OVERVIEW

The PQC250 is designed to be deployed in applications where cooling is primarily considered to be by convection cooling airflow (as opposed to "forced" airflow as provided by a system fan).
As such the design is efficient and designed to dissipate the minimum possible power. However to benefit from convection cooling, the power supply requires to be deployed in the most advantageous orientation in the system enclosure.

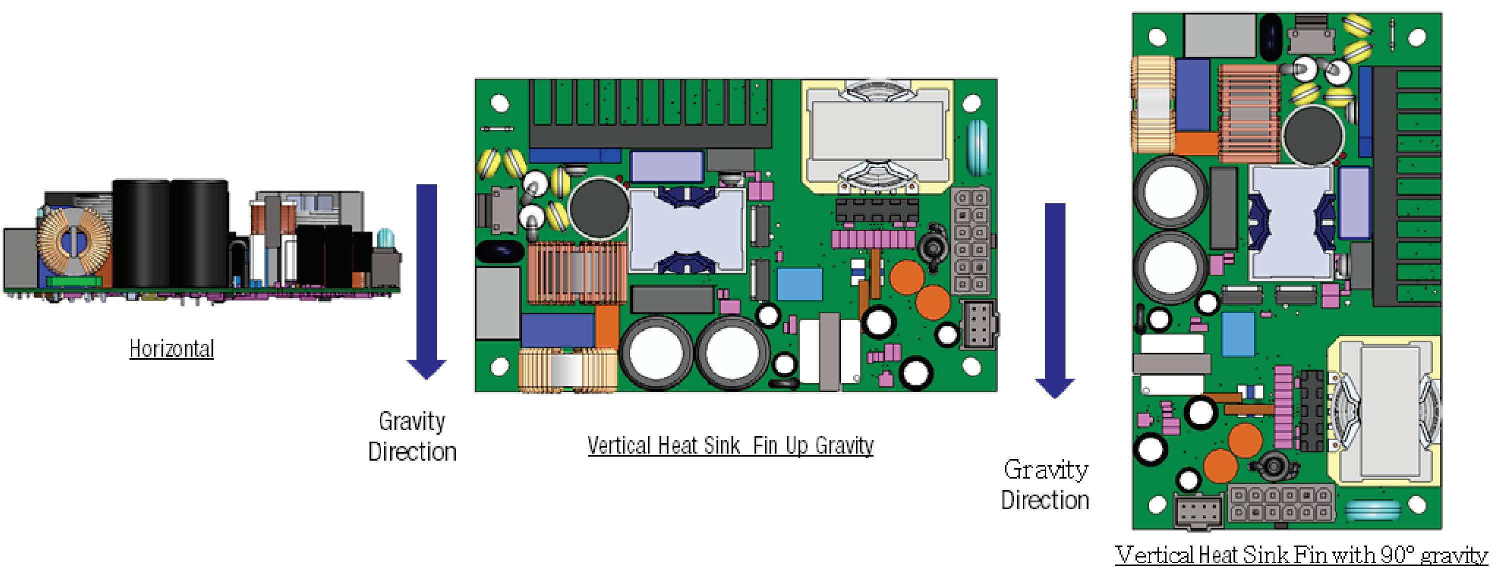
DEPLOYMENT NOTES

There are several factors that can influence the performance of the PQC250 when deployed in an End User application:

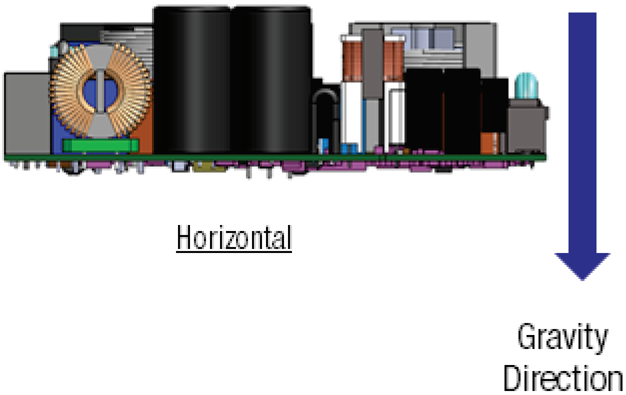
1. Mounting orientations within a customer enclosure. The orientation that is selected for a particular deployment, can affect the overall temperature ofassuming components that are considered safety critical and can also affect long term reliability and life.
2. The overall enclosure size; the volume of air that surrounds the PQC250 and the freedom of circulating convection airflow currents.
3. The external prevailing maximum ambient to the enclosure.
4. Any additional "heat sources" in the enclosure elevating the internal ambient.
5. The enclosure case material; i.e. a metal case will lose heat by conduction through the walls; if these are also provided with some form of "finning" to increase the surface area this would be beneficial.
   Conversely if the enclosure material is a poor heat conductor (plastic) then heat will not be lost to the external ambient by conduction through the walls.
6. Whether the box is sealed or if there are slots/louvres or holes to allow cooling air to enter and exhaust

