



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.	AF-12864KGI-H
APPROVED BY	
DATE	

☐ Approved For Specifications

☐ Approved For Specifications & Sample

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	Contents
2000/10/5	New Release

1 FEATURES

- (1) Display format : 128×64 dot-matrix with Icons.
- (2) Construction : LCD panel and COF.
- (3) Display type : STN Gray mode, Positive, Transflective, 6 o'clock view
- (4) Driver : NT7502
- (5) 3.0V single power input
- (6) Extended temperature type.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.165(W) × 0.22(H)	mm
Dot pitch	0.185(W) × 0.24(H)	mm
Viewing area	29.0(W) × 21.4(H)	mm
Module size	33.0(W) × 43.6(H) × 2.7 (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	V0-VSS	0	16.0	V
Input Voltage	VI	-0.3	VDD+0.3	V
Operating Temp.	TOP	-20	70	°C
Storage Temp.	TSTG	-30	80	°C

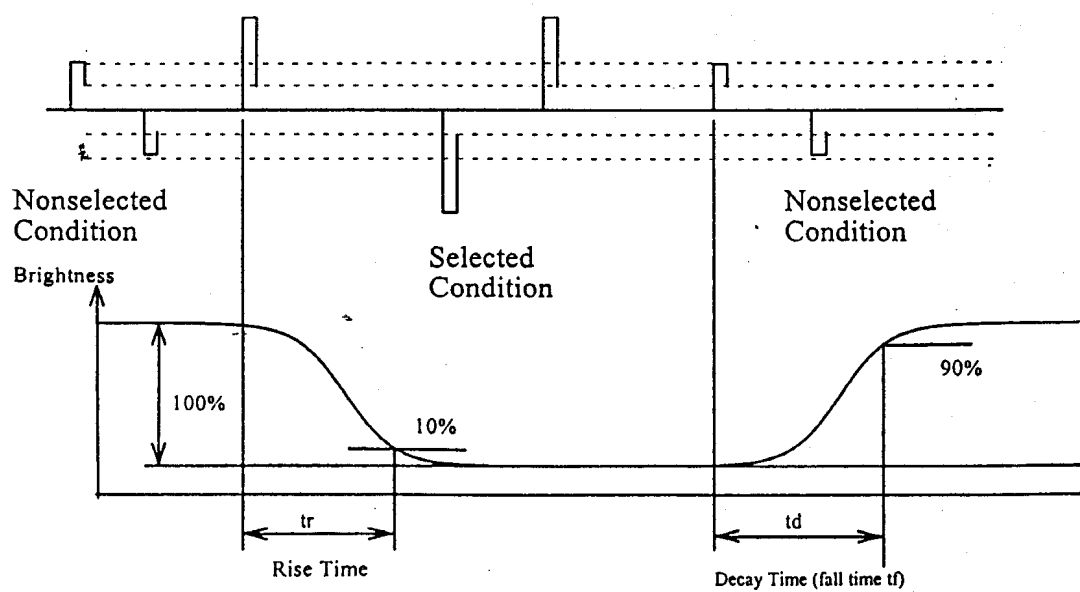
4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.5	3.0	3.5	V	
LCD Driving Voltage	V0-VSS	-20°C	--	10.2	--	V	
		25°C	--	9.0	--		
		70°C	--	7.8	--		
Input Voltage	VIH	--	0.8 VDD	--	VDD	V	
	VIL	--	0	--	0.2 VDD	V	
Logic Supply Current	IDD	VDD = 3V	--	0.2	0.5	mA	
----- Optical Characteristics -----							
Contrast	CR	25°C	--	5	--		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	

