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-16080A**
APPROVED BY	
DATE	

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RECORD OF REVISION

DATE	SUMMARY
1999/11/19	NEW RELEASE
2000/7/31	Modify the VOP characteristics (Page 6)
2000/10/6	Add power on / off sequence Modify sampling plan
2001/12/12	Modify LED characteristic

1 FEATURES

(1)   Display format : 160 × 80dot-matrix ; 1/80duty.

(2)   Construction : STN / FSTN LCD, Bezel, Heat Sea l Zebra and PCB.

(3)   Optional LED or EL back-light.

(4)   Controller : T6963C.

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

(6)   Normal temperature type.

2 NUMBERING SYSTEM

AG-16080A _ _ _ _
                1 2 3 4

No	Code Value	Description	Remark
1	G	STN gray type LCD	LCD Type
	Y	STN yellow green type LCD	
	S	STN negative type LCD	
	F	FSTN type LCD	
2	A	Reflective type / 6:00 view	Polarizer / Viewing Angel
	B	Reflective type / 12:00 view	
	I	Transflective type / 6:00 view	
	J	Transflective type / 12:00 view	
	T	Negative type / 6:00 view	
	U	Negative type / 12:00 view	
3	None	Without backlight	Backlight type
	L	5V LED	
	E	EL	
4	None	Without backlight	Backlight color
	Y	Yellow-green (LED)	
	B	Blue (EL)	
	W	White (EL)	

3 MECHANICAL DATA

| Parameter	Stand Value	Unit
Dot size	0.39(W) × 0.39(H)	mm
Dot pitch	0.42(W) × 0.42(H)	mm
Viewing area	72.3(W) × 37.8(H)	mm
Module size	100.0(W) ×54(H) × 11.3 max (T)	mm
Module size (LED back-light)	100.0(W) ×54(H) × 15.3 max (T)	mm

4 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Logic Circuit Supply Voltage	VDD-VSS	0	7.0	V
LCD Driving Voltage	VDD-VO	0	20	V
Input Voltage	V_I	VSS	VDD	V
Operating Temperature	T_{OP}	0	50	°C
Storage Temperature	Tstg	-20	70	°C

5 ELECTRICAL 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℃	13.3	14.4	15.3	V	
		25℃	12.5	13.6	14.5		
		50℃	11.1	12.2	13.1		
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	4.0	5.0	mA	
----- Optical Characteristics -----							
Contrast	CR	STN type	--	5	--		Note 1
		FSTN type		8			
Rise Time	tr	25°C	--	250	400	ms	Note 2
Fall Time	tf	25°C	--	150	400	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	
----- LED Back-light Characteristics -----							
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Forward Voltage	VF	--	--	4.05	4.2	V	Supply Voltage between A&K
Forward Current	IF	VF=4.05V	--	300	--	mA	
LCM Luminous intensity	VF=4.05V		--	30	--	cd/m^2	

2×36= 72 (Dice numbers)
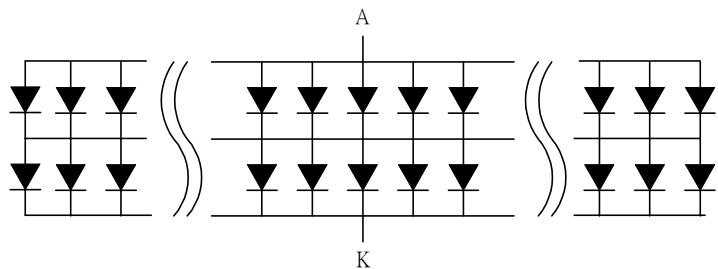
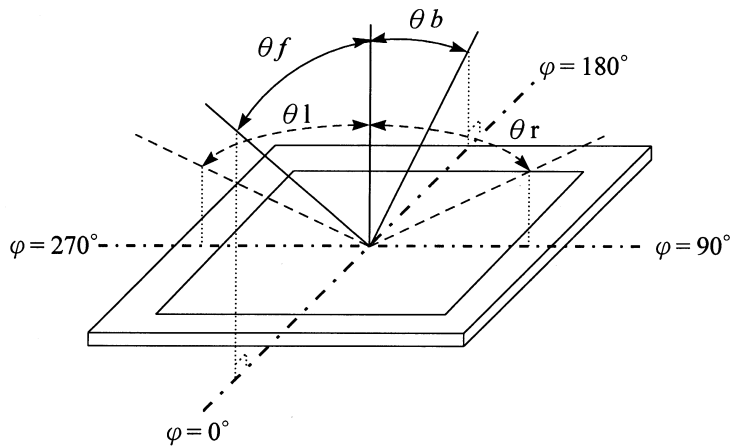| Parameter	Min	Typ	Max	Unit	Note
----- EL Back-light Characteristics -----					
Driving Voltage	--	110	--	Vrms	
Frequency	--	400	--	Hz	
LCM Luminous intensity	--	10	--	cd/m^2	

