



Product Specification

E190ETN-A01

☐ Preliminary Specifications

☒ Final Specifications



Module	19.0" High Brightness TFT-LCD
Model Name	E190ETN-A01
Document Version	Rev.01

Customer

Approved by

Date

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Product Specification

E190ETN-A01

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01	2018/02/26	First Edition	All	



Product Specification

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1 General Description

This specification applies to the 19 inch SXGA Color a-Si TFT-LCD Module E190ETN-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]	482.6 (19.0")
Active Area	[mm]	376.32 (H) x 301.056 (V)
Pixels H x V	-	1280(x3) x 1024
Pixel Pitch	[um]	294 (per one triad) x294
Pixel Arrangement	-	R.G.B. Vertical Stripe
Display Mode	-	TN Mode, Normally White
White Luminance (Center)	[cd/m ²]	1000 (Typ.)
Contrast Ratio	-	1000 (Typ.)
Response Time	[msec]	5 (Typ., on/off)
Power Consumption (LCD Module + Backligh unit)	[Watt]	20.2 (Typ.) LCD module : PDD (Typ.)=2.7 @ Black pattern,Fv=60Hz Backlight unit : P _{BLU} (Typ.) =17.5
Weight	[Grams]	1700
Outline Dimension	[mm]	396(H) x 324(V) x 10.9(D) Typ.
Electrical Interface	-	Dual channel LVDS 8bits RGB data input
Support Color	-	16.7M colors
Surface Treatment	-	Anti-Glare, 3H
Temperature Range Operating Storage (Shipping)	[°C] [°C]	0 to +50 -20 to +60
RoHS Compliance	-	RoHS Compliance
TCO Compliance	-	TCO 7.0 Compliance

1.2 Absolute Maximum Rating of Environment

Permanent damage may occur if exceeding the following maximum rating.

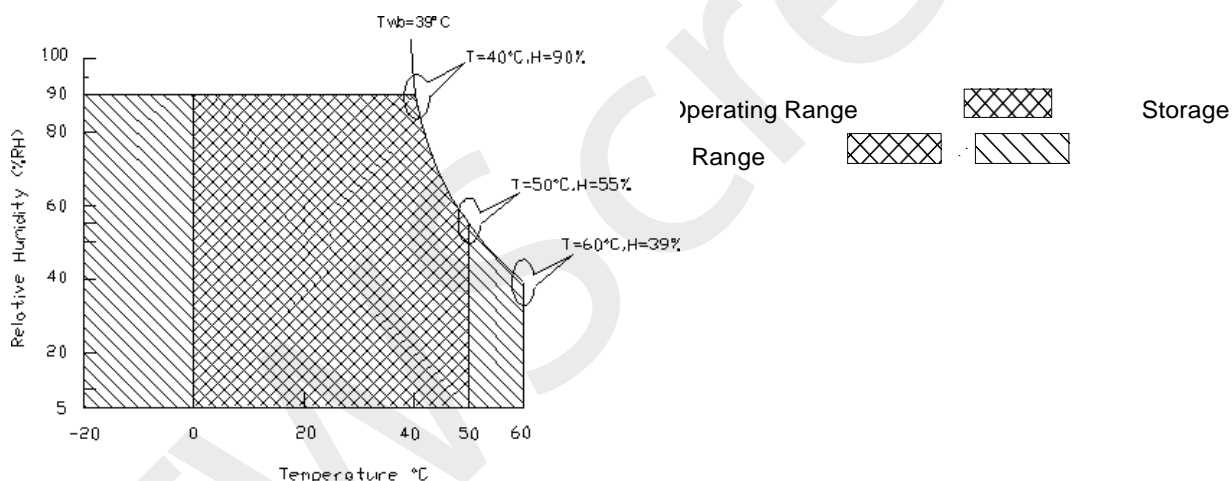
Symbol	Description	Min.	Max.	Unit	Remark
TOP	Operating Temperature	0	+50	[°C]	Note 1-1
TGS	Glass surfacetemperature (operation)	0	+65	[°C]	Note 1-1 Function judged only
HOP	Operation Humidity	5	90	[%RH]	Note 1-1
TST	Storage Temperature	-20	+60	[°C]	
HST	Storage Humidity	5	90	[%RH]	

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

1. 90% RH Max ($T_a \leq 39^\circ\text{C}$)

