

No: 030027

LCD-Module SPECIFICATION

Approved by Customer		

AXFG240128B

APPROVED BY	CHECKED BY	ORGANIZED BY
	Jeffrey	Tina

RECORD OF REVISION

Revision Date	Page	Contents
2003/10/22	-	New Release

1 FEATURES

- (1) Display format : 240 × 128 dot-matrix ; 1/ 128 duty.
- (2) Construction :STN/FSTN LCD, Bezel, Zebra,Heat Seal and PCB,
- (3) Optional LED / EL / CCFL back-light.
- (4) Built in Controller T6963C
- (5) 5V single power input. Built-in DC/DC converter for LCD Driving.
- (6) Normal / Extended temperature type.

2 NUMBERING SYSTEM

AX _ _ - 240128B _ _ _ _ - _

1 2

3 4 5 6 7

No	Code Value	Description	Remark
2	T	TN	LCD type
	H	HTN	
	S	STN yellow-green	
	G	STN Gray	
	B	STN Blue(Negative)	
	F	FSTN	
	C	STN-color	
	A	A-TFT	
	L	Ltps-TFT	
	O	OLED	
3	C	Character-COB	Display type
	D	Character-TAB	
	E	Character-COG	
	F	Character-COF	
	G	Graphic-COB	
	H	Graphic-TAB	
	K	Graphic-COG	
	L	Graphic-COF	
3	A	Reflective type / 6:00 view	Polarizer / Viewing Angle
	B	Reflective type / 12:00 view	
	C	Transflective type / 6:00 view	
	D	Transflective type / 12:00 view	
	E	Transmissive type / 6:00 view	

	F	Transmissive type / 12:00 view	
	G	Negative type / 6:00 view	
	H	Negative type / 12:00 view	
	I	Negative type / 3:00 view	
4	None	None backlight	Backlight type
	L	LED array	
	Q	LED edge	
	E	EL	
	C	CCFL	
5	None	Without backlight	Backlight color
	A	Amber	
	B	Blue	
	G	Green	
	L	Yellow	
	O	Orange	
	R	Red	
	Y	Yellow-green	
	W	White	
6	None	Normal temperature type	LCM temperature type
	H	Extended temperature type	
7	00~99		Version code

3 MECHANICAL DATA

Parameter	Standard Value	Unit
Dot size	0.40 (W) × 0.40 (H)	mm
Dot pitch	0.45 (W) × 0.45 (H)	mm
Viewing area	114.0 (W) × 64.0(H)	mm
Module size	144.0(W) × 104.0(H) × 12.0 max (T)	mm
Module size (LED / CCFLback-light)	144.0(W) × 104.0(H) × 15.0 max (T)	mm

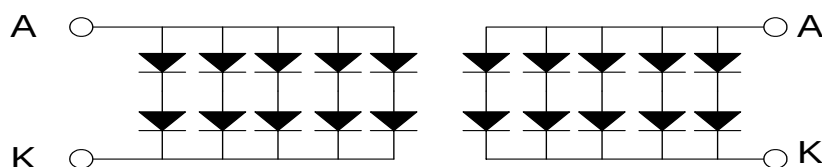
4 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Min	Max	Unit
Logic Circuit Supply Voltage		VDD-VSS	0	7.0	V
LCD Driving Voltage		VDD-VO	0	26.0	V
Input Voltage		VI	VSS	VDD	V
Normal temp. type	Operating Temp.	TOP	0	50	°C
	Storage Temp.	TSTG	-20	70	°C
Extended temp. type	Operating Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

5 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	4.75	5.0	5.25	V	
LCD Driving Voltage	VDD-VO	-20 °C	20.0	21.0	22.0	V	0 ~ 50 °C for Normal Temp. type -20 ~ 70 °C for Extended Temp. type
		0 °C	19.0	20.0	21.0		
		25 °C	18.0	18.9	19.8		
		50 °C	17.1	18.0	18.9		
		70 °C	16.0	17.0	18.0		
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	STN type	--	5	--		Note 1
		FSTN type		8			
Rise Time	tr	25°C	--	170	255	ms	Note 2
Fall Time	tf	25°C	--	400	600	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	35	--		
	θ l		--	40	--		
	θ r		--	40	--		
Frame Frequency	fF	25°C	--	64	--	Hz	
----- White Edge LED Back-light Characteristics -----							
Forward Voltage	VF	--	--	4.05	4.3	V	Supply Voltage between A&K
Forward Current	IF	VF=4.05V	--	1000	--	mA	
Bare LED Luminous intensity		VF=4.05V	--	100	--	cd/m ²	
LCM Luminous intensity		VF=4.05V	--	30	--	cd/m ²	

