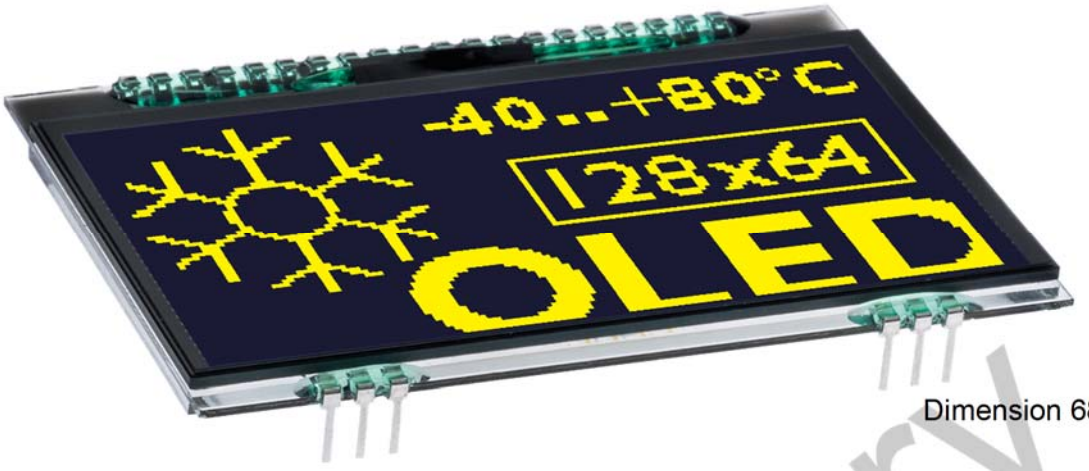
# EA OLEDL128-6

INCL CONTROLLER SSD1309 FOR SPI AND I²C




Dimension 68x51x3.3mm



## FEATURES

- 128X64 DOTS (RELATES TO 8x21 CHARACTER OR 4x16 LARGE CHARACTER)
- HIGH CONTRAST OLED DISPLAY
- INTEGRATED CONTROLLER SSD1309
- SPI INTERFACE: MOSI, CLK, CS, D/C
- I²C INTERFACE: SDA, SCL
- WIDE TEMPERATURE RANGE ($T_{OP}$ -40°C - +80°C)
- NO MOUNTING REQUIRED: JUST PUT INTO PCB
- 3 VERSIONS (WITH / W.O. POLARISOR AND PROTECTION GLASS) IN VARIOUS COLORS)
- FAST RESPONSE TIME, NO AFTERGLOW

## ORDERING CODES

| | |
|---|---|
| • GRAPHIC 128x64, with Polarisor and Protection Glass, Yellow | **EA OLEDL128-6GGA** |
| • GRAPHIC 128x64, with Polarisor, Yellow | **EA OLEDL128-6NGA** |
| • GRAPHIC 128x64, with Polarisor (Standard) | **EA OLEDL128-6LXA** |

X: G = Yellow
B = Blue
W = White
R = Red

## ACCESSORIES

| | |
|---|---|
| • SOCKET 4.8MM HOCH (2 PCS. ARE REQUIRED) | **EA FL-20P** |
| • TOUCHPANEL, 4-WIRE ANALOGUE SELF-ADHESIVE | **EA TOUCH128-2** |
| • ZIFF CONNECTOR FOR TOUCH, BOTTOM CONTACT | **EA WF100-04S** |

ELECTRONIC ASSEMBLY GmbH
Zeppelinstraße 19
D-82205 Gilching
Germany

Fon: +49 (0)8105-7780 90
Fax: +49 (0)8105-7780 99
e-Mail: info@lcd-module.de
Web: www.lcd-module.de

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## EA OLED SERIES

With its EA OLED series ELECTRONIC ASSEMBLY launches worldwide the first display family with OLED-technology for direct mounting and soldering. In comparison to standard displays there's no FFC/FPC cable/connector that may loose contact, this OLED series will be soldered directly or put into a standard 2.54 mm precision socket.
It is designed for compact handheld equipment and provides a lot real advantages:

