Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 800480H TMH-PW-N

(C-TOUCH)

7,0” TFT with Projective Capacitive TP

Product Specification **Ver.: 2**

21.07.2011

Revise Records

Rev.	Date	Contents	Written	Approved
0	21.07.2011	Preliminary Specification	AJ	MH

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

Contents

1. General Description and Features

DEM 800480H TMH-PW-N(C-TOUCH) is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a receiver circuit ,Touch panel and a back-light unit. Graphics and texts can be displayed on a WVGA 800 (W) x RGB x 480 (H) dots (16:9 aspect ratio) with 262,144 colors. The following table described the features.

1.1 Features

- Transmissive and Backlight with 39 LEDs.
- TN (Twisted Nematic) Mode.
- LVDS Receiver 18 bit Interface.
- ROHS Compliance
- Projected Capacitive Touch Panel

1.2 LCD Module

Item	Specification	Unit
Screen Size	7.0 inches	Diagonal
Display Resolution	800 (H) x 480 (V)	Pixel
Active Area	152.4 (H) x 91.44 (V)	mm
Outline Dimension	174.4 (H) x 113.44 (V) x 12 (T)	mm
Display Mode	Normally white mode/ Transmissive	--
Pixel Arrangement	R,G,B Vertical Stripe	--
Pixel Size	0.1905 x 0.1905	mm
Surface Treatment	Glass 7H (min.)	
Display Color	262K	--
Viewing Direction	6 o'clock	--
Input Interface	LVDS Receiver 18 bit Interface	--

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	174.1	174.4	174.7	mm	
	Vertical (V)	113.14	113.44	113.74	mm	
	Thickness (T)	11.7	12	12.3	mm	(1)
Weight		--	(220)	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

3. Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	80	°C	(1)
Operating temperature	T_{OPR}	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. (40 °C ≥ Ta). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.

Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.1.2 Electrical Absolute Maximum Ratings

3.1.2.1 TFT-LCD Module

(V_{SS}=GND=0)

Parameter	Symbol	Min.	Max.	Unit	Remark
Power supply voltage	V_{CC}	-0.3	4.0	V	
input voltage	V_I	-0.3	Vcc+0.3	V	--

3.1.2.2 Backlight Unit

(V_{SS}=GND=0)

Parameter	Symbol	Min.	Max.	Unit	Remark
Current of Backlight Unit	IB	--	325	mA	
Voltage of Backlight Unit	VB	--	10.5	V	

3.1.3 DC Electrical Characteristics of the TFT LCD

(Ta=25±2°C, V_{SS}=GND=0)

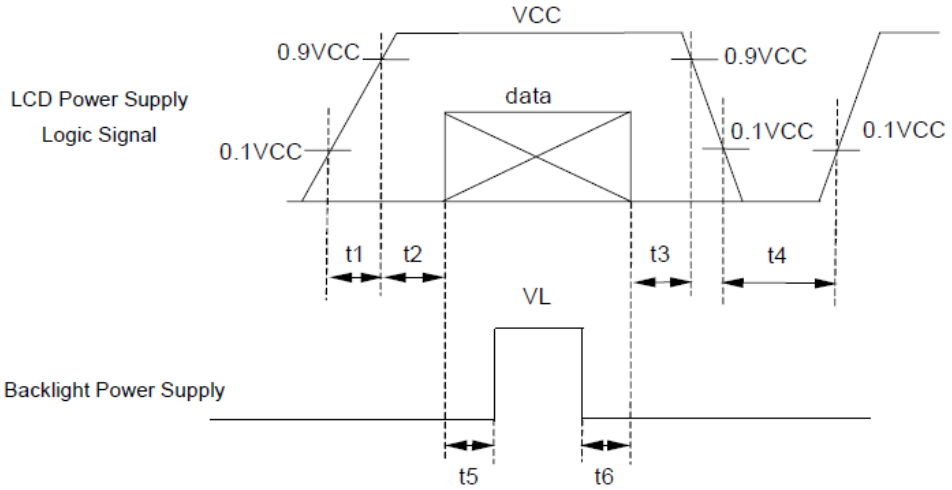
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VCC	3.0	3.3	3.6	V	
Input Voltage for logic	Differential Input High Threshold	VTH			+100	mV	
	Differential Input Low Threshold	VTL	-100			mV	
Power Supply current		ICC	-	(215)	(250)	mA	Note 1

