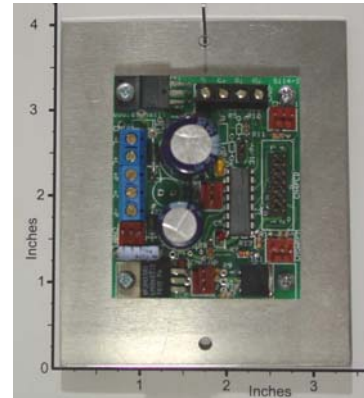




Si14HyUdMC1-50V-20A Hybrid Unidirectional Motor Controller with 20kHz (PWM) Y-Chip and with LCD Port

The **Si14HyUdMC1-50V-20A** is a single, microprocessor based, Hybrid, Unidirectional, Motor-Controller board that uses pulse-width modulation (**PWM**) to efficiently control the power flow (or motor speed) to a brush type DC motor, from 0 to 1000W in 8.33W steps. This board requires a single 9V to 50V DC unregulated power source at 0A to 20A current range to operate normally. An onboard microprocessor generates the 20kHz **PWM** carrier signal, controls the load power (or motor speed), monitors the user inputs and selects the start-delay of the motor. The high-frequency PWM rate provides a smooth motor-speed control, and insures a quiet motor environment. As the name hybrid (**Hy**) implies, the required motor speed (or PWM pulse-duration) is derived from a variable analog-voltages ($V_{P1,G}$), while the other control-signals are digital. This analog input is zener-diode protected, includes an integrator with time-constant of 10mSec; and can be used with DC or PWM input voltages. The user can choose between slow or fast motor acceleration/deceleration modes by short-circuiting or open-circuiting the pins labeled **J1M**. The slow mode, with rise-time/fall-time of 0.5s, is selected by short-circuit (**J1M** 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 onboard LED (red) is used to monitor the motor (or load) voltage and an optional, fast-acting 20A Mini-Fuse (with socket) is used for motor/board protection. A small Aluminum plate (3.3"x4.0"x0.065") is required to operate at 10A current level (or at 500W power levels). Higher current levels (20A) or 1000W power-levels can be achieved with more efficient heat-sinks. This can be accomplished by bolting this plate to a larger metal surface. Please click on this link and read the [Board Mounting Instructions and Heat Sink Selection Guide](#). An optional 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-RPM and Measured-RPM data display. Typical applications are: DC Motor-Speed Controller with variable start-up delay, Light-Dimmer with variable delay, etc. This board can be configured and programmed to perform efficiently in many other customized applications.



Specification and Application for **Si14HyUdMC1-50V-20A** Board

- **Typical Operating Temperature at 10A:** 45°C with the Metal Heat-Ring Bolted to a small Aluminum plate (3.3"x4.0"x0.065") acting as Heat-Sink, while the plate is exposed to air at 25°C (as shown on photograph).
- **Source-Voltage Requirements for V_C (voltage difference from pin +C to pin -P):** 9V to 30V DC, and for V_P (voltage difference from pin +P to pin -P): 9V to 50V, both unregulated and unfiltered DC voltages. For low-voltage applications (9V to 30V) a single DC power supply can be used by connecting pin +P and pin +C together.
- **Adjustable Load Voltage V_L (voltage from pin +L to pin -L):** The average Load-Voltage is adjustable from 0V to 50V (or to V_P) in 0.833% steps, with a Pulse-Width Modulation (PWM) control signal ($V_{P1,G}$) or with an internal/external potentiometer.
- **Load Current i_L :** 0A at 0% Duty-Cycle, 20A max. at 100% Duty-Cycle.



Signal Consulting, LLC

16 Wilelinor Drive, Edgewater, MD 21037-1003 USA

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

- **Load-Current Response-Time** for a $V_{P1,G} = 0$ to $+5V$ step-input is **0.12Sec**, as I_L changes from $0A$ to $20A$.
- **Load Isolation** :The load-resistor (R_L) must be isolated from the source voltage (V_s)
- **PWM Switching Frequency**: $20kHz$, (or switching period of $50\mu Sec$).
- **PWM Duty-Cycle**: Variable linearly from 0% to 100% in 0.833% steps using $V_{P1,G}$ as the control voltage (where $V_{P1,G} = 0V$ yield 0% , and $V_{P1,G} = +5V$ yield 100% Duty-Cycle). Note that the Duty-Cycle is defined as the ratio of the load-voltage on-time (τ) to the switching period (T) times 100% , (i.e. Duty-Cycle = $(\tau/T) \times 100\%$). These variables are defined and shown on the application drawing (on next page).

A Typical Si14HyUdMC1-50V-20A Application

In this 30V or 50V open-loop speed-control application, the PWM pulse-duration (or motor-speed) is linearly adjusted by an external 1-turn $5k\Omega$ pot **P1**; and efficiently controlling the motor (or load) power in the 0 to $1000W$ range in $8.33W$ steps. This potentiometer can be ordered from Signal with part number of [Si5Pot1-5k](#). A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-RPM and Measured-RPM data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, <http://www.lcd-modules.com.tw>.

The DC Motor can be purchased from Bodine, www.bodine-electric.com ; or from other vendors, http://www.e-motorsonline.com/emotors/dcmproduct_list.php .

