



SPECIFICATION FOR APPROVAL

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CRPS DC-DC 300W

SWITCHING POWER SUPPLY

SWITCHING POWER SUPPLY

CRPS DC-DC 300W Manufacturer Part No.: KE260006



Customer Name _____

Customer Part NO. _____

Project Modify List

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1. GENERAL

The specification has defined a DC 300w common redundant power supply (CRPS) that supports server systems, Storage, Networking, etc. The parameters of this power supply are defined in the specification. The specification has defined power supply with main output (+12V) and standby output (+12Vsb).

Reliability level of 100K hours at 80% load MTBF @ 25°C (rated input voltage and using the Telcordia SR-332 issue 3 method).

2. MECHANICAL OVERVIEW

The physical size of the power supply enclosure is 39mm x 73.5mm x 185mm. The power supply contains a single 40mm fan. The power supply has a card edge output that interfaces with 2*25 card edge connector in the system. The DC plugs directly into the external face of the power supply. Refer to the following Figure 1.

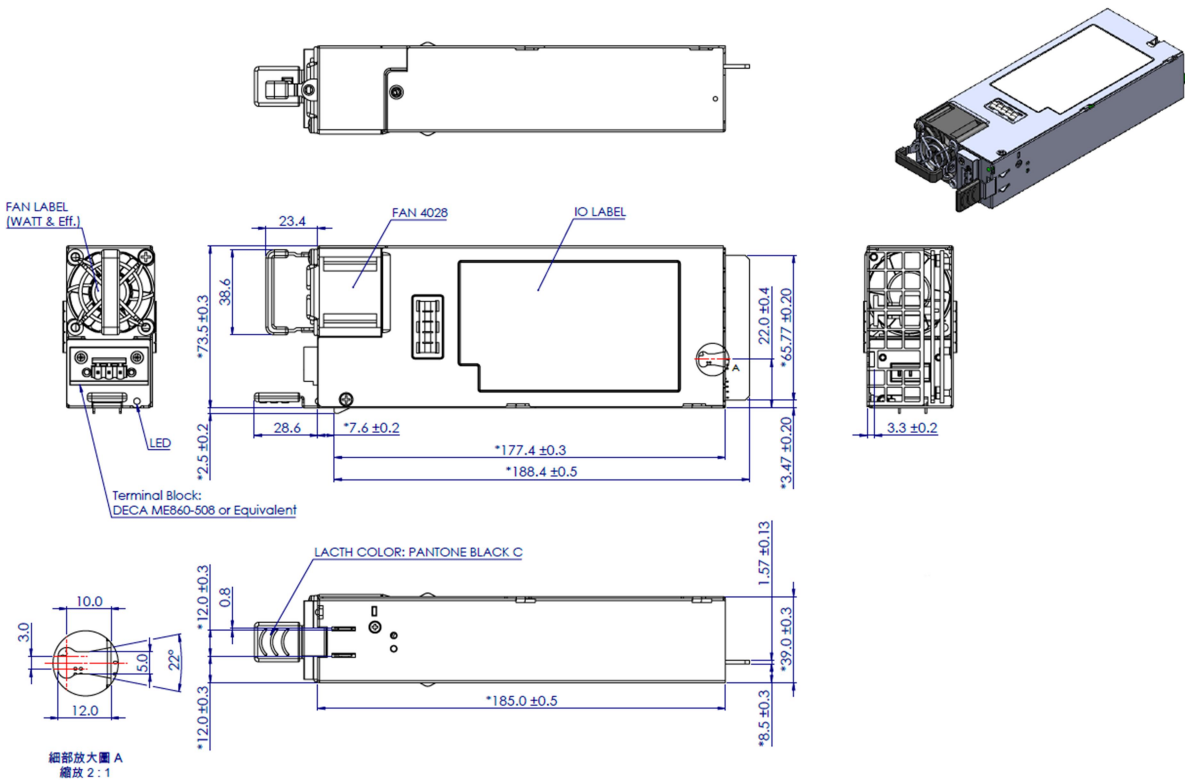


Figure 1 Power Supply Outline Drawing

2.2 DC OUTPUT CONNECTOR

The power supply shall use a card edge output connection for power and signal that is compatible with a 2x25 Power Card Edge connector.

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Table. DC Output Connector

Pin-out	Definition	Pin-out	Definition
A1-9	GND	B1-9	GND
A10-18	+12V	B10-18	+12V
A19	PMBus SDA	B19	A0 (SMBus address)
A20	PMBus SCL	B20	A1 (SMBus address)
A21	PSON	B21	+12VSB
A22	SMBAlert#	B22	SMART_ON
A23	Return Remote Sense	B23	+12V load share bus
A24	+12V Remote Sense	B24	PRESENT#(Reserved)
A25	PWOK	B25	VIN GOOD

2.3 Chemical Substance Control Laws

PAHS 6P NP REACH ROHS

2.4 HANDLE RETENTION

The power supply has a handle to assist extraction. The module can be able to be inserted and extracted without the assistance of tools. The power supply has a latch which retains the power supply into the system and prevents the power supply from being inserted or extracted from the system when the DC power cord is pulled into the power supply.

The handle protects the operator from any burn hazard through the use of the Customer Corporation Industrial designed plastic handle.

2.5 LED MARKING AND IDENTIFICATION

The power supply has a single bi-colored LED for indication of the power supply status. Green &Amber. Below are table showing the LED states for each power supply operating state.

Power Supply Condition	LED State
Output ON and OK	GREEN
No DCIN power to all power supplies	OFF
DCIN present / Only 12VSB on (PS off) or PS in Smart on state	1Hz Blink GREEN
DCIN cord unplugged or DCIN power lost; with a second power supply in parallel still with DC input power.	AMBER
Power supply warning events where the power supply continues to operate; high temp, high power, high current, slow fan.	1Hz Blink Amber
Power supply critical event causing a shutdown; failure, OCP, OVP, Fan Fail	AMBER
Power supply FW updating	2Hz Blink GREEN

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2.6 AIRFLOW DIRECTION

The airflow direction shall be from the DC IN inlet side to the card edge connector side of the power supply.

2.7 ACOUSTIC REQUIREMENTS

The power supply incorporates variable speed fan(s). The declared sound power levels (LwAd) of the power supply meet the requirements shown in the table. Sound power will be measured according to ECMA 74 (www.ecma-international.org) and reported according to ISO 9296.

Table2. Sound Power Requirement

Acoustic Operating Condition	% of Maximum Loading Condition	Altitude	Ambient(Inlet Temperature Condition)	LWA (dBA)
Idle	20%	900m	35°C	TBD
Operating	60%	900m	40°C	TBD
Performance	100%	900m	50°C	TBD

2.8 TEMPERATURE REQUIREMENTS

Table: Environmental Requirements

Description	Min	Max
Operating temperature range	-10°C	50°C
Non-operating temperature range	-40°C	70°C

3. DC INPUT REQUIREMENTS

3.1 DC INLET CONNECTOR

The 48V input power is supplied via a standard pluggable terminal block connector : DECA ME860-508 or equivalent

3.2 DC INPUT VOLTAGE SPECIFICATION

The power supply must operate within all specified limits over the following input voltage range:

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**Table: DC input voltage range**

PARAMETER	MIN	RATED	VMAX	Start Up VDC	Power Off VDC
Input Voltage DC range (300W)	36Vdc	48Vdc	72Vdc	34Vdc~36Vdc	32Vdc~34Vdc
Input current at full load	10.9A	7.8A	5.3A	NA	NA

3.3 DC LINE ISOLATION REQUIREMENTS

The power supply shall meet all safety agency requirements for dielectric strength. Additionally, power supply vendor provides Customer with written confirmation of dielectric withstand test which includes voltage level, duration of test and identification detailing how each power supply is marked to indicate dielectric withstand test had been completed successfully.

Transformers isolation between primary and secondary windings must comply with the 1000Vac (1414Vdc) dielectric strength criteria. If the working voltage between primary and secondary dictates a higher dielectric strength test voltage the highest test voltage should be used. In addition, the insulation system must comply with reinforced insulation per safety standard IEC 62368-1. Separation between the primary and secondary circuits, and primary to ground circuits, must comply with the IEC 62368-1 spacing requirements.

