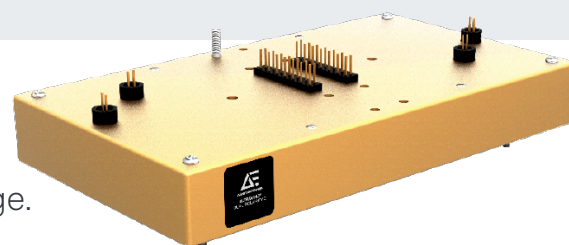


# ULTRAVOLT DUAL POLARITY 1/8C TO 6C SERIES

DUAL OUTPUT HIGH VOLTAGE, HIGH POWER CONVERTERS

The UltraVolt® Dual Polarity C integrates two high power DC-to-DC converters of opposite polarity into a single package.



## PRODUCT HIGHLIGHTS

- Regulated high voltage outputs ranging from  $\pm 125$  to  $\pm 6$  kV VDC maximum
- Positive and negative unipolar outputs, independently controllable
- Choice of 120 W (2 x 60 W) or 250 W (2 x 125 W) total output power
- 24 VDC input
- Output ripple performance  $< 1.0\%$
- Controlled high voltage overshoot enhances longevity of external load components
- Temperature coefficient  $< 50$  ppm/ $^{\circ}\text{C}$
- Ease of installation with chassis or PCB-mount options
- 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

- High voltage power rails for Amplifiers and Piezoelectric devices
- High voltage capacitor charging
- Pulse generators and pulsed power
- Ultrasound
- Lasers and opto-electronics

## AT A GLANCE

### Maximum Output Voltage

125, 250, 500, 1 k, 2 k, 4 k, or 6 k VDC

### Maximum Output Power

250 W

### Type

Dual Output

### Ripple

$< 1.0\%$

### Control

Analog

### Temperature Coefficient

50 ppm/ $^{\circ}\text{C}$

## ULTRAVOLT DUAL POLARITY 1/8C TO 6C SERIES

### ELECTRICAL SPECIFICATIONS

| Model <sup>1</sup>                                                           |                                           | 1/8C Series   |       | 1/4C Series   |       |
|------------------------------------------------------------------------------|-------------------------------------------|---------------|-------|---------------|-------|
| High Voltage Output Range (Adjustable Regulated, Positive Polarity Unit)     |                                           | 0 to +125 VDC |       | 0 to +250 VDC |       |
| High Voltage Output Range (Adjustable Regulated, Negative Polarity Unit)     |                                           | 0 to -125 VDC |       | 0 to -250 VDC |       |
| High Voltage Outputs                                                         |                                           | Dual Unipolar |       | Dual Unipolar |       |
| Input Voltage (VDC, Nominal)                                                 |                                           | 24 VDC        |       | 24 VDC        |       |
| Power Output (Total Watts, Nominal)                                          |                                           | 120 W         | 250 W | 120 W         | 250 W |
| DC Input (Separately for Positive Polarity Unit and Negative Polarity Unit)  |                                           |               |       |               |       |
| Vin Range (Input Voltage)                                                    | VDC (positive polarity only)              | 23 to 30      |       | 23 to 30      |       |
| Vin (Nominal)                                                                | VDC                                       | 24            |       | 24            |       |
| Iin (Input Current, Nominal)                                                 | A @ 100% HVout, 100% LOAD (per unit)      | < 3.3         | < 6.9 | < 3.3         | < 6.9 |
|                                                                              | A @ 100% HVout, 0% LOAD (per unit)        | < 0.5         | < 0.8 | < 0.5         | < 0.8 |
|                                                                              | A @ disable/standby state (per unit)      | < 0.075       |       | < 0.075       |       |
| DC Output (Separately for Positive Polarity Unit and Negative Polarity Unit) |                                           |               |       |               |       |
| HVout (Output Voltage)                                                       | VDC (positive polarity unit = +HVout)     | 0 to +125     |       | 0 to +250     |       |
| HVout (Output Voltage)                                                       | VDC (negative polarity unit = -HVout)     | 0 to -125     |       | 0 to -250     |       |
| Iout (Output Current, Per Unit)                                              | mA (max) @ 0 to 100% HVout, Vin (nominal) | 480           | 1000  | 240           | 500   |
| Pout (Output Power, Per Unit)                                                | Watts (max)                               | 60            | 125   | 60            | 125   |
| Ripple <sup>2,3</sup>                                                        | %                                         | < 1.0         |       | < 1.0         |       |
|                                                                              | ppm                                       | < 10,000      |       | < 10,000      |       |
|                                                                              | Vpp                                       | < 1.3         |       | < 2.5         |       |

| Model <sup>1</sup>                                                           |                                           | 1/2C Series   |       | 1C Series      |       |
|------------------------------------------------------------------------------|-------------------------------------------|---------------|-------|----------------|-------|
| High Voltage Output Range (Adjustable Regulated, Positive Polarity Unit)     |                                           | 0 to +500 VDC |       | 0 to +1000 VDC |       |
| High Voltage Output Range (Adjustable Regulated, Negative Polarity Unit)     |                                           | 0 to -500 VDC |       | 0 to -1000 VDC |       |
| High Voltage Outputs                                                         |                                           | Dual Unipolar |       | Dual Unipolar  |       |
| Input Voltage (VDC, Nominal)                                                 |                                           | 24 VDC        |       | 24 VDC         |       |
| Power Output (Total Watts, Nominal)                                          |                                           | 120 W         | 250 W | 120 W          | 250 W |
| DC Input (Separately for Positive Polarity Unit and Negative Polarity Unit)  |                                           |               |       |                |       |
| Vin Range (Input Voltage)                                                    | VDC (positive polarity only)              | 23 to 30      |       | 23 to 30       |       |
| Vin (Nominal)                                                                | VDC                                       | 24            |       | 24             |       |
| Iin (Input Current, Nominal)                                                 | A @ 100% HVout, 100% LOAD (per unit)      | < 3.3         | < 6.9 | < 3.3          | < 6.9 |
|                                                                              | A @ 100% HVout, 0% LOAD (per unit)        | < 0.5         | < 0.8 | < 0.5          | < 0.8 |
|                                                                              | A @ disable/standby state (per unit)      | < 0.075       |       | < 0.075        |       |
| DC Output (Separately for Positive Polarity Unit and Negative Polarity Unit) |                                           |               |       |                |       |
| HVout (Output Voltage)                                                       | VDC (positive polarity unit = +HVout)     | 0 to +500     |       | 0 to +1000     |       |
| HVout (Output Voltage)                                                       | VDC (negative polarity unit = -HVout)     | 0 to -500     |       | 0 to -1000     |       |
| Iout (Output Current, Per Unit)                                              | mA (max) @ 0 to 100% HVout, Vin (nominal) | 120           | 250   | 60             | 125   |
| Pout (Output Power, Per Unit)                                                | Watts (max)                               | 60            | 125   | 60             | 125   |
| Ripple <sup>2,3</sup>                                                        | %                                         | < 1.0         |       | < 1.0          |       |
|                                                                              | ppm                                       | < 10,000      |       | < 10,000       |       |
|                                                                              | Vpp                                       | < 5.0         |       | < 10           |       |

