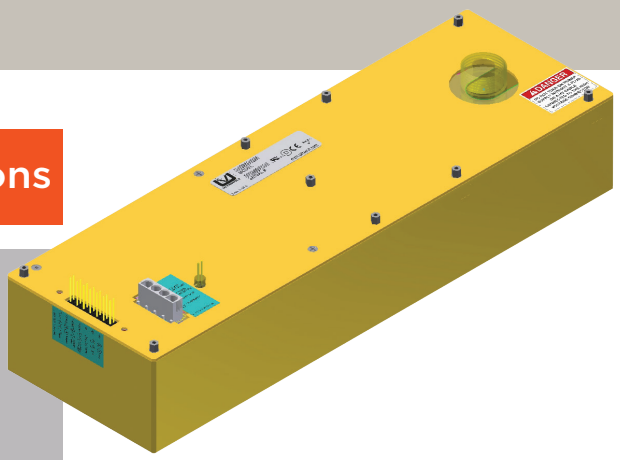
Advanced Energy®

# ULTRAVOLT® HIGH-POWER 40C TO 60C SERIES

## 40 TO 60 KV HIGH VOLTAGE CAP-CHARGING SUPPLIES

# **Single-output** DC to high voltage DC modules for capacitor charging and DC power

**The high-power 40C to 60C line of high voltage regulated DC-to-DC converters is an extension of the C series,** directly addressing the high-power-density needs of > 30 W applications from 40 to 60 kV. This high power density is especially suited to high-energy systems with large capacitances, fast repetition rates, or high continuous-DC-power requirements.



## Features

- 3 models from 0 to 40 kV through 0 to 60 kV
- 60, 125, or 250 W output power
- Maximum Iout capability down to 0 V
- Maximum Iout during charge/rise time
- Output short-circuit protection
- Very fast rise with very low over-shoot
- High efficiency
- High power density
- Output current and voltage monitors
- > 200,000 hour MTBF at 65°C
- Fixed-frequency, low-stored-energy design
- Optional digital-ready higher-performance interface (-I5/-I10)

## Typical Applications

- Pulsed laser
- Ion pump
- Plasma generator
- Electrostatic precipitator
- Deposition
- HV amplifier bias
- HV cap charger
- HV pulse generator
- HV test equipment
  - Insulation testing (hi-pot)
  - Time-domain-resolver (TDR)
  - Motor winding tester or cable thumper

| PARAMETER | CONDITIONS | | | | | | | | | | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Input** | | **All Types** | | | | | | | | | |
| **Voltage Range** | Full Power | +23 to 30 | | | | | | | | | VDC |
| **Voltage Range** | Derated Power Range | 15 to 23; 30 to 32 | | | | | | | | | VDC |
| **Current** | Standby/Disable | < 150 | | | | | | | | | mA |
| **Current** | No Load, Max Eout | < 1250 | | | | | | | | | mA |
| **Current** | Max Load, Max Eout | < 13 | | | | | | | | | A |
| **Output** | | **40 C** | | | **50 C** | | | **60 C** | | | |
| **Voltage Range** | Nominal Input | 0 to 40,000 | | | 0 to 50,000 | | | 0 to 60,000 | | | VDC |
| **Power** | Nominal Input, Max Eout | 60 | 125 | 250 | 60 | 125 | 250 | 60 | 125 | 250 | Watts |
| **Current** | Iout, Entire Output Voltage Range | 1.50 | 3.13 | 6.25 | 1.20 | 2.50 | 5.00 | 1.00 | 2.08 | 4.17 | mA |
| **Current Scale Factor** | Full Load | 0.30 | 0.63 | 1.25 | 0.24 | 0.50 | 1.00 | 0.20 | 0.42 | 0.83 | mA/V |
| **Voltage Monitor Scaling** | | 10,000:1 ±2% | | | | | | | | | - |
| **Internal Capacitance** | Capacitance/95% Decay (50 Meg Load) | 750/104 | 750/104 | 375/52 | 600/84 | 600/84 | 300/42 | 500/70 | 500/70 | 250/35 | pF/mS |
| **Ripple** | Full Load, Max Eout | < 1% | | | | | | | | | V p-p |
| **Rise Time** | Max Iout, Various C Loads and Eout | Figure A | | | | | | | | | - |
| **Storage Capacitance** | Internal | 750 | 750 | 375 | 600 | 600 | 300 | 500 | 500 | 250 | pF |
| **Over-shoot** | C Load, 0 Eout to Full Eout | < 1% | | | | | | | | | V pk |
| **Line Regulation** | Nom. Input, Max Eout, Full Power | < 0.01% | | | | | | | | | VDC |
| **Static Load Regulation** | No Load to Full Load, Max Eout | < 0.01%/< 0.02% | | | | | | | | | VDC |
| **Stability** | 30 Min Warmup, Per 8 H Per Day | | | | | | | | | | VDC |
| **Programming and Controls** | | **All Types** | | | | | | | | | |
| **Input Impedance** | Nominal Input | +Output models 1.1 MΩ to GND, -output models 1.1 MΩ to +5 Vref | | | | | | | | | MΩ |
| **Adjust Resistance** | Typical Potentiometer Values | 10 to 100 K (Pot. across Vref. and signal GND, wiper to adjust) | | | | | | | | | Ω |
| **Adjust Logic** | 0 to +5 for +Out, +5 to 0 for -Out | +4.64 VDC for +output or +0.36 for -output = nominal Eout | | | | | | | | | - |
| **Output Voltage and Impedance** | T=+25°C | +5.00 VDC ±1%, Zout = 464 Ω ±1% | | | | | | | | | - |
| **Enable/Disable** | | 0 to +0.8 V disable, +2.0 to 30 enable (default = enable) | | | | | | | | | VDC |
| **Environmental** | | **All Types** | | | | | | | | | |
| **Operating** | Full Load, Max Eout, Case Temperature | -40 to +65 | | | | | | | | | °C |
| **Coefficient** | Over the Specified Temperature | ±50 (±25 optional) | | | | | | | | | PPM/°C |
| **Thermal Shock** | Mil-Std-810, Method 503-4, Proc. II | -40 to +65 | | | | | | | | | °C |
| **Storage** | Non-Operating, Case Temp. | -55 to +105 | | | | | | | | | °C |
| **Humidity** | All Conditions, Standard Package | 0 to 95% non-condensing | | | | | | | | | - |
| **Altitude** | Standard Package, All Conditions | Sea level through 70,000 | | | | | | | | | ft |
| **Shock** | Mil-Std-810, Method 516.5, Proc. IV | 20 | | | | | | | | | Gs |
| **Vibration** | Mil-Std-810, Method 514.5, Fig. 514.5C-3 | 10 | | | | | | | | | Gs |

