

VPX55HS-3, 3U VPX DC/DC Converter



Made in the USA
Certified Small Business

800-Watt Ruggedized Converter

**Developed in alignment with the SOSA™ Technical Standard
Plug-in Module, Conduction-Cooled, Six Outputs**

Description

NAI's VPX55HS-3 is a high-performance DC/DC converter that delivers up to 800 watts and plugs directly into a standard 3U VPX chassis with a VITA 62, 1.0" power supply slot. Designed for VITA 46.0 and VITA 65 systems, this off-the-shelf solution fully complies with VPX specifications, supporting all VITA standard I/O, signals, and features, and adhering to VITA 62 mechanical and electrical requirements for modular power supplies.

It includes an integrated IPMC with dual-bus IPMB-A and IPMB-B. The VPX55HS-3 is conduction-cooled via card edge/wedgelock and accepts a +28 VDC input voltage, offering up to six outputs as per VITA 62, with an optional SOSA™ (+12 Volt Only) configuration (refer to output power table). Standard features include continuous Background Built-In-Test (BIT), I²C communication, remote error sensing, current sharing, and protection against transients, overvoltage, overcurrent, over-temperature, and short circuits. Its intelligent design also provides the flexibility to accommodate specialized requirements.

Features



- Optimized for rugged 3U VPX power applications
- Features VPX-compatible connectors and I/O in compliance with VITA 62
- Includes a System Management Bus as per VITA 46.11
- Equipped with IPMC dual-bus IPMB-A & IPMB-B for enhanced reliability
- Ready-to-use solution for VITA 46.0 and VITA 65 systems
- Fully supports VITA standard I/O, signals, and features
- Operates with a +28 VDC input
- Delivers up to six configurable outputs and I/O options
- Offers SOSA™-aligned output configuration
- Continuous Background Built-in-Test (BIT) for real-time diagnostics
- Supports current sharing
- Provides input transient protection in line with MIL-STD-704F
- Compliant with MIL-STD-461F for EMI control
- Built to meet environmental standards per MIL-STD-810H and VITA 47.1 ECC4SL1
- Capable of full-load operation across a wide temperature range from -40°C to +85°C

Electrical Specifications

DC Input Characteristics	
Input	+28 VDC (+18 VDC to +40 VDC range)
EMI/RFI	Designed to meet the requirements of MIL-STD-461F; (additional system filtering required)
Input Transient Protection	Ride-through Normal transients Per MIL-STD-704F. No damage when subjected to abnormal transients and power interruption
Output Power	Up to 800 Watts max at 85°C; see Output Power Table, page 8 and refer to notes 1 through 3
Output Voltage	Standard VPX outputs, Heavy +12V or +12V only per SOSA™ (see Output Power Table)
Efficiency	91% typical for SOSA +12V only; 89% typical for other output configurations. Measured @ full load
Switching Frequency	Main Converter 150kHz, Secondary Converters 600kHz
Line Regulation	Within 0.5% or 20 mV (whichever is greater) for low to high line changes at constant load. For current share units: 1.5% for VS1, VS2, VS3; 2% for +3.3 VDC_Aux, +12 VDC_Aux, -12 VDC_Aux
Load Regulation	0.5% or 20 mV (whichever is greater) for 0 to 100% of rated load at nominal input line with remote sense. 1% for -12 VDC_Aux, +12 VDC_Aux, +3.3 VDC_Aux; For current share units: 1.5% for VS1, VS2, VS3, +3.3 VDC_Aux; 2% for +12 VDC_Aux, -12 VDC_Aux
PARD (Noise and Ripple)	1% or 50 mV p-p max per VITA 62; measurements are made with a 20 MHz bandwidth instrument connected on load wires < 5 inches from power supply and terminated with 1uF capacitors across load lines
Load Transient Recovery	Output voltage returns to regulation limits within 0.5 msec, half to full load
Load Transient Under/Overshoot	5% of nominal output voltage set point (1.4 V max); 2.5% for VS3
Short Circuit Protection	Protected for continuous short circuit with automatic recovery
Current Limiting	All outputs to 130%
Over Voltage Protection	Automatic electronic shutdown if outputs exceed 125% \pm 10%
Remote Error Sensing	Sensing pins compensate for up to 0.5 V drop on VS1 to VS3 outputs
Isolation Voltage	500 VDC input to output and input to case; 100 VDC output to case
Insulation Resistance	50 Mega Ohm at 500 VDC

All specifications are subject to change without notice.

