# Thermaltake Toughpower SFX 600W

Serial Number PSSTP0600FPCGUSGMA000060

Lab ID 142

Certification ID 25142

Test Result Report ID:

Certificate Issue Date: Jul 18, 2018

115V 230V

Scheme: ETA-EMI PSU

CYBENETICS GOLD

115V 230V

CYBENETICS STANDARD+

Scheme: LAMBDA PSU

Aristeidis Bitziopoulos, Certification Body General Manager

# General Information

## Test Equipment

| | |
|---|---|
| Electronic Loads | Chroma 63601-5 x2<br>Chroma 63600-2<br>Chroma 63640-80-80 x10<br>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 | Thermaltake |
| Model | Toughpower SFX 600W |
| OEM/ODM | Enhance Electronics |
| Serial Number | PSSTP0600FPCGUSGMA000060 |
| Product Specifications | |
| Manufacturer-Provided Information | |
| Rated Voltage (Vrms) | 100-240 |
| Rated Current (Arms) | 9-4.5 |
| Rated Frequency (Hz) | 50-60 |

| | |
|---|---|
| Rated Power (W) | 600 |
| Operating Temperature (Continuous Full Load) (°C) | |
| Type | SFX |
| Cable Design | Fully Modular |
| Warranty | - |
| Cybenetics Measurements | |
| Dimensions (W x H x D) | |
| Weight | |
| Cooling | 80mm Double Ball-Bearing Fan (R128015SM) |
| Semi-Passive Operation | ✓ |
| Cybenetics Testing Information | |
| Lab ID | 142 |
| Date of receipt | Jul 8, 2018 |
| Testing Date | Jul 15, 2018 |
| Report Issued Date | Jul 18, 2018 |
| 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 |
| ATX connector 20+4 pin (305mm) | 1 | 1 | 18-22AWG |
| 4+4 pin EPS12V (410mm) | 1 | 1 | 18AWG |
| 6+2 pin PCIe (410mm+150mm) | 1 | 2 | 18AWG |
| SATA (300mm+145mm+145mm) | 1 | 3 | 18AWG |
| 4 pin Molex (310mm+145mm) / FDD (+150mm) | 1 | 2 / 1 | 18-22AWG |

## Power Specifications

| Rail | | 3.3V | 5V | 12V | 5VSB | -12V |
|---|---|---|---|---|---|---|
| Max. Power | Amps | 20 | 15 | 50 | 2.5 | 0.3 |
| | Watts | 90 | | 600 | 12.5 | 3.6 |
| Total Max. Power (W) | | 600 | | | | |

## Parts Description

| General Data | |
|---|---|
| Manufacturer (OEM) | Enhance Electronics |
| Primary Side | |
| Transient Filter | 4x Y caps, 2x X caps, 2x CM chokes, 1x MOV |
| Inrush Protection | NTC Thermistor |
| Bridge Rectifier(s) | 1x Vishay BU1506 (600 V, 15 A @ 80 °C) |
| APFC MOSFETS | 2x Infineon IPP50R140CP (550 V, 15 A @ 100 °C, 0.14 Ohm) |
| APFC Boost Diode | 1x CREE C3D08060A (600 V, 8 A @ 152 °C) |
| Hold-up Cap(s) | 1x Nippon Chemi-Con (450 V, 330 uF, 2000 h @ 105 °C, KMR) |
| Main Switchers | 2x Infineon IPP50R140CP (550 V, 15 A @ 100 °C, 0.14 Ohm) |
| FET Driver | 1x Silicon Labs Si8230BD |
| APFC Controller | Champion CM6500 |
| Switching Controller | Champion CM6901 |
| Topology | Primary side: Half-Bridge & LLC Resonant Converter<br>Secondary side: Synchronous Rectification & DC-DC converters |
| Secondary Side | |
| +12V MOSFETS | 6x Inte ational Rectifier IRFH7004PbF (40 V, 164 A @ 100 °C, 1.4 mOhm) |
| 5V & 3.3V | DC-DC Converters:  2x Infineon BSC018NE2LS (25 V, 97 A @ 100 °C, 1.8 mOhm), 2x Infineon BSC050NE2LS (25 V, 37 A @ 100 °C, 5 mOhm)<br>PWM Controllers: 2x ANPEC APW7073 |
| Filtering Capacitors | Electrolytics: Nippon Chemi-Con (105 °C, KZE), United Chemi-Con (105 °C, LXZ) , Rubycon (105 °C, ZL), Suncon (105 °C)<br>Polymers: Unicon |
| Supervisor IC | SITI PS223 (OVP, UVP, OCP, SCP, OTP ) |
| Fan Model | EverflowR128015SM (80 mm, 12 V, 0.25 A, 3000 RPM, 33.27 CFM, 31 dBA, Dual Ball-Bearing) |
| 5VSB Circuit | |

