Anex

Thermaltake Toughpower GF A3 1050W

Lab ID#: TT10502249
Receipt Date: Aug 17, 2023
Test Date: Oct 2, 2023

Report: 23PS2249A
Report Date: Oct 3, 2023

DUT INFORMATION

Brand	Thermaltake
Manufacturer (OEM)	HKC
Series	Toughpower GF A3
Model Number	TTP-1050AH2FKG
Serial Number	PSTPD1050FNFAGEHPK000199
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 Sleeve Bearing Fan [TT-1225 (AV-F12025MS)]
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	89.649%
Efficiency With 10W (≤500W) or 2% (>500W)	70.604
Average Efficiency 5VSB	80.217%
Standby Power Consumption (W)	0.0338000
Average PF	0.988
Avg Noise Output	26.05 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A-

230V

Average Efficiency	91.823%
Average Efficiency 5VSB	80.191%
Standby Power Consumption (W)	0.1024000
Average PF	0.956
Avg Noise Output	24.70 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A

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)	21.7
AC Loss to PWR_OK Hold Up Time (ms)	18.7
PWR_OK Inactive to DC Loss Delay (ms)	3

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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	16-18AWG	No
4+4 pin EPS12V (650mm)	2	2	16AWG	No
6+2 pin PCIe (500mm+155mm)	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+150mm+150mm+150mm)	3	12	18AWG	No
4-pin Molex (500mm+155m+155mm+155mm)	1	4	18AWG	No
FDD Adapter (150mm)	1	1	22AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	18AWG	-

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General Data	
Manufacturer (OEM)	HKC
PCB Type	Double-Sided
Primary Side	
Transient Filter	4x Y caps, 1x X caps, 2x CM chokes, 1x MOV
Inrush Protection	1x NTC Thermistor 5D-15 (5 Ohm @ 25°C) & Relay
Bridge Rectifier(s)	2x Diodes GBU25KH (800V, 25A @with heatsink)
APFC MOSFETs	2x Lonten LSB65R099GT (650V, 26A @ 100°C, Rds(on): 0.099Ohm)
APFC Boost Diode	1x Global Power Tech. G3S06010J (600V, 8A @ 150°C)
Bulk Cap(s)	1x Nippon Chemi-Con (420V, 570uF , 2000h @ 105°C, KHE) 1x Nippon Chemi-Con (420V, 470uF , 2000h @ 105°C, KMZ)
Main Switchers	2x Lonten LSB65R099GT (650V, 26A @ 100°C, Rds(on): 0.099Ohm)
APFC Controller	Champion CM6500UNX & CM03X
Resonant Controller	Champion CM6901X
Digital MCU	Texas Instrument TPS54231
IC Driver	Novesense NSi6602
Topology	Primary side: APFC, Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETs	6x Infineon ISC012N04LM6 (40V, 141A @ 100°C, Rds(on): 1.2Ohm)
5V & 3.3V	DC-DC Converters: 4x Excelliance MOS EMB06N03A (30V, 50A @ 100°C, Rds(on): 6mOhm) PWM Controller(s): 1x ANPEC APW7159C
Filtering Capacitors	Electrolytic: 3x CapXon (3,000h @ 105°C, KF) 8x CapXon (2,000h @ 105°C, KF) 2x CapXon (2,000h @ 105°C, GF) Polymer: 39x CapXon
Supervisor IC	IN1S429I - SCG
Fan Controller	1x
Fan Model	TT-1225 (AV-F12025MS) (120mm, 12V, 0.3A, Sleeve Bearing Fan)
5VSB Circuit	
Rectifier	SB1045L (45V, 10A)
Standby PWM Controller	PN8141

