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-320240A1FICW30H**
APPROVED BY	
DATE	

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RECORD OF REVISION

Revision Date	Page	Contents
2001/12/24		New Release
2003/2/13		Modify the Logic voltage to 3.0~5.5V
2003/2/26		Modify to Extend temp.

1 FEATURES

(1) Display format : 320 × 240 dot-matrix, 1/240 duty.

(2) Construction : FSTN LCD, Bezel, Heat Seal, Zebra, CCFL back-light and PCB.

(3) Display Type: FSTN, Transflective, Positive type, 6 o'clock view.

(4) White Edge LED back-light.

(5) Common and Segment Driver : KS0086.

(6) Besides +5.5V/+3.0V for logic circuit, -20V is needed for LCD driving

(7) Extend temperature type.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.345(W) × 0.345(H)	mm
Dot pitch	0.36(W) × 0.36(H)	mm
Viewing area	122.0(W) × 92.0(H)	mm
Module size (with LED)	167.1(W) × 109.0(H) × 11.0 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		V_I	-0.3	VDD+0.3	V
Extend temp. type	Operating Temp.	T_{OP}	-20	70	°C
	Storage Temp.	T_{STG}	-30	80	°C

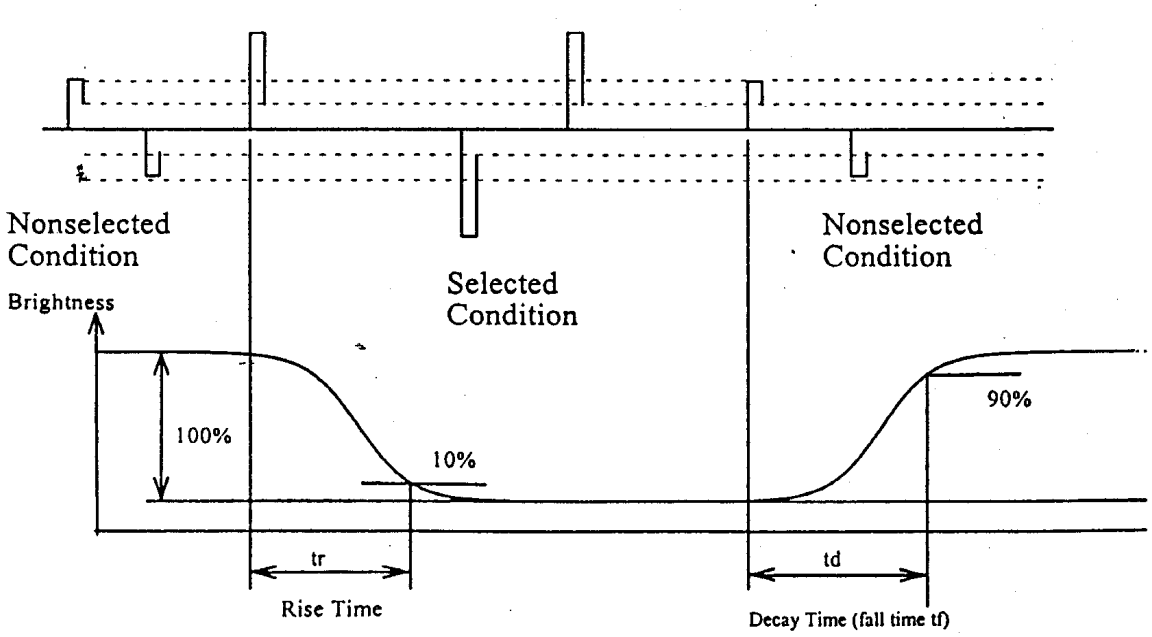
4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	3.0	--	5.5	V	
LCD Driving Voltage	VDD-VO	-20 °C	-	22.6	-	V	0 ~ 50 °C for Normal Temp. type -20 ~ 70 °C for Extended Temp. type
		0 °C	-	21.8	-		
		25 °C	-	21.2	-		
		50 °C	-	20.0	-		
		70 °C	-	19.5	-		
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	5	--	mA	
----- Optical Characteristics -----							
Contrast	CR	FSTN type	--	8	--		Note 1
Rise Time	tr	25°C	--	200	300	ms	Note 2
Fall Time	tf	25°C	--	200	300	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	35	--		
	θ l		--	35	--		
	θ r		--	35	--		
Frame Frequency	fF	25°C	--	64	--	Hz	