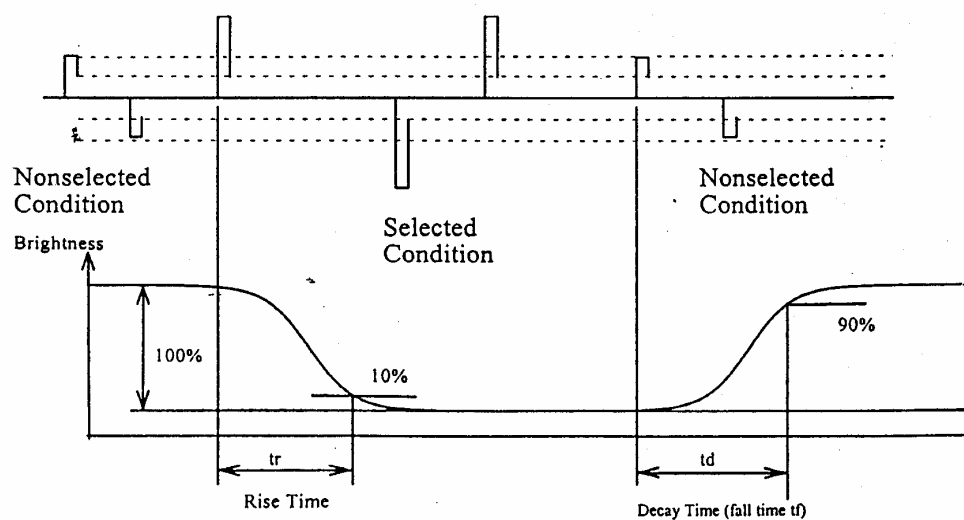
*LED Dice number=2x110=132



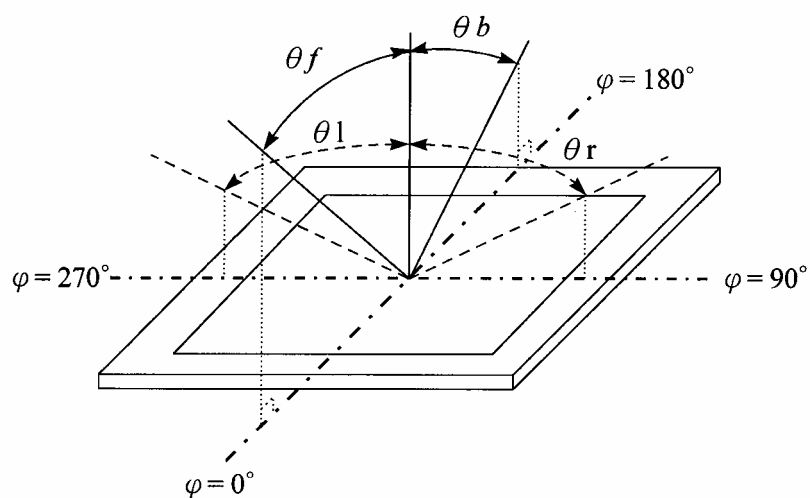
Parameter	Min	Typ	Max	Unit	Note
----- EL Back-light Characteristics -----					
Driving Voltage	--	110	--	Vrms	
Frequency	--	400	--	Hz	
Bare EL Luminous intensity	--	45	--	cd/m ²	
LCM Luminous intensity	--	15	--	cd/m ²	

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

(NOTE 2) Response time :



(NOTE 3) Viewing angle



5.1 C.C.F.L. BACK-LIGHT SPECIFICATION

(1) The brightness life of the back light shall be kept as specified under the following absolute maximum conditions:

Power Consumption	2.88W
TA=25 ,fL=37±5KHz	(with DIYN 43 Inverter)
Tube Current	6.0±0.5mA
TA=25 ,fL=37±5KHz	

(2) Electrical Characteristics

The following operating conditions are recommended for the back loght unit.

