HVP
High Voltage Products. High Voltage Experts

Advanced Energy

ULTRAVOLT 1LE TO 15LE SERIES

PRECISION, LOW RIPPLE DC TO HIGH VOLTAGE DC CONVERTERS

The UltraVolt® LE Series of regulated DC-to-DC converters offer excellent low ripple and stability suitable for precision high-voltage applications.

PRODUCT HIGHLIGHTS

- Regulated high voltage outputs ranging from 1, 2, 4, 6, 10, or 15 kV DC maximum
- Single output: positive and negative polarity models
- 4, 15 (10 and 15k V only), 20 (1 to 6 kV only), or 30 W of maximum output power
- 24 VDC input
- 0 to 10 VDC (full-scale) analog control interface with differential input
- Temperature coefficients 25 ppm/°C (optional 10 ppm/°C)
- Control/monitoring of both output voltage and current setpoint levels
- Optional enhanced output stability option for operation down to 0 VDC (4 W only)
- Chassis mount
- Front and rear panel high voltage output and return options
- UL/cUL recognized, CE mark (LVD and RoHS), IEC-60950-1

TYPICAL APPLICATIONS

- DC to high voltage DC bias supplies
- Mass spectrometry and electrophoresis
- Scanning electron microscopes (SEM/FIB)
- Electron and Ion Beams

AT A GLANCE

Maximum Output Voltage

1, 2, 4, 6, 10 or 15 kV DC

Maximum Output Power

30 W

Type

Single Output

Control Interface

Analog

Temperature Coefficient

25 ppm/°C

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ELECTRICAL SPECIFICATIONS

Model[1]		1LE Series			2LE Series		
High Voltage Output Range (Adjustable Regulated, Positive or Negative Output)		0 to 1000 VDC			0 to 2000 VDC		
High Voltage Outputs		Single Unipolar			Single Unipolar		
Input Voltage (VDC, Nominal)		24 VDC			24 VDC		
Power Output (Watts, Nominal)		4 W	20 W	30 W	4 W	20 W	30 W
DC Input							
Vin (Input Voltage) Range	VDC	23 to 30			23 to 30		
Vin (Nominal)	VDC	24			24		
Iin (Input Current, Nominal)	A @ 100% HVout, 100% LOAD	0.4	1.4	1.7	0.4	1.4	1.7
	A @ 100% HVout, 0% LOAD	< 0.325			< 0.325		
	A @ disable/standby state	< 0.08			< 0.08		
DC Output							
HVout (Output Voltage)	VDC (Postive or Negative Polarity Models)	0 to 1000			0 to 2000		
Iout (Output Current)	mA (max) @ 0 to 100% HVout, Vin (nominal)	4	20	30	2	10	15
Pout (Output Power)	Watts (max)	4	20	30	4	20	30
Ripple	(mV) @ Full LOAD, Max Eout	50			50		

Model[1]		4LE Series			6LE Series		
High Voltage Output Range (Adjustable Regulated, Positive or Negative Output)		0 to 4000 VDC			0 to 6000 VDC		
High Voltage Outputs		Single Unipolar			Single Unipolar		
Input Voltage (VDC, Nominal)		24 VDC			24 VDC		
Power Output (Watts, Nominal)		4 W	20 W	30 W	4 W	20 W	30 W
DC Input							
Vin (Input Voltage) Range	VDC	23 to 30			23 to 30		
Vin (Nominal)	VDC	24			24		
Iin (Input Current, Nominal)	A @ 100% HVout, 100% LOAD	0.4	1.4	1.7	0.4	1.4	1.7
	A @ 100% HVout, 0% LOAD	< 0.325			< 0.325		
	A @ disable/standby state	< 0.08			< 0.08		
DC Output							
HVout (Output Voltage)	VDC (Postive or Negative Polarity Models)	0 to 4000			0 to 6000		
Iout (Output Current)	mA (max) @ 0 to 100% HVout, Vin (nominal)	1	5	7.5	0.67	3.33	5
Pout (Output Power)	Watts (max)	4	20	30	4	20	30
Ripple	(mV) @ Full LOAD, Max Eout	50			60		

