



# **R&D SPECIFICATION**

## **LIQUID CRYSTAL DISPLAY MODULE**

**Model No. UMSH-7303MD-CS**

**CUSTOMER: U.R.T. R&D Standard Module**

***TENTATIVE***

<b>APPROVED SIGNATURE</b>			
<b>VERSION No: 1.3</b>			

**APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_**

**United Radiant Technology Corporation**  
**R&D Department**

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# 1. BASIC Specification

This data sheet defines the specification for a 160x120 dots Color STN delta type Liquid Crystal Display Module with LED backlight. Display size is 30 mm (1.2”).

## 1.1 Mechanical Specifications:

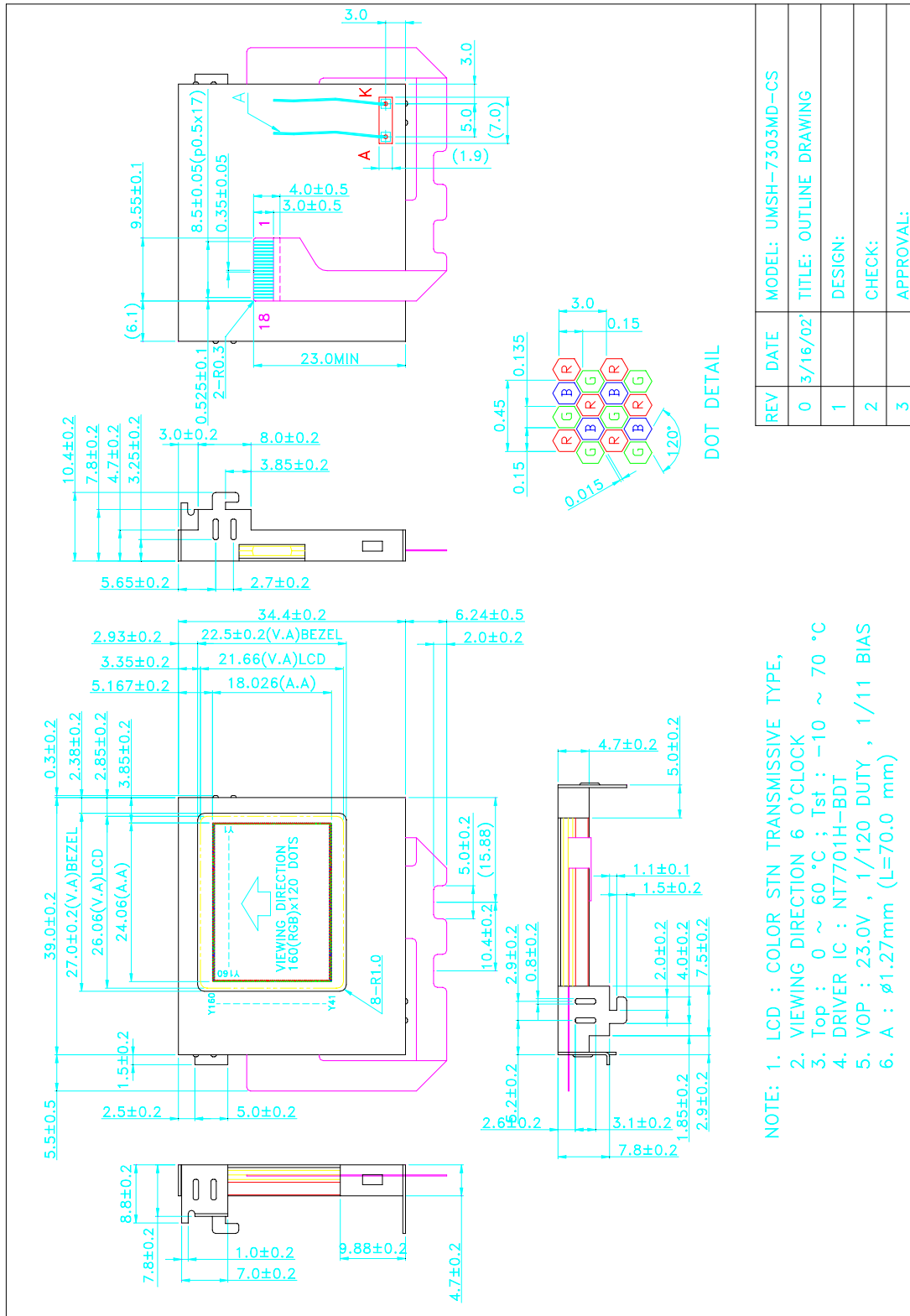
Items	Nominal Dimension	Unit
Dot Matrix	160x120	-
Module Size (W x H x T)	44.8x40.64x10.4	mm.
Display size	30	mm
	1.2	inch
Viewing Area (W x H)	26.06x21.66	mm.
Active Area (W x H)	24.06x18.026	mm.
Dot Size (W x H)	0.14x0.14	mm.
Dot Pitch (W x H)	0.15x0.15	mm.
Driving Method	1/120	Duty
	-	Bias
Driving IC Assembly	COG	-
Weight	TBD	g

