



# PRODUCT SPECIFICATION

10.4" a-Si TFT LCD MODULE  
MODEL: NTFT104s800600 Ver:1.1

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## 1. General Description

The specification 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 and a backlight unit.

## 2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	10.4"	
LCD type	TN TFT	
Display Mode	Normally White/Transmissive	
Resolution	800 RGB x 600	Pixels
View Direction	12 O'clock	Best Image
Gray Scale Inversion Direction	6 O'clock	
Module Outline	228.4(H) x 175.4(V) x 5.9(T) (Note1 )	mm
Active Area	211.20 (H) x 158.40(V)	mm
Pixel Pitch	264(H) x 264(V)	um
Pixel Arrangement	RGB-Stripe	
Display Colors	16M	
Interface	24bit RGB	
With or without touch panel	Without	-
Operating Temperature	-10~50	°C
Storage Temperature	-20~60	°C
Weight	379	g

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

## 3. Absolute Maximum Ratings

$V_{SS}=0V, T_a=25^{\circ}C$

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	VCC	-0.3	5.0	V
Storage temperature	T <sub>STG</sub>	-20	+60	°C
Operating temperature	T <sub>OP</sub>	-10	+50	°C

Note 1: If  $T_a$  below  $50^{\circ}C$ , the maximal humidity is 90%RH, if  $T_a$  over  $50^{\circ}C$ , absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around  $-10^{\circ}C$ , and the back ground will become darker at high temperature operating.

#### 4. DC Characteristics

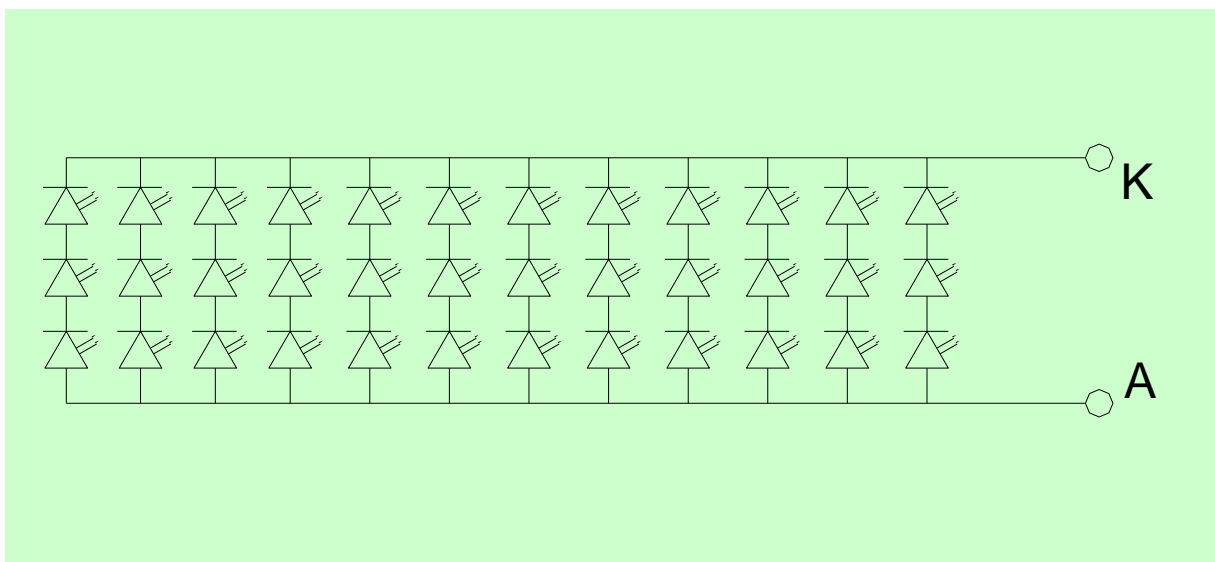
Item	Symbol	Min.	Typ.	Max.	Unit
Digital Power Supply Voltage	VCC	3.0	3.3	3.6	V
Digital Supply Current(Black Pattern)	I <sub>CC</sub>	-	6	12	mA
Analog Power Supply Voltage	AVDD	10.3	10.5	10.7	V
Analog Supply Current(Black Pattern)	I <sub>AVDD</sub>	32	40	60	mA
TFT Device on voltage	V <sub>GH</sub>	-	18	-	V
TFT Device off voltage	V <sub>GL</sub>	-	-7	-	V
Common Electrode Driving Voltage	V <sub>COM</sub>	4.15	4.45	4.75	V
Low Level Input Voltage	V <sub>IL</sub>	0	-	0.3*VCC	V
High Level Input Voltage	V <sub>IH</sub>	0.7*VCC	-	VCC	V

