

Anex

Fractal Design ION SFX G 650

Lab ID#: FD19650128
 Receipt Date: Oct 10, 2019
 Test Date: Oct 15, 2019

Report: 19PS872A

Report Date: Oct 18, 2019

DUT INFORMATION

| | |
|--------------------|-------------------|
| Brand | Fractal Design |
| Manufacturer (OEM) | Seasonic |
| Series | ION SFX G |
| Model Number | ION 650G-BK |
| Serial Number | 1932FD20230100021 |
| DUT Notes | |

DUT SPECIFICATIONS

| | |
|------------------------|--|
| Rated Voltage (Vrms) | 100-240 |
| Rated Current (Arms) | 8-4 |
| Rated Frequency (Hz) | 50-60 |
| Rated Power (W) | 650 |
| Type | SFX-L |
| Cooling | 120mm Fluid Dynamic Bearing Fan (S1201512HB) |
| Semi-Passive Operation | ✓ |
| Cable Design | Fully Modular |

TEST EQUIPMENT

| | |
|--------------------|---|
| Electronic Loads | Chroma 63601-5 x4 Chroma 63600-2 x2 63640-80-80 x20 63610-80-20 x2 |
| AC Sources | Chroma 6530, Keysight AC6804B |
| Power Analyzers | N4L PPA1530 x2 |
| Sound Analyzer | Bruel & Kjaer 2270 G4 |
| Microphone | Bruel & Kjaer Type 4955-A |
| Data Loggers | Picoscope TC-08 x2, Labjack U3-HV x2 |
| Tachometer | UNI-T UT372 x2 |
| Digital Multimeter | Keysight U1273AX, Fluke 289, Keithley 2015 - THD |
| UPS | CyberPower OLS3000E 3kVA x2 |
| Transformer | 3kVA x2 |

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Anex

Fractal Design ION SFX G 650

RESULTS

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

115V

| | |
|---|-------------|
| Average Efficiency | 88.336% |
| Efficiency With 10W (≤500W) or 2% (>500W) | 65.617 |
| Average Efficiency 5VSB | 76.832% |
| Standby Power Consumption (W) | 0.0451001 |
| Average PF | 0.971 |
| Avg Noise Output | 36.77 dB(A) |
| Efficiency Rating (ETA) | GOLD |
| Noise Rating (LAMBDA) | Standard+ |

230V

| | |
|-------------------------------|-------------|
| Average Efficiency | 90.561% |
| Average Efficiency 5VSB | 76.696% |
| Standby Power Consumption (W) | 0.0691234 |
| Average PF | 0.929 |
| Avg Noise Output | 36.23 dB(A) |
| Efficiency Rating (ETA) | GOLD |
| Noise Rating (LAMBDA) | Standard+ |

POWER SPECIFICATIONS

| Rail | | 3.3V | 5V | 12V | 5VSB | -12V |
|----------------------|-------|------|----|-----|------|------|
| Max. Power | Amps | 20 | 20 | 54 | 3 | 0.3 |
| | Watts | 100 | | 648 | 15 | 3.6 |
| Total Max. Power (W) | | 650 | | | | |

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

| | |
|---------------------------------------|------|
| Hold-Up Time (ms) | 21.6 |
| AC Loss to PWR_OK Hold Up Time (ms) | 17.6 |
| PWR_OK Inactive to DC Loss Delay (ms) | 4 |

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CABLES AND CONNECTORS

Modular Cables

| Description | Cable Count | Connector Count (Total) | Gauge | In Cable Capacitors |
|--------------------------------------|-------------|-------------------------|----------|---------------------|
| ATX connector 20+4 pin (350mm) | 1 | 1 | 18-22AWG | No |
| 4+4 pin EPS12V (400mm) | 1 | 1 | 18AWG | No |
| 6+2 pin PCIe (400mm+100mm) | 2 | 4 | 18AWG | No |
| SATA (310mm+200mm+200mm+100mm) | 2 | 8 | 18AWG | No |
| 4-pin Molex (310mm+200mm) | 1 | 2 | 18AWG | No |
| AC Power Cord (1380mm) - C13 coupler | 1 | 1 | 18AWG | - |

