



AMERICAN HIGH VOLTAGE

HTC Series 200 Deg C High Voltage Power Supply

HTC Series

General Description

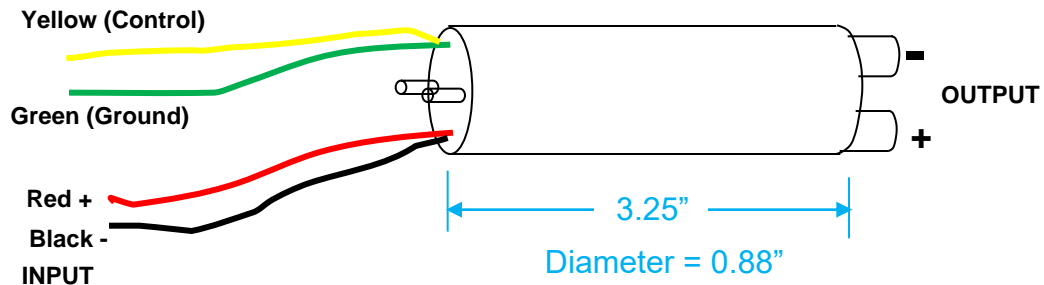
The HTC Series high voltage power supplies are the ultimate in exotic DC to DC converters. They are designed for severe environmental applications requiring a regulated voltage. The output is directly sensed and can be adjusted over a 3 to 1 range by means of a trim resistor. The HTC utilizes advanced high voltage techniques and compensation networks. All components specially selected and burned in prior to assembly. In addition, the high voltage transformer is totally encapsulated with a low loss high temperature epoxy resin that guards against internal breakdown or corona. The HTC is not restricted by orientation. Moreover, as the unit is hard potted, it does not contain oil that could leak out and damage other equipment.

Features

- Output regulated to 0.01 % (HL-FL)
- Encapsulated
- 1,000 VDC to 3,000 VDC available
- 0.3 Watt power
- Various input voltages available
- Ripple 600 mVpp



Outline Drawing:





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Electrical Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions		Value			Units
			Min	Typical	Max	
Supply Voltage*:	HTC-MVP - 15 HTC-MVP - 24 HTC-MVP- 30		14 VDC 22 VDC 27 VDC	15VDC 24VDC 30VDC	16 VDC 26 VDC 33 VDC	VDC VDC VDC
Input Current:	NL: (15Vin model): NL: (24Vin model): NL: (30Vin model): FL: (15Vin model): FL: (24Vin model): FL: (30Vin model):		45 30 30 75 36 36	50 35 35 80 40 40	55 40 40 85 44 44	mA mA mA mA mA mA
Output Ripple:	No Load (all models): Full Load (all models):		0.015 % 0.02 %	0.02 % 0.03 %	0.03 % 0.035%	Vpp Vpp
Load Regulation:	No Load to Full Load Half Load to Full Load		0.01 % 0.01 %	0.02 % 0.01 %	0.025 % 0.01 %	V _{NL} /V _L V _{NL} /V _L
Output Linearity	No Load			1%		ΔV_{OUT} ----- ΔV_{OUT} (ideal)
Output Linearity	Full Load (all models):			1%		ΔV_{OUT} ----- ΔV_{OUT} (ideal)
Short Circuit Current:	(maximum input current)			100	125	mA
Power Efficiency:	Full Load		20%	25%	30%	P_{OUT} ----- P_{IN}
Reverse Input Polarity	Protected to 50 VDC					
Temperature Drift:	No Load Full Load				25 25	ppm/DegC ppm/Deg C
Thermal Rise:	No Load (case) Full Load (case)				2 5	degrees C degrees C
Slew Rate (10% - 90%)	No Load Full Load				100 120	mS mS
Slew Rate (90% - 10%)	No Load Full Load				200 100	mS mS
Drain Out Time	No Load (5 TC)				150	mS



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Physical Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions	Value	Units
Dimensions	MKS	88.9 L x 22.35 diameter	mm
	English	3.5 L x 0.88 diameter	inches
Volume:	MKS	34.87	cm ³
	English	2.12	inch ³
Mass:	MKS	120	grams
	English	4.3	oz
Packaging:	Brass Tubing with solid epoxy encapsulation		
Finish	Flat black		
Terminations:	Input:	Flying Teflon leads #22 AWG	
	Output:	Teflon Terminals	

