Features & Benefits

- 500W SOSA Aligned ANSI/VITA 62.0 Compliant
- Wide Operating Temperature Range: -55 °C to 85 °C
- High Efficiency, High Power Density
- EMI Filters Included
- Up to 470 W Power on Isolated 12 V Primary Output
- Up to 33 W Power on Isolated 3.3 V Auxiliary Output
- Fixed Switching Frequency
- Droop Current Sharing & Internal ORing Diode
- Multiple Units in A Redundant or Parallel System
- IPMI 46.11 Communication
- Input Under Voltage Protection
- Input/Output Over Voltage Protection
- Short Circuit Protection
- Over Temperature Protection

Compliance

Module is designed to meet: *(Note 2)

- MIL-STD-461G
- MIL-STD-810G
- MIL-STD-1275E
- CE marked
- RoHS compliant
- REACH compliant
- Def Stan 61-005
- Def Stan 00-035
- Def Stan 59-411
- Def Stan 59-114

Typical Applications

- Military/Defense Power Supplies
- Armored Vehicles
- Land Platforms
- Aerospace Platforms
- Communications and Radar Systems

Product Ratings	
V_{IN}	18 – 40 V*(Note 1)
V_{OUT} (Primary)	12 V
I_{OUT} (Primary)	39 A
V_{OUT} (Auxiliary)	3.3 V
I_{OUT} (Auxiliary)	10 A
P_{OUT}	500 W

Product Description

This configurable power board is designed to meet the unique and challenging environmental requirements of defense applications. This VPX Board with 3U form factor delivers up to 500W power with high efficiency.

Hi-Rel VPX power supply can operate without failure under extremely harsh conditions, which is crucial for military applications.

Size: 168 × 100 × 25.4 mm

Note 1: *Engineering prototypes are up to 32V only. Production units will comply with 18-40 V input voltage range.*

Note 2: *Production units will be compliant to the standards outlined in this section. Testing will be completed once the detailed specifications are clarified by the end customer. Engineering prototypes do not comply.*

Electrical Characteristics

All data are obtained at nominal line and full load unless otherwise specified. (Ta = 25 °C)

Input Characteristics					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Non-Operating Input Voltage Range	Continuous	-1		50	V
Operating Input Voltage Range		18	28	40*(Note 1)	V
Input Under Voltage Turn-On Threshold		15.1	15.6	16	V
Input Under Voltage Turn-Off Threshold		14	14.5	15	V
Input Over Voltage Turn-Off Threshold		31.7	32	32.3	
Input Over Voltage Turn-On Threshold		28.7	29	29.3	
No-Load Input Current			0.6	1	A
Disabled Input Current			0.55	0.65	A
Maximum Input Current			35		A

Main Output: +12V					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Output Voltage		11.7	12	12.3	V
Output Voltage Line Regulation			± 0.25		%
Output Voltage Load Regulation			± 2		%
Output Voltage Ripple and Noise (pk-to-pk)	20 MHz bandwidth		70		mV
Operating Output Current Range		0		39	A
Output Current Limit		42			A
Output Current Shutdown Limit			44		A
Output DC Current-Limit Shutdown Voltage			6		V
Output Power			468		W
Output Over-Voltage Protection	At nominal output voltage		14.4		V
Maximum Output Capacitance	At nominal output voltage			2.35	mF
Input Voltage Transient Response	50V/ms; See Figure C.				
Step Change	18V to 28V to 18V input voltage		2.5		V
Settling Time	Within 1% of output voltage		4		ms
Load Current Transient Response	1A/µs; See Figure B.				
Step Change	50% to 75% to 50% output load		2		V
Settling Time	Within 1% of output voltage		10		ms
Turn-On Transient Time	Within 90% of output voltage		90		ms
Soft Start Time	Within 90% of output voltage		10		ms

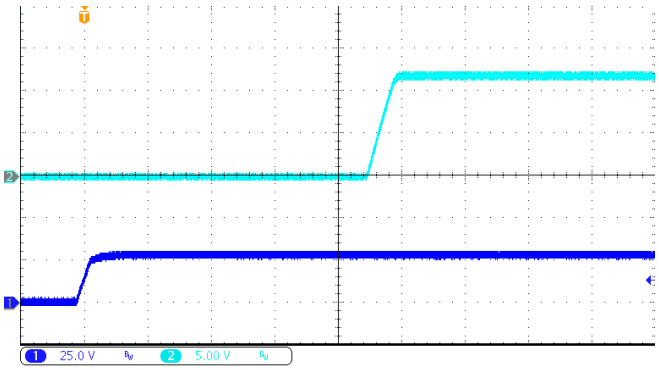
Aux Output: +3.3V					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Output Voltage		3.2	3.3	3.5	V
Output Voltage Line Regulation			± 0.1		%
Output Voltage Load Regulation			± 0.5		%
Output Voltage Ripple and Noise (pk-to-pk)	20 MHz bandwidth		20		mV
Operating Output Current Range		0		10	A
Output Current Limit		15			A
Output Current Shutdown Limit			16		A
Output Power			33		W
Maximum Output Capacitance	At nominal output voltage			2.35	mF
Input Voltage Transient Response	50V/ms; See Figure I.				
Step Change	18V to 28V to 18V input voltage		20		mV
Settling Time	Within 1% of output voltage		1		ms
Load Current Transient Response	1A/µs; See Figure H.				
Step Change	50% to 75% to 50% output load		100		mV
Settling Time	Within 1% of output voltage		40		µs
Turn-On Transient Time	Within 90% of output voltage		90		ms
Soft Start Time	Within 90% of output voltage		5		ms

