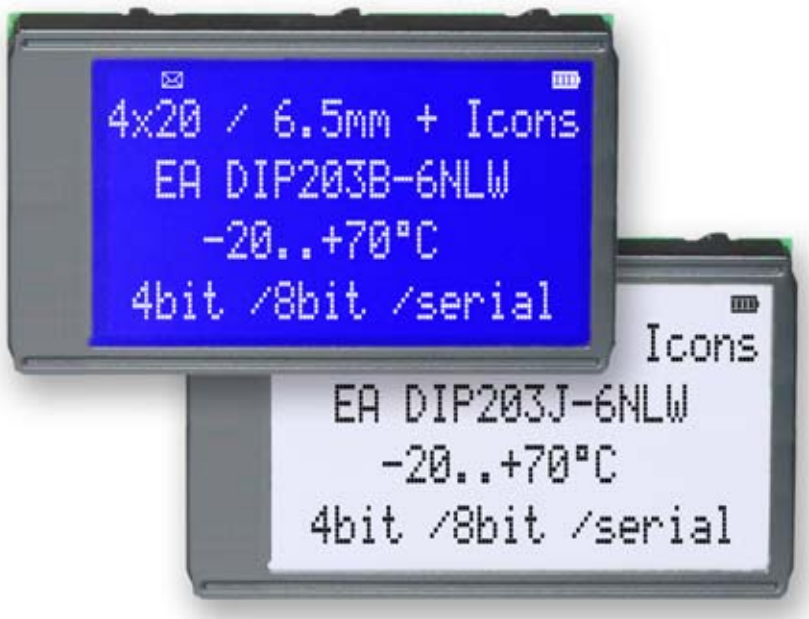
Issue 8.2012

ELECTRONIC ASSEMBLY
new display design

LCD-Modul 4x20 - 6.45mm

INCL. CONTROLLER SSD1803

no mounting required



EA DIP203B-6NLW

EA DIP203J-6NLW: Dimension 75 x 46 mm

FEATURES

* HIGH-CONTRAST LCD-SUPERTWIST DISPLAY
* BLUE BACKGROUD WITH WHITE CHARACTERS
* BLACK&WHITE FSTN
* EXTREME COMPACT WITH 75mm WIDTH
* BUILT-IN CONTROLLER SSD1803 (VERY SIMILAR TO HD44780)
* 4- AND 8-BIT INTERFACE FOR DATABUS
* SERIAL SPI-INTERFACE (SID, SOD, SCLK, CS)
* POWER SUPPLY +3.3 / TYP. 4mA (w./o. B./L.)
* OPERATING TEMP. RANGE -20..+70°C
* AUTOMATIC TEMPERATURE COMPENSATION BUILT-IN
* LED-BACKLIGHT WHITE, max. 75mA@+25°C
* 16 ICONS (BATTERY, ARROWS ETC.) AT THE TOP EDGE
* NO MONTING IS REQUIRED: JUST SOLDER INTO PCB
* SINGLE ROW SOCKET AVAILABLE: EA B254-12 (1 PC.)
* 128x64 GRAPHIC WITH SAME DIMENSION AND SAME PINOUT: EA DIP128

ORDERING INFORMATION

LCD-MODULE 4x20 - 6.45mm WITH LED-B./L. BLUE FSTN BLACK ON WHITE	**EA DIP203B-6NLW**
	EA DIP203J-6NLW
SOCKET 4.5mm HEIGHT, 12 POSITIONS (1 PC.)	**EA B254-12**

PINOUT

4-/8-Bit Mode (Factory Set)					
Pin	Symbo	Function	Pin	Symbo	Function
1	VSS	Power Supply 0V (GND)	13		not connected
2	VDD	Power Supply +5V	14	VSS	Power Supply 0V (GND)
3	VCI	Contrast Adjustment	15	D0	Display Data, LSB
4	RES	L: Reset	16	D1	Display Data D1
5	RS	H=Data; L=Command	17	D2	Display Data D2
6	R/W	H=Read, L=Write	18	D3	Display Data D3
7	E	Enable	19	D4 (D0)	Display Data D4
8		not connected	20	D5 (D1)	Display Data D5
9		not connected	21	D6 (D2)	Display Data D6
10		not connected	22	D7 (D3)	Display Data, MSB
11		not connected	23	A	LED-B/L + (ext. Resistor requ)
12		not connected	24	C	LED-B/L -