Environmental Characteristics

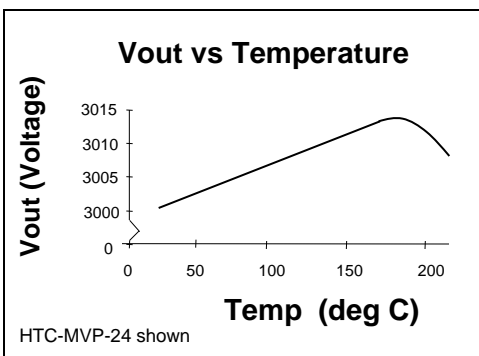
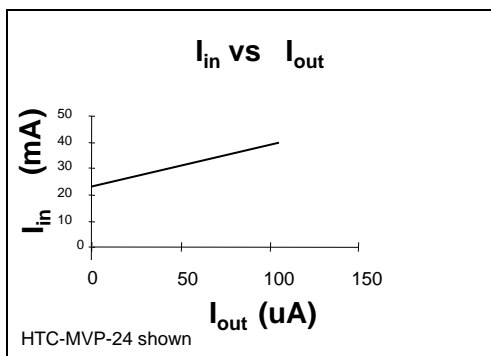
(at 25 degrees C unless otherwise specified)

Parameter	Conditions	Value	Units
Temperature Range	case temperature (max)	-40 degrees to + 200 degrees	Celsius
	case temperature (max)	-40 degrees to + 392 degrees	Fahrenheit
Shock:	MIL-STD-810 Method 516	200 g's	Proc IV
Altitude:	pins sealed against corona	-350 to + 16,700	meters
	pins sealed against corona	-1,000 to +55,000	feet
Vibrations:	MIL-STD-810 Method 514	20 g's	Curve E
Thermal Shock	MIL-STD-810 Method 504	-40 deg C to +200 deg C	Class 2

Models Available (as of September 2019):

Model	Output Voltage Range	Input Voltage	Polarity
HTC-MVP - 15	2,000 VDC @ 150 μ A	15 VDC	Positive
HTC-MVP - 24	2,000 VDC @ 150 μ A	24 VDC	Positive
HTC-MVP - 30	2,000 VDC @ 150 μ A	30 VDC	Positive
HTC-MVN - 15	-2,000 VDC @ 150 μ A	15 VDC	Negative
HTC-MVN - 24	-2,000 VDC @ 150 μ A	24 VDC	Negative
HTC-MVN - 30	-2,000 VDC @ 150 μ A	30 VDC	Negative

HTC Series Application Notes



HTC Series Performance:

The HTC Series high voltage power supplies are regulated against both line and load changes to better than 0.01% for Half Load to Full Load changes. The output load has an effect on the input current as shown in the above graph. There is a fixed input current at the No Load condition to power the regulation circuitry and oscillator. This input current will rise as the temperature of the power supply increases due to leakage in the high voltage diodes. Input current can be expected to increase at least 10 mA when operated to 200 degrees Celsius.

Likewise, the output voltage will vary due to temperature changes that the power supply is subjected to. The above chart indicates the amount of change expected by a HVP unit set to put out 3,000 VDC. Because the high voltage output changes approximately 10 volts from room temperature to 200 degrees Celsius, this is calculated out to be less than 20 ppm/deg C.

Since the output of HTC units are regulated they can also be adjusted to any desired voltage lower than the maximum that the unit is designed for. This can be done either with a resistance of voltage programming. The following sections detail how this is accomplished.

Keep in mind that all HTC units are NON-isolated. The output high voltage return is internally connected to the input ground. The output is NOT floating. In addition, the case is not connected to any circuitry and may be grounded to any reasonable low voltage point. Grounding of the metallic case may lower the output ripple at full load. To improve noise immunity, it is suggested that a 10 uF capacitor is placed across the input power lines (Red and Black). This will improve both line and load regulations.

HTC Series Application Notes (continued)

Resistance program of positive output

To set the output voltage to a fixed value lower than the maximum that the unit can provide is easily accomplished. In the resistance programming mode, a resistor is inserted between the Yellow control wire and the Green ground wire. For positive output units, a resistance value of zero Ohms yields the maximum output voltage. For negative output units, an open circuit yields the maximum. Figure 1 shows the connections for a positive output power supply. Figure 2 shows the output voltage as a function of control resistor. The output ground is internally connected to the input ground. HTC units are NON-Isolated.