MOUNTING ORIENTATION

The PQC250 has been qualified with the following mounting orientations:



Testing has revealed that the most advantageous orientation is the horizontal placement:



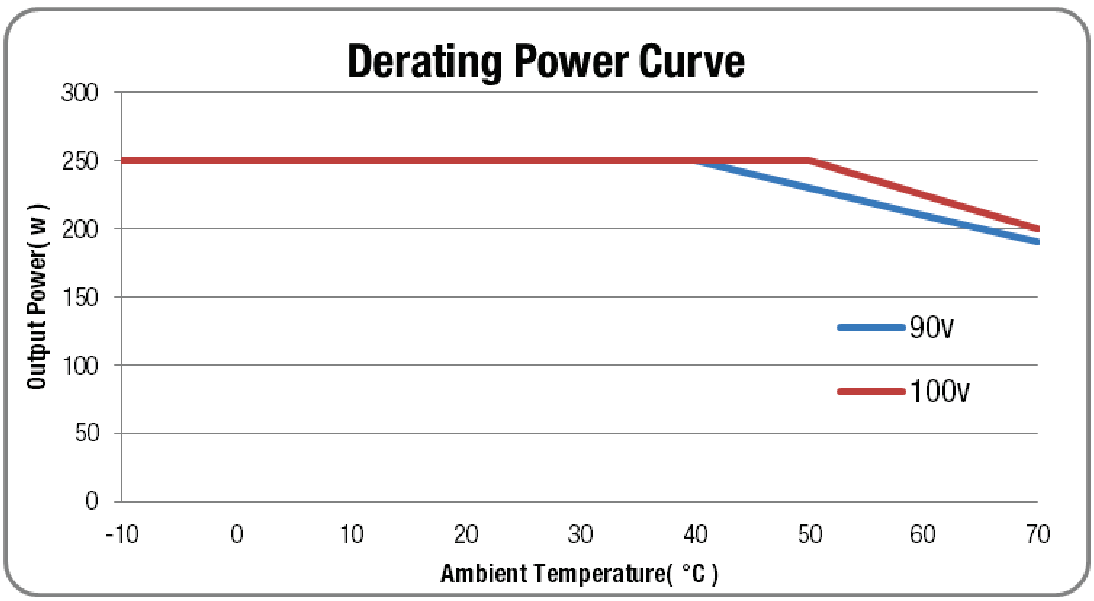
This orientation allows for the most isothermal spread of temperatures across the area of the component side of the PCB.

Even with this, additional space is required above the PCB to allow free circulation of convection cooling currents.

Deployments in 1U "pizza box" (enclosures) are likely not able to provide a free space above the power supply to allow free circulation of convection currents; therefore to prevent stagnation it is recommended that some form of "forced" airflow is provided either from system fans or from a fan dedicated for the power supply. In either case a low velocity flow of 50 to 100LFM should be adequate.

As identified, the PC250 is capable of mounting in other orientations however although "least preferred" these can still provide acceptable operation providing that adequate airflow movement is provided.

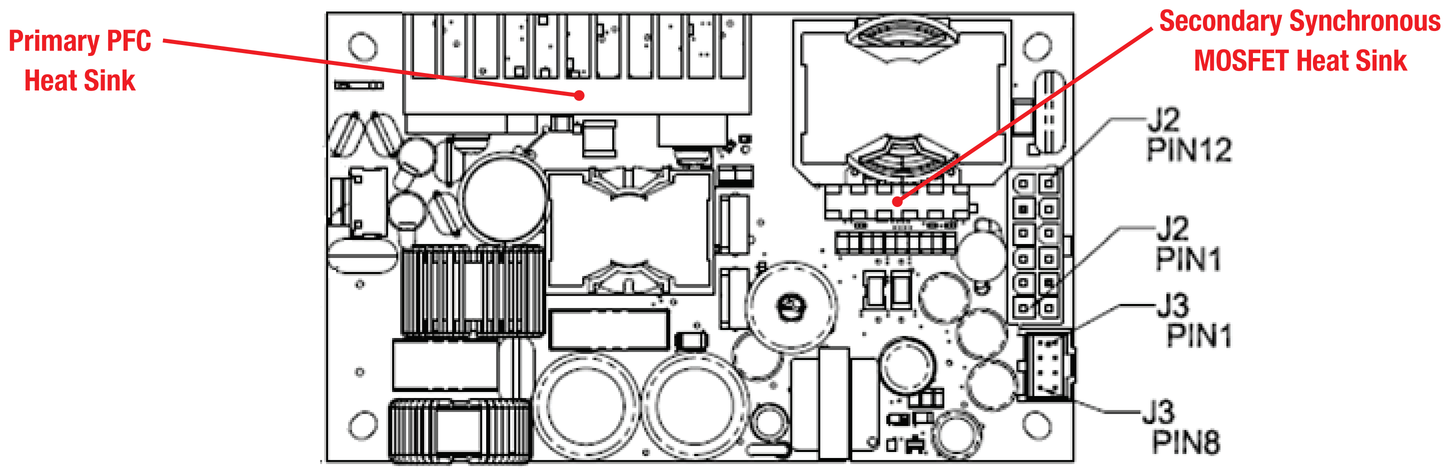
Since the PQC250 is intended for deployment across multiple market segments and is primarily intended as a convection cooled device, it is difficult to provide definitive rules that will allow operation in all diverse End User systems and operation conditions. The PQC250 will reliably provide 250W output power in line with the minor restriction of the derating power curve shown below:



However, there are two overriding factors that **must be observed** for reliable operation of the power supply:

a. The PQC250 is provided with two internal Over Temperature (OTP) protection sensors that are hardware driven and provide OTP shutdown that aligns with safety agency certification limits.
   The OTP sensors are mounted on the following components:
   1. Primary side PFC heat sink; this is calibrated to operate at +125 to +130ºC
   2. Secondary side synchronous MOSFETS heat sink; this is calibrated to operate at +125 to +130ºC

   For successful deployment the End User should measure the temperature of the corresponding heatsink to ensure that the temperatures do not closely approach the OTP temperatures; it is suggested that an operation margin of at least 10ºC is preserved **under worst case operational conditions.**



b. Even assuming that the OTP temperature limits (above) are not exceeded other components may reach temperatures that will provide a limitation of operational life.
   In general operation life is limited by electrolytic capacitors where their case temperature is directly proportional to the expected life.

   The case temperature is affected by the following drivers:

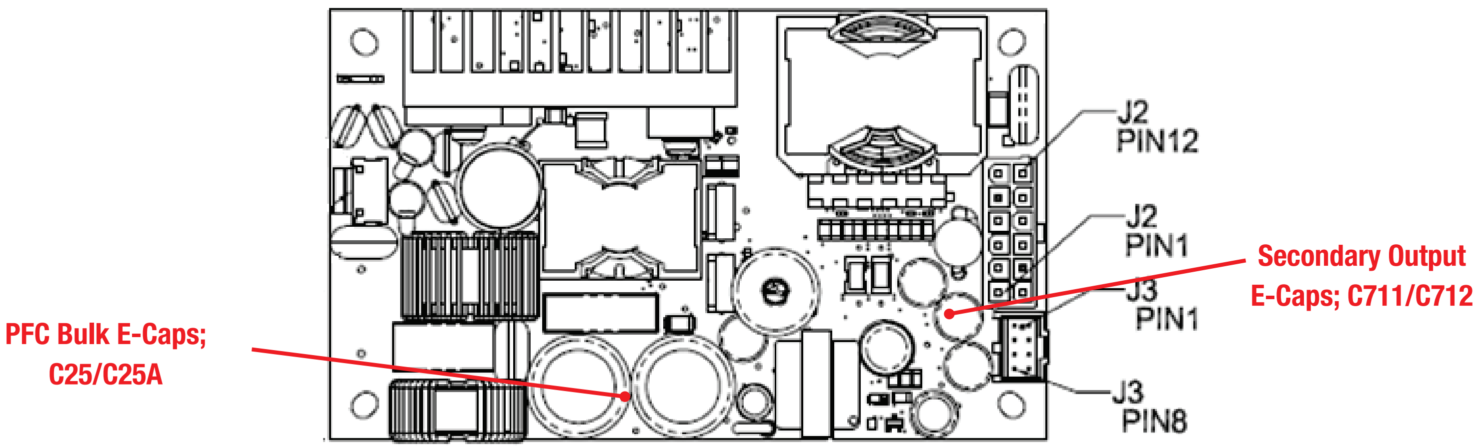
   1. The ambient temperature surrounding the case of the capacitor
   2. The internal heating effect due to ripple current within the capacitor
   3. The airflow that influence the cooling effect of the case.

