The RGBDigit project,

The immediate cause for the RGBDigit project is my desire to build an alarm clock on the wall next to my bed with the option to provide multiple colours, with the intention to provide different colours per day segment e.g. morning green, afternoon 's blue and in the evening pleasantly lit up orange (sunset).

A 2nd option is that when approaching the set alarm time, the display also changes colour before the alarm rings. So you do not actually know what time it is however you can see that the alarm time is approaching.

As a 3rd option, operating, for example with an IR remote control to avoid irritating / complicated controls having to be built in the housing

Searching the Internet for a 7 segment display with RGB with this functionality provided no useful products. Almost all 7 Segment Displays are mono colour. There is one useful option that comes close, see this URL http://www.adafruit.com/products/1399. But it has 25 pins, which creates problems when controlling from a microcontroller. A form of multiplexing is inevitable so the corresponding PCB will be extremely complicated

So there was no other possibility as to make a 7 segment display with RGB functionality myself, using as much as possible out of the box components.

I don't think it is of importance to describe the full process of my development experiences. At the end we're talking about the end product that is the result of many hours, emails, several prototypes, SMD soldering, Arduino programming, visiting manufacturers, lots of patience, etc..

Gradually the development process the idea for two further applications of RGBDigit's work arose, thus creating a RGBDigit SDK shield for an Arduino UNO and a precision clock with 6 or 4 RGBdigit programs. Both applications are further described in detail in this article.

Personally I think, they're very well applicable to gain experience in the usage of the RGBDigit's .

It allows potential users to apply RGBDitig's in their own application / project.

Possible RGBDIGIT applications

- Arduino shield 4 digit, RGB and brightness potentiometer 's, DS3231, I2C
- Clock 4 or 6 digit programs.
- Panel / measuring systems with upper and lower range.
- Temperature, weight, energy, scales, wind meter and speed functions.
- Score board's
- Built-in all white goods (ECO mode).
- Design objects
- Fitness equipment
- Multimeters

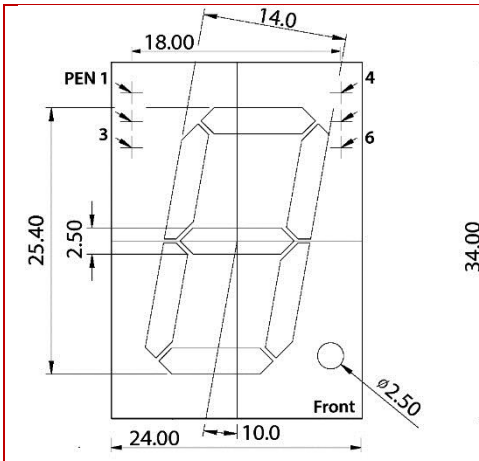
The RGBDigit

The RGBdigit consists of a empty 1" housing (see Figure 1) therein is a through RGBDigit.com designed PCB glued with a black two-component epoxy which ensures that the PCB remains well in place and that as little light as possible crosstalks between the different segments. With a serial control on Pin 2 Data-in and data-out Pin 5 can with the appropriate library Arduino each segment of a colour can be provided. Each segment has an R, G, B LEDs that can be adjusted in 255 steps and therefore 16,581,375 colour combinations occur for each segment of the digit. Also, the ability to control the brightness. For all LED's driven at 255 steps within the library It should be noted that my experience is that brightness values above 100 degree of clear I rarely use. Also in colour mixing the three colours seldom are equally brightly lit. These two arguments results in a moderate power consumption.

So the software drives everything. See for an explanation regarding the software elsewhere in this article.

