SILVERSTONE

TFX SERIES

TX400x Gold / TX500 Gold / TX700 Gold

The reference TFX power supply

400W continuous power output at 40°C operating temperature rated for 24/7 operationn
500W / 700W continuous power output at 50°C operating temperature rated for 24/7 operatio
High efficiency with 80 PLUS Gold certification
Silent running 80mm fan with 18 dBA minimum
Multiple protection circuitry
Single PCI-E 6+2pin connectors support

SPECIFICATION

SilverStone TX Series

SST-TX400-GF

SST-TX500-G

SST-TX700-G
80Plus Gold Switching Power Supply with Active PFC

400W / 500W / 700W

1.Scope

This document defines the Desktop Power Supply quality, 5 output 700W/500W/400W, power supplies for the application of Desktop systems.

This power supplies meet the buss structures of Intel platform, and the following key features:
1)Input: Full Range (90-264Vrms) with Active Power Factor Correction.
2)Output: Product is provided with a total of 5 output to meet the requirement of ATX12V/EPS12V platform.
3)Cooling: A 80mm DC fan is used for cooling the power supply.

2. Electrical

The electrical specifications that follow is going to meet 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 as specified.

Parameter	Min	Nominal Input	Max	Unit
V_{in} Voltage	90	100-240	264	Vrms
V_{in} Frequency	47		63	Hz
Vin Current / 400W		7.0		
V_{in} Current / 500W		8.0		A
V_{in} Current / 700W		10.0		A
Power Factor(PF)		>0.95	at 230Vac input and full load	

Table 1. AC input

- The inrush current is less than 130A under the conditions of 230Vrms 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.
- The leakage current of the power supply module is less than 3.5mA measured at 230Vac input.
- The repetitive ON/OFF cycling of AC input voltage will not damage the power supply.
- The primary fuse 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. when measured the at 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	-12V	+5Vsb	Unit
Total DC Output Regulation	±5.0%	±5.0%	±5.0%	±10.0%	±5.0%	Volt

Table 2. DC Output Voltage Regulations

Note: -12V at 0.3A maximum requires +12V rail to be loaded at 2A minimum.

2.2.2. DC Output Load Distributions

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

Output Rail	Output Voltage	Minimum Current (A)	700W Max. (A)	500W Max. (A)	400W Max. (A)
V1	+12V	0.0	58.3A	41.6A	33.3A
V2	+5V	0.0	22.0A	18.0A	16A
V3	+3.3V	0.0	22.0A	18.0A	16A
V4	-12V	0.0	0.3A	0.3A	0.3A
V5	+5Vsb	0.0	2.5A	2.5A	2.5A
Total Continuous Power			700W	500W	400W
Max. combined O/P of V1			700W	500W	400W
Peak DC Output Power			770W	550W	440W
Max. combined O/P of V2 & V3			120W	100W	80W

Table 3. DC Output Load Distribution (700W/500W/400W)

- Peak DC Output Power: 17 Seconds maximum, one occurrence maximum per minute (115Vac 60Hz, 230Vac 50Hz).

2.2.3. DC Output Efficiency

The power supply efficiency is 87% minimum measured at 20%, efficiency is 90% minimum measured at 50%, , efficiency is 87% minimum measured at 100% which is 115Vrms conditions. shown in Table 4.

	LOAD	+12V	+5V	+3.3V	-12V	+5VSB	SPEC
700W	20%	9.77A	2.42A	2.42A	0.05A	0.42A	87%
	50%	24.42A	6.05A	6.05A	0.13A	1.05A	90%
	100%	48.84A	12.10A	12.10A	0.25A	2.09A	87%
500W	20%	6.76A	1.96A	1.96A	0.05A	0.41A	87%
	50%	16.91A	4.89A	4.89A	0.12A	1.01A	90%
	100%	33.81A	9.78A	9.78A	0.24A	2.03A	87%
400W	20%	5.38A	1.55A	1.55A	0.05A	0.40A	87%
	50%	13.44A	3.89A	3.89A	0.12A	1.01A	90%
	100%	26.88A	7.77A	7.77A	0.24A	2.02A	87%

Table 4. The power supply typical output load distribution

In order to meet 2013 Erp* requirements, the following guidance must be met for the 5Vsb efficiency at 230Vac.

