

CUSTOMER APPROVE

SPECIFICATION

FOR

DOUBLE LIN TFT-LCD MODULE

Edition : Preliminary spec 1.0

Date of issue : 2022-05-03

Product No. :M170ETN01.1

APPROVED	CHECKED	PREPARED
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Revision History

Date	Rev.	Page	Old Description	New Description	Remark
2022-05-03	1.0	All	The specification was first issued		

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1. General Description

This specification applies to the 17inch a-Si TFT-LCD Module M170ETN01.1. The display supports the Full HD -1280(H) x 1024(V) screen format and 16.7M colors (8 bits RGB data input). The input interface is

Dual channel LVDS and this module doesn't contain a driver board for backlights.

* General Information

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")
Active Area	[mm]	337.92×270.34
Pixels H x V	-	1280 x 3(RGB)×1024
Pixels Pitch	[um]	0.264(per one triad) × 0.264
Pixels Arrangement	-	R.G.B. Vertical Stripe
Display Mode	-	Normally White
White Luminance(Center)	[cd/m ²]	250 (Typ.)
Contrast Ratio	-	1000 (Typ.)
Response Time	[msec]	5 (Typ.)(Tr/Td)
Viewing Angle	[degree]	85/85/80/80
Outline Dimension	[mm]	358.5(H) x 296.5(V) x 10.5(D) (Typ.)
Electrical Interface	-	Dual Channel LVDS
Support Color		16.7M colors
Surface Treatment		Anti - glare type, Hardness 3H
Temperature Range Operating Storage(Shipping)	[oC] [oC]	0 to +50°C -20 to +60°C

1.2. Optical Characteristics

The optical characteristics are measured on the following test condition.

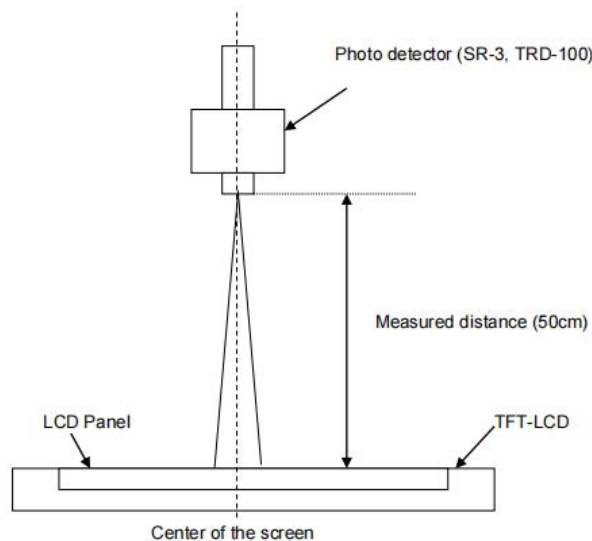
Test Condition:

1. Equipment setup: Please refer to Note 2 - 2.
2. Panel Lighting time: 30 minutes

3. VDD=5.0V, Fv=60Hz, Is=45mA, Ta=25°C

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
Lw	White Luminance (Center of screen)		200	250	-	[cd/m ²]	Note 2 - 2 By SR - 3
Luni	Luminance Uniformity (9 points)		75	80	-	%	Note 2 - 4 By SR - 3
Crr	Contrast Ratio (Center of screen)		600	1000	-	-	Note 2 - 5 By SR - 3
θR	Horizontal Viewing Angle (CR=10)	Right	75	85	-	[degree]	Note 2 - 6 By SR - 3
θL		Left	75	85	-		
ΦH	Vertical Viewing Angle (CR=10)	Up	70	80	-		
ΦL		Down	70	80	-		
θR	Horizontal Viewing Angle (CR=5)	Right	75	88	-		
θL		Left	75	88	-		
ΦH	Vertical Viewing Angle (CR=5)	Up	70	85	-		
ΦL		Down	70	85	-		
TR	Response Time	Rising Time	-	3.8	5.5	[msec]	Note 2 - 7 By TRD - 100
TF		Falling Time	-	1.2	2.5		
-		Rising + Falling	-	5	8		
Rx	Color Coordinates (CIE 1931)	Red x	0.602	0.632	0.662	-	By SR - 3
Ry		Red y	0.308	0.338	.0368		
Gx		Green x	0.265	0.295	0.325		
Gy		Green y	0.624	0.654	0.684		
Bx		Blue x	0.117	0.147	0.177		
By		Blue y	0.037	0.067	0.097		
Wx		White x	0.253	0.283	0.313		
Wy		White y	0.222	0.352	0.382		
NTSC				72		%	By SR - 3

Note2-3: Equipment setup

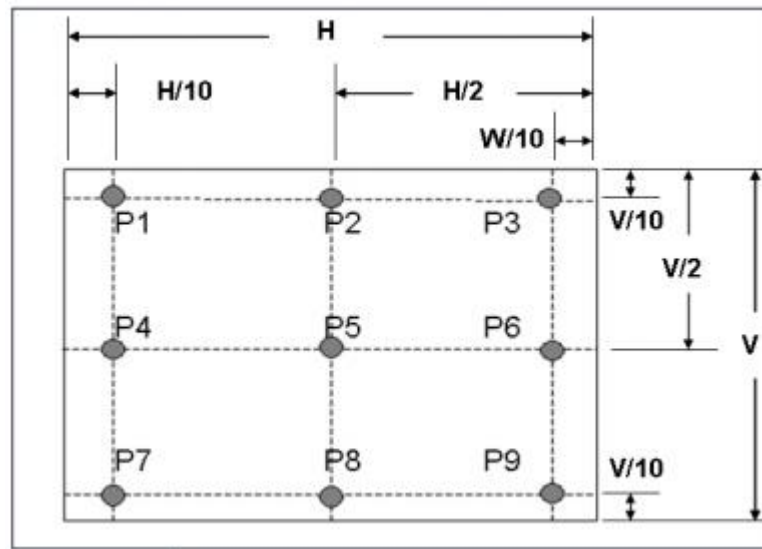


Note 2-4: Luminance Uniformity Measurement

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 2-5: Contrast Ratio Measurement