For more detail information see datasheet at downloads on www.RGBDigit.com

Figuur 1

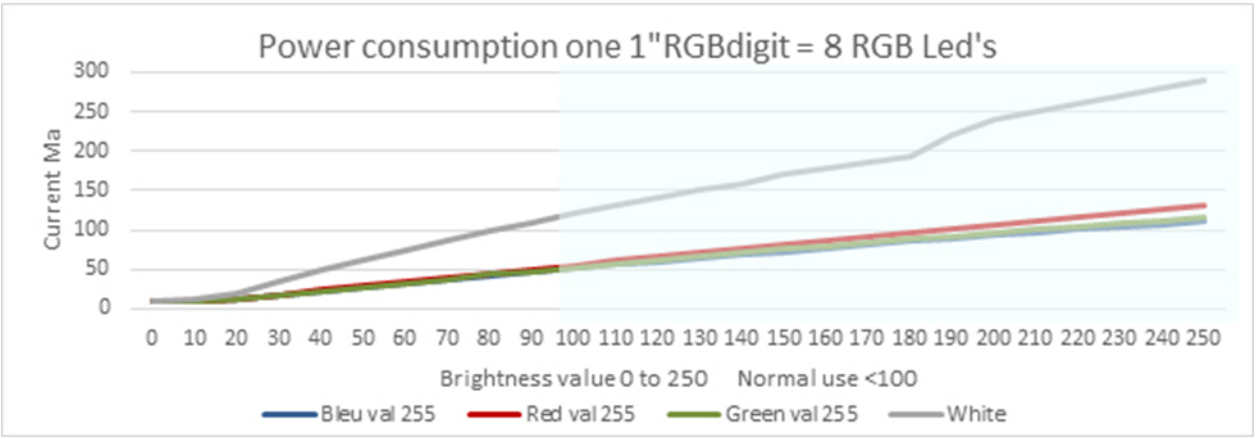


Pen 1	5 V	Pen 4	5 V
Pen 2	Data in	Pen 5	Data out
Pen 3	GND	Pen 6	GND

Features RGBDigit's

- Digit size 1 "= 25.40 mm
- Housing size 34.00 x 24.00 mm
- Full RGB colour Segment 3 x 0 to 255 16581375 gives colour combination's
- Adjustable brightness 1 x 0 to 255
- Simple wiring 3 in 3 out per digit
- 5V USB power supply
- Low power consumption see graph

Grafiek 1



The Arduino UNO multifunction RGBDigit shield

The idea behind this shield is to do with the RGBDigit 's experience and as a number of basic functions of an Arduino be able to apply to the demo or self-developed software.
On the chart, and print figure 2 and 3 , the various components are clearly visible. It can be determined what is needed for your own project.

