

# ULTRAVOLT FL SERIES

FLOATING HOT DECK LVPS WITH ISOLATED DIGITAL AND ANALOG I/O



The FL Series of floating-hot-deck, low-voltage power supplies offers an integrated solution for systems requiring LV power & controls with high-voltage isolation. Combining a highly isolated, DC-to-DC, multi-output low-voltage power supply (LVPS) with an advanced isolated digital & analog I/O topology, the FL sub-system provides both power and controls to floating-hot-deck circuitry. This solution, when combined with one or more UV HVPS or other circuitry, can provide high-performance solutions.

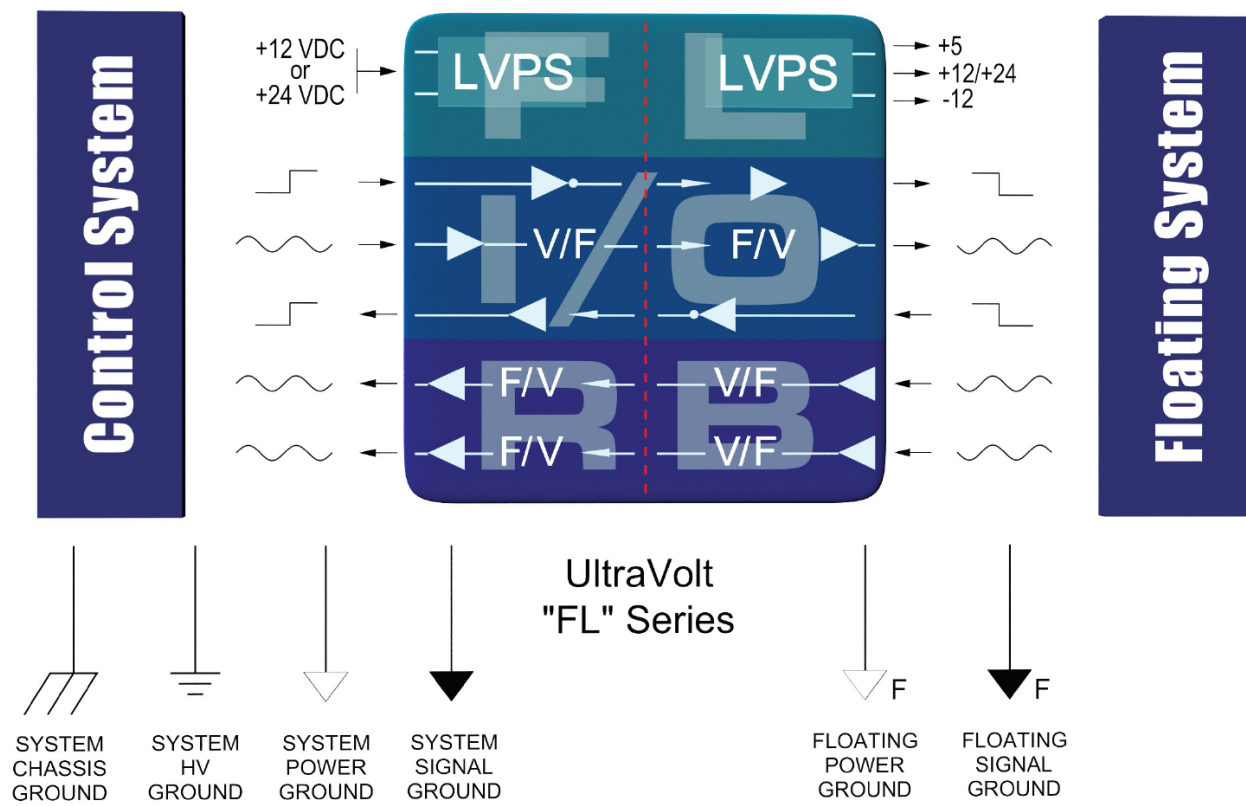
## PRODUCT HIGHLIGHTS

- Isolated up to 15 kV
- DC leakage current of <10 nA
- AC leakage capacitance of <40 pF
- 3 regulated floating LV power outputs
- Isolated digital I/O to and from floating hot deck
- Isolated analog I/O to and from floating hot deck
- UL/cUL Recognized Component; CE Mark (LVD & RoHS)

## TYPICAL APPLICATIONS

- Floating/Stacked Ion or E-Beam Biases
- Floating Pulsers and Gated Grids
- Floating High Side Current Monitors
- Floating Filament Bias
- Floating Capacitance Meters
- Floating Leakage Testers

