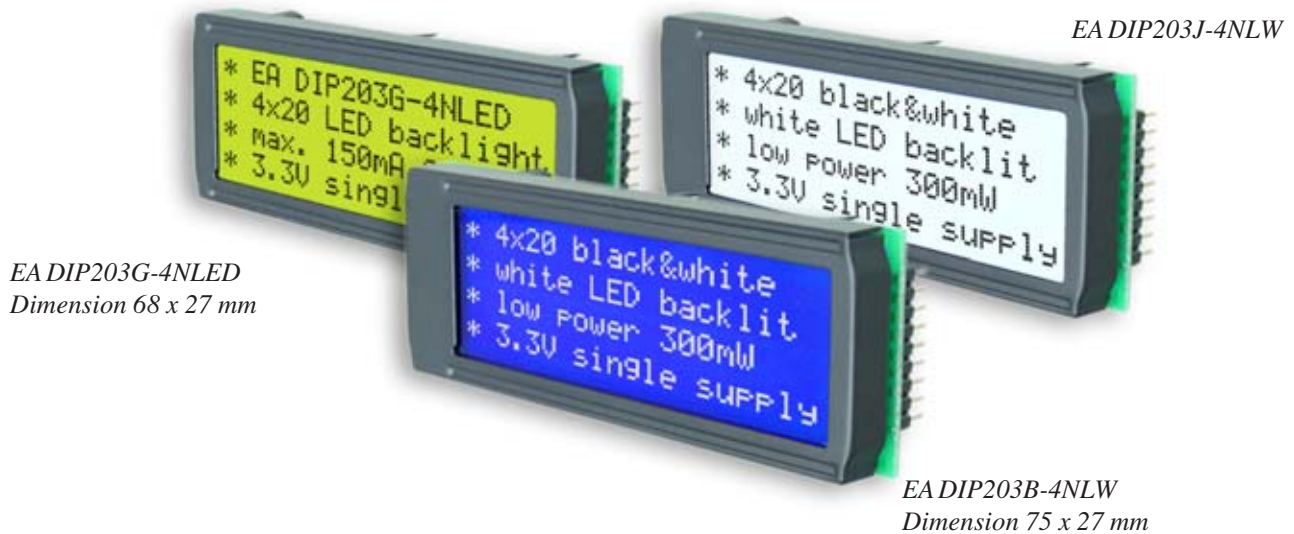


LCD MODULE 4x20 - 3.75mm

Issue 4.2013

INCL. CONTROLLER SSD1803



EA DIP203G-4NLED
Dimension 68 x 27 mm

EA DIP203J-4NLW

EA DIP203B-4NLW
Dimension 75 x 27 mm

FEATURES

- * HIGH CONTRAST LCD SUPERTWIST DISPLAY
- * CONTROLLER SSD1803 (NEARLY 100% COMPATIBLE WITH HD44780)
- * INTERFACE FOR 4- AND 8-BIT DATA BUS
- * SERIAL SPI INTERFACE (SID, SOD, SCLK)
- * POWER SUPPLY +2.7 V ~ +3.45V / 1.5mA
- * LED BACKLIGHT Y/G max. 150mA@+25°C
- * LED BACKLIGHT BLUE-WHITE AND BLACK-WHITE max. 45mA@+25°C
- * OPERATING TEMPERATURE RANGE -20..+70°C
- * BUILT-IN TEMPERATURE COMPENSATION
- * SOME MORE MODULES WITH SAME SIZE AND SAME PINOUT:
 - DOTMATRIX 1x8, 2x16
 - GRAPHIC 122x32
- * NO SCREWS REQUIRED: SOLDER ONTO PCB ONLY
- * DETACHABLE VIA 9-PIN SOCKET EA B200-9 (2 PCS REQUIRED)

ORDERING INFORMATION

LCD MODULE 4x20 - 3.73mm WITH LED BACKLIGHT Y/G
BLUE-WHITE
BLACK-WHITE
9-PIN SOCKET, HEIGHT 4.3mm (1 PC.)

