Design Concept Report

220W AC-DC Resonant Power Supply

Design Specs	Value	Unit
Input Voltage	90-265	VAC
Input Frequency	47-63	Hz
Output Voltage	12	VDC
Output Current	18.3	A
Isolation	Yes	
MPS IC	MP44010, HR1000A, MP6922(A)	
Application	Server Power Supply AC-DC Power Supply	

Document Number	DCXXX
Author	Application Engineering Department
Date	Nov, 2014
Revision	1.0

Design Summary

MP44010+HR1000A + MP6922(A) is a design concept for a universal offline isolated power supply with 12V, 18.3A output. It contains the estimated specification of the power supply, a detailed circuit diagram, drawing of the power inductors and transformers. Such information would be useful to the customer to create a similar design with less effort.

There is no physical PCB that can be ordered for MPS's design concepts, however schematics and further support is available upon request. For ordering reference designs that include an assembled PCB and more detailed spec, please refer to MPS website for more information.

DESCRIPTION

Here introduces a design concept for a 220W AC-DC power supply, it is primary for server applications but also applies to other general AC-DC applications.

This design includes a boost PFC pre-regulator using MP44010. This design concept also utilizes MPS's state-of-art half bridge LLC resonant controller HR1000A and dual fast synchronous rectifier MP6922(A) to realize very high overall efficiency.

MP44010 is a boundary conduction mode PFC controller which can provide simple and high performance active power factor correction using minimum external components.

HR1000A is a controller designed specifically for the resonant half-bridge ZVS. It controls the output power by changing the switching frequency and controlling the half-bridge with a constant 50% duty cycle. And HR1000A can optimize the light load consumption for the burst mode operation.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input AC Voltage	V_{AC}	90 to 265	VAC
Input Frequency	F	47 to 63	Hz
Output Voltage	V_{OUT}	12	VDC
Output Current	I_{OUT}	18.3	A
Power Factor	PF	>0.9*	
THD		<20%*	
Active Mode Efficiency	Eff	>90%*	

