

LCD- MODUL 4x20 - 6.45mm**INCL. CONTROLLER KS0073****no more mounting
required****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
- * $U_{f(LED)} = 3.0\sim 3.6V$
- * 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

**ELECTRONIC
 ASSEMBLY** GMBH

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PINOUT

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

SPI Mode (Solder link changed to "SPI")			
Pin	Symbol	Function	
1	VSS	Power Supply 0V (GND)	
2	VDD	Power Supply +5V	
3	VCI	Contrast Adjustment	
4	RES	L: Reset	
5	CS	Chip Select	
6	SID	Data In	
7	SCLK	Shift Clock	
8		not connected	
9		not connected	
10		not connected	
11		not connected	
12		not connected	
13		not connected	
14	VSS	Power Supply 0V (GND)	
15	SOD	Data Out	
16		not connected	
17		not connected	
18		not connected	
19		not connected	
20		not connected	
21		not connected	
22		not connected	
23	A	LED-B/L + (ext. Resistor requ)	
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 $T_a > +25^\circ\text{C}$

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.

TABEL OF COMAND (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
Display On/Off Control	0	0	0	0	0	0	0	1	D	C	B	Segment bidirectional function (BID=0: Seg1->Seg60; BID=1: Seg60->Seg1) 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
CG RAM Address Set	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
SEG 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
DD 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

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	con RAM address: \$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

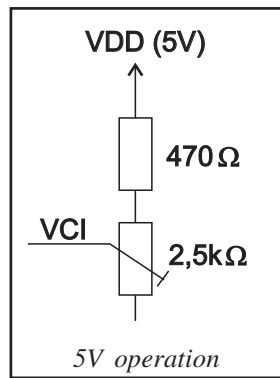
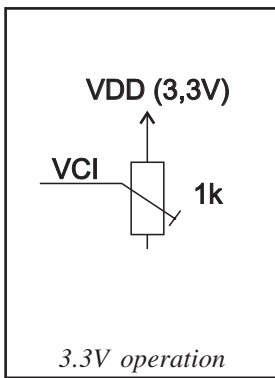
Please make shure that software will check busy-flag before writing any command !

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.



Upper bit	Lower bit	LLLL	LLLH	LLHL	LLHH	LHLH	LHLH	LHLL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLH	HHLH	HHHL	HHHH
CG RAM (1)	(1)	▶	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(2)	(2)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(3)	(3)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(4)	(4)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(5)	(5)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(6)	(6)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(7)	(7)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(8)	(8)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(1)	(1)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(2)	(2)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(3)	(3)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(4)	(4)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(5)	(5)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(6)	(6)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(7)	(7)	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(8)	(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	Bit					Hex		
7	6	5	4		3	2	1	0	Hex	
0	1	0	0	0	0	0	0	0	\$04	
					0	0	1	0	0	\$04
					0	1	0	0	0	\$04
					0	1	1	0	0	\$04
					1	0	0	0	0	\$15
					1	0	1	0	0	\$0E
					1	1	0	0	0	\$04
					1	1	1	0	0	\$00

