

## Signal Consulting, LLC

16 Wilelinor Drive, Edgewater, MD 21037-1003 USA

Phone: 410-224-8429, Fax: 410-510-1821, E-mail: info@signallc.com

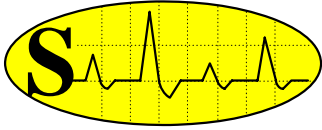
### Si50HyUdMC1-30V-50A, Single Channel, 30V 50A, Open-Loop, Hybrid, Unidirectional Motor Controller with Integrated Heat Sink, Serial LCD Port, 6.2kHz or 25kHz PWM

The **Si50HyUdMC1-30V-50A** is a 30V, 50A, microprocessor based, Single, Open-Loop, Hybrid, Unidirectional, Motor-Controller board that uses 6.2kHz or 25kHz pulse-width modulation (**PWM**) to efficiently control the speed of a brush type DC motor (or load current) in the 0 to 1500W power range, and in 12.5W steps. An onboard microprocessor generates a 6.2kHz or 25kHz **PWM** carrier signal, controls the load-power (or motor speed) and controls the load-current rate (or motor acceleration and deceleration). The **PWM** carrier frequency is user selectable by the jumper **CN4**, 25kHz when **CN4** is open and 6.2kHz when short. The high frequency PWM rate provides a smooth speed control and insures a quiet motor environment. As the name hybrid (**Hy**) implies, the desired motor speed (or PWM pulse-duration) is set by a variable (0 to +5V) analog input-voltage  $V_{I1,G}$ , providing a smooth motor-speed control from 0 to 100% in 0.833% steps; while the other control-signals are digital. This analog input ( $V_{I1,G}$ ) is zener-diode protected and includes an integrator with a time-constant of 0.01s; accordingly, this input can be driven with DC or PWM signals. A normally open switch (or an Open Collector npn Transistor) can be connected to jumper **J1** (as shown below), **J1** Open=Normal operation, **J1** Short=Load is open. The active pin on **J1** is pulled to +5V through a 4.7k Ohm resistor, while the other pin (G) is at ground. The user can choose between slow or fast motor acceleration/deceleration modes by short-circuiting or open-circuiting the pins labeled **J2**. The slow mode, with rise-time/fall-time of 0.5s, is selected by shorting **J2** (**J2** jumper installed); while the fast buildup mode, with rise-time/fall-time of 0.025s, is selected by leaving these pins open (no Jumper installed). An LCD port **CN3** (with 9600 Baud RS232 Interface Standard) is provided for display of the Set and Measured Motor data. The LCD can be order Signal under the part number of [S14LCD2L16CH-3PC](#) (2-Line by 16-Char display with 12" cable and 3-pin connectors, and with back-light). An onboard LED (red) is used to monitor the load-voltage. An onboard LED (red) is used to monitor the load-current. A small (4.0"x3.7"x0.5") finned heat-sink is provided to operate 1500W power level (or at 30V and 50A). This board requires a single 9V to 30V DC unregulated power source at a 0A to 50A current range to operate normally. Typical applications are: DC Motor-Speed Controller, Light-Dimmer with variable delay, Power Amplifier, SPST Solid State Relay, etc. This board can be configured and programmed to perform efficiently in many customized applications.



#### Specification and Application for **Si50HyUdMC1-50V-50A**

- **Typical Operating Temperature at 50A and 6.2kHz:** 45°C with MOSFETs bolted to a small (4.0"x3.7"x0.5") finned heat-sink, while the fins are exposed to air at 25°C (as shown on above).
- **Overall Dimensions:** Length=4.0", Width=3.7", Height=1.95" Inches, (L=100, W=93, H=50 mm).
- **Absolute Maximum Source-Voltage,  $V_P$  (from pin +P to pin- P):** 35V<sub>peak</sub>
- **Typical Source-Voltage Requirement ( $V_P$  from pin +P to pin -P):** Any DC voltage from 9V to 30V, unregulated and unfiltered DC.
- **Average Load-Voltage:** Linearly variable from 0 to  $V_P$  in 0.83% steps, using  $V_{I1,G}$  as control input.
- **Average Load-Current:** 0A at 0% duty-cycle and 52A max. at 100% duty-cycle.
- **Load Isolation:** The Load or Motor must be isolated from the Ground (G or -P).
- **Power-Conversion Efficiency:** Approximately 98.5% at full-load (50V and 50A).
- **PWM Switching Frequency, CN4:** 6.2kHz when **CN4** short and 25kHz when **CN4** open.



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- **PWM Duty-Cycle** : varies linearly from 0% to 100% in 0.83% steps, using  $V_{I1,G}$  as control voltage (voltage at pin I1 relative to pin G on connector CN5): where  $V_{I1,G} = 0V$  yields 0%, and  $V_{I1,G} = +5V$ , yields 100%. This input is zener-diode protected and includes an integrator with time-constant of 10mSec. Accordingly, this control input can be driven with DC or PWM input voltage. Note that the Duty-Cycle is defined as the ratio of the load-voltage on-time (t) to the switching period (T) times 100% ( i.e. Duty-Cycle =  $(t/T)100\%$  ). These variables are defined and shown below.
- **Kill Switch Port, J1**: A normally open switch (or an Open Collector npn Transistor) can be connected to jumper J1 (as shown below), J1 Open=Normal operation, J1 Short=Load is open. The active pin on J1 is pulled to +5V through a 4.7k Ohm resistor, the other pin (G) is at ground.
- **Load-Current Step-Response Time, J2**: The user can choose between slow or fast motor acceleration/deceleration modes by short-circuiting or open-circuiting the pins labeled J2. The slow mode, with rise-time/fall-time of 0.5s, is selected by shorting J2 (J2 jumper installed); while the fast buildup mode, with rise-time/fall-time of 0.025s, is selected by leaving J2 open.
- **Motor-Indicator**: An onboard LED (red) is used to monitor the motor (or load) voltage. .

## A Typical Application of the Si50HyUdMC1-30V-50A

In this open-loop speed control application, the motor speed (or PWM pulse-duration) is linearly adjusted with the [Si5Pot1-5k](#) accessory (an external 1-turn 5k $\Omega$  pot); and efficiently controlling the motor power from 0 to 3840W in 32W steps. An optional LCD module displays the set and measured values (part number: [Si14LCD2L16CH-3PC](#) , 2-Line by16-Character display with back-light, and with 16" cable and 4-pin connector).The DC Motor can be purchased from Bodine, [www.bodine-electric.com](http://www.bodine-electric.com) ; or from [http://www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php).

An inexpensive, unregulated DC power supply is shown in this application drawing. A wide variety of linear and switching power supplies can, also, be used with this board. Consult the most recent catalog on [www.mpja.com](http://www.mpja.com) to purchase these power supplies. **Warning: The connecting wires to the Motor and the Power Supply must be heavy gauge copper wire (#10 AWG or heavier) to handle the rated current level. In addition, these heavy gauge wires act as a heat sink, protecting the board from overheating.**

