Seasonic S12III-650

Serial Number R2002RA1C5251091

Lab ID SS65001679

Certification ID 251679

Test Result Report ID: 20PS1679A

Certificate Issue Date: Jul 17, 2020

Scheme: ETA-EMI PSU

115V

230V

115V

230V

Scheme: LAMBDA PSU

Aristeidis Bitziopoulos, Certification Body General Manager

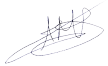
General Information

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	S12III-650
OEM/ODM	Seasonic
Serial Number	R2002RA1C5251091
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	110-240
Rated Current (Arms)	10-5
Rated Frequency (Hz)	50-60

Rated Power (W)	650
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fixed cables
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	120mm Rifle Bearing Fan (DF1202512SEHN)
Semi-Passive Operation	✗
Cybenetics Testing Information	
Lab ID	SS65001679
Date of receipt	Jul 7, 2020
Testing Date	Jul 10, 2020
Report Issued Date	Jul 17, 2020
Engineer Name	-
Authorized By the Laboratory Technical Manager	Aristeidis Bitziopoulos
Signature	

Cables and Connectors(Non-accredited measurements)

Native Cables				
Description	Cable Count	Connector Count (Total)	Gauge	In Cable Caps
ATX connector 20+4 pin (550mm)	1	1	18-24AWG	No
4+4 pin EPS12V (610mm)	1	1	18AWG	No
6+2 pin PCIe (550mm+150mm)	2	4	18-22AWG	No
SATA (580mm+125mm+125mm)	1	3	20AWG	No
SATA (450mm+125mm+125mm)	1	3	20AWG	No
4-pin Molex (450mm+120mm+120mm) / FDD(+120mm)	1	3 / 1	20AWG	No
Modular Cables				
AC Power Cord (1100mm) - C13 coupler	1	1	18AWG	-

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				

Parts Description

General Data	-
Manufacturer (OEM)	Seasonic
PCB Type	Single Sided
Primary Side	-
Transient Filter	4x Y caps, 5x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor 5D-11 & Relay
Bridge Rectifier(s)	1x HY GBU1506 (600V, 15A @ 100°C)
APFC MOSFETs	2x Oriental Semiconductor OSG55R140F (550V, 14.5A @ 100°C, Rds(on): 0.14Ohm)
APFC Boost Diode	1x WeEn BYC15-600P (600V, 15A @ 121°C)
Bulk Cap(s)	1x Teapo (400V, 470uF, 2,000h @ 85°C, LH)
Main Switchers	2x SI23N50F
APFC Controller	Infineon ICE2PCS01G
Resonant Controller	MPS HR1000A
Topology	Primary side: APFC, Half-Bridge & LLC converter Secondary side: Group Regulation & Passive Rectification
Secondary Side	-
+12V & 5V SBRs	2x MHCHXM EBR60L45PT (45V, 60A)
3.3V SBRs	2x MHCHXM EBR3EL45
Filtering Capacitors	Electrolytic: 14x Teapo (1-3,000h @ 105°C, SC) Polymer: -
Supervisor IC	Grenergy GR8313 (OVP, UVP, PG)
Fan Model	DF1202512SEHN (120mm, 12V, 0.23A, Rifle Bearing Fan)
5VSB Circuit	-
Rectifier	1x JX MBR1060CT SBR (60V, 10A)

Standby PWM Controller	Excelliance MOS EM8564A
-12V	-
Rectifier	1x STMicroelectronics L7912CV (-12V, 1.5A)

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)	83.683%
Average Noise Output (>1450 Load Combinations)	38.63dBA
Average PF (>1450 Load Combinations)	0.993
Efficiency With 10W (≤500W) or 2% (>500W) Load	59.867%
Standby Power Consumption	0.0382W
Non-Accredited	
12V Ripple (Full Load)	50.89mV
5V Ripple (Full Load)	24.45mV
3.3V Ripple (Full Load)	36.72mV
5VSB Ripple (Full Load)	19.31mV
12V Load Regulation	0.26%
5V Load Regulation	0.25%
3.3V Load Regulation	0.69%
5VSB Load Regulation	2.34%
Inrush Current	29.620A

