



FORMIKE ELECTRONIC CO.,LTD

PRODUCT SPECIFICATION

TFT LCD MODULE

MODEL : KWH043ST12-F02 Version 1.0

【 ◆ 】 Preliminary Specification

【 】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED BY
Kam	/	Stephen	Roy

Prepared By :

FORMIKE ELECTRONIC CO.,LTD

Address :Room A818 New Energy Building, NanHai Road, NanShan District, ShenZhen, China. 518054

TEL:(86) 755 88306921,88306931 FAX:(86) 755 88304615

Http:// www.wandisplay.com

- This specification is subject to change without notice.Please contact FORMIKE or it's representative before designing your product based on this specification.

Issued Date:May-8-2010



TABLE OF CONTENTS

N0	CONTENTS	PAGE
0	Table of Contents	2
1	Record of Revision	3
2	General Specifications	4
3	Mechanical Drawing	5
4	Absolute Maximum Ratings	6
5	Electrical Characteristics	6
6	DC charateristics	6
7	Timing Charateristics	7
8	Optical Characteristics	12
9	Interface	15
10	Block diagram	17
11	Quality Assurance	18
12	Precautions for use	19



1. Record of Revision

Version	Issued Date	Page	Content	Created or Modified by
1.0	2010.05.08	All	New Creation	Stephen

Formike Electronic CO.,Ltd.



2. GENERAL DESCRIPTION

2.1 Description

KWH043ST12-F02 is a Transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver ICs, FPC, and a backlight unit. The following table described the features of FORMIKE KWH043ST12-F02.

2.2 Application

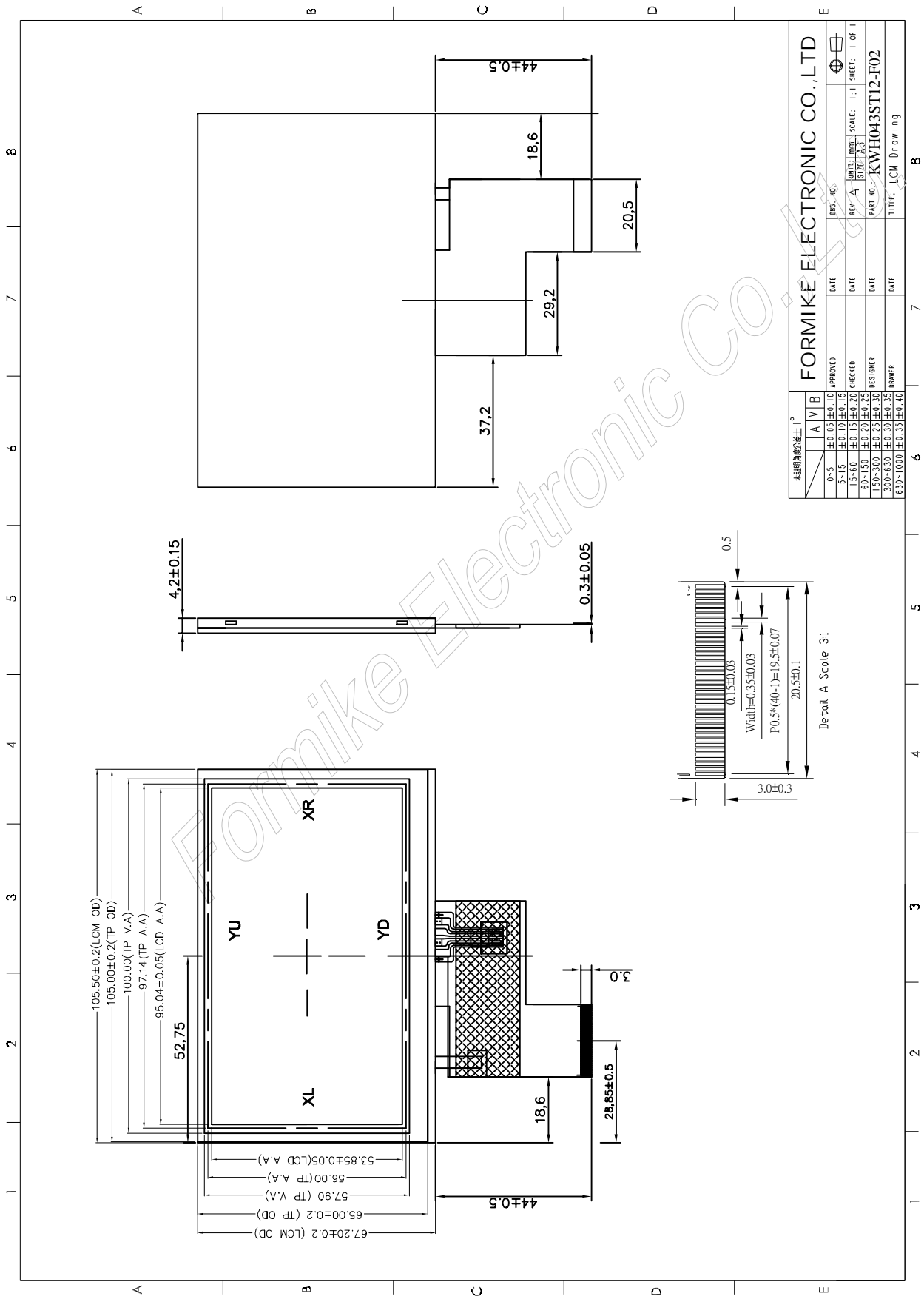
PDA , PMP, MP4, DVB-S, GPS, medical device, Portable Navigation
Etc.