Note1: fv =60Hz , Ta=25°C , Display pattern : Black pattern

3.1.4 Power Signal sequence

t1 ≤ 10 ms
0 < t2 ≤ 50 ms
0 < t3 ≤ 50 ms

200 ms ≤ t4
200 ms ≤ t5
0 ≤ t6



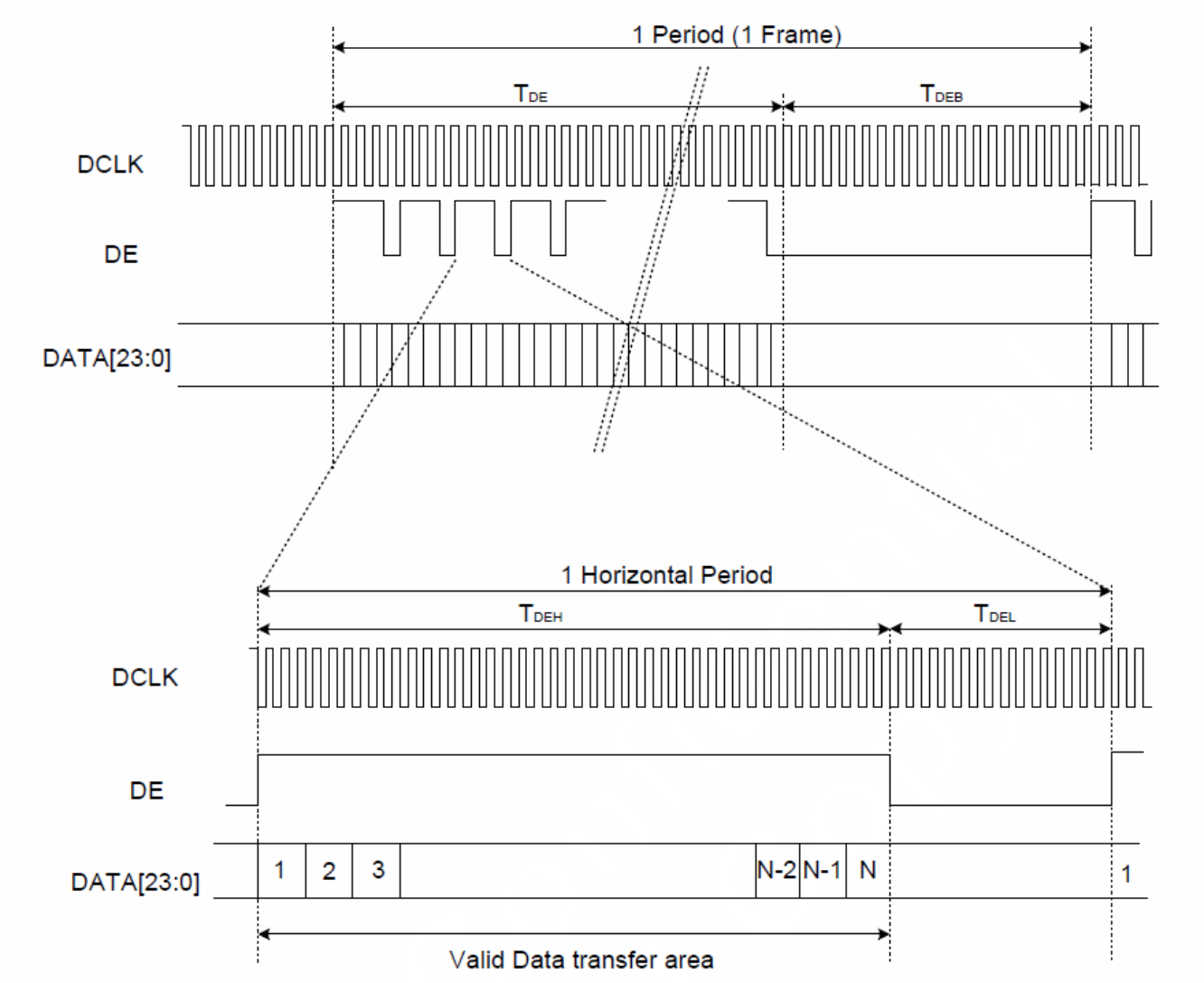
3.2 AC Timing Characteristic of The LCD

3.2.1 Timing Condition (DE only mode

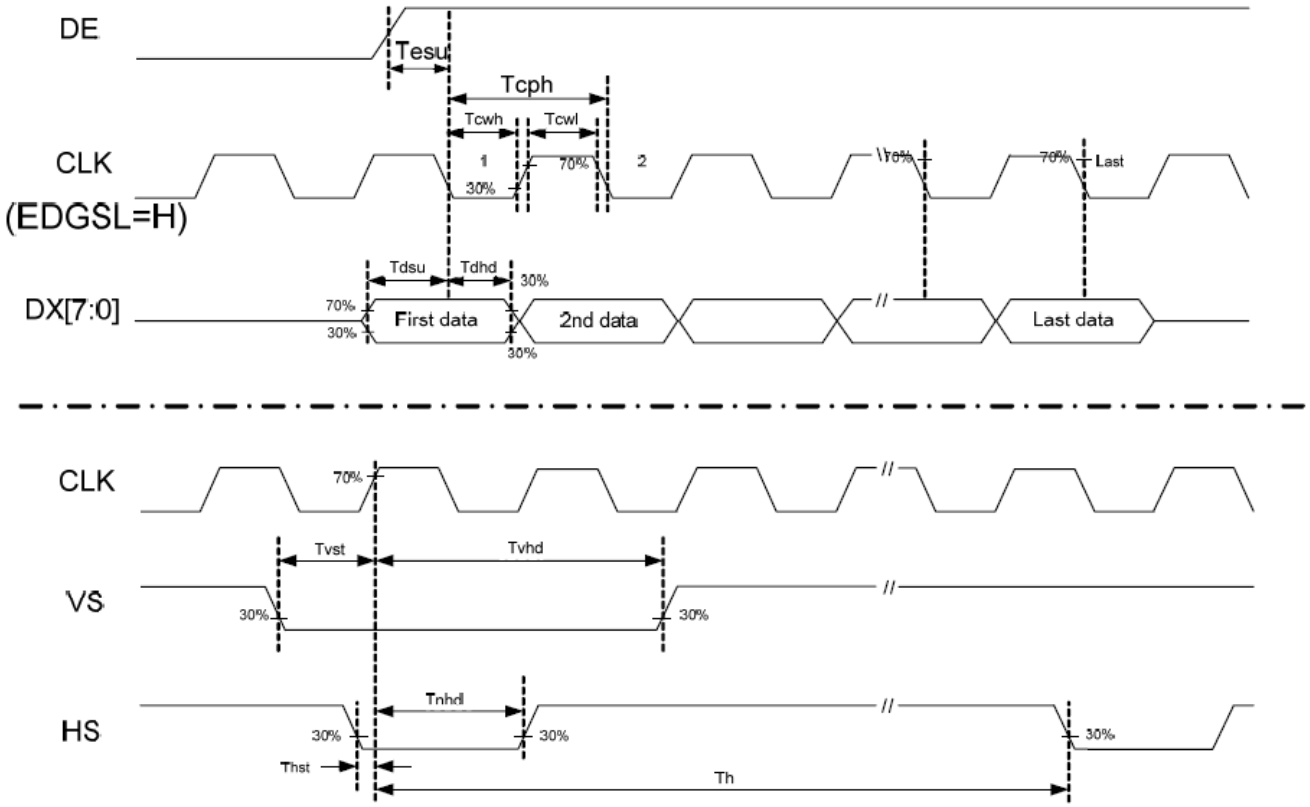
Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	CLK frequency	F_{CPH}	29.4	33.26	42.48	MHz	
	CLK period	T_{CPH}	-	30.06	-	ns	
	CLK pulse duty	T_{CWH}	40	50	60	%	
DE	DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}	
	DE pulse width	T_{DEH}	-	800	-	T_{CPH}	
	DE frame blanking	T_{DEB}	10	45	110	$T_{DEH}+T_{DEL}$	
	DE frame width	T_{DE}	-	480	-	$T_{DEH}+T_{DEL}$	
	DE setup time	T_{esu}	6	-	-	ns	
Data	Data setup time	T_{dsu}	6	-	-	ns	
	Data hold time	T_{dhd}	6	-	-	ns	

