VPX

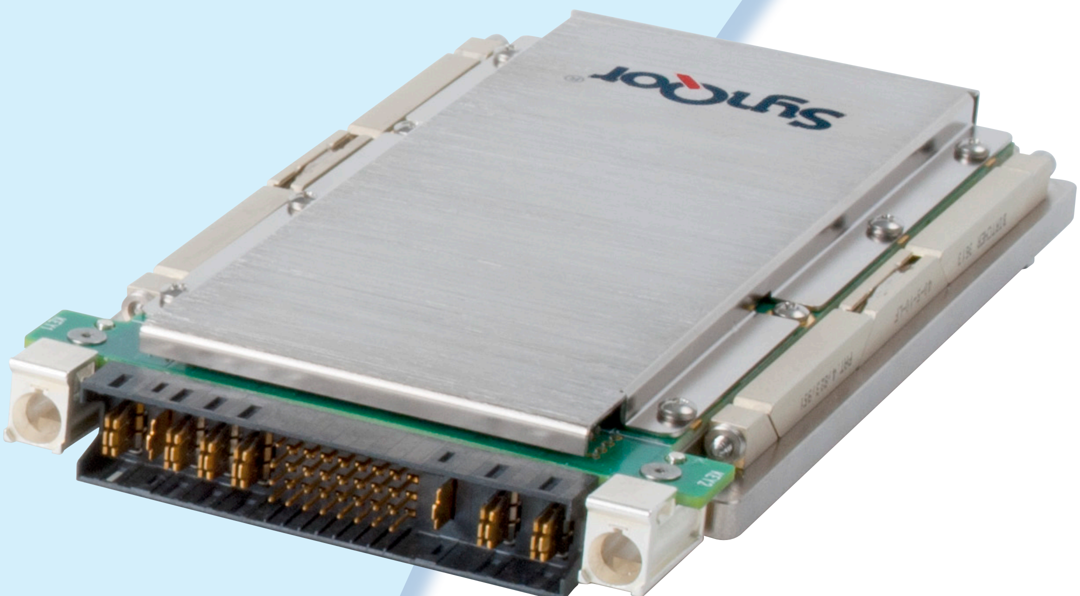
Operator's Guide
VPX 3U I2C

MILITARY GRADE VITA 62 COMPLIANT POWER SUPPLY









VPX 3U I2C

Made in USA

SynQor®

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1 Overview

The SynQor 3U VPX power supply modules have optional I²C capability that provides the ability for the user to query the status of the power supply. The VPX power supply allows the user to monitor input voltage, current and power status; output voltage for each output rails; output current and power status for VS1, VS2 and VS3 outputs and three temperature readings at each card edge and middle of the VPX chassis.

The VPX I²C communication supports both PMBus and IPMI interfaces and complies with VITA 46.11 specification. The VPX dynamically identifies which interface is being used based on the incoming data structure without the need of any additional setup.

2 I²C Configurations

The system management buses SM[3:0] represent the physical lines used for I²C communications. The VPX uses SM[1:0] for the primary I²C bus, and SM[3:2] for the redundant I²C bus. The pin definitions are shown below.

Pin Number	Pin Name	Description
C5	SM0	Primary I²C Clock Line
D5	SM1	Primary I²C Data Line
A6	SM2	Redundant I²C Clock Line
B6	SM3	Redundant I²C Data Line

Table A: VPX 3U I²C Pin Definitions

The primary I²C and redundant I²C buses are identical in their functionalities, but operate independently. For example, the primary I²C bus can be configured to run PMBus interface, and redundant I²C bus configured for IPMI interface at the same time. Both primary and redundant I²C buses have the same I²C address described below. External pull-up resistors on the backplane are required. Pull-up voltage should be 3.3V. The I²C communication is configured for 100 kHz operation.

3 I²C Addressing

The I²C address is 7-bit and configured using Geographical Addressing pins defined by VITA 46.11. GA1* (Pin B5) and GA0* (Pin A5) provide the LSBs of the 7-bit numeric field. GA[1:0]* pins have internal pull-up resistors of 10 kΩ to 3.3V. The I²C address assignment table is shown below. The IPMB address is defined by VITA 46.11 for communication over IPMI interface. The IPMB address is determined by multiplying its 7-bit I²C address by 2, to derive an 8-bit IPMB address.

Geographical Pins		I^2C Address	IPMB Address
GA1*	GA0*		
U	U	20h	40h
U	G	21h	42h
G	U	22h	44h
G	G	23h	46h

Notes:
U = Unconnected
G = Biased to Ground on the Backplane

Table B: I^2C Address Assignment Table

4 PMBus Interface

4.1 PMBus Data Format

Measurement data transmitted on the PMBus uses DIRECT data format defined by the PMBus specification. DIRECT format data is a two byte, two's complement binary integer. Low byte of data is transmitted first.

The user system should use the following equation to convert the value received from the VPX module into a reading of volts, amperes, watts, degrees Celcius:

$$X = \frac{1}{m}(Y * 10^{-R} - b)$$

Where:

X, is the calculated, "real world" value in the appropriate units (A, V, W, °C);

m, the slope coefficient, is a two byte, two's complement integer;

Y, is a two byte two's complement integer received from the VPX module;

b, the offset, is a two byte, two's complement integer;

R, the exponent, is a one byte, two's complement integer.

4.2 PMBus Coefficients

The table below provides the coefficients used for conversion and some examples.