- Extreme compact (68x51mm) with a large viewing area (64x37mm)
- Super flat with 2.4 mm (without frontal protection glass)
- SPI and I²C interface
- Simple mounting with direct soldering
- Ex stock available from 1 pc. off
- Long life time (80,000 h for yellow)
- Wide temperature range (-40..+80°C)
- Fast response time (10µs), no afterglow



## VERSIONS

The EA OLEDL128-6 is available in 3 different versions:
**EA OLEDL128-6LxA:**
This module is the standard module and does fit for the most applications. The flat design (2.4 mm) makes the display perfect for smallest equipment.
4 different colors are available with yellow, white, red and blue (see below).
**EA OLEDL128-6GGA:**
This module is perfect for rough environment. An additional frontal glass protects the display against scratch, shock and UV light. Thanks to its integrated polariser there's no need for an additionally smoked glass.
**EA OLEDL128-6NGA:**
This version is to become favourite for assembly behind a smoked glass. There's no protection glass or polariser which makes it with 2.4mm very flat. The advantage is a doubled brightness which makes it perfect in combination with the smoked glass. We recommend to put it behind a fully smoked glass front to make only the graphic visible, no edges, no print, no overhang.

## COLORS (EA OLEDL128-6LxA)

The standard version is available in 4 colors. Interface and software are 100% compatible. The yellow color provides highest brightness and longest life time:

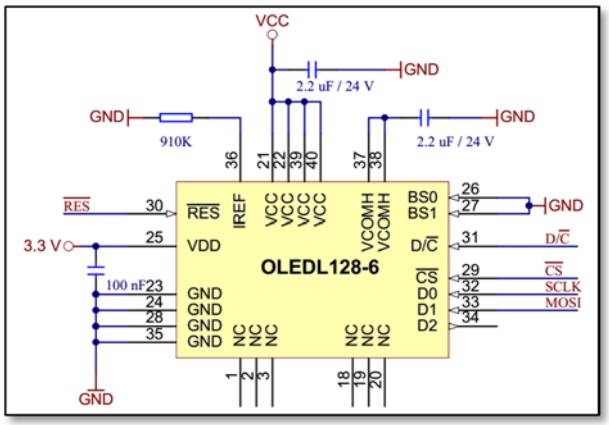
EA OLEDL128-6LGA

EA OLEDL128-6LWA

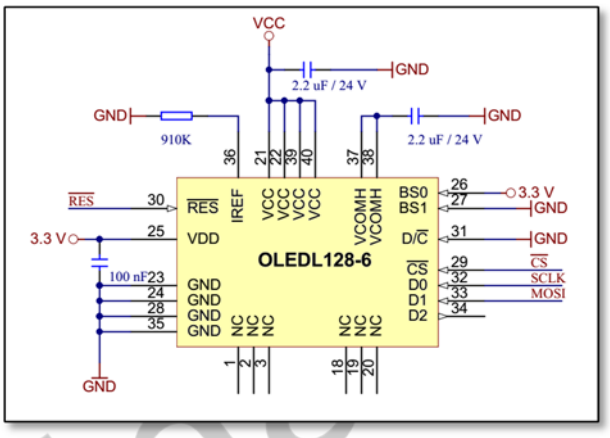
EA OLEDL128-6LRA

EA OLEDL128-6LBA

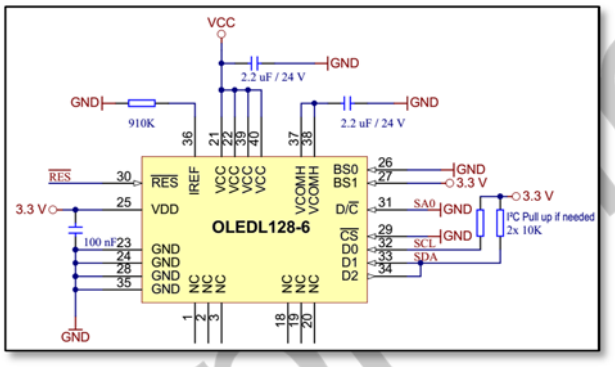
# APPLICATION EXAMPLES



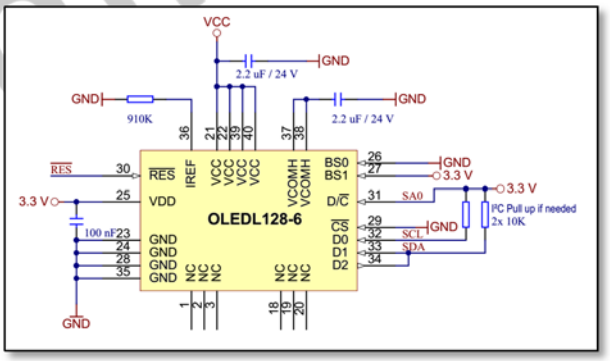

*4-Wire SPI*



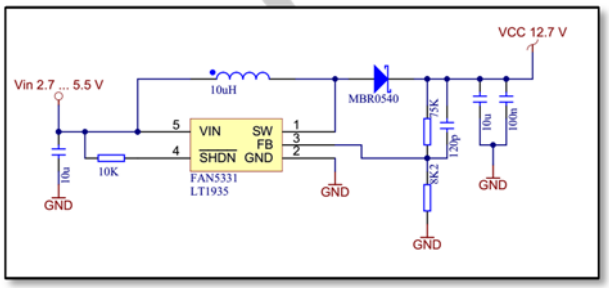

*3-Wire SPI*




*I²C Address 0x78*



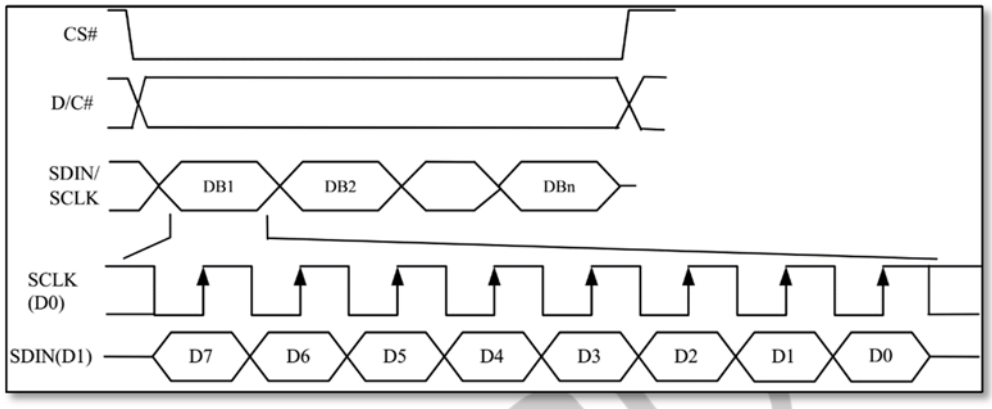

*I²C Address 0x7A*




*VCC – Generation: 12 V (FAN5331, LT1935)*

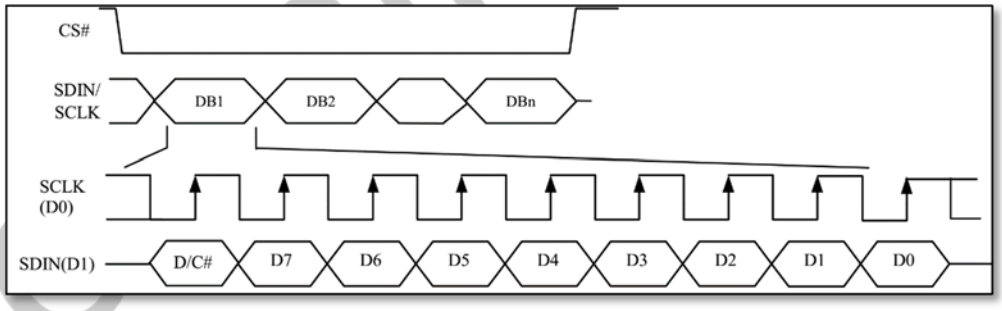
## DATA TRANSFER 4-WIRE SPI (8 BIT)

Data transmission for SPI is unidirectional, that means that data can only be written, there's no data read option. Selection for writing data or command is done with the D/C line. A busy check is not necessary at all. Clock rate may be up to 10 MHz. Data transmission is based on SPI mode 3, MSB first. For more details please refer to the controllers data sheet SSD1309.



