Seasonic Prime TX-1600

Serial Number R2206AA152390025

Lab ID SS16002051

Certification ID 252051

Test Result Report ID: 22PS2051A

Certificate Issue Date: Aug 5, 2022

Scheme: ETA-EMI PSU

115V 230V

Scheme: LAMBDA PSU

115V 230V

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	Prime TX-1600
OEM/ODM	Seasonic
Serial Number	R2206AA152390025
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	15-10
Rated Frequency (Hz)	50-60

Rated Power (W)	1600
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fully Modular
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	135mm Fluid Dynamic Bearing Fan (HA13525H12SF-Z)
Semi-Passive Operation	✓ (selectable)
Cybenetics Testing Information	
Lab ID	SS16002051
Date of receipt	Jul 30, 2022
Testing Date	Aug 4, 2022
Report Issued Date	Aug 5, 2022
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	In Cable Capacitors
ATX connector 20+4 pin (620mm)	1	1	16-18AWG	No
4+4 pin EPS12V (710mm)	3	3	16AWG	No
6+2 pin PCIe (760mm)	8	8	16AWG	No
12+2 pin PCIe (760mm)	2	2	16-28AWG	No
SATA (510mm+150mm+150mm+150mm)	4	16	18AWG	No
SATA (410mm+150mm)	1	2	18AWG	No
4 pin Molex (460mm+125mm+125mm)	1	3	18AWG	No
AC Power Cord (1360mm) - C19 coupler	1	1	16AWG	-

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	25	25	133.33	3	0.5
	Watts	125		1600	15	6
Total Max. Power (W)		1600				

Parts Description

General Data	-
Manufacturer (OEM)	Seasonic
PCB Type	Double Sided
Primary Side	-
Transient Filter	5x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	2x NTC Thermistor MF72-20D20M (20 Ohm) & Relay
Bridge Rectifier(s) (Standby Mode)	1x Shindengen LL25XB60 (600V, 25A @ 113°C)
Rectifier FETs	4x Infineon IPB60R040C7 (600V, 32A @ 100°C, Rds(on): 0.040Ohm)
APFC MOSFETs	4x Infineon IPA60R099P6 (600V, 24A @ 100°C, Rds(on): 0.099Ohm)
APFC Boost Diodes	2x Infineon IDH10G65C6 (650V, 10A @ 140°C)
Bulk Cap(s)	1x Nippon Chemi-Con (420V, 680uF, 2,000h @ 105°C, KMZ) & 2x Nippon Chemi-Con (420V, 820uF each or 1640uF combined, 2,000h @ 105°C, KHE)
Main Switchers	4x Infineon IPP60R099CP (600V, 19A @ 100°C, Rds(on): 0.099Ohm)
Drivers ICs	2x Silicon Labs Si8233BD
APFC Controller	Texas Instruments UCD28070
Resonant Controller	Champion CM6901T2X
Topology	Primary side: Bridgeless, Interleaved PFC, Full-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	16x Nexperia PSMN1R0-40YLD (40V, 198A @ 100°C, Rds(on): 1.93mOhm)
5V & 3.3V	DC-DC Converters
Filtering Capacitors	Electrolytic: 7x Nippon Chemi-Con (105°C, W), 1x Nippon Chemi-Con (5-6,000h @ 105°C, KZH), 1x Nippon Chemi-Con (2-5,000h @ 105°C, KZE), 3x Nippon Chemi-Con (4-10,000h @ 105°C, KY), 2x Rubycon (3-6,000h @ 105°C, YXG) Polymer: 18x Nippon Chemi-Con, 20x FPCAP
Supervisor IC	Weltrend WT7527RA (OCP, OVP, UVP, SCP, PG)

Fan Controller	Weltrend WT51F104
Fan Model	Hong Hua HA13525H12SF-Z (135mm, 12V, 0.5A, Fluid Dynamic Bearing Fan)
5VSB Circuit	-
Rectifier	1x Infineon BSC100N06LS3 FET (60V, 36A @ 100°C, Rds(on): 10mOhm)
Standby PWM Controller	Power Integrations INN3164C

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	✓
ALPM (Alternative Low Power Mode) compatible	✓

Performance Summary

115V

Accredited	
Average Efficiency (>1450 load combinations)	91.980%
Average Noise Output (>1450 Load Combinations)	24.10dBA
Average PF (>1450 Load Combinations)	0.989
Efficiency With 10W (≤500W) or 2% (>500W) Load	73.199%
Standby Power Consumption	0.0200W
Non-Accredited	
12V Ripple (Full Load)	16.54mV
5V Ripple (Full Load)	6.19mV
3.3V Ripple (Full Load)	11.38mV
5VSB Ripple (Full Load)	14.16mV
12V Load Regulation	0.40%
5V Load Regulation	1.26%
3.3V Load Regulation	0.66%

