晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AG-640480C2FTCW00
APPROVED BY	
DATE	

☑ Approved For Specifications
☐ Approved For Specifications & Sample

AMPIRE CO., LTD.
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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2007/9/5	--	New Release	Edward
2008/6/27		Modify Power Supply Current for LCM (Condition : VEE-VSS=22.3V)	Kasha

1. GENERAL SPECIFICATIONS

Item	Contents
Display Contents[pixels]	640(W)×480(H)
Dimensional Outline[mm]	205.5(W)×141.0(H)×7.0 max(D)
Display mode	Transmissive Type (Viewing Direction 6 o'clock)
Circuits	X-Driver,Y-Driver
Interface	Data(UD_0~UD_3,LD_0~LD_3),SCP,FP,LP,DISP

2. ABSOLUTE MAXIMUM RATING

(1)ELECTRICAL ABSOLUTE RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply for Logic	V_{DD}-V_{SS}	-0.3	6.5	V	
Input Voltage	V_{EE}-V_{SS}	0	27	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling LCM.

(2)ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN	MAX	MIN	MAX
Ambient Temperature	0	50	-20	70
Humidity (without Condensation)	Note 2,4		Note 3,4	

Note 2 Ta≤50°C:80%RH max
Ta›50°C: Absolute humidity must be lower than the humidity of 80%RH
at 50°C

Note 3 Ta at -20°C will be < 48hrs at 70°C will be < 120hrs

Note 4 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

3. ELECTRICAL SPECIFICATION (Condition : Ta=25°C)

Item	Symbol	Conditions		Specifications			Unit
				min	typ	max	
Supply Voltage	V_{DD}-Vss	-		3.0	3.3	3.6	V
		-		4.75	5.0	5.25	
LCD Driving Voltage	V_{EE}-Vss	V_{DD}=5V	0℃	22.9	23.3	23.7	V
			25℃	21.9	22.3	22.7	
			50℃	21.0	21.4	21.8	
Input Voltage	V_{IH}	H level		0.8 V_{DD}	V_{DD}	-	V
	V_{IL}	L level		Vss	0.2V_{DD}	-	
Power Supply Current for LCM (Typical case)	I_{DD}	VDD=5.0V VEE-VSS=22.3V FLM=70Hz		-	3.0	6.0	mA
	I_{EE}			-	15	30	

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4. CCFL B/L ELECTRICAL SPECIFICATION

(Condition : Ta=25°C)

Item	Symbol	Conditions	Specifications			Unit
			min	typ	max	
Lamp Voltage	V_L	-	--	295	--	Vrms
Lamp Current	I_L	V_L=295Vrms	4	5	6	mArms
Lamp Power consumption	P_L	(note 1)	--	1.48	-	W
Starting voltage	Vs	Ta=25°C	--	--	430	Vrms
		Ta=0°C	--	--	500	
Lamp Life time	L_L	At I_L = 5mArms (note 2)	--	20000	--	hrs

(Note 1) Power consumption exclude inverter loss

(Note 2) Lamp life time : The final brightness is at 50% of original brightness.

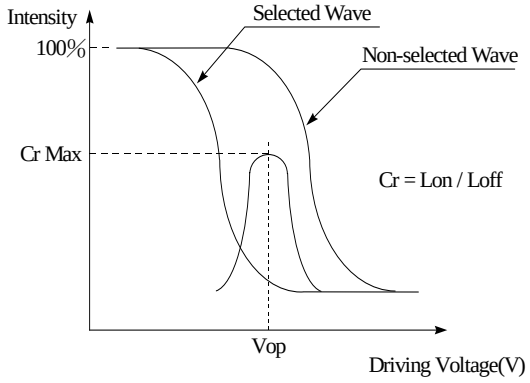
5. MECHANICAL SPECIFICATION

(1)Product No.	AG-640480C2FTCW-00	
(2)Module Size	205.5(W) ×141.0(V) ×7.0 max(D)	
(3)Dot Size	0.21(W)mm × 0.21(H)mm	
(4)Dot Pitch	0.23(W)mm ×0.23(H)mm	
(5)Number of Dots	640(W) × 480(H)Dots	
(6)Duty	1/240 Dual Scan	
(7)LCD Display Mode	STN:	☐Gray Mode ☐Yellow Mode ☐Blue Mode
	FSTN:	☐Black and White (Normally White/Positive Image) ☑Black and White (Normally Black/Negative Image)
	Rear Polarizer :	Reflective ☐Transflective ☑Transmissive ☐Transflective(High Transmissive)
(8)Viewing Direction	☑6 O'clock ☐12 O'clock ☐3 O'clock	
(9)Backlight	☐W/O ☑CCFL☐EL☐LED	
(10)Controller	Excluded	
(11)DC/DC Converter	Excluded	
(12)Data connector	Excluded	
(13)Weight	(310) g	

