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-12864ASTQW-70-A(R)**
APPROVED BY	
DATE	

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

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2008/7/3	--	New Release	Edward

1 FEATURES

(1) Display format : 128 × 64 dot-matrix ; 1/ 64 duty.

(2) Construction : LCD, Bezel, Zebra, White LED back-light and PCB.

(3) Display type : STN, Negative type. 6 o'clock view.

(4) Common LCD Driver IC: SBN6400G

(5) Segment LCD Drive and Controller IC: SBN0064GX-D

(6) 5V single power input. Built-in DC/DC converter for LCD driving.

(7) Normal temperature type.

(8) ROHS compliant.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.48(W) × 0.48(H)	mm
Dot pitch	0.52(W) × 0.52(H)	mm
Viewing area	71.7(W) × 39.0(H)	mm
Module size (w/ LED back-light)	93.0(W) × 70.0(H) × 14.5 max (T)	mm

3 ABSOLUTE MAXIMUM RATINGS

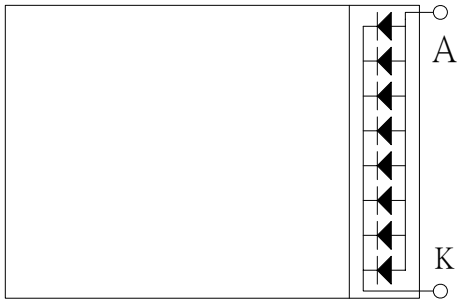
Parameter		Symbol	Min	Max	Unit
Logic Circuit Supply Voltage		VDD-VSS	0	7.0	V
LCD Driving Voltage		VDD-VO	0	16	V
Input Voltage		V_I	VSS	VDD	V
Normal temp. type	Operating Temp.	T_{OP}	0	50	°C
	Storage Temp.	T_{STG}	-20	70	°C

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	0 °C	10.9	11.5	12.1	V	
		25 °C	10.8	11.4	12.0		
		50 °C	10.7	11.3	11.9		
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	3	--	mA	
----- Optical Characteristics -----							
Contrast	CR	STN type	--	5.1	--		Note 1
Rise Time	tr	25°C	--	140	--	ms	Note 2
Fall Time	tf	25°C	--	240	--	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	35	--	Deg.	Note 3
	θ b		--	30	--		
	θ l		--	30	--		
	θ r		--	30	--		
Frame Frequency	fF	25°C	--	70	--	Hz	
----- LED Back-light Characteristics -----							
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**	**Note**
Forward Current	IF		--	120	160	mA	Note 4 & 7
LCM Luminous intensity (Full White pattern)		IF=120mA	--	17	--	cd/m^2	Note 4
Forward Voltage	VF	IF=120mA	--	3.2	3.5	V	Note 5
LED C.I.E	X	IF=120mA	0.26	0.30	0.34		Note 6
	Y	IF=120mA	0.27	0.31	0.35		

Note 4: Luminous intensity is decided by forward current of White LED.
Note 5: White LEDs are with voltage tolerance.
Note 6: White LEDs are with color tolerance.