2.3 Features:

Feature	Description
Size	4.3 inch
Display Mode	Normally White, Transmissive
Surface Treatment	Anti-glare
Resolution	480 (RGB) x 272
Display Format	R.G.B. Stripe type
Color	16.7M color
Pixel Pitch (mm)	0.198 x 0.198
Inteface	R.G.B. 24 bit parallel data
Viewing Direction	6 o'clock
Outline Dimension (W x H x D) (mm)	105.5 x 67.2 x 4.2
Active Area(H x V mm)	95.04 x 53.856
With/Without TSP	With TSP
LED Numbers	7 LED serial type
Weight (g)	45



3.0 Mechanical Drawing





4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	VDD	0.3	5.0	V	
Logic Input Signal	VIN	-0.3	VDD+0.3	V	
Logic Output Signal	VOUT	-0.3	VDD+0.3	V	

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

5. ELECTRICAL CHARACTERISTICS

5.1. Operating conditions:

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Supply	VDD	3.0	3.3	3.6	V	
Operating Current	IDD	-	15	-	mA	Black pattern
Frame frequency	Frame	-	60	90	Hz	
Dot Data Clock	DCLK	-	9.0	15	MHz	
Power Consumption	PLCD	-	49.5	-	mW	Black pattern

5.2 LED driving conditions

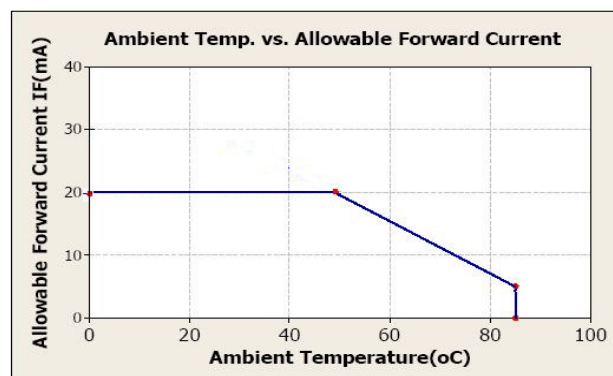
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Consumption	PLED	-	462	-	mW	
LED Current	If	-	20	-	mA	(1)
Backlight Voltage	Vb	-	23.1	-	V	(2)

Ta = 25°C

Brightness to be decreased to 50% of the initial value

Note (1) 7 LEDs serial type

(2) Where If=20mA, Vb= PLED / If



6. DC CHARACTERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Low level input voltage	V _{IL}	0	-	0.3*VDD	V	
High level input voltage	V _{IH}	0.7*VDD	-	VDD	V	

