

PRODUCT SPECIFICATION

MODEL NO: SEL023LQAA2

< ◇ > PRELIMINARY SPECIFICATION

< ◆ > APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED

REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2011/05/25	-	First Issued.	Iris

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1. GENERAL DESCRIPTION

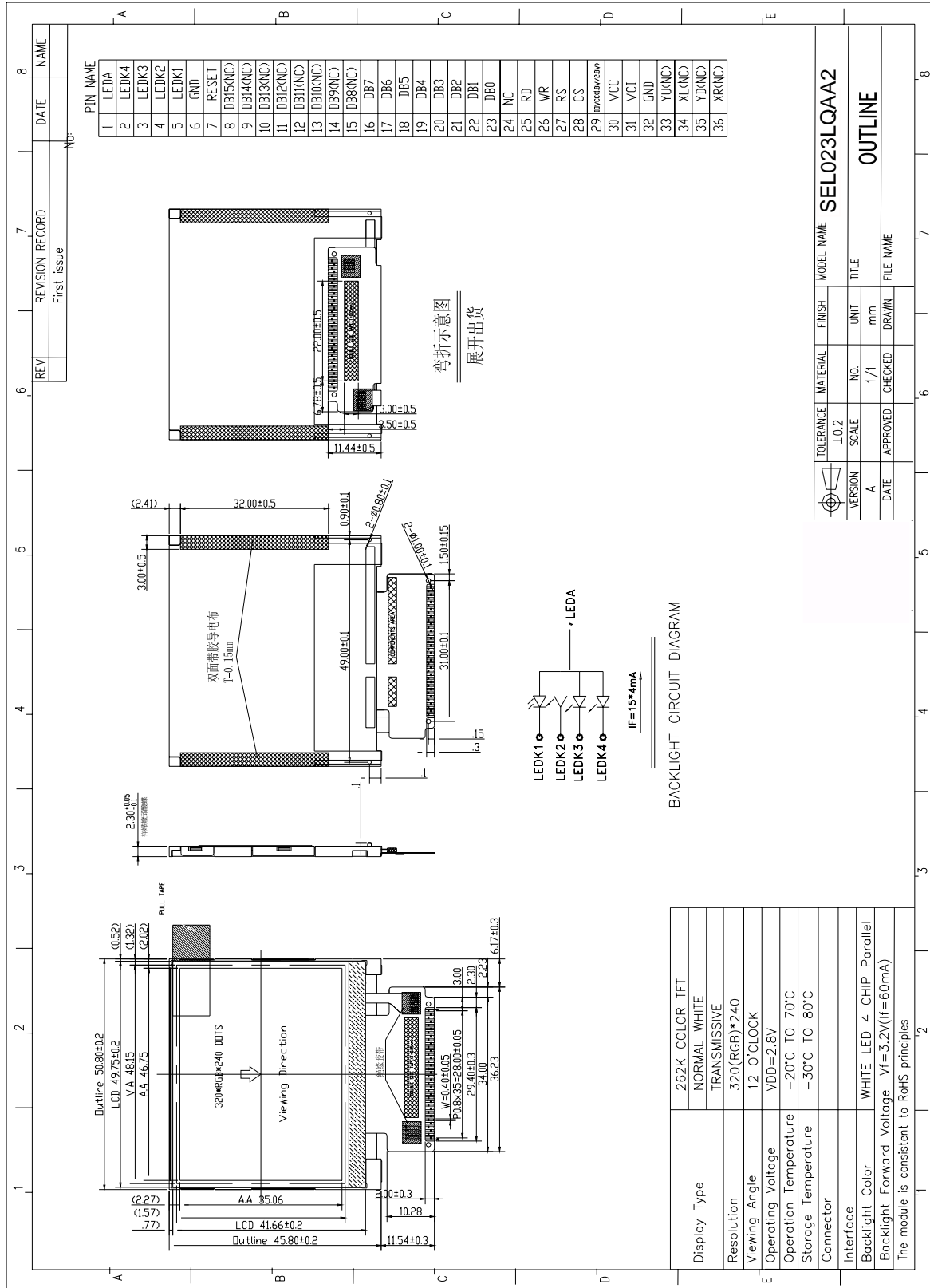
1.1 DESCRIPTION

The specifications is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver ICs and a backlight unit. The following table described the features of SEL023LQAA2

