TDK·Lambda

ZMS100

AC/DC Power Supply Series

APPLICATION NOTE

Contents

1. INPUT

AC INPUT LINE REQUIREMENTS

See datasheet for specification of input line requirements (including Input voltage range, Input frequency, Input harmonics, Input current and leakage current)

The power supply will automatically recover from AC power loss and start-up with maximum loading at 90VAC.

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

- Input Fuses

Two internal fuses are fitted, one in each AC line. These fuses are not user serviceable. Fuses are rated T3,15AL; 250 Vac.

- Input Undervoltage

The power supply is protected against the application of an input voltage below the minimum specified so that it shall not cause damage to the power supply.

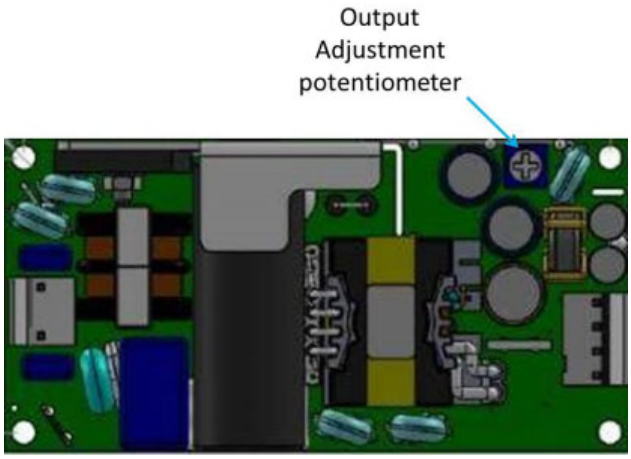
The typical turn on voltage is 81VAC, typical turn off voltage is 70VAC. (Full load, 25°C ambient)

2. DC OUTPUT

OUTPUT VOLTAGE ADJUSTMENT

The output voltage can be adjusted across the range shown using the potentiometer.

Model	Nominal Output Voltage	Adjustment Range
ZMS100-12	12V	11.4 to 13.2V
ZMS100-15	15V	14.25 to 16.5V
ZMS100-24	24V	22.8 to 26.4V
ZMS100-28	28V	**TBD**
ZMS100-36	36V	34.2 to 39.6V
ZMS100-48	48V	45.6 to 52.8V



