



## ASUS TUF-650B-GAMING

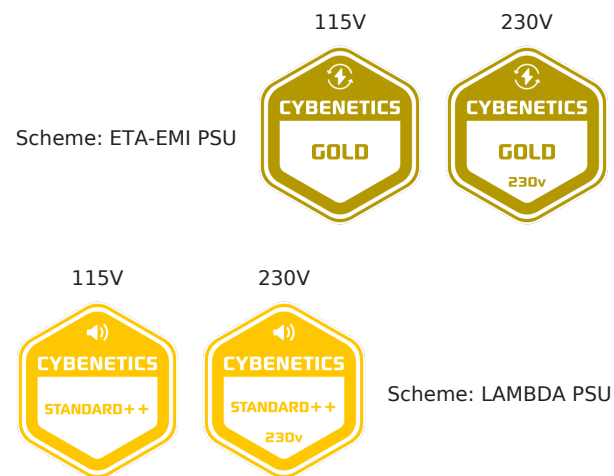
Serial Number L7YEMT000207W5Y

Lab ID AS65001708

Certification ID 251708

Test Result Report ID: 20PS1708A

Certificate Issue Date: Sep 7, 2020



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   | Cybernetics PSU Test Protocol                                                       |

### DUT Information(Non-accredited measurements)

|                                   |                 |
|-----------------------------------|-----------------|
| Product Identification Details    |                 |
| Brand                             | ASUS            |
| Model                             | TUF-650B-GAMING |
| OEM/ODM                           | Great Wall      |
| Serial Number                     | L7YEMT000207W5Y |
| Product Specifications            |                 |
| Manufacturer-Provided Information |                 |
| Rated Voltage (Vrms)              | 100-240         |
| Rated Current (Arms)              | 10-5            |
| Rated Frequency (Hz)              | 47-63           |

|                                                   |                                                                                     |
|---------------------------------------------------|-------------------------------------------------------------------------------------|
| Rated Power (W)                                   | 650                                                                                 |
| Operating Temperature (Continuous Full Load) (°C) |                                                                                     |
| Type                                              | ATX12V                                                                              |
| Cable Design                                      | Fixed cables                                                                        |
| Warranty                                          | -                                                                                   |
| Cybenetics Measurements                           |                                                                                     |
| Dimensions (W x H x D)                            |                                                                                     |
| Weight                                            |                                                                                     |
| Cooling                                           | 135mm Double Ball-Bearing Fan<br>(CF1325H12D)                                       |
| Semi-Passive Operation                            | ✓                                                                                   |
| Cybenetics Testing Information                    |                                                                                     |
| Lab ID                                            | AS65001708                                                                          |
| Date of receipt                                   | Aug 20, 2020                                                                        |
| Testing Date                                      | Sep 3, 2020                                                                         |
| Report Issued Date                                | Sep 7, 2020                                                                         |
| Engineer Name                                     | -                                                                                   |
| Authorized By the Laboratory Technical Manager    | Aristeidis Bitziopoulos                                                             |
| Signature                                         |  |

### Cables and Connectors(Non-accredited measurements)

| Native Cables                         |             |                         |          |               |
|---------------------------------------|-------------|-------------------------|----------|---------------|
| Description                           | Cable Count | Connector Count (Total) | Gauge    | In Cable Caps |
| ATX connector 20+4 pin (610mm)        | 1           | 1                       | 18-20AWG | No            |
| 4+4 pin EPS12V (820mm)                | 2           | 2                       | 18AWG    | No            |
| 6+2 pin PCIe (610mm+100mm)            | 2           | 4                       | 18AWG    | No            |
| SATA (400mm+120mm+120mm)              | 1           | 3                       | 18AWG    | No            |
| SATA (400mm+120mm)                    | 1           | 2                       | 18AWG    | No            |
| 4-pin Molex (400mm+150mm+150mm+150mm) | 1           | 4                       | 18AWG    | No            |

## Power Specifications

|                      |       |      |    |     |      |      |
|----------------------|-------|------|----|-----|------|------|
| Rail                 |       | 3.3V | 5V | 12V | 5VSB | -12V |
| Max. Power           | Amps  | 25   | 25 | 51  | 3    | 0.8  |
|                      | Watts | 130  |    | 612 | 15   | 9.6  |
| Total Max. Power (W) |       | 650  |    |     |      |      |

## Parts Description

|                           |                                                                                                                                                                                                                                                       |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General Data              | -                                                                                                                                                                                                                                                     |
| Manufacturer (OEM)        | Great Wall                                                                                                                                                                                                                                            |
| PCB Type                  | Single Sided                                                                                                                                                                                                                                          |
| Primary Side              | -                                                                                                                                                                                                                                                     |
| Transient Filter          | 4x Y caps, 2x X caps, 2x CM chokes, 1x MOV                                                                                                                                                                                                            |
| Inrush Protection         | NTC Thermistor SCK201R0                                                                                                                                                                                                                               |
| Bridge Rectifier(s)       | 2x GBU1508 (800V, 15A @ 100°C)                                                                                                                                                                                                                        |
| APFC MOSFETs              | 2x Advanced Power AP30SL60WL (650V, 16.5A @ 100°C, Rds(on): 0.13Ohm)                                                                                                                                                                                  |
| APFC Boost Diode          | 1x STMicroelectronics STPSC6H065D (650V, 6A @ 135°C)                                                                                                                                                                                                  |
| Bulk Cap(s)               | 2x Teapo (450V, 270uF each or 540uF combined, 2,000h @ 105°C, LG)                                                                                                                                                                                     |
| Main Switchers            | 2x Advanced Power AP65SL190D (650V, 12.3A @ 100°C, Rds(on): 0.19Ohm)                                                                                                                                                                                  |
| APFC Controller           | Champion CM6500UNX & CM03X Phantom Power Remover                                                                                                                                                                                                      |
| Resonant Controller       | Champion CM6901X                                                                                                                                                                                                                                      |
| Topology                  | Primary side: APFC, Half-Bridge & LLC converter<br>Secondary side: Synchronous Rectification & DC-DC converters                                                                                                                                       |
| Secondary Side            | -                                                                                                                                                                                                                                                     |
| +12V MOSFETs              | 4x Advanced Power AP9990GP (60V, 80A @ 100°C, Rds(on): 6mOhm)                                                                                                                                                                                         |
| 5V & 3.3V                 | DC-DC Converters: 4x Infineon IPD040N03L (30V, 76A @ 100°C, Rds(on): 4mOhm)<br>PWM Controllers: ANPEC APW7159C                                                                                                                                        |
| Filtering Capacitors      | Electrolytic: 2x Elite (3-5,000h @ 105°C, EJ), 2x Elite (2-5,000h @ 105°C, ED), 1x Teapo (6-10,000h @ 105°C, TC), 1x Teapo (3-5,000h @ 105°C, TX), 2x Lelon (4-10,000h @ 105°C, RZW), 1x Lelon (4-7,000h @ 105°C, RXW)<br>Polymer: 4x Elite, 3x Lelon |
| Step-Down DC-DC Converter | Texas Instruments TPS54231                                                                                                                                                                                                                            |
| Supervisor IC             | IN1S429I-DCG                                                                                                                                                                                                                                          |

|                        |                                                             |
|------------------------|-------------------------------------------------------------|
| Fan Model              | Champion CF1325H12D (135mm, 12V, 0.6A, Double Ball Bearing) |
| 5VSB Circuit           | -                                                           |
| Rectifier              | 1x PFC PFR30L45CT SBR (45V, 30A)                            |
| Standby PWM Controller | Power Intergrations TNY278PN                                |

