

(●)Preliminary Specification

() Final Specification

SPECIFICATION FOR APPROVAL

MODEL NO. : YLD350QV-F05

Customer Approval

Any Modification of Spec is not allowed without SEC's permission

Approved by:_____

Reviewed by:_____

Prepared by : _____

POPSA Electronics Co . , LTD.

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RECORD OF REVISIONS

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1. GENERAL DESCRIPTION

1-1 Description

The YLD350QV-F05 is a Color Active Matrix Liquid Crystal Display with Light Emission Diode(LED) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is transmissive type display operating in the normally white mode. This TFT-LCD has 3.5 inch diagonally measured active display area with QVGA resolution 320*RGB*240 pixels can display up to 16.7M colors. resolution. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.

1-2 Features

- Main : 24-bit RGB Interface
- Low Power Consumption
- Driver IC : HX8218 ,HX8655A
- Main viewing angle : 6 o'clock

1-3 Applications

- Display terminals for Smart phone, PDA ,GPS etc.

1-4 General Information

Item	Main TFT LCD	Unit	Note
Number of pixels	320 X RGB X 240(RGB Stripe Arrangement)	Pixel	-
Display colors	16.7M	Colors	-
Pixel Pitch	0.255mm X 0.255mm	mm	-
Active area	70.8(H)×52.56(V)	mm	-

1-5. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module	Horizontal(H)	80.80	80.90	81	mm	(1)
	Vertical(V)	60	60.10	60.20	mm	(1)
	Dept(D)	-	3.50	3.50	mm	(1)
Weight		-	75	-	g	-

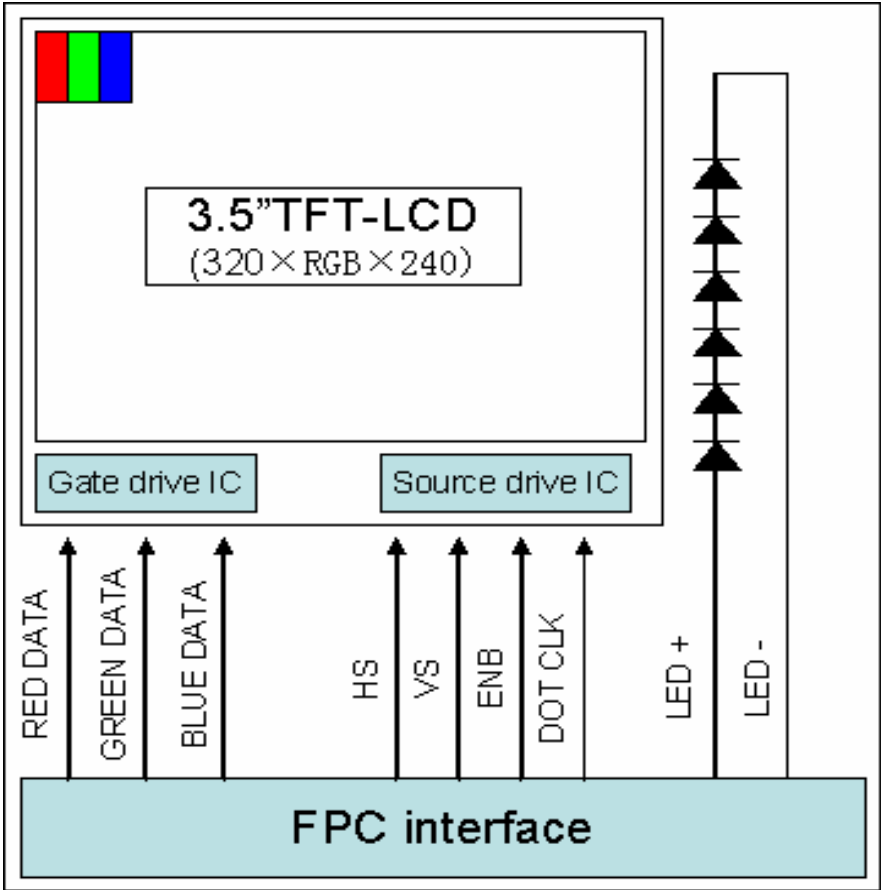
Note (1) : Without FPC

Refer to Outline dimension, Page 18

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1-6 Block Diagram

TFT-LCD Module (Interface System Structure)



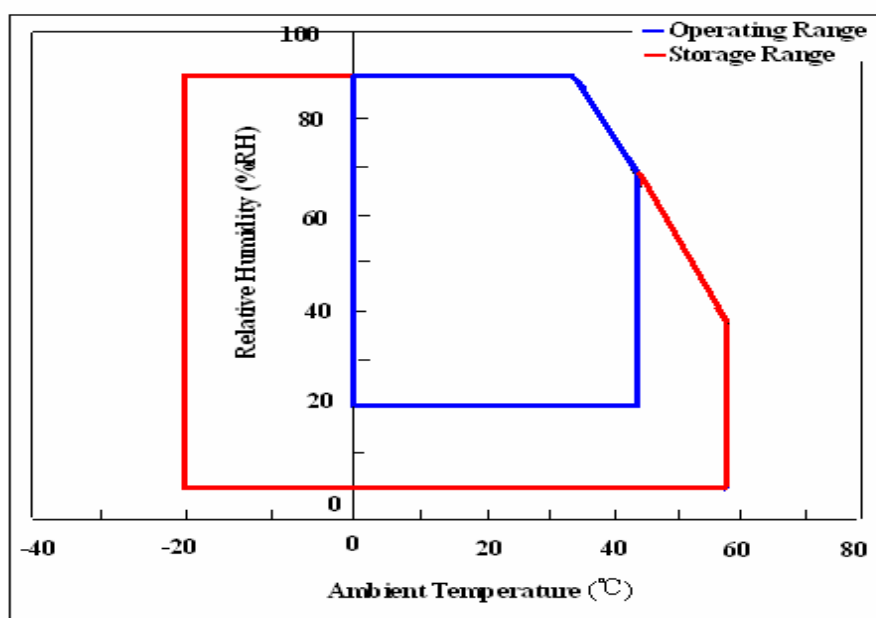
2. Absolute Maximum Ratings

2.1 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	TSTG	-30	75	°C	(1)
Operating temperature (Ambient temperature)	TOPR	-20	65	°C	(1) (2)

Note (1) 90%RH maximum humidity, 60°C maximum wet-bulb temperature

- (2) When operated at a temperature lower than 0°C, the LCD worked slowly and the screen appeared low-contrast images due to the characteristics of LC(Liquid Crystal).
- (3) If any fixed pattern is displayed on LCD for minutes, image-sticking phenomenon may occur.
- (4) Degradation could occur to pixels' TFT when DC BIOS is input into its gate-signal under POWER OFF WAITING STAND-BY & SLEEP MODE. Therefore, LCD should be turn off then.
- (5) Please operate a LCD module on the basis of the recommended S/W(Register DATA). If you want to change any part of the S/W, you must take POPSPA's confirmation.



