thermaltake

Thermaltake Toughpower GF3 850W

Serial Number

Lab ID TT85002066

Certification ID 252066

Test Result Report ID: 22PS2066A

Certificate Issue Date: Sep 21, 2022

Scheme: ETA-EMI PSU

115V: CYBENETICS GOLD

230V: CYBENETICS GOLD 230v

Scheme: LAMBDA PSU

115V: CYBENETICS A-

230V: CYBENETICS A- 230v

CYBENETICS ATX 3.0 PASS

Outside Validation Scope

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 GF3 850W
OEM/ODM	CWT
Serial Number	
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10-5

Rated Frequency (Hz)	50-60
Rated Power (W)	850
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	135mm Fluid Dynamic Bearing Fan (HA13525H12SF-Z)
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	TT85002066
Date of receipt	Sep 1, 2022
Testing Date	Sep 21, 2022
Report Issued Date	Sep 21, 2022
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	16AWG	No
4+4 pin EPS12V (700mm)	1	1	16AWG	No
8 pin EPS12V (700mm)	1	1	16AWG	No
6+2 pin PCIe (500mm+150mm)	2	4	16-18AWG	No
12+4 pin PCIe (610mm) (300W)	1	1	16-24AWG	No
SATA (500mm+150mm+150mm+150mm)	3	12	18AWG	No
4-pin Molex (500mm+150mm+150mm+150mm)	1	4	18AWG	No

FDD Adapter (100mm)	1	1	22AWG	No

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	22	22	70.8	3	0.3
	Watts	120		849.6	15	3.6
Total Max. Power (W)		850				

Parts Description

General Data	-
Manufacturer (OEM)	CWT
Platform	CSZ
PCB Type	Double Sided
Primary Side	-
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	1x NTC Thermistor SCK-075 (7 Ohm) & Relay
Bridge Rectifier(s)	2x Yangjie Electronic GBU1506 (600V, 15A @ 100°C)
APFC MOSFETs	2x STMicroelectronics STF33N60M2 (600V, 16A @ 100°C, Rds(on): 0.125Ohm)
APFC Boost Diode	1x On Semiconductor FFSP0865A (650V, 8A @ 155°C)
Bulk Cap(s)	1x Rubycon (420V, 680uF, 2,000h @ 105°C, MXE)
Main Switchers	2x On Semiconductor
APFC Controller	Champion CM6500UNX & CM03X
Resonant Controller	Champion CU6901VAC
Topology	Primary side: APFC, Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	6x International Rectifier IRFH7004PbF (40V, 164A @ 100°C, Rds(on): 1.4mOhm)
5V & 3.3V	DC-DC Converters: 2x UBIQ QN3107M6N (30V, 70A @ 100°C, Rds(on): 2.6mOhm) & 2x UBIQ QM3054M6 (30V, 61A @ 100°C, Rds(on): 4.8mOhm) PWM Controller(s): uPI-Semi uP3861P
Filtering Capacitors	Electrolytic: 3x Nichicon (2-5,000h @ 105°C, HD), 4x Nichicon (4-10,000h @ 105°C, HE), 1x Rubycon (2-10,000h @ 105°C, YXF), 1x Nippon Chemi-Con (4-10,000h @ 105°C, KY), 1x Nippon Chemi-Con (4-10,000h @ 105°C, KYA) Polymer: 10x Elite, 6x APAQ, 8x CapXon, 4x NIC

Supervisor IC	Weltrend WT7502R
Fan Controller	Microchip PIC16F1503
Fan Model	Hong Hua HA13525H12SF-Z (135mm, 12V, 0.5A, Fluid Dynamic Bearing Fan)
5VSB Circuit	-
Rectifier	1x PS1045L SBR (45V, 10A)
Standby PWM Controller	On-Bright OB2365T

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	✓
ALPM (Alternative Low Power Mode) compatible	✓
ATX v3.0 Compliance	✓

Performance Summary

115V

Accredited	
Average Efficiency (>1450 load combinations)	87.903%
Average Noise Output (>1450 Load Combinations)	29.81dBA
Average PF (>1450 Load Combinations)	0.990
Efficiency With 10W (≤500W) or 2% (>500W) Load	74.570%
Standby Power Consumption	0.0185W
Non-Accredited	
12V Ripple (Full Load)	18.97mV
5V Ripple (Full Load)	11.14mV
3.3V Ripple (Full Load)	10.78mV
5VSB Ripple (Full Load)	8.29mV

12V Load Regulation	1.16%
5V Load Regulation	0.72%
3.3V Load Regulation	1.10%
5VSB Load Regulation	1.43%
Inrush Current	24.440A

