PC Power Fuction Test Report

Model: SFX Gen5 1000W

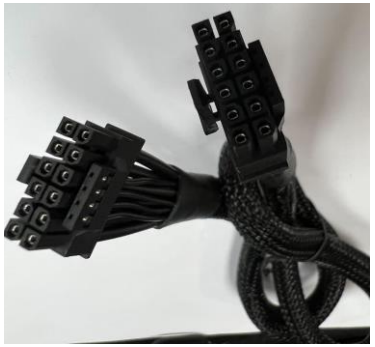
NO:RS202207150001

Version: **20220610 ATX Ver.3.0**

Table of Contents

A.Introduction

Product Specification Content



Product Source	**Model Number**	**SFX Gen5 1000W**
Product Structure	**Surface**	**Standard ATX Type**
	Output Connect	**Normal**
	PFC Choke	**Active Type**
Input Specification	**Voltage**	**1.Input voltage range 90~264 Vac** **2.Input normal voltage 100~240 Vac**
	Current	**5.0A~10.0A**
	Frequency	**47Hz~63Hz**

Output Specification

Voltage	+5V	+3.3V	+12V	-12V	+5Vsb
＊① Max load	22.0A	22.0A	70.8A	0.3A	3.0A
Min load	0.A	0 A	0A	0A	0A
Peak load	--	--	--	--	--
＊③ Regulation	+2,-2%	+2,-2%	+2,-2%	+5,-5%	+2,-2%
＊② Ripple & Noise	30mV	30mV	30mV	40mV	40mV

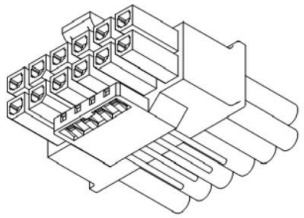
＊① The continuous total output power is 850W max.

・ The combined power of +5V and +3.3V is 120W max.

② Add 0.1uF and 10uF capacitors across output terminal during ripple & noise test.

Test Objective

Test Objective：
This power supply product will be tested in accordance with the rules of **Intel ATX 3.0.**
To confirm all the functions and installed system can meet the requirements and also can operate smoothly.



intel

ATX Version 3.0 Multi Rail
Desktop Platform Power Supply

B. Test Configuration

1.Test Equipment

2.PC System Hardware List

3.ATX3.0 Power Function Test

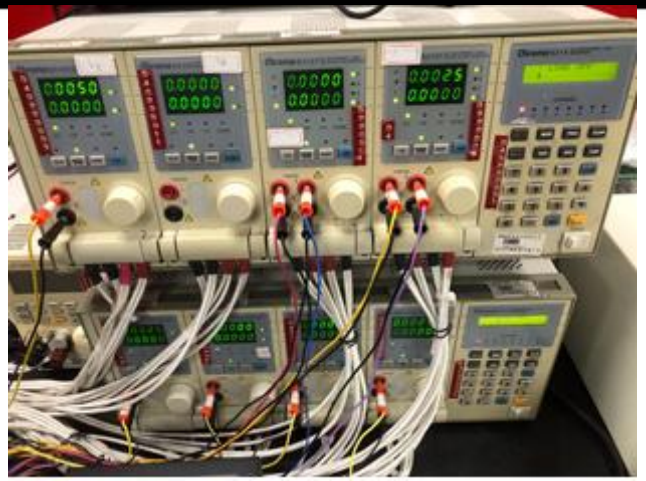
4.The System Test

4.1.System Note Test

4.2.Burn-In Test

1.Test Equipment

Test Equipment	
1	Chroma 6314 DC Electronic Load Main Frame
2	Chroma 6460 Programmable AC Source
3	Chroma 61604 Programmable AC Source
4	Tektronix TDS3014B Digital Phosphor Oscilloscope Test Fixture
5	BRYMEN Differential PROBE LDP-6110
6	YOKOGAWA Power Meter WT210
7	HIOKI Power Meter 3334
8	Fluke Multi Meter 111
9	TES Multi Meter 2360



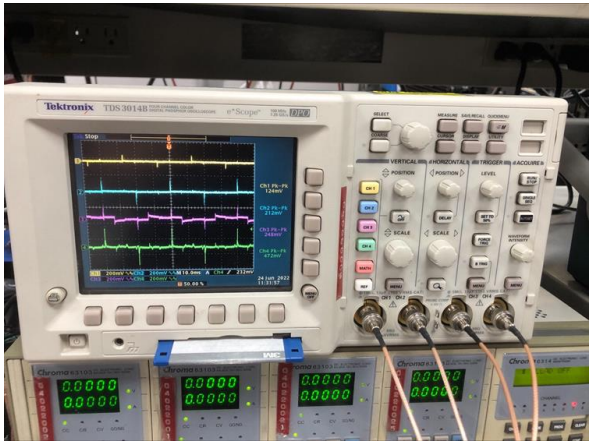
1.Chroma 6314 DC Electronic Load Main Frame

2.Chroma 6460 Programmable AC Source

3. Chroma 61604 Programmable AC Source

NO:RS202207150001

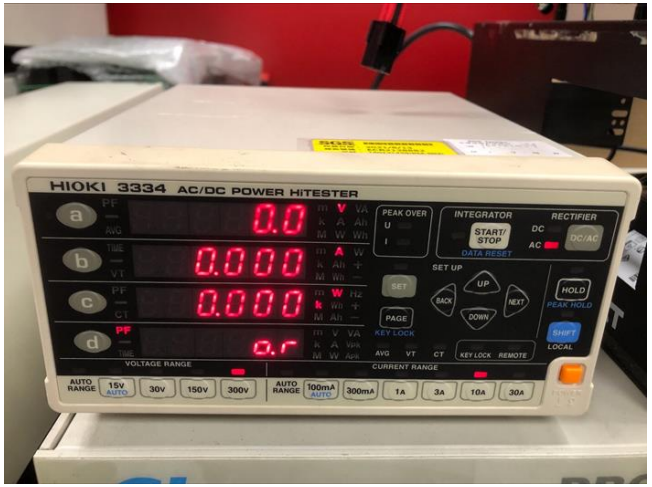
1.Test Equipment



4.Tektronix TDS3014B Digital Phosphor Oscilloscope Test Fixture

5.BRYMEN Differential PROBE LDP-6110

6.YOKOGAWA Power Meter WT210



7. HIOKI Power Meter 3334

8.Fluke Multi Meter 111

9.TES Multi Meter 2360

2.PC System Hardware List

Name	Quantity	Detail Spec
CPU	1	Intel Core i9 (10900K)
RAM	4	Tough RAM DDR4 4000HZ 8G
M.B.	1	ROG MAXIMUS XII HERO(WI-FI)
VGA Card	1	NVIDIA GTX3090TI
Hard Disk	1	PLEXTOR NVM Express SSD 500G
Monitor	1	LG UHD 4K 27UL850

