8 Watt Fluorescent Lamp Inverter
Compact DC to AC Inversion for Efficient Lighting Systems

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Circuit Operation

The circuit shown in Figure 1 has been designed to drive an 8W fluorescent lamp from a 12V source, using an inexpensive inverter based on the ZTX652 transistor. The inverter will operate from supplies in the range of 10V to 16.5V, attaining efficiencies up to 78% thus making it suitable for use in on-charge systems such as caravans / mobile homes/ RVs as well as periodically charged systems such as roadside lamps, camping lights or outhouse lights etc. Other features of the inverter are that it oscillates at an inaudible 20kHz and that it includes reverse polarity protection.

Figure 1
8W Inverter.

Until the fluorescent tube strikes, the transformer is only loaded by the tube heater filaments which present only a minimal load. Thus when the transistor...
turns off the transformer ‘rings’ for half a cycle at a frequency governed by the windings’ inductance and the 0.068\(\mu\)F capacitor, reversing the magnetising current and turning the transistor on again. This ‘ring’ induces a high voltage pulse across the fluorescent tube which will cause it to strike once the heaters have warmed up.

The 2.2\(\Omega\) resistor and 0.22\(\mu\)F capacitor included in the circuit give the inverter a rapid turn-off characteristic, which limits the power dissipation in the transistor to approximately 500mW with the tube lit and with a 12V supply. However the power dissipation in the transistor is much higher if the tube is broken or removed. Taking the worst case conditions of 16.5V supply and no tube, the transistor will dissipate approximately 1.5W. Thus if the inverter may be operated under these conditions as for instance Public Transport applications etc., the transistor should be clamped to a heatsink better than 15 °C/W.

Where the inverter will not remain energised if the tube does not strike, no heatsink is necessary.

Similar higher power designs are possible using the ZTX853 4A DC rated part, which is available in the E-Line package, (enhanced TO92) and also in the surface mount SOT223 package as the FZT853.
Construction

Apart from keeping component lead lengths short, the layout of the circuit is not critical. Care should be taken however in winding the transformer (see figure 3). It is advisable to mount the unit in a metal case as this will provide RF screening of the inverter and also provides a ground plane for the fluorescent tube which significantly reduces its striking voltage. The case could also be used as heatsinking for the ZTX652 transistor when required.

Figure 3
Transformer winding detail.