SPI Mode (Solder link "SPI" closed)					
Pin	Symbo	Function	Pin	Symbo	Funktion
1	VSS	Power Supply 0V (GND)	13		not connected
2	VDD	Power Supply +5V	14	VSS	Power Supply 0V (GND)
3	VCI	Contrast Adjustment	15	SOD	Data Out
4	RES	L: Reset	16		not connected
5	CS	Chip Select	17		not connected
6	SID	Data In	18		not connected
7	SCLK	Shift Clock	19		not connected
8		not connected	20		not connected
9		not connected	21		not connected
10		not connected	22		not connected
11		not connected	23	A	LED-B/L + (ext. Resistor requ)
12		not connected	24	C	LED-B/L -

BACKLIGHT

Using the LED backlight requires an current source or external current-limiting resistor. Forward voltage for white LED backlight is 3.0~3.6V. Please take care of derating for T_a>+25°C

Attention: Do never drive backlight directly to 5V; this may damage backlight immediately !
The blue display cannot be read without backlight. For direct sunlight we suggest to use the J-type.

TABLE OF COMMAND (SSD1803)

Instruction	Code											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	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
	0	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	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	REV	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

SERIAL MODE SPI

Factory set for interface is parallel with 4 bit or 8 bit data bus. Alternative module can be programmes with serial data stream. For that solder link **SPI** has to be closed. Harware specification for serial operation mode is written down in user manual for SSD1803: http://www.lcd-module.de/fileadmin/eng/pdf/zubehoer/SSD1803_0.20.pdf. Software for initialisation and programming keeps the same.

Example of initialisation, 8 bit mode													
Command	**RE Bit**	**RS**	**R/W**	**DB7**	**DB6**	**DB5**	**DB4**	**DB3**	**DB2**	**DB1**	**DB0**	**Hex**	**Note**
Function Set	0	0	0	0	0	1	1	0	0	0	0	$30	8 bit data length, extension bit RE=0
Entry Mode Set	0	0	0	0	0	0	0	0	1	1	0	$06	Cursor Auto-Increment
Function Set	0	0	0	0	0	1	1	0	1	1	0	$36	8 bit data length, RE =1, blink enable BE =1
ext. Function Set	1	0	0	0	0	0	0	1	0	0	1	$09	4 line mode
Set SEGRAM adr	1	0	0	0	1	0	0	0	0	0	0	$40	Icon RAM adress: $00
16 x Write Data	1	1	0	0	0	0	0	0	0	0	0	$00	to clear all icons: write 16x $00
Function Set	1	0	0	0	0	1	1	0	0	0	0	$30	8 bit data length, bit RE =0
Display ON/OFF	0	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	0	1	$01	Clear display, place cursor to 1st. col. /1st. row

