VPX57HS-31 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 VPX57HS-31 is an up to 800 Watt DC/DC Converter that plugs directly into a standard 3U VPX chassis with a VITA 62 1.0" power supply slot. This off-the-shelf solution for VITA 46.0 and VITA 65 systems is compatible with VPX specifications; supports all VITA standard I/O, signals, and features; and conforms to the VITA 62 mechanical and electrical requirements for modular power supplies. Contains Integrated IPMC, with Dual Bus IPMB-A, IPMB-B,

The VPX57HS-31 supply is conduction-cooled through the card edge/wedgelock. It accepts +270 VDC input voltage and provides up to six outputs per VITA 62 with an option for the SOSA™ (+12 Volt Only) configuration. (Refer to output power table). It supports a variety of standard features including continuous Background Built-In-Test (BIT), I^2C communication, remote error sensing, current share and protection against transients, overvoltage, overcurrent, over-temperature and short-circuits. With its intelligent design, the VPX55HS-3 also has the flexibility to address special needs.

Features

- Ideal for rugged 3U VPX power applications
- Standard VPX-compatible connectors and I/O per VITA 62
- Compatible with System Management Bus per VITA 46.11
- IPMC Dual Bus IPMB-A & IPMB-B
- Off-the-shelf solution for VITA 46.0 and VITA 65 systems
- Supports all VITA standard I/O, signals, and features
- Accepts +270 VDC input
- Reverse Polarity Protection
- Provides up to six outputs and I/O at up to 800 Watts
- **SOSA™** Aligned output configuration
- Continuous Background Built-in-Test (BIT)
- Current share
- Environmentals per Mil-Std-810H and VITA 47.1 ECC4SL1
- Input transient protection per MIL-STD-704F
- Integrated EMI filtering per MIL-STD-461F

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

Electrical Specifications

DC Input Characteristics	
Input	+270 VDC (+220 VDC to +320 VDC range)
Reverse Polarity Protection	Prevents damage from reversal of input polarity
Input Fault Containment	
EMI/RFI	Designed to meet the requirements of MIL-STD-461F; For full system level compliance, minimal additional system filtering required
Input Transient Protection	Per MIL-STD-704F Meets 704F Normal, Abnormal and Emergency Steady State. Rides through 704F Normal low voltage transients. Will not be damaged and will automatically restart from 704F abnormal transients and power interruptions.
Output Power	800W max @ 85°C (see Output Power Table, page 3)
Output Voltage	VPX outputs standard (see Output Power Table)
Efficiency	92% typical for SOSA +12V only; 90% typical for other output configurations. Measured @ full load
Switching Frequency	150kHZ, 300kHZ
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; 2% for +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
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)
Short Circuit Protection	Protected for continuous short circuit with automatic recovery
Current Limiting	All outputs 125% to 130%
Over Voltage Protection	Automatic electronic shutdown if outputs exceed 125% ±10%
Remote Error Sensing	Sensing pins compensate for up to 0.5 V drop on VS1 to VS3 outputs
Isolation Voltage	1,000 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.

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

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 Hammer shock per MIL-S 901
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 70,000 Feet Optional with Enhanced High Voltage Connector; Refer to Option Code Table
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
Dimensions	See Mechanical Layout
Enclosure	Aluminum housing to aluminum baseplate
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 Part Numbers table and refer to option code table
Weight	1.6 lbs. Typical

All specifications are subject to change without notice.