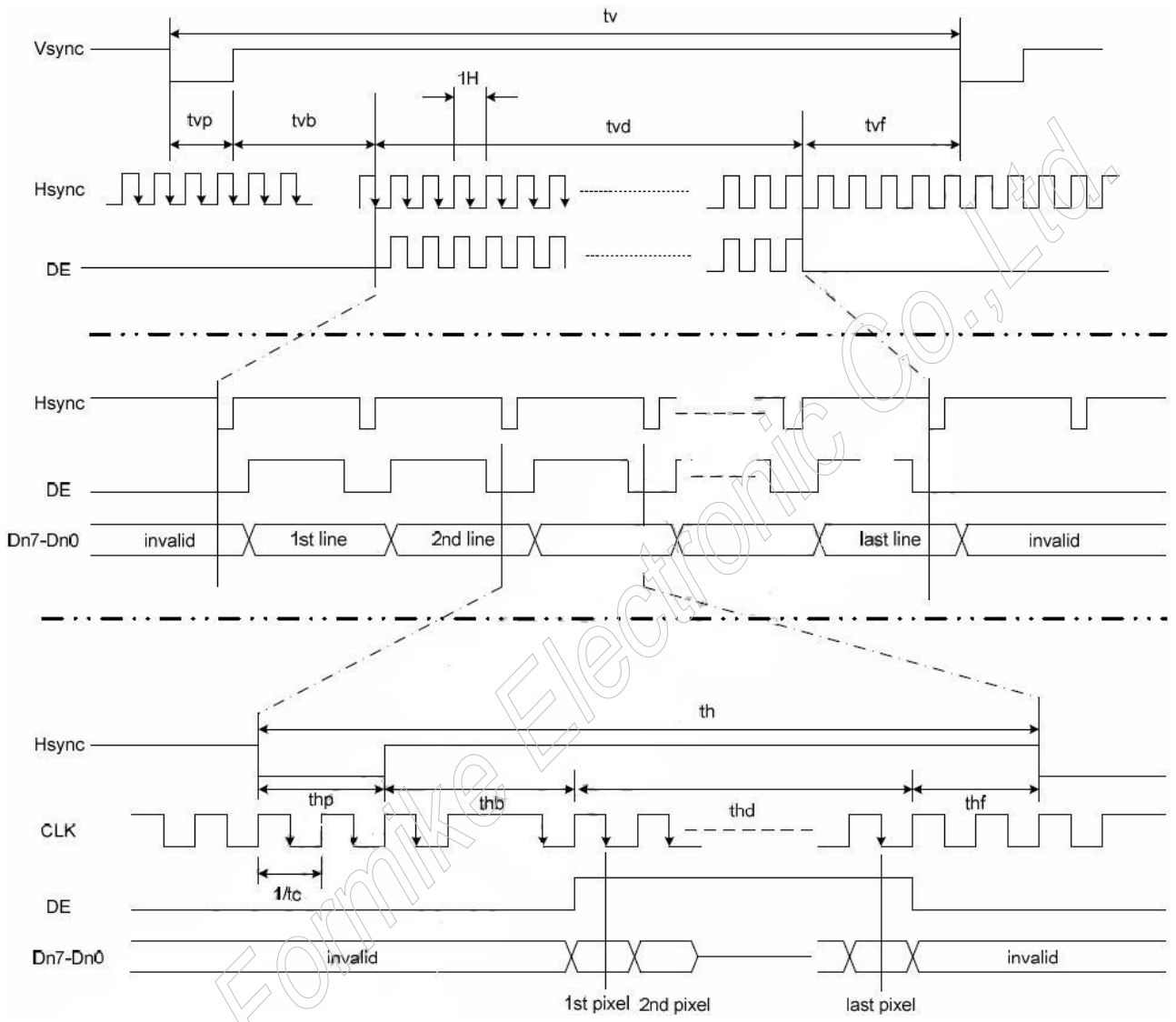
**7. Timing CHARATERISTICS****7.1 DC Timing Characteristics**

Signal	Item	Symbol	Min	Typ	Max	Unit	Note
Dclk	Frequency	DCLK	-	9.0	12	MHZ	
Hsync	Period	TH	-	525	-	DCLK	(1)
	Pulse Width	Thp	2	41	-	DCLK	(2)
	Back-Porch	Thb	2	-	-	DCLK	(2)
	Display Period	Thd	-	480	-	DCLK	
	Front-Porch	Thf	2	-	-	DCLK	(2)
Vsync	Period	Tv	-	286	-	TH	
	Pulse Width	Tvp	1	10	-	TH	
	Back-Porch	Tvb	1	2	-	TH	
	Display Period	Tvd	-	27	-	TH	
	Front-Porch	Tvf	1	-	-	TH	

