

# DMT024QVNMNT0-1A

## PRODUCT SPECIFICATION

Version 0.1  
Sep 08, 2023

TBD

<i>Customer's Approval</i>	
<u>Signature</u>	<u>Date</u>

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Approved by *Evan Huang*

## Revision History

VERSION	DATE	DESCRIPTION	AUTHOR
0.1	Sep 08, 2023	Preliminary	Yvette Hsieh

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# 1. General Description

## 1.1 Introduction

This is a 2.4" size colour active matrix TFT LCD module that uses amorphous silicon TFT as a switching device. The display is normally black mode, transmissive, and featuring high contrast and excellent colour saturation. The resolution of the TFT-LCD is 240 x 320 and can display up to 262K colours. The display module supports MIPI + one data lane interface.

## 1.2 Main Features

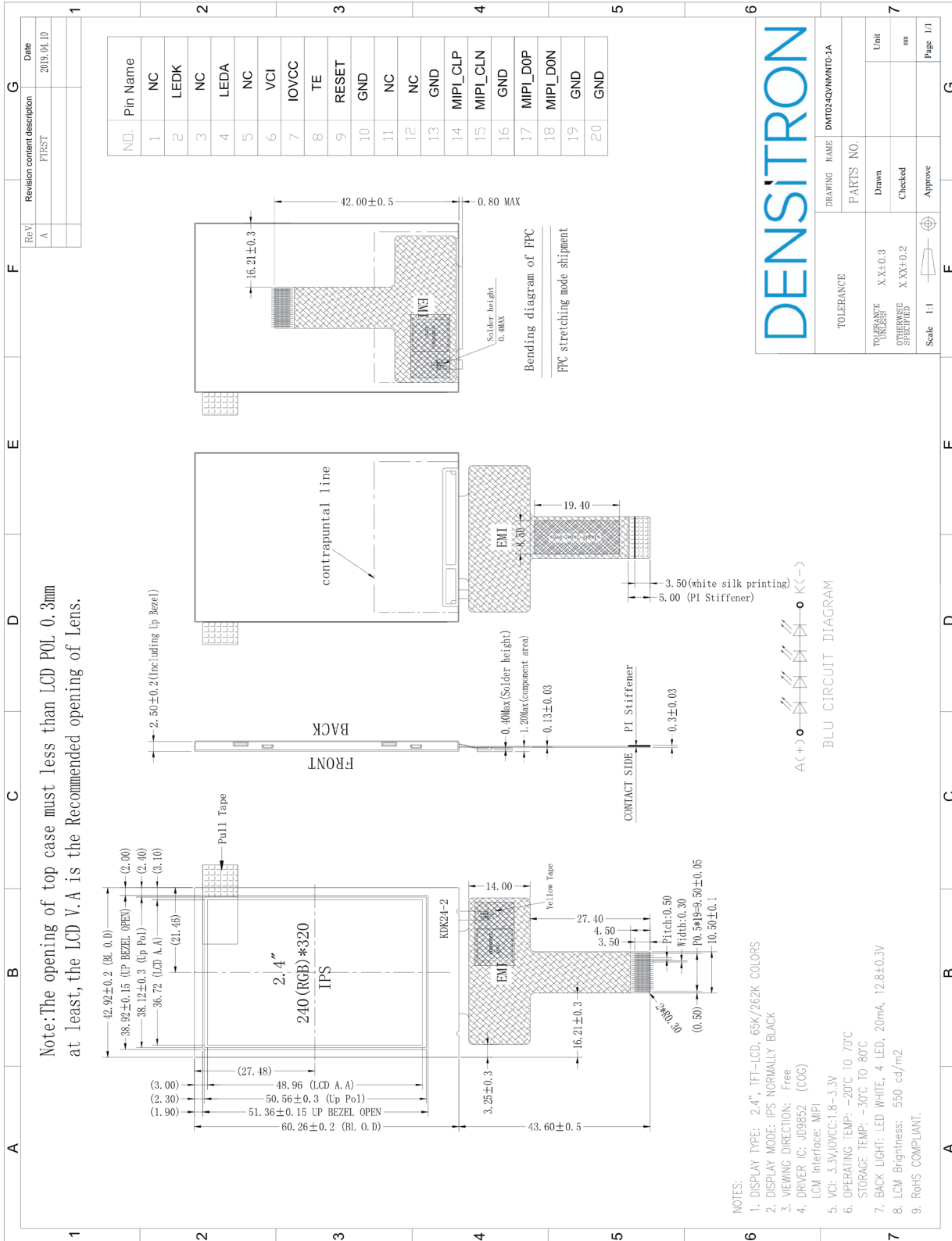
Item	Contents
Display Type	TFT LCD
Screen Size	2.4" Diagonal
Display Format	240 x RGB x 320 Dots
No. of Colour	262K
Overall Dimensions	42.92 (W) x 60.26 (H) x 2.50 (D) mm
Active Area	36.72 (W) x 48.96 (H) mm
Mode	Normally Black / Transmissive
Surface Treatment	Anit-Glare (3H)
Viewing Direction	All round
Interface	MIPI + one data lane
Driver IC	JD9852
Backlight Type	LED, White, 4 chips
Operating Temperature	-20°C ~ +70°C
Storage Temperature	-30°C ~ +80°C
ROHS	Compliant to RoHS 2.0

