



Microtips

TECHNOLOGY

Model No: 13-121GIEBCAA3-W

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RECORD OF REVISION

Version	Revised Date	Page	Content
V1.0	2019/08/15	--	PRELIMINARY SPECIFICATION
V1.1	2019/08/25	6	PIN DESCRIPTION
V1.2	2019/10/19	5	MECHANICAL SPECIFICATION

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1. GENERAL DESCRIPTION

1.1 Description

The specifications is model 13-121GIEBCAA3-W 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 projected capacitive 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) x 184.32 (H)	mm
4	Pixel Pitch	0.240 (W) x 0.240 (H)	mm
5	Outline Dimension	289.47 (W) x 222 (H) x 12.7 (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	Clear ($\geq 6H$)	- -
11	Contrast Ratio	900 (Typ.)	- -
12	Luminance (cd/m ²)	1000 (Typ.)	cd/m2
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	(TBD)	g

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 LED Driver Unit(CN2)

Pin No.	Symbol	I/O	Function	Note
1	DIMMING	I	LED Dimming control (internal pull high 3.3V)	
2	LED_EN	I	LED Enable control(internal pull high 3.3V)	
3	GND	P	Ground	
4	GND	P	Ground	
5	GND	P	Ground	
6	12.0V	P	Power Supply for LED Driver	
7	12.0V	P	Power Supply for LED Driver	
8	12.0V	P	Power Supply for LED Driver	

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 TFT LCD Module

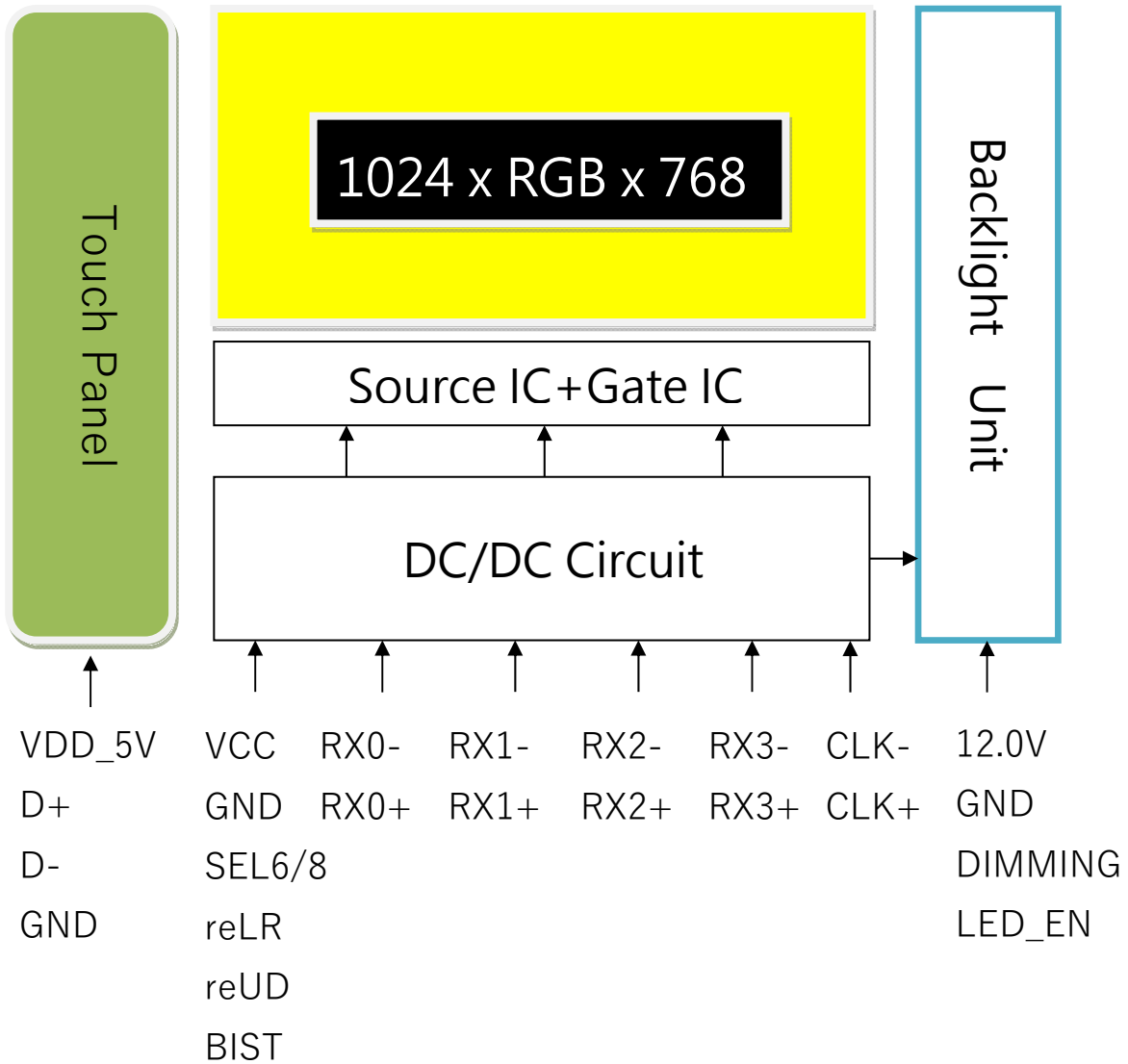
Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VCC	-0.3	+5.0	V	
Logic Input Voltage	VIN	-0.3	VCC+0.3	V	
LED Driver supply voltage	12.0V	-0.3	+14.0	V	