(NOTE 1) Contrast ratio :

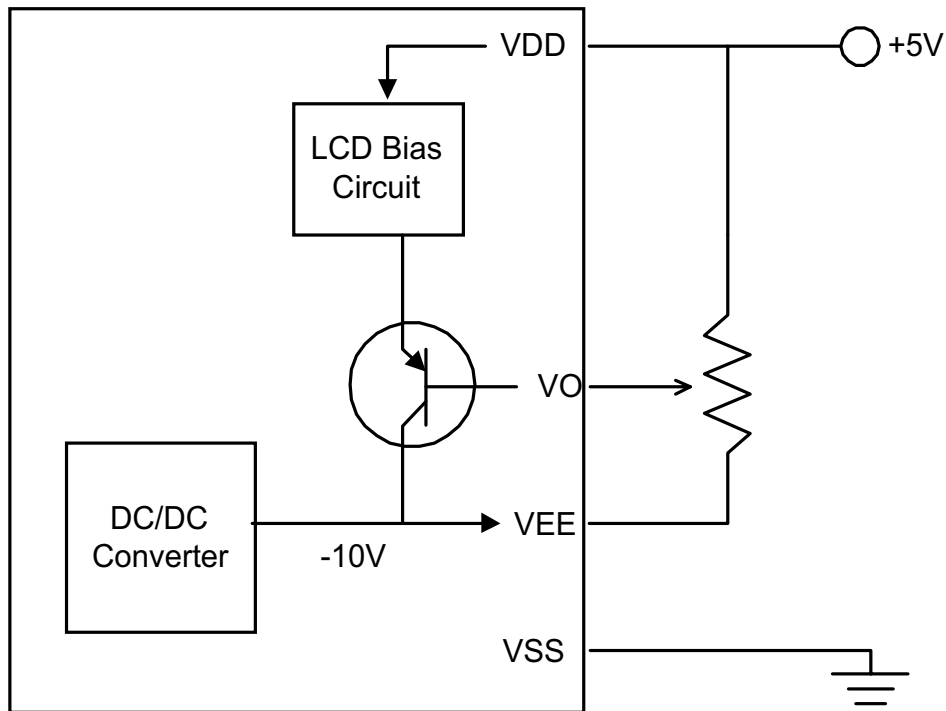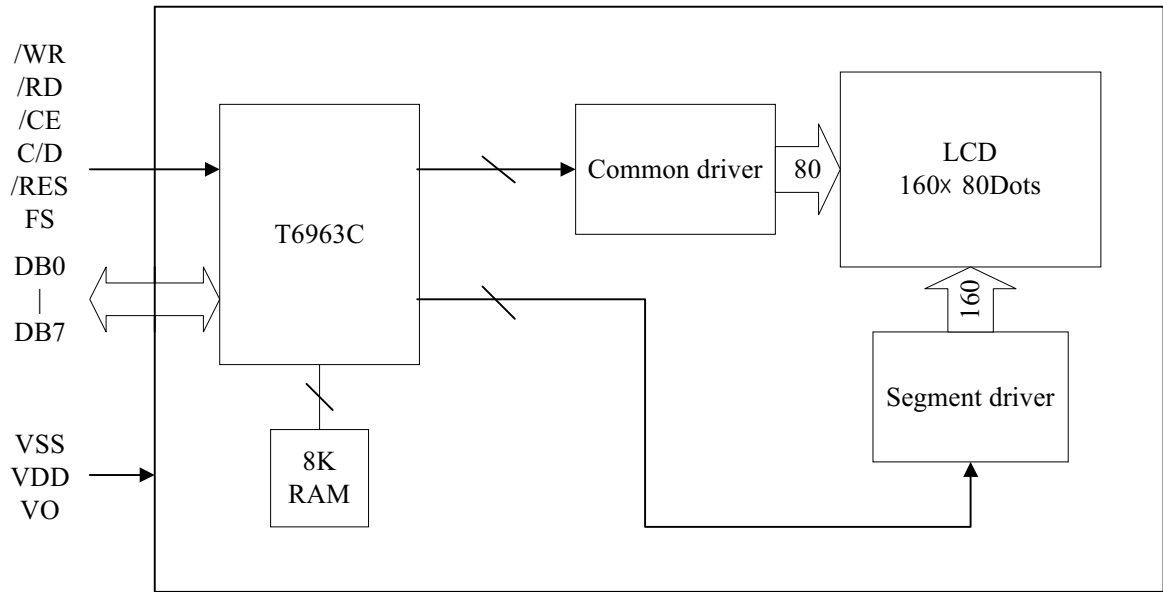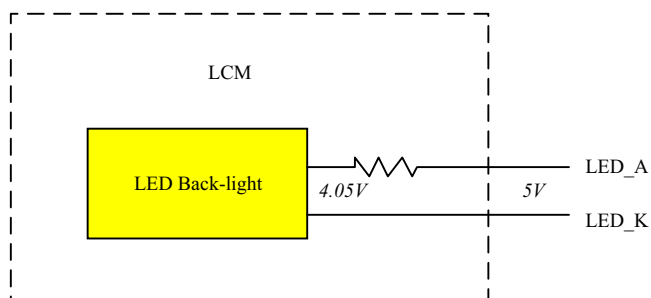CR = (Brightness in OFF state) / (Brightness in ON state)