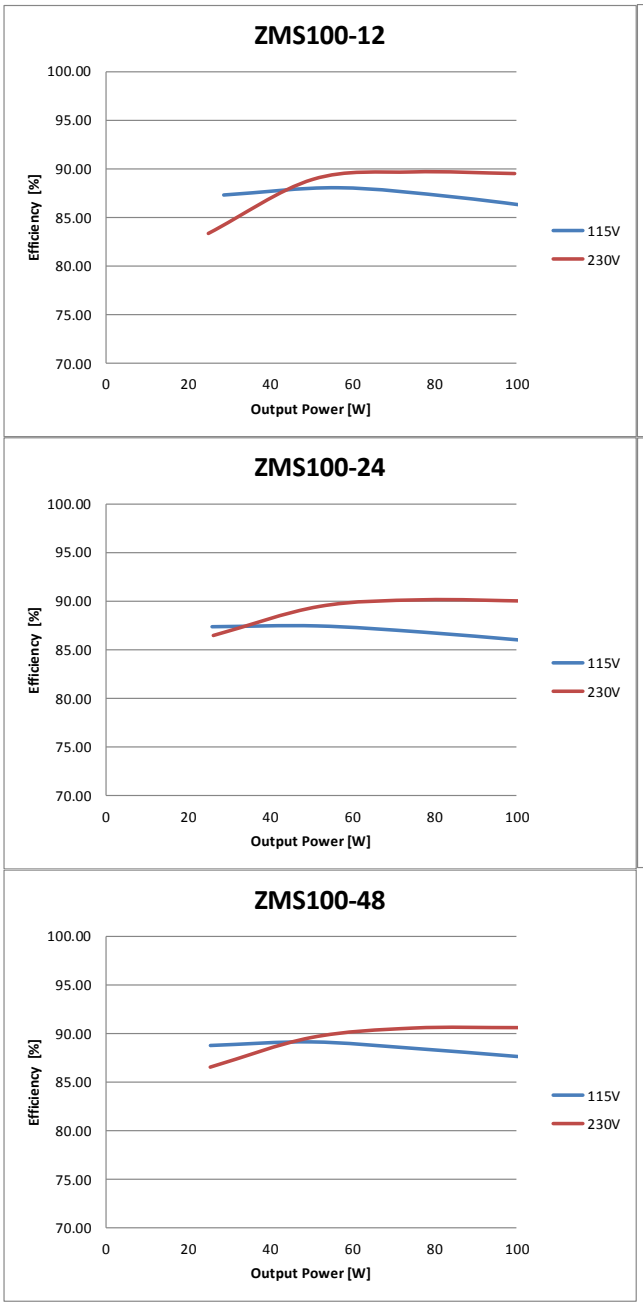
REMOTE SENSE

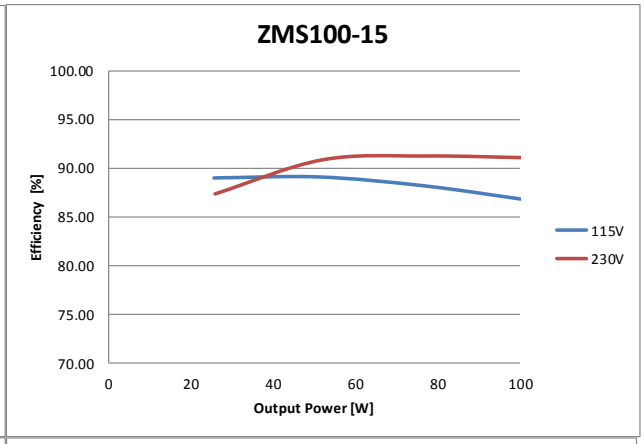
No remote sense connection is available

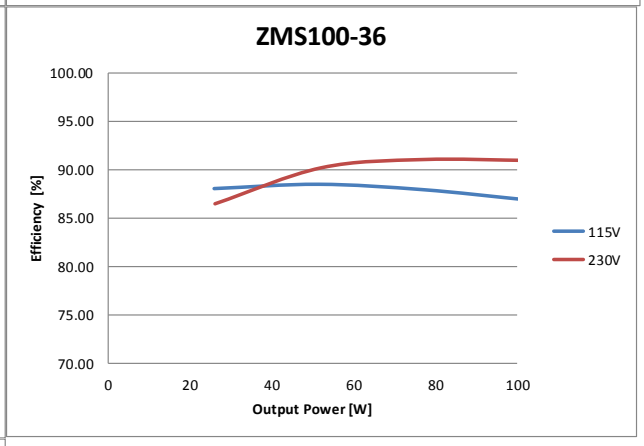
EFFICIENCY

The following charts show the typical efficiency of the ZMS.

ZMS100-12







NO LOAD OPERATION

No minimum load is required for the power supply to operate within specification.

CAPACITIVE LOAD OPERATION

The maximum capacitance that can be connected to the output is as follows:

Model Number	ZMS100-12	ZMS100-15	ZMS100-24	ZMS100-28	ZMS100-36	ZMS100-48
Maximum Capacitance (µF)	3,950	3,150	2,800	**TBD**	1,300	470

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SERIES CONNECTION

It is possible to connect multiple ZMS100 power supplies in series. Do not exceed 150V for the total voltage of outputs connected in series.

Each ZMS100 should have a diode fitted across the output and rated for the output current of the ZMS100.

The outputs connected in series are non-SELV (Safety Extra Low Voltage) if the total output voltage plus 30% of the highest maximum rated output voltage, exceeds 60V (the 30% addition allows for a single fault in any one individual channel).

