

The logo for Microtips Technology features a stylized graphic of three slanted bars in red, green, and blue on the left, followed by the word "Microtips" in a large, bold, serif font. Below this, a thick horizontal line separates the word "TECHNOLOGY" from the rest of the page, with each letter of "TECHNOLOGY" in a large, bold, serif font.

# Microtips

---

# TECHNOLOGY

**MODEL: 13-103HIEBOGA0-S**

This module uses ROHS material

Approved By	

Tel: 1 (888) 499-8477

Fax: (407) 273-0771

E-mail: [mtusainfo@microtipsusa.com](mailto:mtusainfo@microtipsusa.com)

Web: [www.microtipsusa.com](http://www.microtipsusa.com)

## RECORD OF REVISION

Version	Revised Date	Page	Content
V1.0	2021/12/06	--	First Issued

## TABLE OF CONTENTS

No.	Content	Page
	TFT Module Specification .....	1
	TABLE OF CONTENTS .....	3
1.	GENERAL DESCRIPTION .....	4
2.	MECHANICAL SPECIFICATION .....	5
3.	PIN DESCRIPTION .....	6
4.	ABSOLUTE MAXIMUM RATINGS .....	9
5.	BLOCK DIAGRAM .....	10
6.	LVDS INPUT DATA MAPPING .....	11
7.	ELECTRICAL CHARACTERISTICS .....	12
8.	OPTICAL CHARACTERISTICS .....	16
9.	RELIABILITY.....	19
10.	PRECAUTION RELATING PRODUCT HANDLING .....	24

## 1. GENERAL DESCRIPTION

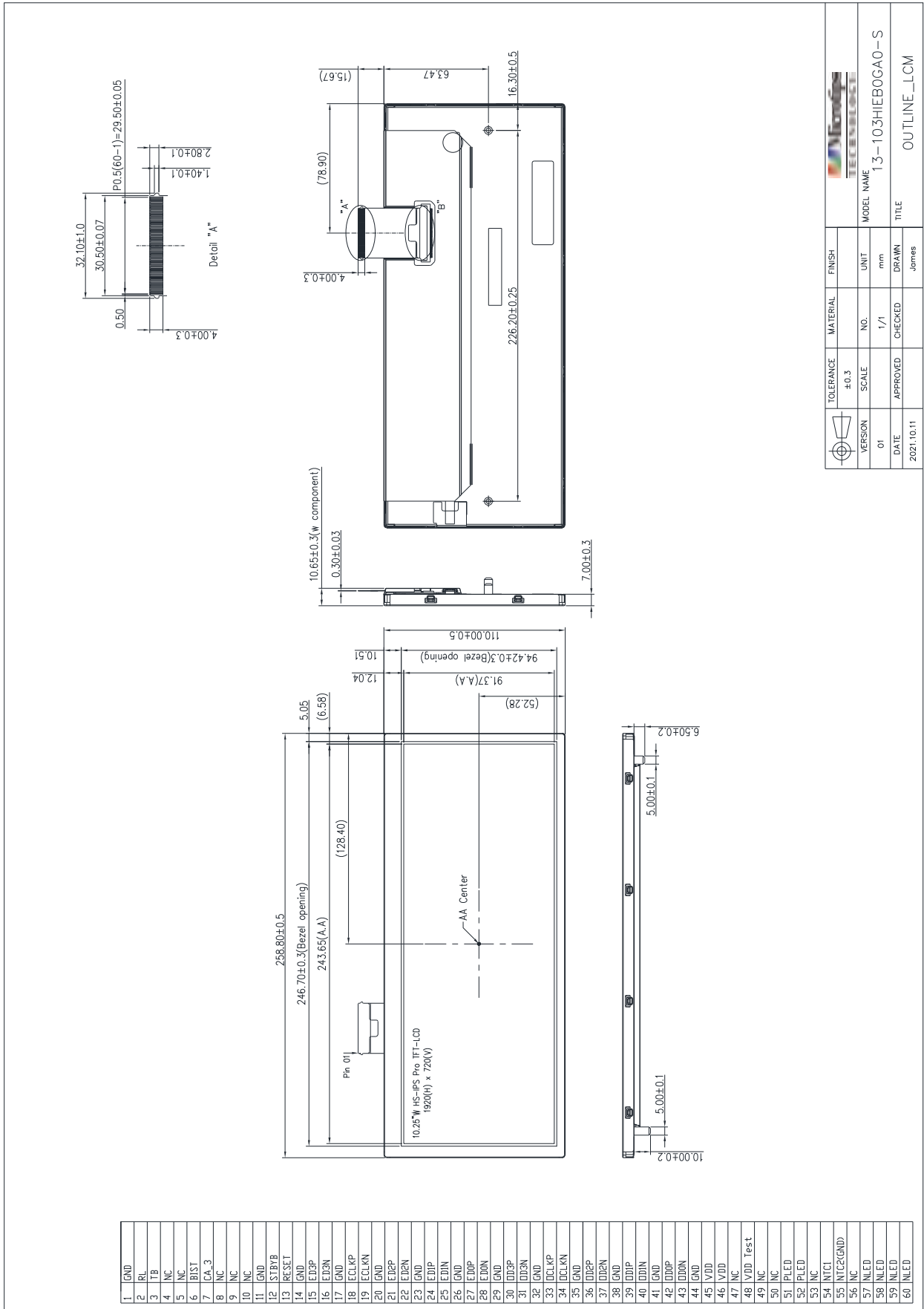
### 1.1 Description

The specification is model 13-103HIEB0GA0-S 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 backlight system. This TFT LCD has a 10.25 (8:3) inch diagonally measured active display area with HD (1920 horizontal by 720 vertical pixels) resolution.

### 1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	10.25"	Inch
2	Number of Pixels	1920 (W) x RGB x 720 (H)	Pixels
3	Active Area	243.65 (W) x 91.37 (H)	mm
4	Pixel Pitch	0.1269 (W) x 0.1269 (H)	mm
5	Outline Dimension	258.8 (W) x 110 (H) x 10.65 (T)	mm
6	Number of Colors	16.7M	- -
7	Display Mode	IPS / Normally Black / Transmissive	- -
8	Viewing Direction	Free direction	- -
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Anti-Glare (3H)	- -
11	Contrast Ratio	1500 (Typ.)	- -
12	Luminance (cd/m <sup>2</sup> )	1000 (Typ.)	cd/m <sup>2</sup>
13	Interface	LVDS 6/8 bit Interface	- -
14	Backlight	White LED	- -
15	Operation Temperature	-40 ~ 85	°C
16	Storage Temperature	-40 ~ 95	°C
17	Weight	(298)	g

