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
240x64 LCD MODULE
PRODUCT NO.: LM_J6_003_P

SPEC. NO.: LM003-0-△0

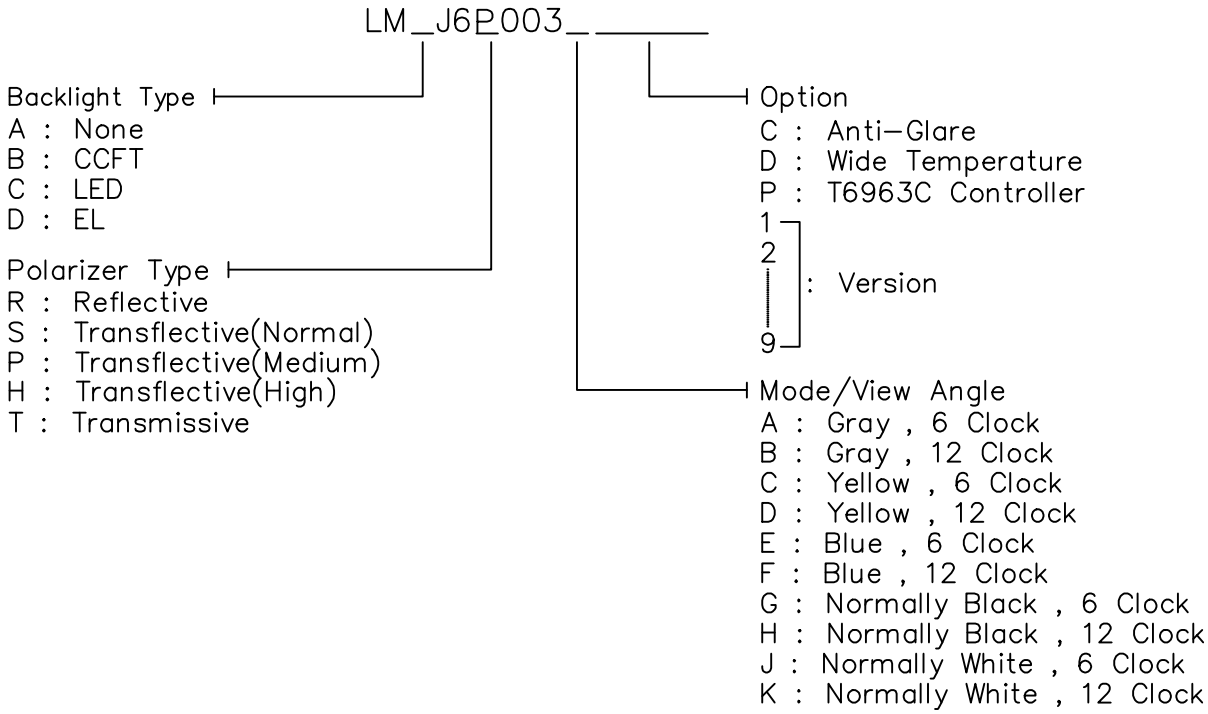
CUSTOMER
APPROVED BY
DATE:

EDITED ON : OCT.08.1998

SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER

1. MECHANICAL DATA

(1) Part Name		LM_J6_003_P
(2) Module Size		180.0(W)mm X 65.0(H)mm X MAX10.5(D)mm (W/O,EL B/L) 180.0(W)mm X 65.0(H)mm X MAX15.5(D)mm (LED B/L) 190.0(W)mm X 65.0(H)mm X MAX13.8(D)mm (CCFL B/L)
(3) Dot Size		0.49 (W)mm x 0.49 (H)mm
(4) Dot Pitch		0.53 (W)mm x 0.53 (H)mm
(5) Number of Dots		240 (W) x 64 (H)Dots
(6) Duty		1/64
(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 ☐ Transmissive
(8) Viewing Direction		☐ 6 O'clock ☐ 12 O'clock ☐____O'clock
(9) Backlight		☐ W/O ☐ EL B/L ☐ LED B/L ☐ CCFL B/L
(10) Weight		W/O B/L: 128.5 g EL B/L: 135.5 g LED B/L: 164.0 g CCFL B/L: 173.0 g



2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	7.0	V	
Power Supply for LCM	VDD−VEE	0	20.0	V	
Input Voltage	VI	−0.3	VDD	V	
Static Electricity	−	−	−	−	Note 1

Note 1 LCM should be grounded during handling LCM.