| | |
|---|---|
| Rectifier | 1x STP3NK90ZFP (900 V, 1.89 A @ 100 °C, 4.8 Ohm) |

# Test Results

## Temperature & Compliance Info

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

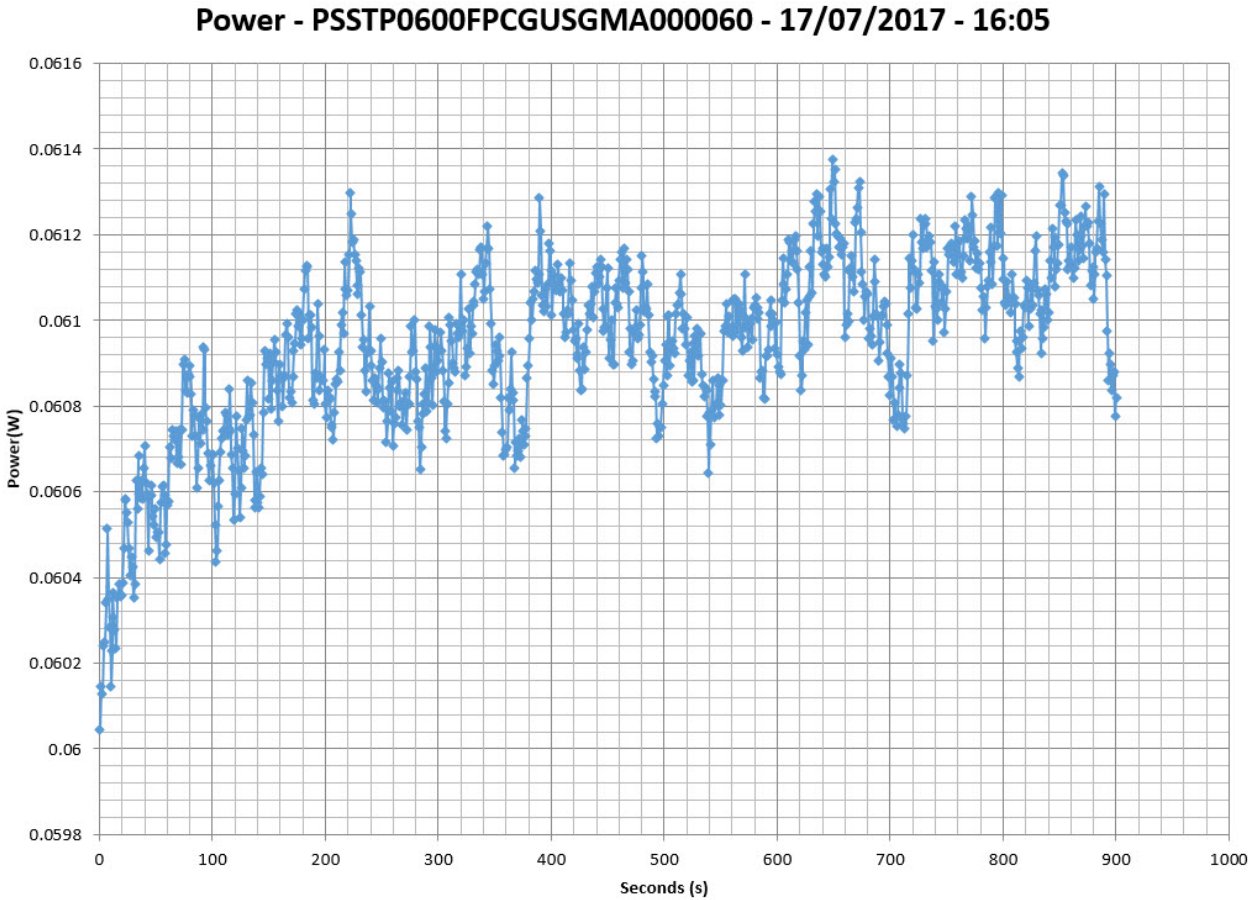
## Performance Summary 115V

| | |
|---|---|
| Accredited | |
| Average Efficiency (>1450 load combinations) | 88.401% |
| Average Noise Output (>1450 Load Combinations) | 36.51dBA |
| Average PF (>1450 Load Combinations) | 0.984 |
| Efficiency With 10W (≤500W) or 2% (>500W) Load | - |
| Standby Power Consumption | 0.0608W |
