



Product Specification

XL750 Series

750-Watt AC to DC

Power Supplies

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1.1 Introduction

This specification defines the design and performance characteristics of an open frame U-channel single-phase (3 wire) universal input, power factor corrected 750-watt switch mode power supply. The XL750 models are listed in Table 3-1 and they provide 750-watts of filtered and regulated main DC output power at 12V, 15V, 24V, 28V, 36V, 40V, 48V, 54V or 56V. They are available with or without built-in OR-ing MOSFET. When supplied with the Convection Cooling Option, the power supplies deliver 300-watts without fans. It is the extremely high efficiency of these supplies that enable them to be packaged in their small 4" x 7" x 1.6" form factor. They all have universal AC inputs to enable operation from 90VAC to 264VAC with power-factor correction to minimize the input current requirements.

All models provide a +5V_{standby} output (1.0A max.) whenever AC power is applied. The main and +12V_{standby} outputs are enabled by grounding the Remote Enable input. The +12V_{standby} may be configured to remain on whenever AC power is applied. These single-output models can be used as standalone power supplies or can be used in redundant or N+1 configuration with up to 4 units connected in parallel. Active OR-ing models are also available – see Section 3.12 for details. The +5V_{standby} and +12V_{standby} outputs may be wired directly together with other XL750s to provide redundancy, but the combined output currents are limited to the single-supply values.



1.2 Digital Control

The XL750 uses a dedicated digital microcontroller to supervise its operation. Doing so greatly improves timing accuracy and eliminates stored charge delays found in analog control circuits. The microcontroller samples the following parameters 500 times per second and uses intelligent algorithms to act upon the constantly changing conditions.

- Output Voltage
- Output Current
- Auxiliary 12V output voltage
- Transformer temperature
- Fan tachometer

The microcontroller is responsible for enabling the main output whenever all of the required startup conditions are met and shutting it down upon command, loss of input power or whenever the power supply's longevity is threatened by excessive loads or temperatures. It will provide the host system with advanced warning of an impending shutdown whenever one of these conditions occurs.

To minimize acoustic noise, the microcontroller can turn a 12V fan on or off based upon the on XL750's transformer temperature or loading condition.

An optional PMBus digital communications interface is also available to allow up to four XL750s to communicate over the same PMBus. This communications interface allows routine remote control of the main outputs and the 12V fans. The host can also query the microcontroller for its output voltage and current as well as the ambient and transformer temperatures. It can also check for a fan failure (lost tachometer pulses). The PMBus option also allows for variable speed fan control based on XL750's ambient temperature. A PMBus User's Guide is available at www.n2power.com/documents.htm.

Because it's programmable, the microcontroller code can be customized to fit an OEM's requirements.

1.3 Agency Compliance

The XL750 complies with the following international agency standards:

Safety	Complies with Standard	Remarks
United States	UL 62368-1, 2nd Ed (Audio/video, information and communication technology equipment)	Leakage Current – see table 2-2 Hi-pot – 2121vdc for 1 second
Canada	CSA 22.2: 62368-1	
EU Council	2006/95/EC	Low Voltage Directive
International	IEC 62368-1:2014	
EMC	Complies with Standard	Remarks
United States	FCC part 15, subpart B	Conducted emissions Limits per CISPR 22 Class B Tested to ANSI C63.4: 2003
EU Council	2004/108/EC	EMC Directive
International	EN 61204-3 (refers to the following) EN 55022 Class B EN 55024 (refers to the following) EN 61000-3-2 Class D EN 61000-3-3 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 EN 61000-4-11	Low Voltage Power Supplies – DC Output Conducted emissions Limits per CISPR 22 Class B Immunity Harmonic Current Emissions (Power Factor Correction – PFC) Voltage Fluctuations & Flicker Radiated Susceptibility Fast Transient/Burst Immunity Power Mains Surge Immunity RF Immunity Voltage Dips, Short Interruptions
Reduction of Hazardous Substances (RoHS)	Complies with Standard	Remarks
EU Council	2002/95/EC	RoHS Directive
Marks of Conformance		
United States & Canada	 (Underwriters Laboratories File E211115)	
EU Council		
RoHS	 	

Table 1-1 Agency Compliance

2.

AC Input

2.1 Input Line Requirements

The following table defines the voltage and frequency requirements for the AC line inputs to the XL750 power supply. The XL750 is capable of supplying full rated power in continuous operation throughout the specified ranges of rated voltages and frequencies. The power supply will automatically recover from AC power loss and is capable of starting under maximum load at the minimum AC input voltage described below.

Parameter	Minimum	Rated	Maximum
RMS Input Voltage	90 VAC	100–240 VAC	264 VAC
RMS Input Current	–	–	10 A @ 100 V 4 A @ 240 V
Input Frequency	47 Hz	50–60 Hz	63 Hz

Table 2-1 XL750 AC Input Parameters

2.1.1 Input Voltage Derating

The XL750 series can be operated at the minimum input voltage of 90VAC with the maximum load of 90% of the total maximum output power. From 90VAC to 100VAC, the output load can be increased by 1%/VAC.

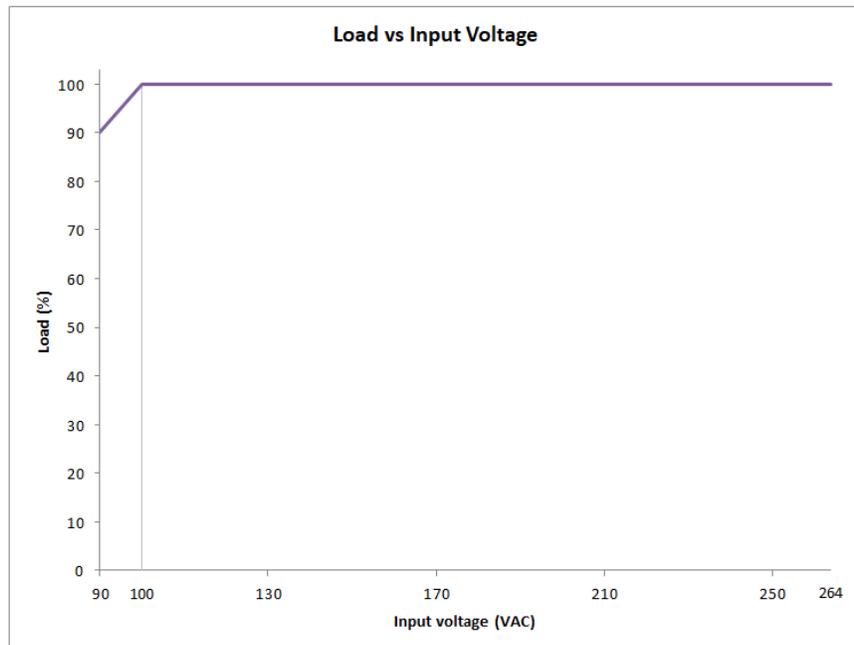


Figure 2-1 - Input Voltage Derating

2.2 Input Over Current Protection

The XL750 series incorporates two 12.5A primary AC line fuses for input over current protection to prevent damage to the power supply and meet product safety requirements as outlined in Section 1.2.

2.3 Inrush Current Limiting

The cold-start inrush current at a 90-degree phase angle (the AC switch is closed at the peak of the AC waveform) is limited to 15-amps peak at 240 VAC input voltage and 7-amps peak at 120 VAC @ 25C.

Repetitive ON/OFF cycling of the AC input voltage should not damage the power supply or cause the input fuse to fail as long as the power remains off for two or more seconds when the outputs are unloaded (less depending upon the output loads). The delay is required for the AC inrush relay to open its contact, upon turning OFF on the power supply, which allows the inrush current limiter to limit the inrush current to the specification of 15-amps at 240 VAC and 7-amps at 120 VAC. If the waiting time of at least 2 seconds is not met, the power supply will not be damaged, however the inrush current will not meet the specification.