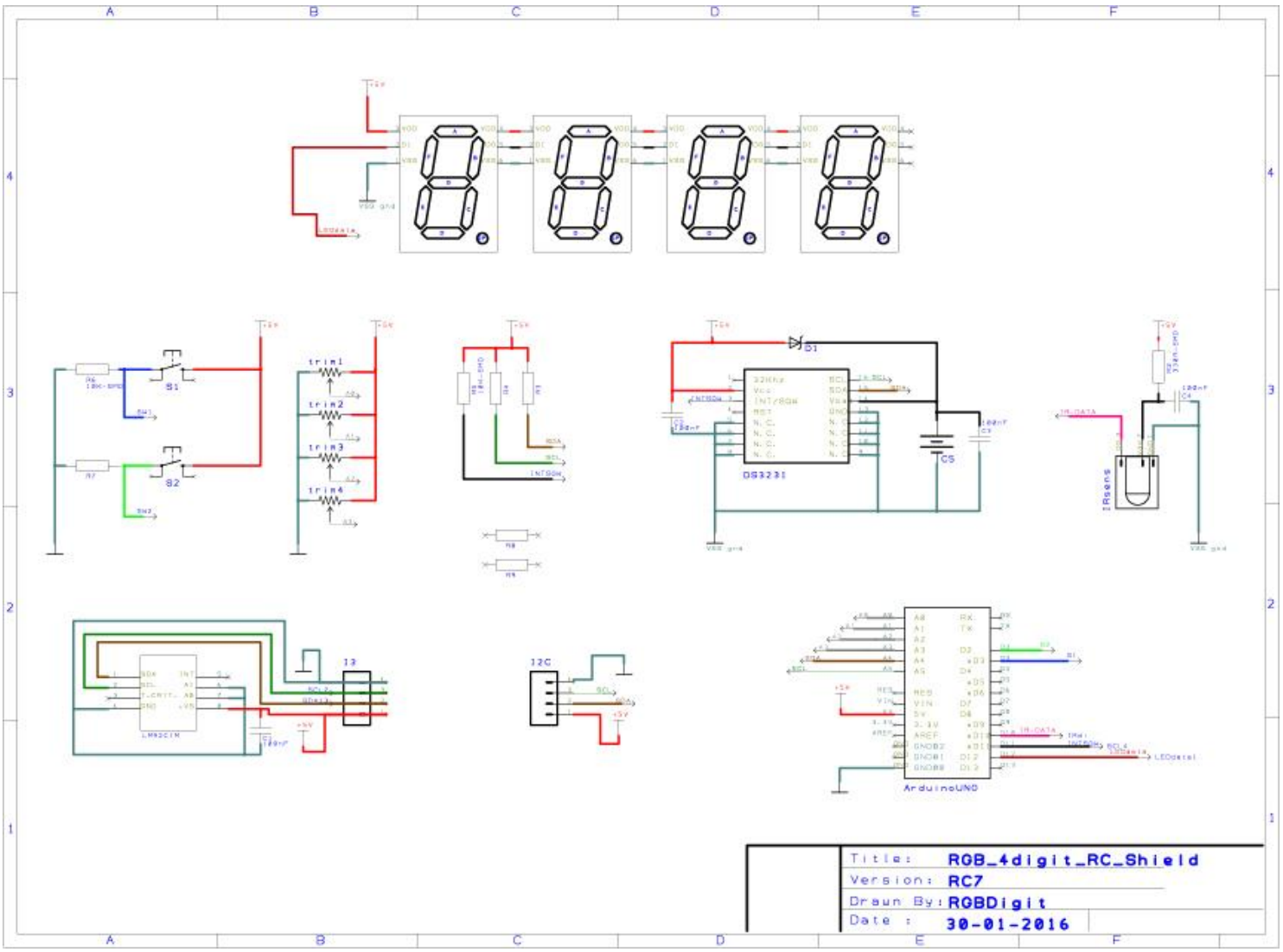
The shield is designed for an Arduino UNO . This provides for all parts of 5V. The first four "RGB Digit 's own facilities are in series so that the plus 5V and GND can be looped through.
The digits are connected to the Arduino Micro pen D12 . This is configured as an output and is the digit of data provided. The two switches are connected to pin D3 D2 , defined as input and hang on the GND via R6, R7. If one of the switches is pressed and will be at the associated pin 5V come to be capable of executing an action. Within the software
The trimmer T1..4 A0..3 to be connected for the purpose which, for example to read a value from analogue can be every 3 colors RGBDigit 's mix used. T4 can be used in order to be able to adjust the brightness. Of the Digit 's
The IR1 receiver via R2 and C11 provide power supply is reading the data on the remote control in . The output pin of the IR receiver will transmit data via D10 pin configured as input to the Arduino Micro. This can be controlled . Include the clock and digit wirelessly all the functions of the keys are defined in the software.
The heart of the clock is a DS3231SN supplied by Maxim. This is a serial RTC with a temperature compensated 32 kHz crystal oscillator which serves as a very precise heart of the clock so that the deviation according to the manufacturer per year can be up to 64 sec .
The 1F 5.5V backup Cap is connected to Vbat (pen14) , it is as soon as the supply voltage is present, via D1 (short key) charged to nearly 5V. This 1F Cap the clock can certainly two weeks keep going when power is lost . The advantage of a Cap is that it need never to be replaced. The clock is via SDA (pen15) and SLC (pen16) and two pull- up resistors R3 / 4 is connected to pin SDA (A4) and SCL (A5) of the Micro. This clock can be set and read out . The DS3231 INTSQW together with R5 is connected to pin D11 but now has no function yet.
Finally, there is a breakaway PCB available where LM92 and C13 is on, and can be read on the I2c bus. I have designed the breakaway PCB so that the temp sensor also works if he's still connected to the shield.
The breakaway PCB can also be broken down and be reconnected to the i2c connector in top of the shield. The sensor can be placed onto an object to be measured. The length of the cable is determined by the bus. but for I²C 1ª 2 meters should be no problem.
The I^2C LM92 is chosen for his extremely high accuracy of ± 0:33 ° C. and his I^2C bus.
The connections in addition to pins 6 and 7 can, if necessary be used for selecting another LM92 address (default addr 0).

