Seasonic Focus Plus Gold 650W

Serial Number R1705AA135760494

Lab ID 132

Certification ID 25132

Test Result Report ID:

Certificate Issue Date: Jun 27, 2018

115V

Scheme: ETA-EMI PSU



115V



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	Focus Plus Gold 650W
OEM/ODM	Seasonic
Serial Number	R1705AA135760494
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	9-4.5
Rated Frequency (Hz)	50-60

Rated Power (W)	650
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	120mm Fluid Dynamic Bearing Fan (HA1225H12F-Z)
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	132
Date of receipt	Jun 13, 2018
Testing Date	Jun 25, 2018
Report Issued Date	Jun 27, 2018
Engineer Name	-
Authorized By the Laboratory Technical Manager	Aristeidis Bitziopoulos
Signature	

Cables and Connectors(Non-accredited measurements)

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

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				

Parts Description

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

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)	87.957%
Average Noise Output (>1450 Load Combinations)	26.34dBA
Average PF (>1450 Load Combinations)	0.987
Efficiency With 10W (≤500W) or 2% (>500W) Load	-
Standby Power Consumption	0.0456W
Non-Accredited	
12V Ripple (Full Load)	30.01mV
5V Ripple (Full Load)	11.67mV
3.3V Ripple (Full Load)	11.50mV
5VSB Ripple (Full Load)	11.18mV
12V Load Regulation	0.11%
5V Load Regulation	0.44%
3.3V Load Regulation	0.60%
5VSB Load Regulation	3.06%
Inrush Current	38.237A

