Product Specification

ML (Medical) Series

5W-1200W Power Supplies

Preliminary 707051 Rev. 5

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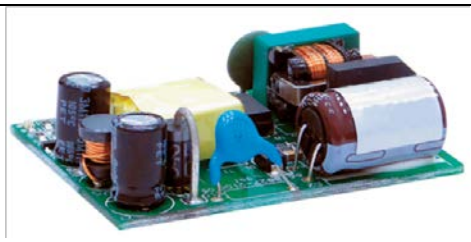
Table of Contents

1. Introduction

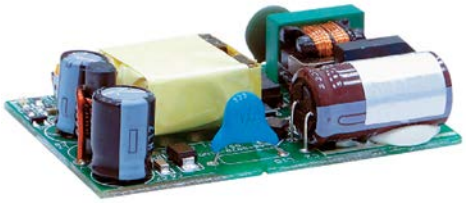
1.1 Introduction

This specification defines the ML series of 5W to 1200W open frame and closed, single-phase (3 wire) universal input switch mode power supplies. The following models are power factor corrected: ML150, ML250, ML350, ML450 and ML1200. It includes information regarding the mechanical details, cooling requirements, connector configurations, electrical and signal specifications, and environmental ranges for storage and operation of the power supplies. These supplies achieve very high packaging densities and low cooling air requirements by virtue of their very high efficiency design.

All models of the ML series can be used as standalone power supplies. Single-output model ML1200 may be connected in parallel for force current sharing up to 8 units maximum.



ML05



ML10

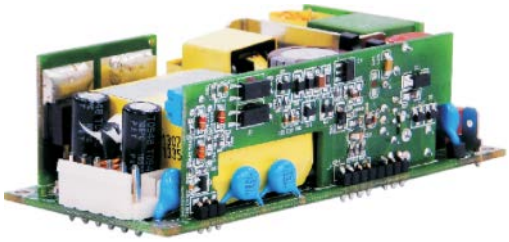
ML15

ML20

ML45

ML60

ML100



ML150

ML250

ML350

ML450

ML1200

Figure 1-1 Sample ML Power Supplies (models differ depending upon wattage)

1.2 Agency Compliance

Safety	Complies with Standard	Remarks
United States	ANSI/AAMI ES60601-1:2005	Leakage Current – see table 2.3
	UL 60601-1	Hi-pot – Input to Output = 4000Vac
Canada	CAN/CSA-C22.2 No. 601.1	
	CAN/CSA-C22.2 No. 60601-1 (2008)	
EU Council	EN 60601-1: 2006	Low Voltage Directive
International	IEC 60601-1: 2005 3rd Edition	

EMC	Complies with Standard	Remarks
Emission	EN 55011: 2009/A1: 2010	Conducted Emission Class B
	CISPR 11: 2009/A1: 2010	Radiated Emission Class B
	EN 60601-1-2: 2007	
	IEC 61000-3-2: 2006+A2: 2009	Harmonic Current Emissions
	IEC 61000-3-3:2008	Voltage Fluctuations & Flicker
Immunity	EN 60601-1-2: 2007	
	EN 61000-4-2	Electrostatic Discharge
	EN 61000-4-3	Radiated Susceptibility
	EN 61000-4-4	Fast Transient/Burst Immunity
	EN 61000-4-5	Power Mains Surge Immunity
	EN 61000-4-6	Conducted Susceptibility
	EN 61000-4-8	Power Frequency Magnetic Field
	EN 61000-4-11	Voltage Dips, Short Interruptions

Reduction of Hazardous Substances (RoHS)	Complies with Standard	Remarks
EU Council	2011/65/EU RoHS 2 Directive	RoHS 2 Directive

Marks of Conformance

United States & Canada — c UL us E469416 (Underwriters Laboratories File E469416)

TUV

EU Council — CE

RoHS — RoHS Compliant

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 ML series which is capable of supplying full rated power in continuous operation throughout the specified ranges of 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	Nominal	Maximum
RMS Input Voltage			
ML05 thru ML20 Series	85 VAC	100–240 VAC	264 VAC
ML45 thru ML1200 Series	90 VAC	100–240 VAC	264 VAC
RMS Input Current			
ML05 Series			0.13A/115VAC 0.08A/230VAC
ML10 Series			0.25A/115VAC 0.15A/230VAC
ML15 Series			0.35A/115VAC 0.2A/230VAC
ML20 Series			0.6A/115VAC 0.4A/230VAC
ML45 Series			0.9A/115VAC 0.5A/230VAC
ML45D-05F, -05K			1.3A/115VAC 0.7A/230VAC
ML60 Series			1.3A/115VAC 0.6A/230VAC
ML60D-05F, -05K			1.3A/115VAC 0.7A/230VAC
ML100 Series			1.15A/115VAC 0.55A/230VAC
ML150 Series			1.72A/100VAC 0.73A/240VAC
ML250 Series			3.23A/100VAC 1.23A/240VAC
ML350 Series			4.07A/100VAC 1.64A/240VAC
ML450 Series			5.23A/100VAC 2.09A/240VAC
ML1200 Series			14.5A/115VAC 6A/230VAC
Input Frequency	47 Hz	50/60 Hz	63 Hz

Table 2-1 ML Series AC Input Parameters

2.2 Input Over Current Protection

The ML series incorporates a primary AC line fuse 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 varies by the ML series power supply model.

Model	Inrush Current
ML05 and ML10 Series	25A/115VAC,45A/230VAC
ML15 Series	30A/115VAC,50A/230VAC
ML20 Series	30A/115VAC,65A/230VAC
ML45, ML60, ML100, ML150 and ML250 Series	30A/115VAC,60A/230VAC
ML350 and ML450 Series	40A/115VAC,80A/230VAC
ML1200 Series	30A/115VAC,45A/230VAC

Table 2-2 Cold Start Inrush Current

Repetitive ON/OFF cycling of the AC input voltage shall not damage the power supply or cause the input fuse to fail.

2.4 Low Input Voltage

The application of an input voltage below the minimums specified in Table 2-1 shall not cause damage to the power supply.

2.5 Leakage Current

There are 2 types of leakage current applicable to medical power suppliers:

Earth leakage current: current flowing from the mains part through or across the insulation into the protective earth conductor.

Touch Current (Enclosure Leakage Current): leakage current flowing from the enclosure or from parts thereof, excluding patient connections, accessible to any operator or patient in normal use, through an external path other than the protective earth conductor, to earth or to another part of the enclosure.

Note: The meaning of this term is the same as that of "enclosure leakage current" in the first and second editions of this standard. The term has been changed to align with IEC 60950-1 and to reflect the fact that the measurement now applies also to parts that are normally protectively earthed.

Model Name	Class I or Class II	Leakage Current Measurement
ML05-XX	Class II	Touch Leakage: 80uA (N.C.) Touch Leakage: 134uA (S.F.C.)
ML10-XX	Class II	Touch Leakage: 80uA (N.C.) Touch Leakage: 121uA (S.F.C.)
ML15-XX	Class II	Touch Leakage: 81uA (N.C.) Touch Leakage: 106uA (S.F.C.)
ML20-XX	Class II	Touch Leakage: 80uA (N.C.) Touch Leakage: 130uA (S.F.C.)
ML45-XX ML45D-XXX	Class I	Earth Leakage: 40uA (N.C.) Earth Leakage: 68uA (S.F.C.)
ML60-XX ML60D-XXX	Class I	Touch Leakage: 49uA (N.C.) Touch Leakage: 71uA (S.F.C.)
ML100-XX	Class I	Earth Leakage: 23uA (N.C.) Earth Leakage: 34uA (S.F.C.) Touch Leakage: 65uA (N.C.) Touch Leakage: 92uA (S.F.C.)
ML150-XX	Class I	Earth Leakage: 88uA (N.C.) Earth Leakage: 167uA (S.F.C.) Touch Leakage: 39uA (N.C.) Touch Leakage: 75uA (S.F.C.)
ML250-XX	Class I	Earth Leakage: 163uA (N.C.) Earth Leakage: 302uA (S.F.C.) Touch Leakage: 40uA (N.C.) Touch Leakage: 76uA (S.F.C.)

Model Name	Class I or Class II	Leakage Current Measurement
ML350-XX	Class I	Earth Leakage: 137uA (N.C.) Earth Leakage: 265uA (S.F.C.) Touch Leakage: 56uA (N.C.) Touch Leakage: 83uA (S.F.C.)
ML450-XX	Class I	Earth Leakage: 205uA (N.C.) Earth Leakage: 309uA (S.F.C.) Touch Leakage: 54uA (N.C.) Touch Leakage: 84uA (S.F.C.)
ML1200-XX	Class I	Earth Leakage: 353uA (N.C.) Earth Leakage: 658uA (S.F.C.) Touch Leakage: 55uA (N.C.) Touch Leakage: 311uA (S.F.C.)

Table 2-3 Leakage Current

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, load and environmental conditions contained herein. The main output (V1) in the single output models (5V thru 60V).

Model	Output	Rated Voltage	Regulation	Minimum (VDC)	Nominal (VDC)	Maximum (VDC)	RemoteSense
ML05-5	V1	5	±2%	4.900	5.00	5.100	V1/RTN
ML05-12	V1	12	±1%	11.880	12.00	12.120	
ML05-15	V1	15	±1%	14.850	15.00	15.150	
ML05-24	V1	24	±1%	23.760	24.00	24.240	
ML10-5	V1	5	±2%	4.900	5.00	5.100	
ML10-12	V1	12	±1%	11.880	12.00	12.120	
ML10-15	V1	15	±1%	14.850	15.00	15.150	
ML10-24	V1	24	±1%	23.760	24.00	24.240	
ML15-5	V1	5	±2%	4.900	5.00	5.100	V1/RTN
ML15-12	V1	12	±1%	11.880	12.00	12.120	
ML15-15	V1	15	±1%	14.850	15.00	15.150	
ML15-24	V1	24	±1%	23.760	24.00	24.240	
ML20-5	V1	5	±2%	4.900	5.00	5.100	
ML20-12	V1	12	±1%	11.880	12.00	12.120	RTN only
ML20-15	V1	15	±1%	14.850	15.00	15.150	
ML20-24	V1	24	±1%	23.760	24.00	24.240	
ML45D-05F	V1	5	+3% / -2%	4.900	5.00	5.150	
	V2	12	±6%	11.280	12.00	12.720	
ML45D-05K	V1	5	+3% / -2%	4.900	5.00	5.150	
	V2	24	+8% / -4%	23.040	24.00	25.920	
ML45-12	V1	12	±2%	11.760	12.00	12.240	
ML45-15	V1	15	±2%	14.700	15.00	15.300	
ML45-24	V1	24	±1%	23.760	24.00	24.240	
ML45-48	V1	48	±1%	47.520	48.00	48.480	
ML60-12	V1	12	±2%	11.760	12.00	12.240	
ML60-15	V1	15	±2%	14.700	15.00	15.300	
ML60-24	V1	24	±1%	23.760	24.00	24.240	
ML60-48	V1	48	±1%	47.520	48.00	48.480	
ML60D-05F	V1	5	+3% / -2%	4.900	5.00	5.150	
	V2	12	±6%	11.280	12.00	12.720	

Model	Output	Rated Voltage	Regulation	Minimum (VDC)	Nominal (VDC)	Maximum (VDC)	RemoteSense
ML60D-05K	V1	5	+3% / -2%	4.900	5.00	5.150	
	V2	24	+8% / -4%	22.080	24.00	25.920	
ML100-12	V1	12	±1%	11.880	12.00	12.120	
ML100-15	V1	15	±1%	14.850	15.00	15.150	
ML100-24	V1	24	±1%	23.760	24.00	24.240	
ML100-28	V1	28	±1%	27.720	28.00	28.280	
ML100-36	V1	36	±1%	35.640	36.00	36.360	
ML100-48	V1	48	±1%	47.520	48.00	48.480	
ML150-12	V1	12	±2%	11.760	12.00	12.240	
ML150-15	V1	15	±2%	14.700	15.00	15.300	
ML150-24	V1	24	±2%	23.520	24.00	24.480	
ML150-48	V1	48	±2%	47.040	48.00	48.960	
ML250-12	V1	12	±2%	11.760	12.00	12.240	
ML250-15	V1	15	±2%	14.700	15.00	15.300	
ML250-24	V1	24	±2%	23.520	24.00	24.480	
ML250-48	V1	48	±2%	47.040	48.00	48.960	
ML350-12	V1	12	±2%	11.760	12.00	12.240	
ML350-15	V1	15	±2%	14.700	15.00	15.300	
ML350-24	V1	24	±2%	23.520	24.00	24.480	
ML350-48	V1	48	±2%	47.040	48.00	48.960	
ML450-12	V1	12	±2%	11.760	12.00	12.240	
ML450-15	V1	15	±2%	14.700	15.00	15.300	
ML450-24	V1	24	±2%	23.520	24.00	24.480	
ML450-48	V1	48	±2%	47.040	48.00	48.960	
ML1200-12	V1	12	±2%	11.760	12.00	12.240	
ML1200-15	V1	15	±2%	14.700	15.00	15.300	
ML1200-24	V1	24	±2%	23.520	24.00	24.480	
ML1200-30	V1	30	±2%	29.400	30.00	30.600	
ML1200-36	V1	36	±2%	35.280	36.00	36.720	
ML1200-48	V1	48	±2%	47.040	48.00	48.960	
ML1200-60	V1	60	±2%	58.800	60.00	61.200	

Table 3-1 ML Output Voltage Specifications

3.2 No Load Operation

The power supply will operate under a no load condition and will not result in damage. The power supply will remain stable and operate normally after application of loads.

CAUTION

Remove AC power prior to installing or removing secondary loads.

3.3 Output Current/Power

The maximum available output power is always a function of the cooling airflow and temperature. The total output is reduced with unrestricted natural convection cooling and an ambient temperature of 50°C or less.

3.3.1 Output Loading for Multiple Output Models

Model	Rated Output	Minimum Load	Maximum Load	Maximum Watts/Output
ML45D-05F, V1	+5V	0.5A	4.70A	23.50
ML45D-05F, V2	+12V	0.1A	1.76A	21.12
ML45D-05K, V1	+5V	0.5A	3.50A	17.50
ML45D-05K, V2	+24V	0.1A	1.21A	29.04
ML60D-05F, V1	+5V	0.5A	5.50A	27.50
ML60D-05F, V2	+12V	0.1A	2.20A	26.40
ML60D-05K, V1	+5V	0.5A	3.85A	19.25
ML60D-05K, V2	+24V	0.1A	1.65A	39.60

Table 3-2 ML45-05F, ML45-05K, ML60-05F and ML60-05K Min/Max Load Currents at 40°C

With unrestricted natural convection cooling, the maximum combined output power of V1 and V2 is limited to 40.2 watts for model MLD45-05F and 43.9 watts for model ML45D-05K. The maximum combined output power of V1 and V2 is limited to 53.9 watts for model ML60D-05F and ML60D-05K is limited to 53.5W.

3.3.2 Output Loading for Single Output Models

The output currents listed in Table 3-3 require natural convection cooling and forced air which is model dependent at no more than 50°C.

Model	Rated V1 Output	Maximum Forced Air Load	Maximum Convection Load
ML05-05	5V	—	1.00A
ML05-12	12V	—	0.42A
ML05-15	15V	—	0.33A
ML05-24	24V	—	0.21A
ML10-05	5V	—	2.00A
ML10-12	12V	—	0.83A
ML10-15	15V	—	0.66A

Model	Rated V1 Output	Maximum Forced Air Load	Maximum Convection Load
ML10-24	24V	—	0.42A
ML15-05	5V	—	3.00A
ML15-12	12V	—	1.25A
ML15-15	15V	—	1.00A
ML15-24	24V	—	0.63A
ML20-05	5V	—	4.00A
ML20-12	12V	—	1.66A
ML20-15	15V	—	1.33A
ML20-24	24V	—	0.84A
ML45D-05F	5V	—	4.20A
	12V	—	1.60A
ML45D-05K	5V	—	3.50A
	12	—	1.1A
ML45-12	12V	—	3.75A
ML45-15	15V	—	3.00A
ML45-24	24V	—	1.875A
ML45-48	48V	—	0.94A
ML60D-05F	5V	—	5.00A
	12V	—	2.00A
ML60D-05K	5V	—	3.50A
	24V	—	1.50A
ML60-12	12V	—	5.00A
ML60-15	15V	—	4.00A
ML60-24	24V	—	2.50A
ML60-48	48V	—	1.25A
ML100-12	12V	—	8.34A
ML100-15	15V	—	6.67A
ML100-24	24V	—	4.17A
ML100-28	28V	—	3.58A
ML100-36	36V	—	2.78A
ML100-48	48V	—	2.09A
ML150-12	12V	12.50A	8.30A
ML150-15	15V	10.00A	6.70A
ML150-24	24V	6.25A	4.20A
ML150-48	48V	3.125A	2.10A
ML250-12	12V	20.85A	12.50A
ML250-15	15V	16.67A	10.00A
ML250-24	24V	10.45A	6.25A
ML250-48	48V	5.25A	3.125A
ML350-12	12V	29.15A	16.67A
ML350-15	15V	23.34A	13.34A

Model	Rated V1 Output	Maximum Forced Air Load	Maximum Convection Load
ML350-24	24V	14.60A	8.34A
ML350-48	48V	7.30A	4.17A
ML450-12	12V	37.50A	25.00A
ML450-15	15V	30.00A	20.00A
ML450-24	24V	18.75A	12.50A
ML450-48	48V	9.38A	6.25A
ML1200-12	12V	100.00A	N/A
ML1200-15	15V	80.00A	N/A
ML1200-24	24V	50.00A	N/A
ML1200-30	30V	40.00A	N/A
ML1200-36	36V	33.40A	N/A
ML1200-48	48V	25.00A	N/A
ML1200-60	60V	20.00A	N/A

Table 3-3 Min/Max Load Currents Single Output Models

3.3.3 High Temperature Derating

The ML05, ML10, ML15, ML20, ML45, ML60, ML100, ML150, ML250, ML350 and ML450 series can be operated at elevated temperatures by derating the total maximum output power (or current) by 2.5%/°C from 50°C to 70°C (see Figure 3-1). The ML1200 can be operated up to 60°C. The maximum power will derate by 4.0 %/°C from 50°C to 60°C. The ML100 can be operated up to 80°C. The maximum power will derate 2.34 %/°C from 50°C to 80°C.

