EFFICIENCY AND NOISE LEVEL CERTIFICATIONS

Anex

Deepcool PN850D

Lab ID#: DC85002335
Receipt Date: Jan 11, 2024
Test Date: Jan 24, 2024

Report: 24PS2335A
Report Date: Jan 29, 2024

DUT INFORMATION

Brand	Deepcool
Manufacturer (OEM)	CWT
Series	PN-D
Model Number	PN850D-FC
Serial Number	
DUT Notes	CWT GPW platform

DUT SPECIFICATIONS

Rated Voltage (Vrms)	100-240
Rated Current (Arms)	10-5
Rated Frequency (Hz)	50-60
Rated Power (W)	850
Type	ATX12V
Cooling	120mm Rifle Bearing Fan (DF1202512SEHN)
Semi-Passive Operation	✗
Cable Design	Fixed cables

TEST EQUIPMENT

Electronic Loads	Chroma 63601-5 x2 Chroma 63600-2 63640-80-80 x10 63610-80-20
AC Sources	Chroma 6530, APM SP300VAC4000W-P
Power Analyzers	RS HMC8015, N4L PPA1530, N4L PPA5530
Oscilloscopes	Picoscope 4444, Rigol DS7014, 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, Keithley 2015 - THD
UPS	FSP Champ Tower 3kVA, CyberPower OLS3000E 3kVA
Isolation Transformer	4kVA

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RESULTS

Temperature Range (°C /°F)	30-32 / 86-89.6
ErP Lot 3/6 Ready	✓
(EU) No 617/2013 Compliance	✓
ALPM (Alternative Low Power Mode) compatible	✓
ATX v3.1 PSU Power Excursion	✓

115V

Average Efficiency	88.937%
Efficiency With 10W (≤500W) or 2% (>500W)	68.146
Average Efficiency 5VSB	78.618%
Standby Power Consumption (W)	0.0449000
Average PF	0.979
Avg Noise Output	33.51 dB(A)
Efficiency Rating (ETA)	GOLD
Noise Rating (LAMBDA)	Standard++

230V

Average Efficiency	91.056%
Average Efficiency 5VSB	78.247%
Standby Power Consumption (W)	0.1207000
Average PF	0.937
Avg Noise Output	33.42 dB(A)
Efficiency Rating (ETA)	PLATINUM
Noise Rating (LAMBDA)	Standard++

POWER SPECIFICATIONS

Rail		3.3V	5V	12V	5VSB	-12V
Max. Power	Amps	20	20	70.5	3	0.3
	Watts	110		846	15	3.6
Total Max. Power (W)		850				

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

Hold-Up Time (ms)	18
AC Loss to PWR_OK Hold Up Time (ms)	16.8
PWR_OK Inactive to DC Loss Delay (ms)	1.2

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CABLES AND CONNECTORS

Captive Cables

Description	Cable Count	Connector Count (Total)	Gauge	In Cable Capacitors
ATX connector 20+4 pin (540mm)	1	1	18-20AWG	No
4+4 pin EPS12V (740mm)	2	2	18AWG	No
6+2 pin PCIe (580mm)	3	3	18AWG	No
12+4 pin PCIe (630mm) (600W)	1	1	16-24AWG	No
SATA (450mm+120mm+120mm+120mm) / 4-pin Molex (+120mm)	2	8 / 2	18AWG	No