| Non-Accredited | |
| 12V Ripple (Full Load) | 68.00mV |
| 5V Ripple (Full Load) | 31.98mV |
| 3.3V Ripple (Full Load) | 22.71mV |
| 5VSB Ripple (Full Load) | 35.09mV |
| 12V Load Regulation | 1.67% |
| 5V Load Regulation | 2.25% |
| 3.3V Load Regulation | 3.82% |
| 5VSB Load Regulation | 3.29% |
| Inrush Current | 33.430A |

## Hold-Up Time & PWR_OK Signal

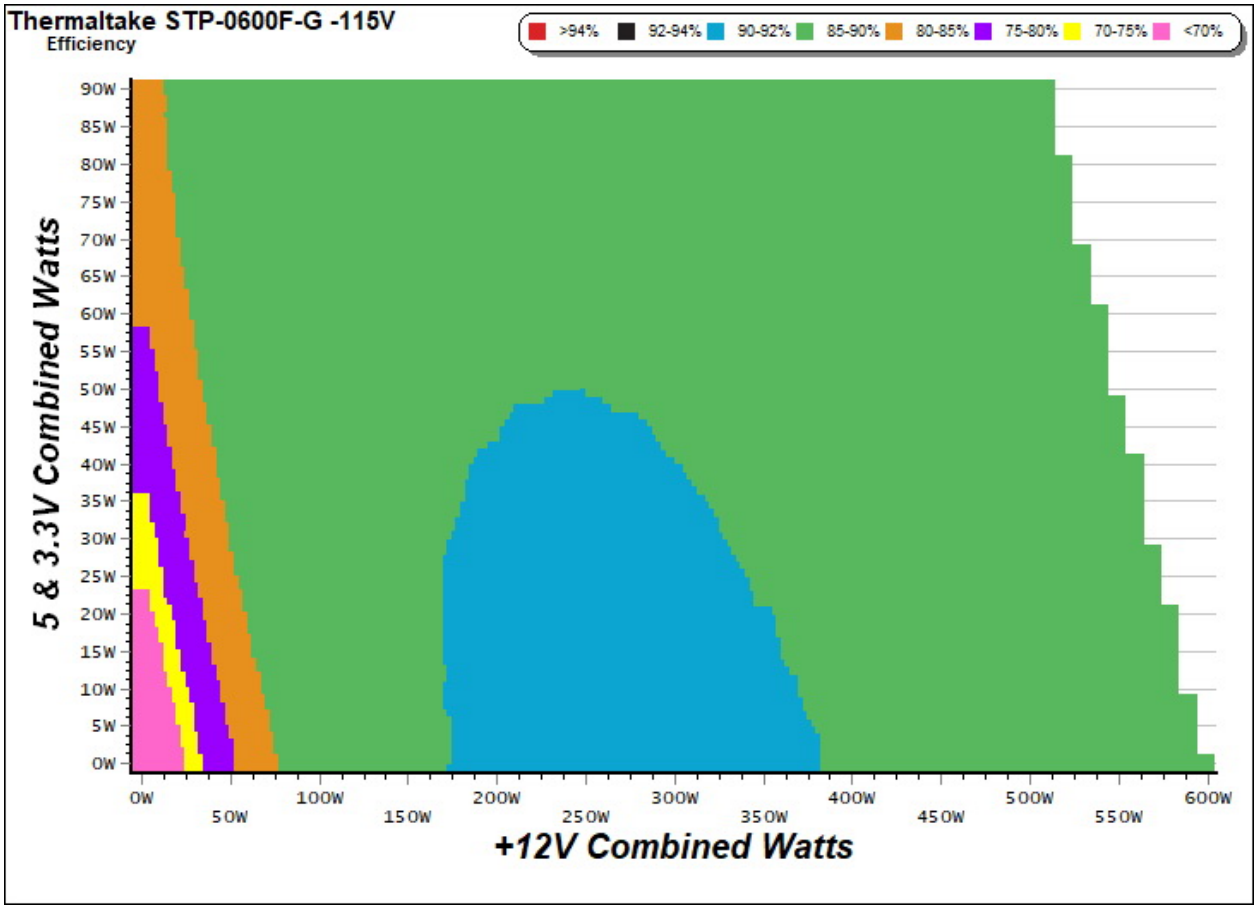
| | |
|---|---|
| Hold-Up Time (ms) | 5.8 |
| AC Loss to PWR_OK Hold Up Time (ms) | 12.8 |
| PWR_OK Inactive to DC Loss Delay (ms) | -7 |

