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.	**AT-128128H1FI-00H**
APPROVED BY	
DATE	

☐ **Approved For Specifications**
☐ **Approved For Specifications & Sample**

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RECORD OF REVISION

Revision Date	Contents	
2002/8/26	New Release	
2002/8/27	Added the block of TAB solder dimension	(Page 14)
2002/8/29	Modify the LCM outline dimension	(Page 14)
2002/8/30	Added the TCP IC dimension	(Page 14)
2002/9/23	Modify the LCM outline dimension	(Page 15)
	Added the LCM default setting	(Page 6)
2003/2/21	Modify the LCM passive component	(Page 11)

1 FEATURES

(1) Display format : 128×128 dots, 1/128 duty.

(2) Construction : LCD panel, TAB IC and FPC.

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

(4) Controller : HD66750S or equivalent

(5) LCD polarizer : New P1 polarizer.

(6) +2.8V single power input.

(7) Built-in temp compensation circuit.

(8) Extend temperature type.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.199(W) × 0.219(H)	mm
Dot pitch	0.213(W) × 0.233(H)	mm
Viewing area	30.5(W) ×32.0 (H)	mm
Module size	36.3(W) × 82.8(H) × 1.4 max.(T)	mm

3 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Min	Max	Unit
Logic Circuit Supply Voltage		VDD-VSS	-0.3	+4.6	V
LCD Driving Voltage		VLCD-VSS	0	20.0	V
Input Voltage		VI	-0.3	VDD+0.3	V
Extend temp. type	Operating Temp.	TOP	-20	75	°C
	Storage Temp.	TSTG	-30	80	°C

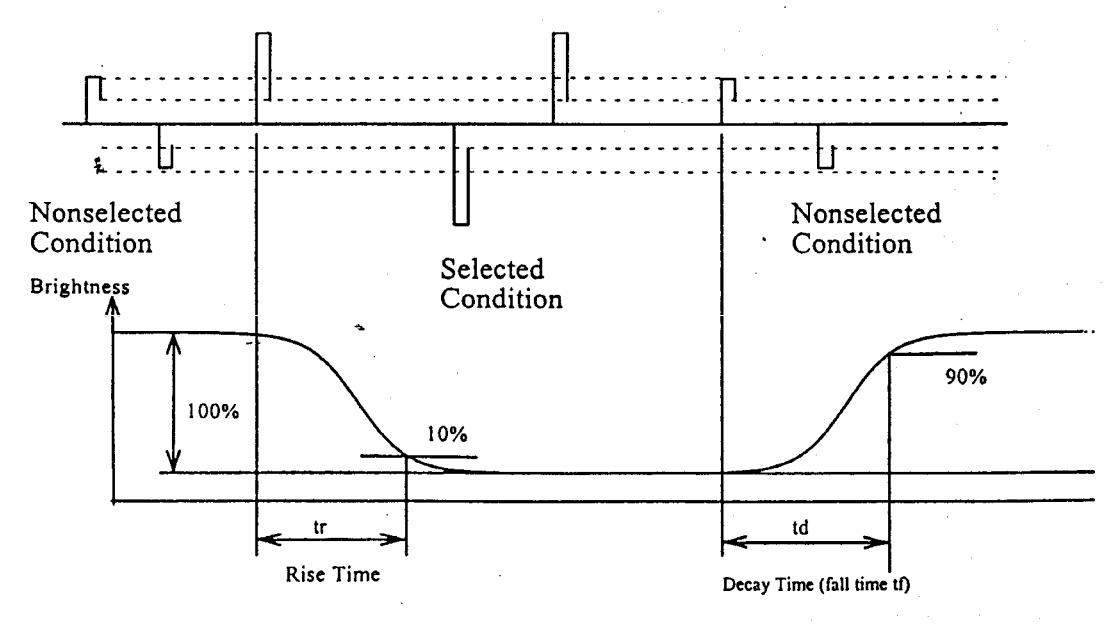
4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.4	2.8	3.6	V	
LCD Driving Voltage (FSTN)	VO-VSS	-20 °C	--	13.55	--	V	
		25 °C	--	12.8	--		
		70 °C	--	12.13	--		
Input Voltage	VIH	--	0.7VDD	--	VDD	V	
	VIL	--	-0.3	--	0.15 VDD	V	
Logic Supply Current	IDD	VDD 3.3V	--	0.2	0.4	mA	
----- Optical Characteristics (FSTN) -----							
Contrast	CR	25°C	--	7	--		Note 1
Rise Time	tr	25°C	--	200	--	ms	Note 2
Fall Time	tf	25°C	--	200	--	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	30	--		
	θ l		--	35	--		
	θ r		--	35	--		
Frame Frequency	fF	25°C	--	64	--	Hz	

