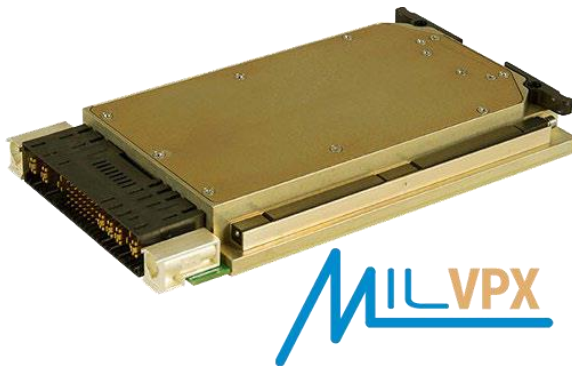


M4365 SERIES

DC/DC POWER SUPPLY



PRODUCT HIGHLIGHTS

- VITA 62 COMPLIANT
- 3U VPX FORM FACTOR
- DC/DC CONVERTER
- 6 OUTPUTS
- 600W (700W PEAK)
- Current Share for VS# Outputs
- Input Options:
 - MIL-STD-704
 - MIL-STD-1275
- System Management Protocol - VITA 46.11
- Cyber secure

M4365 SERIES VPX DC/DC POWER SUPPLY

Electrical Specifications

DC Input

18 to 48 V_{DC}

Max Non-Operating 100V

Options:

- 1) MIL-STD-704 (A-F)
Normal and Abnormal
Steady State
- 2) MIL-STD-704(A-F)
transients Up to 50V, 80V
- 3) MIL-STD-1275 Surge
- 4) Def Stan 61-5 170V Load
dump.

DC Output

VS1: 12V up to 30A

VS2: 3.3V up to 20A

VS3: 5V up to 30A

12V_Aux: 12V up to 1A

-12V_Aux: -12V up to 1A

3.3V_Aux: 3.3V up to 5A

Peak power option:

VS1: 12V up to 40A

VS3: 5V up to 35A

Isolation

Over 20 MΩ at test voltage:

200V between Input and Output

200V between Input and Case

100V between Output and Case

Line/Load regulation

See Table 2 on page 7

Efficiency

Up to 88%

85.5 % @ Full Load

(See Para. 4)

EMC

Complies with MIL-STD-461F

(5μH LISN): CE101, CE102,

CS101, CS114, CS115, CS116

Ripple and Noise

Typically, less than 50mV_{p-p}

(max.1%_p). Measured across a 0.1μF capacitor and 10μF capacitor on load at Input Voltage of 18V-36V, all Temperature Range.

Load Transient Overshoot and Undershoot

Output dynamic response of less than 5% at load Step of 30%-60%.

Output returns to regulation in less than 1mSec

System Management

VITA 46.11 Tier 2 IPMC

Data Available:

- Output voltages and currents
- Input voltage
- Card Temperature
- Card Status

M4365 SERIES VPX DC/DC POWER SUPPLY

Environmental ¹

Design to Meet MIL-STD-810G

Temperature

Operating: -55 °C to +85 °C at unit edge
Storage: -55 °C to +125 °C
Designed to meet 600 thermal cycles durability test

Altitude

Method 500.5, Procedure I & II
Storage/Air Transport: 40 kft
Operation/Air carriage: 70 kft

Salt Fog:

Method 509.5

Fungus

Does not support fungus growth, in accordance with the guidelines of MIL-STD-454, Requirement 4.

Humidity

Method 507.5, Up to 95% RH

Shock

Method 516.6
40g, 11msec saw-tooth (all directions)

Vibration

Vibration: Figure 514.6E-1. General minimum integrity exposure. (1 hour per axis.)

Reliability: 305,000 Hours, calculated IAW MIL-HDBK-217F Notice 2 at +65°C, GF.

Note 1: **Environmental Stress Screening (ESS)** Including random vibration and thermal cycles is also available. **Please consult factory for details.**

Protections [†]

Input

Input Reverse Polarity:

Protection for unlimited time

Inrush Current Limiter

Peak value of $5 \times I_{IN}$ for initial inrush currents lasting more than 50 μ Sec.

Under Voltage

Unit shuts down when input voltage drops below
 17 ± 0.5 VDC.
Automatic restart when input voltage returns to nominal range.

