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# Product Specification

Part Name: 13.3 inch TFT DISPLAY MODULE  
Element Touch ID: TLE1330B02-CP

Customer:
Approved by

## **1. Introduction**

### **1.1 Scope of application**

This specification applies to the LCD module that is supplied by Element Touch Technology.

LCD specification: Dots 1920xRGBx1080.

All material & processing of the LCD module should be Lead Free.

### **1.2 TFT features:**

Structure: TFT PANNEL+IC +FPC+BL+CTP;

ALL O'CLOCK Type LCD

1920dot-segment and1080 dot-common outputs;

16.7M Color can be selected by software;

White LED back light;

2lane EDP interface

### **1.3 Applications:**

## 2. LCM General specification

<b>ITEM</b>	<b>Standard value</b>	<b>Unit</b>
LCD Type	Normally Black	--
Drive element	TFT active matrix	--
Number of pixels	1920*3RGB(H)X1080(V)	Dots
Pixel arrangement	R,G,B vertical stripe	--
Pixel Pitch (W*H)	0.153 (H) × 0.153 (V)	mm
Active area	293.76(H) x 165.24(V)	mm
Viewing direction	ALL O'CLOCK	-
TFT Driver IC	TBD	
TFT interface	2lane EDP interface	-
Approx. Weight	TBD	g
LCM Size(W*H*T)	305.20(W)x178.10(H) x 2.60(T)	mm
LCM+TP Size(W*H*T)	319.74(W)x191.22 (H) x 5.50(T)	mm
Touchstructure	G+G	
Touch Driver IC	GT9271	-
Touch Interface	I2C	



### 3. Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T <sub>OPR</sub>	0	+50	°C
LCM Storage Temperature	T <sub>STG</sub>	-20	+60	°C
TP Operating Temperature & Humidity(20% ~ 90%RH)	T <sub>OPR</sub>	0	+50	°C
TP SStorage Temperature & Humidity(20% ~ 90%RH)	T <sub>STG</sub>	-20	+60	°C
Humidity	RH	-	90	%

