VITA 62.1 3-Phase Front End

VIT3P28x3U750C1

VITA 62.1 AC-DC Front End

Features & Benefits

- OpenVPX™ – VITA 62.1
- 100 – 130V_{RMS} line – neutral
- 750W output power
- 3U OpenVPX
- Conduction cooled
- 400Hz nominal operating frequency
- 0.9 power factor nominal
- IPC 610 class 3
- Enable, inhibit, system reset and power fail controls
- Military standard compliance: [a]
  - MIL-STD-704F
  - MIL-STD-461G
  - MIL-STD-810G

Typical Applications

- VPX power modules
- Avionics
- Shipborne electronics

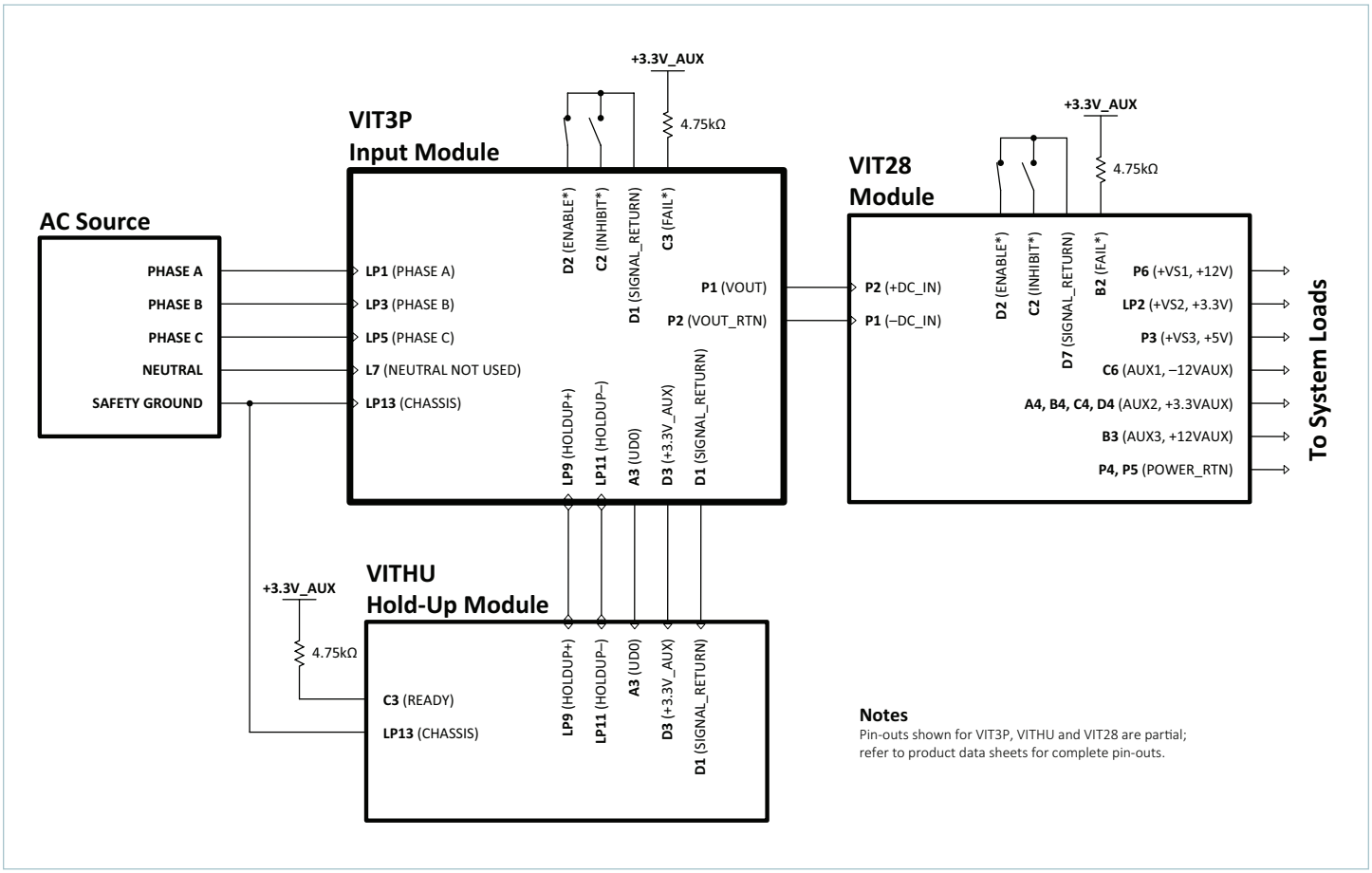
Product Description

The Vicor VITA 62.1 3-phase front end is a COTs front end that is designed for 3U OpenVPX systems. The module utilizes Vicor proprietary technology to enable high efficiency and power density for this highly rugged, conduction-cooled model.

