

## Anex

Seasonic SSR-650PX

Lab ID#: 241

Receipt Date: -

Test Date: -

Report:

Report Date: Nov 12, 2018

DUT INFORMATION	
Brand	Seasonic
Manufacturer (OEM)	Seasonic
Series	FOCUS Plus Platinum
Model Number	SSR-650PX
Serial Number	R1707AA170400337
DUT Notes	Retested on 04/10/2018

DUT SPECIFICATIONS	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	9-4.5
Rated Frequency (Hz)	50-60
Rated Power (W)	650
Type	ATX12V
Cooling	120mm Fluid Dynamic Bearing Fan (HA1225M12F-Z)
Semi-Passive Operation	✓ (selectable)
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 (600mm)	1	1	18-22AWG	Yes
4+4 pin EPS12V (650mm)	1	1	18AWG	Yes
6+2 pin PCIe (680mm+80mm)	2	4	18AWG	Yes
SATA (450mm+110mm+110mm+110mm)	2	8	18AWG	No
4 pin Molex (450mm+120mm+120mm)	1	3	18AWG	No
FDD Adapter (+105mm)	1	1	22AWG	No
AC Power Cord (1370mm) - C13 coupler	1	1	18AWG	No

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General Data	
Manufacturer (OEM)	Seasonic
Platform Model	PX
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV , 1x CM02X
Inrush Protection	NTC Thermistor & Diode
Bridge Rectifier(s)	2x GBU1506 (600V, 15A @ 100°C)
APFC MOSFETS	2x Infineon IPP50R199CP (550V, 15A @ 100°C, 0.199Ohm)
APFC Boost Diode	1x STMicroelectronics STTH8S06D (600V, 8A @ 125°C)
Hold-up Cap(s)	1x Nippon Chemi-Con (400V, 450uF, 2000h @ 105°C, CE)
Main Switchers	4x Infineon IPP50R250CP (550V, 9A @ 100°C, 0.250hm)
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	4x Nexperia PSMN2R6-40YS (40V, 100A @ 100°C, 3.7mOhm @ 100°C)
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), W Polymers: Chemi-Con
Supervisor IC	Weltrend WT7527V (OVP, UVP, OCP, SCP, PG)
Fan Model	Hong Hua HA1225M12F-Z (120mm, 12V, 0.45A, 2050 RPM, Fluid Dynamic Bearing)
5VSB Circuit	
Standby PWM Controller	Excelliance EM8569C
Rectifier	P10V45SP SBR (45V, 10A @ 50% Duty Cycle)

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RESULTS	
Temperature Range (°C /°F)	30-32 / 86-89.6
Average Efficiency	90.168
Efficiency With 10W ( $\leq 500W$ ) or 2% ( $> 500W$ ) Load -115V	0.000
Average Efficiency 5VSB	77.258
Standby Power Consumption (W) -115V	0.0490144
Standby Power Consumption (W) -230V	0.0765786
Average PF	0.986
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
Avg Noise Output	25.35
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A-

