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EVGA SuperNOVA 650 GM

Lab ID#: 513
Receipt Date: Oct 15, 2018
Test Date: Oct 27, 2018

Report:
Report Date: Oct 29, 2018

DUT INFORMATION

Brand	EVGA
Manufacturer (OEM)	FSP
Series	SuperNOVA GM
Model Number	
Serial Number	1803170606801373
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	SFX
Cooling	92mm Double Ball Bearing Fan (D92BH-12B)
Semi-Passive Operation	✓
Cable Design	Fully Modular

POWER SPECIFICATIONS

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	54.1	2.5	0.3
	Watts	100		649.2	12.5	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 (300mm)	1	1	18-22AWG	No
4+4 pin EPS12V (400mm)	1	1	18AWG	No
6+2 pin PCIe (500mm+110mm)	1	2	18AWG	No
6+2 pin PCIe (400mm+110mm)	1	2	18AWG	No
SATA (300mm+110mm+110mm)	2	3	18AWG	No
4-pin Molex (300mm+110mm+110mm+110mm)	1	4	18AWG	No
FDD Adapter (+100mm)	1	1	22AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	18AWG	-

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General Data	
Manufacturer (OEM)	FSP
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor & Relay
Bridge Rectifier(s)	2x
APFC MOSFETS	2x Infineon IPA60R180P7 (650V, 11A @ 100°C, 0.18Ohm)
APFC Boost Diode	1x Infineon IDH06G65C6 (650V, 6A @ 145°C)
Hold-up Cap(s)	1x Nippon Chemi-Con (420V, 330uF, 2000h @ 105 °C, KMZ)
Main Switch	Main FET: 1x STMicroelectronics STF25N80K5 (800V, 12.3A @ 100°C, 0.26Ohm)
Reset Switch	Infineon SPD02N80C3 (800V, 1.2A @ 100°C, 2.7Ohm)
Combo APFC/Switching Controller	FSP 6600 IC
Topology	Primary side: Active Clamp Reset Forward topology Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	5x Infineon BSC0702LS (60V, 84A @ 100°C, 2.7mOhm)
5V & 3.3V	DC-DC Converters: 2x Infineon IPD060N03L G (30V, 50A @ 100°C, 6mOhm), 2x Infineon IPD040N03L G (30V, 76A @ 100°C, 4mOhm) PWM Controller: APW7159C
Filtering Capacitors	Electrolytics: Nippon Chemi-Con (1-5,000 @ 105°C, KZE), Nippon Chemi-Con (4-10,000 @ 105°C, KY), Rubycon (2-5,000h @ 105°C, ZLH) Polymers: Chemi-Con, Teapo
Supervisor IC	Weltrend WT7527 (OVP, UVP, OCP, SCP, PG)
Fan Model	Yate Loon D92BH-12B (92mm, 12V, 0.60A, 46CFM, 38 dBA, Double Ball Bearing)
5VSB Circuit	
RectifierS	Silan Microelectronics SVF3N80F (800V, 1.9A @ 100°C, 4.8Ohm) & 1x Nexperia PSMN2R0-30YLE (30V, 100A @ 25°C, 2mOhm)

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RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓

115V

Average Efficiency	89.876%
Efficiency With 10W (≤500W) or 2% (>500W)	64.309
Average Efficiency 5VSB	79.565%
Standby Power Consumption (W)	0.1158760
Average PF	0.963
Avg Noise Output	28.15 dB(A)
Efficiency Rating (ETA)	SILVER
Noise Rating (LAMBDA)	A-

230V

Average Efficiency	91.678%
Average Efficiency 5VSB	79.084%
Standby Power Consumption (W)	0.1976870
Average PF	0.920
Avg Noise Output	26.15 dB(A)
Efficiency Rating (ETA)	SILVER
Noise Rating (LAMBDA)	A-

