ROHS

PRODUCT SPECIFICATION

10.1"MVA TFT LCD MODULE
MODEL: NTFT101s1240600   Ver:1.6

Table of Contents

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)	10.1"	
LCD type	MVA TFT	
Display Mode	Transmissive /Normally White	
Resolution	1024 RGB x 600	Pixels
View Direction	FULL VIEW	Best Image
Module Outline	235(H) x 143(V) x 6.9(T) (Note1)	mm
Active Area	222.72(H) x125.28(V)	mm
Pixel Pitch	217.5(H) x 208.8(V)	um
Pixel Arrangement	RGB Vertical stripe	
Polarizer Surface Treatment	Anti-glare	
Display Colors	262K	
Interface	LVDS Interface	
Driver IC	HX8282+HX8696	
With or without the touch panel	Without	
Operating Temperature	0～50	ºC
Storage Temperature	-20～60	ºC
Weight	205	g

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

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25ºC

Item	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.3	5	V
Storage temperature	T_{STG}	-20	60	ºC
Operating temperature	T_{OP}	0	50	ºC

Note 1: If Ta below 50ºC, the maximal humidity is 90%RH, if Ta over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10℃, and the back ground will become darker at high temperature operating.
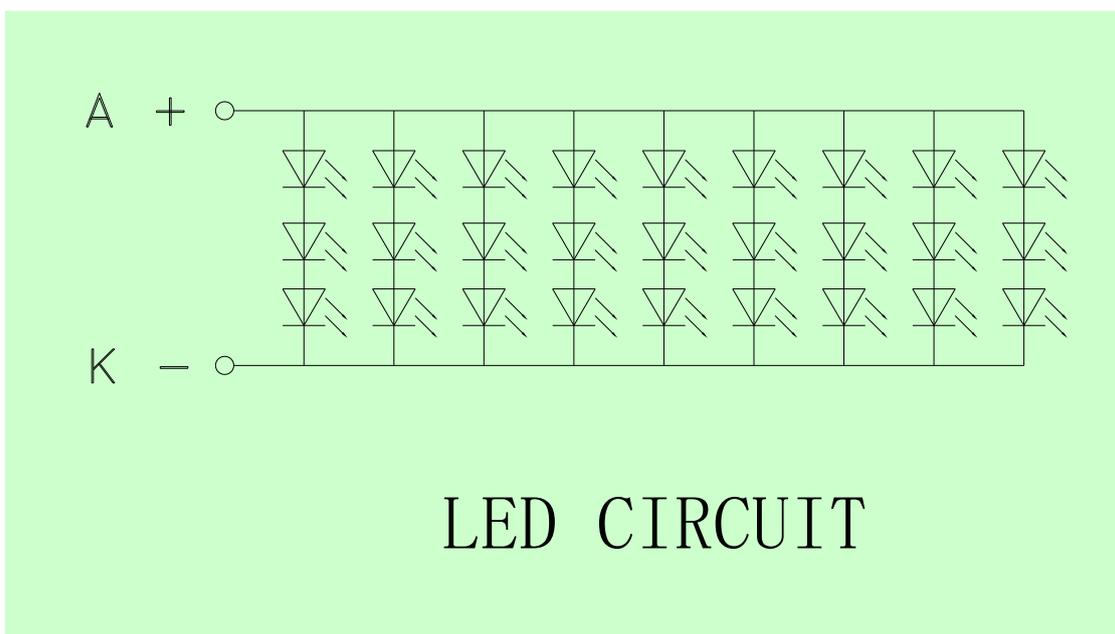
4. DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage		VDD	2.3	3.3	3.6	V
Supply Voltage for EDID		V-EDID	3.0	3.3	3.4	V
Supply Voltage for LED		VLED	4.8	5	24	V
Power Supply Current for LED		I_{LED}	-	340	490	mA
Current Consumption All Black	Logic	I_{CC}+ I_{IN}	200	280	350	mA
	Analog					

5. Backlight Characteristic

5.1. Backlight Characteristic

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	Ta=25 ºC, I_F=15mA/LED	8.7	9.6	10.2	V
Forward Current	I_F	Ta=25 ºC, V_F=3.2V/LED	90	140	180	mA
Power dissipation	P_D	-	873	1344	1836	mW
Uniformity	Avg	-	70	80	-	%
Drive method	Constant current					
LED Configuration	27 White LEDs (3 LEDs in one string and 9 groups in parallel)					

5.2. Backlighting circuit

LED 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 =15mA/LED)		Lv		120	160	-	cd/m²
	Contrast ratio(See 6.3)		CR		400	450	-	
	Response time (See 6.2)		TR+TF		-	8	-	ms
	Chromaticity Transmissive (See 6.5)	Red	XR		0.524	0.574	0.624	
			YR		0.290	0.340	0.390	
		Green	XG		0.255	0.305	0.355	
			YG		0.556	0.606	0.656	
		Blue	XB		0.097	0.147	0.197	
			YB		0.070	0.120	0.170	
		White	XW		0.226	0.276	0.326	
			YW		0.278	0.328	0.378	
	Viewing Angle (See 6.4)	Horizontal	θX+	Center CR≥10	60	75	-	Deg.
			θX-		60	75	-	
		Vertical	φY+		60	75	-	
			φY-		60	75	-	
	NTSC ratio（Color gamut）				-	52	-	%

