

## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AR-320240GRICW</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

APPROVED BY	CHECKED BY	ORGANIZED BY



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## 1. GENERAL SPECIFICATION

ITEM	CONTENT
Display content	320(H) x 240(W)
Dimensional Outline[mm]	154.6(H) x 114.8(W) x 8.5(D)
Display mode	Color Transmissive Type
Circuit	X-driver , Y-driver
Interface	FRM, LOAD,CP, V <sub>LCD</sub> , Data(D7~D0)

## 2. ABSOLUTE MAXIMUM RATING

### (1) ELECTRICAL ABSOLUTE RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Power Supply for LCD	V <sub>LCD</sub> -VSS	0	30	V	
Input Voltage	V <sub>I</sub>	-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		Note4,6	

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

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

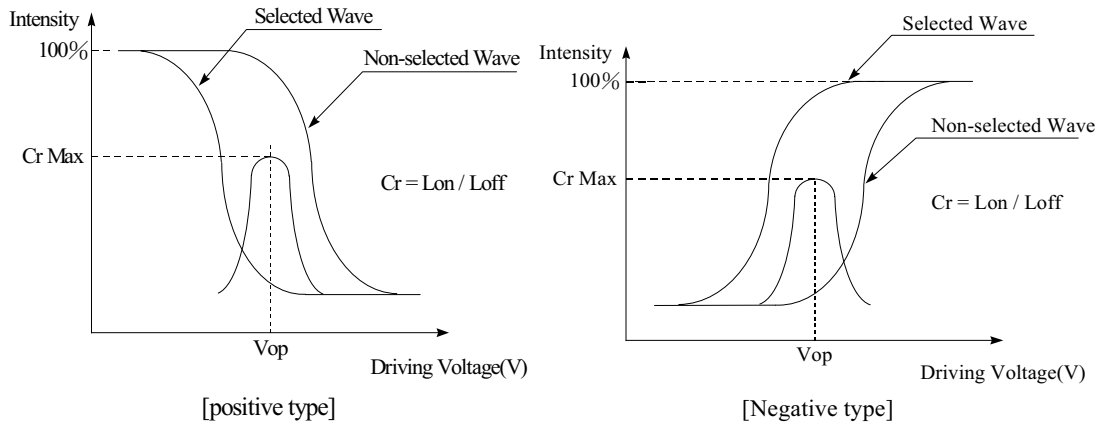
Note 6  $T_a$  at  $-30^\circ\text{C}$  will be <48hrs, at  $80^\circ\text{C}$  will be <120hrs

### 3.ELECTRO-OPTICAL CHARACTERISTICS

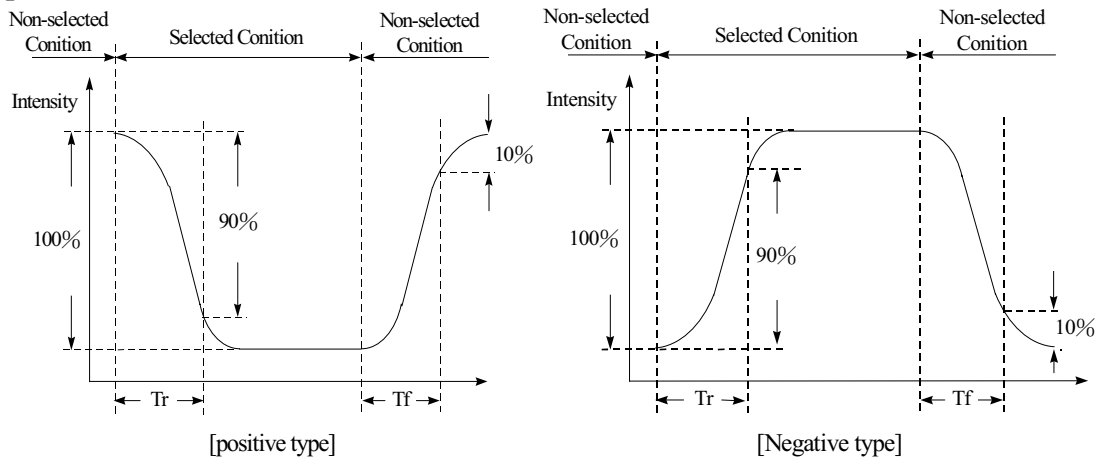
ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX	UNIT	NOTE
Power Supply for Logic	$V_{DD}-V_{SS}$	$T_a=25^{\circ}C$		4.75	5.0	5.25	V	
Input Voltage	$V_{IL}$	L level		$V_{SS}$	-	$0.2V_{DD}$	V	
	$V_{IH}$	H level		$0.8V_{DD}$	-	$V_{DD}$	V	
LCM Recommend LCD Module Driving Voltage	$V_{LCD}-V_{SS}$	1/240 Duty 1/19 Bias	$0^{\circ}C$	-	-	-	V	
			$25^{\circ}C$	-	(26.2)	-		
			$50^{\circ}C$	-	-	-		
Power Supply Current for LCM	$I_{DD}$	$V_{DD}=5.0V$ $V_{LCD}-V_{SS}=26.2V$ $FLM=70Hz$		-	(2.7)	(4.0)	mA	
	$I_{LCD}$			-	(7.5)	(11.0)		
Contrast	K	$25^{\circ}C$		-	(29.1)	-		7
Response Time	$T_r$	$25^{\circ}C$		-	(120)	-	ms	8
	$T_f$			-	(525)	-		
Viewing angle range	$\theta_f$	$25^{\circ}C$		-	(54)	-	Degree	9
	$\theta_b$			-	(30)	-		
	$\theta_l$			-	(46)	-		
	$\theta_r$			-	(48)	-		
Frame frequency	Fr			-	(70)	-	Hz	

