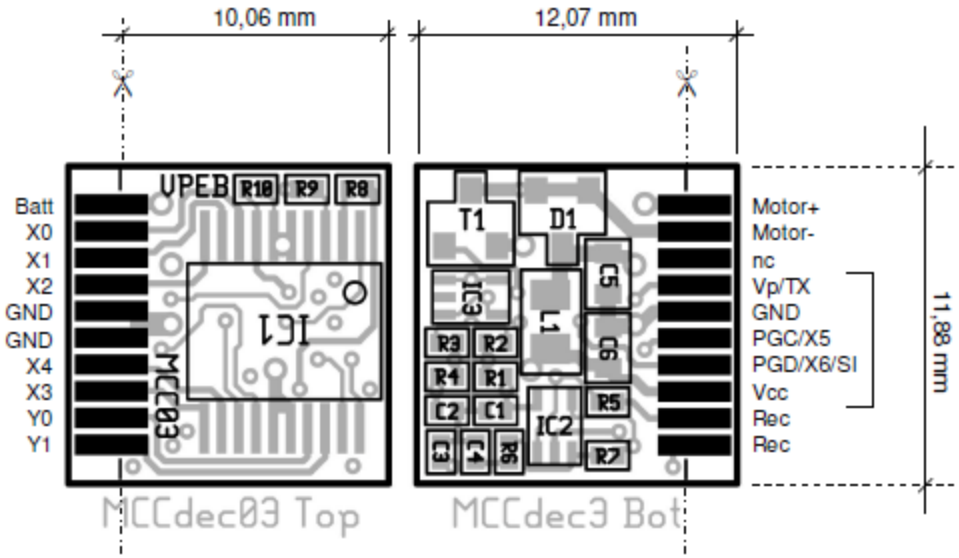
MCCdec03

Dimensions and Connection Diagram



The connection diagram of MCCdec03 is almost equal to the one of MCCdec02. Just mark that MCCdec03 is one connection pad narrower than MCCdec02 (so in total 20 in stead of 22). At MCCdec02, the Motor-minus is located at the corner, at MCCdec03 that connection has "jumped over the Motor-plus". That pad was unused on MCCdec02. Further the double Vbat(+) is degraded to a single one.

MCCdec03 has a 1/3 smaller area than MCCdec02 and is about 1/3 thinner. The total volume of MCCdec03 therefore is about 50% of MCCdec02. MCCdec03 is a multilayer PCB. This implies that no cutting or sanding is allowed to make the PCB smaller. The only exception are the connection pads. On both sides you will find two small marks (in the bove drawing indentified by the scissors-icon) until which point the connection pads may be shortened to save space. Mind that cutting may lead to high forces between the inner layers of the PCB, so sanding or grinding is the preferred method.
To be clear: changes to MCCdec03, including those described above, will void warranty on the product. Service to a modified module is on basis of “best effort”.

Power Supply Voltage

The power supply Voltage range of MCCdec03 is 2,9V..4,2V. In practice this means that MCCdec03 can only be powered by a Lithium Polymer battery or three NiMH cells. Below 2,9V the analog amplifier will fail and the CPU can behave unexpectedly. Above 4,2V The corrective calculations to compensate for changing battery Voltage are no longer correct. Over 4.2V the decoder will not fail immediately. This happens above 5,5V, so there is quite a margin above a completely topped-up LiPo.

Function Outputs

MCCdec03 has the same function-outputs as MCCdec02. However, the voltage on the MCCdec03 outputs is **NOT** regulated, but almost equals the battery voltage.
This is not really an issue when driving yellow and red LEDs, however white and blue LEDs have a forward operating voltage around 2,9V. The output voltage of a normal LiPo cel can vary between 4,2V (topped up) and 3,0V (completely empty). Draining the cell down to 3,0V is not wise. During normal operation you would limit the discharge to e.g. 3,4V. Between 4,2V and 3,4V the current through an LED with a forward operating voltage of 2,9V will change a factor 2,6. In any case, this is visible.

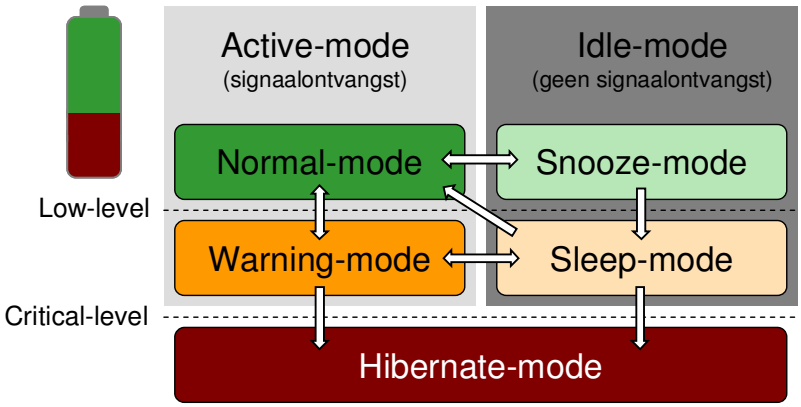
The choice of the LED series resistors shall be made so that the maximum current through the LED is not exceeded at the maximum battery voltage of approx. 4,2V. It is wise to keep some additional safety margin since the operating voltage of LEDs can vary somewhat e.g. with the temperature.
If output voltage variation on function outputs is unacceptable, you'll have to choose the MCCdec02.