2.4 Low Input Voltage

The application of an input voltage below the minimums specified in Table 2-1 shall not damage the XL750.

2.5 Leakage Current

The leakage current from AC line or AC Neutral inputs to Protective Earth varies linearly with the input voltage and frequency (see operating column of Table 2-2). The leakage currents of multiple power supplies are additive. Consult the appropriate electrical safety specification for the maximum leakage current permitted in your product. The leakage current will always go to zero when a DPDT switch simultaneously disconnects both the line and neutral circuits. A single fault can occur when the AC power is applied to only the Neutral input terminal.

Line Voltage Frequency	Operating	Single Fault (see text)
120VAC, 60Hz	0.40 mA	0.75 mA
240VAC, 60Hz	0.80 mA	1.50 mA
240VAC, 50Hz	0.65 mA	1.25 mA

Table 2-2 Leakage Current – Single XL750

2.6 Power Factor

The XL750 power factor exceeds 0.94 with loads of 250-watts or greater at 230VAC. It exceeds 0.98 with loads of 125-watts or greater at 115VAC

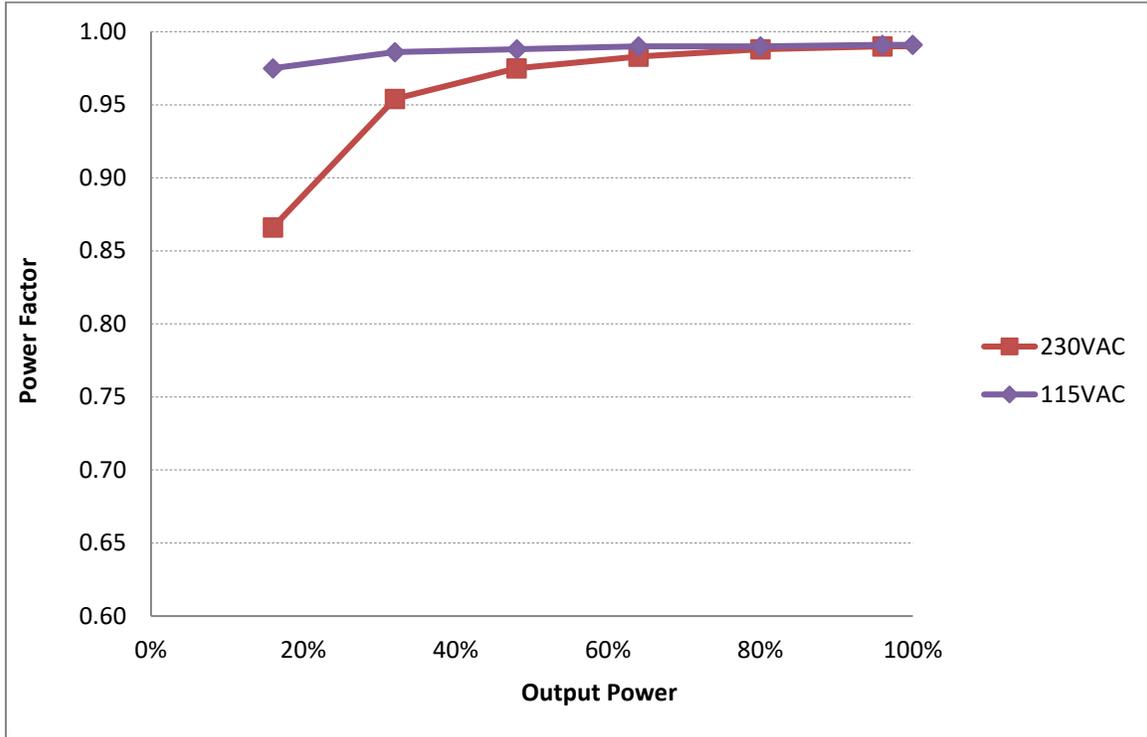


Figure 2-2 Power Factor, Typical

2.7 Safety Warning

WARNING

The XL750 is a component, not a stand-alone power supply. It must be mounted inside a protective enclosure to prevent accidental shock by contact with the supply. Lethal voltages are present while and after AC power is applied to the XL750. Allow 1-minute for storage capacitors to discharge after removing AC power before handling the XL750.

The safety ground connection is the chassis itself and it must be connected to Protective Earth. All four bottom-side mounting screws must always be installed and torqued to 5 in-lb.

The user must keep any bare metal at least 2.6mm from the AC input connector J1. An insulator can be used between J1 and the bare metal to decrease this spacing.

3.

DC Outputs

3.1 Output Voltage Regulation

The DC output voltages shall remain within the minimum and maximum limits of Table 3-1 when measured at the power supply connector under all specified line and environmental conditions contained herein. The regulation accuracy is measured with load currents between zero and the maximum load currents listed in Table 3-3.

Model	Output	Rated Voltage	Regulation	Minimum (VDC)	Nominal (VDC)	Maximum (VDC)	Remote Sense
XL750-12	V1	+12 V	±3%	11.64	12.0	12.36	V1/RTN
XL750-15	V1	+15 V	±3%	14.65	15.0	15.45	V1/RTN
XL750-24	V1	+24 V	±3%	23.28	24.0	24.72	V1/RTN
XL750-28	V1	+28 V	±3%	27.16	28.0	28.84	V1/RTN
XL750-36	V1	+36 V	±3%	34.92	36.0	37.08	V1/RTN
XL750-40	V1	+40 V	±3%	38.80	40.0	41.20	V1/RTN
XL750-48	V1	+48 V	±3%	46.56	48.0	49.44	V1/RTN
XL750-54	V1	+54 V	±3%	52.40	54.0	55.62	V1/RTN
XL750-56	V1	+56 V	±3%	54.32	56.0	57.68	V1/RTN
All	V2	+12 V _{standby}	±5%	11.40	12.0	12.60	None
	V3	+5 V _{standby}	±5%	4.75	5.0	5.25	None

Table 3-1 XL750 Output Voltage Specifications

Note: when remote sensing is not used, the two sense inputs, (+) and (-), should be connected to V1 output terminals to have V1 output voltage within regulation limits.

3.2 Grounding

All DC outputs, status outputs and control inputs share a common DC Return found on all output connectors. DC Return floats from the chassis (Protective Earth) with a 470pF, 630V capacitor between them.

3.3 No Load Operation

A no load condition will not damage the supply or cause a hazardous condition. The power supply will remain stable and operate normally after application of a load. The Power Good logic output will indicate normal operation when the supply is unloaded.

3.4 Overshoot at Turn On/Turn Off

The output voltage overshoot upon the application or removal of the input mains voltage is less than 10% above the nominal voltage. No opposite polarity voltage is present on any output during turn on or turn off.

3.5 Voltage Trim

If voltage trim is not required, the TRIM input should be left unconnected. The voltage trim input pin is provided to allow the user to adjust the V1 output up or down by up to 5%. Connecting a resistor between this pin and DC Return will increase the output voltage while connecting a resistor between this pin and the V1 output will decrease the output voltage. The ability of the V1 output to maintain its specified regulation accuracy under severe load or line conditions could be diminished by trimming the output to a higher than nominal voltage. The trim range is limited to +/- 5% as determined by the Up/Down 5% resistor values listed in Table 3-2. For increased output voltage, use only resistance values greater than or equal to those listed.

At the increased V1 output voltage, the maximum rated output power of 750W should not be exceeded.

