

OVERVIEW

The PQU650 is capable of operation in parallel with another PQU650 (of the same voltage variant) to facilitate:

1. Straight parallel operation to provide extended (additional) power (current) to a host system load; for example: increases the available power to the system load.
2. Parallel redundant (N+N configuration); where one (or more) power supplies are 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:

ORDERING GUIDE (DROOP SHARE VARIANT MODEL NUMBER)						
Model Number:	Murata Internal Part#	Natural Convection	Forced Convection	Main Output (V1)	Aux Output (V2)	Fan Output (V3)
PQU650-12	M2011	450W	650W	12V	5V	12V
PQU650-24	M2010			24V		
PQU650-28	M2061			28V		
PQU650-48	M2012			48V		
PQU650-54	M2030			54V		

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.

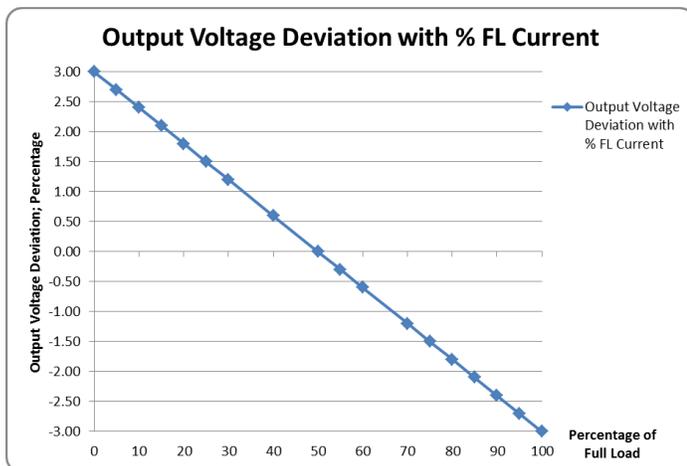
It is scaled in such a way as to vary the output voltage of the power module (over a predefined window) such that it effectively widens the voltage regulation window of the output voltage.

As can be seen from the curves (below) 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 two sharing power supplies) will reduce its output voltage accordingly (due to the droop slope resistance).

Conversely the other sharing power supply operates at a higher output voltage and then attempt to provide a greater contribution which will also cause the output voltage to fall. This causes the other sharing power supply to increase 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. As the power supplies might not share within defined tolerances during ramp up phase, it is recommended to limit the load to the capability of a single power supply during startup.

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
PQU650-12	M2011	12.36VDC	12.00VDC	11.64VDC
PQU650-24	M2010	24.72VDC	24.00VDC	23.28VDC
PQU650-28	M2061	28.84VDC	28.00VDC	27.16VDC
PQU650-48	M2012	49.44VDC	48.00VDC	46.56VDC
PQU650-54	M2030	55.62VDC	54.00VDC	52.38VDC

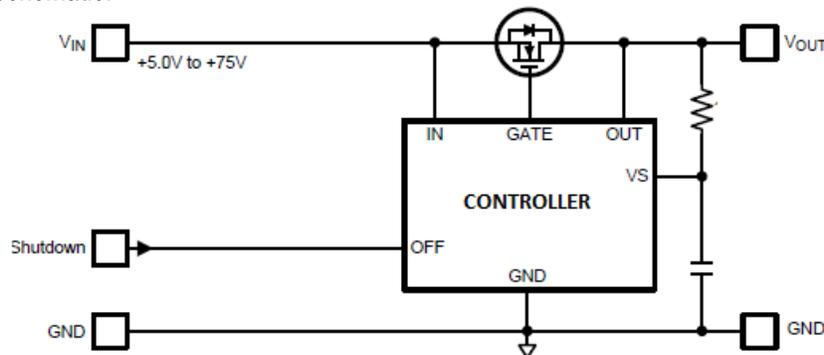
Note: The above regulation window does not include the additional tolerance due to line, temperature, and long term stability.

REDUNDANCY PROTECTION

It is not required to provide isolation devices to enable power PQU650 power supplies to current share. However, 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, it provides a low loss solution (see ACAN-105 for further details).

Typical External Controller Schematic:



DEPLOYMENT NOTES

When deploying the PQU650-xx w the following should be noted to achieve the best possible current sharing:

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 PQU650, 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 are not necessary (or recommended); therefore the remote sense points are internally terminated for convenience.

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ISO 9001 and 14001 REGISTERED



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