

## CNS650-M Series

650 Watt AC-DC Power Supplies

### Data Sheet

**Total Power:** 650 Watts  
**Input Voltage:** 90 - 264 V  
**# of Outputs:** Single



### SPECIAL FEATURES

- Designed for forced air and natural convection cooling
- Medical and ITE safety approvals, 2x MOPP
- PMBus® interface
- Active current share with OR-ing FET
- Dual fused
- Type BF ready
- Active Power Factor Correction, 61000-3-2 compliant
- Built-in Class B EMI filter
- Less than 1U high
- 4" x 6" U-channel construction (open-frame or end-fan variants available for 12 V)
- <500 mW no-load power consumption
- 80 PLUS® certified (-ME model)
- Three-year warranty (consult factory for extended terms)

### Electrical Specifications

| Input               |                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------|
| Input voltage range | 90 - 264 Vac; 127 - 350 Vdc                                                                       |
| Frequency           | 47 - 63 Hz (360 - 440 Hz with higher leakage)                                                     |
| Inrush current      | 50 Apk, cold start                                                                                |
| Leakage current     | <300 µA (using UL test method)                                                                    |
| No load power       | < 500 mW                                                                                          |
| Output              |                                                                                                   |
| Maximum power       | 650 W, forced-air cooling (750 W peak)<br>400 W, free-air natural convection cooling (650 W peak) |
| Adjustment range    | -0% / +15%                                                                                        |
| Holdup time         | 20 ms @ 400 W                                                                                     |
| Fan output          | 12 V @ 1.0 A (forced air)<br>12 V @ 0.5 A (natural convection)                                    |
| Standby output      | 5 V @ 2.0 A (forced air)<br>5 V @ 1.0 A (natural convection)                                      |

### SAFETY

- UL/CSA ES60601-1/C22.2  
No. 60601-1  
UL/CSA 62368-1
- TÜV EN 60601-1
- DEMKO EN 62368-1
- CB IEC 60950-1  
IEC 60601-1  
IEC 62368-1
- CCC GB4943.1/GB9254;  
GB17625.1
- CE LVD, RoHS

\*\* CNS650-M tested according to the medical standard IEC 60601-1-2 4th Edition.

## Electrical Specifications (continued)

### Control and Protection

|                            |                                                                                                                  |
|----------------------------|------------------------------------------------------------------------------------------------------------------|
| Serial bus interface       | PMBus®                                                                                                           |
| Current share              | Active                                                                                                           |
| Remote sense               | 2-wire (+ and -)                                                                                                 |
| Remote inhibit             | Pull inhibit low = main & fan output OFF (5 V standby is ON)<br>Pull inhibit high (or floating) = all outputs ON |
| AC OK                      | Active high when normal AC input is present (with internal 10k ohm pull up to 3.3 Vdc)                           |
| DC OK                      | Active high when main O/P is within regulation (with internal 10k ohm pull up to 3.3 Vdc)                        |
| Smart fan control          | Monitor, control and override                                                                                    |
| Overvoltage protection     | Latching / AC recyle or inhibit toggle required for PSU restart                                                  |
| Overload protection        | Auto-recovery (Constant current mode down to 50% Vout)                                                           |
| Overtemperature protection | Auto-recovery with hysteresis                                                                                    |

## Environmental Specifications

|                        |                                                       |
|------------------------|-------------------------------------------------------|
| Operating temperature  | -20 °C to +80 °C (derate at 50 °C), startup at -40 °C |
| Storage temperature    | -40 °C to +85 °C                                      |
| Operating humidity     | 5% to 95% (non-condensing)                            |
| Non-operating humidity | 5% to 95% (non-condensing)                            |
| Maximum altitude       | 5000 m (3000 m for medical), derating may apply       |

