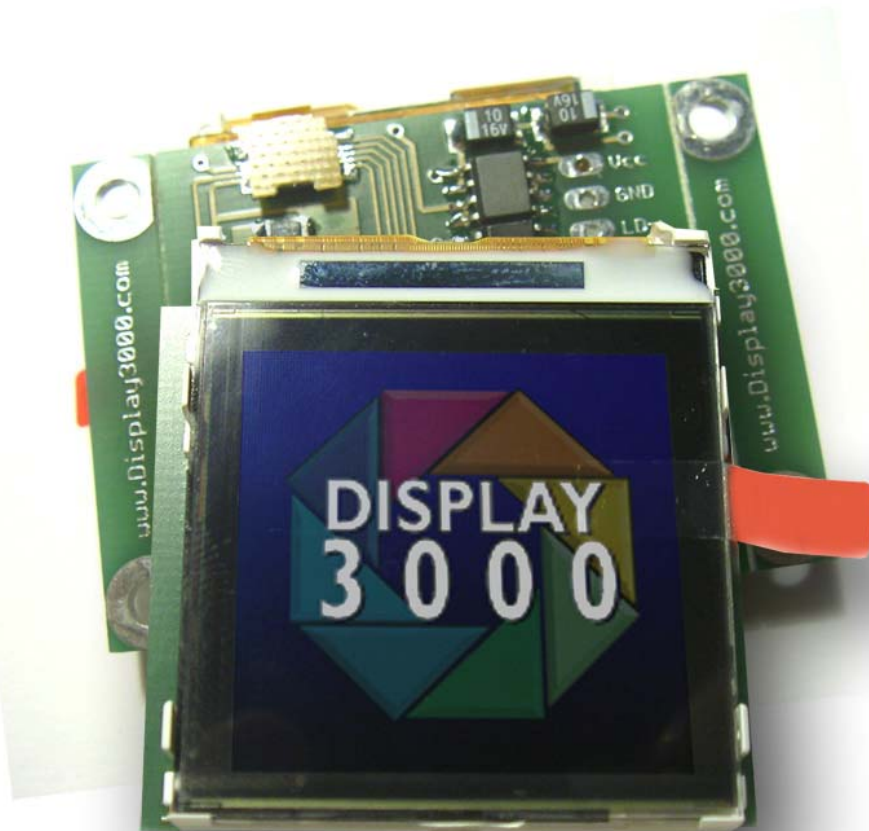


**Manual for
Display module D011 (b)
www.display3000.com**

**V 2.10
20. October 2006**



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Congratulations on the acquisition of our display module kits.

You will recognize, that you will shortly never think of the idea working without a color display. The projects realized by you will get automatically a professional touch now.

You need to complete this kit, by attaching the display (if ordered along) and soldering the necessary cables to your micro controller.

When the module is inevitably frequently moved, this load could damage the patch cord of the LCD in the long run. Therefore we suggest that you fix the display at the lower edge with a drop adhesive or a piece to double-sided tape on the plate.

The display can be removed however only then surely again, if you stick it only at the edge of the plastic. If you are sticking it however on the back, then the back foil of the display is possibly damaged when taking the display off.

Note: by a too strong pressing on the glass of the display it may break.

On the following page you see the available PCBs as well as the direction, how around you must attach the display.

HINT:

The top side is, where the connector is. So if we are talking of top and bottom, make sure the connector at the display always is on top. In the software you may change the direction however, so that you can mount the complete display module also around 180° turned, should this permit a simpler assembly (note: only the complete module can be turned. Never attach the display to the module other than the pictures on the next page shows!) Even running the display through a mirror is possible – the display controller also permits reflecting the output.

In the software (routine: LCD_init) the instructions are noted.

