



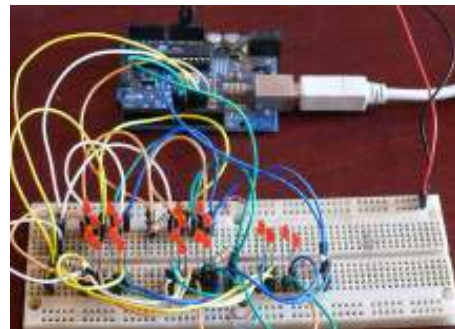
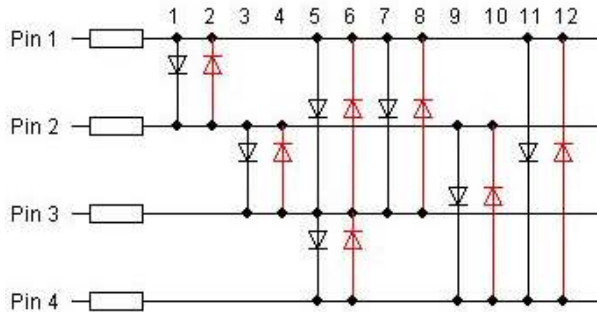
Doc en français: [www.didel.com/diduino/Charlie.pdf](http://www.didel.com/diduino/Charlie.pdf)

## CharliePi - Kit Charlie with amplifier for Raspberry

Raspberry GPIO pins cannot deliver the 20-30 mA required to light a multiplexed led.  
A smart amplifier must be used and will find many other applications.

The Charlieplexing trick is to use the input mode (floating) in order to increase the number of leds one can connect on a given number of pins. Several web links are available.

<https://en.wikipedia.org/wiki/Charlieplexing> The images below are taken from [riaancornelius](http://riaancornelius.com)  
<http://www.instructables.com/id/Controlling-20-Leds-from-5-Arduino-pins-using-Cha/>

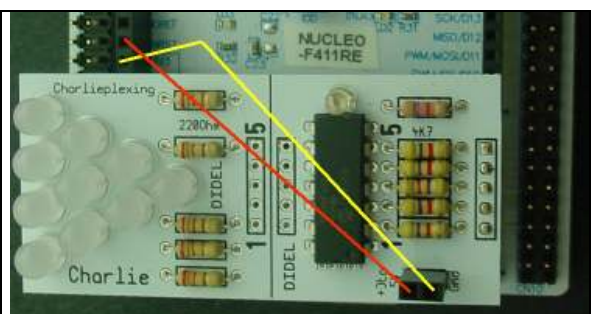


like this, it looks difficult to understand. Let us do the initial steps, assuming you know how to control a pin as an output and input (this mean floating, no action).

Let us consider 2, than 3 leds and have a look at the truth table..

				<p>What is this weak green mentioned at the bottom of the table? If the voltage is greater than 3.6V with pin3 high, pin2 floating and pin 1 low, there is enough voltage to start lighting the D1 and D2 green leds, serially connected (1.8V threshold).</p> <p>If several leds are on, the light intensity vary since their current must go through shared resistors.</p> <p>For these reasons, one selects one led at a time, and scans the display to have several leds on within a 20ms frame.</p> <p>Resistors are usually 200Ohm, in order to limit voltage drop and heat inside the microcontroller.</p>			
Pin 1	Pin 2	Pin 3	Pin 2	Pin 1	D3 1-3	D2 2-3	D1 1-2
0	0	0	0	0	off	off	eteint
0	0	1	0	1	off	off	green
0	1	0	1	0	off	green	rouge
1	0	0	1	1	green	vert	off
1	1	0	0	0	rouge	rouge	off
in	0	0	1	1	eteint	rouge	green
in	1	0	1	0	rouge	eteint	rouge
0	in	0	0	1	off	off	off
1	in	0	0	1	off	off	off
in	in	0	0	1	off	off	vert
		.	.	.			
		0	in	1	green	weak green	weak green

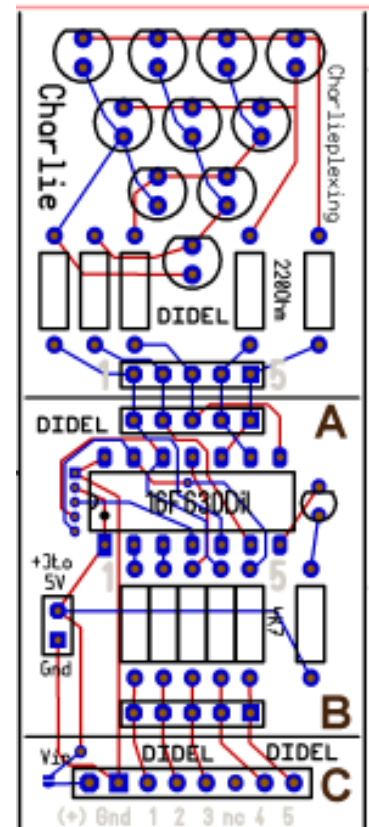
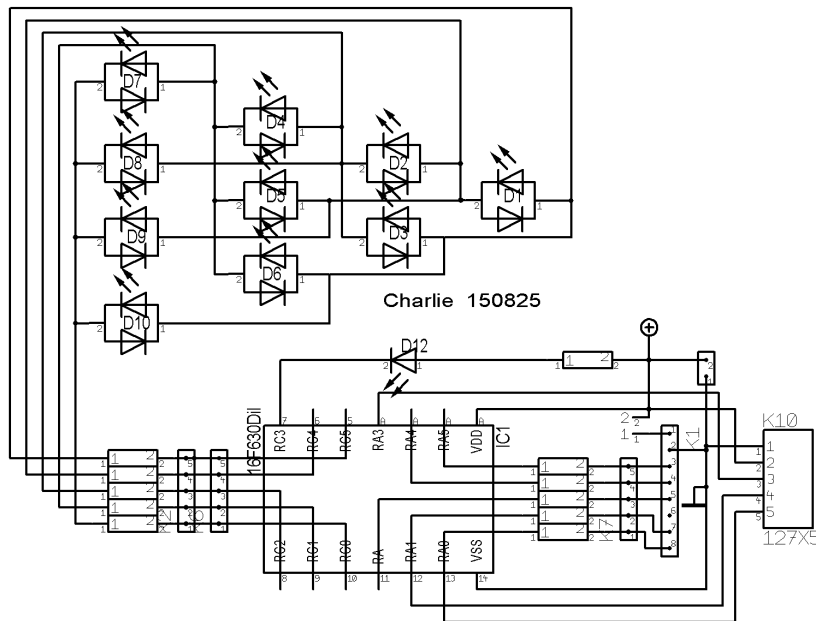
Didel module has an interesting pedagogical aspect: the led arrangement makes it clear when you work with 2, 3, 4, 5 lines.  
Raspberry is current limited on its outputs; our solution is to add an amplifier. The simplest solution for this amplifier is to program a microcontroller. The delay of 50 microseconds it introduces is of no importance for leds applications.



The interest now is to define how to program. Lighting several leds at the same time is tricky and not all configurations are possible.

Lighting one led at a time and avoiding flickering is also tricky

This make the interest of the Charlie kit.



Connector C is compatible with 2 sets of pins on Raspi,

Connector B has the signals in line

Connector A has the amplified signals.

The module with connectors A and B only can be used as a slow general purpose amplifier, 3 to 5V, max 30 mA

