Anex

Seasonic SSR-650FX (Sample #2)

Lab ID#: 166
Receipt Date: -
Test Date: -

Report:
Report Date: Aug 25, 2018

DUT INFORMATION

Brand	Seasonic
Manufacturer (OEM)	Seasonic
Series	FOCUS Plus Gold
Model Number	SSR-650FX (Sample #2)
Serial Number	R1706AA135920167
DUT Notes	

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 (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
ATX connector 20+4 pin (610mm)	1	1	18-22AWG
4+4 pin EPS12V (655mm)	1	1	18AWG
6+2 pin PCIe (680mm+80mm)	2	4	18AWG
SATA (455mm+115mm+115mm+115mm)	2	8	18AWG
4 pin Molex (460mm+125mm+125mm)	1	3	18AWG
FDD Adapter (+110mm)	1	1	22AWG

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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	87.867
Efficiency With 10W (≤500W) or 2% (>500W) Load -115V	0.000
Average Efficiency 5VSB	76.259
Standby Power Consumption (W) -115V	0.0451532
Standby Power Consumption (W) -230V	0.0740241
Average PF	0.985
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
Avg Noise Output	27.87
Efficiency Rating (ETA)	GOLD
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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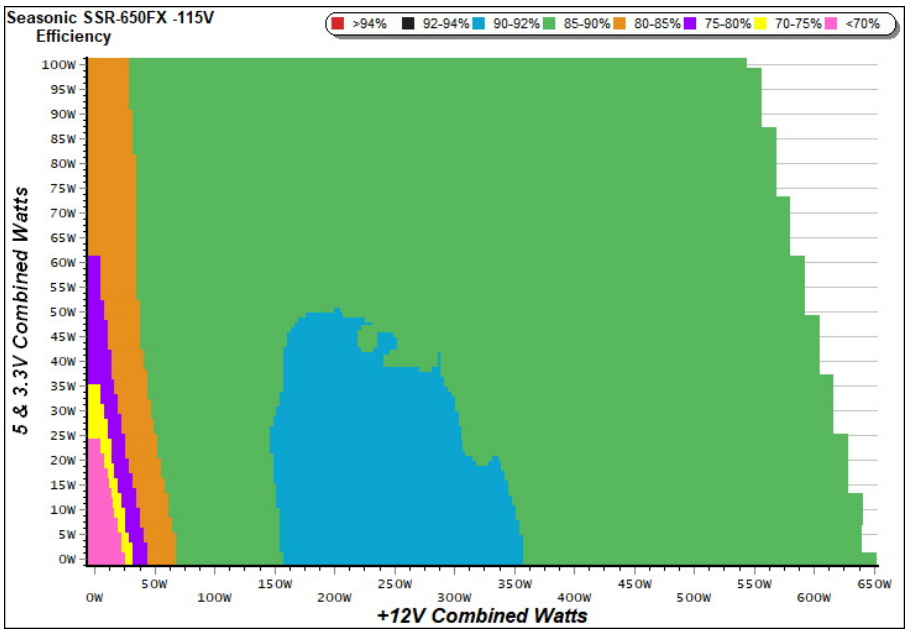
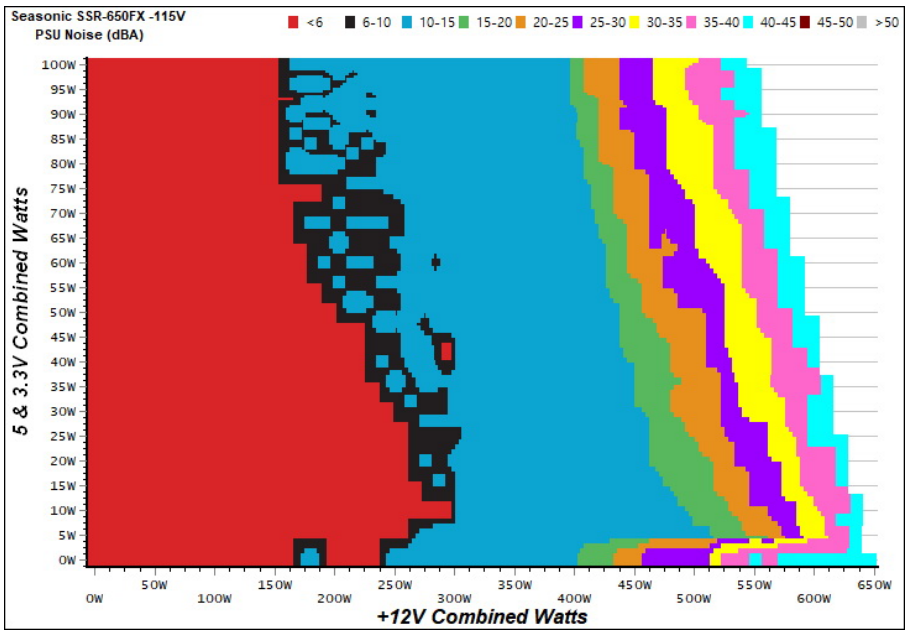
EFFICIENCY GRAPH