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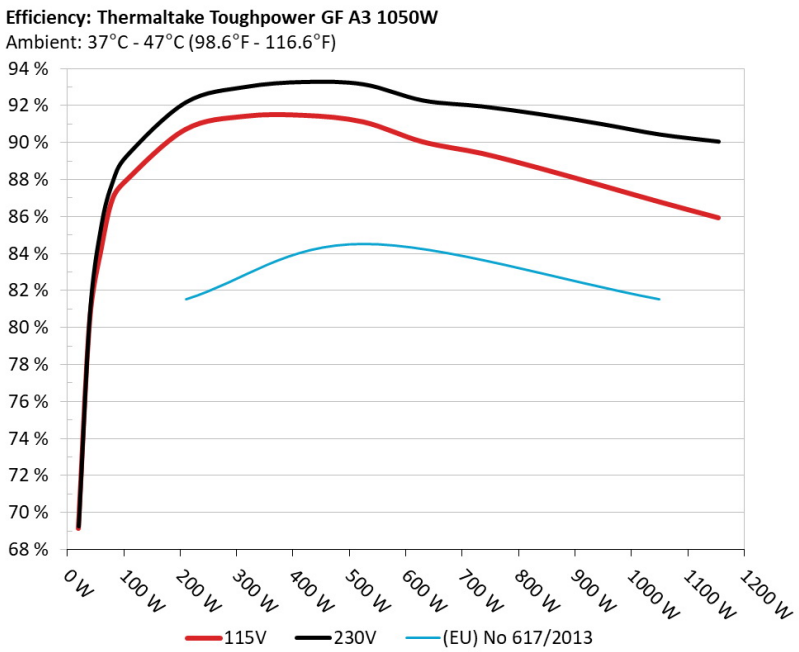
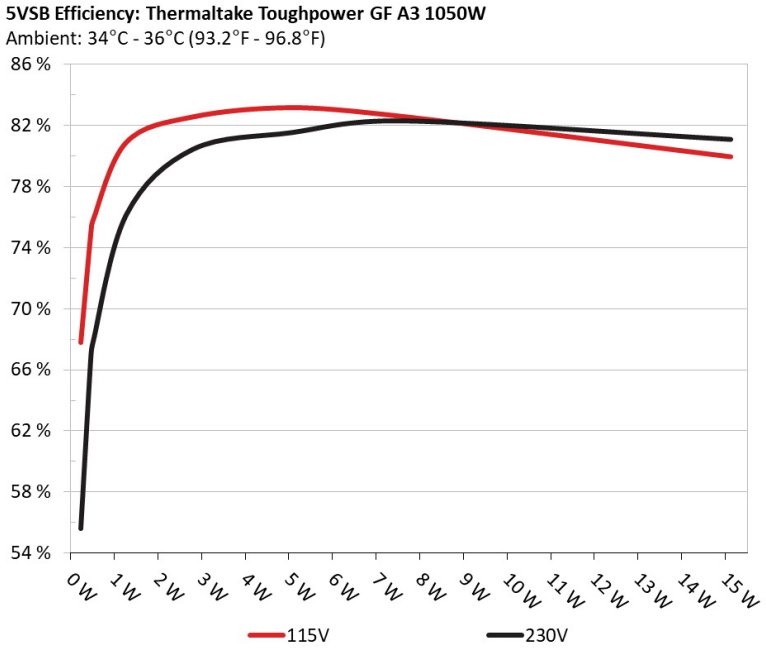
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE



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



INFO

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

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.229W	67.311%	0.031
	5.087V	0.34W		114.89V
2	0.09A	0.458W	74.438%	0.055
	5.086V	0.615W		114.89V
3	0.55A	2.793W	82.037%	0.247
	5.078V	3.404W		114.89V
4	1A	5.071W	82.641%	0.348
	5.071V	6.136W		114.87V
5	1.5A	7.594W	82.067%	0.398
	5.063V	9.254W		114.88V
6	3A	15.112W	79.434%	0.476
	5.038V	19.025W		114.87V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.229W	55.117%	0.011
	5.091V	0.416W		229.95V
2	0.09A	0.458W	66.308%	0.018
	5.088V	0.691W		229.94V
3	0.55A	2.793W	79.912%	0.09
	5.08V	3.496W		229.94V
4	1A	5.072W	81.014%	0.152
	5.072V	6.26W		229.94V
5	1.5A	7.596W	81.778%	0.195
	5.064V	9.287W		229.94V
6	3A	15.115W	80.566%	0.308
	5.039V	18.76W		229.94V