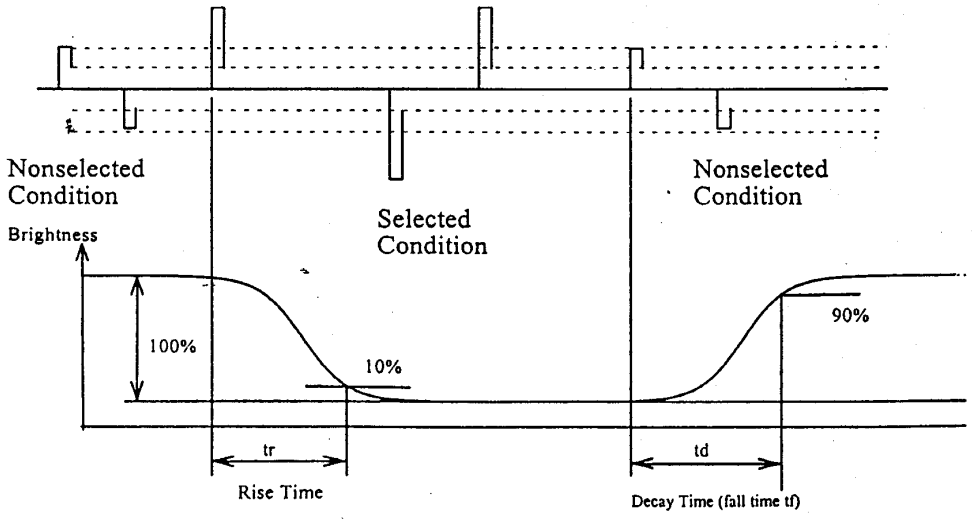
* LED Dice number = 8



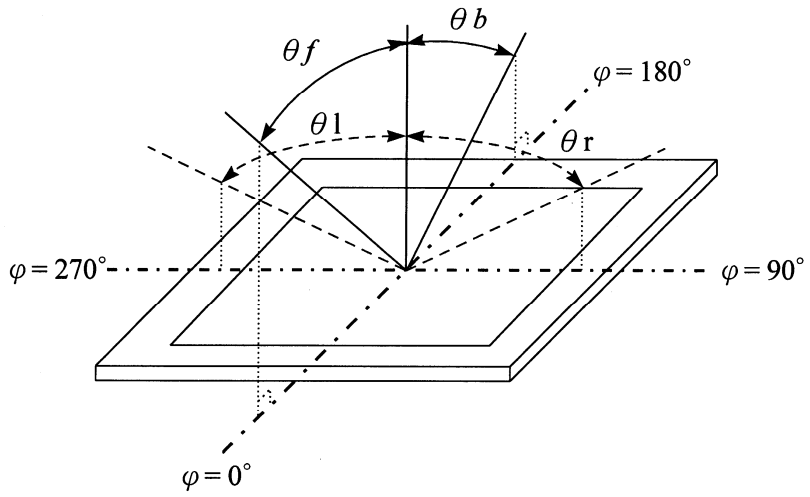
(NOTE 1) Contrast ratio :

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

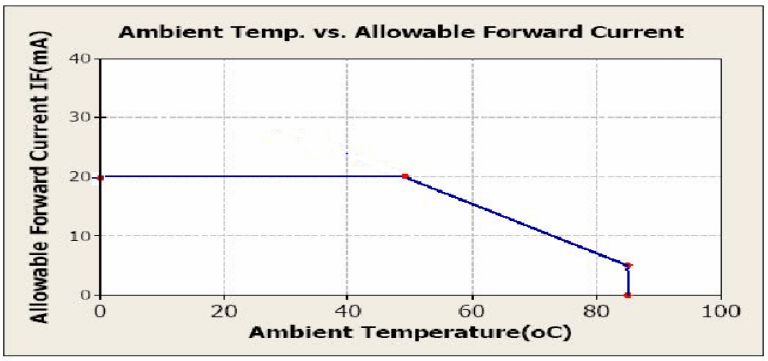
(NOTE 2) Response time :



