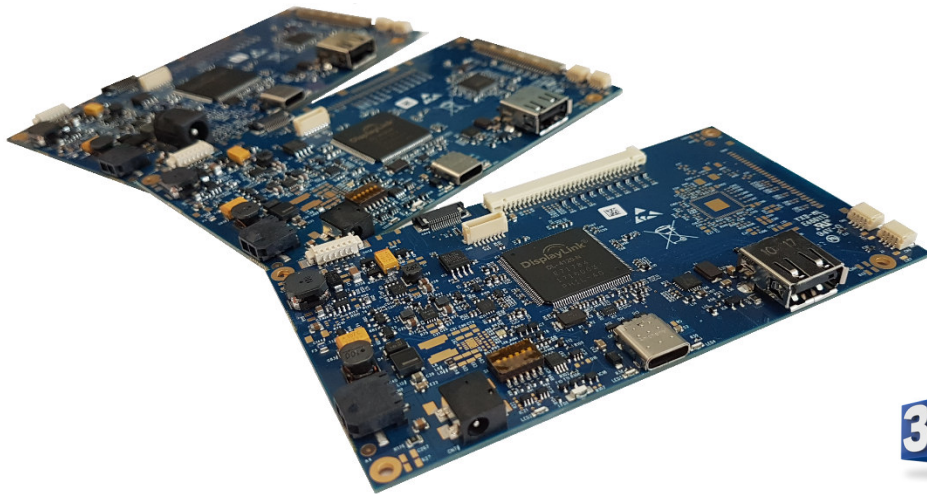


d.SCREEN-USB-3C

Manual

USB Monitor Controller Board USB-3.1 Gen.1 Type-C



3D-Modell (.stp)
available for your
construction

5V-Supply
External-/Bus-Powered
BO1xx-1x-xxx

12V Single-Supply
BO1xx-2x-xxx

Rev 1.2

June, 2018

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Revision History

Date	Rev	Description	Page
June, 2017	1.0	First draft	
November 2017	1.1	DIP-switch settings for low-/high power mode corrected	6,7
June 2018	1.2	Reference designator of backlight connector corrected	14,15

1 General Description

The **d.screen-USB-3C** is an innovative USB-3 monitor controller solution based on the DL-4100 family, a member of DisplayLink's world leading USB graphics technology. It is designed to act as a direct interface between USB 3.1 Gen.1 (5Gbit/s) and any LCD-TFT display from VGA (640x480) up to Full-HD (1920x1080).

The d.screen-USB-3C enables a new category of monitors that connect power and data over USB 3.1 Type-C (BO1xx-01-xxx ONLY) and it provides common LVDS- as well as eDP-interface. It supports SuperSpeed (5Gbit/s) and is backwards compatible with USB2.0 (up to 480Mbit/s) and USB1.1.

An on-board USB 2.0 4-port hub enables the connection of additional USB peripheral.

2 General Features

2.1 General DL41xx Core Features

- USB-Support
 - USB 3.0 SuperSpeed (5Gbit/s)
 - USB 2.0 HighSpeed (480 Mbit/s)
 - USB 1.1 FullSpeed (12Mbit/s)
- DisplayLink DL3 high-performance video compression
 - Ultra-Low latency
 -
 - Link aware-adapts automatically to bandwidth constraints
 - Compression tuned for video content and high quality graphics
 - Clear and crisp text and graphics
- Optional HDCP 2.0 support for protected video playback
- Integrated Monitor upscaling function
- Depending on populated device resolutions from VGA to F-HD are supported
 - DL4110 supports resolutions up to 1024x768/1280x800/1366x768
 - DL4115 supports resolutions up to 1400x1050/1140x900/1600x900
 - DL4120 supports resolutions up to 1600x1200/1680x1050/1920x1080

2.2 Supported Platforms

- Microsoft Windows
 - Windows 10
 - Windows 8, 8.1
 - Windows 7
 - Legacy Windows XP - Vista
- Apple Mac OS: OSX 10.8 onwards
- Google Android: V5.0 Lollipop onwards
- Linux: Ubuntu 14.10 onwards

3 Board Features

3.1 USB Interfaces

- Upstream Port
USB 3.1 Type-C (Gen.1)
- Downstream Ports
 - 1x USB 2.0 HighSpeed / External - Connector: Type-A (Power: max. 500mA)
 - 2x USB 2.0 HighSpeed / Internal (e.g. for touch-controller, etc.)

