

# 億力光電股份有限公司

## EVERVISION ELECTRONICS CO., LTD.

### Product Specification For LCD Module

(KVPPF-7B-002-16)

**Model NO. : VGG644804-6UFLWD(RoHS)**

**REVISION : 3**

APPROVAL FOR SPECIFICATIONS ONLY

APPROVAL FOR SPECIFICATIONS AND SAMPLE

**CUSTOMER :**

**STD**

**APPROVED BY :**

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### 3. Module Numbering System

**V G G 6448 04 – 6 U F L W D**

Serial No: A~Z

Backlight Color:  
**N:** Without Backlight;  
**A:** Amber; **B:** Blue; **G:** Green;  
**L:** Yellow; **O:** Orange; **R:** Red;  
**W:** White; **Y:** Yellow Green;  
**X:** Others

Backlight Type:  
**N:** Without Backlight; **E:** EL; **F:** CCFL;  
**L:** General LED; **H:** High NTSC LED ;  
**R:** RGB LED; **X:** Others

LCD Model:  
**T:** TN; **H:** HTN; **G:** STN Gray; **Y:** STN Yellow;  
**B:** STN Blue; **W:** FSTN Black/White;  
**C:** CSTN; **F:** TFT; **O:** OLED; **P:** PLED;  
**L:** LTPS; **N:** Others

LCD Type:  
**R:** Reflective/Positive;  
**S:** Reflective/Negative ;  
**F:** Transflective/Positive ;  
**G:** Transflective/Negative ;  
**U:** Transmissive/Positive ;  
**T:** Transmissive/Negative ; **N:** Others

Temperature Range & View Direction:  
General Purpose : **1:**6H **2:**12H **3:**3H **4:**9H **5:**Others  
High Performance: **6:**6H **7:**12H **8:**3H **9:**9H **0:**Others

STD Product Serial No.: 01~99  
Customer Made Serial No.: A1,A2... A9,B1,B2... B9,C1..

Display Function:  
Segment Number / Characters Lines / Column and Row Dots  
/ Length \* Width of Other

Display Type:  
**C:** Character Type; **G:** Graphic Type; **S:** Segment Type; **O:** Other

Package Type:  
**B:** COB; **F:** COF; **G:** COG; **H:** Heat Seal; **S:** SMT; **T:** TAB; **O:** Others

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#### 4. Application

This specification is applied to the 5.7 inch VGA supported TFT-LCD module, and can display true 262,144 colors(6 bit/ color). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of a 5.7”TFT-LCD panel, a driver circuit and backlight unit.

#### 5. Features

- VGA (640×480 pixels) resolution.
- Digital 18 bit parallel RGB.
- Dot inversion mode with stripe type.
- LED drive circuit is built in this module to provide PWM Dimmer function

#### 6. General Specifications

Item	Specifications	Unit
Screen Size	5.7 (Diagonal)	inch
Display Format	640RGB(H)×480(V)	dot
Active Area	115.2(H)×86.4(V)	mm
Dot Size	0.060(H)×0.180(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	TN Type Transmissive Mode Normally White	-
Surface Treatment	Anti-Glare and Hard Coating(3H)	-
Viewing Direction	6 O'clock (The Gray Inversion will appear at this direction)	-
Outline Dimension	144.0(W)×104.6(H)×13.0(D)	mm
Weight	145.5	g
RoHS Compliance	Evervision certifies this product to be in compliance with European Union Directive 2002/95/EC on the restriction of certain hazardous substances in electrical and electronic equipment.	-

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## 7. Absolute Maximum Ratings

### 7.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T <sub>ST</sub>	-30	+80	°C	(1)(3)
Operating Temperature	T <sub>OP</sub>	-20	+70	°C	(1)(2)

Note1: Background color changes slightly depending on ambient temperature.  
This phenomenon is reversible.

Note2: Ta 70 : 75%RH max.

Note3: Please refer to item of RELIABILITY.

### 7.2 Electrical Absolute Ratings

#### 7.2.1 TFT-LCD Module

(Ta=25±2°C, GND=VSS=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	VCC	-0.3	4.3	V	-

#### 7.2.2 LED Driver Absolute Maximum Ratings

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
LED Driver Supply Voltage	VLED	-0.3	17	V	(1)
LED Driver PWM	PWM	-0.3	6	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

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## 8. Electrical Characteristics

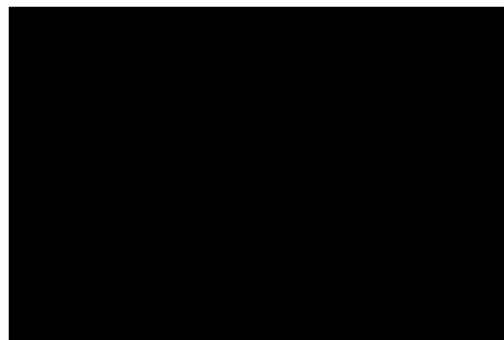
### 8.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	VCC	3.0	3.3	3.6	V	-
Input High Threshold Voltage	VIH	0.7VCC	-	VCC	V	-
Input Low Threshold Voltage	VIL	0	-	0.3VCC	V	-
Current dissipation	ICC	-	140	196	mA	-
Power Consumption	P <sub>L</sub>	-	0.462	0.504	W	(1)
Frame Frequency	F <sub>V</sub>	-	60	-	Hz	-
Dot Clock	DCLK	-	25.175	-	MHz	-

Note (1) The specified power consumption is under the conditions at VCC=3.3V, F<sub>V</sub>=60Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern / 0 Gray



