Thermaltake Toughpower Grand Gold 650W

Serial Number PSTRG0650FPCGEUSLA000190

Lab ID 483

Certification ID 25483

Test Result Report ID:

Certificate Issue Date: Sep 26, 2018

Scheme: ETA-EMI PSU

115V

230V

115V

230V

Scheme: LAMBDA PSU

Aristeidis Bitziopoulos, Certification Body General Manager

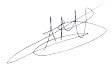
General Information

Test Equipment

Electronic Loads	Chroma 63601-5 x2 Chroma 63600-2 Chroma 63640-80-80 x10 Chroma 63610-80-20
AC Sources	Chroma 6530, APM SP300VAC4000W-P, GW Instek ASR-3500
Power Analyzers	Rohde & Schwarz HMC8015 & NPA701
Oscilloscopes	Picoscope 4444, 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
EMI Analyzer	TekBox TBMR-110M-EU
Isolation Transformer	4kVA
UPS	FSP Champ Tower 3kVA, CyberPower OLS3000E 3kVA
Testing Methodology	Cybenetics PSU Test Protocol

DUT Information(Non-accredited measurements)

Product Identification Details	
Brand	Thermaltake
Model	Toughpower Grand Gold 650W
OEM/ODM	Sirfa
Serial Number	PSTRG0650FPCGEUSLA000190
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10
Rated Frequency (Hz)	50-60

Rated Power (W)	650
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	140mm Hydro Dynamic Bearing Fan (TT-1425 (A1425L12S))
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	483
Date of receipt	Sep 10, 2018
Testing Date	Sep 23, 2018
Report Issued Date	Sep 26, 2018
Engineer Name	-
Authorized By the Laboratory Technical Manager	Aristeidis Bitziopoulos
Signature	

Cables and Connectors(Non-accredited measurements)

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 (660mm)	1	1	18AWG	No
6+2 pin PCIe (500mm+155mm)	2	4	18AWG	No
SATA (510mm+155mm+155mm)	3	9	18AWG	No
4-pin Molex (500mm+150mm+150mm+150mm)	1	4	18AWG	No
RGB Cable (580mm+80mm)	1	1	26AWG	No
FDD Adapter (+160mm)	1	1	22AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	18AWG	-

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	22	22	54.2	3	0.3
	Watts	120		650	15	3.6
Total Max. Power (W)		650				

Test Results

Temperature & Compliance Info

Temperature Range (°C /°F)	28-32 / 82.4-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓

Performance Summary

115V

Accredited	
Average Efficiency (>1450 load combinations)	88.838%
Average Noise Output (>1450 Load Combinations)	29.30dBA
Average PF (>1450 Load Combinations)	0.988
Efficiency With 10W (≤500W) or 2% (>500W) Load	62.497%
Standby Power Consumption	0.0901W
Non-Accredited	
12V Ripple (Full Load)	18.65mV
5V Ripple (Full Load)	18.68mV
3.3V Ripple (Full Load)	17.14mV
5VSB Ripple (Full Load)	11.29mV
12V Load Regulation	1.13%
5V Load Regulation	2.18%
3.3V Load Regulation	3.93%

5VSB Load Regulation	4.78%
Inrush Current	32.625A

230V

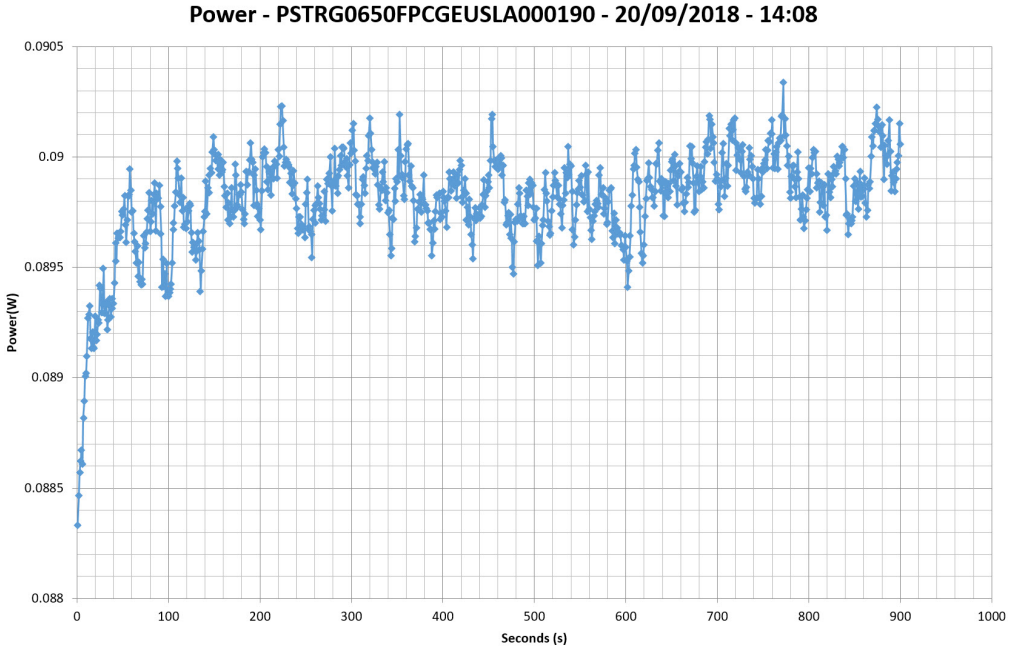
Accredited		
Average Efficiency (>1450 load combinations)	90.410%	
Average Noise Output (>1450 Load Combinations)	29.25dBA	
Average PF (>1450 Load Combinations)	0.940	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.1676W	
Non-Accredited		
12V Ripple (Full Load)	16.91mV	
5V Ripple (Full Load)	18.27mV	
3.3V Ripple (Full Load)	17.00mV	
5VSB Ripple (Full Load)	11.52mV	
12V Load Regulation	1.07%	
5V Load Regulation	2.16%	
3.3V Load Regulation	3.87%	
5VSB Load Regulation	4.77%	
Inrush Current	67.251A	
Hold-Up Time & PWR_OK Signal	16.40ms	
AC Loss to PWR_OK Hold Up Time	15.00ms	
PWR_OK Inactive to DC Loss Delay	1.40ms	
OPP (0.00°C / 0.00°C)	-	-

