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.

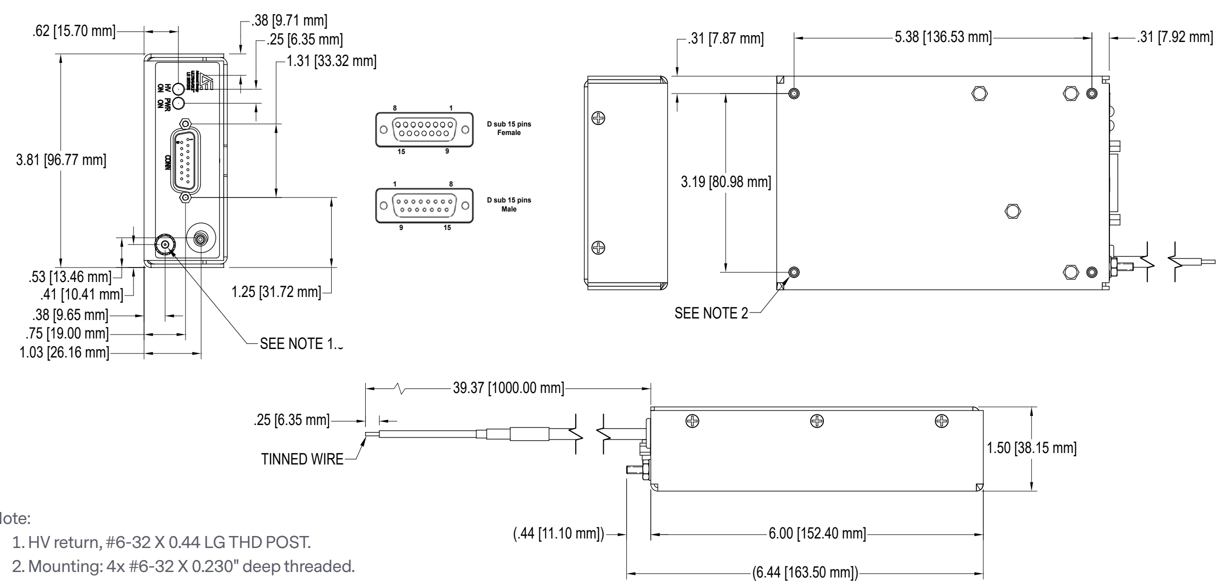
Stability and Regulation	
Stability	0.01% @ 100% HVout (per 8 h interval)
	0.02% @ 100% HVout (after 30 min warmup interval)
Line Regulation	0.0025% (25 ppm) @ 100% HVout, 100% Pout
Static Load Regulation	0.0025% (25 ppm) @ 100% HVout
Temperature Coefficient	25 ppm/°C (standard configuration over operating 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		
	cm^3	in^3
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)

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

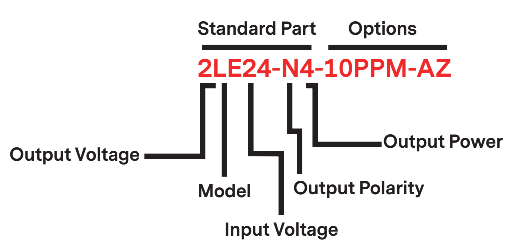
4 LOW = Mode ENABLED (Open Drain) will sink up to 25 mA.

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



ABOUT ADVANCED ENERGY

Since 1981, Advanced Energy (AE) – and its family of products that now includes UltraVolt® – has perfected how power performs for its customers. For both end users and OEMs, AE's comprehensive portfolio of standard and custom high-voltage components precisely match system specifications to deliver unparalleled energy, quality, and performance. Through close customer collaboration, design expertise, application insight, and world-class support, AE creates successful partnerships and enables customers to push the boundaries of innovation and stay ahead of evolving market needs.

PRECISION | POWER | PERFORMANCE | TRUST

CAUTION:
High Voltage

Read and understand all documentation before you install, operate, or maintain Advanced Energy high voltage power supplies. Follow all safety instructions and precautions to protect against property damage and serious or possibly fatal bodily injury. Never defeat safety interlocks or grounds.

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