3.2 Control/OSD - Indication

- Control (OSD)
 - Power on/off
 - Brightness-Control (up/down)
 - Gamma-Control
 - Rotation 0°, 90°, 180°, 270° (optional)
- Indication USB SS or USB HS connection and activity
 - LED3 (Yellow) => USB HS
 - LED4 (Blue) => USB SS
 - Activity => blinking



3.3 Output Interfaces

- LVDS - LCD-TFT connection
 - Single / Double pixel LVDS output
 - Open-LDI and PSWG (VESA) data-mapping
 - Supports LCD-TFTs up to Full-HD (1920x1080@75Hz)
 - Support for 8 or 6-bit LVDS (with high-quality dithering)
 - Spread-Spectrum DPLL to reduce EMI
 - Supports 3.3V/5V/12V LCD-TFT logic supply
- eDP - LCD-TFT connection
 - eDP Bitrate 1.62Gbps and 2.7Gbps
 - eDP Lanes 1, 2 and 4
 - optional SSC
- Backlight supply/control
 - Provides backlight-enable and PWM-signal for brightness-control
 - 5V / 12V supply

3.4 Power Management

The on-board power management of d.screen-USB-3C supports various power supply configurations.

BO1xx-1x-xxx Family - Bus-Powered / +5V Supply

- According to the USB-3.1 Type-C specification USB-monitor applications with a total power-consumption of up to 15 W are supported over a single Type-C connection without additional external power-supply (please ensure, that the suitable cable is used/selected).
 - Besides 5V @ 3.0A mode also the 5V @ 1.5A mode is supported.
 - Depending on the application and the therewith associated total power consumption the minimum required mode can be selected via an on-board dip-switch.
 - In addition a low-power mode can be configured (via dip-switch), which set the USB-monitor to a low-power mode with reduced brightness, as long as the total required power is not provided by the USB-host or an auxiliary 5V power supply
 - At any time the current status of the power management is displayed via LEDs

- For backward compatibility legacy modes are available.
 - USB3.0 => 5V @ 900mA
 - USB2.0 => 5V @ 500mA
- Monitor applications with backlights requiring higher supply voltages (e.g. +12V) are supported at +5V input (via USB or with auxiliary external power supply) with up to 1.0 A

BO1xx-2x-xxx Family - External Single +12V Supply

For applications with higher power requirements (not bus-powered) the BO1xx-2x-xxx board versions enable applications with an external +12V single power supply.

3.5 Green- / Quality Features

- Reduced power dissipation by using switching regulators with very high efficiency
- Extended durability – avoidance of components with short life spans like e.g. electrolytic capacitors
- Improved EMI-behaviour

4 Board Configurations

As the d.screen-USB-3C is suitable for many different LCD-TFT displays the following section shows the possibilities of configuration

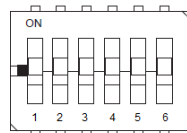
4.1 BO1xx-1x-xxx Family - Bus-Powered / +5V Supply

Members of BO1xx-1x-xxx family support bus-powered/+5V auxiliary supply applications, whereas also backlights with higher input voltages and a power-consumption of up to ~10W (e.g. 12V @ 0,8A) are supported.

On BO1xx-1x-xxx boards 2 power modes have to be configured, low-power and full-power.

Low-Power Mode

In low-power mode the total power-consumption is reduced to a minimum by limiting the backlight to the lowest possible level (implemented by firmware settings). This low-power mode allows the application to work bus-powered for example with a legacy USB 2.0 host (500mA @ 5V) although the total power-consumption at maximum brightness (full-power mode) is 10W and would usually require USB 3.0 Type-C with 2A @ 5V. Using the on-board dip-switch (switches 1-3) the minimum USB-host requirements for a specific low-power mode is selected as shown in the table below.



DIP-Switch - S1		Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6
USB-Host							
Legacy USB 2.0	500mA @ 5V				off	off	off
Legacy USB 3.0	900mA @ 5V				on	off	off
Type-C	1.5A @ 5V				off	on	off
	3.0A @ 5V				off	off	on

As long as d.screen-USB 3C is in low-power mode LED1 is illuminated orange and LED2 is off.



If the d.screen-USB-3C is connected to an USB-host providing less power than the minimum required power, LED2 will be illuminated red and LED1 will be off. This status is called power-down mode. In this mode the USB connection is still active, but the USB-graphics is no longer available.