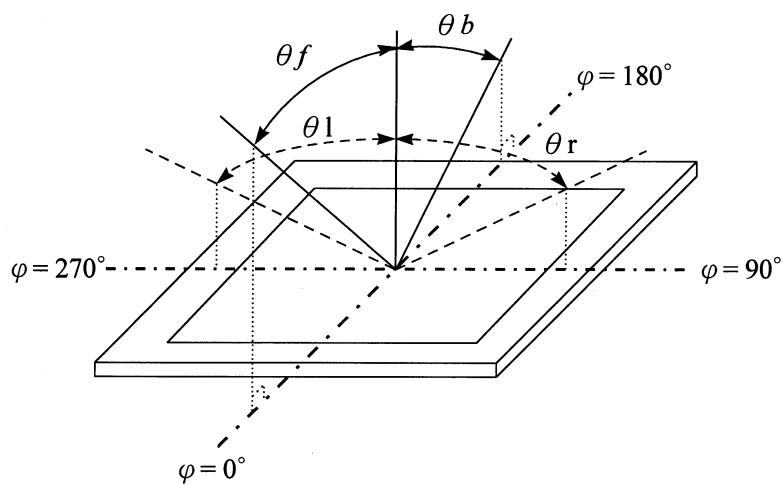
(NOTE 1) Contrast ratio :

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

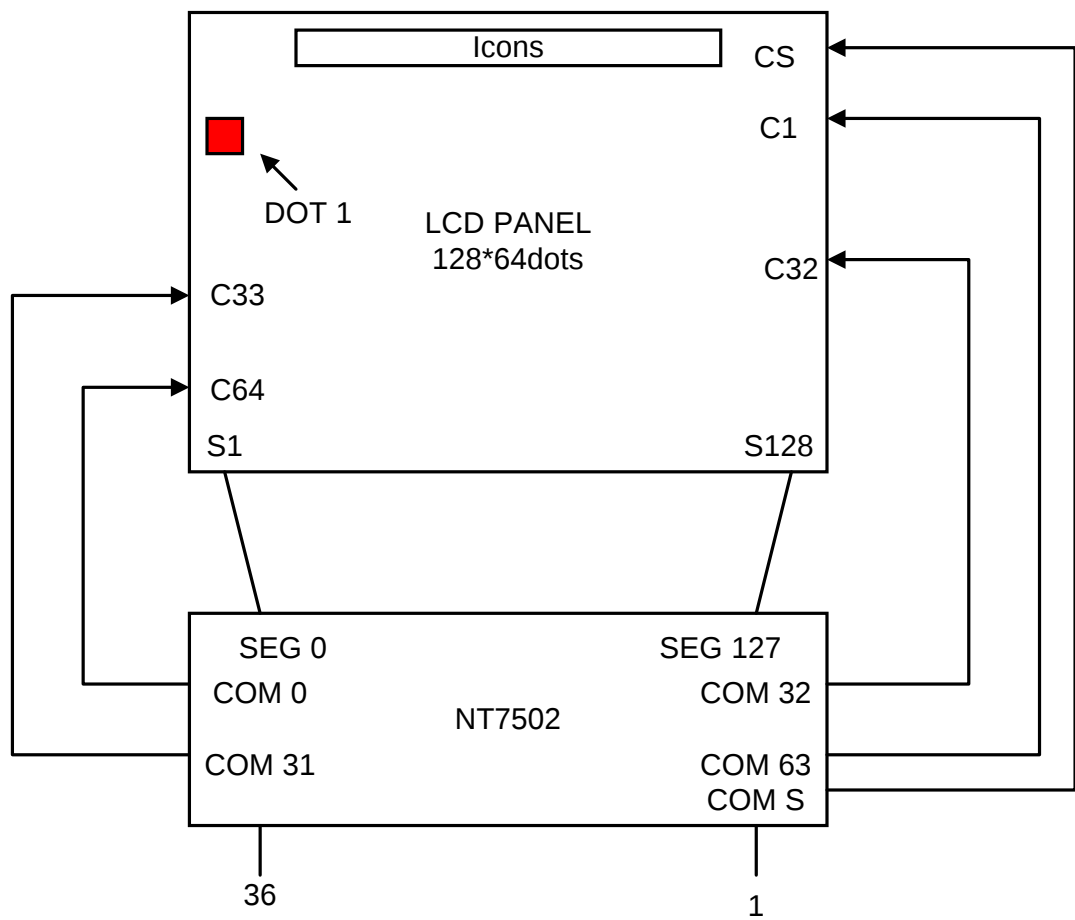
(NOTE 2) Response time :