Hold-Up Time & PWR_OK Signal

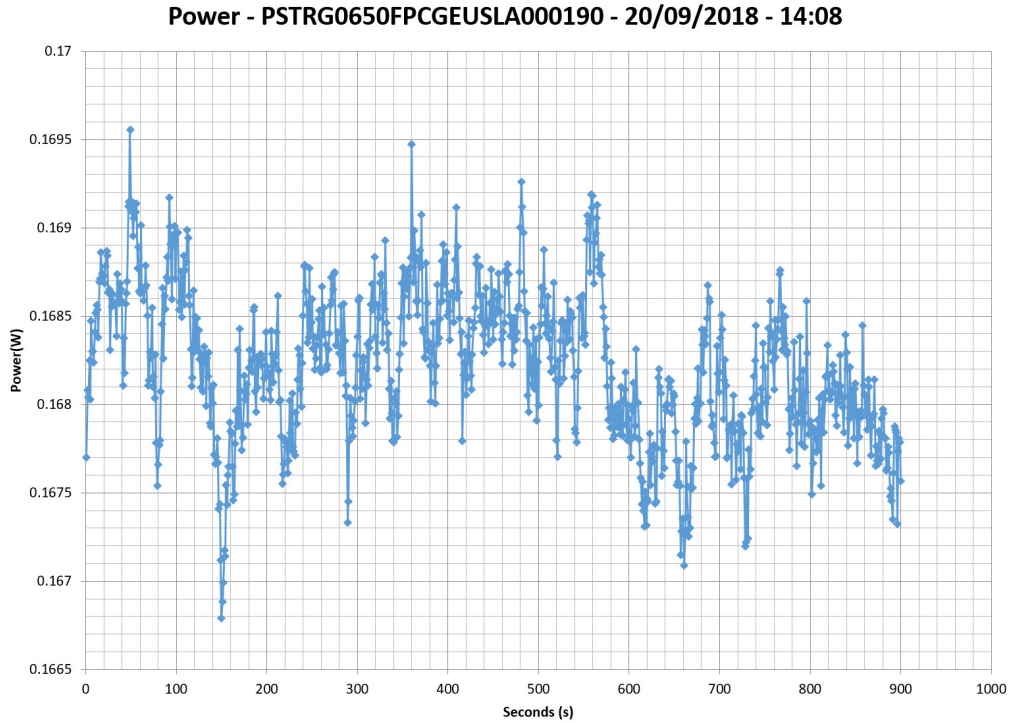
Hold-Up Time (ms)	16.4
AC Loss to PWR_OK Hold Up Time (ms)	15
PWR_OK Inactive to DC Loss Delay (ms)	1.4