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

Signal Types

Signal	Description
ENABLE*	Turns off all of the output voltages, including 3.3 V_AUX, when signal is High. ENABLE* is pulled Low by using a mechanical switch which connects it to SIGNAL_RETURN. A Logic output can also be used to drive the ENABLE*. Opening the switch would turn off all the outputs; closing the switch or applying the Logic output would enable the outputs to come on depending on the state of INHIBIT*. An input of <0.8 VDC is regarded as a Low and an input of >2.0 VDC is regarded as a High. A no-connect is also regarded as a High. Along with INHIBIT*, this signal determines the output power status of the VPX57HS-31 (see Power Status Table below).
INHIBIT*	Turns off all the output voltages. In most implementations, the signal is expected to leave 3.3 V_AUX on. Pulling INHIBIT* Low turns off VS1, VS2, VS3, and ±12 VDC_Aux outputs. An input of <0.8 VDC is regarded as a Low and an input of >2.0 VDC is regarded as a High. A no-connect is also regarded as a High. Along with ENABLE*, this signal determines the output power status of the VPX57HS-31 (see Power Status Table below).
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 spec. 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.
Over Temp Warn	Can be read through I^2C; refer to I^2C programming section, Status Register Bit 5.
Over Temp Shut Down	The PS shall self-shutdown or self-regulate to prevent damage if the temperature is exceeded.
Geographical Addressing	As defined in VITA 46
Current Share	Allows multiple power supplies to share system load for VS1 to VS3 outputs. Connection is made per designated pins for each output. **Up to 90% of the cumulative maximum rated load for each output**
Active Output Fault Containment	
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

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

I²C Communication

Supports VITA 46.11 Tier 2 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.

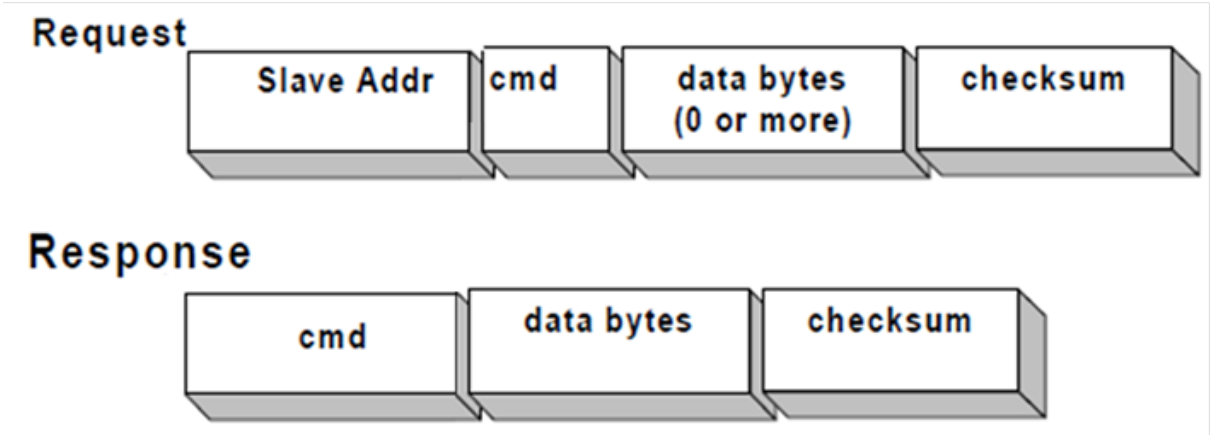
Pin			I2C Address
*GA2	*GA1	*GA0	
Pin C1	Pin B5	Pin A5	
High	High	High	0x20
High	High	Gnd	0x21
High	Gnd	High	0x22
High	Gnd	Gnd	0x23
Gnd	High	High	0x24
Gnd	High	Gnd	0x25
Gnd	Gnd	High	0x26
Gnd	Gnd	Gnd	0x27

3. **Supports Legacy Slave Mode Commands via P1 connector (Molex 5040500891) only. Recommend mating cable Molex 151320805**

P1.4	P1.5	P1.8
Clock	Data	GND

Data Read - Get Sensor Reading results

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com



Request Data	1	cmd	See table
	2 to n-1	Data If Required by cmd or Zero ChkSum* if no Data required.	
	n	Zero ChkSum* if Data was required by cmd	
Response Data	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.

