

Kontron HARTMANN-WIENER VPX360DMS



3U / 5HP / 600W

**SOSA aligned
VPX Power Supply**

Manual

General Remarks

The only purpose of this manual is a description of the product. It must not be interpreted as a declaration of conformity for this product including the product and software.

Kontron Hartmann-Wiener revises this product and manual without notice. Differences between the description in manual and the product are possible.

Kontron Hartmann-Wiener excludes completely any liability for loss of profits, loss of business, loss of use or data, interrupt of business, or for indirect, special incidental, or consequential damages of any kind, even if

Kontron Hartmann-Wiener has been advised of the possibility of such damages arising from any defect or error in this manual or product.

Any use of the product which may influence health of human beings requires the express written permission of **Kontron Hartmann-Wiener**.

Products mentioned in this manual are mentioned for identification purposes only. Product names appearing in this manual may or may not be registered trademarks or copyrights of their respective companies.

No part of this product, including the product and the software may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form by any means without the express written permission of **Kontron Hartmann-Wiener**.

Table of contents:

1	GENERAL DESCRIPTION	5
1.1	Overview	5
1.2	Functional description	6
2	SPECIFICATIONS	7
2.1	Standard Input Voltage Specification.....	7
2.2	Output Voltage, Current & Power Specification	7
2.3	Technical Specification Table.....	8
2.4	MIL STD 810 (Shock / Vibe / Ambient Temperature / Environment)	10
2.5	MIL-STD-461F (EMI) Compliance.....	10
2.6	MIL-STD-704 Compliance	10
2.7	MIL-STD-1275D Compliance	11
2.8	P0 Connector Pin-Layout (as per VITA62).....	13
2.9	USB Connector & LED Status Indicator	14
3	MECHANICAL LAYOUT	15
4	I2C DOCUMENTATION	16
4.1	Timing.....	16
4.1.1	A Typical Slave I2C™ Message: Multiprocessor Command/Status	16
4.1.2	A Typical Slave I2C™ Message: Multiprocessor Command/Status	16
4.1.3	A Typical Slave I2C™ Message: Multiprocessor Command/Status	16
5	User Software	18

Table of contents:

6.0	IPMI Command Support Overview	18
6.1	Interface profile	19
6.2	IPMB addressing.....	19
6.3	Customer-visible FRU Inventory content.....	20
6.3.1	FRU command behavior.....	21
6.4	Published sensor profiles.....	22
6.4.1	Sensor properties and event behavior	22
6.4.2	VPX360DMS sensor list	23
6.5	Recommended integration sequence.....	24
6.6	Supported IPMI commands.....	24
6.6.1	Application commands	24
6.6.2	Sensor and event commands.....	25
6.6.3	Storage, FRU and SEL commands.....	26
6.6.4	VITA 46.11 Group Extension commands	27
6.6.5	Controller-generated event command	28
6.7	Common completion codes	29
6.8	Notable functions not exposed.....	29
6.9	Reference basis.....	29

1 General Description

The Kontron HARTMANN-WIENER VPX360DMS is a COTS, single stage, wide range 28V to 48V DC input voltage based, conduction cooled VPX power supply with 600W output power. Being aligned to the SOSA™ standard it offers a 12V cintric output power configuration while matching the ANSI/VITA 62.0 specification. The power supply can be used to power a SOSA™ 3U VPX chassis and will fit into the standard envelope defined by VITA 46.0 specifications.

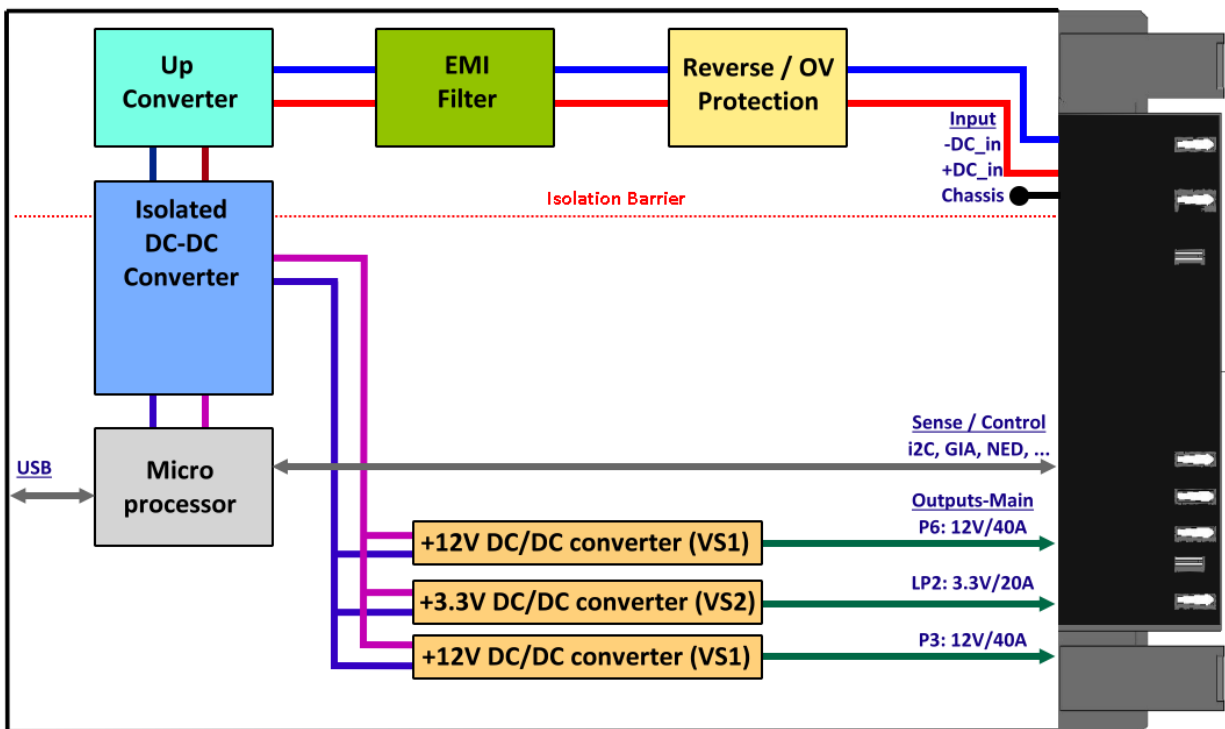
High efficiency and wide input voltage range is achieved by using state of the art switching power technology. No wet electrolytic capacitors are used. An embedded microprocessor allows monitoring and control via two independent I²C communication with VITA 46.11 conform intelligent power-

management interface (IPMI 2.0).

The 600W VPX power supply mechanical dimensions are 3U x 5HP (1.0" slot). It is outfitted with connectors, keying and alignment mechanism as per VITA 62.

The VPX360DMS is designed in compliance with relevant MIL STD 461, 704 and 1275.

1.1 Overview



1.2 Functional description

Figure 1: VPX-360DMS Block-Diagram

WARNING: VPX360DMS is a conduction cooled power supply intended to be used with a wedge-lock heat sink and VITA 62 backplane. Failure to properly regulate wedge-lock temperature within the specified limits may result in damage to the power supply.

NOTICE: VITA 62 (4.6.3.12) systems support Remote Sense & Sense Return Pins that are used to accommodate for power distribution losses (i.e. voltage drops across the connector and PCB traces). VPX360DMS contains three sense lines (12V, 12V, 3.3V_aux) and one sense return line (SENSE_RETURN) that require connection to the backplane in order provide point of load voltage regulation. The connection is typically provided through a jumper (e.g. 0Ω resistor) located on the backplane. Refer to backplane documentation to ensure the necessary sense and sense return jumpers are installed.

