

- 8 models from 0 to 62 Volts through 0 to 6kV
- 20 or 30 watts of output power
- Maximum Iout capability down to 0 Volts
- Maximum Iout during charge/rise time
- Indefinite output short-circuit protection
- Very fast rise with very low overshoot
- Output voltage and current monitors
- >400,000 hour MTBF @65°C
- Fixed-frequency, low-stored-energy design
- **UL, cUL, IEC-60950-1, and Demko Recognized**



### GENERAL INFORMATION:

The “C” Series of high-voltage regulated DC-DC converters are designed for fast rise-time/charging applications utilizing state-of-the-art power conversion topology. Surface-mount technology and encapsulation techniques provide high reliability and low cost. See Application Note 10 for more charging information.

### DESIGN METHODOLOGY:

The “C” converters utilize a dual-ended forward converter topology with a nominal switching frequency of <100kHz. A precision reference is provided so the remote control can program the power supply for a specific voltage. A soft-start circuit brings the converter to full power over a 1ms period, reducing surges on the source supply. A constant-frequency PWM regulation system controls the MOSFET push-pull power stage and high-voltage transformer. The power stage is protected from output current overloads or short circuits via a secondary current limit circuit. This current limit is optimized for low-impedance capacitor charging. The high voltage developed in the multistage multiplier generates feedback voltage, which is sent to the CTRL circuit to maintain regulation. The AC feedback networks are configured for maximum speed of rise with little or no overshoot into capacitive loads.

### WIDE INPUT VOLTAGE RANGE:

The “C” Series is designed for full DC power operation at up to 92% efficiency. A wide input range of +23 to +30VDC maintains full output power. The derated input range is +9 to +32VDC. See Application Note 16 for protection information.

### WIDE OUTPUT RANGE:

The “C” Series is a non-isolated, unipolar converter. Positive or negative output must be specified. Output voltage is adjustable from 0 to 62, 125, 250, 500, 1kV, 2kV, 4kV or 6kV. As the output voltage is reduced towards 0, the maximum current capability remains unchanged.

### OUTPUT VOLTAGE & CURRENT MONITORS:

The “C” Series features a 100:1 voltage monitor. Units 2kV or higher have a 100 MegΩ/1.1 MegΩ divider; units below 2kV use a 10 MegΩ/102k divider. The monitor output impedance is calibrated for use with a 10 MegΩ input impedance meter. Overall accuracy is ±2.0% with a temperature coefficient of ±200 ppm per °C. The voltage monitor is output on pin 9 and referenced to Signal Ground pin 5.

Current from the high-voltage multiplier can be monitored by reading the voltage appearing between Output Monitor pin 3 and Signal Ground pin 5. See Application Note 13.

### REMOTE CONTROL:

The “C” Series is remotely programmed with 0 to +5VDC to produce an output voltage. Input may be from a control voltage, a DAC, or from a variable or fixed resistor. On a negative output converter the programming logic of the remote adjust would be inverted, i.e.: +5 to 0VDC. Connections are on the converter for the internal reference, analog remote adjust and the signal ground. The reference is +5.0VDC, temperature compensated with a 464Ω output impedance. See Figure E and Application Note 1 for more information.

### ENABLE/DISABLE:

The “C” converters also have an enable function. When the enable is TTL 0 (<+0.7V Isink=1mA) the converter is in a standby mode and input current is reduced to <30mA. All functions other than the internal reference are shut down. If the enable pin is left unconnected, TTL 1, or at greater voltages up to +32VDC the converter will initiate soft-start before beginning to operate normally. The open-circuit output voltage from the enable pin is <+5VDC. In the inhibit mode 1mA will have to be sunk for proper shutdown.

### MECHANICAL:

“C” Series converters are in PCB-mountable plastic cases requiring a footprint of 5.5 in<sup>2</sup> and only 4.3 in<sup>3</sup> of volume. Mounting plates and brackets are available for chassis mounting. This series is also available in an RF-tight metal PCB/chassis mount package. See Application Note 6 for thermal considerations and mounting configurations. All models are available with optional, six-sided, wrap-around Mu-Metal Shielding.

### ENVIRONMENTAL:

The “C” Series provides full power operation at case temperatures from -40 to +65°C. All units receive a 24-hour burn-in prior to final testing. Extended temperature range is available along with other enhanced capabilities. Please contact the factory.



