SPECIFICATION

ESD-00003839

FSP750-27SCB

Date:2021-10-18 11:10

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80Plus Gold PSU Specification

FSP750-27SCB

Halogen free and Red Phosphorus free products

SEP.07.2021
REV: 1.1

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Revision History

Rev	Description	Date	Author
1.0	Public release	2021.9.07	Sam
1.1	Modify item 3.10 & 4.0 Hold Up Time defined for 90% max load	2021.10.15	Sam

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1.、General

This document is defined for FSP750-27SCB specification that complies with newest ATX 12VO Revision 002 standards. Regarding to energy saving purpose, the PSU shall pass energy star 8.0 and ErP 2013 requirement. All models have to be certificated by 80 PLUS Gold Level.

2.、Input Specification

2.1、AC Input

Table 1 lists AC input voltage and frequency requirements for continuous operation. The power supply shall be capable of supplying full-rated output power from voltage ranges rated 100 to 240VAC RMS nominal. The power supply shall automatically recover from AC power loss.

Table 1: AC Input Requirements

Parameter	Minimum	Nominal	Maximum	Unit
Vin	90	100~240	264	Vrms
Vin Frequency	47~63			Hz
Iin	10A @ 115V_{AC} / 5A @ 230V_{AC}			Arms
PFC	PF ≥ 0.9@ 50% Load			

2.2、Input over Current Protection

The power supply shall incorporate primary fusing for input over-current protection to prevent damage to the power supply and meet product safety requirements. Fuses should be slow-blow–type or equivalent to prevent nuisance trips

2.3、Inrush Current Limiting

Maximum inrush current from power-on (with power-on at any point on the AC sine)and including, but not limited to, three line cycles, shall be limited to a level below the surge rating of the AC switch if present, bridge rectifier, and fuse components. Repetitive ON/OFF cycling of the AC input voltage should not damage the power supply or cause the input fuse to blow.

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3.、DC Output

3.1、Voltage Regulation

The DC output voltages shall remain within the regulation ranges shown in Table 2 when measured at the load end of the output connectors under all line, load, and environmental conditions.

Table 2: DC Output Voltage Regulation

Output	Range	Minimum	Nominal	Maximum	Units
+ 12V	5%	+11.40	+ 12.00	+ 12.60	Volts
+ 12VSB	5%	+11.40	+ 12.00	+ 12.60	Volts

3.2、Remote Sensing (Optional)

Remote sensing is optional. Remote sensing can accurately control motherboard loads by adding it to the PSU connector. The default sense should be connected to pin 10 of the main power connector.

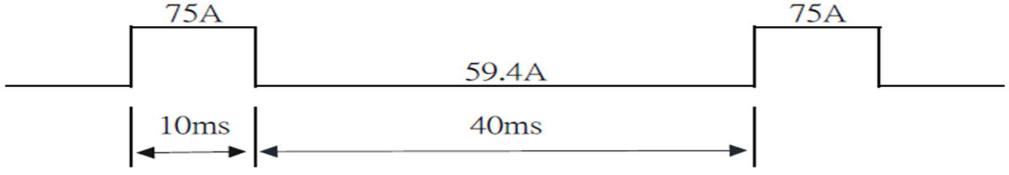
3.3、Power Distribution

It should not be inferred that those three models must conform to these tables. The power supply designed to meet the information in the tables will work for all system configurations under total power consumption.

AC INPUT	100-240~ 10-5A 60-50Hz	
DC OUTPUT	+12V	+12VSB
MAX CURRENT	62.5A	1.5A
PEAK CURRENT	75.0A	

Note:

1. +12V & +12VSB total output not exceed 750W.
2. The PSU shall deliver total power output wattages continuously when ambient temperature is under 40°C without damage and the maximum fan speed shall be controlled by fan curve chart.
3. +12V should be able to supply peak current for 10ms / 20%duty.



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3.4、Cross Load Regulation

The DC load voltages shall remain within the regulation ranges shown in the following tables when measured at the load end of the output connector. The PSU needs to be checked the last connector on modular cables.