PCIE 5.0 12VHPWR

3. ATX3.0 Power Function Test

Power Function Test Item		
Content Test Iteam		Test Result (Pass/Fail)
I. Input Test	1. Power Efficiency	Pass
	2. Power 2% or 10W Efficiency	Pass
	3. +5Vsb Power Efficiency	Pass
	4. ERP Lot6 Standard	Pass
II. Power Timing Test	1. Power on time	Pass
	2. Output Rise time	Pass
	3. Power Good Delay Time	Pass
	4. Power Good Signal Rise time	Pass
	5. Power Good Inactive to DC Loss Delay time	Pass
	6. AC Loss to Power Good hold up time	Pass
	7. AC Power on time	Pass
	8. 12VDC / 5VDC / 3.3VDC Power Sequencing	Pass
	9. Power on/off cycle mode	Pass
III. Output Test	1. Line Regulation	Pass
	2. Load Regulation	Pass
	3. Cross Load Regulation	Pass
	4. Transient Response	Pass
	5. Output Ripple & Noise	Pass
	6. Dynamic Load Test	Pass
	7. PCIe* AIC Peak Power Duty Cycle Test	Pass
IV. Protection Function Test	1. Over Voltage Protection (O.V.P)	NA
	2. Over Power Protection (O.P.P)	Pass
	3. Short Circuit Protection (S.C.P)	Pass
	4. Over Current Protection (O.C.P)	NA

NO:RS202207150001

3.1. Input Test

3.1.1 Power Efficiency

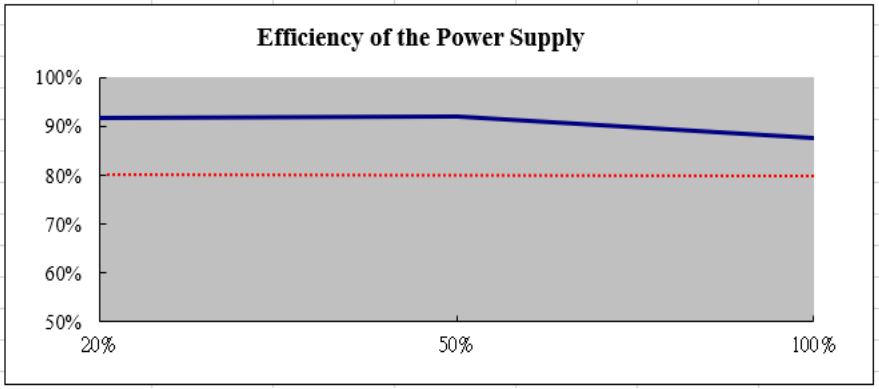
1.Test Condition:
Test the power supply with nominal line voltage and maximum load
2.Check:
Power Supply shall be a minimum percentage efficient under specified loading condition shown as below table

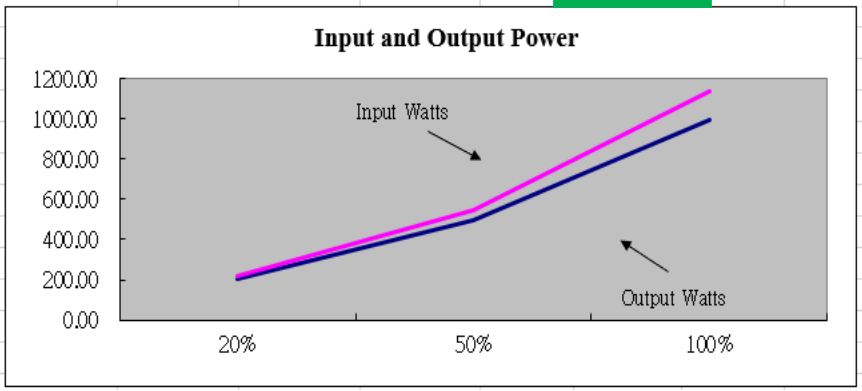
LOAD	5V	3.3V	+12V	-12V	+5VSB	SPEC
20%	2.15	2.15	14.90	0.05	0.54	87%
50%	5.39	5.39	37.25	0.13	1.34	90%
100%	10.77	10.77	74.50	0.27	2.68	87%

3.1. Input Test

HKC Gen5 1000W of efficiency test

Rating	1000W									Total Watt	Vac 115Vac/60HZ				
Combined	1000W				100W		3.60W	0.00W	15.00W	1118.60					
Output Voltage	12	12	12	12	3.3	5	-12	-5	5						
Loading	0.0A	0.0A	0.0A	83.3A	20.0A	20.0A	0.3A	0.0A	3.0A						
Watt	0W	0W	0W	1000W	66.0W	100W	3.6W	0.0W	15W						
Rate	+12V1	+12V2	+12V3	+12V4	+3.3V	+5V	-12V	-5V	+5VSB	Output power	Input power	Efficiency %	Input current	Power Factor	
20%	0.00A	0.00A	0.00A	14.90A	2.15A	2.15A	0.05A	0.00A	0.54A	200.09	217.86	91.84%	2.04	0.93	
				12.00V	3.33V	5.00V	-11.72V		5.07V			PASS			
50%	0.00A	0.00A	0.00A	37.25A	5.39A	5.39A	0.13A	0.00A	1.34A	498.61	542.5	91.91%	4.84	0.98	
				11.96V	3.33V	4.98V	-11.72V		5.06V						
100%	0.00A	0.00A	0.00A	74.50A	10.77A	10.77A	0.27A	0.00A	2.68A	995.09	1134.5	87.71%	10.1	0.98	
				11.94V	3.33V	4.92V	-11.75V		5.06V						



