

# ARTESYN LCC600

600 Watts Conduction Cooling



Advanced Energy's Artesyn LCC600 series of fully enclosed conduction cooled AC-DC power supplies comprises four models, offering main output voltages of 12 V, 28 V, 36 V or 48 V. Each model also provides a 5 Vdc standby output that can supply up to 1.5 amps. Rated at 600 watts, these power supplies incorporate a thermal baseplate and are capable of delivering full output power over a wide operating temperature range of -40 to 85°C. For maximum applications flexibility, the main output is adjustable. The 48 V model, for example, can be adjusted from 44 to 54 V and has a maximum current rating of 12.5 amps.

## SPECIAL FEATURES

- 600 W full power at elevated temperatures
- Wide operating temperature range (-40 °C to 85 °C baseplate)
- Adjustable output
- Remote output On/Off
- AC\_OK; DC\_OK signals
- 5 V standby voltage
- Active current share
- Conduction-cooled/fanless
- I<sup>2</sup>C / PMBus
- Medical and ITE Safety<sup>3</sup>
- Suited for BF-type applications
- Active power factor correction
- Optional IP65 variant
- Optional 277 Vac input variant

## COMPLIANCE

- EMI Class B
- EN61000 Immunity

## SAFETY

- UL + CSA: 62368-1 2<sup>nd</sup> Ed.  
ANSI ES60601-1<sup>3</sup>  
UL 8750<sup>5</sup>  
CSA-C22.2 No. 250.13<sup>5</sup>
- TÜV: 62368-1 2<sup>nd</sup> Ed.  
60601-1 3<sup>rd</sup> Ed.<sup>3</sup>  
EN 61347-1; -2-13<sup>5</sup>
- CB Scheme: IEC 60950-1  
IEC 62368-1  
IEC 60601-1  
IEC 61347-1; -2-13<sup>5</sup>
- China CCC
- CE Mark

\*\* LCC600 tested according to the medical standard IEC 60601-1-2 4th Edition.

## AT A GLANCE

### Total Power

600 W

### # of Outputs

Single

### Outputs

12, 28, 36, 48 Vdc



## ELECTRICAL SPECIFICATIONS

| Input                         |                                                                                                                                                                                                                                                                                                     |           |          |          |          |                     |           |              |                     |           |              |                     |           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|----------|----------|---------------------|-----------|--------------|---------------------|-----------|--------------|---------------------|-----------|
| Input range                   | U Suffix: 90 - 264 Vac (Safety rating:100 - 240 Vac)<br>127 - 374 Vdc <sup>4</sup><br>H Suffix: 180 - 305 Vac (Safety rating: 200 - 277 Vac)<br>254 - 420 Vdc <sup>4</sup>                                                                                                                          |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Frequency                     | 47 - 63 / 440 Hz (Safety rating: 50/60 Hz)                                                                                                                                                                                                                                                          |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Input fusing                  | Internal fuse on both L and N lines (12.5 A - U suffix; 7 A - H suffix)                                                                                                                                                                                                                             |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| EMI/RFI                       | FCC Class B, CISPR22/EN55022 Class B                                                                                                                                                                                                                                                                |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| MIL-STD-461F EMI <sup>1</sup> | Compliance to CE101, 102; CS101, 114, 115, 116 (with external filter <sup>1</sup> )                                                                                                                                                                                                                 |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Inrush current                | ≤ 25 A peak                                                                                                                                                                                                                                                                                         |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Power factor                  | 0.99 typical                                                                                                                                                                                                                                                                                        |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Harmonics                     | Meets EN61000-3-2 Class A and Class C <sup>2</sup>                                                                                                                                                                                                                                                  |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Input current                 | < 10 Arms @ 100 Vac                                                                                                                                                                                                                                                                                 |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Hold up time                  | 20 ms min for Main Output (230 Vac) @ 100% Load                                                                                                                                                                                                                                                     |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Efficiency                    | 93.3% typical @ 230 Vac; 100% Load; 28 Vdc                                                                                                                                                                                                                                                          |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Leakage current <sup>3</sup>  | U Suffix: 115 µA typical (< 200 µA max per ANSI/ES60601-1 264 Vac split-phase / 60 Hz)<br>387 µA typical (< 500 µA max per IEC60601-1; 264 Vac / 50Hz)<br>H Suffix: 0.2 mA typical (< 3.5 mA max per ITE 62368-1 Standard)                                                                          |           |          |          |          |                     |           |              |                     |           |              |                     |           |
| Isolation voltage             | <table><tr><td></td><td>U Suffix</td><td>H Suffix</td></tr><tr><td>PRI-SEC:</td><td>4,000 Vac (2X MOPP)</td><td>3,000 Vac</td></tr><tr><td>PRI-Chassis:</td><td>1,500 Vac (1X MOPP)</td><td>2,000 Vac</td></tr><tr><td>SEC-Chassis:</td><td>1,500 Vac (1X MOPP)</td><td>1,500 Vac</td></tr></table> |           | U Suffix | H Suffix | PRI-SEC: | 4,000 Vac (2X MOPP) | 3,000 Vac | PRI-Chassis: | 1,500 Vac (1X MOPP) | 2,000 Vac | SEC-Chassis: | 1,500 Vac (1X MOPP) | 1,500 Vac |
|                               | U Suffix                                                                                                                                                                                                                                                                                            | H Suffix  |          |          |          |                     |           |              |                     |           |              |                     |           |
| PRI-SEC:                      | 4,000 Vac (2X MOPP)                                                                                                                                                                                                                                                                                 | 3,000 Vac |          |          |          |                     |           |              |                     |           |              |                     |           |
| PRI-Chassis:                  | 1,500 Vac (1X MOPP)                                                                                                                                                                                                                                                                                 | 2,000 Vac |          |          |          |                     |           |              |                     |           |              |                     |           |
| SEC-Chassis:                  | 1,500 Vac (1X MOPP)                                                                                                                                                                                                                                                                                 | 1,500 Vac |          |          |          |                     |           |              |                     |           |              |                     |           |