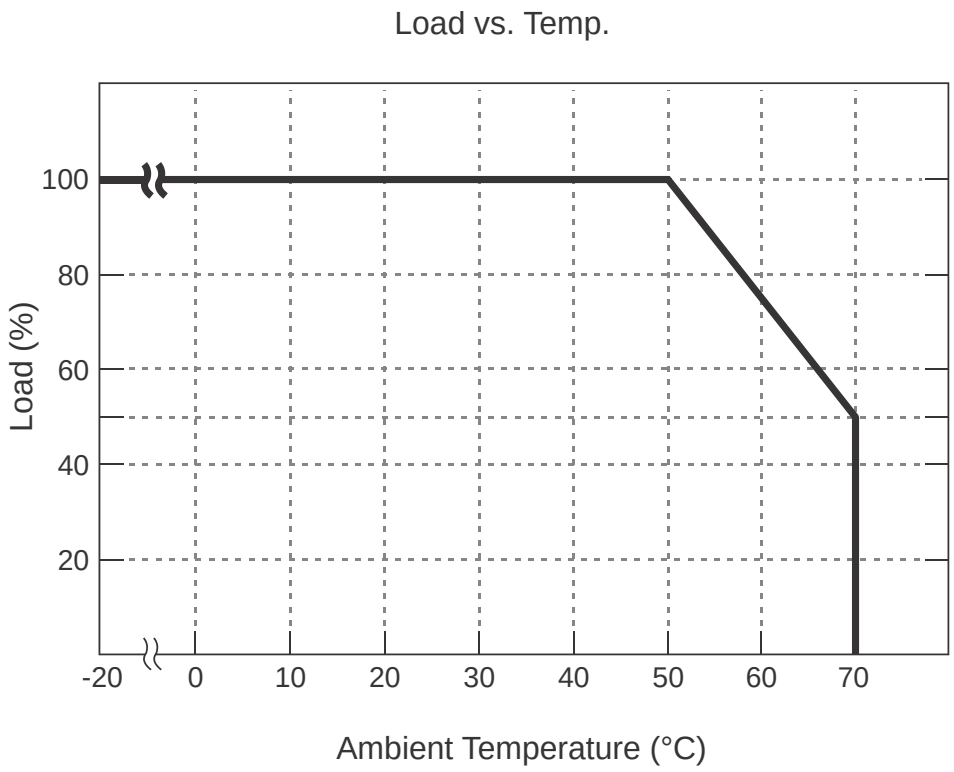


Figure 3-1 Derating Curve: Models ML05 thru ML20 Series

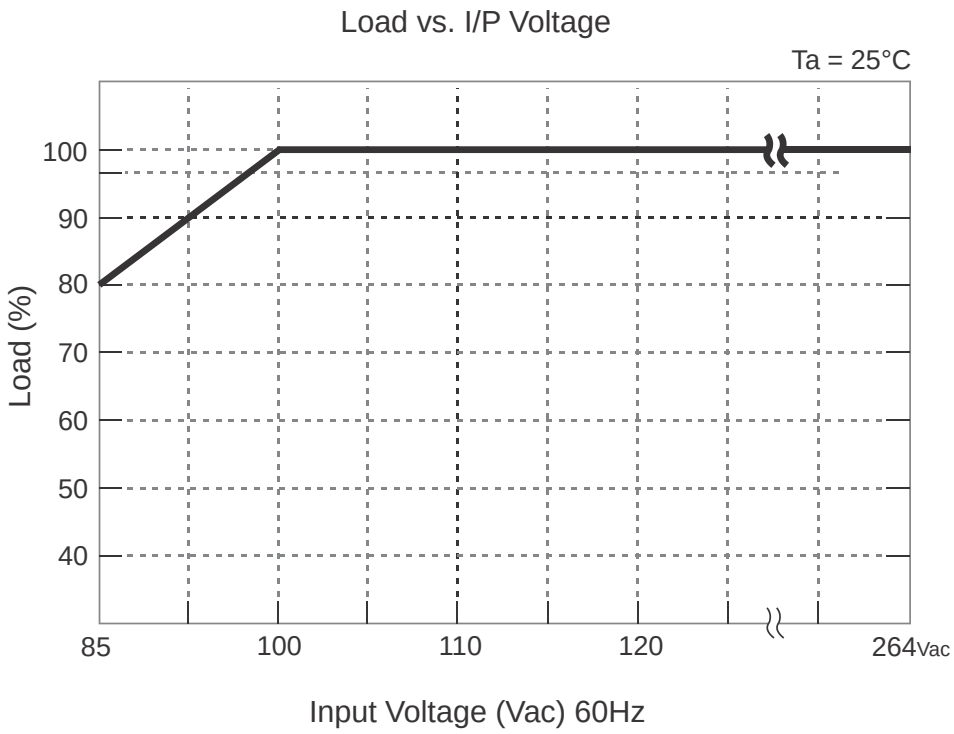


Figure 3-2 Load vs. Input Voltage: Models ML05 thru ML20 Series

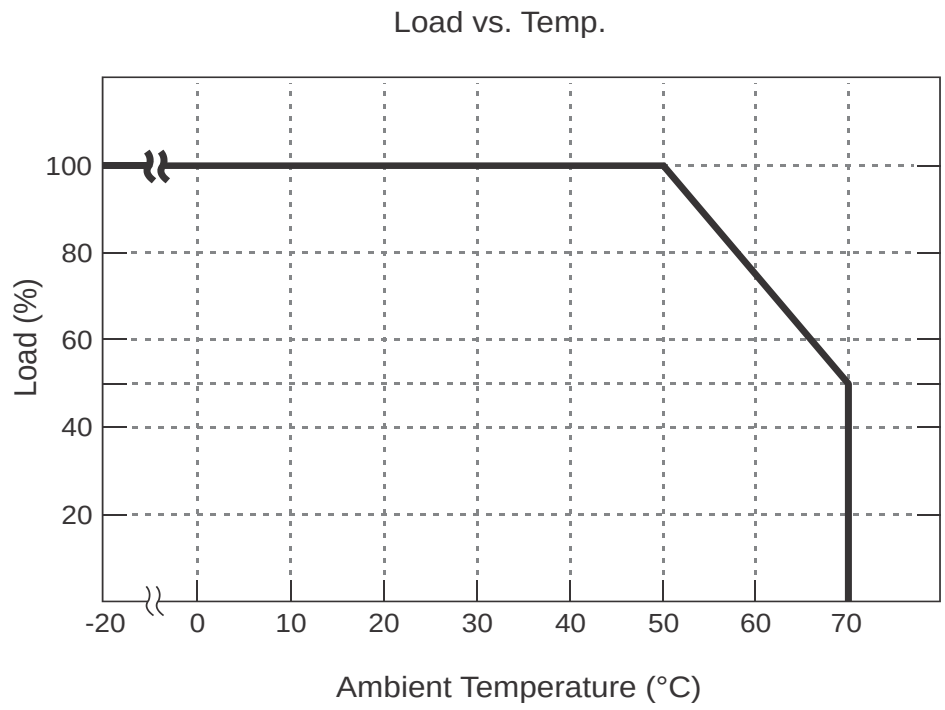


Figure 3-3 Derating Curve: Model ML45 Series

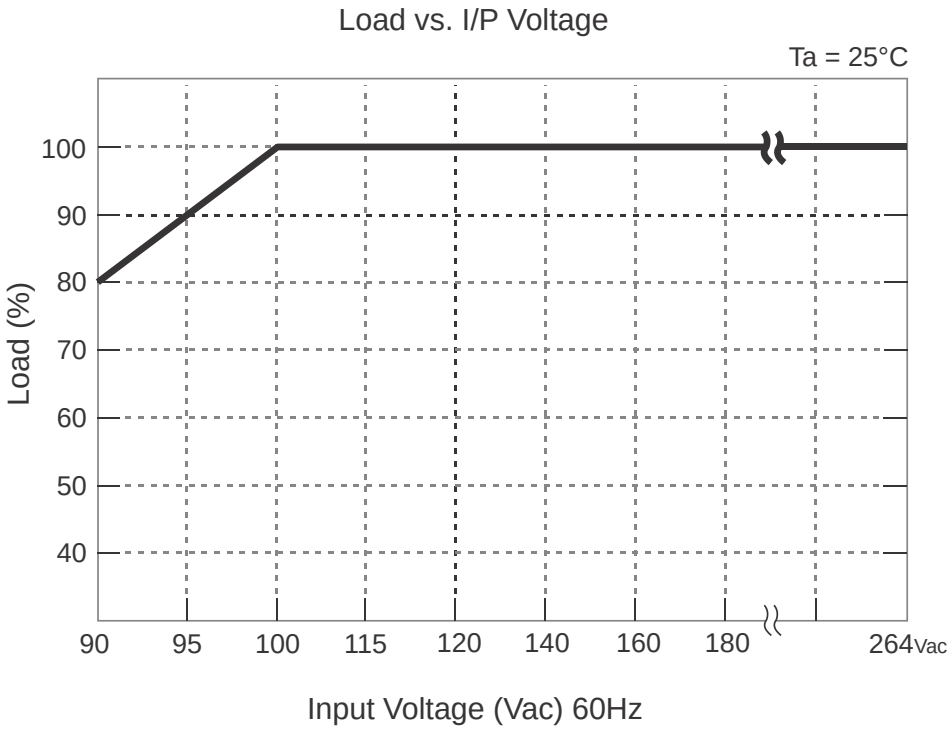


Figure 3-4 Load vs. Input Voltage: Model ML45 Series

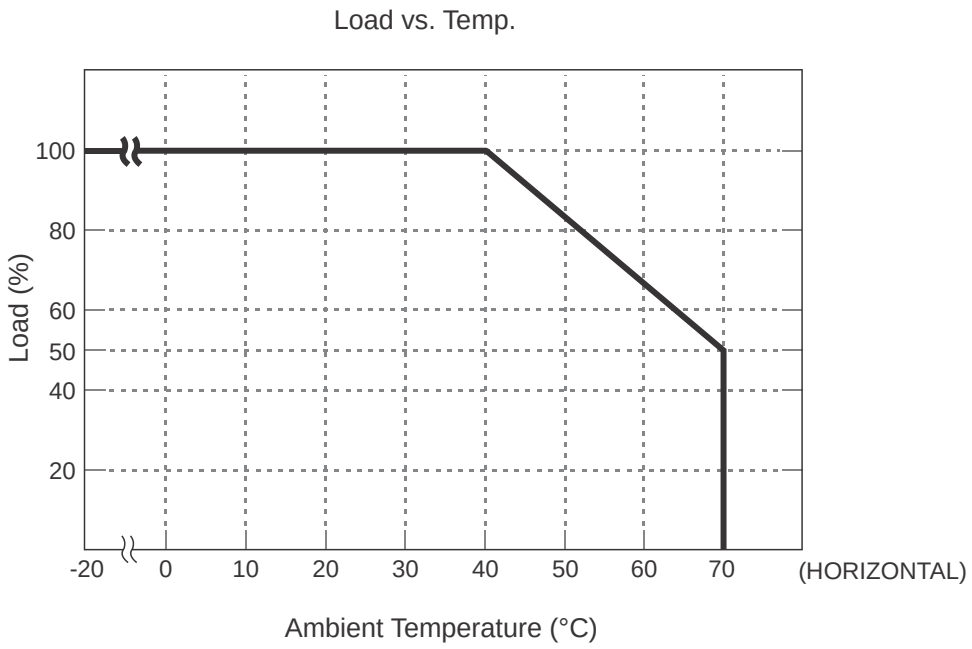


Figure 3-5 Derating Curve: Models ML45D-05F and ML45D-05K

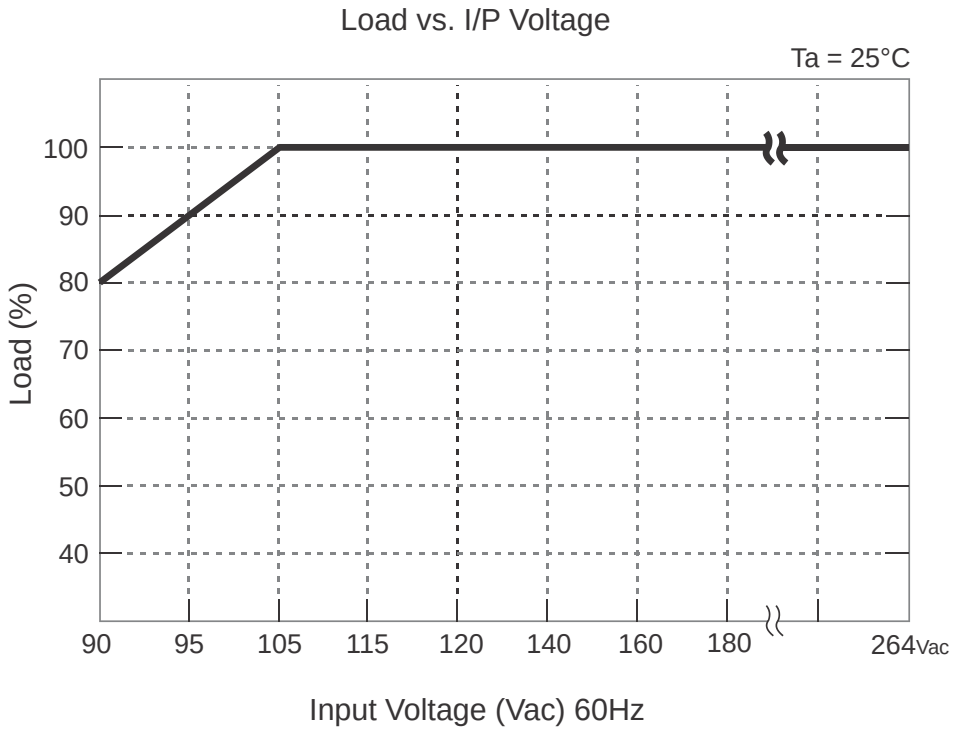


Figure 3-6 Load vs. Input Voltage: Models ML45D-05F and ML45D-05K

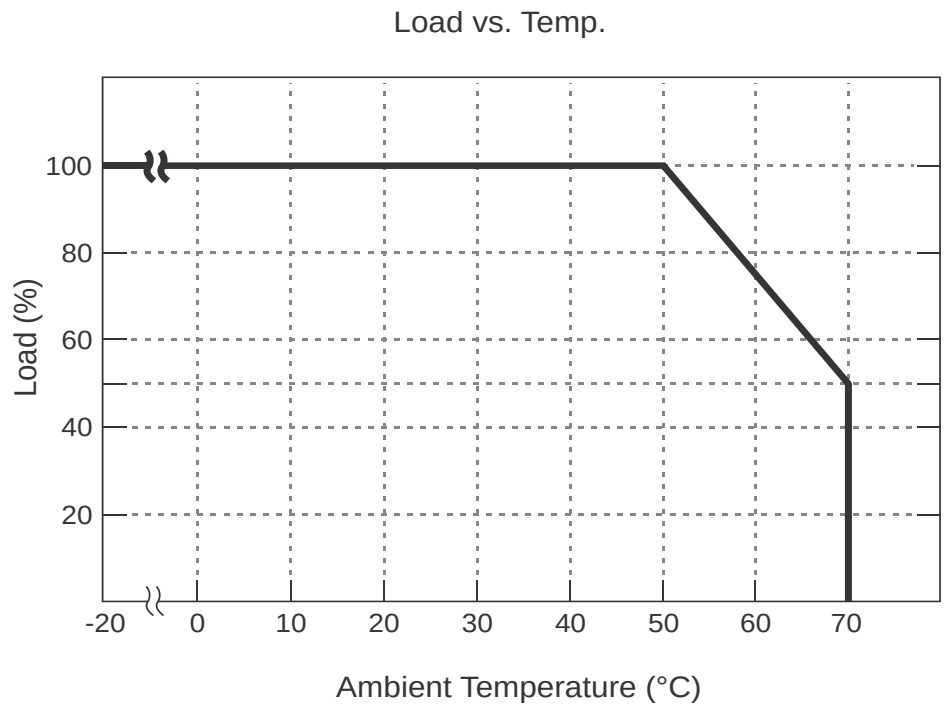


Figure 3-7 Derating Curve: Model ML60 Series

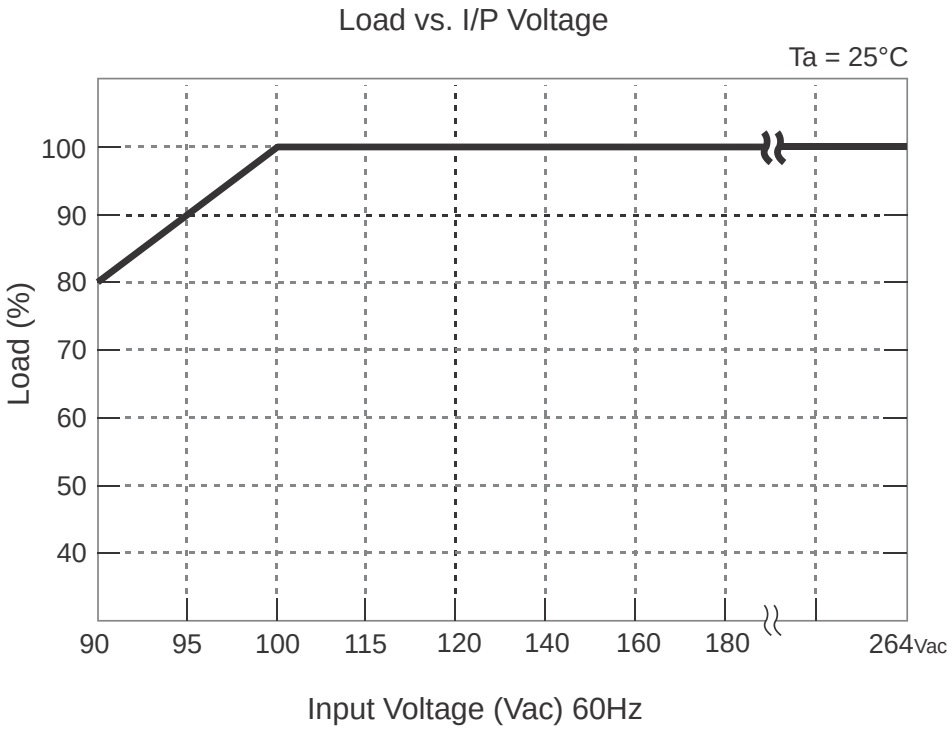


Figure 3-8 Load vs. Input Voltage: Model ML60 Series

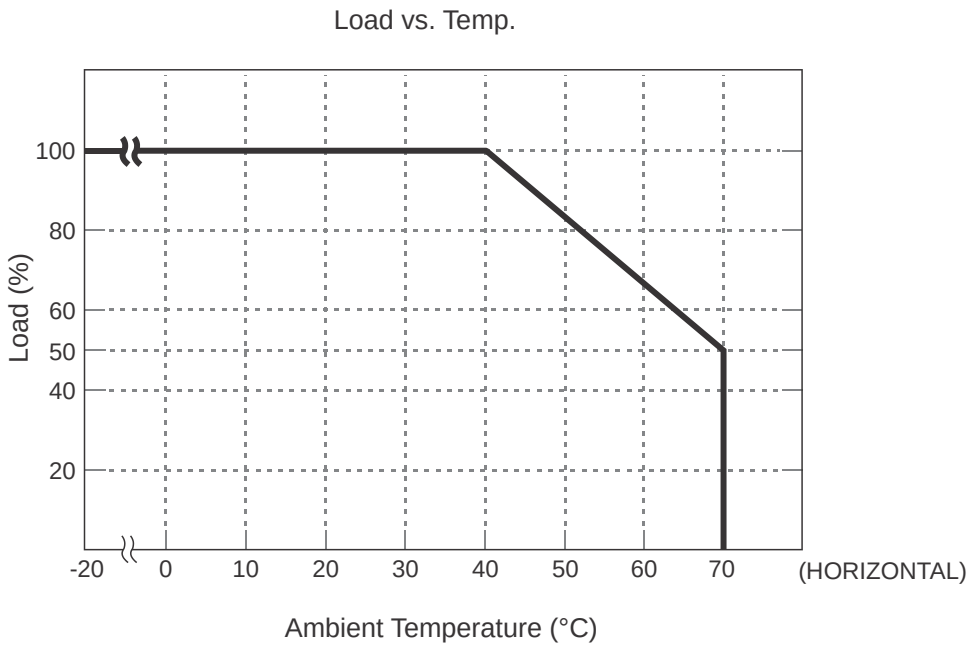


Figure 3-9 Derating Curve: Models ML60D-05F and ML60D-05K

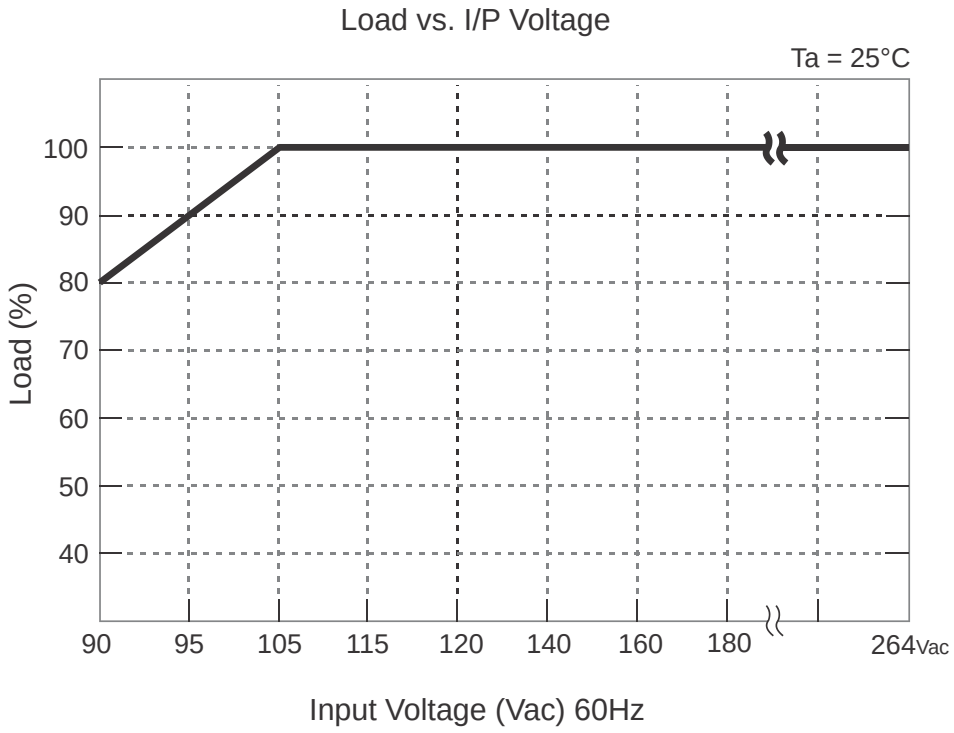


Figure 3-10 Load vs. Input Voltage: Models ML60D-05F and ML60D-05K

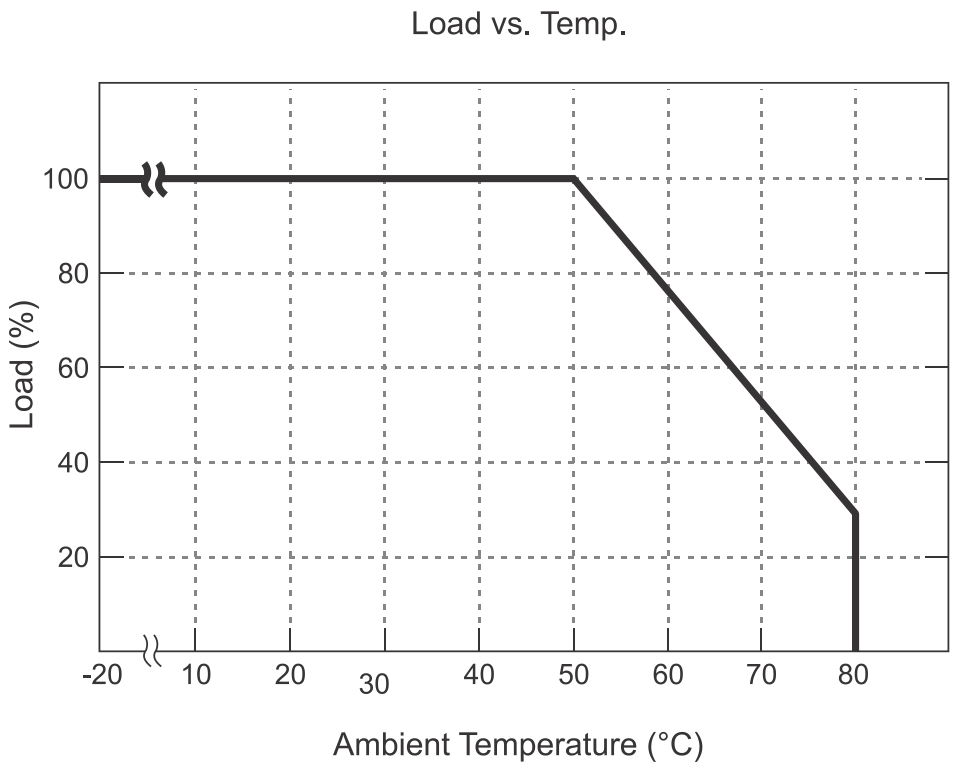


Figure 3-11 Derating Curve: Model ML100 Series

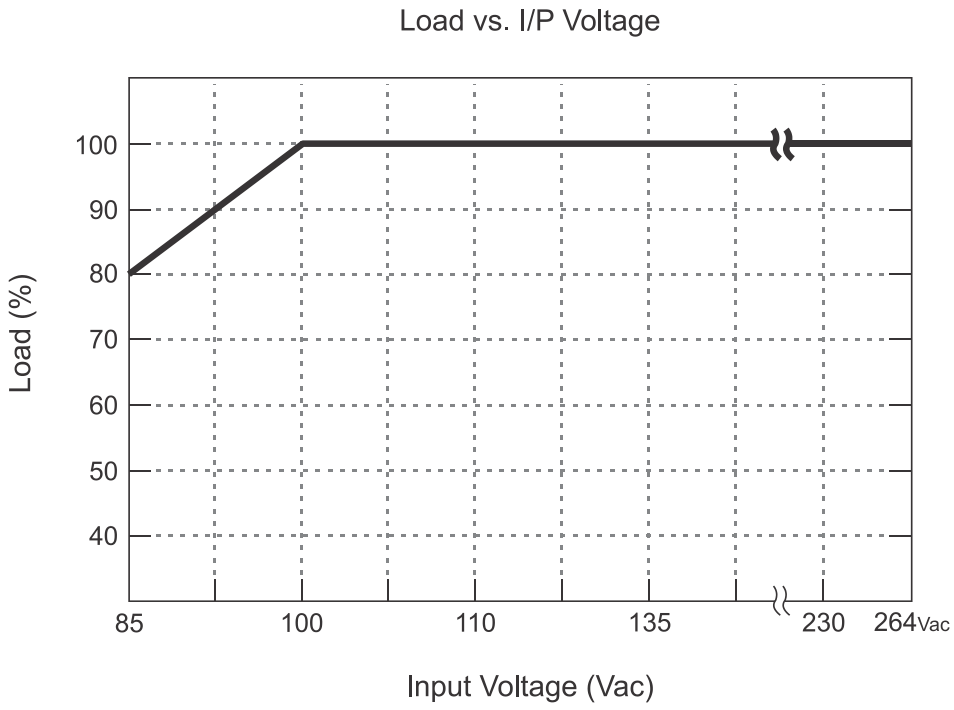


Figure 3-12 Load vs. Input Voltage: Model ML100 Series

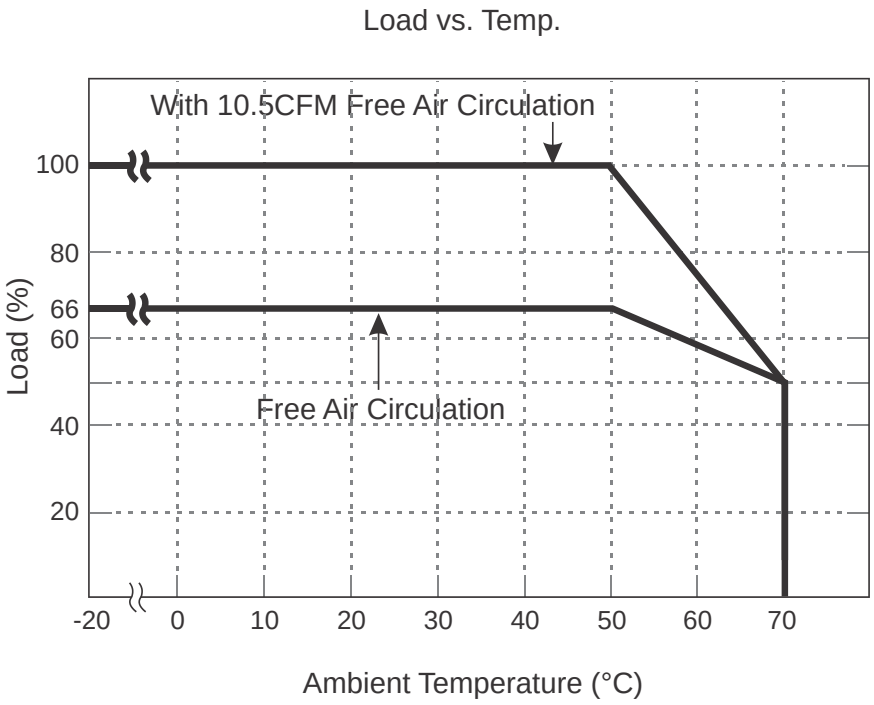


Figure 3-13 Derating Curve: Model ML150 Series

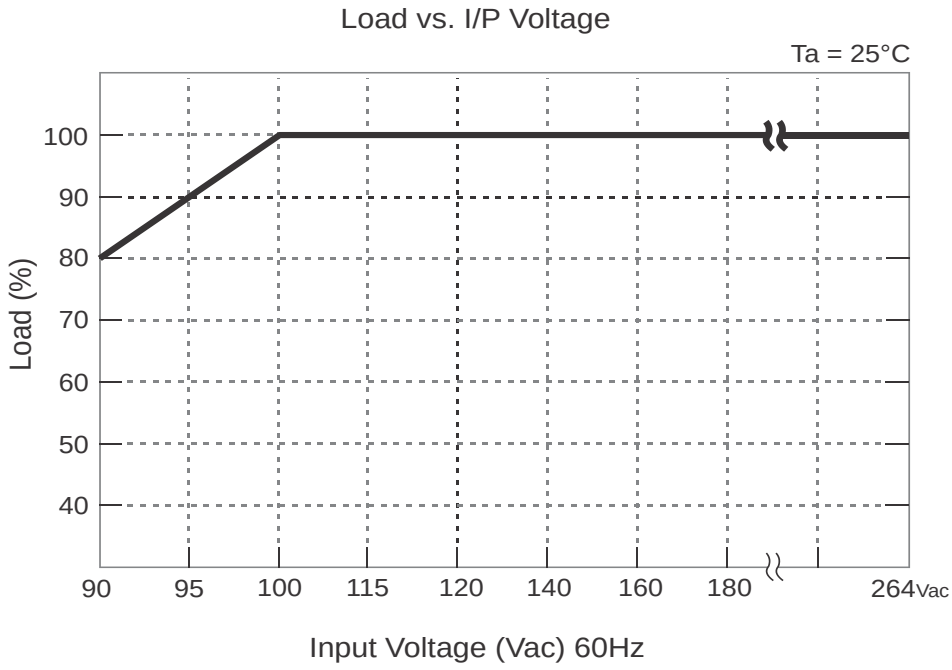


Figure 3-14 Load vs. Input Voltage: Model ML150 Series

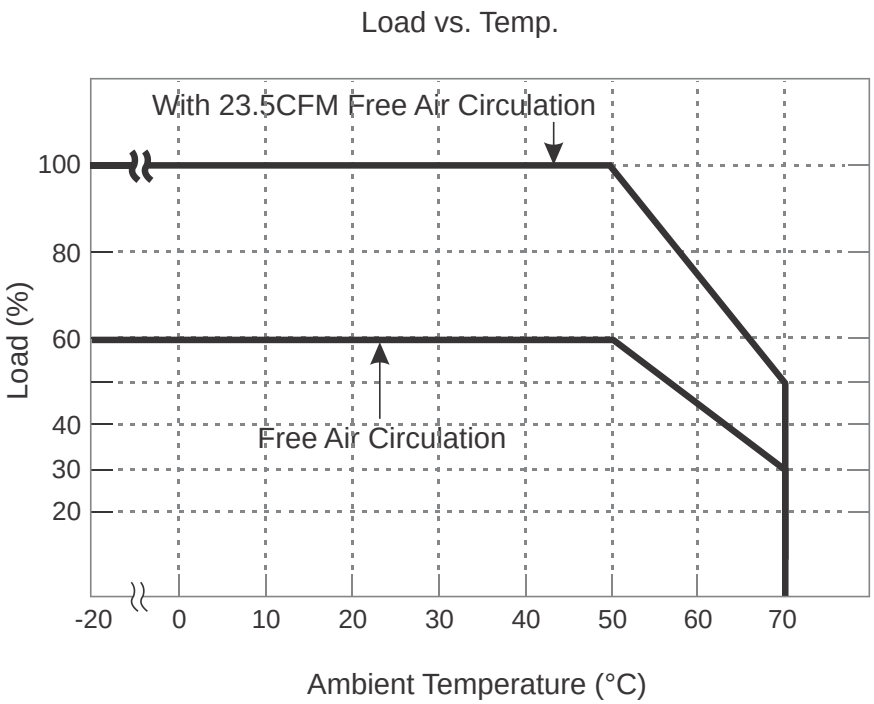


Figure 3-15 Derating Curve: Model ML250 Series

