Seasonic Focus Plus Gold 650W (#3)

Serial Number R1708AA174160086

Lab ID 236

Certification ID 25236

Test Result Report ID:

Certificate Issue Date: Jun 12, 2018

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	Seasonic
Model	Focus Plus Gold 650W (#3)
OEM/ODM	Seasonic
Serial Number	R1708AA174160086
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	9-4.5
Rated Frequency (Hz)	50-60

Rated Power (W)	650
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 (HA1225H12F-Z)
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	236
Date of receipt	Jun 4, 2018
Testing Date	Jun 10, 2018
Report Issued Date	Jun 12, 2018
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 (610mm)	1	1	18-22AWG	Yes
4+4 pin EPS12V (655mm)	1	1	18AWG	No
6+2 pin PCIe (680mm+80mm)	2	4	18AWG	No
SATA (455mm+115mm+115mm+115mm)	2	8	18AWG	No
4 pin Molex (460mm+125mm+125mm)	1	3	18AWG	No
FDD Adapter (+110mm)	1	1	22AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	18AWG	No

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	54	3	0.3
	Watts	100		648	15	3.6
Total Max. Power (W)		650				

Parts Description

General Data	
Manufacturer (OEM)	Seasonic
Platform Model	FX
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor & Diode
Bridge Rectifier(s)	2x GBU1006 (600V, 10A @ 100°C)
APFC MOSFETS	2x UTC GPT18N50DG (500V, 18A @ 100°C, 0.265Ohm)
APFC Boost Diode	1x BYC8-600 (600V, 8A @ 109°C)
Hold-up Cap(s)	1x Nippon Chemi-Con (400V, 450uF, 2000h @ 105°C, CE)
Main Switchers	4x UTC GBT10N50ADG (500V, 10A @ 25°C, 0.61Ohm)
APFC Controller	Champion CM6500UNX
Resonant Controller	Champion CM6901T6X
Topology	Primary side: Full-Bridge & LLC Resonant Controller Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	2x Nexperia PSMN1R8-40YLC (40V, 100A @ 25°C, 1.8mOhm)
5V & 3.3V	DC-DC Converters: 6x Infineon BSC0906NS (30V, 40A @ 100°C, 4.5mOhm) PWM Controller: APW7159
Filtering Capacitors	Electrolytics: Chemi-Con (1-5,000 @ 105°C, KZE), Chemi-Con (4-10,000 @ 105°C, KY), Chemi-Con (105°C, W) Polymers: Chemi-Con
Supervisor IC	Weltrend WT7527V (OVP, UVP, OCP, SCP, PG)
Fan Model	Hong Hua HA1225H12F-Z (120mm, 12V, 0.58A, 2200 RPM, Fluid Dynamic Bearing)
5VSB Circuit	

Standby PWM Controller	Excelliance EM8569

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	✓

Performance Summary

115V

Accredited	
Average Efficiency (>1450 load combinations)	88.653%
Average Noise Output (>1450 Load Combinations)	25.17dBA
Average PF (>1450 Load Combinations)	0.983
Efficiency With 10W (≤500W) or 2% (>500W) Load	-
Standby Power Consumption	0.0458W
Non-Accredited	
12V Ripple (Full Load)	28.73mV
5V Ripple (Full Load)	13.85mV
3.3V Ripple (Full Load)	9.60mV
5VSB Ripple (Full Load)	11.32mV
12V Load Regulation	0.06%
5V Load Regulation	0.34%
3.3V Load Regulation	0.51%
5VSB Load Regulation	2.54%
Inrush Current	26.855A

230V		
Accredited		
Average Efficiency (>1450 load combinations)	90.679%	
Average Noise Output (>1450 Load Combinations)	25.40dBA	
Average PF (>1450 Load Combinations)	0.931	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.0742W	
Non-Accredited		
12V Ripple (Full Load)	28.36mV	
5V Ripple (Full Load)	13.77mV	
3.3V Ripple (Full Load)	9.31mV	
5VSB Ripple (Full Load)	6.65mV	
12V Load Regulation	0.04%	
5V Load Regulation	0.36%	
3.3V Load Regulation	0.54%	
5VSB Load Regulation	2.46%	
Inrush Current	54.955A	
Hold-Up Time & PWR_OK Signal	17.00ms	
AC Loss to PWR_OK Hold Up Time	15.00ms	
PWR_OK Inactive to DC Loss Delay	2.00ms	
OPP (0.00°C / 0.00°C)	-	-

