



PRODUCT SPECIFICATION

5.6" TN TFT LCD MODULE

MODEL: NTFT56s640480 Ver:1.4

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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)	5.6"	
LCD type	TN TFT	
Display Mode	Transmissive /normal white/Anti-glare	
Resolution	640 RGB x 480	Pixels
View Direction	12 O'CLOCK	Best Image
Gray scale inversion direction	6 O'CLOCK	
Module Outline	126.5(H) x100 (V) x 5.7(T) (Note1)	mm
Active Area	112.896(H) x84.672(V)	mm
Pixel Size	176.4(W)x176.4(h)	um
Pixel Arrangement	RGB-Stripe	
Interface	Digital	
With or Without Touch Panel	Without	
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	(83.1)	g

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

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	-0.3	6.5	V
Storage temperature	T _{stg}	-30	+80	°C
Operating temperature	T _{op}	-20	+70	°C

Note 1: If Ta below 50°C, the maximal humidity is 90%RH, if Ta over 50°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°C, and the back ground will become darker at high temperature operating.

4. DC Characteristics

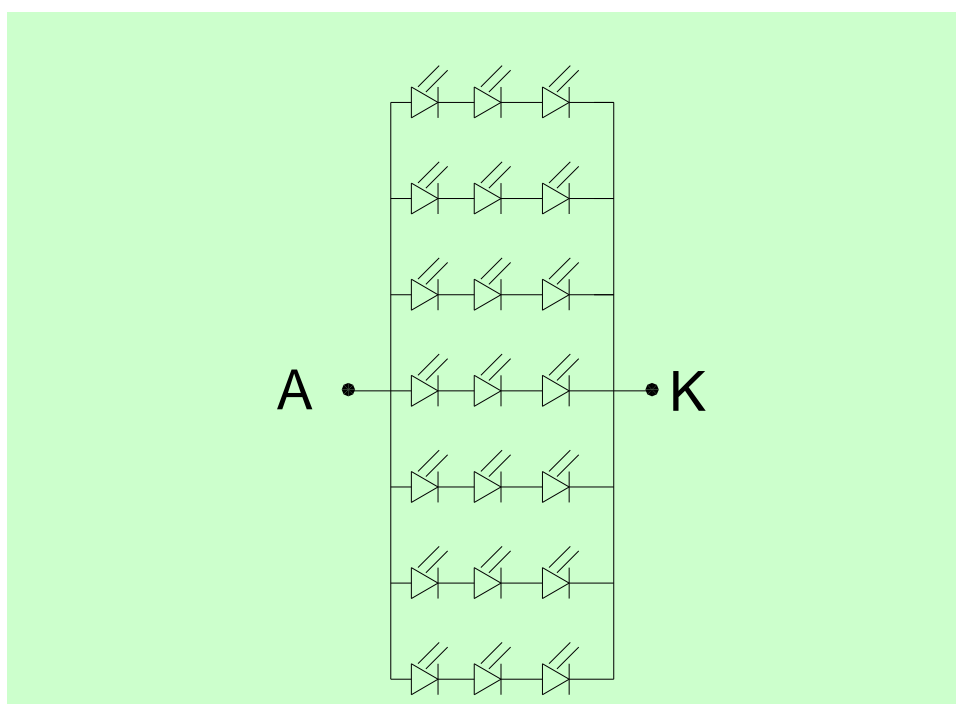
Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	3.1	3.3	3.5	V
Logic Low input voltage	V _{IL}	0	-	0.3*VDD	V
Logic High input voltage	V _{IH}	0.7VDD	-	VDD	V
Current Consumption All Black	I _{CC+} I _{IN}	-	TBD	-	mA

5. Backlight Characteristic

5.1. Backlight Characteristic

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V _F	T _a =25 °C, I _F =20mA/LED	8.7	9.6	10.2	V
Forward Current	I _F	T _a =25 °C, V _F =3.2V/LED	105	140	175	mA
Power dissipation	P _d		-	1344	-	mW
Uniformity	Avg		70	75	-	%
Drive method	Constant current					
LED Configuration	21 White LEDs(3 LEDs in one string and 7 groups in parallel)					