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

ELECTRICAL SPECIFICATIONS

Model[1]		10LE Series			15LE Series		
High Voltage Output Range (Adjustable Regulated, Positive or Negative Output)		0 to 10,000 VDC			0 to 15,000 VDC		
High Voltage Outputs		Single Unipolar			Single Unipolar		
Input Voltage (VDC, Nominal)		24 VDC			24 VDC		
Power Output (Watts, Nominal)		4 W	15 W	30 W	4 W	15 W	30 W
DC Input							
Vin (Input Voltage) Range	VDC	23 to 30			23 to 30		
Vin (Nominal)	VDC	24			24		
Iin (Input Current, Nominal	A @ 100% HVout, 100% LOAD	0.4	1.1	1.7	0.4	1.1	1.7
	A @ 100% HVout, 0% LOAD	< 0.325			< 0.325		
	A @ disable/standby state	< 0.08			< 0.08		
DC Output							
HVout (Output Voltage)	VDC (Postive or Negative Polarity Models)	0 to 10,000			0 to 15,000		
Iout (Output Current)	mA (max) @ 0 to 100% HVout, Vin (nominal)	0.40	1.5	3.0	0.27	1.0	2.0
Pout (Output Power)	Watts (max)	4	15	30	4	15	30
Ripple	(mV) @ Full LOAD, Max Eout	100			150		

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

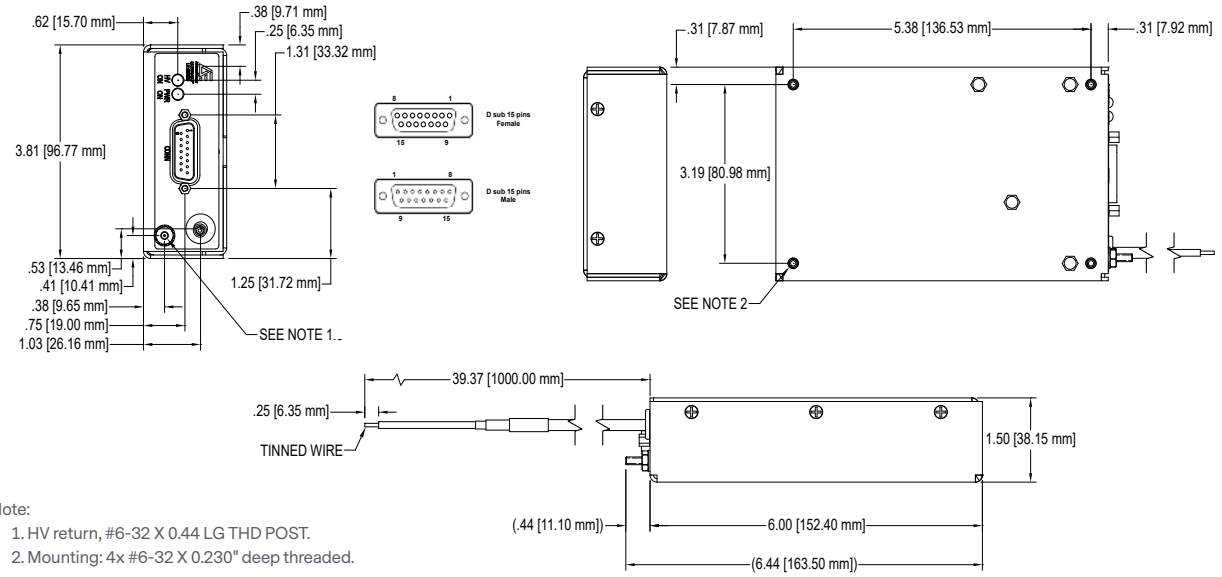
Stability and Regulation	
Stability	0.01% @ 100% HVout (per 8 h interval)
	0.02% @ 100% HVout (after 30 min warmup interval)
Line Regulation	0.0025% (25 ppm) @ 100% HVout, 100% Pout
Static Load Regulation	0.0025% (25 ppm) @ 100% HVout
Temperature Coefficient	25 ppm/°C (standard configuration over operating temperature range)
	10 ppm/°C (with -10PPM option over operating temperature range)
Power-On Rise Time	< 750 msec @ 100% LOAD
	Contact factory for other options.

Environmental	
Operating Temperature Range	10 to 45°C (50 to 113°F) case temperature @ @ 100% HVout, 100% LOAD
Storage	-55 to 105°C (-67 to 222°F) case temperature
Humidity	0 to 95% RH, non-condensing
Altitude	Sea level to 3000 m (10,000 ft)

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

MECHANICAL SPECIFICATIONS

Unit: inch(mm)



Note:
1. HV return, #6-32 X 0.44 LG THD POST.
2. Mounting: 4x #6-32 X 0.230" deep threaded.

