



DATAVISION

APPROVAL SHEET

Customer : _____

Part Name : **TFT MODULE**

Model No. : **DTFS0070A6SHLC-L01**

Drawing No. : _____

Approved by : _____

Date : _____

Approved	Checked	Prepared	Sheet Code:
		JUN	

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SPECIFICATIONS FOR TFT MODULE

MODEL NO: DTFS070A6SHLC-L01

Numbering System

For example:

<u>D</u>	<u>T</u>	<u>F</u>	<u>S</u>	<u>070</u>	<u>F6</u>	<u>SH</u>	<u>L</u>	<u>C</u>	<u>-L</u>	<u>01</u>
1	2	3	4	5	6	7	8	9	10	11

1	D: Data Vision				
2	T: TFT				
3	F: RoHS compliant				
4	S: Standard TFT LCM C: Customized TFT LCM				
5	LCD Size	024: 2.4inch	070: 7.0inch	121: 12.1inch	320: 32inch
6	TFT Serial Number				
7	View Direction & Temp. Range	E: 3 o'clock & Normal temp.	S: 6 o'clock & Normal temp.	W: 9 o'clock & Normal temp.	N: 12 o'clock & Normal temp.
		EH: 3 o'clock & Wide temp.	SH: 6 o'clock & Wide temp.	WH: 9 o'clock & Wide temp.	NH: 12 o'clock & Wide temp.
		M: MVA & Normal temp.	V: MVA & Wide temp.	R: Others	
8	Backlight	L: LED white B/L		C: CCFL white B/L	
9	Touch Panel	X: None touch	A: 4-wire resistive	B: 5-wire resistive	C: Capacitive D: AR glass
10	Interface	A: Analog	D: Digital	L: LVDS	C: CPU
11	Special Code				

Accessories available:

- A/D boards
- Touch Panels (4 wire and 5 wire resistive, capacitive)
- Touch Panel controllers
- Customized cables
- Customized touch panels

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1. General Description and Features

DTFS070A6SHLC-L01 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 DTFS070A6SHLC-L01.

1.1 Features

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

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	193 (H) x 136 (V) x 11.65 (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)	--	193	--	mm	
	Vertical (V)	--	136	--	mm	
	Thickness (T)	--	11.65	--	mm	(1)
Weight		--	--	--	g	--

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

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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.

($T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = \text{GND} = 0$)

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

Note (1) 95 % RH Max. ($40^\circ\text{C} \geq T_a$). Maximum wet-bulb temperature at 39°C or less. ($T_a > 40^\circ\text{C}$) 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 $+25^\circ\text{C}$.

3.1.2 Electrical Absolute Maximum Ratings

3.1.2.1 TFT-LCD Module

($V_{SS} = \text{GND} = 0$)

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

3.1.2.2 Backlight Unit

($V_{SS} = \text{GND} = 0$)

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

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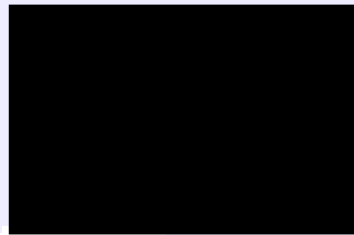
MODEL NO: DTFS070A6SHLC-L01

3.1.3 DC Electrical Characteristics of the TFT LCD

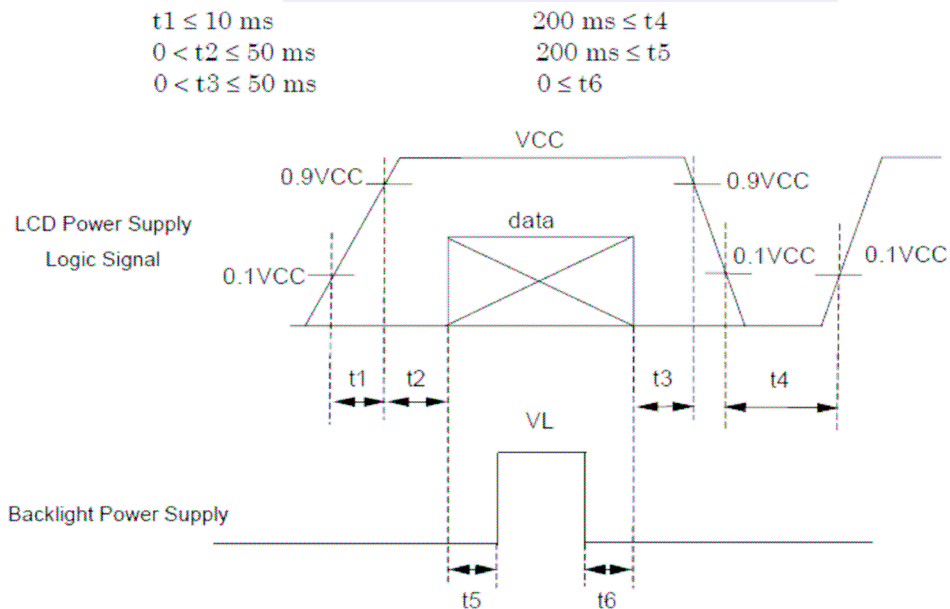
($T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = \text{GND} = 0$)

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: $f_v = 60\text{Hz}$, $T_a = 25^\circ\text{C}$, Display pattern : Black pattern



