Thermaltake Toughpower GF1 650W

Lab ID TT20650003

Certification ID 251578

Test Result Report ID: 20PS1578A

Certificate Issue Date: Jan 27, 2020

Scheme: ETA-EMI PSU

115V



230V



Scheme: LAMBDA PSU

115V



230V





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 GF1 650W
OEM/ODM	Channel Well Technology
Serial Number	
Product Specifications	
Manufacturer-Provided Information	
□□□□ (Vrms)	100-240
□□□□ (Arms)	10
□□□□ (Hz)	50-60

□□□□ (W)	650
Operating Temperature (Continuous Full Load) (°C)	
□□	ATX12V
□□□□	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
□□	
□□□□□	✓ (selectable)
Cybenetics Testing Information	
Lab ID	TT20650003
Date of receipt	Jan 2, 2020
Testing Date	Jan 23, 2020
Report Issued Date	Jan 27, 2020
Engineer Name	-
Authorized By the Laboratory Technical Manager	Aristeidis Bitziopoulos
Signature	

□□□□□ (Non-accredited measurements)

□□□□□				
□□	□□□□	□□□□□□	Gauge	In Cable Capacitors
ATX □□ 20+4 pin (590mm)	1	1	16-18AWG	□
4+4 pin EPS 12V □□ (650mm)	2	2	16AWG	□
6+2pin PCIe□□ (500mm+140mm)	2	4	16-18AWG	□
SATA□□ (510mm+145mm+145mm)	3	9	18AWG	□
4-pin Molex (500mm+145mm+145mm+145mm)	1	3	18AWG	□
□ 4pin □□ (115mm)	1	1	22AWG	□

□□□□

□		3.3V	5V	12V	5VSB	-12V
□□□□	□□	20	20	54	2.5	0.3
	□	100		648	12.5	3.6
□□□□□ (W)		650				

Parts Description

General Data	-
Manufacturer (OEM)	CWT
PCB Type	Double Sided
Primary Side	-
Transient Filter	6x Y caps, 2x X caps, 2x CM chokes
Inrush Protection	NTC Thermistor (MSR 15D2R5) & Relay
Bridge Rectifier(s)	2x GBU1506L (600V, 15A @ 100°C)
APFC MOSFETs	2x Champion GP28S50GN220 (500V, 28A, 0.125Ohm)
APFC Boost Diode	1x Global Power Tech. G3S06008J (600V, 8A @ 150°C)
Hold-up Cap(s)	2x Rubycon (420V, 270uF each or 540uF combined, 3,000h @ 105°C, MXK)
Main Switchers	2x NCE Power NCE65TF130F (650V, 18A @ 100°C, 0.13Ohm)
APFC Controller	Champion CM6500UNX
Resonant Controller	Champion CM6901X
Topology	Primary side: Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	8x Advanced Power AP4N1R8CMT-A (45V, 180A @ 25°C, 1.8mOhm)
5V & 3.3V	DC-DC Converters: 4x Advanced Power AP4024GEMT-HF (30V, 60A @ 25°C, 4.5mOhm) PWM Controllers: 2x ANPEC APW7164
Filtering Capacitors	Electrolytic: 6x Chengx (2-4,000h @ 105°C, GR) Polymer: 7x Teapo
Supervisor IC	Weltrend WT7502V (OVP, UVP, SCP, PG)
Fan Model	BOK BDM12025S (120mm, 12V, 0.30A, Rifle Bearing Fan)
5VSB Circuit	-

Rectifier	1x SB1045L SBR (45V, 10A)
Standby PWM Controller	PN8140

Test Results

Temperature & Compliance Info

□□□□ (°C /°F)	28-32 / 82.4-89.6
□□ ErP Lot3/6□□	✓
□□ (EU) No 617/2013□□	✓

Performance Summary

115V

Accredited	
□□□□ (>1450 load combinations)	89.841%
Average Noise Output (>1450 Load Combinations)	30.47dBA
PF□□□ (>1450 Load Combinations)	0.986
Efficiency With 10W (≤500W) or 2% (>500W) Load	49.777%
□□□□□□	0.0793W
Non-Accredited	
12V Ripple (Full Load)	21.98mV
5V Ripple (Full Load)	13.54mV
3.3V Ripple (Full Load)	19.19mV
5VSB Ripple (Full Load)	10.33mV
12V Load Regulation	0.20%
5V Load Regulation	0.79%
3.3V Load Regulation	1.35%
5VSB Load Regulation	4.49%
Inrush Current	33.250A