ELECTRICAL SPECIFICATIONS (CONTINUED)

| Model <sup>1</sup>                                                          |                                           | 2C Series      |       | 4C Series      |       |
|-----------------------------------------------------------------------------|-------------------------------------------|----------------|-------|----------------|-------|
| High Voltage Output Range (Adjustable Regulated, Positive Polarity Unit)    |                                           | 0 to +2000 VDC |       | 0 to +4000 VDC |       |
| High Voltage Output Range (Adjustable Regulated, Negative Polarity Unit)    |                                           | 0 to -2000 VDC |       | 0 to -4000 VDC |       |
| High Voltage Outputs                                                        |                                           | Dual Unipolar  |       | Dual Unipolar  |       |
| Input Voltage (VDC, Nominal)                                                |                                           | 24 VDC         |       | 24 VDC         |       |
| Power Output (Total Watts, Nominal)                                         |                                           | 120 W          | 250 W | 120 W          | 250 W |
| DC Input (Separately for Positive Polarity Unit or Negative Polarity Unit)  |                                           |                |       |                |       |
| Vin (Input Voltage) Range                                                   | VDC (positive polarity only)              | 23 to 30       |       | 23 to 30       |       |
| Vin (Nominal)                                                               | VDC                                       | 24             |       | 24             |       |
| Iin (Input Current, Nominal)                                                | A @ 100% HVout, 100% LOAD (per unit)      | < 3.3          | < 6.9 | < 3.3          | < 6.9 |
|                                                                             | A @ 100% HVout, 0% LOAD (per unit)        | < 0.5          | < 0.8 | < 0.5          | < 0.8 |
|                                                                             | A @ disable/standby state (per unit)      | < 0.075        |       | < 0.075        |       |
| DC Output (Separately for Positive Polarity Unit or Negative Polarity Unit) |                                           |                |       |                |       |
| HVout (Output Voltage)                                                      | VDC (positive polarity unit = +HVout)     | 0 to +2000     |       | 0 to +4000     |       |
| HVout (Output Voltage)                                                      | VDC (negative polarity unit = -HVout)     | 0 to -2000     |       | 0 to -4000     |       |
| Iout (Output Current, Per Unit)                                             | mA (max) @ 0 to 100% HVout, Vin (nominal) | 30             | 63    | 15             | 31    |
| Pout (Output Power, Per Unit)                                               | Watts (max)                               | 60             | 125   | 60             | 125   |
| Ripple <sup>2,3</sup>                                                       | %                                         | < 1.0          |       | < 1.0          |       |
|                                                                             | ppm                                       | < 10,000       |       | < 10,000       |       |
|                                                                             | Vpp                                       | < 20           |       | < 40           |       |

| Model <sup>1</sup>                                                          |                                           | 6C Series      |       |
|-----------------------------------------------------------------------------|-------------------------------------------|----------------|-------|
| High Voltage Output Range (Adjustable Regulated, Positive Polarity Unit)    |                                           | 0 to +6000 VDC |       |
| High Voltage Output Range (Adjustable Regulated, Negative Polarity Unit)    |                                           | 0 to -6000 VDC |       |
| High Voltage Outputs                                                        |                                           | Dual Unipolar  |       |
| Input Voltage (VDC, Nominal)                                                |                                           | 24 VDC         |       |
| Power Output (Total Watts, Nominal)                                         |                                           | 120 W          | 250 W |
| DC Input (Separately for Positive Polarity Unit or Negative Polarity Unit)  |                                           |                |       |
| Vin (Input Voltage) Range                                                   | VDC (positive polarity only)              | 23 to 30       |       |
| Vin (Nominal)                                                               | VDC                                       | 24             |       |
| Iin (Input Current, Nominal)                                                | A @ 100% HVout, 100% LOAD (per unit)      | < 3.3          | < 6.9 |
|                                                                             | A @ 100% HVout, 0% LOAD (per unit)        | < 0.5          | < 0.8 |
|                                                                             | A @ disable/standby state (per unit)      | < 0.075        |       |
| DC Output (Separately for Positive Polarity Unit or Negative Polarity Unit) |                                           |                |       |
| HVout (Output Voltage)                                                      | VDC (positive polarity unit = +HVout)     | 0 to +6000     |       |
| HVout (Output Voltage)                                                      | VDC (negative polarity unit = -HVout)     | 0 to -6000     |       |
| Iout (Output Current, Per Unit)                                             | mA (max) @ 0 to 100% HVout, Vin (nominal) | 10             | 21    |
| Pout (Output Power, Per Unit)                                               | Watts (max)                               | 60             | 125   |
| Ripple <sup>2,3</sup>                                                       | %                                         | < 1.0          |       |
|                                                                             | ppm                                       | <10,000        |       |
|                                                                             | Vpp                                       | < 60           |       |