(NOTE 2) Response time :
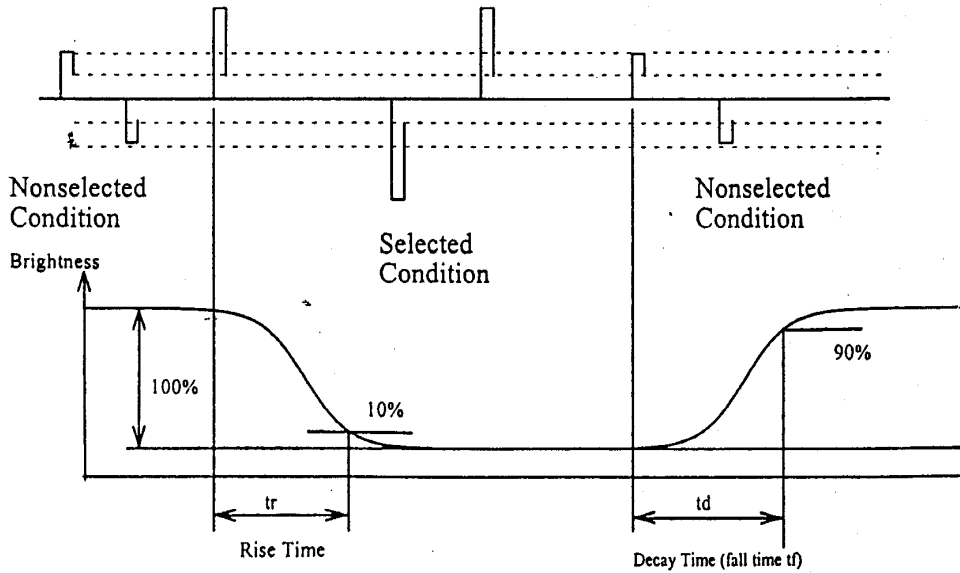
(NOTE 3) Viewing angle

