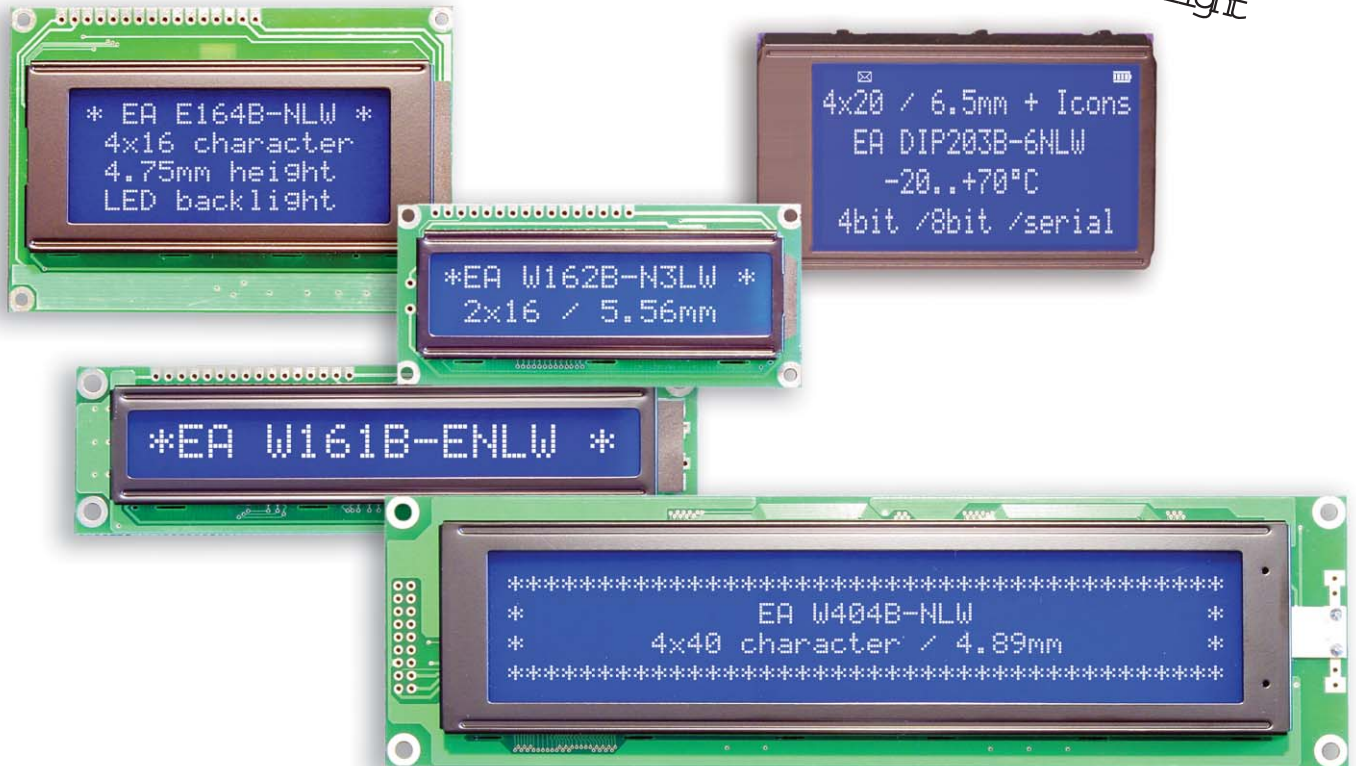


BLUELINE

Issue 07.2021

DOTMATRIX DISPLAYS 1x16..4x40

*15..100mA only
incl. LED backlight*



FEATURES

- * SUPERTWIST BLUE NEGATIVE
- * WITH WHITE LED BACKLIGHT
- * EXTREME POWER SAVING: LED CURRENT 15mA OFF (max. 75mA)
- * CHARACTER HEIGHT 4.75..12.7mm
- * ALL DISPLAYS WITH INTEGRATED CONTROLLER
- * INTERFACE FOR 8-BIT BUS (ALSO 4 BIT) OR ALTERNATIVELY VIA RS-232 INTERFACE
- * ALPHANUMERIC: ASCII CHARACTER SET+SPECIAL CHARACTER+8 FREE DEFINABLE
- * POWER SUPPLY +5V
- * OPERATING TEMPERATURE RANGE -20°C ... +70°C (SOME 0..+50°C)
- * STORAGE TEMPERATURE -30..+80°C (SOME -20..+70°C)

ACCESSORIES

- * FRONTAL BEZEL WITH ANTIGLARE WINDOW: SERIES **EA 017-xxUKE**
- * RS-232 OR RS-422 INTERFACE **EA 9707-V24S**



COMMAND SET HD44780

Instruction	Code										Description	Execute Time (max.)	
	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).	1.64ms	
Cursor At Home	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.	1.64ms	
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets the Cursor move direction and specifies or not to shift the display. These operation are performed during data write and read.	40µs	
Display On/Off Control	0	0	0	0	0	0	1	D	C	B	Sets ON/OFF of all display (D) cursor ON/OFF (C), and blink of cursor position character (B).	40µs	
Cursor / Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the Cursor and shifts the display without changing DD RAM contents.	40µs	
Function Set	0	0	0	0	1	DL	N	F	*	*	Sets interface data length (DL) number of display lines (N) and character font (F).	40µs	
CG RAM Address Set	0	0	0	1	ACG							Sets the CG RAM address. CG RAM data is sent and received after this setting.	40µs
DD RAM Address Set	0	0	1	ADD							Sets the DD RAM address. DD RAM data is sent and received after this setting.	40µs	
Busy Flag / Address Read	0	1	BF	AC							Reads Busy flag (BF) indicating internal operation is being performed and reads address counter contents.	-	
CG RAM / DD RAM Data write	1	0	Write Data								Writes data into DD RAM or CG RAM	40µs	
CG RAM / DD RAM Data Read	1	1	Read Data								Reads data from DD RAM or CG RAM	40µs	

Hint

The execution time shown in table are valid with active check for „Busy Flag“ only; that means that before reading or writing data from or to the display the „Busy Flag“ BF needs to be checked for „0“. If there's no explicit „Busy Flag“ check but delay then execution time may be definitely longer. The 4 bit mode requires the „Busy Flag“ check every byte only.

Explanation:

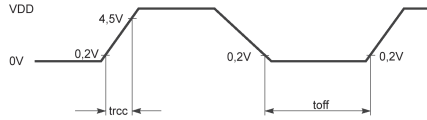
- I/D 1: DD-RAM increment address automatically
- S 1: Shift display content after read/write
- D 1: Display on
- C 1: Cursor visible
- B 1: Character blinks
- S/C 1: Shift display for 1 position (direction depends on R/L)
- R/L 1: Shift to the right
- DL 1: Interface: 8-Bit data bus (DB0..7)
- N 1: 2-line display (also 8+8)
- F 1: 5x10 dot display
- BF 1: Controller st busy
- 0: Decrement DD-RAM address automatically
- 0: Move cursor after read/write
- 0: Display off
- 0: Cursor invisible
- 0: Static character
- 0: Shift cursor for 1 position
- 0: Shift to the left
- 0: Interface: 4-Bit data bus (DB4..7)
- 0: 1-line display
- 0: 5x7 dot display
- 0: Controller is ready to receive new data

