LCC600

600 W Conduction Cooling



Advanced Energy's 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^2C / PMBus
- Medical and ITE Safety[3]
- 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 2nd Ed. ANSI ES60601-1[3] UL 8750[5] CSA-C22.2 No. 250.13[5]
■ TÜV:	62368-1 2nd Ed. 60601-1 3rd Ed.[3] EN 61347-1; -2-13[5]
■ CB Scheme:	IEC 60950-1 IEC 62368-1 IEC 60601-1 IEC 61347-1; -2-13[5]
■ China	CCC

- CE mark/UKCA 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

PMBus® Power Management. Defined.

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ELECTRICAL SPECIFICATIONS

Input	
Input Range	U Suffix: 90 to 264 VAC(Safety rating:100 to 240 VAC) 127 to 374 VDC[4] H Suffix: 180 to 305 VAC (Safety rating: 200 to 277 VAC) 254 to 420 VDC[4]
Frequency	47 to 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[1]	Compliance to CE101, 102; CS101, 114, 115, 116 (with external filter[1])
Inrush Current	≤ 25 A peak
Power Factor	0.99 typical
Harmonics	Meets EN61000-3-2 Class A and Class C[2]
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[3]	U Suffix: 115 µA typical (< 200 µA max per ANSI/ES60601-1 264 Vac split-phase / 60 Hz) 387 µA typical (< 500 µA max per IEC60601-1; 264 Vac / 50Hz) H Suffix: 0.2 mA typical (< 3.5 mA max per ITE 62368-1 Standard)
Isolation Voltage	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 AE 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% 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 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 125 - 130% 5 Vsb	Latching / AC recyle 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; 0-100 kohm external resistance	Consult with productsupport.ep@aei.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