## 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)   | 87.131%  |
| Average Noise Output (>1450 Load Combinations) | 32.23dBA |
| Average PF (>1450 Load Combinations)           | 0.978    |
| Efficiency With 10W (≤500W) or 2% (>500W) Load | 67.284%  |
| Standby Power Consumption                      | 0.0556W  |
| Non-Accredited                                 |          |
| 12V Ripple (Full Load)                         | 37.90mV  |
| 5V Ripple (Full Load)                          | 24.43mV  |
| 3.3V Ripple (Full Load)                        | 21.92mV  |
| 5VSB Ripple (Full Load)                        | 31.35mV  |
| 12V Load Regulation                            | 0.89%    |
| 5V Load Regulation                             | 1.04%    |
| 3.3V Load Regulation                           | 0.81%    |
| 5VSB Load Regulation                           | 1.50%    |

|                |         |
|----------------|---------|
| Inrush Current | 42.800A |
|----------------|---------|

## 230V

|                                                |          |         |
|------------------------------------------------|----------|---------|
| Accredited                                     |          |         |
| Average Efficiency (>1450 load combinations)   | 89.562%  |         |
| Average Noise Output (>1450 Load Combinations) | 31.87dBA |         |
| Average PF (>1450 Load Combinations)           | 0.941    |         |
| Efficiency With 10W (≤500W) or 2% (>500W) Load | -        |         |
| Standby Power Consumption                      | 0.0961W  |         |
| Non-Accredited                                 |          |         |
| 12V Ripple (Full Load)                         | 38.61mV  |         |
| 5V Ripple (Full Load)                          | 23.79mV  |         |
| 3.3V Ripple (Full Load)                        | 22.35mV  |         |
| 5VSB Ripple (Full Load)                        | 29.58mV  |         |
| 12V Load Regulation                            | 0.92%    |         |
| 5V Load Regulation                             | 1.04%    |         |
| 3.3V Load Regulation                           | 0.81%    |         |
| 5VSB Load Regulation                           | 1.43%    |         |
| Inrush Current                                 | 98.100A  |         |
| Hold-Up Time & PWR_OK Signal                   | 12.40ms  |         |
| AC Loss to PWR_OK Hold Up Time                 | 10.10ms  |         |
| PWR_OK Inactive to DC Loss Delay               | 2.30ms   |         |
| PSU Timings: T1 (20% / 100%)                   | 34.0ms   | 32.0ms  |
| PSU Timings: T3 (20% / 100%)                   | 120.0ms  | 122.0ms |
| OPP (28.00°C / 43.00°C)                        | 126.36%  | 126.37% |

## Hold-Up Time & PWR\_OK Signal

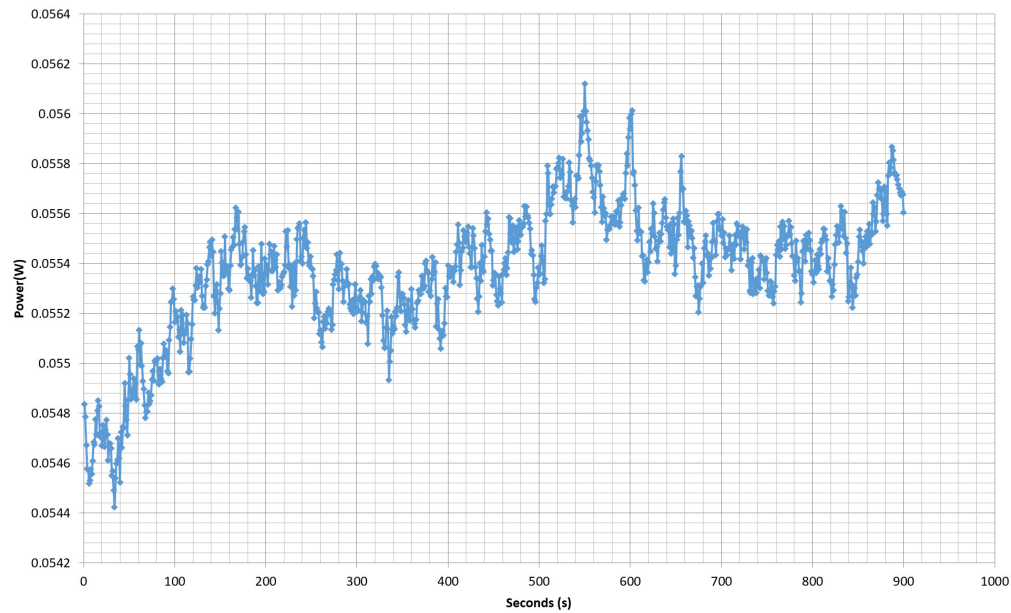
|                                       |      |
|---------------------------------------|------|
| Hold-Up Time (ms)                     | 12.4 |
| AC Loss to PWR_OK Hold Up Time (ms)   | 10.1 |
| PWR_OK Inactive to DC Loss Delay (ms) | 2.3  |