(NOTE 3) Viewing angle



5 BLOCK DIAGRAM



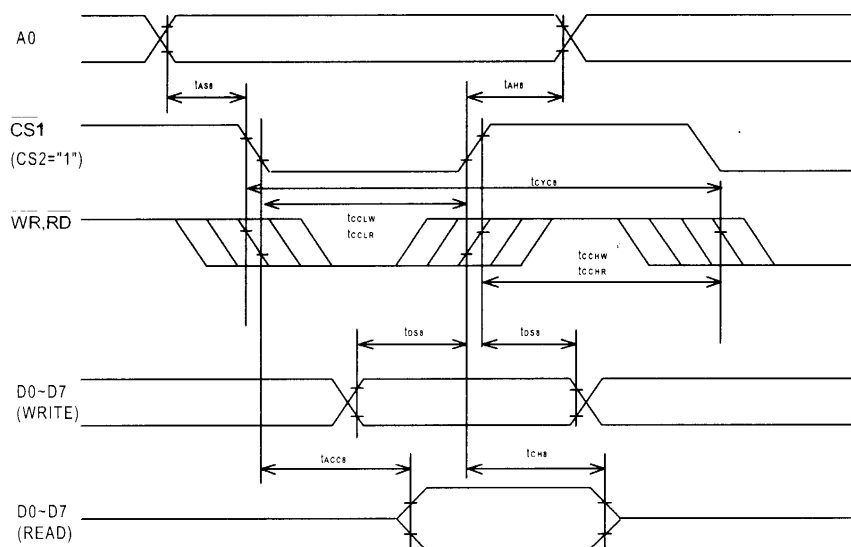
* Please refer to the outline dimension (the last page) for detail Icons control.

6 PIN CONNECTIONS

No.	Signal	Level	Function	
1	NC	--	No Connection	
2	CL	H/L	Display Clock Input	
3	/CS1	H/L	Chip Select Signal	
4	/RES	H/L	Reset Signal	
5	A0	H/L	Data/Instruction Selection Signal	
6	/WR	H/L	Write Signal	
7	/RD	H/L	Read Signal	
8	D0	H/L	Data Bus(8bit)	
9	D1	H/L		
10	D2	H/L		
11	D3	H/L		
12	D4	H/L		
13	D5	H/L		
14	D6(SCL)	H/L		Serial Clock
15	D7(SI)	H/L		Serial Data Input
16	VDD	-	Power Supply	
17	VSS	-	Ground	
18	VOUT	H/L	DC/DC Voltage Converter Output	
19	CAP3+	H/L	DC/DC Voltage Converter Capacitor3+	
20	CAP1-	H/L	DC/DC Voltage Converter Capacitor1-	
21	CAP1+	H/L	DC/DC Voltage Converter Capacitor1+	
22	CAP2+	H/L	DC/DC Voltage Converter Capacitor2+	
23	CAP2-	H/L	DC/DC Voltage Converter Capacitor2-	
24	VEXT	-	The external input reference voltage(VREF) for the internal voltage regulator.	
25	V1	-	LCD driver supply voltages. Voltages should be the following relationship: V0 > V1 > V2 > V3 > V4 > VSS	
26	V2	-		
27	V3	-		
28	V4	-		
29	V0	-		
30	VR	-	Voltage adjustment pad.	
31	CLS	H/L	Terminal to select whether enable or disable the display clock internal oscillator circuit.	
32	C86	H/L	MPU Interface Switch terminal	
33	P/S	H/L	Parallel/Serial Input Data Selection	
34	/HPM	H/L	Power Control Terminal	
35	IRS	H/L	Select Resistors for V0 Voltage Adjust	
36	NC	-	Dummy	

7 TIMING CHARACTERISTICS

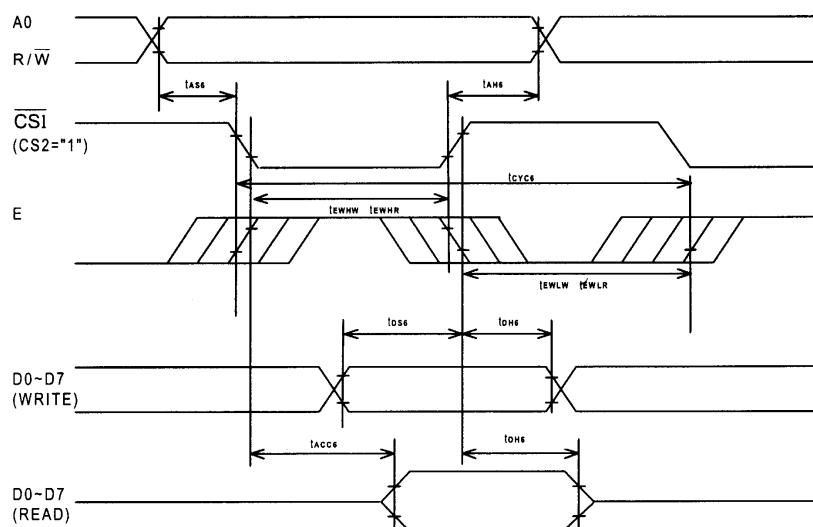
7.1 Read/Write Characteristics(8080-series MPU)