General Characteristics					
Parameters	**Notes & Conditions**	**Min**	**Typ**	**Max**	**Unit**
Efficiency	Nominal line, 50% aggregate loads		89		%
Efficiency	Nominal line, 100% aggregate loads		88		%

Environmental Characteristics

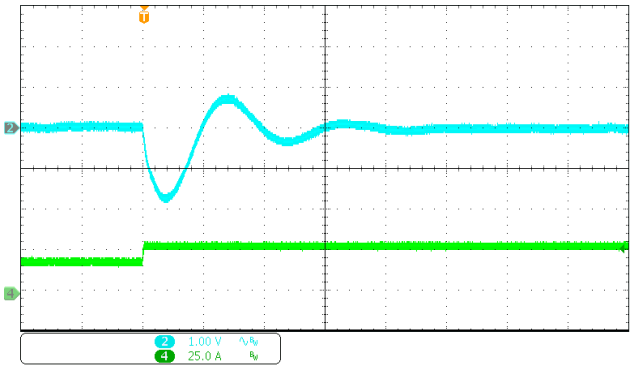
Environmental Characteristics					
Parameters	**Standard**	**Min**	**Typ**	**Max**	**Unit**
Operational Temperature (@wedgelock, card edge)	MIL-STD-810G_CHG-1 Method 501.6/502.6 Procedure II	-55	-	+85*(Note 3)	°C
Storage Temperature	MIL-STD-810G_CHG-1 Method 501.6/502.6 Procedure I	-65	-	+125	°C

Note 3: *Engineering prototypes are up to 75°C cart edge temperature only. Production units will be able to operate at 85°C cart edge temperature.*



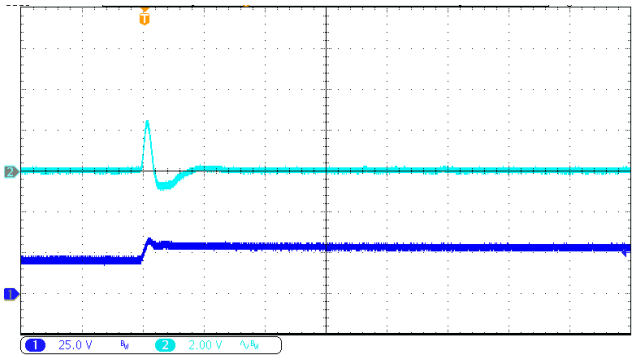
Main output voltage (blue) (5 V/div) Time base: 20 ms/div
Input voltage (navy blue) (25 V/div)

Figure A. Startup waveform of main output at full load



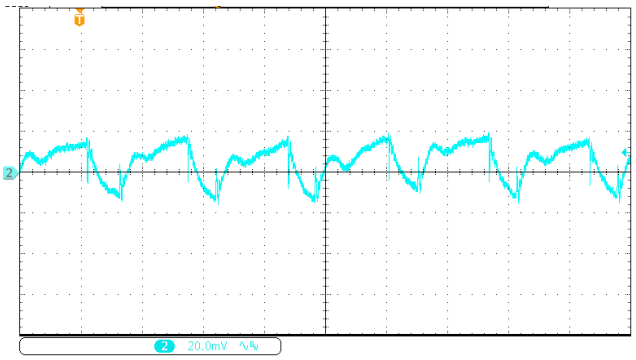
Main output voltage (blue) (1 V/div) Time base: 4 ms/div
Output current (green) (25 A/div)

Figure B. Main output load current transient response, main output voltage (AC coupled): from 50% to 75% (di/dt = 1A/µs)



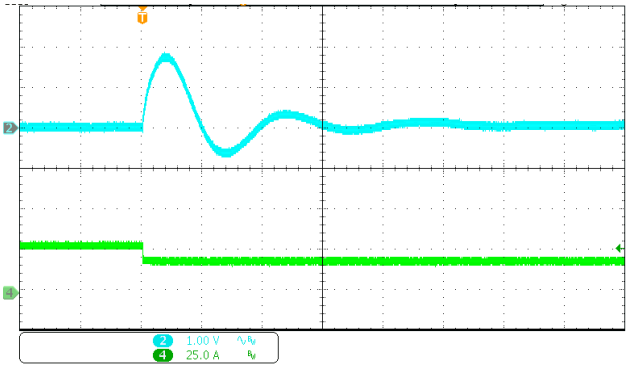
Main output voltage (blue) (2 V/div) Time base: 4 ms/div
Input voltage (navy blue) (25 V/div)