The different data can be displayed on the 4 rgbdigit. Where the different colors, depending on the values of the measured temperature can be used.

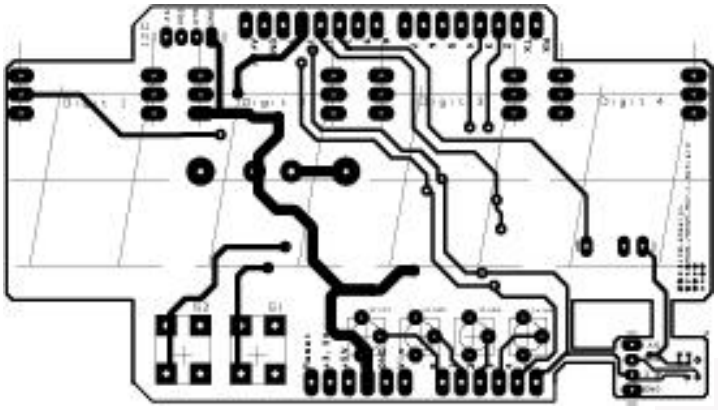
R8 and R9 have a mechanical function to make sure that the Arduino UNO USB enclosure does not touch the PCB tracks.

The shield has 6 functions. The main function will be the RGBDigits the others are optional. The choice is up to you to add additional features

6 functions RGBDigit shield
Main function
• **4 1 "RGBdigit's**
Optional function
• 4 analog inputs trimmers
• 1 DS3231 highly accurate I2C clock
• 1 I2C LM92 highly accurate temp sensor
• 1 IR sensor for remote control
• 2 switches

