, providing up to a 4mm minimum wipe
- Embedded capacitor available
- Differential pairs 28-84 per inch (11-33 differential pairs per centimeter)
- Proven EMI and signal integrity advantages
- Improved impedance matching
- Complete solution for unique customer requirements
- Enables hot plugging
- Meets high density application requirements
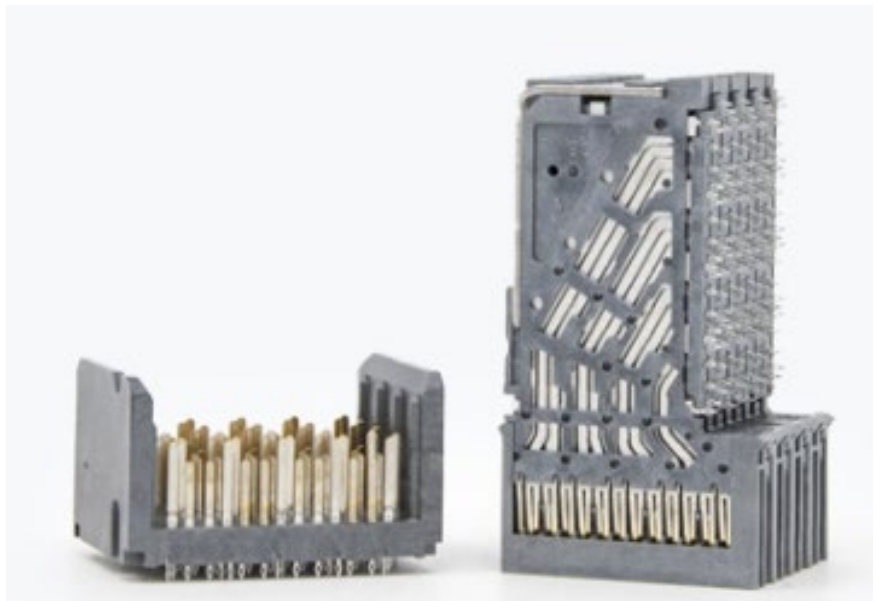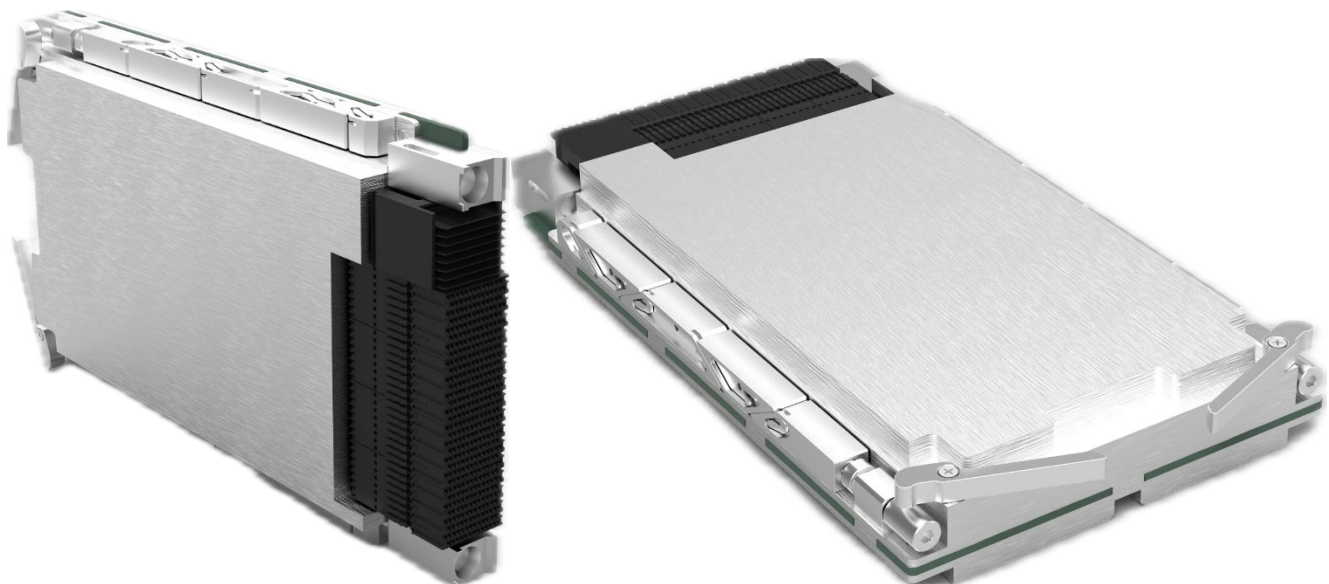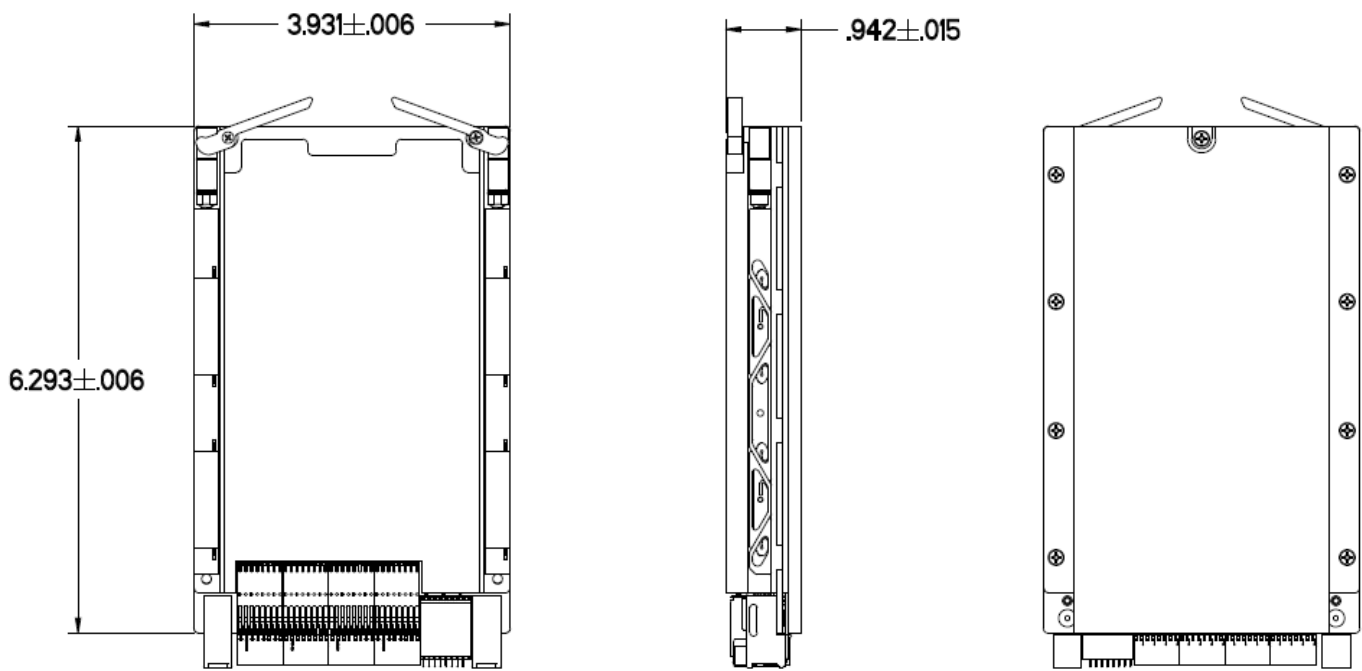
Board Variants with Legacy R-VPX 25G SOSA Connectors