TEST EQUIPMENT

Electronic Loads	Chroma 6314A x2 63123A x6 63102A 63101A	Chroma 63601-5 x4 Chroma 63600-2 x2 63640-80-80 x20 63610-80-20 x2
AC Sources	Chroma 6530, Chroma 61604, Keysight AC6804B	
Power Analyzers	N4L PPA1530 x2, 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	

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

Hold-Up Time (ms)	19.0
AC Loss to PWR_OK Hold Up Time (ms)	14.0
PWR_OK Inactive to DC Loss Delay (ms)	5.0

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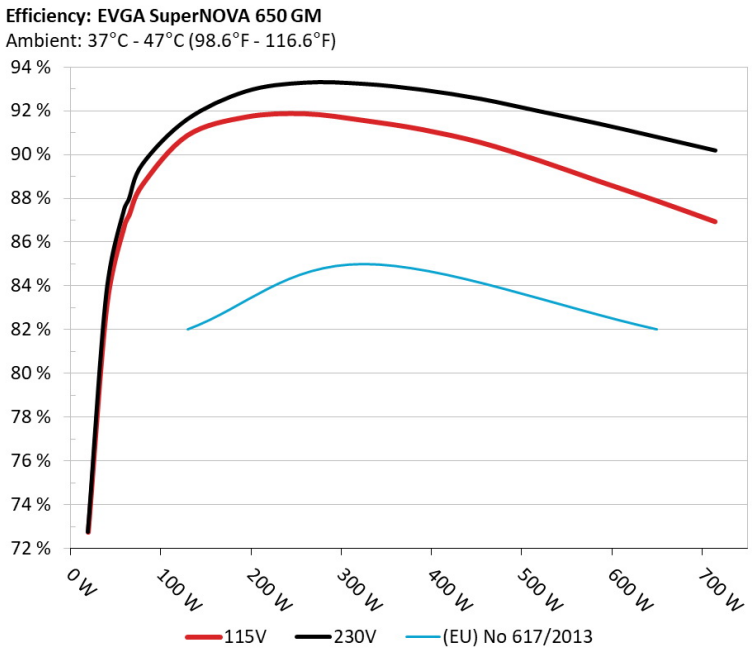
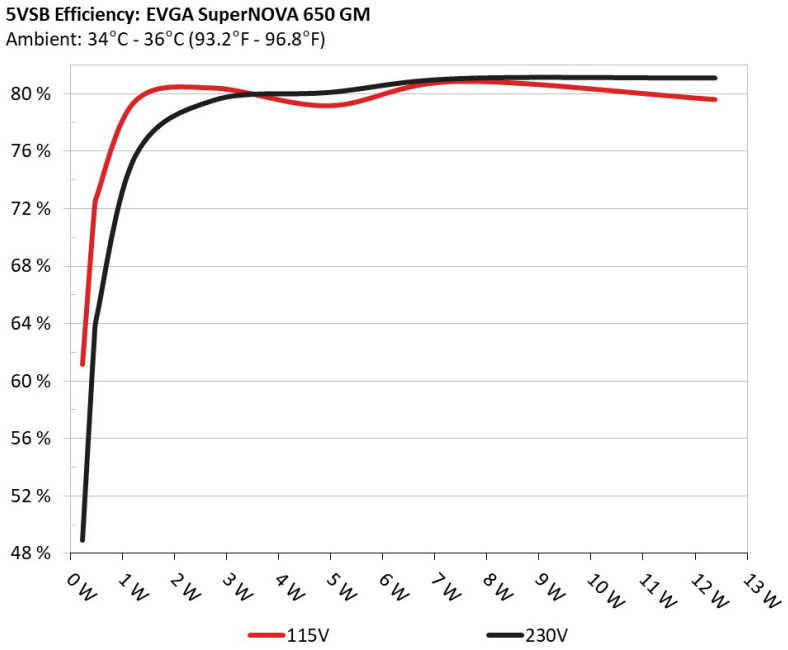
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE



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



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This graph depicts the efficiency levels of the 5VSB rail with 115V and 230V input