3.1Commands

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*

3.2 Composite Sensor Read Command – 21H

Response BYTE #	Data Type	Meaning
0	Completion Code – 21h	Echo of the command
1	Status Register 0, MS Bit	Refer to table below
2-3	Signed Integer, MSB First	Temperature as follows °C = (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

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

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	Current on VS1, 30A = 16384
18-19	U Integer, MSB First	Current on VS2, 20A = 16384
20-21	U Integer, MSB First	Current on VS3, 40A = 16384
22-23	U Integer, MSB First	Current on 3.3Aux, 4A = 16384
24-25	U Integer, MSB First	Current on +12VAux, 1A = 16384
26-27	U Integer, MSB First	Absolute Current on -12VAux, 1A = 16384
28-29	U Integer, MSB First	Internal Reference, 2.5V = 16384
30-31		Reserved
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	U Integer, MSB First	Hardware Rev
60-61	U Integer, MSB First	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.

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

3.3 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

3.4 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).

3.5 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).

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

Output Configurations

Up to 800 Watt 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	1.5	+12V_Aux	+12Vdc	1.5			
C6	-12V_Aux	-12Vdc	1.5	-12V_Aux	-12Vdc	1.5			
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 Part Numbers

Unit Option Code Dash #'s	Unit Connector	Backplane Connector
00	2314578-2; TE Connectivity	2309390-1; TE Connectivity
01	2313442-1; TE Connectivity U.S. Patent No. 11,276,948 Enhanced High Voltage	2313441-1; TE Connectivity U.S. Patent No. 11,276,948 Enhanced Enhanced High Voltage

Pinout Designations (P0)