## 2. MECHANICAL SPECIFICATION



		<b>MODEL NAME</b> 13-103HIEBOGAO-S	
<b>TOLERANCE</b> ±0.3		<b>FINISH</b>	
<b>SCALE</b> 1/1		<b>UNIT</b> mm	
<b>VERSION</b> 01		<b>CHECKED</b> James	
<b>DATE</b> 2021.10.11		<b>DRAWN</b> James	
<b>APPROVED</b>		<b>TITLE</b> OUTLINE_LCM	

### 3. PIN DESCRIPTION

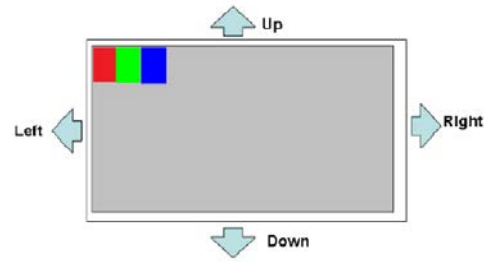
#### 3.1 TFT LCD Module

Pin No.	Symbol	I/O	Function	Note
1	GND	P	Ground	
2	RL	I	Horizontal shift direction (source output) selection. RL = "H": Left -> Right (default) RL = "L": Right -> Left	(1)
3	TB	I	Vertical shift direction (gate output) selection. TB = "H": Top ->Down (default) TB = "L": Down->Top	(1)
4	NC	-	No connection	
5	NC	-	No connection	
6	BIST	I	Normal operation/BIST pattern select. BIST="0"(GND): Normal operation. BIST="1"(3.3V): BIST mode	
7	CA_3	O	fail detect function. Output pin L: Fail H: Normal	
8	NC	-	No connection	
9	NC	-	No connection	
10	NC	-	No connection	
11	GND	P	Ground	
12	STBYB	I	Standby mode control. STBYB="H",normal operation. STBYB="L", LCM is in standby state.(Default)	
13	RESET	I	Global reset pin RESET="H",normal operation.(Default) RESET="L", LCM is in reset state.	
14	GND	P	Ground	
15	ED3P	I	Even Data channel 3+	(2)
16	ED3N	I	Even Data channel 3-	(2)
17	GND	P	Ground	
18	ECLKP	I	Even Clock channel +	(2)
19	ECLKN	I	Even Clock channel -	(2)
20	GND	P	Ground	
21	ED2P	I	Even Data channel 2+	(2)
22	ED2N	I	Even Data channel 2-	(2)
23	GND	P	Ground	
24	ED1P	I	Even Data channel 1+	(2)
25	ED1N	I	Even Data channel 1-	(2)

26	GND	P	Ground	
27	ED0P	I	Even Data channel 0+	(2)
28	ED0N	I	Even Data channel 0-	(2)
29	GND	P	Ground	
30	OD3P	I	Odd Data channel 3+	(2)
31	OD3N	I	Odd Data channel 3-	(2)
32	GND	P	Ground	
33	OCLKP	I	Odd Clock channel +	(2)
34	OCLKN	I	Odd Clock channel -	(2)
35	GND	P	Ground	
36	OD2P	I	Odd Data channel 2+	(2)
37	OD2N	I	Odd Data channel 2-	(2)
38	GND	P	Ground	
39	OD1P	I	Odd Data channel 1+	(2)
40	OD1N	I	Odd Data channel 1-	(2)
41	GND	P	Ground	
42	OD0P	I	Odd Data channel 0+	(2)
43	OD0N	I	Odd Data channel 0-	(2)
44	GND	P	Ground	
45	VDD	P	Power pin for logic	
46	VDD	P	Power pin for logic	
47	NC	-	No connection	
48	VDD Test	O	Open test L: Fail H: Normal	
49	NC	-	No connection	
50	NC	-	No connection	
51	PLED	P	Power LED anode power supply	
52	PLED	P	Power LED anode power supply	
53	NC	-	No connection	
54	NTC1	-	Heat sensor	(3)
55	NTC2(GND)	-	Heat sensor	(3)
56	NC	-	No connection	
57	NLED	P	Power LED cathode power supply	
58	NLED	P	Power LED cathode power supply	
59	NLED	P	Power LED cathode power supply	
60	NLED	P	Power LED cathode power supply	

Note 1: RL and TB control function

RL	TB	Data shifting
VDD	GND	Left→Right ; Down→Up
GND	GND	Right→Left ; Down→Up
VDD	VDD	Left→Right ; Up→Down
GND	VDD	Right→Left ; Up→Down



Note 2: Already built-in terminal resistor on PCB for LVDS signal.

