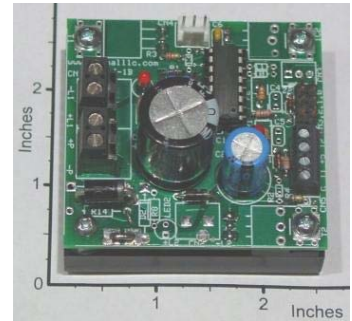




## Si14HyUdPTC1-50V-20A, Hybrid Unidirectional Proportional Temperature Controller with 9-Bit Digital Sensor Port and with RS232 LCD Port

The **Si14HyUdPTC1-50V-20A** is a microprocessor based, Hybrid, Unidirectional, Proportional Temperature Controller board that uses pulse-width modulation (**PWM**) to efficiently control average power to a resistive heater or Thermo-Electric (TE) cooler cell in the 0 to 1000W power range. An onboard microprocessor controls the load-power, monitors the sensor input and drives the LCD port. The temperature is sampled at 1Hz rate and it is measured with a small, 9-bit digital thermometer ( [Si18DTsens](#)). This sensor uses a unique “1-wire interface” (with parasite power mode) that requires only 2-conductors for reliable remote (long as 20 meters) temperature sensing. The term proportional controller implies that the value of the average load current used is proportional to the difference between the actual and desired temperature. Five PWM duty-cycle values are used depending on the absolute-value of the difference between the set and measured temperature values ( $|T_d|$ ). The duty-cycle is 0% when  $|T_d|=0^{\circ}\text{C}$ ; 25% when  $0^{\circ}\text{C} < |T_d| < 0.5^{\circ}\text{C}$ ; 50% when  $0.5^{\circ}\text{C} < |T_d| < 1^{\circ}\text{C}$ ; 75% when  $1^{\circ}\text{C} < |T_d| < 1.5^{\circ}\text{C}$ ; 100% when  $|T_d| > 1.5^{\circ}\text{C}$ . This method allows a even temperature control in the  **$-25^{\circ}\text{C}$  to  $+102^{\circ}\text{C}$  Range, with  $1/2^{\circ}\text{C}$  accuracy**. The desired temperature value (or load current) is set by an external analog voltage (0 to 5V range) or by an external potentiometer. As the name hybrid (**Hy**) implies, the required temperature value (or load current) is derived from a variable analog-voltage ( $V_{I1,G}$ ), while all other control-signals are digital. This analog ( $V_{I1,G}$ ) input is zener-diode protected and includes an integrator with time-constant of 10mSec. This board requires a single 9V to 50V DC unregulated power source at a 0A to 20A current range to operate normally. An onboard LED (red) is used to monitor the load-voltage. A small Finned Heat Sink (2.4"x2.3"x0.9", included with the unit) is required to operate at 20A current level (or at 1000W power levels). Higher current levels (30A) or 1500W power-levels can be achieved with more efficient heat-sinks. Please click on this link and read the [Board Mounting Instructions and Heat Sink Selection Guide](#). Typical applications are: DC Resistive Heater Controller, Thermo-Electric Cooler Controller, etc. This board can be configured and programmed to perform efficiently in many customized applications.



### Specification and Application for **Si14HyUdPTC1-50V-20A**

- **Typical Operating Temperature at 20A:**  $45^{\circ}\text{C}$  with the board bolted to a small (2.4"x2.3"x0.9") Finned Heat-Sink, while it is exposed to air at  $25^{\circ}\text{C}$ .
- **Source-Voltage Requirement for  $V_P$  (voltage difference from pin +P to pin -P):** 9V to 50V, unregulated DC voltage.
- **Average Load-Voltage,  $V_L$  (voltage from pin +L to pin -L):** 0V at 0% Duty-Cycle,  $V_P$  at 100% Duty-Cycle.
- **Average Load-Current of  $i_L(t)$ :** 0A at 0% Duty-Cycle, 20A max. at 100% Duty-Cycle.
- **Load Isolation:** The Load or TE cell must be isolated from the source voltage ( $V_P$ ).
- **Power-Conversion Efficiency:** Approximately 98.5% at full-load (50V and 20A).
- **Closed-Loop Temperature Control in  $1/2^{\circ}\text{C}$  Steps,  $-25^{\circ}\text{C}$  to  $+102^{\circ}\text{C}$  Range**
- **Factory Calibrated 9-Bit Digital Temperature Sensor is Immune to Additive Noise**
- **9-Bit Digital Temperature Sensor:** [Si18DTsens](#)

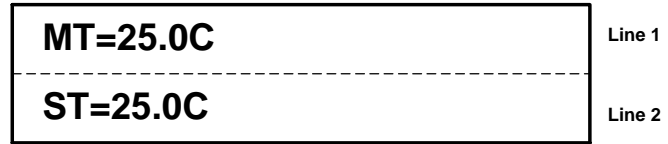


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- **2-Line by 16-Char LCD Data Format:**



**MT:** Measured Temperature.  
**ST:** Set Temperature.

- **Load-Indicator and Board Protection:** An onboard LED (red) is used to monitor the TE cell (or load) voltage, and the power-circuit is protected by an optional 20A fast acting Mini-Fuse.

**About the Voltage Requirement:** The Si14 will work with any DC motor or load in the 9 V to 50 V voltage range. In addition, the power filters are included on this board, consequently, only unfiltered (full-wave rectified) DC input power is required in most applications.

## A Typical Application of the Si14HyUdPTC1-50V-20A

In this heating application, the temperature (load- current) is proportionally controlled (in the 0 to 1000W power range) by the Si14 board and the desired temperature (or load current) is linearly adjusted by the [Si5Pot1-5k](#) external 1-turn 5k pot -25°C to +102°C Range, in 1/2°C Steps. The 9-bit digital temperature sensor can be purchased from us (see [Si18DTsens](#)) or you can wire up your own using the Dallas Semi. [www.dalsemi.com](http://www.dalsemi.com) Digital Thermometer chip DS18S20, in TO-92 casing (order from [www.digikey.com](http://www.digikey.com) as part number **DS18S20-ND**). A 2 line by 16 characters LCD (with 5V, 9600bps, RS232 Interface Standard) is used for Set-Temperature and Measured-Temperature data display. The LCD with back-light (with 12" cable) can be ordered from Signal with part number of [Si14LCD2L16CH](#). The TE Cells can be purchased from Melcor Corp. Trenton, NJ 08648 USA, WEB: [www.melcor.com](http://www.melcor.com).