CAUTION:

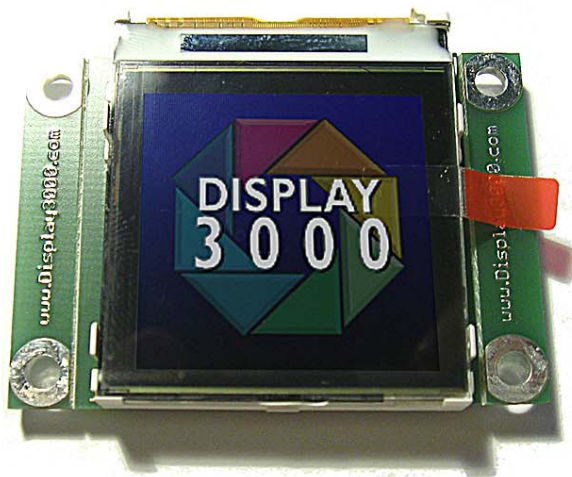
- 1) Never attach the display or remove it, as long as power is switched on
- 2) Connect the display to its connector always correctly (see illustrations on next page). Never attach differently around! If you wrongly attach the display, it is inevitably destroyed.

As you can see at the board, there are mounting wholes at the left and right side of the display PCB. If you need space, the area of these wholes can be easily eliminated by just breaking the mounting frame off.

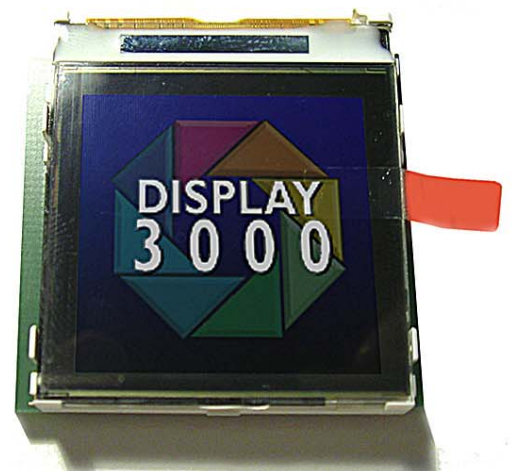
The mounting frame

This display module comes with a removable mounting frame with mounting holes which allows to easily mount the display module in any case you want.

To make it possible to use the module even if there is only very limited space available, we produced the module in a way the mounting frame can be removed easily thus decreasing the width of the module from 51 mm to 39 mm (from 2" to 1,5").



Mit Befestigungsrahmen /
with mounting Frame



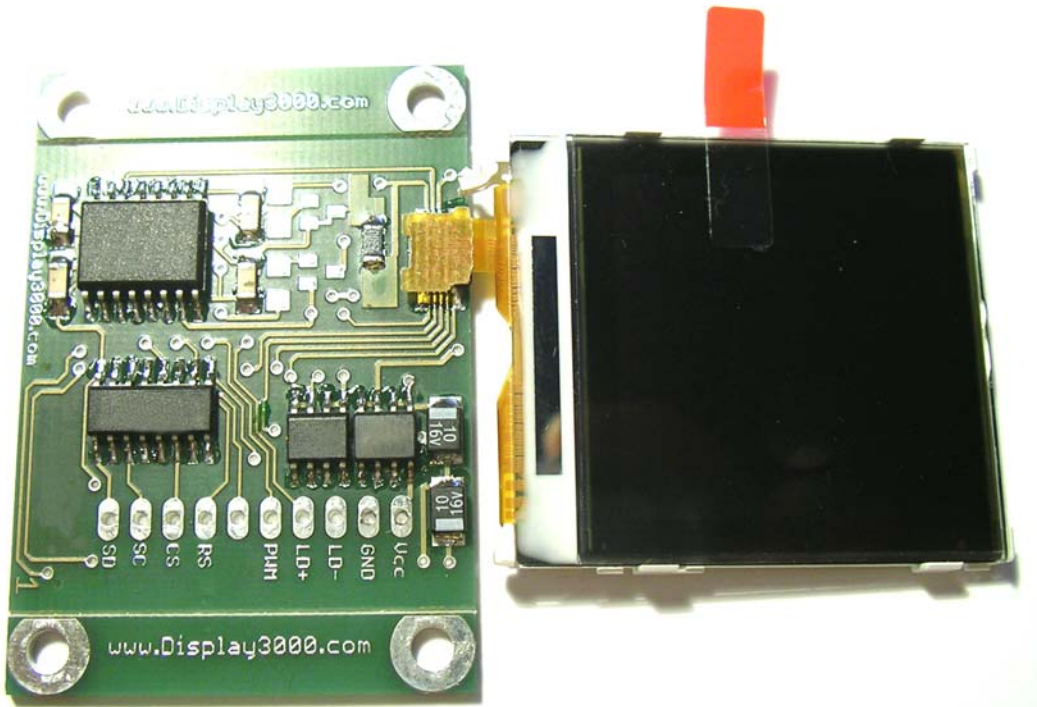
mit entferntem Rahmen /
with removed frame