Item	+12V	+12VSB	Total W
1	X	1.50	18.0
2	0.15	0.00	1.80
3	1.22	0.03	15.00
4	12.20	0.30	150.00
5	30.50	0.75	375.00
6	61.00	1.50	750.00
7	62.50	0.00	750.00

3.5、Efficiency

The power supply required minimum is 87% efficient under “Full” load, 90% under “typical” load, 87% under “light” load, and 72% in a “Low” load or idle condition. The efficiency of the power supply should be tested at nominal input voltage of 115VAC. The loading condition for testing efficiency shown in table below represents a fully loaded system, a ~50% (typical) loaded system, a ~20% (light) loaded system, and a ~2% (low) loaded system.

Specification	Full Load 100% Load	Typical Load 50% Load	Light Load 20% Load	Light Load 10% Load	Low Load 2% Load
115Vac Require Efficiency	87%	90%	87%	80%	72%

Loading Table for 80PLUS Efficiency Measurements

Loading	+12V	+12VSB
100%	61.04	1.46
50%	30.52	0.73
20%	12.21	0.29
10%	6.10	0.15
2%	1.22	0.03

3.6、Energy Star &ErP

To help meet the Blue Angel* system requirements, RAL-UZ 78, US Presidential executive order 13221, ENERGY STAR*, ErP Lot6 requirements, CEC Computers Standard and other low Power system demands, it is recommended that the +12VSB standby supply power consumption should be as low as possible. In order to meet the 2013 ErP Lot 6 requirements and 2014 ErP Lot 3 requirements, and if any Computers use an Alternative Sleep Mode (ASM) then the 12V standby efficiency should be met as shown in Table below which is measured with the main outputs off (PS_ON# high state).

12VSB Load Target	12VSB Actual Load	Efficiency Target (both 115V and 230V input)	Remark
Max / Label	1.5A / Label	75%	Recommend
0.625 A		75%	ASM and ErP Lot 3 2014
400 mA		75%	Recommend
230 mA		75%	ASM and ErP* Lot 3 2014
38 mA		55%	Recommended
19 mA		45%	ErP* Lot 6 2013

3.7、Ripple Noise

The output ripple noise requirements listed in Table below should be met throughout the load ranges specified for the appropriate form factor and under all input voltage conditions as specified in Table 1.
Ripple and noise are defined as periodic or random signals over a frequency band of 10 Hz to 20MHz. Measurements shall be made with an oscilloscope with 20 MHz of bandwidth. Outputs should be bypassed at the connector with a 0.1μF ceramic disk capacitor and a 10μF electrolytic capacitor to simulate system loading. See Figure 1 for the differential noise measurement setup.

Parameter	Maximum	Unit
+ 12V	120	mV_{p-p}
+ 12VSB	120	mV_{p-p}

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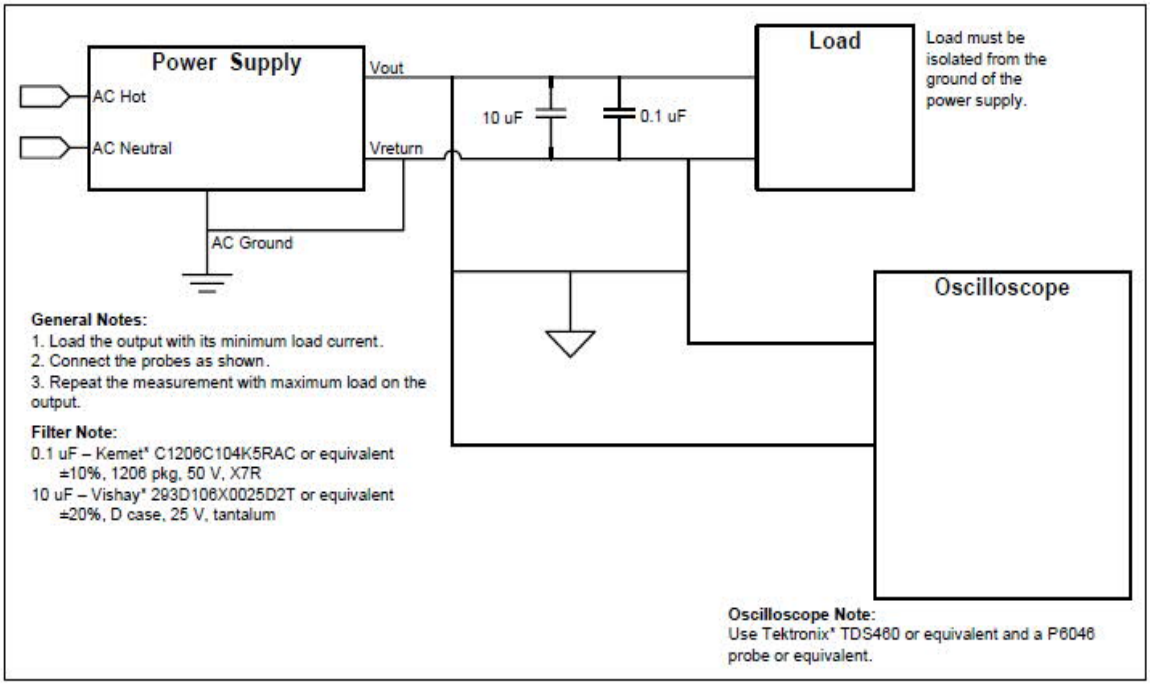

