( ) Preliminary Specifications

(V) Final Specifications

Module	4.3 Inch Color TFT-LCD
Model Name	G043FTN01.0

Customer	Date
Checked & **Approved by**	**Date**

Customer's sign back page

Approved by	Date
Grace Hung	2018/04/24
Prepared by	**Date**
Elaine Hsu	2018/04/24

General Display Business Division /
AU Optronics corporation

Contents

Record of Revision

Version	Date	Page	Old description	New Description
0.0	2017/12/12	All	First draft specification	
0.1	2018/01/04	4	Remove operating precautions13) 13) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.	
		7	Modify Note5	
		15-16	Pin define change (pin1 to pin 40 & pin 40 to pin1)	
		21	Drawing version: X2	Drawing version: X3
		22	**9.1 Shipping Label** (on the rear side of TFT-LCD display) Printing Example：260S06ZL06123456781Z00	Printing Example： 260S06ZL06123456781Z00 → ZL06123456781Z00: Serial number for AUO internal use 26: Production Week S06: Production site code
0.2	2018/01/11	16	Add Note4: Please leave pin 37, pin 38 and pin39 NC, if these pins are not used.	
		21	Drawing version: X3	Drawing version: X4
		22	Modify 9.2 Carton Package	
1.0	2018/03/15	8	Modify Note6 view angle description and figure	
1.1	2018/04/24	6	Item / Unit / Conditions / Min. / Typ. / Max. White Luminance / cd/m² / IL=11mA (center point) / - / 550 / -	Item / Unit / Conditions / Min. / Typ. / Max. White Luminance / cd/m² / IL=11mA (center point) / 440 / 550 / -

1. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and not to scratch it.

2) Be sure to turn off power supply when inserting or disconnecting from input connector.

3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.

5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.

6) To avoid ESD (Electro Static Discharde) damage, be sure to ground yourself before handling TFT-LCD Module.

7) Do not open nor modify the module assembly.

8) Do not press the reflector sheet at the back of the module to any direction.

9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED light bar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the TFT Module may be damaged.

10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.

11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.

12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.

13) The data on this specification sheet is applicable when LCD module is placed in landscape position.

14) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

2. General Description

This specification applies to the 4.3 inch Color Active Matrix Liquid Crystal Display G043FTN01.0 composed of

a TFT-LCD display and a LED backlight system. G043FTN01.0 supply the WQVGA (480RGB(H)×272(V))

resolution and 16.2M colors by digital RGB 8 bits interface.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25 ^{o}C condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	4.3
Active Area	[mm]	95.04(H)×53.856(V)
Resolution		480RGB(H)×272(V)
Pixel Pitch	[mm]	0.066(R.G.B)×0.198(V)
Pixel Arrangement		R.G.B. Strip
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 (typ.)
Power Consumption	[Watt]	0.39 (max.)
Weight	[Grams]	44 (typ.)
Physical Size	[mm]	105.5(H) × 67.2(V) × 2.9(T)_typ.
Electrical Interface		Parallel Digital RGB 24bit
Surface Treatment		Anti-glare (25%)
Support Color		16.2M Colors
Temperature Range		
Operating	[^{o}C]	-20□ ~ 70□
Storage (Non-Operating)	[^{o}C]	-25□ ~ 70□
RoHS Compliance		Yes

2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25 ^{o}C (Room Temperature):

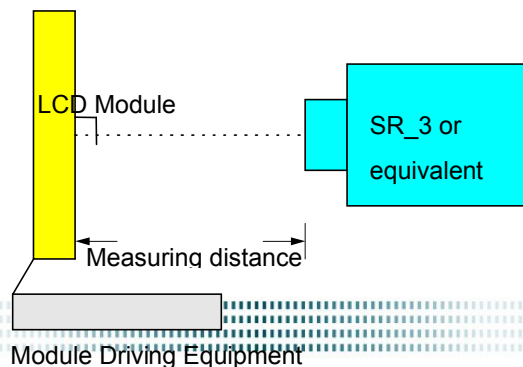| Item	Unit	Conditions		Min.	Typ.	Max.	Note
White Luminance	cd/m^2	IL=11mA (center point)		440	550	-	1
Uniformity	%	9 points		70	75	-	2,3
Contrast Ratio	--			300	400	-	4
Response Time	msec	Rising		-	15	-	5
		Falling		-	20	-	
		Rising + Falling		-	35	-	
Viewing Angle	degree	Horizontal CR >= 10	(Right)	75	80	-	6
			(Left)	75	80	-	
		Vertical CR >= 10	(Upper)	50	55	-	
			(Lower)	60	65	-	
Color / Chromaticity Coordinates (CIE 1931)	--	Red x		0.545	0.595	0.645	
		Red y		0.291	0.341	0.391	
		Green x		0.276	0.326	0.376	
		Green y		0.539	0.589	0.639	
		Blue x		0.102	0.152	0.202	
		Blue y		0.072	0.122	0.172	
		White x		0.255	0.305	0.355	
		White y		0.280	0.330	0.380	
Color Gamut	%			-	50	-	

Note 1: Measurement method (SR3)