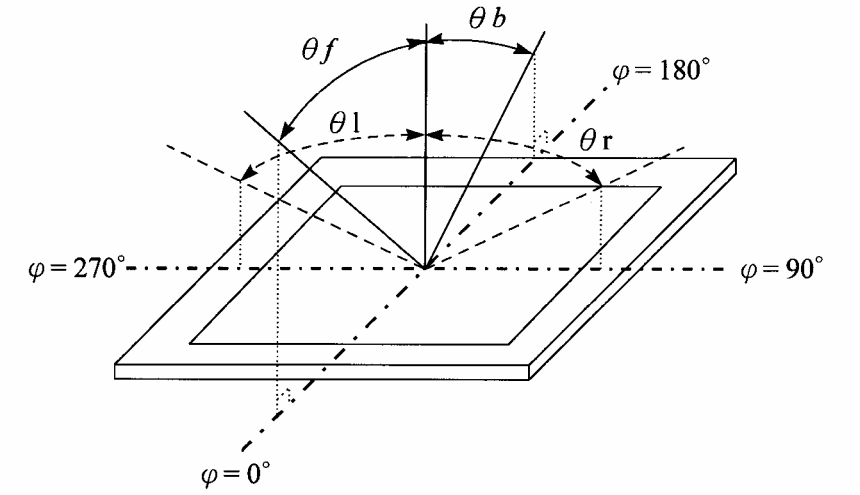
(NOTE 1) Contrast ratio :

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

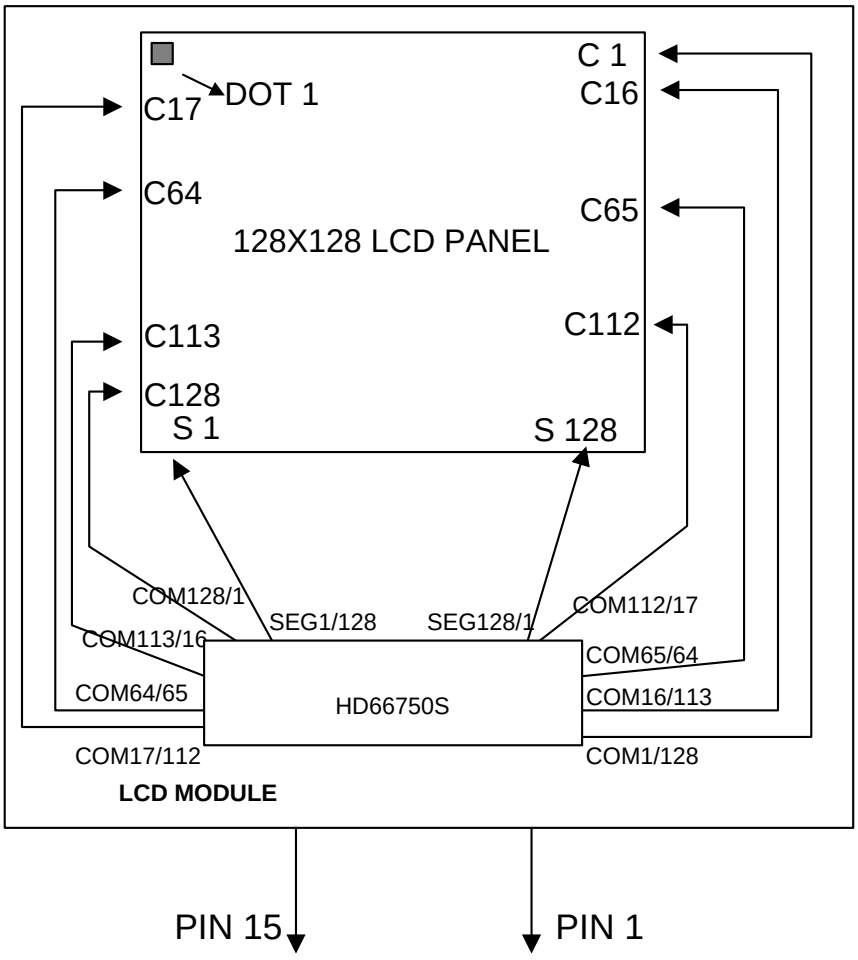
(NOTE 2) Response time :



