SPECIFICATION

2U 1+1 Hot Swap
Redundant Power Supply

Universal AC Input
ATX Output

Part Number:
R5480C 2F (480W)
R5540C 2F (540W)
R5600C 2F (620W)
R5660C 2F (660W)
R5750C 2F (750W)

** Specification Approval**

This specification (including cover page) is approved in it's entirety by:

Company Name	Print Name	Signature	Date

Specification subject to change without prior notice.

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1. Scope

This document defines a series of power supply systems with the output power range from 480W to 750W and with ATX output rails for 1U and 2U system application. The power supply system consists of one or two power supply modules and a backplane providing the removable or redundancy function of the power supply module. The power supply module is capable of "HOT SWAP" exchanging with active current sharing and OR-ing isolation MOSFETs built in for +12V, +5V, +3.3V outputs, and droop current sharing and OR-ing isolation diode built in for -12V and +5Vsb outputs. The AC input is rated 90-264Vrms with power factor corrected (PFC>0.95). There are five outputs with maximum output current up to +12V/60.0A, +5V/30.0A, +3.3V/30.0A, -12V/0.5A, and+5VSB/3.0A. A 38mm high reliable Sanyo Denki fan is installed to the power supply module for cooling the power supply modules.

2. Electrical

The electrical specifications that follow are to be met over the environmental ranges specified in Section 3 unless otherwise noted.

2.1. AC Input

Table 1 lists AC input voltage and frequency range for continuous operation. The power supply is capable of supplying full-rated output power over the input voltage ranges specified.

Parameter	Min	Nominal Input	Max	Unit
V_{in} Voltage	90	100-240	264	Vrms
V_{in} Frequency	47	50/60	63	Hz
V_{in} Current /480W		8.0		A
V_{in} Current /540W		8.0		A
V_{in} Current /600W		10.0		A
V_{in} Current /660W		10.0		A
V_{in} Current /750W		10.0		A

Table 1. AC input

a) The inrush current of power supply module is less than 100A under the conditions of 240Vrms input and 25°C ambient cold start. The inrush current is limited to the extent that no damage will be done to the power supply under any specified line, load, and temperature conditions. The inrush current will not cause external protection devices (fuses) to trip.
b) The leakage current of the power supply module is less than 1.5 mA measured at 240Vac input.
c) The repetitive ON/OFF cycling (2 sec. interval) of AC input voltage will not damage the power supply.
d) The power supply can automatically recover from AC power loss.
e) The primary fuse, F1, is installed for input over-current protection, and meet product safety requirement.

2.2. DC Output

2.2.1. DC Output Voltage Regulations

The DC output voltages remain within the regulation ranges shown in Table 2 for both power supply module and the completed power system when measured at the load end of the output connectors under all AC line, O/P loads, and environmental conditions. The voltage regulation will be maintained under continuous operation for a period of time equal to the MTBF specified in section 5.2 at any steady state temperature and operating conditions specified in section 3.

	+12V	+5V	+3.3V	-5V	-12V	+5Vsb	Unit
Range	±5%	±5%	±5%	N/A	±10%	±5%	Volt
Min	+11.40	+4.75	+3.16	N/A	-10.80	+4.75	Volt
Nom	+12.00	+5.00	+3.30	N/A	-12.00	+5.00	Volt
Max	+12.60	+5.25	+3.46	N/A	-13.20	+5.25	Volt

Table 2. DC Output Voltage Regulations

- The remote sensing is provided to +12V, +5V, and +3.3V outputs to compensate for excessive cable drops.

2.2.2. Model Selection Chart

The Table 3 defines the power supply typical output load distribution for each model.

		Part Number				
Output Voltage	Min. Current (A)	**R5480C 2F** 480W Max. Current (A)	**R5540C 2F** 540W Max Current (A)	**R5600C 2F** 600W Max. Current (A)	**R5660C 2F** 660W Max. Current (A)	**R5750C 2F** 750W Max. Current (A)
+12V	0.5	40.0	45.0	50.0	55.0	60.0
+5V	0.0	20.0/30.0	20.0/30.0	22.0/30.0	22.0/30.0	24.0/30.0
+3.3V	0.0	20.0/30.0	20.0/30.0	22.0/30.0	22.0/30.0	24.0/30.0
-12V	0.0	0.5	0.5	0.5	0.5	0.5
+5Vsb	0.0	2.5/3.0	2.5/3.0	2.5/3.0	2.5/3.0	2.5/3.0
The Max. combined O/P of +5V & +3.3V (Watts)		120/---	120/---	135/---	135/---	150/---

Table 3. DC Output Load Distribution

a) The total continuous output power is 480W~750W max. with one (1) or two (2) modules installed.
b) For 750W model, the max. O/P is de-rated linearly from 750W to 700W when I/P voltage is in the range of 100V to 90V
c) The peak current of +12V output is 110% of max rated current and may last for 15 msec.
d) +5V and +3.3V outputs can be loaded to their max. rated current and the continuous output wattage can be still maintained to max rated wattage as specified (the max. combined O/P of +5V & +3.3V is not required by safety approvals).
e) The smaller current listed for +3.3V and +5V outputs (i.e. 20A for 480W & 540W O/P, 22A for 600W & 660W O/P, 24A for 750W O/P) and the combined output of 3.3V and 5V (i.e. 120W for 480W & 540W O/P, 135W for 600W & 660W O/P, 150W for 750W O/P) that was used only for the efficiency calculation.
f) The +5Vsb output can be loaded up to 3.0A only if the main output is ON and cooling fan is running.
g) The +5V, +3.3V, –12V, and +5Vsb can be optional.

2.2.3. DC Output Efficiency

The power supply efficiency is 80% minimum measured at 20%, 50%, full load and nominal line input, which is 115Vrms and 230Vrms conditions. The efficiency is calculated in accordance with the definition released by Ecova Plug Load Solutions.

