

Isolated Constant Power Converter Using the HV9922

Many applications require the use of a low cost, low power, bias supply. In consumer products such as televisions and audio/video equipment, a bias supply powers the remote control and logic as the main power converter is turned off. White goods, such as washer/dryers and countertop appliances require very low power for the logic and relay control, as the motors or heating elements are powered from the AC input.

This design note describes a very low cost bias supply, using the HV9922. The HV9922 operates in an isolated flyback converter, providing a constant power of 1.0W at

input voltages of 85 - 132VAC. The flyback converter switch is integrated into the HV9922, and its' internal current limit of 50mA allows for the constant power output of 1.0W. A 2-winding transformer provides the isolation. An output Zener, 12V in this case, regulates the output voltage to $\pm 5\%$. This converter meets UL class 2 isolation and CISPR 22 Class B EMI limits. The tables below show the performance of the HV9922 isolated flyback converter. Also, the schematic, waveforms of drain voltage and drain current, transformer parameters and construction, and bill of materials are included in this design note.

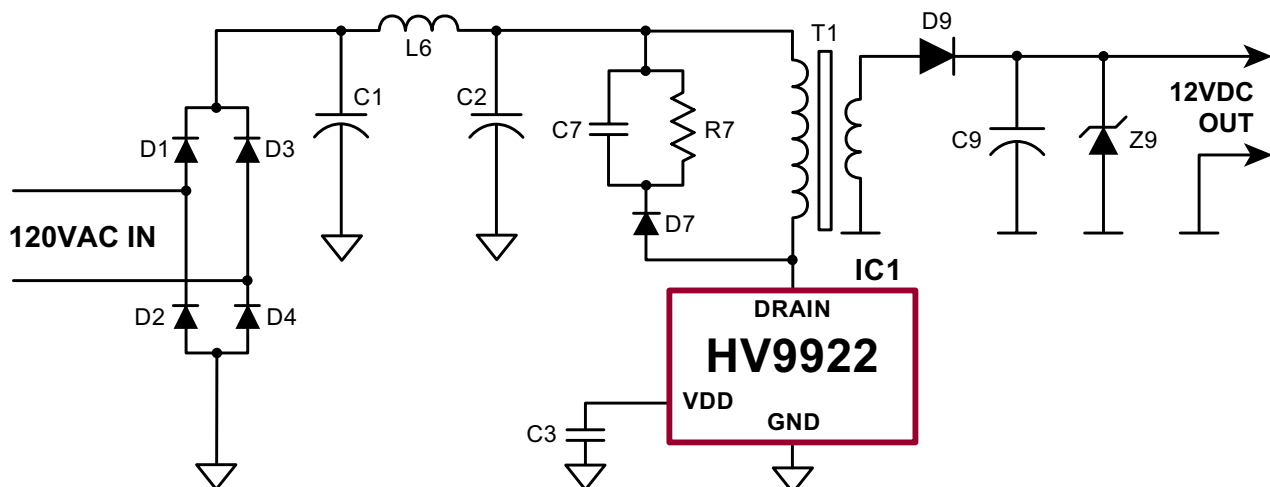
Line Regulation @ 1.0W Load

Input Voltage	Output Voltage	Efficiency
85VAC	12.12V	72.7%
120VAC	12.26V	73.2%
132VAC	12.29V	73.2%