### Graphs 115V



## Efficiency Graph

**115V**

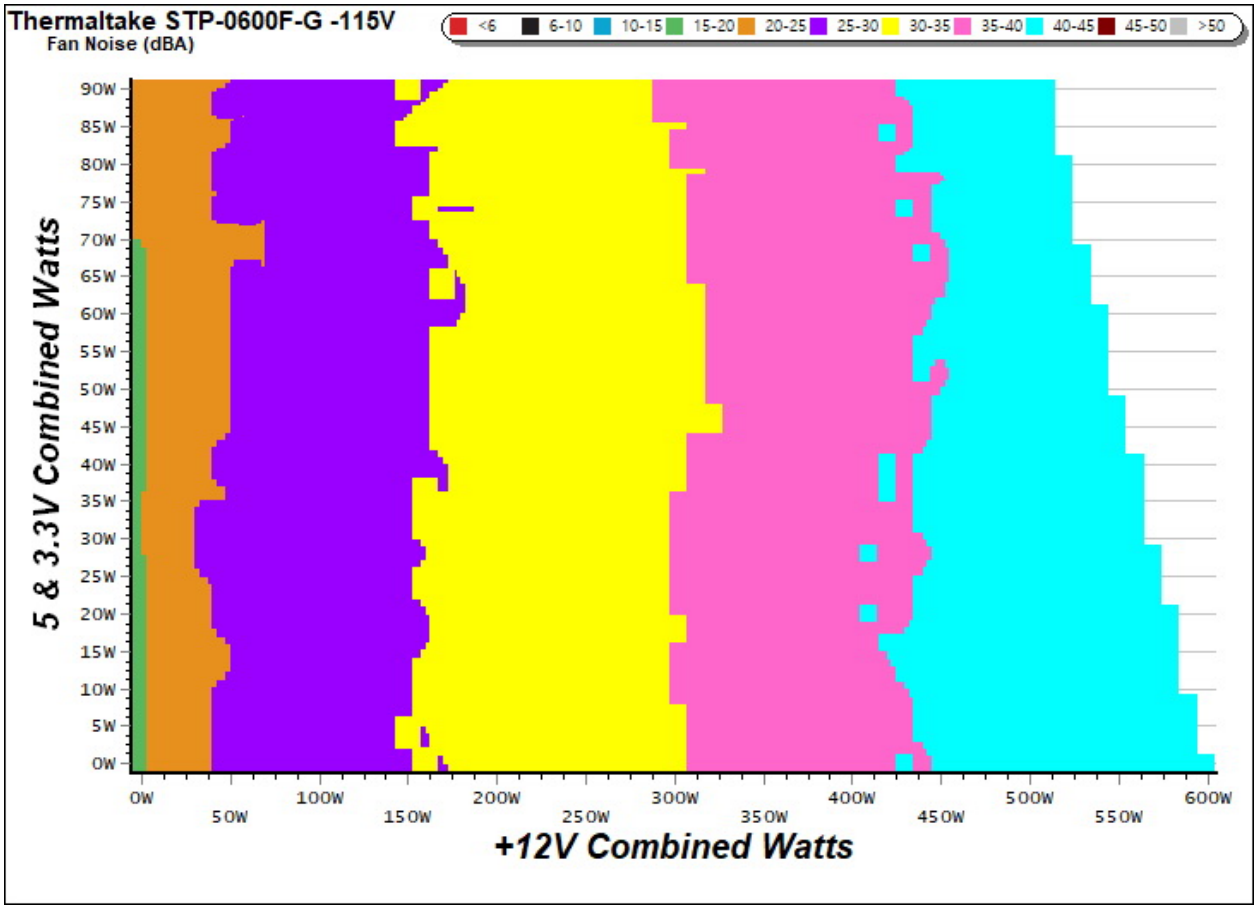



**INFO**