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Deepcool PN850D

General Data	
Manufacturer (OEM)	CWT
Platform Model	GPW
PCB Type	Single-Sided
Primary Side	
Transient Filter	2x Y caps, 1x X caps, 2x CM chokes, 1x MOV , 1x CAP200DG (Discharge IC)
Inrush Protection	1x NTC Thermistor SCK-056 (5 Ohm @25°C) & Relay
Bridge Rectifier(s)	1x GBU1506
APFC MOSFETs	2x Great Power GP28S50 (500V, 28A, Rds(on): 0.125Ohm) & 1x SPN5003 FET (for reduced no-load consumption)
APFC Boost Diode	1x CRXI06D065G2
Bulk Cap(s)	1x Chengx (400V, 680uF , 2000h @ 85°C, AP)
Main Switchers	4x Silan Microelectronics SVF20N50F (500V, 12.6A @ 100°C, Rds(on): 0.27Ohm)
APFC Controller	Champion 6500UNX
Resonant Controller	Champion CM6901X
Topology	Primary side: APFC, Full-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters
Secondary Side	
+12V MOSFETs	6x Infineon BSC014N04LS (40V, 100A @ 100°C, Rds(on): 1.4mOhm)
5V & 3.3V	DC-DC Converters: 4x SPN3006 (30V, 57A @ 100°C, Rds(on): 5.5mOhm) PWM Controller(s): ANPEC APW7159C
Filtering Capacitors	Electrolytic: 11x Chengx (2,000 @ 105°C, GR), Polymer: 9x CapXon , 3x Elite ,3x Chengx , 2x
Supervisor IC	IN1S4291-DCG
Fan Model	MARTECH DF1202512SEHN (120mm, 12V, 0.42A, Rifle Bearing Fan)
5VSB Circuit	
Standby PWM Controller	Power Integrations TNY2907PG

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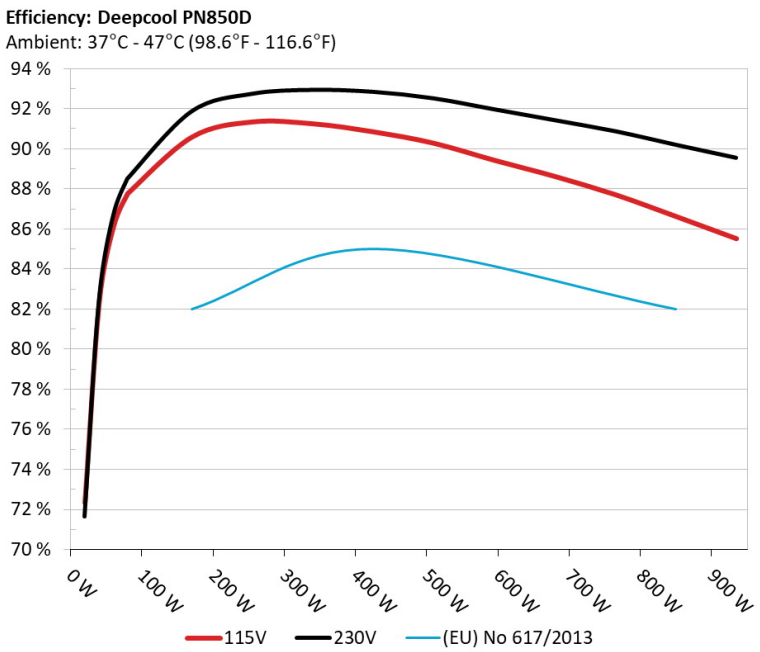
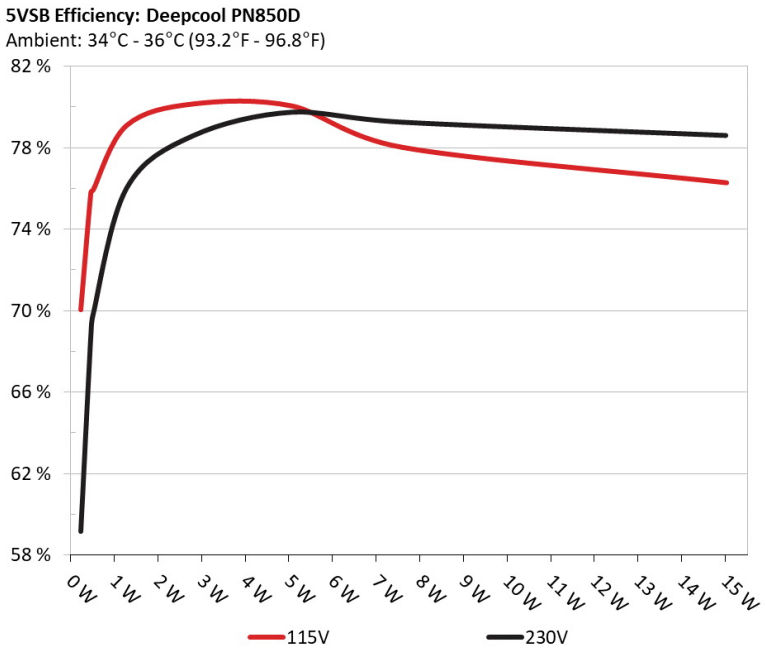
EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE



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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.23W	69.549%	0.033
	5.109V	0.331W		115.14V
2	0.09A	0.46W	75.294%	0.06
	5.107V	0.613W		115.15V
3	0.55A	2.801W	79.634%	0.267
	5.092V	3.517W		115.15V
4	1A	5.077W	79.53%	0.364
	5.076V	6.384W		115.15V
5	1.5A	7.59W	77.509%	0.415
	5.059V	9.793W		115.15V
6	3A	15.019W	75.771%	0.48
	5.006V	19.822W		115.14V

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

Test #	5VSB	DC/AC (Watts)	Efficiency	PF/AC Volts
1	0.045A	0.23W	58.667%	0.012
	5.108V	0.392W		230.38V
2	0.09A	0.46W	68.299%	0.02
	5.107V	0.674W		230.38V
3	0.55A	2.801W	78.073%	0.102
	5.091V	3.588W		230.39V
4	1A	5.076W	79.231%	0.169
	5.075V	6.405W		230.39V
5	1.5A	7.591W	78.739%	0.23
	5.06V	9.64W		230.38V
6	3A	15.013W	78.086%	0.332
	5.004V	19.227W		230.38V

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115V

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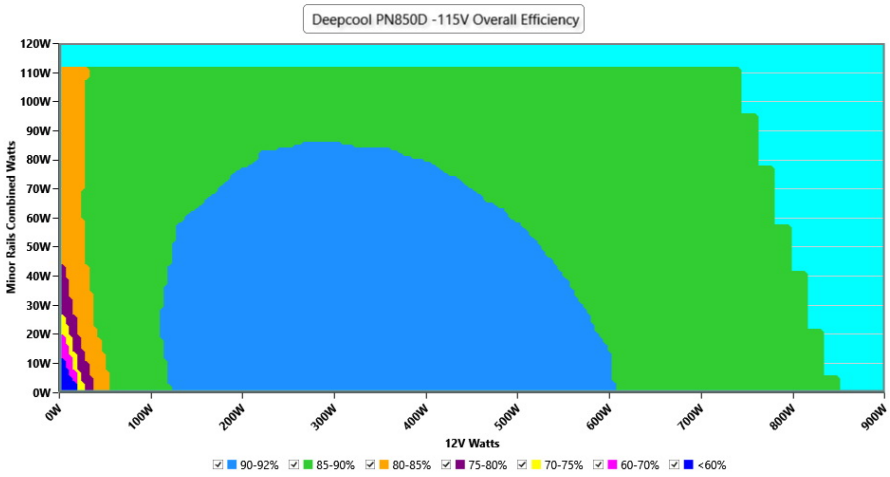
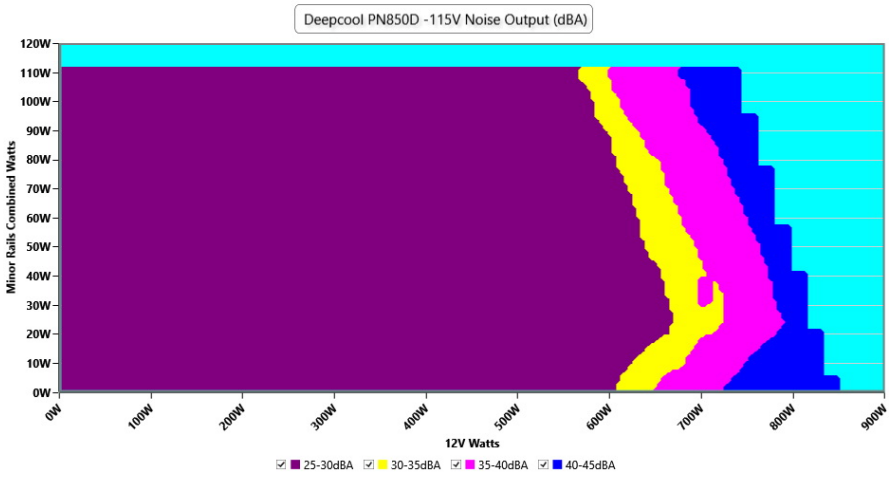
EFFICIENCY GRAPH 115V