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Fractal Design ION SFX G 650

| General Data | |
|------------------------|---|
| Manufacturer (OEM) | Seasonic |
| PCB Type | Double Sided |
| Primary Side | |
| Transient Filter | 4x Y caps, 2x X caps, 2x CM chokes, 1x MOV |
| Inrush Protection | NTC Thermistor & Relay |
| Bridge Rectifier(s) | 1x |
| APFC MOSFETS | 2x Champion GPT18N50D (500V, 18A, 0.270hm) |
| APFC Boost Diode | 1x STTH8S06 (600V, 8A) |
| Hold-up Cap(s) | 1x Nichicon (400V, 470uF, 2,000h @ 105°C, GG) |
| Main Switchers | 2x Infineon IPP50R190CE (550V, 15.7A @ 100°C, 0.190hm) |
| APFC Controller | Champion CM6500UNX |
| Resonant Controllers | Champion CM6901T6 |
| Topology | Primary side: Half-Bridge & LLC converter Secondary side: Synchronous Rectification & DC-DC converters |
| Secondary Side | |
| +12V MOSFETS | 4x Nexperia PSMN1R8-40YLC (40V, 100A @ 100°C, 3.25mOhm @ 150°C) |
| 5V & 3.3V | 2x DC-DC Converters |
| Filtering Capacitors | Electrolytics: 9x Nippon Chemi-Con (4-10,000h @ 105°C, KY), 3x Nippon Chemi-Con (105°C, W), 1x Nichicon (4-10,000h @ 105°C, HE) Polymers: 4x United Chemi-Con, 20x FPCAP |
| Supervisor IC | Weltrend WT7527V (OCP, OVP, UVP, SCP, PG) |
| Fan Model | Globe Fan S1201512HB (120mm, 12V, 0.45A, Fluid Dynamic Bearing Fan) |
| 5VSB Circuit | |
| Rectifier | 1x MCC MPR1045ULPS SBR (45V, 10A @ 90°C) |
| Standby PWM Controller | Excelliance MOS Corp EM8569 |

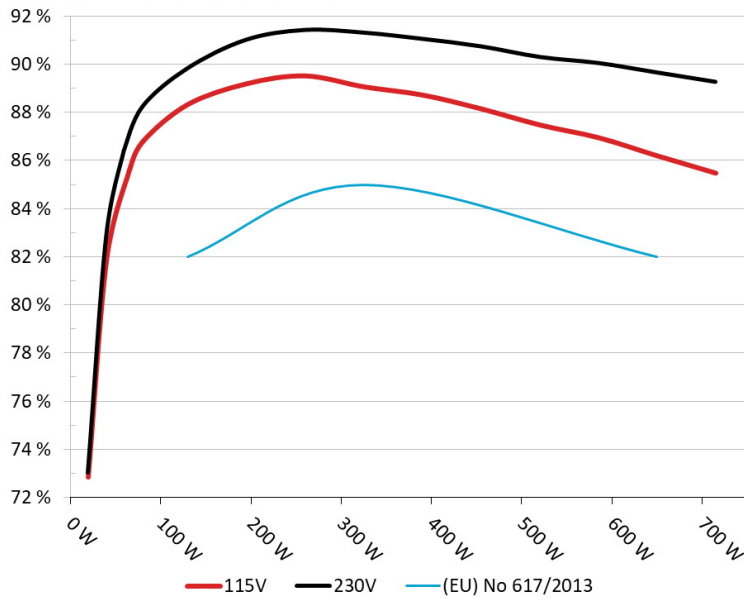
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EFFICIENCY UNDER HIGH AMBIENT TEMPERATURE

Efficiency: Fractal Design ION 650G-BK
Ambient: 37°C - 47°C (98.6°F - 116.6°F)

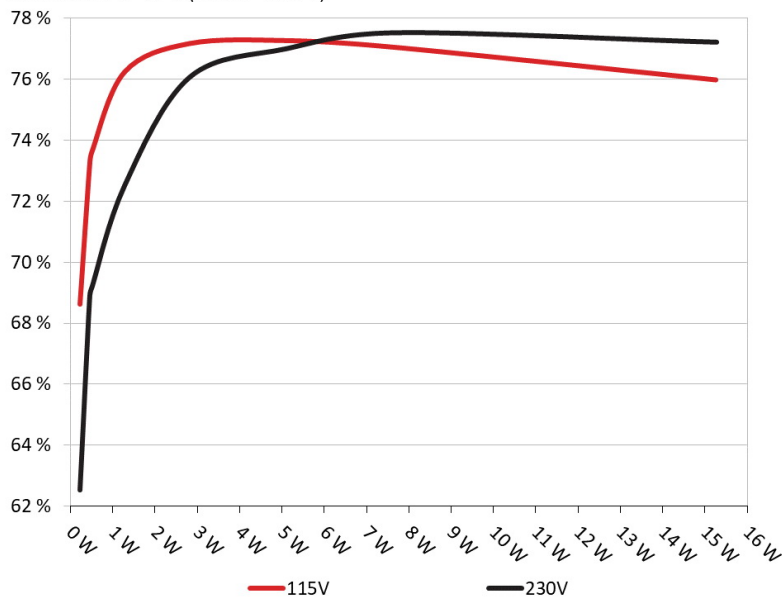


INFO

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

5VSB Efficiency: Fractal Design ION 650G-BK
Ambient: 34°C - 36°C (93.2°F - 96.8°F)



