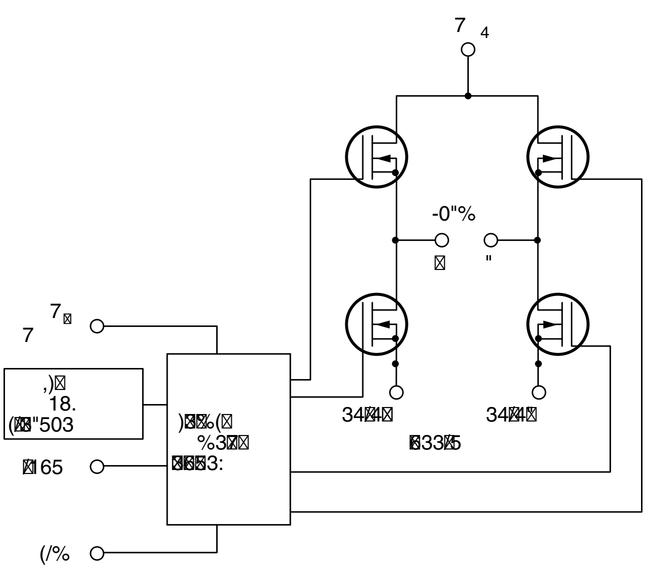
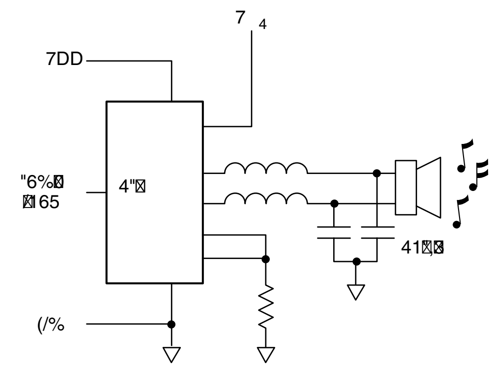
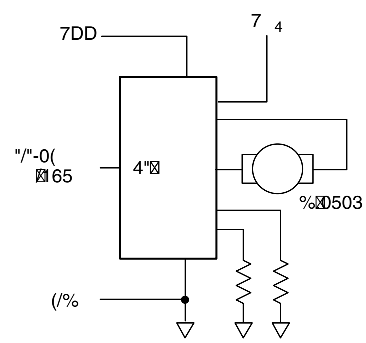
H-Bridge Motor Driver/Amplifiers

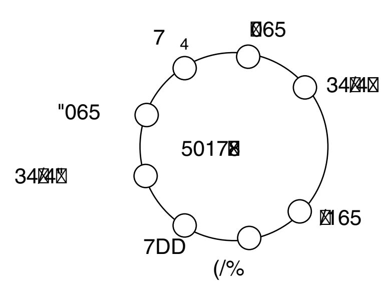
FEATURES

The SA50CE is a pulse width modulation amplifier that can continuously supply 5A to the load. The full bridge amplifier can be operated over a wide range of supply voltages. All of the drive/control circuitry for the lowside and high side switches are internal to the hybrid. The PWM circuitry is internal as well, leaving the user to only provide an analog signal for the motor speed and direction, or audio signal for switchmode audio amplification. The SA50CE is packaged in a space efficient isolated 8-pin TO-3 that can be directly connected to a heatsink.









SA50CE

H-Bridge Motor Driver/Amplifiers

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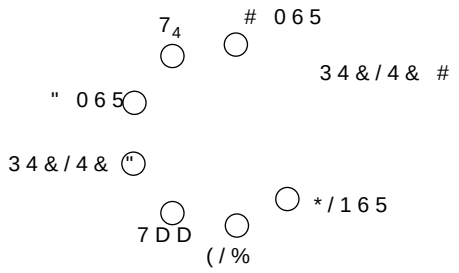
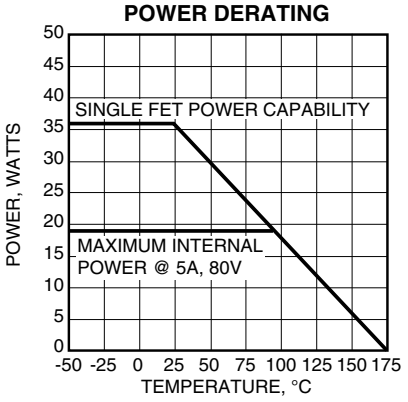
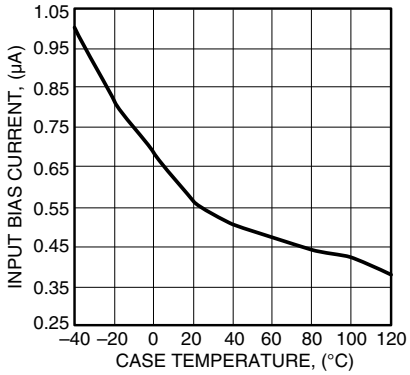