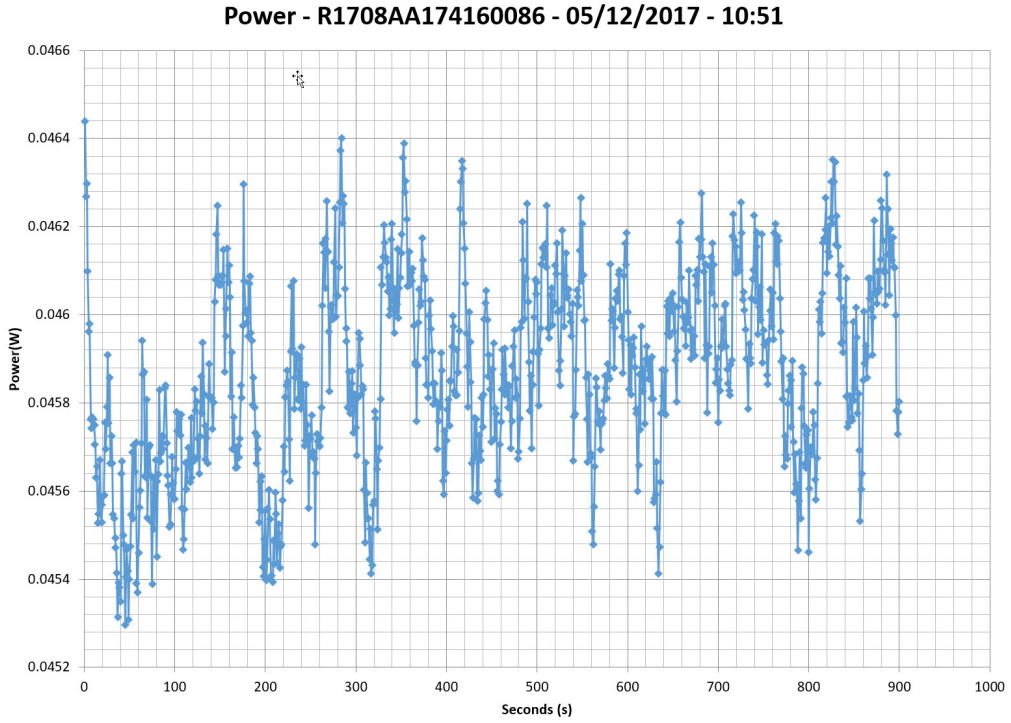
Hold-Up Time & PWR_OK Signal

Hold-Up Time (ms)	17
AC Loss to PWR_OK Hold Up Time (ms)	15
PWR_OK Inactive to DC Loss Delay (ms)	2