230V

Accredited		
Average Efficiency (>1450 load combinations)	89.948%	
Average Noise Output (>1450 Load Combinations)	29.87dBA	
Average PF (>1450 Load Combinations)	0.963	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.0807W	
Non-Accredited		
12V Ripple (Full Load)	20.48mV	
5V Ripple (Full Load)	11.32mV	
3.3V Ripple (Full Load)	10.31mV	
5VSB Ripple (Full Load)	7.59mV	
12V Load Regulation	1.23%	
5V Load Regulation	0.70%	
3.3V Load Regulation	1.11%	
5VSB Load Regulation	1.41%	
Inrush Current	47.190A	
12V Transient Response (200%)	11.42V	
5V Transient Response (200%)	4.898V	
3.3V Transient Response (200%)	3.160V	
5VSB Transient Response (200%)	5.027V	
Hold-Up Time & PWR_OK Signal	17.20ms	
AC Loss to PWR_OK Hold Up Time	15.50ms	
PWR_OK Inactive to DC Loss Delay	1.70ms	
PSU Timings: T1 (20% / 100%)	62.0ms	63.0ms
PSU Timings: T3 (20% / 100%)	126.0ms	126.0ms

OPP (27.63°C / 42.72°C)	124.81%	124.81%

Hold-Up Time & PWR_OK Signal

Hold-Up Time (ms)	17.2
AC Loss to PWR_OK Hold Up Time (ms)	15.5
PWR_OK Inactive to DC Loss Delay (ms)	1.7

Stromverbrauch im Ruhezustand

Tables

115V

Detailed Results						
	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	114.93 V	114.88 V	113.85 V	114.97 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	1.418	1.490	PASS
Mains Voltage THD:	0.14 %	0.12 %	N/A	0.19 %	2.00 %	PASS
Real Power:	0.019 W	0.016 W	N/A	0.020 W	N/A	N/A
Apparent Power:	10.144 W	10.123 W	N/A	10.163 W	N/A	N/A
Power Factor:	0.002	N/A	N/A	N/A	N/A	N/A

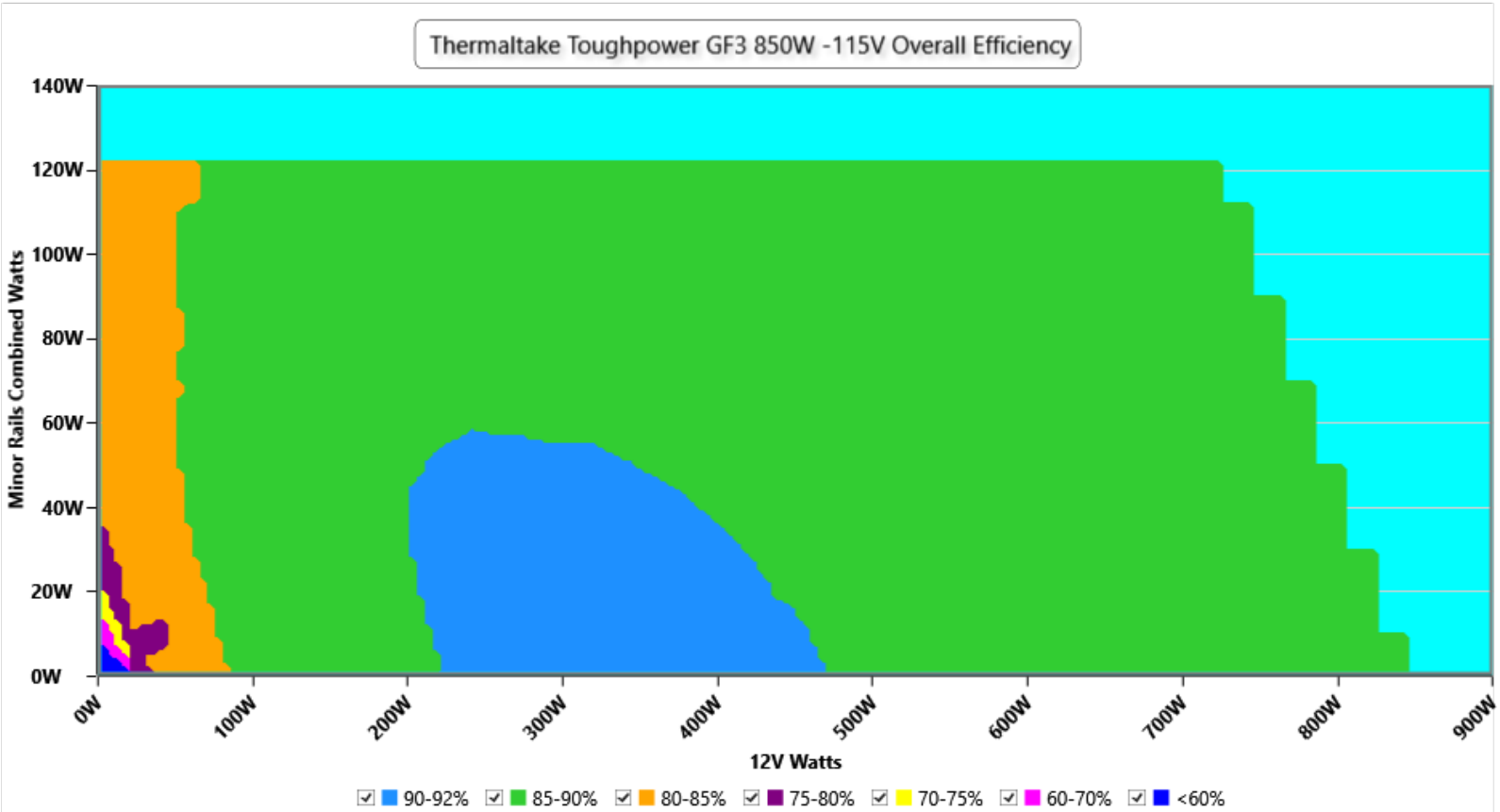
230V

Detailed Results						
	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	229.88 V	229.83 V	227.70 V	229.94 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 %	0.15 %	N/A	0.19 %	2.00 %	PASS