Active Area

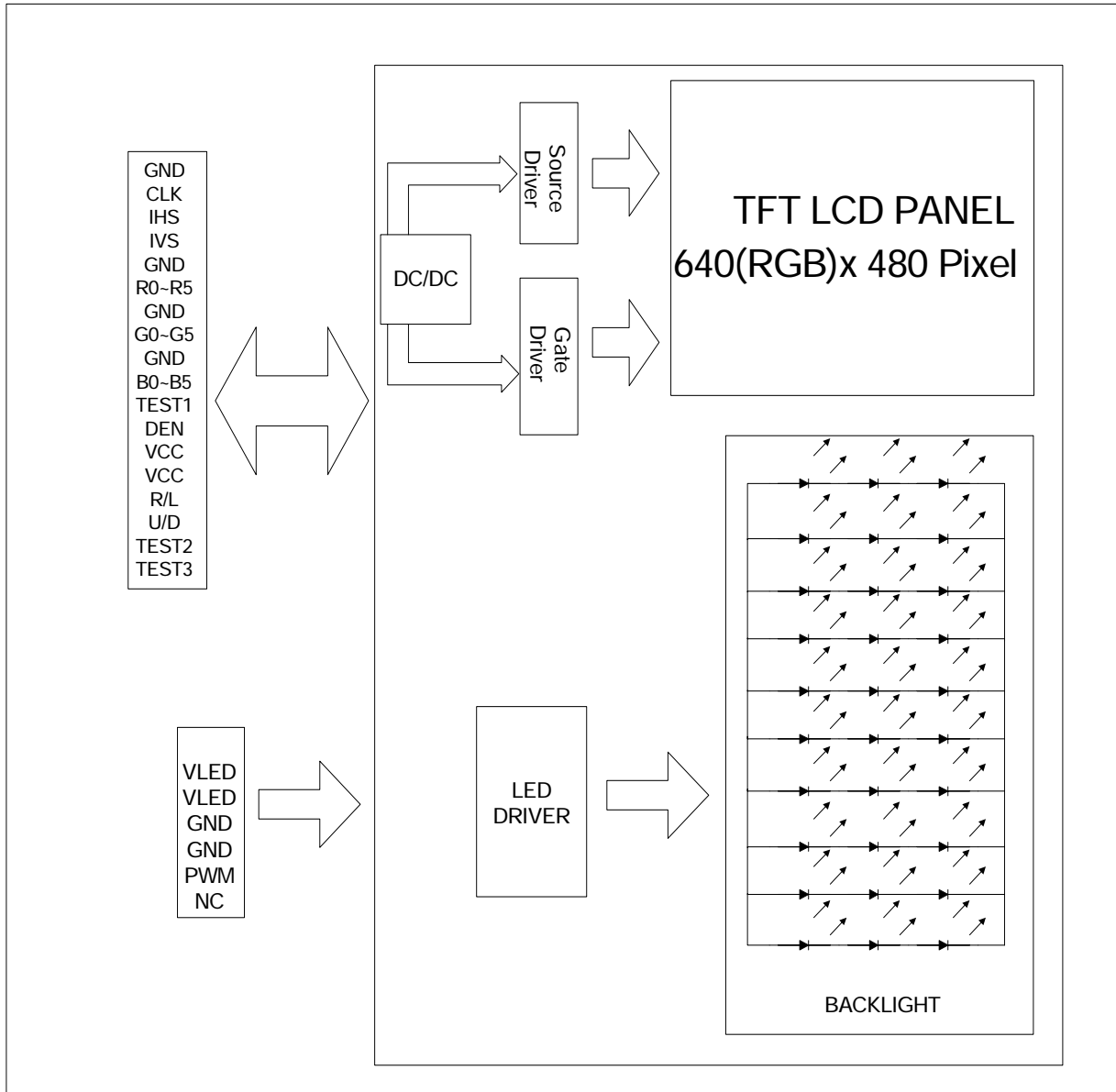
### 8.2 LED Driver Unit

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Voltage of LED Driver Unit	V <sub>LED(DU)</sub>	11.2	12.0	12.6	V	-
Current of LED Driver Unit	I <sub>LED(DU)</sub>	-	180	252	mA	B/L=200mA
Current of LED Driver Unit	I <sub>LED(DU)</sub>	-	130	182	mA	B/L=150mA
Current of LED Driver Unit	I <sub>LED(DU)</sub>	-	80	112	mA	B/L=100mA
Dimmer signal Low voltage	VPWML	-	-	0.2	V	-
Dimmer signal High voltage	VPWMH	4	5.0	5.5	V	-
Dimmer frequency	fPWM	-	120	-	Hz	-
PWM Pulse width	TPWMH	10			us	-
LED Life Time(25 )	-	40000	50000	-	hr	-

### 9. Block Diagram

#### 9.1 TFT-LCD Module with Backlight Unit





## 10. Input / Output Terminals Pin Assignment

### 10.1 TFT-LCD Module

Connector: CVILUX CF25331D0R0-05

Pin No.	Symbol	I/O	Description
1	GND	I	Ground
2	CLK	I	Clock signal
3	IHS	I	Horizontal synchronous signal
4	IVS	I	Vertical synchronous signal
5	GND	I	Ground
6	R0	I	RED data (LSB)
7	R1	I	RED data
8	R2	I	RED data
9	R3	I	RED data
10	R4	I	RED data
11	R5	I	RED data(MSB)
12	GND	I	Ground
13	G0	I	GREEN data(LSB)
14	G1	I	GREEN data
15	G2	I	GREEN data
16	G3	I	GREEN data
17	G4	I	GREEN data
18	G5	I	GREEN data(MSB)
19	GND	I	Ground
20	B0	I	Blue data(LSB)
21	B1	I	Blue data
22	B2	I	Blue data
23	B3	I	Blue data
24	B4	I	Blue data
25	B5	I	Blue data(MSB)
26	TEST1	I	TEST1(Please be sure to connect 26pin with ground)
27	DEN	I	Input data enable control
28	VCC	I	+3.3V power supply
29	VCC	I	+3.3V power supply

Pin No.	Symbol	I/O	Description
30	R/L	I	Selection signal for horizontal scanning direction. Note (1)
31	U/D	I	Selection signal for vertical scanning direction. Note (1)
32	TEST2	I	TEST2(to be open, or connected to either GND or Vcc)
33	TEST3	I	TEST3(Please be sure to connect 33pin with ground)

Note (1)



R/L=L, U/D=H



R/L=H, U/D=H



R/L=L, U/D=L



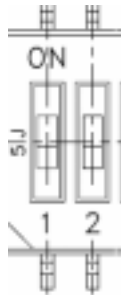
R/L=H, U/D=L

## 10.2 Backlight Unit

Connector: CVILUX CI1106M1HR0-LF

Pin No.	Symbol	Description
1	VLED	LED drive circuit power supply (12V)
2	VLED	LED drive circuit power supply (12V)
3	GND	Ground
4	GND	Ground
5	PWM	PWM Dimmer
6	NC	NO CONNECTION

