

A Brighter Solution

AMP DISPLAY INC.

SPECIFICATIONS

GRAPHIC LCD MODULE

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	A G - 6 4 0 2 0 0 A S T C W - C 0 0
APPROVED BY:	
DATE:	

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APPROVED FOR SPECIFICATIONS

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APPROVED FOR SPECIFICATION AND PROTOTYPES

AMP DISPLAY INC

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2006/5/2	--	New Release	Lorry
2006/5/3	4	Modify the CCFL characteristics	Lorry

1 FEATURES

- (1) Display format : 640×200 dot-matrix ; 1/ 200 duty ; 1/14 bias.
- (2) Construction : LCD, PCB, White Color CCFL Back-light, Heat Seal , Zebra , Bezel and interface cable.
- (3) Display type : STN , Negative , 6 o'clock view.
- (4) Segment and Common Driver : KS0086 or equivalent.
- (5) Besides +5V power input logic circuit. -24V is needed for LCD driving.
- (6) Normal temperature type.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	$0.30(W) \times 0.30(H)$	mm
Dot pitch	$0.33(W) \times 0.33(H)$	mm
Viewing area	$218.0(W) \times 74.0(H)$	mm
Module size	$259.5(W) \times 104.0(H) \times 15.5 \text{ max (T)}$	mm

3 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Min	Max	Unit
Logic Circuit Supply Voltage		VDD-VSS	-0.3	7.0	V
LCD Driving Voltage		VDD-VO	-0.3	26.0	V
Input Voltage		Vi	-0.3	VDD+0.3	V
Normal temp. type	Operating Temp.	TOP	0	50	°C
	Storage Temp.	TSTG	-20	70	°C

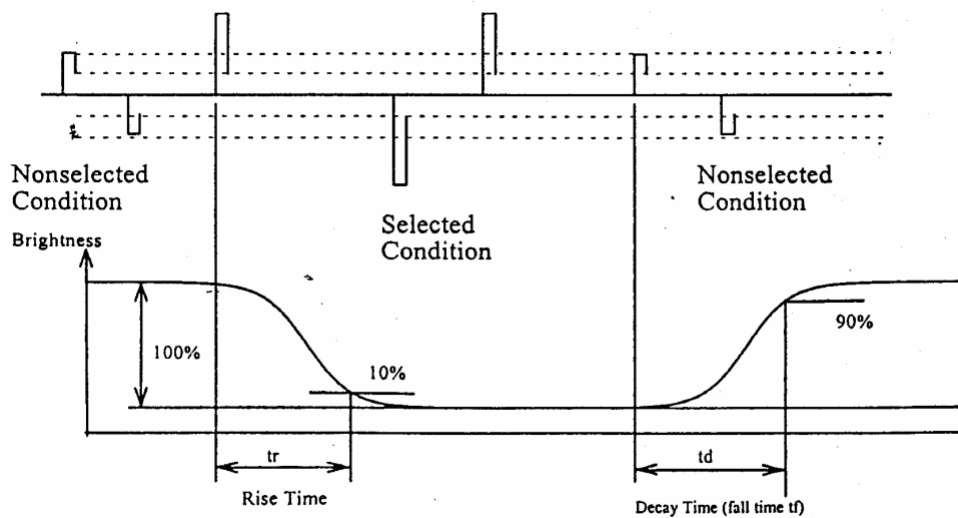
4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	4.5	5.0	5.5	V	
LCD Driving Voltage	VDD-VO	25 °C	20.7	21.84	23.0	V	This should be follow the real design
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	12	--	mA	
----- Optical Characteristics -----							
Contrast	CR		2	3	--		Note 1
Rise Time	Tr	25°C	--	200	300	ms	Note 2
Fall Time	tf	25°C	--	190	285	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	20	--	Deg.	Note 3
	θ b		--	25	--		
	θ l		--	35	--		
	θ r		--	35	--		
Frame Frequency	fF	25°C	--	70	--	Hz	
----- White CCFL Back-light Characteristics -----							
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Tube start Voltage	Vs	--	--	--	930	Vrms	
Tube Current	IL	--	--	5.0	--	mA	
Drive Frequency	F	--	--	40	--	KHz	
Bare CCFL Brightness		IL=5 mA	750	--	--	cd/m ²	Turn on B/L after 10 mins
LCM Average Brightness		--	--	100	--	cd/m ²	