230V

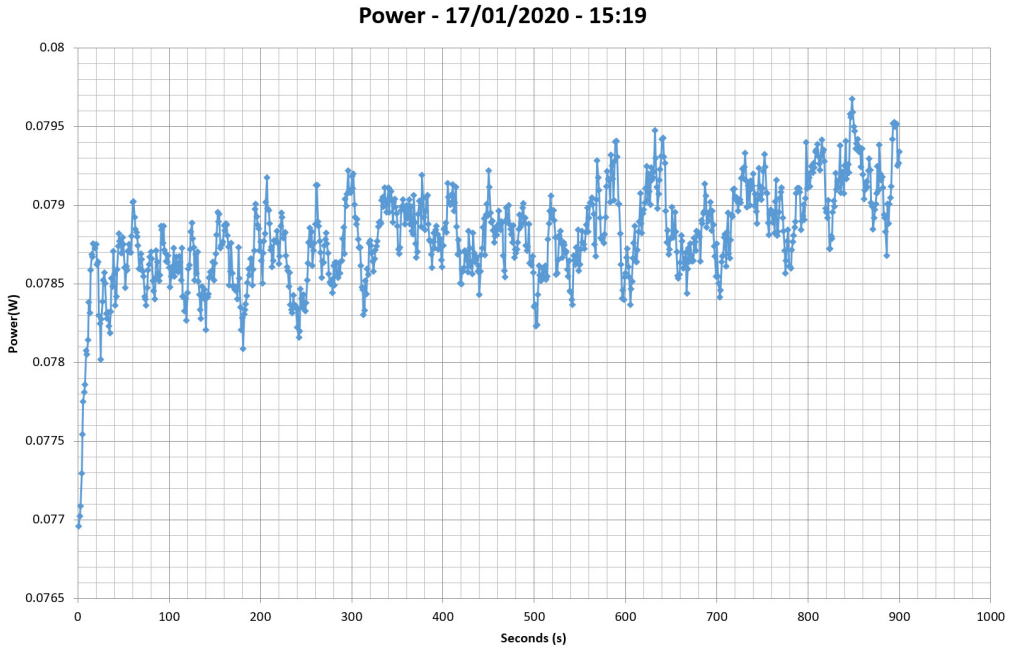
Accredited		
□□□□ (>1450 load combinations)		91.713%
Average Noise Output (>1450 Load Combinations)		30.63dBA
PF□□□ (>1450 Load Combinations)		0.934
Efficiency With 10W (≤500W) or 2% (>500W) Load		-
□□□□□□		0.1076W
Non-Accredited		
12V Ripple (Full Load)		23.28mV
5V Ripple (Full Load)		13.82mV
3.3V Ripple (Full Load)		18.34mV
5VSB Ripple (Full Load)		9.70mV
12V Load Regulation		0.20%
5V Load Regulation		0.88%
3.3V Load Regulation		1.29%
5VSB Load Regulation		4.35%
Inrush Current		57.984A
□□□□ & PG□□		18.20ms
AC Loss to PWR_OK Hold Up Time		16.80ms
PWR_OK Inactive to DC Loss Delay		1.40ms
PSU Timings: T1 (20% / 100%)	85.0ms	82.0ms
PSU Timings: T3 (20% / 100%)	287.0ms	290.0ms
OPP (0.00°C / 0.00°C)	-	-

□□□□ & PG□□

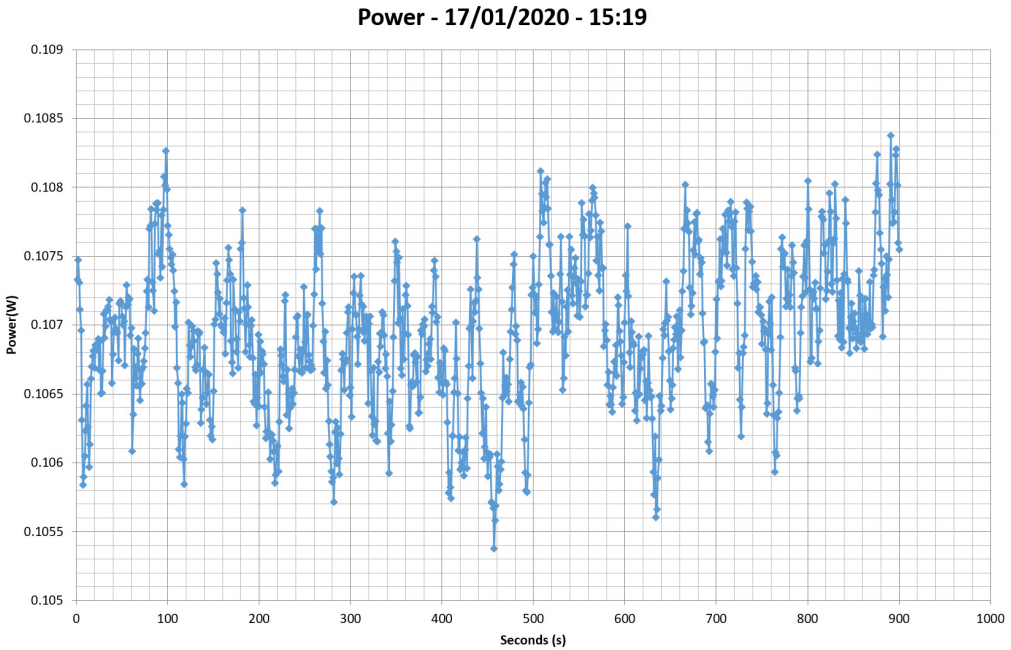
Hold-Up Time (ms)	18.2
AC Loss to PWR_OK Hold Up Time (ms)	16.8
PWR_OK Inactive to DC Loss Delay (ms)	1.4

