




TFT Module Specification

MODEL: 13-121GIEB4GD1-A1

< ◇ > PRELIMINARY SPECIFICATION

< ◆ > APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
		

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RECORD OF REVISION

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1. GENERAL DESCRIPTION

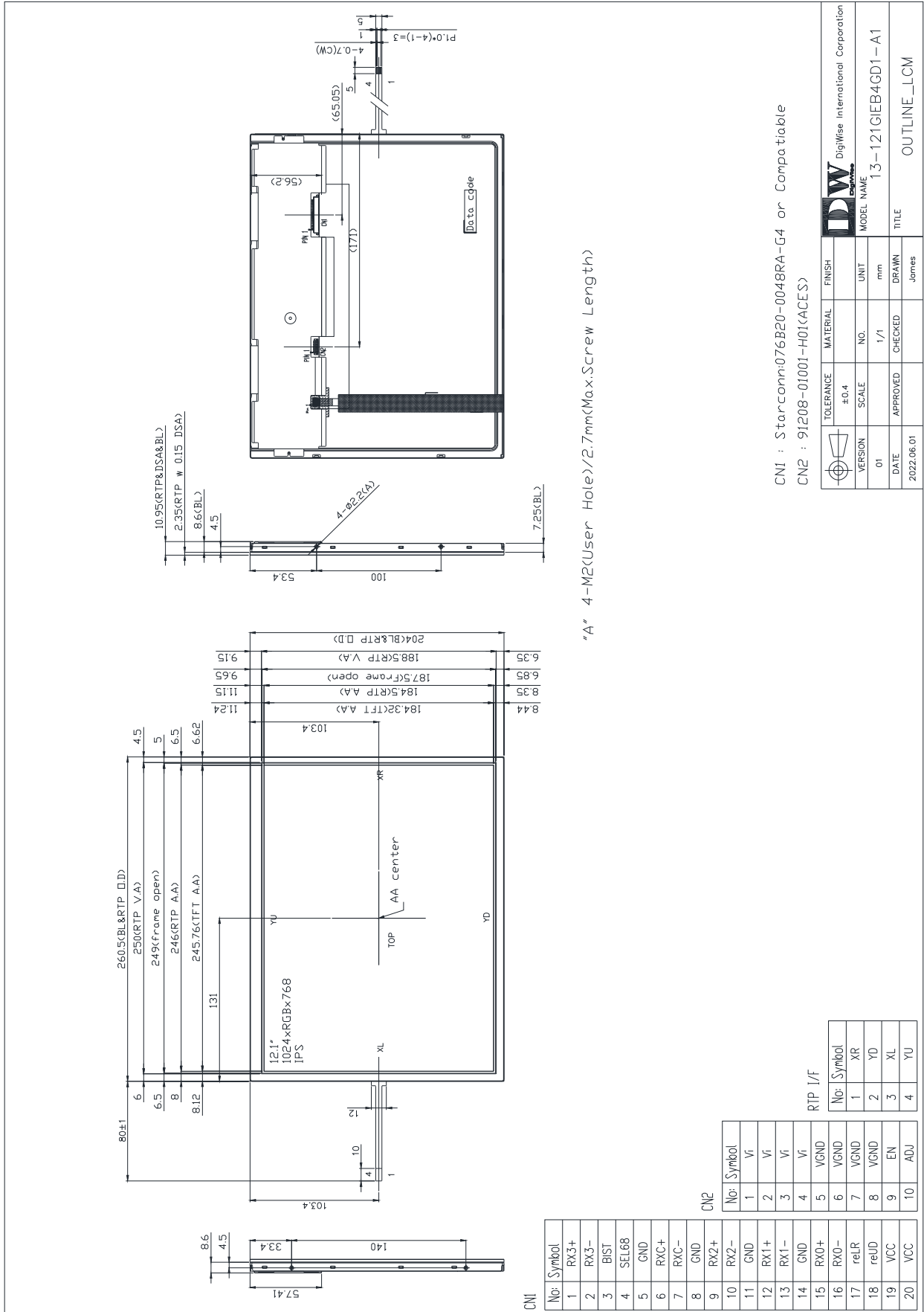
1.1 Description

The specifications is model 13-121GIEB4GD1-A1 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, a back light system and a 4-wire touch panel. This TFT LCD has a 12.1 (4:3) inch diagonally measured active display area with XGA (1024 horizontal by 768 vertical pixels) resolution.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	12.1"	Inch
2	Number of Pixels	1024 (W) x RGB x 768 (H)	Pixels
3	Active Area	245.76 (W) × 184.32 (H)	mm
4	Pixel Pitch	0.240 (W) x 0.240 (H)	mm
5	Outline Dimension	260.5 (W) × 204 (H) × 10.95 (T)	mm
6	Number of Colors	262K/16.2M	- -
7	Display Mode	IPS / Normally Black / Transmissive	- -
8	View Direction	Free direction	- -
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Anti-Glare (3H)	- -
11	Contrast Ratio	900 (Typ.)	- -
12	Luminance (cd/m ²)	450 (Typ.)	cd/m ²
13	Interface	LVDS 6/8 bit Interface	- -
14	Backlight	White LED	- -
15	Operation Temperature	-20 ~ 70	°C
16	Storage Temperature	-30 ~ 80	°C
17	Weight	(740)	g

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

3.1 TFT LCD Module(CN1)

Pin	Symbol	I/O	Function	Note
1	RX3+	I	Differential Data Input, CH3 (Positive)	
2	RX3-	I	Differential Data Input, CH3 (Negative)	
3	BIST	I	Normal operation/BIST pattern select. BIST="1" : BIST mode. BIST="0" : Normal operation.	
4	SEL68	I	LVDS 6/8 bit select function control, Low or NC → 6 bit Input Mode High → 8 bit Input Mode	
5	GND	P	Ground	
6	RXC+	I	Differential Clock Input (Positive)	
7	RXC-	I	Differential Clock Input (Negative)	
8	GND	P	Ground	
9	RX2+	I	Differential Data Input , CH2 (Positive)	
10	RX2-	I	Differential Data Input , CH2 (Negative)	
11	GND	P	Ground	
12	RX1+	I	Differential Data Input , CH1 (Positive)	
13	RX1-	I	Differential Data Input, CH1 (Negative)	
14	GND	P	Ground	
15	RX0+	I	Differential Data Input, CH0 (Positive)	
16	RX0-	I	Differential Data Input, CH0 (Negative)	
17	reLR	I	Left or right display control SHLR="1" : Right → Left SHLR="0" :Left → Right	
18	reUD	I	Up / down display control UPDN="1" : Down → Up UPDN="0" : Up → Down	
19	VCC	P	Power supply	
20	VCC	P	Power supply	

Note 1: "Low" stands for 0V. "High" stands for 3.3V

Note 2: Connector Part No.: STARCONN 076B20-0048RA-G4 or JAE FI-SEB20P-HFE or equivalent.

