

## CUSTOMER APPROVAL SHEET

<b>Company Name</b>	
<b>MODEL</b>	<b>G070VTN02.0</b>
<b>CUSTOMER APPROVED</b>	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 )

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# Product Specification

## 7.0" COLOR TFT-LCD MODULE

**Model Name : G070VTN02.0**

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**Planned Lifetime:  
Phase-out Control:  
EOL Schedule:**

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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	2014/09/10	All	First Draft
0.1	2015/01/08	5	Dimension, weight, powe consumption
		6	Outline Dimension
		7	Modify Panel Pin Assignment Description PIN24 : DE → NC PIN25 : HSD → HSD_DE
			Modify Recommended connector
		10	Update Power Consumption
		11	Update Gamma & VCOM voltage suggested circuit
		15	Update Power On/Off Characteristics
		21	Update Shipping label information
0.2	2015/01/12	13	Update Timing characteristics

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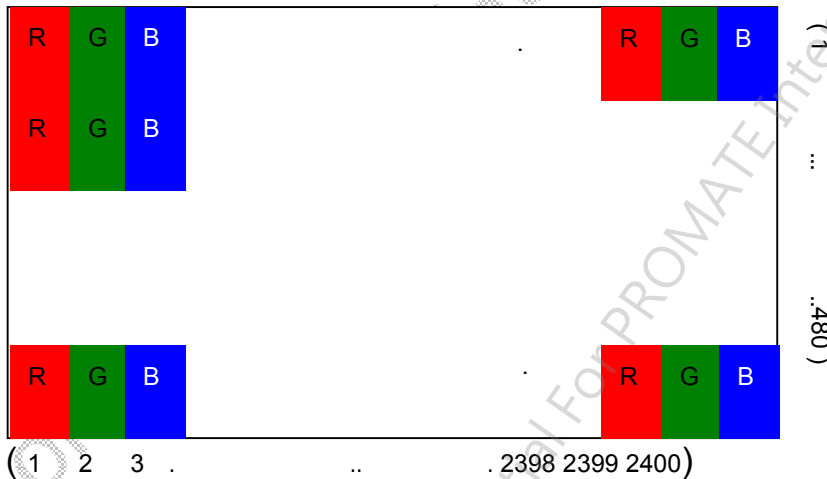
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## A. General Information

This product is for Marine application.

NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	7.0(Diagonal)	
2	Display Resolution	dot	800RGB(W)x480(H)	
3	Overall Dimension	mm	169.0(H)x103.51(V)x6.22(D)	
4	Active Area	mm	152.4(H)x91.44(V)	
5	Pixel Pitch	mm	0.0635×RGB×0.1905	
6	Color Configuration	--	R. G. B. Stripe	Note 1
7	Color Depth	--	262K Colors	Note 2
8	NTSC Ratio	%	60	
9	Display Mode	--	Normally White	
10	Panel surface Treatment	--	Anti-Glare, 3H	
11	Weight	g	157	
12	Panel Power Consumption	mW	270	Note 3
13	Backlight Power Consumption	W	Max. 5.44	
14	Viewing direction		6 o'clock (gray inversion)	

Note 1: Below figure shows dot stripe arrangement.



Note 2: The full color display depends on parallel RGB 6 bit data signal.

Note 3: Please refer to Electrical DC Characteristics chapter.



## C. Electrical Specifications

### 1. TFT LCD Panel Pin Assignment

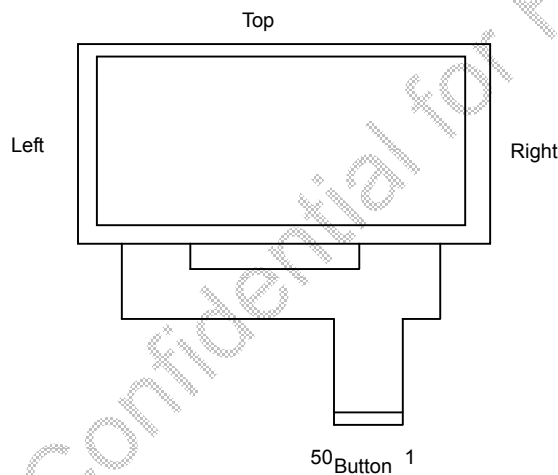
Recommended connector : **Omron XF2M-5015-1A**