## ULTRAVOLT DUAL POLARITY 1/8C TO 6C SERIES

### ELECTRICAL SPECIFICATIONS (CONTINUED)

| 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 (over operating temperature range)                         |
| Power-On Rise Time       | Application dependent (See Rise Time / Capacitor Charging equations) |

| Environmental               |                                                    |
|-----------------------------|----------------------------------------------------|
| Operating Temperature Range | -40 to 65°C (-40 to 149°F) case bottom 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)                    |

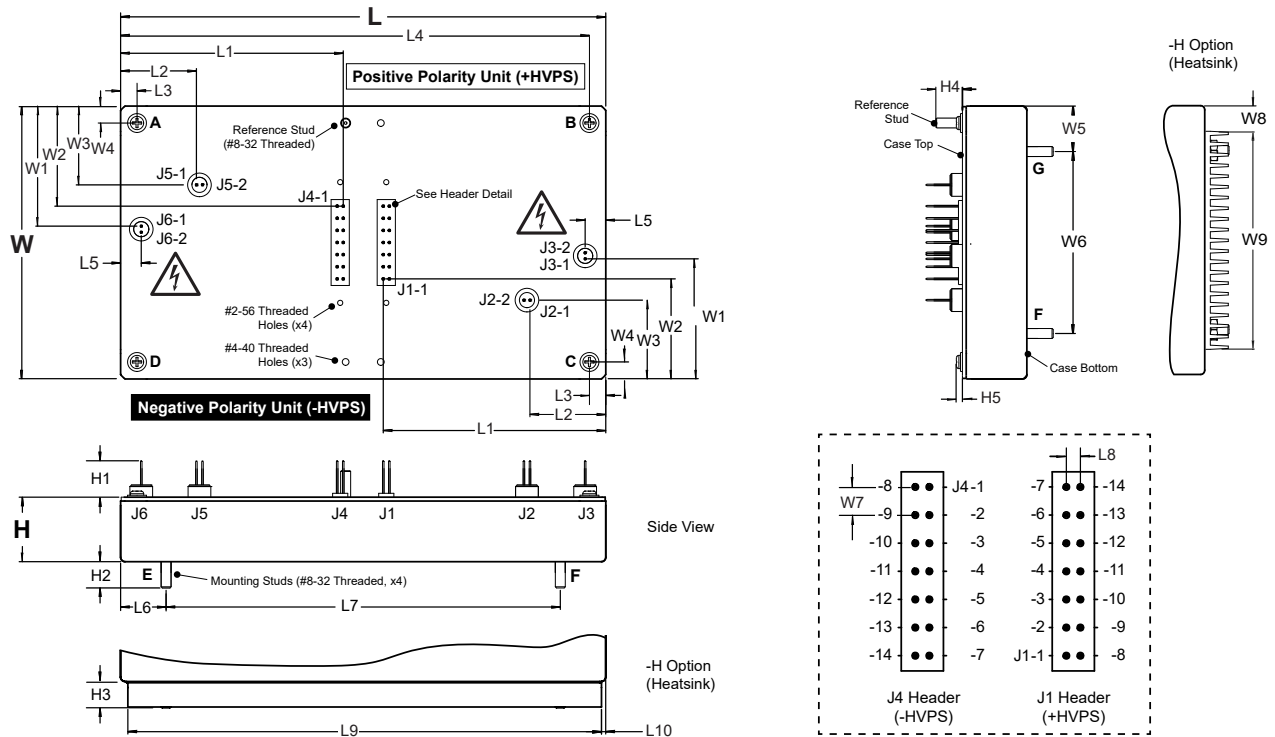
| Regulatory     |                                                        |
|----------------|--------------------------------------------------------|
| Certifications | UL/cUL recognized, IEC-60950-1, CE Mark (LVD and RoHS) |

<sup>1</sup> Standard product specifications shown unless noted. Custom configurations are available.

<sup>2</sup> Nominal ripple measured @ 100% HVout, 100% LOAD into  $C_x > 0.5\mu\text{F}$ . Valid for 10 to 100% HVout range.

<sup>3</sup>  $V_{pp}$  = VDC peak-to-peak @ 100% HVout, % = Percent @ 100% HVout ( $V_{pp}$ ), ppm = parts per million @ 100% HVout ( $V_{pp}$ )

MECHANICAL SPECIFICATIONS



| Volumes and Weights                         | All Models      |                 |
|---------------------------------------------|-----------------|-----------------|
|                                             | cm <sup>3</sup> | in <sup>3</sup> |
| Volume (Module Body Only)                   | 635             | 38.7            |
| Volume (Module Body, plus -H Option Height) | 890             | 54.3            |
|                                             | g               | oz              |
|                                             |                 |                 |
| Weight (Standard Configuration)             | 1140            | 40.2            |
| Weight (with -H Option)                     | 1460            | 51.5            |

| Construction  |                                                        |
|---------------|--------------------------------------------------------|
| Standard Case | Aluminum (Anodized per MIL-A-8625 Type II)             |
| 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                                     |