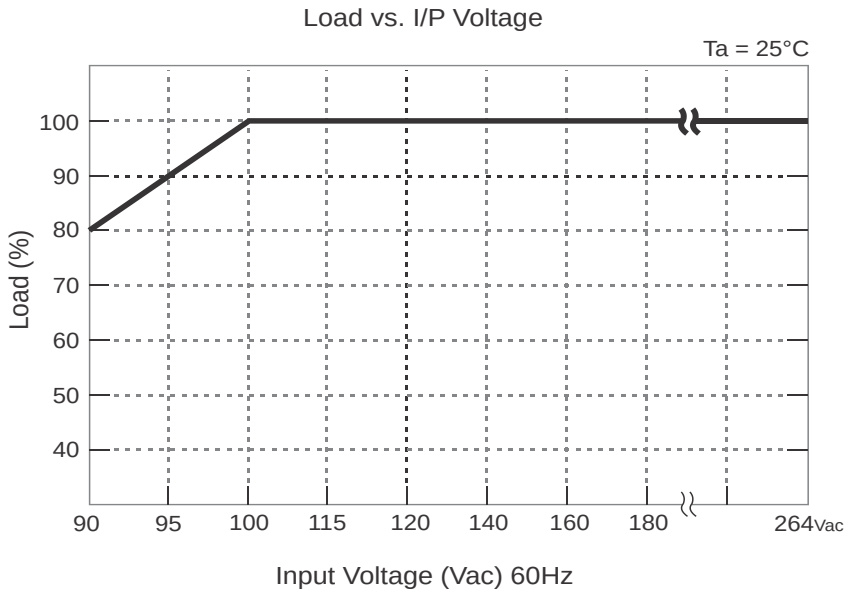


Figure 3-16 Load vs. Input Voltage: Model ML250 Series

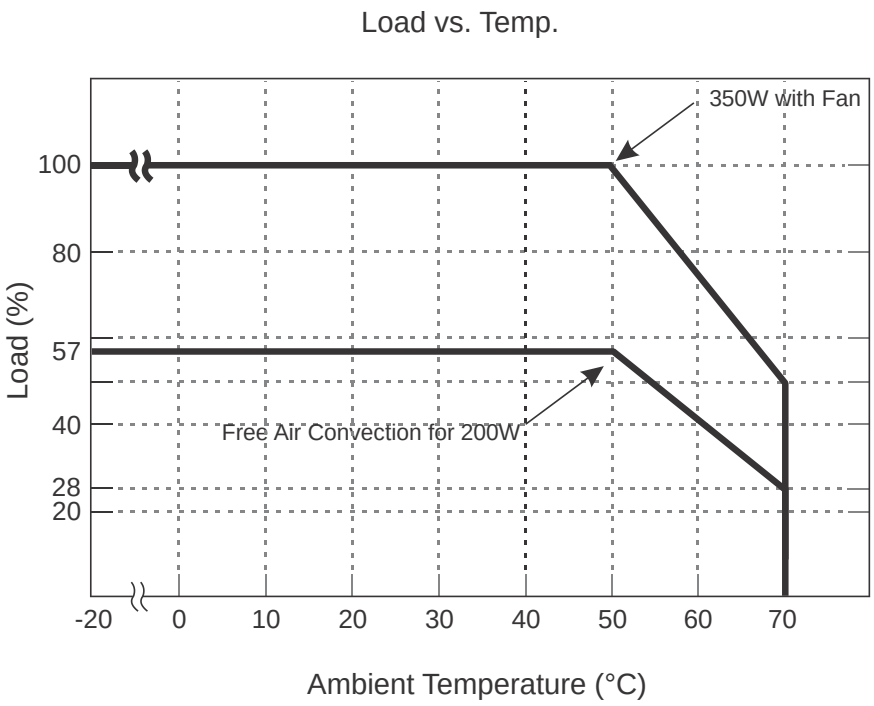


Figure 3-17 Derating Curve: Model ML350 Series

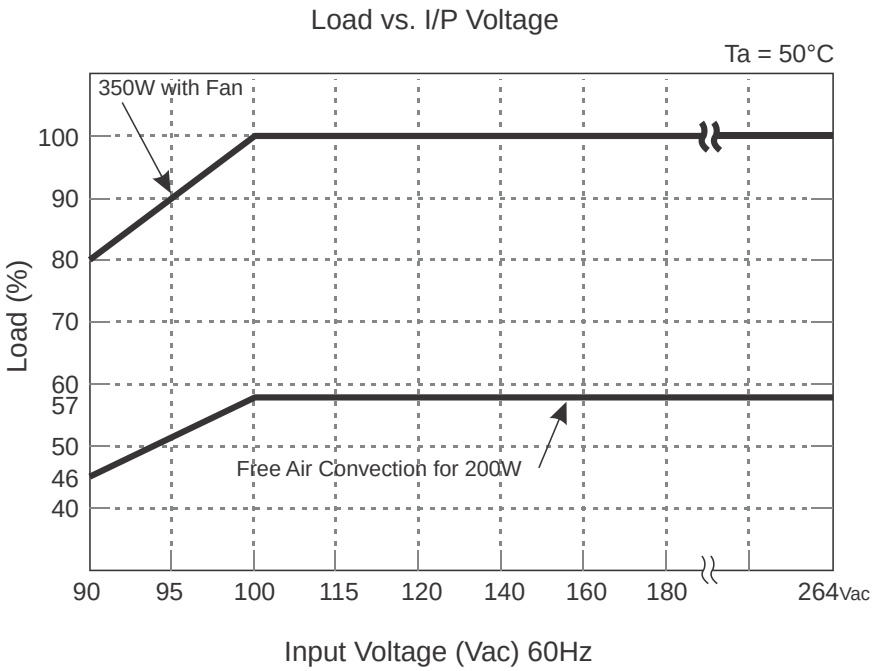


Figure 3-18 Load vs. Input Voltage: Model ML350 Series

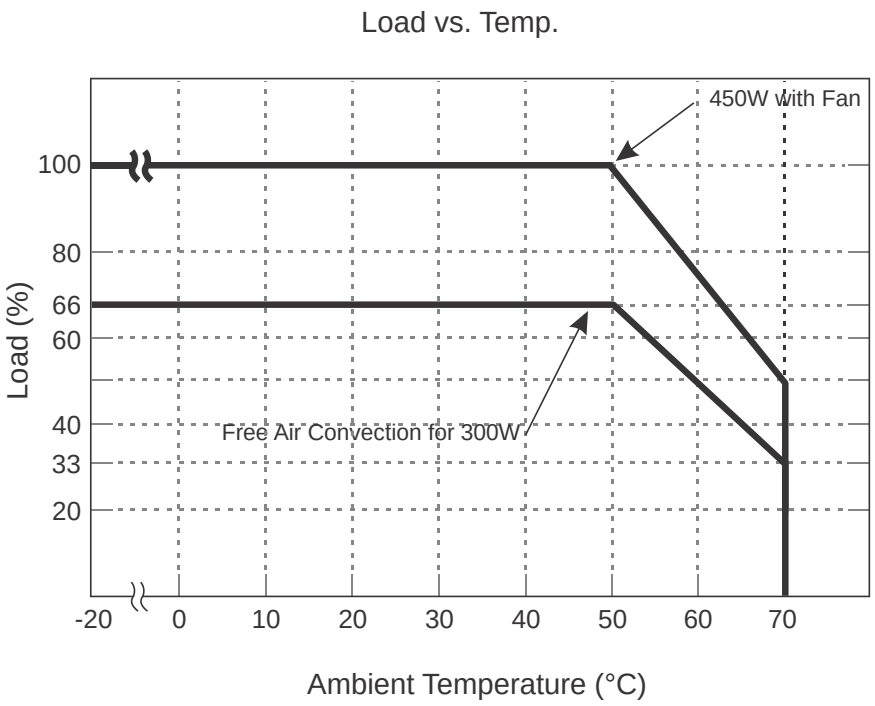


Figure 3-19 Derating Curve: Model ML450 Series

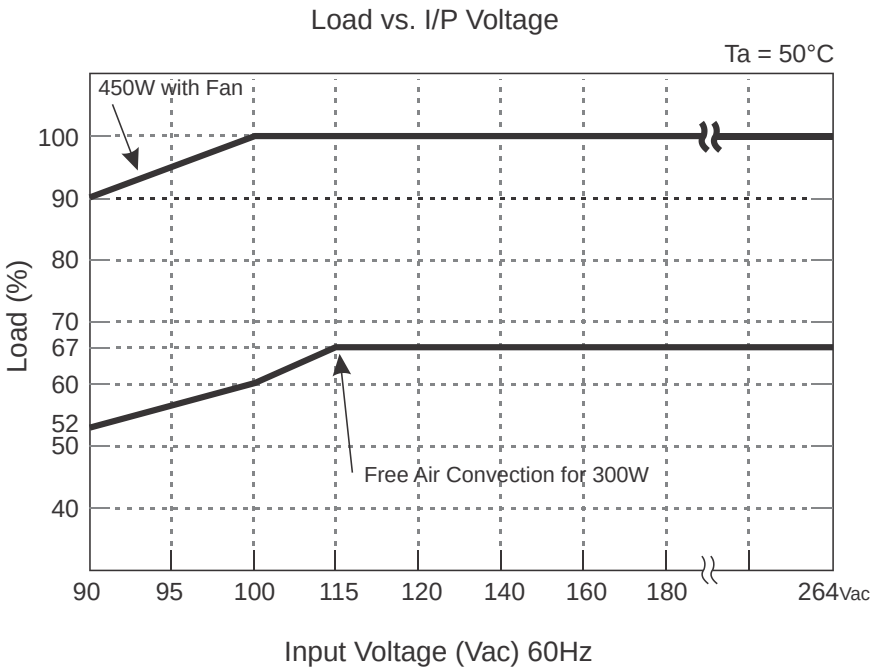


Figure 3-20 Load vs. Input Voltage: Model ML450 Series

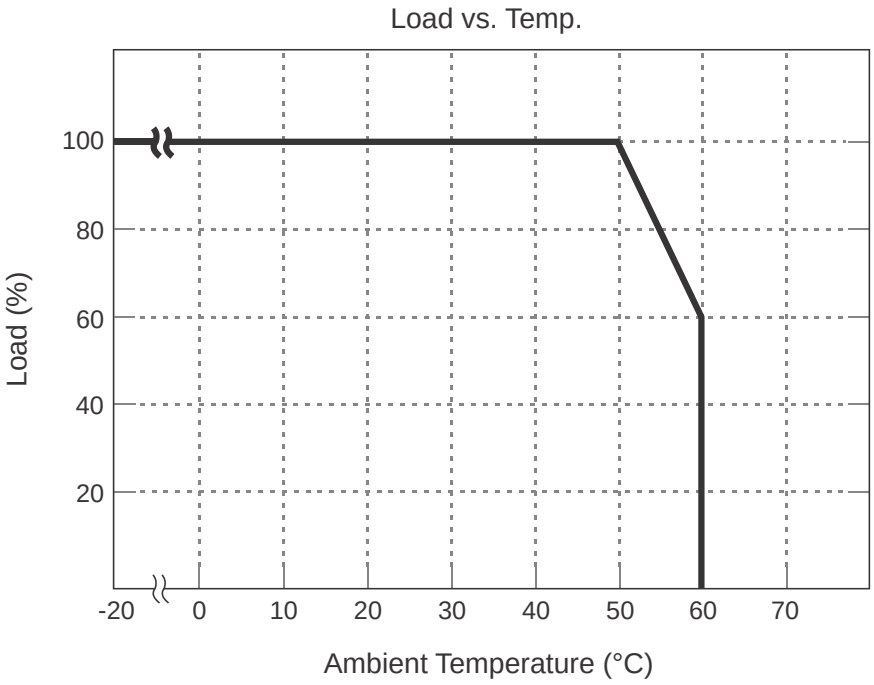


Figure 3-21 Derating Curve: Model ML1200 Series

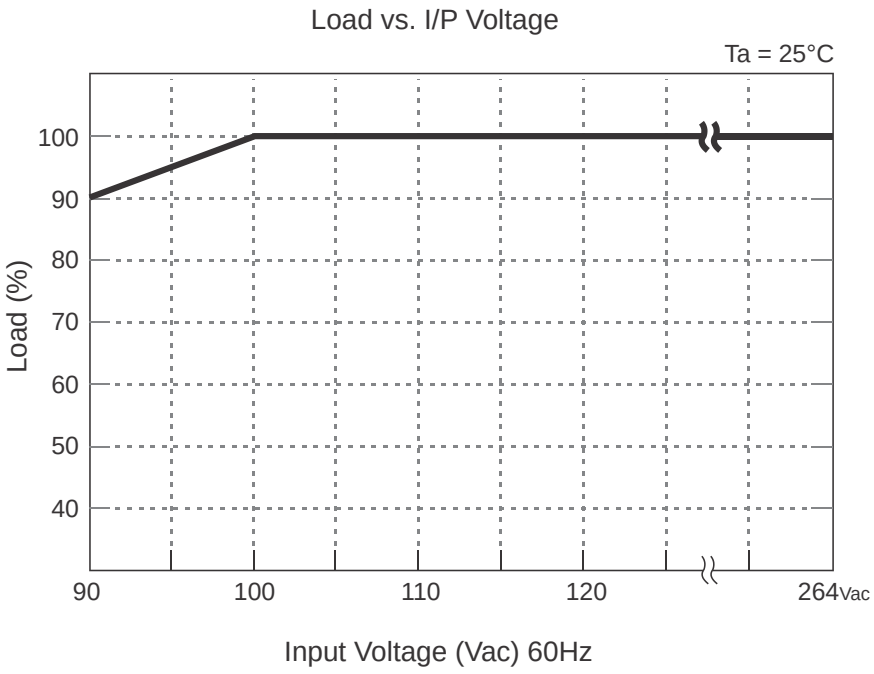


Figure 3-13 Load vs. Input Voltage: Model ML1200 Series

3.4 Output Ripple/Noise

Output ripple voltage and noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47 uf parallel. The ripple noise is measured from the output pin connectors (V+ and V-).

3.4.1 Ripple/Noise Limits: ML05 through ML1200

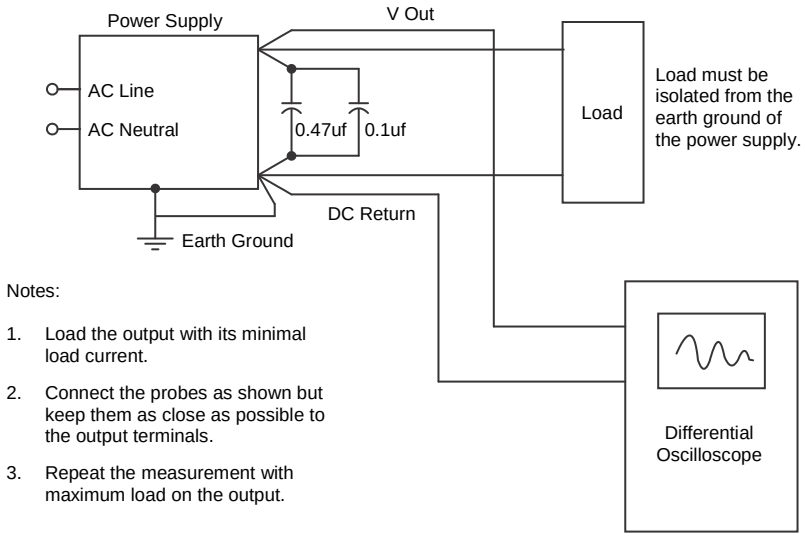
The ripple voltage of the outputs is measured at the pins of the mating connector. Ripple and noise shall not exceed the limits specified in Table 3-4 under any condition of line voltage and frequency specified in Section 2.1 and DC loading specified in Section 3.3.2.

Model	Output	Voltage	Maximum Ripple+Noise (peak-to-peak)
ML05-05	V1	5V	100mV
ML05-12	V1	12V	150mV
ML05-15	V1	15V	150mV
ML05-24	V1	24V	240mV
ML10-05	V1	5V	80mV
ML10-12	V1	12V	150mV
ML10-15	V1	15V	150mV
ML10-24	V1	24V	240mV