Definition:

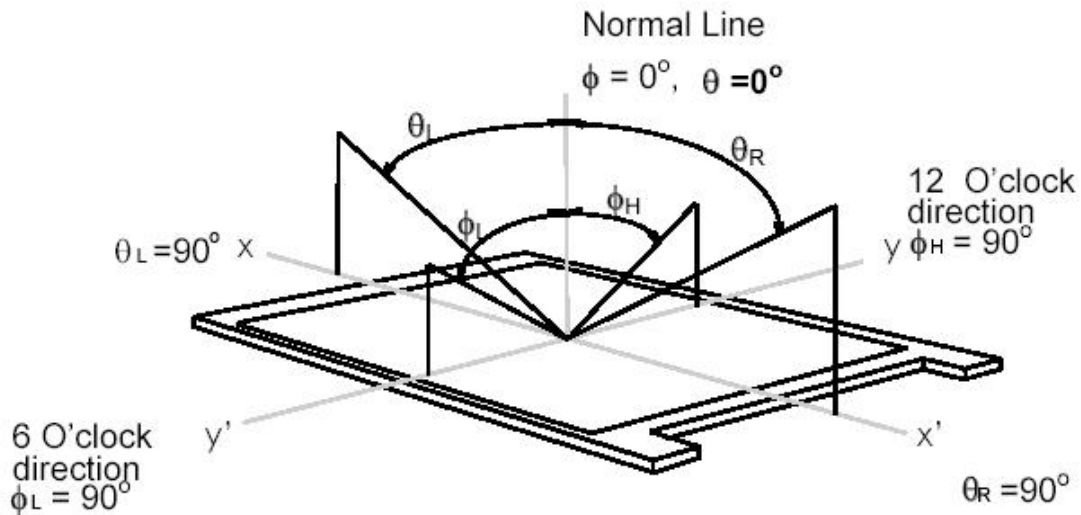
$$\text{Contrast Ratio} = \frac{\text{Luminance of White pattern}}{\text{Luminance of Black pattern}}$$

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

Note 2-6: Viewing angle measurement

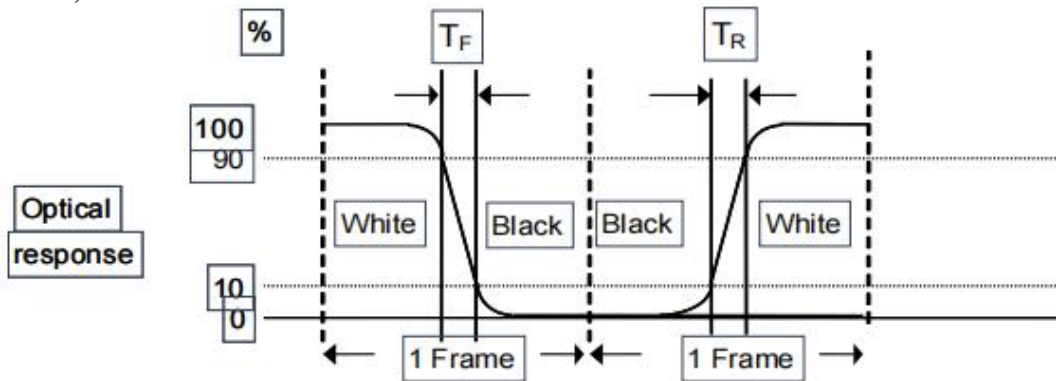
Definition: The angle at which the contrast ratio is greater than 10 & 5.

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



Note 2-7: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)



1.4 Mechanical Characteristics

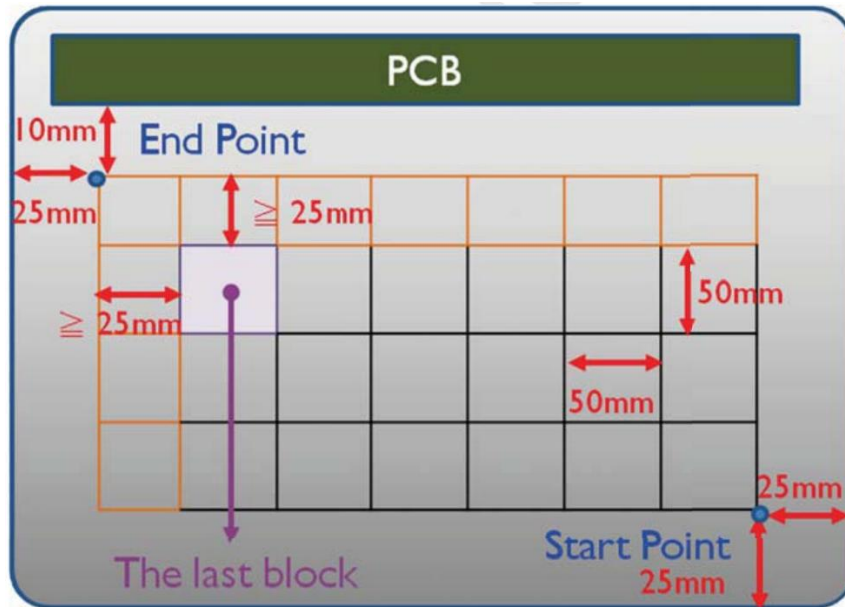
Symbol	Description	Min.	Max.	Unit	Remark
Pbc	Backside Comperssion	2.5	-	[Kgf]	Note2-10

Note 2-10: 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 25mm, add other blocks to make sure that most area of Bezel Back can be measured.

