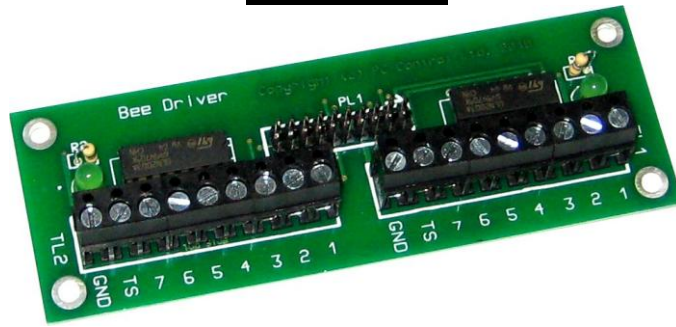
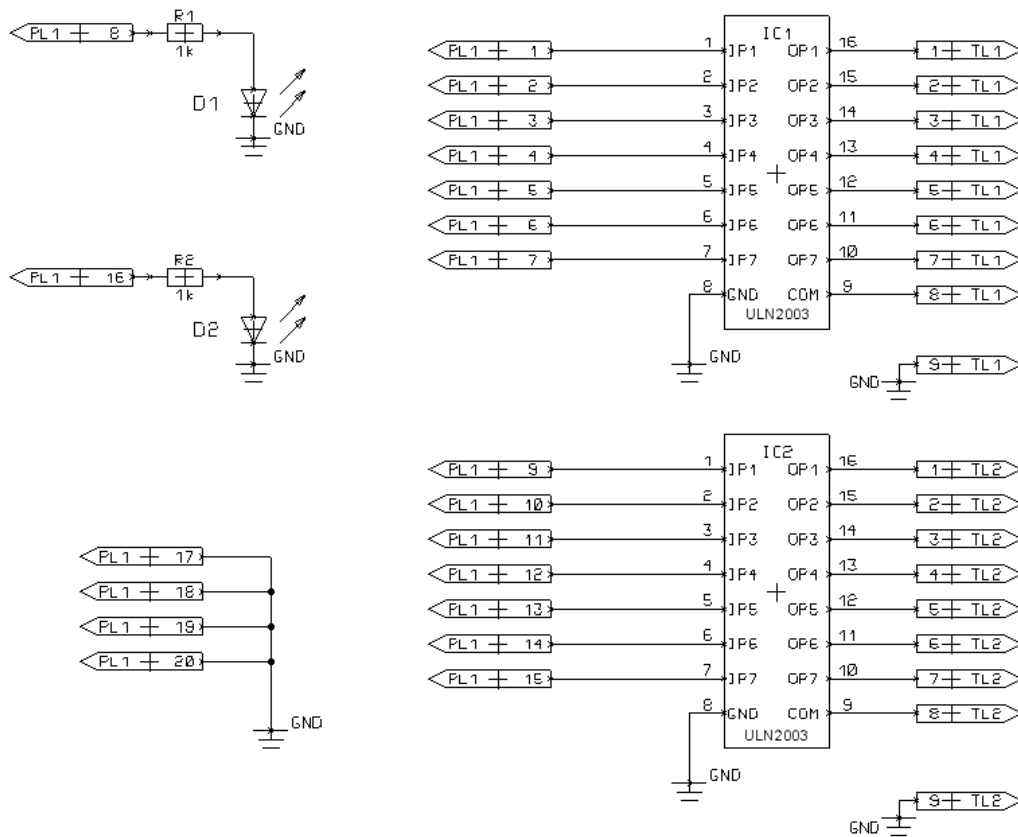


Bee-Driver



The Bee Driver provides 14 switching outputs and 2 LED indicators from 16 standard digital inputs (5v logic). It is pin compatible with the digital output connectors on the DigiBee, DigiBee+ and Maxi-Bee USB automation adaptors. It may also be used standalone as an interface adaptor for “home grown” electronics projects. A circuit schematic for the board is shown below. When connecting the Bee-Driver to one of the USB boards mentioned above please ensure that the ribbon cable is not twisted. i.e. ensure pin1 on the BeeDriver connector (PL1) is connected to pin 1 on the corresponding USB board connector.



