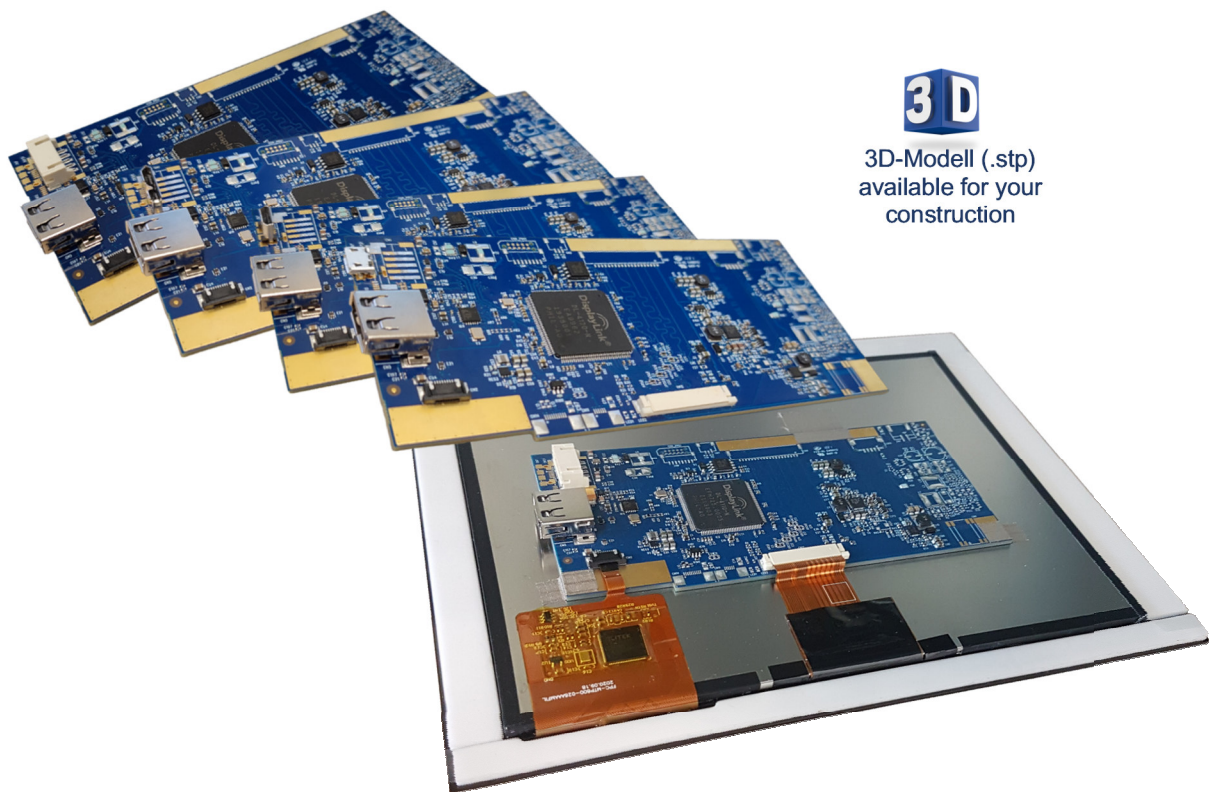# d.screen-USB Smart1

Datasheet

USB2/USB3 Display Controller Board
with PCAP-Support for direct Mounting

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

Rev 1.2

December, 2021

Table of Contents

Revision History

Date	Rev	Description	Page
March, 2020	1.0	First draft	
November, 2020	1.1	Cover picture updated Features of 8-inch XGA with PCAP-Touch updated (2.1) Optical Features updated (2.10)	 4 6
December, 2021	1.2	Operating & storage temperature updated Bottom-View with USB-interface board updated Adding integration guide appendix	7 15 16

1   General Description

The d.screen-USB Smart1 is based on DisplayLink's DL-4110N controller. It is designed to act as a bus-/ self-powered, full-featured, all-in-one HMI-interface requiring only one single USB2/USB3 connection. Besides the USB touch controller the on-board hub-functionality can support one additional USB-A downstream port.