JUMP: HCH HDS502-E



PIN 1	PIN2	Result
ON	ON	200mA
ON	OFF	150mA
OFF	ON	150mA
OFF	OFF	100mA

### 10.3 Color Data Input Assignment

The brightness of each primary color(red, green and blue) is based on the 6 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		D05	D04	D03	D02	D01	D00	D15	D14	D13	D12	D11	D10	D25	D24	D23	D22	D21	D20
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale Of RED	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

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## 11. Interface Timing

### 11.1 Input Signal Characteristics

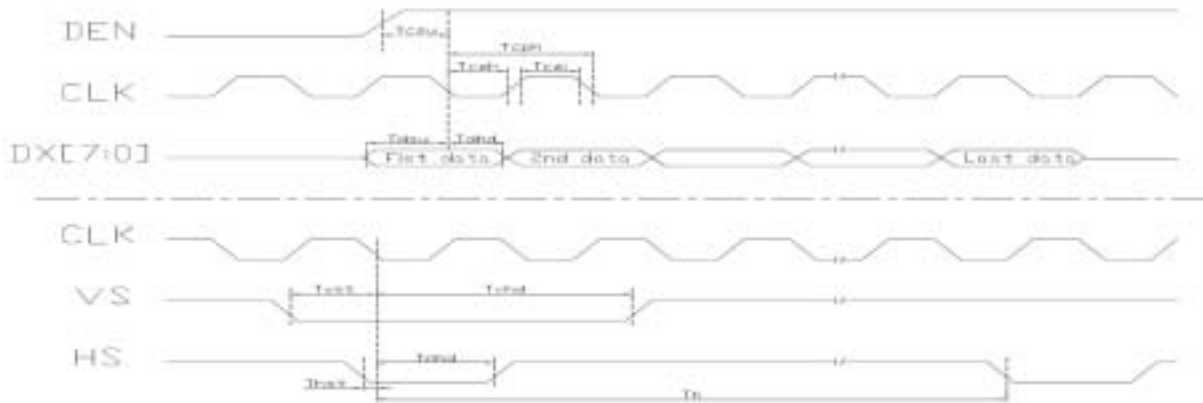
PARAMETER	Symbol	Min.	Typ.	Max.	Unit
HS setup time	$T_{hst}$	10	-	-	ns
HS hold time	$T_{hhd}$	10	-	-	ns
VS setup time	$T_{vst}$	10	-	-	ns
VS hold time	$T_{vhd}$	10	-	-	ns
Data setup time	$T_{dsu}$	10	-	-	ns
Data hold time	$T_{dhd}$	10	-	-	ns
DEN setup time	$T_{esu}$	10	-	-	ns
VS falling to HS falling time on odd field @ RGB mode	$T_{HV\_O}$	-4	0	+4	$T_{CPH}$
VS falling to HS falling time on even field @ RGB mode	$T_{HV\_E}$	0.4	0.5	0.6	$T_H$

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	$F_{CPH}$	22.66	25.175	27.69	MHz
CLK period	$T_{CPH}$	36.11	39.7	44.13	ns
CLK pulse duty	$T_{CWH}$	40	50	60	%
HS period	$T_H$	750	800	850	$T_{CPH}$
HS pulse width	$T_{WH}$	5	30	-	$T_{CPH}$
HS-first horizontal data time	$T_{HS}$	112	144	175	$T_{CPH}$
Horizontal active data area	$T_{HA}$	-	640	-	$T_{CPH}$
VS pulse width	$T_{WV}$	1	3	5	$T_H$
First Line Data input time	$T_{STV}$	-	35	-	$T_H$
VS period	$T_V$	515	525	535	$T_H$

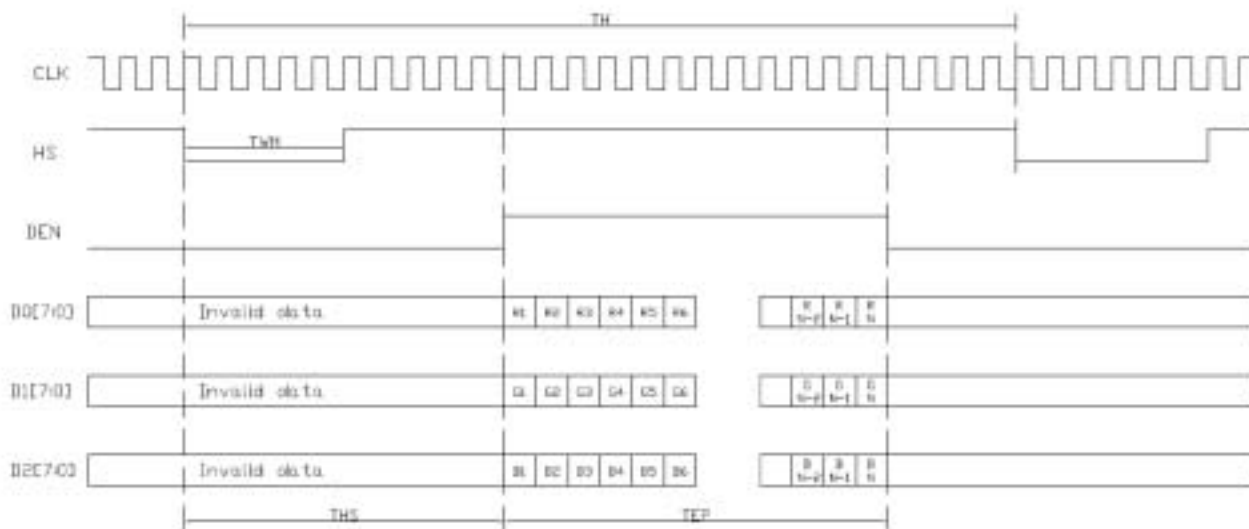
Note: When SYNC mode is used, 1st data start from 144th CLK after HS falling (when  $STHD[5:0]=00000$ )