5.2. Backlighting circuit



6. Optical Characteristics

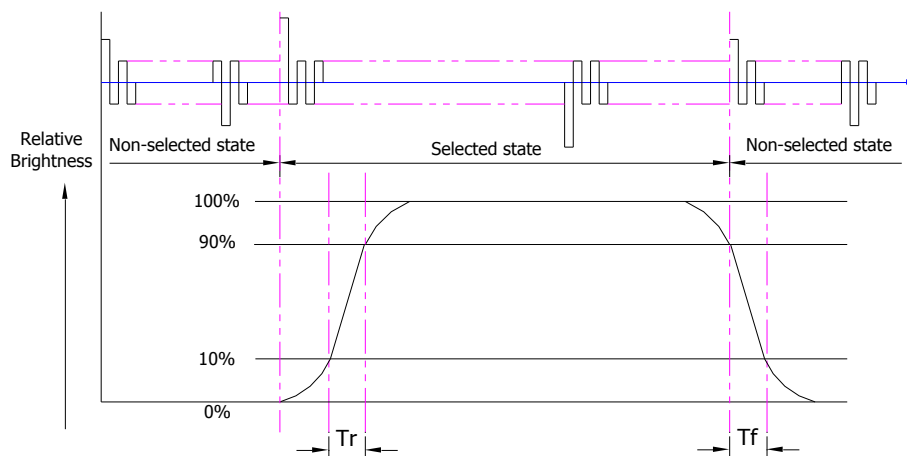
6.1. Optical Characteristics

Ta=25°C, V_{DD}=3.3V, TN LC+ Polarizer

	Item	Symbol	Condition	Specification			Unit	
				Min.	Typ.	Max.		
Backlight On (Transmissive Mode)	Luminance on TFT(I _f =20mA/LED)	Lv	Normally viewing angle $\theta_x = \phi_y = 0^\circ$	280	350	-	cd/m ²	
	Contrast ratio(See 6.3)	CR		400	500	-		
	Response time (See 6.2)	T _R		-	10	20	ms	
		T _F	-	15	30	ms		
	Chromaticity Transmissive (See 6.5)	W _x		0.26	0.31	0.36		
		W _y		0.28	0.33	0.38		
	Viewing Angle (See 6.4)	Horizontal	θ_{x+}	Center CR≥10	60	70	-	Deg.
			θ_{x-}		60	70	-	
		Vertical	ϕ_{y+}		40	50	-	
			ϕ_{y-}		60	70	-	

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

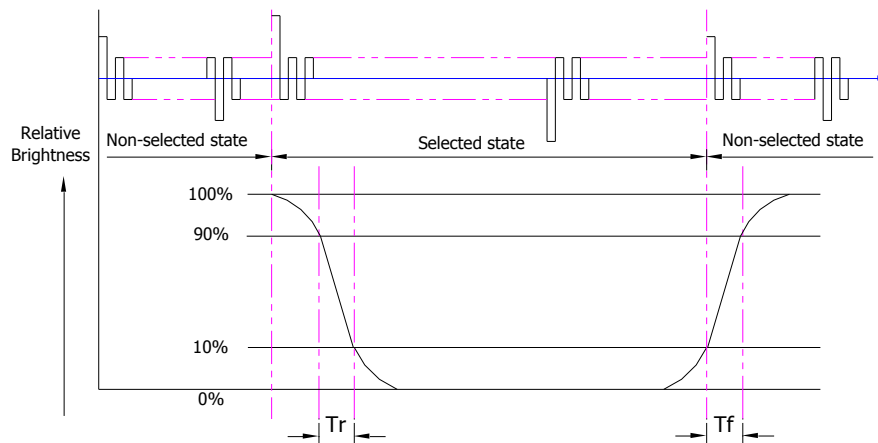


Tr is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

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

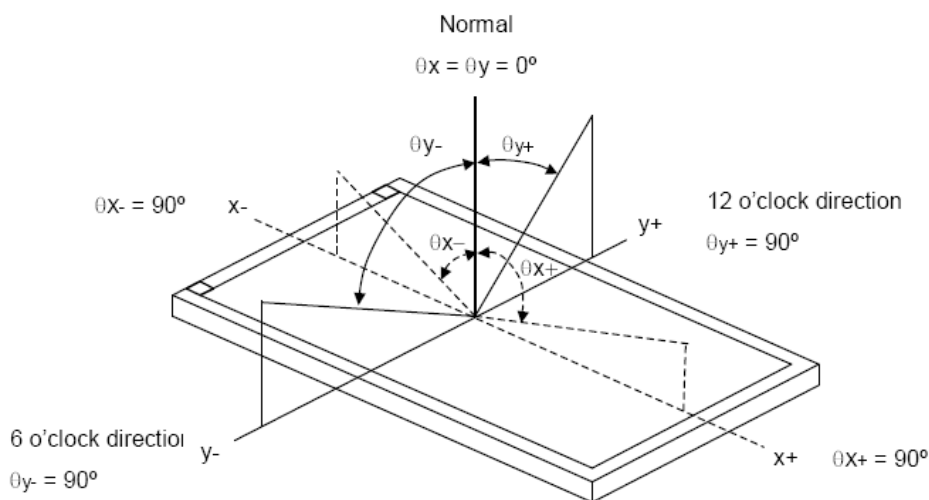
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

