

Anex

Seasonic SSR-650SGX

Lab ID#: SS19650002
Receipt Date: Feb 22, 2019
Test Date: Feb 22, 2019

Report:

Report Date: Feb 27, 2019

DUT INFORMATION	
Brand	Seasonic
Manufacturer (OEM)	Seasonic
Series	Focus Gold
Model Number	SSR-650SGX
Serial Number	R1901AA112440002
DUT Notes	

DUT SPECIFICATIONS	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	8-4
Rated Frequency (Hz)	50-60
Rated Power (W)	650
Type	SFX-L
Cooling	120mm Fluid Dynamic Bearing Fan (S1201512HB)
Semi-Passive Operation	✓
Cable Design	Fully Modular

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				

CABLES AND CONNECTORS				
Modular Cables				
Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (360mm)	1	1	18AWG	No
4+4 pin EPS12V (400mm)	1	1	18AWG	No
6+2 pin PCIe (400mm+100mm)	2	4	18AWG	No
SATA (300mm+200mm+100mm)	2	6	18AWG	No
4 pin Molex (300mm+200mm+200mm)	1	3	18AWG	No
AC Power Cord (1370mm) - C13 coupler	1	1	18AWG	-

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General Data	
Manufacturer (OEM)	Seasonic
PCB Type	Double Sided
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor & Relay
Bridge Rectifier(s)	1x
APFC MOSFETS	2x Champion GPT18N50D (500V, 18A @ 150°C, 0.27Ohm)
APFC Boost Diode	1x STMicroelectronics STTH8S06D (600V, 8A @ 150°C)
Hold-up Cap(s)	1x Nichicon (400V, 470uF, 2000h @ 105°C, CE, GG)
Main Switchers	2x Infineon IPP50R190CE (550V, 15.7A @ 100°C, 0.19Ohm)
Combo APFC/PWM Controller	Champion CM6500UN
Resonant Controllers	Champion CM6901T6X
Topology	Primary side: Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	4x Nexperia PSMN1R8-40YLC (40V, 100A @ 25°C, 1.8mOhm)
5V & 3.3V	2x DC-DC converters
Filtering Capacitors	Electrolytics: 1x Rubycon (3000h - 6000h @ 105°C, YXG), 1x Nichicon (2200uF, 16V @ 105°C), 9x Nippon Chemi-Con (105°C, W) Polymers: 13x FPCAP, 4x Nippon Chemi-Con
Supervisor IC	Weltrend WT7527V (OVP, UVP, OCP, SCP, PG)
Fan Model	Globe Fan S1201512HB (120mm, 12V, 0.45A, Fluid Dynamic Bearing Fan)
5VSB Circuit	
Standby PWM Controller	Excelliance EM8569C
Rectifier	MBR1045ULPS (45V, 10A @ 90°C)

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RESULTS	
Temperature Range (°C /°F)	30-32 / 86-89.6
Average Efficiency	88.541
Efficiency With 10W (≤500W) or 2% (>500W) Load -115V	64.200
Average Efficiency 5VSB	76.893
Standby Power Consumption (W) -115V	0.0458652
Standby Power Consumption (W) -230V	0.0729706
Average PF	0.984
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
Avg Noise Output	36.91
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	Standard+

