

AN PFC T5 LED Tube

Reference Design: PFC for
Energy Saving LED Tubes



General

Future lighting solutions need power factor correction (PFC) solutions in order to reduce the ratio of reactive power. The form factor of energy saving lamps and LED lighting strings is a challenge, now mastered by PE. This application note shows how to introduce power factor solutions to lighting applications while saving components and reducing power consumption.

Description

A miniaturized PFC board for implementation into a standard light tube (standard 16mm T5 glass tube) using PEs PFC IC PE4201 is described. The advantage of LED based lighting equipment over normal light tubes is the waiving of ballasts or inductors outside the lamp. Also, no mercury needs to be used; though LED based lighting products do not endanger the environment. In addition to the lighter BOM (bill of material), a lot of energy can be saved, since for the same light output, LEDs need half of the power compared to compact fluorescent lamps.

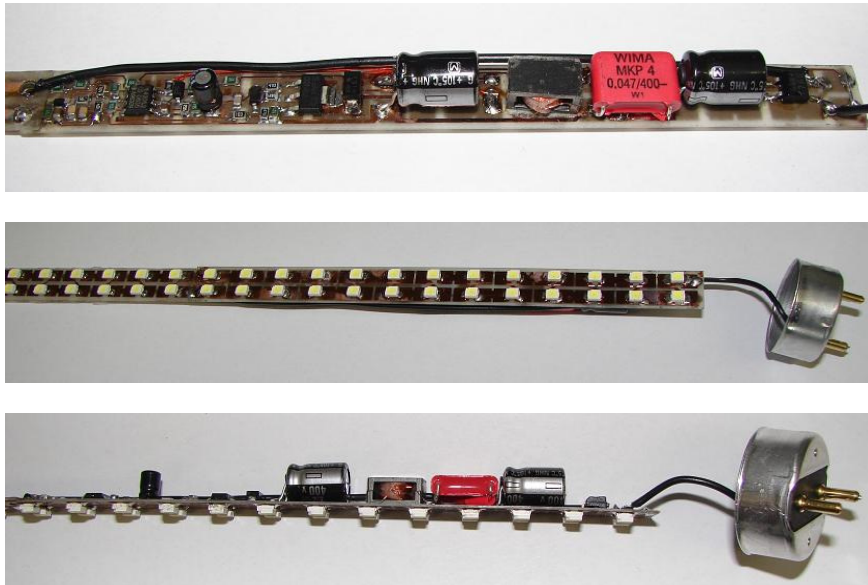


Figure 1:
Top view (circuitry),
bottom view (LEDs) and
side view of the
application board.

Features (PE4201)

- Low total harmonic distortion (THD)
- Low start-up current (<math><5\mu\text{A}</math>)
- Low operating current (<math><450\mu\text{A}</math>)
- Disable function (<math><170\mu\text{A}</math>)
- Under-voltage lockout with >8V hysteresis
- Over voltage and over current protection with separate reference
- Reduced operating frequency if output power low
- High efficiency at high and low output power
- Internal clamping resistor
- Fast driver switch 'off'
- Very fast driver 'off' at over current sense
- Driver load up to 5nF

Technical Data

Input voltage	230V (50/60Hz) AC
Output voltage	360- 380V DC (one time to adjust)
Max. input power	8.5 W with PE4201
Efficiency	>90 %
Power factor	0.90 to 0.98 (depending on power out)
Light output	up to 100lm/W (depending on type of LEDs)
Board dimension	length 540mm, width 10mm, height 10mm

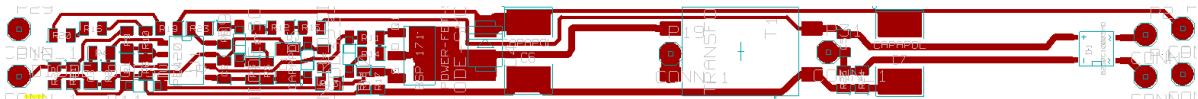


Figure 2: Top view PFC LED tube board (PFC circuitry only, LEDs on the back side of the board, length 540mm)

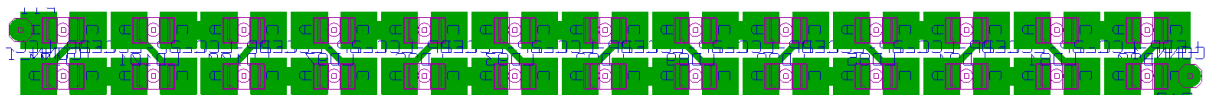


Figure 3: Bottom view PFC LED tube board (partial view, total amount of LEDs: 104- 120)