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	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	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.

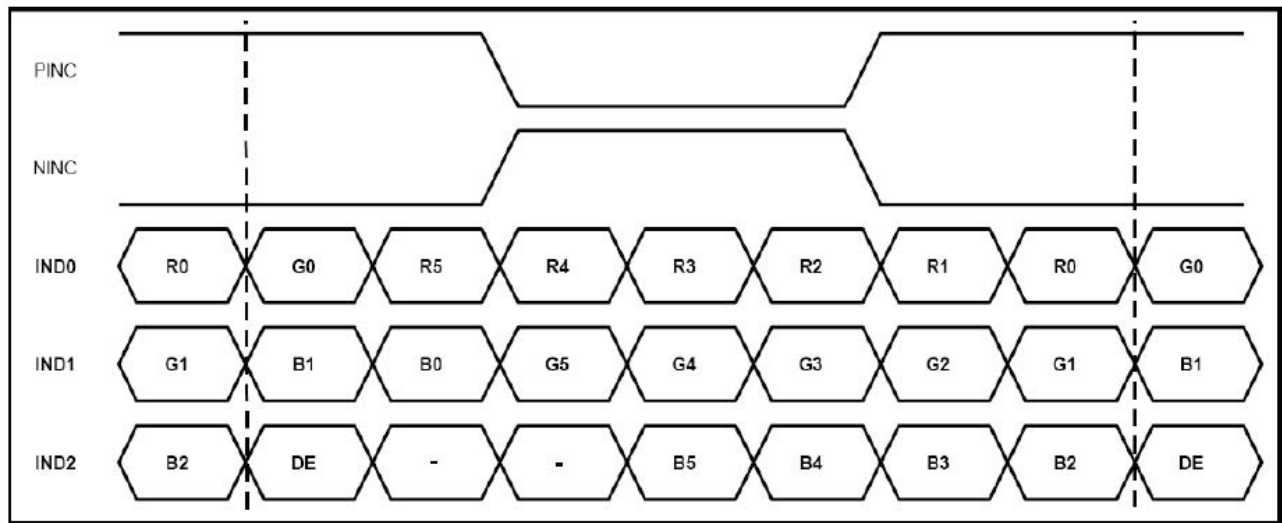
6.2 8 bit

		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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	0	0			
		Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0			
		Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	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	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	0	0			
		Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	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	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	0	1	0			
		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	0				
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
		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	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	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	1	1			

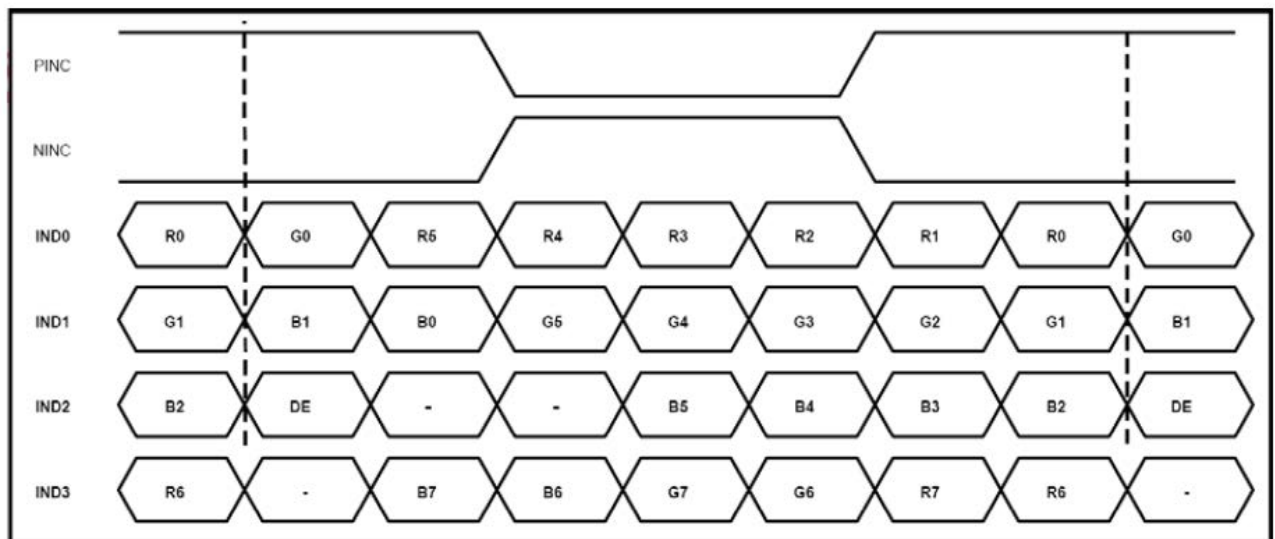
0 : Low level voltage, 1 :High level voltage