## 2. Mechanical Specification

### 2.1 Mechanical Characteristics

Item	Characteristic	Unit
Display Format	240 x RGB x 320	Dots
Overall Dimensions	42.92 (W) x 60.26 (H) x 2.50 (D)	mm
Active Area	36.72 (W) x 48.96 (H)	mm
Dot Pitch	0.153 (W) x 0.153 (H)	mm
Weight	11	g
IC Controller/Driver	JD9852	

## 2.2 Mechanical Drawing



## 3. Electrical Specification

### 3.1 Absolute Maximum Ratings

(VSS=0V, Ta=25°C)

Item	Symbol	Min	Max	Unit
Digital Supply Voltage	V <sub>CI</sub>	-0.3	3.3	V
Digital Interface Supply Voltage	I <sub>OVCC</sub>	-0.3	3.3	V
Operating Temperature	T <sub>OP</sub>	-20	+70	°C
Storage Temperature	T <sub>STG</sub>	-30	+80	°C

**Note 1:** When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. For normal operations, it is desirable to use this module under the conditions according to Section 3.2 "Electrical Characteristics", to avoid malfunctioning.

**Note 2:** Please refer to item of RELIABILITY.

### 3.2 DC Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	V <sub>CI</sub>	2.6	3.3	3.6	V
Digital Interface Supply Voltage	I <sub>OVCC</sub>	1.65	1.8	3.3	V
Normal Mode Current Consumption	I <sub>DD</sub>	-	9	-	mA
Level Input Voltage	V <sub>IH</sub>	0.7 I <sub>OVCC</sub>	-	I <sub>OVCC</sub>	V
	V <sub>IL</sub>	GND	-	0.3 I <sub>OVCC</sub>	V
Level Output Voltage	V <sub>OH</sub>	0.8 I <sub>OVCC</sub>	-	I <sub>OVCC</sub>	V
	V <sub>OL</sub>	GND	-	0.2 I <sub>OVCC</sub>	V

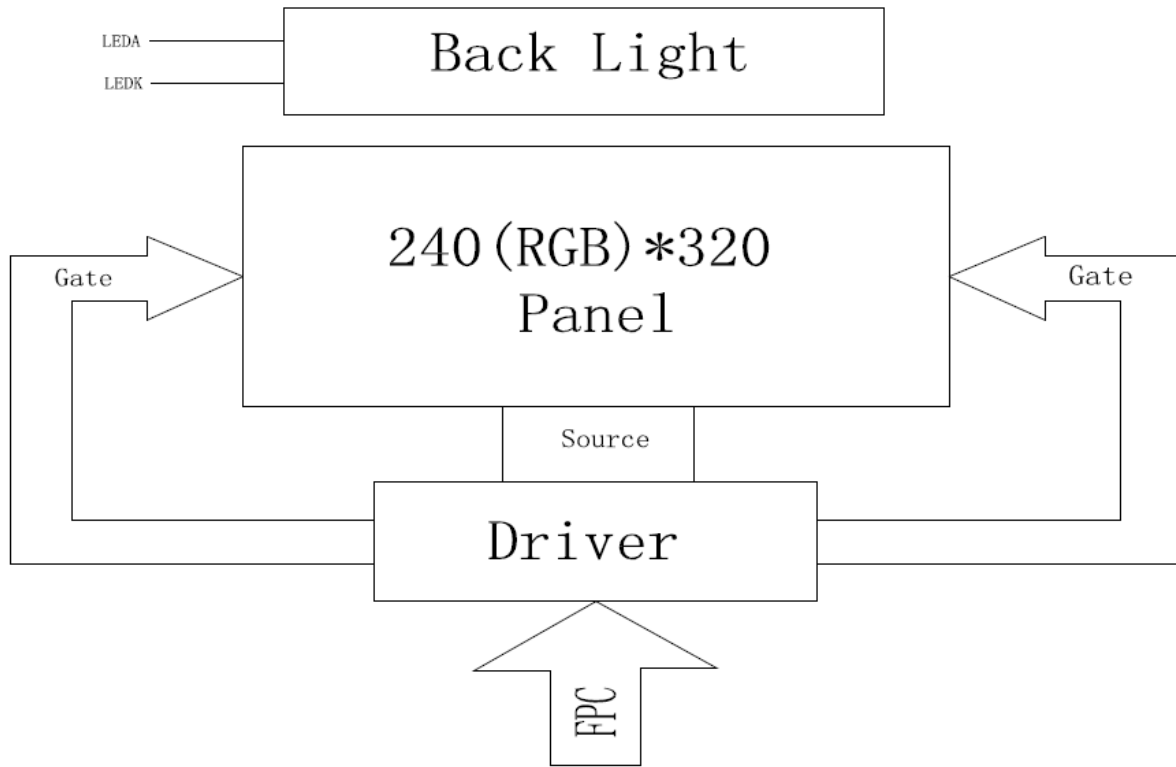


### 3.3 Interface Pin Assignment

#### 3.3.1 TFT Pin Define

No.	Symbol	I/O	Function
1	NC	-	-
2	LEDK	P	Cathode pin of backlight
3	NC	-	-
4	LEDA	P	Anode pin of backlight
5	NC	-	-
6	VCI	I	Supply Voltage (3.3V)
7	IOVCC	P	Power supply for I/O block (1.8-3.3V)
8	TE	O	Serve as a TE (tearing effect) output signal
9	RESET	I	Reset pin. Setting either pin low initialized the LSI. Must re reset after power is supplied
10	GND	P	-
11-12	NC	-	-
13	GND	P	Ground
14	MIPI_CLP	I	DSI. Positive polarity of low voltage differential clock signal
15	MIPI_CLN	-	DSI. Negative polarity of low voltage differential clock signal
16	GND	P	Ground
17	MIPI_D0P	I	DSI. Positive polarity of low voltage differential data signal
18	MIPI_D0N	I	DSI. Negative polarity of low voltage differential data signal
19-20	GND	P	Ground