<table>
<tr><th rowspan="3" colspan="2">Parameter</th><th colspan="3">Conversion Coefficients</th><th colspan="3">Examples</th><th rowspan="3">Note</th></tr>
<tr><th rowspan="2">m</th><th rowspan="2">b</th><th rowspan="2">R</th><th rowspan="2">X</th><th colspan="2">Y</th></tr>
<tr><th>Decimal</th><th>Hex</th></tr>
<tr><td rowspan="3">Input Voltage</td><td>28V/48V Model</td><td>100</td><td>0</td><td>0</td><td>28 V</td><td>2800</td><td>0AF0h</td><td>10 mV/bit</td></tr>
<tr><td>270V Model</td><td>10</td><td>0</td><td>0</td><td>270 V</td><td>2700</td><td>0A8Ch</td><td>0.1 V/bit</td></tr>
<tr><td>AC Model</td><td>1</td><td>0</td><td>0</td><td>115 Vrms</td><td>115</td><td>0073h</td><td>1 V/bit</td></tr>
<tr><td rowspan="2" colspan="2">Output Voltage</td><td rowspan="2">100</td><td rowspan="2">0</td><td rowspan="2">0</td><td>12 V</td><td>1200</td><td>04B0h</td><td rowspan="2">10 mV/bit</td></tr>
<tr><td>-12 V</td><td>-1200</td><td>FB50h</td></tr>
<tr><td rowspan="3">Input Current</td><td>28V/48V Model</td><td>100</td><td>0</td><td>0</td><td>30 A</td><td>3000</td><td>0BB8h</td><td>10 mA/bit</td></tr>
<tr><td>270V Model</td><td>1000</td><td>0</td><td>0</td><td>1.5 A</td><td>1500</td><td>05DCh</td><td>1 mA/bit</td></tr>
<tr><td>AC Model</td><td>1000</td><td>0</td><td>0</td><td>2.0 Arms</td><td>2000</td><td>07D0h</td><td>1 mArms/bit</td></tr>
<tr><td colspan="2">Output Current</td><td>100</td><td>0</td><td>0</td><td>30 A</td><td>3000</td><td>0BB8h</td><td>10 mA/bit</td></tr>
<tr><td colspan="2">Power</td><td>1</td><td>0</td><td>0</td><td>500 W</td><td>500</td><td>01F4h</td><td>1 W/bit</td></tr>
<tr><td rowspan="2" colspan="2">Temperature</td><td rowspan="2">10</td><td rowspan="2">0</td><td rowspan="2">0</td><td>85 °C</td><td>850</td><td>0352h</td><td rowspan="2">0.1 °C/bit</td></tr>
<tr><td>-40 °C</td><td>-400</td><td>FE70h</td></tr>
</table>

Table C: PMBus Coefficients Table

The above **m**, **b** and **R** coefficients can also be retrieved using the *COEFFICIENTS* command. This command uses Block Write-Block Read Process Call as described in the SMBus specification.

4.3 PMBus Packet Error Checking

The PMBus interface implemented on SynQor VPX modules supports the standard packet error checking scheme defined by the PMBus specification. The response data generated by the VPX module will contain a Packet Error Code (PEC) if requested from the host. For any Write command from the host, the VPX module will check PEC to validate the message first. A command message from the host will be disregarded if it contains a PEC that does not match the data received. A Write command will be processed if the message from the host does not contain a PEC.

The PEC uses an 8-bit cyclic redundancy check (CRC-8) represented by the polynomial, $C(x) = x^8 + x^2 + x^1 + 1$ and must be calculated in the order of bits as received. The PEC calculation includes all bytes in the transmission, including address, command and data. The PEC calculation does not include ACK, NACK, START, STOP nor Repeated START bits. This means that the PEC is computed over the entire message from the first START condition.

4.4 PMBus Page Access

The write PAGE command allows the user to select a specific output to query. When a read command is transmitted to the VPX module such as READ_VOUT and READ_IOUT, the VPX module will return the measurement information based on the selected page. The module will return FFFFh if a valid page is not selected or if the command is not supported by the current page. The user could also use read PAGE command to retrieve the current page information. The page description of the VPX 3U power supply module is shown below.

PAGE	Description
00h	Not used, default value on power on
01h	VS1 (+12V) voltage, current, power
02h	VS2 (+3.3V) voltage, current, power
03h	VS3 (+5V) voltage, current, power
04h	+3.3V auxiliary voltage
05h	+12V auxiliary voltage
06h	-12V auxiliary voltage
07h – FFh	Not used

Table D: PMBus Page Description

4.5 Supported PMBus Command List

The following table provides a list of supported PMBus commands by the SynQor VPX 3U module.

Command Code	Command Name	Type	Number of Data Bytes	Description
00h	PAGE	R/W Byte	1	Allows user to set or read the page for any commands that require page selection.
30h	COEFFICIENTS	Block Write-Block Read	See PMBus	Retrieve coefficients for data conversion.
88h	READ_VIN	Read Word	2	Read input voltage.
89h	READ_IIN	Read Word	2	Read input current.
8Bh	READ_VOUT	Read Word	2	Read output voltage for the selected page. Page number between 01h – 06h must be selected.
8Ch	READ_IOUT	Read Word	2	Read output current for the selected page. Page number between 01h – 03h must be selected.
8Dh	READ_TEMPERATURE_1	Read Word	2	Read temperature at card edge towards pin P6.
8Eh	READ_TEMPERATURE_2	Read Word	2	Read temperature at card edge towards pin P1. **Not available on 3U AC Model.**
8Fh	READ_TEMPERATURE_3	Read Word	2	Read temperature at middle of the chassis. **Not available on 3U AC Model.**
96h	READ_POUT	Read Word	2	Read output power for the selected page. Page number between 01h – 03h must be selected.

97h	READ_PIN	Read Word	2	Read input power.
D0	READ_TIMER	Block Read	6	OEM command – read module operating time.
D1	READ_FIRMWARE	Read Word	2	Read firmware information. (Note 1)
D2	READ_SERIAL_NUMBER	Block Read	Module Dependent	Read VPX serial number. (Note 1)
D3	READ_PART_NUMBER	Block Read	Module Dependent	Read VPX part number. (Note 1)
FEh	COMMAND_EXT	Extended Command	0 or 1	OEM extended write byte command. (Note 2)

Note 1: Commands not available on systems built prior to date code 2118. Consult factory for more detail.
Note 2: For Latch_Off command, using data byte to set or clear latch off is not supported on systems built prior to date code 2118. Consult factory for more detail.

Table E: PMBus Supported Commands

4.6 SynQor Specific PMBus Commands

4.6.1 READ_TIMER

READ_TIMER is a SynQor defined Block Read PMBus command. It allows the user to retrieve a timer value that shows how long the module has been operating. This is a volatile time that increment when input voltage is applied, regardless of whether outputs are enabled or not. It will reset upon removing of the input voltage.