## Stromverbrauch im Ruhezustand

### Graphs

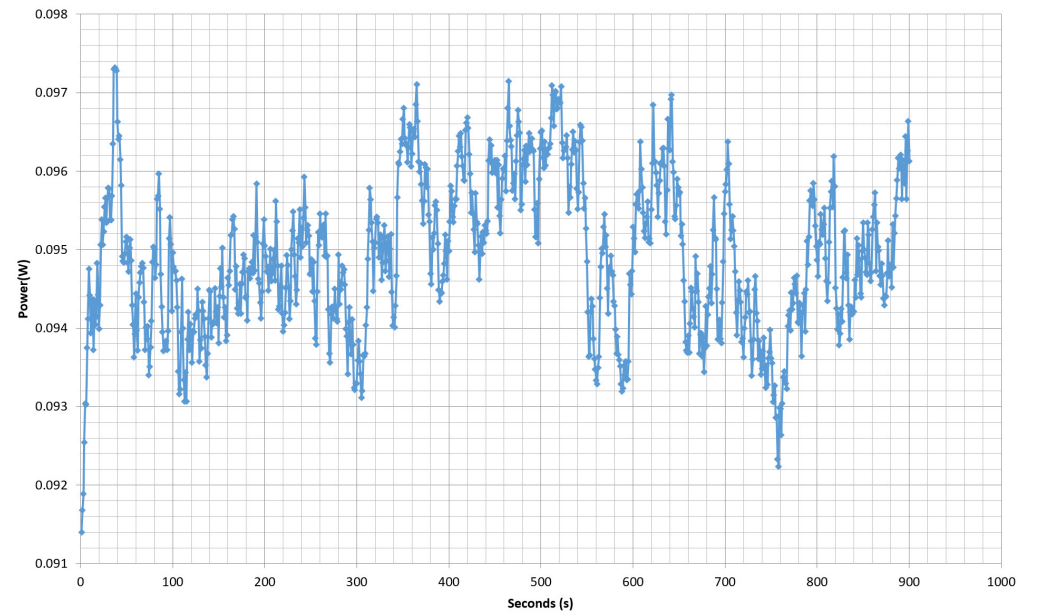
115V

Power - L7YEMT000207W5Y - 31/08/2020 - 10:25



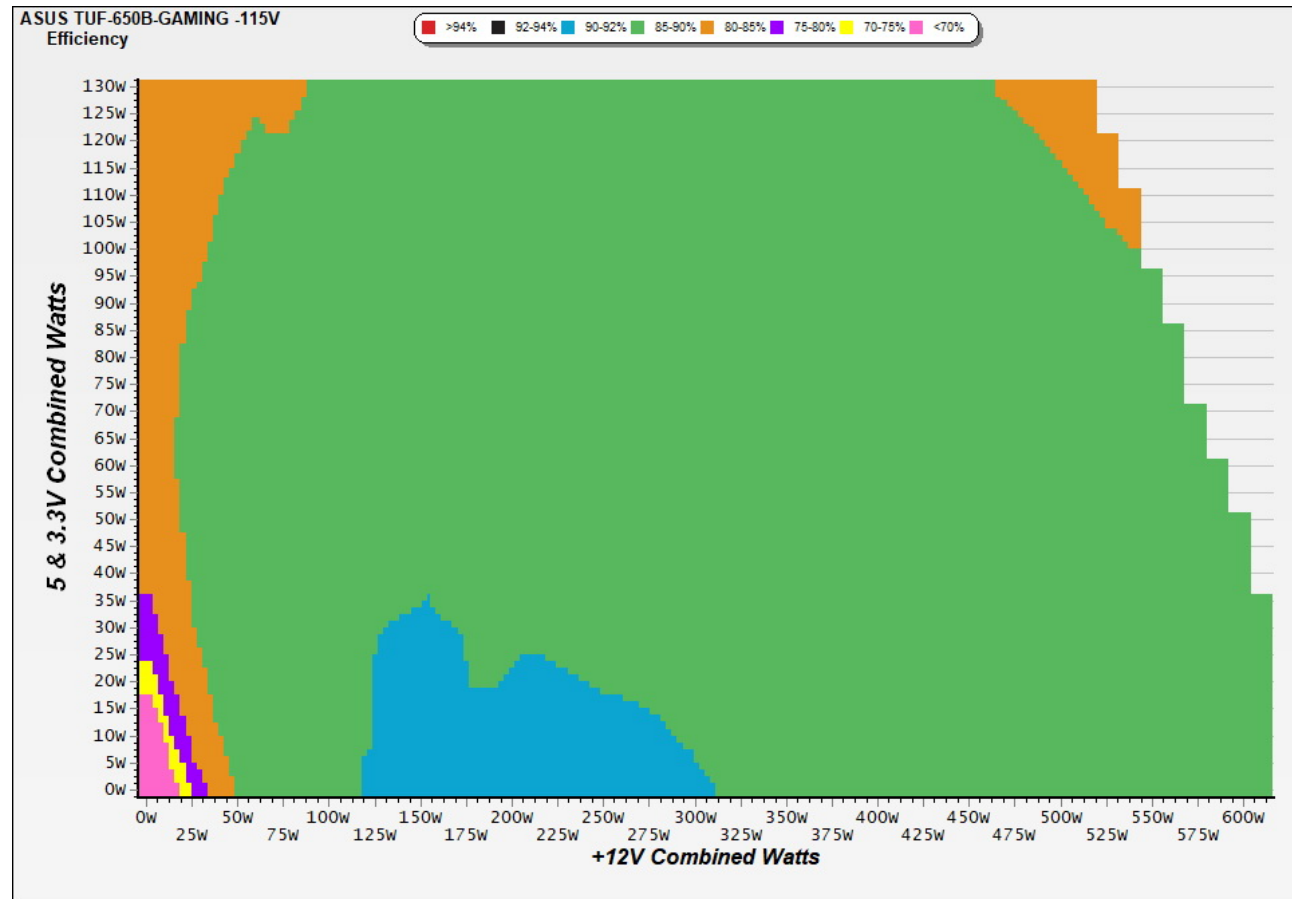
230V

Power - L7YEMT000207W5Y - 31/08/2020 - 10:25



## Efficiency Graph

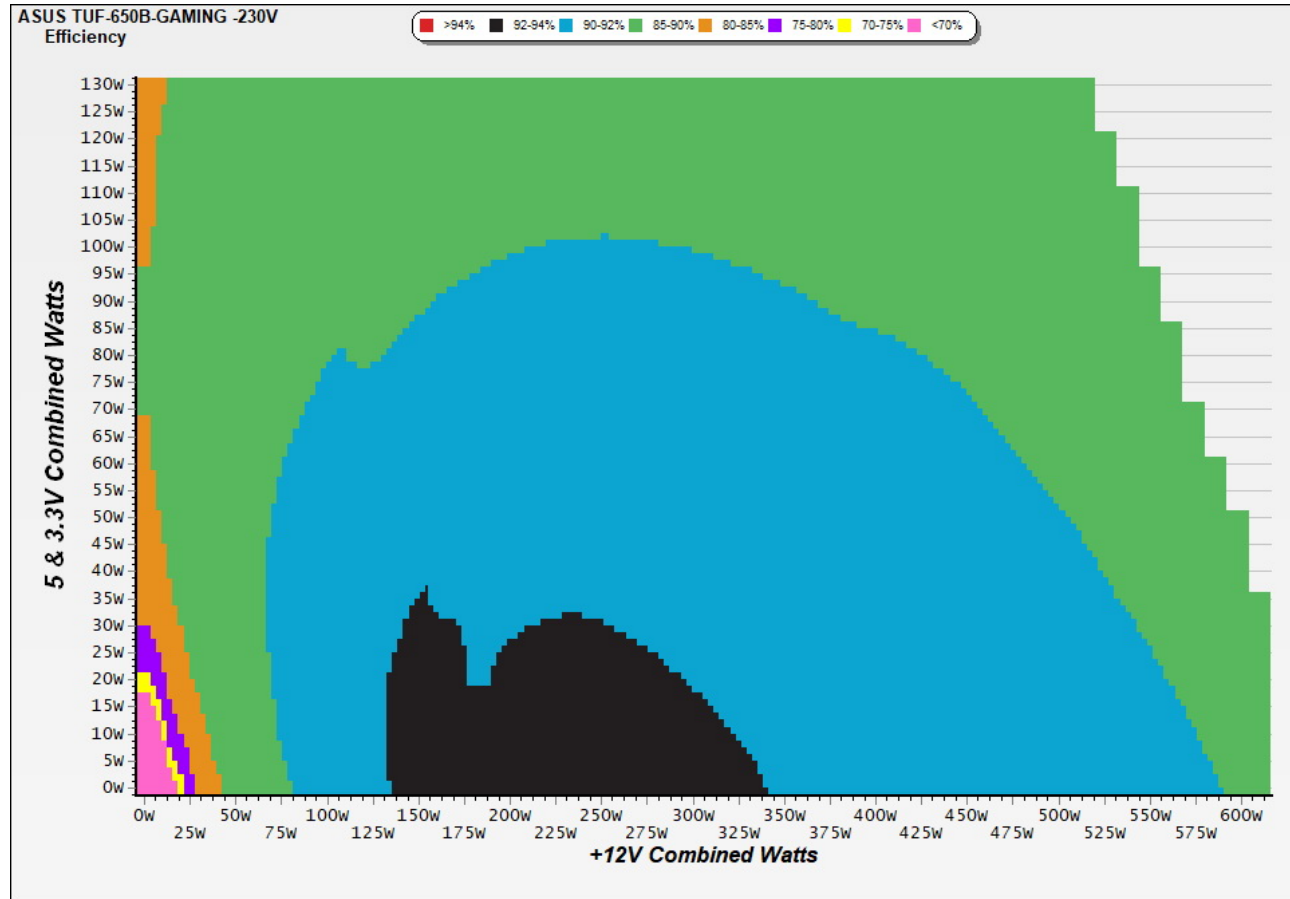
