CLP0512 Open Frame Power Supply

90 - 265V_{ac} Input; 12V_{dc} Output; 550W Output Power; 5V Standby 5V@1A

Description

In a small 3 x 6-inch footprint, the 12V_{dc} single-output CLP0512 open frame power supply delivers greater than 90 percent typical power efficiency and 450W capability at 45°C and 1m/s airflow with derating at higher temperatures or lower airflows. Protection features include output overcurrent (OCP), overvoltage (OVP), and overtemperature (OTP). Applications include: Industrial Equipment | Telecommunications Equipment | Networks, Routers, Switchers

Features

- Compact size 76.2 mm x 152.4 mm x 35 mm (3 in x 6 in x 1.38 in) with density of 21.8 W/in^3
- Universal AC Input Range (90 - 265V_{AC})
- Output voltage of 12V (adjustable ±5%)
- Standby output of 5V @ 1A
- Maximum output current of 45.8A @ 12V_{out} (550W)
- High efficiency (>90% at Full Load, 230VAC in)
- 550W capability at 115 V_{IN}, 50 °C ambient, 400lfm airflow with derating at higher temperatures or lower airflows
- 420W output at 90 V_{IN} for sealed enclosure applications, with enclosure outside surface temp at 55 °C and enclosure inside ambient at 85 °C
- Output overcurrent protection (non-latching)
- Overtemperature protection
- Output overvoltage protection
- Minimum of 11ms of holdup time at 550W out
- Parallelable with output current sharing
- Active power factor corrected input
- Conducted EMI - meets CISPR22 (EN55022) and FCC Class B requirements
- Meets IEC61000-4-5, Level 4 (2kV/4kV) and ANSI C62.41 (6kV)
- Compliant to RoHS Directive 2011/65/EU and amended Directive (EU) 2015/863
- Compliant to REACH Directive (EC) No 1907/2006
- ANSI/UL* 62368-1 and CAN/CSA† C22.2 No. 62368-1 Recognized, DIN VDE‡ 0868-1/A11:2017 (EN62368-1:2014/A11:2017)
- ISO** 9001 and ISO 14001 certified manufacturing facilities
- AC OK signal
- Dual input fusing option - Line & Return

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the Data Sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Device	Min	Max	Unit
Input Voltage - Continuous Operation	All	90	265	V_{ac}
For up to 10 seconds operation	All	90	275	V_{ac}
Operating Ambient Temperature (see Thermal	All	-40	85	°C
Storage Temperature	All	-40	85	°C
Humidity (non-condensing)	All	5	95	%
Altitude	All		5000	m
Isolation Voltage - Input to output	All		3000	V_{ac}
Input to safety ground	All		1500	V_{ac}
Outputs to safety ground	All		50	V_{ac}

Electrical Specifications

Parameter	Device	Min	Typ	Max	Unit
Operating Input Voltage	All	90	115/230	265	V_{ac}
Input Source Frequency	All	47	50/60	63	Hz
Input Current (V_{IN} = 90V_{ac})	All		6.8		A_{RMS}
Input Power Factor (230V_{ac}, Full Load)	All	0.95			
Inrush Transient Current (V_{IN} = 265V_{ac}, T_{amb} = 25°C)	All			60	A_{Peak}
Leakage Current to earth ground (V_{IN} = 265V_{ac})	All			3.5	mA
Output Voltage Setpoint	All		12		V_{dc}
Output Voltage Tolerance (due to set point, temperature variations, load and line regulation)	All	-2		2	%
Output Voltage Adjustment Range	All	11.4		12.6	V_{dc}
Output Remote Sense Range	All			250	V_{dc}
Output Load Regulation	All			1	%V_{out}
Output Line Regulation	All			0.5	%V_{out}
Output Ripple and Noise – measured with 0.1µF ceramic capacitor and 10µF electrolytic capacitor in parallel Peak-to-peak (20MHz Bandwidth; output ripple specification is met over 0 to 85°C)	All			180	mV $_{p-p}$
Dynamic Load Response – 50% to 100% load transient, 1A/µs slew rate					
Output voltage deviation	All			5%	%
Settling Time	All			500	µs
Output Current	All	0		45.8	A_{dc}
Output Current Limit Inception	All	110		145	% $I_{O,max}$
Maximum Output Capacitance	All			10000	µF
Standby Output Voltage	All except		5		V_{dc}
Standby Output Current	All except			1	A_{dc}

Electrical Specifications (continued)