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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VAMPIRE POWER -115V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	115.13 V	115.11 V	113.85 V	115.15 V	116.15 V	PASS
Mains Frequency:	60.00 Hz	59.91 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:	0.045 W	0.013 W	N/A	0.060 W	N/A	N/A
Apparent Power:	9.977 W	9.972 W	N/A	9.981 W	N/A	N/A
Power Factor:	0.006	N/A	N/A	N/A	N/A	N/A

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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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
10%	5.256A	1.98A	1.966A	0.988A	85.006	87.774%	1082	26.1	40.1°C	0.957
	12.064V	5.052V	3.357V	5.061V	96.85				44.35°C	115.15V
20%	11.535A	2.972A	2.952A	1.19A	169.975	90.592%	1090	26.5	40.59°C	0.978
	12.056V	5.049V	3.354V	5.044V	187.63				45.11°C	115.12V
30%	18.168A	3.467A	3.445A	1.394A	255.01	91.355%	1100	26.7	41.1°C	0.981
	12.051V	5.05V	3.353V	5.021V	279.144				46.21°C	115.1V
40%	24.813A	3.965A	3.942A	1.599A	340.08	91.261%	1098	26.6	41.75°C	0.981
	12.045V	5.045V	3.349V	5.004V	372.646				47.28°C	115.07V
50%	31.113A	4.959A	4.932A	1.806A	425.046	90.859%	1101	26.7	42.27°C	0.98
	12.038V	5.042V	3.346V	4.984V	467.802				48.33°C	115.05V
60%	37.382A	5.953A	5.922A	2.001A	509.493	90.291%	1105	26.7	42.77°C	0.981
	12.031V	5.041V	3.344V	4.963V	564.278				49.32°C	115.02V
70%	43.727A	6.948A	6.914A	2.227A	594.91	89.436%	1522	36.5	43.17°C	0.983
	12.024V	5.039V	3.342V	4.94V	665.176				50.24°C	114.99V
80%	50.081A	7.946A	7.91A	2.336A	679.696	88.63%	1904	42.5	43.63°C	0.985
	12.017V	5.034V	3.337V	4.924V	766.894				51.7°C	114.96V
90%	56.836A	8.446A	8.395A	2.446A	765.146	87.712%	2237	46.0	44.5°C	0.986
	12.011V	5.032V	3.335V	4.907V	872.345				53.71°C	114.93V
100%	63.332A	8.944A	8.911A	3.083A	849.978	86.628%	2239	46.0	45.82°C	0.987
	12.005V	5.031V	3.333V	4.867V	981.175				55.84°C	114.9V
110%	69.707A	9.943A	9.999A	3.093A	934.57	85.522%	2239	46.0	46.79°C	0.988
	11.997V	5.029V	3.33V	4.85V	1092.785				57.72°C	114.88V
CL1	0.116A	13.142A	13.034A	0A	111.299	83.857%	1113	26.7	41.02°C	0.974
	12.055V	5.037V	3.352V	5.075V	132.728				46.45°C	115.14V
CL2	0.116A	19.877A	0.001A	0.001A	101.4	82.114%	1114	26.7	40.45°C	0.974
	12.060V	5.031V	3.365V	5.086V	123.487				47.46°C	115.14V
CL3	0.116A	0A	19.693A	0A	67.396	76.587%	1095	26.6	40.01°C	0.958
	12.057V	5.066V	3.351V	5.083V	88.019				49.11°C	115.15V
CL4	70.735A	0.001A	0A	0A	849.683	87.617%	2243	46.1	45.12°C	0.988
	12.013V	5.054V	3.344V	4.998V	969.78				56.09°C	114.91V

