



CUSTOMER APPROVAL SHEET

Company Name	
MODEL	A050VW02 V0
CUSTOMER APPROVED	Title : Name :

- ☐ APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.0)
- ☐ APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 0.0)
- ☐ APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 0.0)
- ☐ CUSTOMER REMARK :

AUO PM :

P/N : 97.05A13.001

Comment :



Doc. version :	0.3
Total pages :	22

Date : 2011/09/29

Product Specification

5" COLOR TFT-LCD MODULE/PANEL

Model Name : **A050VW02 V0**

Planned Lifetime:	From 2010/Oct To 2013/Jun
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Phase-out Control:	From 2013/Jan To 2013/Jun
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EOL Schedule:	2013/Jun
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<◆>Preliminary Specification

< >Final Specification

Note: The content of this specification is subject to change.

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Record of Revision

Version	Revise Date	Page	Content
0.0	20110126		First Draft
0.1	20110624	3	Modify Weight and Power consumption
0.2	20110725	17	Modify RA conditions
0.3	20110929	4	Modify thickness of component area and TP solder area in FPC



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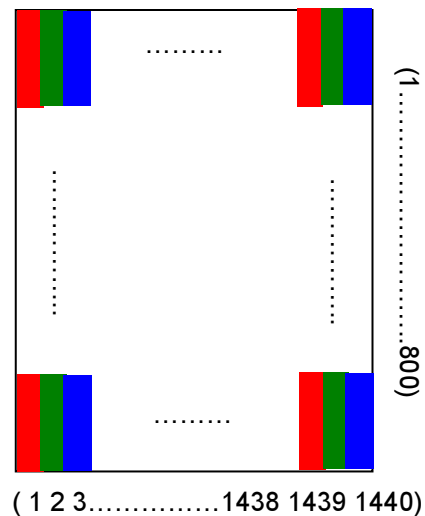
A. General Information

This product is for PND application.

NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	5(Diagonal)	
2	Display Resolution	dot	480RGB(H)×800(V)	
3	Overall Dimension	mm	71.2(H)X119.5(V)X2.61(T)	Note 1
4	Active Area	mm	64.8(H)×108.0(V)	
5	Pixel Pitch	mm	0.045(H)×0.135(V)	
6	Color Configuration	--	R. G. B. Stripe	Note 2
7	Color Depth	--	16.7M Colors	
8	NTSC Ratio	%	50	
9	Display Mode	--	Normally Black	
11	Weight	g	46.5±5	
12	Power Consumption	mW	863 (typical)	Note 3
13	Interface	--	MIPI Display Serial Interface	Note 4

Note 1: Not include backlight cable and FPC. Refer next page to get further information.

Note 2: Below figure shows dot stripe arrangement.

