

Anex

Thermaltake Toughpower PF1 1050W

Lab ID#: TT10502046
Receipt Date: Jul 11, 2022
Test Date: Jul 26, 2022

Report: 22PS2046A
Report Date: Jul 28, 2022

DUT INFORMATION	
Brand	Thermaltake
Manufacturer (OEM)	HKC
Series	Toughpower PF1
Model Number	TTP-1050AH2FLP
Serial Number	PSTPD1050FNFAPE1SKCH00006
DUT Notes	

DUT SPECIFICATIONS	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	16-8
Rated Frequency (Hz)	50/60
Rated Power (W)	1050
Type	ATX12V
Cooling	120mm Hydraulic Bearing Fan [TT-1225(A1225M12S)]
Semi-Passive Operation	✓ (selectable)
Cable Design	Fully Modular

TEST EQUIPMENT	
Electronic Loads	Chroma 63601-5 x4 Chroma 63600-2 x2 63640-80-80 x20 63610-80-20 x2
AC Sources	Chroma 6530, Keysight AC6804B
Power Analyzers	N4L PPA1530 x2
Sound Analyzer	Bruel & Kjaer 2270 G4
Microphone	Bruel & Kjaer Type 4955-A
Data Loggers	Picoscope TC-08 x2, Labjack U3-HV x2
Tachometer	UNI-T UT372 x2
Digital Multimeter	Keysight U1273AX, Fluke 289, Keithley 2015 - THD
UPS	CyberPower OLS3000E 3kVA x2
Transformer	3kVA x2

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PAGE 1/17

Anex

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RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓

115V

Average Efficiency	90.552%
Efficiency With 10W (≤500W) or 2% (>500W)	69.704
Average Efficiency 5VSB	80.755%
Standby Power Consumption (W)	0.1211000
Average PF	0.988
Avg Noise Output	39.00 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	Standard+

230V

Average Efficiency	92.264%
Average Efficiency 5VSB	78.473%
Standby Power Consumption (W)	0.1482000
Average PF	0.948
Avg Noise Output	38.99 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	2.5	0.3
	Watts	100		1050	12.5	3.6
Total Max. Power (W)		1050				

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

Hold-Up Time (ms)	18.3
AC Loss to PWR_OK Hold Up Time (ms)	15.8
PWR_OK Inactive to DC Loss Delay (ms)	2.5

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PAGE 2/17

Anex

Thermaltake Toughpower PF1 1050W

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)	4	8	16AWG	No
SATA (490mm+150mm+150mm+150mm)	3	12	18AWG	No
4-pin Molex (500mm+150mm+150mm+150mm)	1	4	18AWG	No
FDD Adapter (150mm)	1	1	22AWG	No
AC Power Cord (1390mm) - C13 coupler	1	1	16AWG	-

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PAGE 3/17

Anex

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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	NTC Thermistor MF72-5D15 (5 Ohm) & Relay
Bridge Rectifier(s)	2x GBU2506L (600V, 25A @ 100°C)
APFC MOSFETs	2x Lonten LSD65R099GF (650V, 26A @ 100°C, Rds(on): 0.099Ohm)
APFC Boost Diode	1x Global Power Technology G3S06510A (650V, 10A @ 155°C)
Bulk Cap(s)	1x Nichicon (400V, 1,000uF, 2,000h @ 105°C, GG)
Main Switchers	4x Lonten LSD55R140GF (550V, 15A @ 100°C, Rds(on): 0.14Ohm)
APFC Controller	Champion CM6500UNX & CM03AX
Resonant Controller	Champion CM6901T6X
Topology	Primary side: APFC, Full-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	8x Infineon BSC014N04LS (40V, 125A @ 100°C, Rds(on): 1.4mOhm)
5V & 3.3V	DC-DC Converters
Filtering Capacitors	Electrolytic: 3x Nichicon (10,000h @ 105°C, HW), 1x Rubycon (6-10,000h @ 105°C, ZLH), 5x Nippon Chemi-Con (4-10,000h @ 105°C, KY), 1x Nippon Chemi-Con (4-10,000h @ 105°C, KYA) Polymer: 31x Teapo
Supervisor IC	Grenergy GR8329N (OCP, OVP, UVP, SCP, PG)
Fan Model	Thermaltake TT-1225 (A1225M12S) (120mm, 12V, 0.38A, Hydraulic Bearing Fan)
5VSB Circuit	-
Rectifier	1x CRMicro CRTD045N03L (30V, 93A @ 100°C, Rds(on): 4.5mOhm) FET
Standby PWM Controller	Sanken STR-A6069H
-12V Circuit	-
Rectifier	1x

