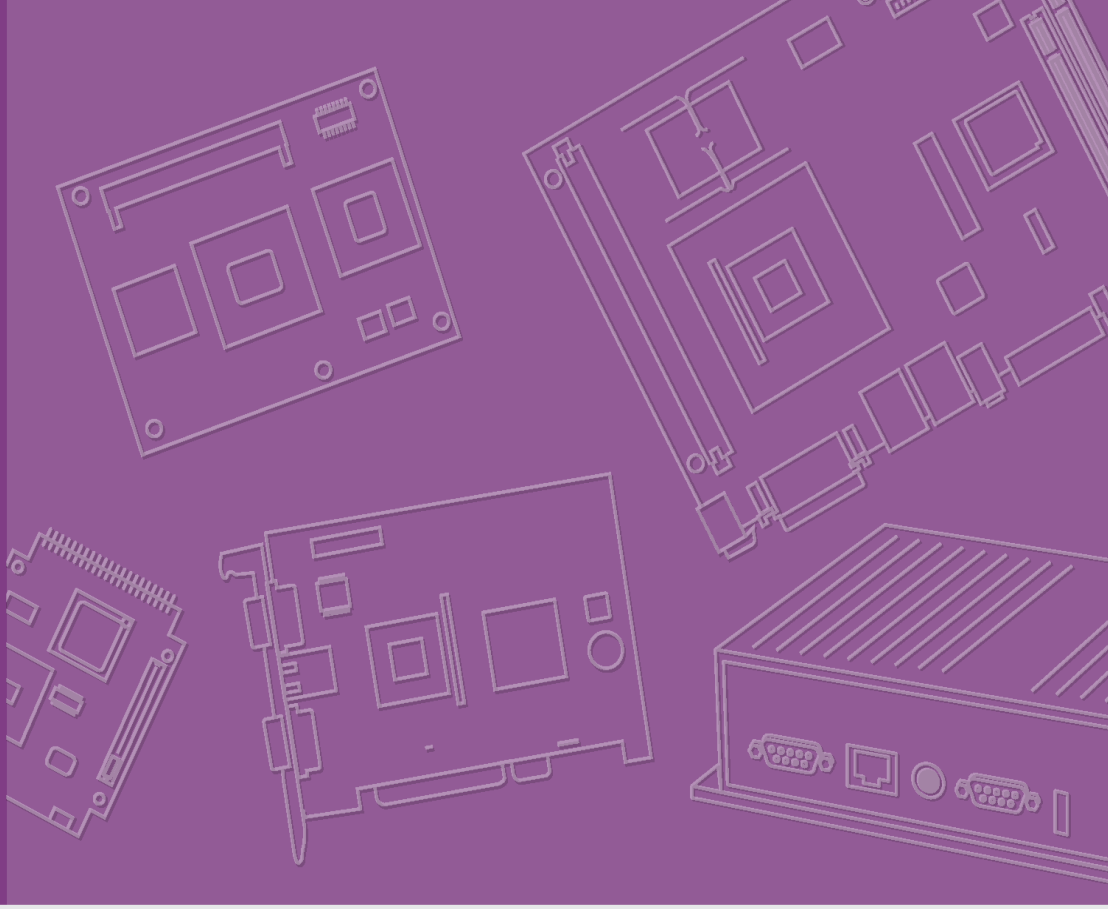

User Manual

# IDK-2115 Series

## 15" High Brightness XGA (LED Backlight)

ADVANTECH

*Enabling an Intelligent Planet*

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# Acknowledgements



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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

# Contents

# Chapter 1

## Overview

## 1.1 General Description

The Advantech IDK-2115 series comes with a 15" 1200 cd/m2 industrial grade LCD display, and an LED driving board. The series is also available with flexible options for touch screens and enhanced treatment such as AR surface treatment and optical bonding solution. IDK-2115 series supports 1200 cd/m2 high brightness with low power consumption at the maximum consumption of 15.58 W. Equipped with high level of brightness and wide operating temperature, IDK-2115 provides superior sun-light readability and is perfect for applications whether in semi-outdoor or outdoor environments.

## 1.2 Specifications

### 1.2.1 LCD Panel

- **Display Size:** 15" LED backlight panel
- **Resolution:** 1024 x 768
- **Viewing Angle(U/D/L/R):** 65°/60°/70°/70°
- **Brightness:** 1200 cd/$m^2$
- **Contrast Ratio:** 1100:1
- **Response Time(ms):** 8ms
- **Colors:** 262K/16.2M
- **Voltage:** 3.3V
- **Power Consumption:** 15.58W
- **Signal Interface:** 1 channel LVDS
- **Weight:** 1350g(N series)
- **Dimensions(W x H x D):** N series: 326.5 x 253.5 x 13.0 mm
  R series: 326.5 x 253.5 x 14.61 mm

### 1.2.2 LED Driver Board

- **Efficiency:** 85%
- **Output Current & Voltage:** 900 mA / 18 V
- **Dimensions(W x H x D):** 90 x 50 x 7 mm