\*( ) REFERENCE ONLY

[Note 7] Definition of Operation Voltage (V<sub>LCD</sub>)



[Note 8] Definition of Response Time (Tr, Tf)



Conditions :

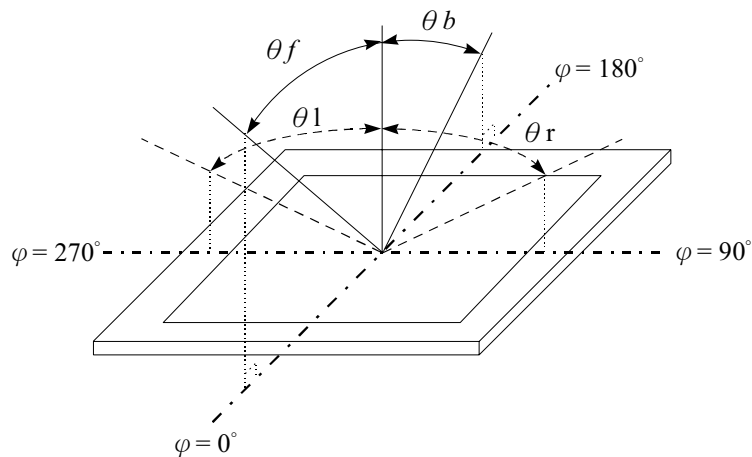
Operating Voltage : V<sub>LCD</sub>

Viewing Angle( $\theta$ ,  $\varphi$ ) :  $0^\circ$ ,  $0^\circ$

Frame Frequency : 70 HZ

Driving Waveform : 1/N duty, 1/a bias

[Note 9] Definition of viewing angle( $CR \geq 2$ )



#### 4. MECHANICAL SPECIFICATION

(1)Product No.		AR-320240GRICW
(2)Module Size		154.6(W)mm x 114.8(H) mm x 8.5(D)mm
(3)Dot Size		0.09(W)mm x 0.33(H)mm
(4)Dot Pitch		0.12(W)RGBmm x 0.36(H)mm
(5)Number of Dots		320(W)RGB x 240(H)Dots
(6)Duty		1/240
(7)Bias		1/19
(8)LCD Display Mode	STN:	<input type="checkbox"/> Gray Mode <input type="checkbox"/> Yellow Mode <input type="checkbox"/> Blue Mode
	FSTN:	<input checked="" type="checkbox"/> Black and White(Normally White/Positive Image) <input type="checkbox"/> Black and White(Normally Black/Negative Image)
	Rear Polarizer:	<input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input checked="" type="checkbox"/> Transmissive <input type="checkbox"/> Transflective(High Transmissive)
(9)Viewing Direction		<input checked="" type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> O'clock
(10)Backlight		<input type="checkbox"/> W/O <input checked="" type="checkbox"/> CCFL <input type="checkbox"/> EL <input type="checkbox"/> LED
(11)Controller		Without
(12)DC/DC Converter		Without
(13)Weight		180g

## 5.INTERFACE

### 5.1 Interface Pin Assignment

#### LCD Connector: MOLEX 53261-1510

Pin No.	Symbol	Level	Function
1	FRM	H	SCAN START-UP SIGNAL
2	CL1	H→L	DATA LATCH PULSE
3	CL2	H→L	DATA SHIFT PULSE
4	DISP	H/L	H: DISPLAY ON, L: DISPLAY OFF
5	VDD	-	POWER SUPPLY FOR LOGIC
6	VSS	-	POWER SUPPLY (0V)
7	VLCD	-	POWER SUPPLY FOR LCD(+V)
8	D7	H/L	DISPLAY DATA
9	D6	H/L	
10	D5	H/L	
11	D4	H/L	
12	D3	H/L	
13	D2	H/L	
14	D1	H/L	
15	D0	H/L	