Note3 : NTC: Murata NCU15XH103F6SRC

TEMP. (deg.C)	R-low (kohm)	R-center (kohm)	R-high (kohm)	TEMP. (deg.C)	R-low (kohm)	R-center (kohm)	R-high (kohm)	TEMP. (deg.C)	R-low (kohm)	R-center (kohm)	R-high (kohm)	TEMP. (deg.C)	R-low (kohm)	R-center (kohm)	R-high (kohm)
-40	188.020	195.652	203.573	1	25.569	26.076	26.590	51	3.950	4.026	4.104	101	0.918	0.949	0.982
-39	177.804	184.917	192.295	2	24.512	24.988	25.470	52	3.821	3.896	3.973	102	0.895	0.925	0.957
-38	168.214	174.845	181.720	3	23.505	23.951	24.403	53	3.698	3.771	3.847	103	0.872	0.902	0.933
-37	159.207	165.391	171.798	4	22.545	22.963	23.386	54	3.578	3.651	3.725	104	0.850	0.880	0.910
-36	150.744	156.513	162.486	5	21.629	22.021	22.418	55	3.463	3.535	3.608	105	0.829	0.858	0.888
-35	142.788	148.171	153.742	6	20.756	21.123	21.494	56	3.353	3.423	3.495	106	0.808	0.837	0.866
-34	135.306	140.330	145.527	7	19.923	20.267	20.614	57	3.246	3.315	3.386	107	0.788	0.816	0.845
-33	128.266	132.958	137.807	8	19.127	19.450	19.775	58	3.143	3.211	3.280	108	0.769	0.796	0.825
-32	121.640	126.022	130.548	9	18.368	18.670	18.975	59	3.044	3.111	3.179	109	0.750	0.777	0.805
-31	115.400	119.494	123.720	10	17.643	17.926	18.211	60	2.949	3.014	3.081	110	0.731	0.758	0.786
-30	109.522	113.347	117.294	11	16.949	17.214	17.481	61	2.858	2.922	2.988	111	0.714	0.740	0.767
-29	103.989	107.565	111.252	12	16.287	16.534	16.784	62	2.770	2.834	2.898	112	0.696	0.722	0.749
-28	98.773	102.116	105.561	13	15.654	15.886	16.119	63	2.686	2.748	2.812	113	0.679	0.705	0.731
-27	93.851	96.978	100.198	14	15.049	15.266	15.484	64	2.604	2.666	2.728	114	0.663	0.688	0.714
-26	89.207	92.132	95.142	15	14.471	14.674	14.877	65	2.526	2.586	2.648	115	0.647	0.672	0.697
-25	84.823	87.559	90.374	16	13.918	14.108	14.298	66	2.450	2.509	2.570	116	0.632	0.656	0.681
-24	80.682	83.242	85.876	17	13.390	13.566	13.744	67	2.377	2.435	2.495	117	0.617	0.640	0.665
-23	76.770	79.166	81.630	18	12.884	13.049	13.215	68	2.306	2.364	2.422	118	0.602	0.625	0.649
-22	73.072	75.316	77.620	19	12.400	12.554	12.708	69	2.238	2.294	2.352	119	0.588	0.611	0.634
-21	69.576	71.677	73.834	20	11.937	12.081	12.224	70	2.172	2.228	2.284	120	0.574	0.596	0.620
-20	66.269	68.237	70.255	21	11.495	11.628	11.762	71	2.109	2.163	2.218	121	0.561	0.583	0.605
-19	63.148	64.991	66.881	22	11.070	11.195	11.320	72	2.047	2.100	2.155	122	0.548	0.569	0.592
-18	60.192	61.919	63.689	23	10.664	10.780	10.896	73	1.987	2.040	2.093	123	0.535	0.556	0.578
-17	57.393	59.011	60.669	24	10.274	10.382	10.489	74	1.930	1.981	2.034	124	0.523	0.544	0.565
-16	54.742	56.258	57.811	25	9.900	10.000	10.100	75	1.874	1.925	1.976	125	0.511	0.531	0.552
-15	52.228	53.650	55.104	26	9.534	9.634	9.734	76	1.820	1.870	1.921	126	0.499	0.519	0.540
-14	49.846	51.178	52.541	27	9.184	9.284	9.383	77	1.768	1.817	1.867	127	0.488	0.507	0.528
-13	47.586	48.835	50.112	28	8.848	8.947	9.047	78	1.718	1.766	1.815	128	0.477	0.496	0.516
-12	45.442	46.613	47.810	29	8.525	8.624	8.723	79	1.670	1.716	1.764	129	0.466	0.485	0.505
-11	43.408	44.506	45.627	30	8.216	8.315	8.413	80	1.623	1.669	1.716	130	0.455	0.474	0.494
-10	41.477	42.506	43.557	31	7.920	8.018	8.116	81	1.577	1.622	1.669	131	0.445	0.464	0.483
-9	39.635	40.600	41.584	32	7.637	7.734	7.831	82	1.533	1.578	1.623	132	0.435	0.454	0.472
-8	37.886	38.791	39.713	33	7.365	7.461	7.558	83	1.491	1.535	1.579	133	0.426	0.444	0.462
-7	36.224	37.073	37.937	34	7.104	7.199	7.295	84	1.450	1.493	1.537	134	0.416	0.434	0.452
-6	34.646	35.442	36.252	35	6.853	6.948	7.043	85	1.410	1.452	1.495	135	0.407	0.424	0.442
-5	33.146	33.892	34.652	36	6.613	6.707	6.801	86	1.372	1.413	1.455	136	0.398	0.415	0.433
-4	31.720	32.420	33.131	37	6.383	6.475	6.568	87	1.334	1.375	1.417	137	0.389	0.406	0.424
-3	30.364	31.020	31.687	38	6.161	6.253	6.345	88	1.298	1.338	1.379	138	0.381	0.397	0.415
-2	29.074	29.689	30.314	39	5.949	6.039	6.130	89	1.264	1.303	1.343	139	0.373	0.389	0.406
-1	27.847	28.423	29.009	40	5.744	5.834	5.924	90	1.230	1.268	1.307	140	0.365	0.381	0.397
0	26.678	27.219	27.768	41	5.547	5.636	5.725	91	1.197	1.234	1.273	141	0.357	0.373	0.389
				42	5.358	5.445	5.533	92	1.165	1.202	1.240	142	0.349	0.365	0.381
				43	5.176	5.262	5.349	93	1.134	1.170	1.207	143	0.342	0.357	0.373
				44	5.002	5.086	5.172	94	1.104	1.139	1.176	144	0.335	0.350	0.365
				45	4.833	4.917	5.002	95	1.075	1.110	1.146	145	0.328	0.342	0.358
				46	4.672	4.754	4.837	96	1.046	1.081	1.116	146	0.321	0.335	0.350
				47	4.516	4.597	4.679	97	1.019	1.053	1.088	147	0.314	0.328	0.343
				48	4.366	4.446	4.527	98	0.993	1.026	1.060	148	0.308	0.322	0.336
				49	4.222	4.301	4.381	99	0.967	0.999	1.033	149	0.301	0.315	0.329
				50	4.083	4.161	4.240	100	0.942	0.974	1.007	150	0.295	0.309	0.323



#### 4. ABSOLUTE MAXIMUM RATINGS

##### 4.1 Electrical Absolute Rating

##### 4.1.1 TFT LCD Module

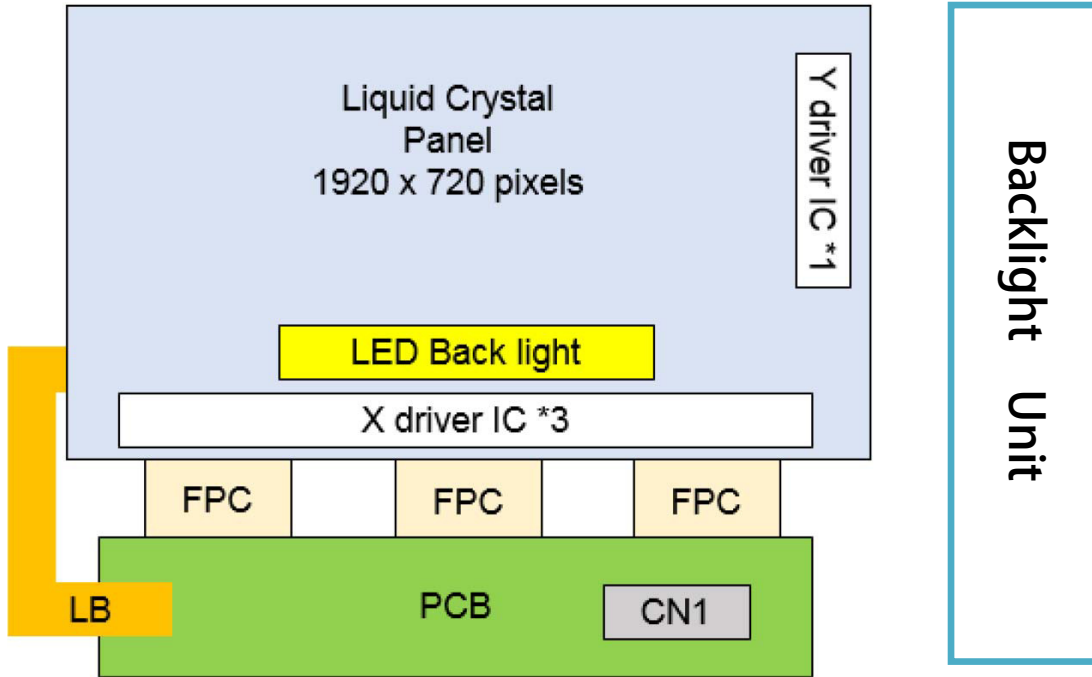
Item	Symbol	Values		Unit	Note
		Min	Max.		
Digital Supply Voltage	VDD	0	5.0	V	

