# ULTRAVOLT HIGH POWER 40C TO 60C SERIES

SINGLE OUTPUT 60, 125, OR 250 W CAPACITOR CHARGING SUPPLY

The UltraVolt® High Power C Series of regulated DC-to-DC converters are designed for high voltage capacitor charging applications that demand fast rise times with controlled voltage overshoot.

## PRODUCT HIGHLIGHTS

- Regulated high voltage outputs ranging from 40,000 to 60,000 VDC maximum
- Single output: positive or negative polarity models
- Choice of 60, 125, or 250 W maximum power
- 24 VDC input
- Output ripple performance < 1.0 %
- Controlled high voltage overshoot enhances longevity of external load components
- Temperature coefficient 50 ppm/°C
- Simplified integration with available 0 to 5 VDC or 0 to 10 VDC interface
- Reliable modular design
- Factory-configured performance, control and integration options
- UL/cUL recognized, IEC-60950-1, CE Mark (LVD and RoHS)

## TYPICAL APPLICATIONS

- Capacitive charging and pulsed power applications
- High potential testing and Electrostatic Discharge (ESD)
- Automated Test Equipment (ATE)
- Lasers and opto-electronics
- Ultrasonic pulse generators

## AT A GLANCE

**Maximum Output Voltage**

40, 50, or 60 kV DC

**Maximum Output Power**

60, 125, or 250 W

**Type**

Single Output

**Ripple**

< 1.0 %

**Control**

Analog

**Temperature Coefficient**

50 ppm/°C

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## ELECTRICAL SPECIFICATIONS

| Model[1] | | 40C Series | | | 50C Series | | | 60C Series | | |
|---|---|---|---|---|---|---|---|---|---|---|
| High Voltage Output Range (Adjustable Regulated, Positive or Negative Output) | | 0 to 40,000 VDC | | | 0 to 50,000 VDC | | | 0 to 60,000 VDC | | |
| High Voltage Outputs | | Single Unipolar | | | Single Unipolar | | | Single Unipolar | | |
| Input Voltage (VDC, Nominal) | | 24 VDC | | | 24 VDC | | | 24 VDC | | |
| Power Output (Watts, Nominal) | | 60 W | 125 W | 250 W | 60 W | 125 W | 250 W | 60 W | 125 W | 250 W |
| **DC Input** | | | | | | | | | | |
| Vin (Input Voltage) Range | VDC (positive polarity only) | 23 to 30 | | | 23 to 30 | | | 23 to 30 | | 23 to 28 |
| Vin (Nominal) | VDC | 24 | | | 24 | | | 24 | | |
| Iin (Input Current, Nominal) | A @ 100% HVout, 100% LOAD | < 3.3 | < 6.6 | < 13.5 | < 3.3 | < 6.6 | < 13.5 | < 3.3 | < 6.6 | < 13.5 |
| | A @ 100% HVout, 0% LOAD | < 1.3 | | | < 1.3 | | | < 1.3 | | |
| | A @ disable/standby state | < 0.15 | | | < 0.15 | | | < 0.15 | | |
| **DC Input** | | | | | | | | | | |
| HVout (Output Voltage) | VDC | 0 to 40,000 | | | 0 to 50,000 | | | 0 to 60,000 | | |
| Iout (Output Current) | mA (max) @ 0 to 100% HVout, Vin (nominal) | 1.5 | 3.13 | 6.25 | 1.2 | 2.5 | 5 | 1 | 2.08 | 4.17 |
| Pout (Output Power) | Watts (max) | 60 W | 125 W | 250 W | 60 W | 125 W | 250 W | 60 W | 125 W | 250 W |
| Capactiance | Internal storage capactiance | 750pf | 750pf | 375pf | 600pf | 600pf | 300pf | 500pf | 500pf | 250pf |
| Ripple[2] | % | < 1.0 | | | < 1.0 | | | < 1.0 | | |

[1] Standard product specifications shown unless noted. Custom configurations are available.