## 11.2 Waveform

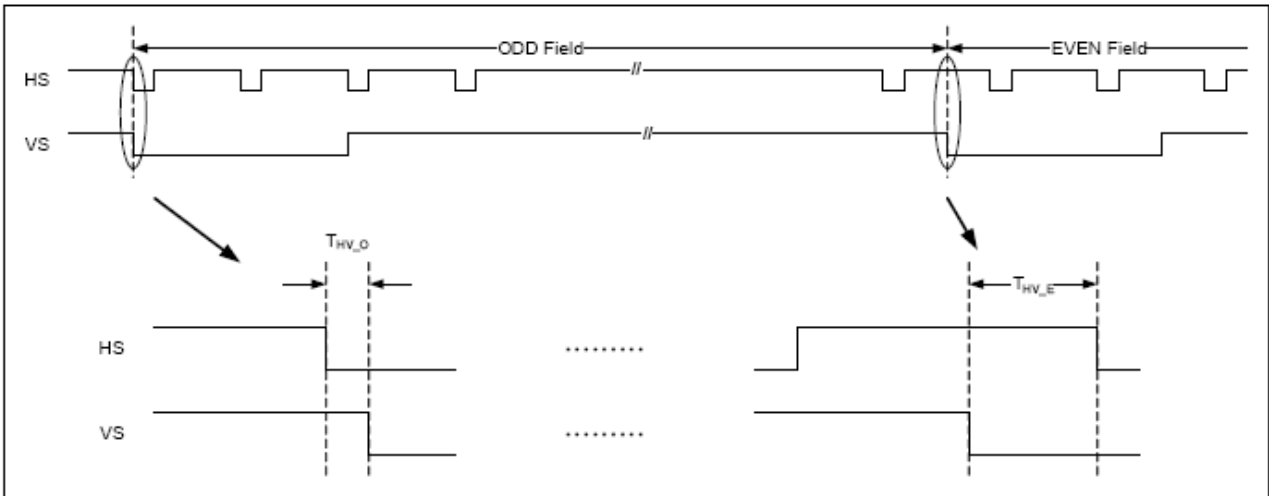
### 11.2.1 Clock and Data input waveforms



### 11.2.2 Data input format for RGB Mode



### 11.2.3 The HS & VS timing of the ODD/EVEN field.



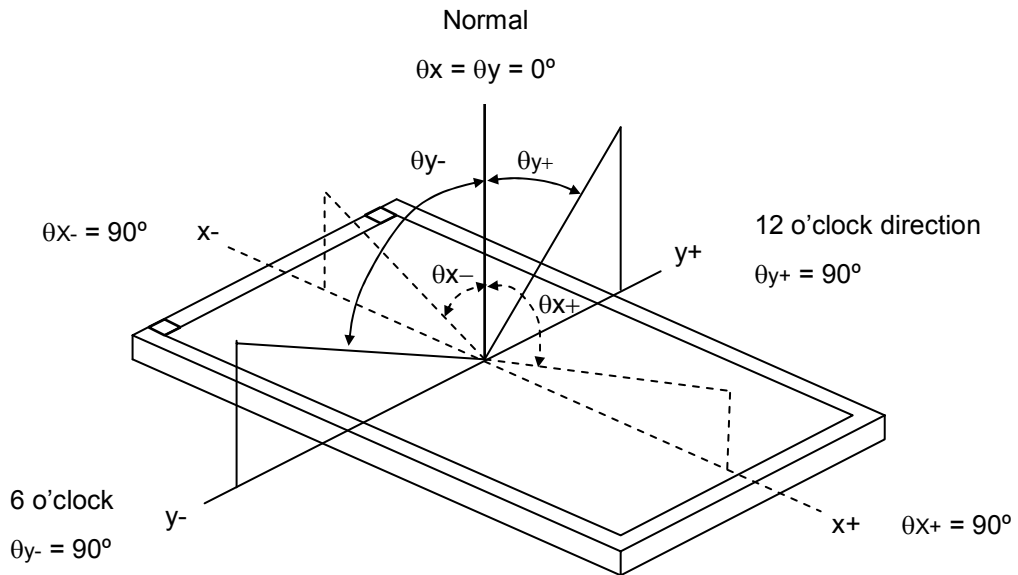
## 12. Optical Characteristics

The optical characteristics should be measured in a dark environment ( 1 lux) or equivalent state with the methods shown in Note (4).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$	200	(350)	-	-	(2)
Response Time		$T_R$	Viewing	-	15	-	ms	(3)
		$T_F$	Normal Angle	-	35	-	ms	
Luminance(Center)		Y	B/L=200mA	620	( 700 )	-	cd/m <sup>2</sup>	(4)
			B/L=150mA	465	( 525 )	-	cd/m <sup>2</sup>	
			B/L=100mA	310	( 350 )	-	cd/m <sup>2</sup>	
Brightness uniformity		BUNI		80	(85)	-	%	(5)
Color Chromaticity	Red	$R_x$	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	0.550	0.600	0.650	-	(1),(4)
		$R_y$		0.300	0.350	0.400	-	
	Green	$G_x$		0.270	0.320	0.370	-	
		$G_y$		0.500	0.550	0.600	-	
	Blue	$B_x$		0.090	0.140	0.190	-	
		$B_y$		0.100	0.150	0.200	-	
	White	$W_x$		0.280	0.320	0.380	-	
		$W_y$		0.330	0.380	0.430	-	
Viewing Angle	Horizontal	$\theta_{x+}$	CR $\geq$ 10	55	(65)	-	deg.	
		$\theta_{x-}$		55	(65)	-		
	Vertical	$\theta_{y+}$		45	(55)	-		
		$\theta_{y-}$		55	(65)	-		