Temperature & Humidity Graph at Absolute Environment

2.2 Electrical Absolute Ratings

(1) TFT-LCD Module

($T_a = 25 \pm 5^\circ\text{C}$ $V_{SS} = \text{GND} = 0$)

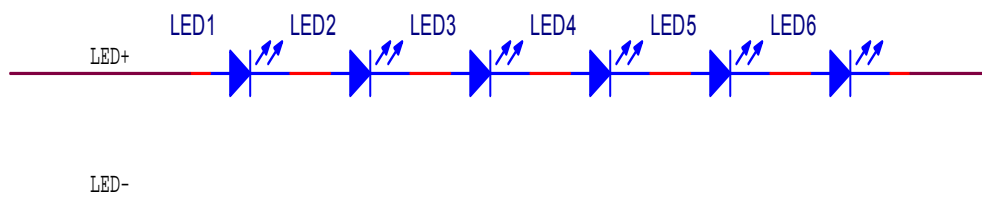
Item	Symbol	Min.	TYP.	Max.	Unit	Note
Digital supply voltage	VDD	3.0	3.3	3.6	V	-
Analog supply voltage	AVDD	4.9	5.0	5.1	V	-

(2) Back-Light Unit

($T_a = 25 \pm 5^\circ\text{C}$)

Item	Symbol	Min.	Typ.	Max.	Unit.	Note
Current	I_B	18	20	25	mA	
Voltage	V_B	18	19.2	24	V	

Note (1) 6 LED's series type.



Back-Light

3. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (2).

Measuring equipment: LCD-7200, BM-5A, BM-7, PR-650, EZ-Contrast

3.1 Optical Characteristics of Main LCD

(Ta = 25 ± 5°C, VCI = 3.3V, IB = 20 mA) (A)

Note (1) : This condition will be changed as the evaluation circumstance of SEC.

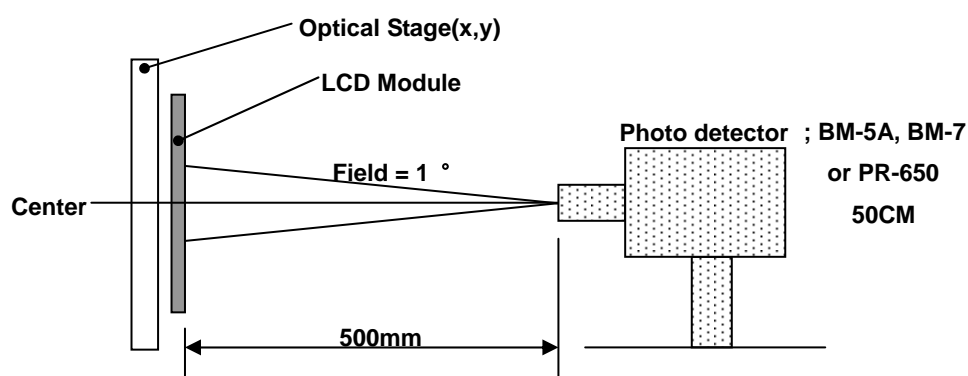
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio (Center point)	C/R	NOTE(1)	200	300	-	-	(3) BM-5A
Luminance of white (Center point)	TI		180	200	-	cd/m ²	(4) BM-5A
Response time	Rising:Tr	Tr+Tf	-	30	50	msec	(5) BM-7
	Falling:Tf						
Color Chromaticity (CIE 1931)	White	Wx	Φ=0 Θ=0 Normal Viewing Angle B/L On	0.1858	0.2858	0.3858	(6) PR-650
		Wy		0.2197	0.3197	0.4197	
	Red	Rx		0.5236	0.6236	0.7236	
		Ry		0.2336	0.3336	0.4336	
	Green	Gx		0.2184	0.3184	0.4184	
		Gy		0.4583	0.5583	0.6583	
	Blue	Bx		0.0428	0.1428	0.2428	
		By		0.0329	0.1329	0.2329	
Viewing angle	Hor.	θL	C/R≥10 B/L On	-	65	-	(7) Ez- Contrast
		θR		-	65	-	
	Ver.	ΦH		-	50	-	
		ΦL		-	60	-	

Note (2) Test Equipment Setup

After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the back-light. This should be measured in the center of screen.

Environment condition : $T_a = 25 \pm 5 \text{ }^{\circ}\text{C}$

-Back-Light On condition



The center of the screen

Note (3) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin) at the center point

$$CR = \frac{G_{max}}{G_{min}}$$

* Gmax : Luminance with all pixels white

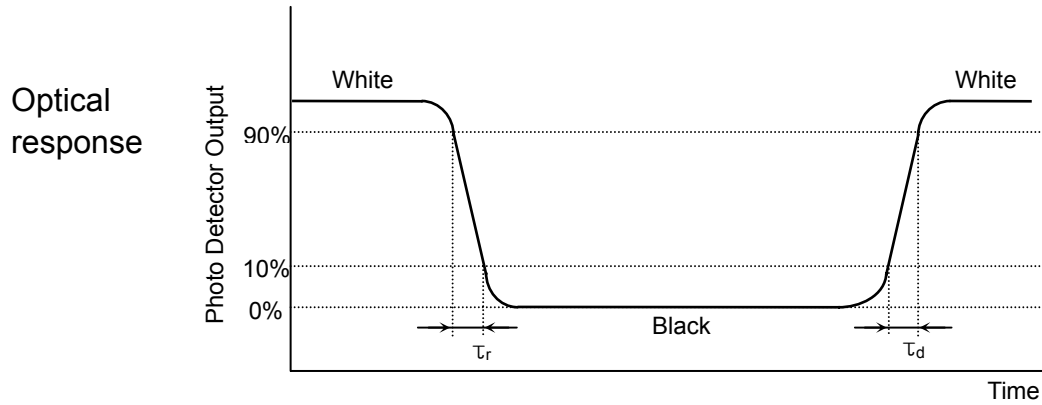
* Gmin : Luminance with all pixels black

