



10 W, 24 V / 5 V Off-Line Power Supply

ON Semiconductor

Device	Application	Input Voltage	Output Power	Topology	I/O Isolation
NCP1027	Industrial Equipment	90 to 270 Vac	10 W (12W peak)	Flyback / Buck	Yes

Other Specifications

	Output 1	Output 2	Output 3	Output 4
Output Voltage	24 Vdc	5.0 Vdc	N/A	N/A
Ripple	200 mV	100 mV	N/A	N/A
Nominal Current	400 mA	250 mA	N/A	N/A
Max Current	500 mA	500 mA	N/A	N/A
Min Current	zero	zero	N/A	N/A

PFC (Yes/No)	No
Minimum Efficiency	80% minimum
Operating Temp. Range	0 to +70°C
Cooling Method/Supply Orientation	Convection

Others	Both outputs regulated.
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Circuit Description

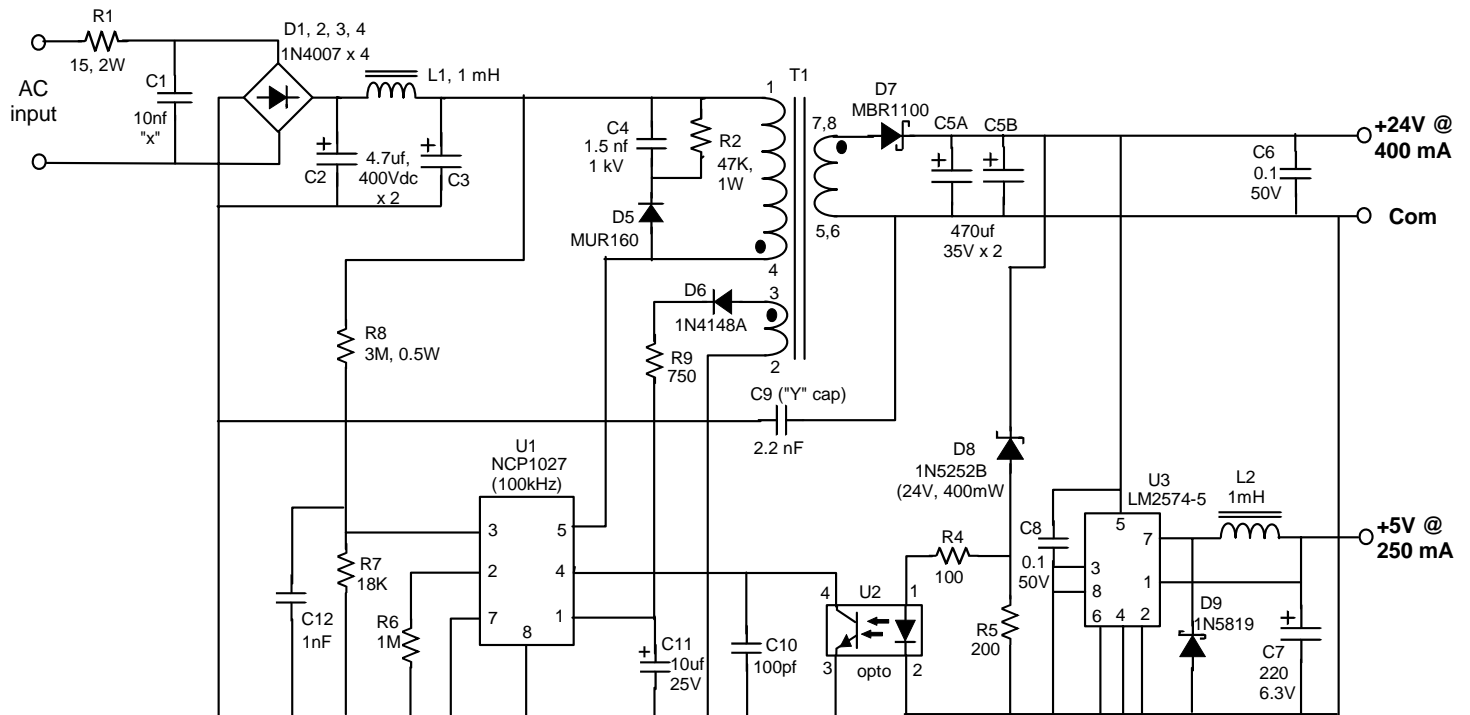
This design note features a low power, off-line dual output power supply intended for industrial control applications. ON Semiconductor's NCP1027 integrated monolithic controller is implemented in a discontinuous conduction mode (DCM) flyback topology to provide 24 volts for powering motors or relays and an additional 5 volt output is provided utilizing the LM2574-5 Buck switching regulator. This latter output is useful for logic level power and is derived from the 24 Vdc main output. With the exception of T1, all magnetics are "off-the-shelf" parts from Coilcraft. The NCP1027 main controller features current mode control and ac mains "brown-out" sensing. Additional features of this chip not specifically used in this application include slope compensation for continuous conduction mode topologies and a power limit function (see NCP1027 data sheet at www.onsemi.com). The circuit also includes a conducted EMI filter composed of C1, C9, and L1.