Figure C. Input voltage transient response, main output voltage (AC coupled): input voltage from 18V to 28V (dV/dt = 50V/ms)



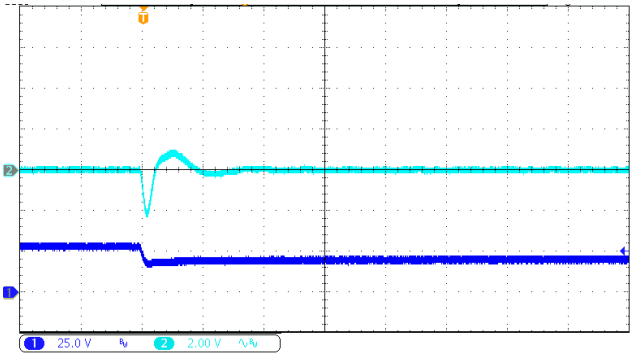
Main output voltage ripple (blue) (20 mV/div) Time base: 2 µs/div

Figure D. Main output voltage ripple at nominal input voltage and full load current



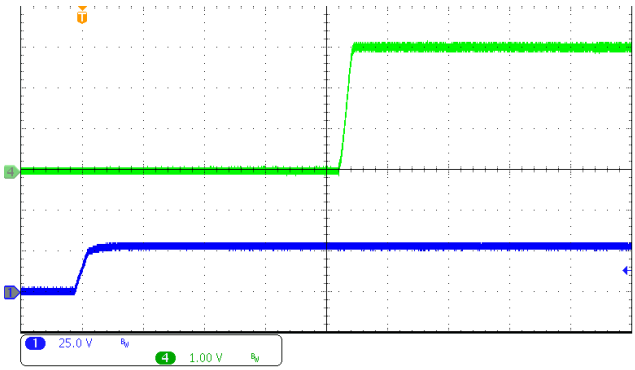
Main output voltage (blue) (1 V/div) Time base: 4 ms/div
Output current (green) (25 A/div)

Figure E. Main output load current transient response, main output voltage (AC coupled): from 75% to 50% (di/dt = 1A/µs)



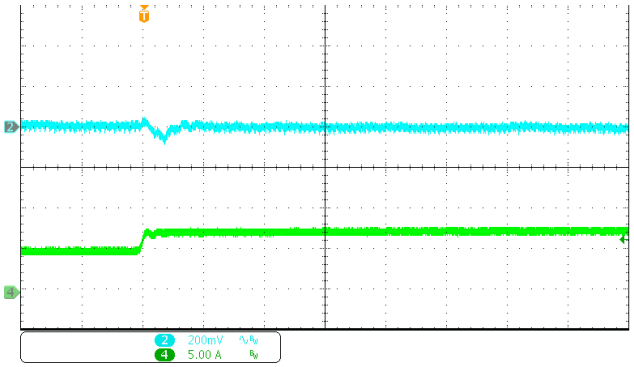
Main output voltage (blue) (2 V/div) Time base: 4 ms/div
Input voltage (navy blue) (25 V/div)

Figure F. Input voltage transient response, main output voltage (AC coupled): input voltage from 28V to 18V (dV/dt = 50V/ms)



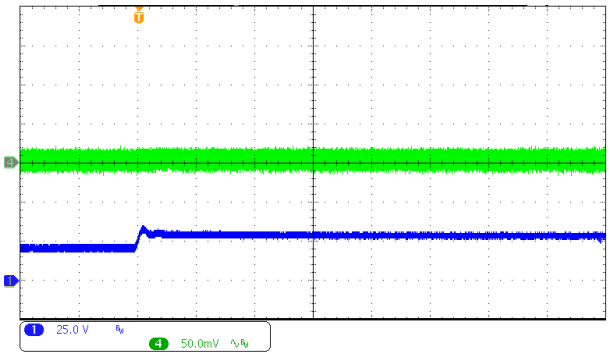
Aux output voltage (green) (1 V/div) Time base: 20 ms/div
Input voltage (navy blue) (25 V/div)

Figure G. Startup waveform of aux output at full load



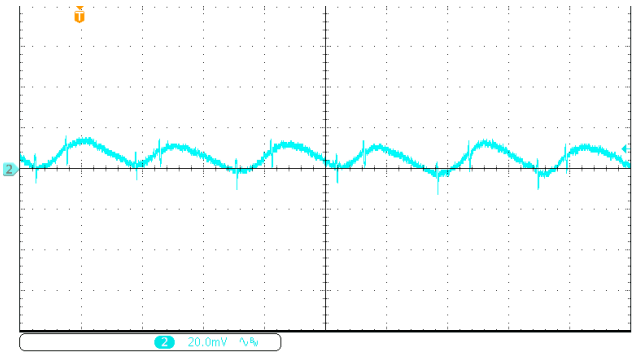
Aux output voltage (blue) (200 mV/div) Time base: 40 µs/div
Output current (green) (5 A/div)