FL SERIES



## ELECTRICAL SPECIFICATIONS

Parameter	Conditions	Models		Units
Input		12 V	24 V	
Voltage Range	Full Power	+12 $\pm$ 5%	+24 $\pm$ 5%	VDC
Voltage Range	Derated Power Range	+10.8 to +16	+21.6 to +30	VDC
Current	Standby (Disabled)	<90	<50	mA
Current	No Load	<0.15	<0.15	A
Current	Max Load	<1.60	<1.40	A
AC Ripple Current	Nominal Input, Full Load	<80	<100	mA pk to pk
Local Controls: Reference		All Types		
Output Voltage	T = +25°C, Initial Value	+5.1 $\pm$ 1%		VDC
Output Impedance	T = +25°C	464 $\pm$ 1%		$\Omega$
Stability	Over Full Temperature Range	0.2		mV/°C
Local Controls: Reference LVPS Enable/Disable		All Types		
Power Supply On	Open, or a Voltage Above TTL High	+2.4 to 32		VDC
Power Supply Off	Grounded, or a Voltage Below TTL Low	0 to +0.7 $\pm$ 0.2 (Isink 1 mA min)		VDC
Input/Output Isolation		12V	24V	
Isolation Voltage	Continuous	15	15	kV
Leakage Current	All Inputs to All Outputs	<10 std, <100 “-E”	<10 std, <100 “-E”	nA
Leakage Capacitance	All Inputs to All Outputs	<40 std, <50 “-E”	<50 std or “-E”	pF

Parameter	Conditions	Models		Units
Isolated Power Outputs		15FL12-12W	15FL12-24W	
Output #1 Power	Nominal Input, Max Iout	12	24	W
Output #1 Voltage	Nominal Input Voltage Range	+12 $\pm$ 2%	+24 $\pm$ 2%	VDC
Output #1 Current	Min to Max	0 to 1	0 to 1	A
Output #1 Line Regulation	Nominal Input Range, Full Load	<0.1%	<0.1%	VDC
Output #1 Load Regulation	No Load to Full Load	<0.1%	<0.1%	VDC
Output #1 Ripple	Full Load	<2%	<1%	V pk to pk
Output #2 Voltage	Nominal Input Voltage Range	-15	-15	VDC
Output #2 Current	Min to Max	0 to 10	0 to 10	VDC
Output #2 Line Regulation	Nominal Input Range, Full Load	<0.1%	<0.1%	VDC
Output #2 Load Regulation	No Load to Full Load	<2%	<2%	VDC
Output #2 Ripple	Full Load	<2%	<2%	VDC
Output #3 Voltage	Nominal Input Voltage Range	+5.6%	+5.6%	VDC
Output #3 Current	Min to Max	0 to 10	0 to 10	mA
Output #3 Line Regulation	Nominal Input Range, Full Load	<1%	<1%	VDC
Output #3 Load Regulation	No Load to Full Load	<1%	<1%	VDC
Output #3 Ripple	Full Load	<1%	<1%	V pk to pk