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.225	61.141%	0.038
	4.999V	0.368		115.05V
2	0.090A	0.450	71.770%	0.063
	4.998V	0.627		115.04V
3	0.550A	2.745	80.428%	0.271
	4.989V	3.413		115.04V
4	1.000A	4.982	79.192%	0.376
	4.981V	6.291		115.04V
5	1.500A	7.459	80.891%	0.431
	4.972V	9.221		115.04V
6	2.500A	12.388	79.625%	0.485
	4.955V	15.558		115.04V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.225	48.913%	0.016
	4.998V	0.460		230.20V
2	0.090A	0.450	62.849%	0.024
	4.998V	0.716		230.20V
3	0.550A	2.745	79.565%	0.110
	4.989V	3.450		230.19V
4	1.000A	4.981	80.119%	0.182
	4.981V	6.217		230.18V
5	1.500A	7.457	81.081%	0.242
	4.971V	9.197		230.18V
6	2.500A	12.384	81.121%	0.323
	4.953V	15.266		230.18V

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115V

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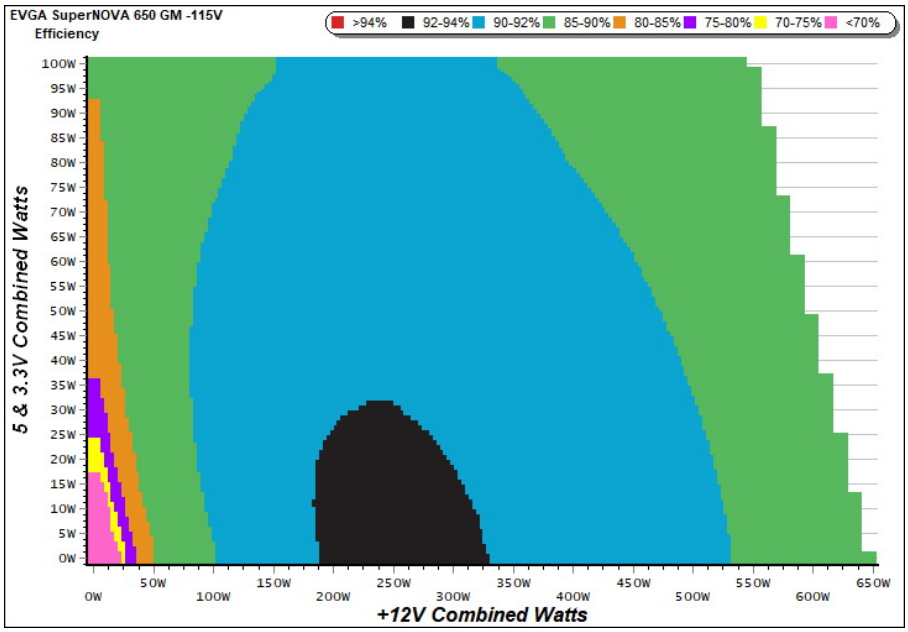
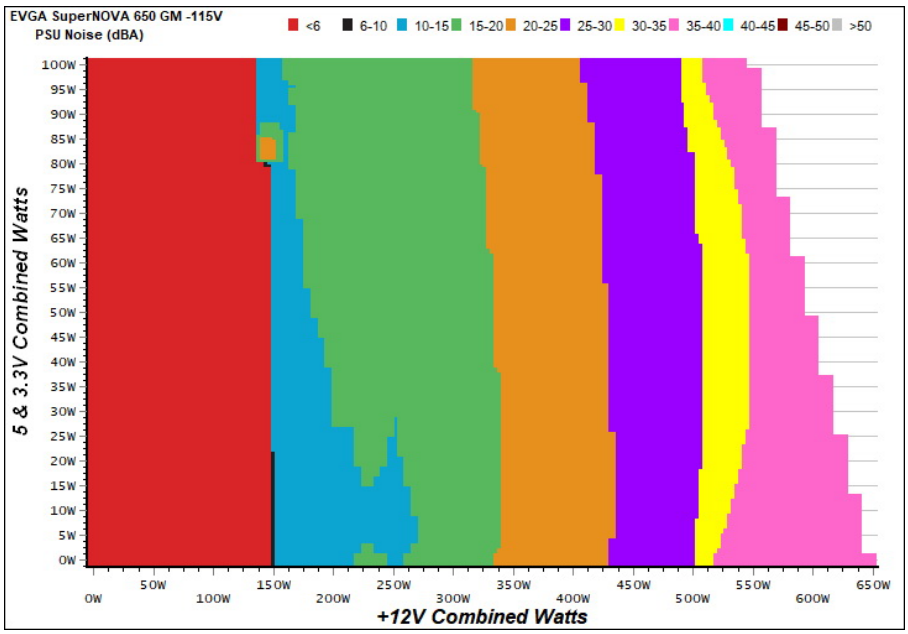
EFFICIENCY GRAPH 115V