115V



### 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

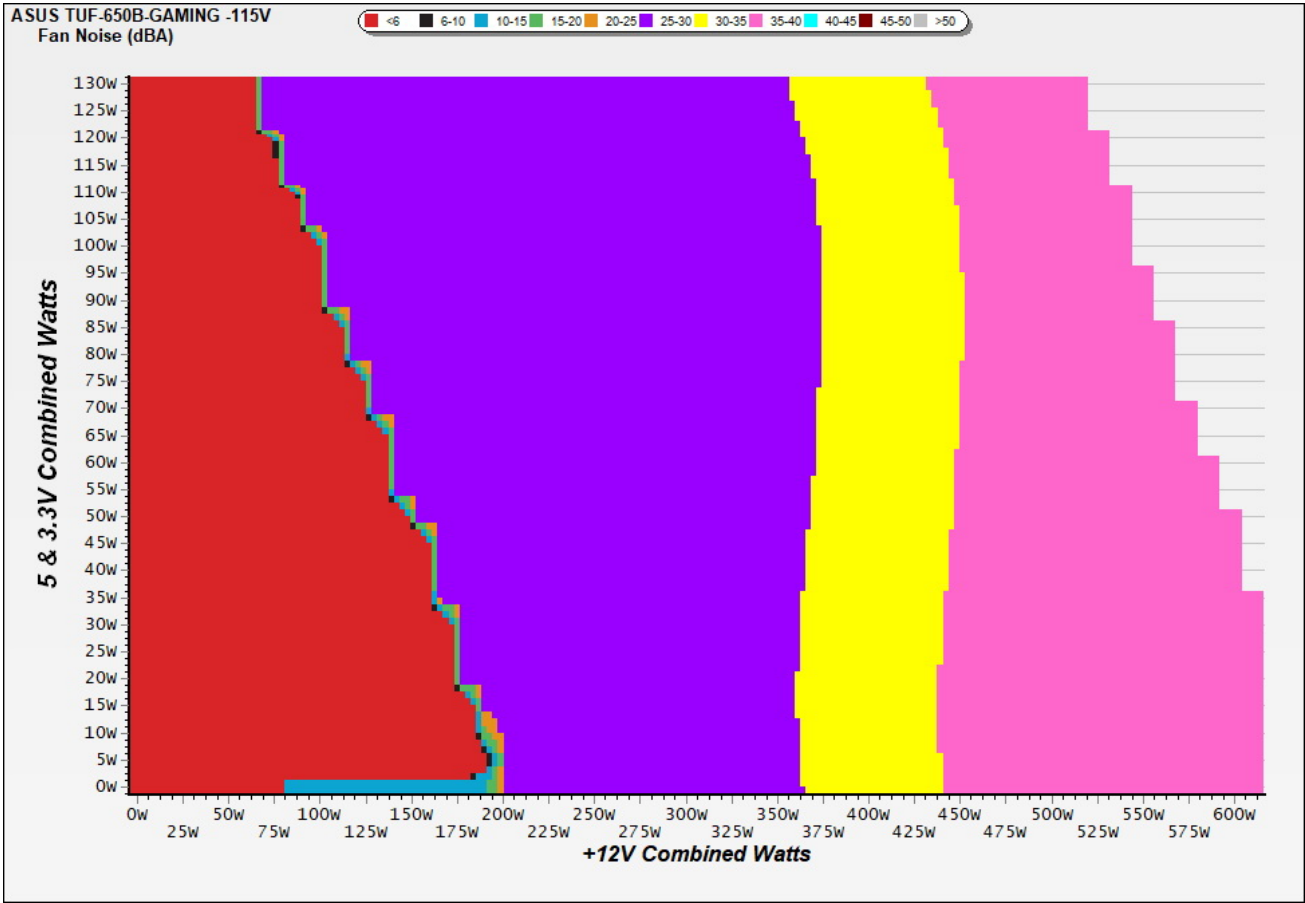


### INFO

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

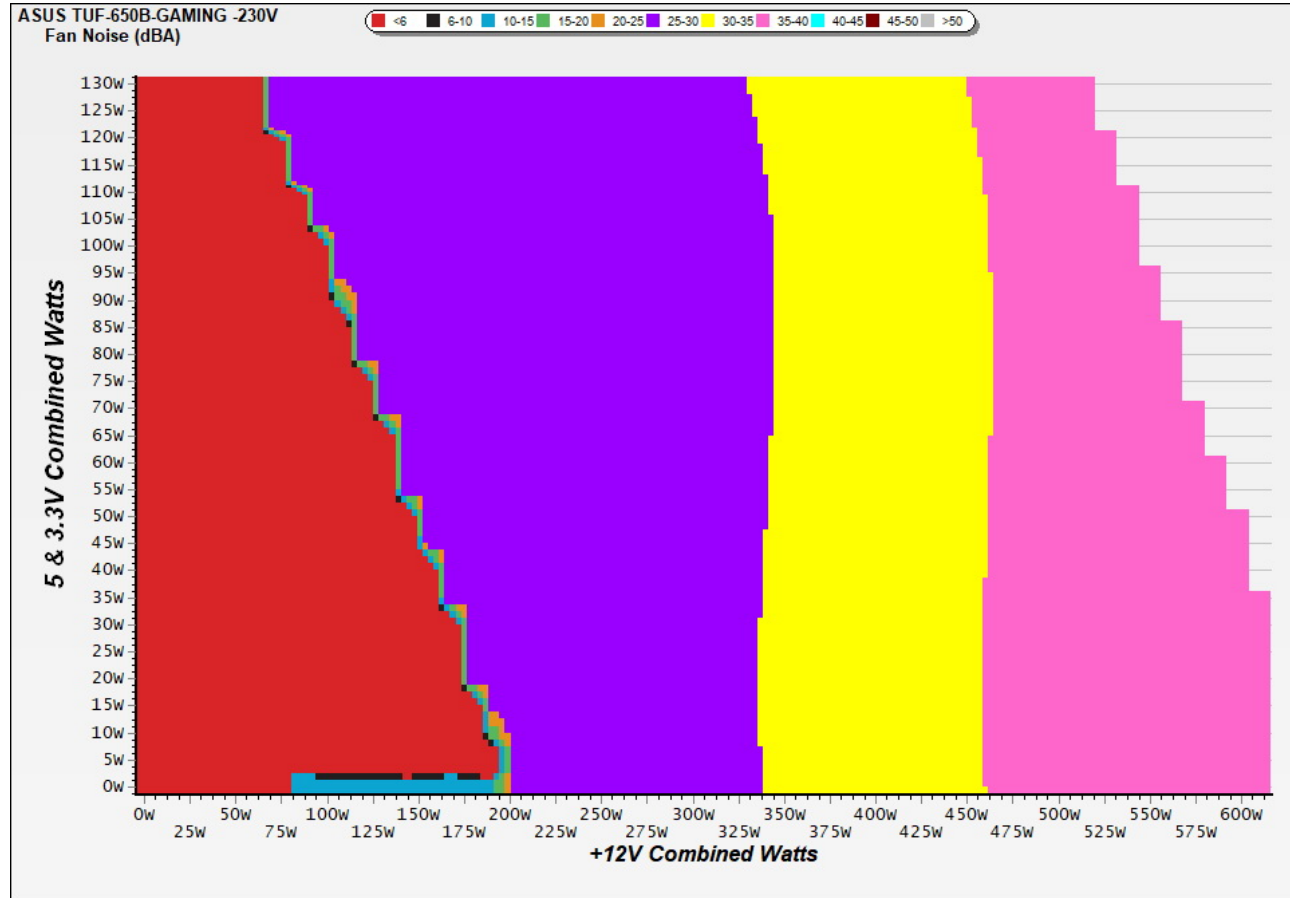
115V