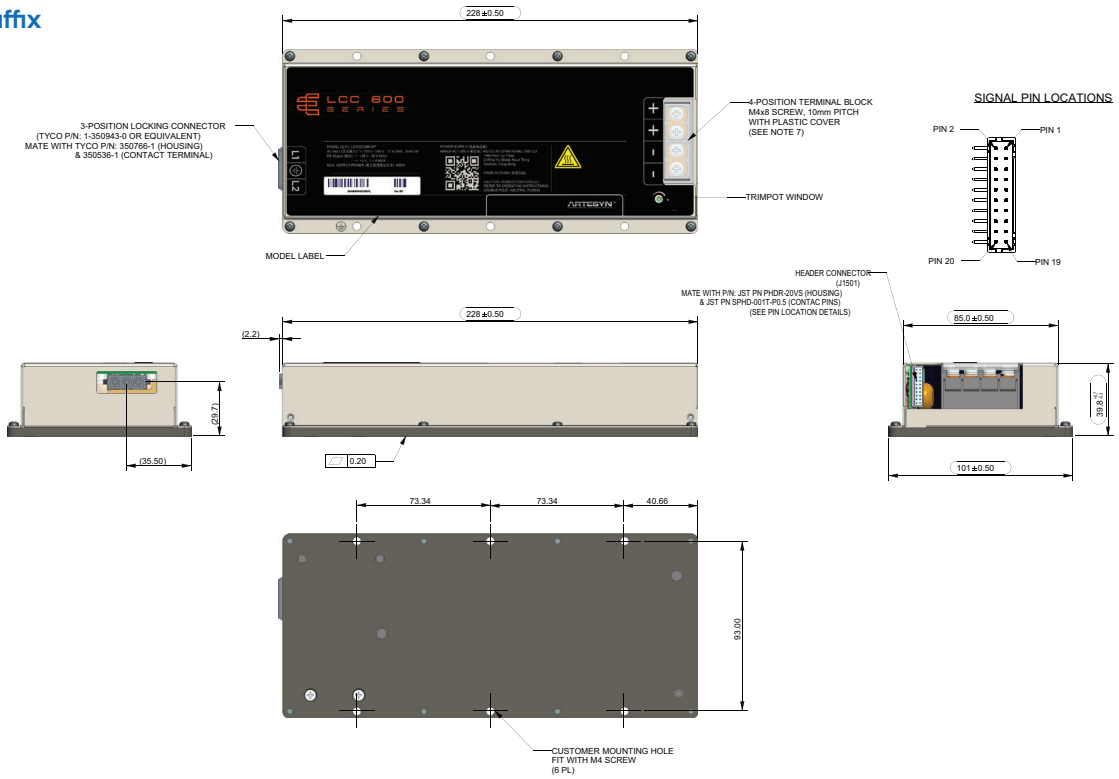
ORDERING INFORMATION

Model Number*	AC Input (VAC)	Output Setpoint	Setpoint Tolerance	Adjustment Range	Output Current [A]		Max O/P Power [W]	Typical Efficiency**	Standby Output
					Min	Max			
LCC600-48U-4PD(1)	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								
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 volatge dimming (11.1 A CC limit). Consult Technical Reference Notes for additional details.
Warranty: 3 years