To remove the mounting frame you only need pliers. Grab the frame at one side and bend it up or down to remove it. Then do the same at the other side of the PCB.

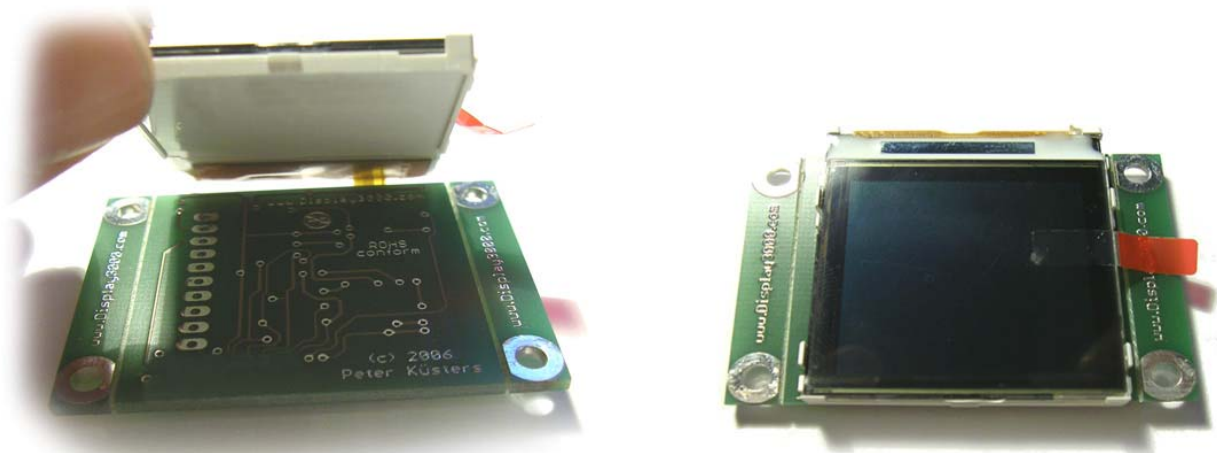
By removing the frame the PCB is barely larger than the display so you may use it where only very little room is left.

To avoid damage to the display, the above should only be done with a removed display.

Plug-on direction of the display toward the connector on the PCB



Position the board and the display as shown on the top picture. Attach the connector and turn over both (PCB and display) with both hands.



Then fold the display back carefully without damaging the foil-cable. You may then fix the display with tape (double sided tape) **but you will not be able than to remove it without destroying the display**. Better use 2-3 drops of glue to fix the lower end of the **display frame** (not the back of the display itself) to the board.

The PowerBooster (5 Volt)

To avoid any damage to the sensitive display and to make your life easier, we developed PCBs with integrated electronics with buffer, protection and voltage regulator. In difference to the modules without PowerBooster, this board creates the needed high voltage by itself so you just need 5 Volt or more at **VCC** and **GND** (minimum 4,5 Volt, max. 18 Volt). You do not need the pin **LED** and you do not need to change any resistors.