### 4. Electrical Characteristics

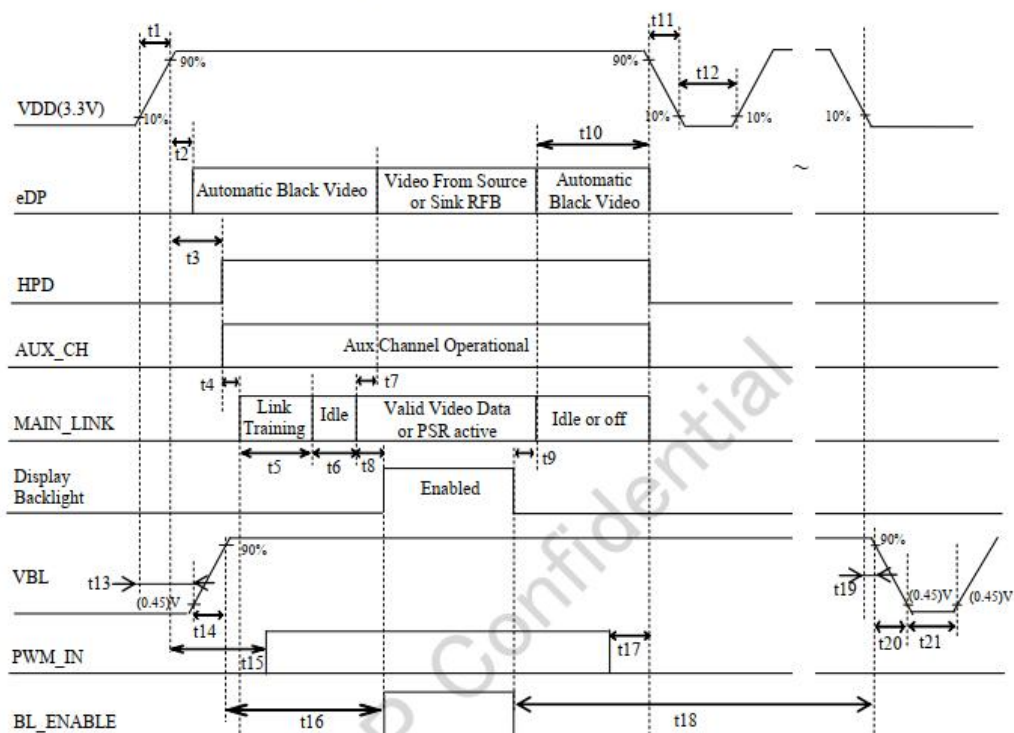
#### 4.1 TFT-LCD panel driving

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage for I/O	VDDIO	-	-	-	V	[Note 6-1-1]
Supply Voltage VDD	VDD	2.5	2.8	3.3	V	[Note 6-1-4]
Current dissipation 1	IDD1	—	200	260	mA	[Note 6-1-4]
Power dissipation 1	PDD1	—	0.66	0.78	W	[Note 6-1-4]
Current dissipation 2	IDD2	—	385	560	mA	[Note 6-1-4]
Power dissipation 2	PDD2	—	1.27	1.68	W	
Current dissipation 2	IDD2	—	385	560	mA	
Hot plug Detection	HPD	+2.25	+3.3	+3.6	V	
Power dissipation 2	VRP	-	-	100	mVp-p	VDD =+3.3 V

eDP AUX Channel Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Unit Interval for AUX channel	UI <sub>AUX</sub>	0.4	0.5	0.6	μs	
peak-to-peak voltage at TP1(Tx)	V <sub>AUX-DIFF-pp-Tx</sub>	0.39	-	1.38	V	
peak-to-peak voltage at TP1(Rx)	V <sub>AUX-DIFF-pp-Rx</sub>	0.32	-	1.36	V	
AUX DC Common Mode Voltage	V <sub>AUX-DC-CM</sub>	0	-	2.0	V	
AUX Short Circuit Current Limit	I <sub>AUX_SHORT</sub>	-	-	90	mA	
AUX CH termination DC resistance	R <sub>AUX_TERM</sub>	-	100	-	Ω	
AUX AC Coupling Capacitor	C <sub>AUX</sub>	75	-	200	nF	
Number of pre-charge pulses	Pre-charge pulses	10	-	16	-	

eDP Main Link Receiver Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Link clock down spreading	Down_Spread_Amplitude	0		0.5	%	
Differential Peak-to-peak Input Voltage at RX package pins	V <sub>RX-DIFF-pp</sub>	120	-	1200	mV	
Differential Return Loss at 1.35 GHz at RX package pins	R <sub>LRX-DIFF</sub>	9	-	-	dB	
Differential termination resistance	V <sub>RX-TERM</sub>	-	100	-	Ω	
RX Short Circuit Current Limit	I <sub>RX-SHORT</sub>	-	-	50	mA	
Lane Intra-pair Skew at RX package pins	L <sub>RX-SKEW-INTRA-PAIR-High-Bit-Rate</sub>	-	-	100	ps	

[Note 6-1-1] ON-OFF conditions for supply voltage



[Note6-1-2] Do not keep the interface signal high-impedance or unusual signal when power is on.

Symbol	Min	Max	Unit	Note
t1	0.5	10	ms	
t2	0	200	ms	
t3	0	200	ms	
t4	-	-	ms	
t5	-	-	ms	
t6	-	-	ms	
t7	0	50	ms	
t8	-	-	ms	
t9	-	-	ms	
t10	0	500	ms	
t11	1	50	ms	[Note 6-1-3]
t12	500	-	ms	
t13	-	-	ms	

t14	0.5	10	ms	
t15	0		ms	[Note 6-1-5]
t16	0	-	ms	
t17	0	-	ms	
t18		-		
t19	-	-	ms	
t20	0.1	-	ms	
t21	100		ms	

[Note 6-1-3] As for the power off sequence for VDD (t11), Be sure to keep above mentioned timing.

If the VDD power off sequence timing is other than shown above, LCD may cause permanent damage.

\*1 : As for the power sequence for backlight, it is recommended to apply above mentioned input timing.

If the backlight is light on and off at a timing other than shown above, displaying image may get disturbed.

VDD-dip conditions

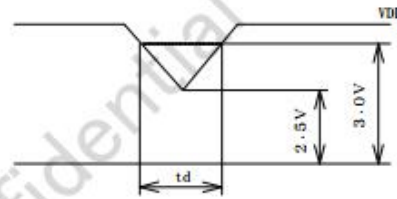
1)  $2.5\text{ V} \leq \text{VDD} < 3.0\text{ V}$

$t_d \leq 10\text{ ms}$

Under above condition, the display image should return to an appropriate figure after VDD voltage recovers.

