Gamemax GM500 rev.2

Serial Number

Lab ID 586

Certification ID 25586

Test Result Report ID: 19PS586A

Certificate Issue Date: May 1, 2019

Scheme: ETA-EMI PSU

115V



230V



115V



230V



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	Gamemax
Model	GM500 rev.2
OEM/ODM	Gamemax
Serial Number	
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	12-6
Rated Frequency (Hz)	50-60

Rated Power (W)	500
Operating Temperature (Continuous Full Load) (°C)	
Type	ATX12V
Cable Design	Fixed cables
Warranty	-
Cybenetics Measurements	
Dimensions (W x H x D)	
Weight	
Cooling	140mm Sleeve Bearing Fan (DF1402512SEM)
Semi-Passive Operation	✗
Cybenetics Testing Information	
Lab ID	586
Date of receipt	Apr 23, 2019
Testing Date	Apr 27, 2019
Report Issued Date	May 1, 2019
Engineer Name	-
Authorized By the Laboratory Technical Manager	Aristeidis Bitziopoulos
Signature	

Cables and Connectors(Non-accredited measurements)

Captive Cables				
Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (490mm)	1	1	18-22AWG	No
4+4 pin EPS12V (510mm)	1	1	18AWG	No
6+2 pin PCIe (500mm)	1	1	18AWG	No
SATA (500mm+150mm+150mm)	1	3	18AWG	No
4-pin Molex (500mm) / SATA (+150mm+150mm)	1	1 / 2	18AWG	No
4-pin Molex (500mm+150mm) / FDD (+150mm)	1	2 / 1	18AWG	No

Power Specifications

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	15	20	32	2.5	0.5
	Watts	100		384	12.5	6
Total Max. Power (W)		500				

Parts Description

General Data	
Manufacturer (OEM)	Gamemax
PCB Type	Single Layer
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor
Bridge Rectifier(s)	1x GBU1506L (600V, 15A @ 100°C)
APFC MOSFETS	2x Champion GP18S50G (500V, 28A @ 150°C, 0.19Ω)
APFC Boost Diode	1x CREE C3D06060A (600V, 6A @ 154°C)
Hold-up Cap(s)	1x CapXon (400V, 270uF, 2000h @ 105 °C, HP)
Main Switchers	2x Champion GP18S50G (500V, 28A @ 150°C, 0.19Ω)
Combo APFC/PWM Controller	Champion CM6805BSX
Topology	Primary side: Double Forward Secondary side: Group Regulation & Passive Rectification
Secondary Side	
+12V MOSFETS	2x MOSPEC S60M60C SBR (60V, 60A)
5V & 3.3V	2x MOSPEC S40M45C SBR (45V, 40A)
Filtering Capacitors	Electrolytics: CapXon (2-5,000 @ 105°C, KF), ChengX (2-4,000h @ 105°C, GR)
Supervisor IC	Grenergy GR8313 (OVP, UVP, SCP, PG)
Fan Model	Xin Zheng Heng Electronic DF1402512SEM (140mm, 12V, 0.20A, 2.4W, Sleeve Bearing)
5VSB Circuit	
Standby PWM Controller	Sanken STR-A6059H

Test Results

Temperature & Compliance Info

Temperature Range (°C /°F)	28-32 / 82.4-89.6
ErP Lot 3/6 Ready	ErP Lot 6 2010: ✓ ErP Lot 6 2013: Partially ErP Lot 3 2014 & CEC: Partially
(EU) No 617/2013 Compliance	✓

Performance Summary

115V

Accredited	
Average Efficiency (>1450 load combinations)	84.327%
Average Noise Output (>1450 Load Combinations)	37.51dBA
Average PF (>1450 Load Combinations)	0.988
Efficiency With 10W (≤500W) or 2% (>500W) Load	55.120%
Standby Power Consumption	0.1072W
Non-Accredited	
12V Ripple (Full Load)	30.13mV
5V Ripple (Full Load)	22.92mV
3.3V Ripple (Full Load)	22.70mV
5VSB Ripple (Full Load)	42.16mV
12V Load Regulation	1.00%
5V Load Regulation	2.25%
3.3V Load Regulation	1.92%
5VSB Load Regulation	2.13%
Inrush Current	99.284A

