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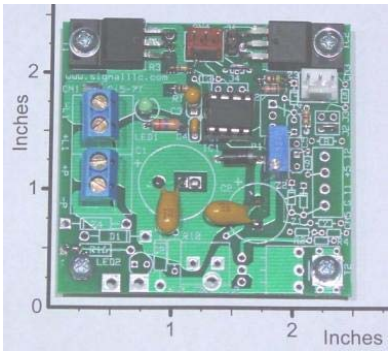
Si5HyUdPTC1-CA9B-30V-10A, Hybrid, Unidirectional Proportional Temperature Controller for Cooling Application with 9-Bit Digital Sensor, 9600 Baud Serial LCD Port



The **Si5HyUdPTC1-CA9B-30V-10A** is a 30V 10A, microprocessor based, Hybrid, Unidirectional, Proportional Temperature Controller board for Cooling Application. This controller uses pulse-width modulation (**PWM**) to efficiently control average current to a resistive heater or Thermo-Electric (TE) cooler cell in 0 to 300W power range. 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 (|Td|). The duty-cycle is 0% when $|Td|=0^0C$; 25% when $0^0C< |Td|<0.5^0C$; 50% when $0.5^0C< |Td|<1C^0$; 75% when $1^0C< |Td|<1.5^0C$; 100% when $|Td|>1.5^0C$. This method allows a uniform temperature control in the **-25^{0}C to +102^{0}C Range, with 1/2^{0}C accuracy**. As the name hybrid (**Hy**) implies, the required temperature value (or load current) is derived from a variable analog-voltage, while the all other control-signals are digital. The desired temperature value (or load current) is set by an (0 to 5V range) external analog voltage ($\mathbf{V_{I1,G}}$), or by an external potentiometer. This analog (**I1**) input is zener-diode protected. This board requires a single 9V to 30V DC power source (unregulated and unfiltered) at a 0A to 10A current range to operate normally. An onboard LED (Green) is used to monitor the load-voltage. No heat sink is required (as shown on the photograph) to operate at 10A or 300W power levels. Higher power-levels (30V, 20A or 600W) can be achieved with 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 Si5HyUdPTC1-CA9B-30V-10A

- **Overall Dimensions:** Length= 2.4", Width=2.3", Height =0.7", (L=61, W= 58, H=18 mm).
- **Typical Operating Temperature at full-load:** 45^{0}C with the Metal Traces exposed to air at 25^{0}C (as shown on photograph).
- **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 of $v_L(t)$ from pin L+ to pin L-):** 0V at 0% Duty-Cycle, $\mathbf{V_p}$ at 100% Duty-Cycle.
- **Max. Continuous Average Load-Current:** 10A at 100% duty-cycle, without heat-sink (as shown).
- **Max. Load-Current for 5sec:** 20A at 100% duty-cycle, with heat-sink (as shown).

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- **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 (30V and 20A).
- **Closed-Loop Cooling Control in 1/2^{0}C Steps, -25^{0}C to +102^{0}C Range**
- **Factory Calibrated 9-Bit Digital Temperature Sensor is Immune to Additive Noise**
- **9-Bit Digital Temperature Sensor:** **Si18DTsens**
- **Load-Indicator:** An onboard LED (Green) is used to monitor the TE cell (or load) voltage.
- **Kill Switch:** J1=Open= Run Mode, J1=Short= Stop Mode (Load Open).
- **Serial LCD Port:** A **Newhaven NHD-0216K3Z-FS(RGB)-FBW**, Serial 2x16 LCD (9600 Baud, 1-Start, 8-Data,1-Stop, No Parity) can be connected to port **CN4** to display the Set and Measured Temperature.

About the Voltage Requirement: The Si5 will work with any 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 Si5HyUdPTC1-CA9B-30V-10A

In this cooling application, the temperature (load-current) is proportionally controlled (in the 0 to 300W power range) by the Si5 board and the desired temperature (or load current) is linearly adjusted (with an onboard 10-turn 5kΩ Trim-Pot); **-25^{0}C to +102^{0}C Temperature Range, in 1/2^{0}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**). The TE Cells can be purchased from Melcor Corp. Trenton, NJ 08648 USA, **www.melcor.com**.