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Si14HyATPC1-50V-20A Single, Hybrid, Adjustable Ramp-Time, Power Controller with RS232 LCD Port and 6.2kHz or 25kHz PWM

The **Si14HyATPC1-50V-20A** is a 50V, 20A single-channel, microprocessor based, Hybrid, Adjustable Ramp-Time, Unidirectional, Power Controller that uses pulse-width modulation (**PWM**) to efficiently control the power flow (or motor speed) to a load, from 0 to 1000W, in 8.33W steps. The motor acceleration and deceleration is adjustable (using the Ramp-Time input) from 500ms to 25.3s in 100ms steps. An onboard microprocessor generates a 6.2kHz or 25kHz **PWM** carrier signal, controls the load power (or motor speed), monitors the user inputs and selects the motor acceleration delay. An optional "Kill-Switch" or an open-collector npn transistor can be connected to **J1** (the active pin, **p1** on **J1** is pulled to +5V through a 4.7k Ohm resistor while the other pin is connected to terminal **-P**) to turn off the load-current (or stop the motor) in emergency situations: (**J1**=Open= Run; **J1**=Short=Stop). The **PWM** carrier frequency is user selectable by jumper **J2**, 25kHz when **J2** is open and 6.2kHz when short. 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) and Ramp-Time are derived from a variable analog-voltages ($\mathbf{V_{I1,G}}$,$\mathbf{V_{I2,G}}$), while the other control-signals are digital. All analog control inputs are Zener Diode protected. An onboard LED (red) is used to monitor the load voltage. Snubbing circuits and filter capacitors are included to suppress inductive switching transients. A small Finned Heat Sink (2.4"x2.3"x0.45") is required to operate at 20A current level (or at 1000W power level). Higher current levels (30A) or 1500W power-levels can be achieved with more efficient heat-sinks. This can be accomplished by bolting the heat sink 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 16-character LCD (with 5V, 9600Baud RS232 Interface Standard) is used for Set, Measured and Ramp-Time data display. This board requires a single unregulated 9V to 50V DC power source at 0A to 20A to operate normally. Typical applications are: DC Motor-Speed Controller with variable acceleration/deceleration, LED Light-Dimmer with variable Ramp-Time, etc.

Specification and Application for Si14HyATPC1-50V-20A

- **Overall Dimensions: Length**=2.4 In (62mm), **Width**= 2.3 In (58mm), **Height**=1.4 In (35mm)
- **Typical Operating Temperature at 20A:** 45^0C with the Metal Heat-Ring Bolted to a small Finned Heat Sink (2.4"x2.3"x0.45"), while the Heat Sink is exposed to air at 25^0C (as shown on photograph).
- **Source-Voltage Requirements for V_P (voltage from pin +P to pin -P):** 9V to 50V, unregulated DC voltage.
- **Adjustable Ramp-Time:** The Load-Voltage Ramp-Time is adjustable from 500ms to 25.3s in 100ms steps, with a control signal ($\mathbf{V_{I2,G}}$ = 0 to +5V) or with an internal/external potentiometer.
- **Adjustable Load Voltage V_L (voltage from pin +L to pin -L):** The average Load-Voltage is adjustable from 0V to 50V (or to Vp) in 0.833% steps, with the Pulse-Width Modulation (%PWM) control signal ($\mathbf{V_{I1,G}}$ = 0 to +5V) or with an internal/external potentiometer.
- **Average Load Current i_L:** 0A at 0% Duty-Cycle, 20A max. at 100% Duty-Cycle.
- **Load Isolation:** The load (**motor**) must be isolated from the source voltage (**Vs**)
- **PWM Switching Frequency:** User selectable; 25kHz when **J2** is **Open**, 6.2kHz when **J2** is **Short**.

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- **PWM Duty-Cycle:** Varies linearly from 0% to 100% in 0.833% steps using $V_{I1,G}$ as the control voltage (where $V_{I1,G}$ = 0V yield 0%, and $V_{I1,G}$ = +5V yield 100% Duty-Cycle).

The motor speed varies linearly with the 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 = (τ /T)x100%). These variables are defined and shown on the application drawing.

- **LCD Data Format:**

Sd=100.0% R=25.3	**Line 1**
Md=100.0% J=nh	**Line 2**

Sd= Set duty-cycle in %. **R=** Ramp-time in sec; the time required for the Duty-Cycle to linearly ramp up or down from 0 to 100%. **Md=** Measured duty-cycle in %. **J=nh**. The digit **n** is a loop-counter that toggles between 0 and 1 on every 16 program-loops. The hex digit **h** indicates the jumper settings; (**h**=b3,j2,J1,b0) where the bit b0 and bit b3 are not used and cleared to zero.

A Typical Si14HyATPC1-50V-20A Application

In this 50V open-loop speed-control application, the PWM pulse-duration (or motor-speed) is linearly adjusted by an external 1-turn 5kΩ pot **P1**; and efficiently controlling the motor (or load) power in the 0 to 1000W range in 8.33W steps. Similarly, the motor acceleration (or Ramp-Time in the 500 ms to 25.3s range) is linearly adjusted by the Pot **P2**. This dual potentiometer can be ordered from Signal with part number of **Si5Pot2-2x5k**. An optional 2-line by 16-character LCD (with 5V, 9600Baud RS232 Interface Standard) is used to display the Set and Measured Duty-Cycles. The LCD with back-light can be ordered from Signal with part number **Si14LCD2L16CH**. The DC Motor can be purchased from **http://www.e-motorsonline.com/emotors/dcmproduct_list.php** or, from **www.bodine-electric.com**.