6 BLOCK DIAGRAM & POWER SUPPLY

/WR
/RD
/CE
C/D
/RES
FS

DB0
|
DB7

VSS
VDD
VO

T6963C

8K
RAM

Common driver

80

LCD
160x 80Dots

160

Segment driver

VDD

+5V

LCD Bias
Circuit

VO

DC/DC
Converter

-10V

VEE

VSS
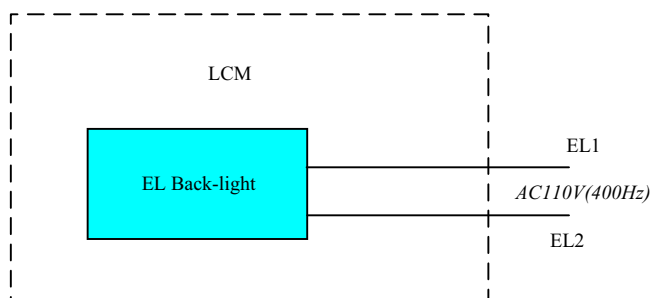
7 PIN CONNECTIONS

PIN NO.	SYMBOL	FUNCTION
1	VEE	Negative Supply Voltage (-10V)
2	VSS	Digital Ground (0V)
3	VDD	Power Logic Supply Voltage(+5V)
4	VO	Contrast adjustment
5	/WR	Write data when WR = L
6	/RD	Read data when RD = L
7	/CE	Chip Enable
8	C/D	WR = L --- C/D = H : Command Write C/D = L : Data Write RD = L --- C/D = H : Status Read C/D = L : Data Read
9	/RST	H --- Normal L --- Initialize T6963C
10 - 17	DB0 - DB7	Data Bus Line
18	FS	Pin for selection of font H --- Font 6*8 L --- Font 8*8
19	LEDA	LED Supply Voltage + (5V)
20	LEDK	LED Supply Voltage - (5V)

8 TIMING CHARACTERISTICS

ITEM	SYMBOL	MIN	MAX	UNIT
C/D SET UP TIME	tCDS	100	--	ns
C/D HOLD TIME	tHCL	10	--	ns
/CE,/RD,/WR PULSE WIDTH	tCE,tRD,tWR	80	--	ns
Data Set Up Time	tDS	80	--	ns
Data Hold Time	tDH	40	--	ns
Access Time	tACC	--	150	ns
Output Hold Time	tOH	10	50	ns

8.1 Power ON/OFF Sequence

POWER ON SEQUENCE

VDD — VSS — 0~50 ms

Signal — VSS — T$\geq$20 ms

VO — VSS

POWER OFF SEQUENCE

VDD — 0 ~ 50 ms — VSS

T$\geq$20 ms — Signal — VSS

VSS — VO
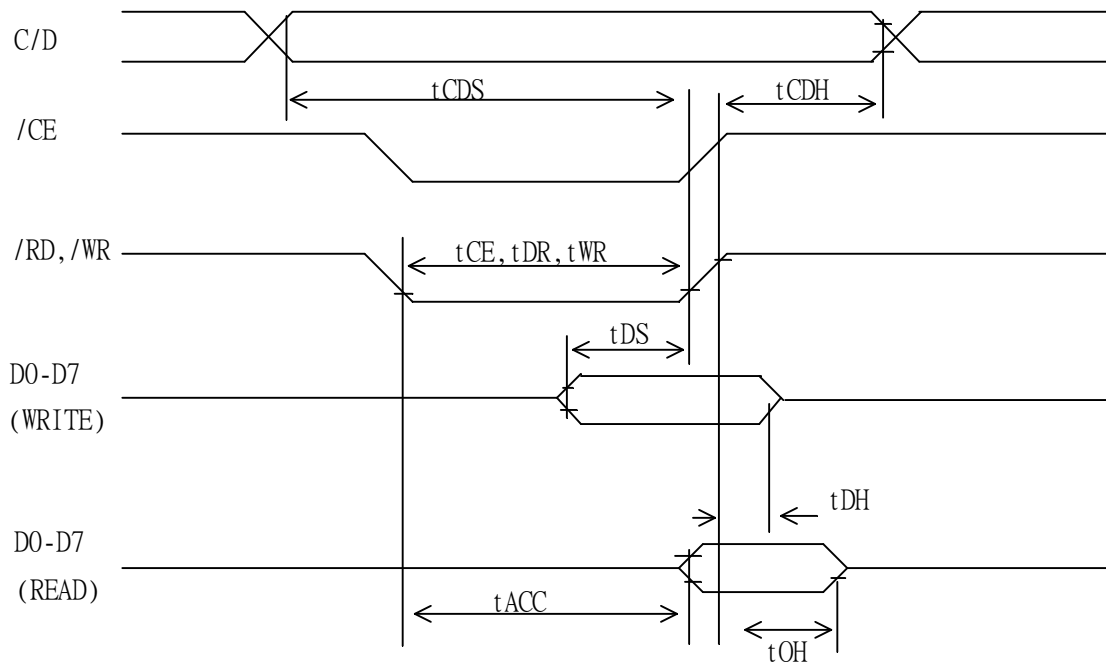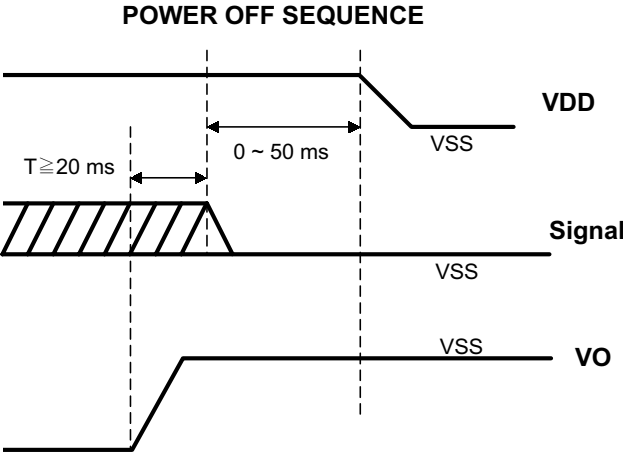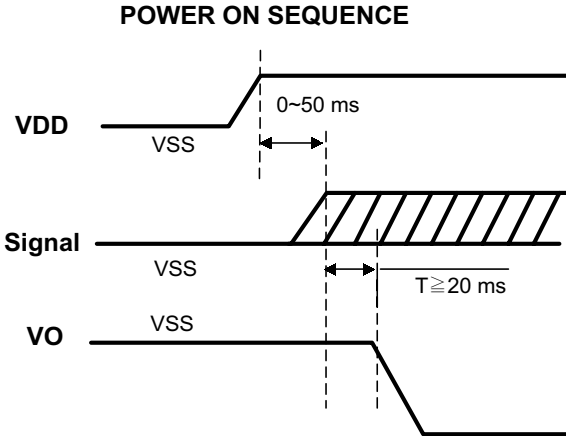
9 QUALITY AND RELIABILITY

