

## Signal Consulting, LLC

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### **Si18HyUdMTC1-50V-20A, Hybrid, Unidirectional Motor Controller and Proportional Temperature Controller with LCD Port and with 20kHz PWM L-Chip**

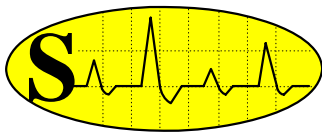
#### **Si18HyUdMTC1-50V-20A Features:**

- Fully Programmed Proportional (PWM) Controller
- Controlling Temperature and DC Motor-Speed Simultaneously in Open or Closed-Loop Modes
- Two External Potentiometers for Set-Temperature and for Set-RPM Inputs
- 2-line by 20-character long LCD Output for Display
- Alarm-Sensor Inputs and LED Outputs are Provided
- The Controller is Immune to Power Interruptions
- Proportional 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 Noise
- Smooth and Silent (20KHz PWM) Unidirectional or Bi-directional Speed Control for a Wide-Range of DC Motors (12V to 50V and 0 to 20A at unregulated power)
- Open or Closed-Loop Speed Control and Display in 1 RPM Steps (in -250 RPM to +250 RPM Scale) or in 10 RPM Steps (in -2500 RPM to +2500 RPM Scale)
- Slow Start/Stop Control Features Assure Long Motor Life



#### **Si18HyUdMTC1-50V-20A Description:**

The **Si18HyUdMTC1-50V** is a versatile, fully-programmed, microprocessor-based, proportional, Hybrid, Unidirectional, Motor and Temperature Controller board; capable of controlling two processes (temperature and DC motor-speed) simultaneously in a closed-loop or open-loop control mode. 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 values. By hybrid controller, we mean that the control inputs are analog but the control outputs are digital. This controller is immune to power interruptions. Set-values and system modes are saved in non-volatile memory as the AC power is interrupted and the system returns to the same working state when the AC power is restored. The Si18 can be configured by the user to control a single process (Temperature only or RPM only) or to control two processes simultaneously. It is suited for embedded applications. In addition, control-modes (open or closed loop; unidirectional or bi-directional speed), control-limits and correction-biases can be defined in the configuration phase (using two push-buttons connected to Pins 1, 3 and pins 1,4 on port CN2/ExK). Two  $10\text{K}\Omega$  potentiometers (connected to pins 1, 6, 8, for temperature; pins 1, 7, 8 for RPM on port CN2/ExK) are used to input set-temperature and Set-RPM values. An optional 2-line by 20-character long LCD Module (with Hitachi HD44780 Interface, connected to CN1/LCD port) is used to display: Set-Temperature, Set-RPM, Measured-Temperature, Measured-RPM, Status and Alarm information.



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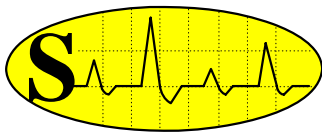
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Pulse-width modulation (PWM) at 1Hz rate is used to achieve closed-loop, proportional-temperature control. Several KW of heating and cooling power can be controlled in this manner. Similarly, pulse width modulation, at 20kHz rate is used to achieve a smooth and noise-free DC motor-speed control in closed-loop or open-loop mode and in 9V to 50V; 0 to 20A range. All power electronics and filter components (IC2, C1) are included on the board to provide unidirectional speed control. Bi-directional speed control (with an external power-bridge) and unidirectional speed control are supported by an optical-wheel/RPM-sensor (2"-OD, 45-holes, in closed-loop mode), and by a 25T RPM-Pot (P2, in open-loop mode). Slow-start, slow-stop control features assure long motor life and prevent power overloads. TTL level (0 to +5V) Pulse-Width- Modulated outputs (PWM @20KHz) are provided (pins1,6 for +RPM; pins1,7 for -RPM on port CN7/HCR) to support bi-directional motor-speed control. A small-size, 9-bit, digital-thermometer sensor, is used to measure and control the temperature with  $\frac{1}{2}^{\circ}$  C accuracy in the  $-25^{\circ}$ C to  $+102^{\circ}$ C range. The sensor is manufactured by Dallas Semi. [www.dalsemi.com](http://www.dalsemi.com) with part number DS18S20 and it is connected to CN4/TS1 port. This sensor can be ordered from Signal with part number [Si18DTsens](#). Because this sensor outputs zeros and ones, it is virtually immune to noise and loading; ideally suited for remote sensing. In addition, this sensor is calibrated by Dallas Semi., guaranteeing  $\pm \frac{1}{2}^{\circ}$  C, accuracy. Heat and cold TTL level (0 to +5V) relay outputs are provided (Heat on pins 3, 2; Cold on pins 1, 2; at port CN7/HCR) to drive solid-state relays. In addition, heat and cold TTL level LED outputs are provided (Heat on pins 5, 4; Cold on pins 2, 3; at port LED2/R-G) to drive indicator lights. A low-power, variable-resistance type alarm-sensor (connected to CN3/LWS port) is used to enable/disable the heating or cooling action. Sensor resistance less than 250K $\Omega$  will enable (while greater than 250K $\Omega$  will disable) the heating or cooling action.