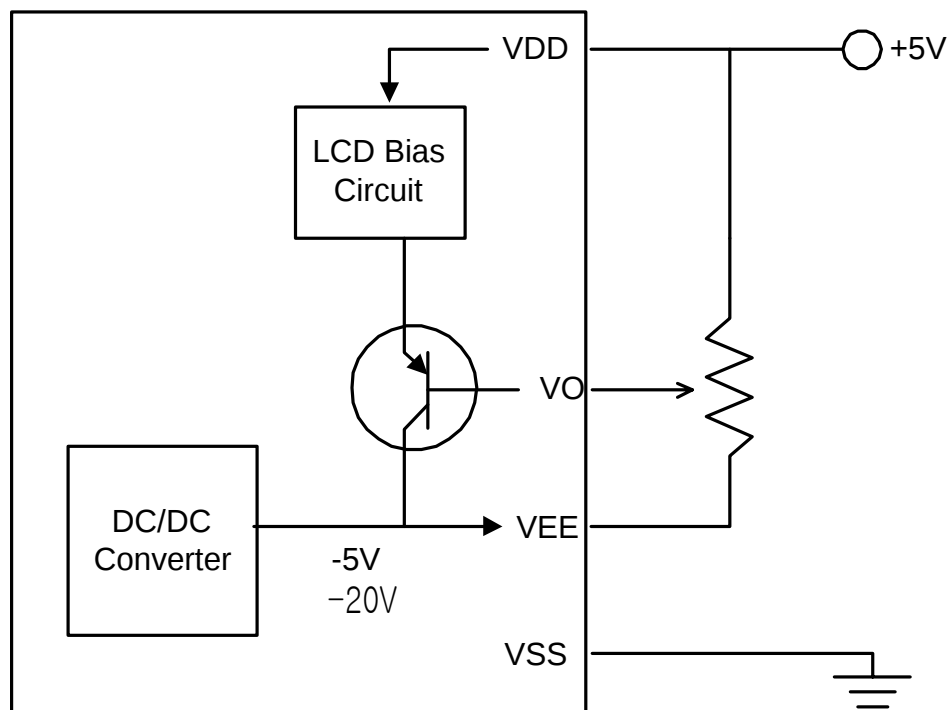
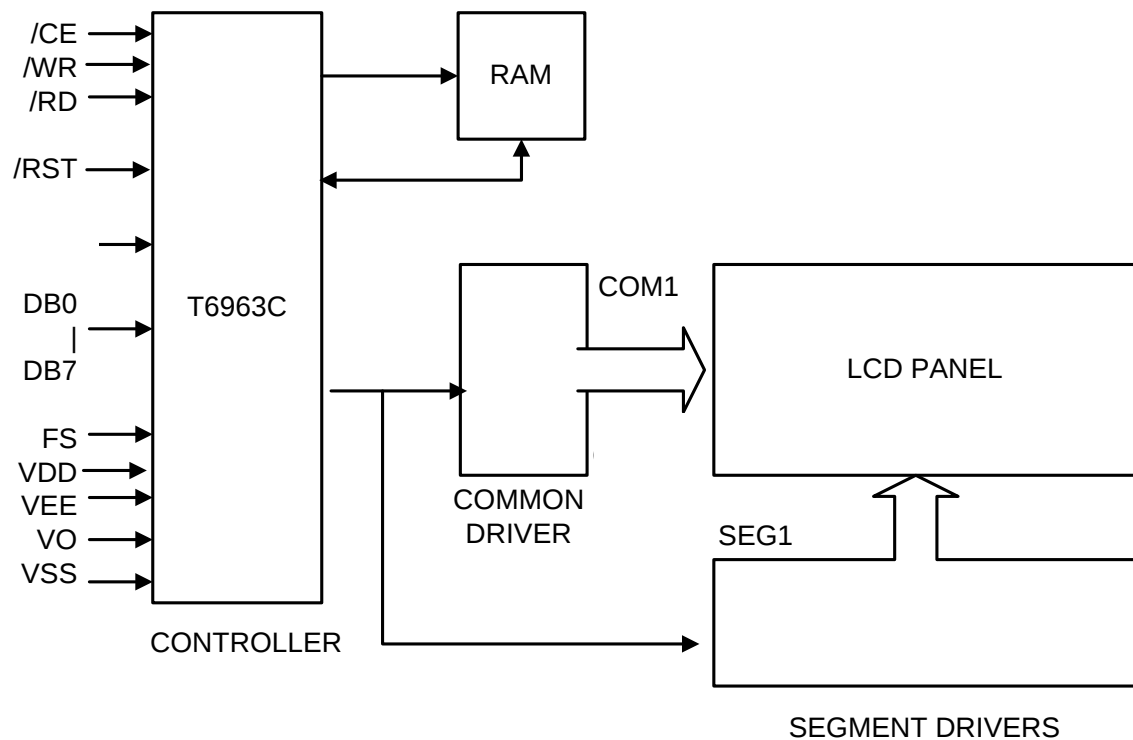
Start Voltage	975 Vrms min, at Ta=0
Tube Voltage	390±40 Vrms typ, at Ta=25
Tube Current	5.0±0.5 mA typ, at Ta=25
Drive Frequency	55±5KHz typ, at Ta=25

(3) Initial Optical Characteristics

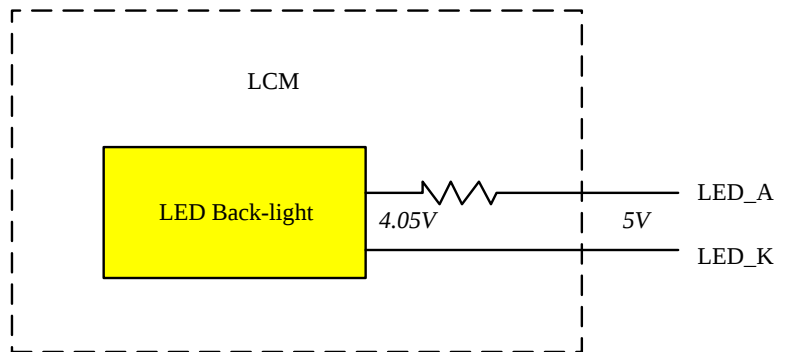
The Unit shall satisfy the following criteria at 25 ± 2 ambient temperature, 30%_85% relative humity, no air flow and with applying rating input Voltage and input current by using DIYN 43 inverter, input Voltage 12V, be measured 3 min. after initial power on.