EA DIP203G-4NLED
EA DIP203B-4NLW
EA DIP203J-4NLW
EA B200-9

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PINOUT

| Pin | Symbo | Level | Function | Pin | Symbo | Level | Function |
|-----|-----------|-------|----------------------------|-----|---------|-------|-----------------------------|
| 1 | VSS | L | Power Supply 0V (GND) | 10 | D3 | H / L | Display Data |
| 2 | VDD | H | Power Supply +3.3V | 11 | D4 (D0) | H / L | Display Data |
| 3 | VEE | - | Contrast adjustment, input | 12 | D5 (D1) | H / L | Display Data |
| 4 | RS (CS) | H / L | H=Data, L=Command | 13 | D6 (D2) | H / L | Display Data |
| 5 | R/W (SID) | H / L | H=Read, L=Write | 14 | D7 (D3) | H / L | Display Data, MSB |
| 6 | E (SCLK) | H | Enable (falling edge) | 15 | - | - | NC (see EA DIP122-5N) |
| 7 | D0 (SOD) | H / L | Display Data, LSB | 16 | RES | L | Reset (internal Pullup 10k) |
| 8 | D1 | H / L | Display Data | 17 | A | - | LED B/L+ Resistor required |
| 9 | D2 | H / L | Display Data | 18 | C | - | LED B/L- |

BACKLIGHT

Using the LED backlight requires a current source or external current-limiting resistor. Forward voltage for yellow/green backlight is 3.9~4.2V and for white LED backlight is 3.0~3.6V. Please take care of derating for $T_a > +25^\circ\text{C}$.

Note: Do never connect backlight directly to 5V; this may destroy backlight immediately !

TABLE OF COMMAND (SSD1803, IE=HIGH)

| Instruction | C ode | | | | | | | | | | Description | Execute Time (270kHz) | |
|--------------------------|--------|----|-----|------------|------|------|------|------|--|---|---|--|------|
| | RE Bit | RS | R/W | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | | | DB 0 |
| Clear Display | * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Clears all display and returns the cursor to the home position (Address 0). | 1.53ms | |
| Cursor At Home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Returns the Cursor to the home position (Address 0). Also returns the display being shifted to the original position. DD RAM contents remain unchanged. | 1.53ms | |
| Power Down Mode | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Set Power down mode bit. PD=0: powerdown mode disable PD=1: powerdown mode enable | 39μs | |
| Entry Mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S Cursor moving direction (I/D=0: dec; I/D=1: inc) shift enable bit (S=0: disable; S=1: enable shift) | 39μs | |
| | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | BID | Segment bidirectional function (BID=0: Seg1->Seg60; BID=1: Seg60->Seg1) | 39μs | |
| Display On/Off Control | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B D=0: display off; D=1: display on C=0: cursor off; C=1: cursor on B=0: blink off; B=1: blink on | 39μs | |
| extended Function Set | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | FW | BW | NW FW=0: 5-dot font width; FW=1: 6-dot font width BW=0: normal cursor; BW=1: inverting cursor NW=0: 1- or 2-line (see N); NW=1: 4-line display | 39μs | |
| Cursor / Display Shift | 0 | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | * | * | Moves the Cursor or shifts the display S/C=0: cursor Shift; S/C=1: display shift R/L=0: shift to left; R/L=1: shift to right | 39μs |
| Scroll Enable | 1 | 0 | 0 | 0 | 0 | 0 | 1 | H4 | H3 | H2 | H1 | Determine the line for horizontal scroll | 39μs |
| Function Set | 0 | 0 | 0 | 0 | 0 | 1 | DL | N | RE | DH | RE | sets interface data length (DL=0:4-bit; DL=1:8-bit) number of display lines (N=0: 1-line; N=1: 2-line) extension register (RE= 0/1) scroll/shift (DH=0: dot scroll; DH=1: display shift) reverse bit (REV=0:normal; REV=1:inverse display) | 39μs |
| | 1 | 0 | 0 | 0 | 0 | 1 | DL | N | RE | BE | LP | CG-/SEG-RAM blink (BE=0: disable; BE=1: enable) LP=0: normal mode; LP=1: low power mode | 39μs |
| CG RAM Address Set | 0 | 0 | 0 | 0 | 1 | AC | | | | | Sets the CG RAM address. CG RAM data is sent and received after this setting. | 39μs | |
| SEG RAM Address Set | 1 | 0 | 0 | 0 | 1 | * | * | AC | | | | Sets the SEG RAM address. SEG RAM data is sent and received after this setting. | 39μs |
| DD RAM Address Set | 0 | 0 | 0 | 1 | AC | | | | | Sets the DD RAM address. DD RAM data is sent and received after this setting. | 39μs | | |
| Set Scroll Quantity | 1 | 0 | 0 | 1 | * | SQ | | | | | Sets the quantity of horizontal dot scroll (DH=0) | 39μs | |
| Busy Flag / Address Read | * | 0 | 1 | BF | AC | | | | | Reads Busy flag (BF) indicating internal operation is being performed and reads address counter contents. | - | | |
| Write Data | * | 1 | 0 | Write Data | | | | | Writes data into internal RAM (DD RAM / CG RAM / SEGRAM) | 43μs | | | |
| Read Data | * | 1 | 1 | Read Data | | | | | Reads data from internal RAM (DD RAM / CG RAM / SEGRAM) | 43μs | | | |

