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be quiet! L10-CM-500

Lab ID#: 115
Receipt Date: -
Test Date: -

Report: 20PS115A
Report Date: May 27, 2000

DUT INFORMATION

Brand	be quiet!
Manufacturer (OEM)	FSP
Series	Pure Power 10
Model Number	L10-CM-500
Serial Number	277S7031000428
DUT Notes	

DUT SPECIFICATIONS

Rated Voltage (Vrms)	100-240
Rated Current (Arms)	8-5
Rated Frequency (Hz)	50-60
Rated Power (W)	500
Type	ATX12V
Cooling	120mm Rifle Bearing Fan (BQ QF1-12025-MS)
Semi-Passive Operation	✗
Cable Design	Semi Modular

POWER SPECIFICATIONS

Rail		3.3V	5V	12V1	12V2	5VSB	-12V
Max. Power	Amps	25	15	28	20	3	0.3
	Watts	120		480		15	3.6
Total Max. Power (W)		500					

CABLES AND CONNECTORS

Native Cables			
Description	Cable Count	Connector Count (Total)	Gauge
ATX connector 20+4 pin (560mm)	1	1	18-24AWG
4+4 pin EPS12V (610mm)	1	1	18AWG
Modular Cables			
6+2 pin PCIe (500mm)	2	2	18AWG
SATA (500mm+150mm+150mm)	1	3	18AWG
SATA (500mm) / 4 pin Molex (+150mm+150mm)	1	1 / 2	18AWG
SATA (500mm+150mm) / 4 pin Molex (+150mm) / FDD (+150mm)	1	2 / 1 / 1	18-22AWG

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General Data	
Manufacturer (OEM)	CWT
Platform Model	-
Primary Side	
Transient Filter	4x Y caps, 2x X caps, 2x CM chokes, 1x MOV
Inrush Protection	NTC Thermistor & Diode
Bridge Rectifier(s)	2x GBU1006 (600V, 10A @ 100°C)
APFC MOSFETS	2x Infineon IPW50R280CE (550V, 11.4A @ 100°C, 0.28Ohm)
APFC Boost Diode	1x Power Integrations QH08TZ600 (600V, 8A @ 150°C)
Hold-up Cap(s)	1x Nichicon (400V, 390uF, 2000h @ 105 °C, GG)
Main Switchers	2x Vishay SiHG20N50C (560V, 11A @ 100°C, 0.27Ohm)
Combo APFC/PWM Controller	Champion CM6800TX & CM03X Green PFC controller
Topology	Primary side: Half-Bridge & LLC Resonant Controller Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETS	4x APEC AP9990GH-HF (60V, 100A @ 25°C, 6mOhm)
5V & 3.3V	DC-DC Converters: 6x APEC AP72T03GP (30V, 47A @ 100°C, 9.5mOhm) PWM Controller: APW7159C
Filtering Capacitors	Electrolytics: Nippon Chemi-Con (1-5,000 @ 105°C, KZE), Su' scon (2-5,000h @ 105°C, MF), TAICON (105°C) Polymers: APAQ, EneSol
Supervisor IC	Weltrend WT7502 (OVP, UVP, SCP, PG)
Fan Model	Power Logic PLA13525S12M (12V, 0.40A, 111.1CFM, 41.6 dBA, Hydro Dynamic Bearing)
5VSB Circuit	
Rectifier	1x MBR2045CT SBR (45V, 20A) & CEF04N7G (700V, 4A, 3.3Ohm)
Standby PWM Controller	On-Bright OB5269CP
-12V Circuit	
Rectifier	UTC 2SB834L

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RESULTS	
Temperature Range (°C /°F)	30-32 / 86-89.6
Average Efficiency	87.174
Efficiency With 10W (≤500W) or 2% (>500W) Load -115V	0.000
Average Efficiency 5VSB	79.237
Standby Power Consumption (W) -115V	0.1006350
Standby Power Consumption (W) -230V	0.1611450
Average PF	0.993
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
Avg Noise Output	20.46
Efficiency Rating (ETA)	GOLD
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	Bruel & Kjaer 2250-L G4	
Microphone	Bruel & Kjaer Type 4189	
Data Loggers	Picoscope TC-08 x2, Labjack U3-HV x2	