Connector Pinouts

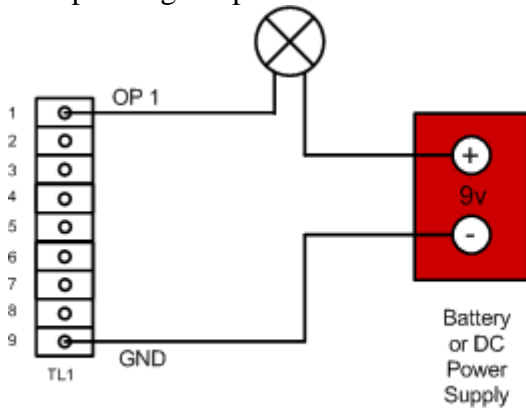
PL2			
Pin	Signal	Pin	Signal
1	Input 1	11	Input 11
2	Input 2	12	Input 12
3	Input 3	13	Input 13
4	Input 4	14	Input 14
5	Input 5	15	Input 15
6	Input 6	16	Input 16 (LED)
7	Input 7	17	GND
8	Input 8 (LED)	18	GND
9	Input 9	19	GND
10	Input 10	20	GND

TL1	
Pin	Signal
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5
6	Output 6
7	Output 7
8	Transient Suppression
9	GND

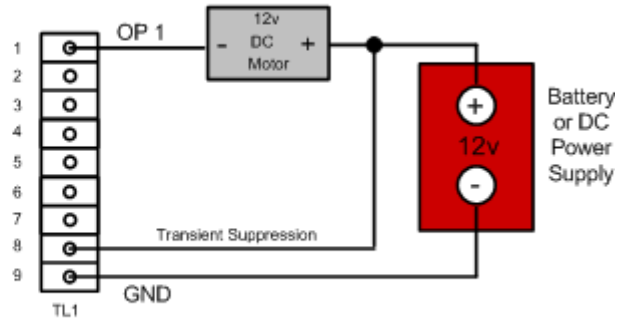
TL2	
Pin	Signal
1	Output 9
2	Output 10
3	Output 11
4	Output 12
5	Output 13
6	Output 14
7	Output 15
8	Transient Suppression
9	GND

Connecting External Devices to the Bee-Driver

The examples below show how to connect a simple lamp and an inductive motor to the BeeDriver. When connecting higher current devices it is important to remember the maximum ratings of the ULN2003 devices. A maximum current of 500mA on any one output and an overall maximum power dissipation chosen to ensure operating temperatures are not exceeded. Please refer to the ULN2003 specifications below.



Connecting a Lamp to Bee-Driver



Connecting an Inductive Load to Bee-Driver

Electrical Characteristics of ULN2003 Driver IC's

At the heart of the BeeDriver are the ULN2003 darlington driver output devices. A summary of their electrical characteristics is given below. More specific details can be obtained online from most good electronics supplier's websites or at datasheet.com.

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_0	Output Voltage	50	V
V_{in}	Input Voltage	30	V
I_c	Continuous Collector Current	500	mA
I_b	Continuous Base Current	25	mA
T_{amb}	Operating Ambient Temperature Range	120 to 85	$^{\circ}C$
T_{stg}	Storage Temperature range	-155 to 150	$^{\circ}C$
T_j	Junction Temperature	150	$^{\circ}C$
$R_{th\ j-amb}$	Thermal Resistance Junction-Ambient	Max 70	$^{\circ}C/W$

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
I_{cex}	Output leakage current	$V_{ce}=50v$ $V_{ce}=50v, T_{amb}=70^{\circ}C$			50 100	μA μA
$V_{ce(sat)}$	Collector-emitter saturation voltage	$I_c=100mA, I_b=250\ \mu A$		0.9	1.1	V
$I_{i(on)}$	Input Current	$V_i=3.85v$		0.93	1.35	mA
$I_{i(off)}$	Input Current	$T_{amb}=70^{\circ}C, I_c=500\ \mu A$	50	65		μA
$V_{i(on)}$	Input Voltage	$V_{ce}=2v, I_c=250mA$			2.7	V
h_{fe}	DC Forward Current Gain		1000			
C_i	Input Capacitance			15	25	pF
t_{PLH}	Turn-on delay time	$0.5V_i$ to $0.5V_o$		0.25	1	μs
t_{PHL}	Turn-off delay time	$0.5V_i$ to $0.5V_o$		0.25	1	μs
I_R	Clamp diode leakage current	$V_R=50v$ $V_R=50v, T_{amb}=70^{\circ}C$			50 100	μA μA
V_F	Clamp diode leakage current	$I_F=350\ mA$		1.7	2	V

Available from "The Control Shop" www.pc-control.co.uk