(NOTE 3) Viewing angle



5 BLOCK DIAGRAM



Default Setting:

Symbol	H/L	Description
IM[2:0]	LHH	8080 System 8-bit bus interface
OPOFF	L	Turn on amplifier
TEST	L	Test pin
DB[7:0]	L	8-bit data bus
VTEST	NC	Test Pin

6 INTERFACE

No.	Symbol	Function
1	VDD	Power supply for logic circuit
2	D7	8-bit data bus for 80 series MPU
3	D6	
4	D5	
5	D4	
6	D3	
7	D2	
8	D1	
9	D0	
10	/RES	Reset pin .Initializes the LSI when low
11	/CS	Chip select at low
12	A0	Select register Lo:Index/status Hi:Control
13	/WR	Data Write
14	/RD	Data Read
15	VSS	Ground (0V)

7 Software setting

Please must follow the blow setting. Otherwise the temp consumption circuit can't work very well. These setting are related to temp consumption circuit, especially in Power control.

Power control

R/W	RS	DB15	DB14	DB13	DB12	DB11	DB10	DB9	DB8	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	*	*	*	BS2	BS1	BS0	BT1	BT0	*	*	DC1	DC0	AP1	AP0	SLP	STB
0	1	0	0	0	0	0	1	1	1	0	0	1	1	0	1	0	0
					1/10 BIAS			7-TIMES				4-DIVIDED		SMALL			

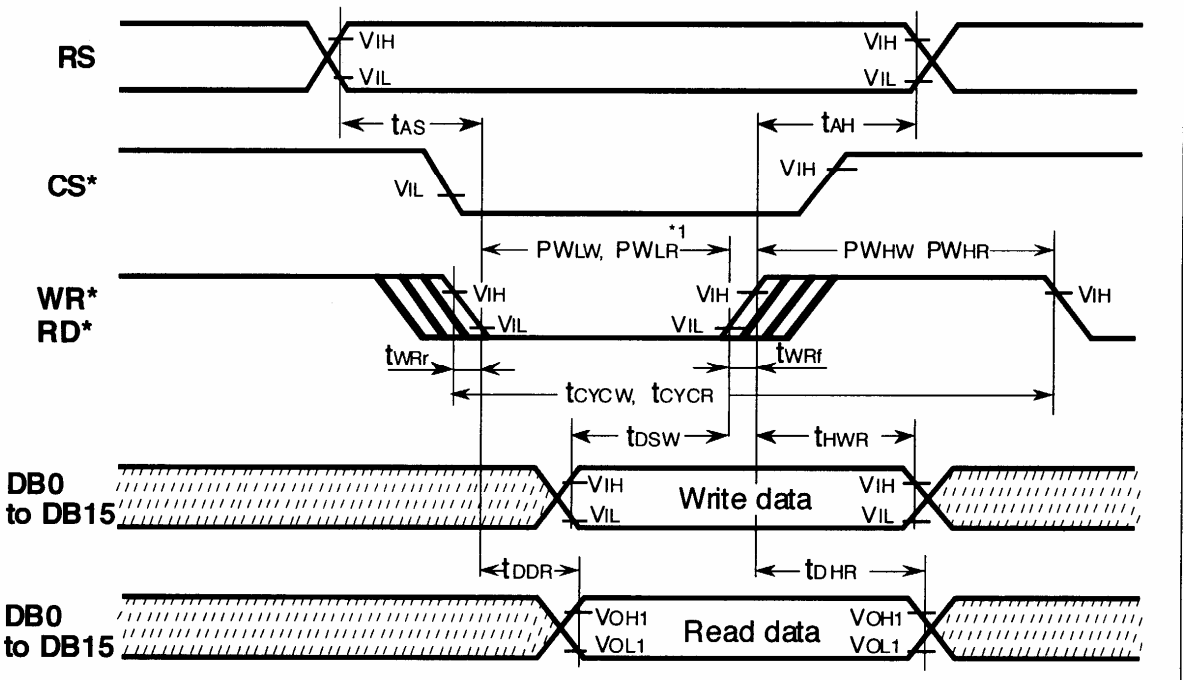
Contrast control

R/W	RS	DB15	DB14	DB13	DB12	DB11	DB10	DB9	DB8	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	*	*	*	*	*	*	*	*	*	*	CT5	CT4	CT3	CT2	CT1	CT0
0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
												28 (HEX) , 40 (DEC)					