Graphs

115V



230V



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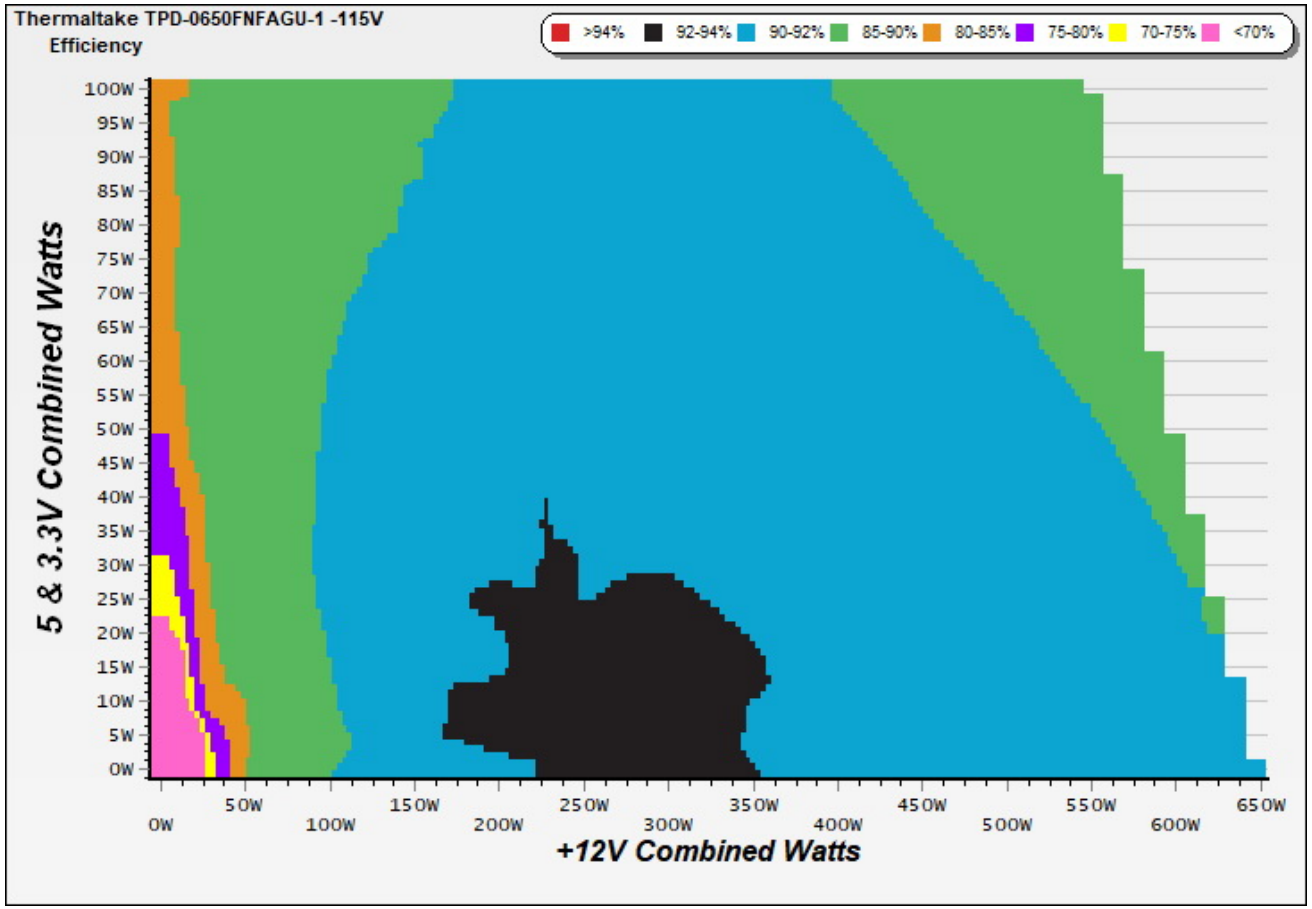
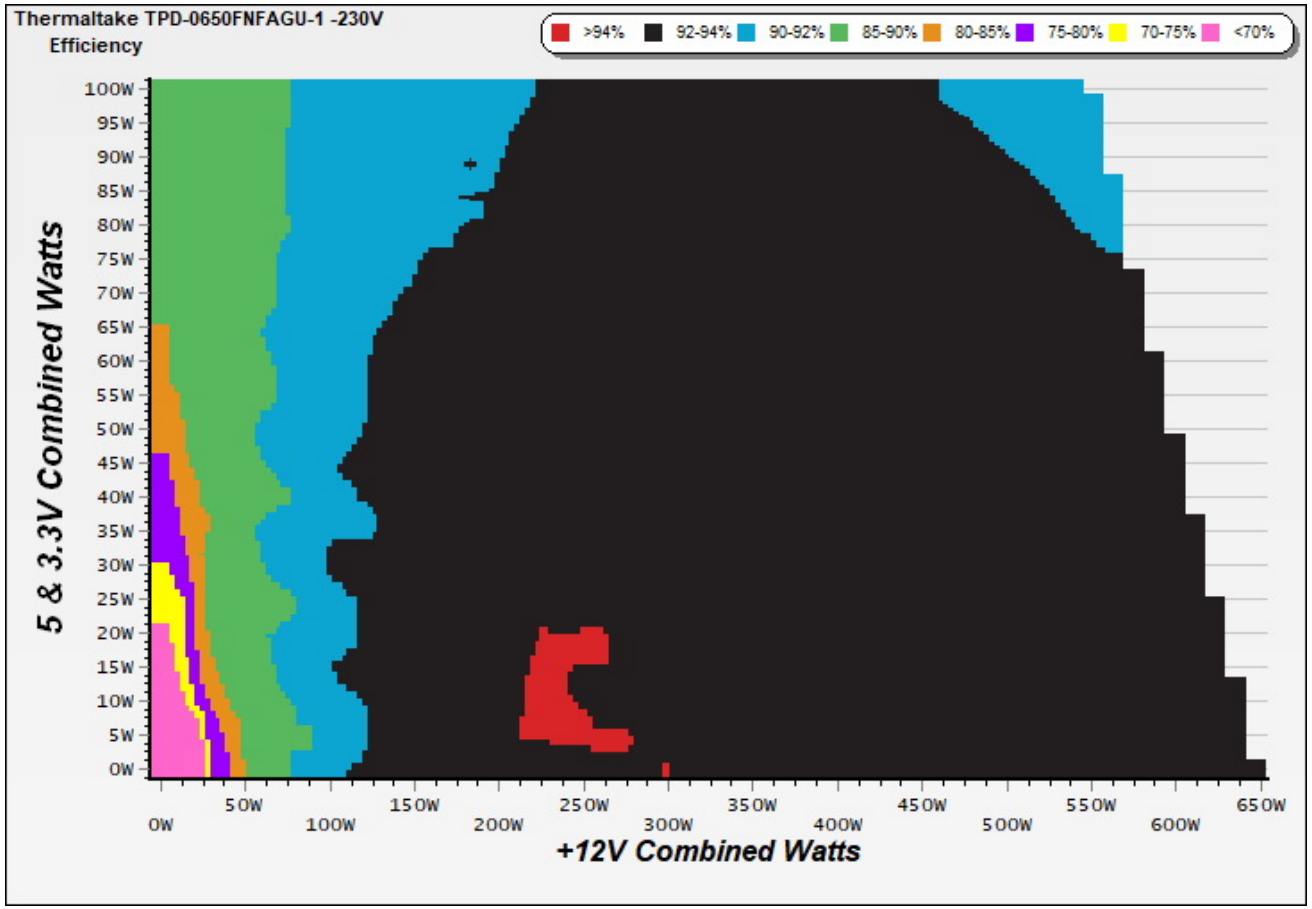
115V