RELATIONSHIP DD-RAM ADDRESS AND POSITION ON DISPLAY

Displaytyp	Anfangs - Endadresse (HEX)				Bemerkung
	1.Zeile	2.Zeile	3.Zeile	4.Zeile	
1x8	\$00-\$07				
1x16	\$00-\$0F				MUX 1:8
1x16(8+8)	\$00-\$07				MUX 1:16 (linke Hälfte) (rechte Hälfte)
	\$40-\$47				
1x20	\$00-\$13				
1x40	\$00-\$27				
2x8	\$00-\$07	\$40-\$47			
2x12	\$00-\$0B	\$40-\$4B			
2x16	\$00-\$0F	\$40-\$4F			
2x20	\$00-\$13	\$40-\$53			
2x24	\$00-\$17	\$40-\$57			
2x40	\$00-\$27	\$40-\$67			
4x16	\$00-\$0F	\$40-\$4F	\$10-\$1F	\$50-\$5F	Kontroller HD44780
	\$00-\$13	\$40-\$53	\$14-\$27	\$54-\$67	
4x20	\$00-\$13	\$20-\$33	\$40-\$53	\$60-\$73	Kontroller KS0073
	\$00-\$27	\$40-\$67	-	-	1. Kontroller (Enable 1)
4x40	-	-	\$00-\$27	\$40-\$67	2. Kontroller (Enable 2)

POWER-ON-RESET

The internal Power-On-Reset works only at following conditions:



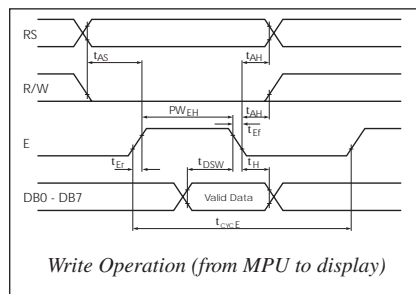
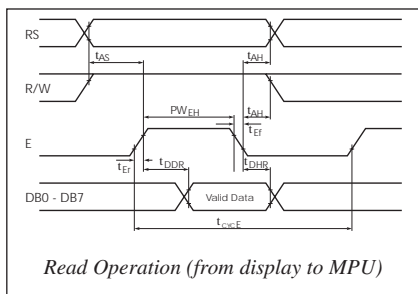
Item	Symbol	Standard Value			Unit
		min	typ	max	
Power Supply Rise Time	trcc	0,1	-	10	ms
Power Supply Off Time	toff	1	-	-	ms

Item	Symbol	Measuring Conditions	Standard Value			Unit
			min.	typ.	max.	
Enable Cycle Time	tCYCE	see Figs.1 and 2	1000	-	-	ns
Enable Pulse Width, High Level	PWEH	see Figs.1 and 2	450	-	-	ns
Enable Rise and Delay Time *)	tER, tEF	see Figs.1 and 2	-	-	25	ns
Address Setup Time, RS, R/W-E	tAS	see Figs.1 and 2	140	-	-	ns
Data Delay Time	tDDR	see Fig.2	-	-	320	ns
Data Setup Time	tDSW	see Fig.1	195	-	-	ns
Data Hold Time	tH	see Fig.1	10	-	-	ns
Data Hold Time	tDHR	see Fig.2	20	-	-	ns
Address Hold Time	tAH	see Figs.1 and 2	10	-	-	ns

*) Important parameter!
Use "74LS" or "74HC" gate

VCC=5,0V ±5%, Ta=25°C

Input E (Enable) is the control pin for data lines DB0 to DB7. At E = H and R/W = 1 (µC reads data from display) the LCD controller switches it's data lines to output. Writing data from µC to the display will be done at the falling edge of E (Enable). The fall time of Enable signal (max. 25ns) is essential for an error free communication. IDC cable may deform signals even at a length of 20cm (depends on driver circuit, ambient condition, noise pinout etc.). Improvement can be done with:



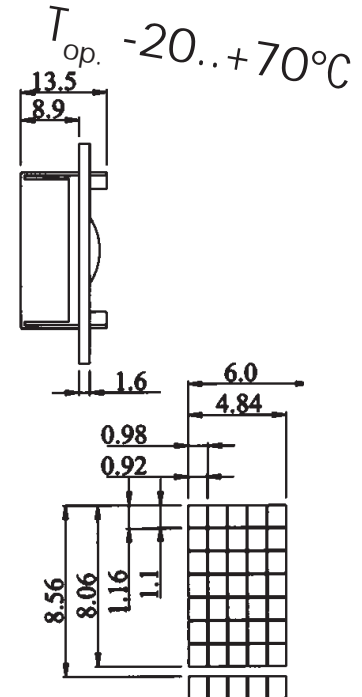
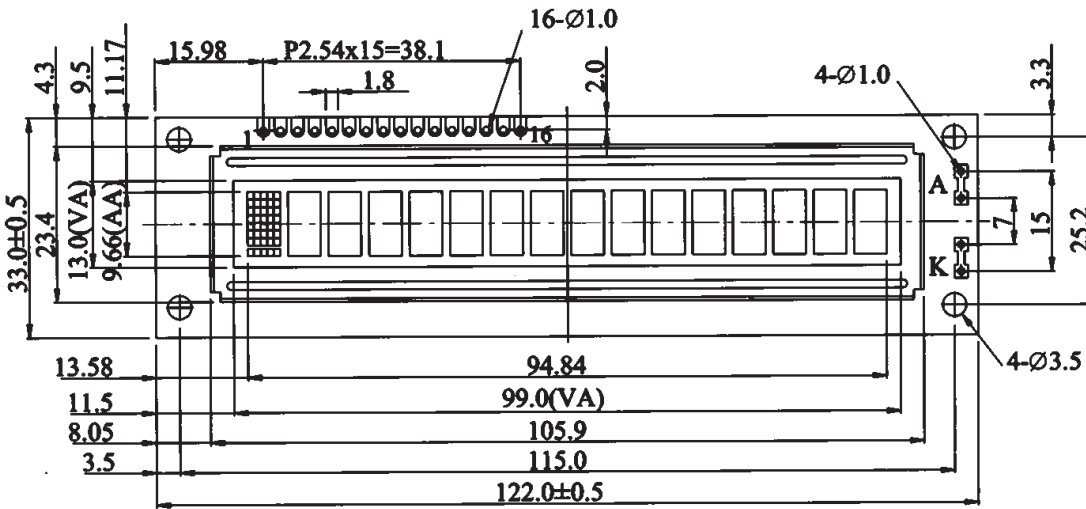
- "slower" data communication via port pins (if data setup or data hold time is too short)
- Pull-Up resistor connected directly to the „E“ pin at display side
- better driver on µC side
- Schmitt trigger on display side for Enable line
- shorten the cable (max. 10cm)

INITIALISIERUNGSBEISPIEL FÜR DEN 4-BIT MODUS							
Befehl	RS	R/W	DB7	DB6	DB5	DB4	Bemerkung
Function Set	0	0	0	0	1	0	4-Bit Datenlänge einschalten (noch im 8-Bit Modus)
Function Set	0	0	0	0	0	0	4-Bit Datenlänge, 1-zeiliges Display, 5x7 Font
Display ON/OFF	0	0	0	0	0	0	Display ein, Cursor ein, Cursor blinken
Clear Display	0	0	0	0	0	0	Display löschen, Cursor auf 1. Spalte von 1. Zeile
Entry Mode Set	0	0	0	0	0	0	Cursor Auto-Increment

INITIALISIERUNGSBEISPIEL FÜR DEN 8-BIT MODUS											
Befehl	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Bemerkung
Function Set	0	0	0	0	1	1	0	0	0	0	8-Bit Datenlänge, 1-zeiliges Display, 5x7 Font
Display ON/OFF	0	0	0	0	0	0	1	1	1	1	Display ein, Cursor ein, Cursor blinken
Clear Display	0	0	0	0	0	0	0	0	0	1	Display löschen, Cursor auf 1. Spalte von 1. Zeile
Entry Mode Set	0	0	0	0	0	0	0	1	1	0	Cursor Auto-Increment