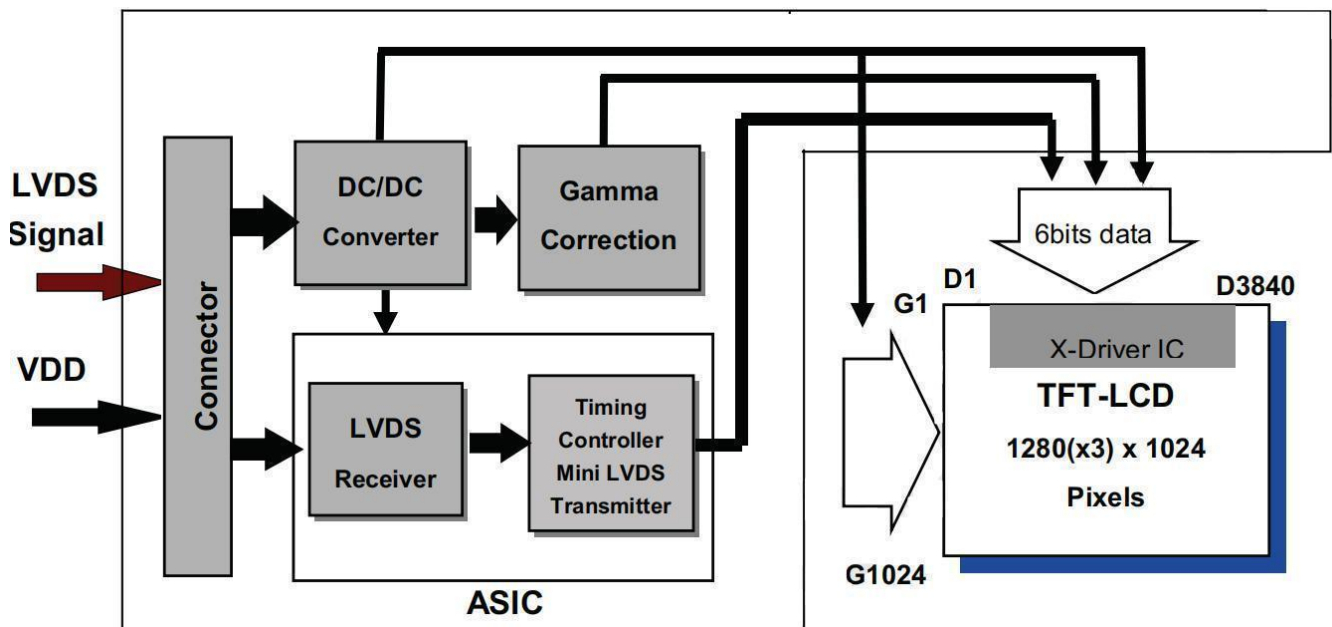


Note 2-11: Evaluation test and mass production inspection shall be applied with LED current I_s @ HDR off condition if there is not specified condition