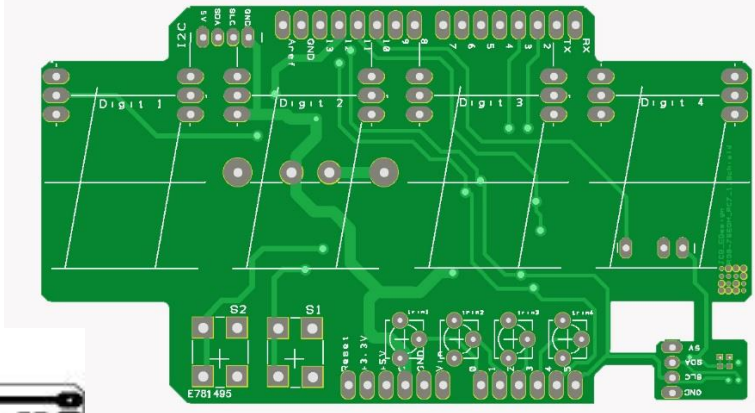

Title: RGB_4digit_RC_Shield
Version: RC7
Drawn By: RGBDigit
Date : 30-01-2016

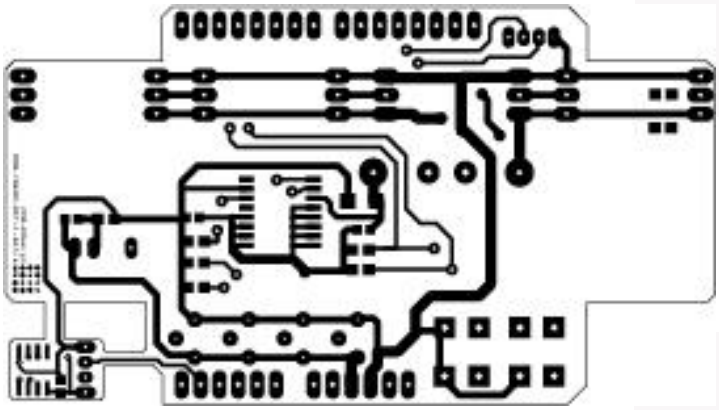
Figuur 2



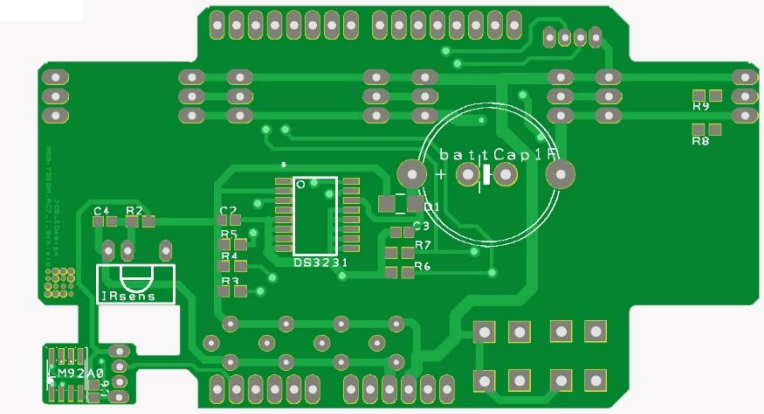
Figuur 3 scale 100%

PCB view TOP (topview)





PCB view BOTTOM (bottomview)



The exact RGB clock

To the schedule and print Figure 4/5 you can see that controlling and connecting RGBDigit 's is very simple.

The circuit consists of 1 Arduino Micro, which provides for all the components of 5V . It unfortunately, has become a loose wire because the 5V is not availabilie on both sides of the Micro. The first six "RGB Digit 's own facilities are in series so that the plus 5V and GND can be looped through the digits are connected to the Arduino Micro pin A12 . This is configured as an output and is the digit of data provided. How this data flow is built in the part of software explained elsewhere in this article.

The IR1 receiver via R2 and C1 provide power is going to the data of the remote control that will read these to the Arduino Micro via A10 pin configured as input. Allows wireless interred the clock and switched . All the functions of the keys are defined in the software (see explanation software).

The DS18B20+ on JP2 connector can be used for temperature measurement.

And the LDR on JP3 can be used for simple light measurement in order to control the brightness of the RGBdigit's.

