



ON Semiconductor

18 to 24 Volt, 85 Watt, Off-line PSU with Short Term, High Surge Current Capability

Device	Application	Input Voltage	Output Power	Topology	I/O Isolation
NCP1217	Industrial – motors, solenoids, etc.	90 to 265 Vac	85 Watts	CCM Flyback	Yes – 3 kV

Other Specifications

	Output 1	Output 2	Output 3	Output 4
Output Voltage	18 to 24 V	N/A	N/A	N/A
Ripple	Less than 1%	N/A	N/A	N/A
Nominal Current	3.5 A	N/A	N/A	N/A
Max Current	7 – 8 A	N/A	N/A	N/A
Min Current	Zero	N/A	N/A	N/A

PFC (Yes/No)	No
Minimum Efficiency	85%
Inrush Limiting / Fuse	3 A fuse, Thermistor inrush limiter
Operating Temp. Range	0 to +60°C
Cooling Method/Supply Orientation	Convection
Signal Level Control	None

Others	High output surge current capability for several seconds.
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Circuit Description

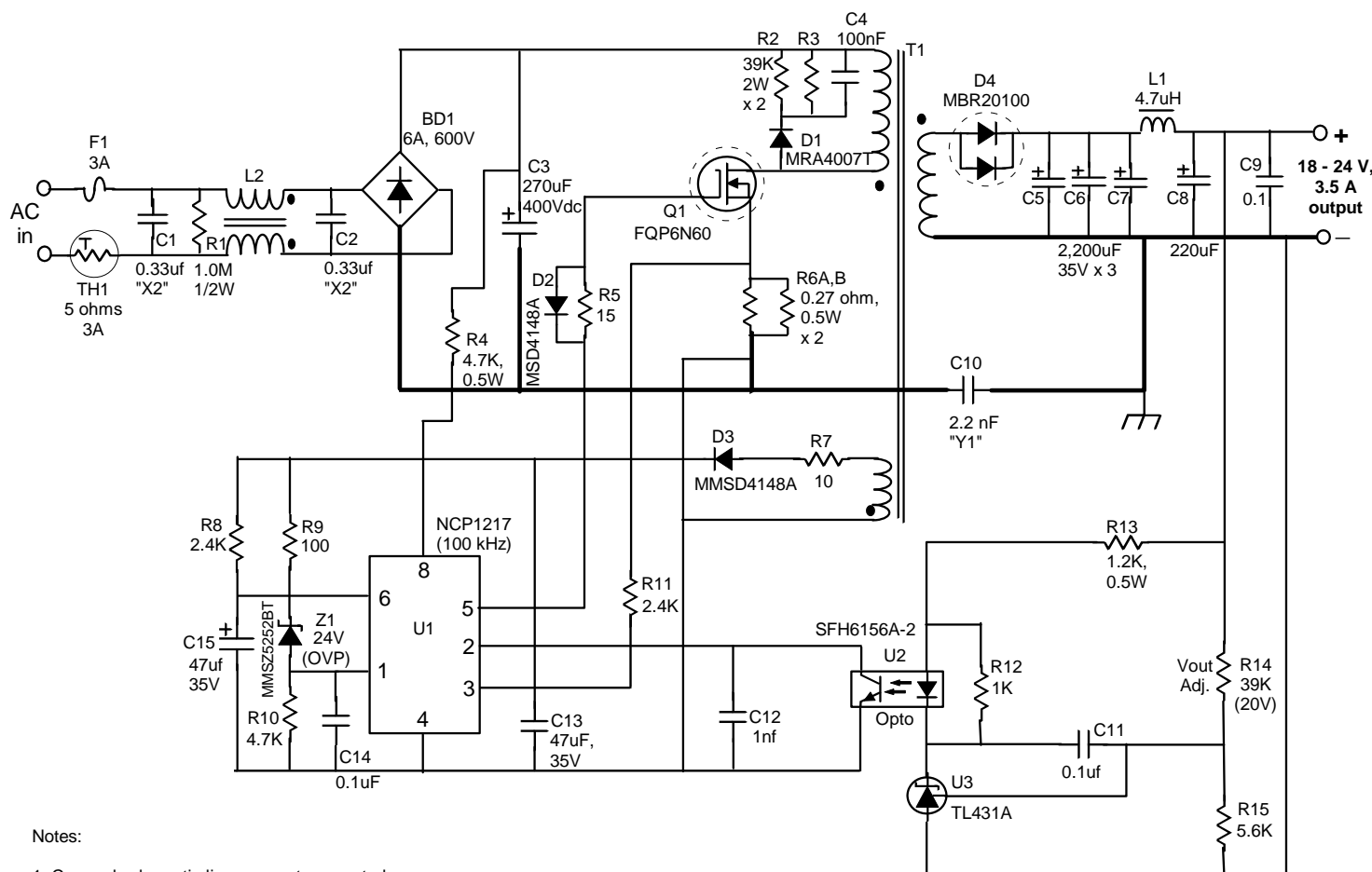
This Design Note is a modification/upgrade to ON Semiconductor's Application Note [AND8076](#). The NCP1217 current mode controller (100 kHz version) has been used to eliminate the additional discrete circuitry required by the original NCP1200/NCP1203 controller for ramp compensation and OVP functions. By using a continuous conduction mode (CCM) flyback topology, which has a constant power output characteristic, this power supply is capable of supplying short term, high surge currents of over 7 A for powering industrial equipment such as motors, solenoids or other inductive loads. Overcurrent protection is initiated at approximately 3.6 A. However, the output current will increase up to double this as the output voltage decreases due to the overload. At a threshold determined by the value of resistor R8, the supply will enter “hiccup” mode overcurrent protection for reduced dissipation in the event of a “hard” short circuit. For the given flyback transformer design, the output voltage is adjustable via R14 from 18 volts to about 24 volts to suit the intended application. The OVP trip level