Item	Min	Typ	Max	Unit	Note
LCM Average Brightness	120	140	--	cd/m ²	
Brightness Uniformity	85			%	
Chromaticity X	0.337	0.341	0.361		
Y	0.382	0.402	0.422		

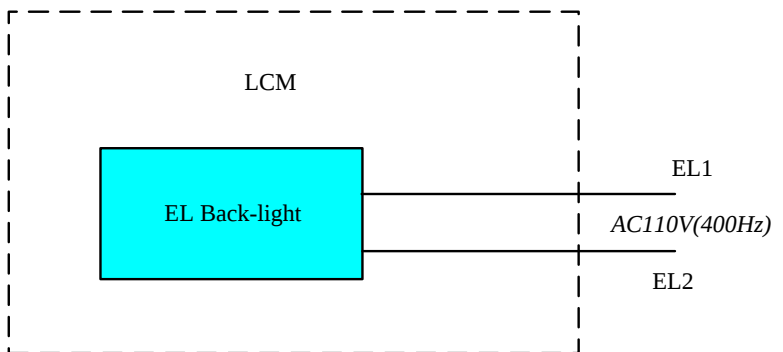
6. BLOCK DIAGRAM & POWER SUPPLY



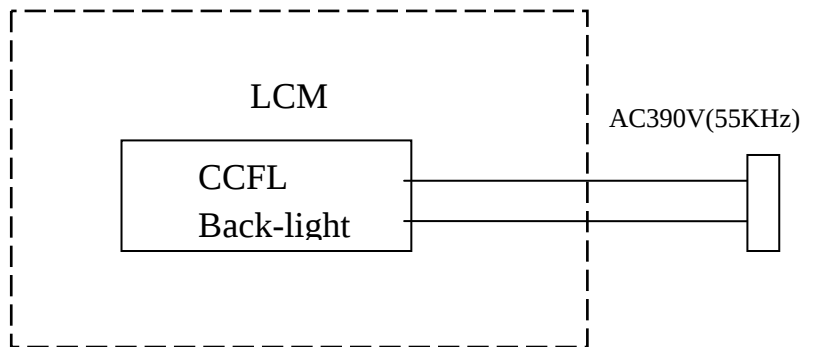
Using LED Back-light



Using EL Back-light



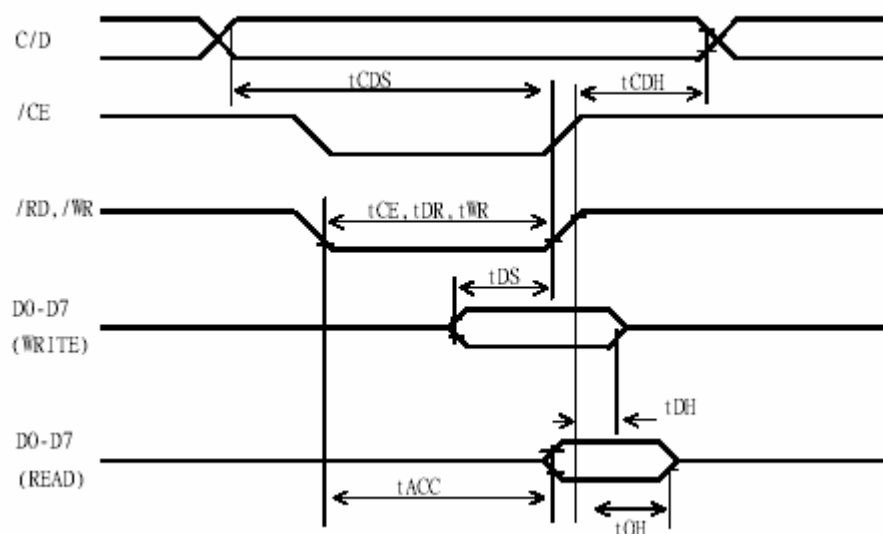
Using CCFL Back-light



7 PIN CONNECTIONS

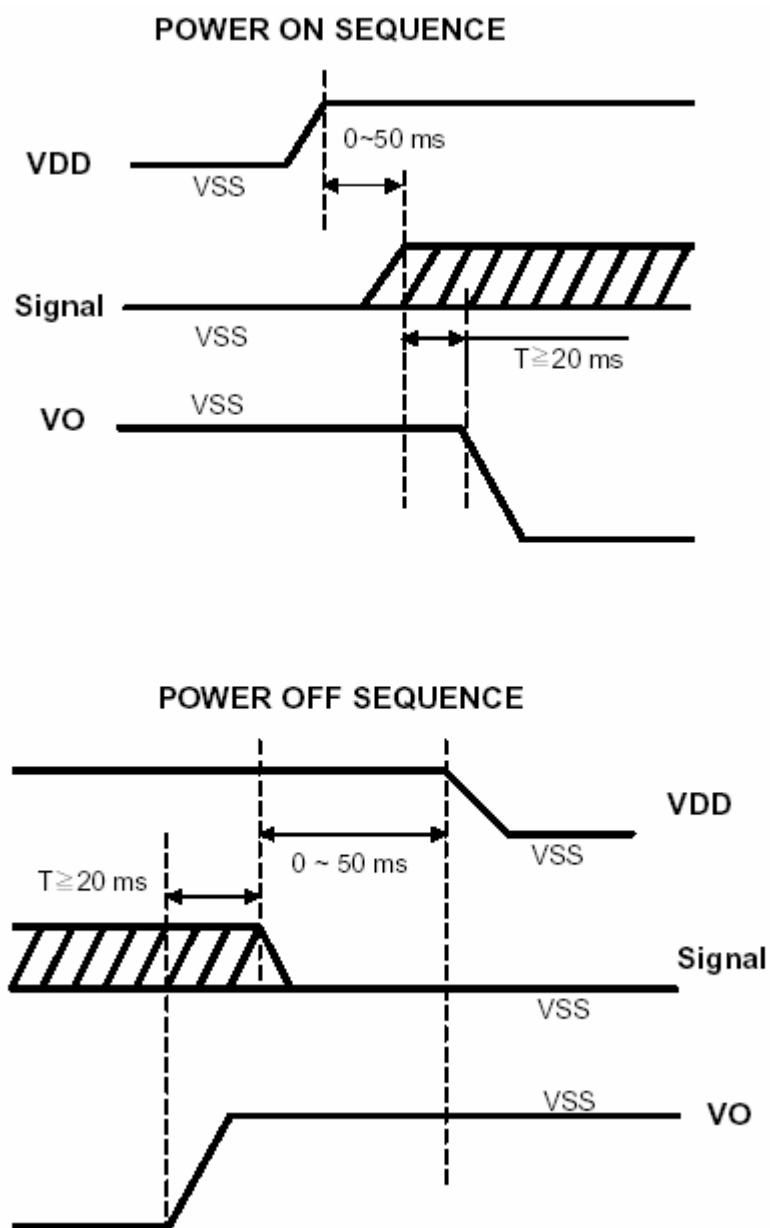
No.	Symbol	Function
1	VSS	Ground (0V)
2	VDD	Logic Supply Voltage (+5V)
3	VO	LCD Power Supply
4	C/D	WR=L---C/D=H:Command write C/D=L:Data write RD=L---C/D=H:Status Read C/D=L:Data read