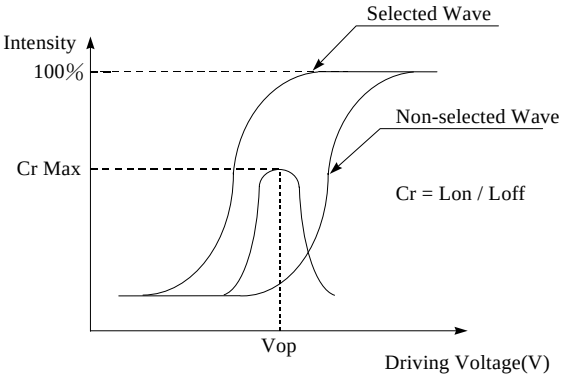
6. OPTICAL SPECIFICATIONS

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	NOTE
Contrast		Cr	0°C		5.5	8.0	-	-	6
			25°C		7.0	10.0	-		
			50°C		2.8	4.0	-		
Response Time		Tr	0°C		440	550	820	ms	7
			25°C		180	234	350		
			50°C		90	110	165		
		Tf	0°C		200	250	375		
			25°C		90	110	165		
			50°C		75	95	140		
Viewing angle range		θf	25°C		-	50	-	Degree	8
		θb			-	26	-		
		θr			-	45	-		
		θl			-	45	-		
Frame frequency		Fr	25°C		-	70	-	Hz	
LCM	Surface Luminance	Ls	Vin=10.1v I_L=5mA	Pattern : (Dots All On)	70.0	85.5	-	cd/m^2	9
				Pattern : (Dots All Off)	-	13.3	20.0	cd/m^2	

[Note 6] Definition of Operation Voltage (V_{EE})

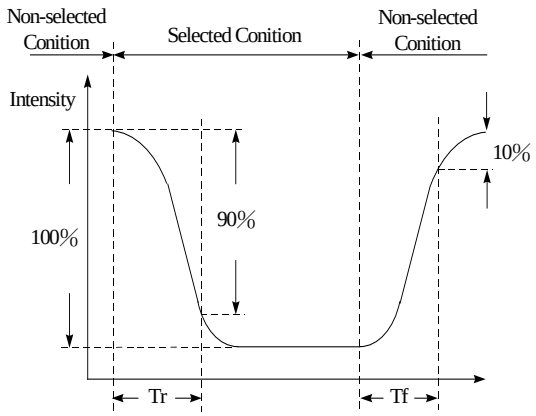


[positive type]

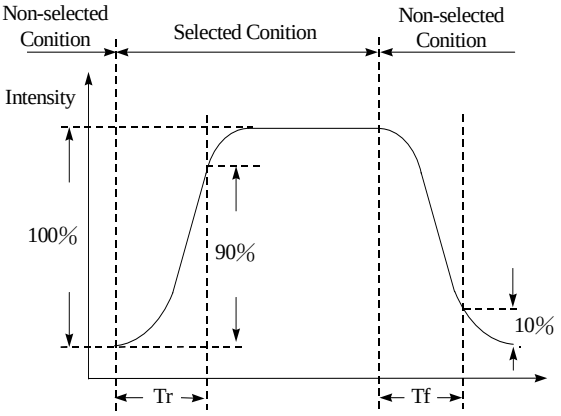


[Negative type]

[Note 7] Definition of Response Time (Tr , Tf)



[positive type]



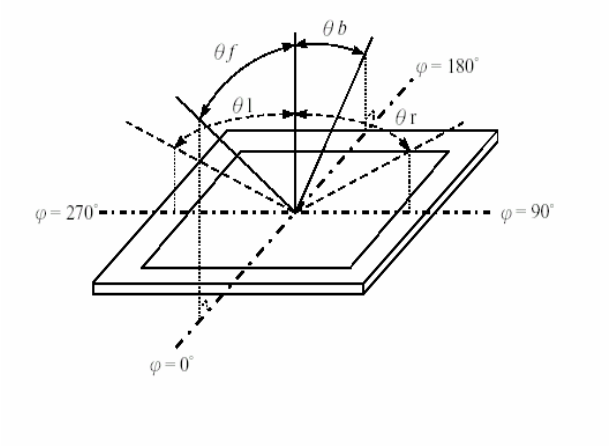
[Negative type]

Conditions :