NO.	Symbol	I/O	Description	Remark
1	VCOM	P	Voltage applied to color filter substrate	
2	VGH	P	Gate driver positive voltage	
3	VGL	P	Gate driver negative voltage	
4	VDD	P	Power supply, 3.3V (typical)	
5	GND	P	Ground	
6	V1	I	Voltage for gamma correction	
7	V2	I	Voltage for gamma correction	
8	V3	I	Voltage for gamma correction	
9	V4	I	Voltage for gamma correction	
10	V5	I	Voltage for gamma correction	
11	V6	I	Voltage for gamma correction	
12	V7	I	Voltage for gamma correction	
13	V8	I	Voltage for gamma correction	
14	V9	I	Voltage for gamma correction	
15	V10	I	Voltage for gamma correction	
16	V11	I	Voltage for gamma correction	
17	V12	I	Voltage for gamma correction	
18	V13	I	Voltage for gamma correction	
19	V14	I	Voltage for gamma correction	
20	AVDD	P	Power for source driver IC	
21	AVDD	P	Power for source driver IC	
22	GND	P	Ground	
23	VS	I	Vertical sync input	
24	HSD_DE	I	MODE = H , HSD_DE active high to enable the data input MODE = L, HSD_DE active low for horizontal sync input	
25	NC	-	NC	
26	GND	P	Ground	
27	DCLK	I	Pixel clock	
28	GND	P	Ground	
29	DB5	I	Blue Data Signal (MSB)	
30	DB4	I	Blue Data Signal	
31	DB3	I	Blue Data Signal	
32	DB2	I	Blue Data Signal	

33	DB1	I	Blue Data Signal	
34	DB0	I	Blue Data Signal (LSB)	
35	DG5	I	Green Data Signal (MSB)	
36	DG4	I	Green Data Signal	
37	DG3	I	Green Data Signal	
38	DG2	I	Green Data Signal	
39	DG1	I	Green Data Signal	
40	DG0	I	Green Data Signal (LSB)	
41	DR5	I	Red Data Signal (MSB)	
42	DR4	I	Red Data Signal	
43	DR3	I	Red Data Signal	
44	DR2	I	Red Data Signal	
45	DR1	I	Red Data Signal	
46	DR0	I	Red Data Signal (LSB)	
47	MODE	I	DE / SYNC Mode select ( H : DE Mode , L : SYNC Mode )	
48	SHLR	I	Horizontal scan direction control	Note
49	UPDN	I	Vertical scan direction control	Note
50	VCOM	P	Voltage applied to color filter substrate	

I: Input pin; P: Power pin; I/O: Input/Output pin

Note.



U/D	STVU	STUD	Direction
H	Output	Input	Button -> Top
L	Input	Output	Top -> Button

L/R	STHL	STHR	Direction
H	Input	Output	Left->Right
L	Output	Input	Right->Left



## 2. Backlight Pin Assignment

Recommended connector : STARCONN 089H08-220100-M1-R

Pin no	Symbol	I/O	Description	Remark
1	A1	P	Anode 1	
2	A2	P	Anode 2	
3	N.C	-	No Connection	
4	C1	P	Cathode 1	
5	C2	P	Cathode 2	
6	N.C	-	No Connction	
7	N.C	-	No Connction	
8	N.C	-	No Connction	

P: Power pin

## 3. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VDD	GND=0	-0.5	5	V	
	AVDD	GND=0	-0.5	15	V	
	VGH	GND=0	-0.3	40	V	
	VGL		-20	0.3	V	
	VGH - VGL		-	40	V	
Input signal voltage	VI	GND=0	-0.3	VDDIO+0.3	V	Note 1
	VCOM		0	6.5	V	
Operating temperature	Topa		-30	70		
Storage temperature	Tstg		-40	95		

Note 1: Digital Data.

Note 2: Functional operation should be restricted under ambient temperature (25 ).

Note 3: Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics chapter.

#### 4. Electrical DC Characteristics

##### a. (VDD = +3.3V, AVDD=11V, GND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply	VDD	3.0	3.3	3.6	V	Note3
	IVDD	--	11.6	14	mA	
	AVDD	10.5	11	11.5	V	
	IAVDD	--	22.2	27	mA	
	VGH	19.5	20	20.5	V	
	IVGH	--	0.22	0.3	mA	
	VGL	-10.5	-10	-9.5	V	
	IVGL	--	0.27	0.32	mA	
	VCOM	4.18	4.22	4.26	V	TBD
Input signal	H Level	Vih	0.7×VDDIO	-	VDDIO	Note 1
	L Level	ViL	0	-	0.3×VDDIO	
Input Voltage Reference	V1~V7	0.4*AVDD	-	AVDD-0.5	V	Note 2
	V8~V14	0.5	-	0.6*AVDD	V	Note 2