Improving off original Vita 46 standards, Amphenol's R-VPX Evolution 2.0 is the next generation of high-speed ruggedized backplane connectors. R-VPX Evolution 2.0 series connectors are designed and optimized to achieve data rates in excess of 25 Gb/s, meeting VITA 46.30 requirements. This makes the Evolution 2.0 Series connectors among the fastest VITA 46.30 connectors in the world. These connectors are tested to VITA 46 levels and are backward intermateable with R-VPX, R-VPX EVO 1 and VITA 46 qualified connectors.

- 25+ Gb/s performance
- Module and backplane connectors utilize smaller compliant contacts for increase Si performance
- Intermateable with existing/legacy VITA 46 connectors
- Qualified to VITA 46 spec
- Ruggedized 4-point contact system
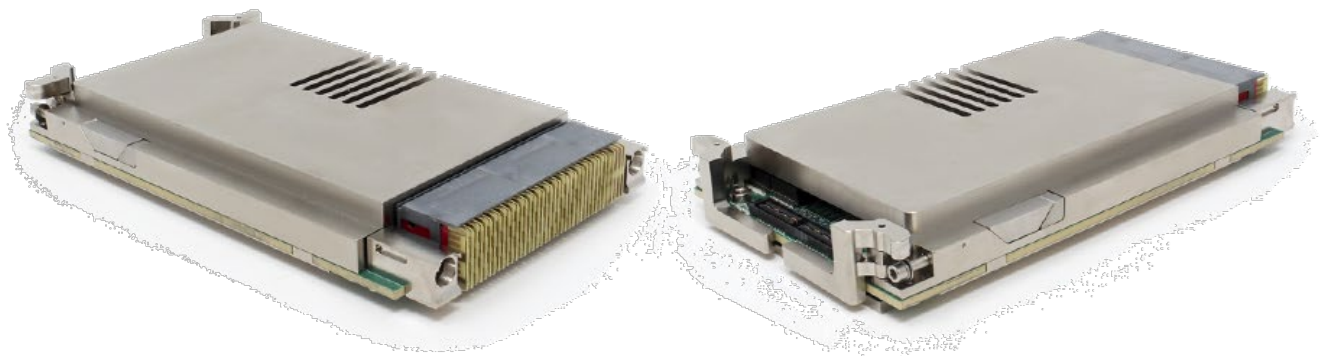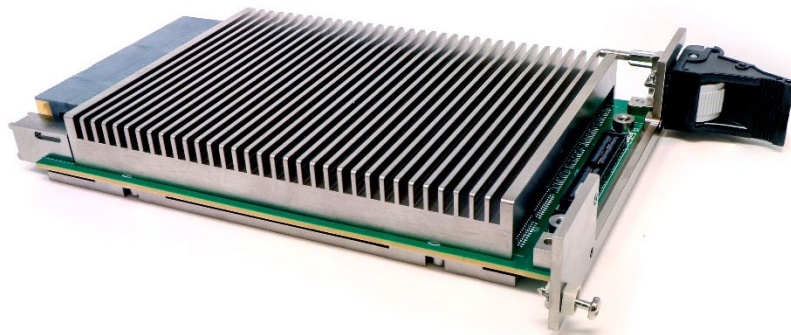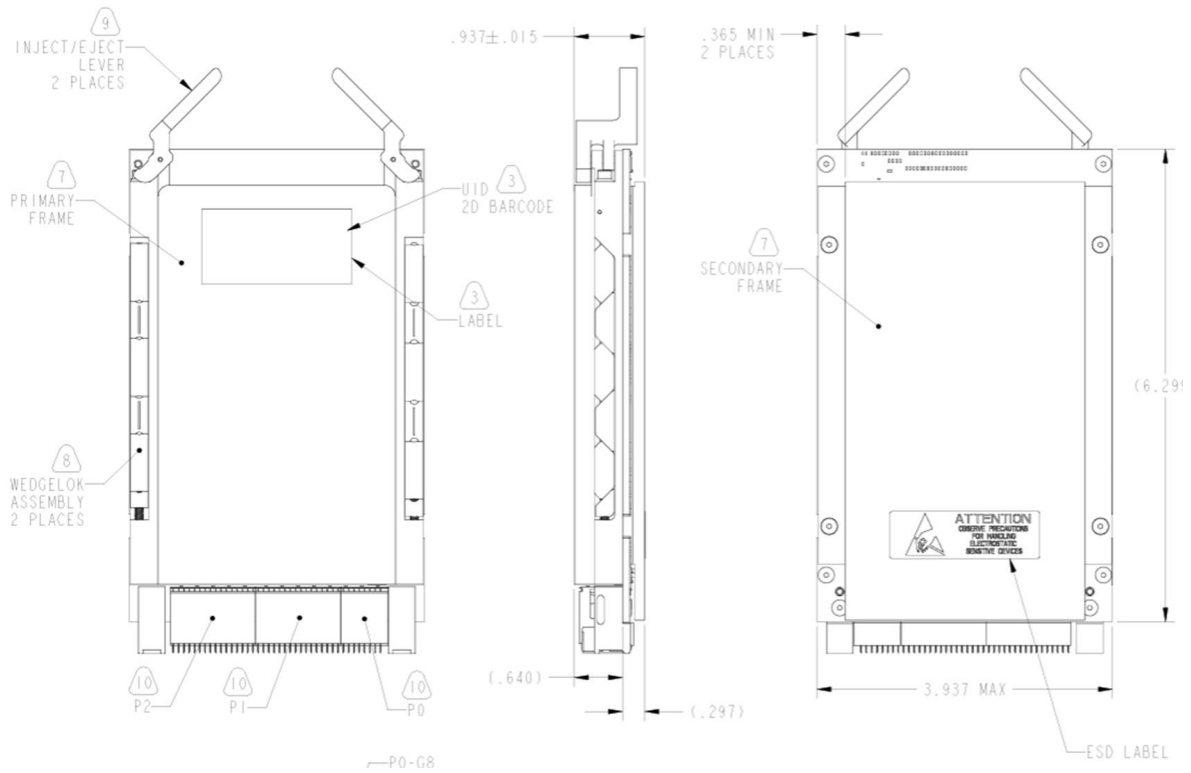- Passed VITA 72 vibration level testing with BER monitoring.
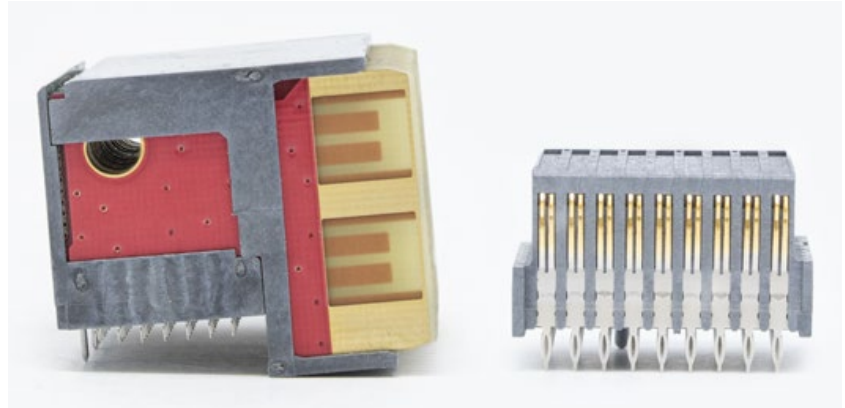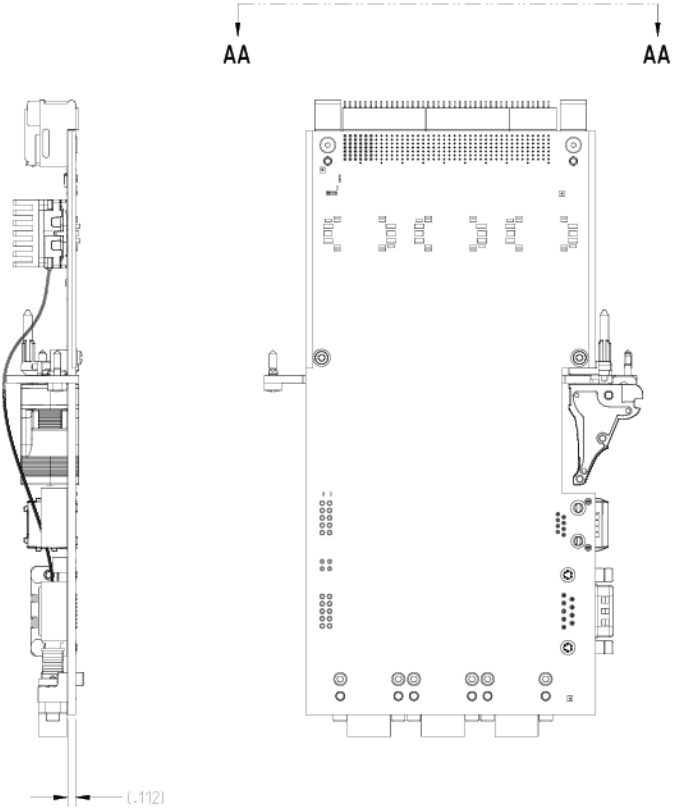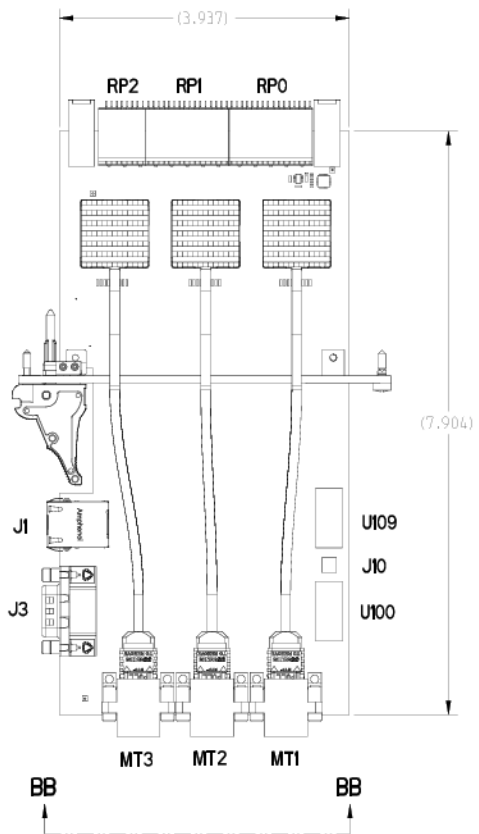
DIMENSIONAL INFORMATION