9.1 TEST CONDITIONS

Tests should be conducted under the following conditions :
Ambient temperature　：　$25 \pm 5°C$
Humidity　　　　　：　$60 \pm 25\%$ 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 flourescent 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≤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

ZONE A active area

ZONE B viewing area
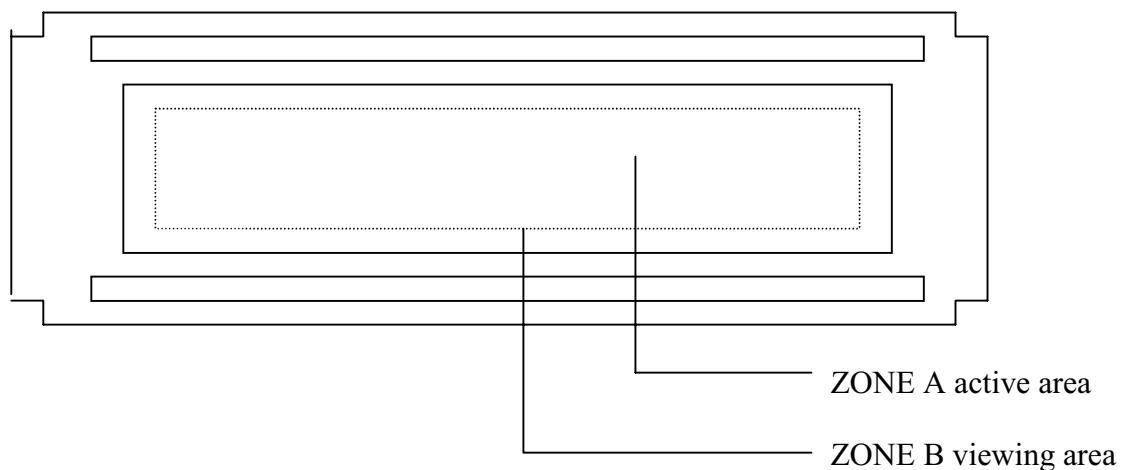
9.6 RELIABILITY

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.

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.

THICKNESS:	VERSION	T1	T2
EL & NO BACKLIGHT		5.9±0.3	11.3Max.
LED BACKLIGHT		10.0±0.3	15.3Max.

4.85　47.8±0.3
9.6　37.8±0.2
11.715　33.57
2.5
6.5
16.565　14.0
4-R1.0
39.24　72.3±0.2
20　87.0±0.3
P2.54×19=48.26　67.17
95.0±0.3
100.0±0.5
A
1
20-Φ1.0
2.5　19.42　10.16　2-Φ1.0
49.0±0.3　4-Φ2.5
54.0±0.5

T2　T1
16

A BLOCK
0.42
0.39
0.42
0.39