## 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

## 230V



### INFO

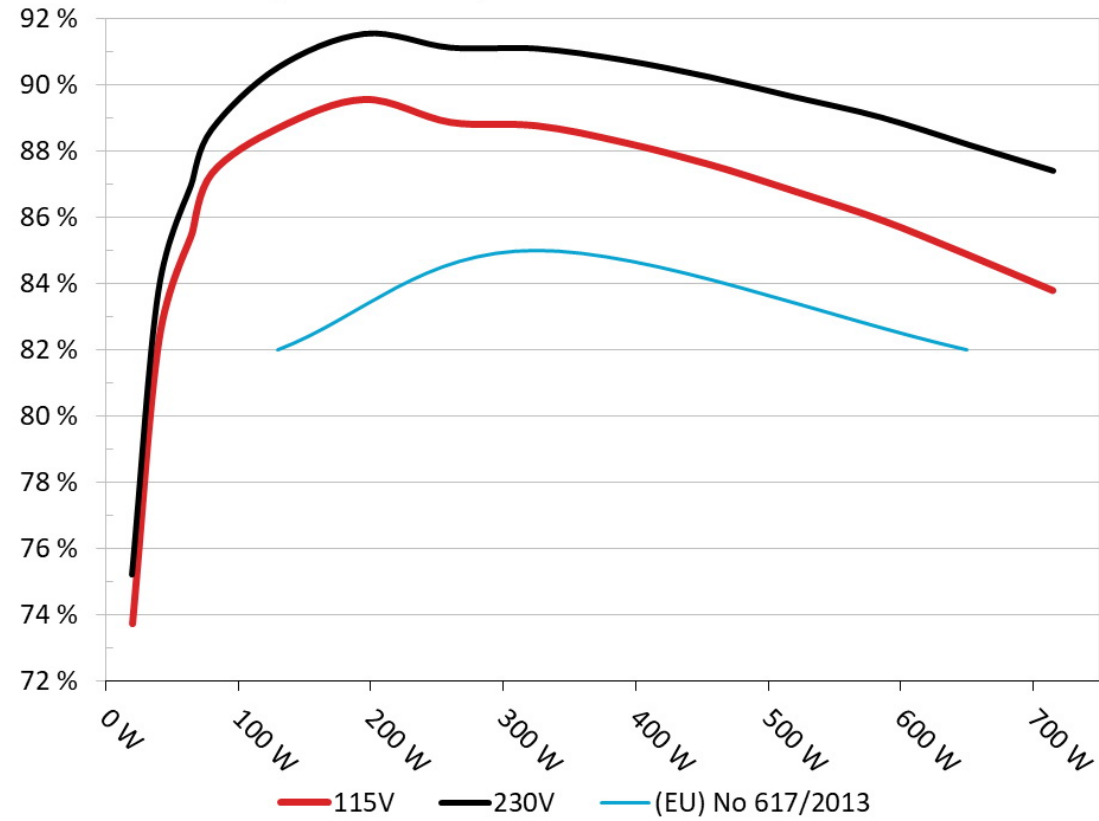
The PSU's noise in its entire operational range and under 30-32 °C ambient is depicted in this graph. The X axis represents the load on the +12V rail(s) while the Y axis is the load on the minor rails