1 Artesyn Filter PN: 700-014447-0000 (Zhongguang PN: ZGLPG-10-02M).

2 Meets Class C ≥ 50% load.

3 U suffix have both ITE and Medical Safeties. H suffix carries ITE approval only.

4 DC input rating not part of product's Safety approval.

5 LED Lighting approvals apply to all 48 V output variants.

## ELECTRICAL SPECIFICATIONS (CONTINUED)

| Output                        |                                                                                   |                                                                                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output rating                 | See Ordering Information table                                                    |                                                                                                                                                                                                         |
| Standby output                | 5.0 Vdc @ 1.5 A Max                                                               |                                                                                                                                                                                                         |
| Set point                     | ± 0.5%                                                                            | Factory set point                                                                                                                                                                                       |
| Total regulation              | Main Output: ± 2.0%<br>5 Vsb: ± 5%                                                | Combined Line / Load / Temperature                                                                                                                                                                      |
| Rated load                    | 600 W maximum                                                                     | 600 W from -40 °C to 85 °C Baseplate Temp. Derate output to 28 W @ 95 °C Baseplate Temp                                                                                                                 |
| Minimum load                  | 0 A                                                                               | For both Main and 5 Vsb Outputs                                                                                                                                                                         |
| Output voltage adjust range   | See Ordering Information table                                                    | Max power limited to 600 W                                                                                                                                                                              |
| Output noise                  | Main Output: 1.0% max p-p<br>5 Vsb: 60 mV max p-p                                 | Measured with 0.1 µF Ceramic and 10 µF Tantalum Cap, 20 MHz BW                                                                                                                                          |
| Remote sense                  | Compensation up to 500 mV                                                         | Pin 10: +Vout_RS / Pin4: -Vout_RS                                                                                                                                                                       |
| Overcurrent protection        | 105 - 130% of full load current                                                   | Default is Shutdown mode with Auto-retry every 2-4 sec. Output latches after 20 sec of continuous OCP fault presence. Restart after latch possible through AC recycle, Inhibit toggle or through PMBus. |
| Overvoltage protection        | 125 - 145% Vo, nom Main Output<br>125 - 130% 5 Vsb                                | Latching / AC Recycle or Inhibit toggle required for PSU restart                                                                                                                                        |
| Overtemperature protection    | > 95 °C Baseplate temperature                                                     | Output Shutdown / Auto-recovery                                                                                                                                                                         |
| AC_OK                         | Open Collector; 0.8 Vdc max / 10 mA                                               | Active low when AC is present                                                                                                                                                                           |
| DC_OK                         | Open Collector; 0.8 Vdc max / 10 mA                                               | Active low when Main Output is within regulation                                                                                                                                                        |
| Remote inhibit                | Contact Closure                                                                   | Pin 19: Open/Float = ON; Close/Ground = OFF                                                                                                                                                             |
| # Units in parallel operation | Qualified up to 5 units in parallel. Consult factory if more than 5 are required. | Pin 5: IShare pin for main output only.                                                                                                                                                                 |
| Output dimming                | 0-10 Vdc external voltage;<br>0-100 kOhm external resistance                      | Consult with productsupport.ep@artesyn.com                                                                                                                                                              |