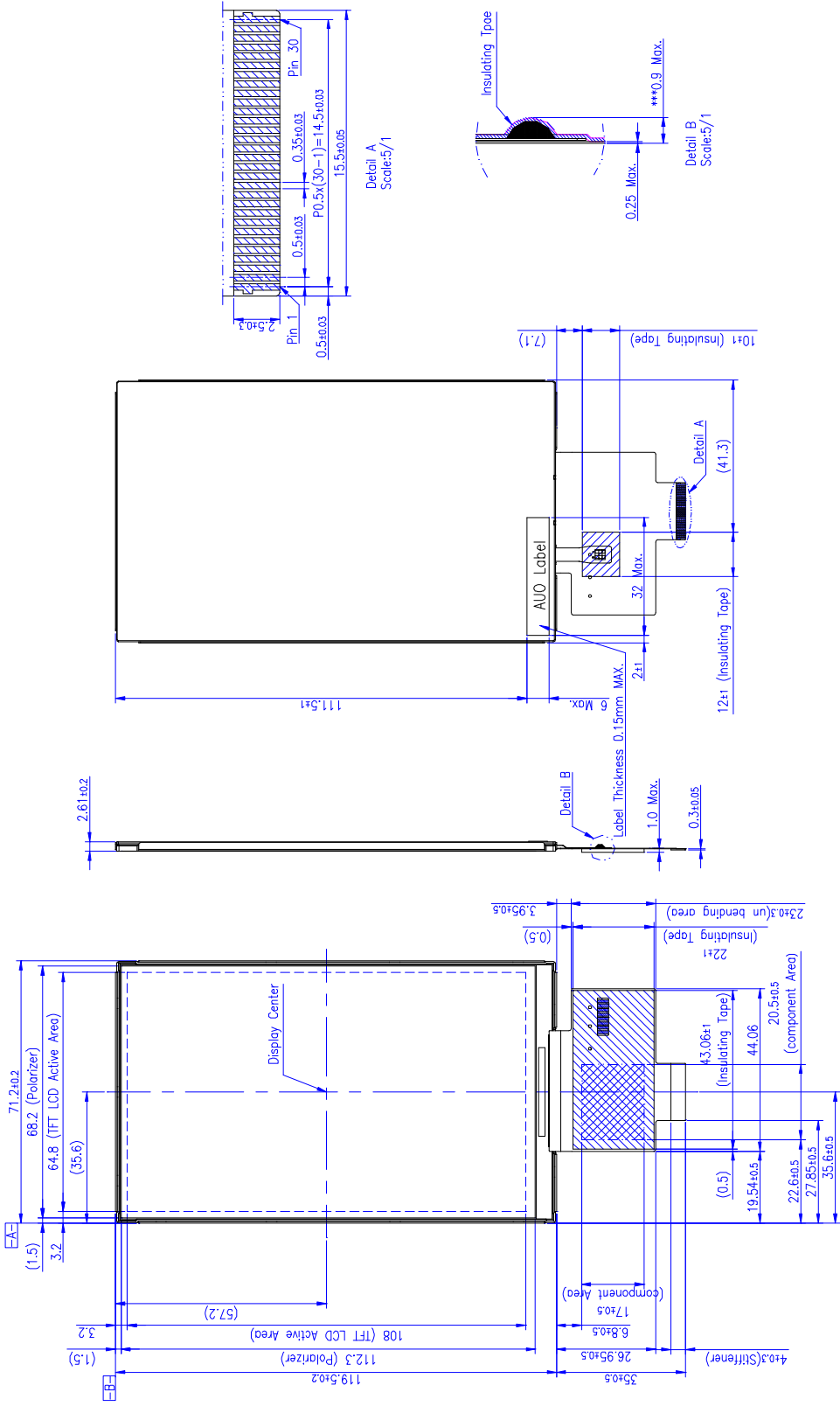


Note 3: Please refer to Electrical Characteristics chapter.

Note 4: DSI V1.01 r11 and D-PHY V1.0, 1 clock and 2 data lane pairs

B. Outline Dimension

NOTES:
General tolerance $\pm 0.3\text{mm}$
The bending radius of FPC should be larger than 0.6mm
*** The thickness of solder area .
FPC golden finger design need fully compatible with Hirose FH19SC-30S-0.5SH requirement.



C. Electrical Specifications

1. TFT LCD Panel Pin Assignment

Recommended connector : FH34S-30S-0.5SH

Pin no	Symbol	I/O	Description	Remark
1	TP reserved	-	Reserved	
2	TP reserved	-	Reserved	
3	TP reserved	-	Reserved	
4	TP reserved	-	Reserved	
5	TP reserved	-	Reserved	
6	TP reserved	-	Reserved	
7	TP reserved	-	Reserved	
8	TP reserved	-	Reserved	
9	LED+	P	LED backlight anode	
10	LED-	P	LED backlight cathode	
11	GND	G	GND	
12	VCI	P	Operating voltage	
13	GND	G	GND	
14	TE	O	Tearing effect output pin	
15	VDDI	P	I/O supply voltage	
16	GND	G	GND	
17	Test PAD	-	No connection. Please leave it open	
18	GND	G	GND	
19	HSSI_D1_P	I	MIPI differential data signal	
20	HSSI_D1_N	I	MIPI differential data signal	
21	GND	G	GND	
22	HSSI_CLK_P	I	MIPI differential clock signal	
23	HSSI_CLK_N	I	MIPI differential clock signal	
24	GND	G	GND	
25	HSSI_D0_P	I	MIPI differential data signal	
26	HSSI_D0_N	I	MIPI differential data signal	
27	GND	G	GND	
28	VDDI	P	I/O supply voltage	
29	RESX	I	Reset (Low active)	
30	GND	G	GND	

I: Input pin; O: Output pin; P: Power pin; G: Ground pin;

2. Absolute Maximum Ratings

Items	Symbol	Values		Unit
		Min.	Max.	
Supply Voltage	VCI	-0.3	+5.5	V
Supply Voltage	VDDI	-0.3	+5.5	V
Differential Input Voltage	HSSI_CLK_P/N, HSSI_DATA0_P/N, HSSI_DATA1_P/N	-0.3	+1.8	V

Note : If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also, if the module operates with the absolute maximum ratings for a long time, the reliability may drop.

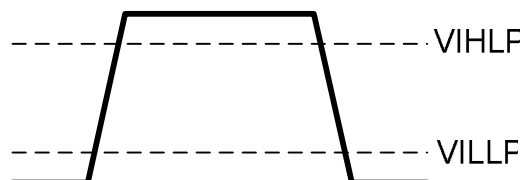
3. Electrical DC Characteristics

a. Typical Operation Condition (GND = 0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Analog operating voltage	VCI	2.6	2.8	3.0	V	
Logic operating voltage	VDDI	2.6	2.8	3.0	V	
Logic high level input voltage	VIH	0.7VDDI	-	VDDI	V	
Logic low level input voltage	VIL	GND	-	0.3 VDDI	V	

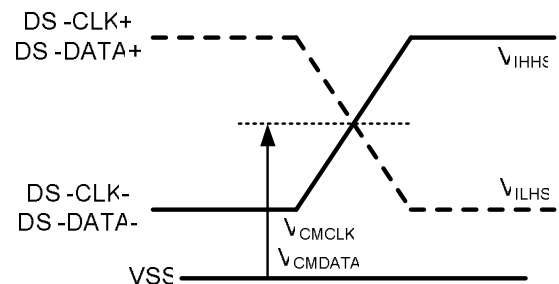
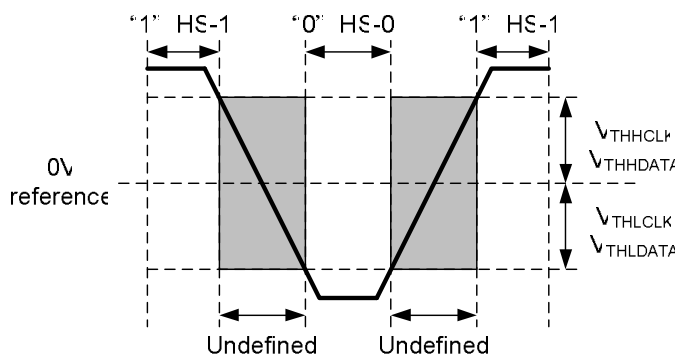
b. MIPI DSI LP Mode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic high level input voltage	VIHLP	880	-	1350	mV	
Logic low level input voltage	VILLP	0	-	550	mV	