($V_{DD}=2.7 - 3.3V$, $T_A = -40 - 85^{\circ}C$)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
T_{AH8}	Address hold time	0			ns	
T_{AS8}	Address setup time	0			ns	
T_{CYC8}	System cycle time	300			ns	
T_{CCLW}	Control L pulse width (WR)	60			ns	
T_{CCLR}	Control L pulse width (RD)	120			ns	
T_{CCHW}	Control H pulse width (WR)	60			ns	
T_{CCHR}	Control H pulse width (RD)	60			ns	
T_{DS8}	Data setup time	40			ns	
$7T_{DH8}$	Data hold time	15			ns	
T_{ACC8}	$\overline{RD}$ access time			140	ns	$C_L=100pF$
T_{CH8}	Output disable time	10		100	ns	$C_L=100pF$

7.2 Read/Write Characteristics(6800-series MPU)

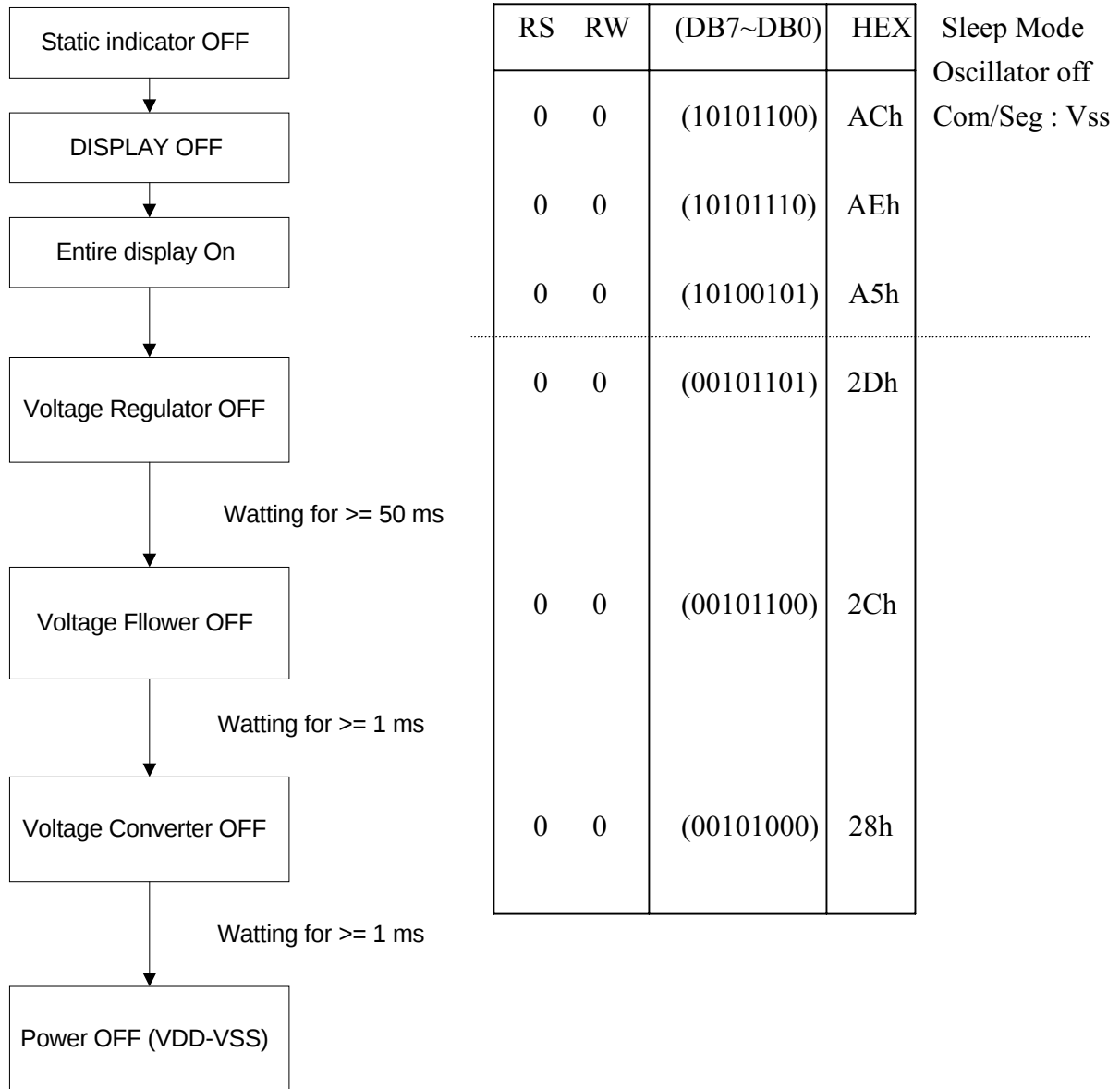


(VDD=2.7 – 3.3V, TA = -40 - 85°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
T _{CYC6}	System cycle time	300			nS	
T _{AS6}	Address setup time	0			nS	
T _{AH6}	Address hold time	0			nS	
T _{DS6}	Data setup time	40			nS	
T _{DH6}	Data hold time	15			nS	
T _{OH6}	Output disable time	10		100	nS	CL=100pF