3.2.2 Timing Characteristic

3.2.2.1 DE and RGB Data Input Timing



3.2.2.2 Clock and Data input waveforms

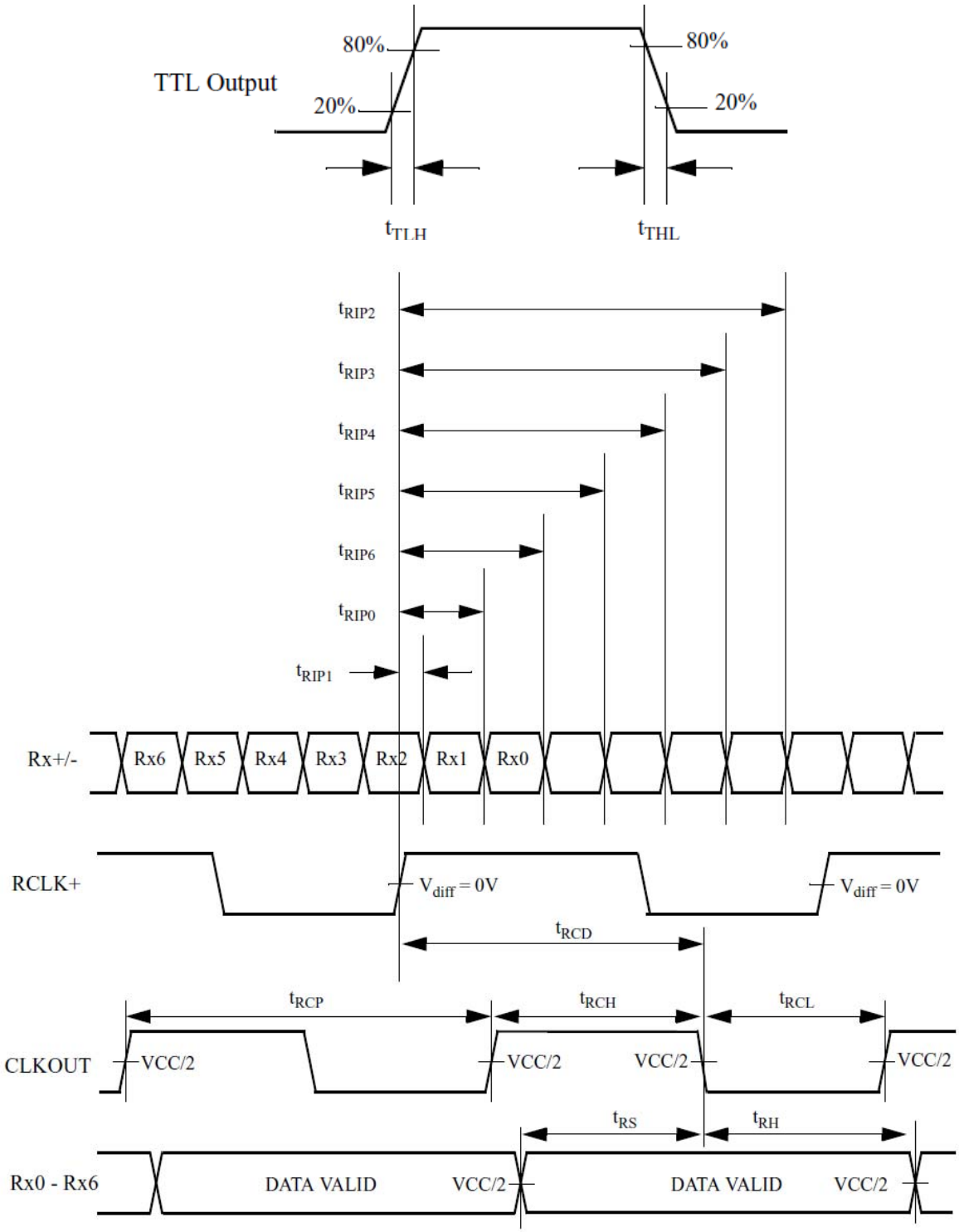


3.3 LVDS Switching Characteristics

3.3.1 LVDS Timing Condition

Symbol	Parameter		Min.	Typ.	Max.	Unit.	Note
tRCP	CLK OUT Period	VCC = 3.0 - 3.6V	11.76	T	50.0	ns	
		VCC = 2.5 - 3.6V	14.28	T	50.0	ns	
tRCH	CLK OUT High Time		-	4T/7	-	ns	
tRCL	CLK OUT Low Time		-	3T/7	-	ns	
tRCD	RCLK +/- to CLK OUT Delay		-	5T/7	-	ns	
tRS	TTL Data Setup to CLK OUT		0.35T-0.3	-	-	ns	
tRH	TTL Data Hold from CKL OUT		0.45T-1.6	-	-	ns	
tTLH	TTL Low to High Transition Time		-	2.0	3.0	ns	
tTHL	TTL High to Low Transition Time		-	1.8	3.0	ns	
tRIP1	Input Data Position0 (T = 11.76ns)		-0.4	0.0	0.4	ns	
tRIP0	Input Data Position1 (T = 11.76ns)		T/7-0.4	T/7	T/7+0.4	ns	
tRIP6	Input Data Position2 (T = 11.76ns)		2T/7-0.4	2T/7	2T/7+0.4	ns	
tRIP5	Input Data Position3 (T = 11.76ns)		3T/7-0.4	3T/7	3T/7+0.4	ns	
tRIP4	Input Data Position4 (T = 11.76ns)		4T/7-0.4	4T/7	4T/7+0.4	ns	
tRIP3	Input Data Position5 (T = 11.76ns)		5T/7-0.4	5T/7	5T/7+0.4	ns	
tRIP2	Input Data Position6 (T = 11.76ns)		6T/7-0.4	6T/7	6T/7+0.4	ns	
tRPLL	Phase Lock Loop Set				10.0	ms	

3.3.2 LVDS AC Timing



3.4 Backlight Unit

The Back-light system is an edge-lighting type with 39 white LED (Light Emitting Diode)s. The characteristics of 39 white LEDs are shown in the following tables.

(Ta= Room Temp)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Voltage	VB	(9.3)	(9.9)	(10.5)	V	
Forward Current	IB	-	260	-	mA	(1)
Power Consumption	P_{BL}	-	2574	-	mW	(2)
LED Life time	-	(40000)	-	-	hr	(3)

Note (1) LEDs in 3 series x 13 parallel type.

(2) Where IB = 260mA, VB = 9.9, P_{BL} = VB × IB

(3) The environmental conducted under ambient air flow ,at Ta=25±2°C, 60%RH±5%

4. Optical Characteristics

4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

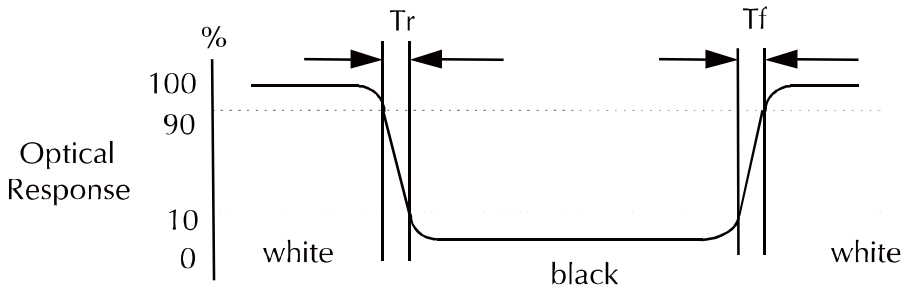
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		B		(700)	(850)	--	cd/m^2	
Response time		T_r	θ=0°	-	5	10	ms	.
		T_f		--	15	20	ms	
Contrast ratio		CR	At optimized viewing angle	(350)	(400)	--	--	
Luminance Uniformity		ΔL		70	75		%	
Color Chromaticity (CIE 1931)	White	Wx	θ=0° Normal Viewing Angle	(0.270)	(0.320)	(0.370)	--	BM-7A
		Wy		(0.300)	(0.350)	(0.400)		
Viewing Angle (6H)	Hor.	θ_R	CR≥10	55	65	--	Degree	
		θ_L		55	65	--		
	Ver.	θ_U		45	55	--		
		θ_D		55	65	--		

