Thermaltake Toughpower PF3 850W

Serial Number PSTPD0850FNFAPU3PD000098

Lab ID TT85002267

Certification ID 252267

Test Result Report ID: 23PS2267A

Certificate Issue Date: Oct 24, 2023

Scheme: ETA-EMI PSU

115V

230V

Scheme: LAMBDA PSU

115V

230V

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 PF3 850W
OEM/ODM	HKC
Serial Number	PSTPD0850FNFAPU3PD000098
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10

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	120mm Fluid Dynamic Bearing Fan [TT-1225 (BDK12025MS)]
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	TT85002267
Date of receipt	Sep 23, 2023
Testing Date	Oct 23, 2023
Report Issued Date	Oct 24, 2023
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 (650mm+150mm)	1	2	18AWG	No
6+2 pin PCIe (500mm+150mm)	2	4	18AWG	No
12+4 pin PCIe (590mm) (450W)	1	1	18-26AWG	No
SATA (500mm+145mm+145mm+145mm)	2	8	18AWG	No
4-pin Molex (500mm+150mm+150mm+150mm)	1	4	18AWG	No
FDD Adapter (150mm)	1	1	22AWG	No

AC Power Cord (1380mm) - C13 coupler	1	1	16AWG	-	

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	70.8	3	0.3
	Watts	100		849.6	15	3.6
Total Max. Power (W)		850				

Parts Description

General Data	-
Manufacturer (OEM)	HKC
PCB Type	Double-Sided
Primary Side	-
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	1x NTC Thermistor 5D-15 (5 Ohm @ 25°C) & Relay
Bridge Rectifier(s)	2x no info
APFC MOSFETs	2x WayOn WML36N60F2 (650V, 20A @ 100°C, Rds(on): 0.11Ohm)
APFC Boost Diode	1x P3D0601012
Bulk Cap(s)	2x Rubycon (420V, 390uF each or 780uF combined, 3000h @ 105°C, MXK)
Main Switchers	4x Ncepower NCE65TF130F (650V, 18A @ 100°C, Rds(on): 0.13Ohm)
APFC Controller	Champion CH6502UHHX
Resonant Controller	Champion CU6901VPA
Topology	Primary side: APFC, Full-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	8x
5V & 3.3V	DC-DC Converters: 2x PWM Controller(s): ANPEC APW7159C
Filtering Capacitors	Electrolytic: 5x Nippon Chemi-Con (2-5,000 @ 105°C, KZE), 2x Nippon Chemi-Con (4-10,000 @ 105°C, KYA) Polymer: 35x no info
Supervisor IC	Weltrend WT7527RA
Fan Model	TT-1225 BDK12025MS (120mm, 12V, 0.30A, Fluid Dynamic Bearing Fan)

5VSB Circuit	-
Rectifier	PJ1256
Standby PWM Controller	PN8141

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)	90.769%
Average Noise Output (>1450 Load Combinations)	27.36dBA
Average PF (>1450 Load Combinations)	0.978
Efficiency With 10W (≤500W) or 2% (>500W) Load	69.244%
Standby Power Consumption	0.0513W
Non-Accredited	
12V Ripple (Full Load)	19.24mV
5V Ripple (Full Load)	10.46mV
3.3V Ripple (Full Load)	16.27mV
5VSB Ripple (Full Load)	20.16mV
12V Load Regulation	0.51%
5V Load Regulation	0.46%
3.3V Load Regulation	0.81%
5VSB Load Regulation	2.42%

Inrush Current	33.260A

230V

Accredited		
Average Efficiency (>1450 load combinations)		92.105%
Average Noise Output (>1450 Load Combinations)		27.24dBA
Average PF (>1450 Load Combinations)		0.939
Efficiency With 10W (≤500W) or 2% (>500W) Load		68.289%
Standby Power Consumption		0.1406W
Non-Accredited		
12V Ripple (Full Load)		21.39mV
5V Ripple (Full Load)		10.40mV
3.3V Ripple (Full Load)		18.21mV
5VSB Ripple (Full Load)		18.72mV
12V Load Regulation		0.84%
5V Load Regulation		0.44%
3.3V Load Regulation		0.81%
5VSB Load Regulation		2.44%
Inrush Current		65.300A
12V Transient Response (200%)		11.49V
5V Transient Response (200%)		4.978V
3.3V Transient Response (200%)		3.225V
5VSB Transient Response (200%)		4.913V
Hold-Up Time & PWR_OK Signal		22.40ms
AC Loss to PWR_OK Hold Up Time		17.80ms
PWR_OK Inactive to DC Loss Delay		4.60ms
PSU Timings: T1 (20% / 100%)	93.0ms	93.0ms
PSU Timings: T3 (20% / 100%)	124.0ms	125.0ms
OPP (25.83°C / 40.25°C)	142.67%	136.20%

Hold-Up Time & PWR_OK Signal

Hold-Up Time (ms)	22.4
AC Loss to PWR_OK Hold Up Time (ms)	17.8
PWR_OK Inactive to DC Loss Delay (ms)	4.6