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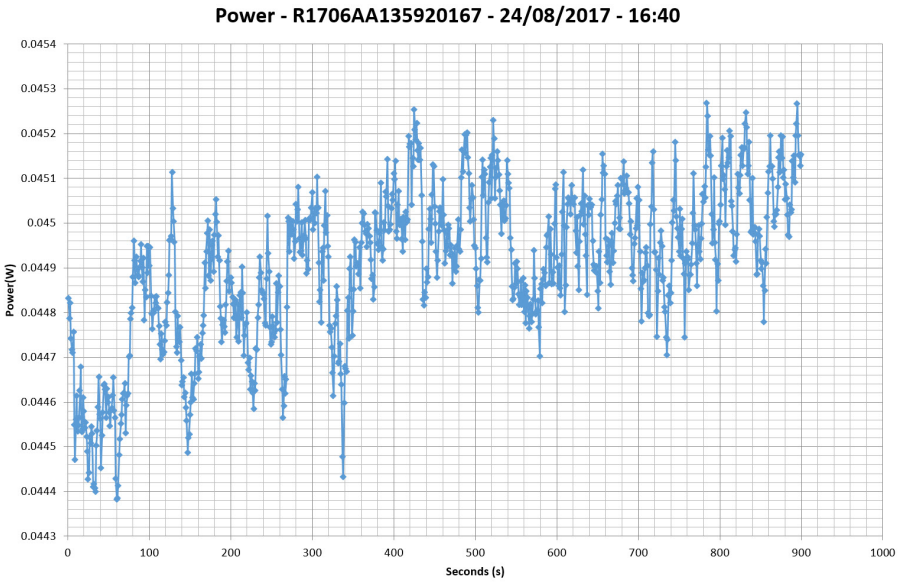
5VSB EFFICIENCY (ERP LOT 3/6 & CEC)

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.042A	0.215	67.398%	0.052
	5.141V	0.319		115.19V
2	0.088A	0.450	73.171%	0.098
	5.139V	0.615		115.16V
3	0.542A	2.780	76.987%	0.339
	5.129V	3.611		115.19V
4	1.002A	5.130	77.247%	0.413
	5.119V	6.641		115.19V
5	1.502A	7.669	77.168%	0.451
	5.107V	9.938		115.18V
6	3.002A	15.193	75.176%	0.494
	5.061V	20.210		115.16V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.042A	0.214	60.282%	0.018
	5.141V	0.355		230.42V
2	0.087A	0.449	67.927%	0.033
	5.139V	0.661		230.42V
3	0.543A	2.782	75.413%	0.160
	5.128V	3.689		230.40V
4	1.002A	5.130	76.659%	0.244
	5.118V	6.692		230.41V
5	1.502A	7.669	76.377%	0.302
	5.106V	10.041		230.46V
6	3.001A	15.222	76.855%	0.380
	5.072V	19.806		230.41V