Figure H. Aux output load current transient response, aux output voltage (AC coupled): from 50% to 75% (di/dt = 1A/µs)



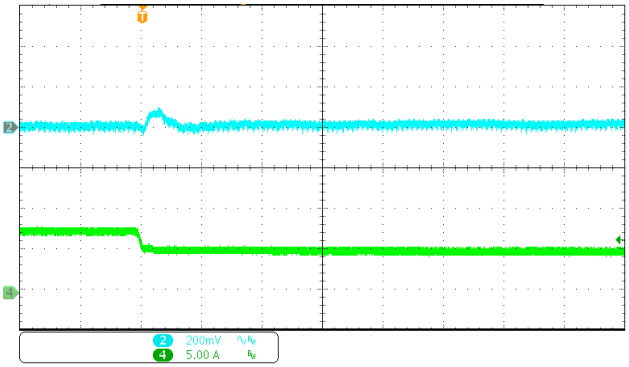
Aux output voltage (green) (50 mV/div) Time base: 4 ms/div
Input voltage (navy blue) (25 V/div)

Figure I. Input voltage transient response, aux output voltage (AC coupled): input voltage from 18V to 28V (dV/dt = 50V/ms)



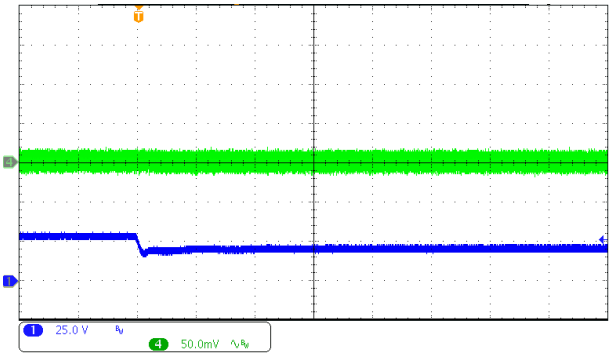
Aux output voltage ripple (blue) (20 mV/div) Time base: 2 µs /div

Figure J. Aux output voltage ripple at nominal input voltage and full load current



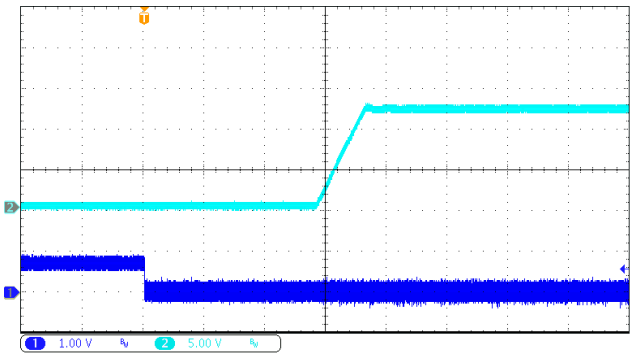
Aux output voltage (blue) (200 mV/div) Time base: 40 µs/div
Output current (green) (5 A/div)

Figure K. Aux output load current transient response, aux output voltage (AC coupled): from 75% to 50% (di/dt = 1A/µs)



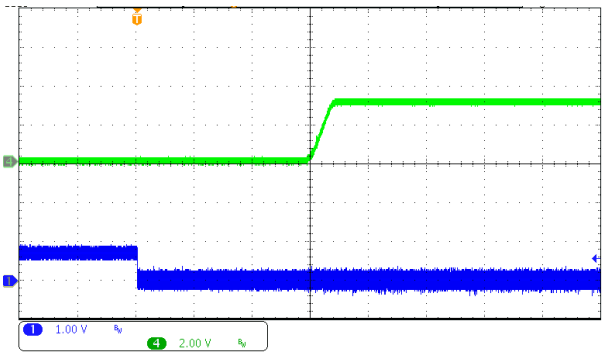
Aux output voltage (green) (50 mV/div) Time base: 4 ms/div
Input voltage (navy blue) (25 V/div)

Figure L. Input voltage transient response, aux output voltage (AC coupled): input voltage from 28V to 18V (dV/dt = 50V/ms)



