



# Product Specification

E170ETN-A01

☐ Preliminary Specifications

☒ Final Specifications

Module	17.0" High Brightness TFT-LCD
Model Name	E170ETN-A01
Document Version	Rev.01

Customer

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Approved by

Date

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# Product Specification

E170ETN-A01

## Contents

<b>1 General Description .....</b>	<b>4</b>
1.1 Display Characteristics.....	4
1.2 Absolute Maximum Rating of Environment .....	5
1.3 Optical Characteristics .....	6
1.4 Mechanical Characteristics.....	10
<b>2 TFT-LCD Module.....</b>	<b>11</b>
2.1 Block Diagram.....	11
2.2 Interface Connection .....	12
2.2.1 Connector Type.....	12
2.2.2 Connector Pin Assignment .....	12
2.3 Electrical Characteristics.....	14
2.3.1 Absolute Maximum Rating.....	14
2.3.2 Recommended Operating Condition .....	14
2.4 Signal Characteristics.....	15
2.4.1 LCD Pixel Format .....	15
2.4.2 LVDS Data Format .....	15
2.4.3 Color versus Input Data.....	16
2.4.4 LVDS Specification .....	17
2.4.5 Input Timing Specification.....	19
2.4.6 Input Timing Diagram.....	20
2.5 Power ON/OFF Sequence.....	21
<b>3 Backlight Unit .....</b>	<b>22</b>
3.1 Electrical Characteristics .....	22
3.1.1 Recommended Operating Condition .....	22
<b>4 Mechanical Characteristics .....</b>	<b>23</b>



# Product Specification

E170ETN-A01

Revised Record				
Version	Date	Revised Content/Summary	Page	Remark
01	2018/04/23	First Edition	All	



# Product Specification

E170ETN-A01

## 1 General Description

This specification applies to the 17 inch wide Color a-Si TFT-LCD Module E170ETN-A01. The display supports the SXGA+ (1280(H) x 1024(V)) screen format and 16.7M colors (8bits RGB data input). The input interface is Dual channel LVDS and this module doesn't contain an driver board for backlight.

### 1.1 Display Characteristics

The following items are characteristics summary on the table under 25°C condition:

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	432 (17.0")
Active Area	[mm]	337.92(H) x 270.34(V)
Pixels H x V	-	1280 x 3(RGB) x 1024
Pixel Pitch	[mm]	0.264(per one triad) x 0.264
Pixel Arrangement	-	R.G.B. Vertical Stripe
Display Mode	-	Normally White
White Luminance ( Center )	[cd/m <sup>2</sup> ]	1000 (Typ.)
Contrast Ratio	-	1000 : 1 (Typ.)
Response Time	[msec]	5 (Typ., on/off)
Power Consumption (LCD Module + Backligh unit)	[Watt]	18.6W (Typ.) LCD module : PDD (Typ.)=3W @ Black pattern,Fv=60Hz Backlight unit : PBLU (Typ.) =15.6W @Is=650mA
Weight	[Grams]	1270 (Typ.)
Outline Dimension	[mm]	358.5(H) x 296.5(V) x 10.3(D) (Typ.)
Electrical Interface	-	Dual Channel LVDS(8bits RGB data input)
Support Color	-	16.7M colors
Surface Treatment	-	Anti-glare type, Hardness 3H
Temperature Range Operating Storage (Shipping)	[°C] [°C]	0 to +50 -20 to +60
RoHS Compliance	-	RoHS Compliance
TCO Compliance	-	TCO7.0 Compliance

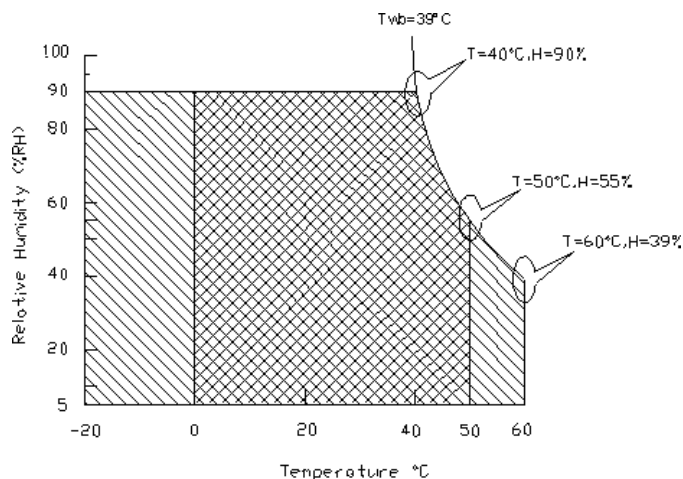
## 1.2 Absolute Maximum Rating of Environment

Permanent damage may occur if exceeding the following maximum rating.

Symbol	Description	Min.	Max.	Unit	Remark
TOP	Operating Temperature	0	+50	[°C]	<b>Note 1-1</b>
TGS	Glass surfacetemperature (operation)	0	+65	[°C]	<b>Note 1-1</b> Function judged only
HOP	Operation Humidity	5	90	[%RH]	<b>Note 1-1</b>
TST	Storage Temperature	-20	+60	[°C]	
HST	Storage Humidity	5	90	[%RH]	

**Note 1-1:** Temperature and relative humidity range are shown as the below figure.

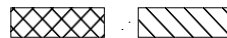
1. 90% RH Max (  $T_a \leq 39^{\circ}\text{C}$  )
2. Max wet-bulb temperature at  $39^{\circ}\text{C}$  or less. (  $T_a \leq 39^{\circ}\text{C}$  )
3. No condensation



Operating Range



Storage Range



## 1.3 Optical Characteristics

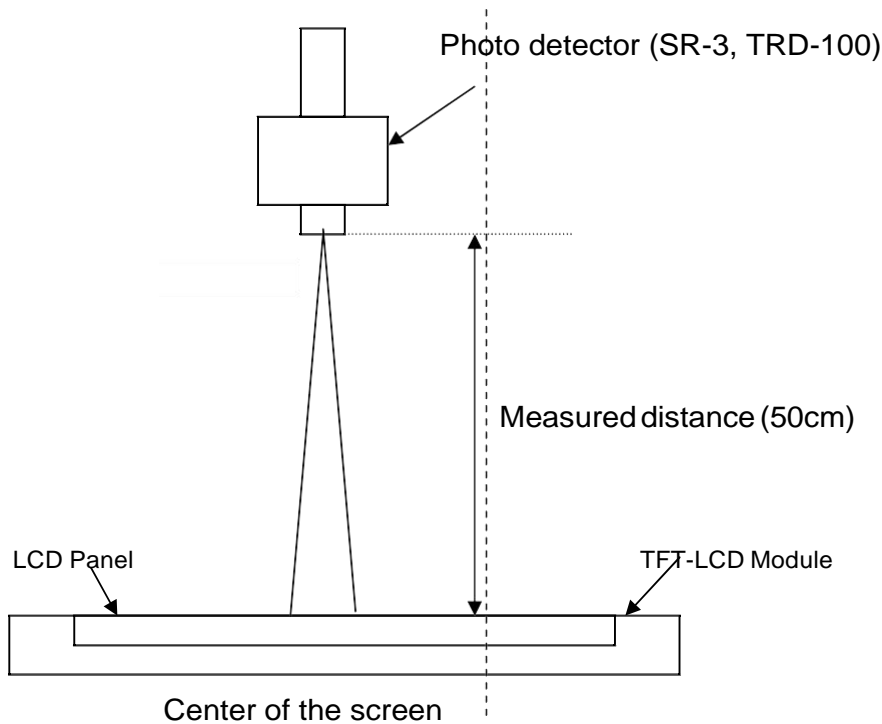
The optical characteristics are measured on the following test condition.