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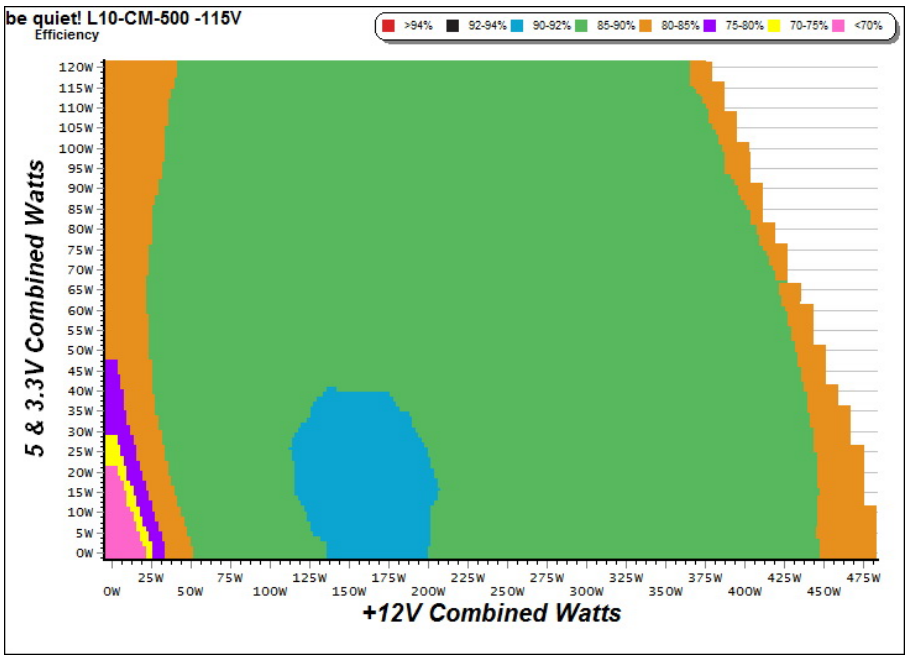
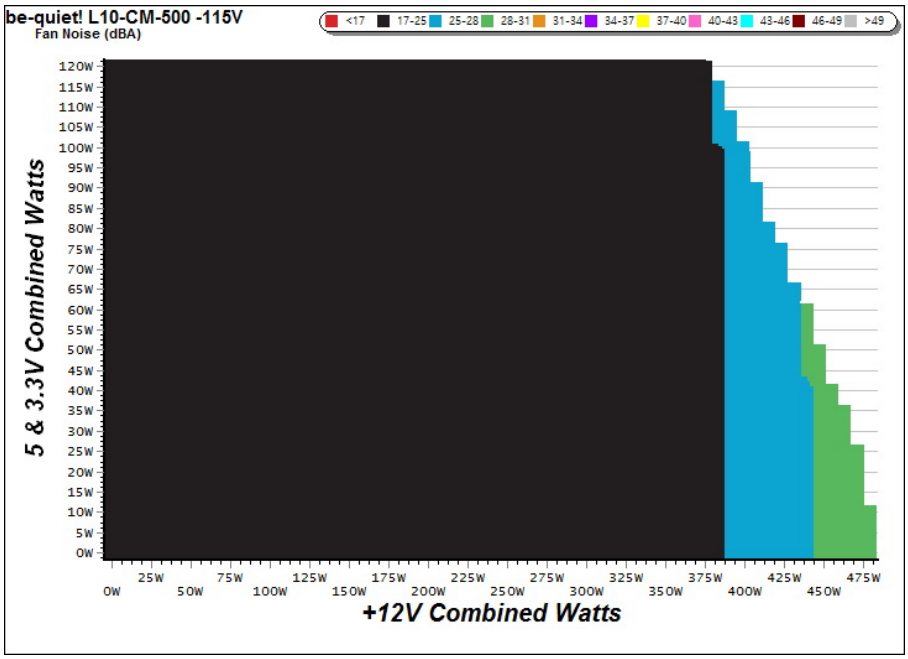
EFFICIENCY GRAPH



