EFFICIENCY AND NOISE LEVEL CERTIFICATIONS

Anex

Thermaltake Toughpower Grand Gold 850W

Lab ID#: 478
Receipt Date: Sep 11, 2018
Test Date: Sep 19, 2018

Report:
Report Date: Sep 22, 2018

DUT INFORMATION

Brand	Thermaltake
Manufacturer (OEM)	Sirfa
Series	Toughpower Grand Gold
Model Number	TPG-0850F-S
Serial Number	PSTPG0850FPCGUSSLA000243
DUT Notes	

DUT SPECIFICATIONS

Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10
Rated Frequency (Hz)	50-60
Rated Power (W)	850
Type	ATX12V
Cooling	140mm Hydro Dynamic Bearing Fan (TT-1425 (A1425L12S))
Semi-Passive Operation	✓ (selectable)
Cable Design	Fully Modular

TEST EQUIPMENT

Electronic Loads	Chroma 6314A x2 63123A x6 63102A 63101A	Chroma 63601-5 x4 Chroma 63600-2 x2 63640-80-80 x20 63610-80-20 x2
AC Sources	Chroma 6530, Chroma 61604, Keysight AC6804B	
Power Analyzers	N4L PPA1530 x2, N4L PPA5530	
Oscilloscopes	Picoscope 4444 & 3424, Keysight DSOX3024A, Rigol DS2072A	
Voltmeter	Keithley 2015 THD 6.5 Digit	
Sound Analyzer	Bruel & Kjaer 2250-L G4	
Microphone	Bruel & Kjaer Type 4955-A, Bruel & Kjaer Type 4189	
Data Loggers	Picoscope TC-08 x2, Labjack U3-HV x2	

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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	88.962%
Efficiency With 10W (≤500W) or 2% (>500W)	58.956
Average Efficiency 5VSB	78.920%
Standby Power Consumption (W)	0.0903854
Average PF	0.991
Avg Noise Output	29.45 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	A-

230V

Average Efficiency	90.687%
Average Efficiency 5VSB	76.899%
Standby Power Consumption (W)	0.1759460
Average PF	0.956
Avg Noise Output	29.38 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	A-

POWER SPECIFICATIONS

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	22	22	70.9	3	0.3
	Watts	120		850	15	3.6
Total Max. Power (W)		850				

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

Hold-Up Time (ms)	16
AC Loss to PWR_OK Hold Up Time (ms)	13.9
PWR_OK Inactive to DC Loss Delay (ms)	2.1

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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	18AWG	No
4+4 pin EPS12V (650mm+155mm)	1	2	16-18AWG	No
6+2 pin PCIe (500mm+155mm)	3	6	16-18AWG	No
SATA (500mm+155mm+155mm+155mm)	3	12	18AWG	No
4-pin Molex (500mm+155mm+155mm+155mm)	1	4	18AWG	No
RGB Cable (580mm+80mm)	1	1	26AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	16AWG	-

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General Data	
Manufacturer (OEM)	Sirfa / High Power
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV, 1x Champion CMD02X
Inrush Protection	NTC Thermistor & Relay
Bridge Rectifier(s)	2x GBU1506L (600V, 15A @ 100°C)
APFC MOSFETS	2x Infineon IPA50R140CP (550V, 15A @ 100°C, 0.14Ohm)
APFC Boost Diode	1x UnitedSiC UJD06508TS (650V, 8A @ 152°C)
Hold-up Cap(s)	1x Rubycon (400V, 680uF, 2000h @ 105 °C, MXH)
Main Switchers	2x Infineon IPA50R140CP (550V, 15A @ 100°C, 0.14Ohm)
APFC Controller	Infineon ICE3PCS01G
LLC Resonant Controller	Champion CM6901X
Primary MCU	STC 15W408AS
Topology	Primary side: Half-Bridge & LLC Resonant Controller Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	6x Infineon BSC027N04LS G (40V, 88A @ 100°C, 2.7mOhm)
5V & 3.3V	DC-DC Converters: 6x Infineon BSC0906NS (30V, 40A @ 100°C, 4.5mOhm) PWM Controller: APW7159C
Filtering Capacitors	Electrolytics: Nippon Chemi-Con (1-5,000 @ 105°C, KZE), Nippon Chemi-Con (4-10,000 @ 105°C, KY), 1x Rubycon (4-10,000 @ 105°C, ZLH) Polymers: Nippon Chemi-Con, FPCAP
Supervisor IC	SITI PS224 (OVP, UVP, OCP,SCP, PG)
Serial EEPROM	ATMEL AT24C02N
Fan Model	Thermaltake TT-1425 (Hong Sheng OEM, A1425L12S, 140mm, 12V, 0.30A, 1560 RPM, Hydro Dynamic Bearing)
5VSB Circuit	
Rectifiers	1x PCF P10V45 SBR (45V, 10A) 2x Infineon BSC0906NS (30V, 40A @ 100°C, 4.5mOhm)
Standby PWM Controller	Sanken STR-A6069H
-12V Circuit	
Rectifier	KEC KIA7912PI