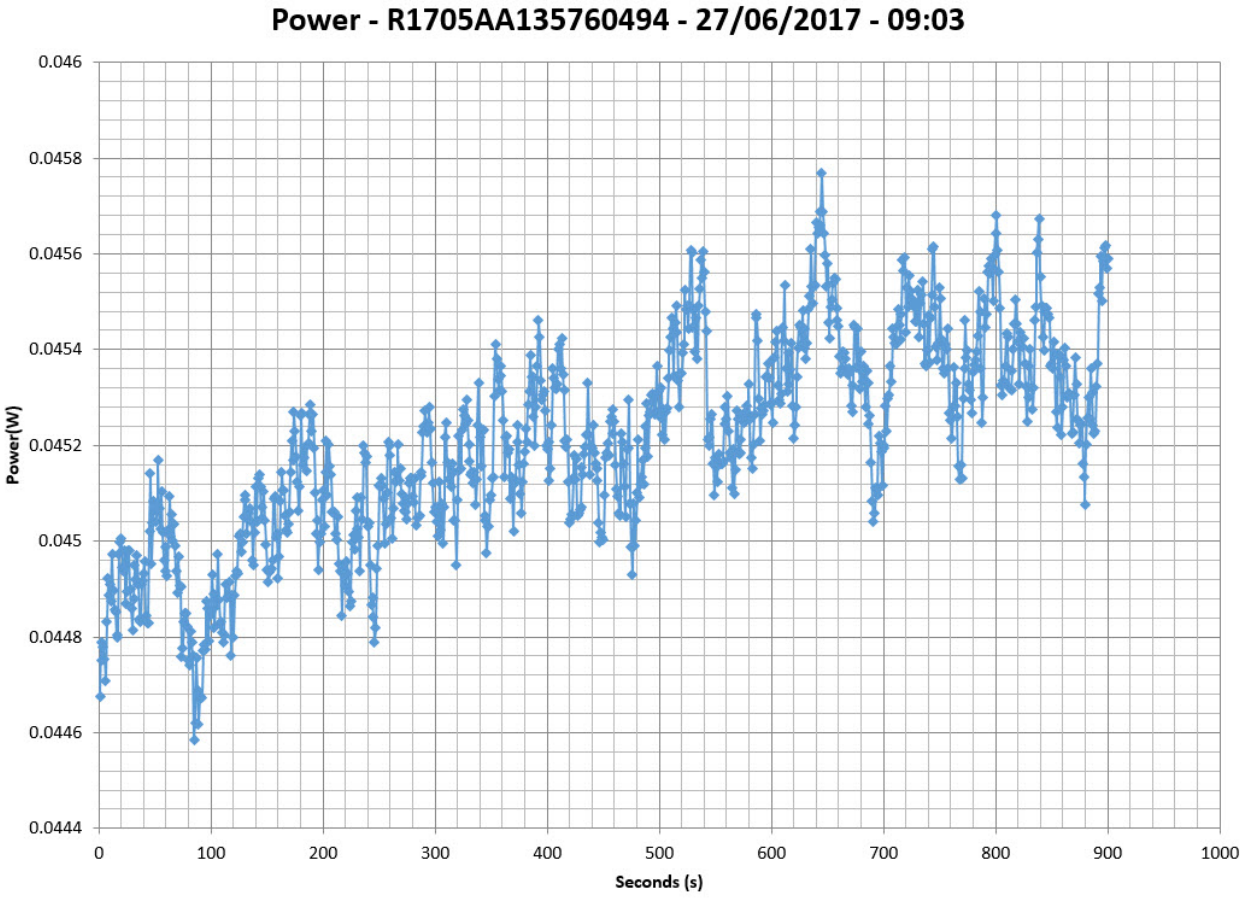
Hold-Up Time & PWR_OK Signal

Hold-Up Time (ms)	21.5
AC Loss to PWR_OK Hold Up Time (ms)	20.7

PWR_OK Inactive to DC Loss Delay (ms)	0.8

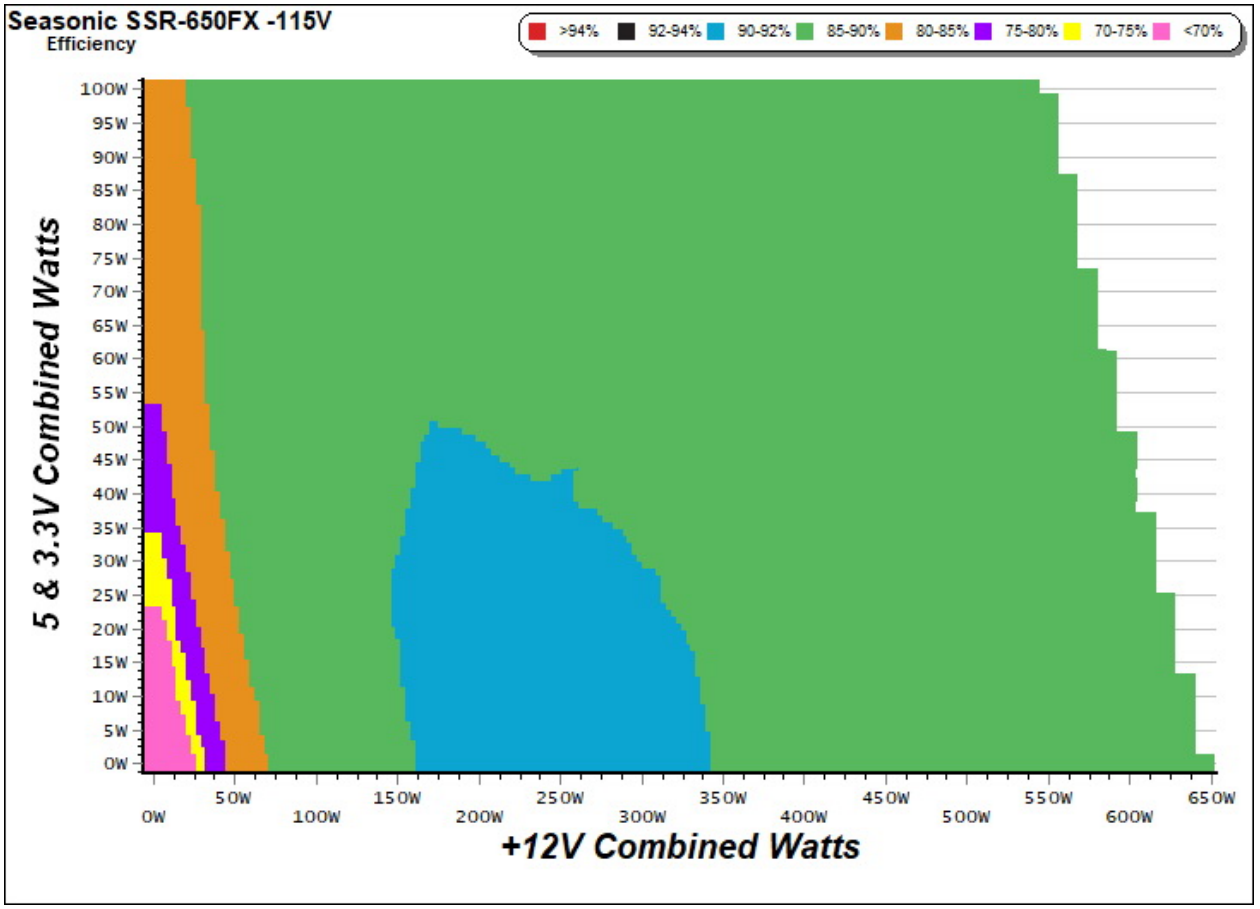
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Graphs 115V



