

NAN YA PLASTICS CORP.  
ELEC. MATERIALS DIV.  
LCD DEPARTMENT

# SPECIFICATION

SPEC. NO. : LM003-1  
DATE : OCT.08, 1998  
SHEET NO. : 1/18

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\_1P

SPEC. NO.: LM003-1-

CUSTOMER
APPROVED BY
DATE:

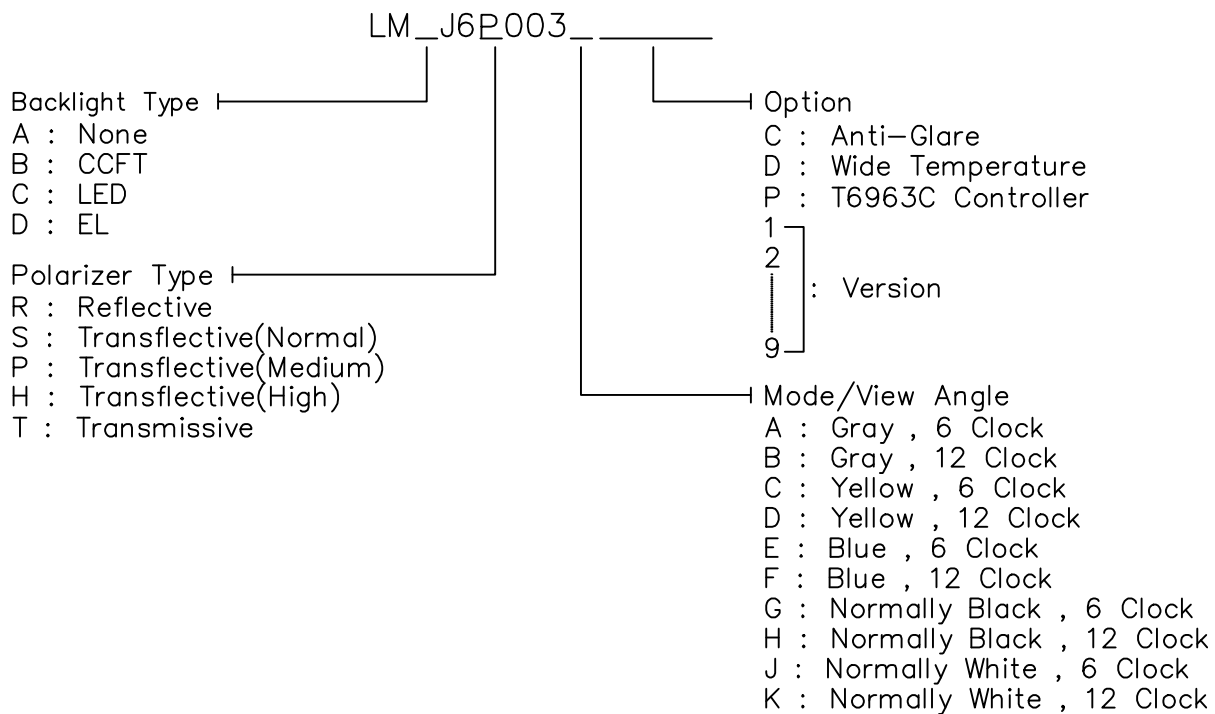
EDITED ON : OCT.08.1998

SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER

REV/DATE	R0/ 10.08,98'					APP	CHK	BY
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# 1. MECHANICAL DATA

- (1) Part Name LM\_J6\_003\_1P
- (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



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## 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  $T_a \leq 50^\circ\text{C}$  : 85%RH max

$T_a > 50^\circ\text{C}$  : Absolute humidity must be lower  
than the humidity of 85%RH at  $50^\circ\text{C}$

Note 3  $T_a$  at  $-20^\circ\text{C}$  will be < 48hrs, at  $70^\circ\text{C}$  will be < 120hrs

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

Note 5  $T_a \leq 70^\circ\text{C}$  : 75%RH max

$T_a > 70^\circ\text{C}$  : Absolute humidity must be lower  
than the humidity of 75%RH at  $70^\circ\text{C}$