Note 3: User's connector Part No.: JAE FI-SE20ME or equivalent.

3.2 Backlight Unit(CN2)

Pin	Symbol	I/O	Function	Note
1	Vi	P	Converter input voltage	12V
2	Vi	P	Converter input voltage	12V
3	Vi	P	Converter input voltage	12V
4	Vi	P	Converter input voltage	12V
5	VGND	P	Converter ground	Ground
6	VGND	P	Converter ground	Ground
7	VGND	P	Converter ground	Ground
8	VGND	P	Converter ground	Ground
9	EN	I	Enable pin	3.3V
10	ADJ	I	Backlight Adjust	PWM Dimming (100Hz-30KHz, Hi: 2.0~3.3V,Lo : 0~0.8V)

Note 1: Connector Part No.: 91208-01001-H01 (ACES) or equivalent.

Note 2: User's connector Part No.: 91209-01011 (ACES) or equivalent

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 TFT LCD Module

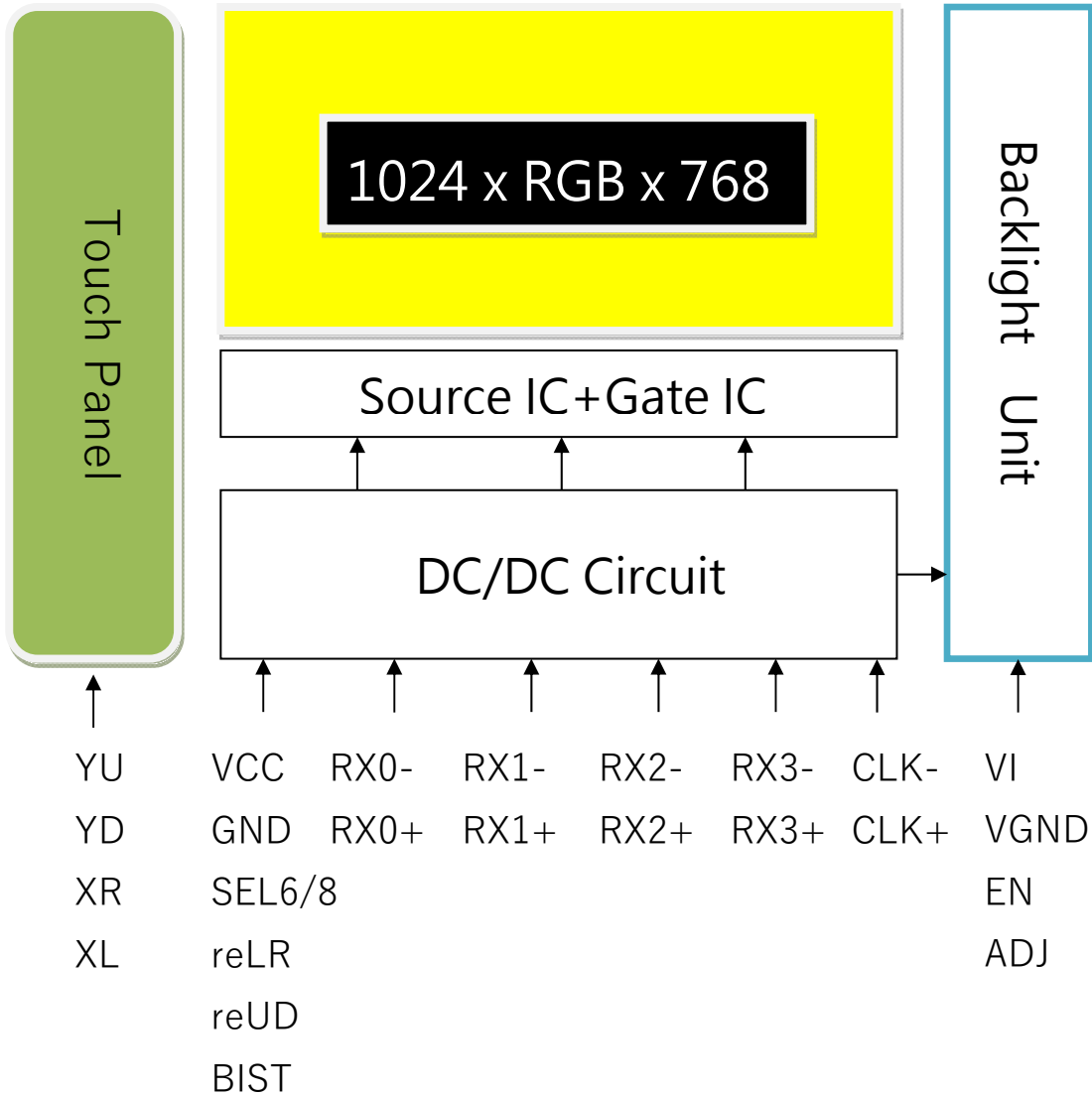
Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VCC	-0.3	+5.0	V	

4.1.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-20	-	70	°C	Ambient temperature
Storage Temperature	Tstg	-30	-	80	°C	

5. BLOCK DIAGRAM

5.1 TFT LCD Module



6. Relationship Between Displayed Color and Input

6.1 6 bit

	Color & Gray Scale	Data Signal																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262K-color display can be achieved on the screen.

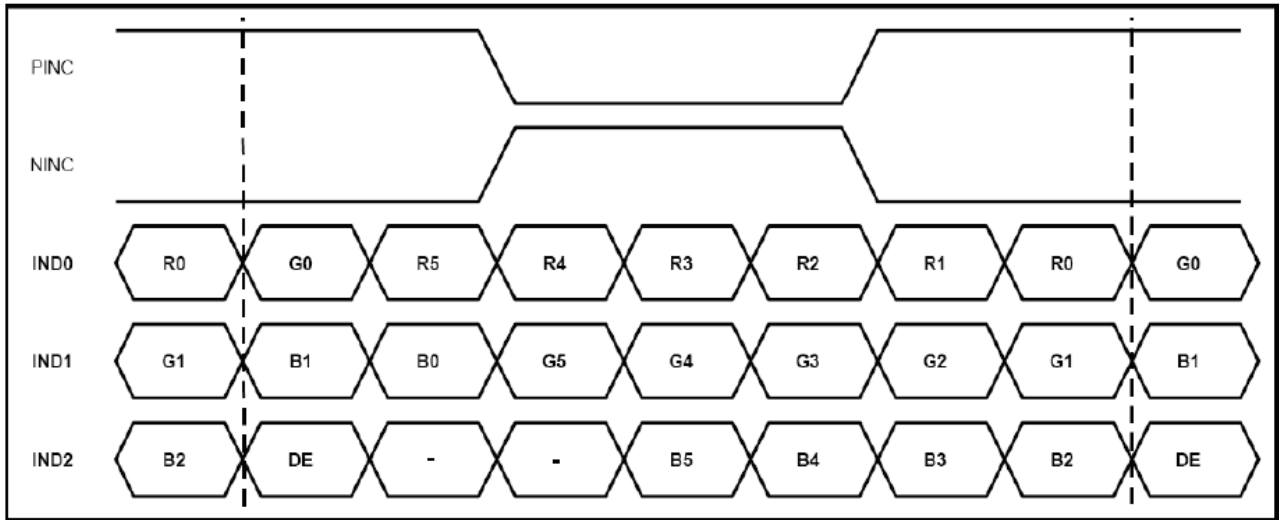
6.2 8 bit

	Color & Gray Scale	Data Signal																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Red(127)	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Green(127)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	