3.8、Transient Response

The table summarizes the expected output transient step sizes for each output. The transient load slew rate is = 1.0 A/us.

Output	Max. Step size (% of rate output amps)	Max. Step Size (amps)
+ 12V	50%	
+ 12VSB		0.5 A

Output voltage should remain the regulation limits of DC voltage regulation (refer to the below table), and the power supply should be stable when subjected to load transients. from any steady states load, including any or all of the following conditions.

DC Output Voltage Regulation with transient respons

Output	Range	Minimum	Nominal	Maximum	Units
+ 12V	5%	+ 11.40	+ 12.00	+ 12.60	Volts
+ 12VSB	5%	+ 11.40	+ 12.00	+ 12.60	Volts

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3.9、Capacitive Load

The power supply should be able to power up and operate normally with the following capacitances simultaneously present on the DC outputs. This capacitive loading should be used to check stability and should not be included for noise testing.

Output Voltage	+ 12V	+ 12VSB
Capacitive Load	3300μF	3300μF

3.10、Hold Up Time & Power-down warning

The power supply should maintain output regulation per Section4.1 despite a loss of input power at the low-end nominal range—115V_{AC} / 60Hz or 230V_{AC} / 50Hz—at 90% continuous output load as applicable for a minimum of 17ms.

3.11、Over Voltage Protection

The over voltage sense circuitry and reference shall reside in packages that are separate and distinct from the regulator control circuitry and reference. No single point fault shall be able to cause a sustained over voltage condition on any or all outputs. The PSU shall provide latch-mode Over Voltage Protection for the main outputs only. A remote power OFF/ON cycle is permitted to restore normal operation but is not required. For the 12VSB a Main AC power OFF/ON cycle is permitted to restore normal operation but is not required.

Output Voltage	Min.	Nom.	Max.	Unit
+ 12V	13.40	14.50	15.60	Volts

3.12、Short Circuit Protection

An output short circuit is defined as any output impedance of less than 0.1 ohms. The PSU shall shut down and latch off for shorting the +12V rails to return or any other rails. Short between main output rails and +12VSB shall not cause any damage to the PSU. The PSU shall either shut down and latch off or fold back for shorting the negative rails. +12VSB must be capable of being shorted indefinitely, but when the short is renoved, the PSU shall recover automatically or by cycling PS_ON#.

The PSU shall be capable of withstanding a continuous short-circuit to the output without damage or overstress to the unit (for example, to components, PCB traces, connectors) under the input conditions specified in Secton 2.1.

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3.13、No Load Operation

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

3.14、Over Current Protection

Basically, the OCP is defined by vendor but the trigger point shall be 125%~155% of maximum current at least each rail. And the PSU can't be damaged when OCP occur. Current protection should be designed to limit the current to operate within safe operating conditions.
Over current protection schemes where only the voltage output that experiences the over current event is shut off may be adequate to maintain safe operation of the power supply and the system; however, damage to the motherboard or other system components may occur. The recommended over current protection scheme is for the power supply to latch into the shutdown state.

3.15、Over Power Protection

The power supply shall shut off when over power protect occurs.

3.16、Over Temperature Protection

The power supply shall include an over-temperature protection sensor, which can trip and shut down the power supply at a preset temperature point. Such an overheated condition is typically the result of internal current overloading or a cooling fan failure. If the protection circuit is non-latching, then it should have hysteresis built in to avoid intermittent tripping.