(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 3,5		Note 4,5		Note 4,6	

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 changes 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 (VDD = 5V±10%)

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage		VIH	H level		0.7VDD	–	VDD	V
		VIO	L level		0	–	0.3VDD	V
Recommended LC Driving Voltage (Normal Temp. LCM)		VDD–VEE	Duty= 1/64 Bias= 1/9	0°C	–	13.3	13.8	V
				25°C	11.7	12.5	13.1	
				50°C	10.8	11.4	–	
Recommended LC Driving Voltage (Wide Temp. LCM)		VDD–VEE	Duty= 1/64 Bias= 1/9	–20°C				V
				0°C				
				25°C	11.2	12.0	13.0	
				50°C				
				70°C	10.4	11.1	–	
Power Supply Current		IDD	FLM=72 Hz VDD=5.0 V VDD–VEE=11.6 V PATTERN : 		6.5	7.2	10.6	mA
		IEE			1.6	1.8	2.4	
LED Power Supply Current		I_{LED}	V_{AK} = 5.0 V R_{18} = R_{19}=10Ω		–	220	–	mA
EL Power Supply Current		I_{EL}	V_{AK} = 110 V_{rms} 400HZ R_{18} = R_{19}=0Ω		–	–	10.0	mA rms
CCFL	Starting Voltage	V_{FLS}	–		–	900	–	Vrms
	Driving Voltage	V_{FLD}	–		–	450	–	Vrms
	Driving Current	I_{FLD}	V_{FLD} =450V_{rms} f_{FLD} =30KHZ		–	5.0	–	mA rms
	Driving Voltage	f_{FL}	–		15	30	50	KHZ

4. OPTICAL CHARACTERISTICS

4-1 Optical Char. of Normal Temp. Mode

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio) 25°C MIN.	Cr(Contrast Ratio) 25°C TYP.	θ(Viewing Angle) 25°C MIN.	θ(Viewing Angle) 25°C TYP.	ø(Viewing Angle) 25°C MIN.	ø(Viewing Angle) 25°C TYP.
R	A, B	3.5	4.5	50	75	20	30
	C, D	6.0	9.0	60	85	20	35
	J	4.5	7.5	55	80	20	35
S	A, B	3.0	4.2	50	75	20	30
	C, D	5.0	8.0	55	85	20	35
	J	4.0	7.0	50	75	20	35
T	A	2.0	2.5	40	60	18	25
	E, F	3.0	4.0	50	70	20	35
note		NOTE6		NOTE5			

AT ø=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	–	600	1200	ms	NOTE 2
		25°C	–	110	220		
		50°C	–	50	100		
Response Time (fall)	Tf	0°C	–	900	1500	ms	NOTE 2
		25°C	–	250	360		
		50°C	–	100	150		

note:

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

4-2 Optical Char. of Wide Temp. Mode

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio) 25°C MIN.	Cr(Contrast Ratio) 25°C TYP.	θ(Viewing Angle) 25°C MIN.	θ(Viewing Angle) 25°C TYP.	ø(Viewing Angle) 25°C MIN.	ø(Viewing Angle) 25°C TYP.
R	A	3.5	4.2	50	68	20	30
	C	5.0		50		30	35
	J	6.0	8.0	50	70	20	38
S	A	3.5	4.0	50	65	20	30
	C	5.0		50		25	35
	J	5.0	7.0	50		25	35
T	E						
	G						
note		NOTE6		NOTE5			

AT ø=0° θ=0°

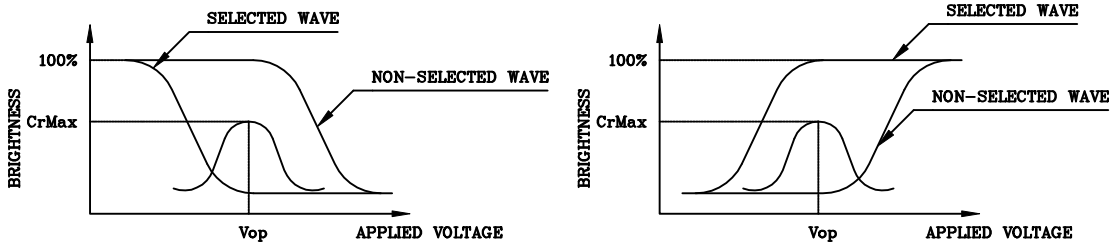
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-25°C				ms	NOTE 2
		0°C					
		25°C	–	90	200		
		50°C					
		70°C	–	40	100		
Response Time (fall)	Tf	-25°C				ms	NOTE 2
		0°C					
		25°C	–	180	360		
		50°C					
		70°C	–	60	120		

note:

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



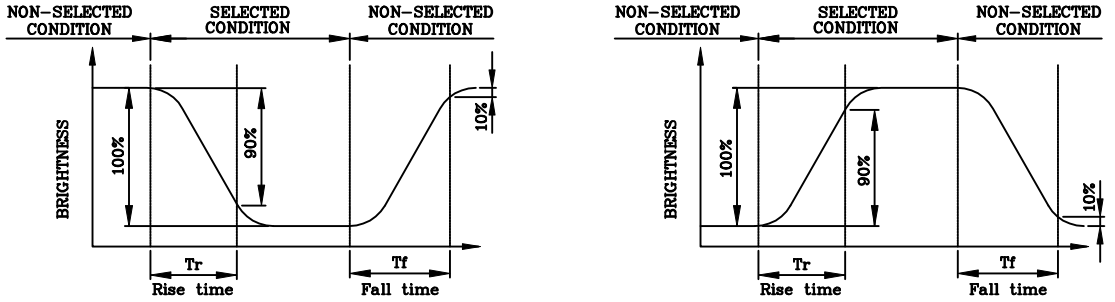
(positive type) (negative type)