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 | 0.232 | 68.639% | 0.056 |
| | 5.137V | 0.338 | | 115.12V |
| 2 | 0.090A | 0.463 | 73.259% | 0.101 |
| | 5.136V | 0.632 | | 115.12V |
| 3 | 0.550A | 2.821 | 77.182% | 0.338 |
| | 5.128V | 3.655 | | 115.12V |
| 4 | 1.000A | 5.122 | 77.278% | 0.407 |
| | 5.122V | 6.628 | | 115.12V |
| 5 | 1.500A | 7.672 | 77.059% | 0.442 |
| | 5.114V | 9.956 | | 115.12V |
| 6 | 3.000A | 15.265 | 75.991% | 0.487 |
| | 5.088V | 20.088 | | 115.12V |

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

| Test # | 5VSB | DC/AC (Watts) | Efficiency | PF/AC Volts |
|--------|--------|---------------|------------|-------------|
| 1 | 0.045A | 0.232 | 62.534% | 0.019 |
| | 5.137V | 0.371 | | 230.24V |
| 2 | 0.090A | 0.463 | 68.899% | 0.034 |
| | 5.136V | 0.672 | | 230.24V |
| 3 | 0.550A | 2.821 | 76.058% | 0.163 |
| | 5.128V | 3.709 | | 230.24V |
| 4 | 1.000A | 5.122 | 76.999% | 0.244 |
| | 5.121V | 6.652 | | 230.25V |
| 5 | 1.500A | 7.672 | 77.518% | 0.299 |
| | 5.114V | 9.897 | | 230.25V |
| 6 | 3.000A | 15.275 | 77.209% | 0.376 |
| | 5.091V | 19.784 | | 230.24V |

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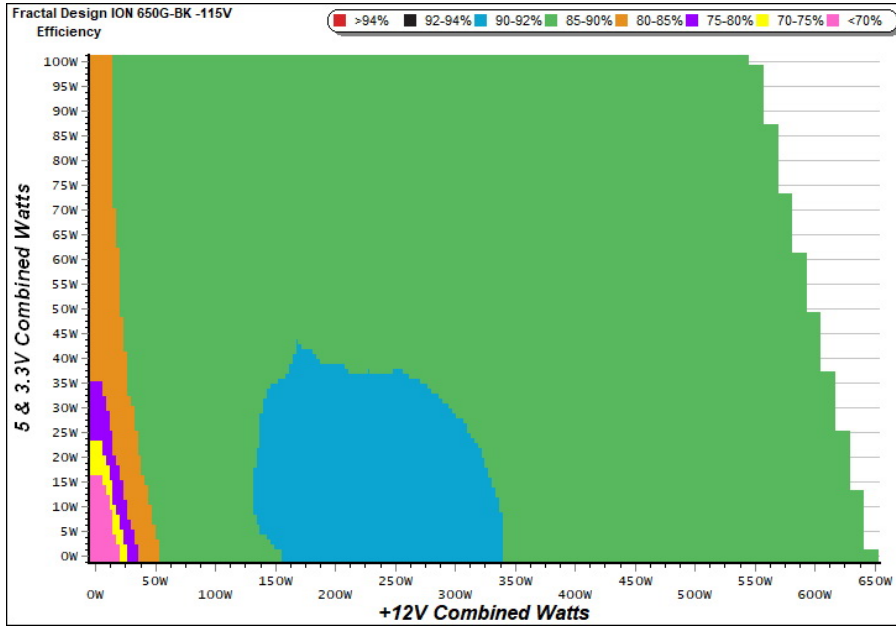
115V