EA W161B-ENLW

1x16 CHARACTER 9,66mm



Kompatibilität mit EA E161-ENLW		
Tätigkeit	Werte	Anmerkung
Widerstand RA einlöten	RA = 56 Ohm	I _{LED} = max. 30mA

LED current max. 30mA@+25°C
external series resistor at Pin 15 and 16 required
VEE= typ. 4,5V@20°C

ORDERING CODE

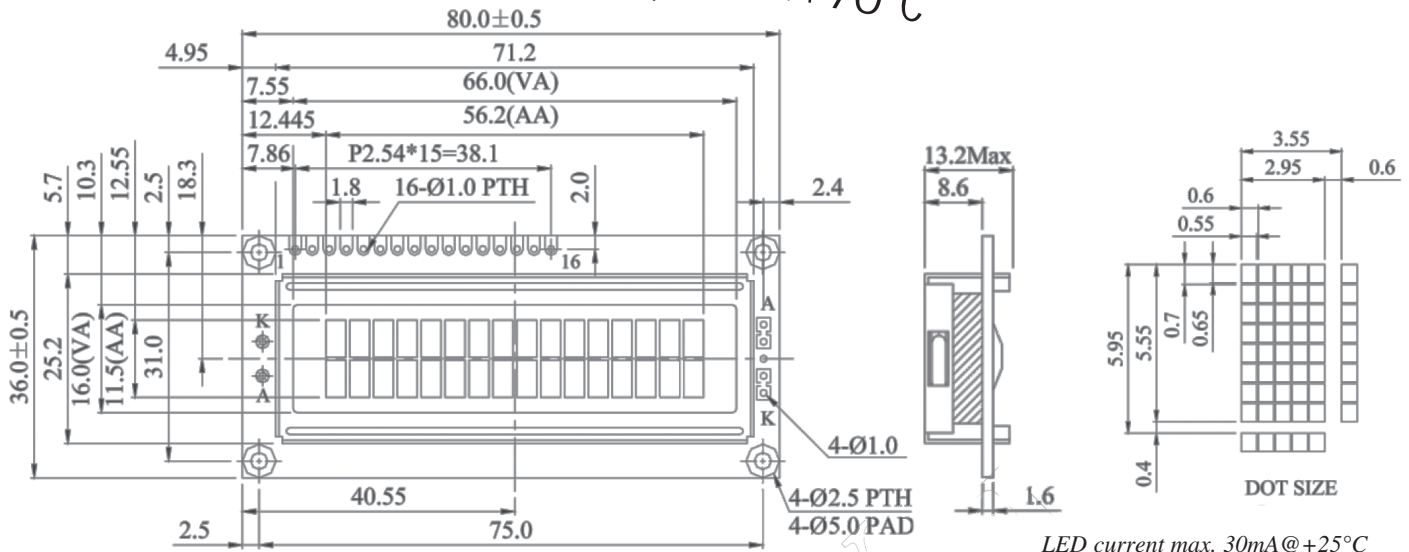
1x16 CHARACTER, 9,66mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 98,5x12,8mm)

EA W161B-ENLW
EA 017-6UKE

EA W162B-N3LW

2x16 CHARACTER 5,56mm

$T_{op.} -20..+70^{\circ}C$



LED current max. 30mA@+25°C
external resistor at Pin 15 and 16
required
VEE= typ. 3,4V@+20°C

ORDERING CODE

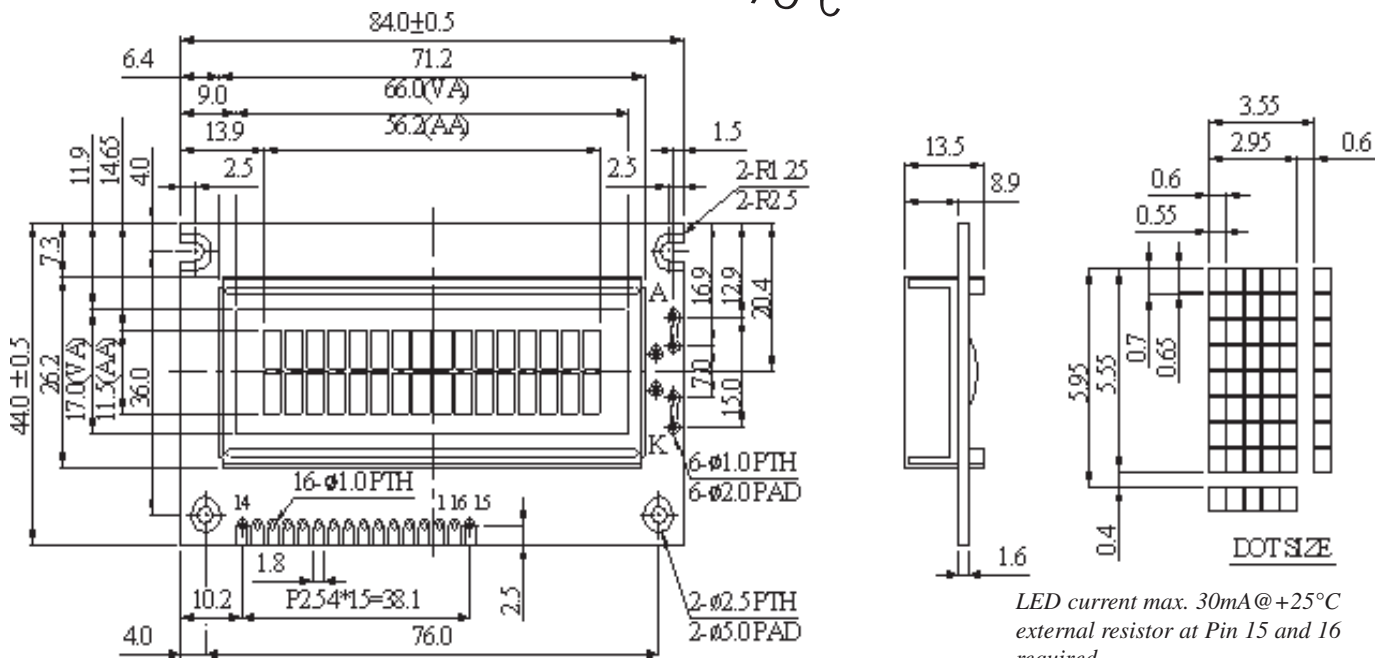
2x16 CHARACTER, 5,56mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 60,0x14,8mm)

EA W162B-N3LW
EA 017-2UKE

EA W162B-NLW

2x16 CHARACTER 5,56mm

$T_{op.} -20..+70^{\circ}C$



LED current max. 30mA@+25°C
external resistor at Pin 15 and 16
required
VEE= typ. 3,7V@+20°C