Note 6  $T_a$  at  $-30^\circ\text{C}$  will be < 48hrs, at  $80^\circ\text{C}$  will be < 120hrs

### 3. ELECTRICAL CHARACTERISTICS ( VDD = 5V±10% )

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Input Voltage	V <sub>IH</sub>	H level	0.7VDD	-	VDD	V	
	V <sub>IO</sub>	L level	0	-	0.3VDD	V	
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD-VEE	Duty= 1/64	0°C	-	13.3	13.8	V
			25°C	11.7	12.5	13.1	
		Bias= 1/9	50°C	10.8	11.4	-	
Recommended LC Driving Voltage (Wide Temp. LCM)	VDD-VEE	Duty= 1/64	-20°C				V
			0°C				
		Bias= 1/9	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	6.5	7.2	10.6	mA	
	IEE	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	1.6	1.8	2.4		
LED Power Supply Current	I <sub>LED</sub>	V <sub>AK</sub> = 5.0 V R <sub>18</sub> = R <sub>19</sub> = 10Ω	-	220	-	mA	
EL Power Supply Current	I <sub>EL</sub>	V <sub>AK</sub> = 110 V <sub>rms</sub> 400HZ R <sub>18</sub> = R <sub>19</sub> = 0Ω	-	-	10.0	mA <sub>rms</sub>	
CCFL	Starting Voltage	V <sub>FLS</sub>	-	-	900	-	V <sub>rms</sub>
	Driving Voltage	V <sub>FLD</sub>	-	-	450	-	V <sub>rms</sub>
	Driving Current	I <sub>FLD</sub>	V <sub>FLD</sub> = 450V <sub>rms</sub> f <sub>FLD</sub> = 30KHZ	-	5.0	-	mA <sub>rms</sub>
	Driving Voltage	f <sub>FL</sub>	-	15	30	50	KHZ

## 4. OPTICAL CHARACTERISTICS

### 4-1 Optical Char. of Normal Temp. Mode

AT Vop

MODE	ITEM	Cr(Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	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  $\phi=0^\circ \theta=0^\circ$

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  $V_{op}$

MODE	ITEM	Cr(Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	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  $\phi=0^\circ \theta=0^\circ$

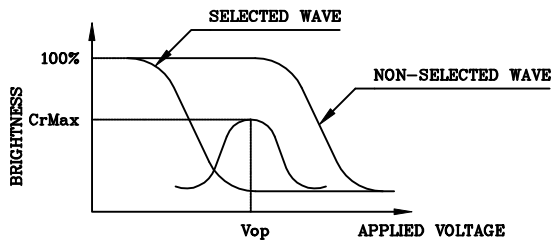
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-25°C				ms	NOTE 2
		0°C					
		25°C	-	90	200		
		50°C					
		70°C	-	40	100		
Response Time (fall)	Tf	-25°C				ms	NOTE 2
		0°C					
		25°C	-	180	360		
		50°C					
		70°C	-	60	120		

note:

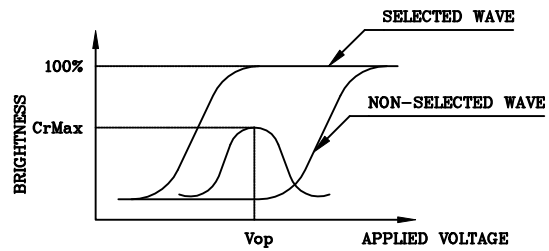
- R: REFLECTIVE
- S: TRANSFLECTIVE
- T: TRANSMISSIVE
- A: GRAY
- C: YELLOW
- E: BLUE
- G: NORMALLY BLACK
- J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



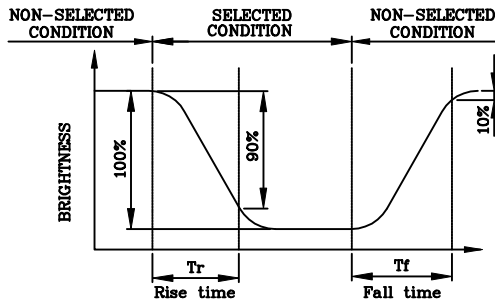
(negative type)