Note 1 : Digital Data

Note 2 : GND < V14 < V13 < V12 < V11 < V10 < V9 < V8 < V7 < V6 < V5 < V4 < V3 < V2 < V1 < AVDD

Note 3 : Typical current test pattern

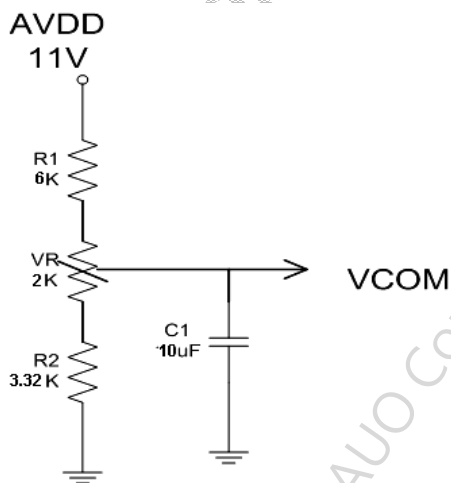


**b. Gamma voltage suggested circuit is as follows**

Recommended voltage setting and resistance for Gamma 2.2

Gamma 2.2				Resistance Value $\pm 1\%$ ( $\Omega$ )	
Gray Level	AVDD				
		11	R1	330	
00H	V1	10.8	R2	1500	
01H	V2	9.86	R3	1800	
10H	V3	8.75	R4	1100	
20H	V4	8.06	R5	620	
C0H	V5	7.68	R6	910	
F8H	V6	7.11	R7	1800	
FCH	V7	5.99	R8	1600	
FCH	V8	5.00	R9	1500	
F8H	V9	4.07	R10	1200	
C0H	V10	3.32	R11	820	
20H	V11	2.81	R12	1100	
10H	V12	2.13	R13	2000	
01H	V13	0.89	R14	1100	
00H	V14	0.20	R15	330	

**c. Vcom suggested circuit is as follows**



**d. Backlight Driving Conditions**

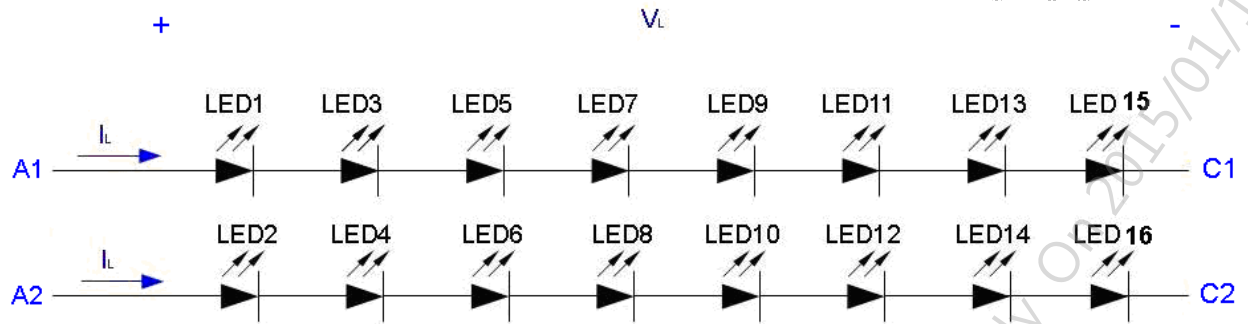
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Lightbar current	$I_L$	-	100	-	mA	Single serial (Note 3)
LED Supply Voltage	$V_L$	-	25.6	27.2	V	Note 3, 25 ° C
LED Lightbar life time		10,000	-	-	Hr	Note 2

Note 1: LED backlight is 16 LEDs (2 strings, 8pcs for each string).

Note 2: The LED lifetime 10000hrs means, after normal use at 100mA, under +25 ° C, the brightness decreases to 50% of original level.

Note 3: The LED supply power is for 2 string of LED.

Note 4: The voltage capacity of LED driver IC must be over max. of LED Voltage.