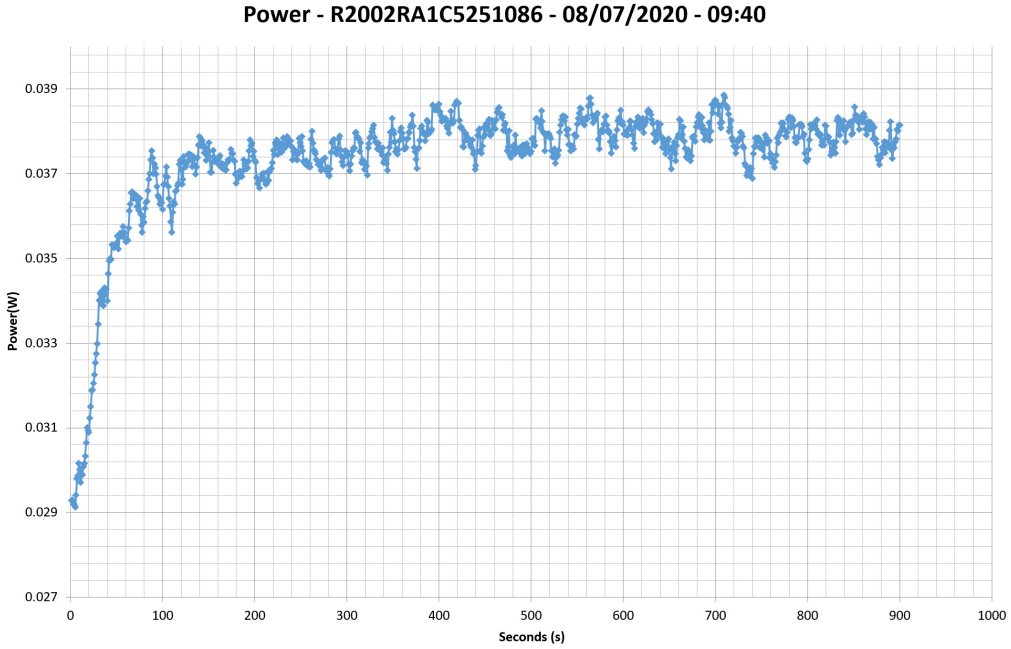
230V		
Accredited		
Average Efficiency (>1450 load combinations)		86.091%
Average Noise Output (>1450 Load Combinations)		38.28dBA
Average PF (>1450 Load Combinations)		0.949
Efficiency With 10W (≤500W) or 2% (>500W) Load		-
Standby Power Consumption		0.0786W
Non-Accredited		
12V Ripple (Full Load)		56.69mV
5V Ripple (Full Load)		24.89mV
3.3V Ripple (Full Load)		35.85mV
5VSB Ripple (Full Load)		18.50mV
12V Load Regulation		0.37%
5V Load Regulation		0.31%
3.3V Load Regulation		0.57%
5VSB Load Regulation		2.40%
Inrush Current		98.720A
Hold-Up Time & PWR_OK Signal		14.40ms
AC Loss to PWR_OK Hold Up Time		18.00ms
PWR_OK Inactive to DC Loss Delay		-3.60ms
PSU Timings: T1 (20% / 100%)	65.0ms	61.0ms
PSU Timings: T3 (20% / 100%)	291.0ms	289.0ms
OPP (24.00°C / 0.00°C)	133.49%	-

Hold-Up Time & PWR_OK Signal

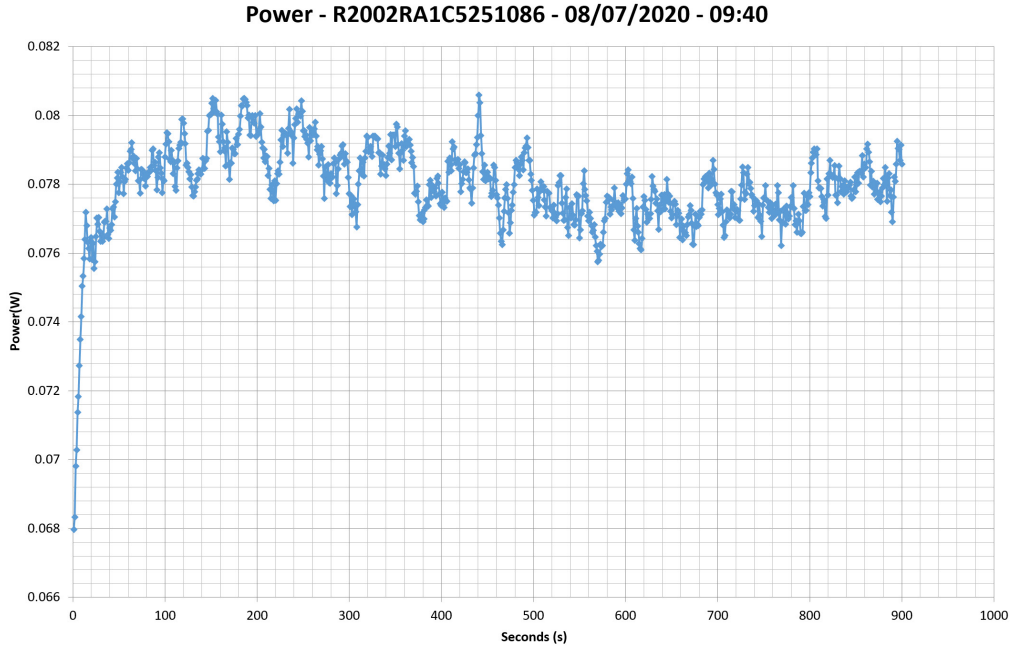
Hold-Up Time (ms)	14.4
AC Loss to PWR_OK Hold Up Time (ms)	18
PWR_OK Inactive to DC Loss Delay (ms)	-3.6