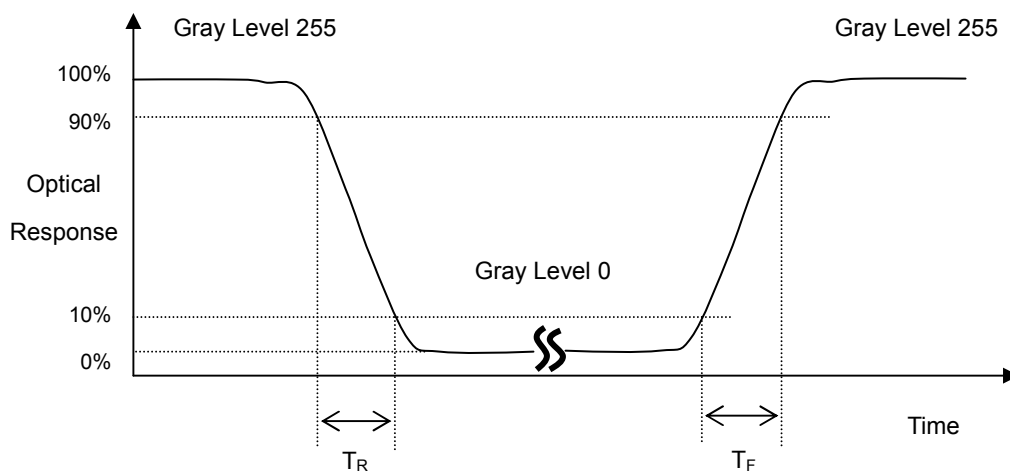
Note (1) Definition of Viewing Angle ( $\theta_x, \theta_y$ ):



Note (2) Definition of Contrast Ratio (CR):

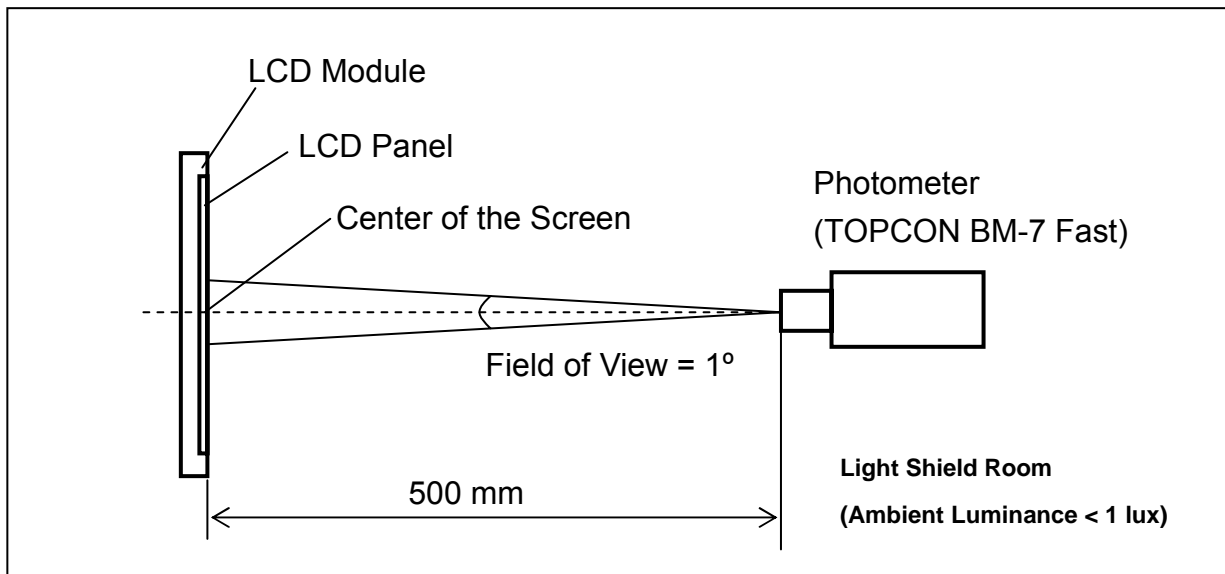
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note (3) Definition of Response Time ( $T_R, T_F$ ):

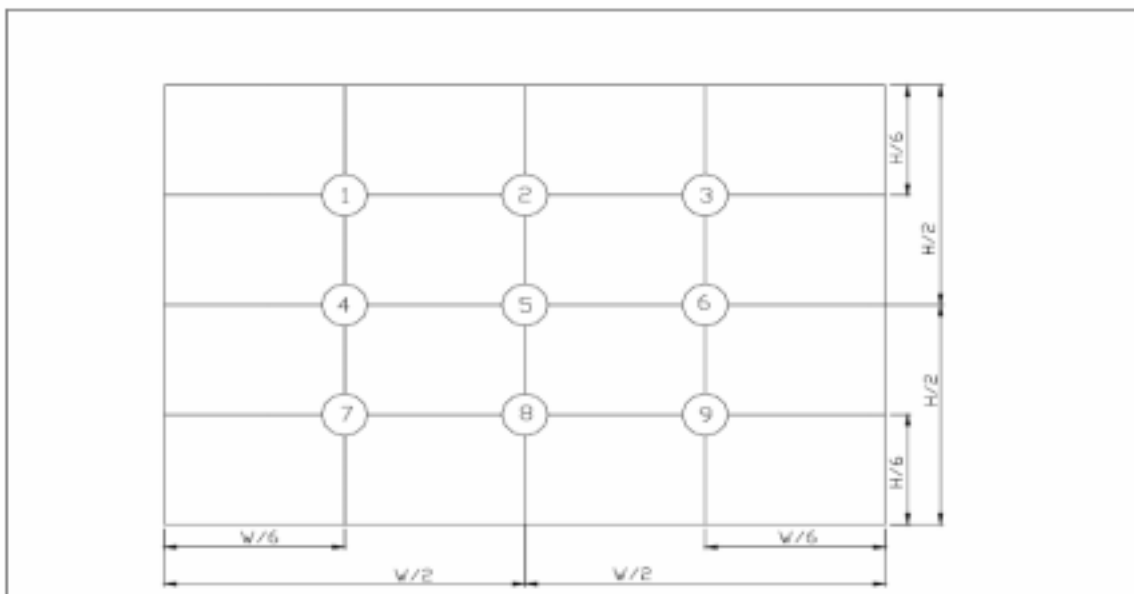


**Note (4) Measurement Set-Up:**

The LCD module should be stabilized at a 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 windless room.