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115V

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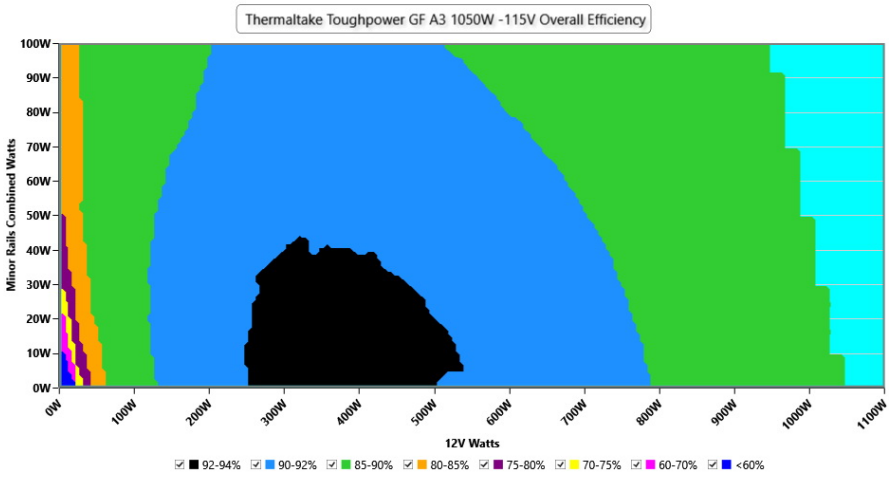
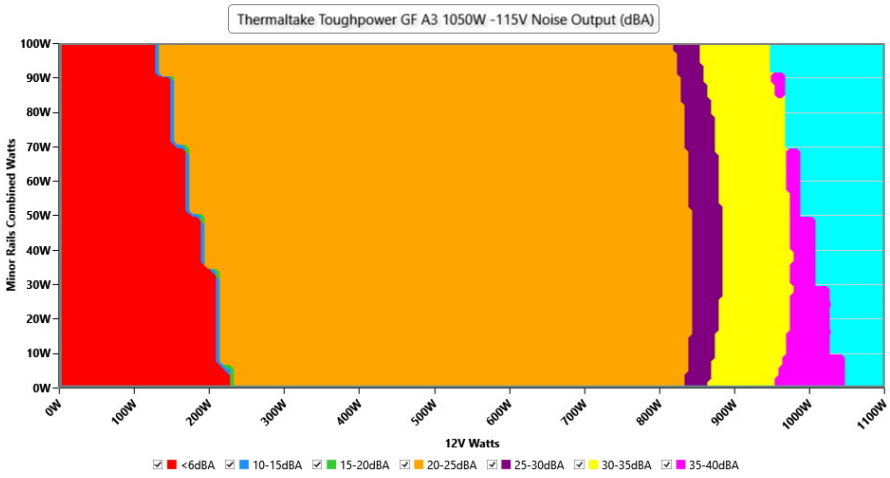
EFFICIENCY GRAPH 115V