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

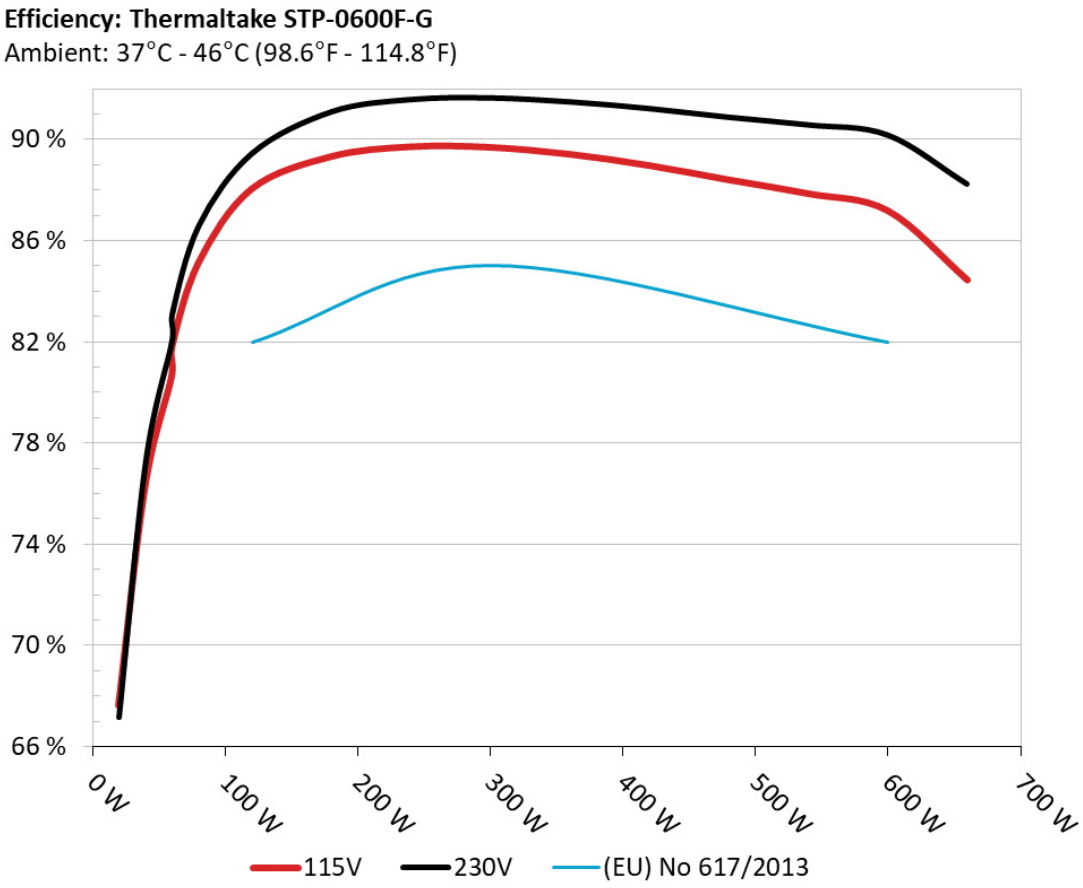



### INFO

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.

