September 2013

Application Note 0004
"ColoSpeed" - visual aid for vehicle speed

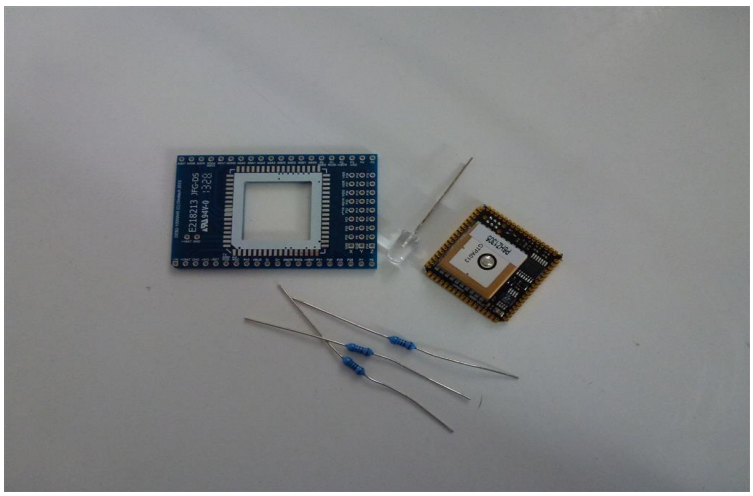
There is the apparent trend for more and more enforced speed limits on the roads. While traffic in big cities gets worse year by year, cars are now faster, safer and more economical, but all those advances are of a very little use when a speeding fine arrives in the mail. And in most of the cases people get booked for just a few k's over.

The simple device described in this application note, could be very helpful to people driving on roads with high probability of speed camera or to all those who simply want to "play by the rules". Instead of looking often at the speedometer to verify how fast are they going, the travel could be much more pleasant and the driver will still receive the needed basic information about the current vehicle speed.

In the core of the whole idea is the fact that the average person perceives colour using much less brain power, than for the recognition of shapes. Therefore a simple unobstuctive colourful light indication in the driver's peripheral sight could supply the needed amount of information without distracting the driver and the need to look at the speedometer.

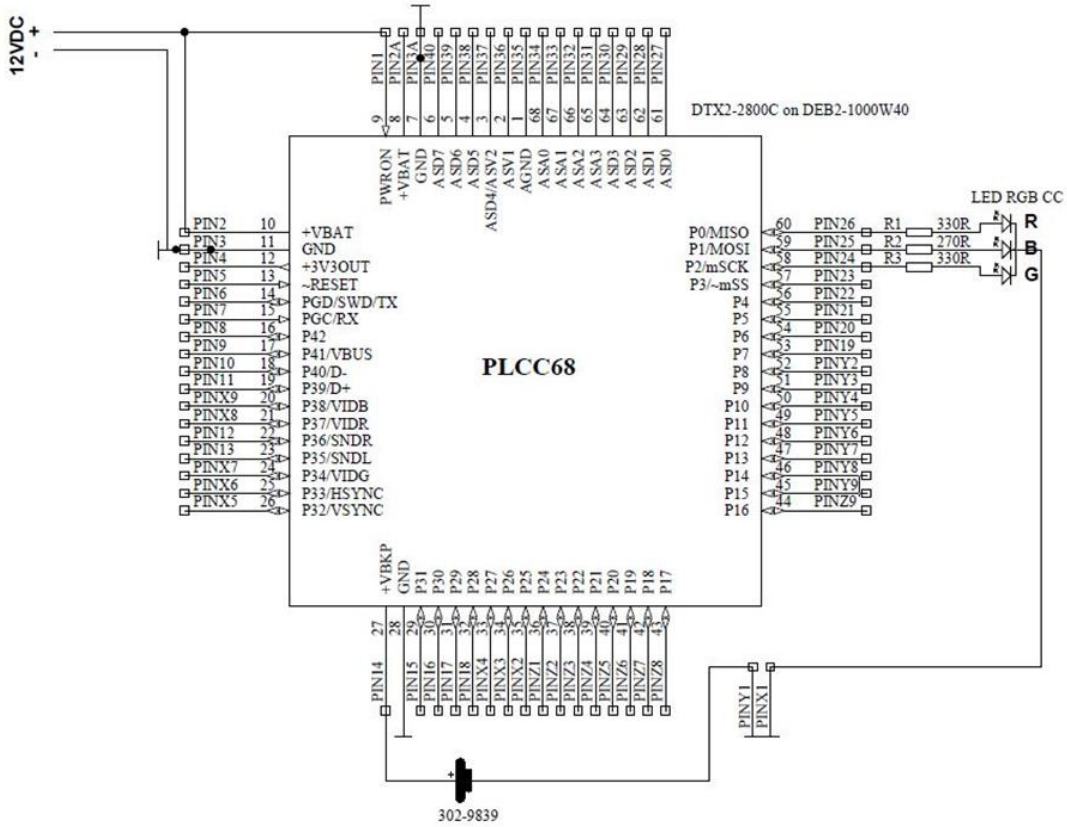
"ColoSpeed" makes use of the high integration of the DTX2-2800C module, but in a rather untraditional way – by loading custom firmware for the application. The whole device consists of only a few components, easily solderable by an average electronics hobbyist in about 15-20 minutes time.