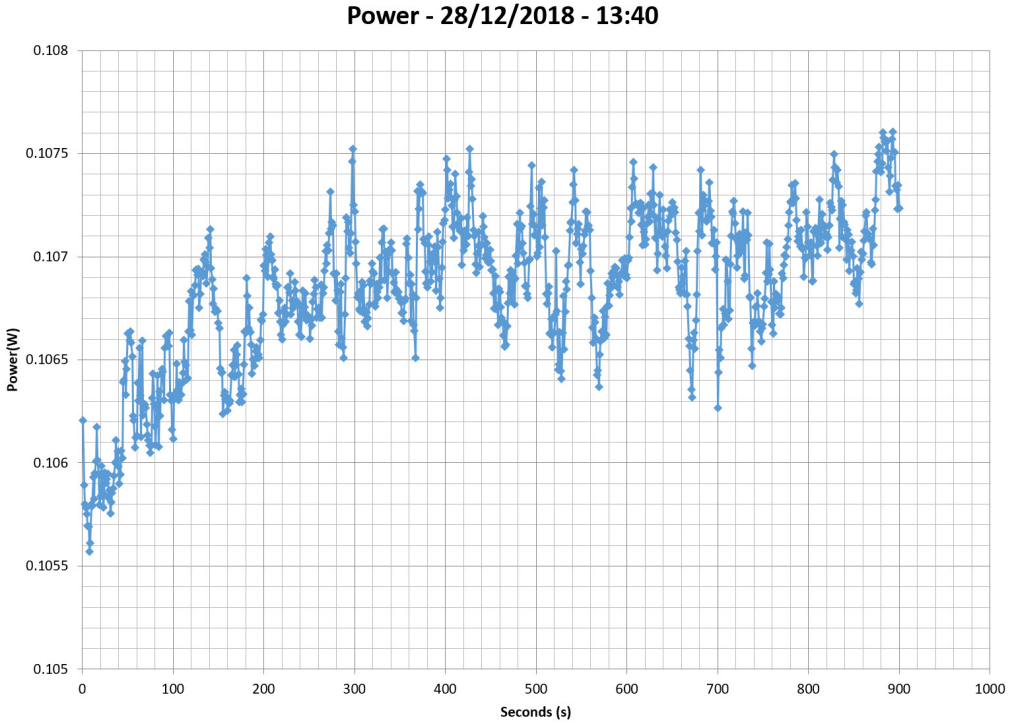
230V		
Accredited		
Average Efficiency (>1450 load combinations)	86.040%	
Average Noise Output (>1450 Load Combinations)	37.49dBA	
Average PF (>1450 Load Combinations)	0.945	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.1890W	
Non-Accredited		
12V Ripple (Full Load)	26.83mV	
5V Ripple (Full Load)	20.90mV	
3.3V Ripple (Full Load)	23.99mV	
5VSB Ripple (Full Load)	38.46mV	
12V Load Regulation	0.99%	
5V Load Regulation	2.35%	
3.3V Load Regulation	1.83%	
5VSB Load Regulation	2.09%	
Inrush Current	66.130A	
Hold-Up Time & PWR_OK Signal	12.50ms	
AC Loss to PWR_OK Hold Up Time	8.10ms	
PWR_OK Inactive to DC Loss Delay	4.40ms	
OPP (0.00°C / 0.00°C)	-	-

Hold-Up Time & PWR_OK Signal

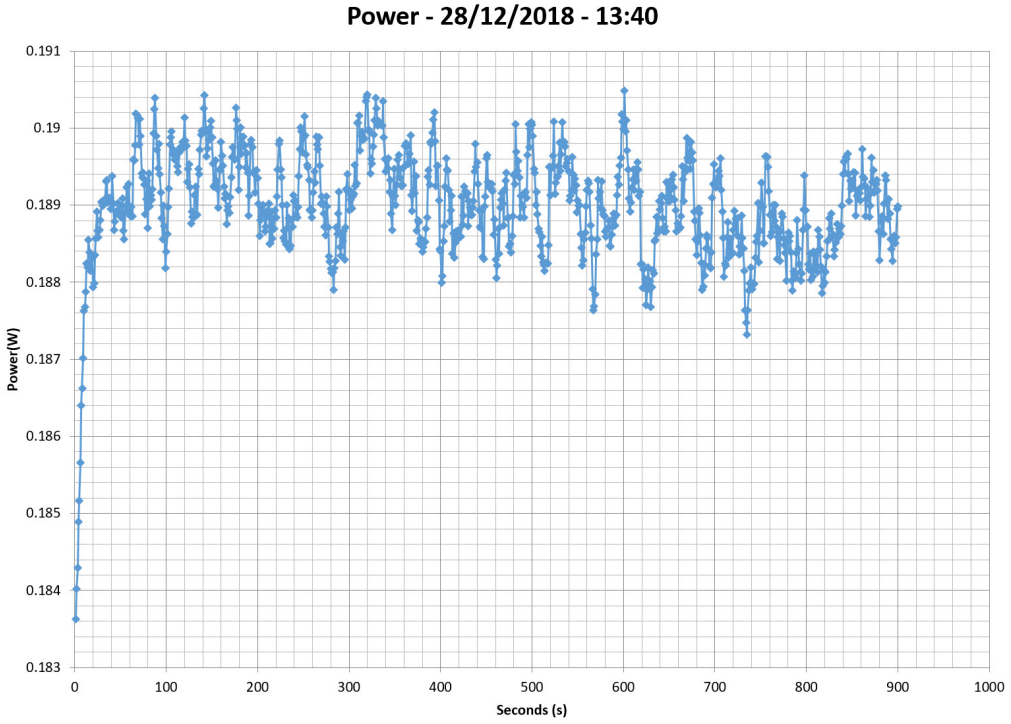
Hold-Up Time (ms)	12.50
AC Loss to PWR_OK Hold Up Time (ms)	8.10
PWR_OK Inactive to DC Loss Delay (ms)	4.40