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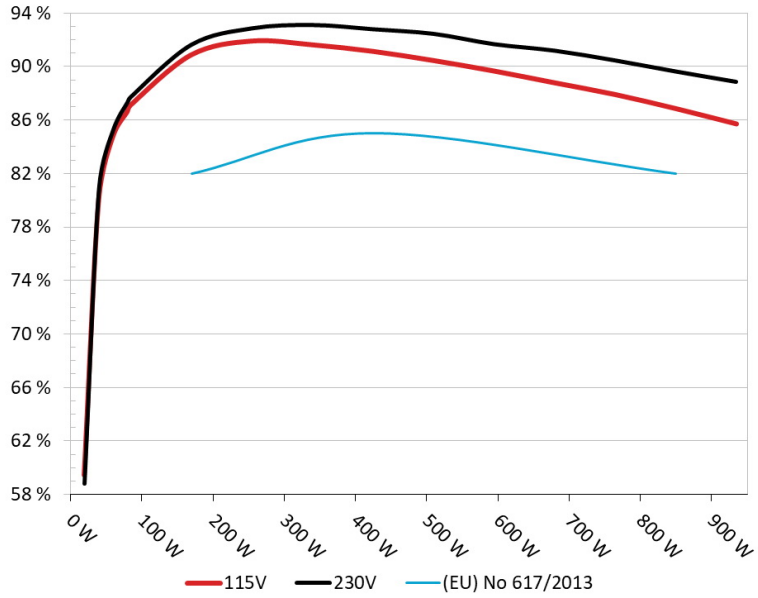
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: Thermaltake TPG-850F-S
Ambient: 37°C - 47°C (98.6°F - 116.6°F)

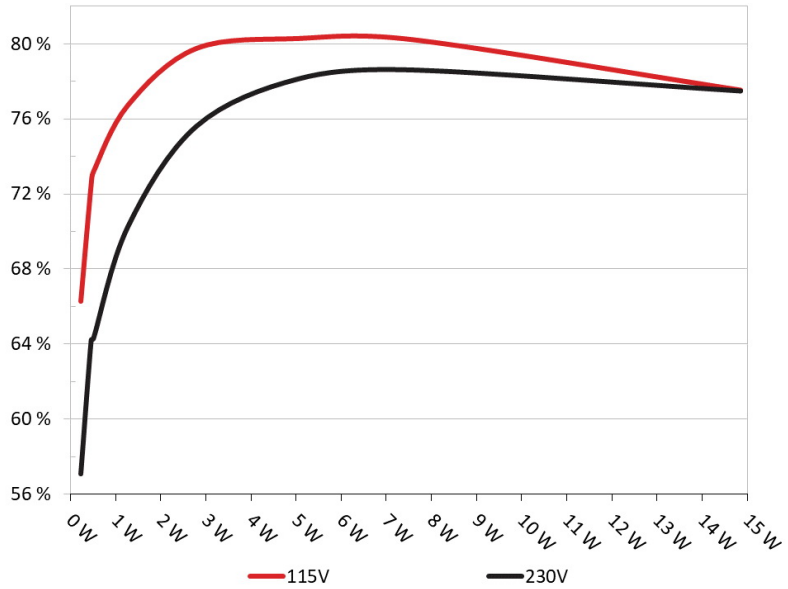


INFO

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 TPG-850F-S
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 Grand Gold 850W