1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	2.3"	inch
2	Number of Pixels	240 x RGB x 320	pixels
3	LCD Active Area	46.75(W) x 35.06(H)	mm
3	Pixel Pitch	0.146(W)x3RGB x 0.146 (H)	mm
4	Outline Dimension	50.80(W) x 45.80 (H) x2.3(D)	mm
5	Number of Colors	262K	-
6	Display Mode	TM, NW	-
7	Viewing Direction	12H	-
8	Display Format	RGB Strip type	-
9	Interface	8	-
10	Driver IC	ILI9342	-
11	Operation Temperature	-20~70	°C
12	Storage Temperature	-30~80	°C
13	Weight	TBD	g

3. MECHANICAL SPECIFICATION



4. Pin Description

Pin No.	Symbol	Description
1	LEDA	Power supply for LEDA
2-5	LEDK4-K1	Power supply for LEDK4-K1
6	GND	Ground
7	RESET	Chip reset signal
8-15	DB15-8 (NC)	Data bus 15-8(Dummy)
16-23	DB7-DB0	Data bus 7-0
24	NC	Dummy
25	RD	Read signal and read data out when it is low
26	WR	Write signal and write data when it is low
27	RS	Register select signal. 0:index register; 1: data register
28	CS	Chip select pin
29	IOVCC	Power supply for the I/O port circuit,1.8/2.8V
30	VCC	Power supply for analog logic circuit ,2.8V
31	VCI	
32	GND	Ground
33	YU(NC)	I/O port of touch panel(Dummy)
34	XL(NC)	
35	YD(NC)	
36		

5. Initial code

```

void INI_ILI9342(void)
{
//unsigned int m;
LCD_WRITE_COMMAND(0xB9);
LCD_WRITE_DATA(0xFF);
LCD_WRITE_DATA(0x93);
LCD_WRITE_DATA(0x42);

LCD_WRITE_COMMAND(0x21);

LCD_WRITE_COMMAND(0x36);
LCD_WRITE_DATA(0xc8);//08

LCD_WRITE_COMMAND(0x3A);
LCD_WRITE_DATA(0x05); //05==16bit;06=18bit

LCD_WRITE_COMMAND(0xC0);
LCD_WRITE_DATA(0x1d);
LCD_WRITE_DATA(0x0A);

LCD_WRITE_COMMAND(0xC1);
LCD_WRITE_DATA(0x02);

LCD_WRITE_COMMAND(0xC5);
LCD_WRITE_DATA(0x2f); //2f
LCD_WRITE_DATA(0x27);

LCD_WRITE_COMMAND(0xC7);
LCD_WRITE_DATA(0xa4);

LCD_WRITE_COMMAND(0xB8);
LCD_WRITE_DATA(0x0B);

LCD_WRITE_COMMAND(0xE0);
LCD_WRITE_DATA(0x0F);

```

```
LCD_WRITE_DATA(0x24);  
LCD_WRITE_DATA(0x21);  
LCD_WRITE_DATA(0x0C);  
LCD_WRITE_DATA(0x0F);  
LCD_WRITE_DATA(0x06);  
LCD_WRITE_DATA(0x50);  
LCD_WRITE_DATA(0x75);  
LCD_WRITE_DATA(0x3f);  
LCD_WRITE_DATA(0x07);  
LCD_WRITE_DATA(0x12);  
LCD_WRITE_DATA(0x05);  
LCD_WRITE_DATA(0x11);  
LCD_WRITE_DATA(0x0b);  
LCD_WRITE_DATA(0x08);  
  
LCD_WRITE_COMMAND(0xE1);  
LCD_WRITE_DATA(0x08);  
LCD_WRITE_DATA(0x1d);  
LCD_WRITE_DATA(0x20);  
LCD_WRITE_DATA(0x02);  
LCD_WRITE_DATA(0x0E);  
LCD_WRITE_DATA(0x04);  
LCD_WRITE_DATA(0x31);  
LCD_WRITE_DATA(0x24);  
LCD_WRITE_DATA(0x42);  
LCD_WRITE_DATA(0x03);  
LCD_WRITE_DATA(0x0b);  
LCD_WRITE_DATA(0x09);  
LCD_WRITE_DATA(0x30);  
LCD_WRITE_DATA(0x36);  
LCD_WRITE_DATA(0x0F);
```

```
LCD_WRITE_COMMAND(0x11);//2 times  
Delay(40);  
LCD_WRITE_COMMAND(0x11);//2 times  
Delay(80);  
LCD_WRITE_COMMAND(0x2A);
```



```

LCD_WRITE_DATA(0x00);
LCD_WRITE_DATA(0x00);
LCD_WRITE_DATA(0x01);
LCD_WRITE_DATA(0x3F);
LCD_WRITE_COMMAND(0x2B);
LCD_WRITE_DATA(0x00);
LCD_WRITE_DATA(0x00);
LCD_WRITE_DATA(0x00);
LCD_WRITE_DATA(0xef);
Delay(120);

LCD_WRITE_COMMAND(0xf2);
LCD_WRITE_DATA(0x00);

LCD_WRITE_COMMAND(0x29);

LCD_WRITE_COMMAND(0x2c);
}
void Enter_Standby_ILI9342(void)
{
  LCD_WRITE_COMMAND(0x28); // Display off
  LCD_WRITE_COMMAND(0x10); // Enter Standby mode
}
void Exit_Standby_ILI9342(void)
{
  LCD_WRITE_COMMAND(0x11); // Standby out

  LCD_WRITE_COMMAND(0x11); //Exit Sleep

  LCD_WRITE_COMMAND(0x29); // Display on