Note (4) Definition of Luminance of White : Luminance of white at the center point

Light Source of Back-Light Unit	6 LEDs series Type
LED Type & Maker	Chip Type White LED
LED Product Code & Rank	SEC 412TS COLOR : E LUMINANCE : F

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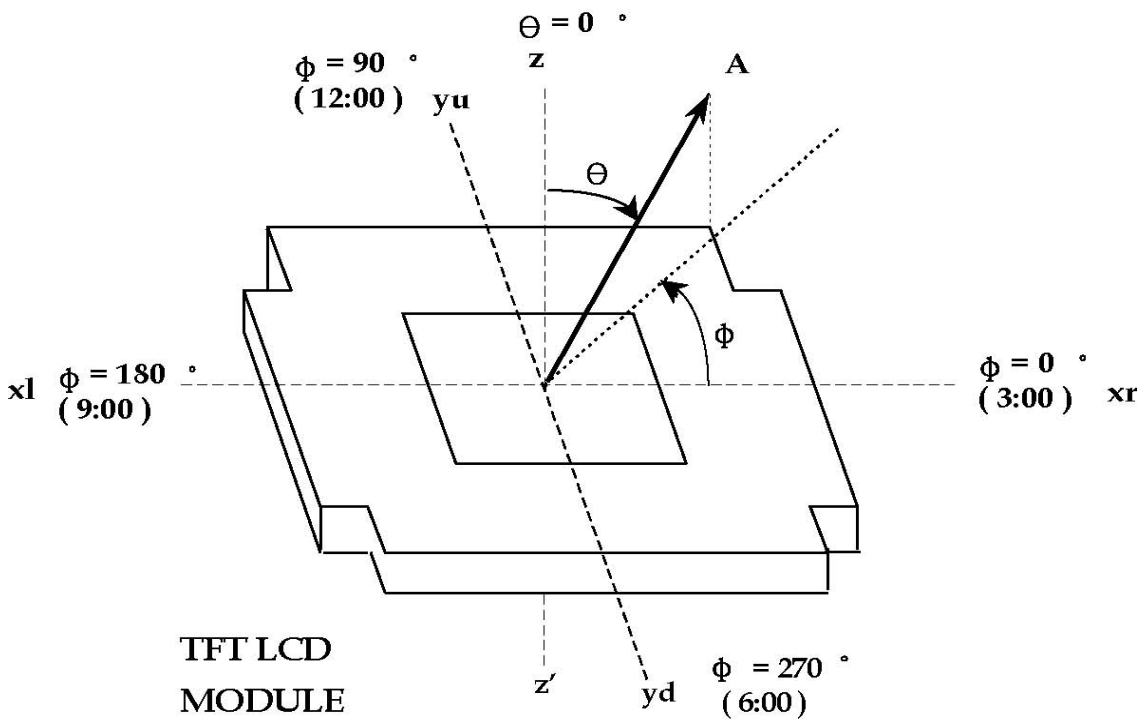
Note (5) Definition of Response time : Sum of τ_r



Note (6) Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.

Note (7) Definition of Viewing Angle



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4. Electrical Characteristics

4.1 TFT-LCD Module

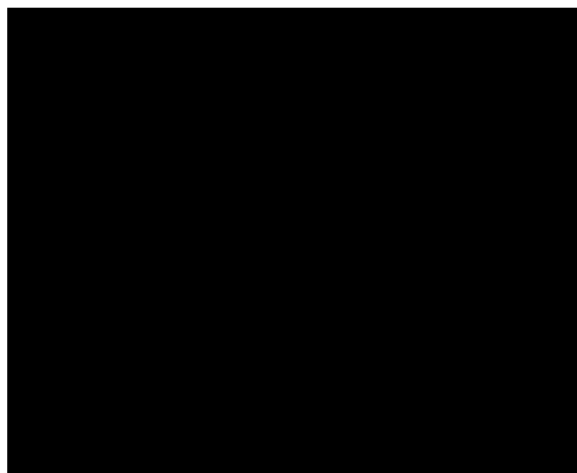
(Ta = 25 ± 2°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Digital supply voltage	VDD	3.0	3.3	3.6	V	-
Analog supply voltage	AVDD	4.9	5.0	5.1	V	-
Current consumption	Stand by	Istb	-	0.1	mA	(1)
	Full	If	-	10		(1)
Vsync frequency	Fvsync	65	70	90	Hz	-
Dot Clock	Fclk	-	6	-	MHz	
Logic Input Voltage	Vih	0.8*VDD	-	VDD		
	Vil	VSS	-	0.2*VDD		
Logic Output Voltage	Voh	VDD-0.3	-	VDD		
	Vol	VSS	-	VSS+0.3		
Power Consumption	P	-	460	-	mW	

* To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the Chapter 8. TFT-LCD Driver IC Control Algorithms

Note (1) VCC=Vci=3.3V,

■ (320*RGB*240) 0 Gray Black Pattern



5. Input Terminal Pin Assignment

5.1 Input Signal & Power

NO	Symbol	Description	Remark
1	LED_K	LED Cathode	
2	LED_K	LED Cathode	
3	LED_A	LED Anode	
4	LED_A	LED Anode	
5	NC	Not connection	
6	NC	Not connection	
7	NC	Not connection	
8	RESET	Reset Pin	
9	CS	Chip select pin	
10	SCL	Serial clock input	
11	SDA	Serial data input	
12	PD0	BLUE DATA(LSB)	
13	PD1	BLUE DATA	
14	PD2	BLUE DATA	
15	PD3	BLUE DATA	
16	PD4	BLUE DATA	
17	PD5	BLUE DATA	
18	PD6	BLUE DATA	
19	PD7	BLUE DATA(MSB)	
20	PD8	GREEN DATA(LSB)	
21	PD9	GREEN DATA	
22	PD10	GREEN DATA	
23	PD11	GREEN DATA	
24	PD12	GREEN DATA	
25	PD13	GREEN DATA	
26	PD14	GREEN DATA	
27	PD15	GREEN DATA(MSB)	
28	PD16	RED DATA(LSB)	
29	PD17	RED DATA	
30	PD18	RED DATA	
31	PD19	RED DATA	
32	PD20	RED DATA	
33	PD21	RED DATA	
34	PD22	RED DATA	
35	PD23	RED DATA(MSB)	
36	HSYNC	Horizontal synchronization signal input pin	