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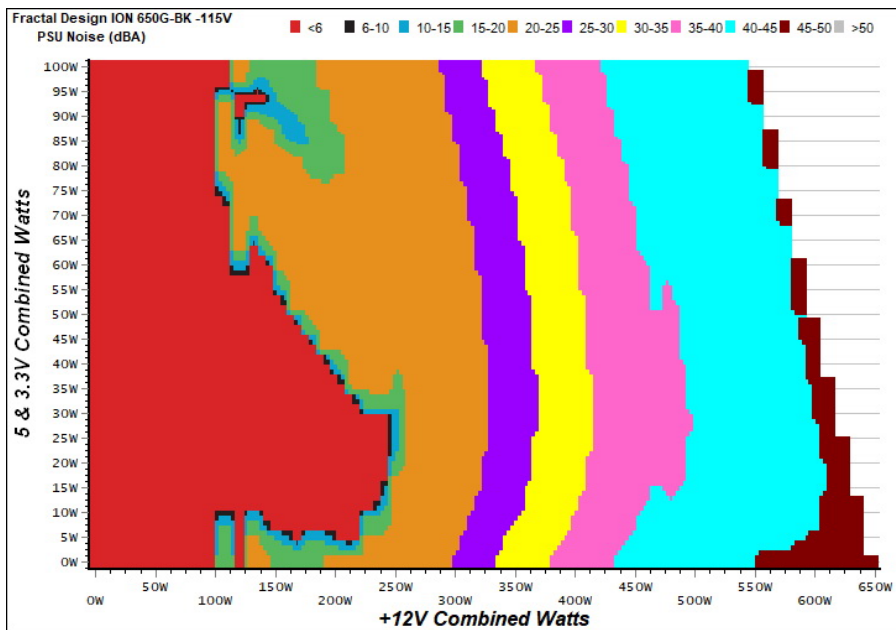
EFFICIENCY GRAPH 115V



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

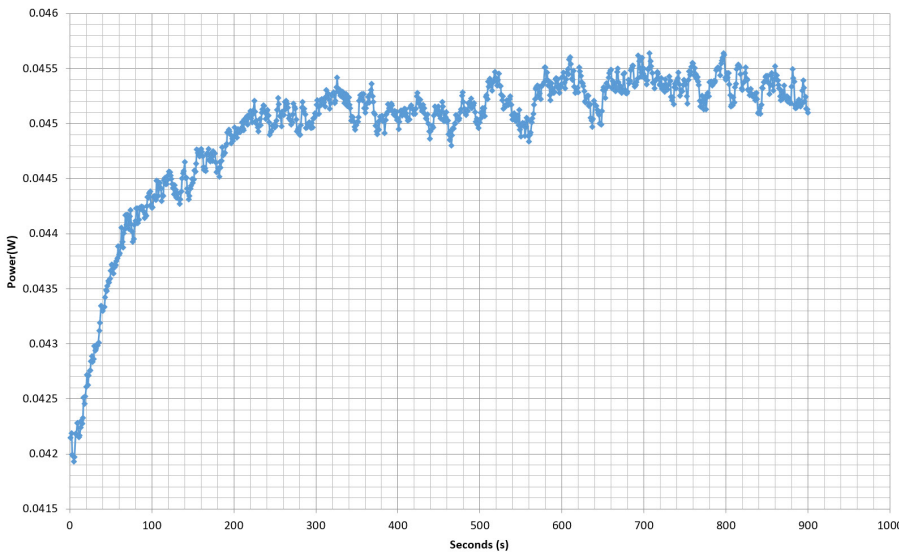
The PSU's noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