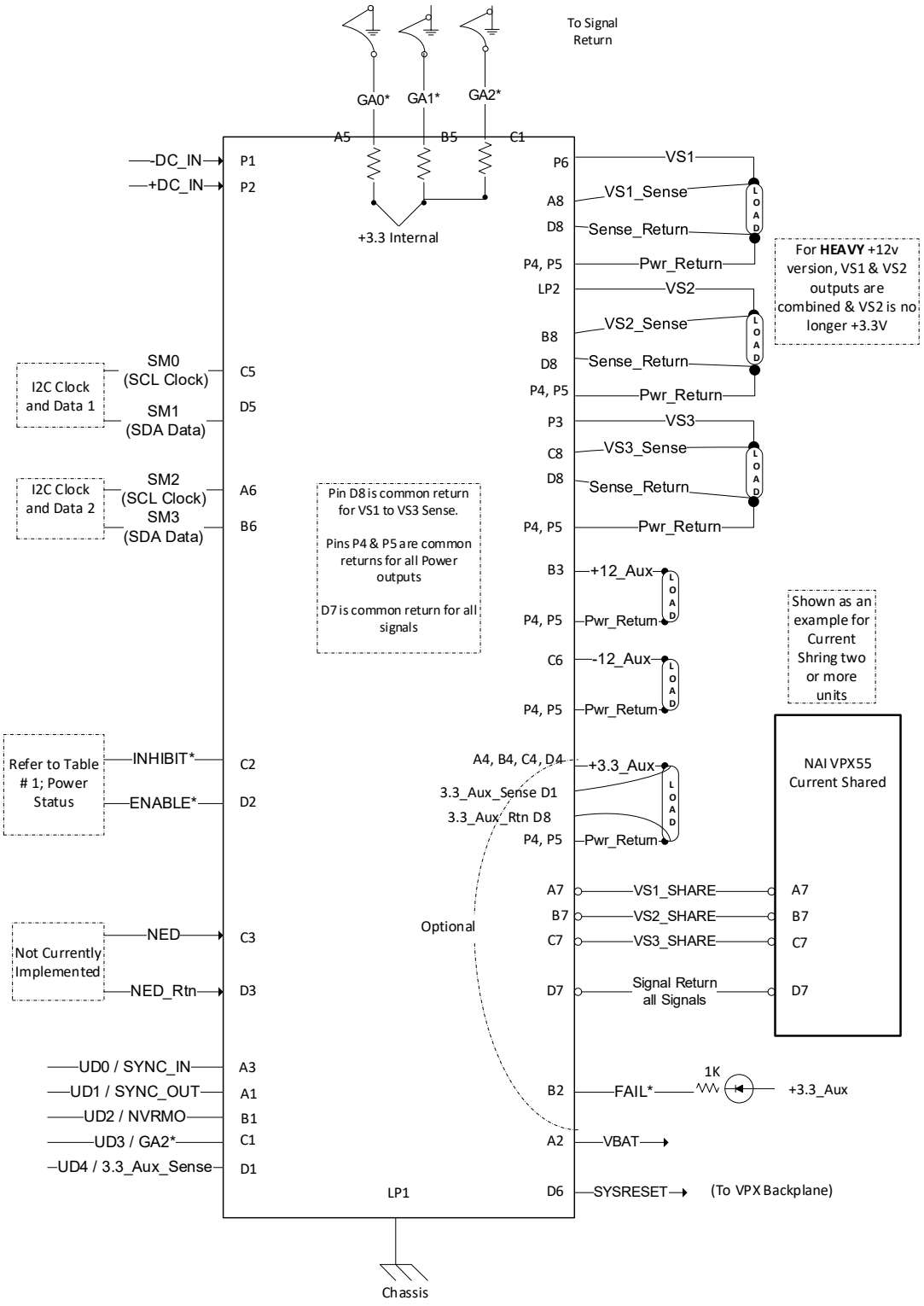
CONNECTOR PIN OUT					
PIN NUMBER	RATED CURRENT	Pin Name	Standard Configuration	12V Only Configuration	12V Heavy Configuration
P1	40A	-DC_IN/ACN	-DC_IN/ACN	-DC_IN/ACN	-DC_IN/ACN
P2	40A	+DC_IN/ACL	+DC_IN/ACL	+DC_IN/ACL	+DC_IN/ACL
LP1	20A	CHASSIS	CHASSIS	CHASSIS	CHASSIS
A1	<1A	UD1	SYNC_OUT (UD1)	SYNC_OUT (UD1)	SYNC_OUT (UD1)
B1	<1A	UD2	NVMRO (UD2)	NVMRO (UD2)	NVMRO (UD2)
C1	<1A	UD3	GA2* (UD3)	GA2* (UD3)	GA2* (UD3)
D1	<1A	UD4	3.3V_AUX_SENSE (UD4)	UD4	3.3V_AUX_SENSE (UD4)

