

## Anex

## Seasonic SSR-650TD

Lab ID#: 44  
Receipt Date: -  
Test Date: Jan 19, 2000

Report: 20PS44A

Report Date: -

DUT INFORMATION	
Brand	Seasonic
Manufacturer (OEM)	Sea Sonic Electronics Co., Ltd.
Series	Prime Titanium
Model Number	SSR-650TD
Serial Number	R1606TA106370016
DUT Notes	Retested on 4/7/17

DUT SPECIFICATIONS	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	8.5-4
Rated Frequency (Hz)	50-60
Rated Power (W)	650
Type	ATX12V
Cooling	135mm Fluid Dynamic Bearing Fan (HA13525M12F-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 (600mm)	1	1	18-22AWG
4+4 pin EPS12V (650mm)	2	2	18AWG
6+2 pin PCIe (680mm+80mm)	2	4	18AWG
SATA (460mm+110mm+110mm+110mm)	1	4	18AWG
SATA (360mm+110mm)	1	2	18AWG
4 pin Molex (360mm+120mm)	1	2	18AWG
4 pin Molex (460mm+120mm+120mm)	1	4	18AWG
FDD Adapter (+110mm)	1	1	22AWG

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PAGE 1/9

## Anex

Seasonic SSR-650TD

Primary Side	
Transient Filter	6x Y caps, 3x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor & Relay
Bridge Rectifier(s)	2x Vishay LVB2560 (600V, 25A @ 105°C)
APFC MOSFETS	2x Infineon IPP50R140CP (550V, 15A @ 100°C, 0.14 Ohm)
APFC Boost Diode	1x SCS110AG (600V, 10A @ 117°C)
Hold-up Cap(s)	2x Nippon Chemi-Con (400V, 450uF each or 900uF combined, 2000h @ 105°C, CE)
Main Switchers	4x Infineon IPP50R199CP (550V, 11A @ 100°C, 0.199 Ohm)
Drivers For Main Switchers	2x Silicon Labs Si8230BD
APFC Controller	ON Semiconductor NPC1654
Switching Controller	Champion <sup>®</sup> CM6901
Topology	Primary side: Full-Bridge & LLC Resonant Converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	4x Fairchild FDMS015N04B (40V, 100A @ 25°C, 1.5 mOhm)
5V & 3.3V	DC-DC Converters: 6x Infineon BSC0906NS PWM Controller: APW7159
Filtering Capacitors	Electrolytics: Nippon Chemi-Con (105°C, KZE, KZH) 1x Rubycon (5VSB circuit, 105°C, YXD) Polymers: FPCAP, Nippon Chemi-Con
Supervisor IC	Weltrend WT7527V (OVP, UVP, OCP, SCP, PG )
Fan Model	Hong Hua HA13525M12F-Z (135mm, 12V, 0.36A, 1800 RPM, Fluid Dynamic Bearing)
5VSB Circuit	
Buck Converter	1x Lite-On LSP5523 (3A max output current )
MOSFET	STi CHN546