Additional Specifications

Physical/Environmental	
Temperature Range	Operating: -40°C to +85°C at 100% load. Temperature measured at card edge, conduction via card edge. Storage: -55°C to +105°C per VITA 47 CC4.
Temperature Coefficient	0.01% per °C
Shock	40 G's each axis per MIL-STD-810H, Method 516, Procedure 1. VITA 47 OS2
Acceleration	6 G's per MIL-STD-810H, Method 513, Procedure II
Vibration	Per MIL-STD-810H, Method 514, Procedure 1; 12 GRMS, VITA 47, Class V3
Humidity	95% at 71°C per MIL-STD-810H, Method 507 (non-condensing)
Altitude	1,500 feet below sea level to +60,000 feet above sea level per VITA 47
Salt & Fog	Per MIL-STD-810H, Method 509, VITA 47 Class SL1.
Sand/Dust	Per MIL-STD-810H, Method 510
Fungus	Per MIL-STD-810H, Method 508
ESD	15 kV EN61000-4-2 per VITA 47
Enclosure	Aluminum housing to aluminum baseplate
Dimensions	See Mechanical Layout
Finish	Chemical film IAW MIL-DTL-5541, Type II, Class 3
Interface	50 Micro-Inch Gold on contacts; plated tails for tin whisker mitigation; See connector specifications table
Weight	1.6 lbs. Typical

All specifications are subject to change without notice.

Signal Types

Signal	Description
ENABLE*	When the signal is High, all output voltages, including 3.3 V_AUX, are turned off. The ENABLE* signal is pulled Low using a mechanical switch that connects it to SIGNAL_RETURN, or it can be driven by a logic output. Opening the switch disables all outputs, while closing the switch or applying the logic signal enables the outputs, depending on the state of the INHIBIT* signal. An input of less than 0.8 VDC is recognized as Low, while an input greater than 2.0 VDC or a no-connect is recognized as High. Together with INHIBIT*, the ENABLE* signal controls the output power status of the VPX55HS-3 (refer to Power Status Table).
INHIBIT*	This signal disables all output voltages, although in most cases, it is expected to leave 3.3 V_AUX powered on. Pulling INHIBIT* Low turns off the VS1, VS2, VS3, and ±12 VDC_AUX outputs. An input below 0.8 VDC is considered Low, while an input above 2.0 VDC or a no-connect is treated as High. Together with ENABLE*, this signal controls the output power status of the VPX55HS-3 (refer to the Power Status Table).
SYSRESET*	An active low open-collector line driven by the Power Monitor module. Signal ensures a clean, stabilized startup based on monitoring the output voltage levels in accordance with VITA 46.0, paragraph 4.8.11. Timing can be factory customized.
FAIL*	Indicates failure when any of the outputs are not within specification. Signal complies with VITA 65 for active Low. FAIL* signal is Open Drain. It is expected that there will be a pull-up resistor on the backplane.
VBAT	Provides a low-power +3.3 VDC @ 1A output to other plug-in modules. Intent is to supply power to low current devices, such as Real Time Clocks, when other outputs are off. While connected internally to the +3.3 VDC_Aux output, the signal provides a separate line dedicated to low power needs and has its own overcurrent protection. The signal is controlled thru power status, along with the +3.3 VDC_Aux output (see Power Status Table below).
Geographical Addressing	As defined in VITA 46
Current Share	Allows multiple supplies to share system load for VS1-VS3 outputs. Optional, refer to ordering information.
Protocol	Per VITA 46.11 System Management Bus.
Status LED	See LED Status table below

