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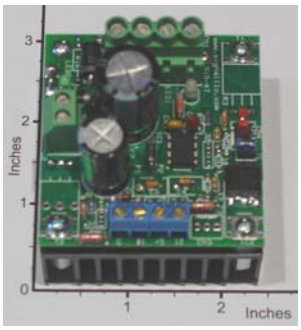
Si5HyPC2-30V-2x16A, Dual, Hybrid, 30V, 2x16A, DC Power Controller with Integrated Heat Sink and with 5kHz or 20kHz PWM, T-Chip



The **Si5HyPC2-30V-2x16A** is a 30V, 2x16A, microprocessor based, Dual, Hybrid, Power Controller with an integrated heat sink. This board uses two independent pulse-width modulators (**PWM**) to efficiently control the power flow (or DC currents) in two inductive loads each in the 0 to 480W power range, and in 4W steps. An onboard microprocessor generates two 5kHz or 20kHz **PWM** carrier signals, controls the load-power to each load and controls the load-current buildup and decay rates. The **PWM** carrier frequency is user selectable by the jumper **CN3**, both 20kHz when **CN3** is open and both 5kHz when short. The high frequency **PWM** rate provides a smooth DC current control to each load and insures a quiet load environment. As the name hybrid (**Hy**) implies, the desired load currents (or PWM pulse-durations) are set by two variable (0 to +5V) analog input-voltages $\mathbf{V_{I1,G}}$ and $\mathbf{V_{I2,G}}$ each providing control from 0 to 100% in 0.83% steps; while the other control-signals are digital. These analog inputs ($\mathbf{V_{I1,G}}$ and $\mathbf{V_{I2,G}}$) are zener-diode protected. The user can choose between both slow or both fast load-current buildup/decay modes by short-circuiting or open-circuiting the pins labeled **J1**. The slow mode, with rise-time/fall-time of 0.5s, is selected by short-circuit (**J1** jumper installed); while the fast mode, with rise-time/fall-time of 0.025s, is selected by leaving these pins open (no Jumper installed). Two onboard LEDs are used to monitor the load-voltages. Snubbing circuits and filter capacitors are included to suppress inductive switching transients. A small (2.3"x2.4"x0.95") finned integrated heat sink is included with mounting hardware (as shown on the photograph) to operate at 2x16A or 960W power levels. Higher power-levels (30V, 2x20A or 1200W) can be achieved with more efficient heat-sinks. This board requires a single 9V to 30V DC power source (unregulated and unfiltered) at a 0A to 32A current range to operate normally. Typical applications are: Dual Power Controller, Dual Light-Dimmer with variable delay, Dual Power Amplifier, Dual SPST Solid State Relay, etc.

Specification and Application for Si5HyPC2-30V-2x16A

- **Typical Operating Temperature at 2x16A:** 45^0C with the Metal Heat-Ring Bolted to a small (2.3"x2.4"x0.95") finned Aluminum Heat-Sink, while it is exposed to ambient air at 25^0C (as shown on photograph).
- **Overall Dimensions:** L=2.4", W= 2.3", H= 2.2" (61 x 58 x56mm).
- **Max. Continuous Average Load-Current:** 16A for each load, with heat-sink (as shown).
- **Max. Load-Current for 5sec:** 40A for each load at 100% duty-cycle, with heat-sink (as shown).
- **One common source voltage V_P (from pin +P to pin -P) for the two loads: V_P** can have any value between 9V to 30V (unregulated DC).
- **Each Average Load-Current is:** 0A at 0% duty-cycle and 16A max. at 100% duty-cycle.
- **Load Isolation:** The Loads or Motors must be isolated from the source voltage ($\mathbf{V_P}$).
- **Power-Conversion Efficiency:** Approximately 97.5% at full-load (30V and 16A).
- **PWM Frequency:** both 5kHz when **CN3** short and both 20kHz when **CN3** open.
- **Analog Control Inputs, I1, I2:** These independent analog inputs $\mathbf{V_{I1,G}}$ and $\mathbf{V_{I2,G}}$ (voltage at pin **I1** or **I2** relative to pin **G** on connector **CN5)** vary the duty-cycle of each DC current (or load-current) from 0% to 100% in 0.83% steps. Each duty-cycle vary linearly with $\mathbf{V_{I1,G}}$ or $\mathbf{V_{I2,G}}$; where $\mathbf{V_{In,G}}$ = 0V yields 0%, and $\mathbf{V_{In,G}}$ = 5V yields 100% duty-cycle. These inputs are zener-diode protected. Note

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that the duty-cycle is defined as the ratio of the load-voltage on-time to the switching period times 100% (i.e. Duty-Cycle = (t /T)100%). These variables are defined and shown below.

- **Load-Current Buildup/Decay Time:** The user can choose between both slow or both fast load-current buildup and decay modes by short-circuiting or open-circuiting the pins labeled **J1**. The slow mode, with rise-time/fall-time of 0.5s, is selected by short-circuit (**J1** 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).
- **Load-Voltage Indicators:** Two onboard LEDs (red) are used to monitor each load voltage.
- **About the Voltage Requirement:** The Si5 will work with any load or DC motor 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 Si5HyUdMC2-30V-2x16A

In this application, two DC load-currents (or PWM pulse-durations) are independently and linearly adjusted by the analog inputs $\mathbf{V_{I1,G}}$ and $\mathbf{V_{I2,G}}$ (via, two 5KOhm Linear tapered pots **SiPot2-2x5K**); efficiently controlling the power to each load (or DC motor) in the 0 to 480W 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**. An inexpensive, unregulated DC power supply design is shown in this application drawing. This power supply consists of a transformer, a 40A bridge rectifier and an optional C=2200uF, 35V capacitor (www.digikey.com part number **493-1323-ND**). The secondary voltage and current rating of the transformer determines the DC voltage and current output of this power supply. Low-current output transformers can be purchased from www.mpja.com with the fallowing part numbers: for 33V, 10A DC output use transformer **7846-TR**; for 16V, 4A DC output use transformer **7840-TR**. A wide variety of linear and switching power supplies can also be used with this board. Consult the most recent catalog on www.mpja.com to purchase these power supplies. **Warning: The connecting wires to the Motor and the Power Supply must be heavy gage copper wire (#12 AWG or heavier) to handle the rated current level. In addition, these heavy gage wires act as a heat sink, protecting the board from overheating.**