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



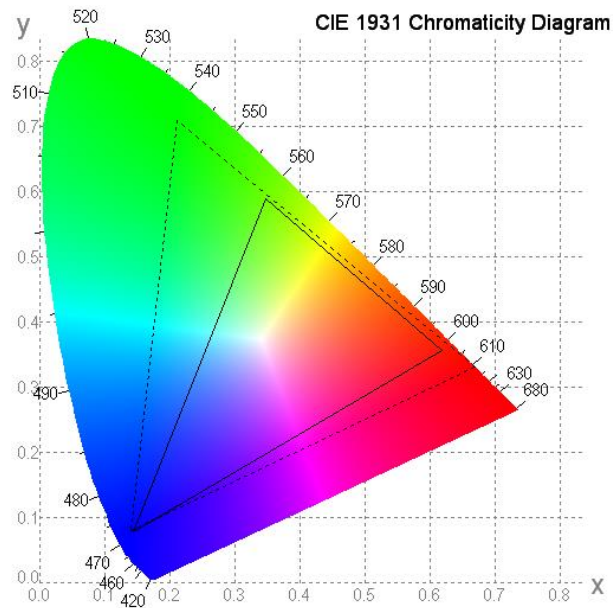
Measuring machine: LCD-5100 or EQUI

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

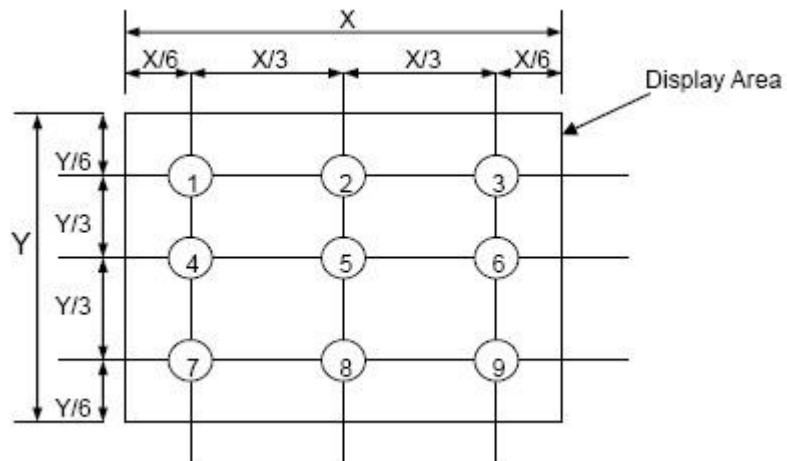
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

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

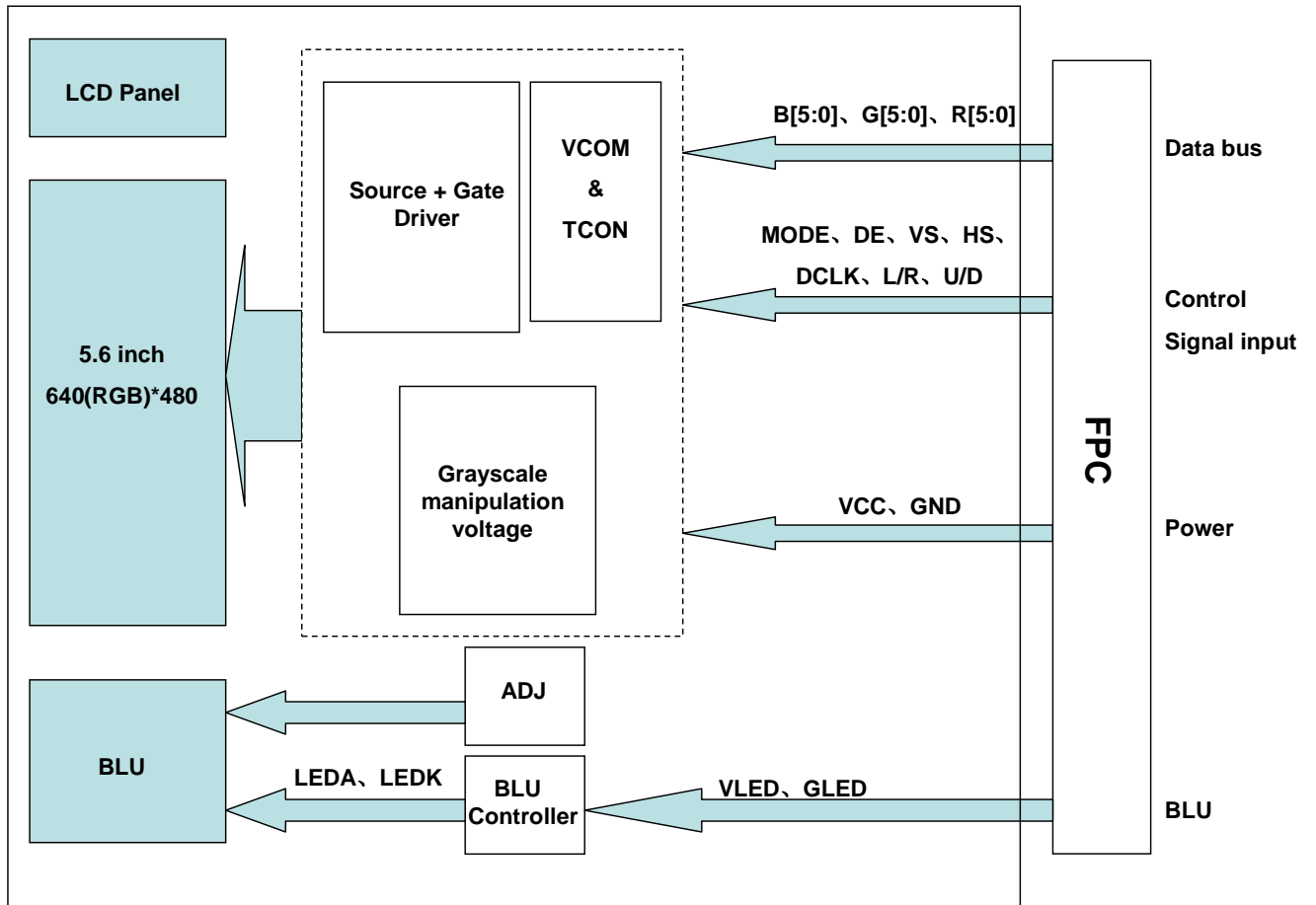
6.6.2 Uniformity = $\text{Minimal} (L_{P1}:L_{P9}) / \text{Maximal} (L_{P1}:L_{P9}) * 100\%$