Over Voltage Lock-Out

Unit shuts down when input steady state voltage rise above 55 ± 2 VDC. Automatic restart when input voltage returns to nominal range.

Output

Passive over voltage protection on Aux outputs

Zener selected at $25\% \pm 5\%$ above nominal voltage, is placed across the output for passive voltage limit.

Active over voltage protection on VS# outputs

$20\% \pm 5\%$ above nominal voltage.
Automatic recovery when output voltage drops below threshold.

Overload / Short-Circuit Protection

Continuous Hiccup protection (110-130%) for VS#.
Aux Typical:
3.3Vaux / 8A
12Vaux. 1.5A-2A
-12Vaux. 2.5A-3A

General

Over Temperature Protection

Automatic shutdown at temperature of 95 ± 5 °C (at unit edge)
Automatic recovery when temperature drops below 90 ± 5 °C.

Note 1: Thresholds and protections can be modified / removed (please consult factory)

M4365 SERIES VPX DC/DC POWER SUPPLY

Functions and Signals - According to VITA 62

Signal Name	Type	Description
FAIL*	Output	Indicates to other modules in the system that a failure has occurred in one of the outputs. Please refer to Figure 2 ¹
SYSRESET*	Output	Indicates to other modules in the system that all outputs are within their working level. Please refer to Figure 2 ¹
INHIBIT*	Input	Controls power supply outputs. This signal in conjunction with ENABLE controls the outputs. Please refer to Table 1 and Figure 1 ¹
ENABLE*	Input	Controls power supply outputs. This signal in conjunction with INHIBIT controls the outputs. Please refer to Table 1 and Figure 1 ¹
GA0*, GA1*, GA2*	Input	Used for geographical addressing. GA2 is the most significant bit and GA0 is the least significant bit. ¹
SCL, SDA	Bidirectional	I2C bus Clock and Data respectively. Through this bus the voltage and temperature readouts can be shared. ¹
REF_CLK	Input	The REF_CLK signal is used to allow the power supply frequency to sync with the system frequency. ¹
VOUT SENSE	Input	The SENSE is used to achieve accurate load regulations at load terminals (this is done by connecting the pins directly to the load's terminals).
Alert Bit	Output	Indicates to other modules in the system about Input Voltage loss. Please refer to Figure 2 ¹
Active Current Share	Bidirectional	Support Active current share between Outputs. See Current Share para. ^{1 2 3}
PO#_SHARE	Bidirectional	Support Passive current share between Outputs ¹

Notes:

1. Signal referenced to **SIGNAL RTN**
2. When not used leave open
3. For Passive or Non-Current Share configuration, this pin is intentionally Disconnected

Table 1 – Inhibit and Enable Functionality

M4365 SERIES VPX DC/DC POWER SUPPLY

INHIBIT*	Low	Low	High	High
ENABLE*	Low	High	Low	High
VS1 ,VS2,VS3, ±12VAux	OFF	OFF	ON	OFF
3.3V_AUX	ON	OFF	ON	OFF

