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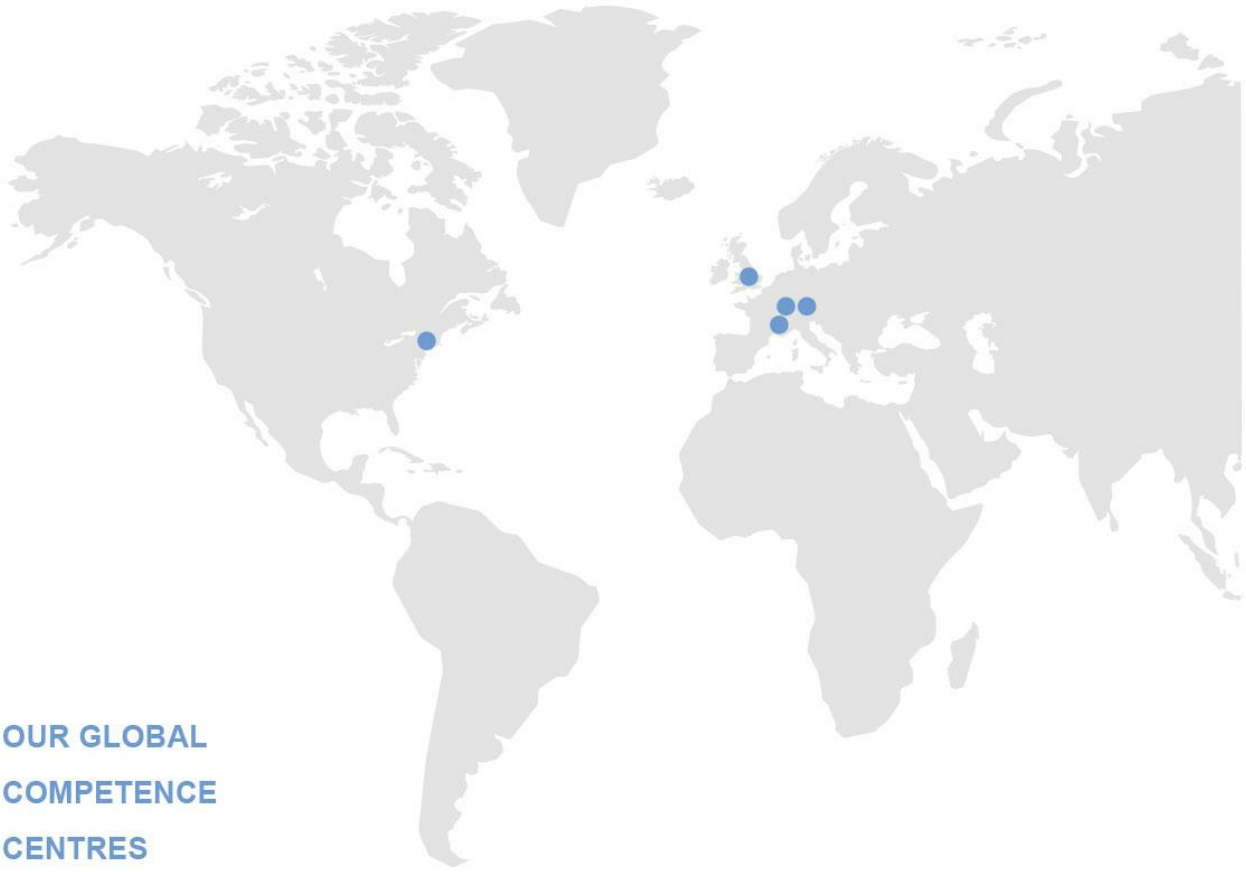

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Datasheet

SGD

GKTW70SNAI5E0

SG-01-001

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Thin-Film-Transistor LCD Module
Model: GKTW70SNAI5E0

Acceptance

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Revise Records

Rev.	Date	Contents	Written	Approved
A	2010/9/16	Preliminary Specification	Kobe_su	Sychang
B	2013/1/21	1.Add 1.1 Features - RoHS Compliance -IIS: T070WNN01 2.Update 3.1.2.2 Backlight Unit 3.Add 3.1.4 Add Power Signal sequence	SK Chen	Roger Yang

Special Notes

Note1.	
Note2.	
Note3.	
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Note5.	

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1. General Description and Features

GKTW70SNAI5E0 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 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 of GKTW70SNAI5E0.

1.1 Features

- Transmissive and back-light with 39 LEDs are available.
- TN (Twisted Nematic) mode.
- LVDS Receiver 18 bit Interface.
- RoHS Compliance
- IIS: T070WNN01

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	166.6 (H) x 109.4 (V) x 10.0 (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	Anti-Glare and Hard Coating(3H)	
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)	--	166.6	--	mm	
	Vertical (V)	--	109.4	--	mm	
	Thickness (T)	--	10.0	--	mm	(1)
Weight		--	(165)	--	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)