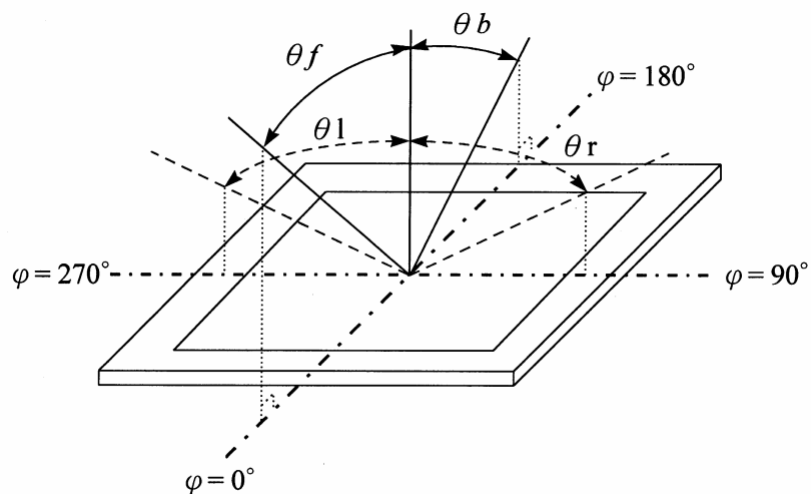
(NOTE 1) Contrast ratio :

$$CR = (\text{Brightness in OFF state}) / (\text{Brightness in ON state})$$

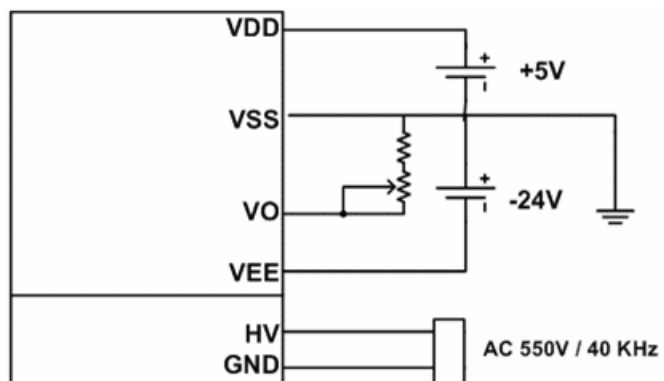
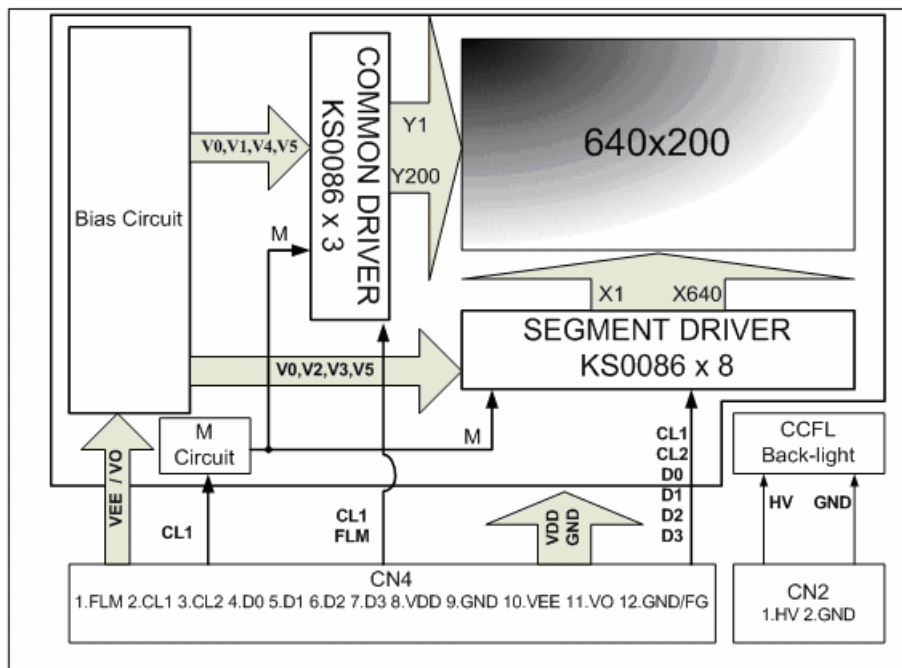
(NOTE 2) Response time :