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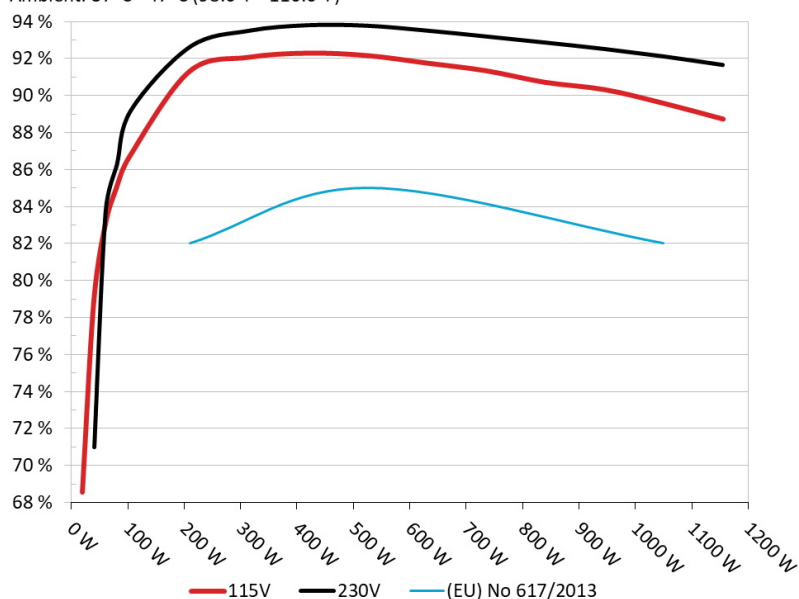
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PAGE 4/17

EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: Thermaltake Toughpower PF1 1050W

Ambient: 37°C - 47°C (98.6°F - 116.6°F)



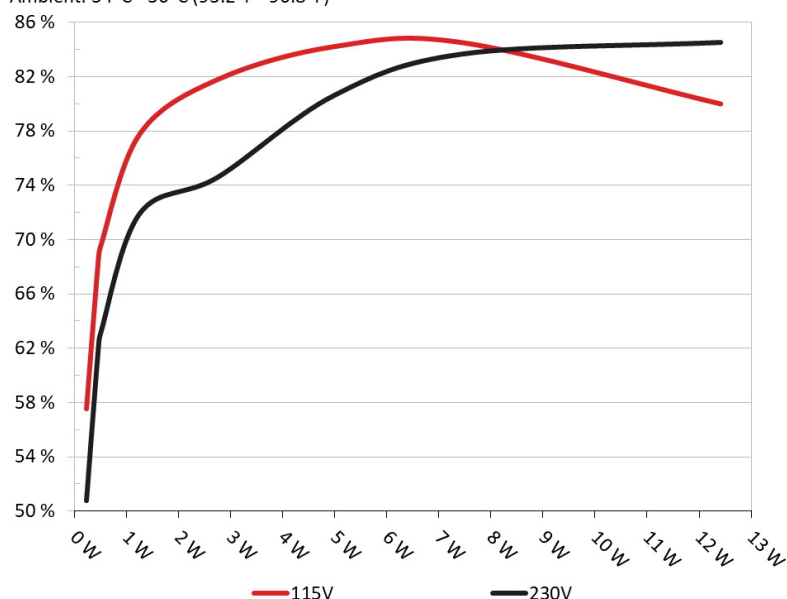
INFO

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 PF1 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 PF1 1050W