3.1.4 Power Signal sequence



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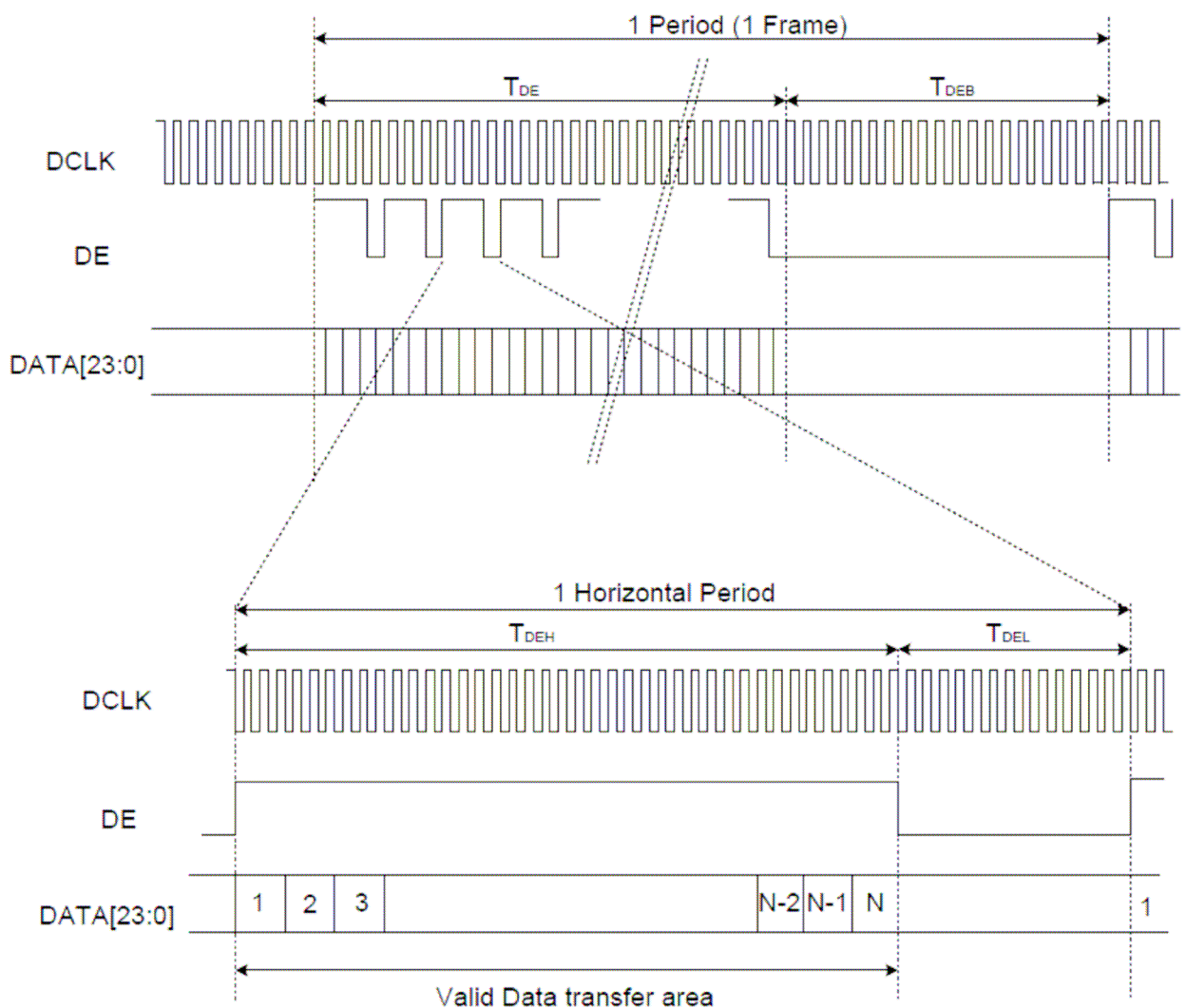
3.2 AC Timing Characteristic of The LCD

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

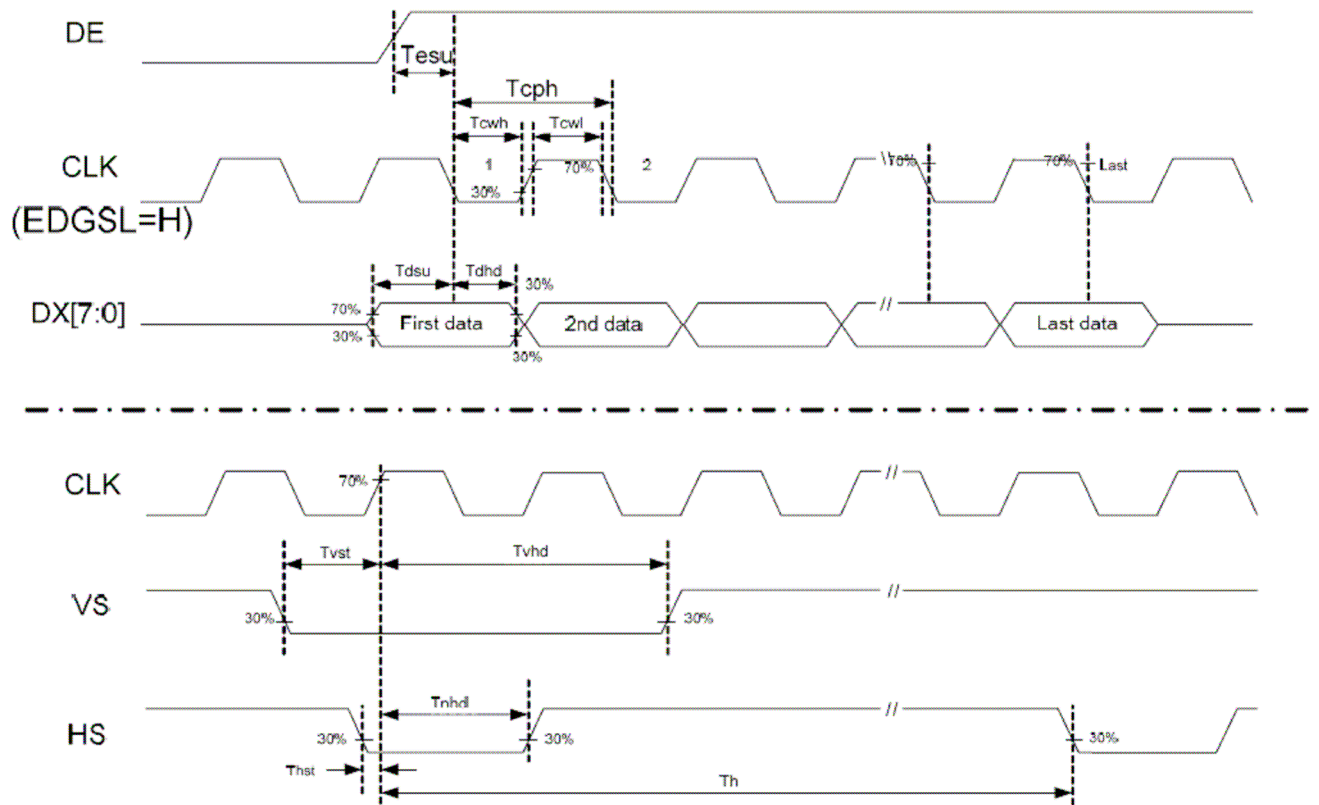
3.2.2.1 DE and RGB Data Input Timing



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3.2.2.2 Clock and Data input waveforms