(NOTE 3) Viewing angle



5 BLOCK DIAGRAM & POWER SUPPLY



6 PIN CONNECTIONS

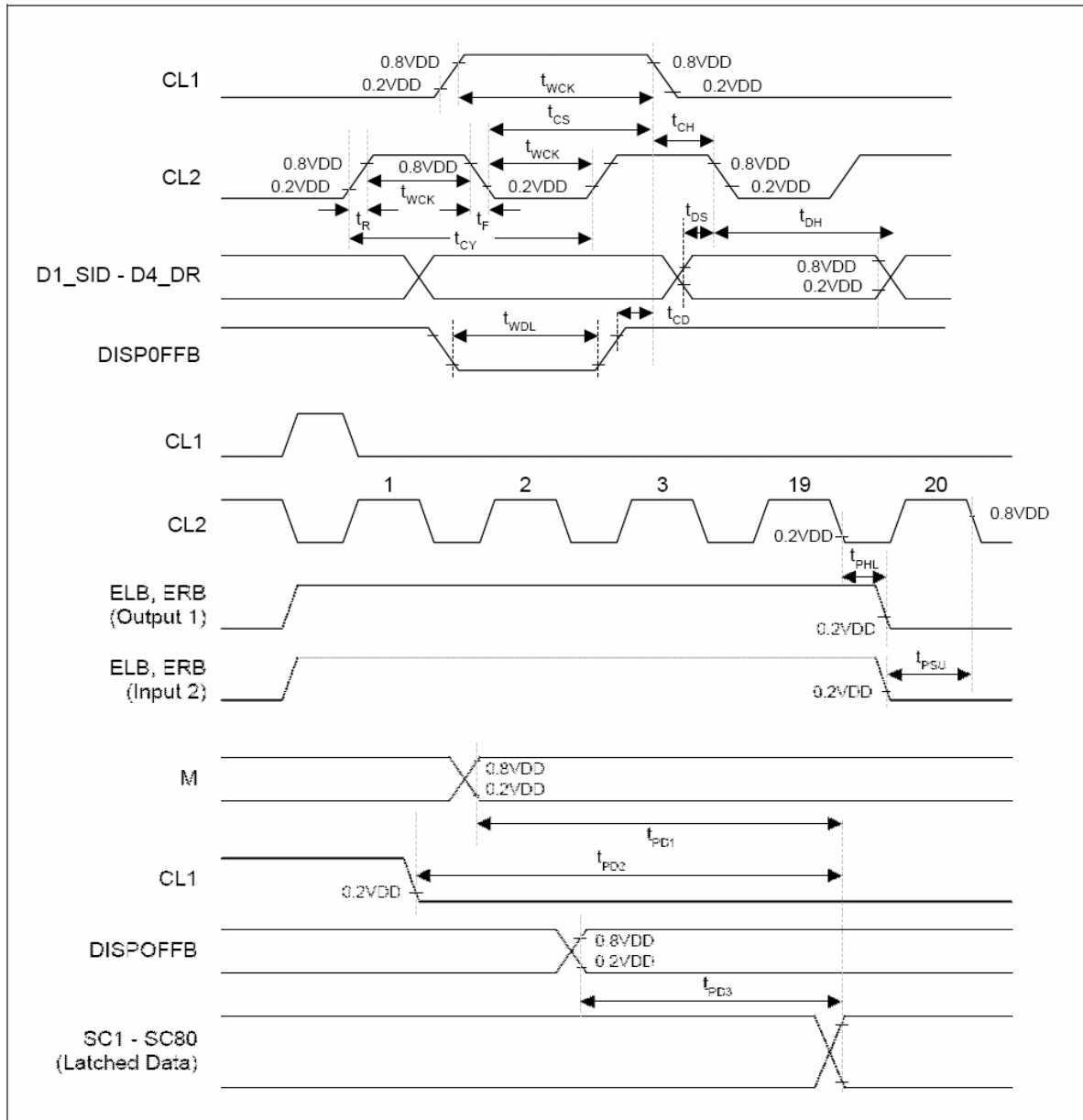
CN4 Molex No 2695 22-01-2125 (or equivalent).		
Pin No.	Symbol	Function
1	FLM	Scan Start Signal
2	LP	Display Data Latch plus
3	CLK	Display Data Receive Signal
4	LD0	Display Data 0
5	LD1	Display Data 1
6	LD2	Display Data 2
7	LD3	Display Data 3
8	VDD	Power supply for Logic (+5V)
9	GND	Power supply for logic (0V)
10	VEE	Power supply to driver LCD (-24V)
11	VO	Adjust contrast
12	GND/FGND	Bezel connect to Logic 0V