### Test Condition:

1. Equipment setup: Please refer to **Note 1-2**.
2. Panel Lighting time: 30 minutes
3. VDD=5.0V, Fv=60Hz, Is=650mA, Ta=25°C

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
$L_w$	White Luminance (Center of screen)		850	1000	-	[cd/m <sup>2</sup> ]	<b>Note 1-2</b> By SR-3
$L_{uni}$	Luminance Uniformity (9 points)		75	80	-	[%]	<b>Note 1-3</b> By SR-3
CR	Contrast Ratio (Center of screen)		600	1000	-	-	<b>Note 1-4</b> By SR-3
$\theta_R$	Horizontal Viewing Angle (CR=10)	Right	75	85	-	[degree]	<b>Note 1-5</b> By SR-3
$\theta_L$		Left	75	85	-		
$\Phi_H$	Vertical Viewing Angle (CR=10)	Up	70	80	-		
$\Phi_L$		Down	70	80	-		
$\theta_R$	Horizontal Viewing Angle (CR=5)	Right	75	88	-		
$\theta_L$		Left	75	88	-		
$\Phi_H$	Vertical Viewing Angle (CR=5)	Up	70	85	-		
$\Phi_L$		Down	70	85	-		
$T_R$	Response Time	Rising Time	-	3.8	5.5	[msec]	<b>Note 1-6</b> By TRD-100
$T_F$		Falling Time	-	1.2	2.5		
-		Rising + Falling	-	5	8		
$R_x$	Color Coordinates (CIE 1931)	Red x	0.617	0.647	0.677	-	By SR-3
$R_y$		Red y	0.305	0.335	0.365		
$G_x$		Green x	0.290	0.320	0.350		
$G_y$		Green y	0.591	0.621	0.651		
$B_x$		Blue x	0.124	0.154	0.184		
$B_y$		Blue y	0.031	0.061	0.091		
$W_x$		White x	0.283	0.313	0.343		
$W_y$		White y	0.299	0.329	0.359		
CT	Crosstalk		-	-	1.5	[%]	<b>Note 1-7</b> By SR-3
$F_{dB}$	Flicker (Center of screen)		-	-	-20	[dB]	<b>Note 1-8</b> By SR-3

**Note 1-2:** Equipment setup :

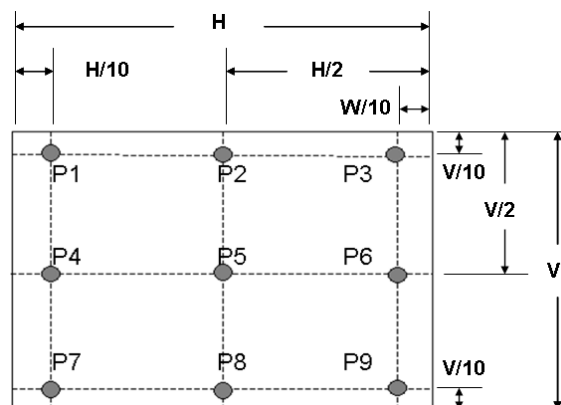


**Note 1-3:** Luminance Uniformity Measurement

**Definition:**

$$\text{Luminance Uniformity} = \frac{\text{Minimum Luminance of 9 Points (P1 ~ P9)}}{\text{Maximum Luminance of 9 Points (P1 ~ P9)}}$$

*a. Test pattern: White Pattern*



## Note 1-4: Contrast Ratio Measurement

### Definition:

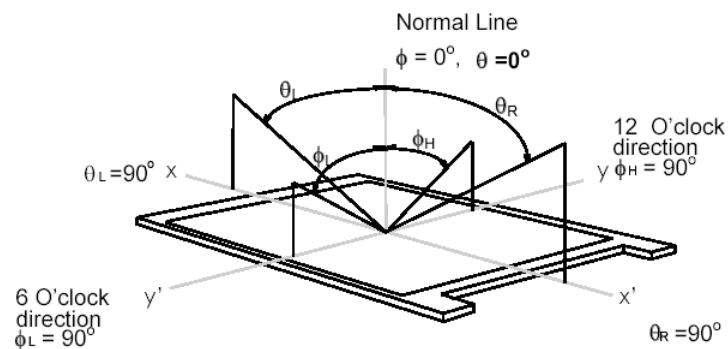
$$\text{Contrast Ratio} = \frac{\text{Luminance of White pattern}}{\text{Luminance of Black pattern}}$$

- a. Measured position: Center of screen (P5) & perpendicular to the screen ( $\theta = \Phi = 0^\circ$ )

## Note 1-5: Viewing angle measurement

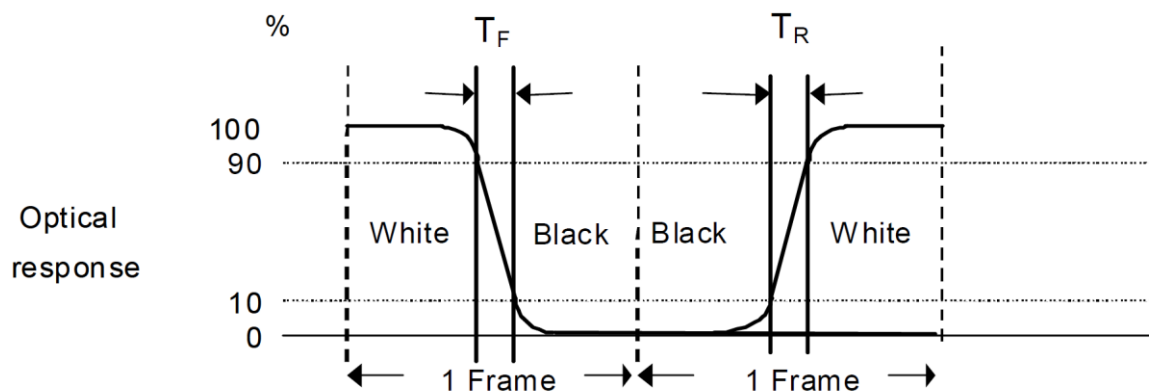
**Definition:** The angle at which the contrast ratio is greater than 10 & 5 .