3.4 DC LINE DROPOUT / HOLDUP

The holdup time should be tested under 48VDC input condition. And the power supply should recover and meet all turn on requirements for DC loss condition.

Loading	Hold up time
NC	NC

3.5 DC LINE 12VSB HOLDUP

The 12VSB output voltage should stay in regulation under its full load (static or dynamic) during DC dropout of 1ms min (=12VSB holdup time) whether the power supply is in ON or OFF state (PSON asserted or de-asserted).

3.6 DC LINE FUSE

The power supply shall have one line fused in the single line fuse on the line (Hot) wire of the DC input. The line fusing shall be acceptable for all safety agency requirements. The input fuse shall be a slow-blow or fast-blow type. DC inrush current shall not cause the DC line fuse to blow under any conditions. All protection circuits in the

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power supply shall not cause the DC fuse to blow unless a component in the power supply has failed. This includes DC output load short conditions.

3.7 DC INRUSH

The power supply shall not exceed 50A peak inrush current requirements for initial startup condition within the rated DC input voltage. This requirement includes outages of all varying duration. Under worst case conditions, peak inrush current at cold turn-on shall be limited to inrush specifications, hot or cold. Peak inrush current at any allowable operating temperature shall not open line fuse or breaker, rectifier diode or cause permanent damage to the power supply. Inrush current caused by x- or y-caps is not considered.

3.8 ELECTROSTATIC DISCHARGE SUSCEPTIBILITY

The power supply shall comply with the limits defined in EN61000-4-2 :

8kV contact discharge ;

15kV air discharge ;

3.9 FAST TRANSIENT/BURST

The power supply shall comply with the limits defined in EN61000-4-4 :

0.5kV DC input lines

3.10 RADIATED IMMUNITY

The power supply shall comply with the limits defined in EN55035, using the IEC 61000-4-3, test standard and performance criteria A defined in Annex B of CISPR 24.

3.11 SURGE IMMUNITY

The power supply shall be tested with the system for immunity to DC Unidirectional wave; 0.5kV line to ground and 0.5kV line to line, per EN 55035, EN 61000-4-5. The pass criteria include: No unsafe operation is allowed under any condition; all power supply output voltage levels to stay within proper spec levels; No change in operating state or loss of data during and after the test profile; No component damage under any condition. The power supply shall comply with the limits defined in EN55035, using the IEC 61000-4-5, test standard and performance criteria A defined in Annex B of CISPR 24.

3.12 POWER FREQUENCY MAGNETIC IMMUNITY

The power supply shall comply with the limits defined in EN55035, using the IEC61000-4-8, Power Frequency Magnetic Field Immunity Test standard.

3.13 POWER RECOVERY

The power supply shall recover automatically after the DC power failure. DC power failure is defined to

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be any loss of DC power that exceeds the dropout criteria.

4. EFFICIENCY

The following table provides the required minimum efficiency level at various loading conditions at 25 degrees condition stated. These are provided at different load levels; 100%, 50%, 20% ; Efficiency shall be tested at DC input voltage of 48VDC.

Table: Efficiency requirement

Loading	100% of maximum	50% of maximum	20% of maximum	10% of maximum
48VDC	83%	85%	80%	NA

5. DC OUTPUT SPECIFICATION

5.1 MAIN OUTPUT POWER / CURRENTS

The following tables define the power and current ratings. The power supply must meet both static and Dynamic voltage regulation requirements for all conditions.

Table : Output load ratings

Parameter	+12V
Output Voltage	12V (Notes)
Minimum Current	0A
Maximum Current	25A
Line Regulation	+/-1%
Load Regulation	+/-3%
Overshoot	5%
Undershoot	5%

Notes : Output voltage adjusted to 12Vdc $\pm$ 0.1Vdc @50% load

The following table defines the peak loading requirement.

Table : CRPS Load Requirements

Output	Input Voltage (Vdc)	Min. Iout (A)	Max. Iout (A)	20s Peak	10ms Peak
12V Main	36 - 72	0.0	25	31	35
12VSB	36 - 72	0.0	2.1	2.4	N/A

Length of time the 20sec peak power can be supported is based on thermal sensor and assertion of the SMBAlert# signal. Minimum peak power duration shall be 20 seconds without asserting the SMBAlert# signal at maximum

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operating temperature.

5.2 12VSB OUTPUT

+12VSB is a standby supply output that is active whenever the DC power is present. This output provides a power source for circuits that must remain operational when the main DC outputs are in a disabled state

Parameter	12VSB
Voltage	+12VDC
Minimum Current	0A
Maximum Current	2.1A
Line Regulation	+/-1%
Load Regulation	+/-3%
Overshoot	5%
Undershoot	5%

5.3 VOLTAGE REGULATION

The power supply output voltages must stay within the following voltage limits when operating at steady state and dynamic loading conditions. These limits include the peak-peak ripple/noise. These shall be measured at the output connectors.

Voltage Regulation Limits

PARAMETER	TOLERANCE	MIN	NOM	MAX	UNITS
+12V	± 5%	+11.4	+12	+12.6	Vrms
+12VSB	± 5%	+11.4	+12	+12.6	Vrms

5.4 DYNAMIC LOADING

The output voltages shall remain within limits specified for the step loading and capacitive loading specified in the tables below. The load transient repetition rate shall be tested between 50Hz and 5kHz at duty cycles ranging from 10%-90%. The load transient repetition rate is only a test specification.

The Δ step load may occur anywhere within the MIN load to the MAX load conditions.

Transient load requirements

Output	Δ Step Load Size (See note)	Load Slew Rate	Test capacitive Load
+12V	50% of Load Max	0.5 A/ μ s	2200 μ F
+12VSB	1.0A	0.5 A/ μ s	1000 μ F

Note: For dynamic condition +12V min loading is 2A

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5.5 CAPACITIVE LOADING

The power supply shall be stable and meet all requirements with the following capacitive loading ranges.

Capacitive loading conditions

Output	MIN	MAX	Units
+12V	2200	12000	μF
+12VSB	100	3100	μF

5.6 GROUNDING

The output ground of the pins of the power supply provides the output power return path. The output connector ground pins shall be connected to the safety ground (power supply enclosure). This grounding should be well designed to ensure passing the max allowed Common Mode Noise levels.

The power supply shall be provided with a reliable protective earth ground. All secondary circuits shall be connected to protective earth ground. Resistance of the ground returns to chassis shall not exceed 1.0 mΩ. This path may be used to carry DC current.

5.7 CLOSED LOOP STABILITY

The power supply shall be unconditionally stable under all line/load/transient load conditions including capacitive load ranges specified in contents 5.5 stable. A minimum of: 45 degrees phase margin and -10dB gain margin is required. The power supply manufacturer shall provide proof of the unit's closed-loop stability with local sensing through the submission of Bode plots. Closed-loop stability must be ensured at the maximum and minimum loads as applicable.

5.8 RESIDUAL VOLTAGE IMMUNITY IN STANDBY MODE

The power supply should be immune to any residual voltage placed on its outputs (Typically a leakage voltage through the system from Standby output) up to 500mV. There shall be no additional heat generated, nor stressing of any internal components with this voltage applied to any individual or all outputs simultaneously. It also should not trip the protection circuits during turn on. The residual voltage at the power supply outputs for no load condition shall not exceed 100mV when DC voltage is applied and the PS_ON signal is de-asserted.

5.9 SOFT STARTING

The Power Supply shall contain control circuit which provides monotonic soft start for its outputs without overstress of the DC line or any power supply components at any specified DC line or load conditions.

5.10 ZERO LOAD STABILITY REQUIREMENTS

When the power subsystem operates in a no load condition, it does not need to meet the output regulation

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specification, but it must operate without any tripping of over-voltage or other fault circuitry. When the power subsystem is subsequently loaded, it must begin to regulate and source current without fault.

5.11 HOT SWAP REQUIREMENTS

Swapping a power supply is the process of inserting and extracting a power supply from an operating Hot power system. During this process the output voltages shall remain within the limits with the capacitive load specified. The hot swap test must be conducted when the system is operating under static, dynamic, and zero loading conditions. The power supply shall use a latching mechanism to prevent insertion and extraction of the power supply when the DC power cord is inserted into the power supply.

