PQU650 Series

650W 4" x 6" AC-DC "U" Channel Power Supply Converter

DESCRIPTION

The PQU650 Series products are rated at 650W employing a "U" channel construction to operate with natural convection or forced airflow. The PQU650 series is a 6"x 4" format capable of providing a continuous 650W[1] output, with a constant current overload characteristic, and 800W "power boost" at output start[4] to deliver transient loads.

The compact form factor offers an impressive 450W of natural convection cooled power at +50°C. Provision of an adjustable Main output, plus Auxiliary/Standby and fan outputs, will enable this technically superior solution to be deployed across multiple market sectors, complemented by safety certification applicable to medical/Audio/Video/Communication and ITE standards.

ORDERING GUIDE (MODEL NUMBER)

Model (Order) Number	Main output (V1)		Aux Output (V2)		Fan Output V3[6]	
	Voltage Vdc	Current Adc @ 50°C 650W[1]	Vdc	Current Adc @50°C	Vdc	Current Adc @50°C
PQU650-12[2]	12	54.2	5	0.5	12	0.6
PQU650-24	24	27.1				
PQU650-28	28	23.2				
PQU650-48[3]	48	13.6				
PQU650-54[2,3]	54	12.1				
PQU650-24P[2]	24	27.1				
PQU650-28P[2]	28	23.2				
PQU650-48P[2,3]	48	13.6				
PQU650-54P[2,3]	54	12.1				
PQU-COVER[2,5]	Optional cover kit; End User assembly required.					

[1] Forced convection airflow required.
[2] Consult Murata sales channel for availability.
[3] PoE Isolation Compliant.
[4] Any condition resulting in the Main V1 output restarting; i.e. recycling of PS_ON or recovery from OCP/OTP protection.
[5] Derating for convection cooling required.
[6] Only available for forced air cooled deployments (not available for convection cooled deployments).

FEATURES[2]

- Compact high density design and thermal performance operation to:
  - 450W convection at +50°C; no derating with input line voltage
  - 650W with forced airflow at +50°C; no derating with input line voltage
  - 800W "power boost" (at output start-up)
- Voltage (+15%)[3] adjustment of Main V1 Output
- +5VAux/Standby and 12V Fan outputs
- 4" x 6" industry standard footprint; "U" channel form factor with industry "standard" mounting footprints.
  - 40mm maximum overall "U" Channel height
  - 42.7mm max overall height with cover
  - Choice of screwed or pluggable connector variants[2]
- High efficiency of 95% typical at 50% load
- Very low no load standby power consumption
- True zero load operation of the Main (V1) output; no minimum load requirements
- Remote sense, main output (option)
- Universal AC input; active PFC; EN61000-3-2 Class A
- MTBF 797Khrs; Telcordia SR332 Issue 3; M1 Case 3; +40ºC)
- RoHS2 compliant
- Active inrush protection
- Droop Current Share
- IEC60601 Ed.3 medical (2 x MOPP Pri-Sec); 1 x MOPP Pri-Chassis Ground)
- IEC62368-1; (migration planned for all PQU650 Series members)
- Designed to comply with IEC60601-2 4th Edition EMC Standard Requirements[1]

[1] When deployed in End User Systems
[2] Consult Murata sales channel for availability.
[3] 54V output adjustment range is +5% max to maintain max voltage to <60V.

INPUT CHARACTERISTICS

Parameter	Conditions	Min	Nom	Max	Units
Input Voltage AC Operating Range	Single Phase	90	100/240	264	Vac
Input Frequency		47	50/60	63	Hz
Turn-on input voltage	Input rising	75		90	Vac
Turn-off input voltage	Input falling	65		80	Vac
Maximum input current	Vin = 90VAC; Full Load[1] (650W FL)			9.0	Arms
Inrush Current	230Vac,Cold start, 25°C		30		Apk
Power Factor	At 230VAC, full load	0.95			W/VA
Hold-up Time	90Vac; 650W	10			msec
Efficiency @ 230VAC	20% Full Load		92		%
	50% Full Load		95		
	100% Full Load		94		
No Load Input Power Consumption	(PS_ON = OFF; Aux (V2) = 0A			<0.5	W