8 TIMING CHARACTERISTICS

80-SYSTEM

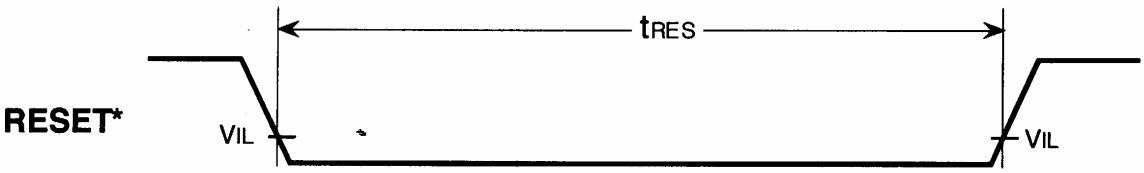
Item	Symbol	VDD=1.8to2.4V		VDD=2.4to3.6V		Unit
		Min	Max	Min	Max	
Bus cycle time	t_{CYCW}	**Write** 600	--	380	--	ns
	t_{CYCR}	**Read** 800		500		
Lo level pulse width	PW_{LW}	**Write**120	--	70	--	
	PW_{LR}	**Read** 350		250		
Hi-level pulse width	PW_{HW}	**Write**300	--	150	--	
	PW_{HR}	**Read** 300		150		
Enable rise/fall time	t_{WRr},t_{WRf}	--	25	--	25	
Address set-up time (RS, R/W to E)	t_{AS}	50	--	50	--	
Address hold time	t_{AH}	20	--	20	--	
Write Data set-up time	t_{DSW}	60	--	60	--	
Write Data hold time	t_{H}	20	--	20	--	
Read Data delay time	t_{DDR}	--	300	--	200	
Read Data hold time	t_{DHR}	5	--	5	--	



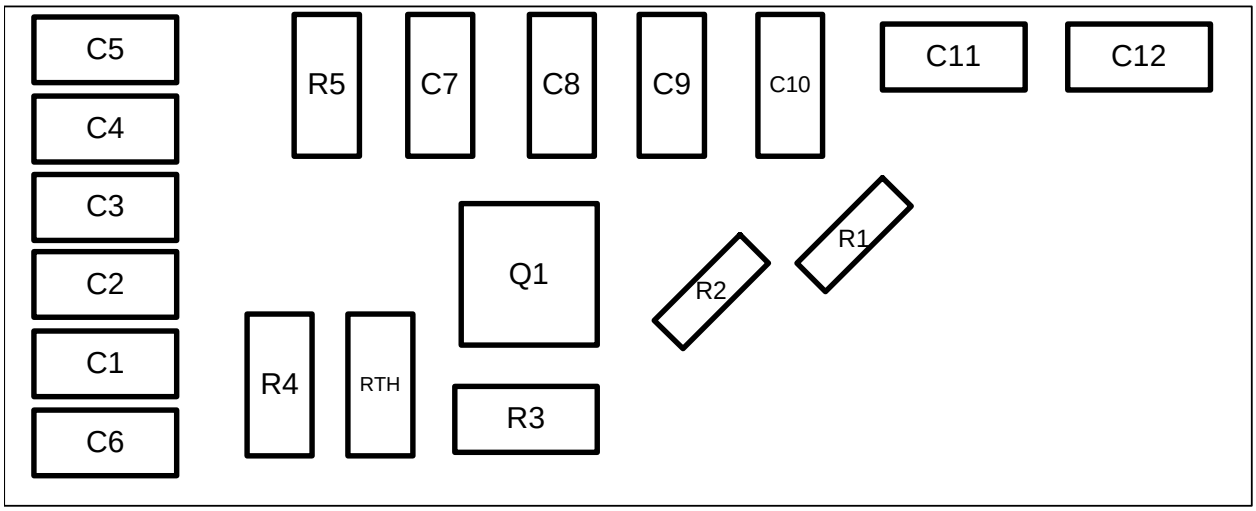
Note 1: PWLW and PWLR are specified in the overlapped period when CS* is low and WR* or RD* is low.