5.12 FORCED LOAD SHARING

The +12V output will have active load sharing. The output will share within 10% at full load. The failure of a power supply should not affect the load sharing or output voltages of the other supplies still operating. The supplies must be able to load share in parallel and operate in a hot-swap / redundant 1+1 configurations.

The VLs(12V load share bus) pin shall be connected together at user system board for load sharing function of two units. All the remote sense pins of power supplies must to be placed at the same point on +12V and its return path at system side.

The +12VSB output is passive current sharing between power supplies (without active sharing).

The +12VSB output of the power supplies are connected together in the system so that a failure or hot swap of a redundant power supply does not cause the output to go out of regulation in the system.

- The 10% of current share error is defined as follows for 1+1 power supplies:

$$\%Error = 100 \times |PS1 \text{ current} - PS2 \text{ Current}| / (PS1 \text{ current} + PS2 \text{ Current})$$

Note: In paralleling mode, the system loading shall be gradually increased to the specified max. rating. It should not be greater than one single PSU's max. loading before PWOK asserted during turn on period and the following step loading (include start-up, DC-off and hot- swap).

NOTES: Current sharing has to meet following accuracy at different load range running in 1+1 configuration.

5.13 RIPPLE / NOISE

The maximum allowed ripple/noise output of the power supply measured over a bandwidth of 10Hz to 20MHz at the power supply output connectors. A 10μF tantalum capacitor in parallel with a 0.1μF ceramic capacitor is placed

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at the point of measurement. To help reduce switching ripple further, an additional 2,200 F low ESR electrolytic capacitor may be placed in parallel (or add minimum capacitive loading of each output also).

Ripples and Noise

+12V main	+12VSB
120mVp-p	120mVp-p

The test set-up shall be as shown below.

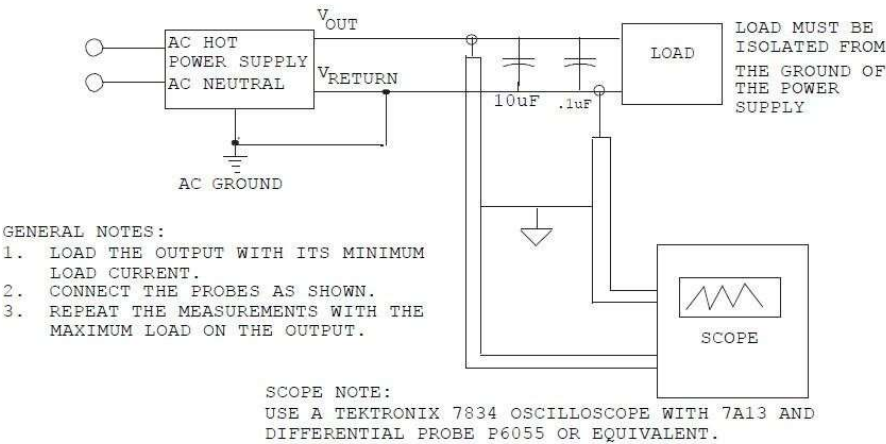


Figure 2 Differential Noise test setup

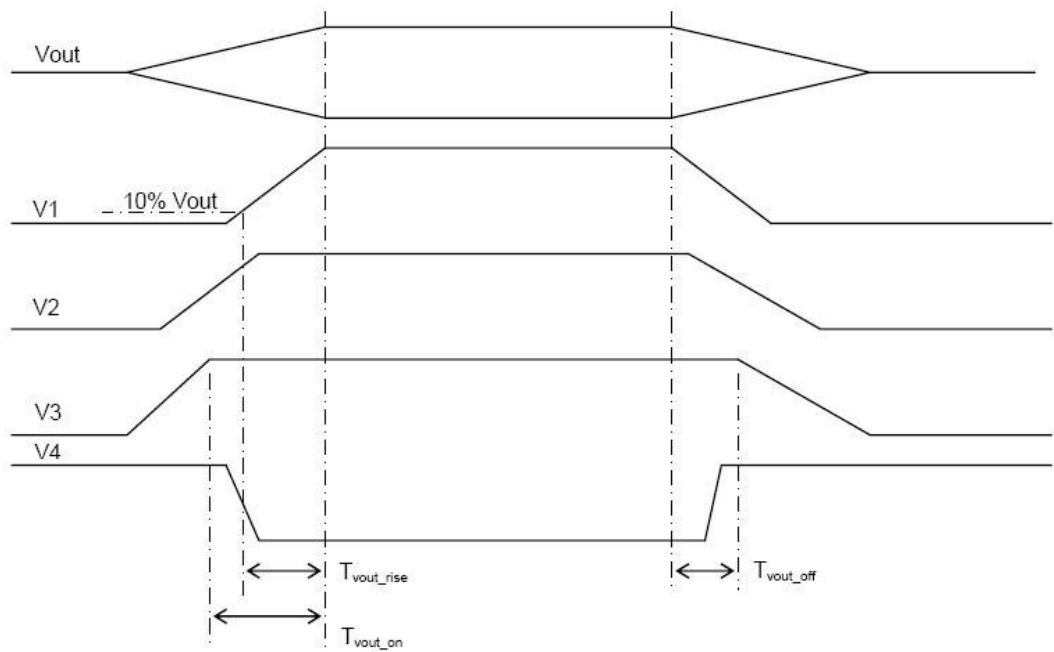
Note: When performing this test, the probe clips and capacitors should be located close to the load.

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5.14 TIMING REQUIREMENTS



Timing value :

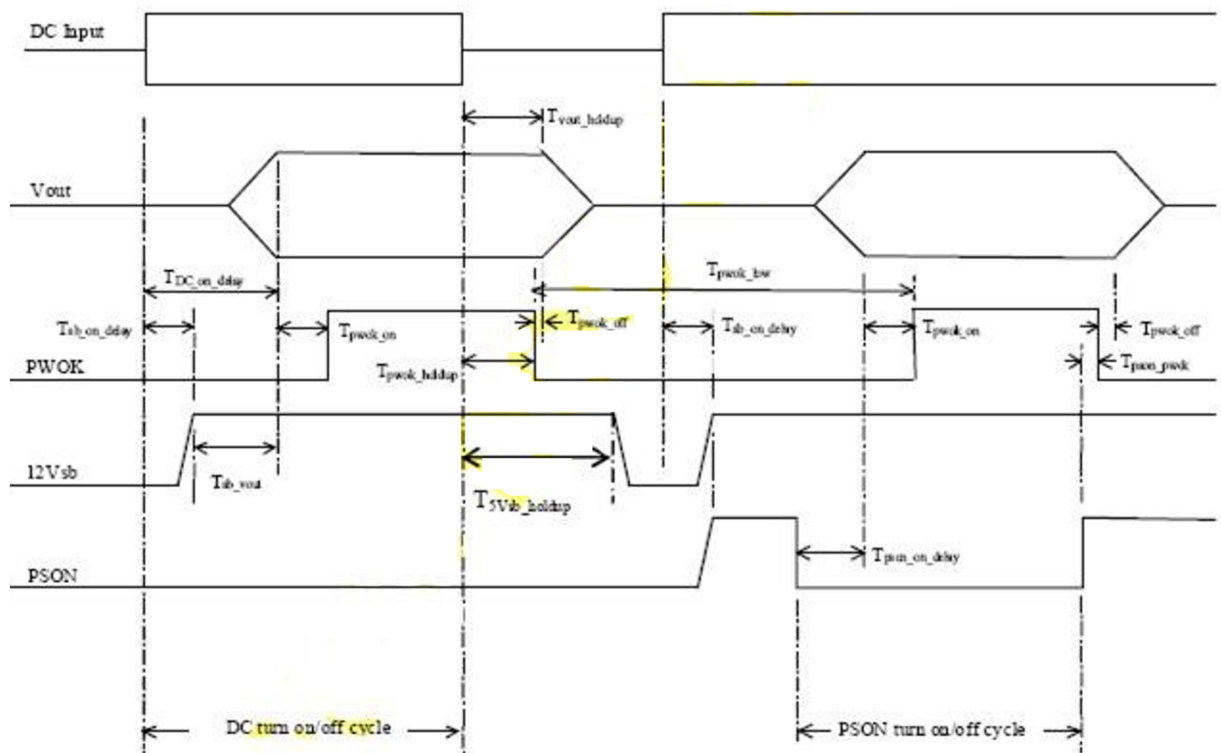
Item	Description	MIN	MAX	Units
T _{vout rise}	Output voltage rise time from each main output.	1	70	ms
T _{12vsb rise}	Ouput voltage rise time for the +12VSB output.	1	50	ms
T _{vout_on}	All main outputs must be within regulation of each other within this time.		50	ms
T _{vout off}	All main outputs must leave regulation within this time.		400	ms