The command code for READ_TIMER is D0h. Upon receiving this command, the VPX module will transmit six data bytes followed by PEC. The data description and an example of 1 Day, 6 Hours, 32 Minutes, 22 Seconds in operation are shown below.

Data Byte	Example	Description
1	05h	The first data byte will always be 05h, indicating there are five data byte following
2	16h	**Seconds**, a value between 0 and 59 will be shown here
3	20h	**Minutes**, a value between 0 and 59 will be shown here
4	06h	**Hours**, a value between 0 and 23 will be shown here
5	01h	Low data byte of **Days**
6	00h	High data byte of **Days**

Table F: READ_TIMER Command

4.6.2 READ_FIRMWARE

READ_FIRMWARE command allows the user to retrieve the VPX module firmware information. The command code for READ_FIRMWARE is D1h. Upon receiving this command, the VPX module will transmit two data bytes followed by PEC. The first data byte indicates the product family; the second data byte indicates the firmware revision on the module.

Data Byte	Example	Description
1	03h	The first data byte indicates the product family of the 3U VPX power supply: 01h: VPX-3U-DC28P-xxx 02h: VPX-3U-DC270P-001 03h: VPX-3U-DC48P-001 04h: VPX-3U-ACUNV-1-C/CH-001 05h: VPX-3U-ACUNV-1-C-N01
2	01h	Firmware revision on the VPX module, 01h indicates revision 01.

Table G: READ_FIRMWARE Command

4.6.3 READ_SERIAL_NUMBER

READ_SERIAL_NUMBER command (D2h) allows the user to retrieve the VPX module serial number. The command uses the Block Read syntax. The first byte of the response from the VPX indicates how many data bytes will be transmitted. The VPX module will then transmit a string of data in hexadecimal, which can be then converted to ASCII to reconstruct its serial number. For example, if the VPX serial number is "S12345678", the corresponding data bytes will be "53h 31h 32h 33h 34h 35h 36h 37h 38h". They will then be followed by PEC to end the transmission.

Data Byte	Example	Description
1	09h	09h indicates there are nine data bytes following
2 - 10	53h 31h 32h 33h 34h 35h 36h 37h 38h	Hexadecimal for S12345678

Table H: READ_SERIAL_NUMBER Command

4.6.4 READ_PART_NUMBER

READ_PART_NUMBER command (D3h) allows the user to retrieve the VPX module part number. An example part number can be "VPX-3U-DC48P-001-SN2". Similar to the READ_SERIAL_NUMBER command, the READ_PART_NUMBER command also uses Block Read syntax. The data transmitted is the hexadecimal conversion of the part number in ASCII code, including the "-"symbol. For example, the above part number in hexadecimal will be "56h 50h 58h 2Dh 33h 55h 2Dh 44h 43h 34h 38h 50h 2Dh 30h 30h 31h 2Dh 53h 4Eh 32h".

Data Byte	Example	Description
1	14h	20 in decimal, it indicates there are twenty data bytes following
2 - 21	56h 50h 58h 2Dh 36h 55h 2Dh 44h 43h 34h 38h 50h 2Dh 30h 30h 31h 2Dh 53h 4Eh 32h	Hexadecimal for VPX-3U-DC48P-001-SN2

Table I: READ_PART_NUMBER Command

4.6.5 COMMAND_EXT

The COMMAND_EXT (FEh) defines SynQor OEM write byte commands. The command code following the COMMAND_EXT (FEh) is the command to be executed by the VPX module, such as 01h. The supported OEM commands are listed below.

Command	Action	Description
01h	Latch Off	The user can issue a latch-off command to the VPX module. Upon receiving this command, the VPX module will permanently disable all the output voltages until either input voltage is removed and re-applied; or a latch-off clear command is received by the VPX module through I^2C interface.

Table J: SynQor Extended Command

4.6.5.1 LATCH_OFF

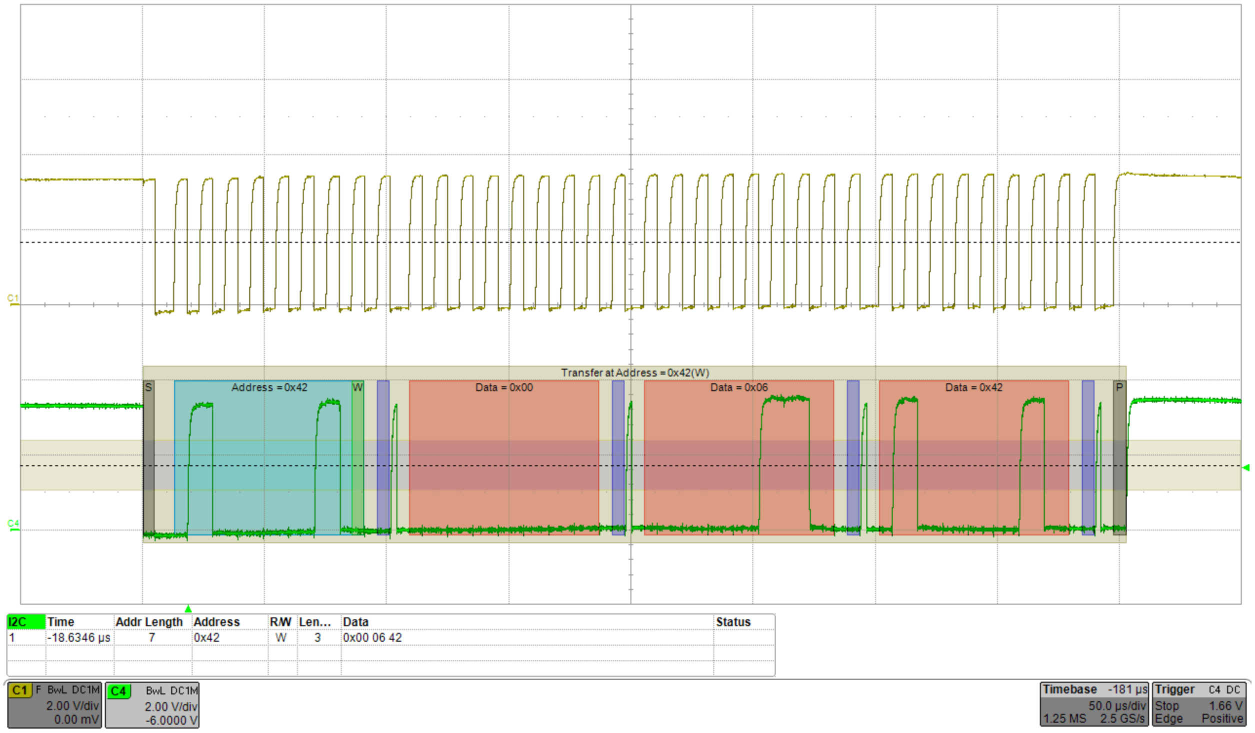
The data byte following the LATCH_OFF command is optional. If no data byte is sent, the VPX module will latch off its outputs. However, if a data byte is sent by the user, it must be either 01h: set the VPX module to the latch-off state; or 00h – clear the latch-off state, VPX will resume normal operation. Data received other than 01h or 00h will be ignored. PEC is also optional.