2.2.4. DC Output Ripple & Noise

The output ripple & noise specifications listed in Table 4 will be met throughout the load ranges as specified in section 2.2.2 and the nominal line input voltage conditions as specified in section 2.1. Ripple & noise is defined as periodic of random signals over a frequency band of 10Hz to 20MHz. Measurements should be made with an oscilloscope with 20MHz bandwidth. Add a 10uF electrolytic capacitor and a 0.1uF ceramic capacitor across output terminal during ripple & noise measurement.

	+12V	+5V	+3.3V	-5V	-12V	+5Vsb	Unit
Max. Ripple	120	50	50	N/A	120	50	mV P-P
Max Ripple & Noise	120	50	50	N/A	120	50	mV P-P

Table 4. DC Output Ripple & Noise

2.2.5. DC Output Transient Response

The output voltages will remain within the regulation limits specified in Table 2. The load-changing repetition rate is 50Hz to 10KHz, and the transient load slew rate 0.5A/us. The maximum step load size, and output capacitive loading are specified as followings in Table 5:

	+12V	+5V	+3.3V	-5V	-12V	+5Vsb
Step Load Size	60% of Max Load	30% of Max Load	30% of Max Load	N/A	0.1A	0.5A
Capacitive Load	10000	10000	10000	N/A	330	1000

Table 5. DC Output Ripple & Noise

2.2.6. DC Output Voltage Hold-up Time

The power supply will maintain outputs in regulation per section 2.2.1 despite a loss of input power at the nominal range of AC input and at 80% of maximum continuous output load as applicable for a minimum of 16 ms.

2.3. Timing / Housekeeping / control

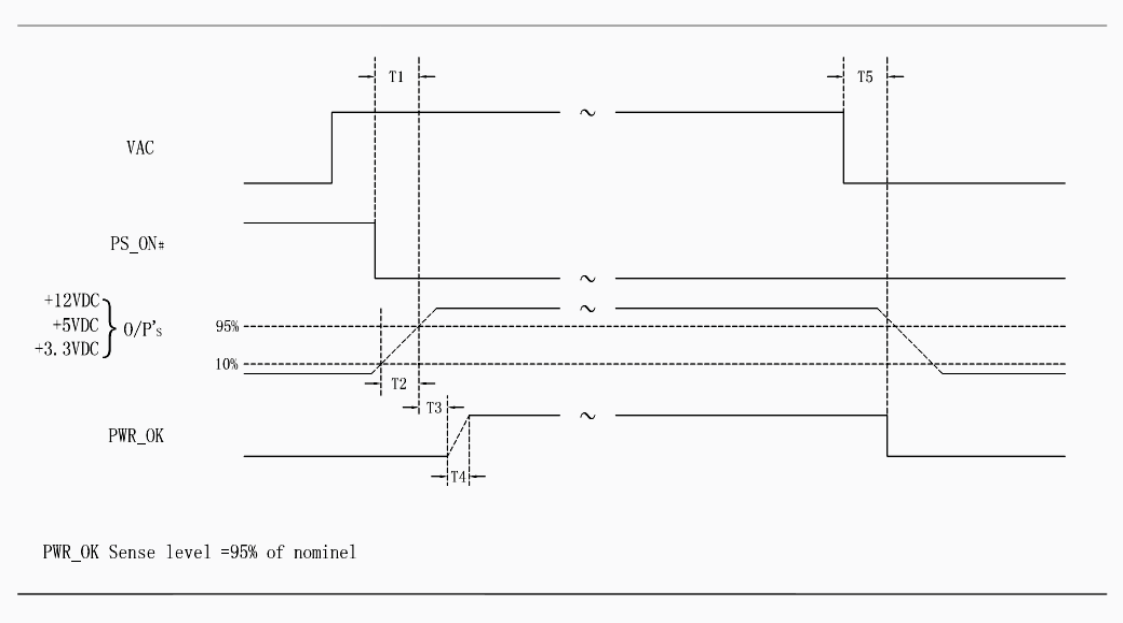


Figure 1. Power Supply Timing

Notes: T1 is defined is section 2.3.4
T2 is defined in section 2.3.5
T3, T4, and T5 are defined in Table 6

2.3.1. PWR_OK (Power Good Signal)

PWR_OK is a "power good" signal. It will be asserted high by the power supply to indicate that +12V, +5V, and +3.3V outputs are above the under voltage threshold listed in Table 2 of Section 2.2. PWR_OK will be de-asserted to a low state when +12V, +5V, or +3.3V outputs voltage fall below under voltage threshold, or when AC power has

been removed for a time sufficiently such that power supply operation cannot work normally. The electrical and timing characteristics of the PWR_OK signal are given in Table 6 and in figure 1.

Signal type	+5V TTL compatible
Logic level low	Less than 0.4V while sinking 10mA
Logic level high	Greater than 4.75V while sourcing 500uA
High-state output impedance	1kΩ from output to common
PWR_OK delay	100ms < T_3 <500ms
PWR_OK rise time	$T_4 \leq$ 10ms
AC loss to PWR_OK hold-up Time	$T_5 \geq$ 12ms

Table 6. PWR_OK Signal Characteristics

2.3.2. PS_ON (DC Soft Start)

PS_ON is an active-low, TTL-compatible signal that allows a motherboard to remotely control the power supply in conjunction with features such as soft on/off, Wake on LAN, or wake-on modem. When PS_ON is pulled to TTL low, the power supply will turn on the main DC output rails: +12V, +5V, +3.3V, and –12V. When PS_ON is pulled to TTL high, the DC output rails will not deliver current and will be held at zero potential with respect to ground. PS_ON has no effect to the +5Vsb output, which is always enabled whenever the AC power is present. Table 7 lists PS_ON signal characteristics.