##### 4.1.2 Environment Absolute Rating

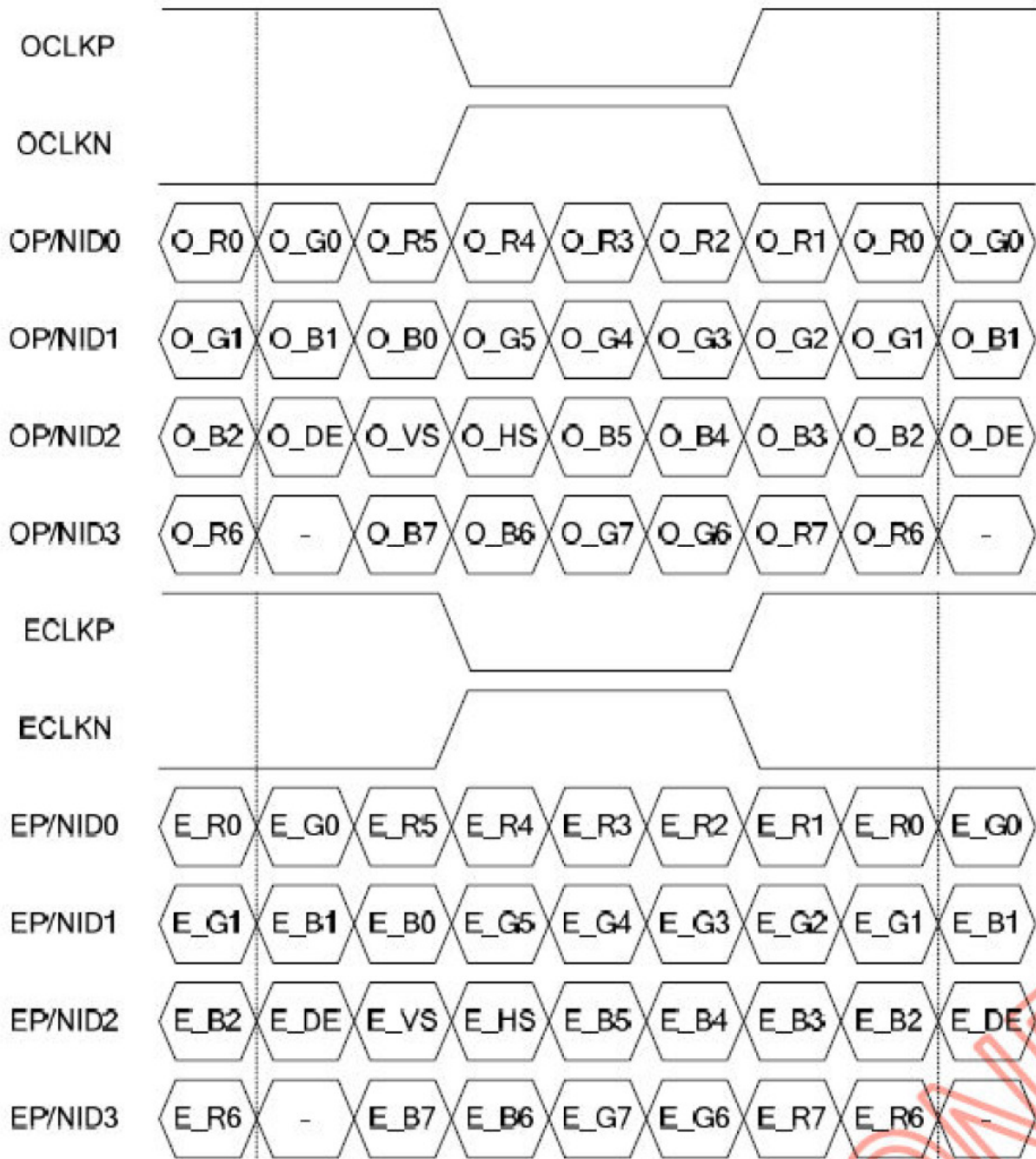
Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-40		85	°C	Ambient temperature
Storage Temperature	Tstg	-40		95	°C	

5. BLOCK DIAGRAM

5.1 TFT LCD Module



6. LVDS Input Data mapping



## 7. ELECTRICAL CHARACTERISTICS

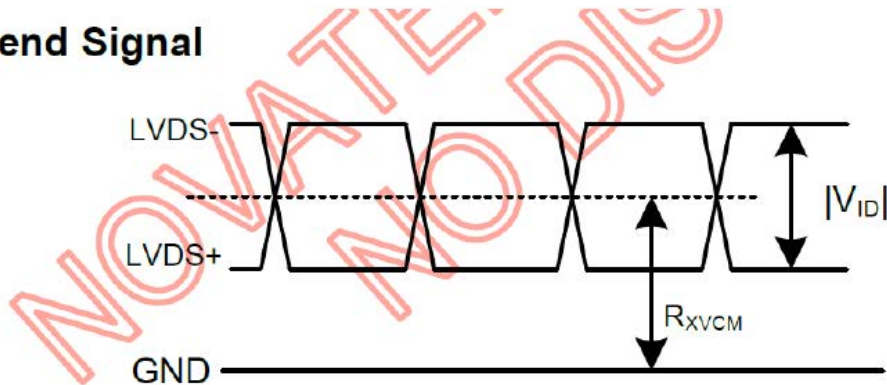
### 7.1 TFT LCD Module

Item	Symbol	Values			Unit	Note
		Min	Typ.	Max.		
Power Supply Voltage	VDD	3.0	3.3	3.6	V	
Input Signal Voltage	V <sub>IH</sub>	0.7VDD	-	VDD	V	
	V <sub>IL</sub>	GND	-	0.3VDD	V	
Differential Input High Threshold	V <sub>TH</sub>	-	-	+100	mV	
Differential Input Low Threshold	V <sub>TL</sub>	-100	-	-	mV	
Differential input Voltage	V <sub>ID</sub>	0.1	-	$\frac{(1.5-V_{CM})^*}{2}$	V	
Differential input common mode voltage	V <sub>CM</sub>	1.0	1.2	1.4	V	
Supply Current	I <sub>DD</sub>	-	-	600	mA	(1)