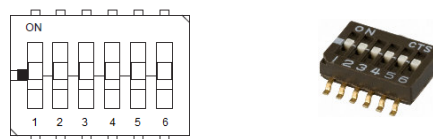


If the low-power mode is entered the board will remain in this status until an auxiliary 5V power-supply is connected or the board is reconnected to an USB-host which supports low-power or full-power mode.

Full-Power Mode

In full-power mode the USB-host provides the overall required power.

Using the on-board dip-switch (switches 4-6) the minimum USB-host requirements for full-power mode is selected as shown in the table below.



DIP-Switch - S1		Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6
USB-Host		1	2	3	4	5	6
Legacy USB 2.0	500mA @ 5V	off	off	off			
Legacy USB 3.0	900mA @ 5V	on	off	off			
Type-C	1.5A @ 5V	off	on	off			
	3.0A @ 5V	off	off	on			

As long as d.screen-USB-3C is in full-power mode LED1 is illuminated green and LED2 is off.



Remark:

Please consider, that the settings for low-power and full-power mode depend very much on the complete application and is usually pre-set by Display-Solution. Wrong settings will cause male function or even can damage the board.

4.2 BO1xx-2x-xxx Family - External +12V Supply

Members of BO1xx-2x-xxx family support external 12V power supply, ONLY. Bus-powered operation is not available.

- Supports LCD-TFT logic supply with 3.3V and 5.0V
- Supports LCD-Backlight with 5.0V and 12V (supply voltage is by-passed input voltage)

5 Control and Status Interface

Connector CN4 provides the following control and status possibilities

5.1 OSD

The embedded Soft-OSD allows the user to handle

- Brightness-Control
- Display on/off

In order to use OSD functionality simple push-buttons (connect to GND if pressed) has to be connected to the following pins of CN4. All OSD-control inputs are active-low.

CN4	Function
Pin 1	Increase Brightness
Pin 2	Decrease Brightness
Pin 3	Enter OSD
Pin 4	On/Off (Stand-By)

5.2 Status LEDs

The status LEDs can be connected to CN4 in order to provide the current status via an external connected interface board. The ports can directly drive simple indication LEDs.

CN4	Function
Pin 5	E.G. Red → USB-host connection not available
Pin 6	E.G. Green → USB-host connection is 2.0
Pin 7	E.G. Blue → USB-host connection is 3.0/3.1 (Gen-1)

6 Driver Support & Installation

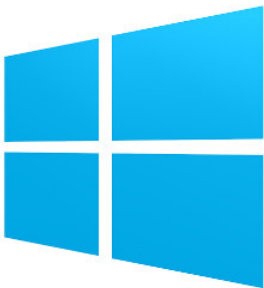
DisplayLink uses the built in USB, networking, and display management software that comes with your computer, so plugging in a DisplayLink product is just like plugging in directly to your computer

Download the driver (PC/Mac/Linux) or App (Android) and install it. Connect the d.screen-USB-3C via an appropriate cable to your host. DisplayLink's software will automatically configure the monitor for optimal picture quality and stores those settings for future use.

DisplayLink publishes updates to the software on the website, via Windows Update, and on the Google Play Store, so it's easy to stay up to date with the latest releases.

The following operating systems are supported:

Microsoft Windows



macOS



Android



Chrome OS



Ubuntu



For the latest driver please always see the following link:
<http://www.displaylink.com/downloads>

7 Electrical Characteristics

7.1 Operating Values

Table below shows typical operating values:

Item	Condition	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage	BO1xx-1x-xxx	4.8	5.0	5.4	VDC	
	BO1xx-2x-xxx	11.0V	12.0	13.0		Note-1
Current Input	Stand-by		TBD		mA	
	640x480		TBD		mA	Note-2
	800x600		TBD		mA	Note-2
	1024x768		TBD		mA	Note-2
	1280x1024		TBD		mA	Note-2
	1440x900		TBD		mA	Note-2
	1600x1200		TBD		mA	Note-2
	1680x1050		TBD		mA	Note-2
	1920x1080		TBD		mA	Note-2
Panel Supply Voltage / Current	+3.3V			TBD	mA	Output
	+5V			TBD	A	Output
Operating Temperature		0	-	70	°C	

Note-1: In case backlight-supply voltage is bypassed input voltage consider backlight controller Requirements!

Note-2: All current values are without connected LCD-TFT and additional connected USB 2.0 devices!

