



ON Semiconductor

DN06010/D

Design Note – DN06010/D

200 W, Single Output Power Supply

Device	Application	Input Voltage	Output Power	Topology	I/O Isolation
NCP1217	Refrigerator	90 to 270 Vac	140 W / 200 W pk	CCM (Continuous Conduction Mode) Flyback	Yes

Other Specifications				
	Output 1	Output 2	Output 3	Output 4
Output Voltage	14 V	N/A	N/A	N/A
Ripple	200 mVp-p	N/A	N/A	N/A
Nominal Current	10 A	N/A	N/A	N/A
Max Current	14 A	N/A	N/A	N/A
Min Current	0 A	N/A	N/A	N/A

PFC (Yes/No)	No
Minimum Efficiency	80%
Operating Temp Range	0 to +70°C

Circuit Description

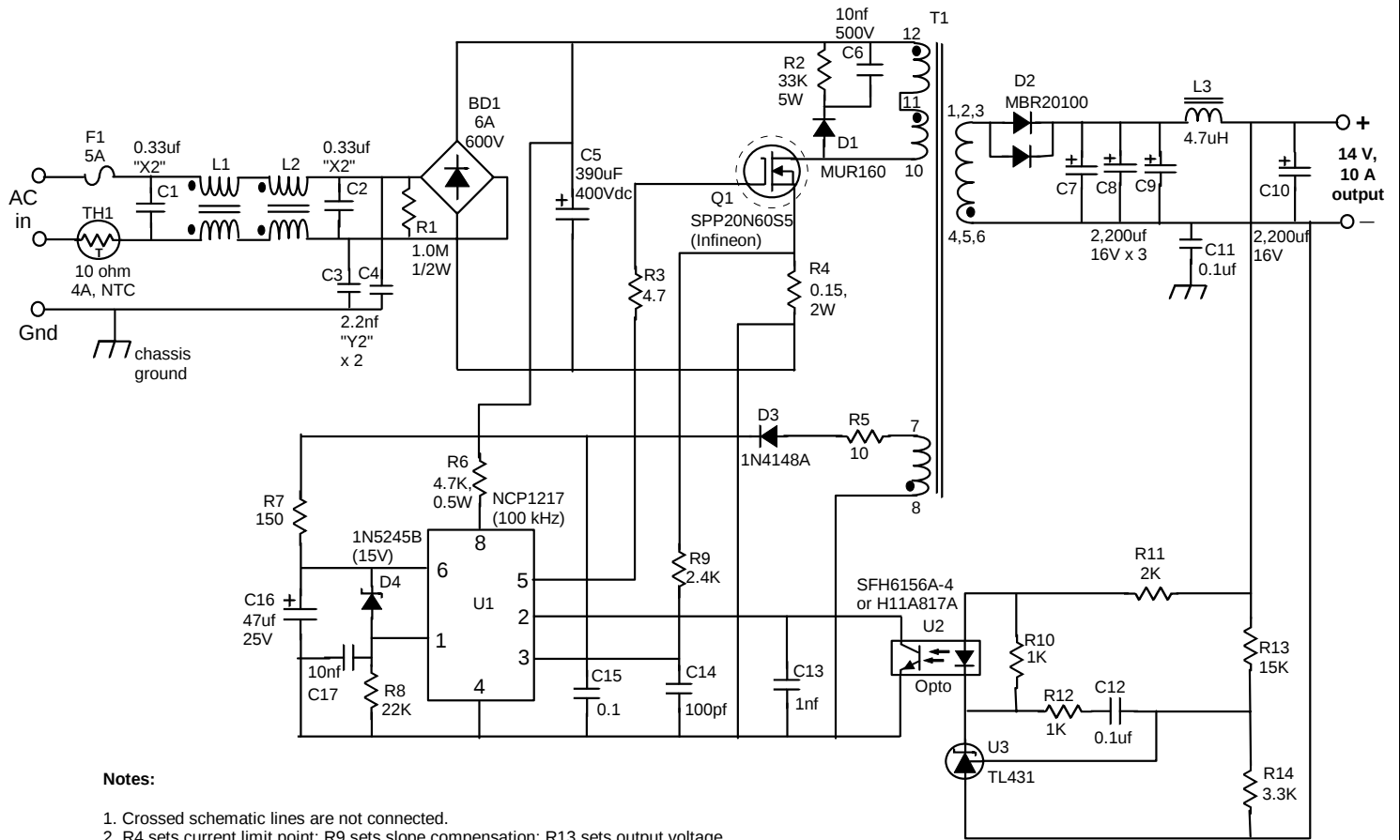
This 14 Vout, off-line power supply was originally designed for refrigeration control applications but can be user tailored to accommodate most 12 to 15 volt applications requiring 140 watts output continuous with a 200 watt peak capability. The converter circuit is designed around a continuous conduction mode (CCM) flyback topology to minimize the inverter's peak-to-average current ratio. Slope compensation for $D > 50\%$ is achieved with the unique internal architecture of the NCP1217 controller and the value of resistor R9. The 100 kHz flyback transformer is designed with a compact PQ3230 ferrite core. Voltage feedback and regulation is implemented with a simple TL431 programmable reference and optocoupler.