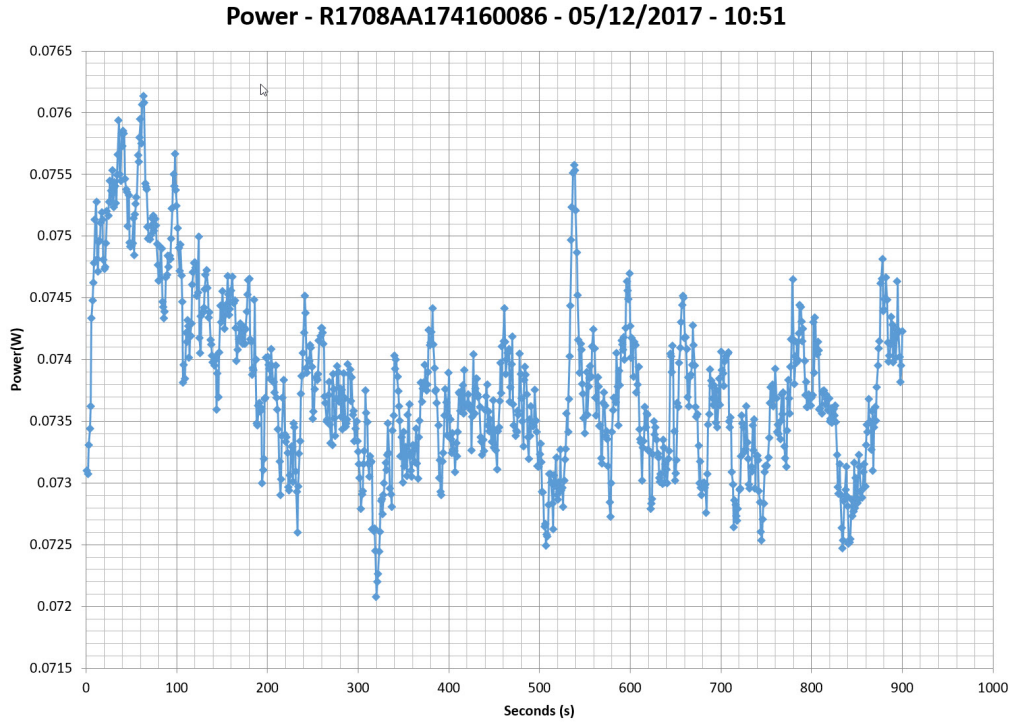
Vampire Power

Graphs

115V

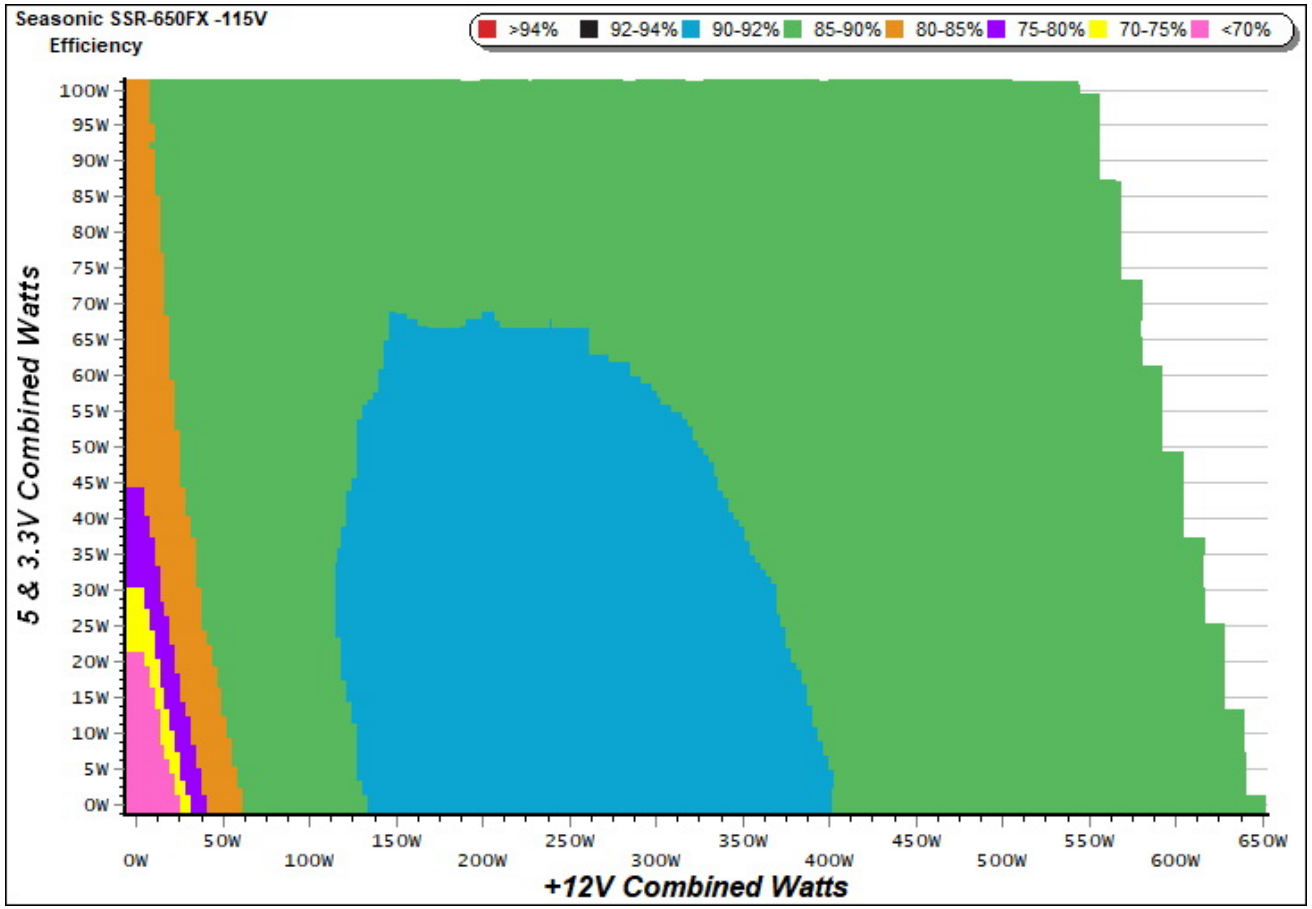


230V



Efficiency Graph

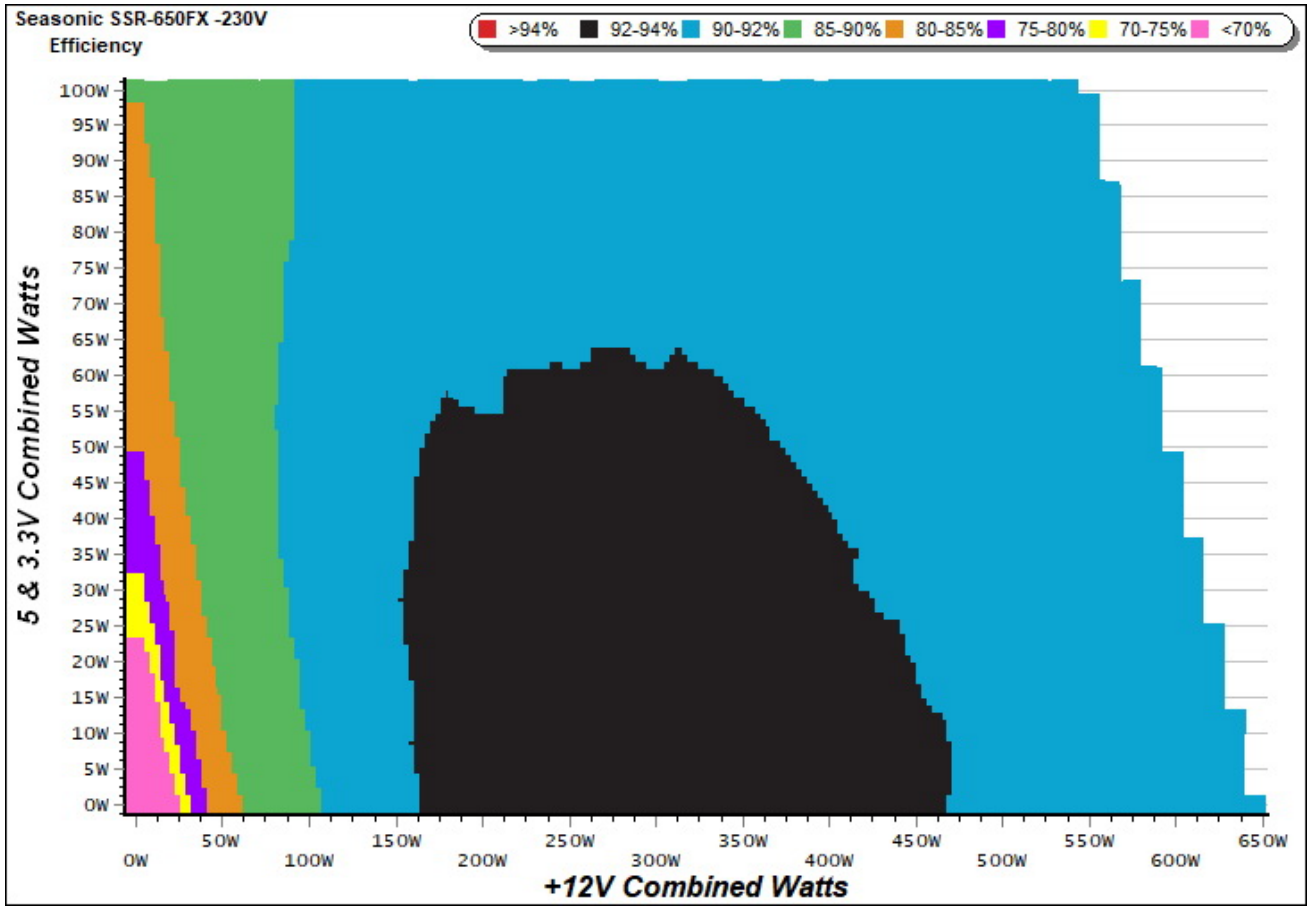
115V



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

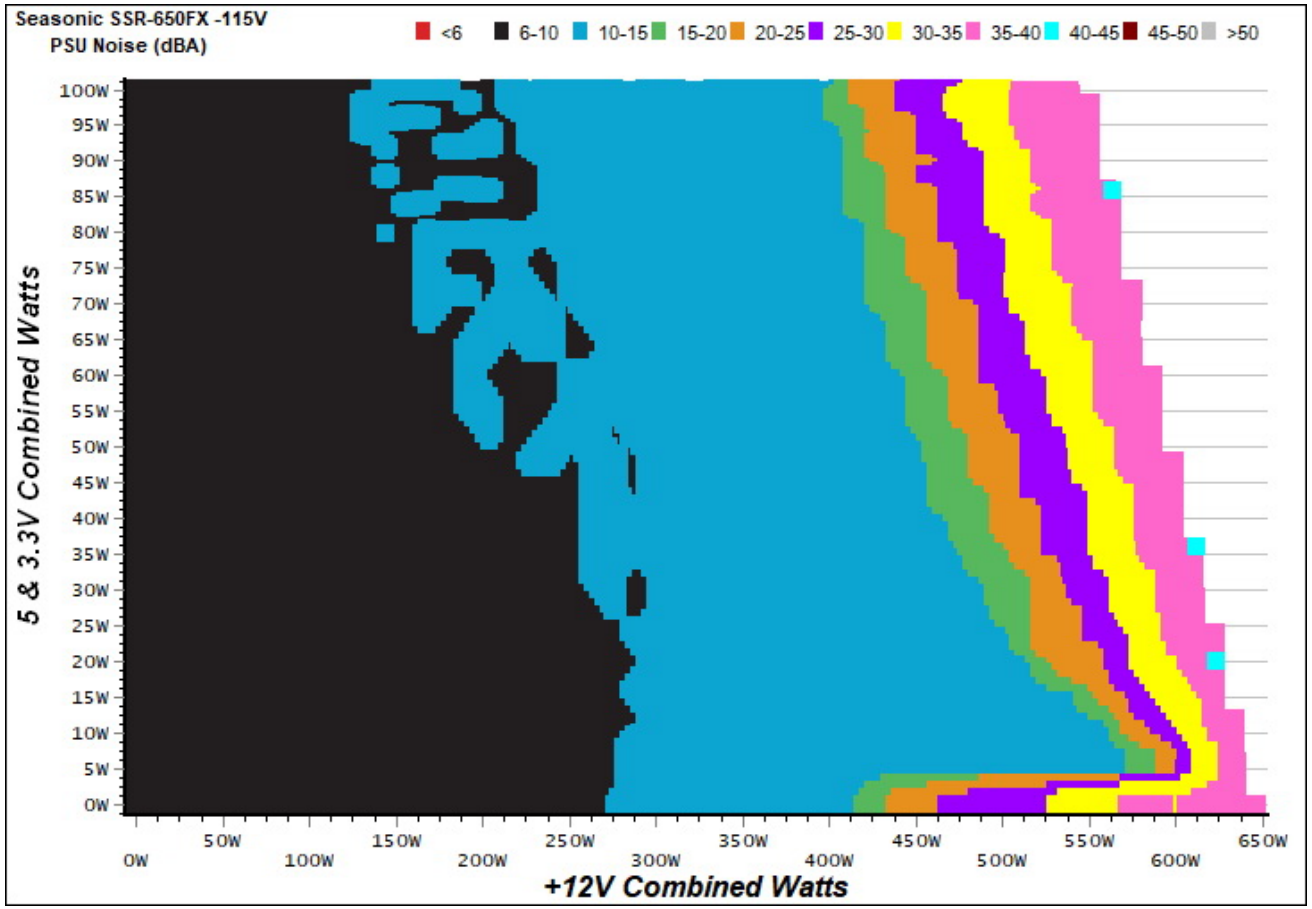


INFO

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

