Part No. 產品型號	FS-TF2408AC3
Product type 產品內容	Mode: Transmissive Type, Negative mode 2.4" TFT LCD module 262K color
RoHS 綠色產品	■ Non-compliance □ Compliance
Remarks 備註欄	

Signature by Customer:
客戶確認簽章:

PREPARED BY: xu dong liu	CHECKED BY: dai	APPROVED BY: Colin

DOCUMENT REVISION HISTORY 1:

NO	Revision No	Revision Date	DESCRIPTION	CHANGED BY	CHECKED BY
1	Ver A	2009.02.20	First Release.	dai	Colin
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

1. General Description

The is a 240(R.G.B) x320 dot matrix TFT LCD module. It has a TFT panel composed of 240(R.G.B) segments and320 commons. The LCM can be easily accessed by micro-processor-unit (MPU) via parallel interface.

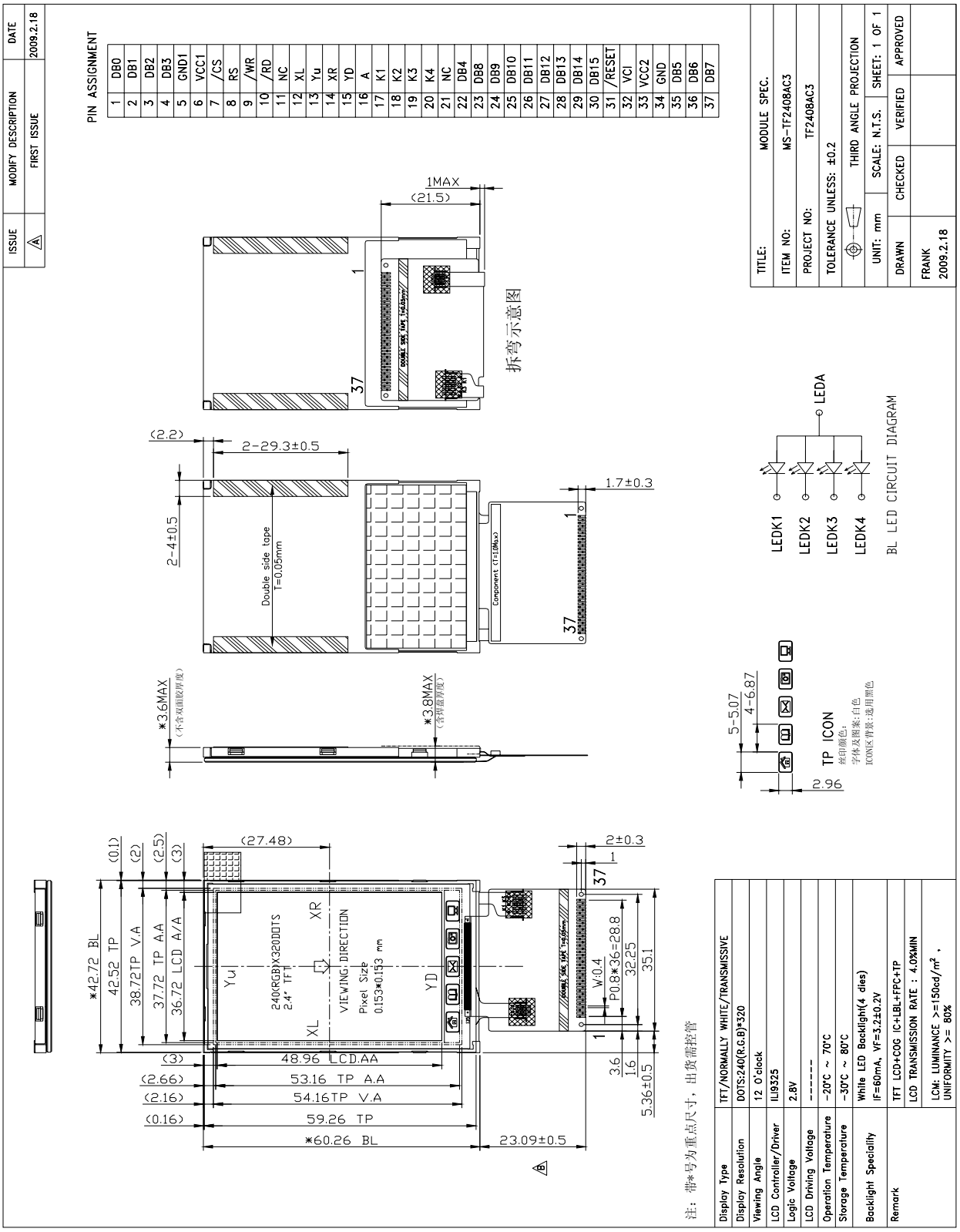
2. FEATURES

Display Mode	2.4" TFT LCD module
	TFT LCD, Transmissive Type, negative mode
Display Format	Display Format RGB Stripe Graphic
Input Data	8080 16 bits Parallel
Multiplexing Ratio	1/320 Duty
Bias	
Viewing Direction	12" clock
Backlight	LED B/L White×4
Driver IC	ILI9325

3. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Parameter	Specifications	Unit
Outline dimensions	42.72W) x 60.26(H) x 3.6(D) (LCM, include TP)	mm
Active area	36.72(W) x48.96(H)	mm
Resolution	240(H)RCBx 320(V) dots	-
Dot size	0.153(W) x 0.153(H)	mm
Overall Weight		grams



1 Figure 1(a): Module specification of the module

4. ELECTRICAL CHARACTERISTICS

4.1 LCM Characteristics

Item	Symbo	Value			Unit	Notes
		Min	Typ	Max		
Supply Voltage for logic	VDD	2.8	3.0	3.3	V	
TFT Gate ON Voltage	VGH *	12	14	16	V	
TFT Gate OFF Voltage	VGL	-10	-8	-6	V	
Current consumption during sleep mode	VDD				MA	
LCM Drive Power Supply Current	VDD				MA	
Operating temperature	Top	-20		+70	℃	
Storage temperature	Tst	-30		+80	℃	

4.2 Backlight Characteristics

Item	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test condition**
Forward Voltage	**VF**	**--**	**3.2**	**--**	**V**	**VF=3.2V**
Forward current	**IF**	**--**	**60**	**--**	**mA**	
Chroma	**X**	**0.260**	**--**	**0.300**		
	Y	**0.260**	**--**	**0.300**		
Brightness	**L**	**3800**		**---**	**Cd/m2**	
Uniformity	**U_{BL}**	**80**			**%**	**IF=60 mA**