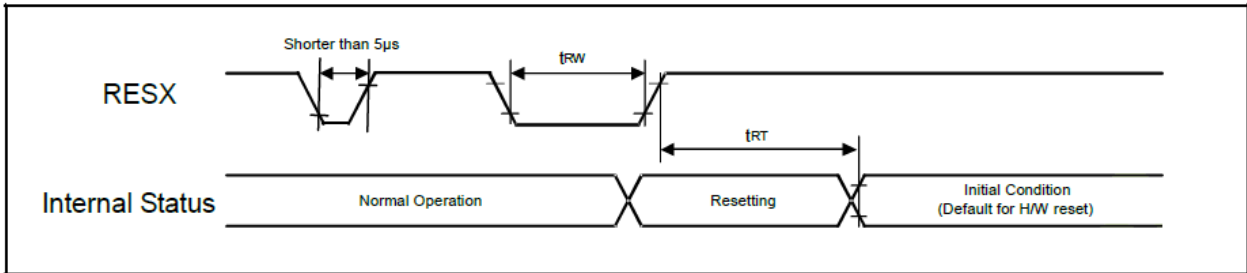
### 3.4 Block Diagram



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### 3.5 Timing Characteristics

#### 3.5.1 Reset Input Timing



Parameter	Symbol	Related pins	Min	Max	Unit	Note
Reset Pulse Width	$t_{RW}$	RESX	10	-	us	-
Reset Complete Time	$t_{RT}$	-	-	5	ms	5
		-	-	120	ms	6, 7

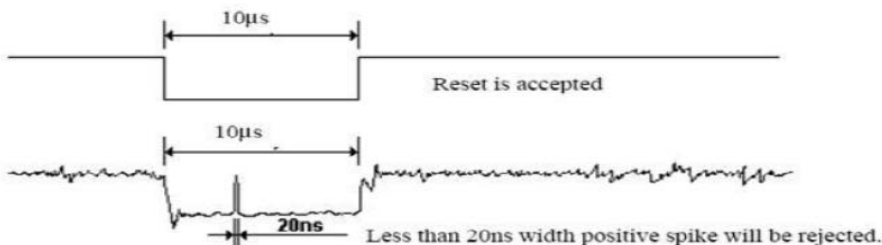
**Note 1:** The reset complete time also required time for loading ID bytes from OTP to registers. This loading is done every time when there is HW reset cancel time ( $t_{RT}$ ) within 5ms after a rising edge or RESX.

**Note 2:** Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5us	Reset rejected
Longer than 10us	Reset
Between 5us and 10us	Reset start

**Note 3:** During the resetting period, the display will be blanked (the display is entering blanking sequence, which maximum time is 120ms, when Reset starts on Sleep Out mode. The display remains the blank state in Sleep In mode) and then returns to Default condition for H/W reset.

**Note 4:** Spike Rejection also applied during a valid reset pulse as shown below.



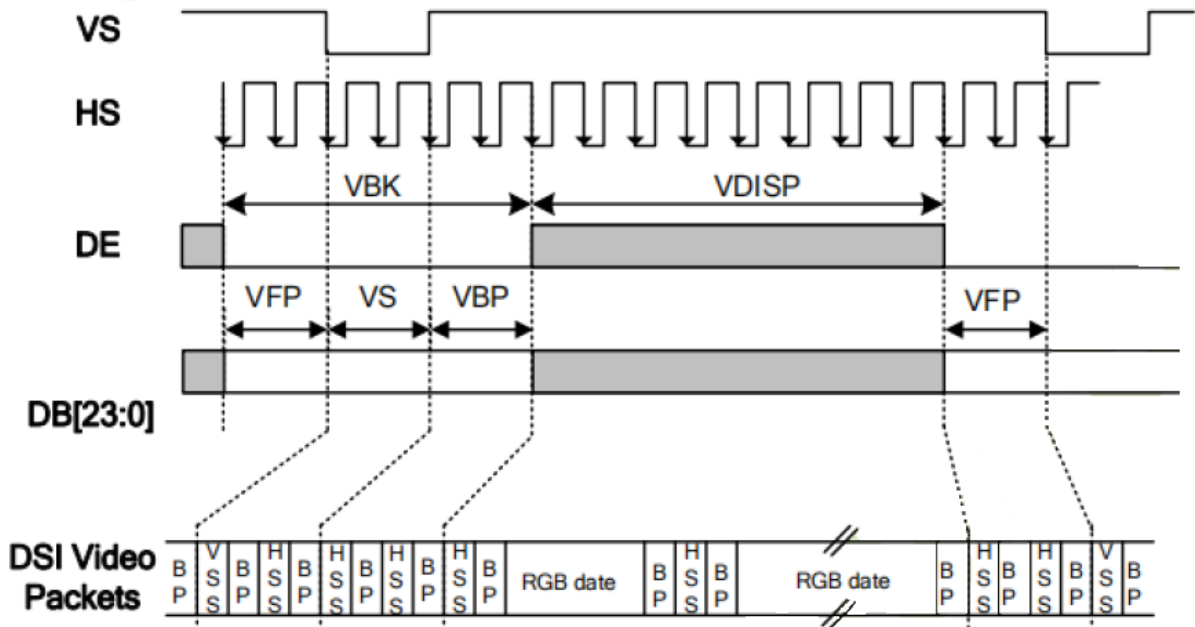
**Note 5:** When Reset is applied during Sleep In mode.

