

Anex

Corsair SF850

Lab ID#: CR85002349
 Receipt Date: Jan 30, 2024
 Test Date: Feb 9, 2024

Report: 24PS2349A
 Report Date: Feb 12, 2024

DUT INFORMATION	
Brand	Corsair
Manufacturer (OEM)	Great Wall
Series	SF
Model Number	RPS0175
Serial Number	A2MFD35331P66W
DUT Notes	

DUT SPECIFICATIONS	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10-5
Rated Frequency (Hz)	47-63
Rated Power (W)	850
Type	SFX
Cooling	92mm Fluid Dynamic Bearing Fan (NR092P)
Semi-Passive Operation	✓
Cable Design	Fully Modular

TEST EQUIPMENT	
Electronic Loads	Chroma 63601-5 x2 Chroma 63600-2 63640-80-80 x10 63610-80-20
AC Sources	Chroma 6530, APM SP300VAC4000W-P
Power Analyzers	RS HMC8015, N4L PPA1530, N4L PPA5530
Oscilloscopes	Picoscope 4444, Rigol DS7014, 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, Keithley 2015 - THD
UPS	FSP Champ Tower 3kVA, CyberPower OLS3000E 3kVA
Isolation Transformer	4kVA

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

RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
ALPM (Alternative Low Power Mode) compatible	✓
ATX v3.1 PSU Power Excursion	✓

115V

Average Efficiency	90.951%
Efficiency With 10W (≤500W) or 2% (>500W)	72.663
Average Efficiency 5VSB	84.480%
Standby Power Consumption (W)	0.0532000
Average PF	0.984
Avg Noise Output	29.42 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A-

230V

Average Efficiency	92.525%
Average Efficiency 5VSB	83.743%
Standby Power Consumption (W)	0.0969000
Average PF	0.942
Avg Noise Output	27.73 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A-

POWER SPECIFICATIONS

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	70.8	3	0
	Watts	130		850	15	0
Total Max. Power (W)		850				

HOLD-UP TIME & POWER OK SIGNAL (230V)

Hold-Up Time (ms)	19.3
AC Loss to PWR_OK Hold Up Time (ms)	17
PWR_OK Inactive to DC Loss Delay (ms)	2.3

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

CABLES AND CONNECTORS

Modular Cables

Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (310mm)	1	1	16-20AWG	No
4+4 pin EPS12V (410mm)	2	2	16AWG	No
6+2 pin PCIe (400mm)	3	3	16AWG	No
12+2 pin PCIe (410mm) (600W)	1	1	16-24AWG	No
SATA (100mm+115mm+115mm+115mm)	2	8	18AWG	No
4-pin Molex (100mm+115mm+115mm)	1	3	18AWG	No

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

Anex

Corsair SF850

General Data	
Manufacturer (OEM)	Great Wall
PCB Type	Double-Sided
Primary Side	
Transient Filter	2x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	1x NTC Thermistor SCK-056 (5 Ohm) & Relay
Bridge Rectifier(s)	2x Vishay GBUE2560 (600V, 25A @ 140°C)
APFC MOSFETs	1x Infineon IPW60R060C7 (650V, 22A @ 100°C, Rds(on): 0.060Ohm) 1x Champion CM03X (reduce the no-load consumption)
APFC Boost Diode	1x Infineon IDH10G65C6 (650V, 10A @ 140°C)
Bulk Cap(s)	1x Rubycon (420V, 450uF, 3,000h @ 105°C, MXK)
Main Switchers	2x Rohm R6035VNX3 (600V, 35A @ 25°C, Rds(on): 0.1190hm)
APFC Controller	Champion CM6502UHHX
Resonant Controller	Champion CM6901X
IC Driver	1x Novosense NSi6602BD
Topology	Primary side: APFC, Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETs	6x Infineon BSC014N04LS (40V, 125A @ 100°C, Rds(on): 1.4mOhm)
5V & 3.3V	DC-DC Converters: 4x Advanced Power AP4024GEMT (30V, 60A, Rds(on): 4.5mOhm) PWM Controller(s): ANPEC APW7159C
Filtering Capacitors	Electrolytic: 2x Rubycon (3-6,000h @ 105°C, YXG) Polymer: 3x United Chemi-Con, 40x FPCAP
Supervisor IC	IN1S429I-SCG (OCP,OVP, UVP, SCP, PG)
Fan Controller	Microchip PIC16F1824
Fan Model	Corsair NR092P (92mm, 12V, 0.22A, Fluid Dynamic Bearing Fan)
5VSB Circuit	
Rectifier	1x Infineon ICE5QR1680AG (800V, 5.8A, Rds(on): 1.75Ohm)
Standby PWM Controller	Infineon ICE5QR1680AG

