



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-320240A4STQW-Q7H(N)
APPROVED BY	
DATE	

AMPIRE CO., LTD.

**TOWER A, 4F, No.114, Sec. 1, HSIN-TAI 5th RD., HIS-CHIH,
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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2007/4/27	-	New Release	Alen

1 FEATURES

- (1) Display format : 320 × 240 dot-matrix, 1/240 duty.
- (2) Construction : STN LCD, Bezel, Heat Seal, Zebra, Edge White LED backlight, and PCB.
- (3) Display type : STN LCD, Negative , 6 o'clock view.
- (4) Common and Segment Driver: KS0086 or equivalent.
- (5) 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 Touch Panel)	167.0(W) × 109.0(H) × 12.5 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	
Extend temp. type	Operating Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

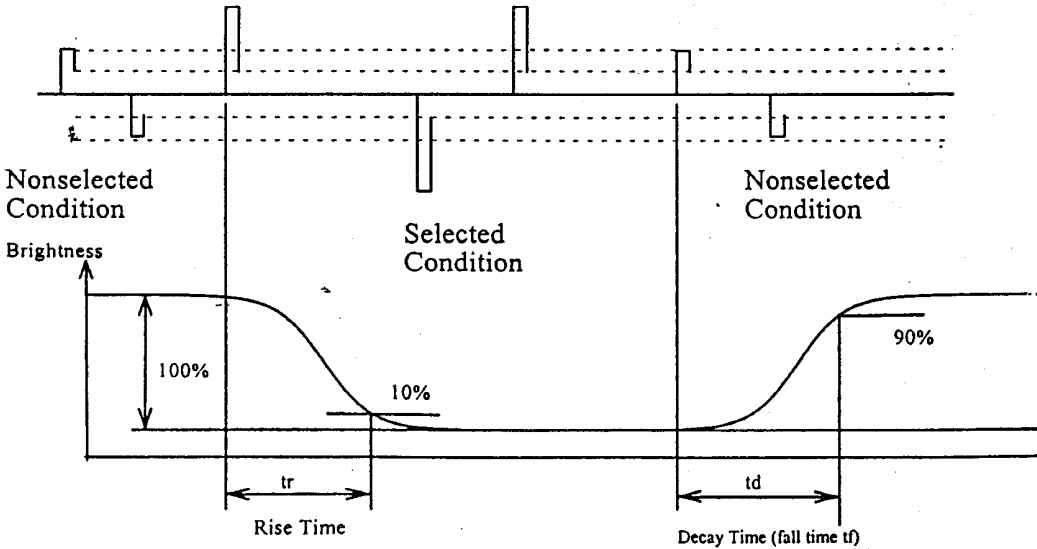
4 ELECTRO-OPTICAL CHARACTERISTICS

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	20.5	21.6	22.7	V	
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	25	--	mA	
----- Optical Characteristics -----							
Contrast	CR	FSTN type	4	5.5	8.0		Note 1
Rise Time	tr	25°C	100	120	180	ms	Note 2
Fall Time	tf	25°C	110	140	210	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	--	70	--	Hz	

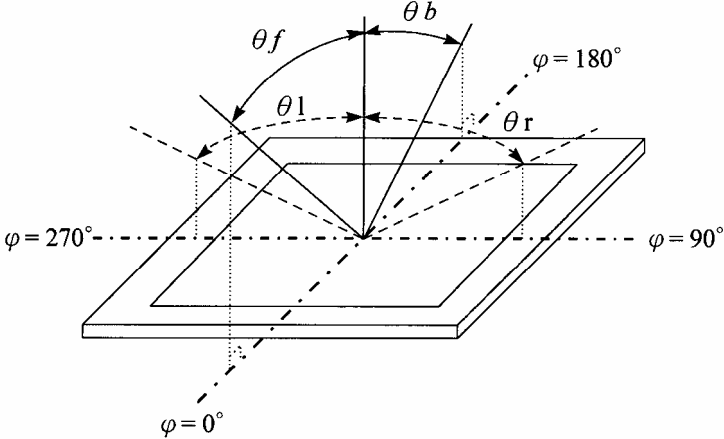
(NOTE 1) Contrast ratio :

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

(NOTE 2) Response time :