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:	114.87 V	114.83 V	113.85 V	114.91 V	116.15 V	PASS
Mains Frequency:	60.00 Hz	59.98 Hz	59.40 Hz	60.02 Hz	60.60 Hz	PASS
Mains Voltage CF:	1.417	1.416	1.340	1.419	1.490	PASS
Mains Voltage THD:	0.14 %	0.11 %	N/A	0.20 %	2.00 %	PASS
Real Power:	0.034 W	-0.005 W	N/A	0.074 W	N/A	N/A
Apparent Power:	11.895 W	11.866 W	N/A	11.930 W	N/A	N/A
Power Factor:	0.005	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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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%	6.972A	1.984A	1.977A	0.984A	104.925	88.449%	0	<6.0	44.24°C	0.973
	11.952V	5.04V	3.338V	5.082V	118.629				39.96°C	114.83V
20%	14.977A	2.977A	2.968A	1.183A	209.908	91.203%	0	<6.0	45.35°C	0.98
	11.952V	5.038V	3.335V	5.072V	230.155				40.7°C	114.79V
30%	23.346A	3.477A	3.467A	1.383A	314.926	91.913%	993	23.2	41.03°C	0.985
	11.945V	5.034V	3.332V	5.061V	342.634				46.22°C	114.76V
40%	31.690A	3.975A	3.966A	1.584A	419.52	91.963%	995	23.2	41.55°C	0.989
	11.938V	5.032V	3.329V	5.05V	456.182				47.16°C	114.72V
50%	39.753A	4.971A	4.962A	1.786A	524.864	91.608%	998	23.3	42.45°C	0.992
	11.933V	5.03V	3.325V	5.039V	572.95				48.51°C	114.69V
60%	47.746A	5.967A	5.959A	1.989A	629.377	90.535%	1000	23.3	42.94°C	0.994
	11.929V	5.028V	3.323V	5.028V	695.18				49.39°C	114.64V
70%	55.818A	6.964A	6.959A	2.192A	734.644	89.908%	1008	23.5	43.35°C	0.995
	11.923V	5.026V	3.32V	5.018V	817.107				50.39°C	114.6V
80%	63.896A	7.961A	7.959A	2.295A	839.463	89.087%	1014	23.7	43.89°C	0.996
	11.919V	5.025V	3.317V	5.011V	942.297				51.95°C	114.56V
90%	72.388A	8.459A	8.448A	2.398A	944.855	88.19%	1513	35.8	44.31°C	0.997
	11.914V	5.024V	3.314V	5.004V	1071.389				53.33°C	114.52V
100%	80.611A	8.961A	8.969A	3.01A	1049.688	87.283%	1818	41.5	45.11°C	0.997
	11.909V	5.021V	3.311V	4.982V	1202.631				55.12°C	114.48V
110%	88.726A	9.963A	10.066A	3.015A	1154.301	86.422%	1941	43.4	46.88°C	0.997
	11.902V	5.018V	3.308V	4.975V	1335.663				57.82°C	114.43V
CL1	0.115A	11.965A	11.917A	0A	101.274	82.877%	1011	23.6	40.12°C	0.976
	11.961V	5.031V	3.331V	5.11V	122.198				45.61°C	114.82V
CL2	0.115A	19.881A	0A	0A	101.35	81.281%	1009	23.5	40.22°C	0.977
	11.958V	5.028V	3.341V	5.11V	124.691				47.25°C	114.82V
CL3	0.115A	0A	19.835A	0A	67.374	75.96%	0	<6.0	49.25°C	0.965
	11.955V	5.043V	3.327V	5.105V	88.698				40.19°C	114.84V
CL4	88.181A	0A	0A	0A	1049.47	88.323%	1152	28.1	45.05°C	0.997
	11.901V	5.032V	3.32V	5.053V	1188.23				56.01°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	1.240A	0.496A	0.494A	0.196A	19.99	69.616%	0	<6.0	39.77°C	0.843
	11.965V	5.038V	3.34V	5.099V	28.715				36.66°C	114.87V
40W	2.734A	0.695A	0.692A	0.294A	39.989	80.85%	0	<6.0	40.36°C	0.928
	11.952V	5.039V	3.34V	5.098V	49.461				37.1°C	114.85V
60W	4.228A	0.893A	0.889A	0.392A	59.989	84.675%	0	<6.0	42.32°C	0.951
	11.949V	5.04V	3.34V	5.095V	70.846				38.49°C	114.85V
80W	5.715A	1.091A	1.087A	0.491A	79.921	87.391%	0	<6.0	43.15°C	0.965
	11.950V	5.04V	3.339V	5.093V	91.453				39.16°C	114.84V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	20.23mV	4.95mV	5.28mV	3.72mV	Pass
20% Load	16.31mV	5.41mV	5.43mV	3.87mV	Pass
30% Load	15.95mV	5.67mV	5.64mV	4.33mV	Pass
40% Load	14.56mV	5.51mV	6.21mV	4.49mV	Pass
50% Load	13.99mV	6.18mV	6.46mV	5.16mV	Pass
60% Load	14.81mV	6.34mV	7.08mV	5.73mV	Pass
70% Load	13.73mV	6.91mV	7.45mV	6.40mV	Pass
80% Load	14.74mV	7.00mV	8.74mV	6.76mV	Pass
90% Load	15.21mV	8.35mV	9.41mV	7.23mV	Pass
100% Load	17.79mV	9.05mV	10.29mV	10.29mV	Pass
110% Load	19.46mV	9.46mV	10.74mV	10.89mV	Pass
Crossload1	18.89mV	9.89mV	9.82mV	4.46mV	Pass
Crossload2	13.73mV	12.11mV	5.79mV	4.08mV	Pass
Crossload3	9.85mV	8.50mV	10.29mV	3.77mV	Pass
Crossload4	16.99mV	6.94mV	7.91mV	8.31mV	Pass