5. MODULE FUNCTION DESCRIPTION

5.1 Pin Description

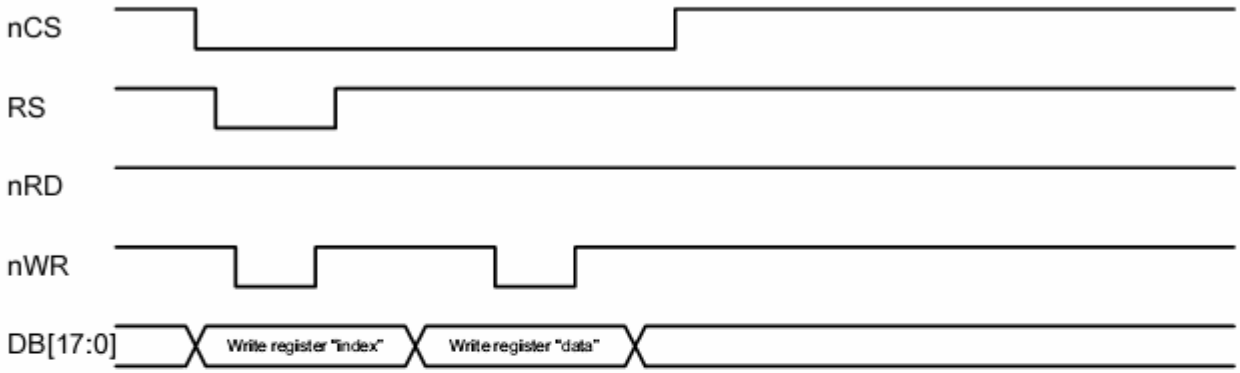
1	DB0	DATA BUS
2	DB1	
3	DB2	
4	DB3	
5	GND1	Ground
6	VCC1	Power supply input for LCM
7	CS	Chip select input pin
8	RS	Data/Instruction select input pin---CD='H ': Display data. ---CD='L ': Instruction data.
9	WR	A write strobe signal can be input via this pin and initiallizes a write operation when the signal is low.
10	RD	A read strobe signal can be input via this pin and initiallizes a read operation when the signal is low.
11	NC	Unused
12	XL	Touch panel input pin （LEFT）
13	YU	Touch panel input pin （UP）
14	XR	Touch panel input pin （RIGHT）
15	YD	Touch panel input pin （DOWN）
16	A	Power supply for LED Anode
17	K1	Power supply for LED cathode
18	K2	Power supply for LED cathode
19	K3	Power supply for LED cathode
20	K4	Power supply for LED cathode
21	NC	Unused
22	DB4	DATA BUS
23	DB8	
24	DB9	
25	DB10	
26	DB11	
27	DB12	
28	DB13	
29	DB14	
30	DB15	
31	RESET	Reset input pin
32	VCI	Power supply input for LCM

33	VCC2	Power supply input for LCM
34	GND	Ground
35	DB5	DATA BUS
36	DB6	
37	DB7	

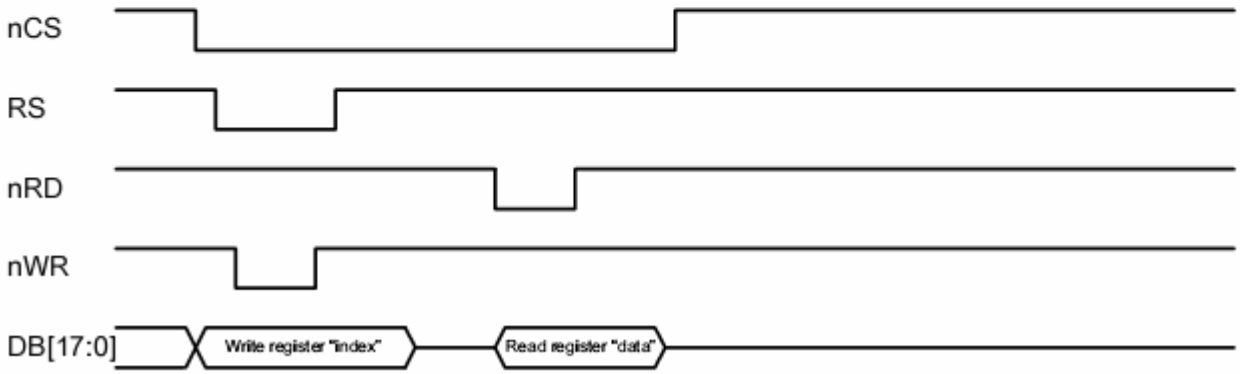
5.2 Interface signals

i80 18-/16-bit System Bus Interface Timing

(a) Write to register



(b) Read from register



5.3 COMMAND SUMMARY

No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
IR	Index Register	W	0	-	-	-	-	-	-	-	-	ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0
SR	Status Read	R	0	L7	L6	L5	L4	L3	L2	L1	L0	0	0	0	0	0	0	0	0
00h	Driver Code Read	R	1	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	1
01h	Driver Output Control 1	W	1	0	0	0	0	0	SM	0	SS	0	0	0	0	0	0	0	0
02h	LCD Driving Control	W	1	0	0	0	0	0	0	BC0	EOR	0	0	0	0	0	0	0	0
03h	Entry Mode	W	1	TRI	DFM	0	BGR	0	0	HWM	0	ORG	0	I/D1	I/D0	AM	0	0	0
04h	Resize Control	W	1	0	0	0	0	0	0	RCV1	RCV0	0	0	RCH1	RCH0	0	0	RSZ1	RSZ0
07h	Display Control 1	W	1	0	0	PTDE1	PTDE0	0	0	0	BASEE	0	0	GON	DTE	CL	0	D1	D0
08h	Display Control 2	W	1	0	0	0	0	FP3	FP2	FP1	FP0	0	0	0	0	BP3	BP2	BP1	BP0
09h	Display Control 3	W	1	0	0	0	0	0	PTS2	PTS1	PTS0	0	0	PTG1	PTG0	ISC3	ISC2	ISC1	ISC0
0Ah	Display Control 4	W	1	0	0	0	0	0	0	0	0	0	0	0	0	FMARKOE	FMI2	FMI1	FMI0
0Ch	RGB Display Interface Control 1	W	1	0	ENC2	ENC1	ENC0	0	0	0	RM	0	0	DM1	DM0	0	0	RIM1	RIM0
0Dh	Frame Maker Position	W	1	0	0	0	0	0	0	0	FMP8	FMP7	FMP6	FMP5	FMP4	FMP3	FMP2	FMP1	FMP0
0Fh	RGB Display Interface Control 2	W	1	0	0	0	0	0	0	0	0	0	0	0	VSPL	HSPL	0	DPL	EPL
10h	Power Control 1	W	1	0	0	0	SAP	0	BT2	BT1	BT0	APE	AP2	AP1	AP0	0	DSTB	SLP	STB
11h	Power Control 2	W	1	0	0	0	0	0	DC12	DC11	DC10	0	DC02	DC01	DC00	0	VC2	VC1	VC0
12h	Power Control 3	W	1	0	0	0	0	0	0	0	0	VCIRE	0	0	PON	VRH3	VRH2	VRH1	VRH0
13h	Power Control 4	W	1	0	0	0	VDV4	VDV3	VDV2	VDV1	VDV0	0	0	0	0	0	0	0	0
20h	Horizontal GRAM Address Set	W	1	0	0	0	0	0	0	0	0	AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
21h	Vertical GRAM Address Set	W	1	0	0	0	0	0	0	0	AD16	AD15	AD14	AD13	AD12	AD11	AD10	AD9	AD8
22h	Write Data to GRAM	W	1	RAM write data (WD17-0) / read data (RD17-0) bits are transferred via different data bus lines according to the selected interfaces.															
29h	Power Control 7	W	1	0	0	0	0	0	0	0	0	0	0	VCM5	VCM4	VCM3	VCM2	VCM1	VCM0
2Bh	Frame Rate and Color Control	W	1	0	0	0	0	0	0	0	0	0	0	0	0	FRS[3]	FRS[2]	FRS[1]	FRS[0]
30h	Gamma Control 1	W	1	0	0	0	0	0	KP1[2]	KP1[1]	KP1[0]	0	0	0	0	0	KP0[2]	KP0[1]	KP0[0]
31h	Gamma Control 2	W	1	0	0	0	0	0	KP3[2]	KP3[1]	KP3[0]	0	0	0	0	0	KP2[2]	KP2[1]	KP2[0]
32h	Gamma Control 3	W	1	0	0	0	0	0	KP5[2]	KP5[1]	KP5[0]	0	0	0	0	0	KP4[2]	KP4[1]	KP4[0]
35h	Gamma Control 4	W	1	0	0	0	0	0	RP1[2]	RP1[1]	RP1[0]	0	0	0	0	0	RP0[2]	RP0[1]	RP0[0]
36h	Gamma Control 5	W	1	0	0	0	VRP1[4]	VRP1[3]	VRP1[2]	VRP1[1]	VRP1[0]	0	0	0	0	VRP0[3]	VRP0[2]	VRP0[1]	VRP0[0]
37h	Gamma Control 6	W	1	0	0	0	0	0	KN1[2]	KN1[1]	KN1[0]	0	0	0	0	0	KN0[2]	KN0[1]	KN0[0]
38h	Gamma Control 7	W	1	0	0	0	0	0	KN3[2]	KN3[1]	KN3[0]	0	0	0	0	0	KN2[2]	KN2[1]	KN2[0]
39h	Gamma Control 8	W	1	0	0	0	0	0	KN5[2]	KN5[1]	KN5[0]	0	0	0	0	0	KN4[2]	KN4[1]	KN4[0]
3Ch	Gamma Control 9	W	1	0	0	0	0	0	RN1[2]	RN1[1]	RN1[0]	0	0	0	0	0	RN0[2]	RN0[1]	RN0[0]
3Dh	Gamma Control 10	W	1	0	0	0	VRN1[4]	VRN1[3]	VRN1[2]	VRN1[1]	VRN1[0]	0	0	0	0	VRN0[3]	VRN0[2]	VRN0[1]	VRN0[0]