The picture below shows the components needed for building ColoSpeed.



In this picture there is the DTX2-2800C module, one DEB2-1000W40 accessory PCB, three resistors and one common cathode RGB LED (the one used here is from Jaycar, but any other similar LED will work fine as well).

These are everything needed to build the device. There is one optional component – a small coin battery holder, which will greatly improve the functionality by providing backup power for the GPS satellite data thus almost immedite signal lock after power up.
The schematic is shown below. It is based upon the DEB2-1000W40 board, but a user could easily modify it for a custom PCB if necessary.



An small detail in the circuit above is the smaller value resistor for the blue LED. This is to equalise its brightness with the others and it only applies to the particular model LED used here. Any other model LED may require other values resistor values.

For simplicity all the resistors can be of one value only.

Another way to adjust the brigthness of each LED is by stting different values for the PWM in the microcontroller's source code.

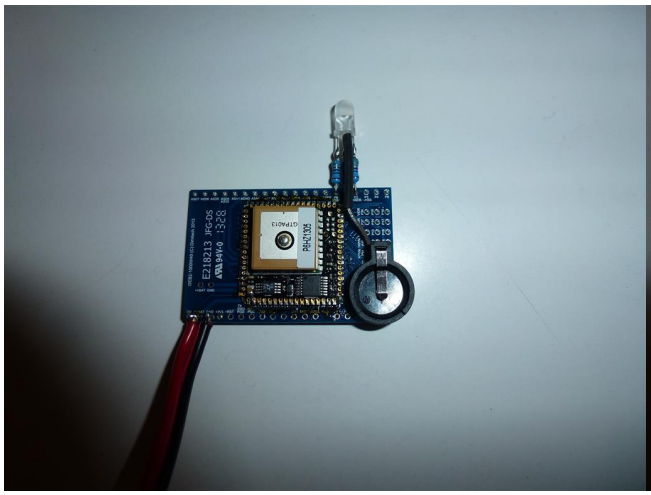
If no battery holder is used, then only a wire for grounding the LED common cathode will be needed as in the picture below.