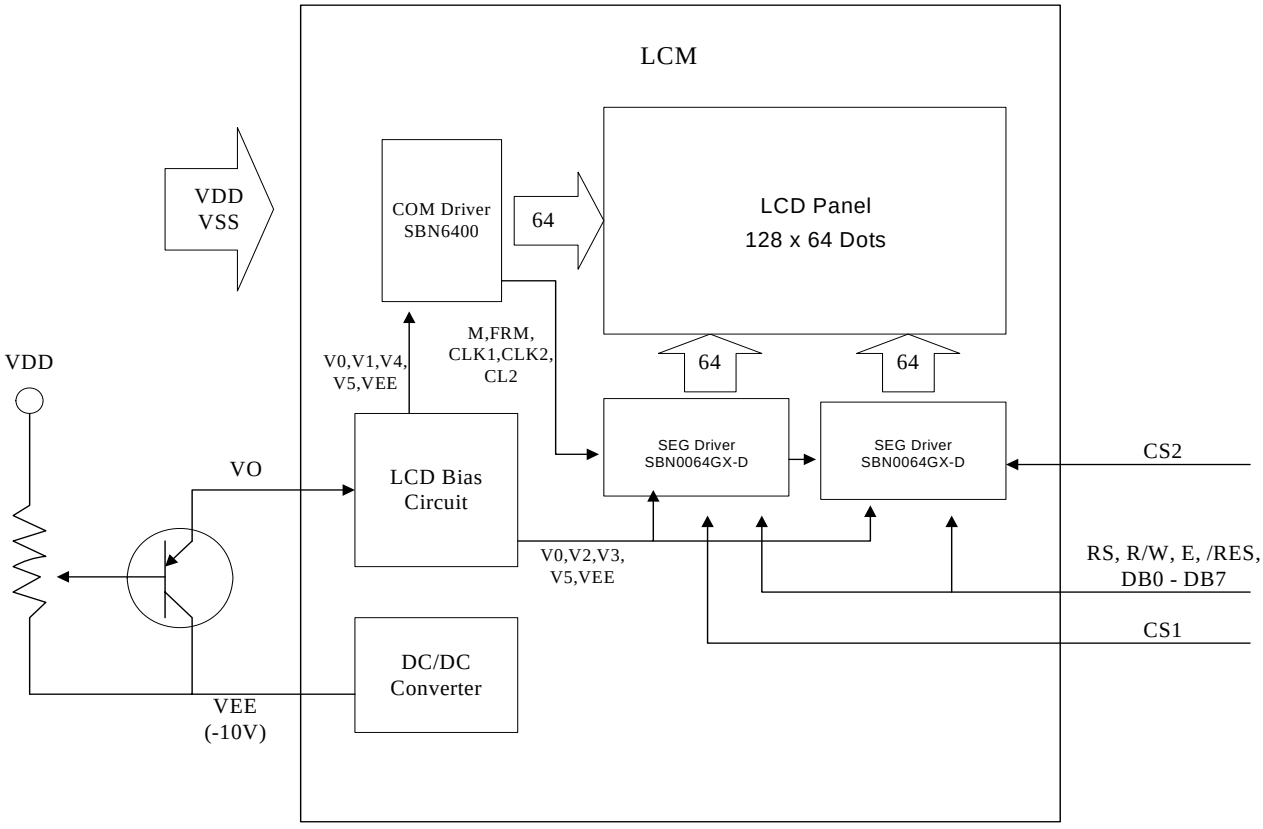
(NOTE 3) Viewing angle

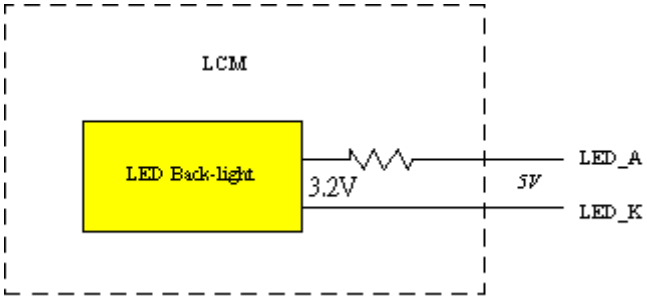


(Note 7) One LED Current Curve Diagram



5 BLOCK DIAGRAM & POWER SUPPLY





Using White LED Back-light

6 PIN CONNECTIONS

Pin No.	Symbol	Function
1	VSS	Ground (0V)
2	VDD	Power Supply (+5V)
3	VO	Power Supply For LCD (VDD-VO=LCD Driving Voltage)
4	RS	H: Data Input L: Instruction Code Input
5	R/W	H: Data Read L: Data Write
6	E	Enable Signal
7-14	DB0-DB7	Data Bus
15	CS1	Chip Selection For Segment IC1
16	CS2	Chip Selection For Segment IC2
17	/RES	Reset
18	VEE	Negative Voltage Output (-10V)
19,20	LEDA,K	LED Supply Voltage (5V)