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

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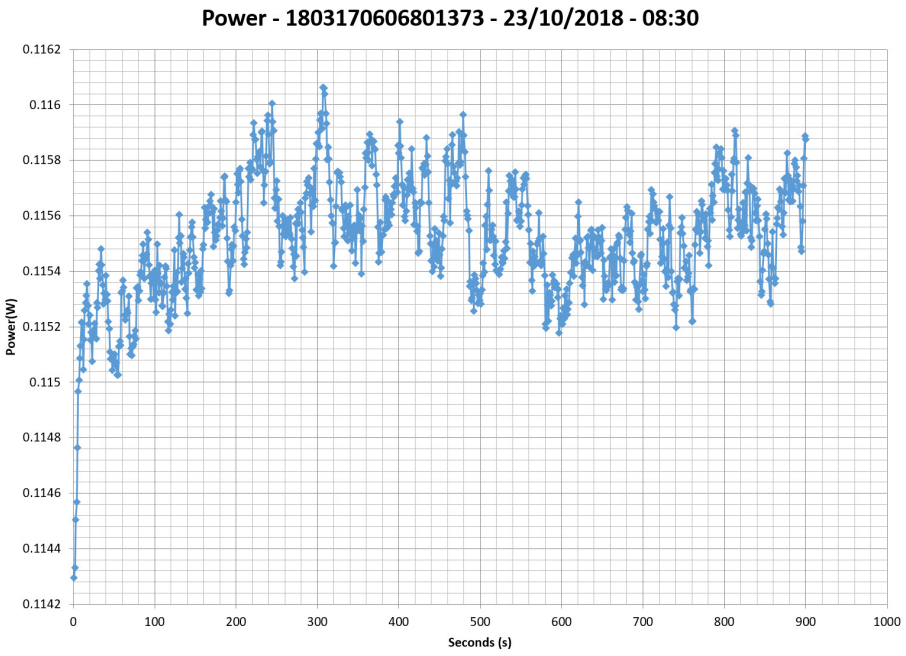
EVGA SuperNOVA 650 GM

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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EVGA SuperNOVA 650 GM