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# “C” SERIES

## HIGH VOLTAGE POWER SUPPLY

Typical Characteristics:

Parameter	Conditions	Models														Units		
<b>Input:</b>		<b>All Types</b>																
Voltage Range	Full Power	+ 23 to 30														VDC		
Voltage Range	Derated Power Range	+ 9 to 32														VDC		
Current	Standby / Disable	< 30														mA		
Current	No Load, Max Eout	< 90														mA		
Current	Max Load, Extended Input Voltage	Figures A & B														Graph		
AC Ripple Current	Nominal Input, Full Load	< 80														mA p-p		
<b>Output:</b>		<b>1/16C</b>	<b>1/8C</b>	<b>1/4C</b>	<b>1/2C</b>	<b>1C</b>	<b>2C</b>	<b>4C</b>	<b>6C</b>									
Voltage Range	Nominal Input	0 to 62		0 to 125		0 to 250		0 to 500		0 to 1,000		0 to 2,000		0 to 4,000		0 to 6,000		VDC
Power	Nominal Input, Max Eout	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	Watts
Current	Iout, Entire Output Voltage Range	320	480	160	240	80	120	40	60	20	30	10	15	5	7.5	3.3	5	mA
Ripple	Full Load, Max Eout, Cload ≥0.5uF	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	V p-p
Overshoot	C Load, 0 Eout to Full Eout	<1V	<1V	<1V	<1V	<1V	<1V	<2V	<2V	<2V	<2V	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	V pk
Voltage Derating	Max Iout, Extended Input Voltage	Figures C														Graph		
Rise Time	Max Iout, Various C Loads & Eout	Figures D & F														Table		
Line Regulation	Nom. Input, Max Eout, Full Power	< 0.01 %														VDC		
Static Load Regulation	No Load to Full Load, Max Eout	<0.01%														VDC		
Stability	30 Min. warmup, per 8 hr/ per day	<0.01% / <0.02%														VDC		
<b>Output Voltage Monitor:</b>		<b>All Types</b>																
Voltage	Full Eout Range, Full Iout Range	10.00														V per kV		
Proportionality	Full Eout Range, Full Iout Range	± 0.1%														V per kV		
<b>Remote Programming:</b>		<b>All Types</b>																
Input Impedance	Nominal Input	+ Output Models 1.1MΩ to GND, - Output Models 1.1MΩ to +5 Vref														MΩ		
Adjust Resistance	Typical Potentiometer Values	10K to 100K (Pot across Vref. & Signal GND, Wiper to Adjust)														Ω		
Adjust Linearity	0% to 100%	Figure E														Graph		
Adjust Voltage	Referenced to signal ground	Figure E (0 to +5 VDC)														Graph		
Adjust Logic	0 to +5 for +Out, +5 to 0 for -Out	+4.64 VDC for +Output or +0.36 for -Output = Nominal Eout																
<b>Reference:</b>		<b>All Types</b>																
Output Voltage	T=+25°C, Initial Value	+ 5.00 ± 2%														VDC		
Output Impedance	T=+25°C	464 ± 1%														Ω		
Stability	Over Full Temperature Range	See "A" Series Datasheet Figure F														Graph		
<b>Enable:</b>		<b>All Types</b>																
Power Supply On	Floated, or voltage ≥ TTL High	+2.4 to 32														VDC		
Power Supply Off	Grounded, or voltage ≤ TTL Low	0 to + 0.7 ± 0.2 (Isink 1mA minimum)														VDC		
<b>Temperature &amp; Humidity:</b>		<b>Standard</b>							<b>-25PPM</b>									
Humidity	All Conditions, Standard Package	0 to 95% non-condensing							0 to 95% non-condensing									
Operating	Full Load, Max Eout, Case Temp.	-40 to +65							+10 to +45							°C		
Storage	Non-Operating, Case Temp.	-55 to +105							-55 to +105							°C		
Coefficient	Over the Specified Temperature	± 50							± 25							PPM / °C		
Thermal Shock	Mil-Std 810, Method 503-4, Proc. II	-40 to +65							-40 to +65							°C		
<b>Altitude:</b>		<b>All Types</b>																
All Conditions	Standard Package	Sea Level through Vacuum																
<b>Shock &amp; Vibration:</b>		<b>Standard</b>							<b>- C Option</b>									
Shock	Mil-Std-810, Method 516.5, Proc. IV	20							40							G's		
Vibration	Mil-Std-810, Method 514.5, Fig. 514.5C-3	10							20							G's		
<b>Packaging:</b>		<b>Standard</b>							<b>- C Option</b>									
Material	Outer construction	Plastic (DAP) ASTM-D-5948							Aluminum Alloy 5052-H32, Finish: Mil-C-5541 Class 1A									
Length	Not including pins or mounting pts	3.70 ± 0.050 (94.0)							4.75 ± 0.025 (120.7)							In (mm)		
Width	Not including pins or mounting pts	1.50 ± 0.050 (38.1)							2.00 ± 0.025 (50.8)							In (mm)		
Height	Not including pins or mounting pts	0.77 ± 0.050 (19.6)							1.00 ± 0.025 (25.4)							In (mm)		
Volume	Not including pins or mounting pts	4.30 (70.5)							8.00 (131.1)							In <sup>3</sup> (cc)		
Weight	Overall	5.0 (142)							10.0 (284)							Oz (g)		