Figure 1 – Inhibit and Enable Input stage

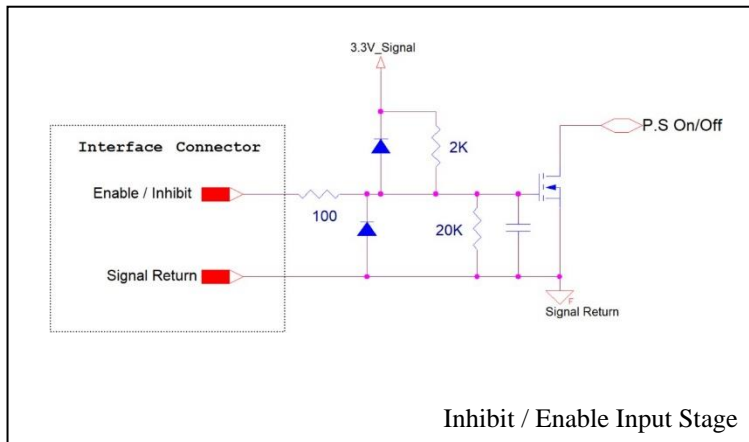
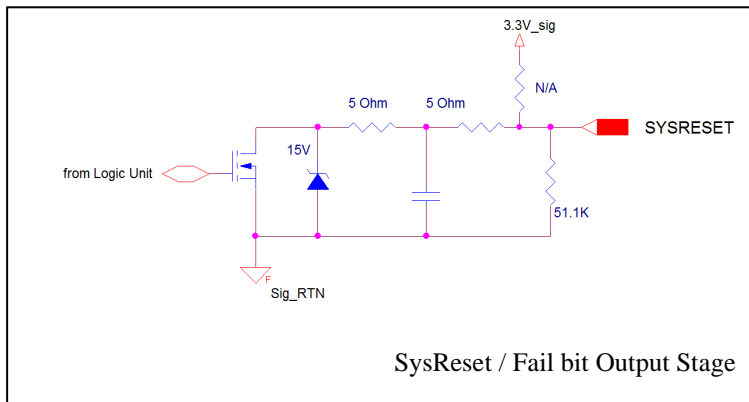
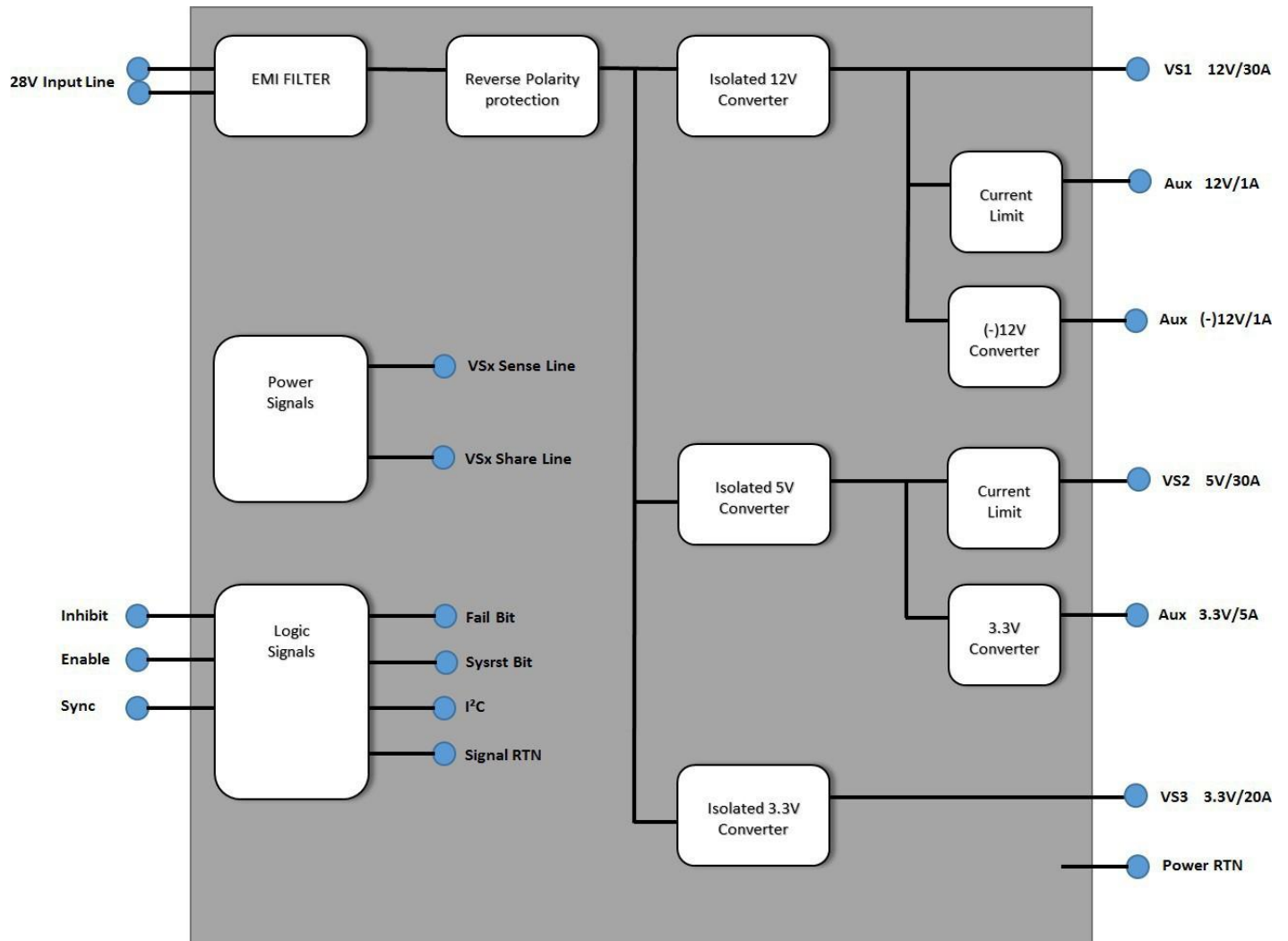