If PEC is sent by the user, the VPX module will verify its validity before processing the command. If no PEC is received, the VPX will process the command based on the data it received. Examples of LATCH_OFF commands are shown in the next section.

4.7 PMBus Examples

In the following PMBus examples, the 7-bit I²C address is configured to 21h.

4.7.1 WRITE_PAGE



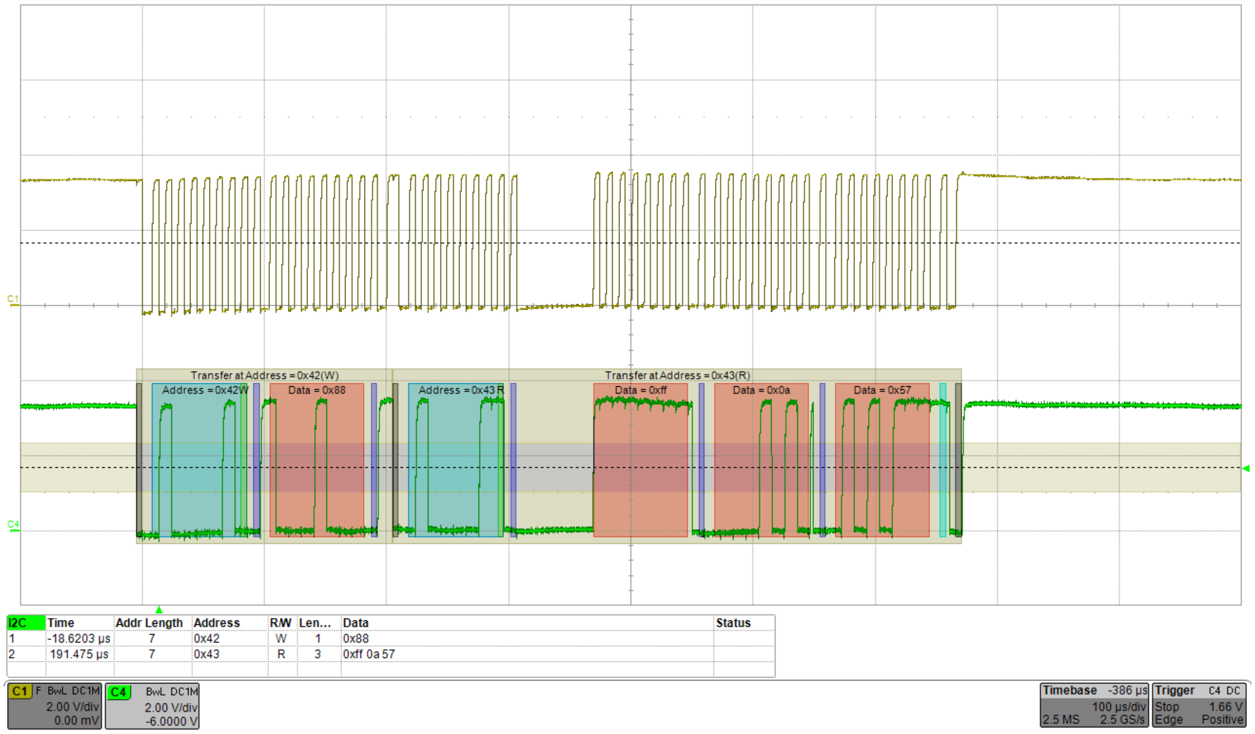
YELLOW – I²C CLOCK GREEN – I²C DATA

FIGURE 4.1: PMBUS WRITE_PAGE COMMAND – WRITE BYTE

Byte	Value	Description
1	42h	I²C address followed by Write bit (0)
2	00h	WRITE_PAGE command code 00h
3	06h	Page 06h: -12V auxiliary output
4	42h	Packet Error Code

The above example configures the VPX page to 06h: -12V auxiliary output. When READ_VOUT command is received afterwards, the VPX will respond the voltage reading on the -12V auxiliary output.