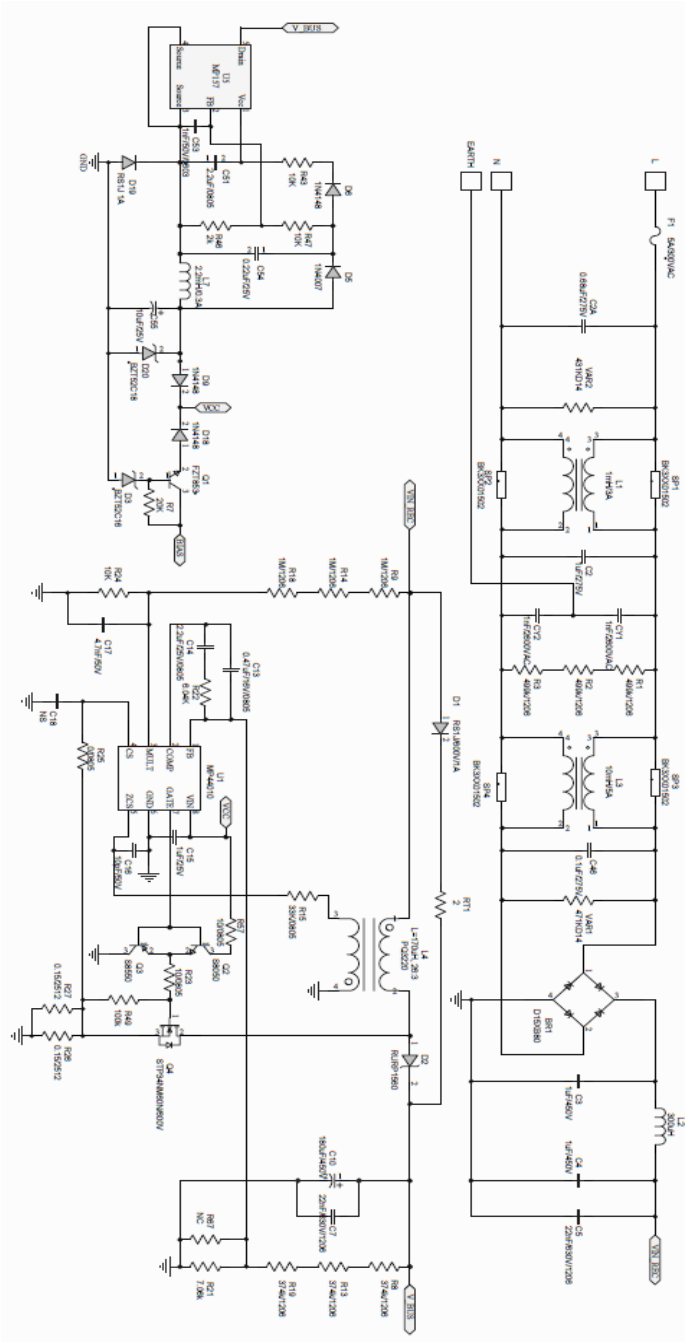
*By estimate

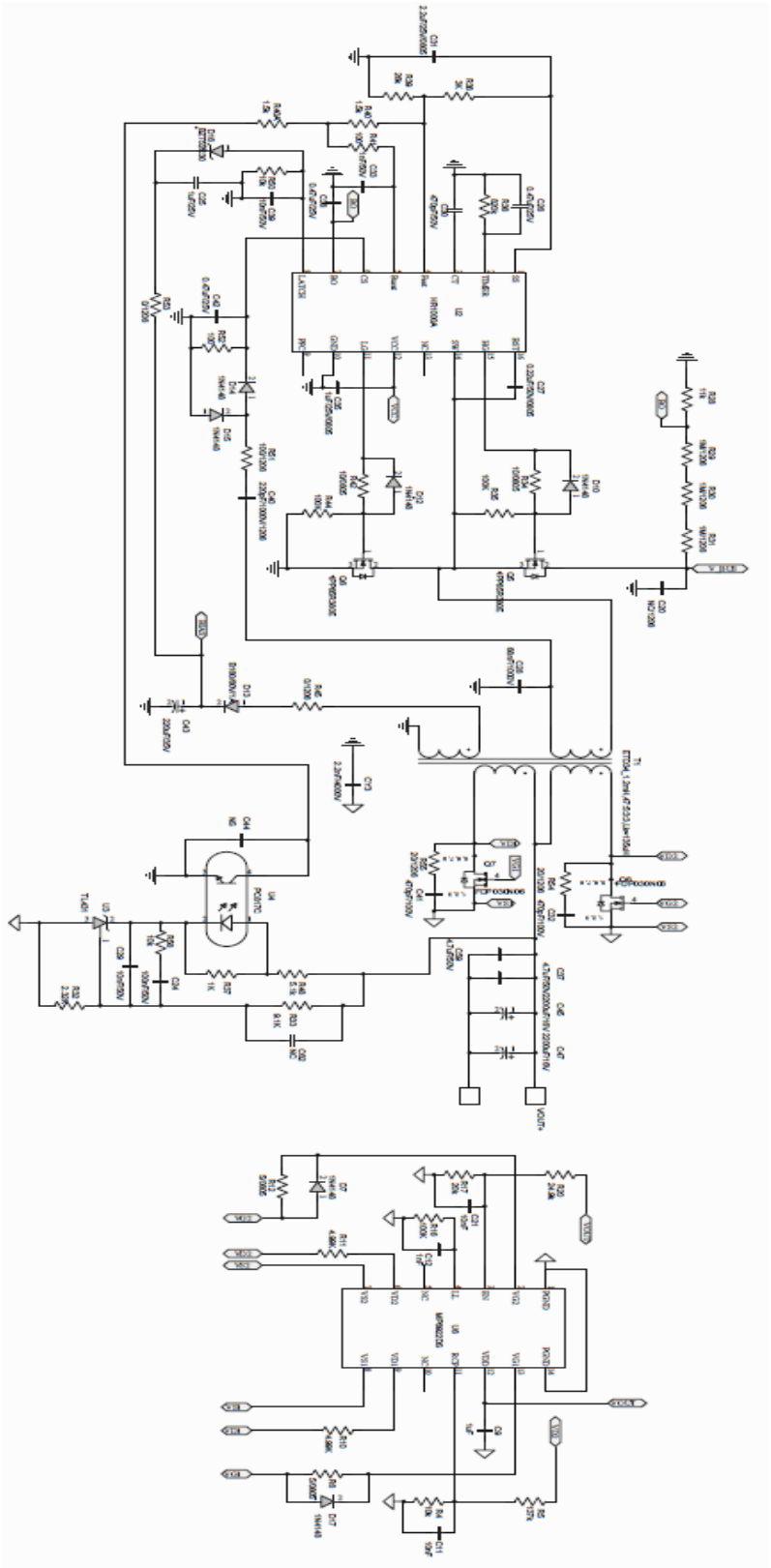
FEATURES

- High Efficiency
- Active PFC
- Very Low No-Load Power Consumption
- Output Short Circuit Protection
- Over Voltage Protection

Warning: Although this board is designed to satisfy safety requirements, the engineering prototype has not been agency approved. Therefore, all testing should be performed using an isolation transformer to provide the AC input to the prototype board.