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.225W	57.033%	0.054
	5.013V	0.395W		115.16V
2	0.09A	0.451W	67.913%	0.088
	5.012V	0.664W		115.16V
3	0.55A	2.751W	81.313%	0.306
	5.003V	3.383W		115.16V
4	1A	4.994W	83.736%	0.389
	4.995V	5.964W		115.15V
5	1.5A	7.478W	84.004%	0.43
	4.986V	8.902W		115.16V
6	2.499A	12.408W	79.504%	0.479
	4.966V	15.607W		115.16V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.225W	50.28%	0.018
	5.013V	0.448W		230.34V
2	0.09A	0.451W	61.395%	0.03
	5.011V	0.732W		230.34V
3	0.55A	2.751W	74.095%	0.139
	5.003V	3.713W		230.34V
4	1A	4.994W	80.131%	0.208
	4.995V	6.232W		230.34V
5	1.5A	7.478W	83.173%	0.264
	4.986V	8.991W		230.34V
6	2.499A	12.413W	84.013%	0.332
	4.968V	14.775W		230.33V

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PAGE 6/17

Anex

Thermaltake Toughpower PF1 1050W

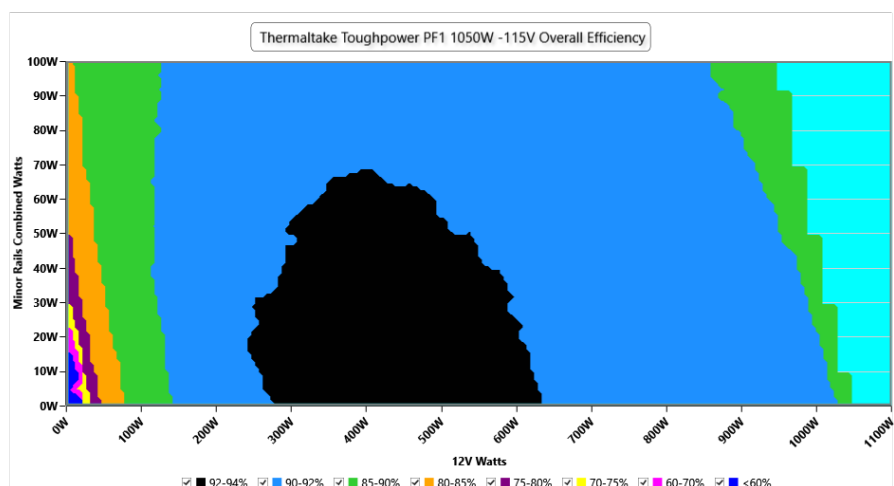
115V

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PAGE 7/17

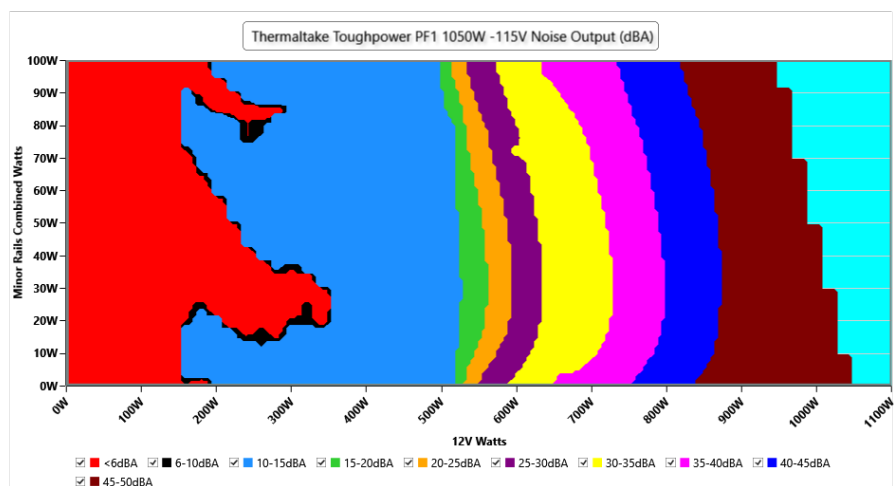
EFFICIENCY GRAPH 115V



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:	115.15 V	115.12 V	113.85 V	115.19 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:	1.416	1.415	1.340	1.418	1.490	PASS
Mains Voltage THD:	0.13 %	0.10 %	N/A	0.19 %	2.00 %	PASS
Real Power:	0.121 W	0.112 W	N/A	0.131 W	N/A	N/A
Apparent Power:	7.779 W	7.566 W	N/A	8.010 W	N/A	N/A
Power Factor:	0.015	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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PAGE 9/17

Anex

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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%	6.920A	1.992A	1.981A	1.001A	104.929	86.782%	0	<6.0	44.67°C	0.976
	12.043V	5.019V	3.332V	4.992V	120.912				40.64°C	115.13V
