

- Isolated up to 15kV
- DC leakage current of <10nA
- AC leakage capacitance of <40pF
- 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, IEC-60950-1, and Demko Recognized



GENERAL INFORMATION:

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 for applications such as:

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

Please contact UltraVolt's customer service department for an analysis of your requirements.

DESIGN METHODOLOGY:

The "FL" Series utilizes a dual-ended forward converter topology with a nominal switching frequency of <100 kHz. Once input voltage stabilizes, under-voltage lockout is released. When the LVPS enable is raised above a TTL 1, the converter begins to switch. The 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 with optically isolated feed back controls the MOSFET push-pull power stage, driving a highly isolated transformer. This isolated power ultimately provides 3 separate LV floating outputs at >80% efficiency. The power stage is protected from intermittent output-current overloads or short circuits via a primary current limit circuit. The isolated digital I/O channel(s) are optically transmitted directly to the floating hot deck with a schmitt trigger buffer providing glitch-free output on the floating hot deck. The isolated analog I/O channel(s) are converted to digital data and optically transmitted directly to the floating hot deck for conversion back to analog.

COMPATIBILITY:

The "FL" Series works directly with any UltraVolt "A" or "C" Series DC-to-DC HVPS from 0 to 62V through 0 to 35kV @ 0 to 4 watts through 0 to 20 watts. By providing isolated power, TTL enable/disable, and voltage programming, UV HVPS can be floated or stacked on one another.

ISOLATED POWER OUTPUTS:

The "15FL12-12W" provides floating +12VDC @ 1 Amp, -12VDC @ 10 mA, and +5VDC @ 10 mA from a single ground side +12VDC input. The "15FL24-24W" provides floating +24VDC @ 1 Amp, -12VDC @ 10 mA, and +5VDC @ 10 mA from a single ground side +24VDC input. The main output is typically used to drive a floating HVPS, or filament switching regulator, etc. The -12VDC is for use with the +DC in providing bias to floated Op-Amps, DACs & ADCs. The +5 VDC can run floating micro-controllers or watchdog reset circuits.

ISOLATED CONTROLS: DIGITAL CHANNELS

The "-I/O" option provides isolated digital I/O channel(s) from the grounded system side to the floating hot deck. The TTL bit is inverted. The output, a schmitt trigger TTL buffer, sources up to 0.8mA and sinks up to 13 mA. This bit is typically used to enable/disable a floated UV HVPS. It can also be used at up to 300kHz to drive a pulser, gate, sample-and-hold multiplexer or to communicate with a floated micro controller. The "-R/B" option provides one additional down channel.

ISOLATED CONTROLS: ANALOG CHANNELS

The "-I/O" option provides isolated analog I/O channel(s) from the grounded system side to the floating hot deck. The analog signal is converted to digital and translated back to analog at the floating hot deck. The output is buffered with a source impedance of 1.5KΩ. This signal is typically used to remote program a floated UV HVPS. It can be used at up to 30 Hz to drive an amplifier, sample-and-hold, or to program other devices such as a floating filament regulator. The "-R/B" option provides one additional down channel.

STANDBY MODE:

All "FL" models feature an LVPS enable/disable function. When the enable is TTL 0 (< +0.7 VDC +/-0.2 Isink=1mA), the floating LVPS is in standby mode. All isolated outputs go to 0VDC; input current drops to < 90 mA; and all functions are shut down except the +5 Volt reference, which is always operational. If the LVPS enable pin is left unconnected, TTL 1 or at greater voltages up to +32VDC the converter operates normally.

MECHANICAL:

"FL" Series units are in PCB-mountable plastic cases requiring a footprint of 8.5 in² and only 10 in³ of volume. Mounting plates and brackets are available for chassis mounting. See Application Note AP-6 for thermal considerations and for mounting configurations.

ENVIRONMENTAL:

The "FL" Series provides full power operation at case temperatures from -20 to +55°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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"FL" SERIES

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

Typical Characteristics:

Parameter	Conditions	Models		Units
Input Power:		12V Models	24V Models	
Voltage Range	Full Power	+12 ± 5%	+24 ± 4%	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 p-p
Local Controls: Reference		All Types		
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 Data Sheet, Figure F		Graph
Local Controls: 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 ± 0.2 (Isink 1mA minimum)		VDC
Input / Output Isolation:		12V Models	24V Models	
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
Isolated Power Outputs:		15FL12-12W	15FL24-24W	
Output #1 Power	Nominal input, max lout	12	24	W
Output #1 Voltage	Nominal input voltage range	+12 ± 5%	+24 ± 5%	VDC
Output #1 Current	Minimum to Maximum	0 to 1	0 to 1	A
Output #1 Line Regulation	Nominal input range, full load	< 0.1 %	< 0.3 %	VDC
Output #1 Load Regulation	No load to full load	< 0.5 %	< 0.25 %	VDC
Output #1 Ripple	Full load	< 2 %	< 1 %	V p-p
Output #2 Voltage	Nominal input voltage range	-12 ± 10%	-12 ± 5%	VDC
Output #2 Current	Minimum > Maximum	0 to 10	0 to 10	mA
Output #2 Line Regulation	Nominal input range, full load	< 0.1 %	< 0.3 %	VDC
Output #2 Load Regulation	No load to full load	< 5 %	< 1 %	VDC
Output #2 Ripple	Full load	< 2 %	< 1 %	V p-p
Output #3 Voltage	Nominal input voltage range	+5.6 ± 5%	+5.6 ± 5%	VDC
Output #3 Current	Minimum > Maximum	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 p-p
Isolated Controls: TTL Channel "UP"		All Types with "-I/O" option		
Local input	Source voltage, sink current	0 = <0.5 (Isink 3mA minimum) 1 = >2.4 (300uA or open collector)		VDC
Isolated output	Inverted & buffered TTL	1 ≥ 2.4, 0 ≤ 0.4 ± (Sources 0.8 mA, Sinks 13 mA)		VDC
Baud Rate	Varying duty cycle	DC to >300		kHz
Isolated Controls: Analog Channel "UP"		All Types with "-I/O" option		
Local input voltage	Range	0 to + 5		VDC
Local input impedance		23.2 K		Ω
Isolated output voltage	Range	0 to + 5		VDC
Isolated output impedance		1.5K Ω ± 1%		Ω
Initial offset error		< ± 2		mV
Gain error	Full scale	< ± 2 %		VDC
Linearity error	0 to full scale	< ± 1 %		VDC
Stability	30 min. warm-up, per 8 hrs / per day	< 0.01% / < 0.02%		VDC
Temperature Coefficient	0 to +55 °C	< ± 50		ppm/°C
Bandwidth	Symmetric or asymmetric signal	DC to 30 (-3dB point is 47 Hz)		Hz

Specifications subject to change without notice



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

‘-RB’ Isolated Controls: TTL Channel “DOWN”

Parameter	Conditions	All Types with “-I/O-R/B” option	Units
Isolated ‘Hot Deck’ Input	Source voltage, sink current	0 = < 0.5 (Isink 1mA Minimum) 1 = > 2.4 (300uA or open collector)	VDC
Local output	Inverted & Buffered TTL	1 > 2.4 (Sources 0.8mA) 0 < 0.4 (Sinks 10mA)	VDC
Bandwidth	Varying duty cycle	DC to >300	kHz

Isolated Controls: Analog Channels #1 & #2 “DOWN”

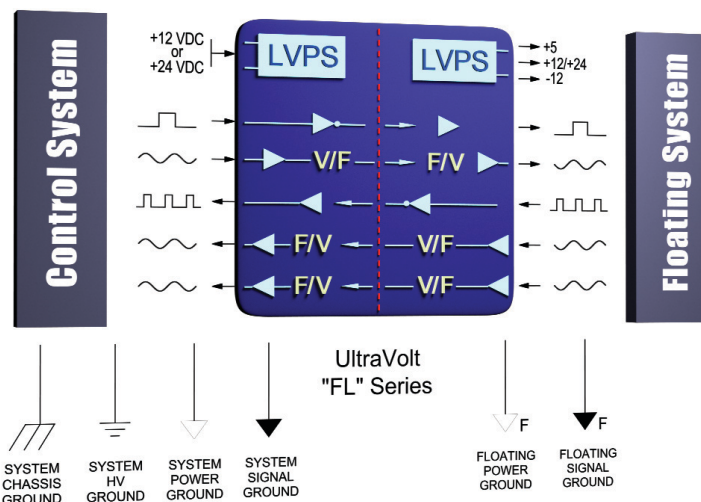
Parameter	Conditions	All Types with “-I/O-R/B” option	Units
Isolated ‘Hot Deck’ +Input	Range	0 to +5, 0 to +10 with >+15VDC input power	VDC
Isolated ‘Hot Deck’ -Input	Range	0 to -5, 0 to -10 with >+15VDC input power	VDC
Isolated ‘Hot Deck’ + or - Input impedance	Signal source	> 10Meg	Ω
Local output +voltage	Range	0 to +5, 0 to +10 with >+15VDC input power	VDC
Local output -voltage	Range	0 to -5, 0 to -10 with >+15VDC input power	VDC
Local output impedance	Signal source	< 150	Ω
Initial offset error	Signal source	< ± 2	mVDC
Gain error	Full scale	< ± 2%	VDC
Linearity error	0 to full scale	< ± 1%	VDC
Stability	30 min. warm-up, per 8 hrs / per day	< 0.01% / < 0.02%	VDC
Temperature Coefficient	-20 °C to +55 °C	< ± 50	ppm/°C
Bandwidth	Symmetric or asymmetric signal	DC to 30 (-3dB point is 47Hz)	Hz

Temperature:	Conditions	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 & Vibration:	Standard	- RB option	
Shock	Mil-Std-810, Method 516.5, Proc IV	20	G's
Vibration	Mil-Std-810, Method 514.5, Fig. 514.5C-3	10	G's

Packaging:	Standard	- RB option	
Material	Outer construction	Plastic (DAP) ASTM-D-5948	Plastic (DAP) ASTM-D-5948
Length	Not including pins or mounting points	5.70" ± 0.050" (144.8)	5.70" ± 0.050" (144.8)
Width	Not including pins or mounting points	1.50" ± 0.050" (38.1)	1.50" ± 0.050" (38.1)
Height	Not including pins or mounting points	1.175" ± 0.050" (29.8)	1.30" ± 0.050" (33.0)
Volume	Not including pins or mounting points	10 (163.9)	11.1 (182)
Weight	Overall	12.0 (340.2)	13.3 (377.1)



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"FL" SERIES

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

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:

24 watt versions are an additional
0.062" (1.57) in height.