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

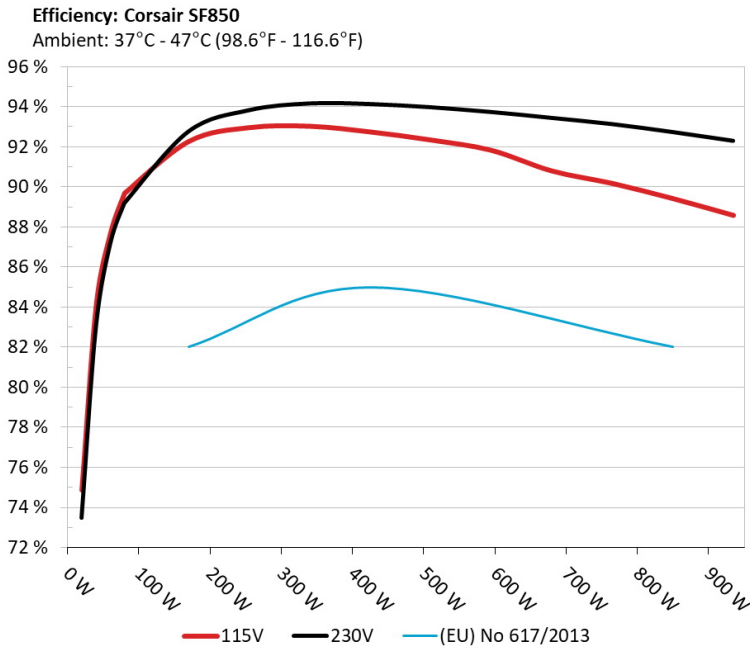
- > It should be mentioned that the test results are provided by Cybenetics
- > The link to the original test results document should be provided in any case

PAGE 4/17

EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

INFO

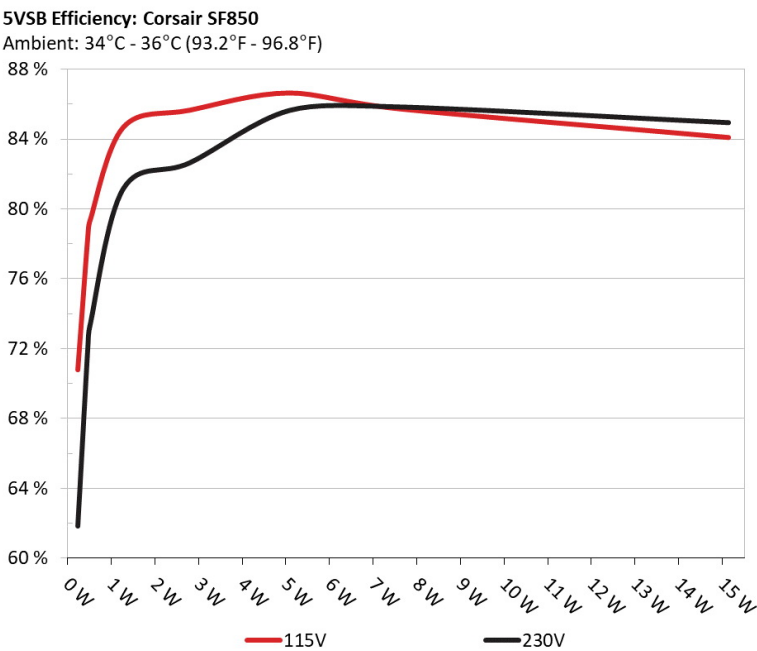
The PSU's efficiency under high ambient temperatures with 115V and 230V input. For this graph the results of the 10-110% load regulation table are used