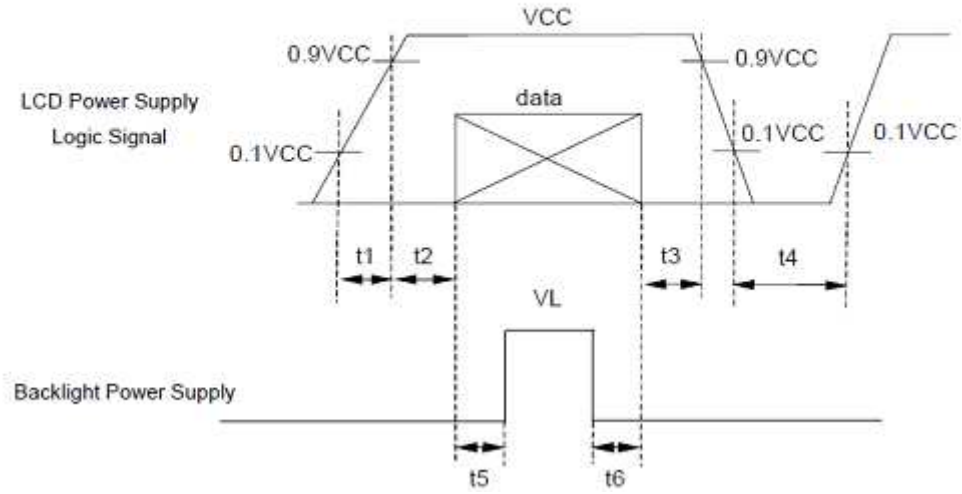
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VCC	3.0	3.3	3.6	V	
Input Voltage for logic	Differential Input High Threshold	VTH			+100	mA	
	Differential Input Low Threshold	VTL	-100			mA	
Power Supply current		ICC	-	(215)	TBD	mA	Note 1