Efficiency Graph

115V

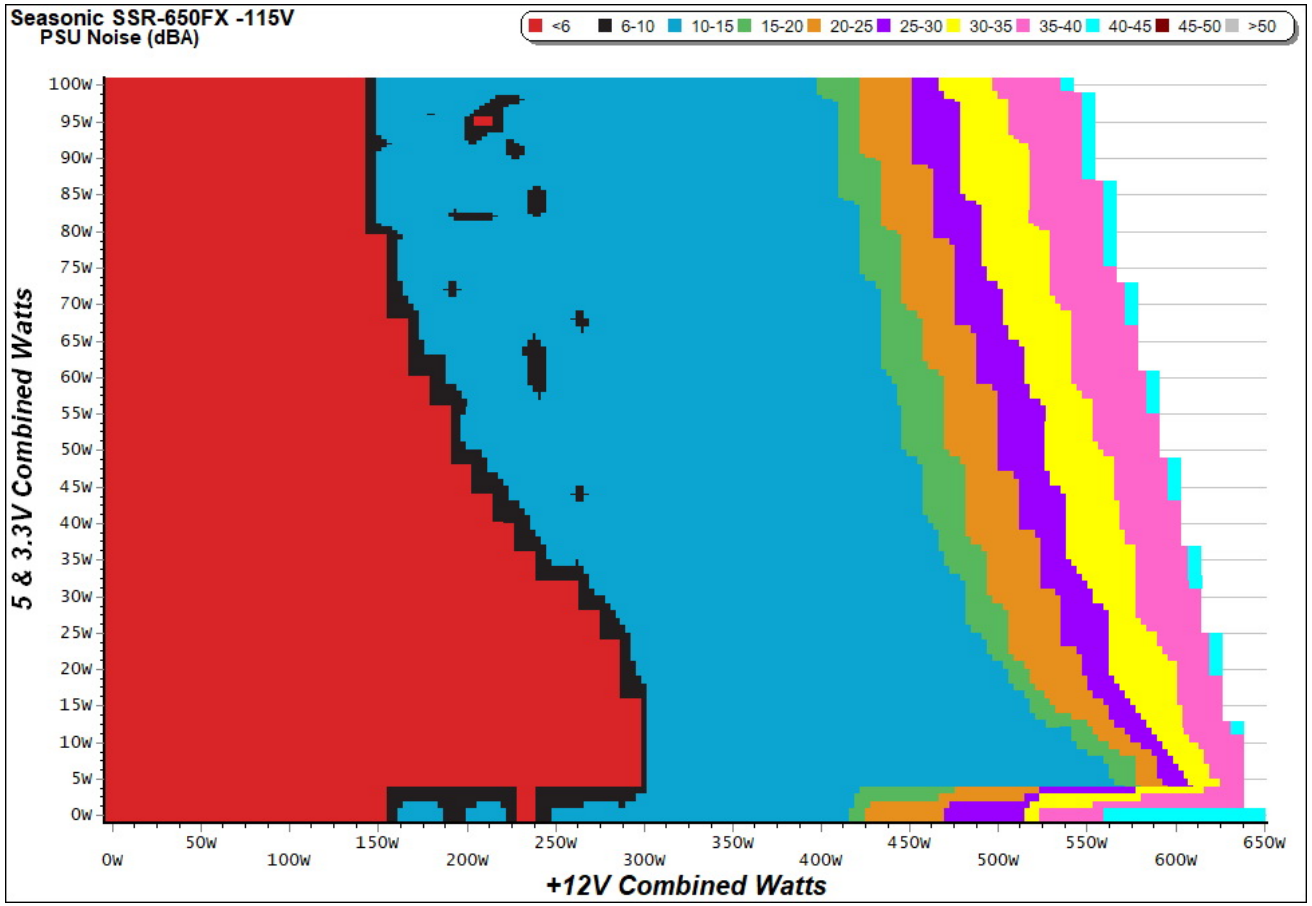


INFO

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.