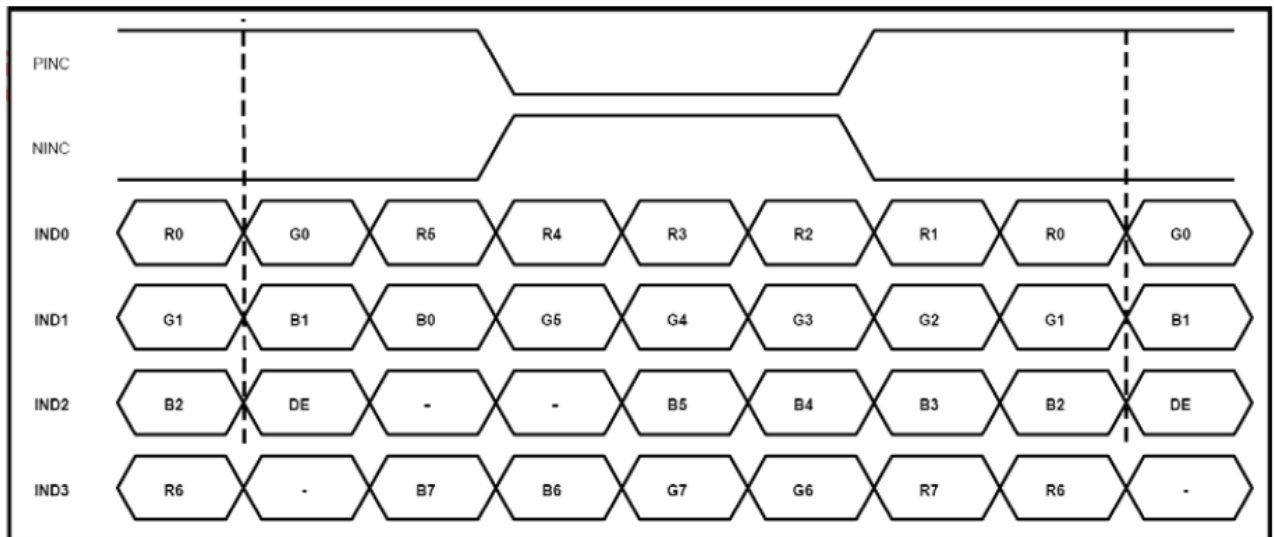
0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16.2M-color display can be achieved on the screen

6.3 Data Mapping



6bit LVDS input



8bit LVDS input

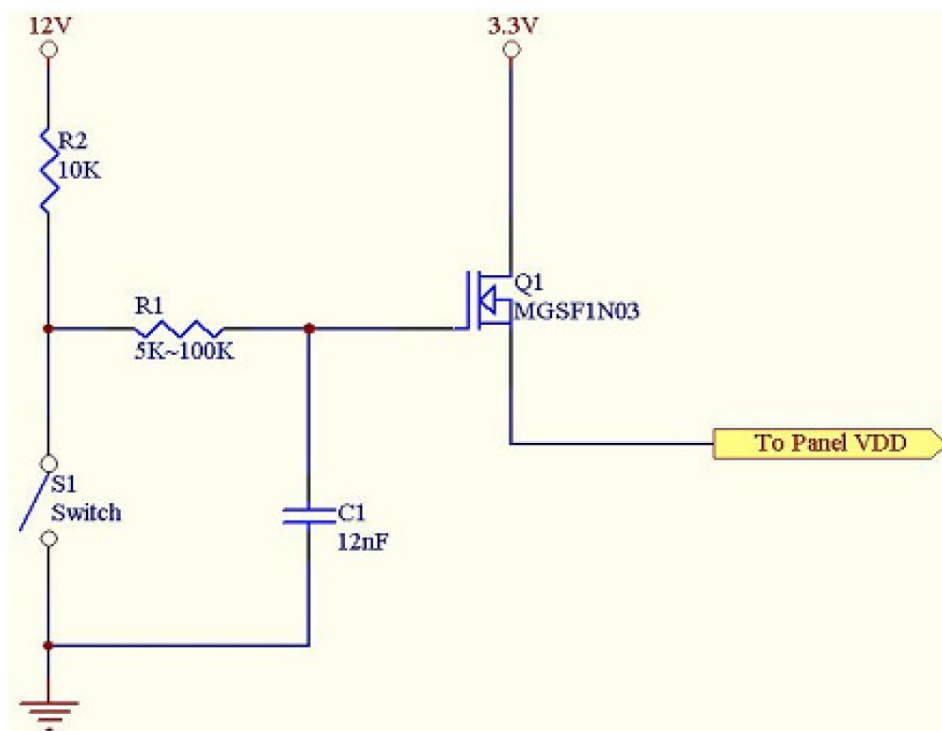
7. ELECTRICAL CHARACTERISTICS

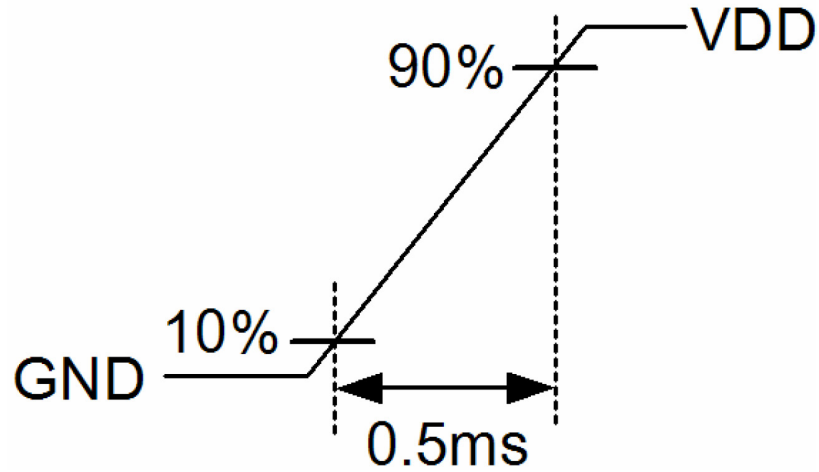
7.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note	
Power supply	VCC	3.0	3.3	3.6	V		
Rush Current	IRUSH	-	-	2.0	A		
VDD Power	PDD	-	0.8	1.2	W	V _{DD} = 3.3V white pattern (L255)	
Input Voltage for logic	Differential Input High Threshold	VTH	100	-	+300	mV	
	Differential Input Low Threshold	VTL	-300	-	-100	mV	
Magnitude differential Input Voltage	VID	200	-	600	mV		
Differential input common mode voltage	VCM	1.0	1.2	1.7 - VID / 2	V		

Note 1: The assembly should be always operated within above ranges.

