Ocean Controls KT-5196 Bipolar Stepper Motor Driver

- Microcontroller Based
- Controls 4, 6 and 8 wire Stepper Motors
- Full and Half Stepping Modes
- High Quality Through Plated Dual Layer PCB
- Screw Terminals for all Connections
- Step and Direction Inputs 0-5V
- Enable Input Removes Current From Coils when Pulled Low
- Controls Motors up to 6A

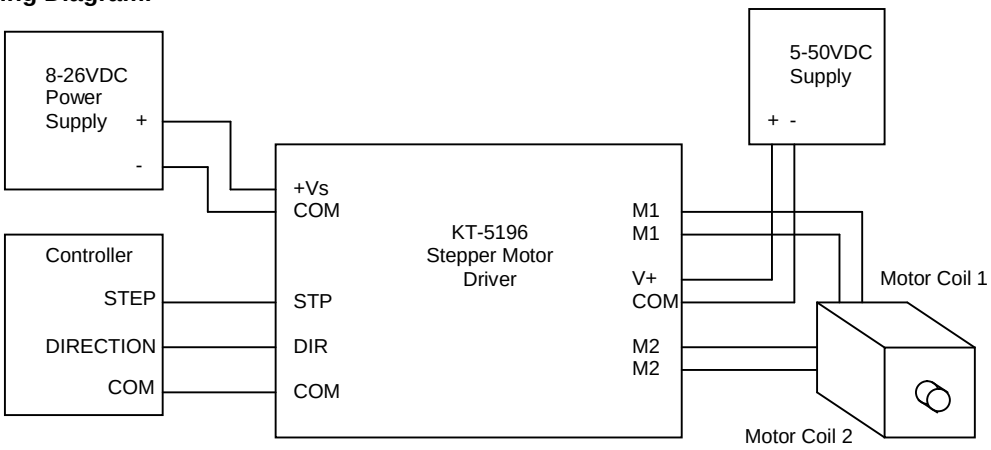
A Stepper Motor Driver converts Step (Pulse) and Direction inputs provided from a PC, Microcontroller or other source, to the signals needed to provide current to the coils of the Stepper Motor.
A Bipolar Stepper Motor Driver must provide current flow in both directions through each motor coil, and is therefore more complex than a Unipolar Stepper Motor Driver.
The KT-5196 consists of a Microcontroller which captures falling edges from pulses on the Step input and converts the pulses to the correct logic sequence for the Dual H-Bridge Output Stage.

Connections:

Label	Description
+Vs	Logic Power Supply Positive Input (8-26)VDC
COM	Common (Ground) Connection and Power Supply Negative Input
5V	5VDC Output
STP	Step Input 0-5V
DIR	Direction Input 0-5V Internally Pulled High
COM	Common (Ground) Connection
ENA	Enable/Disable Input Low Level removes current from Motor Coils
COM	Common (Ground) Connection
AN1	Not Used
AN2	Not Used
COM	Common (Ground) Connection
M1	Motor Coil 1 Connection
M1	Motor Coil 1 Connection
V+	Motor Power Supply Input 5-50VDC
COM	Common (Ground) Connection
M2	Motor Coil 2 Connection
M2	Motor Coil 2 Connection

How to use the Driver:
Using the Wiring Diagram as a guide, connect 12VDC (or anything between 8VDC and 26VDC) positive to the +Vs (Not the V+) terminal connect the 12VDC negative to the COM terminal closest to the +Vs terminal.
Connect the Step/Pulse/Clock output of your controller (PC, Microcontroller etc) to the STP input of the KT-5196.
Connect the Direction output of your controller to the DIR input of the KT-5196.
Connect a common connection of your controller
A safety switch can be connected between ENA and COM, when it closes the motor will be disabled.
Connect the first motor coil between the M1 connections.
Connect the second motor coil between the M2 connections.
If you are using an 8-wire motor you can wire pairs of the coils in series or parallel.
Connect the motor power supply positive to the V+ terminal and the Negative to the COM terminal closest to the V+ terminal.
By default the driver uses half stepping mode, if you wish to use full stepping turn dip switch number 3 on. Dip switches 1, 2 and 4 are not used.