**Note 6:** When Reset is applied during Sleep Out mode.

**Note 7:** It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

### 3.5.2 Timing for DSI Video Mode

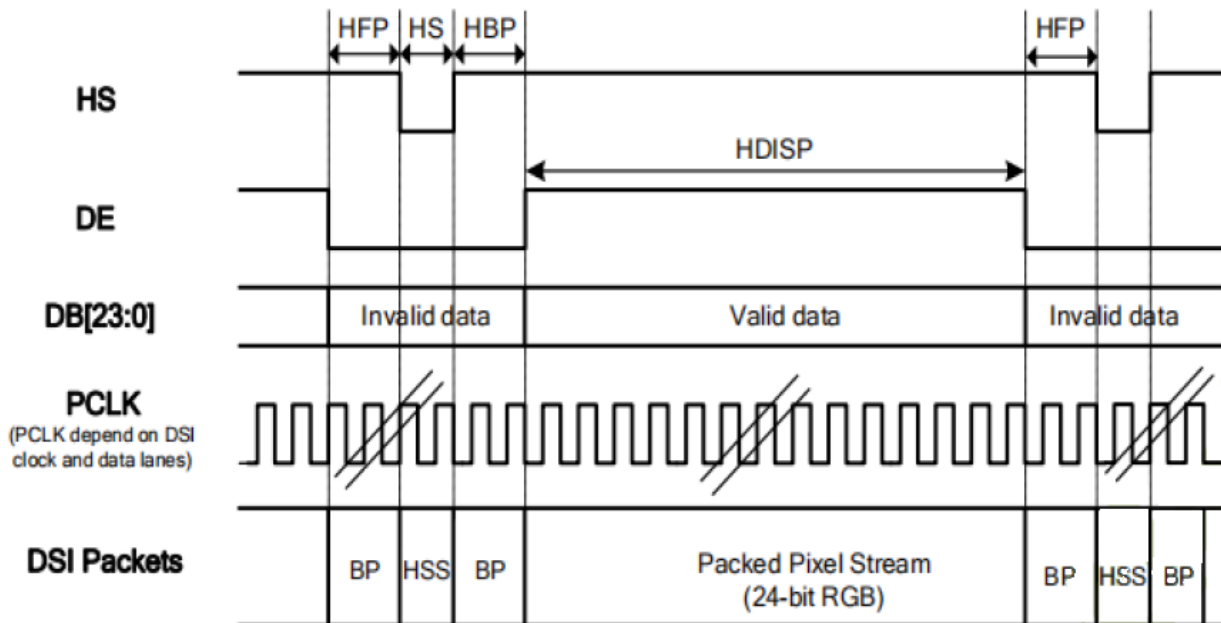
Vertical Timing for DSI Video mode I/F



Resolution = 240 x 320 (ta=25°C, IOVCC=1.8V, VCI=2.8V)

Item	Symbol	Condition	Min	Typ	Max	Unit
Vertical Low Pulse Width	VS	-	2	-	Note 1	Line
Vertical Front Porch	VFP	-	2	-	-	Line
Vertical Back Porch	VBP	-	2	-	1	Line
Vertical Blanking Period	VBK	VS + VBP + VFP	6	-	-	Line
Vertical Refresh Rate	VRR	-	-	60	-	Hz

Horizontal Timing for DSI Video mode I/F



Resolution = 240 x 320 (ta=25°C, IOVCC=1.8V, VCI=2.8V)

Item	Symbol	Condition	Min	Typ	Max	Unit
HS Low Pulse Width	HS	-	6	-	78	DCK
Horizontal Front Porch	HFP	-	5	-	78	DCK
Horizontal Back Porch	HBP	-	5	-	78	DCK
Horizontal Blanking Period	HBLK	HS + HBP + HFP	16	-	88	DCK
Horizontal Active Area	HDSIP	-	-	240	-	DCK