Model	V1 Up 3%	V1 Up 5%	V1 Down 3%	V1 Down 5%
Connect Trim pin to	to DC Return	to DC Return	V1 Output	V1 Output
XL750-12 (12V)	133K	Zero	1.27M	549K
XL750-15 (15V)	133K	Zero	1.65M	775K
XL750-24 (24V)	133K	Zero	2.80M	1.43M
XL750-28 (28V)	133K	Zero	3.32M	1.74M
XL750-36 (36V)	133K	Zero	4.42M	2.43M
XL750-40 (40V)	133K	Zero	4.87M	2.67M
XL750-48 (48V)	133K	Zero	5.90M	3.24M
XL750-54 (54V)	133K	Zero	6.65M	3.65M
XL750-56 (56V)	133K	Zero	6.98M	3.92M

Table 3-2 Minimum Trim Resistors for Maximum Trim

When two or more XL750s are operating in parallel, each unit should be trimmed with the same resistor value. The TRIM input is connected through a 200K resistor to the voltage control loop input of the XL750 and should never be connected to anything but a resistor mounted as close as possible to J2. Long wiring to a trim resistor can pick up noise and could find its way to the output terminals. Do not connect the TRIM inputs from multiple supplies together.

3.6 Output Current/Power

The maximum available output power is always a function of the cooling airflow and its temperature. The maximum of 750-watts combined total power from all outputs is only available with a minimum of 25-CFM of forced air-cooling at no more than 50°C. Each individual output is also limited: V1 output is limited to 750-watts, +12 V_{standby} is limited to 12-watts and +5 V_{standby} is limited to 5-watts.

Model	Output	Rated Voltage	Maximum Load
XL750-12 CS	V1 (main)	12 V	62.5 A
XL750-12 CS CC	V1 (main)	12 V	25.0 A
XL750-15 CS	V1 (main)	15 V	50.0 A
XL750-15 CS CC	V1 (main)	15 V	20.0 A
XL750-24 CS	V1 (main)	24 V	31.2 A
XL750-24 CS CC	V1 (main)	24 V	12.5 A
XL750-28 CS	V1 (main)	28 V	26.8 A
XL750-28 CS CC	V1 (main)	28 V	10.7 A
XL750-36 CS	V1 (main)	36 V	20.8 A
XL750-36 CS CC	V1 (main)	36 V	8.3 A
XL750-40 CS	V1 (main)	40 V	18.7 A
XL750-40 CS CC	V1 (main)	40 V	7.5 A
XL750-48 CS	V1 (main)	48 V	15.6 A
XL750-48 CS CC	V1 (main)	48 V	6.2 A
XL750-54 CS	V1 (main)	54 V	13.9 A
XL750-54 CS CC	V1 (main)	54 V	5.6 A
XL750-56 CS	V1 (main)	56 V	13.4 A
XL750-56 CS CC	V1 (main)	56 V	5.4 A
All	+5 V _{standby}	5 V	1.0 A
All	+12 V _{standby}	12 V	1.0 A

**Table 3-3 Maximum Individual Continuous Load Currents
(Sum limited to 750W for FC and 300W for CC)
FC = Forced air Cooling, CC = Convection Cooling**

3.7 Efficiency

The power supply efficiency varies with the output load and the line voltage. Higher voltage power supplies will exhibit slightly higher efficiencies due to lower output currents (less I x R losses). Efficiency data was measured at 25°C with 25-CFM of cooling air after a 15-minute warm-up period. The +5 V_{standby} and +12 V_{standby} outputs were unloaded.

The least efficient model is the XL750-12 and its main output efficiency is greater than 87% for 115VAC and 90% for 230VAC inputs with loads ranging from 20% to 100% of the rated main output power. Peak efficiencies are approximately 90.5% and 92.5% respectively.

The XL750-56 is typical of the higher output voltage models and its main output efficiency is greater than 88% for 115VAC and 93% for 230VAC inputs with loads ranging from 50% to 100% of the rated main output power. Peak efficiencies are approximately 91.1 % and 94% respectively.

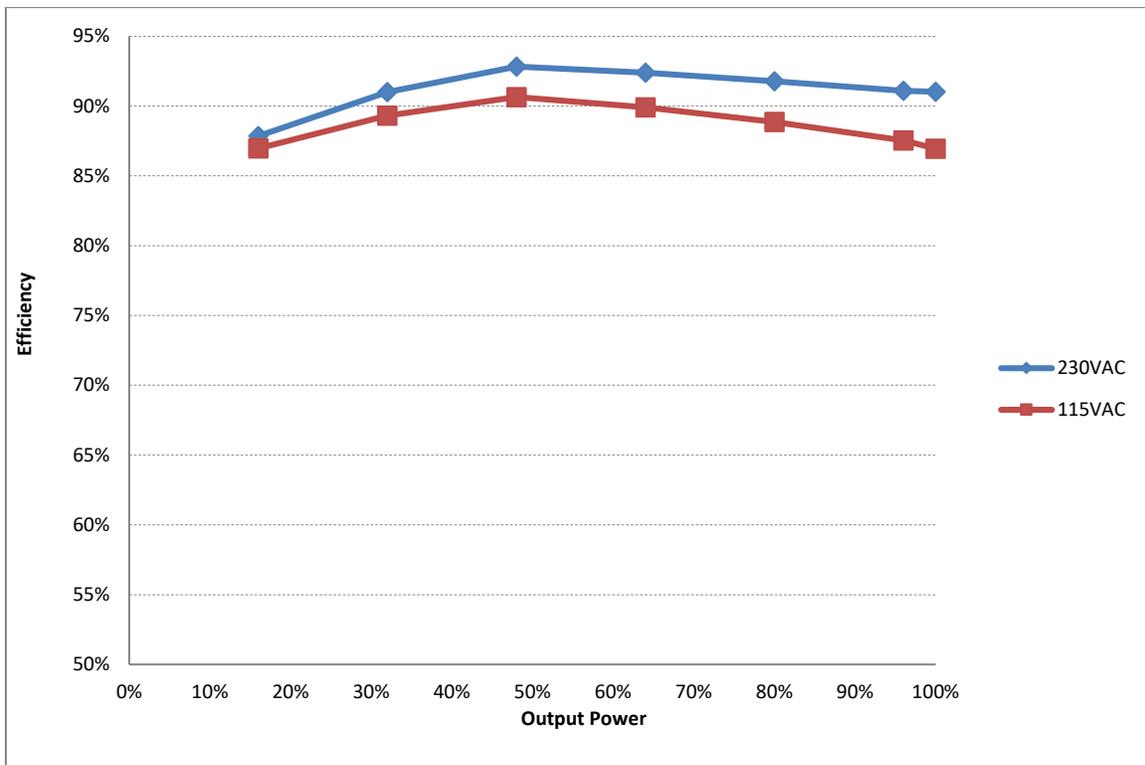


Figure 3-1 Typical XL750-12 (12V, worst-case) Efficiency Curves (note expanded Y-axis)