(NOTE 3) Viewing angle



4.1 LED Back-light Electrical Specification

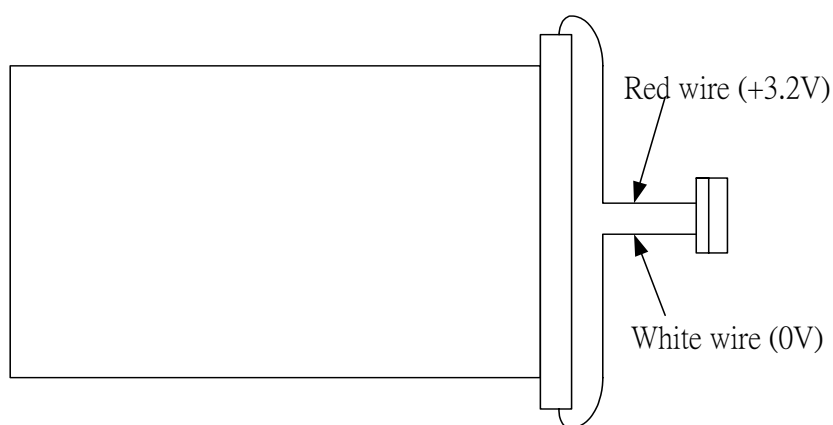
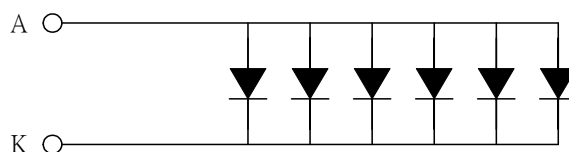
----- White LED Back-light Characteristics -----							
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Forward Current	IF	--	--	90	120	mA	Note 4
LED Luminous intensity		IF=90mA	--	45	--	cd/m ²	Note 4
Forward Voltage	VF	IF=90mA	--	3.2	3.5	V	Note 5
LED C.I.E	X	IF=90mA	0.28	0.31	0.34		Note 6
	Y	IF=90mA	0.29	0.32	0.35		

Note 4: Luminous intensity is decided by forward current of White LED.

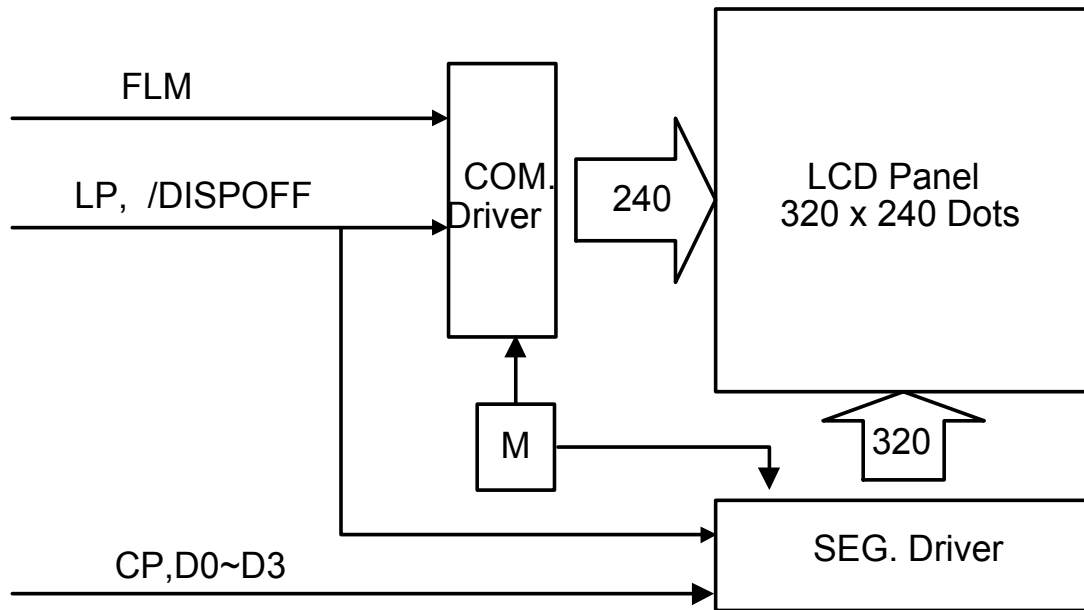
Note 5: White LEDs are with voltage tolerance under the same current.

Note 6: White LEDs are with color tolerance under the same current.