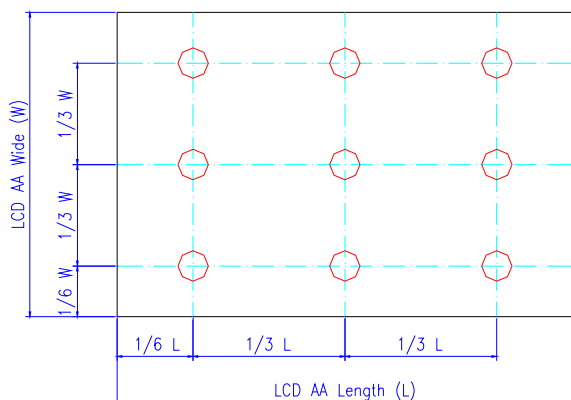Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

      Aperture   1□with 50cm viewing distance

      Test Point   Center

      Environment *< 1 lux*

LCD Module

SR_3 or equivalent

Measuring distance

Module Driving Equipment

Product Specification

AU OPTRONICS CORPORATION

G043FTN01.0

Note 2: Definition of 9 points position

Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

Note 5: Definition of response time:

   The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (rising time) and from "Black" to "White" (falling time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.
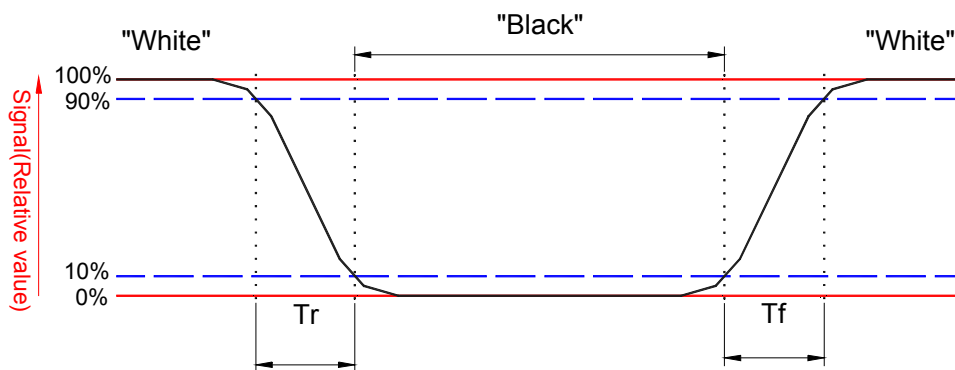
Note 6: Definition of viewing angle (Φ)

Refer to figure as below.
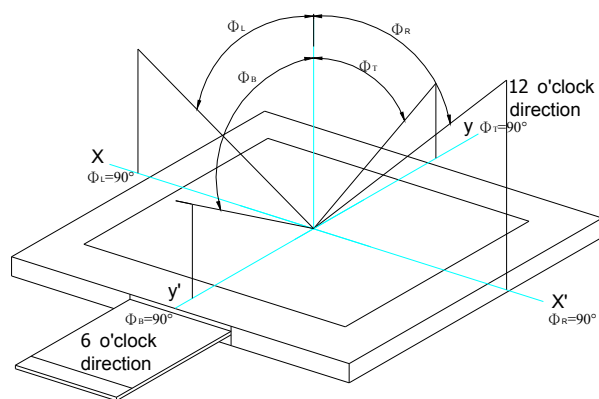
3. Functional Block Diagram

The following diagram shows the functional block of the 4.3 inch color TFT/LCD module:

4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module
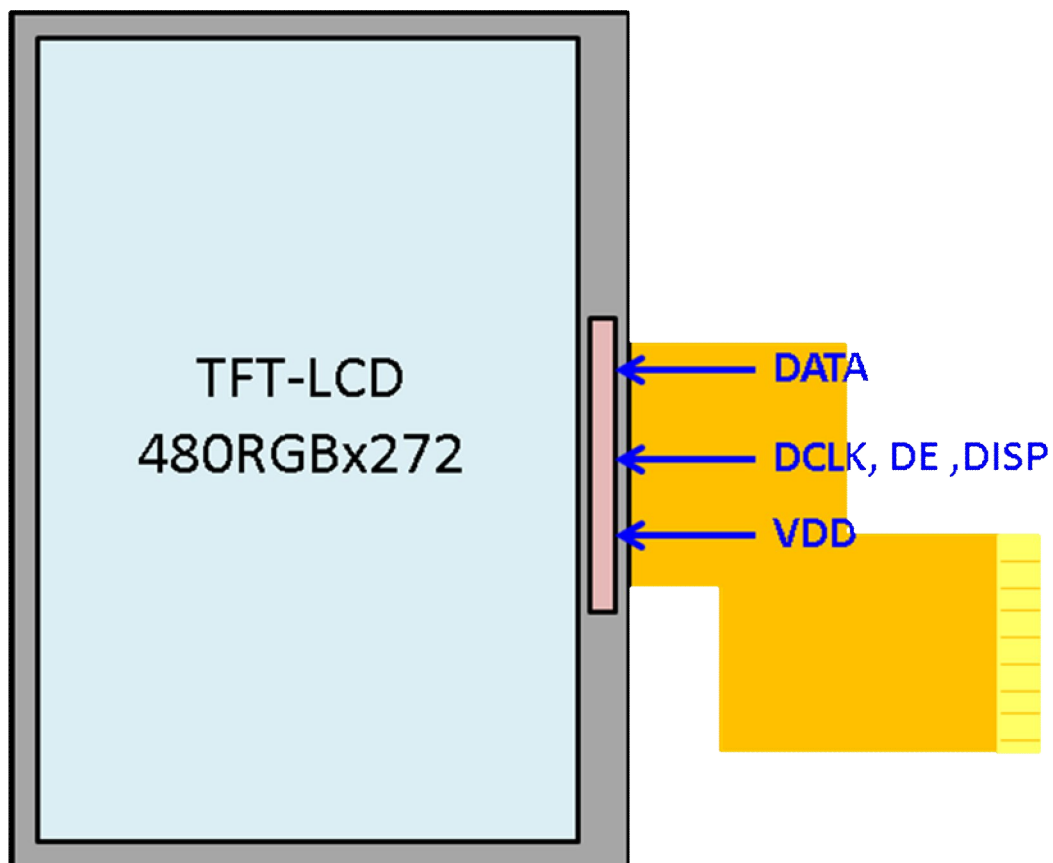
Item	Symbol	Min	Max	Unit
Logic/LCD drive Voltage	VDD	-0.3	6	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-20	70	[^{o}C]
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST	-25	70	[^{o}C]
Storage Humidity	HST	5	90	[%RH]