Load on 5Vsb	Efficiency
< 45mA	AC input power should be <0.5W, including no load
45mA	≥ 50%
100mA	≥ 55%
250mA	≥ 65%
≥ 1A	≥ 75%

Table 5. The power supply typical output load distribution

2.2.4. DC Output Ripple & Noise

The output ripple & noise specifications listed in Table 6. will meet 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. adding a 10uF electrolytic capacitor and a 0.1uF ceramic capacitor across output terminal during ripple & noise measurement.

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

Table 6. 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 1.0A/us. The maximum step load size, and output capacitive loading are specified as followings in Table 7.

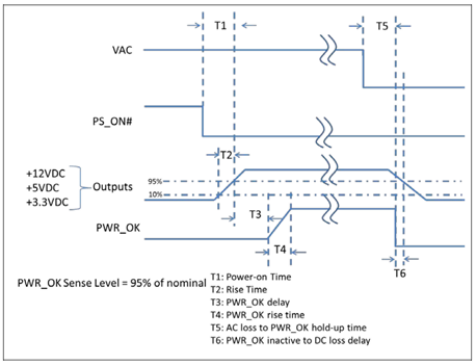
	+12V	+5V	+3.3V	-12V	+5Vsb
Voltage limits.	±5%	±5%	±5%	±10%	±5%
Load Change Low Load	2.0%~62%	0.0%~30%	0.0%~30%	0A ~ 0.1A	0A ~ 0.5A
Load Change High Load	40%~100%	70%~100%	70%~100%	0.2A ~ 0.3A	2.0A ~ 2.5A
Capacitive Load	10000uF	10000uF	10000uF	470uF	3300uF

Table 7. DC Output Transient Response

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 10 msec.

2.3. Timing / Housekeeping / control



Parameter	Description	Value		
		Required	Recommended for Non-Alternative Sleep Mode1	Recommended for Alternative Sleep Mode
T0	AC power on time	<2s		
T1	Power-on time	< 500ms	< 200ms	< 150ms
T2	Rise time	0.2 – 20 ms		
T3	PWR_OK delay	100 – 500 ms	100 – 250 ms	100 – 150 ms
T4	PWR_OK rise time	≤ 10 ms		
T5	AC loss to PWR_OK hold-up time	≥ 10 ms	(at 80% of maximum rated output load)	
T6	PWR_OK inactive to DC loss delay	≥ 1 ms		

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 the +5V output is above the under voltage threshold listed in Table 2. of Section 2.2. PWR_OK will be de-asserted to a low state when +5V output voltage falls 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 8. and in figure 1.

Signal type	+5V 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 200 µA
High-state output impedance	1 kΩ from output to common
Max Ripple/Noise	400 mV p-p

Table 8. 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 should turn on the four main DC output rails: +12 VDC, +5 VDC, +3.3 VDC, and -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 +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	1.5V
I_{IL}, Input Low Current (Vin = 0.4V)		-1.6mA
V_{IH}, Input high Voltage (Iin = -200uA)	2.4V	
V_{IH}, open circuit, Iin =0		-5.25V
Ripple/Noise		400 mV p-p

Table 9. 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 four 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. There is over current 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 the12V1, +5V, and +3.3V output are within the regulation ranges specified in Section 2.2.1. The power-on time will be less than 150ms (T1 <150 ms). +5Vsb has a power on time of two second 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 ≤ T2 ≤ 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 1 second.

2.3.9. +5Vsb at AC Power-down

After AC power is removed, the +5Vsb standby voltage output will 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 are 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 10.