10-110% 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
1	3.592A	1.965A	2.006A	0.987A	64.876	87.236%	0	<6.0	48.39°C	0.850
	12.049V	5.090V	3.287V	5.066V	74.368				40.56°C	115.05V
2	8.175A	2.952A	3.018A	1.187A	129.348	90.877%	0	<6.0	49.26°C	0.925
	12.043V	5.082V	3.278V	5.056V	142.333				41.07°C	115.05V
3	13.164A	3.450A	3.516A	1.388A	194.466	91.722%	1118	14.0	41.53°C	0.956
	12.037V	5.075V	3.271V	5.044V	212.016				50.80°C	115.05V
4	18.160A	3.948A	4.043A	1.590A	259.684	91.873%	1195	16.3	42.28°C	0.972
	12.031V	5.068V	3.263V	5.032V	282.656				52.51°C	115.05V
5	22.834A	4.943A	5.070A	1.793A	325.040	91.566%	1528	23.5	42.88°C	0.980
	12.023V	5.059V	3.254V	5.021V	354.977				53.64°C	115.05V
6	27.439A	5.940A	6.103A	1.996A	389.522	91.153%	1543	24.0	43.38°C	0.985
	12.016V	5.052V	3.245V	5.011V	427.327				55.65°C	115.05V
7	32.124A	6.940A	7.137A	2.200A	454.823	90.556%	1664	26.0	43.84°C	0.987
	12.007V	5.044V	3.237V	5.001V	502.256				57.53°C	115.05V
8	36.817A	7.946A	8.179A	2.406A	520.144	89.727%	2248	34.8	44.13°C	0.988
	11.998V	5.035V	3.228V	4.989V	579.695				59.13°C	115.04V
9	41.921A	8.457A	8.695A	2.408A	585.061	88.799%	2959	42.1	45.04°C	0.988
	11.988V	5.027V	3.220V	4.984V	658.862				60.70°C	115.04V
10	46.965A	8.968A	9.249A	2.513A	649.779	87.897%	3291	45.7	45.85°C	0.988
	11.978V	5.020V	3.212V	4.976V	739.248				62.07°C	115.04V
11	52.423A	8.981A	9.269A	2.517A	714.613	86.940%	3286	45.7	46.54°C	0.987
	11.968V	5.012V	3.204V	4.968V	821.964				64.09°C	115.04V
CL1	0.143A	12.003A	12.000A	0.000A	101.733	84.595%	1552	24.4	42.23°C	0.910
	12.045V	5.068V	3.265V	5.129V	120.259				53.19°C	115.05V
CL2	54.102A	1.002A	0.999A	1.000A	661.252	88.458%	3281	45.7	45.74°C	0.988
	11.977V	5.035V	3.228V	5.003V	747.528				62.29°C	115.04V

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EVGA SuperNOVA 650 GM

20-80W LOAD TESTS 115V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.197A	0.491A	0.486A	0.197A	19.534	72.739%	0	<6.0	0.696
	12.052V	5.098V	3.294V	5.093V	26.855				115.05V
2	2.464A	0.982A	1.000A	0.393A	39.985	83.032%	0	<6.0	0.779
	12.051V	5.094V	3.291V	5.085V	48.156				115.05V
3	3.657A	1.473A	1.489A	0,591A	59.464	86.729%	0	<6.0	0.838
	12.050V	5.092V	3.288V	5.079V	68.563				115.05V
4	4.917A	1.965A	2.008A	0.789A	79.839	88.637%	0	<6.0	0.876
	12.048V	5.089V	3.285V	5.072V	90.074				115.05V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	12.5 mV	8.9 mV	9.8 mV	4.4 mV	Pass
20% Load	13.3 mV	9.2 mV	10.2 mV	4.9 mV	Pass
30% Load	15.6 mV	10.5 mV	11.0 mV	6.3 mV	Pass
40% Load	19.2 mV	12.1 mV	11.9 mV	7.7 mV	Pass
50% Load	22.6 mV	14.1 mV	13.8 mV	9.1 mV	Pass
60% Load	26.2 mV	16.6 mV	15.4 mV	10.8 mV	Pass
70% Load	30.5 mV	18.8 mV	17.3 mV	12.6 mV	Pass
80% Load	34.0 mV	21.0 mV	19.3 mV	14.2 mV	Pass
90% Load	37.9 mV	23.3 mV	21.8 mV	15.3 mV	Pass
100% Load	41.0 mV	25.4 mV	23.0 mV	17.1 mV	Pass
110% Load	45.2 mV	27.4 mV	24.9 mV	18.8 mV	Pass
Crossload 1	15.6 mV	12.0 mV	14.9 mV	5.4 mV	Pass
Crossload 2	40.9 mV	23.2 mV	20.7 mV	15.3 mV	Pass

