be quiet! Pure Power 11 FM 650W

Serial Number 318L0500000093

Lab ID BQ65001796

Certification ID 251796

Test Result Report ID: 21PS1796A

Certificate Issue Date: Feb 23, 2021

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	be quiet!
Model	Pure Power 11 FM 650W
OEM/ODM	Channel Well Technology
Serial Number	318L0500000093
Product Specifications	
Manufacturer-Provided Information	
Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10-5
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 Rifle Bearing Fan (BQ QF2-12025-MS)
Semi-Passive Operation	✗
Cybenetics Testing Information	
Lab ID	BQ65001796
Date of receipt	Feb 10, 2021
Testing Date	Feb 22, 2021
Report Issued Date	Feb 23, 2021
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 (550mm)	1	1	16-18AWG	No
4 pin EPS12V (600mm)	1	1	16AWG	No
4+4 pin EPS12V (600mm)	1	1	16AWG	No
6+2 pin PCIe (500mm+150mm)	2	4	16-18AWG	No
SATA (500mm+150mm+150mm)	1	3	18AWG	No
SATA (500mm+150mm+150mm+150mm)	1	4	18AWG	No
SATA (500mm+150mm) / 4-pin Molex (+150mm+150mm) / FDD (+150mm)	1	2 / 2 / 1	18-20AWG	No
AC Power Cord (1400mm) - C13 coupler	1	1	18AWG	-

Power Specifications

Rail		3.3V	5V	12V(1)	12V(2)	5VSB	-12V
Max. Power	Amps	20	20	32	28	3	0.3
	Watts	120		650		15	3.6
Total Max. Power (W)		650					

Parts Description

General Data	-
Manufacturer (OEM)	CWT
PCB Type	Double Sided
Primary Side	-
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor SCK-075 (7Ohm) & Relay
Bridge Rectifier(s)	1x GBJ1506 (600V, 15A @ 100°C)
APFC MOSFETs	2x ON Semiconductor FCPF165N65S3 (650V, 12.3A @ 100°C, Rds(on): 0.165Ohm)
APFC Boost Diode	1x ON Semiconductor FFSP0665A (650V, 6A @ 153°C)
Bulk Cap(s)	2x Teapo (400V, 270uF & 330uF each or 600uF combined, 2,000h @ 85°C, LH)
Main Switchers	2x ON Semiconductor FCPF190N60E (600V, 13.1A @ 100°C, Rds(on): 0.19Ohm)
No Load Consumption FET	1x Sync Power SPN5003 (500V, 20mA @ 70°C, Rds(on): 250Ohm)
APFC Controller	Champion CM6500UNX
Resonant Controller	Champion CU6901VAC
Topology	Primary side: APFC, Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	-
+12V MOSFETs	4x ON Semiconductor NTMFS5C430N (40V, 131A @ 100°C, Rds(on): 1.7mOhm)
5V & 3.3V	DC-DC Converters: 2x UBIQ QM3054M6 (30V, 61A @ 100°C, Rds(on): 4.8mOhm) & 2x UBIQ QN3107M6N (30V, 70A @ 100°C, Rds(on): 2.6mOhm) PWM Controller(s): uPI-Semi uP3861P
Change Over Switch	1x Sync Power SPN3006 MOSFET (30V, 57A @ 100°C, Rds(on): 5.5mOhm)
Filtering Capacitors	Electrolytic: 7x Teapo (1-3,000h @ 105°C, SC), 1x Elite (2-5,000h @ 105°C, ED), 1x Teapo (1-5,000h @ 105°C, SJ), 7x Teapo (4-10,000h @ 105°C, TA) Polymer: 18x APAQ
Supervisor IC	Weltrend WT7527RT (OCP, OVP, UVP, SCP, PG)

Fan Model	be quiet! BQ QF2-12025-MS (120mm, 12V, 0.20A, Rifle Bearing Fan)
5VSB Circuit	-
Rectifier	1x Silan Microelectronics SVF4N65RDTR FET (650V, 2.5A @ 100°C, Rds(on): 2.7Ohm) & 1x PS1045L SBR (45V, 10A)
Standby PWM Controller	On-Bright OB5282

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)	88.766%
Average Noise Output (>1450 Load Combinations)	21.21dBA
Average PF (>1450 Load Combinations)	0.991
Efficiency With 10W (≤500W) or 2% (>500W) Load	71.820%
Standby Power Consumption	0.0405W
Non-Accredited	
12V Ripple (Full Load)	16.94mV
5V Ripple (Full Load)	7.51mV
3.3V Ripple (Full Load)	13.63mV
5VSB Ripple (Full Load)	11.88mV
12V Load Regulation	0.81%
5V Load Regulation	0.32%
3.3V Load Regulation	0.48%
5VSB Load Regulation	1.51%