Parameter	Device	Min	Typ	Max	Unit
Efficiency V_{IN} = 230V_{ac}—20% load	All		87		%
50% load	All		92		%
100% load	All		92.7		%
Efficiency: V_{IN} = 115V_{ac}— 20% load	All		86		%
50% load	All		91		%
100% load	All		91		%
Holdup Time[2] — V_{IN} = 115V_{ac}, 550W load	All	11			ms
V_{IN} = 230V_{ac}, 450W load	All	11			ms

General Specifications

Parameter	Device	Symbol	Typ	Unit
Calculated Reliability based on Telcordia SR-332 Issue 2: Method 1 Case 3 (V_{IN}=230V_{ac}, 80% full load,	All	MTBF	>750,000	Hours
Weight	All		463 16.3	g oz

Feature Specifications

Parameter	Device	Min	Typ	Max	Unit
On/Off Signal Interface – signal referenced to GND					
Logic Low (Power Supply ON)					
Input Low Current	All except			0.2	mA
Input Low Voltage	All except			0.5	V
Logic High (Power Supply OFF)					
Input High Current	All except			1.1	µA
Input Voltage	All except	2.5		5.5	V
Delay from ON/OFF being enabled to start of	All except			50	ms
Output Voltage Rise Time (from 10 to 90% of final	All		20		ms
Delay from Input being applied to all outputs being	All			800	Ms
Output Overvoltage Protection	All	13.8		16	V_{dc}
Input Undervoltage lockout[2]					
Turn-on Threshold (100% load)	All		86		V_{ac}
Turn-off Threshold (100% load)	All		81		V_{ac}
DC OK – open collector, High when output available					
Sink Current	All except			4	mA
Maximum Collector Voltage	All except			12	V
AC OK – open collector, High when output available					
Sink Current	All except			4	mA
Maximum Collector Voltage	All except			12	V

Safety Specifications

Parameter	Device	Specification
Dielectric Withstand Voltage (between input and output)	All	Minimum of 4,250Vdc for 1 minute
Insulation Resistance (between input and output)	All	Minimum of 5 MΩ
Safety Standards	All	ANSI/UL* 62368-1 and CAN/CSA† C22.2 No. 62368-1 Recognized, DIN VDE‡ 0868-1/A11:2017 (EN62368-1:2014/A11:2017)

Environmental Specifications

Parameter	Device	Specification
Radiated Emissions[3]	All	CISPR22 Class B with 3dB margin
Conducted Emissions	All	CISPR22 Class B with 6dB margin
ESD	All	IEC 61000-4-2, Level 3
Radiated Susceptibility[4]	All	IEC 61000-4-3, Level 3
Electrical Fast Transient Common Mode	All	IEC 61000-4-4, Level 3
Surge Immunity (note-overshoot or undershoot may be observed during an event > 5% for 20 us application dependent)	All	IEC 61000-4-5, Level 4
Conducted RF Immunity	All	IEC 61000-4-6, Level 3
Input Voltage Dips	All	Output stays within regulation for either ½ cycle interruption or 25% dip from nominal line for 1 second
Input Harmonics	All	IEC61000-3-2
Shock and Vibration	All	Per IPC-9592B, Class II

FOOTNOTES

*UL is a registered trademark of Underwriters Laboratories, Inc.

†CSA is a registered trademark of Canadian Standards Association.

‡VDE is a registered trademark of Verband Deutscher Elektrotechniker e..V. ** ISO is a registered trademark of the International Organization of Standard

[1] Holdup time may be lower at cold temperatures

[2] Undervoltage lockout threshold may vary with output load current level – decreasing as load goes lower

[3] Shall meet when tested in a suitable enclosure

[4] Shall meet when tested in a suitable enclosure

Characteristic Curves (CLP0512)

The following figures provide typical characteristics for the CLP0512 power supply.