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.046A	0.230	66.282%	0.199
	5.023V	0.347		115.36V
2	0.090A	0.459	72.512%	0.048
	5.091V	0.633		115.37V
3	0.550A	2.789	79.731%	0.211
	5.069V	3.498		115.37V
4	1.000A	5.050	80.261%	0.290
	5.049V	6.292		115.37V
5	1.500A	7.540	80.213%	0.335
	5.026V	9.400		115.36V
6	3.000A	14.852	77.516%	0.395
	4.950V	19.160		115.35V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.230	57.072%	0.011
	5.094V	0.403		230.93V
2	0.090A	0.459	64.196%	0.019
	5.091V	0.715		230.93V
3	0.550A	2.788	75.576%	0.095
	5.068V	3.689		230.92V
4	1.000A	5.048	78.106%	0.155
	5.048V	6.463		230.92V
5	1.500A	7.538	78.586%	0.207
	5.024V	9.592		230.92V
6	3.000A	14.861	77.466%	0.300
	4.953V	19.184		230.91V

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115V

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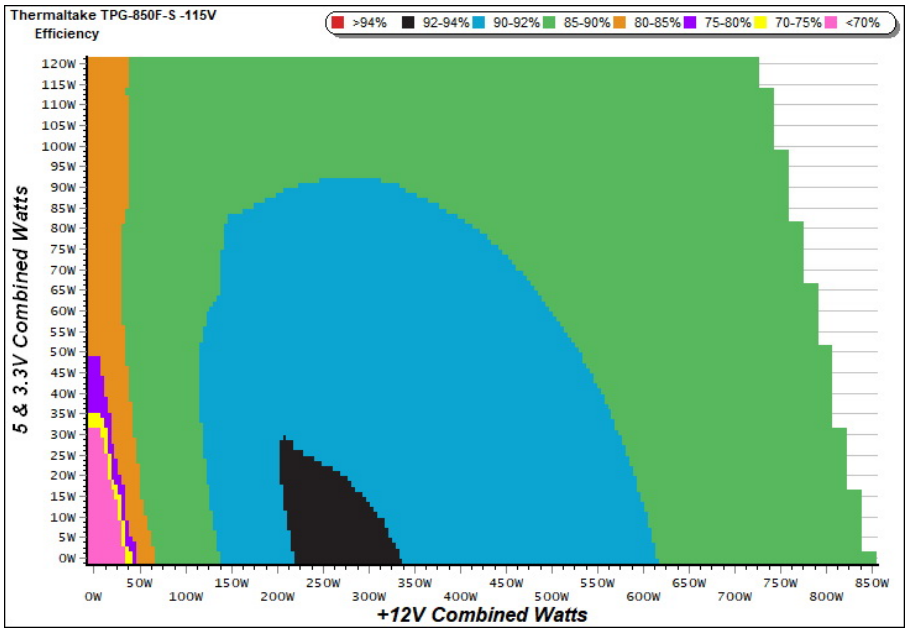
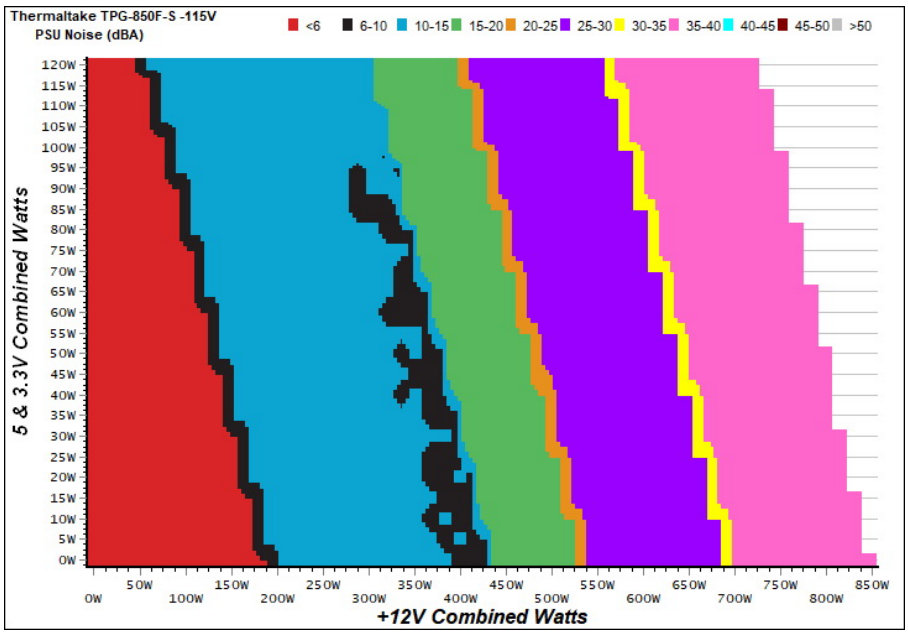
EFFICIENCY GRAPH 115V