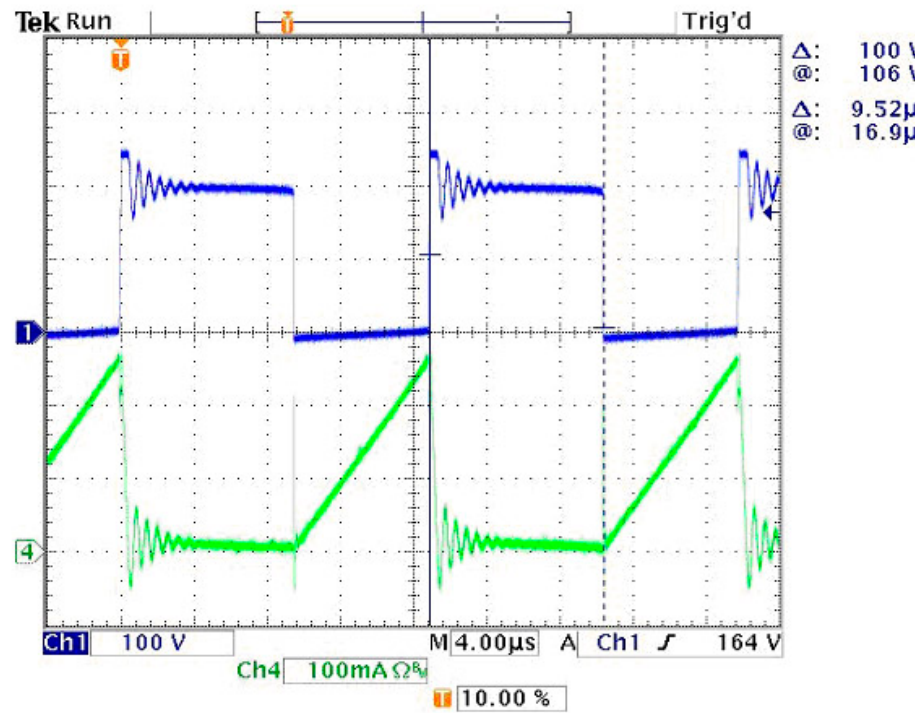
Load Regulation @ 120VAC

Output Load	Output Voltage
0	12.35V
0.5W	12.23V
1.0W	12.03V

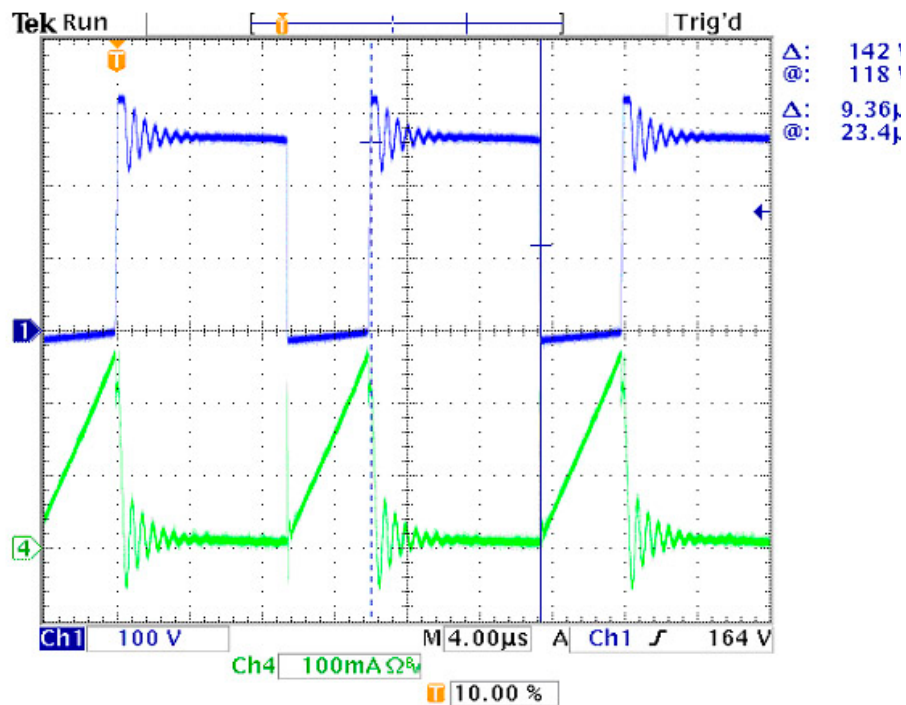
Figure 1: Schematic



Waveforms of Drain Voltage and Drain Current at 85VAC Input



Waveforms of Drain Voltage and Drain Current at 132VAC Input

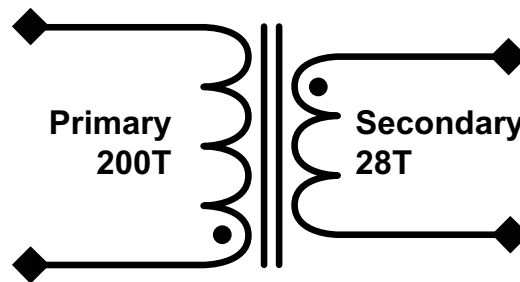


Transformer Details

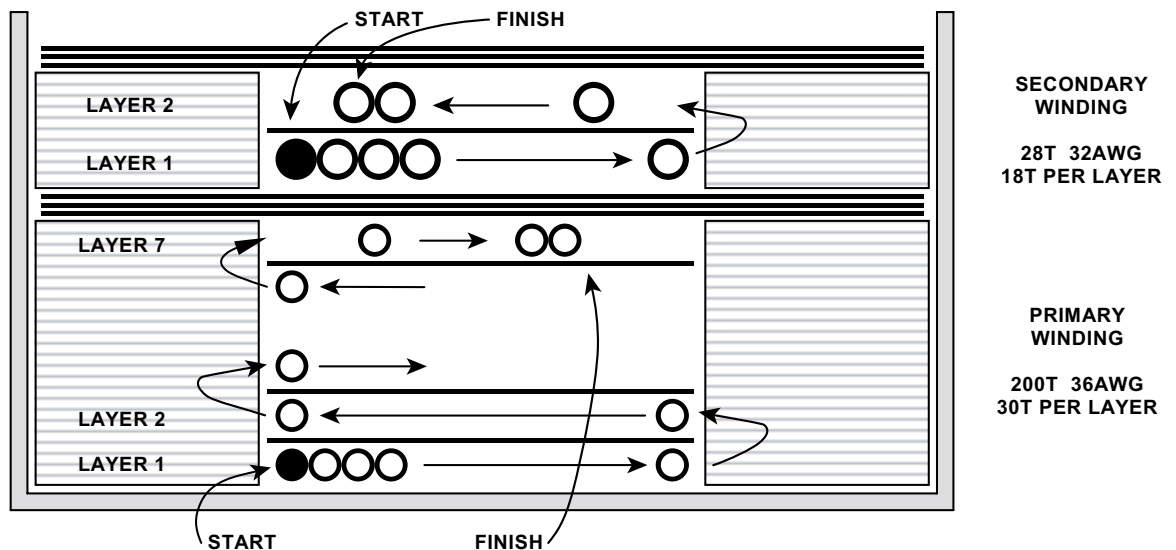
Core	Epcos EE16/8/6 P/N B66307-G60-X1 gapped to $A_L = 303\text{nH}$
Bobbin	Epcos B66308-J1108-T1
Primary	200 turns of AWG#36 magnet wire, 30mA max
Secondary	28 turns of AWG#32 magnet wire, 200mA max
Insulation	3M 1928 polyester film, 2.0mils thick
Margin Tape	3M #10 reinforced epoxy film 5.0mils thick

Primary Inductance	12mH \pm 10%
Leakage Inductance	10% of primary inductance
Switching Frequency	10 μsec fixed off time control; $F_{\text{switching}}$: 50 - 70KHz

Schematic Diagram of Transformer



Winding Diagram



Bill of Materials

Reference	Qty	Description	Footprint	Mfr	Mfr PN
D1, D2, D3, D4	4	Rectifier 1A 1000V DO-41	TH	Micro Commercial Co.	1N4007-TP
C1, C2	2	Cap 1 μ F 200V Elect VR Radial	TH	Nichicon	UVR2D010MED