Specifications subject to change without notice



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Typical Performance Curves:

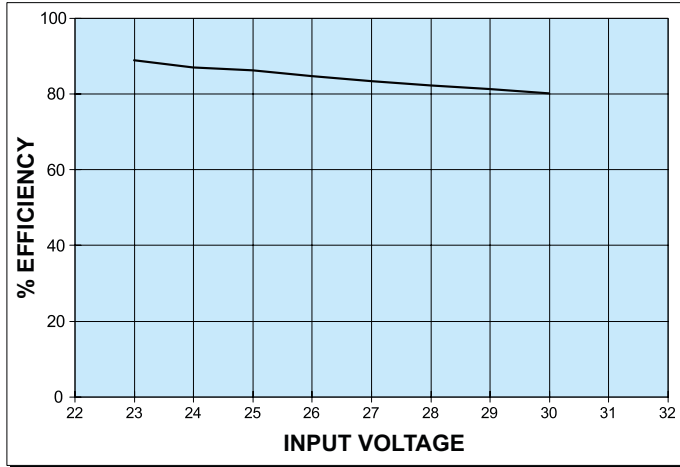


Fig. A

DC Efficiency vs. Input Voltage Range (20W Units)

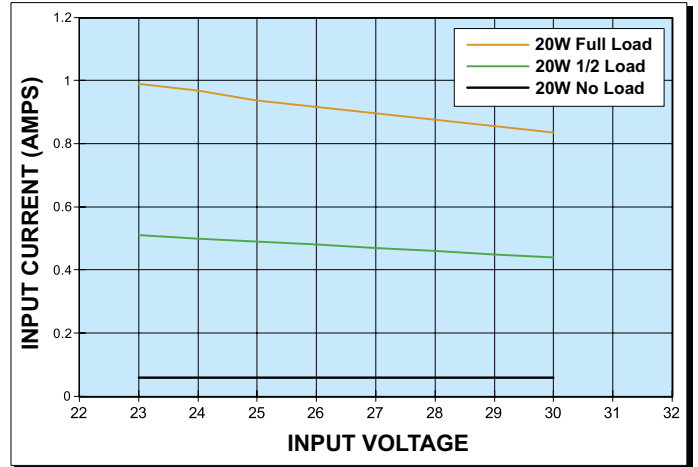


Fig. B

Input Current vs. Input Voltage Range (20W Units)

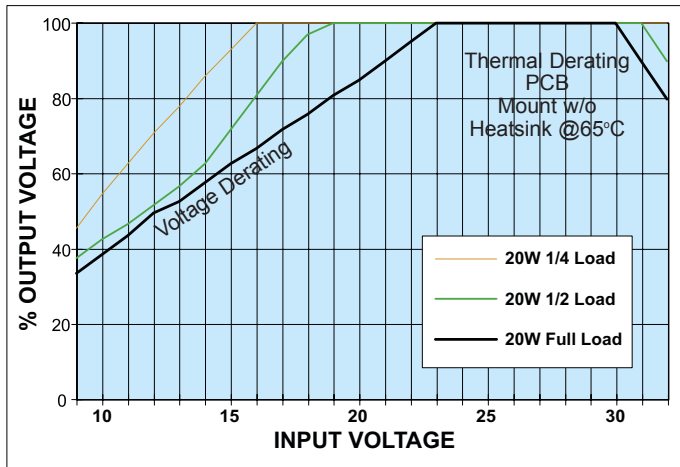


Fig. C

Output Voltage vs. 24V/20 Watt Extended Input Voltage (Up to 65°C Chassis Mount w/o Heatsink)