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)
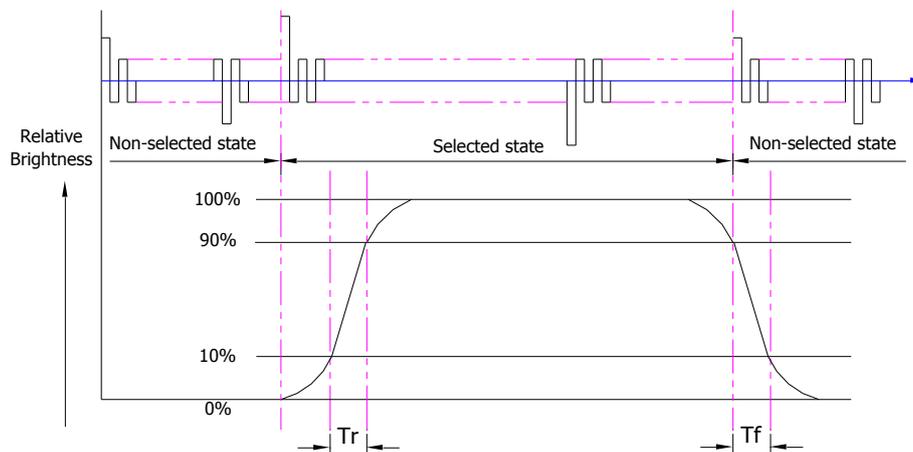
Tr is the time it takes to change form non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

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

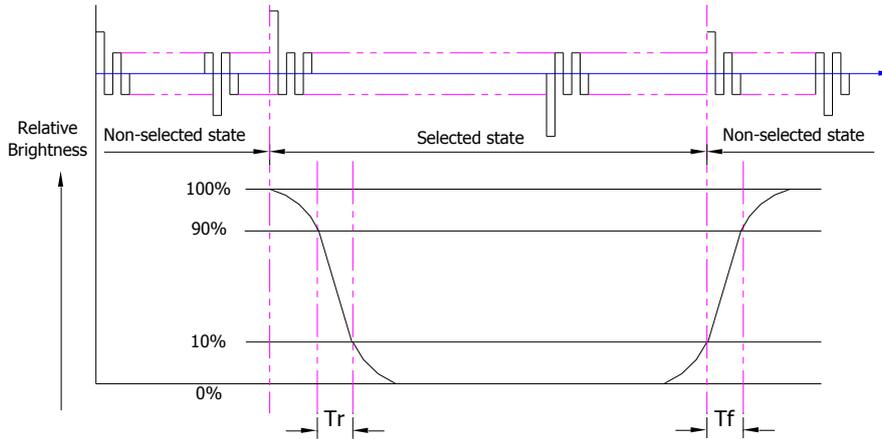6.2.2. Normally White Type (Positive)

Tr is the time it takes to change form 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%;

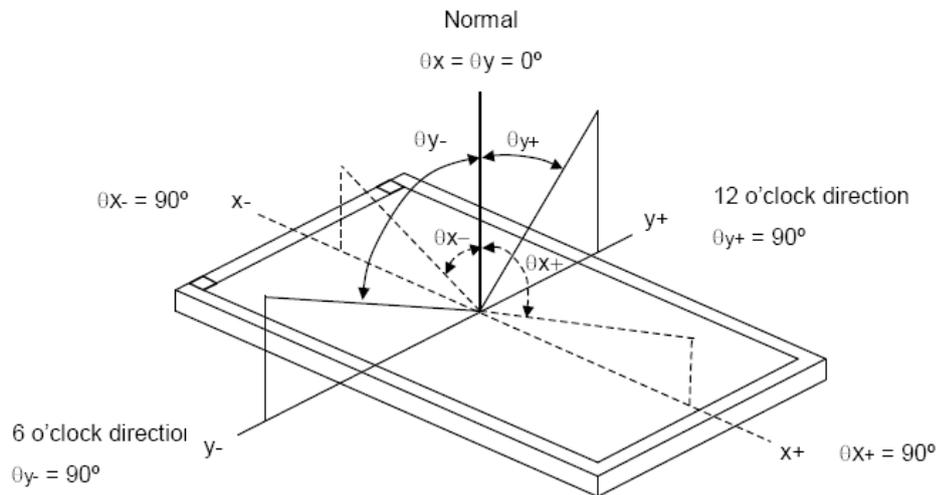Note: Measuring machine: LCD-5100 or EQUI