NOTICE: VITA 62 (4.6.3.10) systems support a Signal Return Pin (SIGNAL_RETURN) that is used as the return path for digital signals distributed across the backplane. VPX360DMS requires SIGNAL_RETURN to be connected to the backplane's ground plane. This connection is typically provided through a jumper (e.g. 0Ω resistor) located on the backplane. Refer to backplane documentation to ensure SIGNAL_RETURN jumper is installed.

TERMINATE PO1 SENSE, PO2 SENSE, PO3 SENSE, SENSE RETURN, & SIGNAL RETURN ON THE VITA 62 BACKPLANE!

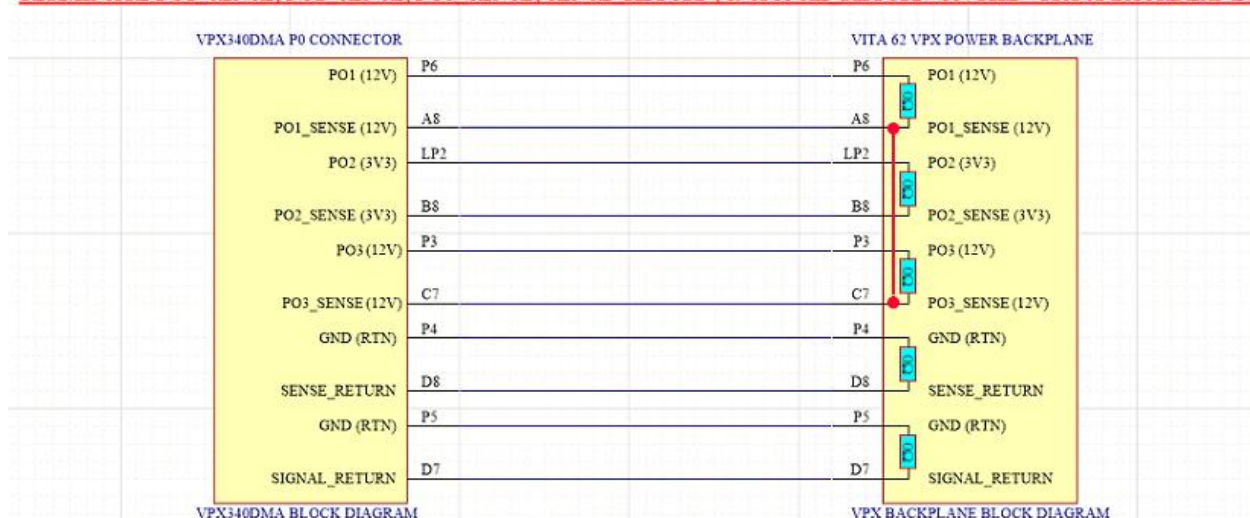


Figure 1.1: Block Diagram of VPX360DMS and VITA 62 Power Backplane. VPX360DMS requires PO1_SENSE, PO2_SENSE, PO3_SENSE, SENSE_RETURN, & SIGNAL RETURN to be terminated on the VITA 62 Power Backplane. Further both 12V sense lines (PO1_SENSE and PO3_SENSE) need to be connected to each other (red line on power backplane)! Verify that these connections are made on your VPX Power Backplane.

RECOMMENDATION: VPX360DMS has been successfully tested and deployed with VITA46/62 VPX Power Backplanes and conduction cooled chassis manufactured by Hartmann Electronics. Hartmann Electronics has over 35 years of experience designing high-speed backplanes, please see:

3U SOSA® Aligned VPX Power Supply – 600 W | Kontron

Support for power supply specific signals: ENABLE*, INHIBIT*, FAIL* and UD (user defined) signals. These input/output signals are low current open collector circuits with electrical characteristics defined per VITA 46 section 4.8.12.1.

NOTICE: NED (C3), NED_RETURN (D3), UD2-4 (B1, C1, D1), SM2-3 (A6, B6), VBAT (A2), & P01-3_SHARE (A7, B7, C7) are open circuit/no connection on VPX360DMS.

Control Inputs		Power Outputs	
ENABLE*	INHIBIT*	VS2 (3.3V AUX)	VS1 & VS2
High	High	Off	Off
High	Low	Off	Off
Low	High	On	On
Low	Low	On	Off

Communication interface: IPMB-A via SM0 (C5) and SM1 (D5). IPMB-B via SM2 (A6) and SM3 (B6)

Communication Features (see paragraph 4):

- Remote On / Off
- DC-IN status and measured voltage and current
- Global status, Temperatures
- Voltage, current and status of individual output power modules
- IPMB (VITA 46.11)

2 Specifications

2.1 Standard Input Voltage Specification

+28 V or 48V DC nominal, 12 V ... 68 V DC input range

UV lockout at 8 V

Outfitted with Reverse Polarity Protection

2.2 Output Voltage, Current & Power Specification

VPX standard outputs as per VITA 62, different power configurations are possible:

VPX360DMS

VPX360DMS	Voltage	Current	Power
VS1	+12.00 V	30 A	360 W
VS1 (on P3)	+12.00 V	30 A	360 W
VS2	+3.30 V	20 A	66 W
Total max			600W

Maximum output power: limited to 600 W

Noise and ripple (PARD) as per VITA 62 specification:

+3.3 V: 50 mV, see [VITA 46.0 Rule 3-6 / 3-9]

+12 V: <120 mV peak-to-peak, measured over a range of 0 to 20 MHz.

Input to Output Insulation: 500 V

Overall Efficiency: ~85% ...92% (dependent on output power distribution),
~88% at full load of 600W with power distributed across all outputs.

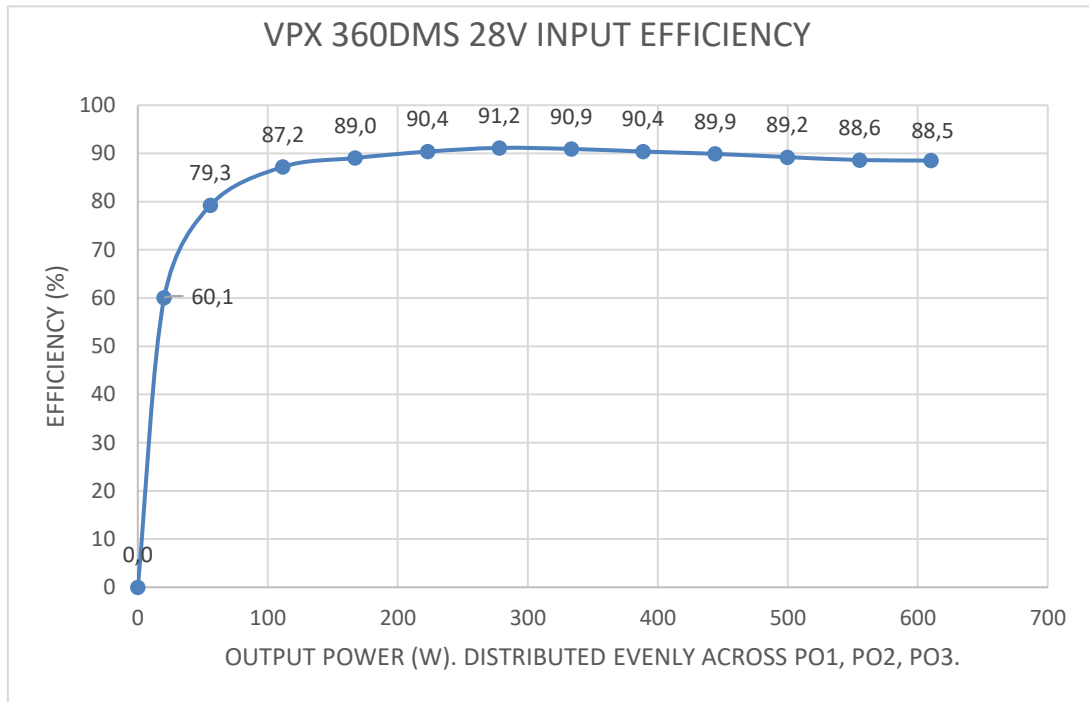


Figure 2: VPX-360DMS Efficiency versus Output Power for VITA 62 nominal input voltage 28V. VPX360DMS is designed to operate with input voltage 28V DC or 48V DC. Efficiency curve was generated from empirical data with power distributed across PO1, PO2, & PO3 outputs. (preliminary)