Inrush Current	24.930A

230V

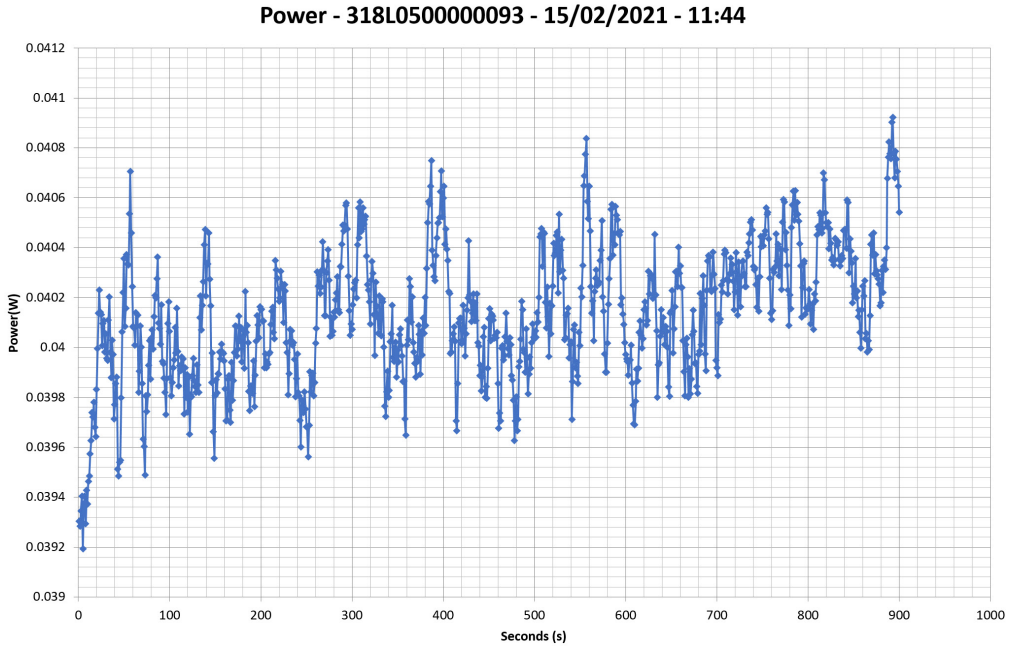
Accredited		
Average Efficiency (>1450 load combinations)	90.793%	
Average Noise Output (>1450 Load Combinations)	21.75dBA	
Average PF (>1450 Load Combinations)	0.963	
Efficiency With 10W (≤500W) or 2% (>500W) Load	-	
Standby Power Consumption	0.0602W	
Non-Accredited		
12V Ripple (Full Load)	18.22mV	
5V Ripple (Full Load)	7.33mV	
3.3V Ripple (Full Load)	13.41mV	
5VSB Ripple (Full Load)	10.52mV	
12V Load Regulation	0.71%	
5V Load Regulation	0.30%	
3.3V Load Regulation	0.45%	
5VSB Load Regulation	1.47%	
Inrush Current	88.750A	
Hold-Up Time & PWR_OK Signal	22.50ms	
AC Loss to PWR_OK Hold Up Time	19.30ms	
PWR_OK Inactive to DC Loss Delay	3.20ms	
PSU Timings: T1 (20% / 100%)	51.0ms	51.0ms
PSU Timings: T3 (20% / 100%)	132.0ms	132.0ms
OPP (25.00°C / 45.70°C)	122.73%	122.73%

Hold-Up Time & PWR_OK Signal

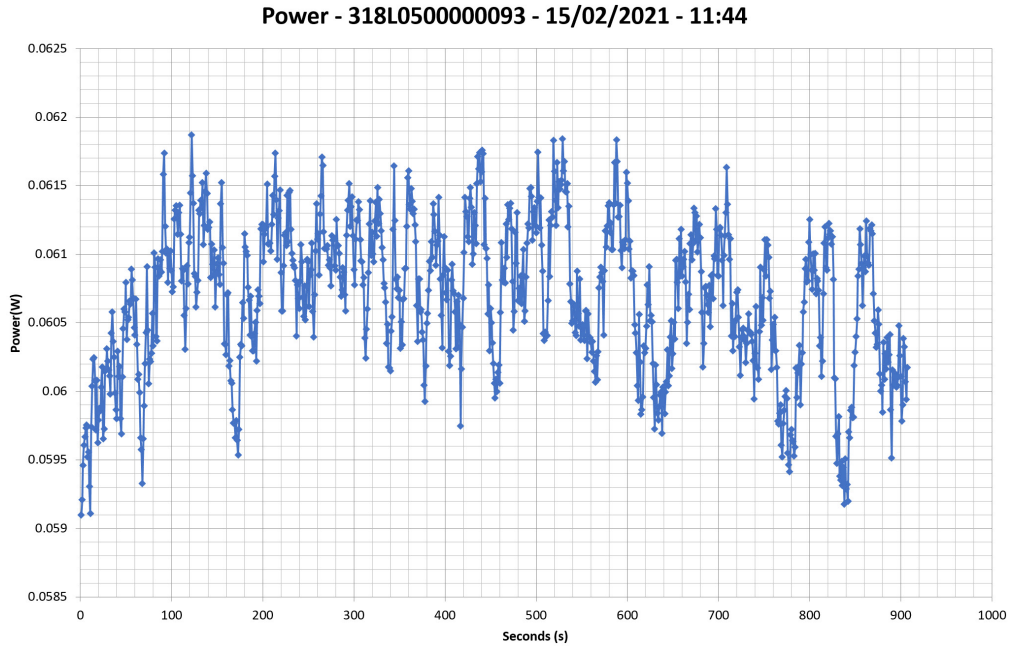
Hold-Up Time (ms)	22.5
AC Loss to PWR_OK Hold Up Time (ms)	19.3
PWR_OK Inactive to DC Loss Delay (ms)	3.2

