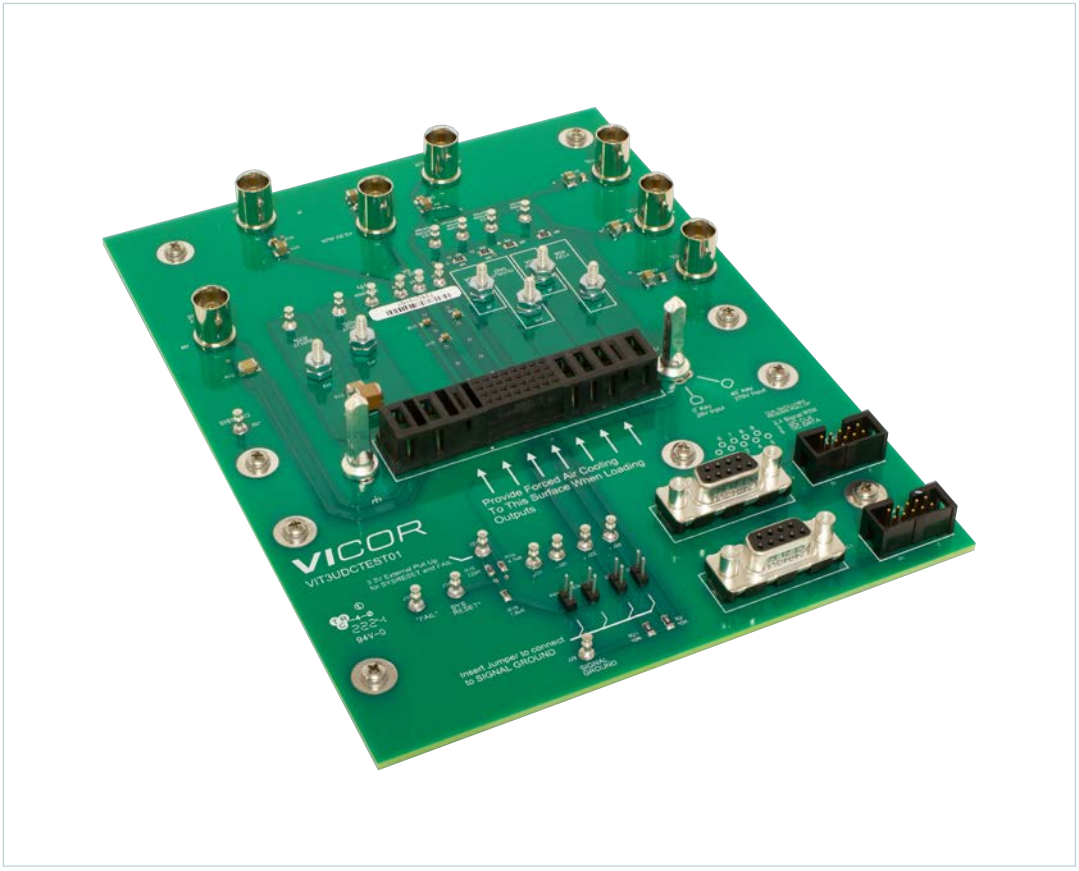
VITA62 3U Evaluation Board



Introduction

The VITA62 3U evaluation platform described in this document is primarily designed to be used with the following power supplies.

1. VIT028x3U600y000
2. VIT270wxx600yzzz
3. SOS028x3U800y000 (requires removal of guide pin KM1)

The focus of this document is to assist the user in using the evaluation platform with 3U form factor VITA62 and SOSA™-aligned power supplies.

It is important to remember that power supplies evaluated with this test platform have no means of cooling other than through natural convection. If power supplies are left powered on for extended periods of time, they will overheat. It is recommended to use forced-air cooling aimed at the heat sink of the power supply to provide active forced cooling when the unit is powered on.

IMPORTANT NOTICE:

Read the precautions below entirely BEFORE using the VITA62 3U Evaluation Board. Do not operate the evaluation board unless you have the appropriate safety precautions in place on your bench to guarantee safety.