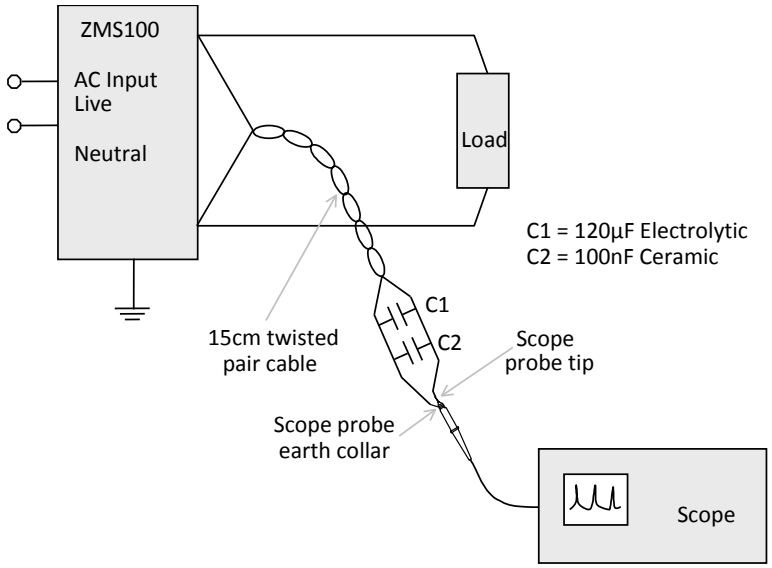
PARALLEL CONNECTION

Outputs must not be connected in parallel as this may cause overheating and reduced field life.

OUTPUT CHARACTERISTICS

Ripple and Noise

Ripple and noise is defined as periodic or random signals over a frequency range of 10Hz to 20MHz. Measurements are to be made with an 20MHz bandwidth oscilloscope. Measurements are taken at the end of a 150mm length of a twisted pair of cables, terminated with a 100nF ceramic capacitor and a 120µF electrolytic capacitor. The earth wire of the oscilloscope probe should be as short as possible; winding a link wire around the earth collar of the probe is the preferred method.



Ripple and Noise Measurement

Transient Response Performance

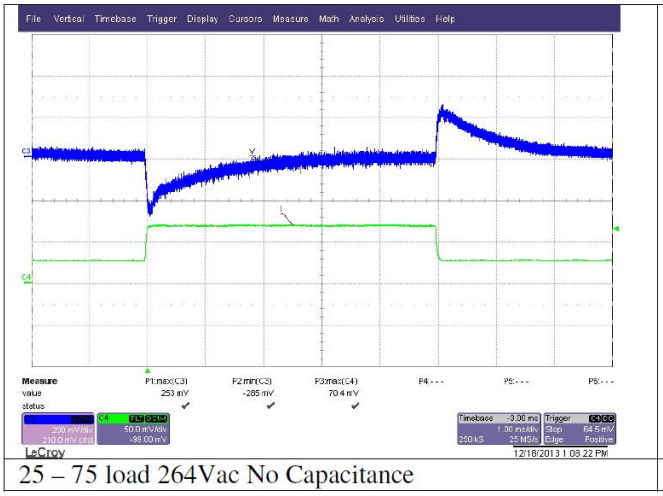
The transient response specification refers to a 25%-75% load change, 100Hz repetition rate, 50% duty cycle at 25°C ambient temperature

Dynamic Load Response (25°C or higher ambient)

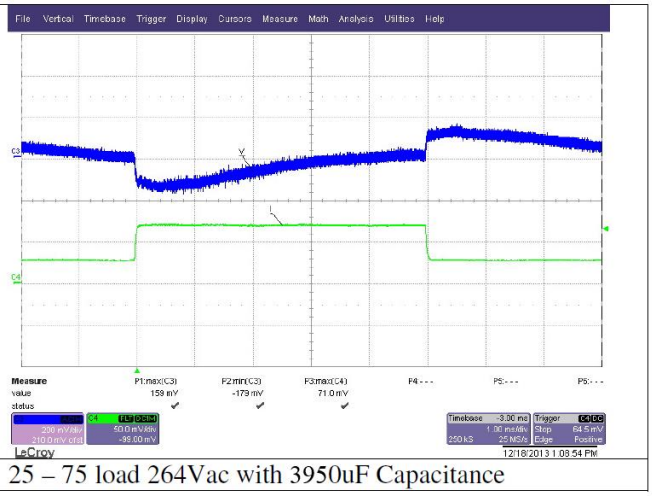
For a 25 to 75% load change the output voltage will remain with 5% of the nominal output voltage.