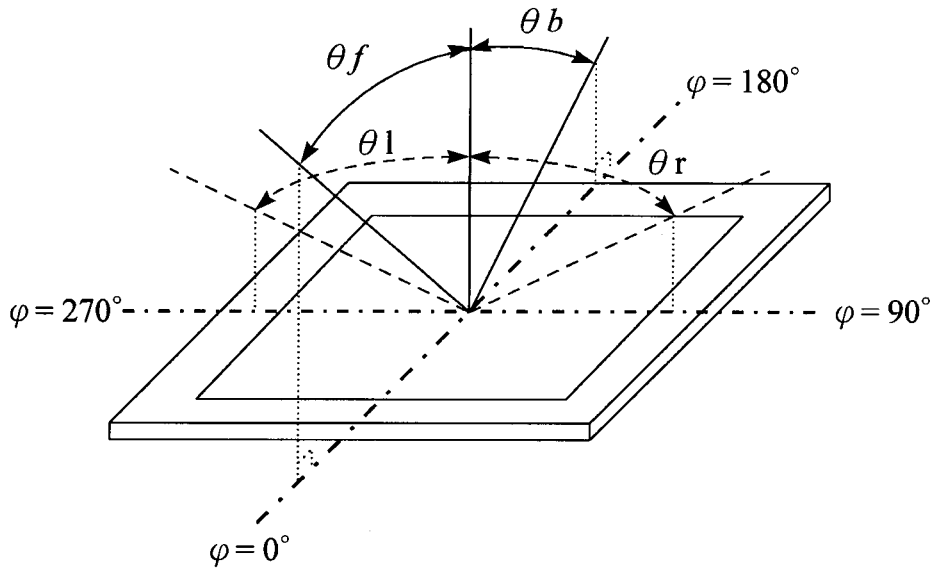
(NOTE 1) Contrast ratio :

CR = (Brightness in OFF state) / (Brightness in ON state)

(NOTE 2) Response time :