c. MIPI DSI HS Mode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Input voltage common mode range	V_{CMCLK} V_{CMDATA}	70	-	330	mV	
Low-level differential input voltage threshold	V_{THLCLK} $V_{THLDATA}$	-70	-	-	mV	
High-level differential input voltage threshold	V_{THHCLK} $V_{THHDATA}$	-	-	70	mV	
Single-ended input low voltage	V_{ILHS}	-40	-	-	mV	
Single-ended input high voltage	V_{IHHS}	-	-	460	mV	



d. Power Consumption (GND=0V)

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Normal	P_N	$V_{CI} = 2.8V$ $V_{DDI} = 2.8V$	-	95	110	mW	Note 1,2
Sleep	P_S		-	30	35	mW	

Note 1: Test Condition is under typical Electrical DC and AC characteristics.

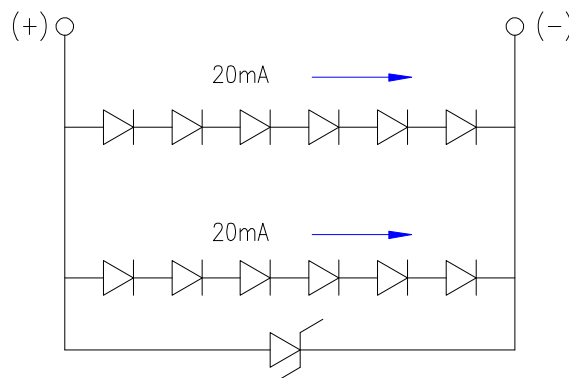
Note 2: Test pattern is the following picture (color bar).



e. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	I_L		20	22	mA	single serial
Power Consumption	PBL		768	937	mW	
LED Life Time	L_L	10,000	---	---	Hr	Note 2

Note 1: LED backlight is 12 LEDs serial type. Suggestion is driven by current 20mA for each LED string.



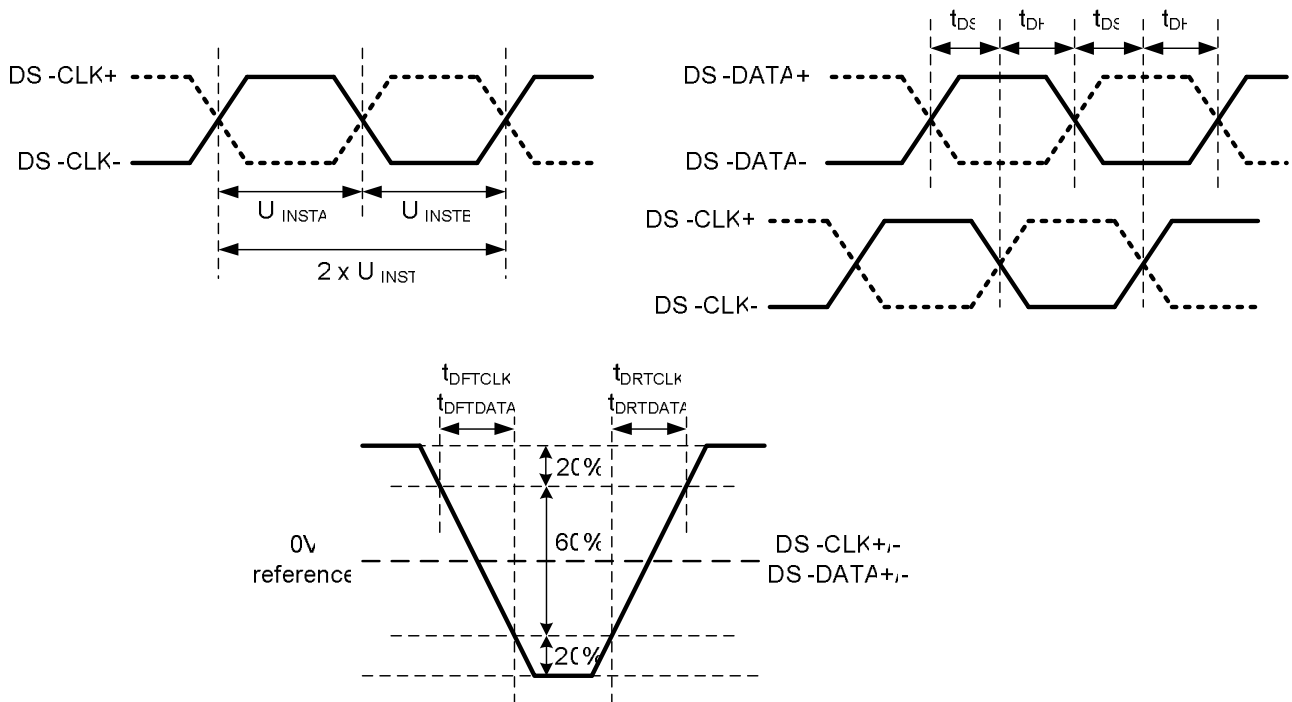
Note 2: Define "LED Lifetime": brightness is decreased to 50% of the initial value. LED Lifetime is restricted under normal condition, ambient temperature = 25°C and LED lightbar current = 20 mA.