The output will recover to within 2% of the nominal output voltage in ≤ 1ms for a 25 to 75% load change. Additional capacitance can be added across the output which can reduce over/undershoots as shown below:

ZMS100-12 model



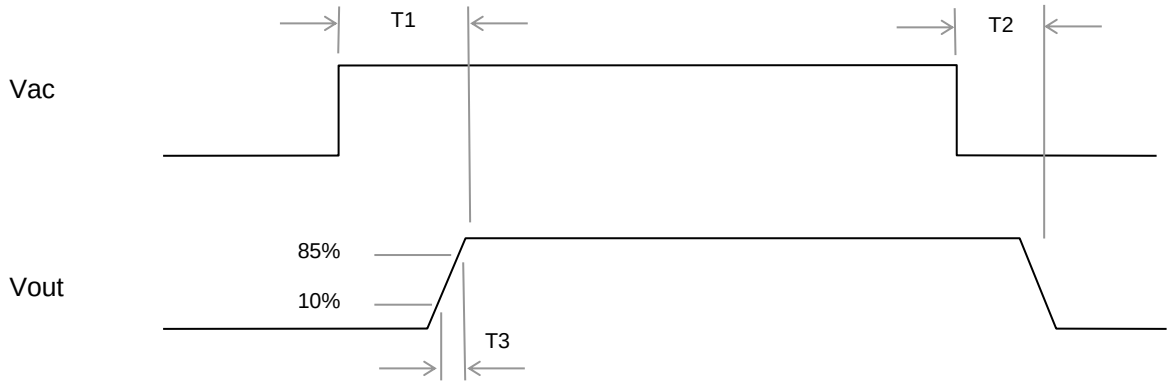
25 – 75 load 264Vac No Capacitance



25 – 75 load 264Vac with 3950uF Capacitance

POWER SUPPLY TIMING

Output timing diagram

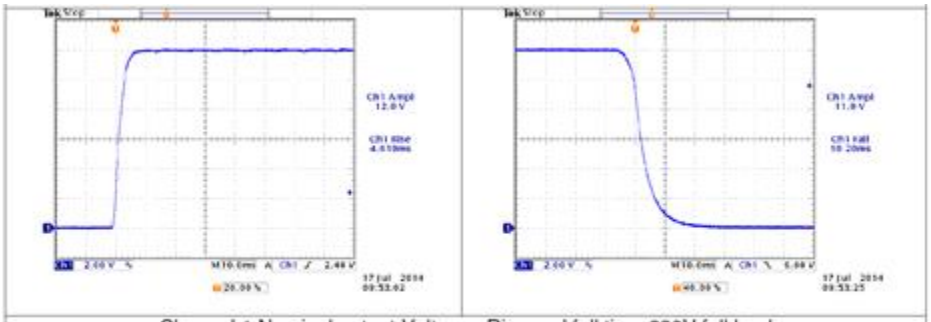


	min	Typical	max	Description
T1			1s	Turn on time
T2	8ms			Hold up time at 100VAC
T3			50ms	Rise time

OVERSHOOT AT TURN ON/OFF

The output voltage overshoot upon the application or removal of the input mains voltage shall be less than 5% (typically <1%) above the nominal voltage. No opposite polarity voltage is present at any time.

The turn on/off characteristics for the ZMS100-12 unit are shown below.



Channel 1 Nominal output Voltages Rise and fall time 230V full load

OUTPUT PROTECTION

No Load Operation

The power supply will operate with no load on the output with no damage, hazardous condition or reduction in performance.