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Signal Timing Sequence 2:



Timing value :

Item	Description	MIN	MAX	UNITS
Tsb_on delay	Delay from DC being applied to 12Vsb being within regulation.		1500	ms
Tdc_on delay	Delay from DC being applied to all output voltages being within regulation.		2500	ms
Tvout holdup	Time 12V output voltage dropping to regulation after loss of DC at 70% load condition.	NC		ms
Tpwok holdup	Delay from loss of DC to desertion of PWOK at 70% load condition.	NC		ms
Tpsn_on delay	Delay from PSOn#active to output voltages within regulation limits.	5	400	ms
Tpsn pwok	Delay from PSOn# deactivate to PWOK being deserted.		5	ms
Tpwok_on	Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	500	ms
Tpwok off	Delay from PWOK de-asserted to +12V dropping out of regulation limits.	NC		ms

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T _{pwok_low}	Duration of PWOK being in the deserted state during an off/on cycle using DC or the PSOn# signal.	100		ms
T _{sb_vout}	Delay from 12 VSB being in regulation to O/Ps being in regulation at DC turn on.	50	2000	ms
T _{12VSB holdup}	Time the +12VSB output voltage stays within regulation after loss of DC.	1		ms

5.15 MAXIMUM CONTINUOUS OUTPUT POWER

Maximum continuous output power is not exceed to 300W.

6. PROTECTION CIRCUITS

Protection circuits inside the power supply shall cause only the power supply's main outputs to shut down. If the power supply latches off due to a protection circuit tripping, an DC OFF for 1sec and a PSOn# cycle HIGH for 1sec shall be able to reset the power supply.

6.1 CURRENT LIMIT (OCP)

The power supply shall have current limit to prevent the outputs from exceeding the values shown in table below. If the current limits are exceeded the power supply shall shutdown and latch off. The latch will be cleared by toggling the PSOn# signal or by an DC power interruption. The power supply shall not be damaged from repeated power cycling in this condition. 12VSB will be auto-recovered after removing OCP limit.

OCP and OCW Requirements for CRPS-185

Spec	Description	MI	MA	MIN	MAX
Slow OCP	12V Slow over current protection (shutdown and latch after MIN/MAX timing)	Rating + 8A	Rating + 15A	20msec	200msec
Slow OCW	Slow over current warning (SMBAlert#)	Rating + 6A	Rating + 10A	10msec	15 msec
OCPstby	12VSB over current protection (shutdown, hiccup mode)	2.5A	4.0A	1msec	100msec

6.2 OVER VOLTAGE PROTECTION (OVP)

The power supply over voltage protection shall be locally sensed. The power supply shall shutdown and latch off after an over voltage condition occurs. This latch shall be cleared by toggling the PSOn# signal or by an DC power interruption. The values are measured at the output of the power supply's connectors. The voltage shall never exceed the maximum levels when measured at the power connectors of the power supply connector during any single point of fail. The voltage shall never trip any lower than the minimum levels when measured at the power connector. 12VSB will be auto-recovered after removing OVP limit.

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Output	Action voltage			Units
	Min	Nom	Max	
+12V	13.3	14.0	15.2	V
+12VSB	13.3	14.0	15.2	V

6.3 OVER TEMPERATURE PROTECTION (OTP)

The power supply will be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU will shutdown. When the power supply temperature drops to within specified limits, the power supply shall restore power automatically, while the 12VSB remains always on. The OTP circuit must have built in margin such that the power supply will not oscillate on and off due to temperature recovering condition. The OTP trip level shall have a minimum of 5 °C of ambient temperature margin.

	Trigger Point	Tolerance
Over Temp. warning (OTW)	TBD	3 °C
Over Temp. Protection (OTP)	TBD	3 °C

Note:

1. Internal fan speed control algorithm shall ramp up the fan speed to the maximum prior to the SMBAlert# insertion.
2. The 2 °C is Ambient temperature RT1 sensor and PMBus reading tolerance.
3. The temperature is for reference only.

6.4 SHORT CIRCUIT PROTECTION (SCP)

The power supply shall shut down and latch off for shorting the main outputs. 12VSB must be capable of being shorted indefinitely. The latch will be cleared by toggling the PSON# signal or by an DC power interruption. The power supply shall not be damaged from repeated power cycling in this condition. 12VSB will be auto-recovered after removing SCP limit.

6.5 OVER POWER PROTECTION (OPP)

The power supply shall support over power protection (OPP) level low enough to protect the power supply running in this mode for repeated 1msec durations at a 1% duty cycle. The power supply shall be stable operating at any load point from rated power up to the OPP point.

CRPS-185 Load Requirement: $OPP\ Threshold = (I_{max} + 30A) \pm 50W$.

SMBAlert shall always assert ahead of the OPP threshold being exceeded.

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7. CONTROL AND INDICATOR FUNCTIONS

The following sections define the input and output signals from the power supply. Signals that can be defined as low true use the following convention: Signal# = low true.

7.1 DEVICE ADDRESS LOCATION (B19: A0; B20: A1)

- Address Bit 0:
A 10kΩ pull-up resistor pulled to internal +3.3V in the PSU.
- Address Bit 1:
A 10kΩ pull-up resistor pulled to internal +3.3V in the PSU.

Locations	PSU#1	PSU#2
PBD addressA1/A0	0/0	0/1
Power supply FRU device	A0h	A2h
Power supply PSMI device	B0h	B2h
Signal type	10k ohm pull up resistor from +3.3Vdd device.	
A1 or A0=low	A1 or A0 address bit=0	
A1 or A0=high	A1 or A0 address bit=1	
	Minimum	Maximum
Logic level low voltage	0V	0.4V
Logic level low voltage	2.4V	3.46V

7.2 I2C BUS (A20: SCL; A19: SDA)

Each module shall provide SCL/SDA bus for EEPROM read/write of system. It’s pull up from +3.3Vdd device by a 10K ohm resistor. System should be has 1k~2k ohm pull high resistor on the SCL/SDA bus. SCL/SDA pin should be link together and closer. The SCL/SDA bus total capacitance must be lower 100pF from system and PDB. The max I2C bus speed is 100KHz and the MCU of PSU is slave device in I2C bus. The time interval of I2C command is 1ms.

7.3 SMBAlert# INDICATE(Pin A22: SMBAlert#)

This is an active low signal and indicates that the power supply is experiencing a problem that the user should investigate. This shall be asserted due to Critical events or Warning events. The signal shall activate in the case of critical component temperature reached a warning threshold, general failure, over-current, over-voltage, under-voltage, failed fan. This signal may also indicate the power supply is reaching its end of life or is operating in an environment exceeding the specified limits.

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This signal is to be asserted in parallel with LED turning solid Amber or blink Amber.

Signal Type (Active Low)	Open collector / drain output from power supply. Pull-up to VSB located in system.	
Alert# = High	OK	
Alert# = Low	Power Alert to system	
	MIN	MAX
Logic level low voltage, Isink=4 mA	0 V	0.4 V
Logic level high voltage, Isink=50uA		3.46 V
Sink current, Alert# = low		4 mA
Sink current, Alert# = high		50 uA

7.4 PS-ON INPUT SIGNAL (PINA21: PS-ON)

The PS-ON signal is required to remotely turn on/off the power supply. PSON# is an active low signal that turns on the +12V power rail. When this signal is not pulled low by the system, or left open, the outputs (except the +12VSB) turn off. This signal is pulled to a standby voltage by a pull-up resistor internal to the power supply.