## Other Specifications

|                                                |                                                                                    |
|------------------------------------------------|------------------------------------------------------------------------------------|
| Isolation                                      | 4000 Vac (input to output)<br>1500 Vac (input to PE; output to PE)                 |
| Line harmonics                                 | 61000-3-2, Class A                                                                 |
| ESD immunity                                   | 61000-4-2; ±15kV (air)/±8kV (contact); Criterion A                                 |
| Conducted EMI                                  | Level B, CISPR 22 and FCC Part 15                                                  |
| Radiated EMI                                   | Level B, CISPR 22 and FCC Part 15 (with cover)                                     |
| Surge immunity                                 | 61000-4-5, Level 3 - Criterion A; Level 4 - Criterion C                            |
| Medical EMC                                    | 60601-1-2, Edition 4 (cover maybe required for some tests)                         |
| MTBF<br>(Telcordia, Issue 3, Method 1, Case 3) | > 950 KHrs, 25 °C, 410 W natural convection<br>> 1.3 MHrs, 25 °C, 650 W forced air |

## Ordering Information

| Model Number             | Output Voltage | Vout Adjust Range (-0% / +15%) | Minimum Load | Max. Continuous Load (Free Air) | Max. Peak Load (Free Air) <sup>1</sup> | Max. Continuous Load (Forced Air) <sup>2</sup> | Max. Peak Load (Forced Air) <sup>2</sup> | Regulation <sup>3</sup> | Ripple (p-p) <sup>4</sup> |
|--------------------------|----------------|--------------------------------|--------------|---------------------------------|----------------------------------------|------------------------------------------------|------------------------------------------|-------------------------|---------------------------|
| CNS653-ME <sup>5,6</sup> | 12 V           | 12 - 13.8 V                    | 0 A          | 54.2 A                          | 62.5 A                                 | NA                                             | NA                                       | ±2%                     | 120 mV                    |
| CNS653-MF <sup>5</sup>   | 12 V           | 12 - 13.8 V                    | 0 A          | 30.8 A                          | 54.2 A                                 | 54.2 A                                         | 62.5 A                                   | ±2%                     | 120 mV                    |
| CNS653-MU                | 12 V           | 12 - 13.8 V                    | 0 A          | 33.3 A                          | 54.2 A                                 | 54.2 A                                         | 62.5 A                                   | ±2%                     | 120 mV                    |
| CNS655-MU                | 24 V           | 24 - 27.6 V                    | 0 A          | 16.7 A                          | 27.1 A                                 | 27.1 A                                         | 31.3 A                                   | ±2%                     | 240 mV                    |
| CNS658-MU                | 48 V           | 48 - 55.2 V                    | 0 A          | 8.3 A                           | 13.5 A                                 | 13.5 A                                         | 15.6 A                                   | ±2%                     | 480 mV                    |

<sup>1</sup> Peak load current not to exceed 10 seconds, Ta = 50 °C.

<sup>2</sup> Requires at least 400 LFM of airflow.

<sup>3</sup> At 25 °C including factory setpoint, line voltage and load current variations.

<sup>4</sup> Peak-to-peak ripple measured at the output terminal with 20 MHz bandwidth and 10 µF (tantalum capacitor) in parallel with 0.1 µF capacitor across the output.

<sup>5</sup> Optional suffix "-ME" (end-fan) and "-MF" (open-frame) available on the 12 V output.

<sup>6</sup> 80 PLUS certified.

## Input Connections (-MU and -MF Suffix)

| Pin | Function   | Power Supply Side                         | System Side                           |
|-----|------------|-------------------------------------------|---------------------------------------|
| TB1 | PE         | Dinkle EHK762V-03P<br>Max Torque: 4kgf-cm | Recommended Wire Size: AWG #22 to #14 |
| TB2 | L2/Neutral |                                           |                                       |
| TB3 | L1/Line    |                                           |                                       |

## Input Connections (-ME Suffix)

| Pin       | Function | Power Supply Side    | System Side           |
|-----------|----------|----------------------|-----------------------|
| IEC Inlet | Input AC | IEC 60320 C14 (Male) | IEC Cord C13 (Female) |