- a. Horizontal view angle: Divide to left & right ( $\theta_L$  &  $\theta_R$ ) Vertical view angle: Divide to up & down ( $\Phi_H$  &  $\Phi_L$ )



## Note 1-6: Response time measurement

The output signals of photo detector are measured when the input signals are changed from “Black” to “White” (rising time,  $T_R$ ), and from “White” to “Black” (falling time,  $T_F$ ), respectively. The response time is interval between the 10% and 90% of optical response. (*Black & White color definition: Please refer section 3.4.3*)





## Note 1-7: Crosstalk measurement

### Definition:

$$CT = \text{Max.} (CT_H, CT_V);$$

Where

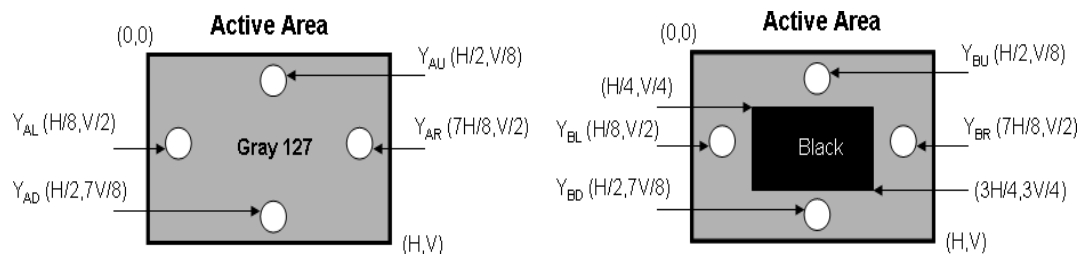
- a. Maximum Horizontal Crosstalk :

$$CT_H = \text{Max.} (|Y_{BL} - Y_{AL}| / Y_{AL} \times 100\%, |Y_{BR} - Y_{AR}| / Y_{AR} \times 100\%),$$

Maximum Vertical Crosstalk :

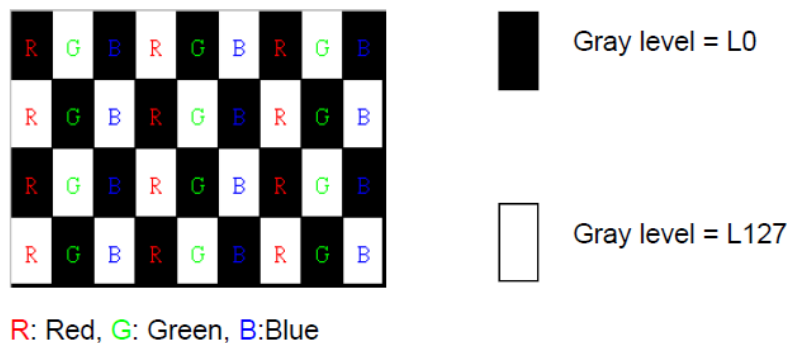
$$CT_V = \text{Max.} (|Y_{BU} - Y_{AU}| / Y_{AU} \times 100\%, |Y_{BD} - Y_{AD}| / Y_{AD} \times 100\%),$$

- b.  $Y_{AU}, Y_{AD}, Y_{AL}, Y_{AR}$  = Luminance of measured location without Black pattern  
 $Y_{BU}, Y_{BD}, Y_{BL}, Y_{BR}$  = Luminance of measured location with Black pattern



## Note 1-8: Flicker measurement

- a. Test pattern: It is listed as following.



- b. Measured position: Center of screen (P5) & perpendicular to the screen ( $\theta = \Phi = 0^\circ$ )

## 1.4 Mechanical Characteristics

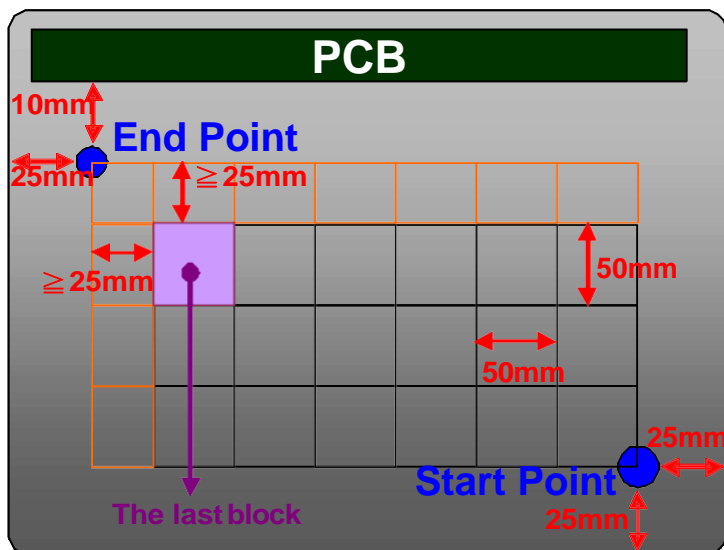
Symbol	Description	Min.	Max.	Unit	Remark
P <sub>bc</sub>	Backside Compression	2.5	-	[Kgf]	<b>Note 2-9</b>

### Note 1-9: Test Method:

The point is at a distance from right-downside 25mm x 25mm defined as the Start Point of Measure Points, and the point is at a distance 25mm from left-side & around 10mm from PCB defined as the End Point.

Align 50mm x 50mm block from Start Point on the Bezel Back, and the corners of each block are Measure Points.

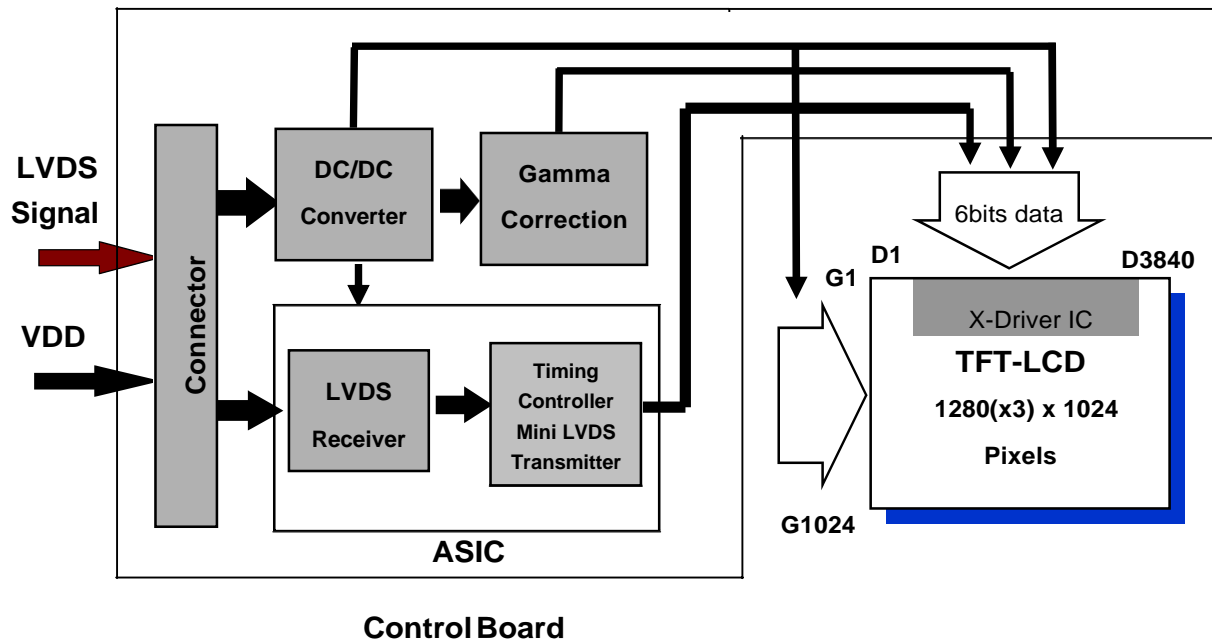
If the distance from the last block to each side of the End Point  $\geq 25\text{mm}$ , add other blocks to make sure that most area of Bezel Back can be measured.



## 2 TFT-LCD Module

### 2.1 Block Diagram

The following shows the block diagram of the 17 inch Color TFT-LCD Module.