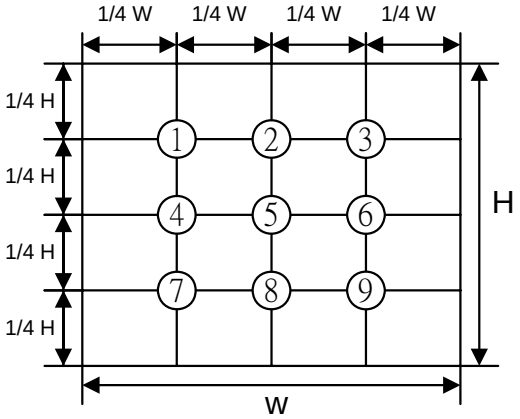
Operating Voltage : V_{LCD} Viewing Angle(θ , Ø) : 0º, 0º

Frame Frequency : 64 HZ Driving Waveform : 1/N duty , 1/a bias

[Note 8] Definition of viewing angle(CR≥2)



[Note 9] Definition of measuring points



7. INTERFACES

7.1 Interface Pin Assignment

LCD Connector : MOLEX 53261-1590

Pin No.	Signal	Function
1	FLM	Frame Pulse Scan start-up signal
2	CL1(LP)	Latch Pulse in one line
3	CL2(SCP)	Shift Clock Pulse for X-Drivers
4	/DISP	Sequence Signal of Power Supply("L":OFF)
5	VDD	Power Supply for Logic(+5V)
6	VSS	Ground(0 V)
7	VEE	Power Supply for Contrast Control
8	UD0	Data Input for Upper Screen
9	UD1	Data Input for Upper Screen
10	UD2	Data Input for Upper Screen
11	UD3	Data Input for Upper Screen
12	LD0	Data Input for Lower Screen
13	LD1	Data Input for Lower Screen
14	LD2	Data Input for Lower Screen
15	LD3	Data Input for Lower Screen

Mating Connector : MOLEX 51021-1500 (HOUSING) x 1 +
MOLEX 50058-8000(TERMINAL) x 15