3.3 LVDS Switching Characteristics

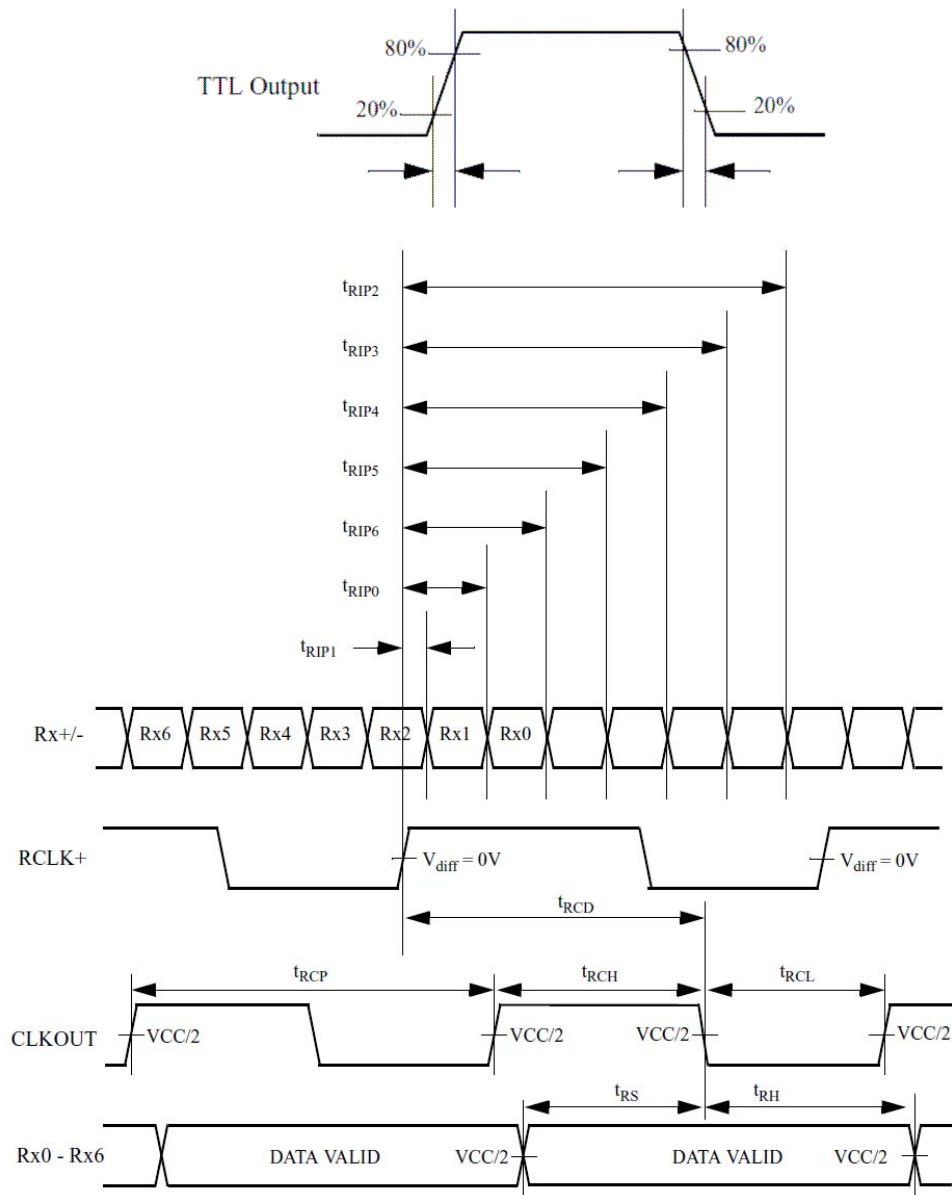
3.3.1 LVDS Timing Condition

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 CLK 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	

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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 $I_B = 260mA$, $V_B = 9.9$, $P_{BL} = V_B \times I_B$

(3) The environmental conducted under ambient air flow ,at $T_a=25\pm2^\circ C$, $60\%RH\pm5\%$

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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

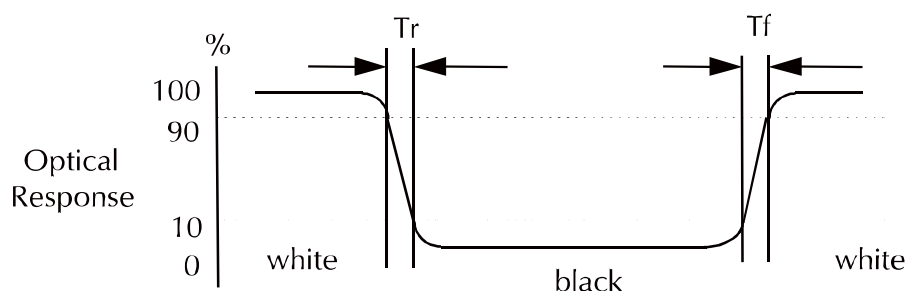
Item	Symbol	Condition	Min	Type	Max	Unit	Note
Brightness	B		(800)	(1000)	--	cd/m ²	
Response time	T _r	$\theta=0^\circ$	-	5	10	ms	.
	T _f		--	15	20	ms	
Contrast ratio	CR	At optimized viewing angle	(300)	(350)	--	--	
Luminance Uniformity	ΔL		70	75		%	
Color Chromaticity (CIE 1931)	White	W _x	(0.270)	(0.320)	(0.370)	--	BM-7A
		W _y	(0.300)	(0.350)	(0.400)		
Viewing Angle (6H)	Hor.	θ_R	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:

Brightness measured when LCD is at "white state"

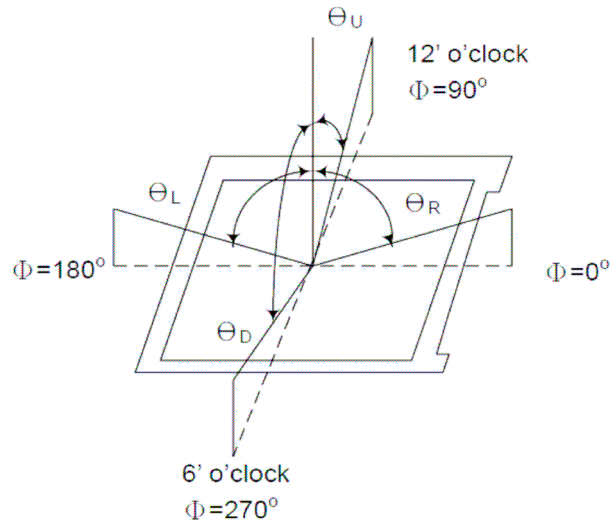
$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

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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
---------------------------------	----------