# Product Specification

E170ETN-A01

## 2.2 Interface Connection

### 2.2.1 Connector Type

TFT-LCD Connector	Manufacturer	P-TWO	STM
	Part Number	AL230F-A0G1D-P	MSCKT2407P30HB
Mating Connector	Manufacturer	JAE	
	Part Number	FI-X30HL (Locked Type)	

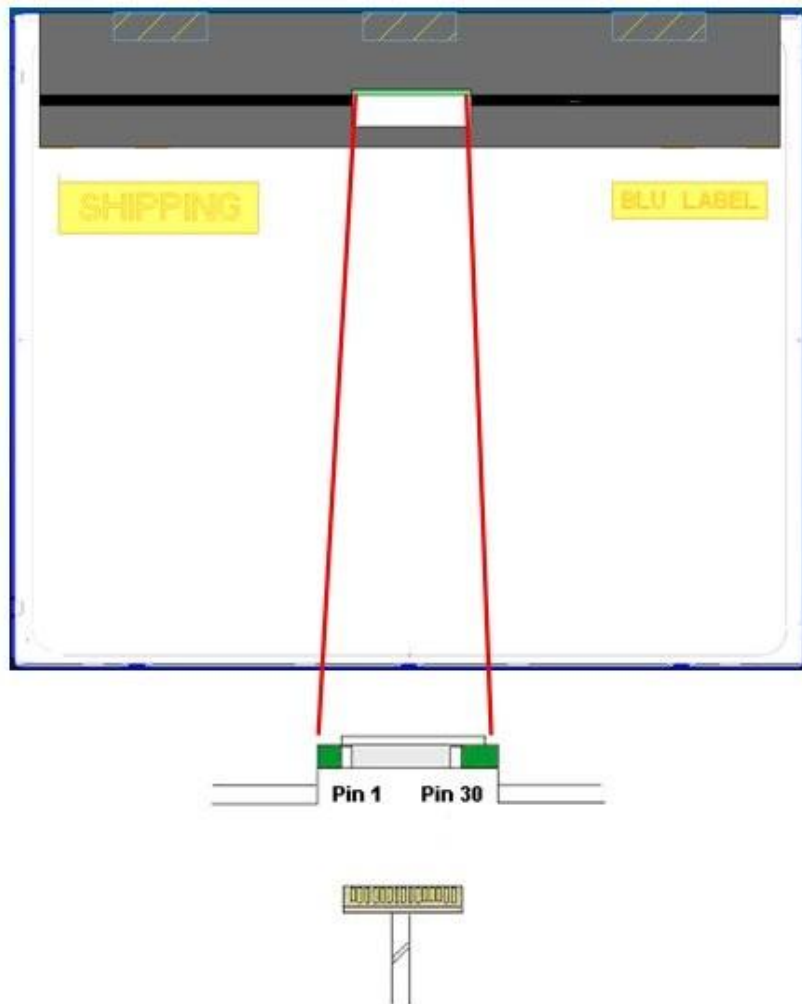
### 2.2.2 Connector Pin Assignment

PIN #	Symbol	Description	Remark
1	RxO0-	Negative LVDS differential data input (Odd data)	
2	RxO0+	Positive LVDS differential data input (Odd data)	
3	RxO1-	Negative LVDS differential data input (Odd data)	
4	RxO1+	Positive LVDS differential data input (Odd data)	
5	RxO2-	Negative LVDS differential data input (Odd data)	
6	RxO2+	Positive LVDS differential data input (Odd data)	
7	GND	Ground	
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)	
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)	
10	RxO3-	Negative LVDS differential data input (Odd data)	
11	RxO3+	Positive LVDS differential data input (Odd data)	
12	RxE0-	Negative LVDS differential data input (Even data)	
13	RxE0+	Positive LVDS differential data input (Even data)	
14	GND	Ground	
15	RxE1-	Negative LVDS differential data input (Even data)	
16	RxE1+	Positive LVDS differential data input (Even data)	
17	GND	Ground	
18	RxE2-	Negative LVDS differential data input (Even data)	
19	RxE2+	Positive LVDS differential data input (Even data)	
20	RxECLK-	Negative LVDS differential clock input (Even clock)	
21	RxECLK+	Positive LVDS differential clock input (Even clock)	
22	RxE3-	Negative LVDS differential data input (Even data)	
23	RxE3+	Positive LVDS differential data input (Even data)	
24	GND	Ground	
25	NC	No connection (for AUO test only. Do not connect)	
26	NC	No connection (for AUO test only. Do not connect)	

# Product Specification

E170ETN-A01

27	NC	No connection (for AUO test only. Do not connect)	
28	VDD	Power Supply Input Voltage	
29	VDD	Power Supply Input Voltage	
30	VDD	Power Supply Input Voltage	





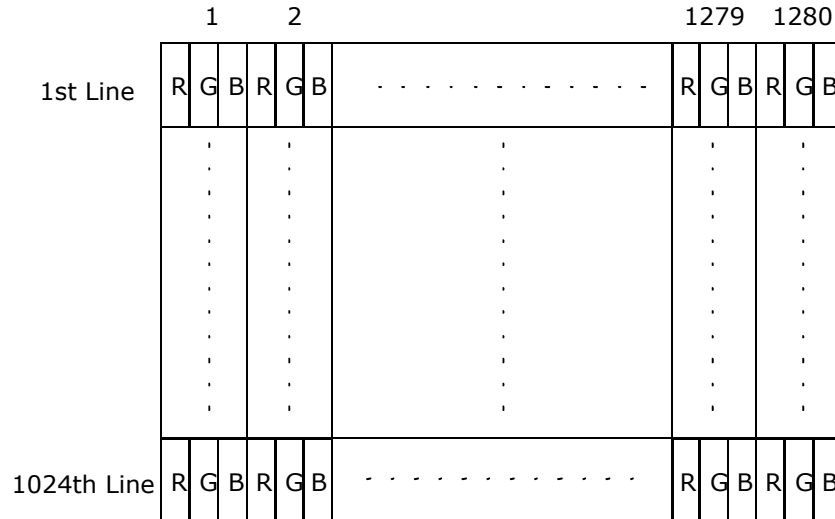


# Product Specification

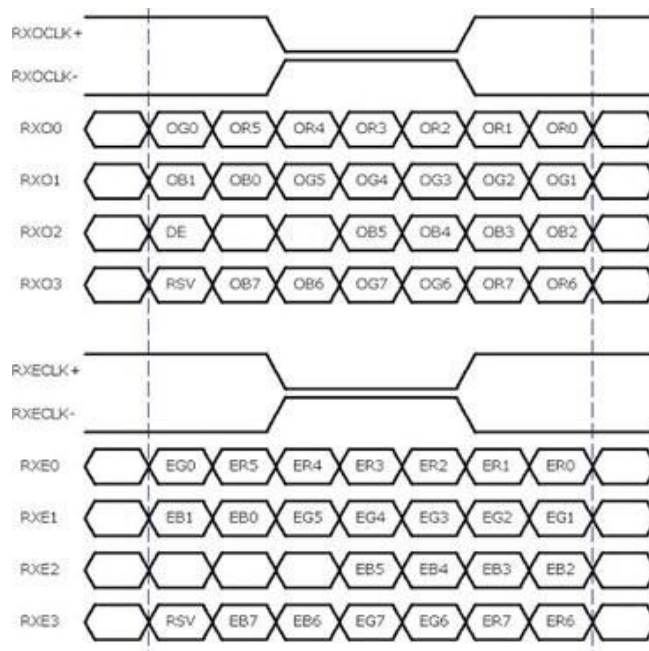
E170ETN-A01

## 2.4 Signal Characteristics

### 2.4.1 LCD Pixel Format



### 2.4.2 LVDS Data Format



8 Bit Color Bit Order			
MSB	R7	G7	B7
	R6	G6	B6
	R5	G5	B5
	R4	G4	B4
	R3	G3	B3
	R2	G2	B2
	R1	G1	B1
LSB	R0	G0	B0

#### Note 2-2:

2.4.2.1 O = "Odd Pixel Data" E = "Even Pixel Data"

2.4.2.2 Refer to 2.4.1 LCD pixel format, the 1st data is 1 (Odd Pixel Data), the 2<sup>nd</sup> data is 2 (Even Pixel Data) and the last data is 1280 (Even Pixel Data).