Note1: Thd=480 DCLK, Thf=2 DCLK, Thp= 41
525 DCLK= 480 + 2 + 41 + 2 (DCLK)

hb=2 DCLK

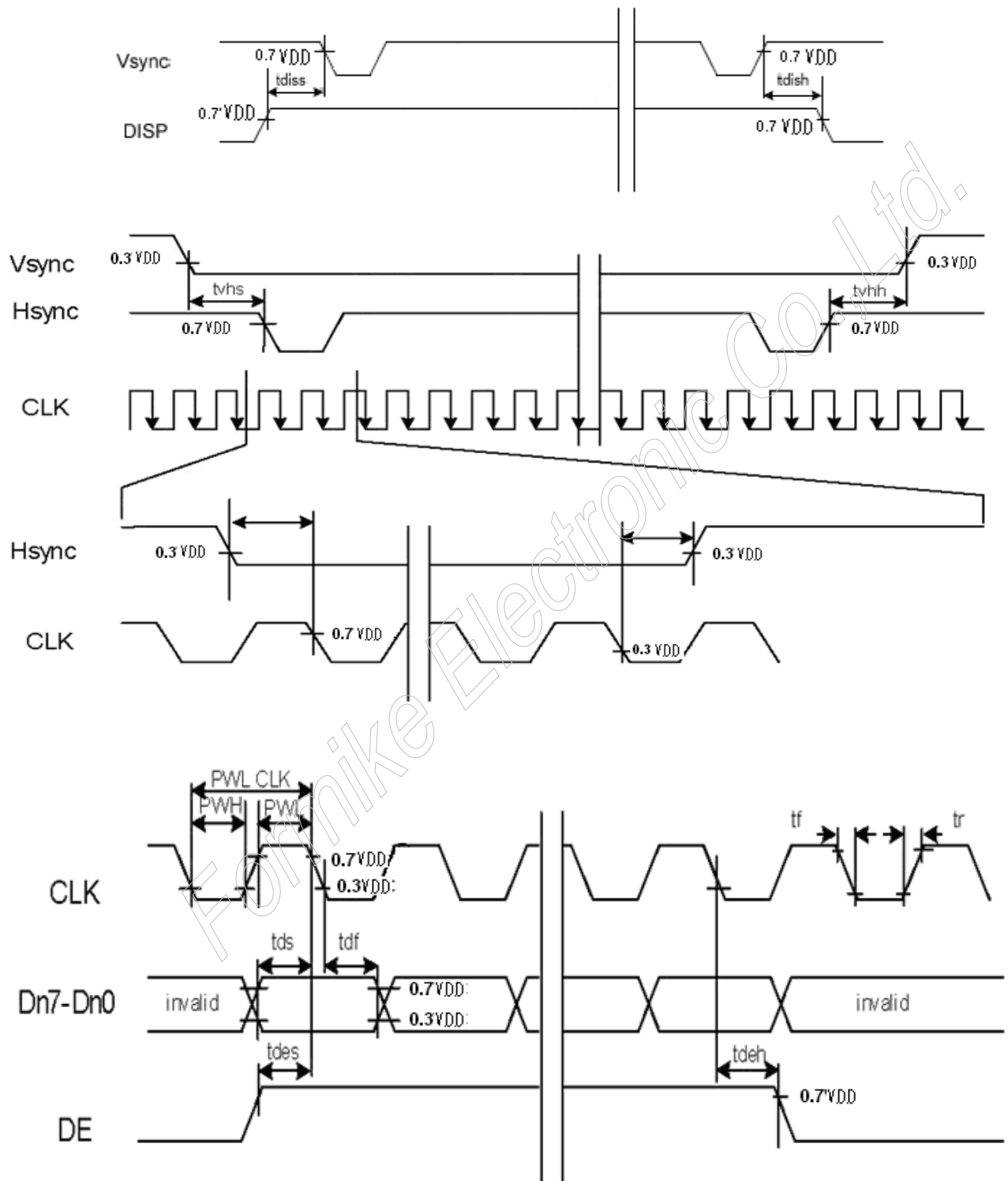
Note2: Thf+ Thp+ Thb >44





7.2 AC Timing Characteristics

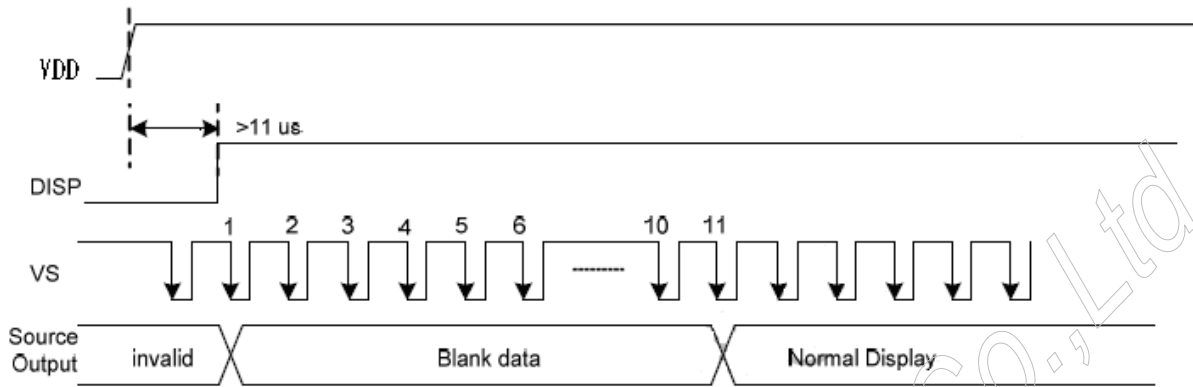
Parameter	Symbol	Spec.			Unit
		Min	Typ	Max	
DISP setup time	t_{diss}	10			ns
DISP hold time	t_{dish}	10			ns
Clock period	$PW_{CLK}^{(2)}$	66.7	-	-	ns
Clock pulse high period	$PWH^{(2)}$	26.7	-	-	ns
Clock pulse low period	$PWL^{(2)}$	26.7	-	-	ns
Hsync setup time	t_{hs}	10	-	-	n
Hsync hold time	t_{hh}	10	-	-	
Data setup time	t_{ds}	10	-		ns
Data hold time	t_{dh}	10	-		ns
DE setup time	t_{des}	10	-		ns
DE hold time	t_{deh}	10			ns