2. TFT-LCD Module

2.1. Block Diagram

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



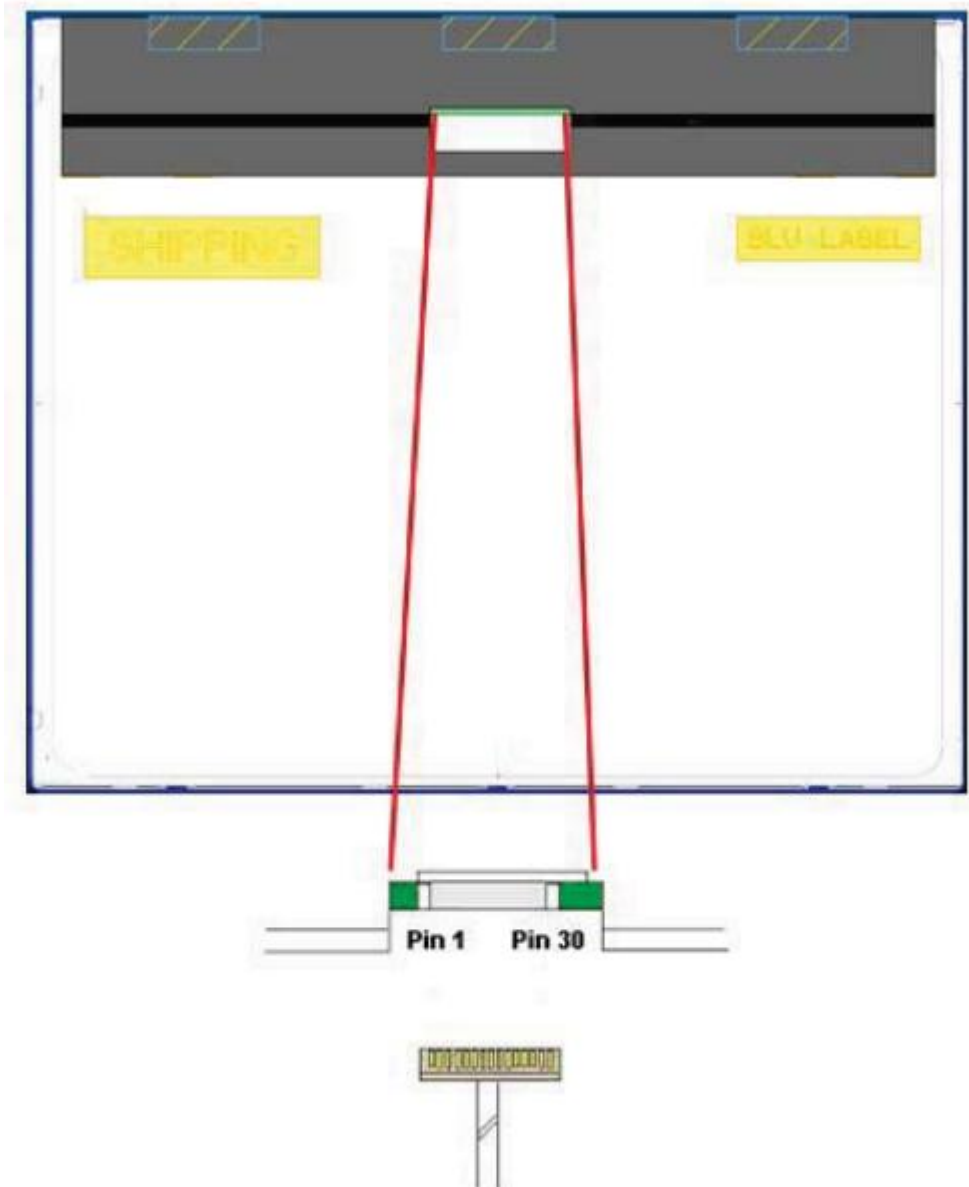
2.2 Interface Connection

2.2.1 Connector Type

TFT_LCD Connector	Manufacturer	P-TWO	STM
	Part Number	AL230-A0G1D-P	MSCKT2407P30HB
Mating Connector	Manufacturer	JAE	
	Part Number	FI-X30HL(Locked Type)	

2.2.2 LCD Connector Pin Assignment

PIN#	SIGNAL NAME	DESCRIPTION
1	RxOIN0-	Negative LDVS differential data input (Odd data)
2	RxOIN0+	Positive LDVS differential data input (Odd data)
3	RxOIN1-	Negative LDVS differential data input (Odd data)
4	RxOIN1+	Positive LDVS differential data input (Odd data)
5	RxOIN2-	Negative LDVS differential data input (Odd data)
6	RxOIN2+	Positive LDVS differential data input (Odd data)
7	GND	Power Ground
8	RxOCLKIN-	Negative LDVS differential data input (Odd clock)
9	RxOCLKIN+	Positive LDVS differential data input (Odd clock)
10	RxOIN3-	Negative LDVS differential data input (Odd data)
11	RxOIN3+	Positive LDVS differential data input (Odd data)
12	RxEIN0-	Negative LDVS differential data input (Even data)
13	RxEIN0+	Positive LDVS differential data input (Even data)
14	GND	Power Ground
15	RxEIN1-	Negative LDVS differential data input (Even data)
16	RxEIN1+	Positive LDVS differential data input (Even data)
17	GND	Power Ground
18	RxEIN2-	Negative LDVS differential data input (Even data)
19	RxEIN2+	Positive LDVS differential data input (Even data)
20	RXECLKIN-	Negative LDVS differential data input (Even clock)
21	RXECLKIN+	Positive LDVS differential data input (Even clock)
22	RxEIN3-	Negative LDVS differential data input (Even data)
23	RxEIN3+	Positive LDVS differential data input (Even data)
24	GND	Power Ground
25	NC	No connection (for AUO test only.Do not)
26	NC	No connection (for AUO test only.Do not)
27	NC	No connection (for AUO test only.Do not)
28	VDD	Power Supply Input Voltage
29	VDD	Power Supply Input Voltage
30	VDD	Power Supply Input Voltage



2.3 Electrical Characteristics

2.3.1 Absolute Maximum Rating

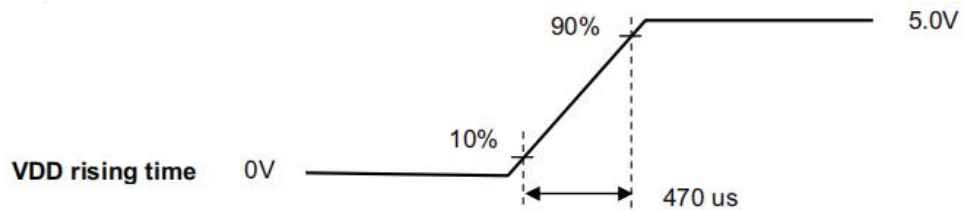
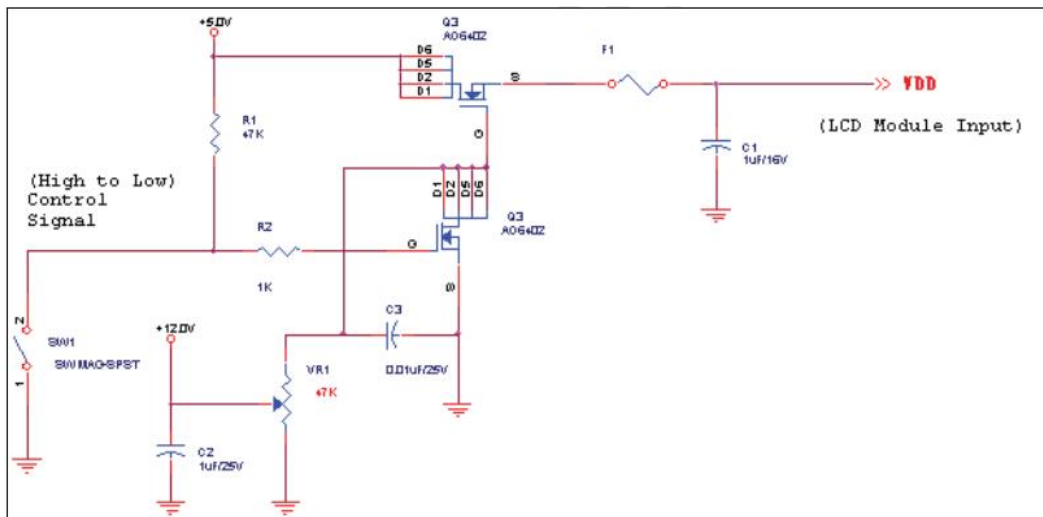
Permanent damage may occur if exceeding the following maximum rating.