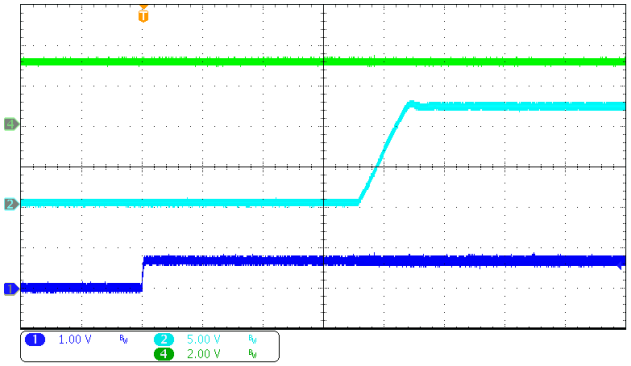
Main output voltage (blue) (5 V/div) Time base: 10 ms/div
ENABLE* (navy blue) (1V/div)

Figure M. ENABLE* asserted low, INHIBIT* de-asserted



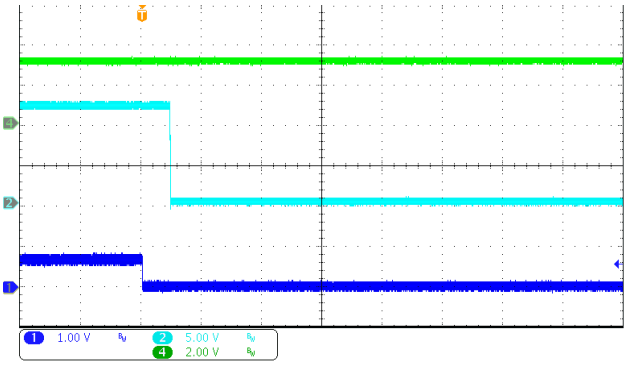
Aux output voltage (green) (2 V/div) Time base: 10 ms /div
ENABLE* (navy blue) (1V/div)

Figure O. ENABLE* asserted low, INHIBIT* de-asserted



Main output voltage (blue) (5 V/div) Time base: 10 ms/div
Aux output voltage (green) (2 V/div)
INHIBIT* signal (navy blue) (1V/div)

Figure N. INHIBIT* asserted float, ENABLE* asserted low



Main output voltage (blue) (5 V/div) Time base: 10 ms/div
Aux output voltage (green) (2 V/div)
INHIBIT* signal (navy blue) (1V/div)

Figure P. INHIBIT* asserted low, ENABLE* asserted low

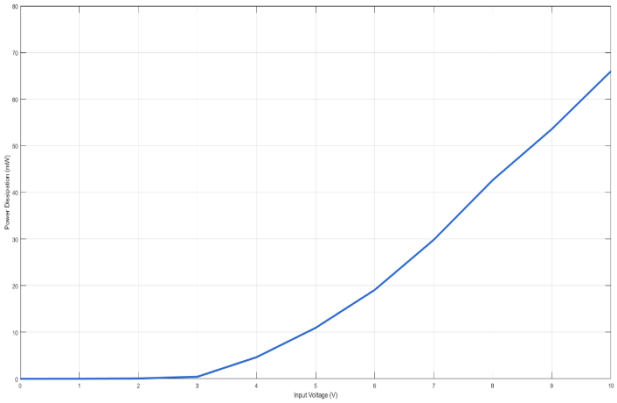


Figure Q. Non-operating power dissipation versus input voltage, ENABLE* and INHIBIT* de-asserted

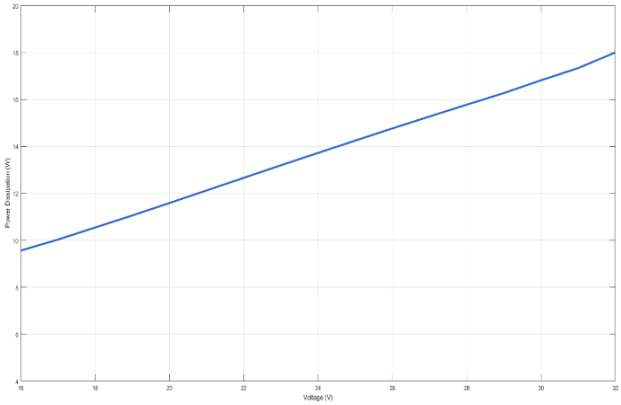


Figure S. Enabled power dissipation versus input voltage, ENABLE* asserted and INHIBT* de-asserted

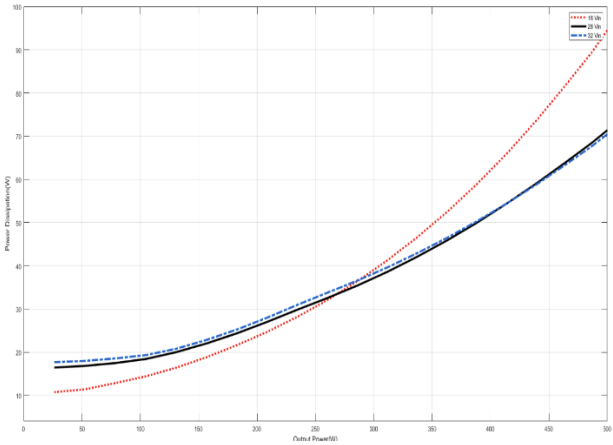


Figure R. Power dissipation versus output power at minimum, nominal and maximum input voltage

