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SPECIFICATION
FOR
LCM MODULE

MODULE NO.: G240064A14-BIW-R
DOC.REVISION: 00

Customer Approval:

	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)		
PREPARED BY (QA ENGINEER)		
CHECKED BY		
APPROVED BY		

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DOCUMENT REVISION HISTORY

Version	DATE	DESCRIPTION	CHANGED BY
00	May-31-2007	First issue	

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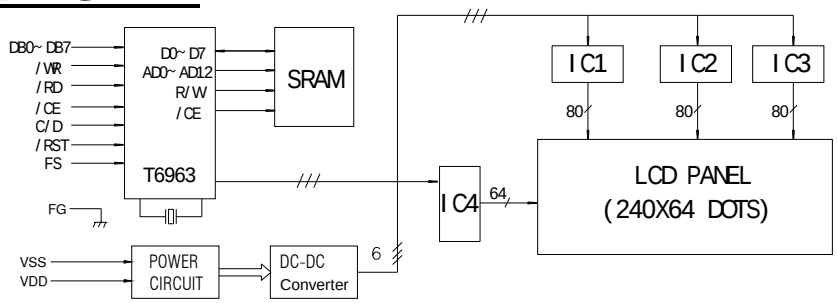
1. FUNCTIONS & FEATURES

1.1. Format	: 240x64 Dots
1.2. LCD mode	: STN /Negative Transmissive mode / Blue
1.3. Viewing direction	: 6 o'clock
1.4. Driving scheme	: 1/64 Duty cycle, 1/9 Bias
1.5. Power supply voltage(V_{DD})	: 5.0V
1.6. LCD driving voltage	: 12V (include negative circuit)
1.7. Operation temp	: -20~70℃
1.8. Storage temp	: -30~80℃
1.9. Backlight color	: White
1.10 Control IC	: T6963
1.11.RoHS standard	

2. MECHANICAL SPECIFICATIONS

2.1. Module size	: 180.0mm(L)*65.0mm(W)* Max13.0(H)mm
2.2. Viewing area	: 132.0mm(L)*39.0mm(W)
2.3. Dot pitch	: 0.53mm(L)*0.53mm(W)
2.4. Dot size	: 0.49mm(L)*0.49mm(W)
2.5. Weight	: Approx.