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

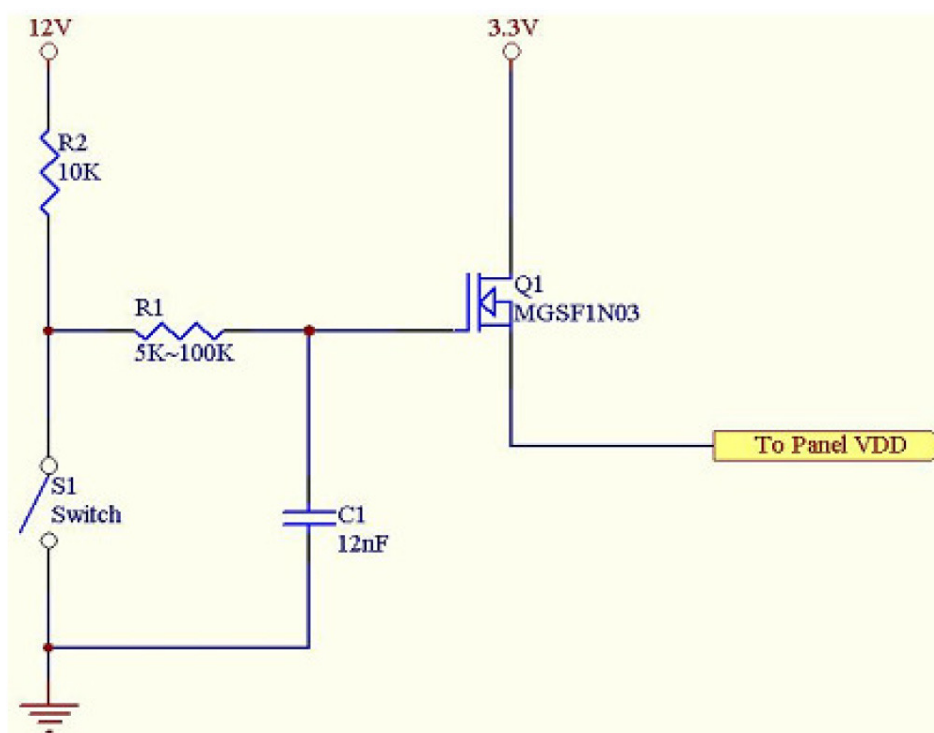
7. ELECTRICAL CHARACTERISTICS

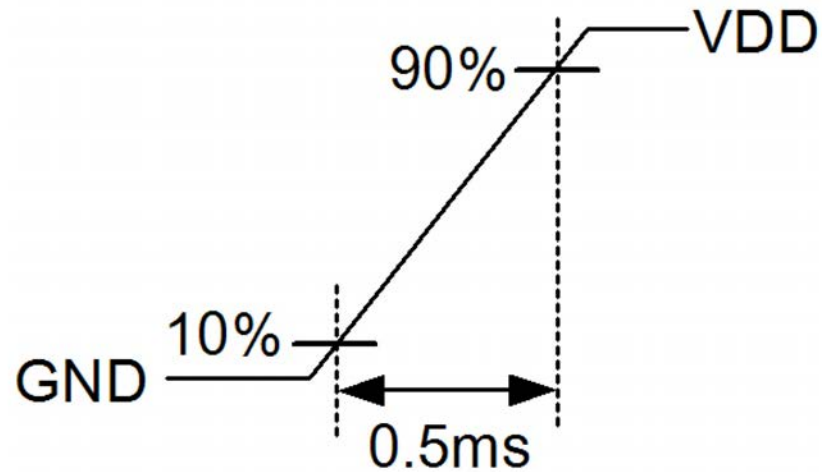
7.1 TFT LCD Module

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	Values			Unit	Note
		Min	Typ.	Max.		
Supply Voltage	12.0V	11	12	13	V	
PWM Dimming Voltage	V _{PWM-IH} (internal pull high)	3.3	-	8	V	
	V _{PWM-IL}	-	-	0.3	V	
PWM frequency		100	-	10K	Hz	
PWM Duty		17	-	100	%	<17%=OFF
LED Enable Control Voltage	V _{LED_EN-IH} (internal pull high)	3.3		12	V	
	V _{LED_EN-IL}	-	-	0.5	V	
Supply Current	IL	-	TBD	-	mA	
Power Consumption	PBL	-	TBD	-	W	