## ULTRAVOLT FL SERIES

### ELECTRICAL SPECIFICATIONS (CONTINUED)

Parameter	Conditions	Models	Units
<b>Isolated Controls: TTL Channel "Up"</b>		<b>All Types with -I/O Option</b>	
Local Input	Source Voltage, Sink Current	10 M $\Omega$ internal pull up to +15 V	VDC
		<1 V low, >2.5 V high	VDC
Isolated Output	Inverted and Buffered TTL	Open collector with internal 1 k $\Omega$ pull up to +5 V (Can sink 10 mA max)	VDC
Baud Rate	Duty Cycle	DC to >300	ms
<b>Isolated Controls: Analog "Up"</b>		<b>All Types with -I/O Option</b>	
Local Input Voltage	Range	0 to +5	VDC
Isolated Output Voltage	Range	0 to +5	VDC
Local Input Impedance		10 Meg	$\Omega$
Isolated Output Impedance		Buffered low impedance	—
Initial Offset Error		< $\pm 1\%$	mV
Gain Error	Full Scale	< $\pm 2\%$	VDC
Linearity Error	0 to Full Scale	< $\pm 1\%$	VDC
Stability	30 Min Warmup, Per 8 h, per day	< 0.01% / < 0.02%	VDC
Temperature Coefficient	0 to +55°C	< $\pm 50$	ppm/°C
Bandwidth	Symmetric or Asymmetric Signal	DC to 30 (-3dB point is 47 Hz)	Hz
<b>-‘RB’ Isolated Controls: TTL Channel “Down”</b>		<b>All Types with -I/O-R/B Option</b>	
Isolated ‘Hot Deck’ Input	Source Voltage, Sink Current	10 M $\Omega$ internal pull up to +15 V	VDC
		<1 V low, >2.5 V high	VDC
Local Output	Inverted and Buffered TTL	Open collector with internal 1 k $\Omega$ pull up to +5 V	VDC
		Can sink 10 mA max	VDC
Bandwidth	Duty Cycle	DC to >300	ms
<b>Isolated Controls: Analog Channels #1 and 2 “Down”</b>		<b>All Types with -I/O-R/B Option</b>	
Isolated ‘Hot Deck’ + Input	Range	0 to +5, 0 to +10 with >+15 VDC input power	VDC
Isolated ‘Hot Deck’ -Input	Range	0 to -5, 0 to -10 with >+15 VDC input power	VDC
Isolated ‘Hot Deck’ + or - Input impedance	Signal Source	>10	M $\Omega$
Local Output +Voltage	Range	0 to +5, 0 to +10 with >+15 VDC input power	VDC
Local Output -Voltage	Range	0 to -5, 0 to -10 with >+15 VDC input power	VDC
Local Output Impedance	Signal Source	Buffered low impedance	$\Omega$
Initial Offset Error	Signal Source	< $\pm 5$	m VDC
Gain Error	Full Scale	< $\pm 1\%$	VDC
Linearity Error	0 to Full Scale	< $\pm 1\%$	VDC
Stability	30 Min Warmup, Per 8 h, Per Day	< 0.01%/< 0.02%	VDC
Temperature Coefficient	-20 to +55°C	< $\pm 50$	ppm/°C
Bandwidth	Symmetric or Asymmetric Signal	DC to 30 (-3dB point is 47 Hz)	Hz

## ELECTRICAL SPECIFICATIONS (CONTINUED)

Parameter	Conditions	Models	
Temperature		All Types	
Operating	Full Load, Case Measurement	-20 to +55°C	
Storage	Non-operating, Case Measurement	-55 to +85°C	
Thermal Shock	Mil-Std-810, Method 503-4, Proc. II	-20 to +55°C	
Altitude		All Types	
Operating	All Operating Conditions	Sea level to vacuum	
Storage	Non-operating	Sea level to vacuum	
Shock and Vibration		Standard	-RB Option
Shock	Mil-Std-810, Method 516.5, Proc. IV 2	20 Gs	20 Gs
Vibration	Mil-Std-810, Method 514.5, Fig.	10 Gs	10 Gs

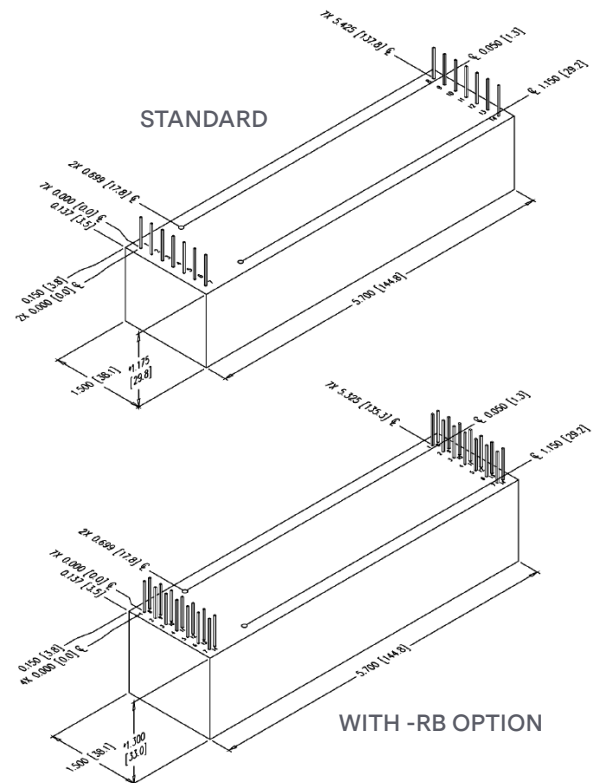
## MECHANICAL SPECIFICATIONS

Construction	
Case	Epoxy-filled DAP box certified to ASTM-D-5948
Volume	Standard: 163.9 cc (10.3 in <sup>3</sup> )
	-R/B Option: 182 cc (11.1 in <sup>3</sup> )
Weight	Standard: 340.2 g (12.0 oz)
	-R/B Option: 377.1 g (13.3 oz)
Tolerance	Overall $\pm 0.050"$ (1.27 mm)
	Pin to Pin $\pm 0.015"$ (0.38 mm)
	Mounting hole locations $\pm 0.025"$ (0.64 mm)

Note: 24-watt versions are an additional 0.062" (1.57 mm) in height.