(NOTE 3) Viewing angle

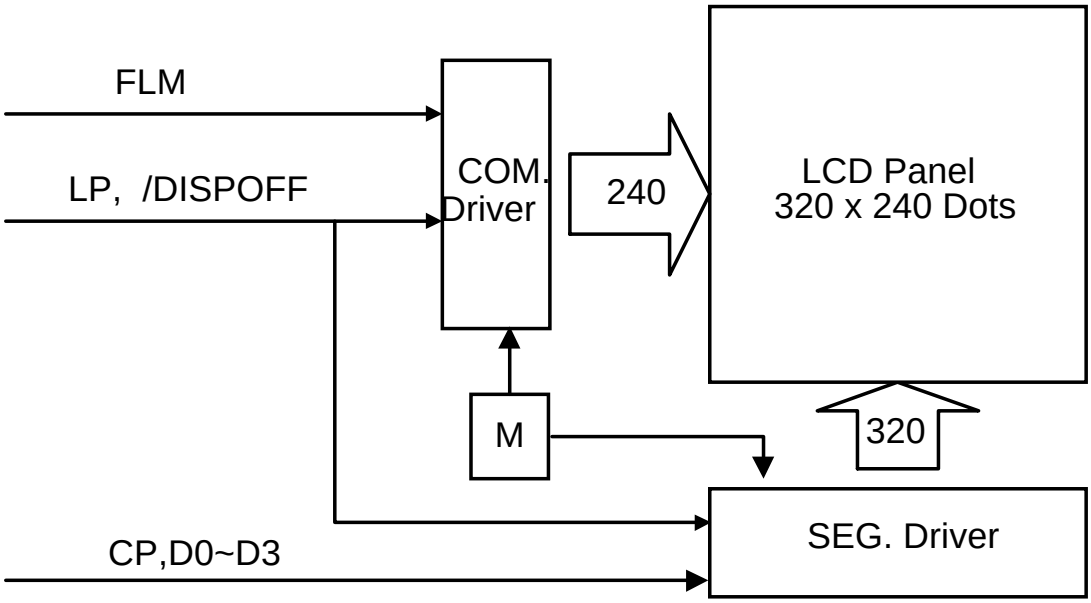


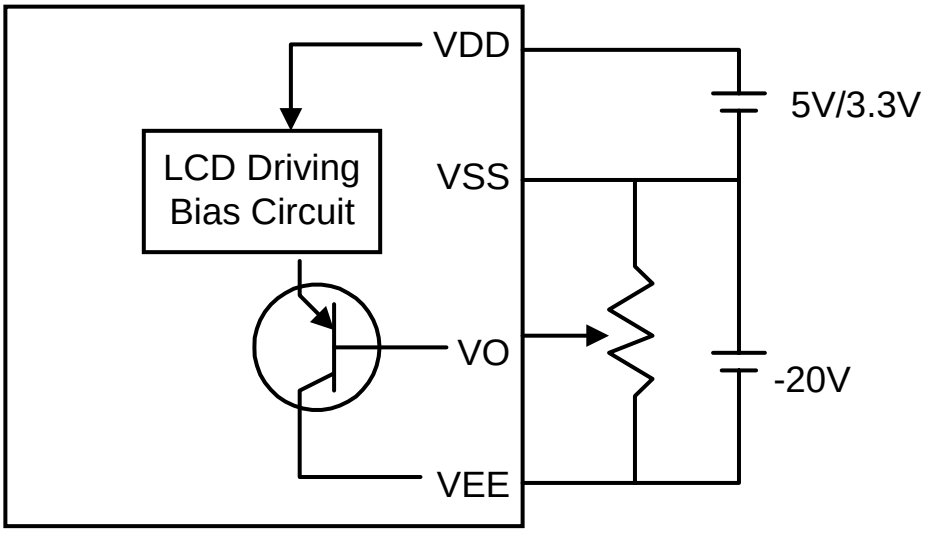
4.1 CCFL Back-light Electrical Specification

Parameter	Condition	Standard Value	Unit
Tube Voltage	Ta=25 °C	370	Vrms
Tube Current	Ta=25 °C	5	mArms
LCM brightness	--	150	Cd / m^2
Half-Brightness Life*	--	10,000	hour
Life Under Low Temperature	Ta=0 °C	Above 400	hour

*The life-time of the average brightness reach to 50% of initial brightness .