Vsync setup time	t_{vhs}	10		-	ns
Vsync hold time	t_{vhh}	10		-	ns



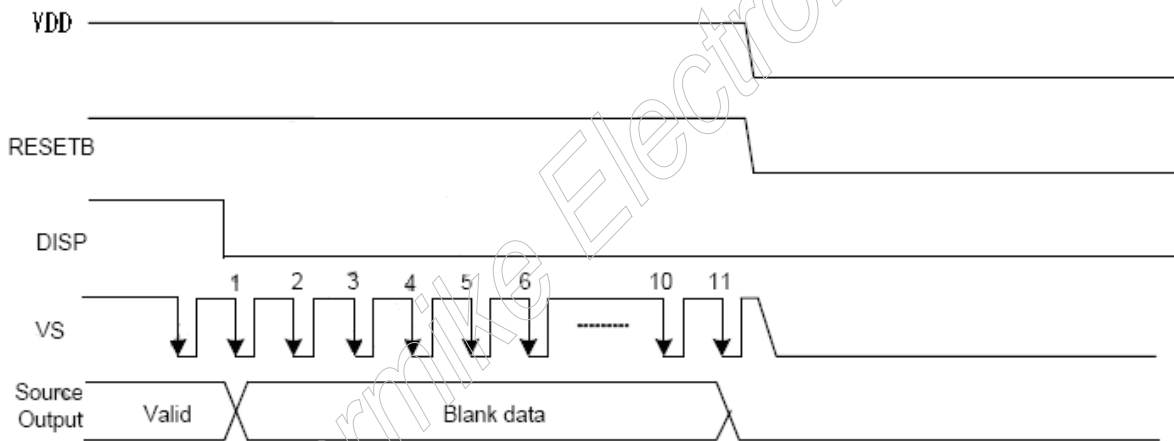


7.3 Power Sequence

The LCD panel power ON/OFF sequence is as below.



Power On Sequence



Power Off Sequence



8. OPTICAL CHARACTERISTIC

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Brightness			200	250	-	cd/m2	
Response time	TR	$\Theta=0$	-	15	-	ms	(3)(5)
	TF		-	15	-	ms	
Contrast ratio	CR	At optimized viewing angle	450	550	-	-	(4)
Color Chromaticity	White	Wx	0.26	0.31	0.36	-	(2)(6)
		Wy	0.28	0.33	0.38		
Viewing Angle	Hor.	ΘR	50	70	-	-	(1)
		ΘL	50	70	-		
	Ver.	ϕH	40	55	-		
		ϕL	50	70	-		
Uniformity			75	80		%	(8)