MECHANICAL DRAWINGS

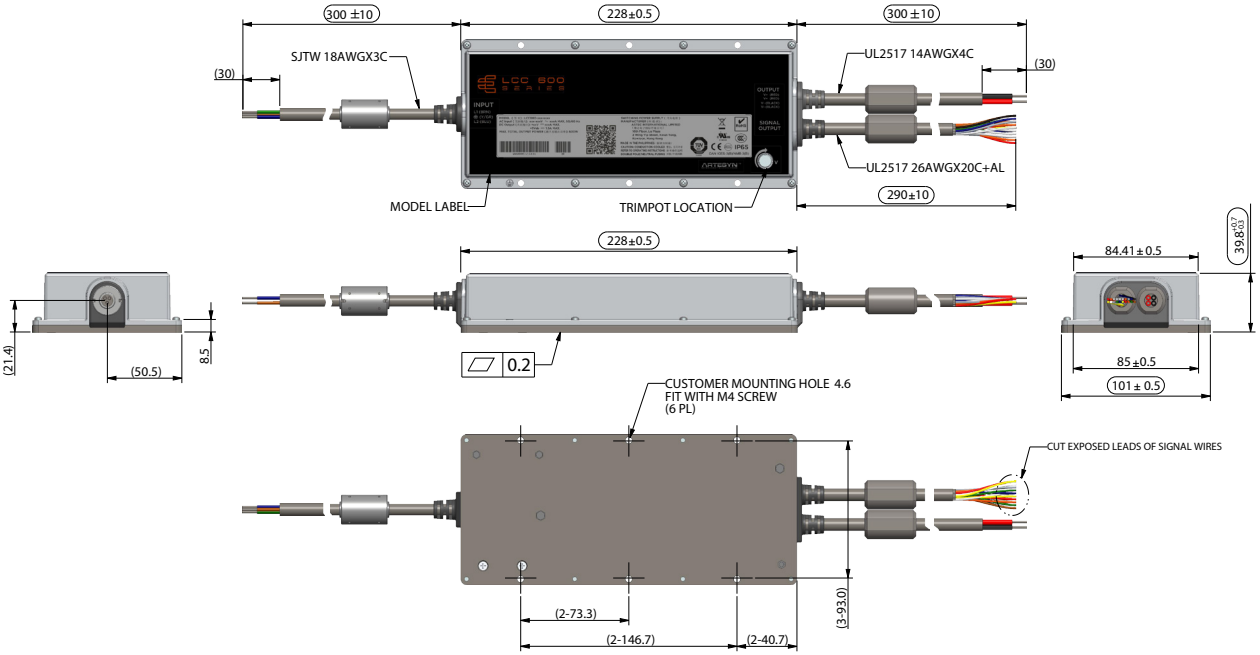
-9P Suffix



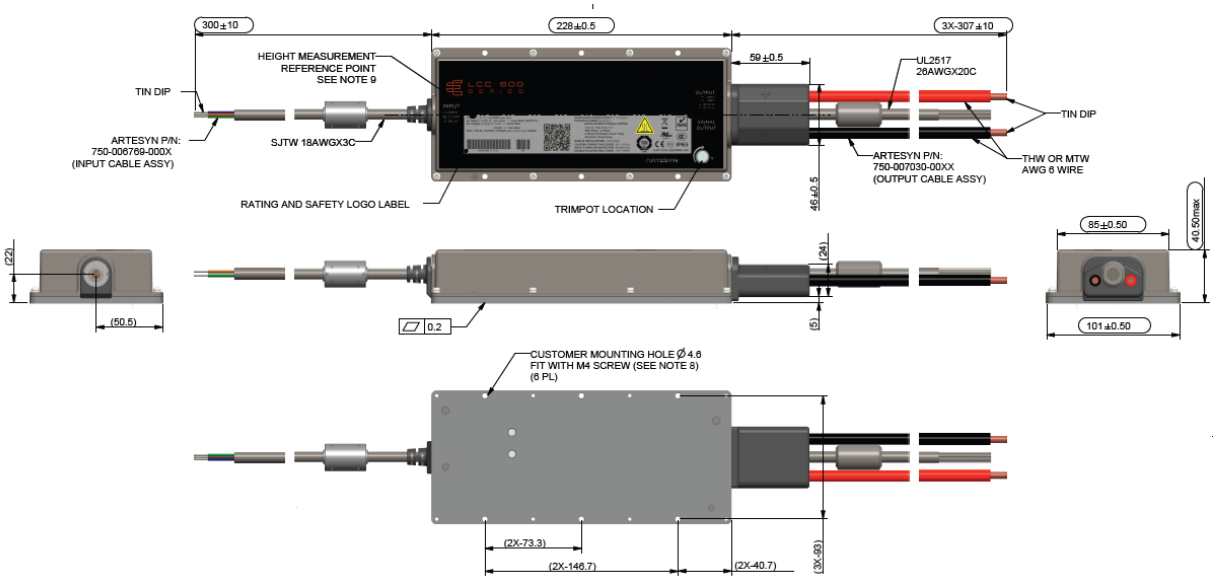
Notes:
1) Recommended mounting screw is M4 in 6 locations; 8-10 kgf-cm torque.
2) Baseplate material/finish: 5 mm Aluminum with Black Anodized.
3) Weight: 9P Suffix: 1.63 kg typical
4P Suffix: 1.81 kg typical
4) Thermal hotspot reference is in the middle of the baseplate.

MECHANICAL DRAWINGS (CONTINUED)

-4P Suffix (28, 36, 48 VDC)