## Output Connections

| Pin  | Function | Power Supply Side                                           | System Side                                                                                                  |
|------|----------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| BAR1 | -Vout    | Output Terminal Screw:<br>M4X8 (4X)<br>Max Torque: 10kgf-cm | Molex 19099-0032 or<br>19141-0063 for AWG #16 to #14<br>Molex 19099-0048 or<br>19141-0083 for AWG #12 to #10 |
| BAR2 | -Vout    |                                                             |                                                                                                              |
| BAR3 | +Vout    |                                                             |                                                                                                              |
| BAR4 | +Vout    |                                                             |                                                                                                              |

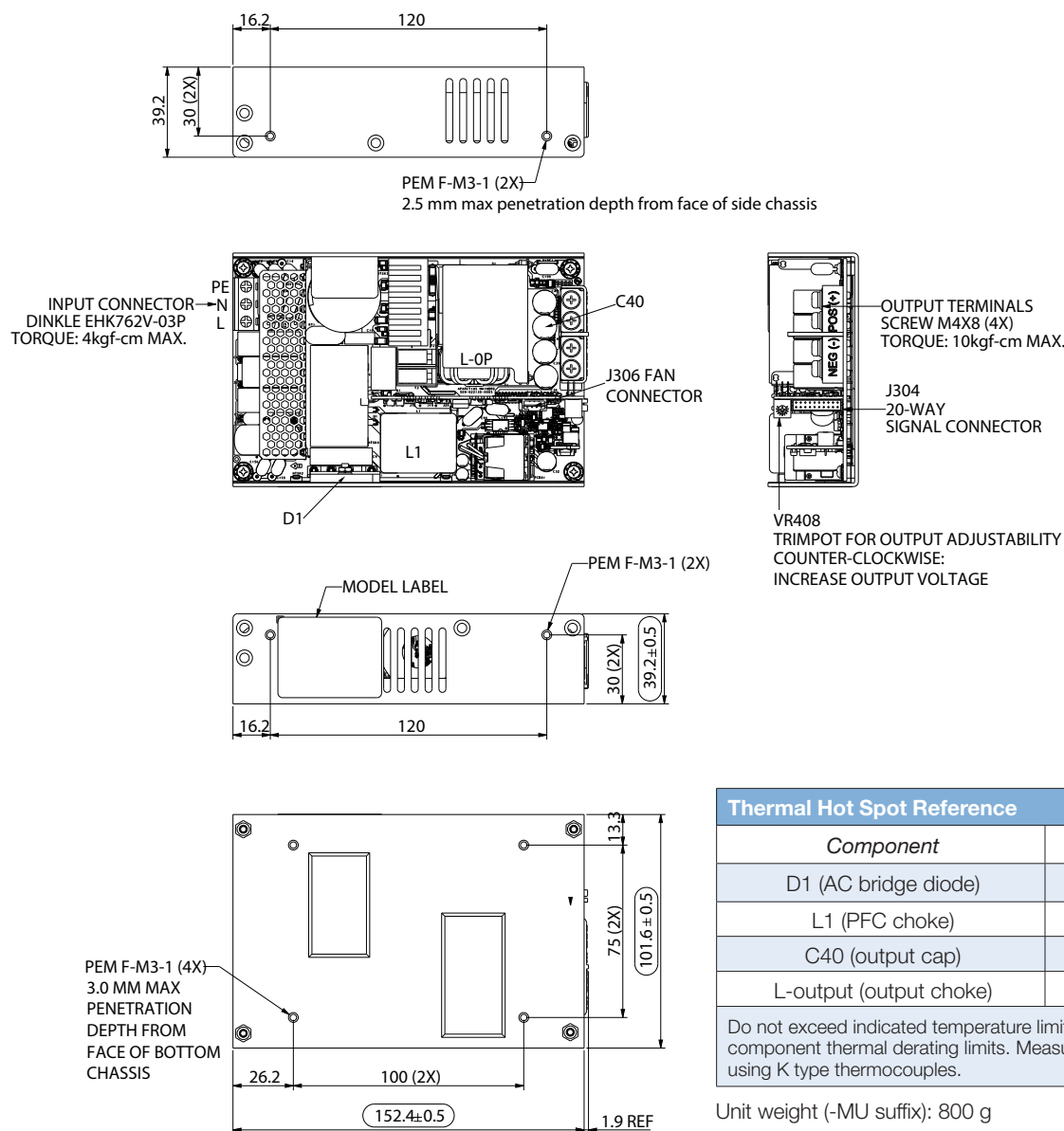
## Other Output and Control Connections (Connector J304)