5VSB EFFICIENCY

INFO

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



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

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.229W	70.266%	0.031
	5.092V	0.326W		114.86V
2	0.09A	0.458W	77.915%	0.056
	5.091V	0.588W		114.86V
3	0.55A	2.796W	85.148%	0.253
	5.084V	3.284W		114.85V
4	1A	5.078W	86.139%	0.355
	5.078V	5.895W		114.84V
5	1.5A	7.606W	85.225%	0.404
	5.071V	8.925W		114.85V
6	3A	15.147W	83.584%	0.484
	5.049V	18.121W		114.84V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.229W	61.333%	0.011
	5.092V	0.374W		229.86V
2	0.09A	0.458W	71.562%	0.018
	5.091V	0.641W		229.86V
3	0.55A	2.796W	82.135%	0.093
	5.084V	3.405W		229.86V
4	1A	5.078W	85.13%	0.154
	5.078V	5.965W		229.85V
5	1.5A	7.607W	85.333%	0.212
	5.071V	8.915W		229.85V
6	3A	15.148W	84.435%	0.31
	5.049V	17.941W		229.85V

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

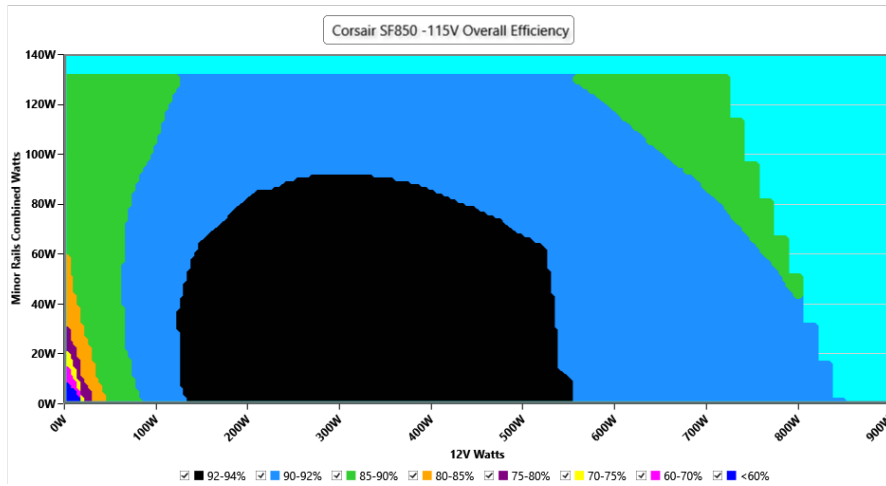
115V

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

PAGE 7/17

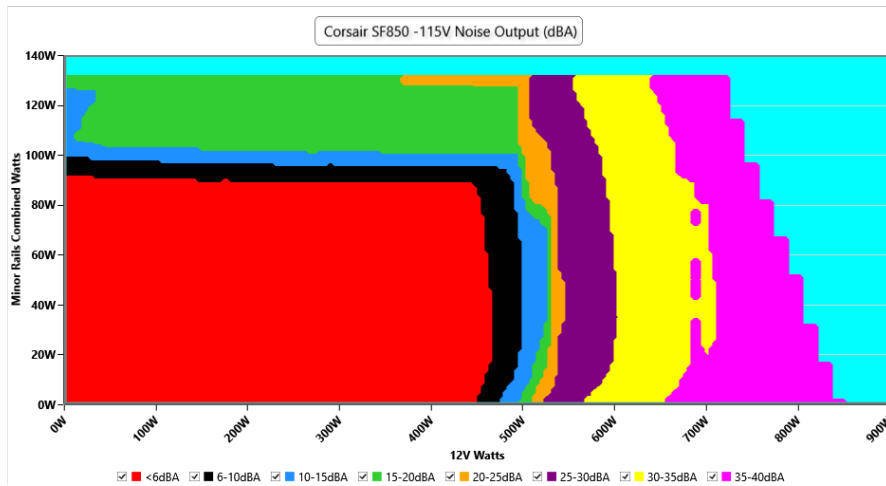
EFFICIENCY GRAPH 115V



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 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