Noise Graph

115V

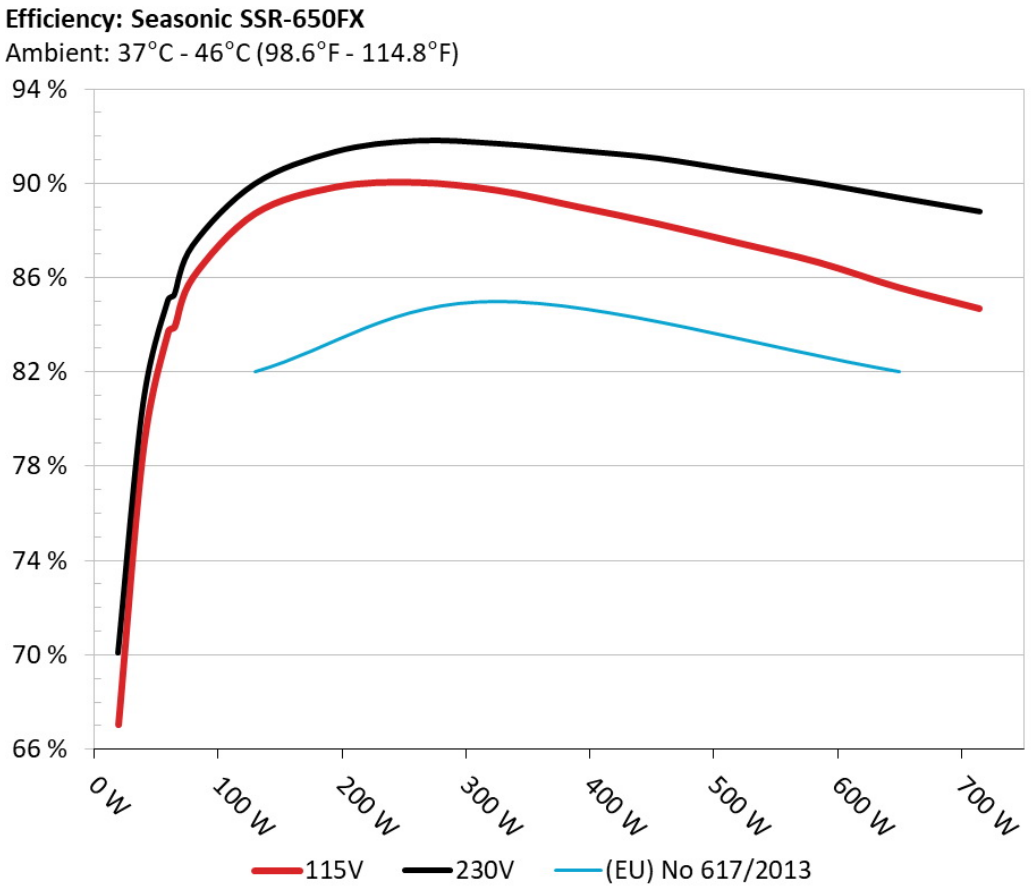


INFO

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.