Graphs

115V

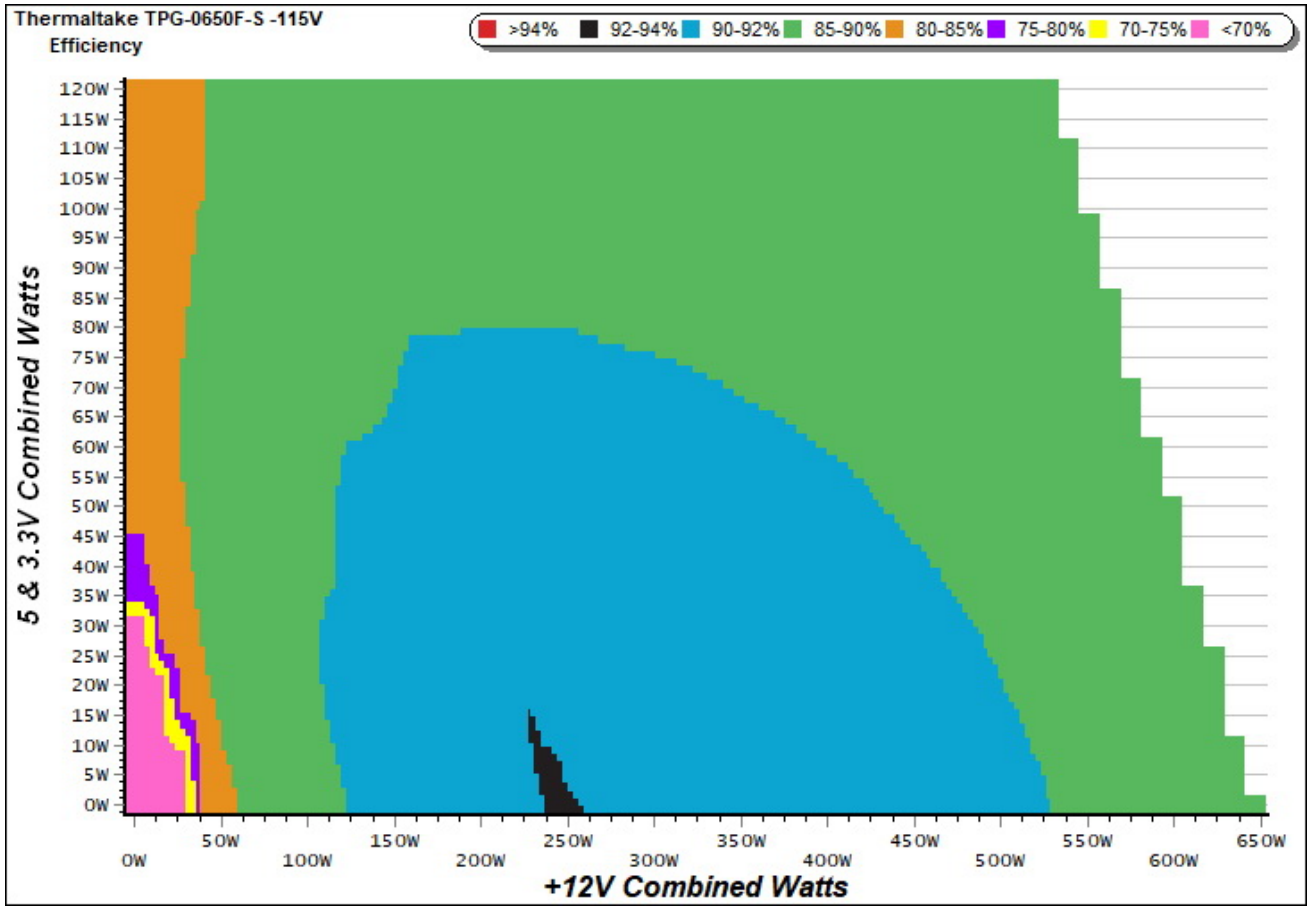


230V



Efficiency Graph

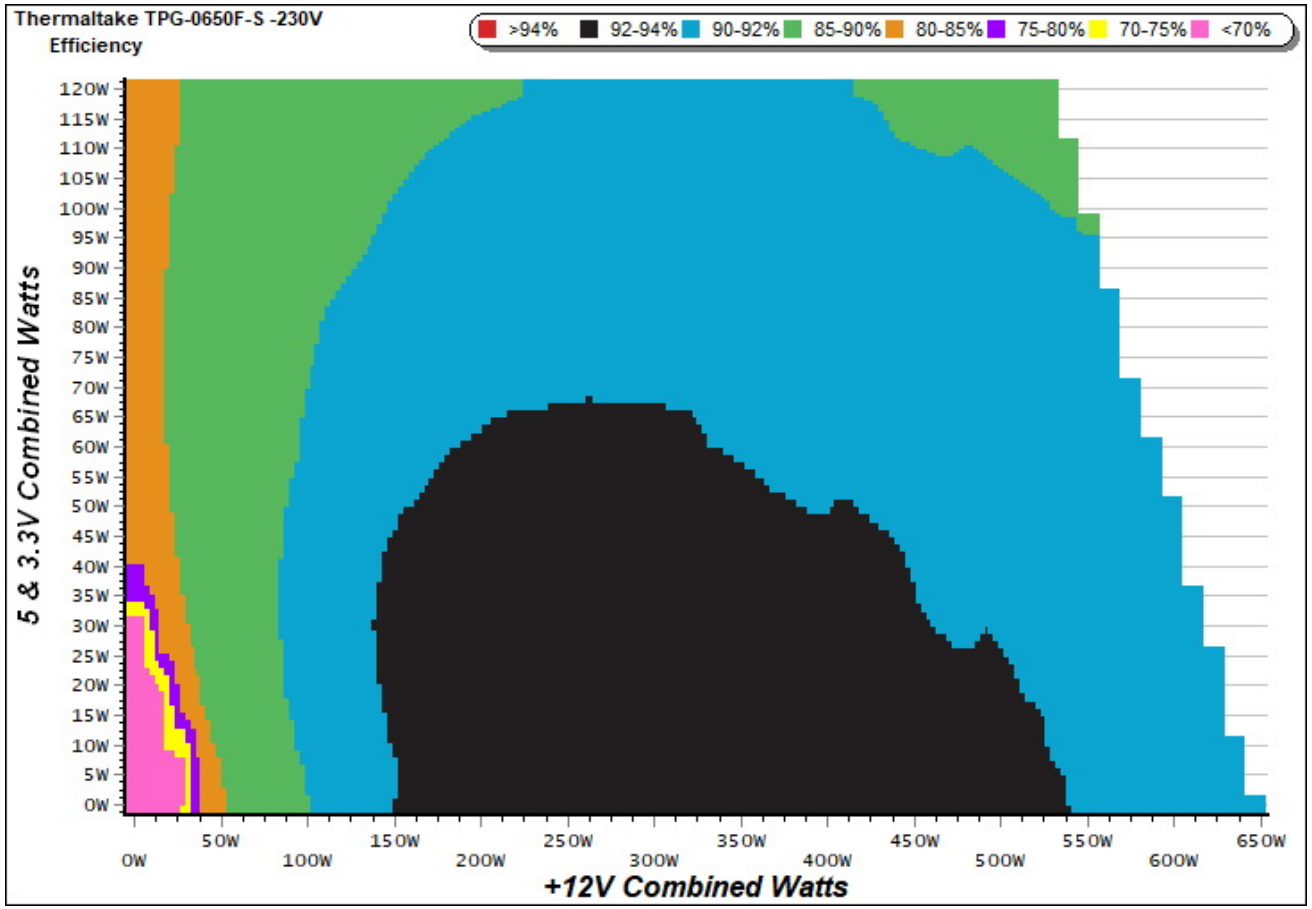
115V