5VSB Load Regulation	0.85%
Inrush Current	17.630A

230V

Accredited		
Average Efficiency (>1450 load combinations)	93.464%	
Average Noise Output (>1450 Load Combinations)	24.44dBA	
Average PF (>1450 Load Combinations)	0.938	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.1379W	
Non-Accredited		
12V Ripple (Full Load)	16.92mV	
5V Ripple (Full Load)	6.61mV	
3.3V Ripple (Full Load)	11.31mV	
5VSB Ripple (Full Load)	14.86mV	
12V Load Regulation	0.38%	
5V Load Regulation	1.26%	
3.3V Load Regulation	0.69%	
5VSB Load Regulation	0.87%	
Inrush Current	32.320A	
12V Transient Response (150%)	11.18V	
5V Transient Response (150%)	4.846V	
3.3V Transient Response (150%)	3.223V	
5VSB Transient Response (150%)	4.916V	
Hold-Up Time & PWR_OK Signal	26.30ms	
AC Loss to PWR_OK Hold Up Time	23.00ms	
PWR_OK Inactive to DC Loss Delay	3.30ms	
PSU Timings: T1 (20% / 100%)	37.0ms	41.0ms
PSU Timings: T3 (20% / 100%)	127.0ms	126.0ms
OPP (31.42°C / 41.39°C)	130.61%	126.49%

Hold-Up Time & PWR_OK Signal

Hold-Up Time (ms)	26.3
AC Loss to PWR_OK Hold Up Time (ms)	23
PWR_OK Inactive to DC Loss Delay (ms)	3.3

Tables

115V

Detailed Results						
	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	115.18 V	115.16 V	113.85 V	115.20 V	116.15 V	PASS
Mains Frequency:	60.00 Hz	60.00 Hz	59.40 Hz	60.01 Hz	60.60 Hz	PASS
Mains Voltage CF:	1.415	1.415	1.340	1.416	1.490	PASS
Mains Voltage THD:	0.13 %	0.11 %	N/A	0.15 %	2.00 %	PASS
Real Power:	0.020 W	0.013 W	N/A	0.028 W	N/A	N/A
Apparent Power:	10.342 W	10.333 W	N/A	10.349 W	N/A	N/A
Power Factor:	0.002	N/A	N/A	N/A	N/A	N/A

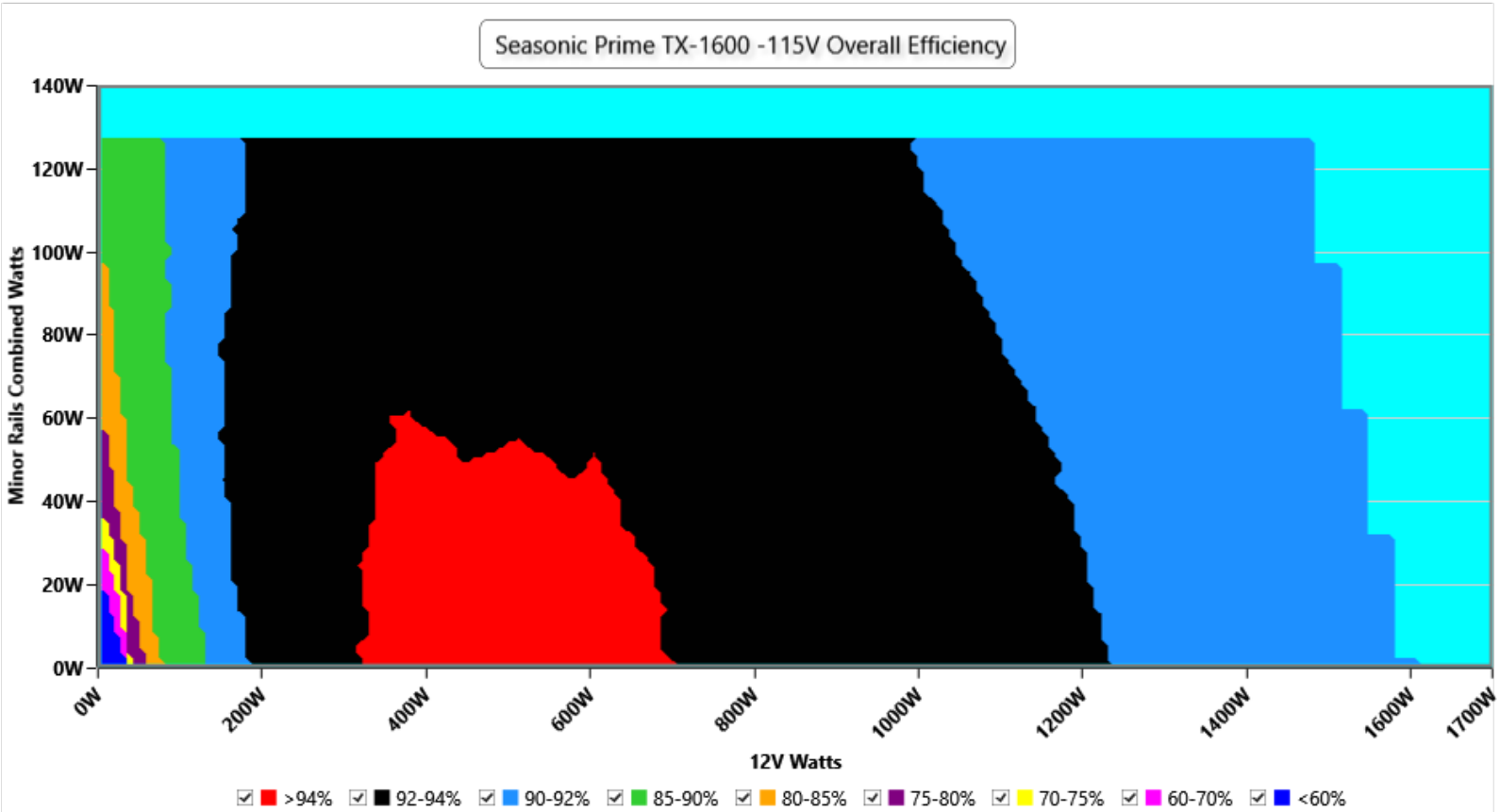
230V

Detailed Results						
	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	230.41 V	230.41 V	227.70 V	230.44 V	232.30 V	PASS
Mains Frequency:	50.00 Hz	50.00 Hz	49.50 Hz	50.00 Hz	50.50 Hz	PASS
Mains Voltage CF:	1.415	1.415	1.340	1.416	1.490	PASS
Mains Voltage THD:	0.14 %	0.13 %	N/A	0.16 %	2.00 %	PASS
Real Power:	0.138 W	0.113 W	N/A	0.167 W	N/A	N/A
Apparent Power:	34.593 W	34.578 W	N/A	34.613 W	N/A	N/A