Over current protection

If a load is applied which puts the power supply into over current then the power supply will enter a hiccup state. This will turn the output off for typically 300ms, then on for typically 35ms. This state will continue until the over load is removed.

Short-Circuit Protection

A short circuit is defined as an impedance of <0.1 Ohms placed between the DC return and any output. A short circuit on the output will cause no damage to the power supply and will cause it to shutdown. The power supply will attempt to restart until the short-circuit is removed. After removal of the short circuit, the power supply will maintain normal operation.

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Over temperature protection

No specified over temperature protection is provided. As a note, some internal component(s) have internal over temperature protection built in, but this is not to be relied upon to ensure safe, reliable operation.

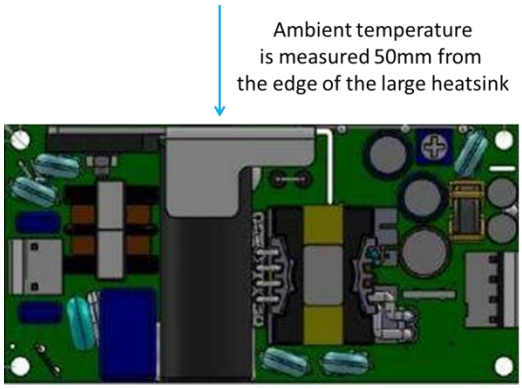
Over voltage protection

An overvoltage on the output will cause the power supply to shut-down. To restart, remove the ac supply for at least 10 seconds and then reapply.

3. COOLING REQUIREMENTS

Convection Cooling

The maximum continuous rating of the power supply is specified on the datasheet (model dependant), with the power supply mounted horizontally (component side uppermost).



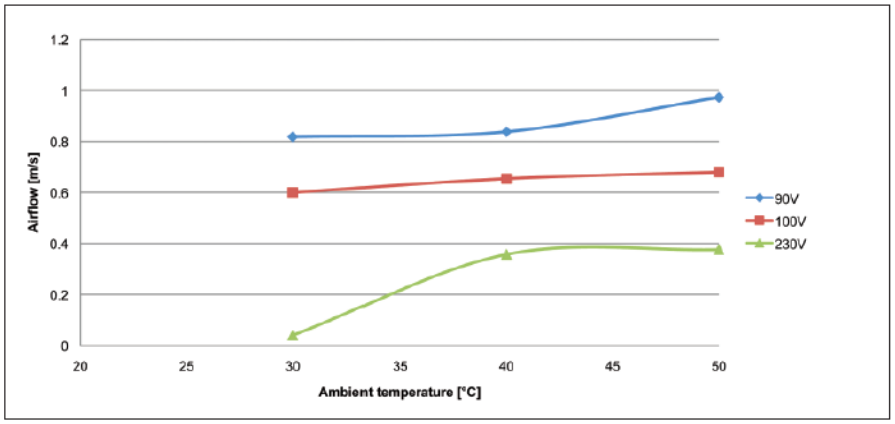
Above 50°C ambient, the output power (and output current) must be de-rated by 2.5%/°C up to 70°C.

Forced Air Cooling

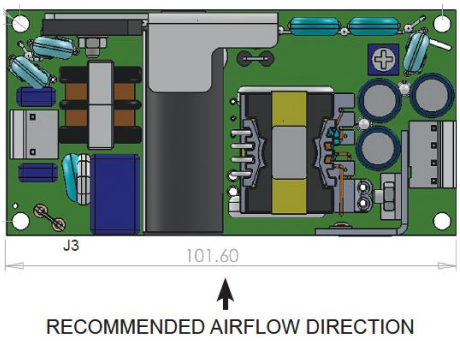
The maximum continuous rating of the power supply is specified on the datasheet (model dependant) up to 50°C. Above this temperature, the total output power (output current) must be de-rated by 2.5%/°C up to 70°C.

The amount of airflow required depends upon the applied input voltage.

Below is shown the minimum required airflow for ZMS100-24 at 100W output to ensure the safety critical components do not exceed their maximum ratings.



Refer to the ZMS100 handbook for the test method and components to be monitored to ensure safe, reliable operation.