Graphs

115V

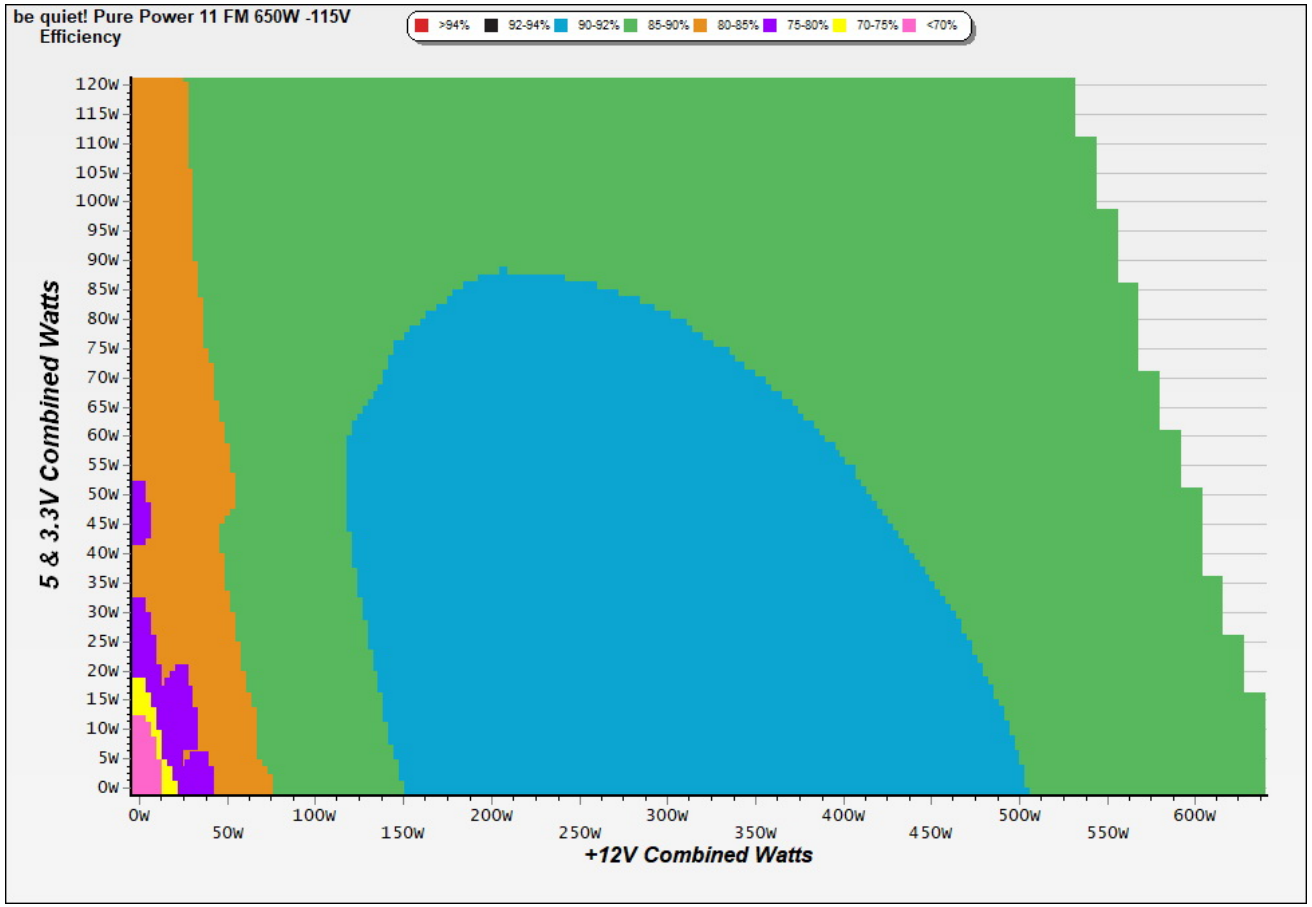


230V



Efficiency Graph

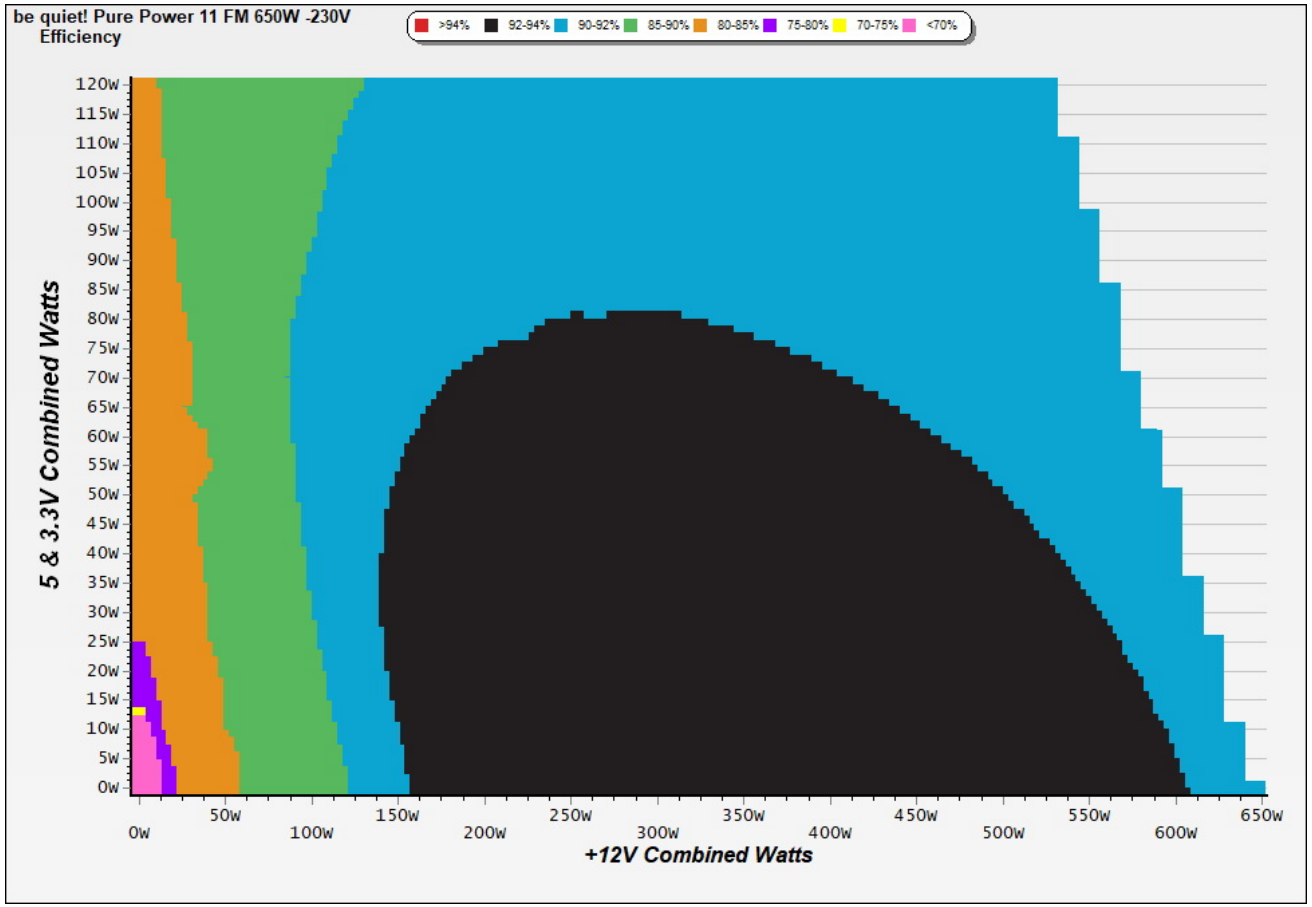
115V