**Note (5) Definition of brightness uniformity**

Brightness uniformity = (Min Luminance of 9 points) / (Max Luminance of 9 points) × 100%



(單位 : mm)

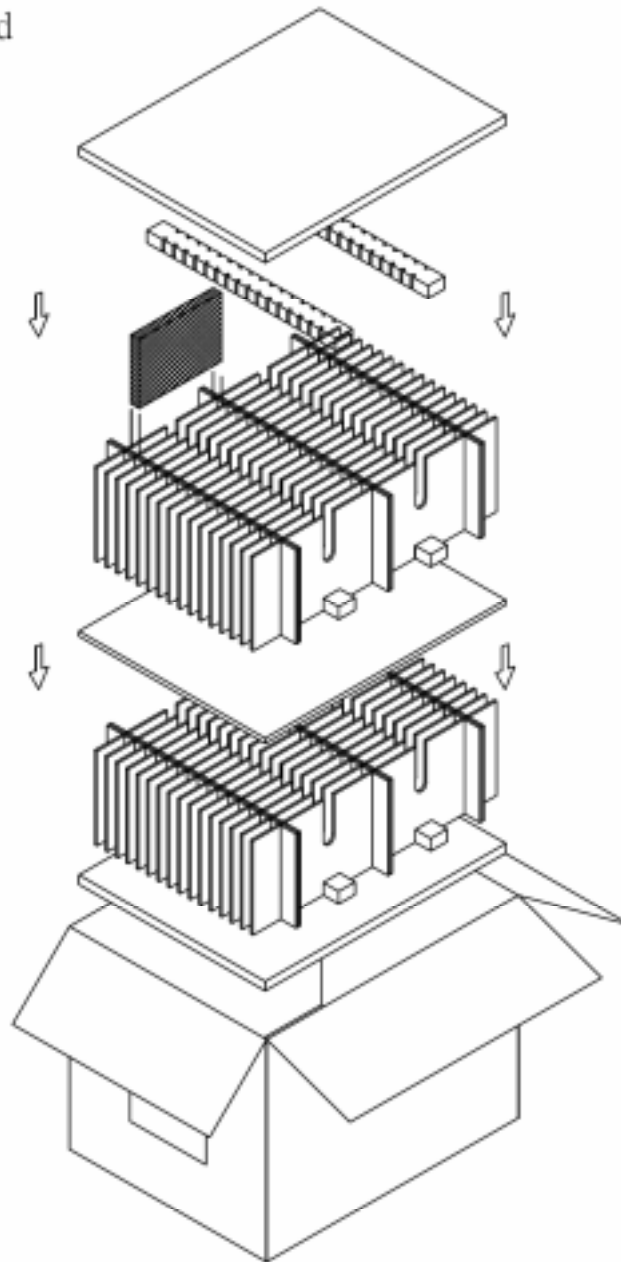
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### 13. Reliability Test

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	T <sub>a</sub> = 80      240 hours	-
2	Low Temperature Storage Test	T <sub>a</sub> = -30      240 hours	-
3	High Temperature Operation Test	T <sub>a</sub> = 70      240 hours	-
4	Low Temperature Operation Test	T <sub>a</sub> = -20      240 hours	-
5	High Temperature and High Humidity Operation Test	T <sub>a</sub> =60      90%RH      240 hours	-
6	Electro Static Discharge Test (non-operating)	-Panel Surface/Top Case : 150pF, 330Ω Air: ±15kV, Contact: ±8kV	-
7	Mechanical Shock Test (non-operating)	Half sine wave, 100G, 6ms 3 times shock of each six surfaces	-
8	Vibration Test (non-operating)	Sine wave, 10 ~ 55 ~ 10Hz, 3 axis, 2 hours/axis	-
9	Thermal Shock Test (non-operating)	-20 (30min) ~ 70 (30min), 100 cycles	-
10	Drop Test(with Carton)	Height: 80cm 1 corner, 3 edges, 6 surfaces	-

## 14. Packaging

Packing Method



PARTS LIST					
	ITEM	SIZE(LxWxH) unit:mm	MATERIAL	Q.T.Y	NOTE
1	STATIC SHIELDING BAGS	200.0x145.0*0.09		60	
2	PU FOAM	440.0x340.0x15.0	SPONGE	2	
3	EPE PAD	345.0x30.0x20.0		8	
4	CARD BOARD	345.0x150.0x3.5	CARTON	12	
5	CARD BOARD	450.0x150.0x3.5	CARTON	32	
6	CARD BOARD	440.0x340.0x8.0	CARTON	1	
7	EXTERNAL BOX	460.0x360.0x355.0	CARTON	1	
8	PRODUCT	144.0x104.6x13.0		60	