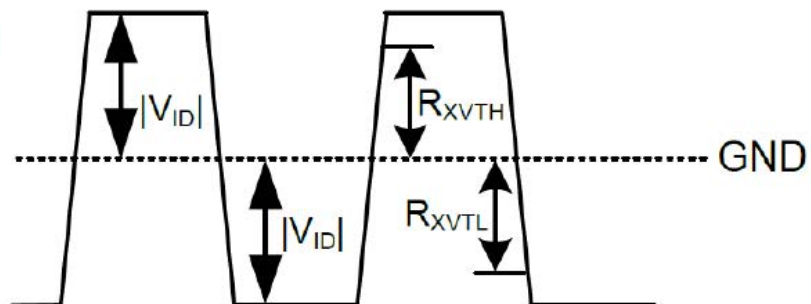
Note 1: Typical: Under white pattern

Note 2:

#### Single-end Signal



#### Differential Signal



## 7.2 Backlight Unit

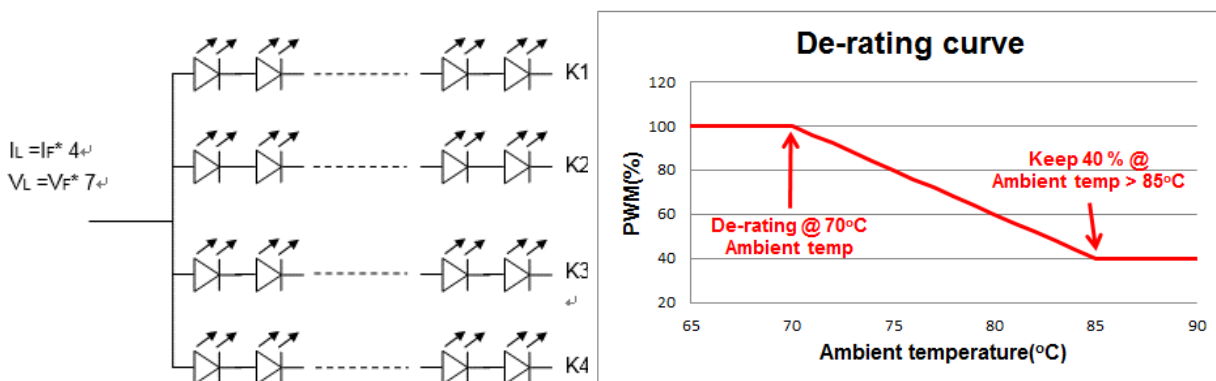
Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	VL	21.2	-	24.2	V	Ta=-40°C
	VL	20.3	-	23.1	V	Ta=25°C
	VL	19.6	-	22.3	V	Ta=85°C
LED Current	IF	-	380	-	mA	Ta=25°C
Power Consumption	PBL	-	8.778	-	W	Max.
LED Life Time (25°C)	-	20000	-	-	hr	(1)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL 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 Ta=25°C and IL=380mA. The LED lifetime could be decreased if operating IL is larger than 380mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit.

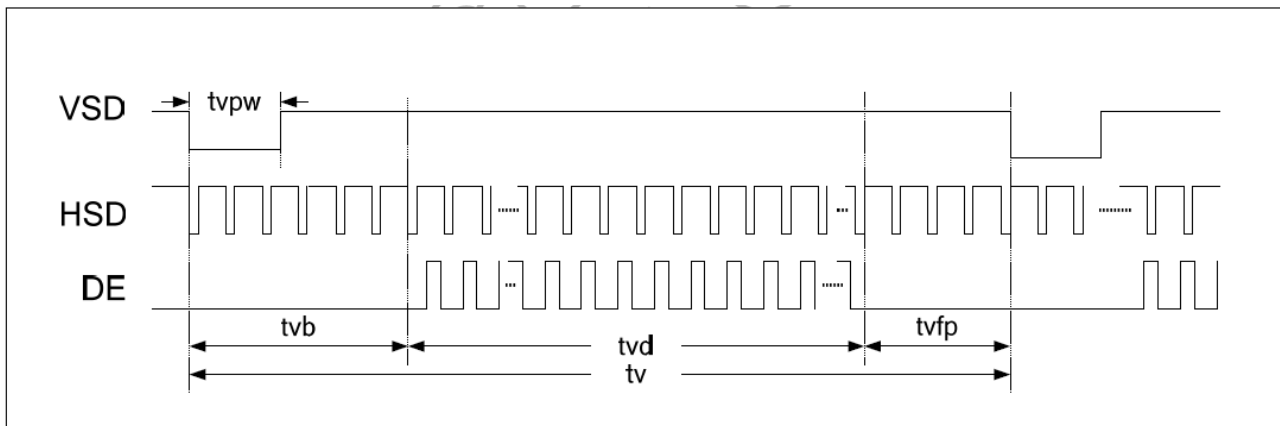
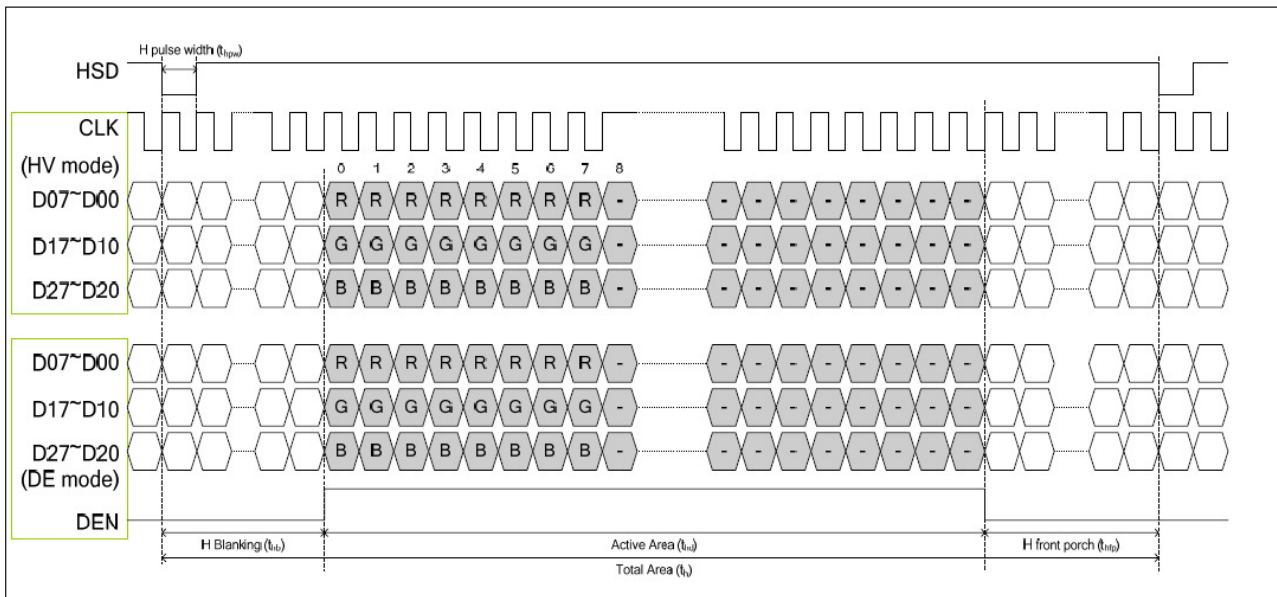
Note (4) The reference derating curve for the backlight is shown below. The derating temperature is > 70 °C (Just for reference, and it will update after design.)