### 5.2 CCFL B/L Pin Assignment

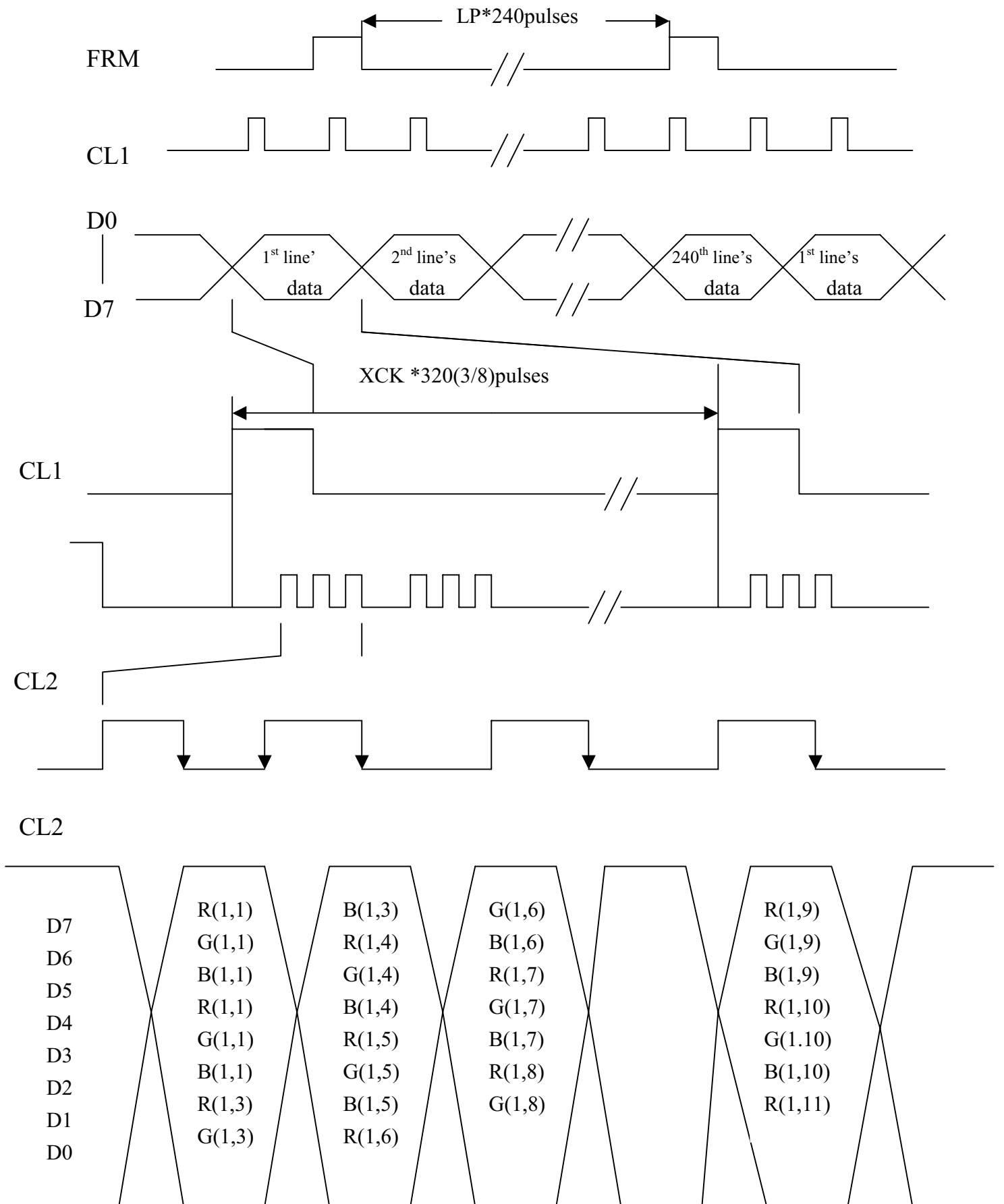
#### FL Connector: BHR-03VS-1(JST)

Pin No.	Signal	Function
1	HOT	Power Supply for CCFL(Hot)
2	GND	Power Supply for CCFL(Ground)

