PLL-based converter controls light source

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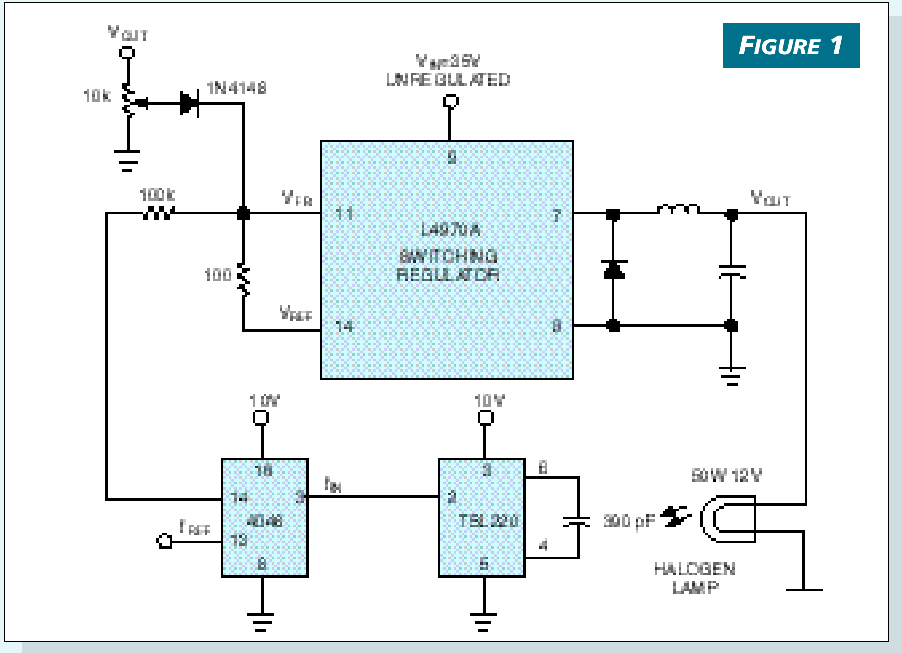
Using the circuit in **Figure 1** , you can digitally control the light intensity of a lamp. The control loop is based on a PLL, in which the VCO comprises a light-to-frequency converter (TSL220) coupled to a light source that derives its drive from a switching regulator (L4970A). The output of the phase/frequency comparator (4046) serves as the control voltage for the switching regulator. The control voltage is proportional to the frequency error between the reference frequency (f_{REF}) and the signal frequency (f_{IN}) coming from the light-to-frequency converter.

Changing the reference frequency regulates the voltage supplied to the lamp to force the output of the TSL220 to lock to f_{REF}. The two resistors at the output of the 4046 provide an attenuation of 1000 to guarantee the loop stability. As an example, we used the L4970A to drive a 12V, 50W halogen lamp. The control loop operates over a frequency of dc to 500 kHz. To prevent the system from entering a positive-feedback condition, the maximum allowable value of f_{REF} should not exceed the saturation frequency of the TSL220. This maximum value depends on the integrating capacitor used for the light-to-frequency converter and must not exceed 750 kHz. To prevent lamp damage, the 10-kΩ trimmer limits the voltage V_{OUT} applied to the light source. (DI #2219)

FIGURE 1



A PLL and a light-to-frequency converter allow you to digitally control the intensity of a lamp.

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