```

6. ELECTRICAL CHARACTERISTICS

6.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Supply Voltage for Source Driver	VCC	-0.3	3.3	V	
	VDDIO	-0.3	4.0	V	

Note:

1. IOVCC,VCC, GND must be maintained.
2. The modules may be destroyed if they are used beyond the absolute maximum ratings.

6.2 DC ELECTRICAL CHARACTERISTICS

6.2.1 OPERATING CONDITIONS

Item	Operating temperature (Topr)		Storage temperature (TSgt) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature	-20°C	+70°C	-30 C	+80°C	Dry
Humidity (Note 1)	80% max. RH for Ta °C < 50% RH for 40° Maximum operating temperature				No condensation

Note 1: Product cannot sustain at extreme storage conditions for long time.

6.2.2 Electrical Specifications

Typical Electrical Characteristics

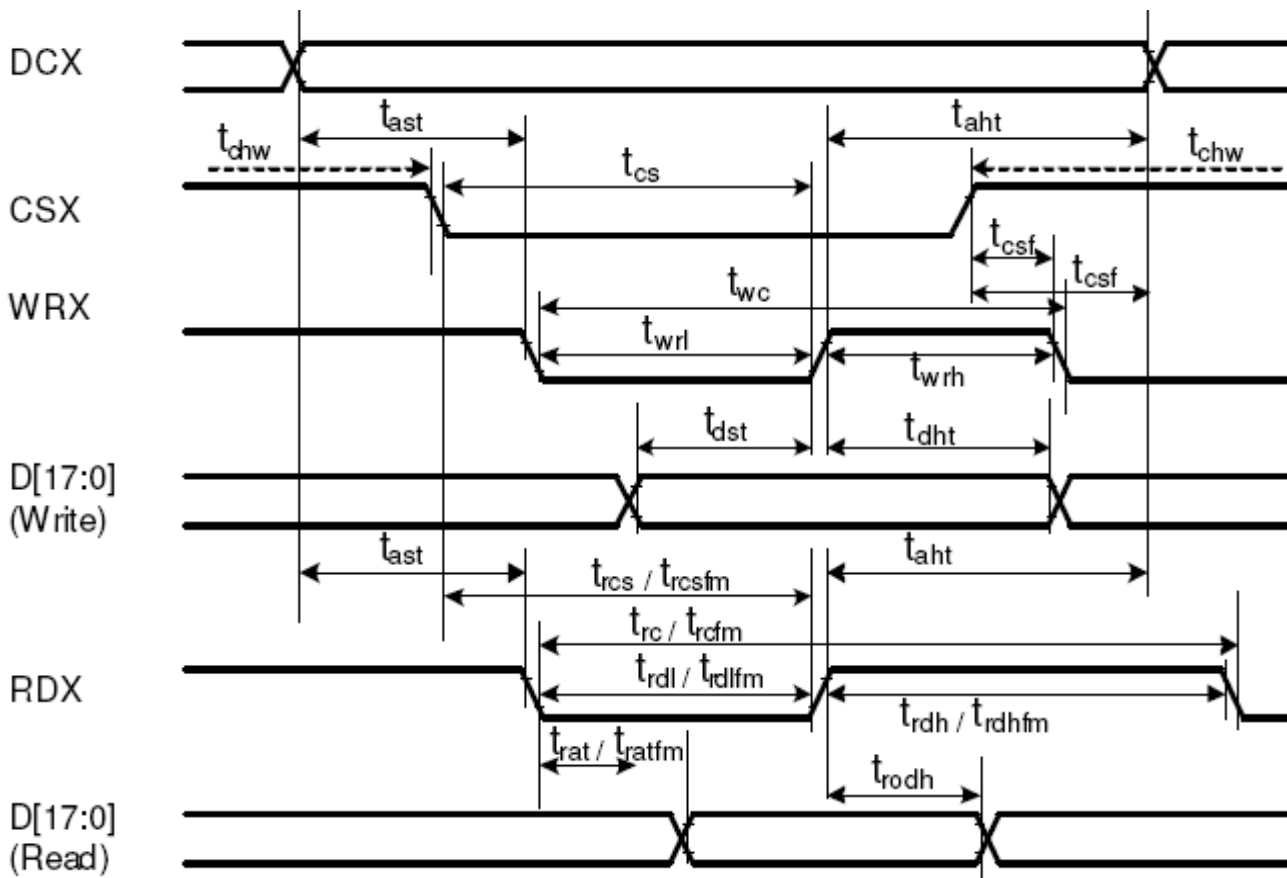
At Ta = 25 °C, VCC= 2.6V to 3.3V, IOVCC=1.65V to 3.3V, GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (analog)	VCC-GND		2.3	2.8	3.3	V
Supply voltage (logic)	IOVCC-GND		1.65	1.8/2.8	3.3	V
Supply current (Logic & LCD)	ICC	VCC=2.8V	-	-	10	mA
Supply voltage of white LED	VLED =V(BL+)- V(BL-)	Forward current =60 mA Number of LED dies = 4	-	3.2	3.4	V
Luminance (on the module surface)			-	180	-	cd/m ²