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

No.	Symbol	Function	Remark
1	V _{LED}	Power Voltage for LED circuit	
2	V _{LED}	Power Voltage for LED circuit	
3	ADJ	Adjust the LED brightness with PWM Pulse	
4	G _{LED}	Ground for LED circuit	
5	G _{LED}	Ground for LED circuit	
6	V _{CC}	Power Voltage for digital circuit	
7	V _{CC}	Power Voltage for digital circuit	
8	MODE	DE or HV mode control DE Mode,MODE="H",HS floating and VS floating HV Mode,MODE="L" and DE floating	
9	DE	Data enable	
10	VS	Vsync signal input	
11	HS	Hsync signal input	
12	GND	Power ground	
13	B5	Blue data input (MSB)	
14	B4	Blue data input	
15	B3	Blue data input	
16	GND	Power ground	
17	B2	Blue data input	
18	B1	Blue data input	
19	B0	Blue data input(LSB)	
20	GND	Power ground	
21	G5	Green data input(MSB)	
22	G4	Green data input	
23	G3	Green data input	
24	GND	Power ground	
25	G2	Green data input	
26	G1	Green data input	
27	G0	Green data input (LSB)	
28	GND	Power ground	
29	R5	Red data input(MSB)	
30	R4	Red data input	
31	R3	Red data input	
32	GND	Power ground	
33	R2	Red data input	
34	R1	Red data input	
35	R0	Red data input(LSB)	
36	GND	Power ground	
37	DCLK	Sample clock	
38	GND	Power ground	

39	L/R	Select left to right scanning direction	
40	U/D	Select up or down scanning direction	

Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	V _{CC}	Up to down, left to right
V _{CC}	GND	Down to up, right to left
GND	GND	Up to down, right to left
V _{CC}	V _{CC}	Down to up, left to right

9 AC Characteristics

(1)Timing Condition

Input/Output Timing

Item	Symbol	Values			Unit.	Remark
		Min.	Typ.	Max.		
PXLCLK clock time	Tclk	33.3	39.7	-	ns	
PXLCLK pulse duty	Tcwh	40	50	60	%	Tclk
DATA set-up time	Tdsu	12	-	-	ns	DATA to PXLCLK
DATA hold time	Tdhd	12	-	-	ns	DATA to PXLCLK
DE setup time	Tesu	12	-	-	ns	DE to PXLCLK
VSYNC setup time	Tvst	12	-	-	ns	
VSYNC hold time	Tvhd	12	-	-	ns	
HSYNC setup time	Thst	12	-	-	ns	
HSYNC hold time	Thhd	12	-	-	ns	
HSYNC period time	Th	22.91	31.76	-	us	
HSYNC width	Thwh	1	-	-	Tclk	
VSYNC width	Tvwh	1	-	-	Th	
HSYNC to CLKIN	Thc	-	-	1	Tclk	