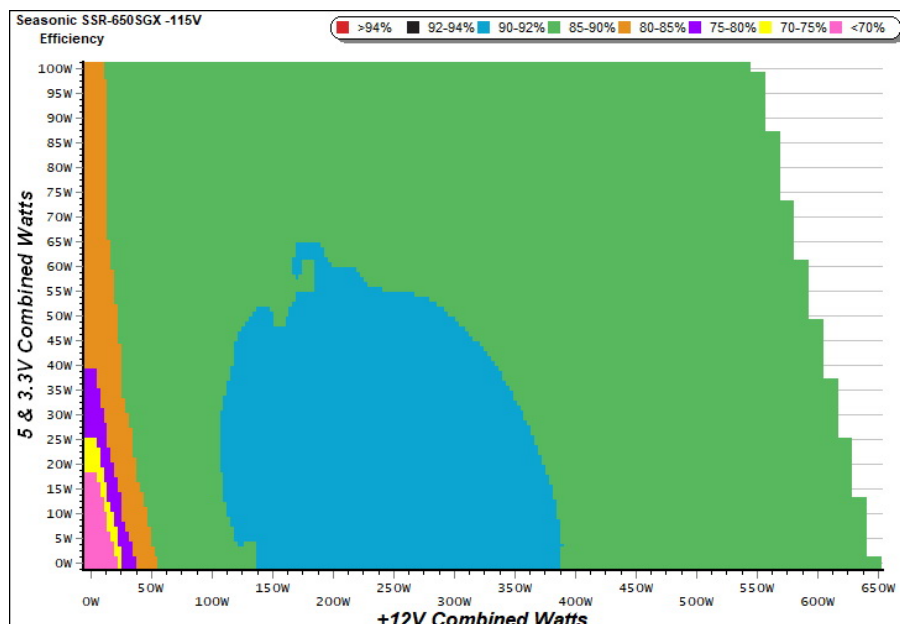
TEST EQUIPMENT		
Electronic Loads	Chroma 6314A x2 63123A x6 63102A 63101A	Chroma 63601-5 x4 Chroma 63600-2 x2 63640-80-80 x20 63610-80-20 x2
AC Sources	Chroma 6530, Chroma 61604, Keysight AC6804B	
Power Analyzers	N4L PPA1530 x2, N4L PPA5530	
Oscilloscopes	Picoscope 4444 & 3424, Keysight DSOX3024A, Rigol DS2072A	
Voltmeter	Keithley 2015 THD 6.5 Digit	
Sound Analyzer	Bruel & Kjaer 2250-L G4	
Microphone	Bruel & Kjaer Type 4955-A, Bruel & Kjaer Type 4189	
Data Loggers	Picoscope TC-08 x2, Labjack U3-HV x2	

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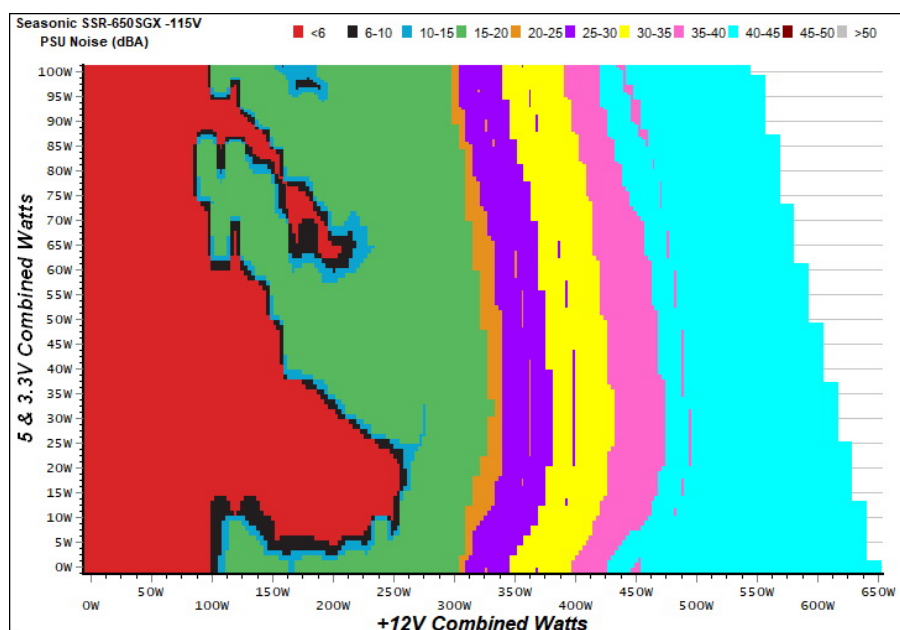
EFFICIENCY GRAPH