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
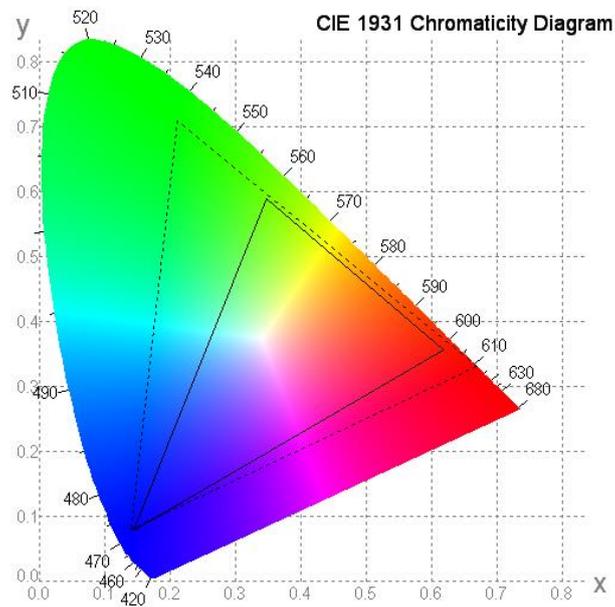
6.4. Definition of Viewing Angles

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

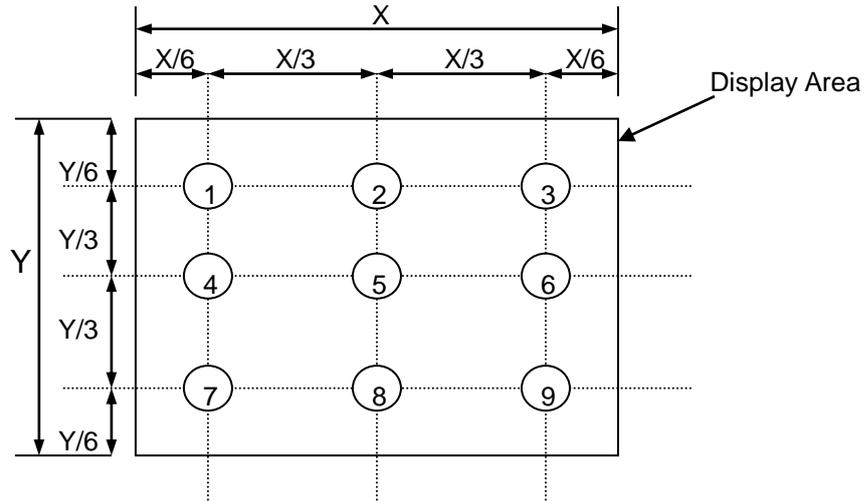Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1.   Surface Luminance: L_V = average (L_{P1}:L_{P9})
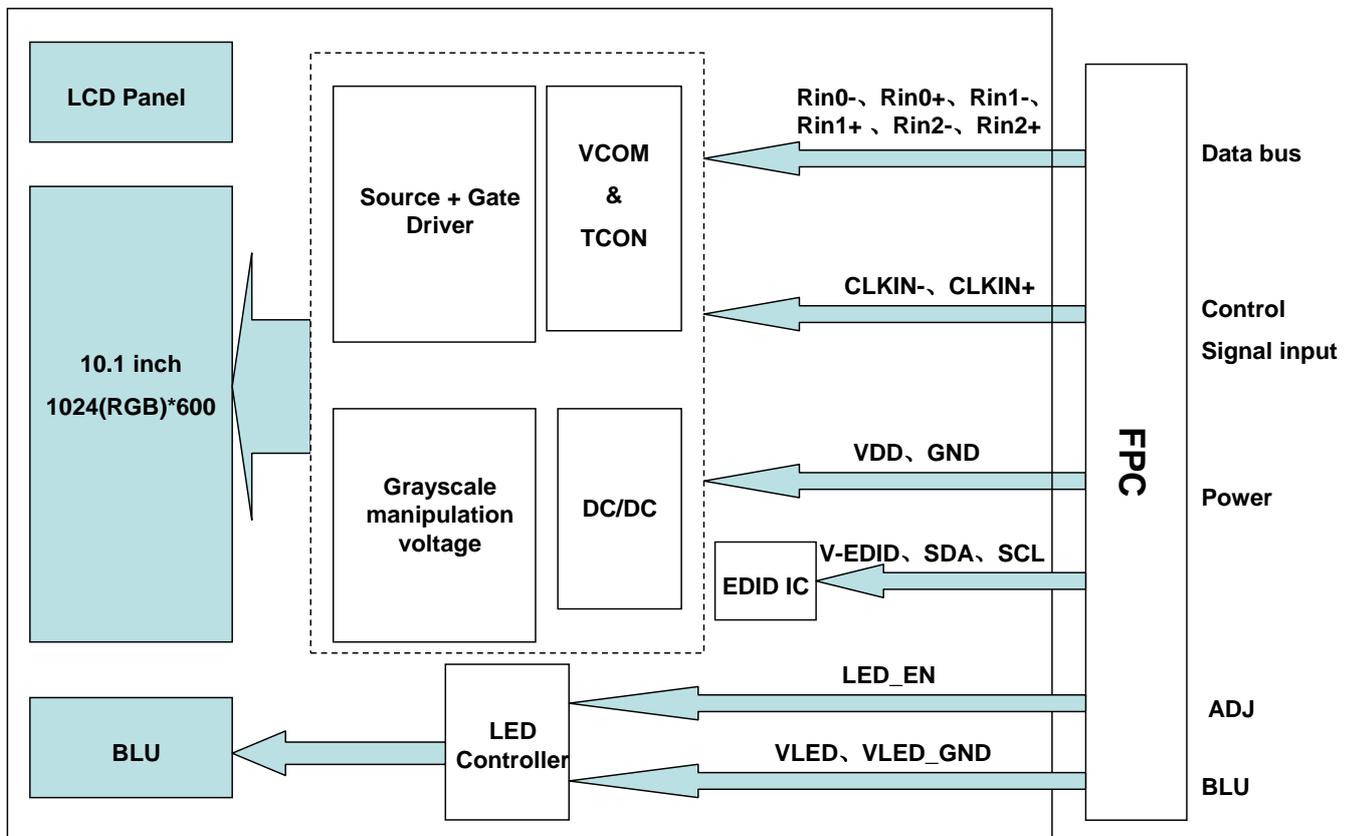
6.6.2.   Uniformity = Minimal (L_{P1}:L_{P9}) / Maximal (L_{P1}:L_{P9}) * 100%