#### 5. Backlight Characteristic

##### 5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V <sub>F</sub>	T <sub>a</sub> =25 °C, I <sub>F</sub> =20mA/LED	-	9.6	10.5	V
Forward Current	I <sub>F</sub>	T <sub>a</sub> =25 °C, V <sub>F</sub> =3.2V/LED	-	240	-	mA
Power dissipation	P <sub>D</sub>		-	2.304	2.52	W
Uniformity	Avg		-	80	-	%
Drive method	Constant current					
LED Configuration	36 White LEDs (3 LEDs in string and 12groups in parallel)					

##### 5.2. Backlighting circuit



## 6. Optical Characteristics

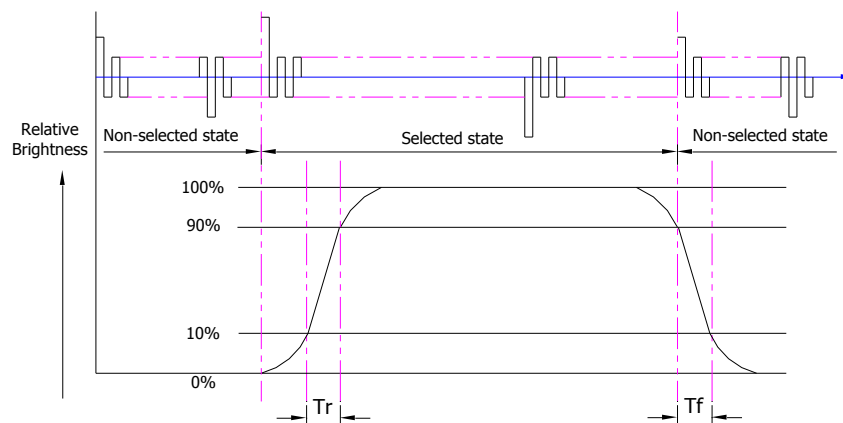
### 6.1. Optical Characteristics

Ta=25°C, V<sub>DD</sub>=3.3V, TN LC+ Polarizer

	Item	Symbol	Condition	Specification			Unit	
				Min.	Typ.	Max.		
Backlight On (Transmissive Mode)	Luminance on TFT(I <sub>f</sub> =20mA/LED)	Lv		200	250	-	cd/m <sup>2</sup>	
	Contrast ratio(See 6.3)	CR		300	500	-		
	Response time (See 6.2)	TR+TF		-	25	50	ms	
	Chromaticity Transmissive (See 6.5)	Red	X <sub>R</sub>		0.523	0.573	0.623	
			Y <sub>R</sub>		0.300	0.350	0.400	
		Green	X <sub>G</sub>		0.286	0.336	0.386	
			Y <sub>G</sub>		0.547	0.597	0.647	
		Blue	X <sub>B</sub>		0.102	0.152	0.202	
			Y <sub>B</sub>		0.062	0.112	0.162	
	White	X <sub>W</sub>		0.26	0.31	0.36		
		Y <sub>W</sub>		0.28	0.33	0.38		
	Viewing Angle (See 6.4)	Horizontal	θ <sub>X+</sub>	Center CR≥10	60	70	-	Deg.
			θ <sub>X-</sub>		60	70	-	
Vertical		φ <sub>Y+</sub>	40		50	-		
		φ <sub>Y-</sub>	50		60	-		
NTSC Ratio(Gamut)				-	50	-	%	

### 6.2. Definition of Response Time

#### 6.2.1. Normally Black Type (Negative)

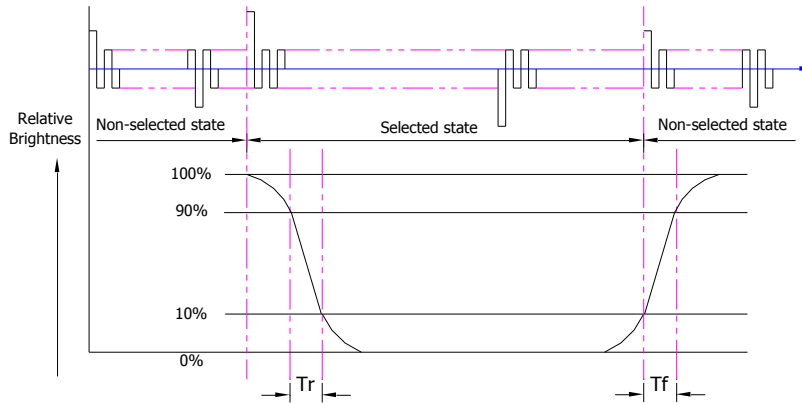


Tr is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note : Measuring machine: LCD-5100

6.2.2. Normally White Type (Positive)



Tr is the time it takes to change from non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note : Measuring machine: LCD-5100 or EQUI