Power Factor:	0.004	N/A	N/A	N/A	N/A	N/A

Efficiency Graph

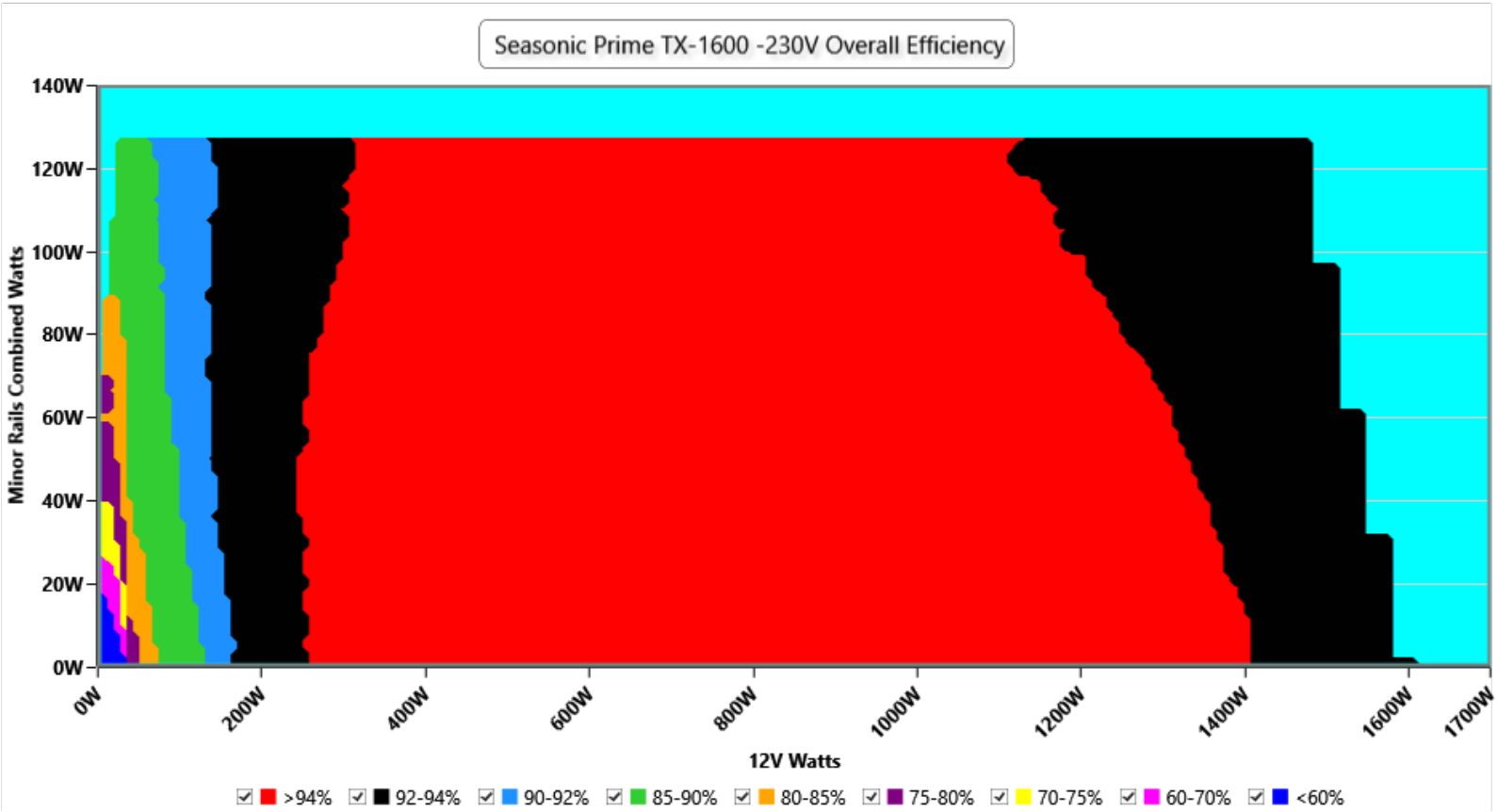
115V



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