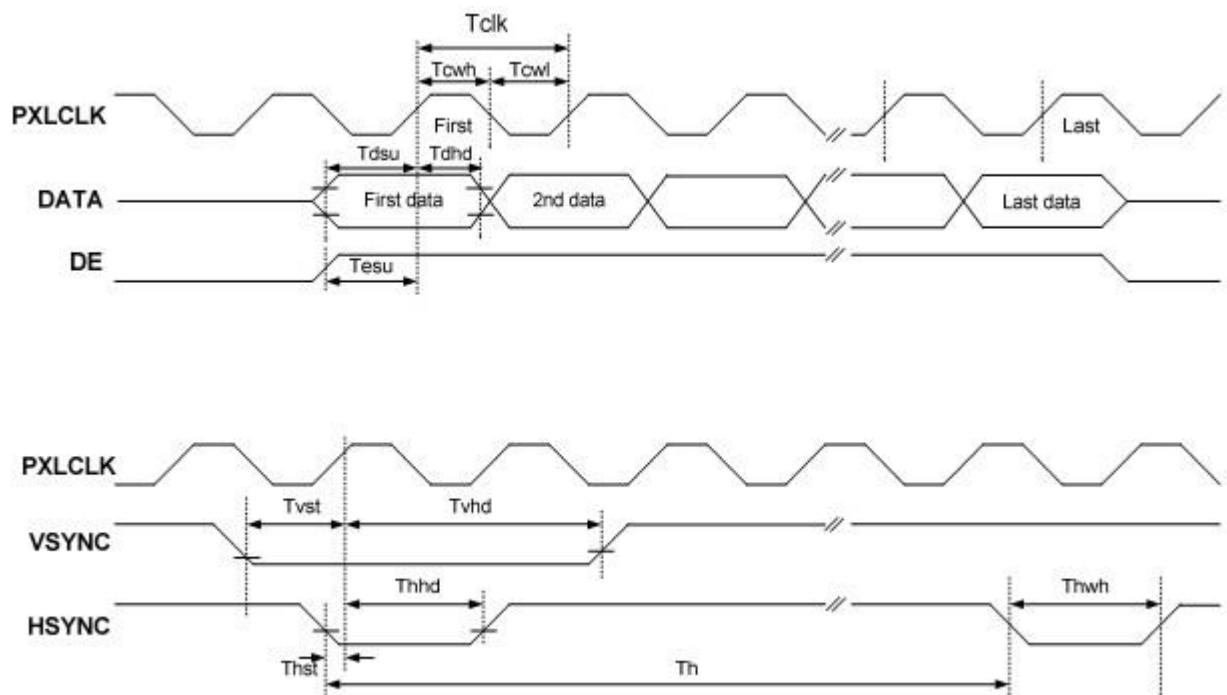
DE Mode input Timing Limitation

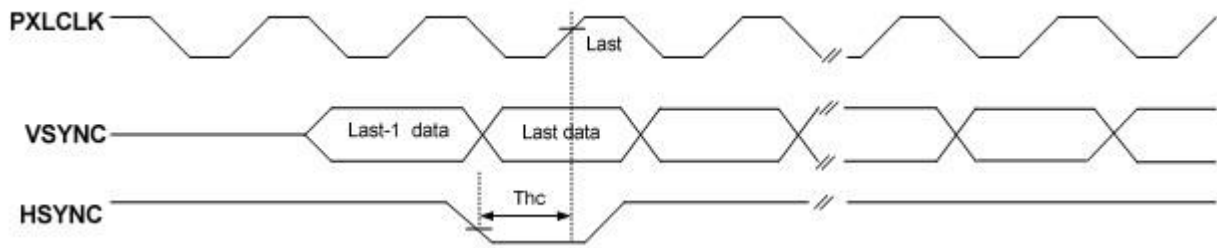
DE Mode	Values			Unit	Remark
	Min.	Typ.	Max.		
THC	48	160	765	tclk	
THD	640	640	640	tclk	
TH	688	800	1405	tclk	1TH=1line
TVC	6	45	255	line	
TVD	480	480	480	line	
TV	486	525	735	line	1TV=1field

HV Mode input Timing Limitation

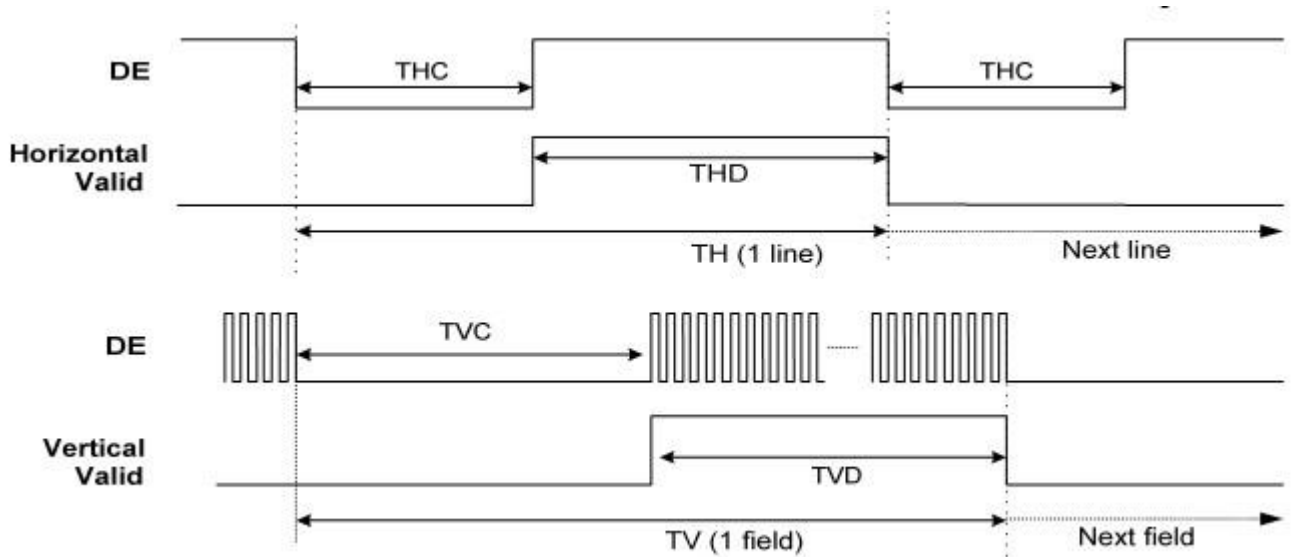
HV Mode	Values			Unit	Remark
	Min.	Typ.	Max.		
Thwh	-	10	-	tclk	
Thbp	-	134	-	tclk	
Thfp	-	16	-	tclk	
THD	-	640	-	tclk	
TH	-	800	-	tclk	1TH=1 line
Tvwh	-	2	-	line	
Tvbp	-	11	-	line	
Tvfp	-	32	-	line	
TVD	-	480	-	line	
TV	-	525	-	line	1TV=1 field

