

# **VARIABLE-OFF-TIME MOTOR CURRENT CONTROL**

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## **ABSTRACT**

The problem is that in motoring mode, electric machines cause winding current waveforms to be destabilized by the induced voltage. For magnitude control, we want to maintain a constant controlled average current. There are a number of ways of doing this, but the new idea – variable-off-time control – does it by using a priori knowledge of what the PWM off-time should be for a stable waveform. The on-time is controlled by the current control loop, while the off-time is generated by an off-time generator according to a derived equation of what it should be for stable current waveforms. This off-time function is nonlinear, but only has a range of  $\times 2$ , and can be somewhat accurately approximated by a linearized off-time generator. The off-time generator can be implemented using a simple 555 timer circuit, with timing current from a speed-to-current converter and appropriate offset. An embedded microcontroller PIC16F877 can be used to calculate the linearized and exact off-times, then the duty ratio and the frequency of a PWM generator on the microcontroller set to drive the motor bridge driver. The current ripple over the motor speed range was measured.