LED Life Time (25°C)	-	50000	-	-	hr	(1)

Note 1: The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C 60% RH.

7.3 INTERFACE SPECIFICATIONS

7.3.1 Timing Specifications

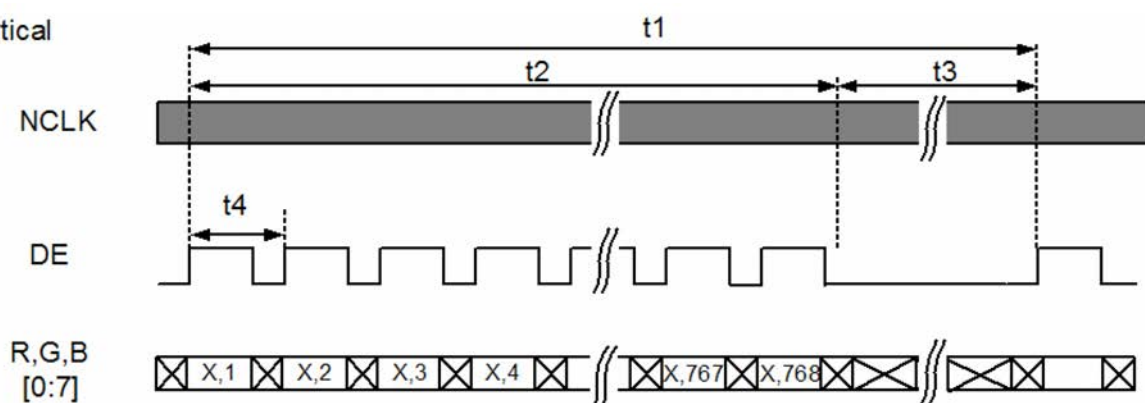
Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK	CLK frequency	Fc	50.3	50.7	51.1	MHz	
DE	Vertical Total Time	Tv	774	776	778	Th	
	Vertical Addressing Time	Tvd	768			Th	
	Vertical Blank	Tvb	6	8	10	Th	
	Horizontal Total Time	Th	1084	1088	1092	Tc	
	Horizontal Addressing Time	Thd	1024			Tc	
	Horizontal Blank	Thb	60	64	68	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.