5	/RD	Read data when RD=L
6	/WR	Write data when WR=L
7-14	DB0-DB7	Data Bus line
15	/CE	Chip Enable
16	/RES	H---Normal L--- Initalize T6963C
17	VEE	Negative Power Supply (-20V)
18	MD2	Pin for selection of number of columns. H---32 columns L---40 columns
19	FS	Pin for Selection of font. H---6x8 (default) L ---8x8
20	NC	No Connection

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



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

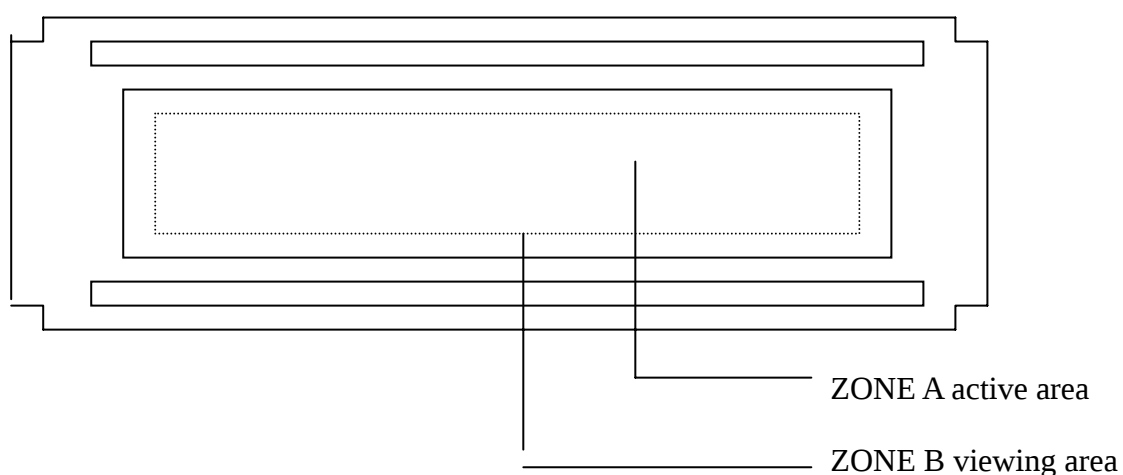
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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