It is intended to be used with Vicor 28V input VITA 62 Power Supply and optional Hold Up card to realize a complete 3-phase input system compliant to VITA 62.1.

[a] See detailed specifications

Typical Application



Example system configuration: VIT3P28x3U750C1 AC front end with VITHU hold-up module powering a VIT28 module

Connector Pin Configuration

ROWS	POWER													SIGNAL			POWER	
	LP1	LP2	**LP3**	LP4	**LP5**	LP6	**LP7**	LP8	**LP9**	LP10	**LP11**	LP12	**LP13**	1	2	3	**P1**	**P2**
D	LM		LM		LM		LM		LM		LM		LM	J	J	J	TM	TM
C														K	K	K		
B														N	N	N		
A														S	S	S		

3-Phase Input Module Connector

Note: See mechanical drawing on page 10 for connector information.

Connector Pin Descriptions

Pin	Rated Current (A)	Pin Name	Description
LP1	20	PHASE A	3-phase 115V/400Hz I.A.W. MIL-STD-704F
LP3	20	PHASE B	
LP5	20	PHASE C	
LP7	20	NEUTRAL	
LP9	20	+HOLDUP	+ Output / Input to / from LP9 of hold-up module [a]
LP11	20	–HOLDUP	– Output / Input to / from LP11 hold-up module [a]
LP13	20	CHASSIS	Chassis (Safety Ground)
A1	< 1	GAO*	Factory use only
A2	< 1	GA1*	Factory use only
A3	< 1	UD0	To A3 of hold-up modulee [a] The current draw by the hold-up module will be < 10mA.
B1	< 1	SM0	Factory use only
B2	< 1	SM1	Factory use only
B3	< 1.5	SM2	Factory use only
C1	< 1	SM3	Factory use only
C2	< 1	INHIBIT*	Connect to signal return to disable the +28V output
C3	< 1	FAIL*	External 4.7kΩ pull-up is required. High = Okay Low = Fault
D1	< 1	SIGNAL_RETURN	Return for +3.3V_AUX, ENABLE*, INHIBIT, and FAIL*
D2	< 1	ENABLE*	Connect to signal return to enable the +3.3V_AUX & the +28V outputs
D3	< 1	+3.3V_AUX	The +3.3V_AUX output is isolated from +28V ouput
P1	40	VOUT	+28V output power terminals optimized to provide input power to a Vicor 28V Input VITA 62.0 3U Power Supply
P2	40	VOUT RTN	

[a] If the system configuration does not include a hold-up module, the LP9, LP11, and A3 connection are not required.

Part Ordering Information

Part Number	Product Grade	Conformal Coating
VIT3P28**H**3U750**C**1	**H** = –40 to 85°C	**C** = Coated

Absolute Maximum Ratings

The absolute maximum ratings below are stress ratings only. Operation at or beyond these maximum ratings can cause permanent damage to the device.

Parameter	Comments	Min	Max	Unit
Output Power	VOUT terminal		750	W
	+3.3V_AUX terminal		1	W
Input Voltage, Continuous	3-phase AC, line to neutral		160	V_{RMS}
Input Voltage, Transient	Meets MIL-STD-704F		180	V_{RMS}
Operating Temperature	Measured at card edge	–55	85	°C
Storage Temperature		–55	125	°C
Isolation Voltage	INPUT to OUTPUT		1000	V
	INPUT to CHASSIS		1000	
	OUTPUT to CHASSIS		500	
	VOUT to +3.3V_AUX		500	

Electrical Characteristics

Unless otherwise specified all data refers to nominal line, nominal load at room temperature.