**Note 1:** HS + HBP > 0.5us

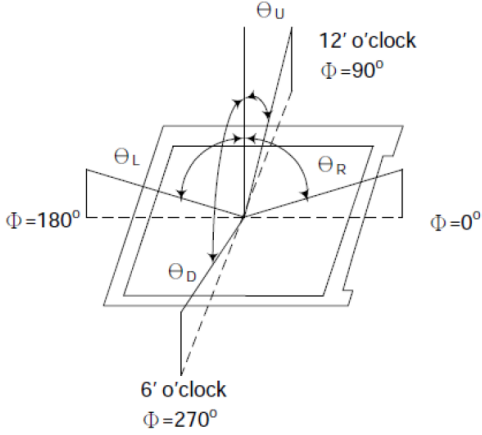
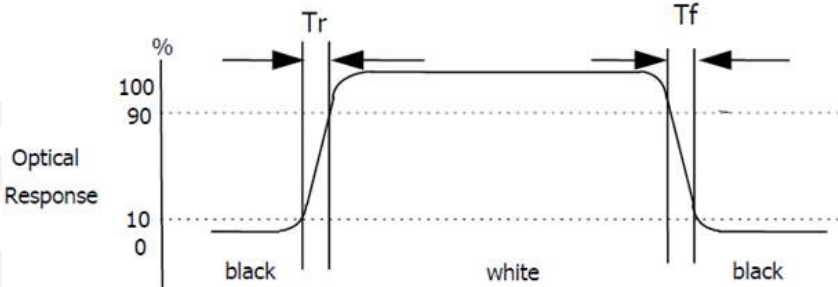
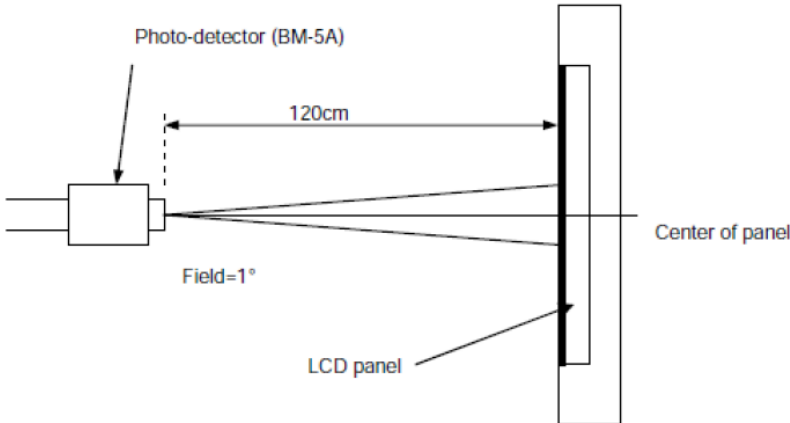
**Note 2:** HFP > 0.5us

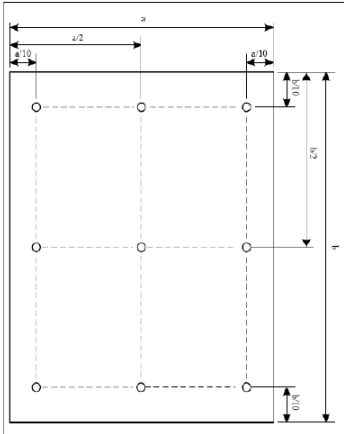
## 4. Optical Specification

### 4.1 Optical Characteristics

Characteristics		Symbol	Conditions	Min	Typ	Max	Unit	Note
Contrast Ratio		CR	$\theta = 0^\circ$	600	800	-	-	1, 2
Response time		$T_R + T_F$	Normal viewing angle	-	35	45	msec	1, 3
Color Gamut		S(%)	-	-	70	-	%	-
Viewing Angle	Left	$\theta_{x-}$	CR $\geq 10$	-	80	-	deg	1, 4
	Right	$\theta_{x+}$		-	80	-		
	Up	$\theta_{y+}$		-	80	-		
	Down	$\theta_{y-}$		-	80	-		
Colour Chromaticity	Red	Rx	$\theta = 0^\circ$ Normal viewing angle	0.5907	0.6307	0.6707	-	CA-310 test
		Ry		0.302	0.342	0.382		
	Green	Gx		0.2839	0.3239	0.3639		
		Gy		0.5724	0.6124	0.6524		
	Blue	Bx		0.1087	0.1487	0.1887		
		By		0.0096	0.0496	0.0896		
	White	Wx		0.2692	0.3092	0.3492		
		Wy		0.2975	0.3375	0.3775		
Luminance		Lv	-	500	550	-	cd/m <sup>2</sup>	5
Uniformity		Avg	-	80	-	-	%	5

**Note:** Measuring Condition = in dark room, at ambient temperature  $25 \pm 2^\circ\text{C}$ , for 15 min warm-up time.

Note	Item	Test method
1	Definition of Viewing Angle	
2	Definition of Contrast Ratio (CR)	<p>Measured at the center point of panel</p> $CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$
3	Definition of Response Time: Sum of $T_R + T_F$	
4	Definition of Optical Measurement Setup	

Note	Item	Test method
5	Definition of Uniformity	<p>Luminance Uniformity of these 9 points is defined as below</p>  <p>Uniformity = <math>\frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}</math></p>

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## 5. LED Backlight Specification

### 5.1 LED Backlight Characteristics

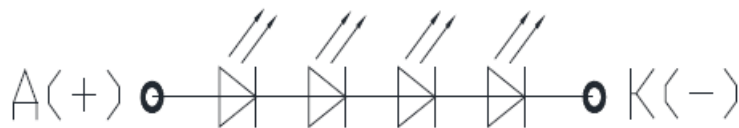
The back-light system is edge-lighting type with 4 chips White LED

Item	Symbol	Min	Typ	Max	Unit	Note-
Forward Voltage	$V_F$	--	12.8	-	V	-
Forward Current	$I_F$	15	20	-	mA	-
LED Life Time	Hr	50000	-	-	Hrs	1,2

Note 1: LED life time can be defined as the time in which it continues to operate under the condition:  $T_a = 25 \pm 3^\circ\text{C}$ , typically  $I_L$  value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a = 25^\circ\text{C}$  and  $I_L = 20\text{mA}$ . The LED life time could be decreased if operating  $I_L$  is larger than 20mA. The constant current driving method is suggested.

### 5.2 Internal Circuit Diagram



BLU CIRCUIT DIAGRAM

## 6. Packaging

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## 7. Quality Assurance Specification

### 7.1 Conformity

The performance, function and reliability of the shipped products conform to the Product Specification.