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

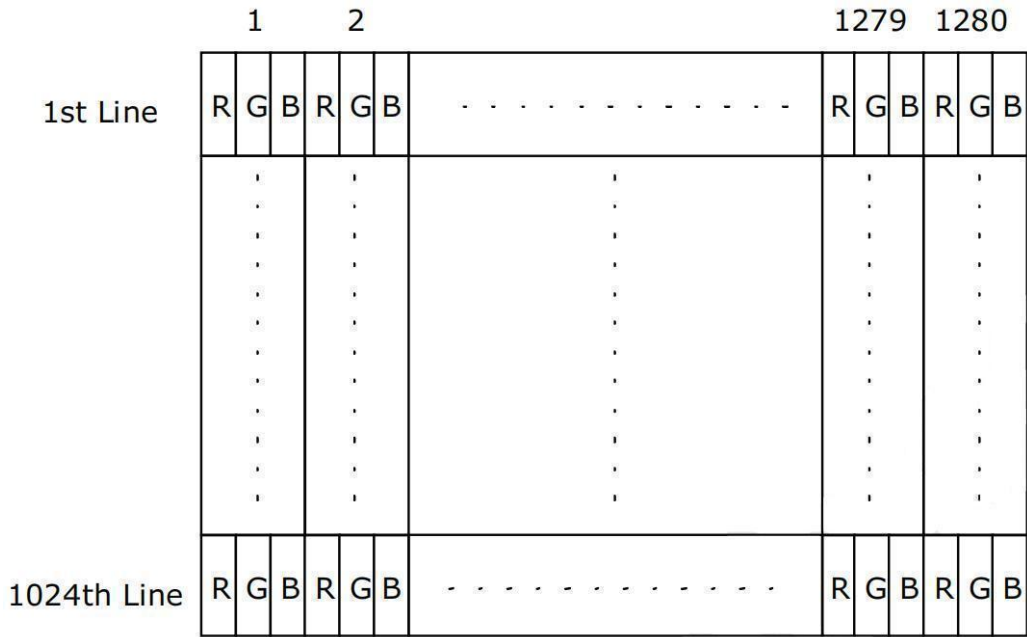
Symble	Parameter	Min.	Typ.	Max.	Unit	Condition
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	
IDD	Power supply Input Current	-	0.6	0.72	[A]	VDD=5V,Black Patternat,Fv=60Hz
			0.72	0.87	[A]	VDD=5V,Black Patternat,Fv=60Hz
PDD	VDD Power Consumption	-	3	3.6	[Watt]	VDD=5V,Black Patternat,Fv=60Hz
			3.6	4.32	[Watt]	VDD=5V,Black Patternat,Fv=60Hz
IRush	Input Current	-	-	3.0	[A]	Note 3-1
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	500	[mV]	VDD=5V,Black Pattern,Fv=75Hz

Note 3-1:Inrush Current measurement:

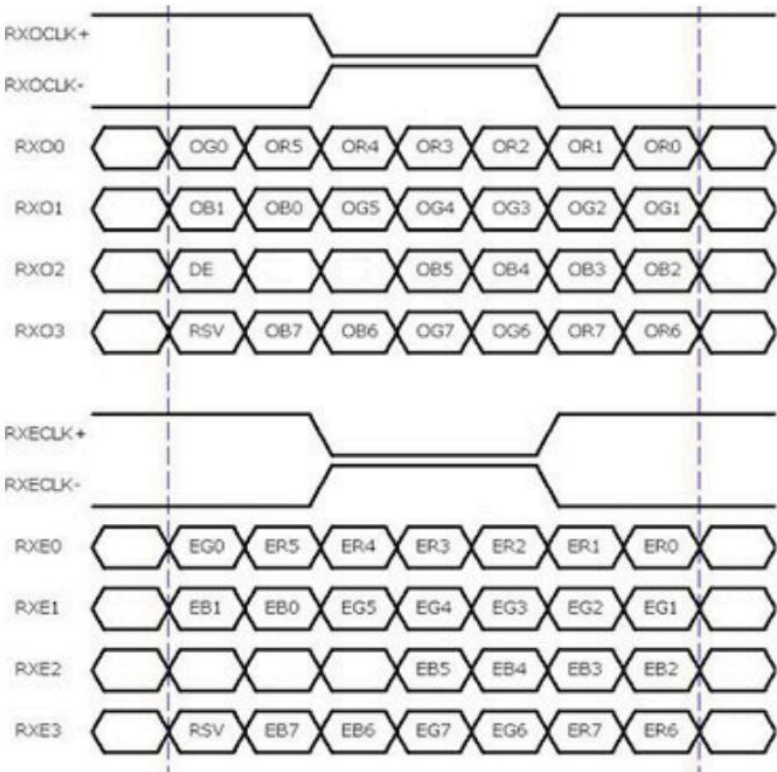


2.4 Singal Characteristics

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 3-2

- a. O= “Odd Pixe Data” E= “Even Pixel Data”
- b. Refer to 2.4.1 LCD pixel format, the 1 st data is 1(Odd Pixe 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

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		
Gray 127	-	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	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	Black		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
	L255	1	1	1	1	1	1	1	1	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	Black		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
	L255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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	Black		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
	L255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1				