| Pin | Designation    | Description                       |                                                                                                      |
|-----|----------------|-----------------------------------|------------------------------------------------------------------------------------------------------|
| 1   | 5VSB           | +5 V Standby Output               | <b>J304 20-Pin Connector (PSU Side):</b><br>Landwin: 2052P20008T or<br>CviLux: CI0120P1HD0-LF        |
| 2   | 5VSB           | +5 V Standby Output               |                                                                                                      |
| 3   | 5VSB_GND       | +5 V Standby Output Return/Ground |                                                                                                      |
| 4   | SCL            | Serial Clock Signal (I2C)         | <b>Recommended Mating Connectors:</b><br>CviLux: CI0120SD000 (housing)<br>CI01TD21PE0 (contact pins) |
| 5   | A0             | EEPROM Address                    |                                                                                                      |
| 6   | SDA            | Serial Data Signal (I2C)          |                                                                                                      |
| 7   | I_SHARE        | Active current share pin          | Landwin: 2050S2000 (housing)<br>2053T021V (contact pins)                                             |
| 8   | SYS_GND        | Return Ground for signals and I2C |                                                                                                      |
| 9   | 12VFAN         | 12 V Fan Output                   |                                                                                                      |
| 10  | REMOTE INHIBIT | Output Inhibit Pin (Main Output)  | JST: PHDR-20VS (housing)                                                                             |
| 11  | FAN_RTN        | 12 V Fan Output Return/Ground     | SPHD-001T-P0.5 (contact pins)                                                                        |
| 12  | VIN_GOOD       | Input Line OK Signal              | <b>See ACCESSORIES Section</b>                                                                       |
| 13  | FAN_PWM1       | FAN PWM                           |                                                                                                      |
| 14  | PWOK           | Output Power OK Signal            |                                                                                                      |
| 15  | FAN_TACH1      | Fan1 Tacho Signal                 |                                                                                                      |
| 16  | FAN_OVERRIDE   | External Fan Sensor for Override  |                                                                                                      |
| 17  | FAN_FAIL       | Fan Fail Signal                   |                                                                                                      |
| 18  | FAN_FAULT_EN   | FAN Fault Enable Due to low RPM   |                                                                                                      |
| 19  | REMOTE_SENSE+  | Positive Remote Sense             |                                                                                                      |
| 20  | REMOTE_SENSE-  | Remote Sense Return               |                                                                                                      |

## Fan Output Connector for -MU, -MF Suffix (Connector J306)

| Pin | Function  | Description      |                                         |
|-----|-----------|------------------|-----------------------------------------|
| 1   | 12VFAN    | 12 V fan output  | <b>J306 4-Pin Connector (PSU Side):</b> |
| 2   | FAN_RTN   | 12 V fan return  | CviLux: CI0104P1HK0-LF                  |
| 3   | FAN_PWM1  | Fan PWM          | Landwin: 2003P0401V                     |
| 4   | FAN_TACH1 | Fan1 tach signal | <b>Recommended Mating Connectors:</b>   |
|     |           |                  | CviLux: CI0104S0000 (housing)           |
|     |           |                  | CviLux: CI01T01MPP0 (contact pins)      |
|     |           |                  | Landwin: 2001S0400 (housing)            |
|     |           |                  | Landwin: 2005T011R (contact pins)       |