6.3 TIMING CHARACTERISTICS

6.3.1. 80-system Bus Interface Timing Characteristics of IC

Signal	Symbol	Parameter	min	max	Unit	Description
DCX	t_{ast}	Address setup time	0	-	ns	
	t_{hat}	Address hold time (Write/Read)	10	-	ns	
CSX	t_{chw}	CSX "H" pulse width	0	-	ns	
	t_{cs}	Chip Select setup time (Write)	15	-	ns	
	t_{rcs}	Chip Select setup time (Read ID)	45	-	ns	
	t_{rcsfm}	Chip Select setup time (Read FM)	355	-	ns	
	t_{csf}	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	t_{wc}	Write cycle	66	740	ns	
	t_{wrh}	Write Control pulse H duration	15	-	ns	
	t_{wrl}	Write Control pulse L duration	15	-	ns	
RDX (ID)	t_{rc}	Read cycle (ID)	160	-	ns	When read ID data
	t_{rdh}	Read Control pulse H duration	90	-	ns	
	t_{rdl}	Read Control pulse L duration	45	-	ns	
RDX (FM)	t_{rcfm}	Read Cycle (FM)	450	-	ns	When read from the frame memory
	t_{rdhfm}	Read Control H duration (FM)	90	-	ns	
	t_{rdlfm}	Read Control L duration (FM)	355	-	ns	
DB[17:0], DB[15:0], DB[8:0], DB[7:0]	t_{dst}	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	t_{dht}	Write data hold time	10	-	ns	
	t_{rat}	Read access time	-	40	ns	
	t_{ratfm}	Read access time	-	340	ns	
	t_{rod}	Read output disable time	20	80	ns	



6.3.2 Reset Operation of IC

Table 9: Reset Timing Characteristics (VCC= 2.6V to 3.3V. IOVCC=1.65V to 3.3V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	tRES	ms	1	-	-
Reset rise time	trRES	μ s	-	-	10

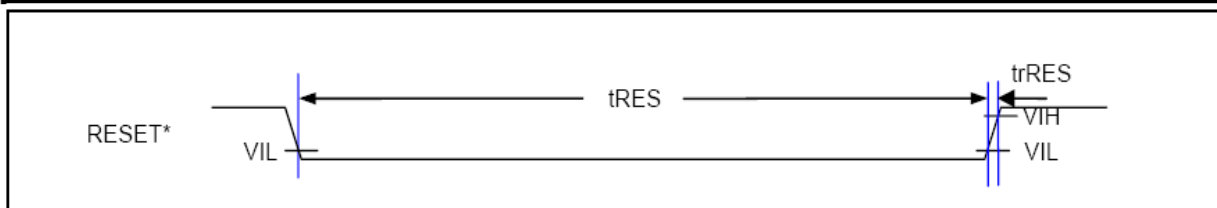


Figure 8: Reset Timing

7. OPTICAL CHARACTERISTICS

7.1 SPECIFICATION

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note.1.