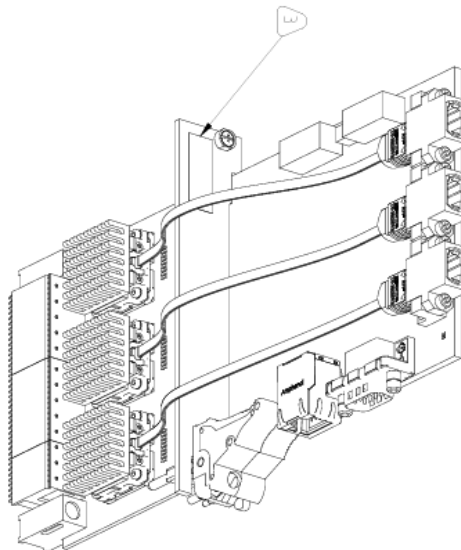VITA91 SOSA Variant - Mechanical prints, pinouts, and step files available upon request

3.931±.006

.942±.015

6.293±.006

LEGACY RVPX SOSA Variant - Mechanical prints, pinouts, and step files available upon request

INJECT/EJECT
LEVER
2 PLACES

.937±.015

.365 MIN
2 PLACES

PRIMARY
FRAME

UID
2D BARCODE

LABEL

SECONDARY
FRAME

(6.29)

WEDGELOK
ASSEMBLY
2 PLACES

ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE DEVICES

P2   P1   P0

(.640)

(.297)

3.937 MAX

ESD LABEL

PO-G8

LEGACY RVPX RTM Variant - Mechanical prints, pinouts, and step files available upon request

(3.937)

RP2   RP1   RP0

(7.904)

J1
J3

U109
J10
U100

AA   AA

BB   BB

(.112)

MT3   MT2   MT1

NOTE: SIGNAL DIRECTION
- TX COMES FROM BACKPLANE
- RX GOES TO BACKPLANE

RP0-G1   RP0-G16   RP1-G1   RP1-G16   RP2-G1   RP2-G8

RP0-A1   RP0-A16   RP1-A1   RP2-A8   RP2-A1   RP1-A16

VIEW AT AA-AA
SCALE 1.500

GUIDE BLOCK
KEYLESS
2000713-0
OR EQUIVALENT
2 PLACES

24   13   24   13

12   MT3   12   MT2   12   MT1
KEYWAY   KEYWAY   KEYWAY

VIEW AT BB-BB
SCALE 2.500
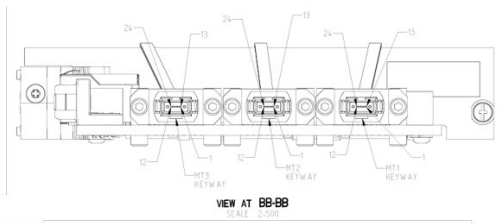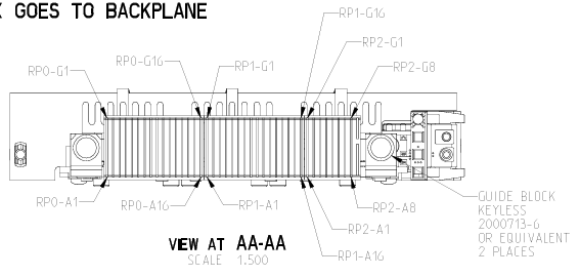
SOFTWARE