Note 3: If it uses larger LED lightbar voltage/ current more than 22mA, it maybe decreases the LED lifetime

4. Electrical AC Characteristics

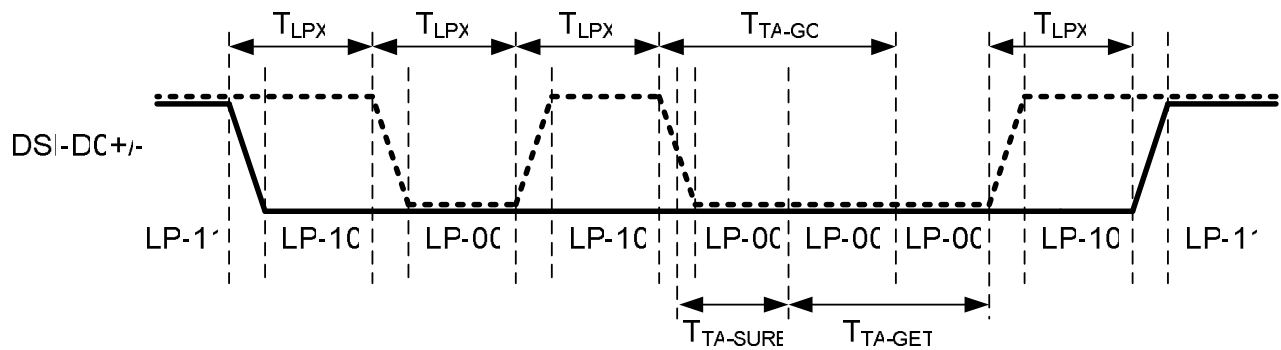
a. MIPI DSI Timing Characteristics – High Speed Mode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Double UI instantaneous	$2 \times UI_{INST}$	4	-	25	ns	
UI instantaneous halves	UI_{INSTA} UI_{INSTB}	2	-	12.5	ns	$UI = UI_{INSTA} = UI_{INSTB}$
Data to clock setup time	t_{DS}	$0.15 \times UI$	-	-	ps	
Data to clock hold time	t_{DH}	$0.15 \times UI$	-	-	ps	
Differential rise time for clock	t_{DRTCLK}	150	-	$0.3 \times UI$	ps	
Differential rise time for data	$t_{DRTDATA}$	150	-	$0.3 \times UI$	ps	
Differential fall time for clock	t_{DFTCLK}	150	-	$0.3 \times UI$	ps	
Differential fall time for data	$t_{DFTDATA}$	150	-	$0.3 \times UI$	ps	



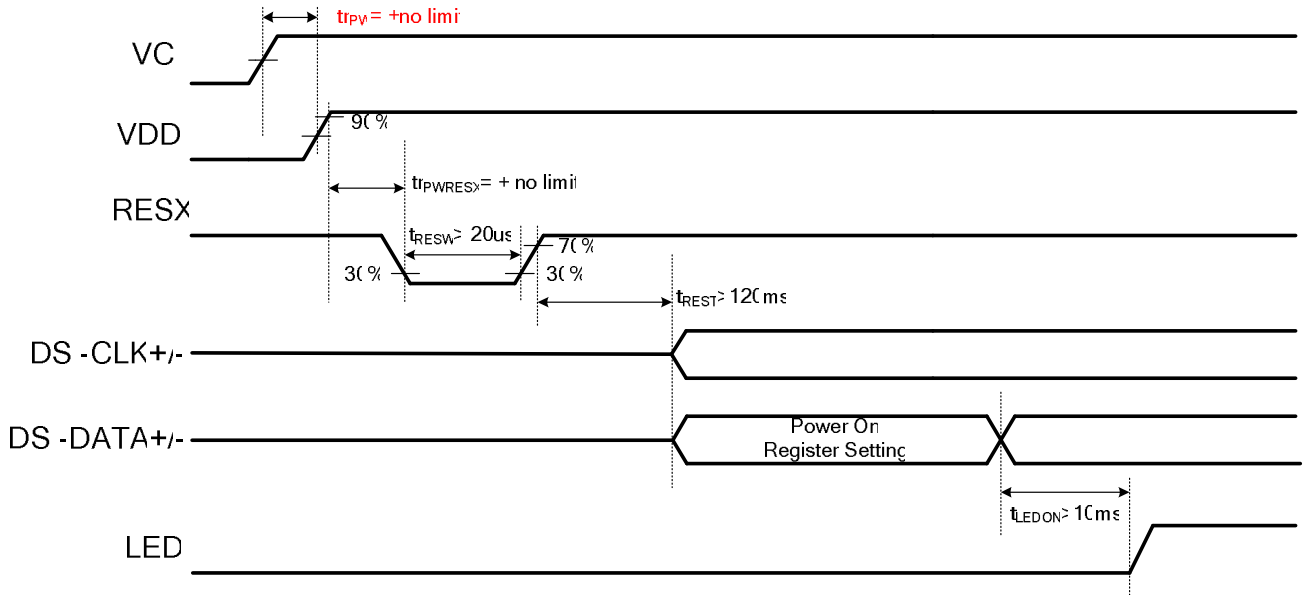
b. MIPI DSI Timing Characteristics – Low Power Mode