20%	14.868A	2.99A	2.973A	1.203A	209.908	91.325%	0	<6.0	45.14°C	0.982
	12.039V	5.017V	3.33V	4.984V	229.857				40.83°C	115.11V
30%	23.183A	3.492A	3.471A	1.407A	314.903	92.086%	835	13.7	41.65°C	0.985
	12.029V	5.012V	3.327V	4.975V	341.967				46.43°C	115.08V
40%	31.457A	3.993A	3.969A	1.611A	419.454	92.308%	846	14	42.05°C	0.99
	12.024V	5.009V	3.325V	4.967V	454.401				47.09°C	115.05V
50%	39.444A	4.993A	4.964A	1.814A	524.776	92.178%	1226	26.6	42.24°C	0.993
	12.024V	5.007V	3.324V	4.96V	569.307				47.71°C	115.02V
60%	47.390A	5.996A	5.961A	2A	629.213	91.774%	1887	38.3	42.95°C	0.994
	12.017V	5.004V	3.322V	4.953V	685.618				49.03°C	114.98V
70%	55.411A	7A	6.959A	2.223A	734.601	91.357%	2380	44	43.18°C	0.995
	12.010V	5.001V	3.319V	4.946V	804.097				50.34°C	114.95V
80%	63.435A	8.002A	7.955A	2.326A	839.465	90.729%	2609	46.6	43.93°C	0.996
	12.006V	4.998V	3.317V	4.942V	925.256				51.96°C	114.91V
90%	72.009A	8.51A	8.451A	2.432A	944.73	90.337%	2580	46.4	44.06°C	0.996
	11.975V	4.993V	3.312V	4.932V	1045.798				53.21°C	114.88V
100%	80.278A	9.011A	8.962A	2.534A	1049.454	89.597%	2638	46.6	45.63°C	0.997
	11.987V	4.993V	3.313V	4.931V	1171.311				55.65°C	114.83V
110%	88.284A	10.014A	10.048A	2.533A	1154.99	88.741%	2661	46.8	47.24°C	0.997
	11.997V	4.993V	3.313V	4.933V	1301.515				58.22°C	114.78V
CL1	0.116A	11.998A	11.921A	0A	101.282	83.358%	866	15.5	40.32°C	0.977
	12.060V	5.018V	3.33V	5.049V	121.515				45.86°C	115.14V
CL2	0.114A	19.904A	0A	0A	101.383	83.016%	849	14.2	40.44°C	0.977
	12.059V	5.024V	3.33V	5.076V	122.129				47.72°C	115.14V
CL3	0.114A	0A	19.767A	0A	67.371	76.639%	837	13.7	40.9°C	0.962
	12.049V	5.024V	3.339V	5.023V	87.896				49.91°C	115.15V
CL4	87.421A	0A	0A	0A	1049.473	89.904%	2625	46.5	44.78°C	0.997
	12.005V	5.006V	3.323V	5.005V	1167.321				55.28°C	114.83V