Note1: Maximum Wet-Bulb should be 39 ^{o}C and no condensation.
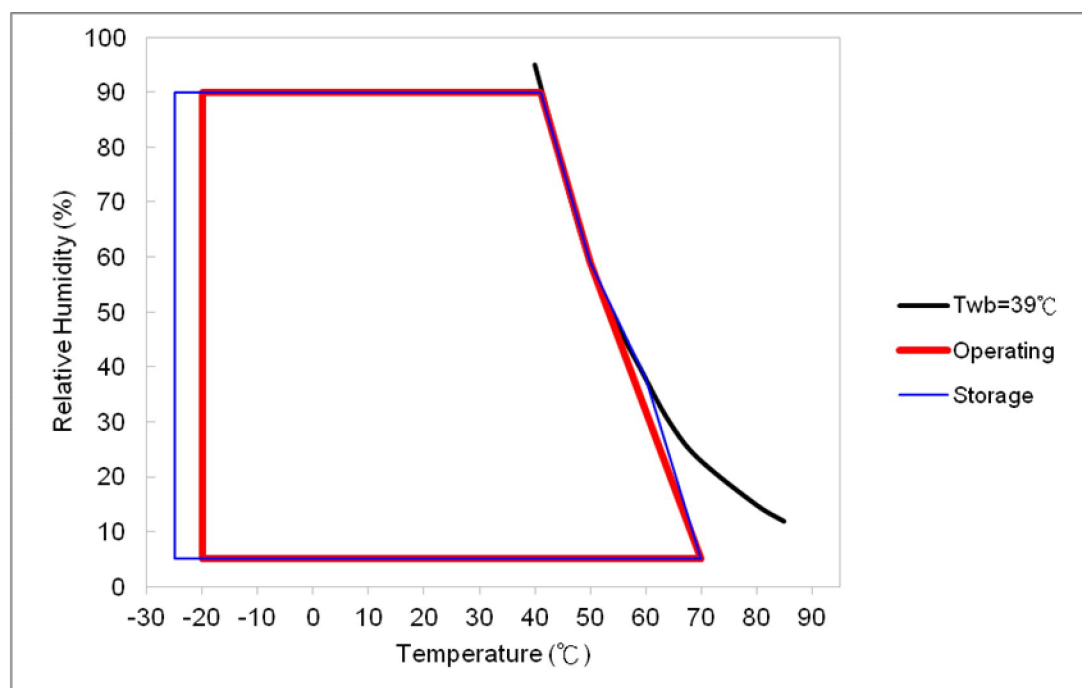
5. Electrical Characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are shown as follows:

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
IDD	VDD Current	-	18	25	[mA]	All Black Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	2	[A]	Note 1
PDD	VDD Power	-	59.4	82.5	[mWatt]	All Black or White Pattern (VDD=3.3V, at 60Hz)
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:
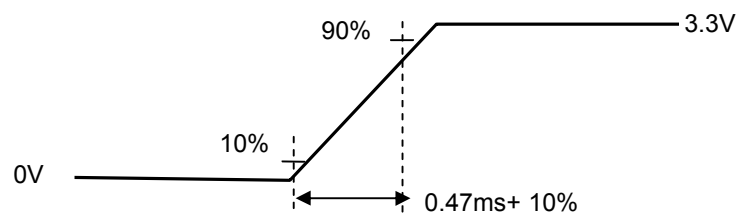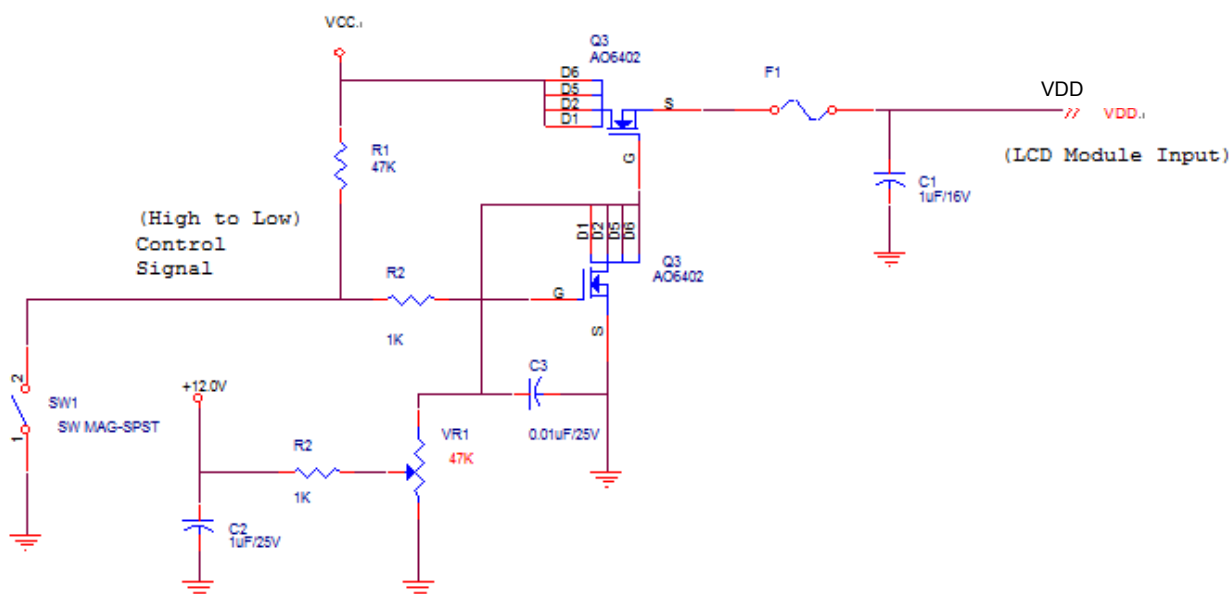
VDD rising time

