

Anex

Thermaltake Toughpower PF3 1050W

Lab ID#: TT10502264
 Receipt Date: Sep 25, 2023
 Test Date: Oct 19, 2023

Report: 23PS2264A
 Report Date: Oct 24, 2023

DUT INFORMATION	
Brand	Thermaltake
Manufacturer (OEM)	HKC
Series	Toughpower PF3
Model Number	TPD-1050AH2FKP
Serial Number	PSTPD1050FNFAPU3PD000086
DUT Notes	

DUT SPECIFICATIONS	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	15
Rated Frequency (Hz)	50-60
Rated Power (W)	1050
Type	ATX12V
Cooling	120mm Fluid Dynamic Bearing Fan [TT-1225 (BDK12025MS)]
Semi-Passive Operation	✓ (selectable)
Cable Design	Fully Modular

TEST EQUIPMENT	
Electronic Loads	Chroma 63601-5 x2 Chroma 63600-2 63640-80-80 x10 63610-80-20
AC Sources	Chroma 6530, APM SP300VAC4000W-P
Power Analyzers	RS HMC8015, N4L PPA1530, N4L PPA5530
Oscilloscopes	Picoscope 4444, Rigol DS7014, Siglent SDS2104X PLUS
Sound Analyzer	Bruel & Kjaer 2270 G4
Microphone	Bruel & Kjaer Type 4955-A
Temperature Logger	Picoscope TC-08
Tachometer	UNI-T UT372
Multimeters	Keysight 34465A, Keithley 2015 - THD
UPS	FSP Champ Tower 3kVA, CyberPower OLS3000E 3kVA
Isolation Transformer	4kVA

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RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
ALPM (Alternative Low Power Mode) compatible	✓
ATX v3.0 PSU Power Excursion	✓

115V

Average Efficiency	90.565%
Efficiency With 10W (≤500W) or 2% (>500W)	70.999
Average Efficiency 5VSB	80.598%
Standby Power Consumption (W)	0.0512000
Average PF	0.980
Avg Noise Output	32.84 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	Standard++

230V

Average Efficiency	91.807%
Average Efficiency 5VSB	79.032%
Standby Power Consumption (W)	0.1409000
Average PF	0.947
Avg Noise Output	32.84 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	Standard++

POWER SPECIFICATIONS

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	87.5	3	0.3
	Watts	100		1050	15	3.6
Total Max. Power (W)		1050				

HOLD-UP TIME & POWER OK SIGNAL (230V)

Hold-Up Time (ms)	22.9
AC Loss to PWR_OK Hold Up Time (ms)	18.3
PWR_OK Inactive to DC Loss Delay (ms)	4.6

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CABLES AND CONNECTORS

Modular Cables

Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (600mm)	1	1	16-22AWG	No
4+4 pin EPS12V (650mm)	2	2	16AWG	No
6+2 pin PCIe (500mm+150mm)	2	4	16-18AWG	No
6+2 pin PCIe (500mm)	1	1	16-18AWG	No
12+4 pin PCIe (600mm) (600W)	1	1	16-26AWG	No
SATA (500mm+145mm+145mm+145mm)	3	12	18AWG	No
4-pin Molex (500mm+150mm+150mm+150mm)	2	8	18AWG	No
FDD Adapter (150mm)	1	1	22AWG	No
AC Power Cord (1380mm) - C13 coupler	1	1	16AWG	-

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General Data	-
Manufacturer (OEM)	HKC
PCB Type	Double-Sided
Primary Side	-
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	1x NTC Thermistor 5D-15 (5 Ohm @ 25°C) & Relay
Bridge Rectifier(s)	2x GBU2506L (600V, 25A @ 100°C)
APFC MOSFETs	2x WayOn WML53N60C4 (600V, 26A @ 100°C, Rds(on): 0.07Ohm)
APFC Boost Diode	1x CH3D16065L
Bulk Cap(s)	2x Rubycon (420V, 470uF each or 940uF combined, 3000h @ 105°C, MXK)
Main Switchers	4x WayOn WML36N60F2 (600V, 20A @ 100°C, Rds(on): 0.11Ohm)
APFC Controller	Champion CM6502UHHX
Resonant Controller	Champion CU6901VPA
Topology	Primary side: APFC, Full-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	8x
5V & 3.3V	DC-DC Converters: 2x PWM Controller(s): ANPEC APW7159C
Filtering Capacitors	Electrolytic: 5x Nippon Chemi-Con (2-5,000 @ 105°C, KZE), 2x Nippon Chemi-Con (4-10,000 @ 105°C, KYA) Polymer: 35x no info
Supervisor IC	Weltrend WT7527RA
Fan Model	TT-1225 BDK12025MS (120mm, 12V, 0.30A, Fluid Dynamic Bearing Fan)
5VSB Circuit	-
Rectifier	PJ1256
Standby PWM Controller	PN8141