2.3 Technical Specification Table

Form Factor	3U VPX CC
Pitch	5HP / 1.0 inch
Weight	0.82 kg / 1.8 Lbs
Storage Temperature	-55 °C to 105 °C
Operating Temperature	-40 °C to 85 °C
	(Operating Temperature is referenced at wedge-lock. Failure to regulate wedge-lock temperature may result in damage). Power derating of 100 W for wedge-lock temperatures from +75°C to +85°C
Input to Output Insulation	500 V
Input to Case Ground Isolation	500 V

Output to Case Ground Isolation	500 V
Maximum Output Power	600 W
Maximum Input Power	~660 W
Maximum Dissipated Power @ max. Power	~60 W
Minimum Turn ON Voltage	12 V
Minimum Turn OFF Voltage	8 V
Maximum Continuous/Peak Input Voltage	70 V / ± 250 V (<1 ms spike)
Input Overvoltage Protection:	Outputs disable if input voltage exceeds 70 VDC for > 600 ms (10 second auto-restart)
Temperature Protection Sensing Point (internal)	125 °C (Outputs disable when internal PCB temperature exceeds threshold)
Maximum Internal Working Temperatures	125 °C
Case Ground to Safety Ground Resistance	< 10 m Ω (preliminary)
Maximum Input Line Inductance	10 μ H (preliminary)

Main Power

Maximum Currents 12V / 3V3	60 A / 20 A
Fixed Switching Frequencies 12V / 3V3	520 kHz / 520 kHz
Peak Efficiencies 12V / 3V3	93% / 82%
Max. Output Ripple and Noise: 12V / 3V3 (0-20 MHz Bandwidth)	<120 mVpp / <50 mVpp Typical < 30 mVpp / <25 mVpp
Line Regulation: 12V / 3V3	<10 mV / <10 mV
V _{in} =V _{in,min} to V _{in,max} , I _o and T _c fixed	< 0.1%
Load Regulation: 12V / 3V3	<10 mV / <10 mV
Maximum output voltage (sense lines open)	12.0 V / 3.3 V
Load Transient Recovery Time (no load to full load change condition)	~1 ms

2.4 MIL STD 810 (Shock / Vibe / Ambient Temperature / Environment)

Ruggedized construction to meet shock and vibration requirements, levels to be specified and tested on request.

Storage Temperature: -55 °C to 105 °C

Operating Temperature: -40 °C to 85 °C (derating to be defined)

Standard acrylic conformal coating (e.g. HumiSeal Type 1B31 or similar) to withstand sand, dust and salt atmosphere. Alternate conformal coating options as for instance Parylene are available upon request.

2.5 MIL-STD-461F (EMI) Compliance

Designed to be in compliance with sections CE102, CS101, CS114, CS115, CS116. **Compliance tests to be performed.**

EMC STANDARD:	TEST CONDITIONS: LINE, LOAD, EXTERNAL FILTER	RESULT:
MIL-STD-461F CE102	Input Voltage = 28V, Output Power = 600W, No external filter needed	
MIL-STD-461F CS101	Input Voltage = 28V, Output Power = 40W, No external filter needed	
MIL-STD-461F CS114	Input Voltage = 28V, Output Power = 600W, No external filter needed	
MIL-STD-461F CS115	Input Voltage = 28V, Output Power = 600W, No external filter needed	
MIL-STD-461F CS116	Input Voltage = 28V, Output Power = 600W, No external filter needed	

2.6 MIL-STD-704 Compliance

Designed to be in compliance for normal and abnormal transients and distortion spectrum. External hold-up circuit optional. **Compliance tests to be performed.**

EMC STANDARD:	TEST CONDITIONS: LINE, LOAD, EXTERNAL FILTER	RESULT:
MIL-STD-704F LDC105 Normal Voltage Transients	Input Voltage = 28V, Output Power = 192W, No external filter needed	
MIL-STD-704F LDC302 Abnormal Voltage Transients	Input Voltage = 28V, Output Power = 192W, No external filter needed	

MIL-STD-704F LDC103 Voltage Distortion Spectrum	Input Voltage = 28V, Output Power = 192W, No external filter needed	
--	---	--

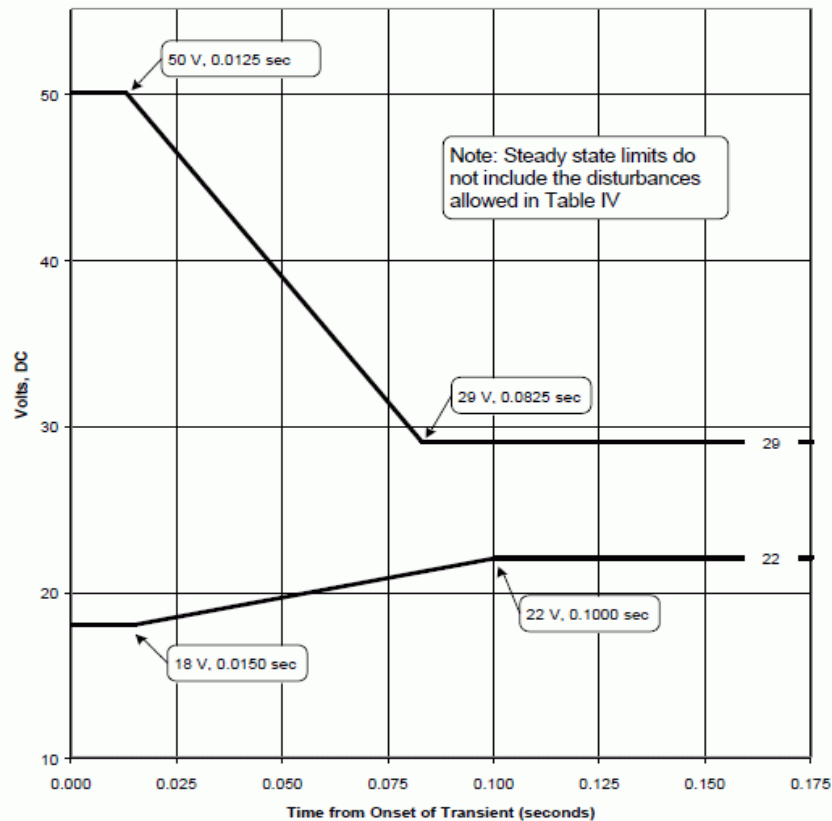


Figure 4: MIL-STD-704F Envelope for normal voltage transients for 28 VDC Systems

2.7 MIL-STD-1275D Compliance

Designed to be in compliance for ripple, surge, & spikes. **Compliance tests to be performed.**

EMC STANDARD:	TEST CONDITIONS: LINE, LOAD, EXTERNAL FILTER	RESULT:
MIL-STD-1275D 5.3.2.2 Exported Voltage Spikes	Input Voltage = 28V, Output Power = 600W, No external filter needed	
MIL-STD-1275D 5.3.2.3 Imported Voltage Spikes	Input Voltage = 28V, Output Power = 600W, No external filter needed, Normal Mode & Generator Mode	
MIL-STD-1275D 5.3.2.4 Imported Voltage Surges	Input Voltage = 28V, Output Power = 600W, No external filter needed, Normal Mode & Generator Mode	