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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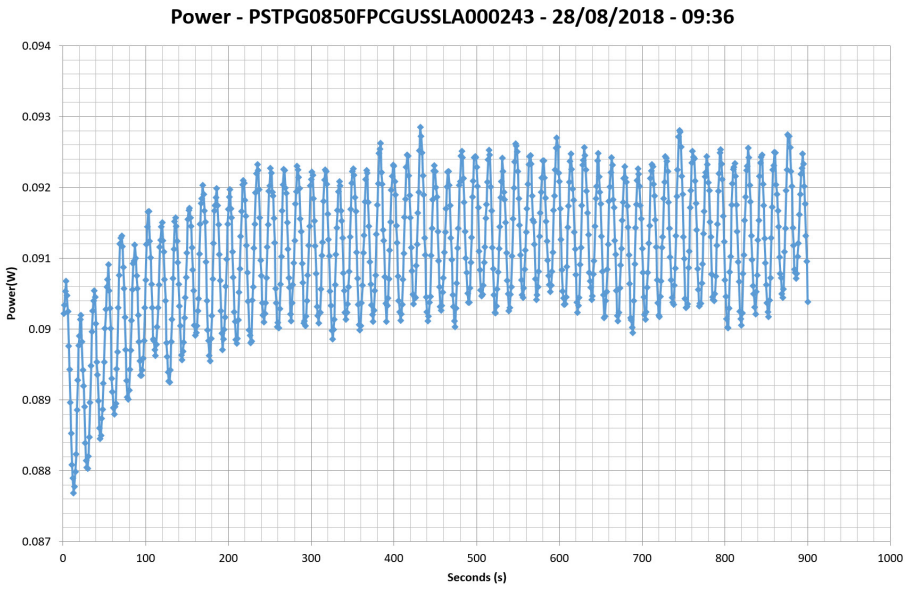
Thermaltake Toughpower Grand Gold 850W

VAMPIRE POWER -115V



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 Grand Gold 850W

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
1	5.230A	1.982A	1.960A	1.000A	84.927	87.123%	415	6.9	40.31°C	0.934
	12.108V	5.048V	3.367V	4.999V	97.479				47.67°C	115.05V
2	11.464A	2.980A	2.953A	1.205A	169.458	90.859%	542	8.9	40.71°C	0.982
	12.086V	5.035V	3.353V	4.979V	186.507				48.67°C	115.05V
3	18.099A	3.485A	3.441A	1.412A	254.535	91.901%	565	9.4	41.37°C	0.995
	12.074V	5.024V	3.341V	4.959V	276.967				49.72°C	115.04V
4	24.756A	3.992A	3.965A	1.620A	339.719	91.622%	565	9.4	41.72°C	0.994
	12.058V	5.013V	3.329V	4.938V	370.785				50.74°C	115.04V
5	31.096A	5.002A	4.977A	1.830A	425.035	91.130%	562	9.3	42.48°C	0.996
	12.044V	5.001V	3.315V	4.918V	466.405				52.39°C	115.04V
6	37.388A	6.017A	5.999A	2.043A	509.561	90.449%	805	19.0	43.06°C	0.996
	12.029V	4.988V	3.301V	4.897V	563.367				53.39°C	115.04V
7	43.758A	7.038A	7.029A	2.257A	594.877	89.659%	990	26.0	43.66°C	0.997
	12.015V	4.975V	3.287V	4.876V	663.488				54.34°C	115.03V
8	50.150A	8.063A	8.069A	2.473A	680.214	88.776%	1105	29.8	44.23°C	0.997
	12.000V	4.962V	3.272V	4.854V	766.212				55.73°C	115.03V
9	56.956A	8.588A	8.590A	2.478A	765.134	87.901%	1380	35.8	44.94°C	0.998
	11.985V	4.950V	3.260V	4.844V	870.453				57.10°C	115.03V
10	63.512A	9.114A	9.149A	3.130A	849.960	86.850%	1385	35.9	45.81°C	0.998
	11.970V	4.939V	3.246V	4.795V	978.652				58.65°C	115.03V
11	70.676A	9.131A	9.181A	3.138A	934.721	85.710%	1390	35.9	46.88°C	0.984
	11.956V	4.929V	3.236V	4.781V	1090.561				60.10°C	115.09V
CL1	0.146A	14.005A	14.001A	0.000A	118.289	81.716%	678	13.2	42.46°C	0.964
	12.101V	5.007V	3.314V	5.067V	144.757				52.27°C	115.05V
CL2	70.842A	1.001A	1.001A	1.000A	861.155	87.409%	1388	35.9	45.68°C	0.998
	11.970V	4.970V	3.284V	4.915V	985.197				58.33°C	115.03V