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4.0、System specification

Figure 1: Power on Timing

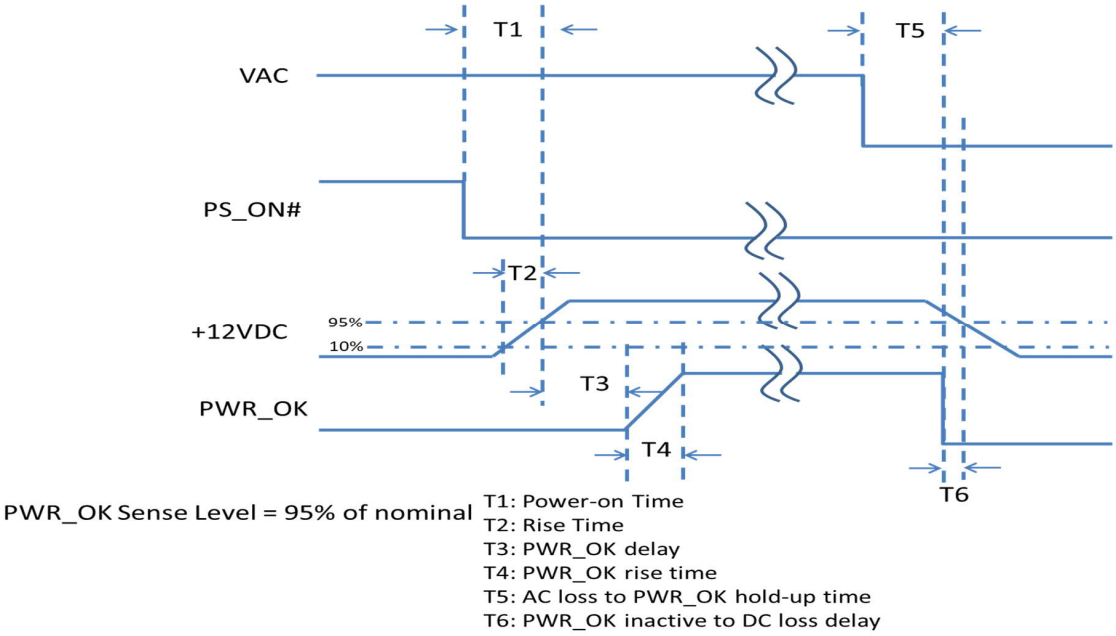

Table 4-1: Power Supply Timing

Parameter	Description	Required
T0	AC power on time	<2s
T1	Power-on time	<120ms
T2	Rise time	0.2 – 20ms
T3	PWR_OK delay	1ms – 80ms
T4	PWR_OK rise time	< 10ms
T5	AC loss to PWR_OK hold-up time	> 16ms
T6	PWR_OK inactive to DC loss delay	> 1ms

1. T1 & T3 required values are set to meet timing requirement for computers that use ASM.
2. T5 to be defined for 90% max load condition.
3. PSUs are recommended to label or indicate the timing value for system designer and integrator reference for T1 & T3. This allows system designers to optimize “turn on” time within the system.

4.1、Power Good Signal PWR_OK

PWR_OK is a “power good” signal. It should be asserted high by the power supply to indicate that the +12 VDC outputs are above the under-voltage thresholds listed and that sufficient mains energy is stored by the converter to guarantee continuous power operation. Conversely, PWR_OK should be de-asserted to a low state when the +12 VDC output voltages falls below its under-voltage threshold, or when mains power has been removed for a time sufficiently long such that power supply operation cannot be guaranteed beyond the power down warning time. The electrical and timing characteristics of the PWR_OK signal are given in table.

Table 4-2: PWR_OK Signal Characteristics

Signal Type	+5 V TTL compatible
Logic level low	< 0.4 V while sinking 4 mA
Logic level high	Between 2.4 V and 5 V output while sourcing 200μA
High state output impedance	1kΩ from output to common
Max Ripple/Noise	400 mV p-p

4.2、PS_ON

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 should turn on the main DC output rail: +12 VDC. When PS_ON# is pulled to TTL high or open-circuited, the DC output rails should not deliver current and should be held at zero potential with respect to ground. PS_ON# has no effect on the +12VSB output, which is always enabled whenever the AC power is present. Table4-3 lists PS_ON# signal characteristics.