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

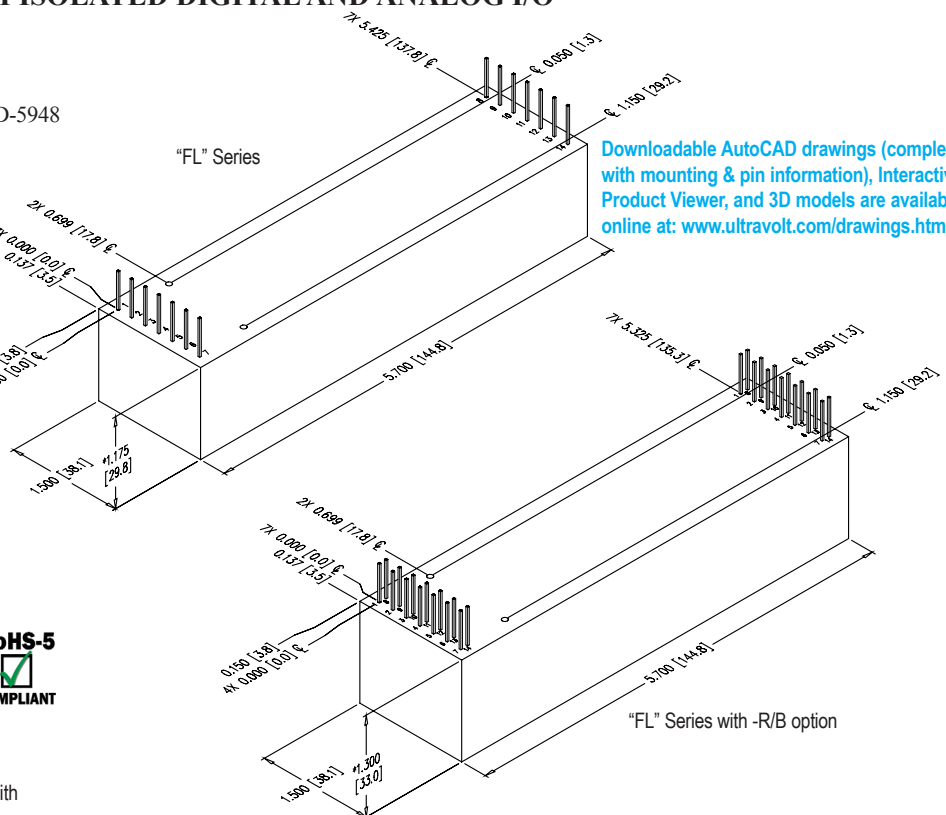
PROUDLY



IEC-60950-1

All units are RoHS-5 compliant.

Models with -RB option are not yet certified with
UL, CUL, IEC-60950-1, or Demko.



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

Local Connections

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

Additional Local Connections (-R/B option)

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 - N/C (reserved for future use)
13 - N/C (reserved for future use)
14 - TTL output (Digital Down Channel 1)

Isolated/Floating Connections

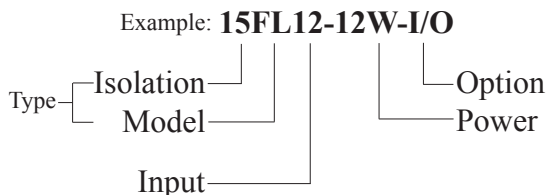
8 - Floating PWR Ground Return
9 - Floating +12VDC or +24VDC Output
10 - Floating -12VDC Output
11 - Floating TTL Up/HVPS Enable/Disable (-I/O Only)
12 - Floating Signal Ground Return
13 - Floating Analog Up/ HVPS Remote Programming Input (-I/O Only)
14 - Floating +5.6V Reference Output

Additional Isolated Connections (-R/B only)

1 - Floating +Iout monitor input (Analog Down Channel 1)
2 - Floating -Iout monitor input (Analog Down Channel 1)
3 - Floating +Eout monitor input (Analog Down Channel 2)
4 - Floating -Eout monitor input (Analog Down Channel 2)
5 - N/C (reserved for future use)
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 (12V only)	-12W
	Watts Output (24V only)	-24W
Options:	(1) Digital Up Channel & (1) Analog Up Channel	-I/O
	(1) Digital Down Channel & (2) Analog Down Channel	-R/B
	Partial Mu-Metal Shield	-M
Case:	Plastic Case - Diallyl Phthalate	STD
	"Eared" Chassis Mounting Plate	-E



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