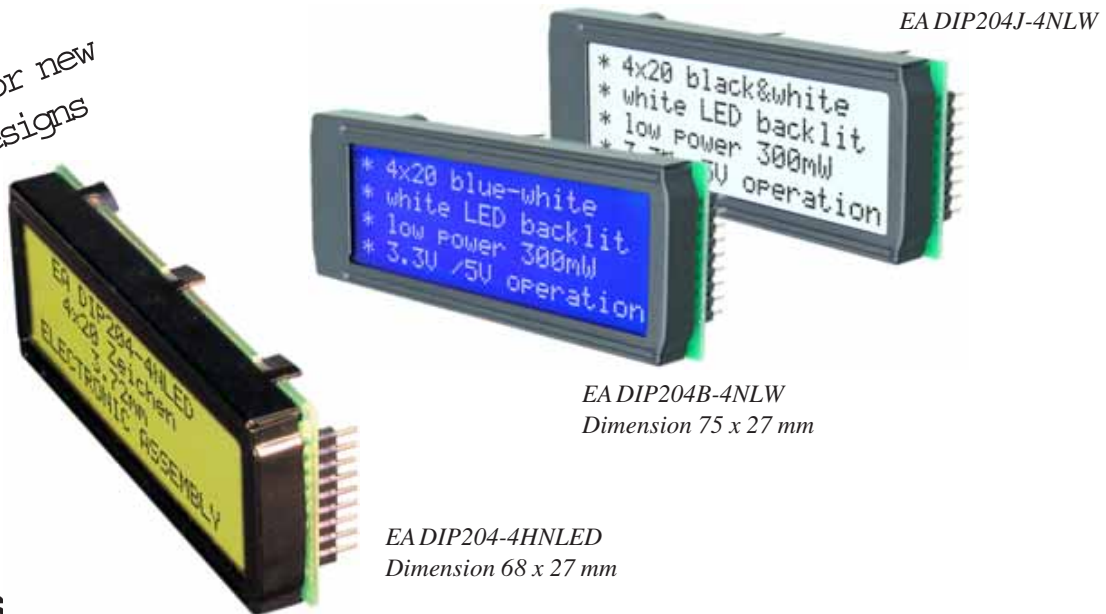


## INCL. CONTROLLER KS0073

Not for new  
designs



EA DIP204J-4NLW

EA DIP204B-4NLW

Dimension 75 x 27 mm

EA DIP204-4HNLED

Dimension 68 x 27 mm

### FEATURES

- \* HIGH CONTRAST LCD SUPERTWIST DISPLAY
- \* CONTROLLER KS0073 (NEAR 100% COMPATIBLE WITH HD44780)
- \* INTERFACE FOR 4- AND 8-BIT DATA BUS
- \* SERIAL SPI INTERFACE (SID, SOD, SCLK)
- \* POWER SUPPLY +3.3..+5V (-4NLW, -4NLED)
- \* POWER SUPPLY +5V ( -4HNLED)
- \* OPERATING TEMPERATURE RANGE 0~+50°C (-20..+70°C: -4NLW, -4HNLED)
- \* BUILT-IN TEMPERATURE COMPENSATION (-4NLW, -4HNLED)
- \* LED BACKLIGHT Y/G max. 150mA@+25°C
- \* LOW POWER WITH BLUE-WHITE OPTIC / max. 45mA@+25°C
- \* 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	<b>EA DIP204-4NLED</b>
SAME BUT FOR T <sub>OP</sub> -20~+70°C / T <sub>STOR.</sub> -30~+80°C	<b>EA DIP204-4HNLED</b>
BLUE-WHITE, T <sub>OP</sub> -20~+70°C / T <sub>STOR.</sub> -30~+80°C	<b>EA DIP204B-4NLW</b>
9-PIN SOCKET, HEIGHT 4.3mm (1 PC.)	<b>EA B200-9</b>
ADAPTOR PCB WITH STANDARD PINOUT PITCH 2.54mm	<b>EA 9907-DIP</b>

**ELECTRONIC  
ASSEMBLY**  
making things easy

## PINOUT

Pin	Symbol	Level	Function	Pin	Symbol	Level	Function
1	VSS	L	Power Supply 0V (GND)	10	D3	H / L	Display Data
2	VDD	H	Power Supply +5V	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 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  $T_a > +25^{\circ}\text{C}$ .