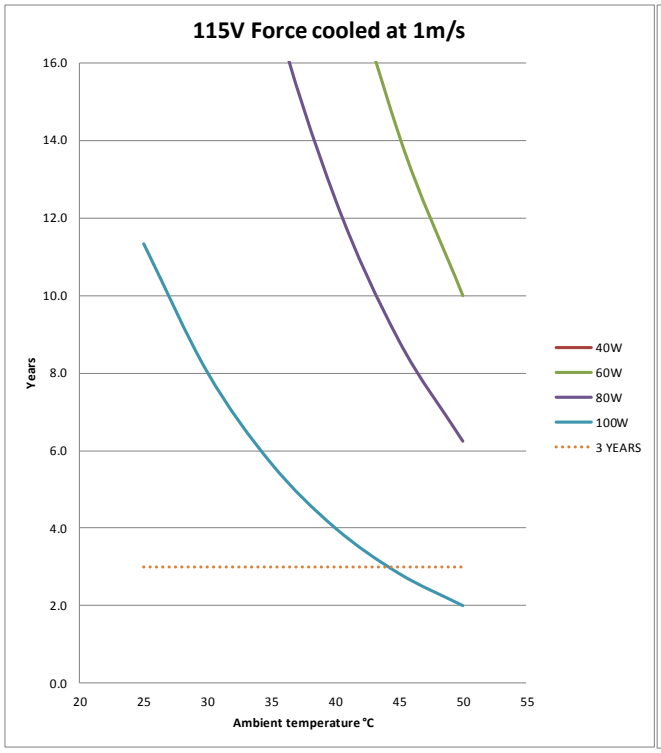


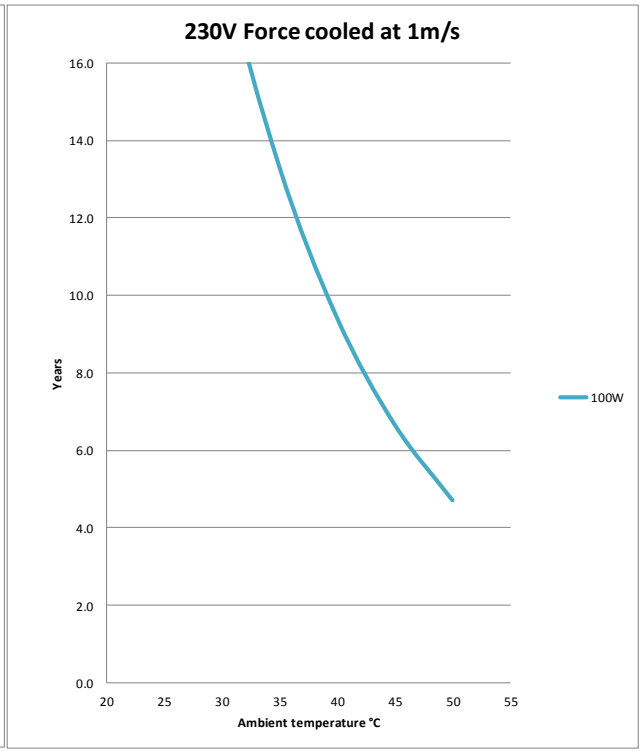
4. RELIABILITY

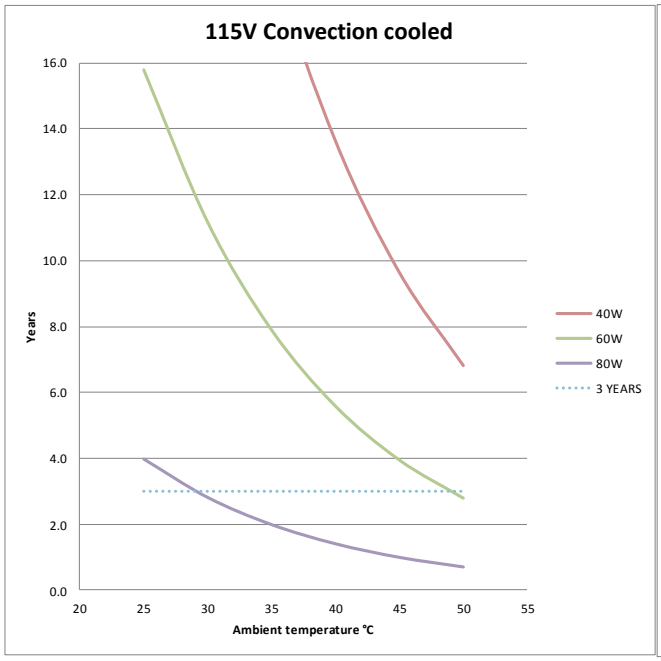
Calculated according to Telcordia SR332 Issue 1, Method I, Case 3, Ground Benign Controlled, at 30°C