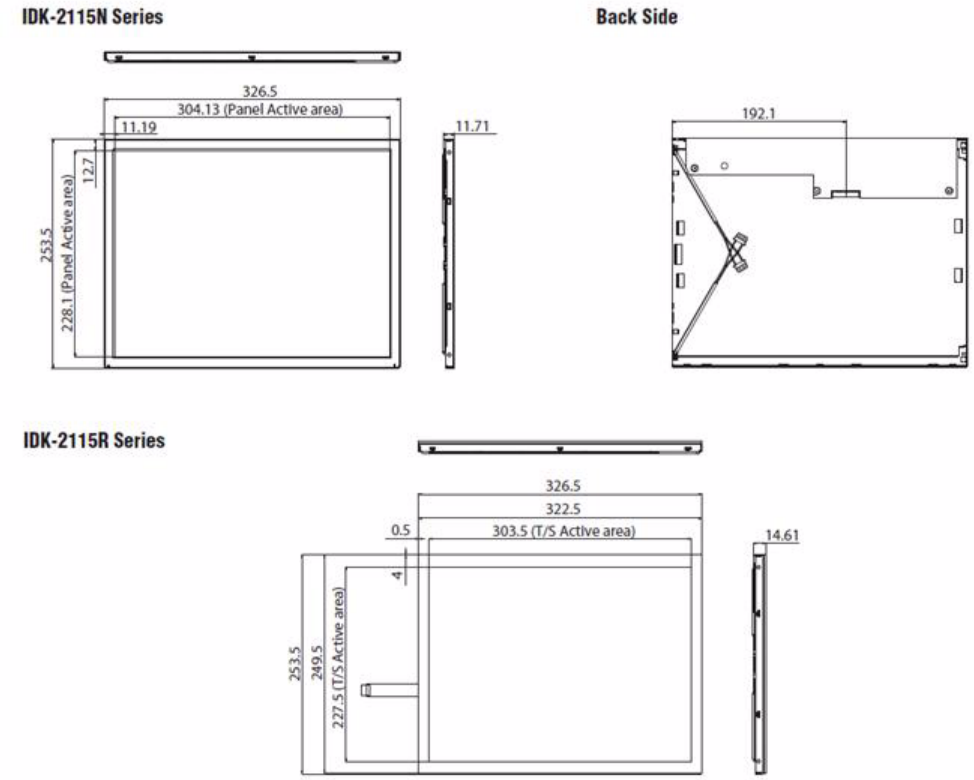
### 1.2.3 Touch Screen (R series)

- **Touch Screen:** 5-Wire Resistive
- **Light Transmission:** 80 ±2 %
- **Durability:** 1 million times

### 1.2.4 Environment

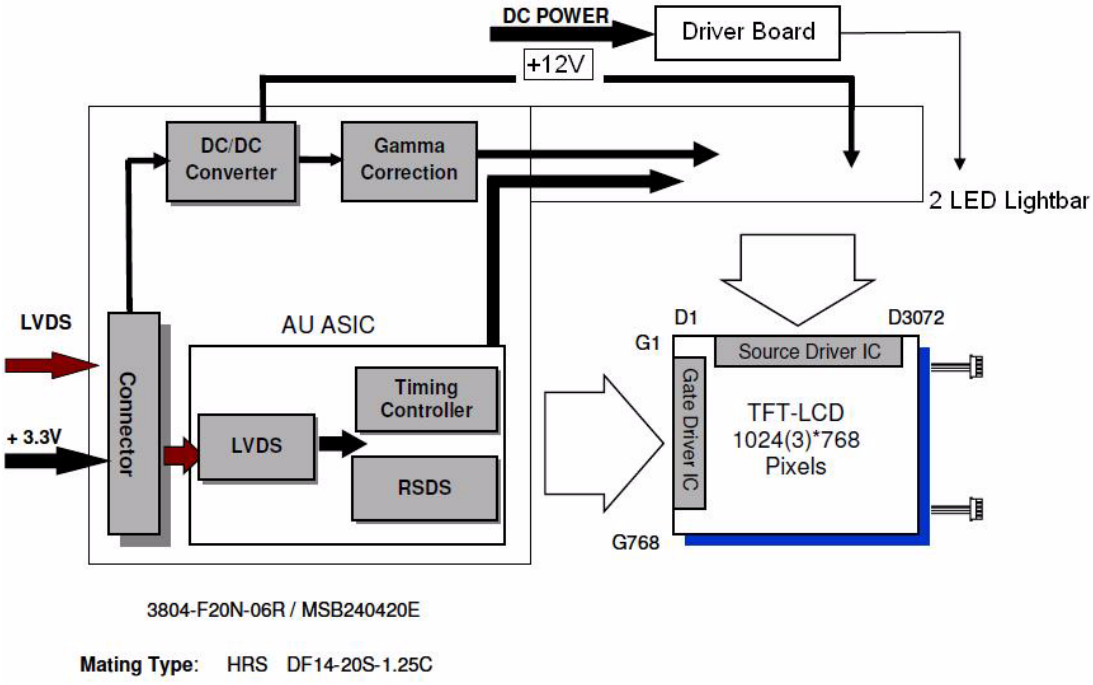
- **Operating Temperature:** 0~65 °C
- **Storage Temperature:** -20 ~ 65°C
- **Humidity:** 5~ 95% @ 40°C, non-condensing

## 1.3 Mechanical Characteristic




## 1.4 Functional Block Diagram

The following diagram shows the functional block of the 15 inches Color TFT-LCD Module:




3804-F20N-06R / MSB240420E

**Mating Type:** HRS DF14-20S-1.25C

**Figure 1.1 Function block diagram**

## 1.5 Touch Screen driver

The T/S driver CD-ROM is in the accessory box and comes with the product.