□□

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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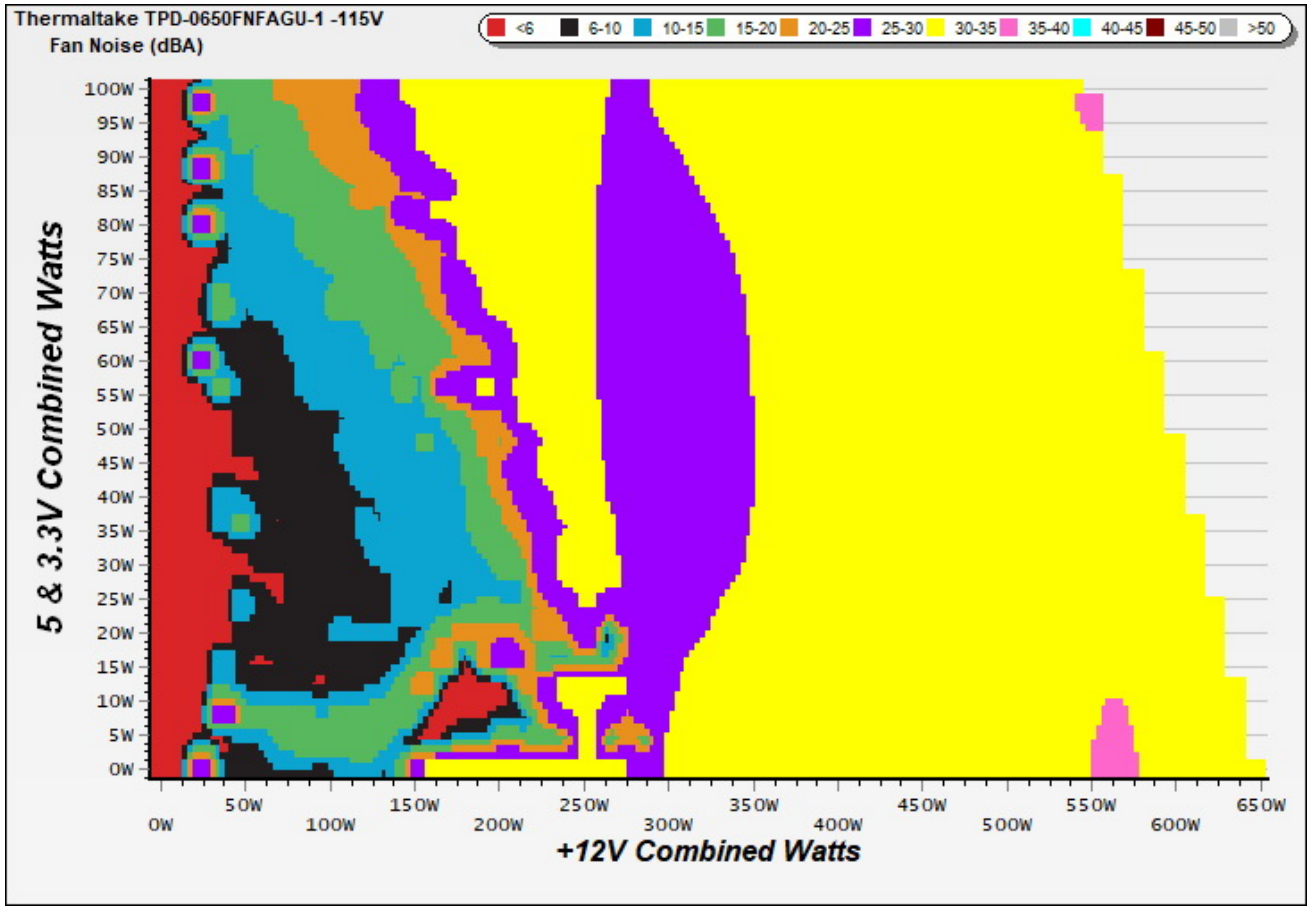
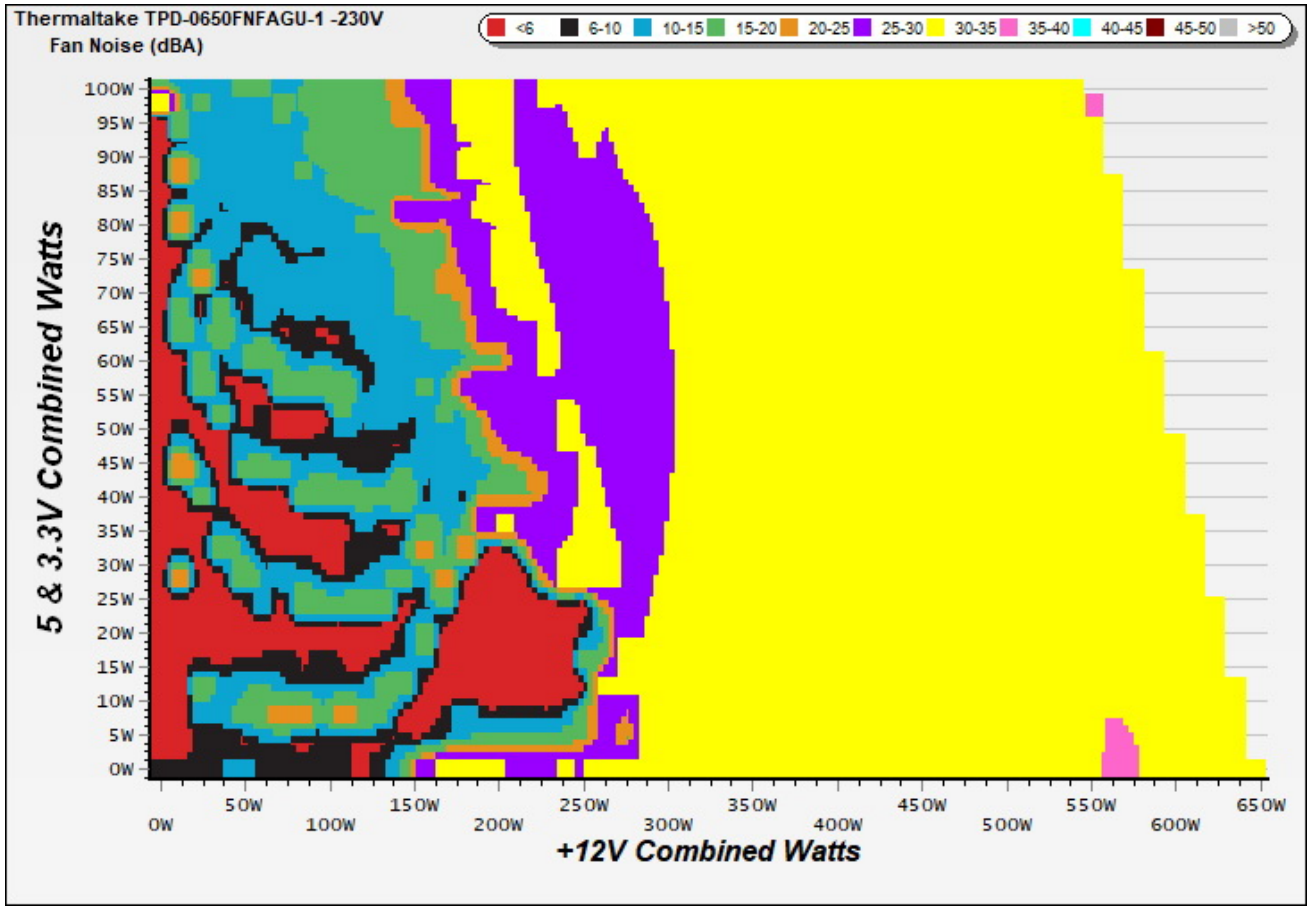
115V