The list below is not comprehensive and is not a substitute for common sense and good practice.

- The evaluation platform is capable of accepting both $270V_{DC}$ and $28V_{DC}$ power supplies. By default, the evaluation platform is assembled to accept 28V power supplies. In order to accept 270V supplies, the appropriate guide pin needs to be rotated to accept 270V supplies. It is not recommended to remove guide-pins to for ease of plugging either 28V or 270V power supplies into the board. Applying 270V power to a 28V power supply will cause permanent damage to the 28V power supply and can damage the evaluation board.
- During operation, the power devices and surrounding structures can be operated safely at high temperatures.
- Remove power and use caution when connecting and disconnecting test probes and interface lines to avoid inadvertent short circuits and contact with hot surfaces.
- When testing electronic products always use approved safety glasses. Follow good laboratory practice and procedures.
- Care should be taken to protect the user from accidental contact when under power.
- Care should be taken to avoid reversing polarities if connecting to the opposite (solder) side of the board.
- The product evaluation boards described in this document are designed for general laboratory evaluation and are not suitable for installation in end-user equipment.
- Refer to the specific system data sheet for electrical, thermal and mechanical product details.

Contents

The evaluation board demo assembly ships with the following contents:

- 1 x VTA62 3U evaluation board

Table 1
Evaluation board

Part Number	Description
VIT3UDCTEST01	VITA62 3U evaluation board for $28V_{DC}$ and $270V_{DC}$ systems

Features

The VITA62 3U evaluation board has the following features:

1. Repositionable guide pins to accept both 28V and 270V power supply models.
2. BNC connectors to measure all input and output power signals.
3. Basic ceramic filtering 10µF + 0.1µF on all outputs and 1µF + 0.1µF ceramic filtering on the input.
4. Test points for all control and address signals.
5. Jumpers to enable, inhibit and set the power supply addresses.
6. DB-9F I^2C communication ports for each I^2C channel.
7. Kelvin sensing for VS1, VS2 and VS3 remote sense pins.
8. Headers to directly accept Total-Phase Aardvark I^2C Adapter or Total Phase Beagle on each I^2C port.
9. Test points and 4-40 screw posts for monitoring and loading outputs
10. Multiple evaluation platforms can be paralleled to evaluate paralleling of power supplies of the same model.
11. Sample Python software to communicate with the power supply using I^2C.

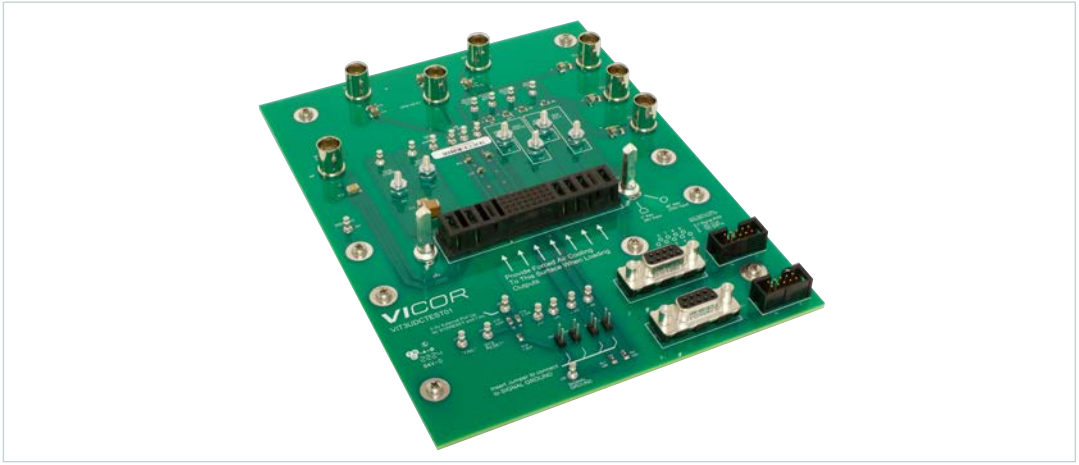
Recommended Parts for I^2C Communication and Debugging (not included)

1. Aardvark™ I^2C/SPI Host Adapter, Total Phase Part Number: TP240141
2. Beagle™ I^2C/SPI Protocol Analyzer, Total Phase Part Number: TP320121
3. Computer operating system: Windows 7, 8, 8.1, 10 (preferred) or macOS® 10.7 – 10.14 or Ubuntu, Fedora, SuSE, Red Hat.