9.6 RELIABILITY

Test Item	Test Conditions		Note
	Normal Temp. type	Extended Temp. type	
High Temperature Operation	50±3°C , t=96 hrs	70±3°C , t=96 hrs	
Low Temperature Operation	0±3°C , t=96 hrs	-20±3°C , t=96 hrs	
High Temperature Storage	70±3°C , t=96 hrs	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	-30±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	-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 :

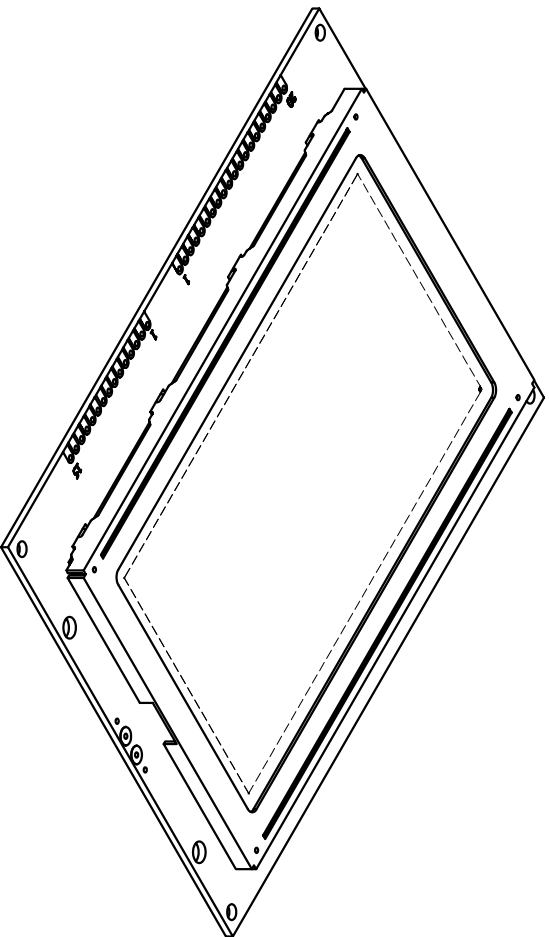
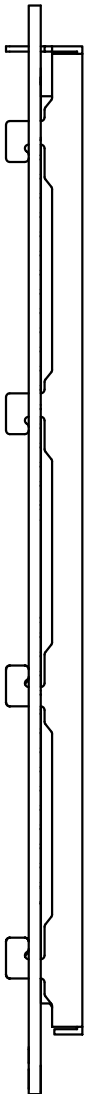
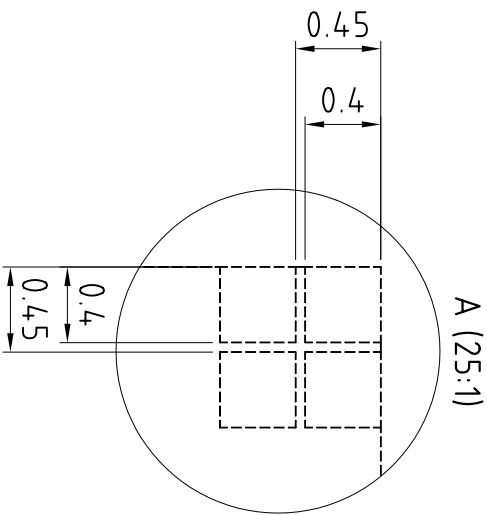
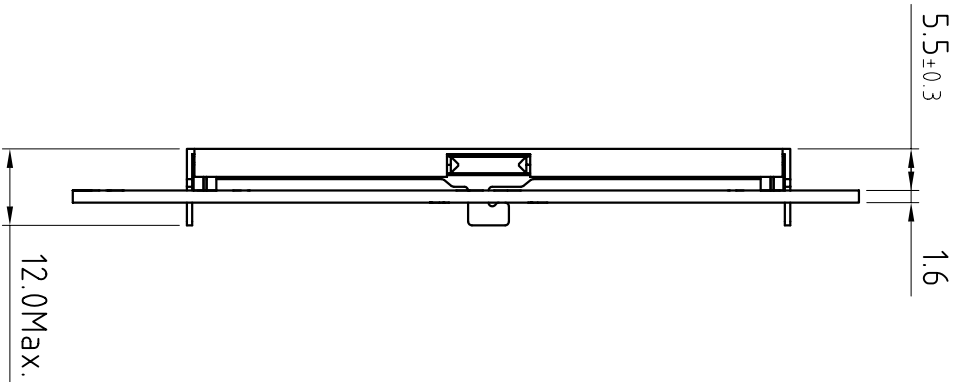
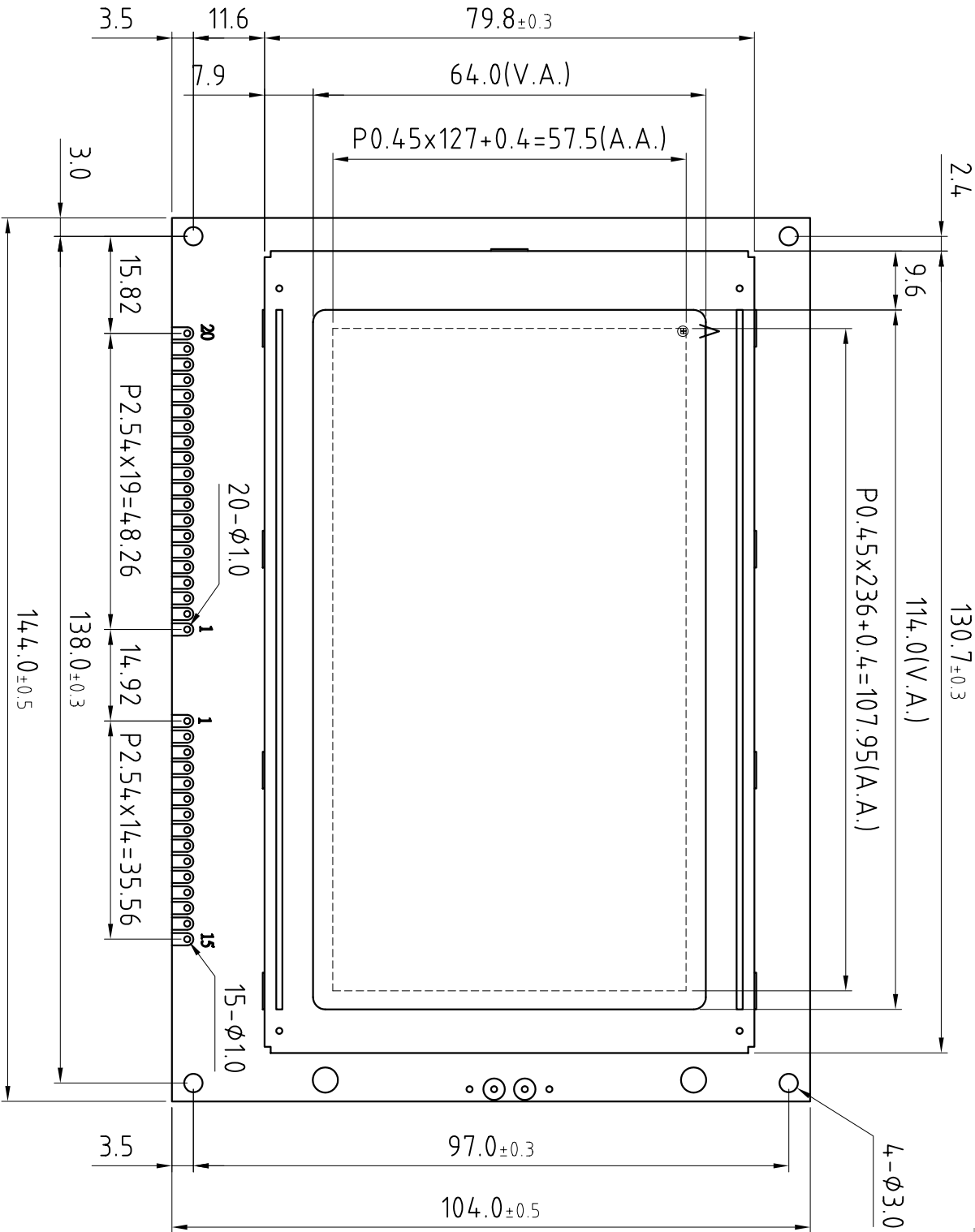
- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