Output	Min.	Nom.	Max.	Unit
+12VDC	13.6	14.6	17	Volts
+5VDC	5.5	6.25	7.0	Volts
+3.3VDC	3.7	4.1	4.7	Volts

Table 10. Over Voltage Protection

2.4.2. Under Voltage Protection

The power supply can provide latch-mode Under voltage protection as defined in Table 11.

Output	Min.	Nom.	Max.	Unit
+12VDC	8.80	9.30	9.80	Volts
+5VDC	4.0	4.30	4.47	Volts
+3.3VDC	2.5	2.69	2.83	Volts

Table 11. Under Voltage Protection

2.4.3. Over Current Protection

The power supply can provide Over Current Protection as defined in Table 12.

Output	Min.	Max.
+12VDC	115%	150%
+5VDC	30A	50A
+3.3VDC	30A	50A

Table 12. Over Current Protection

2.4.4. Short-circuit Protection

The power supply will shut down and latch off for shorting the +12V, +5V, +3.3V, and -12V rails to return or any other rails. Shorts between main output rails and +5Vsb will not cause any damage to power supply. +5Vsb can be capable of being shorted indefinitely, but when the short is removed, the power supply will recover automatically or by cycling PS_ON. The power supply can be capable of withstanding a continuous short circuit to the output without damage or overstress to the unit under the input conditions specified in section 2.1.

2.4.5. Over Power Protection

Fold back at 115%~150% over peak load

2.4.6. OVER TEMPERATURE PROTECTION

>55 degree Celsius ambient at full load <70 degree Celsius ambient at full load. Latch off protection with AC line or PWR_ON reset.

2.4.7. 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.

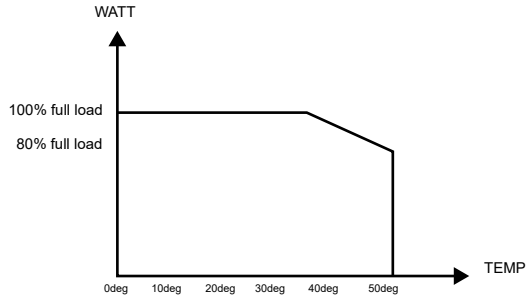
2.4.8. Isolation (High Voltage Withstand)

1800Vac for 1 minute

3. Environmental

The following subsections define recommended environmental specifications and test parameters. Based on the typical conditions to which an ATX 12V power supply may be subjected during operation or shipment.

3.1. Temperature



400W		500W/700W	
Operating	0°C to +40°C	Operating	0°C to +50°C
Non-operating	-20°C to +70°C	Non-operating	-20°C to +70°C

3.2. Humidity

Operating	20% to 90% relative humidity (non-condensing)
Non-operating	5% to 95% relative humidity (non-condensing)

3.3. Altitude

Operating	0 to 10,000 feet
Storage	0 to 50,000 feet

4. Electromagnetic Compatibility

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

4.1. Emissions (Meet)

The power supply can comply with FCC Part 15 and EN55032: 2015 meeting Class B for both conducted and radiated emissions with a 3 dB margin.

4.2. Immunity (Meet)

The power supply can comply with EN 55035: 2017.

4.3. CE Testing (Meet)

The following standards are applied during the CE testing

EN 55032: 2015	Class B with 3dB margin minimum
EN 61000-3-2: 2014	Harmonic Current Measurement
EN 61000-3-3: 2013	Voltage Fluctuation and Flick Measurement
EN 55035: 2017, including	
IEC 61000-4-2: 2009	ESD – air discharge 8kV / ESD contact discharge 4kV
IEC 61000-4-3: 2010	Radiated, Radio Frequency Electromagnetic Field Immunity Test
IEC 61000-4-4: 2012	Electrical Fast Transient/Burst Immunity Test
IEC 61000-4-5: 2014	Surge Immunity Test – 2kV L/N to PE and 1kV L to N
IEC 61000-4-6: 2014	Immunity to Conducted Disturbances Induced by RF Fields
IEC 61000-4-8: 2010	Power Frequency Magnetic Field Immunity Test
IEC 61000-4-11: 2004	Voltage Dips and Short Interruptions Immunity Test