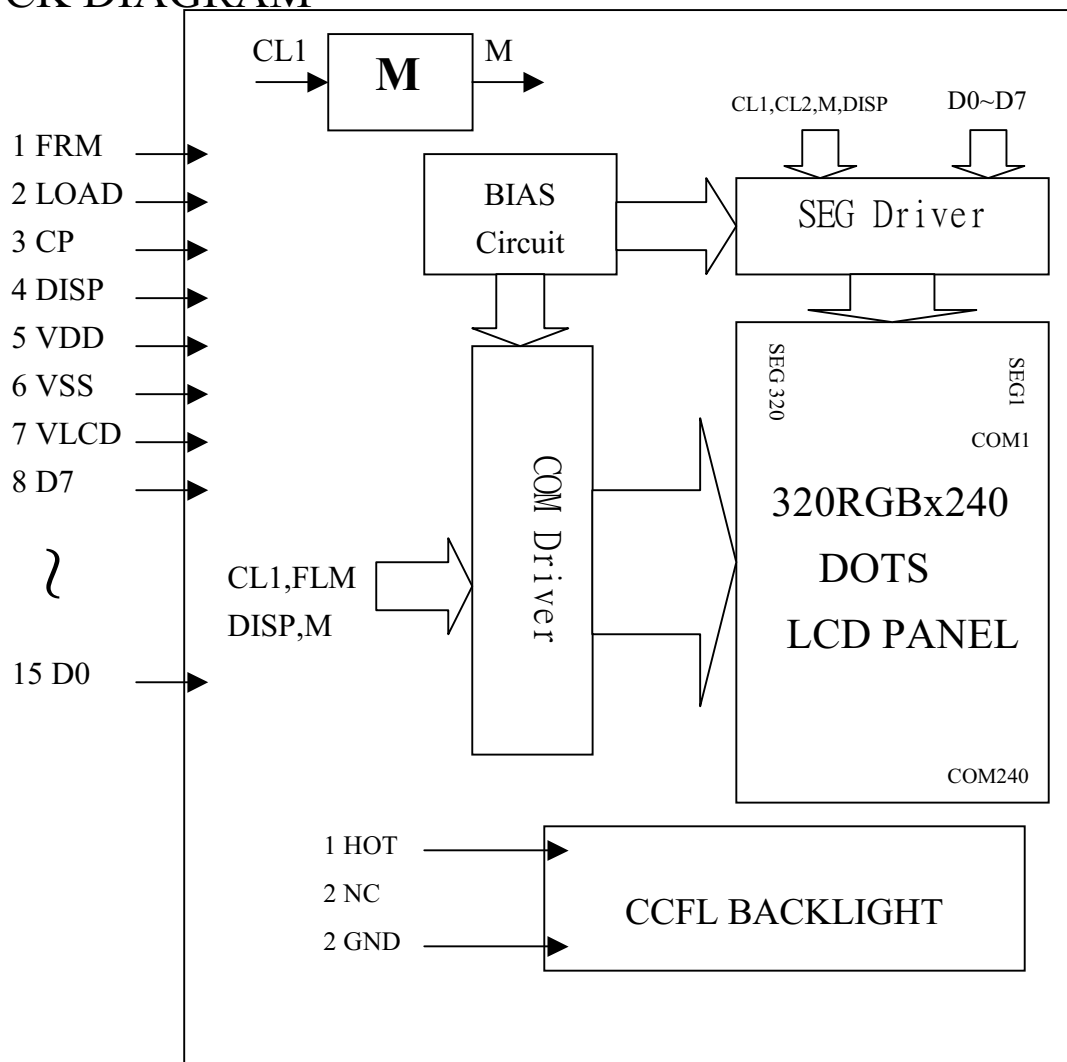
INVERTER RECOMMEND: CXA-M10L(TDK)



