

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

SPECIFICATION

SPEC. NO. : LM203-1
DATE : MAR. 11, 1999
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
320x240 LCD MODULE
PRODUCT NO.: LTBHB_203_1_K

SPEC. NO.: LM203-1-~~0~~^A

CUSTOMER
APPROVED BY
DATE:

EDITED ON : MAR.11.1999

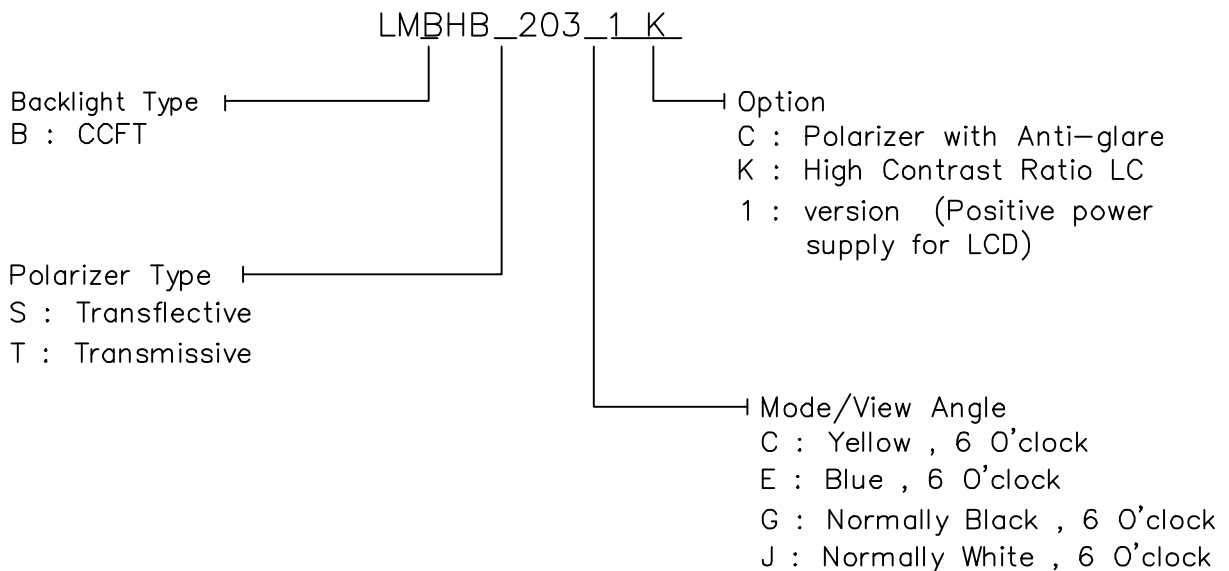
SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER

REV/DATE	R0/ 03.11.99'					APP	CHK	BY
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1. MECHANICAL DATA

- (1) Product No. LTBHB_203_1_K
- (2) Module Size 168 (W)mm x 111.0 (H)mm x 7.4 (D)mm
(CCFT B.L.)
- (3) Dot Size 0.33 (W)mm x 0.33 (H)mm
- (4) Dot Pitch 0.36 (W)mm x 0.36 (H)mm
- (5) Number of Dots 320 (W) x 240 (H)Dots
- (6) Duty 1/240
- (7) LCD Display Mode STN: Gray Yellow Blue
FSTN: Black and White(Normal Black/Negative Image)
 Black and White(Normal White/Positive Image)
Rear Polarizer: Reflective Transflective Transmissive
- (8) Viewing Direction 6 O'clock 12 O'clock
- (9) Backlight CCFT
- (10) Controller Excluded
- (11) DC/DC Converter Excluded
- (12) Weight 180 g(APPROX)

Note :



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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	VEE-VSS	0	30.0	V	
Input Voltage	VI	-0.3	VDD	V	
CCFL Driving Voltage	VFL	500	-	Vrms	
CCFL Input Current	IFL	-	7.0	mArms	
Static Electricity	-	-	-	-	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

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

Note 1 LCM should be grounded during handling LCM.

Note 2 Background color changes slightly depending on ambient temperature.
 This phenomenon is reversible.

Note 3 $T_a \leq 70^\circ\text{C}$: 75%RH max
 $T_a > 70^\circ\text{C}$: Absolute humidity must be lower
 than the humidity of 75%RH at 70°C

Note 4 T_a at -30°C will be < 48hrs, at 80°C will be < 120hrs

Note 5 Operation temp not include CCFL Lamp

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3. ELECTRICAL CHARACTERISTICS