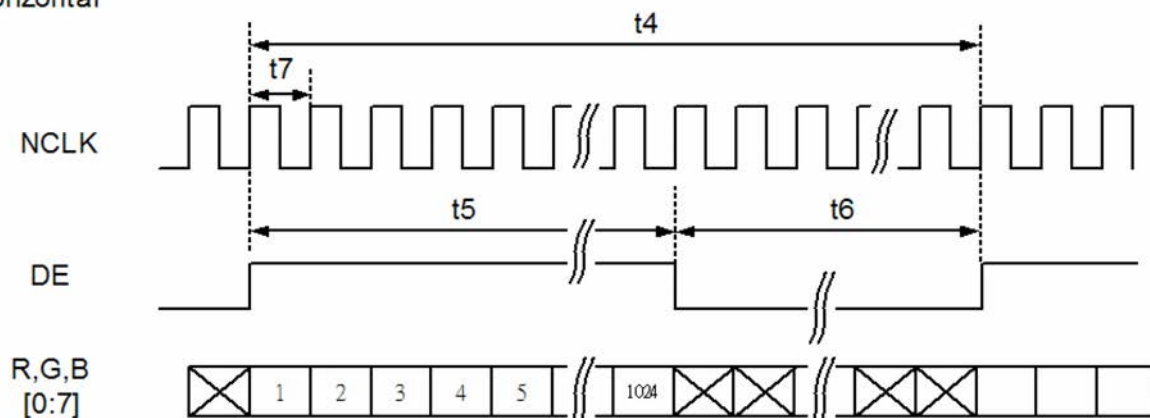
Note 2: Frame rate is 60Hz

7.3.2 Input signal timing diagram

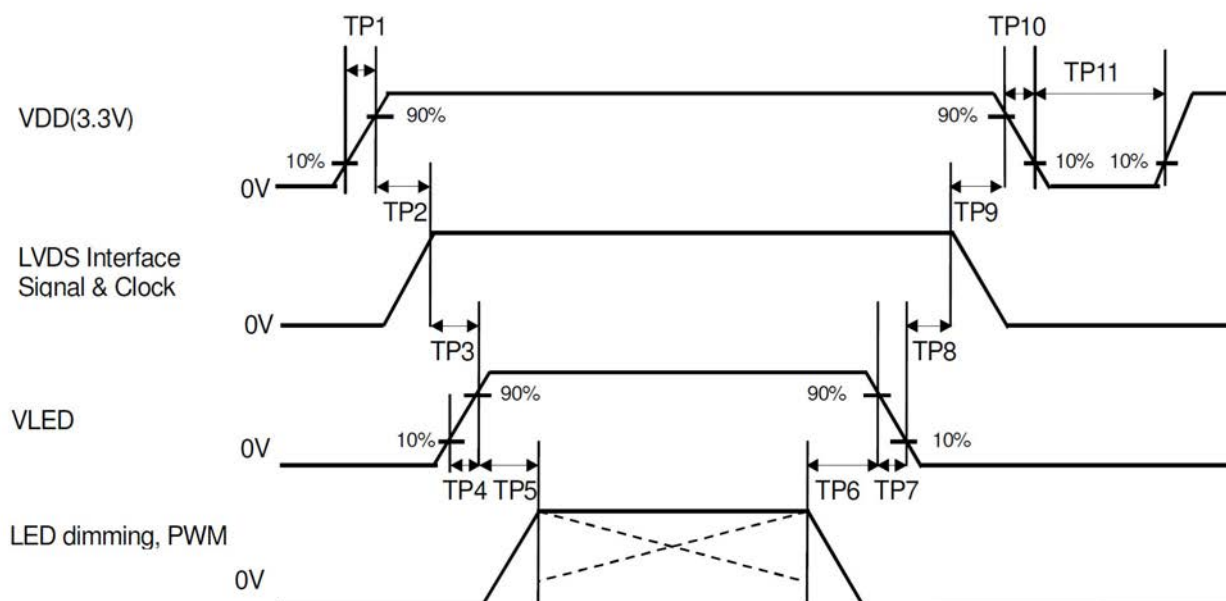
1. Vertical



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	Specification	Unit
Screen Size	12.1 inches	Diagonal
Type	Transparent Type Projected Capacitive Touch Panel	--
Input Mode	Human's Finger	--
View Area	245.99 (H)(typ.) X 184.49 (V)(typ.)	mm
Interface	USB	--
Operating system OS	Windows / Linux / Android	
Touch number	10 points	
Cover glass pencil-hardness	6H(min.)	--
Report Rate	>100Hz	--
Response Time	25 (typ.)	ms
Digital Power Supply	5V DC	V
Power Consumption	TBD	mA
Controller Model	EE80H462938	

8.2 CN3(USB) Pin Assignments and Definitions

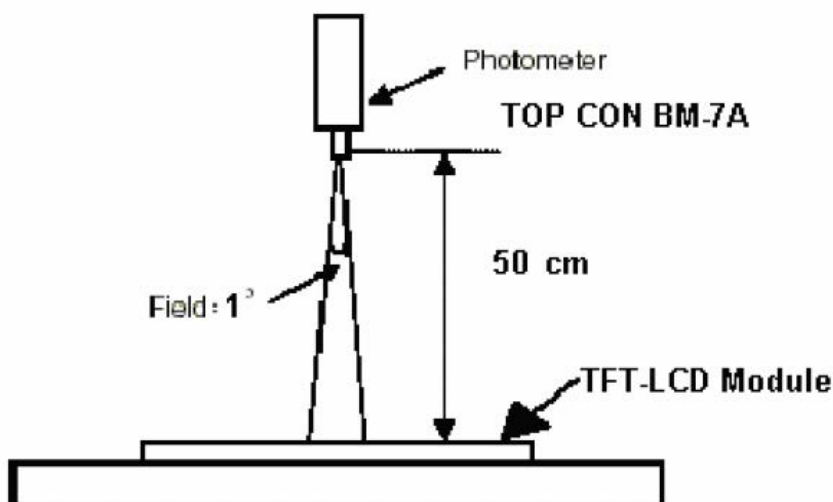
Item	Name	I/O	Unit
1	VDD_5V	P	Power Supply Voltage, 3.3V ~ 5V DC
2	D+	I/O	D+
3	D-	I/O	D-
4	GND	P	Ground
5	N.C.	-	No connection
6	N.C.	-	No connection
7	N.C.	-	No connection
8	N.C.	-	No connection

9. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		--	Note1, Note 3, ($\theta = 0^\circ$; Normal Viewing Angle)	800	1000	--	cd/m ²
Contrast Ratio		CR		600	900	--	--
Response Time		Tr+ Tf		--	30	40	ms
Color Chromaticity	White	Wx	Center CR $\geq$ 10	0.251	0.291	0.331	--
		Wy		0.288	0.328	0.368	--
View angle	Horizontal	$\theta x+$	Center CR $\geq$ 10	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:

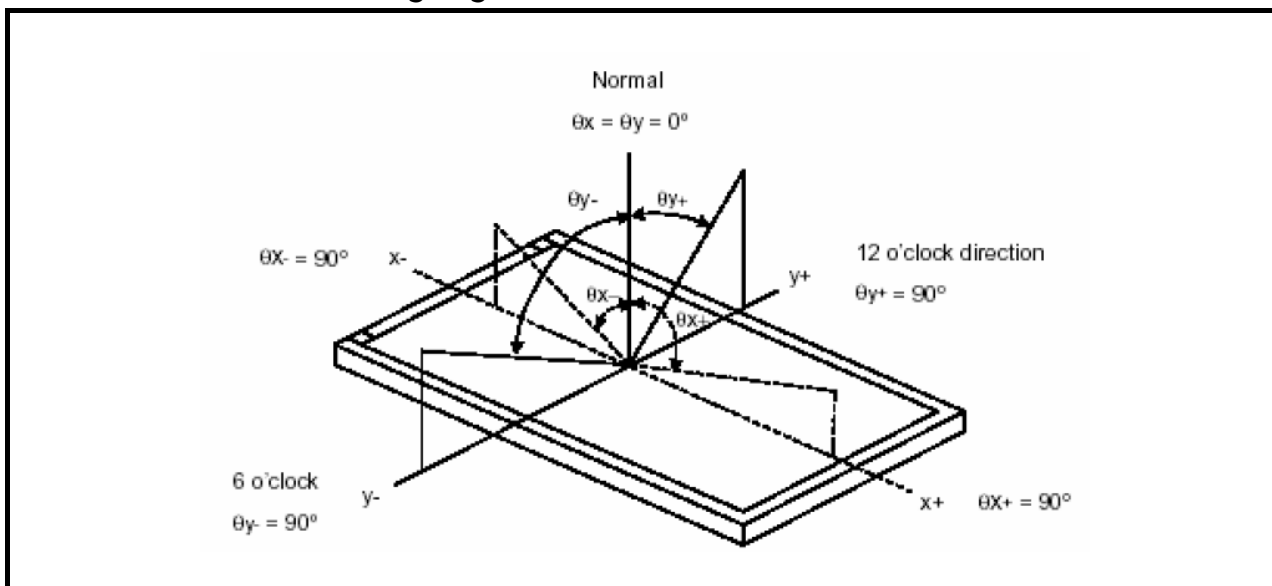


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta x = \theta y = 0^\circ$

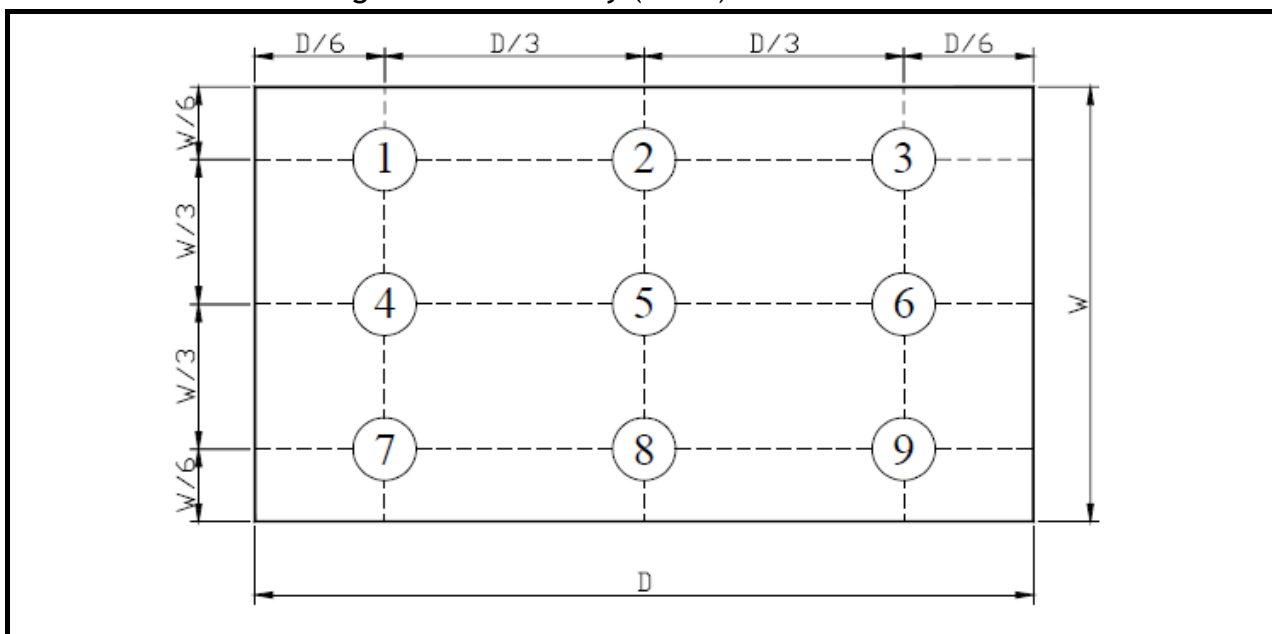
Note3: Definition of Contrast Ratio (CR):