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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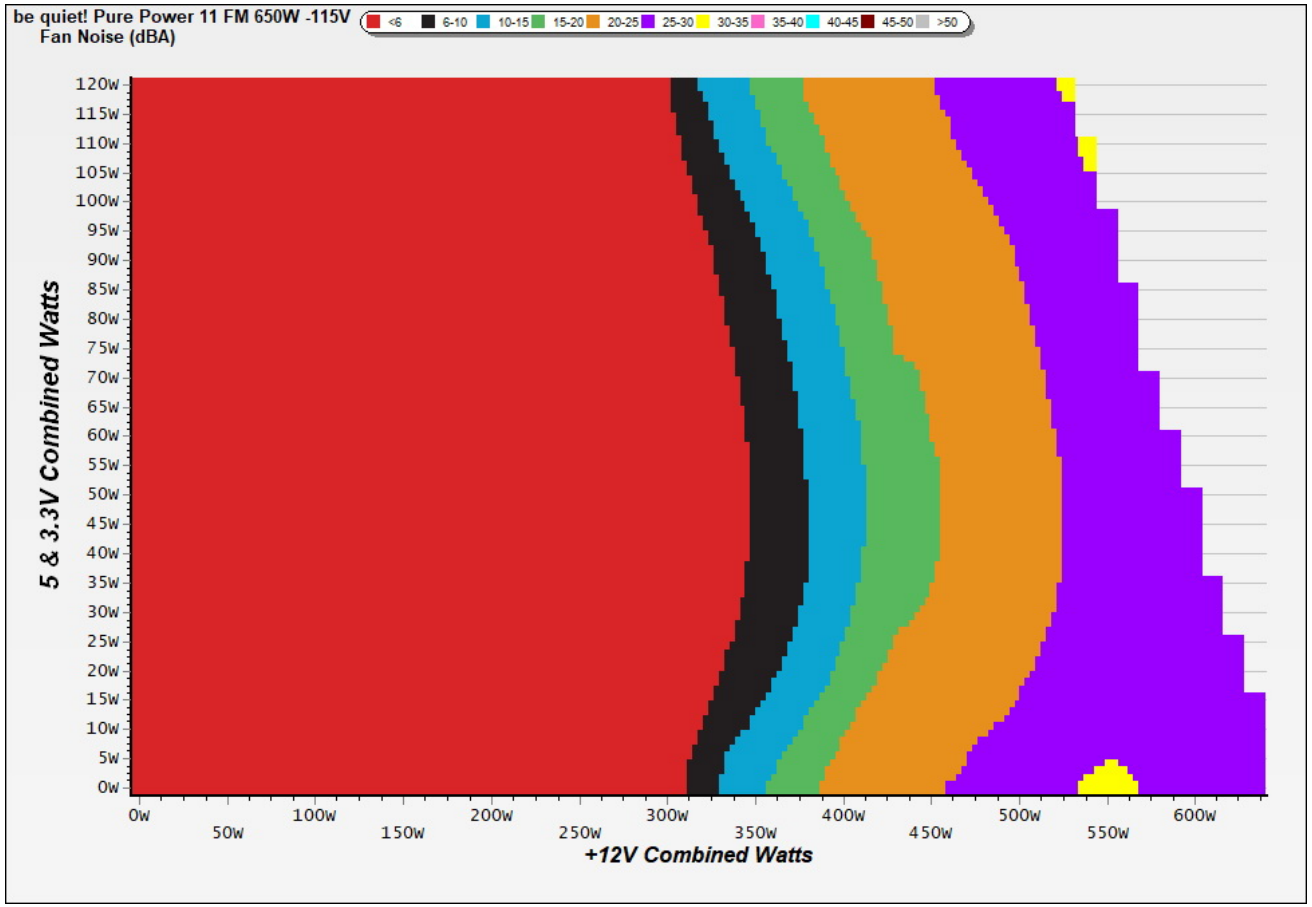
Noise Graph