1.2.1 Max wet-bulb temperature at 39°C or less. ($T_a \leq 39^\circ\text{C}$)

1.2.2 No condensation



1.3 Optical Characteristics

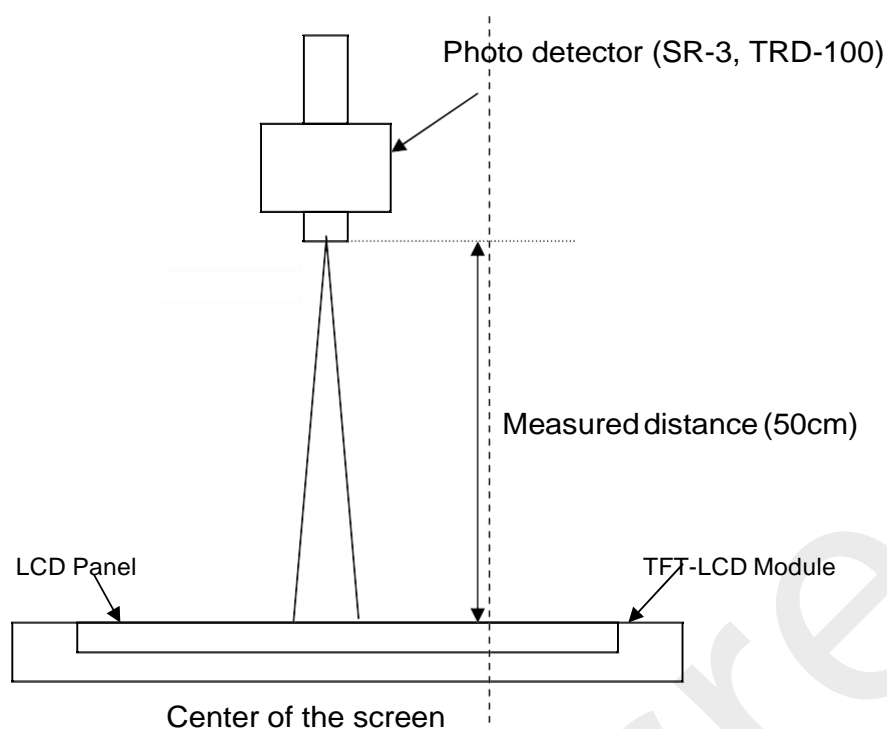
The optical characteristics are measured on the following test condition.

Test Condition:

1. Equipment setup: Please refer to **Note 1-2**.
2. Panel Lighting time: 30 minutes
3. VDD=5.0V, Fv=60Hz, Is=55mA, Ta=25°C

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
L_w	White Luminance (Center of screen)		850	1000	-	[cd/m ²]	
L_{uni}	Luminance Uniformity (9 points)		75	80	-	[%]	Note 1-3 By SR-3
CR	Contrast Ratio (Center of screen)		600	1000	-	-	Note 1-4 By SR-3
θ_R	Horizontal Viewing Angle (CR=10)	Right	75	85	-	[degree]	Note 1-5 By SR-3
θ_L		Left	75	85	-		
Φ_H	Vertical Viewing Angle (CR=10)	Up	70	80	-		
Φ_L		Down	70	80	-		
θ_R	Horizontal Viewing Angle (CR=5)	Right	75	88	-		
θ_L		Left	75	88	-		
Φ_H	Vertical Viewing Angle (CR=5)	Up	70	85	-		
Φ_L		Down	70	85	-		
T_R	Response Time	Rising Time	-	3.6	5.7	[msec]	Note 1-6 By TRD-100
T_F		Falling Time	-	1.4	2.3		
-		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	0.311	0.341	0.371		
G_x		Green x	0.296	0.326	0.356		
G_y		Green y	0.596	0.626	0.656		
B_x		Blue x	0.122	0.152	0.182		
B_y		Blue y	0.025	0.055	0.085		
W_x		White x	0.283	0.313	0.343		
W_y		White y	0.299	0.329	0.359		
CT	Crosstalk		-	-	1.5	[%]	Note 1-7 By SR-3
F_{dB}	Flicker (Center of screen)		-	-	-20	[dB]	Note 1-8 By SR-3

Note 1-2: Equipment setup :



Note 1-3: Luminance Uniformity Measurement

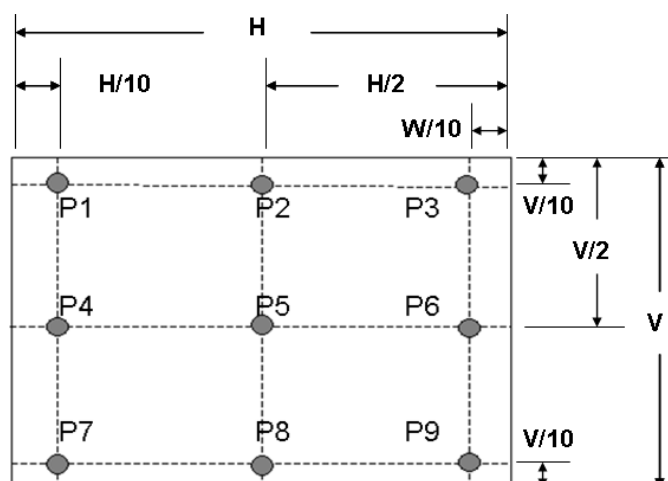
Definition:

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

a. Test pattern: White Pattern

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Note 1-4: Contrast Ratio Measurement

Definition:

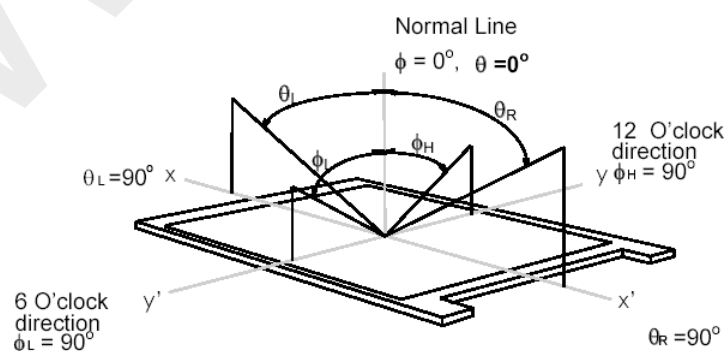
$$\text{Contrast Ratio} = \frac{\text{Luminance of White pattern}}{\text{Luminance of Black pattern}}$$