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230V

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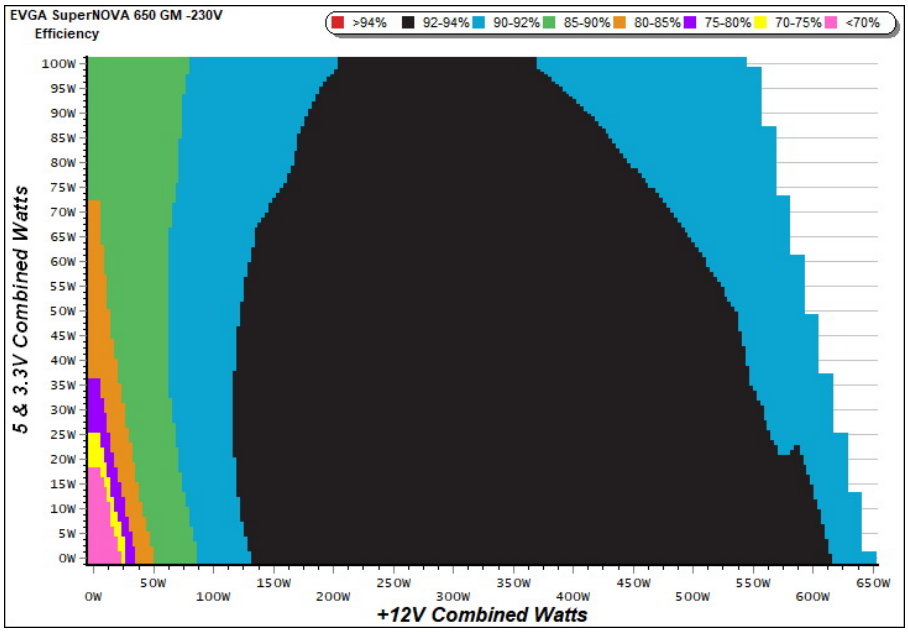
EFFICIENCY GRAPH 230V



INFO

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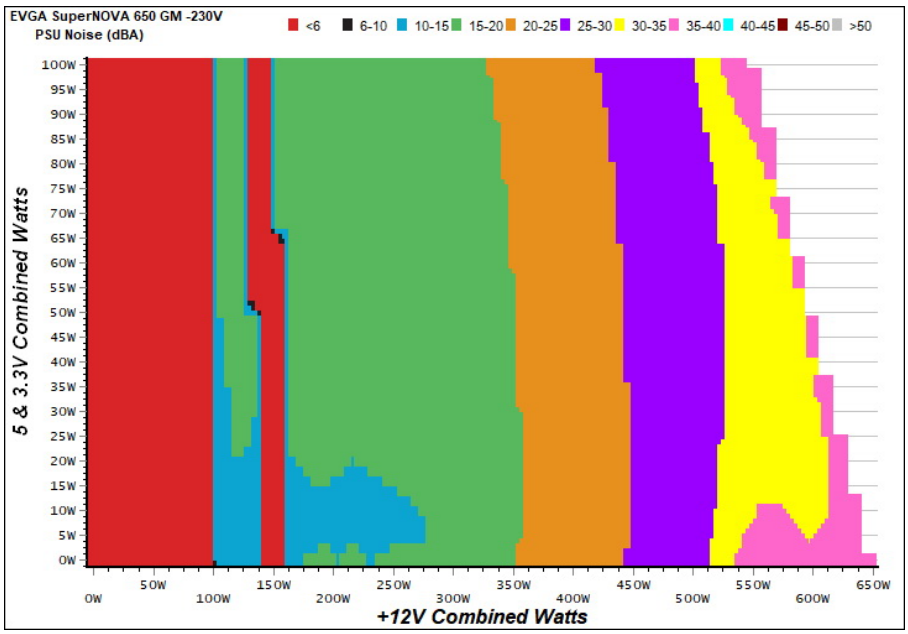
NOISE GRAPH 230V