[2] Nominal ripple measured @ 100% HVout, 100% LOAD into Cx > 0.5 µF. Valid for 10 to 100% HVout range.

| Programming and Controls | Standard | I5/I10 Interface |
|---|---|---|
| Input Impedance | +Output Models: 1.1 MΩ to GND | 10 MΩ |
| | -Output Models: 1.1 MΩ to +5 Vref | |
| Adjust Resistance | 10 to 100 K (Pot. across Vref. and signal GND, wiper to adjust) | Same as Standard |
| Adjust Logic | 0 to 5 for +Output, +5 to 0 for -Output, +4.64 VDC for +output or +0.36 VDC for -output = Nominal | 0 to +5 (I5), 0 to +10 (I10) |
| Reference Voltage and Impedance | +5.00 VDC ±1%, Zout = 464 Ω ±1% | +5 V 3 mA (I5), +10 V 3 mA (I10) |
| Enable/Disable | 0 to +0.8 disable, +2.0 to 30 enable (default = enable) | 0 to +0.8 disable, +2.0 to 30 enable (default = disable) |

| Stability and Regulation | |
|---|---|
| Stability | 0.01% (100 ppm) @ 100% HVout (after 30 min warmup interval) |
| | 0.02% (200 ppm) @ 100% HVout (per 8 h interval) |
| Line Regulation | 0.01% (100 ppm) @ 100% HVout, 100% Pout, Vin (nominal) |
| Static Load Regulation | 0.01% (100 ppm) @ 100% HVout, 0 to 100% LOAD |
| Temperature Coefficient | 50 ppm/°C (Standard configuration over operating temperature range) |
| Power-On Rise Time | Application dependent (See Rise Time / Capacitor Charging Equations) |

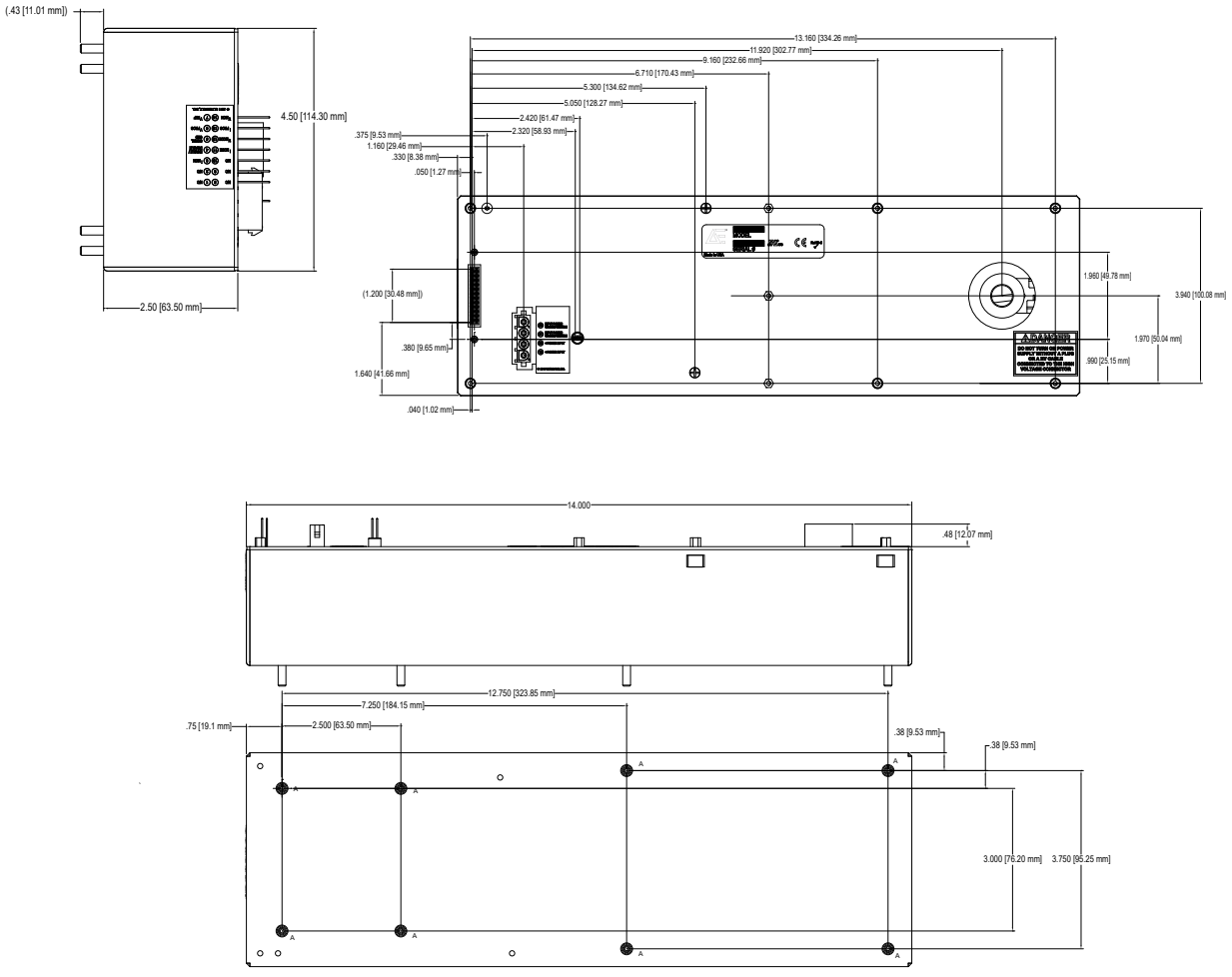
## ELECTRICAL SPECIFICATIONS (CONTINUED)