Product Specification

PIN	Symbol	Description	Note
37	VSYNC	Vertical synchronization signal input pin	
38	DCLK	Dot clock signal input used in the RGB interface circuit	
39	AVDD	Analog Power Supply	
40	AVDD	Analog Power Supply	
41	VDD	Digital Power Supply	
42	VDD	Digital Power Supply	
43	NC	Not connection	
44	NC	Not connection	
45	NC	Not connection	
46	NC	Not connection	
47	NC	Not connection	
48	NC	Not connection	
49	NC	Not connection	
50	NC	Not connection	
51	NC	Not connection	
52	ENABLE	Enable signal input used in the RGB interface circuit	
53	GND	GROUND	
54	GND	GROUND	

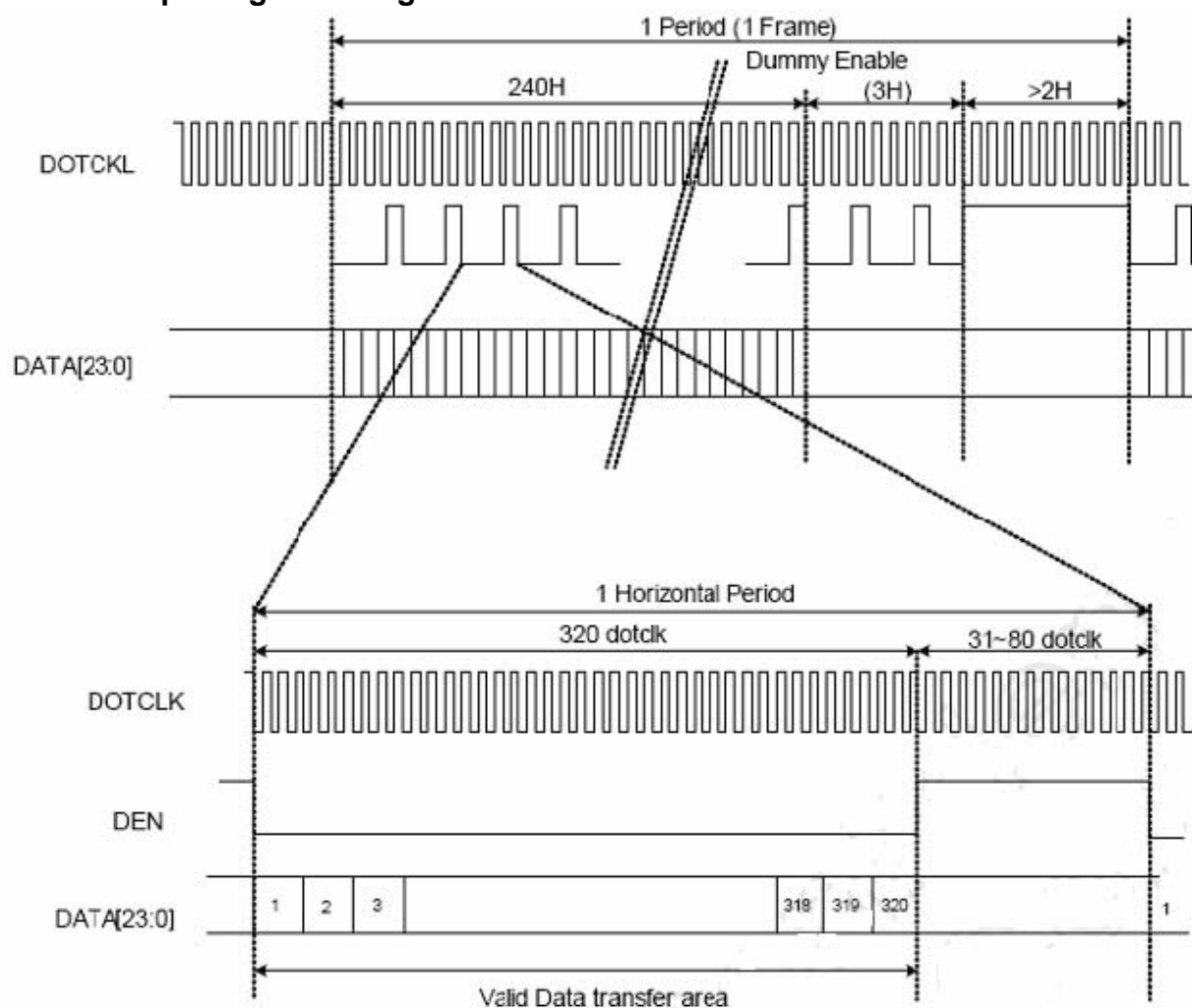
5.2 Input Signal, Basic Display Colors and Gray Scale of Each Colors (16.7Mcolors)

COLOR	DISPLAY																													GRAY SCALE LEVEL
		RED							GREEN							BLUE														
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7					
BASIC COLOR	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	0	0	0	-	
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-		
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-		
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-		
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-		
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-		
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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	0	0	1	1	1	1	1	1	1	1	1	1	-		
GRAY SCALE OF RED	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	0	0	R0		
	↑ DARK	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1		
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2		
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	∞		
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	∞		
		1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253		
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254		
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255		
GRAY SCALE OF GREEN	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	0	0	G0		
	↑ DARK	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1		
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2		
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	∞		
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	∞		
		0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G253		
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G254		
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G255		
GRAY SCALE OF BLUE	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	0	0	B0		
	↑ DARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	B1		
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	B2		
		0	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	∞		
	↓ LIGHT	0	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	∞		
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	B253		
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	B254		
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	B255		

Note) Definition of Gray : Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)
 Input Signal : 0 = Low level voltage, 1 = High level voltage