ML15-05	V1	5V	80mV
ML15-12	V1	12V	150mV
ML15-15	V1	15V	150mV
ML15-24	V1	24V	240mV
ML20-05	V1	5V	80mV
ML20-12	V1	12V	150mV
ML20-15	V1	15V	150mV
ML20-24	V1	24V	240mV
ML45D-05F	V1	5V	80mV
	V2	12V	80mV
ML45D-05K	V1	5 V	80mV
	V2	24 V	100mV
ML45-12	V1	12V	120mV
ML45-15	V1	15V	150mV
ML45-24	V1	24V	240mV
ML45-48	V1	48V	300mV
ML60D-05F	V1	5V	80mV
	V2	12V	100mV
ML60D-05K	V1	5V	80mV
	V2	24V	100mV

Model	Output	Voltage	Maximum Ripple+Noise (peak-to-peak)
ML60-12	V1	12V	120mV
ML60-15	V1	15V	150mV
ML60-24	V1	24V	240mV
ML60-48	V1	48V	300mV
ML100-12	V1	12V	120mV
ML100-15	V1	15V	150mV
ML100-24	V1	24V	160mV
ML100-28	V1	28V	180mV
ML100-36	V1	36V	190mV
ML100-48	V1	48V	340mV
ML150-12	V1	12V	120mV
ML150-15	V1	15V	150mV
ML150-24	V1	24V	240mV
ML150-48	V1	48V	300mV
ML250-12	V1	12V	120mV
ML250-15	V1	15V	150mV
ML250-24	V1	24V	240mV
ML250-48	V1	48V	300mV
ML350-12	V1	12V	150mV
ML350-15	V1	15V	150mV
ML350-24	V1	24V	240mV
ML350-48	V1	48V	300mV
ML350-12	V1	12V	150mV
ML350-15	V1	15V	150mV
ML350-24	V1	24V	240mV
ML350-48	V1	48V	480mV
ML1200-12	V1	12V	120mV
ML1200-15	V1	15V	150mV
ML1200-24	V1	24V	240mV
ML1200-30	V1	30V	300mV
ML1200-36	V1	36V	360mV
ML1200-48	V1	48V	480mV
ML1200-60	V1	60V	600mV

Table 3-4 Ripple Voltage: ML05 through ML1200

3.4.2 Ripple/Noise Test Setup



Notes:

1. Load the output with its minimal load current.
2. Connect the probes as shown but keep them as close as possible to the output terminals.
3. Repeat the measurement with maximum load on the output.