## ULTRAVOLT DUAL POLARITY 1/8C TO 6C SERIES

### MECHANICAL SPECIFICATIONS (CONTINUED)

| Dimensions |                                                            | All Models   |             |
|------------|------------------------------------------------------------|--------------|-------------|
| Key        | Description <sup>1,2,3,4</sup>                             | mm           | in          |
| <b>L</b>   | <b>Overall Length</b>                                      | <b>203.2</b> | <b>8.00</b> |
| L1         | Case Exterior to J1-1 / J4-1                               | 93.0         | 3.66        |
| L2         | Case Exterior to J5-1 / J2-1                               | 32.1         | 1.26        |
| L3         | Case Exterior to Centerline Screw A / D                    | 7.1          | 0.28        |
| L4         | Case Exterior to Centerline Screw B / C                    | 196.1        | 7.72        |
| L5         | Case Exterior to J3-1 / J6-1                               | 9.0          | 0.35        |
| L6         | Case Exterior to Mounting Stud E                           | 19.0         | 0.75        |
| L7         | Centerline, Mounting Stud E to F                           | 165.0        | 6.50        |
| L8         | Pin-to-Pin Centerline Length of J1 and J4 Header (typical) | 2.6          | 0.10        |
| L9         | Heatsink (Overall Length, -H Option)                       | 198.0        | 7.80        |
| L10        | Case Exterior to Heatsink Edge (-H Option)                 | 2.6          | 0.10        |
| <b>W</b>   | <b>Overall Width</b>                                       | <b>114.3</b> | <b>4.5</b>  |
| W1         | Case Exterior to J6-1 / J3-1                               | 50.1         | 1.97        |
| W2         | Case Exterior to J4-1 / J1-1                               | 42.1         | 1.65        |
| W3         | Case Exterior to J5-1 / J2-1                               | 33.0         | 1.30        |
| W4         | Case Exterior to Screw A / D                               | 7.1          | 0.28        |
| W5         | Case Exterior to Mounting Stud G / H                       | 19.0         | 0.75        |
| W6         | Centerline, Mounting Stud E to F / (G to H)                | 76.2         | 3.00        |
| W7         | Pin-to-Pin Centerline Width of J1 and J4 Header (typical)  | 5.1          | 0.20        |
| W8         | Case Exterior to Heatsink Edge (-H Option)                 | 11.0         | 0.43        |
| W9         | Heatsink (Overall Width, -H Option)                        | 93.0         | 3.66        |
| <b>H</b>   | <b>Case Height (Case Bottom to Top, Max)</b>               | <b>27.4</b>  | <b>1.08</b> |
| H1         | Case Top to J6 Header Tip (typical)                        | 15.1         | 0.59        |
| H2         | Length of Mounting Stud E, F, G, H (typical)               | 11.1         | 0.43        |
| H3         | Heatsink Height (-H Option)                                | 10.2         | 0.40        |
| H4         | Length of Reference Stud                                   | 11.0         | 0.43        |
| H5         | Case Top of Screw A / B / C / D Top (typical)              | 2.6          | 0.10        |

<sup>1</sup> Approximate nominal dimensions and weights.

<sup>2</sup> Header pin-to-pin tolerances are  $\pm 0.76$  mm ( $\pm 0.015$  in).

<sup>3</sup> Mounting Stud H is not shown.

<sup>4</sup> Refer to outline drawings and 3D models for detailed information.

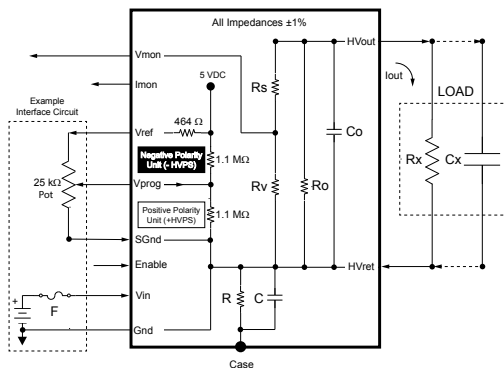
## INTERFACE

Two Standard Interfaces on the Dual Polarity C series permit voltage and monitoring of both output voltage and current using analog DC signals whose range and polarity vary by model. Schematics and control parameters apply to both the positive polarity (+HVPS) and negative polarity (-HVPS) interfaces.

| Standard Interfaces |             |        |        |                                       | -I5 and -I10 Interfaces (Optional) |             |        |        |                                            |
|---------------------|-------------|--------|--------|---------------------------------------|------------------------------------|-------------|--------|--------|--------------------------------------------|
| Pin (+HVPS)         | Pin (-HVPS) | Label  | Type   | Description                           | Pin (+HVPS)                        | Pin (-HVPS) | Label  | Type   | Description                                |
| J1-1                | J4-1        | Gnd    | Ground | DC Input Power Ground                 | J1-1                               | J4-1        | Gnd    | Ground | DC Input Power Ground                      |
| J1-2                | J4-2        | Vin    | Input  | DC Input Power                        | J1-2                               | J4-2        | Vin    | Input  | DC Input Power                             |
| J1-3                | J4-3        | Imon   | Output | Monitor HVout Current Level           | J1-3                               | J4-3        | Imon   | Output | Monitor HVout Current Level <sup>1,6</sup> |
| J1-4                | J4-4        | Enable | Input  | Enable HVout <sup>1</sup>             | J1-4                               | J4-4        | Enable | Input  | Enable HVout <sup>2</sup>                  |
| J1-5                | J4-5        | SGnd   | Ground | Signal Ground                         | J1-5                               | J4-5        | SGnd   | Ground | Signal Ground                              |
| J1-6                | J4-6        | Vprog  | Input  | Set HVout Voltage Level               | J1-6                               | J4-6        | Vprog  | Input  | Set HVout Voltage Level                    |
| J1-7                | J4-7        | Vref   | Output | Control Signal Reference <sup>2</sup> | J1-7                               | J4-7        | Vref   | Output | Control Reference Signal <sup>3,4</sup>    |
| J1-8                | J4-8        | Gnd    | Ground | DC Input Power Ground                 | J1-8                               | J4-8        | Gnd    | Ground | DC Input Power Ground                      |
| J1-9                | J4-9        | Vin    | Input  | DC Input Power                        | J1-9                               | J4-9        | Vin    | Input  | DC Input Power                             |
| J1-10               | J4-10       | N/C    |        | No Connection                         | J1-10                              | J4-10       | N/C    |        | No Connection                              |
| J1-11               | J4-11       | N/C    |        | No Connection                         | J1-11                              | J4-11       | Imode  | Output | Current Mode Indicator <sup>5</sup>        |
| J1-12               | J4-12       | N/C    |        | No Connection                         | J1-12                              | J4-12       | Vmode  | Output | Voltage Mode Indicator <sup>5</sup>        |
| J1-13               | J4-13       | N/C    |        | No Connection                         | J1-13                              | J4-13       | Iprog  | Input  | Set HVout Current Level                    |
| J1-14               | J4-14       | Vmon   | Output | Monitor HVout Voltage Level           | J1-14                              | J4-14       | Vmon   | Output | Monitor HVout Voltage Level <sup>1,6</sup> |
| J2-1                | J5-1        | HVret  | Ground | High Voltage Return                   | J2-1                               | J5-1        | HVret  | Ground | High Voltage Return <sup>6</sup>           |
| J2-2                | J5-2        | HVret  | Ground | High Voltage Return                   | J2-2                               | J5-2        | HVret  | Ground | High Voltage Return <sup>7</sup>           |
| J3-1                | J6-1        | HVout  | Output | High Voltage Output                   | J3-1                               | J6-1        | HVout  | Output | High Voltage Output                        |
| J3-2                | J6-2        | HVout  | Output | High Voltage Output                   | J3-2                               | J6-2        | HVout  | Output | High Voltage Output                        |