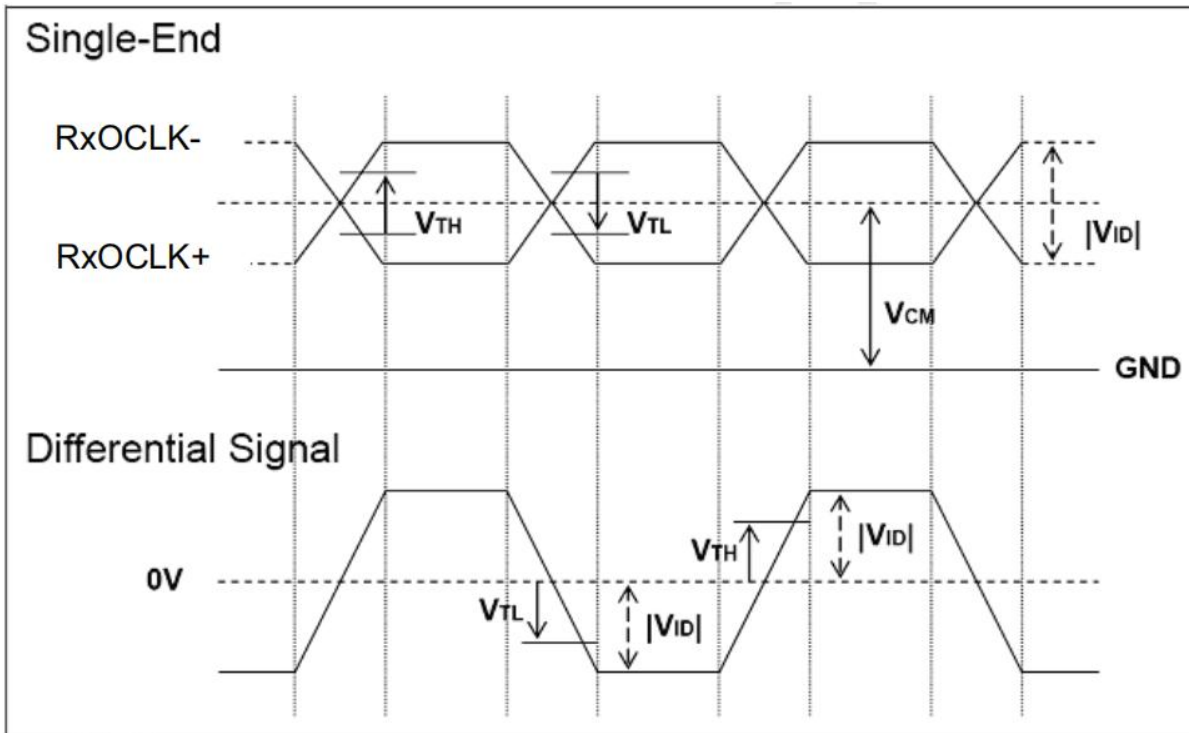
2.4.4 LVDS Specification

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 Differential Mode Voltage	+1.0	+1.2	+1.5	[V]	V _{TH} - V _{TL} =200mV

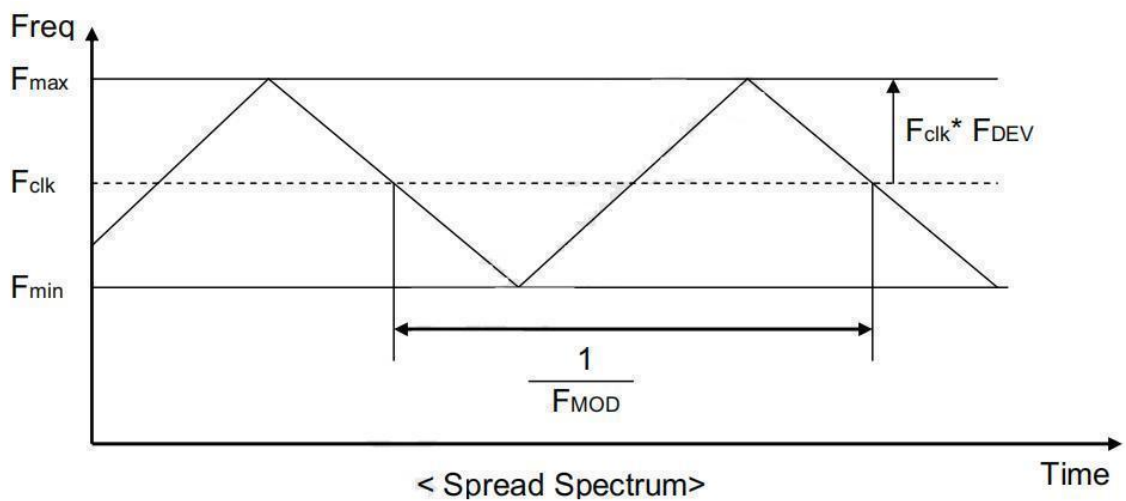
LVDS Signal Waveform

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 deviation of input clock frequency during Spread Spectrum	-	200	KHz	