□□

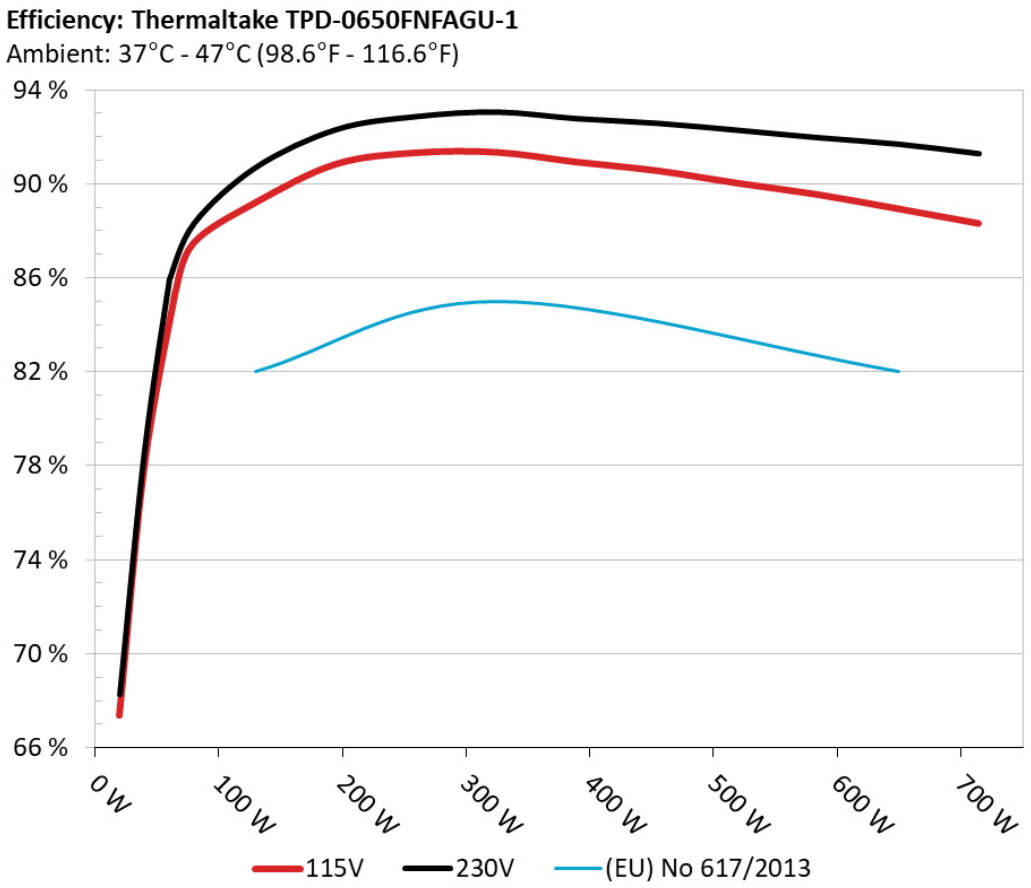
The PSU`s noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