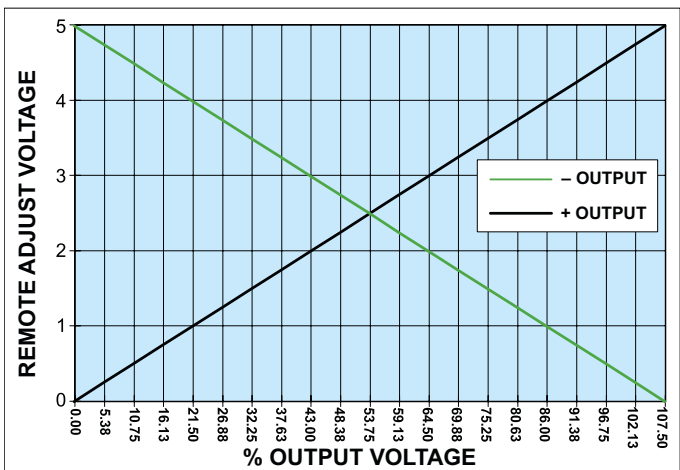


Fig. E

Remote Control Characteristics

$$T = \frac{C \times V}{I} \quad I = C \times V \times F \quad F = \frac{I}{C \times V} \quad J = \frac{C \times E^2}{2}$$

C = uF      C = uF      C = uF      C = uF  
 V = Volts    V = kV      V = kV      E<sup>2</sup> = kV  
 I = mA      I = mA      I = mA      J = Ws  
 T = mS      F = Hz      F = Hz

NOTES:  
 Capacitance must include HVPS internal Capacitance, see figure F.  
 For very light capacitive loads the HVPS exhibits slower than calculated rise times due to the pulse by pulse current limit.

Fig. D  
 Rise Time Formulas

Model	20W	30W
1/8C	0.50 uF	0.50 uF
1/4C	0.15 uF	0.15 uF
1/2C	0.16 uF	0.16 uF
1C	0.033 uF	0.018 uF
2C	0.009 uF	0.009 uF
4C	0.010 uF	0.010 uF
6C	0.0064 uF	0.0064 uF

Fig. F  
 Internal Storage Capacitance



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# "C" SERIES

## HIGH VOLTAGE POWER SUPPLY

### PLASTIC CASE

#### CONSTRUCTION:

Epoxy-filled DAP box certified to ASTM-D-5948

#### TOLERANCE:

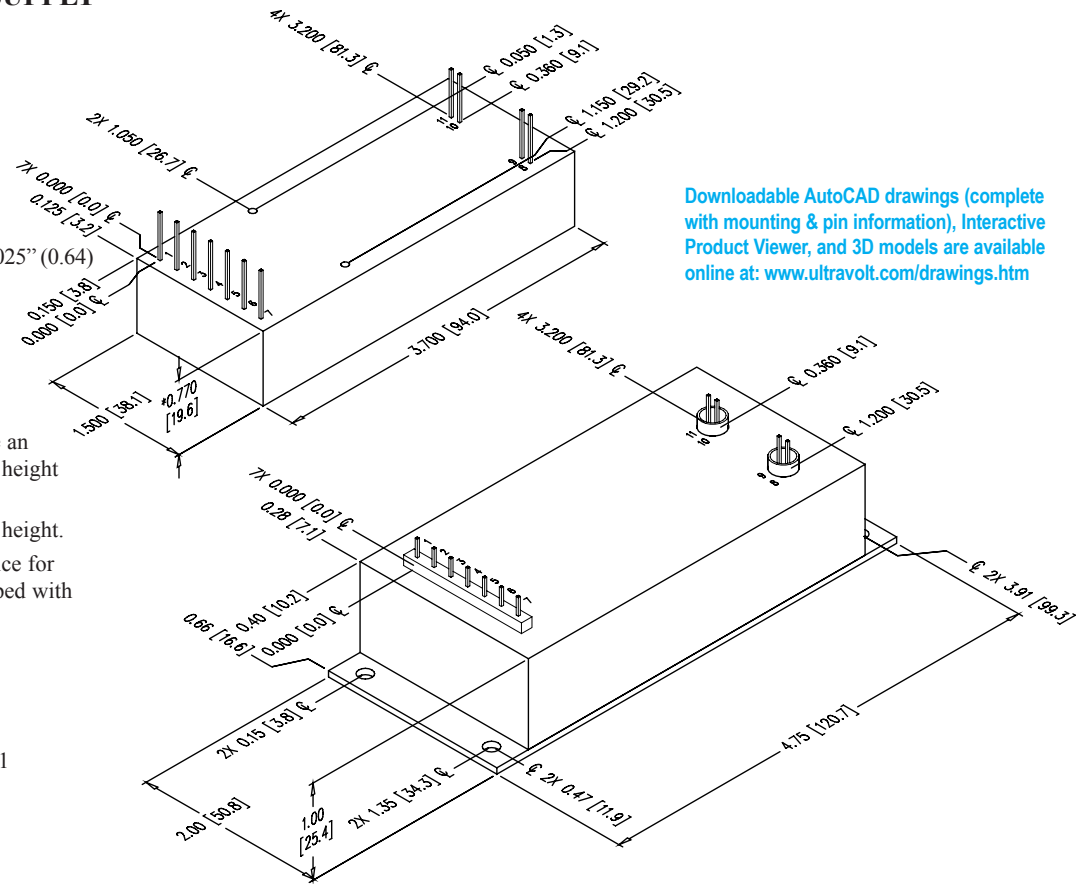
Overall  $\pm 0.050''$  (1.27)  
Pin to Pin  $\pm 0.015''$  (0.38)  
Mounting hole location  $\pm 0.025''$  (0.64)

