

Signal Consulting, LLC

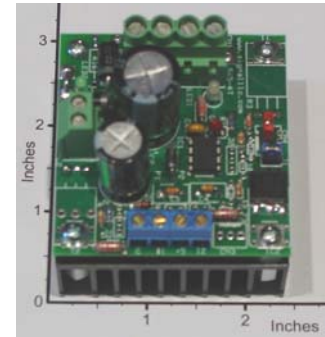
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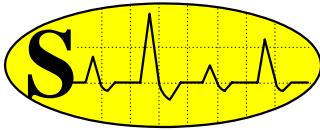
Si5HyUdPTC2-HC-30V-2x20A; Dual, Hybrid, Unidirectional, Heat/Cool, Proportional, Temperature Controller with Integrated Heat Sink and with 9-Bit Digital Sensor Port, Serial RS232 LCD Port

The **Si5HyUdPTC2-HC-30V-2x20A** is a 30V 2x20A, Dual, microprocessor based, Hybrid, Unidirectional, Proportional Temperature Controller board with an integrated heat sink that uses pulse-width modulation (PWM) to efficiently control average current to a heater and to a cooler element. The heating element can be (Thermo-Electric, TE cell or resistive heater) and a cooling element can be (a 2ND TE cell or chilling pump); each element is proportionally controlled in the 0 to 600W power range with 5W steps. Two high-power MOSFETs (55V, 60A max.) are used (one for heating and one for cooling) to control the temperature of an enclosed environment. An onboard microprocessor allocates the load-power and controls the temperature. The sample temperature is measured by 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 uniform temperature control in the **-25^oC to +102^oC Range, with 1/2^oC accuracy**. As the name hybrid (Hy) implies, the desired temperature value is derived from a variable analog-voltage, while the all other control-signals are digital. This desired temperature value is set by an (0 to 5V range) external analog voltage ($V_{H,G}$), or by an external potentiometer. This analog (I1) input is zener-diode protected. A normally-open switch can be to port J1 for Emergency Stop (J1 Open=Run, J1 Short =Kill or Loads Open). This board requires a single 9V to 30V DC power source (unregulated and unfiltered) at a 0A to 20A current range to operate normally. An onboard Red LED is used to monitor the heater voltage, while a Green LED is used for the Cooler port. An optional Serial LCD ([Si14LCD2L16CH](#)) is used to display the Set and Measured Temperatures. A small (2.3"x2.4"x0.45") finned integrated heat sink is included with mounting hardware (as shown on the photograph) to operate at 2x16A or 960W power level. Higher power-levels (30V, 2x20A or 1200W) 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 Si5HyUdPTC2-HC-30V-2x20A

- **Typical Operating Temperature at full-load:** 45^oC with the Metal Heat-Ring Bolted to a small aluminum (2.4"x2.3"x0.95") finned Heat-Sink, while the plate is exposed to air at 25^oC (as shown on photograph).
- **Source-Voltage Requirement (V_P , from pin +P to pin -P):** Any DC voltage from 9V to 30V at 20 A max., unregulated and unfiltered DC.
- **Max. Continuous Average Load-Current, I_{L1} , or I_{L2} :** 20A max. at 100% Duty-Cycle.
- **Load Isolation:** The Loads or TE cells must be isolated from the source voltage (V_P) and for each other.
- **Power-Conversion Efficiency:** Approximately 97.5% at full-load (30V and 20A).



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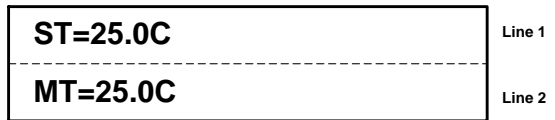
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- LCD Data Format of [Si14LCD2L16CH](#) Serial Display, 2-Line by 16-Char

ST: Set Temperature

MT: Measured Temperature



- Load-Power Indicators and Board Protection:

An onboard Red LED is used to monitor the heater output voltage, and a Yellow LED is used to monitor the cooler output. The power-circuit is protected by an optional 20A fast acting Mini-Fuse.

- Closed-Loop Temperature Control in 1/2°C Steps, -25°C to +102°C Range
- Factory Calibrated 9-Bit Digital Temperature Sensor is Immune to Additive Noise
- 9-Bit Digital Temperature Sensor: [Si18DTsens](#)

About the Voltage Requirement: The Si5 will work with any DC motor or load in the 9 V to 30 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 [Si5HyUdPTC2-HC-30V-2x20A](#)

In this heating and cooling application (both at the same time), the temperature (load-currents to two TE Cells, one for heating and one for cooling) is proportionally controlled (in the 0 to 600W power range) by the Si5 board. The desired temperature is linearly adjusted with the [Si5Pot1-5k](#) accessory (an external 1-turn 5kΩ pot); -25°C to +102°C Temperature Range, in 1/2°C Steps. The 9-bit digital temperature sensor can be purchased from us (see Parts Department [Si18DTsens](#)) or you can wire up your own using the Dallas Semi. Digital Thermometer chip DS18S20, in TO-92 casing (order from www.digikey.com as part number **DS18S20-ND**). An optional Serial LCD ([Si14LCD2L16CH](#)) is used to display the Set and Measured Temperatures. The TE Cells can be purchased from: www.customthermoelectric.com/assemblies.html