Items	Symbol	Condition	Specifications			Unit
			Min.	Typ.	Max.	
Contrast Ratio	CR		400	500	-	-
Response Time	T _R		-	4	8	ms
	T _F		-	12	20	ms
Chromaticity	Red	X _R	0.589	0.609	0.629	-
		Y _R	0.310	0.330	0.350	-
	Green	X _G	0.267	0.287	0.307	-
		Y _G	0.507	0.527	0.547	-
	Blue	X _B	0.127	0.147	0.167	-
		Y _B	0.118	0.138	0.158	-
	White	X _w	0.283	0.303	0.323	-
		Y _w	0.304	0.324	0.344	-
Viewing angle	Hor.	φ1(3 o'clock)			-	deg.
		φ2(9 o'clock)		60	-	
	Ver.	θ2(12 o'clock)		60	-	
		θ1(6 o'clock)		50	-	
NTSC ratio				61.5		%

Note

Note 1: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

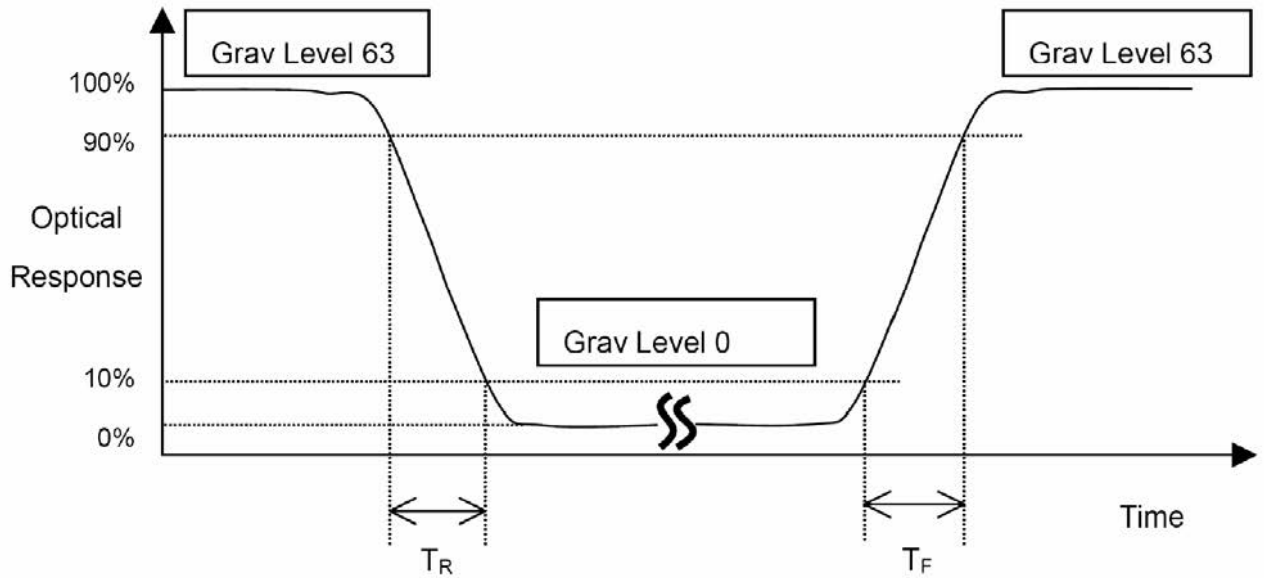
L₆₃: Luminance of gray level 63

L₀: Luminance of gray level 0A

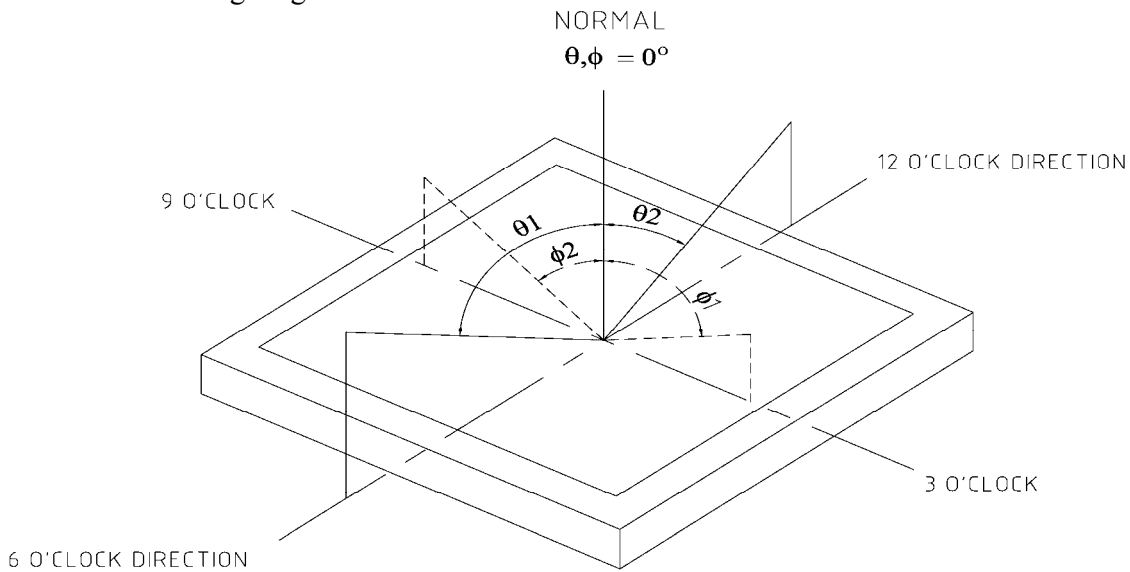
$$\text{CR} = \text{CR} (10)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5.

Note 2: Definition of Response Time (TR, TF):



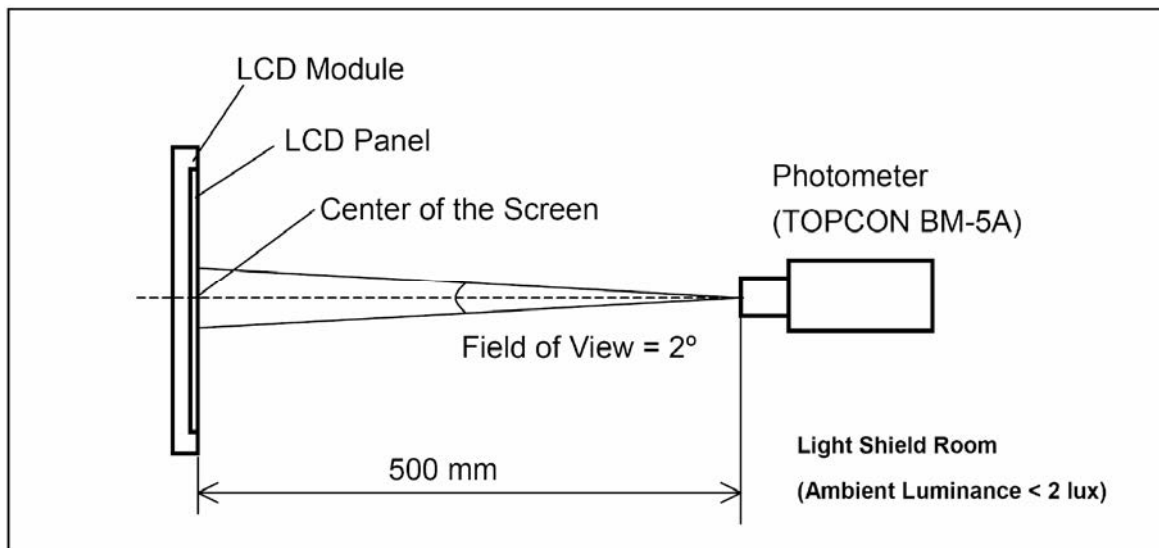
Note 3: Viewing Angle



The above “Viewing Angle” is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the “Viewing Angle” by applying Wide View Film.