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

Note 4: Definition of Viewing Angle:



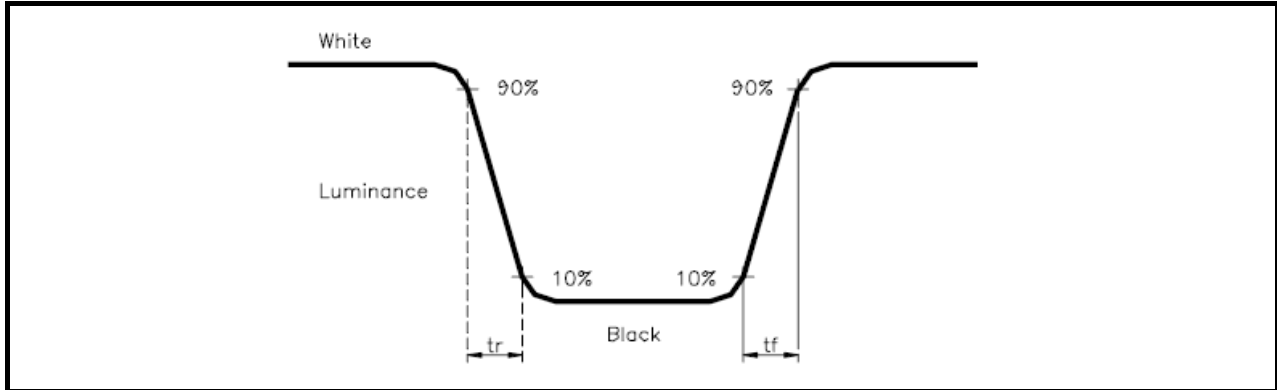
Note 5: Definition of Brightness Uniformity (B-uni):



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

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 : $25 \pm 5^{\circ}\text{C}$

Humidity : $65 \pm 5\%$

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 $\longleftrightarrow$ 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 touch panel 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><tr><th rowspan="2">Item</th><th>Acceptable number</th><th rowspan="2">Total</th></tr><tr><th>Active Area</th></tr><tr><td>Bright</td><td>2</td><td rowspan="2">5</td></tr><tr><td>Dark</td><td>4</td></tr></table>	Item	Acceptable number	Total	Active Area	Bright	2	5	Dark	4			
		Item		Acceptable number		Total								
			Active Area											
		Bright	2	5										
		Dark	4											
		Non-uniformity: Visible through 5%ND filter. (Minor)												
Foreign material in Black or White spots shape ($W>1/4L$)														
<table><tr><th>Zone Dimension</th><th>Acceptable number</th><th rowspan="4">Class Of Defects</th><th rowspan="4">AQL Level</th></tr><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></tr></table>	Zone Dimension	Acceptable number	Class Of Defects	AQL Level	$D>0.5$	0	$0.3 < D \leq 0.5$	5	$D \leq 0.3$	*				
Zone Dimension	Acceptable number	Class Of Defects			AQL Level									
$D>0.5$	0													
$0.3 < D \leq 0.5$	5													
$D \leq 0.3$	*													
$D = (\text{Long} + \text{Short}) / 2$ * : Disregard														
Foreign Material in Line or spiral shape ($W \leq 1/4L$) (Note: 4)														
<table><tr><th>L (mm)</th><th>Zone W(mm)</th><th>Acceptable number</th><th rowspan="4">Class Of Defects</th><th rowspan="4">AQL Level</th></tr><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></tr></table>	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	$L \leq 0.5$	$W \leq 0.03$	*
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												
$L \leq 0.5$	$W \leq 0.03$	*												
L : Length W : Width * : Disregard														
2	External Inspection (non-operating)	Dimension: Outline (Major)												
		Bezel appearance: uneven (Minor)												
		Scratch on the polarize: (Note:2)												
		<table><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><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></tr></table>	L (mm)	Zone W(mm)	Acceptable number	Class Of Defects	AQL Level	--	$W > 0.1$	0	$L \leq 3$	$W \leq 0.1$	3	
		L (mm)	Zone W(mm)	Acceptable number	Class Of Defects			AQL Level						
		--	$W > 0.1$	0										
		$L \leq 3$	$W \leq 0.1$	3										
		L : Length W : Width * : Disregard												
		Dent or bubble on the polarize (Note:2)												
		<table><tr><th>Zone Dimension</th><th>Acceptable number</th><th rowspan="3">Class Of Defects</th><th rowspan="3">AQL Level</th></tr><tr><td>$D \leq 0.3$</td><td>*</td></tr><tr><td>$D \leq 0.5$</td><td>3</td></tr></table>	Zone Dimension	Acceptable number	Class Of Defects	AQL Level	$D \leq 0.3$	*	$D \leq 0.5$	3				
Zone Dimension	Acceptable number	Class Of Defects	AQL Level											
$D \leq 0.3$	*													
$D \leq 0.5$	3													
$D = (\text{Long} + \text{Short}) / 2$ * : Disregard														

Class of defects	Major	AQL 0.65%	Definition
	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.

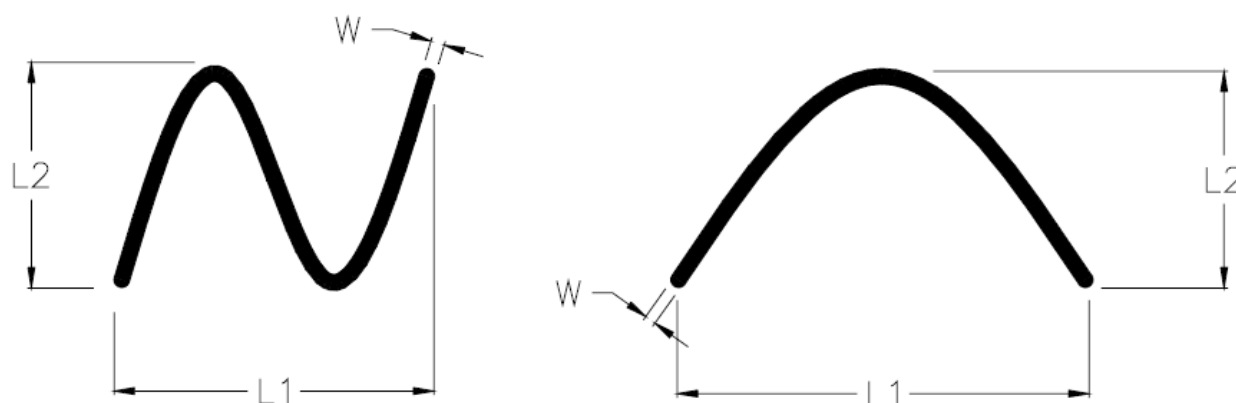
(d) Definition of joined bright point defect and joined dark point defect are as follows:

- 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

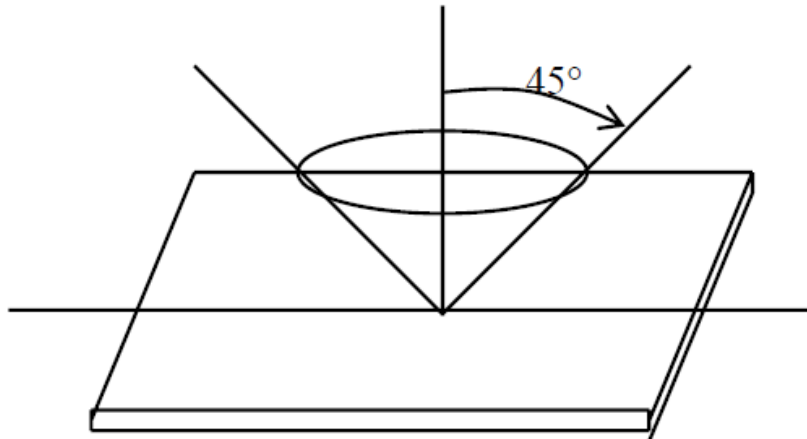
Inspection level: Level II

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.**

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