

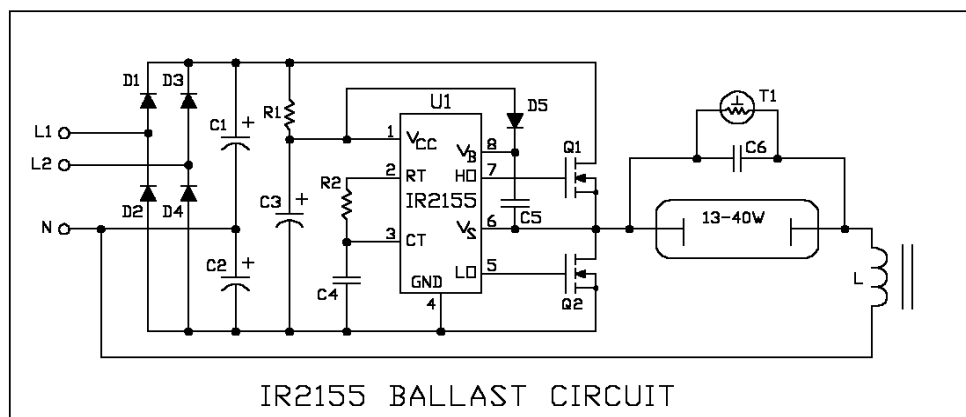
International IOR Rectifier DESIGN TIPS

DT 94-3A

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SIMPLE ELECTRONIC BALLAST USING IR2155 MOS GATE DRIVER

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Description:

Power from either 120V or 230VAC MAINS is rectified by D1 - D4. The rectified DC bus voltage is approximately 320VDC at a nominal AC input voltage of 120V or 230V. The split-reservoir capacitor C1 and C2 operates as a full wave voltage doubler with D1 and D2 when the input AC is applied between L and N, and as a capacitive input filter for a 230VAC input between L1 and L2.

U1 is an IR2155 self-oscillating MOS Gate Driver IC (MGD) which operates directly from the DC bus via a dropping resistor R1. Internal voltage regulation prevents V_{cc} from rising above 15VDC and an under voltage lockout inhibits both gate drive outputs when V_{cc} is less than 9V.

U1 supplies two drive outputs, one a low side output to drive Q2 and the other a floating high side output to drive Q1. These outputs alternate so that Q1 and

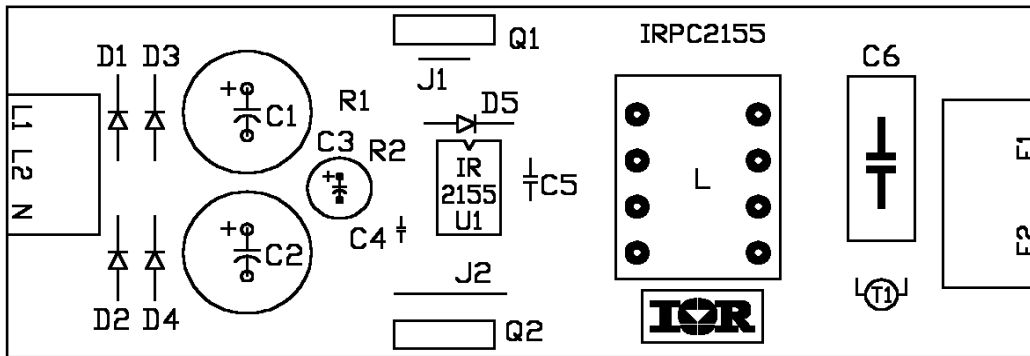
Q2 generate a square wave output for driving the lamp circuits. U1 also provides 1 μ sec. deadtime to prevent cross conduction of Q1 and Q2.

At nominal DC bus voltage (320VDC) the square wave output is 160V RMS and the frequency is set by the selection of R2 and C4 to approximate the resonant frequency of the lamp circuits.

The lamp operates in its own series resonant circuit consisting of a series inductor L and a shunt capacitor C6. The shunt capacitor is paralleled with a positive temperature coefficient thermistor (PTC). The PTC is a low resistance when cold and transitions to a very high resistance as it self heats due to the current in L. Thus the lamp voltage is limited for about 1.5sec until its filament is heated. The gradual increase of lamp voltage with hot filaments allows the lamp to soft start and reduces electrode wear so that lamp life is maximized (20,000 hours).

The actual striking voltage of fluorescent lamps increases with age, particularly at low ambient temperatures. It is for this reason that resonant lamp circuits are used. Even with Q factors less than 5 there is always ample voltage across the capacitive reactance to strike the lamp.

In applications where lamps burn continuously and have to restart only, a few times during their life span the PTC may be omitted. This results in instantaneous starting, a condition that is not recommended unless some reduction in lamp life can be tolerated.



Components List (40 watt version):

| | |
|---------|--|
| U1 | IR2155 Self-Oscillating Power MOSFET/IGBT Gate Driver |
| Q1, Q2 | IRF720 HEXFET® Power MOSFETs |
| C1, C2 | 47µF, 250V electrolytic capacitor |
| C3 | 47µF, 16V electrolytic capacitor |
| C4 | 0.001µF, 50V ceramic capacitor |
| C5 | 0.1µF, 50V ceramic capacitor |
| C6 | 0.01µF, 600V metallized polypropylene capacitor |
| D1 - D4 | 1N4007, 1000V, 1A diode |
| D5 | 11DF4, 400V, 1A, ultra-fast recovery diode |
| R1 | 91k, 1/2W |
| R2 | 13k, 1/4W |
| T1 | TDK 501Y 1002 PTC thermistor |
| L | Core: TDK # PC 30 EE 30Z Bobbin: TDK # BE-30-1110CP Wind: 64T # 22AWG HAPT L = 1.20mH with 0.01 inch Gap Spacer |

L (13-18 watt version):

Core: TDK # PC 30 EE 22Z
Bobbin: TDK # BE-22-118CP
Wind: 80T # 26AWG HAPT
L = 1.6mH with 0.005 inch Gap Spacer

Assembly Notes

- 1 The IR2155 ballast circuit is designed to operate with input voltages of either 120VAC or 230VAC. For 120VAC operation omit diodes D3, D4 and use input terminals L1 - N. 230VAC operation is possible with the addition of diodes D3, D4 and power applied to input terminals L1 - L2.
- 2 When driving lower power (13 - 18 watts) lamps such as compact fluorescents Q1 and Q2 are replaced by IRF710, C1 and C2 by 22µF, 250V and L1 by a 1.5 to 1.6mH inductor.
- 3 For optimum heat dissipation without additional volume or cost, the IR2155 ballast circuit board layout allows the HEXFET® Power MOSFETs to be mounted directly onto the ballast enclosure using appropriate electrical insulators.

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