5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks
Input Signals Voltage	High	VIH	0.7*VDD	-	VDD	Volt	
	Low	VIL	GND	-	0.3*VDD	Volt	

5.1.3 Parameter guideline for LED

Following characteristics are measured under a stable condition using an inverter at 25℃ (Room Temperature):

| Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
I_L	LED Supply Current	-	11	-	[mA]	Ta = 25°C, Note 2
V_L	LED Supply Voltage	-	25.65	27.9	[Volt]	Ta = 25°C Note 2/3
P_{LED}	LED Power Consumption	-	-	0.307	[Watt]	Ta = 25°C Note 3/4/5
L_L	LED Life Time	20,000	30,000	-	Hrs	Ta = 25°C, Note 6/7

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: I_L, V_L are defined for one channel LED. There is one LED channel in back light unit.

Note 3: LED backlight is 9 LEDs (1 strings, 9pcs for each string)

Note 4: The LED supply power is for 1 string of LED

Note 5: The voltage capacity of LED driver IC must be over max. of LED Voltage.
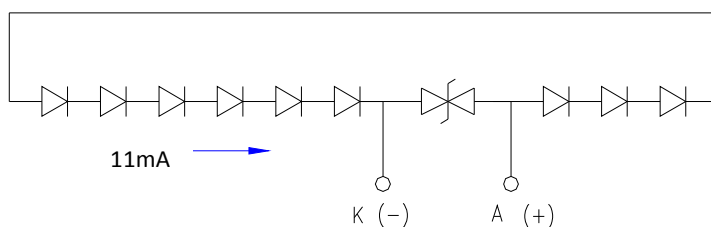
Note 6: Definition of life time: Brightness becomes to 50% of its original value.
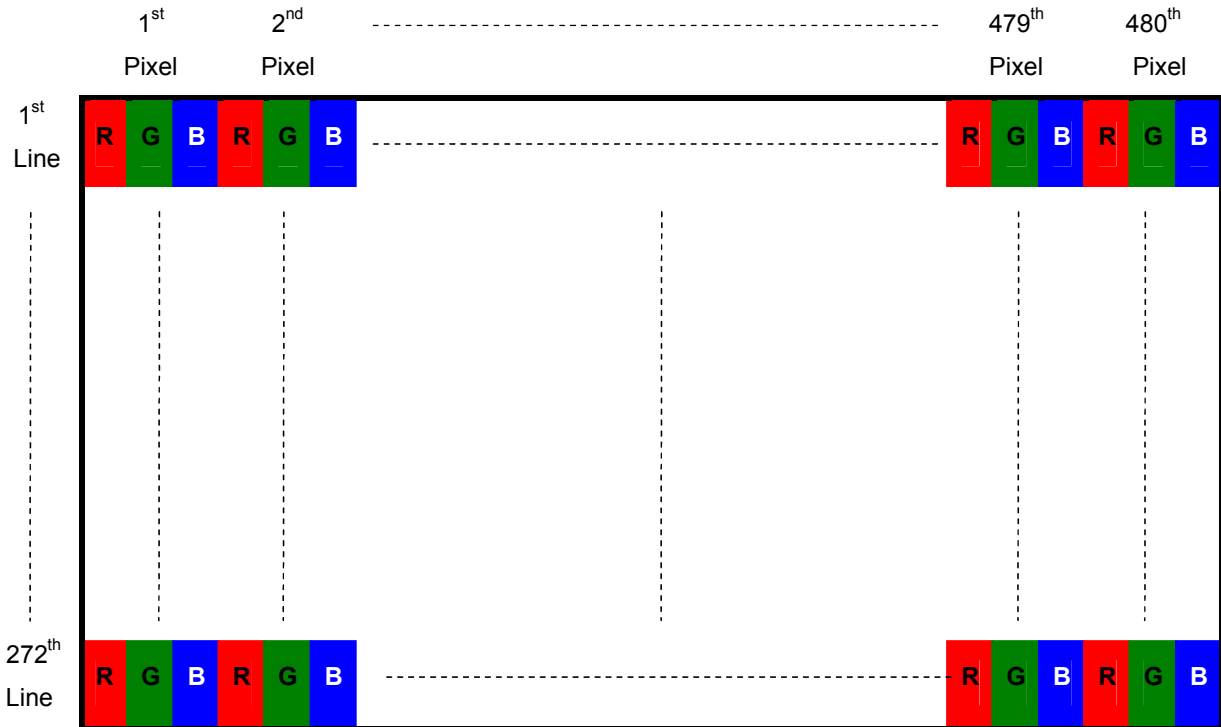
The minimum life time of LED unit is on the condition of I_L and 25±2°C (Room Temperature).