T _{ACC6}	Access time			140	nS	CL=100pF
T _{EWHR}	Enable H pulse width (Read)	120			nS	
T _{EWHR}	Enable H pulse width (Write)	60			nS	
T _{EWLR}	Enable L pulse width (Read)	60			nS	
T _{EWLW}	Enable L pulse width (Write)	60			nS	

7.3 Power OFF Software Sequence

Please maintain the blow sequence when turning off the power supply of the module. If not, the DC component will be supplied to the LCD panel. This may cause damage the LCD module.



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

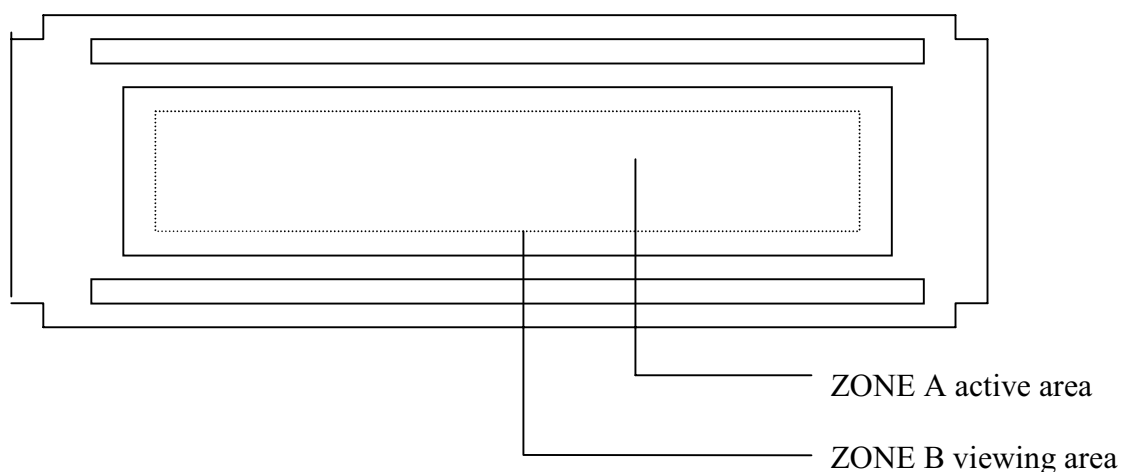
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant 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 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
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
Humidity Test	40°C , Humidity 90%, 96 hrs	1,2
Thermal Shock Test	-20°C (30 min.) ~ 25°C (5 min.) ~ 70°C (30 min.) (1 cycle) Total 5 cycle	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