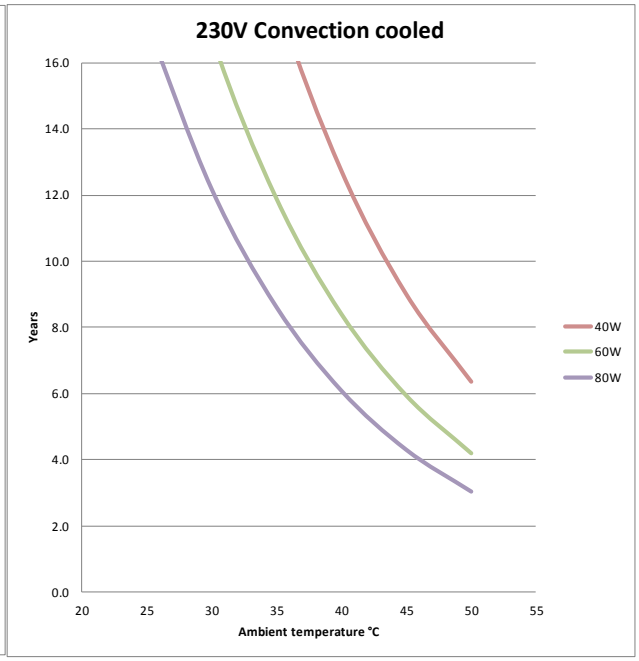
60W convection cooled – 650,307 hours
80W convection cooled – 431,367 hours
100W forced air cooled – 1,015,849 hours

Electrolytic Capacitor Lifetime (ZMS100-12 shown)