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PAGE 2/9

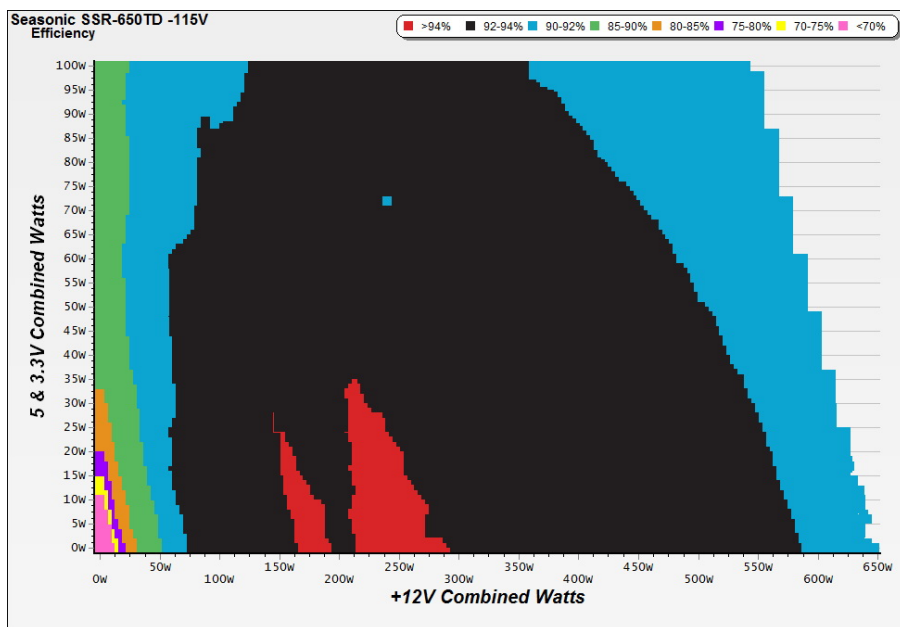
RESULTS	
Temperature Range (°C /°F)	30-32 / 86-89.6
Average Efficiency	92.269
Efficiency With 10W ( $\leq 500W$ ) or 2% ( $> 500W$ ) Load -115V	0.000
Average Efficiency 5VSB	79.036
Standby Power Consumption (W) -115V	0.0565404
Standby Power Consumption (W) -230V	0.0966748
Average PF	0.987
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
Avg Noise Output	15.93
Efficiency Rating (ETA)	TITANIUM
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	Briel & Kjaer 2250-L G4	
Microphone	Briel & Kjaer Type 4189	
Data Loggers	Picoscope TC-08 x2, Labjack U3-HV x2	

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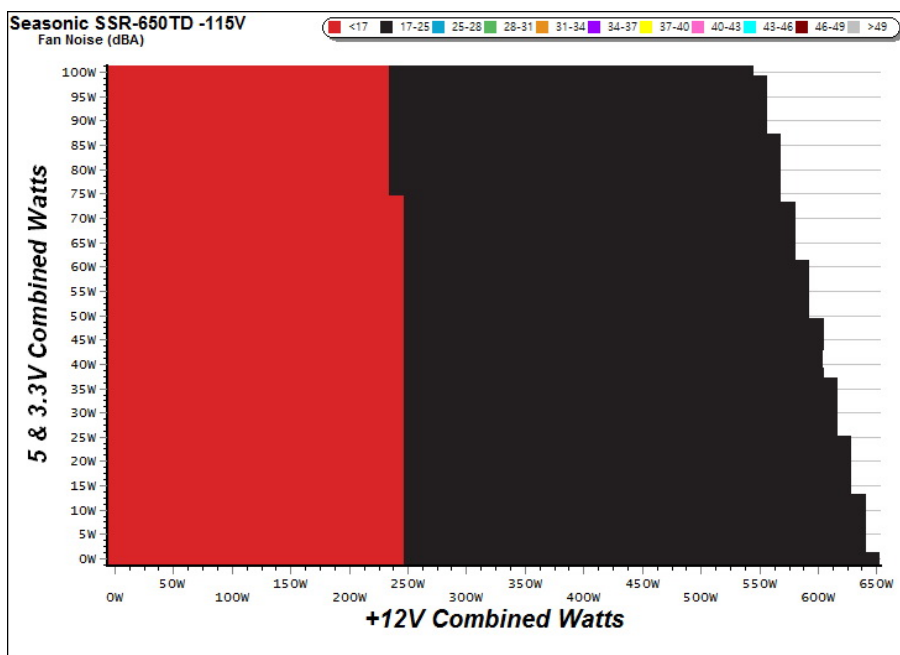
### EFFICIENCY GRAPH