Note 7: If G043FTN01.0 module is driven by high current or at high ambient temperature

& humidity condition. The operating life will be reduce.
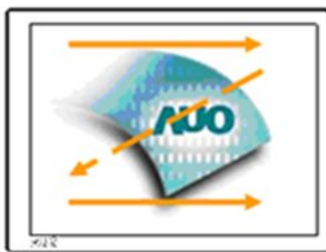
6. Signal Characteristic

6.1.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.
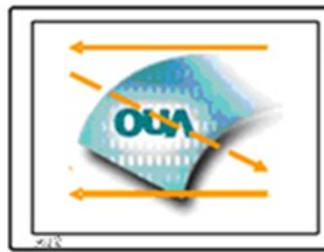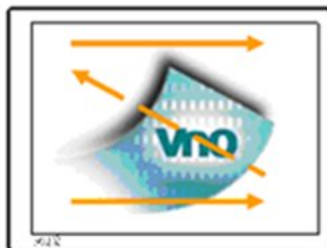

6.1.2 Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of scan.

LR=High; UD=High

LR=Low; UD=High

LR=High; UD=Low

LR=Low; UD=Low

6.2 Signal Description

6.2.1 TFT LCD Module: Connector

Connector Name / Designation	Signal Connector
Manufacturer	HIROSE
Connector Model Number	NA
Adaptable Plug	FH52E-40S-0.5SH

No	Symbol	I/O	Description
1	V_L-	P	Back light cathode
2	V_L+	P	Back light anode
3	GND	P	Ground
4	VDD	P	Power supply
5	R0	I	Data input (LSB)
6	R1	I	Data input
7	R2	I	Data input
8	R3	I	Data input
9	R4	I	Data input
10	R5	I	Data input
11	R6	I	Data input
12	R7	I	Data input (MSB)
13	G0	I	Data input (LSB)
14	G1	I	Data input
15	G2	I	Data input
16	G3	I	Data input
17	G4	I	Data input
18	G5	I	Data input
19	G6	I	Data input
20	G7	I	Data input (MSB)
21	B0	I	Data input (LSB)
22	B1	I	Data input
23	B2	I	Data input
24	B3	I	Data input
25	B4	I	Data input
26	B5	I	Data input

27	B6	I	Data input
28	B7	I	Data input (MSB)
29	GND	P	Ground
30	DCLK	I	Clock for input data Data latched at falling edge of this signal
31	DISP	I	Standby mode. DISP ="1": Normally operation DISP ="0": Standby mode
32	UD	I	Up / Down Display Control UD=H : G1→ G2→ G3→ ⋯→G272 (Default) UD=L : G272→ G271→ ⋯→G1
33	LR	I	Left or Right Display Control LR=H : SO1→ SO2→ SO3→ ⋯→SO480 (Default) LR=L : SO480→ SO479→ SO2→⋯→SO1
34	DE	I	Data input enable
35	NC	--	No connect
36	GND	P	Ground
37	SCL	I	Serial communication clock input.
38	CS	I	Serial communication chip select, low active.
39	SDA	I/O	Serial communication data input and output.
40	GND	P	Ground

Note 1: I: Input pin; O: Output pin; P: Power/Ground

Note 2: Input Signals shall be in low status when VDD is off.

Note 3: High stands for "3.3V", Low stands for "0V", NC means "No Connection".

Note4: Please leave pin 37, pin 38 and pin39 NC, if these pins are not used.

6.3 Interface Timing

6.3.1 Timing Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	Frequency	$1/t_{DCLK}$	5	9	12	MHz	
Frame Rate			50	60	70	Hz	
Frame Frequency	Cycle			16.7		ms	
1 Frame Scanning Time	Cycle	t_v	282	288	400	t_H	
	Display Period	t_{vd}		272		t_H	
	Blanking	t_{vbl}	10	16	128	t_H	
1 Line Scanning Time	Cycle	t_H	495	525	800	t_{DCLK}	
	Display Period	t_{hd}		480		t_{DCLK}	
	Blanking	t_{hbl}	15	45	320	t_{DCLK}	

Note : DE mode.