Indicative Performance

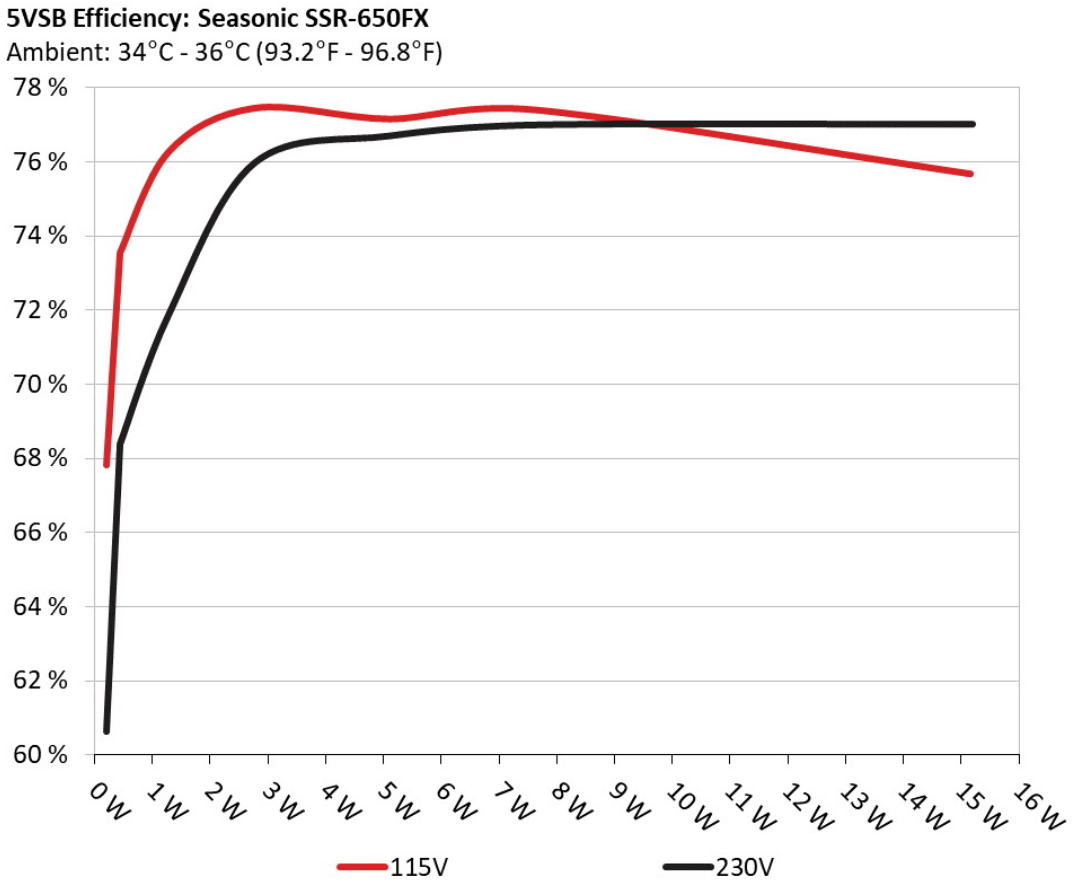
Efficiency under high ambient temperature



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	0.041A	0.213	67.834%	0.052
	5.135V	0.314		115.11V

2	0.087A	0.447	73.520%	0.098
	5.133V	0.608		115.13V
3	0.542A	2.775	77.449%	0.334
	5.122V	3.583		115.13V
4	1.002A	5.120	77.155%	0.405
	5.111V	6.636		115.13V
5	1.502A	7.657	77.398%	0.439
	5.099V	9.893		115.14V
6	3.001A	15.163	75.679%	0.484
	5.052V	20.036		115.14V

Supplementary Tests (For Reference)

Typical Load Tests 115V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	Fan Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	3.524A	1.985A	1.978A	0.981A	64.785	83.886%	0	| 6.0	44.17°C	0.957
	12.260V	5.031V	3.332V	5.100V	77.230				41.62°C	115.17V
2	8.066A	2.980A	2.968A	1.176A	129.741	88.711%	0	| 6.0	44.71°C	0.980
	12.260V	5.029V	3.330V	5.087V	146.252				41.88°C	115.17V
3	12.953A	3.488A	3.480A	1.375A	194.878	89.839%	0	| 6.0	45.38°C	0.987
	12.259V	5.026V	3.328V	5.073V	216.920				42.06°C	115.16V
4	17.830A	3.982A	3.964A	1.580A	259.745	90.035%	0	| 6.0	45.79°C	0.990
	12.258V	5.024V	3.326V	5.060V	288.493				42.23°C	115.16V
5	22.371A	4.976A	4.960A	1.781A	324.680	89.702%	550	10.4	40.25°C	0.991
	12.258V	5.022V	3.323V	5.045V	361.956				48.56°C	115.16V
6	26.912A	5.976A	5.957A	1.985A	389.646	89.008%	560	10.5	41.08°C	0.991
	12.258V	5.019V	3.321V	5.029V	437.766				50.62°C	115.15V
7	31.449A	6.981A	6.959A	2.190A	454.567	88.286%	735	15.4	41.65°C	0.992
	12.257V	5.017V	3.318V	5.015V	514.881				51.38°C	115.16V
8	36.000A	7.975A	7.960A	2.400A	519.523	87.474%	1300	32.4	43.03°C	0.993
	12.254V	5.014V	3.316V	4.999V	593.917				53.07°C	115.15V