Fully Managed – 60 second boot - Manuals available upon request

Column 1	Column 2	Column 3
Stacking	Configuring VLANs	Configuring IGMP Snooping
Stacking Ring Topology	Defining VLAN Properties	Configuring MLD Snooping
Stacking Chain Topology	Defining VLAN Membership	Viewing IGMP/MLD IP Multicast Groups
Stacking Members and Unit ID	Defining VLAN Interface Settings	Defining Multicast Router Ports
Removing and Replacing Stacking Member	Configuring GARP	Defining Forward All Multicast
Exchanging Stacking Members	Defining GARP	Defining Unregistered Multicast Settings
Switching the Stacking Master	Defining GVRP	**Managing System Files**
Configuring System Time	Viewing GVRP Statistics	Downloading System Files
Configuring Daylight Savings Time	**Defining IP Addresses**	Firmware Download
Configuring SNTP	Configuring IP Addressing	Configuration Download
Polling for Unicast Time Information	Defining IP Addresses	Uploading System Files
Polling for Anycast Time Information	Defining ARP	Upload Type
Broadcast Time Information	Defining Domain Name Servers	Software Image Upload
Defining SNTP Settings	Defining DNS Servers	Configuration Upload
Configuring Device Security	Defining DNS Host Mapping	Copying Files
ConfiguringManagement Security	**Defining the Forwarding Database**	Restoring the Default Configuration File
Configuring AuthenticationMethods	Defining Static Forwarding Database Entries	**Configuring Quality of Service**
Defining Access Profiles	Defining Dynamic Forwarding Database Entrie	Quality of Service Overview
Defining Profile Rules	**Configuring Spanning Tree**	VPT Classification Information
Defining Authentication Profiles	Defining Classic Spanning Tree	CoS Services
Mapping AuthenticationMethods	Defining STP on Interfaces	Defining General QoS Settings
Defining RADIUS Settings	Defining Rapid Spanning Tree	Configuring QoS General Settings
Defining TACACS+ Authentication	Defining Multiple Spanning Tree	Restoring Factory Default QoS Interface Setting
Configuring Passwords	Defining MSTP Instance Settings	Defining Queues
Defining Local Users	Defining MSTP Interface Settings	Defining Bandwidth Settings
Defining Line Passwords	**Configuring SNMP**	Mapping CoS Values to Queues
Defining Enable Passwords	SNMP v1 and v2c	Mapping DSCP Values to Queues
Configuring Network Security	SNMP v3	Defining QoS Basic Mode
Network Security Overview	Configuring SNMP Security	Defining Basic Mode Settings
Port-Based Authentication	Defining SNMP Security	Rewriting Basic Mode DSCP Values
Advanced Port-Based Authentication	Defining SNMP View	Defining QoS Advanced Mode
Defining Port Authentication Properties	Defining SNMP Group Profiles	Setting Policy Binding
Defining Port Authentication	Defining SNMP Group Members	**Managing Device Diagnostics**
Configuring Multiple Hosts	Defining SNMP Communities	Configuring Port Mirroring
Defining Authentication Hosts	SNMP Communities Basic Table	**Viewing Statistics**
Viewing EAP Statistics	SNMP Communities Advanced Table	Viewing Interface Statistics
Defining Access Control Lists	Configuring SNMP Notifications	Viewing Interface Statistics
Defining IP Based Access Control Lists	Defining SNMP Notification Global Parameters	Receive Statistics
Defining MAC Based Access Control Lists	Defining SNMP Notification Filters	Transmit Statistics
Binding Device Security ACLs	Defining SNMP Notification Recipients	Viewing Etherlike Statistics
Managing Port Security	SNMPv1,2c Notification Recipients	Managing RMON Statistics
Enabling Storm Control	SNMPv3 Notification Recipients	Viewing RMON Statistics
Configuring System Logs	**Configuring Multicast Forwarding**	Configuring RMON History
Defining General Log Properties	Multicast Forwarding	Defining RMON History Control
Viewing Memory Logs	Typical Multicast Setup	Viewing the RMON History Table
Viewing Flash Logs	Multicast Operation	Configuring RMON Events
Defining System Log Servers	Multicast Registration	Defining RMON Events Control
Configuring Interfaces	Multicast Address Properties	Viewing the RMON Events Logs
Configuring Ports	Defining Multicast Properties	Defining RMON Alarms
Aggregating Ports	Adding MAC Group Address	
Configuring LACP	Adding IP Multicast Groups	