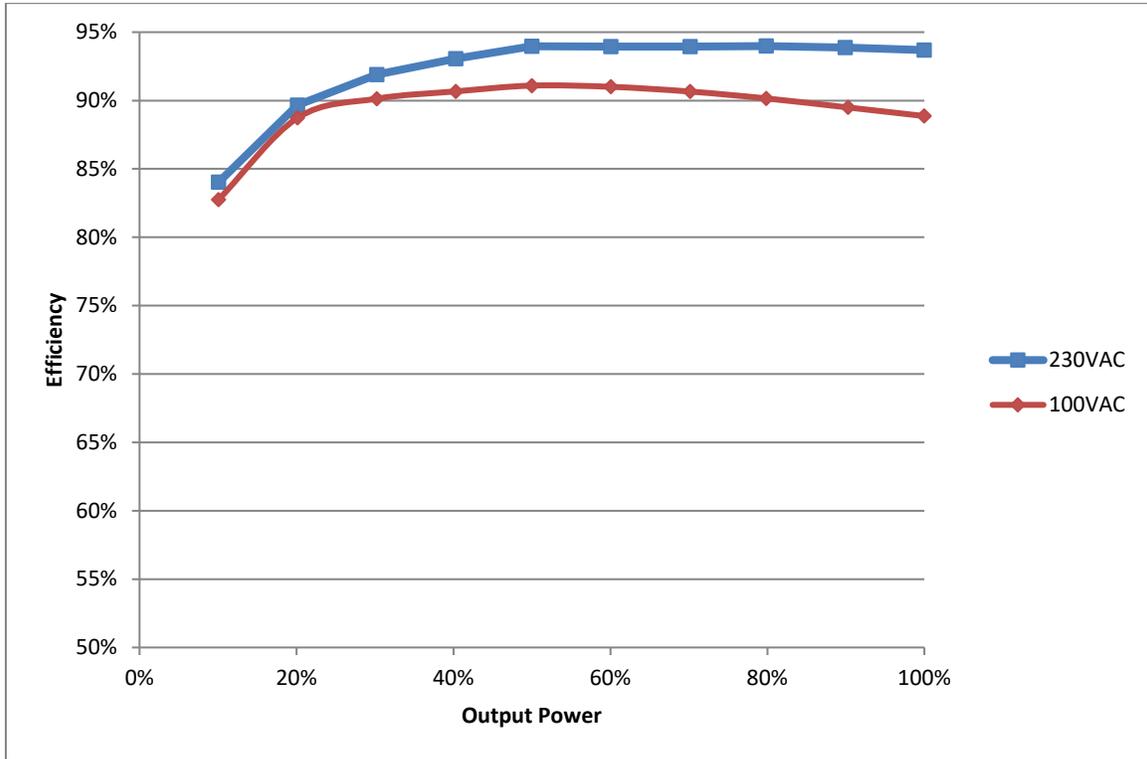


Figure 3-2 Typical XL750-56 Efficiency (note expanded Y-axis)

3.8 Cooling

The XL750 can operate with the Convection Cooling Option at temperatures below 50°C when total power output is less than 300 watts and it is mounted open side up. 25-CFM of forced-air cooling at a maximum of 50°C is required when the output power exceeds 300-watts. The cooling airflow must be either co-planar with the circuit board or it must impinge downward in the center of the open topside. The XL750 may be mounted in any attitude when forced-air cooled.

3.8.1 Output Power Derating at Elevated Temperatures

The XL750 can be operated with cooling air temperatures above 50°C by linearly derating the total maximum output power (or current) by 2.5%/°C from 50°C to 70°C (see Figure 3-3).

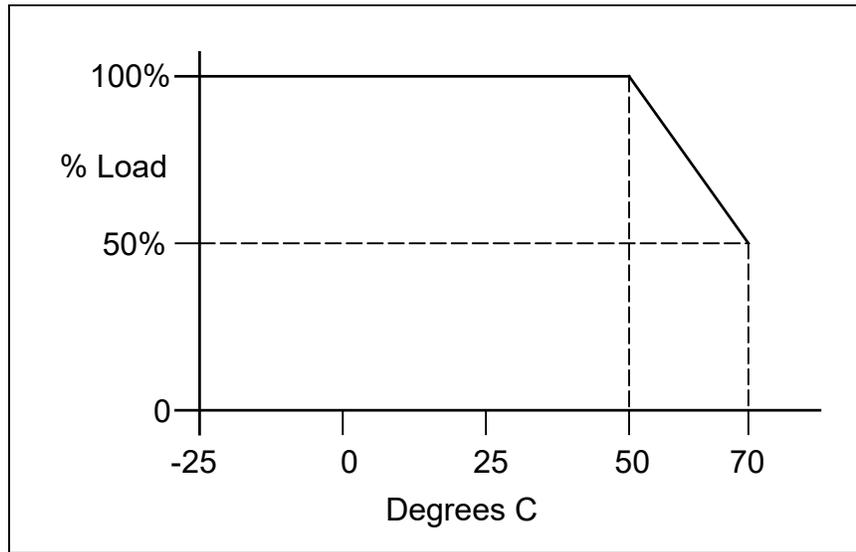


Figure 3-3 XL750 Output Power vs. Ambient Temperature Envelope

3.8.2 Over-temperature Shutdown

The power supply is equipped with an internal temperature sensor. Failure to provide adequate cooling airflow below the maximum operating temperature will result in the power supply shutting down the V1 output while the +5V_{standby} and +12V_{standby} outputs will remain operational. The V1 output will be automatically restored when the temperature of the built-in temperature sensor cools sufficiently.

3.9 Output Ripple/Noise

Output ripple voltage and noise are defined as periodic or random signals over a frequency band of 10 Hz to 20 MHz. Measurements are to be made with an oscilloscope with a 20 MHz bandwidth. Outputs should be bypassed at the connector with a 0.1 μF ceramic disk capacitor and a 10 μF tantalum capacitor to simulate system loading (see Figure 3-4). Ripple and noise shall not exceed the limits specified in the following tables.

The ripple voltage of the output is measured at the pins of the mating connector. Ripple and noise shall not exceed the limits specified in Table 3-4 under any condition of line voltage and frequency specified in Section 2.1 and DC loading specified in Section 3.5.

Model	Output	Rated Voltage	Maximum Ripple+Noise (peak-to-peak)
XL750-12	V1 (main)	+12 V	120 mV
XL750-15	V1 (main)	+15 V	150 mV
XL750-24	V1 (main)	+24 V	240 mV
XL750-28	V1 (main)	+28 V	280 mV
XL750-36	V1 (main)	+36 V	360 mV
XL750-40	V1 (main)	+40 V	400 mV
XL750-48	V1 (main)	+48 V	480 mV
XL750-54	V1 (main)	+54 V	480 mV
XL750-56	V1 (main)	+56 V	480 mV
All	V2 (+12 V _{standby})	+12 V	120 mV
All	V3 (+5 V _{standby})	+5 V	120 mV

Table 3-4 Ripple + Noise Output Voltage

3.9.1 Ripple/Noise Test Setup

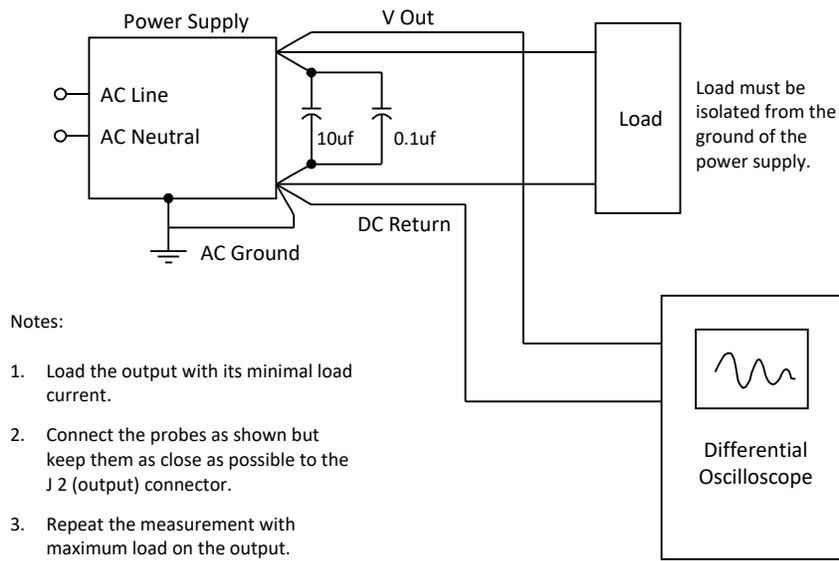


Figure 3-4 Ripple Noise Measurement Setup

3.10 Local and Remote Sensing

Remote sensing is provided to compensate for voltage drops in the V1+ Output and the DC Return wiring to the V1 load. The voltage droop (wiring loss) between the XL750 output terminals and their respective remote sense inputs should be kept to a maximum of 0.4-volts. Reversing the + and - sense lines may permanently damage the XL750.

Connecting the remote sense inputs lifts the voltage at the load to within the specification voltage regulation limits but may increase the V1 voltage at J8 and J11 above the regulation limits. See Figure 3-5.