## 1.6 Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

### 1.6.1 Absolute Ratings of TFT LCD Module

| Item | Symbol | Min. | Max. | Unit | Conditions |
|---|---|---|---|---|---|
| Logic/LCD Drive Voltage | Vin | 0.3 | +3.6 | [Volt] | Note 1, 2 |

### 1.6.2 Absolute Ratings of Backlight Unit

| Item | Symbol | Min. | Max. | Unit | Conditions |
|---|---|---|---|---|---|
| LED Light Bar Current | ILed | 390*2 | 400*2 | [mA] | Note 1, 2 |

### 1.6.3 Absolute Ratings of Environment

| Item | Symbol | Min. | Max. | Unit | Conditions |
|---|---|---|---|---|---|
| Operating Temperature | TOP | 0 | +65 | [oC] | Note 3 |
| Operation Humidity | HOP | 8 | 90 | [%RH] | |
| Storage Temperature | TST | -20 | +65 | [oC] | |
| Storage Humidity | HST | 8 | 90 | [%RH] | |

**Note1:** With in Ta= 25°C

**Note2:** Permanent damage to the device may occur if exceed maximum values

# Chapter 2

## Electrical Characteristics

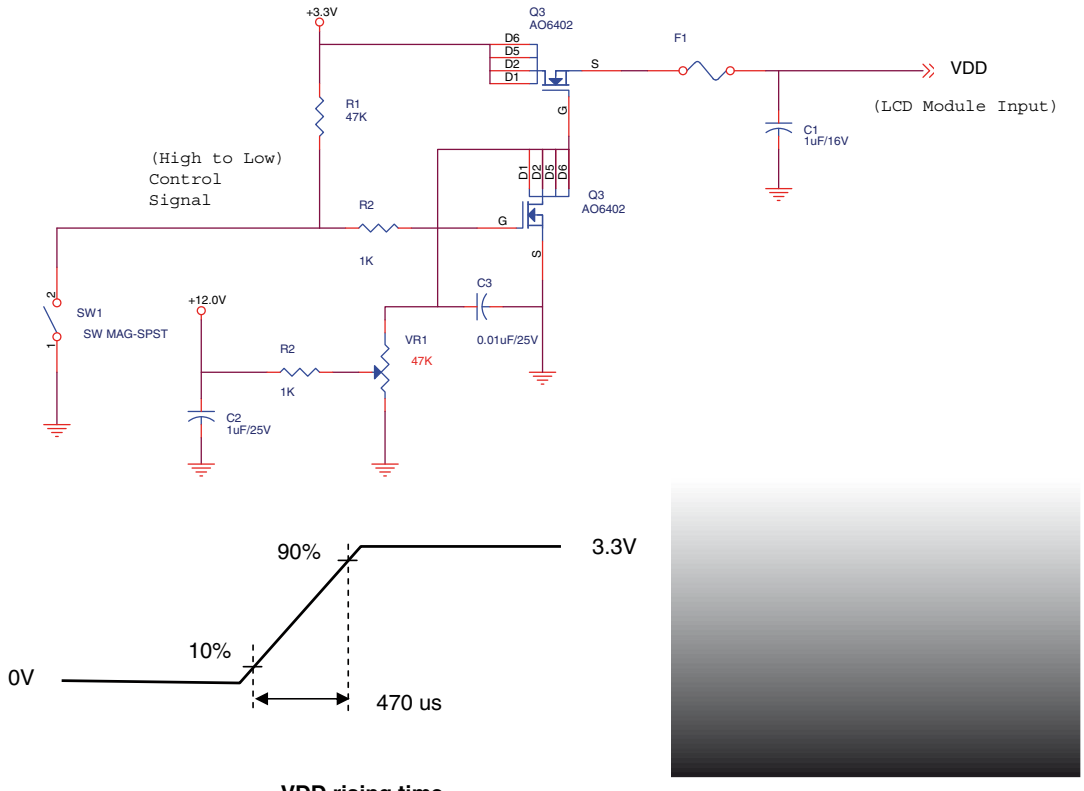
## 2.1 Power Specification

Input power specifications are as follows:

**Table 2.1: Power specification**

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| VDD | Logic/LCD Drive Voltage | 3.0 | 3.3 | 3.6 | [Volt] | 10% |
| IDD | Input Current | - | 550 | 660 | [mA] | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |
| PDD | VDD Power | - | 1.9 | 2.2 | [Watt] | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |
| IRush | Inrush Current | - | - | 3 | [A] | Note 1 |

**Note1** Measurement condition:




**VDD rising time**

64 Gray pattern

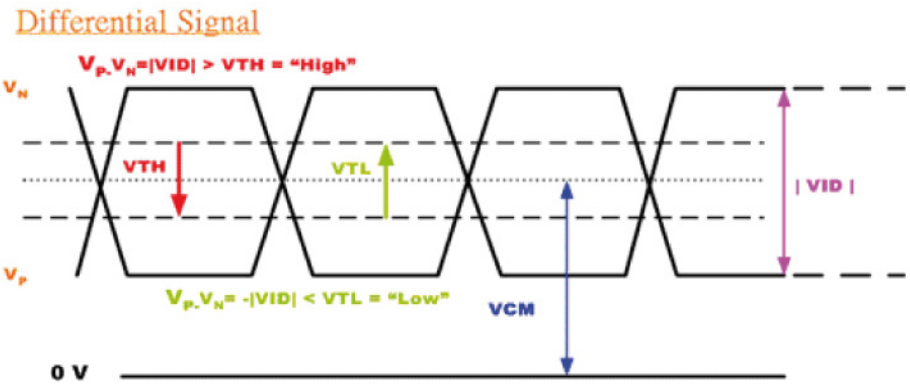
### 2.1.1 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

**Table 2.2: Signal electrical characteristics**

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| VTH | Differential Input High Threshold | - | - | 100 | [mV] | VCM=1.2V |
| VTL | Differential Input Low Threshold | -100 | - | - | [mV] | VCM=1.2V |
| \| VID \| | Input Differential Voltage | 100 | 400 | 600 | [mV] | |
| VICM | Differential Input Common Mode Voltage | 1.1 | - | 1.45 | [V] | VTH / VTL = 100mV |