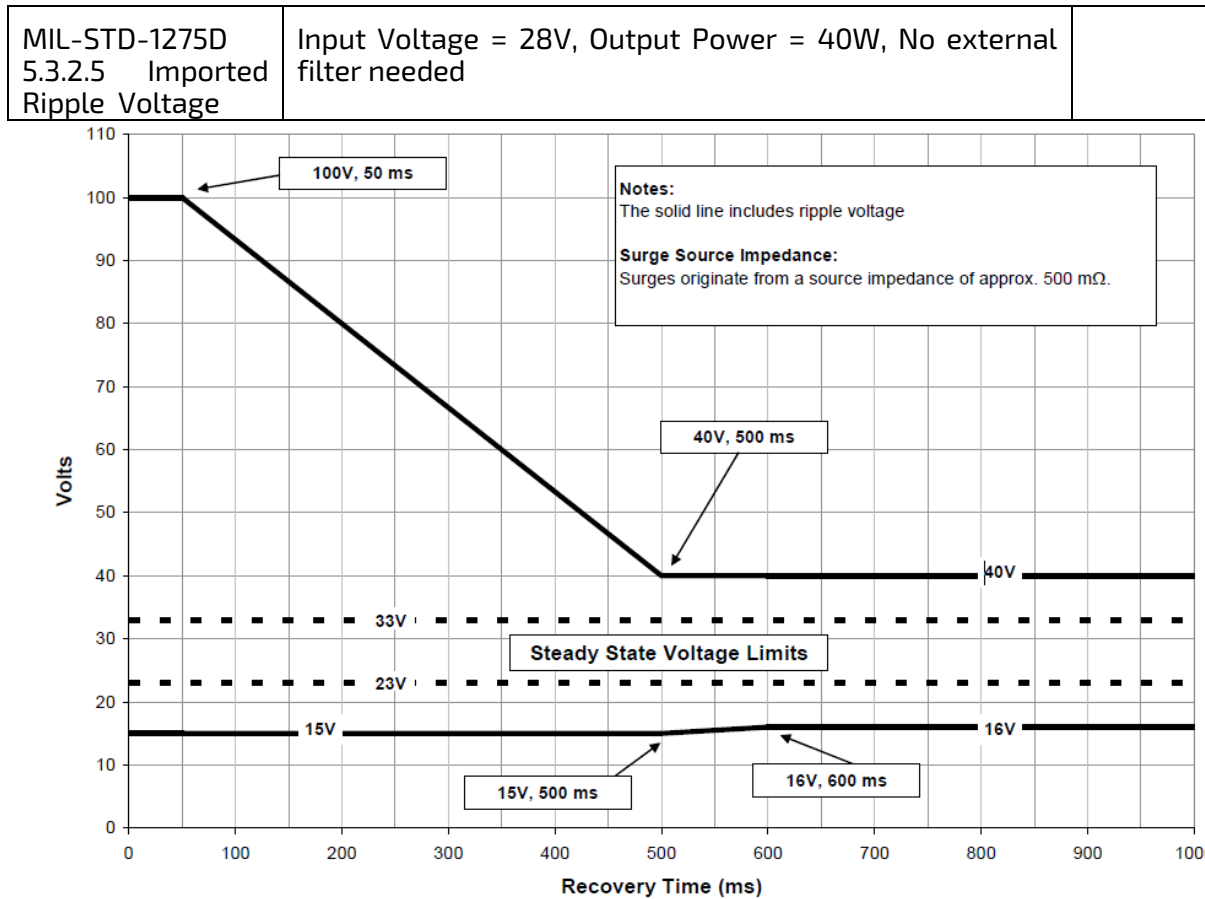


Figure 5: MIL-STD-1275D Envelope of surges in Generator-only Mode for 28 VDC Systems.

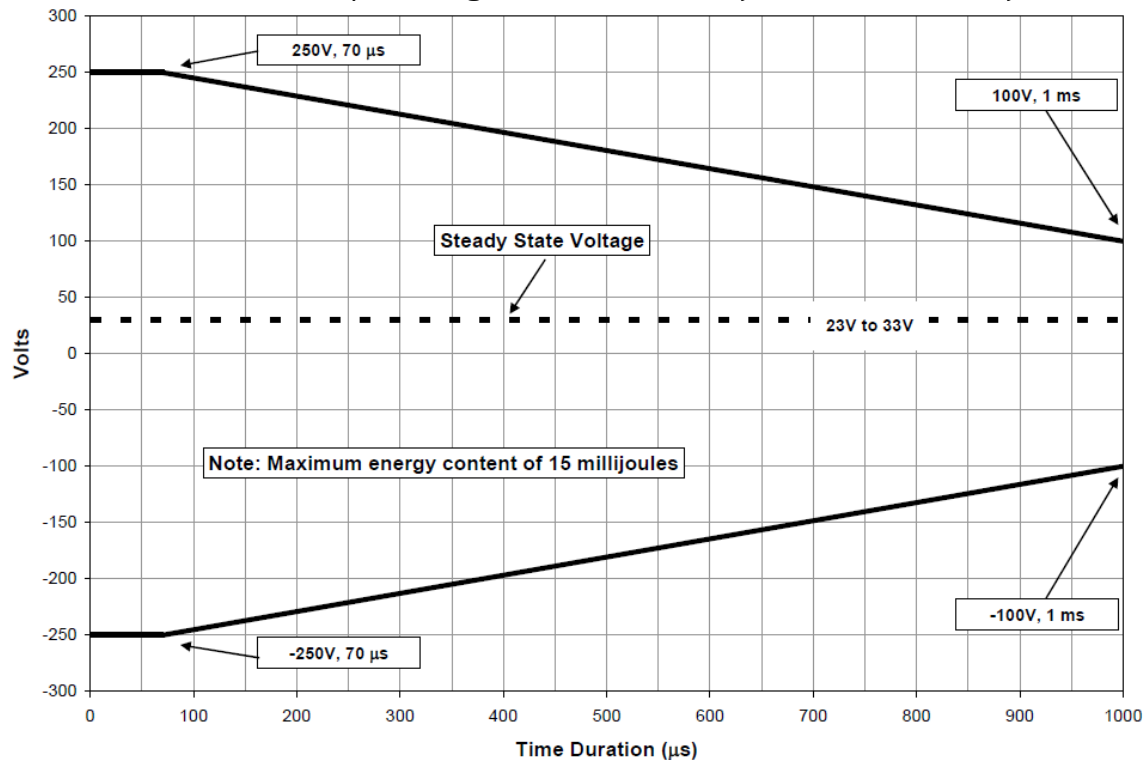
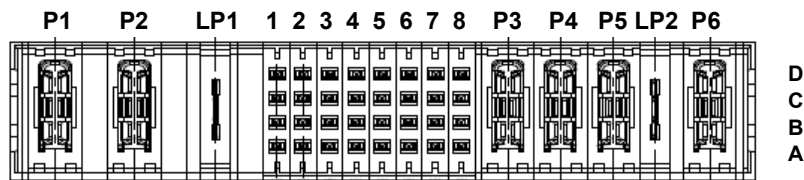


Figure 6: MIL-STD-1275D Envelope of spikes in Generator-only Mode for 28 VDC Systems.