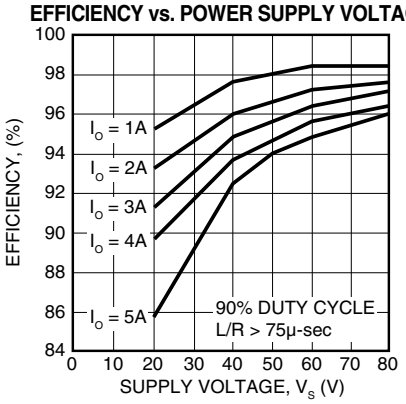
POWER DERATING



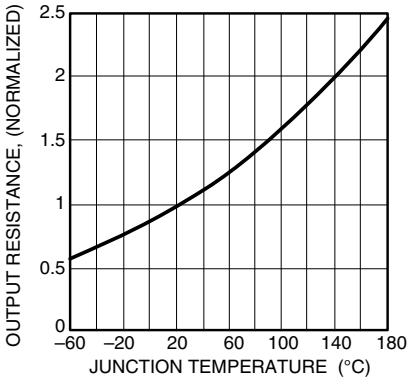
INPUT CURRENT VS TEMP



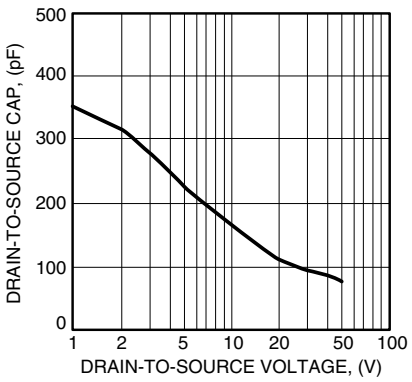
EFFICIENCY vs. POWER SUPPLY VOLTAGE



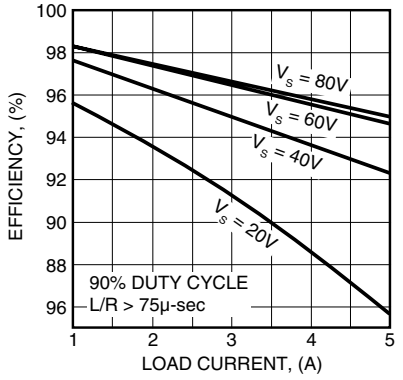
OUTPUT RESISTANCE DRIFT



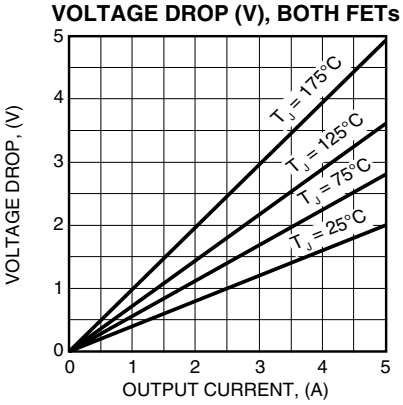
H-BRIDGE FET CAPACITANCE



EFFICIENCY vs. LOAD CURRENT



VOLTAGE DROP (V), BOTH FETs



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Please read Application Note 30 on "PWM Basics". Refer to Application Note 1 "General Operating Considerations" for helpful information regarding power supplies, heat sinking and mounting. Visit www.Cirrus.com for design tools that help automate pwm filter design and heat sink selection. The "Application Notes" and "Technical Seminar" sections contain a wealth of information on specific types of applications. Information on package outlines, heat sinks, mounting hardware and other accessories are located in the "Packages and Accessories" section. Evaluation Kits are available for most Apex Precision Power product models, consult the "Evaluation Kit" section for details. For the most current version of all Apex Precision Power product data sheets, visit www.Cirrus.com.

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V_{CC} - is the low voltage supply for powering internal logic and drivers for the lowside and highside MOSFETS. The supplies for the highside drivers are derived from this voltage.

V_S - is the higher voltage H-bridge supply. The MOSFETS obtain the output current from this supply pin. Proper by-passing to GND with sufficient capacitance to suppress any voltage transients, and to ensure removing any drooping during switching, should be done as close to the pins on the hybrid as possible.