Attribute	Symbol	Conditions / Notes	Min	Typ	Max	Unit
Input Characteristics – Normal Operation						
Operating Input Voltage	V_{IN}	IAW MIL-STD-704F Normal The table values are the line-to-neutral voltages	100		130	V_{RMS}
Overvoltage Transients		IAW MIL-STD-704F Figure 3			180	V_{RMS}
Frequency	F_{SW}	Consult factory before using the input module for a 50Hz or 60Hz application.	360	400	440	Hz
Power Factor	PF	50% load	0.885	0.9		-
		75% load	0.895	0.91		
		100% load	0.9	0.92		
Efficiency	$\eta_{50\%}$	50% load	89.5	91		%
	$\eta_{100\%}$	100% load	90	91		
Inrush	I_{IR}	Without hold-up module		13	20	A
		With hold-up module		17	25	
Output Characteristics – Normal Operation						
Main Output (+28V)	V_{OUT}	This isolated output provides the input power to a Vicor 28V VITA 62.0 3U Power Supply. The Vicor 28V VITA 62.0 3U Power Supply outputs can be loaded to allowable condition as defined within the Vicor 28V VITA 62.0 3U Power Supply data sheet.	27	29	31	V_{DC}
Auxiliary Output (+3.3V)	V_{AUX}	The +3.3V_AUX output is reference signal return, and the +3.3V_AUX is isolated from both the input and from 28V output. The user can draw up to 1W of power from the +3.3V_AUX output	3.2	3.3	3.4	V_{DC}
Hold-Up Output	V_{HU}	This user shall not draw any power from this output. If the system has a hold-up module, this output interfaces with hold-up module. During normal operation, this output charges hold-up capacitors inside of the Hold-up Module. If there is power interruption or there is an undervoltage condition, the hold-up voltage provides the input power to the 3P Input Module.		270		V_{DC}