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



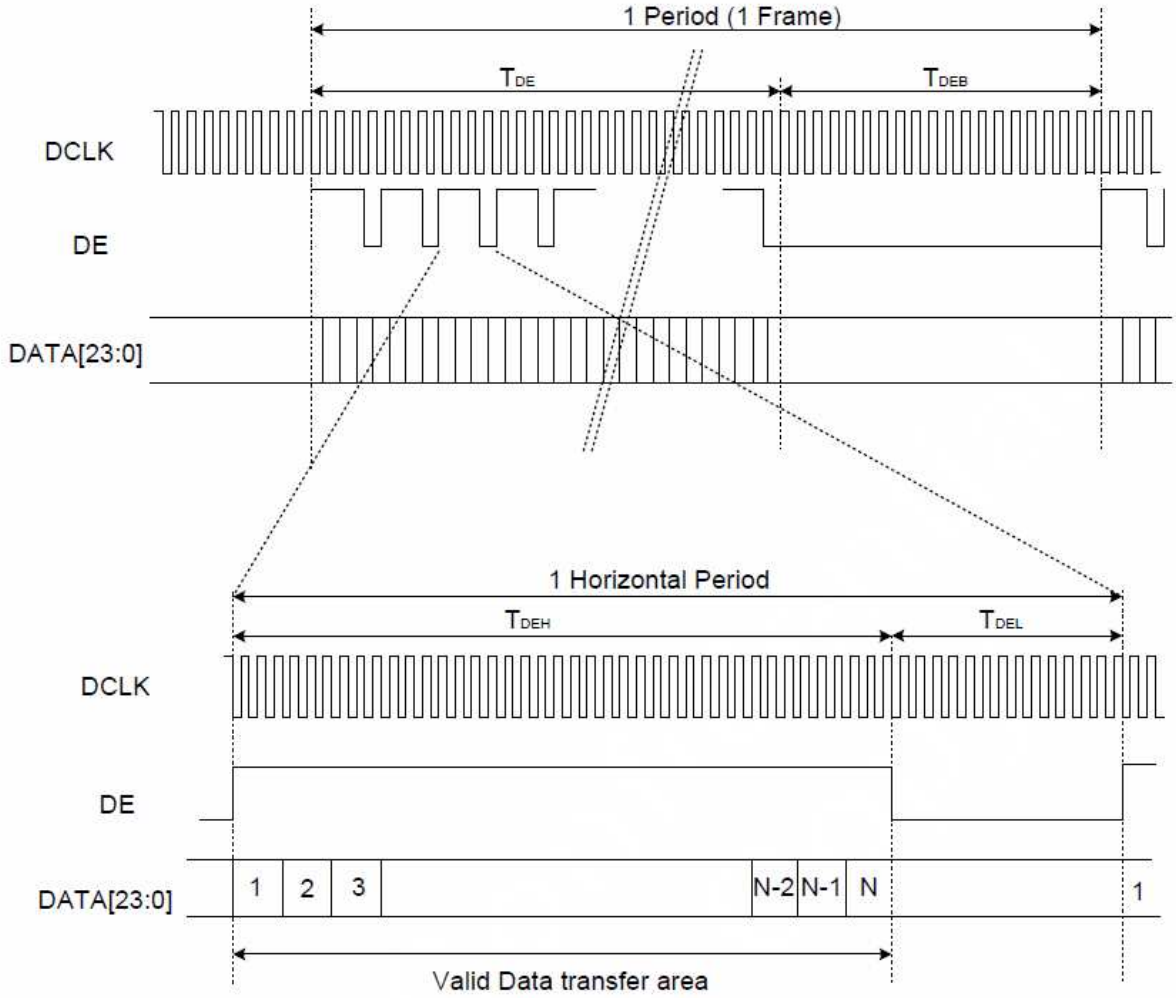
3.2 AC Timing Characteristic of The LCD

3.2.1 Timing Condition (DE only mode)

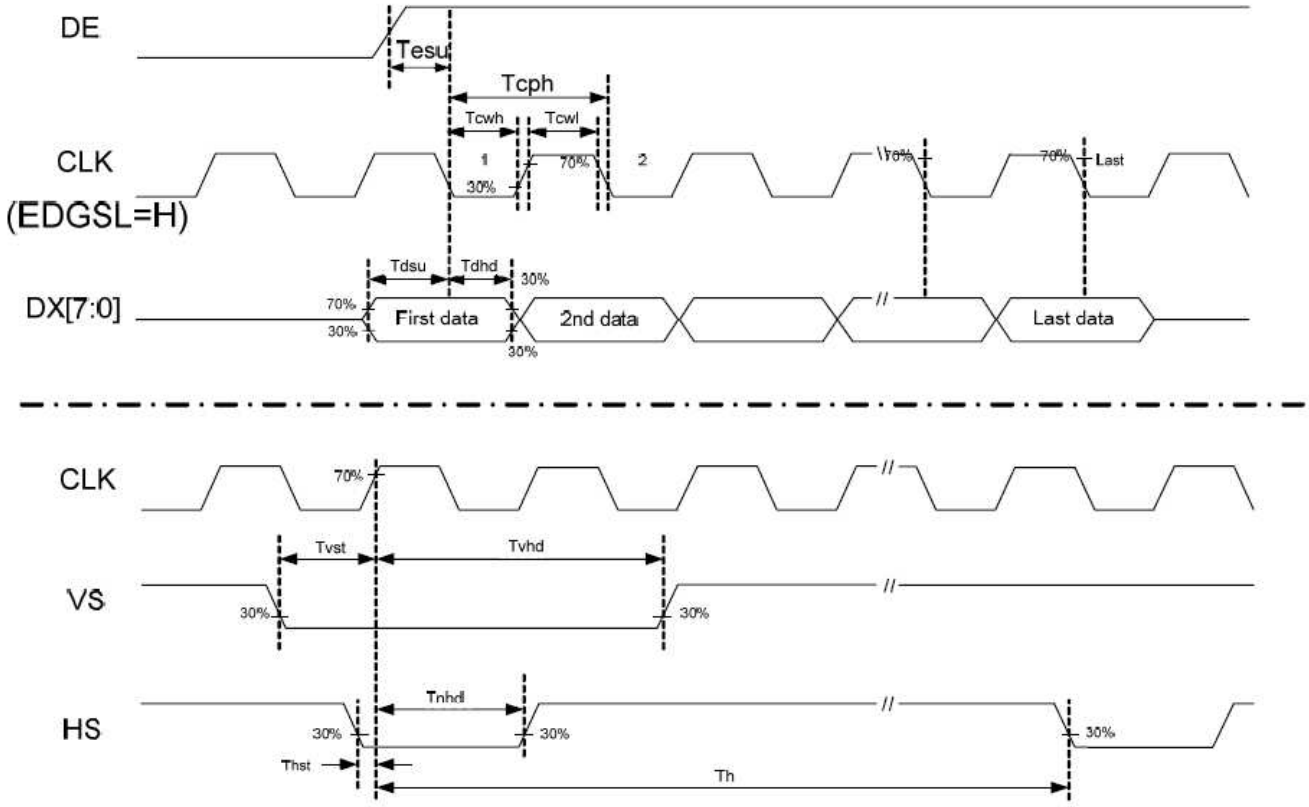
Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	CLK frequency	F_{CPH}	29.4	33.26	42.48	MHz	
	CLK period	T_{CPH}	-	30.06	-	ns	
	CLK pulse duty	T_{CWH}	40	50	60	%	
DE	DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}	
	DE pulse width	T_{DEH}	-	800	-	T_{CPH}	
	DE frame blanking	T_{DEB}	10	45	110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

