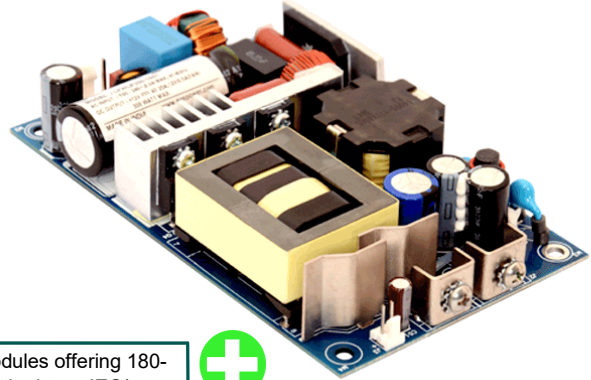


MWLP350 Series

350 Watts

- Low profile 1" in a 5 x 3" footprint
- 200W Convection cooled / 350W Fan cooled
- Latest medical safety EN60601-1 and 4th Ed immunity EN60601-1-2
- Up to 93% efficient
- Cover kits available
- EN55011 Level B conducted & radiated
- 5 Year warranty



Medical

Dimensions:

5 x 3 x 1" (127 x 76.2 x 25.4mm)

The LFMWLP350 series of low profile, open frame medical grade AC-DC power modules offering 180-200W convection cooled and 300-350W fan cooled power in a 5" x 3" package with the latest IEC/EN60601-1 (BF rated) and IEC/EN60601-1-2 approvals. The units are fully featured including screw terminal option, 12V 0.5A fan output and low standby power of <0.5W. They have a wide operating temperature of -40 to 70°C, in a range of voltages from 12V to 58V, with a cover option. All units come with a FIDUS 5 year warranty.

Models & Ratings

Model Number ⁽¹⁾	Output Power ⁽²⁾	Output voltage ⁽³⁾	Output Current		Efficiency ⁽⁴⁾
			Convection	375LFM Fan cooled	
LFMWLP350-1 <u>0</u> 01	300W	12V	15.00A	25.00A	92%
LFMWLP350-1 <u>3</u> 01	225W	12V	15.00A	18.75A	92%
LFMWLP350-1 <u>0</u> 02	325W	15V	12.00A	21.67A	92%
LFMWLP350-1 <u>3</u> 02	270W	15V	12.00A	18.00A	92%
LFMWLP350-1 <u>0</u> 03	350W	24V	8.33A	14.60A	93%
LFMWLP350-1 <u>3</u> 03	350W	24V	8.33A	14.60A	93%

Notes

1. For screw terminal version replace 3 above for 0. Example 'LFMWLP350-1001'
2. Combined output power is main DC output + fan output (12V 0.5A)
3. 30V, 48V and 58V unit also available, please contact sales
4. At 100% load, 230VAC
5. Cover kit available WLP350-CK . Cover kit derates unit to 70%
6. For class II versions please contact sales

Key specifications

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
AC Input range	90		264	VAC	Derate from 100% at 100VAC to 90% at 90VAC
Operating temperature	-40		70	°C	See derating curve p3. Ripple can be 10% or more between -40 and 0°C, start-up guaranteed.
Efficiency	See ratings table above				
Dimensions	5 x 3 x 1" (127 x 76.2 x 25.4mm)				
EMC	EN55011 Level B conducted and radiated EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated. 4th Ed medical immunity EN/IEC60601-1-2				
Safety	IEC/EN60601-1, AAMI/ANSI ES60601-1, CSA22.2 No 60601-1, CE, Class 1 SELV.				

MWLP350 Series

Input

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	90		264	VAC	Derate from 100% at 100VAC to 90% at 90VAC
Input frequency	47		63	Hz	
Power factor	0.95				EN61000-3-2 class D compliant, at full load
Input current (rms)			3.6	A	At 115VAC
			1.8		At 230VAC
Inrush current			25	A	115VAC cold start at 25°C
			45		230VAC cold start at 25°C
No load input power		<0.5		W	

Output

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Output voltage	12		58	VDC	See Model & Ratings table
Output Voltage Adjust		±3		%	
Set point accuracy			±1	%	
Line regulation			±0.5	%	
Load regulation			±1	%	
Minimum load	0			%	
Transient response			5	%	50-100% step change 0.1A/uS slew 50% duty 50hz in <5ms
Ripple & Noise		1		%	All models measured with 0.1uF ceramic and 10uF electrolytic capacitor. 20 MHz bandwidth. At rated line and full load.
Hold up time	8		14	mS	8mS at 350W, 14mS at 200W
Overload protection	110			%	Hiccup mode, Auto recovery
Short circuit protection					Hiccup mode, Auto recovery
Overvoltage protection	110		140	%	Hiccup mode, Auto recovery
Leakage current		300		uA	Not applicable for class II versions
Touch current			100	uA	