7.2 CCFL B/L Pin Assignment

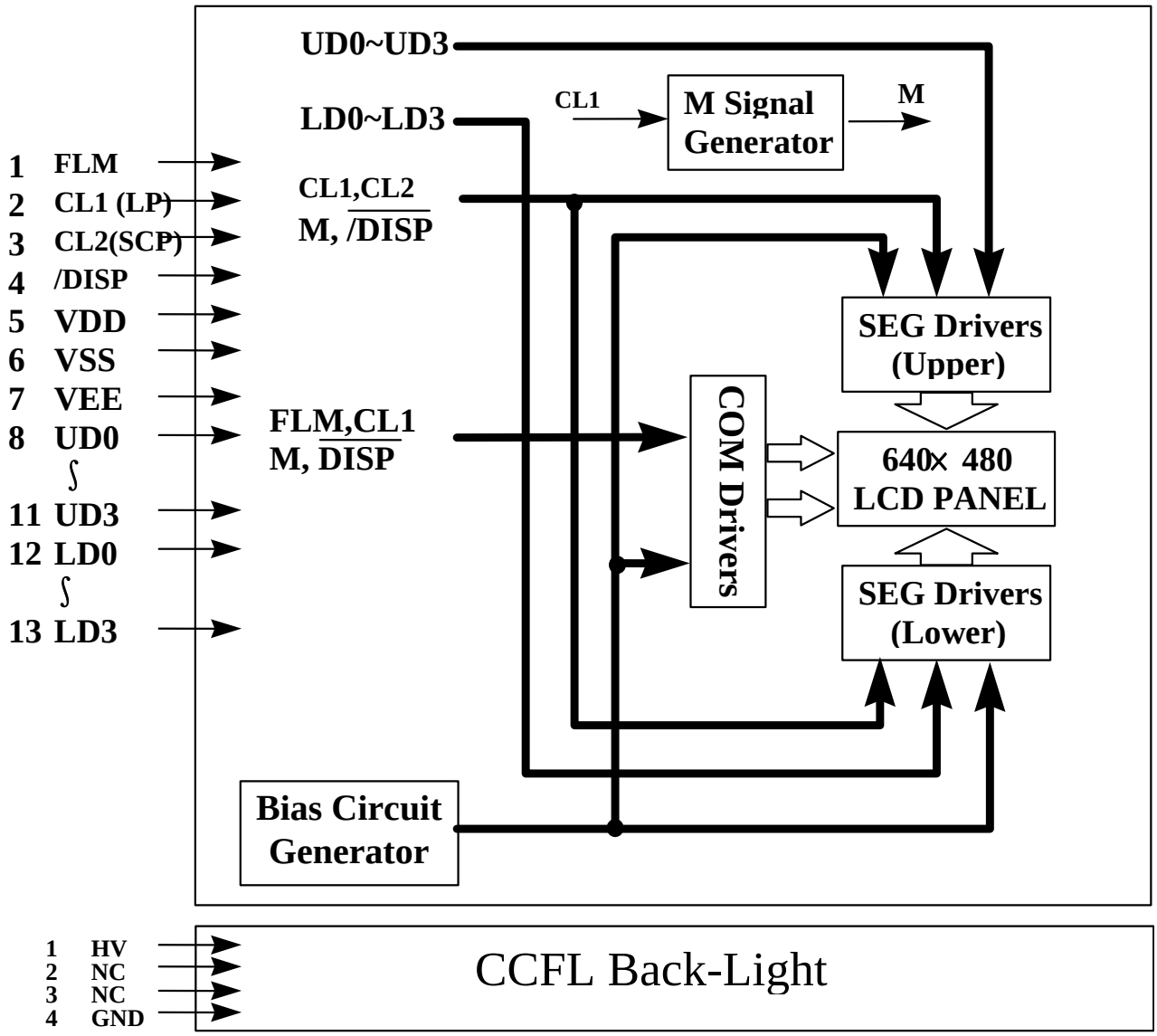
FL Connector MITSUMI : M63-M83-04

Pin No.	Signal	Function
1	HV	Power Supply for FL(Hot) High Voltage Line