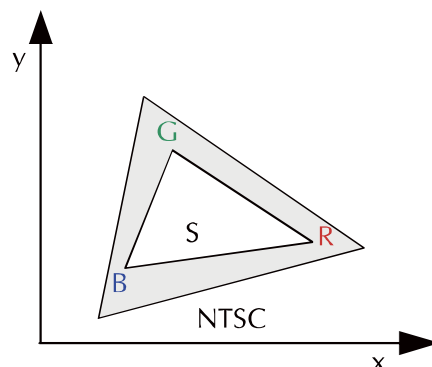
g. Definition of White Uniformity

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

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



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5. I/O Terminal

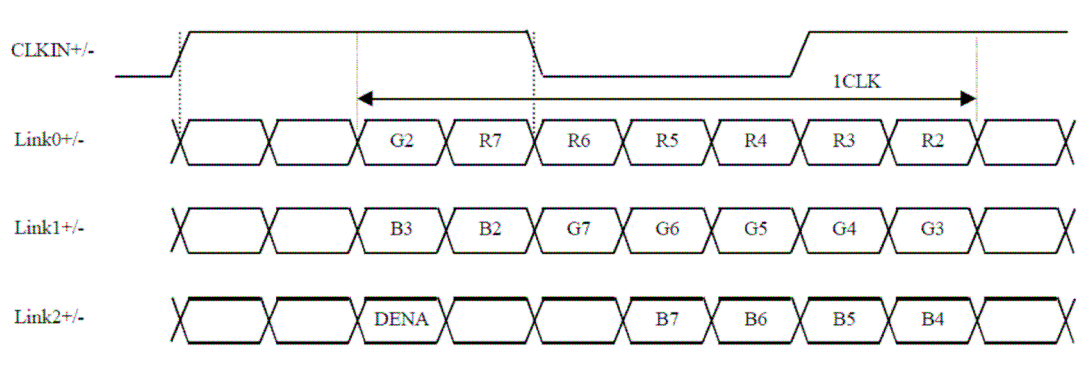
5.1 Pin Assignment (connector part No: MSB24013P20HA or equivalent.)

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.



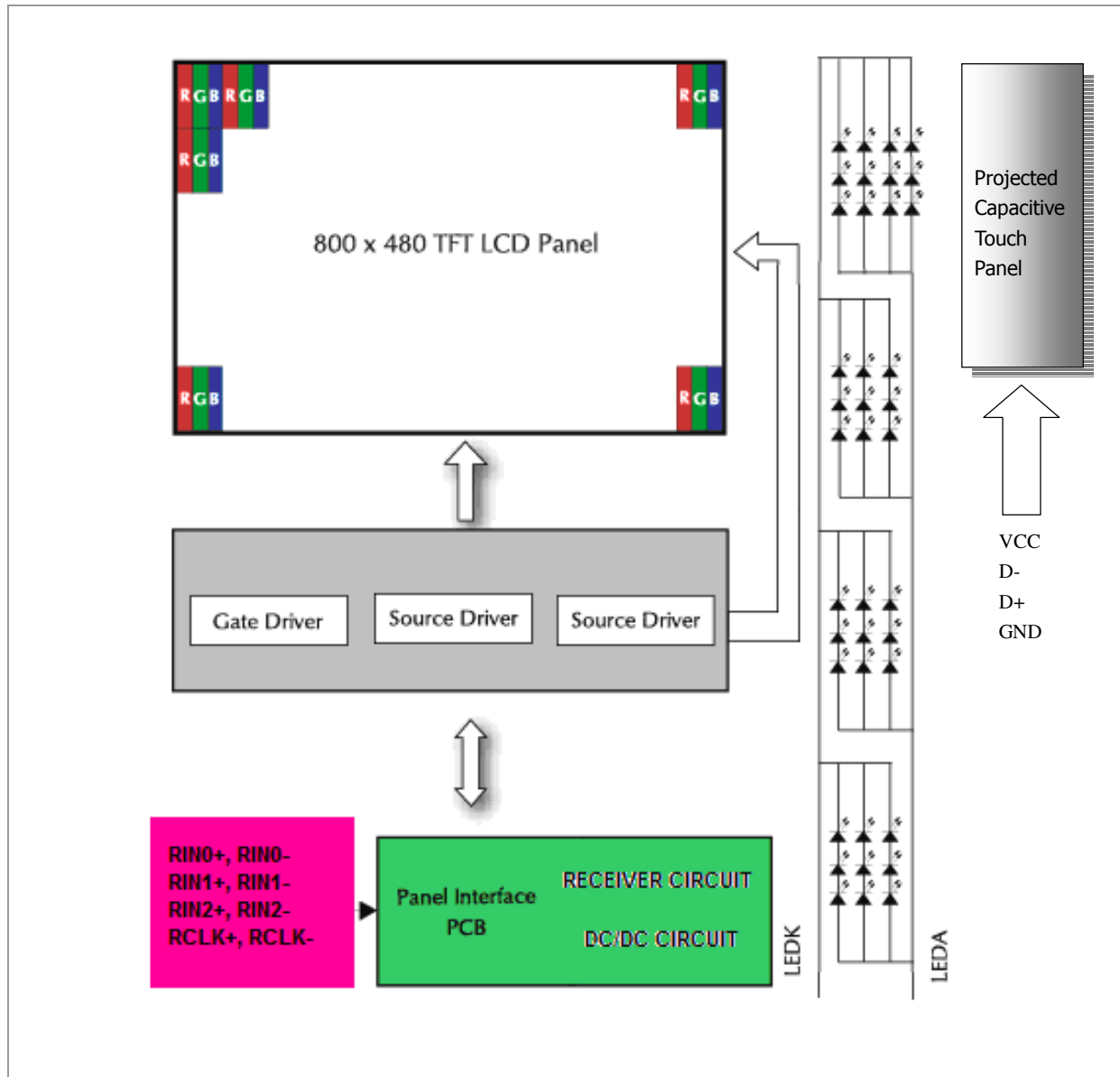
5.2 Back Light Unit (Connector Part No: JST:BHSR-02VS-01(N) or equivalent.)

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

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5.3 Block Diagram



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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.