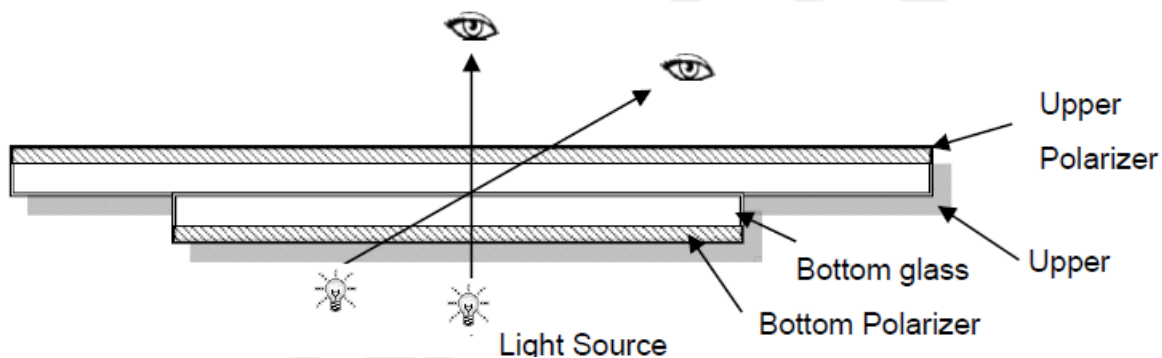
### 7.2 Environment Required

Customer's test & measurement are required to be conducted under the following conditions:

Viewing Angle:	Normal Viewing Angle
Humidity:	65% ± 10% RH
Viewing Angle:	Normal Viewing Angle
Illumination:	300 to 700 Lux single fluorescent lamp
Viewing distance:	30 to 50cm

Finger glove (or finger cover) must be worn by the inspector.

Inspection table or jig must be anti-electrostatic.

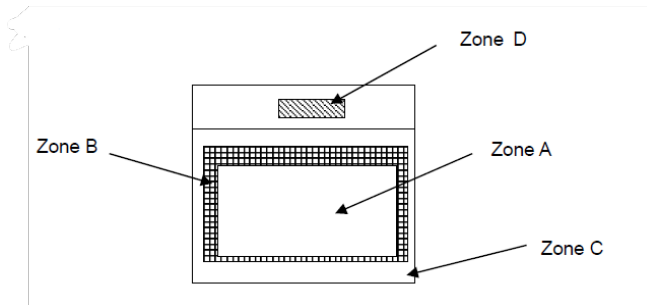


### 7.3 Delivery Assurance

#### 7.3.1 Delivery Inspection Standards

Class II, Normal Inspection, ISO-2859-1

### 7.3.2 Zone Definition



Zone A: Effective viewing area (characteristics or digital can be seen)

Zone B: Viewing area except Zone A

Zone C: Outside (Zone A + Zone B) which can not be seen after assembly by customer

Zone D: IC bonding Area

**Note** : As a general rule, visual defects in Zone C can be ignored when it does not effect product function appearance after assembly by customer.

### 7.3.3 Criteria & Acceptable Quality Level

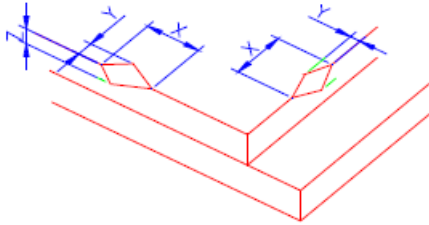
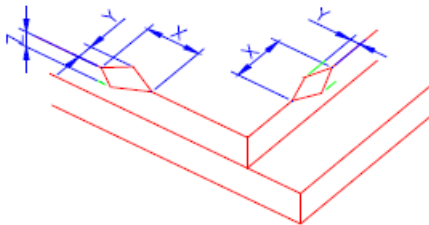
Major Defect	Minor Defect
0.65	1.5

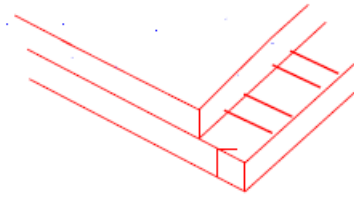
### 7.3.4 Criteria & Classification

LCD: Liquid Crystal Display, TP: Touch Panel , LCM: Liquid Crystal Module

Item	Criteria	Classification of defects
Function Defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function Major	Major
Missing	Missing component	
Outline Dimension	Overall dimension beyond the drawing is not allowed	
Color Tone	Color unevenness, refer to limited sample	Minor
Spot Line Defect	Light dot, dim spot, polarizer bubble, polarize accidented spot	
Soldering appearance	Good soldering, peeling off is not allowed	
LCD/Polarizer/TP	Black/Whit spot/Line, scratch, crack	

Visual

Item	Criteria
LCD Crack/Broken	X: Length Y: Width Z: Hieigh L: Length of ITO T: Height of LCD
	The edge of LCD broken 
	$X \leq 3.0\text{mm}$ , $Y < \text{inner border line of the seal}$ , $Z \leq T$
	LCD corner broken 
	$X \leq 3.0\text{mm}$ , $Y \leq L$ , $Z \leq T$
	LCD crack



Crack not allowed

1. Light dot (LCD/polarizer black/white spot, light dot, pinhole. Dent, stain)

Size	Acceptable Qty		
	A	B	C
$\Phi \leq 0.1$	Ignore		
$0.1 < \Phi \leq 0.2$	3 (distance $\geq 10\text{mm}$ )		
$0.2 < \Phi \leq 0.25$	2		
$\Phi > 3$	0		