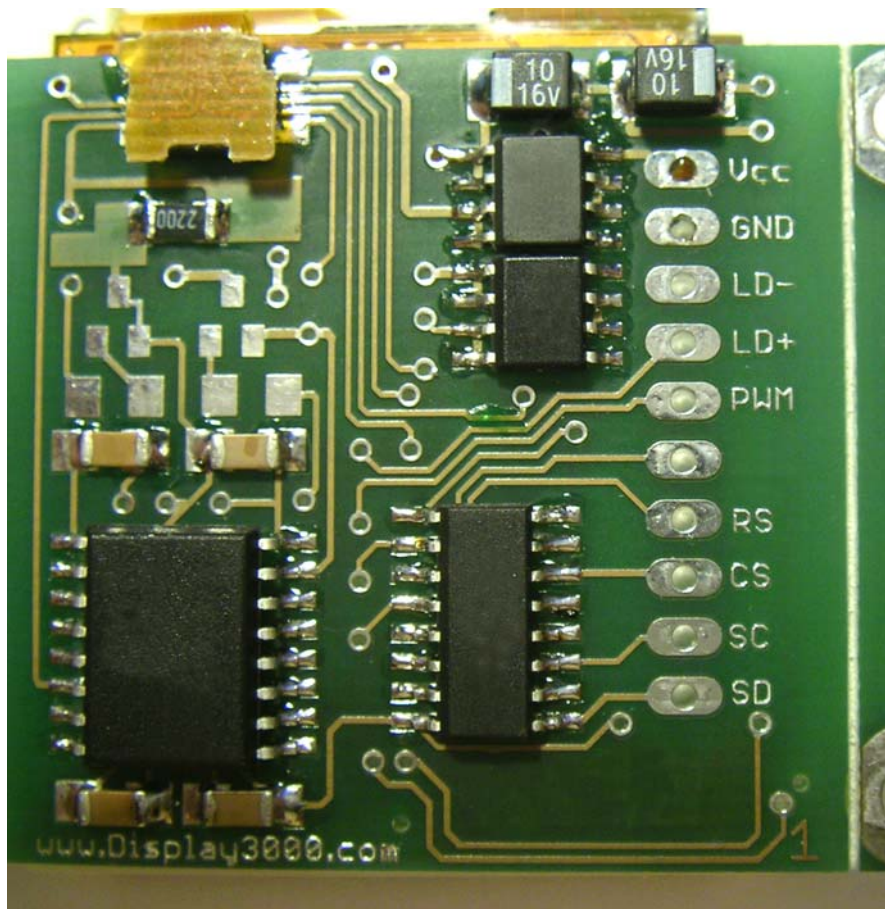
The signals from your micro controller are independent of the used voltage and may lie between 2,5 and 15 Volts.

You may run the PCB and the display also with 3.3 Volt. But the PowerBooster will not work then anymore. You need to take care of the lighting voltage then by yourself (more about this later in this manual)

The voltage supply of this PCB may lie between 3,3 and 18 Volts and needs to be done at the Pins VCC and GND. The signals of the micro controller are independent of the supplied voltage and my lie between 3 Volt and 12 Volt.

You need only Vcc and GND as a supply voltage. Be careful with the pads LD+ and LD-. These pads are showing a high voltage when you supply power to Vcc and GND as LD+ and LD- are connected to the output of our PowerBooster. **Again: Be careful – the voltage at LD+ and LD- can damage your whole system. If there is no need – do not connect anything to these two pads.**