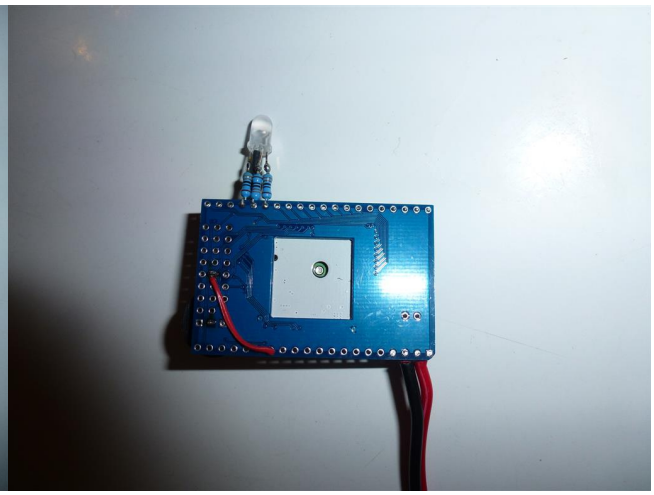
IMPORTANT:

1. Note the short connection between the first two pins of the DEB2-1000W40 board.
2. Make sure $\mathbf{V_f}$ of all three LEDs is lower than 3.3V.

The optional battery holder used in the prototype is model Keystone 500, Farnell/E14 code 302-9839 for 12mm coin batteries. Physically mounted on the DEB2 board it took the Y1 GND hole and the positive lead ideally reached the P11 hole (which has no connection in the DTX2-2800C module). Then a wire running between the battery's positive pin to the +VBKP pin on the bottom of the board is all that's needed.

The two pictures below show the whole device assembled and ready to be programmed.





Programming the DTX2-2800C module can be done in two ways described in the datasheet. Note that once assembled on the DEB2 board, the on-board Tag-Connect pads will not be usable because of the leading rod of the programming connector will be hitting the PCB without the contacts being able to reach to the module.

The firmware for DTX2-2800C is embedded in this application note.

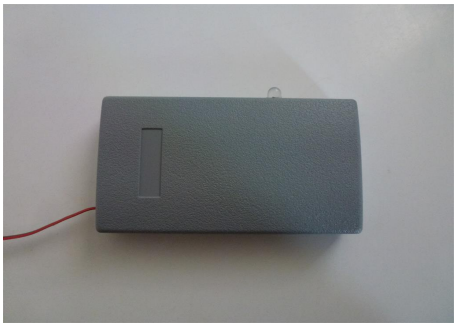
As configured in this project, the device will suit to most of the road speed limits worldwide. The user should modify the code if different rules are needed.

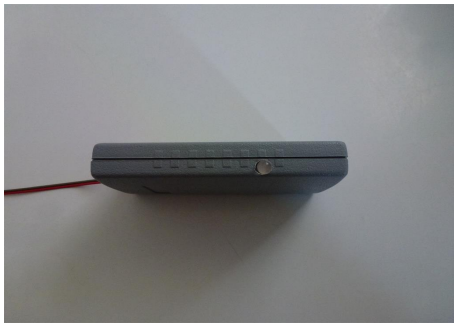
Colour rules:

0-5km/h or no GPS lock	low intensity RED
6-40km/h	BLUE
41-60km/h	CYAN
61-80km/h	GREEN
81-100km/h	YELLOW
101-110km/h	PURPLE
111km/h and above	RED

Firmware v1.1 includes seven speed zones (unlike the six in v1.0) as the zone 6-60km/h has been split in two for better accuracy when driving in low speed residential areas.
Additionaly introduced in firmware v1.1, ColoSpeed will produce a short white blink upon entering a new speed zone.

The physical assembly often proves to be the hardest part to many electronics engineers. Fortunately there is a plentiful choice of off the shelf plastic enclosures on the market. The one used for building the ColoSpeed prototype is from Jaycar, order code HB6030. It is thin enough to hold the board inside without the need of any internal mounting. Then all it needs is two holes – one for the LED and one smaller for the power leads. The device consumes insignificant amount of current. The prototype in the pictures is powered by two thin wires peeled off from an IDC ribbon cable, which are completely sufficient.





When fully assembled (if you have installed a battery holder, don't forget to install the battery in it as well!), the device is ready for mounting in the car.

Where it will be located is completely up to the driver's liking, but it is important to ensure the LED is pointing towards the driver's eyes somewhere in the peripheral sight. Practically proven a very good spot for that is around the inside mirror as in the picture below.