Graphs

115V

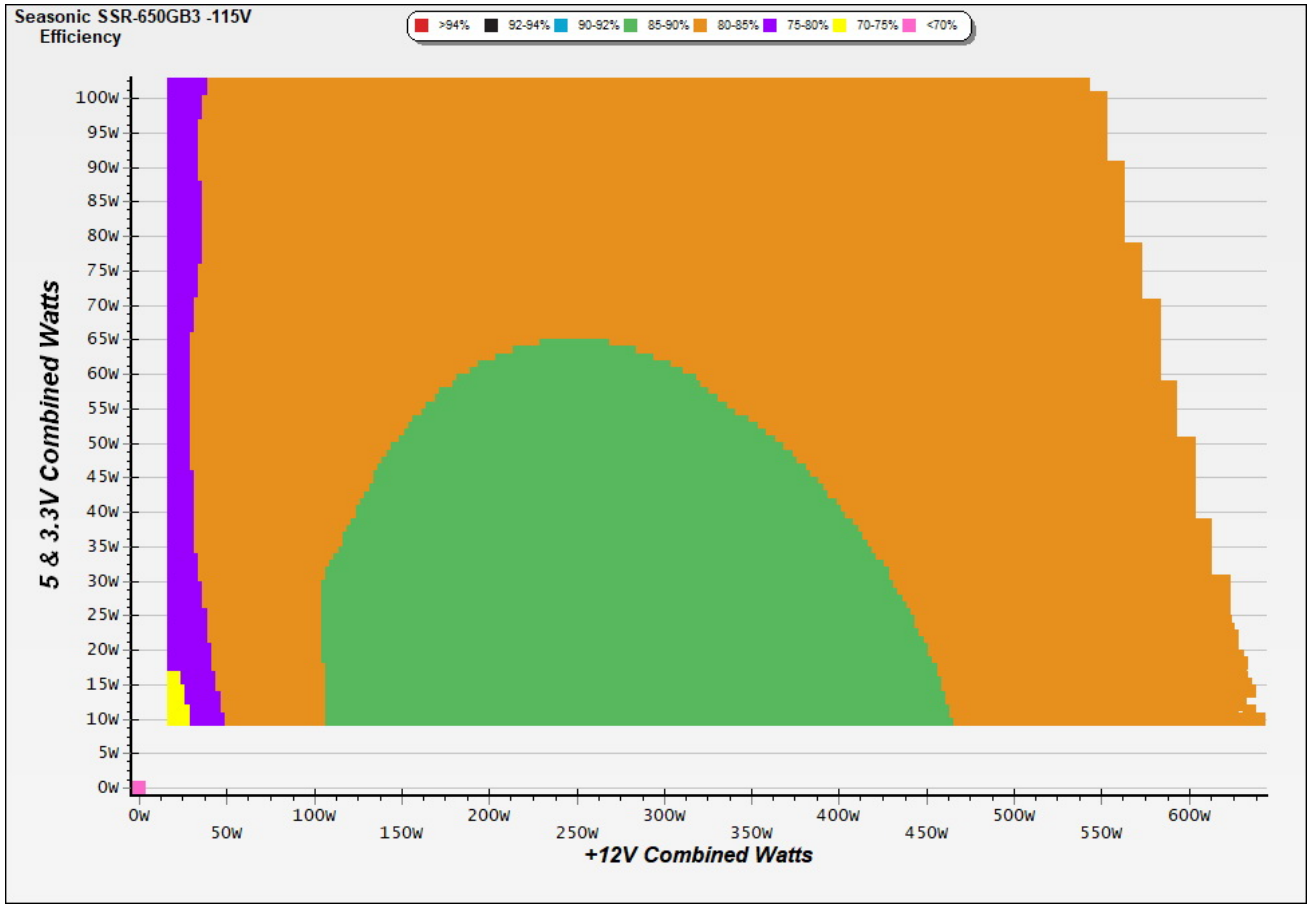


230V



Efficiency Graph

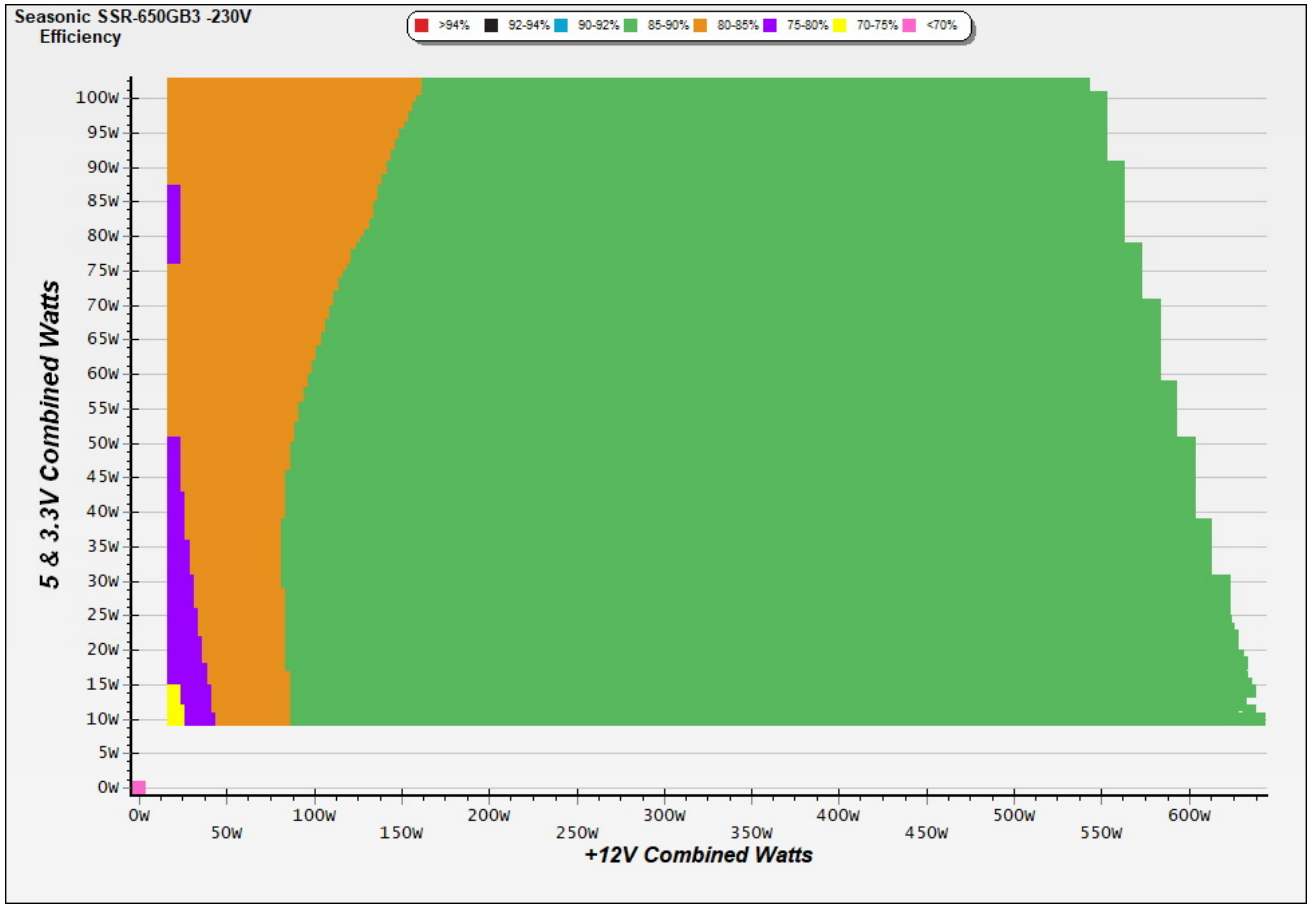
115V