*Figure A. Rise time formulas*

C = uF
V = Volts
I = mA
T = mS

$$T = \frac{C \times V}{I}$$

C = uF
V = kV
I = mA
F = Hz

$$I = C \times V \times F$$

C = uF
V = kV
I = mA
F = Hz

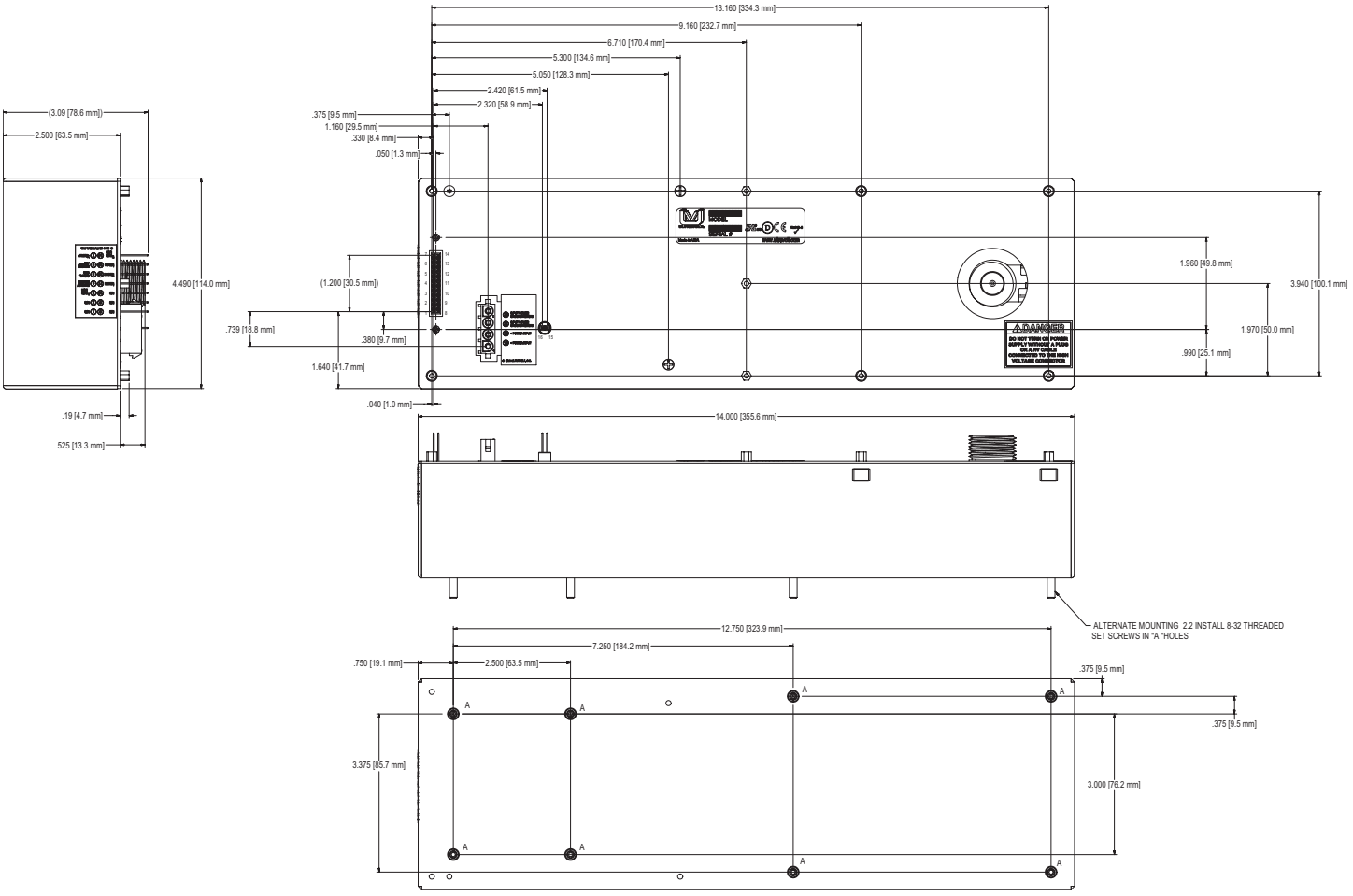
$$F = \frac{I}{CxV}$$

C = uF
$E^2$ = kV
J = Ws

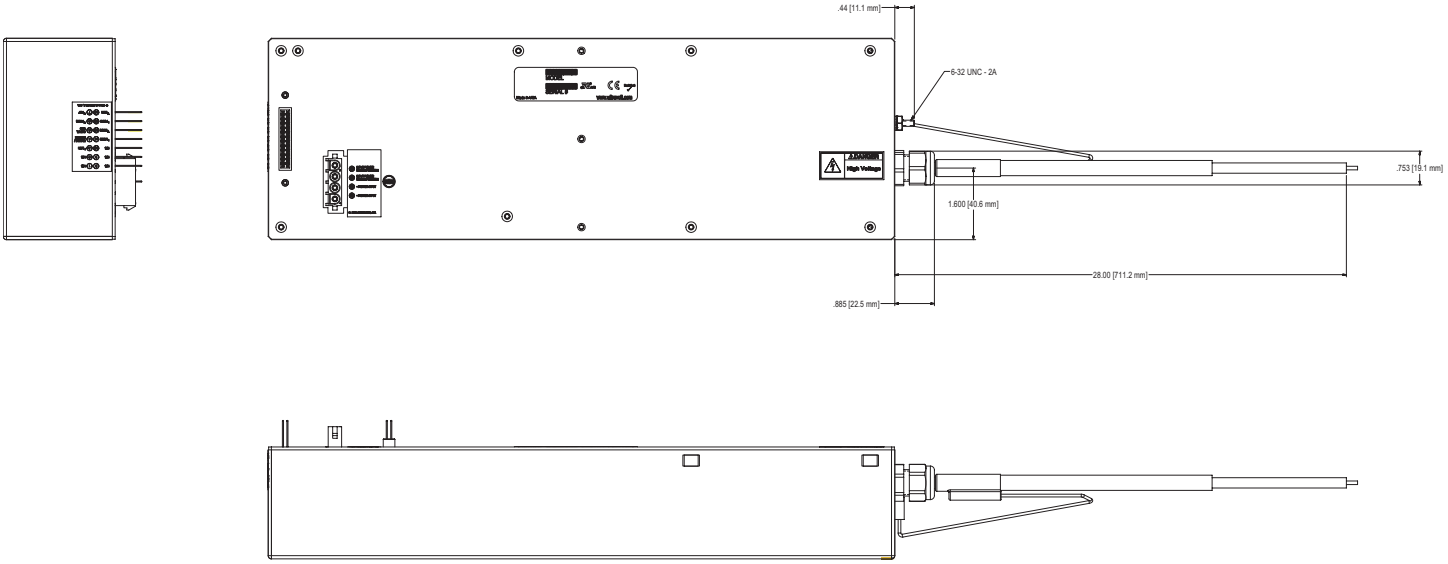
$$J = \frac{C \times E^2}{2}$$

***Note:*** *Capacitance must include HVPS internal capacitance.*

## 40C AND 50C


13.160 [334.3 mm]
9.160 [232.7 mm]
6.710 [170.4 mm]
5.300 [134.6 mm]
5.050 [128.3 mm]
2.420 [61.5 mm]
2.320 [58.9 mm]
.375 [9.5 mm]
1.160 [29.5 mm]
.330 [8.4 mm]
.050 [1.3 mm]
(3.09 [78.6 mm])
2.500 [63.5 mm]
4.490 [114.0 mm]
.19 [4.7 mm]
.525 [13.3 mm]
(1.200 [30.5 mm])
.739 [18.8 mm]
.380 [9.7 mm]
1.640 [41.7 mm]
.040 [1.0 mm]
1.960 [49.8 mm]
3.940 [100.1 mm]
1.970 [50.0 mm]
.990 [25.1 mm]
14.000 [355.6 mm]
ALTERNATE MOUNTING 2.2 INSTALL 8-32 THREADED SET SCREWS IN "A "HOLES
12.750 [323.9 mm]
7.250 [184.2 mm]
.750 [19.1 mm]
2.500 [63.5 mm]
.375 [9.5 mm]
.375 [9.5 mm]
3.375 [85.7 mm]
3.000 [76.2 mm]
A

## 40C AND 50C WITH -WS AND 60C




## PHYSICAL SPECIFICATIONS

| | |