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VAMPIRE POWER -115V

Power - 1932FD20230100021 - 10/10/2019 - 13:35



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 |
|--------|---------|---------|---------|--------|------------------|------------|--------------------|----------------------|-------------------|----------------|
| 1 | 3.634A | 1.971A | 1.972A | 0.977A | 64.936 | 84.894% | 876 | 20.0 | 40.09°C | 0.927 |
| | 11.920V | 5.077V | 3.351V | 5.121V | 76.491 | | | | 44.57°C | 115.12V |
| 2 | 8.268A | 2.959A | 2.961A | 1.174A | 129.453 | 88.310% | 896 | 20.8 | 40.43°C | 0.952 |
| | 11.918V | 5.071V | 3.346V | 5.113V | 146.590 | | | | 45.25°C | 115.12V |
| 3 | 13.306A | 3.454A | 3.441A | 1.371A | 194.553 | 89.177% | 907 | 21.5 | 41.06°C | 0.966 |
| | 11.915V | 5.069V | 3.343V | 5.105V | 218.164 | | | | 46.20°C | 115.12V |
| 4 | 18.341A | 3.949A | 3.951A | 1.570A | 259.748 | 89.508% | 1048 | 26.4 | 41.22°C | 0.973 |
| | 11.915V | 5.068V | 3.341V | 5.097V | 290.196 | | | | 47.03°C | 115.12V |
| 5 | 23.048A | 4.937A | 4.940A | 1.769A | 325.093 | 89.054% | 1551 | 37.1 | 42.81°C | 0.979 |
| | 11.913V | 5.067V | 3.341V | 5.089V | 365.052 | | | | 49.14°C | 115.12V |
| 6 | 27.691A | 5.926A | 5.931A | 1.969A | 389.594 | 88.716% | 1704 | 40.5 | 42.92°C | 0.981 |
| | 11.909V | 5.065V | 3.339V | 5.080V | 439.149 | | | | 50.01°C | 115.12V |
| 7 | 32.398A | 6.913A | 6.923A | 2.169A | 454.888 | 88.141% | 1980 | 43.6 | 43.56°C | 0.982 |
| | 11.907V | 5.065V | 3.338V | 5.072V | 516.089 | | | | 51.24°C | 115.12V |
| 8 | 37.106A | 7.902A | 7.912A | 2.371A | 520.206 | 87.465% | 2044 | 45.8 | 44.19°C | 0.984 |
| | 11.906V | 5.064V | 3.337V | 5.063V | 594.759 | | | | 52.45°C | 115.12V |
| 9 | 42.213A | 8.397A | 8.394A | 2.373A | 585.108 | 86.938% | 2049 | 45.9 | 44.27°C | 0.986 |
| | 11.906V | 5.063V | 3.336V | 5.058V | 673.021 | | | | 53.19°C | 115.11V |
| 10 | 47.058A | 8.891A | 8.906A | 2.975A | 649.946 | 86.187% | 2056 | 46.2 | 45.71°C | 0.988 |
| | 11.905V | 5.063V | 3.335V | 5.043V | 754.113 | | | | 54.90°C | 115.12V |
| 11 | 52.503A | 8.891A | 8.904A | 2.978A | 714.774 | 85.466% | 2055 | 46.2 | 46.54°C | 0.990 |
| | 11.905V | 5.063V | 3.336V | 5.039V | 836.325 | | | | 56.25°C | 115.11V |
| CL1 | 0.148A | 12.003A | 12.000A | 0.000A | 102.687 | 82.995% | 1457 | 35.5 | 42.96°C | 0.946 |
| | 11.927V | 5.066V | 3.343V | 5.125V | 123.727 | | | | 49.60°C | 115.13V |
| CL2 | 54.021A | 1.003A | 1.001A | 1.000A | 656.529 | 86.852% | 2058 | 46.2 | 45.51°C | 0.988 |
| | 11.903V | 5.073V | 3.343V | 5.082V | 755.914 | | | | 54.84°C | 115.12V |

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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 | 1.222A | 0.493A | 0.476A | 0.195A | 19.665 | 72.831% | 0 | <6.0 | 0.815 |
| | 11.917V | 5.082V | 3.354V | 5.136V | 27.001 | | | | 115.13V |
| 2 | 2.496A | 0.983A | 0.985A | 0.390A | 40.042 | 81.889% | 0 | <6.0 | 0.896 |
| | 11.917V | 5.080V | 3.352V | 5.132V | 48.898 | | | | 115.13V |
| 3 | 3.705A | 1.478A | 1.461A | 0.585A | 59.553 | 85.554% | 0 | <6.0 | 0.921 |
| | 11.918V | 5.077V | 3.350V | 5.127V | 69.609 | | | | 115.13V |
| 4 | 4.979A | 1.970A | 1.970A | 0.781A | 79.942 | 86.770% | 0 | <6.0 | 0.932 |
| | 11.919V | 5.076V | 3.349V | 5.123V | 92.131 | | | | 115.13V |