	Min	Max
V_{IL}, Input Low Voltage	0.0V	0.8V
I_{IL}, Input Low Current (Vin = 0.4V)		-1.6mA
V_{IH}, Input high Voltage (Iin = -200uA)	2.0V	
V_{IH}, open circuit, Iin =0		5.25V

Table 7. PS_ON Signal Characteristics

2.3.3. +5Vsb (Standby Voltage Output)

+5Vsb is a standby voltage output that is active whenever the AC power is present. It provides a power source for circuits that must remain operational when the main DC output rails are in a disabled state. Example uses include soft power control, Wake on LAN, wake on modem, intrus ion detection, or suspend state activities. There is over power protection on the +5Vsb output to ensure the power supply will not be damaged if external circuits draw more current than the supply can provide.

2.3.4. Power-on Time

The power-on time is defined as the time from when PS_ON is pulled low to when the12V, +5V, and +3.3V output are within the regulation ranges specified in Section 2.2.1. The power-on time will be less than 800ms (T_1 <800ms). +5Vsb has a power on time of two seconds max. after the valid AC Voltages applied.

2.3.5. Rise Time

The output voltage rise from ≤ 10% of nominal to within the regulation ranges specified in section 2.2.1 within 0.1 ms to 20 ms (0.1 ms ≤ T_2 ≤ 20 ms)

2.3.6. Power Sequencing

The +12V and +5V output levels are equal to or greater than the +3.3V output at all times during power-up and normal operation. The time between the +12V or +5V output reaching its minimum in-regulation level and +3.3V reaching its minimum in-regulation level is ≤ 20 msec.

2.3.7. Overshoot at Turn-on / Turn-off

The output voltage overshoot upon the application or removal of the input voltage, or the assertion / de-assertion of PS_ON will be less than 10% above the nominal voltage.

2.3.8. Reset after Shutdown

If the power supply latches into a shutdown state because of a fault condition on its outputs, the power supply can return to normal operation only after the fault condition has been removed and the PS_ON has been cycled OFF/ON with a minimum OFF time of 3 seconds to discharge the protection circuitry fully.

2.3.9. +5Vsb at AC Power-down

After AC power is removed, the +5Vsb standby voltage output should remain at its steady state value for the minimum hold-up time specified in Section 2.2.6 until the output begins to decrease in voltage. The decrease can be monotonic in nature, dropping to 0.0V. There is no other perturbations of this voltage at or following removal of AC power.

2.4. Output Protection

2.4.1. Over Voltage Protection

The power supply can provide latch-mode over voltage protection as defined in Table 8.

Output	Min.	Nom.	Max.	Unit
+12VDC	13.6	14.6	15.6	Volts
+5VDC	5.5	6.25	7.0	Volts
+3.3VDC	3.7	4.1	4.5	Volts

Table 8. Over Voltage Protection

2.4.2. Over Current Protection

140% maximum for all outputs

2.4.3. Short-circuit Protection

The power supply will shut down and latch off for shorting any main output rails to return or between the main output rails. +5Vsb is capable of being shorted to return indefinitely. When the short is removed, the power supply will recover automatically or by cycling PS_ON. The power supply is capable of withstanding a continuous short circuit to the outputs without damage or overstress to the unit (for example, to components, PCB traces, connectors) under the input conditions specified in section 2.1.

2.4.4. No-load Operation

No damage or hazardous condition will occur with all the DC output connectors disconnected from the load. The power supply may latch into the shutdown state.

2.4.5. Isolation

Primary to Secondary 4242Vdc
Primary to Earth GND 2800Vdc

2.5. Output Signals (for Redundant System only)

2.5.1. Audible Alarm & Power Fail Signal

The Audible alarm and Power Fail signal are available from the signal card located on the backplane. The audible alarm is silence and Power Fail signal is "High" when all power modules are functioning properly. The audible alarm will be sound and Power Fail signal will be "Low" when following conditions happened:

a. One of the power supply module is not functioning and is still attached to the backplane.
b. One of the power supply module is attached to the backplane without AC power cord plugged in.

Removing the not functioning power module from backplane or pushing the reset switch (optional) provided will reset the audible alarm and also the Power Fail signal.

2.5.2. LED light

The LED light installed on the power supply module is functioning as followings:

a. Green color – Power module is ON and working properly.
b. Amber color – Power module is under Standby Mode.
c. No color – Power module is not working properly.

2.5.3. Fan Failed Signal (I2C/PSMI)

The Rotation Detector O/P signal is generated by fan: "0" fan is running well and "1" fan blade is locked or fan is not running properly.

2.5.4. PS Present Signal (I2C/PSMI)

The Power Supply Present signal: "0" power supply is present and "1" power supply is not present.

2.5.5. Power Good Signal (I2C/PSMI)

The Power Good signal: "0" power supply is fail and "1" power supply is good.

2.5.6. Temperature Warning Signal (I2C/PSMI)

The Temperature Warning signal: "0" PS is under normal condition and "1" PS is over heat (measured the temp. at secondary heatsink) under the condition of full load and ambient temperature over 55^{o}C.

2.5.7. AC/DC Input Signal (I2C/PSMI)

The AC/DC Input signal: "0" PS is DC Input and "1" PS is AC Input.

2.5.8. SMB_Alert signal (I2C/PSMI)

The SMB_Alert signal: "0": PS operation normal; "1": faulty conditions detected, automatically cleared upon host reads 0Bh. However, as long as the fault condition exists, this bit will return to "1" right after cleared by host read. This bit can only be completely cleared when both host reading this register (0Bh) and the faulty condition is removed.

The corresponding hardware signal (INTB) will issue an interrupt to host when a faulty condition is detected. The INTB is in low active format. When in normal condition, SMB_Alert bit is "0" but INTB is at logic high level (3.3V). When a faulty condition is detected the SMB_Alert bit is set to "1" and INTB will be pulled to GND (logic low).

2.5.9. Power Module Information (I2C/PSMI)

The I2C/PSMI Bus provides the power module information, i.e. 1). Model Number, 2). Serial Number, 3). Date Code 4). Revision, 5). uP Firmware Version.

3. Environmental

The following subsections define recommended environmental specifications and test parameters. Based on the typical conditions to which an ATX power supply may be subjected during operation or shipment.