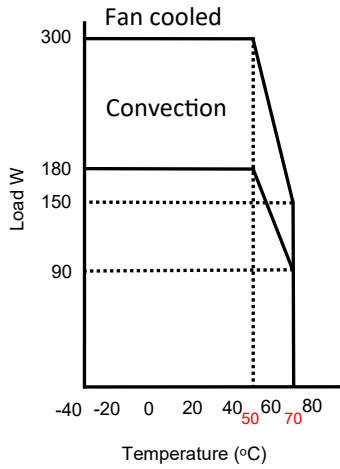
General

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	Please see ratings table on page 1				
Isolation: Input to Output	4000			VAC	
Input to Ground	1500			VAC	
Output to Ground	1500			VAC	BF rated
Switching frequency	50		80	KHz	For power switching, PFC switching: 70-130KHz
Power density			23.33	W/ln ³	
MTBF	>2.56			MHrs	As per Telcordia-SR332- issue 3
Weight		300		g	

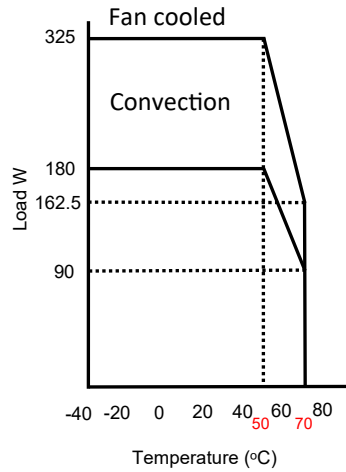
Environmental

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-40		70	°C	Derate above 50°C at 2.5% per °C Please see derating curve on page 3
Storage temperature	-40		85	°C	
Cooling					Convection cooled / fan cooled 375LFM
Altitude	16000		40000	ft	16000ft operating 40000ft non operating
Humidity	5		95	% RH	Non condensing

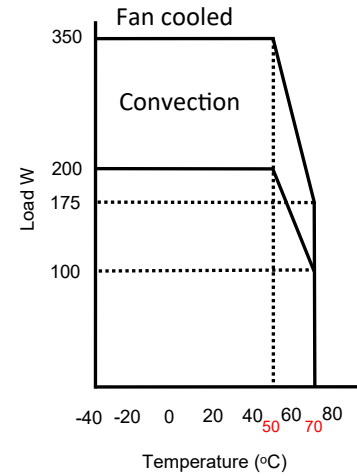
Power Derating Curve 12V



Power Derating Curve 15V



Power Derating Curve Others



EMC: Emissions

	Standard	Test level	Criteria	Notes & Conditions
Conducted	EN55011	B		
Radiated	EN55011	B		With ferrite ring core K5B RC 25x12x15-M on input
Harmonic current	EN61000-3-2	Class D		
Voltage flicker	EN61000-3-3			

EMC: Immunity

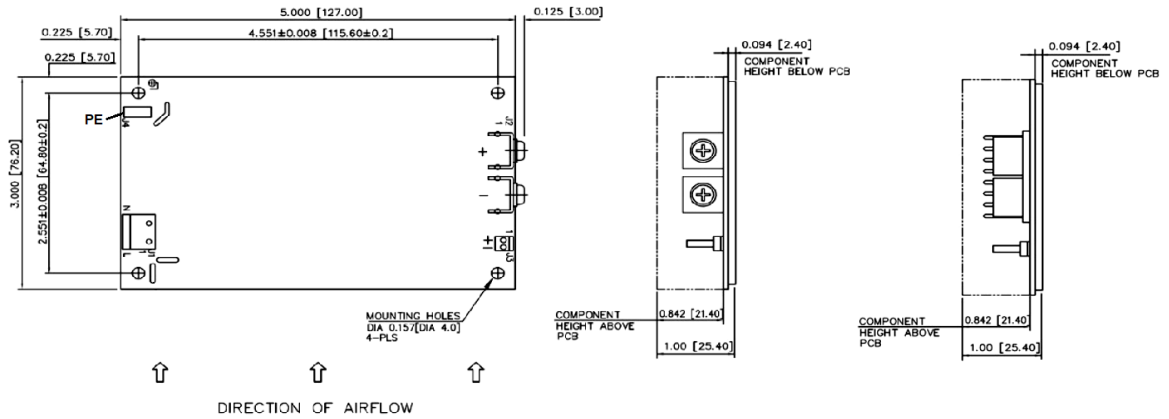
	Standard	Test level	Criteria	Notes & Conditions
ESD	EN61000-4-2	4	A	±8 contact, ±15 air.
Radiated	EN61000-4-3	3	A	10V/m 80MHz-2.7GHz sine wave 80% AM 1KHz
EFT	EN61000-4-4	3	A	2KV Power, 1KV I/O 5KHz
Surges	EN61000-4-5	Installation Class 3	A	1KV Live-Neutral, 2KV Live/Neutral—Earth
Conducted	EN61000-4-6	3	A	10V, 0.15 to 80MHz sine wave 80AM 1KHz
Magnetic Fields	EN61000-4-8	4	A	30A/M
Voltage Dips and Interruptions	EN61000-4-11		B,B,B,B	