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

Note 1-5: Viewing angle measurement

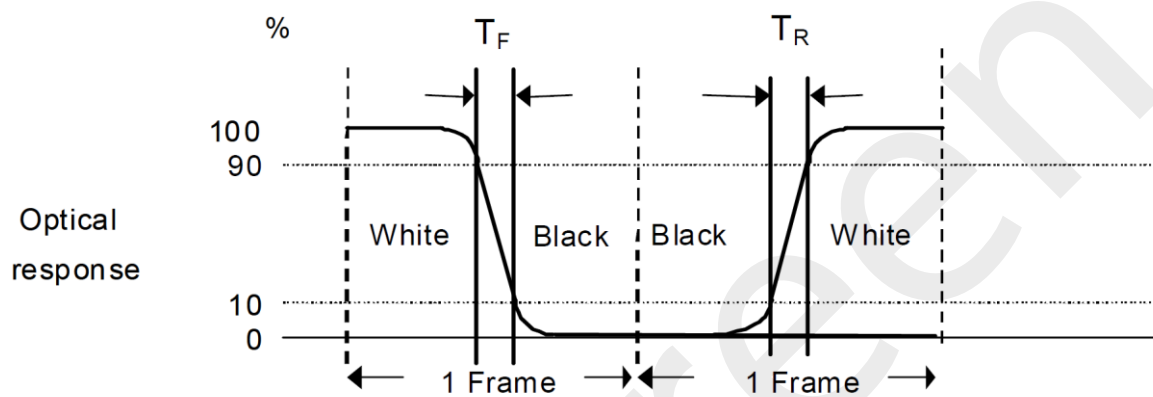
Definition: The angle at which the contrast ratio is greater than 10 & 5 .

- a. Horizontal view angle: Divide to left & right (θ_L & θ_R) Vertical view angle: Divide to up & down (Φ_H & Φ_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

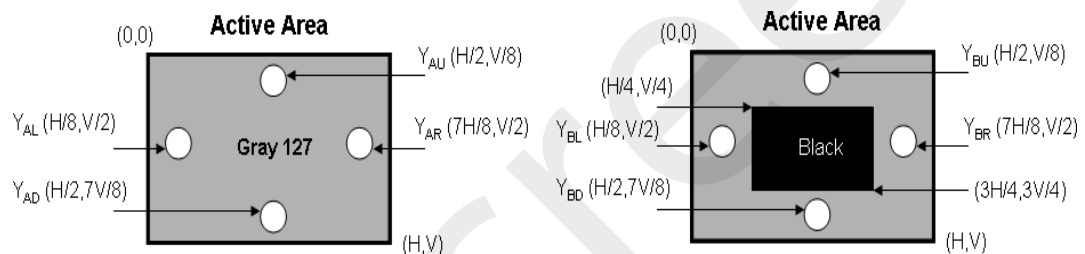
- a. Maximum Horizontal Crosstalk :

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

Maximum Vertical Crosstalk :

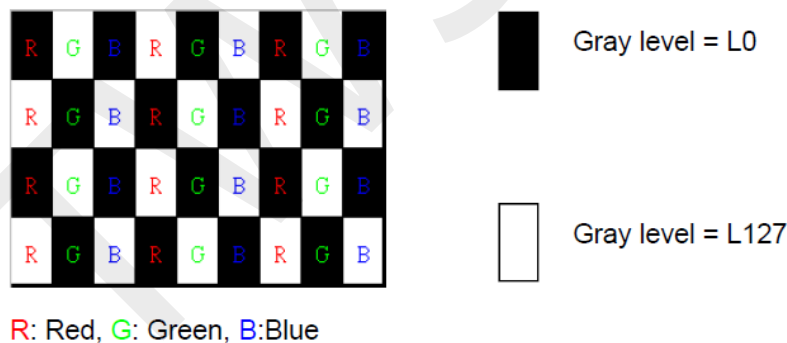
$$CT_V = \text{Max. } (|Y_{BU} - Y_{AU}| / Y_{AU} \times 100 \%, |Y_{BD} - Y_{AD}| / Y_{AD} \times 100 \%),$$

- 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

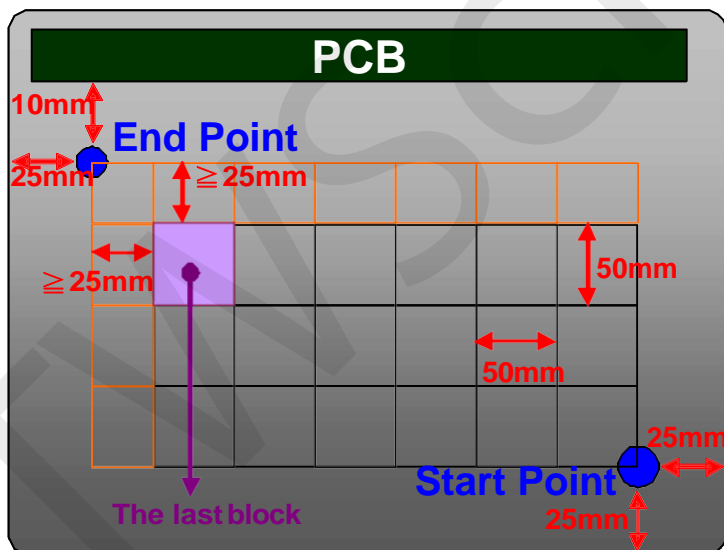
Symbol	Description	Min.	Max.	Unit	Remark
P _{bc}	Backside Compression	2.5	-	[Kgf]	Note 2-9

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.