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7. Reliability Condition

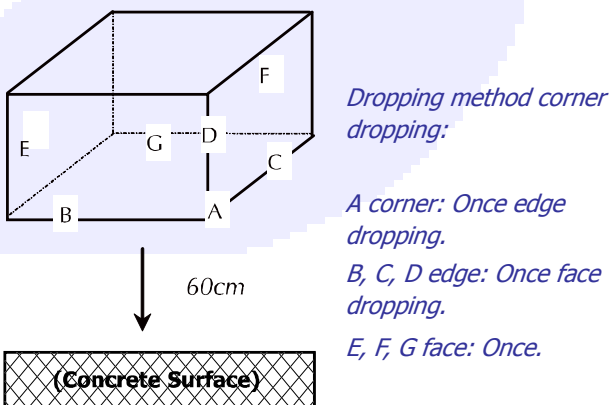
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: $20 \pm 5^{\circ}\text{C}$.

Humidity: $65 \pm 5\% \text{RH}$.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	$70^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs (Operation state).	
2	Low Temperature Operating	$-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs (Operation state).	1
3	High Temperature Storage	$80^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs.	2
4	Low Temperature Storage	$-30^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	$60^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 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.  <i>Dropping method corner dropping:</i> <i>A corner: Once edge dropping.</i> <i>B, C, D edge: Once face dropping.</i> <i>E, F, G face: Once.</i>	

- 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.

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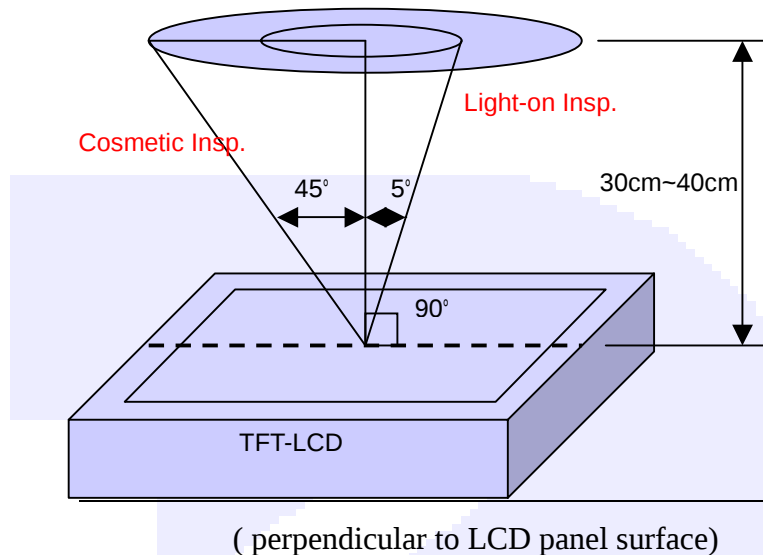
MODEL NO: DTFS070A6SHLC-L01

9. Incoming Inspection Standards

9.1 Inspection and Environment Conditions

9.1.1 Inspection Conditions:

- (1) Inspection Distance: 35 cm $\pm$ 5cm
- (2) View Angle : Light-on Inspection Angle : $\pm 5^\circ$
Cosmetic Inspection Angle : $\pm 45^\circ$



9.1.2 Environment Conditions:

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

9.1.3 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%

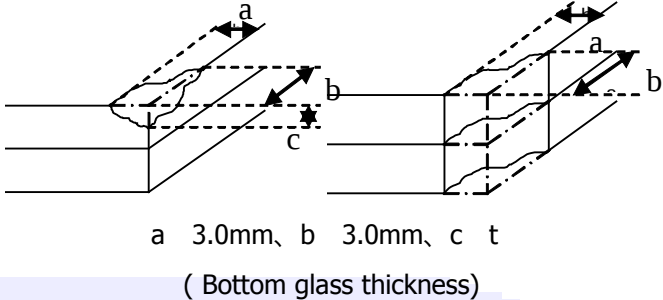
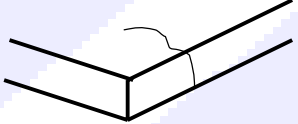
- (3) The classification of Major(MA) and Minor(MI) defects is shown as 3. Inspection Criteria.

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9.1.4 Inspection Criteria

9.1.4.1 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

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9.1.4.2 Functional Inspection:

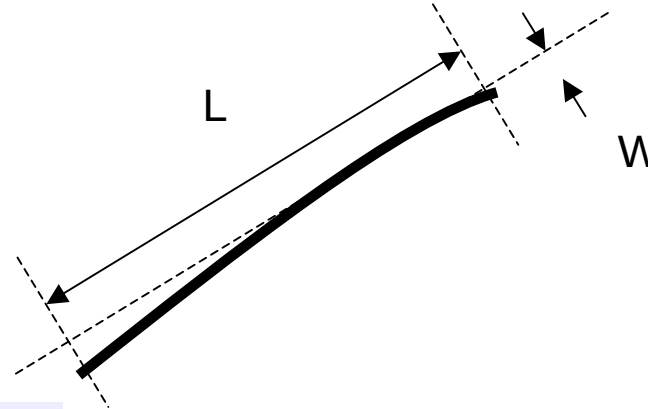
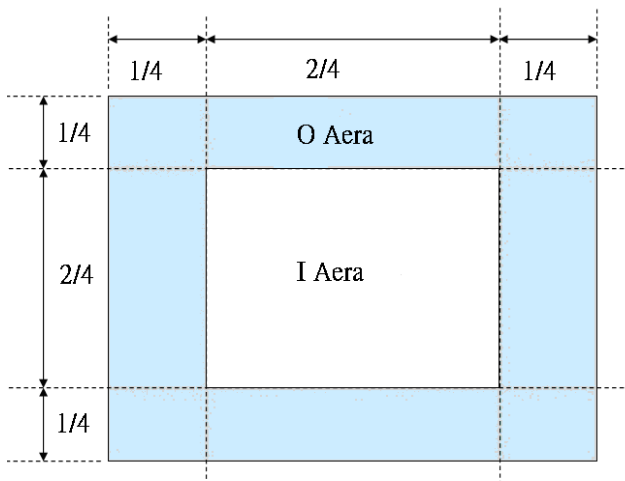
Item	Judgment Criteria				Classification
	Area(Note1)		I	O	
Point Defect	Bright dot	Random	2		MI
		2 dots adjacent	0	0	
		3 dots adjacent or more	0	0	
	Dark dot	Random	3		
		2 dots adjacent	1		
		3 dots adjacent or more	0	0	
	Total Dot Defect		5		
	Distance	Distance between Bright and Bright dot	L 5mm		
		Distance between Bright and Dark dot	L 5mm		
		Distance between Dark dot	L 5mm		
	(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)				
Line Defect	Obvious vertical or horizontal line defect is not allowed.				MA
Mura	Not allowed if it can be observed through ND Filter 5 %				MI
Foreign Material in spot shape *Note-3	D 0.2mm: Ignored 0.2mm<D 0.5mm: N 8 D>0.5mm: Not allowed				MI
Foreign Material in line or spiral shape *Note-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				MI
Display Function Abnormal	No Malfunction can be allowed				MA