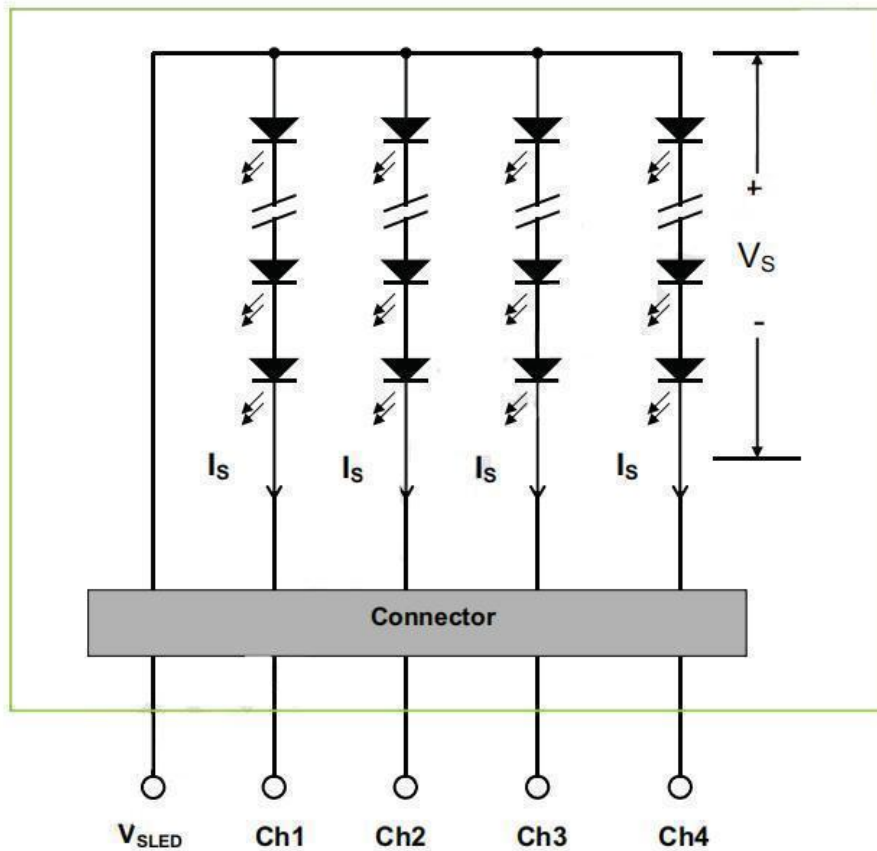


Fclk: LVDS Clock Frequency

3 Backlight Unit

3.1 Block Diagram

The following shows the block diagram of the 17 inch Backlight Unit. And it includes 5 2 pcs (4014) LED in the LED light bar. (4 strings and 1 3 pcs LED of one string)



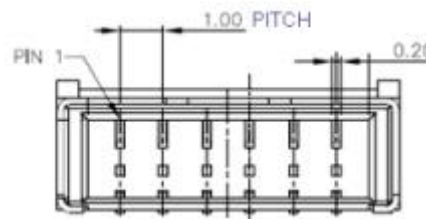
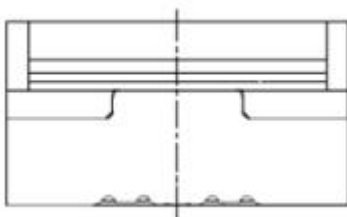
3.2 Interface Connection

3.2.1 Connector Type

Backlight Connector	Manufacturer	ENTERY
	Part Number	3707K-S06N-21R
Mating Connector	Manufacturer	ENTERY
	Part Number	H112K-P06N-13B(Locking type)

Backlight Connector dimension:

H x V x D= 13.9 x 3.00 x 4.25, Pitch=1.0(unit=mm)



3.2.2 Connector Pin Assignment

Pin#	Symbol	Description	Remark
1	Ch1	LED Current Feedback Terminal(Channel 1)	
2	Ch2	LED Current Feedback Terminal(Channel 2)	
3	V _{SLED}	LED Power Supply Voltage Input Terminal	
4	V _{SLED}	LED Power Supply Voltage Input Terminal	
5	Ch3	LED Current Feedback Terminal(Channel 3)	
6	Ch4	LED Current Feedback Terminal(Channel 4)	

3.3 Recommended Operating Condition

(Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit
LED operation Voltage	V _{led}	37.7	-	42.9	V
LED operation Current	I _{led}	-	240	-	mA
Backlight Power	P _{BL}	9.05	-	10.30	W
Luminance	L	200	250		nit
LED Life Time		30000			Hrs
Luminance uniformity	ΔL	75	80		%

6 International Standard

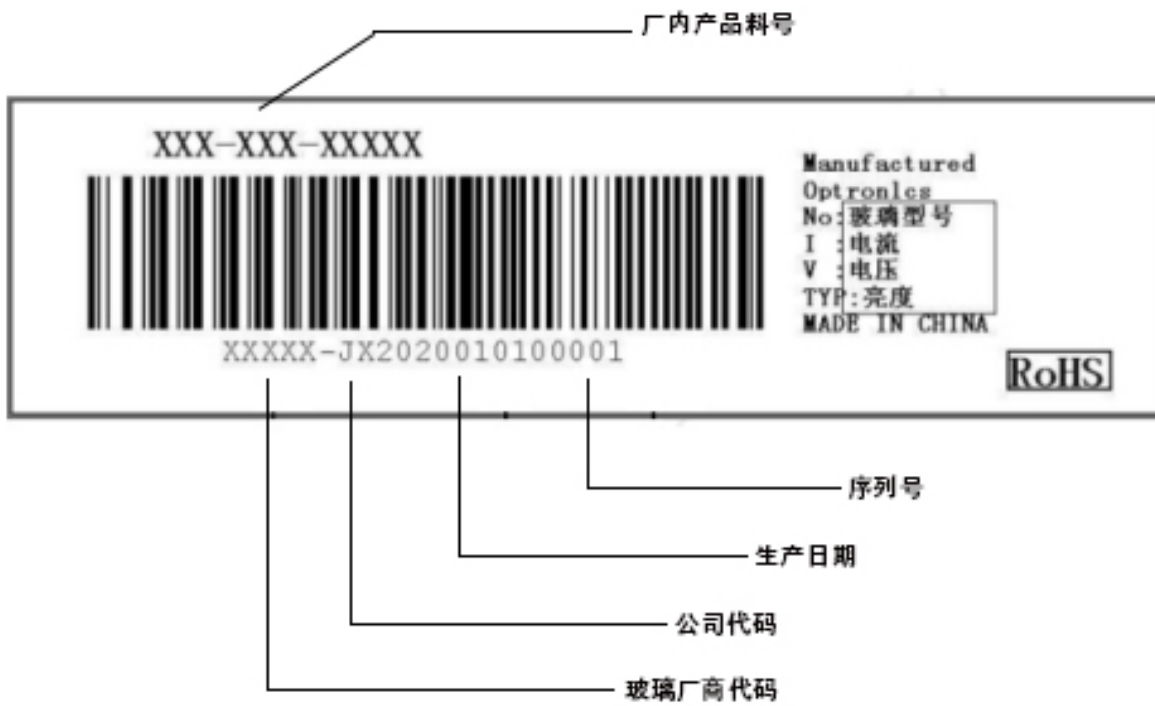
6.3 Safety

- (1) UL 60950-1; Standard for Safety of Information Technology Equipment Including electrical Business Equipment.
- (2) IEC 60950-1; Standard for Safety of International Electrotechnical Commission
- (3) EN 60950-1; European Committee for Electrotechnical Standardization (CENELEC), EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