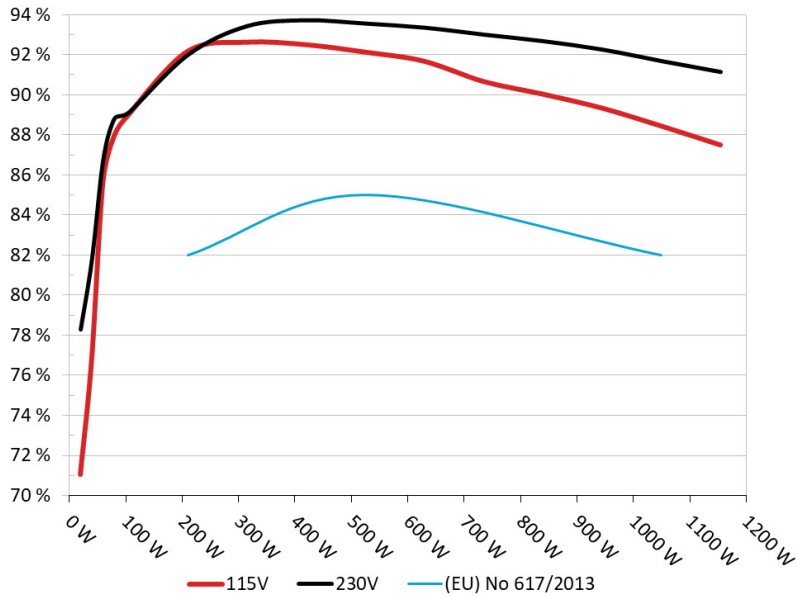
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EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: Thermaltake Toughpower PF3 1050W

Ambient: 36°C - 47°C (96.8°F - 116.6°F)



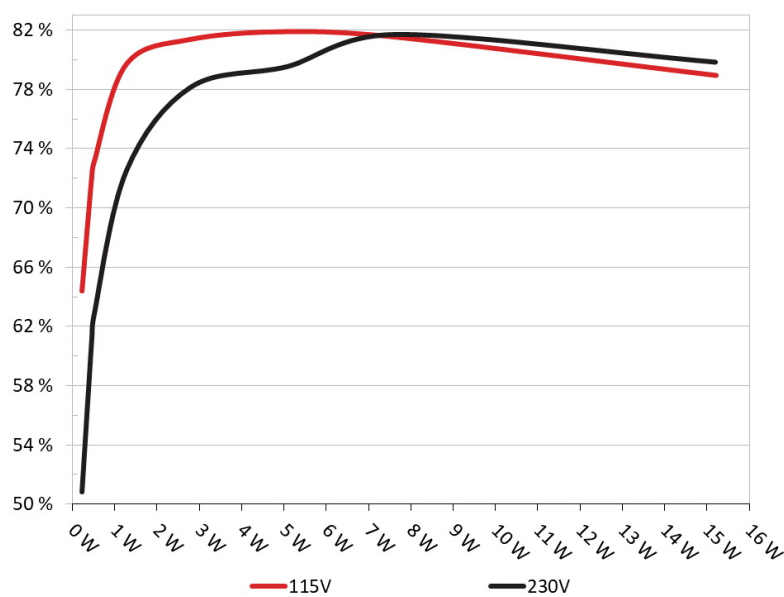
INFO

The PSU's efficiency under high ambient temperatures with 115V and 230V input. For this graph the results of the 10-110% load regulation table are used

5VSB EFFICIENCY

5VSB Efficiency: Thermaltake Toughpower PF3 1050W

Ambient: 34°C - 36°C (93.2°F - 96.8°F)