Signal Type	Accepts an open collector/drain input from the system. Pull-up to 3.3VSB located in power supply.	
PSON# = Low	ON	
PSON# = High or Open	OFF	
	MIN	MAX
Logic level low (power supply ON)	0V	1.0V
Logic level high (power supply OFF)	2.0V	3.46V
Source current, Vpson = low		4mA
Power off delay: Tpson_off_delay		5msec
Power up delay: Tpson_on_delay	5msec	400msec
PWOK delay: Tpsn_pwok		5msec

7.5 PWOK OUTPUT SIGNAL (PIN A25: PWOK)

PWOK is a power OK signal and will be pulled HIGH by the power supply to indicate that all the outputs are within the regulation limits of the power supply. When any output voltage falls below regulation limits or when DC power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, PWOK will be de-asserted to a LOW state. See Table: for a representation of the timing characteristics of PWOK. The start of the PWOK delay time shall be inhibited as long as any power supply output is in current limit.

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Signal Type	Open collector/drain output from power supply. Pull-up to VSB located in the power supply.	
PWOK = High	Power OK	
PWOK = Low	Power Not OK	
Power supply PSMI device	MIN	MAX
Logic level low voltage, Isink=400uA	0V	0.4V
Logic level high voltage, Isource=200 A	2.4V	3.46V
Sink current, PWOK = low		400uA
Source current, PWOK = high		2mA
PWOK delay: Tpwok_on	100ms	500ms
PWOK rise and fall time		100 sec

7.6 SMART ON CONTROL (PIN B22: enable by system)

Before enabling Smart On function, make sure pin B22 (SMART ON) on output golden finger of each PSU is connected together. When the pin is HIGH in the Smart On mode, the slave power supply will enter the Smart Standby mode if system total loading under PSU's pre-set load level. When the pin is LOW in the Smart On mode, the Smart Standby mode power supplies will work in normal redundancy mode.

Smart On feature supports 1+1, 2+1, and 3+1 redundant configurations. It uses the PMBus manufacturer specific command area to define PMBus commands for the system to communicate with the power supplies for enabling, configuration, and monitoring.

The PMBus manufacturer specific command MFR_SPECIFIC_00 is used to configure the operating state of the power supply related to Smart On. We will call the command SMART_ON_CONFIG (D0h). Below is the definition of the values used with the Read-Write Byte SMBus protocol with PEC.

Cold Redundancy Config (D0h)		
Value	State	Description
00h	Standard Redundancy (default power on state)	Turns the power supply ON into standard redundant load sharing more. The power supply make sure no other PSU enter Smart_On mode.
01h	Cold Redundant Active 1	Defines this power supply to be the one that is always ON in a cold redundancy configuration.
02h	Cold Standby 1 1	Defines the power supply that is third to turn off in a Smart On configuration (500ms later) and first to turn on as the load increases.
03h	Cold Standby 2 1	Defines the power supply that is second to turn off in a Smart On configuration (600ms later) and second to turn on as the load increases.
04h	Cold Standby 3 1	Defines the power supply that is first to turn off in a Smart On configuration (400ms later) and third to turn on as the load increases.

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The trigger levels above may have a +/-10% tolerance for actual application. The default state of power supply is in Standard Redundancy mode. Power supply need to be re-specified a state whenever initial power on or the operating module predicts failure. The SMART_ON_CONFIG command will reset to 00h (Standard Redundancy) when any fault happened. And when an active power supply asserts, all parallel power supplies in Smart Standby mode shall power on immediately.

7.6.1 SMART STANDBY POWER SUPPLY OPERATING STATE

A power supply is put into Smart Standby whenever PSON# is asserted, SMART_RED# is de-asserted, and SMART_ON_CONFIG value is set to 02h, 03h, or 04h. In the Smart Standby mode the power supply must.

- 1) Power ON when Smart_On bus is driven LOW.
- 2) Keep PWOK asserted.
- 3) No PMBus fault conditions reported via STATUS commands, any fault happen will made PSU leave smart standby mode.
- 4) keep all fans rolling
- 5) LED is green blinking under normal conditions, amber blinking if any warning conditions happen.

7.6.2 POWERING ON SMART STANDBY SUPPLIES TO MAINTAIN BEST EFFICIENCY

Power supplies in Smart Standby state shall monitor the shared voltage level of the load share signal to sense when it needs to power on. Depending upon which position (1, 2, or 3) the system defines that power supply to be in the Smart Standby configuration; will slightly change the load share threshold that the power supply shall power on at.

7.6.3 POWERING ON SMART STANDBY SUPPLIES DURING A FAULT OR OVER CURRENT CONDITION

Some warnings happen or 12V output shutdown due to any fault will cause SRED_OK# driven low. When an active power supply asserts its SRED_OK# signal, all parallel power supplies in Smart Standby mode shall power on immediately.

The trigger condition:

- 1) 12V OC warning/ fault happens
- 2) 12V OVP fault
- 3) 12V Smart ON UVP (lower than 11.8V)
- 4) OTP fault
- 5) fan speed fault

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- 6) DC loss
- 7) send 00h to PMBus D0h command
- 8) PSON# de-assertion happen

7.7 PRESENT_N# (Pin B24, Optional)

This signal is an active low type signal and is connected to the power supply's output ground internally. The mating pin of this signal in system side should have a pull-up resistor which limit the max. current 4mA to go through from this signal pin to the power supply. A Low state on this signal indicates the PSU is physically presents.

7.8 VIN_GOOD (Pin B25)

The VIN_GOOD signal indicates that input voltage is applied to the power supply and that the input voltage meets the requirements of section 3.3. The input voltage drops to 0V the VIN_GOOD must be driven LOW. In parallel mode the VIN_GOOD signal is always LOW at that power supply which has no input.

Signal Type (Active High)	Pull-high to 3.3V with inner 1K ohm resistor..	
VIN_GOOD = High	Input voltage ok	
VIN_GOOD = Low	Input voltage failure	
	Min.	Max.
Logic level low voltage,	0V	0.4V
Logic level high voltage,	2.0V	3.46V
Sink current		4mA
Source current		400μA

8. ENVIRONMENTAL REQUIREMENTS

8.1 TEMPERATURE

Operating Ambient: -10°C to +50°C

Non-operating Ambient: -40°C to +70°C

8.2 HUMIDITY

Operating: 5% to 85% relative humidity (non-condensing)

Non-Operating: 5% to 95% relative humidity (non-condensing)

8.3 ALTITUDE

Operating: 15250 feet above sea level with a 45°C maximum ambient air temperature.

Non-operating: 50000 feet above sea level

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8.4 MECHANICAL SHOCK

Non-operating: 50 G Trapezoidal Wave, Velocity change = 170 in. / sec.

Three drops in each of six directions are applied to each of the samples.

8.5 RANDOM VIBRATION

Non-Operating Test

Sinusoidal: Input Acceleration: 1.5G, peak to

peak Frequency Band: 10Hz-500Hz-10Hz

Sweep Rate: 0.5

Octaves/minute Sweep Time:

Two sweeps per axis

Orientation: Three mutually perpendicular axes

Random: Break Point: 2Grms, 10Hz-500Hz frequency

content Dwell Time: 60 minutes per axis

Orientation: Three mutually perpendicular axes

8.6 THERMAL SHOCK (SHIPPING)

Non-operating: -40°C to +70°C, 50 cycles, 30°C/min. $\geq$ transition time $\geq$ 15°C/min., duration of exposure to temperature extremes for each half cycle shall be 30 minutes.

8.7 AUDIBLE NOISE

Maximum audible noise allowed <65dB at 100% rated DC load at 25 degree Celsius ambient inlet air temperature (Noise test sensor the distance from the fan 1m).

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9. FRU REQUIREMENTS

9.1 FRU DATA

The FRU data format shall be compliant with the IPMI ver.1.0 (per rev.1.1 from Sept.25, 1999) specification. The following is the exact listing of the EEPROM content. During testing this listing shall be followed and verified.

9.2 FRU DEVICE PROTOCOL

The FRU device will implement the same protocols, including the Byte Read, Sequential Read, Byte Write, and Page Read protocols.

