2.2010

LCD MODULE 4x20 - 3.73mm

INCL. CONTROLLER KS0073



* 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/GEA DIP204-4NLEDSAME BUT FOR T_{OP} -20~+70°C / T_{STOR} -30~+80°CEA DIP204-4HNLEDBLUE-WHITE, T_{OP} -20~+70°C / T_{STOR} -30~+80°CEA DIP204B-4NLW9-PIN SOCKET, HEIGHT 4.3mm (1 PC.)EA B200-9ADAPTOR PCB WITH STANDARD PINOUT PITCH 2.54mmEA 9907-DIP



PINOUT

Pin	Symbol	Level	Function	Pin	Symbol	Level	Function
1	VSS	L	Power Supply 0V (GND)	10	D3	H/L	Display Data
2	VDD	Н	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)	Н	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	А	-	LED B/L+ Resistor required
9	D2	H/L	Display Data	18	С	-	LED B/L-

BACKLIGHT

Using the LED backlight requires an current source or external current-limiting resistor. Forward voltage for yellow/green backlight is $3.9 \sim 4.2$ V and for white LED backlight is $3.0 \sim 3.6$ V. Please take care of derating for T_a>+25°C.

<u>Note:</u> - 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)

	C ode												Execute
Instruction	RE Bit	RS	R/W	DB 7	DB 6	DB 5	DB 4	DB 3	DB 2	DB 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 Mode 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	Ν	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							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 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								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			١	Vrite	Dat	а			Writes data into internal RAM (DD RAM / CG RAM / SEGRAM)	43µs
Read Data	*	1	1			F	Read	Dat	a			Reads data from internal RAM (DD RAM / CG RAM / SEGRAM)	43µs



EA DIP204-4

\$00..\$13

\$20..\$33

\$40..\$53

\$60..\$73

LLLH LLHL LLHH LHLL LHLH LHHL LHHH HLLL HLLH HLHL HLHH HHLL HHLH HHHL HHHH

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INITIALISATION EXAMPLE FOR 8 BIT MODE													Addressing
Command	RS	R/W	DB7	DB6	DB5	DB4	34 DB3 DB2 DB1 DB0 Hex Description 1 0 1 0 0 \$34 8 bit data length, extension	DB2	DB1	DB0	Hex	Description	1st. line
Function Set	0	0	0	0	1	1		8 bit data length, extension bit RE=1	2nd. line				
ext. Function Set	0	0	0	0	0	0	1	0	0	1	\$09	4 line mode	3rd. line
Function Set	0	0	0	0	1	1	0	0	0	0	\$30	8 bit data length, extension bit RE=0	4th. line
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	

Uppe 4bit

LLL

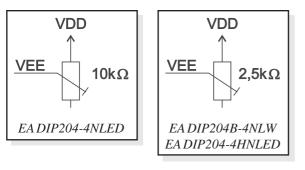
CHARACTER SET

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 !



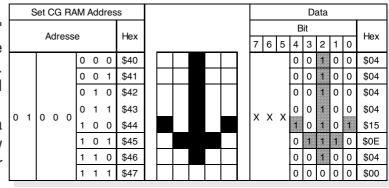
Both versions -4NLW and -4HNLEDdo have а built-in temperature compensatione; so there's no more need for contrats adjustment while operation anymore.

Pérojoar CG RAM LLL (1) lecericex LLLH (2) LLHI (3) ehscheest# T LLHH (4) LHLL (5) 28 K 71318 FETTES 6 200 LHLH (6) LHHL (7) LHHH (8) HLLL (1) HLLH (2) Z%(P HLHL (3) seses docere HLHH (4) HHLL (5) =Mñmñ2s^21•8(HHLH (6) >Nürü£866°°tü ннні (7) /?OScal¤áe¤⇒u> нннн (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. Data

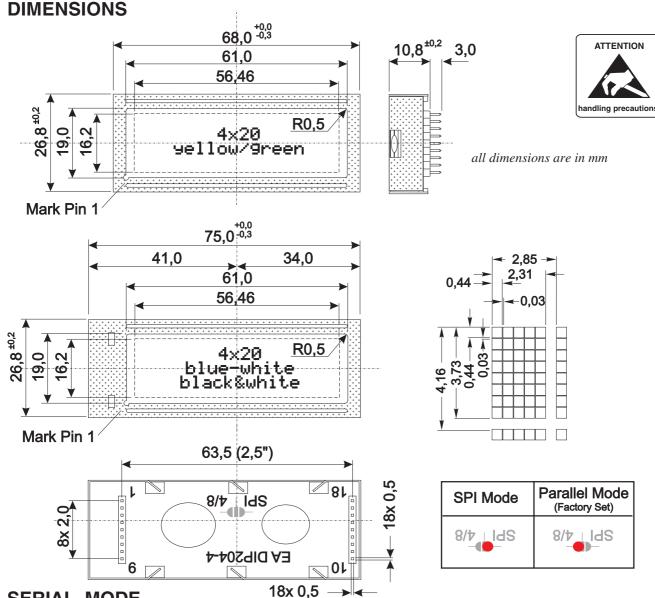
- 1.) The command "CG RAM Address Set" defines the ASCII code (Bit 3,4,5) and the dot line (Bit 0,1.2) of the new character. Example demonstrates creating ASCII code \$00.
- 2.) Doing 8 times the write command "Data Write" defines line by line the new character. 8th. byte stands for the cursor line.



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



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SERIAL MODE

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 **4/8** has to be opened and closed to **SPI** side. Specification for serial operation mode is written down in user manual for KS0073: <u>http:/</u> /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).