#### 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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## Anex

Seasonic SSR-650TD

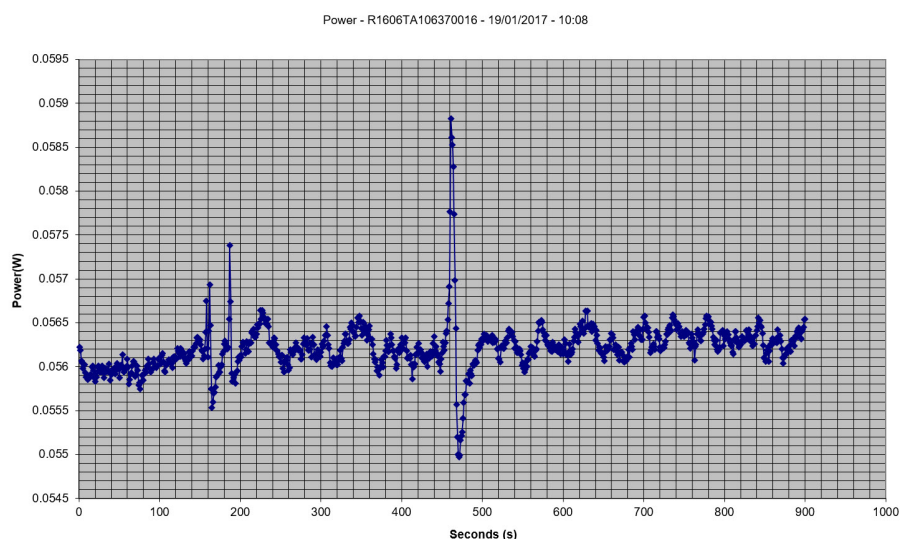
### 5VSB EFFICIENCY -115V (ERP LOT 3/6 & CEC)

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.046A	0.230	66.667%	0.039
	5.004V	0.345		115.09V
2	0.091A	0.455	70.983%	0.070
	5.002V	0.641		115.09V
3	0.552A	2.750	80.105%	0.282
	4.981V	3.433		115.09V
4	3.002A	14.617	78.772%	0.508
	4.869V	18.556		115.09V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.047A	0.235	57.178%	0.014
	5.005V	0.411		230.30V
2	0.092A	0.460	66.667%	0.023
	5.003V	0.690		230.31V
3	0.552A	2.748	77.104%	0.111
	4.979V	3.564		230.33V
4	3.002A	14.560	77.999%	0.350
	4.850V	18.667		230.31V

### 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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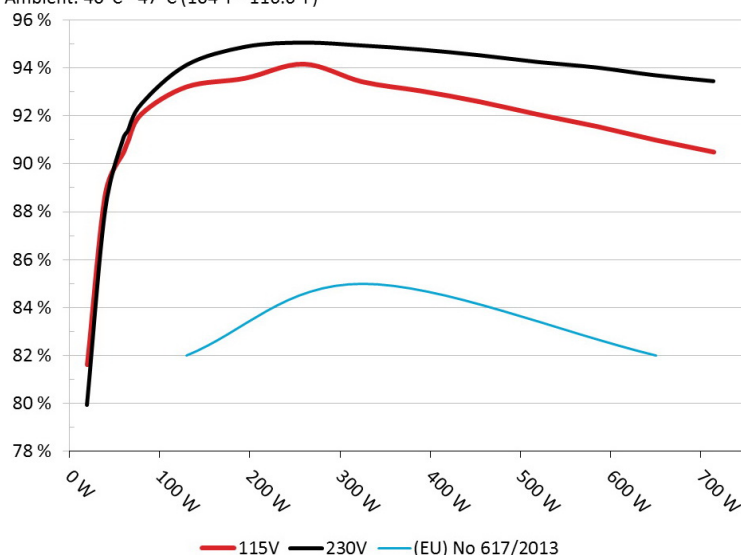
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PAGE 5/9

### EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

#### Efficiency: Seasonic SSR-650TD

Ambient: 40°C - 47°C (104°F - 116.6°F)