(VDD = 5V±5%)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT		
Power Supply for Logic		VDD-VSS	-	4.75	5.0	5.25	V		
Recommended LC Driving Voltage (Wide Temp. LCM)		VLCD-VSS	Duty=1/240 Bias=1/13	-20°C	24.6	25.0	25.4	V	
				0°C	23.6	24.0	24.4		
				25°C	22.8	23.2	23.6		
				50°C	21.7	22.1	22.5		
				70°C	20.8	21.2	21.6		
Input Voltage		VIH	H level	0.7VDD	-	VDD	V		
		VIL	L level	0	-	0.3VDD	V		
Power Supply Current		IDD	FLM = 70 Hz VSS = 0 V VLCD = 23.2 V VLCD-VSS= 23.2 V	-	0.5	-	mA		
		ILCD	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	6.0	-	mA		
CCFL LAMP	Open Voltage	V _{Open}	Lamp Current = 5 mArms Frequency = 35 KHz	-	420	-	Vrms		
	Lamp Voltage	V _L		-	260	-	Vrms		
LCM	Surface Luminance	CCFL	T203G1K	VSS=0V VLCD-VSS=23.2V	PATTERN: (Dots All Off)	-	12	-	cd/m ²
			T203G1K			PATTERN: (Dots All ON)	-	170	-

4.OPTICAL CHARACTERISTICS

(For Wide Temperature Mode LCM)

AT Vop

ITEM		Cr(Contrast Ratio)						θ (Viewing Angle)		θ (Viewing Angle)	
		0℃		25℃		50℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G	-	10	-	10	-	8.0	-	86	-	55
note		NOTE 6						NOTE 5			

note:

T: TRANSMISSIVE

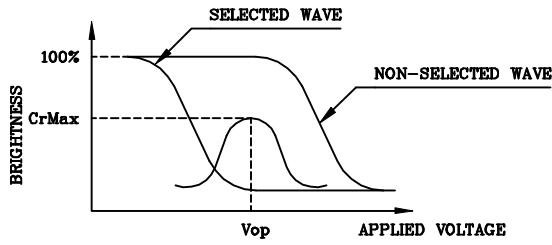
G: NORMALLY BLACK

AT $\theta=0^\circ$ $\theta=0^\circ$

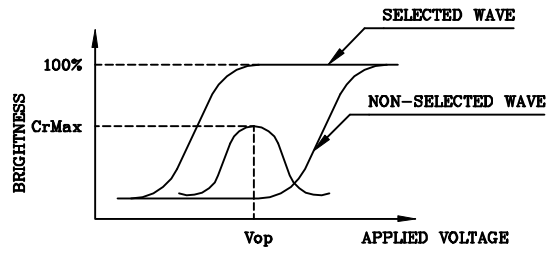
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	2700	4100	ms	NOTE 2
		0℃	-	500	800		
		25℃	-	150	250		
		50℃	-	80	120		
		70℃	-	60	90		
Response Time (fall)	Tf	-20℃	-	3500	5300	ms	NOTE 2
		0℃	-	800	1000		
		25℃	-	250	400		
		50℃	-	120	180		
		70℃	-	80	120		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



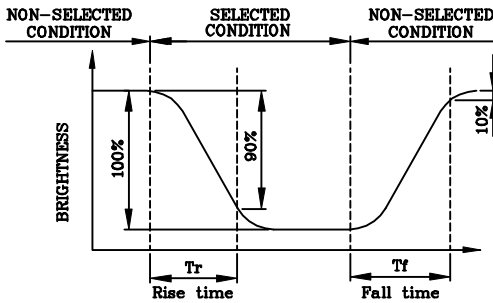
(negative type)

*Conditions

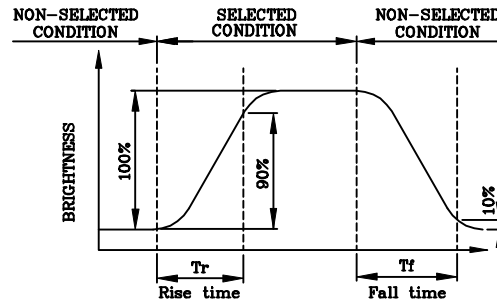
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



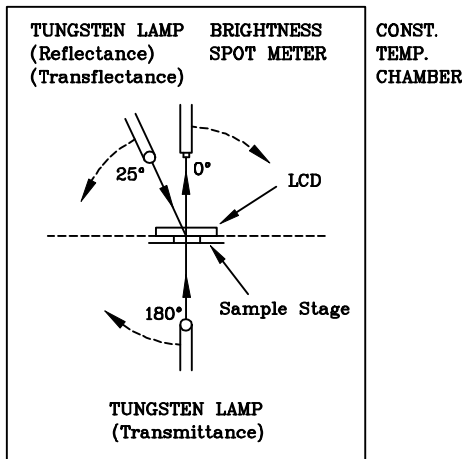
(negative type)

*Conditions

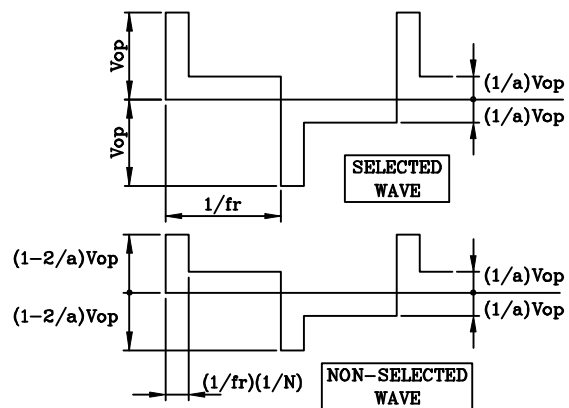
Operating Voltage : Vop
 Viewing Angle (θ,φ) : (0,0)
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