\*Conditions

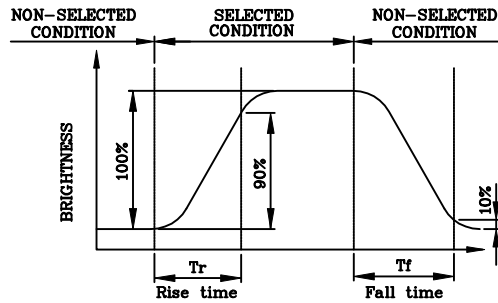
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



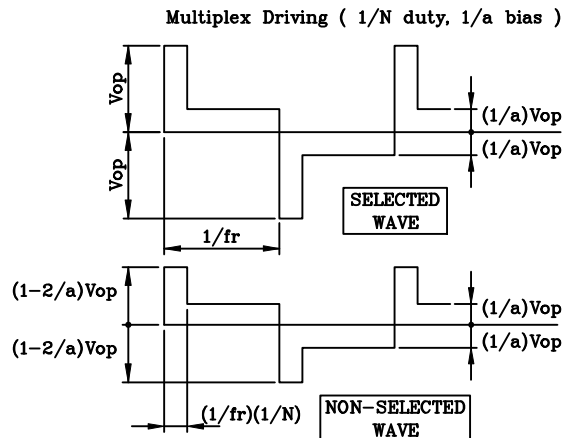
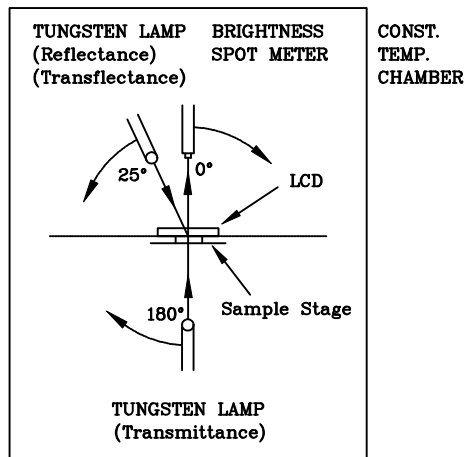
(negative type)

\*Conditions

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

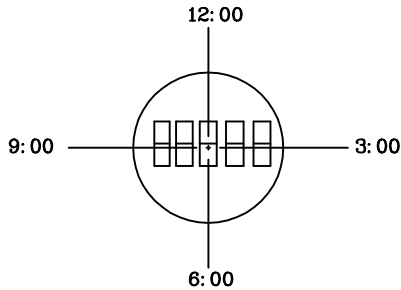
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



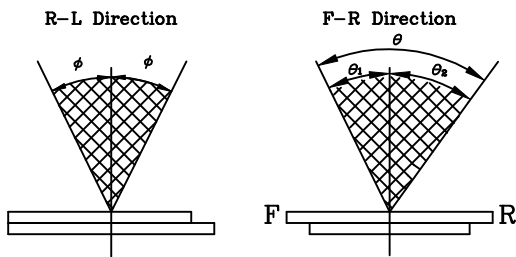
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



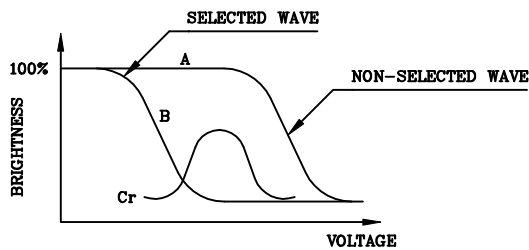
$$\theta = \theta_1 + \theta_2$$

\*Conditions

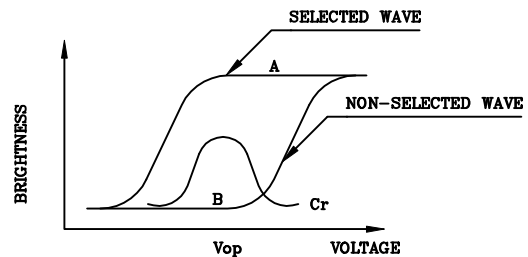
Operating Voltage :  $V_{op}$   
 Frame Frequency : 70Hz  
 Applied Waveform : 1/N duty, 1/a bias  
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