| INITIALISATION EXAMPLE FOR 8 BIT MODE | | | | | | | | | | | | |
|---------------------------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|---|
| Command | RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Hex | Description |
| Function Set | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | \$34 | 8 bit data length, extension bit RE=1 |
| ext. Function Set | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | \$09 | 4 line mode |
| Function Set | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | \$30 | 8 bit data length, extension bit RE=0 |
| Display ON/OFF | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | \$0F | display on, cursor on, cursor blink |
| Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | \$01 | clear display, cursor 1st. row, 1st. line |
| Entry Mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | \$06 | cursor will be automatically incremented |

Addressing:

- 1st. line \$00..\$13
- 2nd. line \$20..\$33
- 3rd. line \$40..\$53
- 4th. line \$60..\$73

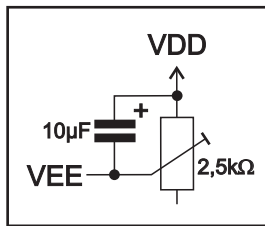
CHARACTER SET

A full character set is built-in already. Additionally to that 8 more characters can be defined individually.

CONTRAST ADJUSTMENT

Pin 3 requires driving voltage for contrast VEE. Adjustment can be done by external potentiometer for example. The capacitor is for a better startup behaviour.

Note: In contrast to many other dotmatrix lcd modules input is supplied with VDD level here !



All versions do have a built-in temperature compensation; so there's no more need for contrast adjustment during operation anymore.

| Upper 4bit / Lower 4bit | LLLL | LLH | LHL | LHH | LHLL | LHLH | LHHL | LHHH | HLLL | HLLH | HHLH | HLLH | HHLH | HHLH | HHLH | HHLH | HHLH | HHLH |
|-------------------------|------|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| CG RAM (1) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (2) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (3) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (4) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (5) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (6) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (7) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (8) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (1) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (2) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (3) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (4) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (5) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (6) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (7) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| (8) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

CREATING YOUR OWN CHARACTERS

All these character display modules got the feature to create 8 own characters (ASCII Codes 0..7) in addition to the 240 ROM fixed codes.

- 1.) The command "CG RAM Address Set" defines the ASCII code (Bit 3,4,5) and the dot line (Bit 0,1,2) of the new character. Example demonstrates creating ASCII code \$00.
- 2.) Doing 8 times the write command "Data Write" defines line by line the new character. 8th. byte stands for the cursor line.
- 3.) The newly defined character can be used as a "normal" ASCII code (0..7); use with "DD RAM Address Set" and "Data Write".

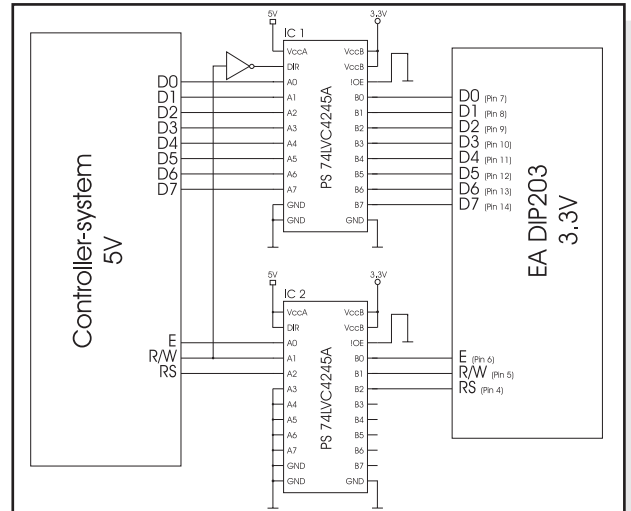
| Set CG RAM Address | | | | Data | | | | | |
|--------------------|---|-----|-----|------|---|---|---|-----|------|
| Adresse | | Hex | Bit | | | | | Hex | |
| 7 | 6 | 5 | 4 | | 3 | 2 | 1 | 0 | Hex |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | \$04 |
| | | | | 0 | 0 | 1 | 0 | 0 | \$04 |
| | | | | 0 | 1 | 0 | 0 | 0 | \$04 |
| | | | | 0 | 1 | 1 | 0 | 0 | \$04 |
| | | | | 1 | 0 | 0 | 0 | 0 | \$04 |
| | | | | 1 | 0 | 1 | 0 | 0 | \$04 |
| | | | | 1 | 1 | 0 | 0 | 0 | \$04 |
| | | | | 1 | 1 | 1 | 0 | 0 | \$00 |