Lightly Managed – 10 second boot - Manuals available upon request

CLI and Web Interface

IPV4 / IPV6 routing

Information on links and routing

Tagged and untagged VLAN configurations

Trunk Link Aggregation

Port Mirroring

Port Based QoS

802.1P QoS

Rate Limitations

Loop Detection

Multicast IGMP Snooping

Cable Diagnostics

ACCESSORIES

El Sharko - 3U VPX Development Chassis

Supporting Legacy RVPX and SOSA Aligned Payload Integration

The El Sharko is a versatile bench-top platform designed to provide the scalability needed for rapid development, demonstration, and evaluation of 3U VPX and SOSA-aligned systems. By streamlining design cycles, El Sharko helps accelerate deployment timelines. Its design allows for quick backplane replacements and seamless transitions between air-cooled and conduction-cooled slot inserts.

Featuring an open-frame design, El Sharko includes a backplane, power supply, fan cooling, and rear transition slots, supporting a wide range of test functions. It comes standard with an 8-slot, 1.2" pitch, 40Gb power and ground backplane to enhance your development capabilities.

The platform is equipped with a balanced 12V/5V power supply for mixed power payloads, with an optional 12V-centric power supply available upon request. Both configurations are optimized to meet current and future VPX and SOSA-aligned module power requirements.

Datasheet:
https://www.amphenol-aerospace.com/resources/literature/view/el-sharko-3u-vpx-dev-chassis-datasheet

PART NUMBER TABLE

CF-020400-604	The El Sharko development chassis, 8 x 1.2" pitch air-cooled slots, power, and ground pass-thru 40Gb backplane with 4 x VITA67 full width apertures and balanced 12V/5V PSU. Consult Amphenol for 12V centric PSU and fully populated backplane availability
CF-020400-605	Conduction cooled guide accessory kit. Includes top and bottom guides plus mounting hardware
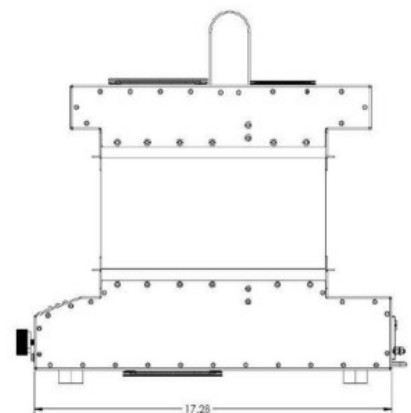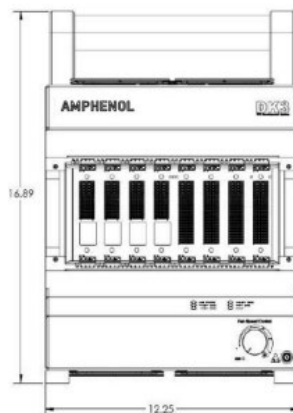
Nessie - 3U VPX 50G Development Chassis

Supporting new VITA-91 and SOSA Aligned Payload Integration

Nessie is the premier development chassis featuring high-density SOSA V91 connectors, specifically designed for next-generation VPX systems operating at 50Gbps. It offers unmatched scalability, making it ideal for rapid development, demonstration, and evaluation of MIL-HD2 Next-Gen SOSA/VITA 91-aligned connectors, perfectly suited for advanced switch and payload card requirements.

By accelerating design cycles, Nessie enables faster time to deployment. Its flexible design allows for quick backplane replacements and seamless transitions between air-cooled and conduction-cooled slot inserts, making it a versatile solution for a range of applications.

The open-frame chassis includes an integrated backplane, power supply, fan cooling, and rear transition slots, all supporting various test functions. Nessie comes standard with a 6-slot, 1.2" pitch, 50Gb backplane, ensuring robust support for your development needs. It also features a balanced 12V/5V power supply for mixed power payloads, with an optional 12V-centric power supply available on request, meeting the power requirements for both current and future VPX and SOSA-aligned modules.