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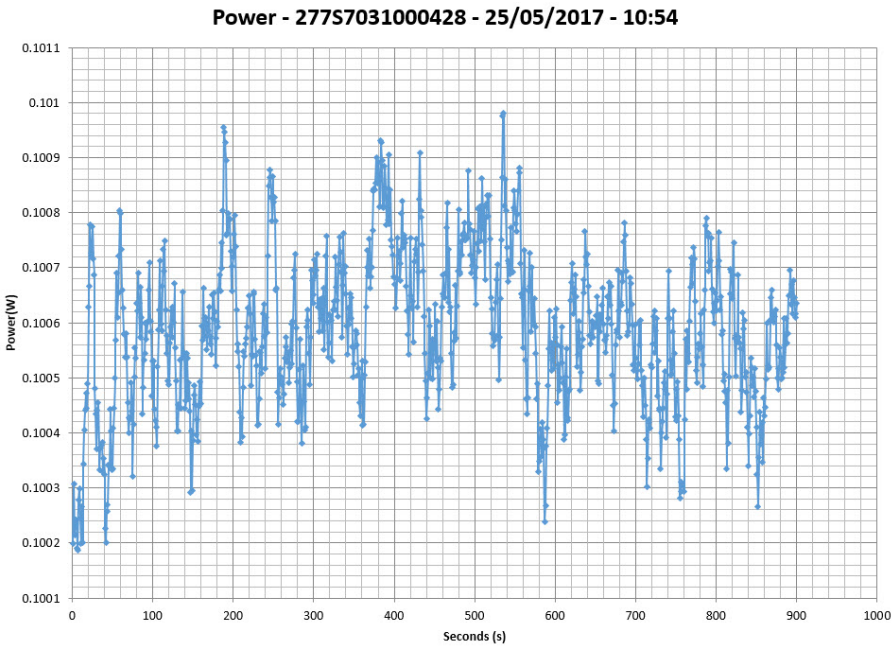
5VSB EFFICIENCY -115V (ERP LOT 3/6 & CEC)