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



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

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Seasonic SSR-650SGX

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

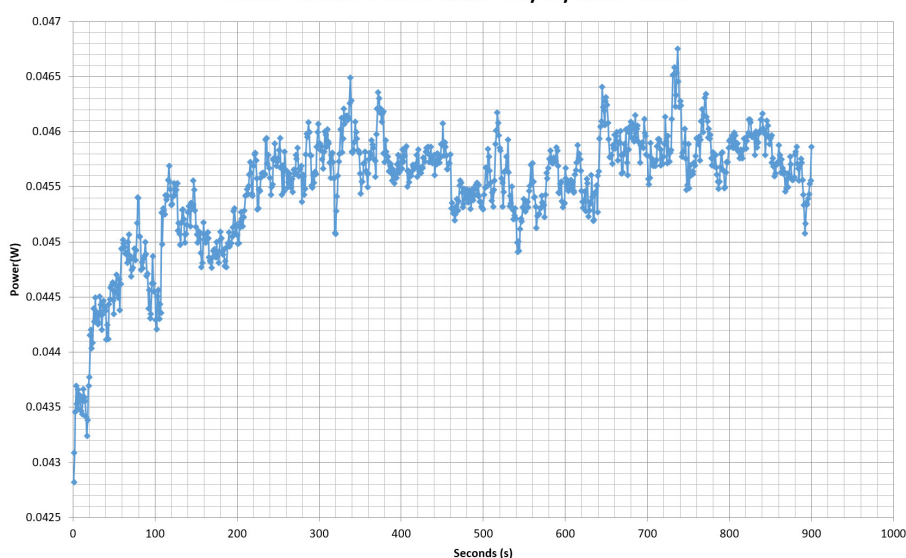
Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.231	68.546%	0.056
	5.136V	0.337		115.11V
2	0.090A	0.462	73.217%	0.101
	5.135V	0.631		115.11V
3	0.550A	2.820	77.387%	0.337
	5.126V	3.644		115.11V
4	1.000A	5.120	77.365%	0.405
	5.119V	6.618		115.11V
5	1.500A	7.667	77.711%	0.439
	5.111V	9.866		115.11V
6	3.000A	15.235	75.940%	0.482
	5.078V	20.062		115.11V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.231	62.264%	0.019
	5.136V	0.371		230.30V
2	0.090A	0.463	68.899%	0.034
	5.135V	0.672		230.30V
3	0.550A	2.820	76.196%	0.161
	5.126V	3.701		230.30V
4	1.000A	5.120	76.900%	0.242
	5.118V	6.658		230.29V
5	1.500A	7.665	77.012%	0.296
	5.109V	9.953		230.28V
6	3.000A	15.252	77.689%	0.369
	5.084V	19.632		230.28V

VAMPIRE POWER -115V

Power - R1901AA112440002 - 20/02/2019 - 09:17



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

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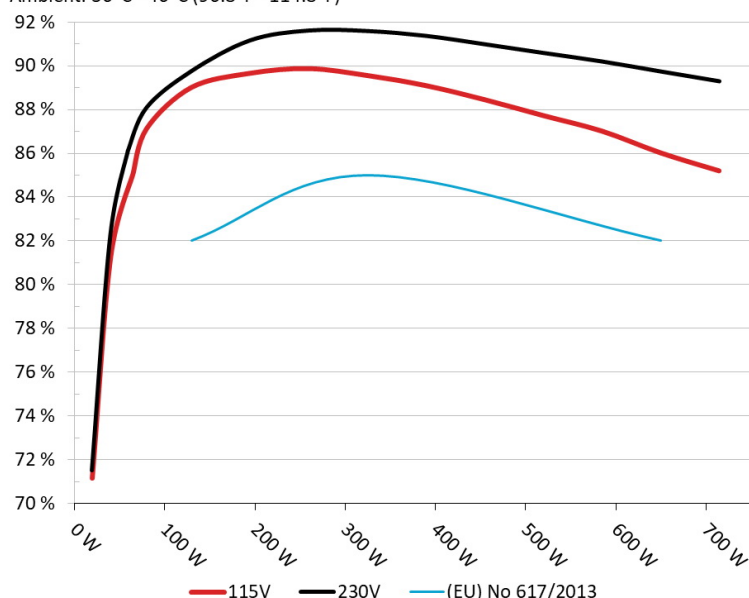
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EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: Seasonic SSR-650SGX