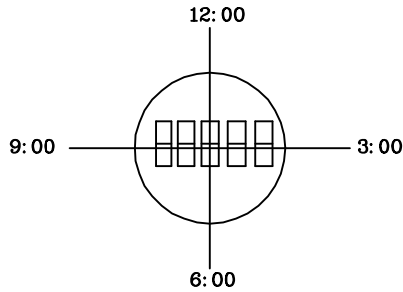


Multiplex Driving (1/N duty, 1/a bias)



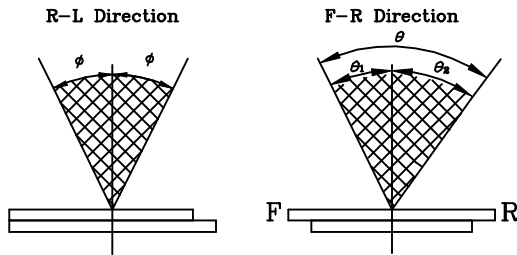
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



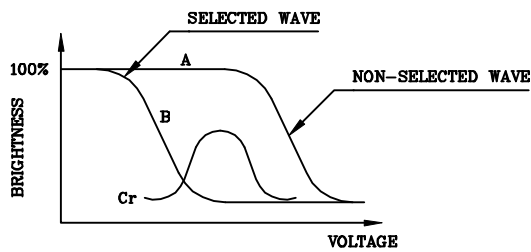
$$\theta = \theta_1 + \theta_2$$

*Conditions

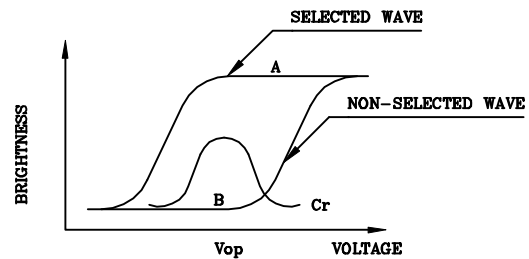
- Operating Voltage : V_{op}
- Frame Frequency : 70Hz
- Applied Waveform : 1/N duty, 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



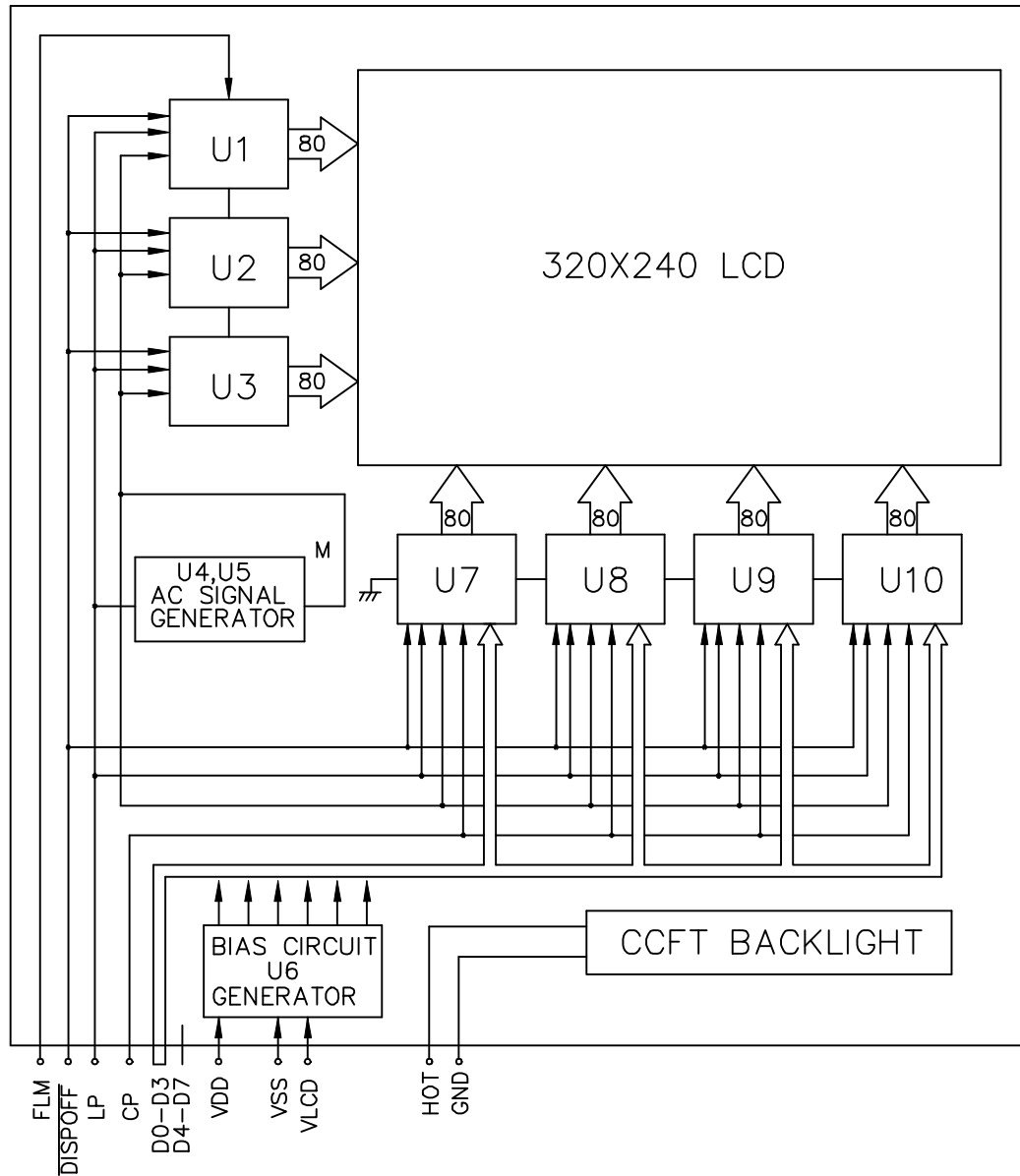
(negative type)

