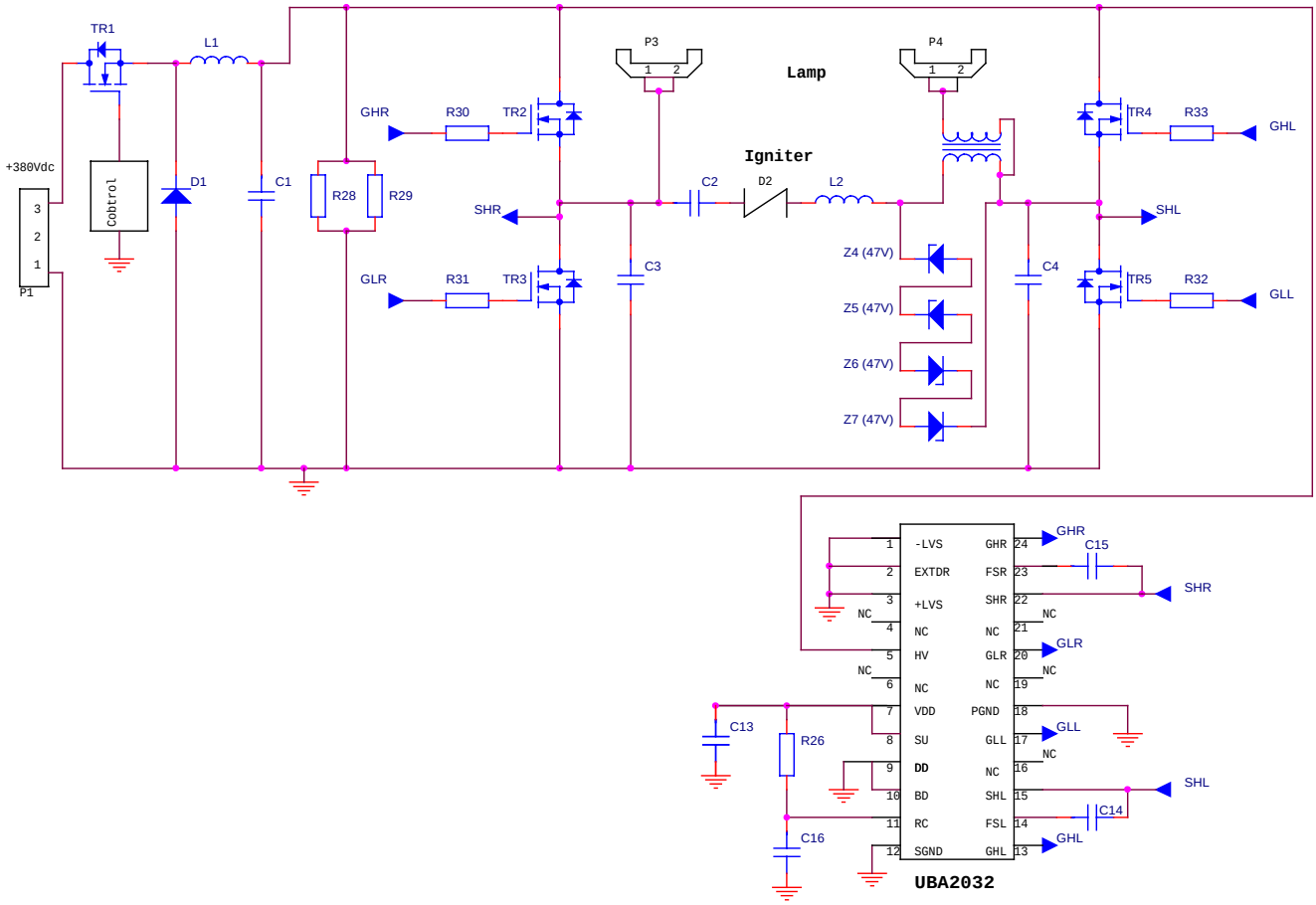
4. CIRCUIT DIAGRAM



5. PARTSLIST

Down converter:
TR1
D1
L1
C1
R28/R29
Control

Ignitor & full bridge commutator:
D2
Z4/Z5/Z6/Z7
L3

L2	
C2	
C3/C4	
TR1/TR2/TR3/TR4	
R30/R31/R32/R33	
C14/C15	
C13	
C16	
R26	
IC	UBA2032
Lamp	MHN-TD 70W

6. LAMP DRIVER CIRCUIT DIMENSIONING

Power control management of the lamp driver circuit is done by the down converter part. This down converter acts as a current source and runs in standard SOPS mode at a relative high frequency of 70kHz at nominal burn of the lamp (85V-rms output voltage = lamp voltage). The SOPS mode is chosen to minimise the switch-on losses in the power mosfet TR1 (400V/0.55mOhm). The down converter inductor is 490uH on EF32-3C85 (DC resistance 240mOhm).

The lamp power is stabilised by a feedback signal formed by the addition of lamp voltage and lamp current to get a power controlled current source. The lamp power as function of lamp voltage is now a parabola. In the top of the parabola we have set the nominal lamp voltage Vn and lamp power Pn (Pn, Un) = (70W, 85V). The maximum lamp current is limited to 1A, while the maximum down converter output voltage, due to parabolical function, is limited to 170V (2x 85V).

During ignition a higher output voltage of the down converter is preferred (> 170V). An ignition voltage control circuit is added to replace the power control by a voltage control when the output voltage is larger then 140V. In this way we force the down converter to act as an voltage source in the output voltage range of 140 – 340V. The 340V is used for the ignitor to generate the maximum ignition pulses of 5kV.

Control loop design is left out of scope.

The igniter is connected between the two mid-points of the full bridge an generates ignition pulses of 4-5kV-peak with a duration of 100usec and a repetition frequency of 115Hz (= commutation frequency). The break down device D2 is a sidac or break-over diode with a typical breakdown voltage of 340V. L2 is a fixed inductor of 270uH which limits the current through the break-over diode and saturates at 2A. After saturation the inductor value is 20uH. L3 is the ignitor transformer, which provides the 5kV maximum ignition voltage for the lamp. Zeners Z4-Z7 limit the voltage across the ignitor primary and thus secondary, this in order to prevent corona (ignition voltage < 5kV).

Low frequency AC operation of the HID lamp is achieved by a full bridge commutator. The power part of the full bridge converter is formed by 4 bridge-configured power mosfets TR2-TR5, the lamp circuit and the UBA2032 driver IC.

Capacitors C3 and C4 are for dV/dt limitation (EMI & protection of the power mosfets). Maximum dV/dt is 4V/nsec at maximum current of 30A. This result in minimum dV/dt-caps of 7.5 nF. Therefor a value of 10nF for C3 and C4 is chosen.

Capacitors C14 and C15 are for bootstrapping cq. floating supply buffer. They provide sufficient gate drive energy for both high side drives. C13 is the low voltage supply buffer capacitor for IC supply and supply of low side drives. Overall voltage supply is provide through pin HV (pin 5)of the UBA2032.

Resistor R26 and C16 form the RC oscillator setting. An R26 of 100kOhm and C16 of 82nF result in the typical (fixed) commutator frequency of 115Hz. Non-overlap timing is done automatically by the UBA2032 IC's internal adaptive non-overlap timing.

7. QUICK MEASUREMENTS