6.Input Signal Timing SPEC

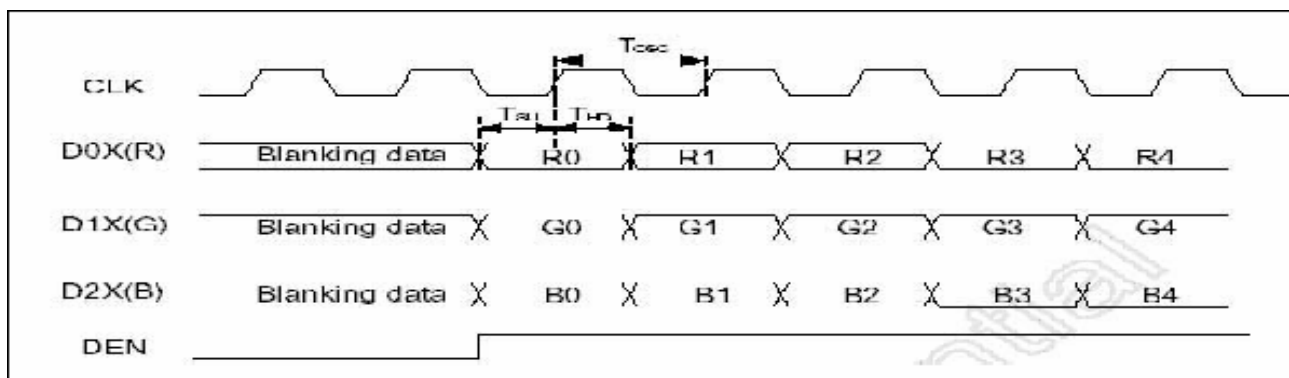
6-1 Input Signal timing



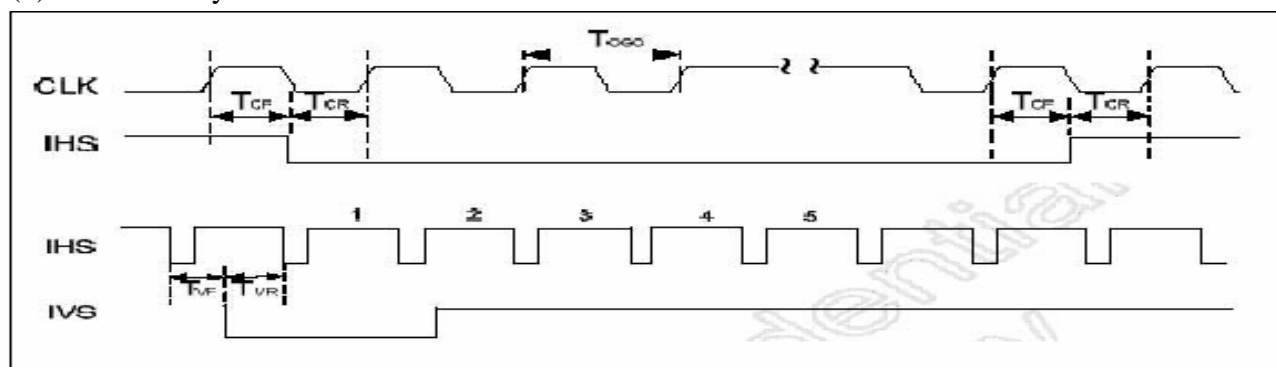
$$\begin{aligned}
 \text{DOTCLK} &= \text{Fframe} \times (320 + \text{VBP}(8) + \text{VFP}(8)) \times (240 + \text{HBP}(24) + \text{HFP}(16)) \\
 &= 70\text{Hz} \times 336 \times 280 \\
 &= 6.59\text{MHz}
 \end{aligned}$$