5±2°C, ILED=20mA

Note 1: Definition of viewing angle range

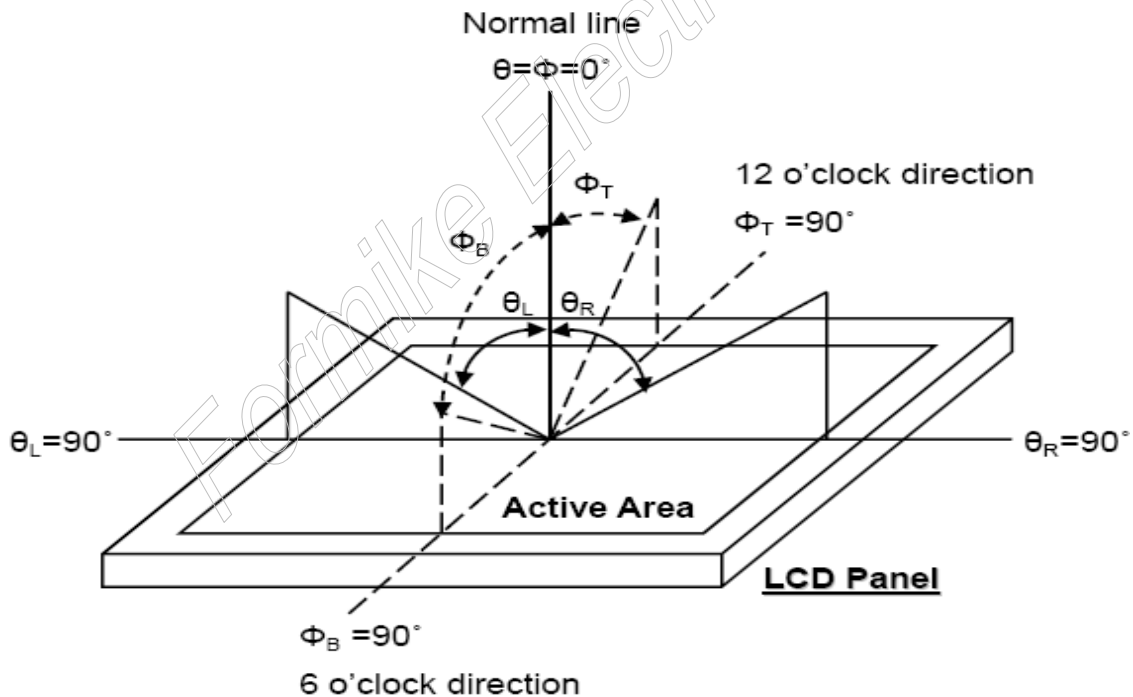


Fig. 8-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

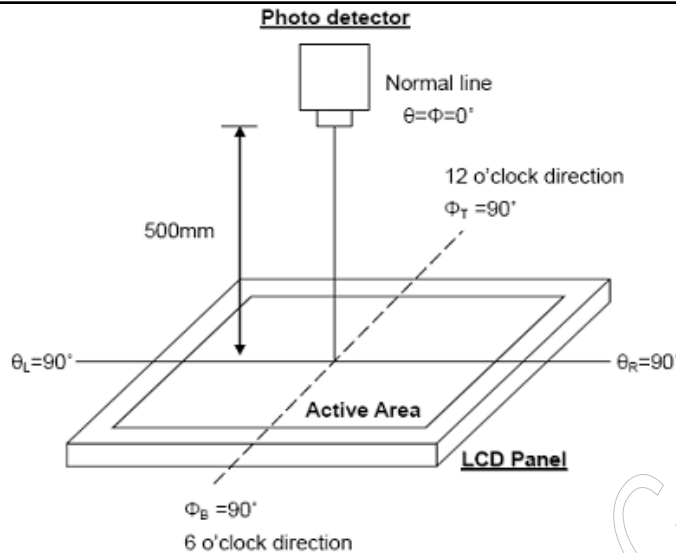


Fig. 8-2 Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10% . And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90% .

