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Si24HyTEPTC1-12B-50V-20A

12-Bit Hybrid, Thermo-Electric (TE), Proportional, Temperature Controller with LCD Port and with PWM, Y-Chip

The **Si24HyTEPTC1-12B-50V-20A** is a 50V 20A, microprocessor based, closed-loop, Hybrid, Thermo-Electric, Proportional Temperature Controller board that heats or cools a thermal-zone. **The temperature is measured with a 12-bit digital sensor and proportionally controlled with 0.0625°C steps in the -25°C to +102°C range.** An efficient high-power H-bridge controls the current (in the 0 to +/- 20A range) to Peltier type Thermo-Electric (TE) cells, functioning as a bidirectional heat-pump. By proportional control, we mean that the amount of correction used in the closed-loop is proportional to the difference between the set and measured temperature values. Two user selectable proportional control grids **G8** or **G9** are used to control a wide range of thermal loads. Grid **G8** is used for small loads (selected when **J3** is installed) and **G9** is used for large loads (selected when **J3** is open). Each control grid consists of sixteen non-uniformly spaced temperature levels (centered at the set-temperature value) with eight PWM duty-cycle values are used to control the temperature in 0.0625°C steps. **The temperature overshoots and oscillations (“hunting”) are limited to approximately + or - 0.5°C.** The temperature is sampled at approximately 1Hz rate and the control-loop/display is updated with the same rate. An onboard microprocessor measures and controls the temperature; monitors the user inputs; and drives a 2 line x 20 character LCD. A small 12-bit digital thermometer, Signal's part number [Si24DTsens-12B](#) (connected to port **CN3** and uses the Dallas Semi., DS18B20 sensor) is used to measure and control the temperature in the -25°C to +102°C range, with ½°C accuracy. Because this sensor is digital, it is virtually immune to noise and loading; ideally suited for remote sensing. This sensor uses a unique “1-wire interface” (with parasite power mode) that requires only 2-conductors for reliable remote (typical length of 20 meters) temperature sensing. As the name Hybrid (**Hy**) implies, the desired set-temperature is linearly adjusted with the [Si5Pot1-5k](#) potentiometer in the -25°C=0V to +102°C=+5V range, with ½°C=19.68mV steps. An LCD port (with HITACHI HD44780 Interface Standard) is provided for display of the Set and Measured temperature data. The 2 line x 20 character LCD can be ordered from Signal under the part number of [Si24LCD2L20CH](#) (2x20 display with 8” ribbon cable and 14-pin connectors and with back-light). A bicolor LED is used to monitor the TE cell (or load) voltage (Red = Heat, Green = Cold). This board operates with a single unregulated voltage source (9V to 50V range). A small Aluminum plate (3.3”x4.0”x0.065”) is required to operate at 1000W power level. Higher power-levels can be achieved with more efficient heat-sinks. Typical applications are: Peltier Effect TE Coolers, Heat Pumps, etc. This board can be configured and programmed to perform efficiently in many customized applications.



Specification and Application of Si24HyTEPTC1-12B-50V-20A

- **Typical Operating Temperature at 20A:** 45°C with the Metal Heat-Ring Bolted to a small Aluminum plate (3.3”x4.0”x0.065”) acting as a Heat-Sink, while the plate is exposed to air at 25°C (as shown on photograph).
- **Source-Voltage Requirements:** V_C (from pin **+C** to pin **-P**): 9V to 30V DC, and for V_P (from pin **+P** to pin **-P**) 9V to 50V, both unregulated 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.
- **Average Load Current of $i_L(t)$:** 0A at 0% Duty-Cycle and 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).