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Note-1 : I/O Area Definition

Note-2 : Polarizer Scratch

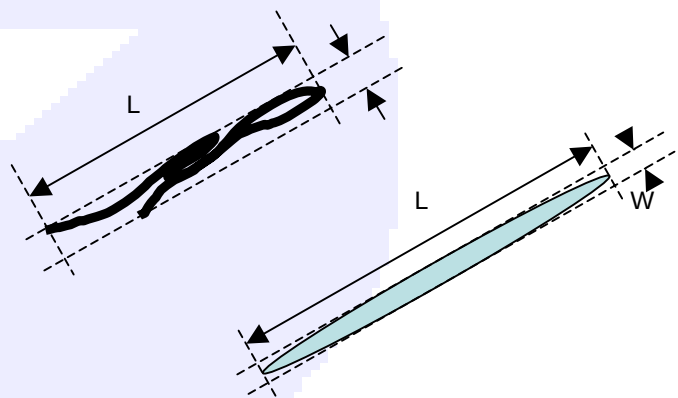
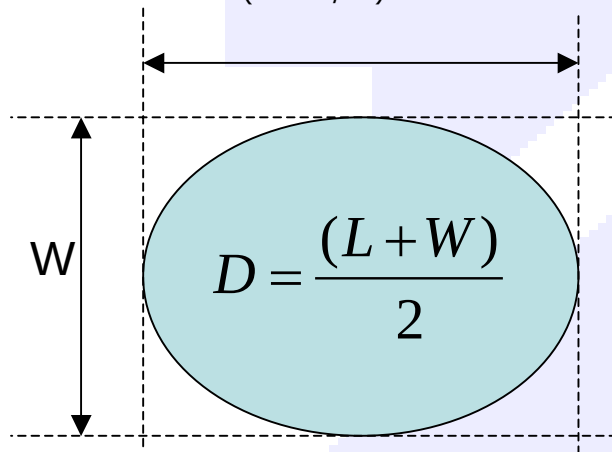


Note-3 : Spot Foreign Material

(W L / 4)

Note-4 : Line or Spiral Foreign Material

(W<L / 4)



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CAPACITIVE TOUCH PANEL

1. 特性 Characteristics

1.1 光學特性 Optical characteristics

	項 目 Item	規 格 Specification	備 註 Remarks
1	全光線透過率 TRANSPARENCY	86% Min. (動作保證範圍內) (Inside of guaranteed active area)	JIS K-7105
2	HAZE	1% Typ.	JIS K-7105

1.2 電性特性 Electric characteristics

1.2-1 操作條件 Operation condition

介面 Interface	USB
系統需求 Support OS	WINDOS 7/Android
反應時間 Response time	MAX 35ms
支援觸控點數 Touch number	2 points
操作電壓 Power Supply Voltage	2.7V~3.3V DC
操作電流 Power Supply Current	50mA(Normal) 8mA(Low Power)

回報率 Report Rate	75 points/sec (Dual points on Windows 7/Android)
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1.3 環境特性 Environmental characteristics

	項 目 Item	規 格 Specification	備 註 Remarks
1	動作溫度 Operation temperature	-20°C ~ 70°C	Max. wet Temp. is 38°C(No dew) 以上條件不代表環境測試規格
2	保存溫度 Storage temperature	-30°C ~ 80°C	
3	動作濕度 Operation Humidity	20% ~ 90%RH	
4	保存濕度 Storage Humidity	10% ~ 90%RH	

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1.4 機械特性 Mechanical characteristics

	項 目 Item	規 格 Specification	備 註 Remarks
1	表面硬度 Hardness of surface	鉛筆硬度 7H Pencil hardness 6H	JIS K-5600-5-4
2	FPC 剝離強度 FPC peeling strength	5N 以上 5N Min.	向上垂直剝離 Peeling upward by 90°
3	FPC 彎曲 Bending	彎曲 3 回	R1.0mm 角度 90°
4	FPC 插拔	插拔 5 回	

1.5 驅動 IC 特性 IC Chip characteristics

1.5-1 HARDWARE OVERVIEW

MCU - EXC7200	
Operating Power	2.7VDC to 3.3VDC Consumption 50mA maximum
Operating Temperature	-40 to 80°C
Storage Temperature	-40 to 125°C
ESD	2000V (HBM)
Package	48 pins 7×7×1.2 mm TQFP RoHS compliant

Peripherals	Analog * Analog signal processing unit * Analog Multiplexer * 12 bits 200KPS SAR ADC
	Digital * UART * I2C * USB 1.1 full speed * GPIO
	Memory * 16KB SRAM + 1KB (USB FIFO) * 32KB Flash Program Memory
Application	Touch screen Controller

SPECIFICATIONS FOR TFT MODULE
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Sensor - EX5404	
Operating Power	2.7V to 3.3V Consumption 10mA maximum
Operating Temperature	-40 to 80
Storage Temperature	-40 to 125
ESD	4000V(HBM)
Packages	64 pins 9x9mm TQFP RoHS compliant
Technology	Slave IC for Projected Capacitive Touchscreen.Up to 54 sensing I/O channels.
Interface	I2C

1.5-2.ELECTRICAL CHARACTERISTIC

MCU - EXC7200						
Voltage characteristics						
symbol	Parameter	Condition	min	TYP	max	unit
VDD-VSS	Digital Supply Power		2.7	3.3	3.6	V
VDDA-VSSA	Analog Power Supply		2.7	3.3	3.6	V
Crystal Clock	Crystal clock			12		MHz
VIH	Input high level voltage		0.65VDD		VDD+0.5	V
VIL	Input Low level		-0.5		0.35VDD	V
VOH	Output high voltage	I = 5mA	VDD-0.4			V
VOL	Output Low voltage	I = 5mA			0.4	V

MCU – EX5404						
Voltage characteristics						
symbol	Parameter	Condition	min	TYP	max	unit
VIH	Input high level voltage		0.7VDD		VDD+0.5	V
VIL	Input low level		0		0.8	V
VOL	Output Low level voltage	Io=5mA			0.4	V
VOH	Output High level	Io=5mA	VDD-0.4			V
CI/O	I/O pin capacitance by design			13.5		pF
fSCL	I2C clock frequency				24	MHz
fSDA	I2C data frequency				24	MHz