LED Status

LED State	Meaning
Off	Input Low
Green (Steady)	Vout OK; All outputs are good
Red (Steady)	Fail; Follows same logic as FAIL* signal
Blinking Green	Unit disabled
Blinking Red	Over Voltage or Over Temperature (all outputs are off)

Power Status

Control Input States		Power Output States	
ENABLE*	INHIBIT*	+3.3V_AUX	VS1, VS2, VS3, +12V_AUX & -12V_AUX
High	High	Off	Off
High	Low	Off	Off
Low	High	On	On
Low	Low	On	Off

I²C Communication

Mode I - VITA 46.11 Tier 3 dual bus

Provides all mandatory Sensor Data Record (SDR) and all required FRU data as well as real-time analog data

1. Hardware Interface.

Electrical interface is based on I²C parameters at 100 kHz. The backplane or I²C master controller should provide pull up resistors on SDA and SCL lines to a 3.3V rail.

2. Address.

The I²C Address is 7 bits. Default base address is 0x20. *GA0, *GA1, and *GA2 provides 3 LSB's for the address. The *GA pins have pull-up resistors internal to the power supply to 3.3V. When left open, the address will be 0x20, with all three pins grounded the address will be 0x27, see table below.

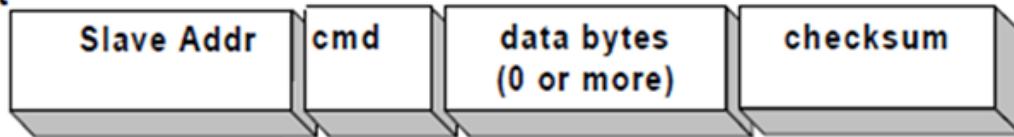
Pin			I ² C Address
*GA2	*GA1	*GA0	
Pin C1	Pin B5	Pin A5	
High	High	High	0x20
High	High	Gnd	0x21
High	Gnd	High	0x22
High	Gnd	Gnd	0x23
Gnd	High	High	0x24
Gnd	High	Gnd	0x25
Gnd	Gnd	High	0x26
Gnd	Gnd	Gnd	0x27

Mode II - Legacy Slave Mode Commands (*Available via ejector panel communication port*)

1. Supports Legacy Slave Mode Commands

Data Read - Get Sensor Reading results

Request



Response



	Byte	Data Field	Data See table
Request Data	1	cmd	
	2 to n-1	Data If Required by cmd or Zero ChkSum* if no Data required.	
Response Data	n	Zero ChkSum* if Data was required by cmd	
	1	Completion Code – Echo cmd Number	
	2 to n-1	Per cmd Response	
	n	Zero ChkSum	

***Note : Slave address should not be included in Zero Checksum calculation.**

2. Commands

Sensor #	Name	Description
21H	Composite Sensor	64 bytes of scanned sensor data. Data is continually scanned and available for report. Data consists of 2 bytes of data for each of the 11 sensors and FRU data.
55H	Status Write Command	Writes Status byte on Composite Sensor.
44H	Firmware release date	22 byte response. Month/Day/Year Hr/Min/Sec in ASCII form.
45H	Hardware Address	3 byte response. Reports address set by GA0*-GA1*

3. Composite Sensor Read Command – 21H

Response BYTE #	Data Type	Meaning
0	Completion Code – 21h	Echo of the command
1	Status Register 0, MS Bit First	Refer to table below
2-3	Signed Integer, MSB First	Temperature as follows $^{\circ}\text{C} = (\text{Reading} * 100 / 16384)$
4-5	U Integer, MSB First	Voltage on VS1, 12V = 16384
6-7	U Integer, MSB First	Voltage on VS2, 3.3 = 16384
8-9	U Integer, MSB First	Voltage on VS3, 5V = 16384
10-11	U Integer, MSB First	Voltage on 3.3Aux, 3.3V = 16384
12-13	U Integer, MSB First	Voltage on +12V Aux, 12V = 16384
14-15	U Integer, MSB First	Absolute Voltage on -12V Aux, 12V = 16384

