# **LCD MODULE 4x20 - 3.75mm**

## **INCL. CONTROLLER SSD1803**



- \* HIGH CONTRAST LCD SUPERTWIST DISPLAY
- \* CONTROLLER SSD1803 (NEAR 100% COMPATIBLE WITH HD44780)
- \* INTERFACE FOR 4- AND 8-BIT DATA BUS
- \* SERIAL SPI INTERFACE (SID, SOD, SCLK)
- \* POWER SUPPLY +3.3V/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 MECHANIC AND SAME PINOUT:
  - DOTMATRIX 1x8, 2x16
  - GRAPHIC 122x32
- \* NO SCREWS REQUIRED: SOLDER ON IN 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 B200-9



#### **PINOUT**

Pin	Symbo	Level	Function	Pin	Symbo	Level	Function
1	VSS	L	Power Supply 0V (GND)	10	D3	H/L	Display Data
2	VDD	Н	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)	Η	Enable (falling edge)	15	-	ı	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	Α	-	LED B/L+ Resistor required
9	D2	H/L	Display Data	18	С	1	LED B/L-

#### **BACKLIGHT**

Using the LED backlight requires an 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  $T_a>+25$ °C.

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

### TABEL OF COMMAND (SSD1803, IE=HIGH)

						C od	e						Execute
Instruction	RE Bit	RS	R/W	DB 7			DB 3	DB DB 2 1		DB 0	Description	Time (270kHz)	
Clear Display	*	0	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	PD	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
Entry Wode Set	1	0	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	С	В	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	ВW	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	НЗ	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			Α	C			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	*	*		Α	C		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	*			S	Q			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			١	Vrite	Dat	а			Writes data into internal RAM (DD RAM / CG RAM / SEGRAM)	43µs
Read Data	*	1	1			F	Read	l Dat	а			Reads data from internal RAM (DD RAM / CG RAM / SEGRAM)	43µs



		11	ITIV	AL	SA	TIO	N E	ΞXΑ	MP	LE	FΟ	R 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 1 0 0 0 1 S01 clear display, cursor 1st. row, 1st. line						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

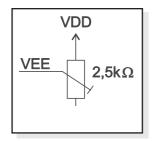
#### CHARACTER SET

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.

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



All versions do have a built-in temperature compensatione; so there's no more need for contrats adjustment while operation anymore.

Upper 4bit																
4bit Lower 4bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	ІННН	HLLL	HLLH	HLHL	нгнн	HHLL	ннгн	нннг	нннн
LLLL	CG RAM (1)			Ø							E					
LLLH	(2)							=			£.	4				
LLHL	(3)					R										Ř
LLHH	(4)		Ħ	3							Ħ					
LHLL	(5)	**	×	4				ŧ.	#			Ì.				Ž
LHLH	(6)	*								I				#		
LHHL	(7)		8										Ë		¥	Ĕ
гннн	(8)			P												ř
HLLL	(1)		Ç			×		*	8		Ď					Š
HLLH	(2)		Þ				i					$\Theta$				Ž
нгнг	(3)		#					×	×				5			
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HHLL	(5)									œ		Ħ				
ннгн	(6)					ij		Ħ	2							K
нннг	(7)			>						8				1		
нннн	(8)		ď			B							*	*		ŀ

#### 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.

Set CG RAM Address

Data

- 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.
- Doing 8 times the write command "Data Write" defines line by line the new character. 8th. byte stands for the cursor line.

	ס	el CG h/	-NIVI A	Huc	1162	5								D	ala			
ı		Adress	_			Hex							В	it				Hex
è		Auress	е			пех				7	6	5	4	3	2	1	0	пех
			0	0	0	\$40							0	0	-	0	0	\$04
			0	0	1	\$41							0	0	•	0	0	\$04
			0	1	0	\$42							0	0	-	0	0	\$04
	0 1	0 0 0	0	1	1	\$43				v	v	v	0	0	1	0	0	\$04
l	0 1	0 0 0	1	0	0	\$44				Х	^	^	1	0	1	0	1	\$15
,			1	0	1	\$45							0	7	7	1	0	\$0E
r			1	1	0	\$46							0	0	7	0	0	\$04
			1	1	1	\$47							0	0	0	0	0	\$00

3.) The new defined character can be used as a "normal" ASCII code (0..7); use with "DD RAM Address Set" and "Data Write".



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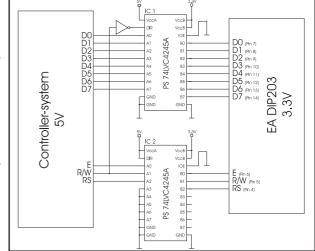
#### **DRIVING WITH 5V-SYSTEMS**

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 biderectional levelshifter (e.g. PS 74LVC4245A), like shown in the opposite figure.

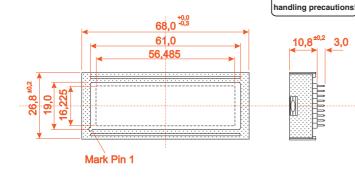
#### **COMPATIBILITY WITH EA DIP204-4**

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. ATTENTION



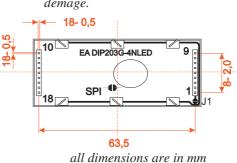
#### **EA DIP203G-4NLED**



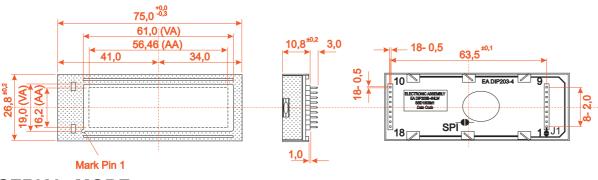
Note:

3,0

LC-Displays are generally not suited to wave or reflow soldering. Temperatures of over 90°C can cause lasting demage.



#### EA DIP203B-4NLW and EA DIP203J-4NLW



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#### **SERIAL MODE**

0 SPI

Factory set 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 0.20.pdf