ORDERING CODE

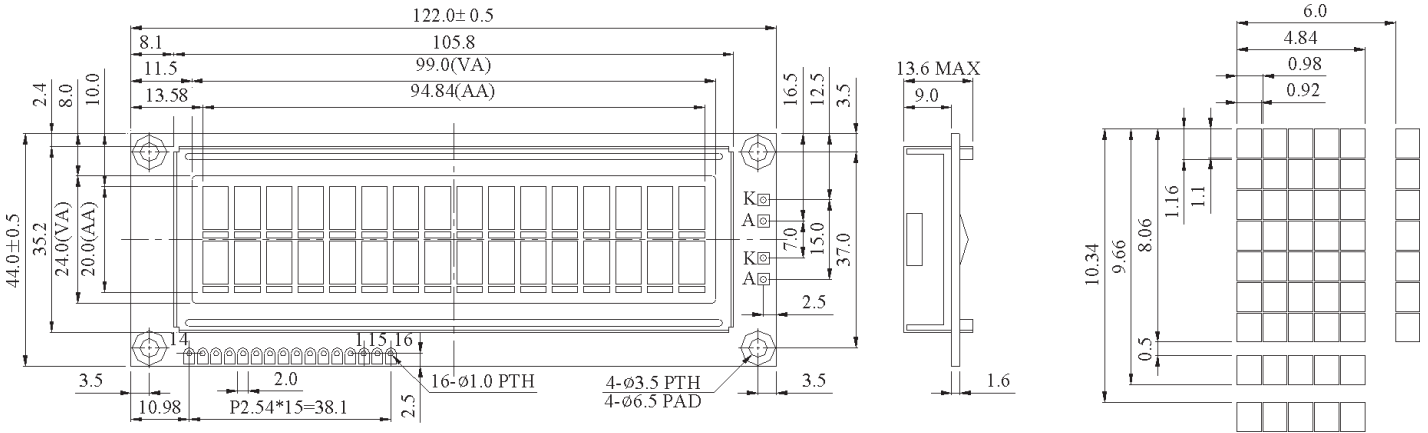
2x16 CHARACTER, 5,56mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 60,0x14,8mm)

EA W162B-NLW
EA 017-2UKE

EA W162B-BNLW

$T_{op.} -20..+70^{\circ}C$

2x16 CHARACTER 9,66mm



Kompatibilität mit EA E162-BNLW		
Tätigkeit	Werte	Anmerkung
Widerstand J15 nach rechts	J2 = 0 Ohm	Pins 15 und 16 freimachen, int. Versorgung über VDD/VSS; Beleuchtung nicht abschaltbar
Widerstand J16 nach rechts	J1 = 0 Ohm	
Widerstand RA austauschen	RA = 33 Ohm	I _{LED} = max. 45mA

LED current max. 45mA@+25°C
external resistor at Pin 15 and 16
required
VEE= typ. 4,4V@20°C

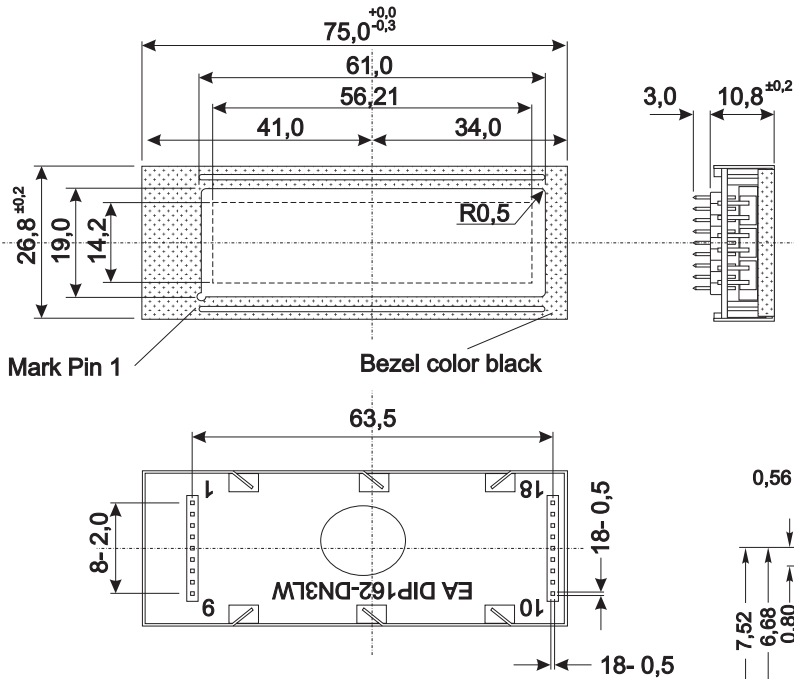
ORDERING CODE

2x16 CHARACTER, 9,66mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 97,4x22,4mm)

EA W162B-BNLW
EA 017-12UKE

EA DIP162-DN3LW

2x16 CHARACTER 6,68mm



$T_{op.} -20..+70^{\circ}C$
Temp.Comp. built-in

ORDERING CODE

2x16 CHARACTER, 6,68mm, BLUE/WHITE
BEZEL (WINDOW 60,0x14,8mm)

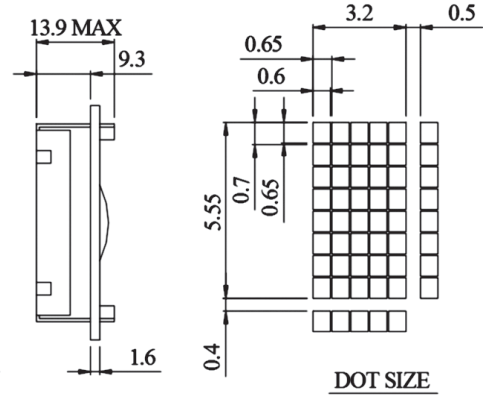
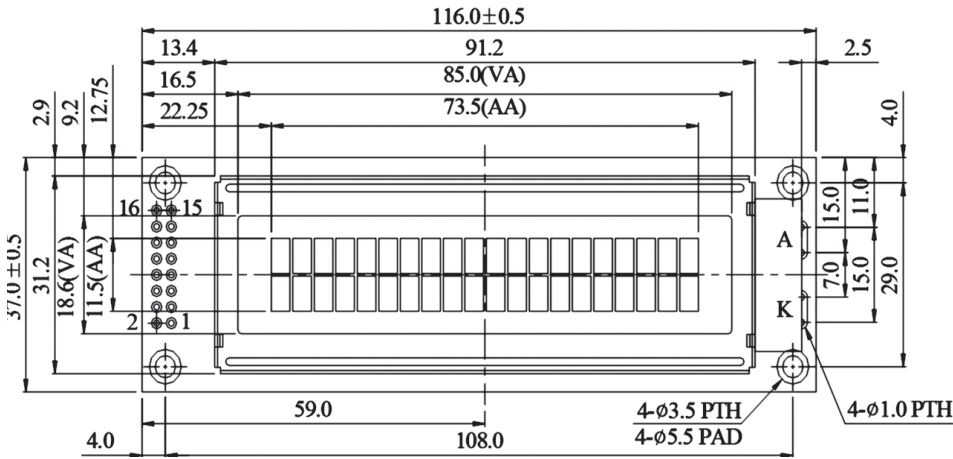
LED current max. 45mA@+25°C
external resistor at Pin 17 and 18
required
VEE= typ. 4,8V@+20°C

EA DIP162-DN3LW
EA 017-2UKE

EA W202B-NLW

2x20 CHARACTER 5,55mm

$T_{op.} -20..+70^{\circ}C$



LED current max. 30mA@+25°C
external resistor at Pin 15+ and 16-
required
VEE= typ. 4,4V@+20°C

ORDERING CODE

2x20 CHARACTER, 5,55mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 81,5x17,2mm)