Four pins will be allocated for the FRU information on the Power Supply connector. One pin is the serial clock (SCL). The second pin is used for serial data (SDA). Two pins are for address lines to indicate to the power supply's EEPROM which position the power supply is located in the system. The SCL and SDA signals are pulled up by system, the address lines are also pulled up by system.

A1 Logical voltage	A0 Logical voltage	PSU address	FRU address
0	0	0xB0	0xA0
0	1	0xB2	0xA2
1	0	0xB4	0xA4
1	1	0xB6	0xA6

10. PMBUS

Refer to the PMBUS application profile for systems for requirements. Note. PMBUS signal should be pull up to 3.3V only inside PSU.

10.1 ACCURACY

For the following PMBus commands a minimum preciseness/accuracy for voltage, current and power readings and settings must be follow below table: Power PMBus Accuracy: (For the DC input voltage:48Vdc);

The maximum deviation for the ambient temperature is +4°C;

READ_VIN

READ_IIN

READ_VOUT

READ_IOUT

READ_POUT

READ_PIN

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Table : Power PMBus Accuracy

	Pin<100W	Pin>100W	
Pin	±10W	±5%	
	lin: 0.25~3A	lin: >3A	
lin	±0.2A or ±8%	±5%	
	20% of Max. Load	20%~50% of Max. Load	50%~100% of Max. Load
Iout	±5% or ±1A	±3%	±2%
Pout	±5% or ±10W	±3%	±2%
	0%~20% of Max. Load	20%~50% of Max. Load	50%~100% of Max. Load
Vout	±3%	±3%	±3%
Vin	±5%	±5%	±5%

Preferred data format is the “Linear Data Format” as specified by PMBus specification Part II version 1.2.

10.2 PMBUS COMMAND SET

10.2.1 Following Table shows mandatory PMBus commands to be supported by the PSU.

Command Name	Command Code	Write	Read
CLEAR_FAULTS	03h	Send Byte	N/A
ON_OFF_CONFIG	02h	Write Byte	Read Byte
PAGE_PLUS_WRITE	05h	Block Write	N/A
PAGE_PLUS_READ	06h	N/A	Block Write – Block Read Process Call
CAPABILITY	19h	N/A	Read Byte
VOUT_MODE	20h	Write Byte	Read Byte
QUERY	1Ah	N/A	Block Write- Block Read Process Call
SMBALERT_MASK	1Bh	Write Word	Block Write- Block Read Process Call
COEFFICIENTS	30h	N/A	Block Write- Block Read Process Call
FAN_CONFIG_1_2	3Ah	Write Byte	Read Byte
FAN_COMMAND_1	3Bh	Write Word	Read Word

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STATUS_WORD	79h	Write Word	Read Word
STATUS_VOUT Command	7Ah	N/A	Read Byte
STATUS_IOUT	7Bh	Write Byte	Read Byte
STATUS_INPUT	7Ch	Write Byte	Read Byte
STATUS_TEMPERATURE	7Dh	Write Byte	Read Byte
STATUS_MFR_SPECIFIC	80h	N/A	Read Byte
STATUS_FANS_1_2	81h	Write Byte	Read Byte
READ_EIN	86h	N/A	Block Read
READ_EOUT	87h	N/A	Block Read
READ_VIN	88h	N/A	Read Word
READ_IIN	89h	N/A	Read Word
READ_VOUT	8Bh	N/A	Read Word
READ_IOUT	8Ch	N/A	Read Word
READ_TEMPERATURE_1	8Dh	N/A	Read Word
READ_TEMPERATURE_2	8Eh	N/A	Read Word
READ_FAN_SPEED_1	90h	N/A	Read Word
READ_POUT	96h	N/A	Read Word
READ_PIN	97h	N/A	Read Word
PMBUS_REVISION	98h	N/A	Read Byte
MFR_ID	99h	N/A	Block Read
MFR_MODEL	9Ah	N/A	Block Read
MFR_REVISION	9Bh	N/A	Block Read
MFR_SERIAL	9Eh	N/A	Block Read
MFR_IOUT_MAX	A6h	N/A	Read Word
MFR_POUT_MAX	A7h	N/A	Read Word
MFR_MAX_TEMP_1	C0h	Write Word	Read Word
MFR_MAX_TEMP_2	C1h	Write Word	Read Word
SMART_ON_CONFIG	D0h	Write Byte	Read Byte

10.2.2 ON_OFF_CONFIG Command (02h)

ONOFF_CONFIG command Default value is 0x15h.

Setting type	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Data value	Description[1]	Supported
1	0	X	X	X	0	0x00	--	--
2	0	X	X	X	1	0x01	If DC ok, turn-on power	OK
3	1	0	0	X	X	0x10	--	--
4	1	0	1	0	0	0x14	--	--
5	1	0	1	0	1	0x15	HW + LO	OK
6	1	0	1	1	0	0x16	--	--
7	1	0	1	1	1	0x17	--	--
8	1	1	0	X	0	0x18	--	--
9	1	1	0	X	1	0x19	SW	OK
10	1	1	1	0	0	0x1C	--	--
11	1	1	1	0	1	0x1D	HW + LO + SW	OK
12	1	1	1	1	0	0x1E	--	--
13	1	1	1	1	1	0x1F	--	--

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Note: “ -- ” is Not supported
[1] : X = don’t care HW = turn-on/off by control pin LO = control pin active low turn-on power SW = turn-on/off by operation command

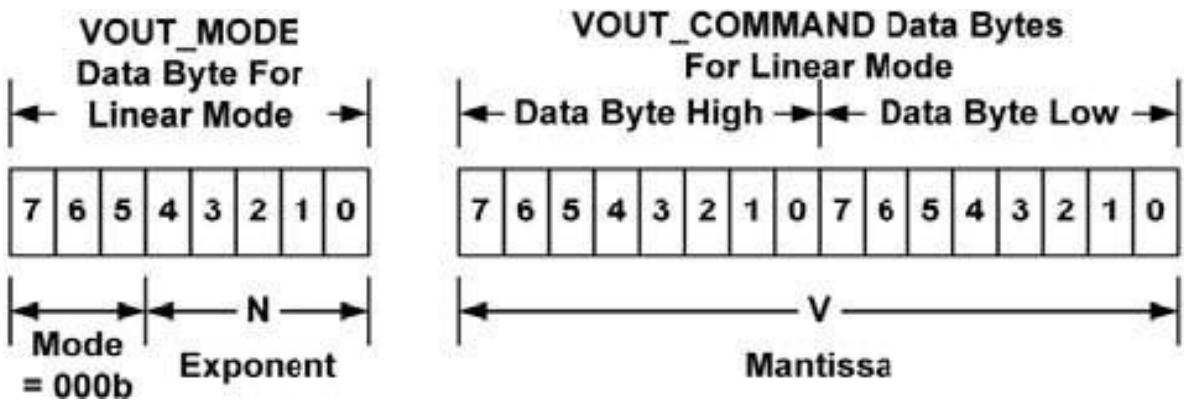
10.2.3 CLEAR_FAULTS Command (03h)

The CLEAR_FAULTS command is used to clear any fault bits that have been set. This command clears all bits in all status registers simultaneously. At the same time, the device negates (clears, releases) its SMBALERT# signal output if the device is asserting the SMBALERT# signal.

10.2.4 VOUT_MODE Command (20h)

The data bytes for the VOUT_MODE and VOUT_COMMAND when using the Linear voltage data format are shown in

Figure . Note that the VOUT_MODE command is sent separately from output voltage related commands and only when the output voltage format changes. VOUT_MODE is not sent every time an output voltage command is sent.



The Mode bits are set to 000b. The Voltage, in volts, is calculated from the equation: Voltage = V·2^N Where: Voltage is the parameter of interest in volts; V is a 16 bit unsigned binary integer; and N is a 5 bit two’s complement binary integer.