| Environmental | |
|---|---|
| Operating Temperature Range | -40 to 65°C (-40 to 149°F) bottom case temperature |
| Storage | -55 to 105°C (-67 to 222°F) case temperature |
| Humidity | 0 to 95% RH, non-condensing |
| Altitude | Sea level to 3000 m (10,000 ft) |

| Regulatory | |
|---|---|
| Certifications | UL/cUL recognized, IEC-60950-1, CE mark (LVD and RoHS) |

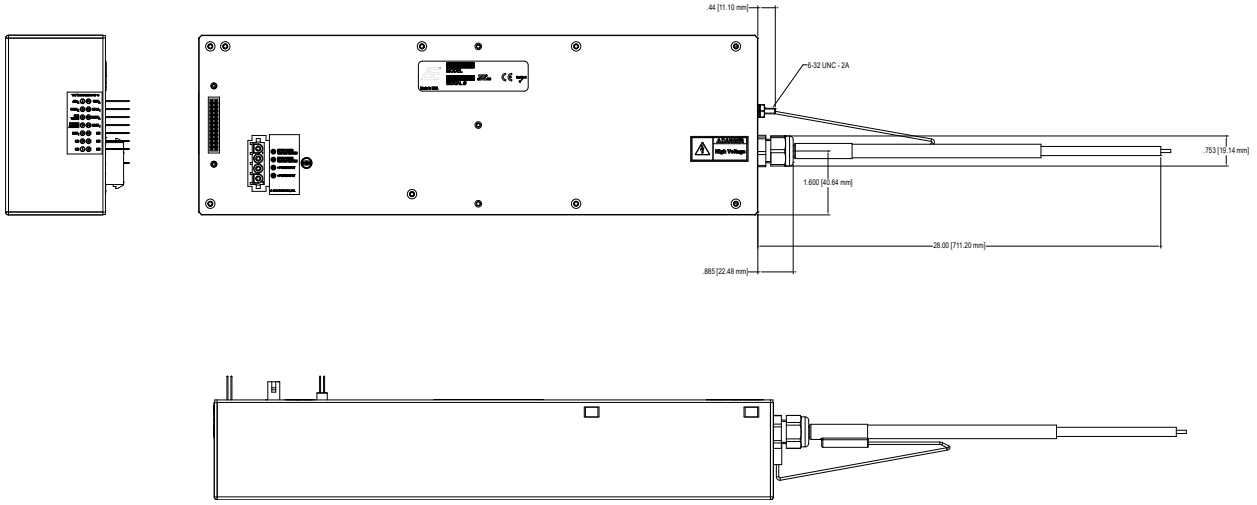
## MECHANICAL SPECIFICATIONS

### 40C and 50C



## MECHANICAL SPECIFICATIONS (CONTINUED)

### 40C and 50C with -WS and 60C




| Construction | |
|---|---|
| Standard Case | Aluminum (Anodized per MIL-A-8625 Type II) |
| Bottom Mounting Studs | Eight #8-32 steel threaded standoffs |
| Heatsink | Aluminum (Anodized, -H Option) |
| PCB Standoffs | Zinc-plated steel (-Z11 Option) |
| Labels | Static-dissipative polyester |
| Cooling | Natural convection and conduction |
| Encapsulation | Silicone-based RTV (contact factory for other options) |
| Pins | Gold-plated bronze |

| Volumes and Weights | All Models | |
|---|---|---|
| Volume (Module body only) | $cm^3$ | $in^3$ |
| | 2621.9 | 160.0 |
| Weight (Standard Configuration) | g | oz |
| | 4536 | 160.0 |

## INTERFACE

| Connections | | |
|---|---|---|
| **Pin** | **Function: Standard** | **Function: I5 or I10 option** |
| 1 and 8 | N/C | N/C |
| 2 and 9 | N/C | N/C |
| 3 | Iout Monitor | Buffered Current Monitor (5 mA max) |
| 4 | Enable/Disable | Enable/Disable |
| 5 | Signal Ground | Signal Ground |
| 6 | Voltage Programming | Voltage Programming |
| 7 | +5 VDC Reference Output | +5 VDC (-I5) or +10 VDC (I10) Reference Output |
| 10 | N/C | N/C or Arc Dectection Option |
| 11 | N/C | Current Mode Indicator |
| 12 | N/C | Voltage Mode Indicator |
| 13 | N/C | Current Programming |
| 14 | Output Voltage Monitor | Buffered Voltage Monitor (5 mA max) |
| 15 and 16 | HV Ground Return | HV Ground Return |
| 19 and 20 | Positive DC Power Input | Positive DC Power Input |
| 21 and 22 | Input Power Ground Return | Input Power Ground Return |
| LGH3 (40, 50 kV)[1] | HV Output | HV Output |
| 28" Coaxial Flying Lead (60 kV) | HV Output | HV Output |

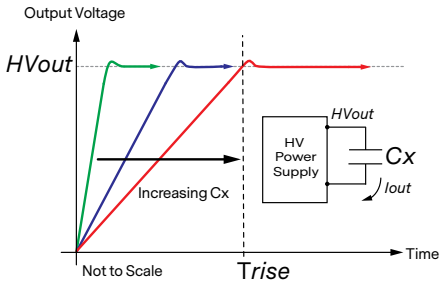
[1] 40 and 50 kV units require mating cable CA-50kV-1000 (Sold Separately)

## STANDARD OPTIONS

The High Power C series can be configured with options that adapt its performance and packaging to many application requirements. Customized models to meet specialized voltage ranges, packaging and environmental needs are also available. For a complete list of available options, contact the factory.