Figure 2 – SysReset and Fail Bit output stage



M4365 SERIES VPX DC/DC POWER SUPPLY

Simplified Block Diagram



Detailed Information

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M4365 SERIES VPX DC/DC POWER SUPPLY

1. M4365 Input Voltage Operation Range.

The M4365 steady state operation voltage is 18V to 48V, continuously work up to 50V Input line. Unit can be modified to work up to 100V or down to 16V transient and Surge.

Max Non operation Voltage 100V.

1.1 Low Line Turn-on and Turn-off Limits

To avoid Turn-on and Turn-off cycling glitch the unit have about 2V Hysteresis.

The Turn-on threshold is under 20V and turn- off below 18V.

Those limits can be adjusted, contact Factory for more information.

2. Outputs Voltage Regulation

The M4365 contains accurate internal sense lines to keep output voltage at less than 3% regulation for all Line/ Load and temperature range (see Table 2).

Output	12V/25A	5V/30A	3.3V/20A	3.3VAux/5A	12VAux/1A	(-)12VAux/1A	Notes
Voltage Range	11.85 – 12.15	4.9 – 5.1	3.28 – 3.42	3.25 – 3.45	11.7 – 12.2	(-)11.85 – (-)12.15	
Voltage Range	11.80 – 12.20	4.9 – 5.2	3.20 – 3.40	3.25 – 3.45	11.7 – 12.2	(-)11.7 – (-)12.2	Current share configuration

Table 2: Outputs voltage regulation. VIN 18V – 48V, Temperature -55 °C – 85 °C single and parallel configuration.

2.1. Sense Lines

Sense Lines are provided for VS1, VS2 and VS3 output to compensate line voltage drop.

Sense Lines proper connection is shown in Figure 3.

Each VSx output has its own *Sense Lines*, additional common *Sense RTN Line* is provided for all VSx Outputs (VITA 62 Standard).

Contact Factory for Sense configuration different than the VITA 62 standard

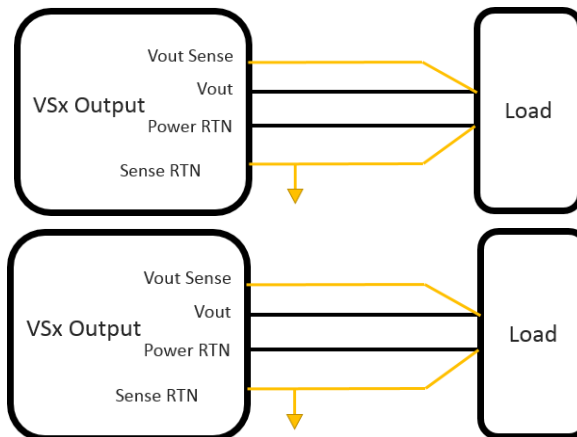


Figure 3: M4365 Sense line connection

M4365 SERIES VPX DC/DC POWER SUPPLY

3. Output Power

The M4365 can deliver up to 616W steady State at all temperature and input range. Unit can support a peak power of 700W, please contact factory for more details and limitations.

Max Total Power Output	12V/30A	5V/30A	3.3V/20A	3.3VAux/5A	12VAux/1A	(-)12VAux/1A
616W	30A	30A	20A	5A	1A	1A
700W	40A	35A	20A	5A	1A	1A

3.1. Mil-STD 1275E Surges (optional)

The Unit can support up to 500W during 12V surge. Operating the unit at higher power may results in a poor output transient response during the surge.