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

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

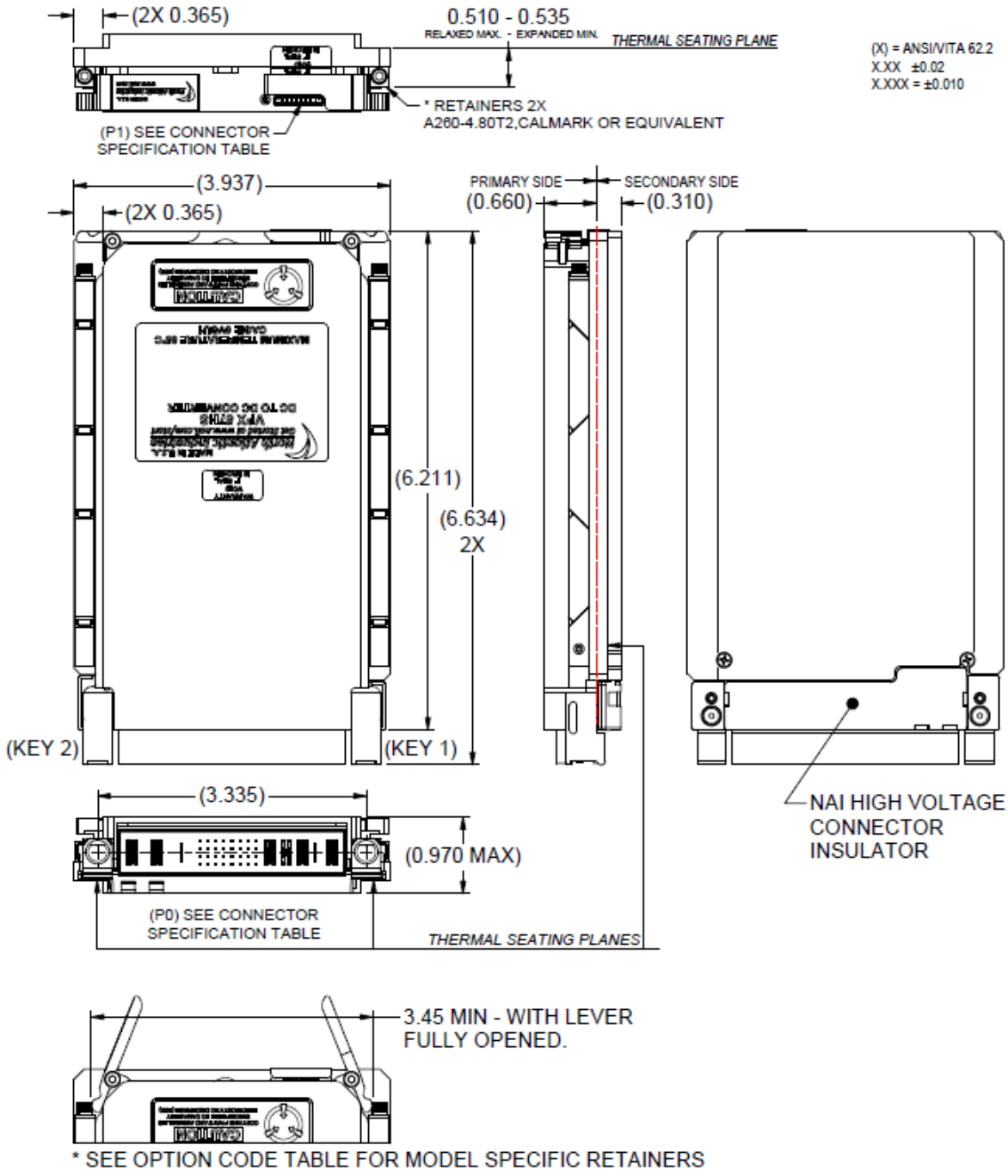
116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

VPX57HS-31 Connections (Shown for Standard Output Configuration)