7 TIMING CHARACTERISTICS

(1) Segment Driver Application

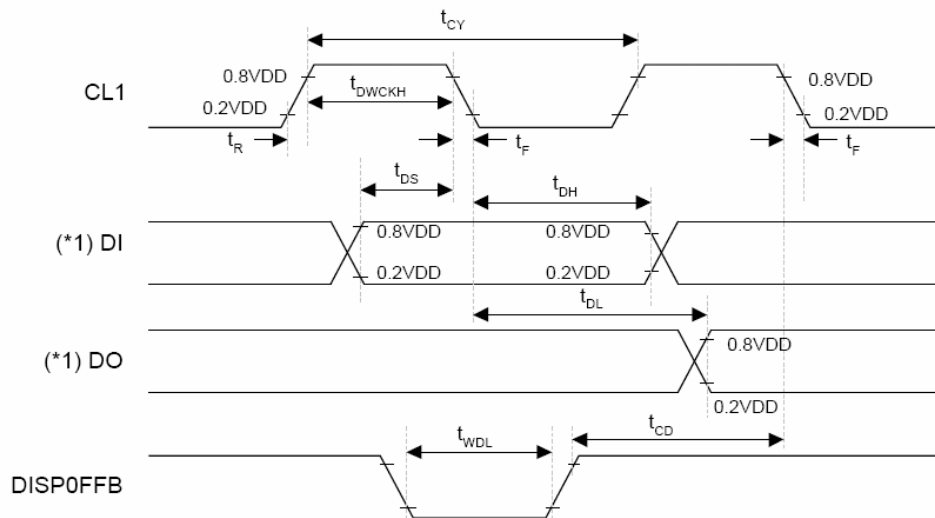
(V_{SS} = 0V, Ta = - 30 – +85°C)

Characteristic	Symbol	Test Condition	(1) V _{DD} = 5V ±10%			(2) V _{DD} = 3V ±10%			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t _{CY}	Duty = 50%	125	-	-	250	-	-	ns
Clock pulse width	t _{WCK}	-	45	-	-	95	-	-	
Clock rise / fall time	t _R /t _F	-	-	-	-	-	-	30	
Data set-up time	t _{DS}	-	30	-	-	65	-	-	
Data hold time	t _{DH}	-	30	-	-	65	-	-	
Clock set-up time	t _{CS}	-	80	-	-	120	-	-	
Clock hold time	t _{CH}	-	80	-	-	120	-	-	
Propagation delay time	t _{PHL}	ELB Output	-	-	60	-	-	125	
		ERB Output			60			125	
ELB,ERB set-up time	t _{PSU}	ELB Input	30	-	-	65	-	-	
		ERB Input	30		65				
DISPOFFB low pulse width	t _{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t _{CD}	-	100	-	-	100	-	-	ns
M - OUT propagation delay time	t _{PD1}	C _L = 15pF	-	-	1.0	-	-	1.2	μs
CL1 - OUT propagation delay time	t _{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB - OUT propagation delay time	t _{PD3}		-	-	1.0	-	-	-	



(2) Common Driver Application $(V_{SS} = 0V, T_a = -30 - +85^{\circ}C)$

Characteristic	Symbol	Test Condition	(1) $V_{DD} = 5V \pm 10\%$			(2) $V_{DD} = 3V \pm 10\%$			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t_{CY}	Duty = 50%	250	-	-	500	-	-	ns
Clock pulse width	t_{WCK}	-	45	-	-	95	-	-	
Clock rise / fall time	t_R/t_F	-	-	-	50	-	-	50	
Data set-up time	t_{DS}	-	30	-	-	65	-	-	
Data hold time	t_{DH}	-	30	-	-	65	-	-	
DISPOFFB low pulse width	t_{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t_{CD}	-	100	-	-	100	-	-	ns
Output delay time	t_{DL}	$C_L = 15pF$	-	-	200	-	-	250	
M – OUT propagation delay time	t_{PD1}		-	-	1.0	-	-	1.2	μs
CL1 - OUT propagation delay time	t_{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB - OUT propagation delay time	t_{PD3}		-	-	1.0	-	-	1.2	