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

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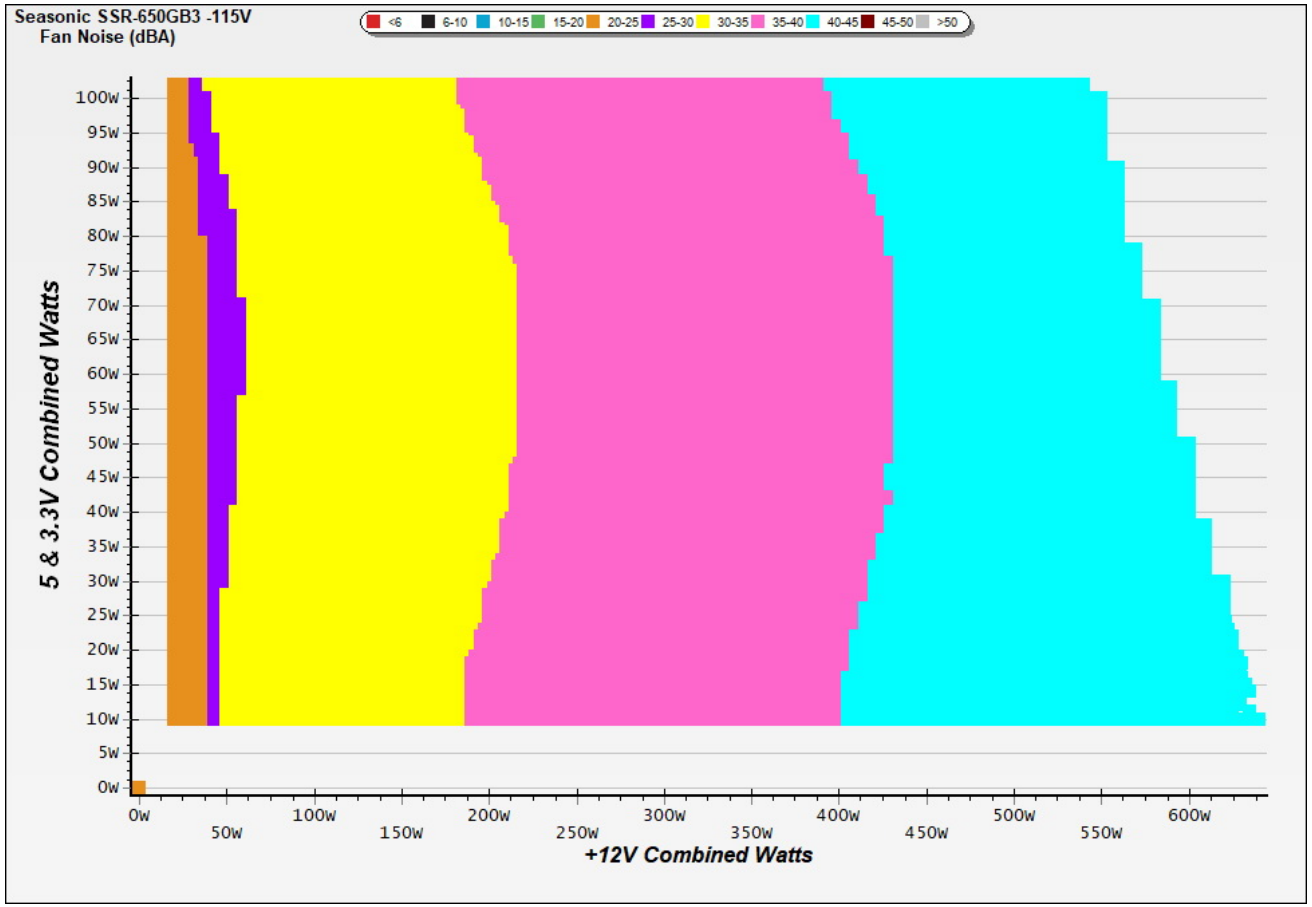
Noise Graph