6.3. Definition of Contrast Ratio

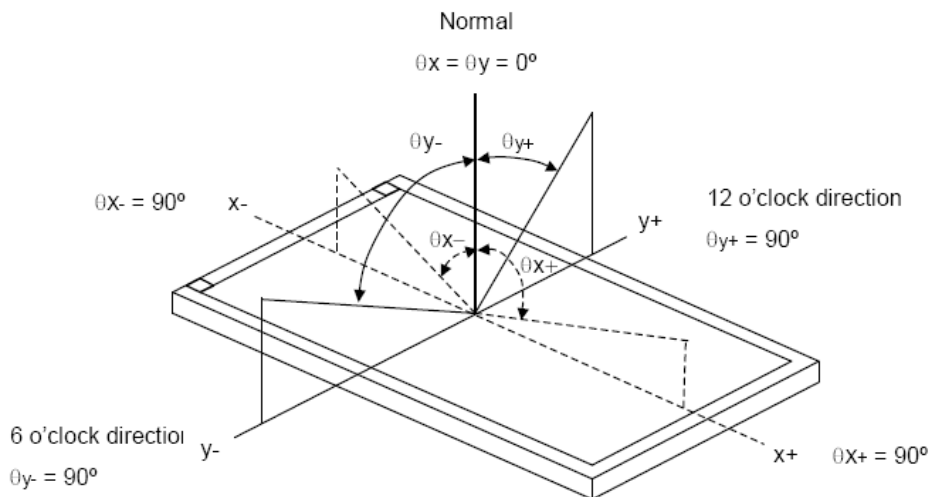
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

6.4. Definition of Viewing Angles



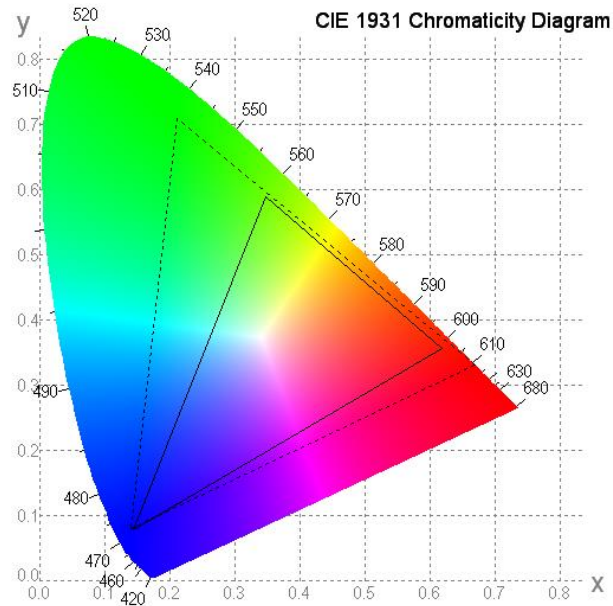
Measuring machine: LCD-5100 or EQUI

### 6.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)



### 6.6. Definition of Surface Luminance, Uniformity and Transmittance

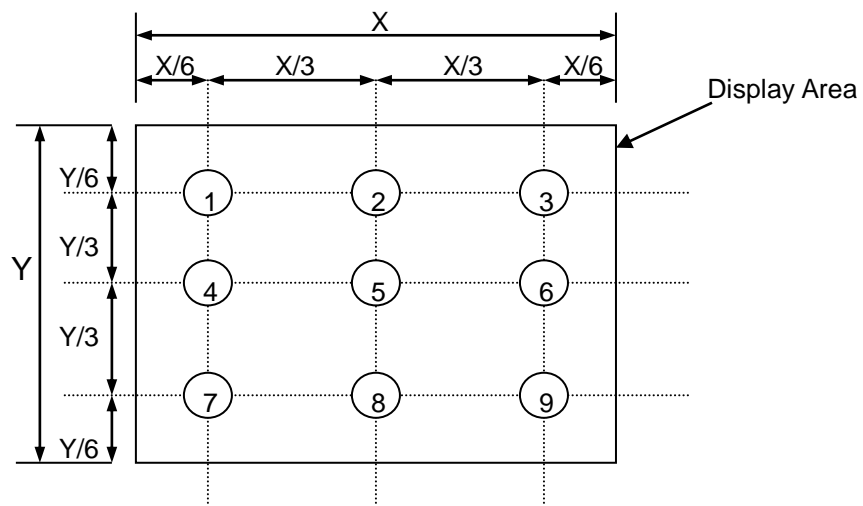
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1. Surface Luminance:  $L_V = \text{average } (L_{P1}:L_{P9})$