Contrast Ratio :  $Cr=A/B$

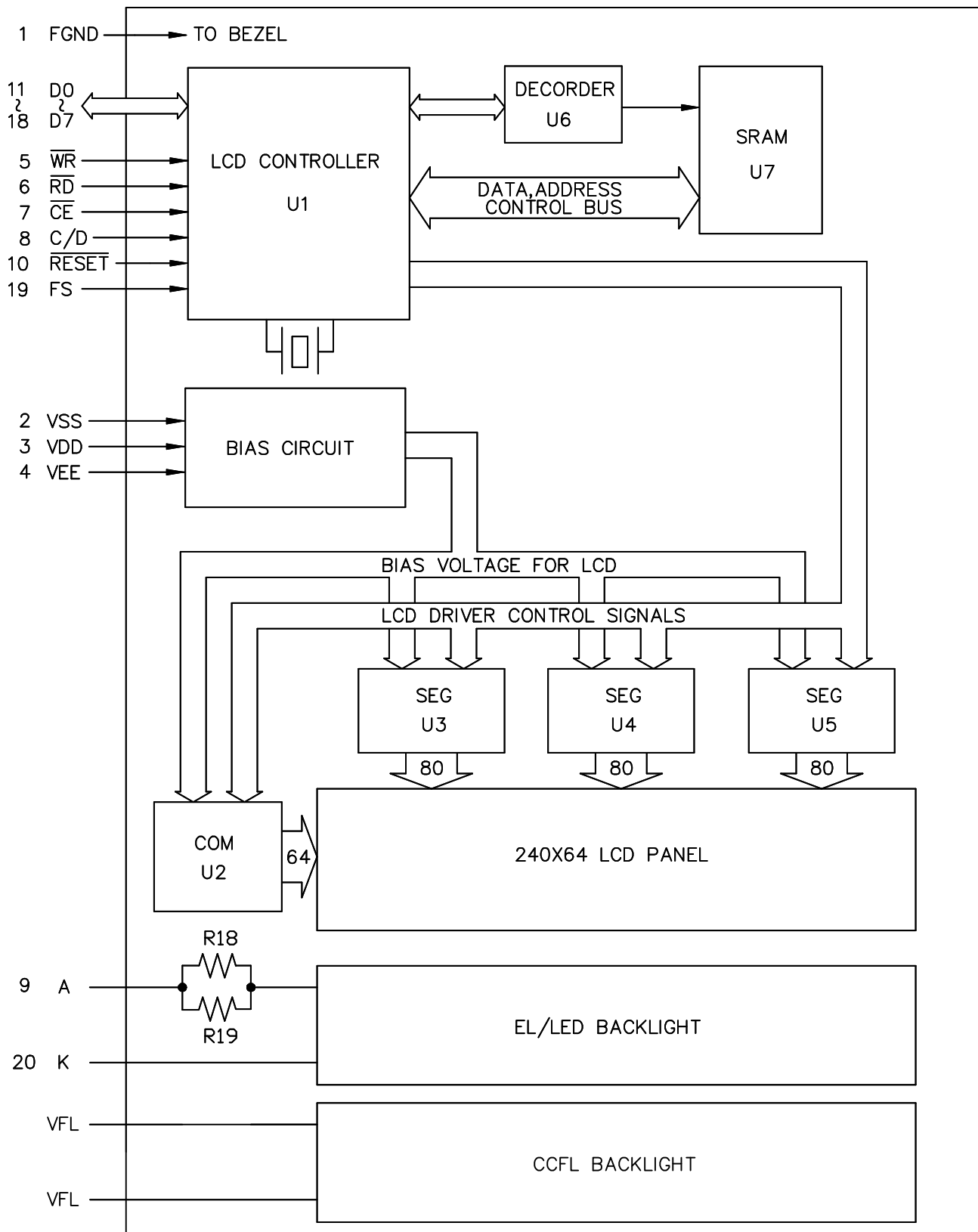
\*Conditions

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

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