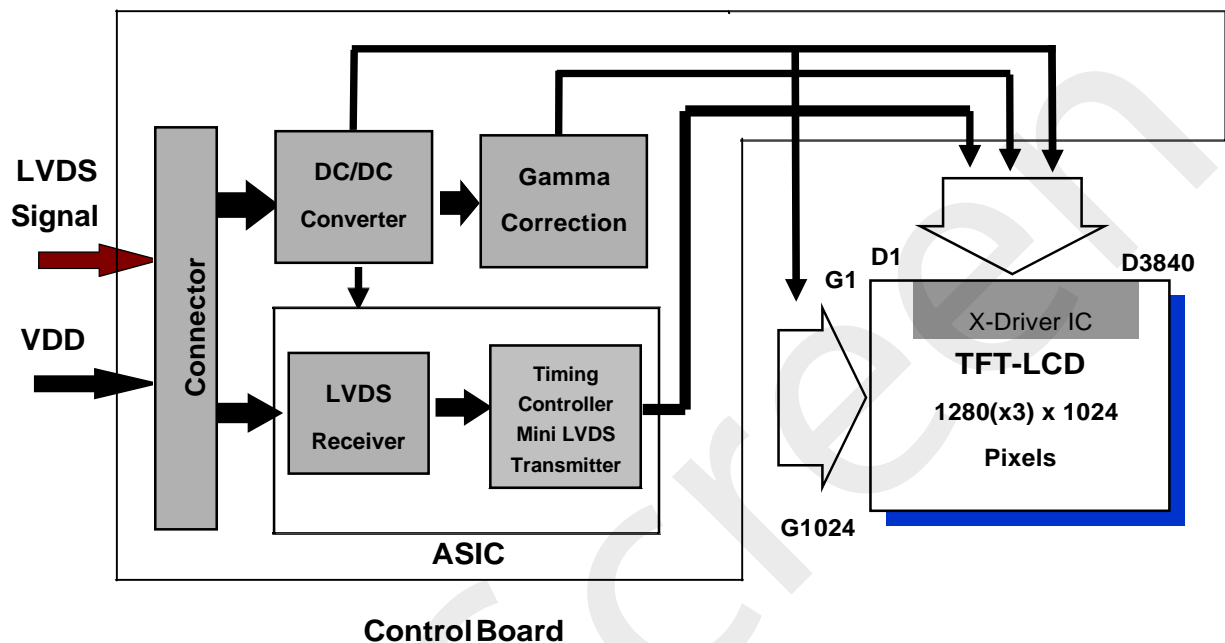
If the distance from the last block to each side of the End Point $\geq 25\text{mm}$, add other blocks to make sure that most area of Bezel Back can be measured.



2 TFT-LCD Module

2.1 Block Diagram

The following shows the block diagram of the 19.0 inch Color TFT-LCD Module.





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2.2 Interface Connection

2.2.1 Connector Type

TFT-LCD Connector	Manufacturer	P-TWO	STM
	Part Number	187034-3009	MSBKT2407P30HB
Mating Connector	Manufacturer	JAE	
	Part Number	FI-X30HL FI-X30H (Unlocked Type)	

2.2.2 Connector Pin Assignment

PIN #	Symbol	Description	Remark
1	RxOIN0-	Negative LVDS differential data input (Odd data)	
2	RxOIN0+	Positive LVDS differential data input (Odd data)	
3	RxOIN1-	Negative LVDS differential data input (Odd data)	
4	RxOIN1+	Positive LVDS differential data input (Odd data)	
5	RxOIN2-	Negative LVDS differential data input (Odd data)	
6	RxOIN2+	Positive LVDS differential data input (Odd data)	
7	GND	Power Ground	
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)	
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)	
10	RxOIN3-	Negative LVDS differential data input (Odd data)	
11	RxOIN3+	Positive LVDS differential data input (Odd data)	
12	RxEIN0-	Negative LVDS differential data input (Even data)	
13	RxEIN0+	Positive LVDS differential data input (Even data)	
14	GND	Power Ground	
15	RxEIN1-	Negative LVDS differential data input (Even data)	
16	RxEIN1+	Positive LVDS differential data input (Even data)	
17	GND	Power Ground	
18	RxEIN2-	Negative LVDS differential data input (Even data)	
19	RxEIN2+	Positive LVDS differential data input (Even data)	
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)	
21	RxECLKIN+	Positive LVDS differential clock input (Even clock)	
22	RxEIN3-	Negative LVDS differential data input (Even data)	
23	RxEIN3+	Positive LVDS differential data input (Even data)	
24	GND	Power Ground	
25	GND	NC & Power Ground	
26	NC	No connection (for AUO test)	



Figure 1: PCB layout of the board. The top part shows a top-down view of the PCB with dimensions in millimeters. The bottom part shows a cross-sectional view of the board with labels for RX/INO- and VDD.