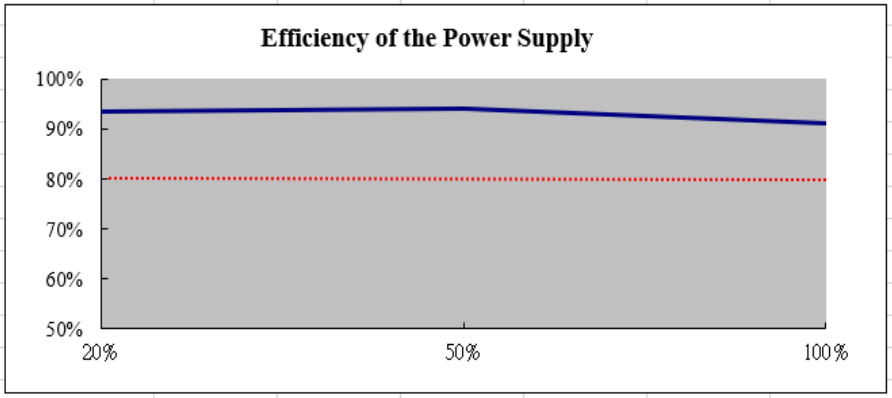


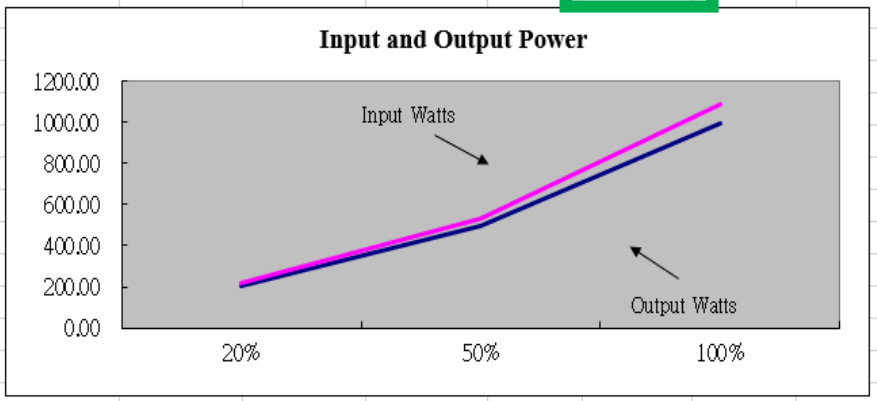
NO:RS202207150001

3.1. Input Test

HKC Gen5 1000W of efficiency test

Rating	1000W									Total Watt	Vac 230Vac/50HZ				
Combined	1000W				100W		3.60W	0.00W	15.00W	1118.60					
Output Voltage	12	12	12	12	3.3	5	-12	-5	5						
Loading	0.0A	0.0A	0.0A	83.3A	20.0A	20.0A	0.3A	0.0A	3.0A						
Watt	0W	0W	0W	1000W	66.0W	100W	3.6W	0.0W	15W						
Rate	+12V1	+12V2	+12V3	+12V4	+3.3V	+5V	-12V	-5V	+5VSB	Output power	Input power	Efficiency %	Input current	Power Factor	
20%	0.00A	0.00A	0.00A	14.90A	2.15A	2.15A	0.05A	0.00A	0.54A	200.11	214.33	93.36%	1.1	0.85	
				12.00V	3.33V	5.01V	-11.72V		5.07V						
50%	0.00A	0.00A	0.00A	37.25A	5.39A	5.39A	0.13A	0.00A	1.34A	498.93	529.99	PASS 94.14%	2.46	0.94	
				11.96V	3.33V	5.06V	-11.72V		4.98V						
100%	0.00A	0.00A	0.00A	74.50A	10.77A	10.77A	0.27A	0.00A	2.68A	993.88	1090	91.18%	4.89	0.97	
				11.91V	3.32V	5.06V	-11.75V		4.92V						





NO:RS202207150001

3.1. Input Test

3.1.2 Power 2% or 10W Efficiency

1.Test Condition:
Test the power supply with Low load efficiency
2.Check:
Power Supply rating above 500W shall be test 2 percentage efficient
Power Supply rating under 500W shall be test 10W efficient
specified loading condition shown as below table

LOAD	5V	3.3V	+12V	-12V	+5VSB	SPEC
2%	0.22	0.22	1.49	0.01	0.05	70%
10W	0.11	0.11	0.74	0.00	0.03	70%

3.1. Input Test

HKC Gen5 1000W of 2% or 10W efficiency test														
Rating	1000W									Total Watt	Vac 115Vac/60HZ			
Combined	1000W				100W		3.60W	0.00W	15.00W	1118.60	&			
Output Voltage	12	12	12	12	3.3	5	-12	-5	5		Vac 230Vac/50Hz			
Loading	0.0A	0.0A	0.0A	83.3A	20.0A	20.0A	0.3A	0.0A	3.0A					
Watt	0W	0W	0W	1000W	66.0W	100W	3.6W	0.0W	15W					
115Vac														
Rate	+12V1	+12V2	+12V3	+12V4	+3.3V	+5V	-12V	-5V	+5VSB	Output power	Input power	Efficiency %	Input current	Power Factor
2%	0.00A	0.00A	0.00A	1.49A	0.22A	0.22A	0.01A	0.00A	0.05A	19.99	28.4	70.38%	0.36	0.68
				11.98V	3.32V	5.06V	-11.70V		5.03V					
230Vac														
Rate	+12V1	+12V2	+12V3	+12V4	+3.3V	+5V	-12V	-5V	+5VSB	Output power	Input power	Efficiency %	Input current	Power Factor
2%	0.00A	0.00A	0.00A	1.49A	0.22A	0.22A	0.01A	0.00A	0.05A	19.99	28.35	70.50%	0.29	0.42
				11.98V	3.32V	5.06V	-11.70V		5.03V					

Pass

NO:RS202207150001

3.1. Input Test

3.1.3 +5Vsb POWER EFFICIENCY

1. Test Condition:
Test the power supply with AC115 and AC 230V voltage and +5Vsb loading
2.Check:
Power Supply shall be a minimum percentage efficient under specified loading condition shown as below table

SPEC

5VSB Load Target	5VSB Actual Load	Efficiency Target (both 115V and 230V input)	Remark
Max / Label	3.0A / Label	75%	Recommend
1.5 A		75%	REQUIRED ALPM and ErP Lot 3 2014
1.00 A		75%	Recommend
0.55 A		75%	REQUIRED ALPM and ErP* Lot 3 2014
90 mA		55%	Recommend
45 mA		45%	REQUIRED ErP* Lot 6 2013

+5Vsb Load condition
0A
0.045A
0.09A
0.10A
0.25A
0.55A
1.0A
1.5A
2.0A
2.5A
3.0A

3.1. Input Test

AC Input Voltage	+5Vsb Loading	Measured Voltage	Measured min / mWh	Input Power	Output Power	Efficiency data(%)	2013 Efficiency standard
115V /60Hz	0.045A	5.037V	5 min / 0.026452	0.317424	0.226665	71.41%	> 45%
	0.090A	5.037V	5 min / 0.048119	0.577428	0.45333	78.51%	> 45%
	0.10A	5.037V	5 min / 0.052657	0.631884	0.5037	79.71%	> 55%
	0.25A	5.034V	5 min / 0.124960	1.49952	1.2585	83.93%	> 65%
	0.55A	5.028V	5 min / 0.269500	3.234	2.7654	85.51%	> 75%
	1.0A	5.021V	5 min / 0.486790	5.84148	5.021	85.95%	> 75%
	1.5A	5.014V	5 min / 0.734890	8.81868	7.521	85.28%	> 75%
	2.0A	5.006V	5 min / 0.991540	11.89848	10.012	84.15%	> 75%
	2.5A	4.997V	5 min / 1.238700	14.8644	12.4925	84.04%	> 75%
	3.0A	4.989V	5 min / 1.481800	17.7816	14.967	84.17%	> 75%

PASS

NO:RS202207150001

3.1. Input Test

AC Input Voltage	+5Vsb Loading	Measured Voltage	Measured min / mWh	Input Power	Output Power	Efficiency data(%)	2013 Efficiency standard
230V /50Hz	0.045A	5.036V	5 min / 0.031333	0.375996	0.22662	60.27%	> 45%
	0.090A	5.035V	5 min / 0.053585	0.64302	0.45315	70.47%	> 45%
	0.10A	5.035V	5 min / 0.058297	0.699564	0.5035	71.97%	> 55%
	0.25A	5.033V	5 min / 0.131330	1.57596	1.25825	79.84%	> 65%
	0.55A	5.025V	5 min / 0.278480	3.34176	2.76375	82.70% PASS	> 75%
	1.0A	5.018V	5 min / 0.493270	5.91924	5.018	84.77%	> 75%
	1.5A	5.011V	5 min / 0.734480	8.81376	7.5165	85.28%	> 75%
	2.0A	5.003V	5 min / 0.982130	11.78556	10.006	84.90%	> 75%
	2.5A	4.993V	5 min / 1.224900	14.6988	12.4825	84.92%	> 75%
	3.0A	4.982V	5 min / 1.465500	17.586	14.946	84.99%	> 75%

