Switching surge protection using Zero Voltage Switching

ABSTRACT

The main concept of this project is to increase the life of an incandescent/halogen lamp by implementing ZVS technique using a TRIAC. In general, incandescent lamps draw more current while remaining switched on at peak voltages that results in fast failure or depletion of their lifespan. Therefore, the proposed system enhances the lifespan of the lamps by switching them exactly at the zero crossing of the voltage.

Random switching of lamps may switch the load at peak supply voltage. When such switching occurs, while the lamp has low resistance (cold condition), then the current further shoots up (at the time of peak supply voltage being switched on) leading to the premature failure of the lamp. The proposed project provides a solution by engaging a TRIAC in such a way that the switched on time is precisely controlled by exactly firing it after detecting the zero-cross point of the waveform of the supply voltage. This would result in current waveform rising from zero at the time of switch to full value thereby, increasing the life of the lamp.

The project includes a comparator which is used for ZVS output. The ZVS (zero voltage switching) is given as reference interrupt to the microcontroller of the 8051 family. A push button is used for changing the on switching time away from the zero voltage of the supply waveform so the lamp switches on only at the next ZVS. The lamp on off operation is deliberately made so as it is practically not possible to ensure switching away from the ZVS. The actual switching on time at the ZVS can be seen on any DSO.