2.3 Electrical Characteristics

2.3.1 Absolute Maximum Rating

Permanent damage may occur if exceeding the following maximum rating.

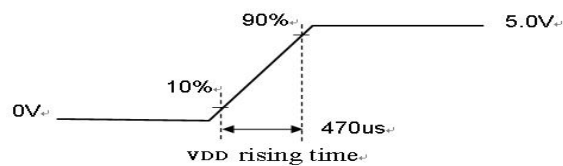
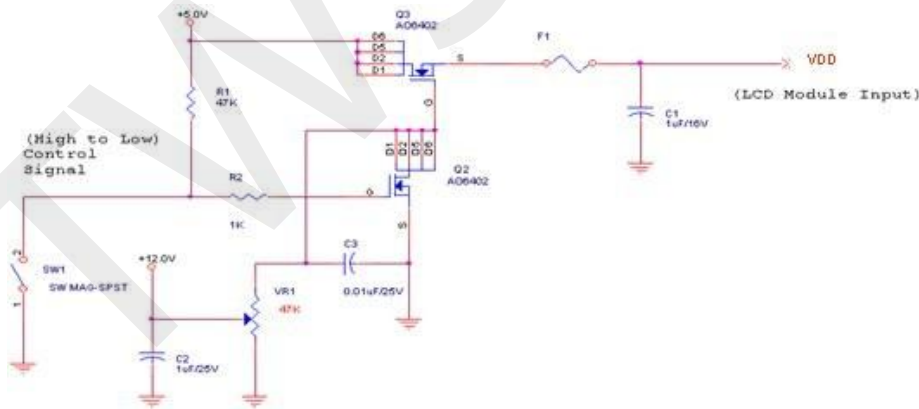
Symbol	Description	Min	Max	Unit	Remark
VDD	Power Supply Input Voltage	GND-0.3	6.0	[Volt]	Ta=25°C

2.3.2 Recommended Operating Condition

Symbol	Description	Min	Typ	Max	Unit	Remark
VDD	Power supply Input voltage	4.5	5.0	5.5	[Volt]	
IDD	Power supply Input Current (RMS)	-	0.53	0.64	[A]	VDD= 5.0V, Black Pattern, Fv=60Hz
			0.61	0.73	[A]	VDD= 5.0V, Black Pattern, Fv=75Hz
PDD	VDD Power Consumption	-	2.7	3.2	[Watt]	VDD= 5.0V, Black Pattern, Fv=60Hz
			3.05	3.7	[Watt]	VDD= 5.0V, Black Pattern, Fv=75Hz
IRush	Inrush Current	-	-	3.0	[A]	Note 2-1
VDDrp	Allowable VDD Ripple Voltage	-	-	500	[mV]	VDD= 5.0V, Black Pattern, Fv=75Hz

Note 2-1: Inrush Current measurement: Test

circuit:



The duration of VDD rising time: 470us.