6.3.2 Input Timing Diagram

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	$1/t_{DCLK}$	5	9	12	MHz	
DCLK width	t_{CW}	33.3	--	--	ns	
Data Setup Time	t_{dst}	6	--	--	ns	Input data to DCLK
Data Hold Time	t_{dhd}	6	--	--	ns	Input data to DCLK
DE Setup Time	t_{dest}	6	--	--	ns	DE to DCLK
DE Hold Time	t_{dehd}	6	--	--	ns	DE to DCLK
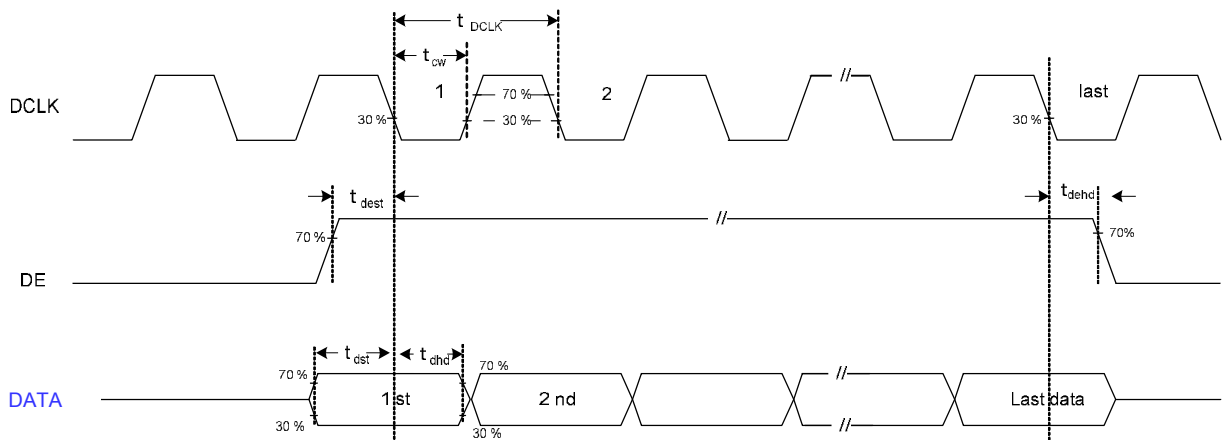
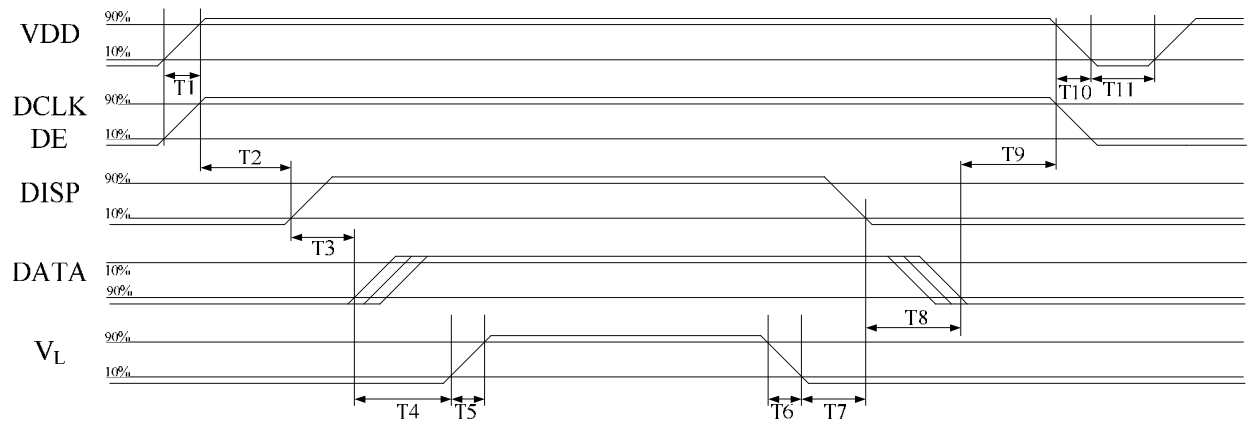**Vertical Timing of Input (DE mode)**
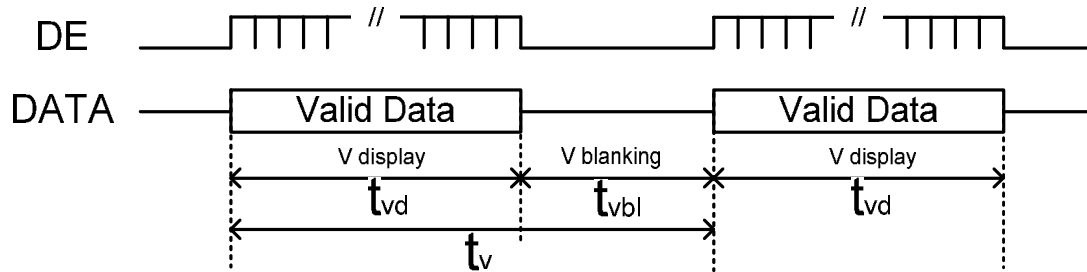
Horizontal Timing of Input (DE mode)
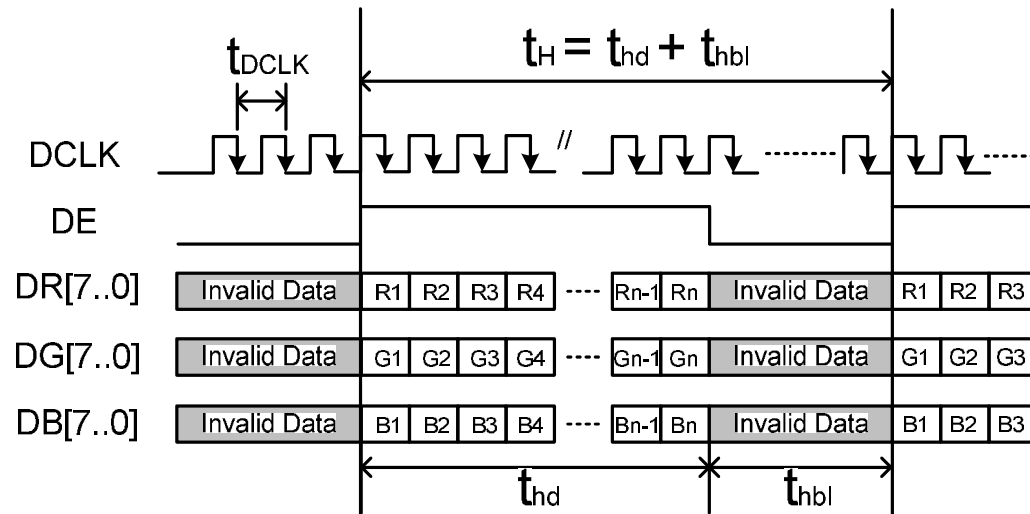
6.4 Power ON/OFF Sequence