2	NC	No Connection
3	NC	No Connection
4	GND	Power Supply for FL(Ground) Ground Line

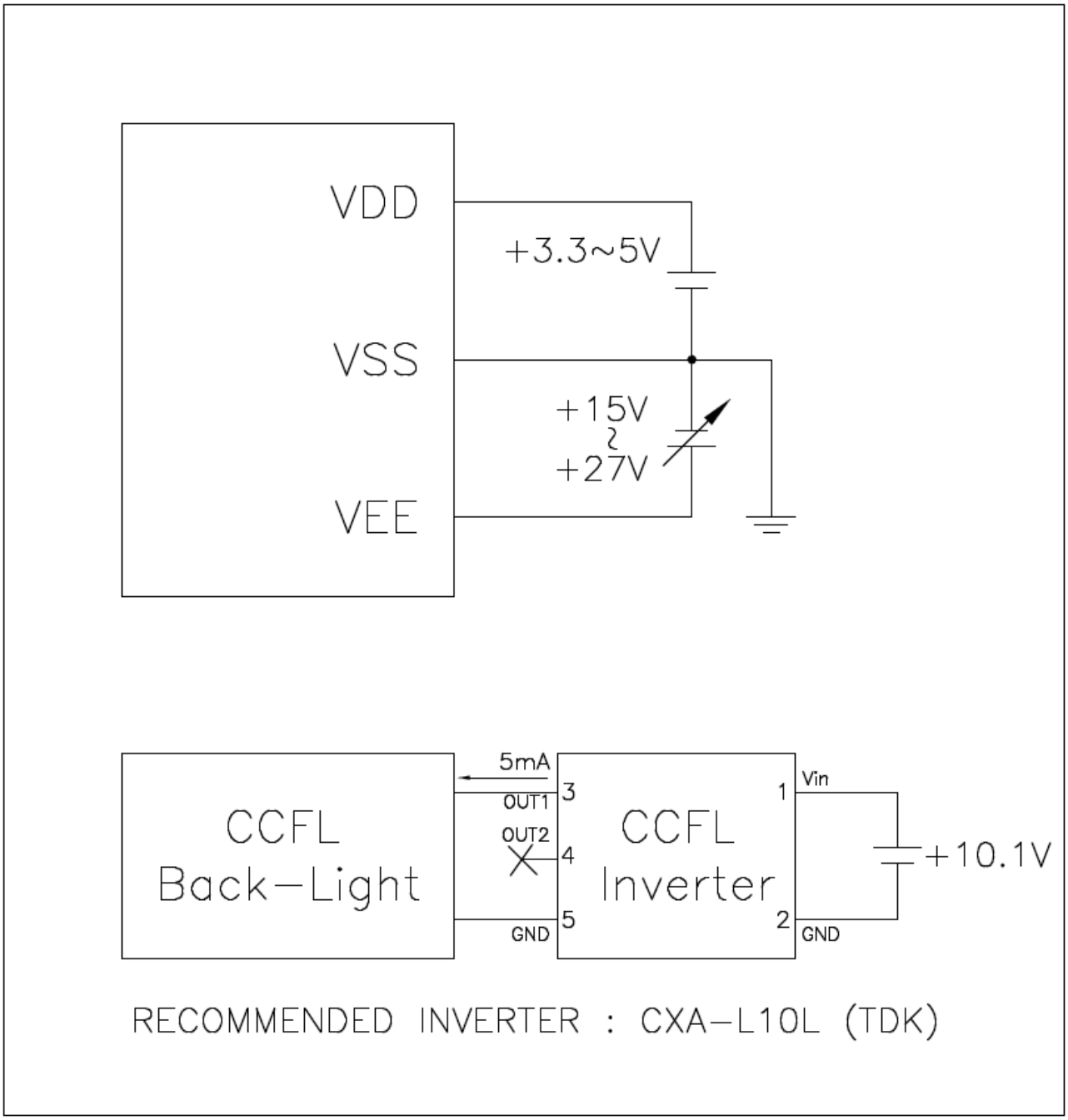
Mating Connector : MITSUMI :