2.8 P0 Connector Pin-Layout (as per VITA62)

P0 (3U)	TE Connectivity	Foxconn
Power Supply	6450849-7	HM811C3-B84F
Backplane	1-6450869-4	HM826B3-B64F



Pin Number	Rated Current (A)	Pin Name
P1	40A	- DC_IN
P2	40A	+ DC_IN
LP1	20A	CHASSIS
A1	<1A	SYNC_OUT
B1	<1A	NVMRO
C1	<1A	GA2*
D1	<1A	Reserved
A2	<1A	VBAT
B2	<1A	FAIL*
C2	<1A	INHIBIT*
D2	<1A	ENABLE*
A3	<1A	UDO: SYNC_IN
B3	<1.5A	Reserved
C3	<1A	NED
D3	<1A	NED_RETURN
A4	<1.5A	Reserved
B4	<1.5A	Reserved
C4	<1.5A	Reserved
D4	<1.5A	Reserved
A5	<1A	GA0*
B5	<1A	GA1*
C5	<1A	SM0 (IPMB-A clock)
D5	<1A	SM1 (IPMB-A data)
A6	<1A	SM2 (IPMB-B clock)
B6	<1A	SM3 (IPMB-B data)
C6	<1.5A	Reserved
D6	<1A	SYSRESET*

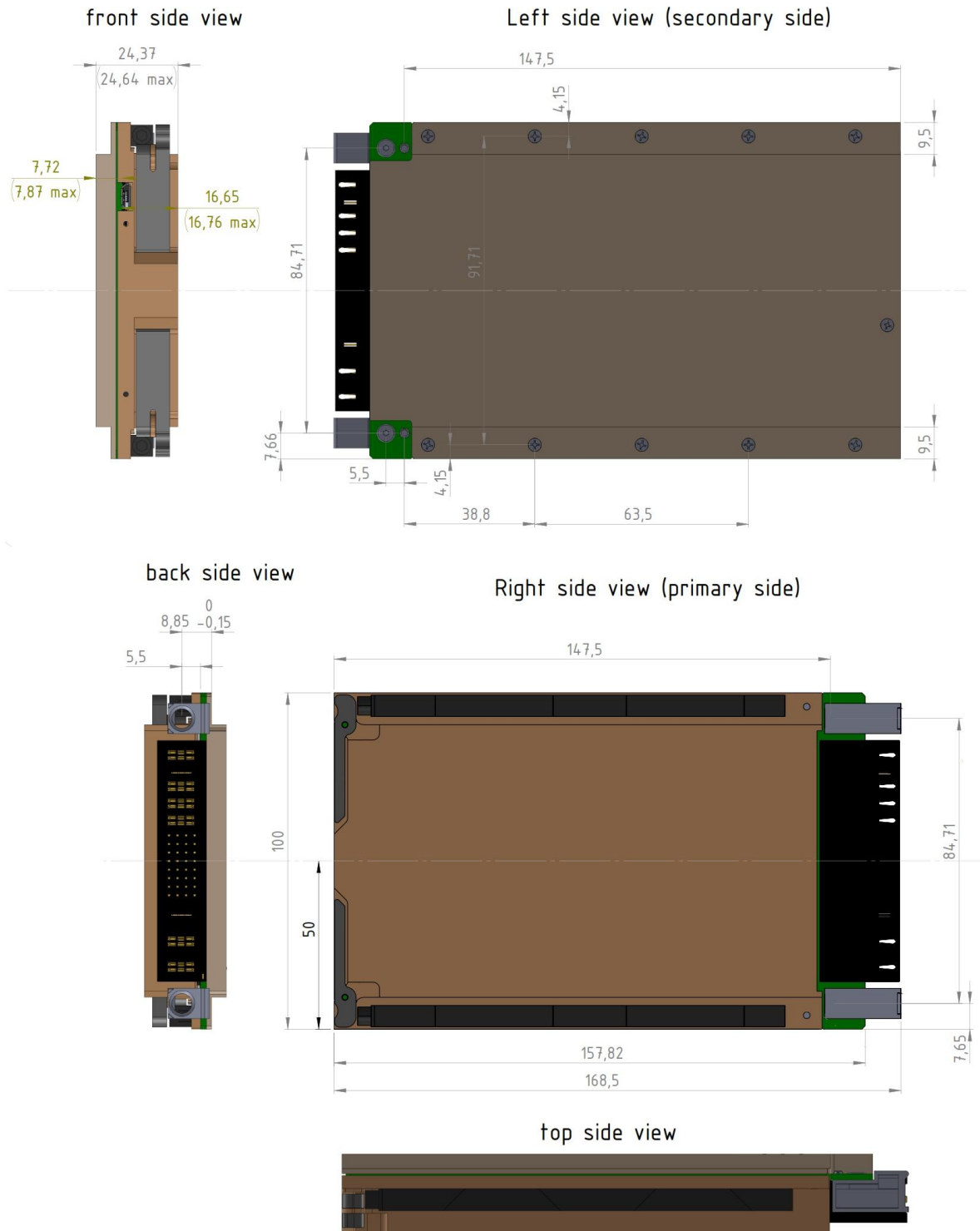
A7	<1A	P01_SHARE (VS1)
B7	<1A	P02_SHARE (VS2)
C7	<1A	P03_SHARE (VS3)
D7	<1A	SIGNAL_RETURN
A8	<1A	P01_SENSE +12VDC (VS1)
B8	<1A	P02_SENSE +3.3V_AUX
C8	<1A	P03_SENSE 12VDC (VS3)
D8	<1A	SENSE_RETURN
P3	40A	P03: +12VDC (VS1)
P4	40A	POWER_RETURN
P5	40A	POWER_RETURN
LP2	20A	P02: +3.3V_AUX
P6	40A	P01: +12VDC (VS1)

2.9 USB Connector & LED Status Indicator

VPX360DMS is outfitted with a USB-C connector. This interface enables communication with a Windows PC running User Software. See section 4.5 of this manual for details on User Software.

VPX360DMS is equipped with a multi-color LED Status Indicator: Flashing GREEN LED indicates that the firmware is running. Solid BLUE LED indicates that the VITA 62 ENABLE* Switch is active (i.e. all outputs are energized). Normal operation is a flashing GREEN LED & Solid BLUE LED on (when ENABLE* active). Contact Kontron HARTMANN-WIENER for support if LED Status indicates otherwise.

3 Mechanical Layout

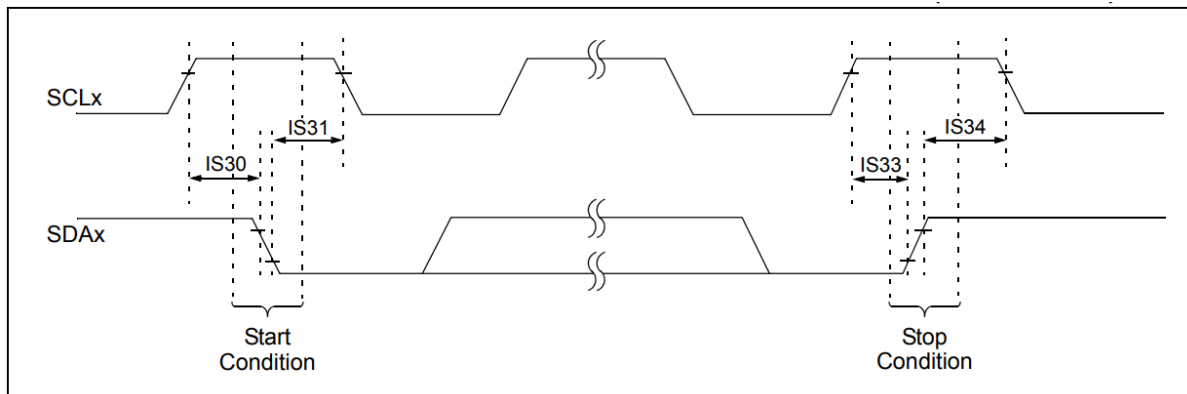


NOTICE: VPX360DMS is a VITA 62 "1.0 PITCH 3U CONDUCTION COOLED PLUG-IN MODULE". See VITA 62 FIGURE A-2 "3U Conduction Cooled Module Layout" for additional mechanical details.