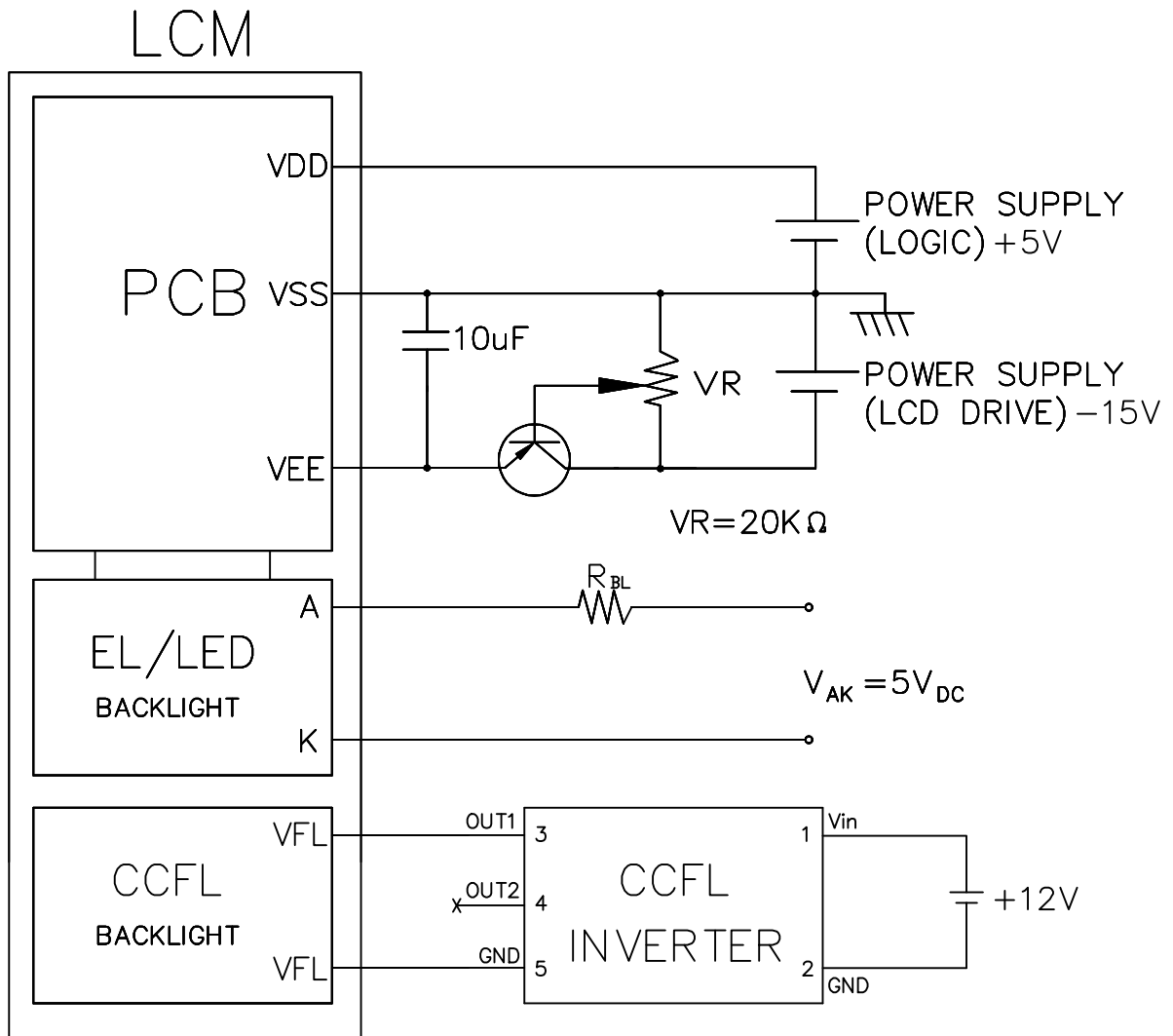
## 5. BLOCK DIAGRAM



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## 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 <sub>AC</sub> 400HZ	5V <sub>DC</sub>