Figure 63 80-system Bus Timing

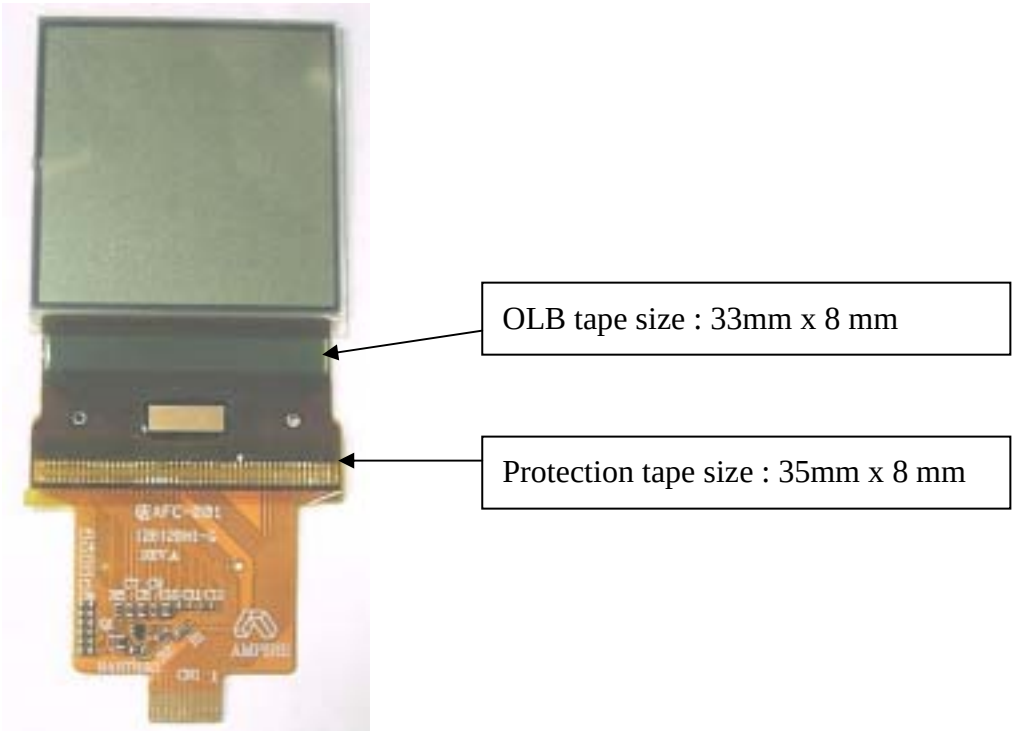
Reset Operation



9 BOM List



Position	Value	Remark
R1	330K ohm	Resister
R2	1K ohm	Resister
R3	6.8K ohm	Resister
R5	0 ohm	Resister
RTH	10K ohm	Thermistor
Q1	2SC4617	Transistor
C1~C12	1UF	Capacitor



10 QUALITY AND RELIABILITY

10.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : 25 ± 5°C

Humidity : 60 ± 25% RH.

10.2 SAMPLING PLAN

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

10.3 ACCEPTABLE QUALITY LEVEL

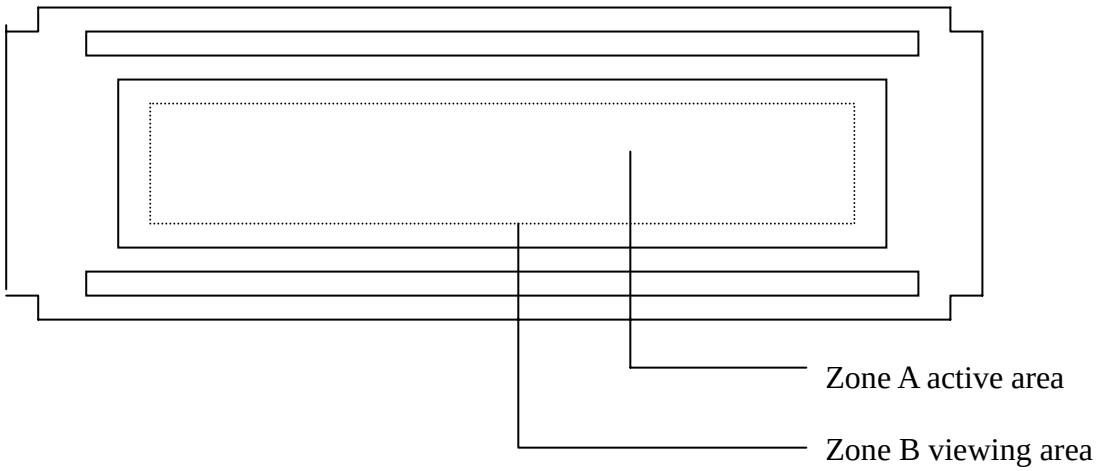
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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

10.4 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.

10.5 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



10.6 RELIABILITY

Test Item	Test Conditions	Note
	Extend Temp. type	
High Temperature Operation	75±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
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.

11 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.

12 OUTLINE DIMENSION