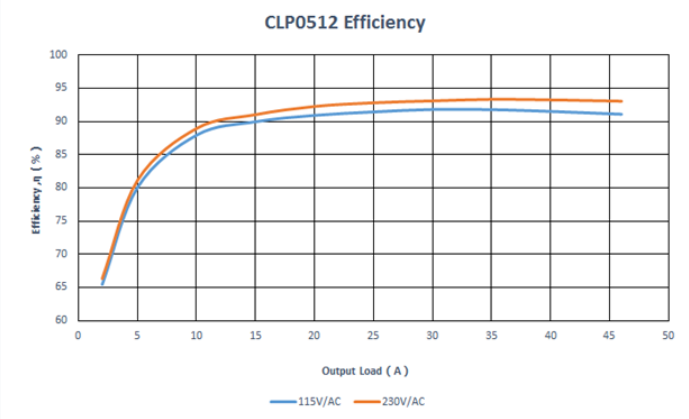


Figure 1: Power Supply Efficiency Versus Output Current

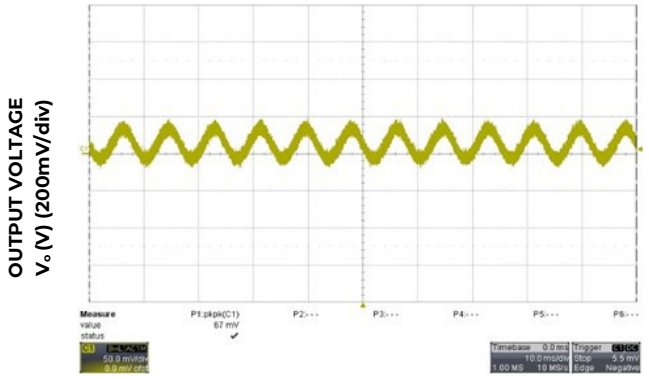


Figure 2. Typical output ripple and noise (V_{IN} = 230V_{ac}, 100% load)

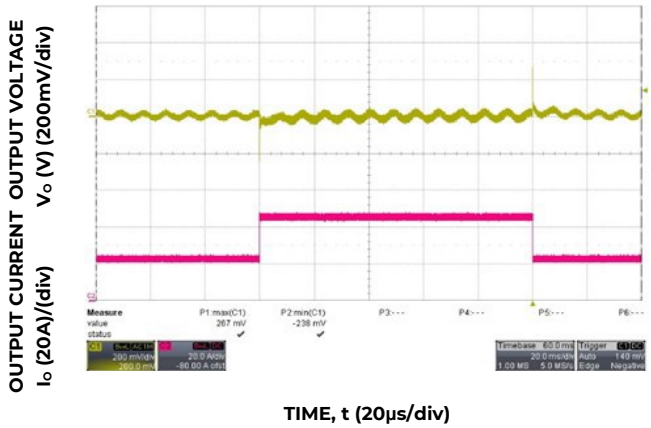


Figure 3. Transient Response to Dynamic Load Change from 50% to 100% at V_{IN} = 230V_{ac}

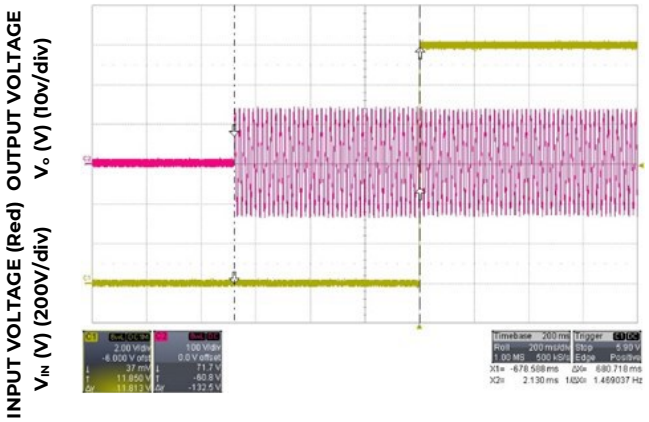


Figure 4. Typical Start-up (V_{IN} = 90V_{ac}, Full Load)

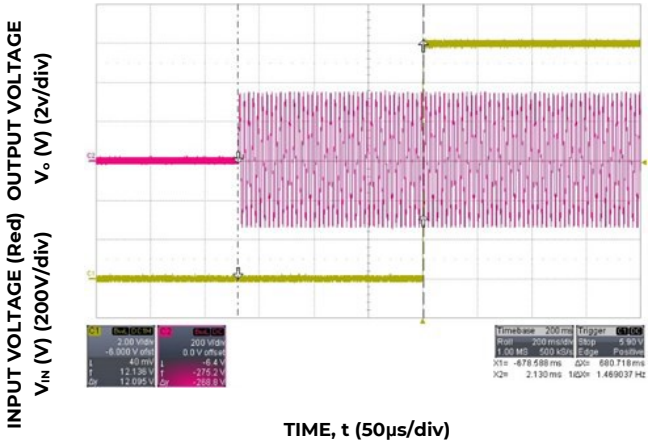


Figure 5. Typical Start-up (VIN = 230V, Full Load)