M60-04-30-114P(MITSUMI)
M60-04-30-134P(MITSUMI)
M61M73-04(MITSUMI)

8. BLOCK DIAGRAM



9. POWER SUPPLY

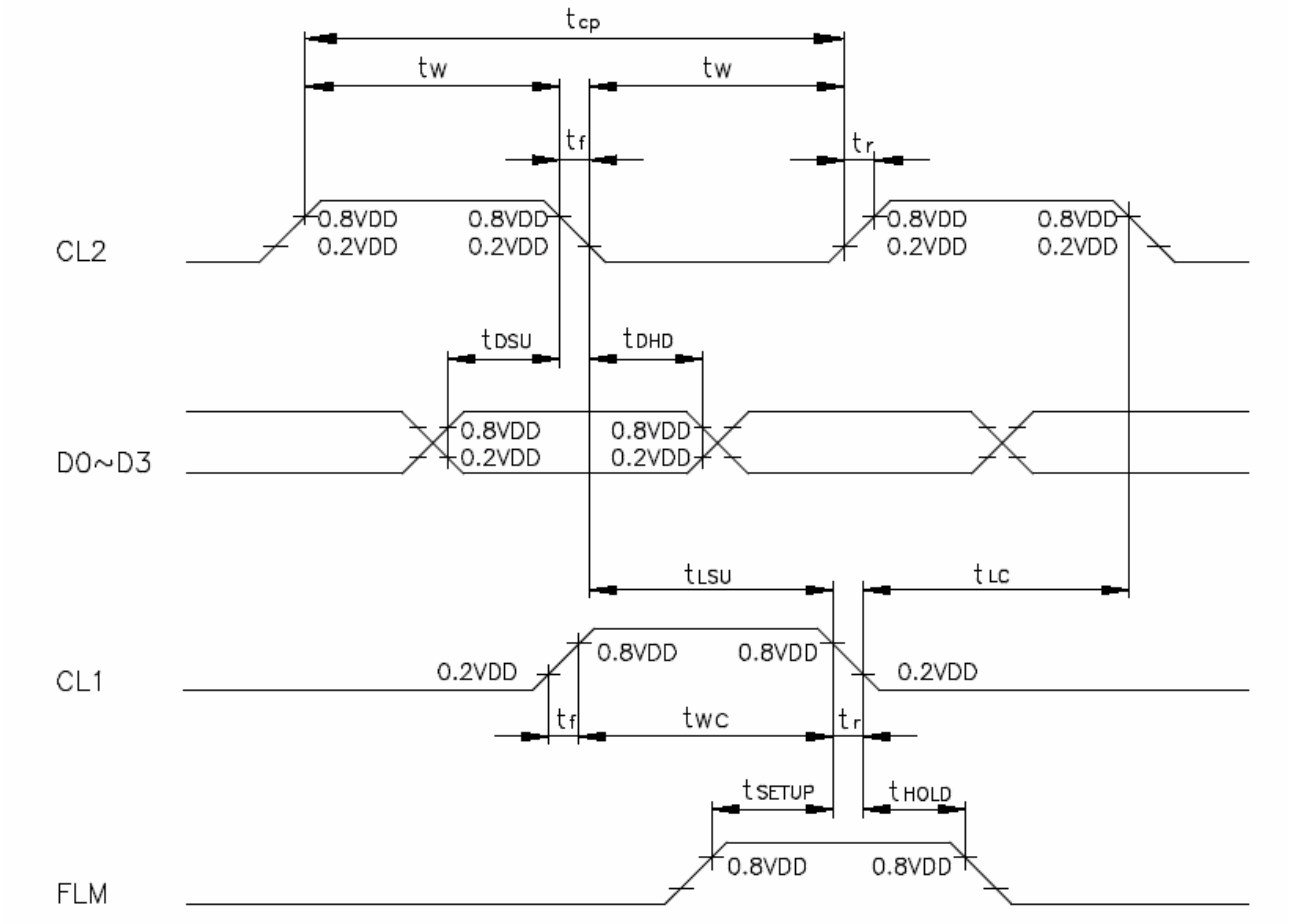


10. TIMING CHARACTERISTICS

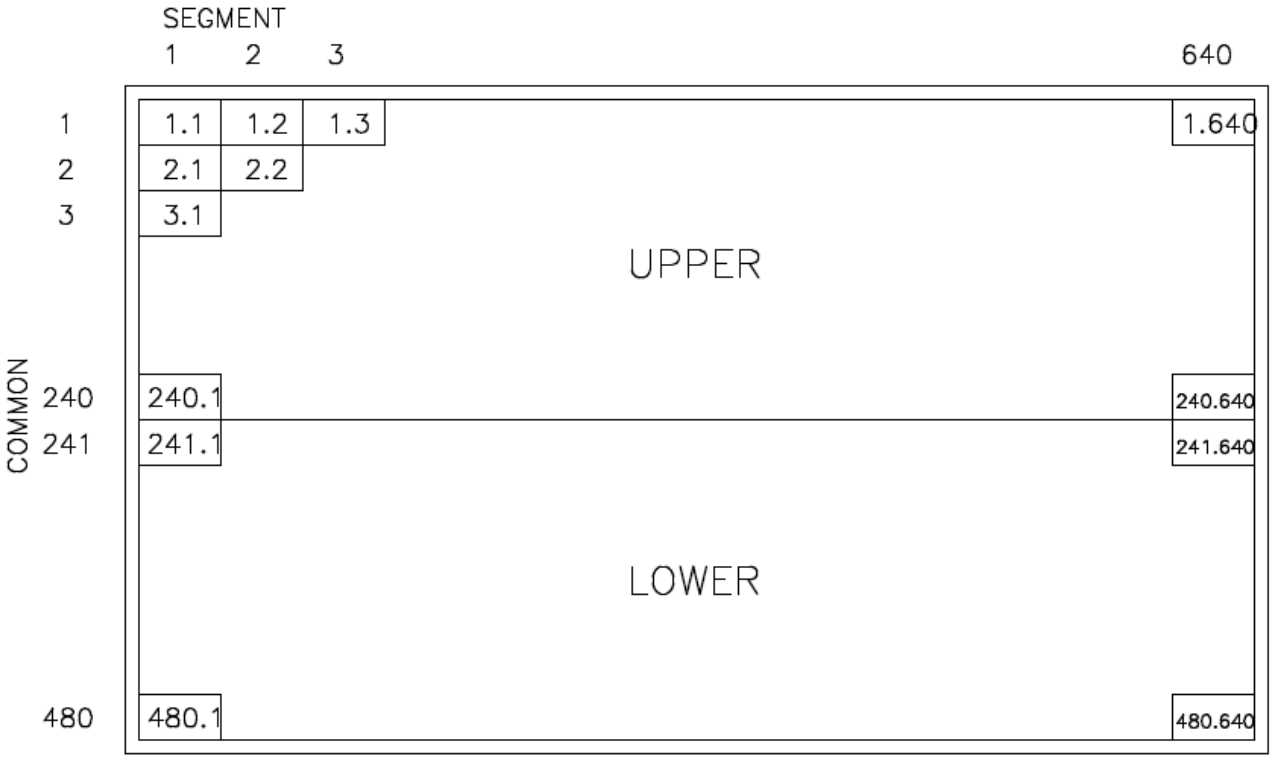
10-1. Interface timing:

@VDD=2.5~5.5V

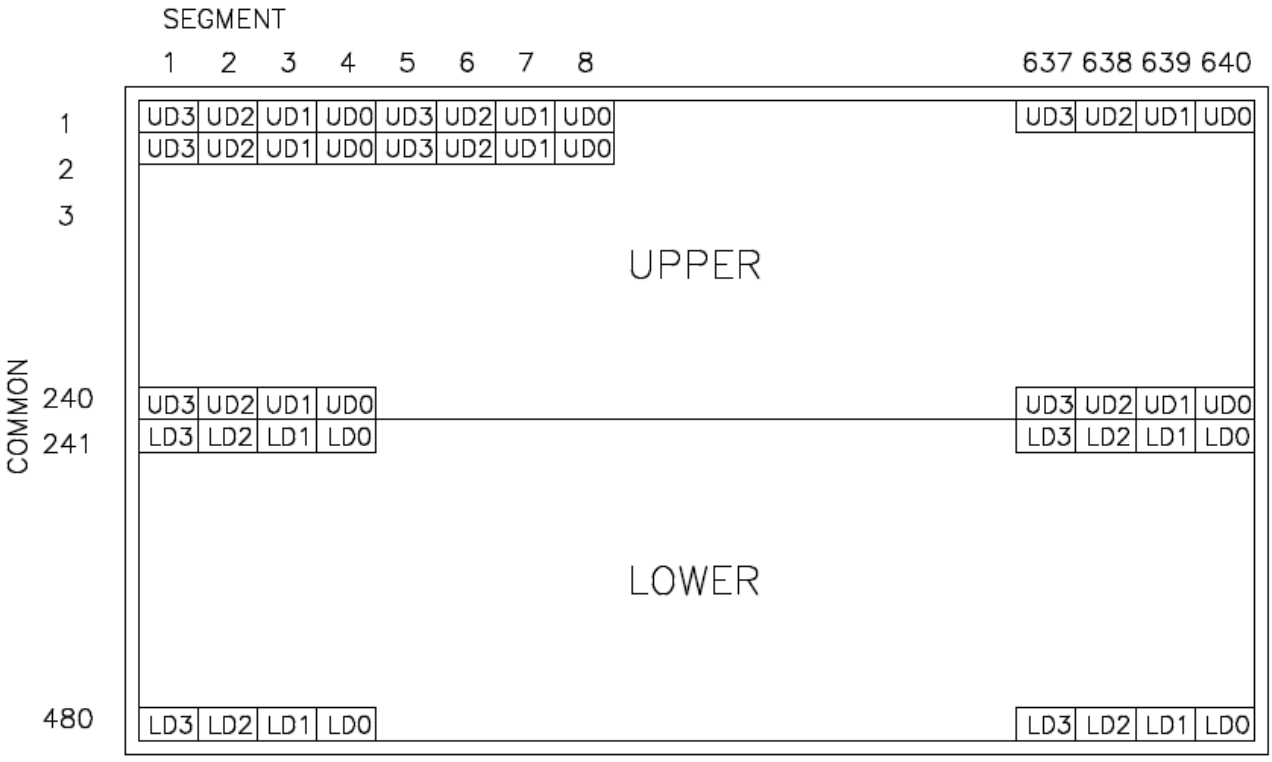
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	152	–	–	ns
"CL2" PULSE WIDTH	t_W	65	–	–	ns
CLOCK RISE, FALL TIME	t_r , t_f	–	–	50	ns
DATA SETUP TIME	t_{DSU}	50	–	–	ns
DATA HOLD TIME	t_{DHD}	40	–	–	ns
"CL2"→ "CL1" FALL TIME	t_{LSU}	65	–	–	ns
"CL1"→ "CL2" FALL TIME	t_{LC}	65	–	–	ns
"FLM" SETUP TIME	t_{SETUP}	100	–	–	ns
"FLM" HOLD TIME	t_{HOLD}	100	–	–	ns
"CL1" PULSE WIDTH	t_{WC}	65	–	–	ns



11. DISPLAY PATTERN



NOTE : 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT



12. RELIABILITY TEST

No	ITEM	Conditions		Note
1	HIGH TEMP. Operation	50°C	120 HR	
2	HIGH TEMP. Storage	70°C	120 HR	
3	LOW TEMP. Operation	0°C	120 HR	
4	LOW TEMP. Storage	-20°C	120 HR	
5	HIGH TEMP/HUMID Storage	50°C 90% RH	120 HR	
6	THERMAL SHOCK	-20°C,30 min 70°C,30 min	10 cycle	

Definitions of life end point

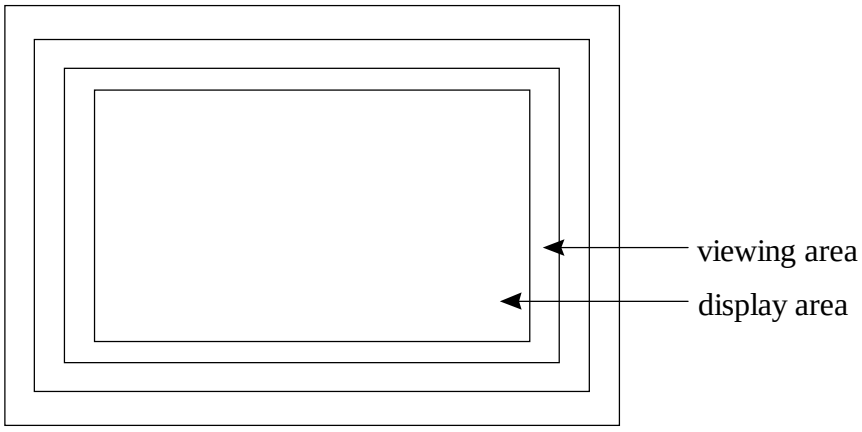
(1) Current consumption is more than specified value
(2) Function of the module is not maintained
(3) There is visible degradation of appearance and display quality
(4) Contrast ratio is less than 50 % of specified value
(5) Brightness is less than 50 % of specified minimum valued

13. APPEARANCE CHECK

CONDITION OF APPEARANCE CHECK :

(1) Specimen shall be checked by eyes in distance of 30cm under 40w fluorescence lamp.

(2) Checking direction shall be in 45 degree from perpendicular line of specimen surface.



14. HANDLING PRECAUTIONS

(1)Treat polarizer very carefully since it is easy to be damaged.

(2)When cleaning the display surface, use soft cloth (e.g. wiper) with a solvent (recommended below)and wipe lightly.