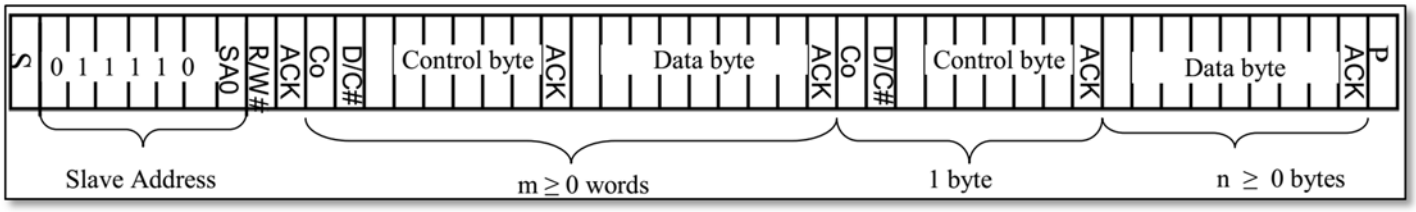

## DATA TRANSFER 4-WIRE SPI (9 BIT)

Data transmission for SPI is unidirectional, that means that data can only be written, there's no data read option. Selection for writing data or command is done with the first bit of the 9 bit data transfer. A busy check is not necessary at all. Clock rate may be up to 10 MHz. Data transmission is based on SPI mode 3, MSB first (9 bit). For more details please refer to the controllers data sheet SSD1309.




## DATA TRANSFER I²C

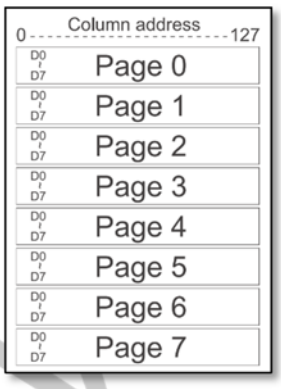
The I²C mode provides a bi-directional data transmission: That means that data can be written and read. With the pin SA0 the I²C address can be changed, so up to 2 displays may be driven on 1 bus. The clock rate may be up to 400 KHz. Please make sure when defining the pull-up resistors that the internal resistance of the display is 600..1000 Ω. This affects the low level when reading data and ACK bit.
**Attention:** When reading data, after the command for page- or column address there need to be a dummy read (discard the first byte).




Control byte: $C_o$ (Continuation bit) = 0 → Display data do follow; 1 → refer D/C bit

## GRAPHIC RAM

The EA OLEDL128-6 comes with an integrated display RAM. Each byte represents 8 dots. For more details please refer to the controllers data sheet SSD1309, available on our website at http://www.lcd-module.de/fileadmin/eng/pdf/zubehoer/ssd1309.pdf.




## COMMAND TABLE (ABSTRACT)

This is a collection of the most important commands. The data sheet SSD1309 provides the full list plus a detailed description.