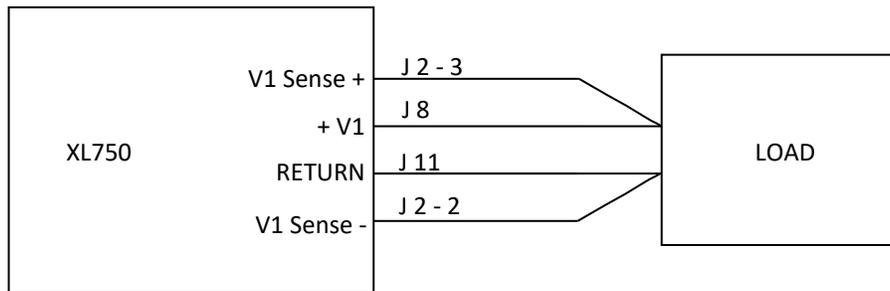


Figure 3-5 Remote Sense Wiring

When remote sensing is not used, the two sense inputs, (+) and (-), should be connected to V1 output terminals to have V1 output voltage within regulation limits.

3.11 Parallel Operation

By using the built-in active current-sharing, the V1 outputs of two, three or four XL750 power supplies may be connected in parallel to provide higher V1 output power as shown in Table 3-5. They can also be used in an N+1 configuration to provide greater reliability. Remote V1 sensing may still be used in parallel operation. The V2 and V3 outputs may also be paralleled for improved reliability, but doing so does not increase the available current beyond 1A.

Only the main output is capable of current sharing. Because of the inherent limitations of current sharing, it is recommended that the total load not exceed 90% of the sum of the rated outputs (see Table 3-5). Current sharing accuracy drops with the total load power, thus a minimum V1 load of 35-watts per power supply is recommended. The following table lists the recommended maximum V1 output power.

Number of XL750s	N+1 Configuration
2	1350 watts
3	2025 watts
4	2700 watts

Table 3-4 Recommended Main Output Power for N+1 Configurations

XL750s running in parallel are capable of starting with a V1 load that exceeds the capability of an individual XL750. They will also tolerate the dramatic load fluctuations encountered in an N+1 redundant configuration when supplies are removed and replaced.

Current-sharing operates normally when the V1 outputs of two XL750 are hard-wired in parallel, but this is not considered an N+1 connection. If the two V1 outputs (wired in parallel) were producing half-power each and the input power fails on one of the supplies, the other supply will continue to provide full power to the load. However, (on non-OR-ing models) if the output synchronous rectifiers failed on one of the supplies, then the V1 output would most likely be shorted and the load would be without power. Hot swapping two units connected in parallel will likely create voltage transients well outside of the voltage regulation tolerance.

Power supplies with OR-ing function are also available. The above scenario did not make use of an OR-ing mosfets on the V1 output of each supply. A sophisticated analog controller monitors the voltage difference between the supply's voltage and the bus voltage and then controls the MOSFET gate voltage to simulate a near-perfect diode with a forward voltage drop of less than 50mV. Use of OR-ing power supplies facilitates hot-swapping and prevents a shorted supply output from dragging down the bus voltage.

3.11.1 Current Sharing Connections

The Current Share signal (V1 I-Share) of each supply operating in parallel must be connected together. Power sharing does not require the Remote Sense signals be connected together, but the sharing accuracy will be reduced unless they are all connected together.

Individual Power Good signals must not be wire OR-ed together. Each individual Power Good signal should be monitored separately by the user's system.

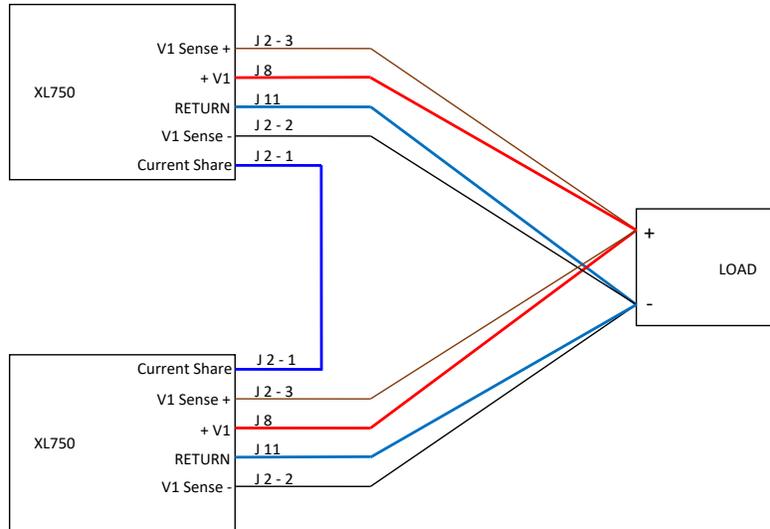


Figure 3-6 Current Sharing Wiring Example

3.11.2 Current Share Accuracy

When all the current share signals are connected together and all the Remote Sense signals are connected together, the load delivered by any two of the sharing supplies will not vary by more than 10% at full load. Sharing accuracy deteriorates with declining load power.

3.11.3 +5 V_{standby} Parallel Operation

The +5 V_{standby} output can be connected in parallel with the same output on like supplies. By doing so, the +5 V_{standby} output will remain alive as long as one of the paralleled supplies is functioning. The output current rating does not increase beyond the single supply rating.

3.11.4 +12 V_{standby} Parallel Operation

The +12 V_{standby} output can be connected in parallel with the same output on like supplies. By doing so, the +12 V_{standby} output will remain alive as long as one of the paralleled supplies is functioning. The output current rating does not increase beyond the single supply rating.

3.11.5 Transients

The output rise time and monotonic requirements of Section 5.5 may not be met when the main load exceeds 750-watts, because of the difference in start-up times of the paralleled power supplies.

3.12 Power Supply Protection

There are several different protection circuits designed to protect the load and the XL750 from component failures and extraordinary circumstances.

3.12.1 Over Temperature Protection (OTP)

If the XL750 is operated without adequate cooling, it will sense an over-temperature condition and shut down the V1 (main) output. It will restart after it has cooled down to below its maximum operating temperature. The PG signal goes false about 2mS before the V1 output is disabled. The V2 and V3 outputs are unaffected by a V1 OTP condition.

3.12.2 Over-Voltage Protection (OVP)

Over-voltage protection is only provided on the V1 (main) output. When an over-voltage condition occurs (approximately 110% of rated output voltage), the power supply will shut down and will not restart until AC power is turned off and back on. The XL750 will shut down under the following over voltage conditions:

Model	Main Output	Over-Voltage Protection Threshold		
		Minimum	Nominal	Maximum
XL750-12	12 V	12.8 V	13.4 V	14.0 V
XL750-24	15 V	16.5 V	17.6 V	18.5 V
XL750-24	24 V	26.0 V	27.3 V	28.7 V
XL750-28	28 V	29.2 V	31.2 V	33.2 V
XL750-36	36 V	40.1 V	43.1 V	46.1 V
XL750-40	40 V	44.7 V	47.0 V	49.4 V
XL750-48	48 V	53.2 V	56.0 V	58.8 V
XL750-54	54 V	59 V	59.4 V	59.8 V
XL750-56	56 V	59 V	59.4 V	59.8 V

Table 3-5 Over Voltage Protection Limits

3.12.3 Over Current Protection (OCP)

An excessive load on the V1 output will induce constant-current limiting which will cause the output voltage to droop. The constant-current limiter has a threshold of approximately 110% (+/- 10%) of the rated output current. The V1 current-limiter is not affected by the V2 and V3 loads.

An under-voltage detector (UVD) turns off the Power Good output signal when the output voltage falls below about 83% of the specified nominal and restores them to the on state when the output voltage rises above about 86%.