2   Features

2.1 DisplayLink DL-41xx Core Features

- USB-Support   (USB 3.0 not supported on this board)
    - 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
- DL-4110N supports resolutions up to 1024x768/1280x800/1366x768

2.2 USB Input Interfaces

- Internal USB 2.0 upstream connection
  One 5-pin board-to-wire connector for USB data & power supply
- USB2 Micro-B connector horizontal or vertical (optional)
- USB3 Micro-B connector vertical (optional)

2.3 USB-Hub Functionality

The USB2 Smart Display controller board provides on-board USB 2.0 hub functionality with up to two additional USB 2.0 downstream ports.

- Up to three internal downstream ports for USB touch-controller connection including +5.0V power supply
- USB-A downstream port with USB-power supply control (500mA)

2.4 Input Power Supply

- Bus-powered application support via
    - Proprietary 5-pin board-to-wire connector with max. 2A @ 5V
    - USB2, Micro-USB-B connector with 500mA (typical)/1A (max) @ 5V
    - USB3, Micro-USB-B connector with 900mA (typical)/1.8A (max) @ 5V

- Self-powered application support with 12V-19V-24V power supply input and hot-swap functionality (Optional)

2.5 LCD-TFT & Backlight Interface

2.5.1 LCD-TFT

- LCD-TFT interface
    - Single pixel 24-bit LVDS output
    - Supports 1024x768 LCD-TFT @60Hz
- Display Logic Supply
    - 3.3V (2.5V optional)
    - Electronically fused
- On-board generation of LCD-Bias voltages
    - AVDD
    - VGH
    - VGL
    - VCOM

2.5.2 LCD-Backlight

- On-board LED driver
    - Up to 300mA (optional higher currents)
    - VLED up to ~10V (optional higher voltages)
- Backlight control (via DDC/CI – MCCS)
    - Backlight enable
    - Brightness control

2.6 Display Control Features

2.6.1 Button control

Using a single push-button tying the signal to GND the device can be deactivated and activated again. This feature is optional available via CN3.

2.6.2 OS supported feature

Windows as well as Linux provides "Power Plan Settings" - energy save options. Within the monitor related settings the time can be defined, after which the monitors are switched off in case of inactivity. When switched off, the USB Smart Display is powered down. This means the logic power supply of the display and the backlight are switched off.

2.6.3 DDC/CI - Display Data Channel / Command Interface

The USB Smart Display based on the DL41xx device supports DDC/CI. Currently supported features are:
- Brightness

- Contrast

The brightness dimming range can be adjusted by firmware

2.7 Supported Platforms

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

2.8 Mechanical Feature

USB Smart Display Controller board is as single-side equipped board so it can be mounted directly on the back of the LCD-TFT. On-board FFC-connectors for the display tail and the PCAP-tail enable a cost effective solution.

3   Electrical Characteristics

Table below shows typical operating values.

Operating Values

Item	Condition	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage	Bus-Powered	4.8	5.0	5.4	VDC	
	Self-Powered	12	24	28	VDC	Optional
Current Input @ +5V Supply	Stand-by		TBD		mA	8" Display 1024x768
	Operation		950		mA	
	Operation		TBD		mA	

4   Temperature & Humidity

Absolute Maximum Ratings

Item		MIN.	TYP.	MAX.	Unit	Note
Operating Temperature	Board	0	-	+70	°C	
	LCD-TFT	-10	-	+50		
Storage Temperature	Board	-30	-	+80	°C	
	LCD-TFT	-20	-	+60		
Humidity			-	95	%RHmax	

Recommended Operating Condition

| Item		MIN.	TYP.	MAX.	Unit	Note
Operating Temperature	Board	0	-	+60	°C	
	LCD (reliability test)	-10	-	+50		
Storage Temperature	Board	-20	-	+60	°C	
	LCD (reliability test)	-20	-	+60		
Humidity			-	90	%RHmax	

5   Board Interfaces

5.1 Connectors and Pin Assignement

CN1 USB 2.0 Upstream (CN1# optional)