8 Temperature & Humidity

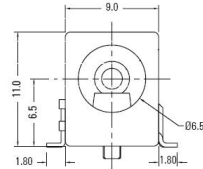
Item	MIN.	TYP.	MAX.	Unit	Note
Operating Temperature	0	-	+70	°C	
Storage Temperature	-30	-	+80	°C	
Humidity		-	95	%RHmax	

9 Connectors

9.1 Power Supply

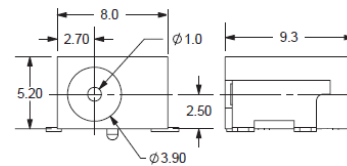
CN7# Power Supply Connector (external)

Pin	Signal	Description
Center	+12V/+24V	12V/24V Power supply (max 3A)
Outer Shield	GND	Ground



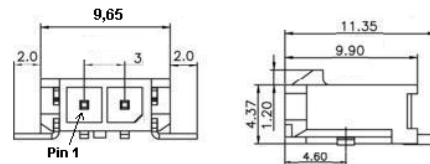
CN7 Power Supply Connector (optional/external)

Pin	Signal	Description
1	+5V	5V Power supply
2	GND	Ground



CN9 Power Supply Connector (internal)

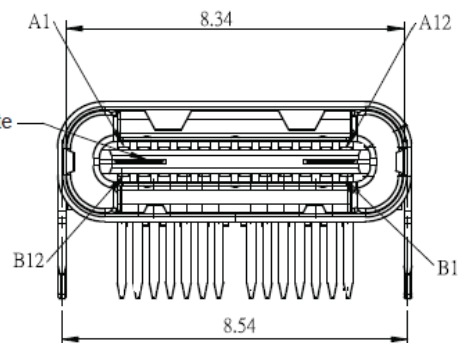
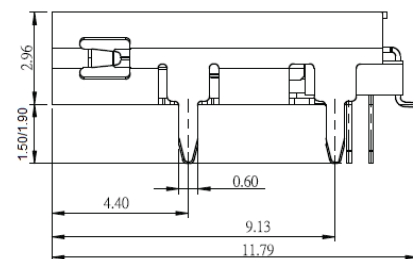
Pin	Signal	Description
1	+5V/+12V	5V/12V Power supply
2	GND	Ground



9.2 USB In-/Output

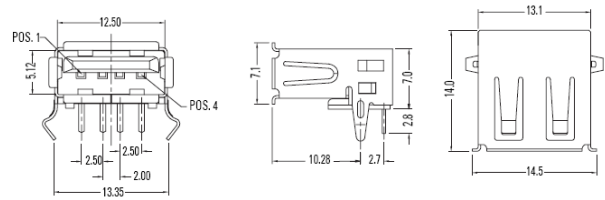
CN1 USB 3.1 (Gen1) Input – Type-C

Pin	Name	Description
1	A1	GND
2	A2	TX1+
3	A3	TX1-
4	A4	VBUS
5	A5	CC1
6	A6	D+
7	A7	D-
8	A8	SBU1
9	A9	VBUS
10	A10	RX2-
11	A11	RX2+
12	A12	GND
13	B1	GND
14	B2	TX2+
15	B3	TX2-
16	B4	VBUS
17	B5	CC2
18	B6	D+
19	B7	D-
20	B8	SBU2
21	B9	VBUS
22	B10	RX1-
23	B11	RX1+
24	B12	GND



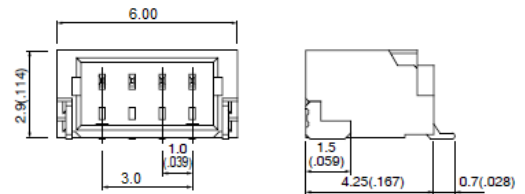
CN14 USB-A Downstream (External)

Pin	Signal	Description
1	VBUS	+5V /max 500mA (fused)
2	D-	Differential Signal -
3	D+	Differential Signal +
4	ID	
5	GND	Ground



CN2 / CN3 USB 2.0 Downstream (Internal)

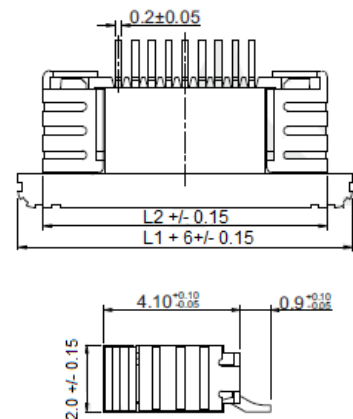
Pin	Signal	Description
1	VBUS	+5V (not fused)
2	D-	Differential Signal -
3	D+	Differential Signal +
4	GND	Ground