Note 2: Measurement Conditions:





Note 3: The specified power supply current is under the conditions at $V_{cc} = 3.3\text{ V}$ or 5 V , $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is

a. White Pattern



Active Area

b. Black Pattern



Active Area

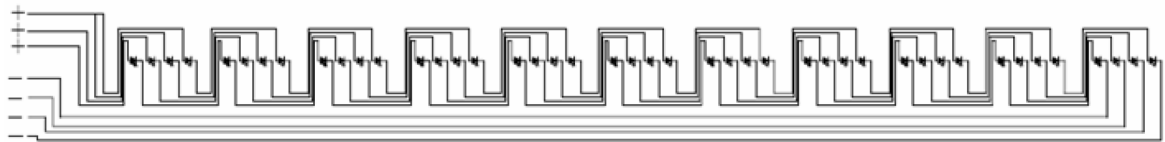
7.2 Backlight Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Converter Power Supply Voltage	V_i	10	12	16	V	
Converter Power Supply Current	I_i	-	0.4	0.5	A	$V_i=12V$
EN Control Level	Backlight on	1.4	3.3	5.0	V	
	Backlight off	0	-	0.8	V	
PWM Control Level	High Level	2.0	3.3	6.0	V	
	Low Level	0	-	0.8	V	
PWM Control Frequency	fPWM	100	-	30K	Hz	(4)
PWM Control Duty Ratio		10	-	100	%	
LED Life Time		-	50000	-	Hr	

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3^\circ C$, typical I_L value indicated in the above table until the brightness becomes less than 50%.

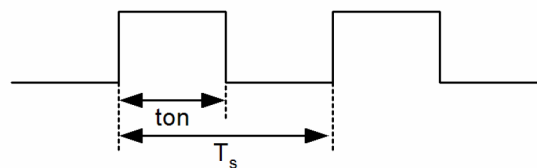
Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^\circ C$ and $I_i=850mA$, the LED lifetime could be decreased if operating I_L is larger than 850mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit



BLU circuit : 11S-4P

Note (4) Dimming controller waveform



$$T_D = \text{ton} \div T_s \times 100\%$$

$$F_{\text{PWM}} = 1 \div T_s$$

7.3 INTERFACE SPECIFICATIONS

7.3.1 Timing Specifications

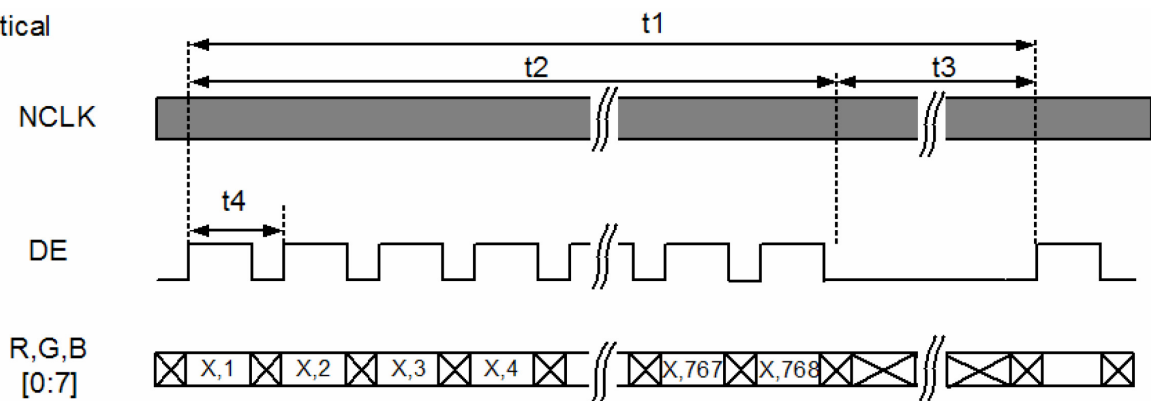
Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK	CLK frequency	Fc	51.2	53.8	56.2	MHz	
DE	Vertical Total Time	Tv	783	798	813	Th	
	Vertical Addressing Time	Tvd	768			Th	
	Vertical Blank	Tvb	15	30	45	Th	
	Horizontal Total Time	Th	1104	1124	1144	Tc	
	Horizontal Addressing Time	Thd	1024			Tc	
	Horizontal Blank	Thb	80	100	120	Tc	