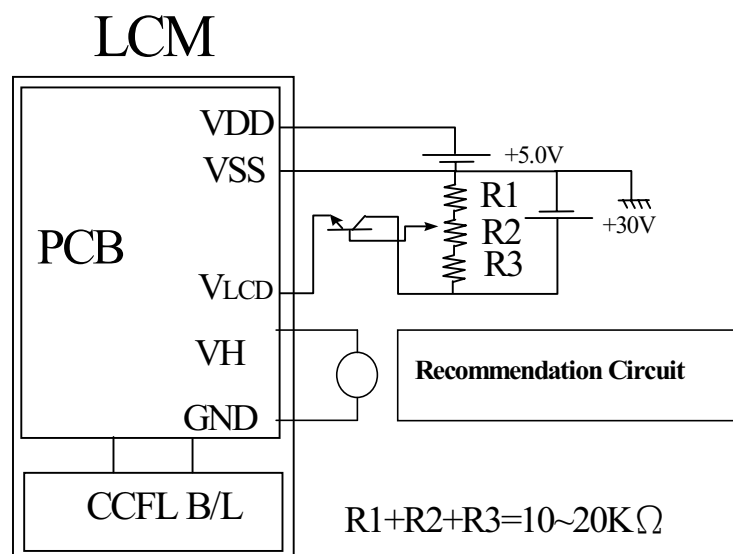
### 5.3 Interface timing



## 6. BLOCK DIAGRAM



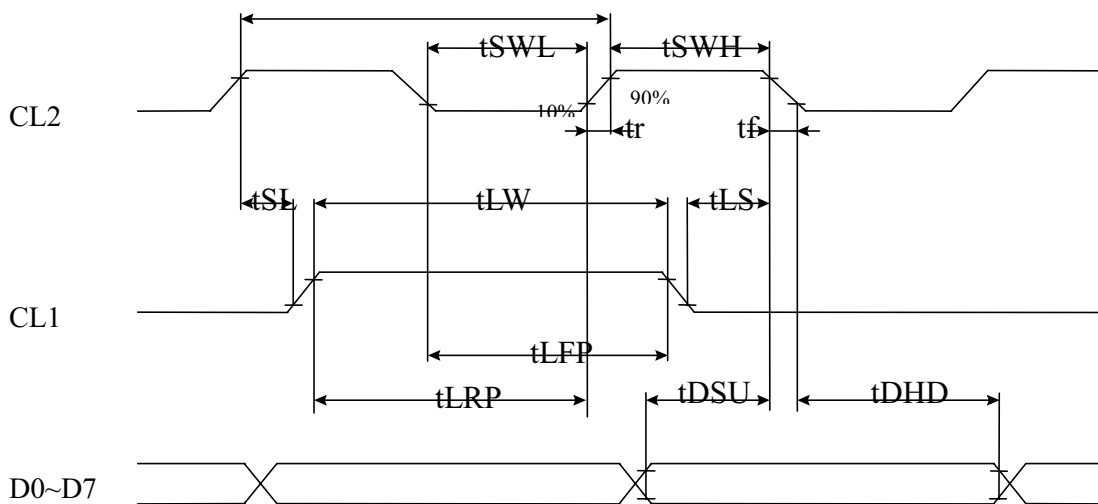
## 7. POWER SUPPLY



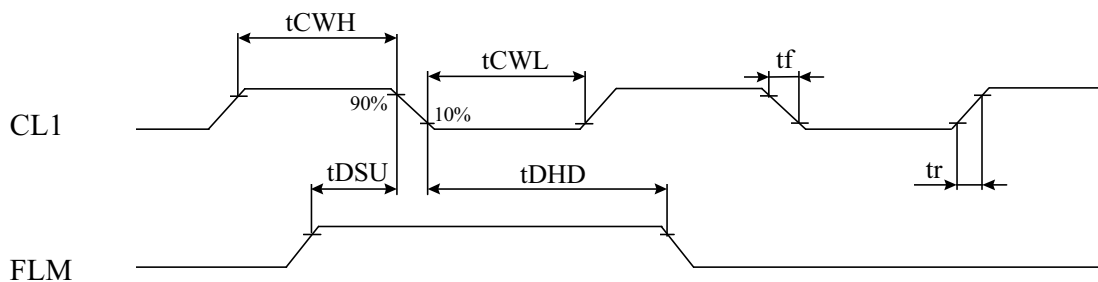
## 8. TIMING CHARACTERISTICS

### 8-1. Common & Segment interface timing:

ITEM	symbol	Test Condition	Min.	Typ.	Max.	Units
Clock Cycle	tC	Fig.1	500			ns
SCP Pulse Width	tSWH,tSWL	Fig.1	240			ns
Data Set Up Time	tDSU	Fig.1 & 2	240			ns
Data Hold Time	tDHD	Fig.1 & 2	240			ns
SCP Rise/Fall Time	tr,tf	Fig.1 & 2			50	ns
LP Rise Time	tLRP	Fig. 1	240			ns
LP Fall Time	tLFP	Fig. 1	240			ns
LP Pulse Width	tLW	Fig. 1	240			ns
SCP To LP Delay Time	tSL	Fig. 1	50			ns
LP To SCP Delay Time	tLS	Fig. 1	100			ns
LP "H" Pulse Width	tCWH	Fig. 2	40			ns
LP "L" Pulse Width	tCWL	Fig. 2	170			ns