3.1. Input Test

3.1.4 ERP Lot6 Standard

1. Test condition & Test result

PASS

AC Input Voltage	+5Vsb Loading	Input power consumption	2013 ErP Lot6 Standard
115V/60Hz	0A	0.021W	<0.5W
230V/50Hz	0A	0.225W	<0.5W

3.2 Power Timing

3.2Power Efficiency

1.Test Condition:

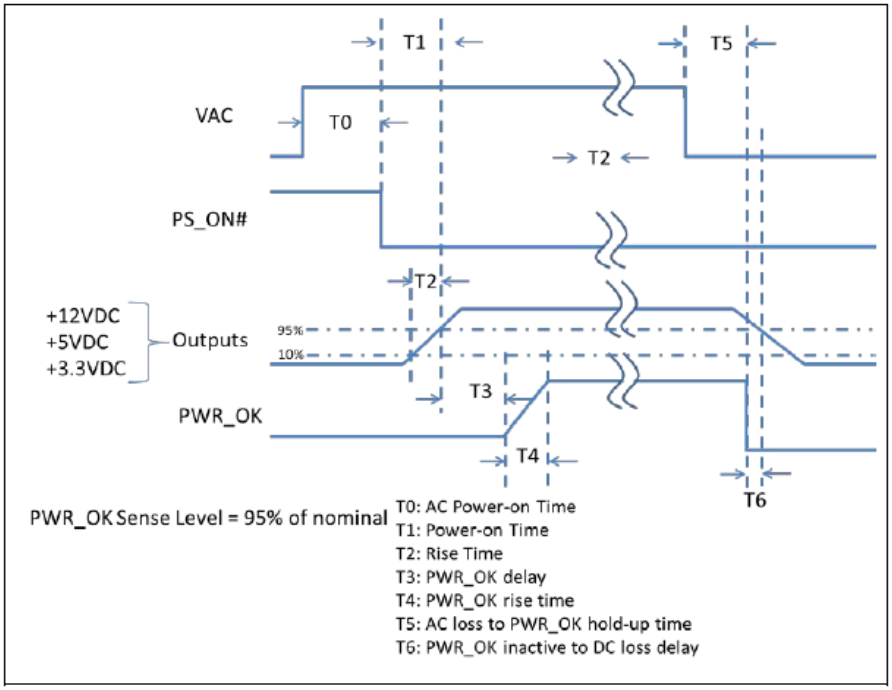
(1.)Test the power supply Input condition at low line and high line

(2.)The test load condition with spec each output rail maximum load

2.Check:

Check T1~T6 under the various test conditions

Parameter	Description	Value		
		Legacy Timings[1]	Required	Recommended for ALPM
T0	AC power on time	-	<2s	-
T1	Power-on time	< 500 ms	< 200 ms	<150 ms
T2	Rise time	-	0.2 – 20 ms	-
T3	PWR_OK delay	100 ms[2] – 500 ms	100 ms[2] – 250 ms	100 ms[2] – 150 ms
T4	PWR_OK rise time	-	< 10 ms	-
T5	AC loss to PWR_OK hold-up time[3]	-	> 16 ms	-
T6	PWR_OK inactive to DC loss delay	-	> 1 ms	-



3.2 Power Timing

3.2.1 Power on time

1. Test Result

T1 Condition test									
Power on Time									
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)					PASS Data (msec)	Spec (msec)
			+5V	+3.3V	+12V	-12V	5Vsb		
Full Load	100Vac (60HZ)	+5V	20.00	0.00	73.45	0.30	3.00	110	< 200 < 150 (ATX ver3.0)
		+3.3V	6.80	20.00	73.45	0.30	3.00	115	
		+12V	0.00	0.00	82.62	0.30	1.00	107	
	240Vac (50HZ)	+5V	20.00	0.00	73.45	0.30	3.00	37.8	
		+3.3V	6.80	20.00	73.45	0.30	3.00	39.0	
		+12V	0.00	0.00	82.62	0.30	1.00	34.6	

3.2 Power Timing

3.2.2 Output Rise time

1.Test Result

T2 Condition test									
Output Rise Time									
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)					PASS Data (msec)	Intel spec (msec)
			+5V	+3.3V	+12V	-12V	5Vsb		
Full Load	100Vac (60HZ)	+5V	20.00	0.00	73.45	0.30	3.00	0.9056	0.2~20
		+3.3V	6.80	20.00	73.45	0.30	3.00	1.399	
		+12V	0.00	0.00	82.62	0.30	1.00	7.823	
	240Vac (50HZ)	+5V	20.00	0.00	73.45	0.30	3.00	0.9117	
		+3.3V	6.80	20.00	73.45	0.30	3.00	1.394	
		+12V	0.00	0.00	82.62	0.30	1.00	7.783	

3.2 Power Timing

3.2.3 Power Good Delay Time

1. Test Result

T3 Condition test									
Power Good Delay Time									
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)					PASS Data (msec)	Spec (msec)
			+5V	+3.3V	+12V	-12V	5Vsb		
Full Load	100Vac (60HZ)	+5V	20.00	0.00	73.45	0.30	3.00	117	100~250 100~150 (ATX ver3.0)
		+3.3V	6.80	20.00	73.45	0.30	3.00	117	
		+12V	0.00	0.00	82.62	0.30	1.00	120	
	240Vac (50HZ)	+5V	20.00	0.00	73.45	0.30	3.00	118	
		+3.3V	6.80	20.00	73.45	0.30	3.00	116	
		+12V	0.00	0.00	82.62	0.30	1.00	121	

3.2 Power Timing

3.2.4 Power Good Signal Rise time

*1msec = 10^6 nsec

1. Test Result

T4 Condition test									
Power Good Rise Time								PASS	
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)					Data (nsec)	Spec (msec)
			+5V	+3.3V	+12V	-12V	5Vsb		
Full Load	100Vac (60HZ)	+5V	20.00	0.00	73.45	0.30	3.00	857.1	<10
		+3.3V	6.80	20.00	73.45	0.30	3.00	830.7	
		+12V	0.00	0.00	82.62	0.30	1.00	821.9	
	240Vac (50HZ)	+5V	20.00	0.00	73.45	0.30	3.00	863.4	
		+3.3V	6.80	20.00	73.45	0.30	3.00	844.8	
		+12V	0.00	0.00	82.62	0.30	1.00	819.4	