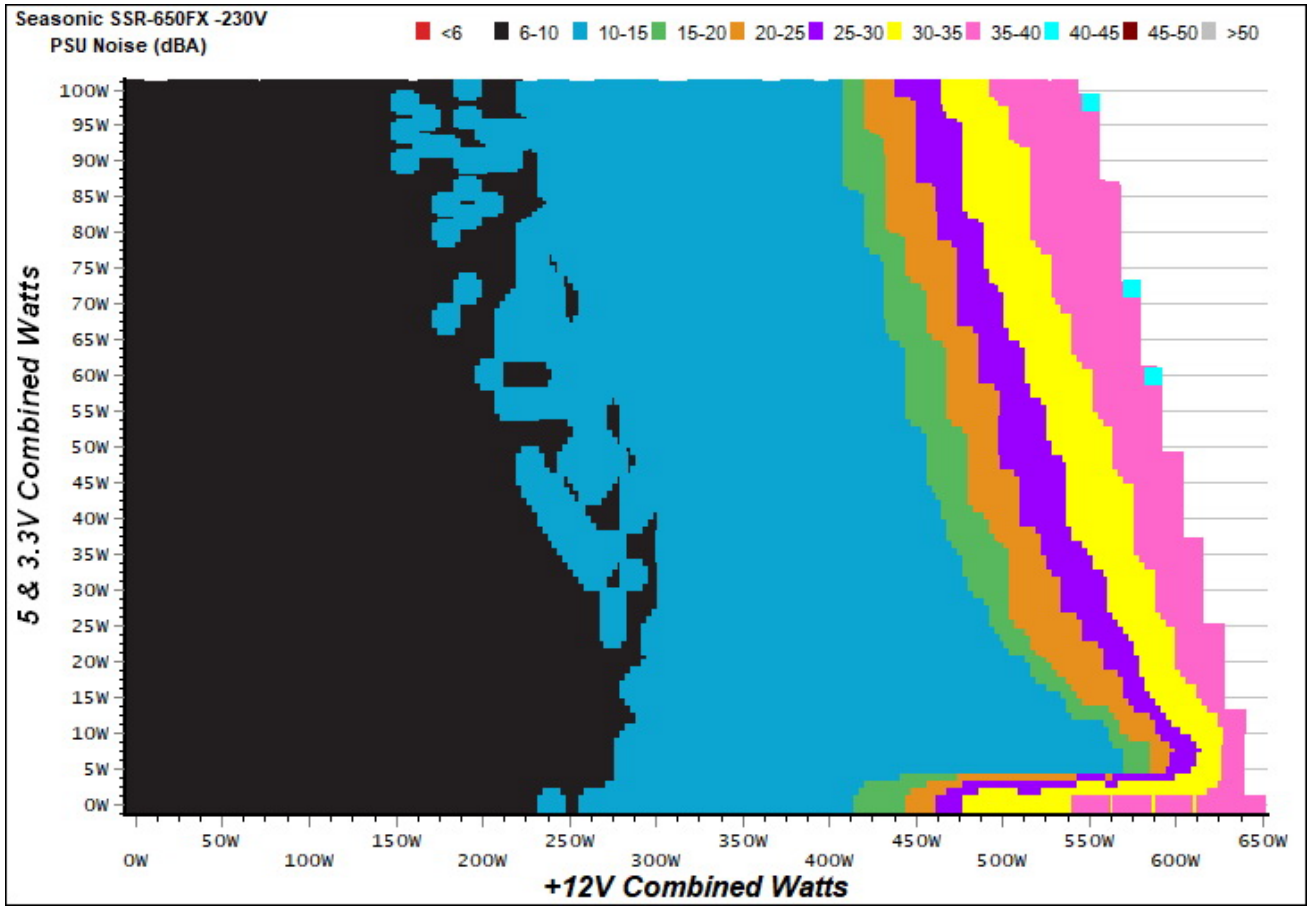
115V



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

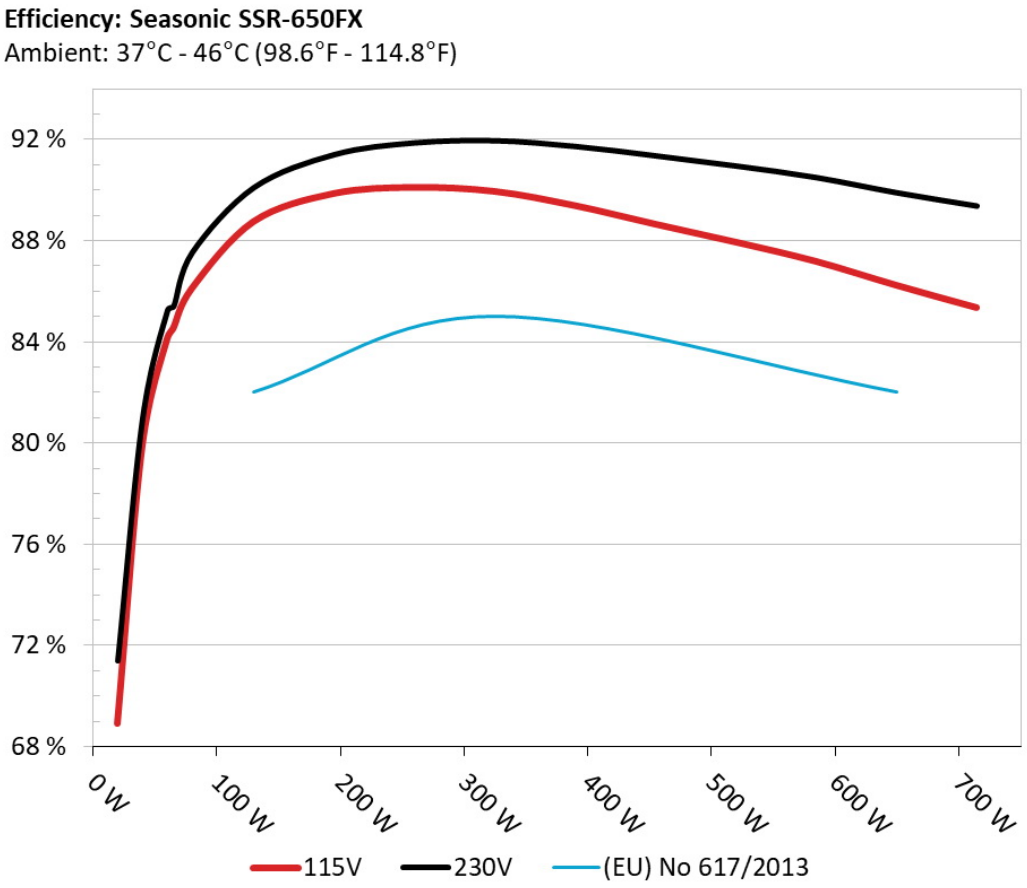


INFO

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

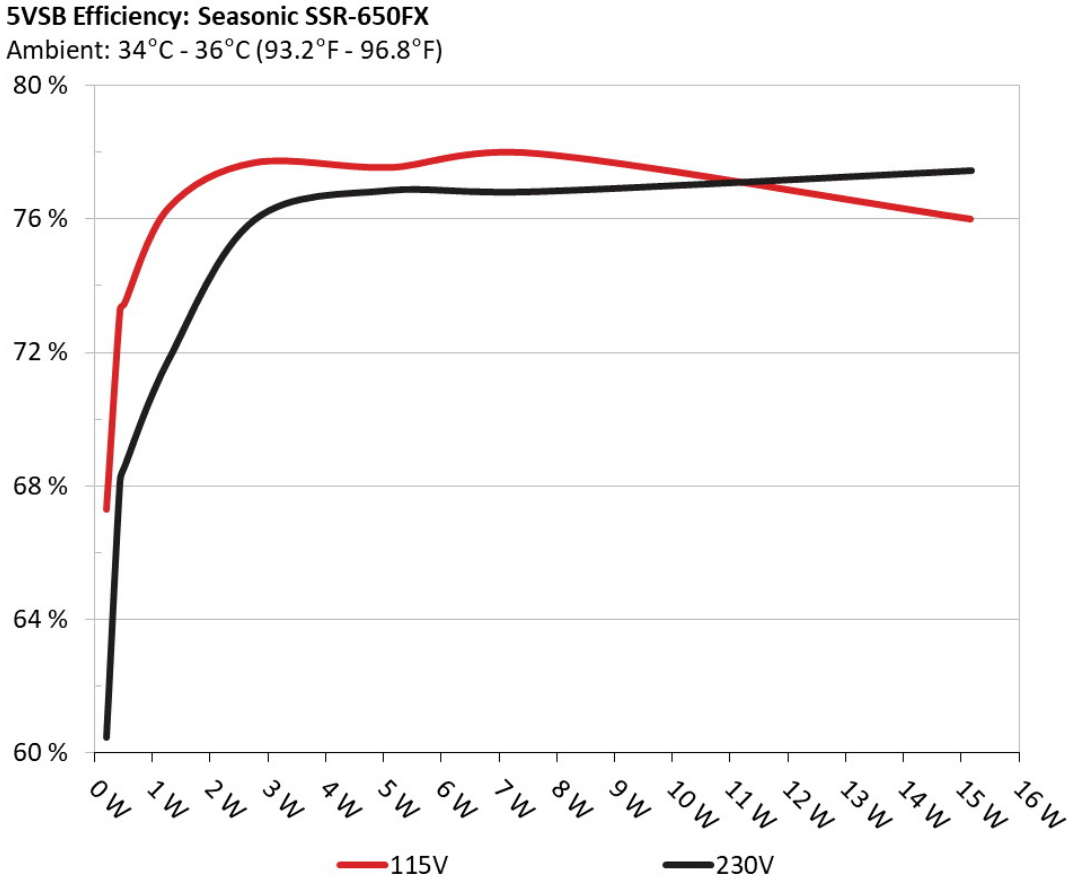
Efficiency under high ambient temperature



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	0.042A	0.214	67.296%	0.052
	5.126V	0.318		115.03V
2	0.087A	0.447	73.279%	0.097
	5.125V	0.610		115.04V
3	0.542A	2.774	77.681%	0.327
	5.115V	3.571		115.03V
4	1.002A	5.115	77.535%	0.397
	5.104V	6.597		115.03V
5	1.502A	7.649	77.956%	0.431
	5.093V	9.812		115.03V
6	3.001A	15.155	75.992%	0.478
	5.050V	19.943		115.03V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.042A	0.214	60.452%	0.018
	5.126V	0.354		230.15V
2	0.087A	0.447	68.140%	0.032
	5.125V	0.656		230.15V
3	0.542A	2.774	75.979%	0.157
	5.115V	3.651		230.14V
4	1.002A	5.116	76.863%	0.239
	5.104V	6.656		230.14V
5	1.502A	7.648	76.826%	0.293
	5.093V	9.955		230.15V
6	3.001A	15.182	77.455%	0.367
	5.059V	19.601		230.15V