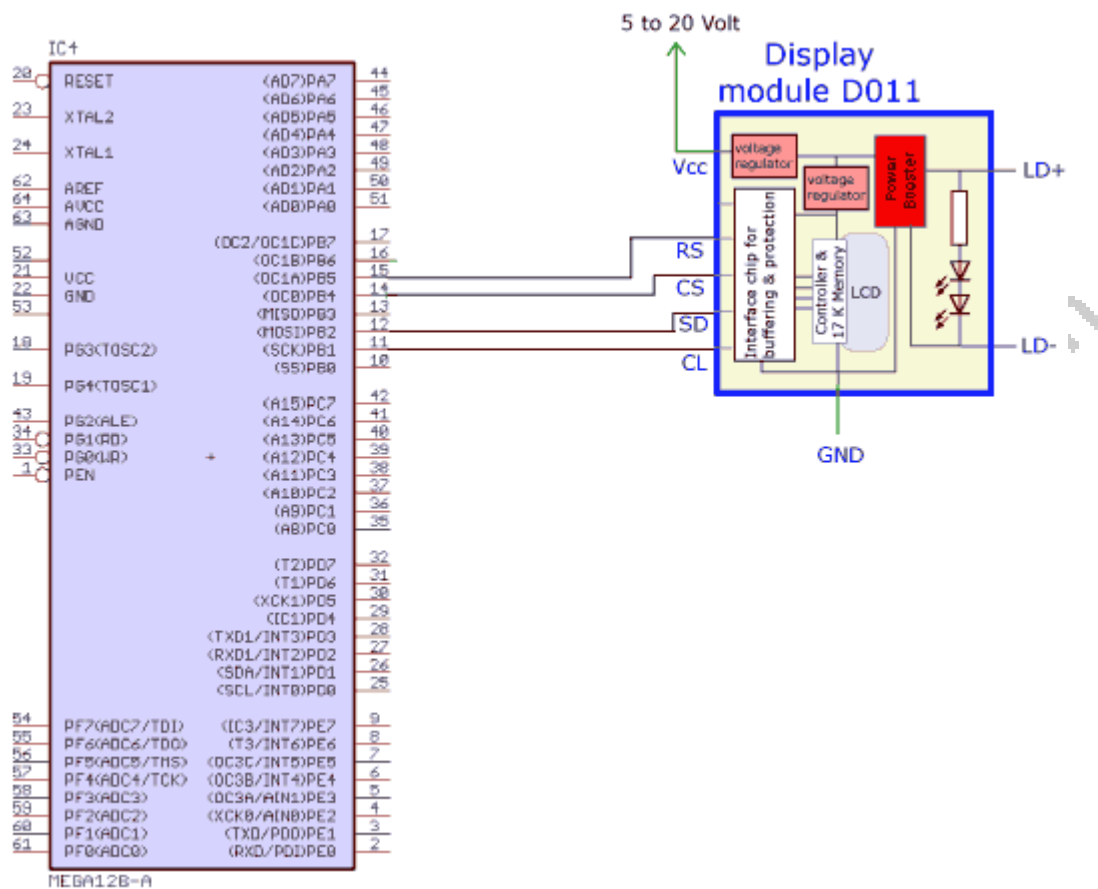
The solder pad allocation of the PCB



At the PCB you will recognize several soldering pads which we will describe in detail in the following table.

Pads	Explanation
Vcc	This are the power supply pads for the display. You may input any DC voltage from 3,3 to 18 Volts.
GND	
LD-	As of the used PowerBooster there is no need to provide a larger voltage for the display lighting. These pads are only needed if you want to provide the power for the display lighting by yourself. Usually these Pads will show a voltage of +10 Volt at LD+ and -10 Volt a LD- (measured against GND). Be careful: this voltage can damage other devices.
LD+	
PWM	This pad may be used for an external command for switching the display lighting on or off. You may also use this for dimming the display lighting with an PWM output of your micro controller.
Not used	
RS	Input signals from your microcontroller to drive your display (allowed are signals from 2,5 up to 15 Volt)
CS	
SC	
SD	

Schematic connection diagram of the modules and the connection to a microcontroller



Exemplarily a ATmega 128 is shown here but this does not matter – you may use any microcontroller you like (e.g. ARM, C-Control, PICs etc.). You may even attach your PC and drive the display by your parallel port for modding.

Again: No matter what voltage you are using: you may operate the microcontroller with any other voltage if you like. (at least 2,5V, max. 15 V). The module and the microcontroller are safely decoupled.

The display lighting

As the display lighting needs a higher voltage as the remaining part of the circuit this would normally become difficult. Some usually do not want to provide two different voltages. Usually 5 Volt is available in the microcontroller circuit.

This is why we added 3 different lighting modes to our module:

1) Using of the PowerBooster:

Without any modification you just add 5 Volt to the Vcc-GND pads of the module and the display lighting will work as of the PowerBooster.

2) Switching the lighting on/off by your microcontroller or dimming by PWM

With the line PWM you may switch the lighting on and off after enhancing our board. If your microcontroller offers a PWM output you may also dim the display lighting.