*Conditions

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

(NOTE 2)

Definition of Response Time(Tr,Tf)



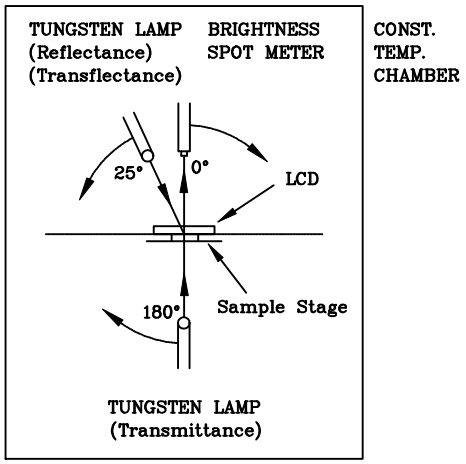
(positive type) (negative type)

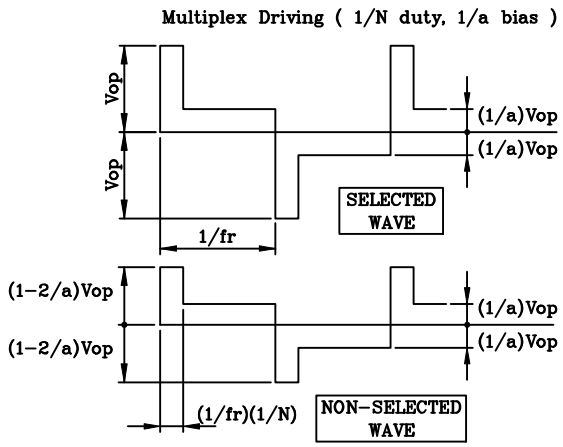
*Conditions

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

(NOTE 3)

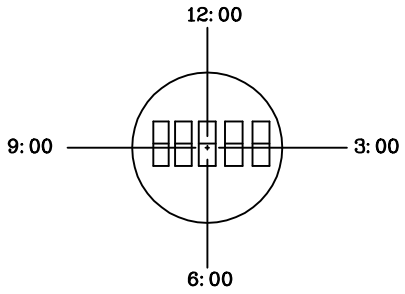
Description of Measuring Equipment and Driving Waveforms





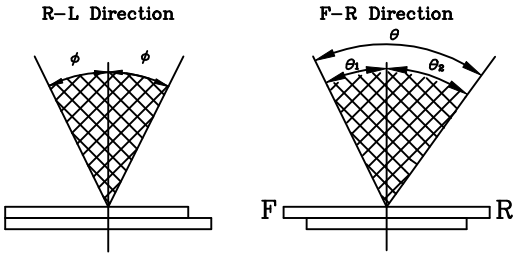
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



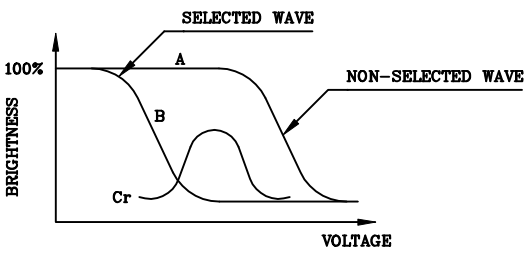
$\theta = \theta_1 + \theta_2$

*Conditions

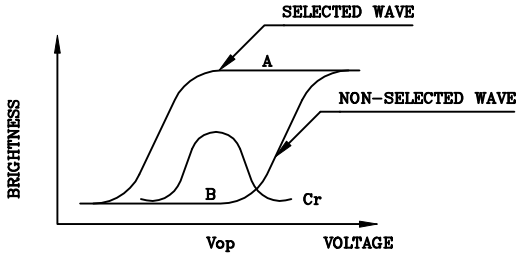
Operating Voltage : Vop
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