3.1. Temperature

Operating -10 °C to +50°C (Part No. R5750C 2F operates up to 55°C)
Non-operating -40°C to +85°C

3.2. Humidity

Operating 10% to 90% relative humidity (non-condensing)
Non-operating 5% to 95% relative humidity (non-condensing)

3.3. Altitude

Operating 0 to 10,000 feet (5000m for CCC)
Storage 0 to 50,000 feet

4. Electromagnetic Compatibility

The following subsections outline applicable product regulatory specifications for this power supply.

4.1. Emissions

The power supply can comply with FCC Part 15 and EN55022:2010 meeting Class B for both conducted and radiated emissions with a 3 dB margin.

4.2. Immunity

The power supply can comply with EN 55024:2010.

4.3. CE Testing

The following standards are applied during the CE testing

CE EN 55022: 2010 Class B
EN 61000-3-2: 2006+A1:2009+A2:2009 Class D
EN 61000-3-3: 2008
EN 55024: 2010, including
IEC 61000-4-2:2008 Criterion A
IEC 61000-4-3:2010 Criterion A
IEC 61000-4-4:2004+A1:2010 Criterion A
IEC 61000-4-5:2005 Criterion A
IEC 61000-4-6:2008 Criterion A
IEC 61000-4-8:2009 Criterion A
IEC 61000-4-11:2004 Criterion A/C

5. Reliability

5.1. Component De-rating

The derating process promotes quality and high reliability. All electronic components are designed with conservative derating for use in commercial and industrial environments.

5.2. Mean Time between Failures (MTBF)

100K hours minimum at full load 25°C

6. Safety

6.1. Safety

cUL UL 60950-1, 2nd Edition, 2011-12-19 / CSA C22.2 No. 60950-1-07, 2nd Edition, 2011-12
TUV EN 60950-1:2006+A11+A1+A12
CB IEC 60950-1:2005 (2nd Edition)+Am1:2009
CCC GB4943.1-2011; GB9254-2008; GB17625.1-2012 (5000m)
BSMI CNS14336-1:2010, CNS13483:2006

6.2. RoHS & REACH Compliance

The power supply meets the requirements of RoHS & REACH Compliance specified as followings:

- European Directive for Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) 2011/65/EU

- ACPEIP, Administration on the Control of Pollution caused by Electronic Information Products (China RoHS), e.g. SJ/T 11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in EIP, SJ/T 11364-2006 Marking for Control of Pollution Caused by EIP

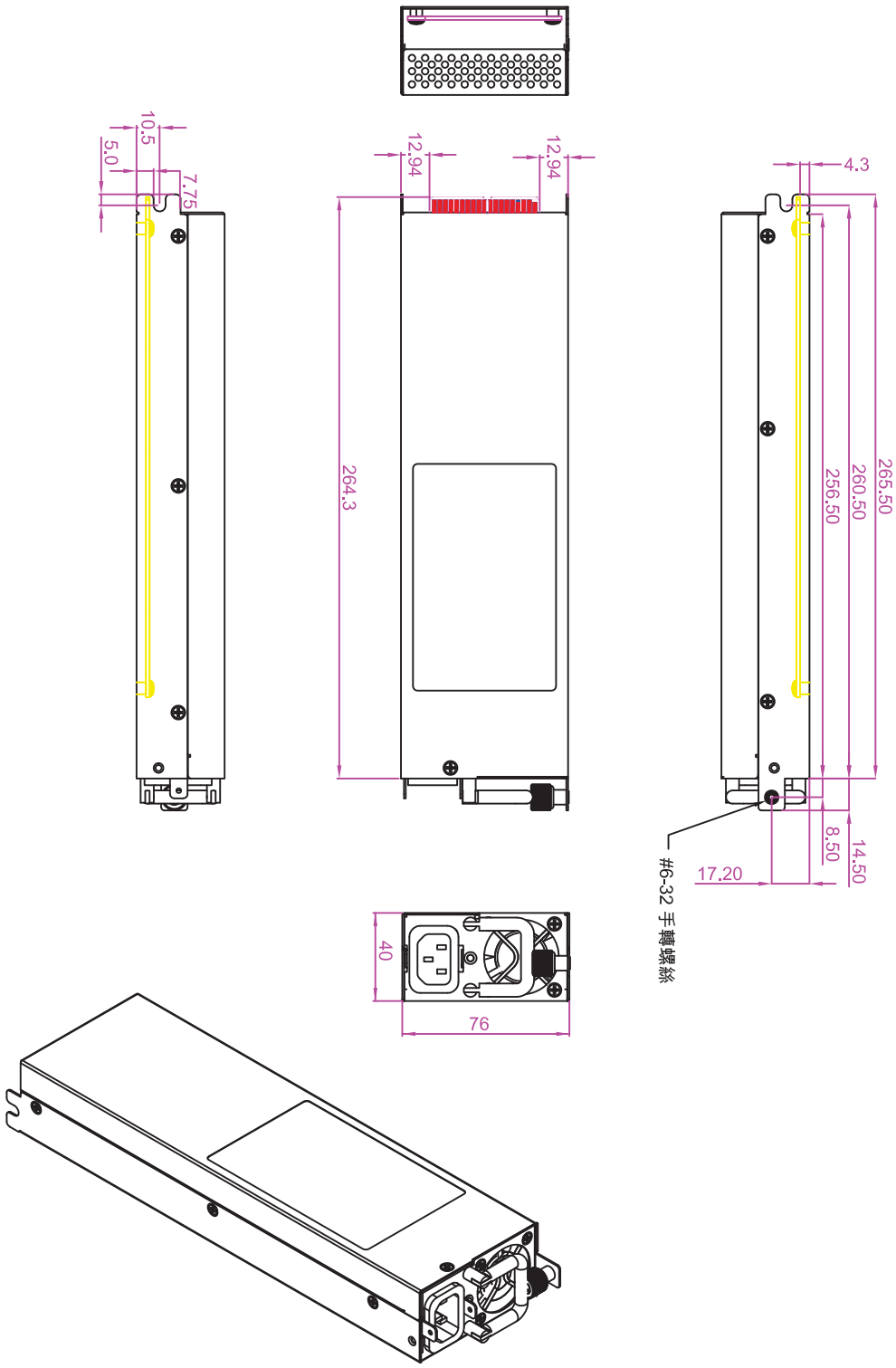
- Plastic and rubber parts are within the limits for 16 PAH and Benzopyrene polycyclic aromatic hydrocarbons
  - PAH (Polycyclic Aromatic Hydrocarbons):
    - 200mg/kg for components touched less than 30 seconds
    - 10mg/kg for components touched longer than 30 seconds
  - Benzopyrene are within the limits of:
    - 20mg/kg for components touched less than 30 seconds
    - 1mg/kg for components touched longer than 30 seconds