4.7.2 READ_VIN



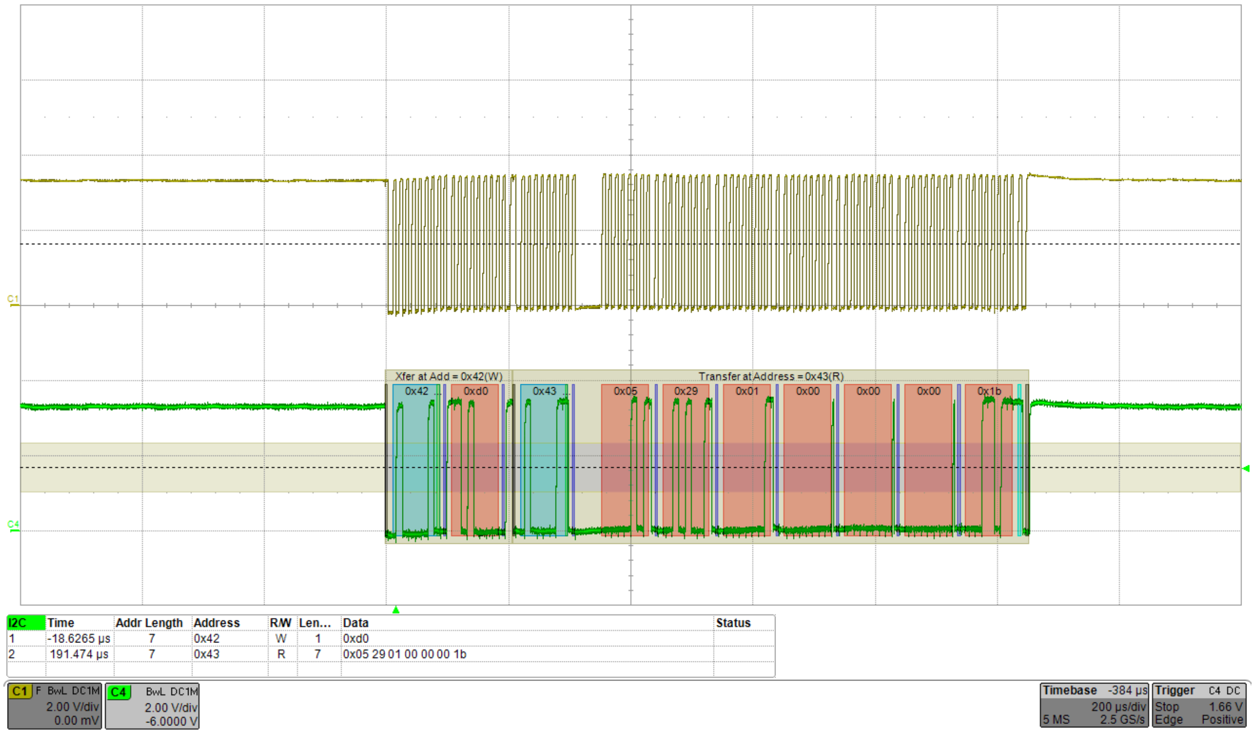
YELLOW – I²C CLOCK GREEN – I²C DATA

FIGURE 4.2: PMBUS READ_VIN COMMAND – READ WORD

Byte	Value	Description
1	42h	I²C address followed by Write bit (0)
2	88h	READ_VIN command code 88h
3	43h	I²C address followed by Read bit (1)
4	ffh	Low-byte of the VPX response data
5	0ah	High-byte of the VPX response data
6	57h	Packet Error Code

The response data to the READ_VIN command in the above example is 0affh, i.e. 2815 in decimal. The converted real world value is 28.15V.

4.7.3 READ_TIMER



YELLOW – I²C CLOCK GREEN – I²C DATA

FIGURE 4.3: PMBUS READ_TIMER COMMAND – BLOCK READ

Byte	Value	Description
1	42h	I²C address followed by Write bit (0)
2	d0h	READ_TIMER command code d0h
3	43h	I²C address followed by Read bit (1)
4	05h	First byte of the response data, 5 bytes of data following
5	29h	**Seconds**
6	01h	**Minutes**
7	00h	**Hours**
8	00h	Low data byte of **Days**
9	00h	High data byte of **Days**
10	1bh	Packet Error Code

The response to the READ_TIMER command in the above example is 1 minute and 41 seconds.

4.7.4 COEFFICIENTS

The VPX module supports COEFFICIENTS command to allow user to retrieve information listed on section 4.2. The following is an example to retrieve the input current reading coefficient.

Byte	Value	Description
1	42h	I^2C address followed by Write bit (0)
2	30h	COEFFICIENTS command code 30h
3	02h	Byte count is 2
4	89h	Command code for READ_IIN
5	01h	Indicates the coefficient is used to decode the value read from VPX
6	05h	First byte of the response data, 5 bytes of data following
7	64h	m: Low Byte
8	00h	m: High Byte, m = 0064h = 100 in decimal
9	00h	b: Low Byte
10	00h	b: High Byte, b = 0
11	00h	R: One Byte, R = 0
12	43h	Packet Error Code

4.7.5 LATCH_OFF

Refer to section 4.6.5.1, LATCH_OFF command can be sent with data byte and PEC being optional. The following are examples to set and clear latch-off on the VPX module.

Set latch-off:

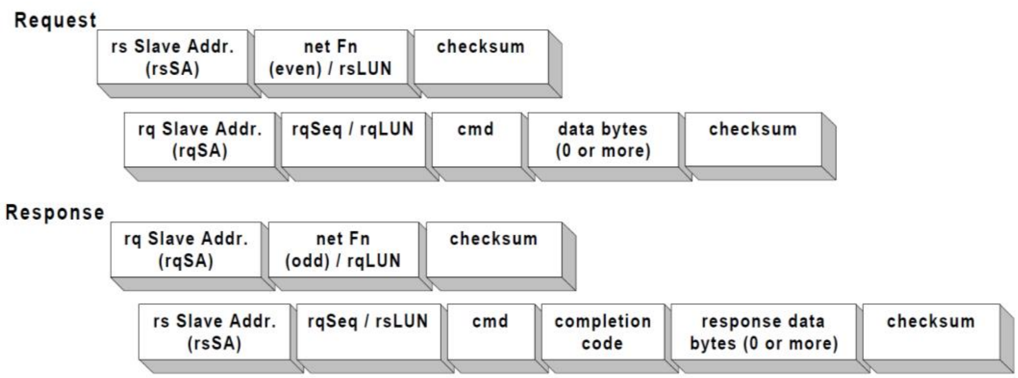
Byte	Value	Description
1	42h	I^2C address followed by Write bit (0)
2	feh	COMMAND_EXT code
3	01h	Command code for LATCH_OFF
4	95h	Packet Error Code (no data byte in this example)

Clear latch-off:

Byte	Value	Description
1	42h	I^2C address followed by Write bit (0)
2	feh	COMMAND_EXT code
3	01h	Command code for LATCH_OFF
4	00h	Data byte for clearing the latch off (no PEC in this example)

5 IPMI Interface

The SynQor VPX module supports IPMI interface and VITA 46.11. It allows the user to retrieve power supply status information using standard IPMB Communications Protocol shown below.



The responder Slave Address (rsSA) is the 8-bit IPMB address described in Section 2. The responder LUN (rsLUN) is 00h. The VPX module supports Sensor/Event messages (netFn 04, 05).