9	40.979A	8.481A	8.473A	2.401A	584.571	86.643%	1960	41.4	43.89°C	0.993
	12.250V	5.012V	3.315V	4.991V	674.691				53.87°C	115.15V
10	45.700A	8.989A	8.963A	3.015A	649.398	85.575%	2320	45.2	44.70°C	0.994
	12.247V	5.010V	3.313V	4.969V	758.863				54.76°C	115.14V
11	51.006A	8.990A	8.966A	3.020A	714.331	84.685%	2330	45.4	46.12°C	0.994
	12.246V	5.009V	3.312V	4.962V	843.518				56.50°C	115.14V
CL1	0.100A	12.012A	12.005A	0.004A	101.428	83.993%	560	10.5	43.48°C	0.975
	12.265V	5.020V	3.322V	5.101V	120.757				56.63°C	115.19V
CL2	54.121A	1.004A	1.003A	1.002A	676.286	85.925%	2330	45.4	45.60°C	0.994
	12.248V	5.017V	3.322V	5.033V	787.070				55.33°C	115.14V

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)	Fan Noise (dB[A])	PF/AC Volts
1	1.189A	0.493A	0.476A	0.196A	19.647	67.023%	0	| 6.0	0.809
	12.254V	5.040V	3.338V	5.126V	29.314				115.16V
2	2.405A	0.990A	0.989A	0.390A	39.749	78.730%	0	| 6.0	0.916
	12.255V	5.032V	3.333V	5.120V	50.488				115.16V
3	3.620A	1.486A	1.500A	0.586A	59.843	83.708%	0	| 6.0	0.952
	12.257V	5.032V	3.333V	5.112V	71.490				115.16V
4	4.829A	1.985A	1.978A	0.781A	79.755	86.006%	0	| 6.0	0.965
	12.258V	5.031V	3.332V	5.102V	92.732				115.16V

The results above are not used in the certification process

Ripple Measurements 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.6 mV	5.9 mV	6.1 mV	5.7 mV	Pass
20% Load	12.4 mV	5.3 mV	5.6 mV	5.4 mV	Pass
30% Load	15.6 mV	6.5 mV	6.2 mV	5.2 mV	Pass
40% Load	17.6 mV	6.9 mV	6.3 mV	5.9 mV	Pass

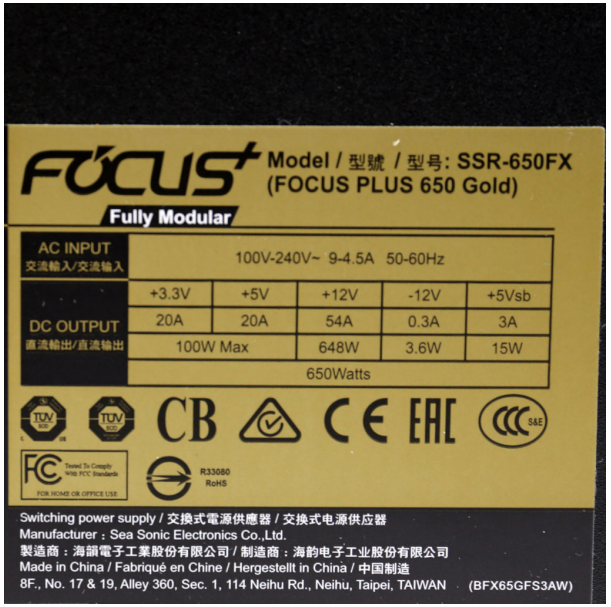
Test	12V	5V	3.3V	5VSB	Pass/Fail
50% Load	19.9 mV	7.4 mV	8.3 mV	5.9 mV	Pass
60% Load	22.0 mV	8.3 mV	8.7 mV	7.5 mV	Pass
70% Load	24.0 mV	9.4 mV	8.2 mV	7.3 mV	Pass
80% Load	25.8 mV	9.6 mV	10.1 mV	10.2 mV	Pass
90% Load	27.4 mV	10.8 mV	9.6 mV	10.6 mV	Pass
100% Load	30.0 mV	11.7 mV	11.5 mV	11.2 mV	Pass
110% Load	31.9 mV	12.1 mV	12.1 mV	11.3 mV	Pass
Crossload 1	14.1 mV	10.3 mV	8.3 mV	9.0 mV	Pass
Crossload 2	28.9 mV	10.6 mV	10.5 mV	10.7 mV	Pass

The results above are not used in the certification process

Seasonic Focus Plus Gold 650W



Top side



Power specifications label