16-17	U Integer, MSB First	Full Load current on VS1 = 16384
18-19	U Integer, MSB First	Full Load current on VS2 = 16384
20-21	U Integer, MSB First	Full Load current on VS3 = 16384
22-23	U Integer, MSB First	Full Load current on 3.3Aux = 16384
24-25	U Integer, MSB First	Full Load current on +12VAux = 16384
26-27	U Integer, MSB First	Absolute Full Load current on -12Vaux = 16384
28-29	U Integer, MSB First	Internal Reference, 2.5V = 16384
30-31	U Integer, MSB First	Input Voltage 28V = 16384
32-51	Character String	Part Number
52-53	U Integer, MSB First	S/N Hi
54-55	U Integer, MSB First	S/N Low
56-57	U Integer, MSB First	Date Code (Year/Week)
58-59	Character String	Hardware Rev
60-61	Character String	Firmware Rev
62	Reserved	Reserved
63	Zero Checksum	Value required to make the sum of bytes 0 to 62 add to a multiple of 256 (decimal).

Status Reg 0		R/Set	R/Set	R/W	R/W	R/W	R	R
Bit	7	6	5	4	3	2	1	0
	x	FAIL	OTWarning	SWPriority	*SW Inh	*SW En	*HW Inh	*HW En

Bits 5 AND 6 (OTWarning - FAIL) are Read and write. They are clear at startup. User can set them with a Status Write command. Hardware will clear them if there is a fault.

Bit 4 (SWPriority) is Read and write. It is clear at Startup. When clear the unit will be controlled by the hardware enable and inhibit signals. When set, the unit will be controlled by the SW inhibit and enable signals.

Bits 3 and 2 (SWInh SWEn) are read and write. Their logic works the same as the logic for the hardware Enable and Inhibit.

*SWEnable	*SWInhibit	OUTPUTS
0	0	INHIBIT (3.3V Aux is On, all other outputs are off)
0	1	ON
1	0	OFF
1	1	OFF

Bits 1 and 0 (HWIn - HWEn) are read only. They show the state of *Enable and *Inhibit pins while SWPriority is low.

4. Status Write Command - 55H

BYTE #	Data Type	Meaning
0	U Character – 55H	Command
1	U Character	Data
2	Zero Checksum	Value required to make the sum of bytes 0 and 1 add to a multiple of 256 (decimal).

The command to write to Status byte is 55h, followed by 8-bit data then zero checksum.

Example: To send a command to clear the faults and turn on all the outputs, the following sequence must be sent.
55h 78h 33h;

55h is the command needed to write to status byte zero.

78h data for byte zero,

Bit 7 set: don't care bit.

Bit 6 set: FAIL signal is high, software will clear it if unit fails

Bit 5 set: OTWarning signal is high, software will clear it if unit is close to 75 degrees.

Bit 4 set: Software has priority to enable/disable unit.

Bit 3 set: SWInhibit is high

Bit 2 low: SWEnable is low.

33h Value to achieve a sum of zero.

5. Firmware release date – 44H

Response BYTE #	Data Type	Meaning
0	Completion Code – 44H	Echo of the command
1-20	Character String	Date
21	Zero Checksum	Value required to make the sum of bytes 0 to 20 add to a multiple of 256 (decimal).

6. Hardware Address – 45H

Response BYTE #	Data Type	Meaning
0	Completion Code – 45H	Echo of the command
1	U Character	I2C Hardware Address
2	Zero Checksum	Value required to make the sum of bytes 0 and 1 add to a multiple of 256 (decimal).

