DT0003
Design tip

Implementing fast decay mode chopping using the L6506

By Thomas Hopkins

Main components	
L6506	Current Controller For Stepping Motors
L6201, L6202, L6203	DMOS Full Bridge Driver
L298	Dual Full Bridge Driver

Purpose and benefits

The configuration using the L6506 with an H-Bridge driver IC implementing fast decay mode or enable chopping is described. Typical applications for the L6506 implement slow decay mode when used with H-Bridge drivers like the L6203 or the L298. In some applications, however, having a fast decay of the motor current is needed to be able to more quickly reduce the current in the motor.

Description

When implementing chopping on a full H-Bridge driver, two chopping modes are possible as shown in Figure 1. The main difference between the two modes is the recirculation path for the current and the slope of the current decay during recirculation. In slow decay, the current ripple is lower, but the current decays slower. In fast decay, the ripple is significantly higher, but the current can fall much faster.

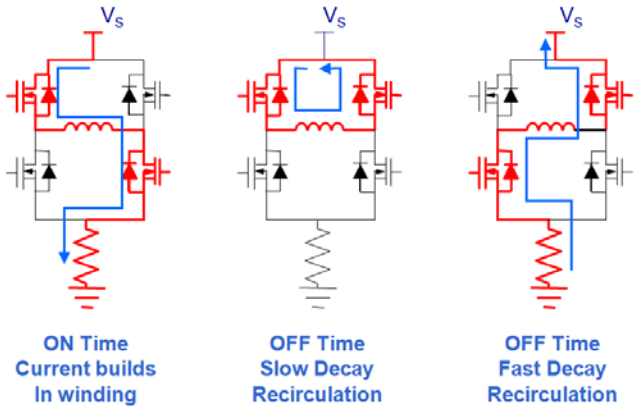

Figure 1. Chopping Mode Operation

The typical application circuit using the L6506 and the L6203 is shown in Figure 2. In this configuration, the phase inputs, coming from the microcontroller, are connected to the four inputs of the L6506. The L6506 senses the motor current and ANDs the PWM control signal with the phase inputs. The modulated phase inputs are then connected to the inputs of the L6203. In this configuration, the device implements phase chopping or slow decay mode.

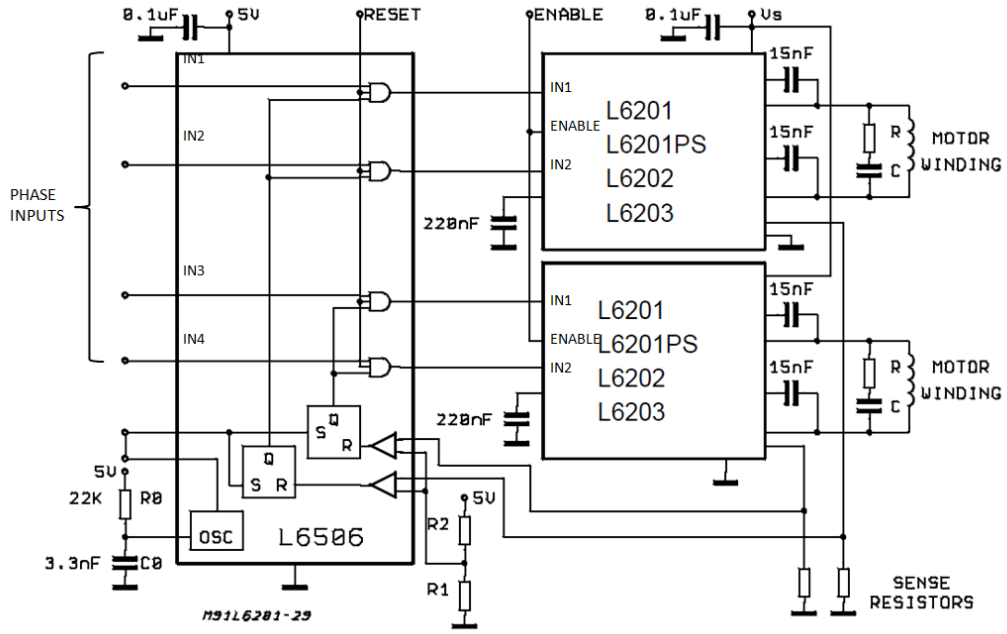

Figure 2. Circuit diagram implementing slow decay

For most applications, this is the preferred chopping method for the stepper motor. However in some applications, specifically when you need the current to quickly change or when implementing microstepping, fast decay mode or enable chopping can decrease the time needed for the current to fall to the lower level. Fast decay can also operate at a lower minimum current than slow decay mode.

The circuit can be modified to implement fast decay mode or enable chopping, as shown in Figure 3, so that the phase inputs from the microcontroller go directly to the inputs of the L6203 and the enable signal for each bridge is connected to one of the inputs of the L6506. The L6506 senses the motor current and ANDs the PWM current control to the ENABLE signal that is connected to the ENABLE input of one of the L6203.

A similar configuration can be used with other H-Bridge drivers like the L298, L6225, L6205, L6226 or L6206.

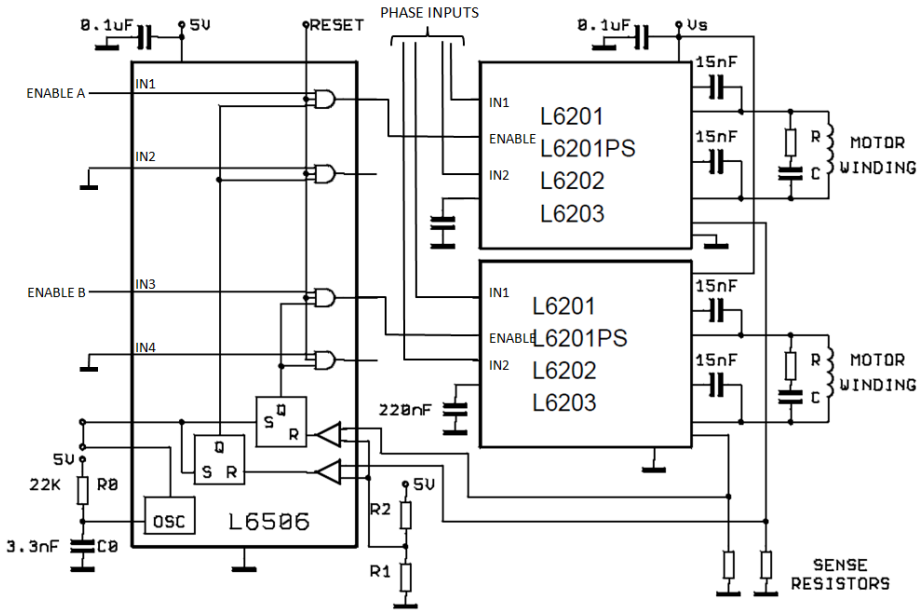

Figure 3. Circuit diagram implementing fast decay

Support material

Documentation
Datasheet, L6506, Current Controller for Stepping Motors
Application note, AN469, Using L6506 for current control of stepping motors
Application note, AN235, Stepper Motor Driving
Application note, AN460, Stepper Motor Driver Considerations, Common Problems and Solutions

Revision history

Date	Version	Changes
05-Apr-2012	1	Initial release

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