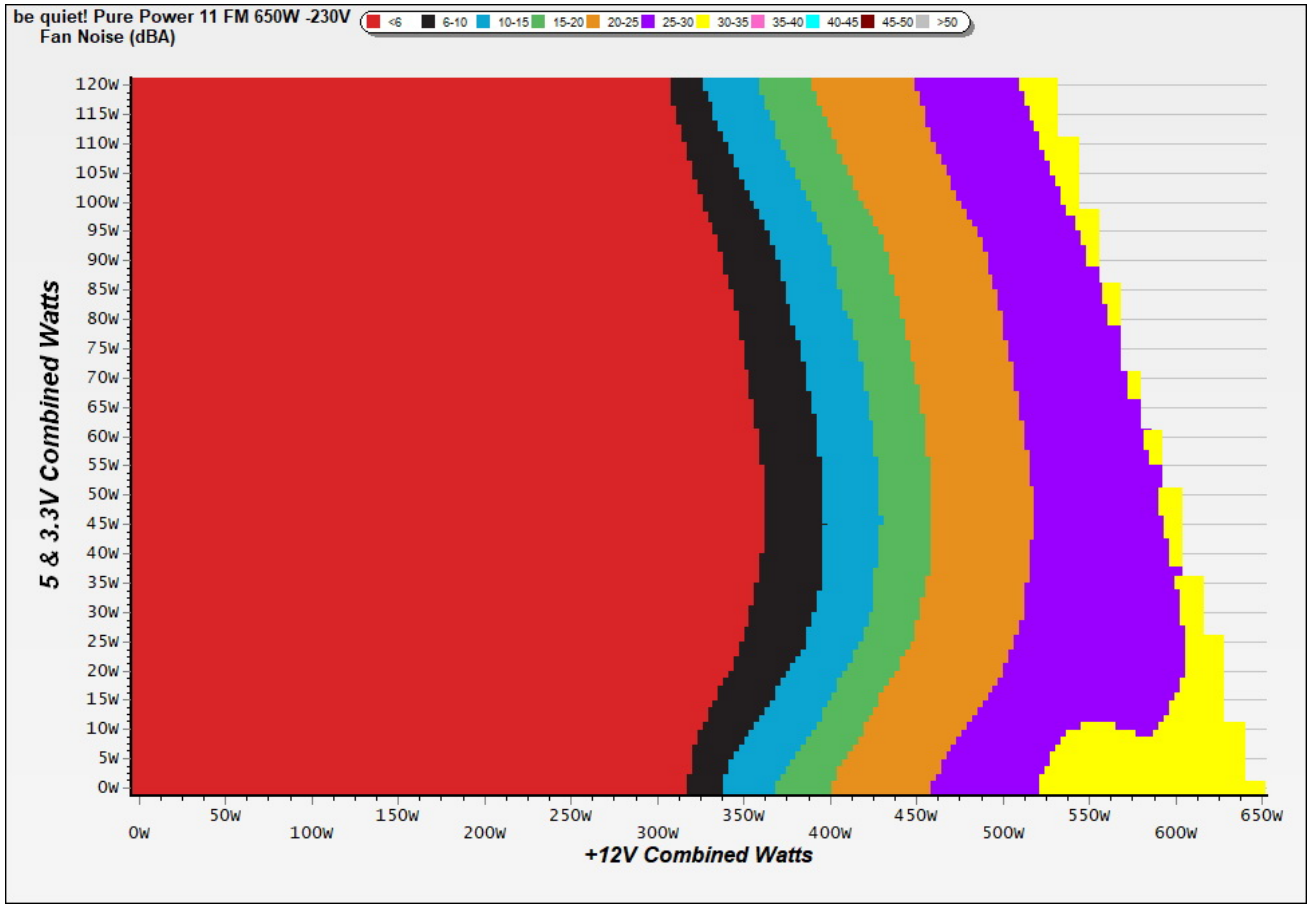
115V



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

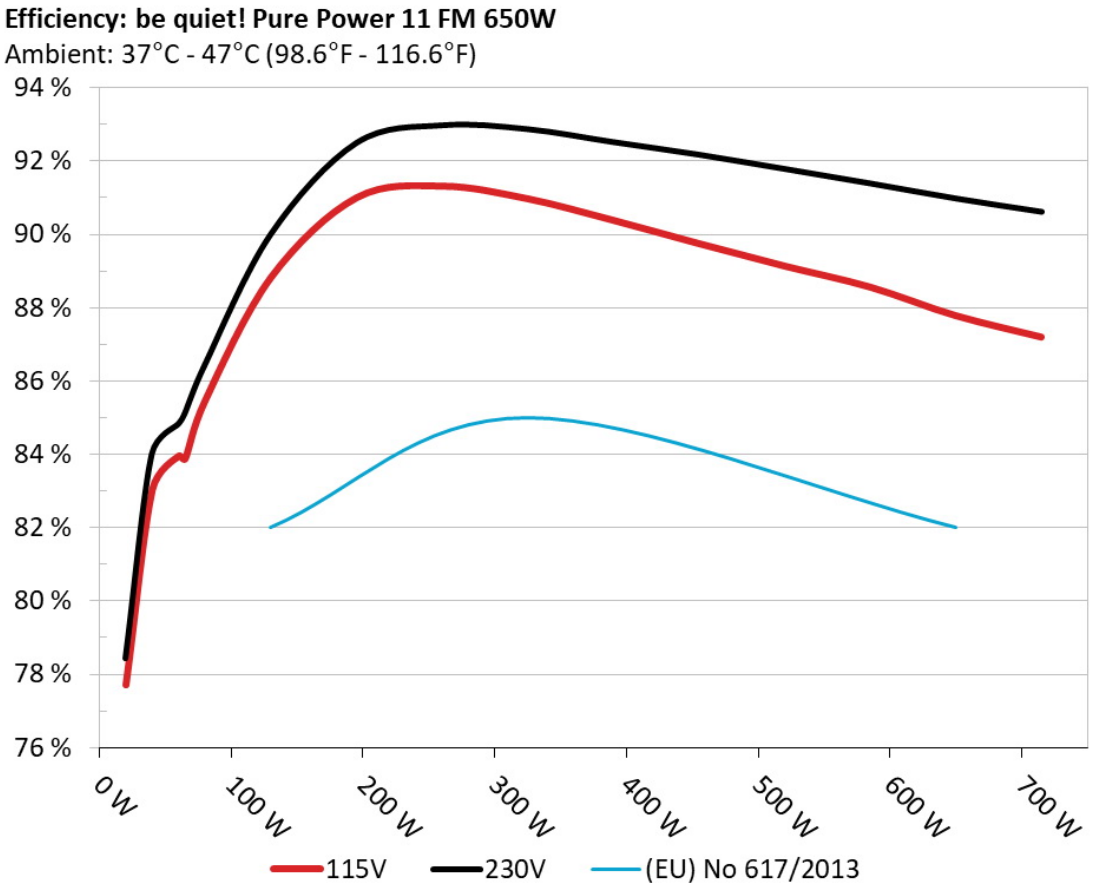