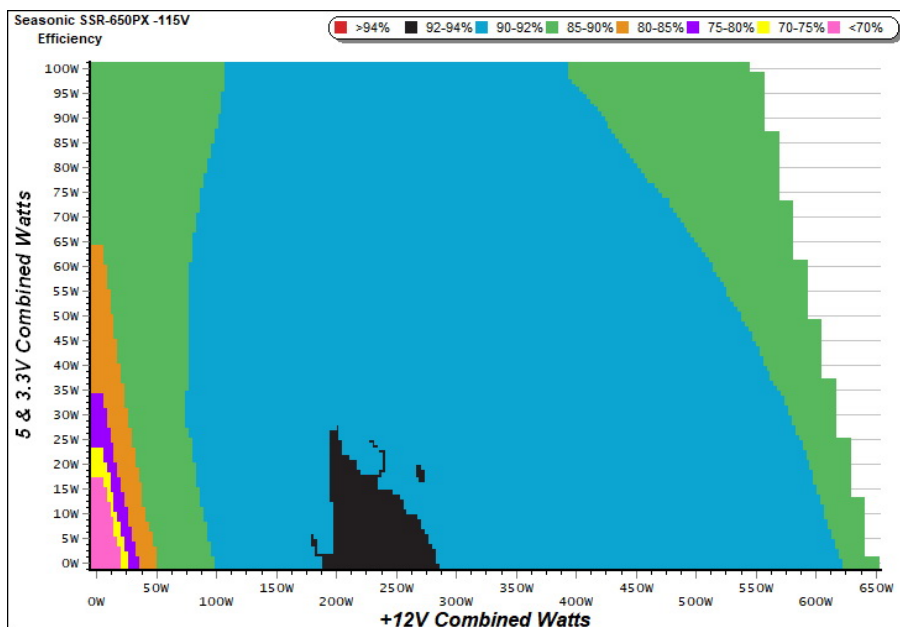
TEST EQUIPMENT		
Electronic Loads	Chroma 6314A x2 63123A x6 63102A 63101A	Chroma 63601-5 x2 Chroma 63600-2 63640-80-80 x10 63610-80-20
AC Sources	Chroma 6530, Chroma 61604	
Power Analyzers	N4L PPA1530, N4L PPA5530	
Oscilloscopes	Picoscope 4444 & 3424, Keysight DSOX3024A, Rigol DS2072A	
Voltmeter	Keithley 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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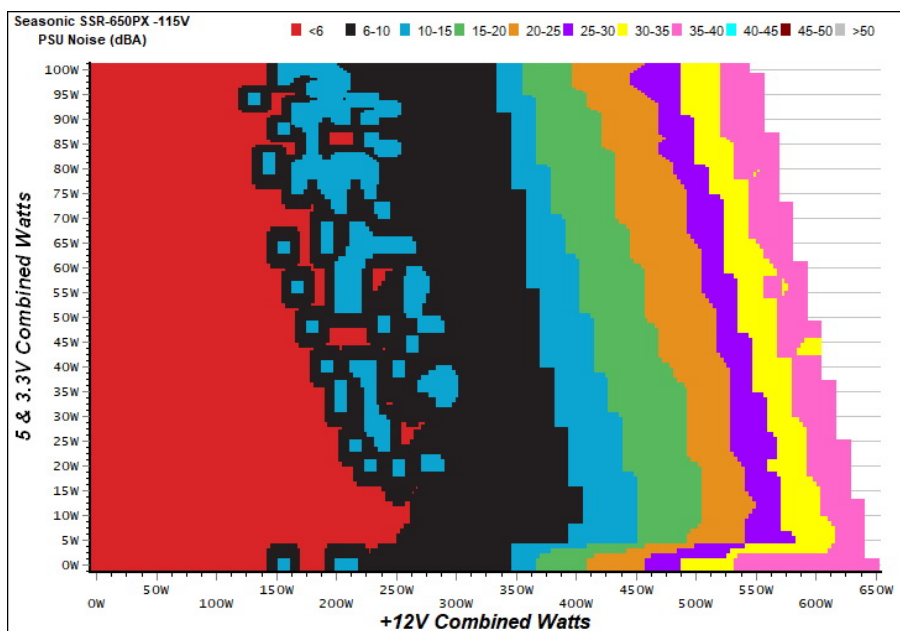
### EFFICIENCY GRAPH



