SPECIFICATIONS

CUSTOMER   : _____

SAMPLE CODE : GFT043CA480272

DRAWING NO. : _____

DATE   :   2009.11.18

CERTIFICATION :   ROHS

Customer Sign	Sales Sign	Approved By	Prepared By

Revision Record

Data(y/m/d)	Ver.	Description	Note	page
2009.11.18	00	New		23

Contents

1 General Description and Features

GFT043CA480272 is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit ,a back-light unit . The resolution of a 4.3" contains 480RGBx272 dots and can display up to 16.7M colors. The following table described the features of GFT043CA480272.

1.1 Features

- Transmissive and back-light with 8 LEDs are available.
- TN (Twisted Nematic) mode.
- 24bit RGB Interface

1.2 Applications

- Personal Navigation Device

- Multimedia applications and Others AV system
- Other devices which require high quality displays.

1.3 General Specification

1.3.1 LCD Module

Item		Specification	Unit
Screen Size		4.3 inches	Diagonal
Display Resolution		480 x RGB x 272	Dot
Dot Pitch		0.198 (H) x 0.198 (V)	mm
Active Area		95.040 (H) x 53.856 (V)	mm
Outline Dimension		105.5 (W) x 67.2 (H) x 2.85 (D)	mm
Display Mode		Normally white/ Transmissive	--
Pixel Arrangement		RGB-Stripe	--
Surface Treatment		Anti-glare (AG)	--
Display Color		16.7M	--
Viewing Direction		6 o'clock	--
Input Interface		Digital 24-bits parallel RGB	--
Power consumption	Logic system	(0.9)(typ)	W
	B/L system	(0.528)(typ)	

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	105.5	--	mm	--
	Vertical (V)	--	67.2	--	mm	(1)
	Thickness (T)	--	2.85	--	mm	(1)
Weight		--	TBD	--	g	--

Note (1) Not include FPC.

Refer to the Dimensional Outlines for further information.

3. Dimensional Outlines

PIN FUNCTION

PIN	SYMBOL	PIN	SYMBOL
1	VLED−	21	B0
2	VLED+	22	B1
3	GND	23	B2
4	VDD	24	B3
5	R0	25	B4
6	R1	26	B5
7	R2	27	B6
8	R3	28	B7
9	R4	29	GND
10	R5	30	DCLK
11	R6	31	DISP
12	R7	32	HSYNC
13	G0	33	VSYNC
14	G1	34	DE
15	G2	35	PSSEL
16	G3	36	GND
17	G4	37	NC(XR)
18	G5	38	NC(YD)
19	G6	39	NC(XL)
20	G7	40	NC(YU)
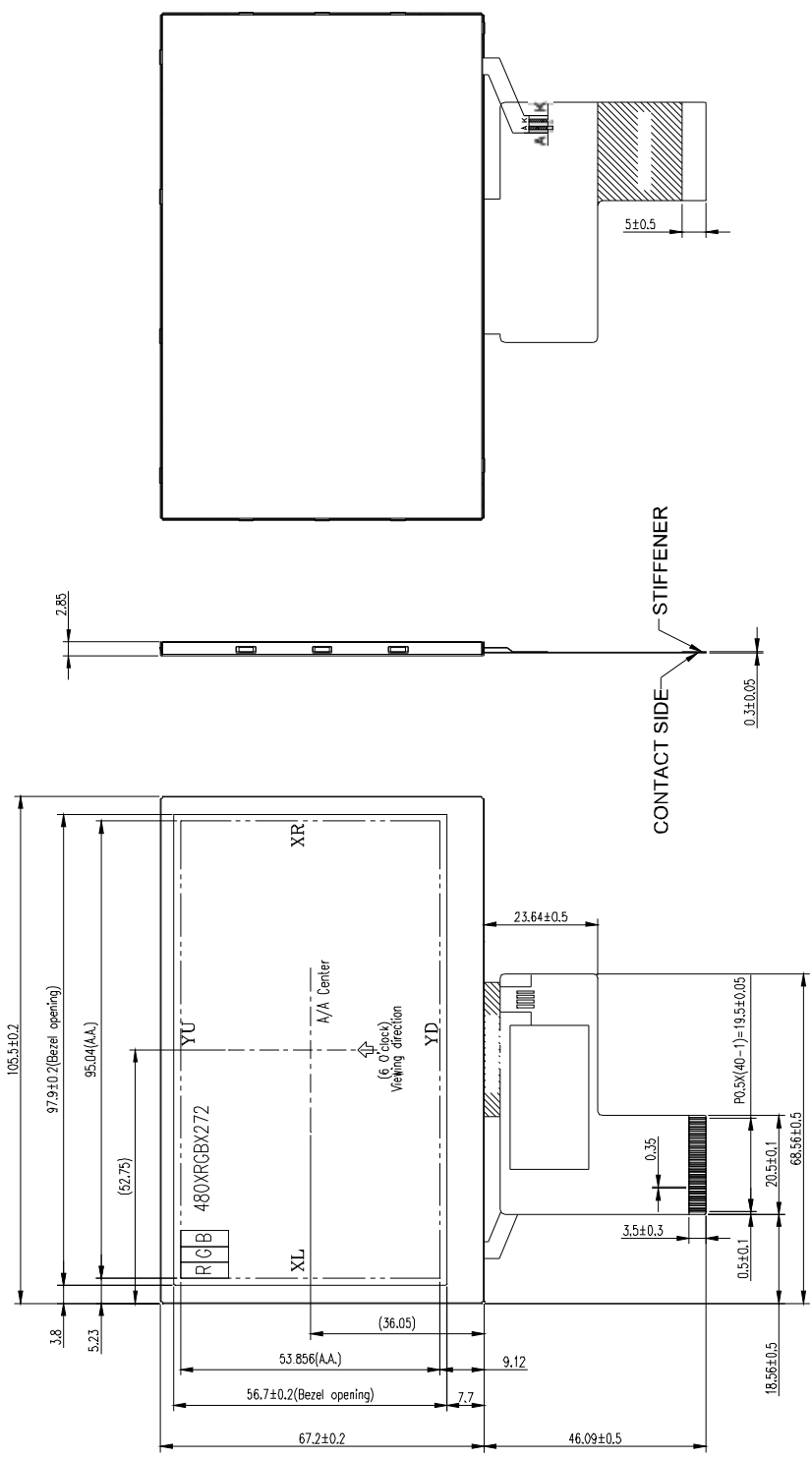
4 Block Diagram