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

VAMPIRE POWER -115V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	115.04 V	115.00 V	113.85 V	115.08 V	116.15 V	PASS
Mains Frequency:	60.00 Hz	59.99 Hz	59.40 Hz	60.01 Hz	60.60 Hz	PASS
Mains Voltage CF:	1.416	1.415	1.340	1.418	1.490	PASS
Mains Voltage THD:	0.13 %	0.09 %	N/A	0.18 %	2.00 %	PASS
Real Power:	0.053 W	0.010 W	N/A	0.073 W	N/A	N/A
Apparent Power:	10.580 W	10.264 W	N/A	10.903 W	N/A	N/A
Power Factor:	0.006	N/A	N/A	N/A	N/A	N/A

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

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

10-110% 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%	5.211A	2.001A	1.991A	0.986A	85.001	89.681%	0	<6.0	44.32°C	0.96
	12.167V	4.996V	3.315V	5.071V	94.781				40.06°C	114.83V
20%	11.426A	3.003A	2.988A	1.185A	169.931	92.259%	0	<6.0	45.49°C	0.971
	12.168V	4.994V	3.313V	5.064V	184.19				40.92°C	114.81V
30%	17.987A	3.504A	3.487A	1.385A	254.935	92.947%	0	<6.0	46.39°C	0.977
	12.169V	4.994V	3.312V	5.056V	274.28				41.33°C	114.77V
40%	24.552A	4.006A	3.986A	1.585A	340.021	93.015%	774	<6.0	41.92°C	0.983
	12.171V	4.993V	3.312V	5.048V	365.557				47.47°C	114.76V
50%	30.757A	5.009A	4.986A	1.786A	424.819	92.733%	1128	13.9	42.03°C	0.988
	12.170V	4.991V	3.31V	5.04V	458.112				48.09°C	114.72V
60%	36.942A	6.013A	5.987A	1.987A	509.353	92.333%	1519	24.2	42.94°C	0.99
	12.169V	4.989V	3.308V	5.033V	551.645				49.46°C	114.69V
70%	43.190A	7.018A	6.988A	2.189A	594.661	91.815%	1906	30.9	43.16°C	0.992
	12.169V	4.988V	3.306V	5.025V	647.67				50.24°C	114.66V
80%	49.434A	8.022A	7.99A	2.291A	679.5	90.788%	2656	39.6	43.6°C	0.993
	12.170V	4.986V	3.304V	5.019V	748.452				51.64°C	114.63V
90%	56.077A	8.526A	8.477A	2.394A	764.935	90.161%	3044	42.0	44.76°C	0.994
	12.169V	4.984V	3.303V	5.013V	848.408				53.86°C	114.61V
100%	62.456A	9.029A	8.995A	3.001A	849.747	89.409%	3401	45.3	45.47°C	0.994
	12.169V	4.983V	3.302V	4.999V	950.407				55.48°C	114.57V
110%	68.701A	10.036A	10.091A	3.004A	934.316	88.575%	3731	47.4	46.78°C	0.995
	12.170V	4.982V	3.3V	4.994V	1054.834				57.68°C	114.54V
CL1	0.114A	15.718A	15.637A	0A	131.298	85.635%	1496	23.4	40.02°C	0.974
	12.187V	4.982V	3.3V	5.079V	153.324				45.51°C	114.82V
CL2	0.114A	20.048A	0A	0A	101.335	84.719%	2277	34.4	40.3°C	0.975
	12.180V	4.985V	3.312V	5.084V	119.614				47.37°C	114.83V
CL3	0.113A	0A	19.988A	0A	67.383	79.91%	2067	33.3	40.82°C	0.961
	12.175V	4.993V	3.302V	5.084V	84.323				49.85°C	114.84V
CL4	69.845A	0A	0A	0A	849.494	90.178%	2968	42.1	45.57°C	0.994
	12.163V	4.995V	3.313V	5.047V	942.029				56.49°C	114.58V