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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])	PF/AC Volts
1	1.192A	0.495A	0.474A	0.198A	19.626	59.480%	0	<6.0	0.878
	12.178V	5.062V	3.382V	5.053V	32.996				115.05V
2	2.449A	0.990A	0.979A	0.397A	40.023	80.075%	0	<6.0	0.876
	12.131V	5.058V	3.377V	5.039V	49.982				115.05V
3	3.641A	1.484A	1.454A	0.597A	59.514	84.717%	377	6.8	0.921
	12.115V	5.053V	3.373V	5.026V	70.250				115.05V
4	4.899A	1.983A	1.961A	0.798A	79.938	86.625%	388	6.8	0.926
	12.109V	5.049V	3.368V	5.012V	92.280				115.05V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	23.0 mV	8.1 mV	7.3 mV	5.0 mV	Pass
20% Load	8.4 mV	8.9 mV	8.4 mV	4.3 mV	Pass
30% Load	10.4 mV	9.1 mV	9.1 mV	4.3 mV	Pass
40% Load	10.7 mV	9.9 mV	10.2 mV	5.0 mV	Pass
50% Load	12.5 mV	14.6 mV	12.7 mV	9.2 mV	Pass
60% Load	13.9 mV	14.1 mV	12.7 mV	6.6 mV	Pass
70% Load	15.5 mV	15.5 mV	13.8 mV	7.2 mV	Pass
80% Load	17.1 mV	17.2 mV	17.1 mV	8.8 mV	Pass
90% Load	18.9 mV	18.4 mV	18.3 mV	8.9 mV	Pass
100% Load	21.2 mV	20.3 mV	19.8 mV	10.5 mV	Pass
110% Load	24.5 mV	22.3 mV	21.2 mV	12.0 mV	Pass
Crossload 1	23.8 mV	12.9 mV	15.5 mV	4.9 mV	Pass
Crossload 2	21.0 mV	16.3 mV	13.0 mV	9.0 mV	Pass

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230V

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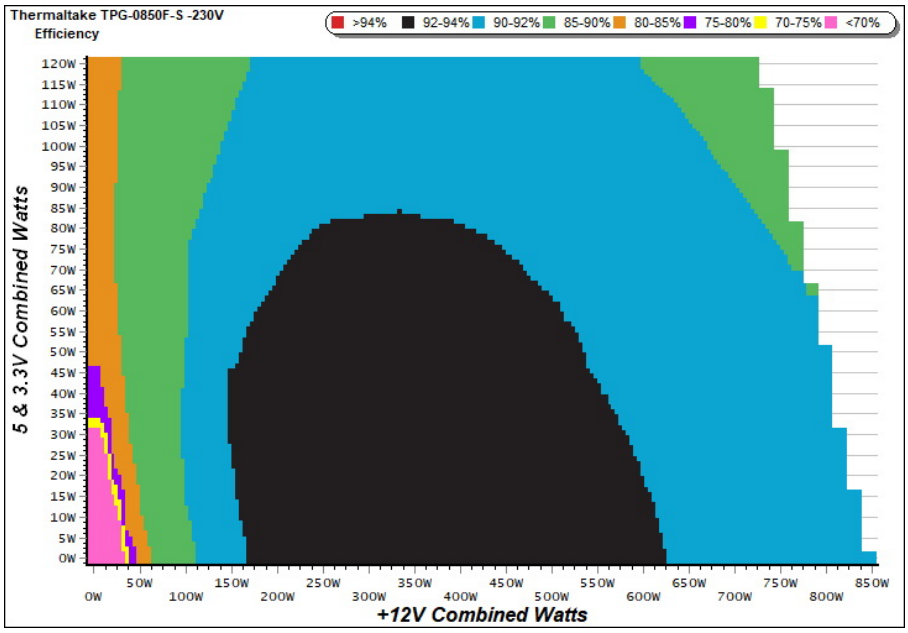
EFFICIENCY GRAPH 230V