(*1) When in single-type interface mode

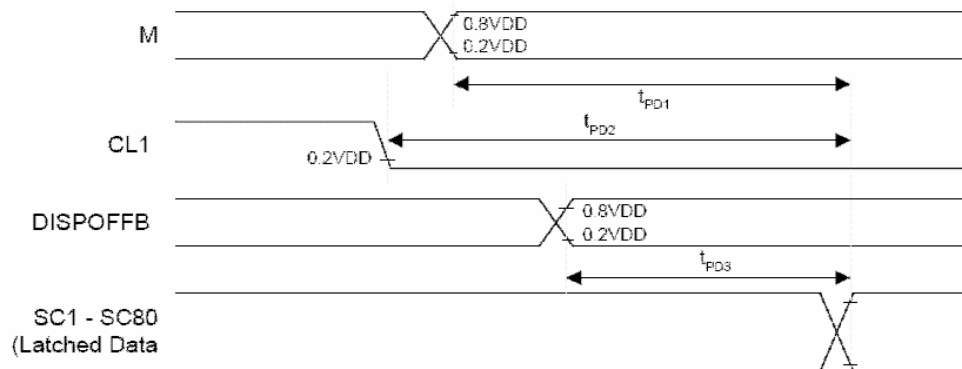
DI => D2_DL (SHL = L), D4_DR (SHL = H)

DO => D4_DR (SHL = L), D2_DL (SHL = H)

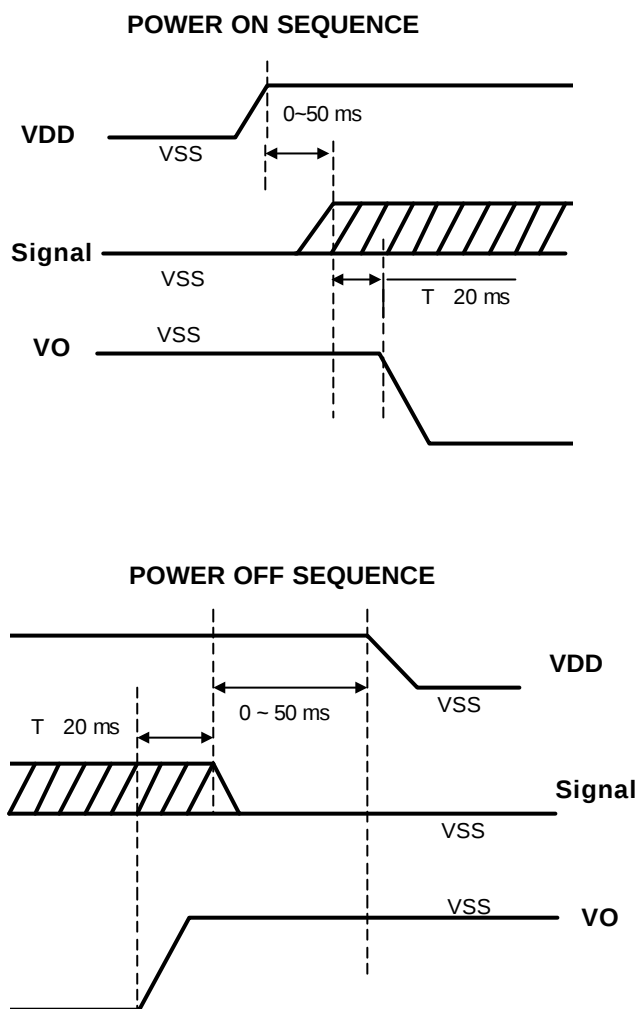
When in dual-type interface mode

DI => D2_DL and D3_DM (SHL = L), D4_DR and D3_DM (SHL = H)

DO => D4_DR (SHL = L), D2_DL (SHL = H)



7.1 Power ON/OFF Sequence



8 QUALITY AND RELIABILITY

8.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $60 \pm 25\% \text{ RH}$.