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.

BUILT-IN CONTROLLER																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
VSS	VDD	V0	C/D	/RD	/WR	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	/CE	/RES	VEE	MD2	FS	NC

INTERFACE														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FLM	CP	LP	M	VDD	VSS	VEE	D0	D1	D2	D3	V0	/DISPOFF	A/EL1	K/EL2



APEX DISPLAY CO.,LTD.
晶英光電科技股份有限公司

Check By
Drawn By Tina

Approved By

Date 2003/10/23
Projection Type

Scale 1:1
UNIT mm

Product No.
AXFG240128B

TITLE
LCM DWG

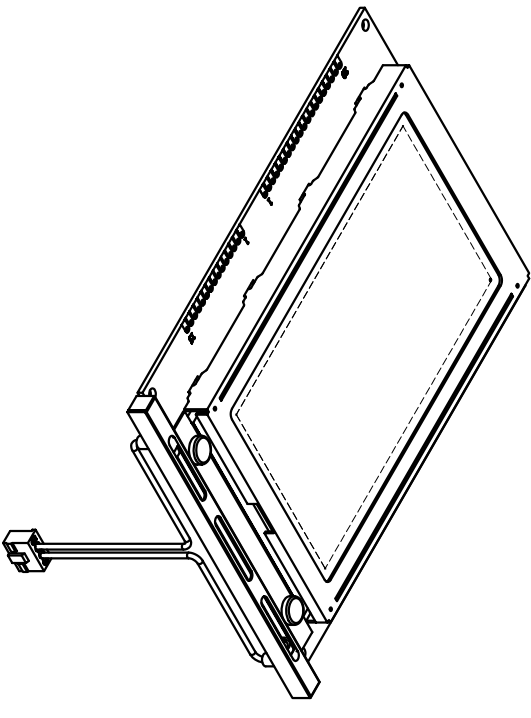
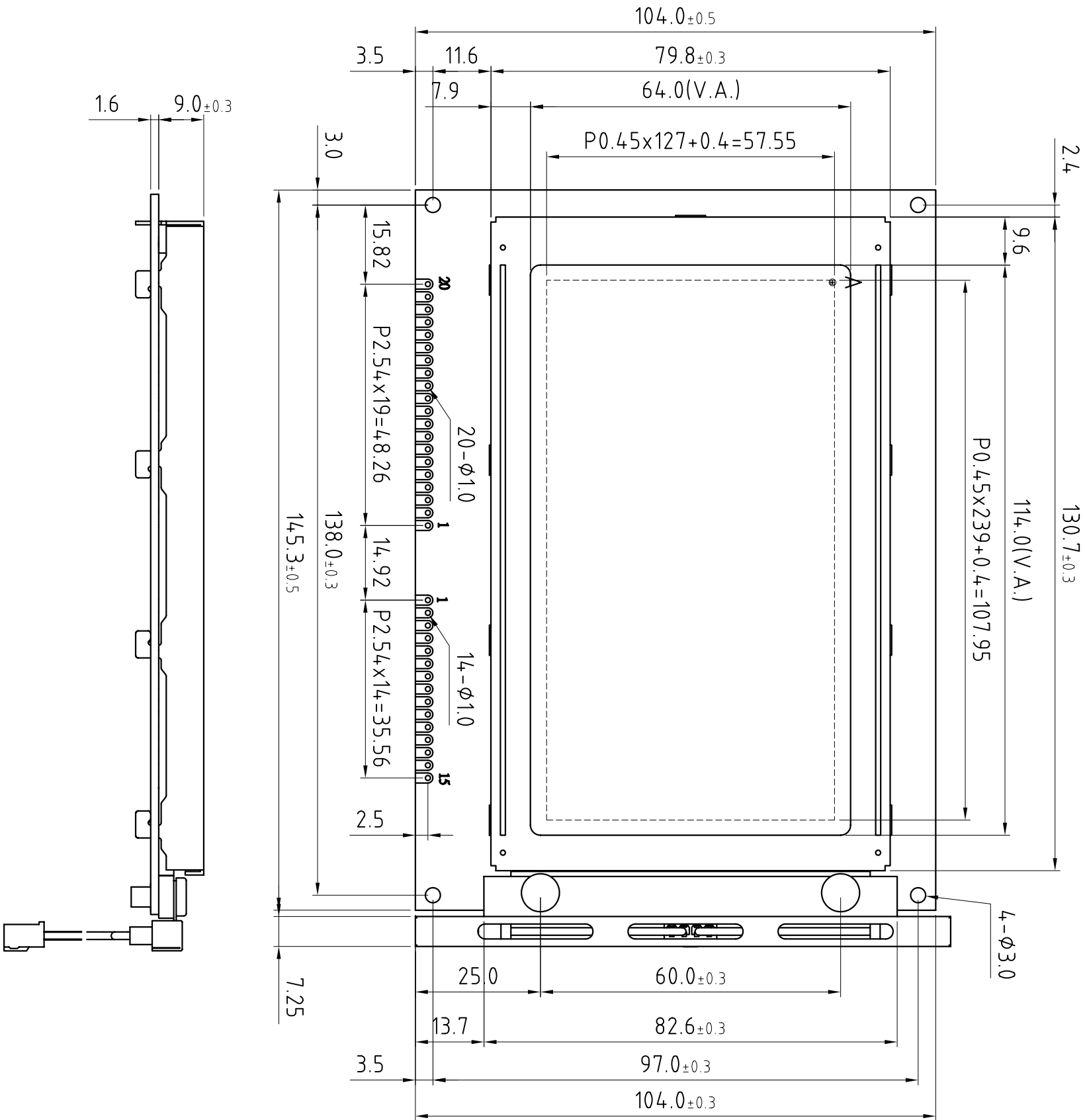
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BUILT-IN CONTROLLER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
VSS	VDD	V0	C/D	/RD	/MR	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	/CE	/RES	VEE	MD2	FS	NC

PURE DRIVER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FLM	CP	LP	M	VDD	VSS	VEE	D0	D1	D2	D3	V0	/DISPOFF	A/EL1	KE/L2



APEX DISPLAY CO.,LTD.
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Date 2003/10/23
Projection Type

Scale 1:1
UNIT mm

Product No.
AXFG240128B

TITLE
LCM DWG

Drawing NO.
AXFG240128B-A-02-02