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

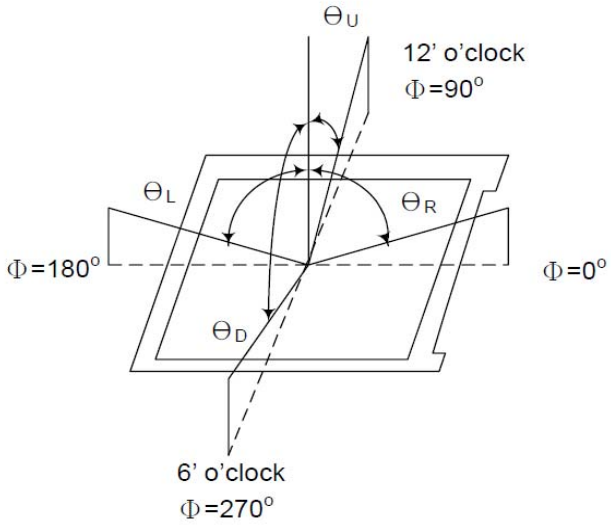


c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

5. I/O Terminal

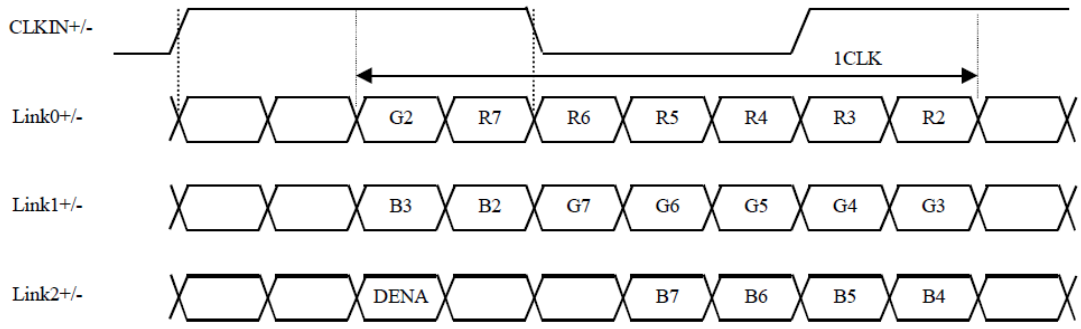
5.1 Pin Assignment (connector part No: MSB24013P20HA or equivalent.)

Pin No.	Symbol	I/O	Function	Remark
1	VCC	P	Power Supply +3.3V	
2	VCC	P	Power Supply +3.3V	
3	VSS	P	Ground	
4	VSS	P	Ground	
5	RIN0-	I	Negative LVDS differential data input	
6	RIN0+	I	Positive LVDS differential data input	
7	VSS	P	Ground	
8	RIN1-	I	Negative LVDS differential data input	
9	RIN1+	I	Positive LVDS differential data input	
10	VSS	P	Ground	
11	RIN2-	I	Negative LVDS differential data input	
12	RIN2+	I	Positive LVDS differential data input	
13	VSS	P	Ground	
14	RCLK-	I	Negative LVDS differential clock input	
15	RCLK+	I	Positive LVDS differential clock input	
16	VSS	P	Ground	
17	NC	-	NO Connect	
18	NC	-	NO Connect	
19	VSS	P	Ground	
20	VSS	P	Ground	

I: Input, P: Power

Notes:

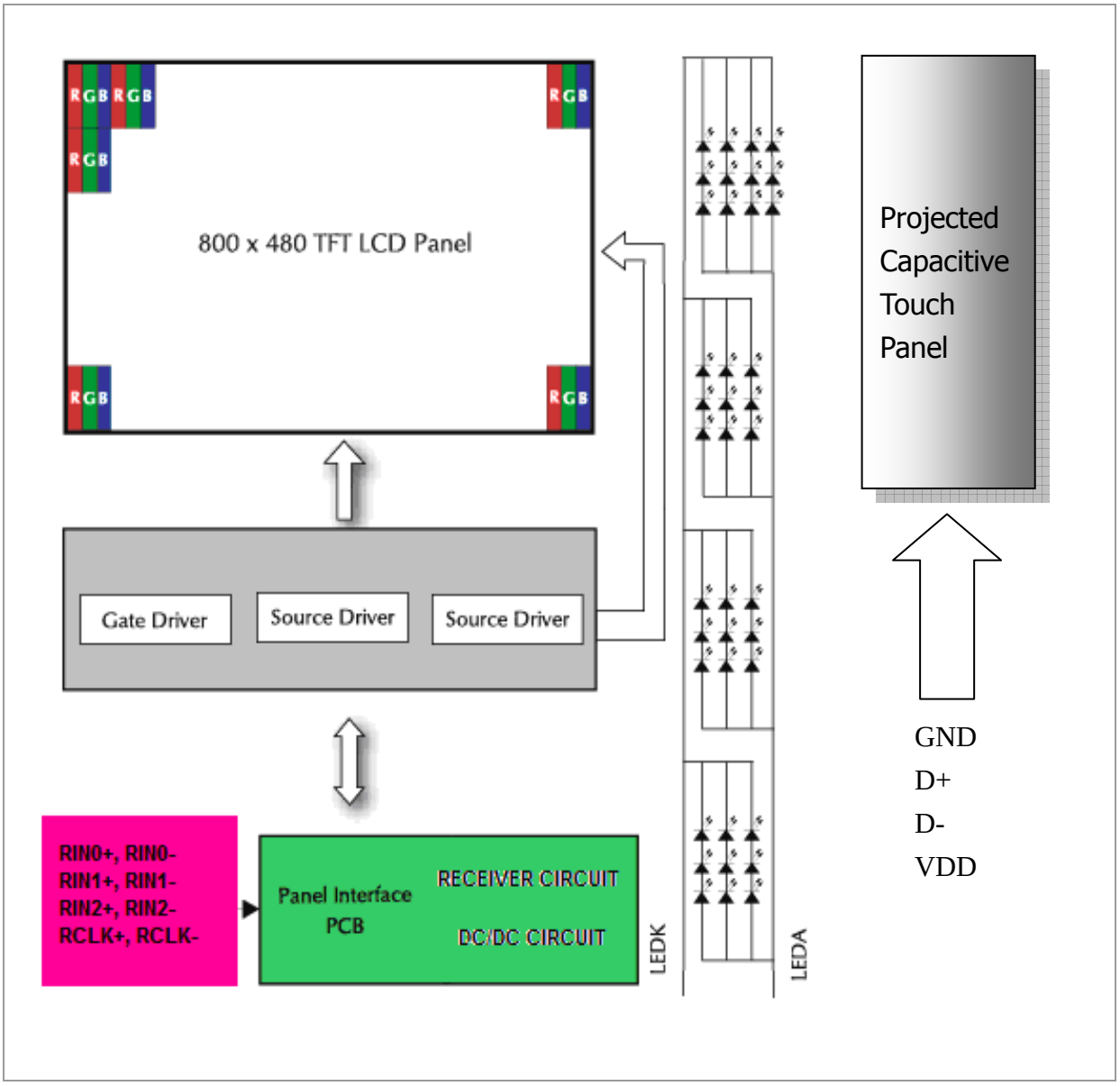
1) NC Pin must be retained; this pin can't contact VSS or other signal.
2) VSS Pin must ground contact, can not be floating.