Pin	Signal	Description
1	VBUS	+5V
2	D-	Differential Signal -
3	D+	Differential Signal +
4	GND	Ground
5	GND_CH	Shielding Ground
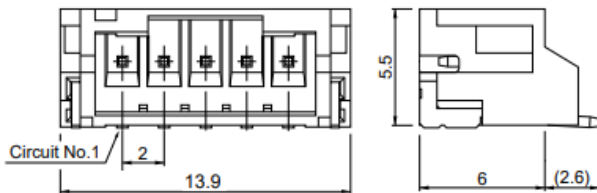
CN1 - Side Entry Type   CN1# - Top Entry Type
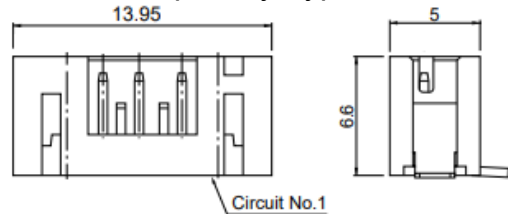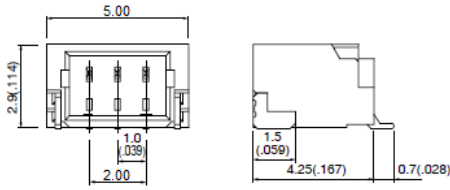

CN2 USB Touch-Ctrl.

Pin	Signal	Description
1	VBUS	+5V (Supply)
2	D-	Differential Signal -
3	D+	Differential Signal +
4	NC	Not Connected
5	GND	Ground
6	NC	Not Connected
7	GND	Ground
8	GND	Ground

B = 0.5 x NB PINS + 6.4
C = 0.5 x (NB PINS - 1)
D = 0.5 x (NB PINS + 1) + 0.1
E = 0.5 x (NB PINS + 1)
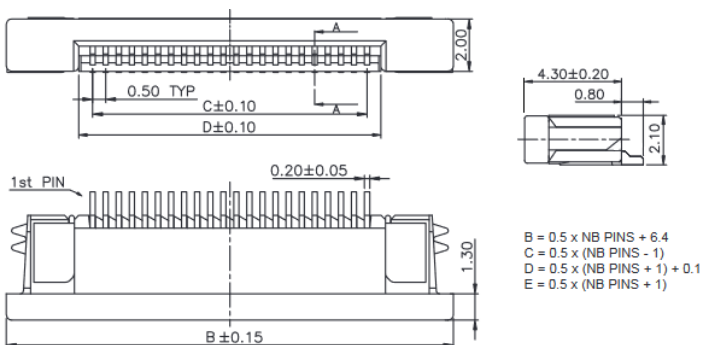
CN3 Board Standby Control (optional)

Pin	Signal	Description
1	VCC	+3.3V
2	KEY_STDBY	Tie to GND for On/Off
3	GND	Ground

CN4 External Power Supply (optional)

Pin	Signal	Description
1	VDD	+12V/+19V/+24V
2	GND	Ground
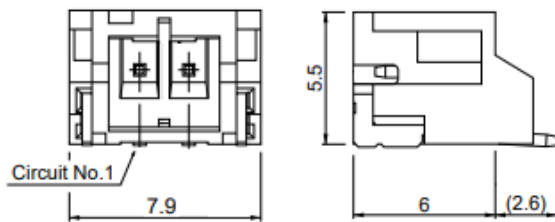
CN5 USB2 Downstream - Type-A (optional)

Pin	Signal	Description
1	VBUS	+5V /max 500mA (fused)
2	D-	Differential Signal -
3	D+	Differential Signal +
5	GND	Ground
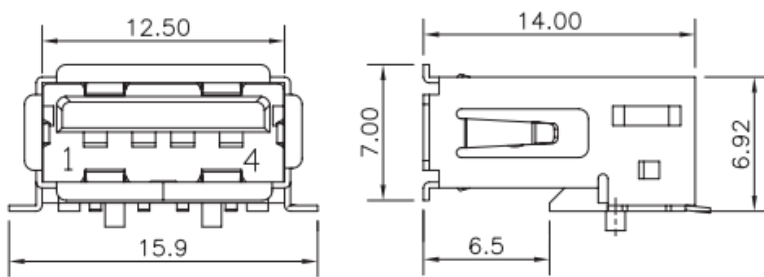
CN6/CN6# LED Backlight Supply (optional)