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PAGE 10/17

Anex

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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	1.234A	0.497A	0.495A	0.199A	19.985	68.55%	0	<6.0	40.04°C	0.775
	12.021V	5.026V	3.336V	5.02V	29.159				37.03°C	115.16V
40W	2.718A	0.696A	0.692A	0.299A	39.987	78.76%	0	<6.0	40.52°C	0.902
	12.025V	5.026V	3.336V	5.017V	50.776				37.22°C	115.15V
60W	4.200A	0.896A	0.891A	0.399A	59.988	82.938%	0	<6.0	42.36°C	0.947
	12.028V	5.023V	3.334V	5.011V	72.327				38.58°C	115.14V
80W	5.676A	1.095A	1.089A	0.499A	79.922	84.984%	0	<6.0	43.93°C	0.967
	12.031V	5.021V	3.332V	5.007V	94.048				39.96°C	115.14V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	35.57mV	12.45mV	8.19mV	21.20mV	Pass
20% Load	14.66mV	5.69mV	8.29mV	8.40mV	Pass
30% Load	12.53mV	12.96mV	8.75mV	10.27mV	Pass
40% Load	9.55mV	6.40mV	10.57mV	8.45mV	Pass
50% Load	9.82mV	12.81mV	8.69mV	12.85mV	Pass
60% Load	10.13mV	7.17mV	8.90mV	9.51mV	Pass
70% Load	11.80mV	7.37mV	9.35mV	10.07mV	Pass
80% Load	10.63mV	7.72mV	11.28mV	9.31mV	Pass
90% Load	11.90mV	14.69mV	12.79mV	12.04mV	Pass
100% Load	17.47mV	10.48mV	13.39mV	11.62mV	Pass
110% Load	18.26mV	10.84mV	13.70mV	11.71mV	Pass
Crossload1	21.06mV	9.05mV	13.50mV	8.90mV	Pass
Crossload2	16.59mV	9.66mV	9.15mV	9.16mV	Pass
Crossload3	7.24mV	14.48mV	14.05mV	12.65mV	Pass
Crossload4	17.15mV	7.32mV	8.89mV	11.03mV	Pass

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PAGE 11/17

Anex

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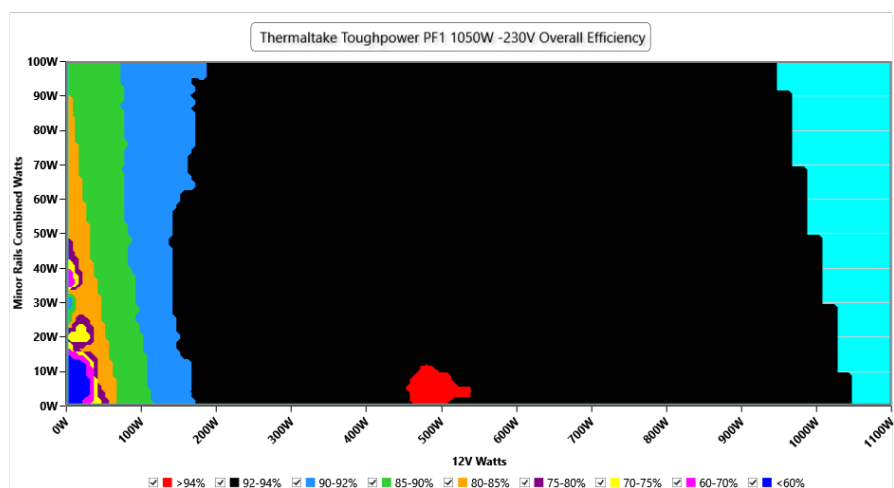
230V