Graphs

115V

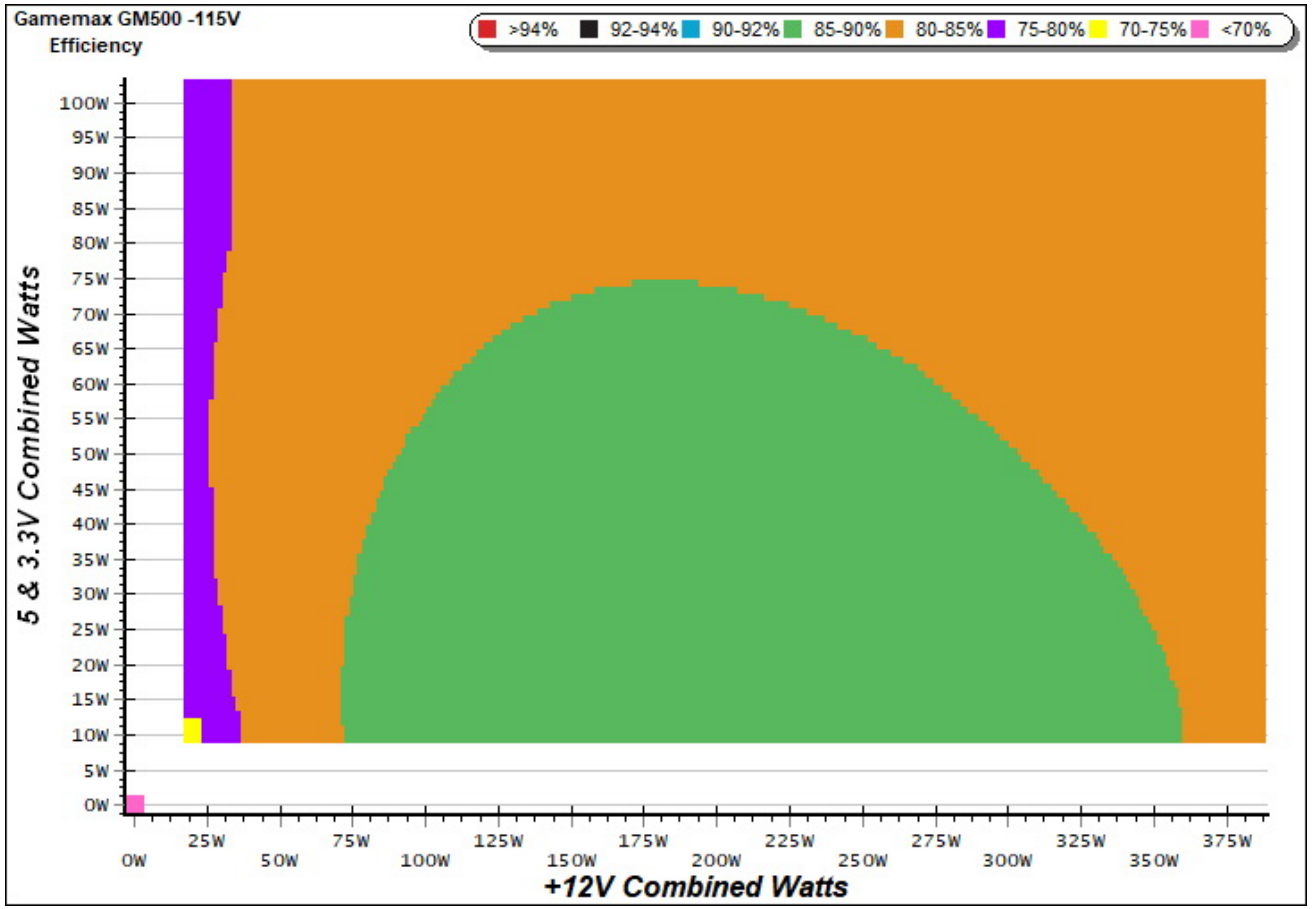


230V



Efficiency Graph

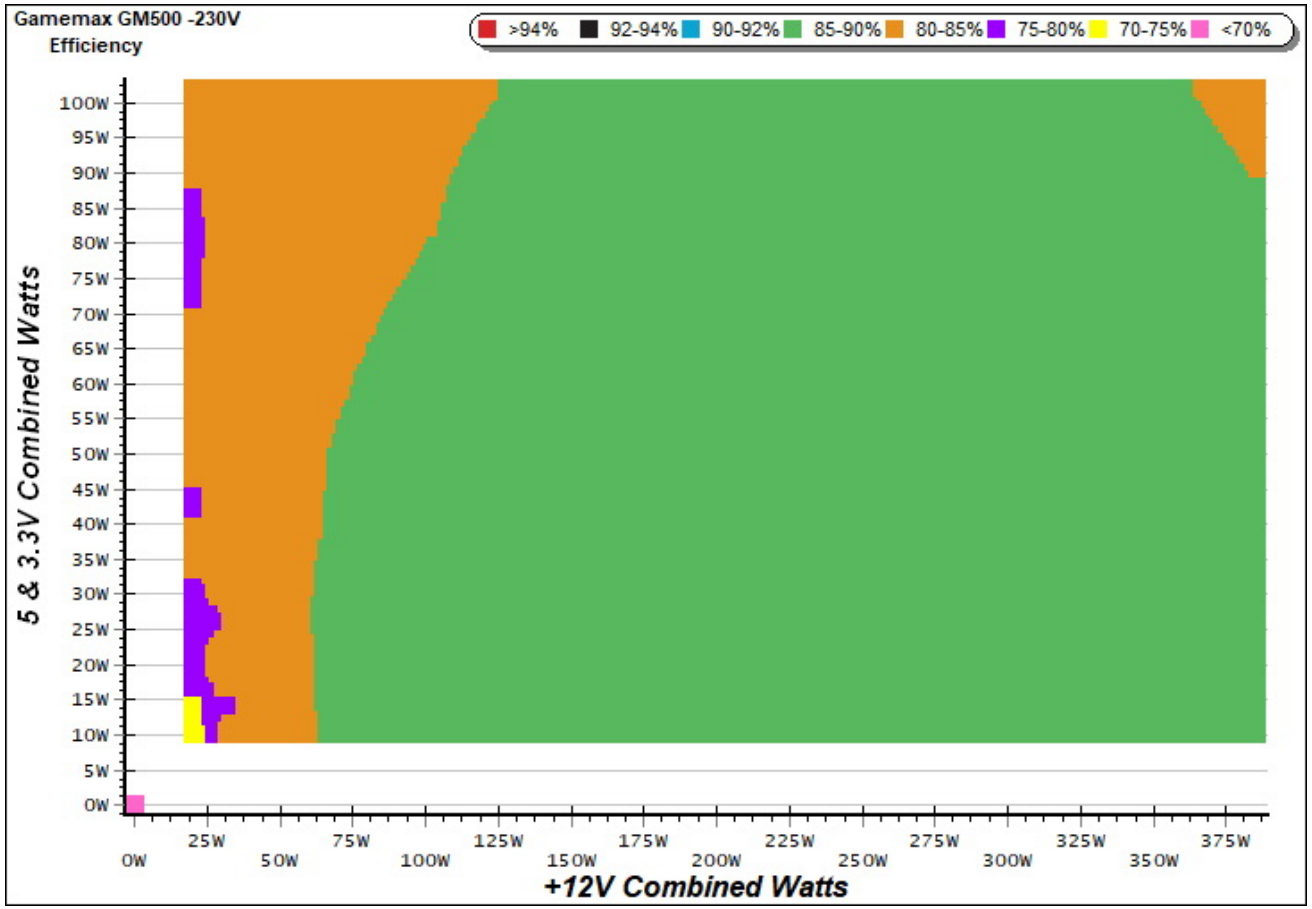
115V



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

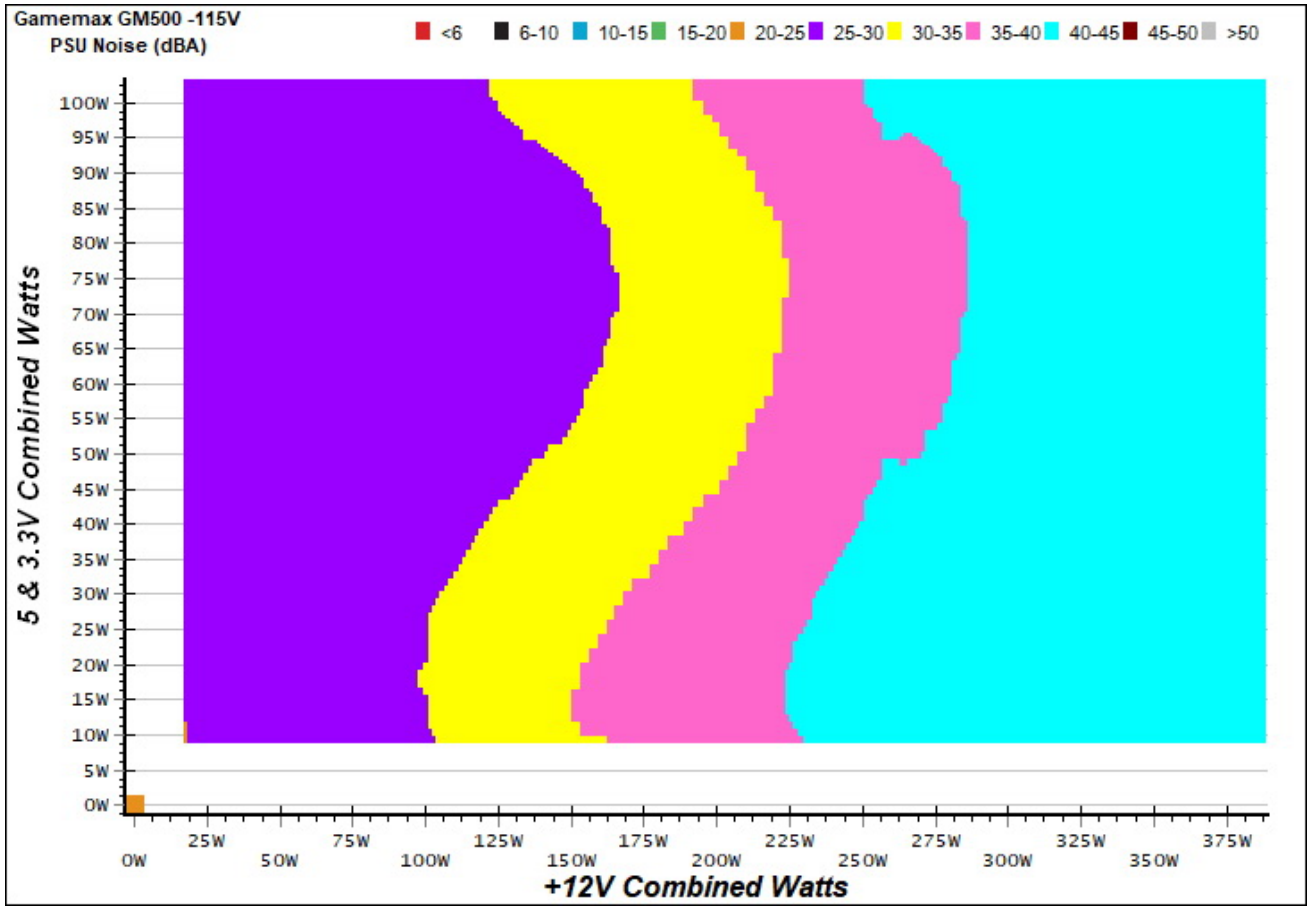


INFO

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Noise Graph

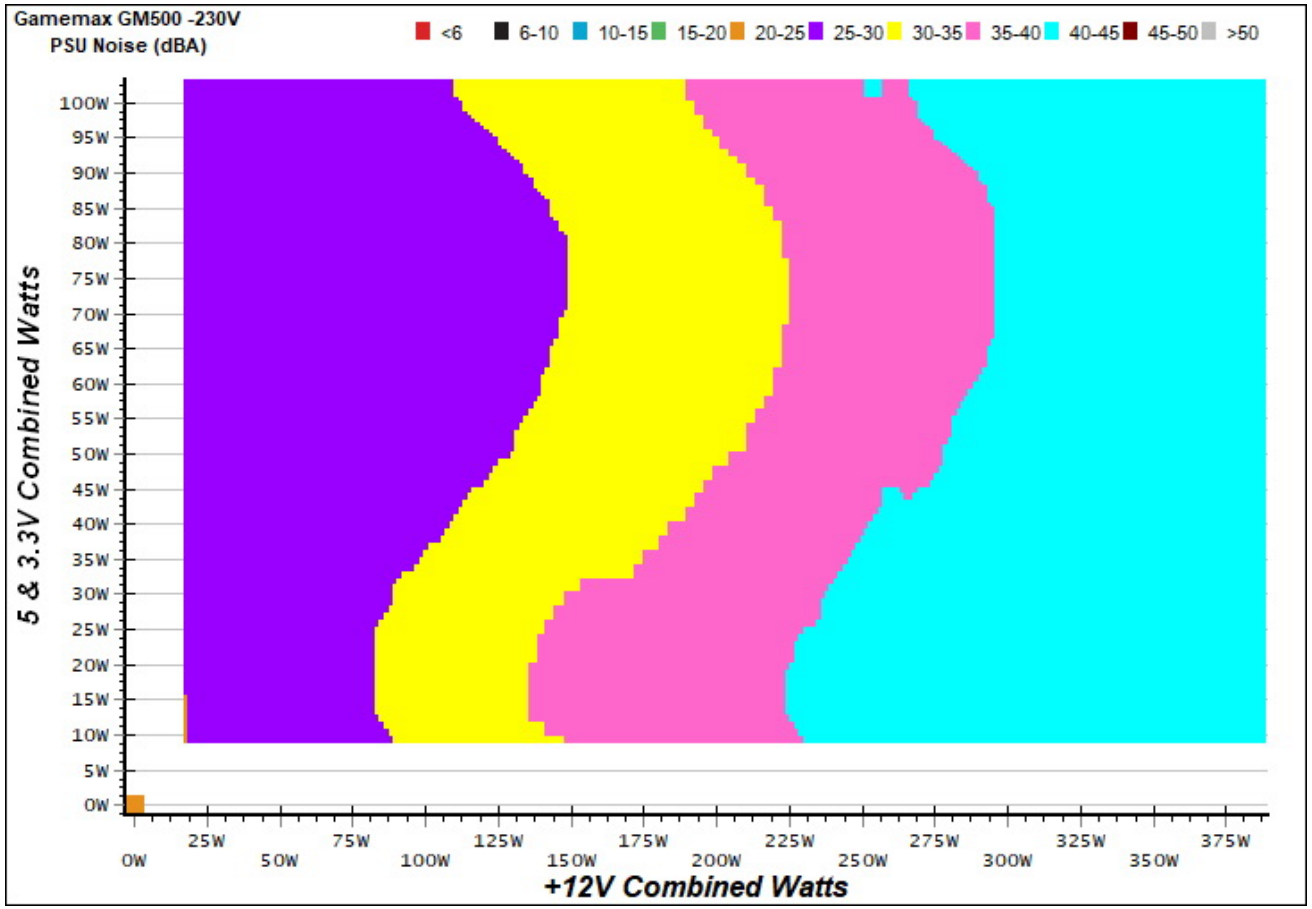