A OUT - is the output pin for one half of the bridge. Increasing the input voltage causes increasing duty cycle at this output.

B OUT - is the output pin for the other half of the bridge. Decreasing the input voltage causes increasing duty cycles at this point.

RSENSE A - This is the connection for the bottom of the A half bridge. This can have a sense resistor connected to the V_S return ground for current limit sensing, or can be connected directly to ground. The maximum voltage on this pin is ±2 volts with respect to GND.

GND - is the return connection for the input logic and V_{CC}.

RSENSE B - This is the connection for the bottom of the B half bridge. This can have a sense resistor connection to the V_S return ground for current limit sensing, or can be connected directly to ground. The maximum voltage on this pin is ±2 volts with respect to GND.

INPUT - is an analog input for controlling the PWM pulse width of the bridge. A voltage higher than $V_{CC}/2$ will produce greater than 50% duty cycle pulses out of A OUT. A voltage lower than $V_{CC}/2$ will produce greater than 50% duty cycle pulses out of B OUT.

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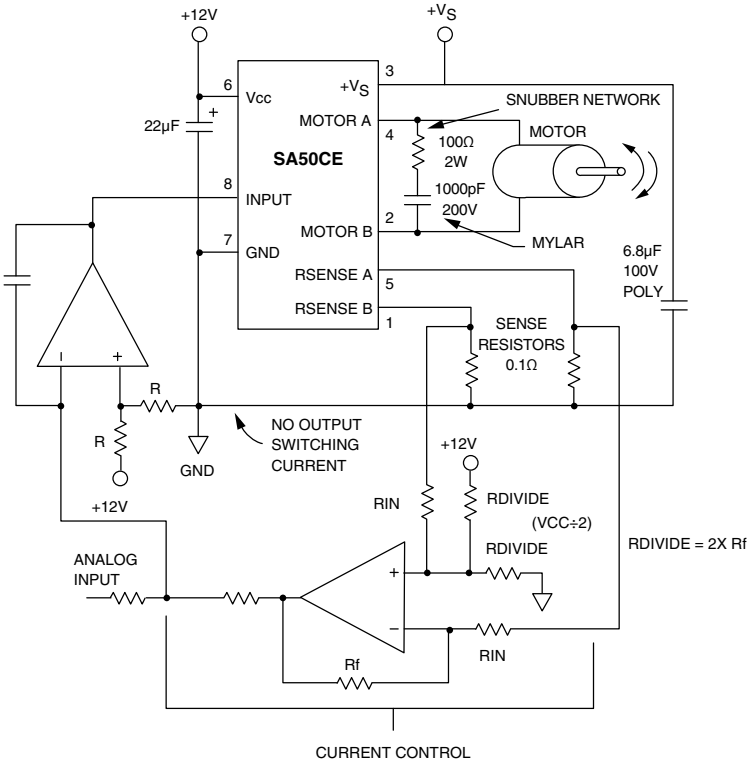

This is a diagram of a typical application of the SA50CE. The design Vcc voltage is +12 volts. V_{CC} is internally bypassed with a good low ESR ceramic capacitor. A higher ESR bulk capacitor, such as a tantalum electrolytic, may be used externally in parallel. The analog input can be an analog speed control voltage from a potentiometer, other analog circuitry or by microprocessor and a D/A converter. This analog input gets pulled by the current control circuitry in the proper direction to reduce the current flow in the bridge if it gets too high. The gain of the current control amplifier will have to be set to obtain the proper amount of current limiting required by the system.

Current sensing is done in this case by a 0.1Ω sense resistor to sense the current from both legs of the bridge separately. It is important to make the high current traces as big as possible to keep inductance down. The storage capacitor connected to the V_S and the hybrid GND should be large enough to provide the high energy pulse without the voltage sagging too far. A low ESR capacitor will be required. Mount capacitor as close to the hybrid as possible. The connection between GND and the V_S return should not be carrying any motor current. The sense resistor signal is common mode filtered as necessary to feed the limiting circuitry. This application will allow full four quadrant torque control for a closed loop servo system.

A snubber network is usually required, due to the inductance in the power loop. It is important to design the snubber network to suppress any positive spikes above $+V_S$ and negative spikes below –2V with respect to pin 7 (GND).

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For all Apex Precision Power product questions and inquiries, call toll free 800-546-2739 in North America.
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