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
1	3.567A	1.994A	1.980A	0.981A	64.823	84.546%	0	<6.0	48.07°C	0.944
	12.120V	5.015V	3.331V	5.093V	76.672				38.07°C	115.08V
2	8.162A	2.988A	2.968A	1.181A	129.797	88.769%	0	<6.0	49.17°C	0.974
	12.121V	5.014V	3.330V	5.081V	146.219				38.46°C	115.08V
3	13.101A	3.494A	3.482A	1.380A	194.914	89.877%	621	11.6	39.51°C	0.984
	12.122V	5.013V	3.329V	5.070V	216.868				50.93°C	115.08V
4	18.031A	3.994A	3.968A	1.580A	259.766	90.117%	550	10.4	39.76°C	0.988
	12.122V	5.010V	3.324V	5.060V	288.253				51.70°C	115.07V
5	22.626A	4.988A	4.962A	1.781A	324.734	89.959%	560	10.5	39.98°C	0.990
	12.122V	5.008V	3.323V	5.050V	360.981				52.34°C	115.07V
6	27.214A	5.992A	5.958A	1.981A	389.683	89.396%	560	10.5	40.21°C	0.990
	12.123V	5.007V	3.321V	5.038V	435.908				52.80°C	115.07V
7	31.799A	6.997A	6.956A	2.185A	454.631	88.664%	845	20.4	41.79°C	0.991
	12.124V	5.005V	3.320V	5.028V	512.760				54.64°C	115.07V
8	36.396A	7.996A	7.957A	2.390A	519.579	87.955%	1300	32.4	42.66°C	0.991
	12.122V	5.003V	3.317V	5.016V	590.736				56.01°C	115.06V
9	41.418A	8.500A	8.473A	2.395A	584.571	87.196%	1890	40.5	43.26°C	0.992
	12.120V	5.000V	3.315V	5.009V	670.407				57.12°C	115.06V
10	46.191A	9.010A	8.962A	3.005A	649.510	86.249%	2320	45.2	45.17°C	0.992
	12.119V	4.998V	3.314V	4.988V	753.061				59.34°C	115.06V
11	51.541A	9.011A	8.963A	3.008A	714.394	85.367%	2020	42.8	46.22°C	0.993
	12.120V	4.998V	3.313V	4.982V	836.853				60.47°C	115.05V
CL1	0.102A	12.011A	12.003A	0.004A	101.413	84.734%	510	6.0	42.36°C	0.969
	12.123V	5.013V	3.328V	5.103V	119.684				55.07°C	115.10V

CL2	53.969A	1.002A	1.002A	1.002A	667.605	86.542%	2320	45.2	45.22°C	0.992
	12.122V	5.002V	3.319V	5.045V	771.421				59.24°C	115.06V

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
1	3.564A	1.995A	1.981A	0.981A	64.809	85.390%	0	<6.0	49.82°C	0.733
	12.122V	5.017V	3.332V	5.093V	75.898				37.99°C	230.25V
2	8.159A	2.989A	2.969A	1.181A	129.795	90.092%	0	<6.0	50.93°C	0.871
	12.123V	5.016V	3.331V	5.081V	144.069				38.30°C	230.24V
3	13.099A	3.494A	3.483A	1.380A	194.908	91.395%	621	11.6	38.42°C	0.919
	12.123V	5.013V	3.329V	5.071V	213.258				52.21°C	230.24V
4	18.028A	3.995A	3.966A	1.580A	259.729	91.856%	459	9.9	38.88°C	0.942
	12.122V	5.010V	3.324V	5.060V	282.756				52.87°C	230.25V
5	22.622A	4.990A	4.965A	1.781A	324.704	91.941%	550	10.4	39.31°C	0.955
	12.122V	5.008V	3.323V	5.049V	353.166				53.82°C	230.25V
6	27.212A	5.994A	5.959A	1.982A	389.654	91.714%	560	10.5	40.17°C	0.963
	12.122V	5.007V	3.321V	5.039V	424.860				55.04°C	230.25V
7	31.796A	6.997A	6.957A	2.185A	454.598	91.345%	800	18.4	41.14°C	0.969
	12.124V	5.005V	3.320V	5.028V	497.674				56.61°C	230.24V
8	36.389A	7.997A	7.957A	2.391A	519.547	90.942%	1270	32.7	42.41°C	0.974
	12.123V	5.003V	3.318V	5.016V	571.292				58.58°C	230.25V
9	41.424A	8.500A	8.473A	2.395A	584.640	90.485%	1960	41.4	43.79°C	0.977
	12.120V	5.000V	3.315V	5.008V	646.118				60.22°C	230.25V
10	46.187A	9.011A	8.961A	3.006A	649.481	89.883%	2310	45.1	45.18°C	0.980
	12.119V	4.999V	3.314V	4.989V	722.584				62.02°C	230.25V
11	51.540A	9.011A	8.962A	3.008A	714.390	89.360%	2320	45.2	46.10°C	0.982
	12.120V	4.998V	3.314V	4.983V	799.454				63.83°C	230.25V
CL1	0.099A	12.013A	12.004A	0.004A	101.403	85.917%	510	6.0	43.42°C	0.838
	12.123V	5.013V	3.329V	5.103V	118.025				55.70°C	230.25V

