Power Supply Specification

Model Number: CSTxV-P Series
(CRS-C40xxxx-92 Series)

ATX 12V Size, ATX 12V output power supply

AC Input: full range, active PFC.

DC Output: 5 Outputs, 1200W / 1050W / 850W / 750W

Revision: 0.1

Revision History

Rev	Description	Owner	Date
0.1	Preliminary		20170426

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1. Scope

This document defines the Desktop Power Supply quality, ATX 12V size, 5 output 1200W/1050W/850W/750W, power supplies for the application of Desktop systems.

The CSTxV-P series of 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 ATX 12V platform.
3) Cooling: A 140mm high reliable 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	50/60	63	Hz
V_{in} Current /750W		5.0/10.0		A
V_{in} Current /850W		6.0/12.0		A
V_{in} Current /1050W		6.0/13.0		A
V_{in} Current /1200W		7.0/15.0		A
Power Factor(PF)		> 0.90	at 230Vac input and full load	

Table 1. AC input

- When AC input 90V, CST1200V-P continuous total output power is 1000W max.
- The inrush current is less than 100A 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
Range	±2%	±2%	±3%	±5%	±2%	Volt
Min	+11.76	+4.90	+3.201	-11.40	+4.90	Volt
Nom	+12.00	+5.00	+3.30	-12.00	+5.00	Volt
Max	+12.24	+5.10	+3.399	-12.60	+5.10	Volt

Table 2. DC Output Voltage Regulations

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

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)	750W Max. (A)	850W Max. (A)	1050W Max (A)	1200W Max. (A)
V1	+12V	0.0	62.5	70.83	83.33	100.0
V2	+5V	0.0	20.0	20.0	22.0	25.0
V3	+3.3V	0.0	20.0	20.0	22.0	25.0
V4	-12V	0.0	0.3	0.3	0.3	0.3
V5	+5Vsb	0.0	3.0	3.0	3.0	3.0
Max. combined O/P of V2 & V3			100W	100W	120W	130W

Table 3. DC Output Load Distribution (750W /850W / 1050W /1200W)

a) The total continuous output power is 750W / 850W /1050W /1200W max; The max. O/P is de-rated linearly to 50% of max. rated output when working temperature is increased from 50°C to 70°C.

b) The peak current of +12V output is 110% of max rated current and may last for 15 msec.

2.2.3. DC Output Efficiency & Eup* requirements

The power supply efficiency is 90% minimum measured at 20%, efficiency is 92% minimum measured at 50%, efficiency is 89% minimum measured at 100%, which is 115Vrms conditions. The efficiency is measured in accordance with the definition released by the 80 Plus Organization (Plug Load Solutions). shown in Table 4.

	LOAD	+12V	+5V	+3.3V	-12V	+5VSB	SPEC
750W	20%	10.79A	2.08A	2.08A	0.05A	0.52A	90%
	50%	26.98A	5.20A	5.20A	0.13A	1.30A	92%
	100%	53.97A	10.4A	10.4A	0.26A	2.59A	89%
850W	20%	12.43A	2.11A	2.11A	0.05A	0.53A	90%
	50%	31.08A	5.29A	5.29A	0.13A	1.32A	92%
	100%	62.16A	10.57A	10.57A	0.26A	2.63A	89%
1050W	20%	15.46A	2.55A	2.55A	0.05A	0.53A	90%
	50%	38.65A	6.39A	6.39A	0.13A	1.33A	92%
	100%	77.30A	12.77A	12.77A	0.27A	2.63A	89%
1200W	20%	17.80A	2.79A	2.79A	0.05A	0.53A	90%
	50%	44.49A	6.97A	6.97A	0.13A	1.33A	92%
	100%	88.98A	13.94A	13.94A	0.27A	2.67A	89%

Table 4. The power supply typical output load distribution

In order to meet Eup* requirements, the following guidance must be met for the 5Vsb efficiency at 230Vac. followings in Table 5.

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(Nominal Input). 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	30	30	30	80	30	mV P-P
Max Ripple & Noise	30	30	30	80	30	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 7-2. 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 7.

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

Table 7. DC Output Transient Response

	+12V	+5V	+3.3V	-12V	Unit
Range	±10%	±10%	±10%	±10%	Volt
Min	-10.8	+4.5	+2.97	-10.8	Volt
Nom	-12.00	+5.00	+3.30	-12.00	Volt
Max	-13.20	+5.5	+3.63	-13.20	Volt

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 100% of maximum continuous output load as applicable for a minimum of 16 msec. for 115CAV/230Vac.