Characteristic Curves (CLP0512) (continued)

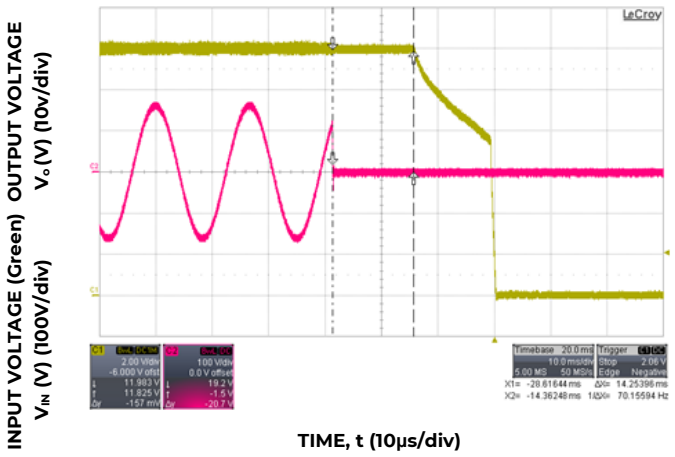


Figure 6. Typical Hold-up Waveforms (V_{IN} = 115V_{ac}, 100% Load)

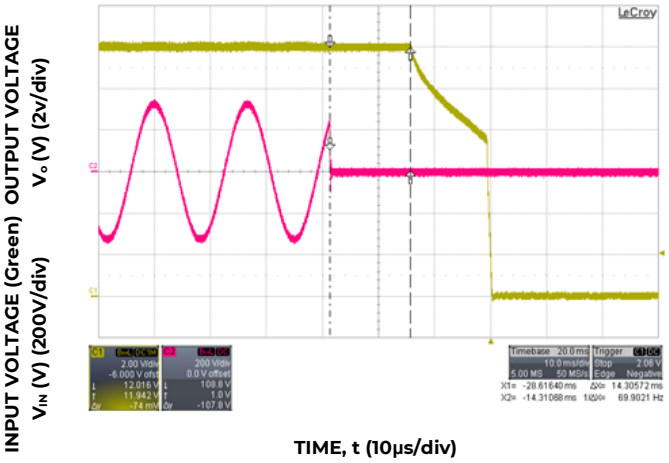
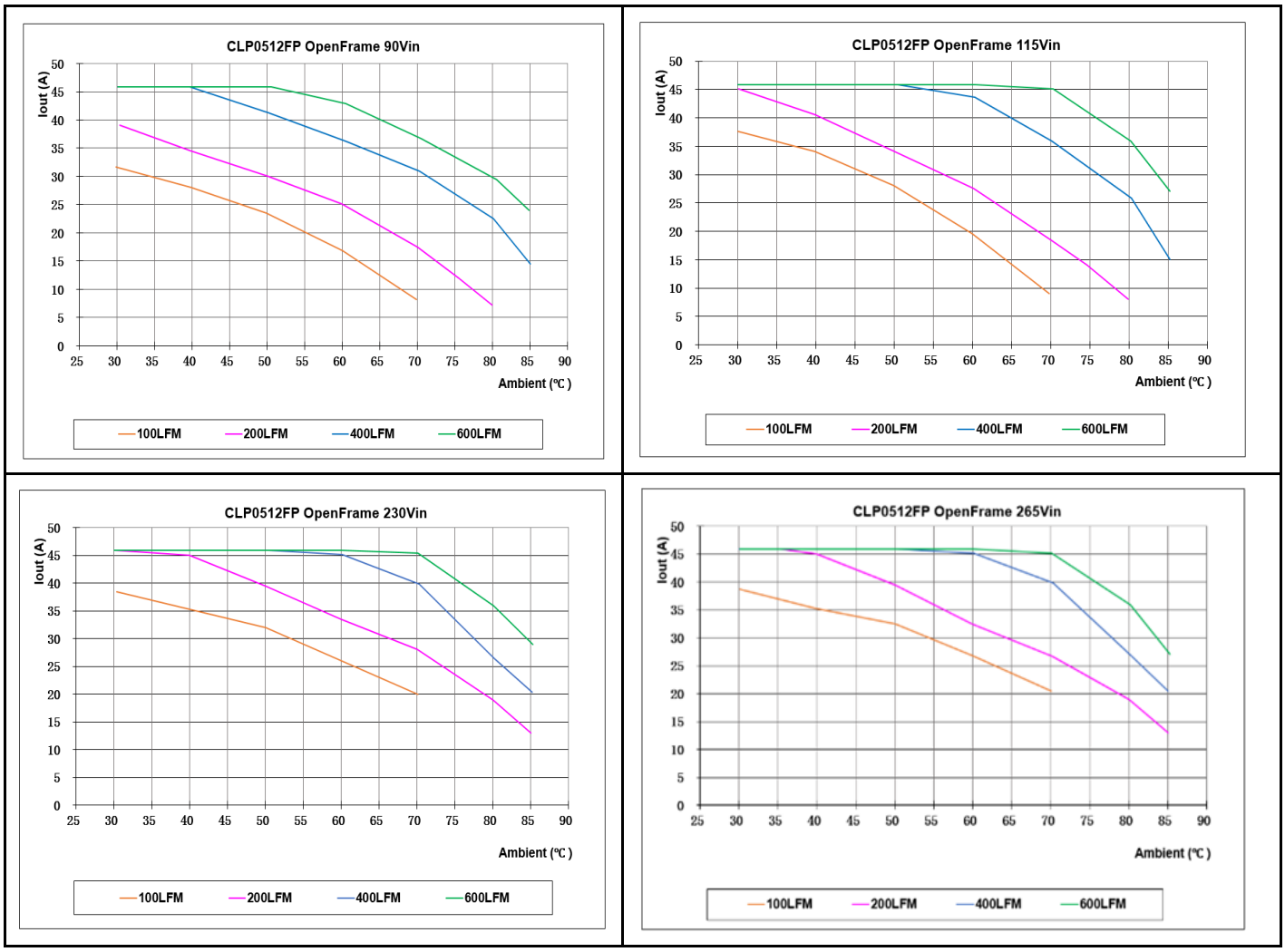