RIPPLE MEASUREMENTS 115V

| Test | 12V | 5V | 3.3V | 5VSB | Pass/Fail |
|-------------|---------|---------|---------|---------|-----------|
| 10% Load | 18.3 mV | 8.8 mV | 10.3 mV | 6.4 mV | Pass |
| 20% Load | 17.8 mV | 10.8 mV | 13.3 mV | 7.3 mV | Pass |
| 30% Load | 16.0 mV | 11.5 mV | 14.9 mV | 8.2 mV | Pass |
| 40% Load | 16.0 mV | 12.1 mV | 15.4 mV | 8.8 mV | Pass |
| 50% Load | 16.9 mV | 11.9 mV | 15.6 mV | 9.5 mV | Pass |
| 60% Load | 17.5 mV | 12.7 mV | 16.3 mV | 9.9 mV | Pass |
| 70% Load | 17.9 mV | 13.3 mV | 16.9 mV | 11.2 mV | Pass |
| 80% Load | 18.3 mV | 13.6 mV | 18.4 mV | 11.3 mV | Pass |
| 90% Load | 17.4 mV | 14.1 mV | 17.8 mV | 11.7 mV | Pass |
| 100% Load | 26.5 mV | 15.0 mV | 17.7 mV | 13.8 mV | Pass |
| 110% Load | 27.4 mV | 14.8 mV | 18.1 mV | 14.6 mV | Pass |
| Crossload 1 | 24.7 mV | 12.2 mV | 15.1 mV | 7.6 mV | Pass |
| Crossload 2 | 26.1 mV | 13.0 mV | 16.1 mV | 13.0 mV | Pass |

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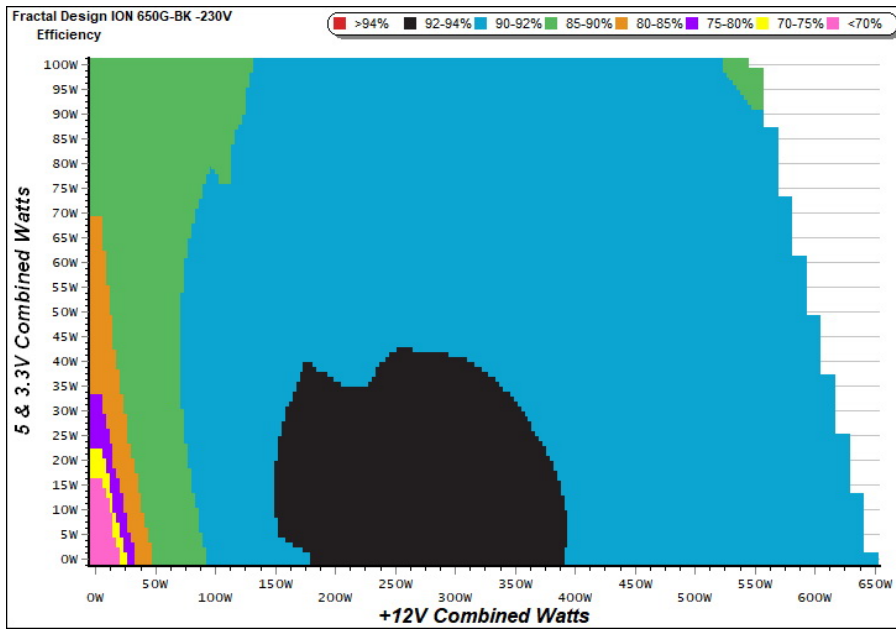
230V

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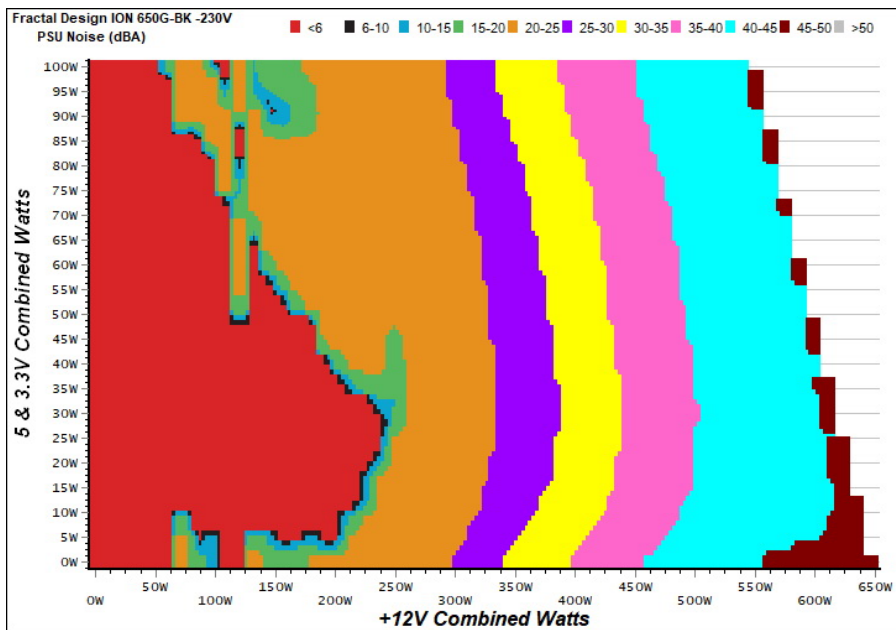
EFFICIENCY GRAPH 230V