4.1 Interface System Structure with Back Light Unit

TFT LCD Panel

Driver IC with Tcon

LED+ LED-

FPC
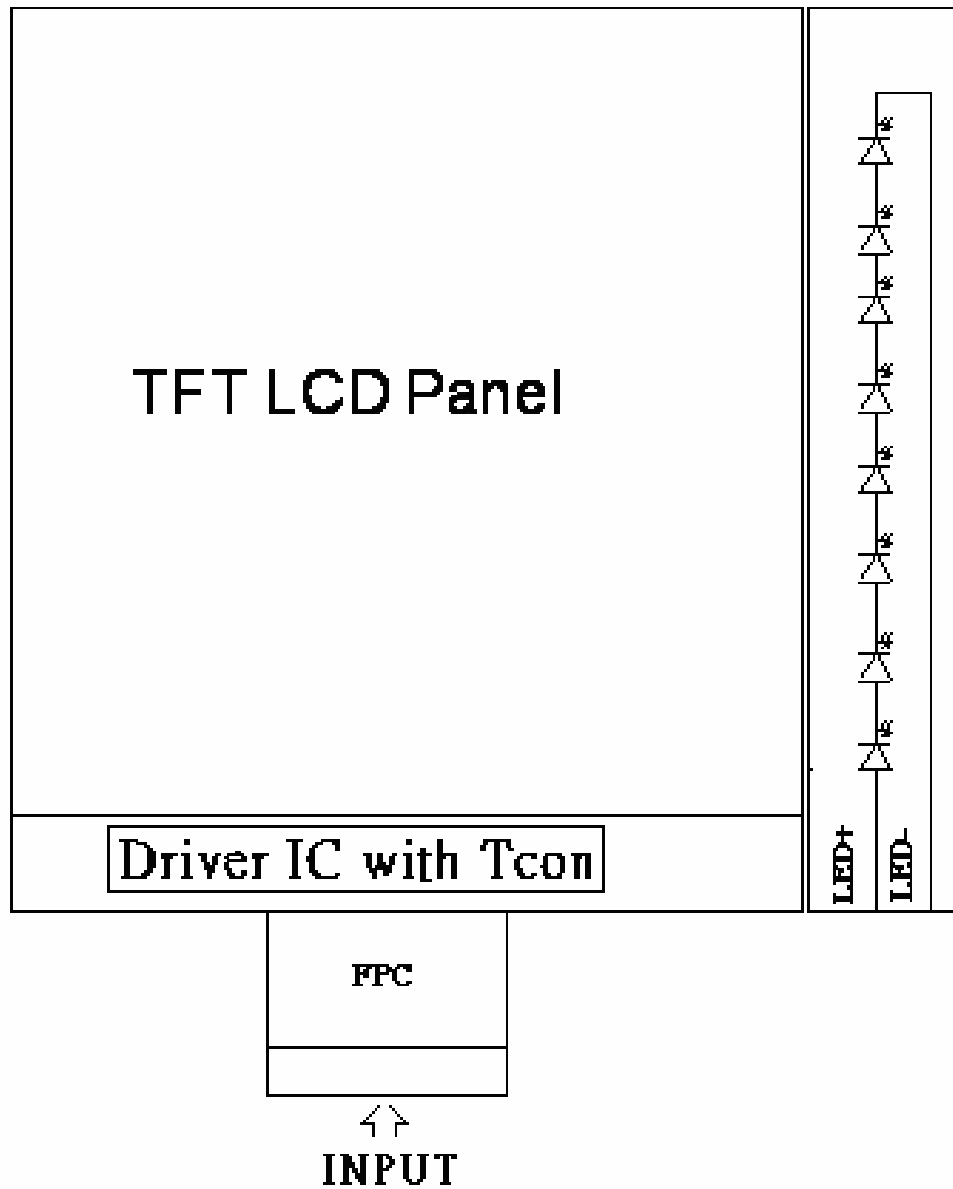
INPUT

5. Input Terminal Pin Assignment

Pin No	Symbol	Description	Input/Output	Note
1	VLED-	Power for LED Backlight Cathode	P	
2	VLED+	Power for LED Backlight Anode	P	
3	GND	Power Ground	P	
4	VDD	Power Supply For digital circuit	P	
5	R0	Red Data (LSB)	I	
6	R1	Red Data	I	
7	R2	Red Data	I	
8	R3	Red Data	I	
9	R4	Red Data	I	
10	R5	Red Data	I	
11	R6	Red Data	I	
12	R7	Red Data (MSB)	I	
13	G0	Green Data(LSB)	I	
14	G1	Green Data	I	
15	G2	Green Data	I	
16	G3	Green Data	I	
17	G4	Green Data	I	
18	G5	Green Data	I	
19	G6	Green Data	I	
20	G7	Green Data(MSB)	I	
21	B0	Blue Data (LSB)	I	
22	B1	Blue Data	I	
23	B2	Blue Data	I	
24	B3	Blue Data	I	
25	B4	Blue Data	I	
26	B5	Blue Data	I	
27	B6	Blue Data	I	
28	B7	Blue Data(MSB)	I	
29	GND	Power Ground	P	
30	DCLK	Dot Clock Signal	I	
31	DISP	Display On/off Mode Control	I	
32	HSYNC	Horizontal Synchronization Signal	I	
33	VSYNC	Vertical Synchronization Signal	I	
34	DE	Input Data Enable Control	I	
35	PSSEL	Parallel 24-bit and Serial 8-bit data input selection. PSSEL="H", Parallel 24-bit RGB data input. (default) PSSEL="L", Serial 8-bit RGB data input.	I	
36	GND	Power Ground	P	
37	NC	No connection	--	
38	NC	No connection	--	
39	NC	No connection	--	
40	NC	No connection	--	

I :Input O: Output P :Power

6 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 (1).