Board Description

This platform provides a convenient way to evaluate, demonstrate or develop software to communicate with the Vicor 3U VITA62 and SOSA™-aligned power supplies without the need of complex backplane assemblies.

Figure 1
Evaluation board photo



General Components

1. *VITA62 3U Connector:* Slot to plug in one VITA62 or SOSA-aligned 3U power supply. Compatible models are listed on page 1.
2. *Guide Pins (KM1 and KM2):* KM1 and KM2 are both connected to each other and CHASSIS on the VITA62 connector. KM2 is set at 0° key position to accept 28V power supplies. In order to plug a 270V power supply into the board, reinstall KM2 at the 45° key position. To test SOSA-aligned 28V input supplies, remove guide pin KM1.
3. *Input Power*
   - *Input Power Terminals (J11 and J12):* J11 and J21 are connected to +DC and +DC_RTN respectively. Ring terminals with cables that connect to an appropriate DC supply be secured at these points.
   - *Input Filtering Capacitors (C14 and C13):* C14 and C13 are paralleled to provide 1µF + 0.1µF of input power filtering to reject high frequency source ripple noise.
   - *Monitoring (J26):* J26 is Kelvin-connected to the press-in contacts of the VITA 62 connector to accurately measure the voltage at the power supply instead of the terminals J11 and J12. C15 provides 0.1µF of ceramic filtering at J26.
     Input power filtering is capable of operating with 28V and 270V sources up to the normal operating limit of all compatible power supply models.
4. *Output Power Common Return (J10):* Output power for all six output points have a common return through J10.
5. *Main Outputs VS1, VS2 and VS3*
   - *VS1 power output (J7):* VS1 output can be loaded by connecting an appropriate load to J7 with J10 being the common return
   - *VS2 power output (J8):* VS2 output can be loaded by connecting an appropriate load to J8 with J10 being the common return
   - *VS3 power output (J9):* VS3 output can be loaded by connecting an appropriate load to J9 with J10 being the common return
6. *PoL Remote Sensing for Main Outputs*
   - *BNC Connections (VS1 POL, VS2 PoL, VS3 PoL):* BNC connectors are provided with Kelvin connections to the remote sense connections of the VITA62 connector. Each BNC connector has 10µF + 0.1µF of ceramic filtering at the BNC connectors.
   - *Test Points (VS1 Remote Sense, VS2 Remote Sense, VS3 Remote Sense, Remote Sense Common):* A second set of test points are provided to monitor the main output regulation at the PoL.

General Components (Cont.)

7. *Auxiliary Outputs:* All auxiliary output monitoring points have 10µF + 0.1µF ceramic filtering.
   - *AUX1 Monitoring and Power (J2 and J27):* BNC port J2 can be used to monitor AUX1 output. Test point turret can be used to load the AUX1 output referenced to J10.
   - *AUX2 Monitoring and Power (J4 and J25):* BNC port J4 can be used to monitor AUX2 output. Test point turret J25 can be used to load the AUX2 output referenced to J10.
   - *AUX3 Monitoring and Power (J6 and J24):* BNC port J4 can be used to monitor AUX3 output. Test point turret J25 can be used to load the AUX3 output referenced to J10.
8. *Signal Ground (J28):* Test point J28 is connected to Signal Ground on the power supply connector. Vicor power supplies have an internal Kelvin connection between Signal Ground and Output Power ground.
9. *Address Selection Jumpers (GA0 and GA1):* If left unconnected both address pins will be floating. Vicor power supplies have internal pull up to 3.3V. Left unconnected, the power supply will start with address 0x20. Connecting the jumpers across GA0 and GA1 headers will connect each pin to Signal Ground through its own 10Ω resistor.
10. *Enable and Inhibit Jumpers (ENABLE and INHIBIT):* If left unconnected both control lines will be pulled up to 3.3V inside the Vicor power supply. Left unconnected, the power supply will start up with all outputs disabled. Connecting a jumper across each control line will connect each pin to Signal Ground directly.
11. *Kelvin connected remote sense jumpers (R1, R6, R7 and R9):* Instead of connecting remote sense lines at the power supply connector on the evaluation platform connector, 0Ω jumpers regulate the main output voltages VS1, VS2 and VS3 at the locations of each jumper resistor to demonstrate the power supply's capability of regulating output voltage at a PoL away from the connector. When paralleling multiple power supplies, care must be taken to Kelvin-connect the remote sense points of different evaluation boards to one single evaluation board.
12. *FAIL* and SYSRESET* Indicators with external pull-up (J16, J14 and J23):* Control lines FAIL* and SYSRESET* are connected to pull ups and pull downs through resistors. Each control line is pulled down to Signal Ground on the evaluation board and pulled up to J23 which is floating. J23 can be connected to an external power voltage source or AUX2 (generally +3.3V) referenced to Signal Ground J28.