Safety Approvals

	Safety standard	Notes & Conditions
UL/CSA	ANSI/AAMI ES60601-1, CSA 22.2 No 60601-1	Class I UL: 20150302-E173812
CB	IEC60601-1 3.1	Class I test cert NO85143, Class II test cert NO85357
Nemko	EN60601-1 2006 A1	Class I Nemko No P15219413, Class II Nemko No P15219458
CE		2011/65/EU RoHS Directive and 2014/35/EU Low voltage directive
Equipment protection class		Class I (please contact sales for class II versions)

Mechanical Details

Molex terminal version

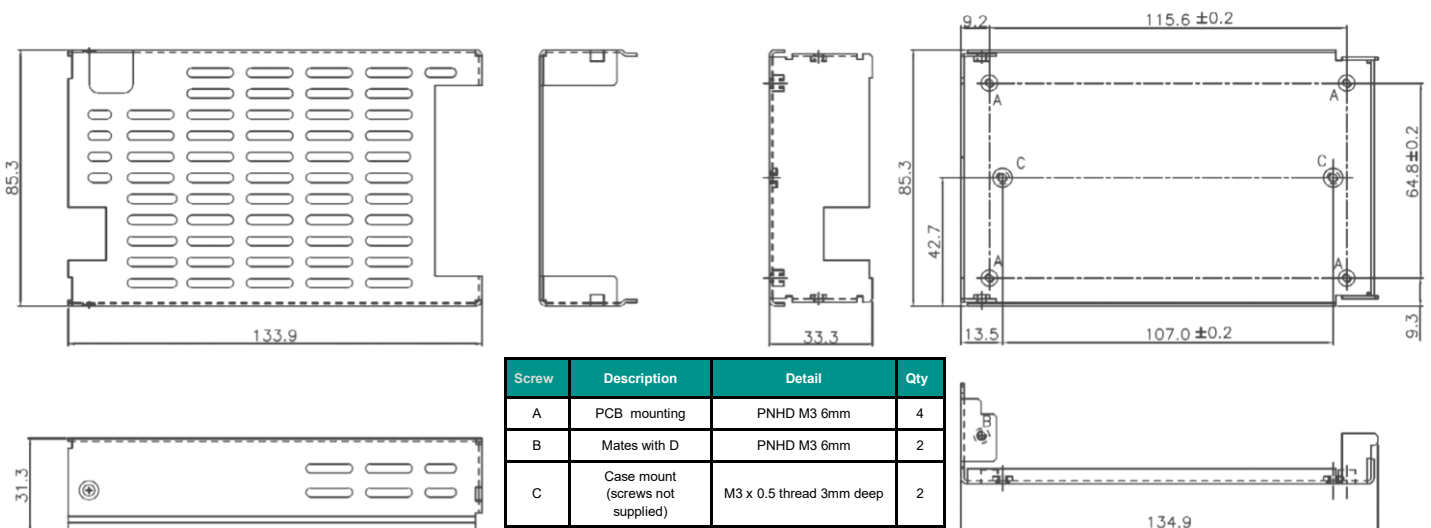


J1: Input Connector ⁽²⁾	
Pin Connections	
Pin	Function
1	AC Line
2	AC Neutral

J2: Output Connector ^(3/4)	
Pin Connections	
Pin	Function
1	+Vout
2	-Vout

J3: Fan Connector ⁽⁵⁾	
Pin Connections	
Pin	Function
1	Fan +
2	Fan -

Cover Kit: WLP350CK

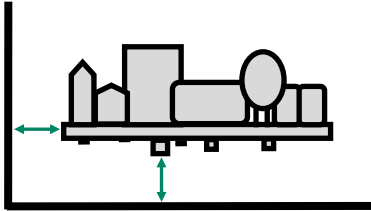


Notes

- All MWLP350 shown in Inches [mm], WLP350CK mm
- J1: Input connector: Molex: 26-60-4030 mating part: Molex: 09-50-3031
- J2: Output connector: 6-32 pan screw. Can accept AMP 8-31886-1 Tongue (11A max AWG16)
- J2: For molex version use: 26-60-4080 mating part Molex: 09-50-3081
- J3: Output connector: AMP: 640456-2 mating part AMP: 640440-2
- J4: Earth connection Molex 19705-4301 mates with 19003-0001
- Case supplied with mylar insulator