VAMPIRE POWER -115V



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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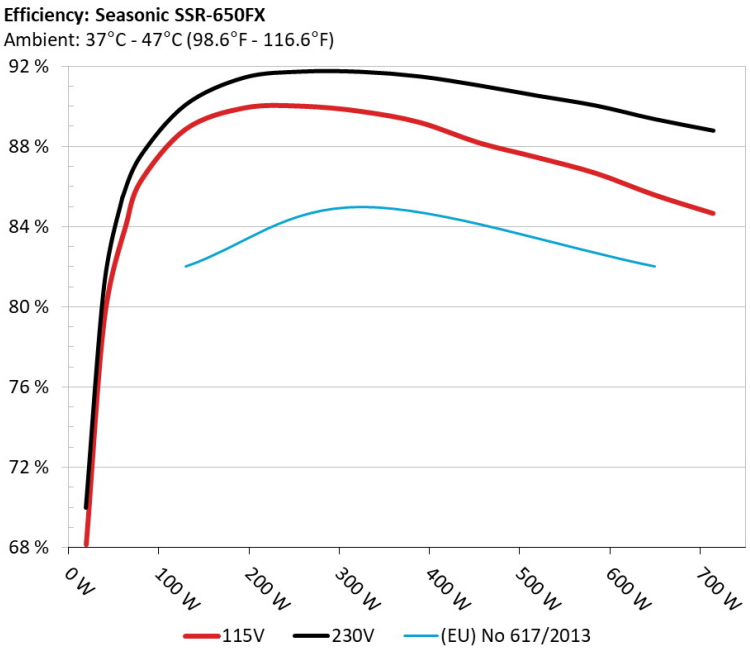
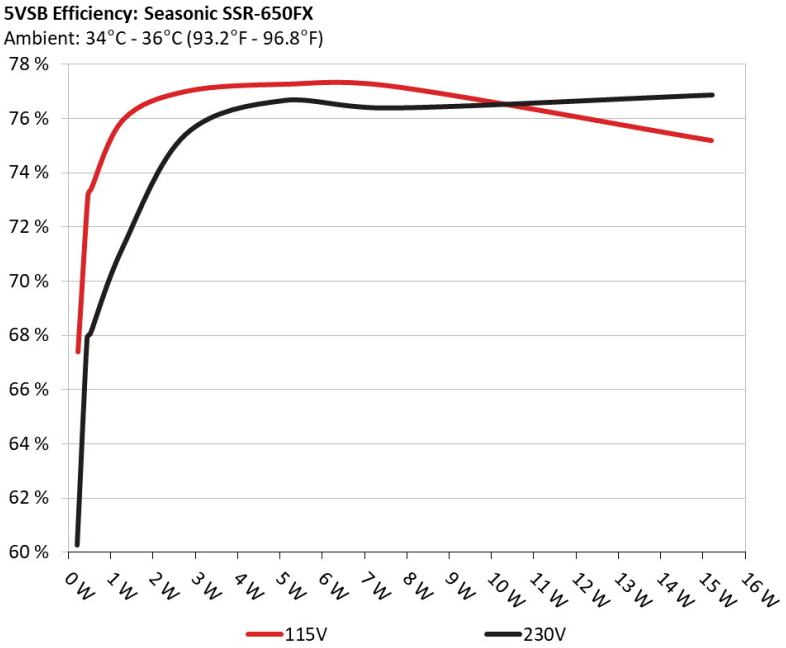
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE



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

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TYPICAL 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	3.552A	2.006A	1.989A	0.975A	64.778	84.178%	0	<6.0	45.35°C	0.955
	12.162V	4.992V	3.310V	5.108V	76.954				38.31°C	115.19V
2	8.134A	3.000A	2.991A	1.176A	129.751	88.854%	0	<6.0	45.70°C	0.978
	12.160V	4.988V	3.306V	5.094V	146.027				38.70°C	115.18V
3	13.056A	3.512A	3.508A	1.375A	194.838	89.918%	0	<6.0	46.41°C	0.985
	12.160V	4.985V	3.302V	5.081V	216.685				39.21°C	115.18V
4	17.975A	4.016A	3.999A	1.575A	259.749	90.002%	459	9.9	40.35°C	0.988
	12.160V	4.980V	3.298V	5.070V	288.609				50.35°C	115.18V
5	22.553A	5.023A	5.006A	1.778A	324.687	89.740%	550	10.4	40.44°C	0.990
	12.159V	4.975V	3.293V	5.056V	361.808				52.16°C	115.19V
6	27.127A	6.039A	6.016A	1.980A	389.633	89.189%	560	10.5	41.06°C	0.990
	12.159V	4.971V	3.290V	5.042V	436.862				53.23°C	115.18V
7	31.702A	7.044A	7.028A	2.185A	454.528	88.183%	845	20.4	42.18°C	0.991
	12.159V	4.967V	3.285V	5.029V	515.439				54.65°C	115.17V
8	36.282A	8.068A	8.044A	2.391A	519.537	87.447%	1333	31.4	43.33°C	0.992
	12.158V	4.962V	3.282V	5.013V	594.117				56.65°C	115.16V
9	41.291A	8.576A	8.570A	2.395A	584.530	86.660%	2007	41.6	44.01°C	0.992
	12.156V	4.958V	3.278V	5.004V	674.508				57.58°C	115.15V
10	46.046A	9.085A	9.069A	3.009A	649.379	85.581%	2310	45.1	45.19°C	0.993
	12.155V	4.954V	3.274V	4.982V	758.788				58.90°C	115.16V
11	51.391A	9.089A	9.078A	3.014A	714.294	84.662%	2140	44.3	46.73°C	0.993
	12.154V	4.951V	3.271V	4.975V	843.697				60.89°C	115.15V
CL1	0.100A	12.014A	12.003A	0.004A	100.569	83.561%	0	0	42.96°C	0.973
	12.166V	4.977V	3.294V	5.108V	120.354				47.41°C	115.20V
CL2	54.115A	1.005A	1.000A	1.002A	670.992	85.971%	2320	45.2	45.76°C	0.993
	12.153V	4.965V	3.287V	5.045V	780.484				58.99°C	115.15V