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.

230V



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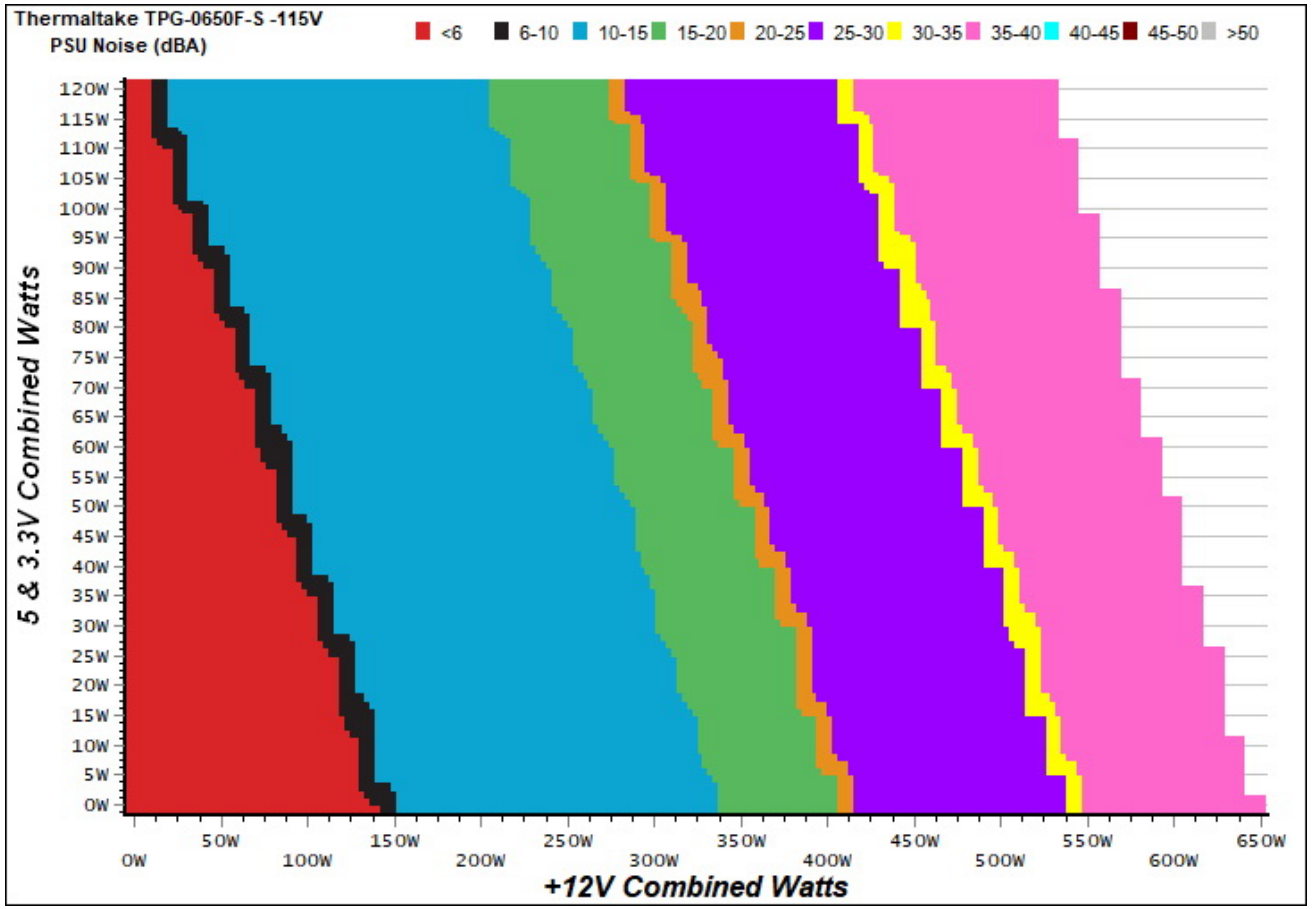
Noise Graph