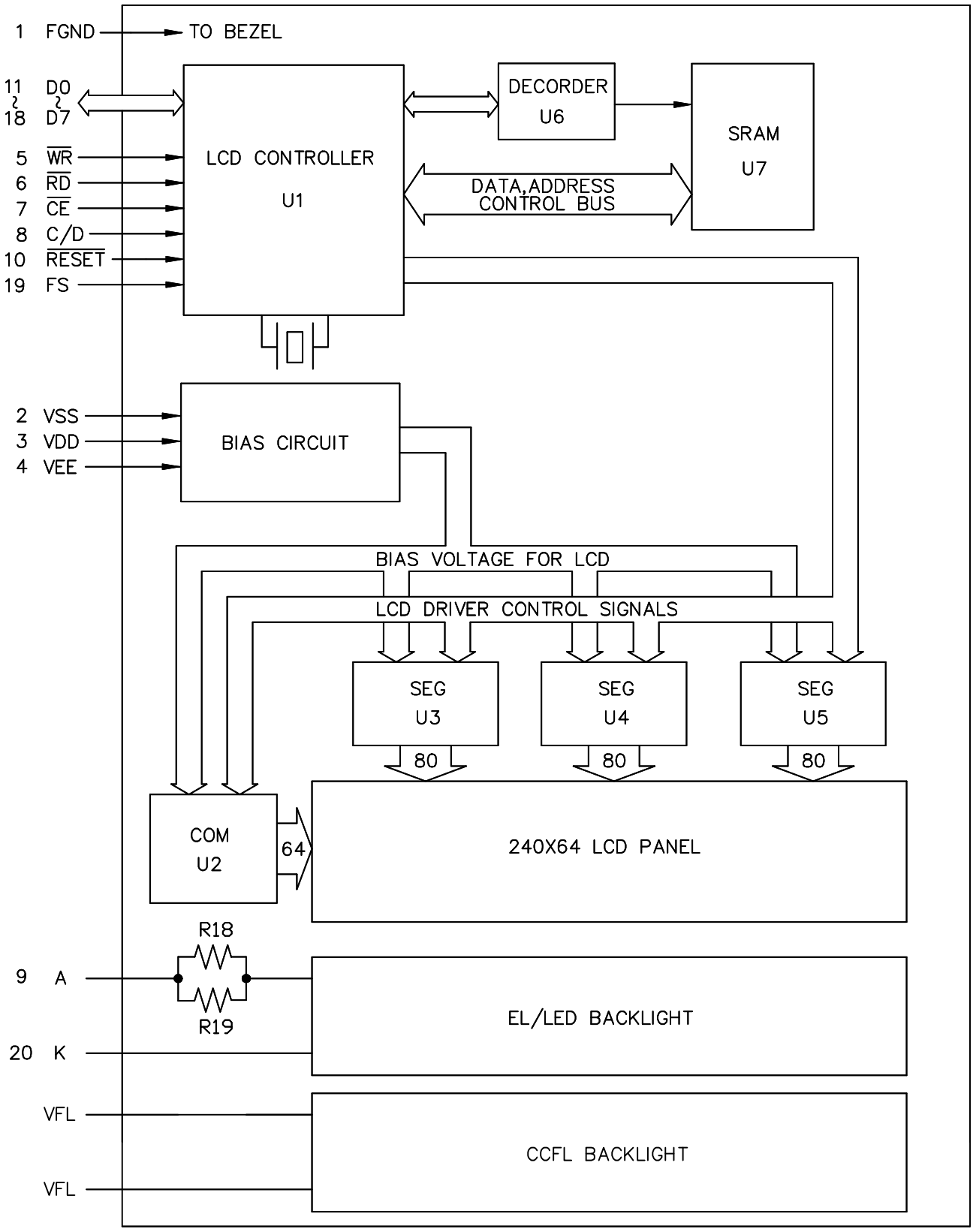
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

5. BLOCK DIAGRAM



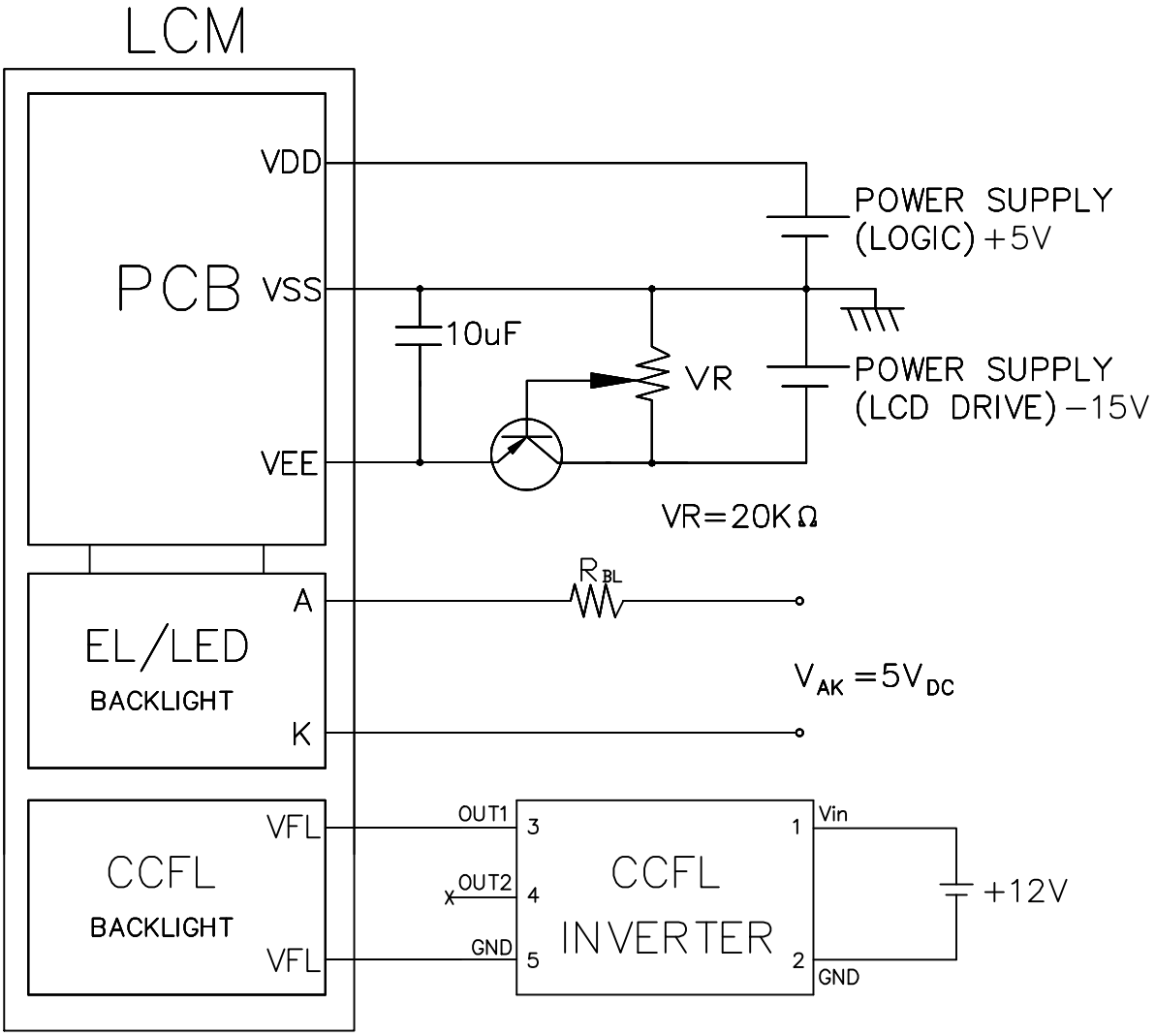
6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)
2	VSS	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	A	Anode of LED B/L and EL B/L
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	K	Cathode of LED B/L and EL B/L

CCFL Connector : J.A.E/IL-G-4S-S3C2

PIN NO	SYMBOL	FUNCTION
1	VFL	POWER SUUPLY FOR CCFL DRIVE
2	NC	-
3	NC	-
4	VFL	POWER SUUPLY FOR CCFL DRIVE

7. POWER SUPPLY



Recommended Inverter : CXA-L10L (TDK)

Recommended Value for R_{BL} and V_{BL}

item / Back Light / interface	R_{BL}		V_{BL}	
	EL	LED	EL	LED
A,K PIN	0Ω	5Ω	$110V_{AC}$ 400HZ	$5V_{DC}$

8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

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

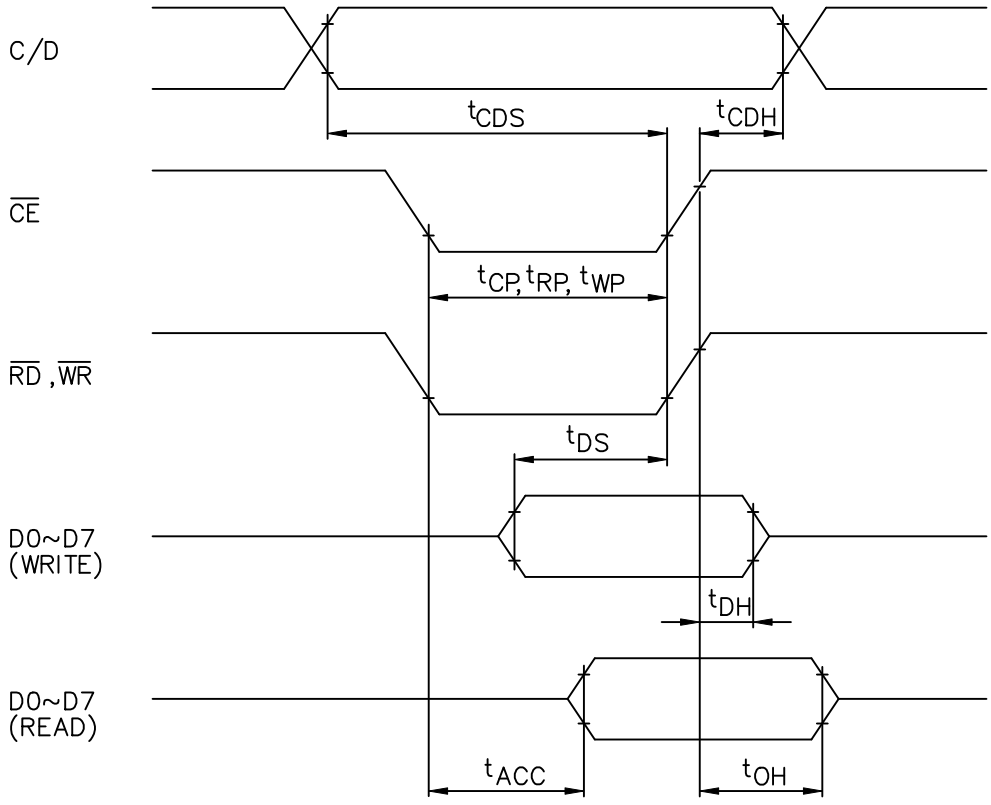
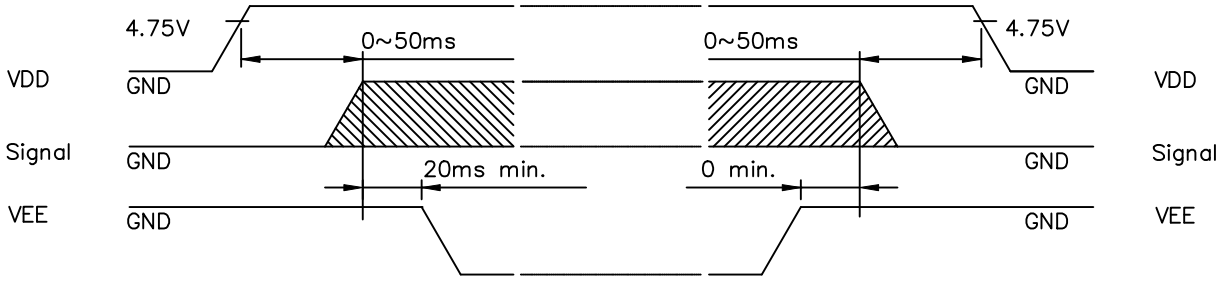


Fig. INTERFACE TIMING CHART

8-2 POWER ON/OFF TIMING

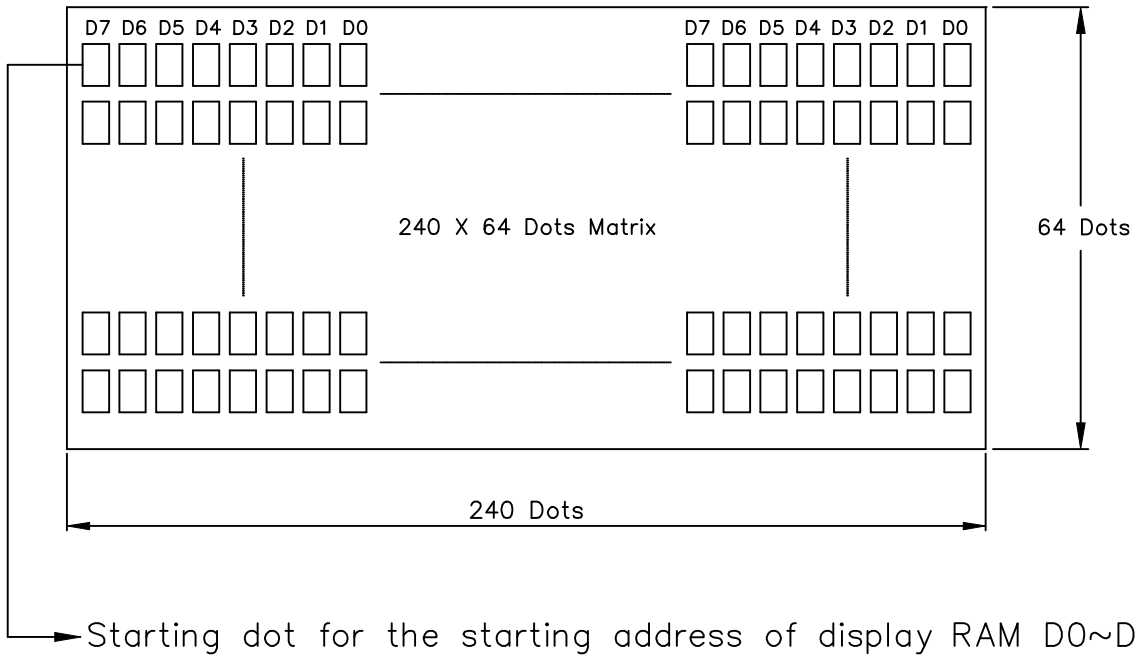


POWER ON

POWER OFF

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

8-3 DISPLAY PATTERN



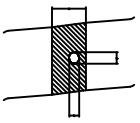
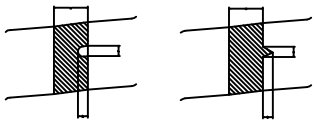
Starting dot for the starting address of display RAM D0~D7 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

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</td><td>NEGLECT</td></tr>
<tr><td>0.20 < a ≦ 0.35</td><td>5 MAX</td></tr>
<tr><td>0.35 < a</td><td>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</td><td>W ≦ 0.03</td><td>NEGLECT</td></tr>
<tr><td>L ≦ 3</td><td>0.03 < W ≦ 0.08</td><td>6</td></tr>
<tr><td>3 < L</td><td>0.08 < W</td><td>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</td><td>NEGLECT</td></tr>
<tr><td>0.15 < a ≦ 0.20</td><td>2 MAX</td></tr>
<tr><td>0.20 < a</td><td>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:

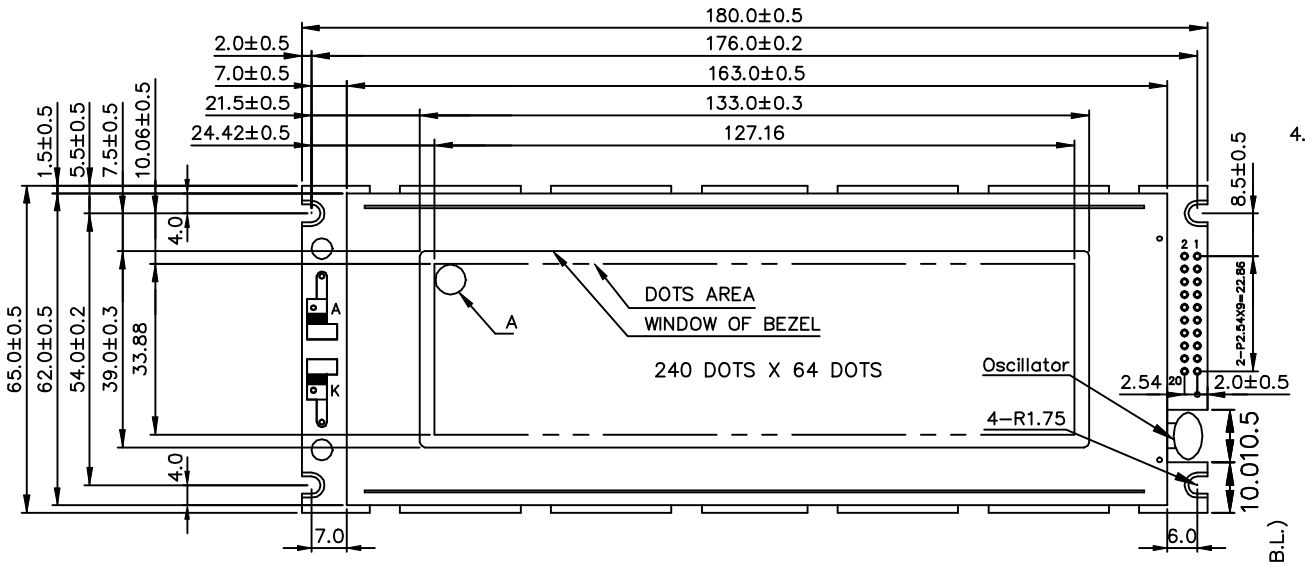
- SAFETY
  1. If the LCD panel breaks, be careful not to allow the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

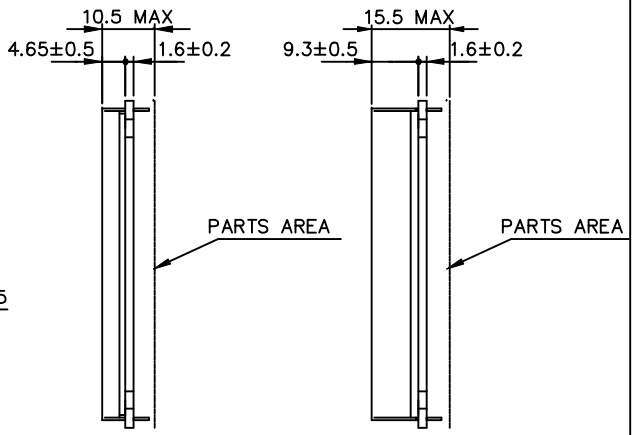
- HANDLING
  1. Prevent all contact with static electricity, which can damage the CMOS ICs. The module is packaged in a static-shielding bag to prevent damage during shipment, warehousing and removal from the shipping carton.
  2. Do not remove the panel or frame from the module.
  3. The polarizing 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.

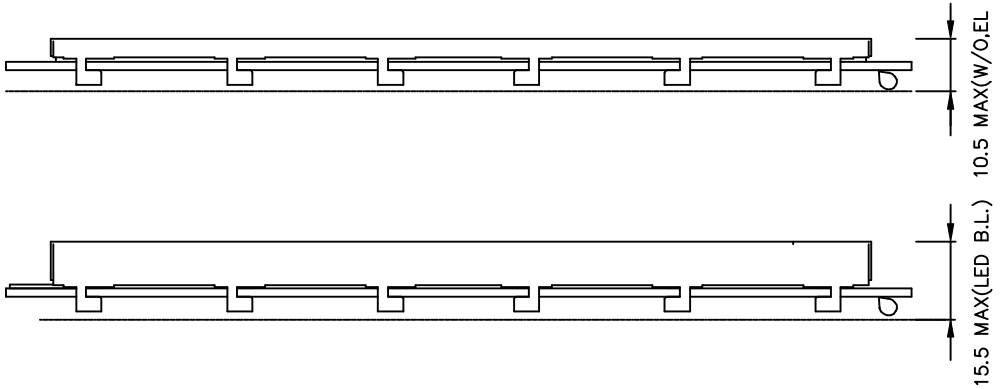
- TYPICAL OPERATING LIFETIME OF BACKLIGHT
  LED : 50,000HR
  EL : 5,000HR
  CCFT : 10,000HR