Pin	Signal	Description
1	VOUT-HIGH	LED-driver output-High
2	VOUT-LOW	LED-driver output -Low
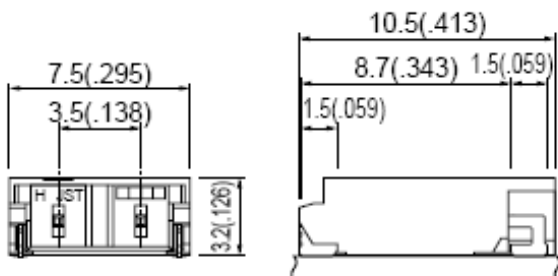
CN7　USB2 Upstream - Type Micro-B (Horizontal)　(optional)

Pin	Signal	Description
1	VBUS	+5V /max 500mA (fused)
2	D-	Differential Signal -
3	D+	Differential Signal +
4	ID	Not used
5	GND	Ground
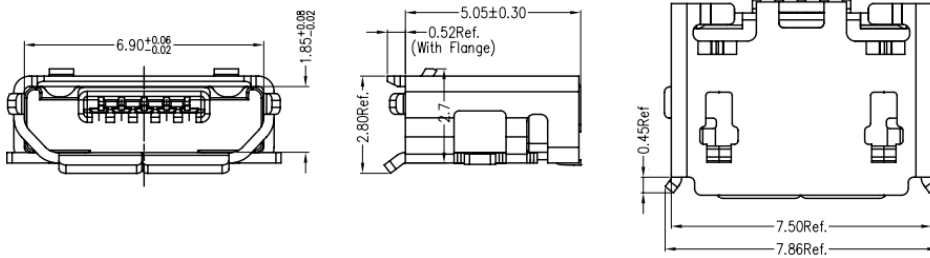
CN7#　USB2 Upstream - Type Micro-B (Vertical)　(optional)

Pin	Signal	Description
1	VBUS	+5V /max 500mA (fused)
2	D-	Differential Signal -
3	D+	Differential Signal +
4	ID	Not used
5	GND	Ground
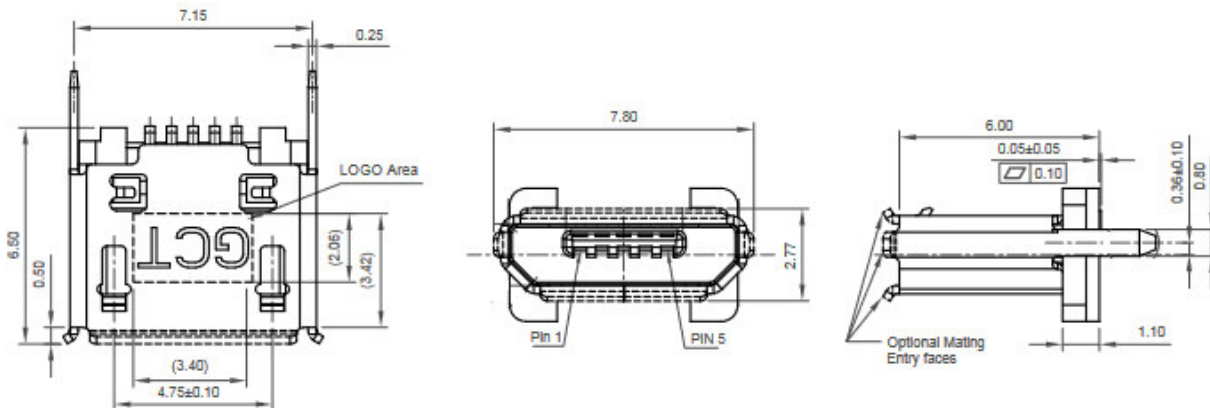
CN11　USB Touch-Ctrl.

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	D-	Differential Signal -
4	D+	Differential Signal +
5	VBUS	+5V (Supply)
6	VBUS	+5V (Supply)
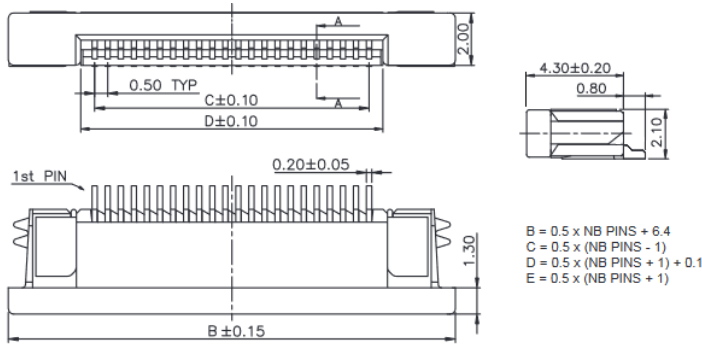
CN12 Display Interface (All-in-One)