Figure 2a
VIT3UDCTEST01 evaluation board photo, top side

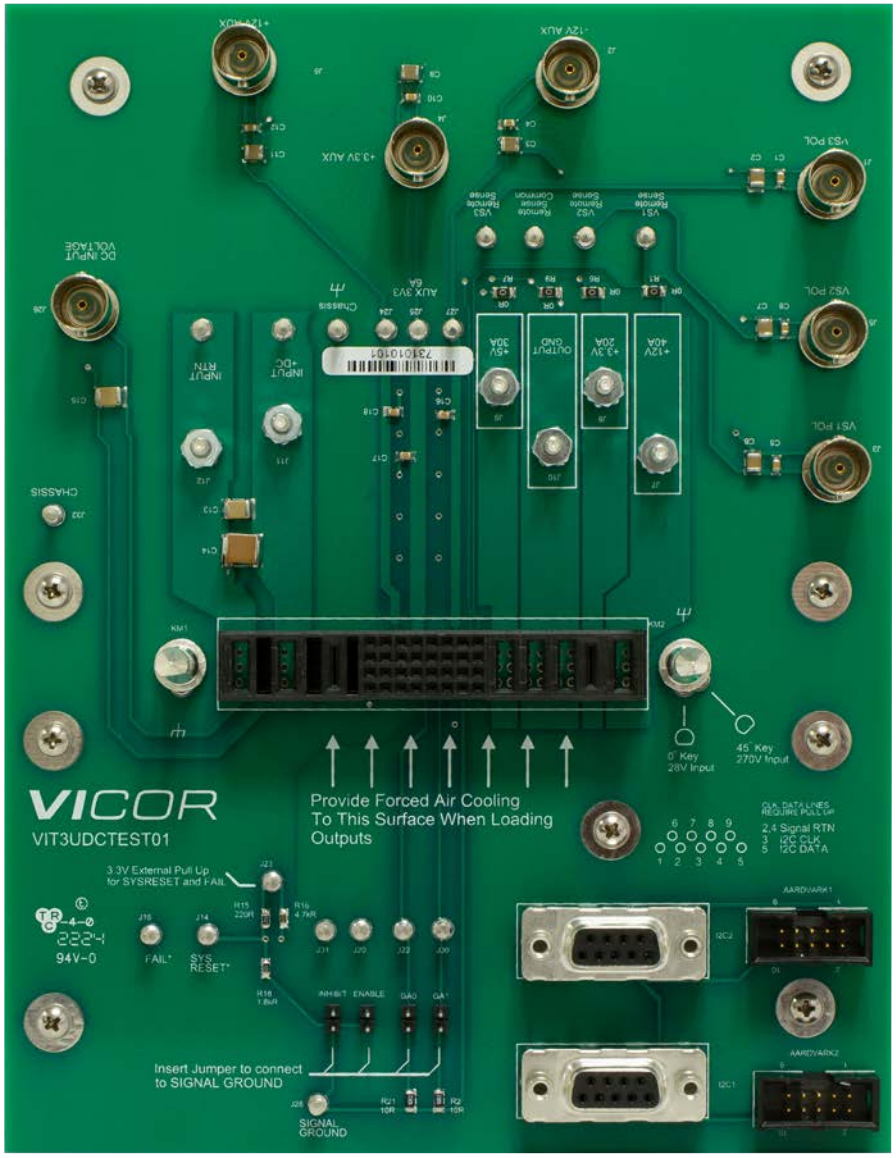