**Note** LVDS Signal Waveform.




## 2.2 Backlight Driving Conditions

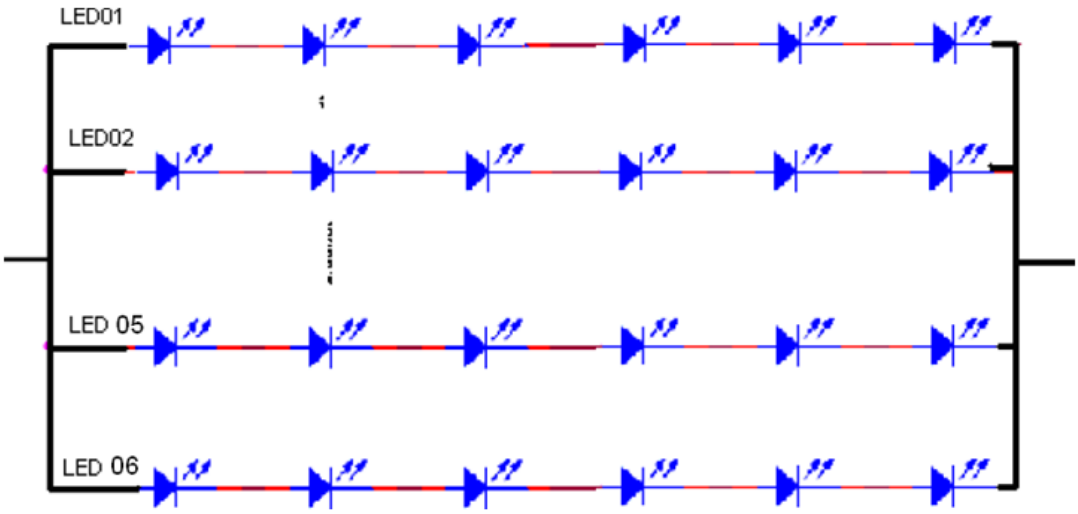
Parameter guideline for LED Light Bar Driver is under stable conditions at 25°C (Room Temperature):

**Table 2.3: Backlight driving conditions**

| Item | Symbol | Values | | | Unit | Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| LED Voltage | VL | 17.7 | | 17.7 | V | Note 2 |
| LED Current | IL | 390 | | 400 | mA | Note 2 |
| LED life time | - | 50,000 | - | - | Hr | Note 1 |

**Note1** The "LED lift time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C and typical LED Current at 400mA.

**Note2** The LED driving condition is defined for each LED module.(6 LED Serial, a LED includes 1 Chip).



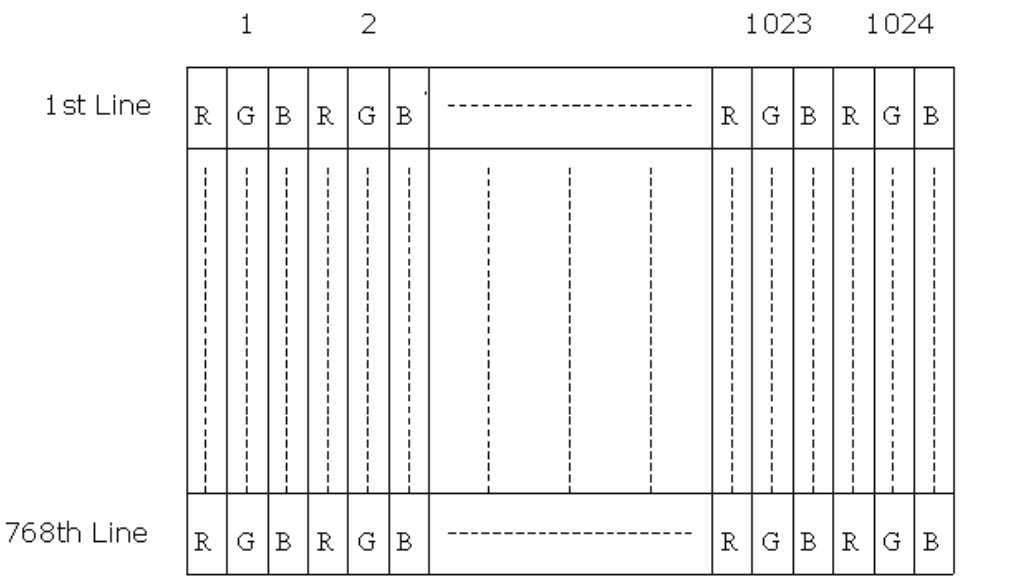

**Note3** The variance of LED Light Bar power consumption is 10%. Calculator value for reference (IL x VL x 2 = PLED)

# Chapter 3

## Signal Characteristics

## 3.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.




## 3.2 Pin Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

**Table 3.1: Pin Description**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VDD | Power Supply,3.3V(typical) |
| 2 | VDD | Power Supply,3.3V(typical) |
| 3 | VSS | Ground |
| 4 | GND | Ground |
| 5 | RxIN1- | LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0) |
| 6 | RxIN1+ | |
| 7 | VSS | Ground |
| 8 | RxIN2- | LVDS differential data input Pair 1<br>LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1) |
| 9 | RxIN2+ | |
| 10 | VSS | Ground |
| 11 | RxIN3- | LVDS differential data input Pair 2<br>LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE) |
| 12 | RxIN3+ | |
| 13 | VSS | Ground |
| 14 | RxCLKIN- | LVDS differential Colock input Pair |
| 15 | RxCLKIN+ | |
| 16 | GND | Ground |

| Table 3.1: Pin Description | | |
|---|---|---|
| 17 | RxIN4- | LVDS receiver signal channel 3, NC for 6 bit LVDS Input<br>LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV) |
| 18 | RxIN4+ | |
| 19 | VSS | Ground |
| 20 | SEL68 | 6/ 8bits LVDS data input selection [H: 8bits L/NC: 6bit] |