#### MOUNTING:

2-56 x 0.30 (7.62) 2 places threaded post may not be flush to cover

#### NOTE:

20W and 30W versions are an additional 0.062" (1.57) in height  
-M equipped units are an additional 0.030" (0.76) in height.  
Contact UV customer service for drawings on models equipped with -E or -H options.



Downloadable AutoCAD drawings (complete with mounting & pin information), Interactive Product Viewer, and 3D models are available online at: [www.ultravolt.com/drawings.htm](http://www.ultravolt.com/drawings.htm)

### METAL CASE

#### CONSTRUCTION:

Aluminum box  
Chem film per MIL-C-5541  
Class 1A

#### TOLERANCE:

Overall  $\pm 0.025''$  (0.64)  
Pin to Pin  $\pm 0.015''$  (0.38)  
Hole to Hole location  $\pm 0.025''$  (0.64)

#### Connections

1 - Input Power Ground Return
2 - Positive Power Input
3 - Iout Monitor
4 - Enable/Disable
5 - Signal Ground Return
6 - Remote Adjust Input
7 - +5V Reference Output
8 - HV Ground Return
9 - Eout Monitor
10 - HV Output
11 - HV Output

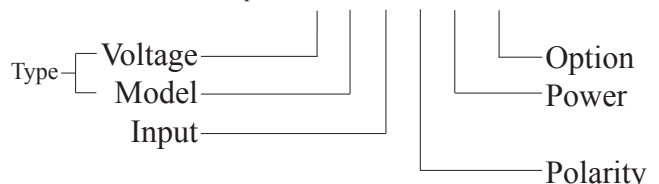
All grounds joined internally. Power-supply mounting points isolated from internal grounds by  $>100k\Omega$ , .01uF / 50V (Max) on all models except -M, -C, and -M-E configurations which are 0 $\Omega$ .

#### Ordering Information

Type:	0 to 62 VDC Main Output	1/16C
	0 to 125 VDC Main Output	1/8C
	0 to 250 VDC Main Output	1/4C
	0 to 500 VDC Main Output	1/2C
	0 to 1,000 VDC Main Output	1C
	0 to 2,000 VDC Main Output	2C
	0 to 4,000 VDC Main Output	4C
	0 to 6,000 VDC Main Output	6C
Input	24VDC Nominal (20W & 30W)	24
Polarity:	Positive Output	-P
	Negative Output	-N
Power:	Watts Output	20
	Watts Output	30
Case:	Plastic Case - Diallyl Phthalate	STD
	"Eared" Heatsink Plate (plastic case)	-E
	RF-Tight Aluminum Case	-C
Heatsink:	.400" High (sized to fit case)	-H
Shield:	Six-Sided Mu-Metal Shield	-M
Temp Coefficient:	25PPM Temperature Coefficient	-25PPM



Example: 1/2C24-P20-C



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