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Length of any low power state period	T_{LPX}	50	-	75	ns	
Time-out before new TX starts driving	$T_{TA-SURE}$	T_{LPX}	-	$2 \times T_{LPX}$	ns	
Time to drive LP-00 by new TX	T_{TA-GET}	$5 \times T_{LPX}$	-	-	ns	
Time to drive LP-00 after turnaround request	T_{TA-GO}	$4 \times T_{LPX}$	-	-	ns	

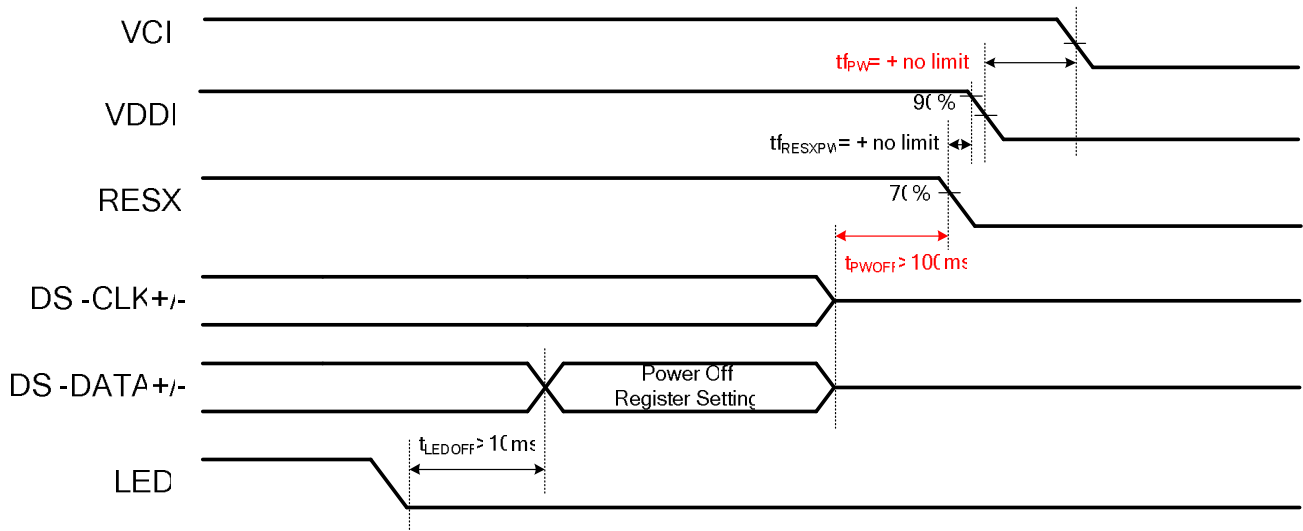


5. Power On / Off Characteristics

a. Recommended Power On Sequence



b. Recommended Power Off Sequence





6. Command Descriptions

a. User Command Set

Instruction	Address	D7	D6	D5	D4	D3	D2	D1	D0	Function
SLPIN	10h	No Argument								Sleep in & booster off
SLPOUT	11h	No Argument								Sleep out & booster on
DISPOFF	28h	No Argument								Display off
DISPON	29h	No Argument								Display on

b. Recommended Power On Register Setting

Number	Address	Data	Description
1	F0h	-	Enable Manufacture Command for Page 0
2	-	55h	
3	-	AAh	
4	-	52h	
5	-	08h	
6	-	00h	
7	B1h	-	Display Option Control
8	-	FFh	
9	-	00h	
10	BCh	-	Inversion Driving Control
11	-	05h	
12	-	05h	
13	-	05h	
14	F0h	-	Enable Manufacture Command for Page1
15	-	55h	
16	-	AAh	
17	-	52h	
18	-	08h	
19	-	01h	
20	TBD	TBD	Power Control
21	TBD	TBD	Gamma Correction
22	11h	-	EXIT_SLEEP_MODE
Wait for more than 120ms			
23	29h	-	SET_DISPLAY_ON

c. Recommended Power Off Register Setting

Number	Address	Data	Description
1	28h	-	SET_DISPLAY_OFF
2	10h	-	ENTER_SLEEP_MODE

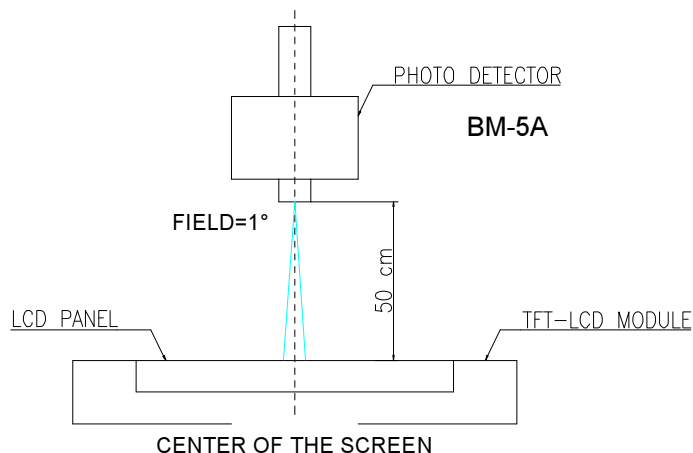
D. Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time								
Rise		Tr	θ=0°	--	20		ms	Note 3
Fall		Tf		--	15		ms	
Contrast ratio		CR	At optimized viewing angle	650	800	--		Note 4
Viewing Angle	Top		CR≥10	60	80	--	deg.	Note 5
	Bottom			60	80	--		
	Left			60	80	--		
	Right			60	80	--		
Brightness		Y _L	θ=0°	360	450	--	cd/m ²	Note 6
Chromaticity	White	X	θ=0°	0.28	0.33	0.38		TBD
		Y	θ=0°	0.30	0.35	0.40		TBD
	Red	X	θ=0°	0.548	0.598	0.648		TBD
		Y	θ=0°	0.306	0.356	0.406		TBD
	Green	X	θ=0°	0.311	0.361	0.411		TBD
		Y	θ=0°	0.536	0.586	0.636		TBD
	Blue	X	θ=0°	0.095	0.145	0.195		TBD
		Y	θ=0°	0.107	0.157	0.207		TBD
Uniformity		ΔY _L	%	70	80	--	%	Note 7