Datasheet:
https://www.amphenol-aerospace.com/resources/literature/view/3u-vpx-50g-development-chassis-nessie

PART NUMBER TABLE

| CF-020400-612 | The Nessie development chassis, 6 x 1.2" pitch air-cooled slots, power, and ground pass-thru 50Gb backplane with 3 x VITA67 full width apertures and balanced 12V/5V PSU. Consult Amphenol for 12V centric PSU and fully populated backplane availability |
| CF-020400-605 | Conduction cooled guide accessory kit. Includes top and bottom guides plus mounting hardware |
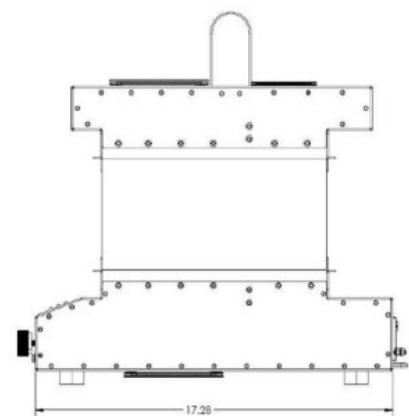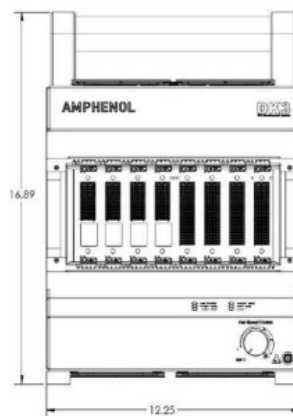
Amphenol Ruggedization Pedigree

OVERVIEW:

Amphenol integrated electronic products are designed and manufactured to our Ruggedization guidelines listed below. These guidelines ensure years of reliable operation in harsh environment applications where extreme operating temperatures, shock, vibration, and corrosive atmospheres are regularly experienced. Unless otherwise noted, the parts conform to the below specifications

TEMPERATURE:

- Operating Temperature- Thermal Cycles between -40°C and 85°C while device is operating
- Temperature is measured at chassis housing or card edge
- Storage Temperature- Thermal Cycles between -55°C and 125°C

HUMIDITY:

- Operating Humidity- Humidity cycle between 0-100% non-condensing humidity while device operating
- Storage Humidity- Humidity cycle between 0-100% condensing humidity

SEALING:

- Sealing can be optionally provided at the MIL-DTL-38999 interface with up to 10-5 cc/sec performance

SHOCK AND VIBRATION:

- Sine Vibration - 10g Peak, 5-2,000Hz
  - Based on a sine sweep duration of 10 minutes per axis in each of three mutually perpendicular axes. May be displacement limited from 5 to 44 Hz, depending on specific test.
- Random Vibration - 0.0005 @ 5Hz, 0.1 @ 15 Hz, 0.1 @ 2,000 Hz
  - 60 minutes per axis, in each of three mutually perpendicular axes.
- 40 G Peak Shock Cycle
  - Three hits in each axis, both directions, ½ sine and terminal-peak saw tooth, Total 36 hits.

LUIDS SUSEPTABILITY:

- MIL-DTL-38999 receptacle interface per EIA-364-10E

ALTITUDE:

- -1,500 to 60,000 ft Altitude Testing w/ Rapid Depressurization

ELECTRONMAGNETIC COMPATIBILITY:

- Designed to comply with MIL-STD-461E

PRINTED CIRCUIT BOARD ASSEMBLIES:

- Conformal Coat
- Amphenol performs Conformal Coting to both sides of printed circuit board assemblies using HUSMISEAL IB31 in accordance with IPC-610, Class 3.
- Printed Circuit Board Rigidity
- Amphenol printed circuit boards are fabricated in accordance with IPC-6012, Class 3.
- Printed Circuit Board Fabrication
- Amphenol printed circuit boards acceptance criteria is in accordance with IPC-610, Class 3.

RELIABILITY PREDICTIONS (MTBF):

Amphenol can perform Mean Time Between Failure (MTBF) reliability analysis in full compliance with MIL-HDBK-217F-1 Parts Count Prediction and MIL- HDBK-217F-1 Parts Stress Analysis Prediction. We can also perform reliability analyses in full compliance of ANSI/VITA 51.1 if it is required or preferred over the later met

40-60 Delaware Avenue
Sidney, NY 13838
amphenol-aerospace.com | amphenolmao.com