Ignore

2. Dim spot (LCD/TP/polarizer dim dot, light leakage, dark spot)

Size	Acceptable Qty		
	A	B	C
$\Phi \leq 0.1$	Ignore		
$0.1 < \Phi \leq 0.2$	3 (distance $\geq 10\text{mm}$ )		
$0.2 < \Phi \leq 0.25$	2		
$\Phi > 3$	0		

Ignore

3. Polarizer accidented spot

Size	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		
$0.3 < \Phi \leq 0.5$	2 (distance $\geq 10\text{mm}$ )		
$\Phi > 0.5$	0		

Ignore

4. Pixel bad points (light dot, dim dot, color dot)

Size	Acceptable Qty		
	A	B	C
$\Phi \leq 0.1$	Ignore		
$0.15 < \Phi \leq 0.2$	2 (distance $\geq 10\text{mm}$ )		
$\Phi > 0.2$	0		

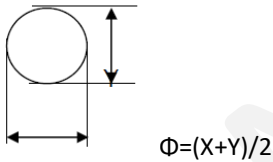
Ignore

5. Polarizer bubble

Size	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		

Ignore

Spot defect



	<table border="1"> <tr> <td><math>0.3 &lt; \Phi \leq 0.4</math></td> <td>3 (distance <math>\geq 10\text{mm}</math>)</td> </tr> <tr> <td><math>0.4 &lt; \Phi \leq 0.5</math></td> <td>2</td> </tr> <tr> <td><math>\Phi &gt; 0.5</math></td> <td>0</td> </tr> </table>	$0.3 < \Phi \leq 0.4$	3 (distance $\geq 10\text{mm}$ )	$0.4 < \Phi \leq 0.5$	2	$\Phi > 0.5$	0																						
$0.3 < \Phi \leq 0.4$	3 (distance $\geq 10\text{mm}$ )																												
$0.4 < \Phi \leq 0.5$	2																												
$\Phi > 0.5$	0																												
Line defect (LCD/TP/polarizer backlight black/white line, scratch, stain)	<table border="1"> <tr> <th rowspan="2">Width (mm)</th> <th rowspan="2">Length (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td><math>W \leq 0.3</math></td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.4</math></td> <td><math>L \leq 3.0</math></td> <td colspan="3"><math>N \leq 2</math></td> </tr> <tr> <td><math>0.04 &lt; W \leq 0.05</math></td> <td><math>L \leq 2.0</math></td> <td colspan="3"><math>N \leq 1</math></td> </tr> <tr> <td><math>0.05 &lt; W</math></td> <td colspan="4">Defined as spot defect</td> </tr> </table>	Width (mm)	Length (mm)	Acceptable Qty			A	B	C	$W \leq 0.3$	Ignore	Ignore			$0.03 < W \leq 0.4$	$L \leq 3.0$	$N \leq 2$			$0.04 < W \leq 0.05$	$L \leq 2.0$	$N \leq 1$			$0.05 < W$	Defined as spot defect			
	Width (mm)			Length (mm)	Acceptable Qty																								
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	$W \leq 0.3$	Ignore	Ignore																										
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$0.04 < W \leq 0.05$	$L \leq 2.0$	$N \leq 1$																											
$0.05 < W$	Defined as spot defect																												
Electronic Components SMT	Not allow missing parts, solderless connection, cold solder joint, mismatch. The positive and negative polarity opposite																												
Display color & Brightness	<p>1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples.</p> <p>2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.</p>																												
LCD Mura	By 5% ND filter invisible																												

Criteria

Item	Criteria (mm)
No Display	Not allowed
Missing Segment	
Short	
Backlight No Lighting	
TP No Function	

## 7.4 Dealing with Customer Complaints

### 7.4.1 Non-conforming Analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.

After accepting it, Densitron should complete the analysis in reasonable time and update the status to the purchaser.

### 7.4.2 Handling of Non-conforming Displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.

Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.

Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.



## 8. Reliability Specification

### 8.1 Reliability Tests

Test Item	Test Condition	Inspection after test
High Temperature Operation	70°C, 96 hours	Inspection after 2 to 4 hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD 2. Non-display 3. Missing segment/line 4. Glass crack 5. Current IDD is twice higher than initial value
Low Temperature Operation	-20°C, 96 hours	
High Temperature Storage	80°C, 96 hours	
Low Temperature Storage	-30°C, 96 hours	
High Humidity Storage	60°C, 90% RH ,96 hours.	
Thermal Cycling Test Storage	-30°C, 30 min ↔ 80°C, 30 min, Change time: 5min, 20 cycles.	
ESD Test	C = 150pF, R = 330, 5 points/panel Air: ±8KV, 5 times. Contact: ±6KV, 5 times (Environment: 15°C ~ 35°C, 30% ~ 60%)	
Vibration (non-operation)	Frequency range:10Hz ~ 50Hz, stroke: 1.5mm Sweep: 10Hz ~ 55Hz ~ 10Hz, 2hours for each direction of X, Y, Z (6 hours for total) (Package condition)	
Box Drop Test	Height: 80 cm,1 corner, 3 edges, 6 surfaces	