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230V

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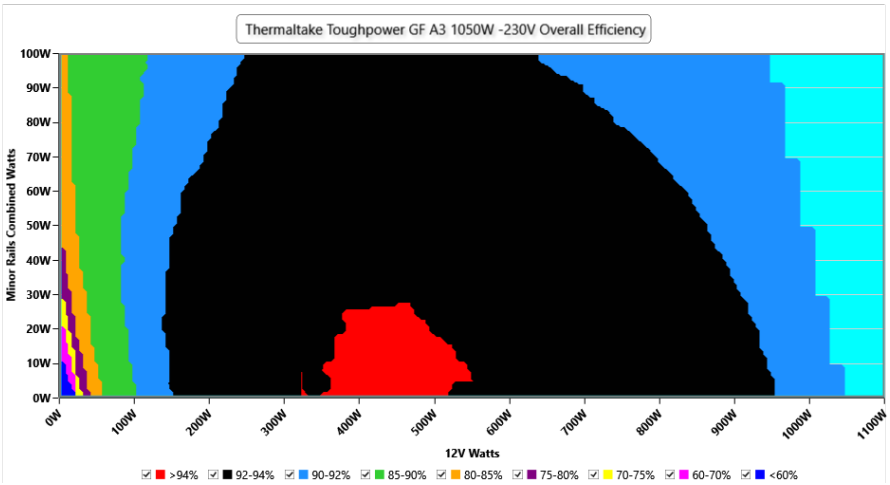
EFFICIENCY GRAPH 230V



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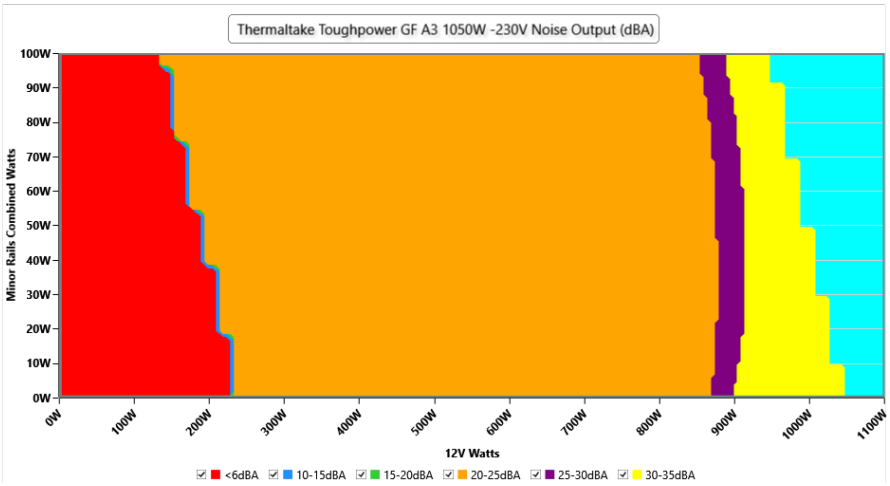
NOISE GRAPH 230V



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VAMPIRE POWER -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	229.98 V	229.90 V	227.70 V	230.04 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:	0.16 %	0.14 %	N/A	0.19 %	2.00 %	PASS
Real Power:	0.102 W	0.053 W	N/A	0.160 W	N/A	N/A
Apparent Power:	41.046 W	40.998 W	N/A	41.100 W	N/A	N/A
Power Factor:	0.003	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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Anex