Total Power Output	12V/25A ¹	5V/30A	3.3V/20A	3.3VAux/5A	12VAux/1A	(-)12VAux/1A
550W	22A	30A	20A	5A	1A	1A

Table 4: Max current per output during 12V surge

Note 1: Max total current of 12V rail (12Vvs1, 12Vaux & (-) 12Vaux) should not exceed 22A in order to stay in spec regulation

3.2 Typical Efficiency (Typical results at room temperature)

Input Voltage	Output Power	Efficiency
28V	170W	88%
	200W	87.6%
	600W	86.1%

4. Current Share (optional)

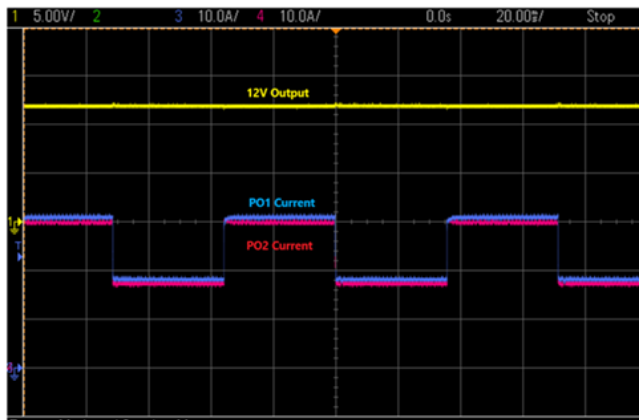
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Current Share FOR vs# Outputs between two or more units is optional (Contact Factory)

4.1 Active current sharing (A.C.S)

Current sharing done in a closed loop. All paralleled outputs are compared and feedback is used to balance their load current. The result is a more stable, less sensitive output voltage without voltage drop. Typical Load Balance of about 2-3A for all Load range is expected.

Typical ACS Dynamic Load of Two 12V Paralleled Outputs (PO1 & PO2 refer to two different units)



Notes 1. When Not used, A.C.S pins can be left open.

4.2 Passive current sharing (P.C.S)

Current sharing is done in open loop, output voltage drops as a function of output load. Load Balance of about 5-10% is expected.

For a required output to current share please connect the following Pins between the two units

- *PO#_Sense & PO#_Sense_RTN*
(for best performance, Pins from paralleled units should be connected to a single point and as close as possible to the load point)
- Unit 1 *VS#_SHARE* to Unit 2 *VS#_SHARE*
A7 to A7
B7 to B7
C7 to C7
- Unit 1 *VS#_AC SHARE* to Unit 2 *VS#_AC SHARE* (not required for P.C.S)
A1 to A1
B1 to B1
D1 to D1

5. Typical EMI Tests

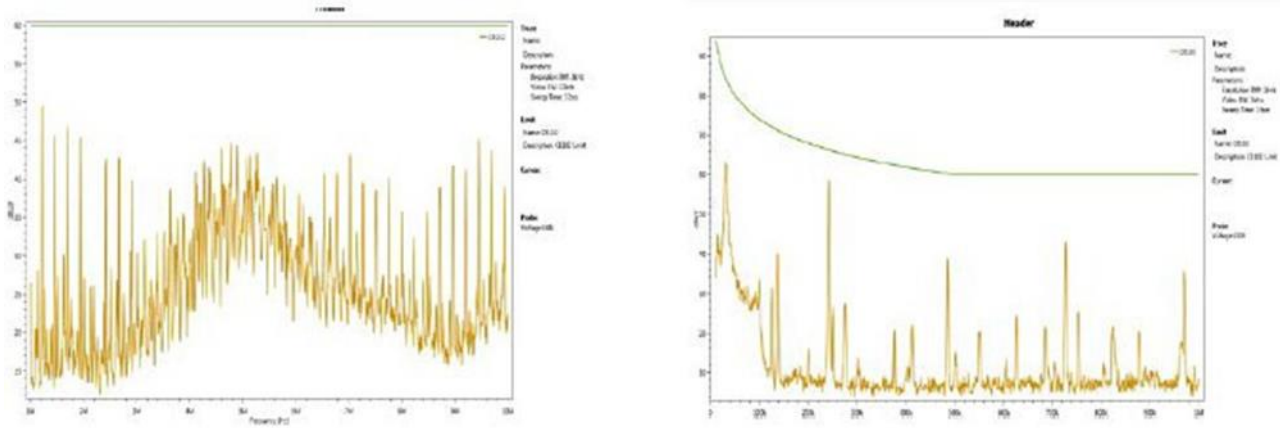


Figure 4: 28V Line, Full Load, 5UH LISN

6. Communication Protocol

Unit communication protocol can be configured as **VITA 46.11 Tier 2 IPMC** or Advanced I2C compatible protocol.

