



FEATURES:

- 80 Plus® Titanium Certified
- Cold redundant operation capability
- Black-Box data-logging feature
- HVAC / HVDC input operation (180-305Vac, 192-400Vdc)
- 54.5Vdc 66A main output
- 12V 2.5A standby output
- Nominal Dimensions:
 - 68.0mm (W) x 49.0mm (L) x 40.0mm (H)
 - 2.68" (W) x 19.29" (L) x 1.57" (H)
- 44.3 Watts per cubic inch density (W/in³)
- N+1 redundancy including hot swap capability, up to 6 power modules
- Integral ORing MOSFETS, both outputs
- Active current sharing main output, Droop current sharing for 12VSB output
- Internally cooled by advanced dual rotor variable speed-controlled fan
- PMBus™ / I²C interface monitoring, configuration and control
- RoHS2 compliant
- PCB card edge fingers provided for incoming voltage source connection and DC output in "double-decked" configuration

PRODUCT OVERVIEW

MWOCP68-3600-D-RM is a highly efficient 80PLUS® Titanium certified 3,600 Watt power factor corrected front end power module that provide a 54.5Vdc main and 12Vdc standby output. With active current sharing for more than six power modules, this supply may be operated in Open Compute compliant shelves from Murata, and is capable of delivering up to 21.6kW (18kW in N+1 configuration) in 1U of height in a standard 19 inch rack. The MWOCP68-3600-D-RM may be hot plugged, recovers from over temperature faults, and provides hardware status LEDs, status signals, and includes PMBus™ 1.2 digital communication capability. The low profile 1U package and 44.3 W/in³ power density is ideal for delivering reliable, high density, efficient power, via the shelf, to OCP open rack architecture or stand-alone applications.

ORDERING GUIDE

Part Number	Output power @ highline (180-300Vac & 192-400Vdc)	Main Output	Standby Output	Airflow
MWOCP68-3600-D-RM	3600W	54.5Vdc	12.0Vdc	Front to Back

INPUT CHARACTERISTICS

Parameter	Conditions	Min	Typ.	Max	Units
Input Voltage Operating Range	AC Voltage	180	230/277	305	Vac
	AC Line Frequency	47	50/60	63	Hz
	DC Voltage	192	240/380	400	Vdc
Turn-on Voltage	AC (Ramp-up)	179	182	185	Vac
	DC (Ramp-up)	182	186	190	Vdc
Turn-off Voltage	AC (Ramp-down)	168	171	174	Vac
	DC (Ramp-down)	172	176	180	Vdc
Maximum Input Current	Vin; 180Vac; 3600W			23.5	Arms
	Vin; 180Vdc; 3600W			23.0	Adc
Inrush Current	Cold Start; <200ms			50	Apk
Power Factor ¹	230 Vac; FL		0.99		W/VA
	230Vac; 10% FL	90	92.5		%
230Vac; 20% FL	94	94.5			
Efficiency (Excluding Fan Load)	230Vac; 50% FL	96	96.2		
	230Vac; 100% FL	91	94.5		

¹The power Factor at 20% loading requires to be >0.95 (W/VA) to meet 80 Plus® limits

OUTPUT VOLTAGE CHARACTERISTICS

Output	Parameter	Conditions	Min	Nom	Max	Units
54.5V Main	Nominal output voltage			54.5		Vdc
	Output set point accuracy	230VAC, 50% load, Ta=25°C	54.23	54.5	54.77	
	Line and load regulation		52.87		56.14	
	Ripple voltage & noise ¹	20MHz bandwidth			500	mVpp
	Output current	Across AC & HVDC input ranges	0		66	A
	Load capacitance		0		10,000	uF
12VSB	Nominal output voltage			12.0		Vdc
	Output set point accuracy	50% load, Ta=25°C	11.94		12.06	
	Line and load regulation		11.64		12.36	
	Ripple voltage & noise ¹	20MHz bandwidth			240	mVpp
	Output current		0		2.5	A
Load capacitance		100		3,100	uF	

¹ Ripple and noise measured with a parallel combination of 0.1uF ceramic and 10uF low ESR capacitors on the power module respective output. A short coaxial cable connected directly to the input of a scope is required.