Figure 3a
VIT3UDCTEST01 evaluation board schematic

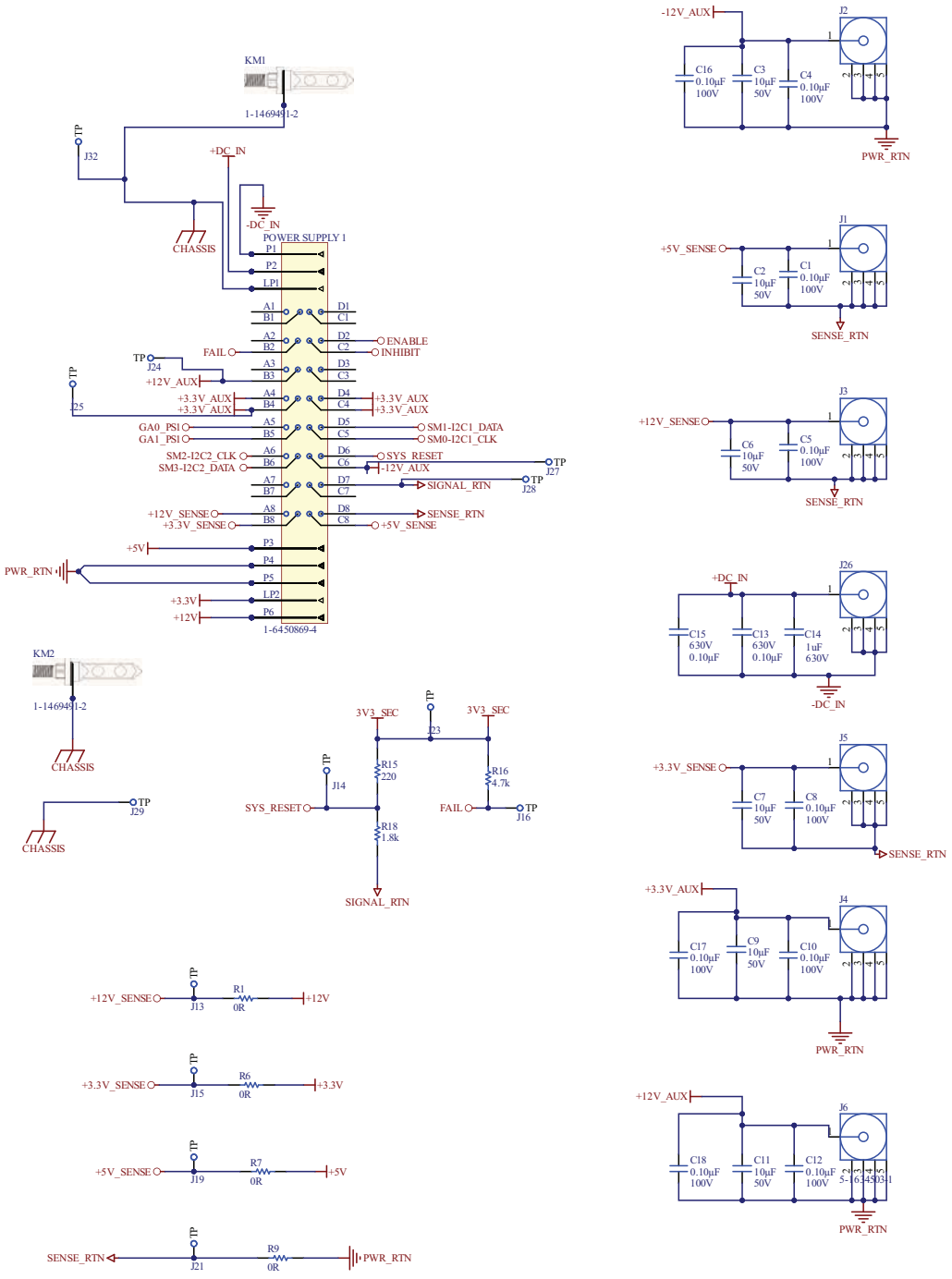