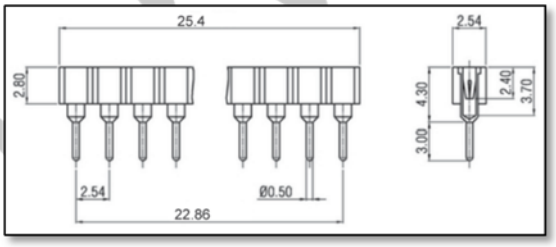
| Command | D/C | Command Code | | | | | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hex | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| Contrast Control | 0<br>0 | 81<br>7F | 1<br>$A_7$ | 0<br>$A_6$ | 0<br>$A_5$ | 0<br>$A_4$ | 0<br>$A_3$ | 0<br>$A_2$ | 0<br>$A_1$ | 1<br>$A_0$ | Double byte command to select 1 out of 256 contrast steps. Contrast increases as the value increases. |
| Display On / Off | 0 | AE/ AF | 1 | 0 | 1 | 0 | 1 | 1 | 1 | $X_0$ | $X_0$=0: Display OFF (sleep mode) (RESET)<br>$X_0$=1: Display ON in normal mode |
| Set Column address | 0<br>0<br>0 | 21<br>0<br>7F | 0<br>$A_7$<br>$B_7$ | 0<br>$A_6$<br>$B_6$ | 1<br>$A_5$<br>$B_5$ | 0<br>$A_4$<br>$B_4$ | 0<br>$A_3$<br>$B_3$ | 0<br>$A_2$<br>$B_2$ | 0<br>$A_1$<br>$B_1$ | 1<br>$A_0$<br>$B_0$ | Setup column start and end address<br>A[7:0] : Column start address, range : 0-127d, (RESET = 0)<br>B[7:0]: Column end address, range : 0-127d, RESET = 127)<br>Note: This command is only for horizontal or vertical addressing mode. |
| Set Page address | 0<br>0<br>0 | 22<br>0<br>7 | 0<br>X<br>X | 0<br>X<br>X | 1<br>X<br>X | 0<br>X<br>X | 0<br>X<br>X | 0<br>$A_2$<br>$B_2$ | 1<br>$A_1$<br>$B_1$ | 0<br>$A_0$<br>$B_0$ | Setup page start and end address<br>A[2:0] : Page start Address, range : 0-7d, (RESET = 0)<br>B[2:0] : Page end Address, range : 0-7d, (RESET = 7)<br>Note: This command is only for horizontal or vertical addressing mode. |
| Display Start Line | 0 | 40 – 7F | 0 | 1 | $A_5$ | $A_4$ | $A_3$ | $A_2$ | $A_1$ | $A_0$ | Set display RAM display start line register from 0-63 using $X_5X_3X_2X_1X_0$.<br>Display start line register is reset to 0 during RESET. |
| Segment remap | 0 | A0/ A1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | $X_0$ | $X_0$=0: column address 0 is mapped to SEG0 (RESET)<br>$X_0$=1: column address 127 is mapped to SEG0 |
| Com output scan direction | 0 | C0/ C8 | 1 | 1 | 0 | 0 | $X_3$ | 0 | 0 | 0 | $X_3$=0: normal mode (RESET) Scan from COM0 to COM[N –1]<br>$X_3$=1: remapped mode. Scan from COM[N-1] to COM0<br>Where N is the Multiplex ratio |
| RAM Data | 1 | XX | $D_7$ | $D_6$ | $D_5$ | $D_4$ | $D_3$ | $D_2$ | $D_1$ | $D_0$ | $D_7$-$D_0$ is written to RAM. |

# INITIALISATION EXAMPLE

```
void init_OLEDL128(void)
{
   send_command(0x40);                      //Set Display start line
   send_command(0xA0);                      //Bottom View no Segment remap
   send_command(0xC0);                      //Bottom View COM scan direction normal
   send_command(0xA6);                      //Display normal (RAM)
   send_command(0x81); send_command(0xFF);  //Set contrast to maximum
   send_command(0xD5); send_command(0x40);  //Clock divider/Oscillator frequency
   send_command(0xD9); send_command(0x44);  //Pre-charge Period
   send_command(0xAF);                      //Display on
}
```

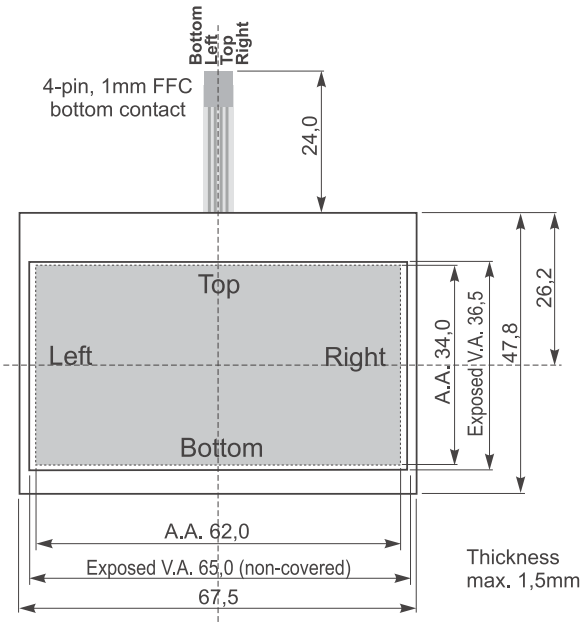
# ACCESSORY: SOCKET EA FL-20P

Using a 20-pin socket makes the display replaceable and adapts the height. Those socket may also be soldered automatically by wave soldering or reflow process. Each display requires 2 pcs.