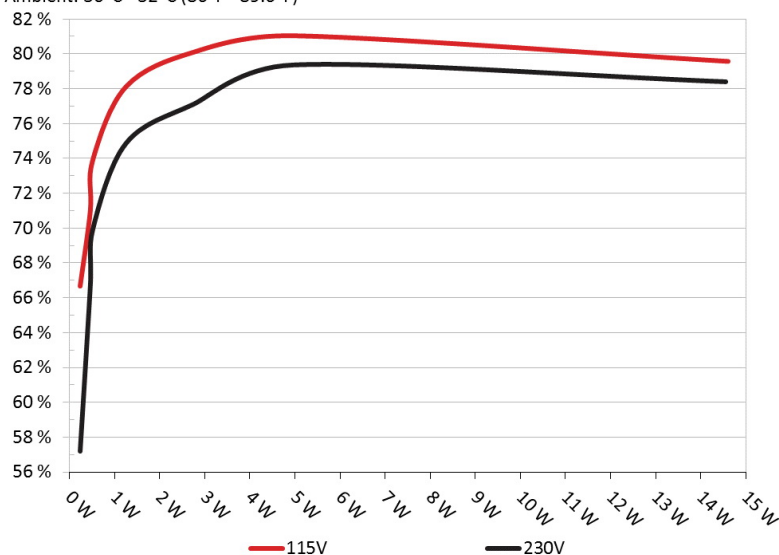
#### INFO

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-650TD

Ambient: 30°C - 32°C (86°F - 89.6°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)	Fan Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	3.523A	1.995A	1.983A	1.000A	64.72	90.937%	490	17.8	39.33°C	0.957
	12.247V	5.009V	3.324V	4.991V	71.17				40.81°C	115.2V
2	8.075A	2.991A	2.976A	1.199A	129.70	93.209%	490	17.8	39.32°C	0.982
	12.242V	5.008V	3.323V	4.989V	139.15				40.91°C	115.2V
3	12.968A	3.499A	3.492A	1.400A	194.79	93.568%	490	17.8	39.75°C	0.989
	12.238V	5.007V	3.319V	4.985V	208.18				41.52°C	115.2V
4	17.954A	3.996A	3.640A	1.604A	259.72	94.159%	490	17.8	40.45°C	0.996
	12.234V	5.005V	3.319V	4.981V	275.83				42.51°C	115.2V
5	22.419A	4.991A	4.969A	1.805A	324.62	93.419%	490	17.8	41.50°C	0.993
	12.229V	5.004V	3.319V	4.980V	347.49				43.85°C	115.2V
6	26.986A	5.996A	5.966A	2.004A	389.64	93.037%	400	16.6	42.95°C	0.991
	12.224V	5.003V	3.317V	4.979V	418.80				45.87°C	115.1V
7	31.546A	7.003A	6.965A	2.207A	454.60	92.587%	480	17.7	43.17°C	0.992
	12.220V	5.002V	3.316V	4.977V	491.00				47.15°C	115.1V
8	36.115A	8.003A	7.965A	2.410A	519.55	92.052%	495	17.9	43.99°C	0.993
	12.215V	5.000V	3.314V	4.976V	564.41				48.45°C	115.1V
9	41.114A	8.503A	8.481A	2.409A	584.56	91.555%	555	19.5	44.53°C	0.994
	12.209V	4.999V	3.313V	4.978V	638.48				49.39°C	115.2V
10	45.865A	9.013A	8.967A	3.019A	649.47	90.989%	670	21.6	45.47°C	0.995
	12.204V	4.998V	3.312V	4.965V	713.79				50.78°C	115.2V
11	51.217A	9.013A	8.968A	3.019A	714.41	90.484%	700	22.7	46.68°C	0.996
	12.197V	4.996V	3.312V	4.964V	789.54				52.57°C	115.2V
CL1	0.098A	12.012A	12.005A	0.000A	101.13	88.594%	495	17.9	46.11°C	0.979
	12.251V	5.004V	3.317V	5.064V	114.15				49.92°C	115.2V
CL2	54.114A	1.003A	1.003A	1.001A	673.03	91.375%	670	21.6	47.05°C	0.995
	12.191V	5.002V	3.308V	4.983V	736.56				51.25°C	115.1V