Output Configurations

Up to 800 Watts Power (refer to Notes Below)

Standard Output Configuration *See Note 1				+12V Heavy Configuration **See Note 2 ***See Note 3			+12V Only per SOSA™ **See Note 2 ***See Note 3		
Pin Number	Designation (Power Form)	Volts	Amps	Designation (Power Form)	Volts	Amps	Designation (Power Form)	Volts	Amps
P6	VS1 (PO1)	+12Vdc	40	VS1 (PO1)	+12Vdc	65	VS1 (PO1)	+12Vdc	65
LP2	VS2 (PO2)	+3.3Vdc	20	VS2 (PO2)	+3.3Vdc	20	+3.3V_Aux	+3.3Vdc	20
P3	VS3 (PO3)	+5Vdc	40	VS1 (PO1)	+12Vdc	65	VS1 (PO1)	+12Vdc	65
B3	+12V_Aux	+12Vdc	1	+12V_Aux	+12Vdc	1			
C6	-12V_Aux	-12Vdc	1	-12V_Aux	-12Vdc	1			
A4,B4,C4,D4	+3.3V_Aux	+3.3Vdc	4	+3.3V_Aux	+3.3Vdc	4			

* Note 1 Total Power limited to 750W at 85°C

**Note 2 Total of 65A capability from PO1 combined, 800 Watts Max

***Note 3 Total power limited to 800W at 85°C / 80 Amps max on Power Return lines, connector limited

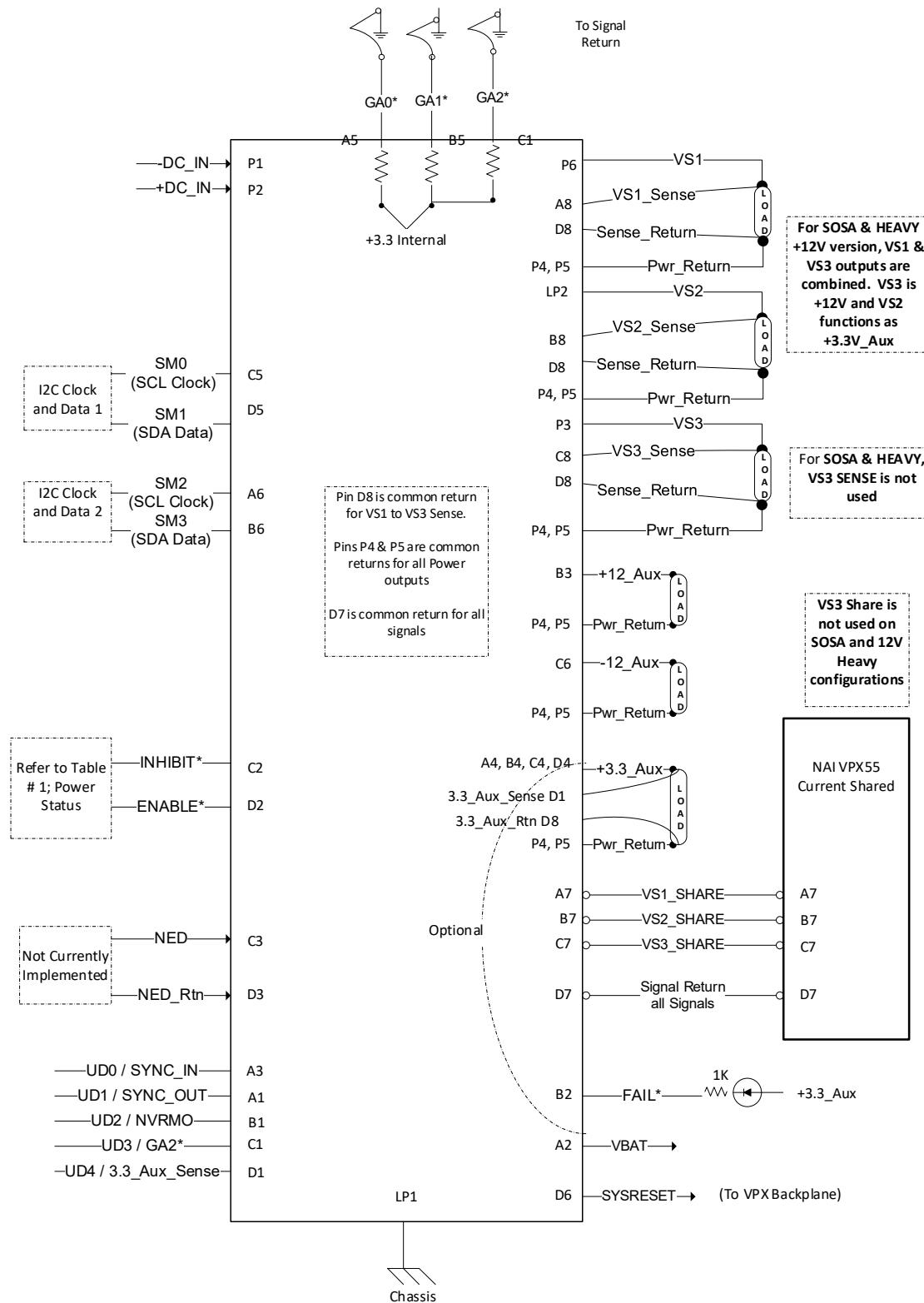
Connector Specifications

Unit	Backplane
P0: TE Connectivity p/n 2314578-2	J0: 2 TE Connectivity p/n 2309390-1

Pinout Designations (P0)