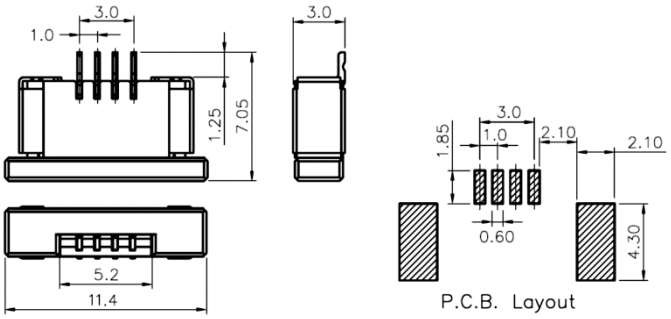

# ACCESSORY: TOUCHPANEL EA TOUCH128-2

As an accessory there is an analogue touchpanel available. It comes with a self-adhesive glue on its rear side. Connection is done via FFC, pitch 1.0 mm. Any standard ZIFF connector can be used (e.g. EA WF100-04S). Bending radius is minimum 5 mm. Interfacing to a processor can be either done by an external touch panel controller or with a controller that is featured with analogue input. The touch panel is similar to a potentiometer: connecting a voltage of e.g. 3.3 V to the pins Top-Bottom makes it possible to read out a voltage on pin Left or Right which is linear to the Y-coordinate of the pressed point. The X-coordinate will result when the voltage will be supplied to Left-Right and measurement is done at Top or Bottom. The pinout of the connecting cable is shown in the drawing.




# ACCESSORY: ZIFF CONNECTOR EA WF100-04S

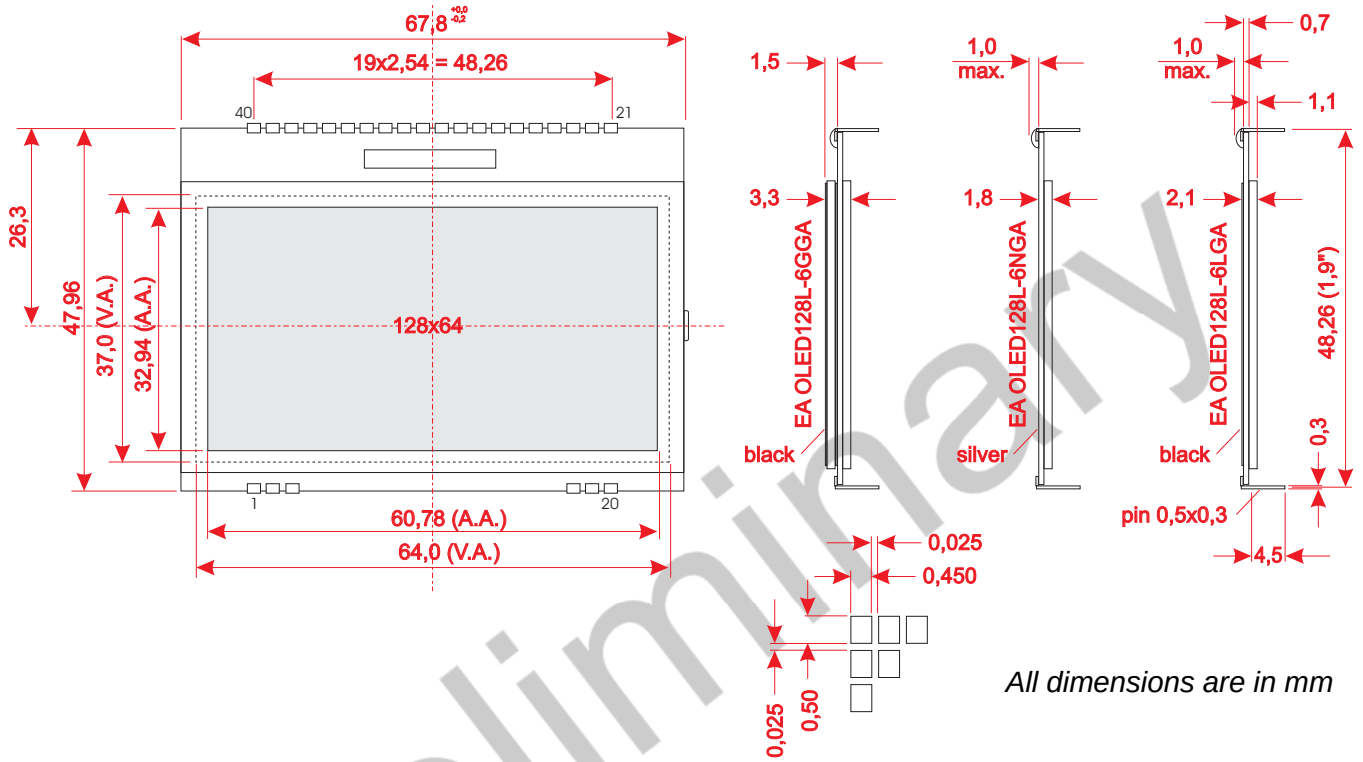
The ZIFF connector matches perfect to the touchpanel EA TOUCH128-2. It provides 4 pins with 1.0 mm pitch. Connection is bottom contact.
Top contact version is called EA WF100-04T.