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

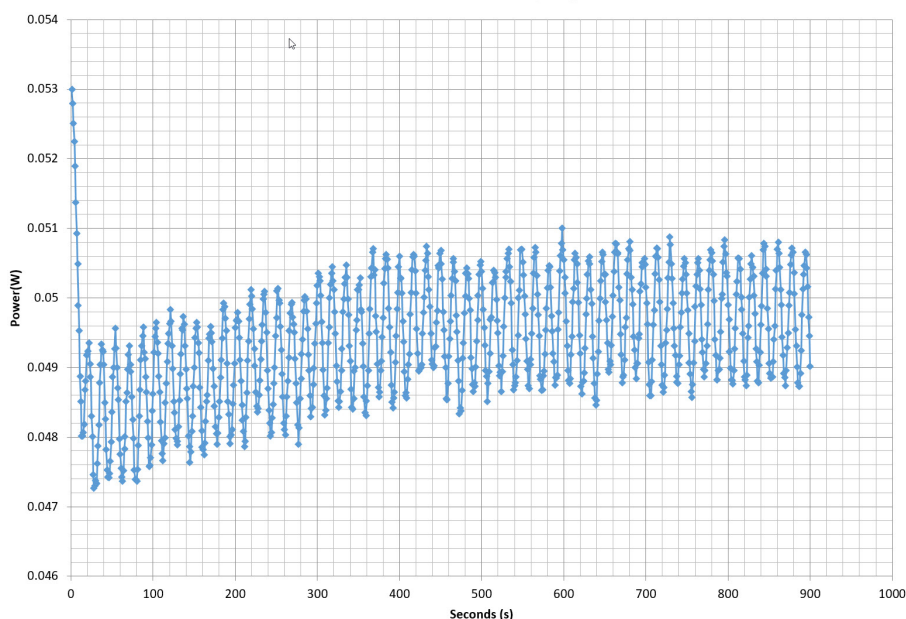
Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.230	68.047%	0.029
	5.112V	0.338		115.27V
2	0.090A	0.460	73.248%	0.054
	5.111V	0.628		115.27V
3	0.550A	2.805	77.593%	0.251
	5.100V	3.615		115.26V
4	1.000A	5.090	77.984%	0.350
	5.091V	6.527		115.26V
5	1.500A	7.619	78.072%	0.408
	5.080V	9.759		115.26V
6	3.000A	15.106	76.335%	0.479
	5.036V	19.789		115.25V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.230	60.847%	0.012
	5.112V	0.378		230.83V
2	0.090A	0.460	67.847%	0.021
	5.111V	0.678		230.82V
3	0.550A	2.805	76.285%	0.106
	5.100V	3.677		230.82V
4	1.000A	5.090	77.580%	0.175
	5.090V	6.561		230.81V
5	1.500A	7.619	77.358%	0.236
	5.079V	9.849		230.82V
6	3.000A	15.135	77.931%	0.338
	5.045V	19.421		230.82V

### VAMPIRE POWER -115V

Power - R1707AA170400337 - 09/12/2017 - 10:15



#### 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

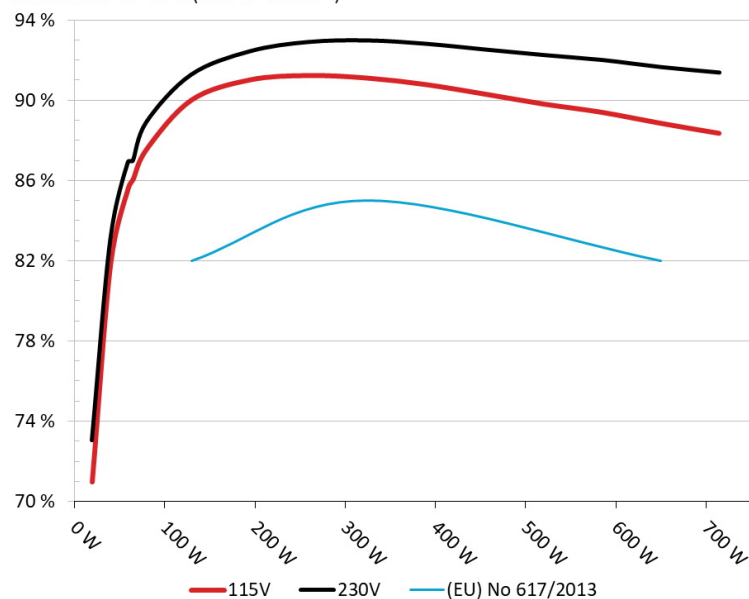
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### EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