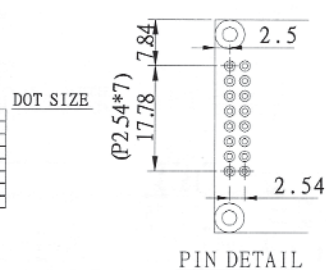
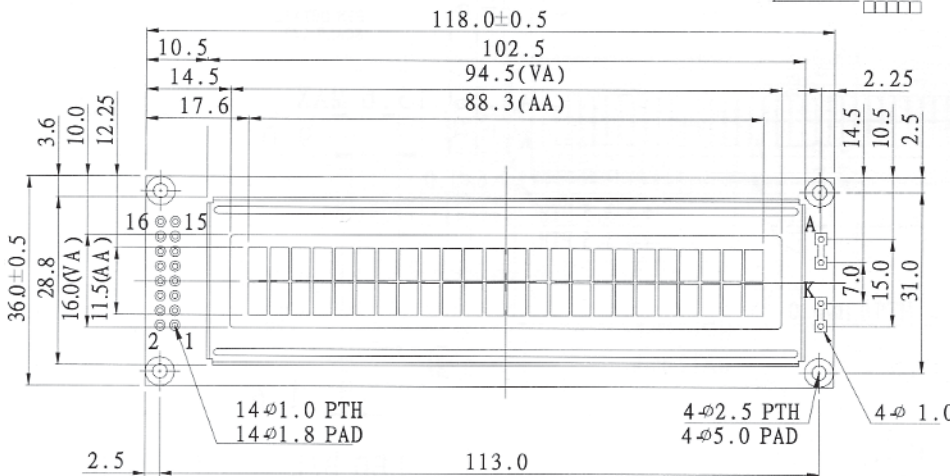
EA W202B-NLW
EA 017-7UKE

EA W242B-NLW

2x24 CHARACTER 5,55mm

$T_{op.} -20..+70^{\circ}C$

Kompatibilität mit EA E242-NLW		
Tätigkeit	Werte	Anmerkung
J15 und J16 öffnen		Pins 15 und 16 freimachen
Widerstände J1 und J2 einlöten	J1 = 0 Ohm J2 = 0 Ohm	Versorgung über VDD/VSS
Widerstand RA einlöten	RA = 33 Ohm	ILED= typ. 40mA



LED current max. 30mA@+25°C
VEE= typ. 4,8V@+20°C

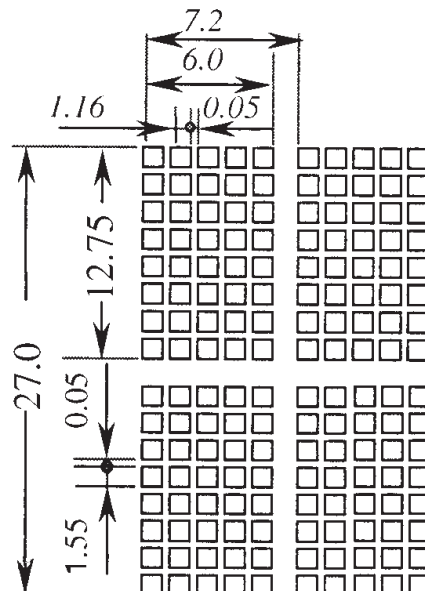
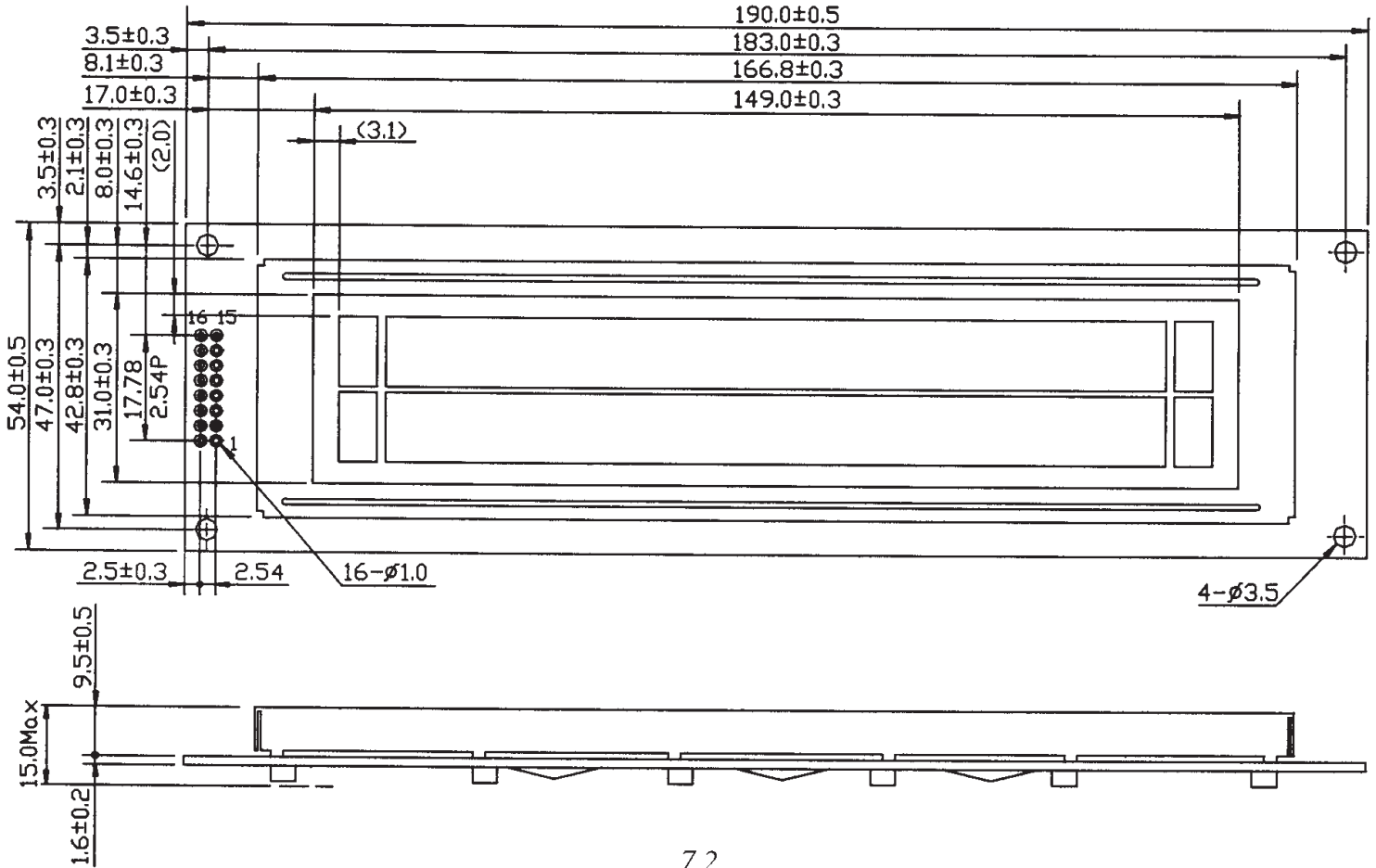
ORDERING CODE

2x24CHARACTER, 5,55mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 92,0x14,8mm)