\*\* To expose the driver IC under blaze (luminosity over than 1 cd) when using LCM may cause IC operation failure

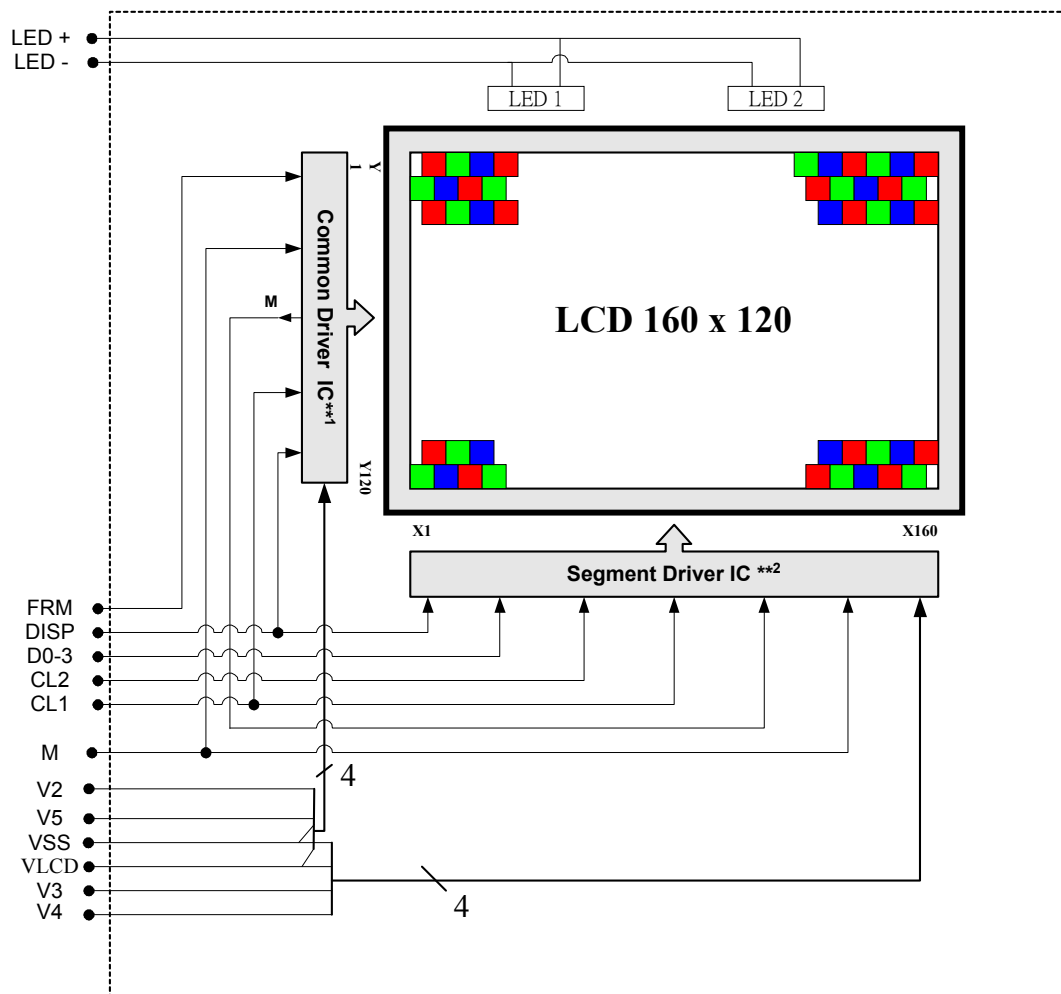
## 1.2 Display Specification:

Items	Description	Note
LCD Type	Color STN	
LCD Mode	Negative	
Display Type	Transmissive	
Polarizer UV - Cutting	With	
Operation Temperature	0 – 60 °C	
Storage Temperature	-10 – 70°C	
Polarizer Surface	Anti-glare treatment	
Dot Display Color	Red, Green and Blue	
Background Color	Black	
Backlight Type	LEDx2	
Backlight Color	White	
Viewing Direction	6 o'clock	

### 1.3 Outline Dimension



## 1.4 Block Diagram



## 1.5 Example of Power Supply

Recommended Circuit for Contrast Adjustment

## 1.6 Interface Pin Assignment

### ■ LCD

PIN No.	SYMBOL	Description	Level
1	VLCD	Power supply for LCD	-
2	V2	Power supply for LCD	-
3	V3	Power supply for LCD	-
4	V4	Power supply for LCD	-
5	V5	Power supply for LCD	-
6	VSS	Power supply for LCD	-
7	VSS	GND	-
8	VDD	Power supply for logic	-
9	D0	Display Data	H(ON), L(OFF)
10	D1		
11	D2		
12	D3		
13	CL2	Data signal shift clock	H -> L
14	FRM	Synchronous signal for driving scanning line	H
15	DISP	Display control signal	H(ON), L(OFF)
16	CL1	Data signal latch clock	H -> L
17	M	AC Signal input for LCD Driving	
18	NC		