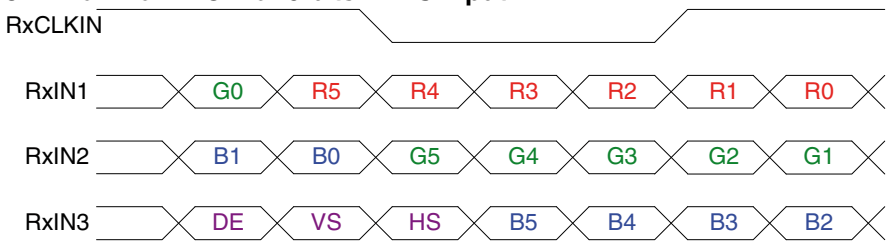
**Note1:** Input signals shall be in low status when VDD is off.

**Note2:** For 6 bits mode, please keep the Pin 17& Pin 18 NC or make sure that the voltage of Pin 18 is always higher than the voltage of Pin 17.

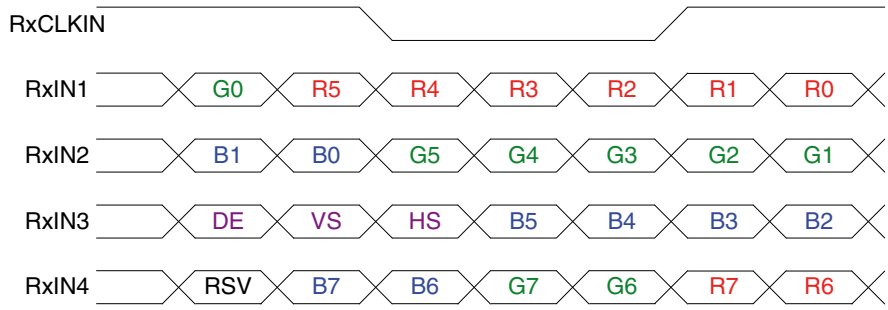
## 3.3 The Input Data Format

### 3.3.1 SEL68

**SEL68 = ”Low” or “NC” for 6 bits LVDS Input**




**SEL68 = “High” for 8 bits LVDS Input**




**Note1:** Please follow PSWG.

**Note2:** R/G/B data 7:MSB, R/G/B data 0:LSB

| Signal Name | Description | Remark |
|---|---|---|
| R7 | Red Data 7 | Red-pixel Data, For 8 bits LVDS input, MSB: R5; LSB:R0 |
| R6 | Red Data 6 | |
| R5 | Red Data 5 | |
| R4 | Red Data 4 | |
| R3 | Red Data 3 | |
| R2 | Red Data 2 | |
| R1 | Red Data 1 | |
| R0 | Red Data 0 | |

| | | |
|---|---|---|
| G7 | Green Data 7 | Green-pixel Data, For 8 bits LVDS input, MSB: G7; LSB:G0 |
| G6 | Green Data 6 | |
| G5 | Green Data 5 | |
| G4 | Green Data 4 | |
| G3 | Green Data 3 | |
| G2 | Green Data 2 | |
| G1 | Green Data 1 | |
| G0 | Green Data 0 | |
| B7 | Blue Data 7 | Blue-pixel Data, For 8 bits LVDS input, MSB: B7; LSB:B0 |
| B6 | Blue Data 6 | |
| B5 | Blue Data 5 | |
| B4 | Blue Data 4 | |
| B3 | Blue Data 3 | |
| B2 | Blue Data 2 | |
| B1 | Blue Data 1 | |
| B0 | Blue Data 0 | |
| RxCLKIN | LVDS Data Clock | |
| DE | Data Enable Signal | When the signal is high, the pixel data shall be valid to be displayed. |
| VS | Vertical Synchronous Signal | |
| HS | Horizotal Synchronous Signal | |

**Note:** Output signals from any system shall be low or Hi-Z state when VDD is off.

# 3.4 Interface Timing

## 3.4.1 Timing Characteristics

**Table 3.2: Timing Characteristics**

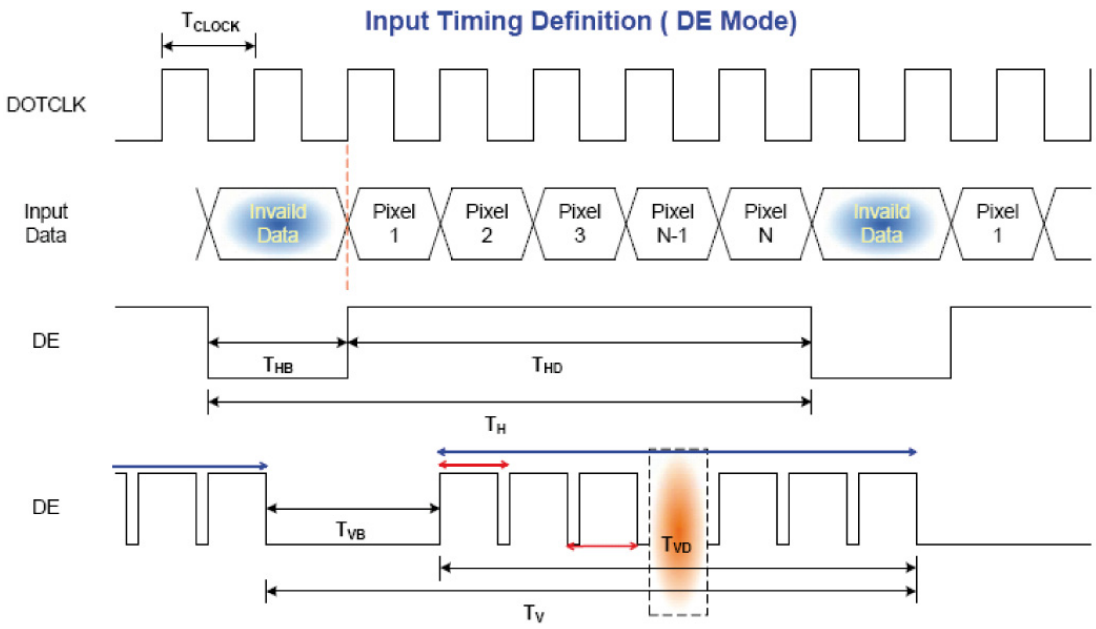
| Signal | Parameter | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Clock Timing | Clock frequency | | 1/ $T_{Clock}$ | 50 | 65 | 81 | MHz |
| Vsync Timing | Vertical Section | Period | $T_V$ | 776 | 806 | 1024 | $T_{Line}$ |
| | | Active | $T_{VD}$ | 768 | 768 | 768 | |
| | | Blanking | $T_{VB}$ | 8 | 38 | 256 | |
| Hsync Timing | Horizontal Section | Period | $T_H$ | 1054 | 1344 | 2048 | $T_{Clock}$ |
| | | Active | $T_{HD}$ | 1024 | 1024 | 1024 | |
| | | Blanking | $T_{HB}$ | 30 | 320 | 1024 | |