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LIGHT LOAD TESTS

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.200A	0.495A	0.479A	0.191A	19.639	68.165%	0	<6.0	0.820
	12.160V	5.002V	3.318V	5.134V	28.811				115.19V
2	2.424A	1.000A	0.995A	0.391A	39.772	79.434%	0	<6.0	0.919
	12.161V	4.993V	3.313V	5.126V	50.069				115.19V
3	3.653A	1.499A	1.511A	0.585A	59.907	84.273%	0	<6.0	0.952
	12.161V	4.993V	3.312V	5.119V	71.087				115.18V
4	4.868A	2.003A	1.991A	0.780A	79.773	86.254%	0	<6.0	0.963
	12.161V	4.991V	3.310V	5.111V	92.486				115.18V

RIPPLE MEASUREMENTS

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	9.0 mV	6.8 mV	7.8 mV	6.0 mV	Pass
20% Load	12.5 mV	6.9 mV	8.2 mV	6.0 mV	Pass
30% Load	14.5 mV	7.0 mV	7.3 mV	6.0 mV	Pass
40% Load	17.2 mV	7.6 mV	7.9 mV	6.6 mV	Pass
50% Load	18.8 mV	8.5 mV	9.1 mV	6.9 mV	Pass
60% Load	21.2 mV	9.1 mV	9.3 mV	7.6 mV	Pass
70% Load	22.2 mV	9.6 mV	8.9 mV	7.4 mV	Pass
80% Load	24.5 mV	11.1 mV	10.5 mV	9.2 mV	Pass
90% Load	25.5 mV	10.8 mV	12.4 mV	9.6 mV	Pass
100% Load	27.9 mV	12.3 mV	12.6 mV	10.8 mV	Pass
110% Load	28.8 mV	15.5 mV	13.3 mV	11.4 mV	Pass
Crossload 1	12.6 mV	10.3 mV	9.1 mV	9.0 mV	Pass
Crossload 2	28.3 mV	12.7 mV	14.7 mV	10.0 mV	Pass

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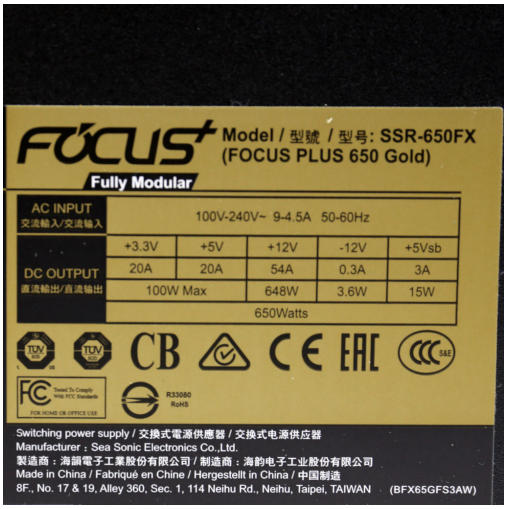
HOLD-UP TIME & POWER OK SIGNAL (230V)	
Hold-Up Time (ms)	20.034
AC Loss to PWR_OK Hold Up Time (ms)	17.740
PWR_OK Inactive to DC Loss Delay (ms)	2.294

Top side



Power specifications label

CERTIFICATIONS