

## Anex

Seasonic SSR-650FX (Sample #3)

Lab ID#: 236

Receipt Date: -

Test Date: -

Report:

Report Date: Jul 12, 2018

DUT INFORMATION		DUT SPECIFICATIONS	
Brand	Seasonic	Rated Voltage (Vrms)	100-240
Manufacturer (OEM)	Seasonic	Rated Current (Arms)	9-4.5
Series	FOCUS Plus Gold	Rated Frequency (Hz)	50-60
Model Number	SSR-650FX (Sample #3)	Rated Power (W)	650
Serial Number	R1708AA174160086	Type	ATX12V
DUT Notes		Cooling	120mm Fluid Dynamic Bearing Fan (HA1225H12F-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 (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

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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

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RESULTS	
Temperature Range (°C /°F)	30-32 / 86-89.6
Average Efficiency	88.653
Efficiency With 10W (≤500W) or 2% (>500W) Load -115V	0.000
Average Efficiency 5VSB	76.986
Standby Power Consumption (W) -115V	0.0458031
Standby Power Consumption (W) -230V	0.0742347
Average PF	0.983
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
Avg Noise Output	25.17
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	A-

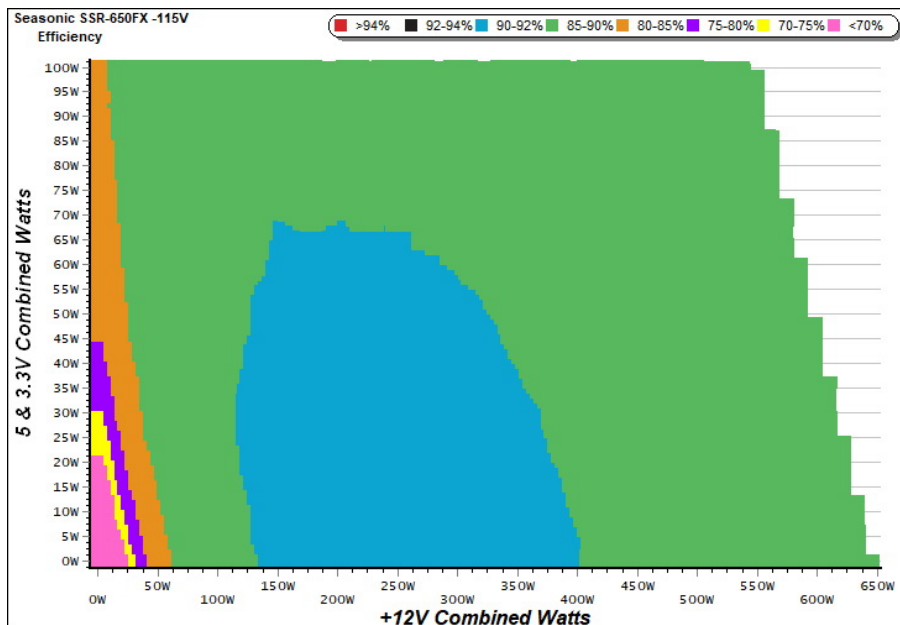
TEST EQUIPMENT		
Electronic Loads	Chroma 6314A x2 63123A x6 63102A 63101A	Chroma 63601-5 x2 Chroma 63600-2 63640-80-80 x10 63610-80-20
AC Sources	Chroma 6530, Chroma 61604	
Power Analyzers	N4L PPA1530, N4L PPA5530	
Oscilloscopes	Picoscope 4444 & 3424, Keysight DSOX3024A, Rigol DS2072A	
Voltmeter	Keithley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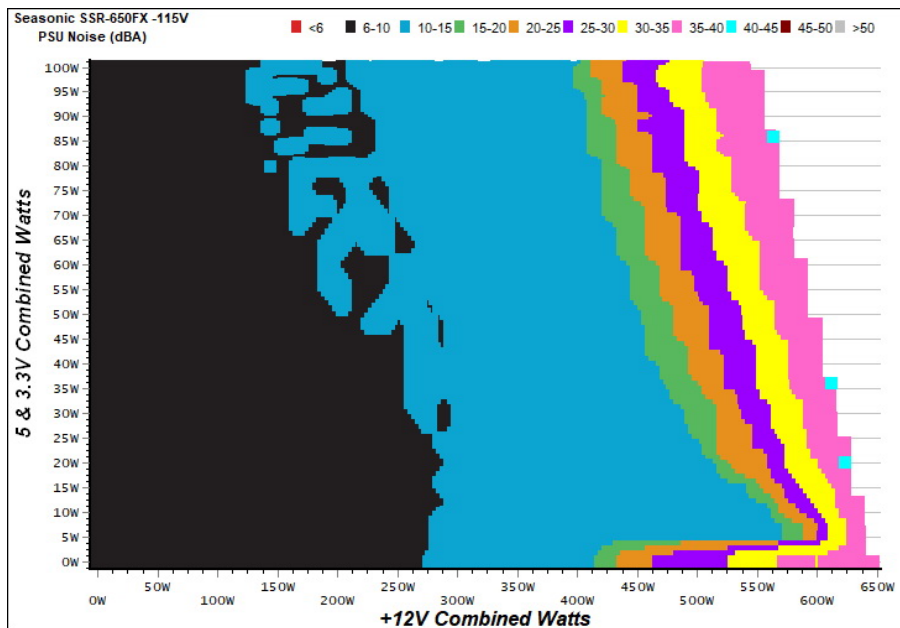
### EFFICIENCY GRAPH