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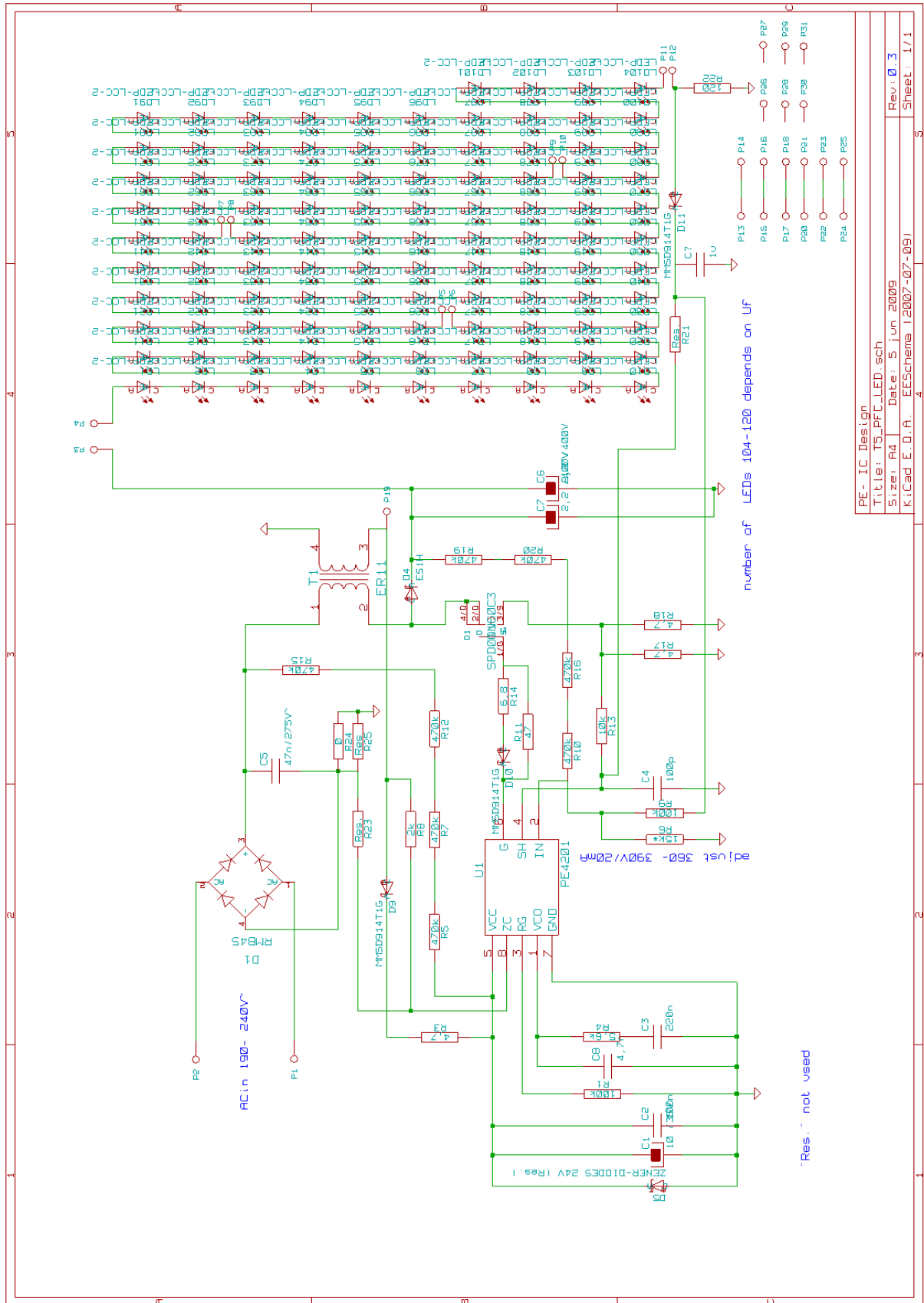
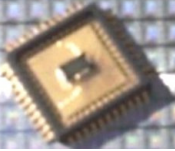
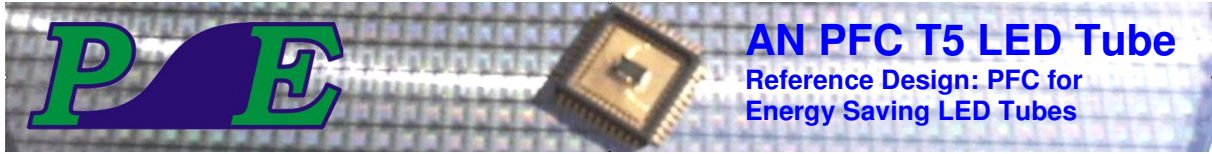


Figure 5: Circuit diagram



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