6.6.3.   Transmittance = L_V on LCD / L_V on Backlight * 100%

Note: Measuring machine: BM-7

7. Block Diagram and Power Supply

8. Interface Pins Definition

8.1. FPC CON (Connector: IPEX 20455-040E-12 or Equivalent)

No.	Symbol	Function
1	NC	No connect
2	VDD	3.3V power
3	VDD	3.3V power
4	V-EDID	3.3V Power for EDID
5	NC	No connect
6	SCL	DDC Clock
7	SDA	DDC Data
8	Rin0-	-LVDS differential data input(R0-R5,G0)
9	Rin0+	+LVDS differential data input(R0-R5,G0)
10	GND	Ground
11	Rin1-	-LVDS differential data input(G1-G5,B0-B1)
12	Rin1+	+LVDS differential data input(G1-G5,B0-B1)
13	GND	Ground
14	Rin2-	-LVDS differential data input(B2-B5,HS,VS.DE)
15	Rin2+	+LVDS differential data input(B2-B5,HS,VS.DE)
16	GND	Ground
17	CLKIN-	-LVDS differential clock input
18	CLKIN+	+LVDS differential clock input
19	GND	Ground
20	NC	No connect
21	NC	No connect
22	GND	Ground
23	NC	No connect
24	NC	No connect
25	GND	Ground

26	NC	No connect
27	NC	No connect
28	GND	Ground
29	NC	No connect
30	NC	No connect
31	VLED_GND	LED Ground
32	VLED_GND	LED Ground
33	VLED_GND	LED Ground
34	NC	No connect
35	ADJ	Adjust for LED brightness
36	LED_EN	LED enable pin(+3.3V Input)
37	NC	No connect
38	VLED	LED Power Supply 5V-24V
39	VLED	LED Power Supply 5V-24V
40	VLED	LED Power Supply 5V-24V

Note1: ADJ can adjust brightness to control pin. Pulse duty the bigger the brighter
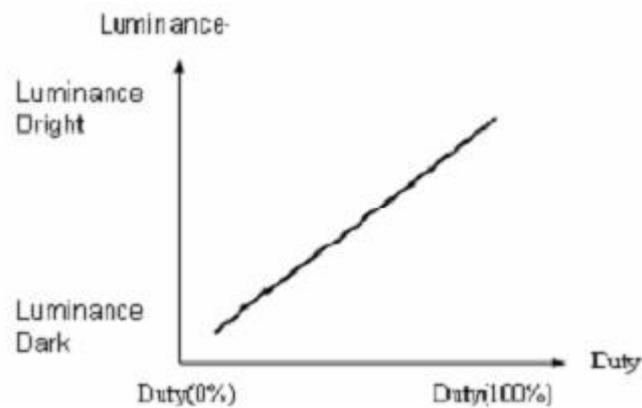
Note2: ADJ Signal=0~3.3V，Operation Frequency：

| Dimming Range		
PWM Frequency (F)	Duty Cycle (Min.)	Duty Cycle (Max.)
100Hz < F < 500Hz	5%	100%
500Hz < F < 20KHz	10%	100%