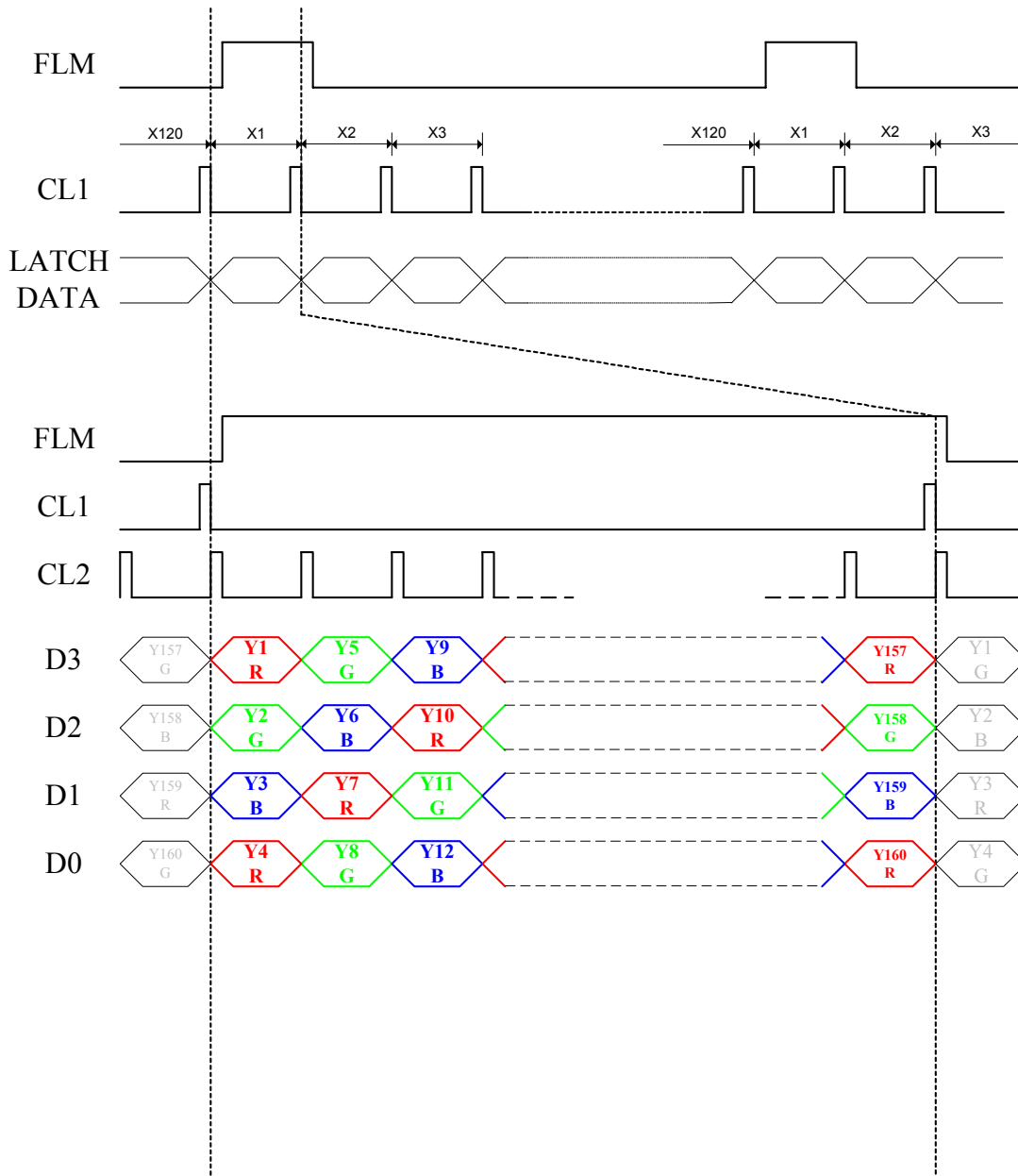
### ■ LED

PIN No.	SYMBOL	Description	Level
1	LED+	Power Supply for LED	
2	LED -	Power Supply for LED	

LCD Side connector :

Recommended connector :

## 1.7 Interface Timing Chart



## 1.8 Data and Screen

<b>X1</b>	D3	D2	D1	D0	D3	D2	D1	D0	D3			D2	D1	D0
	Y1 R	Y2 G	Y3 B	Y4 R	Y5 G	Y6 B	Y7 R	Y8 G	Y9 B			Y158 G	Y159 B	Y160 R
<b>Y120</b>	D3	D2	D1	D0	D3	D2					D2	D1	D0	
	Y1 G	Y2 B	Y3 R	Y4 G	Y5 B	Y6 R					Y158 B	Y159 R	Y160 G	



## 2 Electrical Characteristics

### 2.1 Absolute Maximum Ratings

( $V_{SS} = 0\text{ V}$ , at  $25^{\circ}\text{C}$ )

Items	Symbol	Min.	Max.	Unit
Supply voltage for logics	$V_{DD}-V_{SS}$	-0.3	7.0	V
Supply voltage for driving LCD	$V_{EE}-V_{SS}$	-0.3	30	V
Input voltage	$V_{IN}$	-0.3	$V_{DD}+0.3$	V
Operation temperature range	$T_{OP}$	0	60	$^{\circ}\text{C}$
Storage temperature range	$T_{ST}$	-10	70	$^{\circ}\text{C}$
Supply voltage for LED	LED+ - LED-		5.0	V

## 2.2 DC Characteristics

( $V_{DD}=3.3V\pm 10\%$ ,  $V_{SS}=0V$ , at  $25^{\circ}C$ )