9.3 Control / Status

CN4 / CN4# OSD-Control & System-Status

Pin CN4#	Pin CN4	Signal	Description
1	1	KEY-UP	Increase Brightness
2	2	KEY-DOWN	Decrease Brightness
3	3	KEY-OSD	Enter OSD
4	4	KEY-STDBY	On/Off (Standby-Control)
5	5	LED-RED	Activity/Status LED
6	6	LED-USB-2	USB2.0 Indication LED
7	7	LED-USB3	USB3.0 Indication LED
8	8	GND	Ground
9	9	+3.3V	3.3V Power Supply (max. 100mA)
10	10	GND	Ground
-	11	ADC_AL	Reserved for Future Use
-	12	ROT_INT	Reserved for Future Use
-	13	GPIO_12	Reserved for Future Use
-	14	I2C_SCL0	Reserved for Future Use
-	15	I2C_SDA0	Reserved for Future Use



$L1 = (\text{No. of contacts} - 1) \times 0.50$

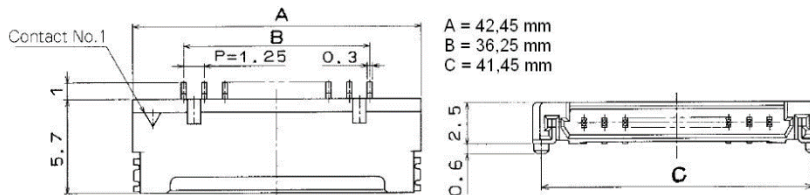
$L2 = \text{No. of contacts} \times 0.50 + 4.00$

9.4 Video Output

CN12 LVDS Output

Pin	Signal	Description
1	TXA3+	LVDS data 1st pixel
2	TXA3-	LVDS data 1st pixel
3	TXACL+	LVDS clock 1st pixel
4	TXACL-	LVDS clock 1st pixel
5	TXA2+	LVDS data 1st pixel
6	TXA2-	LVDS data 1st pixel
7	TXA1+	LVDS data 1st pixel
8	TXA1-	LVDS data 1st pixel
9	TXA0+	LVDS data 1st pixel
10	TXA0-	LVDS data 1st pixel
11	TXB3+	LVDS data 2nd pixel
12	TXB3-	LVDS data 2nd pixel
13	TXBCL+	LVDS clock 2nd pixel
14	TXBCL-	LVDS clock 2nd pixel
15	TXB2+	LVDS data 2nd pixel

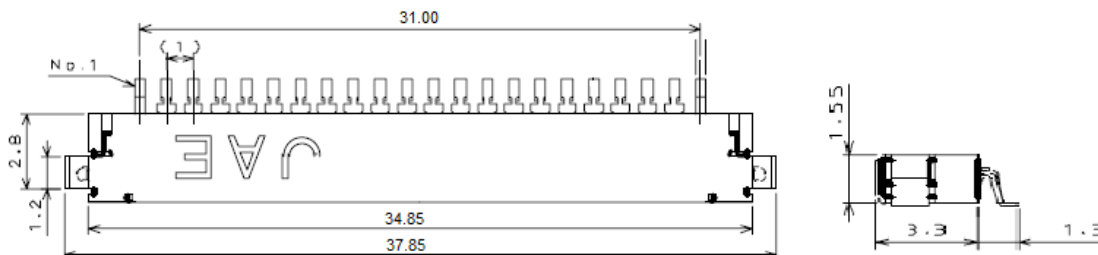
Pin	Signal	Description
16	TXB2-	LVDS data 2nd pixel
17	TXB1+	LVDS data 2nd pixel
18	TXB1-	LVDS data 2nd pixel
19	TXVB0+	LVDS data 2nd pixel
20	TXVB0-	LVDS data 2nd pixel
21		
22	SCD_1	Scan Direction
23		
24	GND	Ground
25		
26		
27		
28	SVCC	Switched panel power supply +3,3V/ +5V/ +12V (fused)
29		
30		



CN10 eDP (embedded DisplayPort) Output

Pin	Signal	Description
1	GND	Ground
2	ML Lane 0 (n)	Lane 0 (negative)
3	ML Lane 0 (p)	Lane 0 (positive)
4	GND	Ground
5	ML Lane 1 (n)	Lane 1 (negative)
6	ML Lane 1 (p)	Lane 1 (positive)
7	GND	Ground
8	ML Lane 2 (n)	Lane 2 (negative)
9	ML Lane 2 (p)	Lane 2 (positive)
10	GND	Ground
11	ML Lane 3 (n)	Lane 3 (negative)
12	ML Lane 3 (p)	Lane 3 (positive)
13	GND	Ground
14	AUX CH (n)	Aux. Channel (neg.)
15	AUX CH (p)	Aux. Channel (pos.)