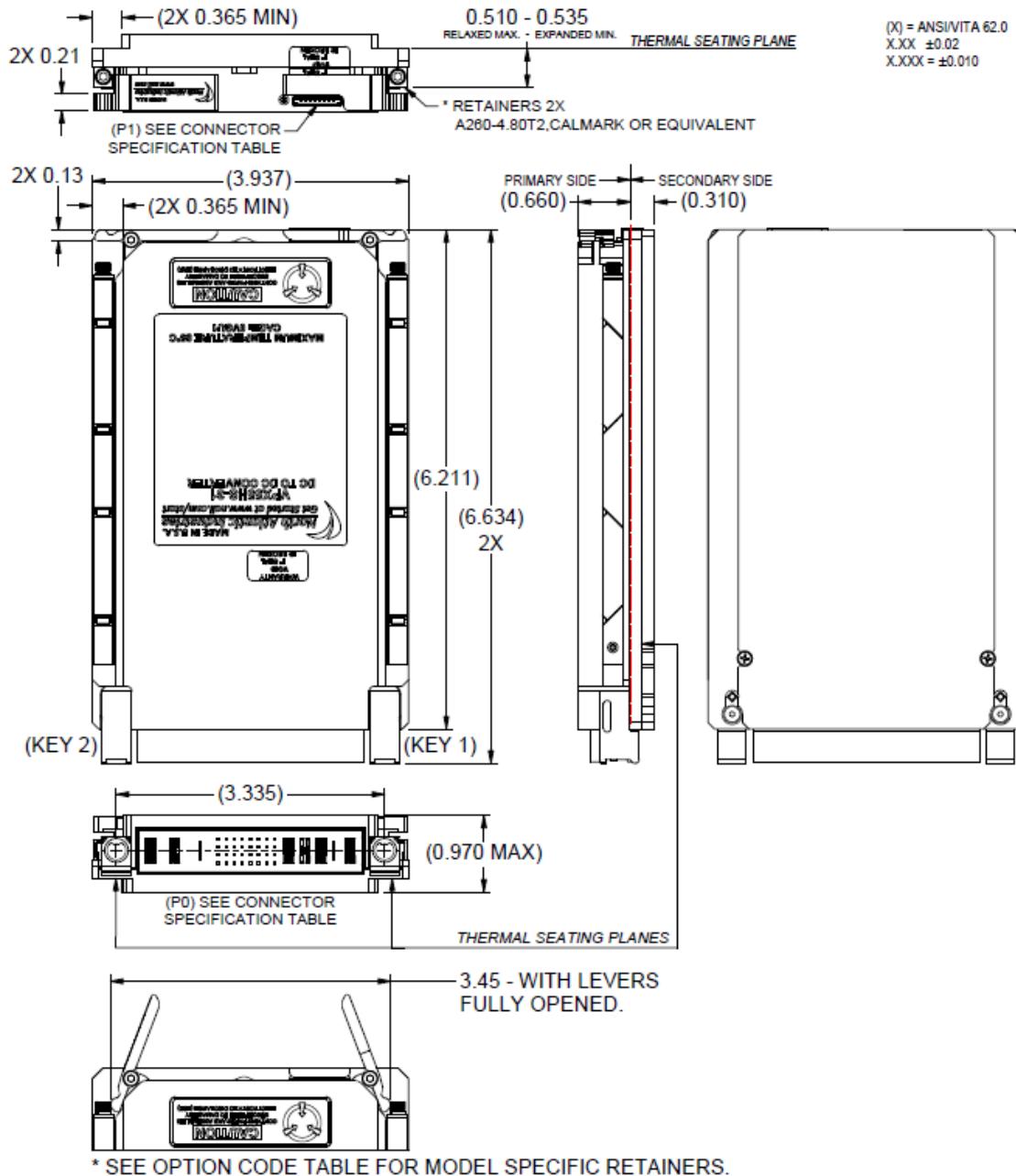
				CONNECTOR PIN OUT							
PIN #	RATED CURRENT (A)	Pin Name	Standard Configuration	12V Only SOSA™ Configuration	12V Heavy Configuration	PIN #	RATED CURRENT (A)	Pin Name	Standard Configuration	12V Only SOSA™ Configuration	12V Heavy Configuration
P1	40A	-DC_IN/ACN	-DC_IN/ACN	-DC_IN/ACN	-DC_IN/ACN	B5	<1A	GA1*	GA1*	GA1*	GA1*
P2	40A	+DC_IN/ACL	+DC_IN/ACL	+DC_IN/ACL	+DC_IN/ACL	C5	<1A	SM0	SM0	SM0	SM0
LP1	20A	CHASSIS	CHASSIS	CHASSIS	CHASSIS	D5	<1A	SM1	SM1	SM1	SM1
A1	<1A	UD1	SYNC_OUT (UD1)	SYNC_OUT (UD1)	SYNC_OUT (UD1)	A6	<1A	SM2	SM2	SM2	SM2
B1	<1A	UD2	NVMRO (UD2)	NVMRO (UD2)	NVMRO (UD2)	B6	<1A	SM3	SM3	SM3	SM3
C1	<1A	UD3	GA2* (UD3)	GA2* (UD3)	GA2* (UD3)	C6	<1.5A	-12V_AUX	-12V_AUX	Reserved	-12V_AUX
D1	<1A	UD4	3.3V_AUX_SENSE (UD4)	UD4	3.3V_AUX_SENSE (UD4)	D6	<1A	SYSRESET*	SYSRESET*	SYSRESET*	SYSRESET*
A2	<1A	VBAT	VBAT	VBAT	VBAT	A7	<1A	SHARE_1	SHARE_1	SHARE_1	SHARE_1
B2	<1A	FAIL*	FAIL*	FAIL*	FAIL*	B7	<1A	SHARE_2	SHARE_2	SHARE_2	SHARE_2
