EFFICIENCY AND NOISE REPORT IN ACCORDANCE WITH
CYBENETICS ETA AND CYBENETICS LAMBDA PROCEDURE

Thermaltake Toughpower GF1 650W

Lab ID#: TT20650003
Receipt Date: Jan 2, 2020
Test Date: Jan 23, 2020

Report: 20PS1578A
Report Date: Jan 27, 2020

DUT INFORMATION

Brand	Thermaltake
Manufacturer (OEM)	Channel Well Technology
Series	Toughpower GF1
Model Number	TPD-0650FNFAGU-1
Serial Number	
DUT Notes	

DUT SPECIFICATIONS

Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10
Rated Frequency (Hz)	50-60
Rated Power (W)	650
Type	ATX12V
Cooling	
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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RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6 (+-2°C / +- 3.6°F)
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓

115V

Average Efficiency	89.841%
Efficiency With 10W (≤500W) or 2% (>500W)	49.777
Average Efficiency 5VSB	80.250%
Standby Power Consumption (W)	0.0793397
Average PF	0.986
Avg Noise Output	30.47 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	Standard++

230V

Average Efficiency	91.713%
Average Efficiency 5VSB	79.039%
Standby Power Consumption (W)	0.1075500
Average PF	0.934
Avg Noise Output	30.63 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	Standard++

POWER SPECIFICATIONS

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	54	2.5	0.3
	Watts	100		648	12.5	3.6
Total Max. Power (W)		650				

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CABLES AND CONNECTORS

Modular Cables

Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (590mm)	1	1	16-18AWG	No
4+4 pin EPS12V (650mm)	2	2	16AWG	No
6+2 pin PCIe (500mm+140mm)	2	4	16-18AWG	No
SATA (510mm+145mm+145mm)	3	9	18AWG	No
4-pin Molex (500mm+145mm+145mm+145mm)	1	3	18AWG	No
FDD Adapter (115mm)	1	1	22AWG	No

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Thermaltake Toughpower GF1 650W

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

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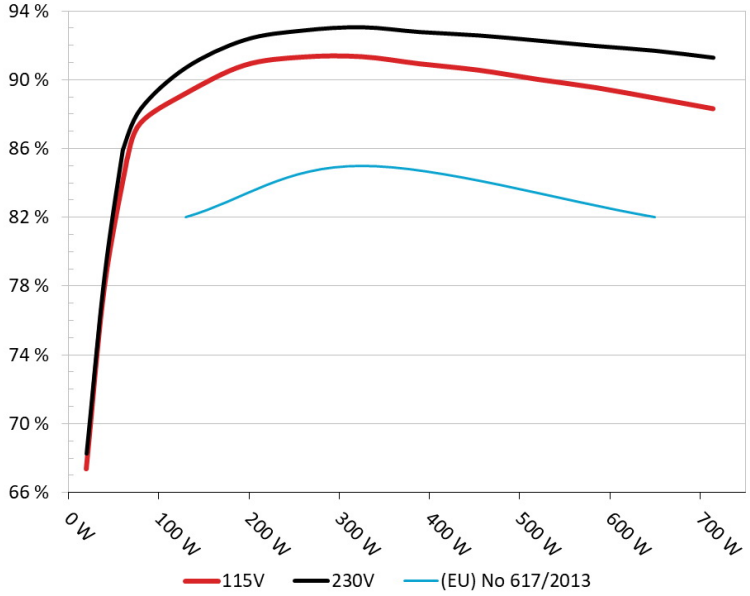
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: Thermaltake TPD-0650FNFAGU-1
Ambient: 37°C - 47°C (98.6°F - 116.6°F)

