

INCL. CONTROLLER KS0073

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FEATURES

- * HIGH-CONTRAST LCD-SUPERTWIST DISPLAY
- * BLUE BACKGROUND 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

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 ASSEMBLY**
 making things easy

PINOUT

4-/8-Bit Mode (Factory 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	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 changed to "SPI")			
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	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 $T_a > +25^{\circ}\text{C}$

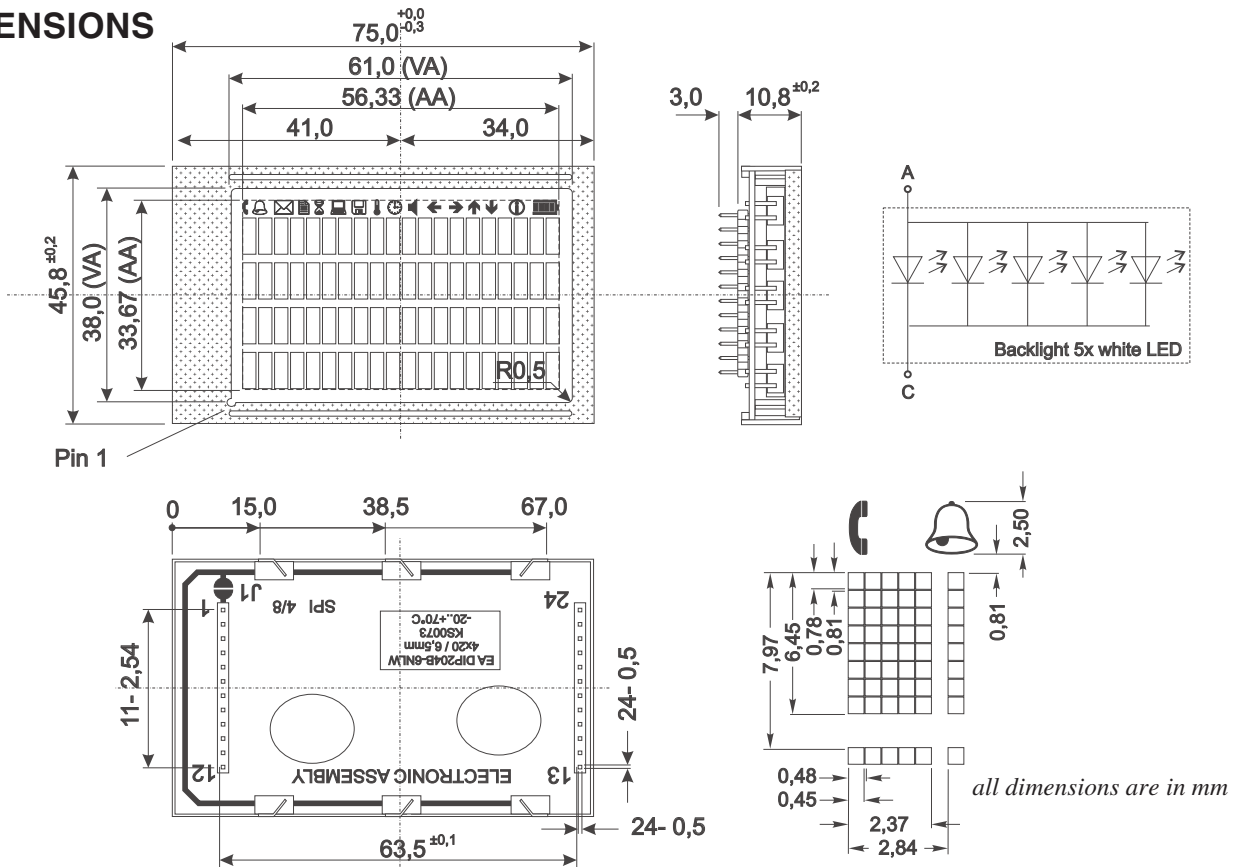
Attention: Do never drive backlight directly to 5V; this may damage backlight immediately !

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	RW	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	0	1	1	BID	Segment bidirectional function (BID=0: Seg1->Seg60; BID=1: Seg60->Seg1)	39µs
extended Function Set	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
Cursor / Display Shift	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
Scroll Enable	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
Function Set	1	0	0	0	0	0	1	H4	H3	H2	H1	Determine the line for horizontal scroll	39µs
CG RAM Address 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
SEG 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
DD 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
Set Scroll Quantity	1	0	0	0	1	*					SQ	Sets the SEG RAM address. SEG RAM data is sent and received after this setting.	39µs
Busy Flag / Address Read	*	0	1								AC	Sets the DD RAM address. DD RAM data is sent and received after this setting.	39µs
Write Data	*	1	0									Writes data into internal RAM (DD RAM / CG RAM / SEGRAM)	43µs
Read Data	*	1	1									Reads data from internal RAM (DD RAM / CG RAM / SEGRAM)	43µs

DIMENSIONS



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.

SERIAL MODE SPI

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. Hardware specification for serial operation mode is written down in user manual for KS0073: <http://www.lcd-module.de/eng/pdf/zubehoer/ks0073.pdf>. Software for initialization and programming keeps the same.

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 address: 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 address 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								Restore DDRAM address

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