2)  $\text{VDD} < 2.5\text{ V}$

VDD-dip conditions should also follow the ON-OFF conditions for supply voltage



[Note 6-1-4] Typical Current and Power dissipation condition: White pattern(V255).

TYP: VDD=+3.3V

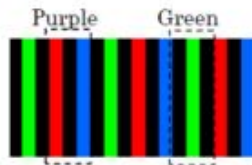
MAX: VDD=+3.0V



Maximum Current and Power dissipation condition: Purple/Green Stripe pattern.

TYP: VDD=+3.3V

MAX: VDD=+3.0V



[Note 6-1-5] If  $T_{15} \geq 0\text{ms}$  damage for T-con is nothing, but please make a decision based on sufficient evaluation of the display state.

## 4.2 Back-Light Unit Characteristics

The back-light system is an edge-lighting type with white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	$V_F$	--	12	--	V	-
Forward current	$I_F$	--	260	--	mA	$V_{BL} = 12.0\text{V}$ (TYP)
Luminance(With LCD)	$L_V$		280	--	$\text{cd/m}^2$	-
LED life time	N/A	10000	----	--	Hr	Note 1



## 5. Module Function Description

### LCM PIN Description:

Pin No.	Symbol	Function	Remark
1	CABC EN	CABC EN	
2	H GND	High Speed Ground	[Note 4-1-2]
3	Lane1 N	Complement Signal Link Lane 1	
4	Lane1 P	True Signal Link Lane 1	
5	H GND	High Speed Ground	[Note 4-1-2]
6	Lane0 N	Complement Signal Link Lane 0	
7	Lane0 P	True Signal Link Lane 0	
8	H GND	High Speed Ground	[Note 4-1-2]
9	AUX CH P	True Signal Auxiliary Channel	
10	AUX CH N	Complement Signal Auxiliary Channel	
11	H GND	High Speed Ground	[Note 4-1-2]
12	VDD	LCD logic and driver power(3.3V)	
13	VDD	LCD logic and driver power(3.3V)	
14	LCD TEST	Panel self test enable	
15	LCD GND	LCD logic and driver ground	
16	LCD GND	LCD logic and driver ground	
17	HPD	HPD signal pin	[Note 4-1-3]
18	BL GND	Backlight ground	
19	BL GND	Backlight ground	
20	BL GND	Backlight ground	
21	BL GND	Backlight ground	
22	BL ENABLE	Backlight On/Off	[Note 4-1-4]
23	BL PWM DIM	System PWM	[Note 4-1-5]
24	MSCL	Serial clock signal pin.	
25	MSDA	Serial data input/output pin.	
26	VBL	Backlight power	
27	VBL	Backlight power	
28	VBL	Backlight power	
29	VBL	Backlight power	
30	NC	Reserved for LCD manufacturer's use	[Note4-1-1]

### TP USB PIN Description:

Pin No.	Symbol	Description
1	VCC(2.8-3.3V)	CTP_Power Supply 2.8-3.3V
2	GND	Ground
3	SDA 2.8V	CTP_Data Singnal
4	SCL 2.8V	CTP_Clock Singnal
5	INT 2.8V	CTP_STOP Singnal
6	RST 2.8V	CTP_Reset Signal input pin.

\*1 P : Power , I : Input , O : Output

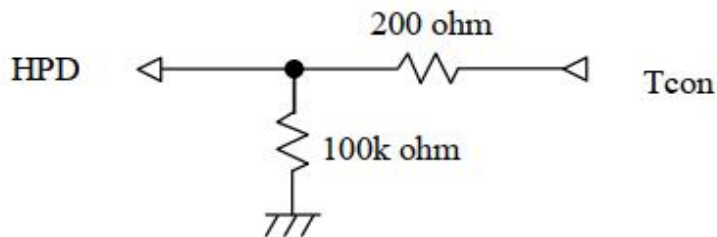
[Note 4-1-1] Don't input any signals or any powers into a NC pin. Keep the NC pin open.

[Note 4-1-2] The shielding case is connected with signal GND.

