

# K8018

ILLUSTRATED ASSEMBLY MANUAL H8018IP1



**K8018W**

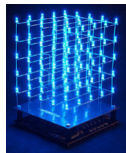
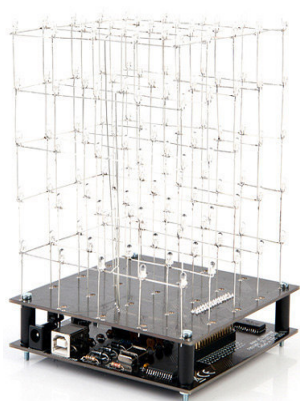


**K8018B**

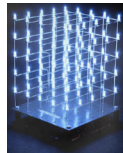
**3D LED CUBE  
5x5x5**



**velleman**<sup>®</sup>  
projects



K8018B (Blue LED)



K8018W (White LED)

Connect to your computer and create  
your own 3D LED effect.

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## News

## NEW PK193 LED CUBE

CubeAnimator software available for download here!!

Posted on 04-06-12

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<b>Velbus</b>				
2	Velbus Home Automation Special section for our new Velbus Home Automation System (domotic) Moderation: Velleman Support	454	3079	Tue Sep 11, 2012 1:11 pm <b>Velbus</b> <b>MD</b>
<b>Kits (Building projects) - Projects à réaliser</b>				
2	General For other topics, general tips and tricks, new ideas Moderation: Velleman Support	131	428	Wed Sep 05, 2012 9:37 pm <b>VELLAK</b> <b>MD</b>
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2	Microcontroller Programmer - Experimenting Projects Here you can discuss PIC programming, example soft... Moderation: Velleman Support	457	1749	Tue Sep 11, 2012 4:27 am <b>VELLAK</b> <b>MD</b>
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2	Remote Projects Innovative related projects, from light drivers to remote control Moderation: Velleman Support	634	2203	Fri Sep 14, 2012 12:00 pm <b>VELLAK</b> <b>MD</b>

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**Expert soldering skills required!**



It is advised to start with the mini 3D LED cube MK193. View the assembly movie of MK193 as guideline for assembly of the LEDs.

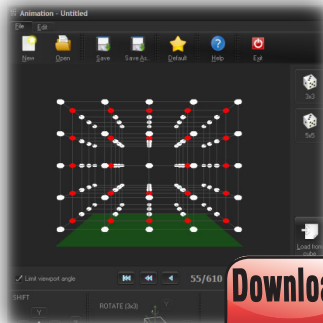
**View  
Assembly**



**Build your 3D led cube and created unlimited 3D effects. The unit comes standard loaded with effects. Connect to your computer (USB) and create your own!**

#### Features

- LEDs:  $5 \times 5 \times 5 = 125$  LEDs
- user programmable via USB (creation of animation/scenes)
- large amount of user programmable frames
- frames are separately dimmable
- 4 transition speeds
- available frames: 3200
- 5 levels LED dimming available
- no coding skills required
- regulated power supply: 9VDC

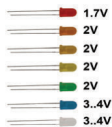


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Software**

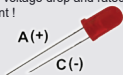


For software, visit [www.vellemanprojects.eu](http://www.vellemanprojects.eu)

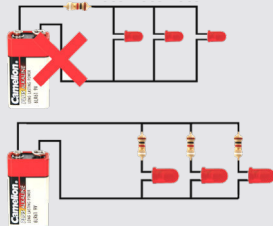
# Leds and how to use them



Leds feature a specific voltage drop, depending on type and colour. Check the datasheet for exact voltage drop and rated current !



Never connect leds in parallel



## How to Calculate the series resistor:

Example: operate a red led (1.7V) on a 9Vdc source.