Installation Advice

Safety



On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

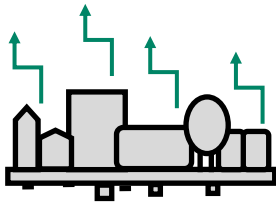
For **Class I** installations there should be 3-4mm between any part of the PSU and any earthed metal part of the enclosure. 3mm is acceptable for IT applications, 4mm required for medical applications. In Class I installations the PSU earth point must be connected to system safety ground.

For **Class II** installations distances may need to be increased if being installed into a surrounding metal enclosure.

Ensure consideration of components on the underside of the PCB or low lying spills when measuring clearance distances between the PSU and the end-equipment. Also top surface especially in tight enclosures such as 1U boxes. An insulation material can be used between PSU and metal if smaller gap required.

FiDUS recommends installing the PSU on 6mm stand offs typically, but check the distances.

EMC

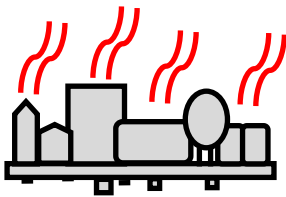


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that can be done to optimise EMC performance either as best practice, or if you are struggling for compliance:

- 1) Connect all marked EMI ground points to earth. Often these are combined with the safety earth point (in class I installations), but on some power supplies there may be additional earth tags or mounting points.
- 2) Minimise the length of input/output wiring where possible and try to maintain max distance of the conductors from the PSU, to prevent noise pick up. Avoid bundling input and output cables together. A common component to avoid placing wiring near is the PFC inductor in power factor corrected power supplies.
- 3) Apply additional filtering before the PSU input (ensure consideration of which frequencies there are issues with before selecting a filter).
- 4) When using an open frame PSU, mount the supply on a metal plate and connect EMI mounting points.
- 5) In multi circuit systems, decouple the circuits locally.
- 6) Ferrites added between the PSU and system input connector and/or the DC output cables can help in reducing radiated noise issues in systems. If seen, issues are commonly in the 30-150MHz area.

For more detailed assistance, if you still have any concerns with compliance, please get in contact with our Engineering department who are on hand to assist with any queries.

Thermal

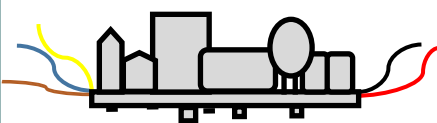


Thermal management is an important consideration when thinking about equipment service life. Electrolytic capacitors within the PSU wear with time and are typically the first end-of-life failure. Keeping the operation temperature of key components within the PSU, such as the electrolytic capacitors, as low as possible is paramount. As a general rule, for every 10°C drop in the operating temperature of the electrolytic capacitors you double their lifetime, and thus the lifetime of the power supply. When looking at thermal performance it is helpful to test under a worst-case set of conditions, to ensure component temperatures are in an acceptable range for the required service life. Then consider the impact of operational time, load and temperature profile to estimate a more realistic lifetime for your PSU.

Also, many FiDUS power supplies offer a *Peak Power* rating to provide for customers with pulsing loads. When using a peak power capability customers must consider:

- 1) Peak duration rating: the maximum length of time the peak can be drawn for
- 2) Duty cycle: the frequency with which the peak can be drawn. (e.g. 10% duty cycle, 1 second on:9 seconds off)
- 3) Average power value: datasheets will state the maximum average power acceptable with peak power PSUs. If any of these elements are exceeded the supply may overheat, with performance and lifetime suffering as a result.

Connectivity



All FiDUS Power engineering samples requested will arrive with a free of charge loom kit for ease of testing.

The loom kit connects to the input/output terminals of the PSU and provides the customer with bare wire ends to connect with.

The loom kits can also prove advantageous for ease of installation in production. Please contact sales if you are interested in including the loom kit in your quotation. Alternatively the input/output connector and mating part details can be found in the attached table.

	Part Number	Mating Part Number
Input	Molex: 26-60-4030	Molex: 09-50-3031
Output	Molex: 26-60-4060 / screw terminal	Molex: 09-50-3061 / AWG16
Loom Kit	N/A	