#### Efficiency: Seasonic SSR-650PX

Ambient: 37°C - 47°C (98.6°F - 116.6°F)



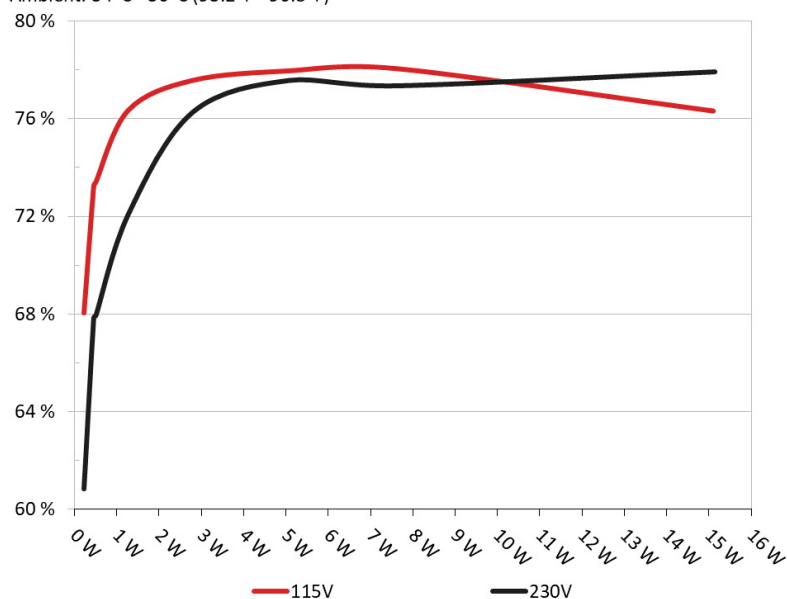
#### INFO

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-650PX

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	3.557A	1.984A	1.989A	0.984A	64.736	86.050%	0	<6.0	45.47°C	0.958
	12.134V	5.029V	3.316V	5.084V	75.231				38.02°C	115.29V
2	8.107A	2.983A	2.985A	1.183A	129.267	89.991%	0	<6.0	46.33°C	0.979
	12.134V	5.028V	3.315V	5.074V	143.644				38.38°C	115.20V
3	13.051A	3.481A	3.470A	1.382A	194.391	90.999%	0	<6.0	47.30°C	0.987
	12.136V	5.028V	3.315V	5.064V	213.620				38.77°C	115.11V
4	17.994A	3.976A	3.983A	1.583A	259.599	91.212%	485	9.3	39.00°C	0.989
	12.138V	5.027V	3.314V	5.054V	284.610				49.36°C	115.12V
5	22.606A	4.974A	4.982A	1.785A	324.927	91.087%	445	9.6	39.68°C	0.990
	12.139V	5.027V	3.313V	5.044V	356.722				51.37°C	115.02V
6	27.154A	5.970A	5.977A	1.987A	389.451	90.764%	795	18.9	40.03°C	0.991
	12.140V	5.026V	3.312V	5.033V	429.079				51.88°C	114.92V
7	31.770A	6.962A	6.978A	2.191A	454.772	90.291%	1155	28.7	41.34°C	0.991
	12.140V	5.025V	3.310V	5.022V	503.673				53.59°C	114.94V
8	36.388A	7.964A	7.979A	2.395A	520.095	89.795%	1670	37.2	42.84°C	0.991
	12.138V	5.024V	3.309V	5.012V	579.203				55.57°C	114.84V
9	41.400A	8.463A	8.464A	2.398A	585.024	89.380%	2005	41.1	43.86°C	0.991
	12.138V	5.023V	3.308V	5.005V	654.535				56.75°C	114.74V
10	46.149A	8.962A	8.980A	3.009A	649.864	88.838%	2025	41.2	45.29°C	0.992
	12.138V	5.022V	3.307V	4.986V	731.517				58.65°C	114.63V
11	51.480A	8.963A	8.982A	3.013A	714.688	88.339%	2035	41.3	46.57°C	0.993
	12.140V	5.022V	3.307V	4.980V	809.032				60.54°C	114.64V
CL1	0.738A	12.001A	12.001A	0.000A	109.074	86.604%	445	9.6	43.65°C	0.979
	12.143V	5.026V	3.316V	5.092V	125.946				52.20°C	115.21V
CL2	54.012A	1.002A	1.000A	1.000A	668.978	89.315%	2025	41.2	45.89°C	0.992
	12.138V	5.024V	3.308V	5.039V	749.007				59.16°C	114.62V