INFO

This graph depicts the efficiency levels of the 5VSB rail with 115V and 230V input

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Thermaltake Toughpower PF3 1050W

5VSB EFFICIENCY -115V (ERP LOT 3/6 & CEC)

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.23W	64.396%	0.045
	5.118V	0.357W		114.87V
2	0.09A	0.461W	72.122%	0.08
	5.118V	0.639W		114.87V
3	0.55A	2.81W	81.386%	0.3
	5.109V	3.453W		114.87V
4	1A	5.102W	81.904%	0.377
	5.102V	6.229W		114.87V
5	1.5A	7.641W	81.532%	0.424
	5.094V	9.373W		114.87V
6	3A	15.212W	78.943%	0.483
	5.07V	19.269W		114.86V

5VSB EFFICIENCY -230V (ERP LOT 3/6 & CEC)

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.23W	50.807%	0.017
	5.119V	0.454W		229.95V
2	0.09A	0.461W	61.131%	0.028
	5.118V	0.754W		229.94V
3	0.55A	2.809W	78.171%	0.126
	5.109V	3.593W		229.95V
4	1A	5.101W	79.559%	0.203
	5.101V	6.415W		229.93V
5	1.5A	7.64W	81.717%	0.261
	5.093V	9.351W		229.94V
6	3A	15.205W	79.85%	0.356
	5.068V	19.043W		229.94V

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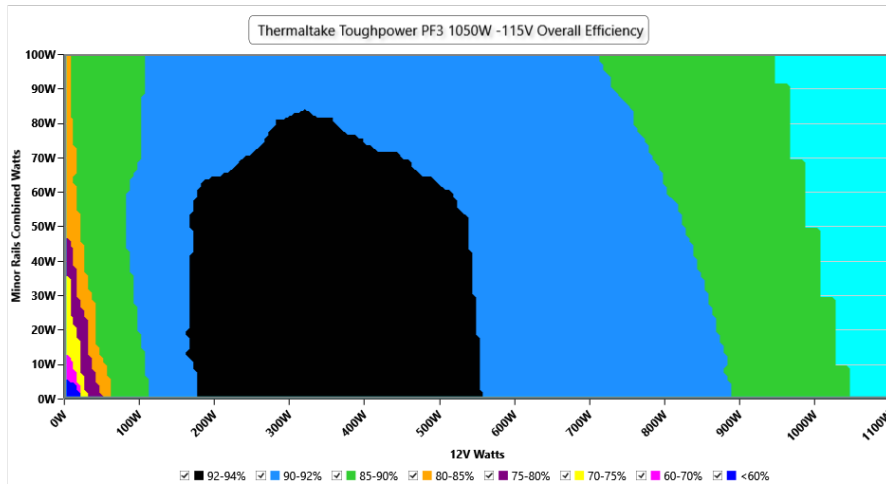
115V

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PAGE 7/17

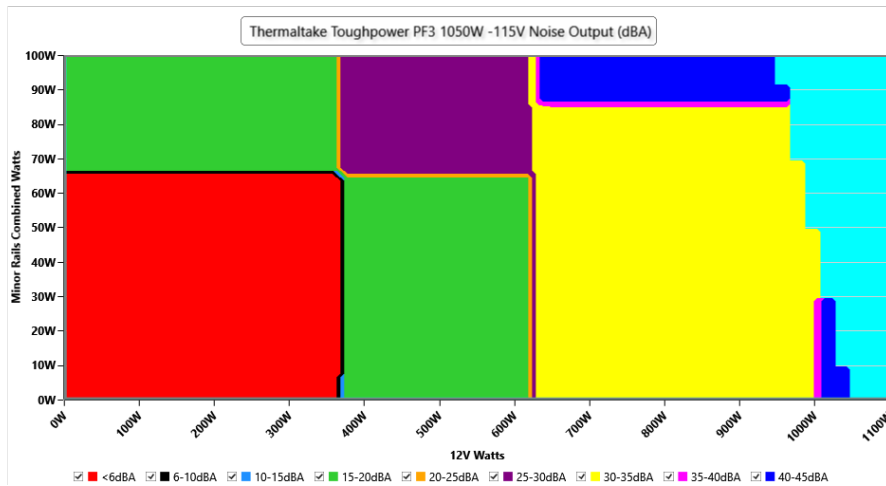
EFFICIENCY GRAPH 115V



INFO

This graph depicts the PSU's efficiency throughout its entire operational range. For the generation of the efficiency and noise graphs we set our loaders to auto mode through our custom-made software before trying thousands of possible load combinations