CL2	53.969A	1.004A	1.003A	1.002A	667.617	90.310%	2320	45.2	45.61°C	0.980
	12.122V	5.001V	3.319V	5.045V	739.247				61.10°C	230.25V

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])	PF/AC Volts
1	1.209A	0.488A	0.478A	0.196A	19.694	68.932%	0	<6.0	0.764
	12.116V	5.019V	3.334V	5.118V	28.570				115.07V
2	2.435A	0.989A	0.990A	0.391A	39.758	79.904%	0	<6.0	0.895
	12.117V	5.014V	3.330V	5.111V	49.757				115.07V
3	3.667A	1.486A	1.499A	0.586A	59.872	84.131%	0	<6.0	0.937
	12.118V	5.015V	3.331V	5.102V	71.165				115.07V
4	4.886A	1.994A	1.979A	0.782A	79.788	86.118%	0	<6.0	0.956
	12.119V	5.014V	3.331V	5.096V	92.650				115.07V

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]) PF/AC Volts 1 1.206A0.491A 0.476A 0.196A 19.667 71.379% 0000 <6.0 0.486 12.122V 5.021V 3.336V 5.117V 27.553 230.23V 2 2.436A0.990A0.989A 0.391A 39.779 80.983% 0000 <6.0 0.605 12.122V 5.016V 3.332V 5.110V 49.120 230.26V 3 3.666A 1.486A 1.499A 0.586A 59.881 85.234% 0000 <6.0 0.710 12.122V 5.017V 3.332V 5.102V 70.255 230.25V 4 4.885A 1.995A 1.979A 0.783A 79.787 87.515% 0000 <6.0 0.782 12.122V 5.016V 3.331V 5.096V 91.170 230.25V
The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	9.7 mV	6.3 mV	5.3 mV	4.7 mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
20% Load	13.4 mV	7.1 mV	5.7 mV	4.7 mV	Pass
30% Load	16.4 mV	7.8 mV	6.5 mV	4.8 mV	Pass
40% Load	18.9 mV	8.9 mV	7.0 mV	4.9 mV	Pass
50% Load	20.6 mV	9.5 mV	6.9 mV	5.4 mV	Pass
60% Load	22.0 mV	10.0 mV	7.8 mV	6.2 mV	Pass
70% Load	23.5 mV	11.3 mV	8.0 mV	6.9 mV	Pass
80% Load	24.8 mV	11.6 mV	7.9 mV	7.9 mV	Pass
90% Load	26.5 mV	12.4 mV	8.9 mV	8.5 mV	Pass
100% Load	28.7 mV	13.9 mV	9.6 mV	11.3 mV	Pass
110% Load	30.0 mV	14.1 mV	10.1 mV	10.4 mV	Pass
Crossload 1	12.5 mV	11.4 mV	7.1 mV	6.4 mV	Pass
Crossload 2	28.3 mV	9.3 mV	9.1 mV	8.3 mV	Pass

The results above are not used in the certification process

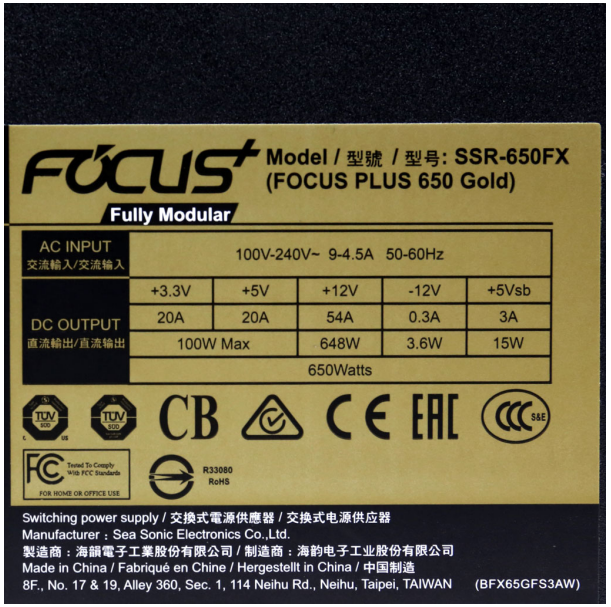
230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.5 mV	5.9 mV	5.2 mV	4.4 mV	Pass
20% Load	13.1 mV	7.1 mV	5.5 mV	4.6 mV	Pass
30% Load	16.1 mV	8.2 mV	5.9 mV	4.6 mV	Pass
40% Load	18.9 mV	8.9 mV	6.9 mV	4.8 mV	Pass
50% Load	20.4 mV	9.2 mV	6.7 mV	5.1 mV	Pass
60% Load	21.9 mV	10.0 mV	7.2 mV	5.6 mV	Pass
70% Load	23.3 mV	11.0 mV	8.1 mV	5.8 mV	Pass
80% Load	24.8 mV	11.3 mV	8.1 mV	6.1 mV	Pass
90% Load	26.3 mV	12.4 mV	9.0 mV	6.0 mV	Pass
100% Load	28.4 mV	13.8 mV	9.3 mV	6.7 mV	Pass
110% Load	30.2 mV	14.1 mV	9.6 mV	6.6 mV	Pass
Crossload 1	11.7 mV	11.4 mV	7.1 mV	6.4 mV	Pass
Crossload 2	28.3 mV	9.6 mV	8.6 mV	5.9 mV	Pass

The results above are not used in the certification process

Seasonic Focus Plus Gold 650W (#3)

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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