**Note** Frame rate is 60 Hz.

**Note** DE mode.

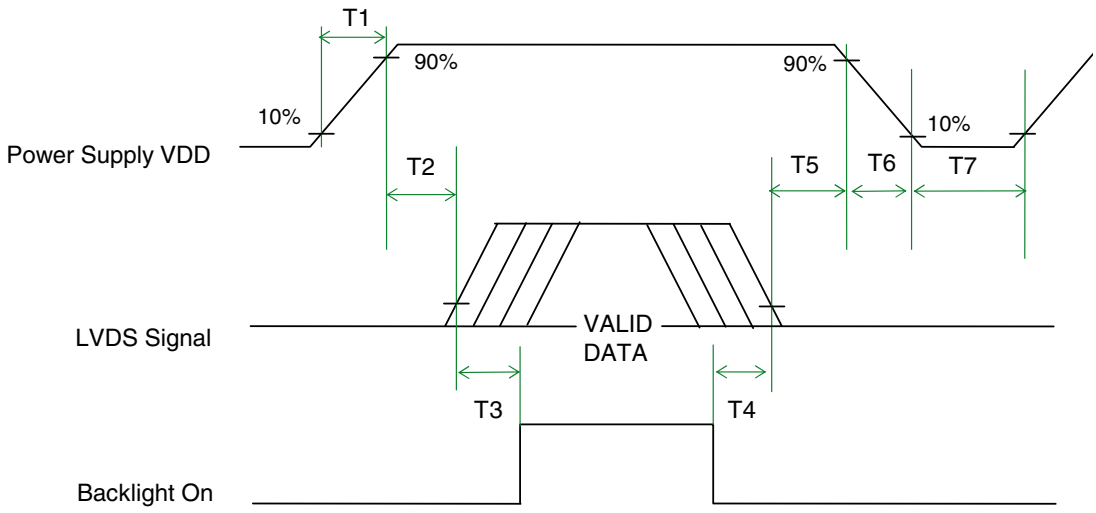
**Note** Typical value refer to VESA STANDARD

### 3.4.2 Input Timing Diagram




## 3.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.




**Power Sequence Timing**

| Parameter | Value | | | Unit |
|---|---|---|---|---|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | [ms] |
| T2 | 0 | 40 | 50 | [ms] |
| T3 | 200 | - | - | [ms] |
| T4 | 200 | - | - | [ms] |
| T5 | 0 | 16 | 50 | [ms] |

| | | | | |
|---|---|---|---|---|
| T6 | 0 | - | 10 | [ms] |
| T7 | 1000 | - | - | [ms] |

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

# Chapter 4

## Connector & Pin Assignment

# 4.1 TFT LCD Module

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

## 4.1.1 Connector

| Table 4.1: Connector | |
|---|---|
| **Connector Name / Description** | **Signal Connector** |
| Manufacture | E&T or compatible |
| Connector Model Number | 3804-F20N-06R / MSB240420E |
| Adapable Plug | HRS DF14-20S-1.25C |

Mating LVDS transmitter: THC63LVDM83A or equivalent device

## 4.1.2 Pin Assignment

| Table 4.2: Pin Assignment | | | |
|---|---|---|---|
| **Pin No.** | **Signal Name** | **Pin No.** | **Signal Name** |
| 1 | VDD | 2 | VDD |
| 3 | VSS | 4 | GND |
| 5 | RxIN1- | 6 | RxIN1+ |
| 7 | VSS | 8 | RxIN2- |
| 9 | RxIN2+ | 10 | VSS |
| 11 | RxIN3- | 12 | RxIN3+ |
| 13 | VSS | 14 | CLKIN- |
| 15 | CLKIN+ | 16 | GND |
| 17 | RxIN4- | 18 | RxIN4+ |
| 19 | VSS | 20 | SEL68 |

# 4.2 Backlight Unit

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

| **Connector Name / Designation** | **LED Light Bar Connector / Backlight lamp** |
|---|---|
| Manufacturer | TKP TERMINAL/ TKP HOVSING |
| Type Part Number | TKP TERMINAL 8820T/ TKP HOVSING 8821-03 |
| Mating Type Part Number | Wire VL 1007 24 AWG |