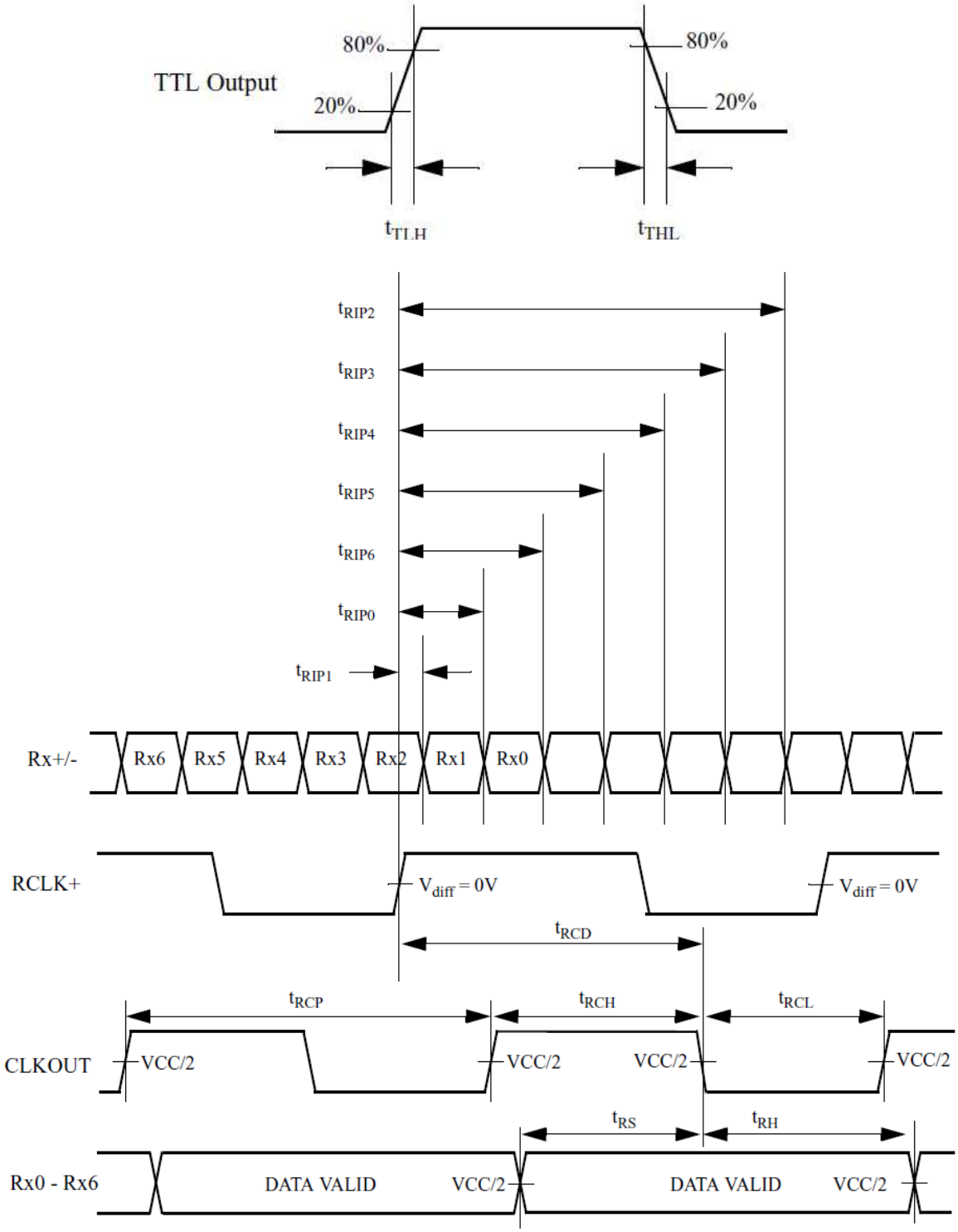


3.3 LVDS Switching Characteristics

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 Back-Light 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

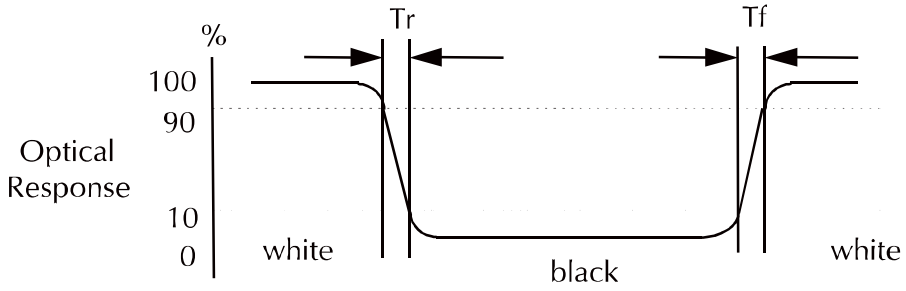
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		B		(800)	(1000)	--	cd/m^2	
Response time		T_r	θ=0°	-	5	10	ms	.
		T_f		--	15	20	ms	
Contrast ratio		CR	At optimized viewing angle	(150)	(250)	--	--	
Color Gamut		NTSC %	--	--	TBD	--	%	
Luminance Uniformity		ΔL		70	75		%	
Color Chromaticity (CIE 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".

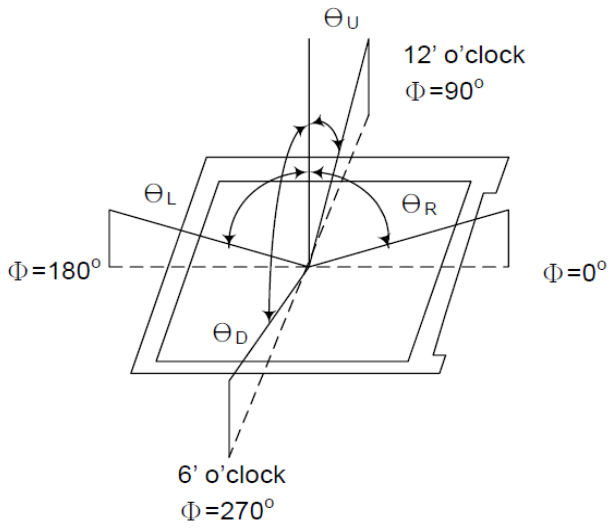


c. Definition of contrast ratio:

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

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

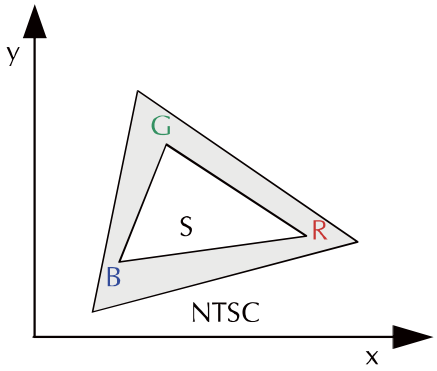
g. Definition of White Uniformity

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

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = (RGB Triangle Area / NTSC Triangle Area) x 100



5. I/O Terminal

5.1 Pin Assignment (connector part No: MSB24013P20A 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

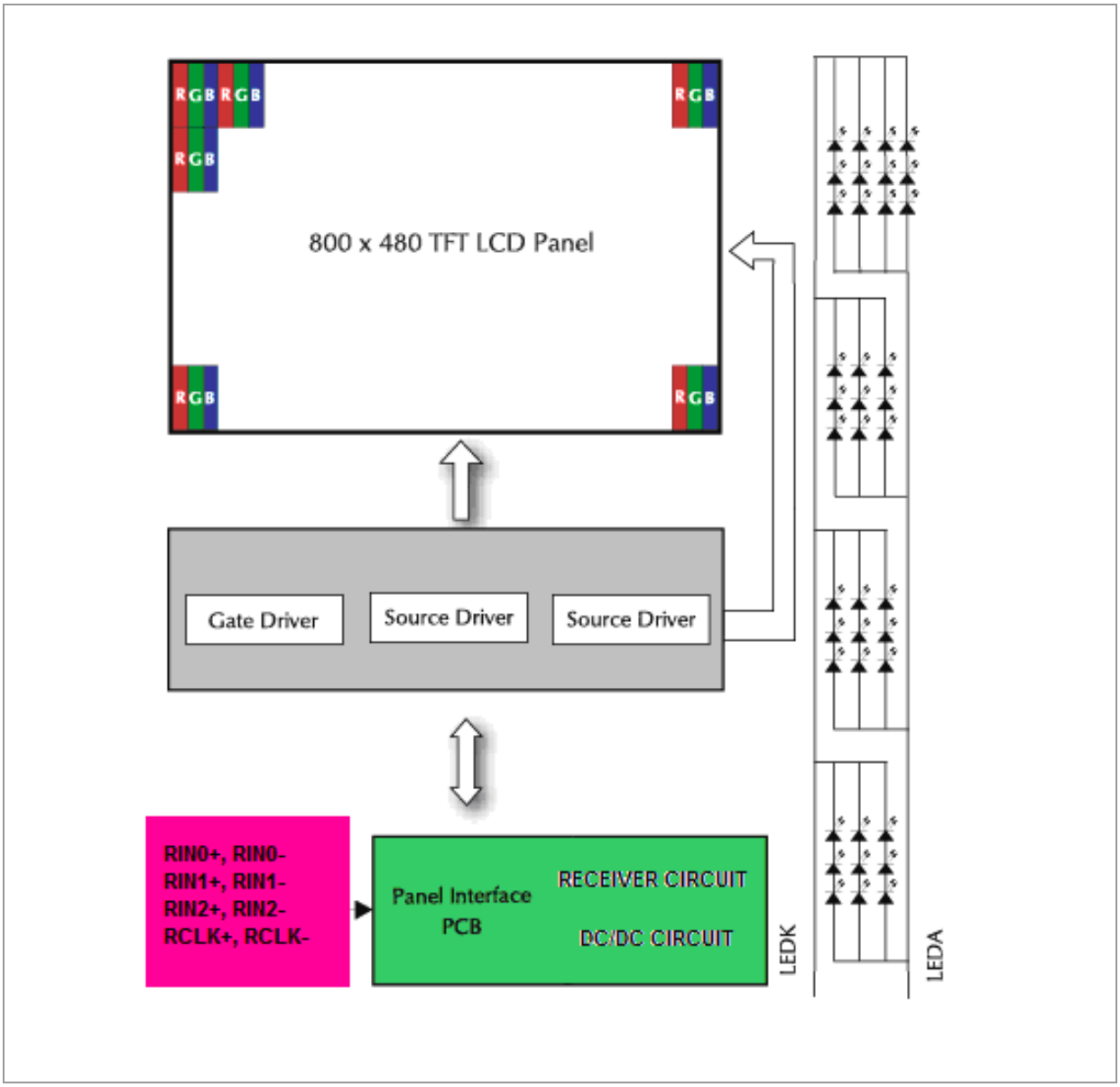
Notes:

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 Back Light 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

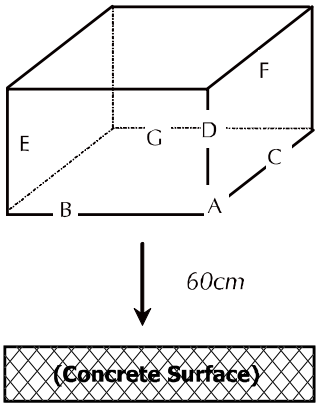
0 : Low level voltage, 1 :High level voltage