For full details go to
www.murata-ps.com/rohs

Planned Submissions:



Test Certificate
and Test Report

OUTPUT CHARACTERISTICS						
Parameter	Conditions	Min	Typ.	Max	Units	
Startup Time	From application of the AC source to turn on of Main 54.5V			2	sec	
Transient Response	54.5V main, 50% load step within range of 10% to 100%, 1A/us di/dt, recovery within 2ms	-2725		+2725	mVpp	
	12VSB, 50% load step within range of 10% to 100%, 1A/us di/dt, recovery within 500us	-600		600		
54.5V main output current sharing accuracy (module to module deviation) up to 6 modules in parallel	Percentage of total host system load current / number sharing units	50% to 100% Load		5	%	
		20% to 50% Load		10		
Hot Swap Transients	All outputs remain within regulation band	-5		5		
Holdup Time	3600W Load	12			ms	
	1800W Load	20				

ENVIRONMENTAL CHARACTERISTICS						
Parameter	Conditions	Min	Nom	Max	Units	
Storage temperature range		-40		70	°C	
Operating temperature range ¹	Altitude < 1,880m (6167 ft)	0		50	°C	
	Altitude < 3,000m (9842 ft)	0		40		
Operating humidity	Non-condensing	5		95	%	
Storage humidity	Non-condensing	5		95	%	
System back pressure tolerance (Target: Module P-Q curves to be provided)		0.5/125			in-H ₂ O/Pa	
MTBF (Target)	Per Telcordia SR-332 issue 3 M1C3 @ 40°C & 230Vac	300k			hrs	
Shock	10G shock without degradation of performance or mechanical damage to components in operational 30G in non-operational condition Validation testing per IEC60068-2-27; test Ea. 30G, 11msec half-sine, 3 shocks per face, 6 faces.					
Operating vibration	Sine sweep; 5-150Hz, 0.78G; Random vibration, 5-500Hz, 0.78G					
Safety approval	CAN/CSA C22.2 No.60950-1-07, Am.1:2011, Am2:2014 UL62368-1 IEC62368-1 EN60950-1:2006 +A11+A1+A12+A2 CQC GB4943.1-2011					
Input fuse	Dual internal fuses 25A/500V fast blow on the AC line and neutral input connections					
Weight	2.1kg (4.63 lbs.)					

¹ Sufficient safety creepage/clearance is provided to allow operation at this altitude however performance may be impacted due to back-pressure imposed by host/system.

PROTECTION CHARACTERISTICS						
Parameter	Conditions	Min	Nom	Max	Units	
Over temperature (intake)	Auto restart	50		60	°C	
54.5V OCP Condition ²	180-305V _{AC}	192-400V _{DC}	SMBALERT Delay		PSU Fault Delay	
OCP Warning Threshold	70.0 A ± 5%	70.0 A ± 5%	20 sec		None	
OCP1 threshold	76.6 A ± 5%	76.6 A ± 5%	20 sec		>20sec +100ms	
OCP2 threshold	87 A ± 10%	87 A ± 10%	<15ms		>20ms	
SCP threshold	>94 A	>94 A	Immediately		Immediately	
12VSB OCP Condition	180-305V _{AC}	192-400V _{DC}	SMBALERT Delay		PSU Fault Delay	
OCP1 threshold	3.5 A ± 10%	3.5 A ± 10%	None		>20 sec ¹	
OCP2 Threshold	> 4.0A	> 4.0A	None		Immediately ¹	

¹ The 12VSB OCP protection shall be non-latching

² repetitive overcurrent conditions (e.g. at reduced duty cycle) may be limited by thermal performance and protected by OTP accordingly

Overvoltage Protection (OVP)						
Parameter	Conditions	Min	Nom	Max	Units	
54.5V Main	Overvoltage	Latching, recycling AC source or toggle PS_ON to reset	57.0	58.5	59.5 ¹	Vdc
12VSB	Overvoltage	Latching, recycling AC source to reset	13		15	Vdc

¹ Shall preserve SELV limit

ISOLATION CHARACTERISTICS						
Parameter	Conditions	Min	Nom	Max	Units	
Insulation safety rating / test voltage	Input to output - Reinforced	3,000			Vrms	
	Input to chassis - Basic	1,500				
Isolation	Output to chassis	50			Vdc	