You need to enhance the board by a small circuit. You need only:

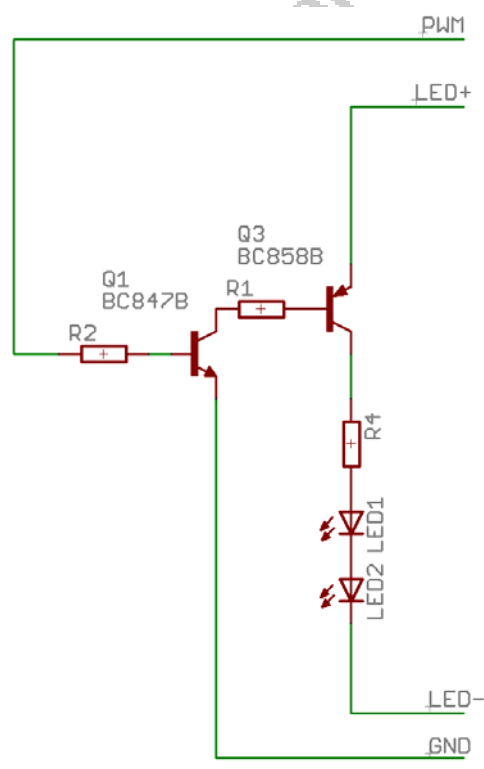
Zur Erweiterung des Boards brauchen Sie lediglich 4 Bauteile:

1 x SMD-Transistore BC847B

1 x SMD-Transistor BC858B

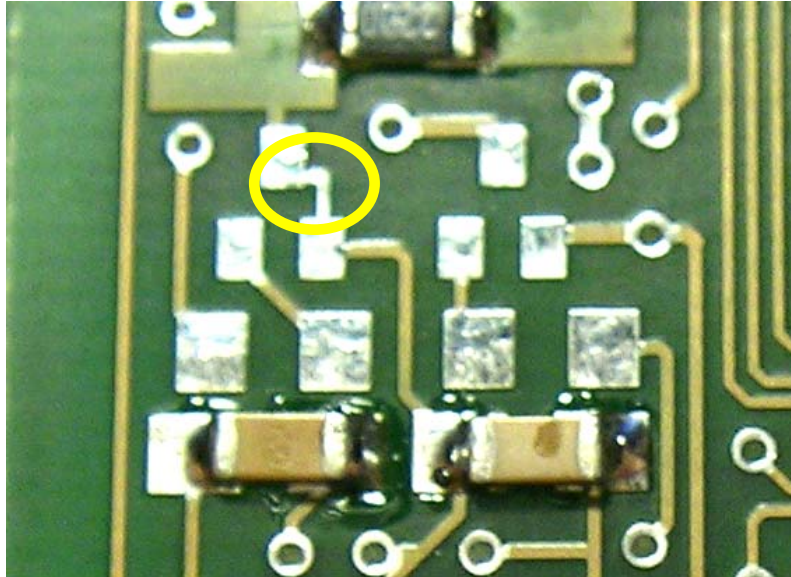
2 x SMD-resistor each 10 KOhm, size 1206 oder 805

The needed schematics looks as follows (the shown LEDs are the ones inside the display):