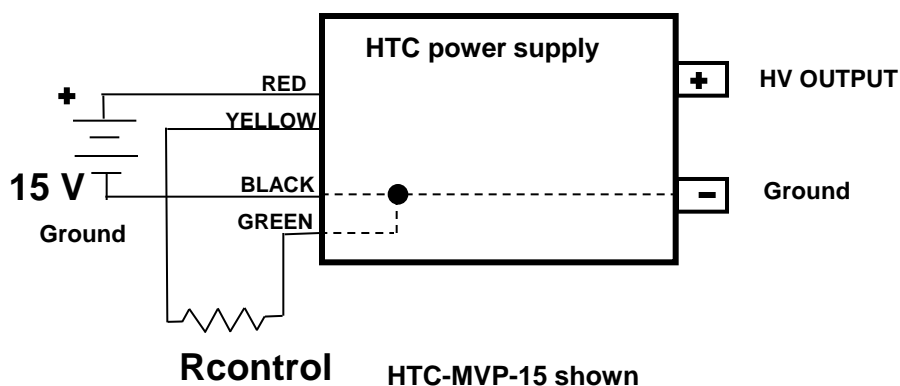


Figure 1: Resistance program of positive output of HTC

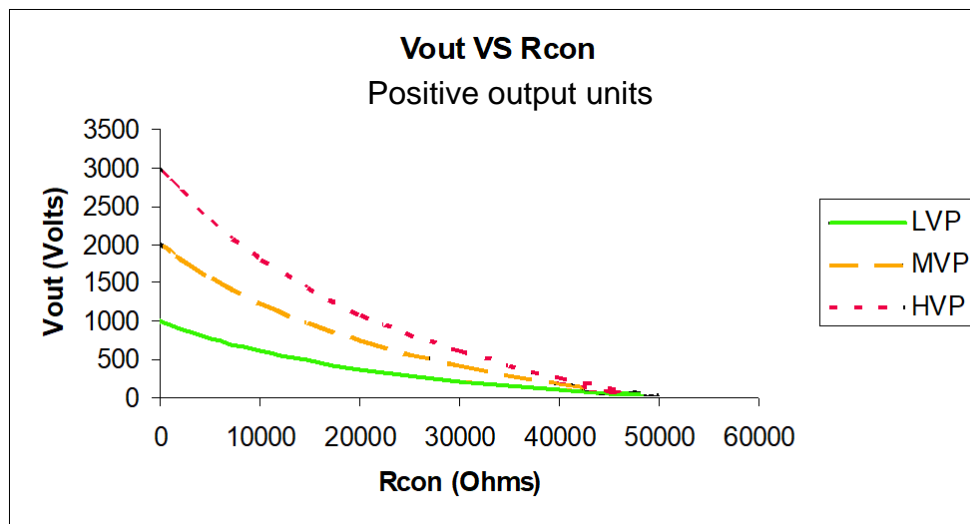


Figure 2: Positive Style HTC Output Voltage as a function of control resistor



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HTC Series Application Notes (continued)

Resistance program negative output:

Some models of the HTC Series high voltage power supplies can provide a negative output voltage. To set the output voltage to a fixed value lower than the maximum that the unit can provide is easily accomplished. In the resistance programming mode, a resistor is inserted between the Yellow control wire and the Green ground wire. For negative output units, an open circuit yields the maximum output voltage. Figure 3 shows the connections for a negative output power supply. Figure 4 shows the output voltage as a function of control resistor.