# 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

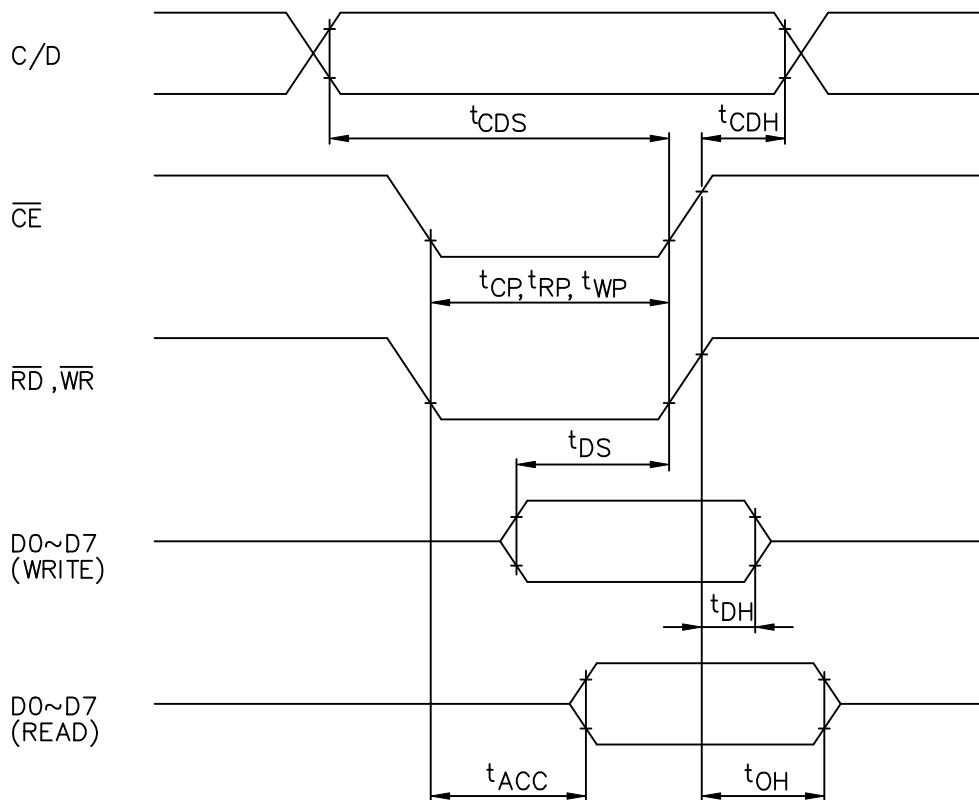
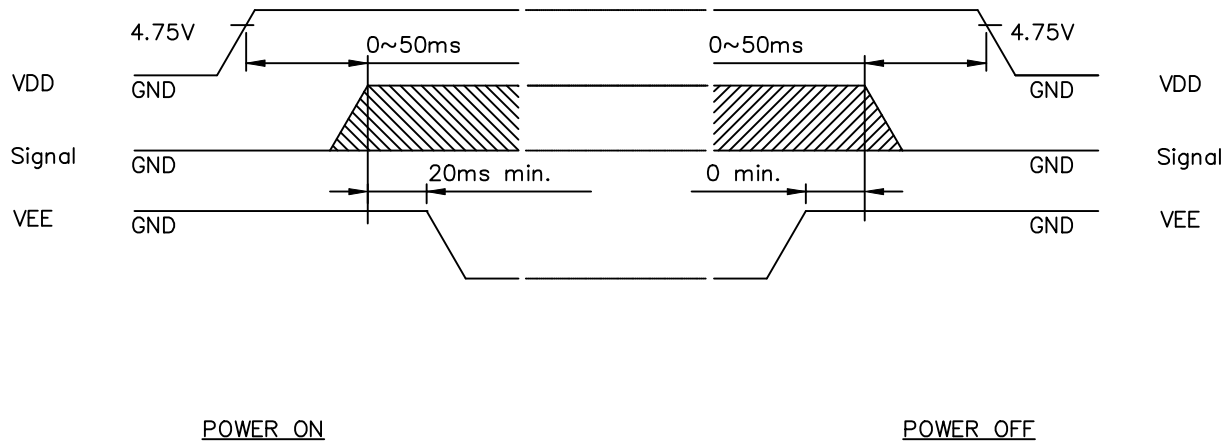