## Mechanical Drawings (“-MU” Suffix for U-Base Construction/12 V, 24 V and 48 V)

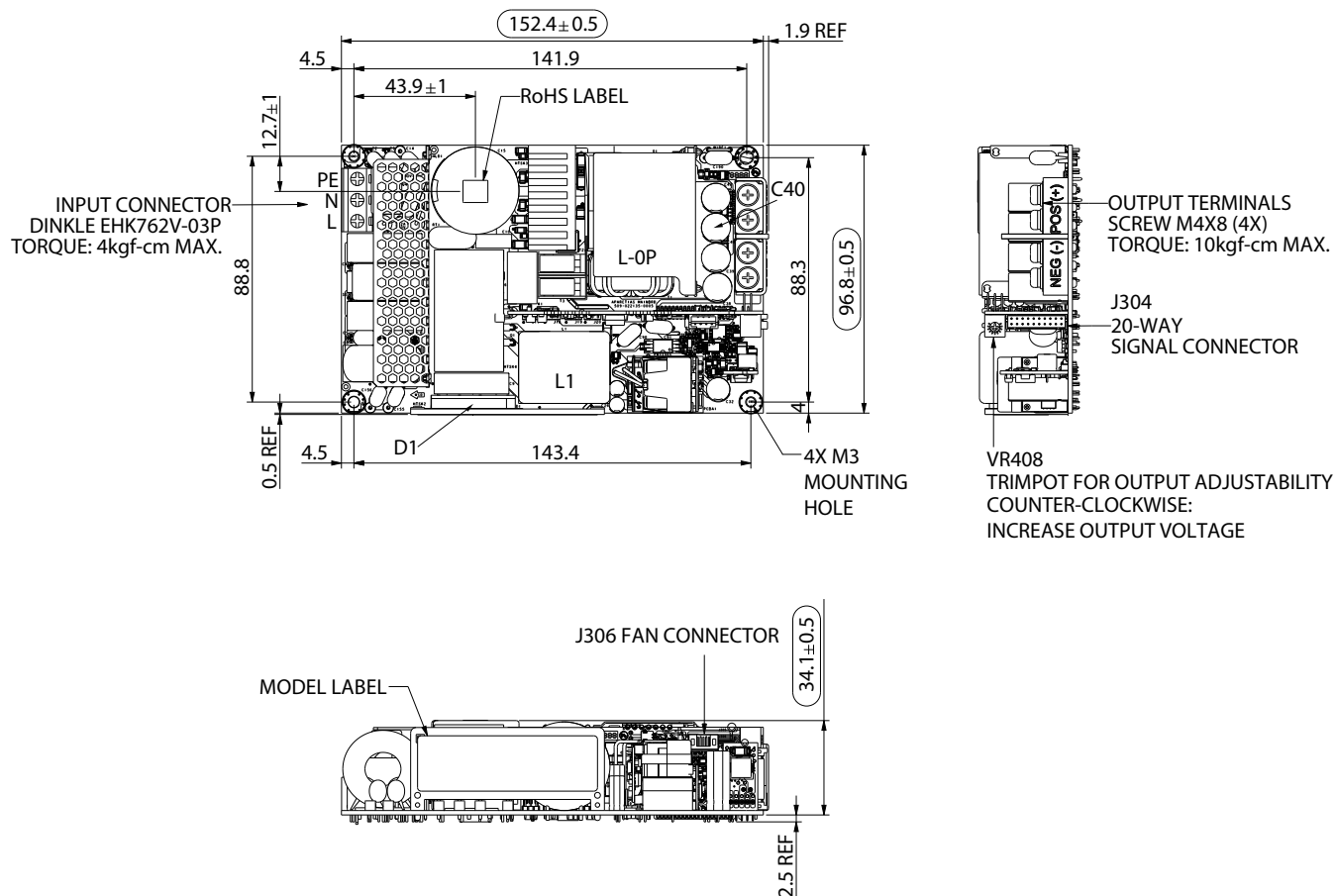


## Thermal Hot Spot Reference

| Component                                                                                                                                                                      | Temperature Limit (-MU) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| D1 (AC bridge diode)                                                                                                                                                           | 105 °C                  |
| L1 (PFC choke)                                                                                                                                                                 | 115 °C                  |
| C40 (output cap)                                                                                                                                                               | 100 °C                  |
| L-output (output choke)                                                                                                                                                        | 125 °C                  |
| Do not exceed indicated temperature limits to ensure operation is within the component thermal derating limits. Measure the component temperatures using K type thermocouples. |                         |