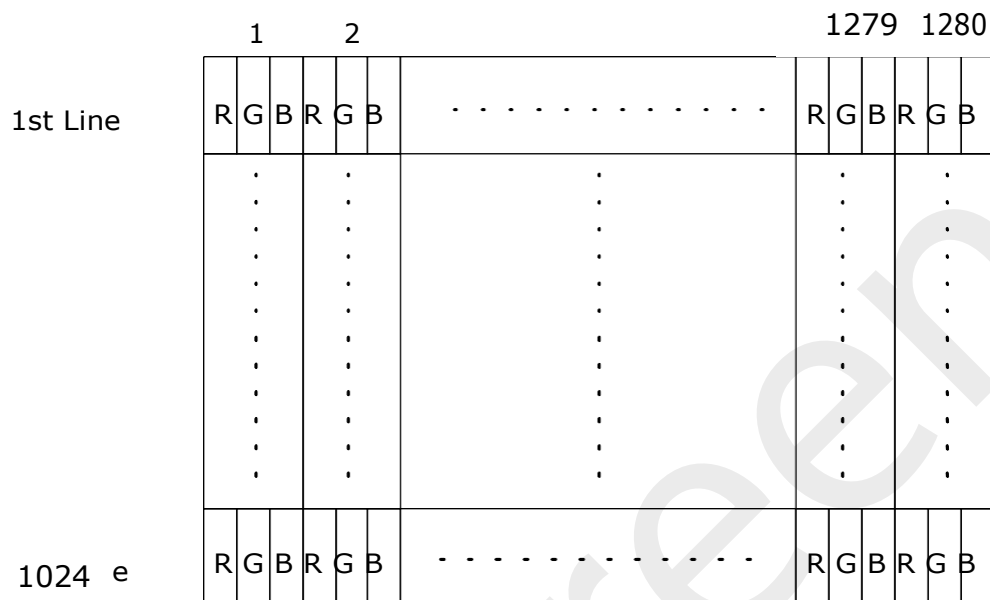


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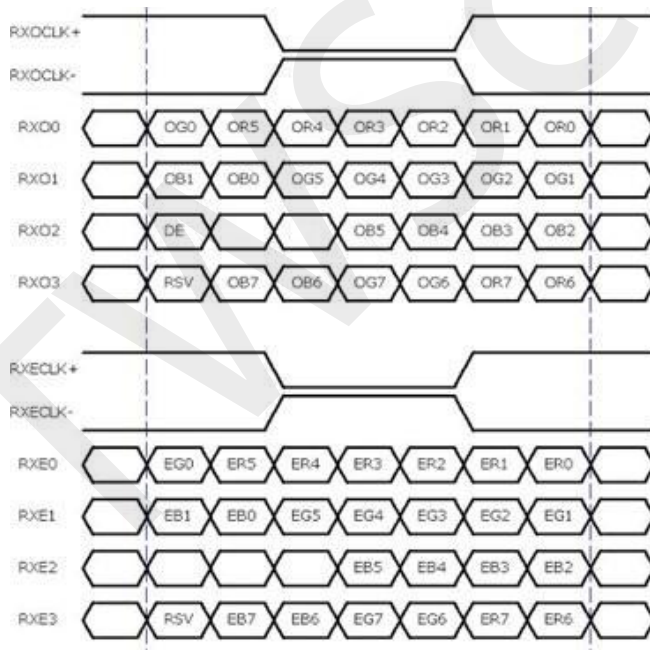
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2.4 Signal Characteristics

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 2nd data is 2 (Even Pixel Data) and the last data is 1280 (Even Pixel Data).

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	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	