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PAGE 12/17

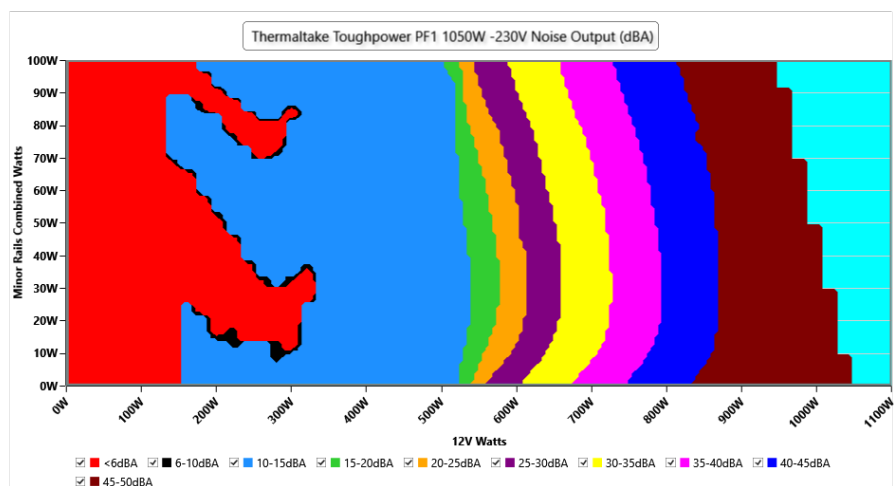
EFFICIENCY GRAPH 230V



INFO

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NOISE GRAPH 230V



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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 -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	230.33 V	230.23 V	227.70 V	230.37 V	232.30 V	PASS
Mains Frequency:	50.00 Hz	49.99 Hz	49.50 Hz	50.01 Hz	50.50 Hz	PASS
Mains Voltage CF:	1.416	1.415	1.340	1.417	1.490	PASS
Mains Voltage THD:	0.12 %	0.10 %	N/A	0.20 %	2.00 %	PASS
Real Power:	0.148 W	0.130 W	N/A	0.176 W	N/A	N/A
Apparent Power:	25.599 W	25.276 W	N/A	25.930 W	N/A	N/A
Power Factor:	0.005	N/A	N/A	N/A	N/A	N/A

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PAGE 14/17

Anex

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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%	6.919A	1.992A	1.981A	1.002A	104.931	89.197%	0	<6.0	44.73°C	0.828
	12.045V	5.02V	3.332V	4.991V	117.632				40.67°C	230.34V
20%	14.876A	2.991A	2.974A	1.204A	209.914	92.637%	0	<6.0	45.13°C	0.929
	12.034V	5.015V	3.329V	4.982V	226.6				40.79°C	230.32V
30%	23.182A	3.491A	3.472A	1.407A	314.916	93.504%	833	13.7	41.35°C	0.955
	12.029V	5.013V	3.327V	4.974V	336.794				46.03°C	230.31V
40%	31.459A	3.992A	3.97A	1.611A	419.464	93.802%	847	14	41.54°C	0.965
	12.024V	5.01V	3.325V	4.965V	447.187				46.61°C	230.3V
50%	39.452A	4.993A	4.965A	1.815A	524.784	93.772%	1222	26.5	42.07°C	0.971
	12.022V	5.008V	3.323V	4.959V	559.639				47.59°C	230.29V
60%	47.391A	5.995A	5.962A	2A	629.215	93.513%	1968	39.2	42.73°C	0.974
	12.017V	5.005V	3.321V	4.953V	672.877				48.89°C	230.27V
70%	55.423A	7A	6.961A	2.224A	734.662	93.196%	2443	44.6	43.39°C	0.978
	12.009V	5.001V	3.319V	4.944V	788.289				50.49°C	230.26V
80%	63.450A	8.002A	7.957A	2.326A	839.465	92.865%	2606	46.6	43.41°C	0.98
	12.003V	4.998V	3.317V	4.941V	903.97				51.51°C	230.24V
90%	71.860A	8.505A	8.443A	2.429A	944.85	92.517%	2628	46.5	44.66°C	0.981
	12.001V	4.996V	3.316V	4.937V	1021.274				53.98°C	230.23V
100%	80.178A	9.01A	8.959A	2.533A	1049.564	92.116%	2640	46.6	45.58°C	0.982
	12.003V	4.994V	3.314V	4.933V	1139.39				55.67°C	230.21V
110%	88.240A	10.015A	10.049A	2.532A	1155.005	91.654%	2655	46.7	46.86°C	0.983
	12.004V	4.992V	3.313V	4.934V	1260.19				57.82°C	230.19V
CL1	0.116A	11.999A	11.923A	0A	101.281	84.659%	885	16.7	42.6°C	0.835
	12.062V	5.017V	3.329V	5.049V	119.644				48.13°C	230.34V
CL2	0.114A	19.907A	0A	0A	101.378	84.439%	842	13.8	40.07°C	0.835
	12.057V	5.024V	3.33V	5.077V	120.065				47.3°C	230.34V
CL3	0.114A	0A	19.765A	0A	67.368	78.207%	828	13.3	41.28°C	0.752
	12.047V	5.024V	3.339V	5.024V	86.132				50.57°C	230.34V
CL4	87.406A	0A	0A	0A	1049.43	92.553%	2632	46.5	45.41°C	0.982
	12.006V	5.006V	3.323V	5.006V	1133.869				56.38°C	230.21V