Pin	Signal	Description	Pin	Signal	Description
1	LED+	LED backlight anode	21	TXA3-	LVDS data 1st pixel
2	LED+	LED backlight anode	22	GND	Ground
3	VGH	Gate ON voltage	23	TXACL+	LVDS clock 1st pixel
4	NC	Not connected	24	TXACL-	LVDS clock 1st pixel
5	NC	Not connected	25	GND	Ground
6	VGL	Gate OFF voltage	26	TXA2+	LVDS data 1st pixel
7	U/D	Up/down scan direction	27	TXA2-	LVDS data 1st pixel
8	L/R	Left/right scan direction	28	GND	Ground
9	LED-	LED backlight cathode	29	TXA1+	LVDS data 1st pixel
10	LED-	LED backlight cathode	30	TXA1-	LVDS data 1st pixel
11	GND	Ground	31	GND	Ground
12	AVDD	Analog power supply	32	TXA0+	LVDS data 1st pixel
13	SELB	6-/8- bit selection	33	TXA0-	LVDS data 1st pixel
14	DIMO	Not used	34	GND	Ground
15	NC	Not connected	35	STBYB	Standby mode
16	GND	Ground	36	RESET	Global reset pin
17	NC	Not connected	37	NC	Not connected
18	NC	Not connected	38	VDD	Power supply
19	GND	Ground	39	VDD	Power supply
20	TXA3+	LVDS data 1st pixel	40	VCOM	Common voltage
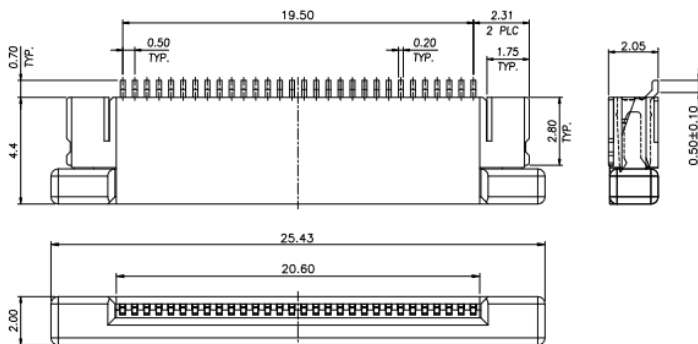
CN14 USB Touch-Ctrl.

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	NC	Not connected
4	NC	Not connected
5	GND	Ground
6	GND	Ground
7	D+	Differential Signal +
8	D-	Differential Signal -
9	VBUS	+5V (Supply)
10	VBUS	+5V (Supply)

B = 0.5 x NB PINS + 6.4
C = 0.5 x (NB PINS - 1)
D = 0.5 x (NB PINS + 1) + 0.1
E = 0.5 x (NB PINS + 1)
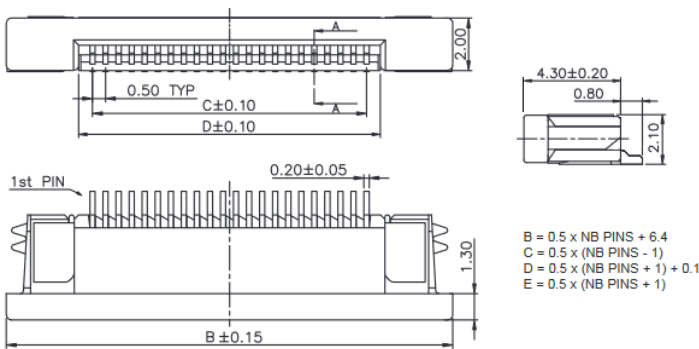
CN13   USB3 Upstream - Type Micro-B (Vertical) (optional)