Figure 7. Typical Hold-up Waveforms (V_{IN} = 230V, 100% Load)

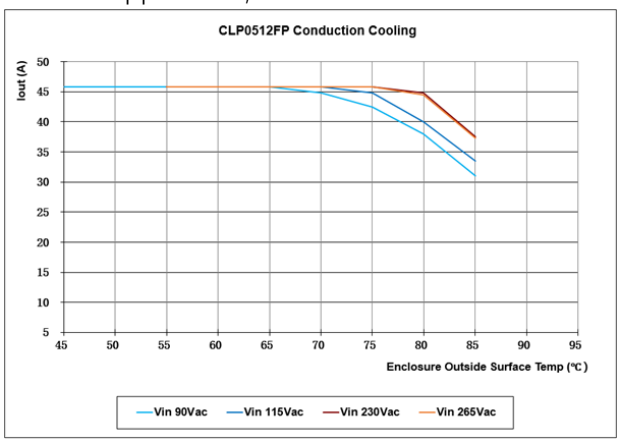
Power Derating for Forced Air Flow Application (CLP0512)

Air flow direction: Long Side (refer to Figure 2: Preferred Airflow Direction for Cooling



Power Derating for Conduction Cooling (CLP0512)

Enclosure Application; No load inside enclosure



Enclosure Application; with 420W resistive load inside enclosure

Enclosure Outside Surface (°C)	Enclosure Inside Ambient (°C)	Resistive Load (W) on CLP0512
55	85	420

Safety Considerations

The CLP0512 power supply is intended for inclusion in other equipment and the installer must ensure that it is complied with all of the requirement the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand-alone product. The power supply should meet ANSI/UL* 62368-1 and CAN/CSA† C22.2 No. 62368-1 Recognized, DIN VDE‡ 0868-1/A11:2017 (EN62368-1:2014/A11:2017)

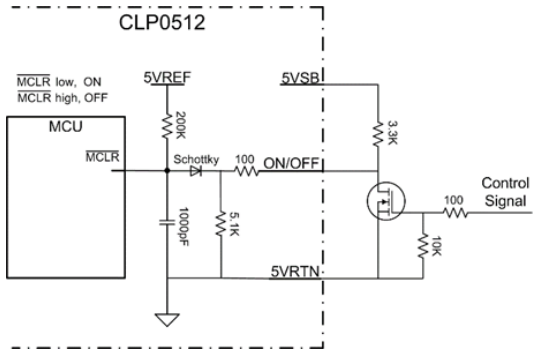
Feature Descriptions

Standby Power Supply

A standby output of 5V in the CLP0512 power supply comes on when AC input in the operating range is applied. 5V standby power is not isolated with main output.