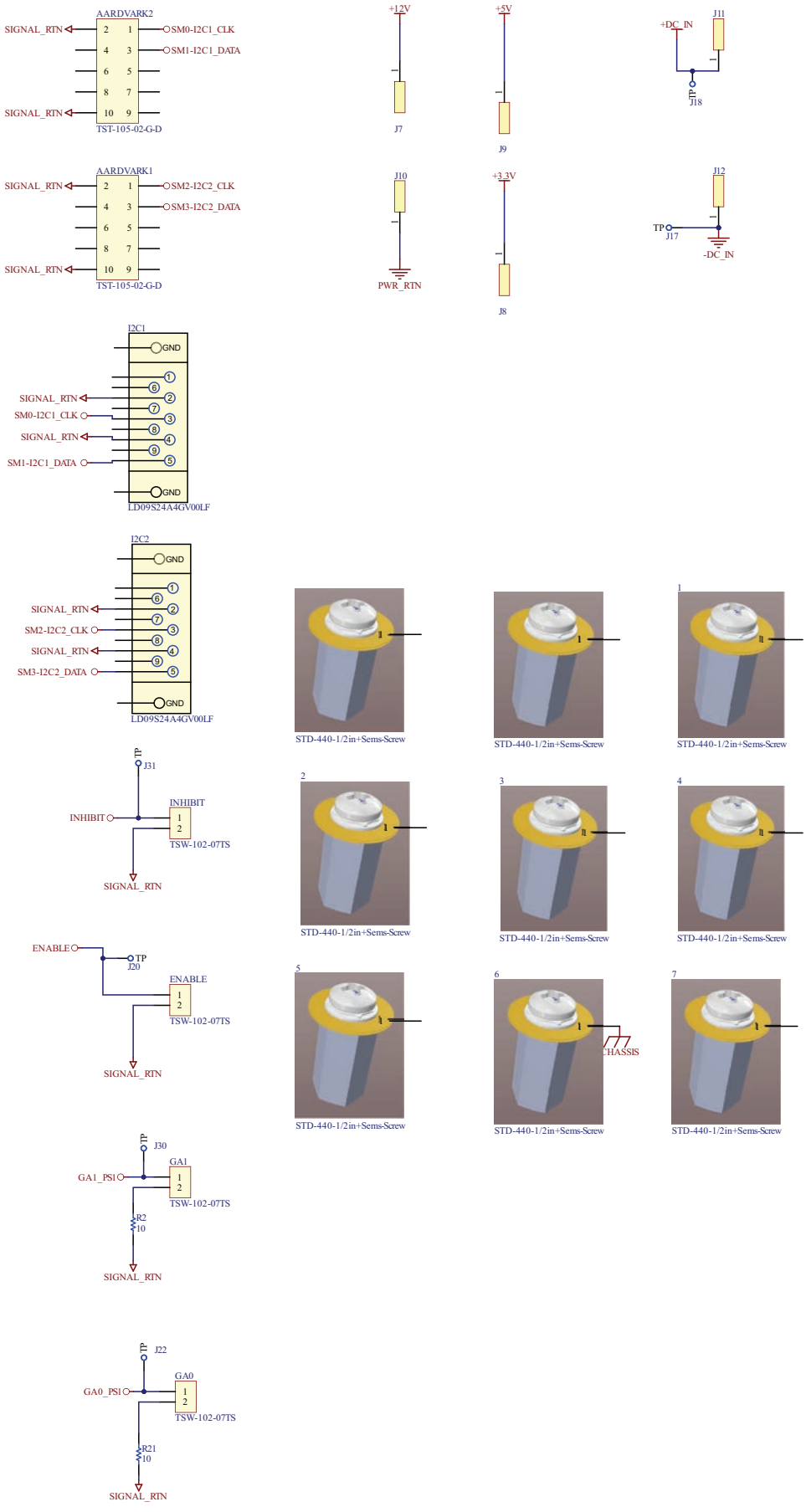


Figure 3b
VIT3UDCTEST01 evaluation board schematic, cont.