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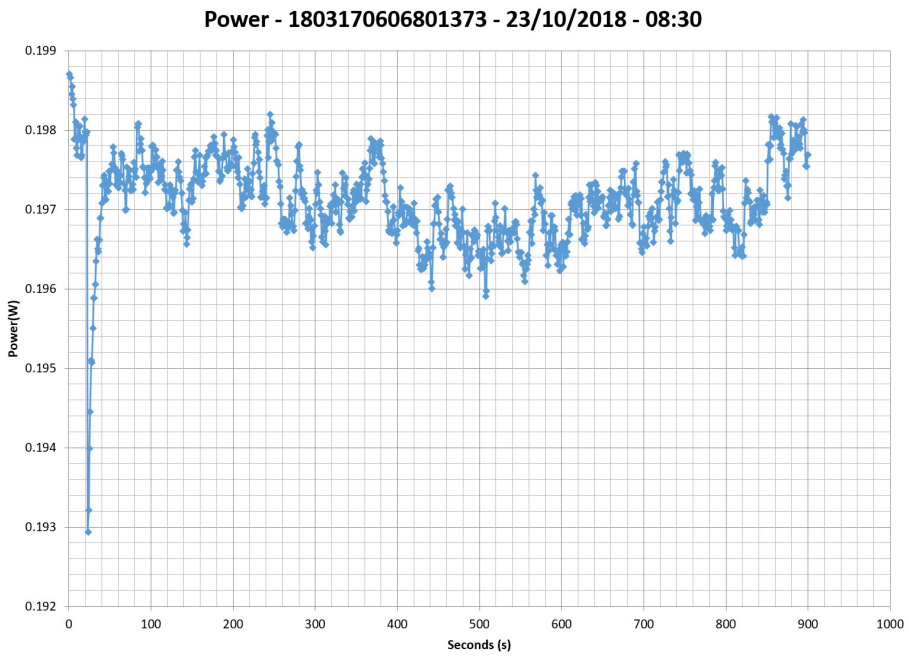
EVGA SuperNOVA 650 GM

VAMPIRE POWER -230V



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EVGA SuperNOVA 650 GM

10-110% LOAD TESTS 230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	3.592A	1.965A	2.007A	0.987A	64.856	87.962%	1060	13.1	39.97°C	0.744
	12.043V	5.090V	3.287V	5.065V	73.732				46.85°C	230.20V
2	8.185A	2.952A	3.019A	1.187A	129.422	91.618%	1266	17.6	40.11°C	0.848
	12.037V	5.082V	3.278V	5.055V	141.263				47.86°C	230.20V
3	13.162A	3.447A	3.516A	1.388A	194.347	92.900%	1093	14.8	41.37°C	0.896
	12.031V	5.075V	3.271V	5.044V	209.201				49.63°C	230.18V
4	18.158A	3.946A	4.042A	1.590A	259.543	93.300%	1127	14.4	41.85°C	0.922
	12.025V	5.069V	3.263V	5.033V	278.182				50.71°C	230.19V
5	22.827A	4.940A	5.068A	1.792A	324.850	93.243%	1350	19.6	42.21°C	0.939
	12.019V	5.060V	3.255V	5.022V	348.390				52.30°C	230.19V
6	27.439A	5.939A	6.097A	1.996A	389.396	92.976%	1539	23.9	42.69°C	0.955
	12.012V	5.052V	3.246V	5.012V	418.814				54.33°C	230.19V
7	32.119A	6.940A	7.136A	2.200A	454.696	92.555%	1745	27.6	43.15°C	0.963
	12.005V	5.044V	3.237V	5.001V	491.272				56.56°C	230.19V
8	36.813A	7.946A	8.176A	2.406A	520.013	91.989%	2373	35.9	43.88°C	0.968
	11.996V	5.035V	3.228V	4.989V	565.300				58.61°C	230.02V
9	41.914A	8.455A	8.693A	2.408A	584.930	91.427%	2953	42.1	44.51°C	0.973
	11.987V	5.028V	3.220V	4.985V	639.781				60.06°C	230.19V
10	46.957A	8.966A	9.248A	2.513A	649.670	90.816%	3224	44.3	45.38°C	0.976
	11.978V	5.020V	3.212V	4.976V	715.371				63.19°C	230.18V
11	52.416A	8.978A	9.267A	2.517A	714.520	90.199%	3183	44.2	46.52°C	0.979
	11.968V	5.013V	3.204V	4.969V	792.160				65.35°C	230.19V
CL1	0.136A	12.003A	11.999A	0.000A	101.657	85.463%	1590	24.9	42.31°C	0.826
	12.039V	5.069V	3.265V	5.130V	118.948				52.82°C	230.20V
CL2	54.089A	1.001A	0.999A	1.000A	661.147	91.474%	3225	44.3	45.70°C	0.977
	11.978V	5.035V	3.228V	5.004V	722.769				63.49°C	230.19V