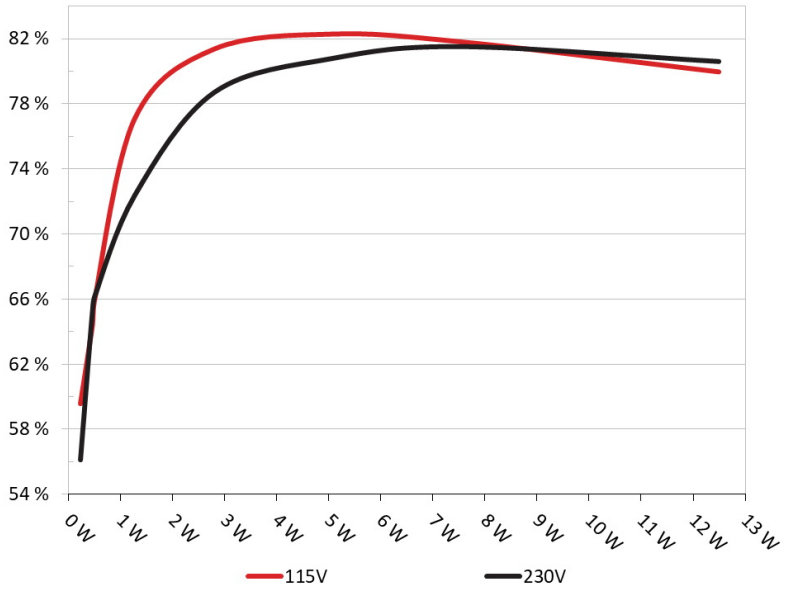


INFO

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 TPD-0650FNFAGU-1
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

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
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

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
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

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115V

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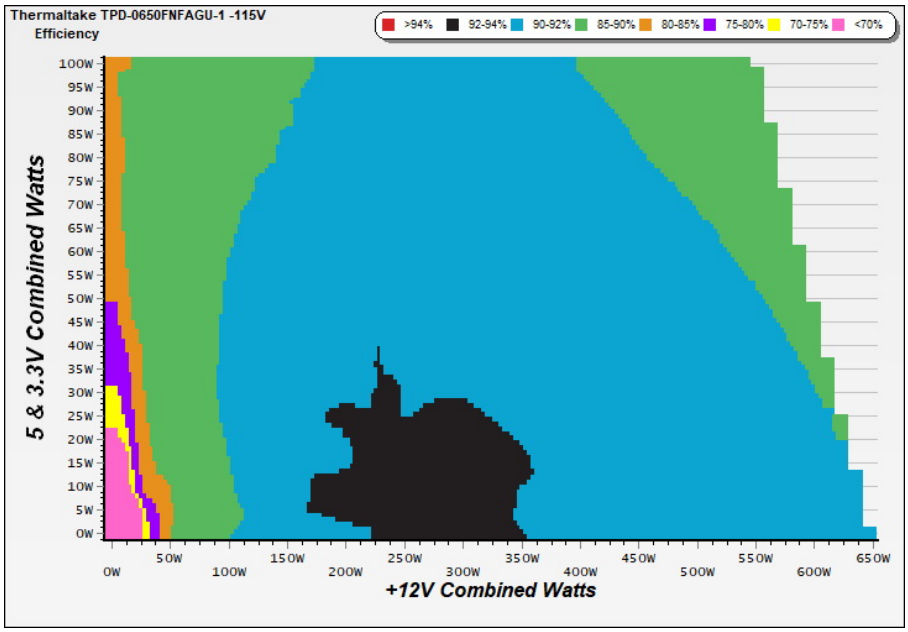
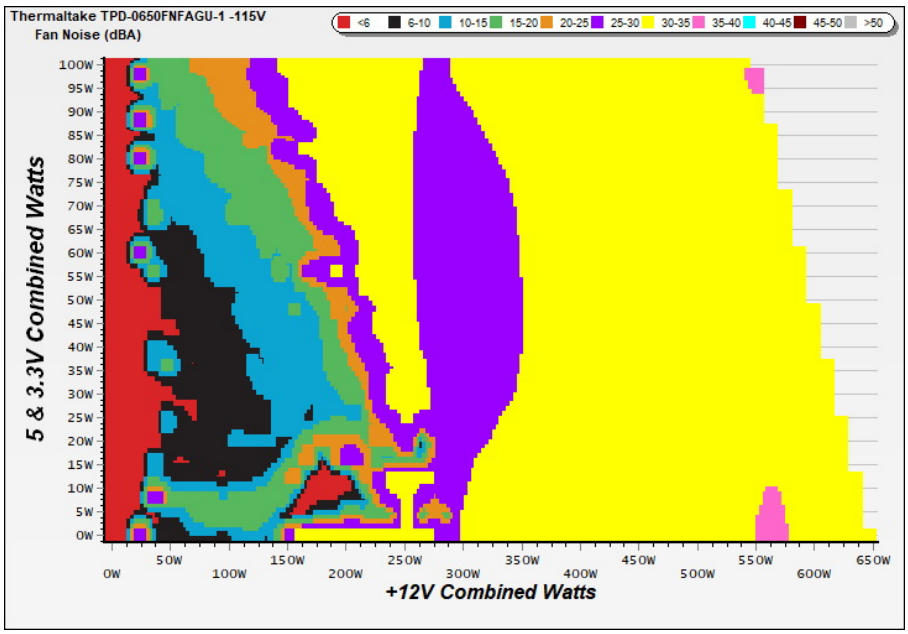
EFFICIENCY GRAPH 115V