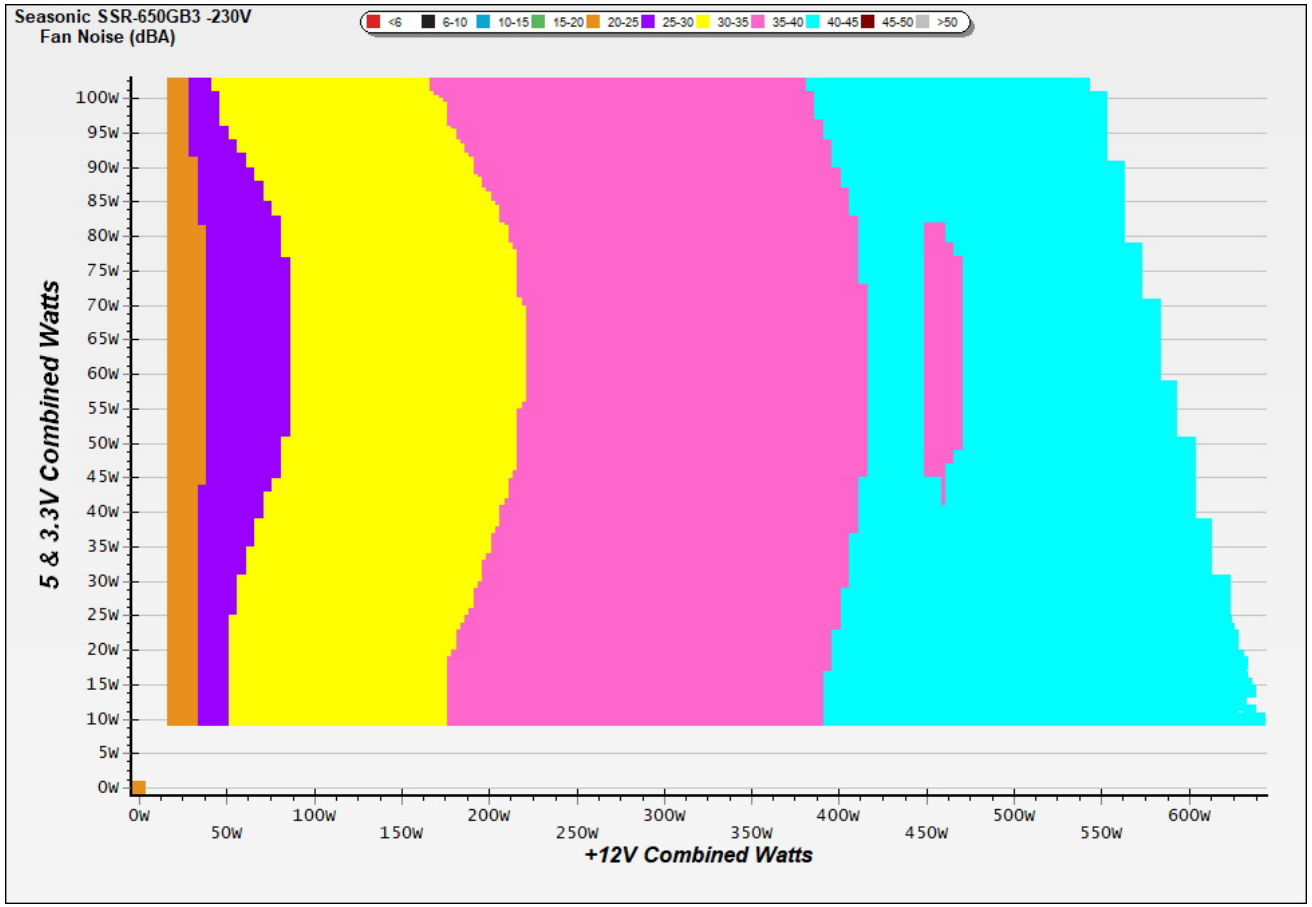
115V



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



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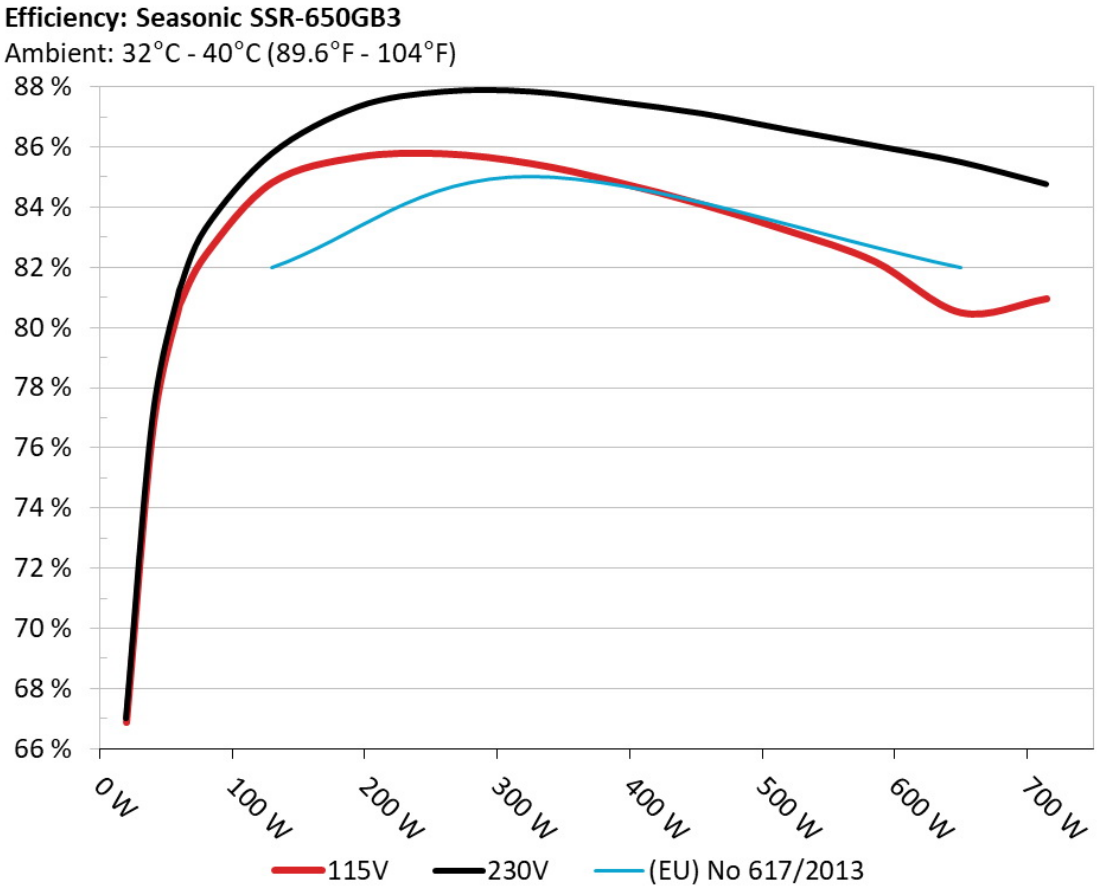