## Indicative Performance

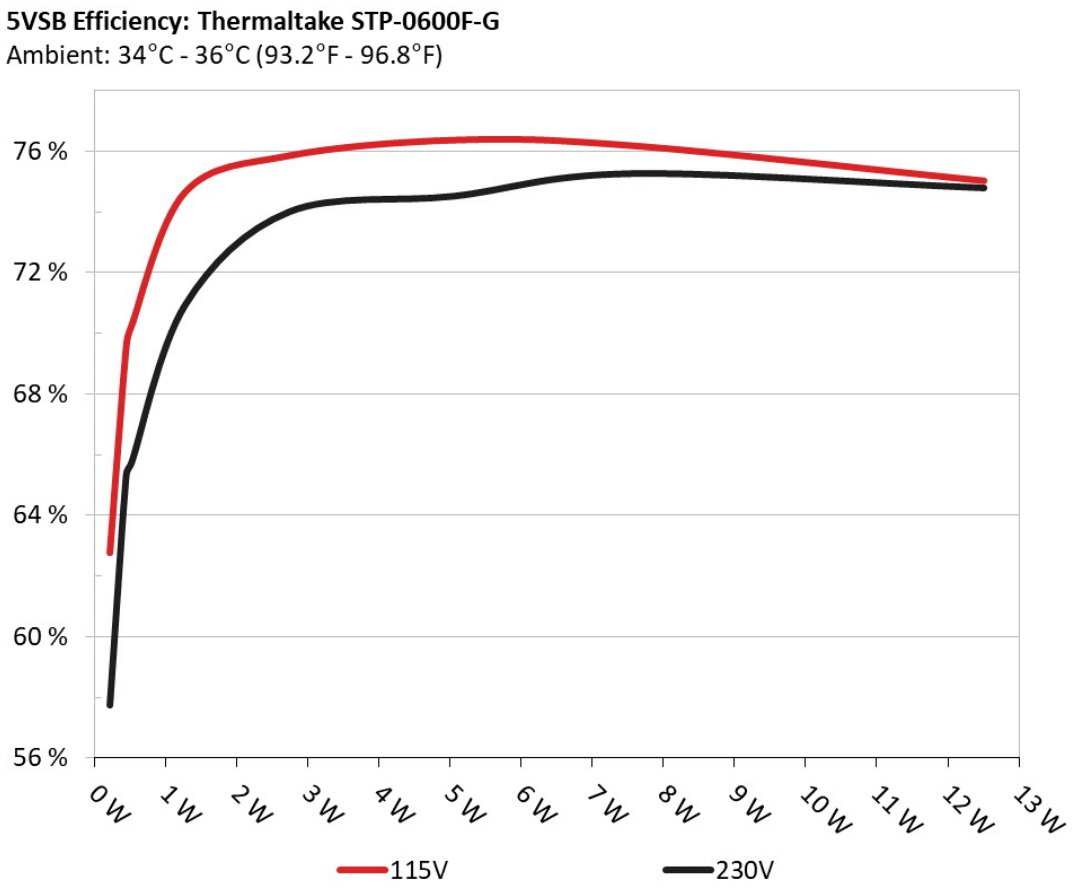
### Efficiency under high ambient temperature