Application Characteristics

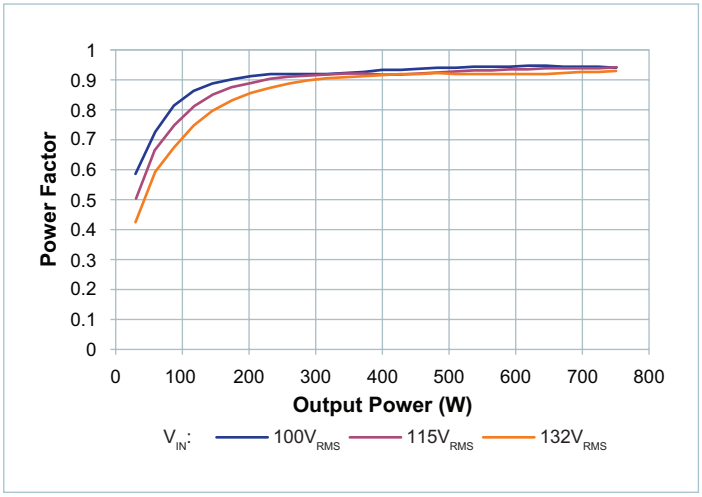


Figure 1 — *Power factor vs. input voltage and output power*

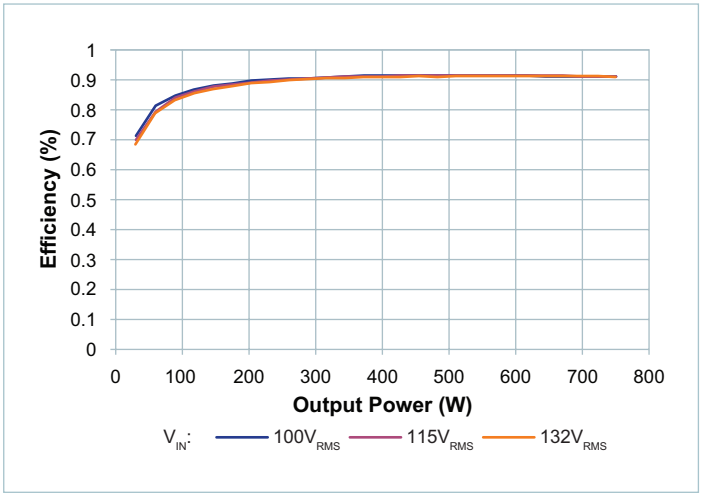


Figure 2 — *Efficiency vs. input voltage and output power*

Conducted Emissions Testing

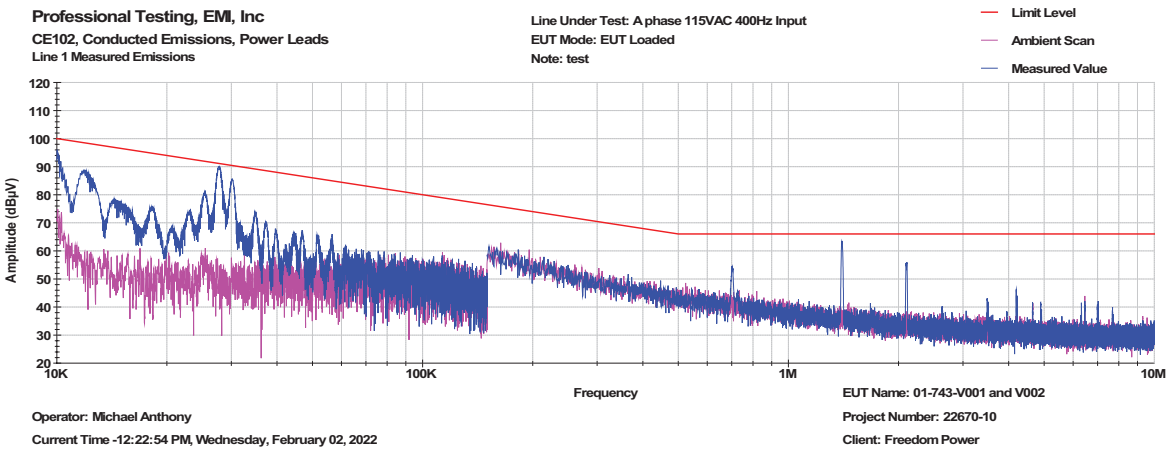


Figure 3 — *Conducted emissions of 115V_{AC} input at full load, line 1*

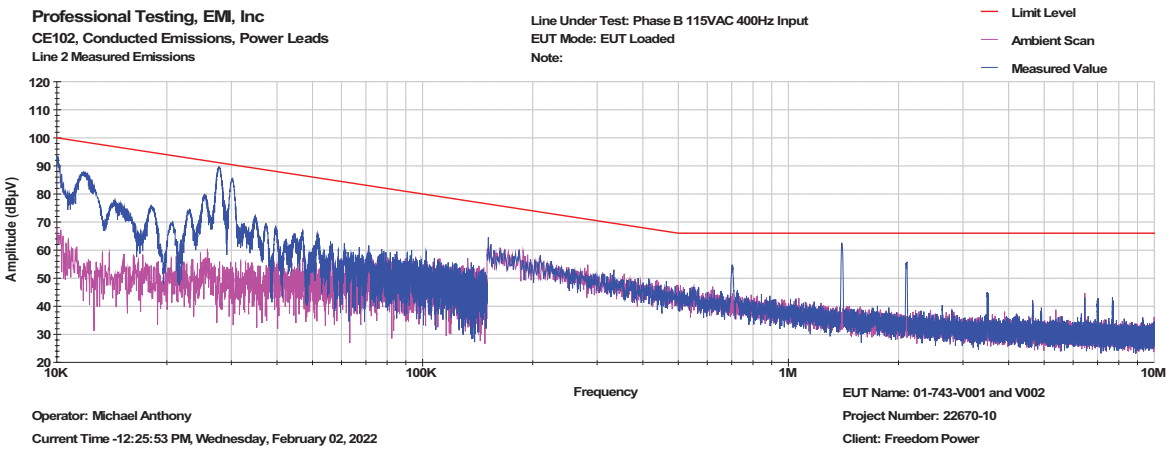


Figure 4 — *Conducted emissions of 115V_{AC} input at full load, line 2*

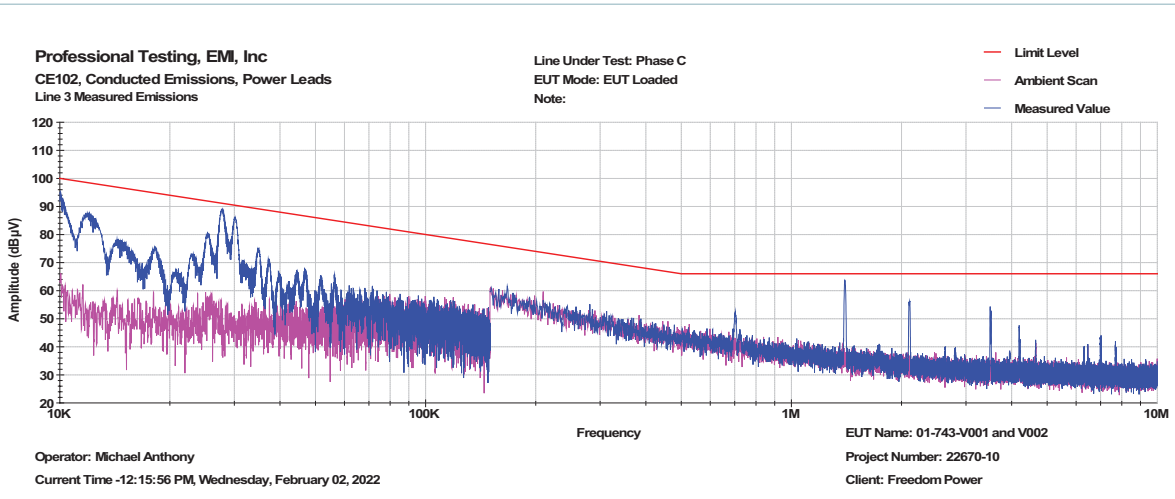


Figure 5 — *Conducted emissions of 115V_{AC} input at full load, line 3*

General Characteristics

Attribute	Symbol	Conditions / Notes	Min	Typ	Max	Unit
Mechanical						
Length	L	Per VITA62		6.634		in
Width	W	Per VITA62		3.937		in
Height	H	Per VITA62		0.951		in
Weight	W			683 [24.1]		g [oz]
Wedge-Lock Torque		Manufacturer's recommended value		7		in·lbs
Thermal						
Operating Temperature	$T_{WEDGE-LOCKS}$	H-Grade	–40		85	°C
Power Dissipation at Maximum Load		PHASE side of connector, measured at rail			33	W
		VOUT side of connector, measured at rail			49	
Assembly						
Storage Temperature			–55		125	°C
ESD Withstand	V_{ESD}	Human Body Model			2000	V
Safety						
MTBF		MIL-HDBK-217Plus Parts Count - 25°C Ground Benign, Stationary, Indoors / Computer		900,946		Hrs