5 BLOCK DIAGRAM & POWER SUPPLY

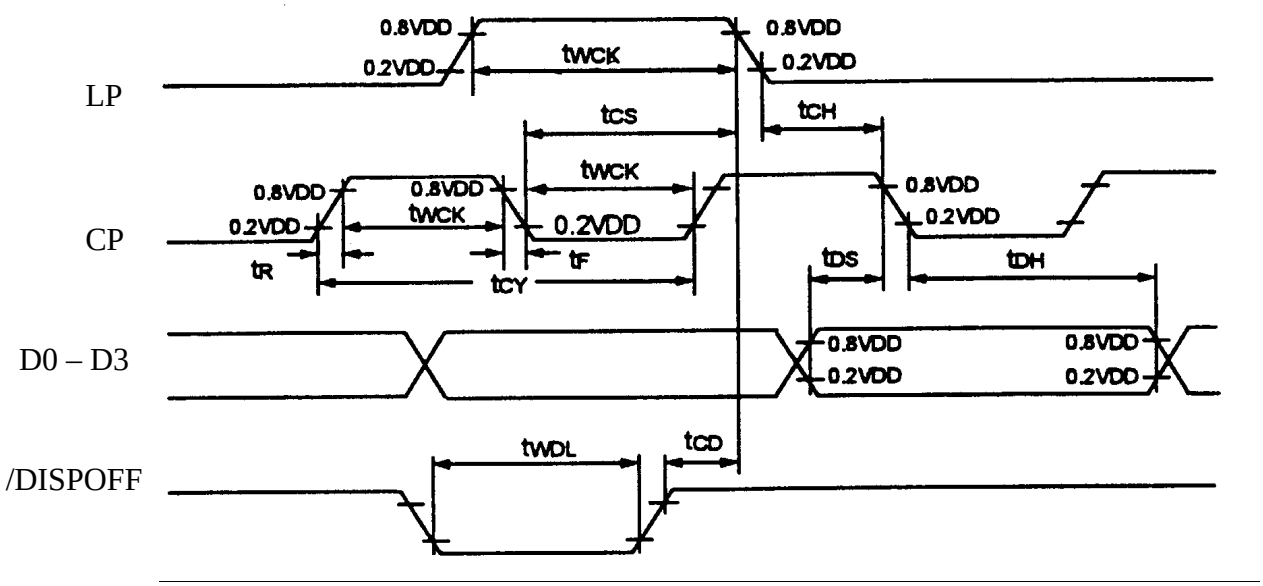




6 PIN CONNECTIONS

No.	Symbol	Function
1	D0	Data Bus Line
2	D1	Data Bus Line
3	D2	Data Bus Line
4	D3	Data Bus Line
5	/DISPOFF	Display Off Control
6	FLM	First Line Marker
7	NC	No Connection
8	LP	Data Latch Clock
9	CP	Data Shift Clock
10	VDD	Supply Voltage for Logic (+5V/3.3V)
11	VSS	Ground (0V)
12	VEE	Supply Voltage for LCD
13	VO	Contrast Adjustment
14	FGND	Frame Ground

7 TIMING CHARACTERISTICS

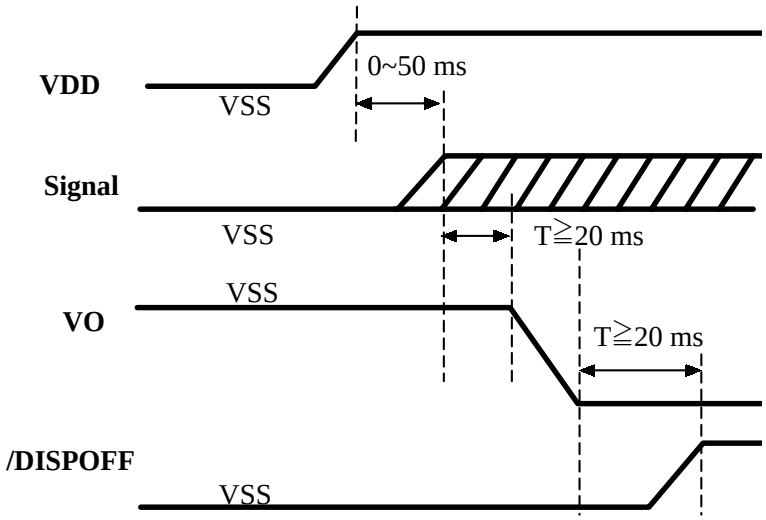


Characteristic	Symbol	Min.	Max.	Unit
Clock cycle time	t_{CY}	125	--	ns
Clock pulse width	t_{WCK}	45	--	
Data set up time	t_{DS}	30	--	
Data hold time	t_{DH}	30	--	
Clock set-up time	t_{CS}	80	--	
Clock hold time	t_{CH}	80	--	
DISPOFF low pulse width	t_{WDL}	1200	--	
DISPOFF clear time	t_{CD}	100	--	