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.041A	0.211	61.337%	0.065
	5.115V	0.344		115.14V
2	0.087A	0.444	71.961%	0.112
	5.115V	0.617		115.14V
3	0.542A	2.765	79.660%	0.329
	5.104V	3.471		115.13V
4	1.002A	5.103	80.782%	0.382
	5.095V	6.317		115.13V
5	1.502A	7.634	80.800%	0.410
	5.084V	9.448		115.13V
6	3.001A	15.161	79.141%	0.455
	5.052V	19.157		115.13V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.042A	0.213	49.766%	0.025
	5.116V	0.428		230.31V
2	0.087A	0.445	64.029%	0.040
	5.115V	0.695		230.31V
3	0.542A	2.767	78.452%	0.171
	5.105V	3.527		230.32V
4	1.002A	5.104	78.973%	0.250
	5.095V	6.463		230.32V
5	1.502A	7.634	79.537%	0.297
	5.084V	9.598		230.31V
6	3.001A	15.162	79.704%	0.359
	5.052V	19.023		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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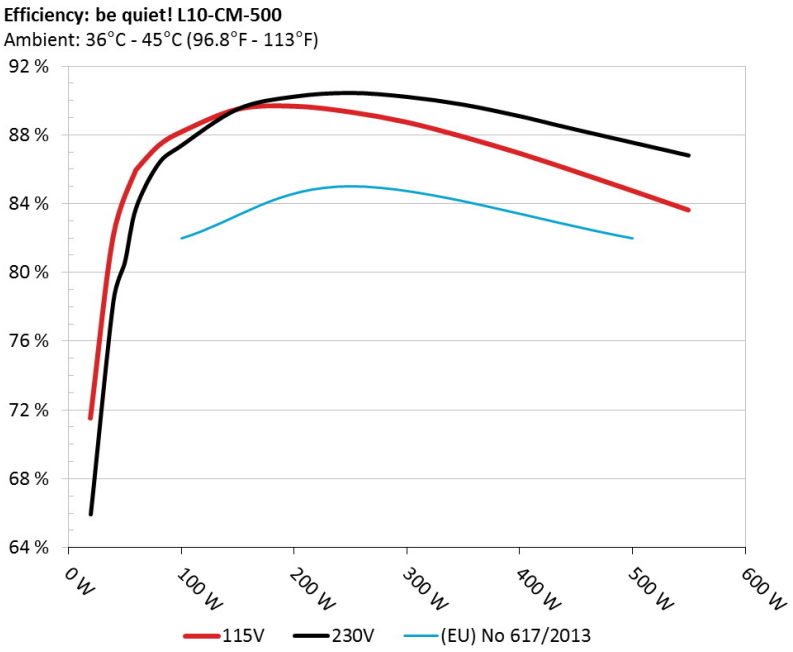
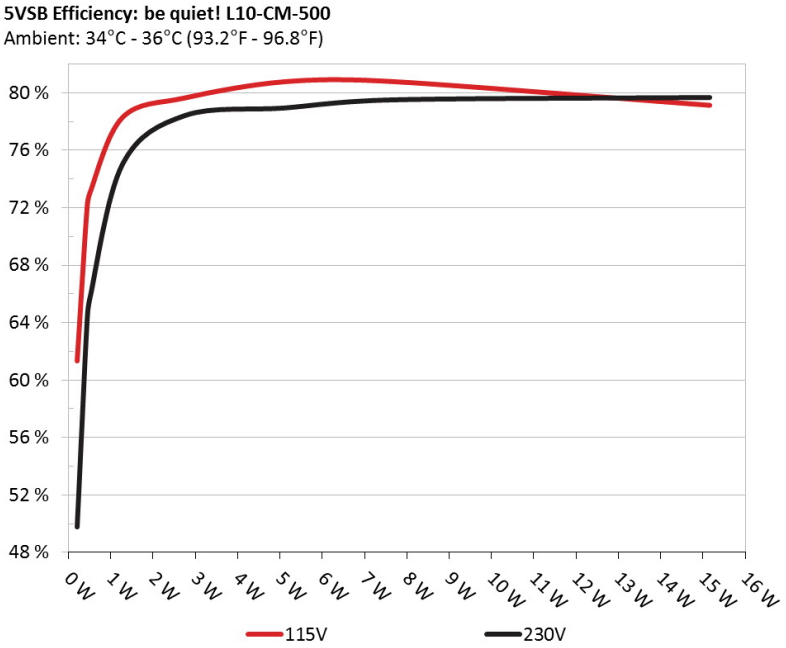
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE



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

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10-110% LOAD TESTS

Test #	12V	5V	3.3V	5VSB	DC/AC (Watts)	Efficiency	Fan Speed (RPM)	PSU Noise (dB[A])	Temps (In/Out)	PF/AC Volts
1	2.324A	1.978A	1.958A	0.981A	49.781	83.194%	568	17.4	38.03°C	0.966
	12.138V	5.051V	3.365V	5.089V	59.837				40.83°C	115.13V
2	5.683A	2.970A	2.943A	1.181A	99.764	88.156%	568	17.4	38.46°C	0.984
	12.126V	5.041V	3.358V	5.079V	113.168				41.58°C	115.12V
3	9.393A	3.476A	3.458A	1.379A	149.876	89.487%	568	17.4	38.50°C	0.990
	12.117V	5.033V	3.349V	5.066V	167.484				41.81°C	115.12V
4	13.098A	3.979A	3.945A	1.579A	199.758	89.663%	568	17.4	39.01°C	0.994
	12.109V	5.024V	3.341V	5.056V	222.788				42.67°C	115.12V
5	16.471A	4.980A	4.948A	1.783A	249.714	89.325%	568	17.4	39.96°C	0.997
	12.099V	5.013V	3.330V	5.042V	279.557				43.86°C	115.12V
6	19.852A	5.996A	5.957A	1.985A	299.734	88.735%	568	17.4	41.14°C	0.998
	12.089V	5.003V	3.317V	5.030V	337.787				45.53°C	115.12V
7	23.236A	7.010A	6.978A	2.190A	349.689	87.890%	765	17.7	41.64°C	0.998
	12.078V	4.991V	3.306V	5.018V	397.870				46.20°C	115.13V
8	26.630A	8.033A	8.004A	2.394A	399.674	86.930%	1040	20.2	42.65°C	0.998
	12.067V	4.978V	3.293V	5.006V	459.764				47.45°C	115.13V
9	30.452A	8.549A	8.539A	2.399A	449.672	85.864%	1235	24.3	43.02°C	0.999
	12.057V	4.969V	3.284V	4.998V	523.704				48.96°C	115.13V
10	34.028A	9.072A	9.059A	3.009A	499.521	84.760%	1280	24.7	44.13°C	0.999
	12.046V	4.959V	3.273V	4.979V	589.334				51.11°C	115.13V
11	38.198A	9.083A	9.075A	3.015A	549.423	83.635%	1300	25.0	44.70°C	0.999
	12.037V	4.953V	3.267V	4.974V	656.929				51.92°C	115.13V
CL1	0.102A	14.025A	14.004A	0.005A	117.794	81.997%	855	18.2	42.54°C	0.988
	12.111V	4.998V	3.316V	5.074V	143.657				45.64°C	115.13V
CL2	39.958A	1.003A	1.004A	1.001A	495.376	84.749%	1085	21.4	42.85°C	0.999
	12.063V	4.987V	3.300V	5.042V	584.522				47.20°C	115.13V

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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	1.200A	0.491A	0.472A	0.196A	19.651	71.544%	590	17.4	0.914
	12.146V	5.058V	3.370V	5.110V	27.467				115.12V
2	2.427A	0.980A	0.980A	0.391A	39.713	82.052%	590	17.4	0.951
	12.141V	5.054V	3.367V	5.102V	48.400				115.12V
3	3.660A	1.477A	1.484A	0.587A	59.858	85.953%	568	17.4	0.971
	12.136V	5.050V	3.363V	5.095V	69.640				115.12V
4	4.880A	1.983A	1.958A	0.785A	79.792	87.358%	568	17.4	0.977
	12.131V	5.048V	3.364V	5.089V	91.339				115.12V

RIPPLE MEASUREMENTS

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	8.2 mV	11.5 mV	11.4 mV	11.9 mV	Pass
20% Load	13.5 mV	16.2 mV	17.6 mV	15.7 mV	Pass
30% Load	14.0 mV	15.4 mV	18.0 mV	14.4 mV	Pass
40% Load	15.2 mV	16.7 mV	21.8 mV	15.4 mV	Pass
50% Load	16.3 mV	18.7 mV	23.4 mV	16.8 mV	Pass
60% Load	18.6 mV	19.1 mV	24.7 mV	18.0 mV	Pass
70% Load	21.2 mV	18.5 mV	27.0 mV	19.2 mV	Pass
80% Load	24.2 mV	20.0 mV	30.2 mV	22.1 mV	Pass
90% Load	28.2 mV	22.5 mV	32.4 mV	22.4 mV	Pass
100% Load	33.2 mV	24.2 mV	36.4 mV	25.9 mV	Pass
110% Load	39.9 mV	24.7 mV	38.4 mV	26.5 mV	Pass
Crossload 1	19.0 mV	18.3 mV	21.3 mV	16.7 mV	Pass
Crossload 2	30.0 mV	23.2 mV	37.2 mV	23.7 mV	Pass

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HOLD-UP TIME & POWER OK SIGNAL (230V)	
Hold-Up Time (ms)	22.74
AC Loss to PWR_OK Hold Up Time (ms)	24.60
PWR_OK Inactive to DC Loss Delay (ms)	-1.86

Top side

Power specifications label

CERTIFICATIONS