		Telcordia Issue 2 - Method I Case III; 25°C Ground Benign, Controlled		1,792,151		Hrs

Signal Pin Functions

ENABLE* & INHIBIT*

Enable and Inhibit pins express active low logic. Table 1 has the truth-table state of the power supply. A contact closure or a +3.3V logic signal can be used to control the ENABLE* or INHIBIT* pins. It is necessary to avoid the indeterminate output where 0.8 – 2.0V is applied to the ENABLE* or INHIBIT* pins.

FAIL* and LED

This signal line is open drain line that monitors the outputs.

If both outputs (VOUT and +3.3V_AUX) are ON and within tolerance, the line will be in the open drain state and the color of the LED will be Green.

If either output (VOUT and +3.3V_AUX) is OFF or out of tolerance, the line will be pulled low and the color of LED will be Red.

SIGNAL RETURN

SIGNAL RETURN is used as the reference for the +3.3V_AUX power and the signal pins (ENABLE*, INHIBIT*, and FAIL). If the user's backplane connects the SIGNAL RETURN and the VOUT RETURN lines together, the 3-Phase Front End module will still function correctly, but the 500V of isolation between the SIGNAL RETURN and the VOUT RETURN will be lost.

ENABLE* Pin	INHIBIT* Pin	+3.3V_AUX	VOUT, VOUT_RTN
High or floating	High or floating	OFF	OFF
Low	High or floating	ON	ON
High or floating	Low	OFF	OFF
Low	Low	ON	OFF