## Indicative Performance

### Efficiency under high ambient temperature

Efficiency: ASUS TUF-650B-GAMING

Ambient: 37°C - 47°C (98.6°F - 116.6°F)



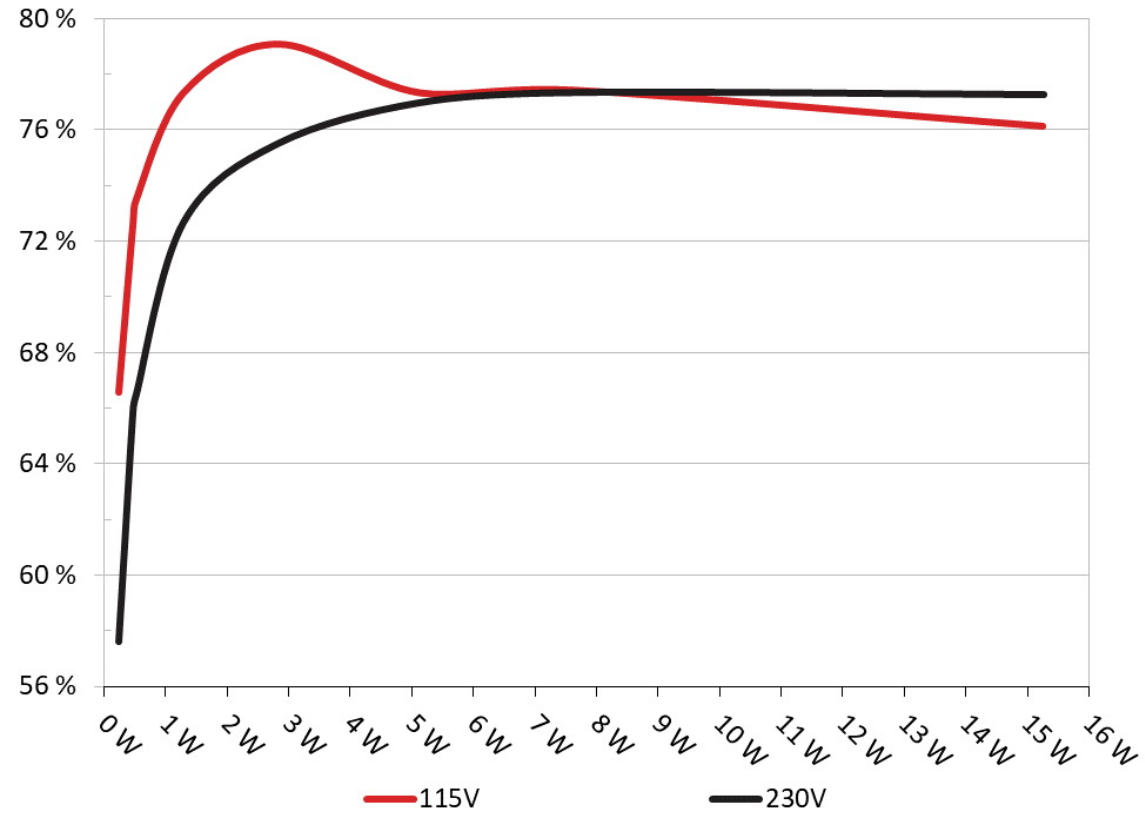
### INFO

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: ASUS TUF-650B-GAMING

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

### 5VSB Efficiency (ERP LOT 3/6 & CEC)

#### 115V

| Test # | 5VSB   | DC/AC (Watts) | Efficiency | PF/AC Volts |
|--------|--------|---------------|------------|-------------|
| 1      | 0.045A | 0.231         | 66.571%    | 0.031       |
|        | 5.133V | 0.347         |            | 115.13V     |
| 2      | 0.090A | 0.462         | 72.642%    | 0.056       |
|        | 5.133V | 0.636         |            | 115.13V     |
| 3      | 0.550A | 2.820         | 79.080%    | 0.231       |
|        | 5.125V | 3.566         |            | 115.13V     |
| 4      | 1.000A | 5.120         | 77.330%    | 0.310       |
|        | 5.119V | 6.621         |            | 115.13V     |
| 5      | 1.500A | 7.667         | 77.421%    | 0.352       |
|        | 5.111V | 9.903         |            | 115.13V     |
| 6      | 3.000A | 15.238        | 76.133%    | 0.410       |
|        | 5.079V | 20.015        |            | 115.13V     |

#### 230V

| Test # | 5VSB   | DC/AC (Watts) | Efficiency | PF/AC Volts |
|--------|--------|---------------|------------|-------------|
| 1      | 0.045A | 0.231         | 57.606%    | 0.011       |
|        | 5.133V | 0.401         |            | 230.27V     |
| 2      | 0.090A | 0.462         | 65.906%    | 0.019       |
|        | 5.133V | 0.701         |            | 230.27V     |
| 3      | 0.550A | 2.820         | 75.522%    | 0.095       |
|        | 5.126V | 3.734         |            | 230.27V     |
| 4      | 1.000A | 5.119         | 76.989%    | 0.154       |
|        | 5.118V | 6.649         |            | 230.27V     |
| 5      | 1.500A | 7.669         | 77.355%    | 0.203       |
|        | 5.112V | 9.914         |            | 230.27V     |
| 6      | 3.000A | 15.257        | 77.282%    | 0.288       |
|        | 5.085V | 19.742        |            | 230.27V     |