Note: The ML100-12 and -15 are measured with 10uf. The ML100-24, -28 and -36 are measured with 1uf. The ML100-48 is measured with 0.1uf. Do not parallel with 0.47uf.

Figure 3-14 Ripple Noise Measurement Setup

3.5 Local and Remote Sensing

Remote sensing is provided to compensate for voltage drops in the V1 (+ Output) and DC RETURN connections to the load. For every model, the 0V Sense input must always be connected to either the DC Return terminal at the load or one of the DC Return pins on the ML350, ML450 and ML1200 models. Connecting it to the return side of the load will reduce the voltage drop in the external return wiring.

If the V1 Sense input is left open, the V1 output may not meet its load regulation specification. The V1 output will meet its load regulation specification when the V1 Sense pin is connected to one of the V1 output pins. Connecting the V1 Sense pin to the V1 output at the load will reduce the voltage drop in the external V1 wiring.

3.5.1 Local and Remote Sensing: ML350, ML450 and ML1200 Models

Up to 0.5V in the return and the V1 connections may be compensated. Note that CN-6 has 8-pins for the ML350 and ML450 models while CN-2 has 24pins for the ML1200 models. Figure 3-15 which shows the required and optional remote sensing connections for the ML350, ML450 and ML1200 models. Refer to Table 4-6 for the pin definition of the ML350, ML450 and ML1200 connectors.

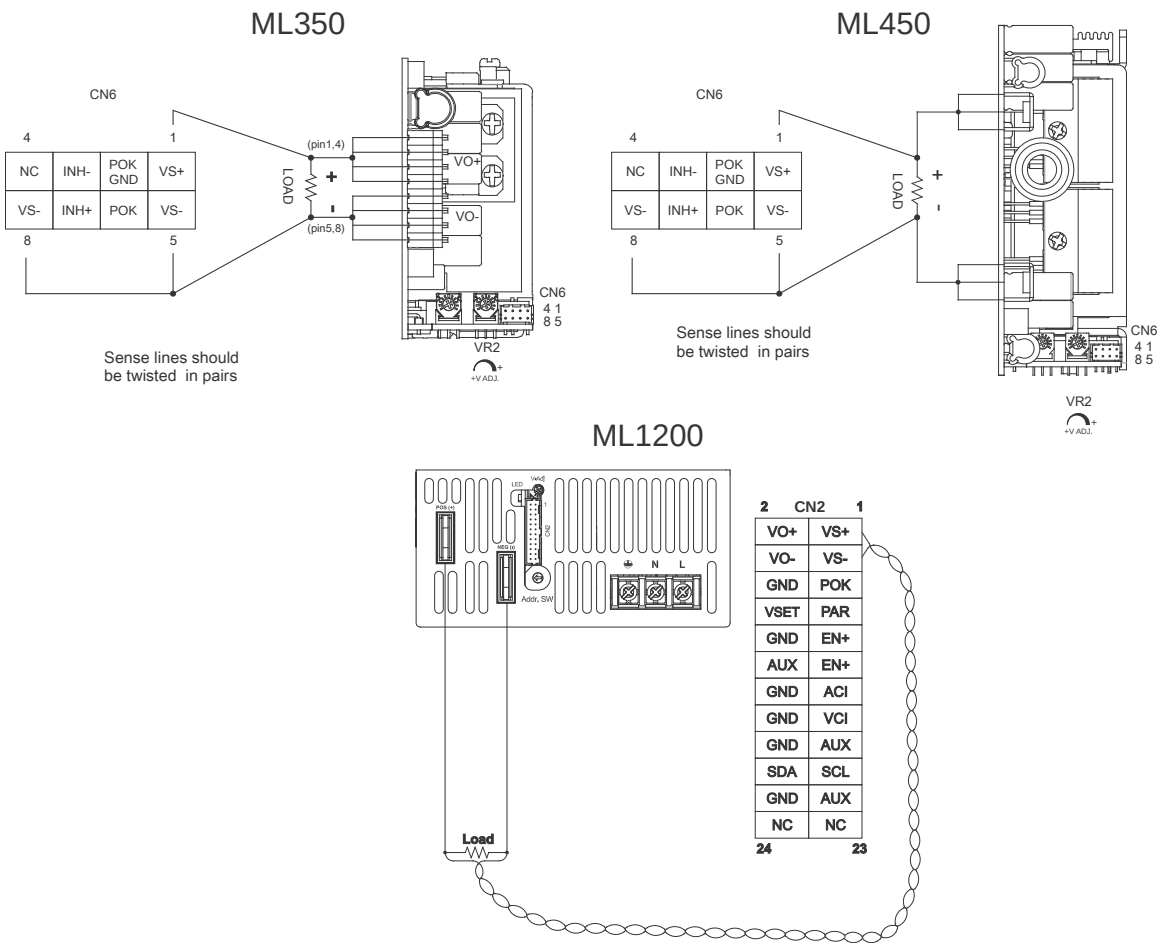


Figure 3-15 Local and Remote Sensing Wiring: ML350, ML450 and ML1200 Models

3.6 Parallel Operation: ML1200 Models Only

The ML1200 models are available for forced current current-share. Up to 8 ML1200 version power supplies may be connected in parallel to provide higher output power and for N+1 configurations.

3.6.1 Current Share Connections

The Par (Parallel or CS) and Gnd (Ground) signal (see Table 4-6) of each supply operating in parallel must be connected together. Power sharing does not require the 0V Sense signals be connected together.

3.7 Output Protection

There are three different output protection schemes designed to protect the load and the ML1200 from component failures and extraordinary circumstances.

3.7.1 Over Temperature Protection

If the ML1200 is operated without adequate cooling, it will sense an over-temperature condition and shut itself down. It will not restart until it has cooled down to below its maximum operating temperature and the AC power is turned off and back on.

3.7.2 Over Voltage Protection

No single fault is able to cause a sustained over voltage condition on any output. When an over-voltage condition occurs, the power supply will shut down and will not restart until AC power is turned off and back on. The ML Series will shut down under the following over voltage conditions: For the ML1200 series power supplies please see the VCI VS OVP Curve:

Model	Minimum	Nominal	Maximum
ML05-05	5.75V	6.50V	7.25V
ML05-12	13.80V	15.60V	17.40V
ML05-15	17.25V	19.50V	21.75V
ML05-24	27.60V	31.20V	34.80V
ML10-05	5.75V	6.50V	7.25V
ML10-12	13.80V	15.60V	17.40V
ML10-15	17.25V	19.50V	21.75V
ML10-24	27.60V	31.20V	34.80V
ML15-05	5.75V	6.50V	7.25V
ML15-12	13.80V	15.60V	17.40V
ML15-15	17.25V	19.50V	21.75V
ML15-24	27.60V	31.20V	34.80V
ML20-05	5.75V	6.63V	7.50V
ML20-12	13.80V	15.90V	18.00V
ML20-15	17.25V	19.88V	22.50V
ML20-24	27.60V	31.80V	36.00V
ML45D-05F	5.75V	6.38V	7.00V
ML45D-05K	5.75V	6.38V	7.00V
ML45-12	13.80V	15.30V	16.80V
ML45-15	17.25V	19.13V	21.00V
ML45-24	27.60V	30.60V	33.60V
ML45-48	55.20V	61.20V	67.20V
ML60D-05F	5.75V	6.38V	7.00V
ML60D-05K	5.75V	6.38V	7.00V
ML60-12	13.80V	15.30V	16.80V
ML60-15	17.25V	19.13V	21.00V
ML60-24	27.60V	30.60V	33.60V
ML60-48	55.20V	61.20V	67.20V

Model	Minimum	Nominal	Maximum
ML100-12	13.80V	15.00V	16.20V
ML100-15	17.25V	18.75V	20.25V
ML100-24	27.60V	30.00V	32.40V
ML100-28	32.20V	35.00V	37.80V
ML100-36	41.40V	45.00V	48.60V
ML100-48	55.20V	60.00V	64.80V
ML150-12	13.80V	15.30V	16.80V
ML150-15	17.25V	19.13V	21.00V
ML150-24	27.60V	30.60V	33.60V
ML150-48	55.20V	61.20V	67.20V
ML250-12	13.80V	15.30V	16.80V
ML250-15	17.25V	19.13V	21.00V
ML250-24	27.60V	30.60V	33.60V
ML250-48	55.20V	61.20V	67.20V
ML350-12	13.80V	15.30V	16.80V
ML350-15	17.25V	19.13V	21.00V
ML350-24	27.60V	30.60V	33.60V
ML350-48	55.20V	61.20V	67.20V
ML450-12	13.80V	15.30V	16.80V
ML450-15	17.25V	19.13V	21.00V
ML450-24	27.60V	30.60V	33.60V
ML450-48	55.20V	61.20V	67.20V
ML1200-12	13.56V	14.40V	15.24V
ML1200-15	16.95V	17.48V	18.00V
ML1200-24	27.12V	27.96V	28.80V
ML1200-30	33.90V	34.95V	36.00V
ML1200-36	40.68V	41.94V	43.20V
ML1200-48	54.24V	55.92V	57.60V
ML1200-60	67.80V	69.90V	72.00V

Table 3-5 Over Voltage Protection Limits

3.7.3 Over Current Protection: ML350, ML450 and ML1200 Models Only

Overload currents applied to the output will cause the output to shut down. The power supply will periodically attempt to restart until the over-current condition is removed. This feature is tested with an ever-increasing load at a rate of 10 A/second starting at maximum load. Constant Current limit:> 105% rated power.

3.7.4 Short Circuit Protection

A short circuit is defined as an impedance of less than 0.1 ohms placed between DC RETURN and any output. A short circuit will cause no damage to the power supply

and will cause it to shutdown. The power supply will periodically attempt a restart until the short circuit condition is removed. After successfully restarting, the power supply will operate normally.

A short circuit on the output for models ML05 thru ML60 and ML100 will not cause the power supply to shut down and the output will resume normal operation when the short circuit is removed. For models ML150 and ML250 the power supply will latch off and recover after AC reset power on. For the ML350 and ML450 models the power supply has auto-recovery: If O/P drops to 40% of the rated output voltage, the PSU will shut down and attempt auto-recover five times. If a fault condition remains after five recovery attempts, the PSU will shut down. The user must re-power the PSU on to recover. For Model ML-1200 the power supply will not sustain damage due to a short circuit.

3.8 Output Rise Time

All output voltages shall rise from 10% to 90% of nominal output voltage (as specified in Table 3-1) within 15ms to 150ms. The output voltages waveform must be a monotonic ramp from 10% to 90% of final setpoint within the regulation band under any loading conditions specified in the respective load current tables in Section 6.

For the purposes of this specification, a monotonic ramp is defined as always having a positive slope of from zero to 10*Vout volts/millisecond. During any 5-millisecond portion of the ramp, its slope must be greater than 5% of its rated voltage per millisecond.

3.9 Overshoot At Turn On/Turn Off

The output voltage overshoot upon the application or removal of the input mains voltage is less than <5% for all ML models above the nominal voltage. No opposite polarity voltage is present on any output during turn on or turn off.

4. General Specifications

4.1 Environmental

The ML Series meets or exceeds the following environmental specifications:

Parameter	Conditions	Specification	Remarks
Temperature	Operating	-20°C to 70°C	ML05, 10, 15, 20, 45, 60, 150, 250, 350 & 450 Series
		-25°C to 80°C	ML100 Series
		-20°C to 60°C	ML1200 Series
	Non-Operating	-40°C to 85°C	
Relative Humidity	Operating	90% Maximum	Non-Condensing
	Non-Operating	95% Maximum	Non-Condensing
Altitude	Operating	6,561 feet MSL Max.	2,000 meters ML05, 10, 15, 20, 45, 60, 150, 250, 350,450 & 1200 Series
		16,404 feet MSL Max.	5,000 meters ML100 Series
Shock	No damage	50G half-sine, 11mS	ML100 Series, 18 shocks (3 shocks for each + axis) + X, + Y, + Z axes
Vibration	No damage	2.0 G RMS Maximum	10-500Hz, 10-min. each axis. Certified IEC60068-2-6-2007; IEC60068-2-64-2008

Table 4-1 Environmental Specifications

4.2 Mean Time Between Failures

The calculated MTBF of all models is equal to or greater than the specified hours of continuous operation at maximum output loading and worst-case input line voltage with convection 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 (MIL-HDBK-217F). Actual failure rates vary from unit to unit.

Model	MTBF
ML05	217.4K HRS
ML10	210.2K HRS
ML15	206.3K HRS
ML20	188.3K HRS
ML45	215.4K HRS
ML60	215.4K HRS
ML100	790.3K HRS
ML150	386.0K HRS

Model	MTBF
ML250	TBD
ML350	TBD
ML450	TBD
ML1200	84.19K HRS

Table 4-2 MTBF by Model

4.3 Labeling/Marking

The power supply is marked and labeled with the N2Power logo and part number, model number, input and output specifications, production code, appropriate safety agency logos and CE mark. Typical labels are pictured below.

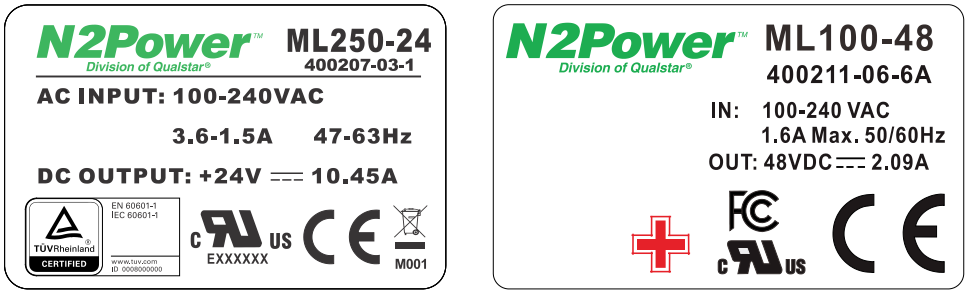


Figure 4-1 Sample ML Labels

4.4 Net Weight

Model:	Pounds	Ounces	Kilograms
ML05	0.09	1.40	0.039
ML10	0.12	1.44	0.054
ML15	0.17	2.65	0.080
ML20	0.19	3.05	0.090
ML45/ML60	0.36	5.76	0.160
ML100	0.34	5.50	0.156
ML150	0.45	7.20	0.204
ML250	0.68	10.88	0.310
ML350	0.93	14.88	0.420
ML450	1.54	24.64	0.700
ML1200	6.10	97.60	2.770

Table 4-3 ML Net Weights

4.5 Mounting

The ML05, ML10 and ML15 series are mounted through the 4 pins (AC input and DC output) at the bottom side of the PCB. The diameter for the pins mounting hole for all three series is 1.05mm.

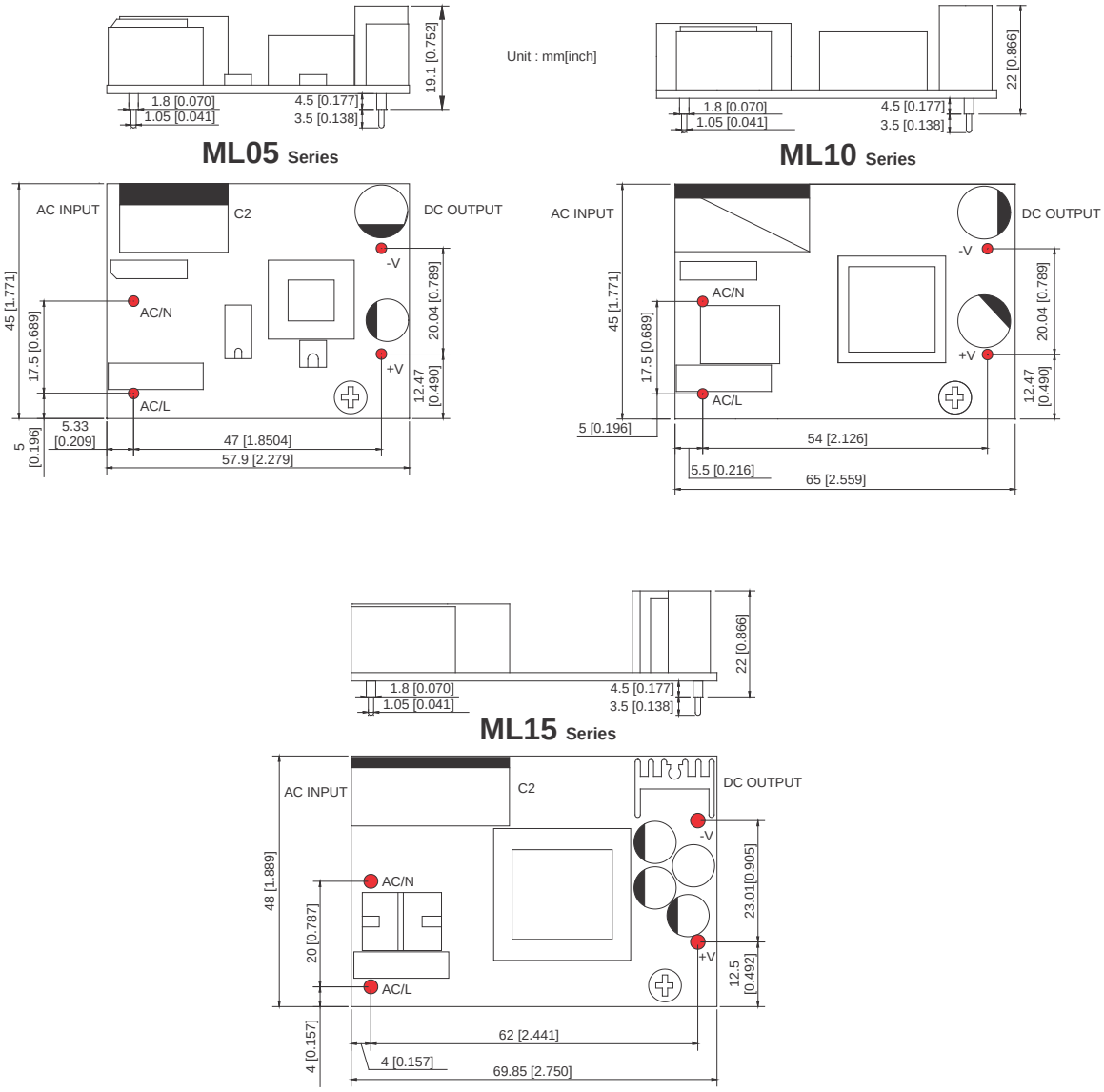


Figure 4-2 ML05, ML10 and ML15 Mounting Pin Locations

The ML20, ML45, ML60, ML150, ML250, ML350 and ML450 series are mounted with screws at the mounting holes at the corners.