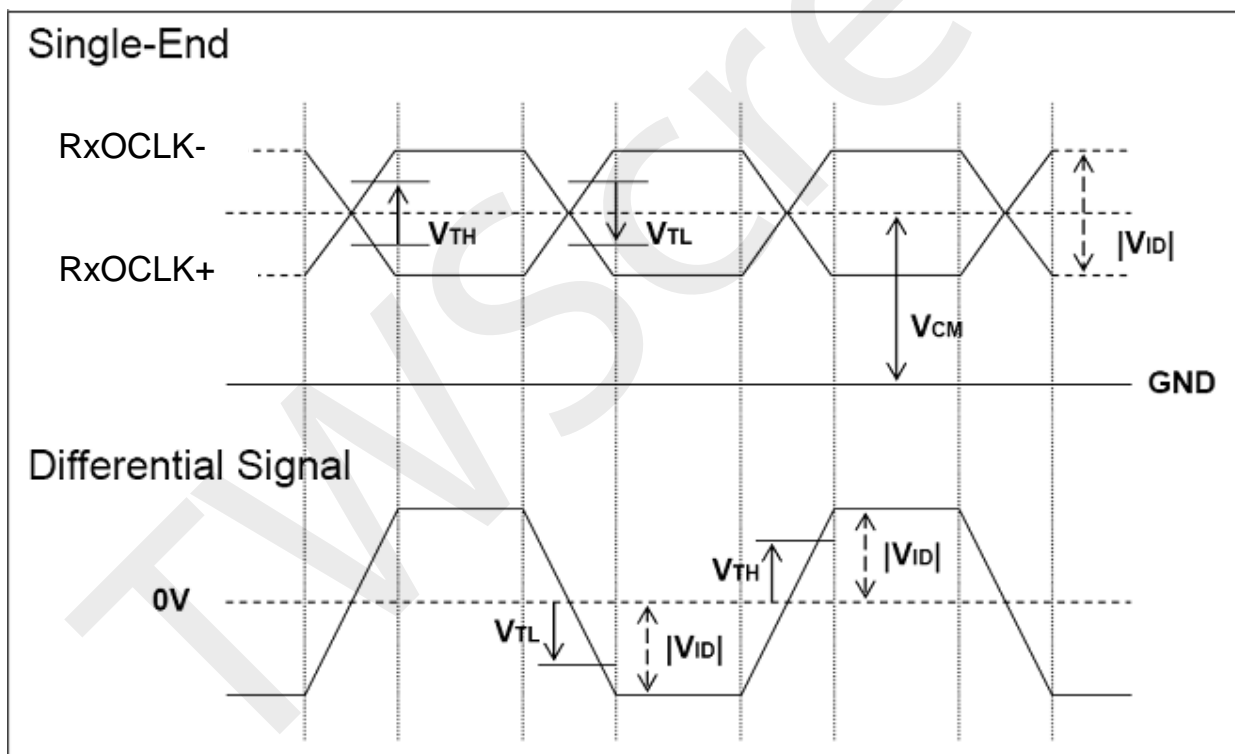
2.4.4 LVDS Specification

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]	$V_{TH}-V_{TL} = 200mV$

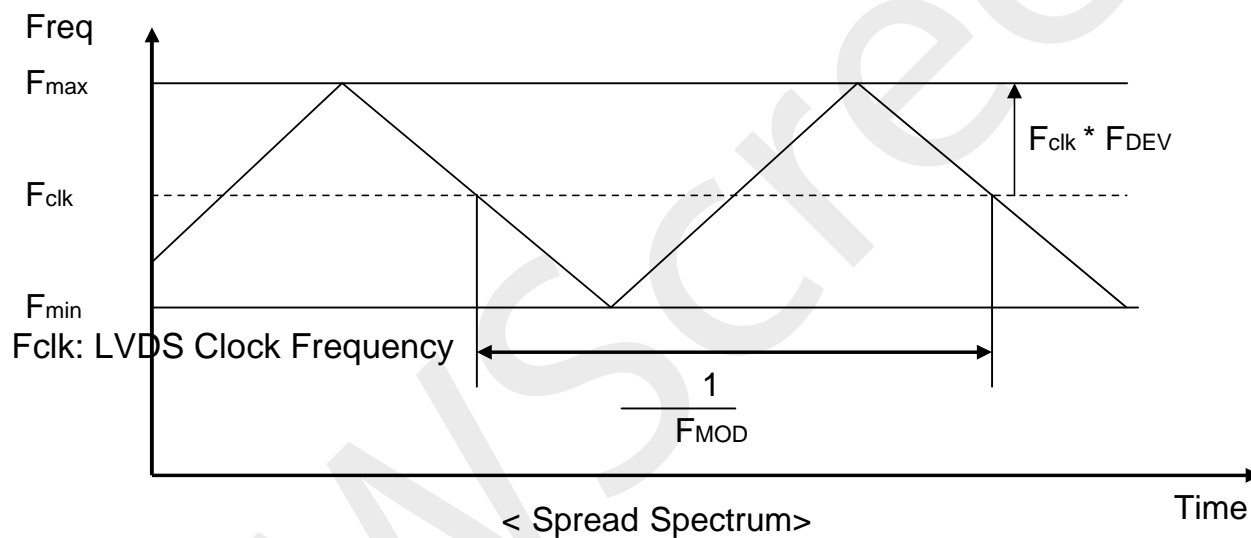
LVDS Signal Waveform:

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	-	± 3	%	
F_{MOD}	Maximum modulation frequency of input clock during Spread Spectrum	-	200	KHz	



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	Note 2-3
Tclk	LVDS Clock	Period	14.6	18.5	26.4	ns	1/Fclk
Fclk		Frequency	37.8	54	68.4	MHz	Note 2-4

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

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

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

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

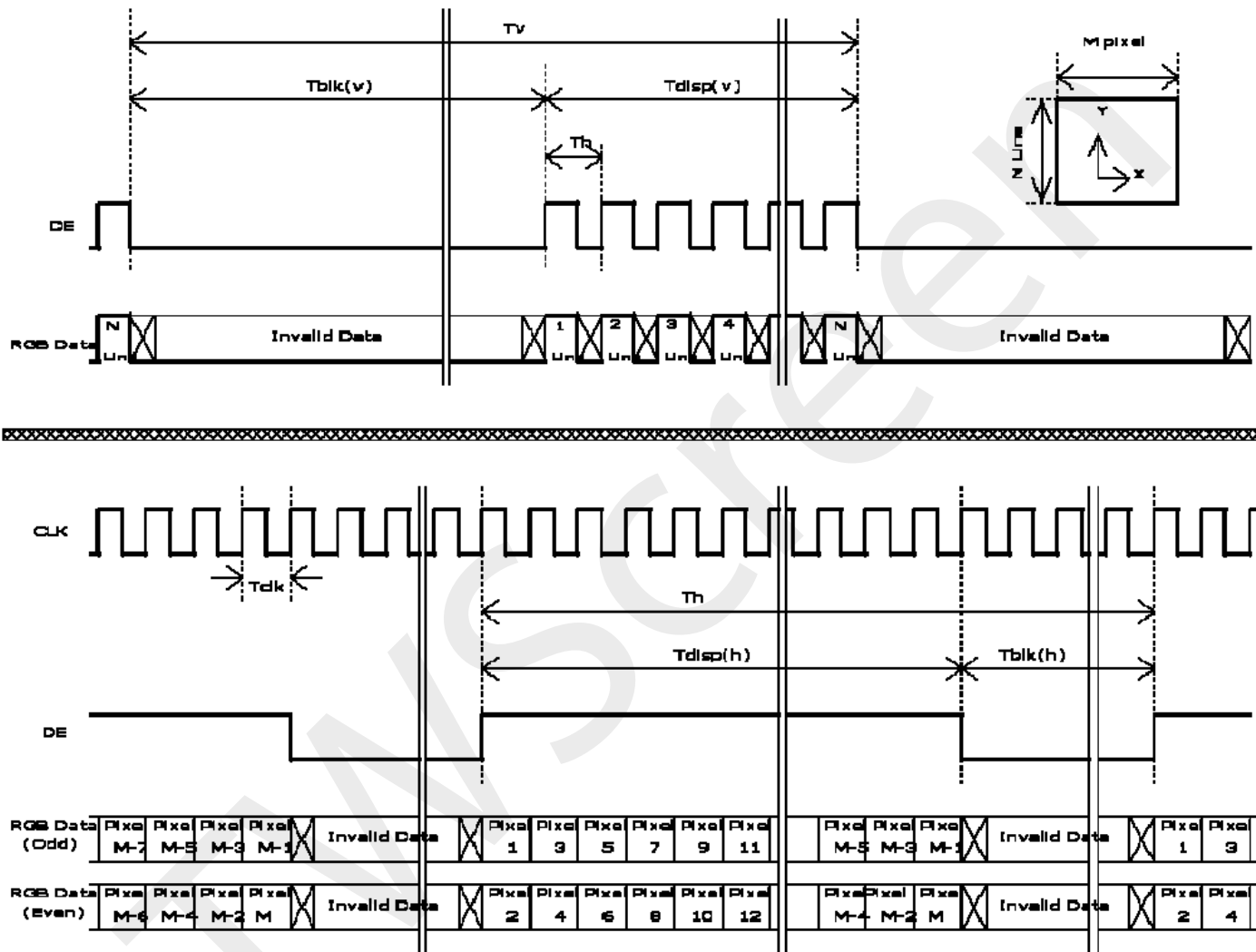
Note 2-4: The equation is listed as following. Please don't exceed the above recommended value.