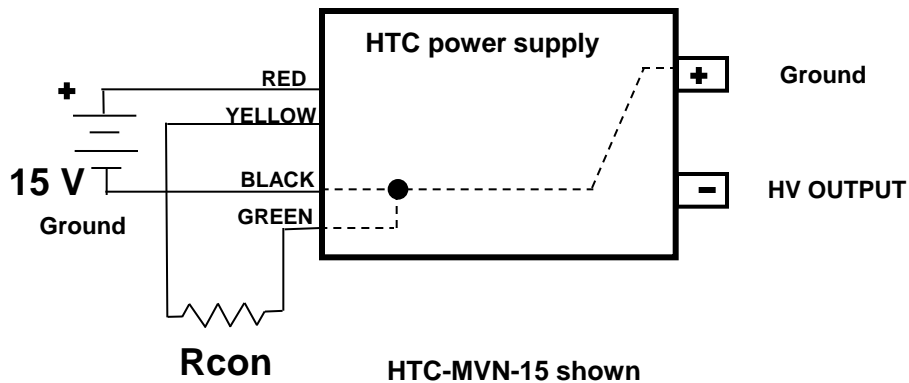


Figure 3: Resistance program of negative output of HTC

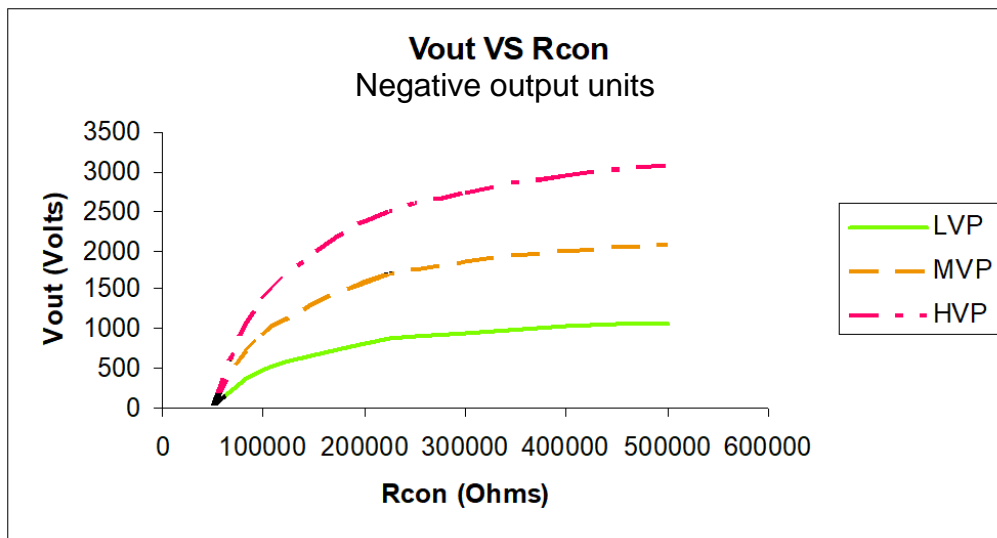


Figure 4: Negative Style HTC Output Voltage as a function of control resistor



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HTC Series Application Notes (continued):

Voltage Control Positive Output:

All HTC power supplies can be controlled by an external reference voltage placed into the YELLOW lead. Figure 5 details this connection for positive style output units while Figure 6 shows the effect of this external voltage on the output voltage of the unit. The power supply will regulate at the set voltage and be stable against line and load variations as long as the external control voltage is fixed in magnitude.

