**What is Diabeto?**

Diabeto is a hardware device which wirelessly transmits Blood Glucose readings from a Glucometer into a Smartphone (iOS/Android). These readings can then be easily analysed with the help of a Smartphone application. Moreover these readings are stored securely on a cloud server and can be accessed via application and API.

For more information you can check out our website <http://diabe.to/>

**Hardware Description**

**Functional Block Diagram**

Power Supply

TPS61200

3.3 V

Battery

3.7v/55mAh LiPo

Mobile Device

Android &

iPhone

SPDT

Switch

Bluetooth Low

Energy

NVC-MDCS71/42A

Micro USB

Port

Diabeto CPU

MCU

ATMEGA-8L

Diabeto Firmware Upgrade

TinyISP

Battery Charger

Manager

MCP73831

T

Glucometer

Connector

**Functional Block Explanation:**

**Battery:**

Diabeto is a battery powered device that contains standard LiPo (Lithium Polymer) single cell battery of 3.7volt with capacity of 55mAh (milli ampere hour). Maximum voltage provided by the battery is 4.2 volt in its complete charge state and the minimum voltage is 3 volt during its drain state. Battery has capacity of providing 55mA current continuously for one hour time whereas Diabeto device peak current consumption is 19.31mA.

**Battery Charge Manager**:

The function of Diabeto battery charge manager system is to recharge battery system. Battery charge manager system is based on Microchip’s (<www.microchip.com>) single cell charging integrated chip **MCP73831.** MCP73831can charge single cell lithium polymer or lithium ion batteries with maximum charge current of 500mA. It helps to charge Diabeto battery system within 15-20 minutes at the charging current of 500mA. User can also charge Diabeto device at different charging current by replacing Rprog resistor with suitable value, please refer datasheet of MCP73831 to find the valid resistor value range. Diabeto charge manager system uses micro USB port to draw the required charging current and it also controls automatic charge termination after fully charging battery system or if temperature goes beyond limitations. The system uses MCP73831 STAT pin to notify the Diabeto CPU system when device battery gets fully charged.

**Power Supply:**

It is not possible to power the Diabeto device directly from the LiPo battery since its voltage start decreasing as battery start discharging. To stabilise the supply voltage Diabeto power supply system uses **Texas** **TPS61200**. TPS61200

is Buck-Booster DC-DC (Direct current to Direct current) converter. It has capability to provide maximum current of 600mA at 5V output and 300mA at 3V. It also protects battery from over draining i.e. it automatically disconnects battery when its voltage drop reaches to battery cut off voltage, this protects battery from over drain condition and increases battery life. Diabeto CPU unit automatically shut down the Diabeto device when LiPo battery goes below 3.6v for the safe operation of the Diabeto device. Diabeto CPU unit continuously monitor battery voltage though the voltage divider circuit of register pair R11 & R12 (Please see the circuit diagram of Diabeto). Diabeto power supply system continuously provides 3.3 volt to Diabeto system. Turn ON and OFF functionality of power supply system is controlled by TPS\_EN pin of TPS61200.

**Diabeto CPU:**

Central processing unit of Diabeto is responsible for handling communication mechanism between glucose meters and mobile device. **Atmega8l** is the core of Diabeto CPU system. Its **ATMEL** 8 bit controller with multiple integrated features such as Timer, USART (serial communication), ADC (analog to digital converter) and etc. Diabeto CPU unit handles the following operation

* Diabeto CPU unit captures all the commands coming from mobile device via Bluetooth media and processes all the commands as per the corresponding request. For e.g. Diabeto auto shutdown
* The main function of CPU system is to capture the glucose sugar data from glucose meter and transferred all the captured data to the mobile
* device without making any changes in the captured data. The Communication between the Diabeto device and glucose meter is controlled by the software UART which changes its configuration as per the connected glucose meter.
* Diabeto CPU system also represents the status of battery system by flashing the corresponding LED mounted under the Diabeto device button.

|  |  |
| --- | --- |
| LED STATUS | BATTERY STATUS |
| WHITE | FULLY CHARGED |
| BLUE | MEDUIM |
| RED | LOW |

* Soft switch control is also one of the important functionality of the Diabeto CPU unit. Soft switch is responsible to turn ON and OFF the device. Diabeto device get turn ON by pulling TPS\_EN pin of TPS61200 high and vice versa.

**Micro USB Port**:

Its standard micro USB port which meets USB 2.0 specification. Diabeto device uses this port for its battery charging and firmware up gradation task.

**SPDT Switch**

SPDT switch is used to flip connection between the glucometer connector and software UART. By default TIP of the 2.5mm audio jack act as transmission line and RING of the connector act as reception line. Diabeto CPU unit has the capability to flip these two signals by simply pulling select line of switch high.

**Glucometer Connector:**

Glucometer connector is nothing but a standard 2.5 mm audio jack which is used to connect Diabeto device with different glucometers.

**Firmware Upgrade:**

Diabetofirmware upgrade system is used to upgrade the firmware of Diabeto device. Diabeto firmware up gradation system is based on AVR USBTinyISP (In

system programming) hardware unit which contains ATMEL ATTiny2313 integrated chip as controlling unit. TinyISP hardware unit accepts USB packets coming from micro USB port and refill the memory section of Diabeto CPU unit. It helps user to upgrade their Diabeto device after the post production. For more information on USBTinyISP please check [http://avr.atspace.eu/projects/usbprogrammer.html](http://avr.atspace.eu/projects/usbprogrammer.html%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20)

**Bluetooth:**

Diabeto device is a Bluetooth enabled device that transfers all the glucose data reading to mobile device via Bluetooth technology. Diabeto device has two different versions, the first one supports Bluetooth 4.0 low energy radio specification which is used for iPhone and Android user (which supports Bluetooth low energy specification) and another one supports Bluetooth 2.0 specification which is used only for Android user. All iOS supported Diabeto devices are equipped with **Novacomm low energy module NVC-MDCS71** and Android supported Diabeto devices are equipped with **Novacomm NVC-MDCS42A** module. Both Bluetooth modules use 2.4 GHZ **ISM** (**Industrial Scientific Management**) band with the range of 100 meters. Diabeto device uses Bluetooth system to accept commands from the mobile device and

transfer all the results to the mobile device via the same media. For the Bluetooth configuration please refer command control user guide of both Bluetooth modules. You can also get more information about this module from <http://www.novacomm.cn/index.php/Index/products>