230V



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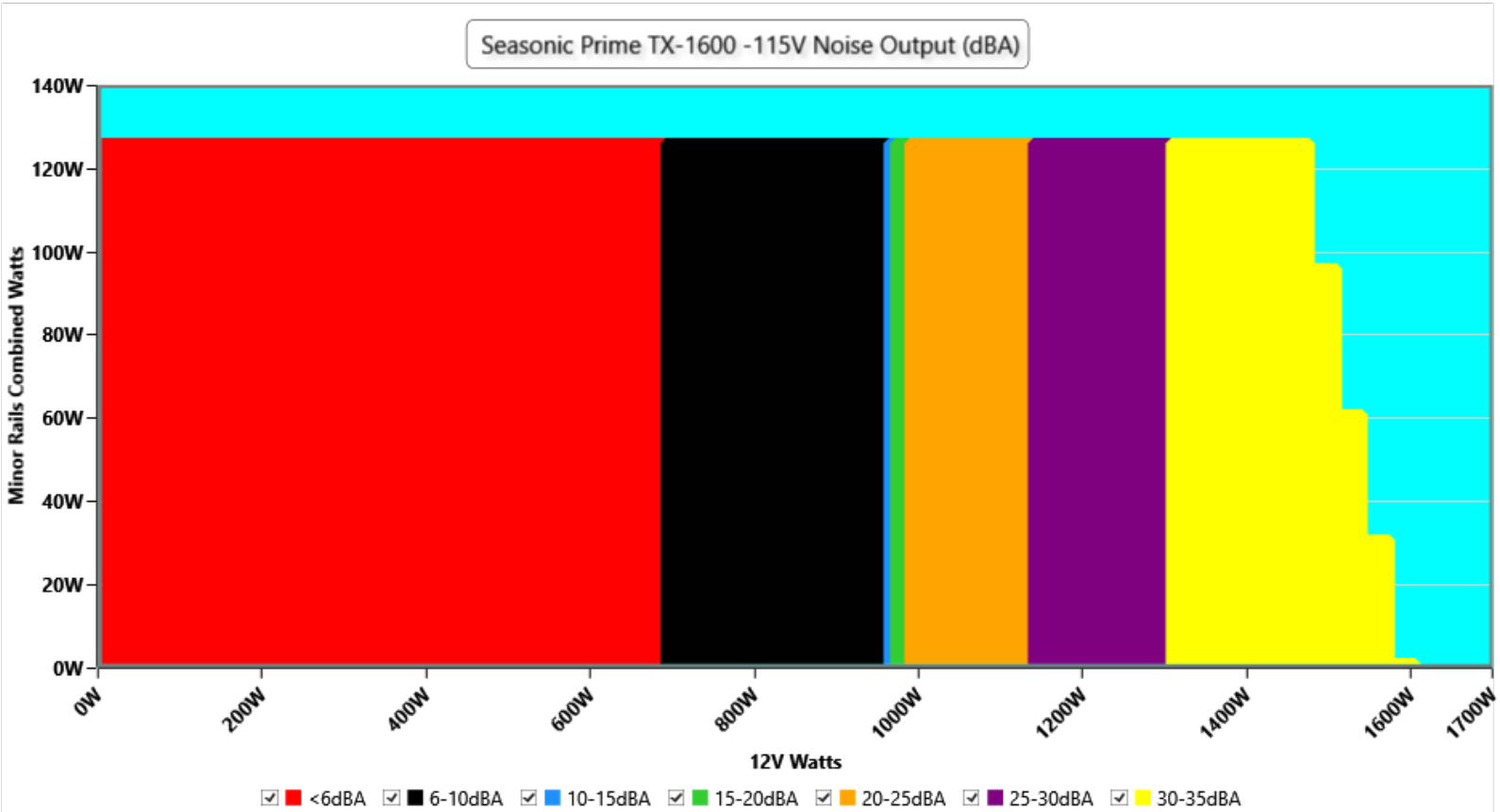
Noise Graph