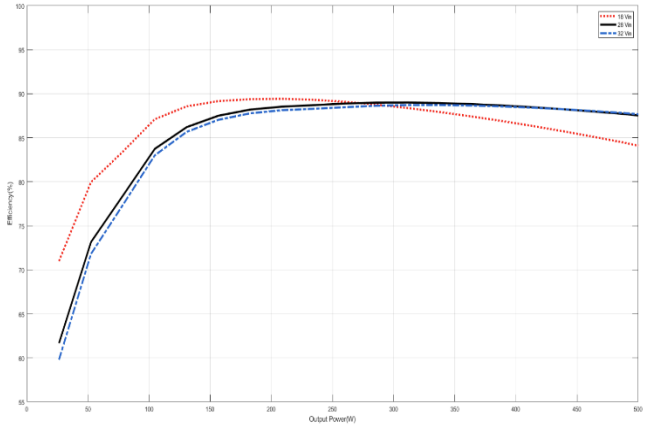


Figure T. Efficiency versus output power at minimum, nominal and maximum input voltage

Block Diagram for KRPS17-DC28-P500-DC12-VX3U

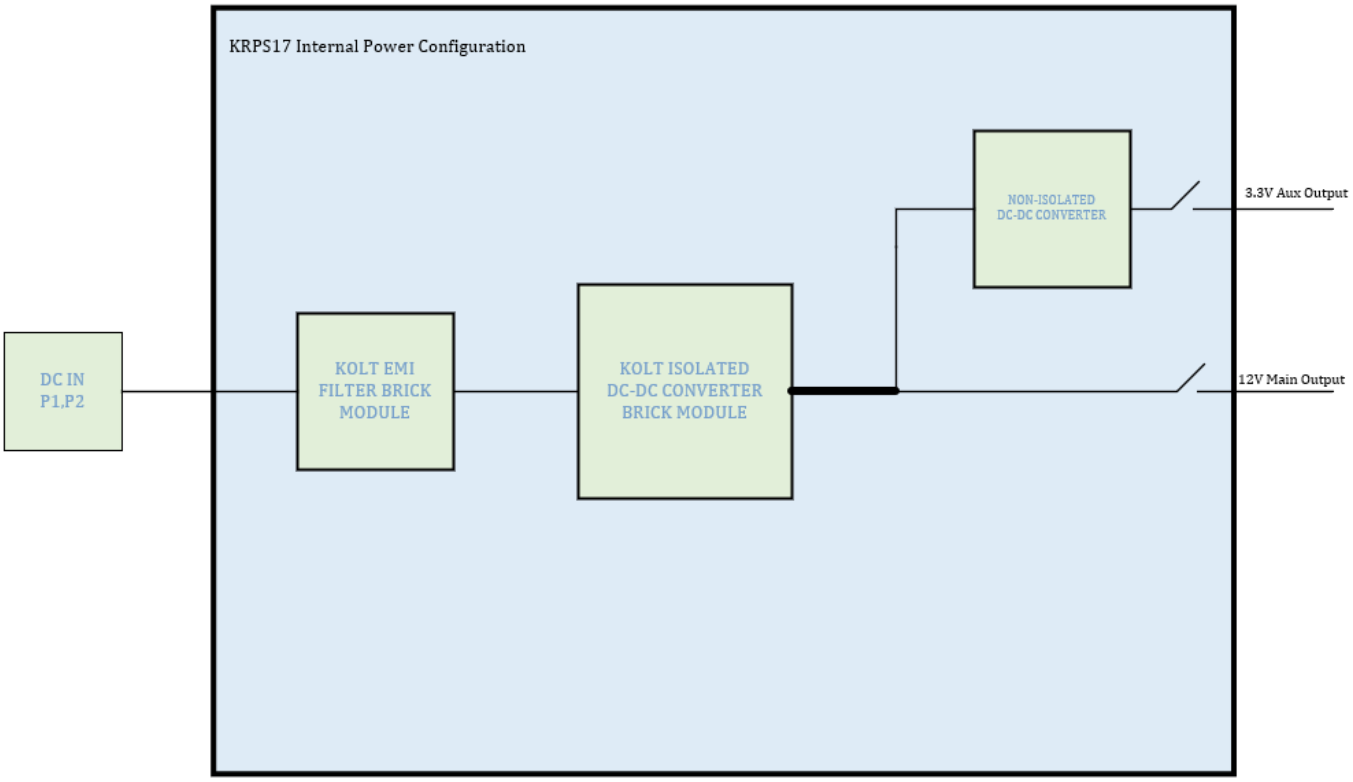


Figure U. Internal Block Diagram Representation of KRPS17

IPMI Interface

Four constants are used to calculate a real-world value from the single byte variable returned in the response. The conversions can be realized with the following equation:

$$y = \left(Mx + (B * 10^{K1})\right) * 10^{K2}$$

Where;

y = the converter reading

x = the raw sensor reading

M = the signed integer multiplier

B = the signed additive offset

K1 = signed exponent for constant B (sets decimal point for B)