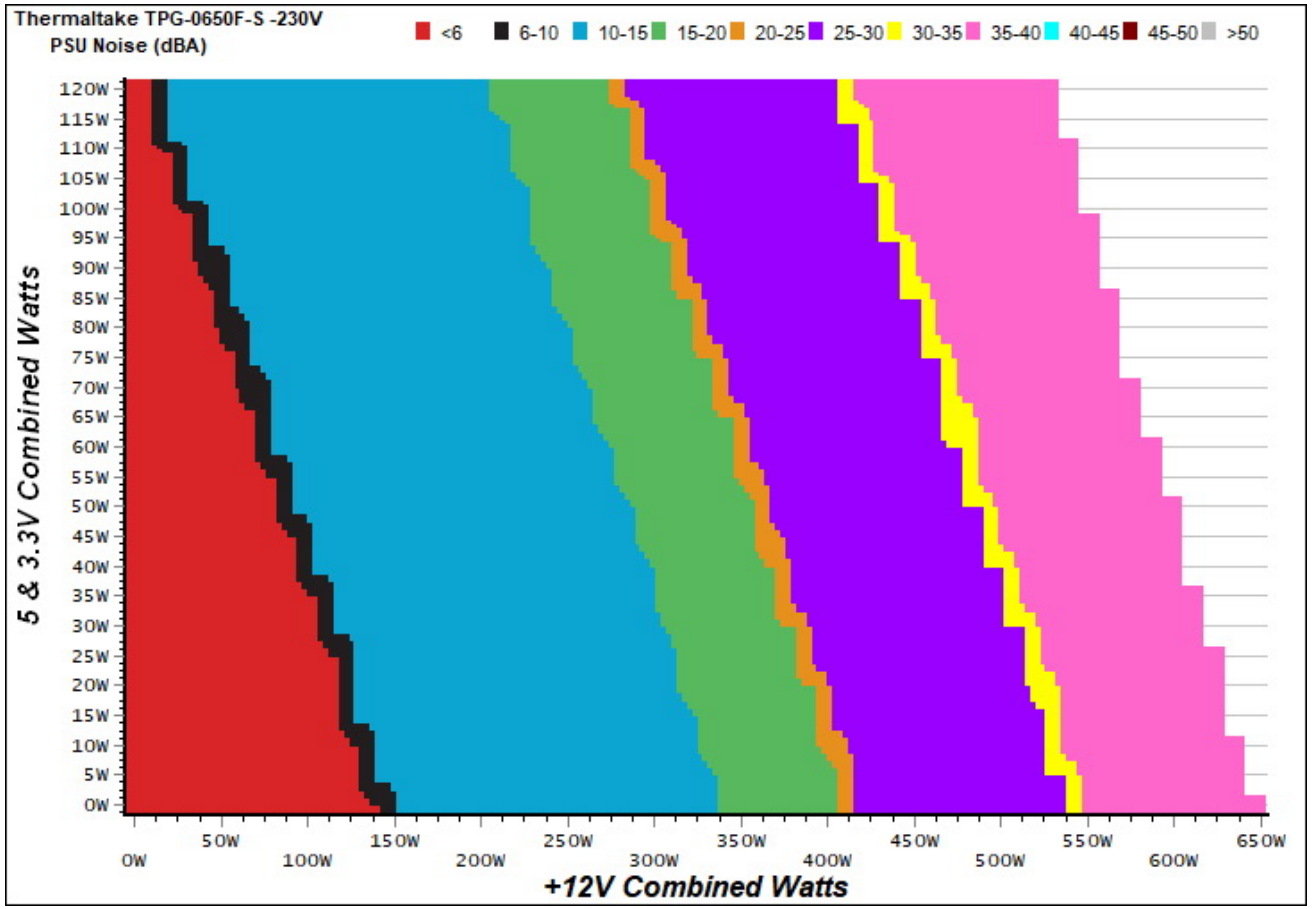
115V



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.

