High Beam to Low Beam "Back-of-the-Envelope" Design

This circuit turns on the low beam if the high beam fails. A single wire goes from the switch to the lamp.

Description of Operation: The common lamp contact is energized and the high beam filament is turned ON by its connection to ground through a low value power resistor. The low beam is kept turned OFF by N-mosfet Q1

When S1 is turned ON, current flows through the high beam filament to ground through a 0.01 ohm resistor, which generates a voltage of 0.01 X 8A= 80 millivolts (in this example). C1 provides some noise filtering. R1 keeps the N-mosfet turned OFF. Additional noise, delay and UV/OV protections may be required.

The "gain block" is not specified because there are many ways to do this based on the requirements. For example—if only 80 mV is available, the voltage is inverted and boosted and biased so that, when the high beam filament is ON, no (or very little) positive output from the GB occurs. The GB can be a couple transistors, an op amp, comparator, buffer, etc. The goal is a 10V (or so) output when the input is zero, and a zero output (or so) when the input is positive. If R2 is made larger, the task is easier, but the load resistor gets bigger and steals power from the lamp. The high and lo beam currents here are only guesses. H4 lamps have various wattages. The whole task could be done by relays but it's not my choice.

Regards,
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