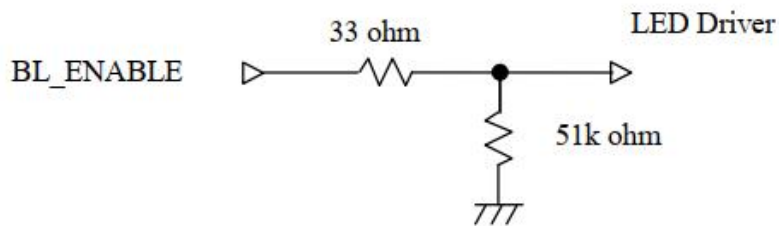
- Connector used :20455-030E-76 (I-PEX)
- Corresponding connector : 20453-030T (I-PEX)

(Sharp is not responsible to its product quality, if the user applies a connector not corresponding to the above model.)

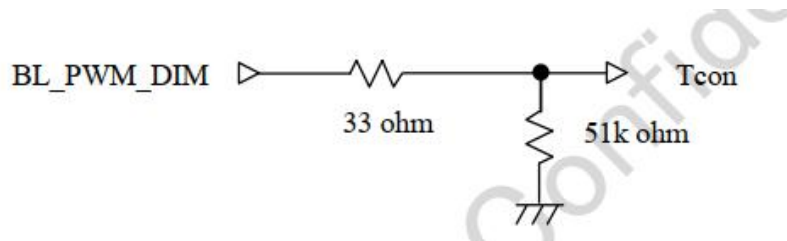
[Note 4-1-3] Output circuit is as below.



[Note 4-1-4] Input circuit is as below.



[Note 4-1-5] Input circuit is as below.



[Note 4-1-6] All terminals except NC terminal must be connected to input signal described as above or supply voltage or GND each.