7 TIMING CHARACTERISTICS

Write operation

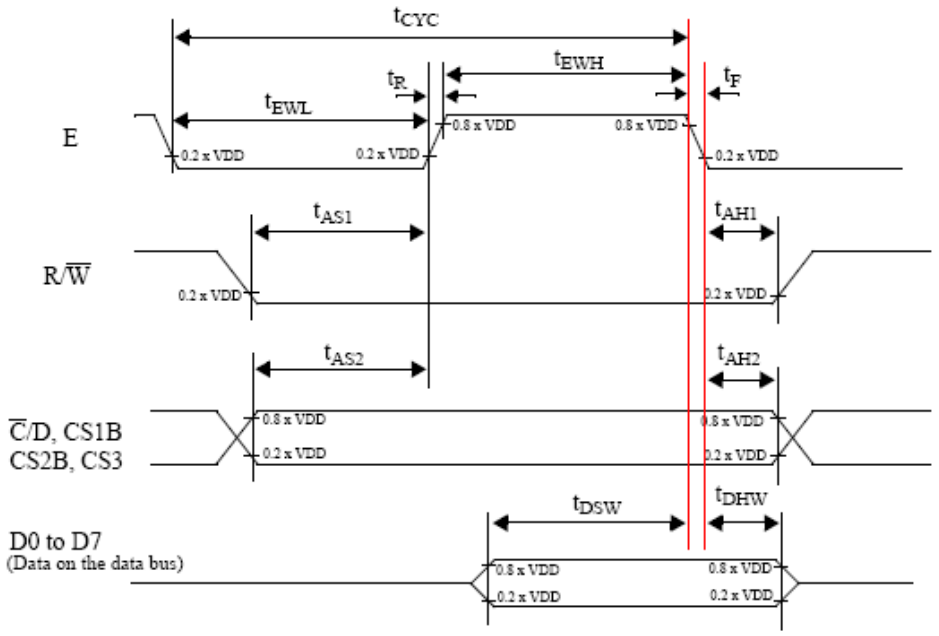


Fig.16 AC timing for writing to the SBN0064G

V_{DD} = 5 V ±10%; V_{SS} = 0 V; T_{amb} = -20 °C to +75°C.

symbol	parameter	min.	max.	test conditions	unit
t_{CYC}	Enable (E) cycle time	1000			ns
t_{EWL}	Enable (E) LOW width	450			
t_{EWH}	Enable (E) HIGH width	450			
t_R	Enable (R) rise time		20		
t_F	Enable (F) fall time		20		
t_{AS1}	Write set-up time	140			
t_{AH1}	Write hold time	10			
t_{AS2}	C/D, CS1B, CS2B, CS3 set-up time	140			
t_{AH2}	C/D, CS1B, CS2B, CS3 hold time	10			
t_{DSW}	Data setup time (on the data bus)	200		The loading on the data bus is shown in Fig. 18.	
t_{DHW}	Data hold time (on the data bus)	10			

Read operation

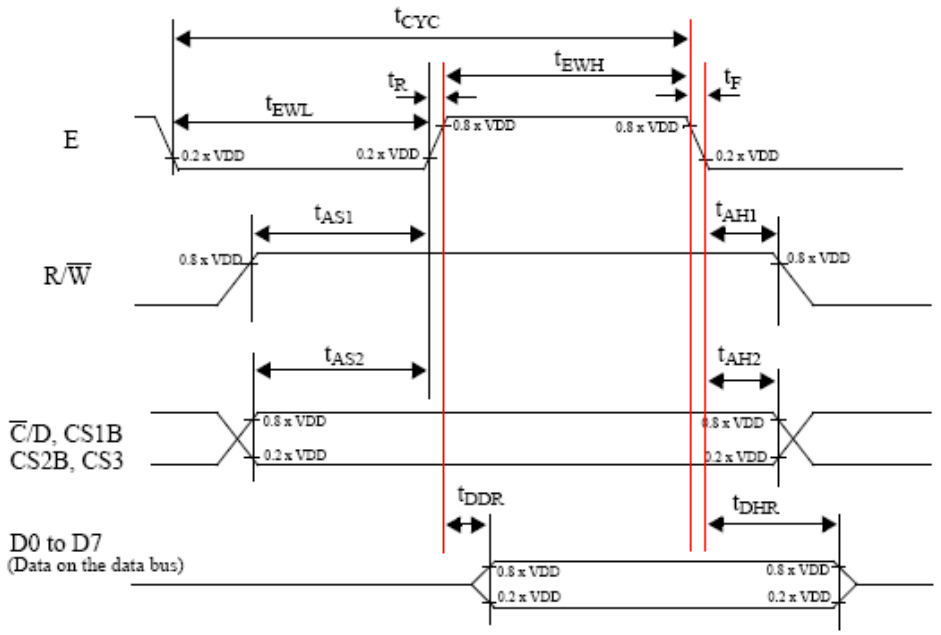
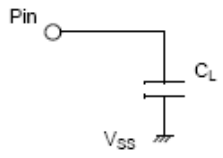


Fig.17 AC timing for reading from the SBN0064G

V_{DD} = 5 V ±10%; V_{SS} = 0 V; T_{amb} = -20 °C to +75°C.

symbol	parameter	min.	max.	test conditions	unit
t_{CYC}	Enable (E) cycle time	1000			ns
t_{EWL}	Enable (E) LOW width	450			
t_{EWH}	Enable (E) HIGH width	450			
t_R	Enable (R) rise time		20		
t_F	Enable (F) fall time		20		
t_{AS1}	READ set-up time	140			
t_{AH1}	READ hold time	20			
t_{AS2}	C/D, CS1B, CS2B, CS3 set-up time	140			
t_{AH2}	C/D, CS1B, CS2B, CS3 hold time	10			
t_{DDR}	Data delay time (on the data bus)	320		The loading on the data bus is shown in Fig. 18.	
t_{DHR}	Data hold time (on the data bus)	20			