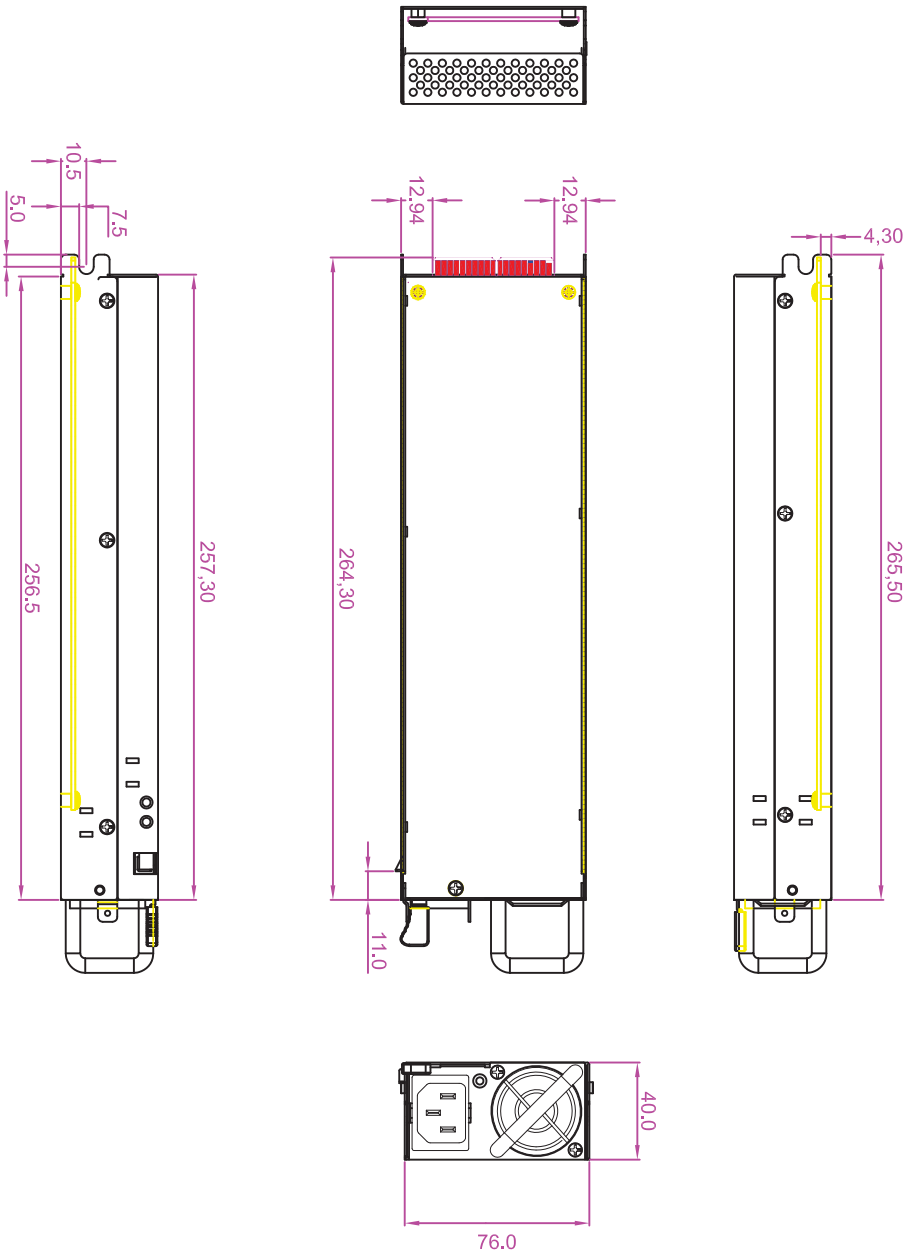
- Phthalate concentration is below 1mg/kg for:
  - Diisononyl phthalate - Diisodecyl phthalate
  - Bis(2-ethylhexyl)phthalate - Butyl benzyl phthalate
  - Di-n-octyl phthalate - Bis(n-butyl)phthalate

- Polychlorinated biphenyl (PCB) concentration limits are less than two (2) parts per million (ppm).

Regulation (EC) No 1907/2006 ... concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH): No substance of Very High Concern of the "Candidate List" exceeds more than 0,1 % of the global weight of the delivered item (without packaging of the item)