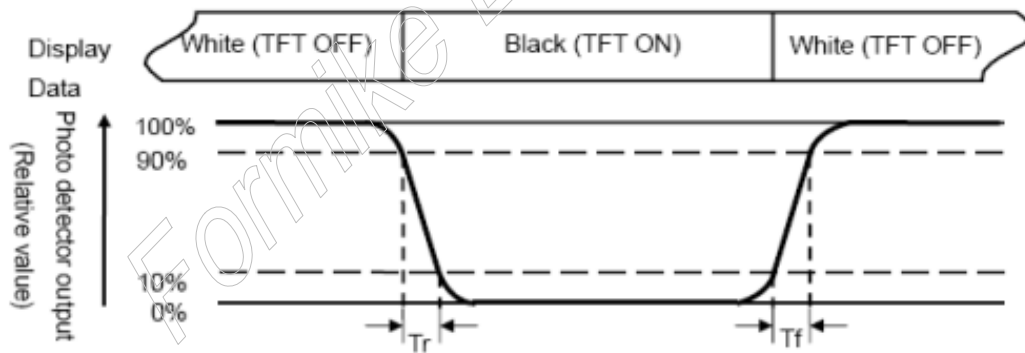


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

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

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals



of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 8 : Uniformity (U) = $\frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$

Formike Electronic Co., Ltd.

**9. INTERFACE****9.1. LCM PIN Definition (Connector type : 40Pin / 0.5mm pitch / Top contact)
- Hirose : FH12 series**

Pin	Symbol	I/O	Function	Remark
1	VLED-	I	LED Ground	
2	VLED+	I	LED Power	
3	GND	I	Ground	
4	VDD	I	Power Supply (+3.3 V)	
5	R0	I	Red Data Bit0 (LSB)	
6	R1	I	Red Data Bit1	
7	R2	I	Red Data Bit2	
8	R3	I	Red Data Bit3	
9	R4	I	Red Data Bit4	
10	R5	I	Red Data Bit5	
11	R6	I	Red Data Bit6	
12	R7	I	Red Data Bit7 (MSB)	
13	G0	I	Green Data Bit0 (LSB)	
14	G1	I	Green Data Bit1	
15	G2	I	Green Data Bit2	
16	G3	I	Green Data Bit3	
17	G4	I	Green Data Bit4	
18	G5	I	Green Data Bit5	
19	G6	I	Green Data Bit6	
20	G7	I	Green Data Bit7 (MSB)	
21	B0	I	Blue Data Bit0 (LSB)	
22	B1	I	Blue Data Bit1	
23	B2	I	Blue Data Bit2	
24	B3	I	Blue Data Bit3	
25	B4	I	Blue Data Bit4	
26	B5	I	Blue Data Bit5	
27	B6	I	Blue Data Bit6	
28	B7	I	Blue Data Bit7 (MSB)	
29	GND	I	Ground	
30	DCLK	I	Dot Data Clock	
31	DISP	I	Display On/Off	Note 1
32	Hsync	I	Horizontal Sync Input	
33	Vsync	I	Vertical Sync Input	