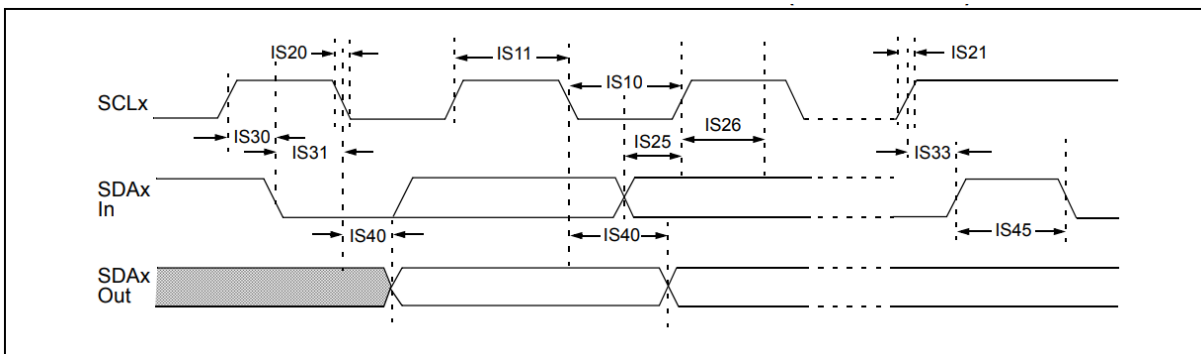
4 I2C Documentation

4.1 Timing

4.1.1 I2C™ BUS START/STOP BITS TIMING CHARACTERISTICS (SLAVE MODE)



4.1.2 I2C™ BUS DATA TIMING CHARACTERISTICS (SLAVE MODE)



4.1.3 I2C™ BUS DATA TIMING REQUIREMENTS (SLAVE MODE)

These parameters are characterized, but not tested in manufacturing.

Characteristic		Min	Max	Units	Conditions
Clock Low Time	100 kHz mode	4.7	-	μs	
	400 kHz mode	1.3	-	μs	

Clock High Time	100 mode	kHz	4.0	-	µs	
	400 mode	kHz	0.6	-	µs	
SDA and SCL Fall Time	100 mode	kHz	-	300	ns	CB is specified to be from 10 to 400pF
	400 mode	kHz	20 + 0.1 CB	300	ns	
SDA and SCL Rise Time	100 mode	kHz	-	100 0	ns	CB is specified to be from 10 to 400pF
	400 mode	kHz	20 + 0.1 CB	300	ns	
Data Input Setup Time	100 mode	kHz	250	-	ns	
	400 mode	kHz	100	-	ns	
Data Input Hold Time	100 mode	kHz	0	-	ns	
	400 mode	kHz	0	0.9	µs	
Start Condition Setup Time	100 mode	kHz	4.7	-	µs	Only relevant for Repeated Start condition
	400 mode	kHz	0.6	-	µs	
Start Condition Hold Time	100 mode	kHz	4.0	-	µs	After this period, the first clock pulse is generated
	400 mode	kHz	0.6	-	µs	
Stop Condition Setup Time	100 mode	kHz	4.7	-	µs	
	400 mode	kHz	0.6	-	µs	
Stop Condition Hold Time	100 mode	kHz	4	-	µs	
	400 mode	kHz	0.6	-	µs	
Output Valid From Clock	100 mode	kHz	0	350 0	ns	
	400 mode	kHz	0	100 0	ns	

Bus Free Time	100 mode	kHz	4.7	-	µs	Time the bus must be free before a new transmission can start
	400 mode	kHz	1.3	-	µs	
Bus Capacitive Loading			-	400	pF	
Pulse Gobbler Delay			65	390	ns	The typical value for this parameter is 130 ns.

5 User Software

MS Windows program with GUI to monitor and control VPX power supply via USB. Note: USB device driver are required.

Features include:

- Global status
- Remote On / Off
- DC-IN status and measured voltage and current
- 2 internal Temperatures
- Voltage, current and status of individual output power modules (all channels)
- setup and diagnostics

Download VPX Tool 2.0.xxxx from <http://file.wiener-d.com/software/VPX/>

6 IPMI Command Support Overview

VITA 46.11 Tier-2 IPMC - Customer Interface Summary

Document status	Interface	Verification basis
Verified customer information	System IPMB	Current firmware and provisioned FRU/SDR profile

Scope. This document lists the IPMI and VITA 46.11 functions accepted or generated by the current IPMC firmware. It also summarizes the customer-visible FRU Inventory and SDR content programmed for the current power-supply profile. The document intentionally excludes implementation-specific source-code and memory-layout details.

6.1 Interface profile

6.2 IPMB addressing

Address source. The IPMB address is derived from the module Hardware Address. Three active-low geographical address inputs, GA0*, GA1* and GA2*, select an offset from 0 to 7. The inputs have internal 10 kOhm pull-ups: an open or high pin represents logical 0, while a grounded or low pin represents logical 1.

Address calculation. GA offset = $((!GA2^*) \ll 2) \mid ((!GA1^*) \ll 1) \mid (!GA0^*)$. Hardware Address = CFG_APP_HWADDRESS_BASE + GA offset. The current firmware uses CFG_APP_HWADDRESS_BASE = 20h, resulting in seven-bit Hardware Addresses 20h through 27h. IPMB Address = Hardware Address x 2 (one-bit left shift).

Item	Current support
Management role	VITA 46.11 Tier-2 IPMC
Command transport	System IPMB, Standard Mode at 100 kHz
IPMB interfaces	One or two interfaces, depending on the product variant
Logical unit	Commands and sensors are provided on LUN 0
FRU scope	One managed Power Supply FRU, FRU Device ID 00h
FRU Inventory	232-byte logical, byte-addressed, read-only inventory area
SDR model	Static, read-only Device SDR repository
Published sensor profile	Device-specific: VPX360DMA publishes 24 sensors; VPX360DMS publishes 18 sensors. Both profiles include 8 VITA management sensors.
System Event Log	Up to 256 standard 16-byte System Event Records with read, reservation, clear, time and overflow support
Event delivery	Platform Event Messages to a configurable Event Receiver
Payload modes	Payload Mode 0 only

GA2*	GA1*	GA0*	GA offset	Hardware address (7-bit)	IPMB write address	I2C read address byte	Site
1	1	1	00h	20h	40h	41h	1

GA2*	GA1*	GA0*	GA offset	Hardware address (7-bit)	IPMB write address	I2C read address byte	Site
1	1	0	01h	21h	42h	43h	2
1	0	1	02h	22h	44h	45h	3
1	0	0	03h	23h	46h	47h	4
0	1	1	04h	24h	48h	49h	5
0	1	0	05h	25h	4Ah	48h	6
0	0	1	06h	26h	4Ch	4Dh	7
0	0	0	07h	27h	4Eh	4Fh	8

Example: GA2* = Low, GA1* = High and GA0* = High produces offset 04h, Hardware Address 24h, IPMB Address 48h and physical Site Number 5. The seven-bit Hardware Address is programmed into the I2C slave address register; IPMI message address fields use the eight-bit IPMB write-address form.

6.3 Customer-visible FRU Inventory content

Access model: The FRU Inventory is available through FRU Device ID 00h. Reads are segmented when required; the firmware returns up to 23 FRU data bytes per transaction. The complete inventory is write-protected.