7. Mechanical

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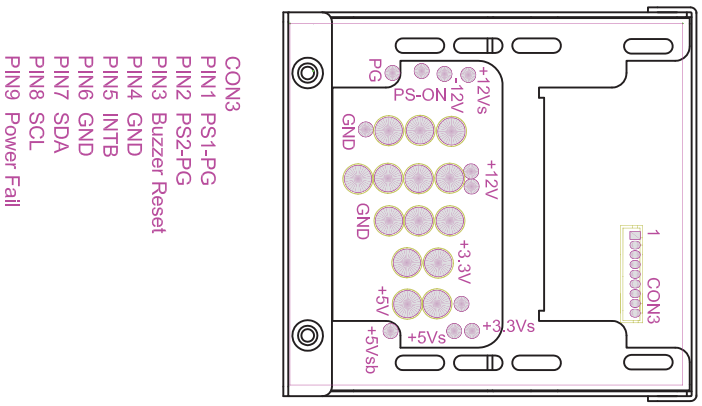
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PIN2 PS2-PG
PIN3 Buzzer Reset
PIN4 GND
PIN5 INTB
PIN6 GND
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PIN8 SCL
PIN9 Power Fail
PG
PS-ON
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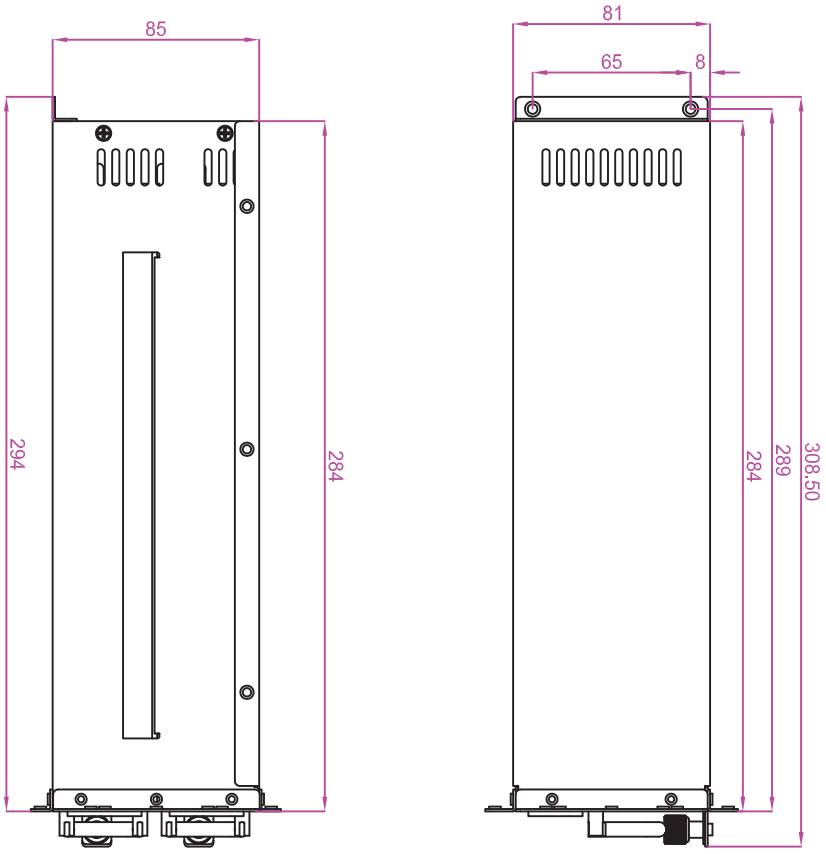
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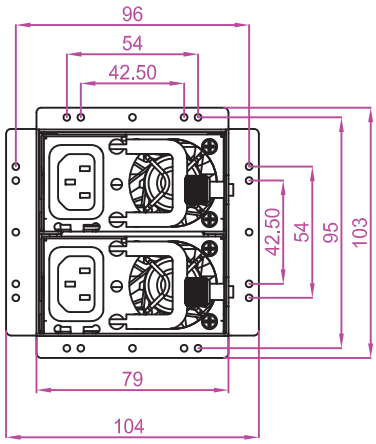
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8. Power Supply Management Interface Specification V5.2

I2C Interface

The I2C interface of power supply units supports 100Kbps communication protocol in 7-bit address slave mode only. All power supply I2C base addresses are optional to set from 0xB0, 0xB2, 0xB4,…, 0xBE according to manufacturer's configuration. To prevent address conflict with other components on I2C bus, users may request other addresses in the range of 0xB0 to 0xBE to the manufacturer. The I2C interface of power supply unit is in slave mode and only support one byte read. When accessing registers, START and STOP bits are required for each register read. Multi-byte read and 10-bit address are **not** supported.

I2C Slave Address Determination

The power supply unit I2C slave address is determined when the unit is plugged into the back plane, either with its own power or power provided by another unit through the back plane. In this case all units are inter changeable or can be easily changed with a new unit without configuring I2C slave address. However, it is important to note that the unit will not set I2C slave address until PS_Present is confirmed to be LOW (PS_Present = 0). Also the firmware in the power supply unit will not execute until I2C address is set.

I2C Interface Signal Levels

SDA and SCL signals of I2C interface are floating at power supply and should be pulled up by the host. It is designed to support 3.3V and 5V logic, depends on the pull-up level at the host. It is important to pull up SDA and SCL since these signals are open drain at power supply. Fail to pull up these signals at host will make power supply I2C interface not able to function and potentially into damage. The DC characteristics of SDA and SCL signals are in the table below

Symbols	Conditions	Min	Max	Unit
VIL	SCL, SDA	-	0.8	V
VIH	SCL, SDA	2.0	$V_{pull-up}$	V
VOL	SDA	-	0.6	V
VOH	SDA	$V_{pull-up}$ – 0.7	-	V
CB	SCL, SDA (Maximum bus capacitance permitted by I2C specification)		400	pF

I2C Register Functions

The register map contains power supply information as
Model number, register 01h ~ 0Ah;
Power supply status, register 0Bh, 0Ch
Serial number, register 0Eh ~ 19h;
Revision code, register 1Bh ~ 1Eh;
Manufacturing date code, register 1Fh and 20h;
uP Firmware Version Code, register 21h;
Typical output voltage specification, register 2Fh ~ 36h;
Typical output current specification, register 39h ~ 40h;
Typical standby voltage specification, register 43h and 44h;
Typical standby current specification, register 45h and 46h;
Maximum output wattage specification, register 47h and 48h;

Register 00h, 0Dh, and 1Ah contain the number of register reserved for model number, serial number and revision code. In register map that 10 registers locations are reserved for model number, 12 register locations are reserved for serial number, and 4 register locations are reserved for revision code. However, due to manufacturer process that these registers may not be used in full.