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## **15. Precautions**

### **15.1 Assembly and Handling Precautions**

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

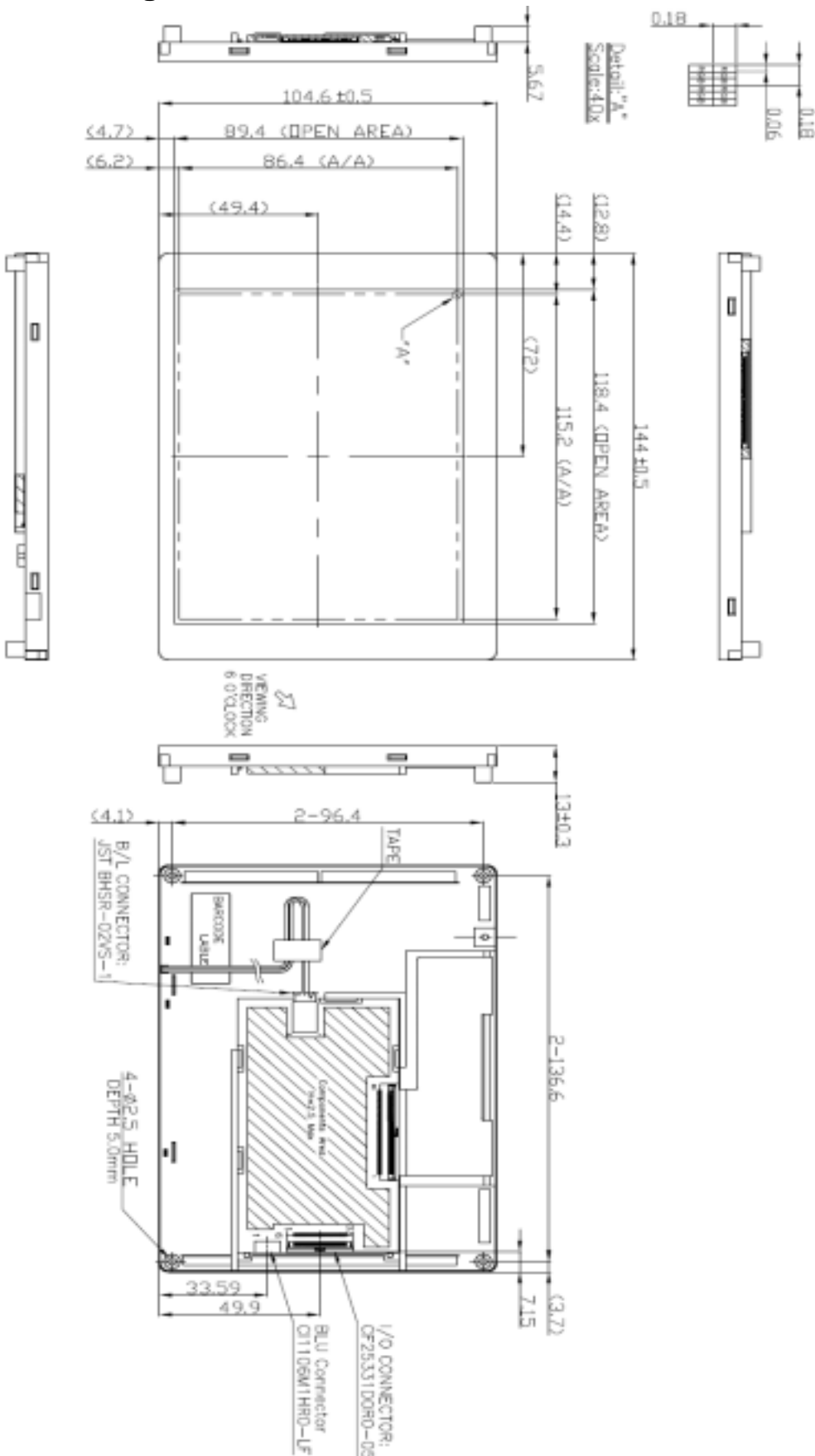
### **15.2 Safety Precautions**

- (1) 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.
- (2) After the module's end of life, it is not harmful in case of normal operation and storage.

### **15.3 Terms of Warrant**

- (1) Acceptance inspection period  
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- (2) Applicable warrant period  
The period is within twelve months since the date of shipping out under normal using and storage conditions.

16.Outline Drawing



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### 17. Definition of Labels

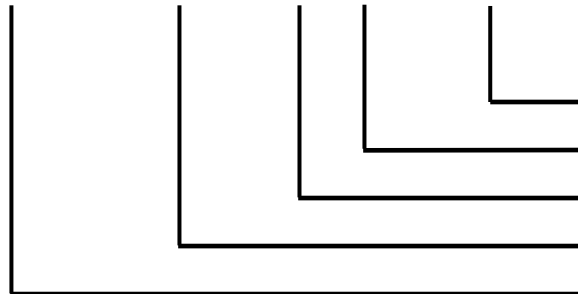
The bar code nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Module Name: VGG644804-6UFLWD

(b) Serial ID:

A B C D E F G H I J K L M



Serial No.  
Revision Code  
Factory Code  
Manufactured Date  
Screen Size

Serial ID includes the information as below:

(a) Screen size (Diagonal): Inch Code (ABCD)

3.5" → 0350

10.4" → 1040

(b) Manufactured Date: Year, Month, Day (EFG)

Year (E)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mark	0	1	2	3	4	5	6	7	8	9
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mark	A	B	C	D	E	F	G	H	I	J

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Month (F)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

Day (G)

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mark	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G
Day	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Mark	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	

(c) Factory Code (H):

For EVERVISION internal use.

(d) Revision Code (I):

Cover all the change, for example: 1: Rev.1, 2: Rev.2, 3: Rev.3...etc.

(e) Serial No. (JKLM):

Manufacturing sequence of product, for example: 0001~9999.



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## 18. Incoming Inspection Standards

### 18.1 The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

- (1) Ambient temperature  $25 \pm 5$
- (2) Humidity:  $60 \pm 5\%$  RH
- (3) Viewing distance is approximately 35 ~ 40 cm
- (4) Viewing angle is normal to the LCD panel as Fig \_1( $10^\circ$ )
- (5) Ambient Illumination: 300 ~ 500 Lux for external appearance inspection

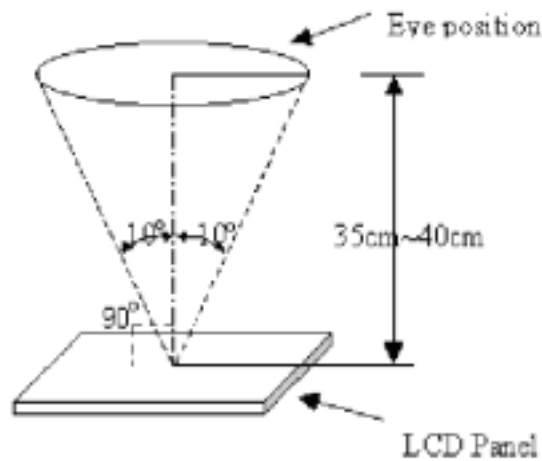


Fig \_ 1

### 18.2 The defects classify of AQL as following:


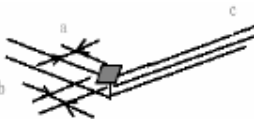
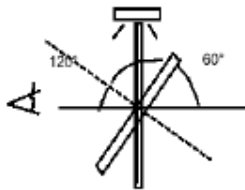
Class of defects	AQL	Definition
Major	0.65%	It is defect that is likely to result in failure or to reduce materially the usability of the intended function.
Minor	1.5%	It is a defect that will not result in functioning problem with deviation classified.