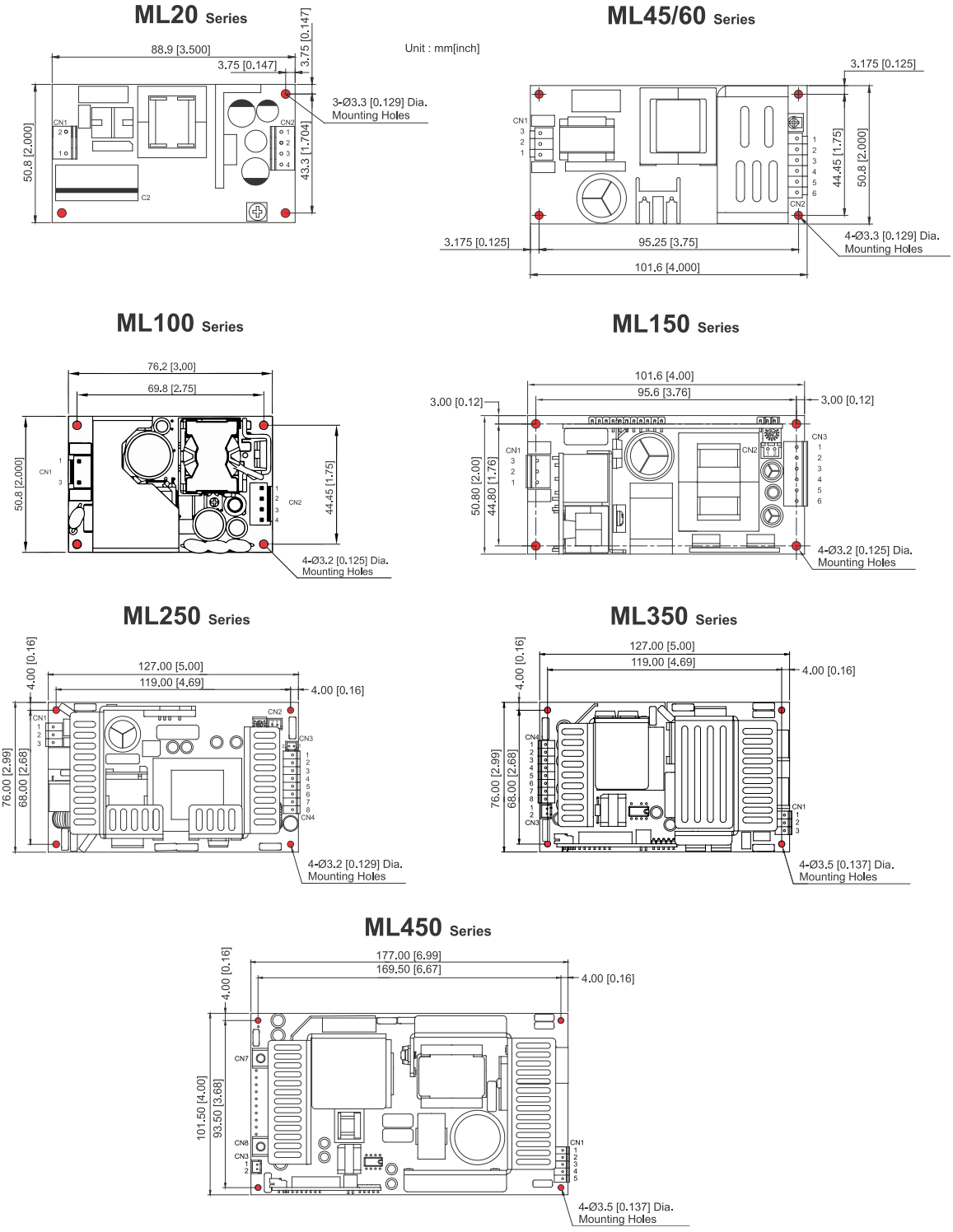


Figure 4-3 ML20, ML45, ML60, ML150, ML250, ML350 and ML450 Mounting Hole Locations

The diameter for the mounting holes for the ML20, ML45, ML60, ML100, ML150, ML250, ML350 and ML450 series are listed in the following table.

Model	Mounting Hole Diameter
ML20, ML45 & ML60	3.3mm [0.129]
ML100, ML150 & ML250	3.2mm [0.125]
ML350 & ML450	3.5mm [0.137]