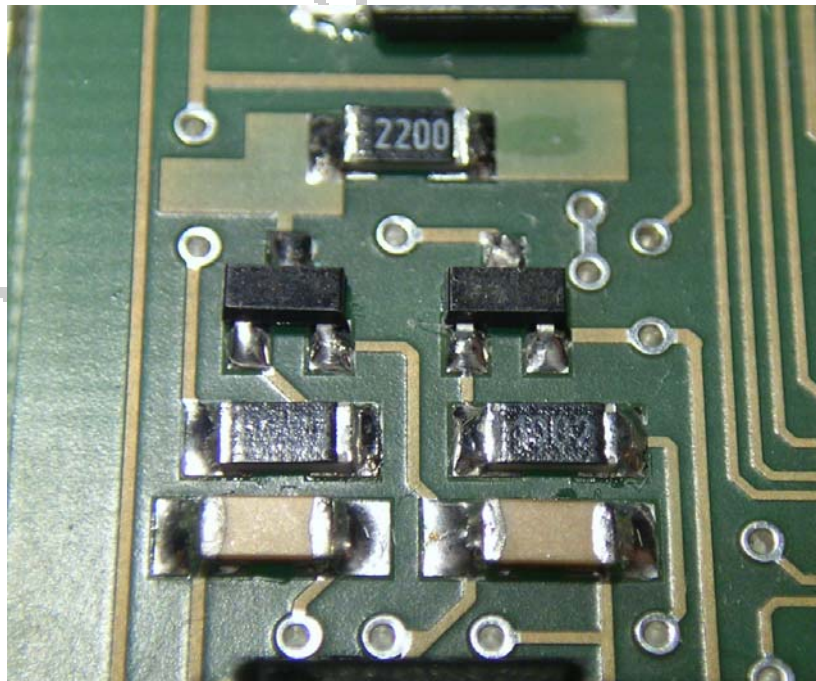


As the display lighting will receive a positive and a negative voltage from the PowerBooster you need two transistors to switch the lighting on and off (1 x PNP and 1 x NPN). R4 is the needed resistor for the LEDs and is placed directly below the display connector.

For the modification you need to do the following:
 First, you need to cut off one connection at the PCB – this is shown in the yellow circle below. This is actually a bridge which function one of the transistors will overtake from now on.



Now you solder to the left field the transistor BC858B and to the right field the BC847B. The two 10 KOhm resistors needs to become soldered below each transistor. Now your PCB should look like the picture below.



Attention: If you now add a voltage to Vcc and GND the display lighting will NOT work, as the transistors are not switched through.

If you now add a voltage (3 to 5 Volt) at the PWM pad, the transistors will switch the light on.

The needed current drops if the lighting is switched off:

Lighting active: ca. 38 mA

Lighting inactive: ca. 7 mA

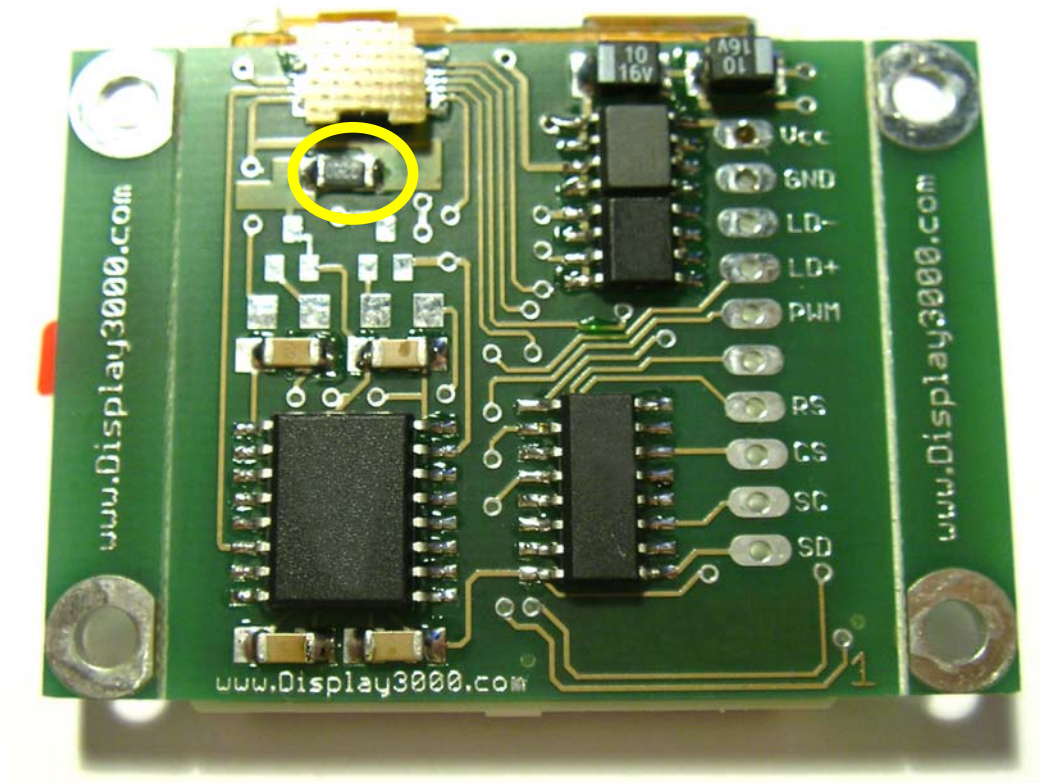
By a pulsed signal, you may also dim the lighting. A 50% PWM signal will decrease the needed current and the lighting intensity by 50%.