6.4.1 Power On/Off Sequence

Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	20	[ms]
T2	20	-	-	[ms]
T3	190	-	-	[ms]
T4	10	-	-	[ms]
T5	0.5	-	10	[ms]
T6	100	-	-	[ms]
T7	10	-	-	[ms]
T8	200	-	-	[ms]
T9	0	16	50	[ms]
T10	-	-	10	[ms]
T11	1000	-	-	[ms]

Note1：The driver IC default mode is standby mode.

It can be changed to normal operation by using DISP hardware pin.

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

7. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	60 ^{o}C /90%,240Hr	
High Temperature Operation	70 ^{o}C, 240Hr	
Low Temperature Operation	-20 ^{o}C, 240Hr	
Hot Storage	70 ^{o}C, 240 hours	
Cold Storage	-25 ^{o}C, 240 hours	
Thermal Shock Test	-25℃/60 min ,70℃/60 min ,50cycles	
Shock Test (Non-Operating)	100G, 6ms for ±x, ±y, ±z; 6 directions,3 times for each direction	
Vibration Test Non-Operating)	1.5G, 10~55~10Hz, Sine wave, 2hrs/axis for 3 direction (X, Y, Z)	
ESD	Contact : ± 4KV/ operation, Class B Air : ± 8KV / operation, Class B	Note 1

Note1: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost

. Self-recoverable. No hardware failures.

8. Mechanical Characteristics
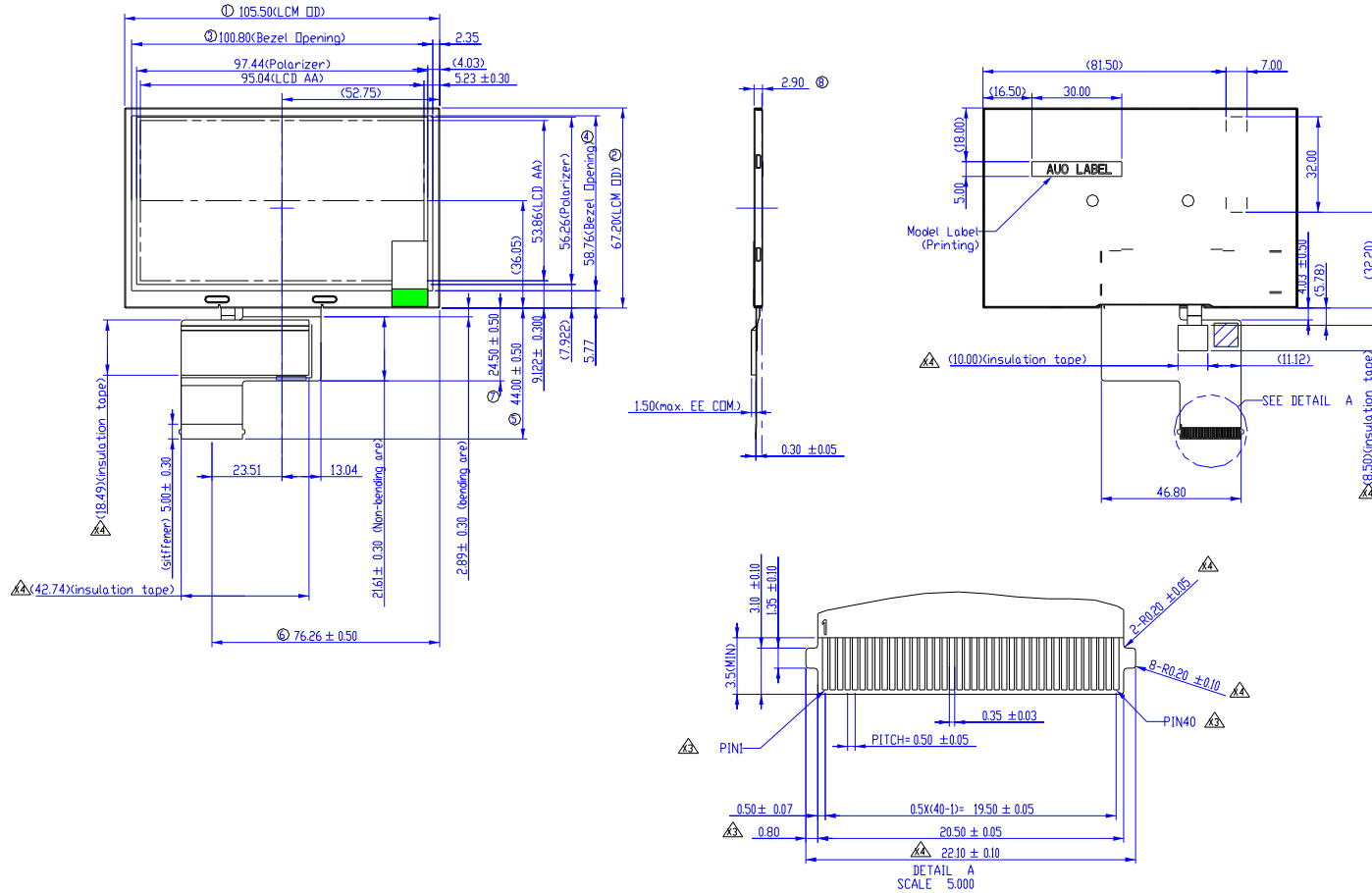
Note:
1. Gerneral tolerance ±0.2 .
2. The bending radius of FPC should be larger than 0.6 .
3. *The thickness of solder area .
4. Unit : mm.