Measuring equipment: BM-5A

6.1 TFT-LCD Module

(Ta=25±2°C , VDD =3.3V, If=40mA)

Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		--	--	（350）	（400）	--	cd/m^2	(1),(2) I$_L$=40mA
Response time		T$_R$	θ=0°	--	2		ms	(1),(2)
		T$_F$		--	6		ms	
Contrast ratio		CR	At optimized viewing angle	(350)	(400)	--	--	(1)
Color Chroma ticity	White	Wx		(0.259)	(0.309)	(0.359)	--	(1)
		Wy		(0.300)	(0.350)	(0.400)		
Viewing Angle (6H)	Hor.	θ$_R$	CR≥10	55	65	--	Degree	(1)
		θ$_L$		55	65	--		
	Ver.	φ$_H$		40	50	--		
		φ$_L$		55	65	--		

Note : (1) Measuring surrounding : dark room
　　　 (2) 15min. warm-up time

a. Test equipment setup

　After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

　The response time is defined as the following figure and shall be measured by switching the input signal for "black" and
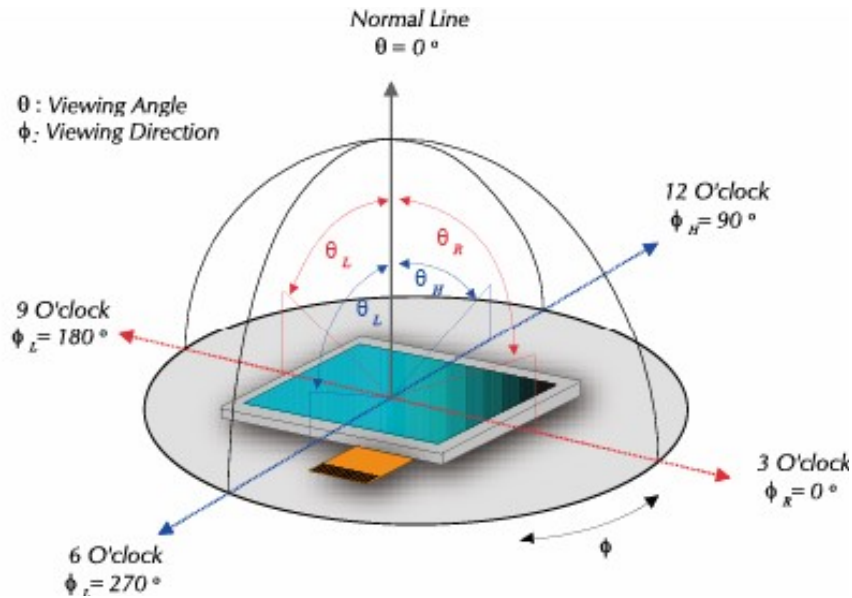
"white".
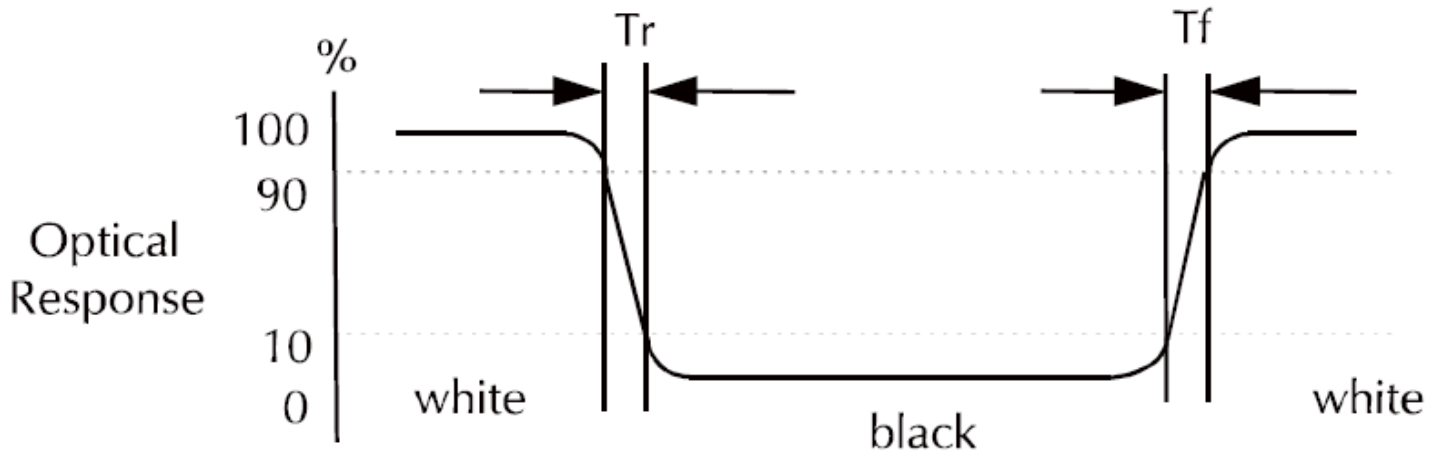
c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{ightness measured when LCD is at "white state"}}{\text{ightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle

f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

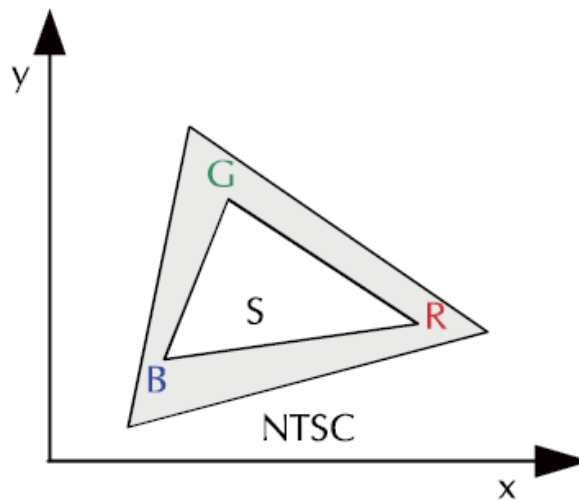g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}}$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931
   Color coordinate of white & red, green, blue at center point.
   Color Gamut : NTSC(%) = (RGB Triangle Area / NTSC Triangle Area)x100

7 Absolute Maximum Ratings

7.1 Absolute Ratings of Environment

7.1.1 TFT-LCD Module

If the operating condition exceeds the following absolute Maximum ratings,

the TFT LCD module may be damaged permanently.

(Ta=25±2°C, GND=0V)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	TSTG	-30	80	°C	(1)
Operating temperature (Ambient temperature)	TOPR	-20	70	°C	(1), (2)

Note (1) 90 % RH Max. (60 °C ≥ Ta)

Absolute humidity shall be less than 90 % RH (Ta > 60 °C) No condensation.

Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes

slower and the color of panel becomes darker than normal one. Level of retardation

depends on temperature, because of LC's character.

7.2 Electrical Absolute Rating

7.2.1 TFT-LCD Module

(Ta=25±2°C, GND=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Logic power supply	VDD	-0.3	5.0	V	GND=0V
Logic signal input level	VI1	-0.3	5.0	V	

Note : Temp. ≤ 60°C, 90% RH MAX.

Temp. >60°C , absolute humidity shall be less than 90% RH at 60°C

7.2.2 Back-Light Unit

Ta=25℃

Item	Symbol	Typ	Max	Unit	Remark
Forward current	IL		25	mA	--

8 Electrical Characteristics

8.1 TFT-LCD Module

(Ta=25±2°C, GND=0V)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Logic power supply	VDD	3.0	3.3	3.6	V	
Input signal voltage	VIH	0.7x VDD	--	VDD	V	
	VIL	0	--	0.3xVDD	V	
Current of power supply	Icc		TBD		mA	VDD=3.3V