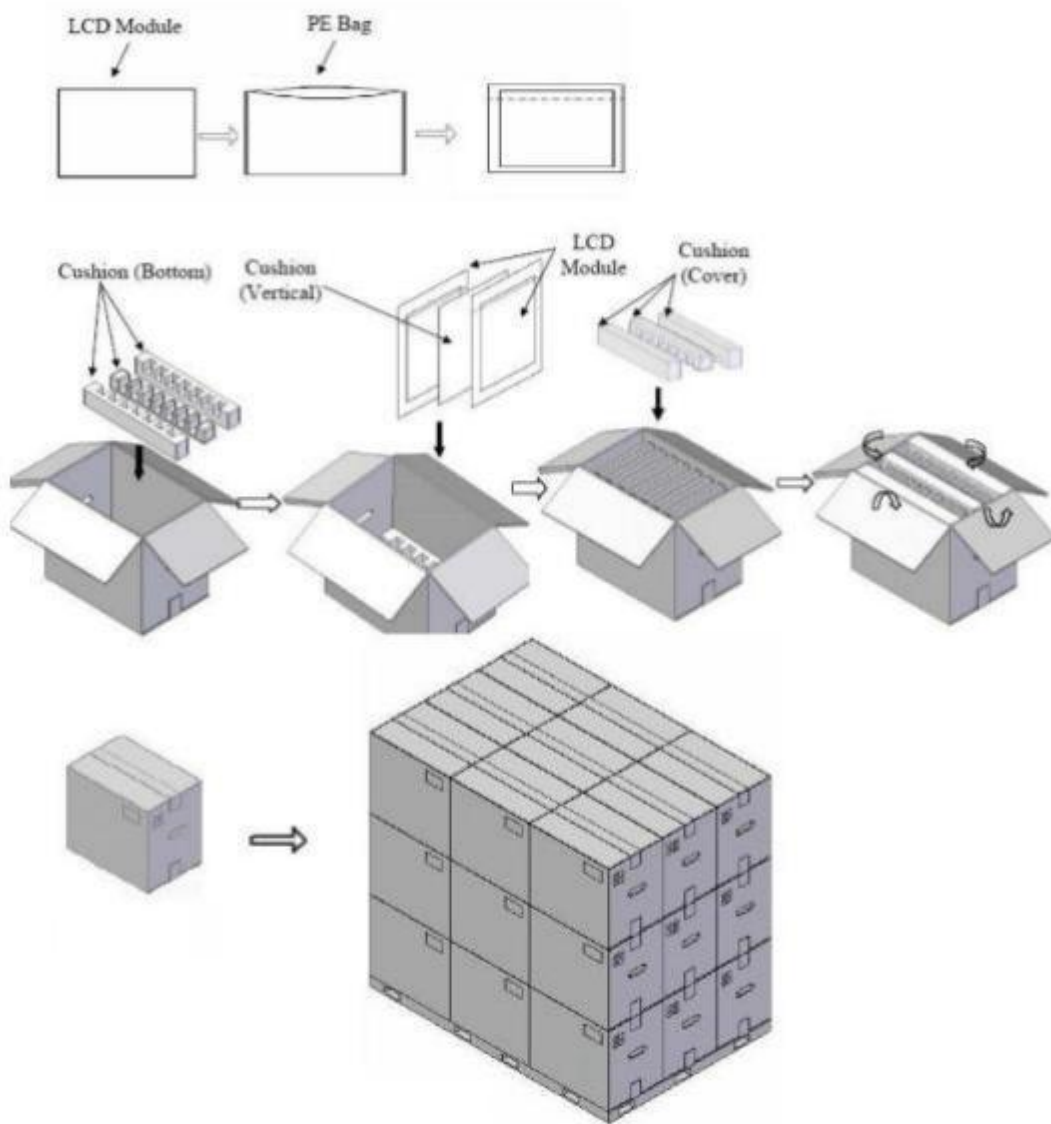
6.4 EMC

- (1) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 40GHz. “American National standards Institute(ANSI), 1992
- (2) C.I.S.P.R “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” International Special committee on Radio Interference.
- (3) EN 55022 “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” European Committee for Electrotechnical Standardization. (CENELEC), 1998

6. Label and Packing



Parameter	Packing box	Unit
Size	410(L)x265(W)x350(H)(typ.)	mm
Weight	1 . 4 3 (typ.)	kg
Total weight	1 4 . 3 2 (typ.) (with 10 products)	kg



7. PRECAUTION

7.1 ASSEMBLY AND HANDLING PRECAUTIONS

1. Do not apply rough force such as bending or twisting to the module during assembly.
2. To assemble or install module into user's system can be in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
3. It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.
4. Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
5. Do not pull the I/F connector in or out while the module is operating.
6. Do not disassemble the module. Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
7. It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.
8. High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
9. When ambient temperature is lower than 10 °C may reduce the display quality. For example, the response time will become slowly.

7.2 SAFETY PRECAUTIONS

- 1 It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
- 2 If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth, in case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- 3 After the module's end of life, it is not harmful in case of normal operation and storage.