115V



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

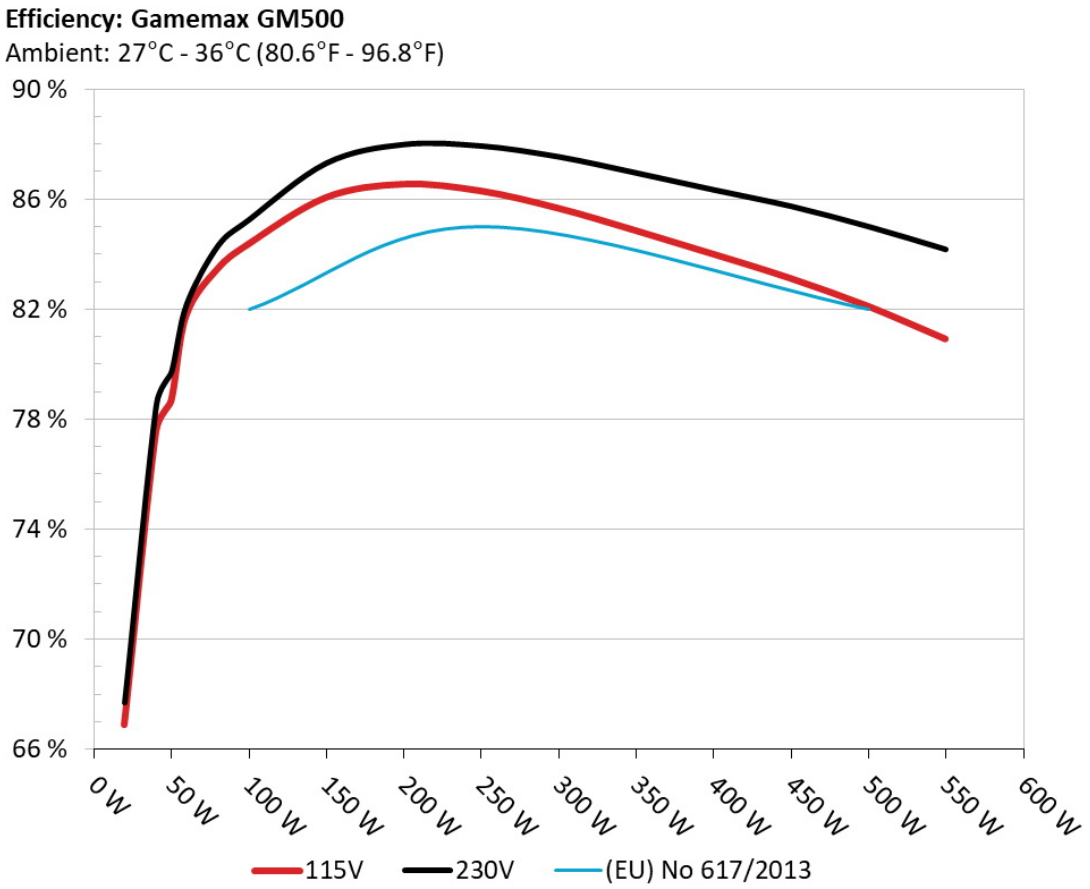


INFO

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

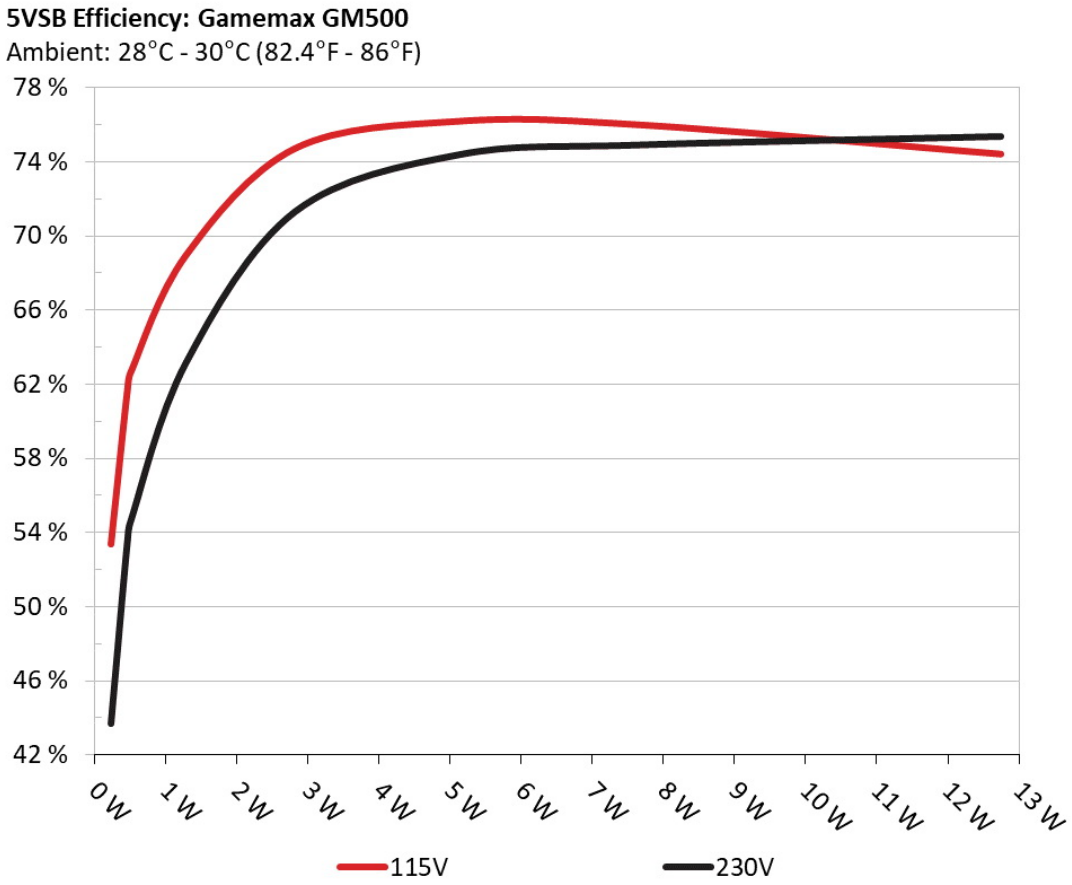
Efficiency under high ambient temperature



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	0.045A	0.231	53.349%	0.068
	5.137V	0.433		115.10V
2	0.090A	0.462	61.682%	0.112
	5.134V	0.749		115.10V
3	0.550A	2.820	74.722%	0.290
	5.126V	3.774		115.10V
4	1.000A	5.120	76.190%	0.332
	5.120V	6.720		115.10V
5	1.500A	7.669	75.998%	0.356
	5.112V	10.091		115.10V
6	2.501A	12.743	74.420%	0.385
	5.096V	17.123		115.10V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.231	43.667%	0.026
	5.134V	0.529		230.28V
2	0.090A	0.462	53.534%	0.041
	5.133V	0.863		230.28V
3	0.550A	2.820	71.320%	0.160
	5.126V	3.954		230.26V
4	1.000A	5.121	74.390%	0.226
	5.120V	6.884		230.26V
5	1.500A	7.669	74.922%	0.269
	5.112V	10.236		230.26V
6	2.501A	12.744	75.377%	0.315
	5.096V	16.907		230.25V