Note 1: Measurement should be performed in the dark room, optical ambient temperature =25°C, and backlight current IL=20 mA.

Note 2: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A, after 15 minutes operation.

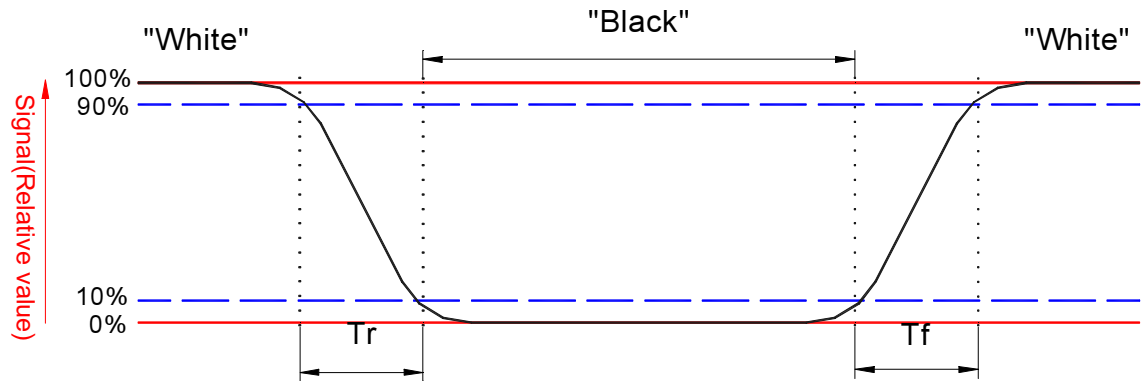


Note 3: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes.

Refer to figure as below.

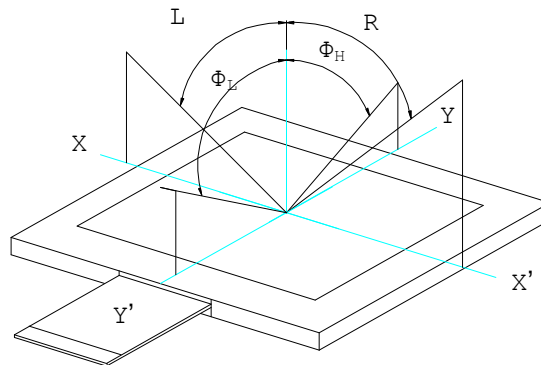


Note 4. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

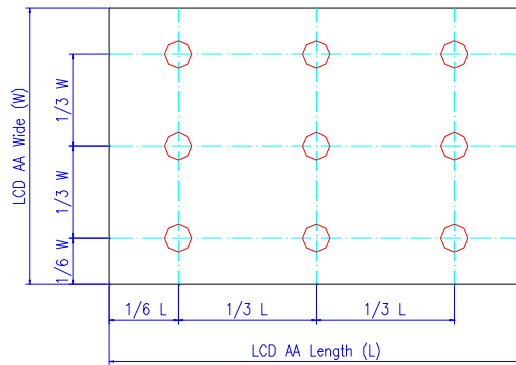
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

Note 5. Definition of viewing angle, θ , Refer to figure as below.



Note 6. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 7: Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

E. Reliability Test Items


No.	Test items	Conditions		Remark
1	High Temperature Storage	Ta= 80°C	240Hrs	Note 1 & Note 2
2	Low Temperature Storage	Ta= -20°C	240Hrs	Note 1 & Note 2
3	High Temperature Operation	Ta= 70°C	240Hrs	Note 1 & Note 2
4	Low Temperature Operation	Ta= -10°C	240Hrs	Note 1 & Note 2
5	High Temperature & High Humidity	Ta= 60°C. 90% RH	240Hrs	Note 1 & Note 2
6	Heat Shock	-20°C ~70°C, 50 cycle, 2Hrs/cycle		Non-operation
7	Electrostatic Discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B		Note 4
8	Vibration	Frequency range	: 8~33.3Hz	Non-operation JIS C7021, A-10 condition A : 15 minutes
		Stoke	: 1.3mm	
		Sweep	: 2.9G ,33.3~400Hz	
		2 hours for each direction of X,Y,Z		
		4 hours for Y direction		

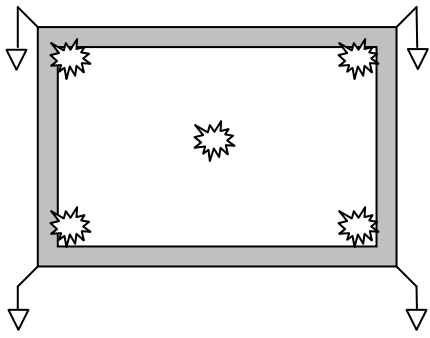
Note 1: Ta: Ambient Temperature.