Unit weight (-MU suffix): 800 g

## Mechanical Drawings ("MF" Suffix for Open-frame Construction/12 V only)



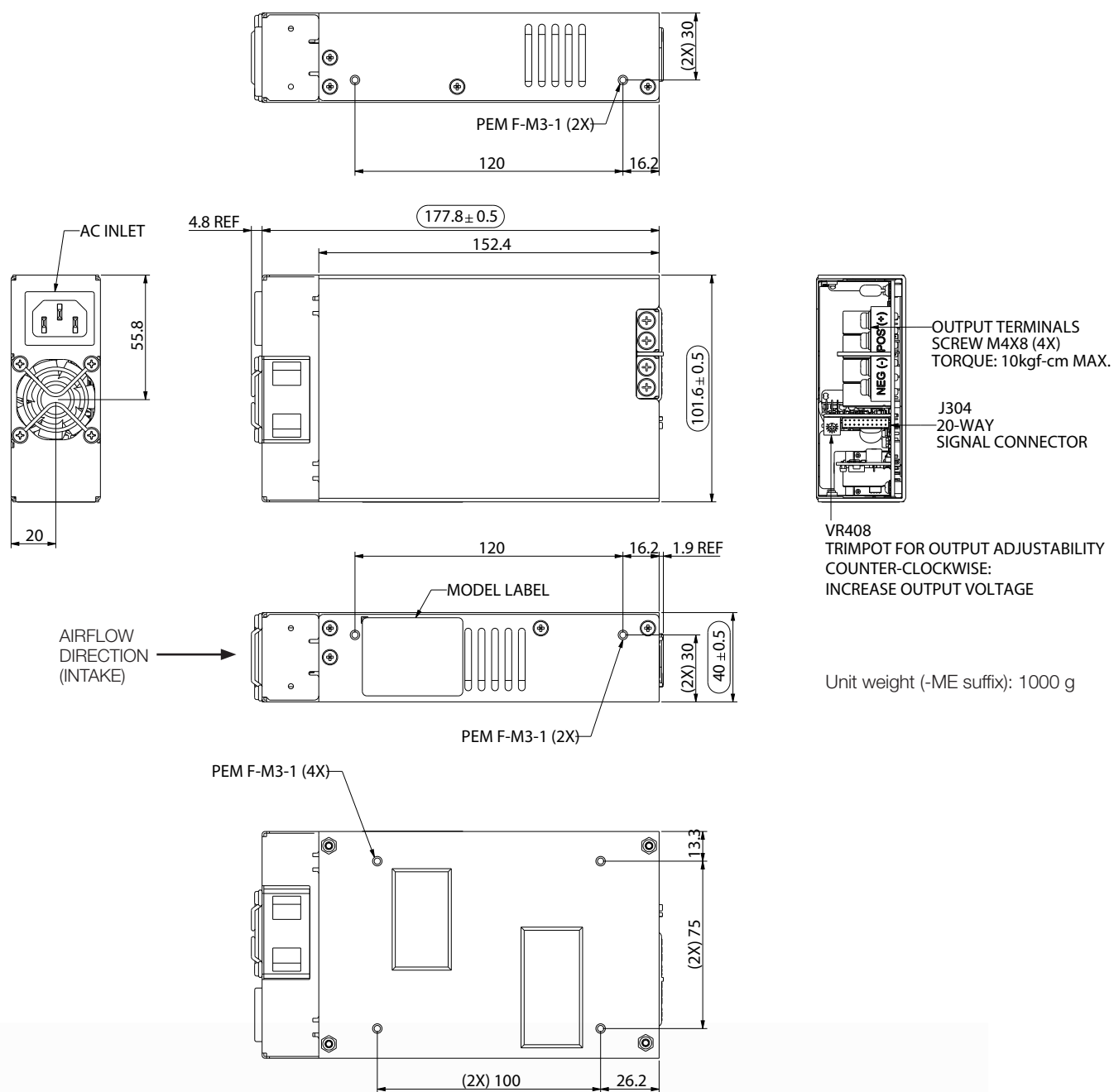
## Thermal Hot Spot Reference

| Component               | Temperature Limit (-MF) |
|-------------------------|-------------------------|
| D1 (AC bridge diode)    | 120 °C                  |
| L1 (PFC choke)          | 120°C                   |
| C40 (output cap)        | 100 °C                  |
| L-output (output choke) | 125 °C                  |