No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
50h	Horizontal Address Start Position	W	1	0	0	0	0	0	0	0	0	HSA7	HSA6	HSA5	HSA4	HSA3	HSA2	HSA1	HSA0
51h	Horizontal Address End Position	W	1	0	0	0	0	0	0	0	0	HEA7	HEA6	HEA5	HEA4	HEA3	HEA2	HEA1	HEA0
52h	Vertical Address Start Position	W	1	0	0	0	0	0	0	0	VSA8	VSA7	VSA6	VSA5	VSA4	VSA3	VSA2	VSA1	VSA0
53h	Vertical Address End Position	W	1	0	0	0	0	0	0	0	VEA8	VEA7	VEA6	VEA5	VEA4	VEA3	VEA2	VEA1	VEA0
60h	Driver Output Control 2	W	1	GS	0	NL5	NL4	NL3	NL2	NL1	NL0	0	0	SCN5	SCN4	SCN3	SCN2	SCN1	SCN0
61h	Base Image Display Control	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	NDL	VLE	REV
6Ah	Vertical Scroll Control	W	1	0	0	0	0	0	0	0	VL8	VL7	VL6	VL5	VL4	VL3	VL2	VL1	VL0
80h	Partial Image 1 Display Position	W	1	0	0	0	0	0	0	0	PTDP08	PTDP07	PTDP06	PTDP05	PTDP04	PTDP03	PTDP02	PTDP01	PTDP00
81h	Partial Image 1 Area (Start Line)	W	1	0	0	0	0	0	0	0	PTSA08	PTSA07	PTSA06	PTSA05	PTSA04	PTSA03	PTSA02	PTSA01	PTSA00
82h	Partial Image 1 Area (End Line)	W	1	0	0	0	0	0	0	0	PTEA08	PTEA07	PTEA06	PTEA05	PTEA04	PTEA03	PTEA02	PTEA01	PTEA00
83h	Partial Image 2 Display Position	W	1	0	0	0	0	0	0	0	PTDP18	PTDP17	PTDP16	PTDP15	PTDP14	PTDP13	PTDP12	PTDP11	PTDP10
84h	Partial Image 2 Area (Start Line)	W	1	0	0	0	0	0	0	0	PTSA18	PTSA17	PTSA16	PTSA15	PTSA14	PTSA13	PTSA12	PTSA11	PTSA10
85h	Partial Image 2 Area (End Line)	W	1	0	0	0	0	0	0	0	PTEA18	PTEA17	PTEA16	PTEA15	PTEA14	PTEA13	PTEA12	PTEA11	PTEA10
90h	Panel Interface Control 1	W	1	0	0	0	0	0	0	DIVI1	DIVI00	0	0	0	0	RTNI3	RTNI2	RTNI1	RTNI0
92h	Panel Interface Control 2	W	1	0	0	0	0	0	NOWI2	NOWI1	NOWI0	0	0	0	0	0	0	0	0
95h	Panel Interface Control 4	W	1	0	0	0	0	0	0	DIVE1	DIVE0	0	0	RTNE5	RTNE4	RTNE3	RTNE2	RTNE1	RTNE0
A1h	OTP VCM Programming Control	W	1	0	0	0	0	OTP_PGM_EN	0	0	0	0	0	VCM_OTP5	VCM_OTP4	VCM_OTP3	VCM_OTP2	VCM_OTP1	VCM_OTP0
A2h	OTP VCM Status and Enable	W	1	PGM_CNT1	PGM_CNT0	VCM_D5	VCM_D4	VCM_D3	VCM_D2	VCM_D1	VCM_D0	0	0	0	0	0	0	0	VCM_EN
A5h	OTP Programming ID Key	W	1	KEY 15	KEY 14	KEY 13	KEY 12	KEY 11	KEY 10	KEY 9	KEY 8	KEY 7	KEY 6	KEY 5	KEY 4	KEY 3	KEY 2	KEY 1	KEY 0

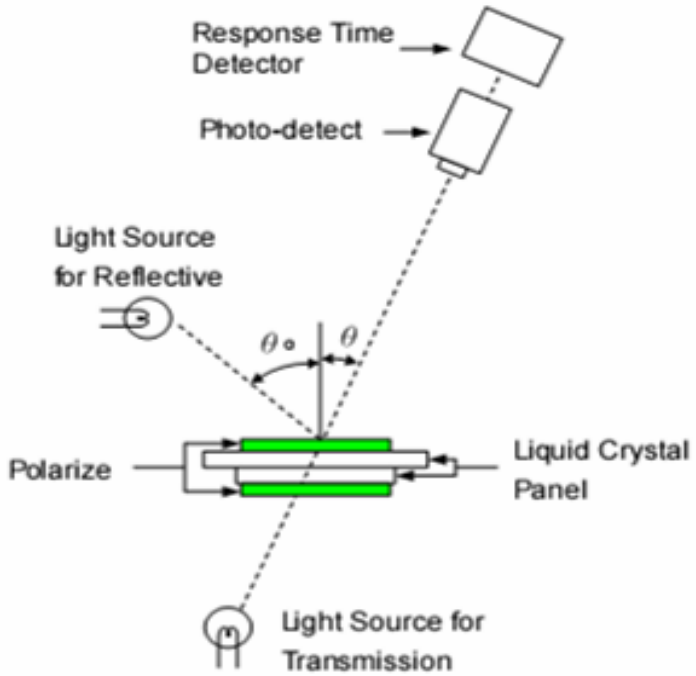
5.4 Reference initial code

```
void ILI9325 (void)
{
// VCI=2.8V
//************ Reset LCD Driver ****************//
LCD_nRESET = 1;
delayms(1); // Delay 1ms
LCD_nRESET = 0;
delayms(10); // Delay 10ms // This delay time is necessary
LCD_nRESET = 1;
delayms(50); // Delay 50 ms
//************ Start Initial Sequence **********//
LCD_CtrlWrite_ILI9325(0x00E3, 0x3008); // Set internal timing
LCD_CtrlWrite_ILI9325(0x00E7, 0x0012); // Set internal timing
LCD_CtrlWrite_ILI9325(0x00EF, 0x1231); // Set internal timing
LCD_CtrlWrite_ILI9325(0x0001, 0x0100); // set SS and SM bit
LCD_CtrlWrite_ILI9325(0x0002, 0x0700); // set 1 line inversion
LCD_CtrlWrite_ILI9325(0x0003, 0x1030); // set GRAM write direction and BGR=1.
LCD_CtrlWrite_ILI9325(0x0004, 0x0000); // Resize register
LCD_CtrlWrite_ILI9325(0x0008, 0x0207); // set the back porch and front porch
LCD_CtrlWrite_ILI9325(0x0009, 0x0000); // set non-display area refresh cycle ISC[3:0]
LCD_CtrlWrite_ILI9325(0x000A, 0x0000); // FMARK function
LCD_CtrlWrite_ILI9325(0x000C, 0x0000); // RGB interface setting
LCD_CtrlWrite_ILI9325(0x000D, 0x0000); // Frame marker Position
LCD_CtrlWrite_ILI9325(0x000F, 0x0000); // RGB interface polarity
//************Power On sequence ****************//
LCD_CtrlWrite_ILI9325(0x0010, 0x0000); // SAP, BT[3:0], AP, DSTB, SLP, STB
LCD_CtrlWrite_ILI9325(0x0011, 0x0007); // DC1[2:0], DC0[2:0], VC[2:0]
LCD_CtrlWrite_ILI9325(0x0012, 0x0000); // VREG1OUT voltage
LCD_CtrlWrite_ILI9325(0x0013, 0x0000); // VDV[4:0] for VCOM amplitude
delayms(200); // Dis-charge capacitor power voltage
LCD_CtrlWrite_ILI9325(0x0010, 0x1490); // SAP, BT[3:0], AP, DSTB, SLP, STB
LCD_CtrlWrite_ILI9325(0x0011, 0x0227); // DC1[2:0], DC0[2:0], VC[2:0]
delayms(50); // Delay 50ms
LCD_CtrlWrite_ILI9325(0x0012, 0x001C); // Internal reference voltage= Vci;
delayms(50); // Delay 50ms
```