I2C Read

All registers in the register map (showing below) are read only. It is to prevent accidentally erase factory preset data. The procedure to read one register data are following:

1. host checks if I2C bus is idle;

2. host sends START bit, I2C device slave address (ex. 0xB0), write bit, register address, and STOP bit
3. host sends START bit, I2C slave address, read bit, then send clock to read back one byte and to send STOP bit to complete register read.
4. Once the register read is successful, release I2C bus.

Power Supply Unit Status Register

The power supply unit status register contains status bits of PS_Present, SMBAlert, ac/dc input, PWR_OK(Power Good), OTP(Over Temperature Protection Warning), and Fan_Fail(Fan Failure Warning) in register address 0Bh and 0Ch, described as following:

Status Register 0Bh

b7	b6	b5	b4	b3	b2	b1	b0
PS_Present	0	0	0	PWR_OK	0	0	SMBAlert

X: Reserved for future use. Default “0” when read back

SMB_Alert: SMB_Alert status bit.

When “0” the power supply operating normally.

When “1” fault status detected. This bit is cleared automatically upon host reads status register 0Bh. However, as long as the fault condition exists, this bit will return to “1” right after cleared by host read. This bit can only be completely cleared when both host reading this register (0Bh) and the faulty condition is removed. When faulty condition is detected, it is recommended that host reads this register at least two times to ensure the faulty condition is not momentarily due to sudden line/load change.

The corresponding hardware signal (INTB) will issue an interrupt to host when a faulty condition is detected. The INTB is in low active format. When in normal condition, SMB_Alert bit is “0” but INTB is at logic high level. When a faulty condition is detected the SMB_Alert bit is set to “1” and INTB will be pulled to GND (logic low).

- For INTB pin assignment and signal level please refer to power supply electrical specification

PWR_OK: Power good status bit.

When “0” the power supply unit is either malfunctioning or has shut down.

When “1” the power supply unit is working properly. All outputs are within range.

PS_Present: Power supply present status bit.

When “0” the power supply is attached to system.

When “1” the power supply is not attached to system.

Status Register 0Ch

b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	Fan_Fail	0	OTP	0	ac/dc

ac/dc: Power good status bit.

When “0” the power supply unit is in DC input.

When “1” the power supply unit is in AC input.

OTP: Over Temperature Protection Warning

When “0” means power supply temperature is in normal range.

When “1” the power supply temperature is higher than normal condition. Over temperature protection function soon will be activated to shut down the power supply unit.

Fan_Fail: Cooling fan status

When “0” the fan is working properly.

When “1” the fan is not working correctly or not working at all.

Note: OTP and Fan_Fail status are ignored and set to "1" (fail) when PWR_OK is "0" (fail) since OTP and Fan_Fail status are unknown when power supply does not function properly.

Power supply status can be retrived at any time. Power supply monitors its own status constantly as long as standby supply is available. The standby supply can be provided by another power supply unit in the chasis. Which means as long as one power supply unit is operating properly, the monitoring circuits in all power supply units will constantly monitoring its own power supply status. When receiving I2C read command from host, the power supply monitor circuit will be interrupted immediately to service I2C read and return to monitoring power supply status once the once the I2C read process is completed.

Power Supply Unit Present Detection and I2C Acknowledge

The power supply unit contain hardware PS_Present (Power Supply Unit Present) signal and there is PS_Present status bit in the status register. The host can check if one power supply unit is attached to the system by reading PS_Present register bit through I2C bus. When read "0" it represents the power supply unit is attached to the system. When read "1" represents the power supply is missing.

The host can also determine if one power supply unit is presenting by checking the read back value of status register. When the power supply is missing, due to pull up of I2C data line, the data line will be pulled high all the time during read so the status register read back will be 0xFF. Since the non-used bits (marked as X) in status register are default "0", there will be not possible to read back 0xFF if the power supply unit is presenting and the I2C communication circuit is working. When host reads back 0xFF from the status register (or any register), the host can assume that the power supply unit is not presenting or, completely shut down, or its I2C communication is out of work. However, to make such determination that host should not wait for Acknowledge when initiating I2C communication. When host is waiting for Acknowledge while the power supply is not presenting, host I2C function will be hanging in an endless loop until it times out. If checking Acknowledge cannot be avoid when reading status register, a time-out mechanism or a watchdog timer needs to be implemented to prevent host holding I2C bus in an endless loop.

Model Number

Model number is stored in registers 01h to 0Ah. Each register location is stored with one digit of the serial number in alphanumerical format. Depends on manufacturer process the serial number could be combined with number (0 ~ 9) and characters (A ~ Z). Not all 10 register locations may be used.

Serial Number

Serial number is stored in registers 0Eh to 19h. Each register location is stored with one digit of the serial number in alphanumerical format. Depends on manufacturer process the serial number could be combined with number (0 ~ 9) and characters (A ~ Z). Not all 12 register locations may be used.

Revision code

Revision code is stored in registers 1Bh to 1Eh. Each register location is stored with one digit of the serial number in alphanumerical format. Depends on manufacturer process the serial number could be combined with number (0 ~ 9) and characters (A ~ Z). Not all 4 register locations may be used.

Date Code

Date code is stored in registers 1Fh and 20h. Register 1Fh stores the YEAR code from 00 ~ 99 (2000 ~ 2099) and register 20h stores the WEEK number from 01 to 53. Different than serial number and revision code that are in ASCII format, the date code is in unsigned integer format from 00h to 7Fh (0 ~ 127).

uP Firmware Version Code

uP firmware version code is stored in register 21h in unsigned integer format. The version code is 0x52, representing version 5.2.

Output Voltage and Output Current manufacturer Specification

Register 2Fh to register 46h store the power supply unit output specification. Register 2Fh to 36h store the output voltage specification and register 39h to register 40h store output current specification. All voltage or current specifications are represented in mV x 10^x or mA x 10^x format. For example, to read back +5V output

voltage specification, host needs to read back register 2Fh and register 30h then to apply equation *(value of register 2Fh) x 10^(value of register 30h)*. For example if register 2Fh value is 52 (52mV) and register 30h value is 2 (10^2) then the +5V manufacturer default output specification would be 52mV x 10^2 = 5200mV(+5.2V). All output voltage and output current specifications can be obtained in a same way. All registers stored output voltage and output current specifications are in 8 bits unsigned integer format.

