LCD- MODUL 4x20 - 6.45mm

INCL. CONTROLLER KS0073



FEATURES

- * HIGH-CONTRAST LCD-SUPERTWIST DISPLAY
- * BLUE BACKGROUD WITH WHITE CHARACTERS
- * BLACK&WHITE FSTN
- * EXTREME COMPACT WITH 75mm WIDTH
- * BUILT-IN CONTROLLER KS0073 (VERY SIMILAR TO HD44780)
- * 4- AND 8-BIT INTERFACE FOR DATABUS
- * SERIAL SPI-INTERFACE (SID, SOD, SCLK, CS)
- * POWER SUPPLY +3.3..5.0V / TYP. 4mA (w./o. B./L.)
- * OPERATING TEMP. RANGE -20..+70°C
- * AUTOMATIC TEMPERATURE COMPENSATION BUILT-IN
- * LED-BACKLIGHT WHITE, max. 75mA@+25°C
- * U_{f(LFD)}= 3.0~3.6V
- * 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 SOCKET 4.5mm HEIGHT, 12 POSITIONS (1 PC.)

EA DIP204B-6NLW EA DIP204J-6NLW EA B254-12



PINOUT

		4-/8-Bit Mode) (F	act	ory Set)	
Pin	Symbol	Function		Pin	Symbol	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	Е	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	А	LED-B/L + (ext. Resistor requ)
12		not connected		24	С	LED-B/L -

	SPI Mode (Solder link changed to "SPI")													
Pin	Symbol	Function		Pin	Symbol	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	А	LED-B/L + (ext. Resistor requ)								
12		not connected		24	С	LED-B/L -								

BACKLIGHT

Using the LED backlight requires an current source or external current-limiting resistor. Forward voltage for white LED backlight is $3.0 \sim 3.6V$. Please take care of derating for $T_a > +25^{\circ}C$

<u>Attention:</u> 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.

TABEL OF COMAND (KS0073, IE=HIGH)

	Bit RS RW 7 6 5 4 3 2 1 0										Execute			
Instruction		RS	R/W									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 Made Cot	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	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	С		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	нз	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			A	С			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	*	*		A	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	*			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			,	Write	e Dat	a			Writes data into internal RAM (DD RAM / CG RAM / SEGRAM)	43µs	
Read Data	*	1	1			I	Read	Dat	a			Reads data from internal RAM (DD RAM / CG RAM / SEGRAM)	43µs	



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	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	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 !

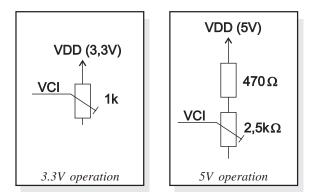
CHARACTER SET

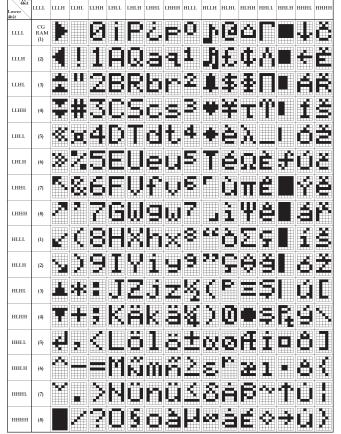
Beside there's a copy of built.in character set. In addition to that up to 8 individual character can be created.

CONTRAST ADJUSTMENT

Contrast will be set by pin 3 (VCI).

Module EA DIP204 comes with built-in temperature compensation for -20..+70°C as a standard; any contrast adjustment while operation is no longer required.

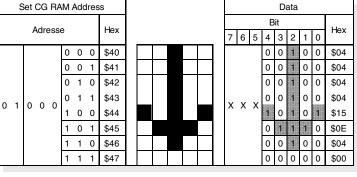




CREATING YOUR OWN CHARACTERS

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.

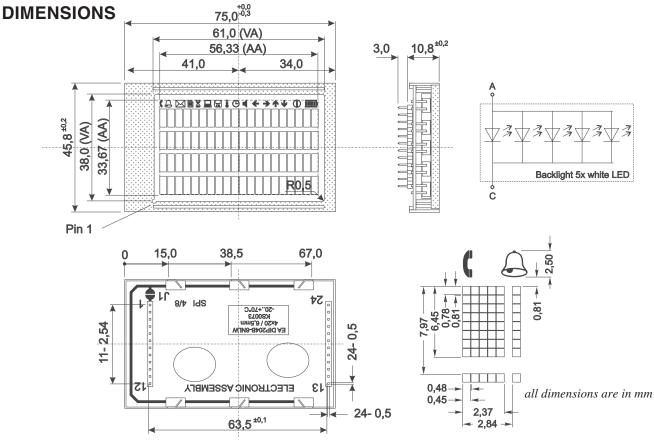
- 1.) The command "CG RAM Address Set" defines the ASCII code (Bit 3,4,5) and the dot line (Bit 0,1,2) of the new character. Example demonstrates creating ASCII code \$00.
- 2.) Doing 8 times the write command "Data Write" defines line by line the new character. 8th. byte stands for the cursor line.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





EADIP204-6

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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.

4 DB3 AC 0	DB2	DB1			Note perhaps store current DDRAM adress: read AC and save as LASTADR=AC Set to 8 bit data length, RE=1, Blink enable BE=1	
	1	1	0		and save as LASTADR=AC	
0	1	1	0	\$36	Set to 8 bit data length, RE=1, Blink enable BE=1	
		0 1 1 0 1 1 0 \$36 Set to 8 bit data length, RE=1, B				
1 0 0 0 0 1 0 \$42 Set Icon-RAM adress to \$02 (letter sy				Set Icon-RAM adress to \$02 (letter symbol)		
0	0	0	0	\$10	Write \$10 to display symbol	
0 1 1 0 0			0	\$30	Set to 8 bit data length, extension bit RE=0	
LASTA	DR			\$80	Restore DDRAM adress	
	0	0 0 0 0 LASTADR	0 0 0	0 0 0 0	0 0 0 0 \$30	

è	Icon - Symbols																				
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'	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

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 **4/8** has to be opened and closed to **SPI** side. Harware specification for serial operation mode is written down in user manual for KS0073: <u>http://www.lcd-module.de/eng/pdf/zubehoer/ks0073.pdf</u>. Software for initialisation and programming keeps the same.



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