Contrast Ratio : $Cr = A/B$

*Conditions

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

5. BLOCK DIAGRAM



* AC SIGNAL SETTING

J1	J2	J3	J4	J5	J6	J7	J8
L	H	L	L	H	L	L	L

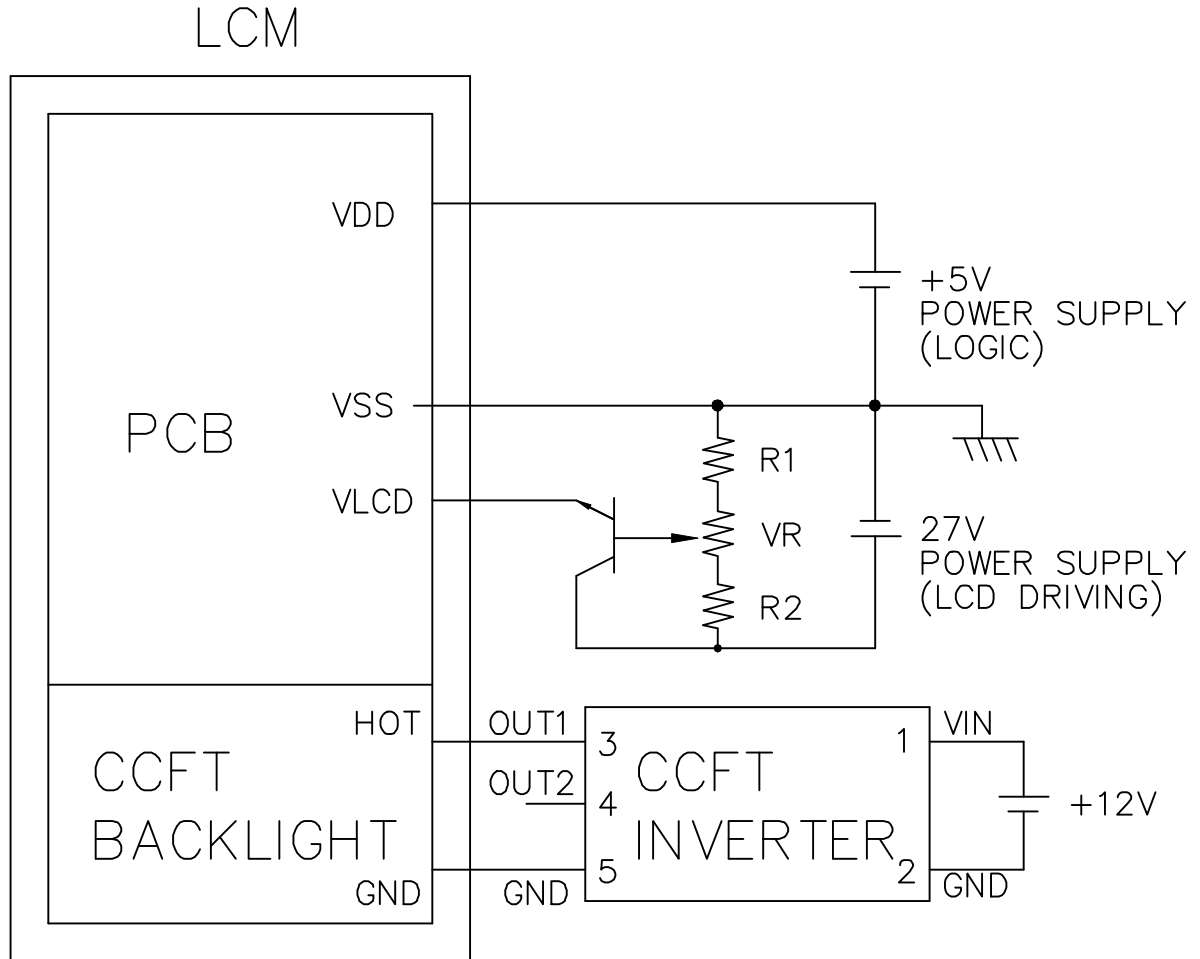
6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	FLM	H	SCAN START-UP SIGNAL
2	LP	H→L	INPUT DATA LATCH SIGNAL
3	CP	H→L	DATA INPUT CLOCK SIGNAL
4	$\overline{\text{DISPOFF}}$	H/L	H: ON/L: OFF
5	VDD	-	POWER SUPPLY FOR LOGIC(+5V)
6	VSS	-	SIGNAL GROUND(0V)
7	VLCD	-	POWER SUPPLY FOR LCD
8	D0	H/L	DISPLAY DATA SIGNAL
9	D1	H/L	
10	D2	H/L	
11	D3	H/L	
12	D4	-	NO CONNECTION
13	D5	-	
14	D6	-	
15	D7	-	
16	VSS	-	SIGNAL GROUND(0V)