5.2 Backlight Unit (Connector Part No: JST:BHSR-02VS-01(N) or equivalent.)

Pin No.	Symbol	Function	Remark
1	LEDA	Power Supply for LED backlight	RED
2	LEDK	GND for LED backlight	BLACK

5.3 Block Diagram



6. Displayed Color and Input Data

	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(0)	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	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	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(62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(61)	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(1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	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(62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(61)	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(1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(0)	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(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(61)	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(1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(0)	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 262,144-color display can be achieved on the screen.

7. Projected Capacitive Touch Panel

7.1 Main Feature

Item	Specification	Unit
Screen Size	7 inches	Diagonal
Type	Transparent Type Projected Capacitive Touch Panel	--
Input Mode	Human's Finger	--
Active Area	158.5 (H)(typ.) X 97.4 (V)(typ.)	mm
Module Outline	174.4 (H)(typ.) X 113.44 (V)(typ.)	mm
I/O	22(H) X 13(V)	Number
Resolution	2816(H) X 1664(V)	--
Interface	USB	--
Cover glass pencil-handness	7H(min) by JIS K5400	--
Report Rate	Max 100	Points/sec
Response time	Max 50	ms
Digital Power Supply	5V DC (typ)	V
Power Consumption	45	mA
IC solution	IC : EETI_ EX5404 MCU : EETI_EXC7200	

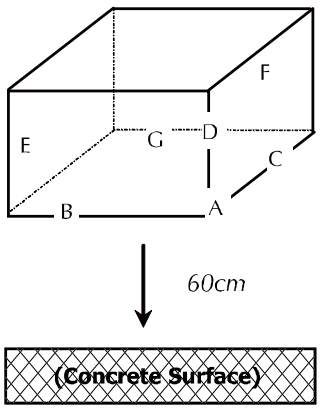
7.2 Pin Assignments and Definitions

Item	Name	I/O	Unit
1	GND	p	Ground
2	D+	I/O	D+
3	D-	I/O	D-
4	VDD	p	Power Supply Voltage
5	NC	-	-
6	NC	-	-
7	NC	-	-
8	NC	-	-
9	GND	p	Ground

8. Reliability Condition

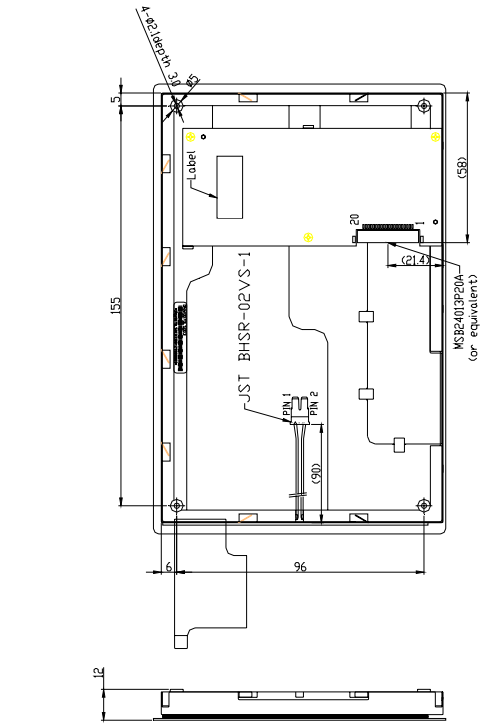
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.
Temperature: 20±5°C.
Humidity: 65±5%RH.
Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state).	1
3	High Temperature Storage	80°C±2°C, 240hrs.	2
4	Low Temperature Storage	-30°C±2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90%, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  *Dropping method corner dropping:* *A corner: Once edge dropping.* *B, C, D edge: Once face dropping.* *E, F, G face: Once.*	

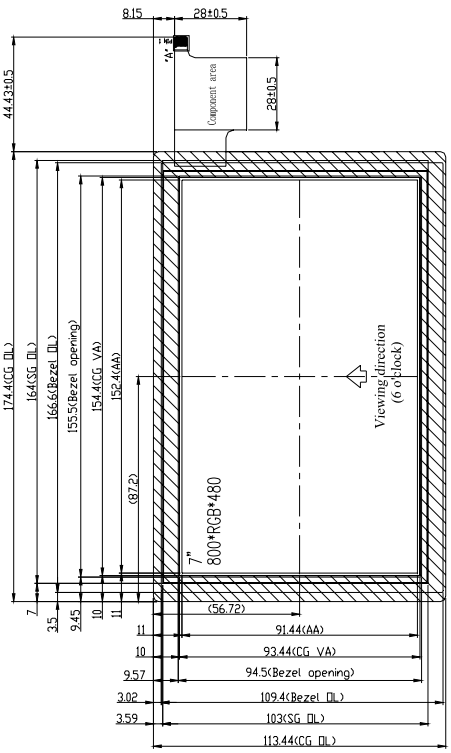
Notes: 1. No dew condensation to be observed.
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
3. Vibration test will be conducted to the product itself without putting I in a container.