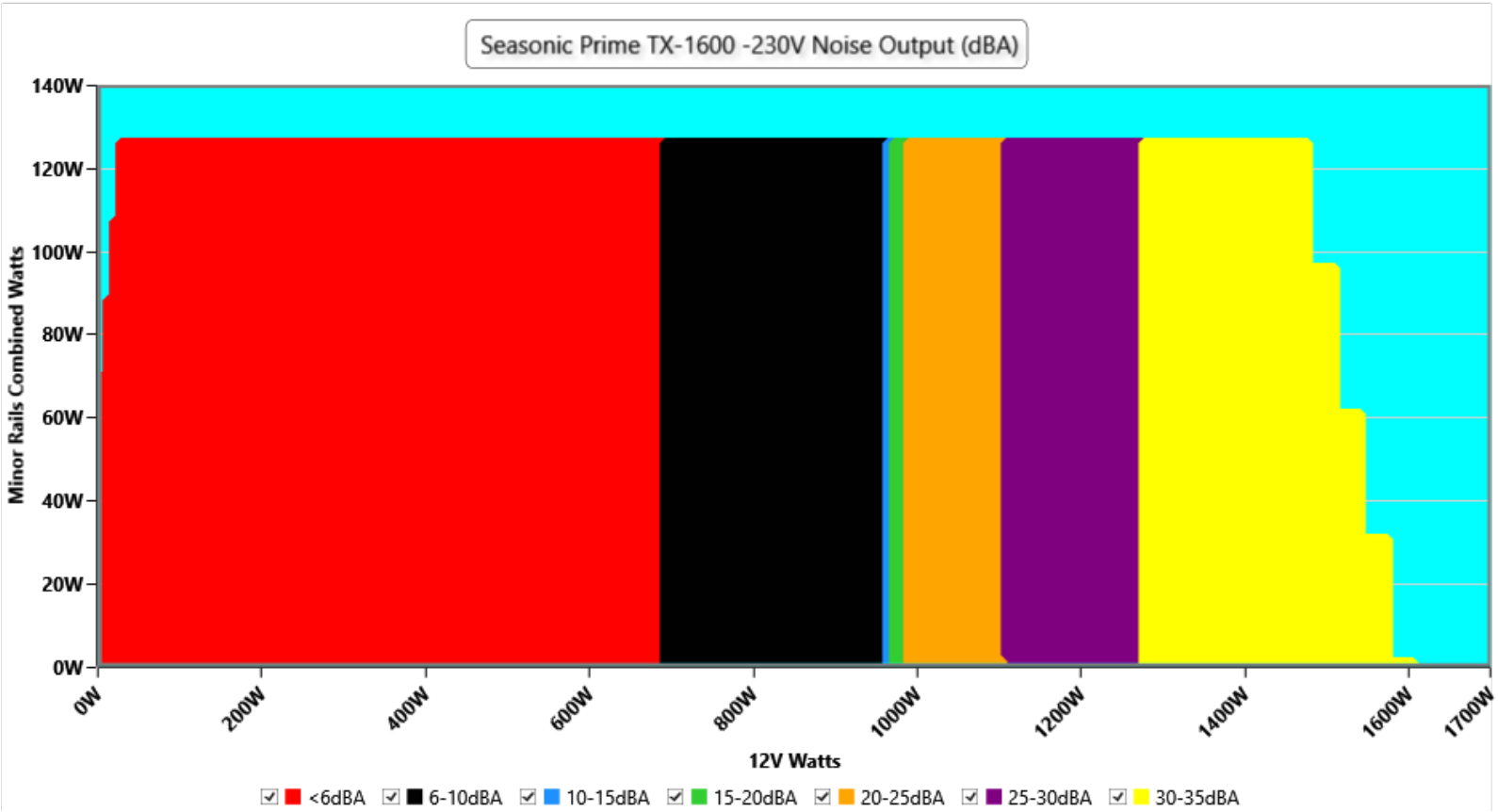
115V



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

230V



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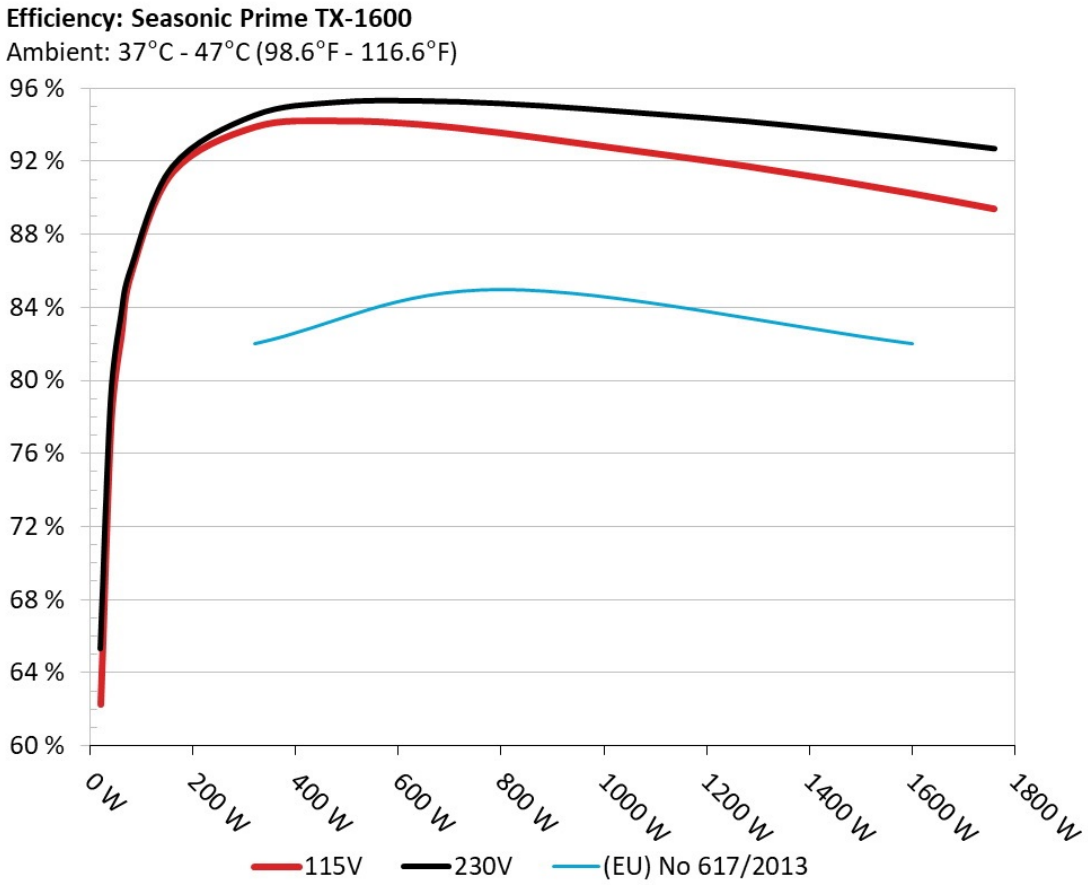
The PSU`s noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