CCFL CONNECTOR : M63M83-04(MITSUMI)

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	HOT	-	POWER SUPPLY FOR CCFT (HOT)
2	NC	-	NO CONNECTION
3	NC	-	NO CONNECTION
4	GND	-	POWER SUPPLY FOR CCFT (GND)

7. POWER SUPPLY

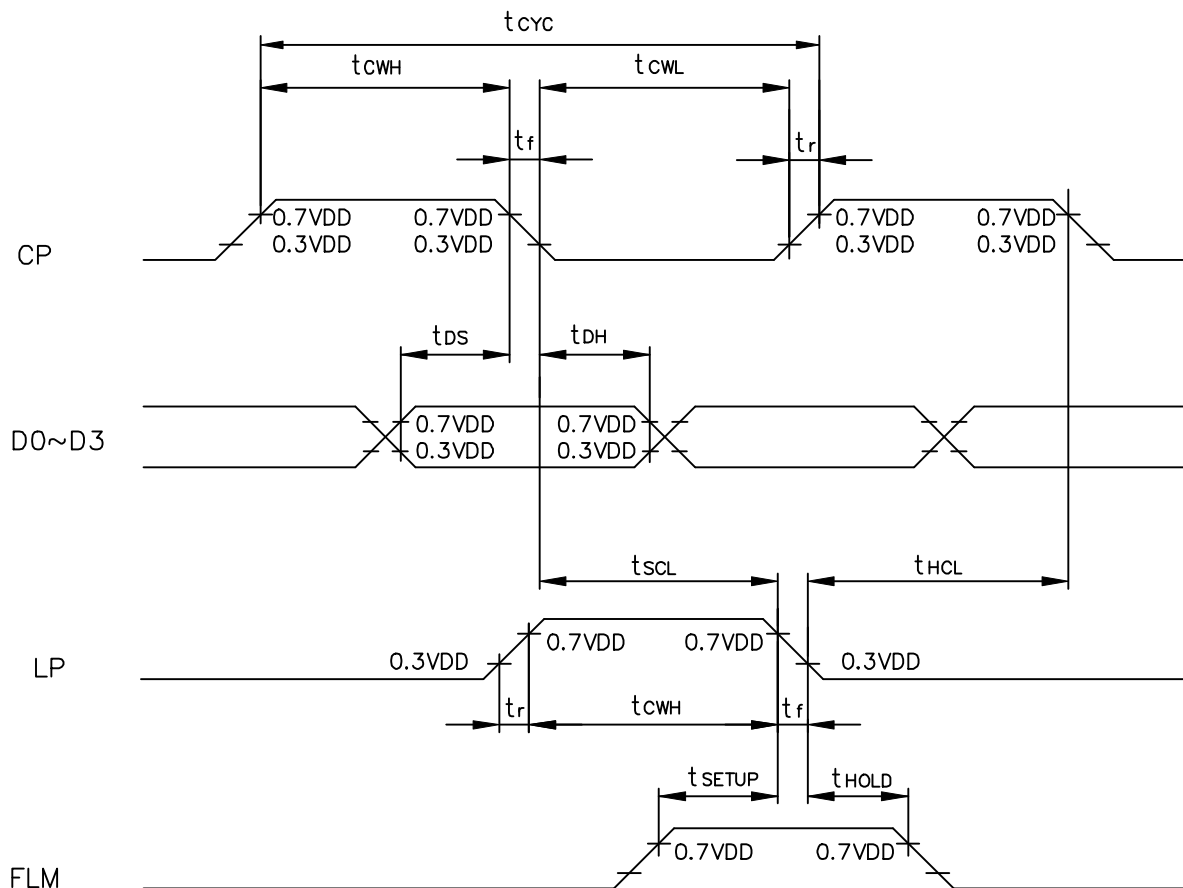


1. $R1 + VR + R2 = 10K \sim 20K \Omega$

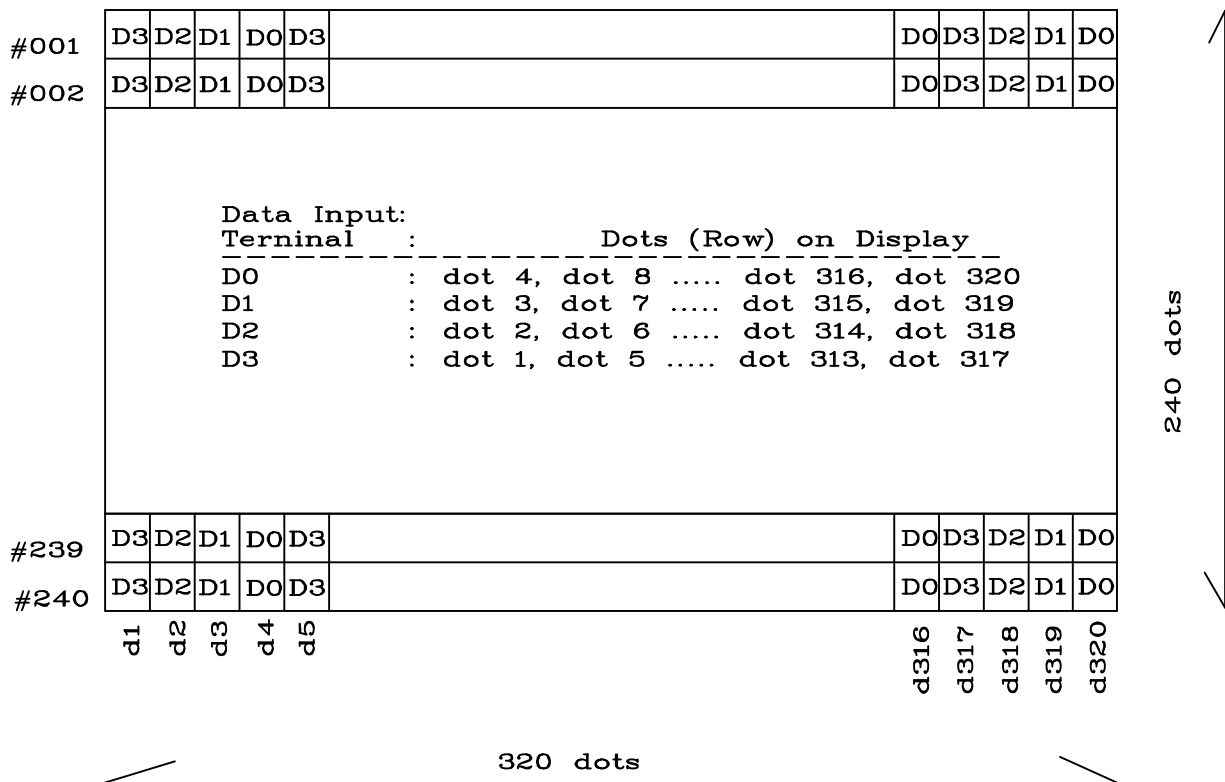
2. RECOMMENDED CCFT INVERTER : CXA-M10L-L(TDK)
 CXA-L10L-L(TDK)

8.1 TIMING CHARACTERISTICS