- Note:** - Do never connect backlight direct to 5V; this may destroy backlight immediately !  
 - Blue-white displays do always need a backlight for contrast (min. 5mA).

## TABEL OF COMMAND (KS0073, 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	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
	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	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	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	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	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

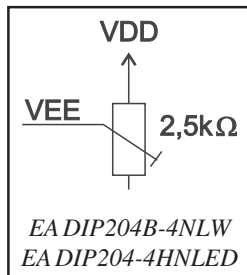
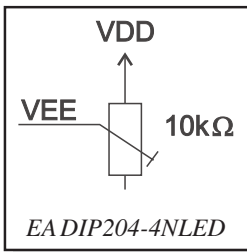
**CHARACTER SET**

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.

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



Both versions -4NLW and -4HNLED do have a built-in temperature compensation; so there's no more need for contrast adjustment while operation anymore.

Lower 4bit	Upper 4bit	LLLL	LLH	LLHL	LLHH	LHLL	LHHL	LHHH	HLLL	HLLH	HHLH	HHLH	HHLH	HHHL	HHHL
LLLL	(1) CG RAM	▶	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
LLH	(2)	◀	!	1	A	Q	a	a	1	◀	◀	◀	◀	◀	◀
LLHL	(3)	◀	"	2	B	R	b	r	2	◀	◀	◀	◀	◀	◀
LLHH	(4)	◀	#	3	C	S	c	s	3	◀	◀	◀	◀	◀	◀
LHLL	(5)	◀	\$	4	D	T	d	t	4	◀	◀	◀	◀	◀	◀
LHHL	(6)	◀	%	5	E	U	e	u	5	T	◀	◀	◀	◀	◀
LHHH	(7)	◀	&	6	F	V	f	v	6	◀	◀	◀	◀	◀	◀
LHHH	(8)	◀	'	7	G	W	w	w	7	◀	◀	◀	◀	◀	◀
HLLL	(1)	◀	<	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
HLLH	(2)	◀	>	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
HLHL	(3)	◀	*	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
HLHH	(4)	◀	+	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
HHLH	(5)	◀	,	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
HHLH	(6)	◀	-	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
HHHL	(7)	◀	.	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
HHHL	(8)	◀	/	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀

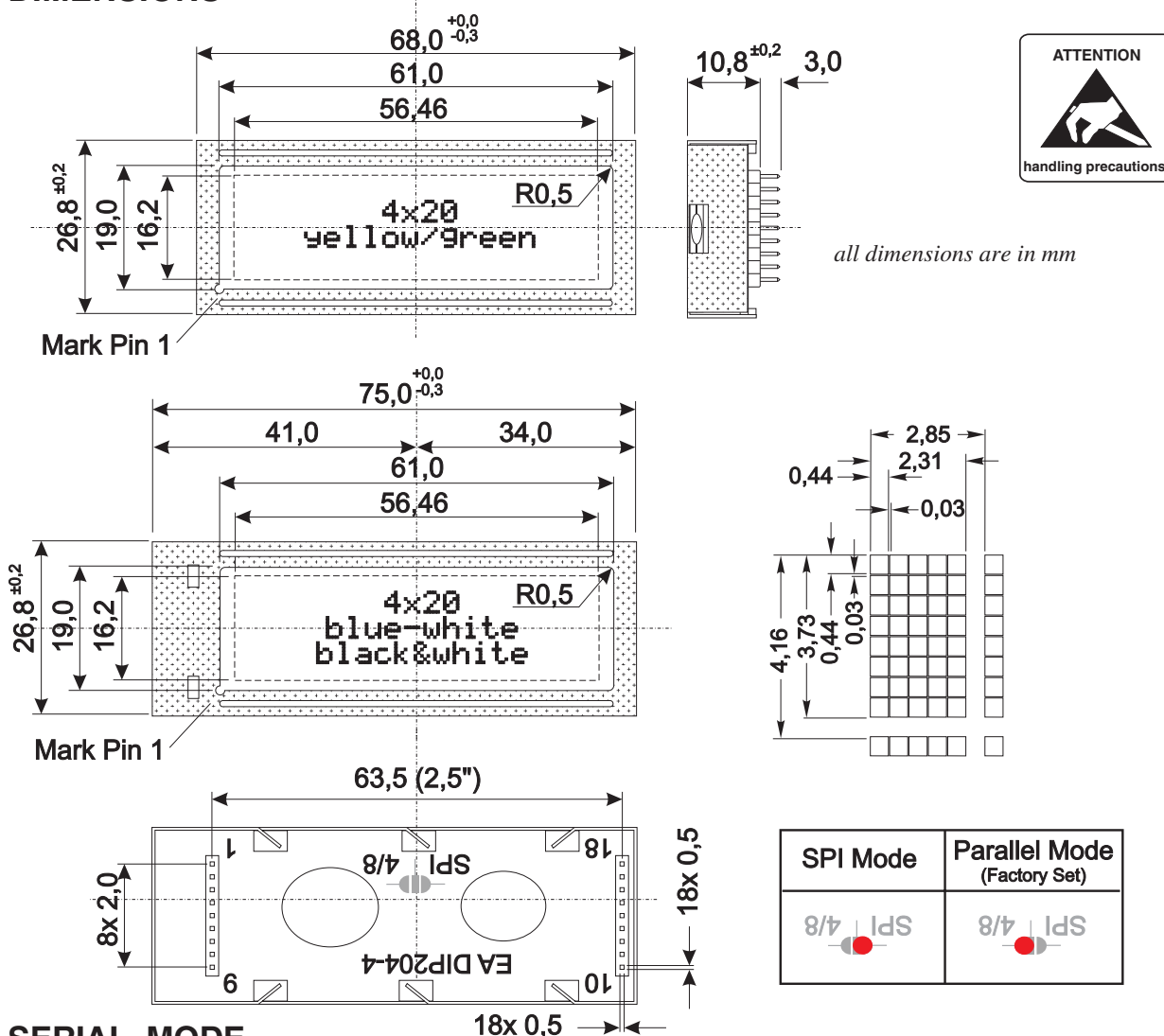
**CREATING YOUR OWN CHARACTERS**

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 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	Hex						
7	6	5			4	3	2	1	0
0	1	0	0	0	0	0	0	\$40	
				0	0	1	0	0	\$41
				0	1	0	0	\$42	
				0	1	1	0	\$43	
				1	0	0	0	\$44	
				1	0	1	0	\$45	
				1	1	0	0	\$46	
				1	1	1	0	\$47	
X X X				0	0	1	0	\$04	
X X X				0	0	1	0	\$04	
X X X				0	0	1	0	\$04	
X X X				0	0	1	0	\$04	
X X X				1	0	1	0	\$15	
X X X				0	1	1	0	\$0E	
X X X				0	0	1	0	\$04	
X X X				0	0	0	0	\$00	

## DIMENSIONS



## SERIAL MODE

Factory set for interface is parallel with 4 bit or 8 bit data bus. Alternative module can be programmed with serial data stream. For that solder link 4/8 has to be opened and closed to SPI side. Specification for serial operation mode is written down in user manual for KS0073: <http://www.lcd-module.de/eng/pdf/zubehoer/ks0073.pdf>

## ADAPTOR PCB

The adaptor pcb EA 9907-DIP is made for a quick function test for all DIP modules. This interface board provides the standard dotmatrix pinout with 1x14, 1x16, 2x7 and 2x8 pins (0.1" pitch).