3.12.4 Fault Code Summary

The XL750 utilizes a microcontroller to supervise its operation. It is powered by V3 (5V Standby) and is not affected by V1 output fault. It will enable and disable the V1 output voltage in response to requests on the REMOTE ENABLE/ input and also provides the Power Good, and Power Good LED.

The microcontroller also measures the V1 output voltage and output current in addition to the ambient and main output transformer temperatures. It will shut the V1 (main) output off whenever an abnormal condition occurs that could potentially damage the load or the power supply.

When the microcontroller disables the V1 output voltage, it blinks an alarm code on the green Power Good LED (located behind J3). It darkens the Power Good LED for 1000mS. A short blink lasts only 300mS. There is a 100mS pause between blinks and a 2000mS pause before repeating a fault code.

Fault Condition	Ends when...	Blink* Code
Under-voltage	AC power is recycled or REMOTE ENABLE/ is recycled	5-Short
Over-voltage	AC power is recycled or REMOTE ENABLE/ is recycled	4-Short
Short-circuit	Attempts to restart every four seconds for up to 5-minutes	3-Short
Over-current	Attempts to restart every four seconds for up to 5-minutes	2-Short
Transformer Over-temperature	XL750 cools down	Long-Short
Ambient Over-temperature	XL750 cools down	Short-Long

*Power Good LED located behind J3 blinks off (dark)

Table 3-6 Fault Code Summary

3.12.5 Short Circuit Protection (SCP)

A short circuit on any output will disable that output but will not damage the XL750. A short on the V2 (+12 V_{standby}) output will disable all outputs. The XL750 will periodically attempt to restart until the short circuit condition is removed. After successfully restarting, the power supply will operate normally.

3.13 Output Transients

The maximum output voltage transient caused by step load changes will not exceed the output voltage regulation limits by more than 5%. With an AC input as specified in Section 2.1, the power supply will remain stable when subjected to the load transients described below with capacitive loading per Table 3-8:

- Load changes between 75% and 100% on any output
- Load changing repetition of 50 to 333 cycles per second
- Transient load slew rate = 1.0 A/microsecond

3.14 Capacitive Loading

The XL750 will startup and operate normally with load capacitances simultaneously present on the all outputs not exceeding those listed in Table 3-8.

Output	XL750-12	XL750-15..28	XL750-36...56
V1 (12 V)	25,000 μ F		
V1 (15 V...28 V)		12,000 μ F	
V1 (36V...56 V)			3,000 μ F
V2 (+12 V _{standby})	180 μ F	180 μ F	180 μ F
V3 (+5 V _{standby})	220 μ F	220 μ F	220 μ F

Table 3-7 XL750 Maximum Capacitive Loading

4.

General Specifications

4.1 Environmental

The XL750 meets or exceeds the following environmental specifications:

Parameter	Conditions	Specification	Remarks
Temperature	Operating	-25°C to 50°C	See cooling requirements
	Non-Operating	-40°C to 85°C	
Relative Humidity	Operating	95% Maximum	Non-Condensing
	Non-Operating	95% Maximum	Non-Condensing
Altitude	Operating	6,561 feet MSL Max.	2,000 meters
	Non-Operating	50,000 feet MSL Max.	15,240 meters
Vibration	No damage	2.4G RMS Maximum	5-500Hz, 10-min. each axis per MIL-PRF-28800F: 3.8.4.1 (Class 3,4)
Mechanical Shock	No damage	30G half-sine, 11mS	Six shocks each axis per MIL-PRF-28800F: 4.5.5.4.1

Table 4-1 Environmental Specifications

The XL750 will start and meet its performance specifications within the environmental conditions listed in Table 4-1. It has also been demonstrated that the XL750 will start reliably at -25°C with an input voltage of 100VAC or greater. Consult N2Power for technical details.

4.2 Mean Time between Failures

The calculated MTBF of the power supply is equal to or greater than 376,644 hours of continuous operation at maximum output loading and worst-case input line voltage with forced-air cooling at 25°C. N2Power does not warrant the MTBF to be representative of any particular unit. The MTBF of the power supply is calculated with an 80% confidence level in accordance with Bellcore, SR-332, Issue 2. Actual failure rates vary from unit to unit.

4.3 Component Stress

The XL750 was designed with the following component-derating guidelines at an operating ambient temperature of 50°C: semiconductor junction temperatures shall not exceed ninety 90 % of manufacturer's rating. Inductor winding temperatures shall not exceed safety agency requirements. Electrolytic capacitor case temperatures shall not exceed 95% of rated temperature. Resistor power dissipation shall not exceed 70% of rated while other components will not be operated at more than 90% of their rated voltage or current.

4.4 Labeling/Marking

The power supply is marked and labeled with the N2Power logo model number, part number, input and output specifications, production code, appropriate safety agency logos, CE mark, and country of origin. An example label is pictured below.



Figure 4-1 Sample XL750 Label

4.5 Physical Dimensions

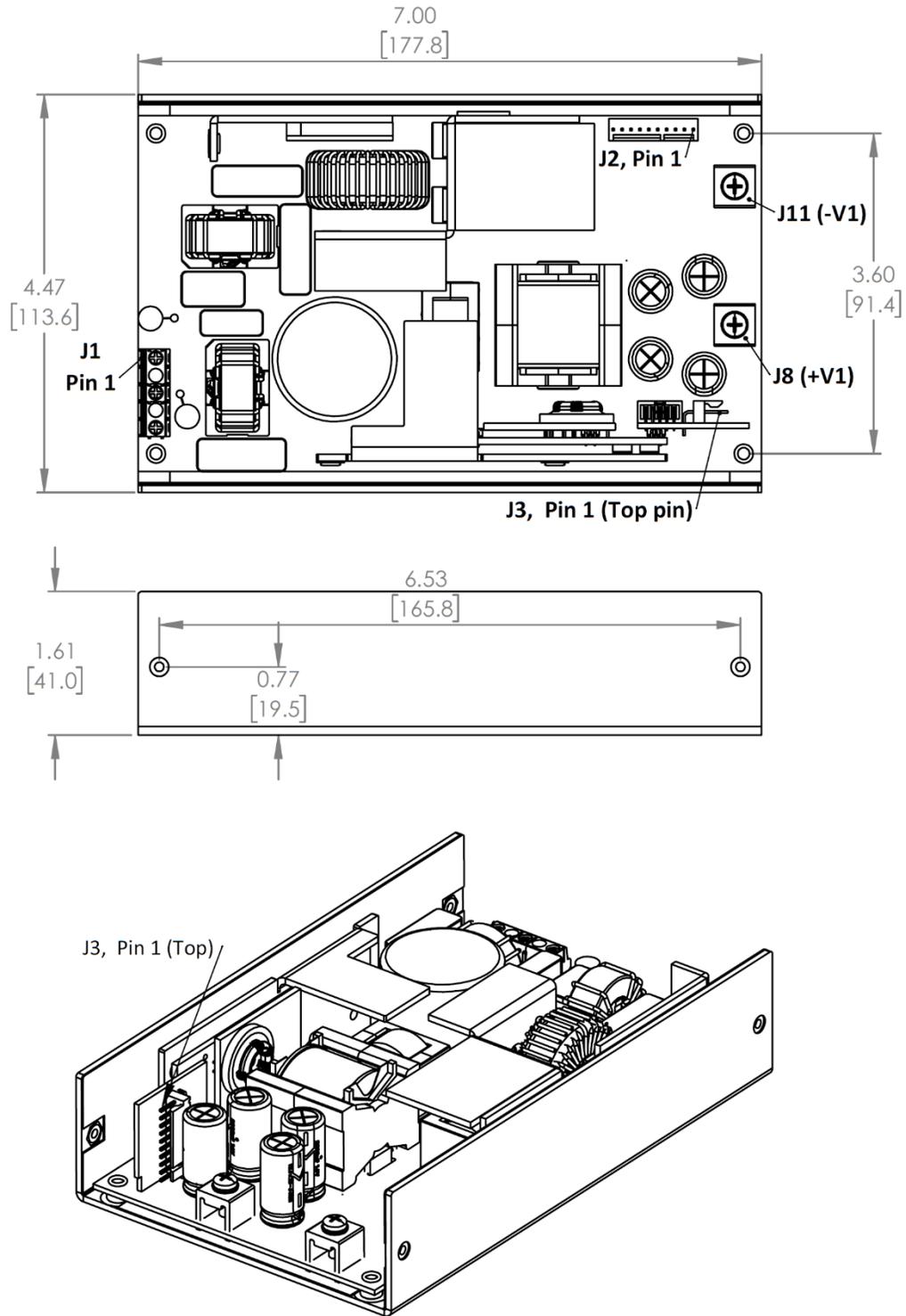


Figure 4-2 XL750 Series Dimensions (U-Channel)

