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8 W, 3-Output Off-Line Switcher

Device	Application	Input Voltage	Output Power	Topology	I/O Isolation
NCP1014	3 Output Power Supply for DVD Player	90 to 270 Vac	8 W	Flyback	Yes - 3 kV I/O

Other Specifications				
	Output 1	Output 2	Output 3	Output 4
Output Voltage	5 V	12 V	-28 V	N/A
Ripple	100 mV	120 mV	250 mV	N/A
Nominal Current	850 mA	150 mA	50 mA	N/A
Max Current	1 A	200 mA	50 mA	N/A
Min Current	50 mA	10 mA	5 mA	N/A

PFC (Yes/No)	No
Minimum Efficiency	68 %
Input Connector / Fuse	1 A fuse
Operating Temp Range	0 to +50 °C
Cooling Method / Supply Orientation	Convection

Circuit Description

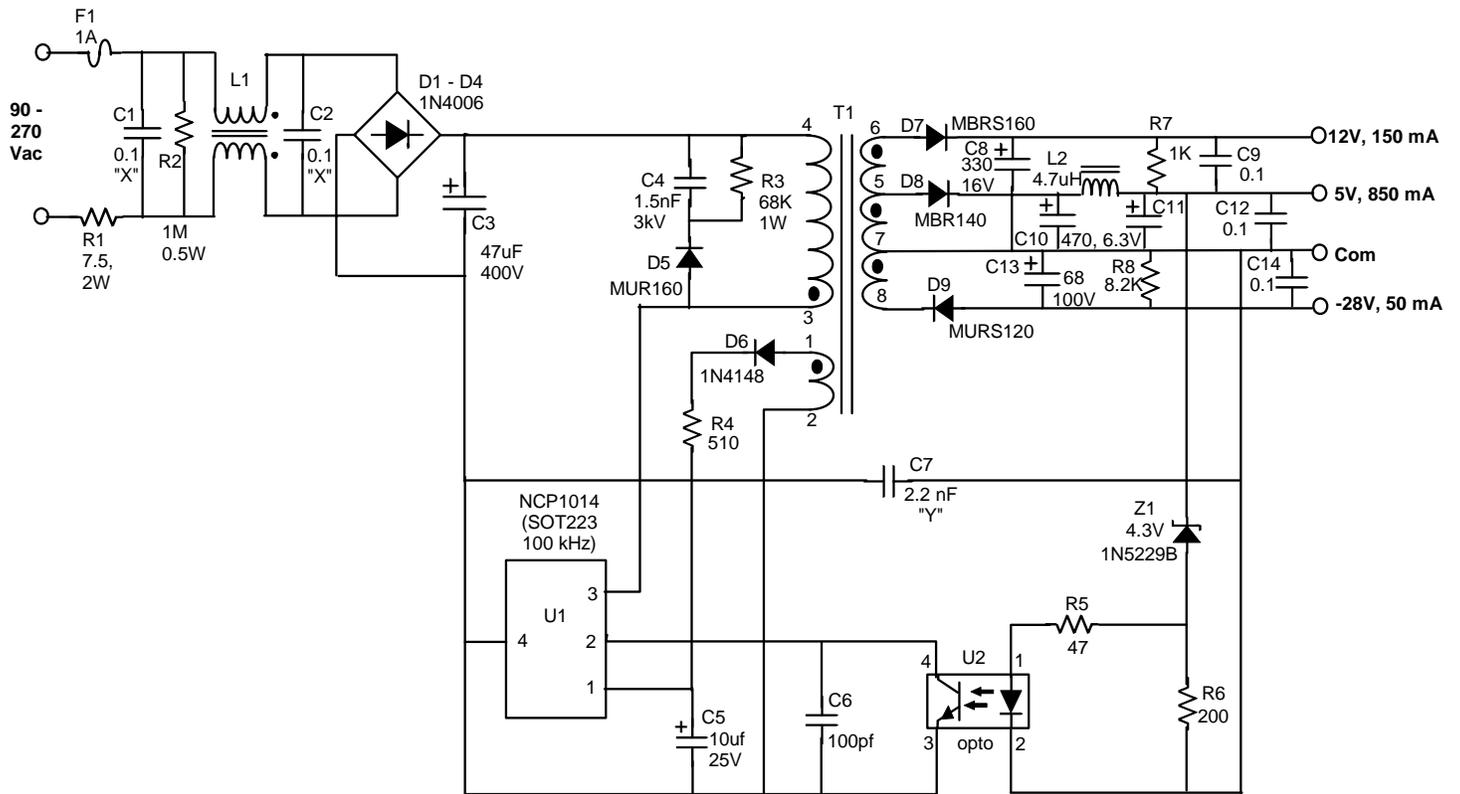
An 8 watt, 3-output, isolated off-line switcher with universal AC input is presented here. The design is based around the NCP1014 monolithic, integrated controller. Utilization of the SOT-223 package for U1 is recommended for optimum thermal management. The power circuit design is a discontinuous mode flyback topology operating at 100 kHz, although the T1 magnetics design will allow for 65 kHz operation also. The output voltage configuration can be changed by altering the turns ratios of the secondaries if desired. Use of stacked windings for the 5 V and 12 V secondaries provides good regulation for both outputs. Voltage sensing and regulation is accomplished with simple zener diode and optocoupler circuit configuration.