INFO

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

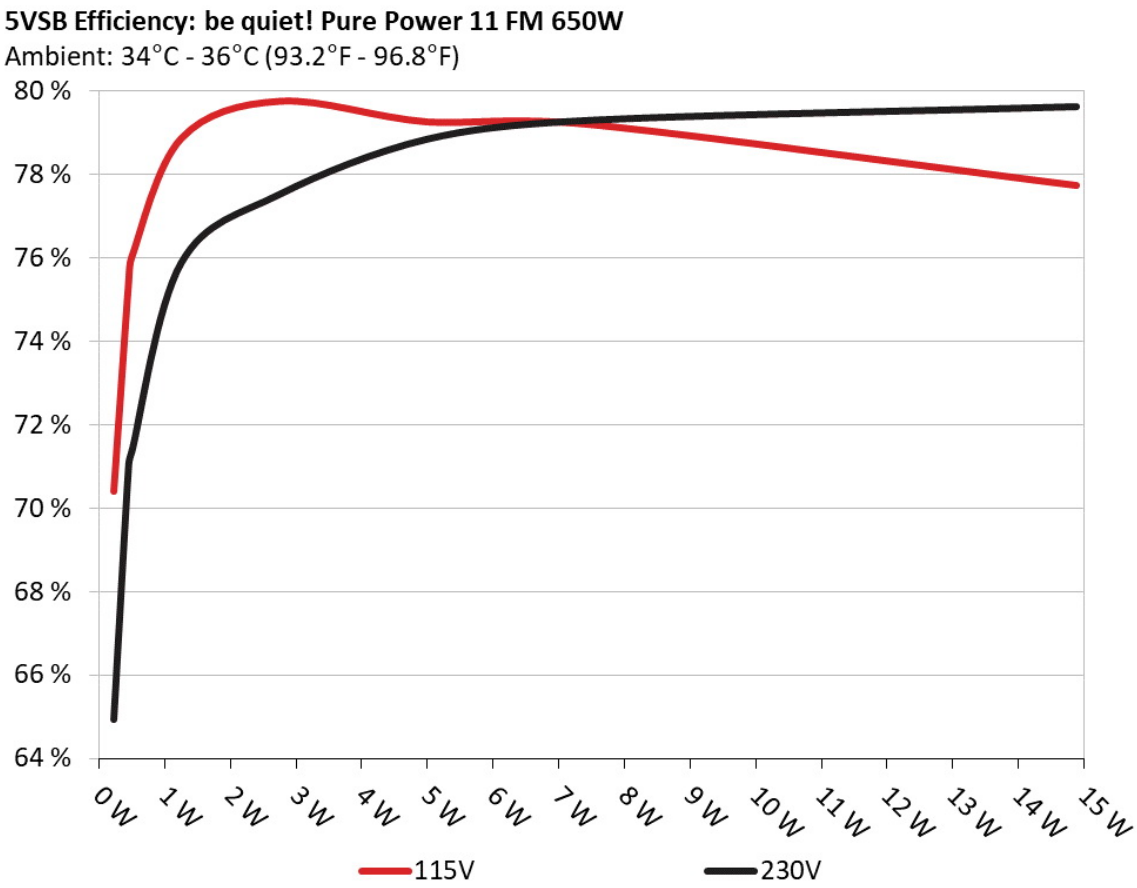
Efficiency under high ambient temperature