The PSU`s noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

Indicative Performance

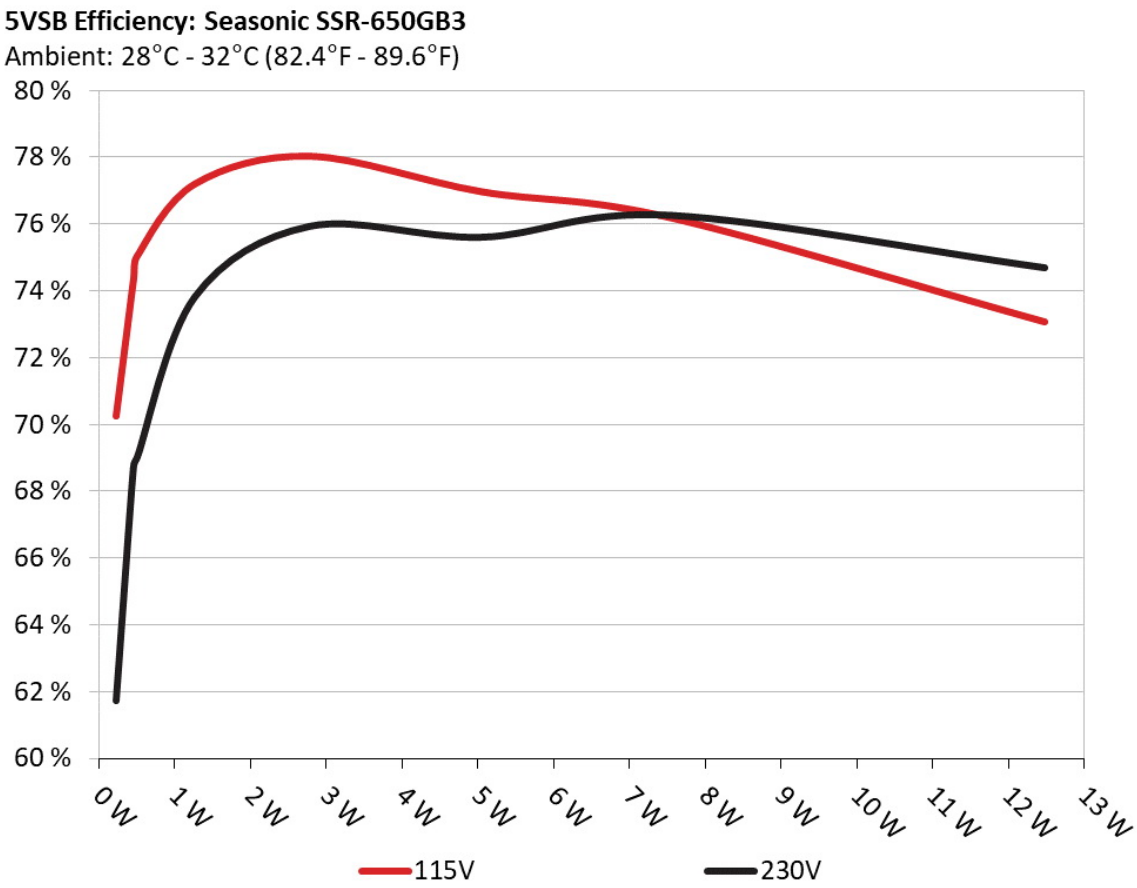
Efficiency under high ambient temperature