230V



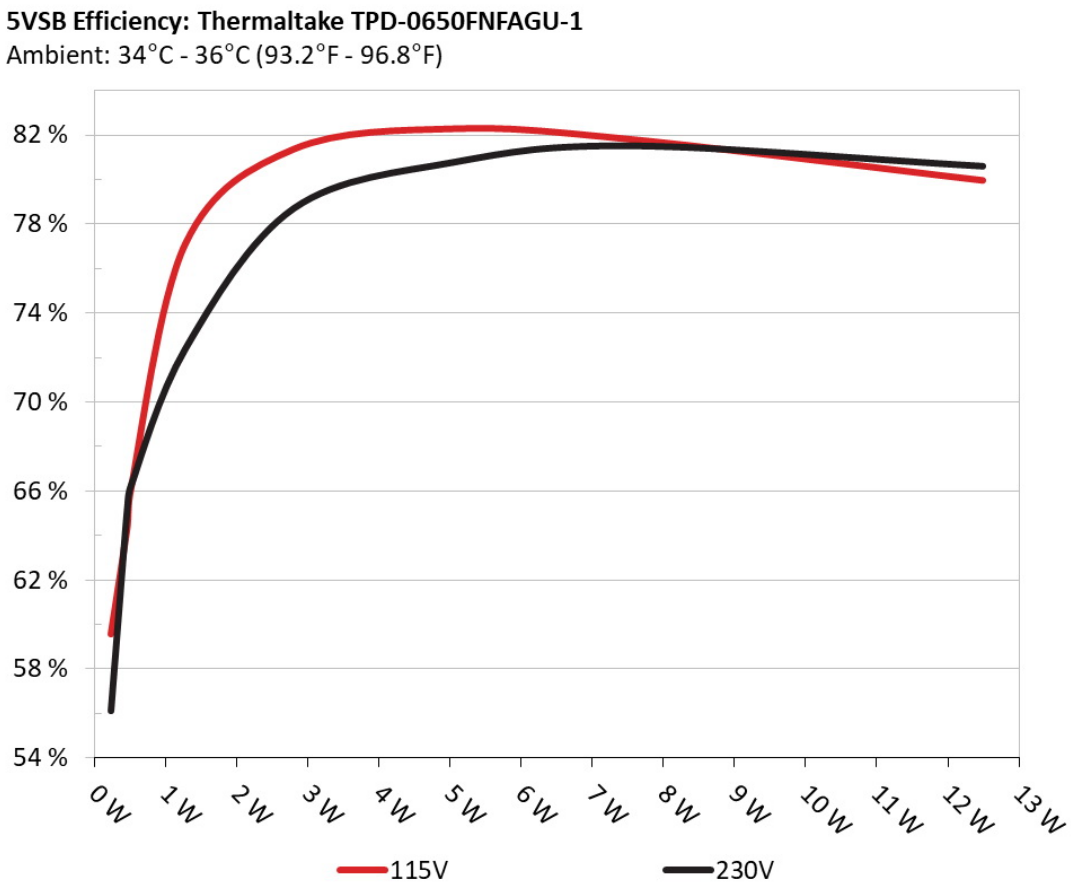
The PSU`s noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

Indicative Performance



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□□□□



□□

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

□□□□ □□ 5Vsb □□ (ErP Lot3/6 & CEC)

115V

□□ #	5VSB	DC/AC (□)	□□	PF/AC □□
1	0.045A	0.230	59.585%	0.044
	5.115V	0.386		115.15V
2	0.090A	0.460	64.426%	0.080
	5.114V	0.714		115.15V
3	0.550A	2.801	81.353%	0.270
	5.091V	3.443		115.15V
4	1.000A	5.071	82.268%	0.347
	5.070V	6.164		115.14V
5	1.500A	7.568	81.781%	0.390
	5.045V	9.254		115.14V
6	2.501A	12.486	79.951%	0.435
	4.993V	15.617		115.14V

230V

□□ #	5VSB	DC/AC (□)	□□	PF/AC □□
1	0.045A	0.230	56.098%	0.014
	5.117V	0.410		230.32V
2	0.090A	0.460	65.248%	0.024
	5.115V	0.705		230.32V
3	0.550A	2.801	78.702%	0.114
	5.092V	3.559		230.31V
4	1.000A	5.071	80.787%	0.180
	5.070V	6.277		230.33V
5	1.500A	7.569	81.510%	0.234
	5.045V	9.286		230.32V
6	2.500A	12.486	80.596%	0.303
	4.994V	15.492		230.31V

Supplementary Tests (For Reference)

10-110%□□□□

115V

□□ #	12V	5V	3.3V	5VSB	DC/AC (□)	□□	□□□□ (RPM)	□□□□□□□ (dB[A])	□□ (□□ /□□)	PF/AC □□
1	3.591A	1.982A	1.983A	0.990A	64.961	84.906%	1317	31.8	40.27°C	0.955
	12.073V	5.046V	3.330V	5.054V	76.509				45.51°C	115.17V
2	8.212A	2.970A	2.980A	1.192A	130.027	89.199%	1343	32.4	40.66°C	0.977
	12.070V	5.051V	3.325V	5.032V	145.771				46.25°C	115.15V
3	13.174A	3.465A	3.478A	1.397A	195.029	90.839%	1345	32.4	41.16°C	0.986
	12.067V	5.052V	3.321V	5.013V	214.698				47.70°C	115.14V
4	18.138A	3.959A	3.980A	1.603A	260.033	91.322%	1397	33.3	41.21°C	0.991
	12.064V	5.053V	3.318V	4.994V	284.742				48.19°C	115.14V
5	22.760A	4.943A	4.980A	1.811A	325.066	91.342%	1508	35.3	42.19°C	0.993
	12.063V	5.060V	3.313V	4.971V	355.879				49.62°C	115.13V
6	27.333A	5.926A	5.988A	2.000A	389.352	90.927%	1565	36.2	42.36°C	0.995
	12.060V	5.064V	3.308V	4.949V	428.202				50.65°C	115.17V
7	31.987A	6.906A	6.996A	2.233A	454.780	90.558%	1618	37.1	43.41°C	0.996
	12.057V	5.069V	3.303V	4.926V	502.200				52.22°C	115.15V
8	36.639A	7.882A	8.009A	2.448A	520.085	90.022%	1728	39.4	43.56°C	0.996
	12.055V	5.075V	3.296V	4.903V	577.732				52.80°C	115.15V
9	41.694A	8.372A	8.502A	2.454A	585.001	89.540%	1778	39.7	44.48°C	0.997
	12.052V	5.077V	3.293V	4.891V	653.342				54.20°C	115.12V
10	46.684A	8.859A	9.029A	2.566A	649.746	88.935%	1846	40.3	45.65°C	0.997
	12.050V	5.080V	3.289V	4.873V	730.582				56.04°C	115.14V
11	52.075A	8.863A	9.034A	2.571A	714.564	88.315%	1847	40.3	46.86°C	0.997
	12.047V	5.078V	3.288V	4.864V	809.108				57.68°C	115.14V
CL1	0.116A	11.999A	11.999A	0.000A	102.252	83.957%	1436	34.2	42.21°C	0.973
	12.069V	5.117V	3.288V	5.071V	121.791				49.85°C	115.15V