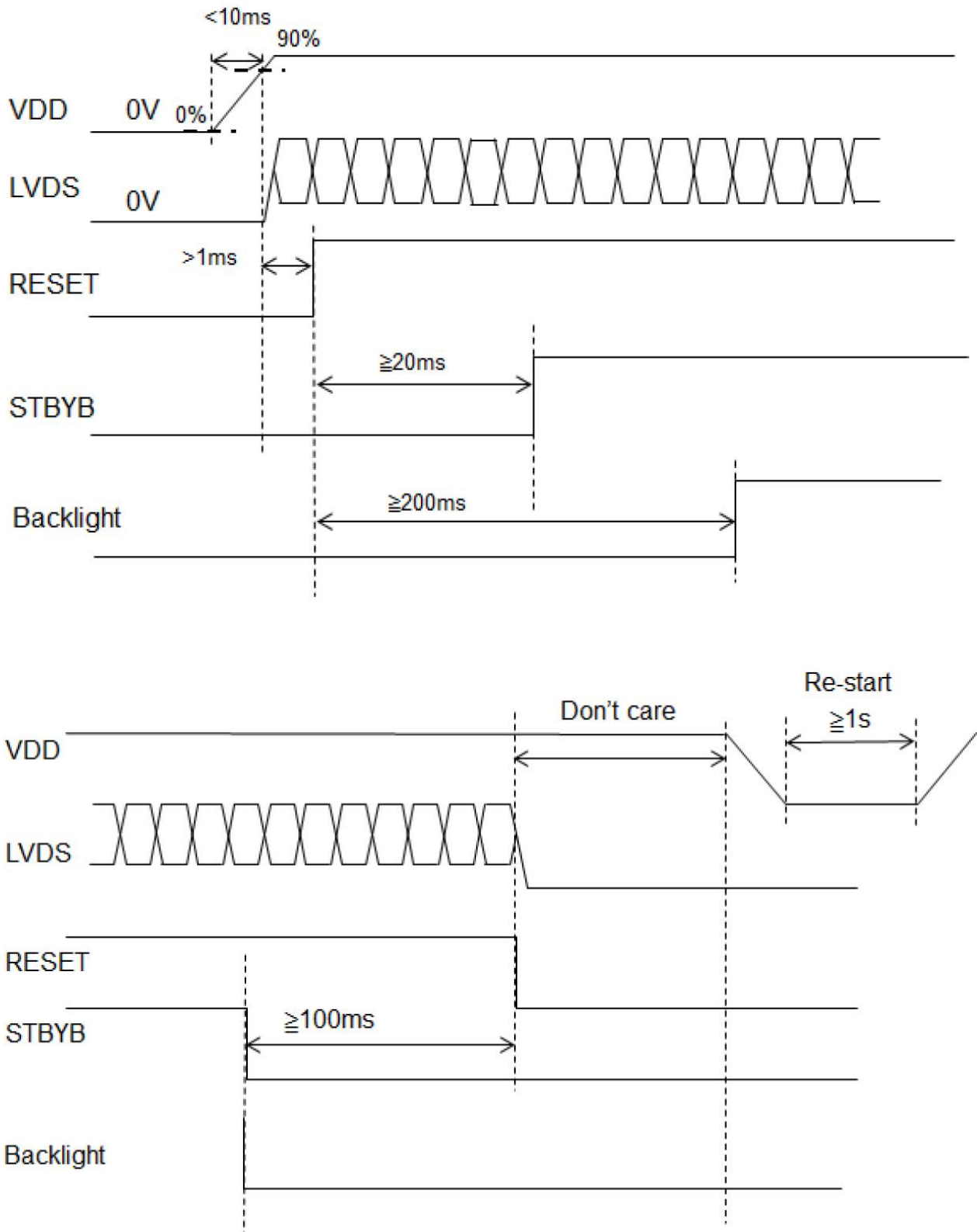
### 7.3 INTERFACE SPECIFICATIONS

#### 7.3.1 DE mode Input signal characteristics

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK	DCLK Frequency	fclk	46.2	46.7	57.1	MHz	
Horizontal	Horizontal display area	thd	-	960	-	DCLK	
	HSD period time	th	1060	1068	1120	DCLK	
	HSD Blanking	thb+thfb	100	108	160	DCLK	
Vertical	Vertical display area	tvd	-	720	-	th	
	VSD period time	tv	726	728	850	th	
	VSD pulse width	tvb+tvfb	6	8	130	th	



### 7.4 Power On / Off Sequence

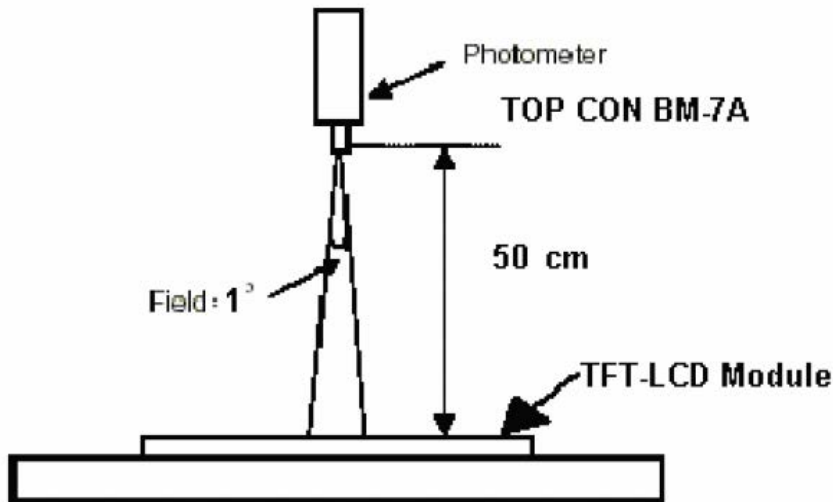


## 8. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness	--	Note1, Note 3, ( $\theta = 0^\circ$ ; Normal Viewing Angle)	750	1000	--	cd/m <sup>2</sup>
Uniformity	B-uni		70	80	-	%
Contrast Ratio	CR		1100	1500	--	--
Response Time	Tr+Tf		--	--	30	ms
Color Chromaticity	White	Wx	0.240	0.290	0.340	--
		Wy	0.270	0.320	0.370	--
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  $\leq 1$  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:



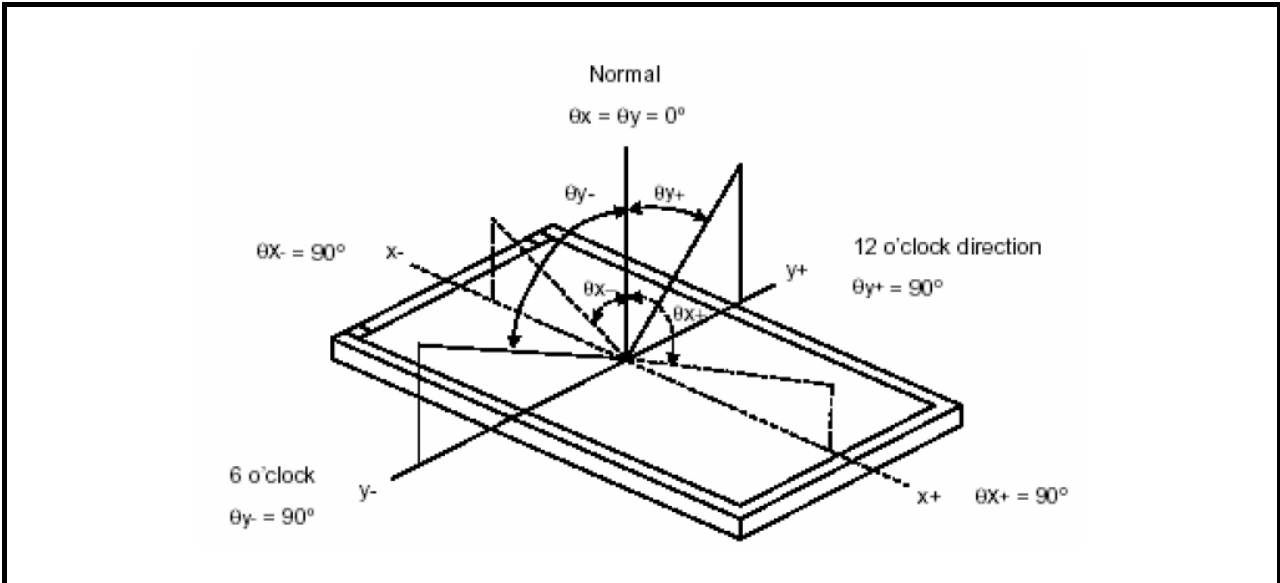
Note2: Measured at the center area of the panel and at the viewing angle of the  $\theta x = \theta y = 0^\circ$

Note3: Definition of Contrast Ratio (CR):

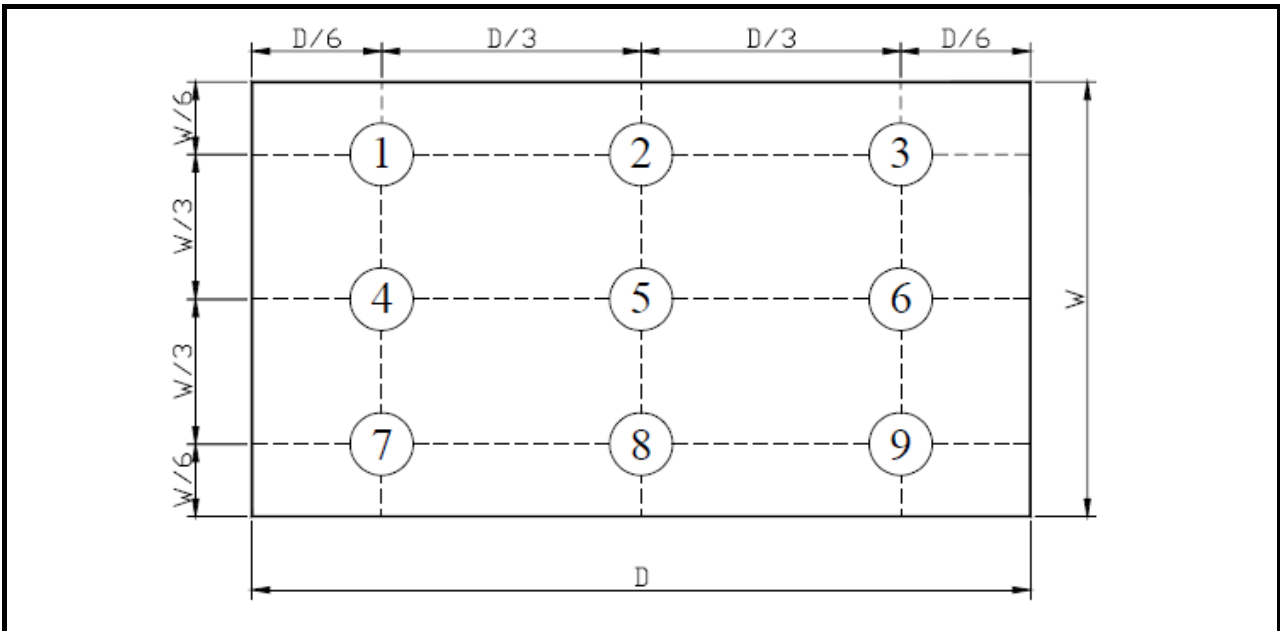
CR = Luminance with all pixels in white state  $\div$  Luminance with all pixels in Black state



**Note 4: Definition of Viewing Angle:**



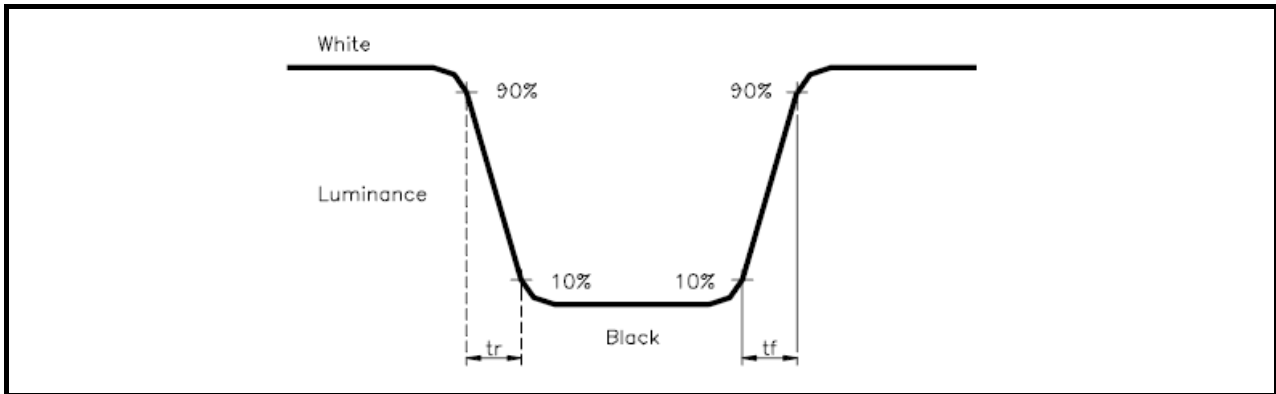
**Note 5: Definition of Brightness Uniformity (B-uni):**