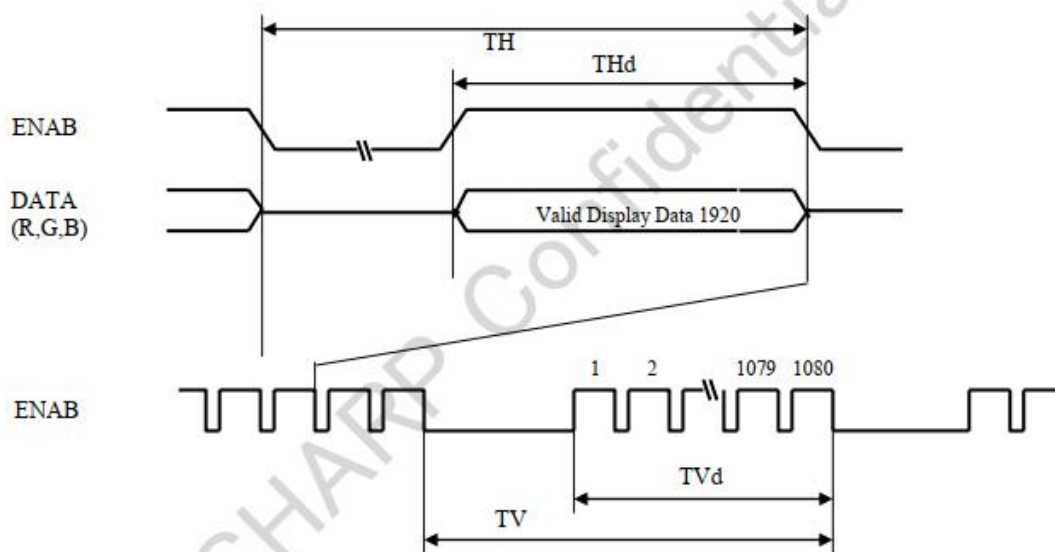
## 6. Timing Characteristics

### Timing characteristics:

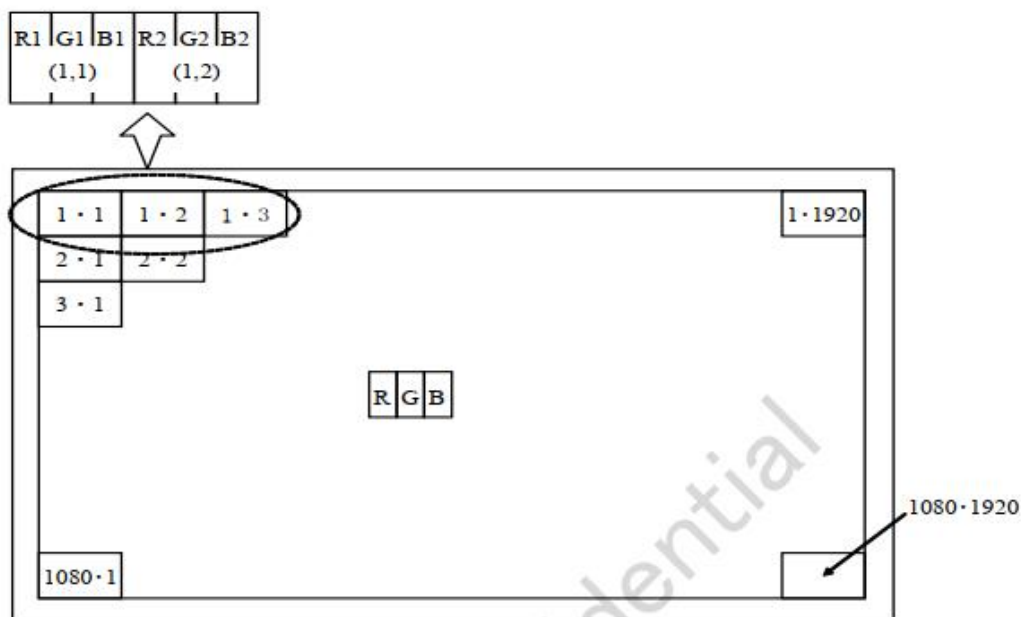
VDD=+3.0V~+3.6V, Ta=0°C~+50°C

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	—	138.5	—	MHz	[Note 7-1-1]
Data enable	Horizontal period	TH	—	2080	—	clock	
				15.02		μs	
	Horizontal period (High)	THd	—	1920	—	clock	
Signal	Vertical period	TV	—	1111	—	line	
			—	16.685	—	ms	
	Vertical period (High)	TVd	—	1080	—	line	

[Note 7-1-1] In case of using the long vertical period, the deterioration of display quality, flicker, etc., may occur.



Input data signals and display position on the screen:



Display position of input data(V · H)

## 7. Optical Characteristics

$T_a=+25^{\circ}\text{C}$ ,  $V_{DD}=+3.3\text{V}$

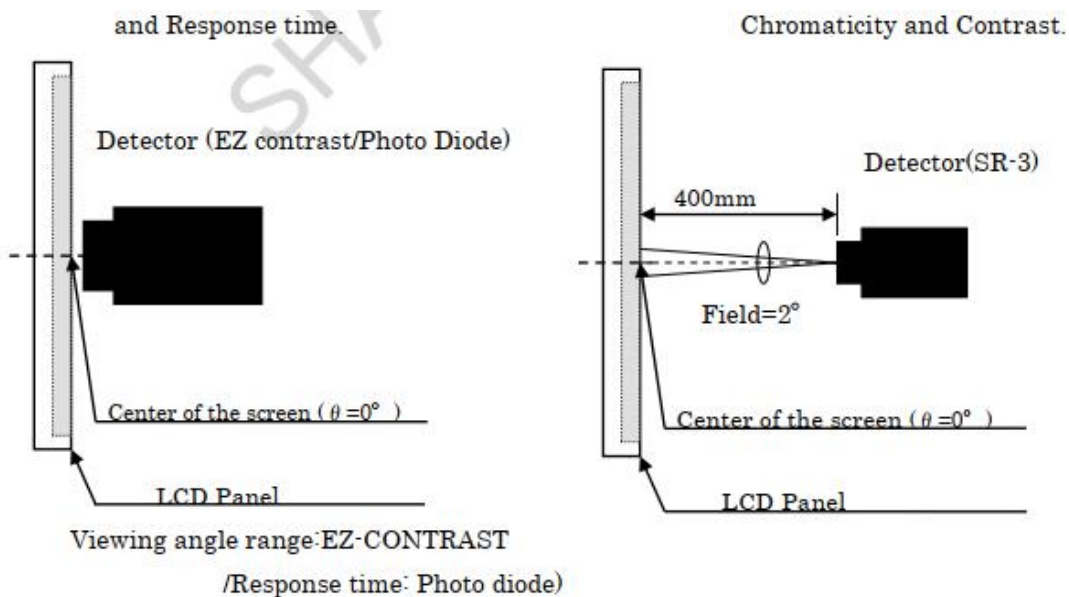
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	$\theta_{21}, \theta_{22}$	80	88	—	deg.	[Note 10-1, 10-3, 10-4, 10-6]
	Vertical	$\theta_{11}$	80	88	—	deg.	
		$\theta_{12}$	80	88	—	deg.	
Contrast ratio	CR	$\theta=0^{\circ}$	700	1000	—		[Note 10-2, 10-4, 10-6]
Response time	$\tau_r + \tau_d$	$\theta=0^{\circ}$	—	25	—	ms	[Note 10-1, 10-5, 10-6]
Chromaticity of white	x		0.283	0.313	0.343		[Note 10-2, 10-6] Normal operation (PWM Duty=100%)
	y		0.299	0.329	0.359		
Chromaticity of red	x		—	0.640	—		
	y		—	0.330	—		
Chromaticity of green	x		—	0.300	—		
	y		—	0.600	—		
Chromaticity of blue	x		—	0.150	—		
	y		—	0.060	—		
NTSC ratio	%		68	72	—		
Luminance of white	$Y_{LI}$	—	300	—	$\text{cd/m}^2$		
White uniformity	$\delta_{w3}$	$\theta=0^{\circ}$	—	—	1.25	[Note 10-2, 10-7]	