Note 4: Measurement Set-Up:

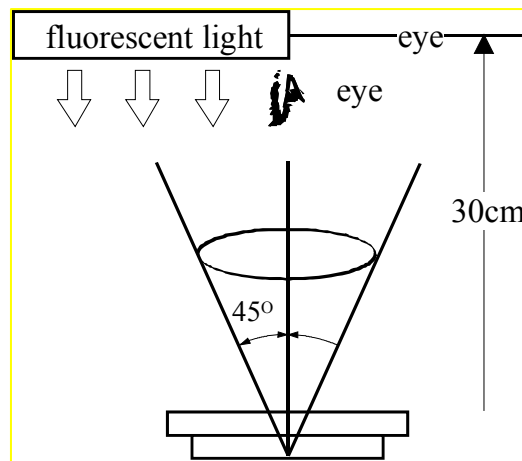
The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



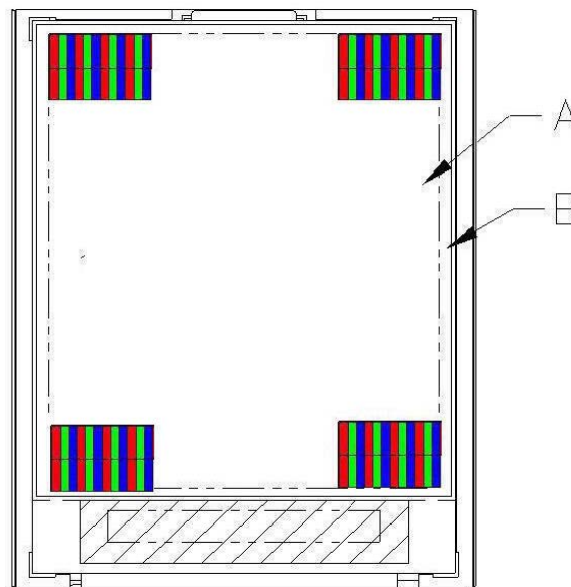
8. QUALITY SPECIFICATIONS

8.1 INSPECTION CONDITION

- (1) Inspect under 300~500Lux fluorescent light, leaving 30~35cm between panels and eyes, and between panels and lights.
- (2) Inspection condition is $23 \pm 5^{\circ}\text{C}$, $50 \pm 20\% \text{RH}$ maximum.



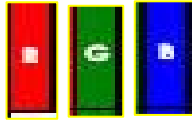

8.2 DEFINITION OF AREA

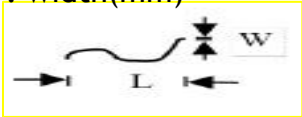
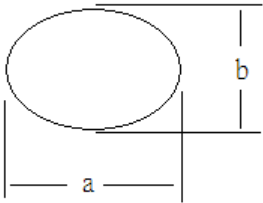


A Area : Viewing area.

B Area : Out of viewing.(outside viewing area)

8.3 INSPECTION SPECIFICATION

NO	Item	Acceptable specification	Judgment Criterion
1	Electrical Testing	<p>1-1 sub pixel classification</p> <ul style="list-style-type: none"> Sub Pixel: Number of sub pixel doesn't exceed one dot. <div style="display: flex; align-items: center; margin: 10px 0;">  <div style="margin-left: 10px;">Sub Pixel (Dot)</div> </div> <p>a> Dark dot ----one Allowed b> Bright dot ---- one Allowed</p> <ul style="list-style-type: none"> Pixel : Three dots link together doesn't exceed ones <div style="display: flex; align-items: center; margin: 10px 0;">  <div style="margin-left: 10px;">Pixel</div> </div> <p>1-2 Leakage to light</p> <ul style="list-style-type: none"> Leakage to light be not allowed. <p>1-3 Picture to shake</p> <ul style="list-style-type: none"> Picture had shake, twinkle and noise etc. instable of defect that be not allowed. <p>1-4 Function</p> <p>No display or No function. Source Line, Gate Line. Contrast Ratio Current consumption exceeds product specifications. Display malfunction.</p>	<p>$N \leq 1$</p> <p>$N \leq 0$</p> <p>$N=0$</p> <p>$N=0$</p> <p>$N=0$</p>
	Mechanical Dimension	<p>2-1 Mechanical Dimension exceeds product specifications.</p> <p>2-2 Out of frame and boss of plastic changed shape that be not allowed</p>	<p>$N=0$</p>