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. Reliability Condition

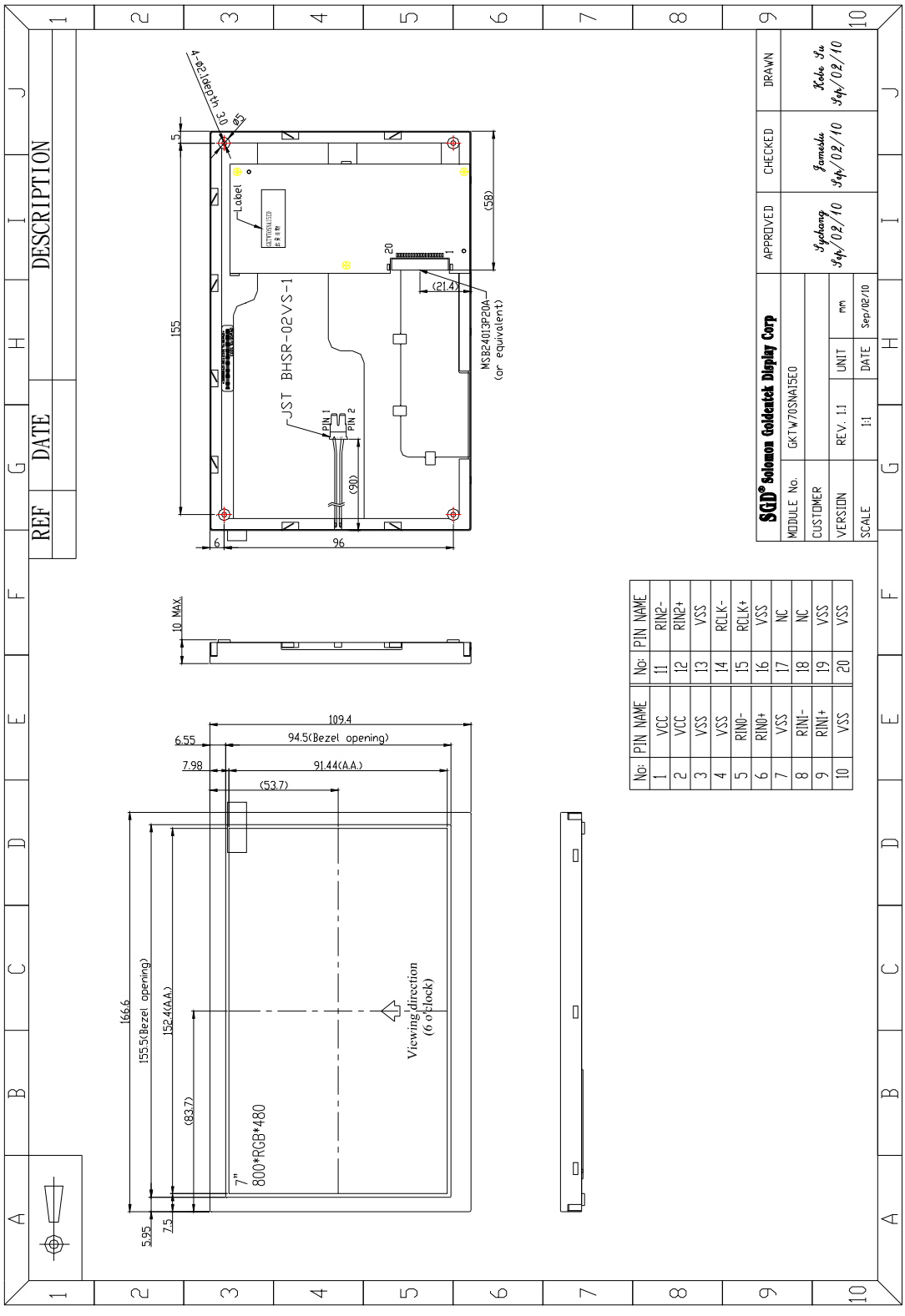
No change on display and in operation under the following test condition.

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.

8. Dimensional Outlines



SOLOMON GOLDENTEK DISPLAY CORP.

LCM Inspection Specification

產品型號/Model No.: **T070WNN01**

<若未標明特定產品型號則視爲認可全應用機種/We may deem that you have approved all model if no model list above>

Version:A

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ISSUE:JAN.3.2013

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2. RECORD OF REVISION

Rev	DATE	PAGE	SUMMARY

SGD

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3.適用範圍/Description

此份文件適用於富相科技生產之 **7" TFT** 模組

This document shall be applied to TFT-LCD Module for **7" TFT**

4.檢查條件與環境/ Inspection and Environment Conditions

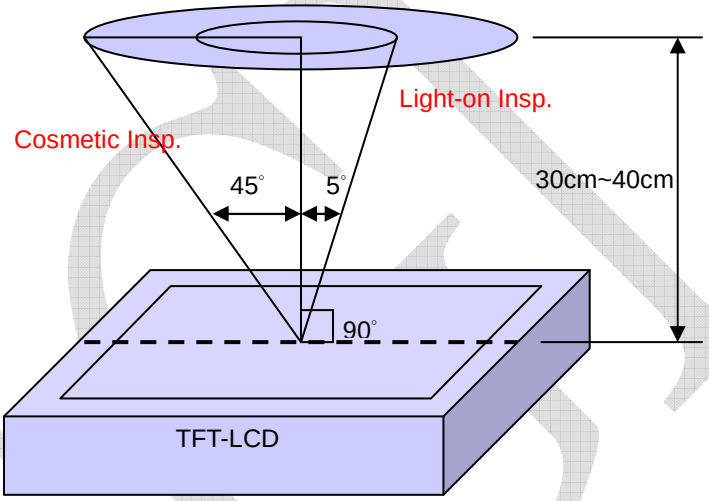
4.1 檢查條件/ Inspection Conditions:

(1)檢測距離/Inspection Distance: 35 cm±5cm

(2)觀看角度/ View Angle:

點燈檢驗角度/ Light-on Inspection Angle：±5°

外觀檢驗角度/ Cosmetic Inspection Angle：±45°



(垂直於液晶顯示表面/ perpendicular to LCD panel surface)

4.2 環境條件/Environment Conditions:

溫度/ Ambient Temperature		23℃±5℃
濕度/ Ambient Humidity		55±10%RH
亮度 Ambient Illumination	外觀檢驗 Cosmetic Inspection	more than 600 Lux
	點燈檢驗 Functional Inspection	300~500 Lux

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4.3 抽樣條件/Sampling Conditions:

(1)批量：單次運送單一機種之數量

Lot Size: Quantity of shipment lot per model

(2)抽樣方法/Sampling Method:

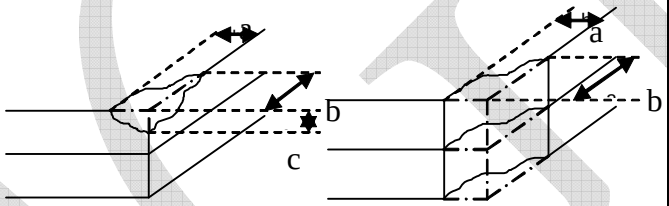
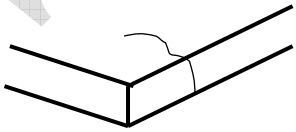
抽樣計畫 Sampling Plan		MIL-STD-105E 正常檢驗、單次抽樣 Normal Inspection, Single Sampling Level II
AQL	主要缺點 Major Defect	1.0%
	次要缺點 Minor Defect	1.5%

(3)主缺(MA)及次缺(MI)定義於"3.檢查標準"

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

5.檢查標準/ Inspection Criteria

5.1 外觀檢查(面板)/Cosmetic Inspection(Panel):

項目/ Item	判斷標準/ Judgment Criteria	分類/ Classification
面板缺角 Chipping on Panel	 a≦3.0mm、b≦3.0mm、c≦t 單片玻璃厚度 (Bottom glass thickness)	MA
面板表面刮傷 Scratch on Panel *Note-2	1.BM: Ignored 2.Pixel area W≦0.05mm or L< 5mm: Ignored/不計 0.05mm<W≦0.1mm and L≦5mm: N≦5 W>0.1mm or L>5mm: Not allowed/不允許	MI
面板 表面氣泡,凹痕 Bubble or Dent on Panel/Touch Panel *Note-3	1.BM: Ignored 2.Pixel area D≦0.2mm: Ignored/不計 0.2mm<D≦0.5mm: N≦5 D>0.5mm: Not allowed/不允許	MI
面板裂痕 Panel Crack	 不允許裂痕/ Not Allowed crack	MA
鐵殼變型 Bezel Deformation	不允許明顯的變形 Obvious deformation is not allowed.	MI

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鐵殼氧化 Bezel Oxidation	生鏽不可連續超過一公分(馬口鐵不保證) Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
鐵殼刮傷 Bezel Scratch	鐵件無感刮傷忽略; 鐵件有感刮傷 L≦20mm , W≦0.2 , N≦3	MI
鐵件壓痕/凹/凸點 (A 面) Metal Squash Dent /Flange(Front Side)	D(W)≦1,L≦3,N≦3;	MI
背光高壓線裸露 B/L High Voltage Wire Denudation	不允許 Not allowed	MA
偏光片脫膠/殘膠/溢膠 Polarizer flaw or leak out resin	顯示領域範圍內不可 Defect is defined as the active area.	MI
外觀尺寸 Outline Dimension	需符合 Product Spec.所示之規格 Must in Spec, refer to related product spec.	MI

5.2 點燈檢查/ Functional Inspection:

<table>
<tr><td rowspan="2">項目/ Item</td><td colspan="4">判斷標準/ Judgment Criteria</td><td rowspan="2">分類/
Classification</td></tr>
<tr><td colspan="2">Area(Note1)</td><td>I</td><td>O</td></tr>
<tr><td rowspan="13">點缺陷
Point Defect</td><td rowspan="3">Bright dot
亮點</td><td>Random</td><td colspan="2">2</td><td rowspan="13">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
暗點</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 總數</td><td colspan="2">5</td></tr>
<tr><td rowspan="3">Distance
距離</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)缺陷大小>0.5dot 定義為點缺陷
It is defined as Point Defect if defect area＞0.5dot
(2)缺陷大小≦0.5dot 不計
It is ignored if defect area≦0.5dot
(3)微弱亮透過 ND Filter 6%仍可視計為點缺陷(全黑畫面檢查)
Weak point defect will be defined as Bright Dot if it can be observed through ND filter 6%(Full Screen Black Inspection)</td></tr>
<tr><td>線缺陷
Line Defect</td><td colspan="4">不允許明顯的線缺陷
Obvious vertical or horizontal line defect is not allowed.</td><td>MA</td></tr>
</table>