* LED Dice number = 6



5 BLOCK DIAGRAM & POWER SUPPLY



6 PIN CONNECTIONS

CN1-1 : 14 pin

PIN NO.	SIGNAL	LEVEL	FUNCTION
1	D0	H/L	Data Bus Line
2	D1	H/L	Data Bus Line
3	D2	H/L	Data Bus Line
4	D3	H/L	Data Bus Line
5	/DISPOFF	H/L	Display Off Control
6	FLM	H/L	First Line Marker
7	M	H/L	No Connection, M signal will generation from inside circuit.
8	LP	H/L	Data Latch Clock
9	CP	H/L	Data Shift Clock
10	VDD	--	Power Supply for Logic(+5.0V)
11	VSS	--	Power Supply(Ground : 0V)
12	VEE	--	DC/DC Negative voltage output (-20V)
13	V0	--	Contrast Adjustment Input
14	FGND	--	Frame Ground

7 TIMING CHARACTERISTICS

7.1 8080 Family Interface Timing

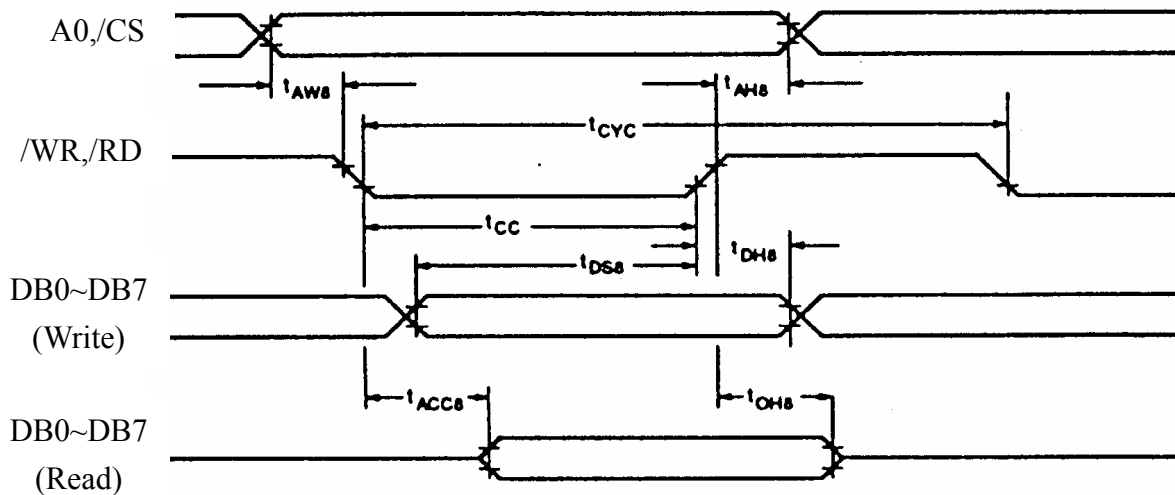
Parameter	Condition	Symbol	Min	Max	Unit	Remark
Address Hold Time	CL=100 pF VDD=2.7~4.5	t_{AH8}	10		ns	A0,/CS
Address Setup Time		t_{AW8}	0		ns	
System Cycle Time		t_{CYC}	Note		ns	/WR,/RD
Strobe Pulse Width		t_{CC}	150		ns	
Data Setup Time		t_{DS8}	120		ns	DB0~DB7
Data Hold Time		t_{DH8}	5		ns	
/RD Access Time		t_{ACC8}	-	80	ns	
Output Disable Time		t_{OH8}	10	55	ns	

Note: For memory control and system control commands:

$$t_{CYC8} = 2t_C + t_{OC} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

$$t_{CYC8} = 4t_C + t_{OC} + 30$$



7.2 6800 Family Interface Timing

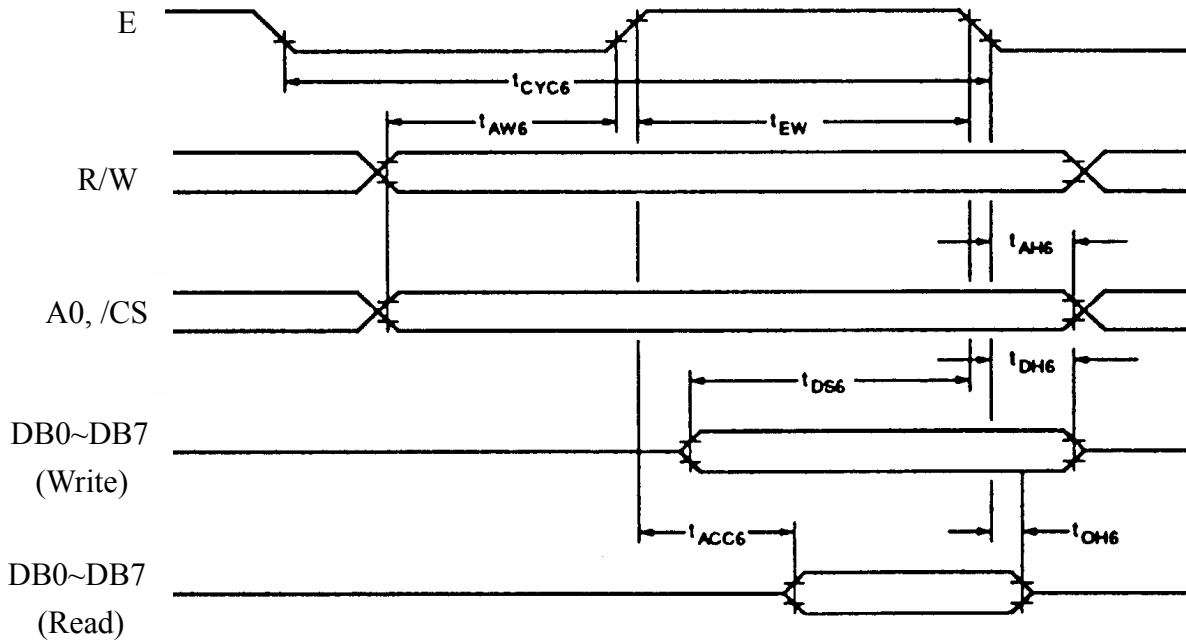
Parameter	Condition	Symbol	Min	Max	Unit	Remark
System Cycle Time	CL=100 pF VDD=2.7~4.5	t_{CYC6}	Note		ns	A0,/CS, R/W
Address Setup Time		t_{AW6}	10		ns	
Address Hold Time		t_{AH6}	0		ns	
Data Setup Time		t_{DS6}	120		ns	DB0~DB7
Data Hold Time		t_{DH6}	0		ns	
Output Disable Time		t_{OH6}	10	75	ns	
Access Time		t_{ACC6}	-	130	ns	
Enable Pulsewidth			t_{EW}	150	-	ns

Note: For memory control and system control commands:

$$t_{CYC6} = 2t_C + t_{EW} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

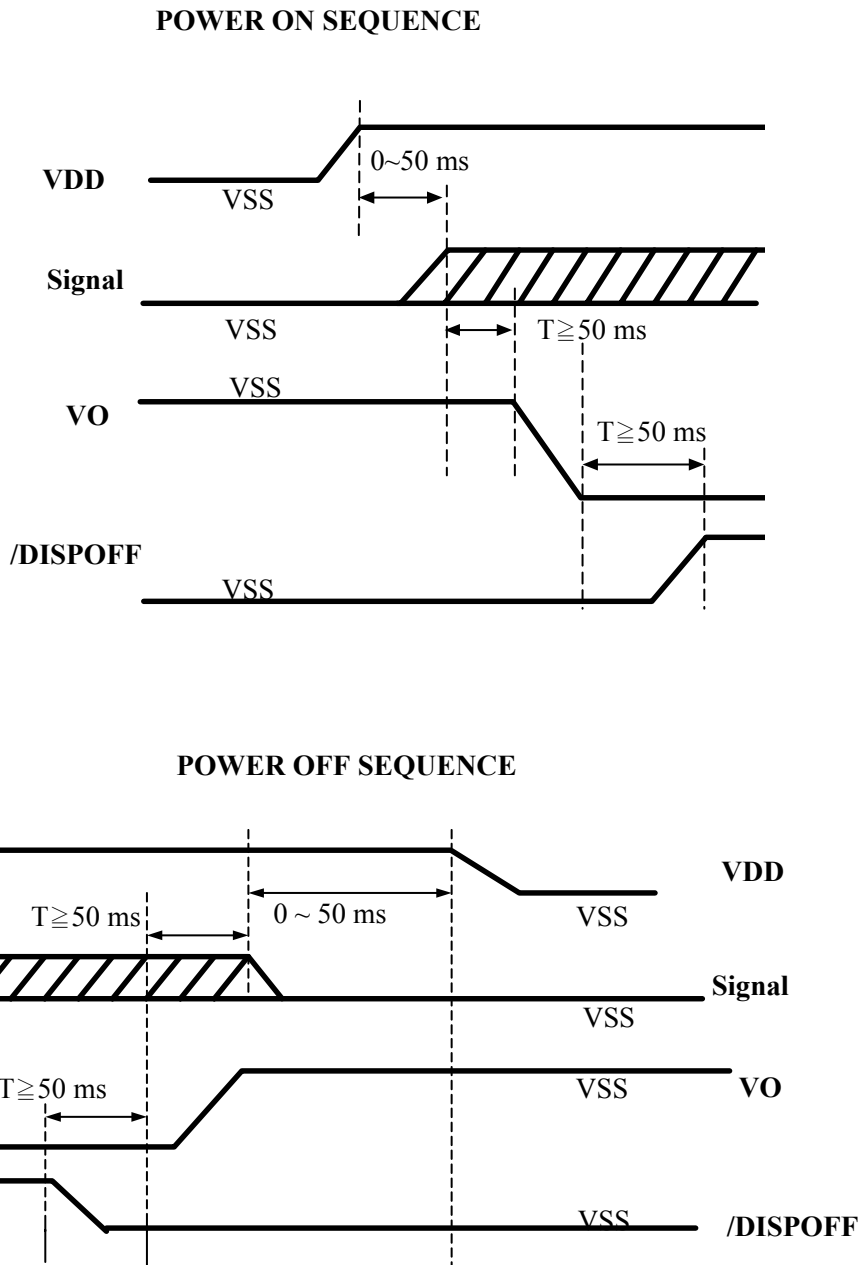
$$t_{CYC6} = 4t_C + t_{EW} + 30$$



AC Electrical Characteristics

8 Power ON/OFF Sequence

Please maintain the below 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.



9 QUALITY AND RELIABILITY

9.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

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

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

9.2 SAMPLING PLAN

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

9.3 ACCEPTABLE QUALITY LEVEL

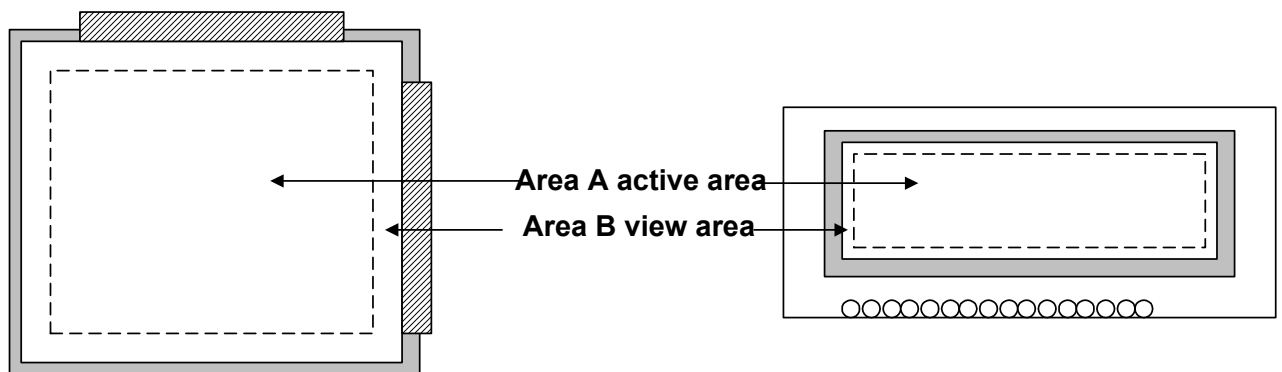
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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

9.4 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.

9.5 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
	$D \leq 0.2$	Disregard			
	$0.2 < D \leq 0.3$	3	4		
	$0.3 < D \leq 0.4$	2	3		
	$0.4 < D$	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	$W \leq 0.03$	disregard			
	$0.03 < W \leq 0.05$	3	4		
	$0.05 < W \leq 0.07, L \leq 3.0$	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 nektion 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



9.6 RELIABILITY

Test Item	Test Conditions	Note
	Extended Temp. type	
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 hrs	1,2
Temperature 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).