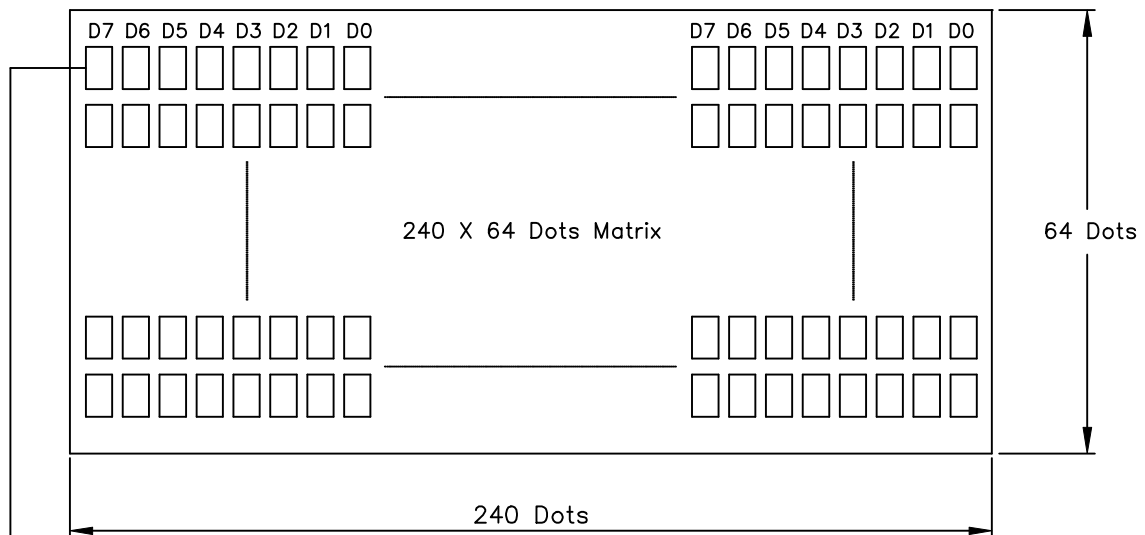
Fig. INTERFACE TIMING CHART

## 8-2 POWER ON/OFF TIMING



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

### 8-3 DISPLAY PATTERN



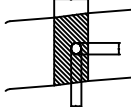
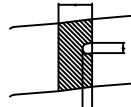
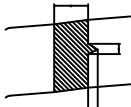
Starting dot for the starting address of display RAM D0~D7  
 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

## 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

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



(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  $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$  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.