3.2 Power Timing

3.2.5 Power Good Inactive to DC Loss Delay time

1.Test Result

T6 Condition test									
Power Good Inactive to DC Loss Delay time								PASS	
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)					Data (msec)	Spec (msec)
			+5V	+3.3V	+12V	-12V	5Vsb		
Full Load	100Vac (60HZ)	+5V	20.00	0.00	73.45	0.30	3.00	3.78	> 1
		+3.3V	6.80	20.00	73.45	0.30	3.00	3.46	
		+12V	0.00	0.00	82.62	0.30	1.00	2.8	
	240Vac (50HZ)	+5V	20.00	0.00	73.45	0.30	3.00	3.78	
		+3.3V	6.80	20.00	73.45	0.30	3.00	3.48	
		+12V	0.00	0.00	82.62	0.30	1.00	2.8	

3.2 Power Timing

3.2.6 Hold Up time (AC Loss to DC Loss Delay time)

1.Test Result

T5 + T6 Condition test									
Hold Up time								PASS	
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)					Data (msec)	Spec (msec)
			+5V	+3.3V	+12V	-12V	5Vsb		
Full Load	100Vac (60HZ)	+5V	20.00	0.00	73.45	0.30	3.00	23.4	>16
		+3.3V	6.80	20.00	73.45	0.30	3.00	22.6	
		+12V	0.00	0.00	82.62	0.30	1.00	22.1	
	240Vac (50HZ)	+5V	20.00	0.00	73.45	0.30	3.00	22.6	
		+3.3V	6.80	20.00	73.45	0.30	3.00	22.3	
		+12V	0.00	0.00	82.62	0.30	1.00	21.8	

3.2 Power Timing

3.2.7 AC Power on Time

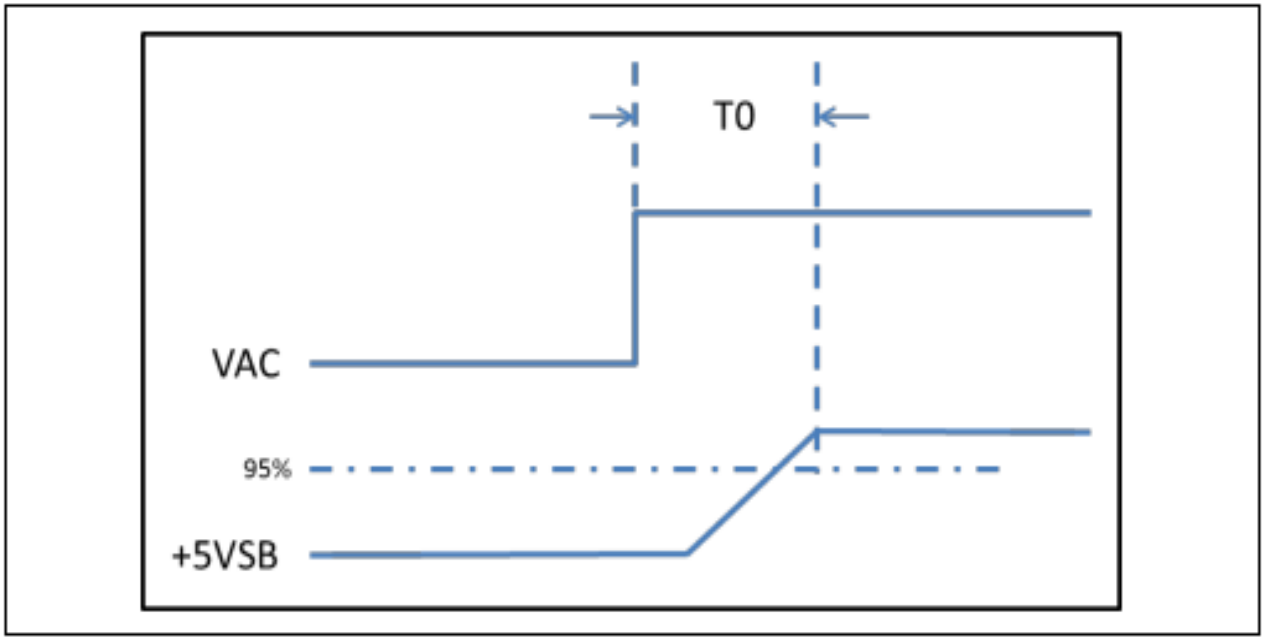
1.Test Condition:

(1.)Test the power supply Input condition at low line and high line

(2.)The test load condition with spec each output rail maximum load

Check:

With new modes of operation for computers like Alternative Low Power Modes (ALPM) the continuous current rating of the 5VSB rail is recommended to be at least 3A. Some scenarios like USB Power Charging in ALPM could require more current on the 5VSB rail.



3.2 Power Timing

1. Test Result

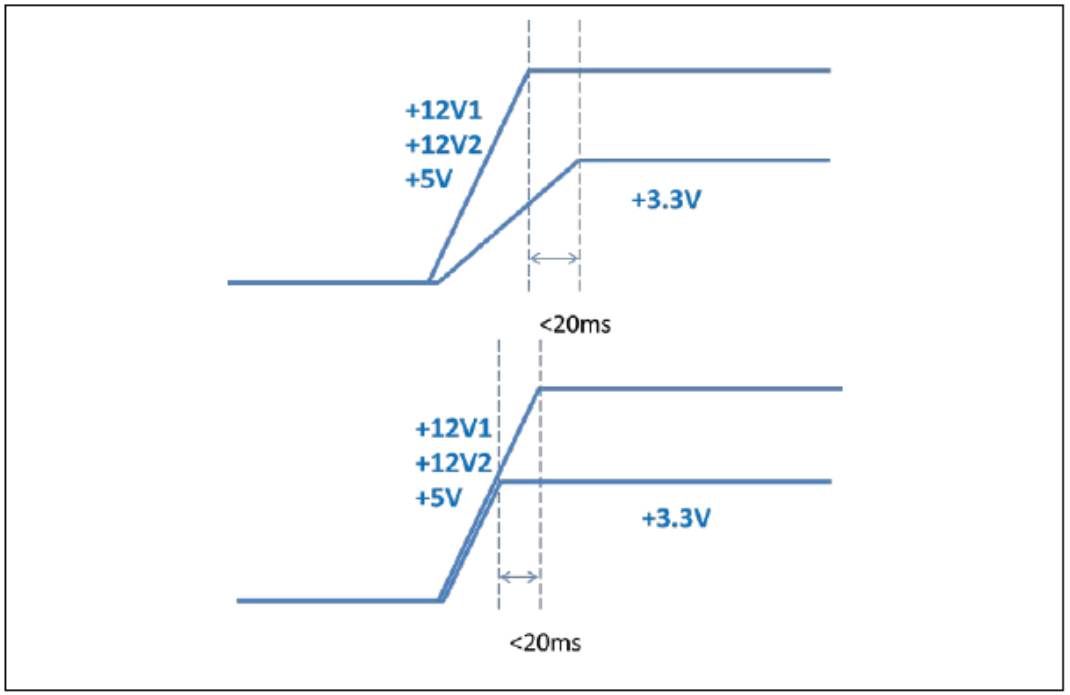
*1sec = 10³ msec

T0 Condition test					
AC Power on Time					
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)	PASS Data (msec)	Spec (sec)
Full Load	100Vac (60HZ)	+5Vsb	3	206	< 2s
	240Vac (50HZ)			163	

3.2 Power Timing

3.2.8 12V DC / 5V DC / 3.3V DC Power Sequencing

1.Test Condition:
(1.)Test the power supply Input condition at low line and high line
(2.)The test load condition with spec each output rail maximum load
2.Check:
The +12V1 DC / +12V2 DC and +5VDC output levels must be equal to or greater than the +3.3 VDC output of +12V1 DC / +12V2 DC and +5VDC reaching it's minimum in-regulation level and +3.3VDC reaching its minimum in-regulation level must be ≤ 20 ms as shown in below figure.