-M equipped units are an additional 0.030" (0.76 mm) in height.

Contact Advanced Energy for drawings of models equipped with -E options.



## INTERFACE

### Local Connections

Pin	Function
1	Input Power Ground Return
2	Positive Power Input
3	LVPS Enable/Disable
4	TTL Up HVPS Enable/Disable (-I/O Only)
5	Signal Ground Return
6	Analog Up/ HVPS Remote Programming Input (-I/O Only)
7	+5 V Reference Output
8	Analog Down Channel 1, +

### Additional Local Connections (-R/B Option)

Pin	Function
8	+Iout Monitor Output (Analog Down Channel 1)
9	-Iout Monitor Output (Analog Down Channel 1)
10	+Eout Monitor Output (Analog Down Channel 2)
11	-Eout Monitor Output (Analog Down Channel 2)
12 and 13	N/C (Reserved for Future Use)
14	TTL Output (Digital Down Channel 1)

### Isolated/ Floating Connections

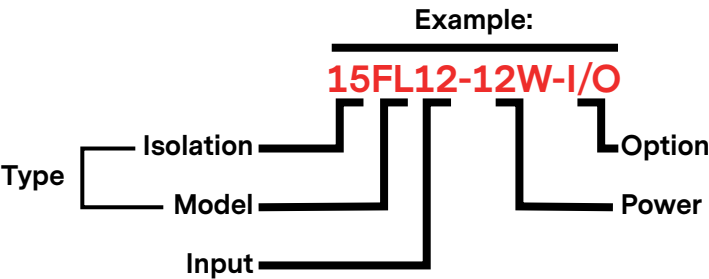
Pin	Function
8	Floating Power Ground Return
9	Floating +12 VDC or +24 VDC Output
10	Floating -15 VDC Output
11	Floating TTL Up/HVPS Enable/Disable (-I/O Only)
12	Floating Signal Ground Return
13	Floating Analog Up/HVPS Remote Programming Input (-I/O Only)
14	Floating +5.6 VDC Reference Output

### Additional Isolated/Floating Connections (-R/B Only)

Pin	Function
1	Floating +Iout Monitor Output (Analog Down Channel 1)
2	Floating -Iout Monitor Output (Analog Down Channel 1)
3	Floating +Eout Monitor Output (Analog Down Channel 2)
4	Floating -Eout Monitor input (Analog Down Channel 2)
5 and 6	N/C (Reserved for Future Use)
7	Floating TTL Input (Digital Down Channel 1)

ORDERING INFORMATION

Type	15 kV Isolation	15FL
Input Voltage	12 VDC Nominal	12
	24 VDC Nominal	24
Power	Watts Output (12 Vin Only)	-12W
	Watts Output (24 Vin Only)	-24W
Standard Features	(1) Digital Up Channel and (1) Analog Up Channels	-I/O
	(1) Digital Down Channel and (2) Analog Down Channels	-R/B
Options	Partial Mu-Metal Shield	-M
Case	Plastic Case—Diallyl Phthalate	Standard
	"Eared" Chassis Mounting Plate	-E





For international contact information,  
visit [advancedenergy.com](http://advancedenergy.com).

[uv-ca@aei.com](mailto:uv-ca@aei.com)  
+1.970.221.0108

## ABOUT ADVANCED ENERGY

Since 1981, Advanced Energy (AE) — and its UltraVolt® family of products — 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



**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.

Specifications are subject to change without notice. Not responsible for errors or omissions. ©2019 Advanced Energy Industries, Inc. All rights reserved. Advanced Energy®, AE®, and Ultravolt® are U.S. trademarks of Advanced Energy Industries, Inc.





# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Advanced Energy:](#)

[15FL24-24W-I/O](#) [15FL12-12W-I/O-M](#) [15FL12-12W-I/O](#)