Note 2: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

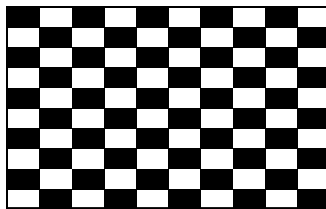
Note 3: All the cosmetic specification is judged before the reliability stress.

Note 4 : All test techniques follow IEC6100-4-2 standard.

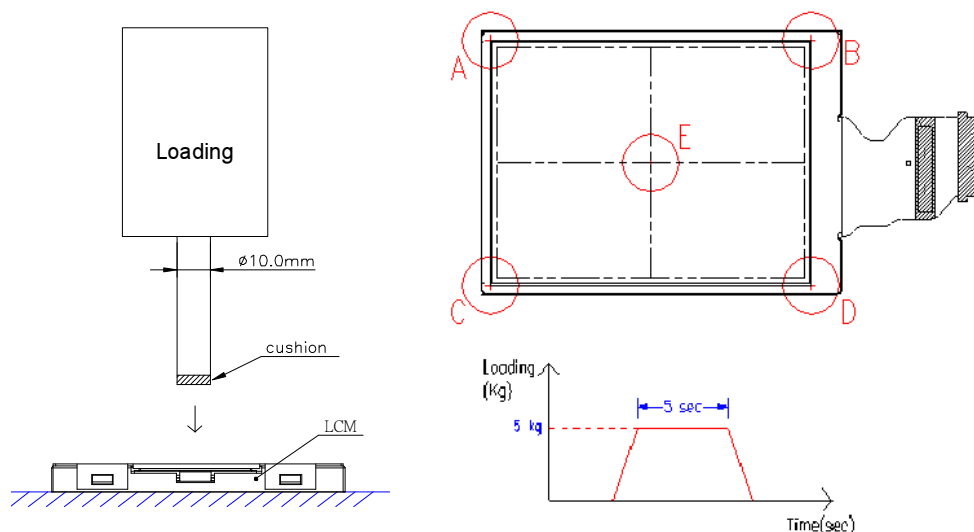
Test Condition		Note
Pattern		
Procedure And Set-up	<u>Contact Discharge</u> : 330Ω, 150pF, 1sec, 5point, 10times/point <u>Air Discharge</u> : 330Ω, 150pF, 1sec, 5 point, 10times/point	

	 <p>Note :</p> <ol style="list-style-type: none"> 1. The metal casing is connected to ground (0V) at four corners. 2. All register commands are repeating transferred. 3. Judging the result after discharging. 	
Criteria	B – Some performance degradation allowed. No data lost. Self-recoverable hardware failure.	
Others	<ol style="list-style-type: none"> 1. Gun to Panel Distance 2. No SPI command, keep default register settings. 	

Note 5: Operate with chess board pattern as figure and lasting time and temperature as the conditions.
Then judge with 50% gray level, the mura is less than JND 2.8



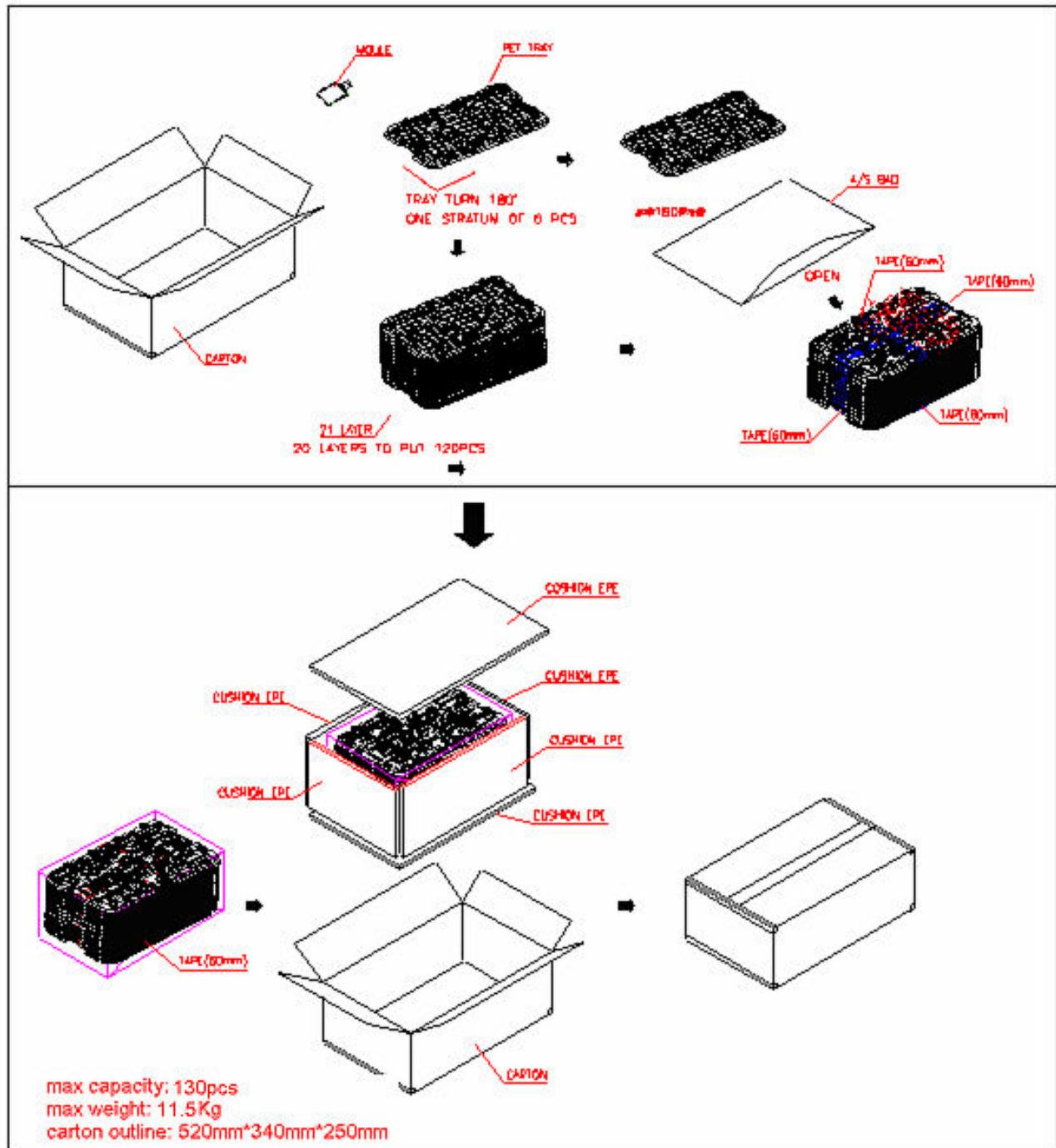
Note 6: The panel is tested as figure. The jig is $\phi 10\text{ mm}$ made by Cu with rubber and the loading speed is 3mm/min on position A~E. After the condition, no glass crack will be found and panel function check is OK.(no guarantee LC mura 、LC bubble)