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10.2.5 STATUS_WORD Command (79h)

Byte	Bit Number	Status Bit Name	Meaning	Supported
Low	7	BUSY	A fault was declared because the device was busy and unable to respond.	--
	6	OFF	This bit is asserted if the unit is not providing pow to the output, regardless of the reason, includin simply not being enabled.	Ok
	5	VOUT_OV	An output overvoltage fault has occurred	Ok
	4	IOUT_OC	An output overcurrent fault has occurred	Ok
	3	VIN_UV	An input under voltage fault has occurred	Ok
	2	TEMPERATURE	A temperature fault or warning has occurred	Ok
	1	CML	A communications, memory or logic fault has occurred	--
	0	NONE OF THE ABOVE	A fault or warning not listed in bits [7:1] of this byte has occurred	--
High	7	VOUT	An output voltage fault or warning has occurred	Ok
	6	IOUT/POUT	An output current or output power fault or warning has occurred	Ok
	5	INPUT	An input voltage, input current, or input power fau or warning has occurred	Ok
	4	MFR	A manufacturer specific fault or warning has occurred	--
	3	POWER_GOOD#	The POWER_GOOD signal, if present, is negated	Ok
	2	FANS	A fan or airflow fault or warning has occurred	Ok
	1	OTHER	A bit in STATUS_OTHER is set	--
	0	UNKNOWN	A fault type not given in bits [15:1] of the SATUS_WORD has been detected	--

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10.2.6 STATUS_VOUT Command (7Ah)

Bit	Meaning	Supported
7	VOUT Over voltage Fault	--
6	VOUT Over voltage Warning	--
5	VOUT Under voltage Warning	--
4	VOUT Under voltage Fault	OK
3	VOUT_MAX Warning (An attempt has been made to set the output voltage to value higher than allowed by the VOUT_MAX command)	--
2	TON_MAX_FAULT	--
1	TOFF_MAX Warning	--
0	VOUT Tracking Error	--

10.2.7 STATUS_IOUT Command (7Bh)

Bit	Meaning	Supported
7	IOUT Over current Fault	OK
6	IOUT Over current And Low Voltage Shutdown Fault	--
5	IOUT Over current Warning	--
4	IOUT Under current Fault	--
3	Current Share Fault	--
2	Power Limiting	--
1	POUT Over power Fault	--
0	POUT Over power Warning	--

10.2.8 STATUS_INPUT Command (7Ch)

Bit	Meaning	Supported
7	VIN Over voltage Fault	Ok
6	VIN Over voltage Warning	--
5	VIN Under voltage Warning	--
4	VIN Under voltage Fault	Ok
3	Unit Is Off For Insufficient Input Voltage	--
2	IIN Over current Fault	--
1	IIN Over current Warning	--
0	PIN Over power Warning	--

10.2.9 STATUS_TEMPERATURE Command (7Dh)

Bit	Meaning	Supported
7	Over temperature Fault	Ok
6	Over temperature Warning	--
5	Under temperature Warning	--
3	Reserved	--
2	Reserved	--
1	Reserved	--
0	Reserved	--

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10.2.10 STATUS_FANS_1_2 (81h)

Bit	Meaning	Supported
7	Fan 1 Fault	Ok
6	Fan 2 Fault	--
5	Fan 1 Warning	--
4	Fan 2 Warning	--
3	Fan 1 Speed Overridden	--
2	Fan 2 Speed Overridden	--
1	Airflow Fault	--
0	Airflow Warning	--

10.2.11 READ_VIN Command (88h)

The READ_VIN command returns the input voltage in volts, The two data bytes are formatted in the Linear Data format.

10.2.12 READ_IIN Command (89h)

The READ_IIN command returns the input current in amperes, The two data bytes are formatted in the Linear Data format.

10.2.13 READ_VOUT Command (8Bh)

The READ_VOUT command returns actual, measured (not commanded) output voltage in the same format as set by the VOUT_MODE command, See Section 10.2.3 for how the VOUT_SCALE command applies to the value returned by this command.

10.2.14 READ_IOUT Command (8Ch)

The READ_IOUT command returns the measured output current in amperes, The two data bytes are formatted in the Linear Data format.

10.2.15 READ_TEMPERATURE_1 Command (8Dh)

The READ_TEMPERATURE_1 command returns the measured ambient temperature in degree Celsius, The two data bytes are formatted in the Linear Data format.

10.2.16 READ_TEMPERATURE_2 Command (8Eh)

The READ_TEMPERATURE_2 command returns the measured hotspot temperature in degree Celsius, The two data bytes are formatted in the Linear Data format.

10.2.17 READ_FAN_SPEED_1 Command (90h)

The READ_FAN_SPEED_1 command returns the fan speed in RPM., The two data bytes are formatted in the Linear Data format.

10.2.18 READ_POUT Command (96h)

The READ_POUT command returns the output power, in watts, The two data bytes are formatted in the Linear Data format.

10.2.19 READ_PIN Command (97h)

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The READ_PIN command returns the input power, in watts, The two data bytes are formatted in the Linear Data format.

10.2.20 MFR_ID Command (99h)

The MFR_ID command is used to read the manufacturer's ID (name, abbreviation or symbol that identifies the unit's manufacturer). Each manufacturer chooses their identifier. MFR_ID is typically only set once, at the time of manufacture.

10.2.21 MFR_MODEL Command (9Ah)

The MFR_MODEL command is used to read the manufacturer's model number. MFR_MODEL is typically set once, at the time of manufacture.

10.2.22 SMART_ON_CONFIG Command (D0h)

The PMBus manufacturer specific command MFR_SPECIFIC_00 is used to configure the operating state of the power supply related to Smart On. We will call the command SMART_ON_CONFIG (D0h).

Below is the definition of the values used with the Read-Write Byte SMBus protocol with PEC.

Cold_Redundancy_Config (D0h)		
Value	State	Description
00h	Standard Redundancy (default power on state)	Turns the power supply ON into standard redundant load sharing more. The power supply make sure no other PSU enter Smart_On mode.
01h	Cold Redundant Active ¹	Defines this power supply to be the one that is always ON in a cold redundancy configuration.
02h	Cold Standby 1 ¹	Defines the power supply that is third to turn off in a Smart On configuration (500ms later) and first to turn on as the load increases.
03h	Cold Standby 2 ¹	Defines the power supply that is second to turn off in a Smart On configuration (600ms later) and second to turn on as the load increases.
04h	Cold Standby 3 ¹	Defines the power supply that is first to turn off in a Smart On configuration (400ms later) and third to turn on as the load increases.

11. RELIABILITY / WARRANTY / SERVICE

11.1 COMPONENT DE-RATING

The following component de-rating guidelines shall be followed. Any exceptions are subject to final approval.

Semiconductor junction temperatures shall not exceed 120°C;

Transformer temperature shall not exceed 110°C & not violate safety's requirement; Inductor case temperature

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shall not exceed 85% of rated temperature in °C . Capacitor case temperature shall not exceed 85% of rated temperature in °C . Resistor wattage de-rating shall be > 30%

Component voltage and current de-rating shall be > 15%

During abnormal conditions (such as a short circuit and the like) no de-rating is required as long as the max rating is not exceeded.

Note: Bulk Cap is an exception to be able to work at maximum rated voltage.

11.2 COMPONENT LIFE REQUIREMENT

All components life expectancy requirement is min 3years,

calculated for: 70% of max continues load @ 40°C ambient temperature and @ 48VDC line voltage.

11.3 INVESTIGATIVE LIFE REQUIREMENT

The power supply shall support 5 year calculated life with a 90% confidence under the following conditions:

48VDC input

50°C inlet temperature

80% of output max-load

11.4 MEAN TIME BETWEEN FAILURES (MTBF)

The power supply shall have a minimum MTBF at continuous operation of 100,000 hours at 80% load and 25°C , as calculated by Bell core Telcordia SR-332- Issue 2.

11.5 WARRANTY PERIOD

Three (3) years.

11.6 ELECTROLYTIC CAP LIFE

TBD

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12. PRODUCT REGULATORY REQUIREMENTS

Intended Application – This product was evaluated as Information Technology Equipment (ITE), which may be installed in offices, schools, computer rooms, and similar commercial type locations.

The suitability of this product for other product categories and environments (such as: medical, industrial, telecommunications, NEBS, residential, alarm systems, test equipment, etc.), other than an ITE application, may require further evaluation.