Pin	Signal	Description
1	VBUS	+5V /max 500mA (fused)
2	D-	Differential Signal -
3	D+	Differential Signal +
4	ID	Not used
5	GND	Ground
6	SSTX-	Transmit Differential-Signal-
7	SSTX+	Transmit Differential-Signal+
8	GND	Ground
9	SSRX-	Receive Differential-Signal-
10	SSRX+	Receive Differential-Signal+

d.screen-USB Smart1
Specification Sheet   Rev 1.2
December, 2021   page 12 of 15
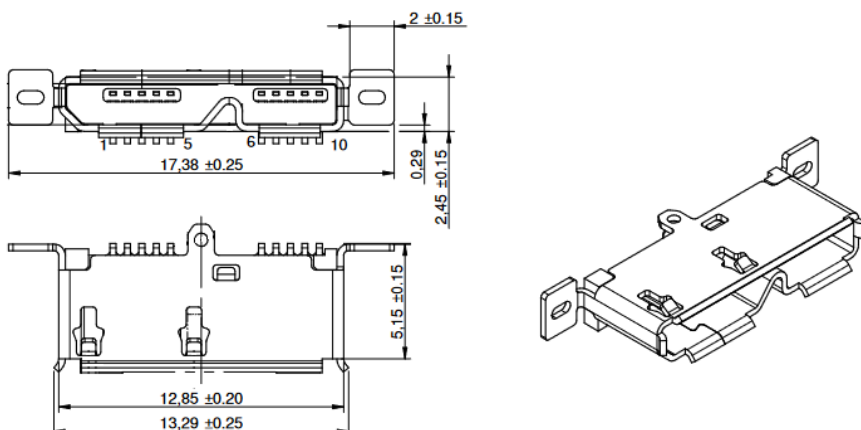
5.2 Connector Overview

CN	Description	Type	Manufacturer
CN1	USB 2.0 Upstream	S5B-PH-SM4-TB	JST
CN1#	USB 2.0 Upstream (optional)	B5B-PH-SM4-TB	JST
CN2	USB Touch-Ctrl.	687 108 145 22	Würth
CN3	Board Standby Control	SM03B-SRSS-TB	JST
CN4	External Power Supply	S2B-PH-SM4-TB	JST
CN5	USB-A	UJ2-AH-SMT	CUI Inc.
CN6/CN6#	LED-Backlight	SM02B-BHSS-1-TB	JST
CN7	USB2 B Micro (HZ)	MCR-B-S-RA-TSMT-NP	AdamTech
CN7#	USB2 B Micro	USB3140-30-0070-1-C	GCT
CN11	USB Touch-Ctrl.	687 106 145 22	Würth
CN12	Display Interface (All-in-One)	4-1734839-0	TE Connectivity
CN13	USB3 B-Micro	692622420101	Würth
CN14	USB Touch-Ctrl.	687 110 145 22	Würth

d.screen-USB Smart1
Specification Sheet   Rev 1.2
                                    December, 2021   page 13 of 15