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
1	2.262A	1.971A	1.980A	0.979A	49.553	78.666%	1018	25.6	29.03°C	0.966
	12.359V	5.076V	3.328V	5.110V	62.992				30.88°C	115.10V
2	5.563A	2.962A	2.981A	1.177A	99.634	84.383%	1022	25.8	29.69°C	0.963
	12.357V	5.062V	3.320V	5.099V	118.073				32.00°C	115.09V
3	9.204A	3.461A	3.469A	1.376A	149.522	86.071%	1022	25.8	30.25°C	0.977
	12.335V	5.056V	3.312V	5.089V	173.719				32.90°C	115.08V
4	12.865A	3.959A	3.989A	1.575A	199.556	86.559%	1029	26.0	30.90°C	0.986
	12.310V	5.052V	3.306V	5.079V	230.542				33.78°C	115.07V
5	16.186A	4.962A	4.997A	1.776A	249.675	86.311%	1247	32.0	31.16°C	0.991
	12.306V	5.038V	3.300V	5.069V	289.272				34.56°C	115.08V
6	19.514A	5.970A	6.010A	1.978A	299.785	85.681%	1498	36.9	31.61°C	0.993
	12.298V	5.025V	3.294V	5.058V	349.883				35.46°C	115.09V
7	22.838A	6.987A	7.026A	2.180A	349.893	84.865%	1736	41.3	32.49°C	0.995
	12.295V	5.010V	3.287V	5.046V	412.296				36.90°C	115.09V
8	26.161A	8.009A	8.042A	2.383A	400.023	84.010%	1737	41.3	33.53°C	0.996
	12.294V	4.995V	3.282V	5.036V	476.162				38.26°C	115.09V
9	29.935A	8.517A	8.544A	2.386A	449.742	83.133%	1726	41.0	33.80°C	0.996
	12.268V	4.990V	3.277V	5.030V	540.994				39.21°C	115.09V
10	33.743A	9.026A	9.092A	2.491A	500.055	82.111%	1729	41.1	35.24°C	0.996
	12.235V	4.986V	3.267V	5.019V	608.996				41.17°C	115.09V
11	37.968A	9.019A	9.105A	2.496A	549.677	80.930%	1718	40.8	35.88°C	0.997
	12.181V	4.989V	3.261V	5.009V	679.198				42.61°C	115.09V
CL1	0.136A	12.000A	12.001A	0.000A	99.215	76.531%	1364	34.3	31.74°C	0.971
	12.939V	4.817V	3.304V	5.105V	129.640				34.72°C	115.10V

CL2	31.993A	1.001A	0.999A	1.000A	393.809	84.564%	1689	40.2	35.93°C	0.996
	11.886V	5.169V	3.294V	5.075V	465.696				41.16°C	115.10V

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
1	2.268A	1.967A	1.981A	0.979A	49.608	79.695%	1014	25.3	28.90°C	0.595
	12.358V	5.076V	3.328V	5.110V	62.247				30.87°C	230.30V
2	5.569A	2.962A	2.980A	1.177A	99.702	85.237%	1016	25.5	29.55°C	0.817
	12.357V	5.061V	3.320V	5.099V	116.970				31.86°C	230.30V
3	9.210A	3.462A	3.469A	1.376A	149.601	87.290%	1019	25.7	30.21°C	0.912
	12.335V	5.056V	3.312V	5.089V	171.383				32.83°C	230.30V
4	12.869A	3.959A	3.989A	1.575A	199.607	87.971%	1025	25.9	30.87°C	0.942
	12.310V	5.052V	3.306V	5.080V	226.901				33.87°C	230.29V
5	16.188A	4.962A	4.997A	1.776A	249.700	87.916%	1255	32.1	31.07°C	0.965
	12.306V	5.038V	3.300V	5.069V	284.021				34.70°C	230.29V
6	19.516A	5.969A	6.010A	1.978A	299.795	87.522%	1487	36.6	31.79°C	0.978
	12.298V	5.024V	3.294V	5.057V	342.535				35.78°C	230.27V
7	22.836A	6.987A	7.027A	2.180A	349.888	86.936%	1721	40.9	32.38°C	0.984
	12.296V	5.009V	3.287V	5.046V	402.465				37.18°C	230.27V
8	26.157A	8.012A	8.042A	2.383A	400.007	86.320%	1725	41.0	33.36°C	0.985
	12.295V	4.994V	3.282V	5.036V	463.401				38.54°C	230.27V
9	29.933A	8.518A	8.543A	2.386A	449.720	85.725%	1724	41.0	33.62°C	0.986
	12.268V	4.990V	3.277V	5.030V	524.609				39.46°C	230.26V
10	33.739A	9.030A	9.089A	2.491A	500.041	84.984%	1722	41.0	34.41°C	0.987
	12.236V	4.985V	3.267V	5.019V	588.396				40.65°C	230.27V
11	37.970A	9.020A	9.104A	2.496A	549.674	84.156%	1716	40.8	35.79°C	0.988
	12.180V	4.989V	3.262V	5.009V	653.161				42.39°C	230.28V
CL1	0.134A	12.000A	12.001A	0.000A	99.176	77.618%	1389	34.7	31.23°C	0.850
	12.937V	4.817V	3.303V	5.105V	127.774				34.75°C	230.29V