(2)Timing Diagram

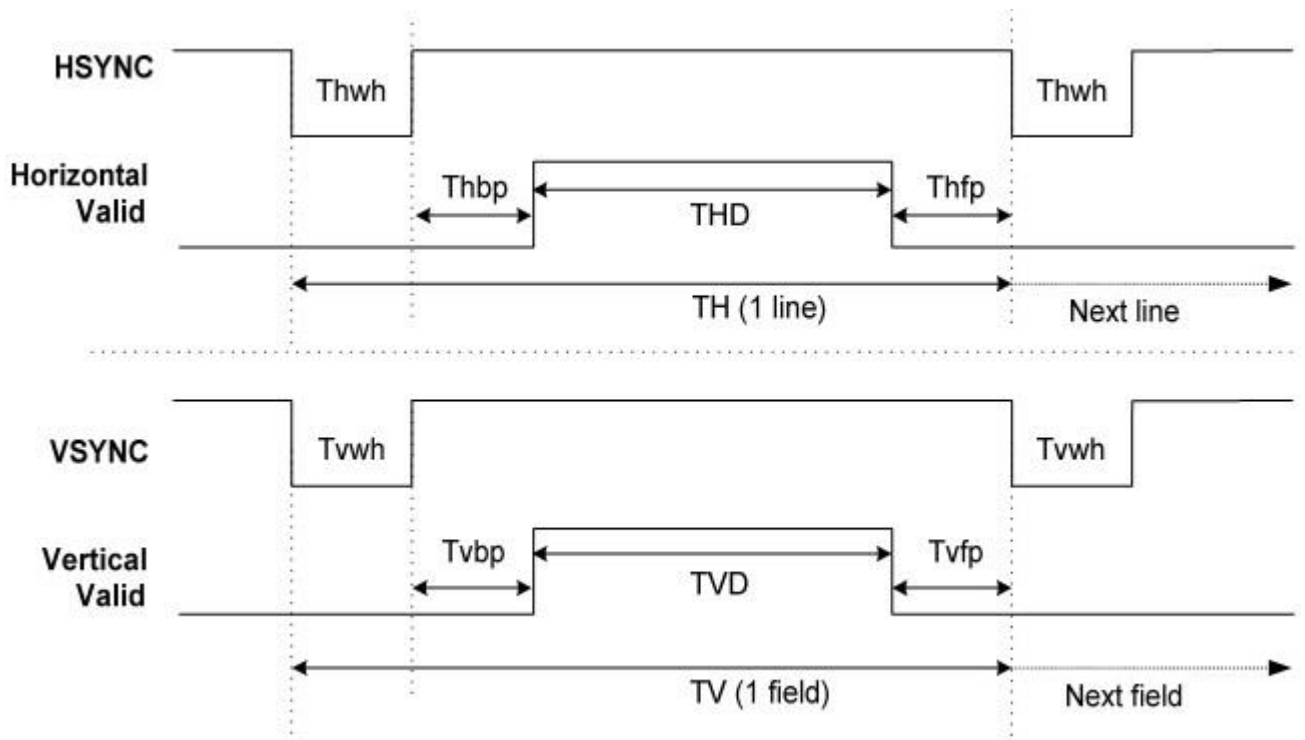




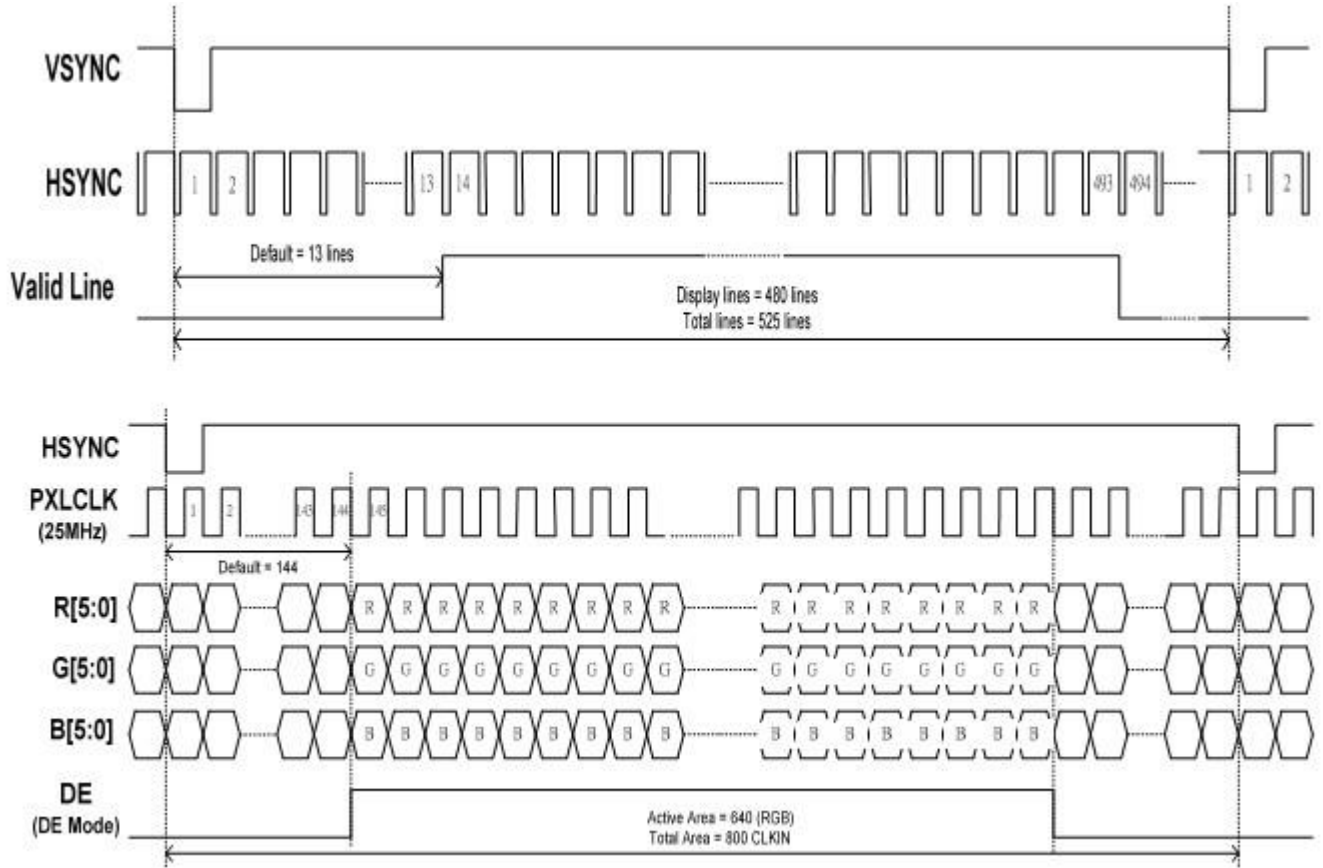
Clock and Data Input Timing Diagram



DE Mode Input Timing