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 (+-2 °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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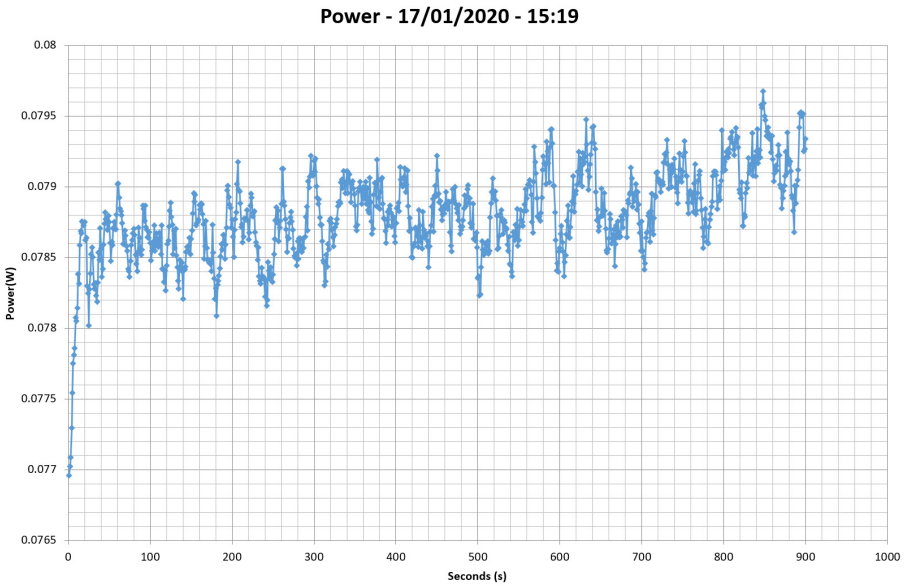
VAMPIRE POWER -115V



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

COMMISSION REGULATION (EU) NO 617/2013 TESTING 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	3.591A	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
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
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

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230V

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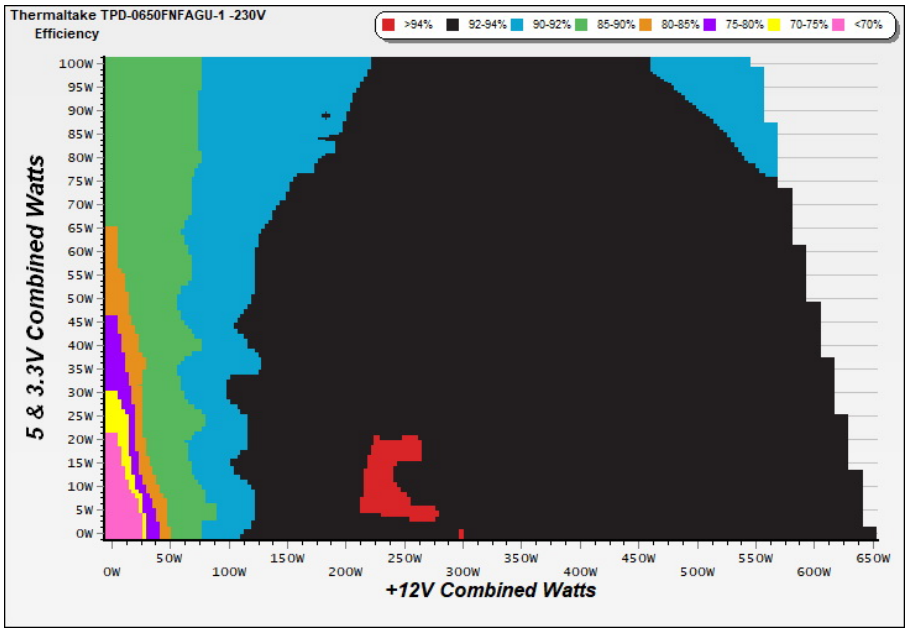
EFFICIENCY GRAPH 230V