<sup>1</sup> Signal inputs: LOW < 0.8 VDC, HIGH > 2.0 VDC (OPEN OR HIGH = ENABLED)

<sup>2</sup> 5 VDC  $\pm 2\%$  through 464 W impedance load.



<sup>1</sup> Can source an output impedance load < 10kW

<sup>2</sup> Signal input: LOW < 0.8 VDC, HIGH > 2.0 VDC (OPEN OR LOW = DISABLED)

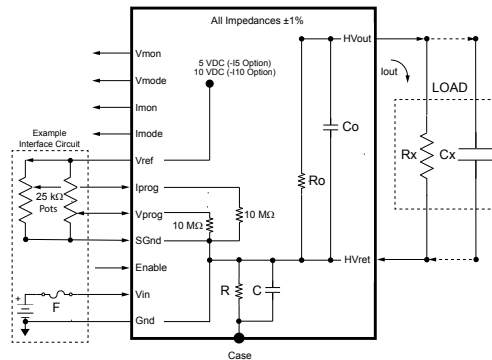
<sup>3</sup> -I5 interface: 5 VDC  $\pm 0.1\%$  @ 5 mA (nominal at case temperature = 25°C, 77°F)

<sup>4</sup> -I10 interface: 10 VDC  $\pm 0.1\%$  @ 5 mA (nominal at case temperature = 25°C, 77°F)

<sup>5</sup> LOW = Mode ON (open drain) will sink up to 30 mA.

<sup>6</sup> Voltage/current monitors will source/sink up to 2 mA.

<sup>7</sup> For proper operation and safety, always route HVret signal thru HVret connection.



## ULTRAVOLT DUAL POLARITY 1/8C TO 6C SERIES

### INTERFACE CONTROL PARAMETERS

| Model                                                                         |                                                   | 1/8C Series   | 1/4C Series   | 1/2C Series   | 1C Series      |
|-------------------------------------------------------------------------------|---------------------------------------------------|---------------|---------------|---------------|----------------|
| High Voltage Output Range (Positive Polarity Unit)                            |                                                   | 0 to +125 VDC | 0 to +250 VDC | 0 to +500 VDC | 0 to +1000 VDC |
| High Voltage Output Range (Negative Polarity Unit)                            |                                                   | 0 to -125 VDC | 0 to -250 VDC | 0 to -500 VDC | 0 to -1000 VDC |
| Input Voltage (VDC, Nominal)                                                  |                                                   | 24 VDC        | 24 VDC        | 24 VDC        | 24 VDC         |
| Power Output (Watts, Nominal, Total)                                          |                                                   | 120 W 250 W   | 120 W 250 W   | 120 W 250 W   | 120 W 250 W    |
| <b>Standard Interface (Monitor/Control Voltage, Monitor Current)</b>          |                                                   |               |               |               |                |
| Scale Factors <sup>1,2,3</sup>                                                | SVm (V/V) where HVout Monitor = SVm x Vmon        | 1000          | 1000          | 1000          | 1000           |
| Positive Polarity Unit                                                        | SVp (V/V) where HVout Control = SVp x Vprog       | 27            | 54            | 108           | 216            |
| Negative Polarity Unit                                                        | SVp (V/V) where HVout Control = SVp x (5 - Vprog) | -27           | -54           | -108          | -216           |
|                                                                               | Slm (mA/V) where Iout Monitor = Slm x Imon        | 103 216       | 51.7 108      | 25.9 53.9     | 12.9 26.9      |
|                                                                               | Slp (mA/V) where Iout Control = Slp x Iprog       | N/A           | N/A           | N/A           | N/A            |
| Impedances <sup>4</sup>                                                       | Ro (HVout impedance, ±1%)                         | 1.04 MΩ       | 2.55 MΩ       | 5.05 MΩ       | 10 MΩ          |
|                                                                               | Rs (Vmon upper tap impedance, ±1%)                | 100 MΩ        | 100 MΩ        | 100 MΩ        | 100 MΩ         |
|                                                                               | Rv (Vmon lower tap impedance, ±1%)                | 1.12 MΩ       | 1.12 MΩ       | 1.12 MΩ       | 1.12 MΩ        |
| <b>-I5 Interface (0 to 5 VDC, Monitor/Control Both Voltage and Current)</b>   |                                                   |               |               |               |                |
| Scale Factors <sup>5,6,8,9</sup>                                              | SVm (V/V) where HVout Monitor = SVm x Vmon        | 25            | 50            | 100           | 200            |
|                                                                               | SVp (V/V) where HVout Control = SVp x Vprog       | 25            | 50            | 100           | 200            |
|                                                                               | Slm (mA/V) where Iout Monitor = Slm x Imon        | 96 200        | 48 100        | 24 50         | 12 25          |
|                                                                               | Slp (mA/V) where Iout Control = Slp x Iprog       | 96 200        | 48 100        | 24 50         | 12 25          |
| Impedances <sup>4</sup>                                                       | Ro (HVout impedance, ±1%)                         | 1.04 MΩ       | 2.55 MΩ       | 5.05 MΩ       | 10.1 MΩ        |
| <b>-I10 Interface (0 to 10 VDC, Monitor/Control Both Voltage and Current)</b> |                                                   |               |               |               |                |
| Scale Factors <sup>5,7,8,9</sup>                                              | SVm (V/V) where HVout Monitor = SVm x Vmon        | 12.5          | 25            | 50            | 100            |
|                                                                               | SVp (V/V) where HVout Control = SVp x Vprog       | 12.5          | 25            | 50            | 100            |
|                                                                               | Slm (mA/V) where Iout Monitor = Slm x Imon        | 48 100        | 24 50         | 12 25         | 6 12.5         |
|                                                                               | Slp (mA/V) where Iout Control = Slp x Iprog       | 48 100        | 24 50         | 12 25         | 6 12.5         |
| Impedances <sup>4</sup>                                                       | Ro (HVout impedance, ±1%)                         | 1.04 MΩ       | 2.55 MΩ       | 5.05 MΩ       | 10.1 MΩ        |
| <b>Other Interface Values</b>                                                 |                                                   |               |               |               |                |
| Impedances <sup>4</sup>                                                       | R (between HVret and case, ±1%)                   | 1.10 MΩ       | 1.10 MΩ       | 1.10 MΩ       | 1.10 MΩ        |
|                                                                               | R (standard case with -I5 /-I10 option, ±1%)      | 1.10 MΩ       | 1.10 MΩ       | 1.10 MΩ       | 1.10 MΩ        |
| Capacitance <sup>4</sup>                                                      | C (@ 50 VDC ±10%, 1/8 W, max)                     | 0.01 mF       | 0.01 mF       | 0.01 mF       | 0.01 mF        |
|                                                                               | Co (Internal storage capacitance)                 | 0.66 μF       | 0.20 μF       | 0.094 μF      | 0.034 μF       |
| Input Voltage Protection                                                      | F (fuse or other protection recommended)          | See note 10   | See note 10   | See note 10   | See note 10    |