Remote On/Off

The CLP0512 power supply features a TTL-compatible On/Off control input. The power supply turns ON when the On/Off input goes low, and turns OFF when the input goes high. Note that if the On/Off pin is left unconnected, the power supply main output will turn ON when AC input is present.



Output Voltage Adjustment

The output voltage can be adjusted between 11.4V and 12.6V using a potentiometer on the power supply.

Remote Sense

The power supply has both positive and negative remote sense connections that can be connected to the positive and negative rails of the main output near the load. The power supply operates even without the remote sense connections being made.

Overcurrent Protection

To provide protection in a fault condition (output overload), the power supply is equipped with internal current-limiting circuitry and can endure current limiting continuously. At the point of current-limit inception, the unit enters hiccup mode. The power supply operates normally once the output current is brought back into its specified range.

Overvoltage Protection

Overvoltage protection is a feature of the CLP0512 power supply that protects both the load and the power supply from an output overvoltage condition. When an overvoltage occurs, the power supply shuts down and latches off until the overvoltage condition is removed. It is necessary to recycle the input to restart the power supply when this protection is activated.

Overtemperature Protection

The CLP0512 also features overtemperature protection in order to provide additional protection in a fault condition. The power supply is equipped with a thermal shutdown circuit which detects excessive internal temperatures and shuts the unit down. Once the power supply goes into overtemperature shutdown, it will cool before attempting to restart. The overtemperature protection circuit will typically kick in when the unit is operated at 550W output with an ambient temperature of 49°C and 1m/s (200LFM) airflow and 115$V_{ac.}$

Input Undervoltage Lockout

At input voltages below the input under-voltage lockout limit, power supply operation is disabled. The power supply will begin to operate at an input voltage above the under-voltage lockout turn-on threshold.

DC OK

The CLP0512 provides a DC OK signal that indicates when the output has come up and is in regulation. This is an open-collector type signal that goes high when the output Is available and within regulation.

AC OK

The CLP0512 provides an AC OK signal that indicates when the Input Vin is in operational range. This is an open- collector type signal that goes High when the Input Vos within Range. This signal is isolated from Vin and referenced to V_{out} return.

Power Good LED

A green LED on board the power supply illuminates when the main output voltage is above 10V.

Paralleling with Active Output Current Sharing (option)

The CLP0512 is capable of being employed in a paralleling scheme, following are some design attributes that need to be carefully considered prior to attempting a parallel operation with multiple CLP0512's. With the following design criteria the CLP0512 will load share at an accuracy of +/-5%, when the total current draw is at levels above 20% of max overall loading.

- Current share signals of each power supply to be connected.
- An external Oring function needs to be employed at the V_{out}(+) signal. An oring diode or a Mosfet & controller scheme can be used.
- The 5V Standby Return SHOULD NEVER be connected with the VOUT-(RETURN). 5V stby returns will need to be connected together, the 5V stby V_{out}(+) leg remain separate. The 5V stby output is not designed to be paralleled, if there is a desire for these to be paralleled for load sharing, then other considerations need to be included as well. Contact your local OmniOn sales rep for FAE involvement.
- In the parallel scheme the remote sense function needs to be unused and remote sense signals left floating.

Assembling

Please use metal screw to mount the unit and make sure 4 mounting holes connected to Earth well.

In Applications were the power supply is enclosed, special attention to clearances between the supply and the enclosure should be a min. 3.5mm on all sides for improved safety. For additional protection a layer of Kapton tape, 3 mil in thickness covering the whole surface under the supply is recommend. If a cover is used a 3 mil Kapton Tape covering the whole cover is also recommend. Please contact your local OmniOn FAE if further information is needed.

Thermal Considerations

The power supply can be operated in a variety of thermal environments; however sufficient cooling should be provided to ensure reliable operation.

Considerations include ambient temperature, airflow, power supply dissipation and the need for increased reliability. A reduction in the operating temperature of the power supply will result in increased reliability. The power supply can deliver 550W capability at 50°C and 400LFM airflow with derating at higher temperatures or lower airflows.

Operation in a Sealed Enclosure

The CLP0512 power supply can also be operated in a sealed enclosure or in an environment where cooling is primarily via conduction. Figure 10 shows an arrangement where thermally conductive pads are used to transfer heat from the top and bottom of the power supply into the enclosure. Under such conditions, the power supply is capable of reduced power operation as shown in Power Derating Curves/ Enclosure Application.