# Product Specification

E170ETN-A01

## 2.4.3 Color versus Input Data

The following table is for color versus input data (8bit). The higher the gray level, the brighter the color.

Color	Gray Level	Color Input Data																								Remark
		RED data (MSB:R7, LSB:R0)								GREEN data (MSB:G7, LSB:G0)								BLUE data (MSB:B7, LSB:B0)								
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Black	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
White	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Gray 127	-	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	
Red	L0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	L0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
Blue	L0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	



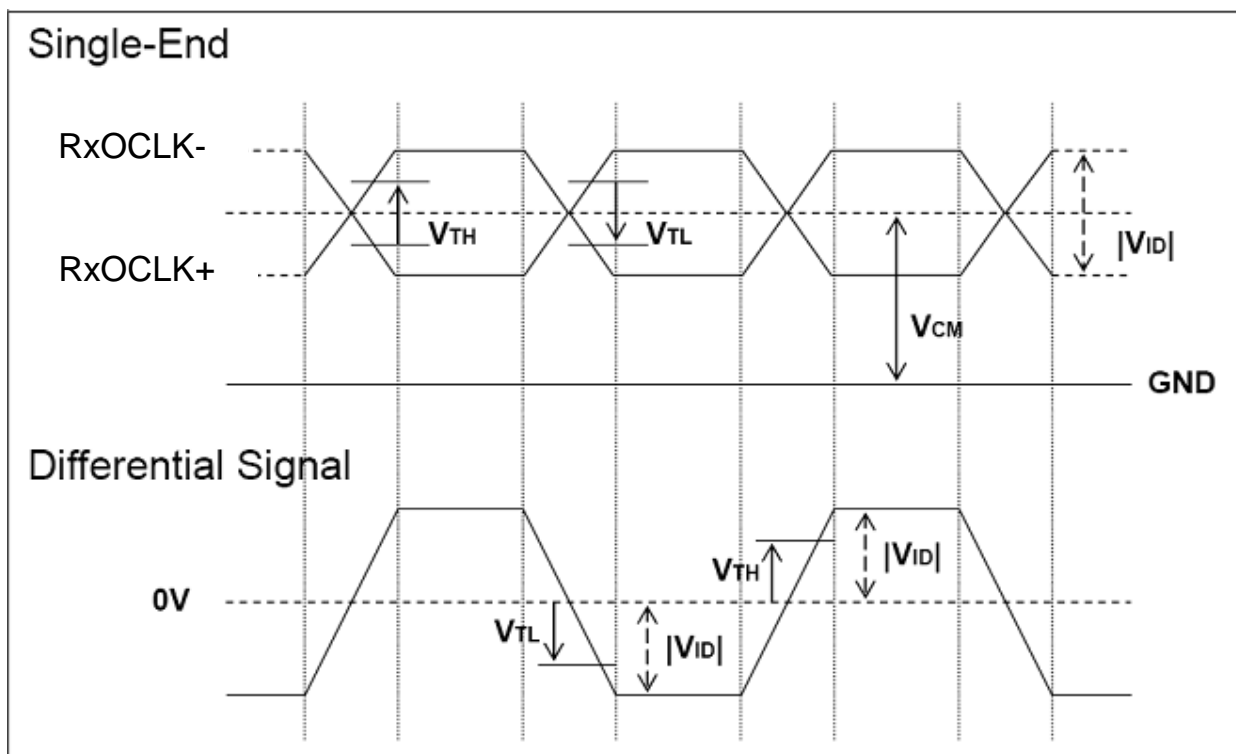
## 2.4.4 LVDS Specification

### a. DC Characteristics:

Symbol	Description	Min	Typ	Max	Units	Condition
$V_{TH}$	LVDS Differential Input High Threshold	-	-	+100	[mV]	$V_{CM} = 1.2V$
$V_{TL}$	LVDS Differential Input Low Threshold	-100	-	-	[mV]	$V_{CM} = 1.2V$
$ V_{ID} $	LVDS Differential Input Voltage	100	-	600	[mV]	
$V_{CM}$	LVDS CommonMode Voltage	+1.0	+1.2	+1.5	[V]	$V_{TH}-V_{TL} = 200mV$

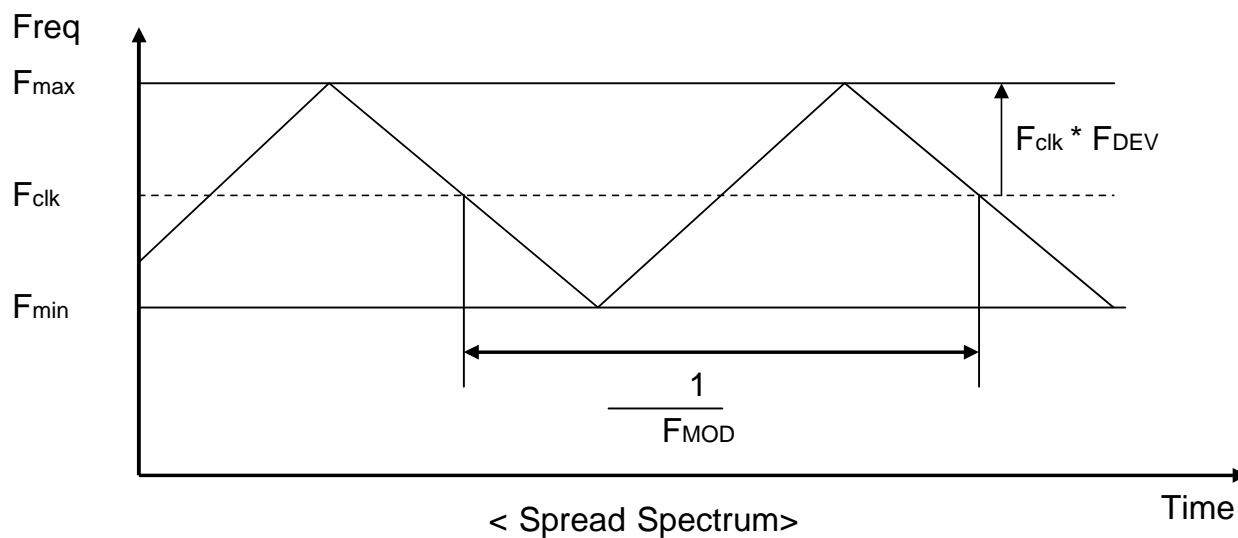
### LVDS Signal Waveform:

Use RxOCLK- & RxOCLK+ as example.



## b. AC Characteristics:

Symbol	Description	Min	Max	Unit	Remark
$F_{DEV}$	Maximum deviation of input clock frequency during Spread Spectrum	-	$\pm 3$	%	
$F_{MOD}$	Maximum modulation frequency of input clock during Spread Spectrum	-	200	KHz	



Fclk: LVDS Clock Frequency



# Product Specification

E170ETN-A01

## 2.4.5 Input Timing Specification

It only support DE mode, and the input timing are shown as the following table.