**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 | 0.041A | 0.209 | 62.763% | 0.036 |
| | 5.057V | 0.333 | | 115.17V |

| | | | | |
|---|---|---|---|---|
| 2 | 0.087A | 0.438 | 69.524% | 0.067 |
| | 5.055V | 0.630 | | 115.17V |
| 3 | 0.542A | 2.732 | 75.847% | 0.274 |
| | 5.045V | 3.602 | | 115.16V |
| 4 | 1.002A | 5.043 | 76.363% | 0.354 |
| | 5.035V | 6.604 | | 115.16V |
| 5 | 1.501A | 7.543 | 76.184% | 0.395 |
| | 5.024V | 9.901 | | 115.16V |
| 6 | 2.501A | 12.513 | 75.022% | 0.436 |
| | 5.003V | 16.679 | | 115.16V |

## Supplementary Tests (For Reference)

### Typical Load Tests 115V

| Test # | 12V | 5V | 3.3V | 5VSB | DC/AC (Watts) | Efficiency | Fan Speed (RPM) | Fan Noise (dB[A]) | Temps (In/Out) | PF/AC Volts |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3.161A | 1.996A | 1.984A | 0.995A | 59.768 | 80.665% | 2122 | 33.8 | 38.48°C | 0.964 |
| | 12.080V | 5.010V | 3.319V | 5.024V | 74.094 | | | | 41.34°C | 115.17V |
| 2 | 7.370A | 2.998A | 2.993A | 1.196A | 119.779 | 88.031% | 2122 | 33.8 | 38.68°C | 0.976 |
| | 12.064V | 4.999V | 3.305V | 5.007V | 136.064 | | | | 41.69°C | 115.17V |
| 3 | 11.941A | 3.510A | 3.518A | 1.400A | 179.867 | 89.318% | 2245 | 25.9 | 39.13°C | 0.969 |
| | 12.042V | 4.986V | 3.293V | 4.991V | 201.378 | | | | 42.54°C | 115.17V |
| 4 | 16.522A | 4.023A | 4.019A | 1.605A | 239.771 | 89.704% | 2306 | 36.8 | 39.83°C | 0.981 |
| | 12.019V | 4.975V | 3.282V | 4.977V | 267.291 | | | | 43.89°C | 115.17V |
| 5 | 20.776A | 5.033A | 5.047A | 1.810A | 299.704 | 89.682% | 2465 | 36.9 | 40.33°C | 0.987 |
| | 11.997V | 4.963V | 3.268V | 4.962V | 334.187 | | | | 45.17°C | 115.17V |
| 6 | 25.045A | 6.061A | 6.085A | 2.020A | 359.731 | 89.409% | 2590 | 38.5 | 40.82°C | 0.991 |
| | 11.976V | 4.951V | 3.253V | 4.945V | 402.344 | | | | 46.22°C | 115.18V |
| 7 | 29.328A | 7.085A | 7.127A | 2.230A | 419.655 | 88.964% | 2777 | 42.2 | 41.91°C | 0.993 |
| | 11.954V | 4.939V | 3.239V | 4.928V | 471.714 | | | | 48.31°C | 115.18V |
| 8 | 33.634A | 8.118A | 8.185A | 2.441A | 479.656 | 88.398% | 2916 | 41.3 | 42.36°C | 0.994 |
| | 11.931V | 4.927V | 3.224V | 4.909V | 542.611 | | | | 50.04°C | 115.17V |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 38.387A | 8.653A | 8.746A | 2.448A | 539.704 | 87.850% | 2987 | 41.6 | 43.90°C | 0.995 |
| | 11.908V | 4.914V | 3.211V | 4.897V | 614.346 | | | | 52.27°C | 115.18V |
| 10 | 43.113A | 9.182A | 9.280A | 2.557A | 599.559 | 87.177% | 3025 | 41.9 | 44.99°C | 0.996 |
| | 11.884V | 4.903V | 3.200V | 4.884V | 687.747 | | | | 55.03°C | 115.17V |
| 11 | 48.259A | 9.202A | 9.310A | 2.562A | 659.464 | 84.442% | 3025 | 41.9 | 46.42°C | 0.996 |
| | 11.858V | 4.893V | 3.190V | 4.873V | 780.970 | | | | 59.00°C | 115.17V |
| CL1 | 0.099A | 11.018A | 11.004A | 0.004A | 92.235 | 84.028% | 3055 | 42.0 | 45.26°C | 0.989 |
| | 12.080V | 4.987V | 3.278V | 5.020V | 109.767 | | | | 52.10°C | 115.18V |
| CL2 | 49.959A | 1.004A | 1.003A | 1.002A | 606.605 | 87.825% | 3025 | 41.9 | 45.19°C | 0.996 |
| | 11.879V | 4.922V | 3.239V | 4.941V | 690.698 | | | | 55.31°C | 115.18V |