Note 1: Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

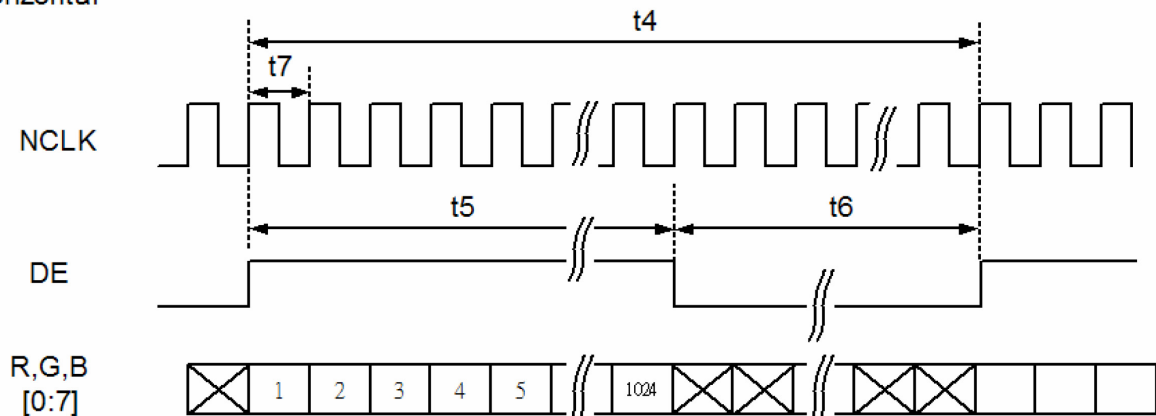
Note 2: Frame rate is 60Hz

7.3.2 Input signal timing diagram

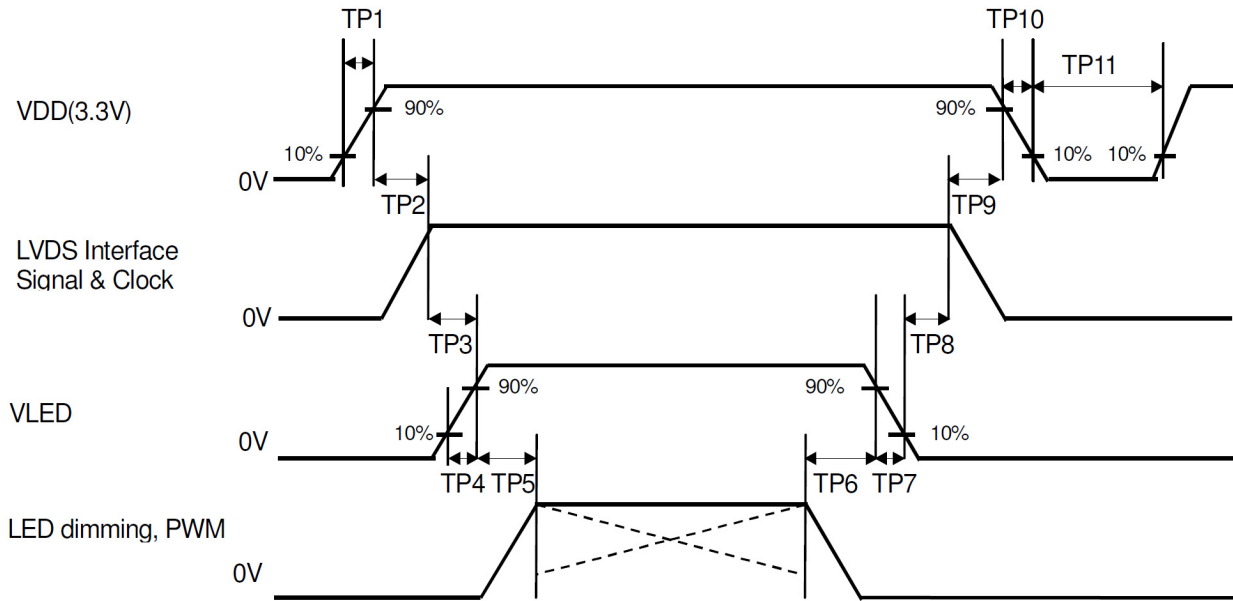
1. Vertical



2. Horizontal



7.4 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit
TP1	0.5	--	10	msec
TP2	0	--	50	msec
TP3	200	--	--	msec
TP4	0.5	--	10	msec
TP5	10	--	--	msec
TP6	10	--	--	msec
TP7	0	--	10	msec
TP8	200	--	--	msec
TP9	0	--	50	msec
TP10	1	--	10	msec
TP11	1000	--	--	msec

8. TOUCH SCREEN PANEL SPECIFICATIONS

8.1 Main Feature

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-1.5	-	+1.5	%	Initial data
	-2.0	-	+2.0	%	After environmental & life test, Refer Note2
Terminal resistance	200	-	900	Ω	X (glass)
	200	-	900	Ω	Y (film)
Insulation resistance	20	-	-	M Ω	DC 25V
Voltage	-	5	-	V	DC
Response time	-	-	10	ms	
Haze	-	8	-	%	ASTM D 1003
Minimum Input force	45	-	110	gf	Test Area is 2mm inside of active area, but not on Dot-Spacer.
Notes life	100000			words	
Input life	1000000			times	

8.2 Pin Assignments and Definitions

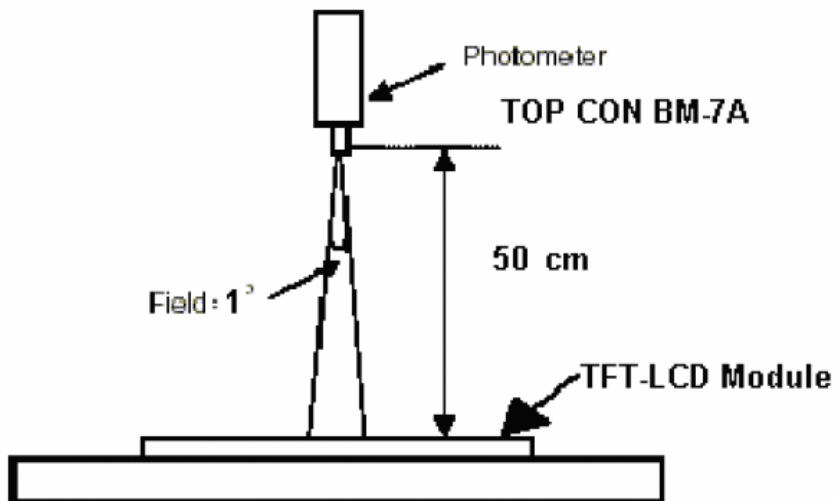
Item	Name	I/O	Unit
1	XR	O	Touch Panel Right
2	YD	O	Touch Panel Down
3	XL	O	Touch Panel Left
4	YU	O	Touch Panel Up

9. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness	--	Note1, Note 3, ($\theta = 0^\circ$; Normal Viewing Angle)	360	450	--	cd/m ²
Contrast Ratio	CR		600	900	--	--
Response Time	Tr+ Tf		--	30	40	ms
Color Chromaticity	White		Wx	0.251	0.291	0.331
		Wy	0.288	0.328	0.368	--
View angle	Horizontal	$\theta x+$	80	85	--	
		$\theta x-$	80	85	--	
	Vertical	$\theta Y+$	80	85	--	
		$\theta Y-$	80	85	--	

Note : The following optical specifications shall be measured in a darkroom or equivalent state(ambient luminance ≤ 1 lux, and at room temperature). The operation temperature is $25^\circ\text{C} \pm 2^\circ\text{C}$. The measurement method is shown in Note1.

Note1: The method of optical measurement:

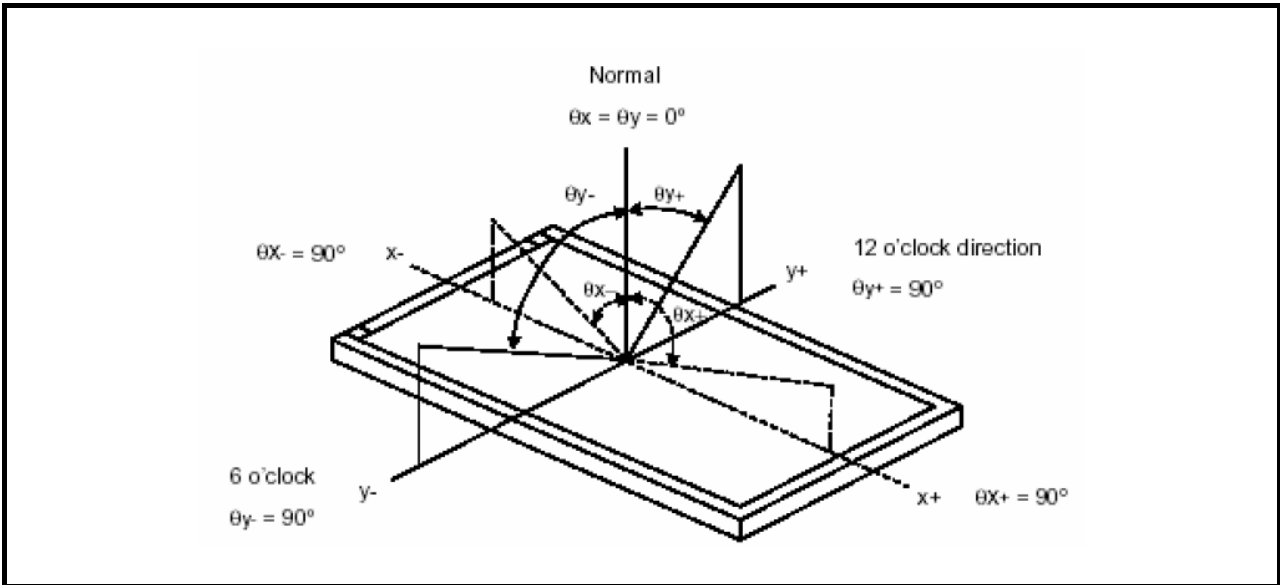


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta x = \theta y = 0^\circ$

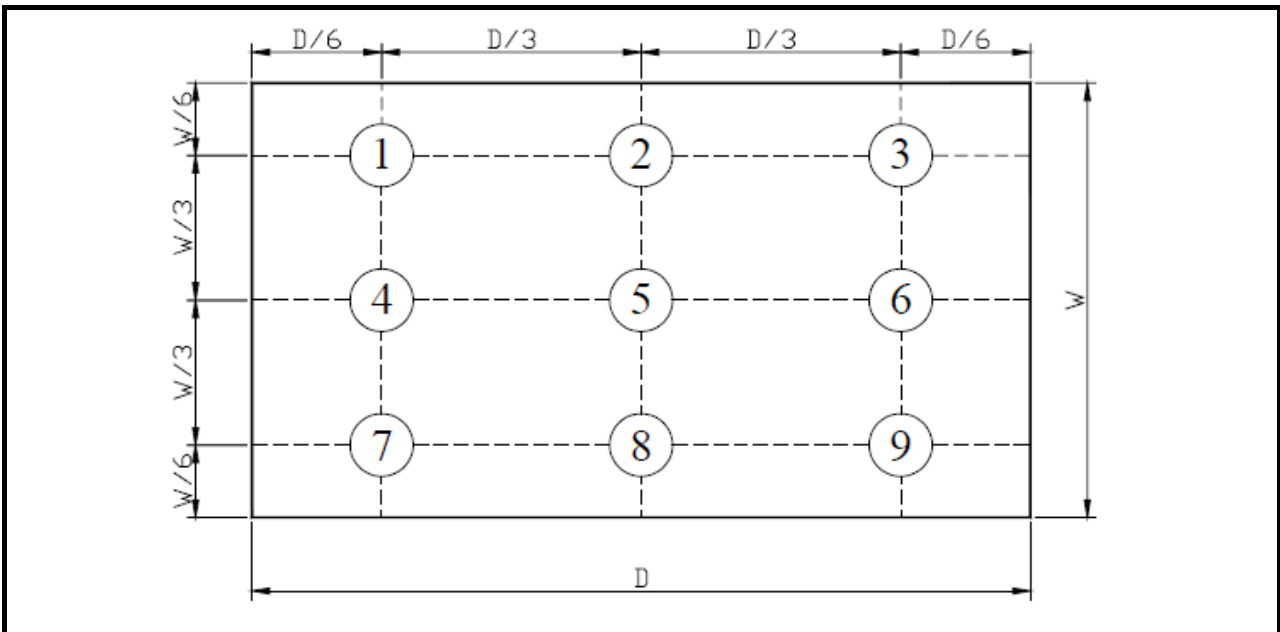
Note3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state \div Luminance with all pixels in Black state

Note 4: Definition of Viewing Angle:



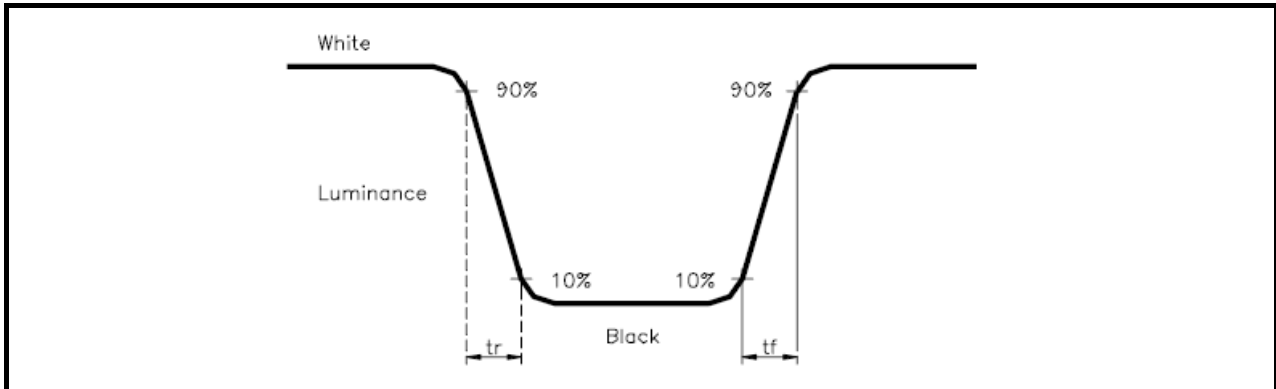
Note 5: Definition of Brightness Uniformity (B-uni):



$$B\text{-uni} = (\text{Minimum luminance of 9 points} \div \text{Maximum luminance of 9 points}) \times 100\%$$

Note 6: Definition of Response Time:

The Response Time is set initially by defining the “Rising Time (T_r)” and the “Falling Time (T_f)” respectively. T_r and T_f are defined as following figure



Note 7: Definition of Chromaticity:

The color coordinates (W_x, W_y), (R_x, R_y), (G_x, G_y), and (B_x, B_y) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

10. RELIABILITY

10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

10.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

10.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

10.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

10.2 TESTS

No.	ITEM	CONDITION CRITERION
1	High Temperature Storage	80°C, 240 hrs
2	Low Temperature Storage	-30°C, 240 hrs
3	High Temperature Operating	70°C, 240 hrs
4	Low Temperature Operating	-20°C, 240 hrs
5	High Temperature/Humidity Non-Operating	60°C, 90%RH, 240 hrs
6	Temperature Shock Non-Operating	-30°C ↔ 80°C (0.5hr each), 100 cycles
7	Vibration Test Non-Operating	Frequency:0 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any function NG issue occurred.