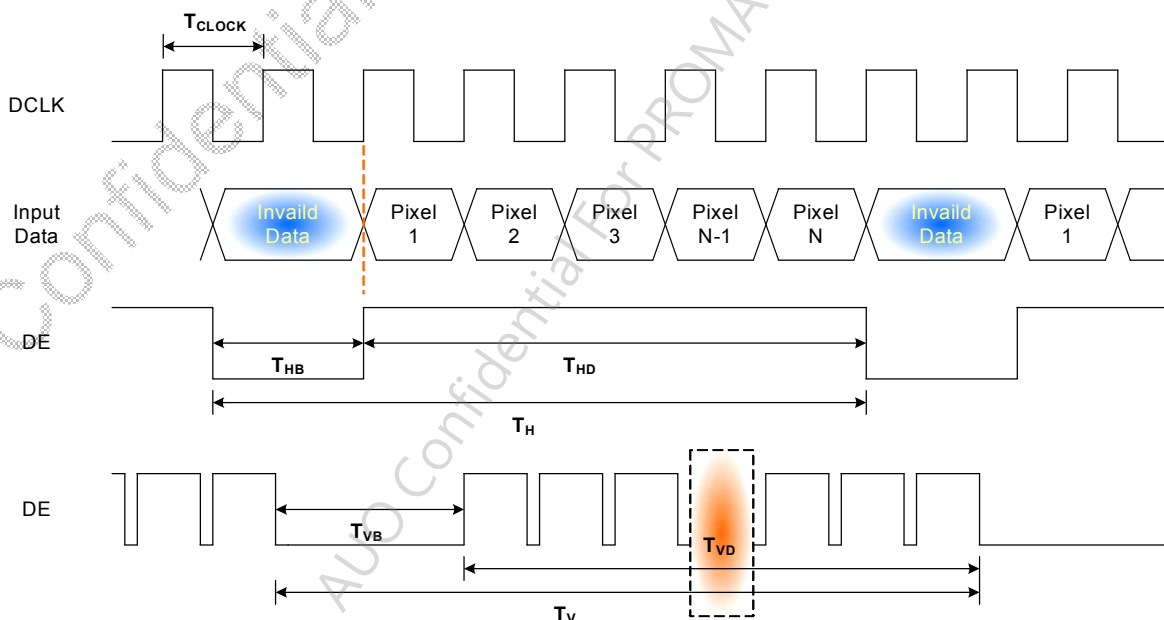


## 5. TFT- LCD Interface Timing

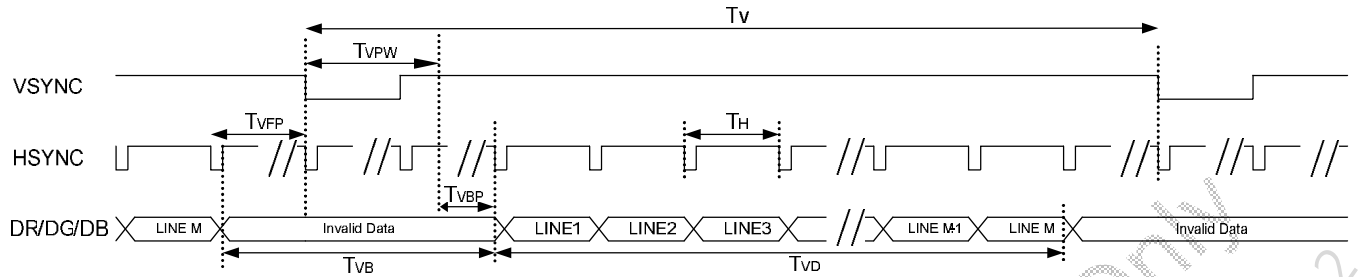
### a. Timing Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	Frequency	$1/T_{\text{CLOCK}}$	26	30	45	MHz	
	Period	$T_{\text{CLOCK}}$	22.2	33.3	38.4	ns	
Horizontal	Active Time	$t_{\text{HD}}$	800			$t_{\text{CLK}}$	
	HSD pulse width	$t_{\text{HPW}}$	1	48	87	$t_{\text{CLK}}$	<b>DE Mode:</b>
	HSD Back porch	$t_{\text{HBP}}$	87	40	1	$t_{\text{CLK}}$	<b>THB (HBlanking)</b>
							$= t_{\text{HPW}} + t_{\text{HBP}} + t_{\text{HFP}}$
	HSD Front porch	$t_{\text{HFP}}$	20	40	167	$t_{\text{CLK}}$	<b>HV Mode:</b>
							$t_{\text{HPW}} + t_{\text{HBP}}$ $= 88 \text{ DCLK is fixed}$
	Frequency	$f_{\text{H}}$	28.4	31.6	44.4	KHz	
	Period	$t_{\text{H}}$	22.5	31.6	35.2	us	
Vertical	Active Time	$t_{\text{VD}}$	480			$t_{\text{H}}$	
	VSD pulse width	$T_{\text{VPW}}$	1	1	3	$t_{\text{H}}$	<b>DE Mode:</b>
	VSD Back porch	$T_{\text{VBP}}$	31	31	29	$t_{\text{H}}$	<b>TVB (VBlanking) =</b>
							$T_{\text{VPW}} + t_{\text{VBP}} + t_{\text{VFP}}$
	VSD Front porch	$T_{\text{VFP}}$	5	13	168	$t_{\text{H}}$	<b>HV Mode:</b>
							$t_{\text{VPW}} + t_{\text{VBP}}$ $= 32 \text{ DCLK is fixed}$
	Frequency	$f_{\text{V}}$	55	60	65	Hz	
	Period	$t_{\text{V}}$	15.3	16.6	18.2	ms	