| Option | Description |
|---|---|
| -I5 | Upgrades analog interface to provide more precise control and monitoring of both HVout and Iout using 0 to 5 VDC (full scale) signals. Also adds Iout control and voltage/current mode indication capability not available on the Standard Interface. Not available with -I10 option. |
| -I10 | Upgrades analog interface to provide more precise control and monitoring of both HVout and Iout using 0 to 10 VDC (full scale) signals. Also adds Iout control and voltage/current mode indication capability not available on the Standard Interface. Not available with -I5 option. |
| -H | Mounts a heatsink onto the case bottom to assist in convective heat dissipation. |
| -Z11 | Permits PCB mounting by adding seven 4.8 mm (0.188 in) x #4-40 threaded standoffs to the case top. Not available with -DA or -DAR option. |
| -DA | Replaces header with D-sub connector (Type DA-15, Male). Not available with -DAR or -Z11 option. |
| -DAR | Replaces header with right-angle D-sub connector (Type DA-15, Male). Not available with -DA or -Z11 option. |
| -AD | Arc detection option (Only available with -I5 or -I10 interface) |
| -AQ | Arc quench option (Only available with -I5 or -I10 interface) (includes-AD) |

## RISE TIME / CAPACITOR CHARGING




$$Trise = \frac{(Co + Cx) \times HVout}{Iout}$$

$$Iout = (Co + Cx) \times HVout \times freq$$

$$Pout = \frac{(Co + Cx) \times (HVout)^2}{2 \times Trise}$$

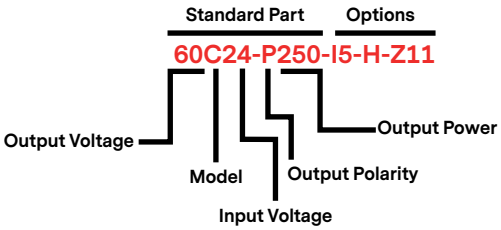
*Trise* = Rise time (Seconds)
*Co* = Internal storage capacitance (Farads)
*Cx* = External capacitive load (Farads)
*freq* = Switching frequency (Hz)
*HVout* = Output voltage (VDC)
*Iout* = Output current (Amps)
*Pout* = Output power (Watts)

## ORDERING INFORMATION

| | | |
|---|---|---|
| Type | 0 to 40,000 VDC Output | 40C |
| | 0 to 50,000 VDC Output | 50C |
| | 0 to 60,000 VDC Output | 60C |
| Input | 24 VDC Nominal | 24 |
| Polarity | Positive Output | -P |
| | Negative Output | -N |
| Power | 60 W Output | 60 |
| | 125 W Output | 125 |
| | 250 W Output | 250 |
| Heatsink | 1.02 cm (0.400") high (sized to fit case) | -H |
| PCB Support | (6) 0.47 cm (0.187) standoffs on top of cover | -Z11 |
| Enhanced Interface | 5 V Control and Monitors | -I5 |
| | 10 V Control and Monitors | -I10 |
| Performance Options | Arc Detect* | -AD |
| | Arc Quench* | -AQ |
| Connection Options | Straight 15-Pin D-sub connector (Type DA-15Male) | -DA |
| | Right-angle 15-Pin D-sub connector (Type DA-15Male) | -DAR |

* Available only with I5 or I 10 options

* -DA and -DAR not available with a -Z11 option



## ABOUT ADVANCED ENERGY

Since 1981, Advanced Energy (AE) — and its UltraVolt® family of products — has perfected how power performs for its customers. For both end users and OEMs, AE's comprehensive portfolio of standard and custom high-voltage components precisely match system specifications to deliver unparalleled energy, quality, and performance. Through close customer collaboration, design expertise, application insight, and world-class support, AE creates successful partnerships and enables customers to push the boundaries of innovation and stay ahead of evolving market needs.

PRECISION | POWER | PERFORMANCE

CAUTION:
High Voltage

Read and understand all documentation before you install, operate, or maintain Advanced Energy high voltage power supplies. Follow all safety instructions and precautions to protect against property damage and serious or possibly fatal bodily injury. Never defeat safety interlocks or grounds.

Advanced Energy

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ENG-High-Power-40C-60C-235-01 03.20