Key Features

- Two regulated dc output voltages (24V, 5V) for industrial controls or similar applications.
- Low cost yet robust 10 watt output power with 12 watt surge capability.
- Mains brown-out sensing.
- Input conducted EMI filter.
- Efficient, low noise DCM flyback topology
- Monolithic current mode controller plus 700 V MOSFET in single DIP-8 package.

DN06012/D

Schematic



NOTES:

1. L1, L2 are Coilcraft inductor part # RFB0807-102L (1 mH @ 250 mA).
2. U2 is 4 pin optocoupler with CTR of 50% minimum (Vishay recommended)
3. See Magnetics Data Sheet for T1 construction details (EF-16 core & horizontal bobbin.)
4. U3 can be 5 volt or 3.3 volt version of LM2574 (DIP8 package).
5. D7 zener sets main Vout: $V_{out} = V_z + 0.85V$.
6. Fuse resistor recommended for R1 (inrush limiting).
7. Crossed schematic lines are not connected.
8. C5B optional depending on output ripple requirements.
9. Components shown are "generic" through-hole devices. SMD versions can be substituted for most of the components if desired.
10. All semiconductors are manufactured by ON Semiconductor except U2 (optocoupler).
11. C1, C9, and L1 required for conducted EMI compliance.
12. All resistors are 1/4W unless otherwise specified.

**10 Watt, Dual Output,
Universal AC Input
Power Supply**
ON Semiconductor
Power Design Group

MAGNETICS DESIGN DATA SHEET

Project : 10 Watt, NCP1027 based off-line supply

Part Description: 10 watt flyback transformer, 100 kHz, 24V / 500mA

Schematic ID: T1

Core Type: EF16 (E16/8/5); 3C90 material or similar

Core Gap: Gap for 1.3 mH

Inductance: 1.3 mH +/-5%

Bobbin Type: 8 pin horizontal mount for EF16

Windings (in order):

Winding # / type

Turns / Material / Gauge / Insulation Data

Vcc/Boost (2 - 3)

12 turns of #32HN spiral wound over 1 layer. Insulate with 1 layer of tape (500V insulation to next winding)

Primary (1 - 4)

105 turns of #32HN over 3 layers, 35 TPL. Insulate for 3 kV to next winding.

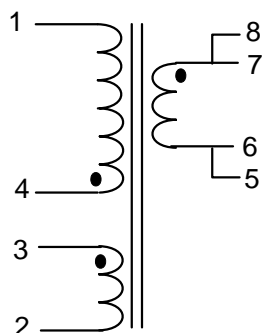
24V Secondary (5, 6 - 7, 8)

20 turns of #28H wound over one layer with 0.050" (1.3mm) end margins. Insulate with tape.

Vacuum varnish assembly.

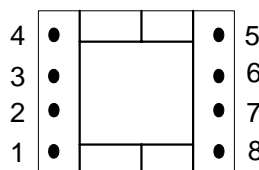
Hipot: 3 kV from boost/primary to secondary for 1 minute.

Schematic



Lead Breakout / Pinout

(Bottom View - facing pins)



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