NOISE GRAPH 115V



INFO

The PSU's noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

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VAMPIRE POWER -115V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	114.88 V	114.83 V	113.85 V	114.93 V	116.15 V	PASS
Mains Frequency:	60.00 Hz	59.99 Hz	59.40 Hz	60.01 Hz	60.60 Hz	PASS
Mains Voltage CF:	1.419	1.417	1.340	1.422	1.490	PASS
Mains Voltage THD:	0.15 %	0.10 %	N/A	0.28 %	2.00 %	PASS
Real Power:	0.051 W	-0.002 W	N/A	0.088 W	N/A	N/A
Apparent Power:	8.247 W	8.215 W	N/A	8.289 W	N/A	N/A
Power Factor:	0.010	N/A	N/A	N/A	N/A	N/A

INFO

This graph is generated by the PPA Standby Power Analysis software which takes full control of the power analyzer during the whole procedure. This application features all of the EN50564 & IEC62301 test limits for standby power software testing

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Thermaltake Toughpower PF3 1050W

10-110% LOAD TESTS 115V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
10%	6.957A	1.995A	1.986A	0.98A	104.932	88.987%	0	<6.0	44.39°C	0.961
	11.980V	5.012V	3.323V	5.101V	117.917				40.17°C	114.84V
20%	14.932A	2.994A	2.982A	1.178A	209.915	92.155%	0	<6.0	45.32°C	0.977
	11.988V	5.01V	3.32V	5.092V	227.784				40.7°C	114.8V
30%	23.238A	3.495A	3.482A	1.377A	314.929	92.615%	0	<6.0	46.63°C	0.982
	12.001V	5.008V	3.317V	5.083V	340.04				41.63°C	114.76V
40%	31.499A	3.996A	3.983A	1.577A	419.52	92.491%	1206	28.3	41.82°C	0.984
	12.011V	5.006V	3.314V	5.074V	453.576				47.33°C	114.72V
50%	39.472A	4.997A	4.983A	1.777A	524.874	92.118%	1203	28.2	42.09°C	0.984
	12.018V	5.003V	3.311V	5.065V	569.782				48.13°C	114.69V
60%	47.366A	6A	5.985A	1.978A	629.369	91.665%	1200	28.2	42.56°C	0.986
	12.024V	5V	3.309V	5.056V	686.593				49.07°C	114.65V
70%	55.211A	7.004A	6.989A	2.179A	734.7	90.652%	1878	41.1	43.13°C	0.987
	12.055V	4.998V	3.306V	5.047V	810.459				50.17°C	114.6V
80%	63.117A	8.001A	7.994A	2.282A	839.471	90.025%	1877	41.1	43.59°C	0.988
	12.066V	4.995V	3.302V	5.039V	932.491				51.57°C	114.57V
90%	71.417A	8.51A	8.485A	2.384A	944.891	89.324%	1875	41.1	44.31°C	0.99
	12.076V	4.994V	3.3V	5.032V	1057.819				53.23°C	114.52V
100%	79.442A	9.013A	9.008A	2.989A	1049.7	88.43%	1874	41.1	45.6°C	0.991
	12.085V	4.992V	3.297V	5.017V	1187.044				55.33°C	114.47V
110%	87.348A	10.02A	10.11A	2.993A	1154.317	87.488%	2241	45.1	46.69°C	0.991
	12.090V	4.99V	3.293V	5.012V	1319.415				57.51°C	114.43V
CL1	0.116A	12.039A	11.976A	0A	101.287	85.073%	1211	28.3	40.13°C	0.961
	11.994V	5V	3.315V	5.115V	119.06				54.4°C	114.83V
CL2	0.115A	20.013A	0A	0A	101.348	83.672%	1215	28.3	40.91°C	0.961
	11.990V	4.995V	3.324V	5.117V	121.122				50.65°C	114.83V
CL3	0.115A	0A	19.935A	0A	67.374	78.953%	1216	28.4	40.61°C	0.945
	11.981V	5.013V	3.311V	5.114V	85.334				47.72°C	114.84V
CL4	86.873A	0A	0A	0.001A	1049.491	89.116%	2243	45.1	45.09°C	0.99
	12.081V	5.004V	3.306V	5.074V	1177.67				52.75°C	114.48V