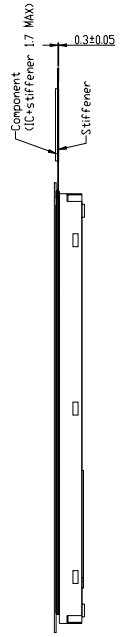
9. Dimensional Outlines

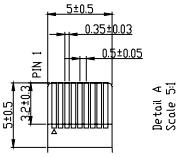


PTC pin assignment_USB

Pin 1	GND
Pin 2	D+
Pin 3	D-
Pin 4	VDD
Pin 5	NC
Pin 6	NC
Pin 7	NC
Pin 8	NC
Pin 9	GND







No.	PIN NAME
1	VCC
2	VCC
3	VSS
4	VSS
5	RIN0-
6	RIN0+
7	VSS
8	RIN1-
9	RIN1+
10	VSS
11	RIN2-
12	RIN2+
13	VSS
14	RCLK-
15	RCLK+
16	VSS
17	NC
18	NC
19	VSS
20	VSS

10. Incoming Inspection Standards

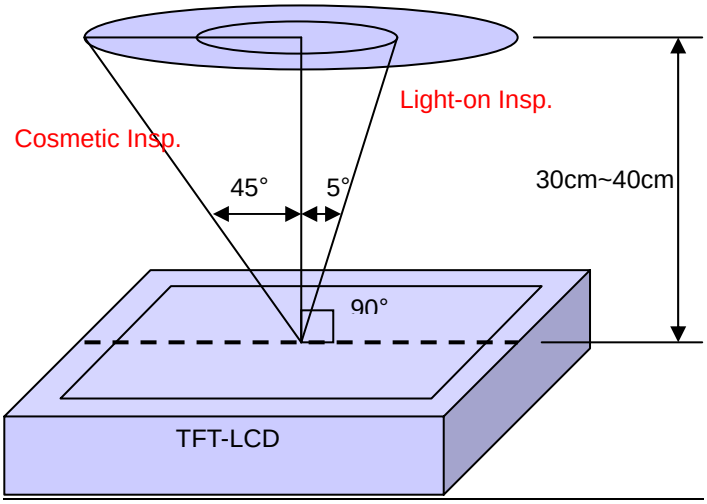
10.1 Inspection and Environment Conditions

10.1.1 Inspection Conditions:

(1)Inspection Distance: 35 cm±5cm

(2)View Angle : Light-on Inspection Angle：±5°

Cosmetic Inspection Angle：±45°



(perpendicular to LCD panel surface)

10.1.2 Environment Conditions:

Ambient Temperature		23℃±5℃
Ambient Humidity		55±10%RH
Ambient Illumination	Cosmetic Inspection	more than 600 Lux
	Functional Inspection	300~500 Lux

10.1.3 Sampling Conditions:

(1) Lot Size: Quantity of shipment lot per model

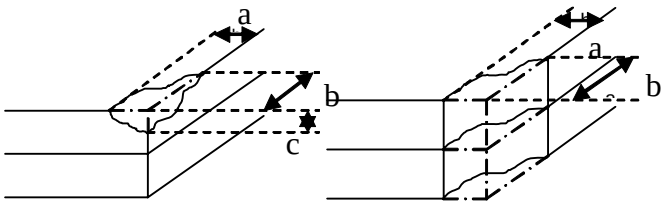
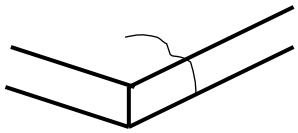
(2) Sampling Method:

Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling
		Level II
AQL	Major Defect	1.0%
	Minor Defect	1.5%

(3) The classification of Major(MA) and Minor(MI) defects is shown as 3. Inspection Criteria.

10.1.4 Inspection Criteria

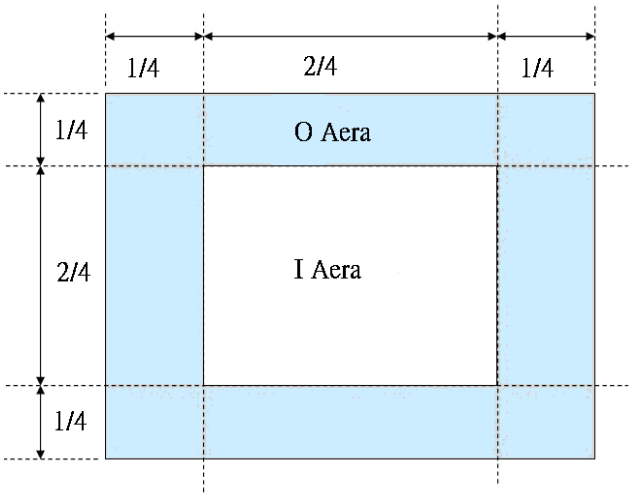
10.1.4.1 Cosmetic Inspection(Panel):