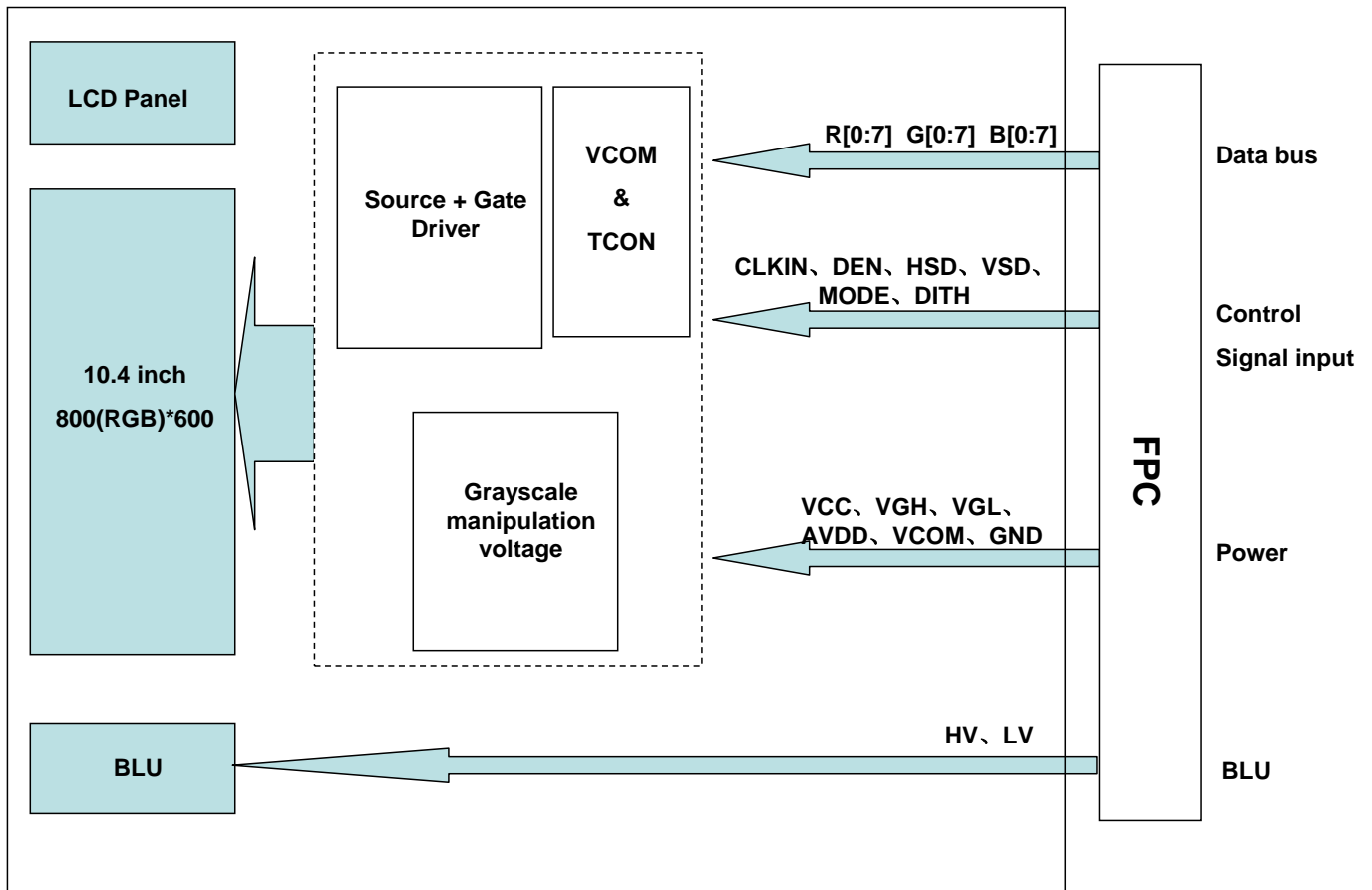
6.6.2. Uniformity = Minimal ( $L_{P1}:L_{P9}$ ) / Maximal ( $L_{P1}:L_{P9}$ ) \* 100%