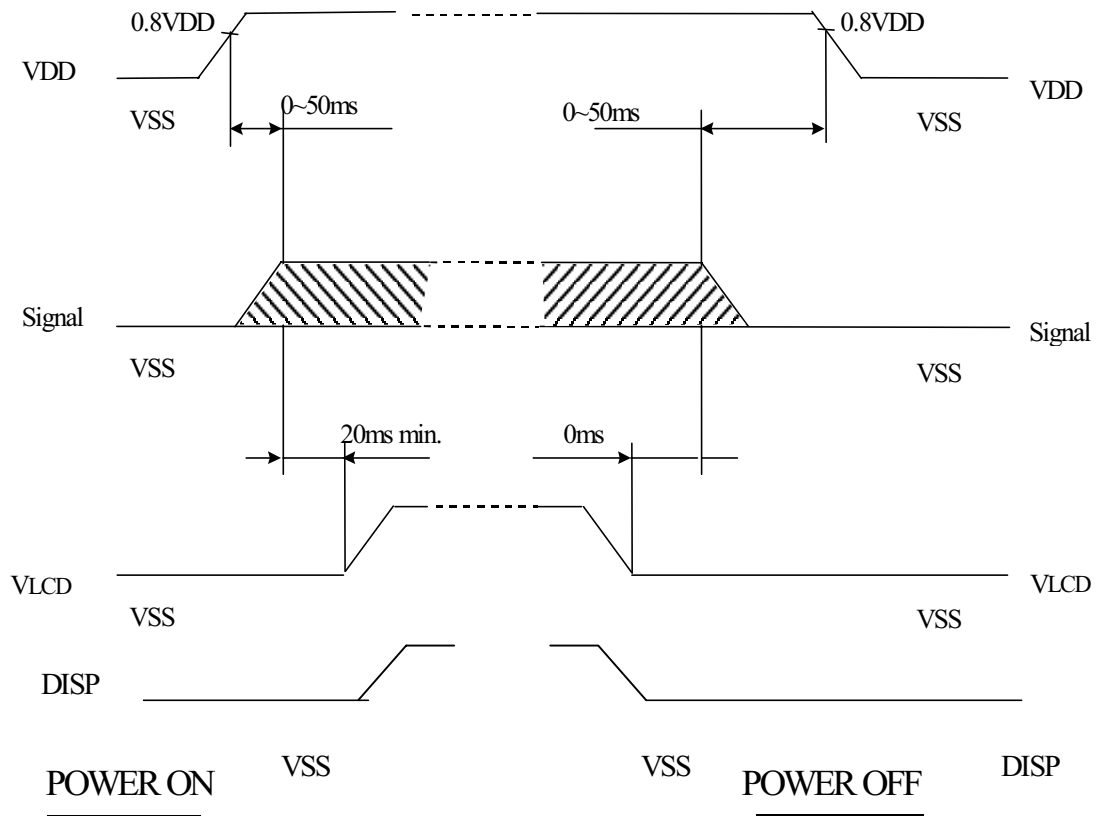


**Fig 1. SEGMENT TIMING**



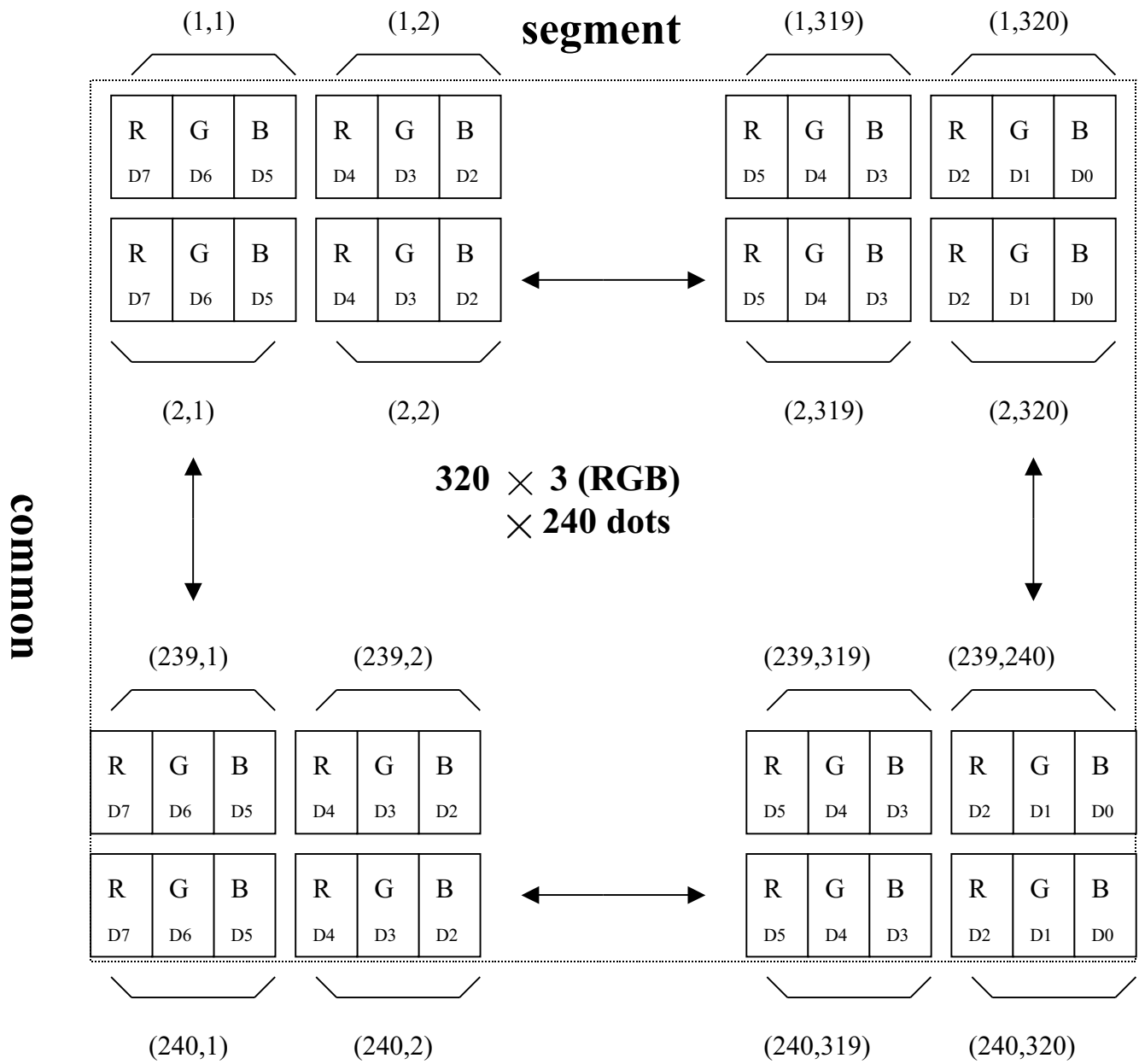
**Fig 2 COMMON TIMING**

## 8.2 POWER ON/OFF TIMING



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

# 9. DISPLAY PATTERN



## 10. RELIABILITY TEST

No	ITEM	Conditions		Note
1	HIGH TEMP. Operation	50°C	120 HR	
2	HIGH TEMP. Storage	60°C	120 HR	
3	LOW TEMP. Operation	0°C	120 HR	
4	LOW TEMP. Storage	-20°C	120 HR	
5	HIGH TEMP/HUMID Storage	60°C 90%RH	120 HR	
6	THERMAL SHOCK	-20°C,30 min 60°C,30 min	10 cycle	