Duty Cycle = t / T *100%

T = 1 / F
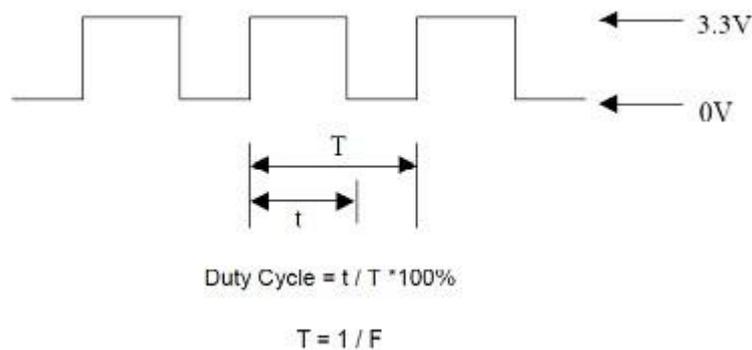
9. INPUT SIGNAL TIMING

9.1 AC ELECTRICAL CHARACTERISTICS

9.1.1 LVDS mode AC electrical characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Clock frequency	RXFCLK	20	-	71	MHz	-
Input data skew margin	TRSKM	500	-	-	pS	| VID |=400mV RXVCM =1.2V RXFCLK =71MHz
Clock high time	TLVCH	-	4/(7* RXFCLK)	-	ns	-
Clock low time	TLVCL	-	3/(7* RXFCLK)	-	ns	-
PLL wake-up time	TemPLL	-	-	150	µs	-
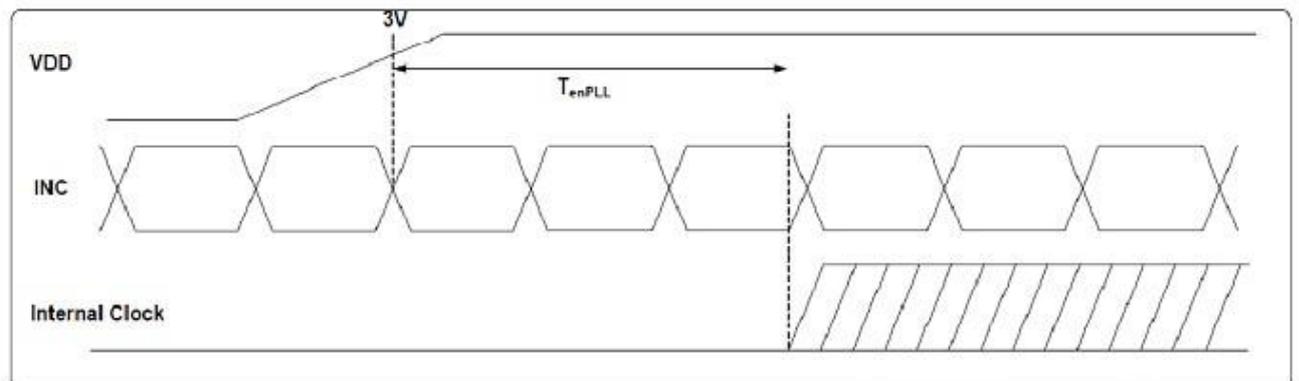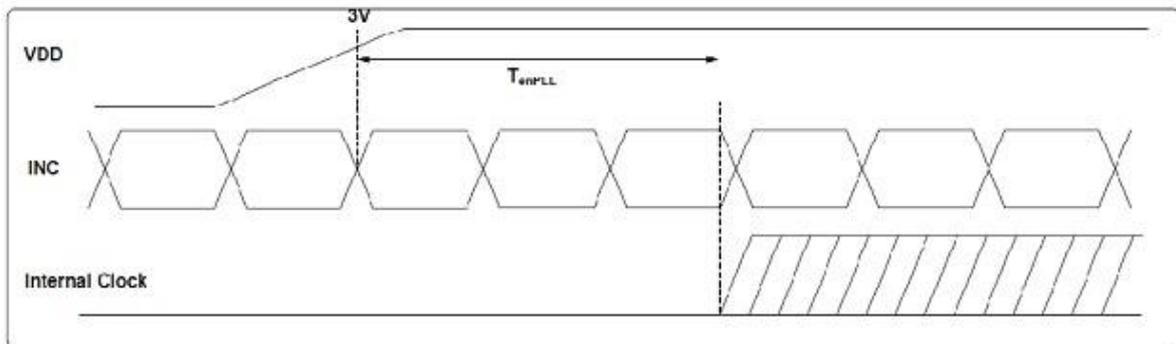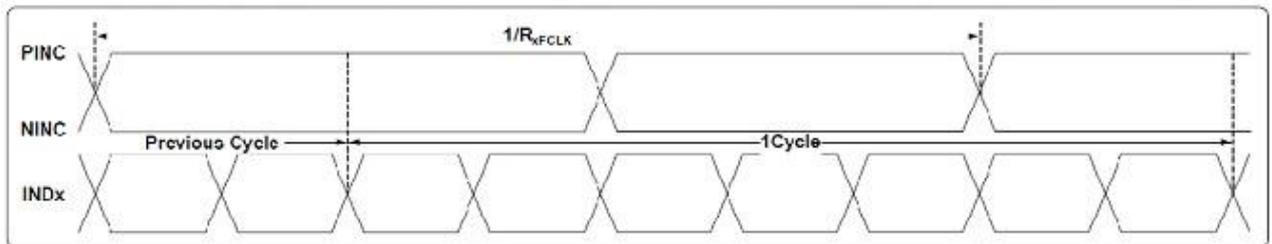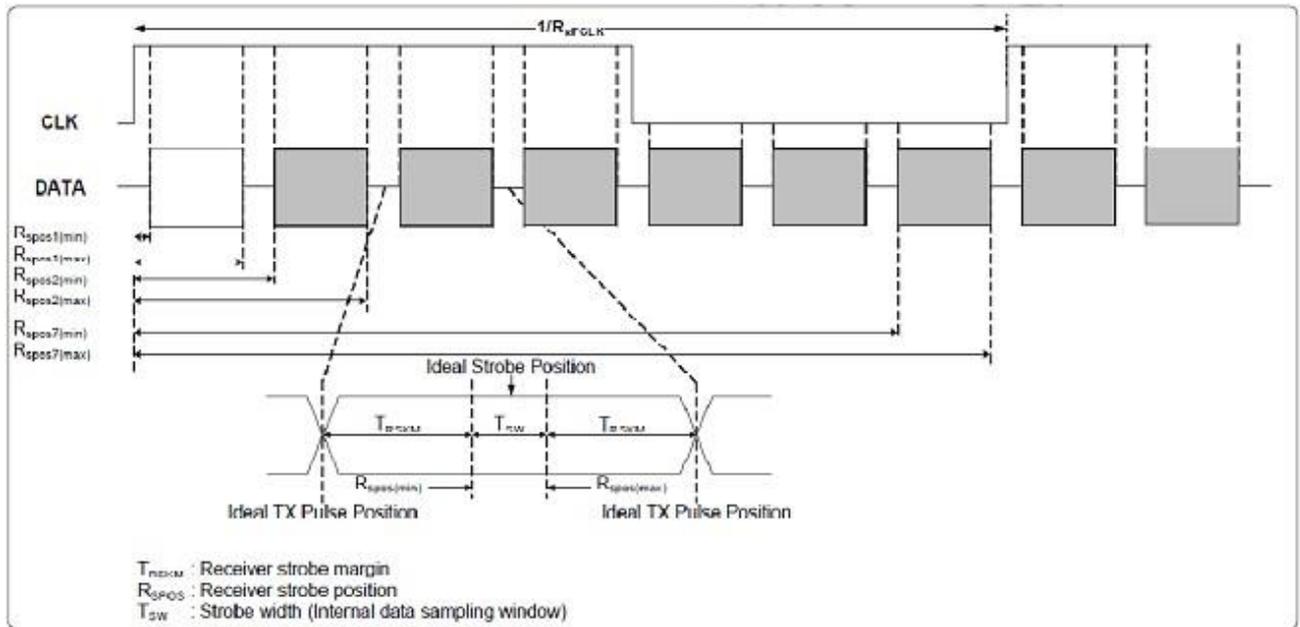
LVDS figure