Real Power:	0.081 W	0.071 W	N/A	0.094 W	N/A	N/A
Apparent Power:	34.177 W	34.156 W	N/A	34.199 W	N/A	N/A
Power Factor:	0.002	N/A	N/A	N/A	N/A	N/A

Efficiency Graph

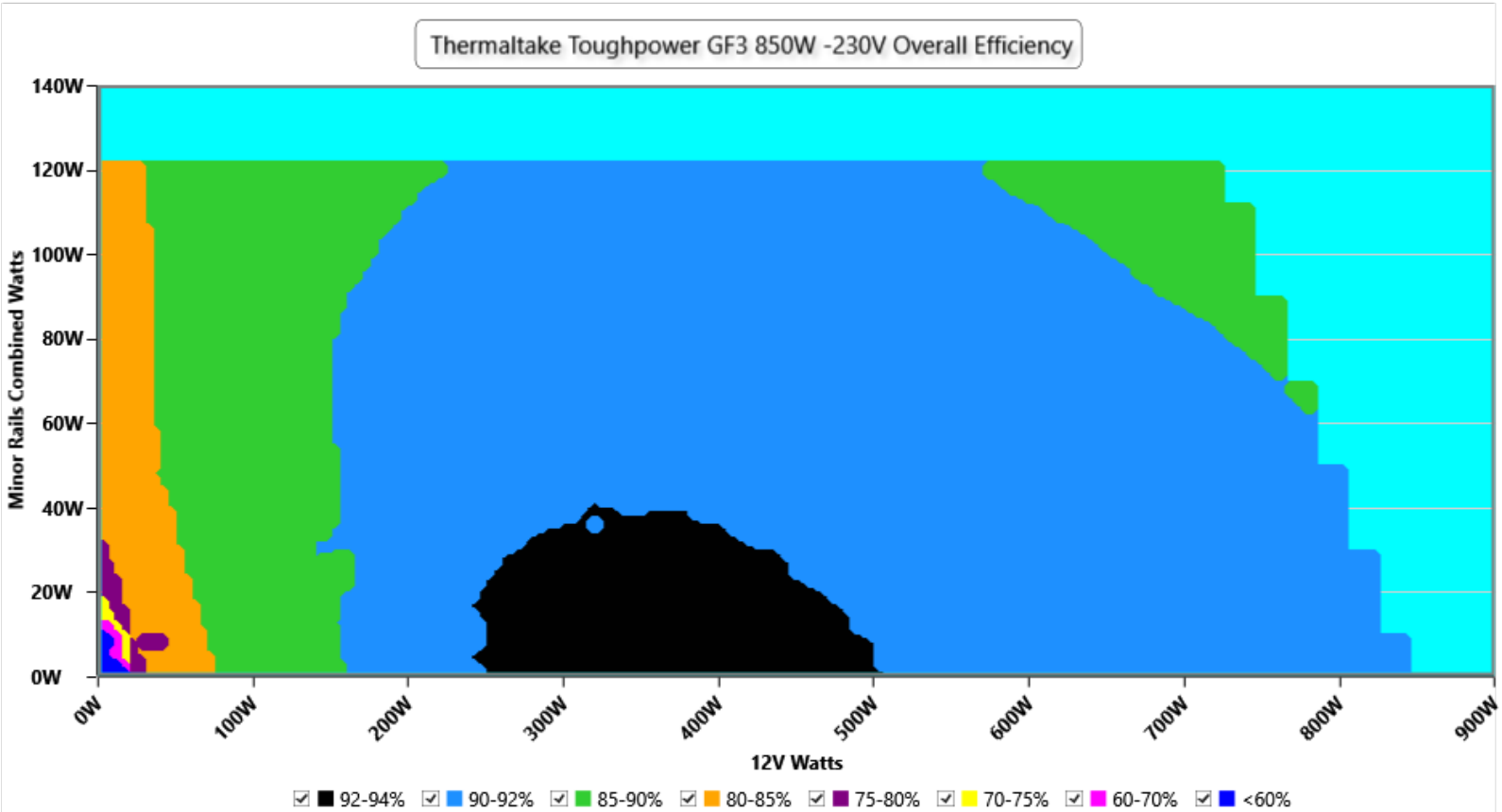