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20-80W LOAD TESTS 115V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
20W	1.249A	0.498A	0.496A	0.195A	19.989	71.052%	0	<6.0	39.11°C	0.823
	11.880V	5.017V	3.327V	5.117V	28.131				36°C	114.86V
40W	2.749A	0.698A	0.694A	0.293A	39.99	76.787%	0	<6.0	40.42°C	0.911
	11.889V	5.016V	3.327V	5.114V	52.081				37.02°C	114.85V
60W	4.218A	0.897A	0.893A	0.391A	59.99	85.65%	0	<6.0	41.79°C	0.938
	11.978V	5.015V	3.326V	5.112V	70.041				38.03°C	114.85V
80W	5.701A	1.097A	1.092A	0.489A	79.923	87.939%	0	<6.0	42.92°C	0.946
	11.979V	5.014V	3.325V	5.11V	90.882				39.02°C	114.84V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.94mV	7.42mV	8.74mV	6.09mV	Pass
20% Load	10.53mV	21.84mV	17.58mV	6.61mV	Pass
30% Load	9.60mV	7.57mV	9.93mV	7.38mV	Pass
40% Load	12.27mV	7.68mV	10.60mV	7.74mV	Pass
50% Load	11.55mV	8.55mV	10.86mV	8.52mV	Pass
60% Load	12.43mV	8.45mV	11.27mV	9.14mV	Pass
70% Load	14.38mV	9.79mV	12.82mV	10.22mV	Pass
80% Load	14.38mV	9.89mV	14.32mV	10.68mV	Pass
90% Load	13.92mV	10.92mV	14.94mV	12.28mV	Pass
100% Load	22.26mV	11.53mV	19.21mV	23.13mV	Pass
110% Load	22.85mV	13.14mV	20.48mV	25.47mV	Pass
Crossload1	16.28mV	8.83mV	11.04mV	6.05mV	Pass
Crossload2	12.58mV	13.50mV	9.31mV	5.73mV	Pass
Crossload3	10.05mV	7.42mV	10.34mV	5.37mV	Pass
Crossload4	19.93mV	10.20mV	19.17mV	11.42mV	Pass

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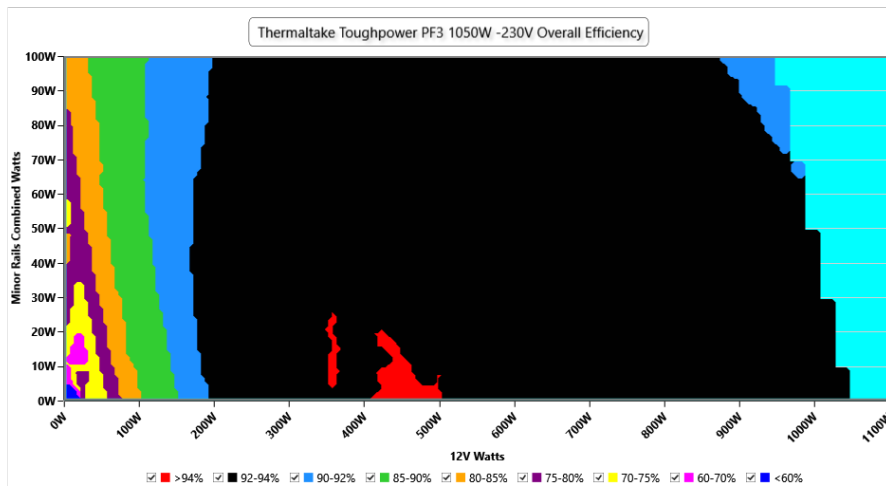
230V