34	DE	I	Data Enable Control	Note 2
35	NC	I	No Connect	
36	GND	I	Ground	
37	TP	I	XR	
38	TP	I	YD	
39	TP	I	XL	
40	TP	I	YU	

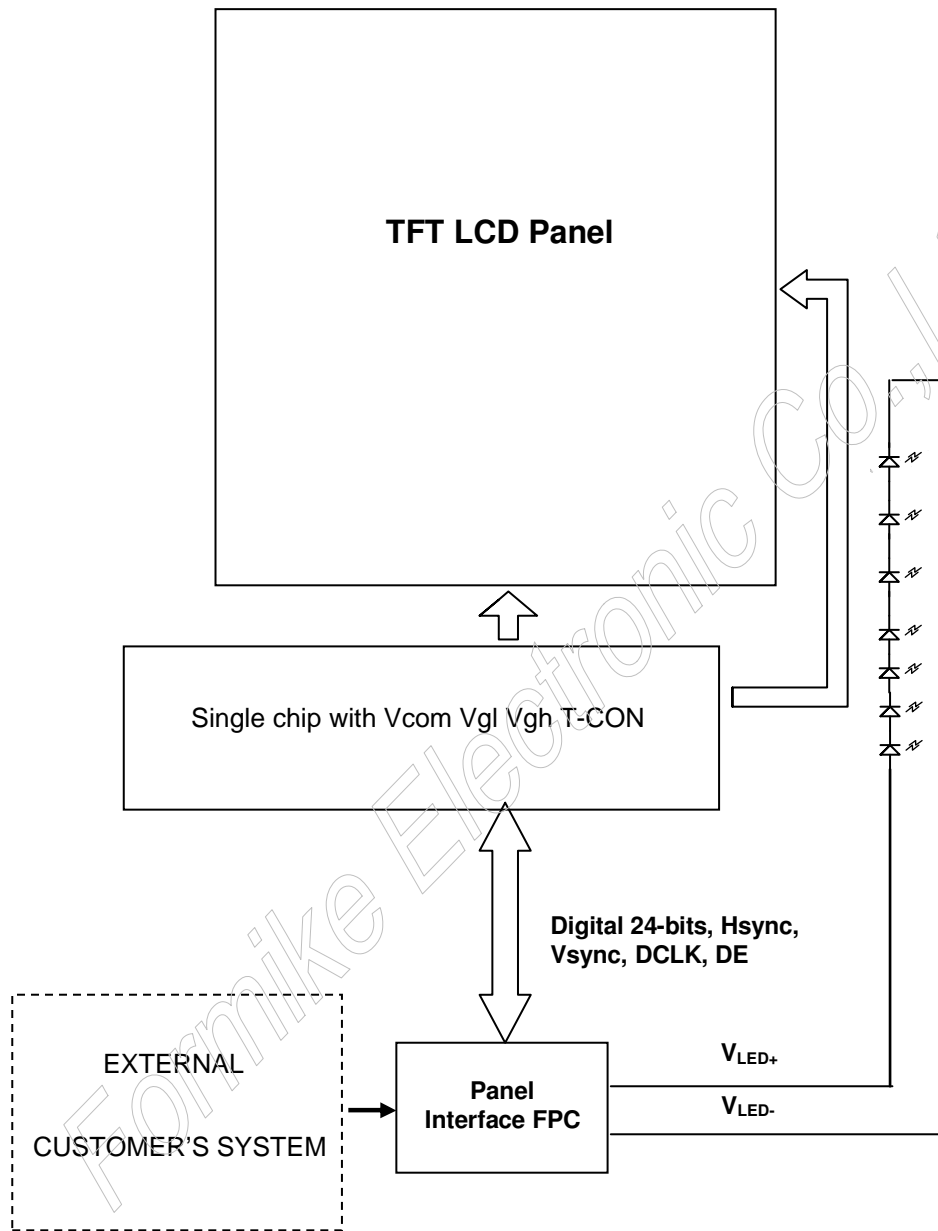
Note1: During set to DISP=" H ", input data are valid. During set to DISP=" L ", input data are invalid and white display data is written to data register automatically.

Note2: DE=" H ": data can be access, DE=" L ": data cannot be access

Formike Electronic Co., Ltd.



10. BLOCK DIAGRAM



**11. QUALITY ASSURANCE**

No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	Ta=80°C Dry 240h	
2	Low Temperature Storage Test	Ta=-30°C Dry 240h	
3	High Temperature Operation Test	Ta=70°C Dry 240h	
4	Low Temperature Operation Test	Ta=-20°C Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=60°C 90%RH 240h	
6	Electro Static Discharge Test	Panel surface / top case Contact / Air : ±6KV / ±8KV , 150pF , 330Ω	Non-operating
7	Shock Test (non-operating)	Shock Level : 180G Waveform: Half Sinusoidal wave Shock Time : 2ms 3 Axis for all six faces/ each	
8	Vibration Test (non-operating)	Frequency Range: 10~500Hz/ Sweep: 1.5G Amplitude: 0.37 oct/min For 3 Axis 1hrs/axis	
9	Thermal Shock Test	-30°C (0.5Hr) ~ +80°C (0.5Hr) for 100 cycles	

Note1: The test samples have recovery time for 4 hours at room temperature before the function check.
In the standard conditions, there is no display function NG issue occurred.

Note2: All the cosmetic specifications are judged before the reliability stress.



12.PRECAUTIONS FOR USE

12.1.Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

12.2.Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\%\text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

12.3.Installing LCD Module

Attend to the following items when installing the LCD Module.

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.
- (2) When assembling the LCD Module into other equipment, the spacer to the bit between the LCD Module and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be $\pm 0.1\text{mm}$.

12.4.Precautions For Operation

- (1) Viewing angle varies with the change of liquid crystal driving voltage (V_0). Adjust V_0 to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.
- (3) Response time is greatly delayed at temperature below the operating



temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.

- (4) When turning the power on, input each signal after the positive/negative voltage becomes stable.
- (5) Do not apply water or any liquid on product which composed of T/P.

12.5.Handling Precautions

- (1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.
- (2) The polarizing plate of the display is very fragile. so, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface; it may cause display abnormal .
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) Do not apply water or any liquid on product, which composed of T/P.

12.6.Warranty

- (1) The period is within 12 months since the date of shipping out under normal using and storage conditions.
- (2) The warranty will be avoided in case of defect induced by customer.