Do not exceed indicated temperature limits to ensure operation is within the component thermal derating limits. Measure the component temperatures using K type thermocouples.

Unit weight (-MF suffix): 650 g

# Mechanical Drawings (“-ME” Suffix for End-fan Construction/12 V only)



## Performance Curves

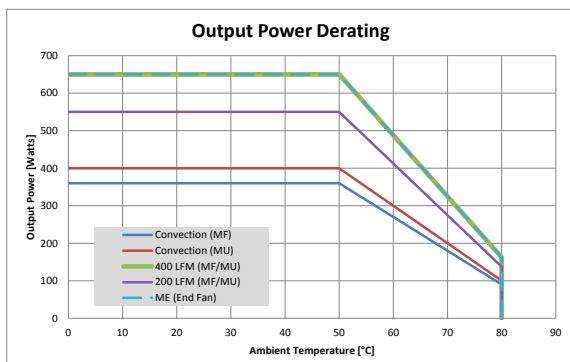


Figure 1. Output Power vs. Ambient Temperature at Natural Convection and Forced Air Cooling

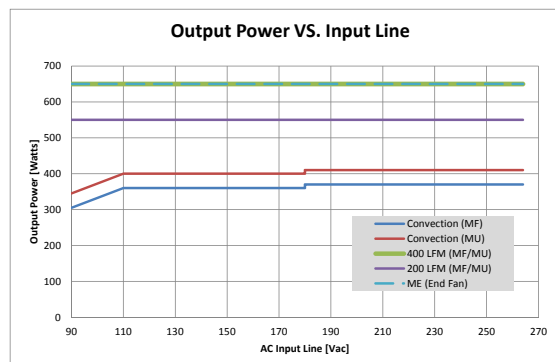


Figure 2. Output Power vs. Input Line at Natural Convection and Forced Air Cooling

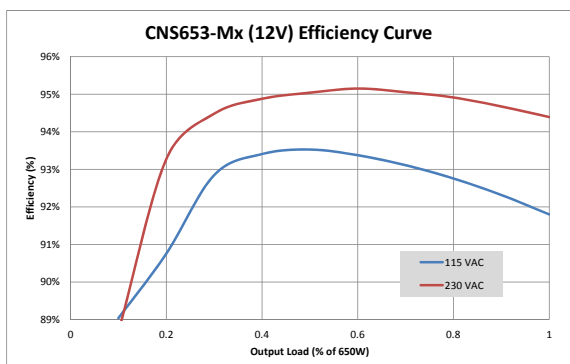


Figure 3. Typical Efficiency for 12 V Output

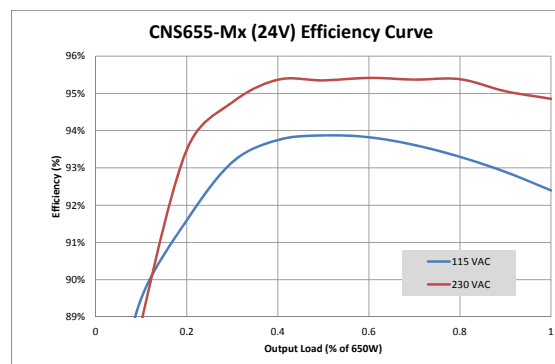


Figure 4. Typical Efficiency for 24 V Output

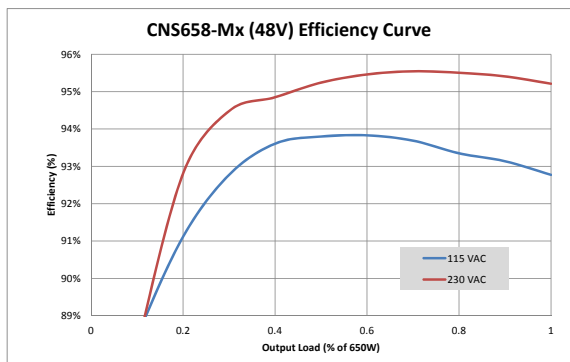


Figure 5. Typical Efficiency for 48 V Output

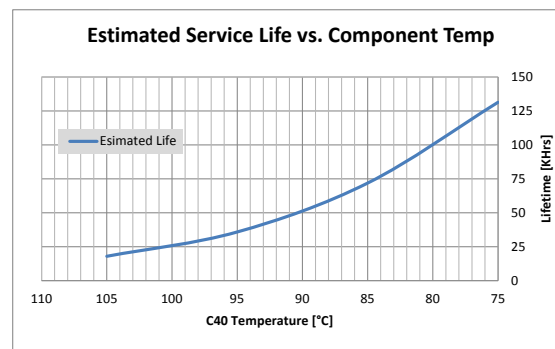


Figure 6. Estimated Product Useful Life Based on C40 Case Temperature

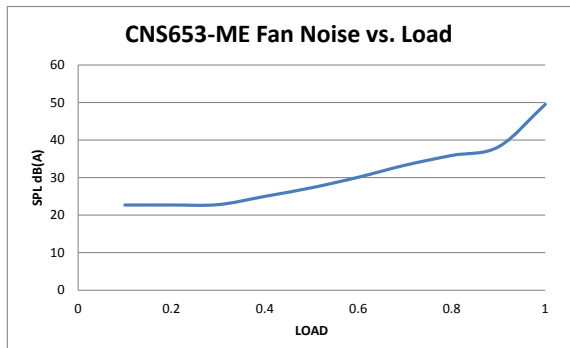
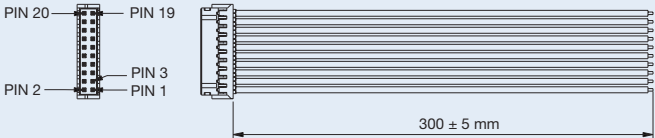
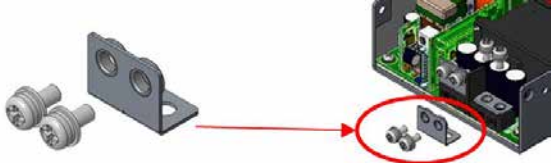


Figure 7. CNS653-ME (End Fan) typical audible noise level vs. Output Load at 90 VAC, ~30 °C Ambient.

## Accessories

| Orderable Part Number | Description                                              | Description                                                                        |
|-----------------------|----------------------------------------------------------|------------------------------------------------------------------------------------|
| 73-788-001            | J304 (20 Pin) Mating Connector with 0.3 m wires attached |  |
| CNS-BBAR-KIT          | Output Bussbar Extension Kit for Vertical Wire Interface |  |
| 73-769-002            | USB to I <sup>2</sup> C Adaptor for PMBus Communication  |  |

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- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
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