<sup>1</sup> For positive polarity unit, Vprog varies from 0 to 4.64 VDC. For negative polarity unit, Vprog varies inversely from 5 to 0.36 VDC.

<sup>2</sup> Slm factor is ±2% @ 100% LOAD, 100% HVout. Valid from 10 to 100% Iout.

<sup>3</sup> SVm factor is ±2% assuming a 10 MΩ measurement impedance. Valid from 10 to 100% HVout.

<sup>4</sup> See interface schematic for definition.

<sup>5</sup> Applies to interfaces on both positive and negative polarity units. For details on -I5/-I10 interfacing, see technical note TN-I5-I10-1.

<sup>6</sup> For the -I5 interface, Imon, Iprog, Vmon, and Vprog input/output signals vary from 0 to 5 VDC (full-scale).

<sup>7</sup> For the -I10 interface, Imon, Iprog, Vmon, and Vprog input/output signals vary from 0 to 10 VDC (full-scale).

<sup>8</sup> SVm factor is ±1% for both -I5 and -I10 Interfaces. SVp factor is also ±1% and is only valid for 10 to 100% HVout.

<sup>9</sup> Slm factor is ±1% for both -I5 and -I10 Interfaces. Slp factor is also ±1% and is only valid for 10 to 100% Iout.

<sup>10</sup> For details on fuse selection, see technical note TN-23.