|---|---|
| **Pins** | Gold-plated 0.64 $mm^2$ (0.025 $in^2$) |
| | Center of pins and mounting holes located from center of pin 1 |
| | Pins 1 through 14 spacing: 2.54 mm x 5.08 mm (0.100″ x 0.200″) on center, height from cover 7.11 mm (0.280″) min |
| | Pins 15 and 16 spacing: 2.54 mm (0.100″) on center, height from cover 11.43 mm (0.450″) min |
| **HV Output Connection** | 40C-50C LGH flying lead cable assembly required, P/N CA-50KV-1000 |
| | 60C standard 0.7 m (28″) coaxial flying lead |
| **Construction** | RTV-filled aluminum box |
| | Chem film per MIL-A-8625 Type II (anodizing) |
| **Approx. Volume** | 0.0026 $m^3$ (160 $in^3$) |
| **Approx. Weight** | 4.5 kg (10 lb) |
| **Overall** | ±1.02 mm (0.040″) pin to pin 0.38 mm (0.015″) |
| **Hole-to-Hole Location** | 0.76 mm (0.03″) |

## CONNECTIONS

| Pin | Function |
|---|---|
| **21 and 22** | Input-power ground return |
| **19 and 20** | Positive power input |
| **3** | Iout monitor |
| **4** | Enable/disable |
| **5** | Signal ground return |
| **6** | Remote adjust input |
| **7** | +5 VDC reference output |