Output Wattage Specification Read Back

Power supply unit maximum output wattage specifications are stored in register 47h and 48h in 16 bits unsigned integer format. To read back, host should read back both values in register 47h and 48h and process as Register[48h] * 256 + Register[47h]. For example if register 47h and 48h have values as 0xee and 0x02, the maximum output power can be obtained as (0x02 * 256) + (0xee) = 750 (Watt).

Register Map

Address	b7	b6	b5	b4	b3	b2	b1	b0	R/W	Format	Description
00h	Number of character								RO	NUM	Number of character in Model Number
01h	Model nimber Char #1								RO	ASCII	Model number
02h	Model nimber Char #2								RO	ASCII	Model number
03h	Model nimber Char #3								RO	ASCII	Model number
04h	Model nimber Char #4								RO	ASCII	Model number
05h	Model nimber Char #5								RO	ASCII	Model number
06h	Model nimber Char #6								RO	ASCII	Model number
07h	Model nimber Char #7								RO	ASCII	Model number
08h	Model nimber Char #8								RO	ASCII	Model number
09h	Model nimber Char #9								RO	ASCII	Model number
0Ah	Model nimber Char #10								RO	ASCII	Model number
0Bh	PS_Present[6]	X	X	X	PG[2]	X	X	SMBAlert[1]	RO	ASCII	Power Supply Status
0Ch	X	X	X	Fan_Fail[5]	X	OTP[4]	X	ac/dc[3]	RO	ASCII	Power Supply Status
0Dh	Number of character								RO	NUM	Number of character in Serial Number
0Eh	Serial number Char #1								RO	ASCII	Serial number
0Fh	Serial number Char #2								RO	ASCII	Serial number
10h	Serial number Char #3								RO	ASCII	Serial number
11h	Serial number Char #4								RO	ASCII	Serial number
12h	Serial number Char #5								RO	ASCII	Serial number
13h	Serial number Char #6								RO	ASCII	Serial number
14h	Serial number Char #7								RO	ASCII	Serial number
15h	Serial number Char #8								RO	ASCII	Serial number
16h	Serial number Char #9								RO	ASCII	Serial number
17h	Serial number Char #10								RO	ASCII	Serial number
18h	Serial number Char #11								RO	ASCII	Serial number
19h	Serial number Char #12								RO	ASCII	Serial number
1Ah	Number of character								RO	NUM	Number of character in Revision Code
1Bh	Revision code Char #1								RO	ASCII	Revision code
1Ch	Revision code Char #2								RO	ASCII	Revision code
1Dh	Revision code Char #3								RO	ASCII	Revision code
1Eh	Revision code Char #4								RO	ASCII	Revision code
1Fh	MFG year								RO	NUM	XX, (0 - 255)
20h	MFG Week								RO	NUM	XX, (1-53)
21h	Firmware Version								RO	NUM	0x52
22h	Reserved								RO	ASCII	NA
23h	Reserved								RO	ASCII	NA
24h	Reserved								RO	ASCII	NA
25h	Reserved								RO	ASCII	NA
26h	Reserved								RO	ASCII	NA
27h	Reserved								RO	ASCII	NA
28h	Reserved								RO	ASCII	NA
29h	Reserved								RO	ASCII	NA
2Ah	Reserved								RO	ASCII	NA
2Bh	Reserved								RO	ASCII	NA
2Ch	Reserved								RO	ASCII	NA
2Dh	Reserved								RO	ASCII	NA
2Eh	Reserved								RO	ASCII	NA
2Fh	+5V Output Voltage								RO	NUM	in milliVolts
30h	+5V Output Voltage Scale								RO	NUM	2 (10^2)
31h	+12V Output Voltage								RO	NUM	in milliVolts
32h	+12V Output Voltage Scale								RO	NUM	2 (10^2)
33h	-12V Output Voltage								RO	NUM	in milliVolts
34h	-12V Output Voltage Scale								RO	NUM	2 (10^2)
35h	+3.3V Output Voltage								RO	NUM	in milliVolts
36h	+3.3V Output Voltage Scale								RO	NUM	2 (10^2)
37h	Reserved								RO	ASCII	NA
38h	Reserved								RO	ASCII	NA
39h	+5V Output Current								RO	NUM	in milliAmps
3Ah	+5V Output Current Scale								RO	NUM	3 (10^3)
3Bh	+12V Output Current								RO	NUM	in milliAmps
3Ch	+12V Output Current Scale								RO	NUM	3 (10^3)
3Dh	-12V Output Current								RO	NUM	in milliAmps
3Eh	-12V Output Current Scale								RO	NUM	2 (10^2)
3Fh	+3.3V Output Current								RO	NUM	in milliAmps
40h	+3.3V Output Current Scale								RO	NUM	3 (10^3)
41h	Reserved								RO	ASCII	NA
42h	Reserved								RO	ASCII	NA
43h	Standby Output Voltage								RO	NUM	in milliVolts
44h	Standby Output Voltage Scale								RO	NUM	2 (10^2)
45h	Standby Output Current								RO	NUM	in Amps, (0 - 255)
46h	Standby Current Scale								RO	NUM	3 (10^3)
47h	Maximum Output Power Specification, Low Byte								RO	NUM	in Watts
48h	Maximum Output Power Specification, High Byte								RO	NUM	in Watts

Notes:
1) "0": PS operation normal; "1": faulty conditions detected, automatically cleared upon host reads 0Bh
2) "1": PWR_OK ok; "0" PWR_OK failure detected
3) "1": AC input; "0" DC input
4) "0" Temperature ok: ; "1" Over temperature detected
5) "0" Fan ok; "1" Fan failed
6) "0" power supply attached; "1" power supply not attached