Checksum is the 2’s complement of preceding bytes in the connection header or between the previous checksum. The 8-bit checksum can be computed using the following algorithm: Initialize checksum to 0. For each byte, checksum = (checksum + byte) module 256, then checksum = - checksum. When the checksum and the bytes are added together, modulo 256, the result should be 0.

5.1 IPMI Sensor Overview

The VPX module allows users to use *Get Sensor Reading* command to retrieve power supply status including voltage, current, power and temperature measurements. The *Get Sensor Reading* command for a threshold-based sensor contains the present analog reading from the sensor.

The following table lists all IPMI sensors available on the VPX 3U modules.

Sensor Number	Sensor Name	Sensor Type Code	Event/Reading Type Code	Description	Unit
2	FRU Health	F2h - VITA 46.11 OEM	04h	Predictive Failure	Discrete
3	FRU Voltage	02h - Voltage	05h	Limit Not Exceeded /Limit Exceeded	Discrete
4	FRU Temperature	F3h - VITA 46.11 OEM	6Fh	Sensor Specific	Discrete
7	Input Voltage	02h - Voltage	01h	Analog	Volts
8	+12V Voltage	02h - Voltage	01h	Analog	Volts
9	+3.3V Voltage	02h - Voltage	01h	Analog	Volts

Sensor Number	Sensor Name	Sensor Type	Event/Reading Type Code	Description	Unit
10	+5V Voltage	02h - Voltage	01h	Analog	Volts
11	+3.3Vaux Voltage	02h - Voltage	01h	Analog	Volts
12	+12Vaux Voltage	02h - Voltage	01h	Analog	Volts
13	-12Vaux Voltage	02h - Voltage	01h	Analog	Volts
14	Input Current	03h - Current	01h	Analog	Amperes
15	+12V Current	03h - Current	01h	Analog	Amperes
16	+3.3V Current	03h - Current	01h	Analog	Amperes
17	+5V Current	03h - Current	01h	Analog	Amperes
18	Card Edge Temperature Towards Pin P6	01h - Temperature	01h	Analog	Kelvin
19	Card Edge Temperature Towards Pin P1	01h - Temperature	01h	Analog	Kelvin
20	Temperature at Middle of the Chassis	01h - Temperature	01h	Analog	Kelvin
21	Input Power Consumption	0Bh - Other Units-based Sensor	01h	Analog	Watts
22	+12V Power Consumption	0Bh - Other Units-based Sensor	01h	Analog	Watts
23	+3.3V Power Consumption	0Bh - Other Units-based Sensor	01h	Analog	Watts
24	+5V Power Consumption	0Bh - Other Units-based Sensor	01h	Analog	Watts

Table K: IPMI Supported Sensors

5.2 IPMI Sensor Reading Conversion

The following formula defined in IPMI specification should be used to convert the one byte “raw” sensor readings to real values in the desired units (e.g. Volts, Amps, Watts, degrees Celcius).

$$y = (Mx + B * 10^{K_1}) * 10^{K_2}$$

Where:

x, is one byte unsigned integer, received from the VPX module;

y, is the calculated, “real world” value in the appropriate units (A, V, W, °C);

M, is signed integer constant multiplier;

B, is signed additive offset;

K_1, is signed “B” exponent;

K_2, is signed *Result* “R” exponent;

The table below provides the coefficients used for IPMI analog sensor conversion.

Sensor		Conversion Coefficients				Valid y Range (calculated “real world” value)	Typical Examples	
		M	B	B exp. (K_1)	R exp. (K_2)		x	y
7: Input Voltage	28V Model	20	90	1	-2	9 V – 60 V	95	28 V
	48V Model	4	0	0	-1	0 – 102 V	120	48 V
	270V and AC Model	20	0	0	-1	0 – 510 V	135	270 V
8: +12V Voltage		20	90	2	-3	9 V – 14.1 V	150	12 V
9: +3.3V Voltage		10	20	2	-3	2 V – 4.55 V	130	3.3 V
10: +5V Voltage		10	35	2	-3	3.5 V – 6.05 V	150	5 V
11: +3.3Vaux Voltage		10	20	2	-3	2 V – 4.55 V	130	3.3 V
12: +12Vaux Voltage		20	90	2	-3	9 V – 14.1 V	150	12 V
13: -12Vaux Voltage		-20	-90	2	-3	-9 V – -14.1 V	150	-12 V
14: Input Current	28V Model	20	0	0	-2	0 – 51 A	150	30 A
	48V Model	10	0	0	-2	0 – 25.5 A	100	10 A
	270V and AC Model	20	0	0	-3	0 – 5.1 A	150	3 A
15: +12V Current	28V/270V/AC Models	20	0	0	-2	0 – 51 A	200	40 A
	48V Model	25	0	0	-2	0 – 63.75 A	200	50 A
16: +3.3V Current		20	0	0	-2	0 – 51 A	100	20 A
17: +5V Current		20	0	0	-2	0 – 51 A	150	30 A
18: Card Edge Temp towards P6		1	20	1	0	200 K – 455 K	150	350 K
19: Card Edge Temp towards P1		1	20	1	0	200 K – 455 K	150	350 K
20: Mid-chassis Temp		1	20	1	0	200 K – 455 K	150	350 K
21: Input Power Consumption	28V/270V/AC Models	25	0	0	-1	0 – 637.5W	200	500 W
	48V Model	30	0	0	-1	0 – 765 W	200	600 W

22: +12V Power Consumption	28V/270V/AC Models	25	0	0	-1	0 – 637.5W	160	400 W
	48V Model	30	0	0	-1	0 – 765 W	200	600 W
23: +3.3V Power Consumption		4	0	0	-1	0 – 102W	125	50 W
24: +5V Power Consumption		10	0	0	-1	0 – 255W	150	150 W

Table L: IPMI Coefficients Table

For the Analog sensors, 00h and FFh are reserved to indicate the reading is below or above the valid range shown in the above Table. **Temperature sensors 19 and 20 are not available on 3U AC Model.**

5.3 IPMI Commands

5.3.1 Sensor Device Commands

The VPX supports IPMI *Get Sensor Reading* command as defined in VITA 46.11 and IPMI specifications.

