NAN YA PLASTICS CORP. ELEC. MATERIALS DIV. LCD DEPARTMENT	SPECIFICATION	SPEC. NO. : LM161-0 DATE : Jun. 25, 1998 SHEET NO. : 1/19

U.S. MARKETING ARM:

MARK PRODUCTS CORPORATION
800 N. EDGEWOOD AVENUE
WOOD DALE, IL 60191
TEL: 630-787-9089
FAX: 630-787-9015

SPECIFICATION OF
320x240 COLOR LCD MODULE
PRODUCT NO.: LCBHBT161M

SPEC. NO. : LM161-0

APPROVED BY

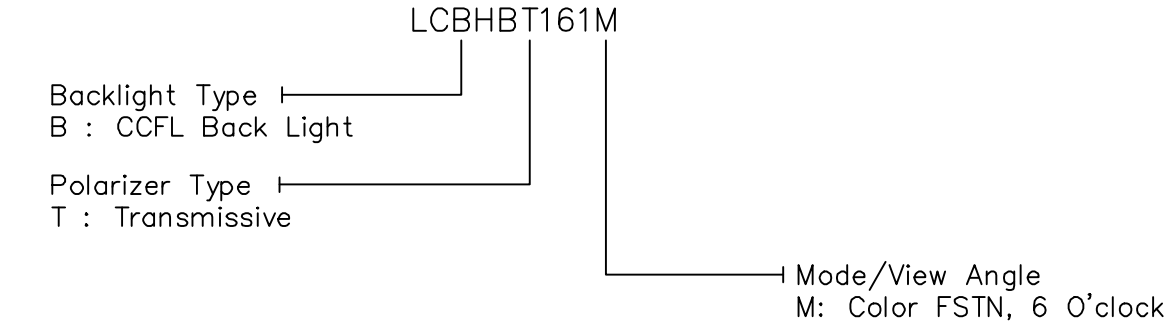
SALES MANAGER	DESIGN MANAGER	PERSON IN CHARGE

REV/DATE	R0/ 06.25.98'					APP	CHK	BY

1. MECHANICAL DATA

(1) Product No.	LCBHBT161M
(2) Module Size	168.0 (W)mm x 111.0 (H)mm x 6.4(D)mm
(3) Dot Size	0.09 (W)mm x 0.33 (H)mm
(4) Dot Pitch	0.12 (W)mm x 0.36 (H)mm
(5) Number of Dots	320 xRGB(W) x 240 (H)Dots
(6) Duty	1/240
(7) LCD Display Mode	FSTN: Black and White(Normal Black/Negative Image)
(8) Viewing Direction	6 O'clock
(9) Backlight	CCFL
(10) Controller	Without
(11) DC/DC Converter	Without
(12) Weight	280 g(approx.)

Note :



2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	7.0	V	
Power Supply for LCD Drive	VLCD−VSS	0	42.0	V	
Input Voltage	VI	−0.3	VDD+0.3	V	
Static Electricity	−	−	−	−	Note 1

Note 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	−20	60
Humidity (Without Condensation)	Note 1,3		Note 2,3	

Note 1 Ta ≦ 50°C : 85%RH max
Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 2 Ta at −20°C will be < 48 hrs, at 60°C will be < 120 hrs

Note 3 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

3. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply	VDD−VSS	Ta= 25°C		4.5	5.0	5.5	V
Input Voltage	VIH	H level		0.8VDD	−	VDD	V
	VIL	L level		0	−	0.2VDD	V
Recommended LCD Driving Voltage (Normal Temp. LCM)	VLCD−VSS	Duty=1/240 Bias=1/13 VDD=5.0V	0°C	−	24.1	24.2	V
			25°C	23.3	23.5	23.6	
			50°C	22.6	22.8	23.0	
Supply Current for Logic	IDD	VDD−VSS = 5.0V VLCD−VSS = 23.5V Ta= 25°C		−	2.0	6.0	mA
Supply Current for LCD	ILCD			−	8.0	15.0	mA

4.OPTICAL CHARACTERISTICS

4-1 Optical Char. of Normal Temp. Mode

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)		θ(Viewing Angle)		φ(Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	M	15	30	50			45
note		NOTE6		NOTE5			

AT φ=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	210	400	ms	NOTE 2
		25℃	–	150	280		
		50℃	–	100	200		
Response Time (fall)	Tf	0℃	–	250	500	ms	NOTE 2
		25℃	–	170	340		
		50℃	–	120	240		

note:

T: TRANSMISSIVE
M: COLOR

4-2 Color of CIE Coordinate

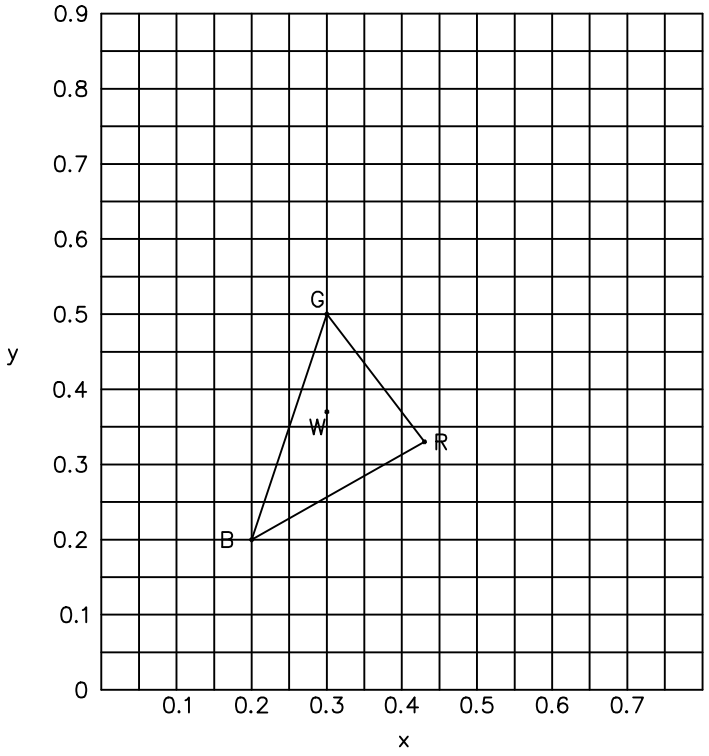
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	BRIGHTNESS (cd/m²)	NOTE
Color of CIE Coordinate	Red	X	ϕ=0°, θ=0° CCFL BACKLIGHT COLOR DEGREE X=0.3352 Y=0.3445 BRIGHTNESS =1350 cd/m²	0.4249	21.1	Note※
		y		0.3254		
	Green	X		0.2918	43.6	
		y		0.4977		
	Blue	X		0.1944	13.2	
		y		0.2053		
	White	X		0.3096	59.5	
		y		0.3649		

Tolerance : ±0.05

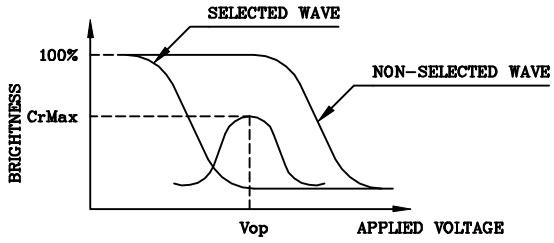
Note※ Measuring at position 3 on Fig.1
CIE chromaticity diagram

Fig.1

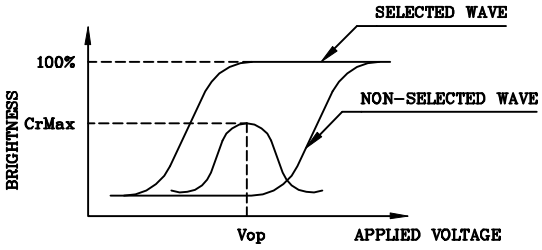


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



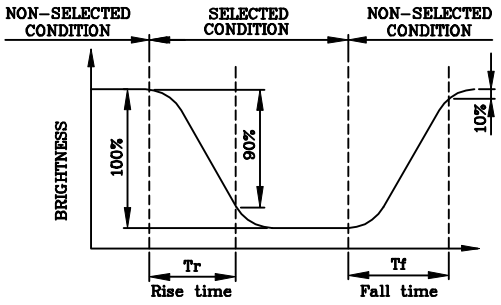
(negative type)

*Conditions

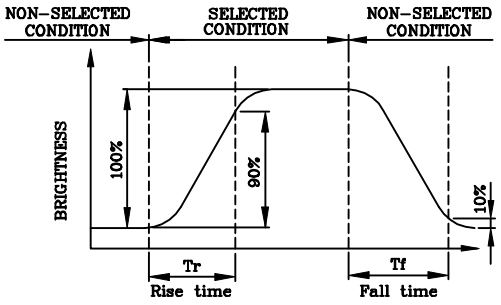
Viewing Angle : 0
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



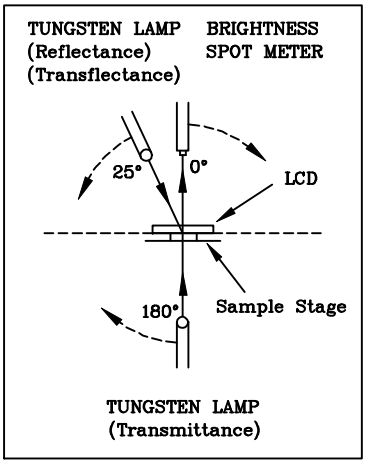
(negative type)

*Conditions

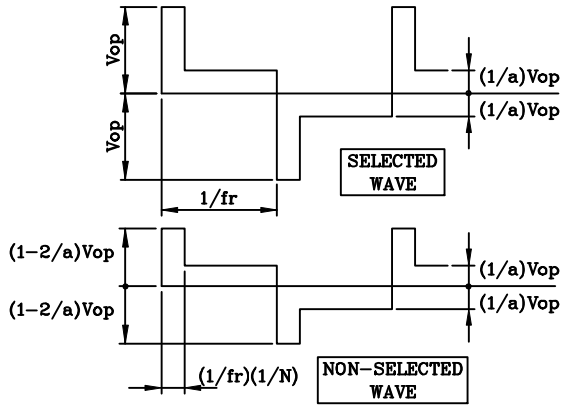
Operating Voltage : Vop
Viewing Angle (θ,ϕ) : (0,0)
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

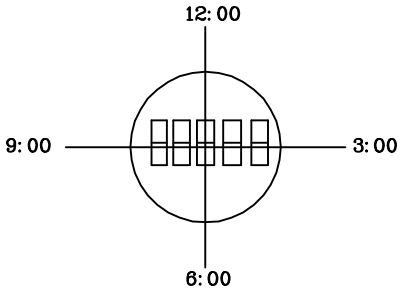


Multiplex Driving (1/N duty, 1/a bias)



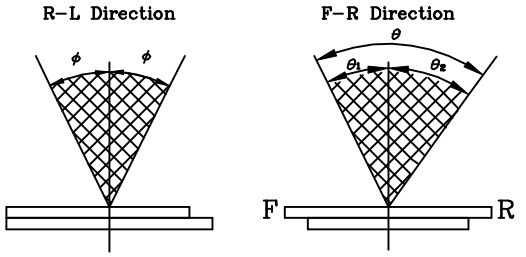
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



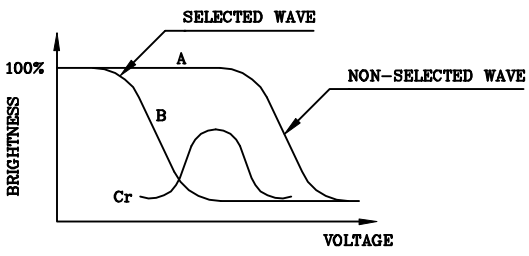
$\theta = \theta_1 + \theta_2$

*Conditions

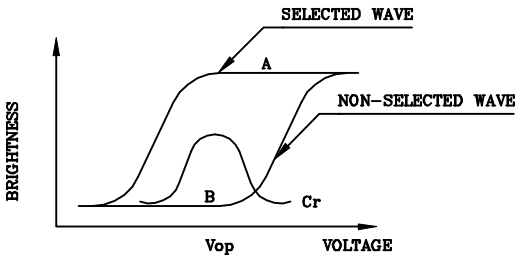
Operating Voltage : Vop
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

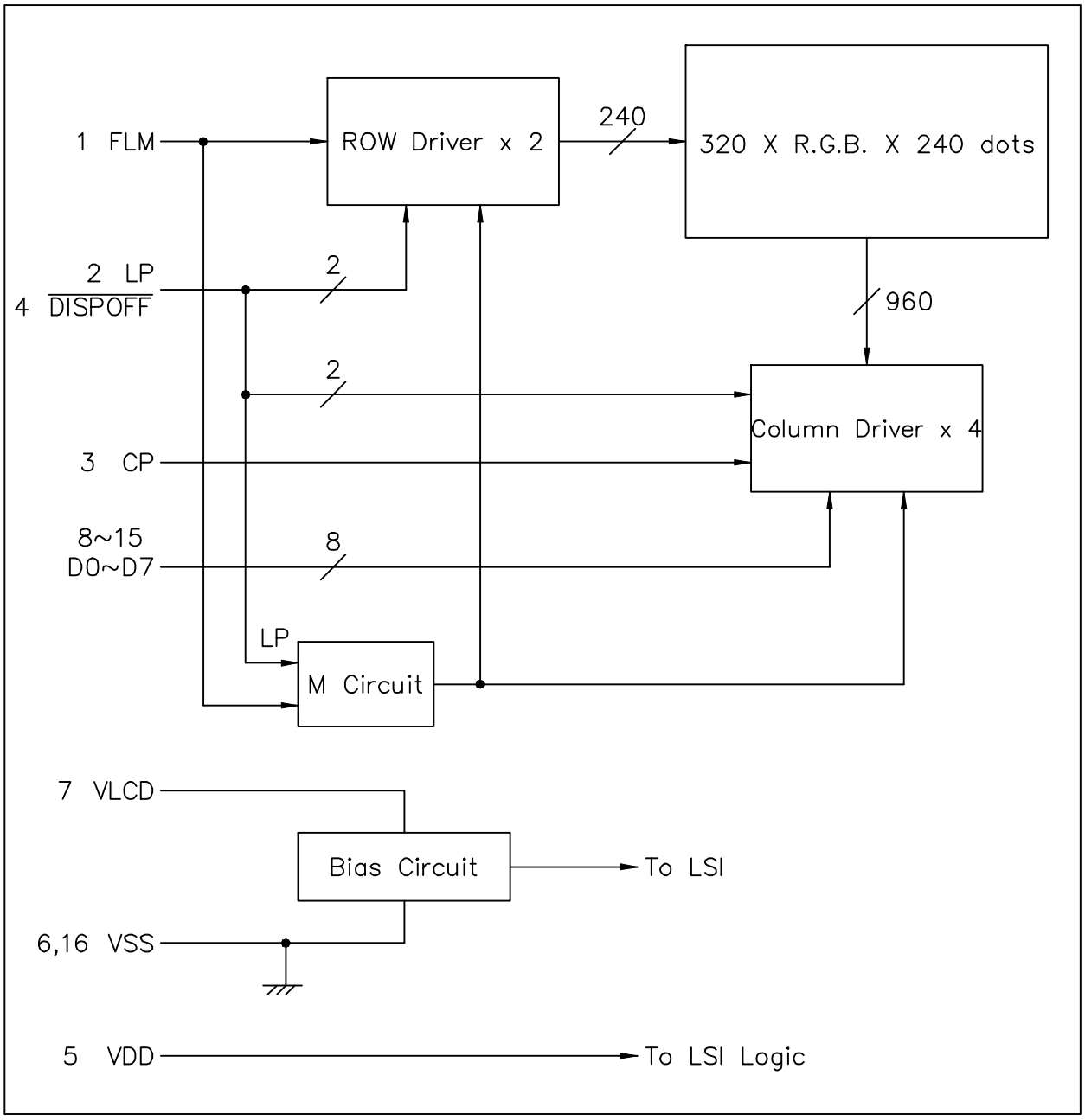
Contrast Ratio : Cr=A/B

*Conditions

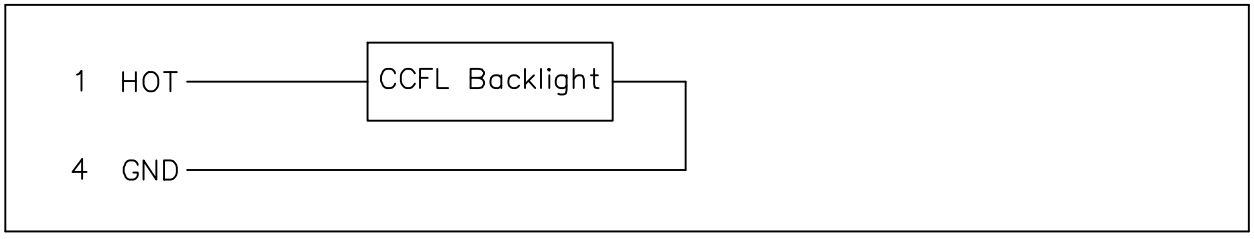
Viewing Angle : 0
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

5. BLOCK DIAGRAM

LCD



CCFL



6. INTERNAL PIN CONNECTION

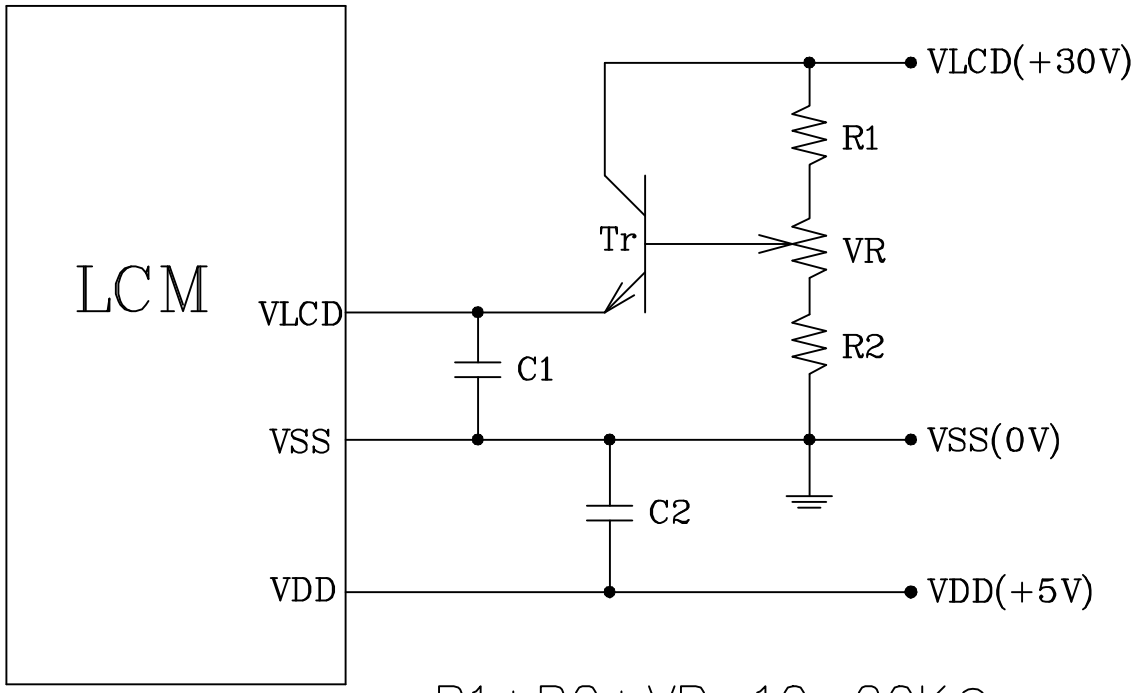
LCD

Pin No.	Symbol	Level	Function
1	FLM	H/L	First Line Marker
2	LP	H→L	Data Latch Signal
3	CP	H→L	Clock Signal for Shifting Data
4	$\overline{\text{DISPOFF}}$	H/L	Display Control Signal, H :Display on L :Display off
5	VDD	–	Power Supply for Logic
6	VSS	–	Power Supply (0V,GND)
7	VLCD	–	Power Supply for LCD Drive
8	D0	H/L	Display Data
9	D1	H/L	Display Data
10	D2	H/L	Display Data
11	D3	H/L	Display Data
12	D4	H/L	Display Data
13	D5	H/L	Display Data
14	D6	H/L	Display Data
15	D7	H/L	Display Data
16	VSS	–	Power Supply (0V,GND)

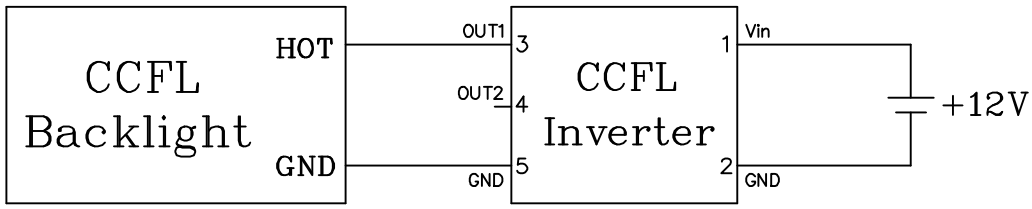
CCFL

Pin No.	Symbol	Level	Function
1	HOT	–	Power Supply for CCFL(HOT)
2	NC	–	Non-connection
3	NC	–	Non-connection
4	GND	–	Power Supply for CCFL(GND)

7. POWER SUPPLY



R1+R2+VR=10~20KΩ
C1,C2=10μF



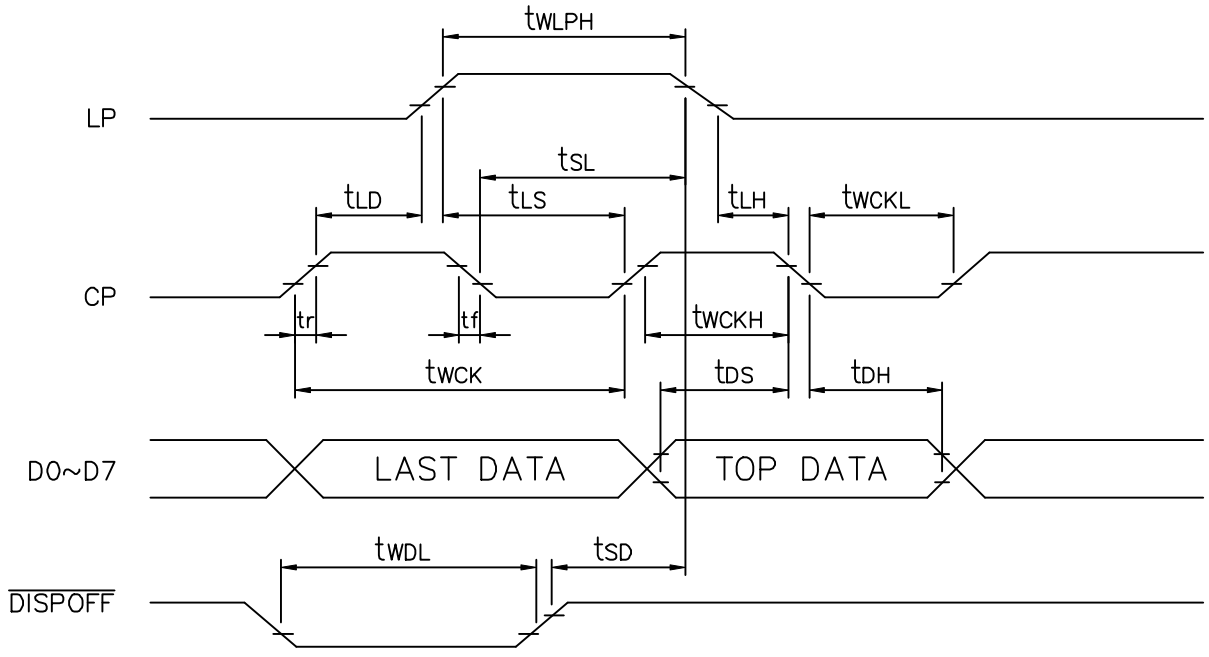
SUGGESTED INVERTER : CXA-L10L (TDK)

8. TIMING CHARACTERISTICS

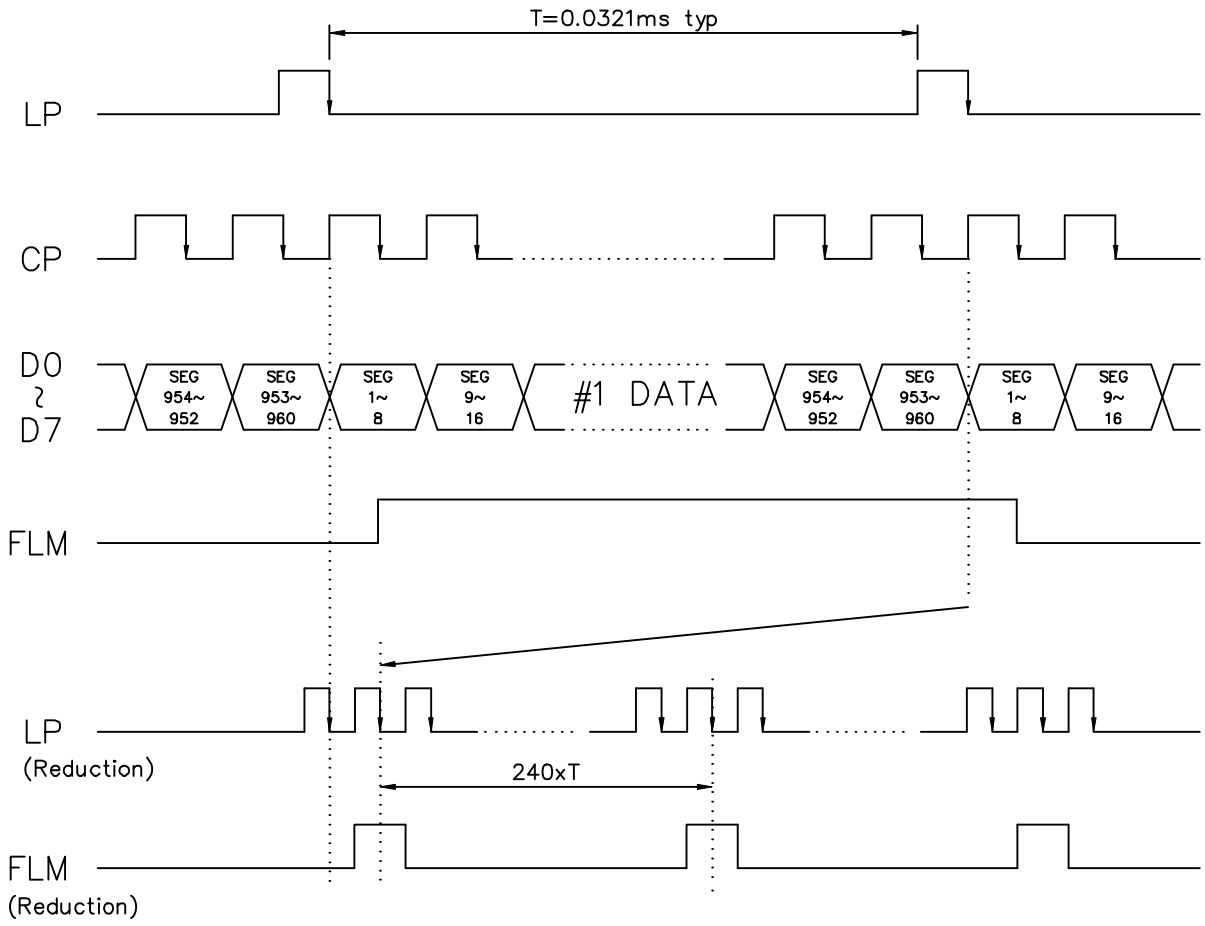
8-1 INTERFACE TIMING

VDD=5.0V ± 10%

Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	t_{WCK}	40	–	ns
CLOCK PULSE HIGH LEVEL WIDTH	t_{WCKH}	12	–	ns
CLOCK PULSE LOW LEVEL WIDTH	t_{WCKL}	14	–	ns
LATCH PULSE HIGH LEVEL WIDTH	t_{WLPH}	15	–	ns
CP→LP RISE TIME	t_{LD}	5	–	ns
CP→LP FALL TIME	t_{SL}	25	–	ns
LP→CP RISE TIME	t_{LS}	25	–	ns
LP→CP FALL TIME	t_{LH}	25	–	ns
CLOCK PULSE RISE/FALL TIME	t_r , t_f	–	50	ns
DATA SETUP TIME	t_{DS}	5	–	ns
DATA HOLD TIME	t_{DH}	15	–	ns
$\overline{\text{DISPOFF}}$ LOW LEVEL WIDTH	t_{WDL}	1.2	–	μs
$\overline{\text{DISPOFF}}$ CANCELLATION TIME	t_{SD}	100	–	ns

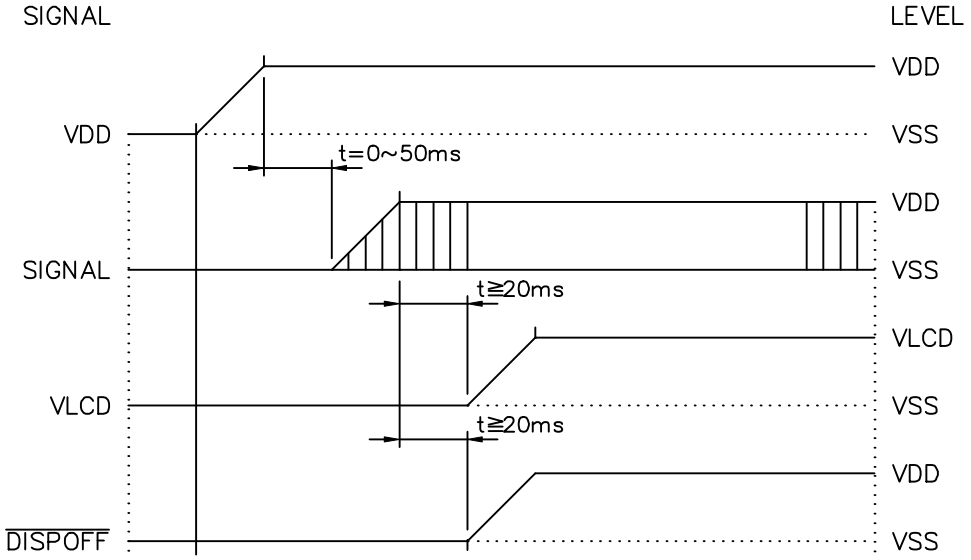


8-2 TIMING CHART OF INPUT SIGNAL

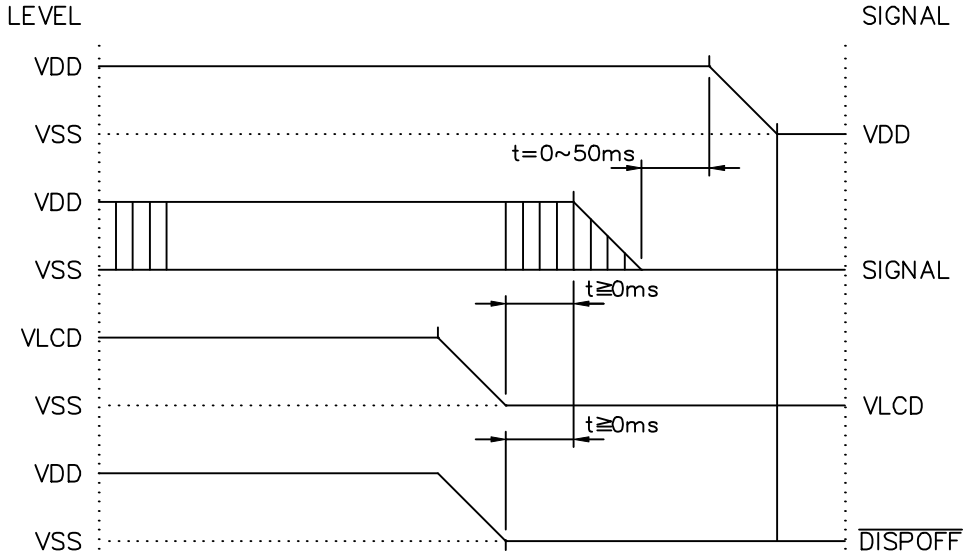


8-3 POWER ON/OFF TIMING

ON SEQUENCE

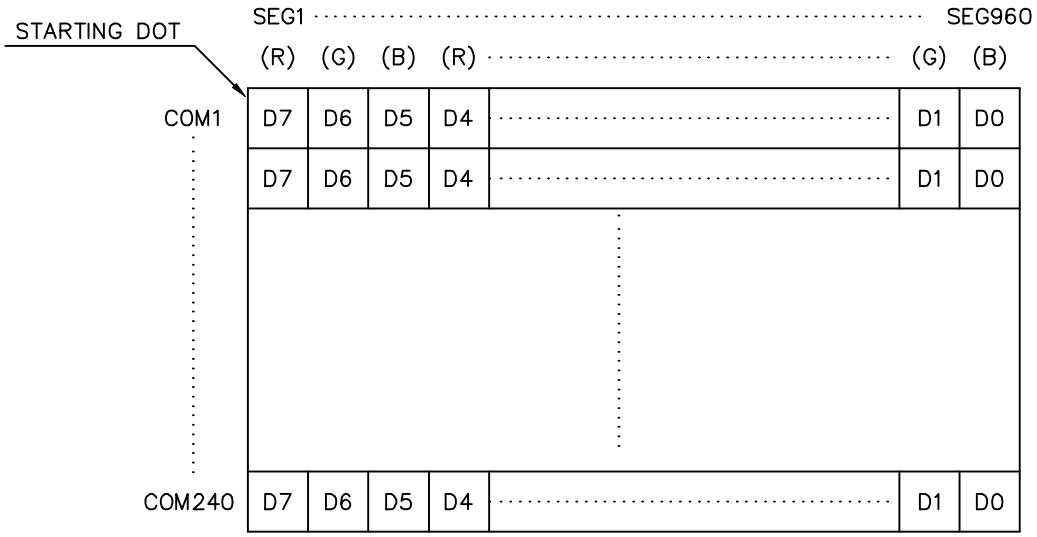


OFF SEQUENCE



Please maintain the above sequence when turning on and off the power supply of the module. If $\overline{\text{DISPOFF}}$ is supplied to the module while internal alternate signal for LCD driving(M) is unstable, DC component will be su-pplied to the LCD panel. This may cause damage the LCD module.

8-4 DISPLAY PATTERN



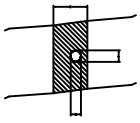
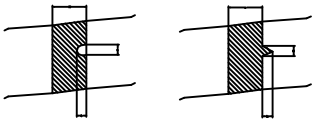
D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.

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 Humidity Storage	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	−20°C,30min → 25°C,5min → 60°C,30min → 25°C,5min (= 1 cycle)			Appearance without defect	5 cycles

10. LCD PRODUCT QUALITY STANDARD

(1) DISPLAY APPEARANCE

<table>
<tr><th>NO</th><th>ITEM</th><th>C R I T E R I A</th></tr>
<tr><td>1.</td><td>INCLUSI-ONS (BLACK SPOT , WHITE SPOT , DUST)</td><td>(1) ROUND TYPE
<table>
<tr><th>DIAMETER mm (a*)</th><th>NO. OF DEFECT*</th></tr>
<tr><td>a ≦ 0.20
0.20 < a ≦ 0.35
0.35 < a</td><td>NEGLECT
5 MAX
NONE</td></tr>
</table>
(2) LINEAR TYPE
<table>
<tr><th>LENGTH mm(L)</th><th>WIDTH mm(W)</th><th>NO. OF DEFECT</th></tr>
<tr><td>N A
L ≦ 3
3 < L</td><td>W ≦ 0.03
0.03 < W ≦ 0.08
0.08 < W</td><td>NEGLECT
6
NONE</td></tr>
</table></td></tr>
<tr><td>2.</td><td>SCRATCH</td><td>1.SCRATCH ON PROTECTIVE FILM IS PERMITTED .
2.SCRATCH ON POLARIZER SHALL BE AS FOLLOW:
(1) ROUND TYPE
<table>
<tr><th>DIAMETER mm (a*)</th><th>NO. OF DEFECT*</th></tr>
<tr><td>a ≦ 0.15
0.15 < a ≦ 0.20
0.20 < a</td><td>NEGLECT
2 MAX
NONE</td></tr>
</table>
(2) LINEAR TYPE
BE JUDGED BY 1.-(2) LINEAR TYPE</td></tr>
<tr><td>3.</td><td>DENT</td><td>DIAMETER < 1.5mm</td></tr>
<tr><td>4.</td><td>BUBBLE</td><td>NOT EXCEEDING 0.5mm AVERAGE DIAMETER IS ACCEPTABLE BETWEEN GLASS AND POLARIZING FILM.</td></tr>
<tr><td>5.</td><td>PIN HOLE</td><td>(a+b)/2 ≦ 0.15 mm
MAXIMUM NUMBER: IGNORED
0.15 < (a+b)/2 ≦ 0.20
MAXIMUM NUMBER: 10
  </td></tr>
<tr><td>6.</td><td>DOT DEFECT</td><td>(a+b)/2 ≦ 0.20 mm
MAXIMUM NUMBER: IGNORED
0.20 < (a+b)/2 ≦ 0.30
MAXIMUM NUMBER: 5
x = WIDTH
  </td></tr>
<tr><td>7.</td><td>CONTRAST IRREGUL-ARITY (SPOT)</td><td>DIAMETER SPEC. — NO. OF DEFECT*
a ≦ 0.50 mm — NEGLECT
0.50 < a ≦ 0.75 — 5
0.75 < a ≦ 1.00 — 3
1.00 < a — NONE</td></tr>
<tr><td>8.</td><td>DOT WIDTH</td><td>DESIGN WIDTH±15%</td></tr>
<tr><td>9.</td><td>COLOR TONE AND UNIFOR-MITY</td><td>OBVIOUS UNEVEN COLOR IS NOT PERMITTED</td></tr>
</table>

(2) NOTE:

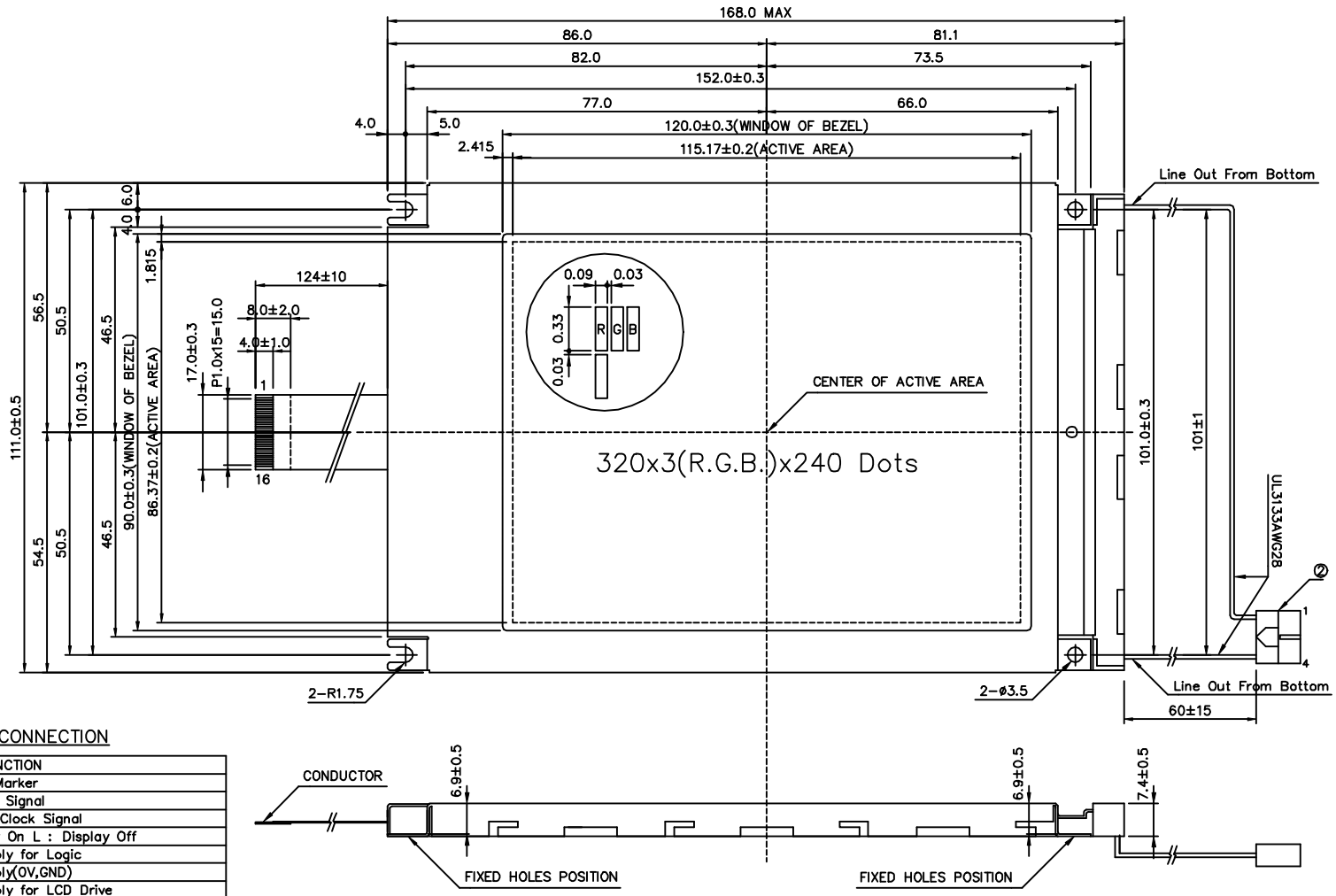
- SAFETY
  1. If the LCD panel breaks, be careful not to allow the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- HANDLING
  1. Prevent all contact with static electricity, which can damage the CMOS ICs. The module is packaged in a static-shielding bag to prevent damage during shipment, warehousing and removal from the shipping carton.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate on the front surface of the display is very fragile and easily scratched. The module is shipped with a protective liner which must be removed from the polarizing plate prior to assembly.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of polarizing plate.
  5. Do not use ketonics solvent or aromatic solvent on the polarizing plate. Use a soft cloth soaked with plastic-lens cleaning solution.

- 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 WARRANTY
  1. Acceptance inspection period
     The inspection period is within one month after the arrival of the contracted goods at the buyer's factory site.
  2. Applicable warranty period
     The warranty period is within twelve months from the date of invoice under normal usage and storage conditions.

- TYPICAL OPERATING LIFETIME OF BACKLIGHT
  LED : 50,000HR
  EL : 5,000HR
  CCFT : 10,000HR



PIN ASSIGNMENT OF I/O CONNECTION

Pin No.	SYMBOL	LEVEL	FUNCTION
1	FLM	H/L	First Line Marker
2	LP	H→L	Data Latch Signal
3	CP	H→L	Data Shift Clock Signal
4	$\overline{DISPOFF}$	H/L	H : Display On L : Display Off
5	V_{DD}	–	Power Supply for Logic
6	Vss	–	Power Supply(0V,GND)
7	V_{LCD}	–	Power Supply for LCD Drive
8	D0	H/L	Display Data
9	D1	H/L	Display Data
10	D2	H/L	Display Data
11	D3	H/L	Display Data
12	D4	H/L	Display Data
13	D5	H/L	Display Data
14	D6	H/L	Display Data
15	D7	H/L	Display Data
16	Vss	–	Power Supply(0V,GND)

PIN ASSIGNMENT OF CCFL CONNECTION

Pin No.	SYMBOL	LEVEL	FUNCTION
1	HOT	–	Power Supply for CCFL(HOT)
2	NC	–	No Connection
3	NC	–	No Connection
4	GND	–	Power Supply for CFL(GND)

NOTE :

1. RESOLUTION : 320 X 3(R.G.B.) X 240 DOTS
2. CONTROLLER : WITHOUT
3. DC/DC CONVERTER : WITHOUT
4. ① INTERFACE CONNECTOR
   FFC, N16 P1.0mm
   ② CCFT CONNECTOR
   M63M83-04(MITSUMI)
5. TOLERANCE NO SPECIFIED : ±0.5mm

產品編號	LCBHBT161M	
	NAME	DATE
APPROVE		
CHECK		
DESIGN		
DRAW	MAY PING	87.05.20

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

TITLE	製品圖	
DWG-NO	CB-T161M	Rev.A
THIRD ANGLE PROJECT	UNIT : mm	
	SCALE :	