115V



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



INFO

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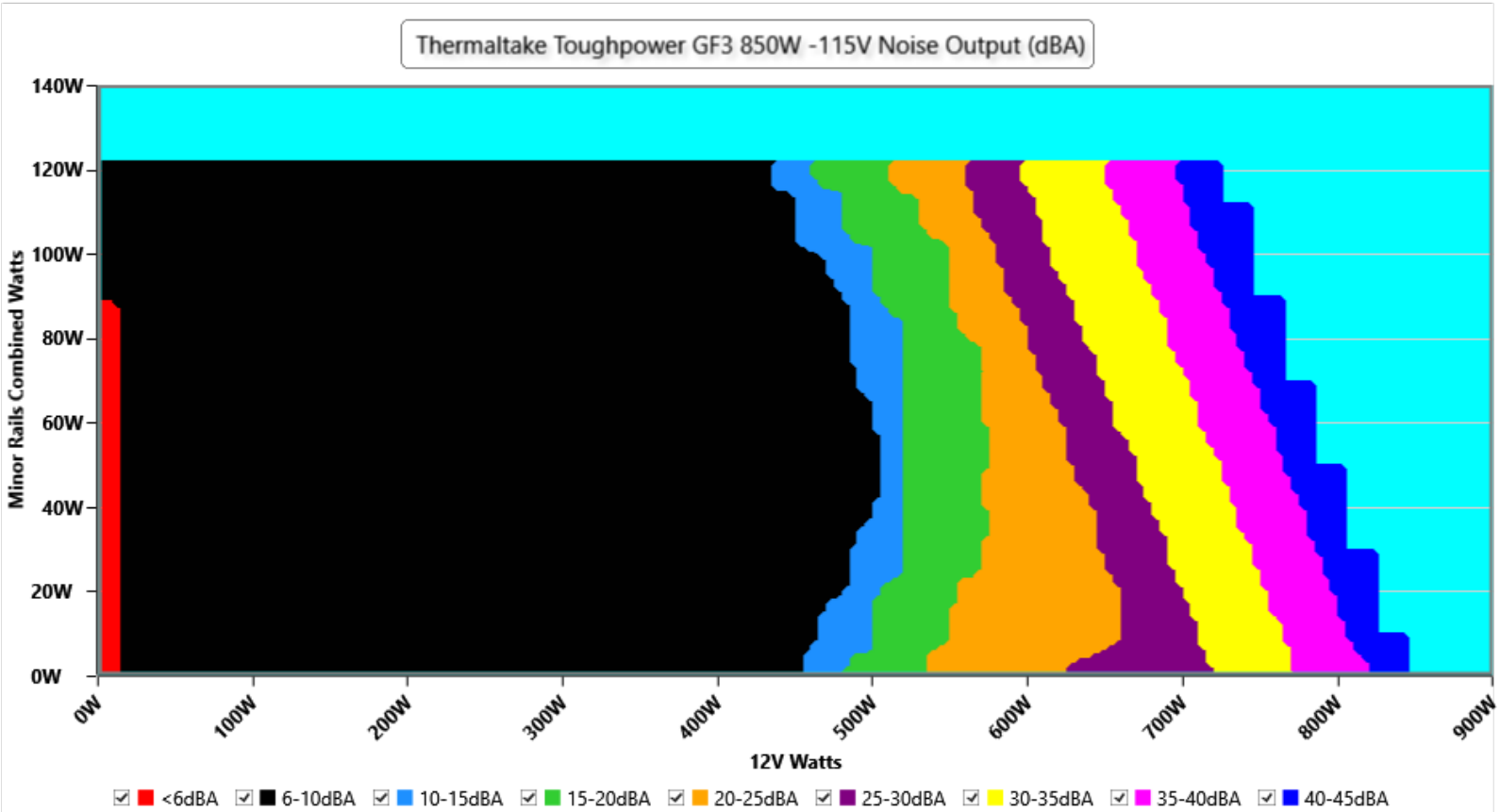
Noise Graph