C2	<1A	INHIBIT*	INHIBIT*	INHIBIT*	INHIBIT*	C7	<1A	SHARE_3	SHARE_3	N/U	N/U
D2	<1A	ENABLE*	ENABLE*	ENABLE*	ENABLE*	D7	<1A	SIGNAL_RETURN	SIGNAL RETURN	SIGNAL RETURN	SIGNAL RETURN
A3	<1A	UD0	SYNC_IN (UD0)	SYNC_IN (UD0)	SYNC_IN (UD0)	A8	<1A	PO1_SENSE	SENSE, +12VDC	SENSE, +12VDC	SENSE, +12VDC
B3	<1.5A	+12V_AUX	+12V_AUX	Reserved	+12V_AUX	B8	<1A	PO2_SENSE	SENSE, +3.3VDC	SENSE, 3.3V_AUX	SENSE, +3.3VDC
C3	<1A	N/U	N/U	N/U	N/U	C8	<1A	PO3_SENSE	SENSE, +5VDC	N/U	N/U
D3	<1A	N/U	N/U	N/U	N/U	D8	<1A	SENSE_RETURN	SENSE RETURN	SENSE RETURN	SENSE RETURN
A4	<1.5A	3.3V_AUX	3.3V_AUX	Reserved	3.3V_AUX	P3	40A	PO3	+5VDC (Vs3)	+12VDC (Vs1)	+12VDC (Vs1)
B4	<1.5A	3.3V_AUX	3.3V_AUX	Reserved	3.3V_AUX	P4	40A	POWER_RETURN	POWER RETURN	POWER RETURN	POWER RETURN
C4	<1.5A	3.3V_AUX	3.3V_AUX	Reserved	3.3V_AUX	P5	40A	POWER_RETURN	POWER RETURN	POWER RETURN	POWER RETURN
D4	<1.5A	3.3V_AUX	3.3V_AUX	Reserved	3.3V_AUX	LP2	20A	PO2	+3.3VDC (Vs2)	3.3V_AUX	+3.3VDC (Vs2)
A5	<1A	GA0*	GA0*	GA0*	GA0*	P6	40A	PO1	+12VDC (Vs1)	+12VDC (Vs1)	+12VDC (Vs1)