Vampire Power

Tables

115V

Detailed Results						
	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	114.87 V	114.82 V	113.85 V	114.93 V	116.15 V	PASS
Mains Frequency:	60.00 Hz	59.98 Hz	59.40 Hz	60.01 Hz	60.60 Hz	PASS
Mains Voltage CF:	1.419	1.417	1.340	1.422	1.490	PASS
Mains Voltage THD:	0.15 %	0.09 %	N/A	0.25 %	2.00 %	PASS
Real Power:	0.051 W	-0.003 W	N/A	0.087 W	N/A	N/A
Apparent Power:	8.845 W	8.817 W	N/A	8.890 W	N/A	N/A
Power Factor:	0.008	N/A	N/A	N/A	N/A	N/A

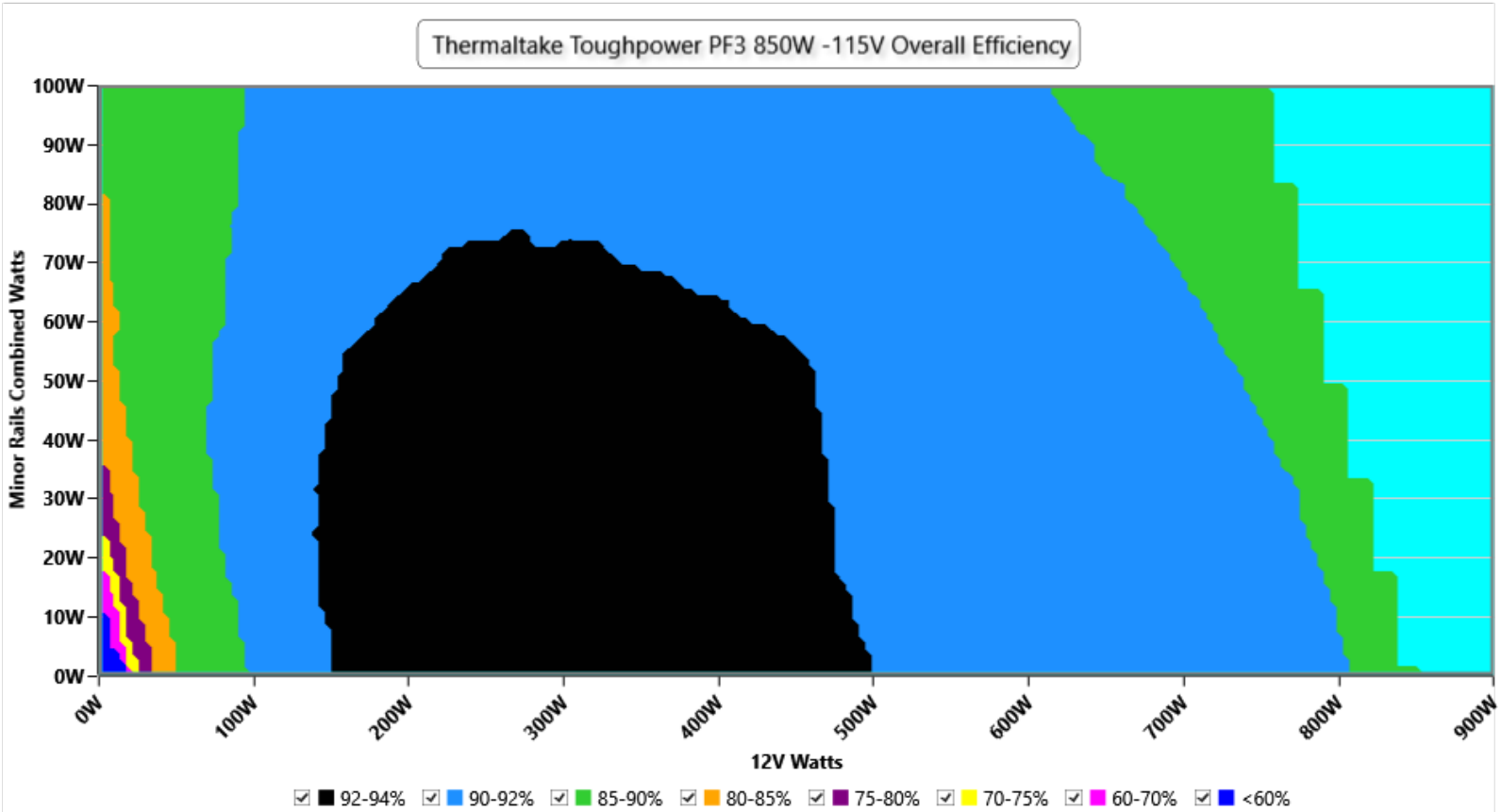
230V

Detailed Results						
	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	229.96 V	229.89 V	227.70 V	230.01 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:	1.417	1.416	1.340	1.419	1.490	PASS
Mains Voltage THD:	0.13 %	0.09 %	N/A	0.18 %	2.00 %	PASS
Real Power:	0.141 W	0.092 W	N/A	0.241 W	N/A	N/A
Apparent Power:	31.052 W	30.994 W	N/A	31.091 W	N/A	N/A