### A Typical [Si18HyUdMTC1-50V-20A](#) Application:

The [Si18HyUdMTC1-50V](#) can be used in many applications including: Shaking Platforms, Heated/ Cooled Shaking Platforms, Heated Waterbaths, Shaking Waterbaths, etc. A typical hybrid application, depicting a shaking, thermo-electric (TE) platform (heated or cooled) is shown below. The TE cells are powered by the [Si20HPB4-50V](#) (High Power H-Bridge Board) and the platform temperature is controlled with  $\frac{1}{2}^{\circ}$  C accuracy in the  $-25^{\circ}$ C to  $+102^{\circ}$ C range. Temperature is measured with the [Si18DTsens](#) 9-bit, digital-thermometer sensor, while the [Si18LEDhc](#) accessory indicates that the heater or cooler is turned on. This circuit uses a 24V, 4A, brush-type DC Motor, and the accessories [Si18RPMsens](#) and [Si18RPMwheel](#), provides the optical feedback, achieving 2% speed regulation. The motor Set-Speed and Set-Temperature values are adjustable from 0 to 100% in 0.66% steps, using the [Si18Pot2PB2MC8](#) accessory. An optional 2 line x 20 character LCD (With HITACHI HD44780 Interface Standard) is used for data display. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Temperature, Measured-Temperature, Set-RPM and Measured-RPM data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, <http://www.lcd-modules.com.tw>. The TE Cells can be purchased from Melcor Corp. Trenton, NJ 08648 USA, [www.melcor.com](http://www.melcor.com).