The power supply shall provide an internal pull-up to TTL high. The power supply shall also provide de-bounce circuitry on PS_ON# to prevent it from oscillating on/off at startup when activated by a mechanical switch. The DC output enable circuitry must be SELV-compliant.

The power supply shall not latch into a shutdown state when PS_ON# is driven active by pulses between 10ms to 100ms during the decay of the power rails.

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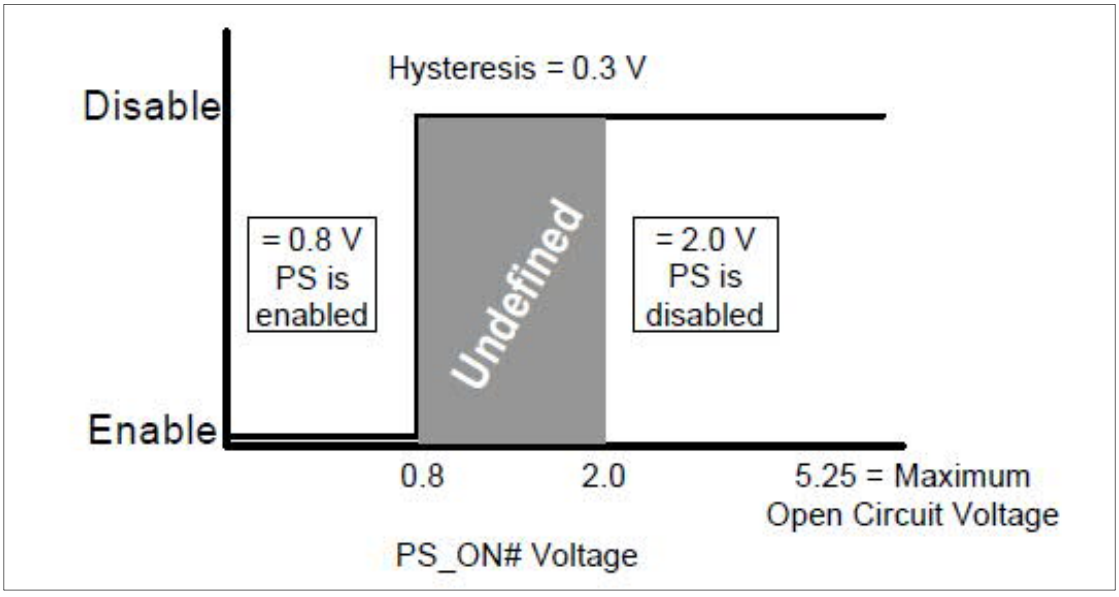
Table 4-3: PS_ON# Signal Characteristics

Parameter	Minimum	Maximum
V_{IL}	0	0.8 V
I_{IL} (V_{IN} = 0.4 V)	-	-1.6 mA[1]
V_{IH} (I_{IN} = 200uA)	2.0 V	-
V_{IH} open circuit	-	-5.25 V
Ripple / Noise		400 mV p-p

NOTES:

1. Negative current indicates that the current is flowing from the power supply to the motherboard.
2. Due to PS_ON# toggle on/off frequently, system and PSU components reliability should be Considered based on the days, months or years of claimed warranty listed on product specification.