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PAGE 12/17

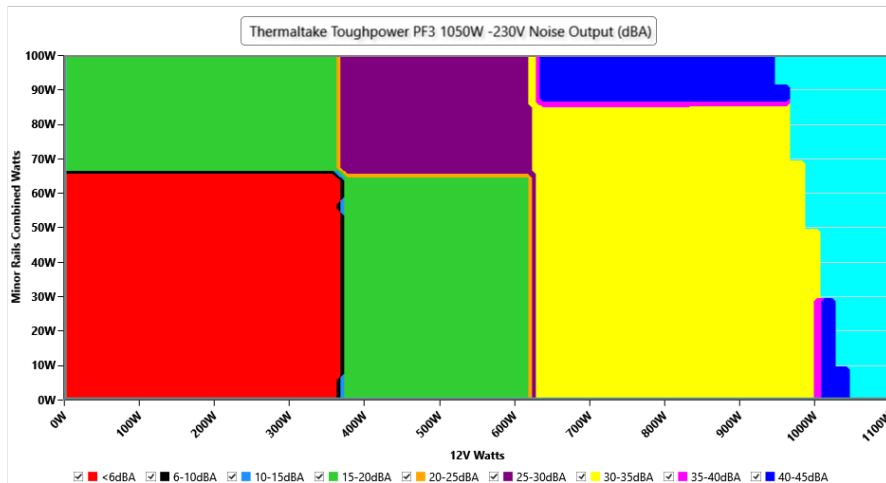
EFFICIENCY GRAPH 230V



INFO

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NOISE GRAPH 230V



INFO

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VAMPIRE POWER -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	229.96 V	229.89 V	227.70 V	229.99 V	232.30 V	PASS
Mains Frequency:	50.00 Hz	50.00 Hz	49.50 Hz	50.01 Hz	50.50 Hz	PASS
Mains Voltage CF:	1.417	1.416	1.340	1.419	1.490	PASS
Mains Voltage THD:	0.13 %	0.08 %	N/A	0.19 %	2.00 %	PASS
Real Power:	0.141 W	0.090 W	N/A	0.221 W	N/A	N/A
Apparent Power:	28.372 W	28.332 W	N/A	28.420 W	N/A	N/A
Power Factor:	0.006	N/A	N/A	N/A	N/A	N/A

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10-110% LOAD TESTS 230V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
10%	6.926A	1.996A	1.986A	0.98A	104.95	89.103%	0	<6.0	44.58°C	0.857
	12.036V	5.011V	3.323V	5.1V	117.785				40.37°C	229.93V
20%	14.879A	2.995A	2.982A	1.178A	209.945	91.982%	0	<6.0	45.46°C	0.926
	12.033V	5.009V	3.32V	5.092V	228.249				40.86°C	229.91V
30%	23.184A	3.495A	3.482A	1.377A	314.942	93.421%	0	<6.0	46.26°C	0.949
	12.029V	5.007V	3.317V	5.084V	337.118				41.24°C	229.89V
40%	31.426A	3.996A	3.983A	1.576A	419.489	93.714%	695	11.7	41.77°C	0.961
	12.038V	5.006V	3.314V	5.075V	447.63				47.44°C	229.87V
50%	39.385A	4.997A	4.983A	1.777A	524.804	93.55%	1199	28.2	42.07°C	0.968
	12.043V	5.003V	3.311V	5.065V	560.989				48.15°C	229.86V
60%	47.270A	6A	5.985A	1.978A	629.329	93.346%	1197	28.2	42.82°C	0.971
	12.048V	5V	3.309V	5.056V	674.192				49.45°C	229.84V
70%	55.200A	7.004A	6.989A	2.179A	734.676	92.998%	1876	41.1	43.08°C	0.974
	12.057V	4.997V	3.305V	5.047V	789.999				50.25°C	229.82V
80%	63.117A	8.001A	7.994A	2.282A	839.471	92.672%	1877	41.1	43.73°C	0.152
	12.066V	4.995V	3.302V	5.117V	905.851				51.97°C	229.92V
90%	71.412A	8.511A	8.486A	2.384A	944.884	92.25%	1871	41.1	44.23°C	0.978
	12.077V	4.993V	3.299V	5.032V	1024.266				53.12°C	229.79V
100%	79.438A	9.014A	9.009A	2.989A	1049.701	91.676%	1870	41.1	45.12°C	0.98
	12.086V	4.992V	3.297V	5.017V	1145.015				54.89°C	229.77V
110%	87.347A	10.02A	10.11A	2.993A	1154.316	91.134%	2242	45.1	46.69°C	0.981
	12.090V	4.99V	3.293V	5.011V	1266.616				57.56°C	229.75V
CL1	0.116A	12.039A	11.976A	0A	101.283	81.275%	1206	28.3	39.98°C	0.857
	12.039V	5V	3.315V	5.114V	124.621				49.17°C	229.93V
CL2	0.114A	20.013A	0A	0A	101.35	80.329%	1208	28.3	40.17°C	0.859
	12.042V	4.995V	3.324V	5.117V	126.167				47.25°C	229.93V
CL3	0.114A	0A	19.934A	0A	67.373	72.727%	1202	28.2	40.44°C	0.805
	12.083V	5.013V	3.311V	5.114V	92.636				46.34°C	229.93V
CL4	86.863A	0A	0A	0.001A	1049.476	92.255%	2240	45.1	45.13°C	0.979
	12.082V	5.004V	3.306V	5.074V	1137.583				49.11°C	229.77V