Items	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	$V_{DD}-V_{SS}$		2.5	3.3	5.5	V
Supply voltage (LCD)	$V_{LCD}-V_{SS}$	0 °C		-		V
		25 °C		23		V
		40 °C		-		V
Input level voltage	$V_{in}$	High, $V_{IH}$	$0.7V_{DD}$		$V_{DD}$	V
		Low, $V_{IL}$	0		$0.3V_{DD}$	V
Output level voltage	$V_{out}$	High, $V_{OH}$	$V_{DD}-0.4$			V
		Low, $V_{OL}$			0.4	V
Power supply current	$I_{DD}$	*Note1		-		mA
Power supply for LED	$V_{LED}$			4.2	5.0	V
LCD power supply current	$I_{DD}$			-		mA
Power consumption	$P_{disp}$			-		mW

\*Note1:

Measuring Condition:

Temp. =  $25^{\circ}C$

$V_{DD}-V_{SS}$  = 3.3 V

$V_{LCD}-V_{SS}$  = Typical  $V_{LCD}$  at  $25^{\circ}C$

$f_{FR}$  = 75 Hz

Duty = 1/120 Duty

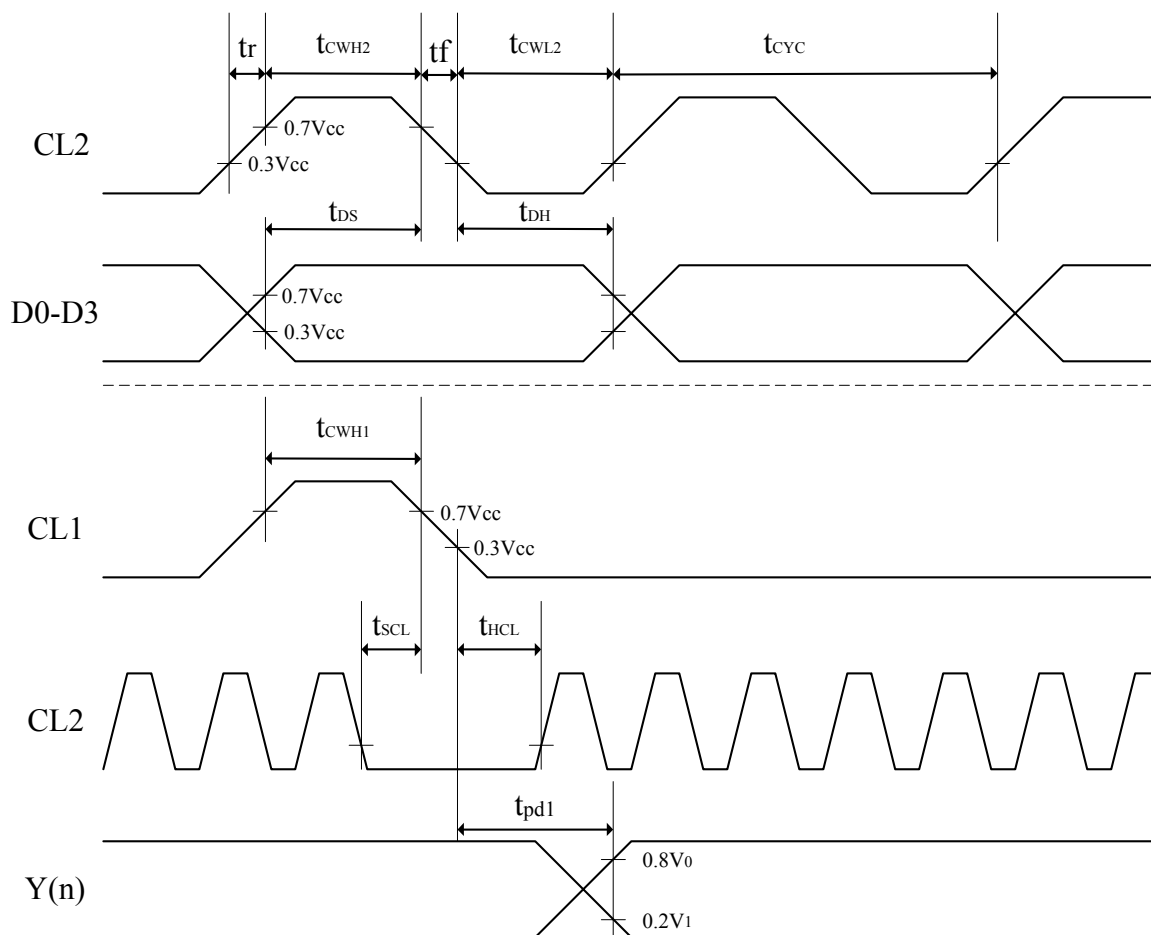
Display Pattern = Checkered pattern

## 2.3 AC Characteristics

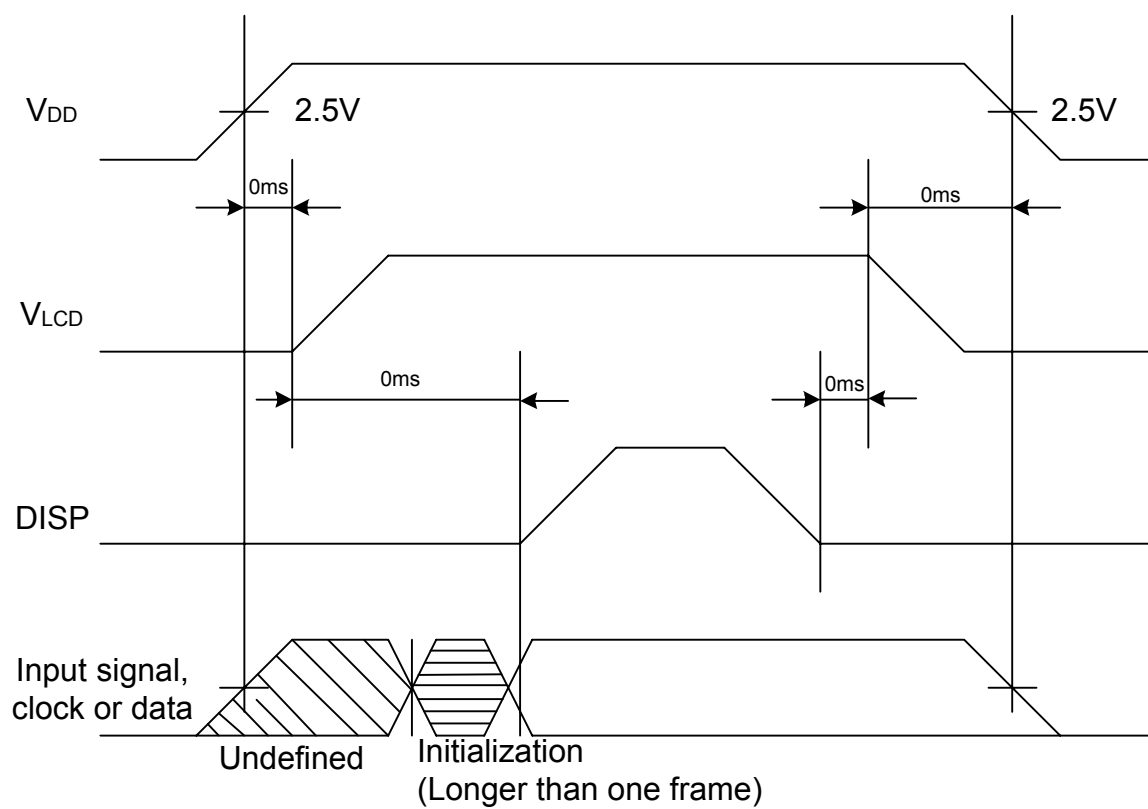
Items	Symbol	Min.	Typ.	Max.	Unit
Clock cycle time	$t_{CYC}$	70	-	-	ns
Clock high-level width 2	$t_{CWH2}$	23	-	-	ns
Clock low-level width 2	$t_{CWL2}$	23	-	-	ns
Clock high-level width 1	$t_{CWH1}$	25	-	-	ns
Clock setup time	$t_{SCL}$	10	-	-	ns
Clock hold time	$t_{HCL}$	20	-	-	ns
Clock rise time	$t_r$	-	-	50	ns
Clock fall time	$t_f$	-	-	50	ns
Data setup time	$t_{DS}$	10	-	-	ns
Data hold time	$t_{DH}$	20	-	-	ns
Output delay time	$t_{pd1}$	-	-	1200	ns