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) | Fan Noise (dB[A]) | PF/AC Volts |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.206A | 0.492A | 0.477A | 0.195A | 19.629 | 67.642% | 1875 | 30.1 | 0.878 |
| | 12.093V | 5.020V | 3.333V | 5.050V | 29.019 | | | | 115.17V |
| 2 | 2.442A | 0.990A | 0.991A | 0.395A | 39.768 | 76.339% | 1920 | 30.9 | 0.942 |
| | 12.086V | 5.016V | 3.327V | 5.042V | 52.094 | | | | 115.17V |
| 3 | 3.676A | 1.487A | 1.503A | 0.596A | 59.847 | 81.778% | 2010 | 31.5 | 0.963 |
| | 12.079V | 5.012V | 3.321V | 5.034V | 73.182 | | | | 115.17V |
| 4 | 4.899A | 1.996A | 1.989A | 0.796A | 79.772 | 85.112% | 2100 | 33.1 | 0.972 |
| | 12.080V | 5.008V | 3.316V | 5.025V | 93.726 | | | | 115.17V |

The results above are not used in the certification process

## Ripple Measurements 115V

| Test | 12V | 5V | 3.3V | 5VSB | Pass/Fail |
|---|---|---|---|---|---|
| 10% Load | 30.0 mV | 14.9 mV | 11.7 mV | 12.2 mV | Pass |
| 20% Load | 26.9 mV | 16.1 mV | 11.8 mV | 13.7 mV | Pass |
| 30% Load | 28.7 mV | 17.0 mV | 11.2 mV | 14.6 mV | Pass |
| 40% Load | 30.9 mV | 18.7 mV | 11.4 mV | 19.1 mV | Pass |

| Test | 12V | 5V | 3.3V | 5VSB | Pass/Fail |
|---|---|---|---|---|---|
| 50% Load | 33.4 mV | 20.1 mV | 12.3 mV | 20.9 mV | Pass |
| 60% Load | 37.6 mV | 22.2 mV | 13.5 mV | 22.4 mV | Pass |
| 70% Load | 44.7 mV | 23.7 mV | 14.2 mV | 25.0 mV | Pass |
| 80% Load | 54.3 mV | 24.6 mV | 16.3 mV | 29.1 mV | Pass |
| 90% Load | 61.5 mV | 27.3 mV | 17.8 mV | 32.3 mV | Pass |
| 100% Load | 68.0 mV | 32.0 mV | 22.7 mV | 35.1 mV | Pass |
| 110% Load | 83.9 mV | 34.1 mV | 24.9 mV | 38.6 mV | Pass |
| Crossload 1 | 30.7 mV | 19.6 mV | 13.9 mV | 21.1 mV | Pass |
| Crossload 2 | 63.4 mV | 30.0 mV | 21.2 mV | 30.6 mV | Pass |

The results above are not used in the certification process

## Thermaltake Toughpower SFX 600W

Top side

Power specifications label