INFO

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NOISE GRAPH 230V



INFO

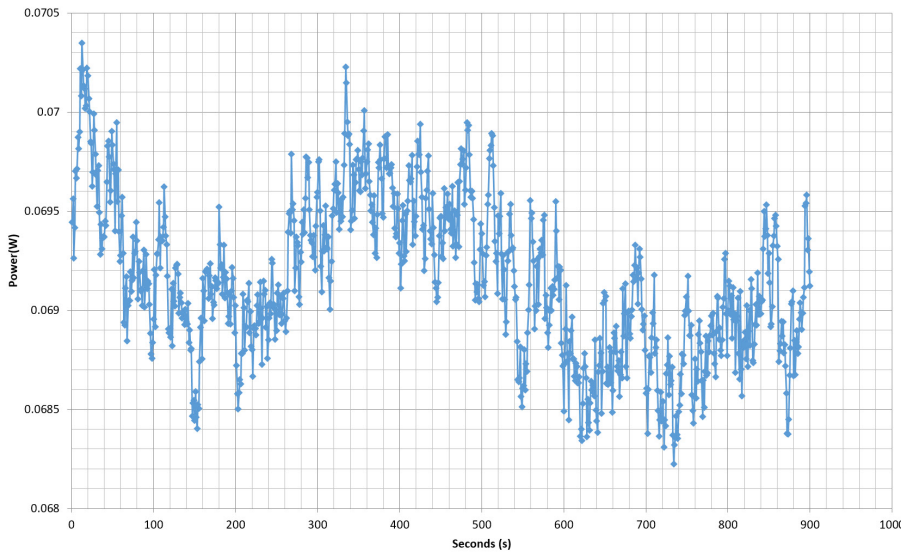
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10-110% LOAD TESTS 230V

| Test # | 12V | 5V | 3.3V | 5VSB | DC/AC (Watts) | Efficiency | Fan Speed (RPM) | PSU Noise (dB[A]) | Temps (In/Out) | PF/AC Volts |
|--------|---------|---------|---------|--------|------------------|------------|--------------------|----------------------|-------------------|----------------|
| 1 | 3.638A | 1.971A | 1.969A | 0.977A | 64.966 | 86.410% | 0 | <6.0 | 44.40°C | 0.769 |
| | 11.920V | 5.076V | 3.349V | 5.120V | 75.183 | | | | 40.56°C | 230.27V |
| 2 | 8.271A | 2.960A | 2.959A | 1.174A | 129.495 | 89.809% | 897 | 20.8 | 40.87°C | 0.879 |
| | 11.918V | 5.073V | 3.347V | 5.112V | 144.189 | | | | 45.10°C | 230.27V |
| 3 | 13.309A | 3.454A | 3.441A | 1.372A | 194.605 | 91.001% | 902 | 20.9 | 41.15°C | 0.918 |
| | 11.916V | 5.069V | 3.343V | 5.105V | 213.849 | | | | 46.24°C | 230.28V |
| 4 | 18.350A | 3.949A | 3.951A | 1.570A | 259.815 | 91.412% | 1019 | 25.3 | 41.47°C | 0.937 |
| | 11.913V | 5.067V | 3.341V | 5.097V | 284.223 | | | | 47.12°C | 230.28V |
| 5 | 23.053A | 4.937A | 4.941A | 1.769A | 325.124 | 91.301% | 1389 | 34.6 | 42.67°C | 0.950 |
| | 11.912V | 5.066V | 3.340V | 5.089V | 356.103 | | | | 48.70°C | 230.28V |
| 6 | 27.691A | 5.926A | 5.932A | 1.969A | 389.652 | 91.045% | 1667 | 39.0 | 42.76°C | 0.958 |
| | 11.911V | 5.065V | 3.339V | 5.080V | 427.977 | | | | 49.19°C | 230.28V |
| 7 | 32.396A | 6.914A | 6.921A | 2.169A | 454.952 | 90.732% | 1914 | 42.7 | 43.46°C | 0.963 |
| | 11.910V | 5.064V | 3.338V | 5.072V | 501.422 | | | | 50.25°C | 230.28V |
| 8 | 37.103A | 7.901A | 7.913A | 2.371A | 520.243 | 90.290% | 2046 | 45.8 | 43.74°C | 0.967 |
| | 11.908V | 5.064V | 3.337V | 5.063V | 576.194 | | | | 51.25°C | 230.28V |
| 9 | 42.207A | 8.396A | 8.394A | 2.373A | 585.125 | 90.038% | 2049 | 45.9 | 44.28°C | 0.970 |
| | 11.908V | 5.064V | 3.336V | 5.059V | 649.864 | | | | 52.61°C | 230.28V |
| 10 | 47.049A | 8.892A | 8.904A | 2.974A | 649.940 | 89.645% | 2057 | 46.2 | 45.63°C | 0.972 |
| | 11.907V | 5.063V | 3.336V | 5.045V | 725.019 | | | | 54.73°C | 230.27V |
| 11 | 52.493A | 8.888A | 8.905A | 2.977A | 714.754 | 89.258% | 2058 | 46.2 | 46.60°C | 0.975 |
| | 11.907V | 5.064V | 3.336V | 5.040V | 800.773 | | | | 56.33°C | 230.27V |
| CL1 | 0.146A | 12.003A | 11.999A | 0.000A | 102.648 | 84.854% | 1273 | 31.7 | 42.24°C | 0.860 |
| | 11.926V | 5.066V | 3.342V | 5.125V | 120.970 | | | | 48.84°C | 230.27V |
| CL2 | 54.020A | 1.002A | 0.999A | 1.000A | 656.503 | 90.294% | 2058 | 46.2 | 45.51°C | 0.972 |
| | 11.903V | 5.071V | 3.342V | 5.083V | 727.074 | | | | 54.45°C | 230.26V |