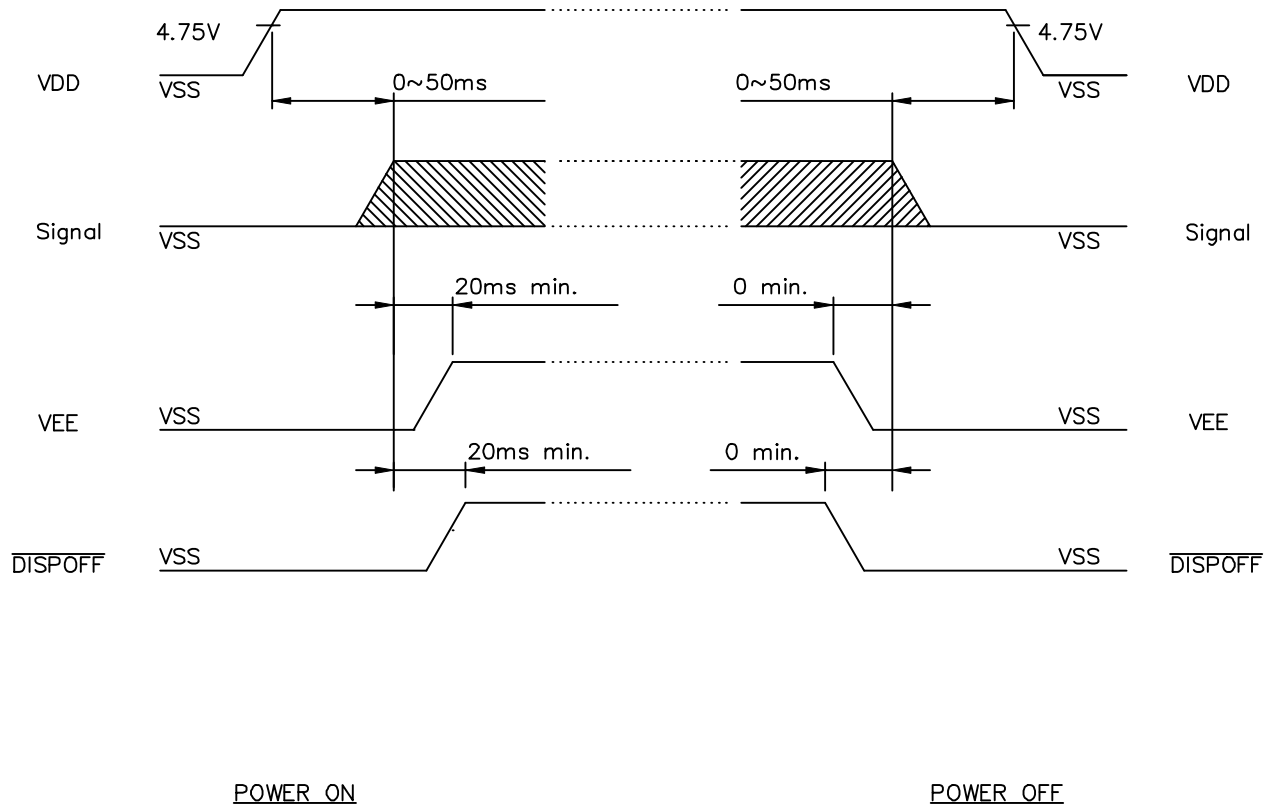
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK CYCLE TIME	t_{CYC}	152	-	-	ns
CLOCK HIGH LEVEL WIDTH	t_{CWH}	65	-	-	ns
CLOCK LOW LEVEL WIDTH	t_{CWL}	65	-	-	ns
CLOCK RISE TIME	t_r	-	-	50	ns
CLOCK FALL TIME	t_f	-	-	50	ns
DATA SETUP TIME	t_{DS}	50	-	-	ns
DATA HOLD TIME	t_{DH}	40	-	-	ns
CLOCK SETUP TIME	t_{SCL}	65	-	-	ns
CLOCK HOLD TIME	t_{HCL}	65	-	-	ns
FRAME SETUP TIME	t_{SETUP}	100	-	-	ns
FRAME HOLD TIME	t_{HOLD}	100	-	-	ns