Power Factor:	0.003	N/A	N/A	N/A	N/A	N/A

Efficiency Graph

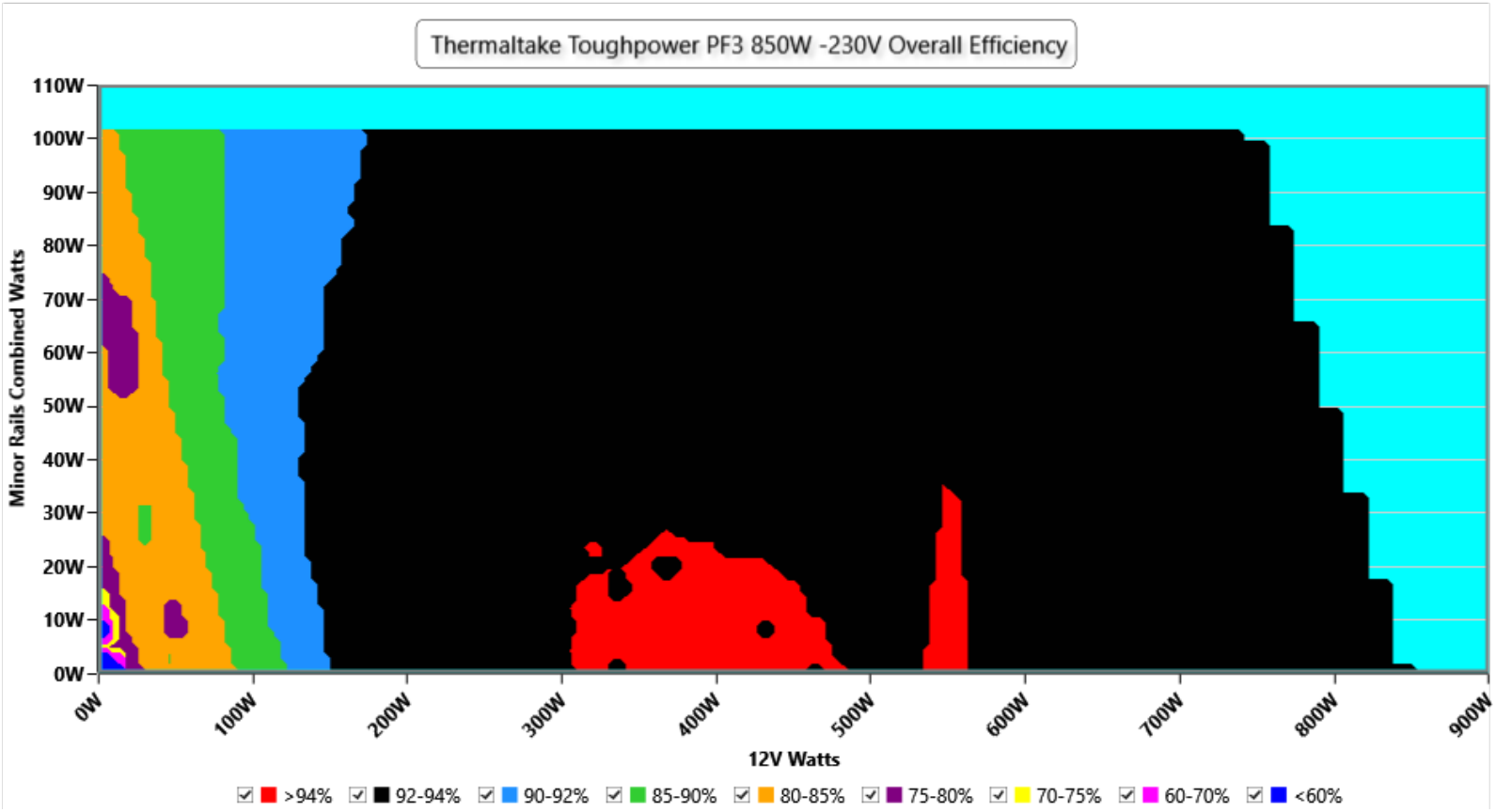
115V



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

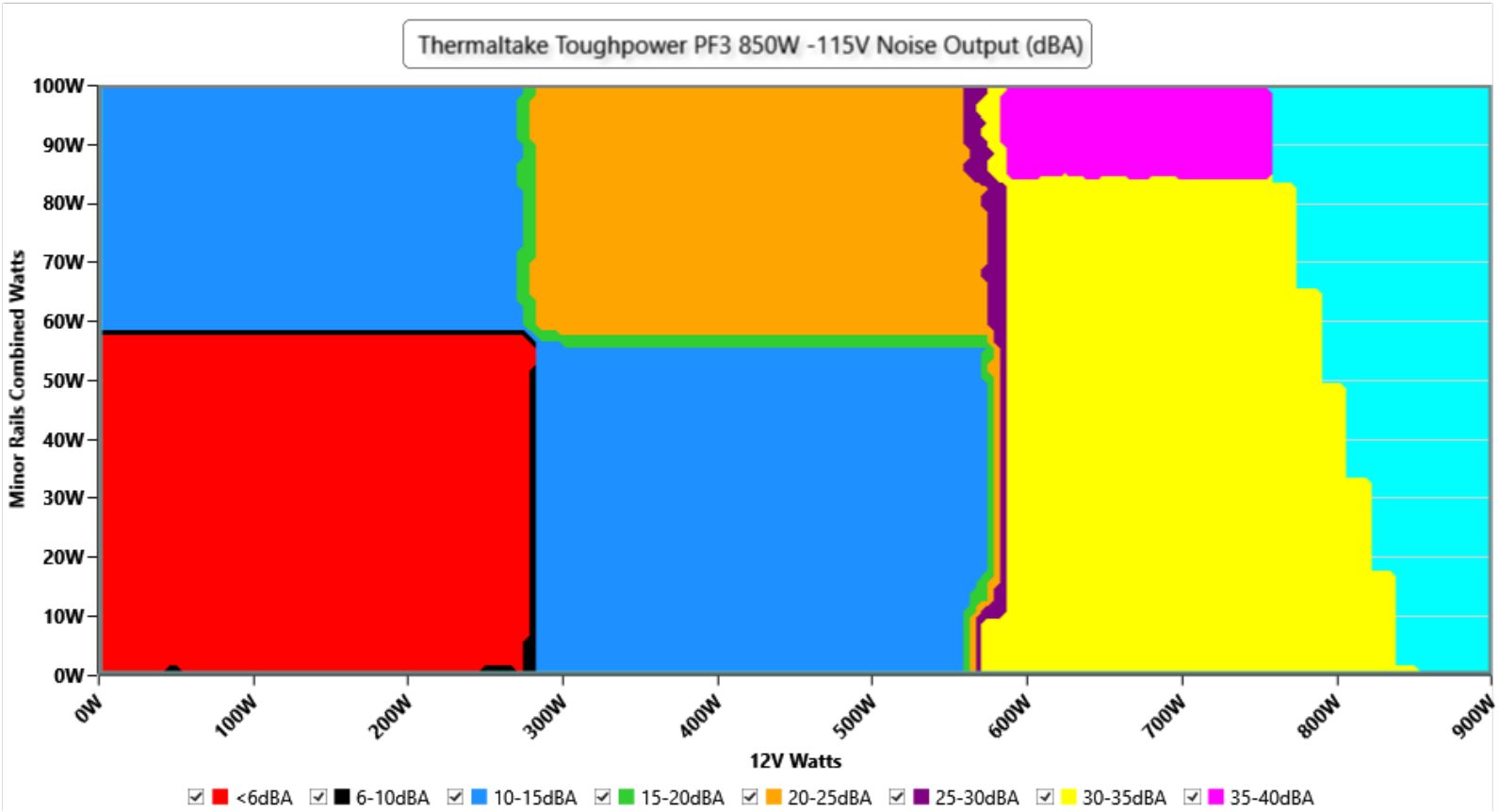


INFO

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

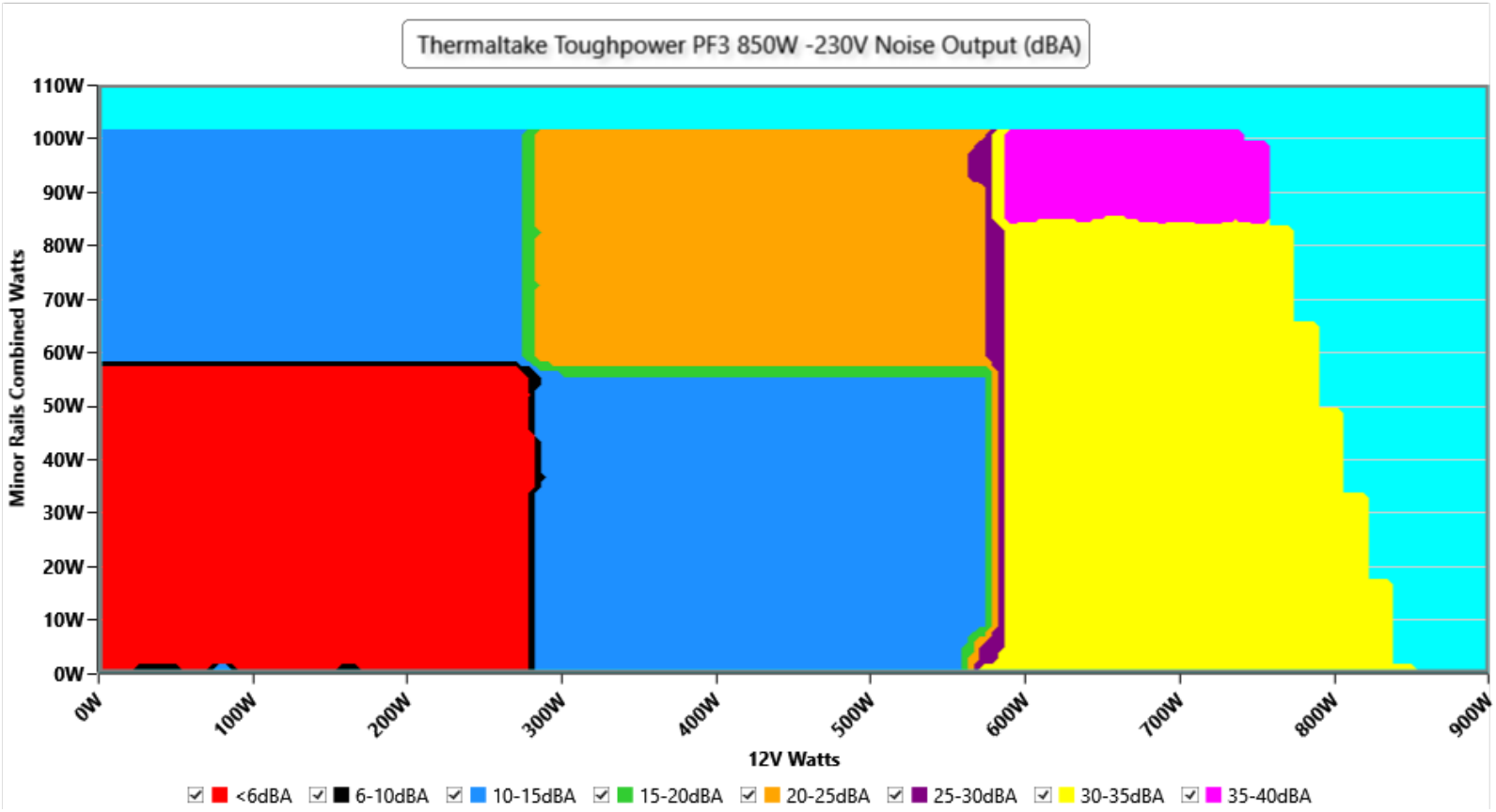
115V