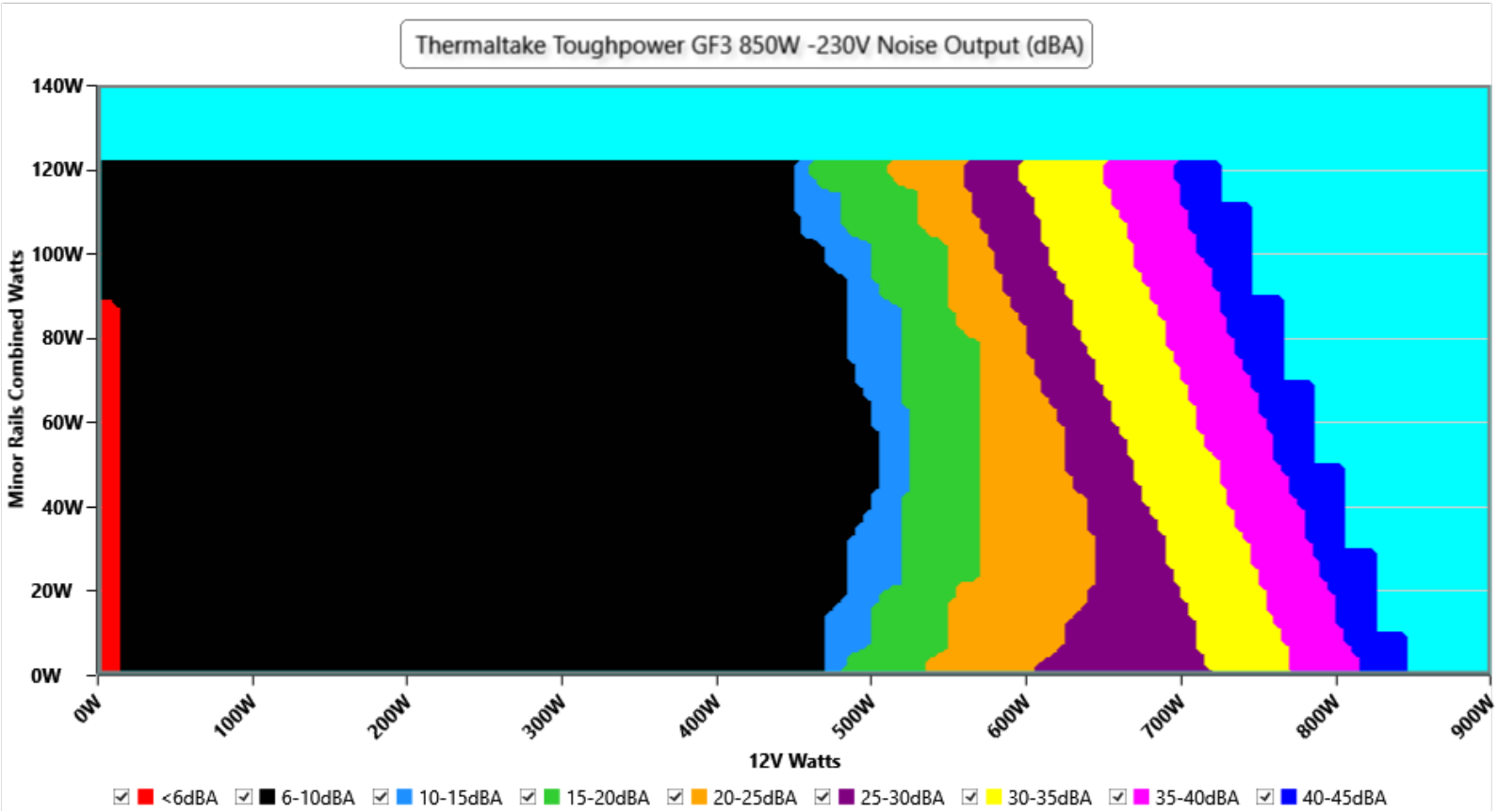
115V



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

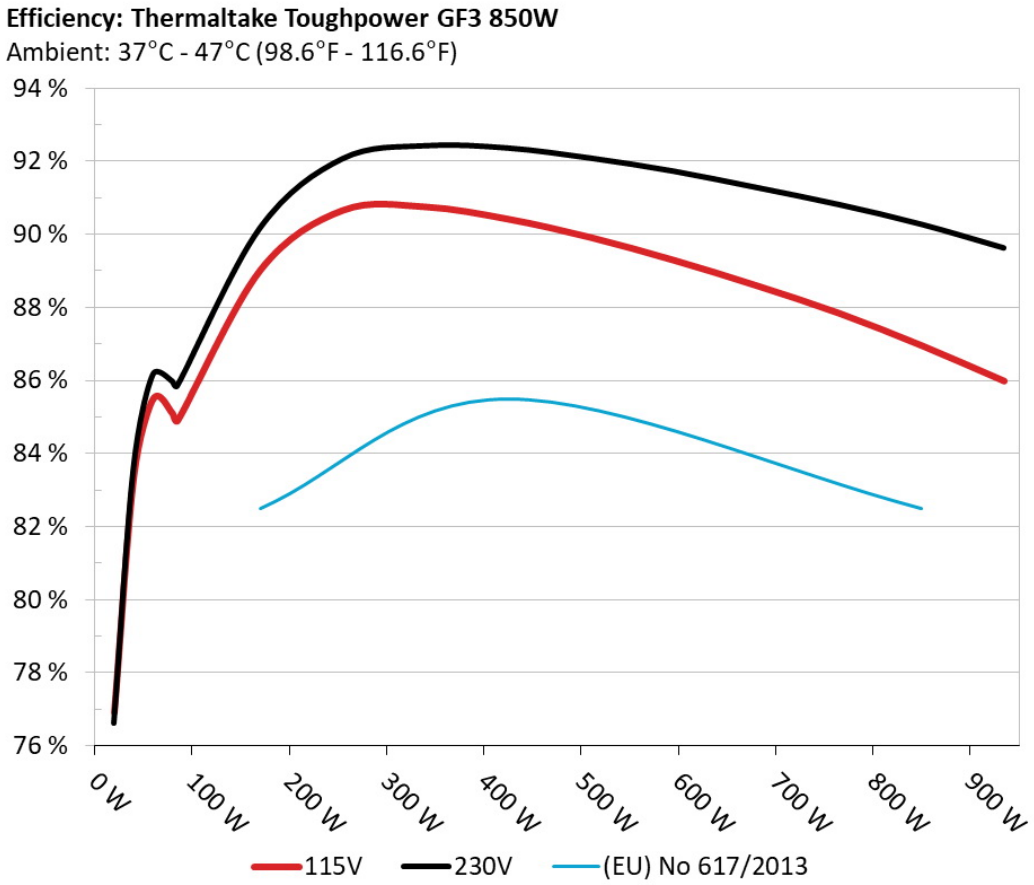


INFO

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

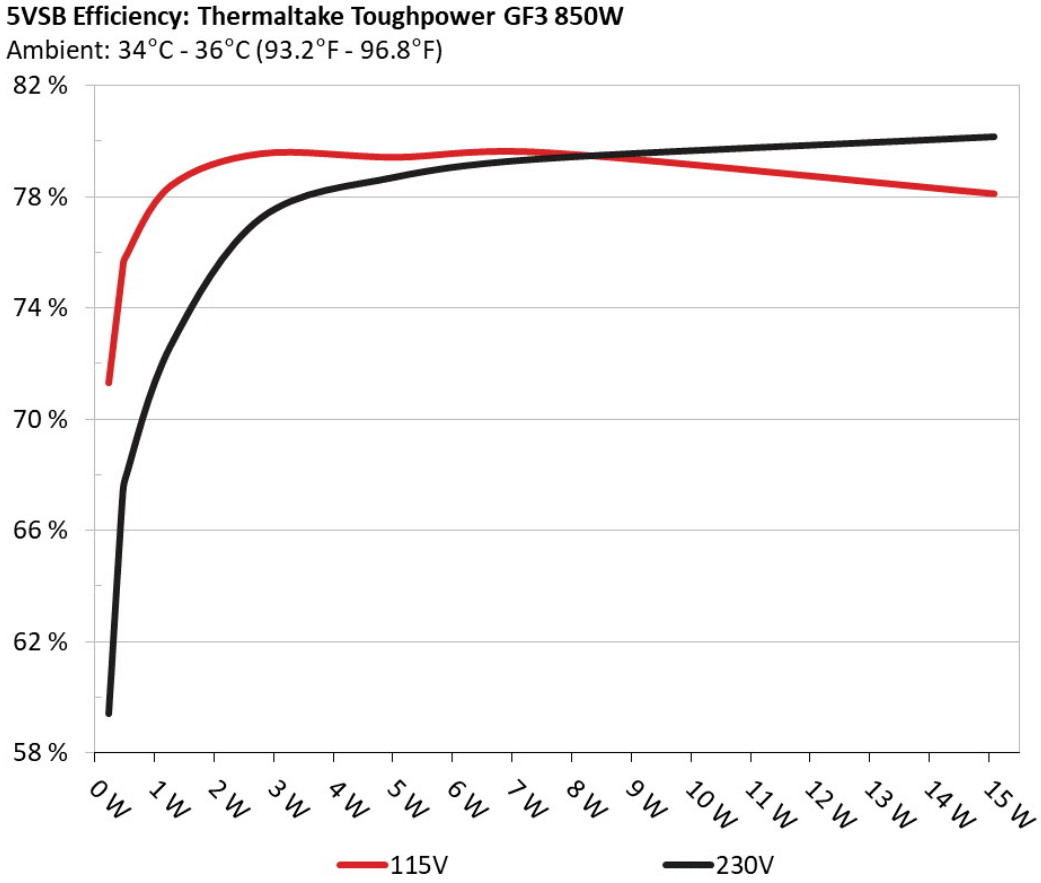
Efficiency under high ambient temperature



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	0.229W	71.291%	0.031
	5.081V	0.321W		114.93V
2	0.09A	0.457W	75.299%	0.059
	5.081V	0.607W		114.93V
3	0.55A	2.791W	79.556%	0.268
	5.073V	3.508W		114.93V
4	1A	5.066W	79.426%	0.36
	5.065V	6.378W		114.93V
5	1.5A	7.585W	79.592%	0.421
	5.056V	9.53W		114.93V
6	3.001A	15.092W	78.111%	0.497
	5.03V	19.321W		114.92V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.229W	59.403%	0.011
	5.081V	0.387W		229.89V
2	0.09A	0.457W	67.116%	0.02
	5.08V	0.681W		229.89V
3	0.55A	2.791W	77.245%	0.101
	5.073V	3.614W		229.88V
4	1A	5.065W	78.719%	0.168
	5.065V	6.434W		229.88V
5	1.5A	7.585W	79.379%	0.228
	5.056V	9.555W		229.88V
6	3A	15.092W	80.159%	0.328
	5.03V	18.828W		229.88V