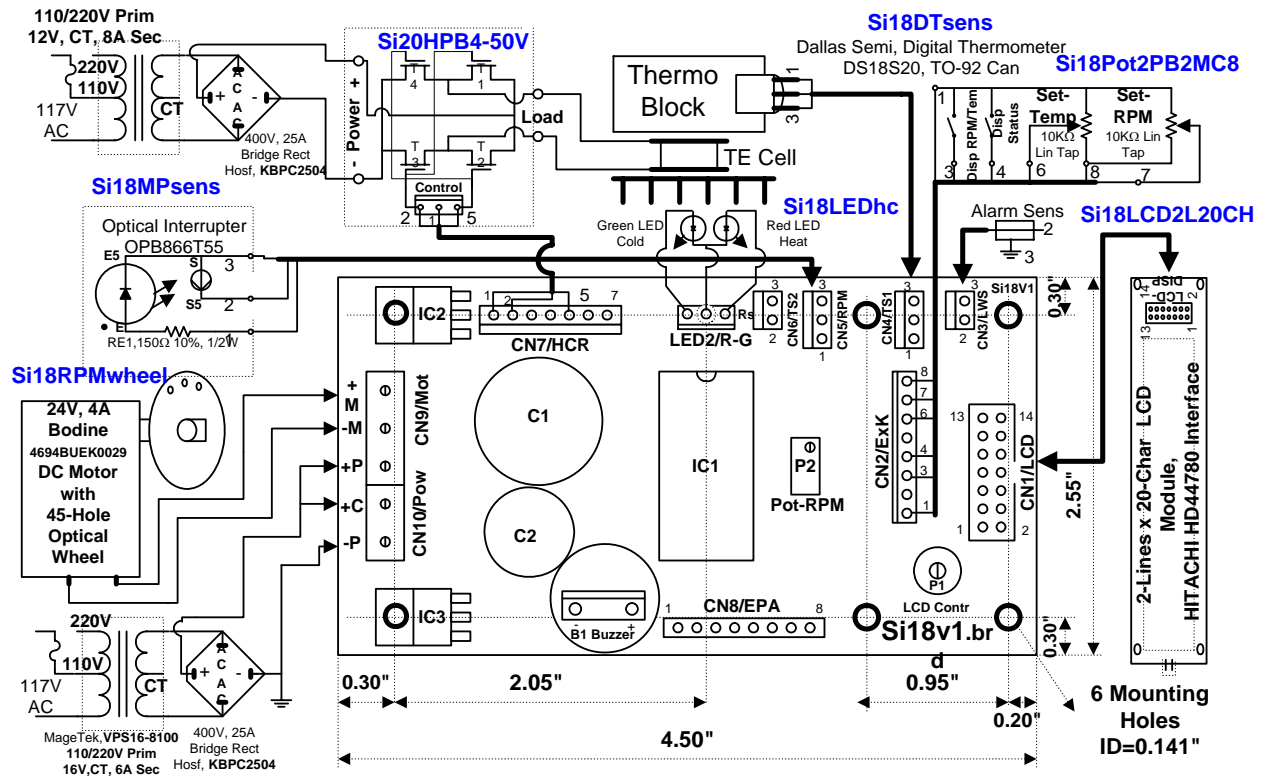
The DC Motor can be purchased from Bodine, [www.bodine-electric.com](http://www.bodine-electric.com) ; or from other vendors, [http://www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php) .



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## Si18-Application Notes and Drawings:

The Si18 Controller Board can be used in numerous applications. Some of these are given in the application notes listed below.

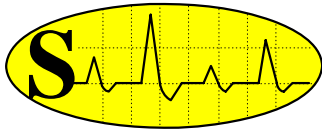
- [Si18HC-HCSh-TEcCL12V-AppNote](#)
- [Si18HC -HCTEHP-TEc12V-AppNote](#)
- [Si18HC-HSh-RHCL12V-AppNote](#)
- [Si18HC-Sh-NTCL12V-AppNote](#)
- [Si18HC-Sh-NTOL12V-AppNote](#)
- [Si18HC-ShWB-RHCL24V-AppNote](#)
- [Si18HC-WBMS-RHOL12V-AppNote](#)

Please click on the blue titles to link to these application notes and drawings:

[Si18HyUdMTC1-50V-AppNotes.](#)

## Si18-Accessories:

Several accessories can be used with the Si18 controller board depending on the required application. Please click on the blue titles to link to these accessories.



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All Hybrid Applications Use the Accessory: [Si18Pot2PB2MC8](#)

To achieve closed-loop motor speed control mode (RPM control only), choose the following additional accessories:

- [Si18RPMsens](#)
- [Si18RPMwheel](#)

To achieve closed-loop proportional temperature control mode (temperature only), choose the following additional accessories:

- [Si18DTsens](#)
- [Si18LEDhc](#)

To achieve simultaneously closed-loop motor speed control and closed-loop proportional temperature control mode, choose the following additional accessories:

- [Si18RPMsens](#)
- [Si18RPMwheel](#)
- [Si18DTsens](#)
- [Si18LEDhc](#)

To achieve simultaneously open-loop motor speed control and closed-loop proportional temperature control mode, choose the following additional accessories:

- [Si18DTsens](#)
- [Si18LEDhc](#)