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
Tv	Vertical Section	Period	1036	1066	1873	Th	
Tdisp (v)		Active	1024	1024	1024	Th	
Tblk (v)		Blanking	12	42	849	Th	
Fv		Frequency	50	60	76	Hz	
Th	Horizontal Section	Period	730	844	1320	Tclk	
Tdisp (h)		Active	640	640	640	Tclk	
Tblk (h)		Blanking	90	204	680	Tclk	
Fh		Frequency	51.8	64	93.7	KHz	<b>Note 2-3</b>
Tclk	LVDS Clock	Period	14.6	18.5	26	ns	1/Fclk
Fclk		Frequency	37.8	54	68.4	MHz	<b>Note 2-4</b>

**Note 2-3:** The equation is listed as following. Please don't exceed the above recommended value.

$$Fh (\text{Min.}) = Fclk (\text{Min.}) / Th (\text{Min.});$$

$$Fh (\text{Typ.}) = Fclk (\text{Typ.}) / Th (\text{Typ.});$$

$$Fh (\text{Max.}) = Fclk (\text{Max.}) / Th (\text{Min.});$$

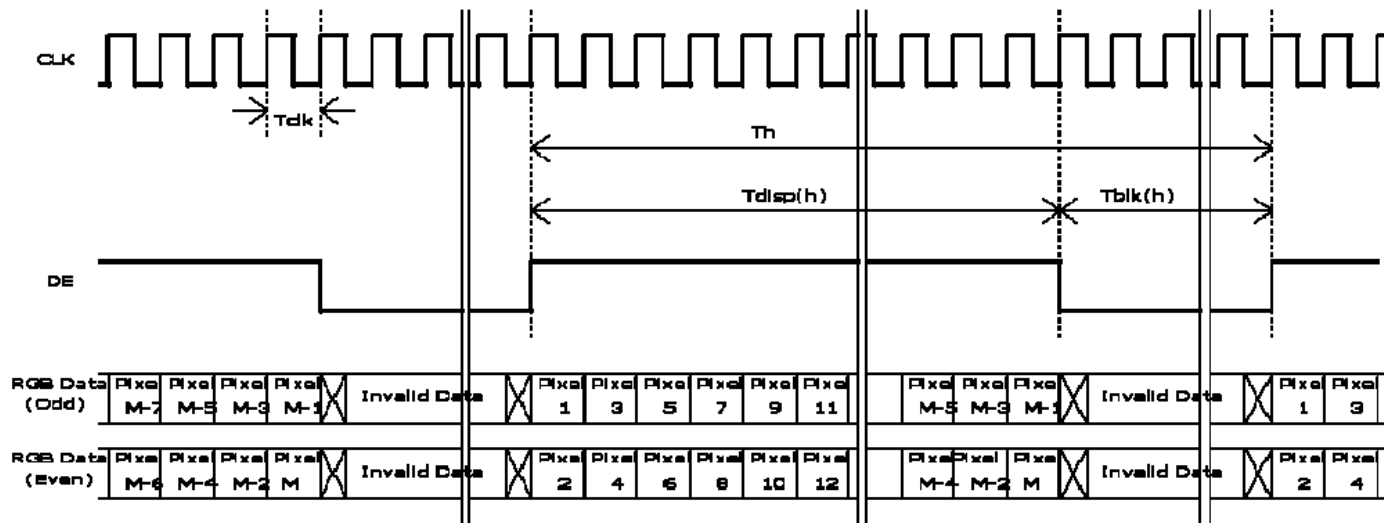
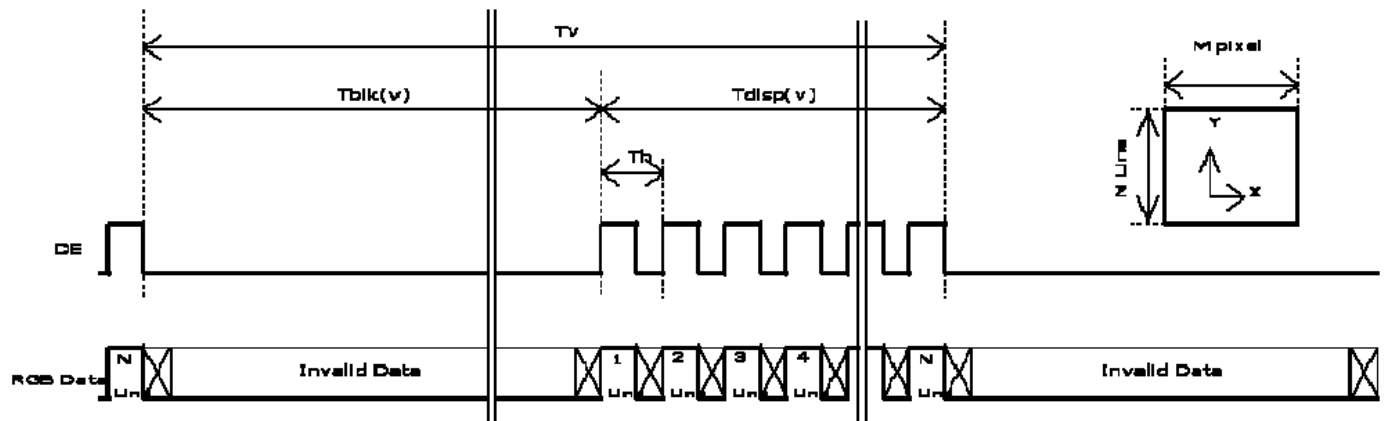
**Note 2-4:** The equation is listed as following. Please don't exceed the above recommended value.

$$Fclk (\text{Min.}) = Fv (\text{Min.}) \times Th (\text{Min.}) \times Tv (\text{Min.});$$

$$Fclk (\text{Typ.}) = Fv (\text{Typ.}) \times Th (\text{Typ.}) \times Tv (\text{Typ.});$$

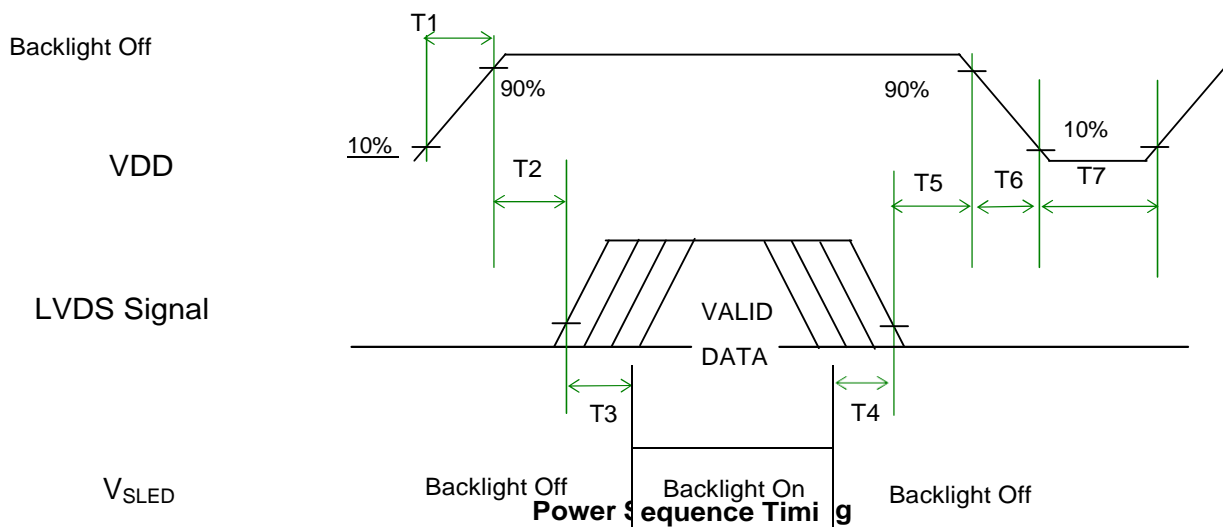
$$Fclk (\text{Max.}) = Fv (\text{Max.}) \times Th (\text{Typ.}) \times Tv (\text{Typ.});$$

## 2.4.6 Input Timing Diagram



## 2.5 Power ON/OFF Sequence

VDD power, LVDS signal and backlight on/off sequence are as following. LVDS signals from any system shall be Hi-Z state when VDD is off.



Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
T1	0.5	-	10	[ms]	
T2	0	-	50	[ms]	
T3	500	-	-	[ms]	
T4	100	-	-	[ms]	
T5	0		50	[ms]	<b>Note 2-5</b> <b>Note 2-6</b>
T6	5	-	100	[ms]	<b>Note 2-6</b>
T7	1000	-	-	[ms]	

**Note 2-5 :** Recommend setting T5 = 0ms to avoid electronic noise when VDD is off.

**Note 2-6 :** During T5 and T6 period , please keep the level of input LVDS signals with Hi-Z state.



# Product Specification

E170ETN-A01

## 3 Backlight Unit

### 3.1 Electrical Characteristics

#### 3.1.1 Recommended Operating Condition

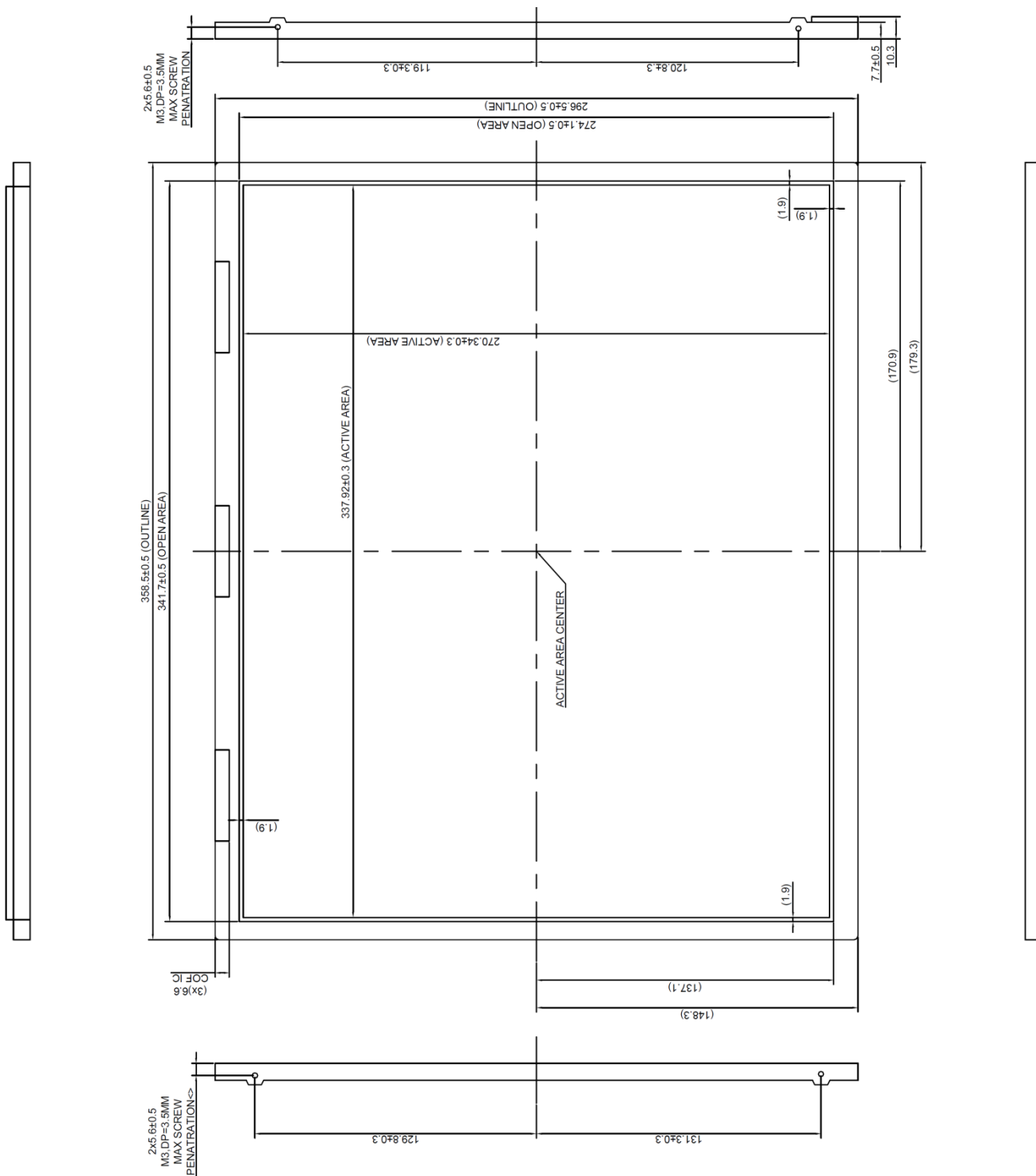
(Ta=25°C)

Symbol	Description	Min.	Typ.	Max.	Unit	Remark
I <sub>L</sub>	Current of LED Backlight	-	650		[mA]	
V <sub>L</sub>	Voltage of LED Backlight		24		[Volt]	
P <sub>BLU</sub>	LED Light Bar Power Consumption	-	15.6		[Watt]	
LT <sub>LED</sub>	LED Life Time	50,000	-	-	[Hour]	<b>Note 3-1</b>