Construction	
Standard Case	Aluminum alloy
	Clear coat per MIL-DTL-5541, Type II, Cl 1A, Clear
Labels	Static-dissipative polyester
Cooling	Natural convection and conduction
Encapsulation	Silicone-based RTV
	Contact factory for other options

Volumes and Weights		
	cm³	in³
Volume[1]	562	34.3
	g	oz
Weight[2]	912	32.1

1 Leads, posts, connectors, mounts excluded

2 Standard configuration, no options

INTERFACE

Standard Interface (DB15 Male Connector)	
Pin	**Description**
1	DC Input Power
2	DC Input Power
3	Signal Ground
4	Voltage Mode Monitor[1]
5	Monitor HVout Voltage[2]
6	Set HVout Voltage Level +Vprog[3]
7	Set HVout Voltage Level -Vprog[3]
8	Control Reference Signal[4]
9	Signal Ground
10	Current Mode Indicator[1]
11	Set HVout Current Level
12	Monitor HVout Current Level[2]
13	Enable HVout[5]
14	DC Input Power Ground
15	DC Input Power Ground
Post	High Voltage Return[6]
Flying Lead	High Voltage Output (non-terminated coaxial cable, 3 ft from case)
PWR ON	DC Input Power Present (Green LED = ON)
HV ON	High Voltage Output Enabled (Yellow LED = ON)

1 LOW = Mode ENABLED (Open Drain) will sink up to 25 mA.

2 Voltage and current monitors will sink/source up to 2 mA.

3 0 to 10 VDC (Full Scale) differential signal between Pin 2 and Pin 3.

4 +10 VDC ±0.05% @ 5 mA (Nominal at case temperature = 25°C (77°F).

5 Signal Input LOW < +0.8 VDC, HIGH > +1.5 VDC (Default or NC = DISABLED = LOW).

6 For proper operation and safety, always route HVret signal through HVret connection.

STANDARD OPTIONS

The LE series can be factory-configured with options that enhance its performance in your application. Customized model configurations to meet special performance needs are also available. Please contact factory for further details.

Option	Description
-10PPM	Upgrades module temperature coefficient rating from 25 ppm/°C to 10 ppm/°C for enhanced high-voltage output stability over standard operating temperature ranges.
-AZ	Enhances the stability of module high voltage output at setpoints below <10% HVout by optimizing performance. (Available only on 4 W models).
-DAF	Replaces male DA-15 Type connector at with female DA-15 Type connector to ease system retrofit and integration tasks. The DA-15 female pin number shows on below "DB15 Female Connector" table.
-LGH	Replaces standard front panel HVout flying lead and ground stud with rear panel mounted LGH Type 1/2L connector and ground stud.
-SHV	Replaces standard front panel HVout flying lead and ground stud with rear panel mounted SHV-5KV connector and ground stud. (Available only on 1 to 4 kV units).
-BNC	Replaces standard front panel HVout flying lead and ground stud with rear panel mounted BNC-10KV connector and ground stud. (Available only on 1 to 10 kV units)

-DAF Interface (DB15 Female Connector)	
Pin	**Description**
1	Control Reference Signal[1]
2	Set HVout Voltage Level -Vprog[2]
3	Set HVout Voltage Level +Vprog[2]
4	Monitor HVout Voltage[3]
5	Voltage Mode Monitor[4]
6	Signal Ground
7	DC Input Power
8	DC Input Power
9	DC Input Power Ground
10	DC Input Power Ground
11	Enable HVout[5]
12	Monitor HVout Current Level[3]
13	Set HVout Current Level
14	Current Mode Indicator[4]
15	Signal Ground
Post	High Voltage Return[6]
Flying Lead	High Voltage Output (non-terminated coaxial cable, 3 ft from case)
PWR ON	DC Input Power Present (Green LED = ON)
HV ON	High Voltage Output Enabled (Yellow LED = ON)

1 +10 VDC ±0.05% @ 5 mA (Nominal at case temperature = 25°C (77°F).

2 0 to 10 VDC (Full Scale) differential signal between Pin 2 and Pin 3.

3 Voltage and current monitors will sink/source up to 2 mA.

4 LOW = Mode ENABLED (Open Drain) will sink up to 25 mA.

5 Signal Input LOW < +0.8 VDC, HIGH > +1.5 VDC (Default or NC = DISABLED = LOW).

6 For proper operation and safety, always route HVret signal through HVret connection.

ORDERING INFORMATION

Type	0 to 1000 VDC Output	1LE
	0 to 2000 VDC Output	2LE
	0 to 4000 VDC Output	4LE
	0 to 6000 VDC Output	6LE
	0 to 10,000 VDC Output	10LE
	0 to 15,000 VDC Output	15LE
Input	24 VDC Nominal	24
Polarity	Positive Output	-P
	Negative Output	-N
Power	4 W Output	4
	15 W Output (10 and 15 kV units only)	15
	20 W Output (1, 2, 4 and 6 kV units only)	20
	30 W Output	30
Performance Options	10ppm temperature coefficient rating	-10PPM
	Enhanced stability of HVout (4 W units only)	-AZ
Connection Options	BNC-10kV connector and ground stud (1 to 10 kV units only)	-BNC
	Female Type DA-15 connector	-DAF
	LGH type 1/2L connector and ground stud	-LGH
	SHV-5kV connector and ground stud (1 to 4 kV units only)	-SHV