Definitions of life end point

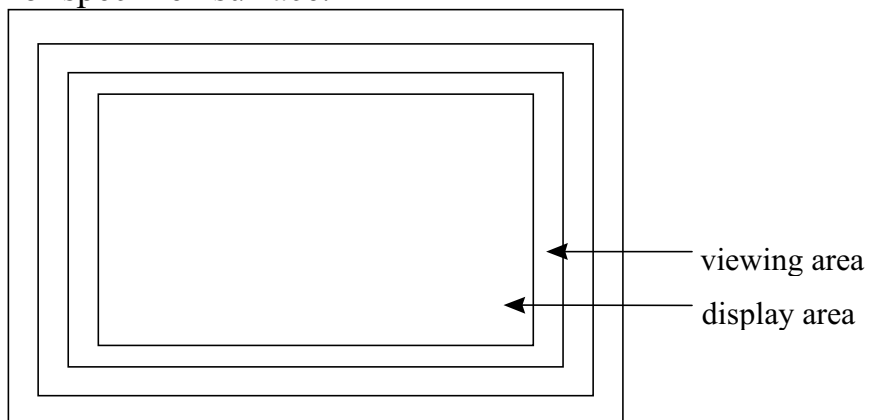
- (1) Current consumption is more than specified value
- (2) Function of the module is not maintained
- (3) There is visible degradation of appearance and display quality
- (4) Contrast ratio is less than 50 % of specified value
- (5) Brightness is less than 50 % of specified minimum valued

**MTTF : LCD Module 5000 HR**

## 11. APPEARANCE CHECK

CONDITION OF APPEARANCE CHECK :

- (1) Specimen shall be checked by eyes in distance of 30cm under 40w fluorescence lamp.
- (2) Checking direction shall be in 45 degree from perpendicular line of specimen surface.



## 12. HANDLING PRECAUTIONS

- (1) Treat polarizer very carefully since it is easy to be damaged.
- (2) When cleaning the display surface, use soft cloth (e.g., gauze) with a solvent (recommended below) and wipe lightly.

- ethyl alcohol
- iso-propanol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

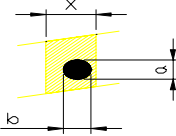
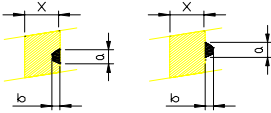
Do not use the following solvents :

- water
- ketone
- aromatics

- (3) Direct current causes electro-chemical reaction with remarkable degradation of the display quality. Give careful consideration to prevent direct current at ON/OFF timing and during operation.
- (4) Avoid strong shock and drop from a height.
- (5) To prevent LCD panels from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.
- (6) Give careful consideration to avoid electrical static discharge with causes uneven contrast.
- (7) Even a small condensation on the contact pads (terminals) causes electro-chemical reaction which makes missing row and column. Give careful attention to avoid condensation. When assembling with zebra connector, clean the surface of the pads with alcohol and keep the air very clean.