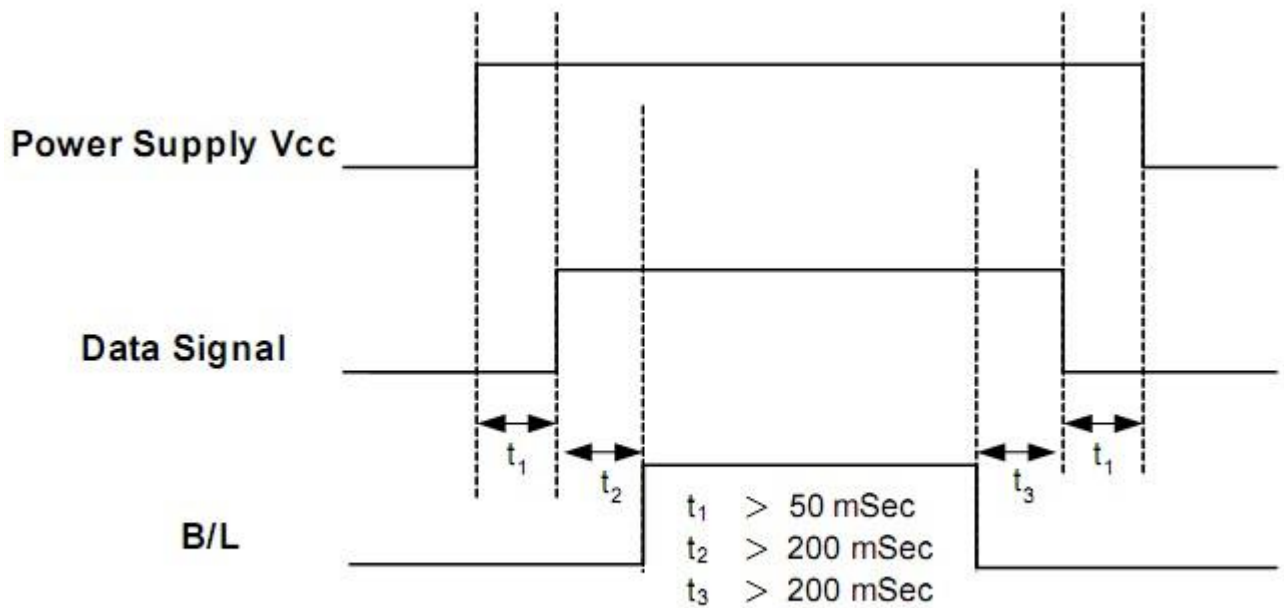


HV Mode Input Timing



18 bit RGB mode for 640*(RGB)*480

(3) Power Sequence



Note: Data includes DE, VS, HS, B0~B5, G0~G5, R0~R5, DCLK.