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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	1.172A	0.494A	0.480A	0.196A	19.296	70.980%	0	<6.0	0.860
	12.128V	5.035V	3.319V	5.107V	27.185				115.34V
2	2.427A	0.993A	0.995A	0.392A	39.729	81.845%	0	<6.0	0.930
	12.129V	5.029V	3.316V	5.100V	48.542				115.32V
3	3.619A	1.490A	1.476A	0.589A	59.286	85.605%	0	<6.0	0.957
	12.130V	5.029V	3.316V	5.094V	69.255				115.29V
4	4.873A	1.987A	1.989A	0.786A	79.711	87.547%	0	<6.0	0.970
	12.133V	5.029V	3.316V	5.088V	91.049				115.26V

### RIPPLE MEASUREMENTS

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.1 mV	4.8 mV	3.7 mV	3.9 mV	Pass
20% Load	11.7 mV	5.6 mV	4.3 mV	4.3 mV	Pass
30% Load	14.3 mV	6.0 mV	4.9 mV	4.4 mV	Pass
40% Load	17.0 mV	6.5 mV	5.6 mV	4.7 mV	Pass
50% Load	19.0 mV	7.9 mV	6.5 mV	4.9 mV	Pass
60% Load	20.4 mV	9.3 mV	7.1 mV	5.4 mV	Pass
70% Load	22.1 mV	10.4 mV	8.2 mV	7.2 mV	Pass
80% Load	22.4 mV	10.9 mV	9.0 mV	9.5 mV	Pass
90% Load	23.4 mV	9.9 mV	9.0 mV	9.8 mV	Pass
100% Load	24.5 mV	11.0 mV	9.4 mV	8.1 mV	Pass
110% Load	26.7 mV	11.5 mV	9.7 mV	8.9 mV	Pass
Crossload 1	10.6 mV	9.5 mV	8.4 mV	5.2 mV	Pass
Crossload 2	24.9 mV	8.2 mV	5.6 mV	7.8 mV	Pass

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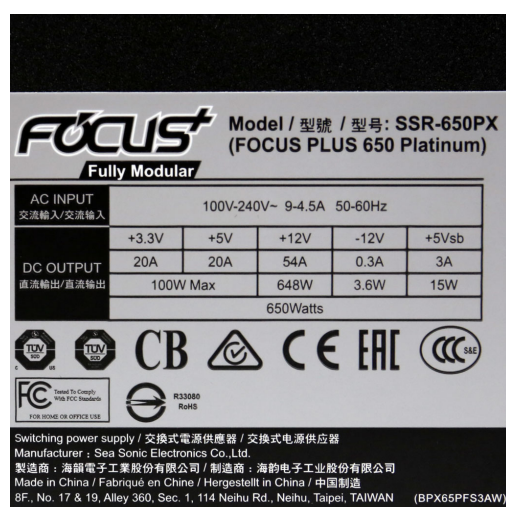
Seasonic SSR-650PX

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

Hold-Up Time (ms)	22.0
AC Loss to PWR_OK Hold Up Time (ms)	17.4
PWR_OK Inactive to DC Loss Delay (ms)	4.6



Top side



Power specifications label

## CERTIFICATIONS



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