Item	Judgment Criteria	Classification
Chipping on Panel	 a≦3.0mm、b≦3.0mm、c≦t (Bottom glass thickness)	MA
Scratch on Panel *Note-2	W≦0.05mm or L< 5mm: Ignored 0.05mm<W≦0.1mm and L≦5mm: N≦5 W>0.1mm or L>5mm: Not allowed	MI
Bubble or Dent on Panel *Note-3	D≦0.2mm: Ignored 0.2mm<D≦0.3mm: N≦5 D>0.3mm: Not allowed	MI
Panel Crack	 Not Allowed crack	MA
Bezel Deformation	Obvious deformation is not allowed.	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	L 20mm , W 0.2 , N 3	MI
Metal Squash Dent /Flange(Front Side)	D(W) 1,L 3,N 3;	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI
Outline Dimension	Must in Spec, refer to related product spec.	MI

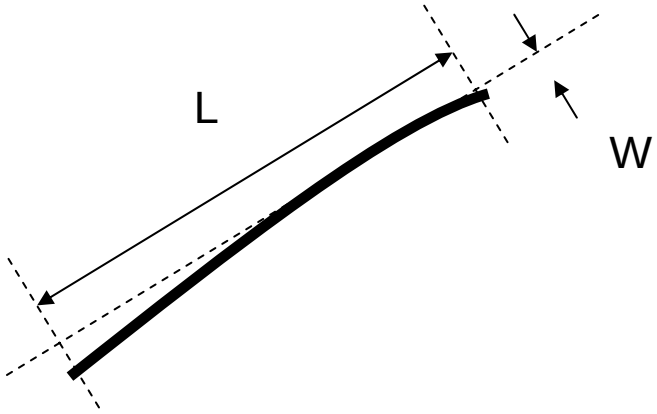
10.1.4.2 Functional Inspection:

<table>
<tr><th rowspan="2">Item</th><th colspan="4">Judgment Criteria</th><th rowspan="2">Classification</th></tr>
<tr><th colspan="2">Area(Note1)</th><th>I</th><th>O</th></tr>
<tr><td rowspan="11">Point Defect</td><td rowspan="3">Bright dot</td><td>Random</td><td colspan="2">2</td><td rowspan="11">MI</td></tr>
<tr><td>2 dots adjacent</td><td>0</td><td>0</td></tr>
<tr><td>3 dots adjacent or more</td><td>0</td><td>0</td></tr>
<tr><td rowspan="3">Dark dot</td><td>Random</td><td colspan="2">3</td></tr>
<tr><td>2 dots adjacent</td><td colspan="2">1</td></tr>
<tr><td>3 dots adjacent or more</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Total Dot Defect</td><td colspan="2">5</td></tr>
<tr><td rowspan="3">Distance</td><td>Distance between Bright and Bright dot</td><td colspan="2">L 5mm</td></tr>
<tr><td>Distance between Bright and Dark dot</td><td colspan="2">L 5mm</td></tr>
<tr><td>Distance between Dark dot</td><td colspan="2">L 5mm</td></tr>
<tr><td colspan="4">(1) It is defined as Point Defect if defect area > 0.5dot
(2) It is ignored if defect area≦0.5dot
(3)Weak point defect will be defined as Bright Dot if it can be observed through ND filter 5%(Full Screen Black Inspection)</td></tr>
<tr><td>Line Defect</td><td colspan="4">Obvious vertical or horizontal line defect is not allowed.</td><td>MA</td></tr>
<tr><td>Mura</td><td colspan="4">Not allowed if it can be observed through ND Filter 5 %</td><td>MI</td></tr>
<tr><td>Foreign Material
in spot shape
*Note-3</td><td colspan="4">D≦0.2mm: Ignored
0.2mm<D≦0.5mm: N≦8
D>0.5mm: Not allowed</td><td>MI</td></tr>
<tr><td>Foreign Material
in line
or spiral shape
*Note-4</td><td colspan="4">W≦0.05mm or L≦5mm: Ignored
0.05mm<W≦0.2mm and L1.0mm≦5mm: N≦8
W>0.2mm or L>5mm: Not allowed</td><td>MI</td></tr>
<tr><td>Display
Function Abnormal</td><td colspan="4">No Malfunction can be allowed</td><td>MA</td></tr>
</table>

Note-1： I/O Area Definition

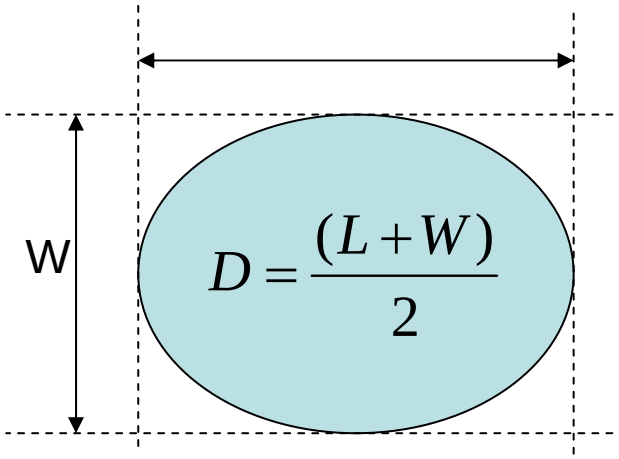


Note-2： Polarizer Scratch



Note-3：Spot Foreign Material

(W ≧L / 4)



Note-4：Line or Spiral Foreign Material

(W<L / 4)