Energy Management

MCCdec03 is optimised to be used with LiPo batteries. LiPo batteries may not be discharged too deep. If this happens, the battery will be irreversibly damaged. For this reason MCCdec03 has a number of precautions to minimize the chance these situations occur:

- MCCdec03 has 2 battery voltage levels that are used to make decisions. Both values are configurable within certain limits
  - Low-level
  - Critical-Level.
- MCCdec03 has 5 possible operating modes:
  - Normal-mode
  - Warning-mode
  - Snooze-mode
  - Sleep-mode
  - Hibernate-mode

Normal -and Warning-mode are grouped as "Active-mode"
Snooze -and Sleep-mode are grouped as "Idle-mode"
The diagram below shows the relationship between the different modes:



Active-mode

The decoder receives signal: All functions are operational. Subdivided modes:

- Normal-mode: The battery voltage is higher than Low-level. There are no limitations
- Warning-mode: The battery voltage is below Low-level. Maximum speed can be limited and indicators can be set to "alarm mode" (equal to MCCdec02)

Idle-mode

The decoder has not received signal during 100 seconds. Subdivided modes:

- Snooze-mode: Battery voltage is higher than Low-level. The decoder enters low-consumption state. Outputs are off, motor is stopped, but the decoder keeps listening for signal and monitors battery level. As soon as signal is received, the decoder switches

to Active-mode.
The decoder indicates it is in Snooze-mode by flashing the indicator lights (Y0 and Y1 only) twice every 67 seconds. This is to warn the user that the decoder is still switched on.
Snooze-mode will remain active during a configurable Snooze-time. After this time, the decoder will switch to Sleep-mode

- Sleep-mode: Battery voltage is below Low-level or Snooze-mode has been active longer than Snooze-time. The decoder enters very-low consumption state. Outputs are off, motor is stopped, receiver and battery monitor are disabled. Every 67 seconds, the decoder awakes, checks battery condition and monitors during one second if signal is present. If a signal is received, the decoder switches to Active mode, otherwise back to Sleep-mode.
  Note in this state, it can take up to 67 seconds before the decoder responds to signal.
  Note in this state there is NO visual indication, because the primary goal of Sleep-mode is to maintain this situation as long as possible. Every not absolutely necessary energy consumption is avoided.
  As a rule of thumb: In Sleep-mode a decoder consumes roughly 10% of the consumption in Snooze-mode. In Sleep-mode the decoder uses about 10% of a 100mAh battery capacity during 14 days. So if your batteries are at least 25% charged, although not recommended, you could go on holiday without switching off your vehicles.

Hibernate

Battery voltage has dropped below Critical-level. The decoder flashes the indicators 5 times and switches off everything possible. There is no warning or monitoring. The only goal is to survive this situation as long as possible without damaging the battery. A decoder in Hibernate-mode can only be taken out of hibernation by electrically switching off the decoder during at least 2 minutes and switching back on with sufficient battery voltage.

Current Consumption

Typical use of the decoder ITSELF (so without the consumption of LEDs and motor):

- Active: 3,0mA at 3,7V;
- Snooze: 320μA at 3,7V;
- Sleep 32μA at 3,7V;
- Hibernate: 11,8μA at 3,2V; 5,6μA at 2,8V

Configuration

Below only the differences with respect to MCCdec02 are described.

There will be a JdinamoCC3.0 shortly that allows configuration of all settings of MCCdec03. Until that moment, configuration of MCCdec03 be done by JdinamoCC2.1. In order for JdinamoCC2.1 to work correctly, in the JdinamoCC2.1 battery-management section, choose battery-type=LiPo and select a minimum level of **exactly** 2,79V. In MCCdec03 this is **NOT** the reference voltage, but it results in in a Critical-level of 3,2V and a Low-level of 3,4V
If you want to adapt “maximum speed” en “braking speed” you need to add the battery management settings to the CV-list to transmit. If you don’t want to change these settings, you don’t add the settings to the CV list, but you need to make the settings anyway to make JdinamoCC2.1 work correctly. You cannot change the battery management settings yet with JdinamoCC2.1