is determined by zener Z1. The overcurrent point is set by parallel resistors R6A and B, and ramp compensation for CCM operation is adjusted by R11. Additional details on basic circuit operation, critical components, and the NCP1217 characteristics can be found in the Application Note [AND8076](#) and the data sheet for the NCP1217 controller. The CCM flyback transformer T1 is available from Coilcraft as part number Z9260-A or Z9007-B. EMI inductor L2 is Coilcraft E3505-AL (or similar), and L1 is an optional output ripple inductor that is Coilcraft part PCV-0-472-05L.

Key Features

- 3.5 A continuous output with over 7 A surge capability with adjustability on the latter threshold
- Overvoltage and overcurrent protection
- Input EMI filter for conducted emissions attenuation
- Thermistor input surge current limiting at turn-on
- Measured efficiencies of 85% at 120 Vac and 87% at 230 Vac input at full load
- Adjustable 18 to 24 volt output range (via R14)

Schematic



Notes:

1. Crossed schematic lines are not connected.
2. Heavy schematic lines indicate recommend ground plane areas.
3. Q1 and D4 require heatsinks.
4. R8 sets U1 Vcc level for overcurrent "hiccup" mode threshold.
5. R11 sets ramp compensation for U1.
6. R6A, B (paralleled resistors) set overcurrent trip level.
7. R14 sets Vout.
8. All resistors 1/8 or 1/4 watt unless otherwise noted.

18 - 24 Vout, 85 Watt, Off-Line CCM Flyback Power Supply

Additional collateral from ON Semiconductor

- [NCP1217](#): Current Mode Controller Fixed Frequency Operation
- [MMSD4148](#): 100 V Switching Diode
- [TL431A](#): Programmable Precision Reference
- [MBR20100](#): 20 A, 100 V Schottky Rectifier
- Application Note [AND8076](#): a 70 W Low Standby Power Supply with NCP120x Series

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Design note created by Frank Cathell, e-mail: f.cathell@onsemi.com