SPECIFICATIONS FOR TFT MODULE

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1.5-3 Maximum ratings

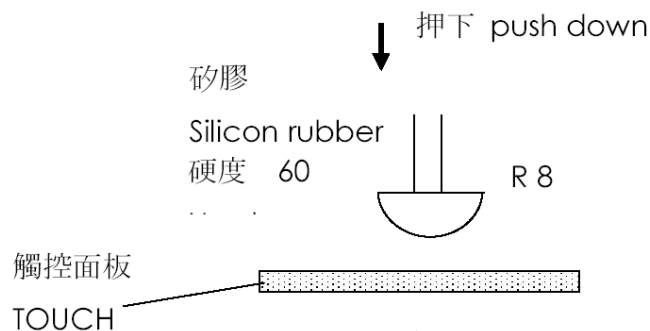
MCU - EXC7200				
symbol	Parameter	min	max	unit
VDD-VSS	Maximum power supply voltage	-0.3	4	V
Vin	Input I/O pin voltage	VSS-0.3	VDD+0.3	V
IVDD	Total current at power		100	mA
IVSS	Total current at Gnd		100	mA
Vesd	Electrostatics Discharge Voltage(HBM)		2000	V

MCU – EX5404				
symbol	Parameter	min	max	unit
VDD-GND	Maximum power supply voltage	-0.3	3.6	V
Vin	Input I/O pin voltage	GND-0.3	VDD+0.3	V
IVDD	Total power supply current		150	mA
IGnd	Total Gnd current		150	mA
IIO	Sink/Source Current by I/O pin		10	mA

2. 耐久性 life test condition

2.1 機械特性 Mechanical characteristics

1	打點壽命 Input Life	1000 萬次以上 10 million times min.	動作保證範圍內 Within" guaranteed active area"
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※ 打點壽命(耐久性)試驗條件 Input life test condition(by finger)

使用矽膠在同一地方連續打點

By silicone rubber tapping at same point.

- 橡膠尖端 Sharp of rubber end : R8 硬度 Hardness 60°(Refer fig.2)
- 操作力 Load : 200g
- 操作頻率 Frequency : 5Hz

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2.2 環境測試條件 Environmental test condition

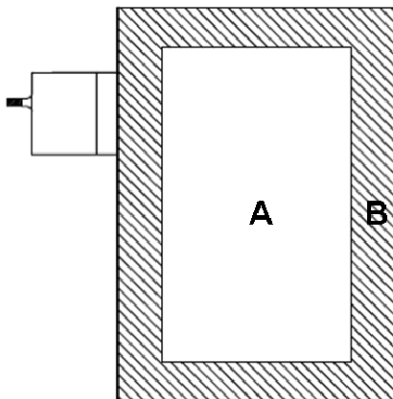
	項 目 Item	規 格 Specification	備 註 Remarks
1	高溫保存試驗 High temperature storage	80°C, 240 hr	
3	低溫保存試驗 Low temperature storage	-30°C, 240 hr	
3	高溫高濕保存試驗 High temperature high humidity storage	60°C, 90%RH, 240 hr	
4	溫度衝擊循環試驗 Temperature Cycling	-30°C ~ +80°C (0.5hr each), 100 cycles	

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.

3. 外觀規格 Appearance.

3.1 外觀基準適用領域(範圍) Scope of reject criteria.

Note: All the cosmetic specifications are judged before the reliability stress.

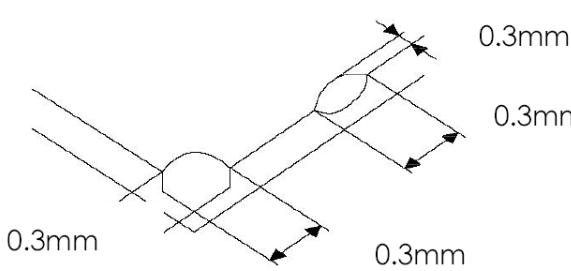


領域 Area	外觀仕様 Specification
A	使用上不會有可視的缺失而影響正常操作。檢查基準依據 3-2 項。 Without any defect point to effect on normal operation.
B	不檢查 None-specify.

A : 可視區域 B : 可視區域以外
View area. View area besides.

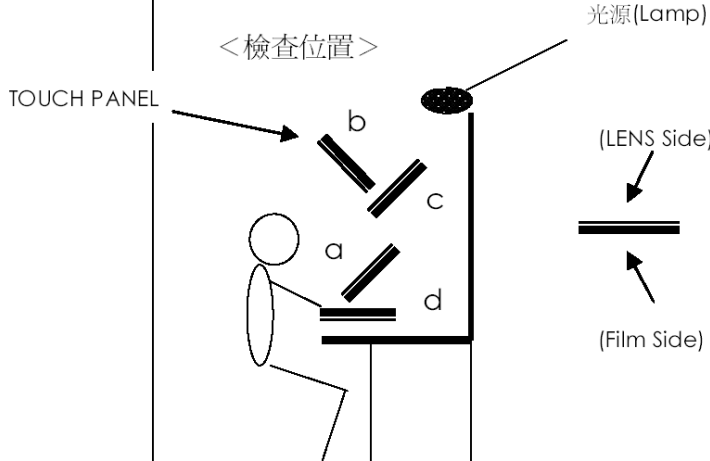
SPECIFICATIONS FOR TFT MODULE
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3.2 檢查基準 Reject criteria.

項 目 Description	檢 查 基 準 Reject criteria
玻璃瑕疵 Glass flaw	不超過下述的規範值，數量不限。 厚度方向的瑕疵(缺角)最大到板厚為止。 To be no flaw which size is over the drawing Specified as below. Number of flaw doesn't specify. Traveling flaw is none. The maximal flaw of thickness direction size is the glass thickness. 