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	0.226	70.405%	0.032
	5.012V	0.321		115.12V
2	0.090A	0.451	75.418%	0.060
	5.011V	0.598		115.12V
3	0.550A	2.752	79.745%	0.268
	5.003V	3.451		115.12V
4	1.000A	4.996	79.251%	0.372
	4.995V	6.304		115.12V
5	1.501A	7.480	79.187%	0.435
	4.984V	9.446		115.12V
6	3.002A	14.879	77.730%	0.514
	4.956V	19.142		115.12V

230V

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.226	64.943%	0.011
	5.016V	0.348		230.29V
2	0.090A	0.451	71.024%	0.019
	5.013V	0.635		230.29V
3	0.550A	2.752	77.521%	0.103
	5.003V	3.550		230.29V
4	1.000A	4.997	78.842%	0.171
	4.996V	6.338		230.29V
5	1.500A	7.483	79.294%	0.232
	4.987V	9.437		230.29V
6	3.001A	14.884	79.619%	0.343
	4.960V	18.694		230.30V

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	3.589A	1.983A	1.993A	0.996A	64.955	83.877%	502	<6.0	40.89°C	0.975
	12.080V	5.044V	3.309V	5.023V	77.441				45.22°C	115.12V
2	8.165A	2.975A	2.995A	1.196A	130.012	88.821%	507	<6.0	40.93°C	0.991
	12.138V	5.042V	3.307V	5.018V	146.376				46.19°C	115.12V
3	13.104A	3.472A	3.493A	1.397A	195.013	90.997%	509	<6.0	41.90°C	0.994
	12.131V	5.041V	3.305V	5.012V	214.307				48.00°C	115.12V
4	18.060A	3.970A	3.995A	1.599A	260.019	91.313%	509	<6.0	42.48°C	0.996
	12.116V	5.039V	3.303V	5.005V	284.756				49.32°C	115.12V
5	22.692A	4.963A	4.998A	1.800A	325.053	90.967%	630	9.5	42.87°C	0.994
	12.099V	5.037V	3.302V	5.000V	357.329				50.49°C	115.11V
6	27.285A	5.959A	5.997A	2.000A	389.426	90.386%	874	18.5	43.01°C	0.994
	12.081V	5.036V	3.301V	4.995V	430.848				51.20°C	115.08V
7	31.956A	6.956A	7.003A	2.205A	454.797	89.745%	1182	27.7	44.13°C	0.995
	12.069V	5.034V	3.299V	4.989V	506.767				52.72°C	115.08V
8	36.599A	7.950A	8.005A	2.408A	520.083	89.131%	1344	31.9	44.46°C	0.996
	12.068V	5.032V	3.298V	4.984V	583.504				53.62°C	115.08V
9	41.640A	8.450A	8.489A	2.409A	585.005	88.557%	1590	36.2	45.73°C	0.996
	12.068V	5.030V	3.297V	4.982V	660.600				55.26°C	115.09V
10	46.407A	8.950A	9.011A	3.022A	649.874	87.780%	1689	38.1	45.77°C	0.997
	12.071V	5.028V	3.295V	4.965V	740.343				56.20°C	115.09V
11	51.780A	8.953A	9.016A	3.022A	714.743	87.195%	1687	38.1	46.63°C	0.997
	12.071V	5.027V	3.294V	4.964V	819.703				57.51°C	115.08V
CL1	0.117A	14.001A	14.001A	0.000A	118.118	82.743%	927	21.0	42.77°C	0.990
	12.134V	5.041V	3.294V	5.058V	142.752				50.35°C	115.15V

CL2	54.183A	1.000A	0.999A	1.000A	667.702	88.335%	1688	38.1	45.38°C	0.997
	12.077V	5.029V	3.300V	5.009V	755.871				56.34°C	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])	Temps (In/Out)	PF/AC Volts
1	3.590A	1.982A	1.996A	0.996A	64.957	85.130%	498	<6.0	40.02°C	0.816
	12.076V	5.044V	3.309V	5.023V	76.303				44.18°C	230.33V
2	8.168A	2.975A	2.994A	1.196A	130.015	90.008%	501	<6.0	40.87°C	0.928
	12.134V	5.043V	3.307V	5.018V	144.449				45.67°C	230.30V
3	13.107A	3.472A	3.495A	1.397A	195.017	92.505%	503	<6.0	41.06°C	0.960
	12.128V	5.041V	3.305V	5.012V	210.817				46.64°C	230.29V
4	18.065A	3.970A	3.994A	1.598A	260.021	92.989%	504	<6.0	41.35°C	0.974
	12.113V	5.039V	3.304V	5.006V	279.627				47.77°C	230.27V
5	22.701A	4.963A	4.997A	1.800A	325.056	92.881%	505	<6.0	41.98°C	0.981
	12.094V	5.038V	3.303V	5.001V	349.971				48.82°C	230.28V
6	27.293A	5.959A	6.000A	2.000A	389.450	92.532%	792	15.7	42.46°C	0.985
	12.078V	5.036V	3.301V	4.995V	420.881				50.30°C	230.28V
7	31.965A	6.954A	7.005A	2.205A	454.816	92.185%	1102	25.8	42.97°C	0.987
	12.066V	5.035V	3.299V	4.990V	493.375				51.52°C	230.29V
8	36.607A	7.951A	8.005A	2.408A	520.120	91.795%	1328	31.3	43.46°C	0.989
	12.066V	5.033V	3.298V	4.984V	566.613				52.59°C	230.30V
9	41.639A	8.449A	8.493A	2.409A	585.044	91.399%	1674	37.8	44.38°C	0.990
	12.069V	5.031V	3.296V	4.982V	640.098				53.83°C	230.31V
10	46.417A	8.948A	9.010A	3.021A	649.813	90.990%	1691	38.5	45.86°C	0.991
	12.067V	5.029V	3.296V	4.966V	714.156				56.18°C	230.30V
11	51.787A	8.952A	9.015A	3.022A	714.718	90.628%	1690	38.5	46.71°C	0.992
	12.069V	5.027V	3.294V	4.965V	788.629				57.48°C	230.33V
CL1	0.115A	14.002A	14.001A	0.000A	118.127	83.790%	948	20.9	41.95°C	0.926
	12.133V	5.042V	3.295V	5.059V	140.979				48.97°C	230.35V