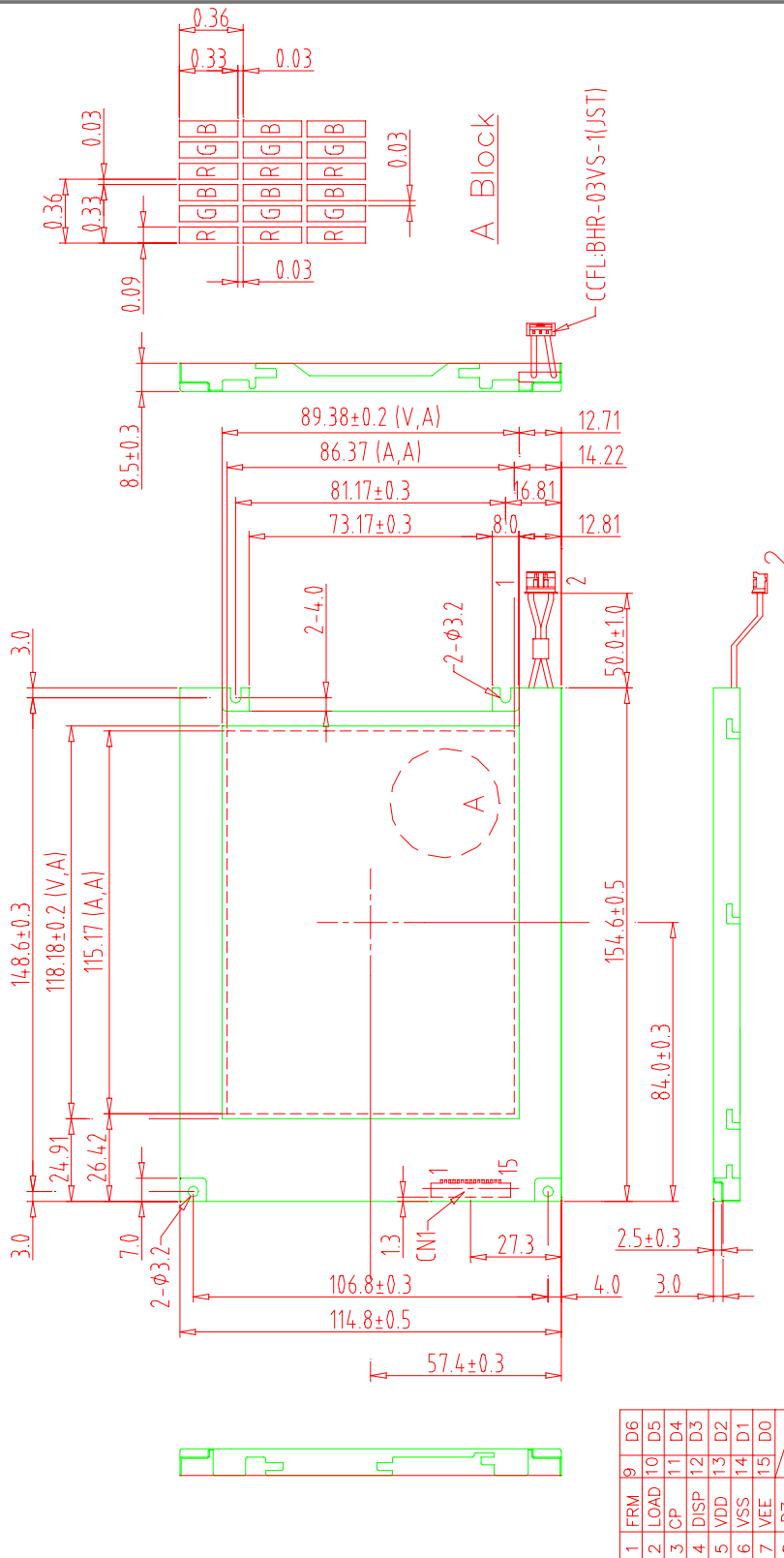
# 13. LCD PRODUCT QUALITY STANDARD

## DISPLAY APPEARANCE

NO	ITEM	CRITERIA	CLASS																				
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><math>a \leq 0.20</math></td> <td>NEGLECT</td> </tr> <tr> <td><math>0.20 &lt; a \leq 0.35</math></td> <td>5 MAX</td> </tr> <tr> <td><math>0.35 &lt; a</math></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>NA</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>	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	NA	$w \leq 0.03$	NEGLECT	$L \leq 3$	$0.03 < w \leq 0.08$	6	$3 < L$	$0.08 < w$	NONE	Minor
DIAMETER mm(a*)	NO. OF DEFECT*																						
$a \leq 0.20$	NEGLECT																						
$0.20 < a \leq 0.35$	5 MAX																						
$0.35 < a$	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</p> <p>2.SCRATCH ON POLARIZER SHALL BE AS FOLLOW:</p> <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><math>a \leq 0.15</math></td> <td>NEGLECT</td> </tr> <tr> <td><math>0.15 &lt; a \leq 0.20</math></td> <td>2 MAX</td> </tr> <tr> <td><math>0.20 &lt; a</math></td> <td>NONE</td> </tr> </tbody> </table> <p>(2)LINEAR TYPE BE JUDGED BYE 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	Minor												
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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	Minor																				
4.	BUBBLE	NOT EXCEEDING 0.5mm AVERAGE DIAMETER IS ACCEPTABLE BETWEEN GLASS AND POLARIZING FILM.	Minor																				
5.	PIN HOLE	<p><math>(a+b)/2 \leq 0.15\text{mm}</math> MAXIMUM NUMBER:IGNORED</p> <p><math>0.15 &lt; (a+b)/2 \leq 0.20\text{mm}</math> MAXIMUM NUMBER:10</p> 	Minor																				
6.	DOT DEFECT	<p><math>(a+b)/2 \leq 0.20\text{mm}</math> MAXIMUM NUMBER:IGNORED</p> <p><math>0.20 &lt; (a+b)/2 \leq 0.30\text{mm}</math> MAXIMUM NUMBER:5</p> <p>X=WIDTH</p> 	Minor																				
7.	CONTRAST IRREGULARITY(S POT)	<table border="1"> <thead> <tr> <th>DIAMETER SPEC</th> <th>NO. OF DEFECT</th> </tr> </thead> <tbody> <tr> <td><math>a \leq 0.50\text{mm}</math></td> <td>NEGLECT</td> </tr> <tr> <td><math>0.50 &lt; a \leq 0.75</math></td> <td>5</td> </tr> <tr> <td><math>0.75 &lt; a \leq 1.00</math></td> <td>3</td> </tr> <tr> <td><math>1.00 &lt; a</math></td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER SPEC	NO. OF DEFECT	$a \leq 0.50\text{mm}$	NEGLECT	$0.50 < a \leq 0.75$	5	$0.75 < a \leq 1.00$	3	$1.00 < a$	NONE	Minor										
DIAMETER SPEC	NO. OF DEFECT																						
$a \leq 0.50\text{mm}$	NEGLECT																						
$0.50 < a \leq 0.75$	5																						
$0.75 < a \leq 1.00$	3																						
$1.00 < a$	NONE																						
8.	DOT WIDTH	DESIGN WIDTH $\pm 15\%$	Minor																				
9.	COLOR TONE AND UNIFORMITY	OBVIOUS UNEVEN COLOR IS NOT PERMITTED	Minor																				



REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	09-21-01 BRIAN



Recommend	Company	Parts No.
CN1	Molex.	53261-1510

Note:  
1. Unless indicated, Tolerance Grade "B" is adopted.

1	7	TOLERANCE	GRADE(±)	A	B	DIM.	MM	DRN.	BRIAN	DATE	09-21-01	TITLE AR320240G
2	8		~6	0.05	0.1			CHK.		DATE		
3	9		6~18	0.08	0.18							DWC. NO. *O10946MA SHEET 1 OF 1
4	10		18~50	0.1	0.25							
5	11		50~180	0.2	0.4			PARTS NO.	LCM	APPD.		
6	12		180~	0.3	0.5							