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

20-80W 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	1.222A	0.5A	0.497A	0.197A	19.994	74.88%	0	<6.0	39.76°C	0.826
	12.156V	4.997V	3.317V	5.086V	26.702				36.69°C	114.84V
40W	2.688A	0.7A	0.696A	0.295A	39.996	84.056%	0	<6.0	40.41°C	0.914
	12.160V	4.997V	3.317V	5.084V	47.583				37.03°C	114.84V
60W	4.154A	0.9A	0.895A	0.394A	59.996	87.657%	0	<6.0	42.64°C	0.945
	12.162V	4.998V	3.317V	5.081V	68.443				38.86°C	114.83V
80W	5.616A	1.1A	1.094A	0.492A	79.934	89.655%	0	<6.0	43.19°C	0.96
	12.164V	4.998V	3.317V	5.079V	89.157				39.22°C	114.82V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	18.16mV	18.63mV	15.54mV	12.47mV	Pass
20% Load	20.25mV	18.22mV	16.72mV	11.91mV	Pass
30% Load	21.07mV	18.01mV	16.32mV	12.31mV	Pass
40% Load	21.43mV	18.27mV	17.03mV	11.95mV	Pass
50% Load	22.40mV	18.68mV	16.83mV	11.90mV	Pass
60% Load	25.88mV	18.37mV	17.96mV	12.67mV	Pass
70% Load	27.93mV	18.32mV	17.03mV	13.34mV	Pass
80% Load	27.36mV	18.99mV	20.78mV	12.27mV	Pass
90% Load	29.20mV	19.09mV	21.70mV	14.06mV	Pass
100% Load	39.56mV	22.38mV	23.34mV	13.60mV	Pass
110% Load	41.63mV	20.88mV	22.16mV	13.79mV	Pass
Crossload1	26.66mV	22.68mV	18.11mV	28.28mV	Pass
Crossload2	23.53mV	21.09mV	16.21mV	26.78mV	Pass
Crossload3	20.46mV	18.17mV	17.80mV	26.78mV	Pass
Crossload4	36.41mV	20.07mV	20.36mV	29.16mV	Pass

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

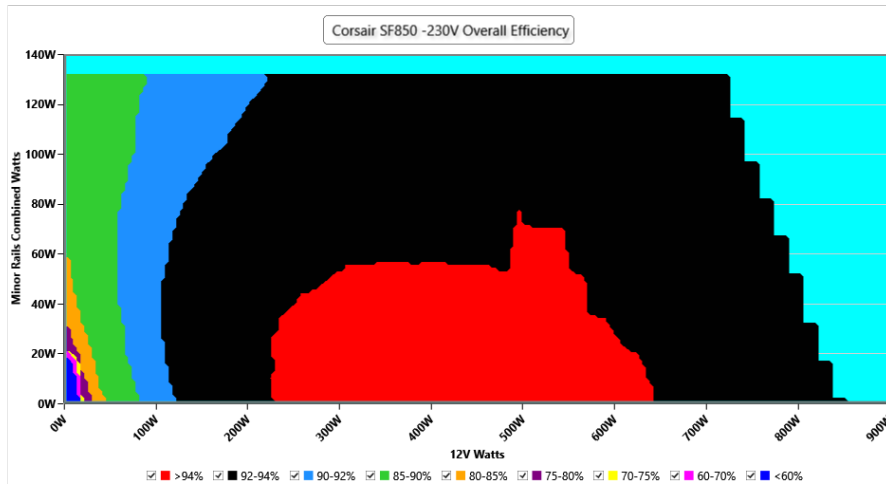
230V

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

PAGE 12/17

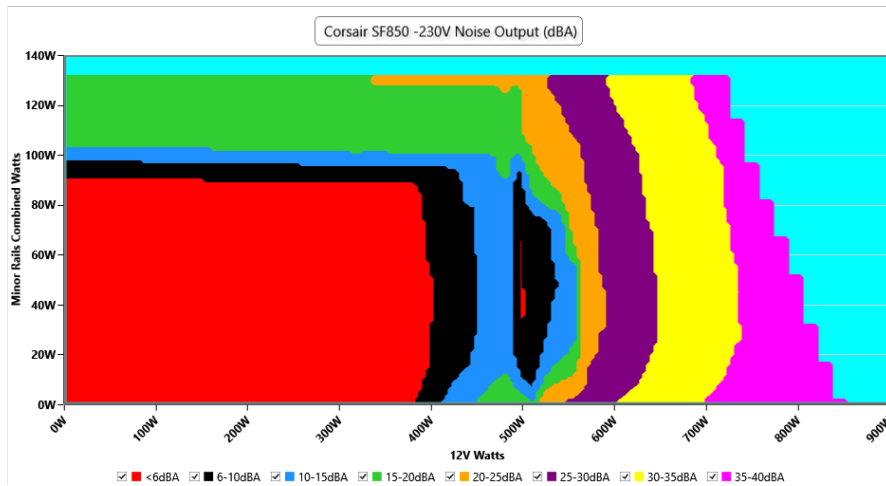
EFFICIENCY GRAPH 230V



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 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

