FACT SHEET

HID 70W application with UBA2032

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1. INTRODUCTION

This report describes a lamp driver demonstrator circuit intended for the MHN-TD 70W lamp (Metal Halide Lamp), belonging to the group of compact HID lamps (High Intensity Discharge lamps).

In contrast with low-pressure mercury TL and CFL lamps, HID lamps are high-pressure discharge lamps. The presence of iodine will make starting more difficult compared to the low pressure discharge lamps mentioned before. Normally an ignition voltage of 4-5kV must be applied for proper ignition. An ignition voltage up to 25kV can be needed to ignite an HID lamp in case of hot re-strike (= immediate re-ignition after burn-operation period). Also the transition from ignition to burn phase, with dedicated take over & run-up phase, is far more critical for this type of lamps.

HID lamps are applied in various areas, among other: automotive (MPXL), projection (UHP) and general lighting (shop window & down lighting). All applications use similar lamp types, but operating requirements are rather different, so exact circuit topologies depend strongly on the application area. The demonstrator circuit described in this report gives a driver concept for a general lighting application.

HID lamps, just as CFL and TL, are designed to operate on AC current. However in comparison to CFL and TL, HID must be operated in the low frequency range. HID lamps are not allowed to use at high frequencies, since accoustic resonance of the lamp-arc may occur in the 10kHz – 1MHz frequency domain. Mention that some safe, free-of-acoustic-resonance frequency windows do exist. To avoid problems in these areas, the lamp manufacturer prescribes an safe operation area within 50Hz – 10kHz range. In practise, the HID lamp operation is limited to 100 – 400Hz by design engineers.

Again in comparison with CFL and TL, the HID driver topology differs. This is due to above, specific HID operating requirements. In stead of a half bridge topology, we use a different set up. The HID lamp driver circuit consists out of three main parts: 1. down converter for power control; 2. ignitor for ignition of the lamp and 3. full bridge commutator for low frequency AC-operation of the lamp. Figure 1 shows the basic block diagram.

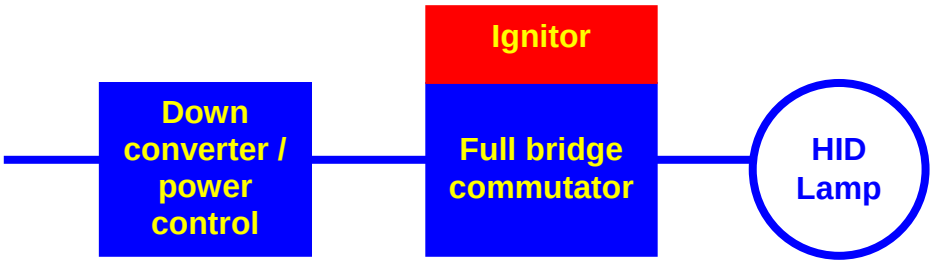

Figure 1. Block diagram of HID lamp driver circuit

A key-role in the HID lamp driver & full bridge commutator is played by the UBA2032 driver IC. This report will focus on the full bridge commutator and the dedicated UBA2032 driver IC.

2. FEATURES

Lamp driver specific

- Main function blocks are down converter (power control); ignitor (ignition of the lamp) full bridge commutator (low frequency AC lamp operation).
- The lamp driver takes care of high performance start and burn conditions dedicated for a MHN-TD 70W HID lamp. The lamp will be guided properly through the phases: ignition, take over, run-up and burn.
- The maximum ignition voltage is 5kV peak (pulse ignition). This is high enough to let (cold) lamp breakdown occur within 10 nsec. For re-ignition after a burn period 25kV is needed. The current ignitor on this demonstrator can not provide this high voltage. NB: hot-restrike fulfilment can be done, however this requires a dedicated high voltage pulse ignitor.
- During take over phase, which takes less then 1msec, the lamp-conducting channel is formed. The lamp voltage is 20V-rms. At this lamp voltage the lamp driver provides a current of xxx A to keep the arc in place. This lamp current requirement is depending on lamp resistance at breakdown.
- The HID lamp requires a relative high run-up current of xxx A preventing extinguishing of the lamp. Mention that a too high run-up current causes electrode melting. In the run-up phase the lamp voltage gradually increases to the nominal value of 85V-rms. The required run-up time is about 2 minutes.
- In burn phase the lamp is operated at 85V-rms and 820 mA (= 70W). The lamp operating frequency (= commutation frequency) is set at 115Hz typical, with a tolerance range of 110-120Hz.

UBA2032 driver IC specfic

- UBA2032 incorporates a driver IC for full bridge topology.
- Integrated high side & low side driver pairs (high voltage level shift function, including bootstrap diodes).
- Defined IC start up via a high voltage supply (550V maximum) and internal supply (low voltage supply and bootstrap supplies).
- Full bridge disable function & input for start up delay (not used in this demonstrator).
- Adjustable oscillator frequency, which is set on 115Hz typical (commutation).