CL2	32.005A	1.002A	0.997A	1.000A	393.919	86.870%	1689	40.2	34.14°C	0.985
	11.885V	5.169V	3.295V	5.075V	453.459				40.50°C	230.29V

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])	PF/AC Volts
1	1.164A	0.487A	0.476A	0.195A	19.359	66.894%	1006	24.8	0.841
	12.267V	5.121V	3.334V	5.128V	28.940				115.11V
2	2.403A	0.979A	0.987A	0.391A	39.856	77.567%	1011	25.1	0.949
	12.306V	5.101V	3.331V	5.121V	51.383				115.10V
3	3.563A	1.474A	1.469A	0.587A	59.290	81.782%	1013	25.2	0.987
	12.320V	5.090V	3.328V	5.115V	72.498				115.09V
4	4.798A	1.966A	1.983A	0.783A	79.727	83.488%	1016	25.5	0.967
	12.327V	5.081V	3.324V	5.110V	95.495				115.09V

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])	PF/AC Volts
1	1.171A	0.487A	0.476A	0.195A	19.443	67.677%	1007	24.8	0.399
	12.265V	5.121V	3.334V	5.128V	28.729				230.29V
2	2.408A	0.980A	0.988A	0.391A	39.923	78.527%	1007	24.8	0.545
	12.305V	5.101V	3.331V	5.121V	50.840				230.29V
3	3.569A	1.473A	1.469A	0.587A	59.353	82.144%	1010	25.0	0.669
	12.319V	5.090V	3.327V	5.115V	72.255				230.30V
4	4.803A	1.968A	1.981A	0.783A	79.791	84.297%	1011	25.1	0.759
	12.327V	5.080V	3.324V	5.110V	94.655				230.29V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	6.7 mV	8.7 mV	11.7 mV	13.4 mV	Pass
20% Load	8.9 mV	9.0 mV	21.3 mV	14.5 mV	Pass
30% Load	11.1 mV	9.4 mV	13.8 mV	15.9 mV	Pass
40% Load	12.5 mV	9.7 mV	14.4 mV	16.7 mV	Pass
50% Load	13.7 mV	10.6 mV	15.5 mV	18.4 mV	Pass
60% Load	15.7 mV	12.2 mV	17.5 mV	23.3 mV	Pass
70% Load	17.6 mV	13.7 mV	20.2 mV	25.1 mV	Pass
80% Load	19.0 mV	15.4 mV	19.5 mV	32.5 mV	Pass
90% Load	21.0 mV	17.1 mV	24.0 mV	36.8 mV	Pass
100% Load	30.1 mV	22.9 mV	22.7 mV	42.2 mV	Pass
110% Load	36.1 mV	26.8 mV	23.6 mV	54.7 mV	Fail
Crossload 1	12.7 mV	72.7 mV	24.0 mV	28.2 mV	Fail
Crossload 2	23.6 mV	18.9 mV	15.1 mV	20.9 mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	7.0 mV	8.7 mV	13.5 mV	13.2 mV	Pass
20% Load	8.4 mV	8.2 mV	13.5 mV	14.6 mV	Pass
30% Load	9.4 mV	9.3 mV	13.1 mV	15.6 mV	Pass
40% Load	10.6 mV	9.5 mV	13.6 mV	15.9 mV	Pass
50% Load	11.2 mV	10.0 mV	15.1 mV	18.8 mV	Pass
60% Load	12.0 mV	11.3 mV	17.1 mV	23.2 mV	Pass
70% Load	13.6 mV	12.8 mV	17.1 mV	27.0 mV	Pass
80% Load	16.1 mV	13.6 mV	21.0 mV	30.3 mV	Pass

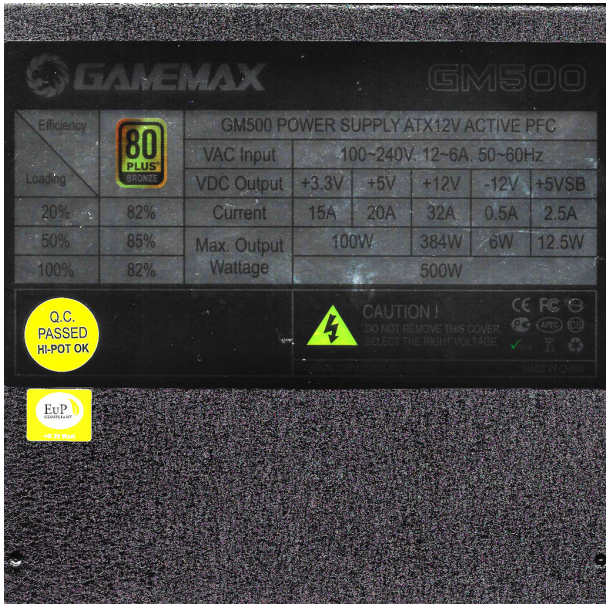
Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	18.0 mV	15.6 mV	20.8 mV	34.8 mV	Pass
100% Load	26.8 mV	20.9 mV	24.0 mV	38.5 mV	Pass
110% Load	30.5 mV	24.8 mV	24.4 mV	50.5 mV	Fail
Crossload 1	12.2 mV	61.8 mV	27.1 mV	28.2 mV	Fail
Crossload 2	18.1 mV	17.0 mV	15.3 mV	20.7 mV	Pass

The results above are not used in the certification process

Gamemax GM500 rev.2



Top side



Power specifications label