※ The measurement shall be taken 30 minutes after lighting the module at the following rating.

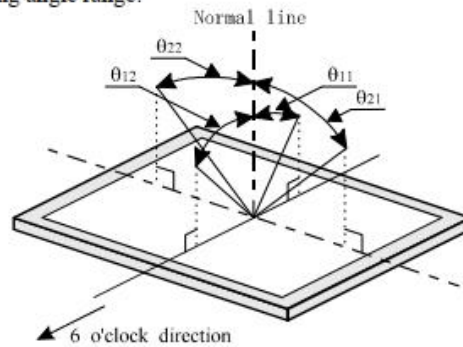
Condition: PWM Duty = 100%

The optical characteristics shall be measured in a dark room or equivalent.

[Note 10-1] Measurement of viewing angle range [Note 10-2] Measurement of luminance and



[Note 10-3] Definitions of viewing angle range:



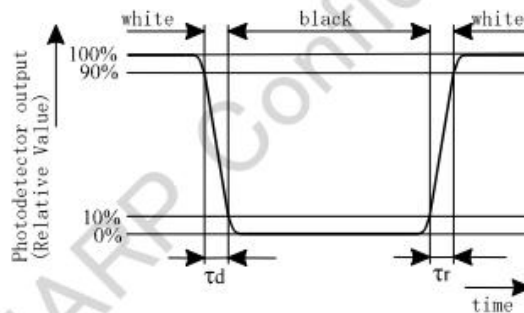
[Note 10-4] Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

[Note 10-5] Definition of response time:

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

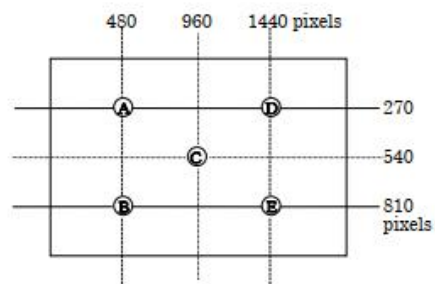


[Note 10-6] This shall be measured at center of the screen.

[Note 10-7] Definition of white uniformity:

White uniformity is defined as the following with five measurements (A ~ E).

$$\delta w5 = \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$



## 8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+60°C / 96H	1. Functional test isOK. Missing Segment,short, unclear segment non-display,display abnormally and liquid crystal leakare un-allowed. 2. No low temperature bubbles,end seal loose andfall, frame rainbow.
2	Low Temp. Storage	-20°C / 96H	
3	High Tempe. Operating	+50°C / 96H	
4	Low Tempe. Operating	0°C / 96H	
5	High Temperature /Humidity storage	50°C x 90%RH /96H	
6	Thermal and cold shock	Static state, -20°C 30min) ~50°C (30min) , 50 cycles	

## 9. Packing Method----TBD

- END -