## 4.2.1 Signal for LED light bar connector

| | **Connector No.** | **Pin No.** | **Input** | **Color** | **Function** |
|---|---|---|---|---|---|
| Upper | CN1 | 1 | HI 1 | Red | Power supply for backlight unit |
| | | 2 | GND 1 | Black | Ground for backlight unit |

| | | | | | |
|---|---|---|---|---|---|
| Lower | CN2 | 1 | HI 2 | Red | Power supply for backlight unit |
| | | 2 | GND 2 | Black | Ground for backlight unit |

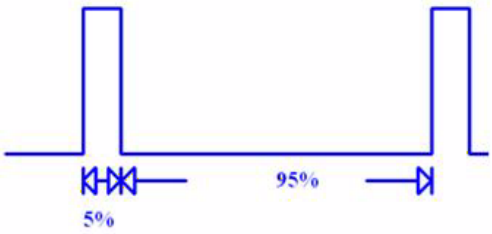
Cable Length : 250mm+/-10mm

## 4.2.2 LED Driver Board

### 4.2.2.1 Specification:

**Table 4.3: Specification**

| Symbol | Characteristics | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input | Voltage | | 10 | 12 | 15 | V |
| | Efficiency | Vin=12V, Iout=1.5A, Vout=18V | | 90 | | % |
| | Power | | 3 | | 30 | W |
| Output | Voltage | | 18 | | 24 | V |
| | Current | | 150 | | 1500 | mA |
| | Current Accurancy | 150mA≤Iout≤1000mA | | ±5 | ±10 | % |
| | Protection | | Thermal/OVP | | | |
| Environment | Thermal Shutdown | | | 165 | | °C |
| | Operating Junction Temperature | | | | 125 | °C |
| | Operating Temperature | | -20 | | +70 | °C |
| | Storage Temperature | | -40 | | + 85 | °C |
| PWM Dimmer | Dimmer range(Note. 1) | | 5 | | 100 | V |
| | Dimmer VH | | 2 | | 5 | V |
| | Dimmer VL | | 0 | | 1.5 | V |
| | Dimmer Frequency | | 0.25 | 0.5 | 1 | KHz |
| ON/OFF | Von | | 3.5 | | 5.5 | V |
| | off | | 0 | | 2 | V |




**Note1:** When the input ≤1KHz, the high-level digital output must be greater than the total output level of only 5%.

### 4.2.2.2 Input connector pin define

**Table 4.4: Input connector pin define**

| Pin No. | Pin Define |
|---|---|
| 1 | Vin(+12V) |

| Table 4.4: Input connector pin define | |
|---|---|
| 2 | Vin(+12V) |
| 3 | GND |
| 4 | GND |
| 5 | ON/OFF(0V: Off ; +5V: On) |
| 6 | Dimming(PWM) |

#### 4.2.2.3 Output connector pin define

| Table 4.5: Output connector pin define | |
|---|---|
| **Pin No.** | **Pin Define** |
| 1 | VLED- |
| 2 | VLED+ |