Wiring Diagram:

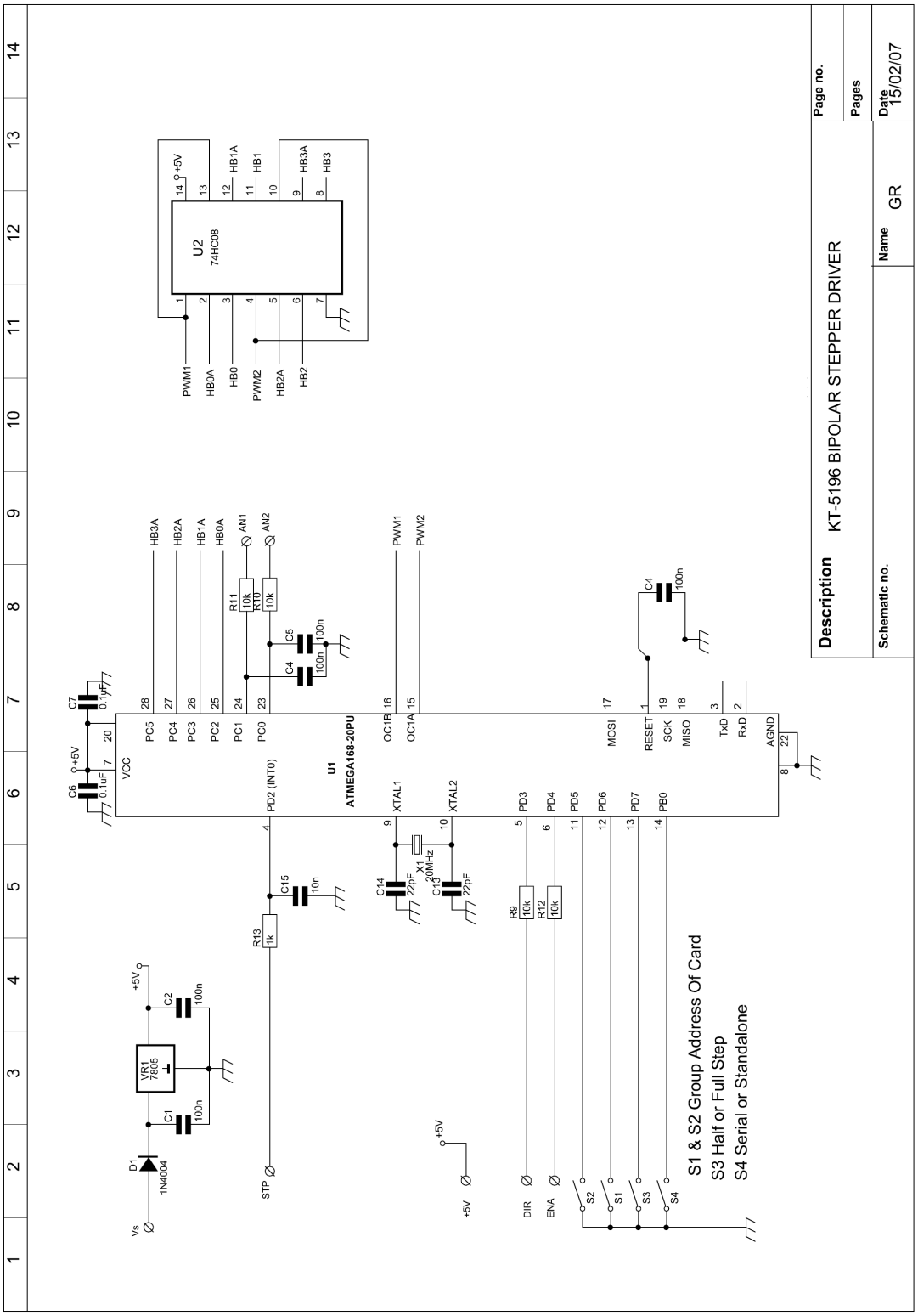


Half and Full Stepping:
Because the KT-5196 is controlled by a Microcontroller it is possible to use half stepping. In half stepping mode one input pulse will advance the motor half of one full step. This is done by removing current from one coil before reversing the current. This allows for smoother operation and in many cases a higher top speed for the motor.
By default the driver will be in half stepping mode. To use full stepping mode turn dip switch 3 on.