Ambient: 36°C - 46°C (96.8°F - 114.8°F)



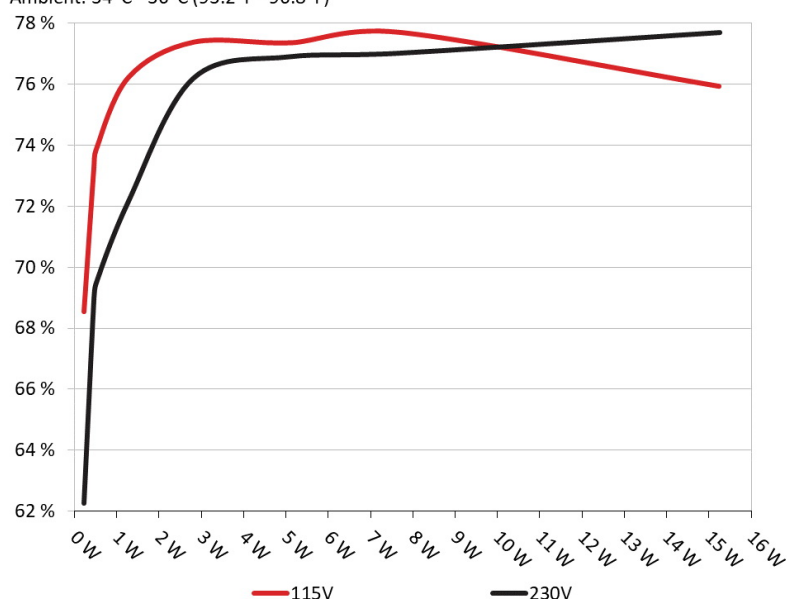
INFO

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

5VSB Efficiency: Seasonic SSR-650SGX

Ambient: 34°C - 36°C (93.2°F - 96.8°F)



INFO

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

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10-110% LOAD TESTS

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	3.619A	2.004A	1.990A	0.978A	64.819	84.899%	0	<6.0	43.77°C	0.960
	11.944V	4.992V	3.312V	5.112V	76.348				39.04°C	115.12V
2	8.243A	3.007A	2.989A	1.176A	129.342	88.998%	932	19.7	39.53°C	0.978
	11.943V	4.989V	3.310V	5.103V	145.332				44.61°C	115.12V
3	13.271A	3.510A	3.475A	1.374A	194.470	89.648%	939	19.8	40.02°C	0.984
	11.941V	4.987V	3.309V	5.094V	216.925				45.78°C	115.12V
4	18.296A	4.012A	3.990A	1.573A	259.673	89.863%	1000	23.9	40.64°C	0.987
	11.941V	4.986V	3.308V	5.085V	288.966				47.23°C	115.12V
5	22.988A	5.016A	4.986A	1.774A	324.974	89.544%	1337	33.2	41.35°C	0.989
	11.940V	4.985V	3.307V	5.076V	362.923				48.68°C	115.11V
6	27.614A	6.020A	5.989A	1.974A	389.487	89.087%	1604	40.0	41.57°C	0.989
	11.939V	4.984V	3.306V	5.066V	437.199				49.83°C	115.11V
7	32.310A	7.023A	6.986A	2.176A	454.816	88.442%	1854	40.8	42.41°C	0.989
	11.938V	4.984V	3.306V	5.056V	514.251				51.10°C	115.10V
8	37.001A	8.029A	7.987A	2.379A	520.128	87.713%	2084	44.1	42.74°C	0.991
	11.938V	4.983V	3.305V	5.046V	592.987				52.26°C	115.10V
9	42.096A	8.534A	8.475A	2.381A	585.051	87.005%	2087	44.1	43.54°C	0.992
	11.938V	4.981V	3.304V	5.040V	672.430				53.71°C	115.10V
10	46.925A	9.039A	8.992A	2.987A	649.891	86.013%	2093	44.2	44.57°C	0.992
	11.938V	4.979V	3.302V	5.023V	755.570				55.41°C	115.11V
11	52.359A	9.043A	8.995A	2.991A	714.713	85.193%	2096	44.2	46.18°C	0.993
	11.937V	4.977V	3.301V	5.016V	838.932				57.53°C	115.10V
CL1	0.145A	12.000A	11.997A	0.000A	101.263	83.226%	1339	33.2	41.55°C	0.974
	11.946V	4.990V	3.305V	5.112V	121.673				48.47°C	115.13V
CL2	54.015A	1.002A	0.999A	1.000A	658.197	86.754%	2094	44.2	44.32°C	0.992
	11.938V	4.983V	3.310V	5.067V	758.692				55.17°C	115.13V