#### 4.2.2.4 Dimension

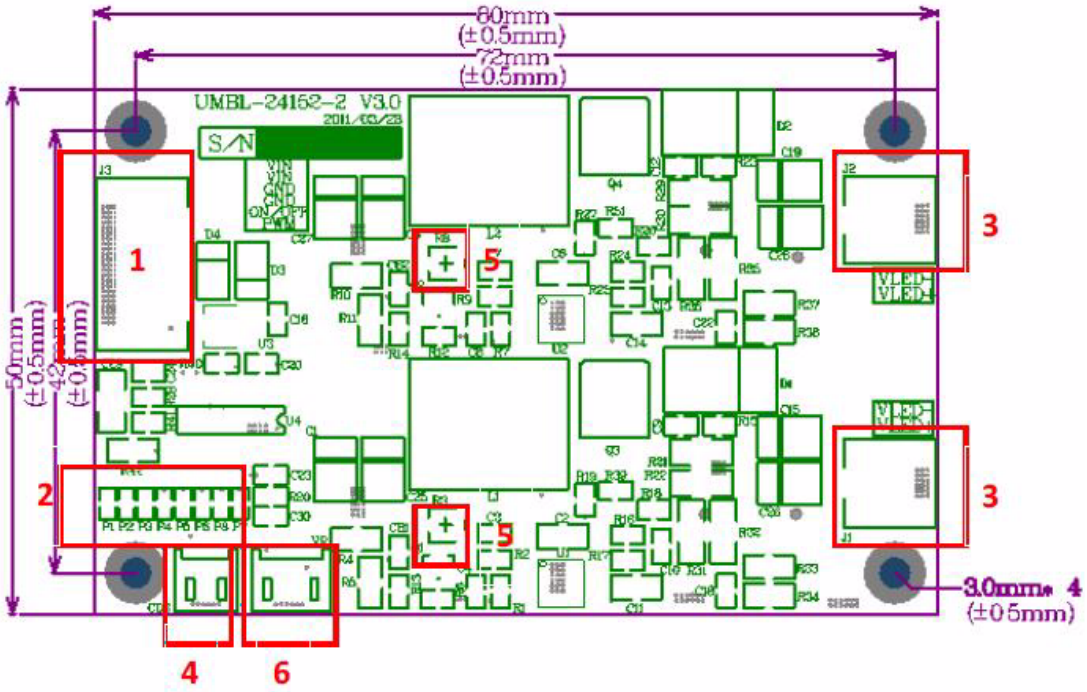



**Figure 4.1 Dimension**

# Appendix A

## Optical Characteristics

# A.1 Optical Characterisctics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

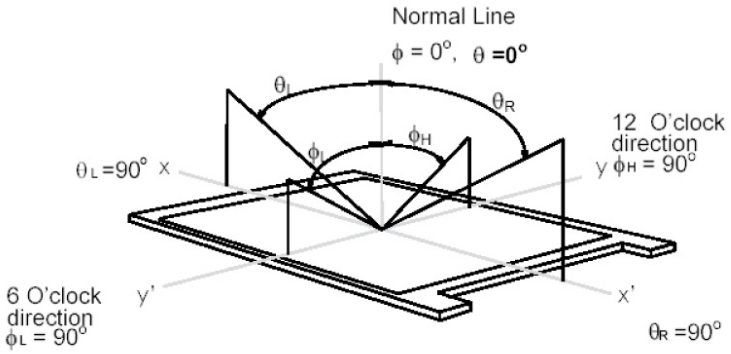
**Table A.1: Optical Characteristics**

| Item | Unit | Conditions | Min. | Typ. | Max. | Note |
|---|---|---|---|---|---|---|
| Viewing Angle | [degree] | Horizontal (Right) | | 70 | - | 1 |
| | | CR = 10 (Left) | | 70 | | |
| | | Vertical (Upper) | | 55 | - | |
| | | CR = 10 (Lower) | | 65 | | |
| Luminance Uniformity | [%] | 9 Points | 75 | 85 | - | 2, 3 |
| Optical Response Time | [msec] | Rising | - | 10 | 20 | 5 |
| | | Falling | - | 20 | 30 | |
| | | Rising + Falling | - | 30 | 50 | |
| Color/Chromaticity Coordinates (CIE 1931) | | White x | - | 0.313 | - | 4 |
| | | White y | - | 0.322 | - | |
| Color Temp. | K | | - | 6500 | | |
| White Luminance | [cd/m$^2$] | | 1100 | 1200 | - | 4 |
| Contrast Ratio | | | - | 550 | - | 4 |

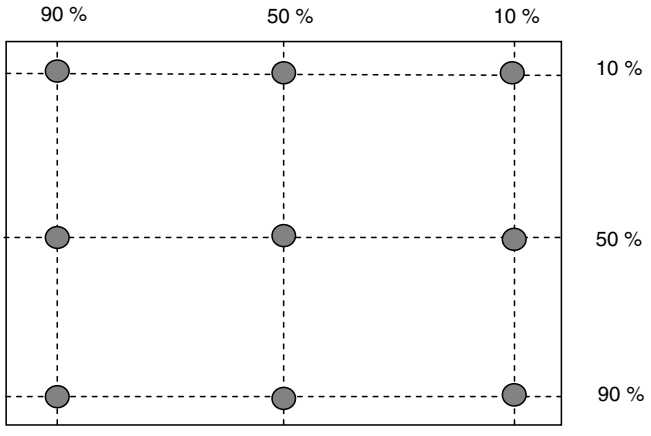
**Note** Optical Equipment: BM-7, DT-101, or equivalent

**Note1** Definition of viewing angle

Viewing angle is the measurement of contrast ratio®R10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.




**Note2** 9 points position

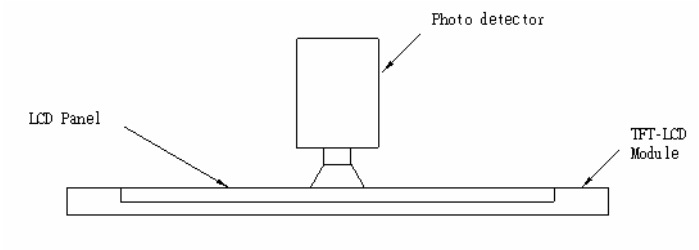


**Note3** The luminance uniformity of 9 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

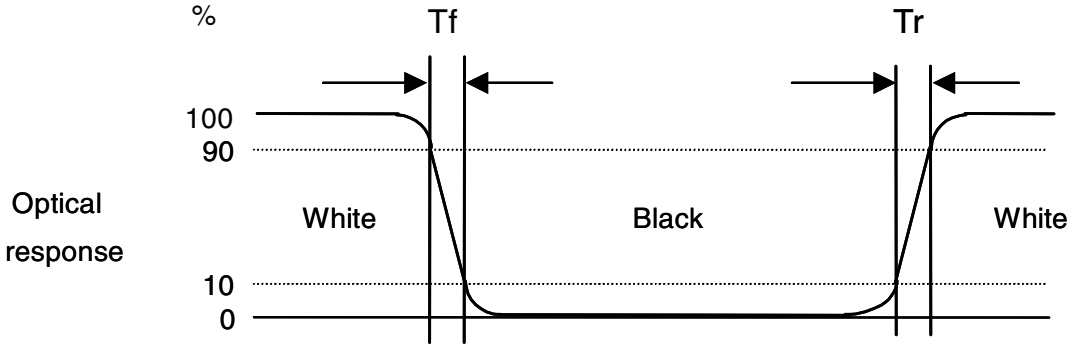
**Note4** Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room. Optical Equipment: DT-100, or equivalent




**Note5** Definition of response time

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time), and from "Full White" to "Full Black "(falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.



# Appendix B

## Handling Precautions

# B.1 Optical Characterisctics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature)

1. Since front polarizer is easily damaged, pay attention not to scratch it.
2. Be sure to turn off power supply when inserting or disconnecting from input connector.
3. Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4. When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
5. Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
6. Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7. Do not open or modify the Module Assembly.
8. Do not press the reflector sheet at the back of the module to any directions.
9. In case if a Module has to be put back into the packing container slot after once it was taken out from the container, please press at the far ends of the LED light bar reflector edge softly. Otherwise the TFT Module may be damaged.
10. At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11. After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
12. Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.

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