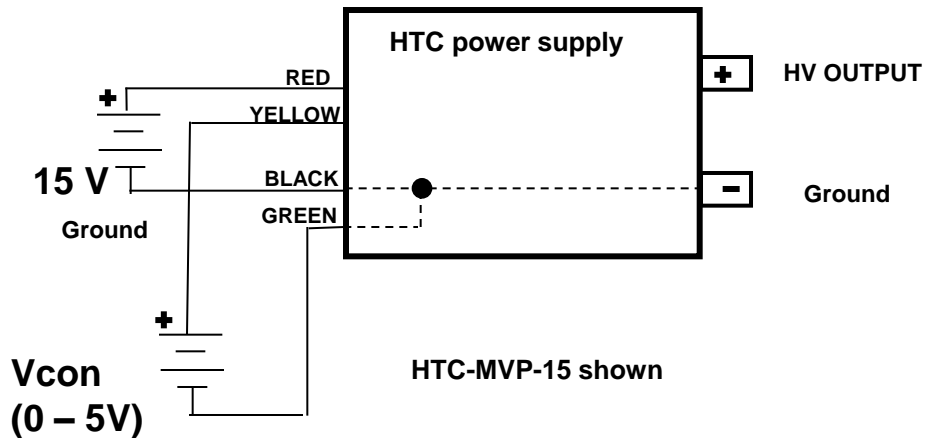


Figure 5: Voltage programming of positive output HTC

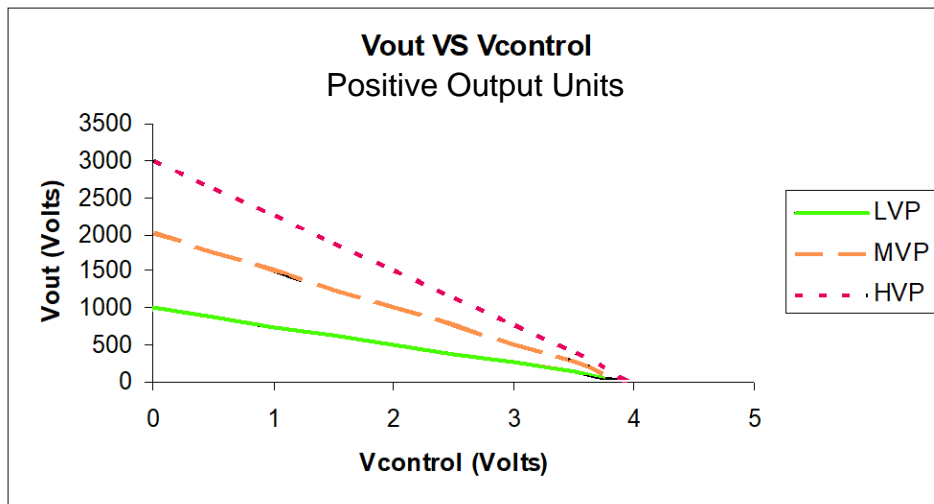


Figure 6: Positive Style HTC Output Voltage as a function of program voltage



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HTC Series Application Notes (continued):

Voltage Control Negative Output:

Negative output HTC power supplies can also be controlled by an external reference voltage placed into the YELLOW lead. Figure 7 details this connection for negative style output units while Figure 8 shows the effect of this external voltage on the output voltage of the unit. The power supply will regulate at the set voltage and be stable against line and load variations as long as the external control voltage is fixed in magnitude.

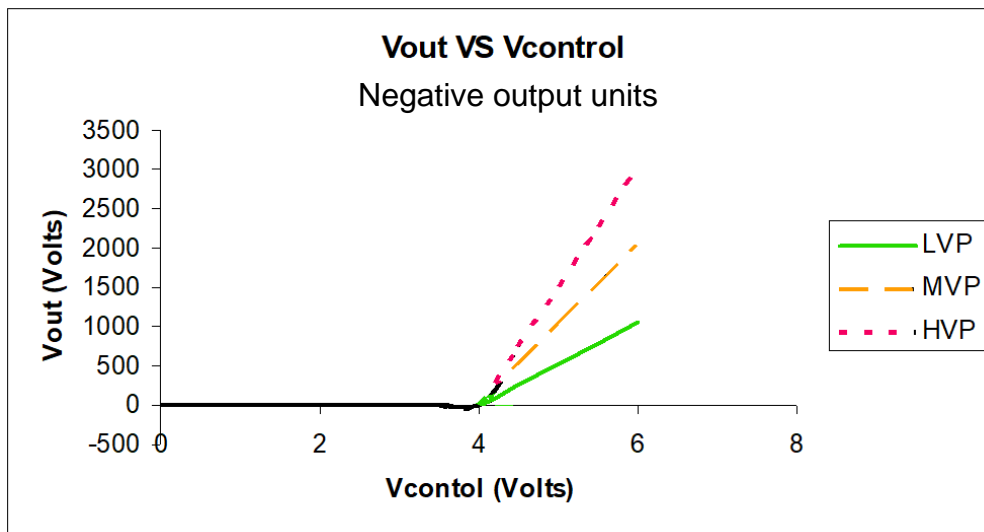
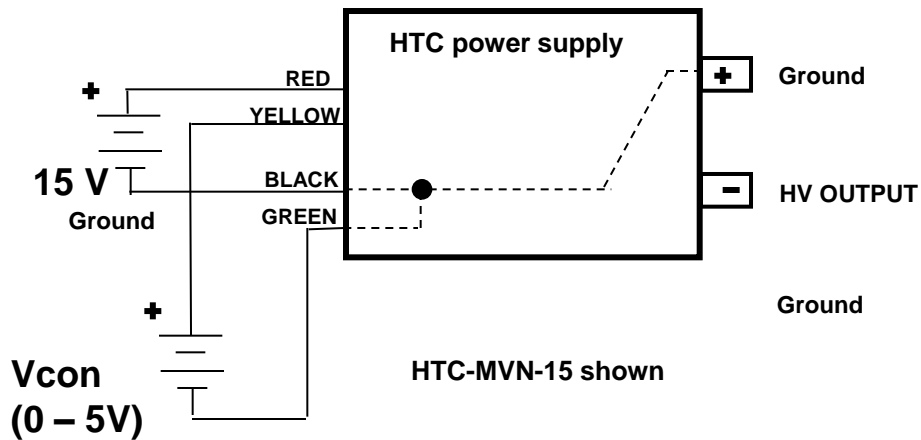
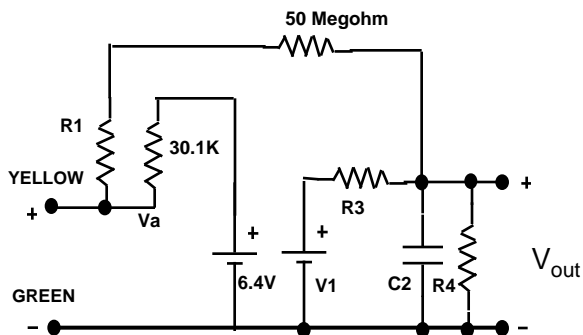