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20-80W LOAD TESTS

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.210A	0.500A	0.481A	0.195A	19.546	71.154%	0	<6.0	0.857
	11.942V	4.999V	3.318V	5.131V	27.470				115.12V
2	2.483A	1.002A	0.993A	0.390A	39.952	81.254%	0	<6.0	0.932
	11.942V	4.997V	3.317V	5.125V	49.169				115.12V
3	3.688A	1.503A	1.476A	0.586A	59.442	85.068%	0	<6.0	0.958
	11.943V	4.993V	3.314V	5.120V	69.876				115.12V
4	4.961A	2.004A	1.991A	0.782A	79.850	87.123%	0	<6.0	0.963
	11.944V	4.991V	3.312V	5.114V	91.652				115.12V

RIPPLE MEASUREMENTS

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	12.4 mV	9.9 mV	12.7 mV	10.3 mV	Pass
20% Load	13.6 mV	11.4 mV	13.1 mV	10.6 mV	Pass
30% Load	14.1 mV	12.8 mV	14.5 mV	11.7 mV	Pass
40% Load	15.2 mV	13.9 mV	15.1 mV	12.2 mV	Pass
50% Load	16.9 mV	15.9 mV	15.6 mV	12.8 mV	Pass
60% Load	18.5 mV	17.1 mV	16.9 mV	14.1 mV	Pass
70% Load	20.8 mV	18.7 mV	17.6 mV	16.2 mV	Pass
80% Load	21.8 mV	20.6 mV	18.8 mV	18.3 mV	Pass
90% Load	23.4 mV	22.0 mV	19.6 mV	19.7 mV	Pass
100% Load	24.8 mV	23.3 mV	21.4 mV	18.9 mV	Pass
110% Load	36.8 mV	23.6 mV	21.3 mV	23.2 mV	Pass
Crossload 1	16.5 mV	19.3 mV	18.7 mV	10.8 mV	Pass
Crossload 2	23.3 mV	15.1 mV	15.9 mV	18.5 mV	Pass

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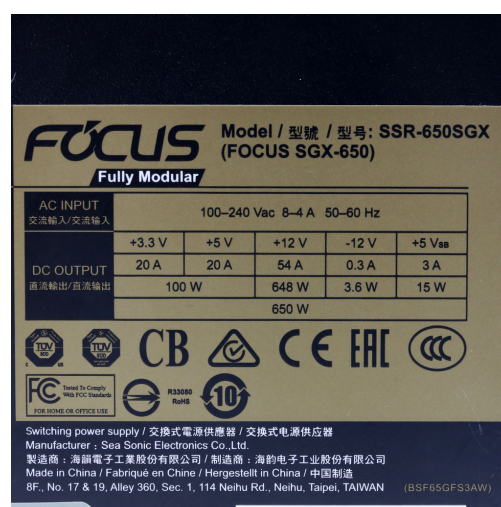
Seasonic SSR-650SGX

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

Hold-Up Time (ms)	19.0
AC Loss to PWR_OK Hold Up Time (ms)	16.6
PWR_OK Inactive to DC Loss Delay (ms)	2.4



Top side



Power specifications label

CERTIFICATIONS



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