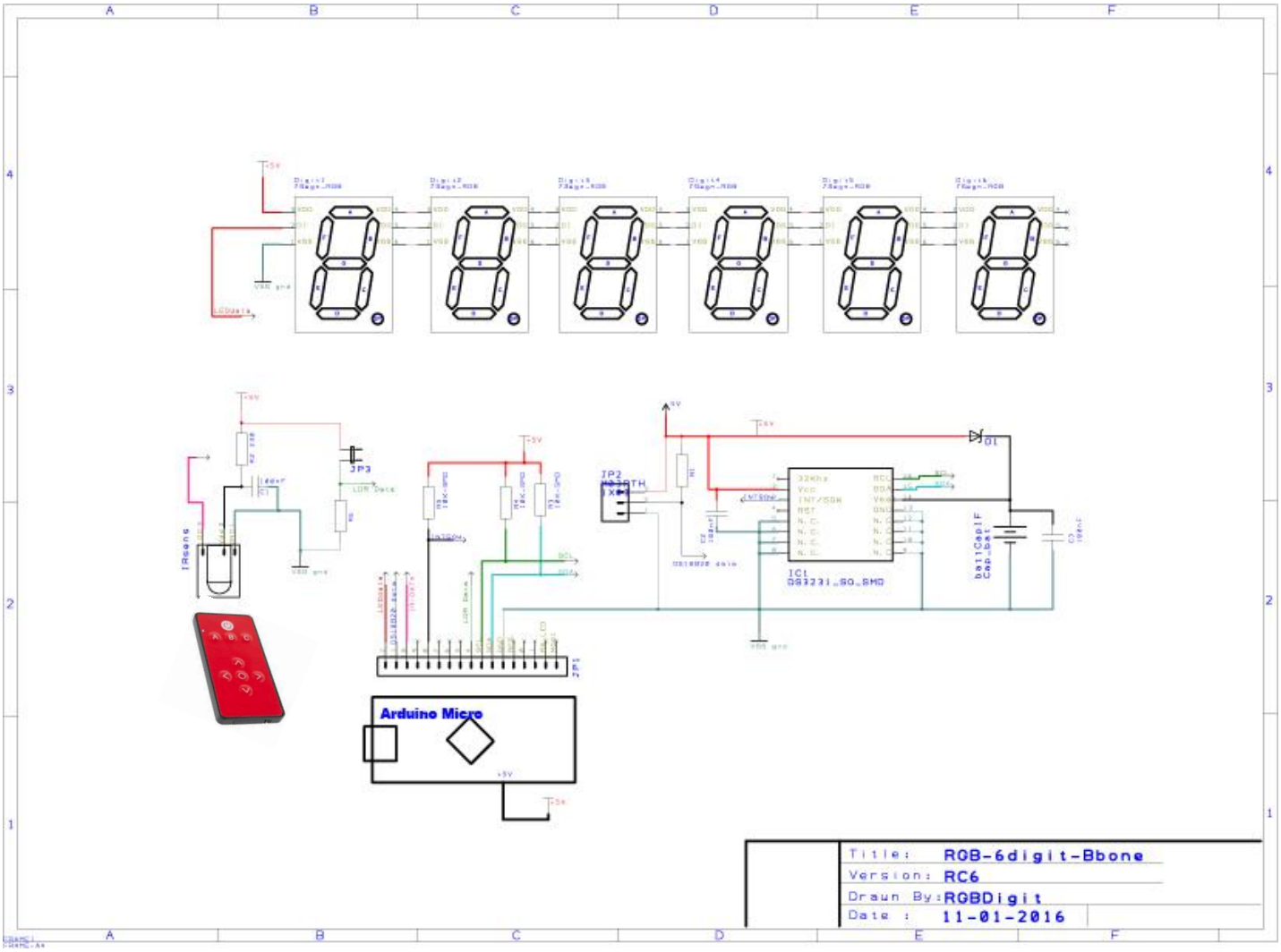
Heart of the clock is a DS3231SN Maxim used with a 5.5V 1F Cap as a backup battery that is when the supply voltage is present charged through D1 (short key) to almost 5V. This 1F Cap the clock can certainly two weeks keep going when power is lost . The advantage of a 1 F Capacitor 5.5V is that it does not have to never be replaced. The clock is through SDA and SLC and two pull- up resistors R3 / 4 is connected to pin SDA and SCL of the Micro. This clock can be put in and read . The INTSQW the DS3231 via R5 is connected to pin A9 but now has no function.

The Arduino firmware via a USB cable and the Arduino IDE in Micro are loaded after the circuit works independently to a USB port or power supply. The power consumption depends heavily on the brightness and colour selection but is generally regarded as low (see graph) .