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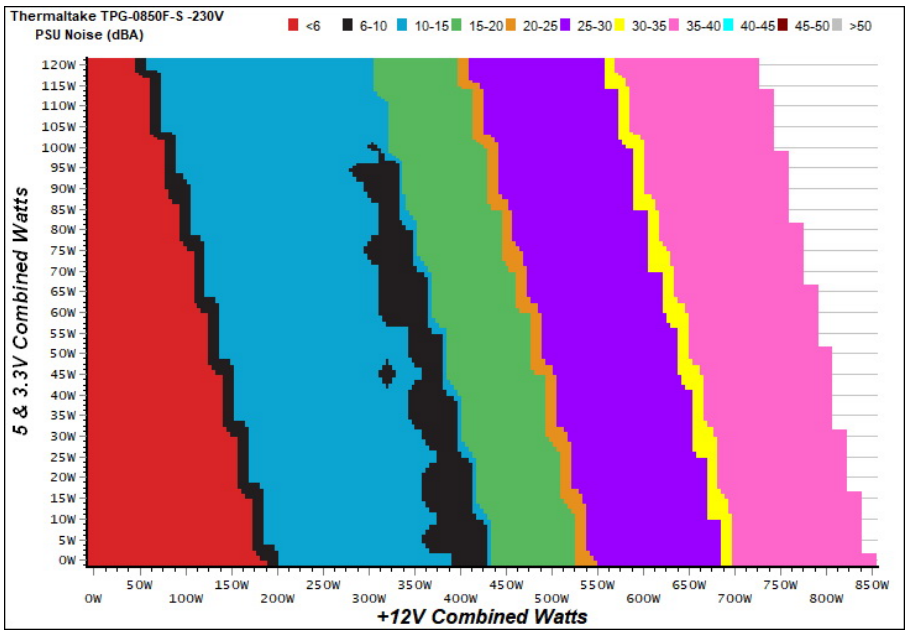
NOISE GRAPH 230V



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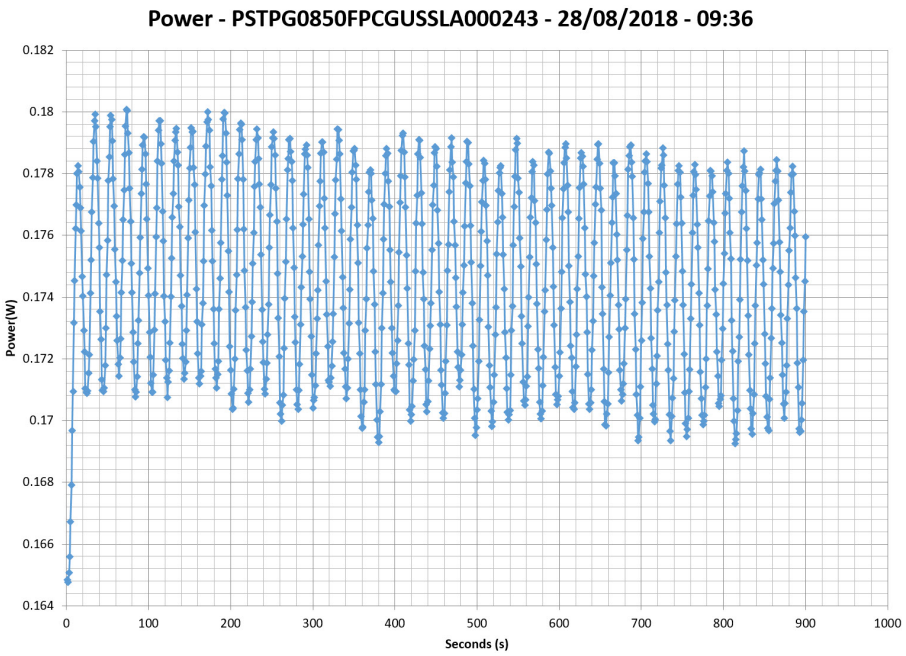
VAMPIRE POWER -230V