# SPECIFICATION

| Value | Condition | min | typ | max | unit |
|---|---|---|---|---|---|
| Operating Temperature | | -40 | | +80 | °C |
| Storage Temperature | | -40 | | +80 | °C |
| Storage Humidity | <40°C | | | 90 | %RH |
| Operating Voltage VDD (logic supply) | | 1.8 | 3.0 | 3.3 | V |
| Operating Voltage VCC (OLED supply) | | 12.0 | 12.5 | 13.0 | V |
| High Logic input level | | 0.8 x VDD | | | V |
| Low Logic input level | | | | 0.2 x VDD | V |
| Power Supply | All Pixel on | | | tbd | mA |
| | 50 % Pixel on | | 25 | 45 | mA |
| | All Pixel off | | | tbd | mA |

# DIMENSIONS EA OLEDL128-6




*All dimensions are in mm*

| Pin | Symbol | | Pin | Symbol | Description |
|---|---|---|---|---|---|
| 1 | NC | | 21 | VCC | Typ. 12 V OLED driving voltage |
| 2 | NC | | 22 | VCC | |
| 3 | NC | | 23 | GND | Ground |
| 4 | | | 24 | GND | |
| 5 | | | 25 | VDD | Typ. 3.3 V logic power supply |
| 6 | | | 26 | BS0 | 00 = 4-Wire SPI; 01 = 3-Wire SPI 10 = I²C Interface |
| 7 | | | 27 | BS1 | |
| 8 | | | 28 | GND | Ground |
| 9 | | | 29 | CS | Chip Select (active low) |
| 10 | | | 30 | RES | Reset (active low) |
| 11 | | | 31 | D/C | SPI (4-Wire): L=Command, H=Data, I²C: SA0 |
| 12 | | | 32 | D0 | SPI: SCLK, I²C: SCL |
| 13 | | | 33 | D1 | SPI: MOSI, I²C: $SDA_{in}$ |
| 14 | | | 34 | D2 | SPI: NC, I²C: $SDA_{out}$ |
| 15 | | | 35 | GND | Ground |
| 16 | | | 36 | Iref | Reference for current source for segement drivers |
| 17 | | | 37 | VCOMH | Common deselect level. (Internally regulated) |
| 18 | NC | | 38 | VCOMH | |
| 19 | NC | | 39 | VCC | Typ. 12 V OLED driving voltage |
| 20 | NC | | 40 | VCC | |

*Note:*
*- OLED displays are generally not suited for wave or reflow soldering. Temperatures of over 80°C can cause lasting damage.*
*- The surfaces of the displays are protected from scratching by self-adhesive protective foil. Please remove before mounting*