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EVGA SuperNOVA 650 GM

20-80W LOAD TESTS 230V

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	PF/AC Volts
1	1.198A	0.489A	0.485A	0.197A	19.526	72.777%	0	<6.0	0.514
	12.046V	5.098V	3.295V	5.093V	26.830				230.20V
2	2.465A	0.982A	1.001A	0.393A	39.985	83.666%	0	<6.0	0.652
	12.044V	5.095V	3.291V	5.085V	47.791				230.02V
3	3.657A	1.473A	1.489A	0.591A	59.440	87.480%	0	<6.0	0.726
	12.043V	5.092V	3.288V	5.078V	67.947				230.20V
4	4.921A	1.965A	2.006A	0.789A	79.845	89.572%	0	<6.0	0.777
	12.041V	5.089V	3.285V	5.071V	89.141				230.03V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	18.7 mV	8.7 mV	10.6 mV	4.6 mV	Pass
20% Load	12.0 mV	9.2 mV	11.5 mV	5.0 mV	Pass
30% Load	14.5 mV	10.2 mV	12.4 mV	6.3 mV	Pass
40% Load	17.8 mV	12.3 mV	13.8 mV	7.8 mV	Pass
50% Load	21.3 mV	14.4 mV	15.0 mV	9.1 mV	Pass
60% Load	24.5 mV	17.4 mV	16.3 mV	10.9 mV	Pass
70% Load	28.4 mV	19.5 mV	18.4 mV	12.5 mV	Pass
80% Load	33.0 mV	21.1 mV	20.6 mV	14.4 mV	Pass
90% Load	36.4 mV	23.3 mV	22.4 mV	15.5 mV	Pass
100% Load	39.5 mV	26.2 mV	24.5 mV	17.3 mV	Pass
110% Load	44.0 mV	28.7 mV	26.5 mV	18.7 mV	Pass
Crossload 1	13.6 mV	12.3 mV	15.9 mV	5.9 mV	Pass
Crossload 2	38.0 mV	23.1 mV	21.2 mV	15.6 mV	Pass

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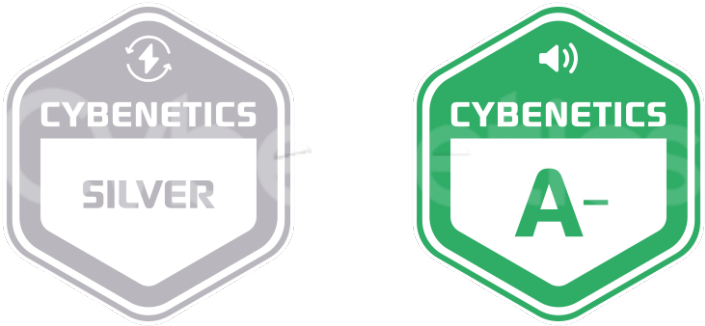
Top side

Power specifications label

CERTIFICATIONS 115V



CERTIFICATIONS 230V