**Note 3-1:** Definition of life time:

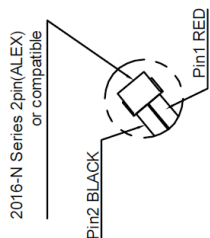
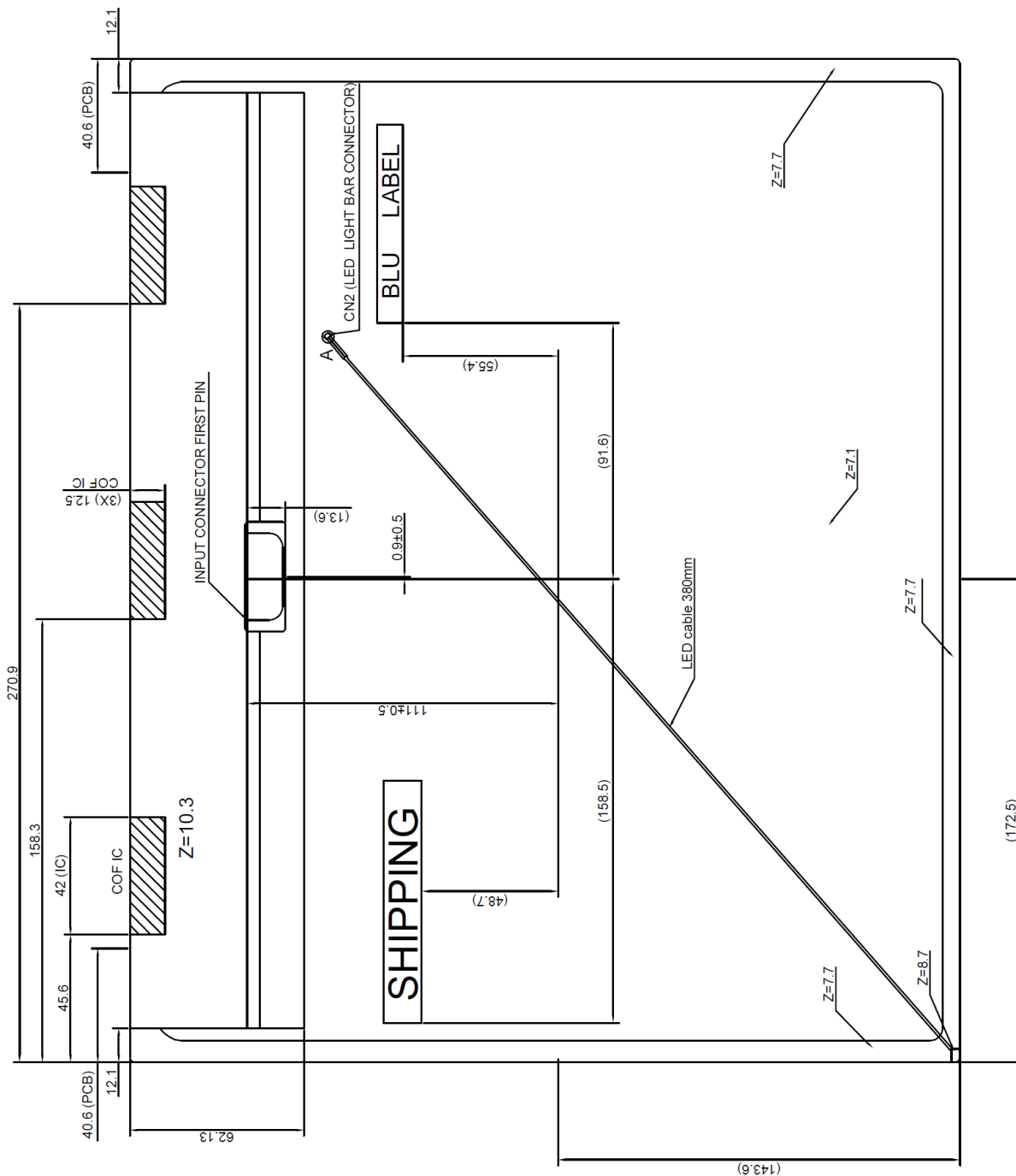
- Brightness of LED becomes to 50% of its original value
- Test condition: I<sub>L</sub> =650mA and 25°C (Room Temperature)

### 4 Mechanical Characteristics



# Product Specification

E170ETN-A01



Detail A

CN2 (LED Light)	
PIN	PIN Define
1	LED-Vin
2	LED-GND





# Product Specification

DB-LB0C-08

☐ Preliminary Specifications

☒ Final Specifications

Product	LED Driver Board
Model Name	DB-LB0C-08
Document Version	Rev.01

Customer

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Approved by

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# **Product Specification**

DB-LB0C-08

## Contents

<b>1. General Description .....</b>	<b>4</b>
<b>2. Feature .....</b>	<b>4</b>
<b>3. Protection .....</b>	<b>5</b>
<b>4. Optional Backlight Driving Condition .....</b>	<b>5</b>
<b>5. Absolute maximum ratings .....</b>	<b>5</b>
<b>6. Interface Characteristics .....</b>	<b>6</b>
<b>7. Environmental .....</b>	<b>6</b>
<b>8. Connector Socket .....</b>	<b>7</b>
8.1 Connector Type.....	7
8.2 Pin Definition .....	8
<b>9. Mechanical Characteristics .....</b>	<b>9</b>



# Product Specification

DB-LB0C-08

Revised Record				
Version	Date	Revised Content/Summary	Page	Remark
01	2018/04/23	First Edition	All	

## **1. General Description**

This Product Specification is made to be the standard of Elite manufactured LED Driving Board such a standard will be followed in Taiwan Screen production, shipment, and quality inspection.



## **2. Feature**

- 30W LED Driver
- Constant-Current Control
- Support PWM Dimming

## 3. Protection

Item	Max.	Remark
Over current protection (OCP)	Depending on LED B/L	
Over voltage protection (OVP)	56V(Note1)	

**Note :** When the LED string is opened, over voltage protection will limit the output to approximately 56V

## 4. Optional Backlight Driving Condition

Item	Symbol	Min.	TYP.	Max.	Unit	Remark
LED Voltage	$V_{LED}$		24		V	
LED Current	$I_{LED}$		650		mA	

## 5. Absolute maximum ratings

Parameter	Symbol	Min.	TYP	Max.	Unit	Remark
Input Voltage	$V_{in}$	10.8	12	15	V	
Output Voltage	$V_{out}$			50	V	
Output Current	$I_{out}$			1000	mA	



# Product Specification

DB-LB0C-08

## 6. Interface Characteristics

Parameter	Symbol	Min.	TYP.	Max.	Unit	Remark
Backlight ON Voltage	INVON	1.25	5	Vin	V	
Backlight OFF Voltage	INVON			0.4	V	
PWM Control	PWM	3.3	5		V	
PWM Control Frequency	PWM	85	100		Hz	
PWM Control Duty	PWM	0		100	%	

## 7.Environmental

Item	Symbol	Conditions	MIN	MAX	Unit	Remark
Operating Temperature	Top	Ha=90%RH	0	60	°C	
Storage Temperature	Tstg	Ha=95%RH	-20	85	°C	

## 8. Connector Socket

### 8.1 Connector Type

Connector (J1)

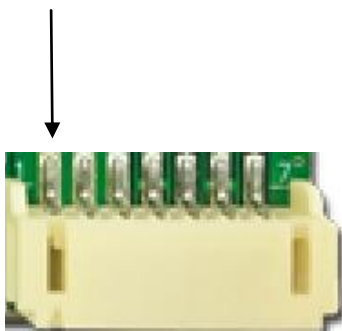
Connector Name / Designation	For Signal Connector
Manufacturer	JST or compatible
Type / Part Number	S7B-PH-SM4-TB or compatible
Mating Housing / Part Number	PHR-7 or compatible

Connector (J2 & J3)

Connector Name / Designation	For Signal Connector
Manufacturer	JST or compatible
Type / Part Number	S2B-PH-SM4-TB or compatible
Mating Housing / Part Number	PHR-2 or compatible

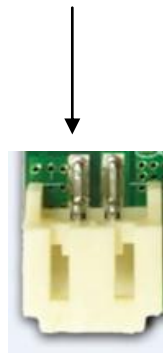
J1 S7B-PH-SM4-TB

(Pin 1)



J2 & J3 S2B-PH-SM4-TB

(Pin 1)





# Product Specification

DB-LB0C-08

## 8.2 Pin Definition

Connector (J1)

PIN No.	Symbol	Description
1	Vin	Power Input (+12V)
2	Vin	Power Input (+12V)
3	Vin	Power Input (+12V)
4	GND	Ground
5	PWM	PWM Brightness Control
6	GND	Ground
7	EN	Backlight on/off Control (5V / 0V)

Connector (J2 & J3)

PIN No.	Symbol	Description
1	V_LED+	LED Power +
2	V_LED-	LED Power -



## 9. Mechanical Characteristics

Dimension: 75(L) \*30(W) \*8.5(H) mm

Weight: MAX. 20g