## ENVIRONMENTAL SPECIFICATIONS

|                             |                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------|
| Operating temperature range | -40 °C to +85 °C Baseplate temperature                                                                  |
| Storage temperature         | -40 °C to +85 °C                                                                                        |
| Humidity                    | 10% to 95%                                                                                              |
| Altitude                    | 16,402 ft (Operating) / 50,000 ft (Non-Operating)                                                       |
| Shock                       | MIL-STD-810F 516.5 Procedure I, VI                                                                      |
| Vibration                   | MIL-STD-810F 514.5 Cat. 4, 10                                                                           |
| Ingress protection          | IP65 (for suffix "-4P")                                                                                 |
| MTBF (calculated)           | >2M Hrs, 25 °C per SR-332 Issue 3                                                                       |
| Electromagnetic immunity    | Designed to meet EN61000-4-3, -4, -5, -8, -11 (Level 3); EN61000-4-2 (Level 4); EN60601-1-2 and EN55024 |
|                             | For H suffix, Level 4 for EN61000-4-5                                                                   |

## ORDERING INFORMATION

| Model Number*                 | AC Input (Vac) | Output Setpoint | Setpoint Tolerance | Adjustment Range | Output Current [A] |       | Max O/P   | Typical Efficiency** | Standby Output |
|-------------------------------|----------------|-----------------|--------------------|------------------|--------------------|-------|-----------|----------------------|----------------|
|                               |                |                 |                    |                  | Min                | Max   | Power [W] |                      |                |
| LCC600-48U-4PD <sup>(1)</sup> | 90 - 264       | 54 V            | ±0.5%              | 44 - 54 V        | 0                  | 11.1  | 600       | 93.0%                | 5 Vdc @ 1.5 A  |
| LCC600-48U-9P                 | 90 - 264       | 48 V            | ±0.5%              | 44 - 54 V        | 0                  | 12.5  | 600       | 93.0%                | 5 Vdc @ 1.5 A  |
| LCC600-48H-9P                 | 180 - 305 V    |                 |                    |                  |                    |       |           |                      |                |
| LCC600-36U-9P                 | 90 - 264       | 36 V            | ±0.5%              | 32 - 38 V        | 0                  | 16.7  | 600       | 92.0%                | 5 Vdc @ 1.5 A  |
| LCC600-36H-9P                 | 180 - 305      |                 |                    |                  |                    |       |           |                      |                |
| LCC600-28U-9P24               | 90 - 264       | 24 V            | ±0.5%              | 24 - 30 V        | 0                  | 25    | 600       | 93.0%                | 5 Vdc @ 1.5 A  |
| LCC600-28U-9P                 | 90 - 264       | 28 V            | ±0.5%              | 24 - 30 V        | 0                  | 25*** | 600       | 93.5%                | 5 Vdc @ 1.5 A  |
| LCC600-28H-9P                 | 180 - 305      |                 |                    |                  |                    |       |           |                      |                |
| LCC600-12U-9P                 | 90 - 264       | 12 V            | ±0.5%              | 12 - 15V         | 0                  | 50    | 600       | 92.3%                | 5 Vdc @ 1.5 A  |
| LCC600-12H-9P                 | 180 - 305      |                 |                    |                  |                    |       |           |                      |                |

\*Change suffix "-9P" to "-4P" for IP65 rated enclosure with fly lead wires

\*Change suffix "-4P" to "-4PR" for IP65 rated enclosure with right angle fly lead wires (applies to 28, 36, 48 Vdc)

\*Change suffix "-4P" to "-4PV" to omit the control cable (applies to 28, 36, 48 Vdc)

\*Add suffix "24" after "P" to designate output voltage factory set to 24V (only on 28V models like LCC60028H-4P24CC)

\*Add suffix "CC" for Constant Current setting (e.g. "-4PCC"; "-9PCC").