Notes: Please use on following conditions:

- $t_r, t_f < \{t_{CYC} - t_{CWH2} - t_{CWL2}\} / 2$
- $t_r, t_f \leq 50$  ns



## 2.4 Power Supply Sequence



## 3. Optical Characteristic

### 3.1 Optical Characteristic

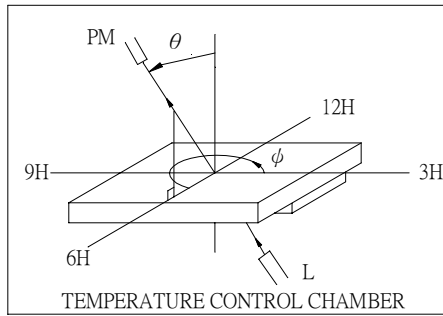
Items		Symbol	Condition	Min.	Typ.	Max.	Unit
Response time	Rise	tr	$\theta = \phi = 0^\circ$		90		ms
	Fall	tf	$\theta = \phi = 0^\circ$		60		ms
Viewing Angle ( $\theta$ )		$\theta$	CR $\geq$ 2	$\phi=0^\circ$		30	$^\circ$
		$\phi$		$\theta=0^\circ$		50	$^\circ$
Contrast ratio		CR	$\theta = \phi = 0^\circ$		5		-
Chromaticity Coordinates	Red	x	$\theta = \phi = 0^\circ$		(TBD)		-
		y			(TBD)		
	Green	x	$\theta = \phi = 0^\circ$		(TBD)		
		y			(TBD)		
	Blue	x	$\theta = \phi = 0^\circ$		(TBD)		
		y			(TBD)		
	White	x	$\theta = \phi = 0^\circ$		(TBD)		
		y			(TBD)		
	Black	x	$\theta = \phi = 0^\circ$		(TBD)		
		y			(TBD)		

## 3. 2 Definition of Optical Characteristics

Measurement Condition

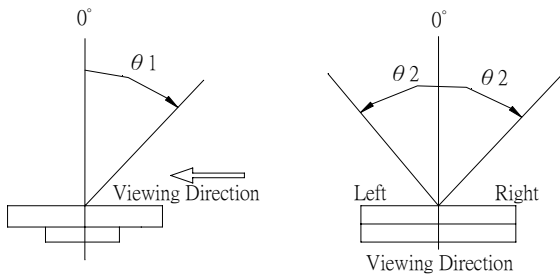
L: LIGHT SOURCE

PM: LIGHT RECEIVING PHOTOMULTIPLIER TUBE

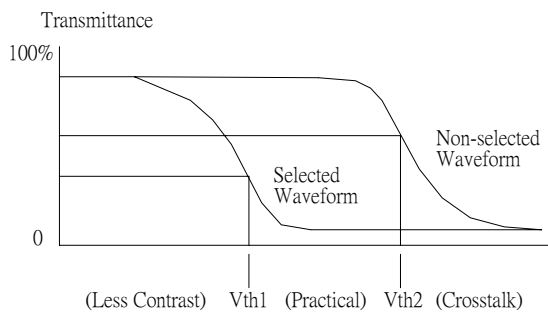


[Note 1] Definition of Viewing Angle

Viewing Direction:  $\phi = 270^\circ$



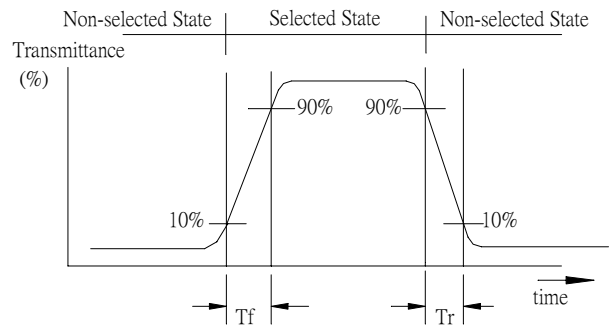
[Note 2] Definition of "Vth"