## 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      | 3.598A  | 1.961A  | 1.989A  | 0.979A | 64.972        | 85.416%    | 0               | <6.0              | 46.70°C        | 0.938       |
|        | 12.053V | 5.100V  | 3.320V  | 5.108V | 76.065        |            |                 |                   | 40.84°C        | 115.13V     |
| 2      | 8.232A  | 2.945A  | 2.985A  | 1.177A | 130.045       | 88.697%    | 0               | <6.0              | 47.77°C        | 0.960       |
|        | 12.043V | 5.094V  | 3.317V  | 5.100V | 146.617       |            |                 |                   | 40.91°C        | 115.13V     |
| 3      | 13.215A | 3.438A  | 3.484A  | 1.374A | 195.053       | 89.561%    | 0               | <6.0              | 48.86°C        | 0.972       |
|        | 12.032V | 5.090V  | 3.315V  | 5.095V | 217.787       |            |                 |                   | 41.19°C        | 115.13V     |
| 4      | 18.211A | 3.934A  | 3.987A  | 1.572A | 260.069       | 88.868%    | 1330            | 31.6              | 41.40°C        | 0.978       |
|        | 12.018V | 5.086V  | 3.311V  | 5.089V | 292.648       |            |                 |                   | 49.86°C        | 115.13V     |
| 5      | 22.872A | 4.924A  | 4.990A  | 1.771A | 325.116       | 88.767%    | 1346            | 32.0              | 42.32°C        | 0.983       |
|        | 12.006V | 5.079V  | 3.307V  | 5.084V | 366.257       |            |                 |                   | 51.54°C        | 115.13V     |
| 6      | 27.502A | 5.916A  | 5.993A  | 1.970A | 389.675       | 88.273%    | 1427            | 33.6              | 42.58°C        | 0.986       |
|        | 11.994V | 5.073V  | 3.304V  | 5.078V | 441.442       |            |                 |                   | 52.50°C        | 115.12V     |
| 7      | 32.201A | 6.911A  | 7.000A  | 2.170A | 454.986       | 87.602%    | 1588            | 36.5              | 43.29°C        | 0.988       |
|        | 11.983V | 5.066V  | 3.301V  | 5.071V | 519.377       |            |                 |                   | 53.74°C        | 115.12V     |
| 8      | 36.909A | 7.908A  | 8.006A  | 2.370A | 520.297       | 86.782%    | 1730            | 39.0              | 43.97°C        | 0.989       |
|        | 11.972V | 5.060V  | 3.298V  | 5.065V | 599.542       |            |                 |                   | 54.83°C        | 115.12V     |
| 9      | 42.024A | 8.410A  | 8.495A  | 2.372A | 585.217       | 85.918%    | 1857            | 41.1              | 44.49°C        | 0.991       |
|        | 11.962V | 5.056V  | 3.296V  | 5.061V | 681.132       |            |                 |                   | 56.41°C        | 115.12V     |
| 10     | 46.888A | 8.912A  | 9.018A  | 2.973A | 650.050       | 84.878%    | 1950            | 42.5              | 45.87°C        | 0.992       |
|        | 11.950V | 5.052V  | 3.294V  | 5.049V | 765.863       |            |                 |                   | 58.16°C        | 115.12V     |
| 11     | 52.356A | 8.915A  | 9.025A  | 2.974A | 714.865       | 83.787%    | 2047            | 43.7              | 46.57°C        | 0.993       |
|        | 11.940V | 5.050V  | 3.292V  | 5.045V | 853.197       |            |                 |                   | 59.38°C        | 115.11V     |
| CL1    | 0.102A  | 16.006A | 16.001A | 0.000A | 134.556       | 81.669%    | 0               | <6.0              | 51.37°C        | 0.964       |
|        | 12.030V | 5.027V  | 3.304V  | 5.095V | 164.758       |            |                 |                   | 42.67°C        | 115.13V     |

|     |         |        |        |        |         |         |      |      |         |         |
|-----|---------|--------|--------|--------|---------|---------|------|------|---------|---------|
| CL2 | 51.016A | 0.999A | 1.000A | 1.000A | 624.184 | 86.001% | 1964 | 42.5 | 45.60°C | 0.992   |
|     | 11.971V | 5.090V | 3.306V | 5.080V | 725.790 |         |      |      | 58.53°C | 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]) | Temps (In/Out) | PF/AC Volts |
|--------|---------|---------|---------|--------|---------------|------------|-----------------|-------------------|----------------|-------------|
| 1      | 3.598A  | 1.962A  | 1.988A  | 0.979A | 64.976        | 86.927%    | 0               | <6.0              | 46.92°C        | 0.789       |
|        | 12.054V | 5.100V  | 3.320V  | 5.107V | 74.748        |            |                 |                   | 40.63°C        | 230.28V     |
| 2      | 8.234A  | 2.943A  | 2.985A  | 1.177A | 130.054       | 90.510%    | 0               | <6.0              | 48.03°C        | 0.894       |
|        | 12.042V | 5.094V  | 3.318V  | 5.101V | 143.690       |            |                 |                   | 40.74°C        | 230.27V     |
| 3      | 13.215A | 3.438A  | 3.484A  | 1.374A | 195.069       | 91.530%    | 0               | <6.0              | 49.04°C        | 0.930       |
|        | 12.033V | 5.090V  | 3.316V  | 5.095V | 213.120       |            |                 |                   | 41.37°C        | 230.27V     |
| 4      | 18.213A | 3.934A  | 3.987A  | 1.572A | 260.078       | 91.114%    | 1317            | 31.5              | 41.73°C        | 0.949       |
|        | 12.017V | 5.086V  | 3.311V  | 5.091V | 285.443       |            |                 |                   | 50.44°C        | 230.28V     |
| 5      | 22.878A | 4.923A  | 4.988A  | 1.770A | 325.130       | 91.084%    | 1297            | 31.0              | 42.80°C        | 0.960       |
|        | 12.004V | 5.079V  | 3.307V  | 5.086V | 356.955       |            |                 |                   | 52.16°C        | 230.28V     |
| 6      | 27.507A | 5.916A  | 5.992A  | 1.969A | 389.701       | 90.744%    | 1439            | 34.0              | 43.08°C        | 0.966       |
|        | 11.993V | 5.073V  | 3.304V  | 5.079V | 429.451       |            |                 |                   | 53.14°C        | 230.28V     |
| 7      | 32.206A | 6.911A  | 7.000A  | 2.170A | 455.016       | 90.231%    | 1569            | 36.3              | 43.44°C        | 0.972       |
|        | 11.982V | 5.066V  | 3.301V  | 5.072V | 504.281       |            |                 |                   | 54.08°C        | 230.28V     |
| 8      | 36.914A | 7.909A  | 8.004A  | 2.370A | 520.328       | 89.614%    | 1733            | 39.0              | 43.81°C        | 0.975       |
|        | 11.971V | 5.060V  | 3.299V  | 5.066V | 580.631       |            |                 |                   | 55.38°C        | 230.27V     |
| 9      | 42.031A | 8.410A  | 8.498A  | 2.372A | 585.229       | 89.003%    | 1844            | 40.9              | 45.06°C        | 0.978       |
|        | 11.960V | 5.056V  | 3.296V  | 5.062V | 657.536       |            |                 |                   | 57.03°C        | 230.28V     |
| 10     | 46.893A | 8.915A  | 9.018A  | 2.972A | 650.074       | 88.191%    | 1960            | 42.5              | 46.59°C        | 0.981       |
|        | 11.949V | 5.052V  | 3.294V  | 5.049V | 737.118       |            |                 |                   | 58.89°C        | 230.28V     |
| 11     | 52.363A | 8.916A  | 9.023A  | 2.975A | 714.900       | 87.391%    | 2044            | 43.7              | 46.81°C        | 0.983       |
|        | 11.939V | 5.050V  | 3.292V  | 5.045V | 818.049       |            |                 |                   | 59.59°C        | 230.28V     |
| CL1    | 0.102A  | 16.006A | 16.003A | 0.000A | 134.578       | 83.390%    | 0               | <6.0              | 52.80°C        | 0.906       |
|        | 12.029V | 5.028V  | 3.304V  | 5.098V | 161.383       |            |                 |                   | 42.20°C        | 230.28V     |