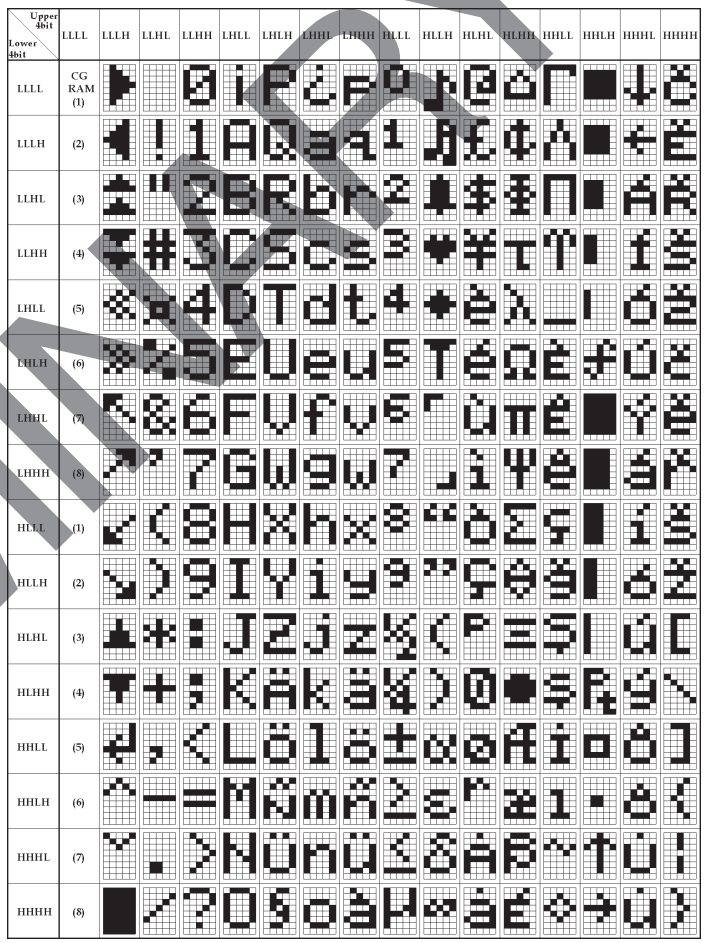
Adress:

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

Please make shure that software will check busy-flag before writing any command !

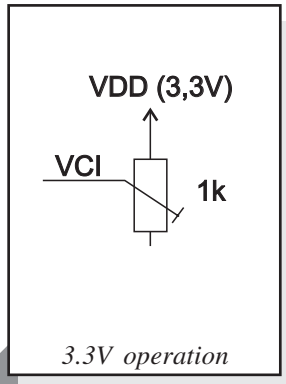
CHARACTER SET

Beside there's a copy of built.in character set. In addition to that up to 8 individual character can be created.



CONTRAST ADJUSTMENT

Contrast will be set by pin 3 (VCI).
Module EA DIP203 comes with built-in temperature compensation for -20..+70°C as a standard; any contrast adjustment while operation is no longer required.



CREATING YOUR OWN CHARACTERS

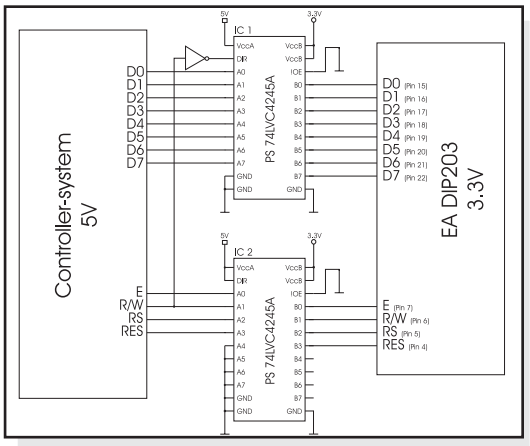
All these character display modules got the feature to create 8 own characters (ASCII Codes 0..7) in addition to the 240 ROM fixed codes.

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 new 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	
0 1	0 0 0	0 0 0	$40	X	X	X	0	0	1	0	0	$04
		0 0 1	$41				0	0	1	0	0	$04
		0 1 0	$42				0	0	1	0	0	$04
		0 1 1	$43				0	0	1	0	0	$04
		1 0 0	$44				1	0	1	0	1	$15
		1 0 1	$45				0	1	1	1	0	$0E
		1 1 0	$46				0	0	1	0	0	$04
		1 1 1	$47				0	0	0	0	0	$00