8.2 Power ON/OFF sequence

This LCM has a power ON/OFF sequence control function. When DISP pin is pulled. "H", blank data is outputted for 10-frames first, from the falling edge of the following VSYNC signal. Similarly, when DISP is pulled "L", 10-frames of blank data will be outputted from the falling edge of the following VSYNC, too. The blank data would be gray level 0 for normally black LC (NBW="H"), and be gray level 255 for normally white LC (NBW="L").
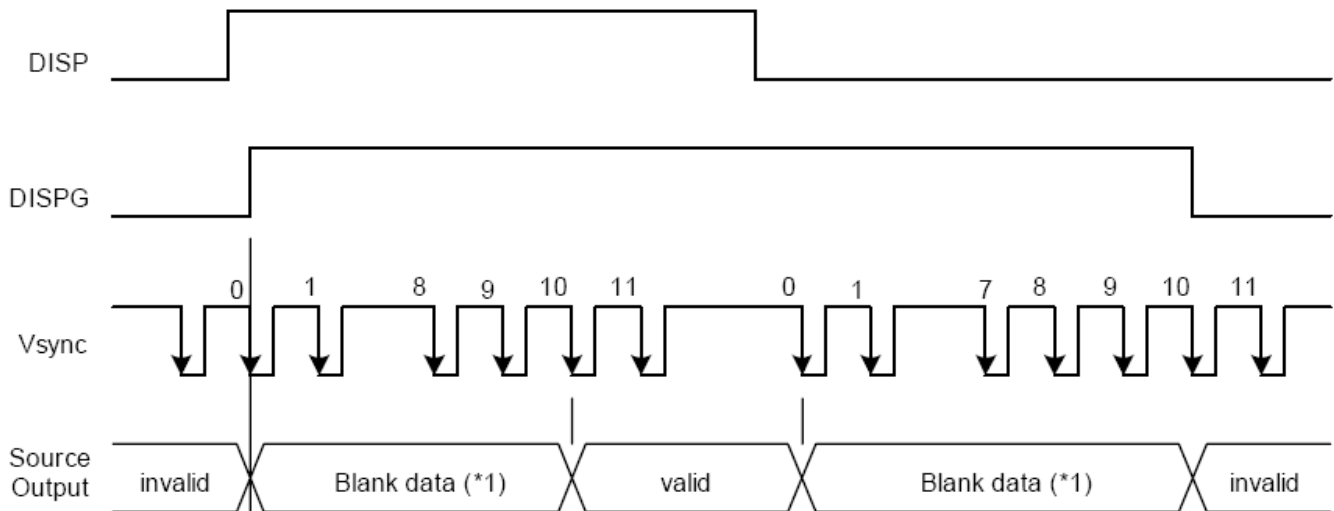
8.3 Backlight Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Remark

Current	IL		20	25	mA	
Forward voltage	VL		26.4	28.8	V	
Power Consumption	PBL	--	528	720	mW	

- Eight LEDs are in serial type.

- The luminous intensity of LED is strongly dependent on the driving current.

9 AC Timing

9.1 AC Timing Characteristics

$(T_A=25ºC, VDD=3.3V, GND=0V)$

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Dot Clock cycle frequence	Fclk	--	9	15	MHz
Hsync cycle frequence	1/th	--	17.14	--	KHz
Vsync cycle frequence	1/tv	--	59.94	--	Hz
Horizontal Signal					
Horizontal cycle	Th	525	525	605	CLK
Horizontal display period	Thd	480	480	480	CLK
Horizontal front porch	Thf	2	2	82	CLK
Horizontal pulse width	Thp	2	41	41	CLK
Horizontal back porch	Thb	2	2	41	CLK
Vertical Signal					
Vertical cycle	Tv	285	286	399	H
Vertical display period	Tvd	272	272	272	H
Vertical front porch	Tvf	1	2	227	H
Vertical pulse width	Tvp	1	10	11	H
Vertical back porch	Tvb	1	2	11	H