\*\*Typical efficiency at high line, factory default voltage and full load

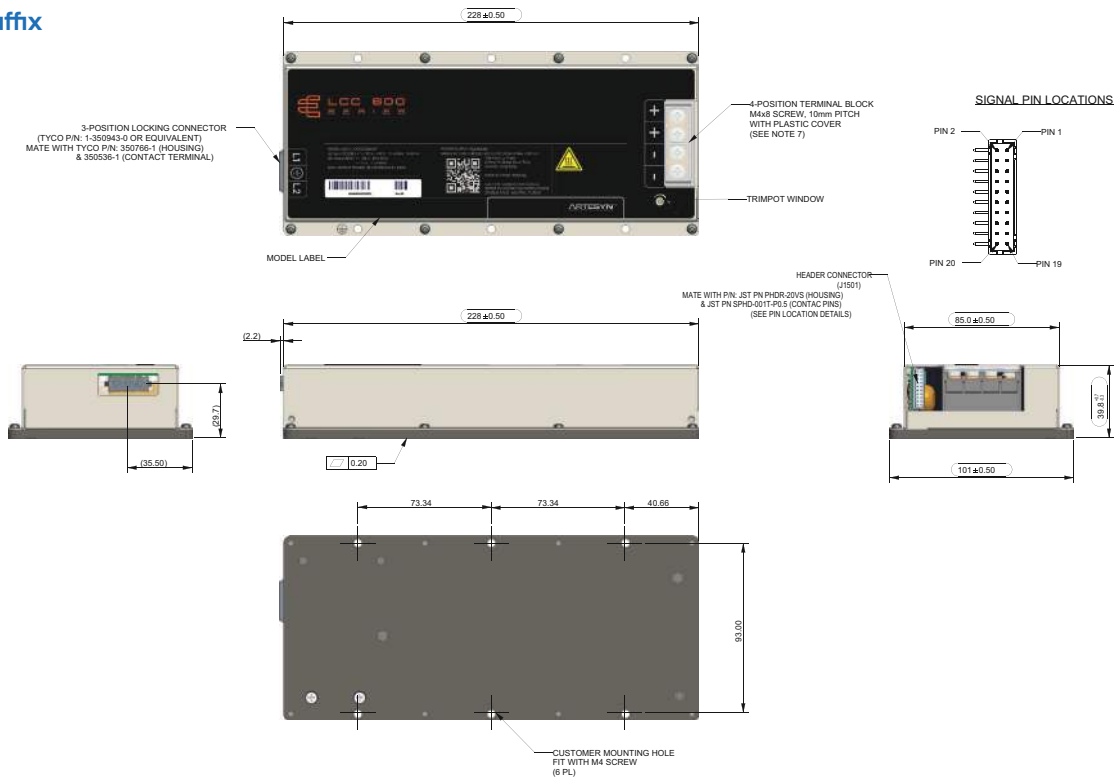
\*\*\*When Vout is adjusted down to 24 V, the supply can deliver 25 A max (600 W max). At 28 V default output setting, max Iout is 21.43 A (600 W max).

(1) "D" suffix for 0-10 Vdc analog external voltage dimming (11.1 A CC limit). Consult Technical Reference Notes for additional details.