DRIVING WITH 5V-SYSTEMS

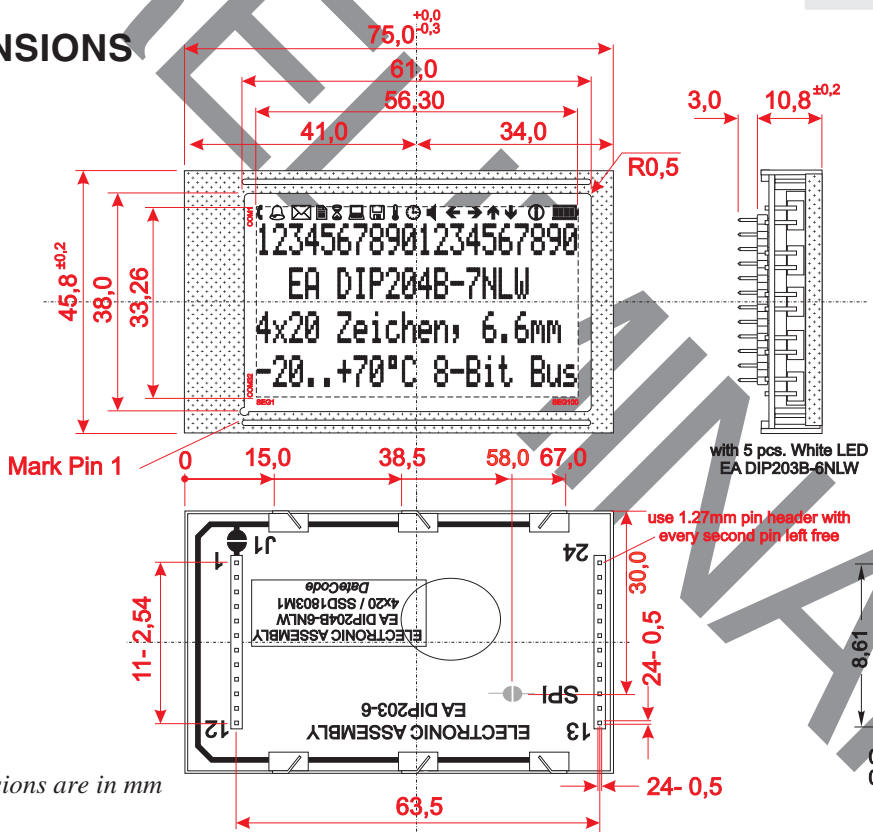
The supply voltage of the display is necessarily 3.3V.
If a 5V-system is used, the level have to be adapted.
For example you can use a biderectional levelshifter (e.g. PS 74LVC4245A), like shown in the opposite figure.

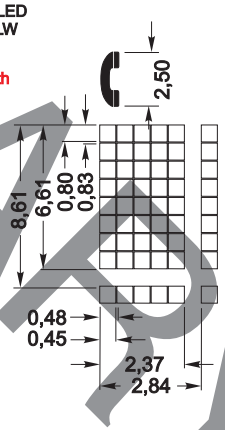


COMPATIBILITY WITH EA DIP204-6

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.

DIMENSIONS





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

all dimensions are in mm

DRIVING THE SYMBOLS

After power-on symbols will be set accidental. To switch off them all please refer to the example of initializing on page 3. To display an individual symbol have a look at the program example at the right.
Each symbol can be displayed in normal (solid) and blinking style.

Example program to display an icon (8 bit mode interface)

Command	RE Bit	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Hex	Note
Busy-Flag / Address read	0	0	1	BF	AC								perhaps store current DDRAM adress: read AC and save as LASTADR=AC
Function Set	0	0	0	0	0	1	1	0	1	1	0	$36	Set to 8 bit data length, RE=1, Blink enable BE=1
Set SEGRAM adr	1	0	0	0	1	0	0	0	0	1	0	$42	Set Icon-RAM adress to $02 (letter symbol)
Write Data	1	1	0	0	0	0	1	0	0	0	0	$10	Write $10 to display symbol
Function Set	1	0	0	0	0	1	1	0	0	0	0	$30	Set to 8 bit data length, extension bit RE=0
Set DDRAM adr	0	0	0	1	LASTADR							$80	Restore DDRAM adress

Icon - Symbols

SEGRAM address	$00	$01	$02	$03	$04	$05	$06	$07	$08	$09	$0A	$0B	$0C	$0D	$0E	$0F	$0F	$0F	$0F	$0F
data solid	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$1F	$1E	$1C	$18	$10
data blink (BE=1!)	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50					$50

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