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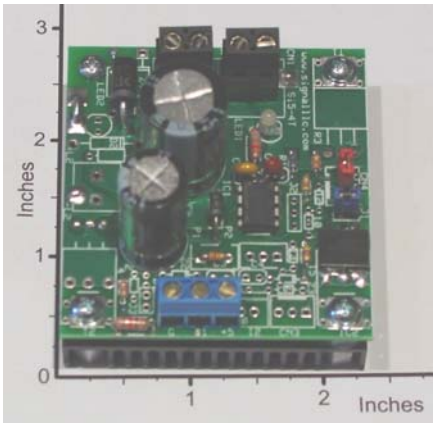
Si5HyUdMCPS1-30V-20A, Single, 30V 20A, Hybrid, Unidirectional, Motor Controller, with Integrated Heat Sink, Reflective Infra-Red Proximity Sensor, and with 5kHz or 20kHz PWM, T-Chip



The **Si5HyUdMCPS1-30V-20A** is a 30V 20A, Single, open-loop, microprocessor based, Hybrid, Unidirectional, Motor-Controller board with an Integrated Heat Sink that uses pulse-width modulation (**PWM**) for efficient control of a load (or brush type DC motor) in the 0 to 600W power range in 5W steps. The desired motor speed (or load current) is set by an external analog voltage (0 to 5V range) but the motor motion is initiated by a reflective infra-red (IR) proximity sensor which keeps the motor turning long as an object is in the view of the sensor. This sensor has an approximate range from 0 to 0.2". 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 **CN3**, 20kHz when **CN3** 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 ($\mathbf{V_{P1,G}}$), while the other control-signals are digital. This analog ($\mathbf{V_{P1,G}}$) input is zener-diode protected. The user can choose between slow or fast motor acceleration/deceleration modes by short-circuiting or open-circuiting the pins labeled **J1M**. The slow mode, with rise-time/fall-time of 0.5s, is selected by short-circuit (**J1M** jumper installed); while the fast buildup mode, with rise-time/fall-time of 0.025s, is selected by leaving these pins open (no Jumper installed). All control lines (analog and digital) are sampled approximately at 700Hz rate in the fast mode, and at 20Hz rate in the slow mode. An onboard LED (red) is used to monitor the load-voltage and an optional. 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, 30A or 900W) can be achieved with more efficient heat-sinks. Please click on this link and read the **Board Mounting Instructions and Heat Sink Selection Guide**. This board requires a single 9V to 30V DC power source (unregulated and unfiltered) at a 0A to 20A current range to operate normally. Typical object triggered applications are: DC Motor-Speed Controller, Light-Dimmer with variable delay, Power Amplifier, SPST Solid State Relay, etc.

Specification and Application for Si5HyUdMCPS1-30V-20A

- **Typical Operating Temperature at 20A:** 45^0C with the Metal Heat-Ring Bolted to a small (2.3"x2.4"x0.45") finned Aluminum Heat-Sink, while exposed to air at 25^0C (as shown on photograph).
- **Source-Voltage Requirement: V_P (from pin +P to pin -P):** 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:** 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 **CN3** short and 20kHz when **CN3** open.

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- **PWM Duty-Cycle:** is linearly variable from 0% to 100% in 0.83% steps, using $\mathbf{V_{P1,G}}$ as control voltage (voltage at pin **P1** relative to pin **G** on connector **CN5**); where $V_{P1,G}$ = 0V yield 0%, and $V_{P1,G}$ = +5V to 25V, yield 100% Duty-Cycle. This upper limit is chosen with an optional, onboard, fixed or adjustable voltage divider (+5V is the default value). 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%). These variables are defined and shown on the application drawing.
- **Proximity Sensor:** The **Si6IROsens** proximity sensor is used for motor start and stop.
- **Load-Current Step-Response Time:** Software adjustable from 0.02Sec to 0.5Sec with default value of 0.1Sec.
- **Motor-Indicator:** An onboard LED (red) is used to monitor the motor (or load) voltage.

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 Si5HyUdMCPS1-30V-20A

In this object-triggered application, the motor motion is triggered by a reflective IR proximity sensor with a proximate range from 0 to 0.2". This sensor can be ordered from Signal, **Si6IROsens** (sensor with 8" wires and 3-Pin connector) or can be purchased from **www.digikey.com** (using the part number **QRD1114-ND**). The PWM pulse-duration (or motor-speed) is linearly adjusted with **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** .