## INTERFACE CONTROL PARAMETERS (CONTINUED)

| Model                                                                  |                                                   | 2C Series      |       | 4C Series      |       | 6C Series      |       |
|------------------------------------------------------------------------|---------------------------------------------------|----------------|-------|----------------|-------|----------------|-------|
| High Voltage Output Range (Positive Polarity Unit)                     |                                                   | 0 to +2000 VDC |       | 0 to +4000 VDC |       | 0 to +6000 VDC |       |
| High Voltage Output Range (Negative Polarity Unit)                     |                                                   | 0 to -2000 VDC |       | 0 to -4000 VDC |       | 0 to -6000 VDC |       |
| Input Voltage (VDC, Nominal)                                           |                                                   | 24 VDC         |       | 24 VDC         |       | 24 VDC         |       |
| Power Output (Watts, Nominal, Total)                                   |                                                   | 120 W          | 250 W | 120 W          | 250 W | 120 W          | 250 W |
| Standard Interface (Monitor/Control Voltage, Monitor Current)          |                                                   |                |       |                |       |                |       |
| Scale Factors <sup>1,2,3</sup>                                         | SVm (V/V) where HVout Monitor = SVm x Vmon        | 1000           |       | 1000           |       | 1000           |       |
| Positive Polarity Unit                                                 | SVp (V/V) where HVout Control = SVp x Vprog       | 431            |       | 862            |       | 1293           |       |
| Negative Polarity Unit                                                 | SVp (V/V) where HVout Control = SVp x (5 - Vprog) | -431           |       | -862           |       | -1293          |       |
|                                                                        | Slm (mA/V) where Iout Monitor = Slm x Imon        | 6.5            | 13.5  | 3.2            | 6.7   | 2.2            | 4.5   |
|                                                                        | Slp (mA/V) where Iout Control = Slp x Iprog       | N/A            |       | N/A            |       | N/A            |       |
| Impedances <sup>4</sup>                                                | Ro (HVout impedance, ± 1%)                        | 20.1 MΩ        |       | 40.1 MΩ        |       | 60.1 MΩ        |       |
|                                                                        | Rs (Vmon upper tap impedance, ± 1%)               | 100 MΩ         |       | 100 MΩ         |       | 100 MΩ         |       |
|                                                                        | Rv (Vmon lower tap impedance, ± 1%)               | 1.12 MΩ        |       | 1.12 MΩ        |       | 1.12 MΩ        |       |
| -I5 Interface (0 to 5 VDC, Monitor/Control Both Voltage and Current)   |                                                   |                |       |                |       |                |       |
| Scale Factors <sup>5,6,8,9</sup>                                       | SVm (V/V) where HVout Monitor = SVm x Vmon        | 400            |       | 800            |       | 1200           |       |
|                                                                        | SVp (V/V) where HVout Control = SVp x Vprog       | 400            |       | 800            |       | 1200           |       |
|                                                                        | Slm (mA/V) where Iout Monitor = Slm x Imon        | 6.0            | 12.5  | 3.0            | 6.3   | 2.0            | 4.2   |
|                                                                        | Slp (mA/V) where Iout Control = Slp x Iprog       | 6.0            | 12.5  | 3.0            | 6.3   | 2.0            | 4.2   |
| Impedances <sup>4</sup>                                                | Ro (HVout impedance, ±1%)                         | 20.1 MΩ        |       | 40.1 MΩ        |       | 60.1 MΩ        |       |
| -I10 Interface (0 to 10 VDC, Monitor/Control Both Voltage and Current) |                                                   |                |       |                |       |                |       |
| Scale Factors <sup>5,7,8,9</sup>                                       | SVm (V/V) where HVout Monitor = SVm x Vmon        | 200            |       | 400            |       | 600            |       |
|                                                                        | SVp (V/V) where HVout Control = SVp x Vprog       | 200            |       | 400            |       | 600            |       |
|                                                                        | Slm (mA/V) where Iout Monitor = Slm x Imon        | 3              | 6.3   | 1.5            | 3.1   | 1              | 2.1   |
|                                                                        | Slp (mA/V) where Iout Control = Slp x Iprog       | 3              | 6.3   | 1.5            | 3.1   | 1              | 2.1   |
| Impedances <sup>4</sup>                                                | Ro (HVout impedance, ±1%)                         | 20.1 MΩ        |       | 40.1 MΩ        |       | 60.1 MΩ        |       |
| Other Interface Values                                                 |                                                   |                |       |                |       |                |       |
| Impedances <sup>4</sup>                                                | R (between HVret and case, ±1%)                   | 1.10 MΩ        |       | 1.10 MΩ        |       | 1.10 MΩ        |       |
|                                                                        | R (standard case with -I5 /-I10 option, ±1%)      | 1.10 MΩ        |       | 1.10 MΩ        |       | 1.10 MΩ        |       |
| Capacitances <sup>4</sup>                                              | C (@ 50 VDC ±10%, 1/8 W, max)                     | 0.01 mF        |       | 0.01 mF        |       | 0.01 mF        |       |
|                                                                        | Co (Internal storage capacitance)                 | 0.0168 μF      |       | 0.0084 μF      |       | 0.0056 μF      |       |
| Input Voltage Protection                                               | F (fuse or other protection recommended)          | See note 10    |       | See note 10    |       | See note 10    |       |

<sup>1</sup> For positive polarity unit, Vprog varies from 0 to 4.64 VDC. For negative polarity unit, Vprog varies inversely from 5 to 0.36 VDC.

<sup>2</sup> Slm factor is  $\pm 2\%$  @ 100% LOAD, 100% HVout. Valid from 10 to 100% Iout.

<sup>3</sup> SVm factor is  $\pm 2\%$  assuming a 10 M $\Omega$  measurement impedance. Valid from 10 to 100% HVout.

<sup>4</sup> See interface schematic for definition.

<sup>5</sup> Applies to interfaces on both positive and negative polarity units. For details on -I5/-I10 interfacing, see technical note TN-I5-I10-1.

<sup>6</sup> For the -I5 interface, Imon, Iprog, Vmon, and Vprog input/output signals vary from 0 to 5 VDC (full-scale).

<sup>7</sup> For the -I10 interface, Imon, Iprog, Vmon, and Vprog input/output signals vary from 0 to 10 VDC (full-scale).

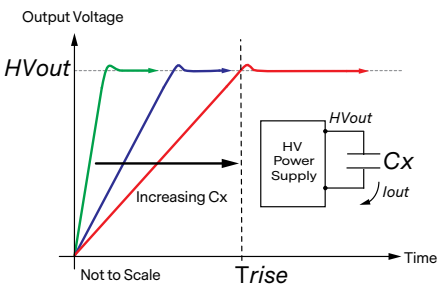
<sup>8</sup> SVm factor is  $\pm 1\%$  for both -I5 and -I10 Interfaces. SVp factor is also  $\pm 1\%$  and is only valid for 10 to 100% HVout.

<sup>9</sup> Slm factor is  $\pm 1\%$  for both -I5 and -I10 Interfaces. Slp factor is also  $\pm 1\%$  and is only valid for 10 to 100% Iout.

<sup>10</sup> For details on fuse selection, see technical note TN-23.

ULTRAVOLT DUAL POLARITY 1/8C TO 6C SERIES

RISE TIME / CAPACITOR CHARGING



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

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

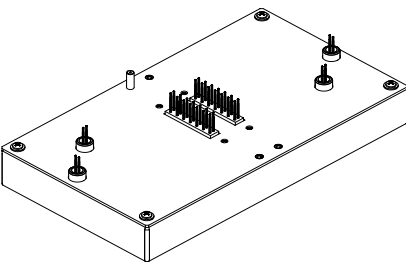
$$Pout = \frac{(Co + Cx) \times (HVout)^2}{2 \times Trise}$$

- 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)

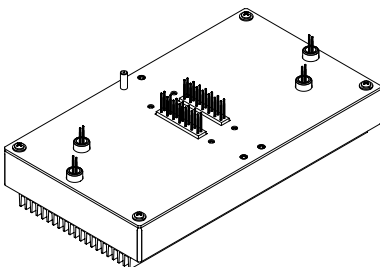
STANDARD OPTIONS

The Dual Polarity C can be configured with several options and accessories that adapt its performance and packaging to many application requirements. Customized models to meet specialized voltage ranges, packaging and environmental needs are also available.