230V

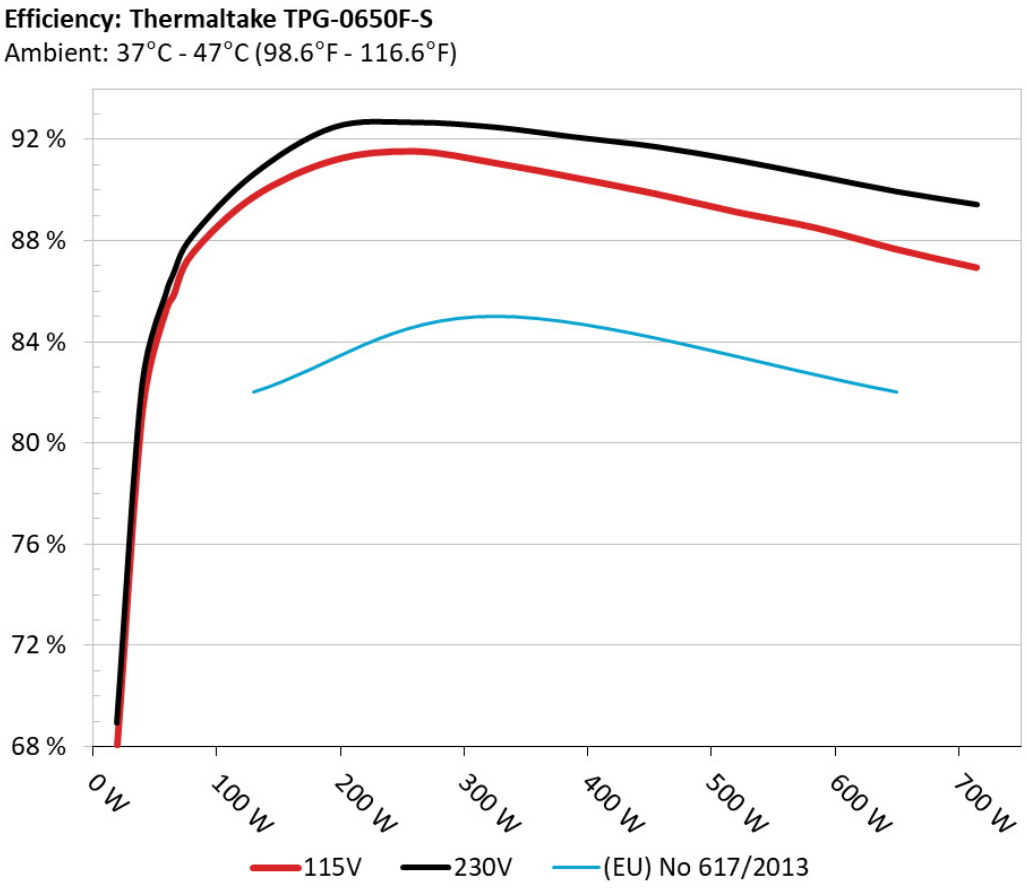


INFO

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.

Indicative Performance

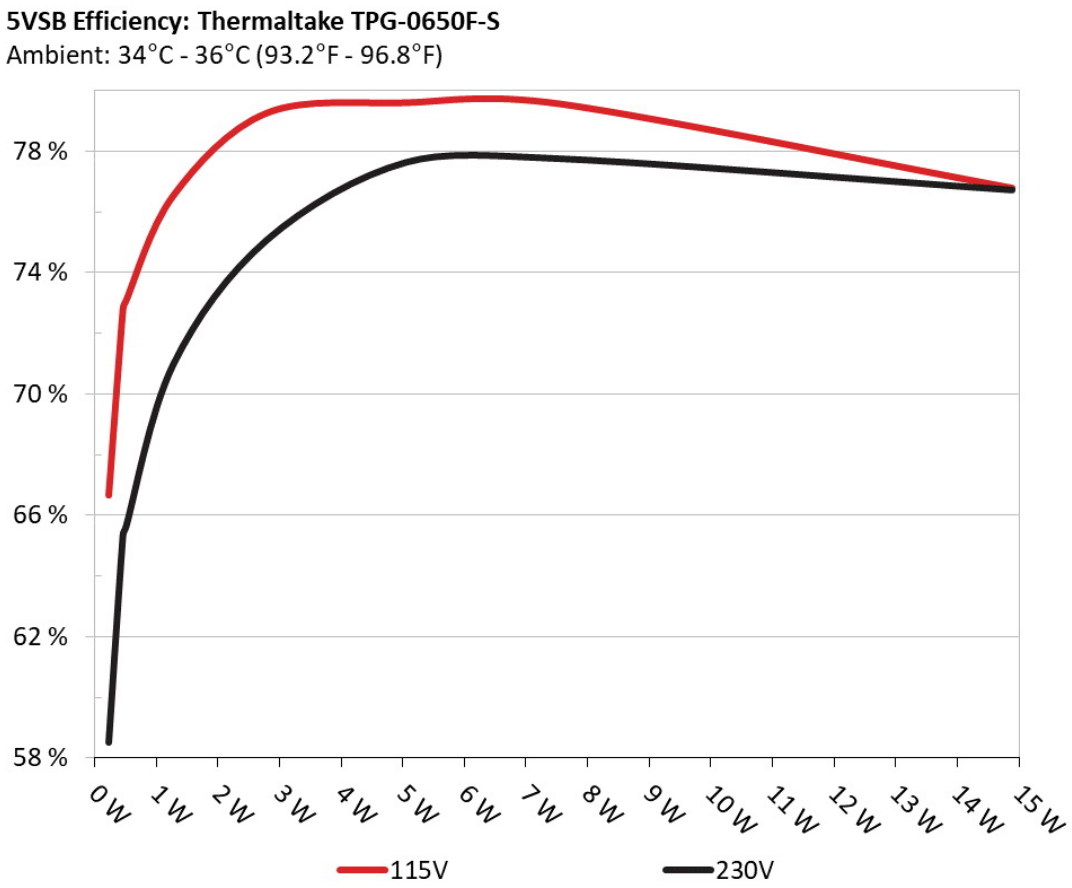
Efficiency under high ambient temperature



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.