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Deepcool PN850D

20-80W 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	1.232A	0.495A	0.491A	0.196A	20.011	72.322%	1069	25.8	36.56°C	0.813
	12.055V	5.054V	3.359V	5.099V	27.668				39.64°C	115.17V
40W	2.712A	0.693A	0.688A	0.295A	40.007	82.318%	1073	26	37.24°C	0.914
	12.054V	5.054V	3.358V	5.093V	48.599				40.57°C	115.17V
60W	4.192A	0.891A	0.885A	0.393A	60.004	86.112%	1075	26	38.08°C	0.943
	12.055V	5.054V	3.358V	5.087V	69.681				41.89°C	115.16V
80W	5.664A	1.089A	1.081A	0.492A	79.973	87.898%	1080	26.1	39.59°C	0.957
	12.064V	5.054V	3.357V	5.08V	90.984				43.54°C	115.15V

RIPPLE MEASUREMENTS 115V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	24.29mV	10.66mV	9.77mV	10.24mV	Pass
20% Load	24.34mV	11.94mV	11.44mV	10.85mV	Pass
30% Load	25.85mV	13.01mV	14.60mV	13.04mV	Pass
40% Load	24.83mV	13.82mV	13.83mV	15.08mV	Pass
50% Load	25.64mV	16.02mV	14.50mV	18.44mV	Pass
60% Load	26.61mV	17.19mV	13.83mV	19.97mV	Pass
70% Load	29.92mV	24.74mV	15.00mV	23.74mV	Pass
80% Load	33.02mV	27.34mV	20.80mV	25.53mV	Pass
90% Load	34.60mV	29.94mV	26.24mV	22.32mV	Pass
100% Load	48.23mV	26.59mV	30.48mV	24.62mV	Pass
110% Load	52.05mV	34.91mV	32.93mV	29.92mV	Pass
Crossload1	50.94mV	26.35mV	21.44mV	12.62mV	Pass
Crossload2	35.06mV	29.43mV	16.73mV	14.67mV	Pass
Crossload3	33.28mV	18.16mV	25.03mV	8.20mV	Pass
Crossload4	40.06mV	20.99mV	25.13mV	14.19mV	Pass

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230V

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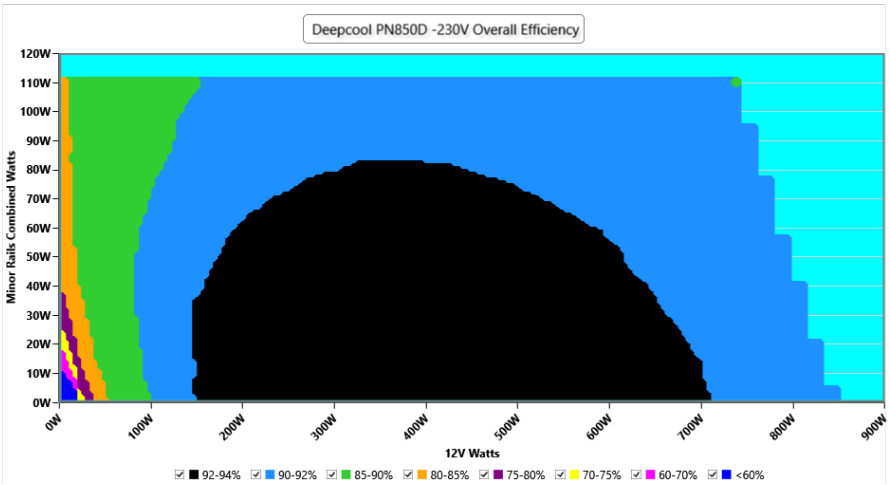
EFFICIENCY GRAPH 230V