116 Wilbur Place, Bohemia, NY 11716
Tel: 631.567.1100
www.naii.com

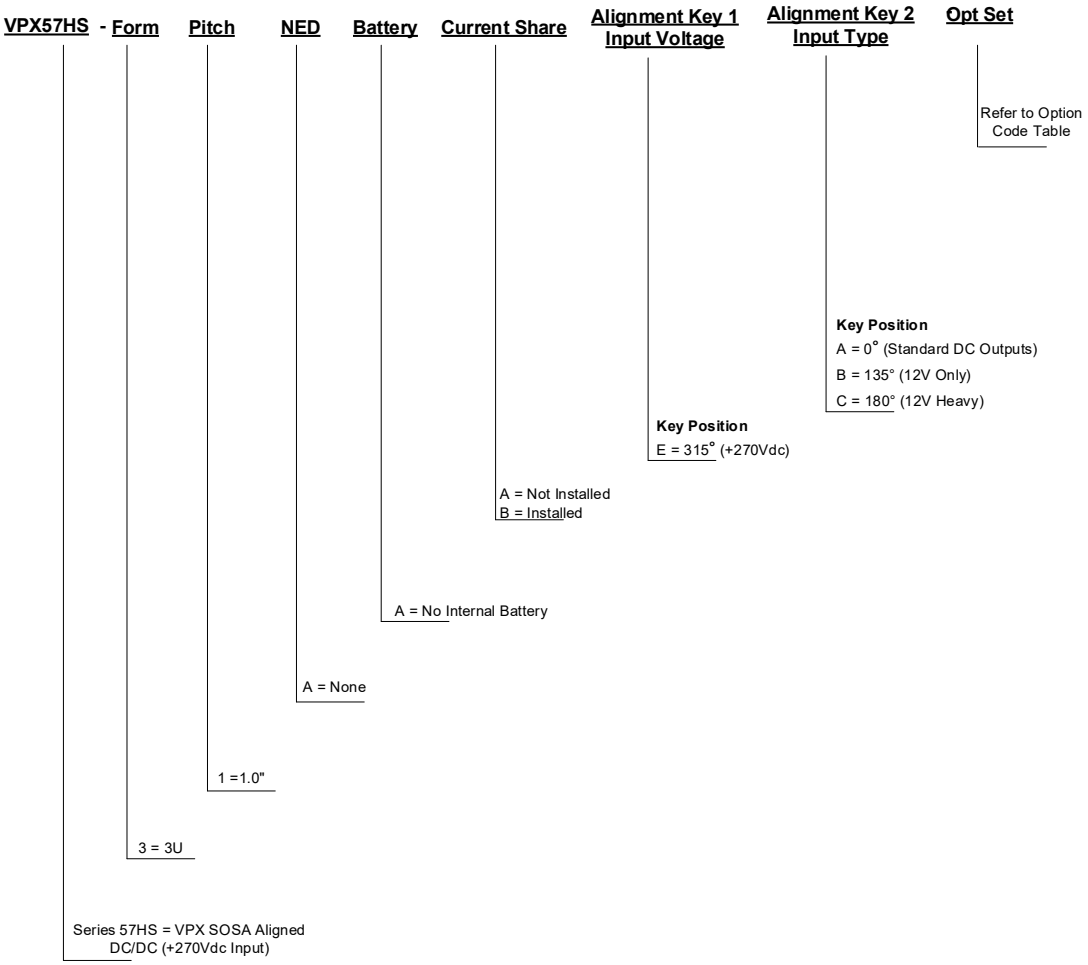
MECHANICAL LAYOUT FOR VPX57HS-31
NAI HIGH VOLTAGE VITA 62.2 PLUG-IN MODULE



* SEE OPTION CODE TABLE FOR MODEL SPECIFIC RETAINERS

116 Wilbur Place, Bohemia, NY 11716
Tel: 631.567.1100
www.naii.com

Ordering Information



Example Part Number:
VPX57HS-31AABEA-00; 3U VPX DC/DC Power Supply, 1.0" pitch, current share on VS1, VS2 and VS3, +270Vdc input, Standard Outputs, no additional options

Refer to option code table for description of option codes

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com

Option Code Table

Code	Description	Connector Type
00	Standard unit, no additional options	Standard VITA 62
01	Standard unit with Enhanced, High Voltage VITA 62.2 Connector U.S. Patent No. 11,276,948	VITA 62.2 U.S. Patent No. 11,276,948
02	Temperature screening performed down to -55ºC	-
03	▪ Standard Cover with Connector Cutouts and Standard Wedgelocks ▪ Faster output Ramp Rates as follows: ▪ +3.3Vdc_Aux ≤ 4 milliseconds ▪ All other outputs ≤ 10 milliseconds ▪ Stainless-Steel Guides ▪ Will operate down to 160Vdc ▪ Typical efficiency > 87%	Standard VITA 62
04	▪ RESERVED	VITA 62.2 U.S. Patent No. 11,276,948

***ENHANCED VITA 62 Connector utilizes enhanced creepage and clearance features used in high voltage, high altitude applications**

116 Wilbur Place, Bohemia, NY 11716 Tel: 631.567.1100 www.naii.com