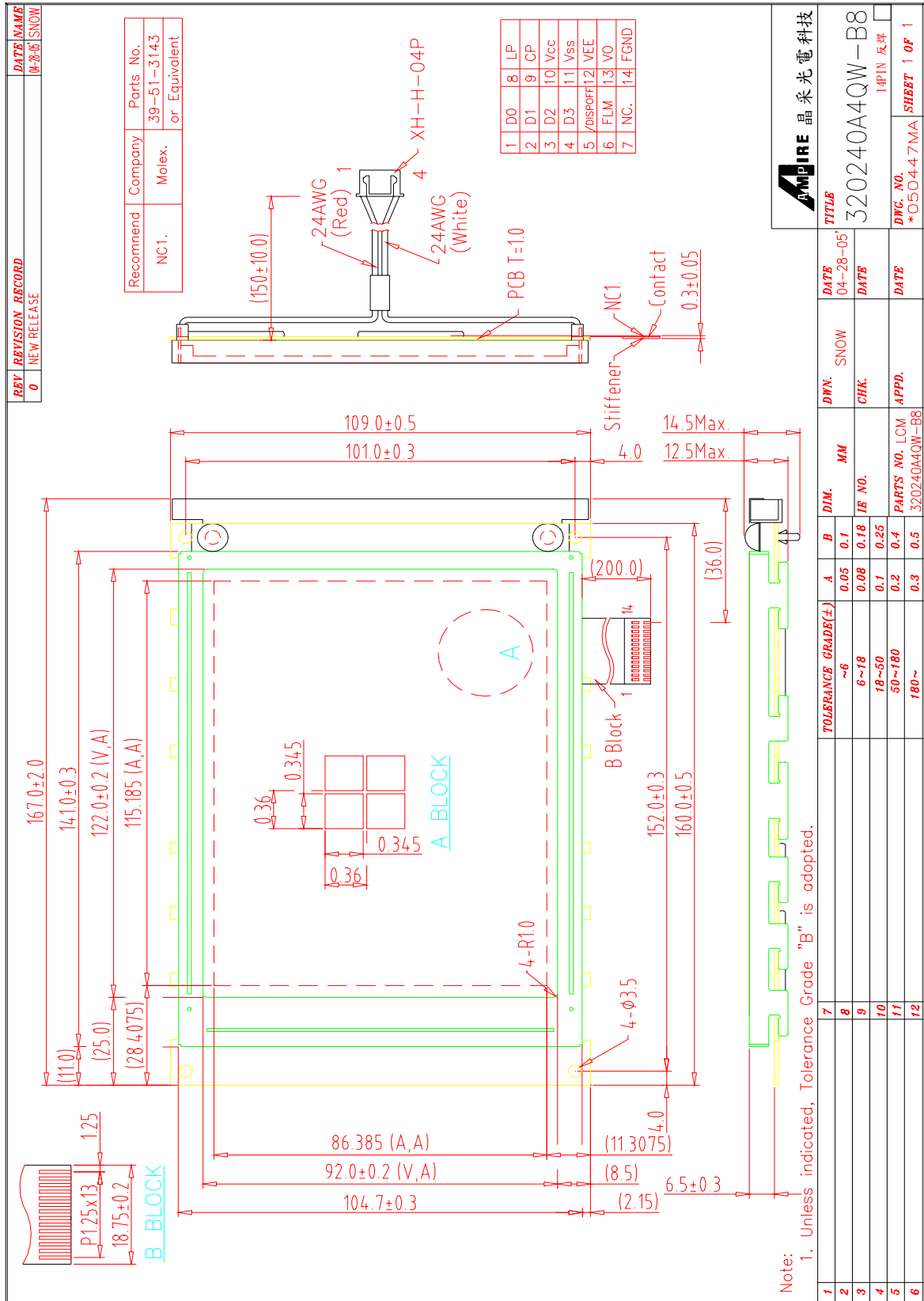
Definitions of life end point :

- 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.

10 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.

11 OUTLINE DIMENSION



AMPIRE 晶采光电科技

TITLE 320240A4QW-B8

DWG. NO. *O50447MA

DATE 04-28-05

CHK. SNOW

APPD. 14PIN 反牌

SHEET 1 OF 1

Note: 1. Unless indicated, Tolerance Grade "B" is adopted.

7	TOLERANCE GRADE(±)	A	B	DIM.	MM	DWN.	DATE
8	~6	0.05	0.1			SNOW	04-28-05
9	6~18	0.08	0.18	IB NO.			
10	18~50	0.1	0.25				
11	50~180	0.2	0.4	PARTS NO. LCM			
12	180~	0.3	0.5	320240A4QW-B8			