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

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

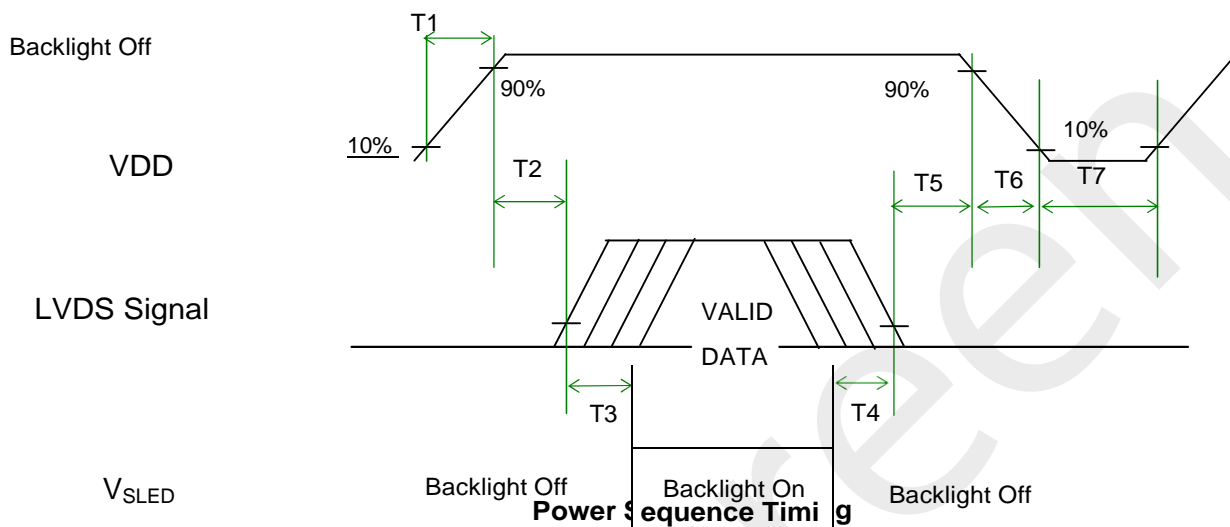
$$Fclk (\text{Max.}) = Fv (\text{Max.}) \times Th (\text{Typ.}) \times Tv (\text{Typ.});$$

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]	Note 2-5 Note 2-6
T6	5	-	100	[ms]	Note 2-6
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.

3 Backlight Unit

3.1 Electrical Characteristics

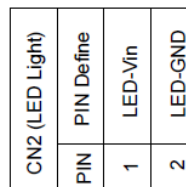
3.1.1 Recommended Operating Condition

(Ta=25°C)

Symbol	Description	Min.	Typ.	Max.	Unit	Remark
I_L	Current of LED Backlight	-	615		[mA]	
V_L	Voltage of LED Backlight		28.5		[Volt]	
P_{BLU}	LED Light Bar Power Consumption	-	17.5		[Watt]	
LT_{LED}	LED Life Time	50,000	-	-	[Hour]	Note 3-1

Note 3-1: Definition of life time:

- Brightness of LED becomes to 50% of its original value
- Test condition: $I_L = 615\text{mA}$ and 25°C (Room Temperature)





Product Specification

DB-LB0C-05

☐ Preliminary Specifications

☒ Final Specifications



Product	LED Driver Board
Model Name	DB-LB0C-05
Document Version	Rev.01

Customer

Approved by

Date

Notice: This Specification is subject to change without notice.

Approved By	Prepared By
	



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01	2018/01/05	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}		28.5		V	
LED Current	I_{LED}		615		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	

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)

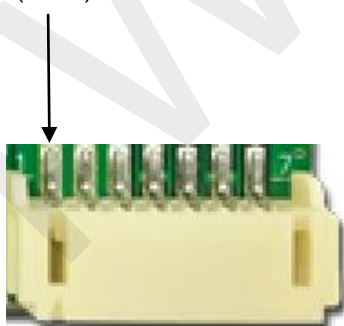
Connector Name / Designation	For Signal Connector
Manufacturer	JST or compatible
Type / Part Number	S7B-PH-SM4-TB or compatible
Mating Housing / Part Number	PHR-7 or compatible

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

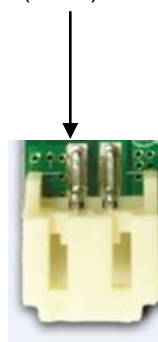
J1 S7B-PH-SM4-TB

(Pin 1)



J2 & J3 S2B-PH-SM4-TB

(Pin 1)





Product Specification

DB-LB0C-05

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

