

[Ideas For Design]

## Flexible Power Amplifier Doubles As Process Controller

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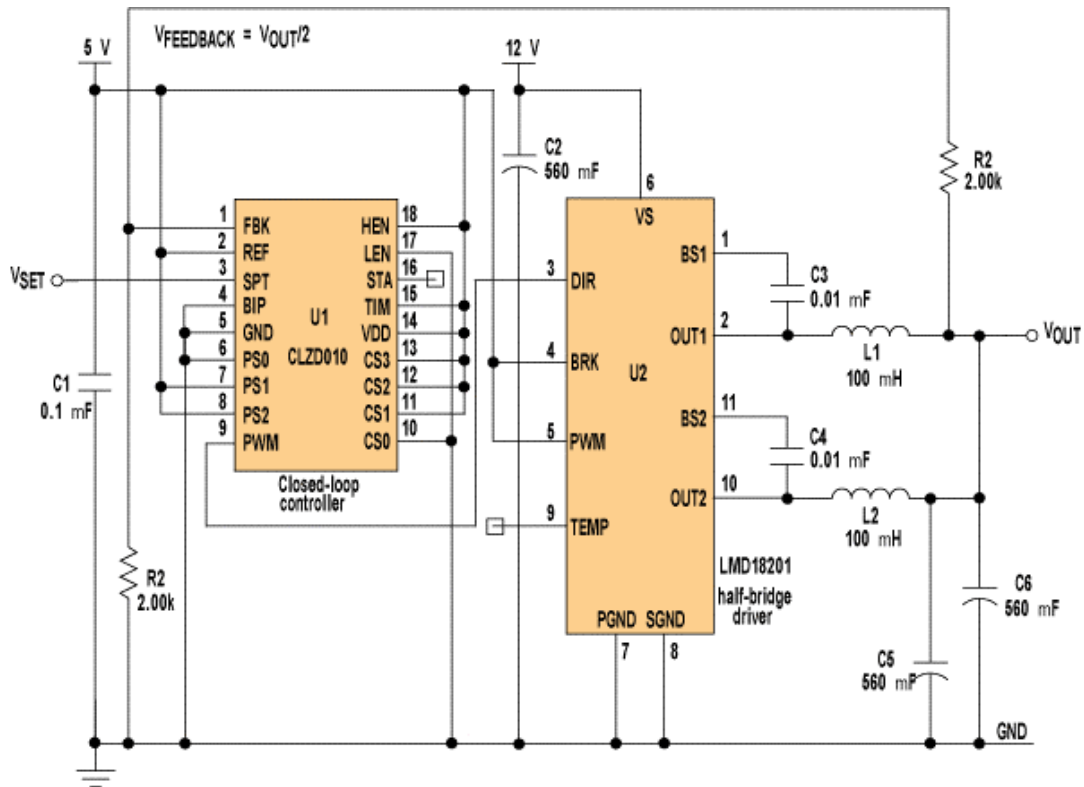
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Using integrated drivers and controllers with flexible architectures to satisfy multiple applications can reduce design time. The LMD18201 motor driver is billed as a 3-A full-bridge type. But scrutiny of the data sheet reveals that it can also be applied as a 6-A half-bridge unit by reconfiguring logic pins and paralleling outputs. Adding a closed-loop control chip results in a flexible power amplifier and process controller.

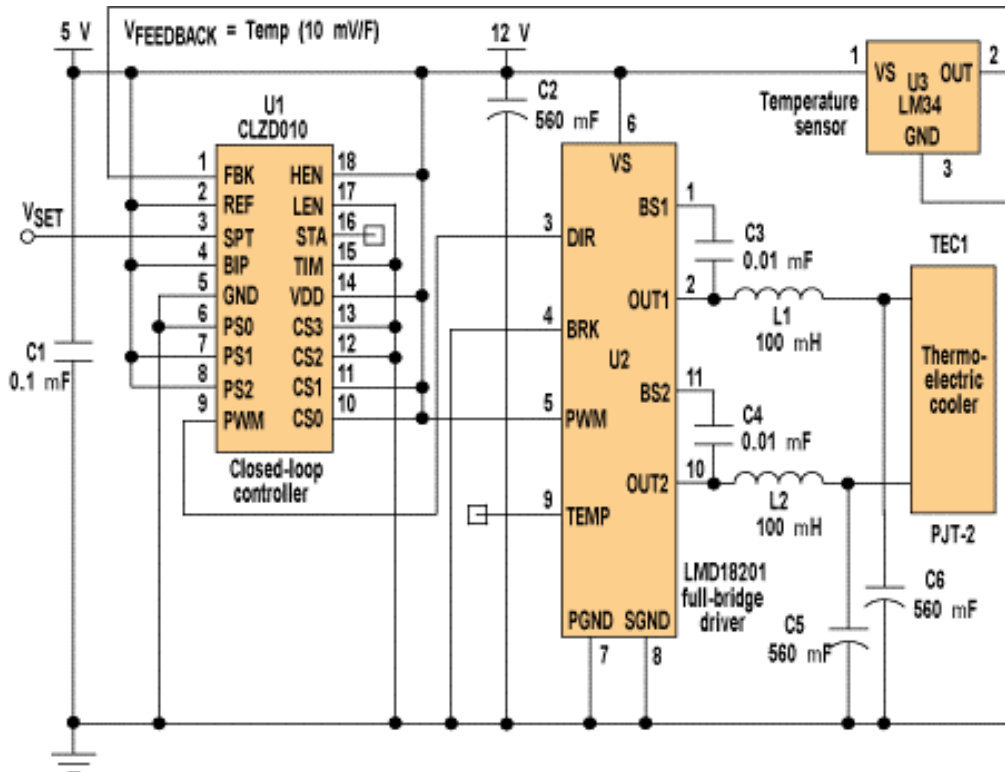
Figure 1 illustrates a power amplifier that sources or sinks current while maintaining constant voltage ( $V_{OUT}$ ) at twice the analog setpoint ( $V_{SET}$ ). This circuit is a switching converter that behaves like a low-frequency (100-Hz), high-power (10-V/6-A) op amp. It requires few parts that are inherently robust because critical functions are integrated, including digital signal processing, power switching, and fault protection.

The pulse-width-modulator (PWM) output of the CLZD010 controller is connected to the Direction (DIR) input of the LMD18201 driver, while the Brake (BRK) and PWM pins of the driver are tied high for half-bridge operation. The controller's PS2-PS0 pins are set for 31.25-kHz switching, and the CS3-CS0 pins are configured for 128- $\mu$ s control updates. The controller automatically adjusts the duty cycle of the driver until the feedback voltage equals the setpoint command.

Figure 2 illustrates a thermal controller that uses a thermo-electric cooler (TEC) or Peltier Cell to heat (PWM > 50%) or cool (PWM < 50%), depending on current direction. This circuit is useful for applications that require variable temperatures, including ambient. The BRK pin of the driver is tied low for antiphase, full-bridge switching. The controller is configured for a 134-s, closed-loop time constant. Its Bipolar (BIP) pin is tied high to start the PWM at 50% for zero initial power transfer (both outputs equal).



1. When connected as shown here, the closed-loop controller and half-bridge driver create a low-frequency, high-power op amp.



2. With minimal modification, the Figure 1 power amplifier becomes a thermal process controller.