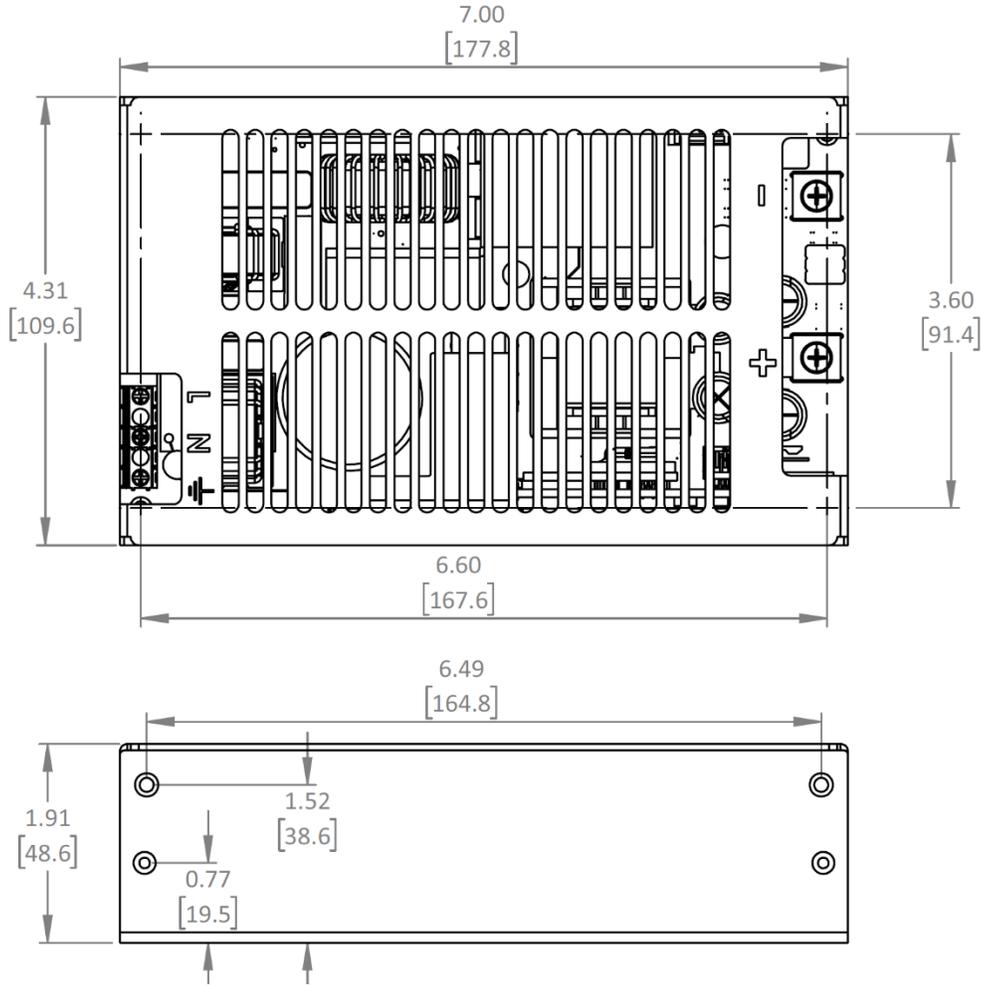


Figure 4-3 XL750 Series Dimensions (Enclosed Model)

3D CAD models are available by contacting sales@n2power.com.

4.6 Weight

Units	Net Weight
Pounds	1.7
Ounces	28
Kilograms	0.8

Table 4-2 XL750 Weight

4.7 Mating Connectors

The user must furnish all mating connectors. The mating connectors must meet the requirements of all applicable safety agencies (notably UL).

Note that the female contacts that mate to the power supply are only rated for 25-30 mating cycles. Excessive mating cycles cause dramatically increased terminal resistance and heating resulting in the eventual failure of the mating terminal and possibly the header on the power supply.

4.7.1 AC Input Connector (J1)

The AC input connector to the XL750 is 6-positions terminal block with screw connection (Phoenix Contact: part number PT 1,5/ 6-5,0-H – 1935200). Though the connector has 6-positions, positions 2 and 4 are removed to provide adequate insulation spacing. The minimum and maximum for the tightening torque of the screws are 0.35 Nm and 0.4 Nm respectively. The nominal cross section area for each hole is 1.5mm². A minimum of AWG 18 wire is recommended.

J1	
Connector Circuits (pins)	3 of 5
Rated Contact Current	17.5 A
Rated Wire Size	AWG 16

Table 4-3 J1 Connector

4.7.2 Protective Earth

The chassis is connected to protective earth via J1 (AC Input Connector) Pin 5.

4.7.3 DC Output Terminals (J8 and J11)

The DC output terminals are designed to accept a ring-lug terminal. There are many sources available. A minimum of AWG 16 wire is recommended. The lugs must have a minimum I.D. of 0.140" [3.53mm] and a maximum O.D. of 0.32" [8.1mm]. The lugs must be contaminant free and should be tightened to a torque of approximately 8-inch-pounds [0.9 N-m]. The positive terminal is on the left. These terminals use M5 Metric screws.

4.7.4 Auxiliary (J2) and Control (J3) Connectors

The auxiliary connector on the XL750 is a Molex KK header with 0.100" centers. The Molex part numbers for the mating housing and crimp-style snap-in terminals are listed below. There may be equivalent connectors available from other manufacturers.

J2 & J3	Molex P/N
Connector Circuits (pins)	10
Mating Housing	22-01-3097
Crimp terminal	08-55-0102 / 08-50-0113
Rated Contact Current	2.5 A
Rated Wire Size	AWG 22 thru 30

Table 4-4 J2 and J3 Mating Connectors

4.8 Signal Descriptions and Remarks

Signal	Description/Remarks
AC Line	Highest in potential compared to earth ground. Should be connected to the AC power switch.
AC Neutral	Closest in potential to earth ground. Should not be connected to a single-pole power switch.
DC Return	XL750 ground for all outputs and status/control signals.
V1	The main output (+)
V1 Sense (+)	Remote sense for V1 at load (compensates for wiring losses)
V1 Sense (-)	Remote sense for DC Return at load (affects V1, see above)
V1 Trim	Adjusts V1 output voltage up to +/- 5% using an external resistor. See Section 3.5
V1 I-Share	Current Share Signal common to all sharing XL750s
V2 (+12V _{standby})	Provides 1A of 12V power for fans. Uses common ground DC Return.
V3 (+5 V _{standby})	Provides 1A of 5V power whenever AC power is presents. Uses common ground DC Return
Remote Enable	Low-true logic input enables V1 output
Power Good	A high-logic level (4.5V) indicates the output power is in regulation for at least the next 2ms. See Section 5.2
FAN: Tachometer Input	The tachometer output of a single fan may be connected to this input. The loss of the tachometer signal is detected and can be reported over the optional serial data interface.
FAN: Controlled Output	This output can drive a 12V fan and turns on only when the ambient temperature approaches the normal operating limits.
I2C Serial Data	Provides PMBus control/status interface
I2C Serial Clock	Provides PMBus control/status interface