[1] Input current will increase to ≈10Arms under 800W peak power

MAIN OUTPUT CHARACTERISTICS (ALL MODELS)

Parameter	Conditions	Min	Nom	Max	Units
Line, Load Regulation	Main (V1) Output[1]			±5	%
Minimum Load Capability	Stable Operation	0			A
Output Ripple	Zero to Full Load[2]			1%	mVPP

[1] Zero load output voltage may exceed the regulation window however will not cause OVP to engage or PWOK to change to low state.
[2] Ripple and noise are measured with 0.1uF ceramic capacitor and 10uF tantalum capacitor. A short coaxial cable with 50 ohm termination is used. Min 120uF cap required at the output to keep ripple within 1% for 54V output. Min 10% load current required, to maintain ripple within 1% for 12V output model. 1A min.

AUXILIARY OUTPUT CHARACTERISTICS

Auxiliary Output	Aux Output Voltage	Load Current	Load Capacitance	Line, Load, Cross Regulation	Ripple Voltage & Noise
Aux (V2)	5V	0 to 0.5A	0 to 220µF	4.75t o 5.25Vdc	100mVPP

FAN OUTPUT CHARACTERISTICS (ALL MODELS)

Auxiliary Output[1]	Aux Output Voltage	Load Current	Load Capacitance	Line, Load, Cross Regulation	Ripple Voltage & Noise
Aux (V3)	12V	0 to 0.6A	0 to 220µF	10.8 to 13.2Vdc	120mVPP

[1] Not recommended for "general use" due to its semi regulated characteristic. The output is for use with a fan intended to cool the PQU650; therefore if the PQU650 is convection cooled only then this output should not be used. A 1.5A non replaceable fuse is provided in this output for overload protection.
[2] Only available for forced air cooled deployments (not available for convection cooled deployments)

RoHS COMPLIANT 25 Report & Certificate

MAIN OUTPUT CHARACTERISTICS (ALL MODELS EXCEPT UNLESS NOTED)

Parameter	Conditions	Typ.	Max.	Units
Transient Response[1]	50% load step, 1A/µsec slew rate and min 10% load		± 5	%
Settling Time to 1% of Nominal			500	µsec
Turn On Delay	After application of input power		3	sec
Output Voltage Rise		200		msec
Remote Sense[2]	Compensates for up to 120mV of total lead drop (output and return connections) with remote sense connected. Protected against short circuit and reverse connection.		1	%

[1] Min. 1 second time between consecutive transients; requires 10% minimum load.
[2] Remote sense fs not offered as a standard feature due to droop current share characteristic offered on the standard models; consult the sales channel for availability of remote sense option.