Functies

- Full RGB color Segment 3 x 0 to 255
- Adjustable brightness 1 x 0 to 255
- Simple wiring 3 in 3 out per digit
- Zeron button operation
- IR Remote or wireless operation
- Controlled by Arduino micro
- DesignSpark PCB design available
- Arduino Source code available
- Precise clock DS3231 Maxim
- 1F backup batt t.b.v DS3231
- Low power consumption
- DS18B20+
- LDR light sensor
- USB power supply

Figuur 4

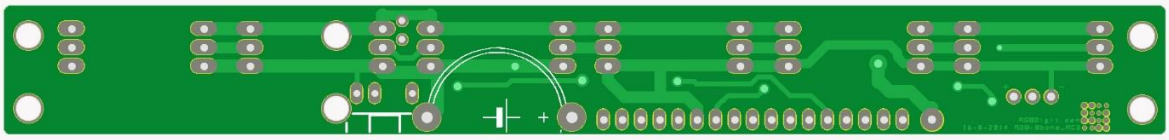

Arduino Micro
Title: RGB-6digit-Bbone
Version: RC6
Draun By: RGBDigit
Date : 11-01-2016

Parts list

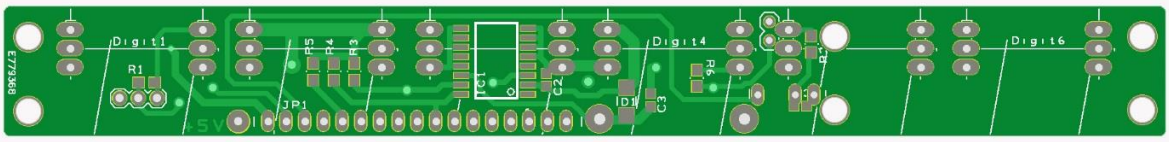
Resistors	CR0805-FX-xxxxxGLF serie
R2 = 330 Ω	RS-online
R3,R4,R5 = 10 k	RS-online
R6 on JP3 = LDR	http://floris.cc/
Capacitors	
C1,C2,C3 = 100nf, 25V smd	Farnell 317287
C4 = 1F, 5.5V, RAD Backup Capp	Farnell 9697497
Semiconductors	
D1 = BYS10-25-E3/TR, Schottky Diode	RS-online 636-5022 of700-0934
IC1 = DS3231 (SN)	RS-online 732-7582
IC2 = TSOP31236	RS-online 700-5295
IC4 on JP = DS18B20+	Farnell 118-7948
IC3…IC8 = 7Segm_RGB 1”	RGBDigit.com
Miscellaneous	
Back-bone-6digits print	RGBDigit.com
Arduino Micro qwithout headers	RS-online 779-8864
HEADER, 1ROW, 50WAY	Farnell 3418388
Infrared Remote Control	http://floris.cc/

Figuur 5 scale 100%

PCB view BOTTOM (bottomview)



PCB view TOP (topview)



Wishlist

- Finish final points of the clock and an option to be able to operate the alarm Loose Hands e.g. a PIR sensor.
- Customize Software for Arduino users e.g. create library for Digit control .
- Success full completion kick-start project 1st Digit version making scaling up to production of larger numbers possible .
- Making the 4 Digit 's Arduino shield serving a kickstart project production ready.The prototype has been working properly.
- Developing other sizes Digit 's .
- Expand clock with Bluetooth module for use with Smartphone.

Call

Finally, I want to finance using kickstart to enable the production of a larger numbers (> 1000) for this project that is scheduled somewhere in the future.

http://rgbdigit.com

info@rgbdigit.com

Facbook

Conclusion

The colour capabilities of the Digit's and simplicity of wiring and control make the displays very user friendly !
Mind you, some experience in the Arduino world and deepening my software knowledge will be required in order to use independent Digit 's.
Furthermore, this project is excellent to be used as a standalone unit clock but can also be used as the basis for programming yourself and displaying all kinds of readings or simple texts from their own projects.