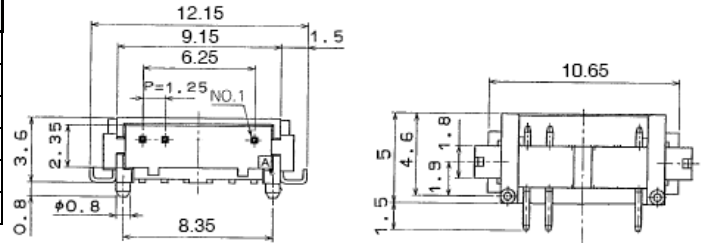
Pin	Signal	Description
16	GND	Ground
17	Hot Plug	Hot Plug Detect
18		Switched panel power supply +3,3V/ +5V/ +12V (fused)
19	SVCC	
20		
21		
22	GND	Ground
23		
24	Config1	Connected to GND
25	Config2	Connected to GND
26	+5.0V	+5V (not fused)
27		
28	GND	Ground
29		
30	NC	Not connected



9.5 Backlight

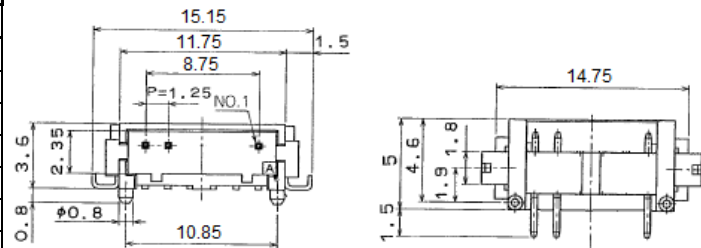
CN5 Backlight Power Supply & Control

Pin	Signal	Description
1	BPS	Backlight power supply
2	BPS	Backlight power supply
3	EBKL	Enabel backlight signal
4	BRCTRL	Brightness Control
5	GND	Ground
6	GND	Ground



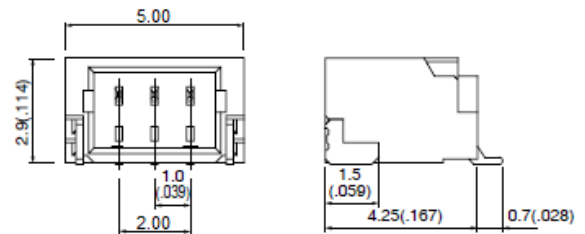
CN5# Backlight Power Supply & Control (Optional)

Pin	Signal	Description
1	BPS	Backlight power supply
2	BPS	Backlight power supply
3	BPS	Backlight power supply
4	EBKL	Enabel backlight signal
5	BRCTRL	Brightness Control
6	GND	Ground
7	GND	Ground
8	GND	Ground



CN6 High Voltage LED-Supply (Optional)

Pin	Signal	Description
1	LED_A	LED-Stripe Anode
2	NC	Not connected
3	LED_K	LED-Stripe Cathode



9.6 Connector Overview

CN	Description	Type	Manufacturer
CN1	USB 3.1 Upstream	USB Type-C	--
CN2	USB 2.0 Downstream	SM04B-SRSS-TB	JST
CN3	USB 2.0 Downstream	SM04B-SRSS-TB	JST
CN4	OSD-Ctrl. & System-Status	SFV15R-1STE1HLF	FCI
CN4#	OSD-Ctrl. & System-Status	SFV10R-1STE1HLF	FCI
CN5	Backlight Supply	53261-0671	Molex
CN5#	Backlight Supply	53261-0871	Molex
CN6	High Voltage LED-Supply	SM03B-SRSS-TB	JST
CN7	Power Supply	PJ-014C	CUI
CN7#	Power Supply	KLDX-SMT2-0202-A	Kycon
CN9	Power Supply	2-1445057-2	Tyco
CN10	eDP	FI-X30s-HF	JAE
CN12	LCD-TFT Interface: LVDS	DF14-30P-1.25	Hirose
CN14	USB Downstream	USB Type-A	

10 Outline Dimensions