CL2	54.009A	1.000A	1.000A	1.000A	664.078	89.747%	1685	38.3	45.18°C	0.997
	12.049V	5.024V	3.323V	4.976V	739.948				56.03°C	115.13V

The results above are not used in the certification process

230V

□□ #	12V	5V	3.3V	5VSB	DC/AC (□)	□□	□□□□ (RPM)	□□□□□□□ (dB[A])	□□ (□□ /□□)	PF/AC □□
1	3.591A	1.981A	1.984A	0.990A	64.961	85.927%	1306	31.7	40.07°C	0.721
	12.072V	5.048V	3.330V	5.054V	75.600				45.36°C	230.35V
2	8.213A	2.968A	2.980A	1.192A	130.029	90.708%	1335	32.1	40.25°C	0.879
	12.069V	5.054V	3.324V	5.034V	143.349				45.86°C	230.35V
3	13.175A	3.463A	3.479A	1.397A	195.034	92.319%	1374	32.9	41.81°C	0.932
	12.066V	5.055V	3.321V	5.014V	211.260				47.86°C	230.36V
4	18.139A	3.956A	3.978A	1.603A	260.042	92.870%	1441	34.4	42.14°C	0.953
	12.064V	5.058V	3.318V	4.994V	280.005				48.72°C	230.36V
5	22.764A	4.939A	4.983A	1.811A	325.080	93.058%	1481	35.1	42.30°C	0.967
	12.061V	5.064V	3.313V	4.972V	349.330				49.57°C	230.36V
6	27.340A	5.918A	5.989A	2.001A	389.410	92.780%	1578	36.5	42.97°C	0.974
	12.059V	5.070V	3.307V	4.951V	419.713				51.31°C	230.36V
7	31.993A	6.897A	6.998A	2.233A	454.833	92.583%	1627	37.3	43.84°C	0.977
	12.056V	5.077V	3.302V	4.927V	491.271				52.55°C	230.37V
8	36.648A	7.874A	8.006A	2.447A	520.132	92.285%	1671	38.2	44.02°C	0.980
	12.053V	5.082V	3.297V	4.905V	563.617				53.56°C	230.33V
9	41.702A	8.361A	8.503A	2.453A	585.067	91.971%	1800	40.0	44.68°C	0.983
	12.051V	5.085V	3.293V	4.892V	636.140				54.80°C	230.36V
10	46.693A	8.851A	9.029A	2.564A	649.821	91.692%	1786	39.8	45.66°C	0.985
	12.049V	5.085V	3.290V	4.877V	708.703				56.18°C	230.38V
11	52.087A	8.854A	9.031A	2.570A	714.650	91.292%	1848	40.3	46.61°C	0.987
	12.046V	5.084V	3.288V	4.865V	782.816				57.51°C	230.37V
CL1	0.117A	12.001A	12.000A	0.000A	102.361	85.291%	1471	34.8	42.93°C	0.843
	12.068V	5.124V	3.288V	5.070V	120.014				49.39°C	230.39V

CL2	54.018A	1.000A	1.002A	1.000A	664.134	92.439%	1755	39.5	45.44°C	0.985
	12.048V	5.023V	3.322V	4.974V	718.460				56.23°C	230.37V

The results above are not used in the certification process

20-80□□□□□

115V

□□ #	12V	5V	3.3V	5VSB	DC/AC (□)	□□	□□□□ (RPM)	□□□□□□□ (dB[A])	PF/AC □□
1	1.229A	0.496A	0.494A	0.196A	19.993	67.357%	398	8.1	0.778
	12.080V	5.038V	3.336V	5.102V	29.682				115.18V
2	2.459A	0.993A	0.988A	0.393A	39.983	77.897%	844	19.1	0.916
	12.072V	5.040V	3.334V	5.089V	51.328				115.18V
3	3.691A	1.488A	1.484A	0.591A	60.013	85.342%	659	12.8	0.948
	12.074V	5.043V	3.332V	5.075V	70.321				115.18V
4	4.917A	1.983A	1.983A	0.790A	79.961	87.477%	1048	25.3	0.973
	12.072V	5.044V	3.329V	5.062V	91.408				115.17V

The results above are not used in the certification process

230V

□□ #	12V	5V	3.3V	5VSB	DC/AC (□)	□□	□□□□ (RPM)	□□□□□□□ (dB[A])	PF/AC □□
1	1.229A	0.496A	0.495A	0.196A	19.990	68.288%	572	11.0	0.430
	12.075V	5.039V	3.336V	5.102V	29.273				230.36V
2	2.459A	0.992A	0.989A	0.393A	39.980	78.662%	811	17.9	0.576
	12.071V	5.041V	3.334V	5.089V	50.825				230.35V
3	3.691A	1.487A	1.485A	0.591A	60.009	85.744%	1283	31.1	0.691
	12.073V	5.044V	3.332V	5.075V	69.986				230.35V
4	4.917A	1.982A	1.983A	0.790A	79.958	88.325%	1082	26.3	0.775
	12.071V	5.047V	3.329V	5.062V	90.527				230.35V