Table 1 — *Control lines referenced to SIGNAL_RETURN*

Standards Compliance

MIL-STD-461G		
CE102	Conducted emissions, power leads, 10kHz to 10MHz [b]	Passed
CS101	Conducted susceptibility, power leads, 30Hz – 150kHz)	Passed
CS114	Conducted susceptibility, bulk cable injection, 10kHz – 200 MHz	Passed
CS115	Conducted susceptibility, bulk cable injection, impulse excitation	Passed
CS116	Conducted susceptibility, damped sinusoidal transients, cables and power leads, 10kHz – 100MHz	Passed
CS118	ESD with 8kV for contact discharge and 15kV for air discharge	Passed
MIL-STD-704F per MIL-HDBK-704-3		
TAC102	Steady-state limits for voltage (including unbalance) and frequency [c]	Passed
TAC103	Voltage phase difference [c]	Passed
TAC104	Voltage modulation [c]	Passed
TAC106	Voltage distortion spectrum [c]	Passed
TAC107	Total voltage distortion [c]	Passed
TAC108	DC voltage component [c]	Passed
TAC109	Normal voltage transients [c]	Passed
TAC110	Normal frequency transients [c]	Passed
TAC201	Power interrupt [d]	Passed
TAC301	Abnormal steady-state limits for voltage and frequency [c]	Passed
TAC302	Abnormal voltage transients [e]	Passed
TAC303	Abnormal frequency transients [c]	Passed
TAC601	Power failure (three phase) [f]	Passed
TAC602	One- and two-phase power failures [g]	Passed
TAC603	Phase reversal (three phase) [c]	Passed

[b] CE102 compliance requires a few small filtering components to be installed on the user's backplane.

[c] These test methods are applicable for VITA 62.1 3-Phase Front End with or without the optional hold-up module installed without loss of performance.

[d] Performance criteria for TAC201 with and without the optional hold-up module.

- With the optional hold-up module installed: The EUT will operate without any loss of performance before, during and after the power interrupt.
- Without the optional hold-up module: The EUT will survive the TAC201 Power Interrupt without sustaining any damage, but the output the unit may shut down during the power interrupt.

[e] Performance criteria for TAC 302 with and without the optional hold-up module:
The EUT will operate without any loss of performance before, during and after the overvoltage transients, and the EUT may temporarily shut down for the undervoltage transients with a transient voltage level less than $85V_{RMS}$.

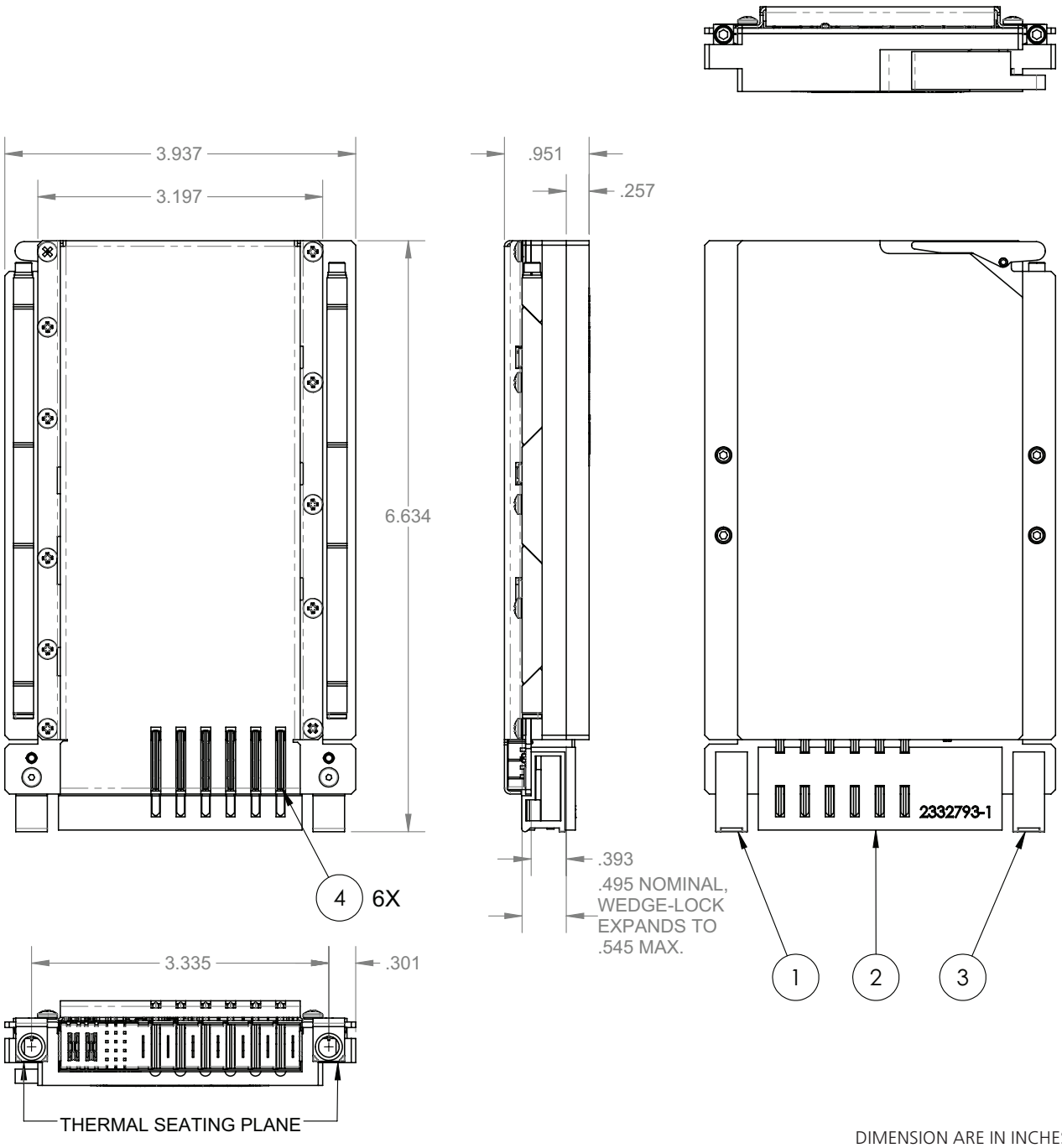
[f] Performance criteria for TAC 601 with and without the optional hold-up module:
The EUT will survive the TA601 power failure without sustaining any damage, but the output the unit may shut down during the power failure.