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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
1	5.230A	1.981A	1.961A	1.000A	84.933	87.713%	147	5.0	39.67°C	0.847
	12.109V	5.048V	3.367V	5.000V	96.831				46.55°C	230.02V
2	11.465A	2.980A	2.952A	1.205A	169.470	91.597%	520	8.3	40.21°C	0.891
	12.086V	5.035V	3.353V	4.980V	185.017				47.73°C	230.20V
3	18.100A	3.484A	3.443A	1.412A	254.549	92.823%	565	9.4	40.83°C	0.920
	12.074V	5.024V	3.341V	4.960V	274.231				48.81°C	230.20V
4	24.758A	3.991A	3.964A	1.620A	339.737	93.073%	562	9.3	41.22°C	0.964
	12.058V	5.013V	3.329V	4.939V	365.022				49.48°C	230.19V
5	31.100A	5.002A	4.977A	1.830A	425.050	92.759%	558	9.3	41.81°C	0.978
	12.043V	5.001V	3.315V	4.918V	458.228				50.43°C	230.19V
6	37.390A	6.016A	5.998A	2.043A	509.576	92.417%	805	19.0	42.29°C	0.986
	12.029V	4.988V	3.301V	4.897V	551.389				51.50°C	230.02V
7	43.763A	7.038A	7.029A	2.257A	594.893	91.643%	990	26.0	43.05°C	0.989
	12.014V	4.975V	3.287V	4.876V	649.145				52.74°C	230.18V
8	50.145A	8.062A	8.069A	2.472A	680.097	91.155%	1105	29.8	43.63°C	0.992
	11.999V	4.962V	3.272V	4.855V	746.087				53.93°C	230.02V
9	56.956A	8.589A	8.590A	2.478A	765.092	90.424%	1385	35.9	44.13°C	0.995
	11.984V	4.951V	3.260V	4.844V	846.117				55.26°C	230.02V
10	63.513A	9.115A	9.147A	3.130A	849.966	89.603%	1385	35.9	45.40°C	0.997
	11.970V	4.939V	3.246V	4.794V	948.594				57.22°C	230.18V
11	70.681A	9.133A	9.182A	3.138A	934.727	88.832%	1390	35.9	46.92°C	0.997
	11.955V	4.929V	3.236V	4.782V	1052.239				59.77°C	230.19V
CL1	0.148A	14.004A	14.000A	0.000A	118.305	82.522%	678	13.2	41.84°C	0.867
	12.101V	5.007V	3.314V	5.067V	143.362				50.94°C	230.19V
CL2	70.846A	1.001A	1.002A	1.000A	861.136	90.180%	1392	35.9	45.34°C	0.997
	11.969V	4.970V	3.284V	4.915V	954.909				57.29°C	230.19V

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20-80W LOAD TESTS 230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.193A	0.494A	0.472A	0.198A	19.622	58.798%	0	<6.0	0.634
	12.175V	5.062V	3.382V	5.052V	33.372				230.19V
2	2.450A	0.989A	0.977A	0.397A	40.024	80.870%	0	<6.0	0.751
	12.131V	5.058V	3.377V	5.039V	49.492				230.19V
3	3.642A	1.484A	1.452A	0.597A	59.521	85.167%	0	<6.0	0.813
	12.115V	5.054V	3.373V	5.027V	69.887				230.20V
4	4.900A	1.982A	1.958A	0.798A	79.951	87.297%	460	7.4	0.841
	12.111V	5.050V	3.369V	5.013V	91.585				230.02V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	23.1 mV	8.1 mV	7.0 mV	4.7 mV	Pass
20% Load	8.7 mV	8.5 mV	8.4 mV	4.3 mV	Pass
30% Load	9.7 mV	9.0 mV	9.0 mV	4.3 mV	Pass
40% Load	9.6 mV	9.7 mV	10.1 mV	5.2 mV	Pass
50% Load	11.6 mV	14.7 mV	13.6 mV	9.0 mV	Pass
60% Load	13.0 mV	13.9 mV	12.8 mV	6.5 mV	Pass
70% Load	14.2 mV	15.6 mV	13.9 mV	7.3 mV	Pass
80% Load	15.6 mV	17.1 mV	16.8 mV	8.6 mV	Pass
90% Load	18.0 mV	18.2 mV	17.9 mV	8.8 mV	Pass
100% Load	20.0 mV	20.7 mV	19.5 mV	11.1 mV	Pass
110% Load	22.4 mV	22.3 mV	20.9 mV	12.4 mV	Pass
Crossload 1	22.4 mV	13.2 mV	15.9 mV	4.7 mV	Pass
Crossload 2	19.1 mV	16.7 mV	12.8 mV	9.4 mV	Pass

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Anex

Thermaltake Toughpower Grand Gold 850W

Top side

Power specifications label

CERTIFICATIONS 115V

CERTIFICATIONS 230V

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Lab Director