NO	Item	Acceptable specification	Judgment Criterion																																												
3	Cosmetic Inspection	<p>3-1 Blemish: Line shapes of defect</p> <table border="1" data-bbox="363 461 1315 815"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable number</th> <th>Mini. space</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td>Ignore</td> <td rowspan="3"></td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.05 < W \leq 0.1$</td> <td>2</td> </tr> <tr> <td>--</td> <td>$W > 0.1$</td> <td>Not allowed</td> <td></td> </tr> </tbody> </table> <p>L: length(mm) W: width(mm)</p>  <p>3-2 Blemish: dot shapes of defect</p> <table border="1" data-bbox="435 1095 1283 1330"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. Space</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td>Ignore</td> <td>---</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.15$</td> <td>2</td> <td rowspan="2">5 m m</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.25$</td> <td>1</td> </tr> <tr> <td>$\Phi > 0.25$</td> <td>0</td> <td>---</td> </tr> </tbody> </table> <p>3-3 Polarizer Bubble</p> <table border="1" data-bbox="435 1413 1283 1581"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. Space</th> </tr> </thead> <tbody> <tr> <td>≤ 0.20</td> <td>Ignore</td> <td>---</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td>2</td> <td>15 m m</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td>0</td> <td>---</td> </tr> </tbody> </table> <p>Foreign Substances</p>  <p style="text-align: right;">$\Phi = (a+b)/2$</p>	Length	Width	Acceptable number	Mini. space	---	$W \leq 0.03$	Ignore		$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.1$	2	--	$W > 0.1$	Not allowed		Dimension	Acceptable number	Mini. Space	$\Phi \leq 0.10$	Ignore	---	$0.10 < \Phi \leq 0.15$	2	5 m m	$0.15 < \Phi \leq 0.25$	1	$\Phi > 0.25$	0	---	Dimension	Acceptable number	Mini. Space	≤ 0.20	Ignore	---	$0.20 < \Phi \leq 0.30$	2	15 m m	$\Phi > 0.30$	0	---	
		Length	Width	Acceptable number	Mini. space																																										
		---	$W \leq 0.03$	Ignore																																											
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NO	Item	Acceptable specification	Judgment Criterion			
3	Cosmetic Inspection	3-4 Scratch <ul style="list-style-type: none"> ● Sensate scratch not allowed. ● Impassive scratch as below. <p style="text-align: right; color: green;">Unit:mm</p>				
		Length		Width	Acceptable number	Mini.
		-----		$W \leq 0.03$	Ignore	5 m m
		$L \leq 2.5$		$0.03 < W \leq 0.05$	3	
		$L \leq 2.5$		$0.05 < W \leq 0.1$	2	---
		----		$0.1 < W$	Not allowed	
		$L > 2.5$		----	Not allowed	
4	Package	4-1 Mixed product types 4-2 Shipping q'ty should be the same as "shipping notice form" q'ty. 4-3 Outer box can't broken.	N=0			

9. RELIABILITY

Test Item	Sample Type	Test Condition	Test result determinant gist	
High temperature storage	Normal temperature	70±3℃;96H	the inspection of appearance and function	
	Wide temperature	80±3℃;96H		
Low temperature storage	Normal temperature	-20±3℃;120H		
	Wide temperature	-30±3℃;120H		
High temperature /humidity storage	Normal temperature	50℃±3℃,90%±3%RH;96H		
	Wide temperature	60℃±3℃,90%±3%RH;96H		
High temperature operation	Normal temperature	60±3℃;96H	no objection of the function character; no fatal objection of	
	Wide temperature	70±3℃;96H		
Low temperature operation	Normal temperature	0±3℃;96H		
	Wide temperature	-20±3℃;96H		
High temperature /humidity operation	Normal temperature	40℃±3℃,90%±3%RH;96H		
	Wide temperature	50℃±3℃,90%±3%RH;96H		
Temperature Shock	Normal temperature	- 20±3℃,30min ,30mi		inspect the objections appearance、 function & the whole structure
	Wide temperature	-30±3 80±3,30min;10cycle		The inspection of appearance、 function & the whole structure

10. HANDLING PRECAUTION

10.1 SAFETY

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

10.2 STORAGE CONDITIONS

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\% \text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.

10.3 HANDLING PRECAUTIONS

- (1) Avoid static electricity which can damage the CMOS LSI.
- (2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonic solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.

10.4 W

The period is within twelve months since the date of shipping out under normal using and storage conditions.