Command Name	**NetFn**	**CMD**
Get Sensor Reading	Sensor/Event	2Dh

Get Sensor Reading description:

Request Data	1	sensor number (FFh = reserved)
Respond Data	1	Completion Code.
	2	Sensor reading Byte 1: byte of reading. Write as 00h if sensor does not return a numeric (analog) reading, ignore on read.
	3	Provides information on the sensor.
	4	For “Analog” sensor: Indicates where the reading stands against the threshold values. Applicable to sensor number 7 to 24. For VITA 46.11 “Discrete” sensor: Indicates the state of the sensor. Applicable to sensor number 2, 3, 4.

5.3.2 Event Commands

The VPX supports Event Messages as defined in VITA 46.11 for FRU Health Sensor, FRU Voltage Sensor and FRU Temperature Sensor.

Command Name	**NetFn**	**CMD**
Set Event Receiver	Sensor/Event	00h
Get Event Receiver	Sensor/Event	01h
Platform Event (a.k.a. “Event Message”)	Sensor/Event	02h

In order for the VPX to transmit an event message, *Set Event Receiver* command must be received by the VPX to acquire the IPMB (I^2C) Slave Address and LUN.

FRU Health Sensor Event Message description:

Request Data	1	Event Message Rev=04h (IPMI 1.5)
	2	Sensor Type = F2h (VITA-defined FRU Health)
	3	Sensor Number
	4	[7] – Event Direction: 0b = Assertion, 1b = Deassertion [6:0] – Event Type: 04h (Predictive Failure)
	5	Event Data 1 [7:4] – 0000b [3:0] – 0h = (change in) Predictive Failure Deasserted 1h = (change in) Predictive Failure Asserted

FRU Voltage Sensor Event Message description:

Request Data	1	Event Message Rev=04h (IPMI 1.5)
	2	Sensor Type = 02h (Voltage)
	3	Sensor Number
	4	[7] – Event Direction: 0b = Assertion, 1b = Deassertion [6:0] – Event Type: 05h (digital discrete Limit Not Exceeded/Limit Exceeded)
	5	Event Data 1 [7:4] – 0000b [3:0] – 0h = (change in) “Limit Not Exceeded” status bit 1h = (change in) “Limit Exceeded” status bit

FRU Temperature Sensor Event Message description:

Request Data	1	Event Message Rev=04h (IPMI 1.5)
	2	Sensor Type = F3h (VITA-defined OEM for FRU Temperature)
	3	Sensor Number
	4	[7] – Event Direction: 0b = Assertion, 1b = Deassertion [6:0] – Event Type: 6Fh (Sensor-specific discrete)
	5	Event Data 1 [7:4] – 0000b [3:0] – 0h = Change in bit 0 (temp at or below lower non-critical) state 1h = Change in bit 1 (temp at or below lower critical) state 2h = Change in bit 2 (temp at or below lower non-recoverable) state 3h = Change in bit 3 (temp at or above upper non-critical) state 4h = Change in bit 4 (temp at or above upper critical) state 5h = Change in bit 5 (temp at or above upper non-recoverable) state

5.4 IPMI Message Handling

5.4.1 Message Queuing

The VPX can queue up to 16 incoming messages from the requester. If the requester sends more than 16 messages in a row while the VPX response is still pending, subsequent messages after message 16 will be ignored.

5.4.2 Corrupted Request

If a request is received with a bad checksum, the VPX will ignore the request entirely and let the requester retry the message.

5.4.3 Unexpected Request

If an IPMI request message is not supported by the VPX module, the request will be ignored and no response will be generated.

5.4.4 Message Time-out

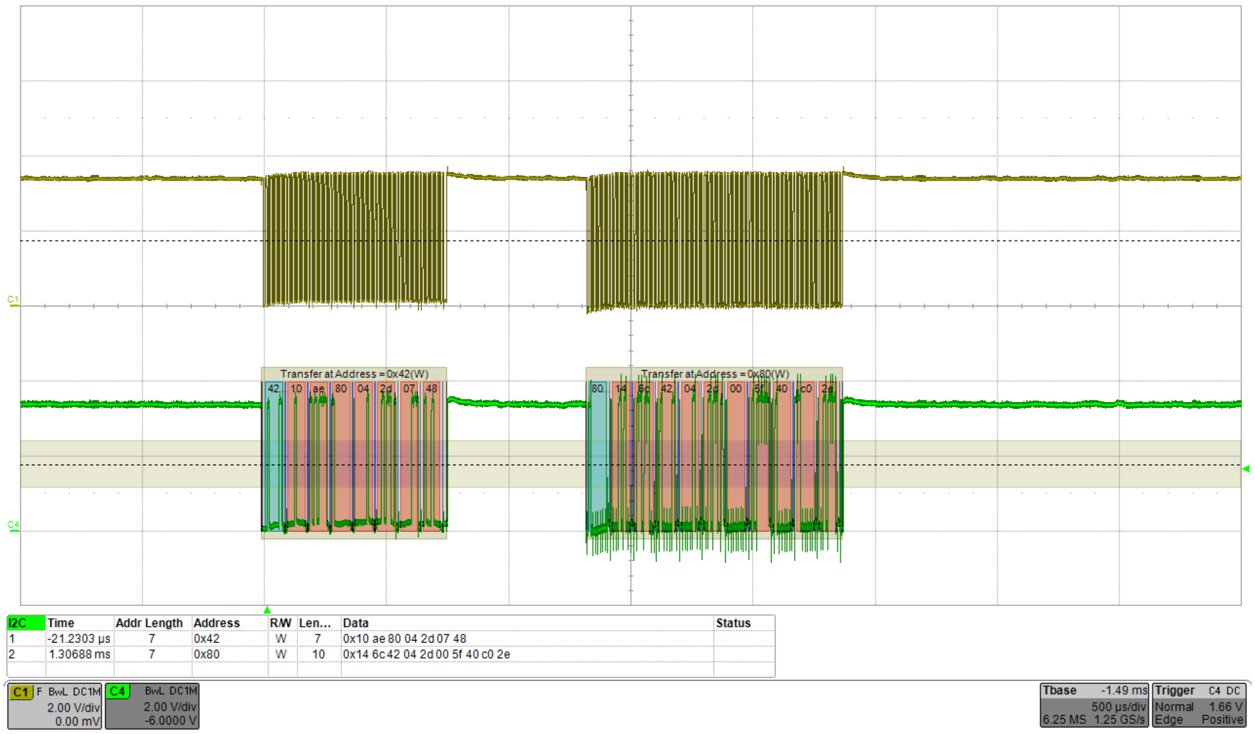
Once a valid request is received and a response is generated by the VPX module, it is expected that the requester will ACK the response message. However, if the response is not transmitted successfully for any reason, e.g. due to bus corruption, the VPX will retry the response three times. If the message is still not transmitted after three retries, the response will be disregarded.