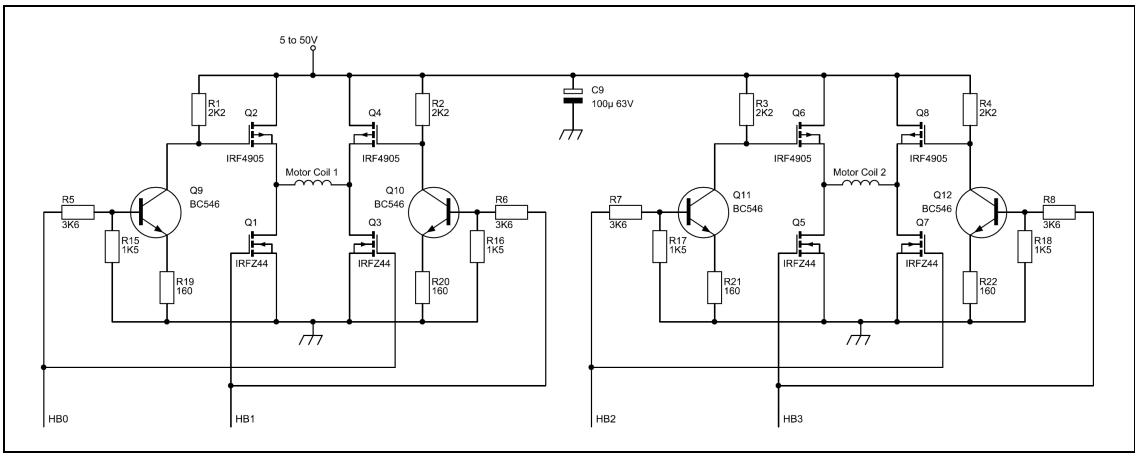
Heat:
It is recommended that you monitor the heat output of the FET's on the KT-5196 for the first few minutes, if you are using a motor which draws more than 2A of current. If you notice the FET's getting too hot you may need to use a heatsink (such as a drilled piece of aluminium) and fan to dissipate the heat.
You will need to use insulating bushes and washers to ensure that there is no electrical connection between any of the FET's as they do not sit at the same potential.

Performance:
It is possible to get better performance (higher speed and better torque response) from your stepper motor if you use current limiting resistors and a higher motor supply voltage. This will help overcome the coil inductance. You can find plenty of information on the internet on how to do this with stepper motor drivers. A good resource to look for is "Jones on Stepper Motors".

Circuit Diagram:



Circuit Diagram Page 2 (H-Bridge):



Parts List:

Part	Designator	Quantity
160 Ohm Resistor	R19-R22	4
1K Resistor	R13	1
1K5 Resistor	R15-R18	4
2K2 Resistor	R1-R4	4
3K6 Resistor	R5-R8	4
10K Resistor	R9-R12	4
1N4004 Diode	D5	1
22pF Capacitor Ceramic	C13, C14	2
10nF Capacitor Monolithic	C15	1
0.1uF Capacitor Monolithic	C1-C8	8
100uF 63V Capacitor Electrolytic	C16	1
BC546 NPN Transistor	Q9-Q12	4
IRFZ44N N-Channel MOSFET	Q1, Q3, Q5, Q7	4
IRF4905 P-Channel MOSFET	Q2, Q4, Q6, Q8	4
7805 5V Regulator	VR1	1
4-way DIP Switch		1
3-way Terminal Block	T4-T6	3
2-way Terminal Block	T1-T3, T7	4
28-pin Narrow IC Socket	U1	1
14-pin IC Socket	U2	1
20MHz Low Profile Crystal	X1	1
ATMega168 IC Programmed	U1	1
74HC08	U2	1
D9 Female IDC socket		1
10-pin IDC Header Connector		1
9-wire IDC Ribbon		120mm

Note: U3, C9-C12, K1, K2, D6 and R14 are not required for the KT-5196.