2.3. Timing / Housekeeping / control

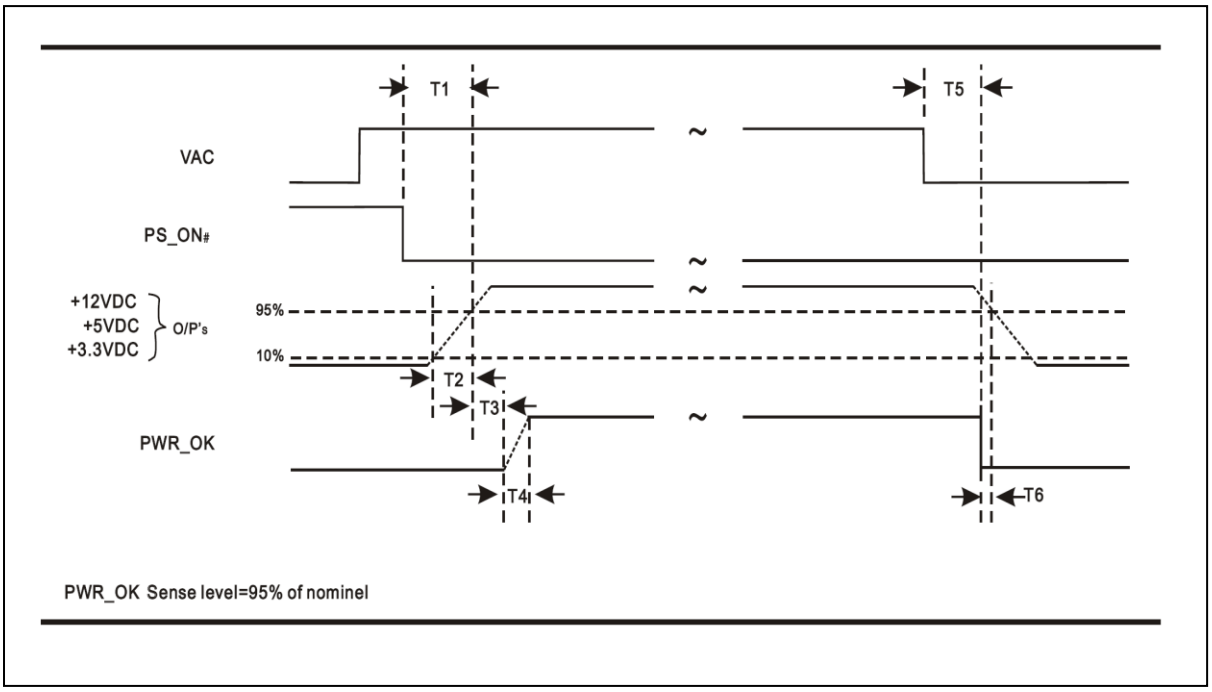

Figure 1. Power Supply Timing

Notes: T1 is defined is section 2.3.4
T2 is defined in section 2.3.5
T3, T4, T5 and T6 are defined in Table 8.

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	Less than 0.4V while sinking 10mA
Logic level high	Greater than 4.75V while sourcing 200uA
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	$T_5 \geq$ 16ms (at 100% of maximum rated output load)
Power-down warning	$T_6 \geq$ 1ms

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 low-level (1.5V max.), the power supply will turn on the main DC output rails: +12V, +5V, +3.3V, and –12V. When PS_ON is pulled to high-level (2.4V min.), 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 9. 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

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 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 500ms (T_1 <500 ms). +5Vsb has a power on time of one 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 ≤ T_2 ≤ 20 ms)

2.3.6. Power Sequencing

The +12V1 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	15.6	Volts
+5Vdc	5.5	6.25	7.0	Volts
+3.3Vdc	3.7	4.1	4.5	Volts

Table 10. Over Voltage Protection

2.4.2. Over Current Protection

150% maximum for +12V outputs
50A maximum for +3.3V and +5V outputs

2.4.3. 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.

2.4.4. Over Power Protection

Fold back at 115%~150% over peak load

2.4.5. OVER TEMPERATURE PROTECTION

Protection temperature is 55℃ to 75℃ at 115V and full load

2.4.6. 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.

2.4.7. 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

Operating 0°C to +50°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

The power supply can comply with FCC Part 15 and EN55022: 2006 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: 1998+A1: 2001+A2: 2003.

4.3. CE Testing

The following standards are applied during the CE testing

EN 55032: 2012	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 55024: 2010, including	
IEC 61000-4-2: 2009	ESD – air discharge 8kV / ESD contact discharge 6kV
IEC 61000-4-3: 2010	Radiated, Radio Frequency Electromagnetic Field Immunity Test
IEC 61000-4-4: 2012	Electrical Fast Transient/Burst Immunity Test:2kV
IEC 61000-4-5: 2014	Surge Immunity Test – 2kV L/N to PE and 1kV L to N
IEC 61000-4-6: 2013	Immunity to Conducted Disturbances Induced by RF Fields
IEC 61000-4-8: 2010	Power Frequency Magnetic Field 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^{o}C MIL-HDBK-217F

6. Safety

6.1. Safety

cTUVus UL60950-1:2007 R10.14 CAN/CSA-C22.2 NO.60950-1-07+A1:2011+A2:2014 IEC62368-1:2014
TUV EN 60950-1:2006+A11+A1+A12+A2 IEC62368-1:2014
CB IEC 60950-1:2005 (2nd Edition)+Am2:2013 IEC62368-1:2014
CCC GB 4943.1-2011; GB9254-2008; GB17625.1-2012 (5000m altitude)
BSMI CNS14336-1(099/09/30 年版),CNS13438(095/06/01 年版)

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 = 150 x 160 x 86 mm.