Figure 8: Negative Style HTC Output Voltage as a function of program voltage



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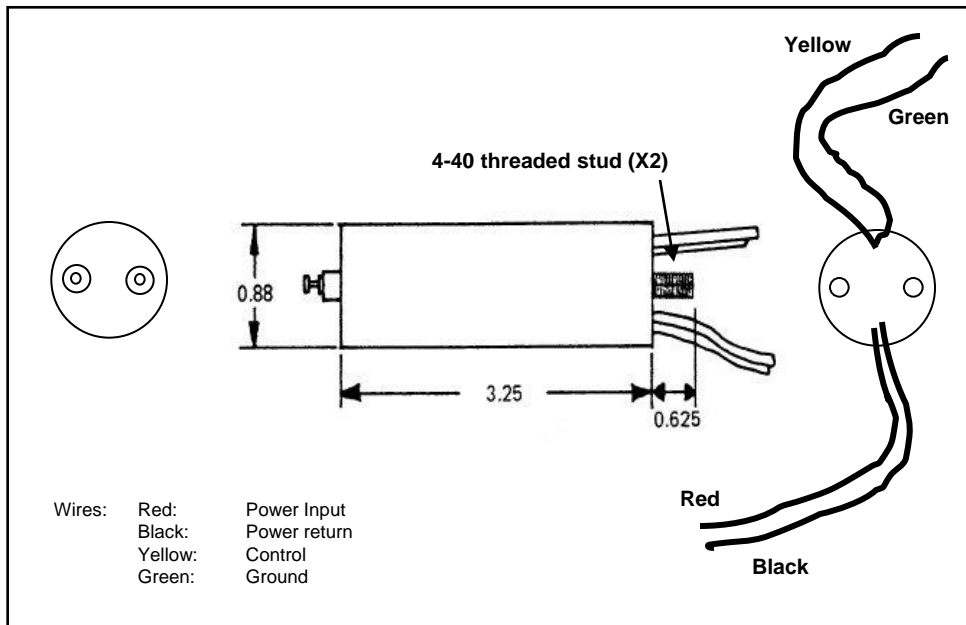
Equivalent HTC Circuit Model



HTC Circuit Model

- R1 =
- 201K Ohm (LVP)
 - 100K Ohm (MVP)
 - 67K Ohm (HVP)
 - 90K Ohm (LVN)
 - 30K Ohm (MVN)
 - 10K Ohm (HVN)
 - 1 K Ohm
- R3 =
- R4 = 100 Megohm (diode leakage)
- C2 = (3×10^{-9}) Farads
- V1 = Positive output units: $4.01 + (2 E8) / R1 - (50 E6)(Va)/R1$
 = Negative output units: $(50 E6)(Va)/R1 - (2 E8)/R1 + 4.01$

Outline Drawing: (inches)



Ordering Information:

HTC-XVY - Z

X = Output voltage range: L = 1KV, M = 2KV, H = 3KV
Y = polarity P = positive, N = negative
Z = Input voltage 15, 24, 30

Example:

HTC-MVP-24: Maximum output = 2,000 V positive polarity 24 VDC input
HTC-MVN-30: Maximum output = 2,000 V negative polarity 30 VDC input
HTC-HVP-15: Maximum output = 3,000 V positive polarity 15 VDC input
HTC-LVN-30: Maximum output = 1,000 V negative polarity 30 VDC input