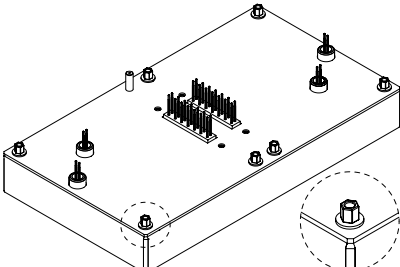
| Featured Options |                                                                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -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 4.8 mm (0.188 in) x #4-40 threaded standoffs to the case top.                                                                                                                                                                                          |



Standard Configuration  
(All Interface Options)



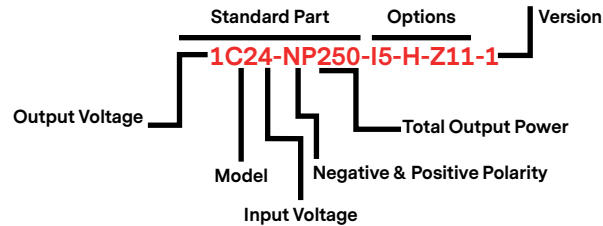
-H Option (Heatsink)



-Z11 Option (PCB Standoffs)

ORDERING INFORMATION

| Standard Part |              | STANDARD CONFIGURATION         |                                                                |                                                                |                          |                                         |                                            |                                       |                                  |                          |                          | OPTIONS             |                                   |                                                    |                                                       | Other Options | Version Code (Required) |
|---------------|--------------|--------------------------------|----------------------------------------------------------------|----------------------------------------------------------------|--------------------------|-----------------------------------------|--------------------------------------------|---------------------------------------|----------------------------------|--------------------------|--------------------------|---------------------|-----------------------------------|----------------------------------------------------|-------------------------------------------------------|---------------|-------------------------|
|               |              | Electrical Performance         |                                                                |                                                                |                          |                                         |                                            |                                       |                                  | Standard Features        |                          | Interfaces          |                                   | Mechanical                                         |                                                       |               |                         |
|               |              |                                |                                                                |                                                                |                          |                                         |                                            |                                       |                                  |                          |                          | Select One          |                                   |                                                    |                                                       |               |                         |
|               |              | Number of High Voltage Outputs | High Voltage Output Range (+HVout VDC, Positive Polarity Unit) | High Voltage Output Range (-HVout VDC, Positive Polarity Unit) | Input Voltage (Vin, VDC) | High Voltage Output Polarity (Unipolar) | Positive Polarity Unit Power (Pout, Watts) | Negative Polarity Power (Pout, Watts) | Total Power Output (Pout, Watts) | Dual Standard Interfaces | Aluminum Case (Anodized) | Chassis Mount Studs | 50 ppm/°C Temperature Coefficient | Dual -15 Interfaces (0 to 5 VDC Monitors/Controls) | Dual -110 Interfaces (0 to 10 VDC Monitors/ Controls) |               |                         |
| 1/8C          | 1/8C24-NP125 | 2                              | 0 to 125                                                       | 0 to -125                                                      | 24                       | Pos/Neg                                 | 60                                         | 60                                    | 120                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
|               | 1/8C24-NP250 | 2                              | 0 to 125                                                       | 0 to -125                                                      | 24                       | Pos/Neg                                 | 125                                        | 125                                   | 250                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
| 1/4C          | 1/4C24-NP125 | 2                              | 0 to 250                                                       | 0 to -250                                                      | 24                       | Pos/Neg                                 | 60                                         | 60                                    | 120                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
|               | 1/4C24-NP250 | 2                              | 0 to 250                                                       | 0 to -250                                                      | 24                       | Pos/Neg                                 | 125                                        | 125                                   | 250                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
| 1/2C          | 1/2C24-NP125 | 2                              | 0 to 500                                                       | 0 to -500                                                      | 24                       | Pos/Neg                                 | 60                                         | 60                                    | 120                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
|               | 1/2C24-NP250 | 2                              | 0 to 500                                                       | 0 to -500                                                      | 24                       | Pos/Neg                                 | 125                                        | 125                                   | 250                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
| 1C            | 1C24-NP125   | 2                              | 0 to 1000                                                      | 0 to -1000                                                     | 24                       | Pos/Neg                                 | 60                                         | 60                                    | 120                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
|               | 1C24-NP250   | 2                              | 0 to 1000                                                      | 0 to -1000                                                     | 24                       | Pos/Neg                                 | 125                                        | 125                                   | 250                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
| 2C            | 2C24-NP125   | 2                              | 0 to 2000                                                      | 0 to -2000                                                     | 24                       | Pos/Neg                                 | 60                                         | 60                                    | 120                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
|               | 2C24-NP250   | 2                              | 0 to 2000                                                      | 0 to -2000                                                     | 24                       | Pos/Neg                                 | 125                                        | 125                                   | 250                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
| 4C            | 4C24-NP125   | 2                              | 0 to 4000                                                      | 0 to -4000                                                     | 24                       | Pos/Neg                                 | 60                                         | 60                                    | 120                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
|               | 4C24-NP250   | 2                              | 0 to 4000                                                      | 0 to -4000                                                     | 24                       | Pos/Neg                                 | 125                                        | 125                                   | 250                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
| 6C            | 6C24-NP125   | 2                              | 0 to 6000                                                      | 0 to -6000                                                     | 24                       | Pos/Neg                                 | 60                                         | 60                                    | 120                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |
|               | 6C24-NP250   | 2                              | 0 to 6000                                                      | 0 to -6000                                                     | 24                       | Pos/Neg                                 | 125                                        | 125                                   | 250                              | Included                 |                          | -15                 | -110                              | -H                                                 | -Z11                                                  |               |                         |





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