12.1 PRODUCT SAFETY COMPLIANCE (TBD)

For short	Country or Region	Certified Status	Standard
UL	USA	/	UL 62368-1
CUL	Canada	/	CSA C22.2 NO.62368-1
FCC	America	/	Class B part 15
CE	Europe	/	Declared& CE Mark EN62368-1
CB	IEC	/	IEC62368-1

12.2 PRODUCT EMC COMPLIANCE – CLASS A COMPLIANCE (TBD)

Note: The product is required to comply with Class A emission requirements as the end system that it is configured into is intended for a commercial environment and market place. Power supply is to have minimum of 6dB margin to Class A Limits to support Customer's margin requirements. (For conduct EMI, can have a minimum of 6 db margin to class A limits.)

FCC /ICES-003 - Emissions (USA/Canada) Verification CISPR 22 – Emissions (International) EN55022 –

Conducted & Radiated Emissions (Europe)

EN55024 - Immunity (Europe)

EN61000-4-2 Electrostatic Discharge

EN61000-4-3 Radiated susceptibility

EN61000-4-4 Electrical Fast Transients/ burst

EN61000-4-5 Surge

EN61000-4-6 Conducted susceptibility

EN61000-4-8 Power Frequency Magnetic Field

EN61000-4-11 Voltage Dips and Interruption

*EN61000-3-2 – Power Harmonics (Europe)

*EN61000-3-3 – Voltage Fluctuation and Flicker

(Europe) CE – EMC Directive 2004/65/EC* and 2014/30/EU (Europe)

*Directive 2004/65/EC is repealed with effect from 20 April 2016.

SWITCHING POWER SUPPLY

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12.3 PRODUCT ECOLOGY REQUIREMENTS

All materials, parts and subassemblies must not contain restricted materials as defined in Customer's Environmental Product Content Specification of Suppliers and Outsourced Manufacturers –Compliance to Customer's content specification incorporates compliance requirements for the European Union's (EU)

12.4 COMPONENT REGULATION REQUIREMENTS

All Fans shall have the minimum certifications: UL and TUV or VDE

All current limiting devices shall have UL and TUV or VDE certifications and shall be suitable rated for the application where the device in its application complies with IEC62368-1.

All printed wiring boards shall be rated UL94V-0 and be sourced from a UL approved printed wiring board manufacturer.

All connectors shall be UL recognized and have a UL flame rating of UL94V-0

All wiring harnesses shall be sourced from a UL approved wiring harness manufacturer. SELV Cable to be rated minimum 80V, 130C

Product safety label must be printed on UL approved label stock and printer ribbon. Alternatively labels can be purchased from a UL approved label manufacturer.

The product must be marked with the correct regulatory markings to support the certifications that are specified in this document.

12.5 PRODUCT ECOLOGY REQUIREMENTS

All materials, parts and subassemblies must not contain restricted materials as defined in Customer's Environmental Product Content Specification of Suppliers and Outsourced Manufacturers –Compliance to Customer's content specification incorporates compliance requirements for the European Union's (EU) Restriction of Hazardous Substances (RoHS).

All plastic parts >25g shall not use brominated flame retardant or any other halogenated retardants that are not accepted by environmental programs such as Blue Angels, Nordic White Swan, and Swedish TCO. All plastic parts that weigh >25gm shall be marked with the ISO11469 requirements for recycling.

Example >PC/ABS< If sold as a retail product, packaging materials must be marked with applicable recycling logos for Europe (green dot) and Japan (Eco-marks). All cords and cables shall contain < 100 ppm of cadmium.

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12.6 OTHER SAFETY REQUIREMENT NOTATIONS

12.6.1 LEAKAGE CURRENT MAXIMUMS

Maximum leakage current to ground shall be less than 3.5mA at 48Vdc.

12.6.2 MAX SURFACE TEMPERATURES

The temperature of the power supply chassis shall not exceed 70 °C under all circumstances.

Otherwise a UL international HOT SURFACE label is required. If this HOT SURFACE label is required, it shall be placed in such a manner that when the power supply is extracted from the system, the label shall be visible before the operator has a chance to touch the hot surface of the power supply.

12.6.3 DATE CODED SERIAL NUMBERS

Power supply shall be marked with a date-coded number for traceability purposes and to comply with CSA 950 marking requirements.

12.6.4 POWER INPUT ELECTRICAL RATINGS

Power supply shall be tested to allow Nominal DC input operating voltage (36VDC to 72VDC) and current rating.

12.6.5 POWER INPUT ELECTRICAL RATINGS

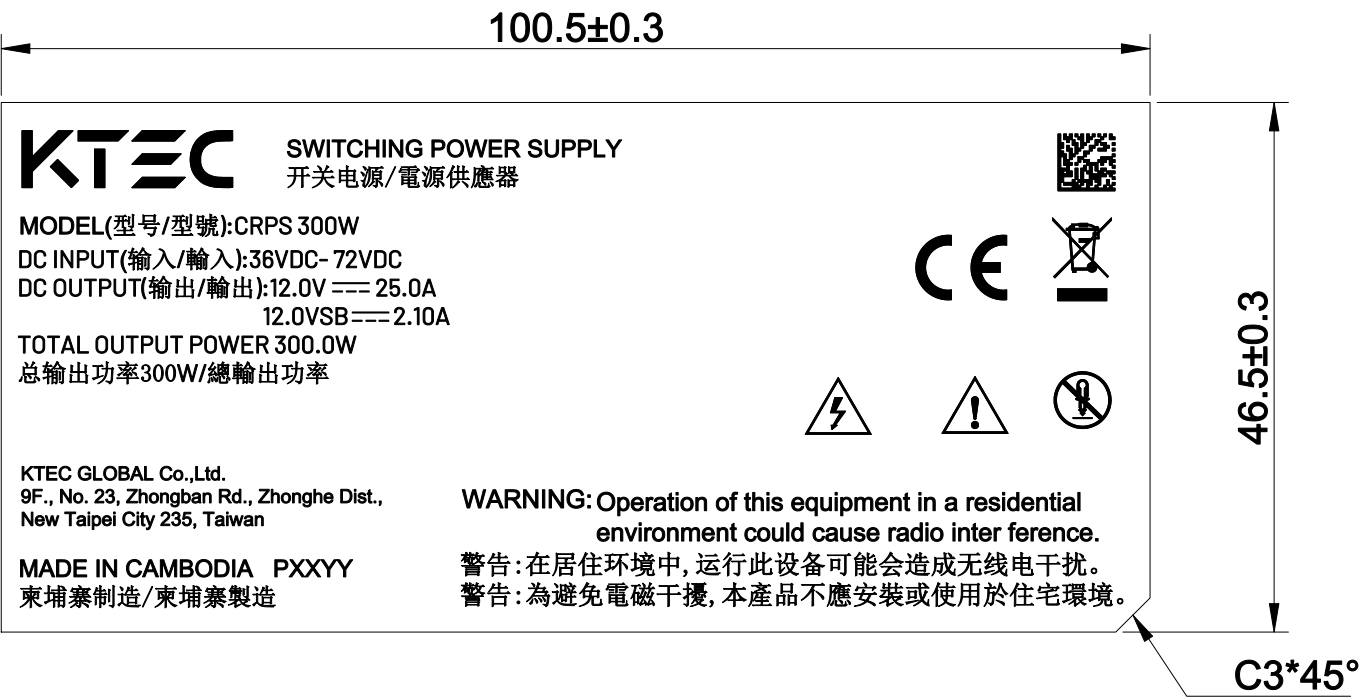
Power supply shall be tested to allow Nominal DC input operating voltage (36VDC to 72VDC) and current rating.

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13. NAME PLATE



Note: MATERIAL: silver polyester (消银龙); Thickness: 0.08+-0.01mm

Black characters silver background

PAHS REACH ROHS

PXXYY (P=PAHS, 6P, NP XX=Week, YY=Year), use the actual production date.

SN (Data Matrix Code size: 5*5mm):

First code G(Ktec)+Production part number (Product code)+Ten yards of flow code SSSSSSSSSS (decimal)

Total 19 codes

Example: GKE26000600000000001, GKE26000600000000002...GKE26000699999999999.

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14. PACKING (UNIT: MM)

TBD