10 Precautions and Warranty

10.1 Safety

10.1.1 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

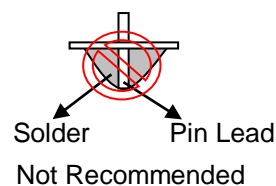
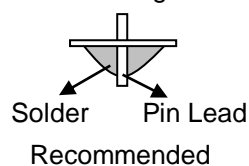
Maximum Solder Temperature: 370°C

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

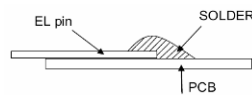
Typical Soldering Time: ≤2s

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

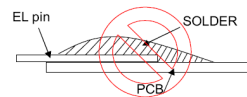
12.4.2.4 No horizontal press on the EL leads during soldering.

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

12.4.2.6 Solder Wetting

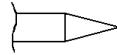


Recommended

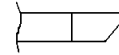


Not Recommended

12.4.2.7 The type of the solder iron:

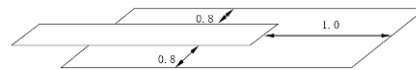


Recommended



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".

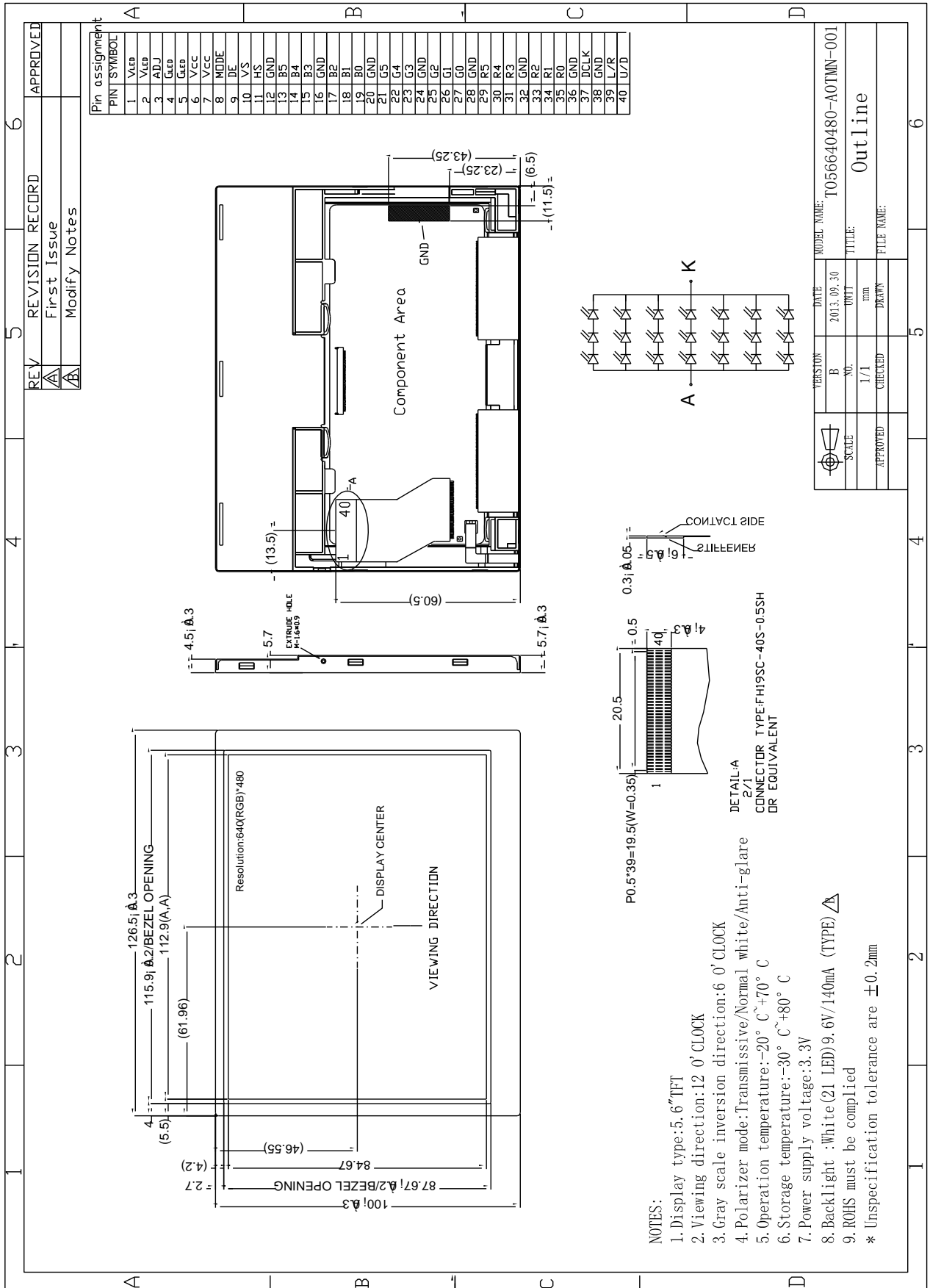
12.6 Static Electricity

- 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	APPROVED
A	First Issue	
B	Modify Notes	

VERSION	DATE	MODEL NAME:
B	2013.09.30	T056640480-A0TWN-001
NO.	UNIT	TITLE:
1/1	mm	Outline
CHECKED	DRAWN	FILE NAME: