SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LMBHA_014_7_

SPEC. NO.: LM014-7-△3

CUSTOMER
APPROVED BY
DATE :

RECORDS OF REVISION

SPEC. NO. : LM014-7

DATE	REVISED NO.	REF. PAGE	SUMMARY	DESIGN	CHECK
10.28.99'	0	26/26	First Issue Controller : T6963C Driver : LC7942/LC7940 SRAM : 32K	J.Y. Lin	Louis Lee
06.16.00'	1	31/31	1.Use New Form & Page Number Modified 2.Add Outline Drawing(28/31~31/31) 3.Add Wide Temp. Characteristics(2/31, 3/31,6/31)	J.Y. Lin	Louis Lee
08.15.00'	2	3/31	1.Add Electrical Characteristics Of LCM	J.Y. Lin	Louis Lee
		5/31	2.Add Optical Characteristics Of LCM		
03.29.01'	3	1/31	Add Polarizer Data	J.Y. Lin	
		2/31	Modify Electrical Absolute Ratings		
		3/31	Add Electrical Characteristics		
		6/31	Add Optical Characteristics		

1. MECHANICAL DATA

(1) Product No.		LMBHA_014_7_
(2) Module Size		170.0 (W)mm x 102.0 (H)mm x MAX 14.0 (D)mm
(3) Dot Size		0.47 (W)mm x 0.47 (H)mm
(4) Dot Pitch		0.5 (W)mm x 0.5 (H)mm
(5) Number of Dots		240 (W) x 128 (H)Dots
(6) Duty		1/128
(7) LCD Display Mode	STN:	☐ Gray Mode ☐ Yellow Mode ☐ Blue Mode
	FSTN:	☐ Black and White(Normal White/Positive Image)
		☐ Black and White(Normal Black/Negative Image)
	Rear Polarizer:	☐ Reflective ☐ Transflective ☐ Transmission
(8) Viewing Direction		☐ 6 O'clock ☐ 12 O'clock ☐____O'clock
(9) Backlight		CCFL
(10) Weight		225 g(Approx.)
(11) LCD Controller		Built-in
(12) DC/DC Converter		Excluded

Note :

LMBHA_014_7_

Back Light
B : CCFT Back Light

Reflective/Transmissive
S : Transflective(Normal)
T : Transmission

Option
C : Anti-Glare
D : Wide Temperature
K : High Contrast Ratio Lc
7 : Version

Mode/View Angle
E : Blue, 6 O'clock
G : Normally Black, 6 O'clock
J : Normally White, 6 O'clock
K : Normally White, 12 O'clock
H : Normally Black, 12 O'clock

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

GND=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−GND	0	5.5	V	
Power Supply for LC Drive	VDD−VEE	0	20.0	V	
Input Voltage	VI	GND	VDD	V	
Static Electricity	−	−	−	−	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.				WIDE TEMP.			
	OPERATING		STORAGE		OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	−20	70	−20	70	−30	80
Humidity (Without Condensation)	Note 2,4		Note 3,4		Note 4,5		Note 4,6	

Note 1 LCM should be grounded during handling LCM.

Note 2 Ta ≦ 50°C : 85% RH max
Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 3 Ta at −20°C will be < 48hrs, at 70°C will be < 120hrs

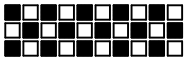
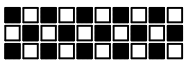
Note 4 Background color will change slightly depending on ambient temperature. This phenomenon is reversible.

Note 5 Ta ≦ 70°C : 75% RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 6 Ta at −30°C will be < 48hrs, at 80°C will be < 120hrs

3. ELECTRICAL CHARACTERISTICS

3-1. ELECTRICAL CHARACTERISTICS OF LCM

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD-GND	Ta=25°C		4.5	5.0	5.5	V
Power Supply for LCD Driving (Normal Temp. LCM)		VDD-VEE	VDD=5.0V 1/128 Duty 1/13 Bias	0°C	19.8	20.1	20.4	V
				25°C	18.2	18.5	18.8	
				50°C	16.8	17.1	17.4	
Power Supply for LCD Driving (Wide Temp. LCM)		VDD-VEE	VDD=5.0V 1/128 Duty 1/13 Bias	-20°C	20.5	20.8	21.3	V
				0°C	19.5	19.8	20.1	
				25°C	19.4	19.7	20.0	
				50°C	19.3	19.6	19.9	
				70°C	17.8	19.2	19.2	
Input Voltage		VIH	H level		0.7VDD	-	VDD	V
		VIL	L level		GND	-	0.3VDD	
Supply Current (LCD) (Normal Temp. LCM)		IDD	VDD = 5.0V VEE = -13.5V PATTERN: 		-	11.5	17.3	mA
		IEE			-	4.0	6.0	
Supply Current (LCD) (Wide Temp. LCM)		IDD	VDD = 5.0V VEE = -14.7V PATTERN: 		-	12.2	18.3	mA
		IEE			-	4.3	6.5	
LCM Surface Luminance	L	T014G7	VDD=5.0V VEE=-13.5V IL=5mA @ Vin=10.4V for Inverter TDK CXA-L10L	PATTERN: DOTS ALL ON	-	163	-	cd/m²
		T014G7C			-	160	-	
		T014E7C			-	125	-	
		T014G7		PATTERN: DOTS ALL OFF	-	27	-	
		T014G7C			-	24	-	
		T014E7C			-	40	-	
		T014K7CK	VDD=5.0V VEE=-14.7V IL=5mA @ Vin=10.4V for Inverter TDK CXA-L10L	PATTERN: DOTS ALL ON	-	-	-	
		T014E7CK			-	220	-	
		S014J7CD			-	25	-	
		T014H7D			-	164	-	
		T014K7CK		PATTERN: DOTS ALL OFF	-	-	-	
		T014E7CK			-	45	-	
		S014J7CD			-	80	-	
		T014H7D			-	28	-	

3-2. ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used lamp : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	V_L	–	370	–	Vrms	–
Lamp current	I_L	4	5	6	mArms	(*1)
Lamp power consumption	P_L	–	1.85	–	W	(*2)
Lamp frequcncy	F_L	20	30	50	KHz	
Lamp life time	L_L	–	20000	–	hrs	IL = 5 mArms

(*1) It is recommended that IL be not more than 5.0 mArms so that heat radiation of CCFT backlight may least affect the display quality .

(*2) Power consumption excluded inverter loss .

4-1. OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT Vop

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		φ(Viewing Angle)	
		0°C		25°C		50°C		50°C		50°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G	–	10	–	10	–	7	–	60	–	±29
	E	–	4.0	–	4.0	–	3.5	–	65	–	±40
NOTE		NOTE 6						NOTE 5			

note:

T : Transmission

G : Normally Black, 6 O'clock

E : Blue, 6 O'clock

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	—	480	720	ms	NOTE 2
		25℃	—	230	350		
		50℃	—	100	150		
Response Time (fall)	Tf	0℃	—	280	420	ms	NOTE 2
		25℃	—	80	120		
		50℃	—	60	90		

4-2. OPTICAL CHARACTERISTICS

(FOR WIDE TEMPERATURE MODE LCM)

AT Vop

ITEM / MODE		Cr(Contrast Ratio)										θ(Viewing Angle)		φ(Viewing Angle)	
		-20℃		0℃		25℃		50℃		70℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	E	–	4.0	–	4.5	–	4.5	–	3.0	–	3.0	–	60	–	±50
	H	–	8.0	–	10.0	–	10.0	–	7.0	–	6.5	–	65	–	±40
	K	–	4.0	–	4.0	–	4.0	–	3.0	–	3.0	–	60	–	±50
S	J	–	6.0	–	6.0	–	7.0	–	5.0	–	3.0	–	55	–	±45
note		NOTE 6										NOTE 5			

note:

S : Transflective(Normal)
T : Transmission

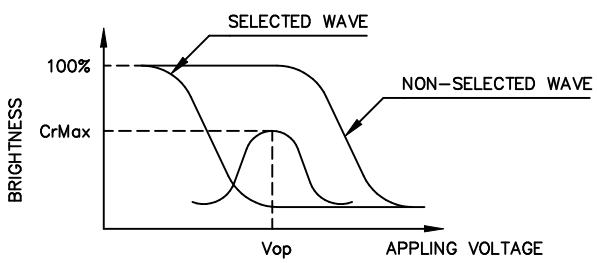
E : Blue, 6 O'clock
H : Normally Back, 12 O'clock
J : Normally White, 6 O'clock
K : Normally White, 12 O'clock

AT ø=0° θ=0°

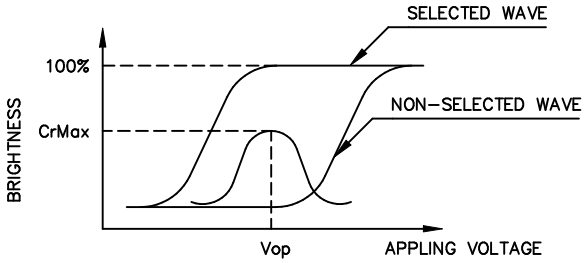
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	—	2700	4100	ms	NOTE 2
		0℃	—	600	900		
		25℃	—	200	300		
		50℃	—	110	170		
		70℃	—	90	140		
Response Time (fall)	Tf	-20℃	—	1400	2100	ms	NOTE 2
		0℃	—	300	450		
		25℃	—	130	200		
		50℃	—	70	110		
		70℃	—	40	60		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



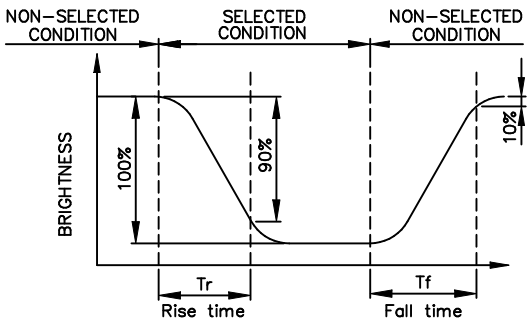
(negative type)

*Conditions

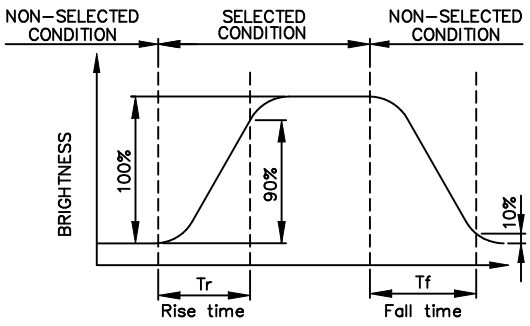
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



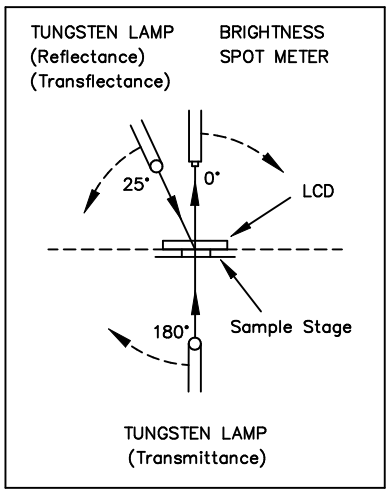
(negative type)

*Conditions

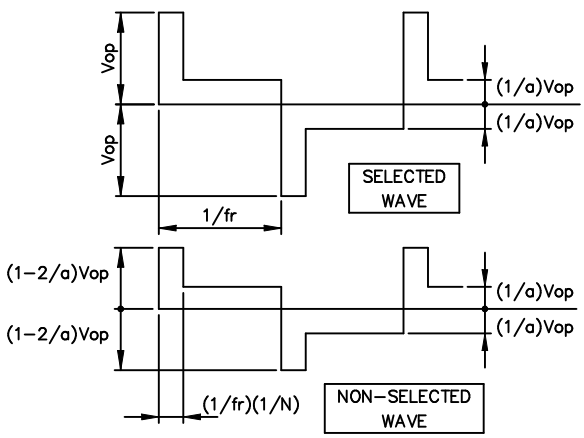
Operating Voltage : Vop
Viewing Angle (θ,ϕ) : (0,0)
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



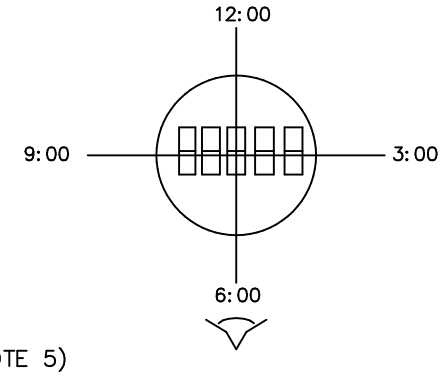
Multiplex Driving (1/N duty 1/a bias)



REV/DATE	R0/ 10.28.99'	R1/ 06.16.00'				BY J.Y. Lin

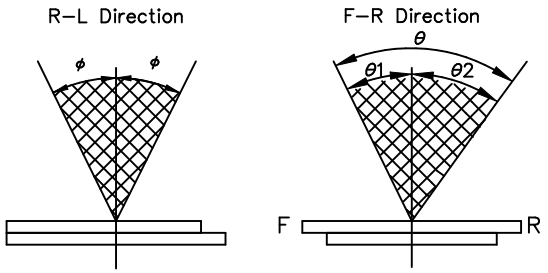
(NOTE 4)

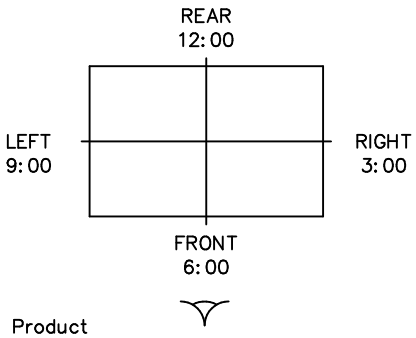
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

$$\theta = \theta 1 + \theta 2$$

*Conditions

Operating Voltage : Vop

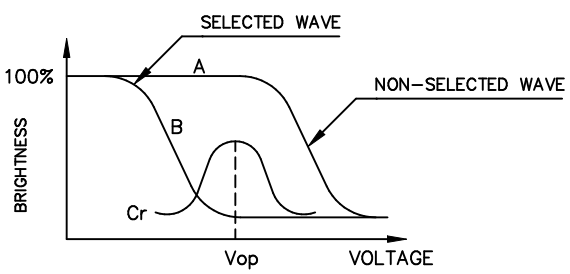
Frame Frequency : 70Hz

Appling Waveform : 1/N duty 1/a bias

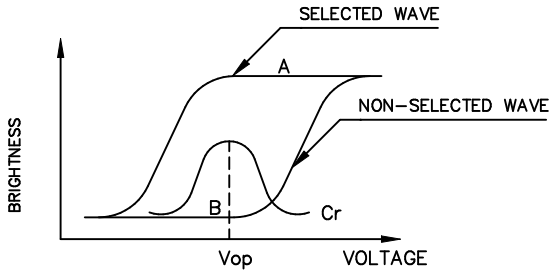
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