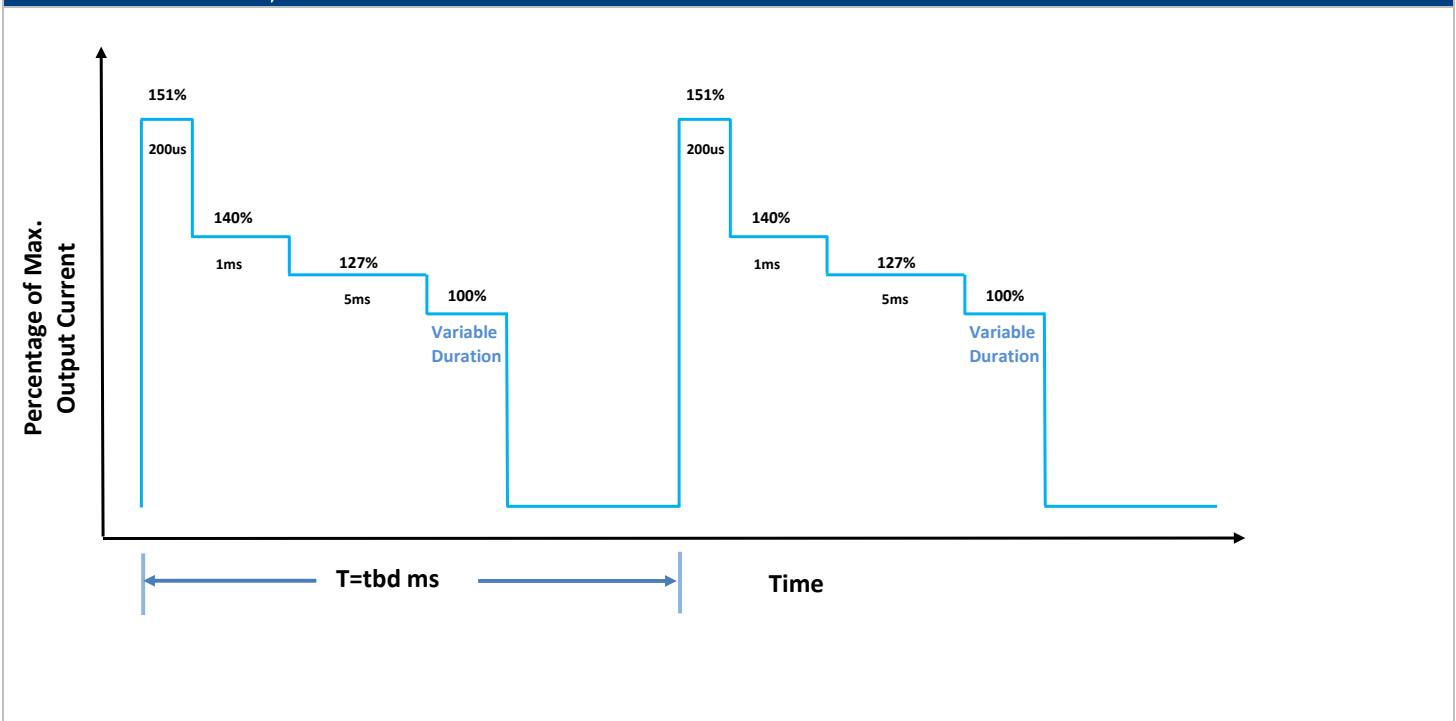
EMISSION AND IMMUNITY

Characteristics	Standard	Criteria
Input current harmonics	IEC/EN 61000-3-12	Complies with Class A Limits
Voltage fluctuation and flicker	IEC/EN 61000-3-11	Complies
Conducted emission	FCC47 CFR part15/CISPR 22/ EN55032	Class A with 6dB margin
ESD immunity	IEC/EN 61000-4-2	Level 4 criteria A
Radiated field immunity	IEC/EN 61000-4-3	Level 3 criteria B
Electrical fast transient/burst immunity	IEC/EN 61000-4-4	Level 3 criteria B
Surge immunity	IEC/EN 61000-4-5	Level 3 criteria A
RF conducted immunity	IEC/EN 61000-4-6	Level 3 criteria A
Magnetic field immunity	IEC/EN 61000-4-8	3A/m criteria B
Voltage dips, interruptions	IEC/EN 61000-4-11	230V _{in} , 100% load, phase 0°, dip 100% duration 10ms (A) 230V _{in} , 50% load, phase 0°, dip 100% duration 20ms (54.5V main: B, 12VSB: A) 230V _{in} , 100% load, phase 0°, dip 100% duration >20ms (B)

RELATED PRODUCTS

Model	Function	Description
MWOCES-191-M-B	OCP Power Shelf	19" x 1RU up to 21.6kW OCP Compliant Power Shelf comprised of the Power Shelf, 6PSUs, 1 RMU with optional Automatic Transfer Switches