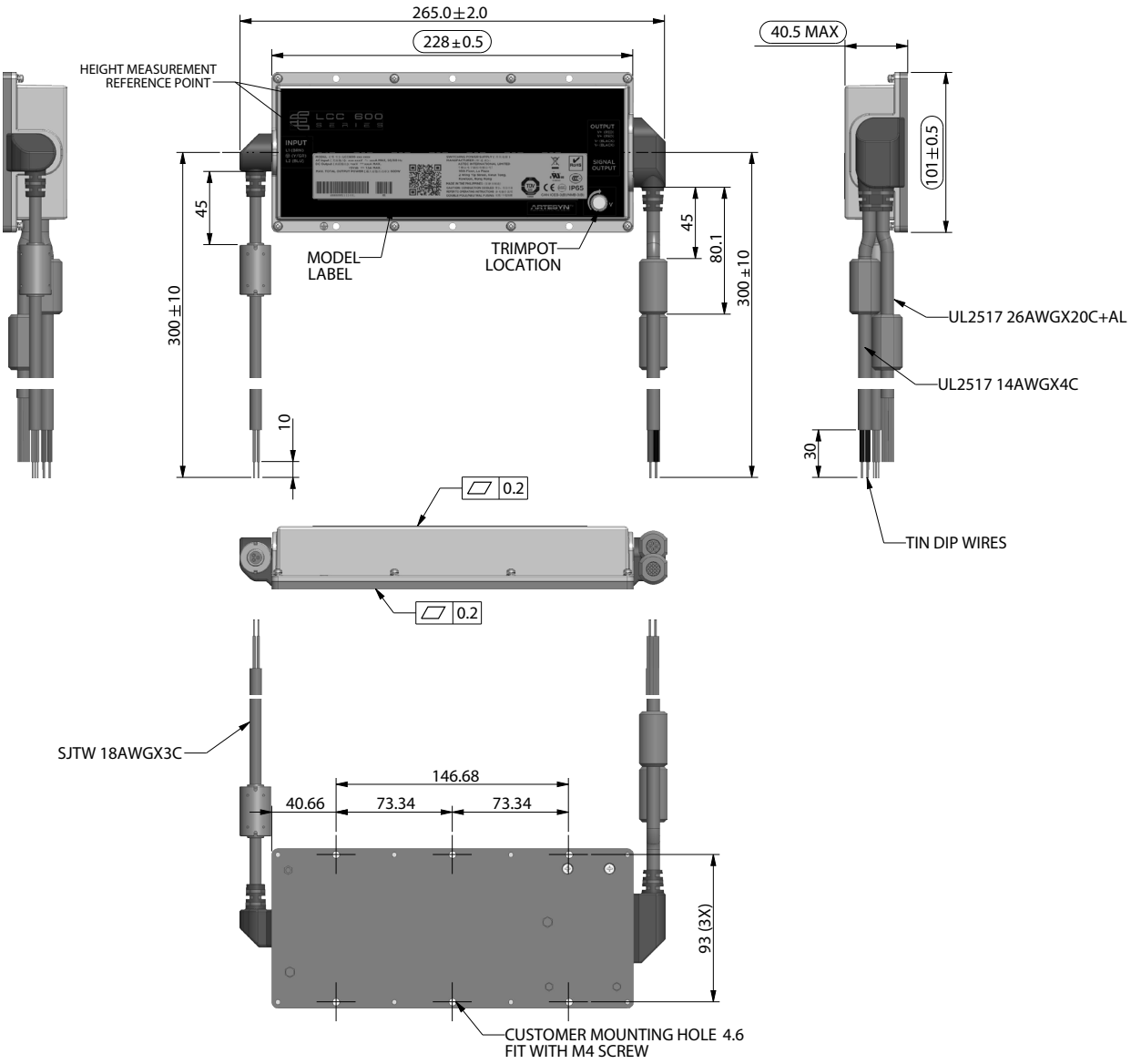


-4P Suffix (12 VDC)



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: 350766-1 (Housing); 350536-1 (Contact Terminals)	Brown	SJTW 18AWGX3C; PVC jacket; 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 Screw/10mm Pitch; 12kgf-cm Torque; Accepts 14-16AWG Ring Tongue - Spade Terminals MOLEX BB-124-08 (19141-0058) or EQUIVALENT	Red	14AWGX4C; PVC jacket; 105 °C / 300 V	Red	6AWG Multi-Strand; PVC jacket; 105 °C / 600 V
			Red			
Main Output 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: JST PN PHDR-20VS Contact Pins: JST PN SPHD-001T-P0.5	BLACK	26AWGX20C+AL; PVC jacket; 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^2C 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