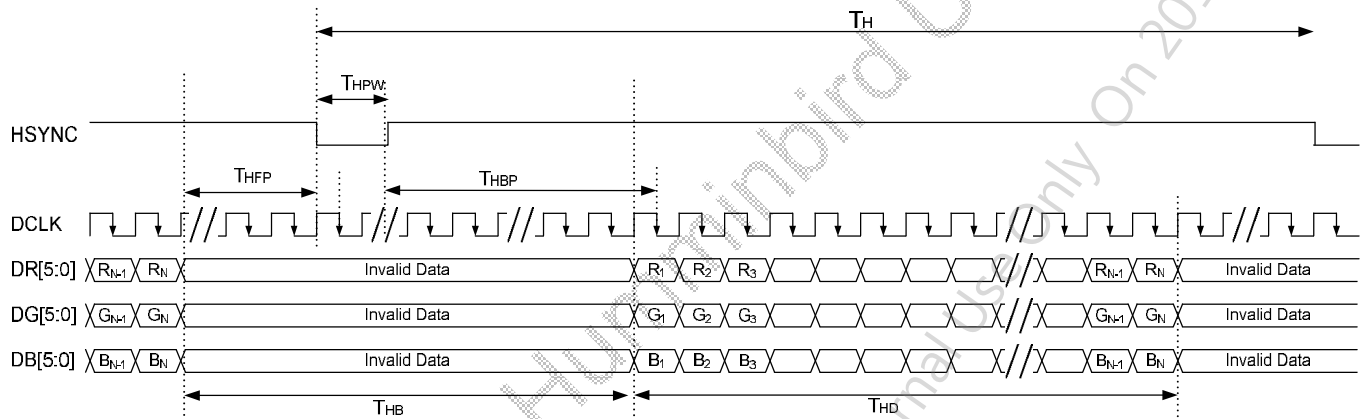
### b. Timing Diagram of input ( DE Mode )



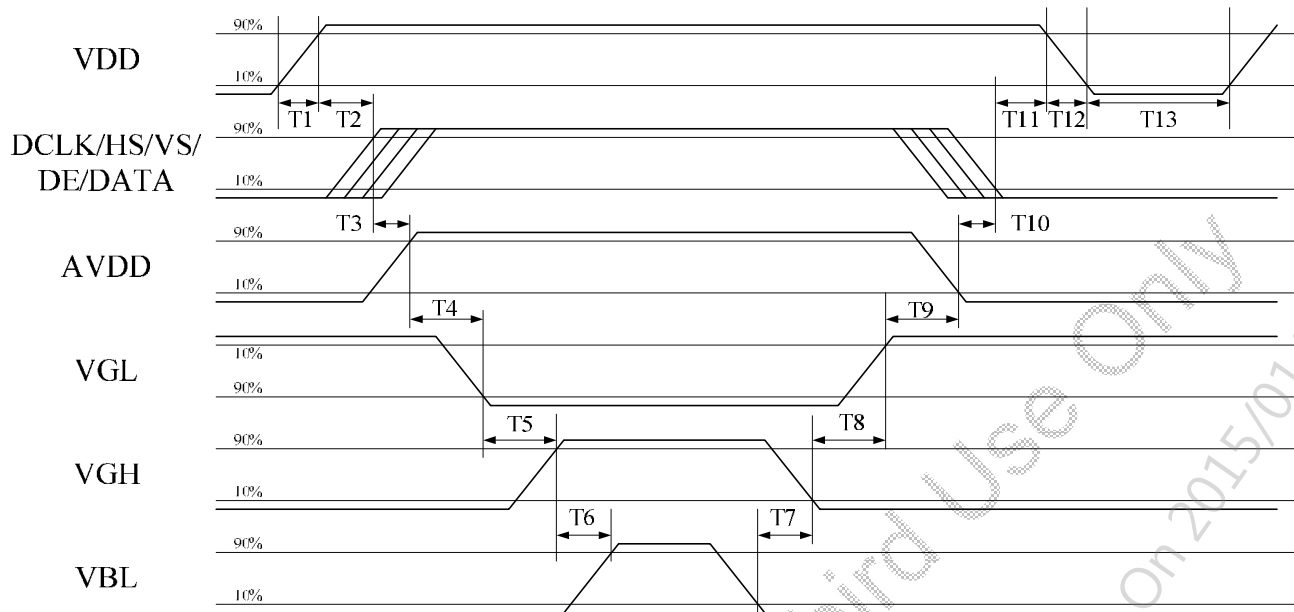
**c. Vertical Timing Diagram of Input (HV Mode)**