Table 4-5 Signal Descriptions and Remarks (All outputs and inputs are referenced to DC Return)

Pin	Signal
J1-1	AC Neutral
J1-2	No Pin
J1-3	AC Line
J1-4	No Pin
J1-5	Protective Earth
J2-1	V1 I-Share
J2-2	V1 Sense (-)
J2-3	V1 Sense (+)
J2-4	V3 (+5V _{standby})
J2-5	V1 Trim Input
J2-6	V2 (+12V _{standby})
J2-7	DC Return (Output Ground)
J2-8	N/A
J2-9	Power Good (logic output, high-true)
J2-10	N/A
J8	V1 + Output
J11	V1 DC Return (Output Ground)

Note: Above are Input & Output Connectors on the Main Board

Pin	Signal
J3-1	NA
J3-2	I2C Serial Data
J3-3	I2C Serial Clock
J3-4	NA
J3-5	Power Good LED (+output)
J3-6	Standby LED (+output)
J3-7	DC Return
J3-8	Remote Enable (logic input, low-true)
J3-9	DC Return
J3-10	NA

Note: Above is J3 Connector on the Supervisory Board

Table 4-6 Pin Assignments in Pin Order

5.

Timing and Control

5.1 Power Supply Timing

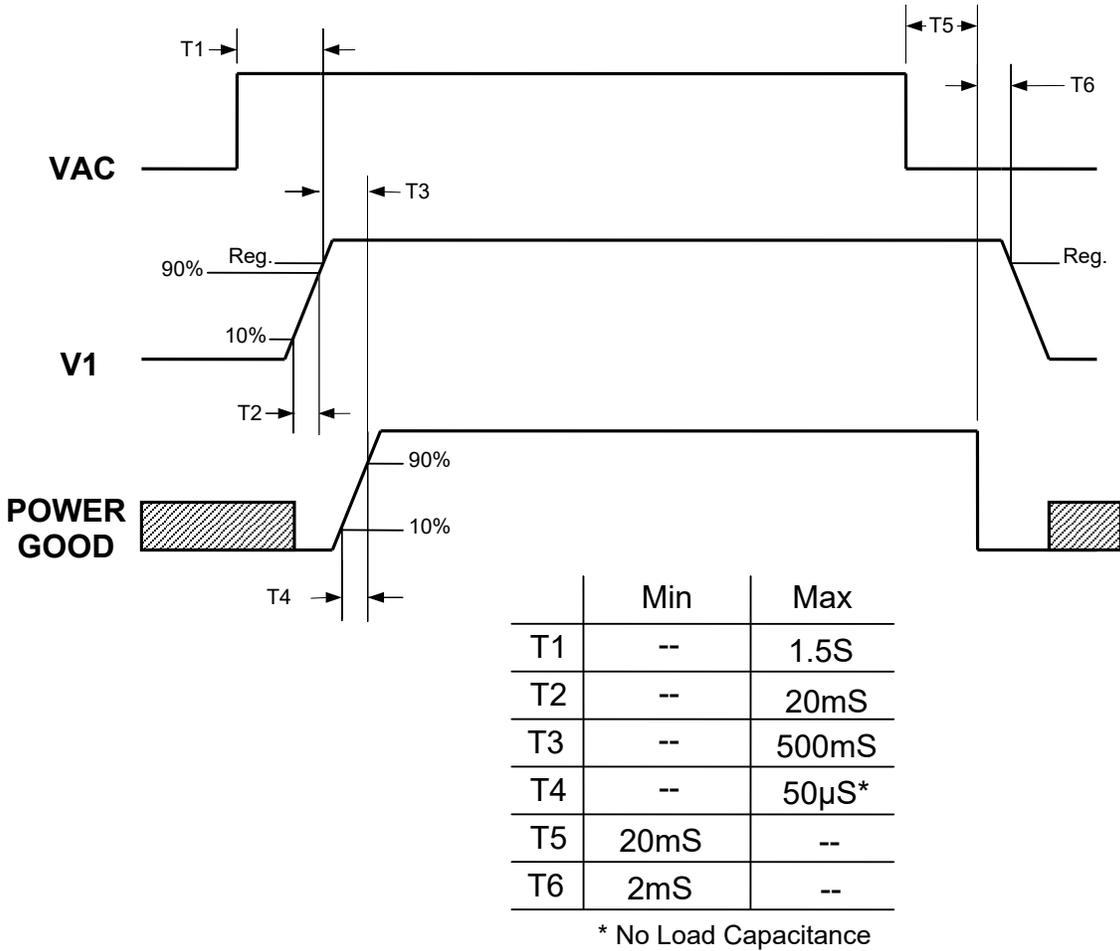


Figure 5-1 XL750 Timing Diagram

5.2 Power Good Output

The Power Good signal provides a high logic level to indicate the DC outputs are within their regulation limits and that sufficient mains energy is stored by the power supply to ensure continuous power operation within specification for the duration of the hold-up time. When the AC mains power is removed for a period longer than 20ms, the Power Good signal transitions to a low logic level. The Power Good signal (CMOS output) is capable of sinking or sourcing 4mA from an internal 5.0V supply.

5.3 Remote Enable Input

This input must be grounded to enable the V1 (main) output. It has no effect on the +5V_{standby} and +12V_{standby} outputs. It is pulled-up to 5.0V through a 6.8K-ohm resistor. The input voltage must be less than 0.4V to activate the V1 output and higher than 3.0V to disable the output.

There are output enable and disable commands available in the PMBus interface. These commands can override the state of the REMOTE ENABLE input. Likewise, the REMOTE ENABLE input can override the last PMBus command. The last commanded on/off state (from interface pin or PMBus) will always take precedence.

5.4 Voltage Hold-Up Time

The power supply will maintain output regulation per Table 3-1 despite a loss of input power at 100VAC/60Hz and 230VAC/50Hz at maximum continuous output load for a minimum of 20-milliseconds (measured at 90% load current).

5.5 Output Rise Time

All output voltages from a single XL750 shall rise monotonically (always positive slope) from 10% to 90% of their nominal output voltage (as specified in Table 3-1) within 0.2ms to 30ms under any loading conditions specified in Table 3-3. The rise of the shared V1 output from two or more XL750s operating in parallel may not be monotonic.

6.

Ordering Information

The CS suffix after the part number stands for Current-Sharing, the CC stands for Convection Cooling and OR stands for built-in OR-ing function. All XL750s are active current-sharing capable. OR-ing models can be used to isolate V1 outputs for improved reliability or hot swapping. See Section 3.12. The following table provides the N2Power part numbers that should appear on your purchase order and will appear on any N2Power correspondence:

Model Number	V1	N2Power Part Number
XL750-12 CS	12 V	400750-01-4
XL750-15 CS	15 V	400750-09-7
XL750-24 CS	24 V	400750-02-2
XL750-28 CS	28 V	400750-03-0
XL750-36 CS	36 V	400750-04-8
XL750-40 CS	40 V	400750-05-5
XL750-48 CS	48 V	400750-06-3
XL750-54 CS	54 V	400750-07-1
XL750-56 CS	56 V	400750-08-9

Table 6-1 XL750 Part Numbers

For warranty information, refer to www.n2power.com. All XL750 power supplies are RoHS compliant.

Direct all questions, orders or requests for quotation as follows:

N2Power Order Desk:	orders@n2power.com 805-583-7744 x112
Fax (Attention N2Power):	805-583-7749
Sales:	sales@n2power.com 805-583-7744 x122
Technical Support	techsupport@n2power.com 805-583-7744 x119
Street Address:	N2Power a Qualstar Company 1267 Flynn Road, Camarillo, CA 93012