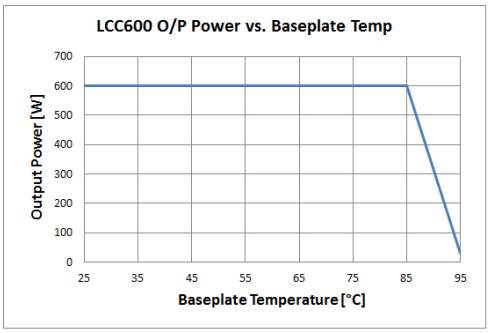


Figure 1. Output Power vs. Baseplate Temperature

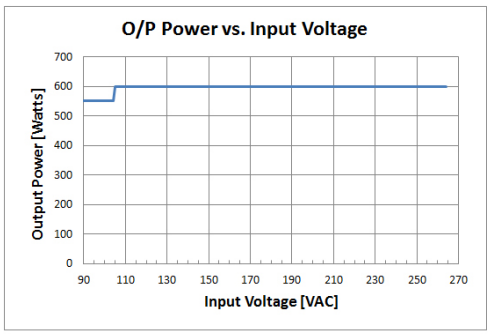


Figure 2. Output Power vs. Input Voltage

EFFICIENCY CURVES

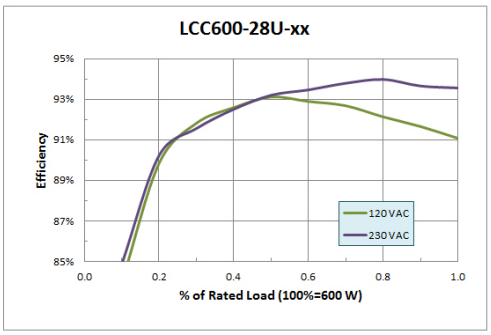


Figure 3. Typical Efficiency for 28 V output

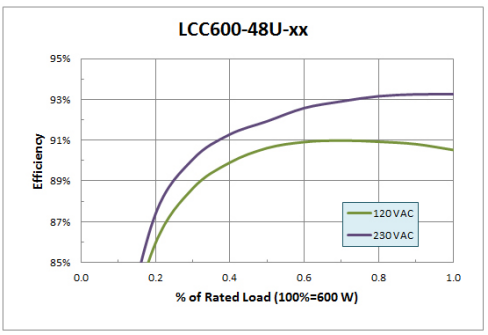


Figure 4. Typical Efficiency for 48 V output

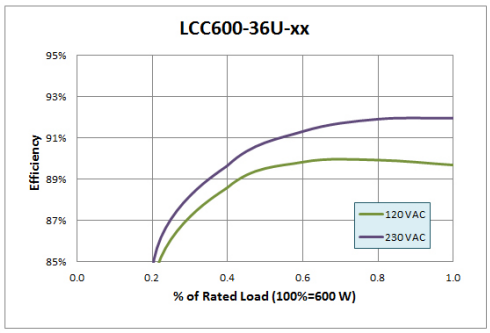


Figure 5. Typical Efficiency for 36 V output

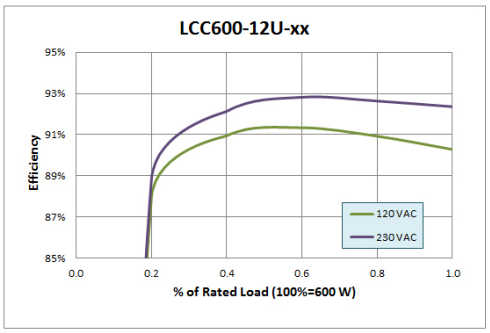
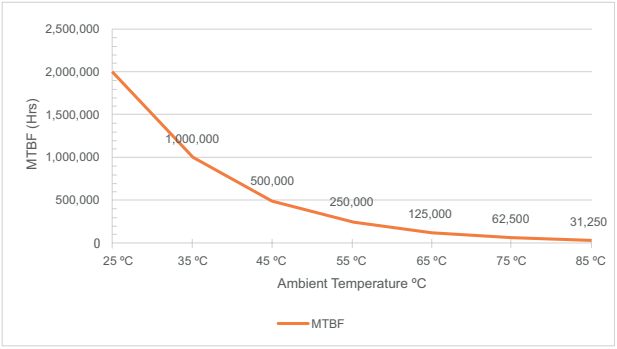


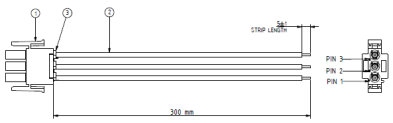
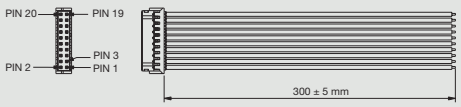
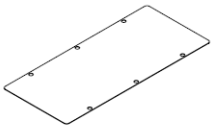
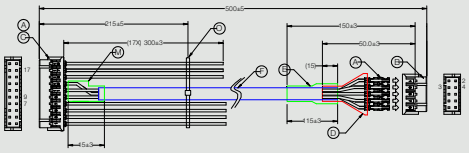
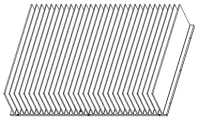
Figure 6. Typical Efficiency for 12 V output

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	

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than four 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.

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