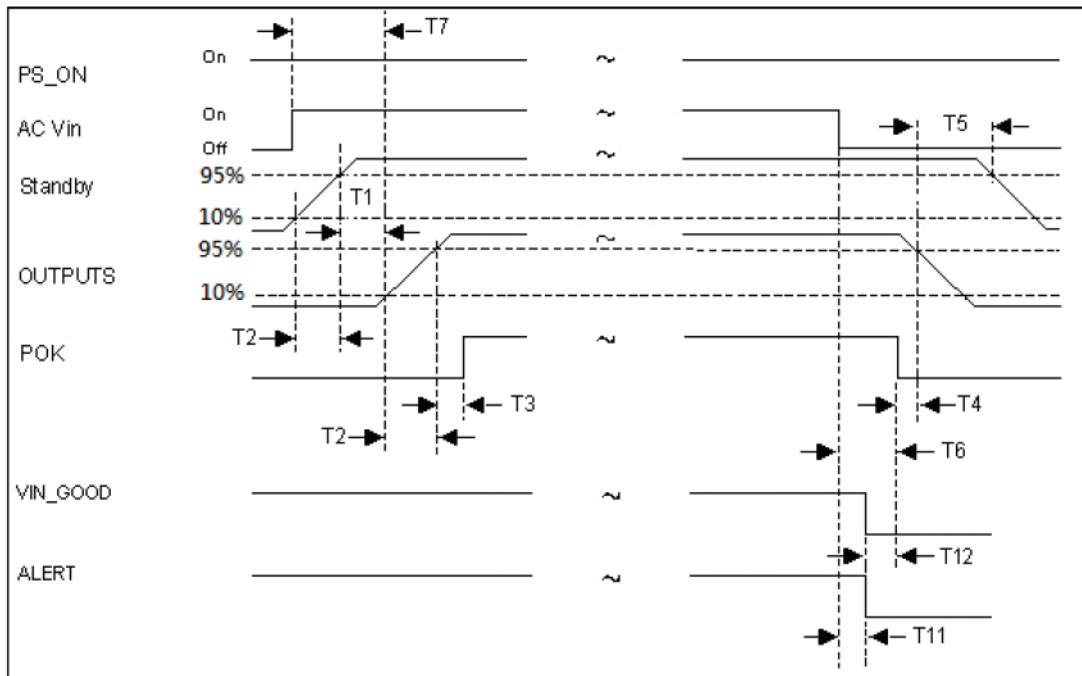
OUTPUT CHARACTERISTICS; PEAK LOAD PROFILE



The above profile illustrates the power module's peak repetitive load operating capability and the output should not shut down under these conditions. The power module should not be operated continuously at load conditions that exceed the product's safety ratings.

TIMING SPECIFICATIONS

Time Reference	Description	Min	Max	Units
T1	Delay from 12V _{SB} regulation to 54V _{DC} output turn on.	5	500	ms
T2A	Main 54V _{DC} rise time	2	100	ms
T2B	12V _{SB} rise time	2	20	ms
T3	Delay from Main 54V _{DC} output within regulation to PWOK assertion at turn on	100	500	ms
T4	Delay from PWOK de-assertion to Main 54V _{DC} dropping out of	1		ms
T5	Delay from Main 54V _{DC} out of regulation to 12V _{SB} turn off.	5		ms
T6	Delay from loss of INPUT to PWOK de-assertion	10		ms
T7	Delay from application of INPUT on to Main 54V _{DC} turn on		2000	ms
T8	PS_ON negation (PSU off) to PWOK negation		2	ms
T9	PS_ON (PSU on) to output established		350	ms
T11	Delay from VIN drop out to VIN_GOOD negation & SMBALERT assertion		2	ms
T12	Delay from VIN GOOD to PWOK	1		ms



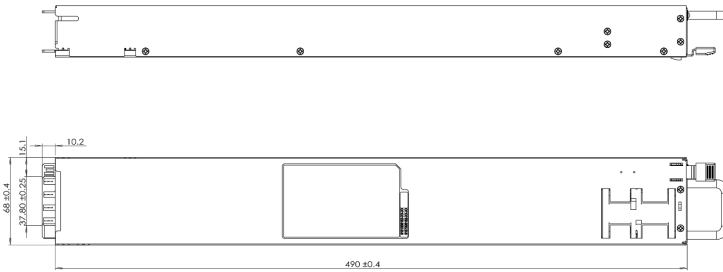
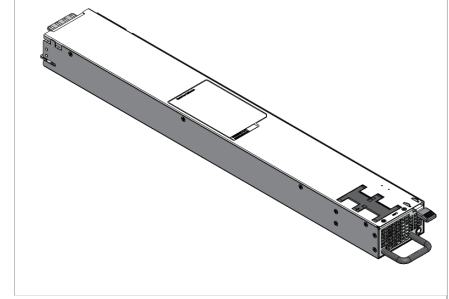
INPUT POWER INTERFACE CARD EDGE "GOLD FINGER" PIN ASSIGNMENT