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

230V

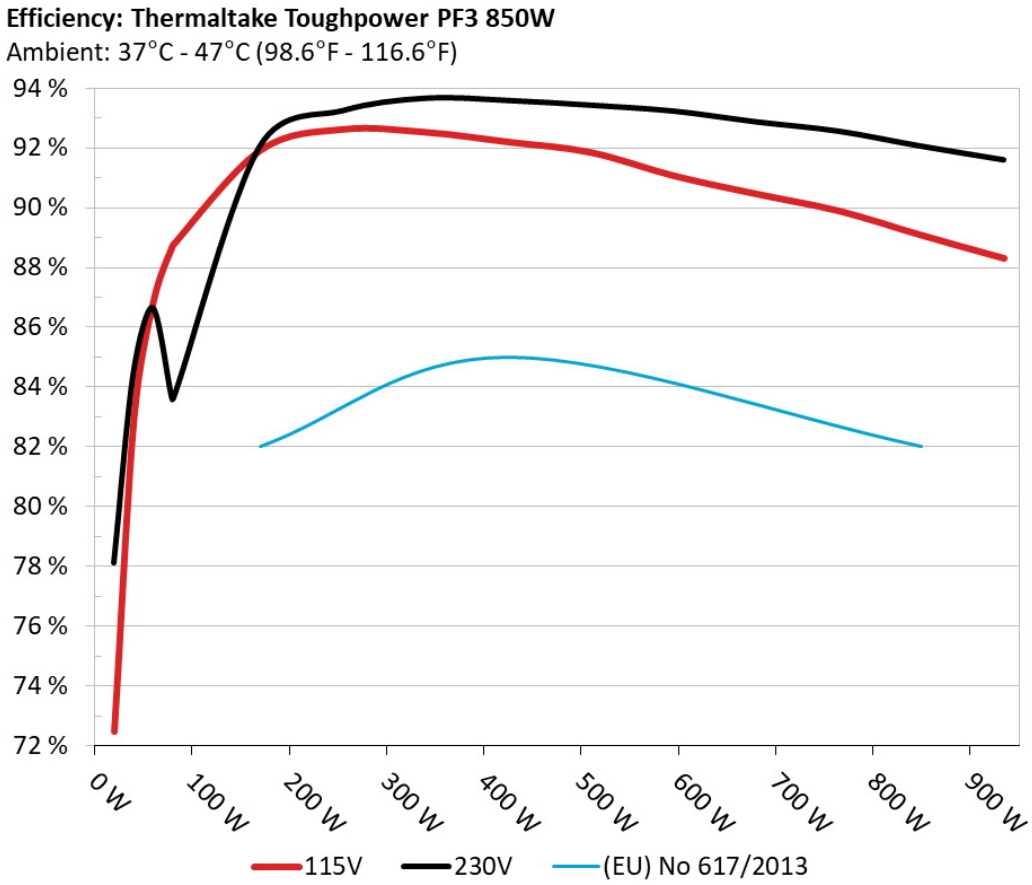


INFO

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

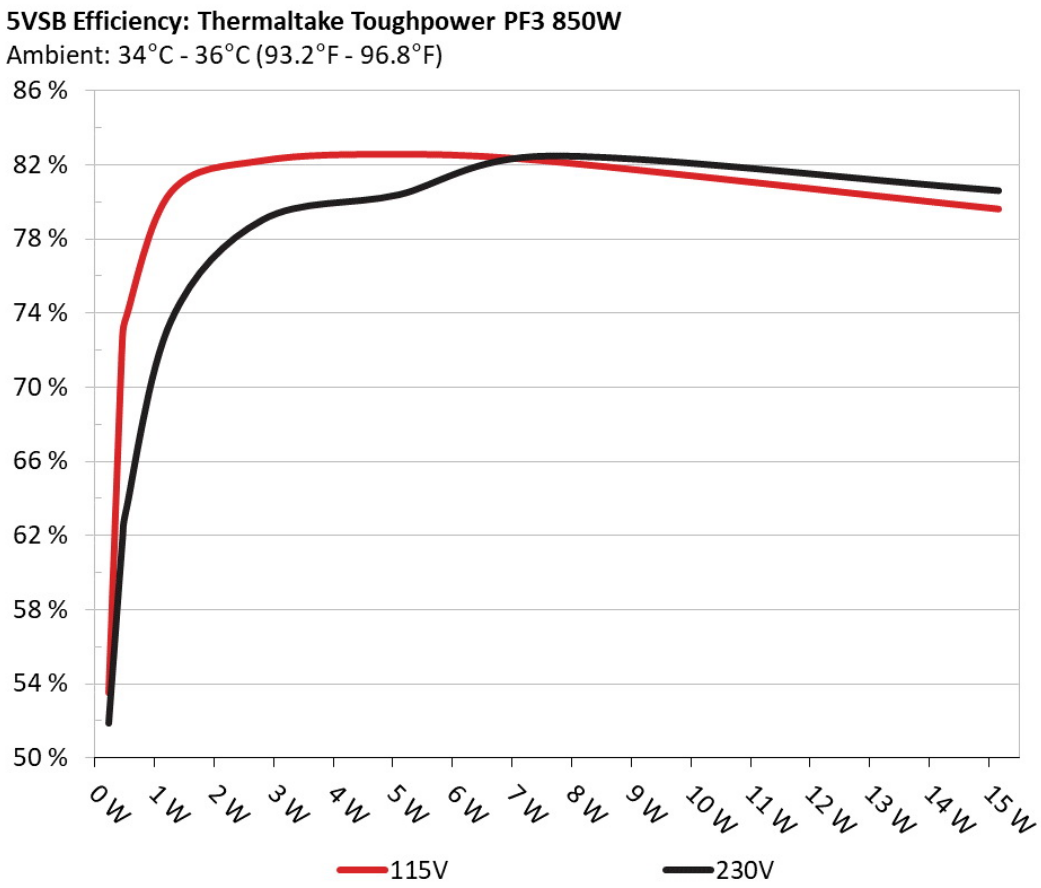
Efficiency under high ambient temperature



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	0.23W	53.036%	0.031
	5.115V	0.247W		114.87V
2	0.09A	0.46W	72.244%	0.079
	5.114V	0.637W		114.87V
3	0.55A	2.806W	81.716%	0.3
	5.104V	3.434W		114.87V
4	1A	5.094W	82.054%	0.374
	5.095V	6.208W		114.87V
5	1.5A	7.626W	81.678%	0.426
	5.085V	9.337W		114.87V
6	3A	15.162W	79.108%	0.491
	5.055V	19.167W		114.87V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.23W	51.398%	0.017
	5.113V	0.448W		229.94V
2	0.09A	0.46W	61.315%	0.028
	5.112V	0.751W		229.94V
3	0.55A	2.807W	78.543%	0.124
	5.103V	3.573W		229.94V
4	1A	5.094W	79.905%	0.199
	5.094V	6.375W		229.94V
5	1.5A	7.627W	81.996%	0.258
	5.084V	9.301W		229.94V
6	3A	15.163W	80.129%	0.346
	5.054V	18.924W		229.94V