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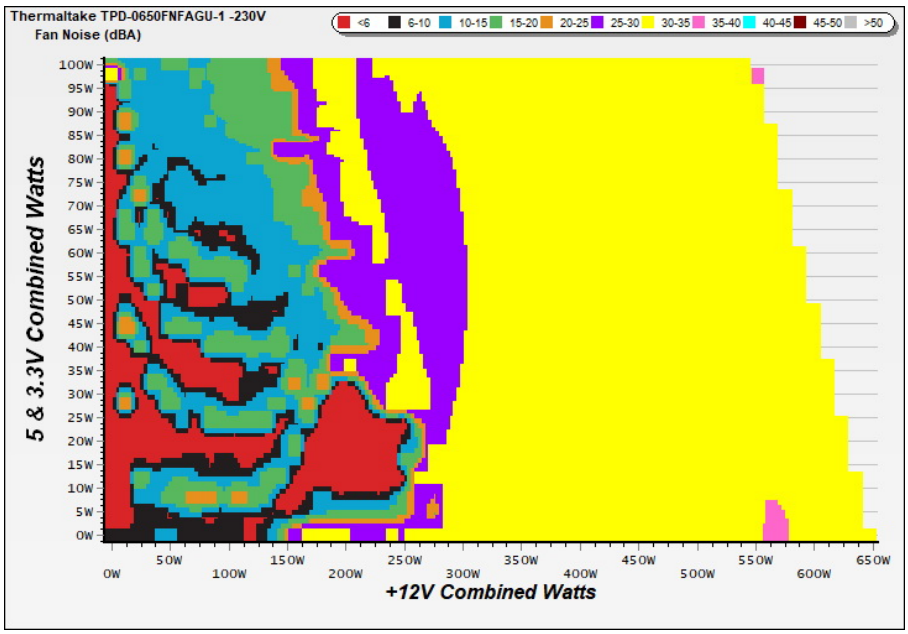
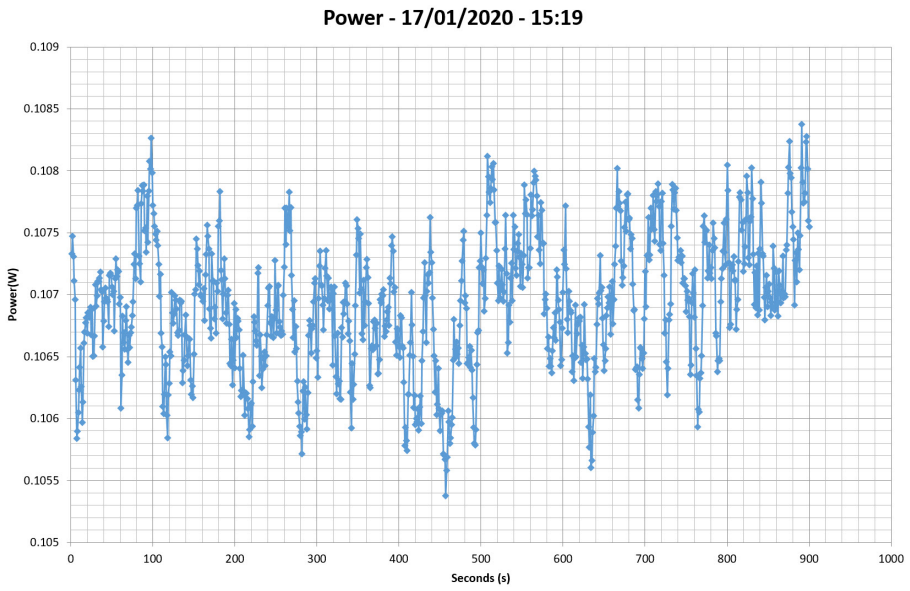
NOISE GRAPH 230V



INFO

The PSU's noise in its entire operational range and under 30-32 °C (+-2 °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

VAMPIRE POWER -230V



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COMMISSION REGULATION (EU) NO 617/2013 TESTING 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	3.591A	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
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
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

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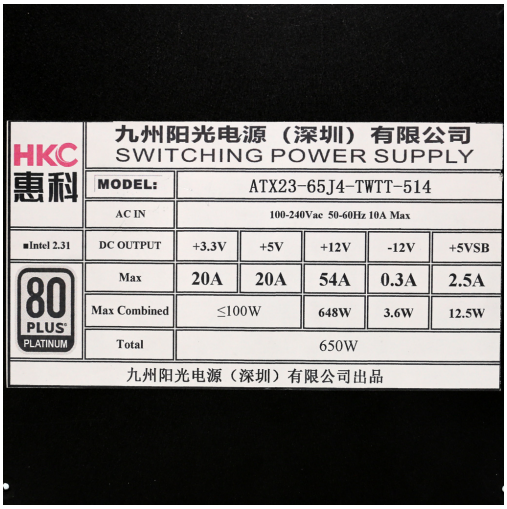
Thermaltake Toughpower GF1 650W

Top side



Power specifications table

CERTIFICATIONS 115V

CYBENETICS PLATINUM

CYBENETICS STANDARD++

CERTIFICATIONS 230V

CYBENETICS GOLD 230v

CYBENETICS STANDARD++ 230v

Aristeidis Bitziopoulos
Lab Director