3.2 Power Timing

1. **Test Result**

12V DC / 5V DC / 3.3V DC Power Sequencing Condition test									
12V DC / 5V DC / 3.3V DC Power Sequencing								PASS	
Output Load Condition	Input Voltage (Vac)	Output	Output Load Condition (A)					Data (msec)	Spec (msec)
			+5V	+3.3V	+12V	-12V	5Vsb		
Full Load	100Vac (60HZ)	+5V	20.00	0.00	73.45	0.30	3.00	4.36	≤ 20
		+3.3V	6.80	20.00	73.45	0.30	3.00	4.68	
		+12V	0.00	0.00	82.62	0.30	1.00	4.44	
	240Vac (50HZ)	+5V	20.00	0.00	73.45	0.30	3.00	4.52	
		+3.3V	6.80	20.00	73.45	0.30	3.00	4.72	
		+12V	0.00	0.00	82.62	0.30	1.00	4.4	

3.2 Power Timing

3.2.9 Power On/Off Cycle Mode

1.Test Condition:
Use Scope to measure PG signal in 24Pin main connector at no load condition.

2. Check
The PG signal always rises to “Hi” when the PS_ON is start.

3. Test Result: PASS

3.3.Output Test

3.3.1. LINE REGULATION

1.1 Test Condition & Check

Purpose: Measure the stability of the output voltage when the input voltage is variable

Environmental Condition: Temperature 25C relative Humidity 65%

Test Condition:

1.The input voltage frequency must be under any condition in the range of the product specification

2.The output load is full load on all outputs at under the product specification

3.Test can be performed only after the SPS is on for about 10 minutes

Result Limit: The output voltage can't exceed the allowed difference

Output Load	Output Load Condition (A)				
	+5V	+3.3V	+12V	-12V	+5Vsb
Full Load	10.77	10.77	74.50	0.27	2.68

1.2 Test Result

Vin \ Vout	+5V (V)	+3.3V (V)	+12V (V)	-12V (V)	+5Vsb (V)
100V/60HZ	5.06	3.33	12.01	-11.74	4.92
115V/60HZ	5.06	3.33	12.01	-11.74	4.92
132V/60HZ	5.06	3.33	12.01	-11.74	4.92
180V/50HZ	5.06	3.32	11.99	-11.74	4.93
230V/50HZ	5.06	3.32	11.99	-11.74	4.93
240V/50HZ	5.06	3.32	11.99	-11.74	4.93
Spec	±2%	±2%	±2%	±5%	±5%

PASS

3.3.Output Test

3.3.2. LOAD REGULATION

2.1 Test Condition & Check

Purpose: Measure the stability of the output voltage when the load is variable
Environmental Condition: Temperature 25C relative Humidity 65%
Test Condition:
1.The input voltage frequency must be under any condition in the range of the product specification
2.Output Load Maximum , Middle , Minimum load by the product specification
Result Limit: The output voltage do not exceed the allowed difference

Output Load	Output Load Condition (A)				
	+5V	+3.3V	+12V	-12V	+5Vsb
Min Load	0.0	0.0	0.0	0.0	0.0
Half Load	5.39	5.39	37.25	0.13	1.34
Full Load	10.77	10.77	74.50	0.27	2.68

3.3.Output Test

2.2 Test Result

Vin	Load \ Vout	+5V (V)	+3.3V (V)	+12V (V)	-12V (V)	+5Vsb (V)
100V/60HZ	Min Load	5.07	3.33	12.08	-11.71	5.03
	Half Load	5.06	3.33	12.01	-11.72	4.98
	Full Load	5.06	3.33	12.01	-11.74	4.92
115V/60HZ	Min Load	5.07	3.33	12.08	-11.71	5.03
	Half Load	5.06	3.33	12.01	-11.72	4.98
	Full Load	5.06	3.33	12.01	-11.74	4.92
132V/63HZ	Min Load	5.07	3.33	12.08	-11.71	5.03
	Half Load	5.06	3.33	12.01	-11.72	4.98
	Full Load	5.06	3.33	12.01	-11.74	4.92
180V/47HZ	Min Load	5.07	3.33	12.04	-11.71	5.03
	Half Load	5.06	3.33	12.00	-11.72	4.98
	Full Load	5.06	3.32	11.99	-11.74	4.93
230V/50HZ	Min Load	5.07	3.33	12.04	-11.71	5.03
	Half Load	5.06	3.33	12.00	-11.72	4.98
	Full Load	5.06	3.32	11.99	-11.74	4.93
240V/50HZ	Min Load	5.07	3.33	12.04	-11.71	5.03
	Half Load	5.06	3.33	12.00	-11.72	4.98
	Full Load	5.06	3.32	11.99	-11.74	4.93
Spec		±2%	±2%	±2%	±5%	±5%

PASS

3.3.3.CROSS LOAD REGULATION

3.1 Test Condition & Check

1.Test Condition:

Test the power supply one the Auto tester at low line to high line and under all possible
Combinations of output loads except specified.

	+5V	+3.3V	+12V	-12V	+5Vsb
LOAD1	20.00	0.00	73.45	0.30	3.00
LOAD2	6.80	20.00	73.45	0.30	3.00
LOAD3	0.00	0.00	82.62	0.30	1.00
LOAD4	0	0	0	0	0
LOAD5	2.15	2.15	14.90	0.05	0.54
LOAD6	5.39	5.39	37.25	0.13	1.34
LOAD7	10.77	10.77	74.50	0.27	2.68

2.Check:

The DC Output voltage shall remain follow with in the regulation ranges specified in the standard
Specification when measured at the load end of the output connectors.