9.2 AC Timing Diagram
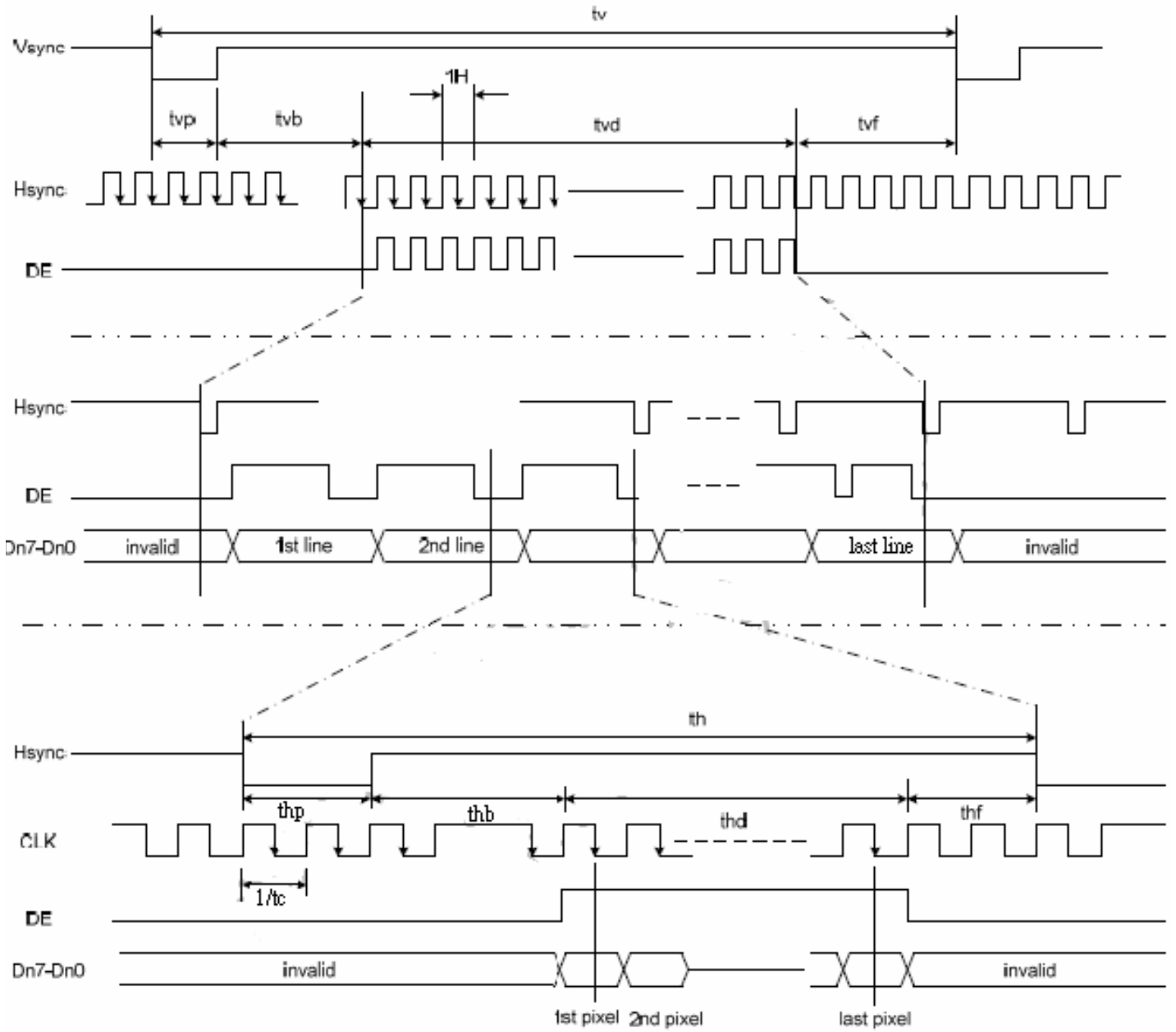
Parallel RGB Input Timing

9.3 Basic Display Color and Gray Scale

		Color & Gray Scale	Data Signal																													
			R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
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
		Red(0)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Green(0)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	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	0	1	1	1	1	1	1	1	1
		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
		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
		Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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	1
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
		Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Red(31)	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Red(62)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(63)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
		Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(31)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(62)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
		Green(63)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
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
		Blue(1)	0	0	0	0	0	0	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	0	0	0	0	0	1	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
		Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.
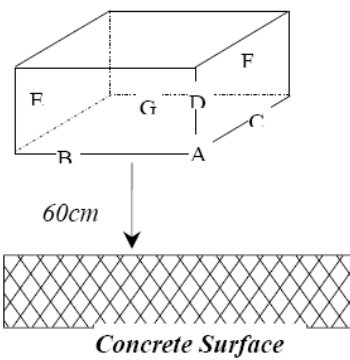
10 Reliability Condition

No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20±5°C Humidity: 65±5%RH

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C,240hrs (Operation state)	
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state)	1
3	High Temperature Storage	80°C±2°C, 240hrs	2
4	Low Temperature Storage	-30°C±2°C, 240hrs	1,2
5	Operate at high temperature and humidity	60°C±2°C, 90%, 240hrs	1,2
6	Thermal shock	-30degree for 30mins and then 80degree for 30mins,total 200cycles,start with cold temperature and end with high temperature	
7	Vibration Test	Total fixed amplitude: 1.5mm Vibration Frequency: 10~55Hz One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
8	Shock Test	To be measured after dropping from 60cm high on the concrete surface in packing state. Dropping method corner dropping A corner: once Edge dropping B, C, D edge: once Face dropping E, F, G face: once	

Notes: 1. No dew condensation to be observed.

2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.