MP44010+HR1000A + MP6922(A) DESIGN CONCEPT SCHEMATICS





Design Number	MPS IC Number
MP44010+HR1000A + MP6922(A)	HR1000A
	MP44010
	MP6922, MP6922A

Disclaimer

Monolithic Power Systems (MPS) reserves the right to make changes to its products and to discontinue products without notice. The applications information, schematic diagrams, and other reference information included herein is provided as a design aid only and are therefore provided as-is. MPS makes no warranties with respect to this information and disclaims any implied warranties of merchantability or non-infringement of third-party intellectual property rights.

MPS cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a MPS product. No circuit patent licenses are implied.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage (“Critical Applications”).

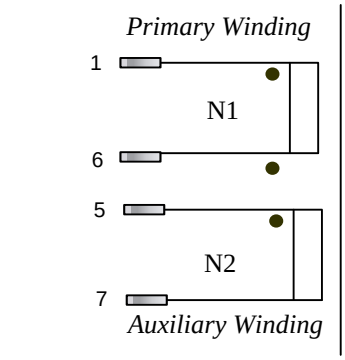
MPS PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE‐SUPPORT APPLICATIONS, DEVICES OR SYSTEMS, OR OTHER CRITICALAPPLICATIONS.

Inclusion of MPS products in critical applications is understood to be fully at the risk of the customer. Questions concerning potential risk applications should be directed to MPS.

MPS semiconductors are typically used in power supplies in which high voltages are present during operation. High voltage safety precautions should be observed in design and operation to minimize the chance of injury.

APPENDIX: PFC INDUCTOR SPECIFICATION

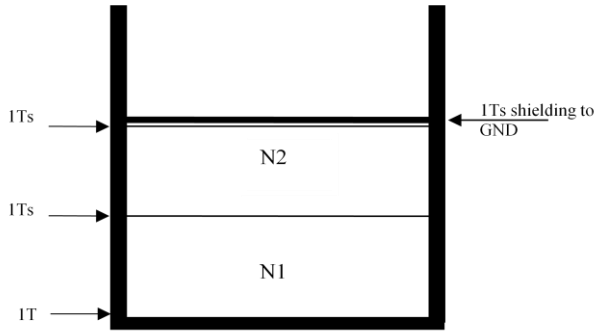
Electrical Diagram



Note: ○ Winding start

Teflon tube

Winding Diagram



Electrical Characteristic

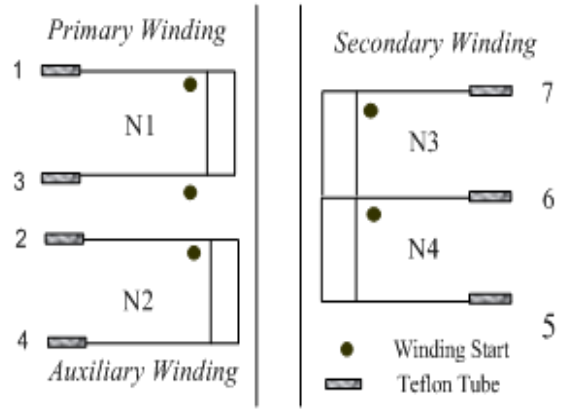
Parameter	Value
Inductance	170μH±5%
Core	PQ3220
Bobbin	PQ3220
Core Material	PC40
Turns Ratio	26:3

Winding Specification

Winding Order	Pin Number		Wire Type (Φ)	Number of Turns	Tube
	Start	Finish			
N1	6	1	0.1mm*100	26	Matching Wire
N2	5	7	0.2	3	Matching Wire

APPENDIX: LLC TRANSFORMER SPECIFICATION

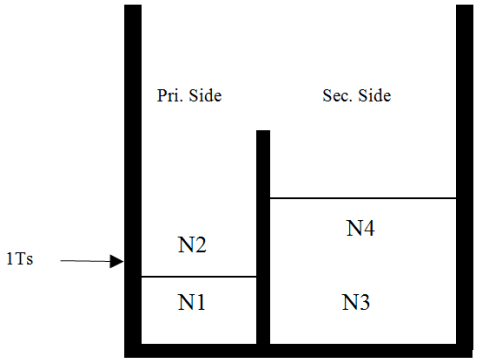
Electrical Diagram



Note: O Winding start

Teflon tube

Winding Diagram



Electrical Characteristic

Parameter	Condition	Value
Primary Inductance		1.2mH±5%
Leakage Inductance		135uH (Max)
Core		ETD34
Bobbin		ETD34
Core Material		PC40
Turn Ratio	N1:N2:N3:N4	47:5:3:3

Winding Specification

Winding Order	Pin Number		Wire Type (Φ)	Number of Turns	Tube
	Start	Finish			
N1	1	3	0.1mm*40	47	Matching with Wire
N2	2	4	0.2mm	5	Matching with Wire
N3	5	6	0.1mm*200	3	Matching with Wire
N4	6	7	0.1mm*200	3	Matching with Wire