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

**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.

## 9. RELIABILITY

### 9.1 Test Condition

#### 9.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

#### 9.1.2 Operation

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

#### 9.1.3 Container

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

#### 9.1.4 Test Frequency

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

### 9.2 TESTS

No.	ITEM	CONDITION CRITERION
1	High Temperature Storage	95°C, 240 hrs
2	Low Temperature Storage	-40°C, 240 hrs
3	High Temperature Operating	85°C, 240 hrs
4	Low Temperature Operating	-40°C, 240 hrs
5	High Temperature/Humidity Non-Operating	60°C, 90%RH, 240 hrs
6	Temperature Shock Non-Operating	-40°C ↔ 85°C (0.5hr each), 300 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.

### **9.3 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.

### 9.4 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 $\leq 5$ 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											
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><math>D &gt; 0.5</math></td> <td>0</td> </tr> <tr> <td><math>0.3 &lt; D \leq 0.5</math></td> <td>5</td> </tr> <tr> <td><math>D \leq 0.3</math></td> <td>*</td> <td>Minor</td> <td>1.5</td> </tr> </tbody> </table> <p><math>D = (\text{Long} + \text{Short}) / 2</math> * : 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) \ 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><math>L &gt; 5</math>    <math>W &gt; 0.1</math></td> <td>0</td> </tr> <tr> <td><math>0.5 &lt; L \leq 5</math>    <math>0.03 &lt; W \leq 0.1</math></td> <td>5</td> </tr> <tr> <td><math>L \leq 0.5</math>    <math>W \leq 0.03</math></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) \ 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>--    <math>W &gt; 0.1</math></td> <td>0</td> </tr> <tr> <td><math>L \leq 3</math>    <math>W \leq 0.1</math></td> <td>3</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		
		L (mm) \ Zone W(mm)	Acceptable number	Class Of Defects			AQL Level					
		-- $W > 0.1$	0									
$L \leq 3$ $W \leq 0.1$	3											
Dent or bubble on the polarize (Note:2)												
<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><math>D \leq 0.3</math></td> <td>*</td> </tr> <tr> <td><math>D \leq 0.5</math></td> <td>3</td> </tr> </tbody> </table> <p><math>D = (\text{Long} + \text{Short}) / 2</math> * : Disregard</p>	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											

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

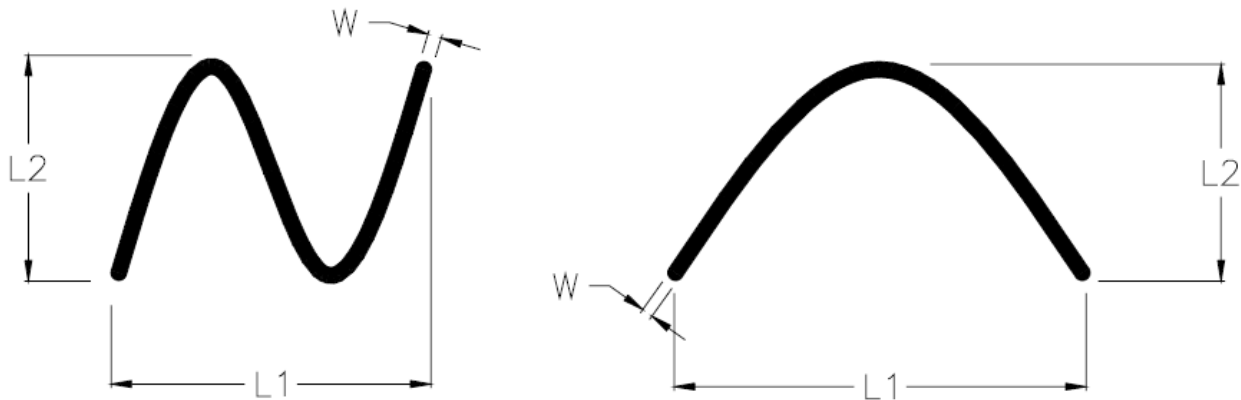
**Note1:**

- (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  $30 \pm 5$ cm between the eyes of inspector and the panel.

**Note3:** Luminance measurement for contrast ratio is at the distance  $50 \pm 5$ 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.



### 9.5 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

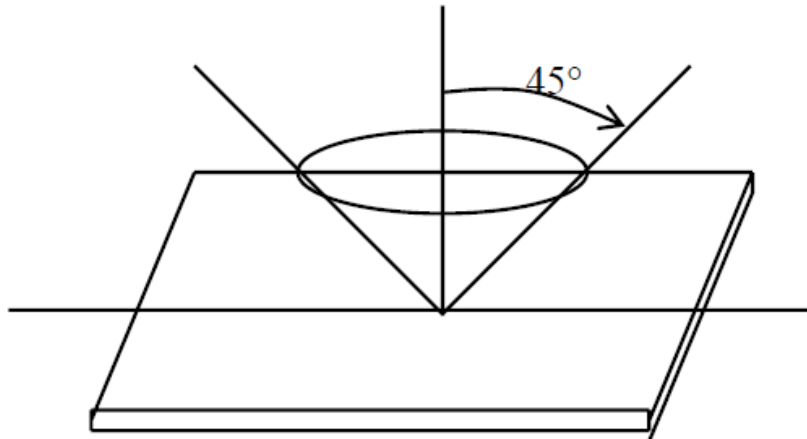
Inspection level: Level II

### 9.6 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



## **10. PRECAUTION RELATING PRODUCT HANDLING**

### **10.1 SAFETY**

- 10.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.**
- 10.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.**

### **10.2 HANDLING**

- 10.2.1 Avoid any strong mechanical shock which can break the glass.**
- 10.2.2 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.**
- 10.2.3 Do not remove the panel or frame from the module.**
- 10.2.4 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.)**
- 10.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.**
- 10.2.6 Do not touch the display area with bare hands , this will stain the display area.**
- 10.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.**
- 10.2.8 To control temperature and time of soldering is  $280 \pm 10^{\circ}\text{C}$  and 3-5 sec.**
- 10.2.9 To avoid liquid (include organic solvent) stained on LCM.**

### **10.3 STORAGE**

- 10.3.1 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.**
- 10.3.2 Do not place the module near organics solvents or corrosive gases.**
- 10.3.3 Do not crush, shake, or jolt the module.**