[g] Performance criteria for TAC 602 with and without the optional hold-up module:
The EUT will survive the TA602 power failure without sustaining any damage, but the output the unit may shut down during the power failure.

Standards Compliance (Cont.)

MIL-STD-810G		
Random Vibration	Method 514.6, Procedure I	Passed
	Vibration Class V3	
	The plug-in unit shall withstand vibration as defined below for 1 hour per axis:	
	5 – 100Hz PSD increasing at 3dB/octave	
	100 – 1000Hz PSD = $0.1g^2/Hz$	
	1000 – 2000Hz PSD decreasing at 6dB/octave	
Shock	Method 516.6, Procedure I	Passed
	Operational Shock Class OS2	
	The plug-in unit shall withstand exposure to either 40g, 11ms shock half-wave; or 40g, 11ms, terminal sawtooth shock pulses in all three axis.	
Altitude	Method 500.5, Procedure II	Passed
	Sea level to 60,000 feet	
Humidity	Method 507.5, Procedure II	Passed
	Five 48-hour cycles with exposures up to 95% relative humidity	
Fungus	Method 508.6	N/A Designed to meet by close similarity to another that was tested and verified to meet this item.
Operating Temperature	VITA 47 Section 4.1.2 class CC4	Passed
Temperature Cycling	MIL-STD-202 Method 107 per VITA 47 Section 4.3	Passed
ESD	Human Body Model, JEDEC JS-001-2012, Table 2B, Class 2, ±2000V minimum	Passed
	Charged Device Model, JESD22-C101-E, Class III ±500V minimum	Passed

Mechanical Drawing



Connector Components					
Item #	**Description**	**Notes**	**Manufacturer**	**Manufacturer Part Number**	**Quantity**
1	VITA46 90 DEG GUIDE SOCKET		TE Connectivity	1-1469492-3	1
2	VITA62.1 CONNECTOR PLUG	Mates TE Connectivity P/N 2332795-1	TE Connectivity	2332791-1 or 2332793-1	1
3	VITA46 270 DEG GUIDE SOCKET		TE Connectivity	1-1469492-7	1
4	MULTIBEAM 270V, RA FIN, VITA 62.1	Mates TE Connectivity P/N 2313444-1	TE Connectivity	2313445-1	6

Revision History

Revision	Date	Description	Page Number(s)
1.0	04/21/22	Initial release	n/a
1.1	06/23/22	Added detailed information to MIL-STD-810G temperature specifications	10

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