項 目 Description	檢 查 基 準 Reject criteria		
汙漬和斑點 Spot And Dots	Diameter:	$0.9\text{mm} < D$	zero
		$0.7\text{mm} < D \leq 0.9\text{mm}$	Max: 2 points
		$0.5\text{mm} < D \leq 0.7\text{mm}$	Max: 4 points
		$D \leq 0.5\text{mm}$	disregard
刮傷 Scratch	Width:	$0.2\text{mm} < W$	zero
	Width:	$0.15\text{mm} < W \leq 0.2\text{mm}$	Max:2 points
	Length:	$L \leq 8\text{mm}$	
	Width:	$0.1\text{mm} < W \leq 0.15\text{mm}$	Max:4 points
	Length:	$L \leq 8\text{mm}$	
	Width:	$W \leq 0.1\text{mm}$	disregard

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打痕(魚眼) Dent/ Fish Eye	Diameter:	0.9mm<D	zero
		0.7mm<D≤0.9mm	Max: 2 points
		0.5mm<D≤0.7mm	Max: 4 points
		D≤0.5mm	disregard
氣泡 Bubble	Diameter:	0.9mm<D	zero
		0.7mm<D≤0.9mm	Max: 2 points
		0.5mm<D≤0.7mm	Max: 4 points
		D≤0.5mm	disregard
FPC 異物/髒污 Foreign material	Film 內層雜質不可跨越兩迴路。 Foreign material can not short two patterns.		
FPC 刮傷 FPC Scratch	會造成製品電氣特性障礙的刮傷皆不可。 Any caused scratch which effects electrical characteristic is prohibited		
FPC 皺折 FPC Crumple	會造成製品電氣特性障礙的皺折皆不可。 Any caused crumple which effects electrical characteristic is prohibited		
			

※ D : Diameter[D=(長徑+短徑)/2], W : 寬(Width), L : 長(Length)

4. 注意事項 Attention

(1) 本產品是使用玻璃所製，因為玻璃的邊、角是銳利的，在使用觸控面板時請多注意。

在使用觸控面板時請戴手套作業。

Since Touch Panel is consist of glass, please be careful your hands to be injured during handling. You must wear gloves during handling.

(2) 本產品是使用玻璃所製，在使用觸控面板時，請注意不要施加強力衝擊。

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Do not strike touch panel.

- (3) 拿起觸控面板時請勿從 FPC 拿取。

Do not lift touch panel by cable (FPC).

- (4) 請勿施加重力於 TP。(例：在組裝時勿從 Cover Glass 吸取移動)

Excessive force onto the TP is prohibited.

(Ex. Don't transfer the panel from TP with vacuum)

- (5) 表面清潔時，請使用「乾的柔性布」或「浸泡過中性清潔液擰乾的布」或「沾有酒精的柔性布」。請勿使用有機溶劑、酸、鹼類溶劑。

Please use dry cloth or soft cloth with neutral detergent (after wring dry) or one with ethanol at cleaning. Do not use any organic solvent, acid or alkali solution.

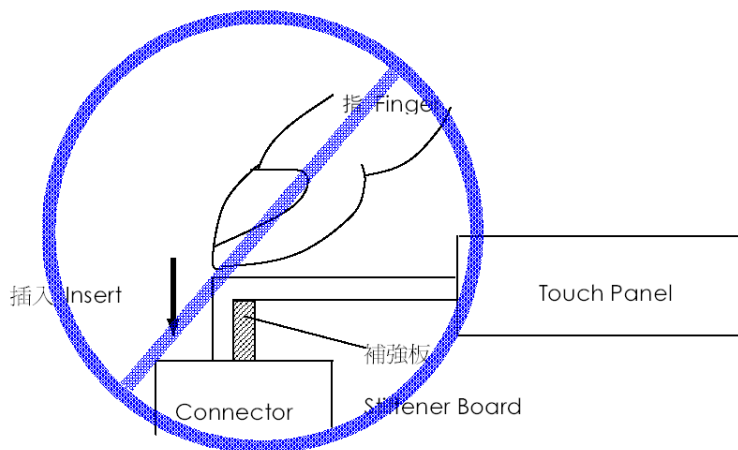
- (6) 保存時請勿重疊放置。特別是請勿用重物壓著。

Do not stack the touch panels together. Do not put heavy objects on touch panels.

- (7) FPC 請勿折彎，有可能使迴路線斷裂。特別是對於連結器的插入部分，因為貼有補強板，在插入連結器時請勿施加過多的力量。請避免以下圖方式插入。

Do not bend the cable (FPC) of touch panel to prevent the circuit broken.

Please don't use following method for inserting into FPC tail to connector.



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(8) 在實際組裝設計時，請注意以下事項。

Please pay attention for the matters stated below at mounting design of touch panel & enclosure

- 1. 觸控面板的上蓋支撐物請設定在透明範圍的外側。
(上蓋請勿壓在透明範圍上，會有誤動作的情況發生)
Enclosure support to fix touch panel must be out of view (transparent) area. (Do not design enclosure presses the view area to protect from miss input)
- 2. 上蓋的外框請設定在透明範圍的內側、動作保證範圍的外側。
(上蓋的外框請勿接觸到透明範圍)。
The enclosure edge must be between view area & Guaranteed active area.
(Enclosure edge must not touch the view area)
- 3. 觸控面板上下部的壓合，請以橡膠等彈性材質。
Elastic materials are recommended as a support to fix touch panel.
- 4. 觸控面板上部的邊角，因為玻璃導電層有傳導性，在組裝設計時請注意不要與金屬材質接觸。
The corners and edges of touch panel (fig.*) may be conductive. Do not touch it with metallic components after mounting.
- 5. 有防水需求時，請考慮用橡膠等材質對迴路週邊做防水。
Special design is required for water resistance.
- 6. 當使用 Air gun 向觸控面板吹氣時，建議 Air 壓力調整為 $2\text{kg}/\text{cm}^2$ 以下，並且勿從玻璃側朝 FPC 直接吹氣，以免 FPC 在強烈 Air 壓力下，造成脫落。
Cleaning touch panel by Air gun, pressure below $2\text{kg}/\text{cm}^2$ is suggested.
To prevent FPC to be peeled off, air blowing to the FPC is avoided from glass side.
- 7. 當觸控面板組裝時，在 LCD 外框與觸控面板間必須留有間隔，以避免 LCD 的電磁波造成的雜訊影響觸控面板的特性。建議機構預留 5mm 以上組裝空間。
The mounting structure must has a reserved space between LCD and TP to avoid the noise from LCD influence the performance of TP. Assembly space is

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recommended at least 5mm. Refer to mounting condition example 2 & 3.

- 8. 必須在靠近 FPC 位置處預留 FPC 線路空間, 絕對避免外殼或其他零件碰觸或擠壓 FPC, 造成 FPC 脫落. 建議機構預留 4mm 以上組裝空間, 請參考實裝構造圖.

The mounting structure must has a reserved space for the FPC tail and never touch or squeeze the FPC by case or another components preventing FPC to peel off. Assembly space is recommended at least 4mm. Refer to mounting condition example 2 & 3.

【實裝構造例 Mounting condition example】