VPX55HS-3 Connections



Mechanical Layout

MECHANICAL LAYOUT VPX55HS-31 STANDARD VITA 62.0 PLUG-IN MODULE



Ordering Information

<u>VPX55HS- Power</u>	<u>Form / Power</u>	<u>Pitch</u>	<u>Reserved</u>	<u>Battery</u>	<u>Current Share</u>	<u>Alignment Key 1 Voltage Input</u>	<u>Alignment Key 2 Voltage Outputs</u>	<u>- Opt Set</u>
								<p>Refer to Option Code Table</p> <p>Key Position / Outputs A = 0° (Standard Outputs) B = 135° (12V Only) C = 180° (12V Heavy)</p> <p>Key Position / Input Value A = 0° (+28Vdc)</p> <p>A = Not Installed B = Installed</p> <p>A = No Internal Battery B = Connected Internally to +3.3v Aux</p> <p>A = None</p> <p>1 = 1.0"</p> <p>3 = 3U</p>

Series 55HS = VPX SOSA Aligned

Example Part Number:
VPX55HS-31AABAA-00 = 3U VPX DC/DC Converter, 1.0" pitch, No Battery, Current Share on VS1 to VS3, +28Vdc Input, 800 Watts Output Power

Refer to option code table for description of option codes

Option Code Table

Code	Description
00	Standard unit, no additional options
01	SYS_RESET signal asserted under all conditions when any of the voltages are not above minimum operating levels as specified in VITA 46.0 section 4.8.12.4. SYS_RESET* can be de-asserted 300 +/- 25ms after all output power supply rails are above minimum operating levels as specified in VITA 46.0 section 4.8.12.4.
02	This option applies for VPX55HS-31ABAAA-02 only. Board to mezzanine connectors shall be specified to contain 30µ gold plating. Board to mezzanine connectors to be bonded on each end, Fail and Sysreset signals shall be delayed by a programmed value of 2.5 mS when input power is interrupted. Input power threshold shall be 14.5V maximum. Outputs shall not be commanded off for at least 2.5 mS due to input power disturbance.
03	SOSA outputs. Full load defined as VS1 - 12V @ 25Amps and 3.3 Aux - 3.3V at 15Amps. Current limit to engage on VS1 at 27 to 31 Amps and on 3.3 Aux at 16 to 20Amps.