- ethyl alcohol
- iso-propanol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvents :

- water
- ketone
- aromatics

(3)Direct current causes electro-chemical reaction with remarkable degradation of the display quality. Give careful consideration to prevent direct current at ON/OFF timing and during operation.

(4)Avoid strong shock and drop from a height.

(5)To prevent LCD panels from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

(6)Give careful consideration to avoid electrical static discharge with causes uneven contrast.

(7) Even a small condensation on the contact pads (terminals) causes electro-chemical reaction which makes missing row and column. Give careful attention to avoid condensation. When assembling with zebra connector, clean the surface of the pads with alcohol and keep the air very clean.

15. LCD PRODUCT QUALITY STANDARD

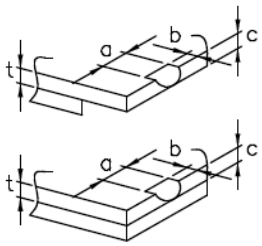
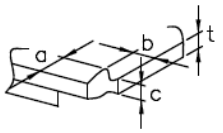
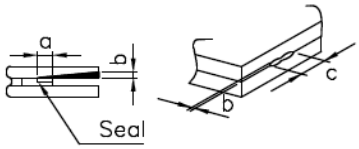
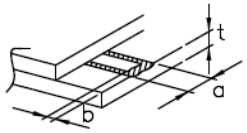
<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1.</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>
(1)−1−Spots
<table>
<tr><th>Average Diameter(mm):D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.1</td><td>Ignore</td></tr>
<tr><td>0.1<D≦0.2</td><td>5</td></tr>
<tr><td>0.2<D≦0.3</td><td>2</td></tr>
<tr><td>0.3<D</td><td>0</td></tr>
</table>
Number of total pieces is set to within 5 pieces.

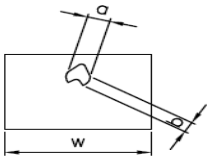
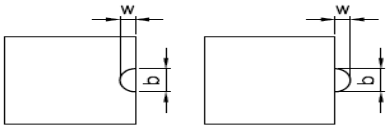
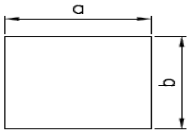
Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2

(1)−2−Blurred Spots(At lighting condition)
<table>
<tr><th>Average Diameter(mm):D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.3</td><td>Ignore</td></tr>
<tr><td>0.3<D≦0.75</td><td>5</td></tr>
<tr><td>0.75<D</td><td>0</td></tr>
</table>
Number of total pieces is set to within 5 pieces.

Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2
</td></tr>
</table>

<table>
<tr><td>1.</td><td>Line</td><td>(1)−1 Lines(At non lighting condition)
<table><tr><th>Width(mm):W</th><th>Length(mm):L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦4</td><td>2</td></tr><tr><td>0.08<W≦0.1</td><td>L≦1</td><td>1</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.
(1)−2 Lins(At lighting condition)
<table><tr><th>Width(mm):W</th><th>Length(mm):L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦3</td><td>6</td></tr><tr><td>0.08<W</td><td>3<L</td><td>None</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.</td></tr>
<tr><td>2.</td><td>Scratches(Glass, reflection plates, and polarizing plates)</td><td>In accordance with black spots.
(At non lighting condition)</td></tr>
<tr><td>3.</td><td>Color irregular</td><td>Not remarkable color irregular.</td></tr>
<tr><td>4.</td><td>Air bubbles polarizing plates, and reflection plates</td><td><table><tr><th>Average Diameter (mm):D</th><th>Number of pieces permitted</th></tr><tr><td>D≦0.3</td><td>Ignore</td></tr><tr><td>0.3<D</td><td>0</td></tr></table>Average diameter = (Long diameter + Short diameter)/2
Note that when there are 4 pieces or more, they are not to be concentrated.</td></tr>
</table>

5.	Cracks	(1)General crack 	a≦5 b≦2 c≦t Where, a and b are ignored when less that or equal 0.5. The numbers of pieces are set at up to 5 pieces.
		(2)Corner crack 	a≦2.5 b≦2.5 c≦t a+b≦4
		(3)Seal portion crack 	a≦The seal widthx1/3 b≦tx2/3 c≦5 The numbers of pieces are set at up to 5 pieces.
		(4)ITO Pin crack 	a≦5 b≦1/3 pin length c≦t
		(5)Progressive cracks	All taken to be unacceptable.

NO.	Item	Criteria
1.	Plinhole	 Dot display a and b are each ≦0.2mm The overall total is taken be with in 10 units. Note that they are not to be concentrated.
2.	Missing	 Dot display a and b are each ≦0.2mm The overall total is taken to be with in 10 units.
3.	Thick and thin display	 Taken to be within±1.5% of display character width(a) and height(b).

16. OUTLINE DIMENSIONS