9.2 Data Input format

9.2.1 LVDS mode data input format

6-bit LVDS input

9.3 Data input format

HV mode

Horizontal timing

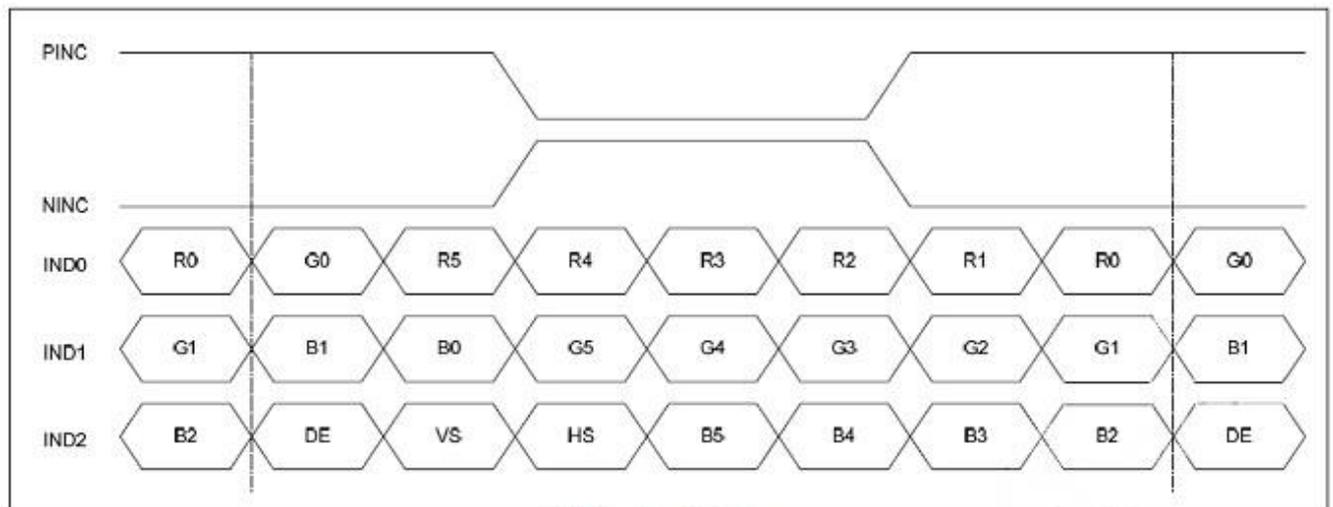| Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	44.9	51.2	63	MHz
Horizontal Display Area	thd		1024		DCLK
HSD Period	th	1200	1344	1400	DCLK
HSD Pulse Width	thpw	1	-	140	DCLK
HSD Back Porch	thbp		160		DCLK
HSD Front Porch	thfp	16	160	216	DCLK