Warranty: 2 years

# MECHANICAL DRAWINGS

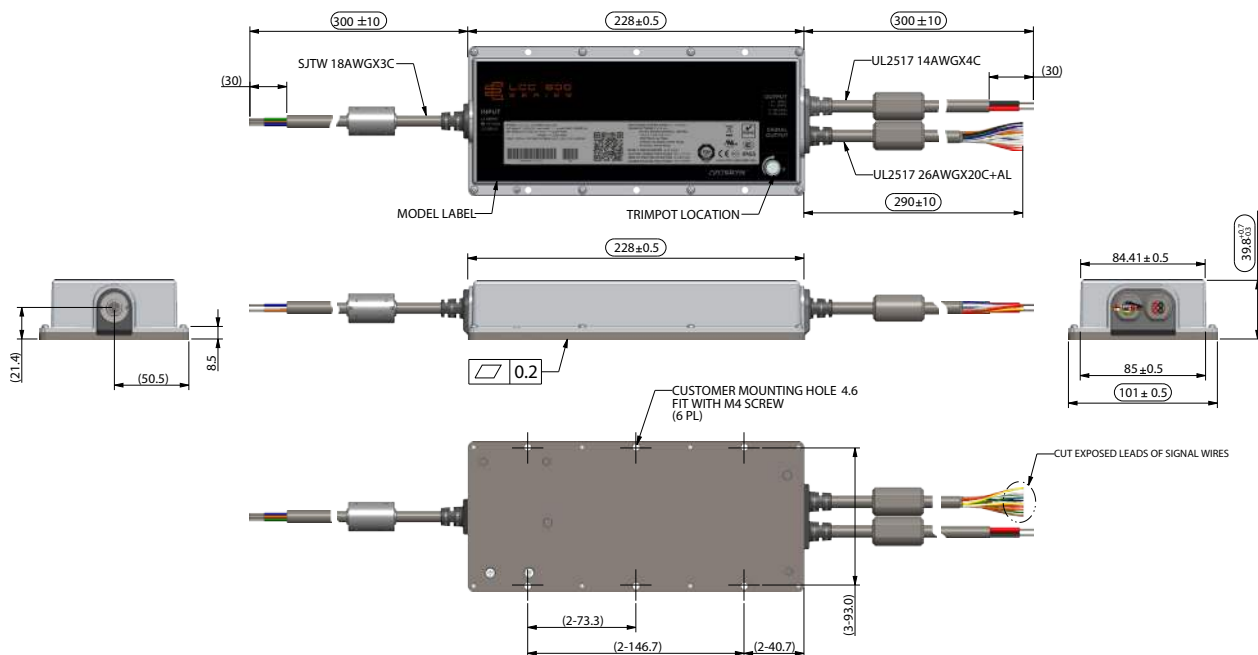
## -9P Suffix



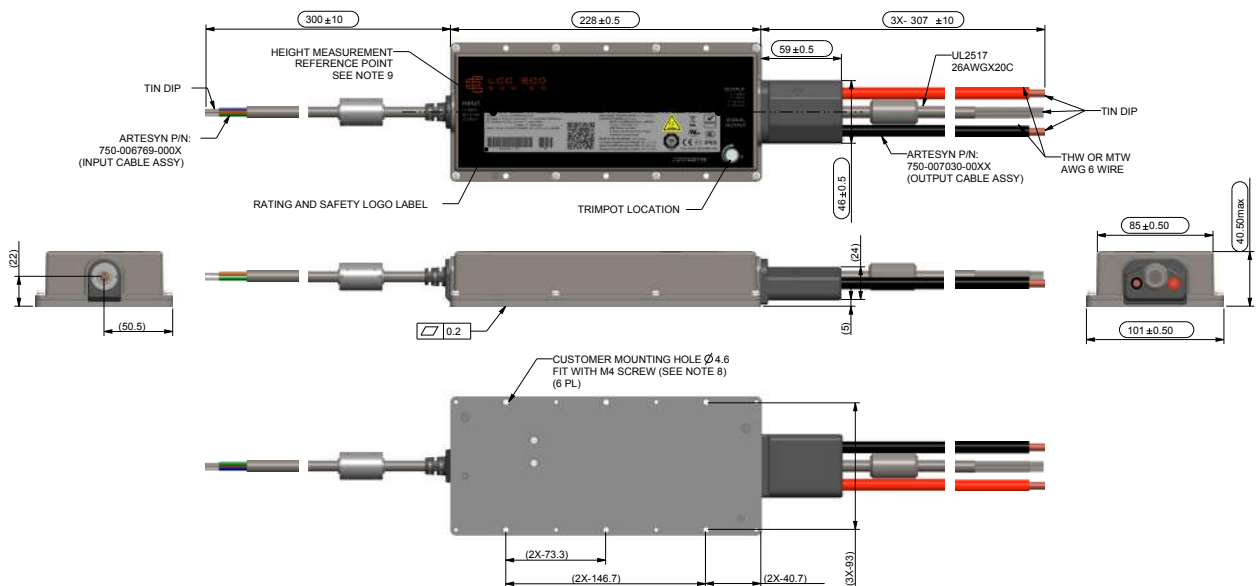
- Notes:
- 1) Recommended mounting screw is M4 in 6 locations; 8-10 kgf-cm torque.
  - 2) Baseplate material/finish: 5 mm Aluminum with Black Anodized.
  - 3) Weight: 9P Suffix: 1.63 kg typical  
4P Suffix: 1.81 kg typical
  - 4) Thermal hotspot reference is in the middle of the baseplate.

## MECHANICAL DRAWINGS (CONTINUED)

## -4P Suffix (28, 36, 48 Vdc)

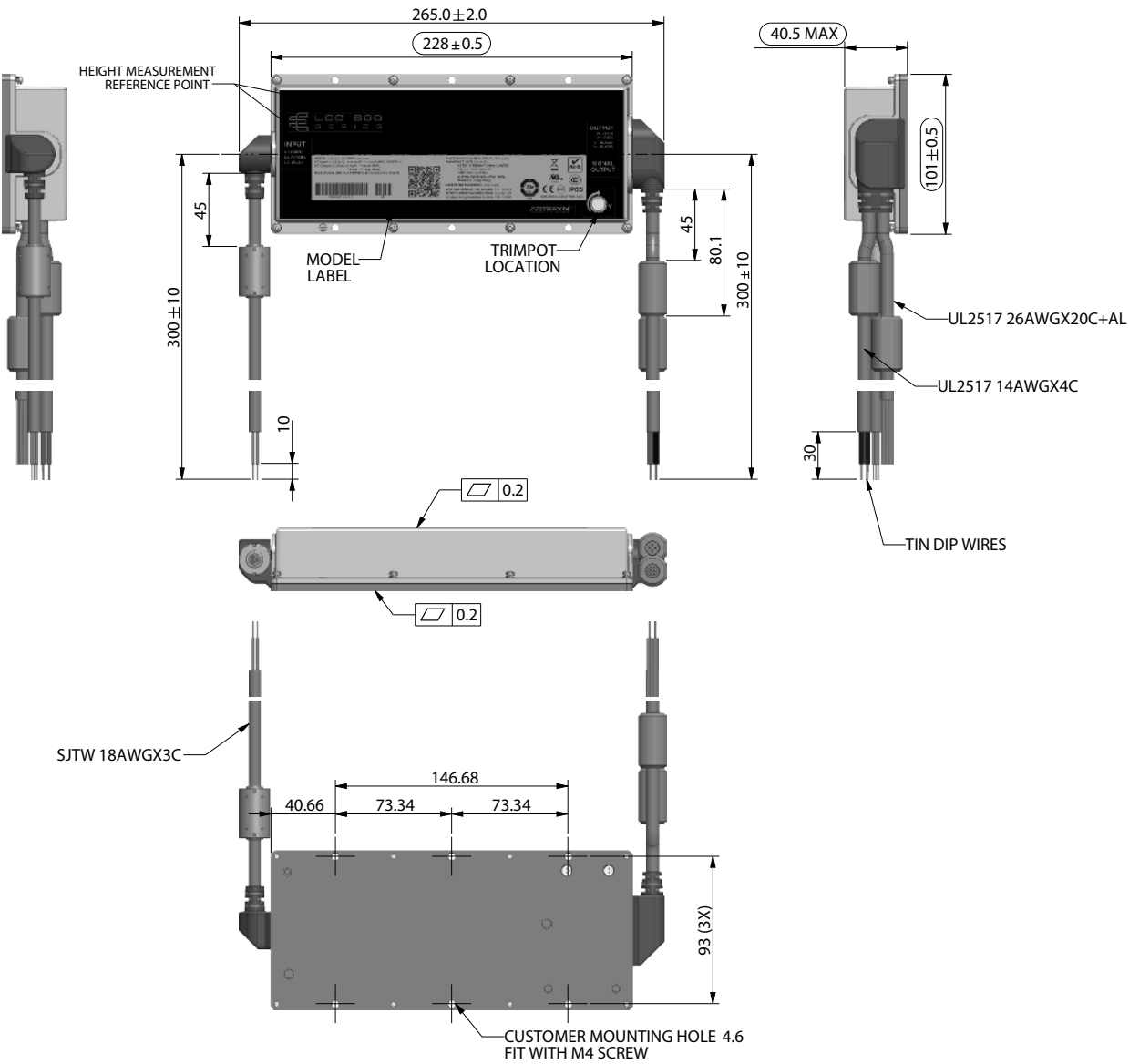


## -4P Suffix (12 Vdc)



MECHANICAL DRAWINGS (CONTINUED)

-4PR Suffix (28, 36, 48 Vdc)



## PIN ASSIGNMENT (INPUT)

| -9Px Suffix |             |                                                                          | -4Px Suffix |                                                 |
|-------------|-------------|--------------------------------------------------------------------------|-------------|-------------------------------------------------|
| DESCRIPTION | DESIGNATION | NOTES                                                                    | DESIGNATION | NOTES                                           |
| Live        | L1          | Mating Connector:<br>350766-1 (Housing);<br>350536-1 (Contact Terminals) | Brown       | SJTW 18AWGX3C;<br>PVC jacket;<br>105 °C / 300 V |
| Neutral     | L2          |                                                                          | Blue        |                                                 |
| Ground      | G           |                                                                          | Y/GR        |                                                 |

## PIN ASSIGNMENT (MAIN OUTPUT)

| -9Px Suffix               |             |                                                                                                                                                                           | -4Px Suffix (28, 36, 48 Vdc) |                                            | -4Px Suffix (12 Vdc) |                                                     |
|---------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------|----------------------|-----------------------------------------------------|
| DESCRIPTION               | DESIGNATION | NOTES                                                                                                                                                                     | DESIGNATION                  | NOTES                                      | DESIGNATION          | NOTES                                               |
| Main Output               | +Vout       | 4 Position Terminal Block: M4<br>Screw/10mm Pitch; 12kgf-cm<br>Torque; Accepts 14-16AWG Ring<br>Tongue - Spade Terminals MOLEX<br>BB-124-08 (19141-0058) or<br>EQUIVALENT | Red                          | 14AWGX4C;<br>PVC jacket;<br>105 °C / 300 V | Red                  | 6AWG Multi-Strand;<br>PVC jacket;<br>105 °C / 600 V |
|                           |             |                                                                                                                                                                           | Red                          |                                            |                      |                                                     |
| Main Output<br>Return GND | -Vout       |                                                                                                                                                                           | Black                        |                                            | Black                |                                                     |
|                           |             |                                                                                                                                                                           | Black                        |                                            |                      |                                                     |