Table 4-4 Mounting Hole Sizes by Model

4.6 Physical Dimensions

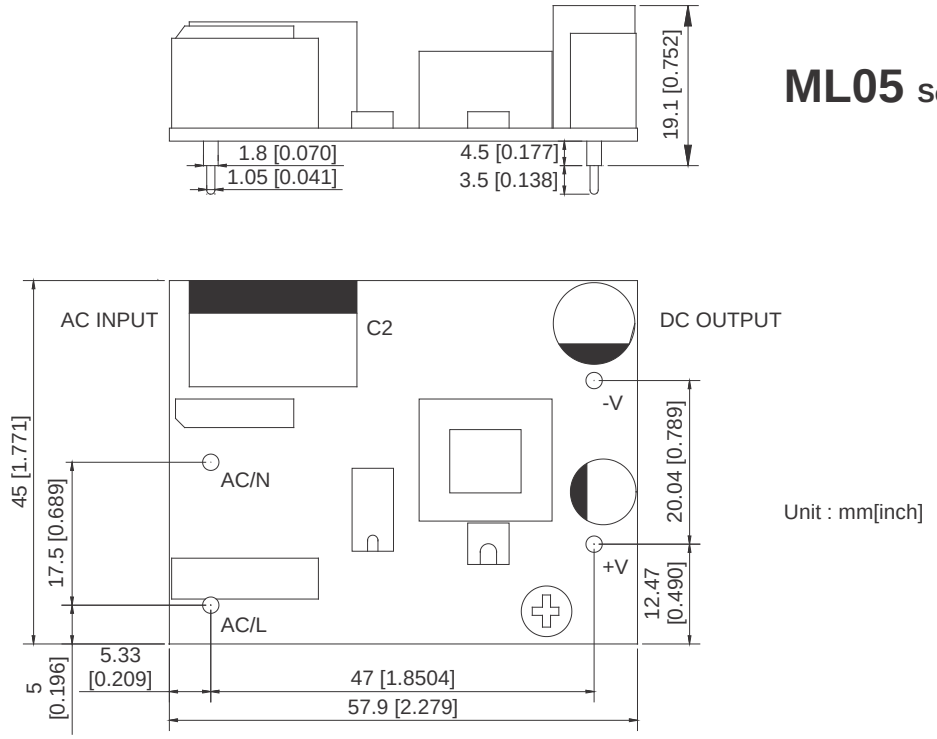


Figure 4-4 ML05 Dimensions

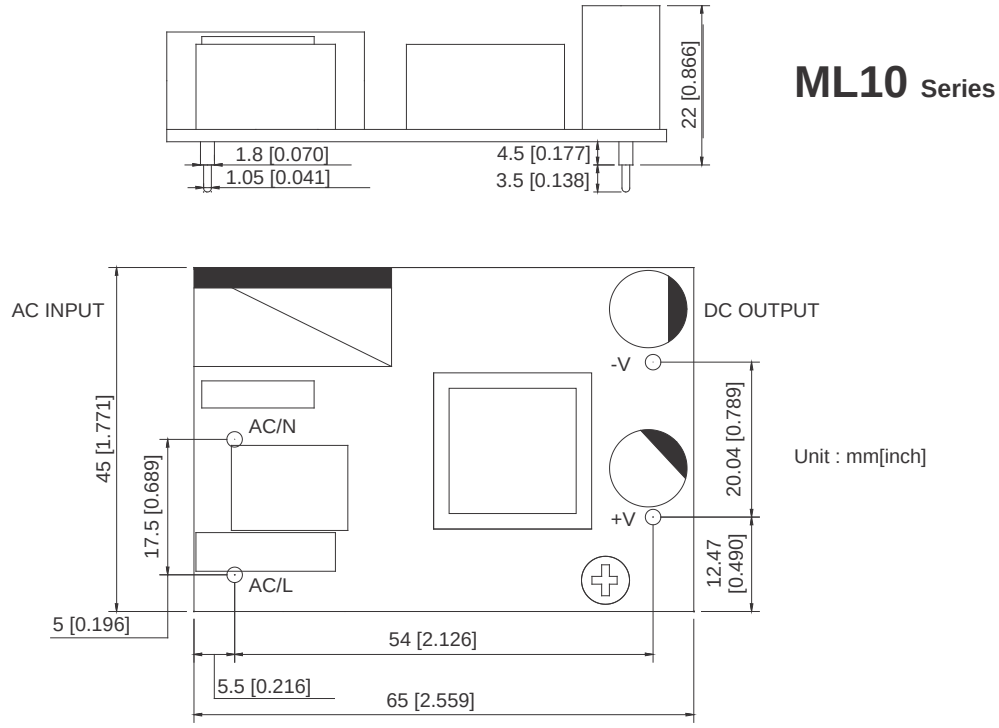


Figure 4-5 ML10 Dimensions

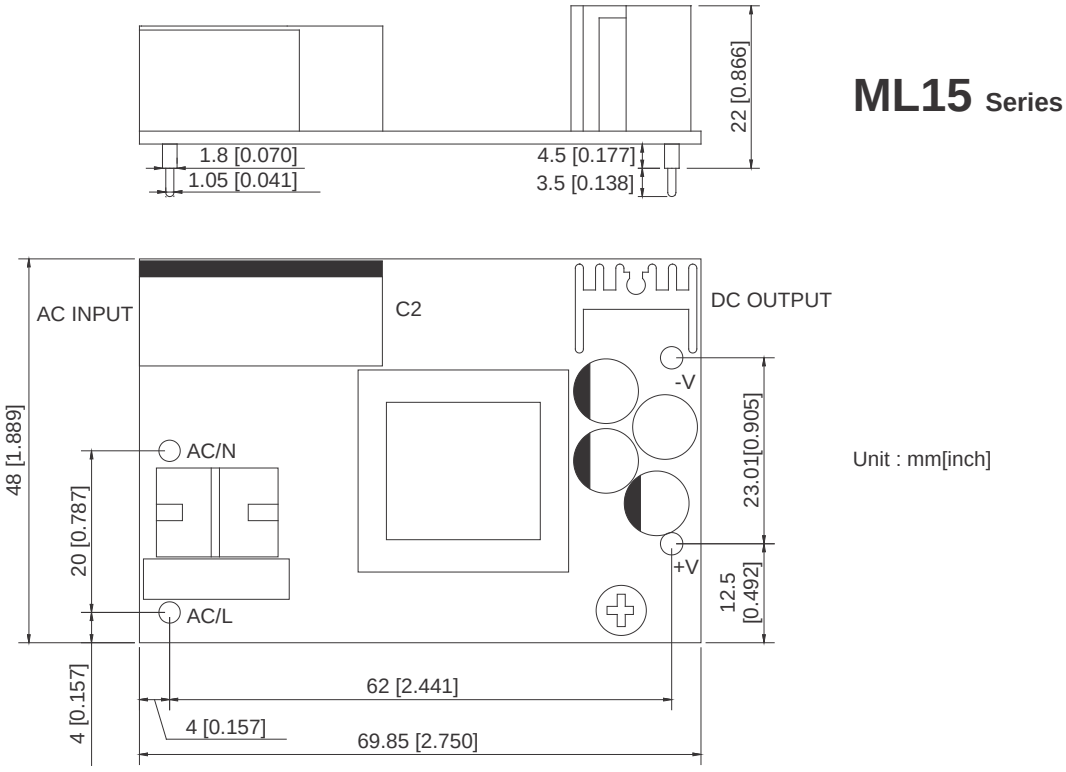


Figure 4-6 ML15 Dimensions

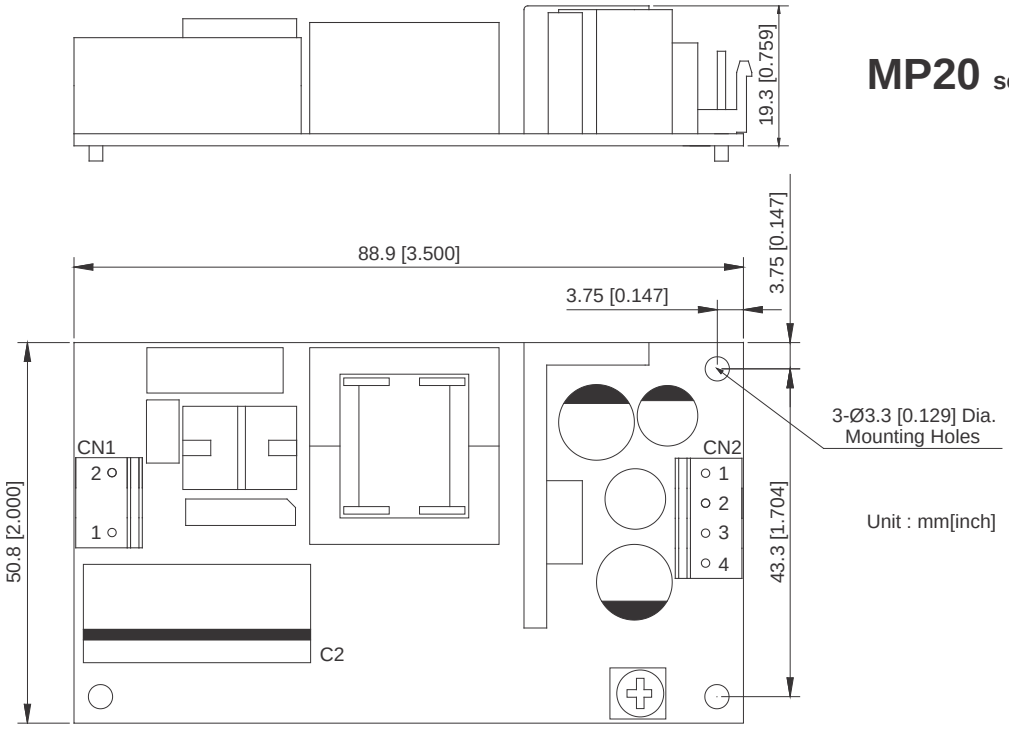


Figure 4-7 ML20 Dimensions

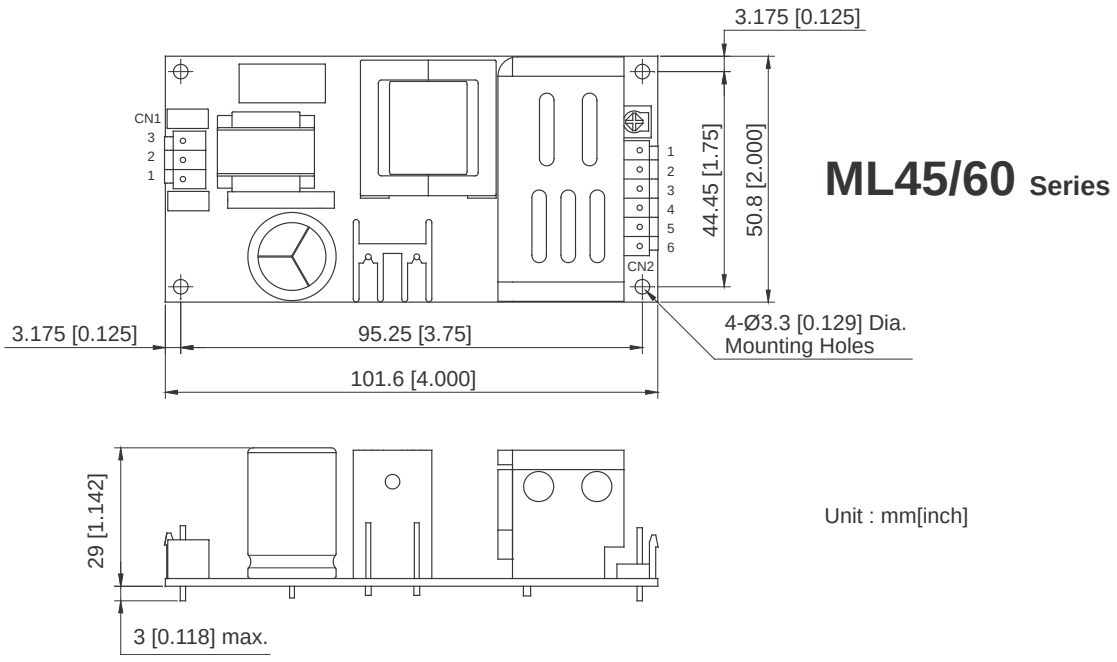


Figure 4-8 ML45/60 Dimensions

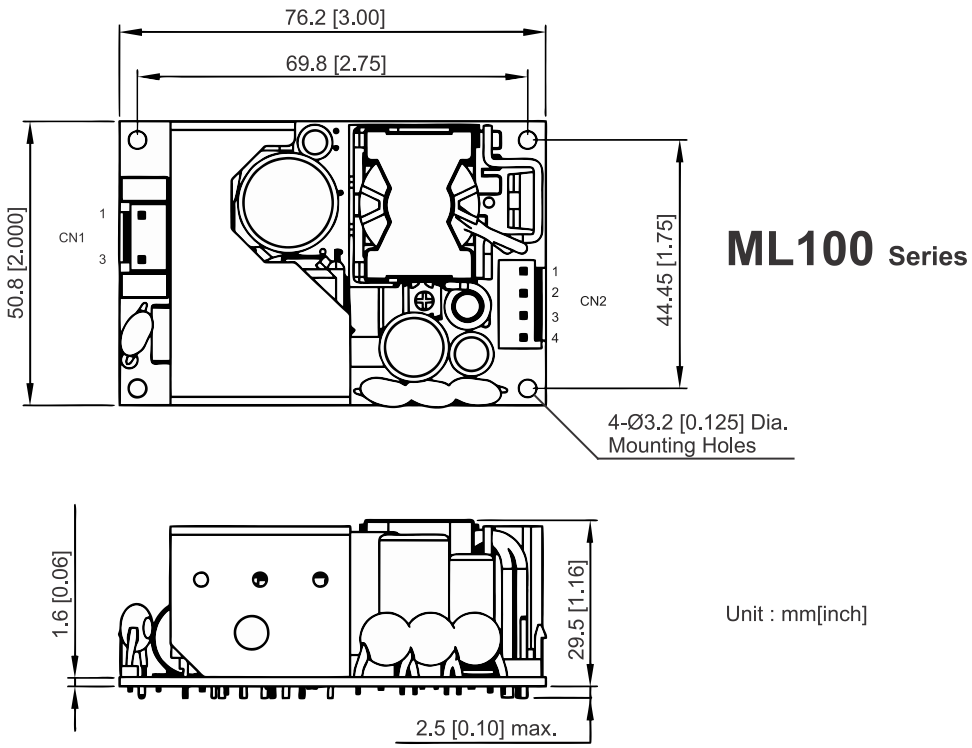


Figure 4-9 ML100 Dimensions

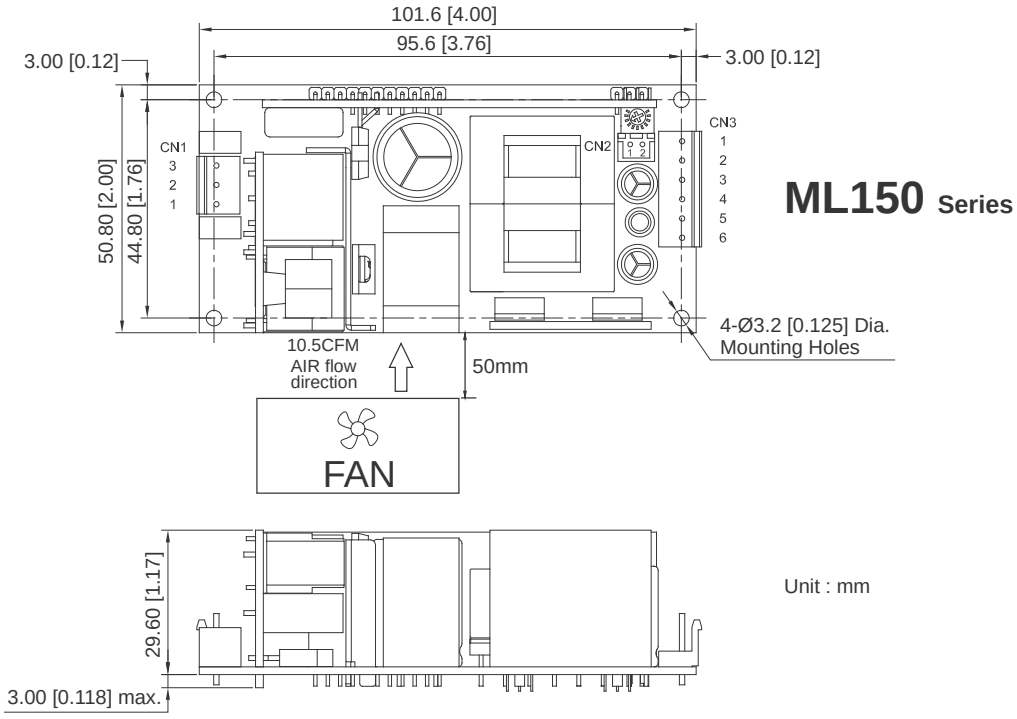


Figure 4-10 ML150 Dimensions

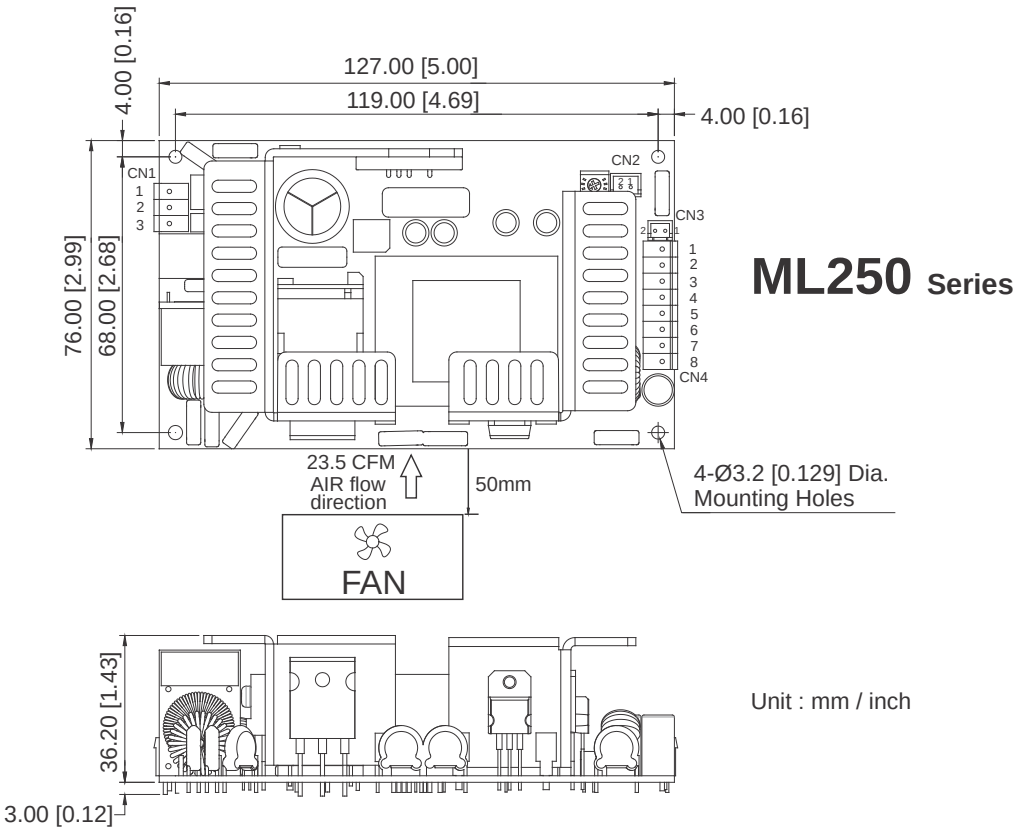


Figure 4-11 ML250 Dimensions

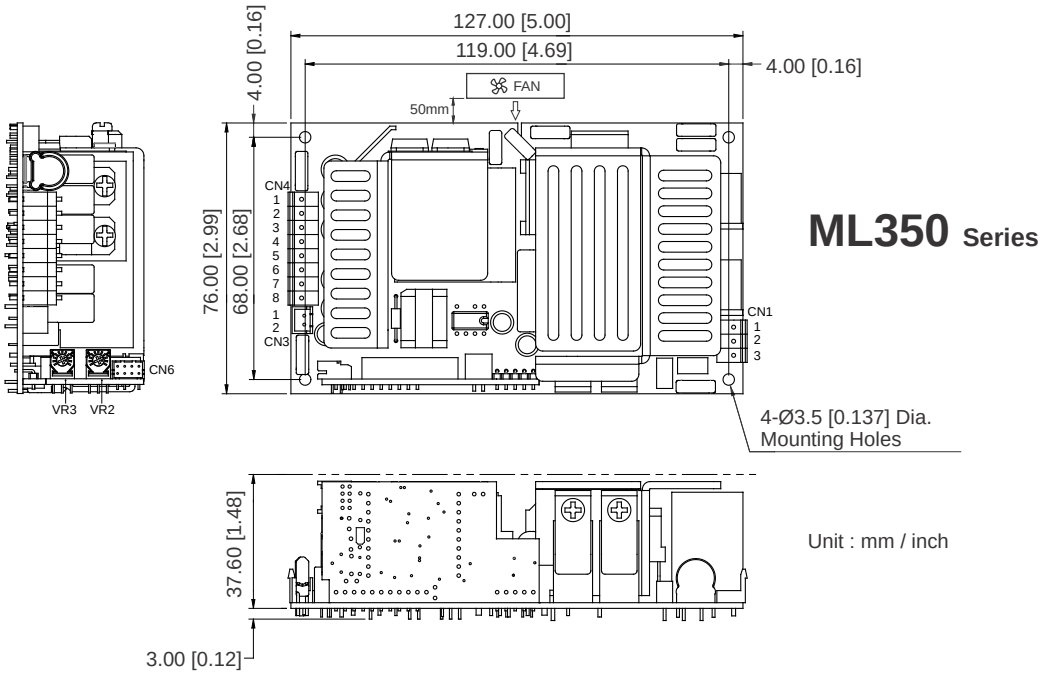


Figure 4-12 ML350 Dimensions

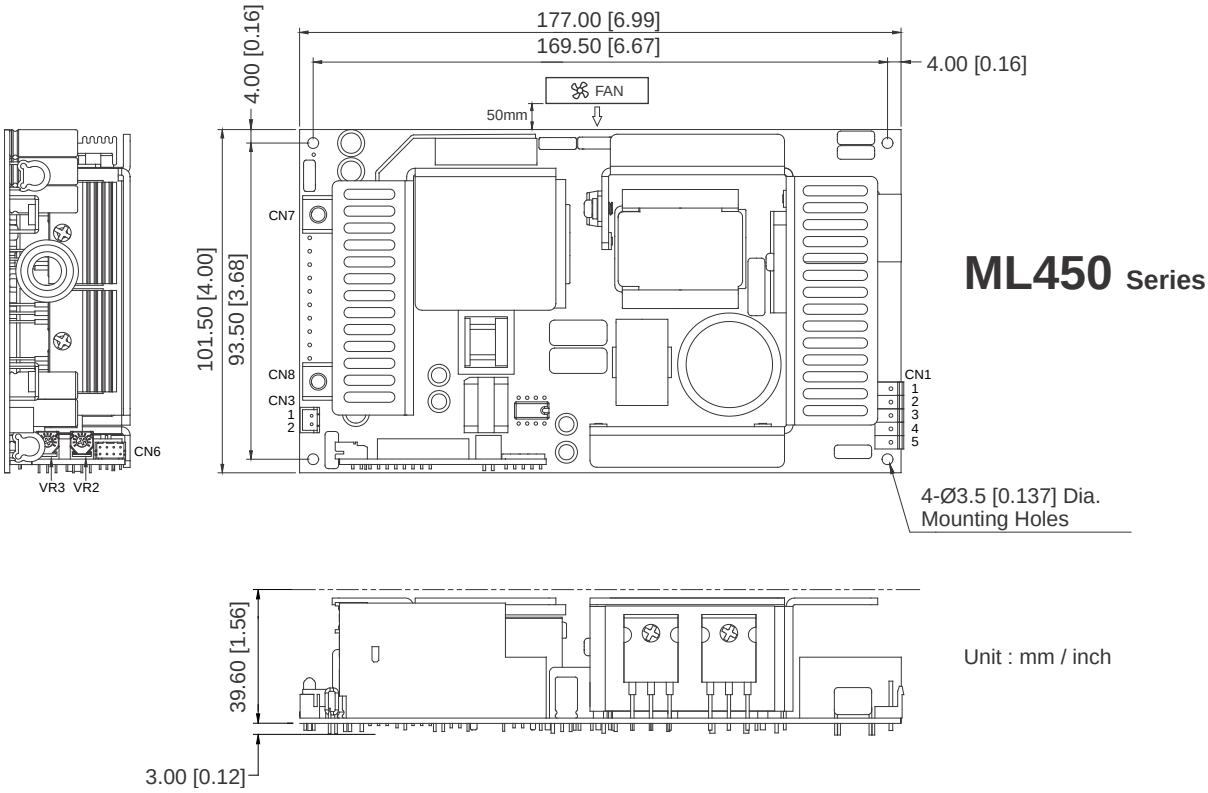


Figure 4-13 ML450 Dimensions

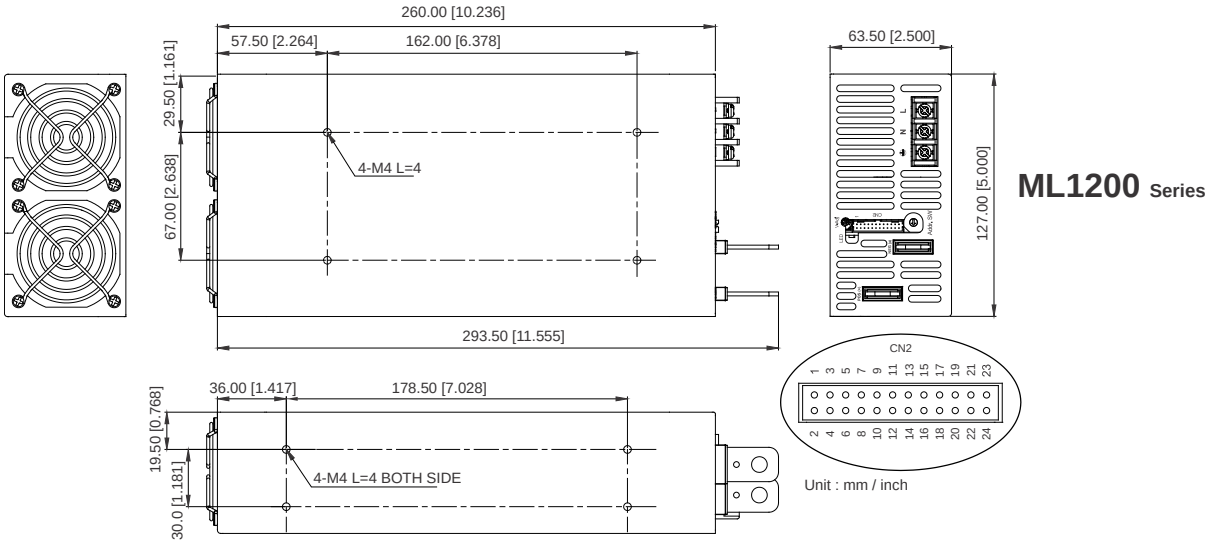


Figure 4- ML1200 Dimensions

4.7 Mating Connectors

The user must furnish all mating connectors. The mating connectors must meet the requirements of all applicable safety agencies (UL and/or TUV). There are no mating connectors for the ML05, ML10 and ML15 series. These models are connected to a PCB with input and output pins.

Model	Designator	Connector	Mating Housing	Terminal
ML20	CN1 (AC Input)	Molex 41791-03 or equivalent	Molex 2139	Molex 2478
	CN2 (DC Output)	Molex 41791-04 or equivalent	A3996H02-4P	Molex 2478
ML45	CN1 (AC Input)	JST B3P-VH or equivalent	JST VHR or equivalent	JST SVH-21T-P1.1 or equivalent
	CN2 (DC Output)	JST B4P-VH or equivalent	JST VHR or equivalent	JST SVH-21T-P1.1 or equivalent
ML60	CN1 (AC Input)	JST B3P-VH or equivalent	JST VHR or equivalent	JST SVH-21T-P1.1 or equivalent
	CN2 (DC Output)	JST B4P-VH or equivalent	JST VHR or equivalent	JST SVH-21T-P1.1 or equivalent
ML100	CN1 (AC Input)	JST B3P-VH or equivalent	JST VHR-3N or equivalent	JST SVH-21T-P1.1 or equivalent
	CN2 (DC Output)	JST B4P-VH or equivalent	JST VHR-4N or equivalent	JST SVH-21T-P1.1 or equivalent
ML150	CN1 (AC Input)	JST B3P-VH or equivalent	JST VHR-3N or equivalent	JST SVH-21T-P1.1 or equivalent
	CN2 (External Fan Power)	JST B2B-XH-A or equivalent	JST XHP-2 or equivalent	JST SXH-001T-P0.6 or equivalent
	CN3 (DC Output)	JST B6P-VH or equivalent	JST VHR-6N or equivalent	JST SVH-41T-P1.1 or equivalent
ML250	CN1 (AC Input)	JST B3P-VH or equivalent	JST VHR-3N or equivalent	JST SVH-21T-P1.1 or equivalent
	CN2 (External Fan Power)	JST B2B-XH-A or equivalent	JST XHP-2 or equivalent	JST SXH-001T-P0.6 or equivalent
	CN4 (DC Output)	JST B6P-VH or equivalent	JST VHR-6N or equivalent	JST SVH-41T-P1.1 or equivalent
ML350	CN1 (AC Input)	JST B3P-VH or equivalent	JST VHR-3N or equivalent	JST SVH-21T-P1.1 or equivalent
	CN3 (External Fan Power)	JST B2B-XH-A or equivalent	JST XHP-2 or equivalent	JST SXH-001T-P0.6 or equivalent
	CN4 (DC Output)	JST B6P-VH or equivalent	JST VHR-6N or equivalent	JST SVH-41T-P1.1 or equivalent

Model	Designator	Connector	Mating Housing	Terminal
ML450	CN1 (AC Input)	JST B5P-VH or equivalent	JST VHR-3N or equivalent	JST SVH-21T-P1.1 or equivalent
	CN3 (External Fan Power)	JST B2B-XH-A or equivalent	JST XHP-2 or equivalent	JST SXH-001T-P0.6 or equivalent
	CN7 / CN8 (DC Output)	M4 Pan Head Screw	M4 PC Mount Screw Terminal	N/A
	CN6 (Control)	JST S8B-PHDSS or equivalent	JST PHD-08VS or equivalent	JST SPHD-002T-P05 or equivalent
ML1200	CN2 (Control)	JST S24B-PHDSS or equivalent	JST PHDR-24VS or equivalent	JST SPHD-002T-P0.5 or equivalent

Table 4-5 ML Mating Connectors

4.8 Output Grounding

The DC RETURN signal may be connected to the power supply chassis ground (safety earth) at the plated through mounting hole(s) shown colored in red in Figure 4-10.