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### 18.3 Inspection Parameters

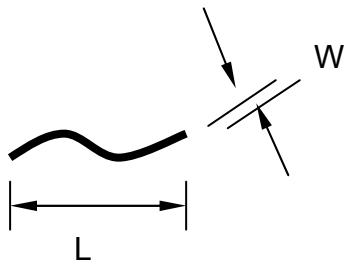
Item		Specification/Description			Note	
Display	Function	No Display			-	
		Malfunction			-	
Operating	Contrast ratio	Out of Spec			-	
	Line defect	No obvious Vertical and Horizontal line defect in bright , dark and colored.			-	
	Point Defect (red,green,blue,dark, white)	Item	Acceptable number			Note: 1、4、 5、6
			A	B	Total	
		BRIGHT DOT	$N \leq 2$	$N \leq 2$	$N \leq 7$	
		DARK DOT	$N \leq 3$	$N \leq 4$		
		TOTAL DOT	$N \leq 4$	$N \leq 5$		
TWO ADJACENT DOT		NOT ALLOWED				
THREE OR MORE ADJACENT DOT	NOT ALLOWED					
External Inspection (non-operating)	Scratch on the polarizer	L(mm)	W(mm)	Acceptable number	Note:2	
		$L \leq 2.5$	$W \leq 0.1$	4		
		$L > 2.5$	$W > 0.1$	0		
	Dent or bubble on the polarizer	Dimension(mm)		Acceptable number		Note:3
		$D \leq 0.5$		4		
		$D \leq 0.15$		Disregard		
	Foreign material on the polarizer	Dimension(mm)		Acceptable number		Note:3
		$D \leq 0.5$		4		
		$D \leq 0.15$		Disregard		

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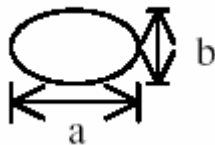
Item		Specification/Description			Note
Touch Panel	Scratch	L(mm)	W(mm)	Acceptable number	Note:2
		$L \leq 10$	$W < 0.05$	Disregard	
			$0.05 \leq W < 0.1$	$N \leq 4$	
			$W \geq 0.1$	0	
	Foreign Materials (Linear shape)	$L \leq 10$	$W < 0.05$	Disregard	Note:2
			$0.05 \leq W < 0.1$	$N \leq 3$	
			$W \geq 0.1$	0	
	Foreign Materials (Circular shape)	Dimension(mm)		Acceptable number	Note:3
		$D \leq 0.25$		Disregard	
		$0.25 < D \leq 0.5$		$N \leq 6$	
$D > 0.5$		0			
Glass chipping			$a \leq 5\text{mm}$ $b \leq 3\text{mm}$ $c \leq t$ (t : Glass think)	Note:7	
			$a \leq 3\text{mm}$ $b \leq 3\text{mm}$ $c \leq t$ (t : Glass think)	Note:7	
Newton-ring	(In case of doubtful situations) Observe on $60^\circ$ from the product surface under a white Fluorescent lamp(3-wavelength lamp).			Average diameter $\leq 1/3$ Touch Panel area Disregard.  Note:7	

Note1. The definition of dot defect : The dot defect was judged after repair and the size of defective dot over 1/2 of whole dot is regarded as one defective dot.

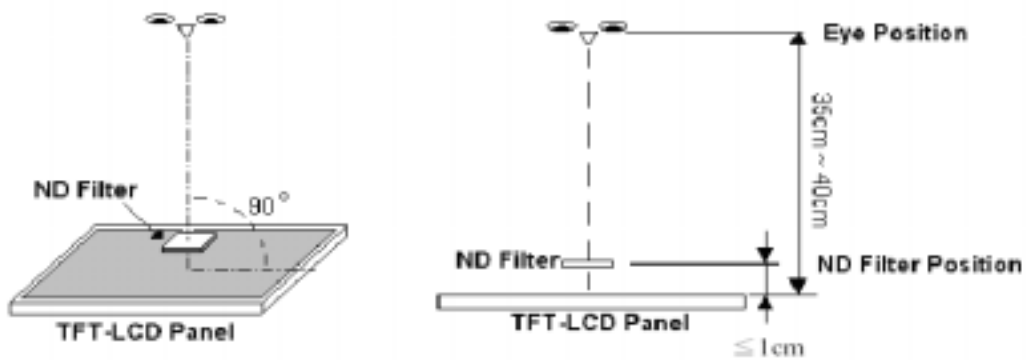
Note2.



Note3. D : Diameter  $D=(a+b)/2$



Note4. Bright dot is defined through 6% transmission ND Filter as following.

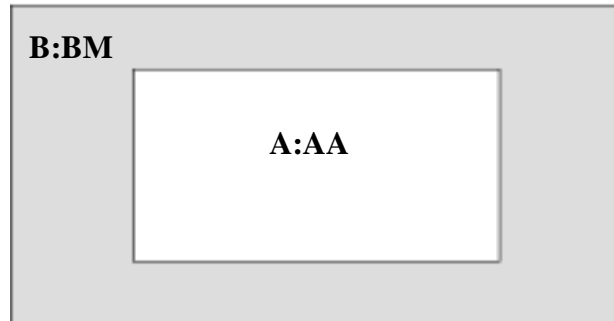


Note5. ADJACENT DOT

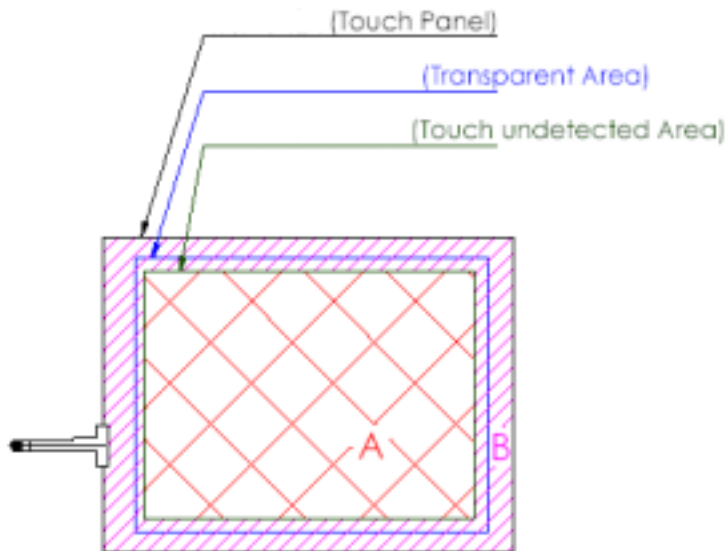


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Note6.



Note7.



A area : Without any defect point effect on normal operation.

B area : None-specify

#### 18.4 Handling of LCM

- (1) Don't give external shock.
- (2) Don't apply excessive force on the surface.
- (3) Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't disassemble the LCM.