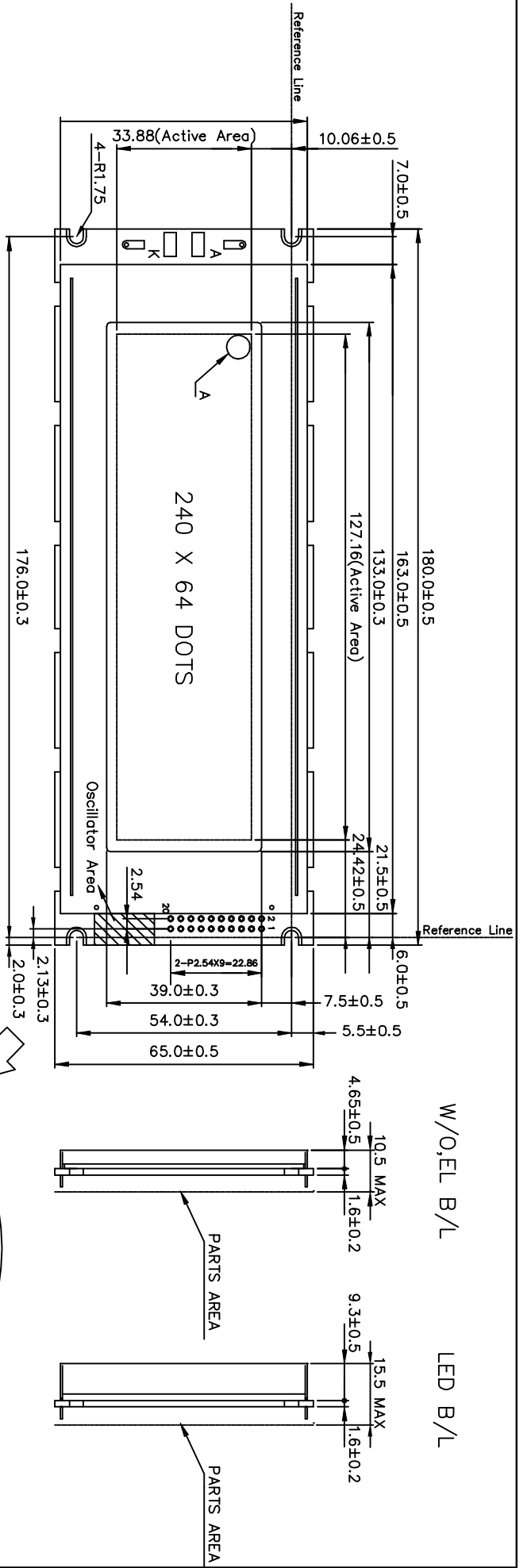
• TERMS OF WARRANTY

- 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.

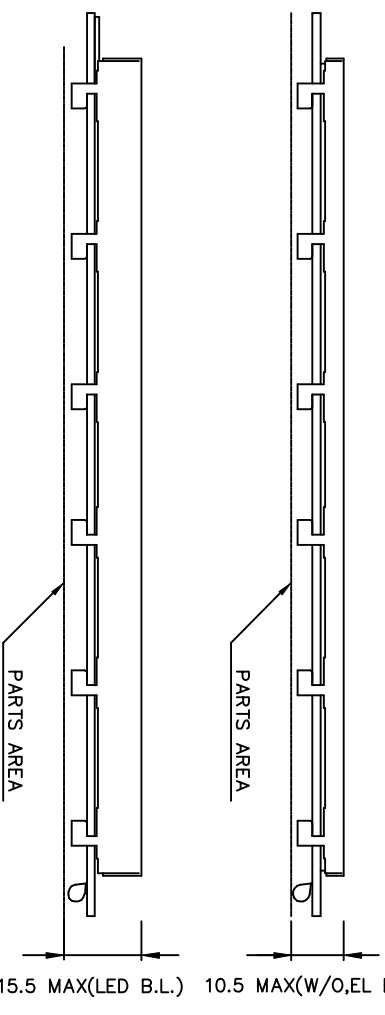
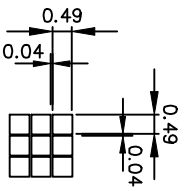
• TYPICAL OPERATING LIFETIME OF BACKLIGHT

- LED : 50,000HR  
EL : 5,000HR  
CCFT : 10,000HR

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W/O,EL B/L LED B/L

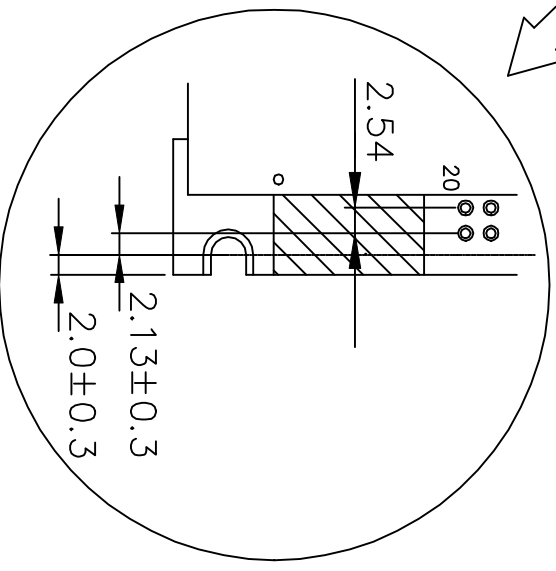


NOTES:

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

A DETAIL(PIXELS DETAIL)

PIN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FGND	VSS	VDD	VEE	WR	RD	CE	C/D	A	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_1P	南亞塑膠工業股份有限公司
APPORVE	NAME	DATE
CHECK	DESIGN	
DRAW	MAY PING 86.07.19	
DWG-NO	MXBX003X1XP	Rev.A
UNIT	mm	
SCALE	1/1	