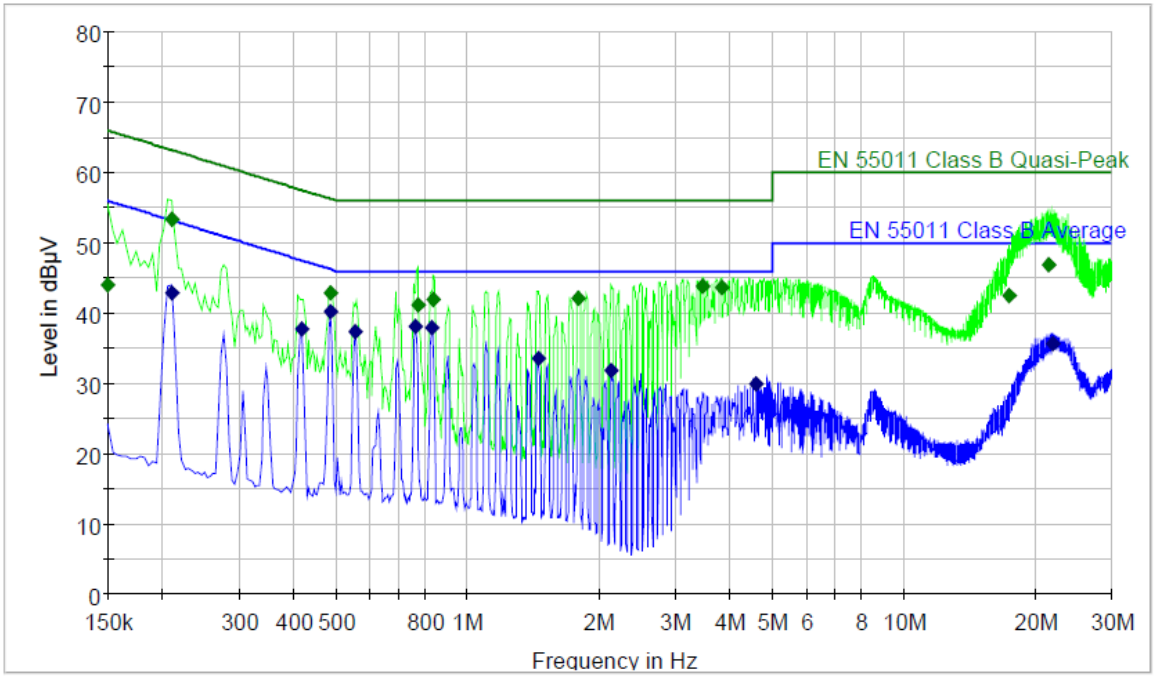






5. ELECTROMAGNETIC COMPATIBILITY

Typical Conducted Emissions result for the ZMS100-12 at 100W output:



INSTALLATION FOR OPTIMUM EMC PERFORMANCE

Mounting

All equipment ideally should be mounted inside an earthed shielded metal box. Alternatively an earthed metal plate can be used to mount the power supply and load. All four mounting holes (one in each corner) on the ZMS100 should be utilized for best electrical and mechanical performance, with 6mm (minimum height) metal stand offs.

The ZMS100 can be operated as a Class II power supply (without a ground connection). If used inside of a plastic enclosure, the fitted link wire connects the input and output noise filtering ceramic “Y” capacitors together. This replaces the connection that would be made by the use of a metal plate.

Cables

All cables (both AC input and DC output) should be run as close as possible to the earthed metal box/plane. AC input cable should be a twisted group laid as flat to the earthed metal box/plane as possible.

All output cables should be routed as far away from the input cables as possible. If the input and output cables must be run close to each other screen one (or ideally both).

The positive and negative supply cables should be twisted together.
All cable run loops should be kept as small as possible (this should be implemented in the system PCB design also).

Connecting between boxes

If cables must be connected between equipment boxes, then at the closest possible point to the port where the cables exit the 1st enclosure connect 100nF decoupling Y caps (between the output and earth). Note that these capacitors must be rated at the working voltage. Ideally these capacitors should be between all signal cables which have to connect between boxes although this may not be practical if fast switching [digital] signals are involved (if this is the case then smaller value Y capacitors should be used).

Earth star point

Where the AC supply enters the equipment, this should be taken to a 'star point' chassis mounted earth point (Note for compliance with EN60950-1 requires the main protective earth to have its own dedicated spring washer and nut) as close as possible to the mains inlet. All other earth points should be taken back to this point only.

Switching frequency

The ZMS has a variable switching frequency ranging from 28kHz to 200kHz, depending upon the input voltage, output voltage and output load.

6. CONNECTIONS

(J1) AC Input Mating Connector Parts

Molex part numbers		Crimps required
Housing	Crimp	
09-50-1031	08-70-1030	2

(J1) AC Input Connector Pin Definition

Pin	Function
J1-1	Neutral
J1-2	No connection
J1-3	Live

(J2) Output Mating Connector Parts

Molex part numbers		Crimps required
Housing	Crimp	
09-50-1041	08-70-1030	4

(J2) Output Connector Pin Definition

Pin	Function
J2-1	- Vout (0V)
J2-2	- Vout (0V)
J2-3	+ Vout
J2-4	+ Vout

(J3) Earth Ground Connector Pin Definition

Pin	Function
J3-1	Earth

(J3) Ground Mating Connector Part

Tyco part numbers		Qty required
22-18AWG	16-14AWG	
2-520407-2	3-520408-2	1

7. MOUNTING

Please refer to handbook for allowable orientations.

Mount using all four corner holes.

8. WEIGHT

The ZMS100 weighs 150 grams