## PIN ASSIGNMENT

| J1501 - Signal & Control |                                                              |       | -9Px Suffix                                                                                  |  | -4Px Suffix  |                                                |
|--------------------------|--------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------|--|--------------|------------------------------------------------|
| SIGNALS                  | DESCRIPTION                                                  | PIN # | NOTES                                                                                        |  | Wire Color   | NOTES                                          |
| A2_OUT                   | EEPROM Address                                               | 1     | J1501 Mating Connector:<br>JST PN<br>PHDR-20VS<br><br>Contact Pins:<br>JST PN SPHD-001T-P0.5 |  | BLACK        | 26AWGX20C+AL;<br>PVC jacket;<br>105 °C / 300 V |
| GND                      | Ground                                                       | 2     |                                                                                              |  | BROWN        |                                                |
| A1_OUT                   | EEPROM Address                                               | 3     |                                                                                              |  | RED          |                                                |
| -VOUT_RS                 | Remote Sense Return (Main O/P)                               | 4     |                                                                                              |  | ORANGE       |                                                |
| ISHARE                   | Load Share Voltage                                           | 5     |                                                                                              |  | YELLOW       |                                                |
| A0_OUT                   | EEPROM Address                                               | 6     |                                                                                              |  | GREEN        |                                                |
| SDA                      | Serial Data Signal (I2C)                                     | 7     |                                                                                              |  | BLUE         |                                                |
| SPARE_1                  | Spare/Unused Pin (Dimming input for “-4PD” suffix)           | 8     |                                                                                              |  | VIOLET       |                                                |
| SCL                      | Serial clock Signal (I2C)                                    | 9     |                                                                                              |  | GRAY         |                                                |
| +VOUT_RS                 | Remote Sense (Main O/P)                                      | 10    |                                                                                              |  | WHITE        |                                                |
| 5VSB                     | 5V Standby (1.5A Max)                                        | 11    |                                                                                              |  | PINK         |                                                |
| SGND                     | 5V Standby Return                                            | 12    |                                                                                              |  | LIGHT BLUE   |                                                |
| SPARE_2                  | Spare/Unused Pin                                             | 13    |                                                                                              |  | WHITE/VIOLET |                                                |
| G_DCOK_C                 | Global DC_OK Collector                                       | 14    |                                                                                              |  | WHITE/YELLOW |                                                |
| WP                       | EEPROM Write Protect                                         | 15    |                                                                                              |  | WHITE/ORANGE |                                                |
| G_DCOK_E                 | Global DC_OK Emitter (GND)                                   | 16    |                                                                                              |  | WHITE/BLACK  |                                                |
| GND                      | Return GND for O/P Signal and I <sup>2</sup> C communication | 17    |                                                                                              |  | WHITE/RED    |                                                |
| G_ACOK_C                 | Global AC_OK Collector                                       | 18    |                                                                                              |  | WHITE/BROWN  |                                                |
| INH_EN                   | Output Inhibit_Enable Pin (turns output off)                 | 19    |                                                                                              |  | WHITE/GREEN  |                                                |
| G_ACOK_E                 | Global AC_OK Emitter (GND)                                   | 20    |                                                                                              |  | WHITE/BLUE   |                                                |



## THERMAL SENSING

| Location                                         | PMBus ADDR | Max Temp |
|--------------------------------------------------|------------|----------|
| Internal Secondary Output (near base plate)      | 8Dh        | 111 °C   |
| Internal Primary Hotspot (at FET Heatsink)       | 8Eh        | 124 °C   |
| Internal Primary Input Hotspot (near base plate) | 8Fh        | 101 °C   |