#### 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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Seasonic SSR-650FX (Sample #3)

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

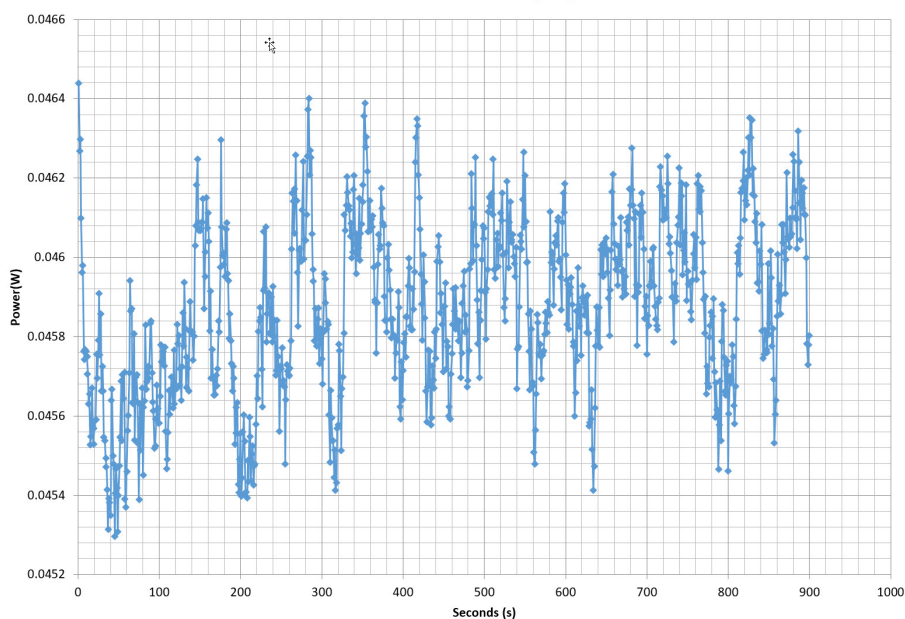
Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.042A	0.214	67.296%	0.052
	5.126V	0.318		115.03V
2	0.087A	0.447	73.279%	0.097
	5.125V	0.610		115.04V
3	0.542A	2.774	77.681%	0.327
	5.115V	3.571		115.03V
4	1.002A	5.115	77.535%	0.397
	5.104V	6.597		115.03V
5	1.502A	7.649	77.956%	0.431
	5.093V	9.812		115.03V
6	3.001A	15.155	75.992%	0.478
	5.050V	19.943		115.03V