**d. Horizontal Timing Diagram of Input (HV Mode)**



## 6. Power On/Off Characteristics



Parameter	Value			Units
	Min.	Typ.	Max.	
<b>T1</b>	0.5	-	20	ms
<b>T2</b>	16	-	50	ms
<b>T3</b>	0	-	20	ms
<b>T4</b>	20	-	40	ms
<b>T5</b>	10	-	30	ms
<b>T6</b>	100	-	-	ms
<b>T7</b>	100	-	-	ms
<b>T8</b>	10	-	30	ms
<b>T9</b>	20	-	40	ms
<b>T10</b>	0	-	10	ms
<b>T11</b>	10	-	50	ms
<b>T12</b>	-	-	10	ms
<b>T13</b>	1000	-	-	ms

## D. Optical Specification

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time							
Rise	Tr	$\theta=0^\circ$	--	12	15	ms	Note 2
Fall	Tf		--	18	25	ms	
Contrast ratio	CR	At optimized viewing angle	400	600	--		Note 3
Viewing Angle		CR 10				deg.	Note 4
Top			35	50			
Bottom			45	60	--		
Left			50	65			
Right			50	65			
Brightness	$Y_L$	$\theta=0^\circ$	1000	1500	--	cd/m <sup>2</sup>	Note 5
Chromaticity	White	x	$\theta=0^\circ$	0.256	0.306	0.356	
		y	$\theta=0^\circ$	0.278	0.328	0.378	
	Red	x	$\theta=0^\circ$	TBD	TBD	TBD	
		y	$\theta=0^\circ$	TBD	TBD	TBD	
	Green	x	$\theta=0^\circ$	TBD	TBD	TBD	
		y	$\theta=0^\circ$	TBD	TBD	TBD	
	Blue	x	$\theta=0^\circ$	TBD	TBD	TBD	
		y	$\theta=0^\circ$	TBD	TBD	TBD	
Uniformity	$\Delta Y_L$	%	70	75	--	%	Note 6

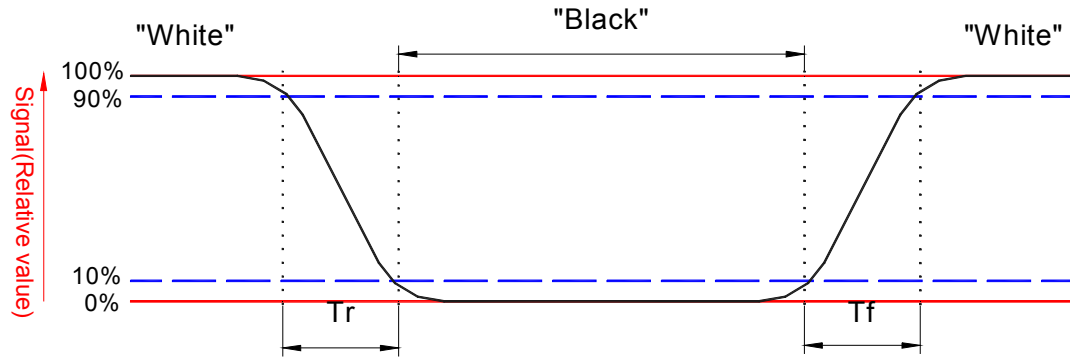
Note 1: Ambient temperature =25 , and LED lightbar currently = 100mA. To be measured in the dark room.

Note 2: 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.