8.2 SAMPLING PLAN

Sampling method shall be in accordance with MIL -STD-105E , level II, normal single sampling plan .

8.3 ACCEPTABLE QUALITY LEVEL

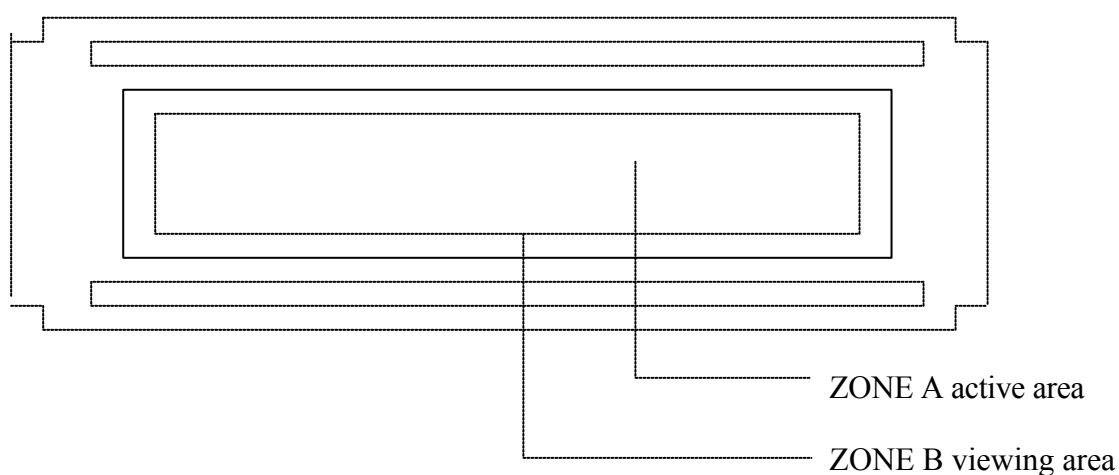
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

8.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under fluorescent light. The inspection area of LCD panel shall be within the range of following limits.

8.5 INSPECTION QUALITY CRITERIA

Item	Description of defects			Class of Defects	Acceptable level (%)	
Function	Short circuit or Pattern cut			Major	0.65	
Dimension	Deviation from drawings			Major	1.5	
Black spots	Ave . dia . D	area A	area B	Minor	2.5	
	D≤0.2	Disregard				
	0.2<D≤0.3	3	4			
	0.3<D≤0.4	2	3			
	0.4<D	0	1			
Black lines	Width W, Length L		A	B	Minor	2.5
	W≤0.03		disregard			
	0.03<W≤0.05		3	4		
	0.05<W≤0.07 , L≤3.0		1	1		
	See line criteria					
Bubbles in polarizer	Average diameter D 0.2 < D < 0.5 mm for N = 4 , D > 0.5 for N = 1			Minor	2.5	
Color uniformity	Rainbow color or newton ring.			Minor	2.5	
Glass Scratches	Obvious visible damage.			Minor	2.5	
Contrast ratio	See note 1			Minor	2.5	
Response time	See note 2			Minor	2.5	
Viewing angle	See note 3			Minor	2.5	



8.6 RELIABILITY

Test Item	Test Conditions	Note
High Temperature Operation	50±3°C , t=96 hrs	
Low Temperature Operation	0±3°C , t=96 hrs	
High Temperature Storage	70±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	1,2
Thermal Shock Test	-30°C ~ 25 °C ~ 80 °C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15 ~ -35°C , 45-65%RH).

Definitions of life end point :

Current drain should be smaller than the specific value.

Function of the module should be maintained.

Appearance and display quality should not have degraded noticeably.

Contrast ratio should be greater than 50% of the initial value.

9 HANDLING PRECAUTIONS

- (1) A LCD module is a fragile item and should not be subjected to strong mechanical shocks.
- (2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in color.
- (3) Under no circumstances should the position of the bezel tabs or their shape be modified.
- (4) Do not modify the display PCB in either shape or positioning of components.
- (5) Do not modify or move location of the zebra or heat seal connectors.
- (6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.
- (7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.
- (8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketone or aromatic is not permitted.
- (9) Prior to initial power up input signals should not be applied.
- (10) Protect the module against static electricity and observe appropriate anti-static precautions.

10 OUTLINE DIMENSION