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
10%	5.244A	1.99A	2.01A	0.989A	85.015	84.401%	0	<6.0	44.77°C	0.979
	12.094V	5.025V	3.284V	5.056V	100.724				40.41°C	114.91V
20%	11.498A	2.987A	3.019A	1.189A	169.975	88.519%	0	<6.0	45.58°C	0.99
	12.095V	5.022V	3.28V	5.047V	192.023				40.87°C	114.89V
30%	18.096A	3.487A	3.525A	1.368A	254.994	90.163%	0	<6.0	46.89°C	0.994
	12.100V	5.02V	3.277V	5.119V	282.819				41.57°C	114.87V
40%	24.744A	3.987A	4.032A	1.564A	340.096	90.256%	418	7.8	41.84°C	0.991
	12.079V	5.017V	3.274V	5.115V	376.812				47.89°C	114.85V
50%	31.025A	4.986A	5.045A	1.762A	425.107	89.92%	418	7.8	42.18°C	0.991
	12.074V	5.015V	3.271V	5.108V	472.757				48.63°C	114.83V
60%	37.269A	5.985A	6.059A	1.961A	509.623	89.419%	624	17.0	42.96°C	0.992
	12.069V	5.013V	3.268V	5.1V	569.925				49.99°C	114.8V
70%	43.582A	6.986A	7.075A	2.161A	594.932	88.797%	829	26.4	43.15°C	0.993
	12.065V	5.011V	3.266V	5.092V	669.985				50.71°C	114.79V
80%	49.903A	7.987A	8.091A	2.262A	679.78	88.103%	1021	32.8	43.87°C	0.994
	12.061V	5.01V	3.263V	5.085V	771.582				52.06°C	114.75V
90%	56.622A	8.489A	8.588A	2.364A	765.213	87.34%	1394	41.6	44.68°C	0.995
	12.056V	5.008V	3.26V	5.078V	876.131				54.03°C	114.74V
100%	63.069A	8.992A	9.117A	2.963A	850.026	86.454%	1684	47.1	45.98°C	0.995
	12.055V	5.006V	3.258V	5.063V	983.212				55.99°C	114.71V
110%	69.421A	9.995A	10.231A	2.966A	934.602	85.484%	1928	50.1	46.91°C	0.996
	12.047V	5.004V	3.255V	5.058V	1093.306				57.82°C	114.68V
CL1	0.116A	14.412A	14.57A	0A	121.33	82.161%	442	8.3	42.08°C	0.988
	12.107V	5.011V	3.274V	5.061V	147.672				48.53°C	114.89V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
CL2	0.116A	21.944A	0A	0A	111.428	80.589%	445	8.3	43.01°C	0.987
	12.109V	5.014V	3.289V	5.068V	138.267				50.09°C	114.9V
CL3	0.116A	0A	22.225A	0A	73.991	75.34%	424	7.9	44.43°C	0.978
	12.112V	5.03V	3.266V	5.063V	98.214				52.47°C	114.91V
CL4	70.572A	0A	0A	0A	849.791	87.157%	1537	44.2	45.78°C	0.995
	12.042V	5.03V	3.271V	5.122V	975.014				55.73°C	114.7V

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
10%	5.245A	1.99A	2.01A	0.989A	85.012	85.344%	0	<6.0	44.33°C	0.853
	12.089V	5.025V	3.284V	5.056V	99.608				40.02°C	229.88V
20%	11.502A	2.987A	3.019A	1.189A	169.974	89.658%	0	<6.0	45.65°C	0.942
	12.091V	5.022V	3.28V	5.047V	189.584				40.67°C	229.87V
30%	18.101A	3.486A	3.524A	1.368A	254.997	91.563%	0	<6.0	46.53°C	0.965
	12.096V	5.02V	3.277V	5.118V	278.497				41.23°C	229.86V
40%	24.755A	3.987A	4.032A	1.564A	340.123	91.919%	417	10.4	41.72°C	0.976
	12.075V	5.017V	3.274V	5.115V	370.029				47.74°C	229.84V
50%	31.032A	4.986A	5.045A	1.762A	425.12	91.854%	418	7.8	42.13°C	0.981
	12.072V	5.015V	3.271V	5.107V	462.822				48.58°C	229.83V
60%	37.272A	5.985A	6.059A	1.961A	509.651	91.58%	639	17.8	42.52°C	0.984
	12.069V	5.013V	3.268V	5.099V	556.507				49.55°C	229.83V
70%	43.592A	6.986A	7.076A	2.161A	594.968	91.222%	829	26.4	43.17°C	0.985
	12.063V	5.012V	3.266V	5.091V	652.226				50.86°C	229.82V
80%	49.916A	7.988A	8.092A	2.263A	679.823	90.778%	1026	32.9	43.93°C	0.987
	12.058V	5.01V	3.263V	5.084V	748.887				52.02°C	229.81V
90%	56.639A	8.489A	8.589A	2.364A	765.256	90.308%	1377	41.3	45.44°C	0.988
	12.054V	5.008V	3.26V	5.078V	847.382				54.54°C	229.8V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
100%	63.101A	8.992A	9.119A	2.964A	850.065	89.766%	1686	47.1	46.4°C	0.988
	12.049V	5.007V	3.257V	5.062V	946.976				56.57°C	229.79V
110%	69.433A	9.995A	10.232A	2.967A	934.653	89.121%	2002	51.1	47.41°C	0.989
	12.045V	5.004V	3.254V	5.057V	1048.748				58.31°C	229.77V
CL1	0.116A	14.41A	14.571A	0A	121.334	83.218%	453	8.5	42.16°C	0.914
	12.109V	5.012V	3.274V	5.061V	145.803				48.64°C	229.87V
CL2	0.116A	21.948A	0A	0A	111.432	81.534%	421	7.9	43.31°C	0.905
	12.117V	5.013V	3.288V	5.068V	136.669				50.41°C	229.87V
CL3	0.115A	0A	22.23A	0A	73.988	75.97%	420	7.9	44.83°C	0.848
	12.114V	5.026V	3.265V	5.062V	97.39				52.98°C	229.88V
CL4	70.556A	0A	0A	0A	849.661	90.519%	1392	41.6	45.97°C	0.988
	12.043V	5.029V	3.271V	5.122V	938.649				55.93°C	229.79V