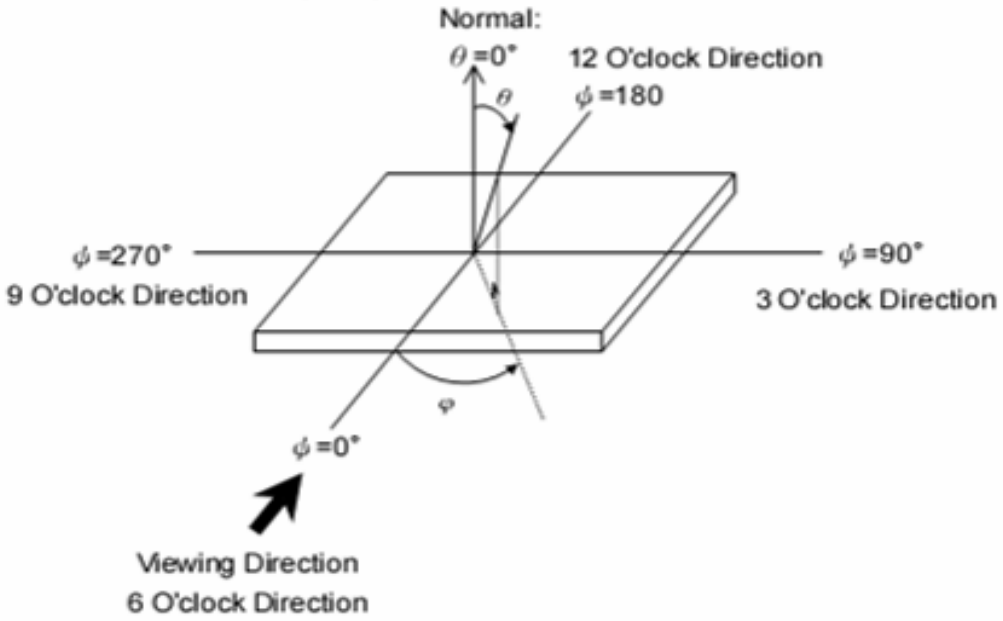
```
LCD_CtrlWrite_ILI9325(0x0013, 0x1A00); // Set VDV[4:0] for VCOM amplitude
LCD_CtrlWrite_ILI9325(0x0029, 0x0025); // Set VCM[5:0] for VCOMH
LCD_CtrlWrite_ILI9325(0x002B, 0x000C); // Set Frame Rate
delayms(50); // Delay 50ms
LCD_CtrlWrite_ILI9325(0x0020, 0x0000); // GRAM horizontal Address
LCD_CtrlWrite_ILI9325(0x0021, 0x0000); // GRAM Vertical Address
// ----------- Adjust the Gamma Curve ----------//
LCD_CtrlWrite_ILI9325(0x0030, 0x0000);
LCD_CtrlWrite_ILI9325(0x0031, 0x0506);
LCD_CtrlWrite_ILI9325(0x0032, 0x0104);
LCD_CtrlWrite_ILI9325(0x0035, 0x0207);
LCD_CtrlWrite_ILI9325(0x0036, 0x000F);
LCD_CtrlWrite_ILI9325(0x0037, 0x0306);
LCD_CtrlWrite_ILI9325(0x0038, 0x0102);
LCD_CtrlWrite_ILI9325(0x0039, 0x0707);
LCD_CtrlWrite_ILI9325(0x003C, 0x0702);
LCD_CtrlWrite_ILI9325(0x003D, 0x1604);
//------------------ Set GRAM area ---------------//
LCD_CtrlWrite_ILI9325(0x0050, 0x0000); // Horizontal GRAM Start Address
LCD_CtrlWrite_ILI9325(0x0051, 0x00EF); // Horizontal GRAM End Address
LCD_CtrlWrite_ILI9325(0x0052, 0x0000); // Vertical GRAM Start Address
LCD_CtrlWrite_ILI9325(0x0053, 0x013F); // Vertical GRAM Start Address
LCD_CtrlWrite_ILI9325(0x0060, 0xA700); // Gate Scan Line
LCD_CtrlWrite_ILI9325(0x0061, 0x0001); // NDL,VLE, REV
LCD_CtrlWrite_ILI9325(0x006A, 0x0000); // set scrolling line
//-------------- Partial Display Control ---------//
LCD_CtrlWrite_ILI9325(0x0080, 0x0000);
LCD_CtrlWrite_ILI9325(0x0081, 0x0000);
LCD_CtrlWrite_ILI9325(0x0082, 0x0000);
LCD_CtrlWrite_ILI9325(0x0083, 0x0000);
LCD_CtrlWrite_ILI9325(0x0084, 0x0000);
LCD_CtrlWrite_ILI9325(0x0085, 0x0000);
//-------------- Panel Control -------------------//
LCD_CtrlWrite_ILI9325(0x0090, 0x0010);
LCD_CtrlWrite_ILI9325(0x0092, 0x0600);
LCD_CtrlWrite_ILI9325(0x0007, 0x0133); // 262K color and display ON}
```

6. ELECTRO-OPTICAL CHARACTERISTICS

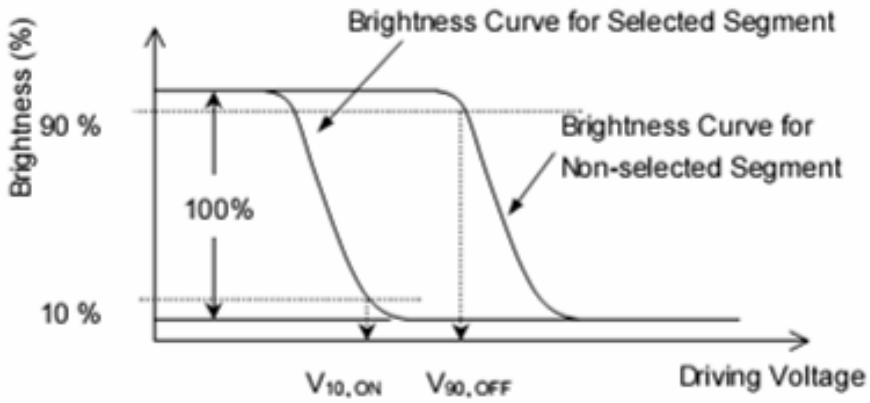
Note 1: Electro-Optical Characteristics Test Method.