10.3 JUDGMENT STANDARD

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

10.4 INCOMING INSPECTION STANDARDS

No.	Parameter	Criteria														
1	Operating	Display function: No Display malfunction (Major)														
		Contrast ratio (Black, White): Does not meet specified range in the spec. (Major) (Note:3)														
		Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)														
		Point Defect : Active area ≤ 5 dots (Minor) (Note:1)														
		<table border="1"> <thead> <tr> <th rowspan="2">Item</th> <th>Acceptable number</th> <th rowspan="2">Total</th> </tr> <tr> <th>Active Area</th> </tr> </thead> <tbody> <tr> <td>Bright</td> <td>2</td> <td rowspan="2">5</td> </tr> <tr> <td>Dark</td> <td>4</td> </tr> </tbody> </table>	Item	Acceptable number	Total	Active Area	Bright	2	5	Dark	4					
Item	Acceptable number	Total														
	Active Area															
Bright	2	5														
Dark	4															
2	External Inspection (non-operating)	Non-uniformity: Visible through 5%ND filter. (Minor)														
		Foreign material in Black or White spots shape ($W > 1/4L$)														
		<table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td>$D > 0.5$</td> <td>0</td> </tr> <tr> <td>$0.3 < D \leq 0.5$</td> <td>5</td> </tr> <tr> <td>$D \leq 0.3$</td> <td>*</td> <td>Minor</td> <td>1.5</td> </tr> </tbody> </table> <p>$D = (\text{Long} + \text{Short}) / 2$ * : Disregard</p>	Zone Dimension	Acceptable number	Class Of Defects	AQL Level	$D > 0.5$	0	$0.3 < D \leq 0.5$	5	$D \leq 0.3$	*	Minor	1.5		
		Zone Dimension	Acceptable number	Class Of Defects			AQL Level									
		$D > 0.5$	0													
$0.3 < D \leq 0.5$	5															
$D \leq 0.3$	*	Minor	1.5													
Foreign Material in Line or spiral shape ($W \leq 1/4L$) (Note: 4)																
<table border="1"> <thead> <tr> <th>L (mm)</th> <th>Zone W(mm)</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td>$L > 5$</td> <td>$W > 0.1$</td> <td>0</td> </tr> <tr> <td>$0.5 < L \leq 5$</td> <td>$0.03 < W \leq 0.1$</td> <td>5</td> </tr> <tr> <td>$L \leq 0.5$</td> <td>$W \leq 0.03$</td> <td>*</td> <td>Minor</td> <td>1.5</td> </tr> </tbody> </table> <p>L : Length W : Width * : Disregard</p>	L (mm)	Zone W(mm)	Acceptable number	Class Of Defects	AQL Level	$L > 5$	$W > 0.1$	0	$0.5 < L \leq 5$	$0.03 < W \leq 0.1$	5	$L \leq 0.5$	$W \leq 0.03$	*	Minor	1.5
L (mm)	Zone W(mm)	Acceptable number	Class Of Defects			AQL Level										
$L > 5$	$W > 0.1$	0														
$0.5 < L \leq 5$	$0.03 < W \leq 0.1$	5														
$L \leq 0.5$	$W \leq 0.03$	*	Minor	1.5												
2	External Inspection (non-operating)	Dimension: Outline (Major)														
		Bezel appearance: uneven (Minor)														
		Scratch on the polarize: (Note:2)														
		<table border="1"> <thead> <tr> <th>L (mm)</th> <th>Zone W(mm)</th> <th>Acceptable number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">AQL Level</th> </tr> </thead> <tbody> <tr> <td>--</td> <td>$W > 0.1$</td> <td>0</td> </tr> <tr> <td>$L \leq 3$</td> <td>$W \leq 0.1$</td> <td>3</td> <td>Minor</td> <td>1.5</td> </tr> </tbody> </table> <p>L : Length W : Width * : Disregard</p>	L (mm)	Zone W(mm)	Acceptable number	Class Of Defects	AQL Level	--	$W > 0.1$	0	$L \leq 3$	$W \leq 0.1$	3	Minor	1.5	
		L (mm)	Zone W(mm)	Acceptable number	Class Of Defects			AQL Level								
--	$W > 0.1$	0														
$L \leq 3$	$W \leq 0.1$	3	Minor	1.5												
Dent or bubble on the polarize (Note:2)																
<table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">AQL Level</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.3$</td> <td>*</td> </tr> <tr> <td>$D \leq 0.5$</td> <td>3</td> <td>Minor</td> <td>1.5</td> </tr> </tbody> </table> <p>$D = (\text{Long} + \text{Short}) / 2$ * : Disregard</p>	Zone Dimension	Acceptable number	Class Of Defects	AQL Level	$D \leq 0.3$	*	$D \leq 0.5$	3	Minor	1.5						
Zone Dimension	Acceptable number	Class Of Defects			AQL Level											
$D \leq 0.3$	*															
$D \leq 0.5$	3	Minor	1.5													

Class of defects			Definition
	Major	AQL 0.65%	
Minor	AQL 1.5%		It is a defect that will not result in functioning problem with deviation classified.

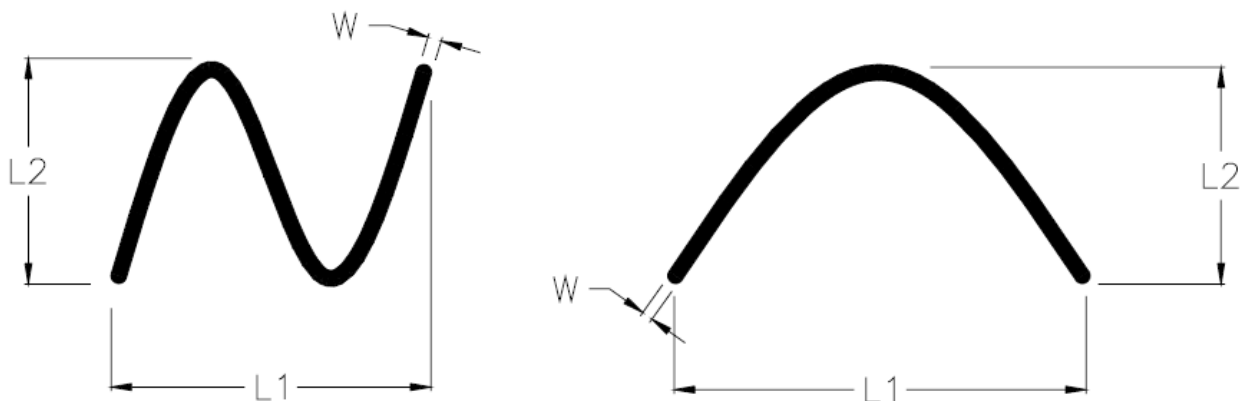
Note1:

- (a) Bright point defect is defined as point defect of R,G,B with area $> 1/2$ pixel respectively
- (b) Dark point defect is defined as visible in full white pattern.
- (c) Definition of distribution of point defect is as follows:
 - minimum separation between dark point defects should be larger than 5mm.
 - minimum separation between bright point defects should be larger than 5mm.
- (d) Definition of joined bright point defect and joined dark point defect are as follows:
 - Two or more joined bright point defects must be nil.
 - Three joined dark point defects must be nil.
 - Coupling of one dark and one bright point in junction is counted as one dark and bright spot with 1 pair maximum.
 - Two Joined dark point is counted as two dark points with 2 pair maximum.