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

VAMPIRE POWER -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	229.92 V	229.85 V	227.70 V	230.05 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:	1.418	1.418	1.340	1.419	1.490	PASS
Mains Voltage THD:	0.15 %	0.13 %	N/A	0.18 %	2.00 %	PASS
Real Power:	0.097 W	0.056 W	N/A	0.285 W	N/A	N/A
Apparent Power:	39.419 W	39.354 W	N/A	39.491 W	N/A	N/A
Power Factor:	0.002	N/A	N/A	N/A	N/A	N/A

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

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

10-110% LOAD TESTS 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%	5.208A	2.001A	1.99A	0.986A	85.003	89.187%	0	<6.0	44.51°C	0.81
	12.173V	4.997V	3.316V	5.071V	95.311				40.23°C	229.85V
20%	11.415A	3.003A	2.987A	1.185A	169.935	92.766%	606	<6.0	40.7°C	0.91
	12.180V	4.995V	3.314V	5.064V	183.186				45.24°C	229.83V
30%	17.977A	3.504A	3.487A	1.385A	254.941	93.831%	728	<6.0	41.03°C	0.938
	12.176V	4.994V	3.313V	5.056V	271.699				46.03°C	229.82V
40%	24.546A	4.006A	3.987A	1.585A	340.027	94.168%	1005	9.6	41.79°C	0.951
	12.174V	4.992V	3.311V	5.049V	361.087				47.36°C	229.8V
50%	30.751A	5.01A	4.986A	1.786A	424.839	94.139%	1410	21.7	42.22°C	0.961
	12.173V	4.99V	3.309V	5.041V	451.289				48.29°C	229.79V
60%	36.935A	6.014A	5.987A	1.987A	509.372	93.98%	1784	28.5	42.78°C	0.965
	12.172V	4.989V	3.308V	5.034V	542				49.37°C	229.78V
70%	43.186A	7.019A	6.989A	2.189A	594.675	93.741%	2117	34.0	43.12°C	0.97
	12.170V	4.987V	3.306V	5.026V	634.38				50.21°C	229.76V
80%	49.438A	8.023A	7.99A	2.291A	679.512	93.448%	2536	38.4	43.95°C	0.974
	12.169V	4.985V	3.304V	5.02V	727.157				52.02°C	229.75V
90%	56.082A	8.527A	8.478A	2.394A	764.948	93.135%	2958	42.1	44.22°C	0.976
	12.169V	4.984V	3.303V	5.014V	821.33				53.29°C	229.74V
100%	62.461A	9.03A	8.996A	3A	849.759	92.738%	3305	44.6	45.64°C	0.978
	12.168V	4.983V	3.301V	5V	916.303				55.69°C	229.72V
110%	68.705A	10.037A	10.092A	3.003A	934.333	92.301%	3665	46.9	46.95°C	0.98
	12.169V	4.981V	3.299V	4.995V	1012.267				57.89°C	229.71V
CL1	0.115A	15.72A	15.639A	0A	131.298	85.85%	1798	29.2	41.12°C	0.889
	12.192V	4.981V	3.299V	5.08V	152.935				46.64°C	229.84V
CL2	0.114A	20.05A	0A	0A	101.338	84.827%	2283	34.5	40.65°C	0.854
	12.180V	4.985V	3.312V	5.084V	119.463				47.76°C	229.84V
CL3	0.113A	0A	19.989A	0A	67.382	79.447%	2076	33.3	41.82°C	0.78
	12.175V	4.992V	3.302V	5.084V	84.814				50.84°C	229.85V
CL4	69.842A	0A	0A	0A	849.502	93.412%	2921	42.0	45.85°C	0.977
	12.164V	4.995V	3.313V	5.048V	909.413				56.83°C	229.72V