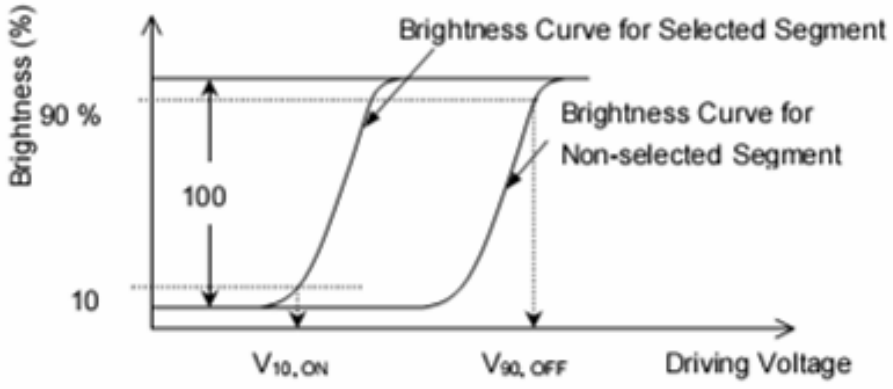
Note 2: Definition of Viewing Angel.



Note 3: Definition of Driving Voltage, $V_{LCD} = (V_{10,ON} + V_{90,OFF}) / 2$.

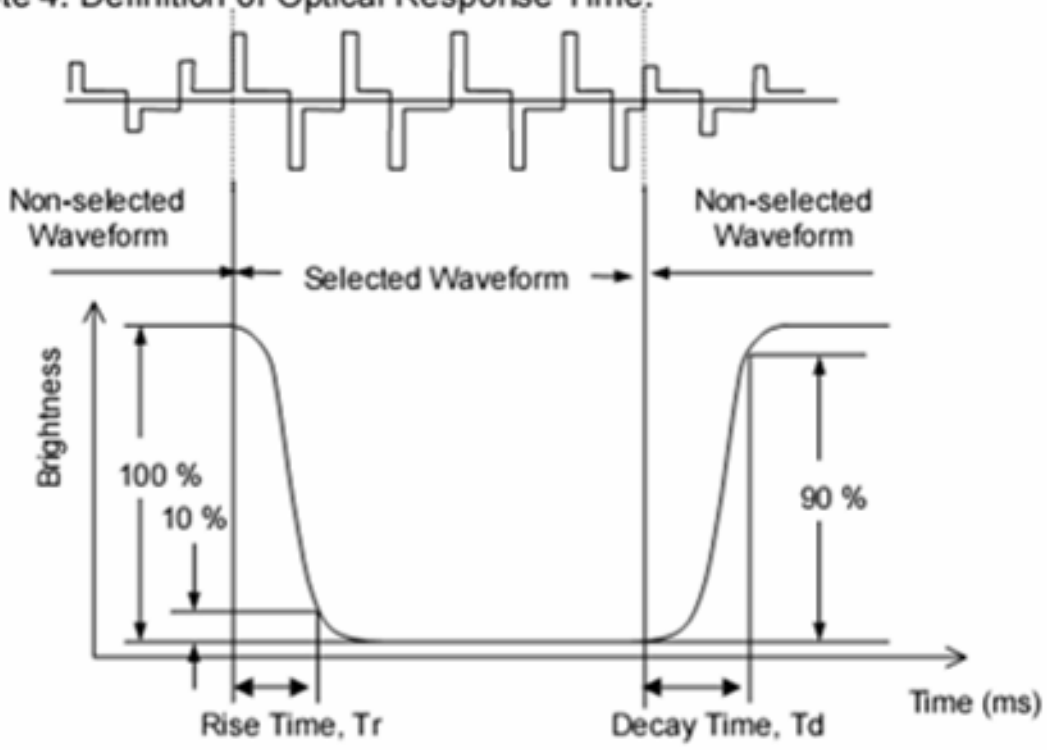


(Positive Type)

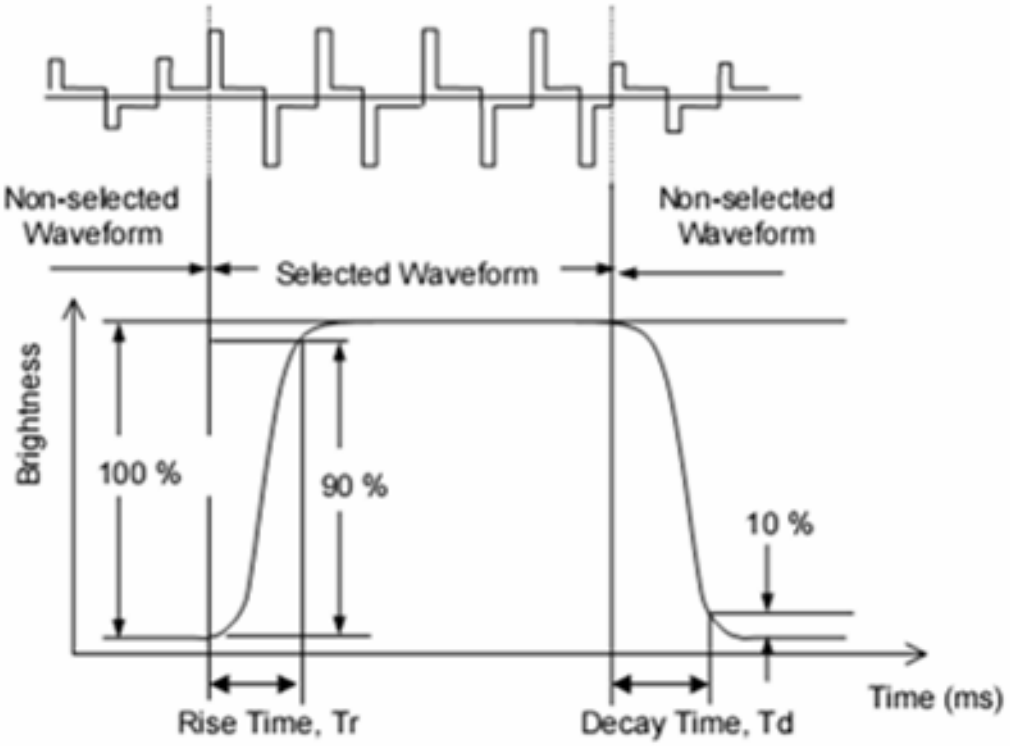


(Negative Type)

Note 4: Definition of Optical Response Time.



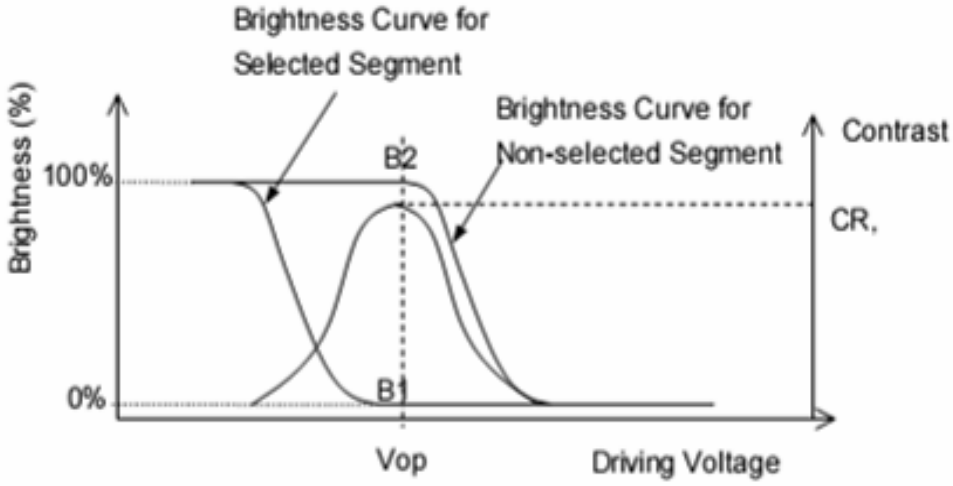
(Positive Type)



(Negative Type)