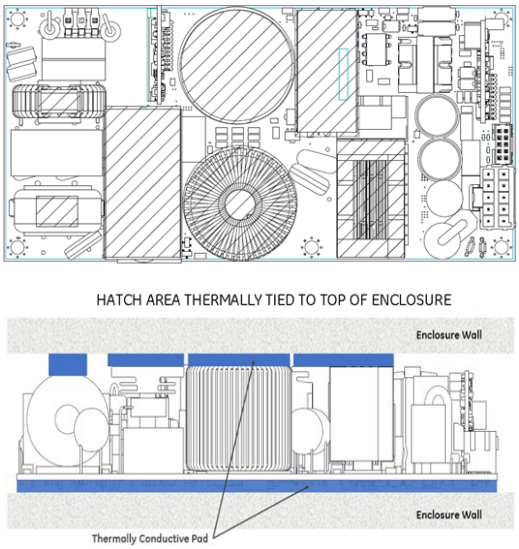


Fig. 1. Example arrangement of the CLP0512 for sealed enclosure applications.

Thermal conductivity should be 3.0 W/m-K for thermal pad application and 1kV+ isolation, example:

Thermal gap pad:
http://www.bergquistcompany.com/pdfs/dataSheets/PDS_GP_HC3_0714%20v7.pdf

Thermal gap pad:
https://www.lairdtech.com/products/tputty-502

Heat Transfer Via Convection

Increased airflow through the power supply enhances the heat transfer via convection. Fig 2 shows the preferred airflow direction. Contact your technical representative for derating information in other airflow directions.

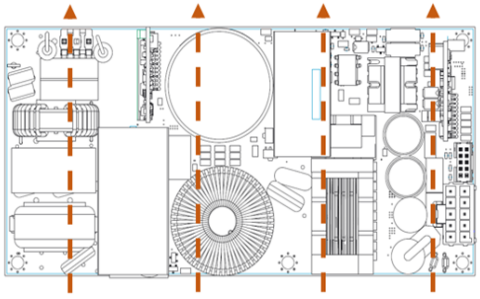
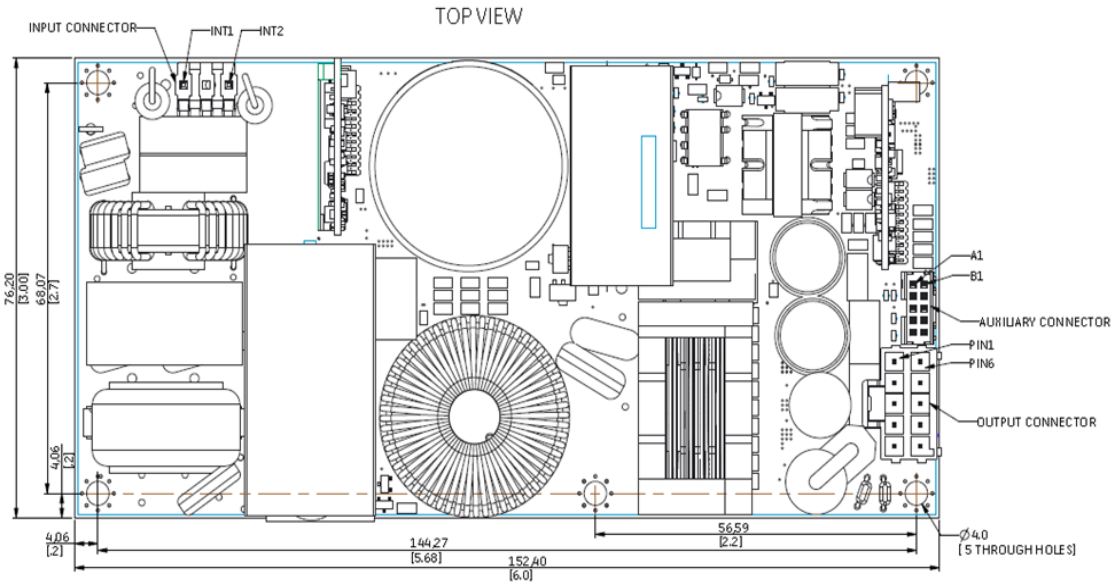
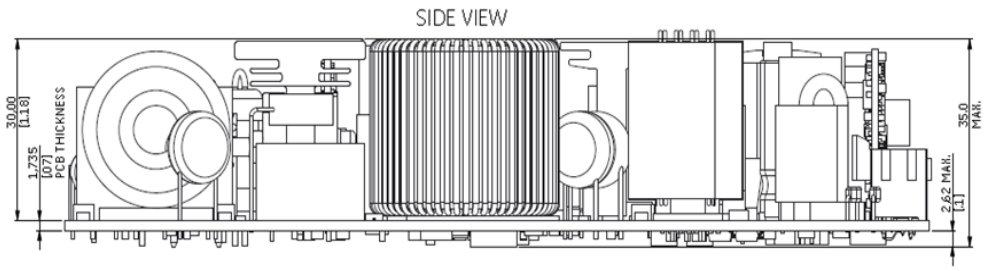