CL2	54.182A	1.000A	0.998A	1.000A	667.525	91.576%	1686	38.1	45.72°C	0.991
	12.074V	5.029V	3.300V	5.009V	728.929				55.95°C	230.32V

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	1.233A	0.497A	0.498A	0.198A	19.984	77.704%	493	<6.0	0.848
	12.028V	5.044V	3.311V	5.041V	25.718				115.11V
2	2.464A	0.991A	0.999A	0.397A	39.973	83.031%	496	<6.0	0.945
	12.040V	5.044V	3.311V	5.037V	48.142				115.11V
3	3.696A	1.486A	1.494A	0.596A	60.003	83.948%	497	<6.0	0.972
	12.057V	5.044V	3.310V	5.032V	71.476				115.11V
4	4.901A	1.983A	1.994A	0.796A	79.953	85.451%	497	<6.0	0.981
	12.110V	5.043V	3.310V	5.027V	93.566				115.12V

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	1.233A	0.496A	0.500A	0.198A	19.986	78.444%	496	<6.0	0.452
	12.028V	5.044V	3.310V	5.041V	25.478				230.35V
2	2.466A	0.990A	0.995A	0.397A	39.976	84.022%	495	<6.0	0.671
	12.039V	5.045V	3.310V	5.037V	47.578				230.34V
3	3.699A	1.486A	1.494A	0.596A	60.006	84.837%	496	<6.0	0.794
	12.048V	5.044V	3.310V	5.032V	70.731				230.34V
4	4.905A	1.982A	1.995A	0.796A	79.956	86.438%	498	<6.0	0.861
	12.101V	5.044V	3.309V	5.028V	92.501				230.34V

The results above are not used in the certification process

Ripple Measurements

115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	5.80mV	4.00mV	4.50mV	6.20mV	Pass
20% Load	6.30mV	4.20mV	4.90mV	6.40mV	Pass
30% Load	9.40mV	4.40mV	6.20mV	7.00mV	Pass
40% Load	7.80mV	4.30mV	5.20mV	6.90mV	Pass
50% Load	7.30mV	4.90mV	5.50mV	7.40mV	Pass
60% Load	8.50mV	5.20mV	5.90mV	7.90mV	Pass
70% Load	9.10mV	8.10mV	12.10mV	10.70mV	Pass
80% Load	9.90mV	8.20mV	16.00mV	11.30mV	Pass
90% Load	10.90mV	7.20mV	11.90mV	9.70mV	Pass
100% Load	16.90mV	7.50mV	13.60mV	11.90mV	Pass
110% Load	18.50mV	7.60mV	14.20mV	12.60mV	Pass
Crossload1	7.10mV	5.20mV	12.50mV	7.50mV	Pass
Crossload2	16.40mV	6.70mV	8.10mV	11.30mV	Pass

The results above are not used in the certification process

230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.40mV	4.10mV	4.70mV	5.90mV	Pass
20% Load	6.30mV	4.40mV	5.10mV	6.10mV	Pass
30% Load	8.80mV	4.10mV	5.60mV	6.00mV	Pass
40% Load	8.70mV	4.50mV	5.40mV	7.30mV	Pass
50% Load	7.70mV	4.50mV	5.40mV	6.90mV	Pass
60% Load	9.00mV	5.70mV	6.40mV	8.20mV	Pass
70% Load	9.60mV	8.10mV	13.70mV	10.60mV	Pass
80% Load	9.70mV	8.30mV	17.90mV	10.50mV	Pass

Test	12V	5V	3.3V	5VSB	Pass/Fail
90% Load	10.70mV	7.10mV	12.10mV	9.30mV	Pass
100% Load	18.20mV	7.30mV	13.40mV	10.50mV	Pass
110% Load	19.80mV	7.70mV	13.90mV	11.20mV	Pass
Crossload1	7.90mV	5.20mV	12.60mV	7.40mV	Pass
Crossload2	17.50mV	6.50mV	8.10mV	9.90mV	Pass

The results above are not used in the certification process

be quiet! Pure Power 11 FM 650W

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