ENVIRONMENTAL CHARACTERISTICS

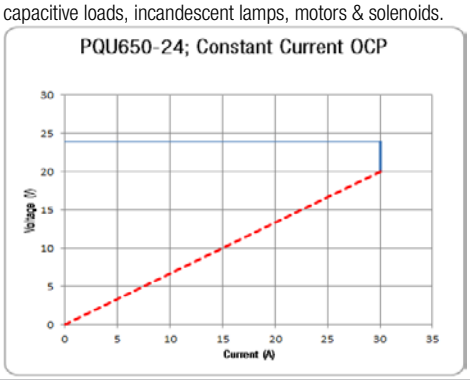
Parameter	Conditions	Min.	Typ.	Max.	Units
Storage Temperature Range		-40		85	°C
Operating Temperature Range[4]	See power derating curves	-30		70	
Operating Humidity	Non-condensing	10		95	%
Operating Altitude		-200		5000[2]	m
MTBF	Telcordia SR-332 Issue 3; M1C3 @ 25°C Telcordia SR-332 Issue 3; M1C3 @ 40°C		1810K 797K		Hours
Shock	30G, non-operating	Complies			
Operational Vibration	Sine Sweep; 5-150Hz, 2G Random Vibration, 5-500Hz, 1.11G	Complies			
Safety – Medical Standards 2 x MOPP (Primary-Secondary)	IEC 60601-1 (ed.3.1) CAN/CSA-C22.2 No. 60601-1:2008/A1:2014 ANSI/AAMI ES 60601-1:2005/A1:2012 EN 60601-1:2006/A1:2013				
Safety – ITE, Audio/Video/Communications & Consumer Standards	IEC 60950-1:2005, IEC 60950-1:2005/AMD1:2009, IEC 60950-1:2005/AMD2:2013 CAN/CSA-C22.2 No. 60950-1-07, Amendment 1:2011, Amendment 2:2014 (MOD) ANSI/UL 60950-1-2014 EN 60950-1:2006/A2:2013 CCC: GB17625.1-2012; GB4943.1-2011; GB/T9254-2008 (Class A) CE Marking per LVD IEC 62368-1[1]				
Fuses	Dual Fuses; Line and Neutral; 12.5A Fast Acting; 250V				
Outside Dimensions	4.0" x 6.0" x 1.69" (101.6mm x 152.4mm x 42.8mm) nominal				
Weight (typ.)	0.692/1.526				kg/lbs.

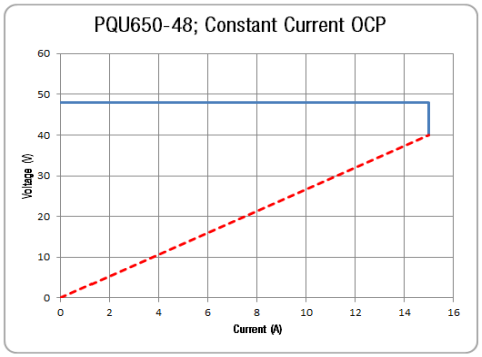
[1] Planned submission end 2019; contact Murata for additional details.
[2] Meets 5000 M max. altitude for Medical certification requirements.
[3] When deployed in End User Systems
[4] Starts at -30°C at 100Vac minimum input; however full specification guaranteed at -20°C; *contact Murata for lower operating temperature range.

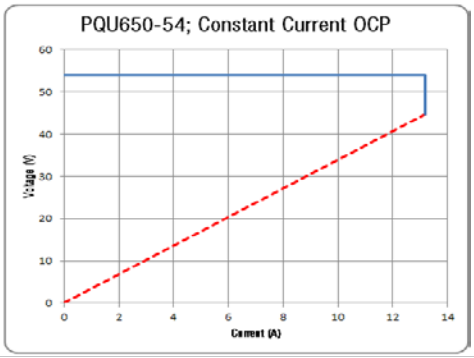
PROTECTION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Over Voltage Protection	V1 (main output) latching	115		140	%
	V1 (48V *54V models) latching			60	Vdc
	V2 (aux output) latching	5.5		7.5	
Over Current Protection	V3, (Fuse Protected)			1.5A	Adc

The Constant Current characteristic as shown in the following curves. This feature will enable the PQU650 to successfully start in to application loads exhibiting large inrush current i.e. large capacitive loads, incandescent lamps, motors & solenoids.







1. Curves generated for the PQU650 variants by subjecting output to an incremental (constant resistance load, equivalent to 1Adc increments (above full load).
2. The resultant curve shows the current limited to a constant "brick wall" shown by the blue portion of curve.
3. If the load current is further incremented the output will enter "hiccup" (recycling on/off; shown by the red dashed curve) commencing when the output voltage falls to ~75% of the nominal set point.
4. If the overload current is maintained above maximum load for an extended period the "hiccup" operation will continue indefinitely while the overload persists. In the event that the overload is maintained just below that where "hiccup" operation is initiated then, dependent on the prevailing operating conditions, the power module may enter thermal protection.
5. Each time the output recovers from hiccup the output power will be capable of 800W peak to provide additional power to ensure that the transient load is delivered.