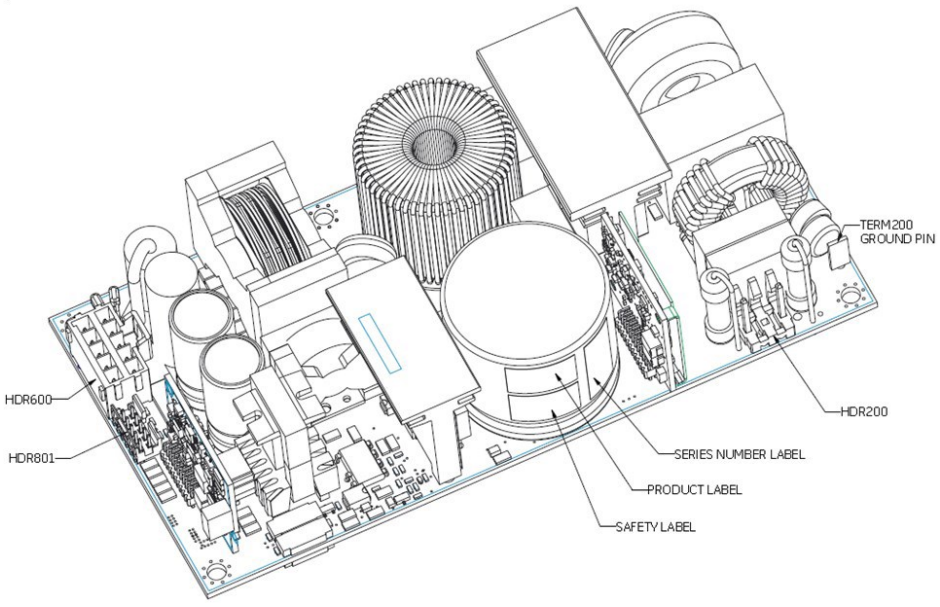
Fig. 2. Preferred airflow direction for cooling

Mechanical Outline (CLP0512)

TOP VIEW







Connector Information

Connector	Connector on Power Supply	Connector Housing	Crimp Terminal	TPA
AC Input Connector (HDR200)	Molex 41671-3473 or equivalent	Molex 09-50-3031 or equivalent	Molex 08-55-0133 or equivalent	\
DC Output Connector (HDR600)	Molex 172298-1210 or equivalent	Molex 172258-1110 or equivalent	Molex 172253-6011 or equivalent	Molex 172264-1008 or equivalent
Auxiliary Connector (HDR801)	FCI 98414-G04-10ULF or equivalent	FCI 90311-010LF or equivalent	FCI 10044403 (22~24AWG) or equivalent	\
Ground Pin (TERM200)	TE P/N: 63756-1		TE 110series Receptacles eg:63093 -1 18~14AWG or equivalent	

Pinout Information

AC Input Connector (HDR200)		DC Output Connector (HDR600)		Auxiliary Connector (HDR801)	
INT 1	L	Pins 1 - 5	12 V_{OUT}	Pin A1 - SV Standby	Pin B1 - ISHARE
INT 2	N	Pins 6-10	$12V_{RTN}$	Pin A2 - SV Standby	Pin B2 - SV Standby
				Pin A3 - AC_OK	Pin B3 - SV Standby
				Pin A4 - REMOTE	Pin B4 - DC_OK
				Pin A5 - REMOTE	Pin B5 - ON/OFF

Ordering Information

Device Code	Input Voltage Range	Output Voltage	Output Current	On/Off Control	Standby Supply	Temperature Range	Ordering Code
CLP0512FPXXXZ01A	90 – $265V_{dc}$	$12.0V_{dc}$	45.8A	Negative Logic	5V@ 1A	-40 to 85°C	CLP0512FPXXXZ01A

Change History (excludes grammar & clarifications)

Revision	Date	Description of the change
4.3	12/11/2021	Updated as per template
4.4	12/17/2023	Updated as per OmniOn template
4.5	02/29/2024	Update Molex Crimp Terminals on Pg 4

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