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PAGE 15/17

Anex

Thermaltake Toughpower PF1 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	1.235A	0.497A	0.495A	0.199A	19.986	70.98%	0	<6.0	40.27°C	0.513
	12.013V	5.025V	3.335V	5.019V	28.168				37.18°C	230.34V
40W	2.719A	0.697A	0.693A	0.299A	39.987	70.763%	0	<6.0	40.45°C	0.589
	12.018V	5.025V	3.335V	5.015V	50.331				37.13°C	230.34V
60W	4.202A	0.896A	0.891A	0.399A	59.987	83.706%	0	<6.0	41.62°C	0.688
	12.023V	5.022V	3.333V	5.01V	71.662				38.12°C	230.34V
80W	5.678A	1.095A	1.089A	0.499A	79.921	86.241%	0	<6.0	42.52°C	0.769
	12.028V	5.02V	3.332V	5.005V	92.661				38.79°C	230.34V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	15.98mV	4.93mV	8.19mV	7.34mV	Pass
20% Load	14.51mV	9.09mV	8.59mV	10.63mV	Pass
30% Load	11.82mV	5.54mV	8.69mV	8.35mV	Pass
40% Load	9.70mV	11.59mV	10.16mV	11.49mV	Pass
50% Load	9.09mV	6.56mV	8.85mV	9.01mV	Pass
60% Load	9.32mV	10.93mV	9.15mV	11.39mV	Pass
70% Load	10.03mV	12.75mV	9.20mV	11.03mV	Pass
80% Load	11.64mV	11.74mV	11.37mV	12.60mV	Pass
90% Load	10.58mV	13.36mV	12.28mV	13.00mV	Pass
100% Load	17.44mV	10.28mV	12.36mV	12.46mV	Pass
110% Load	18.26mV	11.43mV	13.56mV	12.84mV	Pass
Crossload1	20.20mV	8.55mV	13.01mV	8.98mV	Pass
Crossload2	16.93mV	9.96mV	8.09mV	9.82mV	Pass
Crossload3	5.92mV	6.10mV	12.34mV	7.44mV	Pass
Crossload4	16.87mV	11.36mV	9.57mV	20.15mV	Pass

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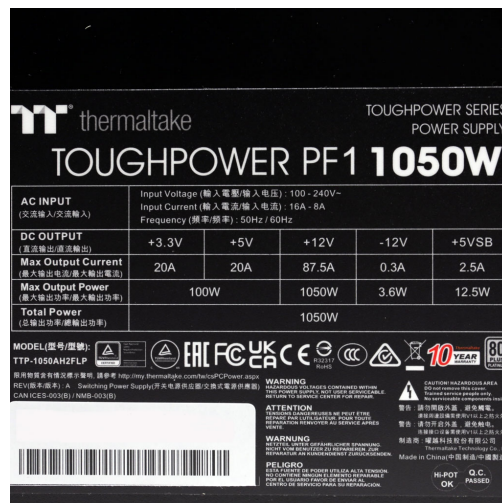
PAGE 16/17

Anex

Thermaltake Toughpower PF1 1050W



Top side



Power specifications label

CERTIFICATIONS 115V



CERTIFICATIONS 230V



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