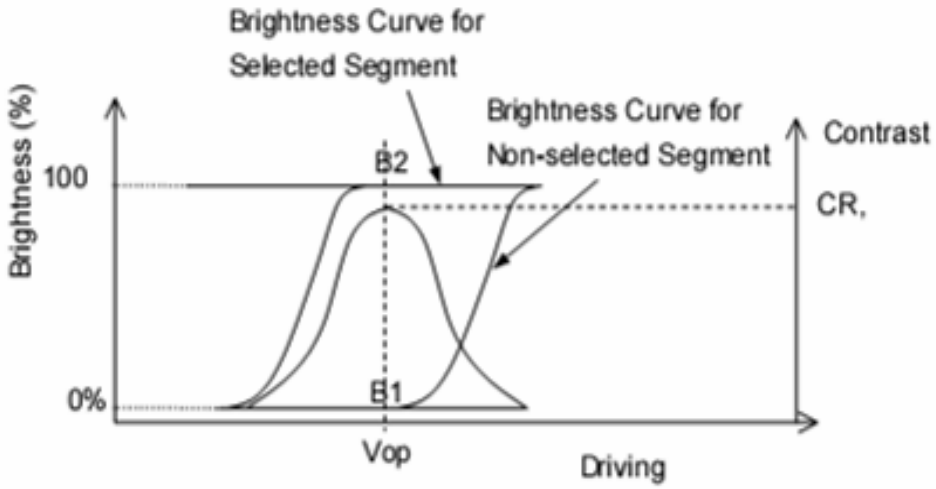
Note 5: Definition of Contrast Ratio (CR).

$$CR = \frac{\text{Brightness of Non-selected Segment}}{\text{Brightness of Selected Segment (B1)}}$$



(Positive Type)

$$CR = \frac{\text{Brightness of Selected Segment (B2)}}{\text{Brightness of Non-selected Segment}}$$



(Negative Type)

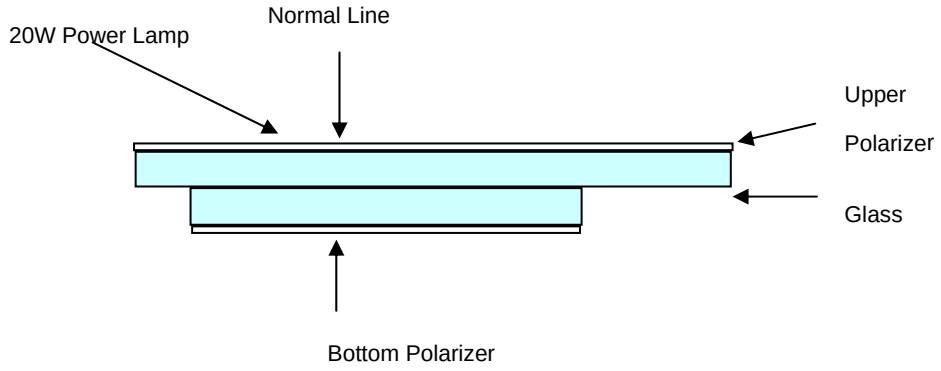
7. Reliability

ITEM	CONDITIONS	CRITERIA
High temperature operation	70℃ for 200 hours	◆ No defect in cosmetic and operational functions ◆ Total current consumption below double of initial value
Low temperature operation	-20℃ for 200 hours	
High humidity storage	40℃,90%RH for 240 hours	
High temperature storage	80℃ for 200 hours	
Low temperature storage	-30℃ for 200 hours	
Temperature cycling	-30℃(30 min) ↓ ↑ 25℃(5 min) ↓ ↑ 80℃(30 min) CYCLES：10	
Vibration	Random Wave:40～500 Hz Acceleration:5g Each Direction (x, y, z):50sec	

8. Outgoing Quality Spec

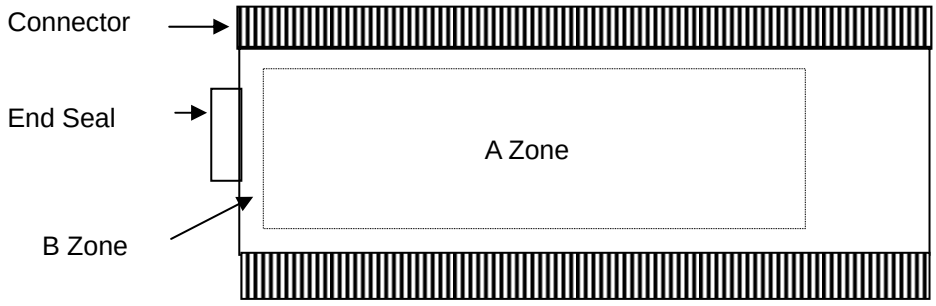
8.1 LCM VISUAL & ELECTRONIC INSPECTION STANDARD

A. Fluorescent Lamp : 20W ; viewing distance 30 cm



Viewing Angle: Normal to the Front Surface

8.2 Definition



A Zone: Effective Viewing

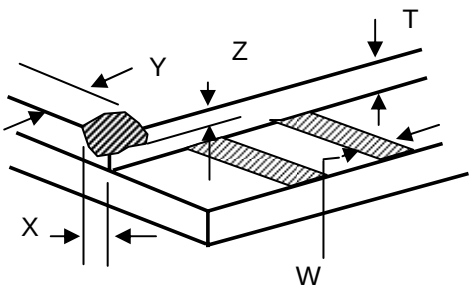
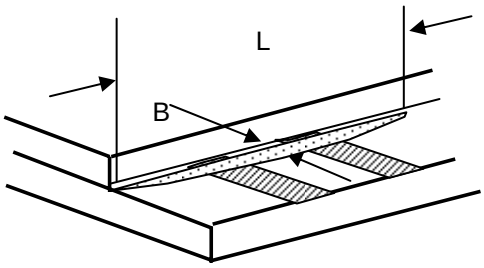
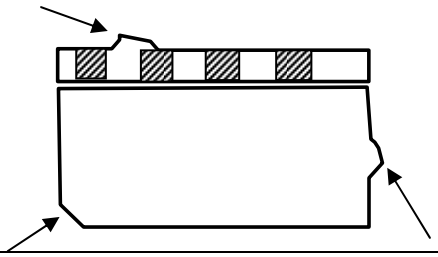
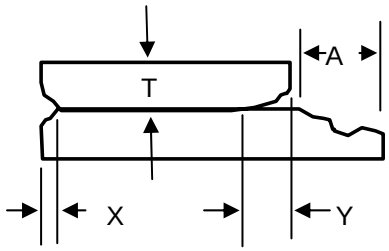
B Zone: Non-effective Viewing

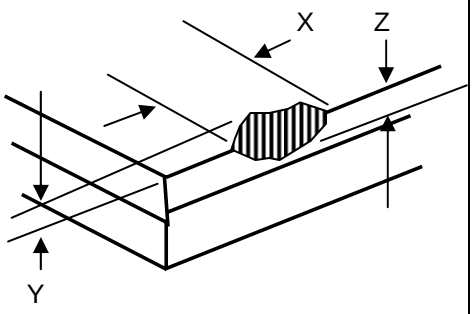
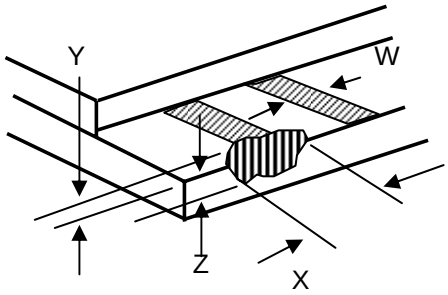
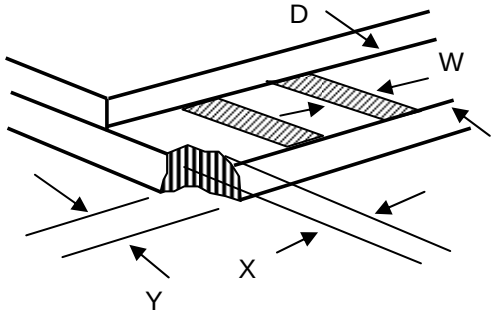
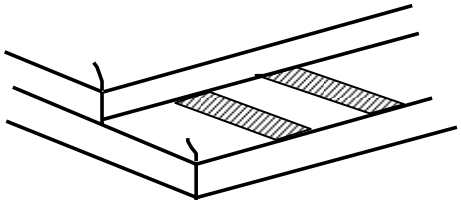
8.3 Quality Level:

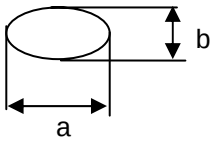
ACCORDING TO: ANSI Z 1.4 LEVEL II

	Major	Minor	Total
Visual	0.40%	1.00%	1.00%
Electronic	0.25%	0.65%	0.65%

8.4 Visual Items

DEFECT	INSPECTION ITEM	CRITERIA
1 Damage (Minor)		1.X,Y damage reaching effective viewing area — Reject 2.Damage causing exposure of cross-over dots & the exposure area being larger than 1/3 of the entire area.(#) — Reject 3. Damage touching main seal & being larger than 1/3 width of main seal.(#) (#:damage between upper & lower glass)
2 Poor Rifting (Major)		1.B ＞ 1/3 Length of connector — Reject 2. length of " L" — Disregard
3 Poor Cutting (Major)		According to Engineering Drawing
4 Poor Cutting (Major)		1. X, Y damage touching main seal & being larger than 1/3 width of main seal — Reject 2.Damage causing exposure of cross-over dots & The exposure area being larger than 1/3 of the entire area — Reject 3. A ＞ 1/3 length of connector — Reject

5 Damage (Minor)		**1. Y damage reaching effective viewing area** **Reject** **2. Damage causing exposure of cross-over dots & the exposure area being larger than 1/3 of the entire area.(#)** **Reject** **3. Damage touching main seal & being larger than 1/3 width of main seal.(#)** **(#:damage between upper & lower glass)**
6 Damage (Minor)		**1. Y ＜ 1/3 length of connector, Z ＜ 1/2T , X disregard.** **Accept** **2. X≦3mm (or ≦ 1/8 length of longer edge), Y ≦1/3 length of connector , 1/2T ＜ Z ≦ T** **Accept** **If damage in another side of connector** **1. X ＞ 1/8 length of longer edge** **Reject** **2. Y ＞ D** **Reject** **3. Z ＞ 1/2 T** **Reject**
7 Damage (Minor)		**1. X ＞ 3 mm** **Reject** **2. Damage causing exposure of cross-over dots & the exposure area being larger than 1/3 of the entire area.** **Reject** **3. Y ＞ 1/2 D** **Reject** **4. X ≦ 1mm and Y ≦ D** **Accept**
8 Cracks (Major)		**Any Cracks** **Reject**

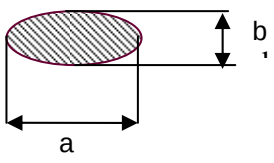
<table>
<tr><td>9
(Minor)</td><td> 

Black Spots
Foreign Substances
φ = (L+W)/2</td><td>
<table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>A: φ ≦0.1mm</td><td>Disregard ※ 1</td></tr>
<tr><td>B : 0.1mm＜ φ ≦0.20mm</td><td>3</td></tr>
<tr><td>C : 0.20mm＜ φ ≦0.25mm</td><td>1</td></tr>
<tr><td>D : 0.25mm＜ φ</td><td>0</td></tr>
<tr><td>Total defective point (B.C.D)</td><td>3</td></tr>
</table>
※ 1: 5pcs or more gatherings within 5 mm circuit is not acceptable .</td></tr>
<tr><td>10
(Minor)</td><td>Slanted Polarizer,
Shifted Polarizer</td><td>Tolerance＞1.2 mm
(Measure from glass edge) Reject</td></tr>
<tr><td>11
(Minor)</td><td>Polarizer Scratch</td><td>
<table>
<tr><th colspan="2">Dimension</th><th rowspan="2">Acceptable Numbers</th></tr>
<tr><th>Length</th><th>Width</th></tr>
<tr><td>A:</td><td>W≦0.01mm</td><td>Disregard ※ 1</td></tr>
<tr><td>B:L≦5 mm</td><td>0.01mm＜W≦0.02mm</td><td>3</td></tr>
<tr><td>C:L≦3 mm</td><td>0.01mm＜W≦0.05mm</td><td>1</td></tr>
<tr><td>D :</td><td>0.05mm＜W</td><td>0</td></tr>
<tr><td colspan="2">Total defective point (B.C.D)</td><td>3</td></tr>
</table>
※ 1: 5pcs or more gatherings within 5 mm circuit is not acceptable</td></tr>
<tr><td>12
(Minor)</td><td>Polarizer Bubble

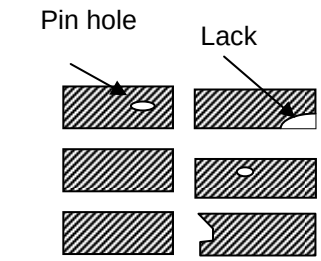
Visual Inspection

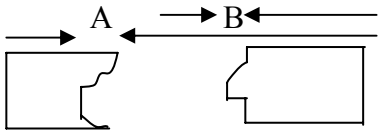
φ ψ= (L+W)/2</td><td>
<table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>D＞1.0mm</td><td>Reject</td></tr>
<tr><td>0.5mm＜D≦1.0 mm</td><td>1</td></tr>
<tr><td>D＜0.5 mm</td><td>Disregard</td></tr>
</table></td></tr>
<tr><td>13
(Minor)</td><td>Polarizer Prick, Shape (point)
Visual Inspection

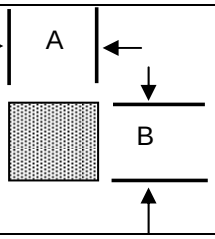
φ = (L+W)/2</td><td>
<table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>φ ≦0.1mm</td><td>Disregard ※ 1</td></tr>
<tr><td>0.1mm＜ φ ≦0.20mm</td><td>3</td></tr>
<tr><td>0.20mm＜ φ ≦0.25mm</td><td>1</td></tr>
<tr><td>0.30mm＜ φ</td><td>0</td></tr>
</table>
The distance between two spots shall exceed 5 mm
Outside Effective Viewing Area Disregard</td></tr>
<tr><td>14
(Major)</td><td>Dirty Conductive Pattern</td><td>Oil or Foreign Substances Reject
(Visual Inspection)</td></tr>
<tr><td>15
(Minor)</td><td>Dirty Polarizer(After removing protection film)</td><td>Reject</td></tr>
<tr><td>16
(Minor)</td><td>Protection Film not adhering to Polarizer</td><td>Reject</td></tr>
<tr><td>17
(Minor)</td><td>NAP (Fiber)</td><td>L≦ 3mm
Accept</td></tr>
<tr><td>18
(Major)</td><td>The Deviation of the Basic Color</td><td>Base on Limited sample</td></tr>
</table>