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 (Meet)

6.1. Safety

cTUVus	UL62368-1
TUV	EN 62368-1
CB	IEC 62368-1

6.2. RoHS & REACH Compliance

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

European Directive for Waste of electrical and electronic equipment (WEEE) 2012/19/EU
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

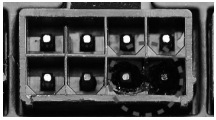
Plastic and rubber parts are within the limits for 16 PAH and Benzopyrene polycyclic aromatic hydrocarbons
- PAH (Polycyclic Aromatic Hydrocarbons):
- 200mg/kg for components touched less than 30 seconds
- 10mg/kg for components touched longer than 30 seconds
- Benzopyrene are within the limits of:
- 20mg/kg for components touched less than 30 seconds
- 1mg/kg for components touched longer than 30 seconds
Phthalate concentration is below 1000mg/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

Dimension W x L x H = 85 x 175 x 65mm. 80*15mm FAN x1 ON CASE TOP

8. Power Supply Connector Overuse Definition



DE Definition einer Überlastung des Netzanschlusses

FR Définition de l'utilisation excessive du connecteur d'alimentation électrique

ES Definición de uso excesivo del conector de la Fuente de alimentación

IT Definizione di uso eccessivo del connettore di alimentazione

RU Определение чрезмерной нагрузки на коннектор блока питания

TH [illegible]

KR 전원 공급 커넥터 과용 정의

JP 電力供給コネクタの使用限度超過に関する説明

CN 电源供应器接头过度使用定义

TW 電源供應器接頭過度使用定義

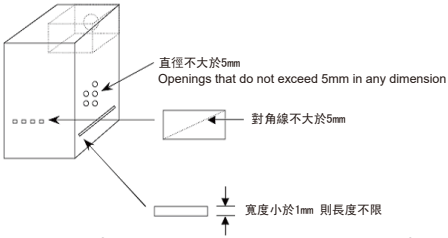
1. 為了保護使用者及防火的目的，安裝此交換式電源供應器時，必須安裝於符合下列各項要求的外殼中，並且安裝妥善後，才可接上電源。

1-1. 外殼材質須為防火外殼。外壳材质须为防火外壳。

1-2. 外殼的上方及側邊之圖形開孔，最大內徑不可大於5mm。

1-3. 外殼的上方及側邊之長條型開孔，對角線距離不可大於5mm；若寬度小於1mm，則長度不受限制。

1-4. 外殼底部不可有開孔。外壳底部不可有开孔。



Openings that do not exceed 1mm in width regardless of length

2. 本產品輸出含有危險能量，為避免操作時發生危險，須於裝入系統機殼並將所有設備安裝妥當後才可開啟電源。
3. 本產品之電源輸出非屬電力限制型電源，請連接使用具防火外殼之周邊，以避免火災危險發生。

BSMI ROHS 資訊
http://www.silverstonetek.com/downloads/PSU/RSD.pdf

开关电源供应器　有毒有害物质/元素及其化学含量表

部件名称	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
外壳	○	○	○	○	○	○
接头	○	○	○	○	○	○
风扇	○	○	○	○	○	○
电子卡	○	○	○	○	○	○
线材	○	○	○	○	○	○
螺丝	○	○	○	○	○	○
包材	○	○	○	○	○	○

本表格依据SJ/T 11364的规定编制

○：表示该有毒有害物质在该部件所有均质材料中的含量均在低于 26572 规定的限量要求以下。

×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 26572 规定的限量要求。

10 产品合格证

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

SST-TX400-GF

Model (safety certification):SST-TX400-G

The equipment a Class | Switching Power Supply intended to use for information technology equipment or Audio and Video equipment.

※付属の電源コードは当該製品専用です。他の機器に使用しないでください。

Please refer to SilverStone website for latest specifications updates.

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