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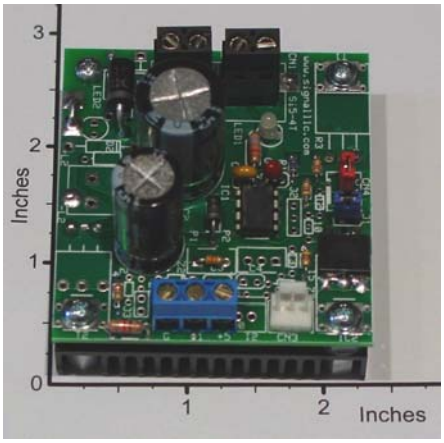
Si5HyUdMCDF1-30V-20A, Single, 30V 20A, Proportional Closed-Loop, Hybrid, Unidirectional Motor Controller with Integrated Heat Sink, Digital Feedback Port and with 5kHz or 20kHz PWM, T-Chip



The **Si5HyUdMCDF1-30V-20A** is a 30V 20A, microprocessor based, Single, Closed-Loop, Hybrid, Unidirectional, Motor-Controller with an integrated heat sink and with a Digital Feedback port. This board uses pulse-width modulation (**PWM**) to efficiently control the speed of a brush type DC motor (or load current) in open or closed loop control mode in the 0 to 600W power range, and in 5W steps. The desired control mode is selected by a jumper (**J1M**). An open-circuit (no jumper) selects the open-loop mode, while short-circuit (jumper installed) selects the closed-loop mode. The desired motor speed (or load current) is set by a (0 to 5V) range external analog voltage (applied to **I1** input pin on port **CN4**). The **Si18V1RPM-Sens** optical interrupter (connected to port **CN3**) along with **Si18V1RPM-Wheel** optical wheel (mounted on the motor shaft) provides proportional feedback, keeping the motor-shaft rotating at a constant speed. The speed-range is adjustable with an onboard 25-turn trim pot in the 50 to 3000 rpm range. 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 microprocessor generates a 5kHz or 20kHz **PWM** carrier signal, controls the load-power (or motor speed) and monitors the sensor inputs. The **PWM** carrier frequency is user selectable by the jumper **CN4**, 20kHz when **CN4** is open and 5kHz when short. The high frequency PWM rate provides a smooth motor-speed control, and insures a quiet motor environment. As the name hybrid (**Hy**) implies, the required motor speed (or PWM pulse-duration) is derived from a variable analog-voltage ($\mathbf{V_{I1,G}}$), while the other control-signals are digital. This analog (**I1**) input is zener-diode protected. An onboard LED (red) is used to monitor the load-voltage. 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 20A or 600W power levels. Higher power-levels (30V, 33A or 1000W) 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 Motor-Speed Controller, Light-Dimmer with variable delay, Power Amplifier, SPST Solid State Relay, etc.

Specification and Application for Si5HyUdMCDF1-30V-20A

- **Typical Operating Temperature at 20A:** 45^{0}C with the Metal Heat-Ring Bolted to a small (2.3"x2.4"x0.45") finned Aluminum Heat-Sink, while 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 DC.
- **Average Load-Voltage:** Linearly variable from 0 to $\mathbf{V_p}$ in 0.833% steps, using $\mathbf{V_{I1,G}}$ as control input.
- **Max. Continuous Average Load-Current:** 20A at 100% duty-cycle, with heat-sink (as shown).
- **Max. Load-Current for 5sec:** 40A at 100% duty-cycle, with heat-sink (as shown).
- **Load Isolation:** The Load or Motor must be isolated from the source voltage ($\mathbf{V_P}$).
- **Power-Conversion Efficiency:** Approximately 97.5% at full-load (30V and 20A).
- **PWM Switching Frequency:** 5kHz when **CN4** short and 20kHz when **CN4** open.

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- **PWM Duty-Cycle:** varies linearly from 0% to 100% in 0.833% steps, using $V_{I1,G}$ as control voltage (voltage at pin **I1** relative to pin **G** on connector **CN4**): where $V_{I1,G}$ = 0V yields 0%, and $V_{I1,G}$ = +5V, yields 100%. Note that the Duty-Cycle is defined as the ratio of the load-voltage on-time (t) to the switching period (T) times 100% (i.e. Duty-Cycle = (t /T)100%).
- **Load-Current Step-Response Time:** Software adjustable from 0.02Sec to 0.5Sec with default value of 0.1Sec.
- **Closed-Loop Control Mode** is selected by inserting a short-circuit jumper into **J1M** port and using the accessories **Si18V1RPM-Sens** (connected to port **CN3)** and **Si18V1RPM-Wheel** . Proportional feedback with Trim-Pot adjustable (50 to 3000 rpm) range is used to achieve motor speed regulation. The default is open-loop mode (**J1M** open).
- **Motor-Indicator:** An onboard LED (red) is used to monitor the motor (or load) voltage.

A Typical Application of the Si5HyUdMCDF1-30V-20A

In this closed-loop application (shown below) the shaft-speed of a 24V DC Motor is controlled, with the accessories **Si18V1RPM-Sens** and **Si18V1RPM-Wheel**. The desired motor speed (or PWM pulse-duration) is linearly adjusted with the **Si5Pot1-5k** accessory (an external 1-turn 5kΩ pot); and efficiently controlling the motor power in the 0 to 600W range in 4W steps. The DC Motor can be purchased from Bodine, **www.bodine-electric.com** ; or from other vendors, **http://www.e-motorsonline.com/emotors/dcmproduct_list.php** . .

Warning: The connecting wires to the Motor and the Power Supply must be heavy gauge copper wire (#12 AWG or heavier) to handle the rated current level. In addition, these heavy gauge wires act as a heat sink, protecting the board from overheating.