## POWER DERATING CURVES

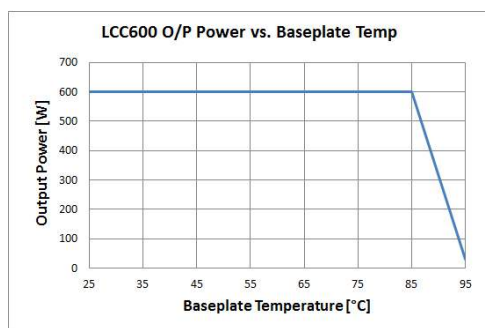


Figure 1. Output Power vs. Baseplate Temperature

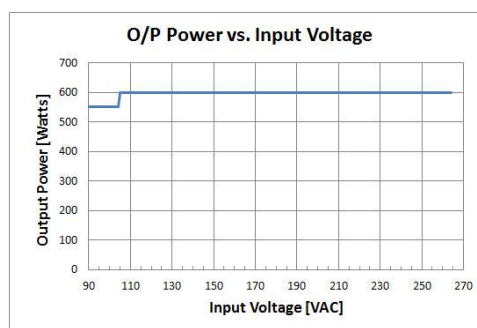


Figure 2. Output Power vs. Input Voltage

## EFFICIENCY CURVES

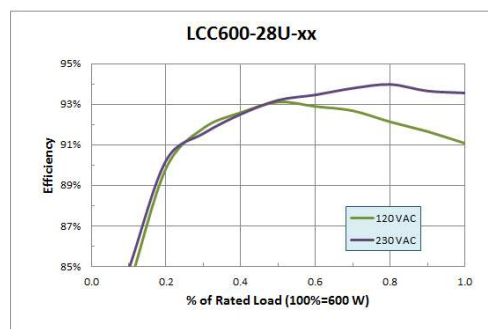


Figure 3. Typical Efficiency for 28 V output

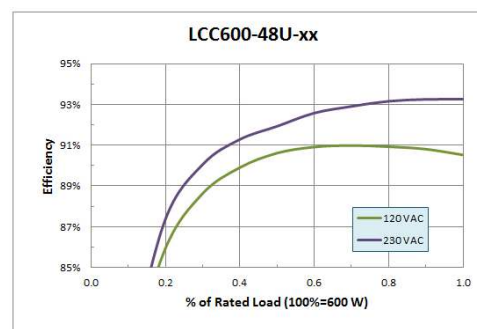


Figure 4. Typical Efficiency for 48 V output

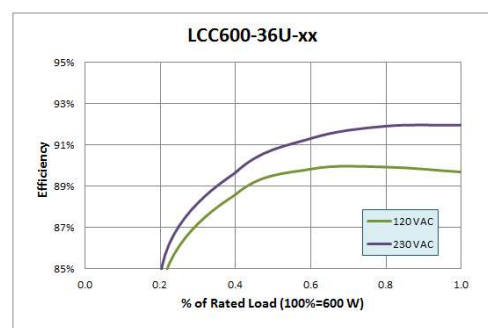


Figure 5. Typical Efficiency for 36 V output

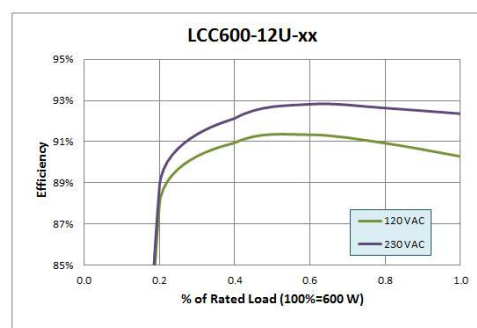
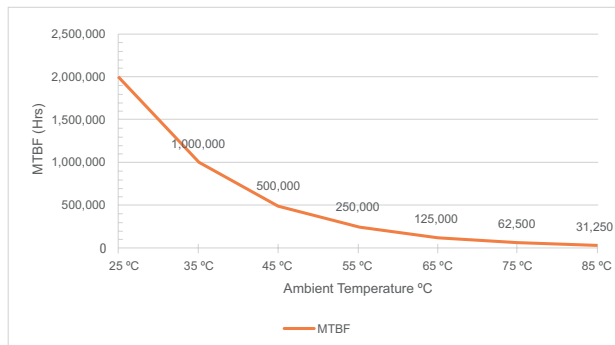


Figure 6. Typical Efficiency for 12 V output

## MTBF VS. AMBIENT TEMPERATURE



| Ambient Temperature | MTBF      |
|---------------------|-----------|
| 25 °C               | 2,000,000 |
| 35 °C               | 1,000,000 |
| 45 °C               | 500,000   |
| 55 °C               | 250,000   |
| 65 °C               | 125,000   |
| 75 °C               | 62,500    |
| 85 °C               | 31,250    |

## ACCESSORIES

| Orderable Part Number | Description                                                                                                      | Diagram |
|-----------------------|------------------------------------------------------------------------------------------------------------------|---------|
| 70-841-030            | For Suffix "-9P" AC Input Mating Connector Cable Assembly (w/ 0.3 m wire length)                                 |         |
| 73-788-001            | J1501 (20 Pin Control Signal) Mating Connector with 0.3 m wires attached for "-9P" suffix                        |         |
| 70-841-031            | Pre-Cut thermal insulator (Laird TFLEX HR220FG)                                                                  |         |
| 700-014447-0000       | MIL-STD-461F AC input In-line EMI filter (Zhongguang ZGLPG-10-02M)                                               |         |
| 73-769-002            | USB to I2C High Speed Adaptor for PMBus Communication                                                            |         |
| 73-769-007            | J1501 (20 Pin) Mating connector with 10 Pin header termination for use with 73-769-002                           |         |
| 466-003103-0000       | Test Heatsink for unit characterization. Size: 331 x 220 x 69 mm; Aluminum with natural finish; Weight = 1.7 kgs |         |



For international contact information,  
visit [advancedenergy.com](http://advancedenergy.com).

[powersales@aei.com](mailto:powersales@aei.com) (Sales Support)  
[productsupport.ep@aei.com](mailto:productsupport.ep@aei.com) (Technical Support)  
+1 888 412 7832

## ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

## PRECISION | POWER | PERFORMANCE

---

Specifications are subject to change without notice. Not responsible for errors or omissions. ©2021 Advanced Energy Industries, Inc. All rights reserved. Advanced Energy®, AE® and Artesyn™ are U.S. trademarks of Advanced Energy Industries, Inc.