8.3 DISPLAY PATTERN



8.4 POWER ON/OFF TIMING



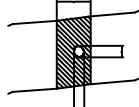
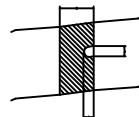
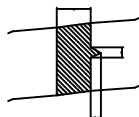
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

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.	INCLUSIONS (BLACK SPOT , WHITE SPOT , DUST)	<p>(1) ROUND TYPE</p> <table border="1"> <thead> <tr> <th>DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td>$a \leq 0.20$</td> <td>NEGLECT</td> </tr> <tr> <td>$0.20 < a \leq 0.35$</td> <td>5 MAX</td> </tr> <tr> <td>$0.35 < a$</td> <td>NONE</td> </tr> </tbody> </table> <p>(2) LINEAR TYPE</p> <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>$W \leq 0.03$</td> <td>NEGLECT</td> </tr> <tr> <td>$L \leq 3$</td> <td>$0.03 < W \leq 0.08$</td> <td>6</td> </tr> <tr> <td>$3 < L$</td> <td>$0.08 < W$</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	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
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$L \leq 3$	$0.03 < W \leq 0.08$	6																					
$3 < L$	$0.08 < W$	NONE																					
2.	SCRATCH	<p>1.SCRATCH ON PROTECTIVE FILM IS PERMITTED . 2.SCRATCH ON POLARIZER SHALL BE AS FOLLOW: (1) ROUND TYPE</p> <table border="1"> <thead> <tr> <th>DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td>$a \leq 0.15$</td> <td>NEGLECT</td> </tr> <tr> <td>$0.15 < a \leq 0.20$</td> <td>2 MAX</td> </tr> <tr> <td>$0.20 < a$</td> <td>NONE</td> </tr> </tbody> </table> <p>(2) LINEAR TYPE BE JUDGED BY 1.-(2) LINEAR TYPE</p>		DIAMETER mm (a*)	NO. OF DEFECT*	$a \leq 0.15$	NEGLECT	$0.15 < a \leq 0.20$	2 MAX	$0.20 < a$	NONE												
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$a \leq 0.15$	NEGLECT																						
$0.15 < a \leq 0.20$	2 MAX																						
$0.20 < a$	NONE																						
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 IRREGULARITY (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±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.