For more details on protocols refer to para. 6.1 and 6.2

Electrical Parameters

Vcc: 3.3VDC
 Pull-up: 10K Ohm
 Input Capacitance 330Pf

Slave Device Addressing

- 256 address spaces
- Baud rate: 200kHz maximum
- 7 Bit Protocol
- Support Slot Addressing per VITA 62

Slot Number	MSB							LSB
	A6	A5	A4	A3	A2	A1/*GA1	A0/*GA0	R/W
Slot0	0	1	0	0	0	0	0	
Slot1	0	1	0	0	0	0	1	
Slot2	0	1	0	0	0	1	0	
Slot3	0	1	0	0	0	1	1	

* Slot location is determined by GAx per VITA 62.

M4365 SERIES VPX DC/DC POWER SUPPLY

6.1. Advanced I2C Protocol

Read Command – 21Hex, deliver 64Bytes of Data. (More commands are available by request) The communication starts when the master sends a start followed by the unit slave address, command, checksum and a stop. A second start followed by the slave address and a read will be followed by a 64 Bytes response.

S	Slave Address	R/W	A	Command	A	Check sum	A	P
	A6:A0	0	0	21 Hex	0	DF Hex	0	

S	Slave Address	R/W	A	DATA	A	DATA	A	DATA	A	...	DATA	A	Check sum	N/A	P
	A6:A0	1	0	D7:D0	0	D7:D0	0	D7:D0	0	...	D7:D0	0	D7:D0		1

Command – 21Hex read all 64 Bytes

S-Start

P- Stop

Master Transmit	Unit Transmit
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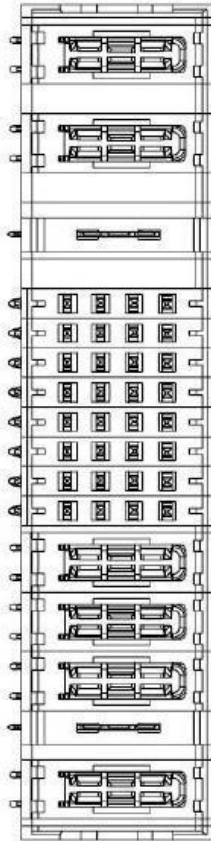
6.2. 46.11 Tier 2

Please see *46.11 User Manual* for detailed information of operation. Sensors included are seen in the table below.

Record ID	Sensor ID	Sensor Type	Name
0000	00	F0h	FRU State Sensor
0001	01	F1h	System IPMB Link Sensor
0002	02	F2h	FRU Health Sensor
0003	03	02h	FRU Voltage Sensor
0004	04	F3h	FRU Temperature Sensor
0005	05	F4h	Payload Test Results Sensor
0006	06	F5h	Payload Test Status Sensor
0100	07	02h	VS1 Voltage
0101	08	02h	VS2 Voltage
0102	09	02h	VS3 Voltage
0103	0A	02h	3.3V Aux Voltage
0104	0B	02h	+12V Aux Voltage
0105	0C	02h	-12V Aux Voltage
0106	0D	03h	VS1 Current
0107	0E	03h	VS2 Current
0108	0F	03h	VS3 Current
0109	10	03h	3.3V Aux Current
010A	11	03h	+12V Aux Current
010B	12	03h	-12V Aux Current
010C	13	01h	Analog Temperature
9999	N/A	N/A	Device Management