6.6.3. Transmittance =  $L_V \text{ on LCD} / L_V \text{ on Backlight} * 100\%$

Note : Measuring machine: BM-7



## 7. Block Diagram and Power Supply





## 8. Interface Pins Definition

### 8.1. FPC CON

No.	Symbol	Function	Remark
1	GND	Ground	
2	AVDD	Analog input voltage	
3	VCC	Digital input voltage	
4	R0	Red data input(LSB)	
5	R1	Red data input	
6	R2	Red data input	
7	R3	Red data input	
8	R4	Red data input	
9	R5	Red data input	
10	R6	Red data input	
11	R7	Red data input(MSB)	
12	G0	Green data input(LSB)	
13	G1	Green data input	
14	G2	Green data input	
15	G3	Green data input	
16	G4	Green data input	
17	G5	Green data input	
18	G6	Green data input	
19	G7	Green data input(MSB)	
20	B0	Blue data input(LSB)	
21	B1	Blue data input	
22	B2	Blue data input	
23	B3	Blue data input	
24	B4	Blue data input	
25	B5	Blue data input	
26	B6	Blue data input	
27	B7	Blue data input(MSB)	
28	CLKIN	Dot clock input	
29	DEN	Data enable signal	
30	HSD	HSYNC signal	
31	VSD	VSYNC signal	
32	MODE	H:DE mode(Default) L:SYNC mode	
33	NC	No connection	
34	NC	No connection	
35	NC	No connection	
36	VCC	Digital input voltage	
37	NC	No connection	
38	GND	Ground	

39	GND	Ground	
40	AVDD	Analog input voltage	
41	VCOM	VCOM DC input	
42	DITH	Dithering function setting H:Disable dithering function L:Enable dithering function	
43	NC	No connection	
44	VCOM <sub>OUT</sub>	Connec a capacitor	
45	NC	No connection	
46	NC	No connection	
47	NC	No connection	
48	NC	No connection	
49	NC	No connection	
50	NC	No connection	
51	NC	No connection	
52	NC	No connection	
53	NC	No connection	
54	NC	No connection	
55	NC	No connection	
56	VGH	TFT turn on voltage	
57	VCC	Digital input voltage	
58	VGL	TFT turn off voltage	
59	GND	Ground	
60	NC	No connection	

**Backlight:**

No.	Pin assignment	Description	Color
1	HV	High voltage	Red
2	LV	GND	White

## 9. AC Characteristics

### 9.1. Data Timing(Under frame rate is equal to 60Hz)

#### Horizontal Timing

Parameter	Symbol	Spec			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd	800			CLK
CLK Frequency	fclk	-	40	50	MHz
One Horizontal Line	th	862	1056	1200	CLK
HS Pulse Width	thpw	1	-	40	CLK
HS Back Porch	thb	46			CLK
HS Front Porch	thfp	16	210	354	CLK

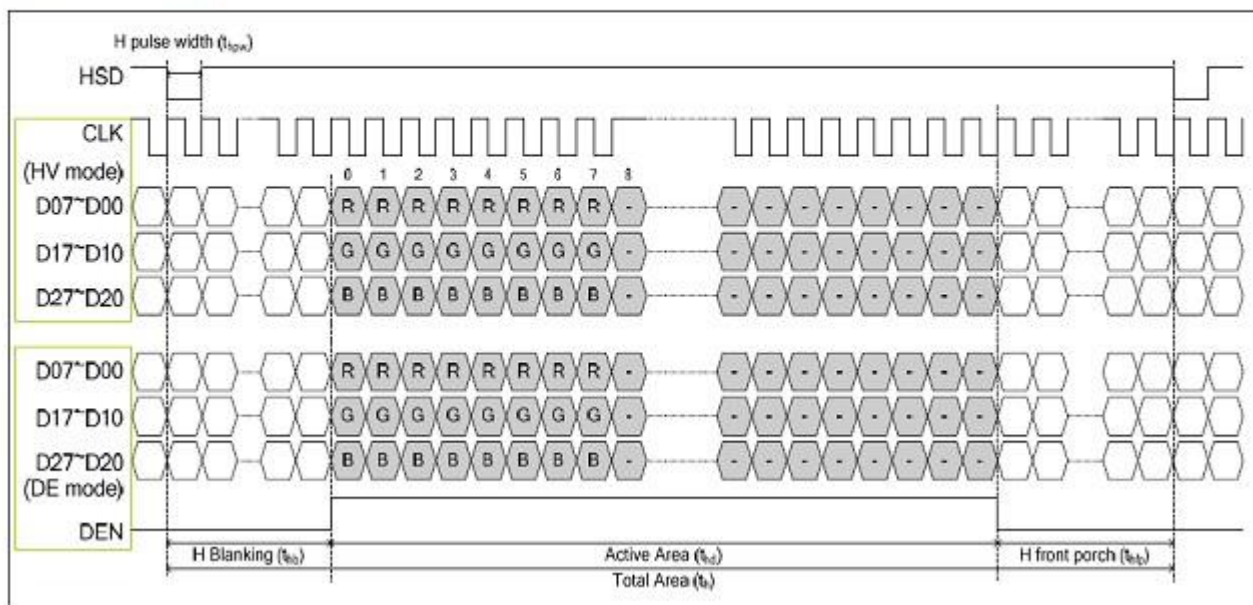
#### Vertical Timing

Parameter	Symbol	Spec			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	600			th
VS Period Time	tv	624	635	700	th
VS Pulse Width	tvpw	1	-	20	th
VS Back Porch	tvb	23	23	23	th
VS Front Porch	tvfp	1	12	77	th