The results above are not used in the certification process

□□□□

115V

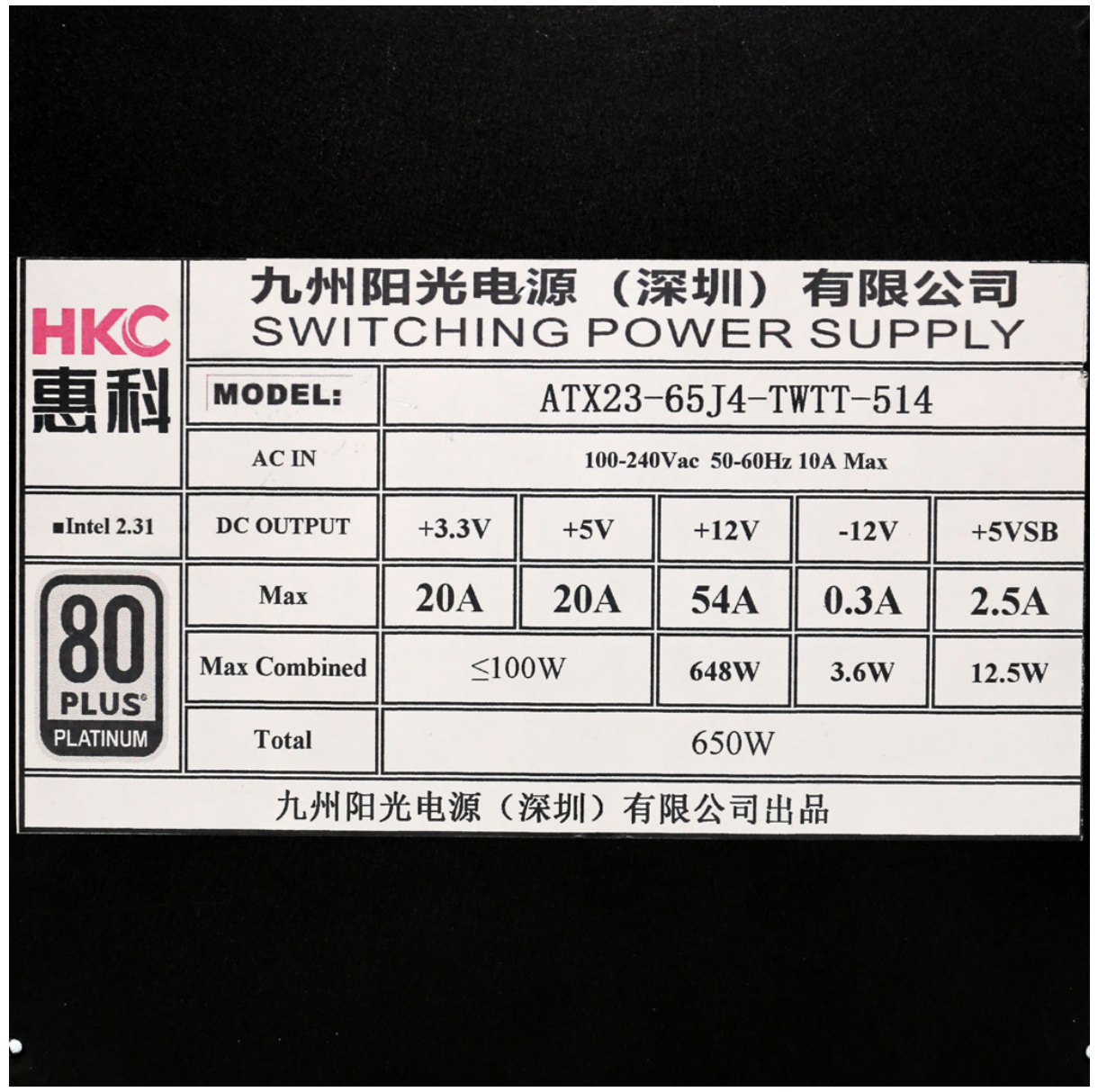
Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	21.7 mV	5.9 mV	10.0 mV	3.5 mV	Pass
20% Load	23.0 mV	6.6 mV	9.8 mV	3.5 mV	Pass
30% Load	17.1 mV	7.2 mV	10.3 mV	4.4 mV	Pass
40% Load	15.0 mV	8.4 mV	11.2 mV	5.4 mV	Pass
50% Load	13.1 mV	9.7 mV	12.5 mV	6.1 mV	Pass
60% Load	14.9 mV	10.5 mV	12.4 mV	6.8 mV	Pass
70% Load	14.0 mV	11.9 mV	13.8 mV	7.3 mV	Pass
80% Load	14.6 mV	12.5 mV	16.4 mV	8.1 mV	Pass
90% Load	13.4 mV	12.2 mV	16.8 mV	8.5 mV	Pass
100% Load	22.0 mV	13.5 mV	19.2 mV	10.3 mV	Pass
110% Load	22.3 mV	14.3 mV	18.8 mV	10.6 mV	Pass
Crossload 1	28.7 mV	10.3 mV	19.5 mV	8.3 mV	Pass
Crossload 2	22.2 mV	11.7 mV	12.8 mV	10.0 mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	20.3 mV	5.7 mV	9.6 mV	3.5 mV	Pass
20% Load	21.8 mV	7.0 mV	10.2 mV	3.6 mV	Pass
30% Load	17.1 mV	6.9 mV	10.0 mV	4.5 mV	Pass
40% Load	14.7 mV	8.2 mV	11.0 mV	5.2 mV	Pass
50% Load	13.4 mV	9.5 mV	11.1 mV	6.0 mV	Pass
60% Load	15.9 mV	10.9 mV	12.3 mV	6.4 mV	Pass
70% Load	13.7 mV	11.8 mV	13.1 mV	6.8 mV	Pass
80% Load	13.5 mV	12.0 mV	17.7 mV	7.5 mV	Pass





Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	13.8 mV	11.9 mV	19.5 mV	8.5 mV	Pass
100% Load	23.3 mV	13.8 mV	18.3 mV	9.7 mV	Pass
110% Load	23.7 mV	13.9 mV	19.3 mV	10.5 mV	Pass
Crossload 1	26.5 mV	10.4 mV	18.8 mV	8.3 mV	Pass
Crossload 2	22.7 mV	11.2 mV	12.1 mV	9.2 mV	Pass

The results above are not used in the certification process

Thermaltake Toughpower GF1 650W

Top side

Power specifications table

本测试报告中包含的所有数据和图表均可在以下条件下由任何人使用：使用过程需提及测试结果由Cybenetics提供。
在任何情况下都应提供原始测试结果文档的网站链接

Cybenetics 提供自愿性认证计划：电源方面有ETA（效率）、LAMBDA（噪声）与SAFE（安全与正确运行）；散热产品方面有DELTA（机箱隔音）与PHI（风扇风量与静压）