Bill of Materials

The following table describes the components of the VITA62 3U evaluation board.

Table 2
VITA62 3U evaluation board components

Reference Designator	Quantity	Description	Manufacturer	Manufacturer Part Number
R1, R6, R7, R9	4	0Ω 1206	YAGEO	RMCF1206ZT0R00
R2, R21	2	10Ω 5% 1/8W 1206	YAGEO	RC1206FR-0710KL
R16	1	4.7kΩ 5% 1/10W 0805	YAGEO	RC0805JR-074K7L
C14	1	1.0µF, 630V, 20%, X7T, 2220	TDK	CKG57NX7T2J105M
C1, C4, C5, C8, C10, C12, C16, C17, C18	9	100nF 100V X7R 0805	Murata	GCM21BR72A104KA37L
C13, C15	2	100nF 630V X7R 1812	Murata	GRM43DR72J104KW01K
C2, C3, C6, C7, C9, C11	6	10µF 50V X7R 1210	KYOCERA AVX	12105C106K4Z2A
R18	1	1.8kΩ 1% 1/8W 0805	YAGEO	RC0805FR-071K8L
R15	1	220Ω 5% 1/10W 0805	YAGEO	RC0805FR-07220RL
ENABLE, GA0, GA1, INHIBIT	4	2 pin header	Samtec	TSW-102-07-TS
AARDVARK1, AARDVARK2	2	Conn Shrouded HDR 10 POS 2.54mm TH	Samtec	TST-105-02-G-D
-	9	4-40 X .500LG X .25 HEX ALUM STND	RAF	2104-440-A-7
-	9	SCREW, PHD, SEMS, SS, 4-40 X 5/16	McMaster-Carr	91241A414
-	12	Nut Hex, 4-40, Mach Screw, Zinc, 2 per 4-40 Stud	McMaster-Carr	90480A005
J13, J14, J15, J16, J17, J18, J19, J20, J21, J22, J23, J24, J25, J27, J28, J29, J30, J31, J32	19	Terminal Turret Connector Single End 0.219in [5.56mm] Tin	MIIIMAX	2501-2-00-80-00-00-07-0
J7, J8, J9, J10, J11, J12	6	4-40 X 0.500L PRESS IN STUD	PEM	KFH-440-8ET
J1, J2, J3, J4, J5, J6, J26	7	BNC Jack, Vertical, PCB Mount	TE Connectivity	5-1634503-1
POWER SUPPLY 1	1	VITA62 Connector Female Blade Sockets Through-Hole Multi-Beam	TE Connectivity	1-6450869-4
KM1, KM2	2	VITA62 Guide Pin	TE Connectivity	1-1469491-2
I2C1, I2C2	2	DB9 Female Vert Board Lock	Amphenol	LD09S24A4GV00LF

Connection Cross-Reference

Cross-reference for PCB component for power input/output, associated monitoring points and VITA 62 connector contact with description and monitor point.