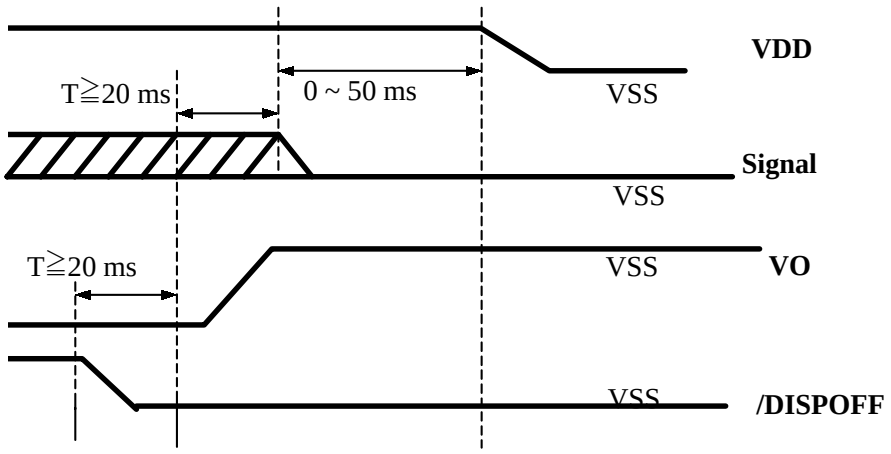
7.1 Power ON/OFF Sequence

Please maintain the blow sequence when turning on and off the power supply of the module. If /DISPOFF is supplied to the module while internal alter signal for LCD driving (M) is unstable, DC component will be supplied to the LCD panel. This may cause damage the LCD module.

POWER ON SEQUENCE



POWER OFF SEQUENCE



8 QUALITY AND RELIABILITY

8.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : 25 ± 5°C

Humidity : 60 ± 25% 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

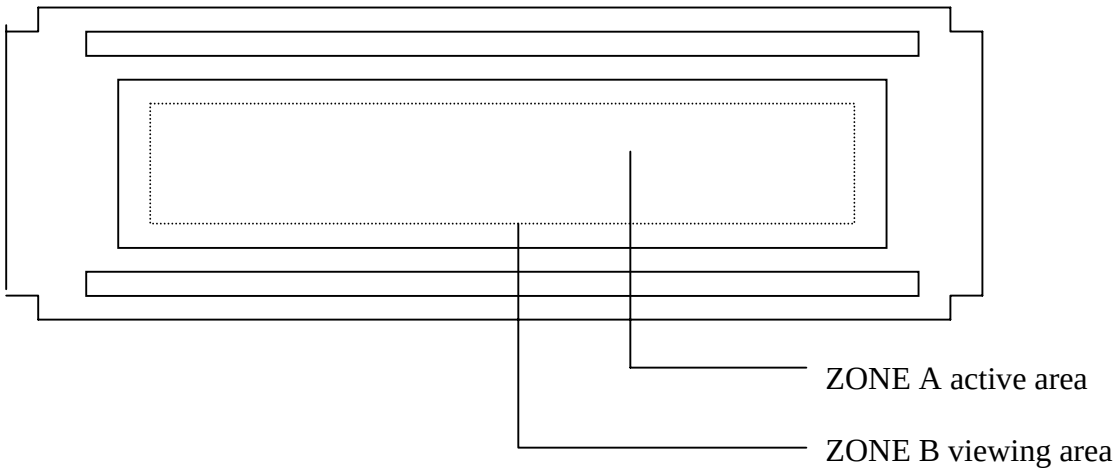
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant 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 flourescent 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
	Normal Temp. type	Extended Temp. type	
High Temperature Operation	50±3°C , t=96 hrs	70±3°C , t=96 hrs	
Low Temperature Operation	0±3°C , t=96 hrs	-20±3°C , t=96 hrs	
High Temperature Storage	70±3°C , t=96 hrs	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	-30±3°C , t=96 hrs	1,2
Temperature Cycle	-20°C ~ 25°C ~ 70°C 30 min. 5 min. 30 min. (1 cycle) Total 5 cycle	-30°C ~ 25°C ~ 80°C 30 min. 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