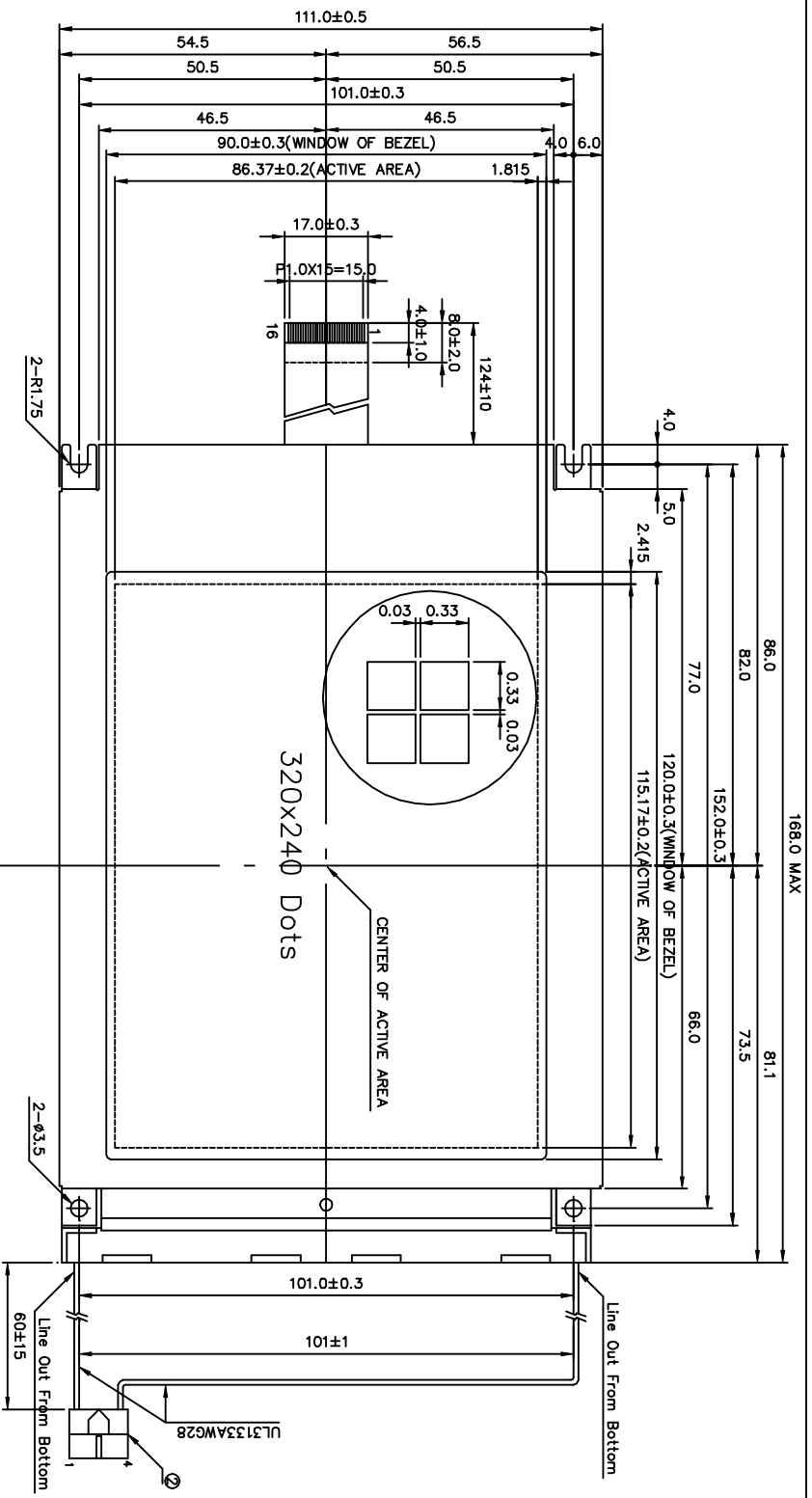
• TERMS OF WARRANTY

- 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

REV/DATE	RO/ 03.11.99'					APP	CHK	BY
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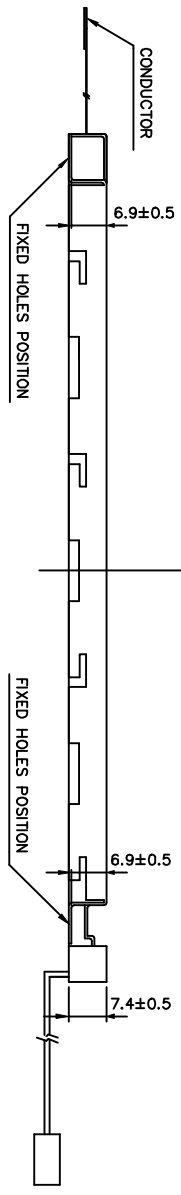


PIN ASSIGNMENT OF I/O CONNECTION

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	DISPOFF	H/L	H-ON/L-OFF
5	VDD	-	POWER SUPPLY FOR LOGIC
6	VSS	-	GND
7	VLCD	-	POWER SUPPLY FOR LCD DRIVER (+)
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	-	No Connection
13	D5	-	No Connection
14	D6	-	No Connection
15	D7	-	No Connection
16	VSS	-	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 CCFL(GND)



NOTE :

1. RESOLUTION : 320 X 240 DOTS
2. CONTROLLER : EXCLUDED
3. DC/DC CONVERTER : EXCLUDED
4. INTERFACE CONNECTOR
FFC: N16 P1.0mm
CCFL CONNECTOR
M63M83-04(MITSUMI)
5. TOLERANCE NO SPECIFIED : ±0.5mm

產品編號	LTBHB_203_1K	南亞塑膠工業股份有限公司
APPORVE		NAN YA PLASTICS CORPORATION
CHECK		製品圖
DESIGN		DWG-NO TBAT203G1K Rev.A
DRAW	MAY PING BB.03.11	UNIT : mm
		SCALE : 1/1