6-2 RGB Data Interface Timing Figure

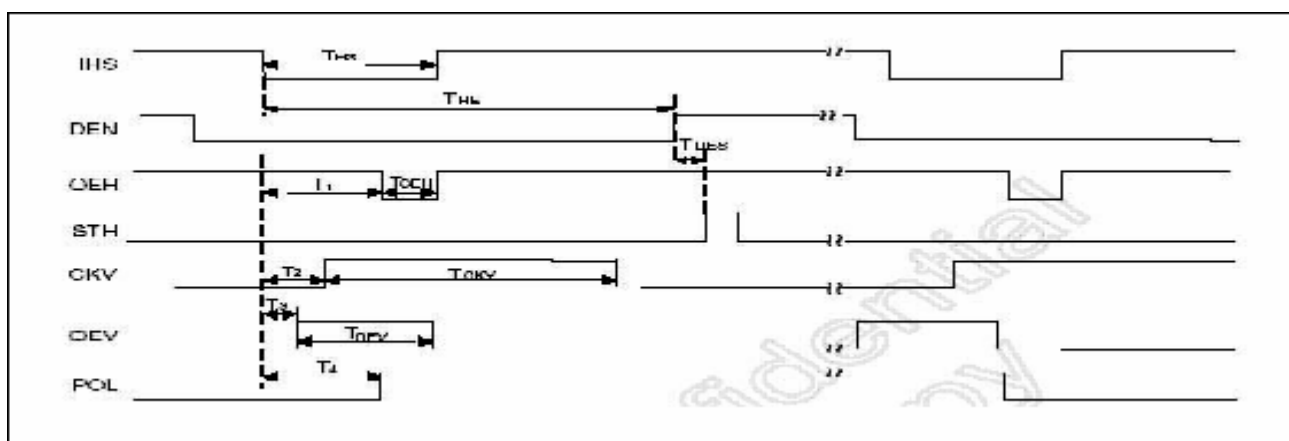
(1) Digital Parallel RGB



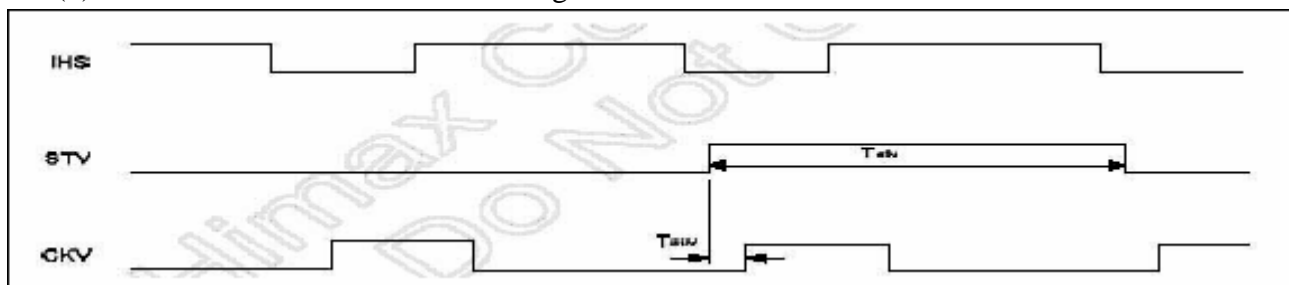
(2) Clock and Sync Waveform



(3) HIS and Horizontal Control Timing Waveforms



(4) HIS and Vertical Shift Clock Timing Waveforms



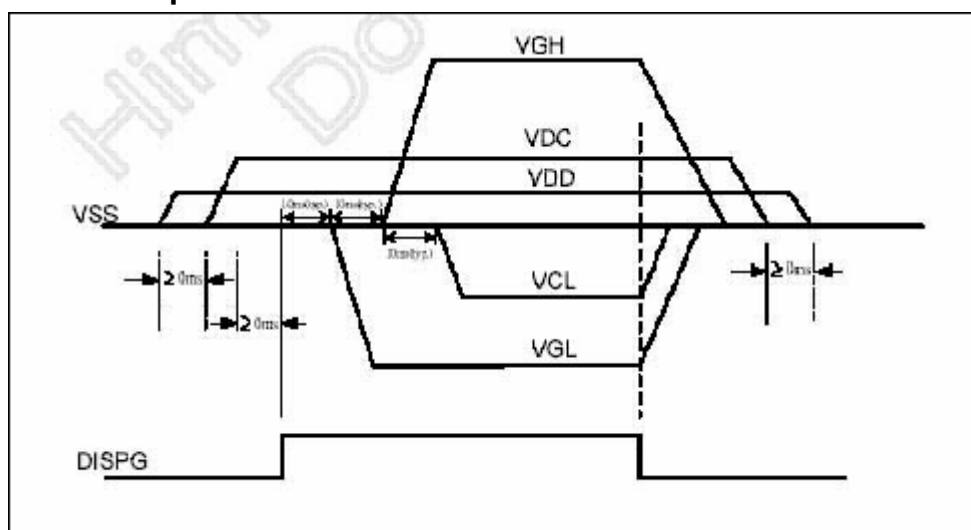
6-3 Timing Characteristics of input signals

(T=25 °C, V_{ss}=0V)

PARAMETER	SYMBOL	Min	TYP	Max	Unit	Remark
Data Setup Time	T _{su}	12	-	-	ns	
Data Hold Time	T _{hd}	12	-	-	ns	
IHS period	T _h	-	408	-	Tosc	
IHS Pulse Width	T _{hs}	-	30	-	Tosc	
IHS Setup Time	T _{cr}	12	-	-	ns	
IHS Hold Time	T _{cf}	12	-	-	ns	
IVS Pulse Width	T _{vs}	1	3	5	Th	
IVS Setup Time	T _{vr}	12	-	-	ns	
IVS Hold Time	T _{vf}	12	-	-	ns	
IVS-DEN Time	T _{vse}	-	18	-	Th	NTSC
	T _{vse}	-	26	-	Th	PAL
HIS-DEN Time	T _{he}	36	68	88	Tosc	
DEN Pulse Width	T _{fp}	-	320	-	Tosc	
DEN-STH Time	T _{des}	-	1	-	Tosc	
IVS Period	-	-	262.5	-	Th	NTSC
	-	-	312.5	-	Th	PAL