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	0.229	70.245%	0.015
	5.083V	0.326		115.17V
2	0.090A	0.457	74.309%	0.028
	5.082V	0.615		115.16V
3	0.550A	2.786	78.017%	0.151
	5.066V	3.571		115.16V
4	1.000A	5.049	76.955%	0.248
	5.050V	6.561		115.17V
5	1.500A	7.548	76.173%	0.324
	5.032V	9.909		115.16V
6	2.499A	12.474	73.063%	0.416
	4.991V	17.073		115.16V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.229	61.725%	0.005
	5.082V	0.371		230.30V
2	0.090A	0.457	68.722%	0.009
	5.081V	0.665		230.30V
3	0.550A	2.786	75.933%	0.049
	5.066V	3.669		230.30V
4	1.000A	5.049	75.606%	0.087
	5.050V	6.678		230.30V
5	1.500A	7.547	76.263%	0.126
	5.032V	9.896		230.30V
6	2.499A	12.485	74.693%	0.197
	4.995V	16.715		230.30V

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	3.589A	1.949A	1.982A	0.991A	64.954	80.767%	1064	27.2	34.28°C	0.945
	12.081V	5.130V	3.328V	5.046V	80.421				37.43°C	115.16V
2	8.205A	2.924A	2.975A	1.192A	130.008	84.822%	1247	32.2	34.84°C	0.984
	12.080V	5.129V	3.325V	5.035V	153.271				38.32°C	115.16V
3	13.168A	3.413A	3.477A	1.393A	195.006	85.667%	1391	35.5	35.12°C	0.992
	12.071V	5.128V	3.323V	5.025V	227.633				39.12°C	115.16V
4	18.133A	3.901A	3.974A	1.596A	260.007	85.776%	1532	37.3	35.80°C	0.995
	12.067V	5.126V	3.321V	5.014V	303.122				40.81°C	115.16V
5	22.755A	4.879A	4.970A	1.799A	325.041	85.451%	1630	38.7	36.02°C	0.996
	12.065V	5.125V	3.319V	5.004V	380.385				42.01°C	115.16V
6	27.314A	5.857A	5.971A	2.000A	389.336	84.845%	1730	40.2	36.72°C	0.997
	12.065V	5.123V	3.316V	4.993V	458.880				43.81°C	115.15V
7	31.962A	6.835A	6.974A	2.207A	454.676	84.086%	1828	41.2	37.32°C	0.998
	12.063V	5.122V	3.314V	4.983V	540.726				45.24°C	115.15V
8	36.629A	7.816A	7.971A	2.413A	519.944	83.204%	1891	42.4	37.98°C	0.998
	12.054V	5.120V	3.312V	4.973V	624.906				46.69°C	115.15V
9	41.676A	8.302A	8.460A	2.416A	584.858	82.188%	1961	43.1	38.09°C	0.998
	12.054V	5.119V	3.309V	4.968V	711.613				47.79°C	115.14V
10	46.678A	8.790A	8.981A	2.521A	649.601	80.496%	2029	43.5	38.99°C	0.999
	12.049V	5.118V	3.306V	4.958V	807.000				49.83°C	115.13V
11	51.561A	8.800A	8.969A	2.502A	714.222	80.958%	1766	40.4	39.91°C	0.999
	12.161V	5.113V	3.311V	4.995V	882.218				51.50°C	115.13V
CL1	0.098A	11.998A	11.998A	0.000A	96.740	76.106%	1675	39.4	36.67°C	0.973
	12.251V	5.049V	2.914V	5.102V	127.113				42.34°C	115.17V

CL2	53.987A	0.999A	1.001A	1.000A	670.995	82.266%	1823	41.0	38.60°C	0.999
	12.179V	5.120V	3.315V	5.054V	815.639				49.35°C	115.13V