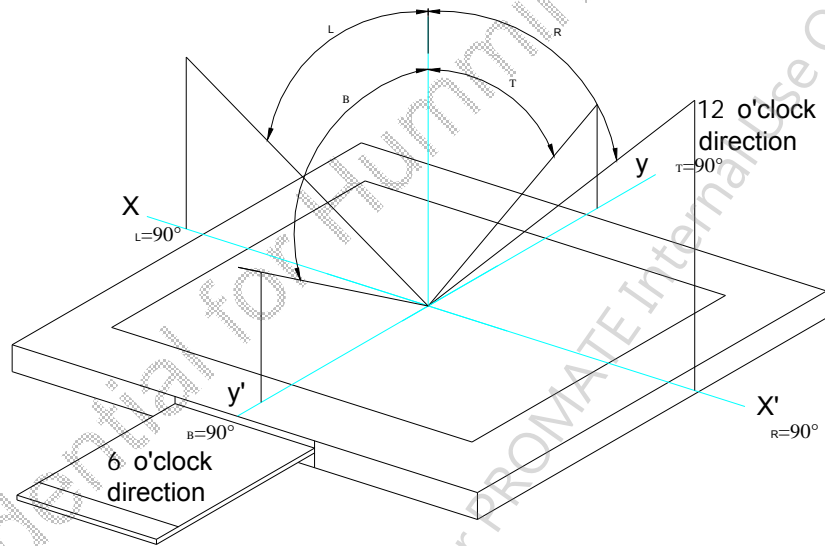


Note 3. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

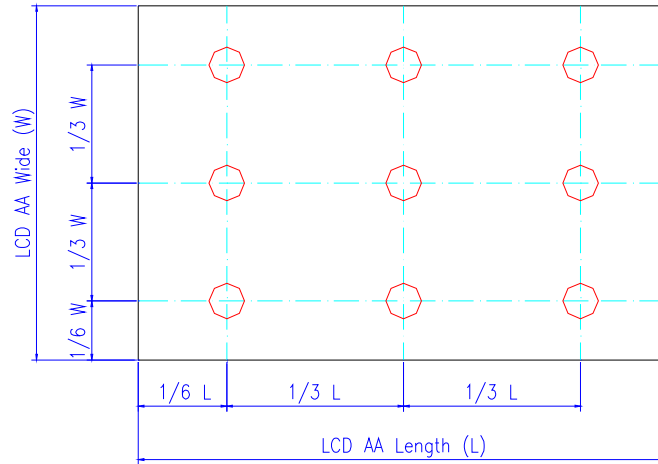
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

Note 4. Definition of viewing angle,  $\Phi$ , Refer to figure as below.



Note 5. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 6. Luminance Uniformity of these 9 points is defined as below:



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

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## E. Reliability Test Items

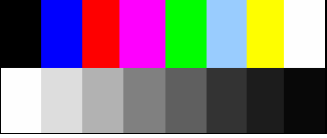
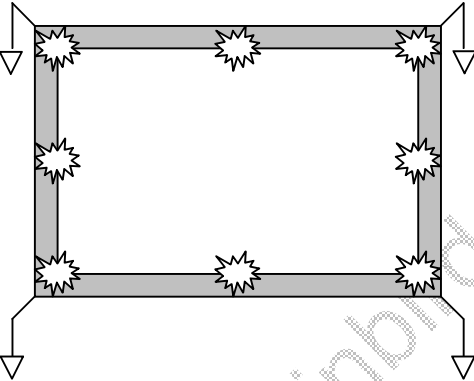
No.	Test items	Conditions	Remark
1	High Temperature Storage	Ta= 95      240Hrs	
2	Low Temperature Storage	Ta= -40      240Hrs	
3	High Ttemperature Operation	Tp= 70      240Hrs	
4	Low Temperature Operation	Ta= -30      240Hrs	
5	High Temperature & High Humidity	Tp= 60   . 90% RH      240Hrs	Operation
6	Heat Shock	-30 /0.5h~80 /0.5h , 100 cycles	Non-operation
7	Electrostatic Discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B	Note 4
8	Vibration	Frequency range :8~33.3Hz Stoke : 1.3mm Sweep : 2.9G,33.3~400Hz 2 hours for each direction of X,Z  4 hours for Y direction	Non-operation JIS C7021, A-10 condition A Cycle:: 15 minutes
9	Mechanical Shock	100G . 6ms, ±X,±Y,±Z 3 times for each direction	Non-operation JIS C7021, A-7 condition C
10	Vibration (With Carton)	Random vibration: 0.015G <sup>2</sup> /Hz from 5~200Hz -6dB/Octave from 200~500Hz	IEC 68-34
11	Drop (With Carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	

Note 1: Ta: Ambient Temperature. Tp: Panel Surface Temperature

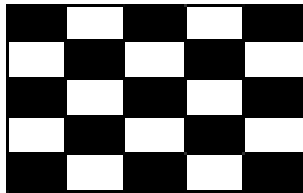
Note 2: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

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

Note4 : All test techniques follow IEC6100-4-2 standard.

Test Condition		Note
<p><b>Pattern</b></p>		
<p><b>Procedure And Set-up</b></p>	<p>Contact Discharge : 330Ω, 150pF, 1sec, 8 point, 25times/point            Air Discharge : 330Ω, 150pF, 1sec, 8 point, 25times/point</p> 	
<p><b>Criteria</b></p>	<p>B – Some performance degradation allowed. No data lost.            Self-recoverable hardware failure.</p>	
<p><b>Others</b></p>	<p>1. Gun to Panel Distance</p>	

Note 5: Operate with 5×5 chess board pattern as figure and lasting time and temperature as the conditions. Then judge with 50% gray level after waiting 20 min, the mura is less than JND 2.8.