DETAIL A
SCALE 5.000

9. Label and Packaging

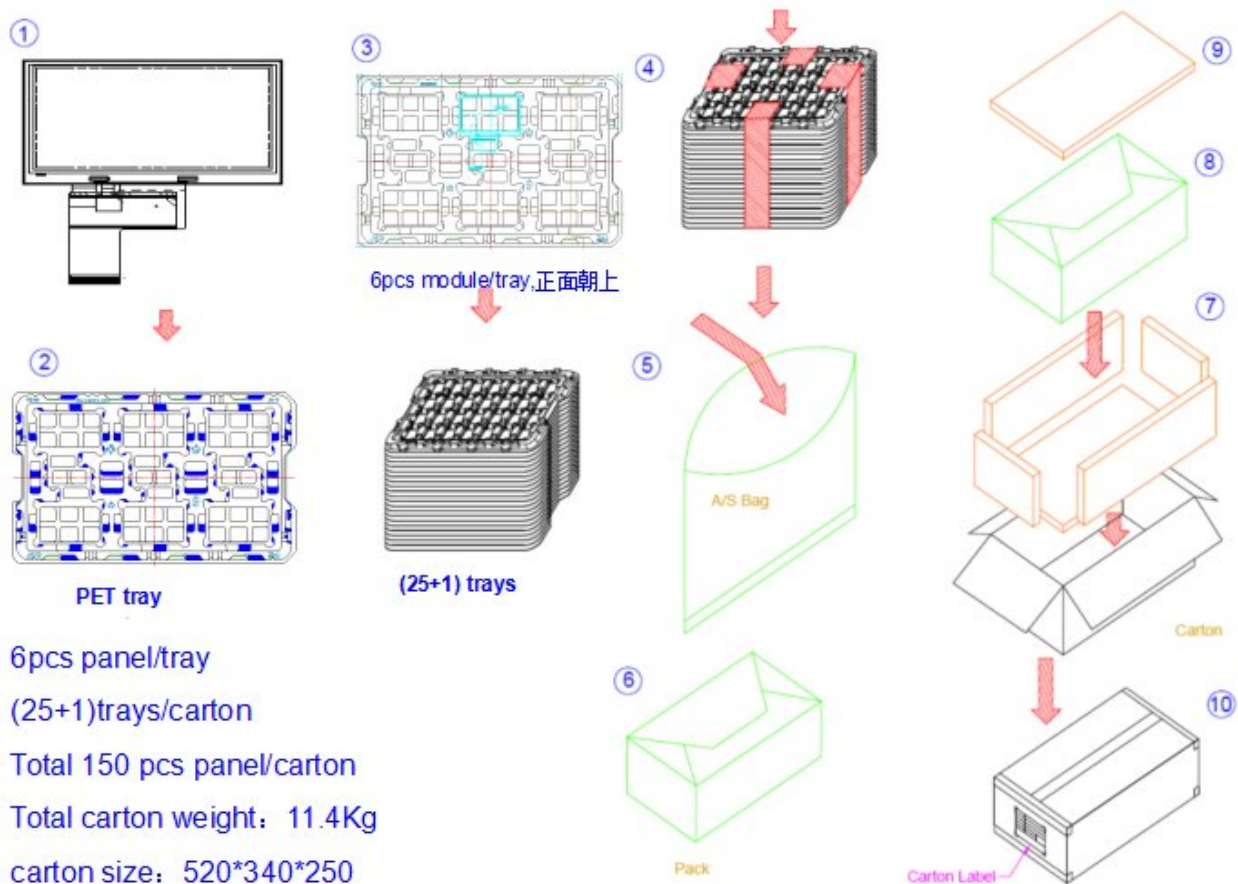### 9.1 Shipping Label (on the rear side of TFT-LCD display)

Printing

Example：

260S06ZL06123456781Z00 ⟶ ZL06123456781Z00:
Serial number for AUO internal use

26: Production Week

S06: Production site code

9.2 Carton Package

6pcs module/tray, 正面朝上

PET tray

(25+1) trays

A/S Bag

Pack

Carton

Carton Label

6pcs panel/tray

(25+1)trays/carton

Total 150 pcs panel/carton

Total carton weight：11.4Kg

carton size：520*340*250

10. Safety

10.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

10.2 Materials

10.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

10.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.
The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

10.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

10.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

UL 60950-1 second edition   U.S.A. Information Technology Equipment