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Mura	不允許任何透過 ND Filter 6 % 仍可視之 Mura Not allowed if it can be observed through ND Filter 6 %	MI
點狀異物 Foreign Material in spot shape *Note-3	Visible under：ND6% D≦0.2mm: Ignored/不計 0.2mm<D≦0.5mm: N≦5 D>0.5mm: Not allowed/不允許	MI
線狀異物 Foreign Material in line or spiral shape *Note-4	Visible under：ND6% W≦0.05mm or L≦6.0mm: Ignored/不計 0.05mm<W≦0.5mm and L ≦6.0mm: N≦5 W>0.5mm or L>6.0mm: Not allowed/不允許	MI
顯示異常 Display Function Abnormal	不允許任何顯示異常 No Malfunction can be allowed	MA

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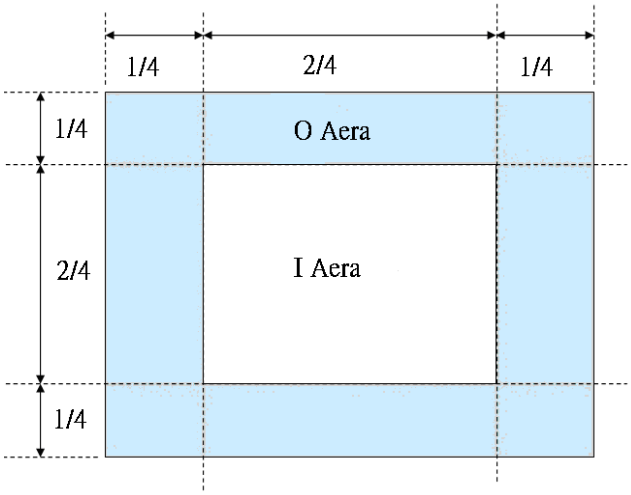
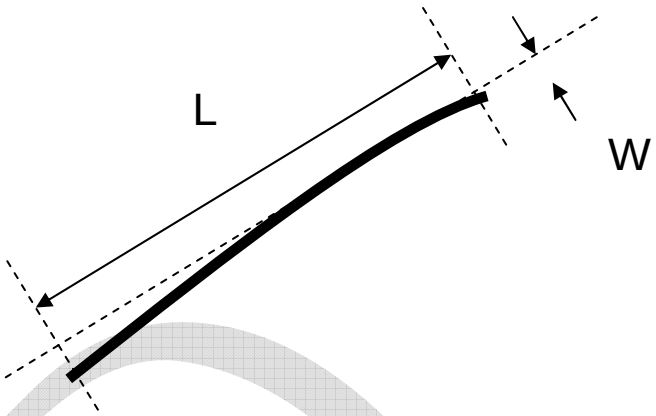
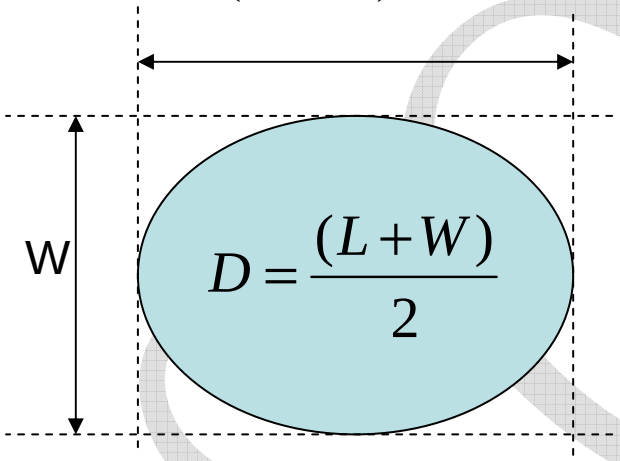
Note-1：I/O 區定義/ I/OArea Definition



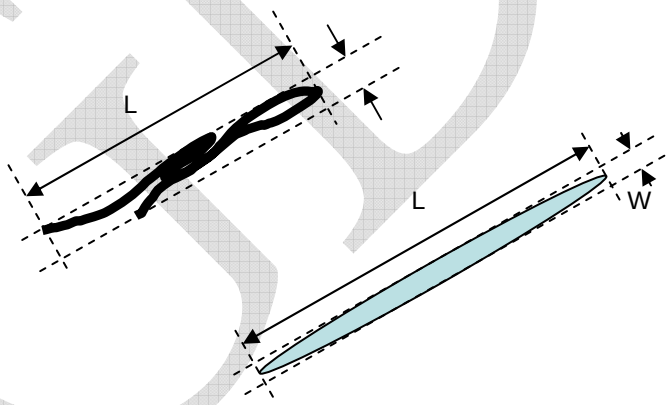
Note-2：Polarizer 刮傷/ Polarizer Scratch



Note-3：點狀異物/ Spot Foreign Material
(W ≧L / 4)



Note-4：線狀異物 Line or Spiral Foreign Material
(W<L / 4)



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