| **10** | N/C (or arc detect option) |
| **11, 12, and 13** | N/C |
| **14** | Eout monitor |
| **15 and 16** | HV ground return |

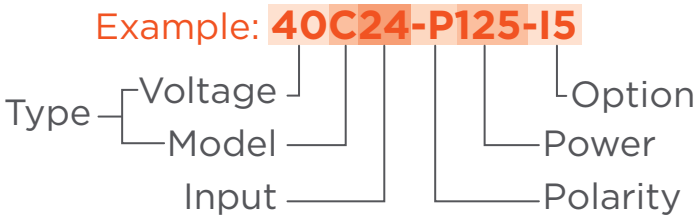
- *All grounds joined internally. Power-supply mounting points isolated from internal grounds by > 100 kΩ, 0.01 µF/500 V (max).*

## ORDERING INFORMATION

| | | |
|---|---|---|
| **Type** | 40,000 VDC Output | 40C |
| | 50,000 VDC Output | 50C |
| | 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 |
| **Heat Sink** | 1.02 cm (0.400") High (Sized to Fit Case) | -H |
| **PCB Support** | (5) 0.47 cm (0.187") Standoffs on Top Cover | -Z11 |
| **Enhanced Interface** | 5 V Controls and Monitors | -I5 |
| | 10 V Control and Monitors | -I10 |
| **Options** | Arc Detect* | -AD |
| | Arc Quench* | -AQ |

** Available only with I5 or I10 options*

*Note: For more information on the enhanced interface options, download the I5/I10 option datasheet.*




IEC-60950-1

*Non-RoHS compliant units are available. Please contact the factory for more information.*

*Manufactured in U.S.A.*

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