**Note 1:** The test sample should be applied to only one test item.

**Note 2:** Sampel size for each test item is 5 ~ 10pcs

**Note 3:** For Damp Proof Test, pure water (resistance > 10MΩ) should be used.

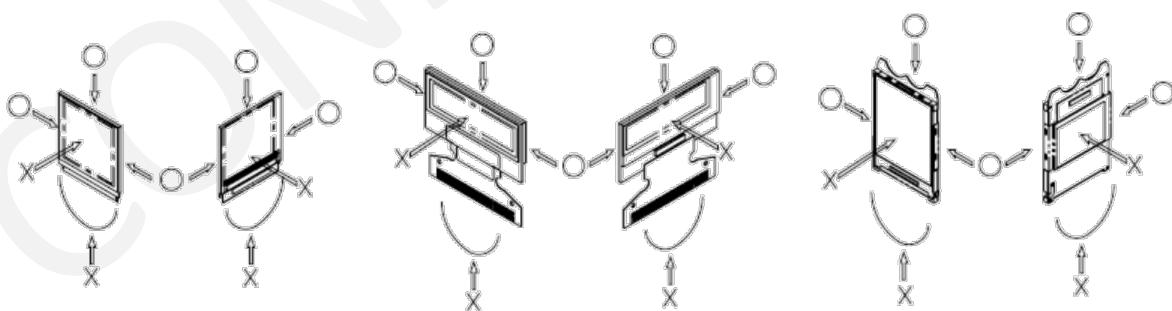
**Note 4:** In case of malfunction defect cause ESD damage, if it would be recovered to normal state resetting, it would be judged as a good part.

**Note 5:** Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

## 9. Handling Precautions

### 9.1 Handling Precautions

- 1) Since the display panel is made of glass, do not apply mechanical impacts such as dropping from a high position.
- 2) If the display panel is broken by accident and the internal organic substance leaks out, be careful not to inhale nor lick the organic substance.
- 3) If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.
- 4) If pressure is applied to the display surface or its neighbourhood of the display module, the cell structure may be damaged and be careful not to apply pressure to these sections.
- 5) The polarizer covering the surface of the display module is soft and easily scratched. Please be careful when handling the display module.
- 6) When the surface of the polarizer of the display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
  - a. Scotch Mending Tape No. 810 or an equivalent
  - b. Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
  - c. Also, pay attention that the following liquid and solvent may spoil the polarizer:
    - Water
    - Ketone
    - Aromatic Solvents
- 7) Hold the display module very carefully when placing it into the system housing. Do not apply excessive stress or pressure to display module. And, do not over bend the film with electrode pattern layouts. These stresses will



influence the display performance. Also, secure sufficient rigidity for the outer cases.

- 8) Do not apply stress to the LSI chips and the surrounding molded sections.
- 9) Do not disassemble nor modify the display module.
- 10) Do not apply input signals while the logic power is off.
- 11) Pay sufficient attention to the working environments when handling display modules to prevent occurrence of element breakage accidents by static electricity.
  - a. Be sure to make human body grounding when handling display modules.

- b. Be sure to ground tools to use or assembly such as soldering irons.
  - c. To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
  - d. Protective film is being applied to the surface of the display panel of the display module. Be careful since static electricity may be generated when exfoliating the protective film.
- 12) A Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. If the display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5).
- 13) If electric current is applied when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

## 9.2 Storage Precautions

- 1) When storing display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps, etc. and, also, avoiding high temperature and high humidity environments or low temperature (less than 0°C) environments. (We recommend you store these modules in the packaged state when they are shipped from Densitron) At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.
- 2) If electric current is applied when water drops are adhering to the surface of the display module, when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

## 9.3 Designing Precautions

- 1) The absolute maximum ratings are the ratings which cannot be exceeded for display module, and if these values are exceeded, panel damage may happen.
- 2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
- 3) We recommend you install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
- 4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighbouring devices.
- 5) As for EMI, take necessary measures on the equipment side basically.
- 6) When fastening the display module, fasten the external plastic housing section.
- 7) If power supply to the display module is forcibly shut down by such errors as taking out the main battery while the display panel is in operation, we cannot guarantee the quality of this display module.

## 9.4 Operation Precautions

- 1) It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.
- 2) Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation.
- 3) Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged.
- 4) To protect display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the display modules.
  - a. Pins and electrodes
  - b. Pattern layouts such as the FPC
- 5) When the driver is being exposed (COG), semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if the driver is exposed to light, malfunctioning may occur.
  - a. Design the product and installation method so that the driver may be shielded from light in actual usage.
  - b. Design the product and installation method so that the driver may be shielded from light during the inspection processes.
- 6) Although the display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from the influences of noise on the system design.
- 7) We recommend you construct its software to make periodical refreshments of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

## 9.5 Cleaning Precautions

- 1) **Keep TFT Scratch free:** Avoid using abrasive materials like paper towels and newspaper in cleaning TFT LCD screens as they may scratch the surface. Instead, opt for a lint-free cloth. Don't spray the liquid directly on the monitor and remember to put gentle pressure when wiping the screen.
- 2) **Avoid Vibration: During cleaning process, try to keep the TFT on shock proof platform to avoid strong shock and vibration. Do not apply pressure to the LCD screen of the LCD or bump or squeeze the LCD display back cover.**
- 3) When the surface of the polarizer of the display module has soil, clean the surface. It takes advantage of using the following adhesion tape:
  - a) Scotch Mending Tape No. 810 or an equivalent.
  - b) Never try to breathe upon the soiled surface.
  - c) List of Safe and Unsafe solvents to clean TFT display:

Safe Solvents	Unsafe Solvents
Distilled Water	Ammonia
Isopropyl Alcohol	Acetone
Diluted White Vinegar = Water (Mix 1 part vinegar + 5 parts of Water)	Ethyl Alcohol
	Methyl Chloride
	Ethyl Acid

## 9.6 Other Precautions

- 1) Request the qualified companies to handle industrial wastes when disposing of the display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.