Required led current for full brightness: 5mA (this can be found in the datasheet of the led)

$$\frac{\text{Supply voltage (V) - led voltage (V)}}{\text{required current (A)}} = \text{series resistance (ohms)}$$

$$\rightarrow \frac{9V - 1.7V}{0.005A} = 1460 \text{ ohm}$$

closest value :  
use a 1k5 resistor

Required resistor power handling =  
voltage over resistor x current passed trough resistor

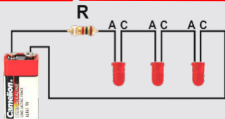
$$\rightarrow (9V - 1.7V) \times 0.005A = 0.036W$$

a standard 1/4W resistor  
will do the job

## LEDs in series:

Example: 3 x red led (1.7V) on 9V battery

Required led current for full brightness: 5mA  
(this can be found in the datasheet of the led)



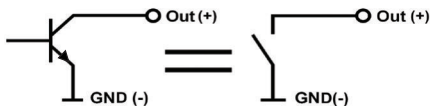
$$\frac{\text{Supply voltage (V) - (number of leds x led voltage (V))}}{\text{required current (A)}} = \text{series resistance (ohms)}$$

$$\rightarrow \frac{9V - (3 \times 1.7V)}{0.005A} = 780 \text{ ohm}$$

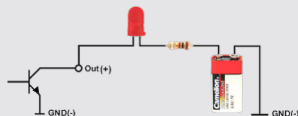
use an  
820 ohm resistor

# open collector outputs

An open collector output can be compared to a switch which switches to ground when operated



Example: How to switch an LED by means of an open collector output



## assembly hints

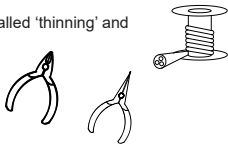
### 1. Assembly (Skipping this can lead to troubles !)

Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.



#### 1.1 Make sure you have the right tools:

- A good quality soldering iron (25-40W) with a small tip.
- Wipe it often on a wet sponge or cloth, to keep it clean; then apply solder to the tip, to give it a wet look. This is called 'thinning' and will protect the tip, and enables you to make good connections. When solder rolls off the tip, it needs cleaning.
- Thin raisin-core solder. Do not use any flux or grease.
- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes.
- Needle nose pliers, for bending leads, or to hold components in place.
- Small blade and Phillips screwdrivers. A basic range is fine.



For some projects, a basic multi-meter is required, or might be handy



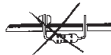
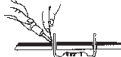
#### 1.2 Assembly Hints :

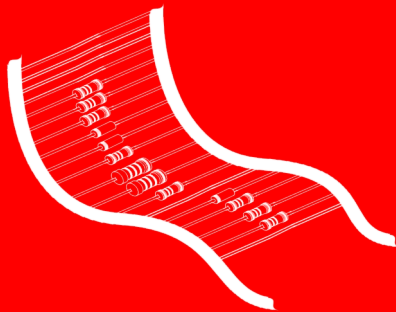
- Make sure the skill level matches your experience, to avoid disappointments.
- Follow the instructions carefully. Read and understand the entire step before you perform each operation.
- Perform the assembly in the correct order as stated in this manual
- Position all parts on the PCB (Printed Circuit Board) as shown on the drawings.
- Values on the circuit diagram are subject to changes, the values in this assembly guide are correct\*
- Use the check-boxes to mark your progress.
- Please read the included information on safety and customer service

\* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

#### 1.3 Soldering Hints :

1. Mount the component against the PCB surface and carefully solder the leads
2. Make sure the solder joints are cone-shaped and shiny
3. Trim excess leads as close as possible to the solder joint





REMOVE THEM FROM THE TAPE ONE AT A TIME !

Included in this kit

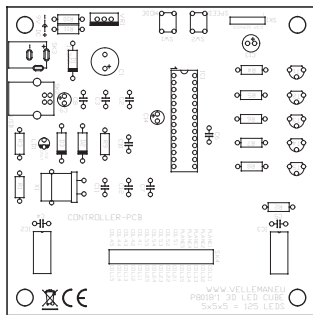
**RESISTOR**

R1 : 120 (1 - 2 - 1 - B)

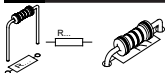
COLOUR	COLOUR NAME	1ST DIGIT/ STRIPE	2ND DIGIT/ STRIPE	3RD DIGIT/ STRIPE	MULTIPLIER STRIPE	TOLE 4TH
Black	BLACK	0	0	0	x1	1%
Brown	BROWN	1	1	1	x10	
Red	RED	2	2	2	x100	
Orange	ORANGE	3	3	3	x1.000	
Yellow	YELLOW	4	4	4	x10.000	
Green	GREEN	5	5	5	x100.000	
Blue	BLUE	6	6	6	x1.000.000	

**DO NOT BLINDLY FOLLOW THE ORDER OF THE COMPONENTS ONTO THE TAPE. ALWAYS CHECK THEIR VALUE ON THE PARTS LIST!**

## P8018 - TOP



## 1 Resistors

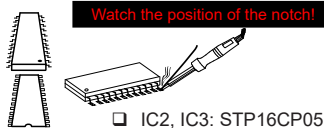


- R1, R2 : 2K2 (2-2-2-B)
- R3 : 10 (1-0-0-B)
- R4 ... R8 : 390 (3-9-1-B)
- R9 : 4K7 (4-7-2-B)
- R10 : 470 (4-7-0-0-1)
- R11 : 1K1 (1-1-0-1-1)

## 2 Ceramic Capacitors



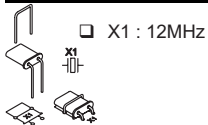
## 3 SMD IC



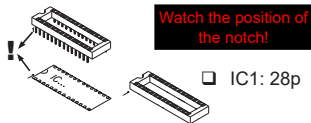
## 4 Diodes (Check polarity!)



## 5 Quartz crystal



## 6 IC socket



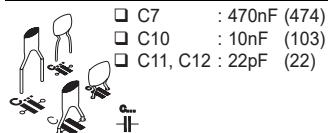
## 7 LED



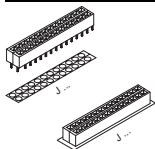
## 8 Push buttons



## 9 Ceramic Capacitors

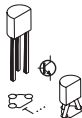


## 10 Female Header



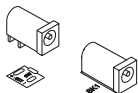
□ SK4 : 30pins

## 11 Transistors



□ T1 ... T5: BC640

## 12 DC-Jack



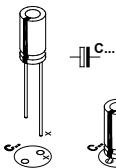
□ SK3 : 9VDC

## 13 USB connector



□ SK2

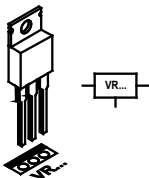
## 14 Electrolytic capacitors



Watch the polarity!

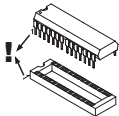
- C9 : 4,7 $\mu$ F
- C13 : 100 $\mu$ F
- C14 : 10 $\mu$ F
- C1 : 470 $\mu$ F

## 15 Voltage regulator



□ VR1 : LM317

## 13 IC



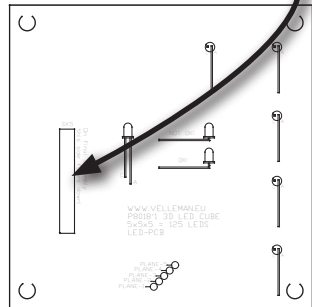
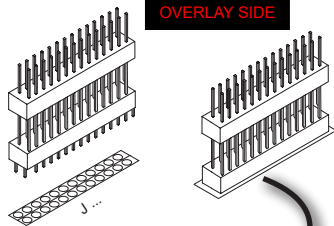
Watch the position of the notch!



□ IC1: VK8018 (programmed PIC18F27J53ISP)

## P8018 - BOTTOM

MOUNT ON TOP-OVERLAY SIDE



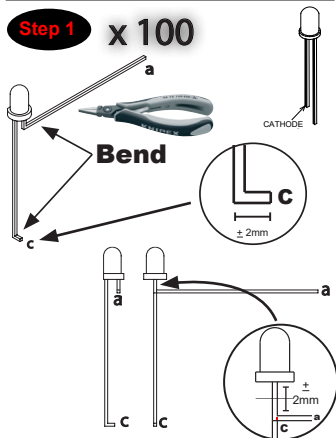


## ASSEMBLY OF THE LEDs

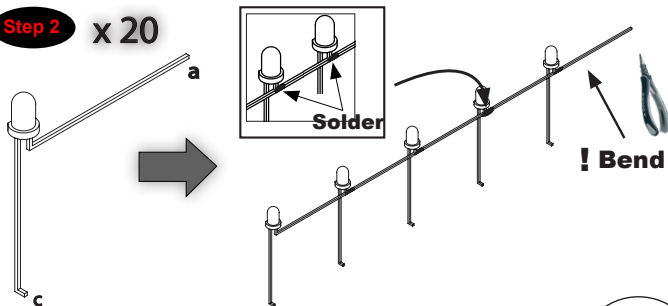


View the assembly movie of MK193 as guideline for assembly of the LEDs.

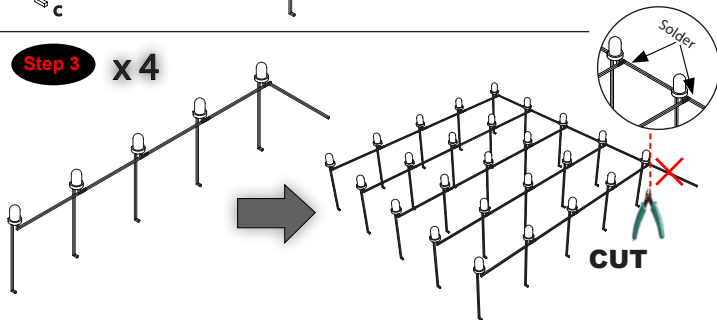
**Step 1** x 100



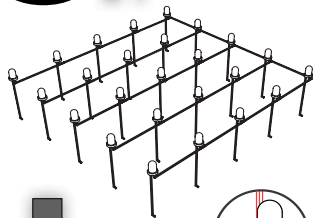
**Step 2** x 20



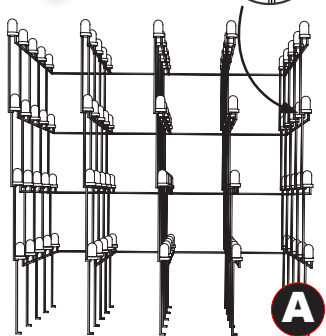
**Step 3** x 4



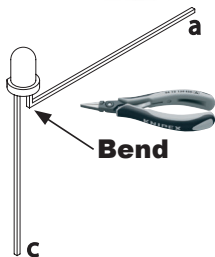
Step 4 x 1



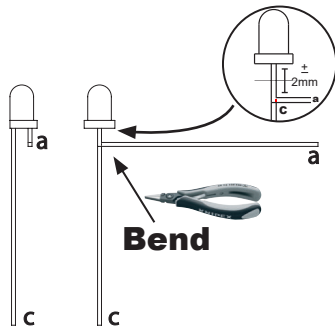
Solder



Step 5 x 25

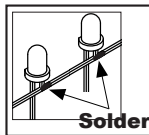
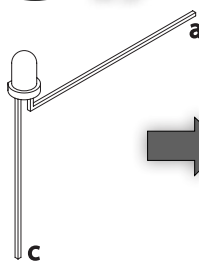


Bend

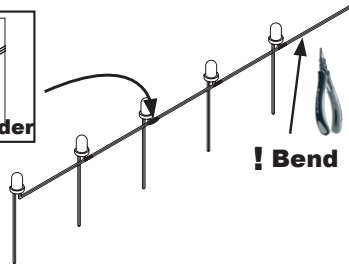


Bend

Step 6 x 5

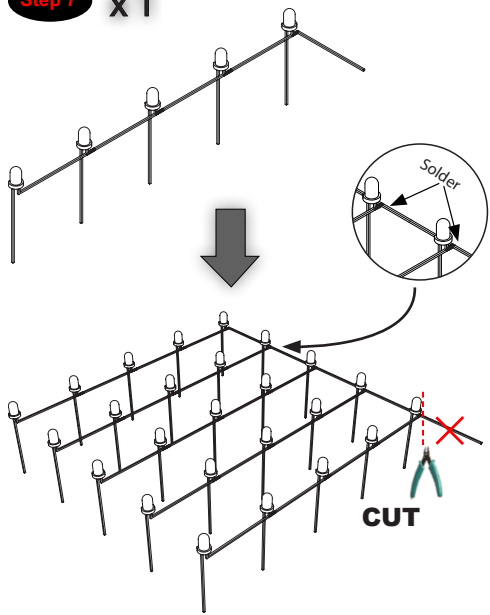


Solder

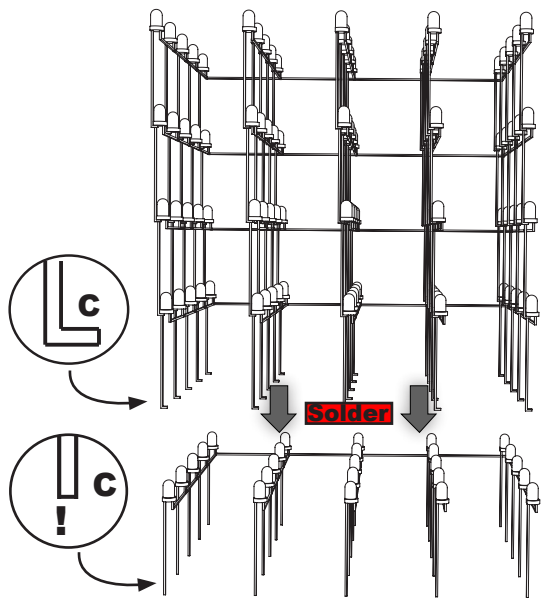


! Bend

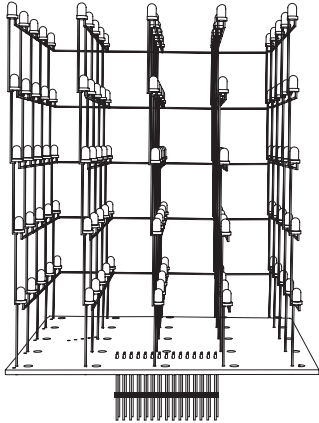
Step 7 x 1



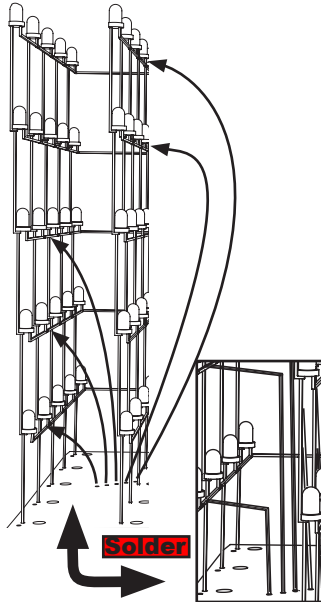
Step 8 x 1



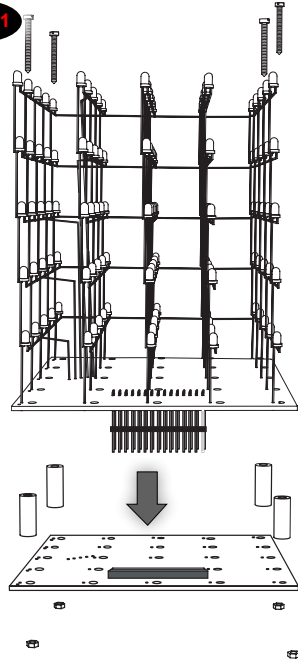
Step 9



Step 10



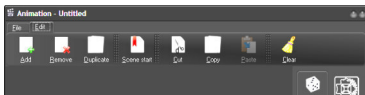
Step 11



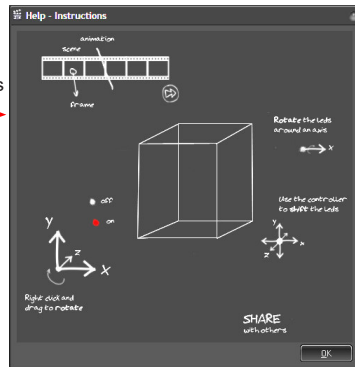



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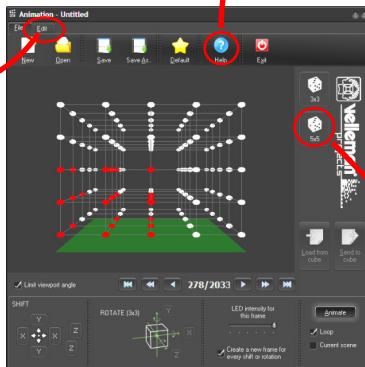
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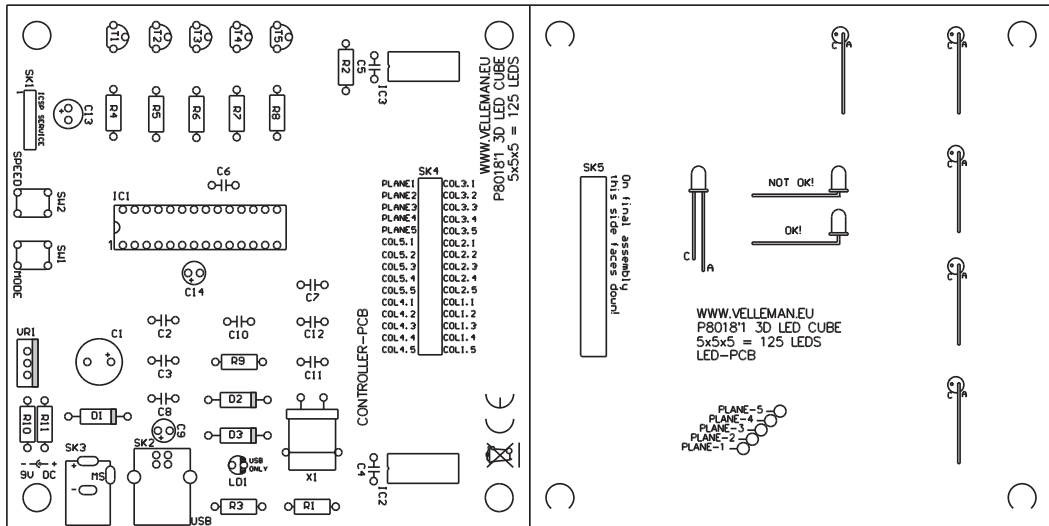
Help instructions

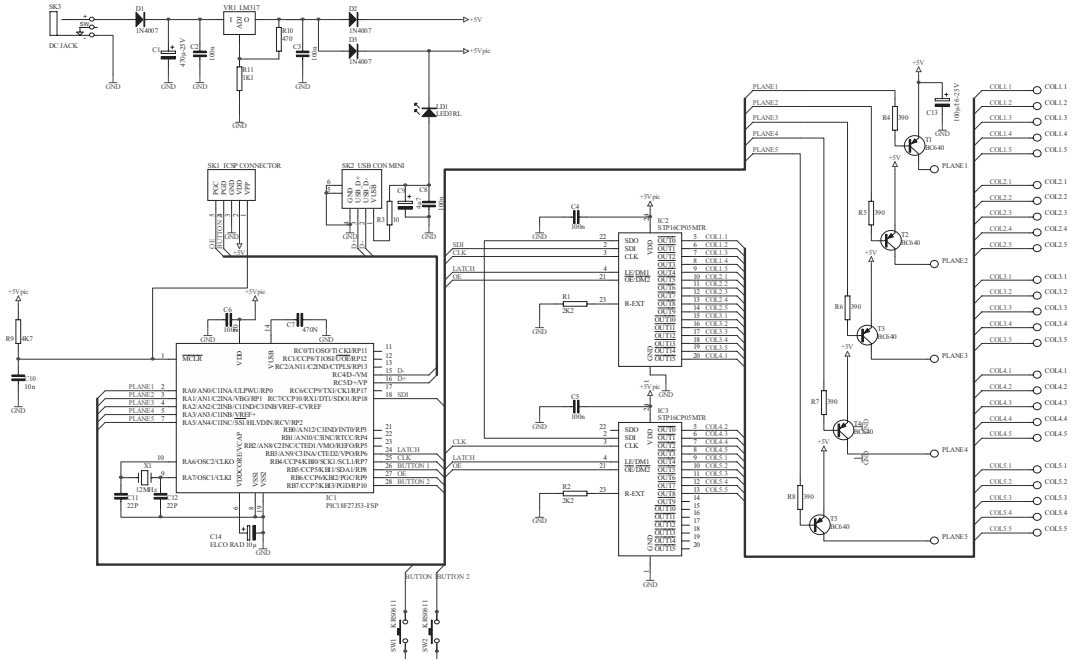


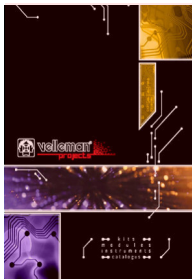
Create, edit or remove your own animation



Choose 5x5 to send or read the animations of your 5x5 LED cube.







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