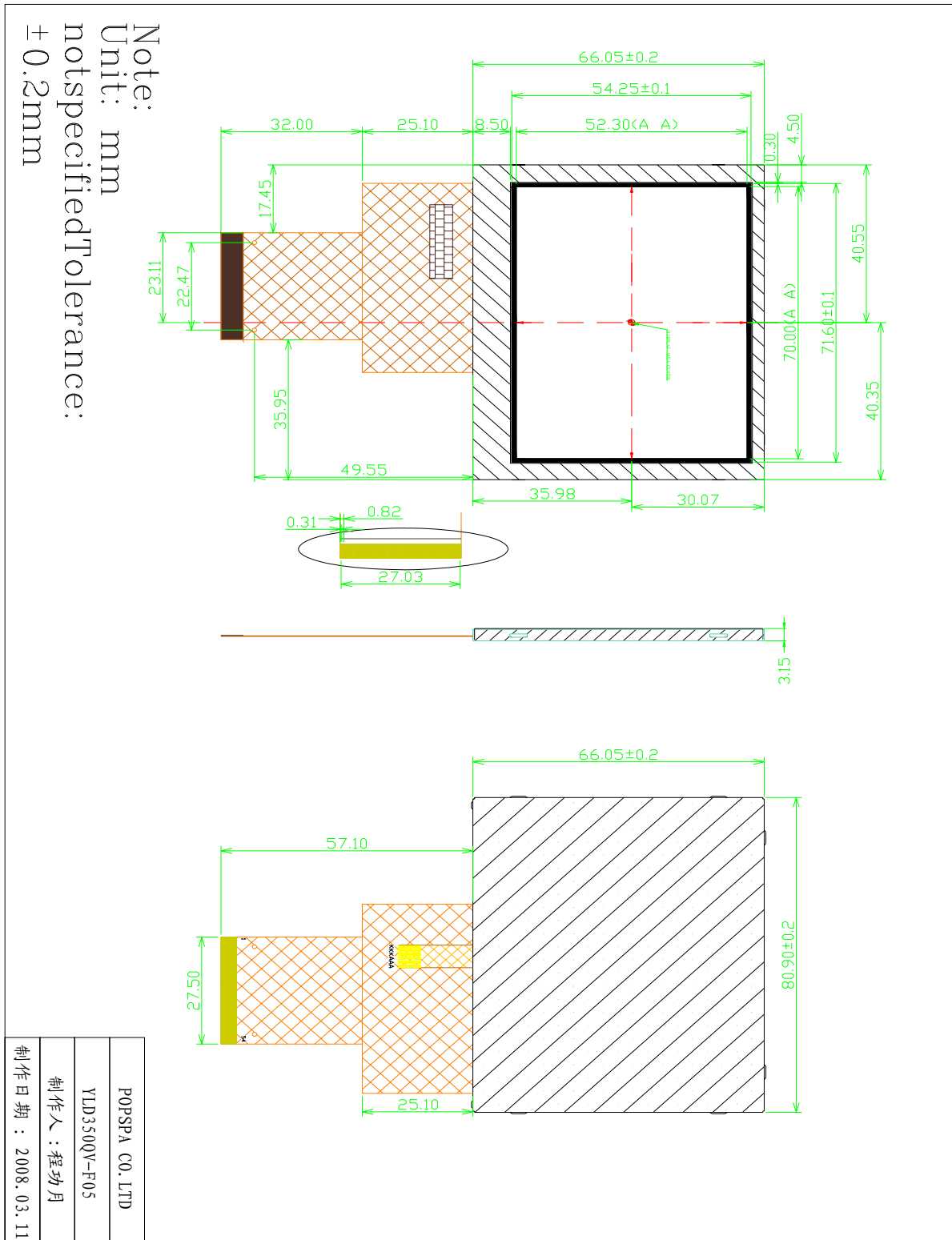
7. Operating Sequence

* Power ON/Off Sequence



8. Outline Dimension

(Unit :mm)

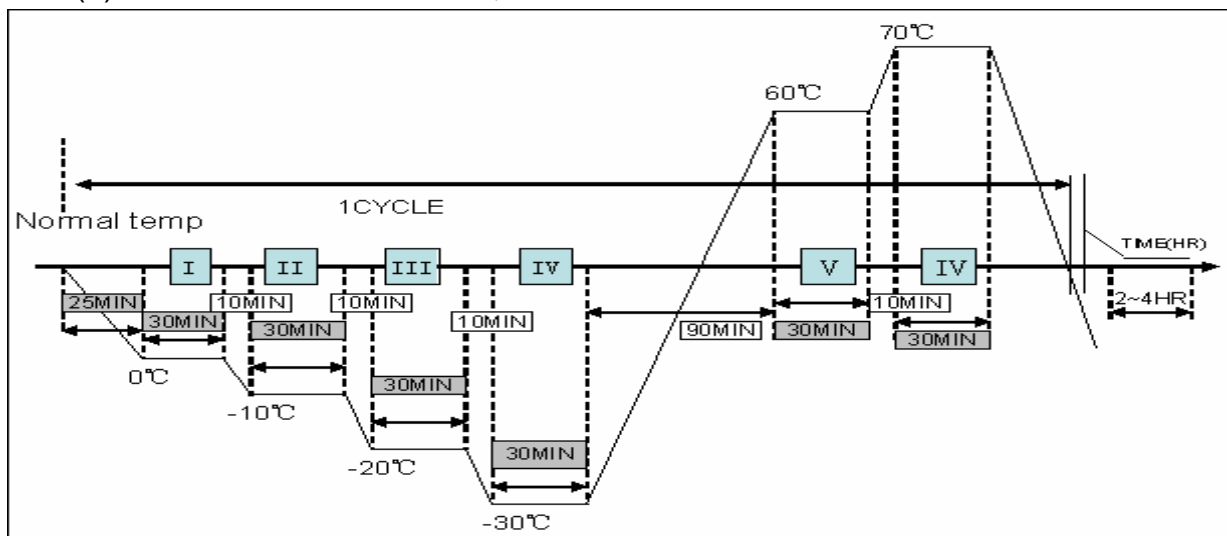


9. Reliability Test

9.1 Condition

ITEM	CONDITION	Test Result	REMARK
High Temperature Operating Life-test	60℃,160HR		
Low Temperature Operating Life-test	-20℃,160HR		
Temperature Humidity Bias test	60℃ 90%RH,160HR		
Temperature Cycle ON/Off test	-30℃ <=> 70℃ ON/OFF,5CY		Note(1)
High Temperature Storage test	85℃,160HR		
Low Temperature Storage test	-40℃,160HR		
Thermal Shock Test	-40℃ <=> 85℃,30CY		Note(2)
Electro-Static Discharge test	CONTACT:±4 KV,20times AIR:±8 KV, 20times		Note(3)
Box Vibration Test	RANDOM 0.74Grms,1HR/Y axis (SMALL BOX)		Note(4)
Box Drop Test	1 Corner 3 Edges 6 faces, 66cm (MEDIUM BOX)		

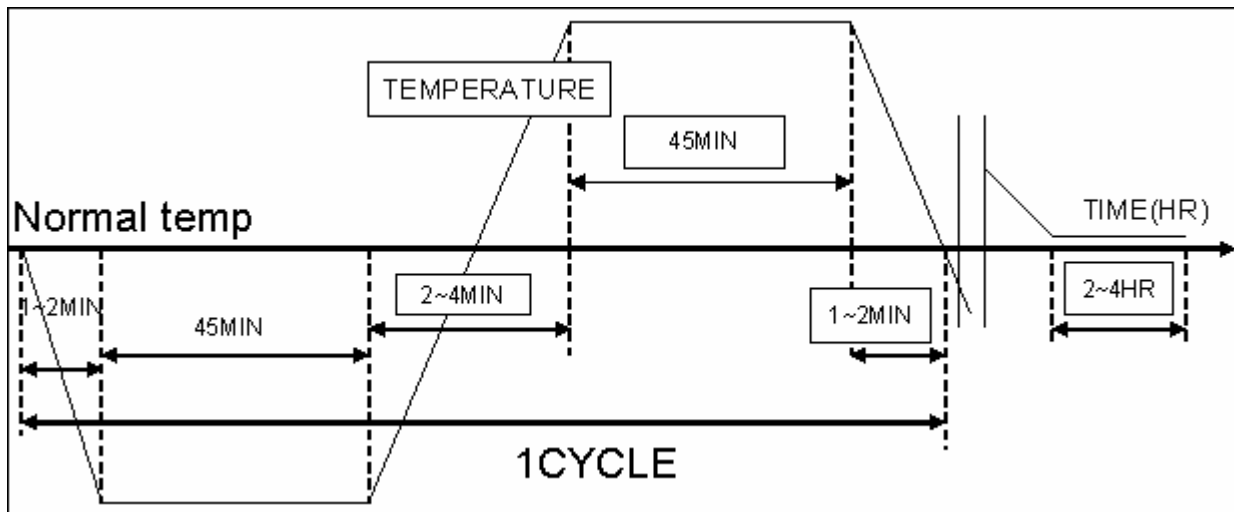
Note(1) ON Time over 10 seconds, OFF Time under 10 seconds