Table 3
VITA62 3U connector and monitoring point cross-reference

Power / Control Item Reference Designator	VITA62 Connector Contact	Function	Monitor Point Reference Designator
J12	P1	DC Input RTN	-
J11	P2	+DC Input	J26 referenced to P1
KM1, KM2	LP1	CHASSIS	Chassis
J16	B2	FAIL*	J16
INHIBIT	C2	INHIBIT*	J31
ENABLE	D2	ENABLE*	J20
J24	B3	VAUX3 (+12V)	J6
J25	A4, B4, C4, D4	VAUX2 (+3.3V)	J4
GA0	A5	*GA0	J22
GA1	B5	*GA1	J30
I2C1, Aardvark1 (Requires pull up to 3.3V or 5V)	C5	I^2C Bus 1 Clock	I2C1, Aardvark1
	D5	I^2C Bus 1 Data	-
I2C1, Aardvark1 (Requires pull up to 3.3V or 5V)	A6	I^2C Bus 2 Clock	I2C2, Aardvark1
	B6	I^2C Bus 2 Data	-
J27	C6	VAUX1 (–12V)	J2
J14	D6	SYSRESET*	J14
-	D7	Signal Ground	SIGNAL GROUND
-	A8	VS1 Remote Sense+	VS1 POL (J3), VS1 Remote Sense
-	B8	VS2 Remote Sense+	VS2 POL (J5), VS3 Remote Sense
-	C8	VS3 Remote Sense+	VS3 POL (J1), VS3 Remote Sense
-	D8	Remote Sense Common Return	Remote Sense Com-mon
J9	P3	VS3 Output	-
J10	P4, P5	Common Output Voltage RTN	-
J8	LP2	VS2 Output	-
J7	P6	VS1 Output	-

Testing I²C Communication

Figure 4
Aardvark™ I²C/SPI adapters connected to I2C1 with a VITA62 power supply plugged in

The sample Python code provided will function with only one adapter plugged in and can be extended by the user to use both channels concurrently. The example code is provided as a means of demonstrating communicating power supplies that support I²C communication. Examples provided implement I²C communication using standard I²C commands following parent-child responses and not multi-parent communication which is part of the IPMI 2.0 protocol the Vicor power supplies are also equipped with.

Sample Python code was developed using:

- Windows 10 x64 computer,
- Anaconda® Python™ 3.9
- Using Aardvark™ I²C/SPI adapters with 3.0 drivers

One additional Python library is necessary to execute the example software.

- dec2bin

The Python example code contains version 5.60 of the Total Phase Aardvark API drivers for Windows and macOS®. Linux® API drivers are not included and can be downloaded from the Total Phase website.

Functions will connect to the Aardvark adapter and read data from the power supply. The figure below shows one section of data that will be printed on the screen when executing the script.

Contact Vicor field applications for support using I²C communication, including sample Python code.

Figure 5
Example of data printed when executing script

```
Aardvark Connection Successful. 1 Aardvark devices found and available.
Bitrate for adapters 0 set to 100 kHz respectively


I2C address of the power supply is: 0x20


Firmware timestamp for power supply is: Apr 19 2022 11:57:38


Result from reading composite sensor data using command 0x21

Byte     0: Completion Code   : 0x21
Byte     1: Status Register   : 0x6
Byte   2-3: PCB Temperature   : 29.4
Byte   4-5: +12V Sense        : 12.1
Byte   6-7: +3.3V Sense       : 3.403
Byte   8-9: +5V Aux Voltage   : 5.053
Byte 10-11: +3.3V Aux Voltage : 3.362
Byte 12-13: +12V Aux Voltage  : 12.097
Byte 14-15: -12V Aux Voltage  : -12.212
Byte 16-17: +12V Current      : 0.513
Byte 18-19: +3.3V Current     : 0.007
Byte 20-21: +5V Current       : 0.013
Byte 22-23: +3.3V Aux Current : 0.004
Byte 24-25: +12V Aux Current  : 0.063
Byte 26-27: -12V Aux Current  : -0.072
Byte 28-29: Int Reference     : 2.505
Byte 29-31: Input Voltage     : 30.934
Byte 32-51: Part Number       : VIT028H3U600C000
Byte 52-55: Serial Number     : 220307008
Byte 56-57: Date Code         : 2022-10
Byte 58-59: Hardware Rev      : 1C
Byte 60-61: Firmware Rev      : 2.30
Byte    62: Input Current     : 0.471
Byte    63: Checksum          : 0x47
Checksum Verification         : PASS

```

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Vicor Corporation
25 Frontage Road
Andover, MA, USA 01810
Tel: 800-735-6200
Fax: 978-475-6715
www.vicorpower.com

email
Customer Service: custserv@vicorpower.com
Technical Support: apps@vicorpower.com