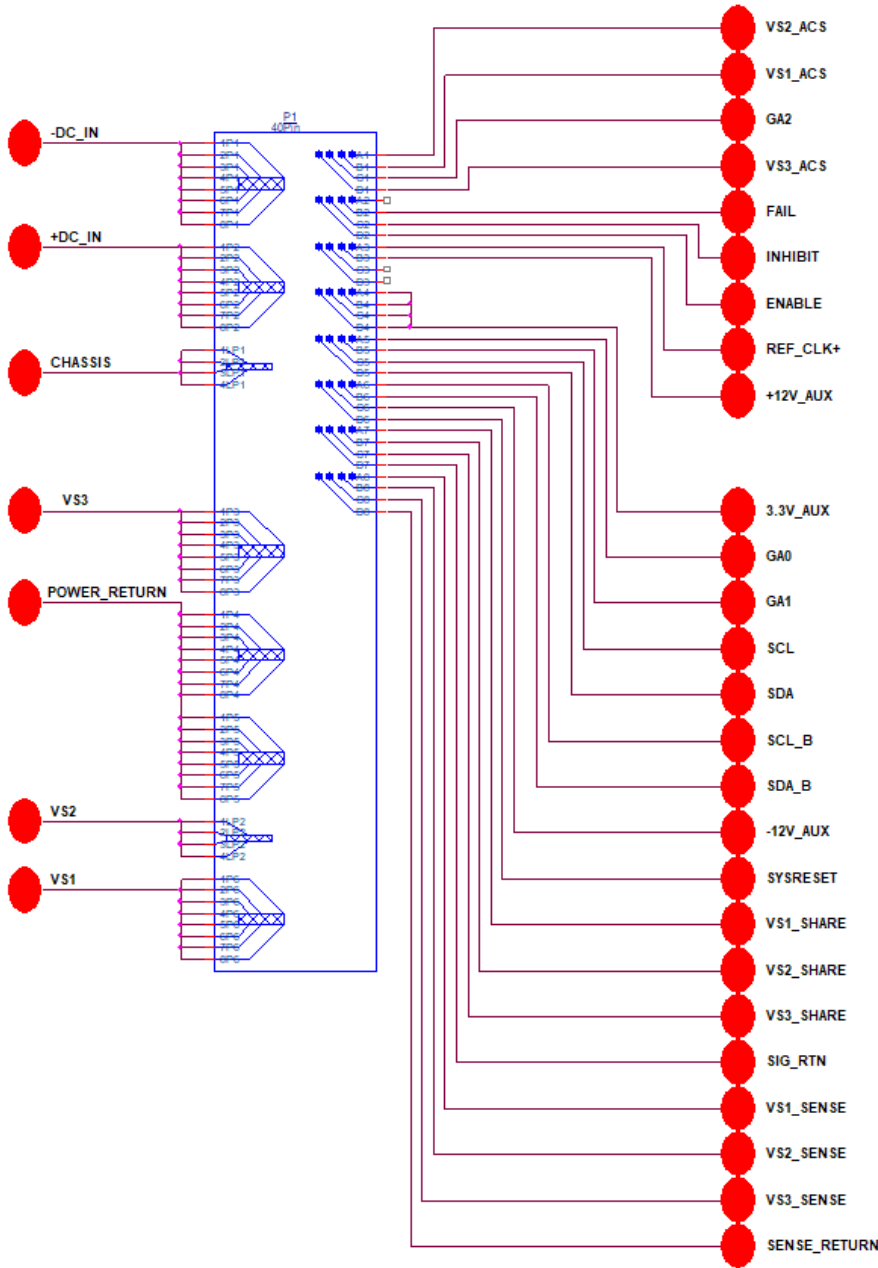
M4365 SERIES VPX DC/DC POWER SUPPLY

Pin Assignment



PART NUMBER	ROWS	POWER						SIGNAL						POWER					
		P1	P2	LP1	1	2	3	4	5	6	7	8	P3	P4	P5	LP2	P6		
6450849-7	D				Z5	Z5	Z5	Z5	Z5	Z5	Z5	Z5	Z5	Z5	Z5	Z5	Z5		
	C				Y5	Y5	Y5	Y5	Y5	Y5	Y5	Y5	Y5	Y5	Y5	Y5	Y5		
	B	TT	TT	LT	R5	R5	R5	R5	R5	R5	R5	R5	R5	R5	R5	R5	R5		
	A				O5	O5	O5	O5	O5	O5	O5	O5	O5	O5	O5	O5	O5		
2ACP+LP+32S+3HDP+ILP+IHP																			