|     |         |        |        |        |         |         |      |      |         |         |
|-----|---------|--------|--------|--------|---------|---------|------|------|---------|---------|
| CL2 | 51.026A | 1.000A | 1.001A | 1.000A | 624.163 | 89.254% | 1945 | 42.4 | 46.02°C | 0.980   |
|     | 11.968V | 5.091V | 3.305V | 5.084V | 699.314 |         |      |      | 58.74°C | 230.28V |

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      | 1.231A  | 0.490A | 0.497A | 0.195A | 20.000        | 73.714%    | 0               | <6.0              | 0.847       |
|        | 12.061V | 5.108V | 3.323V | 5.126V | 27.132        |            |                 |                   | 115.14V     |
| 2      | 2.462A  | 0.980A | 0.994A | 0.391A | 39.990        | 82.304%    | 0               | <6.0              | 0.911       |
|        | 12.057V | 5.105V | 3.321V | 5.121V | 48.588        |            |                 |                   | 115.14V     |
| 3      | 3.698A  | 1.469A | 1.491A | 0.587A | 60.021        | 85.521%    | 0               | <6.0              | 0.934       |
|        | 12.053V | 5.102V | 3.320V | 5.117V | 70.183        |            |                 |                   | 115.13V     |
| 4      | 4.927A  | 1.962A | 1.987A | 0.783A | 79.972        | 87.330%    | 0               | <6.0              | 0.945       |
|        | 12.050V | 5.099V | 3.319V | 5.112V | 91.574        |            |                 |                   | 115.13V     |

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      | 1.231A  | 0.490A | 0.497A | 0.195A | 20.002        | 75.195%    | 0               | <6.0              | 0.495       |
|        | 12.062V | 5.108V | 3.322V | 5.127V | 26.600        |            |                 |                   | 230.26V     |
| 2      | 2.462A  | 0.980A | 0.994A | 0.391A | 39.993        | 83.769%    | 0               | <6.0              | 0.676       |
|        | 12.058V | 5.106V | 3.321V | 5.122V | 47.742        |            |                 |                   | 230.26V     |
| 3      | 3.698A  | 1.469A | 1.490A | 0.587A | 60.025        | 87.010%    | 0               | <6.0              | 0.771       |
|        | 12.054V | 5.103V | 3.321V | 5.117V | 68.986        |            |                 |                   | 230.28V     |
| 4      | 4.927A  | 1.961A | 1.987A | 0.783A | 79.976        | 88.636%    | 0               | <6.0              | 0.825       |
|        | 12.051V | 5.100V | 3.320V | 5.113V | 90.230        |            |                 |                   | 230.27V     |

The results above are not used in the certification process

## Ripple Measurements

### 115V

| Test       | 12V     | 5V      | 3.3V    | 5VSB    | Pass/Fail |
|------------|---------|---------|---------|---------|-----------|
| 10% Load   | 16.90mV | 13.20mV | 12.90mV | 9.50mV  | Pass      |
| 20% Load   | 15.40mV | 15.20mV | 14.10mV | 11.30mV | Pass      |
| 30% Load   | 15.20mV | 17.10mV | 15.30mV | 16.60mV | Pass      |
| 40% Load   | 16.00mV | 19.40mV | 16.20mV | 17.60mV | Pass      |
| 50% Load   | 18.10mV | 19.70mV | 17.80mV | 20.00mV | Pass      |
| 60% Load   | 20.60mV | 20.80mV | 17.20mV | 21.40mV | Pass      |
| 70% Load   | 21.60mV | 20.80mV | 17.80mV | 21.70mV | Pass      |
| 80% Load   | 23.30mV | 21.50mV | 19.30mV | 24.40mV | Pass      |
| 90% Load   | 25.90mV | 22.60mV | 19.80mV | 25.40mV | Pass      |
| 100% Load  | 37.90mV | 24.40mV | 21.90mV | 31.40mV | Pass      |
| 110% Load  | 40.00mV | 24.80mV | 22.10mV | 32.10mV | Pass      |
| Crossload1 | 21.20mV | 20.00mV | 19.70mV | 11.20mV | Pass      |
| Crossload2 | 33.40mV | 22.10mV | 19.90mV | 21.50mV | Pass      |

The results above are not used in the certification process

### 230V

| Test     | 12V     | 5V      | 3.3V    | 5VSB    | Pass/Fail |
|----------|---------|---------|---------|---------|-----------|
| 10% Load | 19.00mV | 11.90mV | 10.60mV | 9.20mV  | Pass      |
| 20% Load | 16.20mV | 13.10mV | 11.90mV | 10.80mV | Pass      |
| 30% Load | 12.10mV | 13.40mV | 12.20mV | 15.50mV | Pass      |
| 40% Load | 14.20mV | 15.90mV | 13.00mV | 16.70mV | Pass      |
| 50% Load | 16.10mV | 16.20mV | 14.10mV | 19.20mV | Pass      |
| 60% Load | 18.70mV | 17.50mV | 15.90mV | 20.30mV | Pass      |
| 70% Load | 20.10mV | 18.00mV | 16.60mV | 20.60mV | Pass      |
| 80% Load | 22.00mV | 19.60mV | 18.20mV | 23.00mV | Pass      |

| Test       | 12V     | 5V      | 3.3V    | 5VSB    | Pass/Fail |
|------------|---------|---------|---------|---------|-----------|
| 90% Load   | 27.00mV | 21.40mV | 19.50mV | 25.30mV | Pass      |
| 100% Load  | 38.60mV | 23.80mV | 22.40mV | 29.60mV | Pass      |
| 110% Load  | 40.10mV | 24.10mV | 22.40mV | 31.30mV | Pass      |
| Crossload1 | 20.40mV | 17.10mV | 18.70mV | 10.50mV | Pass      |
| Crossload2 | 35.70mV | 21.00mV | 20.90mV | 21.60mV | Pass      |

The results above are not used in the certification process

## ASUS TUF-650B-GAMING



Top side



Power specifications label

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