DRIVING WITH 5V-SYSTEMS

The supply voltage of the display is necessarily 3.3V. If a 5V-system is used, the level have to be adapted. For example you can use a bidirectional levelshifter (e.g. PS 74LVC4245A), like shown in the opposite figure.

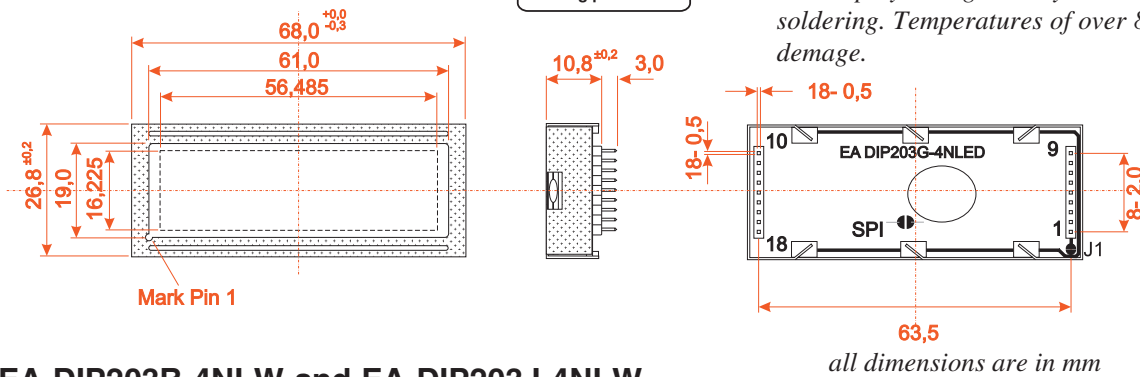
COMPATIBILITY WITH EA DIP204-4

The displays of EA DIP203 and EA DIP204 series are electrically and mechanically identical to each other running with 3.3V supply mode. Merely a 5V supply is not acceptable with the new EA DIP203 series.

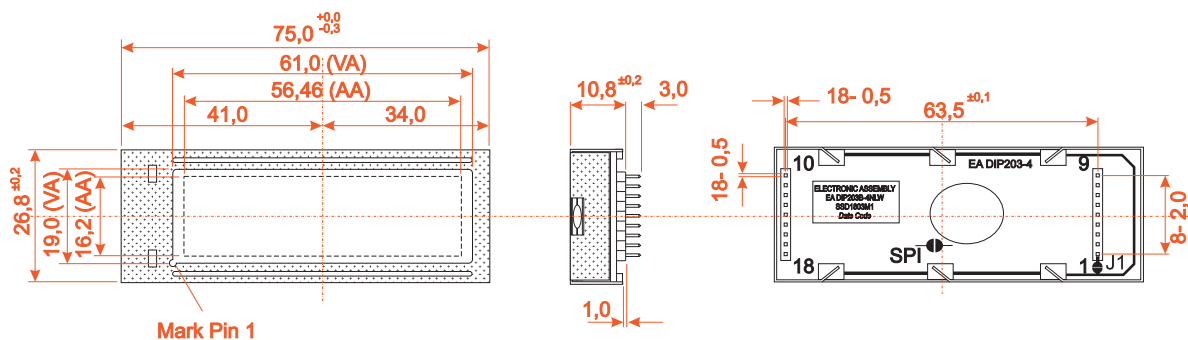


Note:
LC-Displays are generally not suited to wave or reflow soldering. Temperatures of over 80°C can cause lasting damage.

EA DIP203G-4NLED



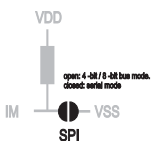
EA DIP203B-4NLW and EA DIP203J-4NLW



SERIAL MODE

Factory setting for interface is parallel with 4 bit or 8 bit data bus. Alternatively the module can be used with serial data stream. For that, solder link **SPI** has to be closed. Specification for serial operation mode is described in user manual for SSD1803:

http://www.lcd-module.de/fileadmin/eng/pdf/zubehoer/ssd1803_2_0.pdf



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