AN828
APPLICATION NOTE

1500W - 440V POWER FACTOR CORRECTOR PREREGULATOR

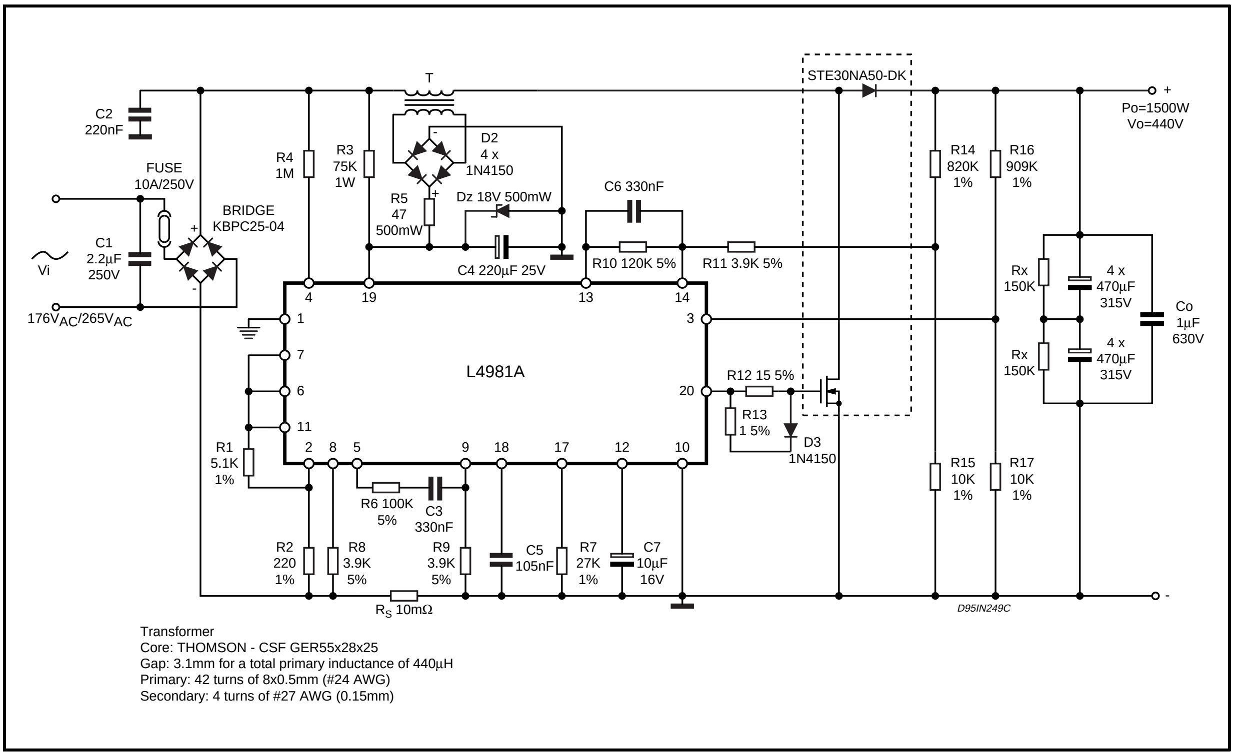
The application here described has been tailored to supply a three phase inverter for motion control (see fig.1). To reduce the current in the switches of the inverter, the output voltage of the power factor has been held quite high.

The target specification of the PFC application is:

Mains supply Vin(rms)	= 220Vac ±20% (f = 50/60Hz)
Output Voltage Vout	= 440Vdc
Output Power Pout	= 1500W

A switching frequency of 60kHz has been chosen as a good compromise between requirements of small size magnetics and low switching losses.
For this application a full isolated ISOTOP(TM) STE30NA50-DK has been used.
This module is especially intended for boost applications and consists off the integration of a low RDS/500V Mosfet with a TURBOSWITCH(TM) diode.
The use of the module allows a compact and effective solution in terms of layout and power dissipation. The output stage of the L4981A/B is capable of driving directly the module without the aid of a buffer stage. The L4981A controller is supplied by the auxiliary of the boost inductor, a Graetz bridge and a simple resistor for the start-up phase. The Output capacitor filter has been realized connecting in parallel four tap in "series" configuration. This solution allows the use standard parts, in terms of the rated voltage, resulting easier to be implemented in comparison with a "single" configuration. To be noted that the high frequency filter (C1 + C2) has been split in two parts. In this way it is possible to held a low value capacitor (C2) connected to the output of the rectifier bridge, minimising the harmonic distortion (introduced by the rectified DC contents). On the other hand, the capacitor (C1) connected to the AC side of the bridge, performs most of the high frequency filter function without introducing DC content.
The schematic circuit is shown in fig.1

Figure 1: Schematic Diagram



L4981A PARTS LIST

Boost inductor (T) L = 0.44mH Core :Thomson - E 55x28x25 Gap = 3mm Primary Turns = 42 (8 x 0.5mm) Secondary Turns = 4 (0.15mm) Co= 940µF = [(4 + 4) x 470µF/315V + 1µF/630V] C1 = 2.2µF/250Vac C2 = 220nF/630V C3 = 330nF C4 = 220µF/25V C5 = 1.5nF C6 = 330nF C7 = 10µF Power Switch = STE30NA50-DK Input Bridge = KPBC25-04 D2 = 1N4150 (X 4) D3 = 1N4150	Rs = 10mΩ /1W R1 = 5.1kΩ /1% R2 = 220Ω /1% R3 = 75kΩ/1Ω R4 = 1M R5 = 47 /1/2Ω R6 = 100kΩ R7 = 27k /1% R8 + R9 = 3.9kΩ R10 = 120kΩ R11 = 3.9kΩ R12 + R13 = 15Ω R14 = 820kΩ /1% R15 = 10kΩ /1% R16 = 909kΩ R17 = 10kΩ

Table 1: Test Result.

Mains rms (V)	Vout (V)	Pout (W)	Power Factor	Harmonic Distortion (%) THD	AH3	Efficiency (%)
176	451	509	0.998	2.0	1.9	94.2
176	444	937	0.999	1.4	1.3	94.0
176	438	1396	0.999	1.0	0.9	94.0
220	451	509	0.996	2.1	1.9	95.6
220	445	941	0.998	1.5	1.4	95.2
220	438	1396	0.999	1.0	0.9	95.3
260	452	511	0.993	2.5	1.9	95.1
260	446	945	0.997	1.4	1.3	96.4
260	439	1402	0.999	1.1	0.8	96.1

CONCLUSIONS

The evaluation has been done using the "A" version of the L4981 controller, without using additional features obtaining high performance results, in terms of efficiency and harmonic content.

Further improvements are possible using the additional features of the I.C. such as the LFF (pin 16) for the best control of the output voltage or by the use of the B version to minimise the EMI filter.