K2 = signed result exponent (sets decimal point for y)

Sensor Number	Hex	Sensor Name	SI Units	M	B	K1	K2
7	0x07	Input Voltage	V	30	90	1	-2
8	0x08	Main Output Voltage	V	20	90	2	-3
11	0x0B	Aux Output Voltage	V	10	20	2	-3
18	0x12	Temperature P6	°K	1	20	1	0
19	0x13	Temperature P1	°K	1	20	1	0
25	0x19	Aux Output Current	A	10	0	0	-2

Protection Features

Input Under Voltage Lockout

The VPX module starts operating when the input voltage is raised above the "Under Voltage Turn-On Threshold." Once turned on, turn off is initiated when the input falls below the "Under Voltage Turn-Off Threshold." The "Module Input Specifications" Table gives the associated limits.

Input Over Voltage Protection

The VPX module protects itself by ceasing operation when the input goes above the "Over Voltage Turn-Off Threshold." It resumes operation when the input falls below the "Over Voltage Turn-On Threshold." The associated limits are given in the "Module Input Specifications" Table.

Output Current Limit

The VPX module will derate the output voltage if the output current exceeds the "Output Current Limit" value. If the fault condition is resolved, the control output voltage will increase to the nominal value.

Output Over Voltage Protection

If the output voltage exceeds the "Output Over Voltage-Protection" value the VPX module outputs are disabled immediately and retries after cooldown period. The "Output Over Voltage Protection Limit" is 120% of Output Voltage.

Output Over Current Protection

If the output current exceeds the "Output Current Shutdown Limit" value the VPX module outputs are disabled immediately and retries after cooldown period.

Short Circuit Protection

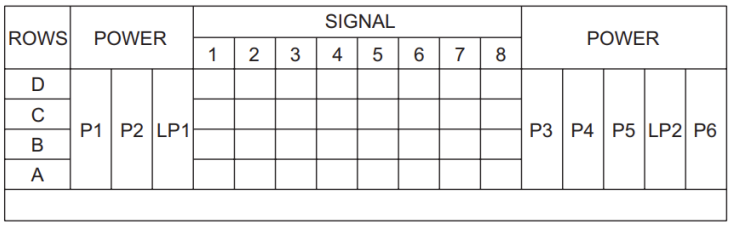
The short circuit condition is an extreme case of the Output Current Limit condition. When output voltage drops below "Output DC Current-Limit Shutdown Voltage" limit, the VPX module outputs are disabled immediately and retries after cooldown period. The "Output DC Current-Limit Shutdown Voltage" is 50% of Output Voltage.

Over Temperature Shutdown

The brick has a thermistor located at the hottest point inside the module. The thermal shutdown circuit is designed to turn the VPX module off when the temperature at the sensed location goes above the "Over Temperature Shutdown" limit. It locks itself and waits to cool off. The VPX module then resumes operation automatically when the temperature of the sensed location falls below the trip point by the amount equal to the "Over Temperature Shutdown Hysteresis."

