OVERVIEW

The PQC250 is capable of operation in parallel with another PQC250 (of the same voltage variant) to facilitate:

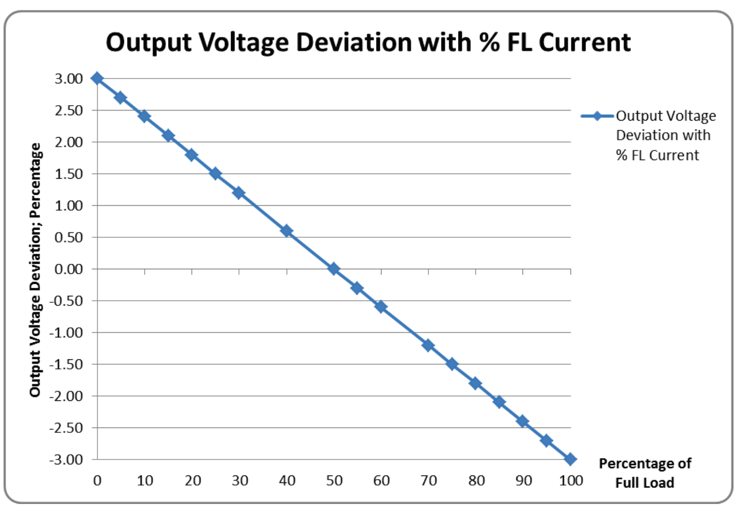
1. Straight parallel operation to provide extended (additional) power (current) to a host system load; i.e. increases the available power to the system load
2. Parallel redundant (N+N configuration); one power supply is required to support the system load with the remaining power supply operational and “sharing” the system load. With this scheme if one power supply is “offline” then the remaining power supply can support the system load. The advantage of N+N operation is that each power supply operates at reduced stress.
3. Parallel redundant (N+1 configuration) where “N” power supplies are required to support the system load with the remaining “+1” operational in the event that one power supply goes “offline”.

The following models are available with a “droop” sharing characteristic:

<table>
<tr><th colspan="5">ORDERING GUIDE (DROOP SHARE VARIANT MODEL NUMBER)</th></tr>
<tr><th>Model Number:</th><th>Murata Internal Part#</th><th>Natural Convection</th><th>Main Output (V1)</th><th>Aux Output (V2)</th></tr>
<tr><td>PQC250-12D</td><td>M1950</td><td rowspan="5">250W</td><td>12V</td><td rowspan="5">5V</td></tr>
<tr><td>PQC250-24D</td><td>M1951</td><td>24V</td></tr>
<tr><td>PQC250-36D</td><td>M1952</td><td>36V</td></tr>
<tr><td>PQC250-48D</td><td>M1953</td><td>48V</td></tr>
<tr><td>PQC250-54D</td><td>M1954</td><td>54V</td></tr>
</table>

OPERATIONAL DESCRIPTION

Droop current (sometimes known as passive or voltage pre-positioning) sharing is a method whereby a sample of the current (that is being supplied by a sharing power supply) is sensed and summed in to the internal voltage regulation loop of the power supply.
It is scaled in such a way as to vary the output voltage of the power module (over a predefined window) such that it effectively widens the voltage regulation window of the output voltage.
As can be seen from the curves (opposite) the regulation window for the “droop” variant varies from +3.00% (at 0% FL) to -3.00% (at 100% FL).
Sharing operates due to each power supply monitoring its own current contribution (the currents from both power supplies are summed in to the system load).



The system load will demand a specific current and each power supply “positions” itself appropriately on the droop curve.

The power supply initially contributing the highest current contribution (of the two sharing power supplies) will reduce its output voltage accordingly (due to the droop slope resistance). Conversely the other sharing power supply will operate at a higher output voltage and then attempt to provide a greater contribution which will also cause the output voltage to fall. This will cause the other sharing power supply to increases in voltage to provide a higher voltage. A balance is achieved whereby both power supplies share the total load current “equally” (50/50 ideally; however in practice within current sharing tolerances) with the overall feedback loop compensation preventing “hunting”. No external current signal bus connection is required (as with active current sharing) which provides a robust method of sharing.

The following table shows the actual limits for the variants that employ droop current sharing:

DROOP REGULATION WINDOW (BY VOLTAGE VARIANT)				
Model Number:	Murata Internal Part#	Output (V1) 0% FL	Output (Nominal V1) 50% FL	Nominal Output (V1) 100% FL
PQC250-12-Dxx	M1950	12.36VDC	12.00VDC	11.64VDC
PQC250-24-Dxx	M1951	24.72DC	24.00VDC	23.28VDC
PQC250-36-Dxx	M1952	37.08VDC	36.00VDC	34.92VDC
PQC250-48-Dxx	M1953	49.44DC	48.00VDC	46.56VDC
PQC250-54-Dxx	M1954	55.62DC	54V.00DC	52.38VDC

Note: The above regulation window does not include the additional tolerance due to line, temperature, long term stability etc.

REDUNDANCY PROTECTION

Although it is not required to provide isolation devices to enable power PQC250-xx-Dxx power supplies to current share, if the intent of parallel operation is to provide load protection in the event of a loss of a single power supply (i.e.1+1 redundancy), then consideration should be given to the use of isolation devices (also known as ORING devices). These can take the form of:

- Diodes; usually Schottky diodes for lower loss (vs. conventional epitaxial diodes); these are passive devices that do not require any “active” control circuitry

- MOSFET devices (sometimes referred to as an ideal diode); these devices require an “ORING” Controller IC which although represents additional complexity does provides a very low loss solution.

MPS recommends the use of an optional integrated solution that includes the MOSFET device.

To specify this option the relevant model number will become PQC250-xx-DRT; this option contains both the droop current share option and the MOSFET ORING (isolation) device provided on a daughter card that replaces the J2 connector of the power supply and provides an alternative screw terminal output connection.

DEPLOYMENT NOTES

When deploying the PQC250 with either the “D” (droop share) or “DRT” (droop plus MOSFET ORING and terminal block) the following should be noted:

1. Since the “droop characteristic” method of current sharing can be influenced by external resistance (as provided by connection cables) it is important that the overall placement of the PQC250 and layout of the host system enclosure is considered when the power supplies are mechanically designed in.
   The cable runs to the load from both power supplies should be connected to a common point of the system load
2. Cable lengths from both power supplies should be of equal length (symmetrical) and as short as realistically possible
3. The gauge of the cable should be adequate to support the maximum current available from each power supply and if the length is long then consideration should be given to increasing the gauge of cable to minimize voltage drops
4. Remote sense connections to the point of load; it is not necessary (or recommended); therefore the remote sense points are internally terminated for convenience.

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