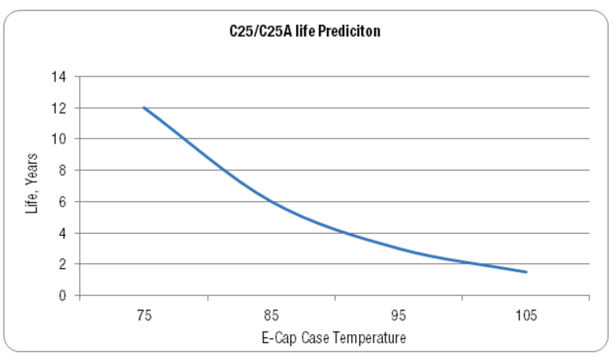
For the PQC250 the case temperature of all of the electrolytic capacitors is measured at:

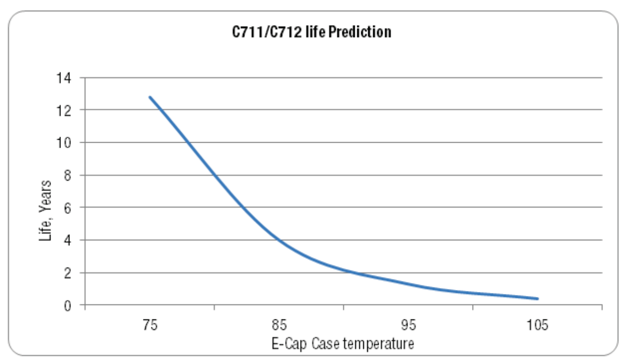
- 80% loading conditions
- 90VAC input
- Up to +60ºC.

As a “rule of thumb” the predicted life (of the electrolytic capacitor) halves for each +10ºC increase in case temperature. The following curves are based upon the lowest predicted life of the following components:

- C25/C25A; these components are the PFC bulk electrolytic capacitors (E-Caps)
- C711/C712; these are the Main output electrolytic capacitors (E-Caps)







These curves are an expanded SCALE of the full curve that shows life to 10 years (which is in line with the typical offered by MPS for this product)

As illustrated in the above curves, the expected life of the referenced E-Caps is inversely proportional to the case temperature. The End User should measure the case temperature of the relevant component to ensure that the expected service life (either in hours or years) aligns with that predicted by the curves above.

Irrespective of the conditions and environment of the deployment (whether convection cooled or provided with some form of "forced" airflow) the PQC is rated for 250W operation.

As such it will be the remit of the End User to verify critical component temperatures fall with the safe operating scope of the product to align with safety certification and provide reliable operation (MTBF and service life).

CONDUCTION COOLING

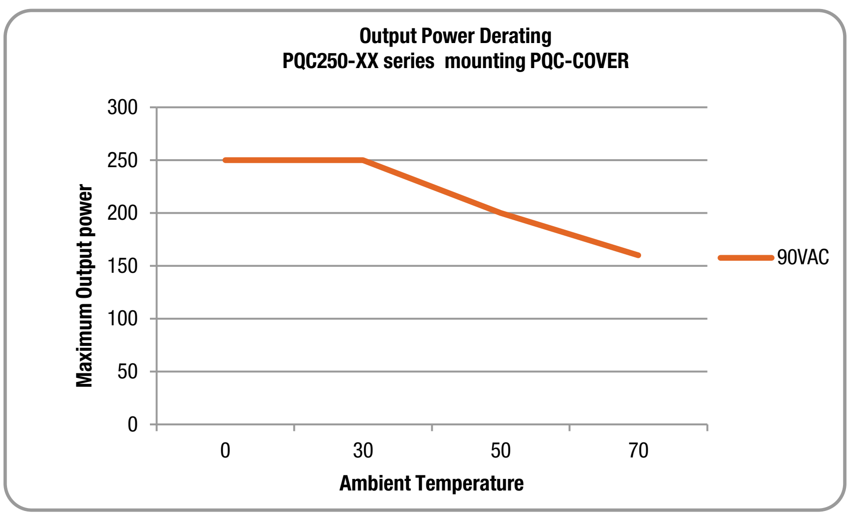
Under certain conditions it may be advantageous to supplement convection cooling with conduction cooling of the underside of the PCB.
This will involve the use of a suitable material that both provides galvanic insulation between hazardous voltages and is a good conductor of heat ("cold plate")

Possible suitable material is as follows:

- Bergquist Gap Pad® V0 Ultra Soft
- Parker (Chomerics Division) THERMA-A_GAP 58 Thermally Conductive Gap Filler Pads

Note that a minimum insulation thickness is required to maintain the required insulation (basic) between high voltage points and the based plate material (grounded).

Power derating PQC-COVER kit, mounted in horizontal orientation, no external airflow:



Murata Power Solutions, Inc.
129 Flanders Road
Westborough, MA 01581
ISO 9001 and 14001 REGISTERED