5.5 IPMI Examples

In the following IPMI examples, the 7-bit I^{2}C address is configured to 21h. The Responder's Slave Address (rsSA) is 42h and Responder's LUN (rsLUN) is 0.

The Requester's Slave Address (rqSA) is set to 80h and Requester's LUN (rqLUN) set to 0. These two fields are arbitrarily chosen.

5.5.1 Get Sensor Reading – Input Voltage



YELLOW – I²C CLOCK GREEN – I²C DATA

FIGURE 5.1: IPMI GET SENSOR READING – INPUT VOLTAGE

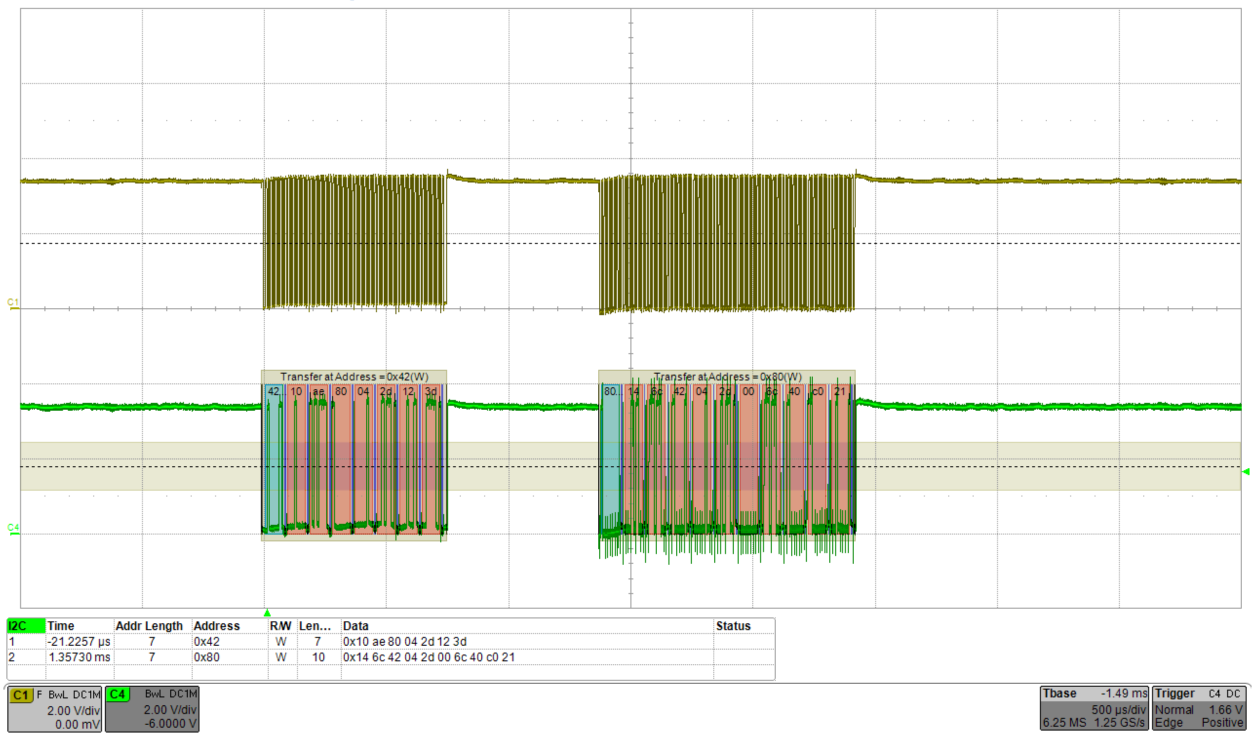
The first block of data is the Request message sent to the VPX module:

Byte	Value	Function	Description
1	42h	rs Slave Addr. (rsSA)	VPX IPMB address, LS is always 0
2	10h	Net Fn (even) / rsLUN	Net Fn is 04 (Sensor / Event), rsLUN is 0
3	aeh	checksum	Checksum for the connection header
4	80h	rq Slave Addr. (rqSA)	Requester's slave address, LS always 0
5	04h	rqSeq / rqLUN	Sequence is 1 and requester's LUN is 0
6	2dh	command	Command 2dh – Get Sensor Reading
7	07h	sensor number	Sensor 07 – Input Voltage
8	48h	checksum	Checksum for preceding bytes between the previous checksum

The second block of data is the Response message transmitted from the VPX module:

Byte	Data	Function	Description
1	80h	rq Slave Addr. (rqSA)	Requester's slave address
2	14h	Net Fn (odd) / rqLUN	Net Fn is 05 (Sensor / Event), rqLUN is 0
3	6ch	checksum	Checksum for the connection header
4	42h	rs Slave Addr. (rsSA)	Responder's slave address
5	04h	rqSeq / rsLUN	Sequence is 1 and responder's LUN is 0
6	2dh	command	Command 2dh – Get Sensor Reading
7	00h	completion code	Completion code
8	5fh	sensor reading	Sensor reading is 95, converted real world value is 28V
9	40h	sensor information	Event message is disabled for this sensor
10	c0h	threshold comparison	Sensor reading is within normal range
11	2eh	checksum	Checksum for preceding bytes between the previous checksum

5.5.2 Get Sensor Reading – Temperature



YELLOW – I^2C CLOCK GREEN – I^2C DATA

FIGURE 5.2: IPMI GET SENSOR READING – TEMPERATURE

Similar to the previous example, the sensor number in this request message is 12h, i.e. sensor number 18 - card edge temperature towards P6. Response data is 6ch, 108 in decimal. Converted real world value is 308 Kelvin or 35 degrees Celcius.

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VPX

Operator's Guide
VPX 3U I2C

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