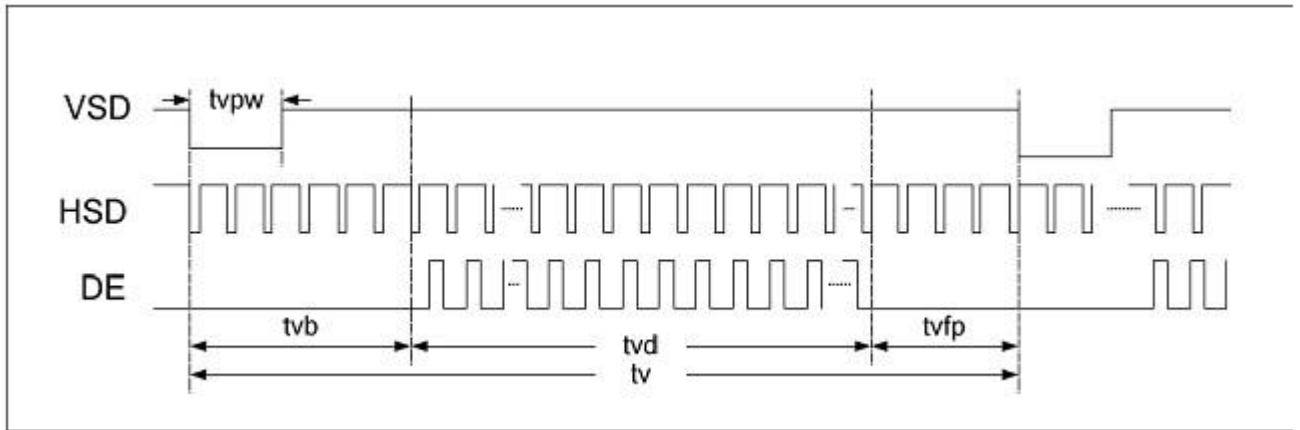
Note:

CMO suggest using frame rate 60Hz to have better performance

#### Horizontal Timing



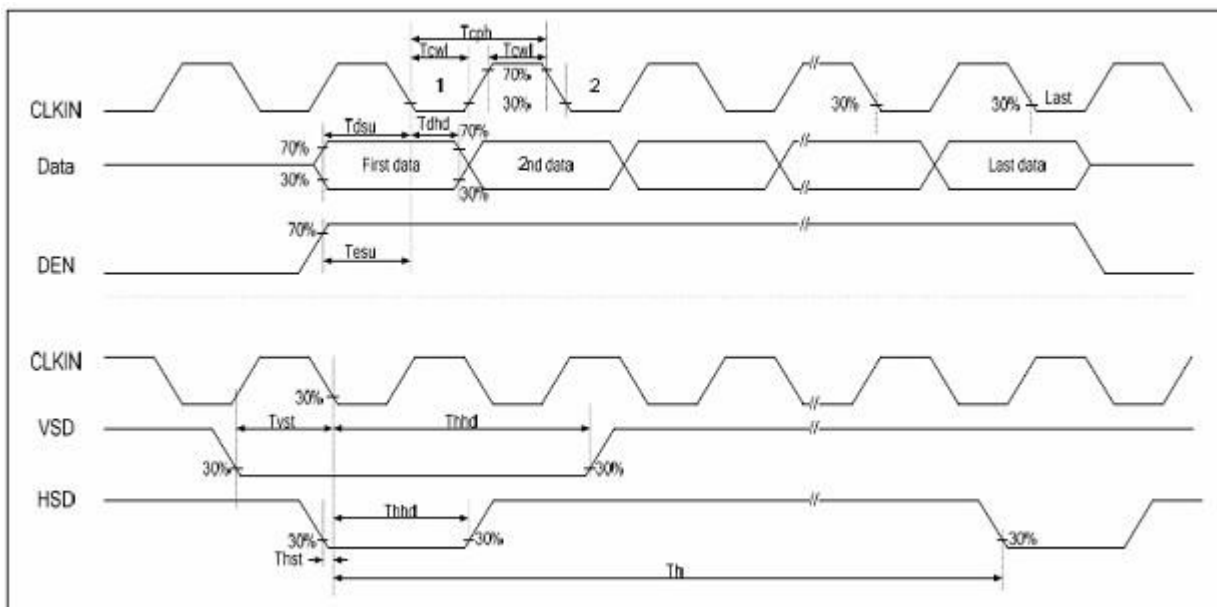
Vertical Timing



9.2. AC Electrical characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	$T_{hst}$	8	-	-	ns
HS hold time	$T_{hhd}$	8	-	-	ns
VS setup time	$T_{vst}$	8	-	-	ns
VS hold time	$T_{vhd}$	8	-	-	ns
Data setup time	$T_{dsu}$	8	-	-	ns
Data hold time	$T_{dhd}$	8	-	-	ns
DE setup time	$T_{esu}$	8	-	-	ns
DE hold time	$T_{ehd}$	8	-	-	ns
VDD Power On Slew Rate	$T_{POR}$	-	-	20	ms
RSTB pulse width	$T_{Rst}$	10	-	-	us
CLKIN cycle time	$T_{cph}$	20	-	-	ns
CLKIN pulse duty	$T_{cwh}$	40	50	60	%
Output stable time	$T_{sst}$	-	-	6	us
Repair OPA Output Stable time	$T_{Rsst}$	-	-	6	ns

9.3. Input Clock and Data Timing Waveform



## 10. Precautions and Warranty

### 10.1 Safety

12.1.1 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.

12.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

### 10.2 Handling

12.2.1 Reverse and use within ratings in order to keep performance and prevent damage.

12.2.2 Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

### 10.3 Storage

12.3.1 Do not store the LCD module beyond the specified temperature ranges.

### 10.4 Metal Pin (Apply to Products with Metal Pins)

#### 12.4.1 Pins of LCD and Backlight

12.4.1.1 Solder tip can touch and press on the tip of Pin LEAD during the soldering

12.4.1.2 Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

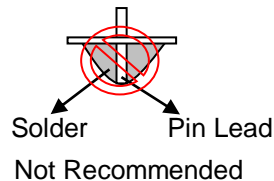
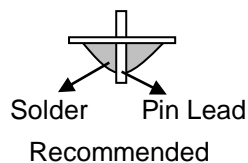
Maximum Solder Temperature: 370°C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20°C

Typical Soldering Time: ≤3s

12.4.1.3 Solder Wetting



#### 12.4.2 Pins of EL

12.4.2.1 Solder tip can touch and press on the tip of EL leads during soldering.

12.4.2.2 No Solder Paste on the soldering pad on the motherboard is recommended.

12.4.2.3 Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270~290°C

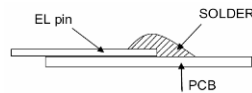
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

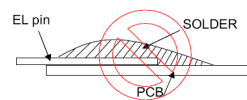
12.4.2.4 No horizontal press on the EL leads during soldering.

12.4.2.5 180° bend EL leads three times is not allowed.

#### 12.4.2.6 Solder Wetting

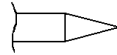


Recommended

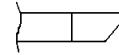


Not Recommended

#### 12.4.2.7 The type of the solder iron:

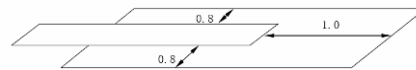


Recommended



Not Recommended

#### 12.4.2.8 Solder Pad



### 12.5 Operation

- 12.5.1 Do not drive LCD with DC voltage
- 12.5.2 Response time will increase below lower temperature
- 12.5.3 Display may change color with different temperature
- 12.5.4 Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear "fractured".