6　Outline Dimension

Top-View
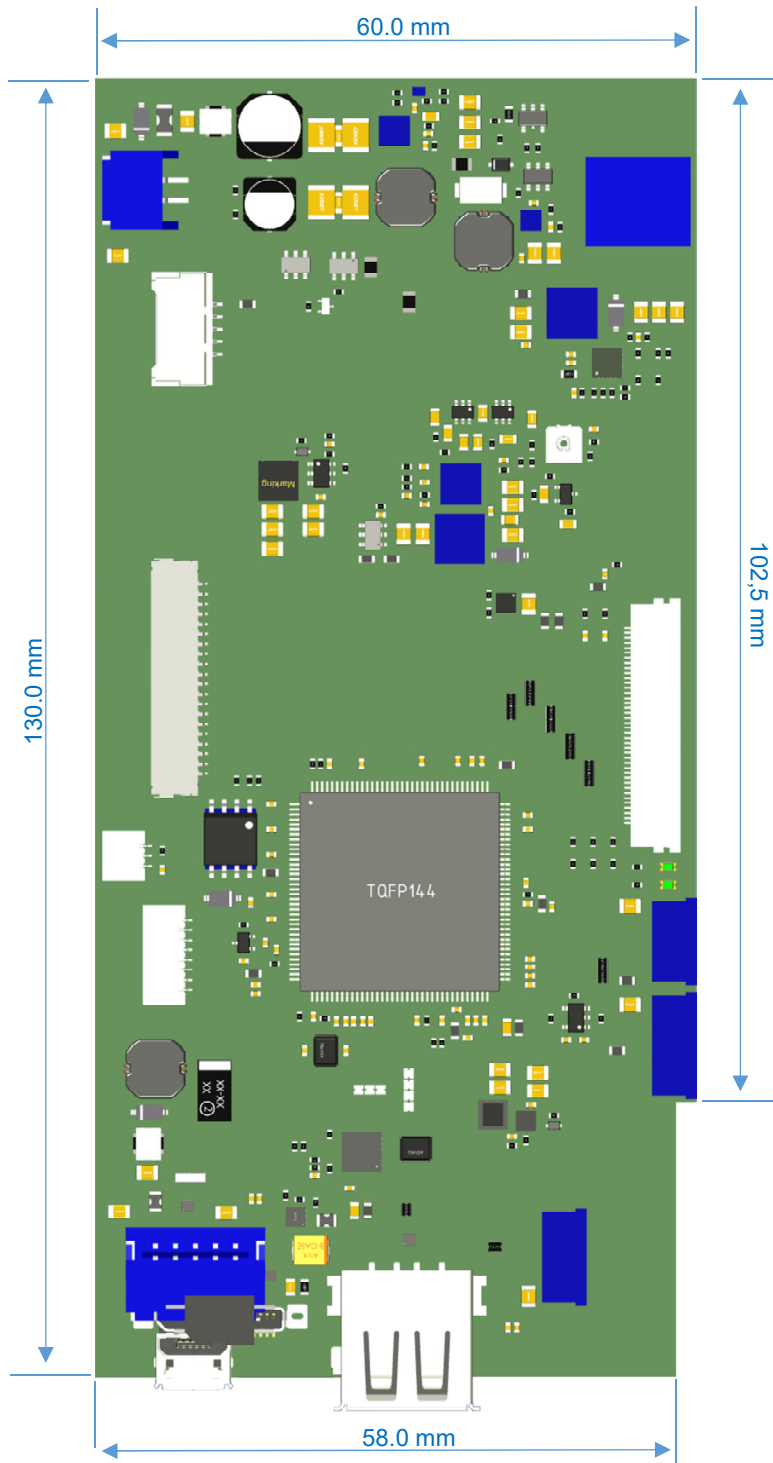
7 Appendix – Integration Guide

Electrical Grounding

- In order to prevent from un expected touch issue (ghost touch) and to suppress influence noise from system, the LCM metal frame should be connected to system ground in customer's device
- Please ensure the grounding resistance between system ground and LCM metal frame is lower than 5 ohm.
- If customer has front metal frame in their system, it also needs to get connected to system ground.

Integration of Total Solution

The cover-glass is already equipped with a double-sided adhesive tape on the back with which the module is mounted into the customer application. Please consider, that the complete stack additionally needs to get properly supported by the housing and display holder.

Example set-up:
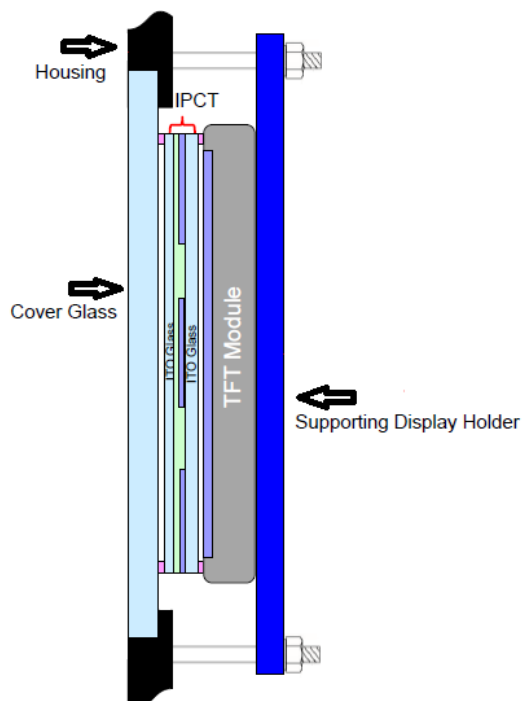
Environment Restrictions

The IPCT must be placed as far as possible from components like SMPS, inverters , transformers and other components which producing frequency noise of 50 - 200kHz.