<table>
<tr><td>19
(Major)</td><td>Incomplete Etching</td><td>Reject</td></tr>
<tr><td>20
(Major)</td><td>Excessive Etching</td><td>Reject</td></tr>
<tr><td>21
(Minor)</td><td>The Width of Main seal</td><td>1. ≦1/2 of the Average Width Reject
2. ≧1/2 of the Average Width Reject</td></tr>
<tr><td>22
(Minor)</td><td>Shifting of Main Seal</td><td>Outside Effective Viewing Area Reject</td></tr>
<tr><td>23
(Minor)</td><td>Foreign Substance, Bubble in Main Seal</td><td>≧1/2 of the Main Seal Width Reject</td></tr>
<tr><td>24
(Major)</td><td>Main Seal color BeingNon Uniform</td><td>Reject</td></tr>
<tr><td>25
(Major)</td><td>Deviation of End Sealing Glue Color</td><td>Reject</td></tr>
<tr><td>26
(Minor)</td><td>Shifting of End Sealing Glue</td><td>Out of Spec on the Engineering Drawing Reject</td></tr>
<tr><td>27
(Major)</td><td>End sealing Glue Intruding into the Cell</td><td>Outside Effective Viewing Area Reject</td></tr>
<tr><td>28
(Minor)</td><td>Black Dot/ White Dot</td><td>
<table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>A: φ ≦0.1mm</td><td>Disregard ※ 1</td></tr>
<tr><td>B : 0.1mm＜ φ ≦0.20mm</td><td>3</td></tr>
<tr><td>C : 0.20mm＜ φ ≦0.25mm</td><td>1</td></tr>
<tr><td>D : 0.25mm＜ φ</td><td>0</td></tr>
<tr><td>Total defective point (B.C.D)</td><td>3</td></tr>
</table>
※ 1: 5pcs or more gatherings within 5 mm circuit is not acceptable .
</td></tr>
<tr><td>29
(Minor)</td><td>Black Line
White Line</td><td>
<table>
<tr><th colspan="2">Dimension</th><th>Acceptable Numers</th></tr>
<tr><th>Length</th><th>Width</th><th>Disregard ※ 1</th></tr>
<tr><td>A:</td><td>W≦0.01mm</td><td></td></tr>
<tr><td>B:L≦5 mm</td><td>0.01mm＜W≦0.02mm</td><td>3</td></tr>
<tr><td>C:L≦3 mm</td><td>0.02mm＜W≦0.05mm</td><td>1</td></tr>
<tr><td>D :</td><td>0.05mm＜W</td><td>0</td></tr>
<tr><td colspan="2">Total defective point (B.C.D)</td><td>3</td></tr>
</table>
※ 1: 5pcs or more gatherings within 5 mm circuit is not acceptable .
</td></tr>
<tr><td>30
(Minor)</td><td>Contrast Variation
 

φ = (a+b)/2</td><td>
<table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>A: φ ≦0.20mm</td><td>Disregard ※ 1</td></tr>
<tr><td>B : 0.20mm＜ φ ≦0.30mm</td><td>2</td></tr>
<tr><td>C : 0.30mm＜ φ ≦0.40mm</td><td>1</td></tr>
<tr><td>D : 0.40mm＜ φ</td><td>0</td></tr>
<tr><td>Total defective point (B.C.D)</td><td>3</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td>※ 1: 5pcs or more gatherings within 5 mm circuit is not acceptable .</td></tr>
<tr><td>31
(Minor)</td><td>Dot Matrix:
 

Convex</td><td>Part A : Lack > 0.05 mm Reject
Part B: Convex > 0.05 mm Reject</td></tr>
<tr><td>32
(Minor)</td><td>Not 

Assemble Match (For Dot Matrix)</td><td>A : Distortion of Square ≦ ±15 % Accept
B: Distortion of Square ≦ ±15 % Accept</td></tr>
<tr><td>33
(Minor)</td><td>Rainbow</td><td>Reject</td></tr>
<tr><td>34
(Major)</td><td>Open, Short</td><td>Reject</td></tr>
<tr><td>35
(Major)</td><td>Conductive Point
Poor Conduction</td><td>Reject</td></tr>
<tr><td>36
(Minor)</td><td>Low Speed</td><td>Reject</td></tr>
<tr><td>37
(Major)</td><td>Large Current</td><td>≧2 uA/Cm^2 Reject</td></tr>
<tr><td>38
(Minor)</td><td>Surface is not uniform</td><td>
<table>
<tr><th>Dimension</th><th>Acceptable Numbers</th></tr>
<tr><td>A: $\varphi \leqq 0.20$mm</td><td>Disregard ※ 1</td></tr>
<tr><td>B : 0.20mm$< \varphi \leqq$0.30mm</td><td>2</td></tr>
<tr><td>C : 0.30mm$< \varphi \leqq$0.40mm</td><td>1</td></tr>
<tr><td>D : 0.40mm$< \varphi$</td><td>0</td></tr>
<tr><td>Total defective point (B.C.D)</td><td>3</td></tr>
</table>
※ 1: 5pcs or more gatherings within 5 mm circuit is not acceptable .</td></tr>
</table>

9. PRECAUTIONS

9.1 Static charge

Since this LCD module contains CMOS LSIs that are sensitive to static charge, care must be taken when handing it.

9.2 Power on sequence

1. Input signals should not be applied to the LCD module before the logic system voltage has reached the specified voltage. If the above sequence is not keep the LCD module might be permanently damaged.
2. When connecting the power supply, connect the LCD bias voltage after connecting the logic system voltage.
3. When disconnecting the power supply, disconnect the logic system voltage after the LCD bias voltage.
4. It is recommended to connect a serial resistor or fuse to the LCD bias power supply of the system, as a current limiter. The value of the resistor depends on the kind of LCD used, but is typically 50～100Ω.

9.3 Operation

1. It is essential to drive the LCD within the specified voltage limits, since a higher driving voltage than allowed causes a shorter LCD lifetime. Under these circumstances, electrochemical reactions will result in undesirable deterioration of the LCD.
2. The response time of the LC fluid is considerably longer at low temperatures than in the normal operating temperature rang. On the other hand, the LCD will show a dark blue color at high temperatures. Those phenomena do not indicate a malfunction or defect of the LCD. Back at normal temperatures, the LCD will be return to its original behavior.
3. If the display area is pressed hard during operation, some abnormal display patterns might appear. However, the display will resume normal operation after turning the module off and on.
4. Moisture on the terminals could cause an electrochemical reaction resulting in an open terminal connection. If the environmental temperature is higher than 40℃, it is required that the relative humidity is 50% or less.

9.4 Packing

1. Do not leave the product in a place of high humidity for a long period. For storage in a location where the temperature is 35℃ or higher, special care to protect the product from high humidity is required. A combination of high temperature and high humidity may cause polarization degradation and damage as well. Please keep the temperature and humidity within the specified range for storing.
2. Since LCD panels tend to be easily damaged, they should be handled with full care. Avoid any contact with materials that have a hardness of more than 2H.
3. Adhesives used for adhering upper/lower polarizers and aluminum plates are made of organic substances that will deteriorate by chemical reactions with for example chemicals such as acetone, toluene, ethanol, and isopropylalcohol. Please prevent the use of these chemicals and contact us when it is necessary for you to use other chemicals.
4. Immediately wipe off saliva or water drops from the display area with an absorbent cotton cloth, without scrubbing it. If adhered for a long period, such particles might cause deformation or faded color.
5. Moisture deposited on the display surface and contact terminals due to low temperatures will be a cause for polarizer damage, stains, and dirt. Before use, such panels should be slowly warmed up to a temperature that is higher than room temperature.
6. Touching the display area and contact terminals with bare hands is harmful to polarizer and may lead to poor insulation at the terminals.
7. The glass is fragile and can be cracked or chipped easily by handling, in particular on near its edge. Please prevent sudden shocks or exposing the glass to other sorts of stress.

9.5 Long-term storage

For long-term storage the following methods are highly recommended:

1. Store the product in a polyethylene bag with a sealed opening to prevent fresh air entering from the outside. Placing it with a desiccant is not necessary.
2. Store the product in a dark place, with the temperature in the range from0℃to35℃.
3. Keep the sensitive polarizer surface of the LCD panels clear of any contact. We recommend using the container that was used by LEYI to deliver the products.

9.6 Cleaning of the product

To clean the product make sure to use absorbent cotton cloth or other soft material like chamois. Make sure to rub it gently, and do not use chemicals when cleaning.

10. FINAL REMARKS

1. The above specifications are the binding criteria for LEYI's outgoing quality inspection.
2. The customer is kindly requested to inform LEYI as soon as possible on any questions, remarks, and disagreements regarding these specifications.
3. LEYI is not responsible for damage to its products due to neglect of the precautions as described in the previous chapter.

----------END----------