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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 | 1.221A | 0.493A | 0.478A | 0.195A | 19.659 | 73.030% | 0 | <6.0 | 0.518 |
| | 11.918V | 5.080V | 3.352V | 5.135V | 26.919 | | | | 230.27V |
| 2 | 2.495A | 0.986A | 0.984A | 0.390A | 40.041 | 82.880% | 0 | <6.0 | 0.673 |
| | 11.918V | 5.078V | 3.351V | 5.131V | 48.312 | | | | 230.27V |
| 3 | 3.705A | 1.478A | 1.464A | 0.585A | 59.561 | 86.323% | 0 | <6.0 | 0.752 |
| | 11.918V | 5.076V | 3.349V | 5.127V | 68.998 | | | | 230.27V |
| 4 | 4.980A | 1.972A | 1.970A | 0.781A | 79.956 | 88.224% | 0 | <6.0 | 0.807 |
| | 11.918V | 5.075V | 3.348V | 5.122V | 90.628 | | | | 230.27V |

RIPPLE MEASUREMENTS 230V

| Test | 12V | 5V | 3.3V | 5VSB | Pass/Fail |
|------------|---------|---------|---------|---------|-----------|
| 10% Load | 18.20mV | 8.40mV | 8.00mV | 5.90mV | Pass |
| 20% Load | 18.30mV | 9.30mV | 10.40mV | 6.60mV | Pass |
| 30% Load | 15.10mV | 10.50mV | 11.20mV | 7.30mV | Pass |
| 40% Load | 15.50mV | 11.00mV | 12.50mV | 8.20mV | Pass |
| 50% Load | 16.20mV | 11.10mV | 12.90mV | 8.40mV | Pass |
| 60% Load | 16.50mV | 12.10mV | 14.10mV | 8.80mV | Pass |
| 70% Load | 16.90mV | 12.90mV | 14.80mV | 9.20mV | Pass |
| 80% Load | 17.40mV | 13.00mV | 15.60mV | 10.00mV | Pass |
| 90% Load | 17.60mV | 13.40mV | 16.40mV | 10.60mV | Pass |
| 100% Load | 25.30mV | 14.90mV | 17.10mV | 12.90mV | Pass |
| 110% Load | 26.40mV | 14.70mV | 17.00mV | 12.50mV | Pass |
| Crossload1 | 23.00mV | 11.10mV | 12.50mV | 7.30mV | Pass |
| Crossload2 | 24.20mV | 13.40mV | 15.20mV | 11.10mV | Pass |

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Anex

Fractal Design ION SFX G 650

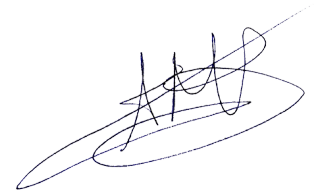


Top side



Power specifications label

CERTIFICATIONS 115V

Aristeidis Bitziopoulos
Lab Director

CERTIFICATIONS 230V



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