Figure 2: PS_ON# Signal Characteristics



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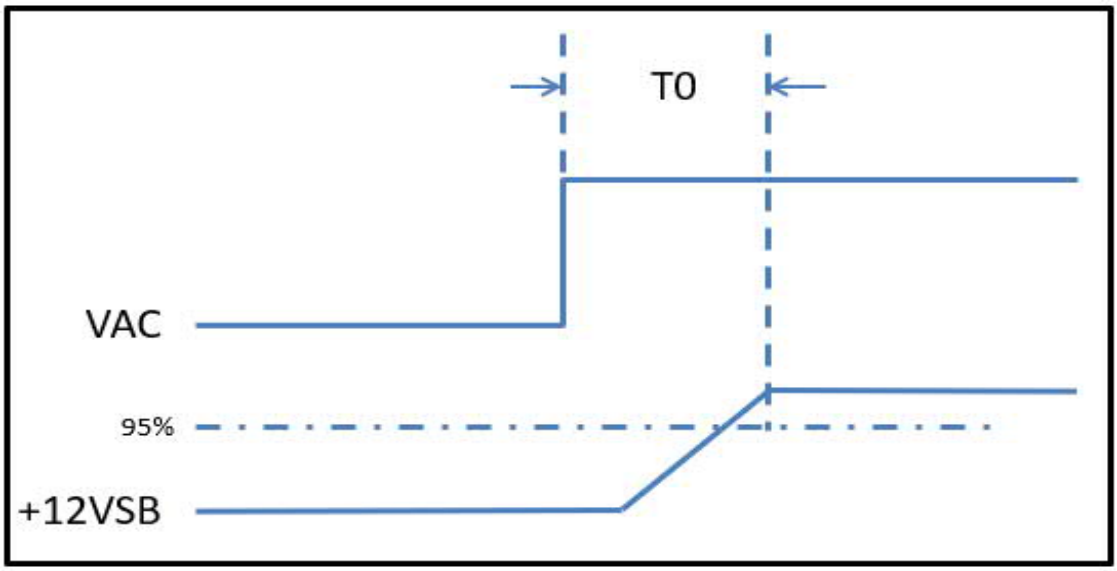
4.3、+12VSB

+12VSB is a standby supply output that is active whenever the AC power is present. This output 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, intrusion detection, or suspend state activities.

The power supply must be able to provide the required power during a “wake up” event. If an external USB device generates the event, there may be peak currents as high as 2.0A, lasting no more than 500ms.

Over current protection is required on the +12VSB output regardless of the output current rating. This ensures the power supply will not be damaged if external circuits draw more current than the supply can provide.

Figure 3 +12VSB Power on timing versus VAC



4.4、Power-on Time

The power-on time is defined as the time from when PS_ON# is pulled low to when the +12 VDC outputs are within the regulation ranges specified in Section 3.1. The power-on time shall be less than 120ms (T1 < 120ms). +12VSB shall have a power-on time of two seconds maximum after application of valid AC voltages.

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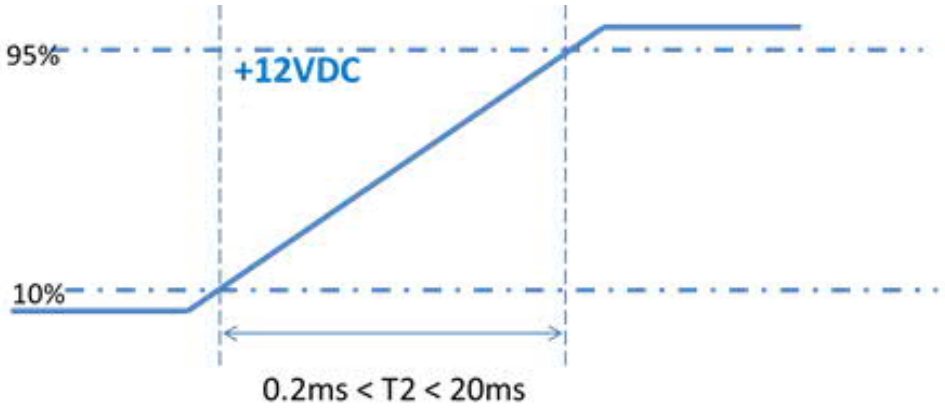
4.5、Rise Time

The output voltages shall rise from ≦ 10% of nominal to within the regulation ranges specified in Section 3.1 within 0.2 ms to 20 ms (0.2 ms ≦ T2 ≦ 20 ms).

There must be a smooth and continuous ramp of each DC output voltage from 10% to 95% of its final set—point within the regulation band, while loaded as specified in the Section 3.4. The smooth turn-on requires that, during the 10% to 95% portion of the rise time, the slope of the turn-on waveform must be positive and have a value of between 0 V/ms and [Vout, norminal /0.1] V/ms. Also, for any 5 ms segment of the 10% to 95% risetime waveform, a straight line drawn between the end points of the waveform segment must have a slope ≥ [Vout, nominal / 20] V/ms.