Vertical Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		600		T_H
VSD Period	tv	624	635	750	T_H
VSD Pulse Width	tvpw	1	-	20	T_H
VSD Back Porch	tvbp		23		T_H
VSD Front Porch	tvfp	1	12	127	T_H

Vertical timing
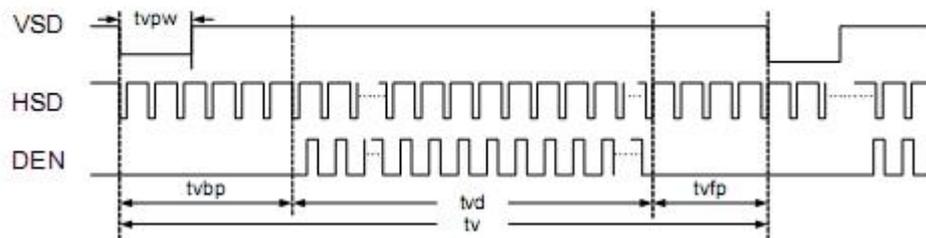
Vertical input timing diagram

Horizontal timing
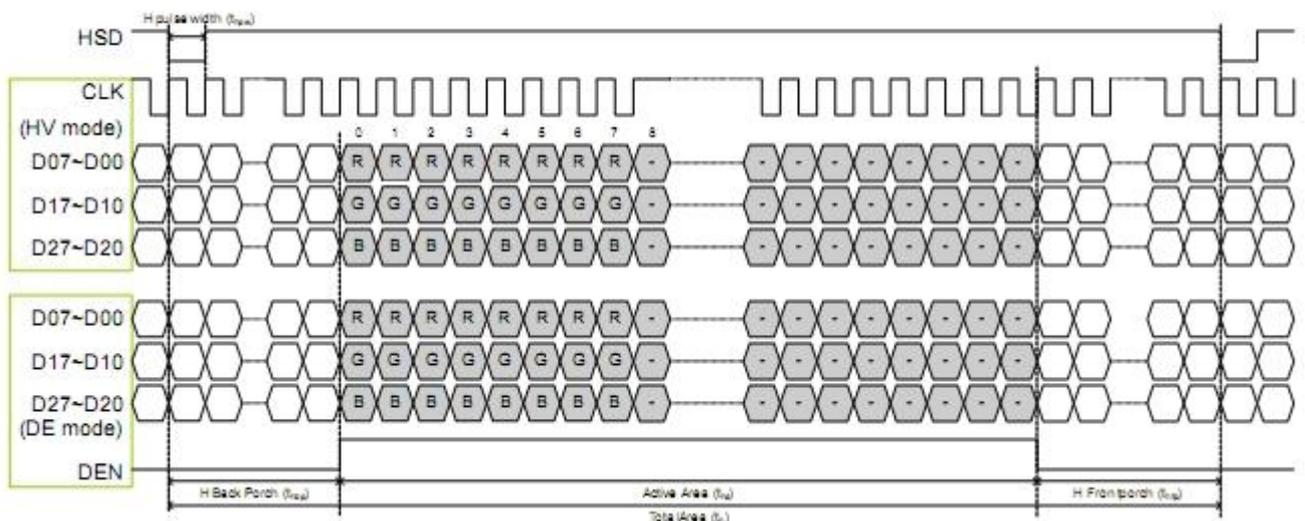
Horizontal input timing diagram

9.4 Power On/Off Sequence

Parameter	SPEC			Unit
	Min.	Typ.	Max.	
T1	1	-	10	ms
T2	60	-	-	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	1	-	-	ms
T6	1000	-	-	ms
T7	50	-	-	ms
T8	50	-	-	ms