Contrast Ratio : Cr=A/B

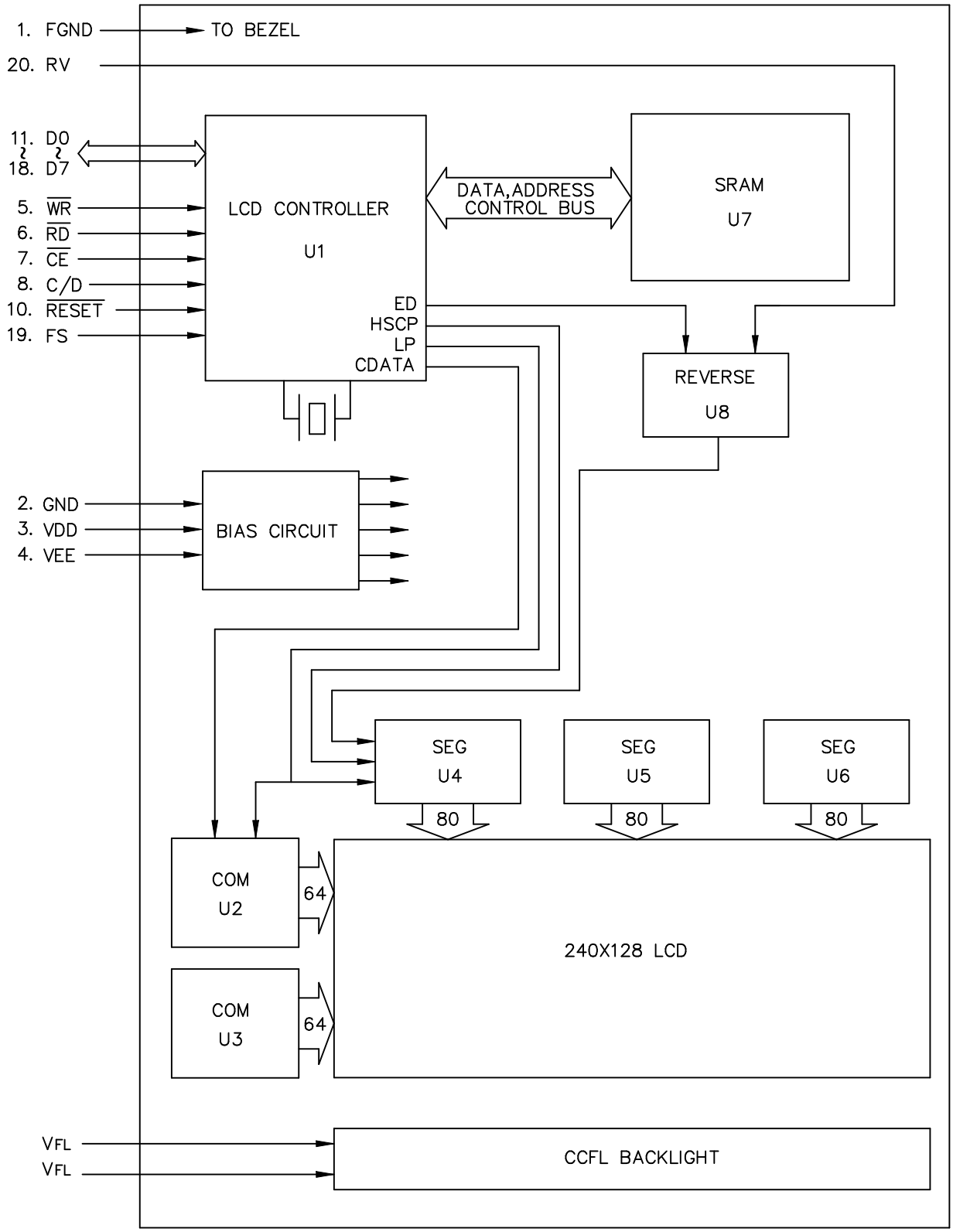
*Conditions

Viewing Angle : 0

Frame Frequency : 70Hz

Appling Waveform : 1/N duty 1/a bias

5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

LCD INTERFACE

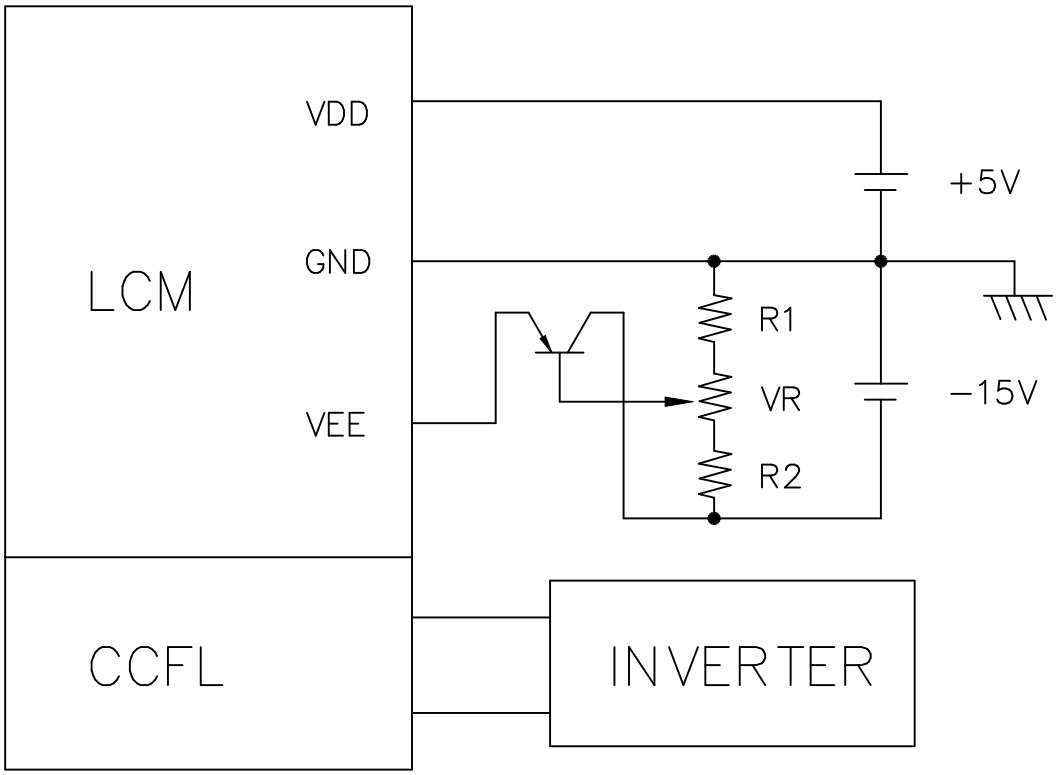
PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)
2	GND	GROUND
3	VDD	POWER SUPPLY FOR LOGIC (+5V)
4	VEE	POWER SUPPLY FOR LC DRIVING
5	$\overline{WR}$	DATA WRITE
6	$\overline{RD}$	DATA READ
7	$\overline{CE}$	CHIP ENABLE
8	C/D	$\overline{WR}$="L",C/D="H" :COMMAND WRITE $\overline{WR}$="L",C/D="L" :DATA WRITE $\overline{RD}$="L",C/D="H" :STATUS READ $\overline{RD}$="L".C/D="L" :DATA READ
9	NC	NO CONNECTION
10	$\overline{RESET}$	CONTROLLER RESET
11	D0	DATA INPUT/OUTPUT
12	D1	DATA INPUT/OUTPUT
13	D2	DATA INPUT/OUTPUT
14	D3	DATA INPUT/OUTPUT
15	D4	DATA INPUT/OUTPUT
16	D5	DATA INPUT/OUTPUT
17	D6	DATA INPUT/OUTPUT
18	D7	DATA INPUT/OUTPUT
19	FS	FONT SELECT CONNECT TO VDD : 6X8 PIXELS/CHARACTER CONNECT TO GND : 8X8 PIXELS/CHARACTER
20	RV	DISPLAY DATA REVERSE RV=H : REVERSE DISPLAY RV=L : NORMAL DISPLAY

CCFL INTERFACE

PIN NO.	SYMBOL	FUNCTION
1	V_{FL}	POWER SUPPLY FOR FL DRIVE
2	NC	NO CONNECTION
3	NC	NO CONNECTION
4	NC	NO CONNECTION
5	V_{FL}	POWER SUPPLY FOR FL DRIVE

USED CCFL CONNECTOR : IL-G-5S-S3C2(JAE) or Compatible

7. POWER SUPPLY



1. R1+VR+R2=10K~20K
2. Recommended CCFL Inverter : TDK CXA-L10L
   @ Vin=10.4V

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

@VDD = 5V±10%

ITEM	ITEM	CONDITION	MIN.	MAX.	UNIT
C/D SET UP TIME	t_{CDS}	Fig.	100	–	ns
C/D HOLD TIME	t_{CDH}	Fig.	10	–	ns
$\overline{CE}$,$\overline{RD}$,$\overline{WR}$ CLOCK WIDTH	t_{CP}, t_{RP}, t_{WP}	Fig.	80	–	ns
DATA SET UP TIME	t_{DS}	Fig.	80	–	ns
DATA HOLD TIME	t_{DH}	Fig.	40	–	ns
ACCESS TIME	t_{ACC}	Fig.	–	150	ns
DATA OUTPUT HOLD TIME	t_{OH}	Fig.	10	50	ns

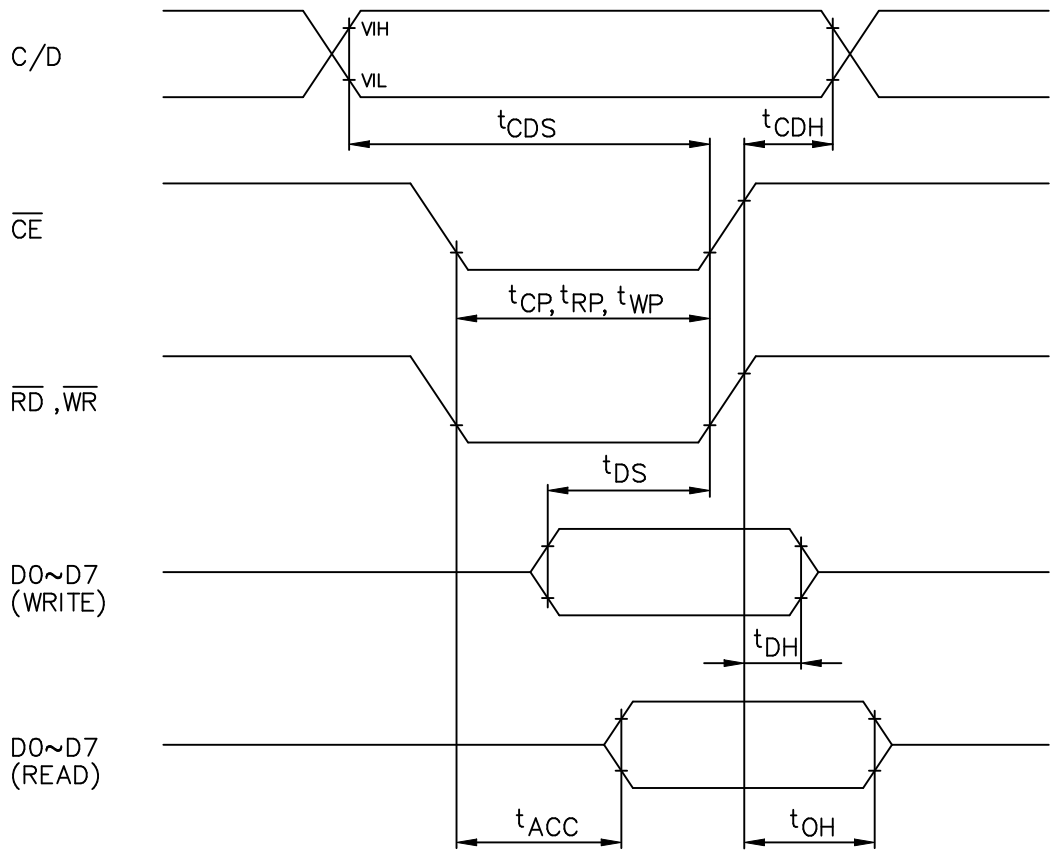
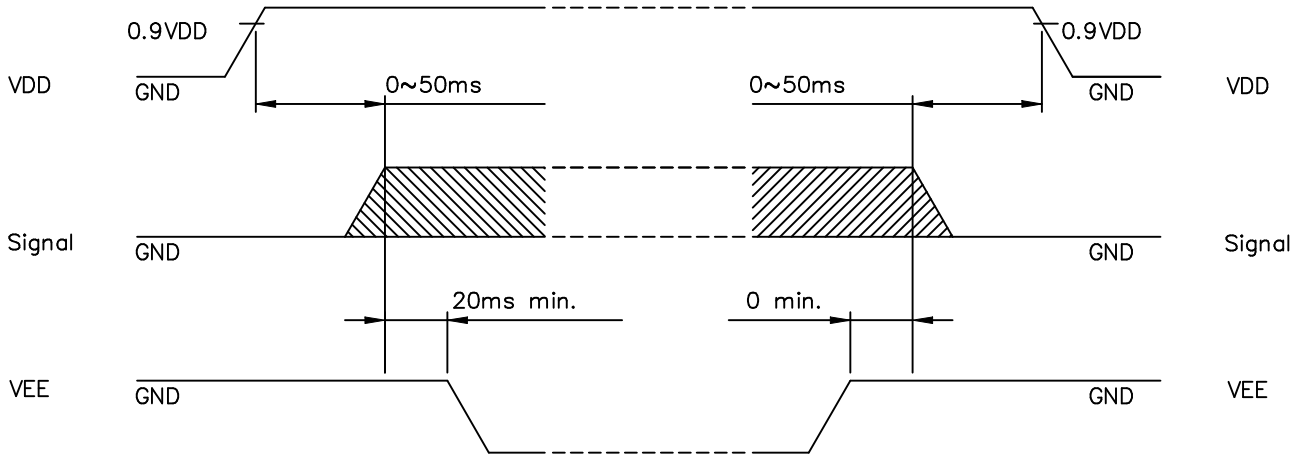


Fig. INTERFACE TIMING CHART

8-2.POWER ON/OFF TIMING

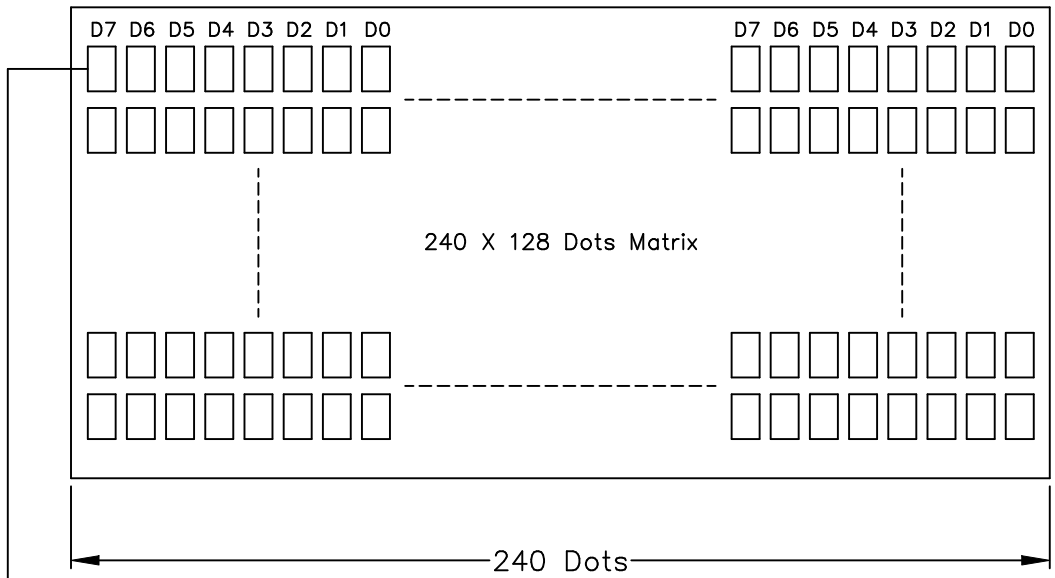


POWER ON

POWER OFF

The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

8-3. DISPLAY PATTERN



Startting dot for the startting address of display RAM.

D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.

8-4.COMMAND LIST

COMMAND	CODE	D1	D2	FUNCTION
REGISTER SET	00100001	X address	X address	Cursor pointer set
	00100010	Data	OOH	Offset register set
	00100100	Low address	High address	Address pointer set
CONTROL WORD SET	01000000	Low address	High address	Text home address set
	01000001	Columns	OOH	Text area set
	01000010	Low address	High address	Graphic home address set
	01000011	Columns	OOH	Graphic area set
MODE SET	1000X000	—	—	"OR" mode
	1000X001	—	—	"EXOR" mode
	1000X011	—	—	"AND" mode
	1000X100	—	—	"Text attribute" mode
	10000XXX	—	—	Internal CG ROM mode
	10001XXX	—	—	External CG RAM mode
DISPLAY MODE	10010000	—	—	Display off
	1001XX10	—	—	Cursor on, blink off
	1001XX11	—	—	Cursor on, blink on
	100101XX	—	—	Text on, graphic off
	100110XX	—	—	Text off, graphic on
	100111XX	—	—	Text on, graphic on
CURSOR PATTERN SELECT	10100000	—	—	1 line cursor
	10100001	—	—	2 lines cursor
	10100010	—	—	3 lines cursor
	10100011	—	—	4 lines cursor
	10100100	—	—	5 lines cursor
	10100101	—	—	6 lines cursor
	10100110	—	—	7 lines cursor
	10100111	—	—	8 lines cursor
DATA AUTO READ/WRITE	10110000	—	—	Data auto write set
	10110001	—	—	Data auto read set
	10110010	—	—	Auto reset
DATA READ WRITE	11000000	Data	—	Data write and ADP increment
	11000001	—	—	Data read and ADP increment
	11000010	Data	—	Data write and ADP decrement
	11000011	—	—	Data read and ADP decrement
	11000100	Data	—	Data write and ADP nonvariable
	11000101	—	—	Data read and ADP nonvariable
SCREEN PEEK	11100000	—	—	Screen peek
SCREEN COPY	11101000			Screen copy
BIT SET/RESET	11110XXX	—	—	bit reset
	11111XXX	—	—	bit set
	1111X000	—	—	bit0(LSB)
	1111X001	—	—	bit1
	1111X010	—	—	bit2
	1111X011	—	—	bit3
	1111X100	—	—	bit4
	1111X101	—	—	bit5
	1111X110	—	—	bit6
	1111X111	—	—	bit7(MSB)

* STATUS READ

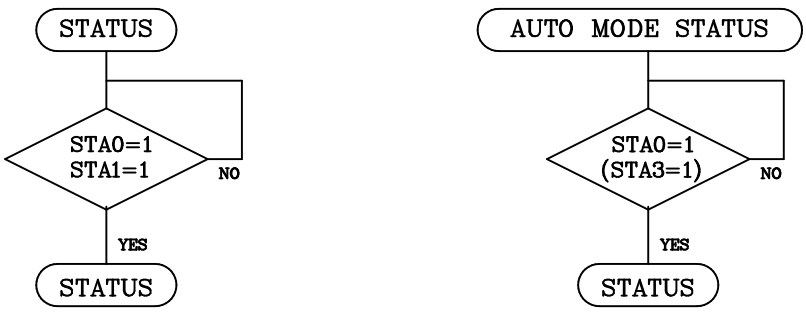
Before sending data (read/write), command it is necessary to check the status.

T6963C status word format is following :

LSB	D0	STA0	Check capability of command execution	0: Disable 1: Enable
	D1	STA1	Check capability of data read/write	0: Disable 1: Enable
	D2	STA2	Check capability of auto mode data read	0: Disable 1: Enable
	D3	STA3	Check capability of arto mode data write	0: Disable 1: Enable
	D4	STA4	Not use	
	D5	STA5	Check capability of controller operation	0: Disable 1: Enable
	D6	STA6	Error flag. Using screen peek/copy command	0: Disable 1: Enable
MSB	D7	STA7	Check the condition blink	0: Disable 1: Enable

Note 1: It is necessary to check STA0 and STA1 at the same time. The error is happened by sending data at executing command.
Note 2: The status check will be enough to check STA0/STA1.
Note 3: STA2/STA3 are valid in auto mode STA0/STA1 are invalid.

Status checking flow



Note 4: It is impossible to save status check in the case of command of MSB0. To have the delay time cannot be save status check. The interrupt of hardware is happened at the end of lines. If command of MSB0 is sent in this period, the command executing is waited. The state of waiting doesn't disregarded or rewrites data of waiting command.

9. RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120HR		Appearance without defect	
2	Low Temp. Storage	−20°C	120HR		Appearance without defect	
3	High Temp. & High Humi. Storage	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	−20°C, 30min → 25°C, 5min → 70°C, 30min → 25°C, 5min (1cycle)			Appearance without defect	5 cycles

Inspection Provision

1.Purpose

The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

2.Applicable Scope

The NAN YA inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3.Technical Terms

3-1 NAN YA Technical Terms

4.Outgoing Inspection Provision

Outgoing inspection is according to the product inspection manual. (Per 1-1, 1-2 & 1-3)

4-1 Ispection Method

MIL-STD-105D Level Ⅱ Regular inspection

4-2 Inspection Standard

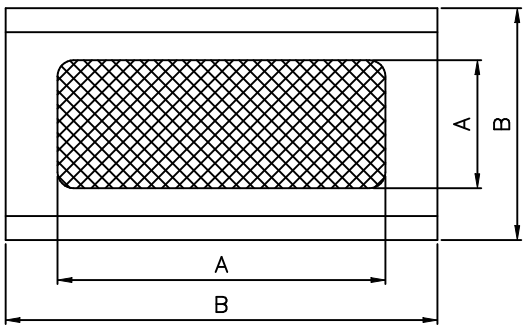
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		

	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	faults which appear to pose almost no obstacle to the practicality, effective use, and operation.
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color unevenness		
	Solder appearance	Cold solder Solder projections		

4-3 Inspection Provisions

*Viewing Area Definition

Fig. 1



A : Zone Viewing Area
B : Zone Glass Plate Out Line

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring.
The distance between luminous source(daylight fluorescent lamp and cool white fluorescent lamp) and a sample to be 30cm to 50cm.

*Test and measurement are performed under the following conditions, unless otherwise specified.

Otherwise specfied.

Temperature	20± 15°C
Humidity	65± 20%R.H..
Pressure	860~1060hPa(mmbar)

In case of doubtful judgment, it is performed under the following conditions.

Temperature	20± 2°C
Humidity	65± 5%R.H..
Pressure	860~1060hPa(mmbar)

5. Specification for quality check

5-1 Electrical characteristics

NO.	Item	Criterion
1.	Non operational	Fail
2.	Miss operating	Fail
3.	Missing dot	Fail
4.	Contrast irregular	Not allowable
5.	Response time	Within Specified value
6.	CCFL backlight turn on/off	Within Specified value

5-2 External Appearance Defect

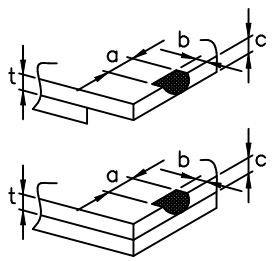
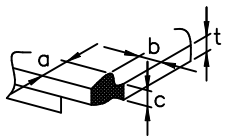
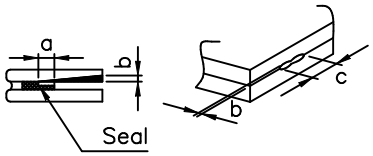
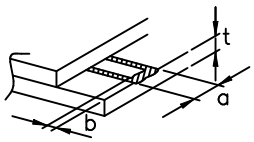
<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1.</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>(1)-1-Spots
<table><tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th></tr><tr><td>D≦0.1</td><td>Ignore</td></tr><tr><td>0.1<D≦0.2</td><td>5</td></tr><tr><td>0.2<D≦0.3</td><td>2</td></tr><tr><td>0.3<D</td><td>0</td></tr></table>Number of total pieces is set to within 5 pieces.

Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2

(1)-2-Blurred Spots(At lighting condition)
<table><tr><th>Average Diameter(mm): D</th><th>Number of pieces permitted</th></tr><tr><td>D≦0.3</td><td>Ignore</td></tr><tr><td>0.3<D≦0.75</td><td>5</td></tr><tr><td>0.75<D</td><td>0</td></tr></table>Number of total pieces is set to within 5 pieces.

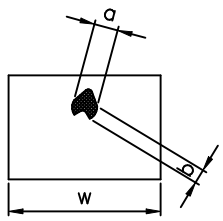
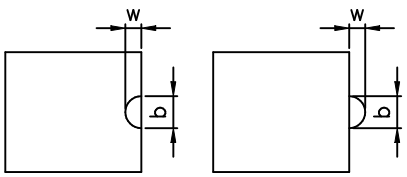
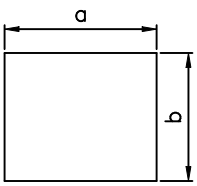
Note that when there are 2 pieces or more, they are not to be concentrated.
Set as: Average diameter = (Long diameter + Short diameter)/2</td></tr>
</table>

<table>
<tr><td>1.</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>(1)−1 Spots
<table><tr><th>Width(mm): W</th><th>Length(mm): L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦4</td><td>2</td></tr><tr><td>0.08<W≦0.1</td><td>L≦1</td><td>1</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.
(1)−2−Blurred Spots(At lighting condition)
<table><tr><th>Width(mm): W</th><th>Length(mm): L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦3</td><td>6</td></tr><tr><td>0.08<W</td><td>3<L</td><td>None</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.</td></tr>
<tr><td>2.</td><td>Scratches(Glass, reflection plates, and polarizing plates)</td><td>In accordance with black spots.
(At non lighting condition)</td></tr>
<tr><td>3.</td><td>Color irregular</td><td>Not remarkable color irregular.</td></tr>
</table>

<table>
<tr><td>4.</td><td>Air bubbles polarizing plates, and reflection plates</td><td colspan="2">
<table>
<tr><th>Average Diameter (mm): D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.3</td><td>Ignore</td></tr>
<tr><td>0.3<D</td><td>0</td></tr>
</table>
Average diameter = (Long diameter + Short diameter)/2
Note that when there are 4 pieces or more, they are not to be concentrated.
</td></tr>
<tr><td rowspan="5">5.</td><td rowspan="5">Cracks</td><td>(1)General crack
 
</td><td>a≦5
b≦2
c≦t
Where, a and b are ignored when less that or equal 0.5. The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(2)Corner crack
 
</td><td>a≦2.5
b≦2.5
c≦t
a+b≦4</td></tr>
<tr><td>(3)Seal portion crack
 
</td><td>a≦The seal widthx1/3
b≦tx2/3
c≦5
The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(4)ITO Pin crack
 
</td><td>a≦5
b≦1/3 pin length
c≦t</td></tr>
<tr><td>(5)Progressive cracks</td><td>All taken to be unacceptable.</td></tr>
</table>

6.	Outer dimensions	Should be with in the tolerance.
7.	Soldering	Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mouting position, etc.

5-3 Dot Appearance Defect

NO.	Item	Criteria
1.	Plinhole	 Dot display a and b are each ≦0.2mm The overall total is taken be with in 10 units. Note that they are not to be concentrated.
2.	Missing	 Dot display a and b are each ≦0.2mm The overall total is taken to be with in 10 units.
3.	Thick and thin display	 Taken to be within±1.5% of display character width(a) and height(b).

NOTE:

- SAFETY
  1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- HANDLING
  1. Avoid static electricity which can damage the CMOS LSI.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
  5. Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

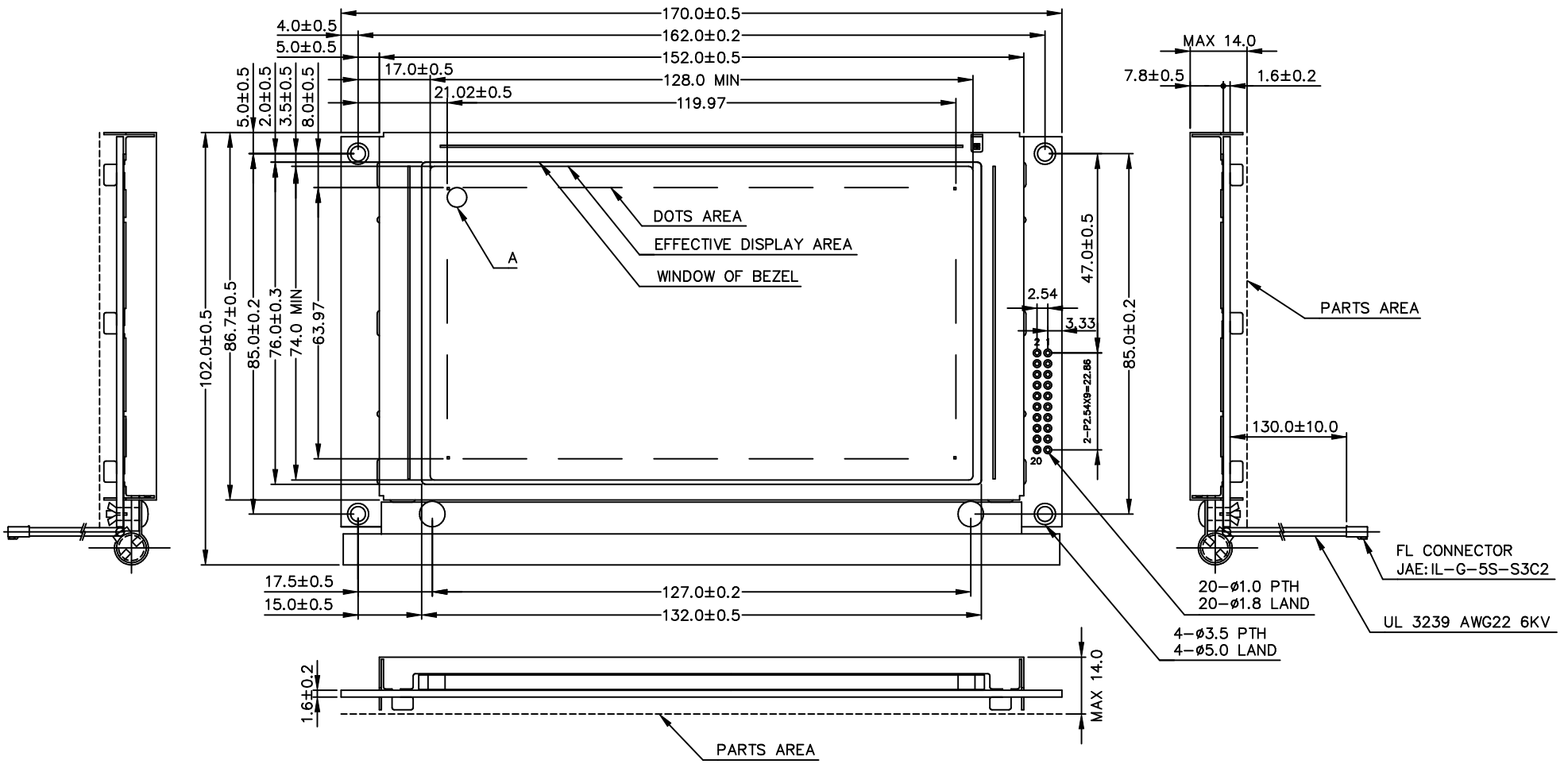
- STORAGE
  1. Store the panel or module in a dark place where the temperature is 25°C±5°C and the humidity is below 65% RH.
  2. Do not place the module near organics solvents or corrosive gases.
  3. Do not crush, shake, or jolt the module.

- TERMS OF WARRANT
  1. Acceptance inspection period
     The period is within one month after the arrival of contracted commodity at the buyer's factory site.
  2. Applicable warrant period
     The period is within twelve months since the date of shipping out under normal using and storage conditions.

- THE AVERAGE LIFE TIME OF BACK LIGHT
  CCFT : 20,000hrs for lamp-current 5mA, 35KHz, 25°C
  (Operating life time is defined as follows : The final brightness is at 50% of original brightness.)

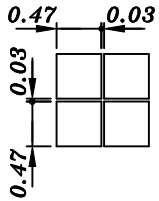
LCD VIBRATION & DROP TEST

NO	ITEM	CONDITIONS			RESULT
1.	Vibration Test	a. Frequency	5 ⟶ 13.95Hz 13.95 ⟶ 33Hz 33 ⟶ 51Hz 51 ⟶ 500Hz	Displacement: 0.2inch Acceleration: 2G Displacement: 0.036inch Acceleration: 5G	OK
		b. Time	20 min. ± 1 min. X.Y.Z 3 Direction		
		Total Time	60 min. ± 3 min.		
2.	Drop Test	Three-time free drop In X.Y.Z direction & One conner from a height of 70cm about ground			OK



NOTES :

1. RESOLUTION : 240 X 128 Dots
2. CONTROLLER : T6963C(Toshiba)
3. DC/DC : Without
4. GENERAL TOLERANCE : ±0.5 mm



240X128 DOTS

A DEITAIL

PIN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FGND	GND	VDD	VEE	$\overline{WR}$	$\overline{RD}$	$\overline{CE}$	C/D	NC	$\overline{RESET}$
PIN NO.	11	12	13	14	15	16	17	18	19	20
SYMBOL	D0	D1	D2	D3	D4	D5	D6	D7	FS	RV

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK
5				
4				
3				
2				
1				

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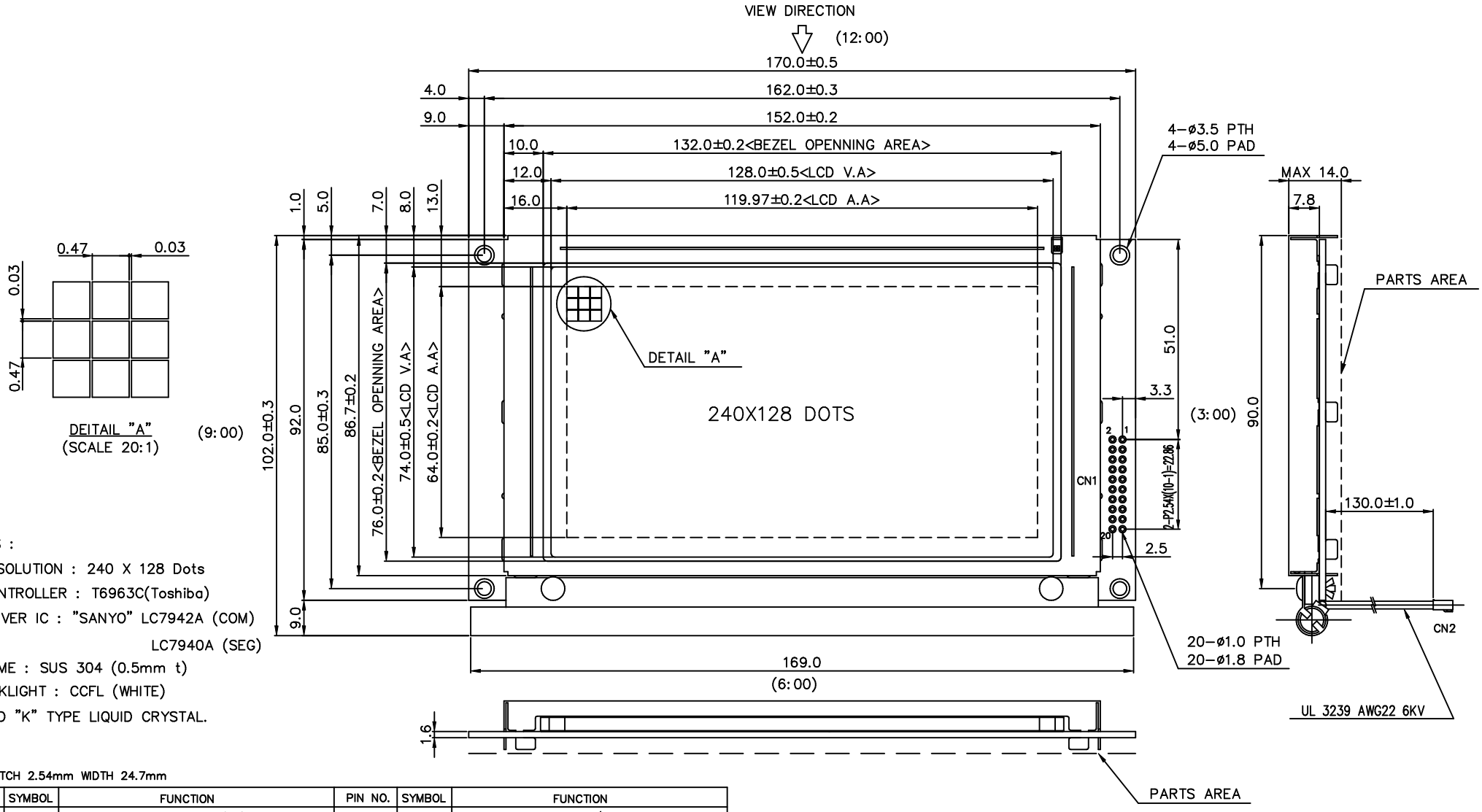
NAN YA PLASTICS CORPORATION

製品圖

LMBHAT014G7C_

TITLE	NAME	DATE	THIRD ANGLE P.
APPROVE	TONY CHOU	88.10.28	
CHECK	LOUIS LEE	88.10.28	
DESIGN	J.Y.LIN	88.10.28	SCALE / UNIT
DRAWN	J.Y.LIN	88.10.28	0.68/1 / mm

DWG NO. MBT014G7 1/1 0



NOTES :

1. RESOLUTION : 240 X 128 Dots
2. CONTROLLER : T6963C(Toshiba)
3. DRIVER IC : "SANYO" LC7942A (COM)
   LC7940A (SEG)
4. FRAME : SUS 304 (0.5mm t)
5. BACKLIGHT : CCFL (WHITE)
6. USED "K" TYPE LIQUID CRYSTAL.

CN1 : PITCH 2.54mm WIDTH 24.7mm

PIN NO.	SYMBOL	FUNCTION	PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)	15	D4	DATA INPUT/OUTPUT
2	GND	GROUND	16	D5	DATA INPUT/OUTPUT
3	VDD	POWER SUPPLY FOR LOGIC (+5V)	17	D6	DATA INPUT/OUTPUT
4	VEE	POWER SUPPLY FOR LC DRIVING	18	D7	DATA INPUT/OUTPUT
5	$\overline{WR}$	DATA WRITE	19	FS	FONT SELECT CONNECT TO VDD : 6X8 PIXELS/CHARACTER CONNECT TO GND : 8X8 PIXELS/CHARACTER
6	$\overline{RD}$	DATA READ	20	RV	DISPLAY DATA REVERSE RV=H : REVERSE DISPLAY RV=L : NORMAL DISPLAY
7	$\overline{CE}$	CHIP ENABLE			
8	C/D	$\overline{WR}$="L" ,C/D="H" : COMMAND WRITE $\overline{WR}$="L" ,C/D="H" : DATA WRITE $\overline{RD}$="L" ,C/D="H" : STATUS READ $\overline{RD}$="L" ,C/D="H" : DATA READ			
9	NC	NO CONNECTION			
10	$\overline{RESET}$	CONTROLLER RESET			
11	D0	DATA INPUT/OUTPUT			
12	D1	DATA INPUT/OUTPUT			
13	D2	DATA INPUT/OUTPUT			
14	D3	DATA INPUT/OUTPUT			

CN2 : "JAE" IL-G-5S-S3C2

PIN NO.	SYMBOL	FUNCTION
1	V_{FL}	POWER SUPPLY FOR FL DRIVE
2	NC	NO CONNECTION
3	NC	NO CONNECTION
4	NC	NO CONNECTION
5	V_{FL}	POWER SUPPLY FOR FL DRIVE

DIMENSION	TOLERANCE
L ≦ 6	±0.25 (mm)
6 < L ≦ 18	±0.3 (mm)
18 < L ≦ 50	±0.4 (mm)
50 < L ≦ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
5					
4					
3					
2					
1					

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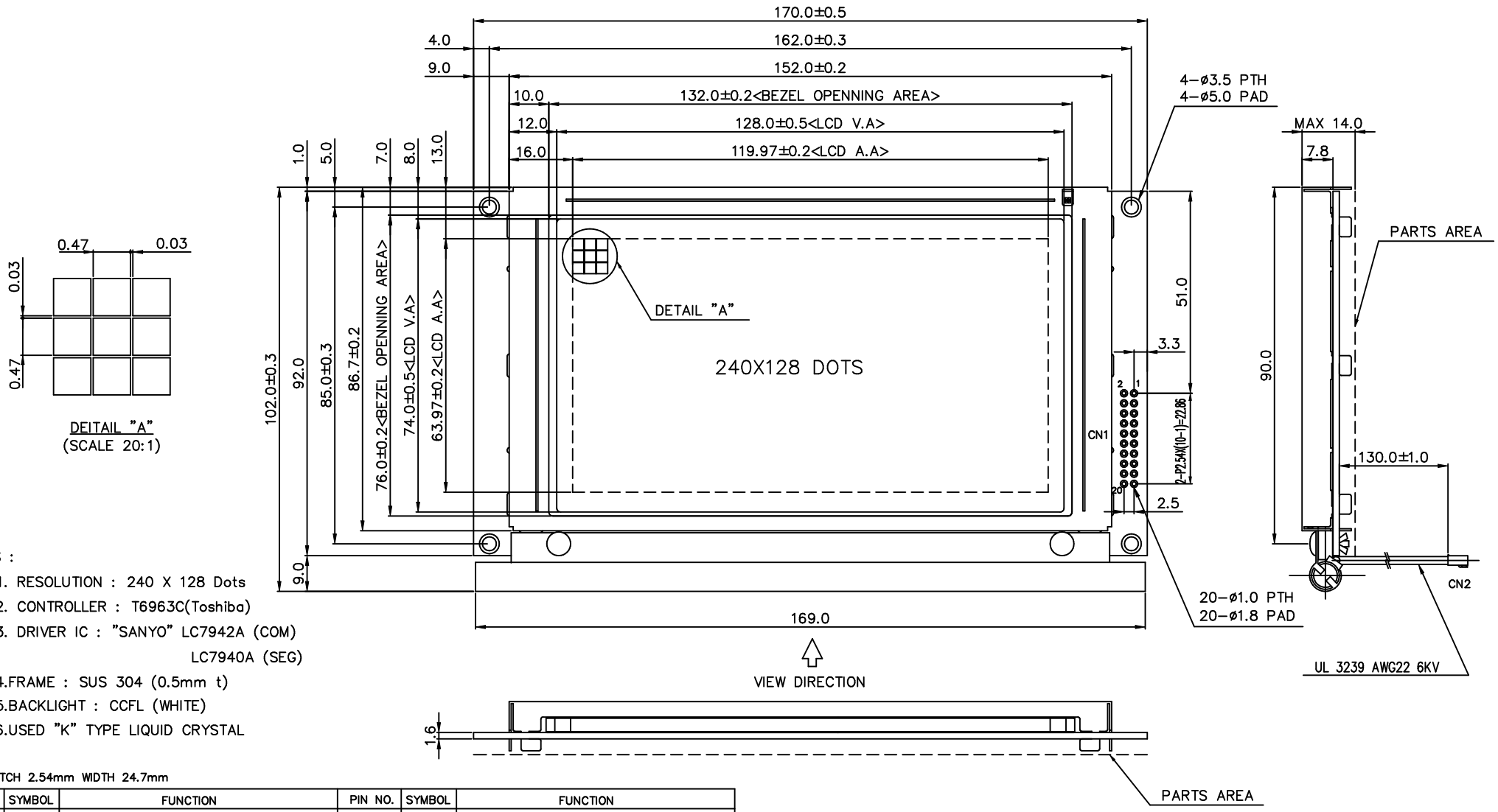
NAN YA PLASTICS CORPORATION

製品圖

LMBHAT014K7CK

APPROVE			THIRD ANGLE P.
CHECK			
DESIGN	J.Y.Lin	89.06.07	
DRAWN	Ping Ping	89.06.07	SCALE / UNIT
	NAME	DATE	1/1 / mm

DWG NO. M014AD7A (1/1) (0)



NOTES :

1. RESOLUTION : 240 X 128 Dots
2. CONTROLLER : T6963C(Toshiba)
3. DRIVER IC : "SANYO" LC7942A (COM)
   LC7940A (SEG)
4. FRAME : SUS 304 (0.5mm t)
5. BACKLIGHT : CCFL (WHITE)
6. USED "K" TYPE LIQUID CRYSTAL

CN1 : PITCH 2.54mm WIDTH 24.7mm

PIN NO.	SYMBOL	FUNCTION	PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)	15	D4	DATA INPUT/OUTPUT
2	GND	GROUND	16	D5	DATA INPUT/OUTPUT
3	VDD	POWER SUPPLY FOR LOGIC (+5V)	17	D6	DATA INPUT/OUTPUT
4	VEE	POWER SUPPLY FOR LC DRIVING	18	D7	DATA INPUT/OUTPUT
5	$\overline{WR}$	DATA WRITE	19	FS	FONT SELECT CONNECT TO VDD : 6X8 PIXELS/CHARACTER CONNECT TO GND : 8X8 PIXELS/CHARACTER
6	$\overline{RD}$	DATA READ	20	RV	DISPLAY DATA REVERSE RV=H : REVERSE DISPLAY RV=L : NORMAL DISPLAY
7	$\overline{CE}$	CHIP ENABLE			
8	C/D	WR="L" ,C/D="H" : COMMAND WRITE WR="L" ,C/D="H" : DATA WRITE RD="L" ,C/D="H" : STATUS READ RD="L" ,C/D="H" : DATA READ			
9	NC	NO CONNECTION			
10	$\overline{RESET}$	CONTROLLER RESET			
11	D0	DATA INPUT/OUTPUT			
12	D1	DATA INPUT/OUTPUT			
13	D2	DATA INPUT/OUTPUT			
14	D3	DATA INPUT/OUTPUT			

CN2 : "JAE" IL-G-5S-S3C2

PIN NO.	SYMBOL	FUNCTION
1	V_{FL}	POWER SUPPLY FOR FL DRIVE
2	NC	NO CONNECTION
3	NC	NO CONNECTION
4	NC	NO CONNECTION
5	V_{FL}	POWER SUPPLY FOR FL DRIVE

DIMENSION	TOLERANCE
L ≦ 6	±0.25 (mm)
6 < L ≦ 18	±0.3 (mm)
18 < L ≦ 50	±0.4 (mm)
50 < L ≦ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
5					
4					
3					
2					
1					

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NAN YA PLASTICS CORPORATION

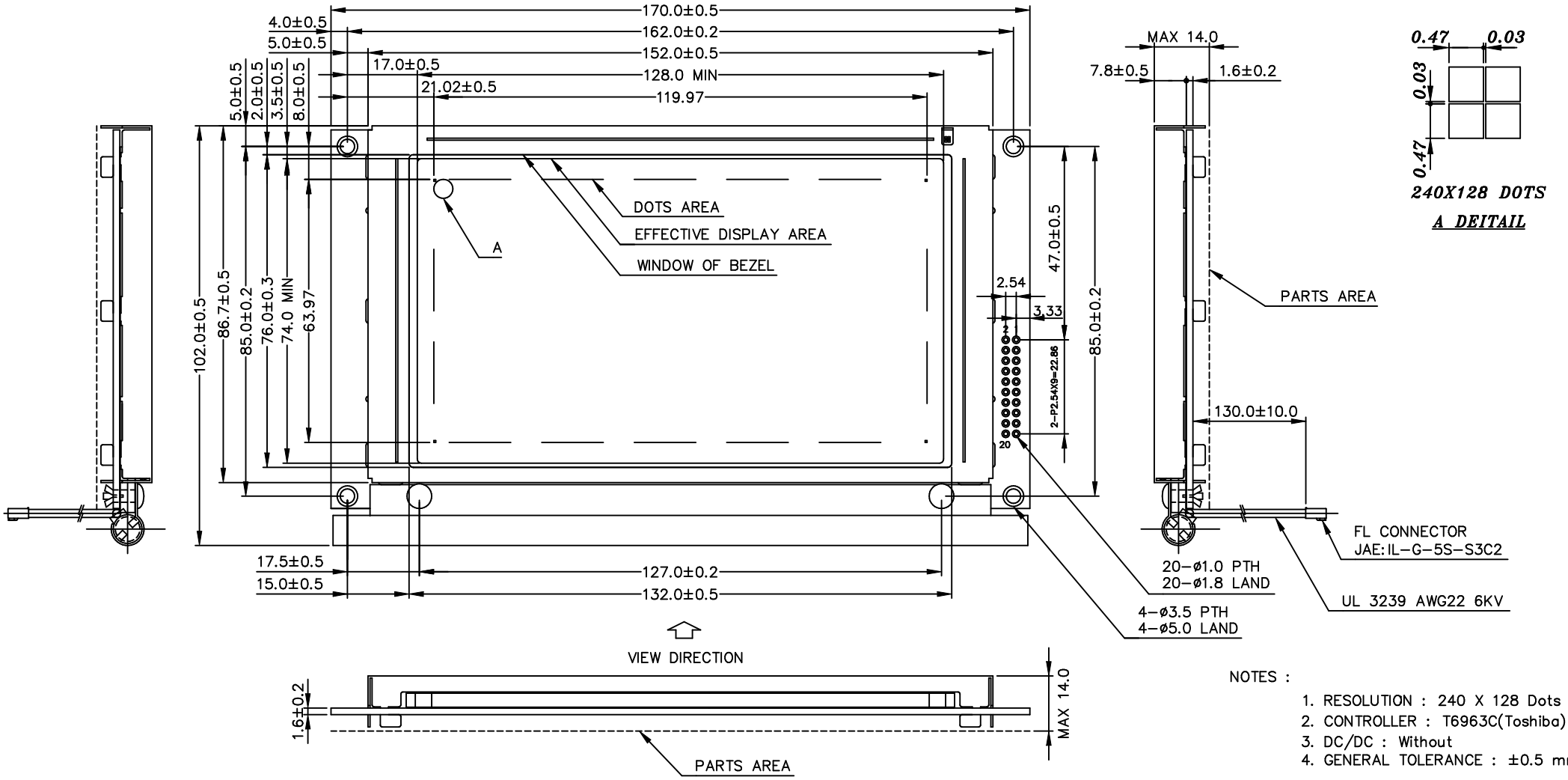
製品圖

LMBHAX014X7XX

APPROVE			THIRD ANGLE P.
CHECK			
DESIGN	J.Y.Lin	89.08.25	
DRAWN	Ping Ping	89.08.25	SCALE / UNIT
	NAME	DATE	1/1 / mm

DWG NO. M014XD7A

SHEET NO. : 29/31



NOTES :