Indicative Performance

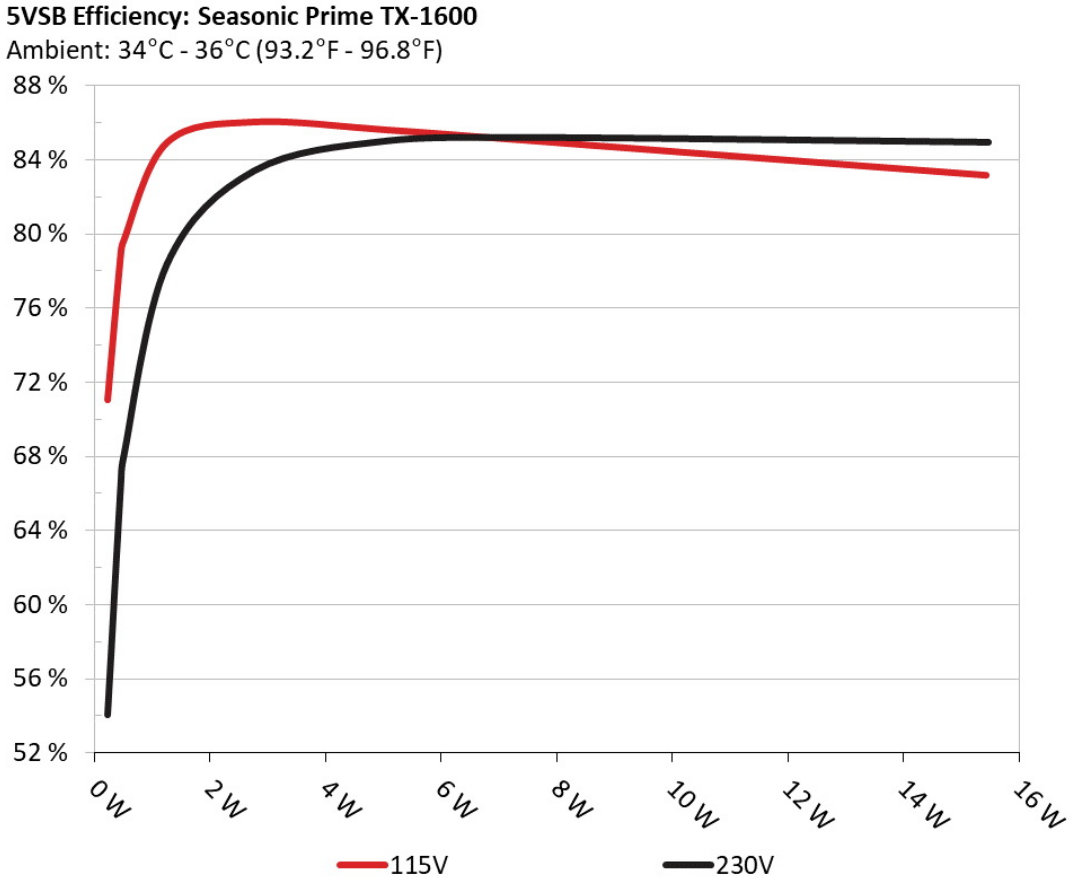
Efficiency under high ambient temperature



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	0.045A	0.226W	71.051%	0.031
	5.007V	0.318W		115.18V
2	0.09A	0.451W	78.843%	0.055
	5.006V	0.572W		115.18V
3	0.55A	2.766W	86.023%	0.253
	5.027V	3.215W		115.18V
4	1A	5.056W	85.595%	0.366
	5.054V	5.907W		115.18V
5	1.5A	7.636W	84.995%	0.434
	5.089V	8.985W		115.18V
6	3.001A	15.44W	83.152%	0.528
	5.146V	18.569W		115.18V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.226W	54.075%	0.012
	5.008V	0.418W		230.42V
2	0.09A	0.451W	66.376%	0.02
	5.004V	0.679W		230.42V
3	0.55A	2.765W	83.406%	0.093
	5.025V	3.316W		230.42V
4	1A	5.055W	85.017%	0.157
	5.054V	5.946W		230.42V
5	1.5A	7.627W	85.201%	0.219
	5.084V	8.954W		230.42V
6	3.001A	15.472W	84.945%	0.342
	5.156V	18.215W		230.42V

Supplementary Tests (For Reference)