10. Precautions and Warranty

12.1 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.
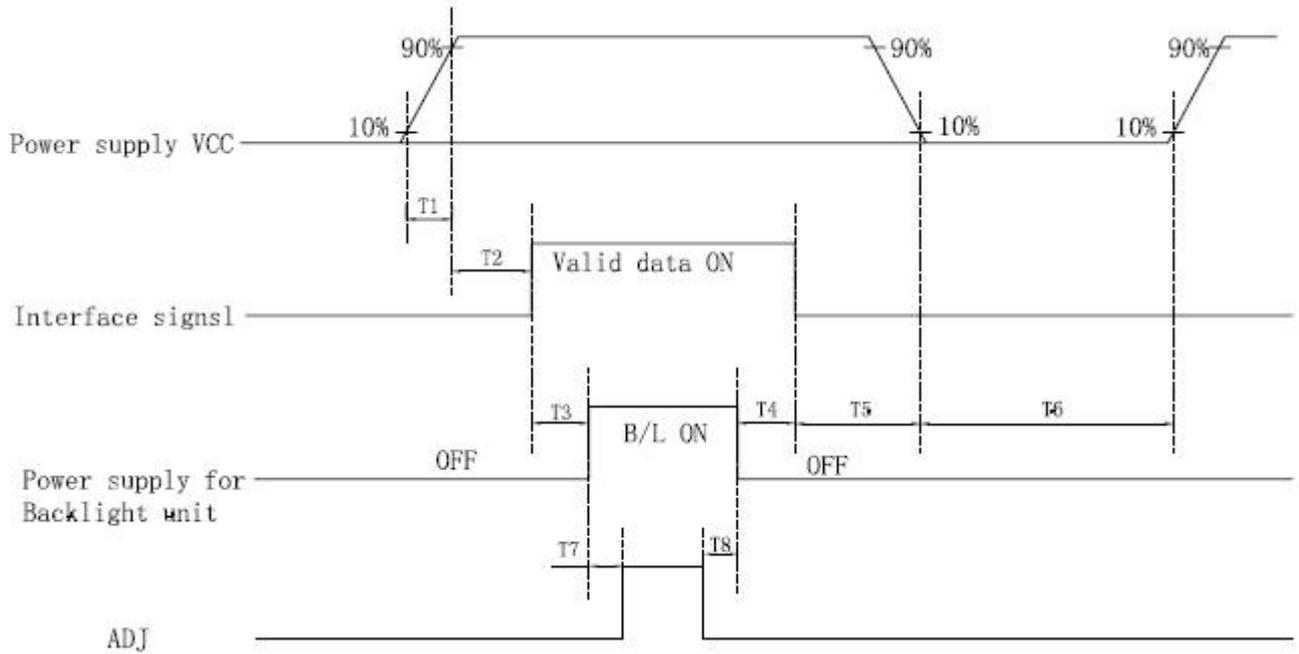
12.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

12.2 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.

12.3 Storage

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

12.4 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℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

12.4.1.3 Solder Wetting

| Solder | Pin Lead | | Solder | Pin Lead |
| Recommended | | | Not Recommended | |
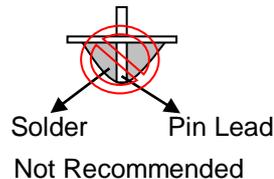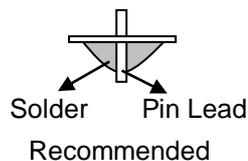
12.4.2 Pins of EL

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℃

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:
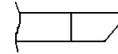
Recommended   Not Recommended

12.4.2.8 Solder Pad
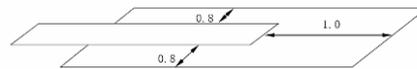
12.5   Operation

12.5.1   Do not drive LCD with DC voltage
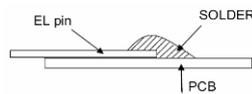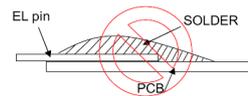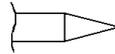
12.5.2   Response time will increase below lower temperature

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.

12.7.3 After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

11. Outline Drawing

Pin assignment

PIN	SYMBOL
1	NC
2	VDD
3	VDD
4	V-EDID
5	NC
6	SCL
7	SDA
8	Rind0-
9	Rind0+
10	GND
11	Rind1-
12	Rind1+
13	GND
14	Rind2-
15	Rind2+
16	GND
17	CLKIN-
18	CLKIN+
19	GND
20	NC
21	NC
22	GND
23	NC
24	NC
25	GND
26	NC
27	NC
28	GND
29	NC
30	NC
31	VLED-GND
32	VLED-GND
33	VLED-GND
34	NC
35	ADJ
36	LED-EN
37	NC
38	VLED
39	VLED
40	VLED

REVISION RECORD

REV	REVISION RECORD	SIGN	DATE
A	First Issue	sjh	10/18
B	Modify the temperature	D.S	03/11
C	Modify the electricity	D.S	03/13
D	Modify the BLU		
E	Add Copper foil		
F	Modify details	D.S	04/01

VERSION	F
DATE	2014.04.01
NO.	1/1
UNIT	mm

MODEL NAME: TI01102600-A1MMN-001
TITLE: Outline
FILE NAME: TI01102600-A1MMN-001_F

DRAWN
CHECKED
SCALE
APPROVED

LED CIRCUIT

COMPONENT
BACK
FRONT
ACTIVE AREA CENTER
component area
1024(RGB)*600

NOTES:
1. Display size:10.1"TFT
2. Viewing direction:FULL VIEW
3. Display mode:Transmissive/Normal white/Anti-glare
4. Operation temperature:0¡ æ~+50¡ æ
5. Storage temperature:-20¡ æ~+60¡ æ
6. Connector model : IPEX 20455-040E-12 or Equivalent
7. Backlight : White(27 LED) / 9.6V/ 140(TYP) mA
8. ROHS must be complied
* Unspecification tolerance are ¡ À0.2mm