4) Usage without the PowerBooster:

If you want to run the module with less than 5 Volt (e.g. 3,3 Volt) the power booster is not able to work and cannot build up the needed voltage for the lighting.

In this case YOU need to add the needed lighting voltage to the pads LD+ and LD- However – if you want to do this you should desolder the large chip at the module (the PowerBooster chip) or at least desolder pins 15 and 16 to disconnect it from the supply voltage. If you do not disconnect the PowerBooster, damage to the module might occur.

With the resistor (see yellow circle) you may adapt the provided voltage to the LED-lighting. At the display LEDs itself (means: behind the resistor, measured against LD- then) the voltage should not be above 6,5 Volt and the current should not raise above 15-20 mA. You need to change the resistor to stay inside the above limits.



Possible problems and their solutions:

Nothing is happening; the display does not show anything.

1) Is the lighting active?

Darken the room; you can then easily recognize whether the edge of the display is bright or not. Without lighting you will hardly see anything on the display.

2) Did you assign the port lines of the display correctly and did you solder the lines correctly?

Examine

3) Program is not working correctly

Check your program. Use a very simple program to get the first connection and test run done (e.g. draw just a colored box on the screen).

Check the timing: Please refer to the programming manuals and the timing diagram at the end of the manual. Make sure your clock / bit timing stays inside these limits.

You will find other possibilities regarding the software in our programming manual.

Crazy results at the screen, not always repeatable

4) Electrical/static disturbances

The signals of the micro controller are actually non-critical. Nevertheless it is possible that longer cords or other unfavorable factors impair the usage. Then the display works for a while and does not react then any longer (that might also be a timing problem). In this case you should either use shorter cables (max 20 cm), or with necessary larger lengths use shielded cables. Possibly also helpfully: add a buffer between the microcontroller and the cables e.g. a 74HC4050.

5) Display not working correctly in bright light

At the top of the display you see a 1" wide silver shining stripe. This is the display controller which is sensitive against bright light. If you are not able to build the display unit in a closed box you should think about darkening the chip surface with a black pen or some dark tape.

Technical data of display module kits:

Item# D011

Supply voltage: 5,0 to 18 V DC
ca. 38 mA with PowerBooster
ca. 7 mA without PowerBooster (see manual)

3,3 to 4,5 V without usable PowerBooster
(see manual)

Signals of the microprocessor: 2,5 to 15 V (few μ A)

Display: 132x132 pixel, 65.536 colors
Note! There are several models of this display available (all looking identical). Only one works with our software! In the case of doubt you may order displays for a good price at www.shop-en.display3000.com

Size including display (with mounting frame): 51 mm x 40 mm, Höhe: 7-8 mm
2" x 1,57"; Height: 0,3"

Size including display (without mounting frame): 39 mm x 40 mm, Höhe: 7-8 mm
1,5" x 1,57"; Height: 0,3"

Manufacturer:

Speed IT up
Owner Peter Kuesters
Wekeln 39
47877 Willich
Germany
Telephone: +49-21 54-88 27 5-10
Fax: +49-21 54-88 27 5-22

Further information and updates: www.display3000.com

Author of this manual: Peter Kuesters
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EMV conformity

If you are finished by connection this module to any other circuit, **you**, as of DIN VDE 0869 are the manufacturer of the whole unit. You need to take care of the current security and EMV-regulations and to make sure your units stays in the needed specifications.

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