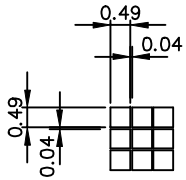
W/O,EL B/L

LED B/L



NOTES:

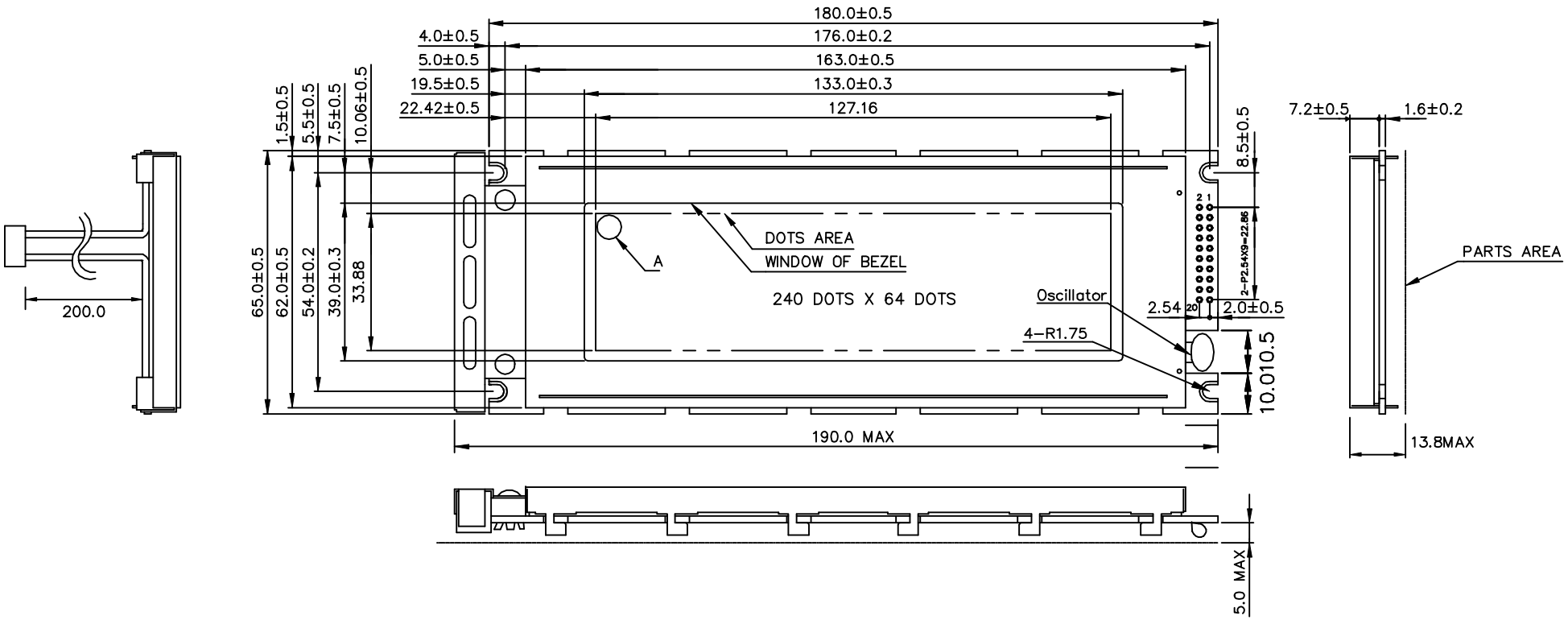
1. Resolution : 240 x 64 Dots
2. Controller : T6963C(Compatible)
3. DC/DC Converter : Without
4. General Tolerance : ±0.5 mm



A DETAIL

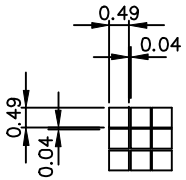
PIN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FGND	VSS	VDD	VEE	$\overline{WR}$	$\overline{RD}$	$\overline{CE}$	C/D	A	$\overline{RESET}$
PIN NO.	11	12	13	14	15	16	17	18	19	20
SYMBOL	D0	D1	D2	D3	D4	D5	D6	D7	FS	K

產品編號	LM_J6_003_P		南亞塑膠工業股份有限公司 NAN YA PLASTICS CORPORATION		
	NAME	DATE			
APPROVE			TITLE	製品圖	
CHECK			DWG-NO	MX-X003XP	Rev.A
DESIGN			THIRD ANGLE PROJECT	UNIT : mm	
DRAW	MAY PING	87.09.11		SCALE :	



NOTES:

1. Resolution : 240 x 64 Dots
2. Controller : T6963C(Compatible)
3. DC/DC Converter : Without
5. General Tolerance : ±0.5 mm



A DETAIL

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

產品編號	LMBJ6_003_P		南亞塑膠工業股份有限公司 NAN YA PLASTICS CORPORATION		
	NAME	DATE			
APPROVE			TITLE	製品圖	
CHECK			DWG-NO	MB-X003XP	Rev.A
DESIGN					
DRAW	MAY PING	87.09.11	THIRD ANGLE PROJECT	UNIT : mm	
				SCALE : 1/1	