EA W242B-NLW
EA 017-14UKE

EA E202-CNLW

2x20 CHARACTER 12,7mm
Operating temperature 0..+50°C



$T_{op.} 0..+50^{\circ}C$

LED current max. 60mA@+25°C
Pin 15+ and 16- directly at 5V

ORDERING CODE

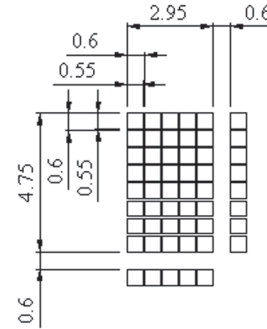
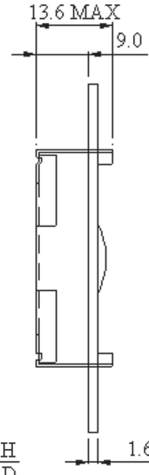
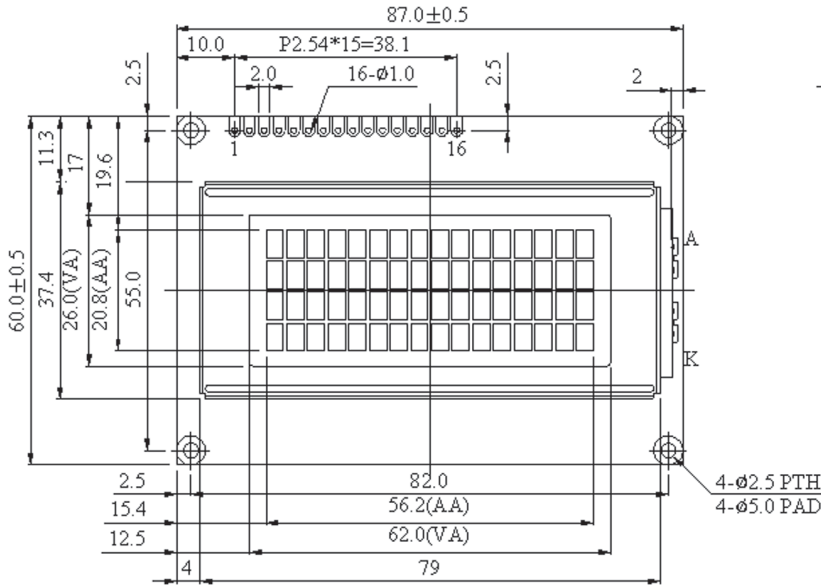
2x20 CHARACTER, 12,7mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 145,0x33,8mm)

EA E202-CNLW
EA 017-27KE

EA W164B-NLW

4x16 CHARACTER 4,75mm

$T_{op.} -20..+70^{\circ}C$
Temp.Comp. built-in



LED current max. 45mA@+25°C
external resistor at Pin 15+ and 16-
required
VEE= typ. 4,5V@+20°C

ORDERING CODE

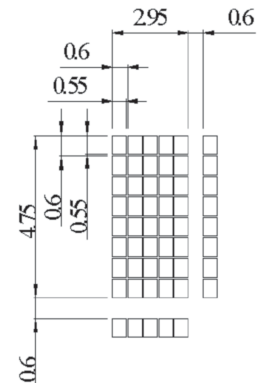
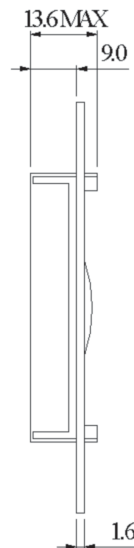
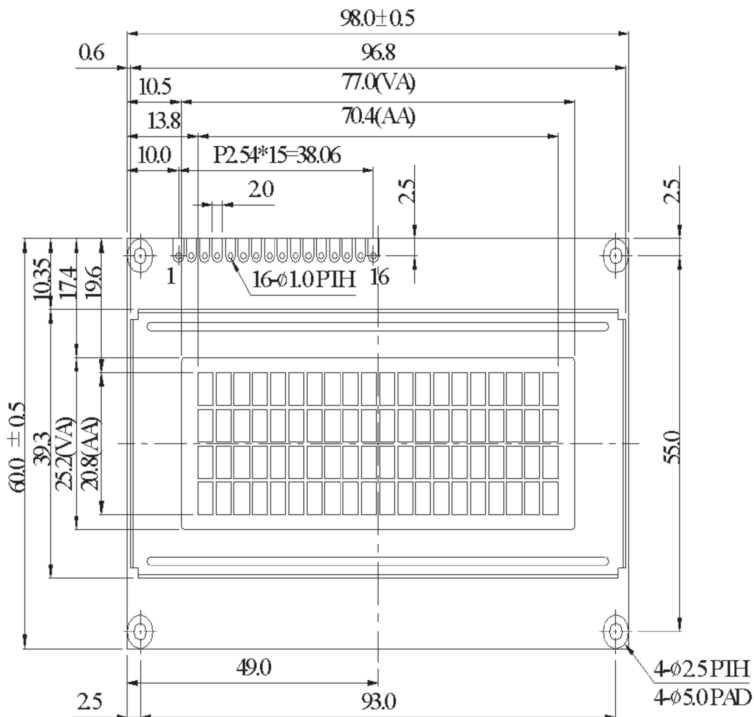
4x16 CHARACTER, 4,75mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 60,8x24,2mm)

EA W164B-NLW
EA 017-8UKE

EA W204B-NLW

4x20 CHARACTER 4,75mm

$T_{op.} -20..+70^{\circ}C$



LED current max. 45mA@+25°C
external resistor at Pin 15 and 16-
required
VEE= typ. 4,7V@+20°C

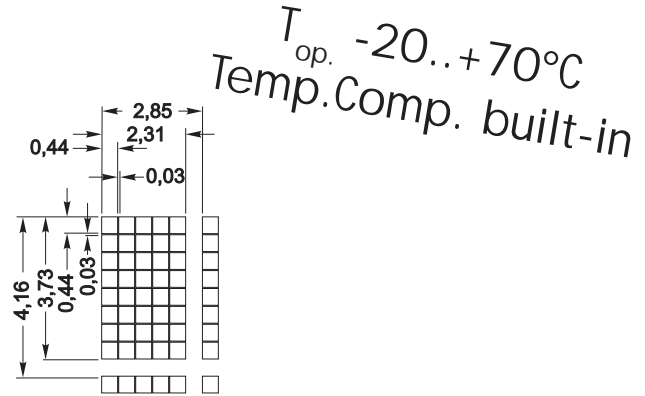
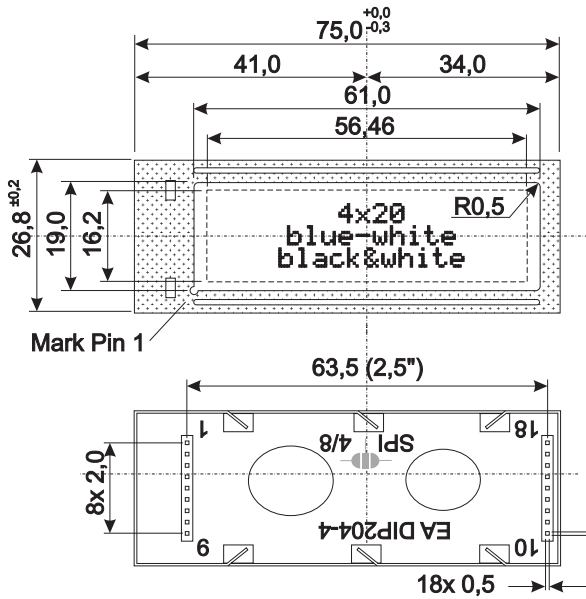
ORDERING CODE

4x20 CHARACTER, 4,75mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 75,0x24,2mm)

EA W204B-NLW
EA 017-9UKE

EA DIP203B-4NLW

4x20 CHARACTER 3,75mm



SPI Mode	Parallel Mode (Factory Set)