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### 20-80W LOAD TESTS

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	Fan Noise (dB[A])	PF/AC Volts
1	1.188A	0.492A	0.480A	0.196A	19.600	81.599%	0	0	0.792
	12.250V	5.014V	3.329V	5.008V	24.020				115.2V
2	2.406A	0.990A	0.989A	0.395A	39.700	88.755%	0	0	0.909
	12.249V	5.012V	3.326V	5.003V	44.730				115.2V
3	3.624A	1.488A	1.500A	0.598A	59.820	90.472%	490	17.8	0.953
	12.247V	5.010V	3.325V	4.999V	66.120				115.2V
4	4.834A	1.995A	1.984A	0.799A	79.770	92.081%	490	17.8	0.965
	12.245V	5.009V	3.324V	4.995V	86.630				115.2V

### RIPPLE MEASUREMENTS

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	7.1 mV	5.0 mV	6.1 mV	3.5 mV	Pass
20% Load	9.2 mV	5.4 mV	6.1 mV	3.8 mV	Pass
30% Load	10.0 mV	5.5 mV	6.7 mV	4.2 mV	Pass
40% Load	10.1 mV	5.5 mV	6.8 mV	3.7 mV	Pass
50% Load	10.2 mV	5.6 mV	6.6 mV	3.7 mV	Pass
60% Load	10.6 mV	5.6 mV	6.9 mV	4.1 mV	Pass
70% Load	9.5 mV	6.2 mV	7.8 mV	4.6 mV	Pass
80% Load	9.9 mV	7.4 mV	8.3 mV	5.4 mV	Pass
90% Load	10.6 mV	7.7 mV	10.5 mV	5.6 mV	Pass
100% Load	12.2 mV	8.0 mV	11.7 mV	6.2 mV	Pass
110% Load	13.3 mV	8.0 mV	11.9 mV	7.1 mV	Pass
Crossload 1	8.9 mV	6.8 mV	8.2 mV	3.9 mV	Pass
Crossload 2	11.9 mV	7.1 mV	11.3 mV	5.3 mV	Pass

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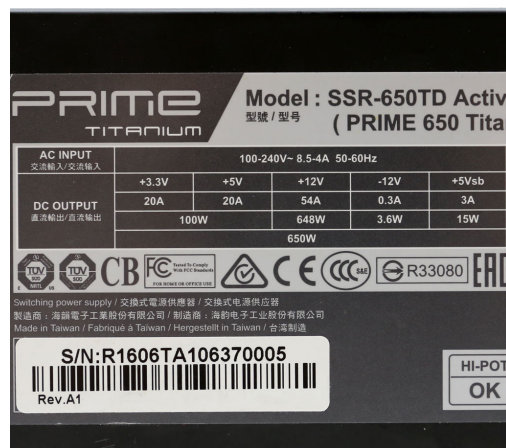
Seasonic SSR-650TD

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

Hold-Up Time (ms)	35.3
AC Loss to PWR_OK Hold Up Time (ms)	34.0
PWR_OK Inactive to DC Loss Delay (ms)	1.3

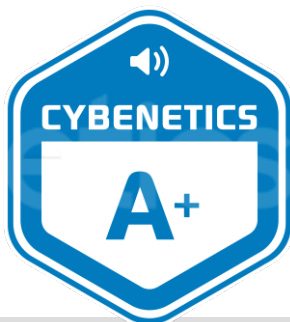


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Power specifications label

## CERTIFICATIONS



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PAGE 9/9