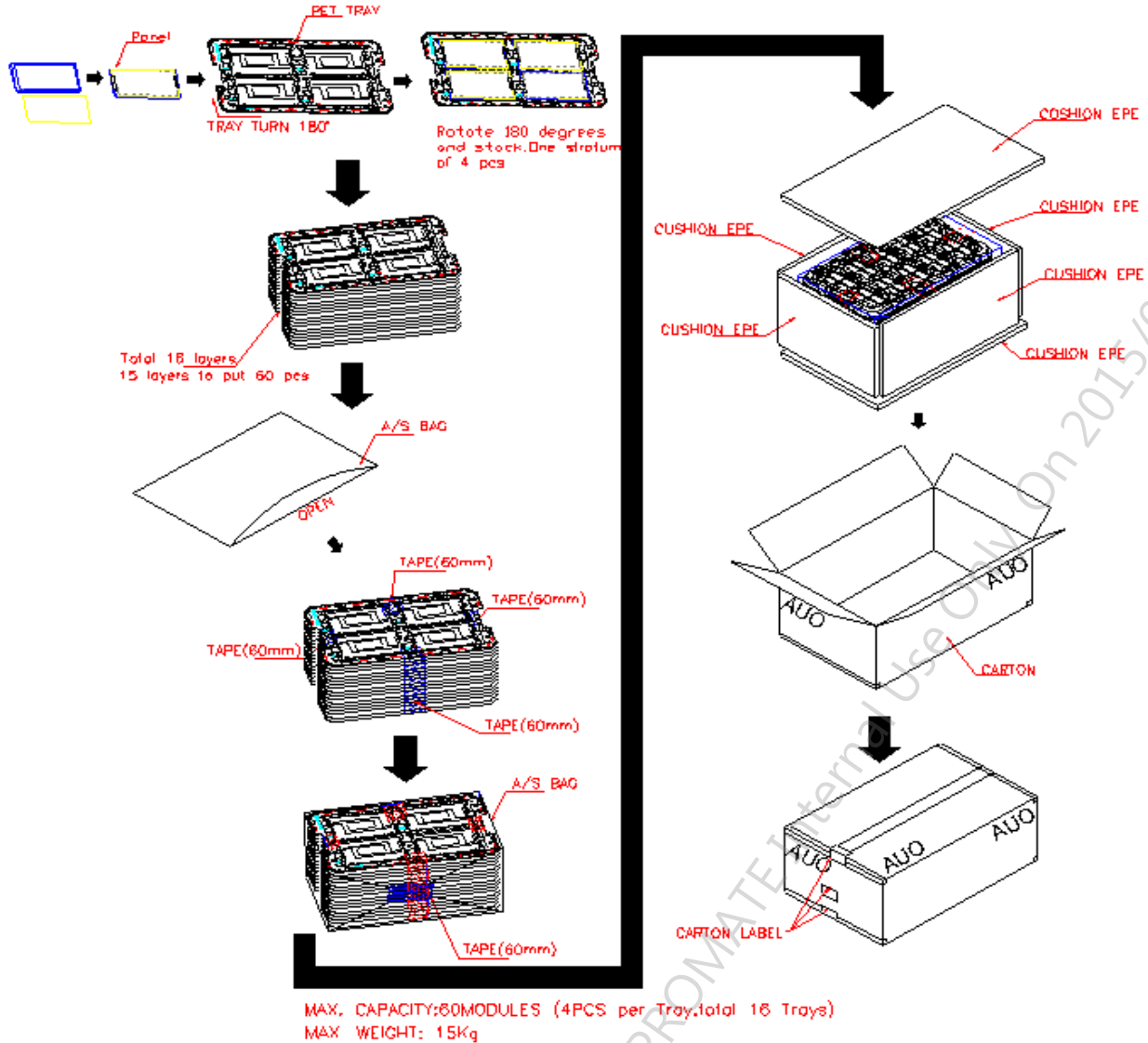


Note 6: The panel is tested as figure. The jig is  $\varphi 10$  mm made by Cu with rubber and the loading speed is 3mm/min on position A~E. After the condition, no glass crack will be found and panel function check is OK. (no guarantee LC mura, LC bubble)

Note 7. In Reliability test, performance is confirmed after leave in room temperature

## F. Packing and Marking

### 1. Packing Form



### 2. Module/Panel Label Information



## G. 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.
22. It was forbidden to bend the FPC upward to the panel surface.”