Temperature Cycle Transit Condition

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Note(2) STORAGE



Thermal Shock Transit Condition

Note(3) Main-LCD, 5 times to every 4 corners of active area

Note(4) Basic transportation by common carrier environmental, 514.4 MIL-STD-810E

OVERALL RMS LEVEL	BREAK POINT					
	FREQUENCY	PSD VALUE	FREQUENCY	PSD VALUE	FREQUENCY	PSD VALUE
0.74G	10Hz	0.0065	121Hz	0.003	340Hz	0.00003
	20Hz	0.0065	200Hz	0.003	500Hz	0.00015
	100Hz	0.0002	240Hz	0.0015		

9.2 Judgement

- > Main LCD should work under the normal condition.
- > After the temperature and humidity test,
the luminance and CR(Contrast Ratio) should not be changed over 50% compared with those before the test

10. PACKING

10.1 Tray Packing process(8pcs/tray) (11trays/carton,1pcs empty tray on the top layer)

TBD

10.2 Carton Packing process. (11 Pcs tray put into the Anti-ESD bag)

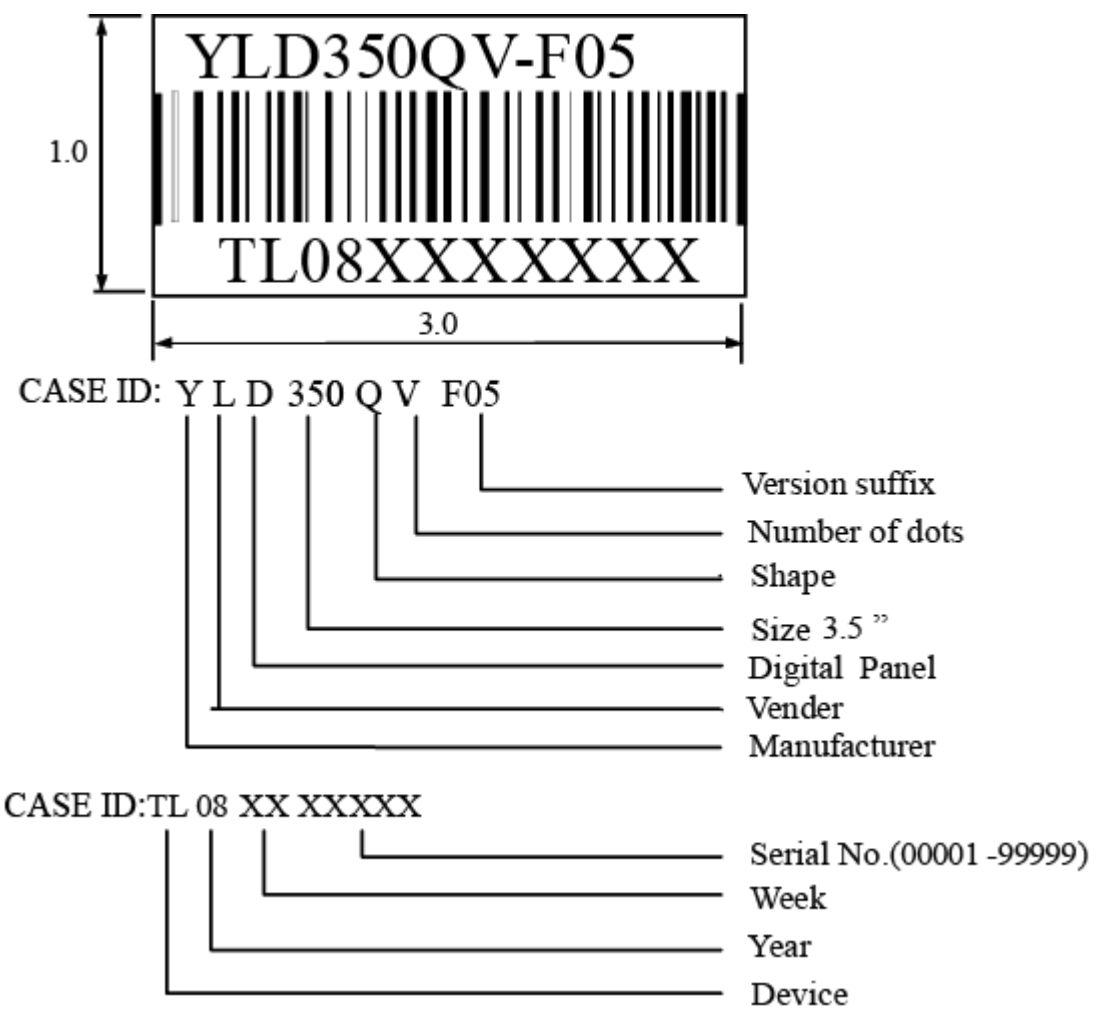
TBD

(Finished packing)

Put 1PC Anti-ESD pearl cotton inside the carton bottom. Then pack the finished package into the carton.and put 1PC Anti-ESD pearl cotton above packing.Last sealing with adhesive tape on the carton.(80PCS/carton)

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11. MARKING & OTHERS



12. General Precautions

12.1 Handling

- (a) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.
- (b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
- (c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.
- (d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.
- (e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (f) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (g) 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, legs or clothes, it must be washed away thoroughly with soap.
- (h) Protect the module from static , it may cause damage to the CMOS Gate Array IC.
- (i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (j) Do not disassemble the module.
- (k) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (l) Pins of I/F connector shall not be touched directly with bare hands.

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12.2 Storage

- (a) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD module in direct sunlight.
- (c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

12.3 Operation

- (a) Do not connect, disconnect the module in the "Power On" condition.
- (b) Power supply should always be turned on/off by the chapter 8 "Power On/Off sequence"

12.4 Others

- (a) The Liquid crystal is deteriorated by ultraviolet, do not leave it in direct sunlight and strong ultraviolet ray for many hours.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, andsoon) Otherwise the panel may be damaged.
- (d) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.
- (e) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.