Signal	QTY pins	Pin assignment	Description
NEUTRAL	4	A13-A14 / B13-B14	Incoming Neutral/L2 or HVDC connection; Dual fusing allows for phase connection of suitable voltage rating
LIVE Line/L1/HVDC	4	A9-A10 / B9-B10	Incoming line/phase or HVDC connection; Dual fusing allows for phase connection of suitable voltage rating
PE	8	A1, 2, 5, 6 / B1, 2, 5, 6	Protective earth; connects to enclosure/chassis

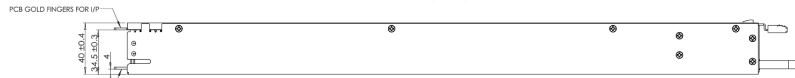
OUTPUT, SIGNAL INTERFACE CARD EDGE "GOLD FINGER" PIN ASSIGNMENT

Signal	No. of pins	Pin Location	Description
12VSB	2	B9, B10	12V "Standby"; 12VSB "+VE" output connection
I_SHARE	1	B6	An active analogue current share "bus" directly connected between sharing power modules
REMOTE_SENSE_RETURN	1	B7	Compensation of voltage drops caused by resistive losses to the load
12VSB_RETURN	2	A9, A10	12V "standby Return"; 12VSB_RETURN & SIGNAL_RETURN must be shorted together at system side
REMOTE_SENSE	1	B8	Compensation of voltage drops caused by resistive losses to the load
PSKILL	1	A4	Power module kill pin; used during insertion and extraction during "hot swap" of the power module; shortest sequenced pin, Last to Make, First to Break (LMFB) contact
VIN_GOOD	1	A2	Input source voltage present and within operational limits
PS_ON_L	1	A3	Remote ON/OFF (enable/disable) of the 54.5V Main output
PWOK	1	A1	All outputs are present valid and exhibit no faults (within operational limits)
SMBALERT_L	1	B2	An alert (interrupt) issued to the host system in response to a warning of fault condition raised in the power module
PS_A2	1	B3	I2C bits to allow addressing of slave devices operating on the PMBus™ (Power Management Bus protocol).
PS_A1	1	B4	
PS_A0	1	B5	
SCL	1	A7	Serial clock (SCL) and data (SDA) lines use for communication with slave PMBus™ slave devices
SDA	1	A6	
SIGNAL_RETURN	1	A8	A signal ground (common) for all signals (including I2C); note that this signal must be directly connected to 12VSB_RETURN at the system connector
PRESENT	1	A5	A passive signal directly connected internally within the power module to SIGNAL_RETURN
54.5V MAIN_OUTPUT	12	A17-A22, B17-B22	The positive terminal of the main output
54.5V MAIN_RETURN	12	A11-A16, B11-B16	The return terminal of the main output

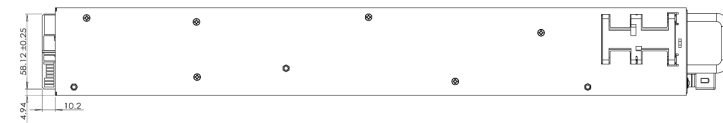
MECHANICAL DIMENSIONS



TOP SIDE



BOTTOM SIDE



1. This drawing is a graphical representation of the product and may not show all fine details such as molded part surface features, internal components, screw head type. Please contact Murata for 3D model for additional details
2. Dimensions in mm
3. Latch Cover Colour: Pantone 654C (Blue)
4. Subject to change without notice; contact factory for latest version

OPTIONAL ACCESSORIES

Part Number	Description
MWOCP68-CONC	Single power supply, output and signal break-out connector board

APPLICATION NOTES

Document Number	Description	Link
ACAN-104	Output Connector Card	https://power.murata.com/datasheet/?data/apnotes/acan-104.pdf
ACAN-114	MWOCP68-3600-D-RM PMBus™ Protocol	https://power.murata.com/datasheet/?data/apnotes/acan-114.pdf