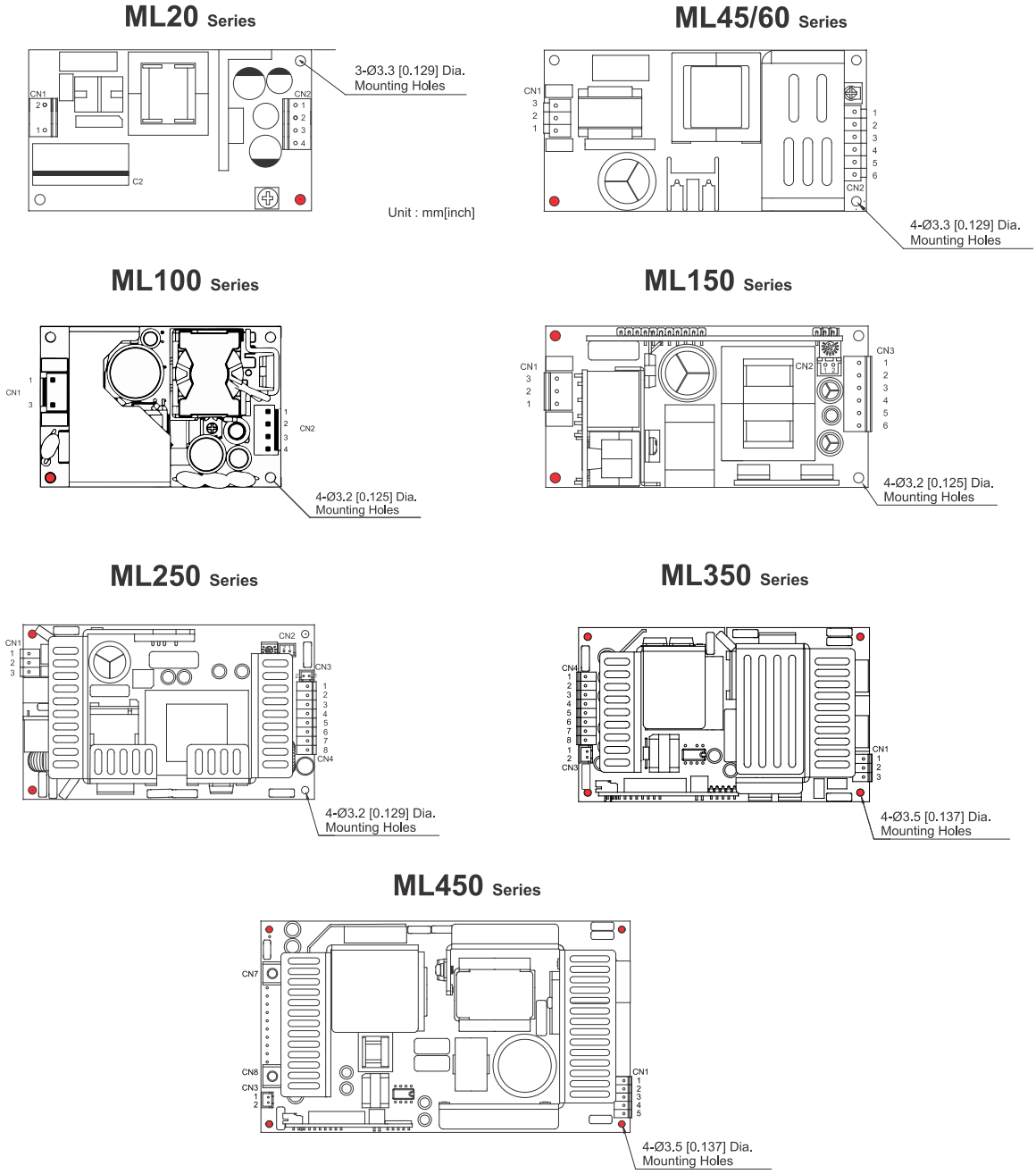


Figure 4-10 Chassis Grounding Locations

4.9 Signal Pin Definitions

Model	Connector	Pin No.	Assignment
ML20	CN1 (AC Input)	1	AC / N
		2	AC / L
	CN2 (DC Output)	1	+V
		2	+V
		3	-V
		4	-V
ML45-12 thru -48	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
	CN2 (DC Output)	1,2	+V
		3,4	-V
ML45-05F & -05K	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
	CN2 (DC Output)	1,2	V1
		3,4	COM
		5	V2
		6	NC
ML60-12 thru -48	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
	CN2 (DC Output)	1,2	+V
		3,4	-V
ML60-05F & -05K	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
	CN2 (DC Output)	1,2	V1
		3,4	COM
		5	V2
		6	NC
ML100		1	AC / L
		3	AC / N
		1,2	-V
		3,4	+V
ML150	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
	CN2 (External Fan Power)	1	GND
		2	+12V
	CN3 (DC Output)	1,2,3	+VO

Model	Connector	Pin No.	Assignment
		4,5,6	-VO
ML250	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
	CN2 (External Fan Power)	1	GND
		2	+12V
	CN4 (DC Output)	5,6,7,8	+VO
		1,2,3,4	-VO
ML350	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
	CN3 (External Fan Power)	1	GND
		2	+12V
	CN4 (DC Output)	1,2,3,4	VO+
		5,6,7,8	VO-
	CN6 (Control)	1	VS+
		2	S GND
		3	INH-
		4	No Pin
		5	VS-
		6	POK
		7	INH+
		8	VS-
ML450	CN1 (AC Input)	1	AC / N
		2	No Pin
		3	AC / L
		4	No Pin
		5	FG
	CN3 (External Fan Power)	1	GND
		2	+12V
	CN7 (DC Output)	N/A	VO+
	CN8 (DC Output)	N/A	VO-
	CN6 (Control)	1	VS+
		2	S GND
		3	INH-
		4	No Pin
		5	VS-
		6	POK
		7	INH+
		8	VS-

Model	Connector	Pin No.	Assignment
ML1200	AC Input Terminal	1	ACL
		2	ACN
		3	D
	CN2 (Control)	1	VS+
		2	VO+
		3	VS-
		4	VO-
		5	POK
		6	GND
		7	PAR
		8	VSET
		9	EN-
		10	GND
		11	EN+
		12	AUX
		13	ACI
		14	GND
		15	VCI
		16	GND
		17	AUX
		18	GND
		19	SCL
		20	SDA
		21	AUX
		22	GND
		23	No Pin
		24	No Pin

Table 4-6 ML Signal Pin Definitions

5. Efficiency

The efficiencies for Medical power supplies are listed below. They were measured at full load, 25C at 230AC.

Model	Output	Load	AC	Efficiencey
ML05	5V	1.00A	230VAC	71%
ML05	12V	0.42A	230VAC	75%
ML05	15V	0.33A	230VAC	75%
ML05	24V	0.21A	230VAC	77%
ML10	5V	2.00A	230VAC	77%
ML10	12V	0.82A	230VAC	79%
ML10	15V	0.66A	230VAC	80%
ML10	24V	0.42A	230VAC	82%
ML15	5V	3.00A	230VAC	79%
ML15	12V	1.25A	230VAC	82%
ML15	15V	1.00A	230VAC	84%
ML15	24V	0.63A	230VAC	85%
ML20	5V	4.00A	230VAC	77%
ML20	12V	1.66A	230VAC	82%
ML20	15V	1.33A	230VAC	84%
ML20	24V	0.84A	230VAC	85%
ML45	12V	3.75A	230VAC	85%
ML45	15V	3.00A	230VAC	85%
ML45	24V	1.87A	230VAC	86%
ML45	48V	0.94A	230VAC	87%
ML45-05F	5V	4.20A	230VAC	80%
	12V	1.60A		
ML45-05K	5V	3.50A	230VAC	82%
	24V	1.10A		
ML60	12V	5.00A	230VAC	85%
ML60	15V	4.00A	230VAC	85%
ML60	24V	2.50A	230VAC	86%
ML60	48V	1.25A	230VAC	87%
ML60-05F	5V	5.00A	230VAC	80%
	12V	2.00A		
ML60-05K	5V	3.50A	230VAC	82%
	24V	1.50A		
ML100	12V	8.34A	230VAC	91%
ML100	15V	6.67A	230VAC	92%
ML100	24V	4.17A	230VAC	92%
ML100	28V	3.58A	230VAC	92%
ML100	36V	2.78A	230VAC	91%

Model	Output	Load	AC	Efficiencey
ML100	48V	2.09A	230VAC	91%
ML150	12V	12.50A	230VAC	90%
ML150	15V	10.00A	230VAC	91%
ML150	24V	6.25A	230VAC	90%
ML150	48V	3.12A	230VAC	91%
ML250	12V	20.85A	230VAC	90%
ML250	15V	16.67A	230VAC	90%
ML250	24V	10.45A	230VAC	91%
ML250	48V	5.25A	230VAC	91%
ML350	12V	29.17A	230VAC	90%
ML350	15V	23.34A	230VAC	90%
ML350	24V	14.60A	230VAC	90%
ML350	48V	7.30A	230VAC	91%
ML450	12V	37.50A	230VAC	90%
ML450	15V	30.00A	230VAC	90%
ML450	24V	18.75A	230VAC	90%
ML450	48V	9.39A	230VAC	91%
ML1200	12V	100.00A	230VAC	89%
ML1200	15V	80.00A	230VAC	90%
ML1200	24V	50.00A	230VAC	91%
ML1200	30V	40.00A	230VAC	92%
ML1200	36V	33.40A	230VAC	92%
ML1200	48V	25.00A	230VAC	93%
ML1200	60V	20.00A	230VAC	93%

Table 5-1 ML Series Output Currents at Rated Efficiency

6. Signals

6.1 Power Good Signal/PS_OK Signal/

6.1.1 Power Good (PG)

The Power Good (PG) Signal provides a low logic level to indicate that sufficient time has expired for the DC outputs to be 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.

6.1.2 PS_OK

The PS_OK signal is the logical complement of the Power Good signal and both signals are driven by open-collector transistors.. The electrical specifications for the Power Good and PS_OK outputs are described in Table 6-1.

Signal Type	
Power OK□ (Power good, Logic low)	Models ML1200-12 thru 60
Power On Delay	Models ML05 thru ML15 <100ms Model ML20 <1000ms Model ML45 <500ms Models ML45-05F and -05K <200ms Model ML60 <500ms Models ML60-05F and -05K <200ms Model ML100 <1000ms Models ML150 and ML250 <2000ms, 230VAC; <3500ms, 115VAC Models ML350, ML450 and ML1200 <800ms
Rise Time	Models ML05, ML10 and ML15 <25ms/230VAC, 25ms/115VAC at full load Model ML20 <35ms/230VAC, 25ms/115VAC at full load Model ML45 <30ms/230VAC, 30ms/115VAC at full load Models ML45-05F and 05K <15ms/230VAC, 15ms/115VAC at full load Model ML60 <30ms/230VAC, 30ms/115VAC at full load Models ML60-05F and 05K <15ms/230VAC, 15ms/115VAC at full load Model ML100 10ms to 30ms 115/230VAC at full load Models ML150 and ML250 <50ms/230VAC, 50ms/115VAC at full load Model ML350 <150ms/230VAC at full load Model ML450 <150ms/230VAC at full load Model ML1200 <100ms/230VAC, 100ms/115VAC at full load
PS_OK Output	Models MP250, MP350, MP450 and MP1200 are open collector transistors.

Table 6-1 ML Status and Control Signal Specifications

6.2 Power OK LED

An LED on ML1200-12 thru -60 models (single output models) illuminates solid green whenever the Power OK signal is true (high). See Figure 6-1 for the LED location on the rear of the power supply and see Table 6-2 for the LED status modes.

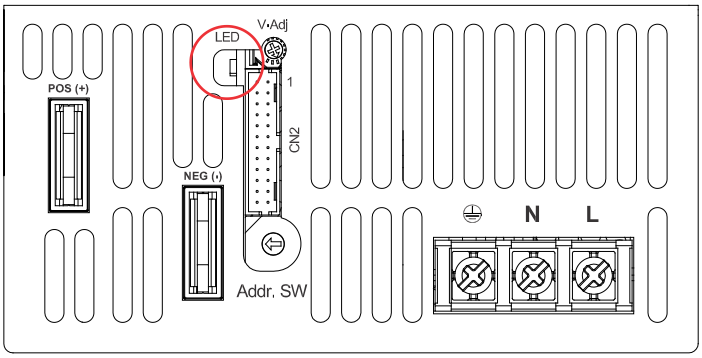


Figure 6-1 ML1200 LED Location

LED	Signal	Status
Solid (Green)		Power OK (Local mode)
Solid (Orange)		Power OK (Remote mode)
Slow Blink (Green)		Power Standby
Fast Blink (Red)		Over Voltage Protection (OVP)
Solid (Red)		Over Load Protection (OLP)
Slow Blink (Red)		Over Temperature Protection (OTP)
Intermittent Blink (Red)		Fan Failure
Interlace Blink (Red)		Power Failure

Table 6-2 ML1200 LED Status Modes

6.3 Voltage Hold-Up Time

The power supply will maintain output regulation per Table 3-1 despite a loss of input power.

Models	Hold-Up Time
ML05 thru ML15	25ms/115VAC at full load and 25ms/230VAC
ML20	18ms/115VAC at full load and 60ms/230VAC
ML45	13ms/115VAC at full load and 50ms/230VAC
ML45-05F & -05K	14ms/115VAC at full load and 70ms/230VAC
ML60	13ms/115VAC at full load and 50ms/230VAC
ML60-05F & -05K	14ms/115VAC at full load and 70ms/230VAC
ML100	16ms/115vac at full load and 30ms/230VAC
ML150	16ms/115VAC at full load and 16ms/230VAC
ML250	10ms/115VAC at full load and 10ms/230VAC
ML350	>5ms at 350W / 230VAC
ML450	>16ms at 450W / 230VAC
ML1200	16ms/230VAC

Table 6-3 Hold-Up Time by Model

7. Ordering Information

N2Power is in the process of changing the model numbering system for single-output power supplies to reflect the actual output voltage instead of a code. The following table provides the N2Power part numbers that should appear on your purchase order and will appear on any N2Power correspondence:

New Model Number	V1	N2Power Part Number
ML05-05	5V	400200-01-0
ML05-12	12V	400200-02-8
ML05-15	15V	400200-03-6
ML05-24	24V	400200-04-4
ML10-05	5V	400201-01-8
ML10-12	12V	400201-02-6
ML10-15	15V	400201-03-4
ML10-24	24V	400201-03-4
ML15-05	5V	400202-01-6
ML15-12	12V	400202-02-4
ML15-15	15V	400202-03-2
ML15-24	24V	400202-04-0
ML20-05	5V	400203-01-4
ML20-12	12V	400203-02-2
ML20-15	15V	400203-03-0
ML20-24	24V	400203-04-8
ML45-12	12V	400204-01-2
ML45-15	15V	400204-02-0
ML45-24	24V	400204-03-8
ML45-48	48V	400204-04-6
ML45D-05F	5V	400204-05-3
ML45D-05K	5V	400204-06-1
ML60-12	12V	400205-01-9
ML60-15	15V	400205-02-7
ML60-24	24V	400205-03-5
ML60-48	48V	400205-04-3
ML60D-05F	5V	400205-05-0
ML60D-05K	5V	400205-06-8
ML100-12	12V	400211-01-7
ML100-15	15V	400211-02-5
ML100-24	24V	400211-03-3
ML100-28	28V	400211-04-1
ML100-36	36V	400211-05-8
ML100-48	48V	400211-06-6

New Model Number	V1	N2Power Part Number
ML150-12	12V	400206-01-7
ML150-15	15V	400206-02-5
ML150-24	24V	400206-03-3
ML150-48	48V	400206-04-1
ML250-12	12V	400207-01-5
ML250-15	15V	400207-02-3
ML250-24	24V	400207-03-1
ML250-48	48V	400207-04-9
ML350-12	12V	400208-01-3
ML350-15	15V	400208-02-1
ML350-24	24V	400208-03-9
ML350-48	48V	400208-04-7
ML450-12	12V	400209-01-1
ML450-15	15V	400209-02-9
ML450-24	24V	400209-03-7
ML450-48	48V	400209-04-5
ML1200-12	12V	400210-01-9
ML1200-15	15V	400210-02-7
ML1200-24	24V	400210-03-5
ML1200-30	30V	400210-04-3
ML1200-36	36V	400210-05-0
ML1200-48	48V	400210-06-8
ML1200-60	60V	400210-07-6

Table 7-1 ML Series Part Numbers

All ML Series power supplies are RoHS compliant For warranty information refer to www.n2power.com . 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
Address	3990-B Heritage Oak Court	Simi Valley CA 93063