Key Features

- CCM operation for low peak to average current ratio.
- Output ripple reduction inductor (L3)
- Dual common mode EMI filter for low conducted EMI.
- Very low standby input current at no load (< 1 watt).
- Simple, low cost yet highly effective converter circuit.
- Overcurrent and overvoltage protection.

DN06010/D

Schematic



Notes:

1. Crossed schematic lines are not connected.
2. R4 sets current limit point; R9 sets slope compensation; R13 sets output voltage.
3. D4 sets OVP to 15V on Vcc rail (nominally 10 - 12Vdc)
4. Q1 and D2 will need heatsinks; Aavid #529802B02100 or similar
5. Small heatsink or plate recommended for BD1
6. L1 is Coilcraft CMT1-2.1-4L; L2 is Coilcraft F5593-A; L3 is Coilcraft PV-0-472-20L
7. TH1 is NTC thermistor for inrush limiting (Ametherm or equivalent).
8. Output caps C7, 8, 9, 10 should have low ESR with high ripple current rating.

MAGNETICS DESIGN DATA SHEET

Project / Customer: 14 Vout, 200 Wpk power supply

Part Description: 100 kHz flyback transformer, 14 Vout

Schematic ID: T1

Core Type: PQ3230 ($A_e = 1.6$)

Core Gap: Gap center leg approximately 1 mm for $L = 300 \mu\text{H}$

Inductance: 300 μH +/-10% (measured from pins 10 to 12)

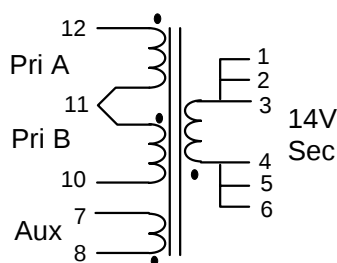
Bobbin Type: Vertical 12 pin pcb mount

Windings (in order):

Winding # / type	Turns / Material / Gauge / Insulation Data
"A" Primary (12 - 11)	20 turns of 2 strands of #26HN over one layer; Self-leads to pins; insulate for 2.7 kV to next layer.
Vcc/Aux (8 - 7)	5 turns sprial wound over the center 12.5mm with 3mm end margins. Insulate for 2.7 kV to next layer.
14 V Secondary (4,5,6 - 1,2,3)	6 turns of #17 equivalent Litz wire (or 8 strands of #26HN twisted) over the center 12.5mm with 3mm end margins. Insulate with tape for 2.7 kV to next winding.
"B" Primary (11 - 10)	Same as "A" primary. Insulate with tape.

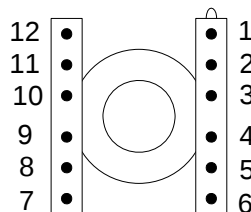
Hipot: 2.7 kV primary/aux to 14V secondary. Vacuum varnish.

Schematic



Lead Breakout / Pinout

Bottom (pin side) view



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