L6	1	Coil 1000. μ H Molded Unshielded	TH	API Delevan Inc	1025-92K
C7	1	CAP .01 μ F 200V Poly B Series	TH	Panasonic - ECG	ECQ-B2103JF
R7	1	Res 220K Ω 1/4W 5% Carbon Film	TH	Yageo	CFR-25JB-220K
D7, D9	2	Rectifier High-Eff 400V 1A DO-41	TH	Diodes Inc	HER105-T
C3	1	CAP 0.1 μ F 50V Poly B Series	TH	Panasonic - ECG	ECQ-B1H104JF
IC1	1	LED Driver 55MA TO92	TH	Supertex Inc.	HV9922N3
C9	1	Cap 100 μ F 16V Elect VR Radial	TH	Nichicon	UVR1C101MDD
Z9	1	Diode Zener 5W 12V DO41	TH	ON Semiconductor	1N5349BRL
T1	1	Flyback Transformer Off-Line 1W	TH	Custom	***

Supertex inc. does not recommend the use of its products in life support applications, and will not knowingly sell them for use in such applications unless it receives an adequate "product liability indemnification insurance agreement." **Supertex inc.** does not assume responsibility for use of devices described, and limits its liability to the replacement of the devices determined defective due to workmanship. No responsibility is assumed for possible omissions and inaccuracies. Circuitry and specifications are subject to change without notice. For the latest product specifications refer to the **Supertex inc.** (website: <http://www.supertex.com>)