Thermaltake Toughpower GF A3 1050W

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%	6.974A	1.984A	1.977A	0.984A	104.942	89.765%	0	<6.0	44.37°C	0.85
	11.952V	5.04V	3.338V	5.081V	116.909				40.22°C	229.92V
20%	14.980A	2.978A	2.968A	1.183A	209.94	92.671%	0	<6.0	44.98°C	0.937
	11.952V	5.038V	3.335V	5.07V	226.54				40.57°C	229.91V
30%	23.348A	3.477A	3.467A	1.384A	314.943	93.5%	988	23.1	41.47°C	0.961
	11.945V	5.034V	3.332V	5.06V	336.838				46.47°C	229.89V
40%	31.686A	3.975A	3.965A	1.585A	419.489	93.771%	994	23.2	41.91°C	0.972
	11.939V	5.032V	3.329V	5.048V	447.357				47.42°C	229.88V
50%	39.745A	4.97A	4.961A	1.787A	524.789	93.642%	999	23.3	42.21°C	0.978
	11.933V	5.03V	3.326V	5.037V	560.421				48.23°C	229.86V
60%	47.740A	5.966A	5.959A	1.99A	629.32	92.775%	1003	23.4	42.62°C	0.984
	11.930V	5.029V	3.323V	5.026V	678.333				49.21°C	229.84V
70%	55.815A	6.963A	6.958A	2.193A	734.657	92.449%	1007	23.5	43.15°C	0.986
	11.924V	5.027V	3.32V	5.015V	794.667				50.24°C	229.82V
80%	63.894A	7.961A	7.958A	2.296A	839.463	92.018%	1013	23.7	43.84°C	0.988
	11.919V	5.025V	3.317V	5.007V	912.284				51.88°C	229.81V
90%	72.389A	8.459A	8.447A	2.4A	944.848	91.503%	1408	33.9	44.67°C	0.989
	11.913V	5.024V	3.314V	4.998V	1032.593				53.74°C	229.79V
100%	80.613A	8.96A	8.968A	3.014A	1049.671	90.933%	1780	40.6	45.07°C	0.99
	11.908V	5.022V	3.311V	4.977V	1154.332				55.11°C	229.77V
110%	88.736A	9.96A	10.064A	3.019A	1154.253	90.546%	1598	37.4	46.91°C	0.991
	11.900V	5.02V	3.308V	4.968V	1274.782				57.84°C	229.75V
CL1	0.115A	11.963A	11.916A	0A	101.272	84.131%	1014	23.7	40.68°C	0.856
	11.961V	5.032V	3.331V	5.109V	120.375				46.21°C	229.93V
CL2	0.115A	19.88A	0A	0A	101.351	82.416%	1012	23.6	40.32°C	0.859
	11.958V	5.029V	3.341V	5.109V	122.973				47.41°C	229.93V
CL3	0.115A	0A	19.83A	0A	67.376	76.654%	0	<6.0	49.09°C	0.786
	11.954V	5.046V	3.328V	5.104V	87.883				40.02°C	229.93V
CL4	88.190A	0A	0A	0A	1049.5	91.896%	1001	23.3	45.35°C	0.99
	11.900V	5.032V	3.32V	5.052V	1142.055				56.29°C	229.77V

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Anex

Thermaltake Toughpower GF A3 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	1.240A	0.496A	0.494A	0.196A	19.991	69.738%	0	<6.0	39.82°C	0.457
	11.966V	5.039V	3.34V	5.1V	28.669				36.75°C	229.94V
40W	2.734A	0.694A	0.692A	0.294A	39.99	81.294%	0	<6.0	40.46°C	0.619
	11.953V	5.04V	3.34V	5.098V	49.193				37.16°C	229.94V
60W	4.228A	0.893A	0.889A	0.392A	59.99	85.981%	0	<6.0	41.52°C	0.722
	11.950V	5.04V	3.34V	5.096V	69.769				38.07°C	229.94V
80W	5.715A	1.091A	1.087A	0.491A	79.922	88.345%	0	<6.0	42.86°C	0.791
	11.950V	5.04V	3.339V	5.093V	90.466				39.06°C	229.93V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	19.56mV	5.10mV	5.28mV	3.71mV	Pass
20% Load	16.05mV	5.15mV	5.69mV	3.98mV	Pass
30% Load	16.46mV	5.62mV	5.95mV	4.28mV	Pass
40% Load	15.23mV	5.87mV	6.62mV	4.65mV	Pass
50% Load	14.35mV	6.18mV	6.41mV	5.01mV	Pass
60% Load	15.74mV	6.80mV	7.24mV	5.68mV	Pass
70% Load	13.53mV	6.96mV	7.39mV	6.30mV	Pass
80% Load	14.59mV	7.06mV	9.00mV	6.86mV	Pass
90% Load	14.20mV	8.40mV	9.36mV	6.97mV	Pass
100% Load	17.53mV	9.29mV	10.53mV	10.23mV	Pass
110% Load	18.77mV	9.53mV	11.36mV	10.04mV	Pass
Crossload1	18.58mV	10.04mV	9.56mV	4.55mV	Pass
Crossload2	14.86mV	11.64mV	6.20mV	3.82mV	Pass
Crossload3	9.59mV	7.11mV	9.36mV	3.56mV	Pass
Crossload4	16.74mV	6.76mV	8.30mV	7.91mV	Pass

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Anex

Thermaltake Toughpower GF A3 1050W

Top side

Power specifications label

CERTIFICATIONS 115V

CYBENETICS PLATINUM

CYBENETICS A-

CERTIFICATIONS 230V

CYBENETICS PLATINUM 230v

CYBENETICS A 230v

Aristeidis Bitziopoulos
Lab Director

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