Area	Customer-visible fields	Current profile and limitations
Common Header	Format version, area offsets and checksum	Board Information and Product Information areas are present. Internal Use, Chassis Information and MultiRecord areas are not populated.
Board Information	Manufacturer; board product name; board serial number; board part number; manufacturing date/time	English-language text fields. The manufacturing timestamp is the UTC time at which the FRU image is generated for programming. Board FRU File ID is empty.
Product Information	Manufacturer; product name; part/model number; product version; product serial number	Product Name and Part/Model Number currently both use the configured part number. Product Version is currently "1.0". Asset Tag and Product FRU File ID are empty.
Data integrity	Area lengths, padding and checksums	Generated automatically by the provisioning software. The resulting image must fit within the 232-byte logical inventory area.

6.3.1 FRU command behavior

Command	Behavior
Get FRU Inventory Area Info	Reports a 232-byte, byte-addressed inventory area for FRU Device ID 00h.
Read FRU Data	Supports segmented reads of up to 23 data bytes per transaction.
Write FRU Data	Performs request validation but returns the write-protected indication; no inventory bytes are modified.

6.4 Published sensor profiles

Sensor access. All sensors are published as Full Sensor Records in the static Device SDR repository on LUN 0. Management software should discover the sensor list and conversion parameters from the SDRs instead of assuming fixed scaling values. Get Sensor Reading returns the current value or discrete state; Get Sensor Thresholds applies to threshold-based measurement sensors.

6.4.1 Sensor properties and event behavior

Sensor group	Numbers	Reading model	Properties
VITA management sensors	00h-07h	Discrete	Operational state, IPMB link, health summaries and payload status. These sensors report states rather than physical numeric values.
Voltage sensors	Device-specific	Analog threshold	Two's-complement reading with voltage units and SDR conversion factors. Lower and upper non-recoverable thresholds are taken from the configured device limits.
Current sensors	Device-specific	Analog threshold	Two's-complement reading with current units and SDR conversion factors. An upper non-recoverable threshold is provided; the lower limit is 0 A.
Temperature sensors	Device-specific	Analog threshold	Two's-complement reading in degrees Celsius. The upper non-recoverable threshold follows the configured temperature limit; the lower non-recoverable threshold is -40 degrees C.
Event control	All event-capable sensors	Configurable	Scanning and event generation can be queried and controlled with Get/Set Sensor Event Enable, limited to the event masks advertised by the SDR.

6.4.2 VPX360DMS sensor list

Source profile: VPX360DMS.defaultSensorTable in VPX3360DMS_IPMI_Data.cs. Total published sensors: 18.

Sensor number	Published SDR name	Type / direction	Properties and customer use
00h (0)	FRU State	Discrete VITA state	FRU operational state M0 through M7; the current state is represented by its active discrete offset.
01h (1)	FRU IPMB LINK	Discrete VITA link state	Reports IPMB-A and IPMB-B enabled/isolated states and supports assertion/deassertion events for the advertised link offsets.
02h (2)	FRU Health	Discrete summary health	Healthy/fault summary for the managed FRU; fault assertion and recovery deassertion are event-capable.
03h (3)	FRU Voltage	Discrete summary voltage	Indicates whether the FRU voltage condition is within range or faulty; this is a summary sensor, not a numeric voltage reading.
04h (4)	FRU Temperature	Discrete summary thermal	Reports the FRU thermal warning/fault state, including the upper critical state used by the current profile.
05h (5)	FRU PL. Res	Discrete payload test result	Reports the payload test result state.
06h (6)	FRU PL. Stat	Discrete payload test status	Reports whether the payload test status is active/available according to the advertised discrete state.
07h (7)	FRU PL. Mode	Discrete payload mode	Reports the selected payload mode. The current firmware supports Payload Mode 0 only.
08h (8)	Input Voltage	Analog voltage - input	Threshold-based; lower and upper non-recoverable limits from the device configuration.
09h (9)	Input Current	Analog current - input	Threshold-based; upper non-recoverable limit, with lower limit 0 A.
0Ah (10)	VS1 12V [V]	Analog voltage - output	First 12 V output voltage; lower and upper non-recoverable limits.
0Bh (11)	VS1 12V [A]	Analog current - output	First 12 V output current; upper non-recoverable limit.
0Ch (12)	VS2 3.3VAUX [V]	Analog voltage - output	3.3 V auxiliary output voltage; lower and upper non-recoverable limits.
0Dh (13)	VS2 3.3VAUX [A]	Analog current - output	3.3 V auxiliary output current; upper non-recoverable limit.
0Eh (14)	VS3 12V [V]	Analog voltage - output	Second 12 V output voltage; lower and upper non-recoverable limits.
0Fh (15)	VS3 12V [A]	Analog current - output	Second 12 V output current; upper non-recoverable limit.
10h (16)	Board Temp	Analog temperature	Board temperature; upper non-recoverable configured limit and lower non-recoverable limit of -40 degrees C.
11h (17)	Micro Temp	Analog temperature	Controller temperature; upper non-recoverable configured limit and lower non-recoverable limit of -40 degrees C.

6.5 Recommended integration sequence

- **Discover the IPMC:** Use Get Device ID and Get VSO Capabilities.
- **Identify the FRU and SDRs:** Use Get FRU Address Info, Get Device Locator Record ID, Get Device SDR Info and Get Device SDR.
- **Read inventory and sensors:** Use the FRU Inventory commands and Get Sensor Reading / Get Sensor Type / Get Sensor Thresholds.
- **Configure event delivery:** Set the Event Receiver, then configure sensor event enable states where required.
- **Read or clear the event log:** Use Get SEL Info, Reserve SEL and Get SEL Entry. Clear SEL requires a reservation and initiate/status polling. Set SEL Time during system initialization.
- **Control the payload:** Use the VITA FRU policy, activation and payload-mode commands within the valid operational state.

Supported	Conditional	Read-only	Generated
-----------	-------------	-----------	-----------

6.6 Supported IPMI commands

Summary: 37 incoming commands are recognized across the Application, Sensor/Event, Storage and VITA Group Extension network functions. In addition, the IPMC generates Platform Event Messages.6.1 Application commands

[Request NetFn 06h](#) / [Response NetFn 07h](#)

6.6.1 Application commands

Cmd	Command	Customer use	Support and limitations
01h	Get Device ID	Discovers the controller and returns device, firmware, manufacturer, product and capability information.	Supported. No command-specific restriction beyond the standard request format.
02h	Cold Reset	Restarts the IPMC management functions and restores power-up defaults.	Conditional. IPMB communication is temporarily interrupted. Use only during controlled service or recovery procedures.
04h	Get Self Test Results	Reads the controller's reported self-test status.	Conditional. The current implementation reports that no self-test was performed; the command does not start an active diagnostic test.

6.6.2 Sensor and event commands

Request NetFn 04h / Response NetFn 05h

Cmd	Command	Customer use	Support and limitations
00h	Set Event Receiver	Configures the IPMB address and LUN that receive Platform Event Messages.	Conditional. Address FFh disables event transmission. Setting a receiver globally re-arms sensors and can cause currently active assertions to be reported again.
01h	Get Event Receiver	Returns the currently configured Event Receiver address and LUN.	Supported. When event delivery is disabled, the disabled receiver value is returned.
20h	Get Device SDR Info	Returns the number of available sensor records and the SDR population type.	Supported. The repository is static and all sensors are exposed on LUN 0.
21h	Get Device SDR	Reads Device SDR records for controller and sensor discovery.	Conditional. Large records must be read in segments Up to 22 record bytes are returned per transaction; a valid reservation is required for reads starting at a non-zero offset.
22h	Reserve Device SDR Repository	Creates an SDR reservation for segmented record access.	Supported. Used for partial reads. The Device SDR repository is read-only and cannot be updated through IPMI.
27h	Get Sensor Thresholds	Reads the threshold values advertised for a sensor.	Conditional. Valid only for threshold-based sensors with readable thresholds. Threshold programming is not supported.
28h	Set Sensor Event Enable	Enables or disables sensor scanning, complete-sensor event delivery or individual event masks.	Conditional. Only event bits advertised by the sensor's SDR are accepted. Individual event control is available only where the SDR capability permits it.
29h	Get Sensor Event Enable	Returns the effective scanning and event-enable state for a sensor.	Supported. Event-mask bytes can be omitted when event messaging is disabled, as permitted by IPMI.
2Dh	Get Sensor Reading	Reads current analog values or discrete states from published sensors.	Conditional. Only sensor numbers published in the SDR repository are valid. The available sensor set can differ by product profile.
2Fh	Get Sensor Type	Returns the sensor type and event/reading type for a published sensor.	Conditional. Only sensor numbers published in the SDR repository are valid.