1. RESOLUTION : 240 X 128 Dots
2. CONTROLLER : T6963C(Toshiba)
3. DC/DC : Without
4. GENERAL TOLERANCE : ±0.5 mm

PIN NO	SYMBOL	FUNCTION	PIN NO	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)	11	D0	DATA INPUT/OUTPUT
2	GND	GROUND	12	D1	DATA INPUT/OUTPUT
3	VDD	POWER SUPPLY FOR LOGIC (+5V)	13	D2	DATA INPUT/OUTPUT
4	VEE	POWER SUPPLY FOR LC DRIVING	14	D3	DATA INPUT/OUTPUT
5	$\overline{WR}$	DATA WRITE	15	D4	DATA INPUT/OUTPUT
6	$\overline{RD}$	DATA READ	16	D5	DATA INPUT/OUTPUT
7	$\overline{CE}$	CHIP ENABLE	17	D6	DATA INPUT/OUTPUT
8	C/D	$\overline{WR}$="L",C/D="H":COMMAND WRITE $\overline{WR}$="L",C/D="L":DATA WRITE $\overline{RD}$="L",C/D="H":STATUS READ $\overline{RD}$="L",C/D="L":DATA READ	18	D7	DATA INPUT/OUTPUT
			19	FS	FONT SELECT CONNECT TO VDD:6X8 PIXELS/CHARACTER CONNECT TO GND:6X8 PIXELS/CHARACTER
9	NC	NC CONNECTION	20	RV	DISPLAY DATA REVERSE RV=H:REVERSE DISPLAY RV=L:NORMAL DISPLAY
10	$\overline{RESET}$	CONTROLLER RESET			

GENERAL TOLERANCE LIST

DIMENSION	TOLERANCE
L ≦ 6	±0.25 (mm)
6 < L ≦ 18	±0.3 (mm)
18 < L ≦ 50	±0.4 (mm)
50 < L ≦ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
5					
4					
3					
2					
1					

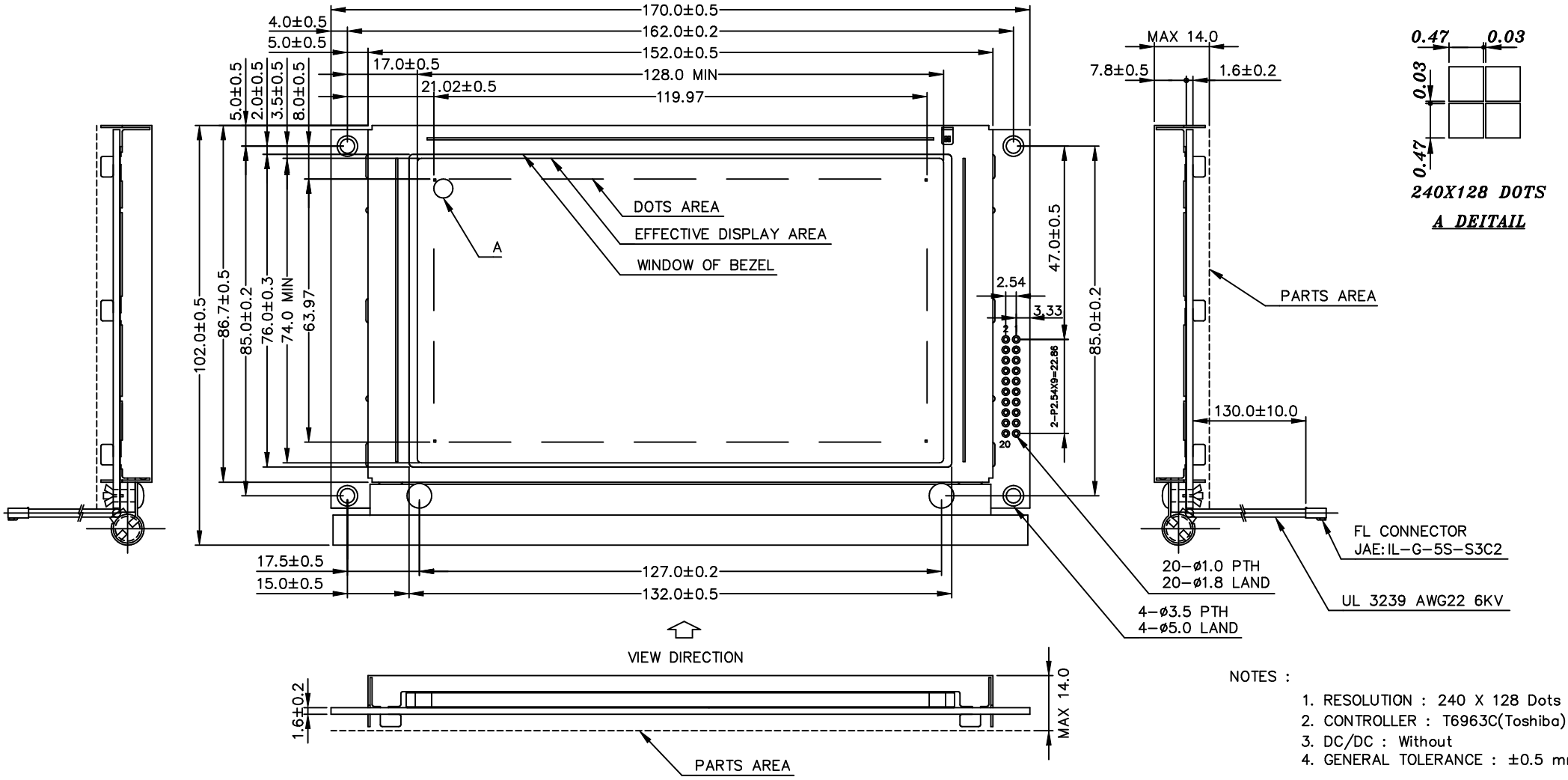
南亞塑膠工業股份有限公司
NAN YA PLASTICS CORPORATION

製 品 圖

LMBHAS014J7CD

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	J.Y.Lin	89.06.07	SCALE: 1/1
DRAWN	Ping Ping	89.06.07	UNIT: mm

DWG NO. M014CD7A (1/1) 0



NOTES :

1. RESOLUTION : 240 X 128 Dots
2. CONTROLLER : T6963C(Toshiba)
3. DC/DC : Without
4. GENERAL TOLERANCE : ±0.5 mm

PIN NO	SYMBOL	FUNCTION	PIN NO	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)	11	D0	DATA INPUT/OUTPUT
2	GND	GROUND	12	D1	DATA INPUT/OUTPUT
3	VDD	POWER SUPPLY FOR LOGIC (+5V)	13	D2	DATA INPUT/OUTPUT
4	VEE	POWER SUPPLY FOR LC DRIVING	14	D3	DATA INPUT/OUTPUT
5	$\overline{WR}$	DATA WRITE	15	D4	DATA INPUT/OUTPUT
6	$\overline{RD}$	DATA READ	16	D5	DATA INPUT/OUTPUT
7	$\overline{CE}$	CHIP ENABLE	17	D6	DATA INPUT/OUTPUT
8	C/D	$\overline{WR}$="L",C/D="H":COMMAND WRITE $\overline{WR}$="L",C/D="L":DATA WRITE $\overline{RD}$="L",C/D="H":STATUS READ $\overline{RD}$="L",C/D="L":DATA READ	18	D7	DATA INPUT/OUTPUT
9	NC	NC CONNECTION	19	FS	FONT SELECT CONNECT TO VDD:6X8 PIXELS/CHARACTER CONNECT TO GND:6X8 PIXELS/CHARACTER
10	$\overline{RESET}$	CONTROLLER RESET	20	RV	DISPLAY DATA REVERSE RV=H:REVERSE DISPLAY RV=L:NORMAL DISPLAY

GENERAL TOLERANCE LIST

DIMENSION	TOLERANCE
L ≦ 6	±0.25 (mm)
6 < L ≦ 18	±0.3 (mm)
18 < L ≦ 50	±0.4 (mm)
50 < L ≦ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
5					
4					
3					
2					
1					

南亞塑膠工業股份有限公司
NAN YA PLASTICS CORPORATION

製 品 圖

LMBHAT014G7

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	J.Y.Lin	89.06.07	SCALE: 1/1
DRAWN	Ping Ping	89.06.07	UNIT: mm

DWG NO. M014DD7A (1/1) 0