(a). Vth1:  $\phi = 270^\circ, \theta_1 = 10^\circ$ , Selected Waveform 50% Transmittance

(b). Vth1:  $\phi = 270^\circ, \theta_1 = 40^\circ$ , Non-selected Waveform 70% Transmittance

[Note 4] Definition of Response Time



Measurement Condition: Viewing Angle:  $\theta_2 = 0^\circ, \theta_1 = 0^\circ$

[Note 3] Definition of Contrast Ratio

$$(a). \text{Contrast Ratio} = \frac{\text{Transmittance under Non-selected Waveform}}{\text{Transmittance under Selected Waveform}}$$

(b). Measurement Condition: Viewing Angle:  $\theta_2 = 0^\circ, \theta_1 = 10^\circ$

# 4 Reliability

## 4.1 Environmental Test

Item No	Items	Content of Test	Test Condition	Applicable Standard
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200 Hrs	
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200Hrs	
3	High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time	70°C 200Hrs (*1)	
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200Hrs (*1)	
5	High temperature / humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	40°C 90% RH 200Hrs	
6	Temperature cycle	Endurance test applying the low and high temperature cycles. <div style="text-align: center;"> <math display="block">-30^{\circ}\text{C} \longleftrightarrow 80^{\circ}\text{C}</math> <math display="block">(30\text{min.}) \quad (30\text{min.})</math> <math display="block">\longleftarrow \hspace{10em} \longrightarrow</math> <p>1 Cycle</p> </div>	10 Cycles.	
7	Vibration test	10 →55→ 10 Hz, within 1 minute amplitude 1.5mm .	15 minutes for each direction (X, Y, Z)	
8	Drop test	Packed, 100CM free fall, (6 sides, 1 corner, 3edges)		

**\*1): Driving condition for operation test:**

**Power supply voltage for logic system = + 5.0V**

**Power supply voltage for LCD system = Getting Optimum Contrast at 25°C**

# 5 HANDLING INSTRUCTION

## PRECAUTION IN USE OF LCD

- Don't contact or scratch the front surface and the contact pads of an LCD panel with hard materials such as metal or glass or with one's nail.
- To clean the surface, wipe it gently with soft cloth dampened alcohol.
- Do not attempt to wipe off the contact pads.
- Keep LCD panels away from direct sunlight, also avoid storing them in a high-temperature & high humidity environment for a long period.
- Do not drive LCD panels by DC voltage.
- Do not expose LCD panels to organic solvent.
- Liquid in LCD is hazardous substance, any contacts with liquid crystal materials, wash it off immediately with soap and water.
- The polarizer is easily damaged and should be handled with special care. Don't press or rub it with hard objects.

## PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. To avoid damage to the LSI from static electricity generated while working, Ground your body, work/assembly areas and assembly equipment to protect the module against STATIC ELECTRICITY.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the LCM protective film slowly since static electricity may be generated.
- Pay attention to the humidity of the workshop, 50~60%RH is satisfactory.
- Use a non-leak iron for soldering LCM.
- Do not touch the display surface or connection terminals area with bare hands. Smudges on the display surface reduce the insulation between terminals.
- Cautions for soldering to LCM:  
Conditions for soldering I/O terminals:  
Temperature at iron tip:  $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$ .  
Soldering time: 3~4 sec./ terminal.  
Type of solder: Eutectic solder (rosin flux filled).

## PRECAUTION FOR STORING LCM

- To avoid degradation of the device, do not store the module under the conditions of direct sunlight, high temperature or high humidity. Keep the module in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperature below  $0^{\circ}\text{C}$ ).



□ **PRODUCTION NO. DEFINITION**

**NO: 80601 - 01**