6.6.3 Storage, FRU and SEL commands

Request NetFn 0Ah / Response NetFn 0Bh

Cmd	Command	Customer use	Support and limitations
10h	Get FRU Inventory Area Info	Returns the size and access method of the FRU Inventory Area.	Conditional. Only FRU Device ID 00h is implemented. The area is 232 bytes and is accessed by bytes.
11h	Read FRU Data	Reads board and product inventory data.	Conditional. Only FRU Device ID 00h is available. Up to 23 FRU data bytes are returned per transaction; larger reads must be segmented.
12h	Write FRU Data	Provides standards-compatible handling of FRU write requests.	Read-only. The complete FRU Inventory Area is write-protected. The response reports a write-protected offset and zero bytes written.
40h	Get SEL Info	Returns SEL version, record count, free space, timestamps, supported operations and overflow state.	Read-only. The log stores up to 256 standard System Event Records. Remote add, partial-add and delete operations are not provided.
42h	Reserve SEL	Creates a reservation for reservation-restricted SEL access.	Supported. Used for partial record reads and Clear SEL.
43h	Get SEL Entry	Reads complete or partial 16-byte event records and returns the next record ID.	Conditional. Record ID 0000h selects the first record and FFFFh selects the last. Partial reads from a non-zero offset require a valid reservation.
47h	Clear SEL	Erases all stored System Event Log records.	Conditional. Requires a valid reservation and the standard CLR signature. Erase is asynchronous: initiate the clear, then poll its status. SEL access can report erase-in-progress while the operation is active.
48h	Get SEL Time	Reads the current IPMI timestamp maintained for event logging.	Supported. Returned in standard IPMI timestamp format.
49h	Set SEL Time	Sets the timestamp used for subsequent event logging.	Conditional. Only valid absolute IPMI timestamps are accepted. Relative, uninitialized and reserved timestamp values are rejected.

6.6.4 VITA 46.11 Group Extension commands

Request NetFn 2Ch / Response NetFn 2Dh; VSO Identifier 03h

Cmd	Command	Customer use	Support and limitations
00h	Get VSO Capabilities	Discovers VITA 46.11 tier, IPMB and FRU capabilities.	Supported. Uses VSO Identifier 03h. Reports Tier-2 behavior, Standard Mode IPMB and the single managed FRU.
04h	FRU Control	Requests a basic control operation for the managed FRU.	Conditional. Only the Cold Reset control option is supported. Warm reset, graceful reboot and diagnostic interrupt options are not implemented.
09h	Set IPMB State	Places available System IPMB interfaces under local control or isolates an interface.	Conditional. Only the bused System IPMB and 100 kHz Standard Mode are supported. The command cannot isolate all interfaces or remove the last validated communication path. FAST-MODE requests are rejected.
0Ah	Set FRU State Policy Bits	Changes activation and deactivation policy for the managed FRU.	Conditional. Only defined policy bits for FRU 00h are accepted. Some changes are rejected when they conflict with the current operational state.
0Bh	Get FRU State Policy Bits	Returns the current activation and deactivation policy.	Supported. Available for FRU Device ID 00h only.
0Ch	Set FRU Activation	Requests activation or deactivation of the payload.	Conditional. Available for FRU Device ID 00h only. Requests are accepted only in valid operational states and can be rejected when a transition is locked, unsafe or already in progress.
0Dh	Get Device Locator Record ID	Returns the SDR record ID that identifies the IPMC.	Supported. Available for FRU Device ID 00h only.
1Eh	FRU Control Capabilities	Reports the FRU control operations supported by the controller.	Supported. The advertised capability is Cold Reset only.
40h	Get FRU Address Info	Returns the derived seven-bit Hardware Address, eight-bit IPMB Address, FRU ID and physical site information.	Conditional. The address is derived from active-low GA0*/GA1*/GA2* and CFG_APP_HWADDRESS_BASE = 20h. Physical-address keying is supported; IPMI Channel 7 addressing is not available.
44h	Get Mandatory Sensor Numbers	Returns the sensor-number mapping used for the VITA-defined FRU sensors.	Supported. Available for FRU Device ID 00h. The reserved external-standard sensor entry is returned as not supported.
46h	Get Payload Mode Capabilities	Returns the payload operating modes supported by the FRU.	Supported. Payload Mode 0 is the only advertised mode.
47h	Set Payload Mode	Selects the active payload operating mode.	Conditional. Only Payload Mode 0 is accepted; all other mode values are rejected.
4Bh	Get Power Supply Capabilities	Reports the power-supply status and protection fields available through VITA 46.11.	Supported. Reports inhibit, fail, overtemperature-protection and input-voltage-fault status. Fault-latch configuration is fixed and self-protect bypass is not supported.

Cmd	Command	Customer use	Support and limitations
4Ch	Get Power Supply Status	Reads the current power-supply signal and protection status.	Supported. Protection status can include latched overtemperature and input-voltage faults.
4Dh	Set Power Supply Status	Applies the supported remote power-supply status controls.	Conditional. Latch mode must remain enabled. Self-protect bypass is not supported, inhibit is status-only, and active overtemperature or input-voltage fault latches cannot be cleared through this command. The supported fail indication can be controlled.

6.6.5 Controller-generated event command

Generated request NetFn 04h / received response NetFn 05h

Cmd	Command	Customer use	Support and limitations
02h	Platform Event Message	Reports sensor assertions and deassertions to the configured Event Receiver.	Generated. Generated with Sensor/Event NetFn 04h; the controller processes the corresponding NetFn 05h response. Event delivery requires a configured receiver and successful command completion.

6.7 Common completion codes

Code	Meaning in this interface
00h	Command completed normally
80h	FRU write-protected offset
81h	SEL erase is in progress
C0h	Node busy; retry after the current operation completes
C1h	Command not supported
C5h	Reservation invalid or cancelled
C7h	Request data length invalid
C9h	Parameter out of range
CAh	Requested byte count cannot be returned in one response
CBh	Requested sensor, record or data is not present
CCh	Invalid data field in the request
CDh	Command is not applicable to the selected sensor or object
D5h	Command is not supported in the current operational state

6.8 Notable functions not exposed

- IPMI LAN, RMCP+, session, user-management, Serial-over-LAN, chassis and watchdog command sets
- FRU LED control and fan-control commands
- Get IPMB Link Info
- Get Sensor Reading Factors, Get Sensor Hysteresis, Re-arm Sensor Events and Get Sensor Event Status
- Set Sensor Thresholds and SDR repository modification/update commands
- Get SEL Allocation Info, Add SEL Entry, Partial Add SEL Entry and Delete SEL Entry
- Writable FRU Inventory and the VITA FRU inventory lock/write command set
- 400 kHz System IPMB FAST-MODE
- Payload modes other than Mode 0

6.9 Reference basis

1. Intelligent Platform Management Interface Specification, Second Generation, Version 2.0, Revision 1.0.
2. ANSI/VITA 46.11-2022, System Management on VPX.
3. Current product firmware command interface and provisioned FRU/SDR profile.