LED current max. 45mA@+25°C
external resistor at Pin 17 and 18
required

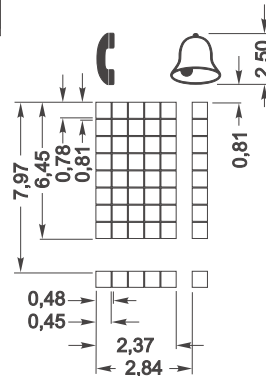
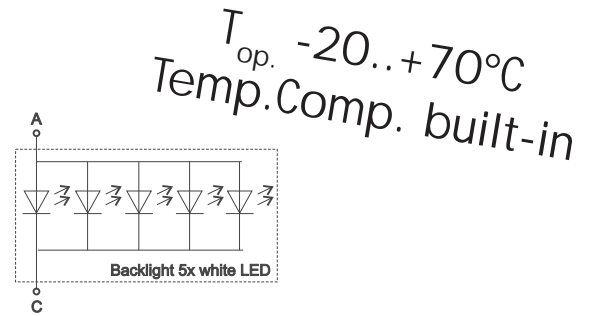
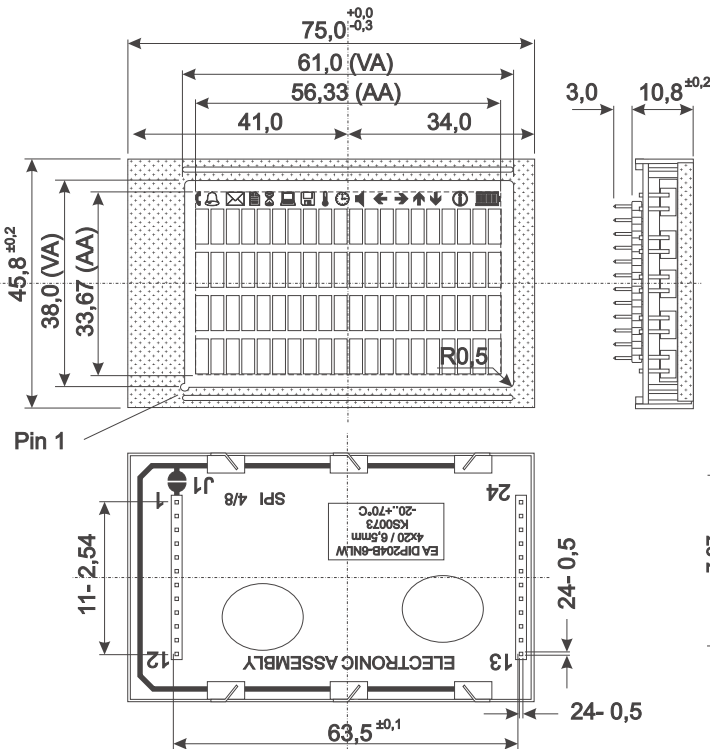
ORDERING CODE

4x20 CHARACTER, 3,75mm, BLUE/WHITE

EA DIP203B-4NLW

EA DIP203B-6NLW

4x20 CHARACTER 6,45mm



LED current max. 75mA@+25°C
external resistor at Pin 23 and 24
required

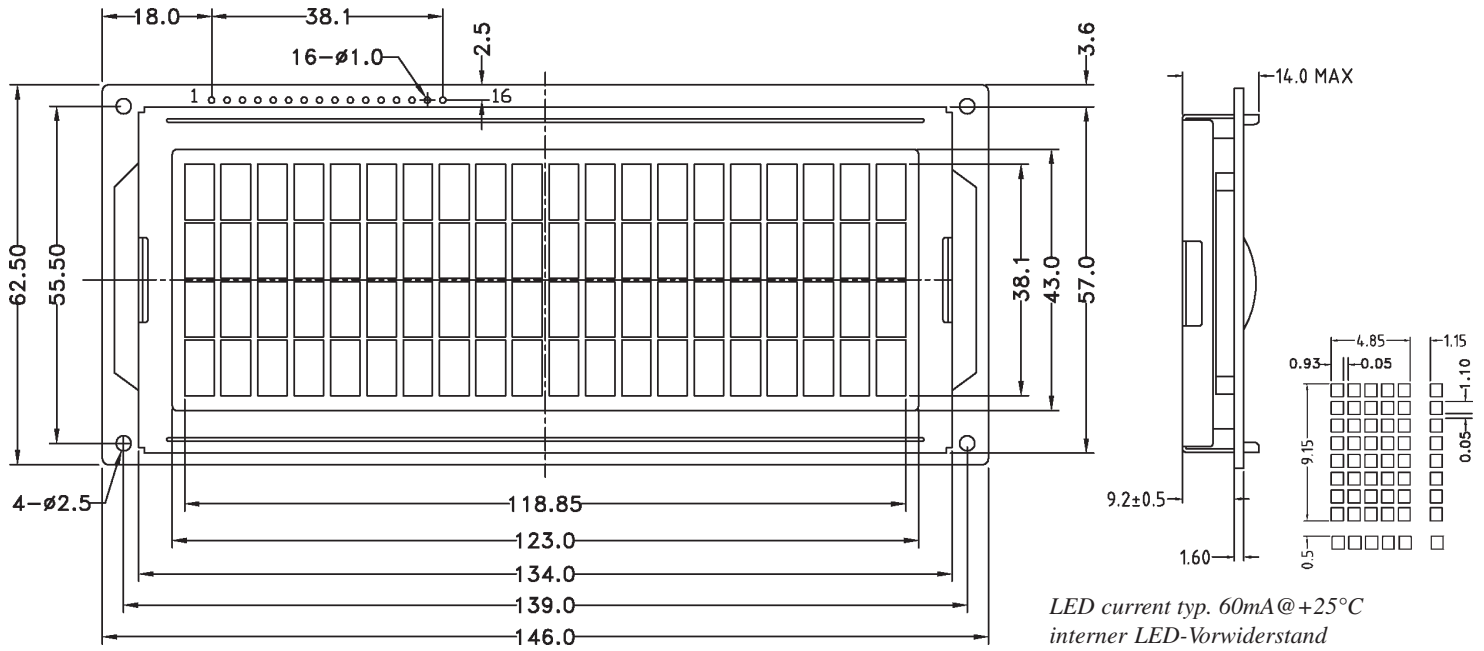
ORDERING CODE

4x20 CHARACTER, 6,45mm, BLUE/WHITE

EA DIP203B-6NLW

EA T204B-BNLW

4x20 CHARACTER 9,22mm



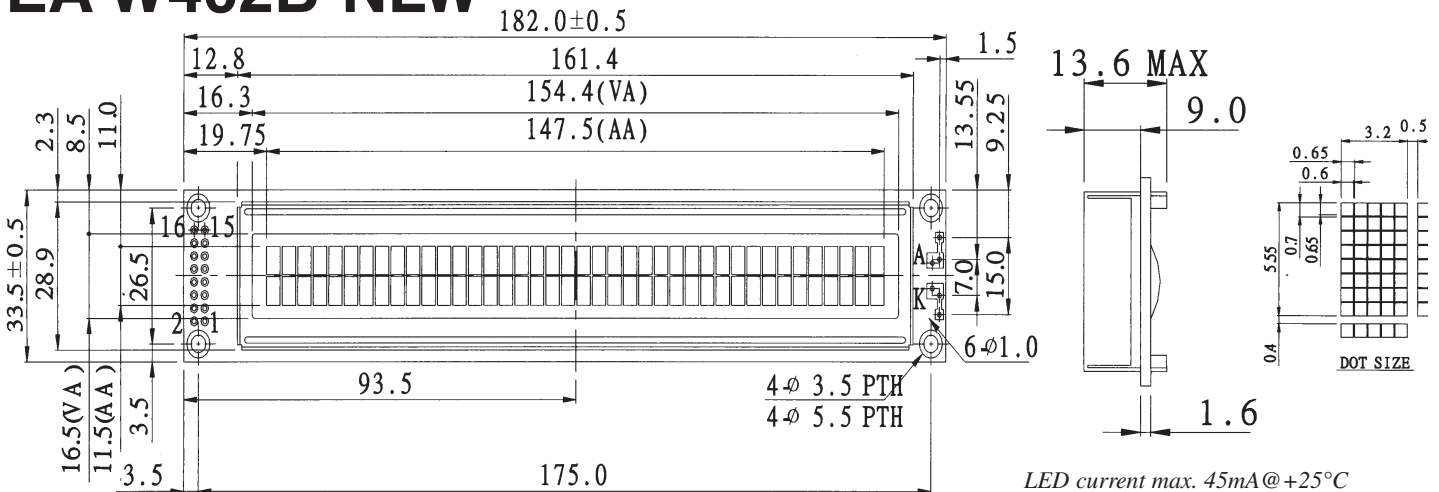
ORDERING CODE

4x20 CHARACTER, 9,22mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 121,0x41,5mm)