Typical Load Tests

115V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
10%	11.504A	1.982A	1.976A	0.987A	160.039	91.365%	0	<6.0	44.79°C	0.976
	12.033V	5.047V	3.34V	5.07V	175.17				40.71°C	115.13V
20%	24.033A	2.977A	2.966A	1.186A	320.023	93.842%	0	<6.0	45.36°C	0.985
	12.030V	5.041V	3.338V	5.061V	341.027				41.05°C	115.09V
30%	36.876A	3.477A	3.462A	1.379A	479.547	94.175%	0	<6.0	46.42°C	0.985
	12.026V	5.035V	3.336V	5.077V	509.224				41.67°C	115.05V
40%	49.801A	3.978A	3.959A	1.58A	639.968	93.987%	0	<6.0	47.4°C	0.989
	12.023V	5.029V	3.335V	5.066V	680.904				42.36°C	115.01V
50%	62.336A	4.977A	4.951A	1.777A	799.73	93.523%	486	9.4	42.8°C	0.992
	12.019V	5.025V	3.333V	5.065V	855.115				48.34°C	114.97V
60%	74.946A	5.979A	5.945A	1.976A	960.233	92.92%	486	9.4	43.65°C	0.994
	12.015V	5.019V	3.331V	5.062V	1033.396				49.79°C	114.96V
70%	87.494A	6.983A	6.94A	2.174A	1119.99	92.317%	722	21.8	43.71°C	0.995
	12.011V	5.014V	3.329V	5.06V	1213.194				50.77°C	114.93V
80%	100.122A	7.991A	7.935A	2.276A	1280.073	91.692%	822	26.1	44.3°C	0.995
	12.006V	5.008V	3.327V	5.054V	1396.048				52.41°C	114.88V
90%	113.093A	8.5A	8.42A	2.378A	1439.917	90.985%	973	31.3	44.75°C	0.996
	12.002V	5.001V	3.326V	5.048V	1582.587				54.04°C	114.84V
100%	125.866A	9.011A	8.937A	2.966A	1599.951	90.214%	1028	33	45.32°C	0.996
	11.998V	4.995V	3.324V	5.059V	1773.5				55.38°C	114.8V
110%	138.585A	10.024A	10.026A	2.971A	1760.605	89.374%	1031	33.1	46.83°C	0.996
	11.994V	4.989V	3.322V	5.049V	1969.92				57.75°C	114.75V
CL1	0.117A	14.948A	14.895A	0A	126.32	86.503%	0	<6.0	50.42°C	0.971
	12.026V	5.038V	3.33V	5.016V	146.013				45°C	115.14V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
CL2	0.116A	24.771A	0A	0A	126.406	85.219%	465	8.8	40.89°C	0.971
	12.033V	5.046V	3.331V	5.028V	148.323				48.23°C	115.14V
CL3	0.116A	0A	24.727A	0A	83.902	79.482%	439	8.2	41.15°C	0.964
	12.019V	5.039V	3.336V	5.009V	105.554				50.17°C	115.15V
CL4	133.335A	0A	0A	0A	1600.366	90.57%	1027	33	43.51°C	0.996
	12.002V	5.005V	3.333V	4.948V	1766.982				54.25°C	114.8V

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
10%	11.503A	1.982A	1.976A	0.987A	160.031	91.713%	0	<6.0	44.74°C	0.88
	12.033V	5.047V	3.341V	5.067V	174.484				40.69°C	230.38V
20%	24.033A	2.976A	2.966A	1.186A	320.004	94.525%	0	<6.0	45.3°C	0.932
	12.029V	5.041V	3.338V	5.059V	338.536				40.94°C	230.36V
30%	36.873A	3.477A	3.462A	1.38A	479.517	95.243%	0	<6.0	45.77°C	0.949
	12.026V	5.035V	3.337V	5.075V	503.452				41.05°C	230.34V
40%	49.799A	3.978A	3.959A	1.58A	639.942	95.317%	0	<6.0	46.56°C	0.957
	12.023V	5.029V	3.335V	5.064V	671.383				41.54°C	230.32V
50%	62.335A	4.976A	4.951A	1.778A	799.688	95.176%	485	9.4	42.06°C	0.963
	12.018V	5.025V	3.333V	5.064V	840.216				47.6°C	230.3V
60%	74.947A	5.979A	5.945A	1.976A	960.208	94.894%	458	8.6	42.31°C	0.969
	12.014V	5.019V	3.331V	5.062V	1011.88				48.38°C	230.28V
70%	87.499A	6.983A	6.939A	2.175A	1119.969	94.553%	720	21.7	43.32°C	0.973
	12.009V	5.014V	3.33V	5.06V	1184.489				50.35°C	230.27V
80%	100.113A	7.989A	7.934A	2.276A	1279.923	94.196%	821	26.1	43.61°C	0.977
	12.006V	5.008V	3.327V	5.054V	1358.773				51.62°C	230.25V
90%	113.094A	8.499A	8.42A	2.377A	1439.838	93.74%	973	31.3	44.18°C	0.981
	12.002V	5.002V	3.326V	5.049V	1536.009				53.35°C	230.23V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
100%	125.859A	9.01A	8.937A	2.965A	1599.817	93.253%	1029	33	45.28°C	0.984
	11.998V	4.996V	3.324V	5.06V	1715.578				55.36°C	230.21V
110%	138.585A	10.024A	10.026A	2.97A	1760.558	92.701%	1032	33.1	47.11°C	0.986
	11.994V	4.989V	3.321V	5.051V	1899.183				58.02°C	230.2V
CL1	0.118A	14.946A	14.894A	0A	126.333	86.754%	0	<6.0	49.33°C	0.86
	12.025V	5.039V	3.33V	5.015V	145.623				43.8°C	230.39V
CL2	0.117A	24.773A	0A	0A	126.411	85.44%	464	8.8	42.82°C	0.862
	12.031V	5.046V	3.331V	5.028V	147.945				49.99°C	230.39V
CL3	0.117A	0A	24.731A	0A	83.904	79.837%	440	8.2	42.44°C	0.814
	12.018V	5.037V	3.336V	5.009V	105.085				51.69°C	230.39V
CL4	133.355A	0A	0A	0A	1600.385	93.495%	1029	33	44.45°C	0.984
	12.001V	5.005V	3.333V	4.948V	1711.764				55.35°C	230.21V

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)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
20W	1.234A	0.494A	0.493A	0.199A	20.013	62.29%	0	<6.0	40.24°C	0.875
	12.046V	5.058V	3.346V	5.034V	32.146				37.23°C	115.17V
40W	2.719A	0.692A	0.69A	0.298A	40.008	77.593%	0	<6.0	40.88°C	0.928
	12.026V	5.057V	3.346V	5.035V	51.558				37.55°C	115.16V
60W	4.202A	0.891A	0.888A	0.397A	60.006	82.444%	0	<6.0	41.91°C	0.947
	12.027V	5.053V	3.344V	5.039V	72.796				38.18°C	115.15V
80W	5.682A	1.089A	1.086A	0.496A	79.975	85.897%	0	<6.0	42.29°C	0.957
	12.027V	5.051V	3.342V	5.042V	93.11				38.32°C	115.15V