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

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

### VAMPIRE POWER -115V

Power - R1708AA174160086 - 05/12/2017 - 10:51



#### 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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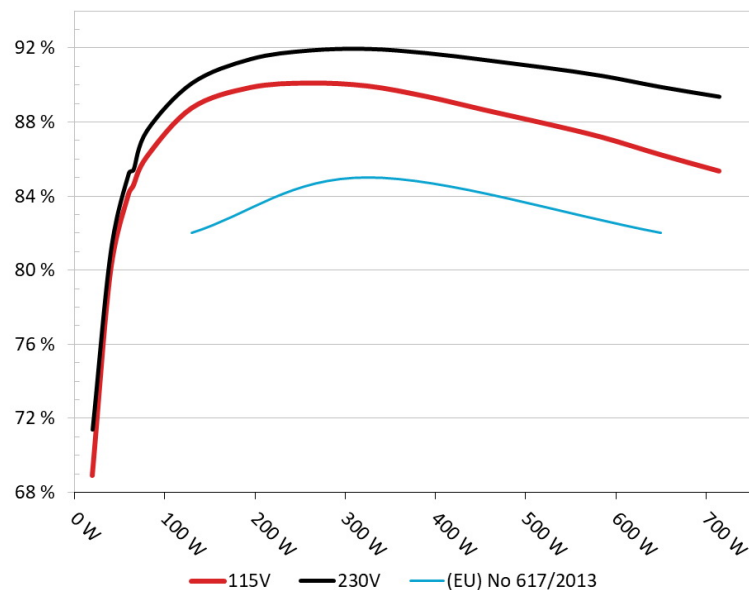
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#### EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

##### Efficiency: Seasonic SSR-650FX

Ambient: 37°C - 46°C (98.6°F - 114.8°F)



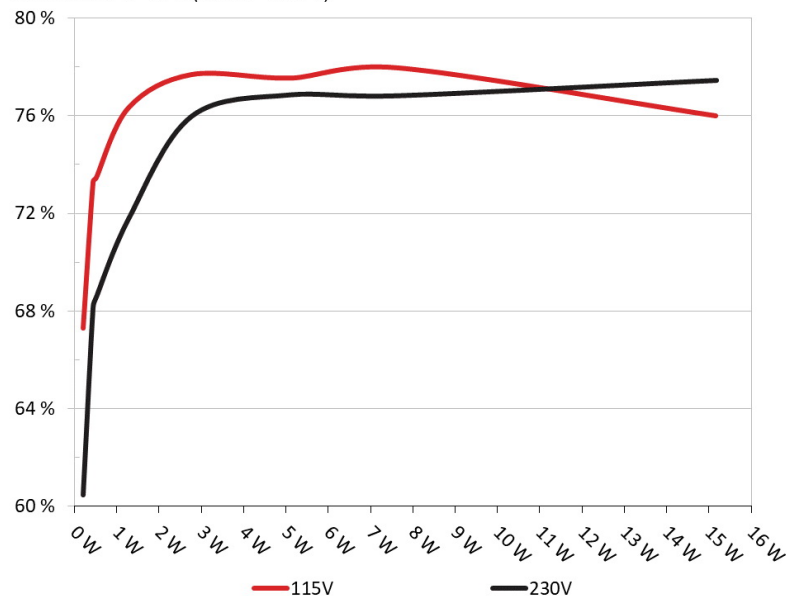
##### INFO

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-650FX

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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Seasonic SSR-650FX (Sample #3)

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	3.567A	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

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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	1.209A	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

### RIPPLE MEASUREMENTS

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

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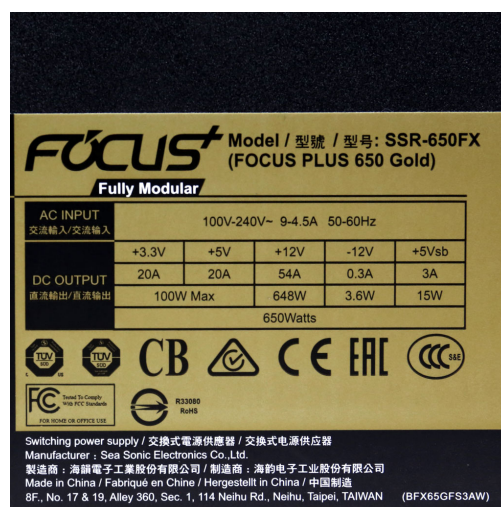
Seasonic SSR-650FX (Sample #3)

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

Hold-Up Time (ms)	17.02
AC Loss to PWR_OK Hold Up Time (ms)	15.02
PWR_OK Inactive to DC Loss Delay (ms)	2.0



Top side



Power specifications label

## CERTIFICATIONS



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