EA T204B-BNLW
EA 017-25KE

EA W402B-NLW

2x40 CHARACTER 5,55mm



LED current max. 45mA@+25°C
RV_{LED} extern required
VEE= typ. 4,5V@+20°C

$T_{op.} -20..+70^{\circ}C$

Kompatibilität mit EA E402-NLW		
Tätigkeit	Werte	Anmerkung
J15 und J16 öffnen		Pins 15 und 16 freimachen
Widerstände J1 und J2 einlöten	J1 = 0 Ohm J2 = 0 Ohm	Versorgung über VDD/VSS
Widerstand RA einlöten	RA = 38 Ohm	ILED= max. 45mA

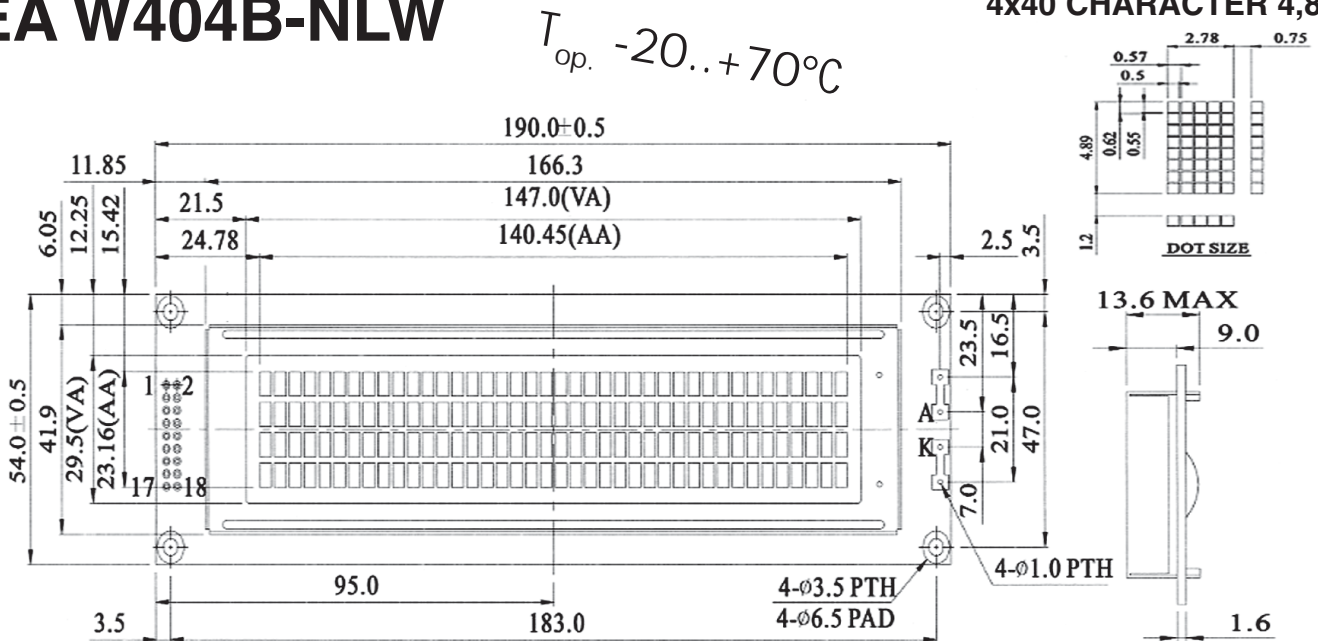
ORDERING CODE

2x40 CHARACTER, 5,55mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 153,0x14,8mm)

EA W402B-NLW
EA 017-4UKE

EA W404B-NLW

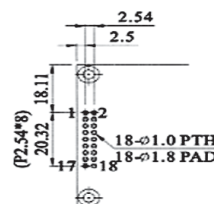
4x40 CHARACTER 4,89mm



LED current max. 75mA@+25°C
RV_{LED} extern required
VEE= typ. 4,8V@+20°C

$T_{op.} -20..+70^{\circ}C$

Kompatibilität mit EA E404-NLW		
Tätigkeit	Werte	Anmerkung
Widerstand J14 nach links	J14 = 0 Ohm	Pins 17 und 18 freimachen, Versorgung über VDD/VSS
Widerstand J13 nach unten	J13 = 0 Ohm	
Widerstand RA auswechseln	RA = 23 Ohm	ILED= max. 75mA



ORDERING CODE

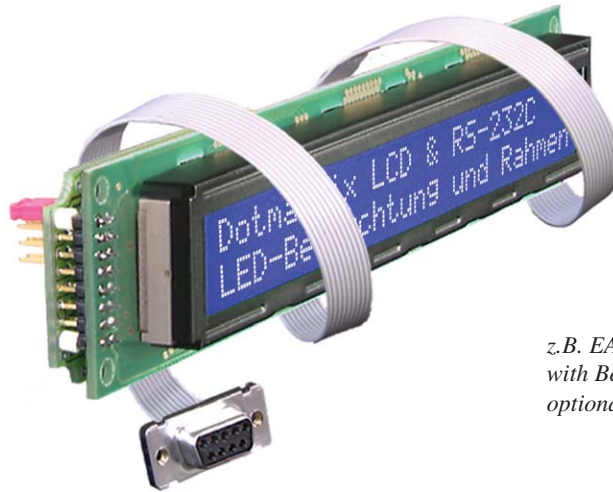
4x40 CHARACTER, 4,89mm, BLUE/WHITE, LED BACKLIGHT
BEZEL (WINDOW 145,0x28,0mm)

EA W404B-NLW
EA 017-13UKE

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BLUELINE DISPLAYS WITH RS-232 / RS-422



*z.B. EA SER402-NLW
with Bezel and
optionally cable EA KV24-9B*

FEATURES

- * SUPPLY VOLTAGE +5V
- * SET BAUDRATE BY JUMPER: 300, 1200, 2400 OR 9600 BAUD
- * AUTOMAT. LINE MANAGEMENT: CR / LF / SCROLL / PLACE CURSOR
- * MULTIPLE DISPLAYS AT 1 RS-232 LINE, ADDRESSABLE
- * SHIPMENT INCL. BEZEL WITH ANTIGLARE WINDOW

OPTIONALLY

- * DIP SWITCH INSTEAD OF SOLDER LINK TO SET THE ADDRESS: **EA OPT-DIP6**
- * RS-422 INTERFACE INSTEAD OF RS-232C (STANDARD): **EA OPT-RS422**

ACCESSORY

- * EA KV24-9B: CABLE WITH 9-PIN D-SUB CONNECTOR (FEMALE)

ORDERING CODE

1x16 CHARACTER, 9,66mm, RS-232
 2x16 CHARACTER, 5,56mm, RS-232
 2x16 CHARACTER, 5,56mm, RS-232
 2x16 CHARACTER, 9,66mm, RS-232
 2x20 CHARACTER, 5,55mm, RS-232
 2x20 CHARACTER, 12,7mm, RS-232
 2x24 CHARACTER, 5,55mm, RS-232
 4x20 CHARACTER, 4,75mm, RS-232
 2x40 CHARACTER, 5,55mm, RS-232
 4x40 CHARACTER, 4,89mm, RS-232

EA SER161-ENLW
EA SER162-N3LW
EA SER162-NLW
EA SER162-BNLW
EA SER202-NLW
EA SER202-CNLW
EA SER242-NLW
EA SER204-NLW
EA SER402-NLW
EA SER404-NLW