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])	Temps (In/Out)	PF/AC Volts
20W	1.242A	0.496A	0.501A	0.197A	20.01	76.407%	0	<6.0	40.12°C	0.834
	11.961V	5.042V	3.294V	5.075V	26.191				37.01°C	114.93V
40W	2.732A	0.694A	0.701A	0.296A	40.01	82.884%	0	<6.0	41.07°C	0.938
	11.967V	5.041V	3.293V	5.072V	48.272				37.61°C	114.93V
60W	4.220A	0.894A	0.904A	0.395A	60.011	85%	0	<6.0	42.32°C	0.964
	11.974V	5.031V	3.287V	5.069V	70.601				38.55°C	114.92V
80W	5.653A	1.094A	1.105A	0.494A	79.974	84.591%	0	<6.0	43.07°C	0.978
	12.090V	5.028V	3.285V	5.066V	94.546				39.11°C	114.92V

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
20W	1.243A	0.496A	0.501A	0.197A	20.002	76.113%	0	<6.0	40.19°C	0.434
	11.948V	5.042V	3.293V	5.076V	26.278				37.1°C	229.9V
40W	2.735A	0.694A	0.702A	0.296A	40.003	83.082%	0	<6.0	40.81°C	0.646
	11.954V	5.041V	3.292V	5.073V	48.149				37.45°C	229.89V
60W	4.224A	0.895A	0.904A	0.395A	60.004	85.653%	0	<6.0	41.74°C	0.763
	11.961V	5.03V	3.286V	5.069V	70.055				38.2°C	229.89V
80W	5.657A	1.094A	1.105A	0.494A	79.963	85.475%	0	<6.0	42.19°C	0.84
	12.078V	5.027V	3.284V	5.066V	93.554				38.4°C	229.89V

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Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	4.91mV	8.43mV	6.19mV	4.97mV	Pass
20% Load	5.58mV	8.22mV	6.09mV	5.17mV	Pass
30% Load	17.83mV	7.46mV	6.39mV	6.60mV	Pass
40% Load	14.30mV	7.61mV	6.54mV	6.81mV	Pass
50% Load	13.53mV	7.97mV	7.01mV	5.78mV	Pass
60% Load	12.81mV	8.07mV	7.31mV	6.45mV	Pass
70% Load	12.56mV	10.06mV	12.88mV	6.96mV	Pass
80% Load	12.35mV	11.90mV	14.37mV	7.42mV	Pass
90% Load	12.41mV	9.65mV	9.41mV	8.03mV	Pass
100% Load	18.97mV	11.14mV	10.78mV	8.29mV	Pass
110% Load	19.91mV	11.38mV	11.01mV	9.00mV	Pass
Crossload1	13.62mV	10.39mV	8.88mV	9.53mV	Pass
Crossload2	13.41mV	12.61mV	7.21mV	10.08mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
Crossload3	6.04mV	6.23mV	10.53mV	8.85mV	Pass
Crossload4	16.68mV	9.35mV	8.77mV	10.46mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	5.32mV	8.33mV	5.68mV	4.50mV	Pass
20% Load	5.48mV	7.82mV	6.03mV	4.61mV	Pass
30% Load	18.30mV	7.86mV	6.49mV	6.34mV	Pass
40% Load	14.51mV	7.51mV	6.29mV	5.37mV	Pass
50% Load	13.63mV	7.81mV	7.11mV	5.27mV	Pass
60% Load	13.38mV	7.97mV	7.31mV	6.04mV	Pass
70% Load	13.33mV	11.59mV	12.73mV	6.65mV	Pass
80% Load	13.94mV	11.75mV	14.32mV	6.76mV	Pass
90% Load	14.30mV	9.55mV	9.36mV	7.27mV	Pass
100% Load	20.48mV	11.32mV	10.31mV	7.59mV	Pass
110% Load	20.94mV	11.96mV	10.81mV	8.13mV	Pass
Crossload1	14.60mV	10.71mV	9.72mV	9.18mV	Pass
Crossload2	14.89mV	12.26mV	7.36mV	9.52mV	Pass
Crossload3	5.78mV	6.49mV	11.15mV	8.80mV	Pass
Crossload4	17.86mV	9.83mV	9.05mV	9.74mV	Pass

The results above are not used in the certification process

Thermaltake Toughpower GF3 850W

Top side

Power specifications label

Cybenetics bietet freiwillige Zertifizierungsprogramme für Netzteile – ETA für Effizienz, LAMBDA für Lautstärke und SAFE für Sicherheit und korrekten Betrieb – sowie für Kühlprodukte mit DELTA für die Schalldämmung von Gehäusen und PHI für Luftstrom und statischen Druck von Lüftern

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