5VSB Efficiency (ERP LOT 3/6 & CEC)

115V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.230	66.667%	0.043
	5.104V	0.345		115.05V
2	0.090A	0.460	72.785%	0.077
	5.102V	0.632		115.05V
3	0.550A	2.795	79.246%	0.252
	5.080V	3.527		115.06V
4	1.000A	5.060	79.585%	0.299
	5.060V	6.358		115.05V
5	1.500A	7.556	79.545%	0.324
	5.037V	9.499		115.05V
6	3.000A	14.887	76.777%	0.360
	4.962V	19.390		115.04V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.230	58.524%	0.017
	5.104V	0.393		230.20V
2	0.090A	0.460	65.341%	0.029
	5.102V	0.704		230.02V
3	0.550A	2.794	75.087%	0.133
	5.080V	3.721		230.20V
4	1.000A	5.060	77.655%	0.192
	5.059V	6.516		230.20V
5	1.500A	7.555	77.774%	0.233
	5.036V	9.714		230.18V
6	3.000A	14.895	76.739%	0.286
	4.965V	19.410		230.20V

Supplementary Tests (For Reference)

Typical 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	3.560A	1.970A	1.968A	0.994A	64.889	85.816%	0	<6.0	48.34°C	0.946
	12.160V	5.078V	3.351V	5.032V	75.614				40.47°C	115.06V
2	8.109A	2.961A	2.966A	1.197A	129.390	89.713%	687	13.7	40.88°C	0.977
	12.145V	5.067V	3.338V	5.014V	144.226				49.23°C	115.06V
3	13.059A	3.462A	3.459A	1.402A	194.464	91.167%	585	9.6	41.09°C	0.985
	12.134V	5.056V	3.325V	4.994V	213.306				50.02°C	115.06V
4	18.029A	3.966A	3.983A	1.609A	259.687	91.524%	580	9.5	41.71°C	0.994
	12.118V	5.045V	3.314V	4.974V	283.738				51.23°C	115.05V
5	22.676A	4.969A	5.001A	1.817A	324.980	91.064%	575	9.5	42.30°C	0.994
	12.104V	5.033V	3.299V	4.954V	356.870				52.44°C	115.05V
6	27.270A	5.976A	6.028A	2.027A	389.503	90.481%	830	19.4	42.53°C	0.994
	12.090V	5.021V	3.285V	4.934V	430.481				53.45°C	115.05V
7	31.941A	6.990A	7.063A	2.239A	454.760	89.849%	1020	26.2	43.37°C	0.995
	12.074V	5.008V	3.270V	4.914V	506.139				54.81°C	115.05V
8	36.617A	8.007A	8.111A	2.453A	520.081	89.129%	1150	30.0	43.57°C	0.996
	12.062V	4.996V	3.255V	4.893V	583.514				55.46°C	115.04V
9	41.720A	8.530A	8.632A	2.457A	584.994	88.497%	1415	36.1	44.75°C	0.996
	12.044V	4.985V	3.243V	4.885V	661.033				56.80°C	115.04V
10	46.549A	9.051A	9.196A	3.102A	649.842	87.655%	1430	36.3	45.63°C	0.997
	12.033V	4.974V	3.229V	4.837V	741.364				58.22°C	115.04V
11	51.991A	9.066A	9.222A	3.108A	714.651	86.935%	1430	36.3	46.57°C	0.997
	12.020V	4.966V	3.220V	4.827V	822.051				59.73°C	115.04V
CL1	0.142A	14.002A	13.999A	0.000A	118.128	82.280%	695	13.8	42.39°C	0.978
	12.152V	5.033V	3.281V	5.092V	143.569				52.47°C	115.06V

CL2	54.172A	1.003A	0.999A	1.000A	665.100	88.437%	1430	36.3	45.34°C	0.997
	12.033V	5.007V	3.275V	4.954V	752.060				58.34°C	115.04V

The results above are not used in the certification process

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	3.557A	1.967A	1.968A	0.994A	64.854	86.629%	0	<6.0	46.76°C	0.790
	12.163V	5.079V	3.352V	5.033V	74.864				40.25°C	230.03V
2	8.108A	2.961A	2.965A	1.197A	129.350	90.583%	687	13.7	40.75°C	0.884
	12.143V	5.066V	3.337V	5.013V	142.797				47.78°C	230.21V
3	13.059A	3.461A	3.458A	1.402A	194.438	92.458%	585	9.6	41.34°C	0.911
	12.133V	5.055V	3.325V	4.993V	210.299				48.89°C	230.03V
4	18.027A	3.964A	3.982A	1.609A	259.648	92.656%	580	9.5	41.65°C	0.916
	12.118V	5.045V	3.314V	4.973V	280.227				49.80°C	230.20V
5	22.676A	4.968A	5.000A	1.817A	324.887	92.467%	575	9.5	42.31°C	0.955
	12.100V	5.033V	3.300V	4.955V	351.356				50.94°C	230.21V
6	27.270A	5.979A	6.028A	2.027A	389.479	92.076%	830	19.4	42.55°C	0.972
	12.089V	5.020V	3.284V	4.934V	422.997				51.67°C	230.20V
7	31.940A	6.991A	7.067A	2.240A	454.825	91.697%	1020	26.2	43.21°C	0.976
	12.076V	5.008V	3.269V	4.913V	496.010				52.68°C	230.02V
8	36.617A	8.009A	8.113A	2.453A	520.126	91.168%	1150	30.0	43.63°C	0.983
	12.063V	4.996V	3.254V	4.893V	570.514				53.67°C	230.02V
9	41.713A	8.528A	8.635A	2.458A	585.067	90.549%	1417	36.2	44.47°C	0.989
	12.048V	4.985V	3.242V	4.883V	646.133				55.20°C	230.03V
10	46.554A	9.051A	9.200A	3.103A	649.898	89.922%	1430	36.3	45.78°C	0.991
	12.033V	4.973V	3.228V	4.836V	722.733				57.16°C	230.19V
11	52.000A	9.067A	9.229A	3.109A	714.718	89.412%	1422	36.2	46.66°C	0.993
	12.019V	4.965V	3.219V	4.826V	799.352				58.63°C	230.19V
CL1	0.144A	14.003A	14.000A	0.000A	118.147	82.901%	695	13.8	42.85°C	0.880
	12.151V	5.032V	3.281V	5.092V	142.516				51.65°C	230.21V