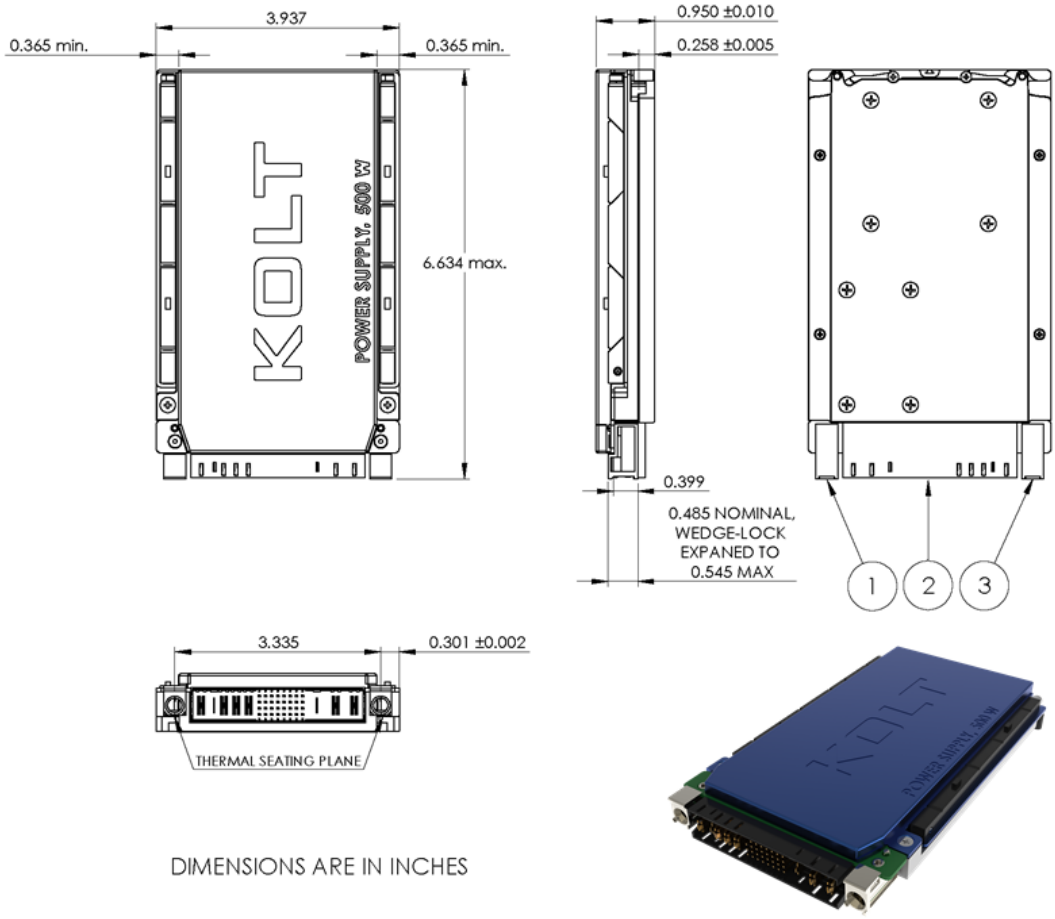
Mechanical Drawing

Connector Pin Configuration



Pin	Function/Name	Description
P1	-DC_IN	V_{in-}
P2	+DC_IN	V_{in+}
LP1	CHASSIS	-
A1	NC (SYNC_OUT)	-
B1	NC (NVMRO)	-
C1	GA2*	Address Bit 2
D1	NC	-
A2	NC (VBAT)	-
B2	FAIL*	When any of the output is not within specification, FAIL* signal will be driven low to indicate a failure
C2	INHIBIT*	Input control signal defined in VITA 62, referenced to SIGNAL RETURN
D2	ENABLE*	Input control signal defined in VITA 62, referenced to SIGNAL RETURN.
A3	NC (SYNC_IN)	-
B3	NC	JTAG VDD
C3	NC (NED)	-
D3	NC (NED_RETURN)	-
A4	NC	JTAG TDO
B4	NC	JTAG TCK
C4	NC	JTAG TDI
D4	NC	JTAG TMS
A5	GA0*	Address Bit 0
B5	GA1*	Address Bit 1
C5	SM0 (IPMB-A SCL)	Primary I^2C clock
D5	SM1 (IPMB-A SDA)	Primary I^2C data
A6	SM2 (IPMB-B SCL)	Redundant I^2C clock
B6	SM3 (IPMB-B SDA)	Redundant I^2C data
C6	NC	-
D6	SYSRESET*	System reset is actively low. It will be high impedance when all outputs are within voltage specification. It will be pulled low if any failure has occurred or if the outputs are disabled by the user during operation.
A7	NC (+12VDC SHARE)	-
B7	NC (3.3V_AUX SHARE)	
C7	NC (+12VDC SHARE)	
D7	SIGNAL RETURN	Ground pin for control and communication signals; internally Kelvin-connected to POWER RETURN
A8	+12VDC SENSE	Main output sense, should be connected at point-of-load
B8	3.3V_AUX SENSE	Aux output sense, should be connected at point-of-load
C8	+12VDC SENSE	Main output sense, should be connected at point-of-load
D8	SENSE RETURN	Aux output sense, should be connected at point-of-load
P3	+12VDC	+12V main output
P4	POWER RETURN	Common output voltage return pin
P5	POWER RETURN	
LP2	3.3V_AUX	+3.3V auxiliary output
P6	+12VDC	+12V main output

Mechanical Dimensions



Item	Desciption	Manufacturer Part Number	Manufacturer
1	VITA 46 0 Deg Guide Socket	1-1469492-1	TE Connectivity
2	VITA 62 Connector Plug	6450849-7	
3	VITA 46 0 Deg Guide Socket	1-1469492-1	

Part Ordering Information

Family	Input Voltage	Power	Output Voltage	Package	Option Field
KRPS17	**DC28** 28 VDC	**P500** 500 W	**DC12** 12 VDC	**VX3U** 3U VPX	**-**

Revision History

Document Number	Revision	Date	Description	Page Number(s)
110180	01	25.04.2025	Initial Release	-
110180	02	15.05.2025	Second Release • Electrical characteristics updated • Main and aux output measurements added • Efficiency measurements added • Internal block diagram added	2,3,4,5,6,7,8

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