Key Features

- Low parts count, inexpensive off-line power supply for telecom, appliance or telecom applications.
- Input EMI filter for agency compliance
- Stacked 5 and 12 V transformer windings for improved cross regulation.
- 8 watt output with 10 watt peak if SOT-223 package is used for NCP1014.
- Ripple inductor for low ripple on 5 V output.
- Over current and overvoltage protection.

DN06003/D

Schematic



Notes:

1. Crossed lines on schematic are not connected.
2. U2 is Vishay H11A817A optocoupler or equivalent.
3. L1 is Coilcraft BU16-4530R5BL or similar CM EMI inductor.
4. Z1 sets 5V output level ($V_{out} = V_z + 0.85V$)
5. U1 pin 4 tab should be soldered to clad for heatsinking.
6. See magnetics design for T1 details.

Triple Output, 8 Watt, Off-line Power Supply based on NCP1014 Controller
ON Semiconductor Design Group

MAGNETICS DESIGN DATA SHEET

Project / Customer: Triple output, off-line NCP1014 based power supply

Part Description: Flyback transformer, 10W, 100 kHz, 3 output

Schematic ID: T1

Core Type: 42515-EC or similar ($A_e = 0.4 \text{ cm}^2$)

Core Gap: Gap for 1.2 mH on primary (pins 3 to 4)

Inductance: 1.2 mH +/- 5%

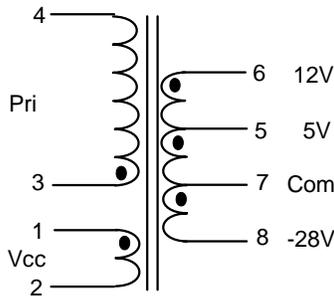
Bobbin Type: TBD (8 pin minimum)

Windings (in order):

Winding # / type	Turns / Material / Gauge / Insulation Data
Aux/Vcc winding (1 - 2)	9 turns of 32HN (0.25 mm dia) magnet wire evenly spiral wound over one layer with 3 mm end margins. Insulate for 1.5 kV to next layer.
Primary (3 - 4)	88 turns of #32HN (0.25 mm dia) magnet wire over 2 layers with 44 turns per layer. Allow 3 mm end margins for both layers. Self-leads to pins and insulate for 3 kV to next winding.
12V secondary (6 - 5)	5 turns of #26HN (0.46 mm) wire spiral wound with 3 mm end margins. Self-leads to pins.
5V secondary (5 - 7)	4 turns of 0.46 mm wire spiral wound between the turns of the previous winding. Keep 3 mm end margins and insulate for 1 kV to next winding with tape.
-28V secondary (7 - 8)	20 turns of #30HN (0.30 mm dia) wire spiral wound over previous winding with 3 mm end margins. Self-leads to pins. Tape insulate for 1 kV to next winding.

Hipot: 3 kV from Vcc/primary to all secondaries.

Schematic



Lead Breakout / Pinout

(Bottom view facing pins)

T.B.D. based on PCB layout.

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