3.3.Output Test

3.2 Test Result

Output Voltage	+5V(V)	+3.3V(V)	+12V(V)	-12V(V)	+5Vsb(V)
AC Input Condition	AC Input 100Vac 60HZ				
Load 1	5.06	3.33	12.02	-11.74	4.92
Load 2	5.06	3.33	12.02	-11.75	4.91
Load 3	5.06	3.33	12.02	-11.73	4.96
Load 4	5.07	3.33	12.08	-11.71	5.03
Load 5	5.06	3.33	12.02	-11.71	5.01
Load 6	5.06	3.33	12.01	-11.72	4.98
Load 7	5.06	3.33	12.01	-11.74	4.92
Spec	±2%	±2%	±2%	±5%	±5%

PASS

Output Voltage	+5V(V)	+3.3V(V)	+12V(V)	-12V(V)	+5Vsb(V)
AC Input Condition	AC Input 240Vac 50HZ				
Load 1	5.06	3.33	12.01	-11.74	4.92
Load 2	5.06	3.33	12.01	-11.75	4.92
Load 3	5.07	3.33	12.00	-11.73	4.97
Load 4	5.07	3.33	12.04	-11.71	5.03
Load 5	5.07	3.33	12.00	-11.71	5.01
Load 6	5.06	3.33	12.00	-11.72	4.98
Load 7	5.06	3.32	11.99	-11.74	4.93
Spec	±2%	±2%	±2%	±5%	±5%

PASS

3.3.Output Test

3.3.4. Transient Response

4.1 Test Condition & Check

1.Test Condition:

Follow as below condition table.

2.Test Purpose

Simulate PSU at transient response 20% to 50% load situation with below table different changing repetition rate conditions

Output voltage	+5V	+3.3V	+12V	-12V	+5Vsb
Load slew rate	1A/us	1A/us	1A/us	200mA/us	200mA/us
Load changing repetition rate	20msec	20msec	20msec	20msec	20msec
	1msec	1msec	1msec	1msec	1msec

3.Check:

Compare with transient response load and before changing condition, and the voltage regulation should be follow the spec see below table

3.3.Output Test

4.2 Test Result

Input Voltage (100Vac)	Load change repetition	Output Load Condition 20% - 50%			
		Before	After	Change Rate	Spec
+5V	20ms	5.070	5.062	0.16%	±5%
	1ms		5.063	0.14%	
+3.3V	20ms	3.331	3.326	0.15%	±5%
	1ms		3.326	0.15%	
+12V	20ms	12.050	12.000	0.41%	±5%
	1ms		12.000	0.41%	
-12V	20ms	-11.710	-11.720	-0.09%	±5%
	1ms		-11.720	-0.09%	
+5Vsb	20ms	5.031	4.993	0.76%	±5%
	1ms		4.993	0.76%	

PASS

Input Voltage (240Vac)	Load change repetition	Output Load Condition 20% - 50%			
		Before	After	Change Rate	Spec
+5V	20ms	5.071	5.063	0.16%	±5%
	1ms		5.064	0.14%	
+3.3V	20ms	3.332	3.326	0.18%	±5%
	1ms		3.328	0.12%	
+12V	20ms	12.050	12.000	0.41%	±5%
	1ms		12.010	0.33%	
-12V	20ms	-11.710	-11.720	-0.09%	±5%
	1ms		-11.720	-0.09%	
+5Vsb	20ms	5.031	4.993	0.76%	±5%
	1ms		4.992	0.78%	

PASS

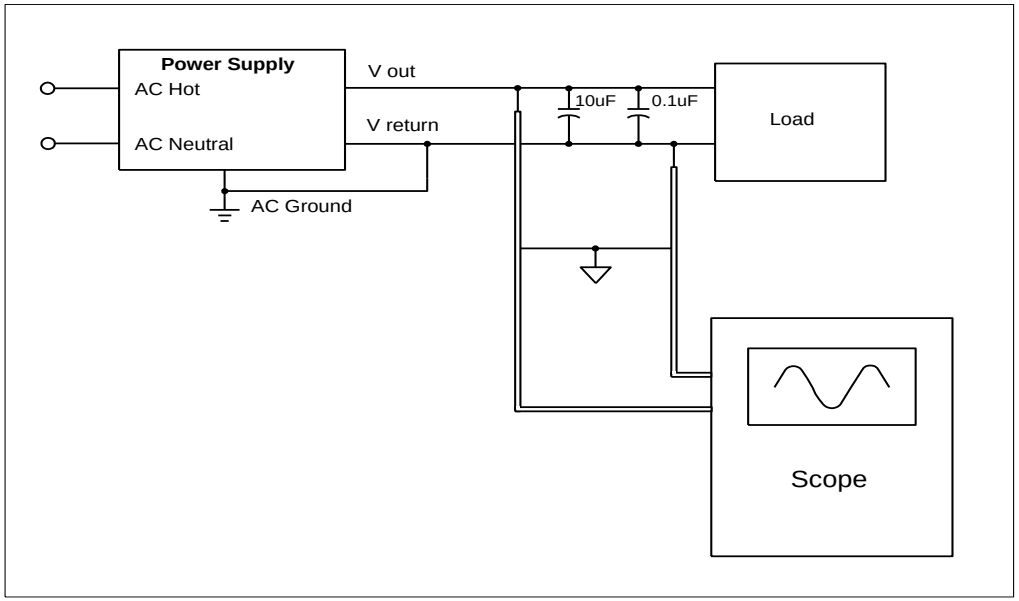
3.3.Output Test

3.3.5. OUTPUT RIPPLE & NOISE

5.1 Test Condition & Check

1.Test Condition:

Power on the UUT at AC input low range and AC input high range,
than measured the UUT under load condition shown on as the below table
(Noise bandwidth is from 20MHZ. Add 0.1uf ceramic capacitor in parallel with a 10uf tantalum capacitor at output connector terminals for ripple & noise measurements.)



2.Check:

Measure the output ripple and peak to peak voltage ,
The ripple of power supply should be follow with in the specification
(Shown on the worst case of the each output and attached the waveform . As follows)

3.3.Output Test

5.2 Load Condition

	+5V	+3.3V	+12V	-12V	+5Vsb
LOAD1	20.00	0.00	73.45	0.30	3.00
LOAD2	6.80	20.00	73.45	0.30	3.00
LOAD3	0.00	0.00	82.62	0.30	1.00
LOAD4	0	0	0	0	0
LOAD5	2.15	2.15	14.90	0.05	0.54
LOAD6	5.39	5.39	37.25	0.13	1.34
LOAD7	10.77	10.77	74.50	0.27	2.68

5.3 Test Result

PASS

Output Voltage	Measured value (mv)				
	+5V	+3.3V	+12V	-12V	+5Vsb
AC Input Condition	AC Input 100Vac 60Hz				
Load 1	24.8	12.4	34.8	16.0	20.0
Load 2	23.0	14.8	36.8	17.2	19.8
Load 3	24.6	11.8	34.4	17.0	14.6
Load 4	18.4	7.2	16.4	5.6	12.8
Load 5	18.6	8.4	18.8	7.8	5.8
Load 6	20.2	10.8	20.0	11.8	10.4
Load 7	25.0	12.6	35.2	15.6	16.4
Max value	25.0	14.8	36.8	17.2	20.0
Spec	40mV	40mV	40mV	80mV	50mV

PASS

Output Voltage	Measured value (mv)				
	+5V	+3.3V	+12V	-12V	+5Vsb
AC Input Condition	AC Input 240Vac 50Hz				
Load 1	24.0	14.2	37.6	17.4	18.6
Load 2	24.2	14.6	37.2	17.2	18.6
Load 3	23.2	14.4	34.4	16.2	15.0
Load 4	18.4	7.4	18.8	5.2	12.8
Load 5	18.8	7.6	18.0	7.8	5.4
Load 6	18.8	10.0	19.6	11.6	10.2
Load 7	22.6	12.0	32.4	15.6	15.4
Max value	24.2	14.6	37.6	17.4	18.6
Spec	40mV	40mV	40mV	80mV	50mV