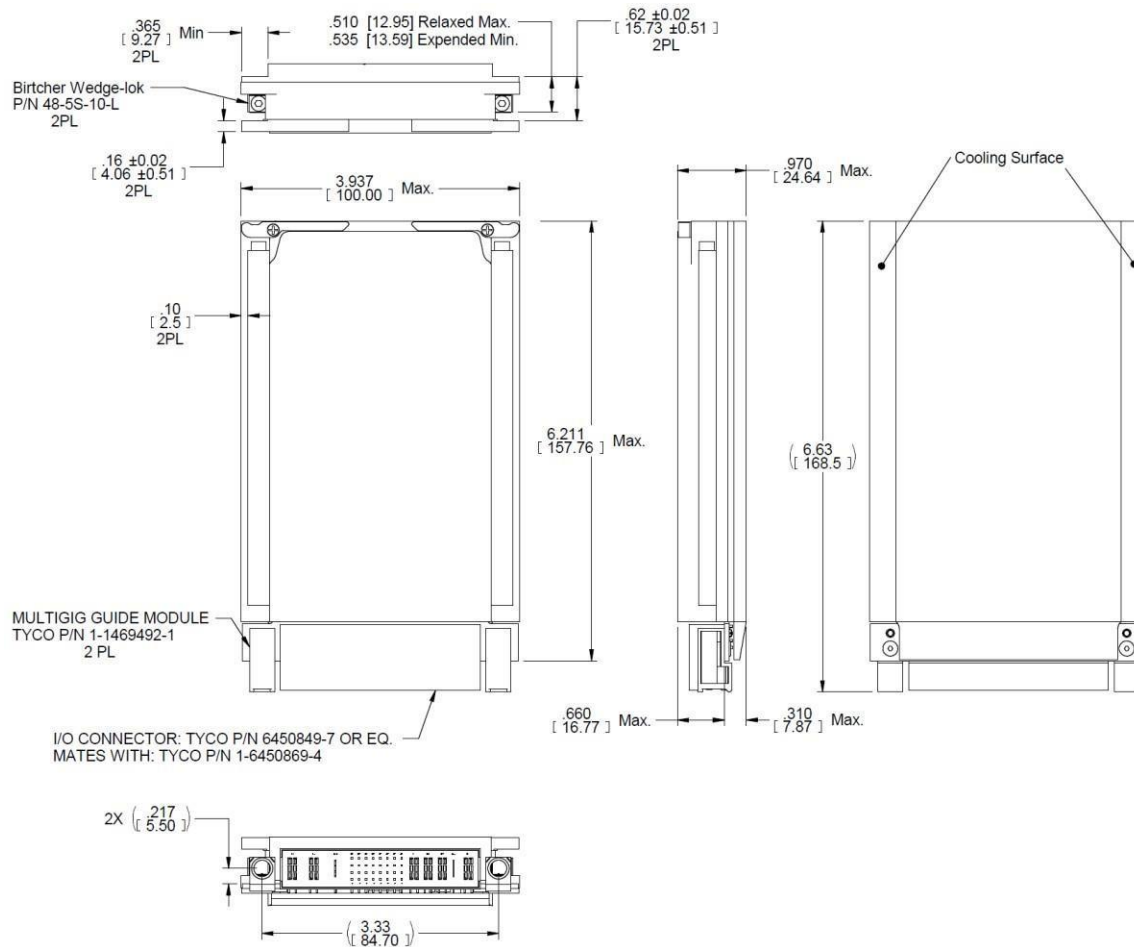
M4365 SERIES VPX DC/DC POWER SUPPLY



Pin Number	Pin Name
P1	-DC_IN
P2	+DC_IN
LP1	CHASSIS
P3	VS3
P4	POWER_RETURN
P5	POWER_RETURN
LP2	VS2
P6	VS1
A8	VS1_SENSE
B8	VS2_SENSE
C8	VS3_SENSE
D8	SENSE_RETURN
A7	VS1_SHARE
B7	VS2_SHARE
C7	VS3_SHARE
D7	SIG_RTN
A6	SCL_B
B6	SDA_B
C6	-12V_AUX
D6	SYSRESET*
A5	GA0*
B5	GA1*
C5	SCL
D5	SDA
A4	+3.3V_AUX
B4	+3.3V_AUX
C4	+3.3V_AUX
D4	+3.3V_AUX
A3	Sync_IN
B3	+12V_AUX
C3	N.C
D3	N.C
A2	N.C
B2	FAIL*
C2	INHIBIT*
D2	ENABLE*
A1	VS2_ACS
B1	VS1_ACS
C1	GA2
D1	VS3_ACS

M4365 SERIES VPX DC/DC POWER SUPPLY

Outline Drawing



Notes

1. Dimensions are in Inches[mm]
2. Tolerance is:
.XX ± 0.02 IN
.XXX ± 0.008 IN
3. Weight: Approx. 796 g (28.08 oz)
4. 3D model available

Note: Specifications are subject to change without prior notice by the manufacturer.