CL2	54.178A	1.000A	1.001A	1.000A	665.109	90.773%	1425	36.3	45.35°C	0.992
	12.032V	5.007V	3.275V	4.954V	732.720				57.27°C	230.19V

The results above are not used in the certification process

Light Load Tests

115V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.186A	0.493A	0.475A	0.197A	19.568	68.093%	0	<6.0	0.870
	12.192V	5.089V	3.366V	5.080V	28.737				115.06V
2	2.439A	0.983A	0.981A	0.395A	39.982	81.302%	0	<6.0	0.916
	12.171V	5.085V	3.361V	5.067V	49.177				115.05V
3	3.625A	1.476A	1.461A	0.594A	59.505	85.335%	0	<6.0	0.943
	12.165V	5.082V	3.356V	5.055V	69.731				115.05V
4	4.876A	1.970A	1.969A	0.794A	79.905	87.469%	0	<6.0	0.957
	12.162V	5.078V	3.350V	5.042V	91.352				115.06V

The results above are not used in the certification process

230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.184A	0.490A	0.476A	0.197A	19.542	68.939%	0	<6.0	0.547
	12.199V	5.092V	3.367V	5.083V	28.347				230.21V
2	2.434A	0.983A	0.982A	0.395A	39.936	82.281%	0	<6.0	0.696
	12.174V	5.087V	3.361V	5.070V	48.536				230.20V
3	3.622A	1.475A	1.458A	0.594A	59.453	85.936%	0	<6.0	0.776
	12.165V	5.082V	3.356V	5.056V	69.183				230.21V
4	4.871A	1.970A	1.969A	0.794A	79.822	88.120%	0	<6.0	0.825
	12.158V	5.077V	3.350V	5.042V	90.583				230.21V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	17.0 mV	9.6 mV	9.3 mV	16.0 mV	Pass
20% Load	23.7 mV	10.5 mV	10.3 mV	17.6 mV	Pass
30% Load	26.9 mV	11.5 mV	11.1 mV	19.7 mV	Pass
40% Load	27.9 mV	13.2 mV	15.8 mV	19.7 mV	Pass
50% Load	31.0 mV	15.0 mV	17.7 mV	20.1 mV	Pass
60% Load	37.7 mV	17.3 mV	34.0 mV	21.8 mV	Pass
70% Load	36.5 mV	19.7 mV	16.9 mV	32.1 mV	Pass
80% Load	39.2 mV	21.4 mV	17.9 mV	27.9 mV	Pass
90% Load	41.0 mV	23.9 mV	28.2 mV	30.1 mV	Pass
100% Load	45.1 mV	29.9 mV	33.9 mV	28.4 mV	Pass
110% Load	47.2 mV	31.7 mV	39.7 mV	30.2 mV	Pass
Crossload 1	36.2 mV	17.4 mV	11.9 mV	15.1 mV	Pass
Crossload 2	37.4 mV	26.8 mV	38.9 mV	33.9 mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	28.0 mV	6.3 mV	6.8 mV	4.1 mV	Pass
20% Load	21.4 mV	7.3 mV	9.0 mV	4.7 mV	Pass
30% Load	11.3 mV	9.3 mV	10.6 mV	7.2 mV	Pass
40% Load	11.5 mV	9.3 mV	10.2 mV	6.2 mV	Pass
50% Load	12.0 mV	11.1 mV	11.2 mV	6.9 mV	Pass
60% Load	12.3 mV	15.1 mV	14.1 mV	10.2 mV	Pass
70% Load	13.2 mV	13.5 mV	13.4 mV	8.4 mV	Pass
80% Load	14.1 mV	15.1 mV	15.2 mV	9.2 mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	15.6 mV	16.4 mV	16.6 mV	10.3 mV	Pass
100% Load	16.9 mV	18.3 mV	17.0 mV	11.5 mV	Pass
110% Load	19.0 mV	19.6 mV	17.8 mV	12.0 mV	Pass
Crossload 1	21.7 mV	13.4 mV	14.6 mV	6.9 mV	Pass
Crossload 2	17.6 mV	13.0 mV	12.1 mV	9.1 mV	Pass

The results above are not used in the certification process

Thermaltake Toughpower Grand Gold 650W

Top side

Power specifications label

Cybenetics □□□□□□□□□□□□□□□□□□ ETA□□□□ LAMBDA□□□□ SAFE□□□□□□□□□□□□□□□□□□ DELTA□□□□□□□ PHI□□□□□□□□□

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