3.3.Output Test

3.3.6. DYNAMIC LOAD

6.1 Test Condition & Check

1.Test Condition:
Follow as below condition table.
2.Test Purpose
PSU of load simulate computer of load condition

Output voltage	+5V	+3.3V	+12V	-12V	+5Vsb
Load slew rate	1A/us	1A/us	1A/us	0.2A/us	0.2A/us
Load changing repetition rate	10msec	10msec	10msec	10msec	10msec

3.Check:
PSU no any shut down state and no any fault condition during the test

6.2 Test Result

Input Voltage (Vac)	Output Load Condition (A)					Test time	Test result (Pass/Fail)
	+5V	+3.3V	+12V	-12V	5Vsb		
100Vac/60HZ	5.00~10.00	7.58~15.15	36.73~73.45	0.15~0.30	1.50~3.00	1h	Pass
240Vac/50HZ	5.00~10.00	7.58~15.15	36.73~73.45	0.15~0.30	1.50~3.00	1h	Pass

3.3.Output Test

3.3.7.PCIe* AIC Peak Power Duty Cycle test

7.1 Test Condition & Check

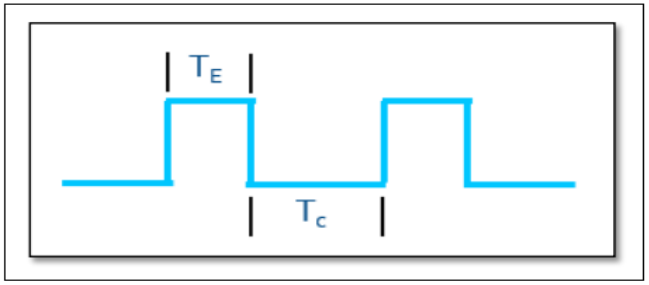
1.Test Condition:

Follow as below condition table.

Table 3-3: PCIe* AIC and PSU Power Budget used for Peak Power Excursion

Power Excursion % of PSU Rated Size PSU ≤ 450 Watts & PSUs without 12VHPWR Connector	Power Excursion % of PSU Rated Size PSU > 450 Watts & 12VHPWR Connector present	Time for Power Excursion (TE)	Testing Duty Cycle
100%	100%	Infinite	--
110%	120%	100 ms	50%
135%	160%	10 ms	25%
145%	180%	1 ms	20%
150%	200%	100 µs	10%

Figure 3-2: Duty Cycle Definition



2.Test Purpose

Simulate PSU at above table duty cycle 10%, 20%, 25%, 50% load situation.

Test input voltage at low line and high line, 10min test time for each Duty Cycle part.

3.Check:

PSU no any shut down state and no any fault condition during the test

3.3.Output Test

7.2 Test Result

Input Voltage (Vac)	Testing Duty Cycle	Output Load Condition (A)		Test time	Test result (Pass/Fail)
		12V			
		TE	TC		
100Vac/60HZ	10%	166.67	68.04	10m	Pass
	20%	150.00	55.28	10m	Pass
	25%	133.33	57.74	10m	Pass
	50%	100.00	62.37	10m	Pass
240Vac/50HZ	10%	166.67	68.04	10m	Pass
	20%	150.00	55.28	10m	Pass
	25%	133.33	57.74	10m	Pass
	50%	100.00	62.37	10m	Pass

3.4. Protection Function Test

3.4.1. OVER VOLTAGE PROTECTION (O.V.P)

3.1 Test Condition & Check

3.4.2. OVER POWER PROTECTION (O.P.P)

2.1 Test Condition & Check

1.Test Condition:
Test input voltage at low line and high line, when over power for output load the PSU must be self protection.
2.Check:
(1.) Check PSU reach over power protection point is latched in spec range.
(2.) The PSU can be restart and normal working when over load condition was removed.

2.2 Test Result

Input	Over power Condition (W)			
	Rating Power (W)	Over Power Spec	Test Over Power Point (W)	Over Power (%)
100Vac 60Hz	1000W	110%~170%	1642.03W	164.2%
240Vac 50Hz	1000W	110%~170%	1618.03W	161.8%

PASS

3.4. Protection Function Test

3.4.3. SHORT CIRCUIT PROTECTION (S.C.P)

3.1 Test Condition & Check

1.Test Condition:

Input Power On the power supply at nominal line and the UUT is min load condition.

And max load condition

Output Load	Output Load Condition (A)				
	+5V	+3.3V	+12V	-12V	+5Vsb
Min Load	0.0	0.0	0.0	0.0	0.0

2.Check:

(1.) Check the power supply is latched when any output is short circuit. The power supply can be turned on normal by AC line or remote on if the short circuit fault is removed.

(2.) Short circuit the +5Vsb should cause all of the outputs remain low until the short circuit is removed.

3.2 Test Result

Input Voltage	+5V	+3.3V	+12V	-12V	5VSB
100Vac/60HZ	Latch	Latch	Latch	Latch	Auto Recovery
240Vac/50HZ	Latch	Latch	Latch	Latch	Auto Recovery

PASS

3.4. Protection Function Test

3.4.4. SHORT CIRCUIT PROTECTION (S.C.P)

3.1 Test Condition & Check

3.4.1. The System Note Test

3.4.1.Test Condition:

A.The system devices

Name	Quantity	Detail Spec
CPU	1	Intel Core i9 (10900K)
RAM	4	Tough RAM DDR4 4000HZ 8G
M.B.	1	ROG MAXIMUS XII HERO(WI-FI)
VGA Card	1	NVIDIA GTX3090TI, GTX3090, GTX3080
Hard Disk	1	PLEXTOR NVM Express SSD 500G
Monitor	1	LG UHD 4K 27UL850

B. Test Software:

1. 3Dmark
2. Game benchmark

4.The System Test

2.Check:

(1.) The tester will not hear electronic noise form PSU within the 30cm.

(2.) The case must be close side panel.

(3.) Test Time: 1 hour

3.Test Result: Pass

PASS

3.4.2.Burn-In Test

1.Test Condition:

a. Follow up system devices b. Test Software: O.C.C.T

2.Check:

(1.) All tests does not occur shutdown, reboot or any defective status.

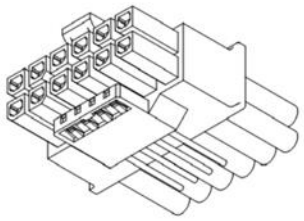
(2.) Test time: 1 hour

3.Test Result: Pass

PASS

C. Conclusion

This product has been tested and passed the regulation of **Intel ATX 3.0** for the power supply product.
Under the latest Video card 3090 TI , it can also operate smoothly and stably, ensuring the highest performance.



intel

ATX Version 3.0 Multi Rail
Desktop Platform Power Supply

thermaltake

20 YEARS

Thank you!