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Anex

Thermaltake Toughpower PF3 1050W

20-80W LOAD TESTS 230V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
20W	1.246A	0.498A	0.496A	0.195A	19.986	78.271%	0	<6.0	39.36°C	0.48
	11.903V	5.016V	3.327V	5.117V	25.534				36.23°C	229.94V
40W	2.740A	0.698A	0.694A	0.293A	39.988	81.792%	0	<6.0	40.25°C	0.642
	11.930V	5.016V	3.327V	5.114V	48.89				36.93°C	229.94V
60W	4.176A	0.897A	0.893A	0.391A	59.991	86.767%	0	<6.0	41.83°C	0.768
	12.098V	5.015V	3.326V	5.112V	69.14				38.26°C	229.93V
80W	5.658A	1.097A	1.092A	0.489A	79.934	88.809%	0	<6.0	42.9°C	0.818
	12.074V	5.013V	3.324V	5.11V	81.808				39.17°C	229.93V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	6.14mV	6.49mV	6.72mV	6.35mV	Pass
20% Load	10.88mV	7.16mV	7.81mV	6.71mV	Pass
30% Load	11.84mV	7.73mV	9.20mV	7.17mV	Pass
40% Load	13.10mV	23.91mV	19.34mV	7.59mV	Pass
50% Load	12.05mV	17.88mV	20.63mV	8.05mV	Pass
60% Load	12.27mV	9.43mV	12.72mV	8.77mV	Pass
70% Load	14.47mV	8.97mV	13.34mV	10.53mV	Pass
80% Load	14.60mV	8.35mV	12.00mV	9.81mV	Pass
90% Load	14.23mV	10.31mV	14.74mV	11.77mV	Pass
100% Load	24.00mV	11.49mV	19.43mV	23.71mV	Pass
110% Load	24.11mV	11.31mV	20.08mV	23.57mV	Pass
Crossload1	9.09mV	8.06mV	10.38mV	6.25mV	Pass
Crossload2	9.74mV	13.14mV	7.91mV	5.99mV	Pass
Crossload3	10.16mV	7.37mV	9.88mV	5.62mV	Pass
Crossload4	21.30mV	9.49mV	18.52mV	11.09mV	Pass

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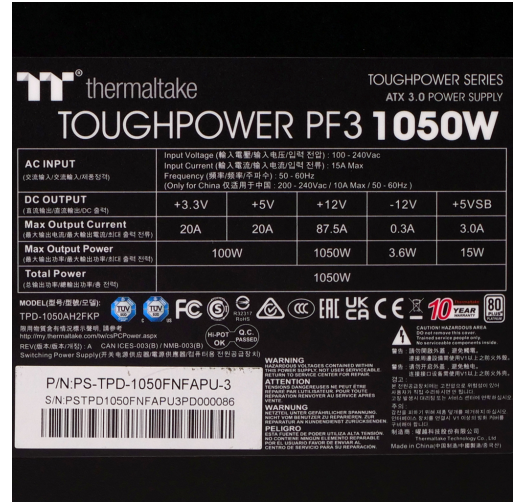
PAGE 16/17

Anex

Thermaltake Toughpower PF3 1050W



Top side



Power specifications label

CERTIFICATIONS 115V



Aristeidis Bitziopoulos
Lab Director

CERTIFICATIONS 230V



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