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
20W	1.234A	0.494A	0.493A	0.199A	20.008	65.326%	0	<6.0	40.19°C	0.549
	12.044V	5.059V	3.347V	5.031V	30.621				37.14°C	230.39V
40W	2.718A	0.692A	0.69A	0.298A	40.006	78.93%	0	<6.0	40.56°C	0.661
	12.025V	5.057V	3.346V	5.035V	50.676				37.26°C	230.39V
60W	4.202A	0.891A	0.888A	0.397A	60.005	83.539%	0	<6.0	43.21°C	0.743
	12.027V	5.054V	3.344V	5.035V	71.828				39.69°C	230.38V
80W	5.682A	1.089A	1.086A	0.496A	79.968	86.187%	0	<6.0	43.58°C	0.794
	12.027V	5.051V	3.343V	5.039V	92.782				39.81°C	230.38V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	12.50mV	4.04mV	4.40mV	25.64mV	Pass
20% Load	10.71mV	4.25mV	4.30mV	10.04mV	Pass
30% Load	9.99mV	3.89mV	4.45mV	23.81mV	Pass
40% Load	10.56mV	4.45mV	4.66mV	14.89mV	Pass
50% Load	10.86mV	4.14mV	4.71mV	10.04mV	Pass
60% Load	10.91mV	4.75mV	4.56mV	17.23mV	Pass
70% Load	11.07mV	5.68mV	4.91mV	15.60mV	Pass
80% Load	11.78mV	6.14mV	10.13mV	17.08mV	Pass
90% Load	12.04mV	5.78mV	11.15mV	16.16mV	Pass
100% Load	16.54mV	6.19mV	11.38mV	14.16mV	Pass
110% Load	17.61mV	5.73mV	12.01mV	16.52mV	Pass
Crossload1	17.44mV	5.24mV	13.00mV	6.98mV	Pass
Crossload2	14.64mV	6.14mV	5.99mV	5.97mV	Pass

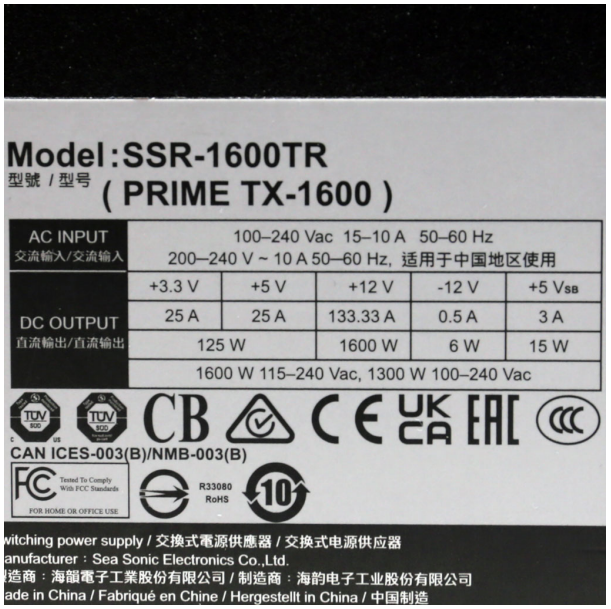
Test	12V	5V	3.3V	5VSB	Pass/Fail
Crossload3	8.53mV	4.60mV	15.71mV	5.81mV	Pass
Crossload4	16.16mV	5.73mV	5.59mV	9.25mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	15.34mV	4.14mV	4.40mV	26.51mV	Pass
20% Load	12.27mV	3.78mV	4.35mV	10.10mV	Pass
30% Load	10.59mV	3.84mV	4.45mV	24.32mV	Pass
40% Load	10.97mV	3.84mV	4.61mV	14.07mV	Pass
50% Load	10.92mV	4.09mV	4.81mV	10.20mV	Pass
60% Load	11.53mV	4.81mV	4.55mV	15.91mV	Pass
70% Load	11.58mV	5.62mV	4.97mV	15.30mV	Pass
80% Load	12.29mV	6.29mV	10.80mV	17.89mV	Pass
90% Load	12.70mV	6.49mV	10.90mV	20.09mV	Pass
100% Load	16.92mV	6.61mV	11.31mV	14.86mV	Pass
110% Load	18.74mV	5.97mV	12.09mV	16.30mV	Pass
Crossload1	22.15mV	5.15mV	12.91mV	7.09mV	Pass
Crossload2	18.66mV	5.83mV	6.09mV	6.17mV	Pass
Crossload3	7.66mV	4.40mV	15.81mV	5.96mV	Pass
Crossload4	17.21mV	5.62mV	5.55mV	9.12mV	Pass

The results above are not used in the certification process



Seasonic Prime TX-1600

Top side

Power specifications label

Cybenetics 提供自願性認證方案: 電源供應器方面有 ETA (效率)、 LAMBDA (噪音) 與 SAFE (安全與正確運作)；散熱產品方面有 DELTA (機殼隔音) 與 PHI (風扇風量與靜壓)

CYBENETICS LTD Syrou 6, Latsia, 2231, Nicosia Cyprus

www.cybenetics.com - info@cybenetics.com