Figure 4: Rise Time Characteristics



	Min slew rate (10-95%)	Max Slew Rate (10-95%)	Min Slew Rate for any 5ms segment (10-95%)
+12VDC	0V/ms	60V/ms	0.6V/ms

4.6、Over Shoot at Turn-on / Turn-off

The output voltage overshoot upon the application or removal of the input voltage, or the assertion/desertion of PS_ON#, under the conditions specified in Section 2.1, shall be less than 10% above the nominal voltage. No voltage of opposite polarity shall be present on any output during turn-on or turn-off.

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4.7、Reset after Shutdown

If the power supply latches into a shutdown status because of a fault condition on its outputs, the power supply shall return to normal operation only after the fault has been removed and the PS_ON# (or AC input) has been cycled OFF/ON with a minimum OFF time of 1 second.

4.8、+12VSB at AC Power-down

After AC power is removed, the +12VSB standby voltage output should remain at its steady state value for the minimum hold-up time specified in Section 3.10 until the output begins to decrease in voltage. The decrease shall be monotonic in nature, dropping to 0.0V. There shall be no other perturbations of this voltage at or following removal of AC power.

4.9、I Sys Reporting

Parameter	Description
Sensitivity	10uA per 1% of Capacity 1.5mA @ 150% of Capacity Examples:750W,62.5A=10uA /0.625A
I Sys current at 100% of Rated Capacity	1.0mA
Maximum Reporting Capability	150%
Accuracy (at 100% Capacity)	TBD (+/-4%)

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5.0、Mechanical

5.1、Dimension

Mechanical specifications are to be the SFX12V
(125mm x 63.5mm x 100mm).

5.2、Airflow / Fan / Fan Speed Control

Exact CFM requirements vary by application and end-use environment, but 50-60 CFM is typical for the fan itself. The noise-sensitive applications, it is recommended that a thermally sensitive fan speed control circuit be used to balance system-level thermal and acoustic performance. The circuit typically senses the temperature of an internal heatsink and/or incoming ambient air and adjusts the fan speed as necessary to keep power supply and system component temperatures within specification.

The power supply fan should be turned off when PS_ON# is de-asserted (high). In this status, any remaining active power supply circuitry must rely only on passive convection for cooling. In general, more venting in a power supply case yields reduced airflow impedance and improved cooling performance. Intake and exhaust vents should be as large, open, and unobstructed as possible so as not to impede airflow or generate excessive acoustic noise.

5.3、Insulating Sheet

An insulating sheet shall be provided and cover the entire area between the solder side of the PCB and the PSU chassis and between the sides of the component side of the PCB and the sides of the PSU chassis. The insulating sheet shall be rated minimum 3000 Vac, 94V-0 and 105℃ for the thickness used.

6.0、Environmental

The following subsections define recommended environmental specifications and test parameters, based on the typical conditions to which an SFX12V power supply may be subjected during operation or shipment.

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6.1、MTBF

FSP requires the MTBF shall be meet 100,000 hours at full load condition. The vendor shall provide test report after MP for a while.

6.2、Operation Temperature

- Operating ambient: 0 ~ 40 ℃ (At full load, with a maximum temperature rate of change of 5 ℃ / 10mins., but no more than 10 ℃/ hr)
- Non-operating ambient: -40 ~ 70℃

6.3、Altitude

- Operation Altitude: 5000 meters
- Storage Altitude: 6000 meters

6.4、Mechanical Shock

SYSTEM
OP-Shock: Half sine 2g, 11 mSec pulse, 100 pulses with 5 second delay between pulses are to be applied in each of the three axis for each unit half sine 20g, 2 mSec pulse, 100 pulses with 5sec delay Between pulses are to be applied in each of the axis for each unit

Non op-Shock: Shock = Trapezoidal 25g
Velocity = 250 inches/sec
2 shock table drops in each of 6 directions

6.5、Random Vibration

0.01g^2/ Hz at 5 Hz, sloping to 0.02g^2/ Hz at 20 Hz, and maintaining 0.02g^2/ Hz from 20Hz to 500Hz. The area under the PSD curve is 3.13gRMS. The duration shall be 10 minutes per axis for all three axes on all samples. (non-operating)

7.0、Regulatory

FSP will apply UL, CE, RCM, CB, TUV, BSMI and CCC based on multiple listing or new file. And follow the Intel standard below.