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%	5.313A	1.983A	1.977A	0.982A	84.999	88.745%	0	<6.0	44.55°C	0.951
	11.932V	5.043V	3.338V	5.092V	95.781				40.27°C	114.84V
20%	11.649A	2.975A	2.968A	1.181A	169.923	91.927%	0	<6.0	45.38°C	0.97
	11.935V	5.041V	3.335V	5.082V	184.843				40.8°C	114.81V
30%	18.334A	3.472A	3.466A	1.38A	254.922	92.629%	0	<6.0	46.28°C	0.98
	11.938V	5.04V	3.333V	5.072V	275.207				41.21°C	114.78V
40%	25.016A	3.969A	3.964A	1.58A	340.003	92.533%	1064	24.1	41.95°C	0.982
	11.944V	5.039V	3.33V	5.061V	367.437				47.46°C	114.75V
50%	31.326A	4.964A	4.959A	1.782A	424.775	92.208%	1061	24.1	42.38°C	0.984
	11.948V	5.037V	3.328V	5.05V	460.67				48.38°C	114.72V
60%	37.606A	5.96A	5.955A	1.984A	509.296	91.86%	1058	24.0	42.75°C	0.984
	11.953V	5.034V	3.325V	5.04V	554.427				49.25°C	114.69V
70%	43.900A	6.958A	6.953A	2.187A	594.61	91.079%	1052	23.8	43.26°C	0.985
	11.970V	5.031V	3.322V	5.029V	652.853				50.27°C	114.66V
80%	50.223A	7.956A	7.952A	2.291A	679.45	90.468%	1652	37.2	43.85°C	0.986
	11.977V	5.028V	3.32V	5.02V	751.038				51.91°C	114.63V
90%	56.938A	8.454A	8.44A	2.394A	764.871	89.898%	1650	37.2	44.29°C	0.987
	11.985V	5.027V	3.317V	5.011V	850.824				53.38°C	114.59V
100%	63.375A	8.955A	8.959A	3.004A	849.724	89.082%	1645	37.2	45.11°C	0.988
	11.993V	5.025V	3.315V	4.992V	953.872				55.19°C	114.56V
110%	69.676A	9.953A	10.053A	3.009A	934.293	88.312%	1978	42.9	46.67°C	0.989
	11.999V	5.023V	3.312V	4.985V	1057.953				57.59°C	114.52V
CL1	0.117A	11.963A	11.922A	0A	101.286	86.052%	1059	24.0	40.51°C	0.958
	11.943V	5.032V	3.33V	5.105V	117.703				45.99°C	114.83V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
CL2	0.115A	19.882A	0A	0A	101.359	84.348%	1657	37.3	40.11°C	0.959
	11.939V	5.029V	3.339V	5.108V	120.17				47.14°C	114.83V
CL3	0.115A	0A	19.843A	0A	67.372	80.043%	1064	24.1	40.13°C	0.945
	11.931V	5.044V	3.326V	5.105V	84.171				49.18°C	114.84V
CL4	70.861A	0A	0A	0A	849.442	89.909%	1649	37.2	45.59°C	0.988
	11.988V	5.038V	3.324V	5.061V	944.782				56.56°C	114.57V

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%	5.290A	1.983A	1.977A	0.982A	85.002	83.999%	0	<6.0	44.43°C	0.814
	11.987V	5.042V	3.338V	5.093V	101.194				40.21°C	229.93V
20%	11.618A	2.976A	2.968A	1.181A	169.932	92.057%	0	<6.0	45.27°C	0.904
	11.967V	5.041V	3.335V	5.082V	184.593				40.72°C	229.92V
30%	18.306A	3.473A	3.466A	1.38A	254.927	93.244%	0	<6.0	46.19°C	0.937
	11.956V	5.039V	3.333V	5.072V	273.398				41.15°C	229.9V
40%	24.981A	3.97A	3.964A	1.58A	340.008	93.662%	1060	24.0	41.79°C	0.952
	11.961V	5.039V	3.33V	5.062V	363.016				47.31°C	229.89V
50%	31.286A	4.964A	4.959A	1.782A	424.793	93.587%	1058	24.0	42.03°C	0.961
	11.963V	5.036V	3.328V	5.051V	453.901				48.09°C	229.87V
60%	37.567A	5.96A	5.956A	1.984A	509.338	93.431%	1055	23.9	42.8°C	0.966
	11.966V	5.034V	3.325V	5.039V	545.148				49.31°C	229.86V
70%	43.898A	6.958A	6.954A	2.187A	594.635	93.232%	1051	23.8	43.42°C	0.97
	11.971V	5.031V	3.322V	5.029V	637.803				50.51°C	229.85V
80%	50.224A	7.956A	7.952A	2.291A	679.461	92.874%	1651	37.2	43.77°C	0.972
	11.977V	5.028V	3.32V	5.02V	731.588				51.8°C	229.83V
90%	56.940A	8.454A	8.44A	2.394A	764.869	92.558%	1647	37.2	44.15°C	0.974
	11.984V	5.027V	3.317V	5.011V	826.365				53.16°C	229.82V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
100%	63.383A	8.954A	8.959A	3.004A	849.709	92.058%	1647	37.2	45.01°C	0.976
	11.991V	5.025V	3.315V	4.992V	923.015				55.02°C	229.81V
110%	69.685A	9.953A	10.052A	3.009A	934.29	91.603%	1980	42.9	46.73°C	0.978
	11.997V	5.024V	3.312V	4.985V	1019.933				57.66°C	229.79V
CL1	0.116A	11.963A	11.922A	0A	101.287	83.153%	1054	23.9	40.32°C	0.848
	11.975V	5.032V	3.33V	5.105V	121.807				45.84°C	229.93V
CL2	0.115A	19.882A	0A	0A	101.363	81.87%	1655	37.3	40.77°C	0.85
	11.975V	5.029V	3.339V	5.108V	123.811				47.86°C	229.93V
CL3	0.115A	0A	19.844A	0A	67.375	73.383%	1052	23.8	40.12°C	0.796
	11.984V	5.044V	3.326V	5.105V	91.89				49.21°C	229.94V
CL4	70.848A	0A	0A	0A	849.46	92.779%	1646	37.2	45.1°C	0.976
	11.990V	5.038V	3.324V	5.061V	915.567				56.03°C	229.8V