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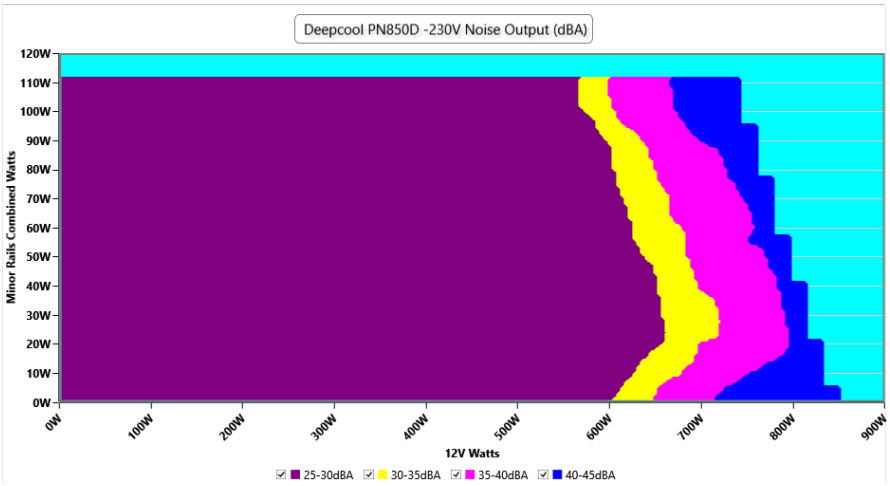
NOISE GRAPH 230V



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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

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VAMPIRE POWER -230V

Detailed Results

	Average	Min	Limit Min	Max	Limit Max	Result
Mains Voltage RMS:	230.35 V	230.31 V	227.70 V	230.35 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	1.415	1.490	PASS
Mains Voltage THD:	0.14 %	0.13 %	N/A	0.15 %	2.00 %	PASS
Real Power:	0.121 W	0.104 W	N/A	0.147 W	N/A	N/A
Apparent Power:	33.379 W	33.367 W	N/A	33.390 W	N/A	N/A
Power Factor:	0.004	N/A	N/A	N/A	N/A	N/A

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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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
10%	5.254A	1.979A	1.965A	0.988A	85	88.514%	1096	26.6	40.42°C	0.808
	12.066V	5.055V	3.358V	5.06V	96.03				44.68°C	230.37V
20%	11.531A	2.97A	2.951A	1.19A	169.958	91.869%	1098	26.6	40.8°C	0.905
	12.059V	5.051V	3.355V	5.043V	184.996				45.33°C	230.36V
30%	18.162A	3.467A	3.446A	1.394A	254.967	92.754%	1096	26.6	41.29°C	0.934
	12.053V	5.049V	3.352V	5.024V	274.882				46.36°C	230.36V
40%	24.808A	3.964A	3.941A	1.599A	340.057	92.949%	1102	26.7	41.7°C	0.949
	12.046V	5.047V	3.35V	5.004V	365.856				47.24°C	230.35V
50%	31.106A	4.957A	4.93A	1.806A	425.02	92.854%	1106	26.7	42.15°C	0.957
	12.039V	5.045V	3.347V	4.983V	457.709				48.23°C	230.34V
60%	37.375A	5.951A	5.92A	2.001A	509.484	92.529%	1110	26.7	42.67°C	0.961
	12.033V	5.043V	3.345V	4.963V	550.622				49.26°C	230.33V
70%	43.722A	6.947A	6.913A	2.227A	594.889	91.979%	1612	37.6	43.29°C	0.964
	12.025V	5.04V	3.342V	4.941V	646.772				50.38°C	230.32V
80%	50.074A	7.944A	7.908A	2.336A	679.725	91.439%	1990	43.8	43.78°C	0.966
	12.018V	5.035V	3.338V	4.924V	743.367				51.79°C	230.31V
90%	56.831A	8.445A	8.394A	2.446A	765.163	90.884%	2241	46.1	44.89°C	0.968
	12.012V	5.033V	3.335V	4.906V	841.913				53.91°C	230.3V
100%	63.328A	8.943A	8.909A	3.083A	849.991	90.207%	2240	46.0	45.69°C	0.97
	12.005V	5.032V	3.333V	4.866V	942.271				55.73°C	230.29V
110%	69.701A	9.943A	9.998A	3.093A	934.572	89.56%	2242	46.1	46.87°C	0.972
	11.998V	5.029V	3.33V	4.851V	1043.511				57.78°C	230.28V
CL1	0.116A	13.139A	13.031A	0A	111.299	84.755%	1115	26.7	40.76°C	0.866
	12.056V	5.038V	3.353V	5.076V	131.315				46.21°C	230.39V
CL2	0.116A	19.871A	0.001A	0.001A	101.402	82.863%	1117	26.8	40.19°C	0.854
	12.061V	5.032V	3.365V	5.087V	122.358				47.22°C	230.38V
CL3	0.116A	0A	19.698A	0A	67.397	77.388%	1101	26.7	40.39°C	0.785
	12.056V	5.068V	3.35V	5.083V	87.09				49.45°C	230.39V
CL4	70.740A	0.001A	0A	0A	849.724	91.17%	2244	46.1	45.32°C	0.971
	12.012V	5.052V	3.343V	4.997V	932.017				56.3°C	230.3V