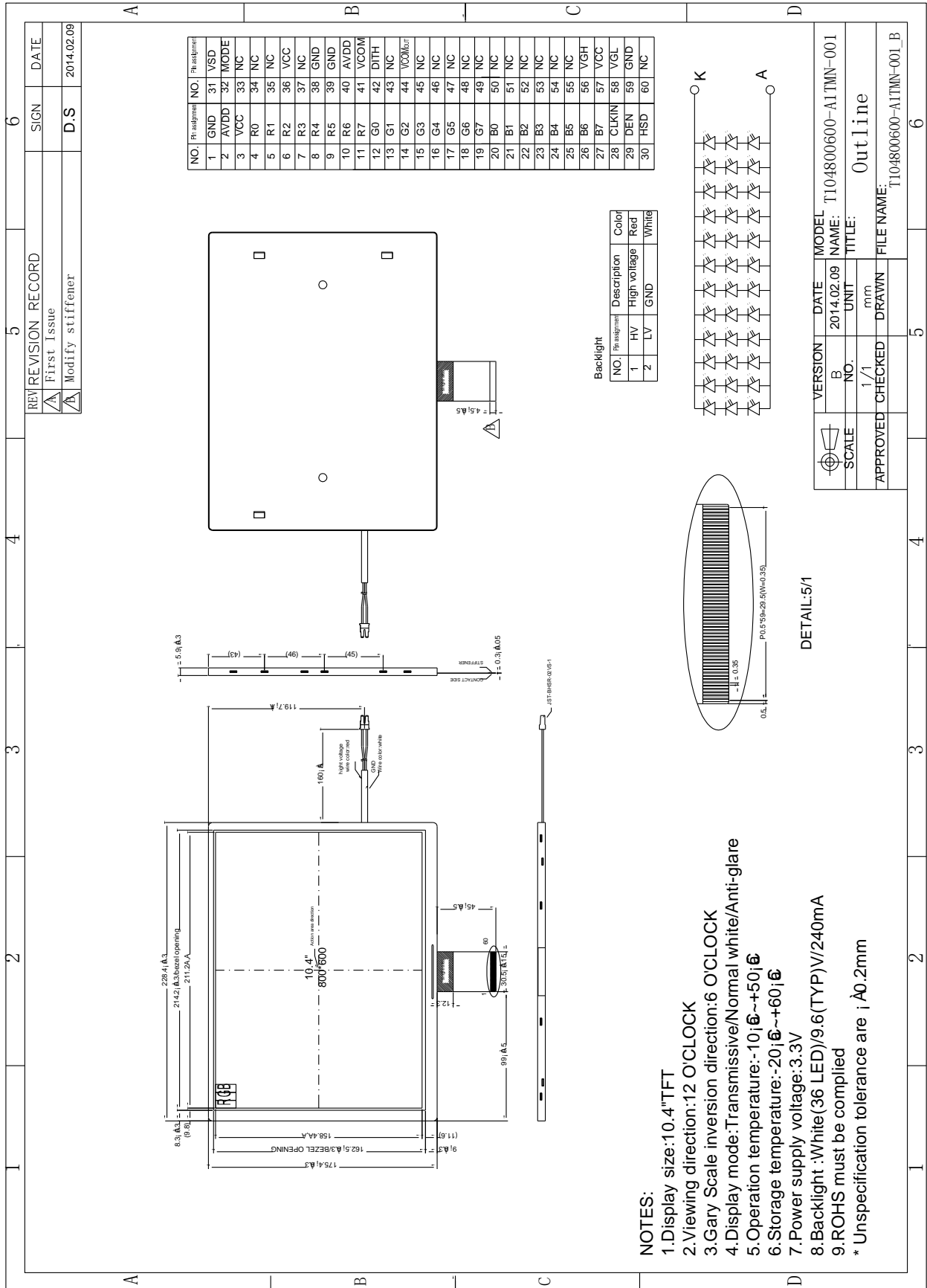
### 12.6 Static Electricity

- 12.6.1 CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 12.6.2 The normal static prevention measures should be observed for work clothes and benches.
- 12.6.3 The module should be kept into anti-static bags or other containers resistant to static for storage.

### 12.7 Limited Warranty

- 12.7.1 Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- 12.7.2 If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used

# 11. Outline Drawing



REV/REVISION RECORD			
NO.	Description	SIGN	DATE
1	First Issue		2014.02.09
2	Modify stiffener	D.S	

NO.	Pin assignment	NO.	Pin assignment
1	GND	31	VSD
2	AVDD	32	MODE
3	VCC	33	NC
4	R0	34	NC
5	R1	35	NC
6	R2	36	VCC
7	R3	37	NC
8	R4	38	GND
9	R5	39	GND
10	R6	40	AVDD
11	R7	41	VCOM
12	G0	42	DITH
13	G1	43	NC
14	G2	44	VCOM
15	G3	45	NC
16	G4	46	NC
17	G5	47	NC
18	G6	48	NC
19	G7	49	NC
20	B0	50	NC
21	B1	51	NC
22	B2	52	NC
23	B3	53	NC
24	B4	54	NC
25	B5	55	NC
26	B6	56	VGH
27	B7	57	VCC
28	CLKIN	58	VGL
29	DEN	59	GND
30	HSD	60	NC

NO.	Pin assignment	Description	Color
1	HV	High voltage	Red
2	LV	GND	White

- NOTES:**
1. Display size: 10.4" TFT
  2. Viewing direction: 12 O'CLOCK
  3. Gary Scale inversion direction: 6 O'CLOCK
  4. Display mode: Transmissive/Normal white/Anti-glare
  5. Operation temperature: -10°C ~ +50°C
  6. Storage temperature: -20°C ~ +60°C
  7. Power supply voltage: 3.3V
  8. Backlight : White (36 LED)/9.6(TYP)/9.6(V)/240mA
  9. ROHS must be complied
- \* Unspecification tolerance are ; A0.2mm

VERSION	DATE	MODEL	
B	2014.02.09	T104800600-A1TMN-001	
NO.	UNIT	NAME:	
1/1	mm	TITLE:	
APPROVED	CHECKED	DRAWN	FILE NAME:
			T104800600-A1TMN-001_B

DETAIL:5/1