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

20-80W LOAD TESTS 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	1.220A	0.5A	0.497A	0.197A	19.997	73.469%	0	<6.0	39.96°C	0.457
	12.162V	4.997V	3.317V	5.086V	27.222				36.89°C	229.86V
40W	2.687A	0.7A	0.696A	0.295A	39.998	82.964%	0	<6.0	40.98°C	0.628
	12.165V	4.998V	3.317V	5.084V	48.21				37.68°C	229.85V
60W	4.154A	0.9A	0.895A	0.394A	59.998	87.138%	0	<6.0	42.44°C	0.73
	12.166V	4.998V	3.317V	5.081V	68.856				38.92°C	229.85V
80W	5.614A	1.1A	1.094A	0.492A	79.938	89.194%	0	<6.0	42.98°C	0.794
	12.169V	4.998V	3.317V	5.079V	89.623				39.14°C	229.85V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	17.75mV	17.81mV	15.70mV	12.01mV	Pass
20% Load	22.66mV	18.78mV	16.62mV	11.65mV	Pass
30% Load	20.10mV	18.53mV	16.37mV	11.85mV	Pass
40% Load	21.84mV	19.09mV	16.47mV	12.06mV	Pass
50% Load	21.84mV	18.94mV	17.70mV	12.21mV	Pass
60% Load	24.04mV	20.22mV	21.86mV	12.57mV	Pass
70% Load	26.95mV	21.61mV	23.39mV	12.42mV	Pass
80% Load	27.26mV	19.20mV	21.45mV	12.21mV	Pass
90% Load	28.64mV	18.99mV	20.42mV	13.29mV	Pass
100% Load	38.71mV	20.12mV	20.83mV	13.54mV	Pass
110% Load	41.82mV	21.88mV	22.44mV	14.31mV	Pass
Crossload1	35.89mV	21.27mV	17.78mV	28.28mV	Pass
Crossload2	35.44mV	20.79mV	17.49mV	27.91mV	Pass
Crossload3	21.12mV	18.84mV	17.39mV	26.83mV	Pass
Crossload4	38.62mV	19.76mV	22.01mV	29.62mV	Pass

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

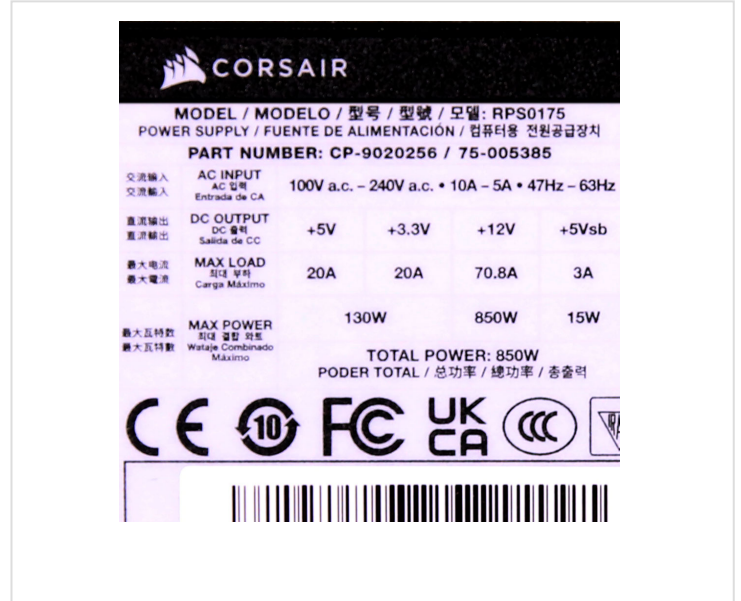
- > It should be mentioned that the test results are provided by Cybenetics
- > The link to the original test results document should be provided in any case

Anex

Corsair SF850

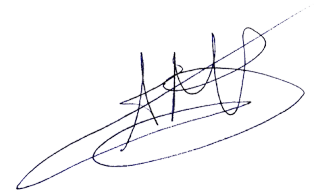


Top side



Power specifications label

CERTIFICATIONS 115V

Aristeidis Bitziopoulos
Lab Director

CERTIFICATIONS 230V



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