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Anex

Deepcool PN850D

20-80W 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
20W	1.232A	0.495A	0.491A	0.196A	20.003	71.648%	1083	26.1	36.88°C	0.461
	12.057V	5.056V	3.36V	5.099V	27.918				39.93°C	230.41V
40W	2.712A	0.692A	0.688A	0.295A	40.001	82.375%	1083	26.1	37.18°C	0.628
	12.056V	5.055V	3.359V	5.093V	48.562				40.55°C	230.41V
60W	4.191A	0.89A	0.884A	0.393A	60	86.656%	1086	26.2	38.55°C	0.734
	12.056V	5.055V	3.358V	5.087V	69.241				42.11°C	230.4V
80W	5.664A	1.088A	1.081A	0.492A	79.964	88.687%	1087	26.2	39.03°C	0.794
	12.064V	5.054V	3.358V	5.08V	90.166				42.89°C	230.4V

RIPPLE MEASUREMENTS 230V

Test	12V	5V	3.3V	5VSB	Pass/Fail
10% Load	27.85mV	11.02mV	10.07mV	11.46mV	Pass
20% Load	25.10mV	11.89mV	11.19mV	10.90mV	Pass
30% Load	25.34mV	13.98mV	16.48mV	14.72mV	Pass
40% Load	24.68mV	14.23mV	14.04mV	15.34mV	Pass
50% Load	23.61mV	14.64mV	13.48mV	15.28mV	Pass
60% Load	26.26mV	17.29mV	14.04mV	21.09mV	Pass
70% Load	29.56mV	25.35mV	15.77mV	25.98mV	Pass
80% Load	31.80mV	28.36mV	20.91mV	25.68mV	Pass
90% Load	33.43mV	28.77mV	25.99mV	24.71mV	Pass
100% Load	48.31mV	33.40mV	31.10mV	28.18mV	Pass
110% Load	51.36mV	28.40mV	33.63mV	28.30mV	Pass
Crossload1	50.67mV	26.00mV	21.69mV	12.70mV	Pass
Crossload2	29.61mV	28.92mV	16.07mV	13.91mV	Pass
Crossload3	38.32mV	19.89mV	28.38mV	9.42mV	Pass
Crossload4	40.18mV	20.60mV	24.64mV	13.91mV	Pass

Anex

Deepcool PN850D

Top side

Power specifications label

CERTIFICATIONS 115V

CERTIFICATIONS 230V

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