Note2: The external inspection should be conducted at the distance 30 ± 5 cm between the eyes of inspector and the panel.

Note3: Luminance measurement for contrast ratio is at the distance 50 ± 5 cm between the detective head and the panel with ambient luminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note4: W-Width in mm , L-length of Max.(L1,L2) in mm.



10.5 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

Sampling table: MIL-STD-105E

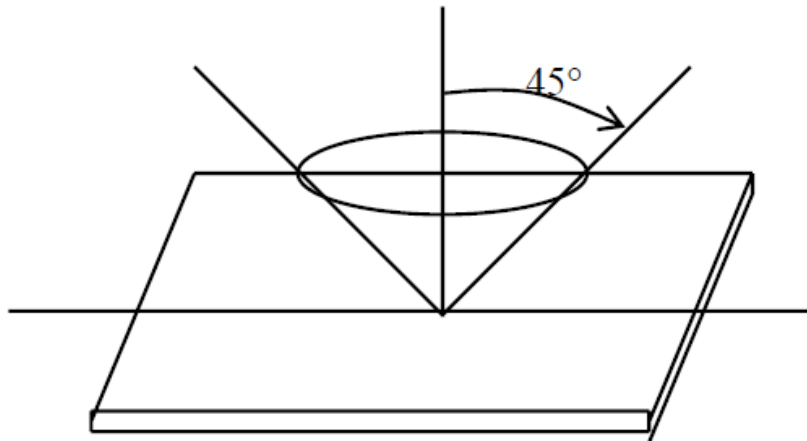
Inspection level: Level II

10.6 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.

$\theta \leq 45^\circ$ inspection under non-operating condition.

$\theta \leq 5^\circ$ inspection under operating condition



11. PRECAUTION RELATING PRODUCT HANDLING

11.1 SAFETY

11.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

11.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

11.2 HANDLING

11.2.1 Avoid any strong mechanical shock which can break the glass.

11.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.

11.2.3 Do not remove the panel or frame from the module.

11.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, Do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

11.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

11.2.6 Do not touch the display area with bare hands , this will stain the display area.

11.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

11.2.8 To control temperature and time of soldering is $280 \pm 10^{\circ}\text{C}$ and 3-5 sec.

11.2.9 To avoid liquid (include organic solvent) stained on LCM.

11.3 STORAGE

11.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.

11.3.2 Do not place the module near organics solvents or corrosive gases.

11.3.3 Do not crush, shake, or jolt the module.

12. RoHS Declaration

This Declaration is made by Digiwise International Corporation (the “Supplier”), for the benefit of Takkoh International Company Limited/or any of its subsidiaries or affiliates, (the “Customer”)

The Supplier declares that it has read and understood the EU Directive no. **Directive 2011/65/EU and amendment Commission Delegated Directive (EU) 2015/863** on Restriction on Hazardous Substances AND requirement in Takkoh RoHS Survey Overview.

below referred to as the “RoHS Directive”. The RoHS Directive prohibits the use of certain substances in Electrical and Electronic Equipment, below referred to as the “RoHS Requirements”.

After evaluation of the RoHS Requirements, the Supplier hereby certifies that:

13-121GIEB4GD1-A1 (12.1" 1024*768, IPS, RTP)

that the Supplier delivers to the Customer fulfill the RoHS Requirements.

By signing this letter, the undersigned Supplier agrees that all material ship from the Supplier to Customer will comply with applicable EU rules, regulations and directives, including without Limitation the RoHS Directive, meaning that no raw materials, compounds, components or products Incorporated into the products supply contains any material or substance banned under said directive. Supplier confirms the compliant substances are equal or better in quality, performance and functionality as their predecessors.

The Supplier should be ready to provide a third-party certification (from an accredited laboratory) or Support customer audit on attesting the compliance of delivered products to the RoHS Directive if so Requested by the Customer.

Digiwise International Corporation



Date: 1st June, 2022

Full Address: 3F, No 10, Ln 83, Sec 1, GuangFu Rd., Sanchong Dist., New Taipei City, Taiwan

Name: Kiri Huang

Title: Marketing Specialist

Vendor Declaration Use of RoHS material (ROHS 2.0)

Overview

The Restriction of Hazardous Materials (RoHS) Directive has been enacted by the European Union (EU). The latest version of this documentation can be found at the following hyperlink:

<http://www.rohs.eu>

For the products sold in Europe, the initiative states that the content of RoHS-banned materials cannot exceed concentration as per table shown below with effect from July 1, 2006. (Remark: Deca BDE effect from July 1, 2008)

Restricted Substances	Proposed Maximum Concentration
Cadmium (Cd)	0.01% (100 mg/kg)
Lead (Pb)	0.1% (1000 mg/kg)
Mercury (Hg)	0.1% (1000 mg/kg)
Chromium (VI) (Cr ⁶⁺)	0.1% (1000 mg/kg)
Polybrominated Biphenyls (PBBs)	0.1% (1000 mg/kg)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000 mg/kg)
Dibutyl phthalate (DBP)	0.1% (1000 mg/kg)
Di-(2-ethyl hexyl) phthalate (DEHP)	0.1% (1000 mg/kg)
Benzyl butyl phthalate (BBP)	0.1% (1000 mg/kg)
Di-(iso-butyl) phthalate (DIBP)	0.1% (1000 mg/kg)
The above limits were quoted from Directive 2011/65/EU and amendment Commission Delegated Directive (EU) 2015/863 for homogeneous material.	

13. Supply and Phase out Policy

Supply and Phase out Policy for 13-121GIEB4GD1-A1 TFT-LCD products

To: Takkoh International Company Limited

1st June, 2022

DigiWise will provide a typically 3-years availability on the 13-121GIEB4GD1-A1, based on the same form factor and electrical interface.

The customer forecast will be helpful for the manufacturing schedule. As a result, an annual forecast offer by customer year by year is required in order to maintain the 3-year supply of TFT-LCD.

If unfortunately changes or discontinuities are going to happen, DigiWise will do its best to support and help customers to maintain electrical and mechanical compatibility after the changes or discontinuities.

For the production process or process management change, DigiWise promise that as long as there are any changes-- including processor engineering changes arising from product appearance, function, quality, assembly, reliability or institutional requirements-- the related information will be notified, and the relevant official documents will be provided to the customer in advance.

DigiWise will announce to customers the information about changes or discontinuities typically 3 months earlier before the changes or discontinuities.

The last-time buy chance will be provided upon announcement and it will be based on a non-cancelable purchase order.

It may occur that customer has to change their software or other relevant components, in order to cope with the new version while changes or discontinuities.

Hence, DigiWise will discuss the exact details with customer, including but not limited to:

1. Materials preparation for non-cancellable order
2. New sample approval process

The details and the conditions will be implemented based on the coordination and commitment of both parties.

Sincerely yours,

Digiwise International Corporation