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	1.244A	0.495A	0.494A	0.196A	19.996	72.479%	0	<6.0	39.69°C	0.801
	11.934V	5.048V	3.342V	5.113V	27.589				36.61°C	114.86V
40W	2.740A	0.693A	0.691A	0.294A	39.998	82.895%	0	<6.0	40.44°C	0.898
	11.932V	5.047V	3.341V	5.109V	48.251				37.18°C	114.86V
60W	4.235A	0.892A	0.889A	0.392A	60	86.846%	0	<6.0	42.33°C	0.931
	11.932V	5.046V	3.34V	5.106V	69.087				38.64°C	114.85V
80W	5.725A	1.09A	1.087A	0.49A	79.941	88.991%	0	<6.0	43.15°C	0.949
	11.932V	5.045V	3.339V	5.103V	89.831				39.2°C	114.84V

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	1.248A	0.495A	0.494A	0.196A	19.991	78.14%	0	<6.0	39.69°C	0.455
	11.893V	5.047V	3.342V	5.114V	25.583				36.6°C	229.94V
40W	2.748A	0.693A	0.691A	0.293A	39.993	84.48%	0	<6.0	40.44°C	0.619
	11.891V	5.047V	3.341V	5.11V	47.339				37.09°C	229.94V
60W	4.246A	0.892A	0.889A	0.392A	59.996	86.659%	0	<6.0	41.55°C	0.727
	11.900V	5.046V	3.34V	5.107V	69.231				38.03°C	229.94V
80W	5.698A	1.09A	1.087A	0.49A	79.941	83.607%	0	<6.0	42.85°C	0.804
	11.988V	5.044V	3.339V	5.103V	95.618				39.02°C	229.93V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	6.65mV	6.49mV	8.27mV	6.14mV	Pass
20% Load	7.22mV	6.70mV	8.38mV	5.99mV	Pass
30% Load	8.30mV	6.85mV	9.05mV	6.30mV	Pass
40% Load	10.31mV	7.11mV	9.57mV	6.50mV	Pass
50% Load	11.03mV	8.29mV	10.91mV	7.02mV	Pass
60% Load	11.34mV	8.71mV	11.07mV	6.97mV	Pass
70% Load	11.34mV	8.04mV	12.00mV	7.79mV	Pass
80% Load	12.48mV	8.40mV	12.78mV	7.95mV	Pass
90% Load	13.30mV	9.48mV	13.86mV	8.41mV	Pass
100% Load	19.24mV	10.46mV	16.27mV	20.16mV	Pass
110% Load	18.38mV	11.00mV	18.57mV	14.12mV	Pass
Crossload1	13.40mV	9.24mV	10.70mV	6.01mV	Pass
Crossload2	11.55mV	13.19mV	9.46mV	5.42mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
Crossload3	9.44mV	7.57mV	10.86mV	4.80mV	Pass
Crossload4	19.88mV	9.21mV	16.57mV	7.02mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	6.24mV	6.80mV	8.43mV	6.14mV	Pass
20% Load	15.48mV	7.11mV	8.22mV	6.19mV	Pass
30% Load	11.64mV	8.50mV	12.88mV	6.50mV	Pass
40% Load	11.44mV	10.15mV	15.77mV	6.45mV	Pass
50% Load	10.52mV	7.62mV	10.55mV	6.97mV	Pass
60% Load	10.72mV	8.40mV	12.05mV	7.28mV	Pass
70% Load	10.93mV	9.02mV	11.64mV	7.59mV	Pass
80% Load	12.53mV	8.60mV	13.34mV	7.74mV	Pass
90% Load	13.10mV	9.94mV	14.43mV	8.67mV	Pass
100% Load	21.39mV	10.40mV	18.21mV	18.72mV	Pass
110% Load	20.48mV	12.30mV	18.31mV	13.90mV	Pass
Crossload1	9.37mV	8.66mV	10.20mV	5.47mV	Pass
Crossload2	9.07mV	12.67mV	8.89mV	5.58mV	Pass
Crossload3	26.71mV	6.75mV	10.60mV	5.16mV	Pass
Crossload4	22.02mV	8.49mV	18.44mV	7.00mV	Pass

The results above are not used in the certification process

Thermaltake Toughpower PF3 850W

Top side

Power specifications label

All data and graphs included in this test report can be used by any individual on the following conditions:

› It should be mentioned that the test results are provided by Cybenetics

› The link to the original test results document should be provided in any case

Cybenetics runs voluntary certification programs for power supplies - ETA for efficiency, LAMBDA for noise and SAFE for safety and correct operation - and for cooling products, with DELTA for chassis soundproofing and PHI for fan airflow and static pressure. THETA rates cooler performance on AMD AM5 and Intel LGA1851 outside ISO 17065 and accreditation scope

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