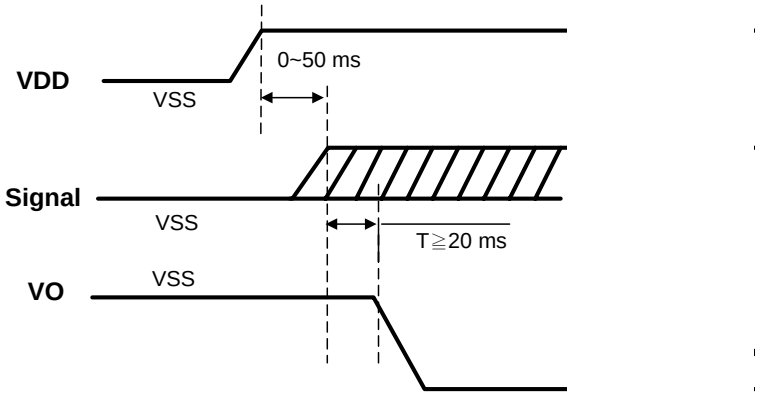


C_L = 50 pF (including wiring and probe capacitance).

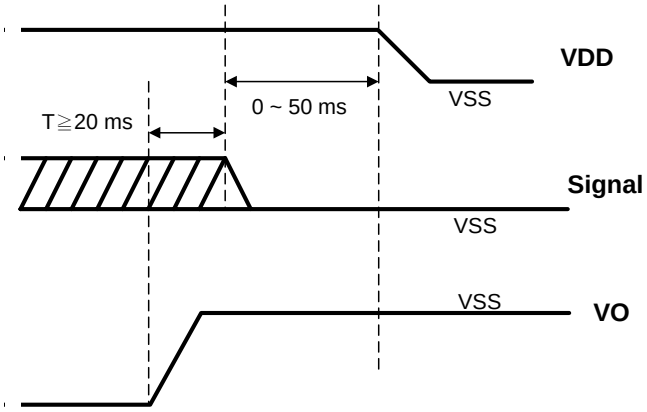
Fig.18 Load circuit for each bit of the data bus.

7.1 Power ON/OFF Sequence

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

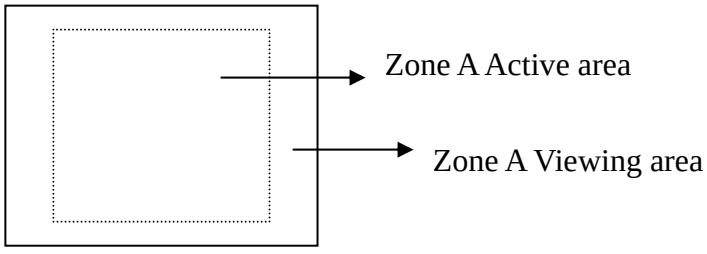
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant 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	remark
Function	No display		Reject		Major	
	Display abnormal		Reject		Major	
	Missing line		Reject		Major	
Black spots	Ave. dia. D		Area A	Area B	Minor	Two spots must be between about 5 mm
	D≦0.13		Disregard			
	0.13＜D≦0.15		2	2		
	0.13＜D≦0.25		1	2		
	0.25＜D		0	1		
Black line	Width W	Length L	Area A	Area B	Minor	
	≦3.0	≦0.02	Disregard			
	≦2.0	≦0.04	2	2		
	≦1.0	≦0.06	1	2		
		＞0.06	0	0		
Scratch	Width W		Length L	Accept	Minor	
	W≦0.02		---------	Disregard		
	0.02≦W≦0.05		L≦3.0	2		
	W＞0.05		-------	0		
Appearance	PCB copper circuit showed		Reject		Minor	
	PCB scratch was over 5 mm		Reject			
	Sort pad was damaged		Reject			
★ Back-Light	Function didn't work		Reject		Major	
	Some area didn't work		Reject			
	Bright was not even		Reject			
	B/L color was not correct		Reject			
★T/P (DOTS)	D≦0.2mm		Reject		Major	
	0.2mm＜D≦0.3mm		Reject			
	0.3mm＜D		Reject			
★T/P(Scratch)	W≦0.02mm		10mm＜L	Disregard	Major	
	0.05mm≦W≦0.1mm		10mm＜L	1		
	0.1mm≦W		10mm＜L	0		
『★』 Symbol means LCM has this material.						



8.6 RELIABILITY

Test Item	Test Conditions	Note
	Normal Temp. type	
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
Temperature Cycle	-20°C ~ 25°C ~ 70°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.

(11) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

10 OUTLINE DIMENSION