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	3.545A	1.948A	1.982A	0.985A	64.955	81.213%	925	23.7	34.44°C	0.689
	12.229V	5.132V	3.332V	5.078V	79.981				37.62°C	230.33V
2	8.106A	2.924A	2.973A	1.184A	130.012	85.768%	1033	27.3	34.73°C	0.865
	12.227V	5.130V	3.329V	5.069V	151.586				38.51°C	230.34V
3	13.012A	3.413A	3.471A	1.384A	195.009	87.322%	1221	31.4	35.01°C	0.925
	12.216V	5.129V	3.327V	5.059V	223.323				39.33°C	230.33V
4	17.917A	3.902A	3.970A	1.585A	260.009	87.829%	1342	34.1	35.15°C	0.954
	12.212V	5.127V	3.325V	5.048V	296.039				39.78°C	230.34V
5	22.490A	4.878A	4.966A	1.787A	325.040	87.828%	1481	36.3	35.55°C	0.971
	12.207V	5.125V	3.323V	5.038V	370.085				41.29°C	230.33V
6	26.998A	5.856A	5.963A	1.989A	389.321	87.492%	1621	38.5	36.15°C	0.979
	12.205V	5.124V	3.321V	5.028V	444.977				42.77°C	230.32V
7	31.596A	6.834A	6.961A	2.192A	454.639	87.098%	1715	40.1	36.64°C	0.985
	12.202V	5.122V	3.319V	5.017V	521.984				43.75°C	230.32V
8	36.201A	7.816A	7.956A	2.397A	519.949	86.555%	1811	40.8	37.34°C	0.988
	12.197V	5.120V	3.317V	5.005V	600.716				45.60°C	230.32V
9	41.200A	8.300A	8.444A	2.400A	584.842	86.033%	1904	42.7	37.86°C	0.990
	12.193V	5.119V	3.316V	5.001V	679.790				47.00°C	230.32V
10	46.152A	8.794A	8.959A	2.503A	649.552	85.488%	1922	42.8	38.12°C	0.991
	12.185V	5.117V	3.314V	4.994V	759.814				48.83°C	230.31V
11	51.497A	8.796A	8.969A	2.505A	714.368	84.751%	2003	43.2	39.62°C	0.992
	12.179V	5.115V	3.311V	4.989V	842.905				51.35°C	230.31V
CL1	0.100A	11.997A	11.998A	0.000A	96.197	76.751%	1866	42.1	35.83°C	0.823
	12.256V	5.049V	2.867V	5.099V	125.337				41.03°C	230.32V

CL2	54.005A	1.000A	1.000A	1.000A	671.699	85.911%	1977	43.4	38.91°C	0.992
	12.188V	5.121V	3.315V	5.051V	781.856				49.18°C	230.31V

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	1.228A	0.487A	0.495A	0.197A	19.981	66.880%	847	21.6	0.761
	12.080V	5.131V	3.330V	5.077V	29.876				115.16V
2	2.456A	0.975A	0.991A	0.395A	39.971	76.658%	876	21.5	0.890
	12.079V	5.131V	3.329V	5.069V	52.142				115.16V
3	3.689A	1.462A	1.485A	0.593A	60.003	80.524%	904	22.4	0.935
	12.079V	5.130V	3.328V	5.060V	74.516				115.16V
4	4.914A	1.949A	1.985A	0.792A	79.955	82.431%	1026	26.8	0.957
	12.078V	5.130V	3.327V	5.052V	96.996				115.16V

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	1.212A	0.487A	0.495A	0.196A	19.983	66.996%	884	22.0	0.343
	12.236V	5.134V	3.334V	5.109V	29.827				230.33V
2	2.426A	0.975A	0.989A	0.392A	39.973	76.982%	886	22.0	0.531
	12.231V	5.133V	3.333V	5.101V	51.925				230.34V
3	3.644A	1.461A	1.485A	0.589A	60.005	81.027%	898	22.4	0.662
	12.228V	5.132V	3.333V	5.093V	74.056				230.33V
4	4.855A	1.948A	1.982A	0.786A	79.956	83.282%	916	23.3	0.748
	12.226V	5.132V	3.332V	5.086V	96.006				230.33V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.80mV	7.50mV	8.40mV	5.00mV	Pass
20% Load	12.50mV	9.10mV	11.90mV	6.10mV	Pass
30% Load	16.10mV	10.90mV	15.20mV	7.60mV	Pass
40% Load	17.80mV	13.00mV	19.20mV	11.80mV	Pass
50% Load	20.90mV	13.30mV	20.40mV	14.00mV	Pass
60% Load	23.30mV	14.40mV	22.30mV	15.80mV	Pass
70% Load	26.40mV	16.60mV	24.70mV	16.00mV	Pass
80% Load	31.20mV	18.40mV	29.50mV	15.40mV	Pass
90% Load	42.40mV	21.30mV	32.60mV	14.40mV	Pass
100% Load	50.90mV	24.50mV	36.70mV	19.30mV	Pass
110% Load	66.20mV	27.50mV	41.80mV	21.60mV	Pass
Crossload1	13.90mV	79.10mV	73.10mV	9.60mV	Fail
Crossload2	71.40mV	24.50mV	38.50mV	25.10mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.50mV	7.20mV	8.40mV	5.70mV	Pass
20% Load	12.30mV	8.60mV	11.50mV	7.60mV	Pass
30% Load	14.80mV	10.40mV	14.90mV	10.80mV	Pass
40% Load	17.20mV	11.90mV	16.80mV	15.20mV	Pass
50% Load	19.30mV	13.40mV	19.00mV	17.10mV	Pass
60% Load	21.60mV	14.30mV	21.90mV	18.30mV	Pass
70% Load	24.90mV	15.70mV	23.80mV	16.70mV	Pass
80% Load	28.50mV	17.10mV	27.40mV	16.30mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	37.00mV	19.60mV	30.00mV	15.80mV	Pass
100% Load	56.70mV	24.90mV	35.90mV	18.50mV	Pass
110% Load	71.20mV	28.20mV	38.80mV	20.00mV	Pass
Crossload1	8.90mV	19.80mV	24.10mV	8.50mV	Pass
Crossload2	70.50mV	25.00mV	33.20mV	23.60mV	Pass

The results above are not used in the certification process

Seasonic S12III-650

Top side

Power specifications label