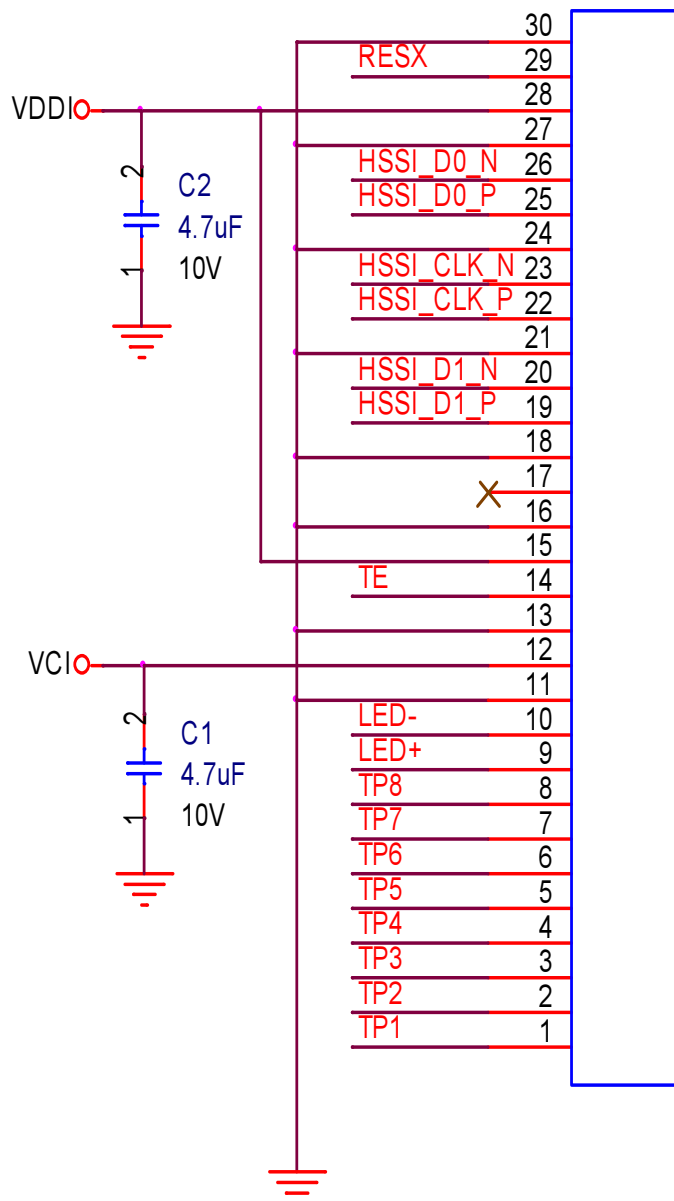


G. Packing and Marking

1. Packing Form



H. Application Circuit



I . Precautions

1. Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
2. Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
5. Less EMI: it will be more safety and less noise.
6. Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
7. Avoid to display the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.
8. Be sure to turn off the power when connecting or disconnecting the circuit.
9. Polarizer scratches easily, please handle it carefully.
10. Display surface never likes dirt or stains.
11. A dewdrop may lead to destruction. Please wipe off any moisture before using module.
12. Sudden temperature changes cause condensation, and it will cause polarizer damaged.
13. High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
14. Acetic acid or chlorine compounds are not friends with TFT display module.
15. Static electricity will damage the module, please do not touch the module without any grounded device.
16. Do not disassemble and reassemble the module by self.
17. Be careful do not touch the rear side directly.
18. No strong vibration or shock. It will cause module broken.
19. Storage the modules in suitable environment with regular packing.
20. Be careful of injury from a broken display module.
21. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the display non-uniformity or other function issue.