3. Vibration test will be conducted to the product itself without putting I in a con

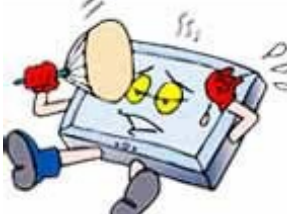# 11 Precautions
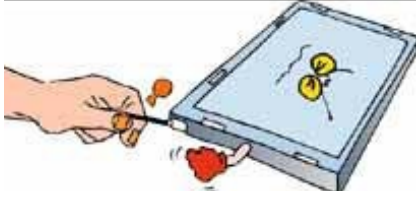
11.1 Operation

Burn-in sometimes happens when the same character was displayed at along time. Therefore, to prevent Burn-in, it is recommended to set up a Screen-saver function.

11.2 Safety

The liquid crystal in the LCD is poisonous, DO NOT put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.
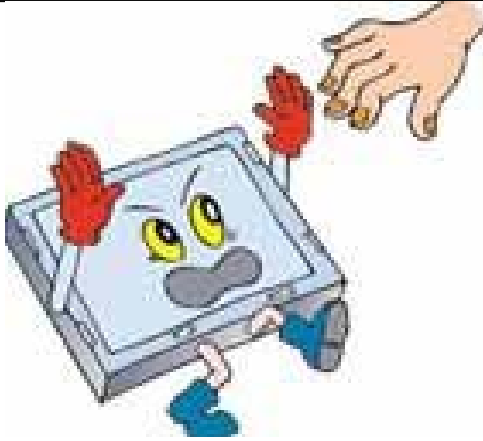
11.3 Handling

	a. The LCD module shall be installed flat, without twisting or bending. b. COF or FPC has narrow pattern width, so easily become open circuit by external force. DO NOT apply pressure to COF or FPC especially in bending area.
	c. To avoid damage in appearance or malfunction, DO NOT subject the module to mechanical shock or to excessive force on its surface.
	d. The polarizer attached to the display is very easy to damage, handle it with care to avoid scratching.
	e. To avoid contamination on the display surface, DO NOT touch the display surface with bare hands. f. Provide a space so that the LCD module does not come into contact with other components.
	g. To protect the LCD panel from external pressure, put covering glass (acrylic board or similar board) to keep appropriate space between them.
	h. Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
	i. Property of semiconductor devices may be affected when they are exposed to light possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, your design and mounting layout done are so that the IC is not exposed to light in actual use.

|	
	j. Strong light exposure causes degradation of color filter. It may not recover
	k. DO NOT contact with water to avoid Metal corrosion. l. When it is not in use, the screen must be turned off or the pattern must be frequently changed by a screen saver. If it displays the same pattern for a long period of time, brightness down/image sticking may develop due to the LCD structure.
	m. Never disassemble LCD product under any circumstances. If unqualified operators or users assemble the product after disassembling it, it may not function or its operation may be seriously affected.

11.4 Static electricity

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.

	a. The LCD module shall be installed flat, without twisting or bending. Ground soldering iron tips, tools and testers when they operate. b. Ground your body when handling the products. c. DO NOT apply voltage to the input terminal without applying power supply. d. DO NOT apply voltage that exceeds the absolute maximum rating. e. Store the products in an anti-electrostatic container. f. Peel off protect tape, attached to polarizer, slowly to minimize ESD damage

11.5 Storage
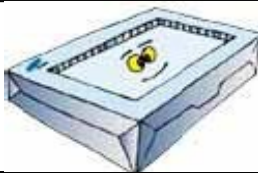
	Store the products in a dark place at +5 ~ +25 degree C, low humidity (50%RH or less). DO NOT store the products in an atmosphere containing organic solvents or corrosive gases.

11.6 Cleaning

	a. DO NOT wipe the polarizer with dry cloth, as it might cause scratch. b. Wipe the polarizer with a soft cloth soaked with petroleum IPA, other chemical might damage.

11.7 Waste

	When dispose of LCD module, manage it at the production waste according to the relevant laws and regulations.

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12 Warranty

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire

and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

1. We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
2. We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
3. We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.
4. We cannot accept responsibility for industrial property, which may arise through the use of your product, with exception to those issues relating directly to the structure or method of manufacturing of our product.
   GI FAR-origin longer than one year from GI FAR production..