3. BLOCK DIAGRAM



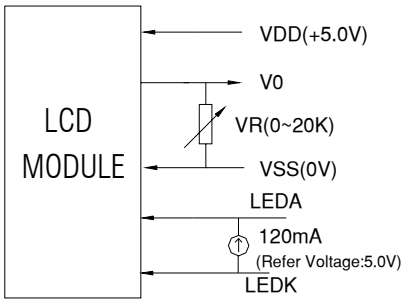


Figure 1. Block diagram

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4. DIMENSIONAL OUTLINE

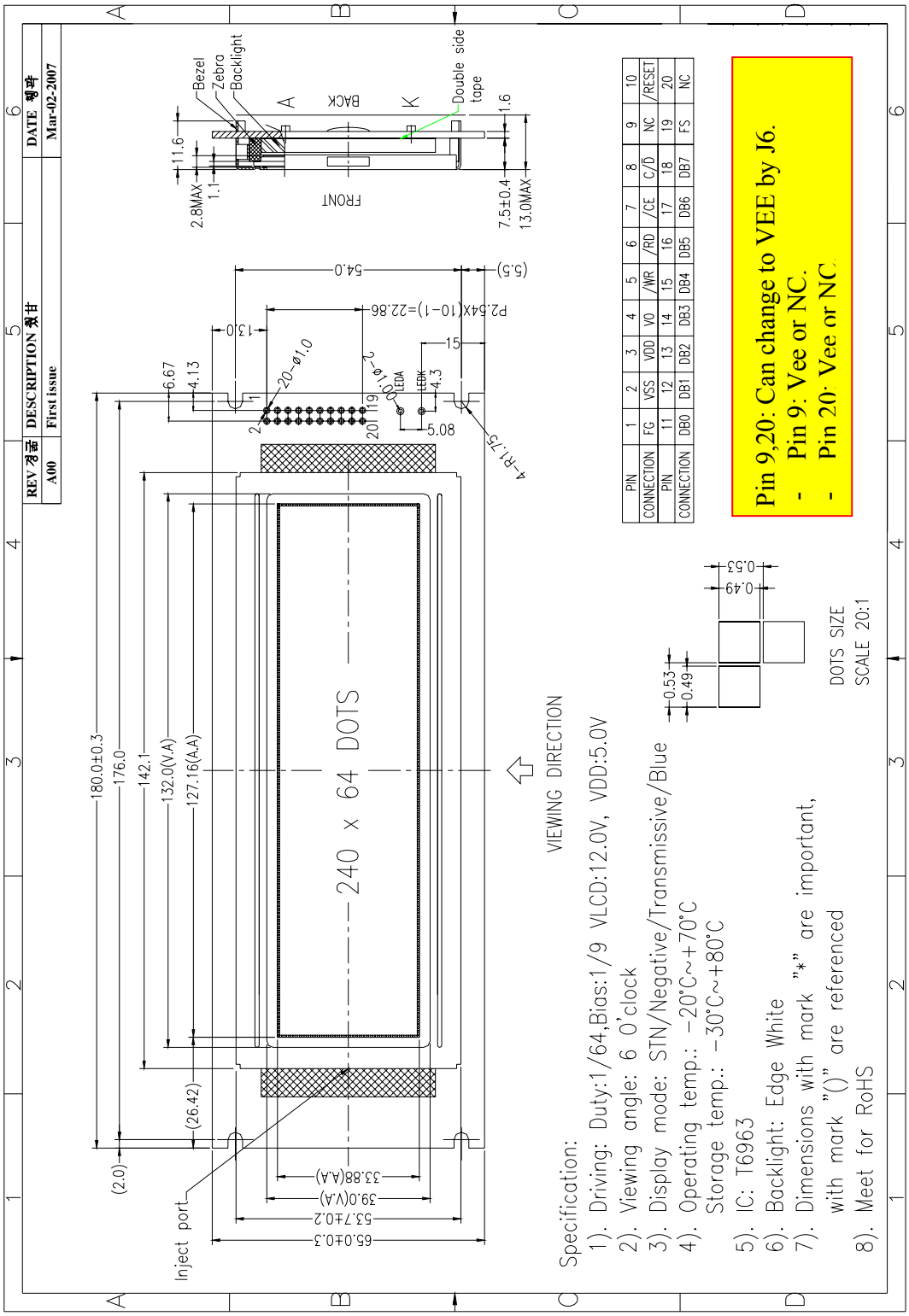

Figure 2. Dimensional outline

CBG24064A14 VEE supply

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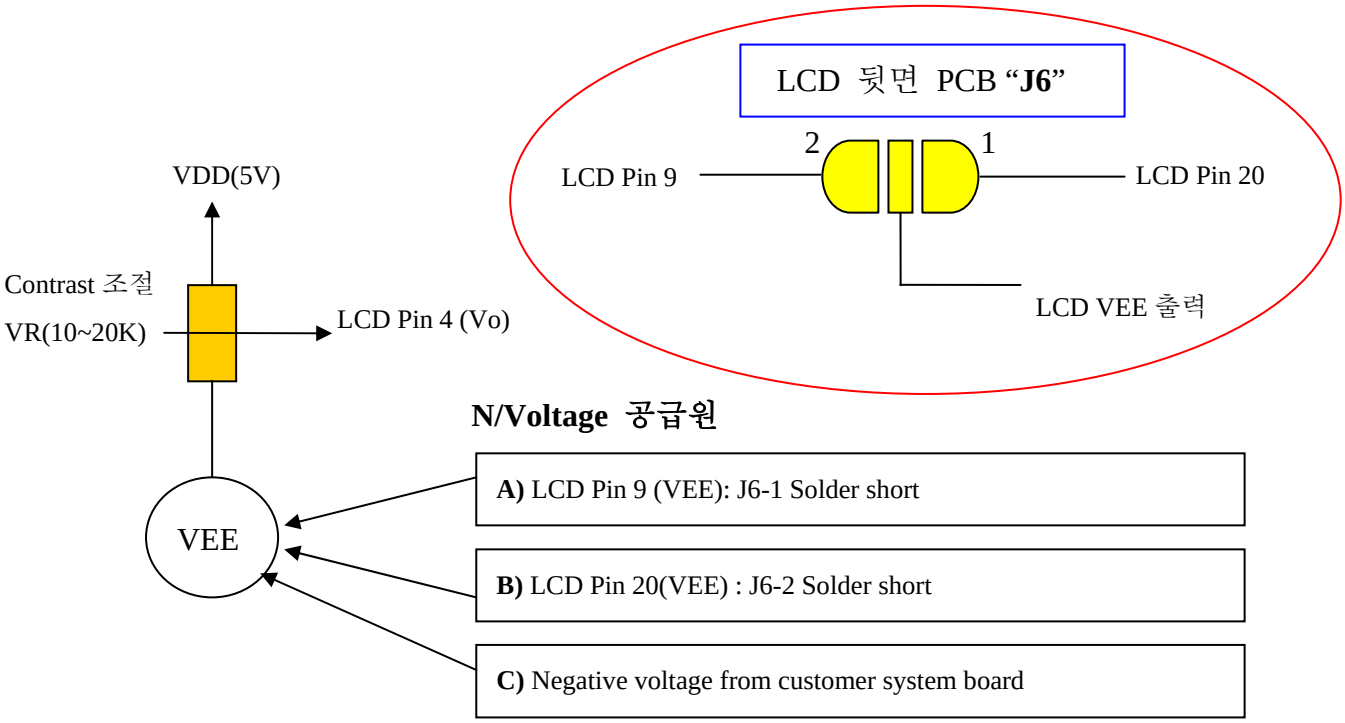
Pin No.	Symbol	Function
1	FG	Frame GND
2	VSS	GND(0V)
3	VDD	Power supply for the logic (+5V)
4	V0	Power supply for the LCD drive
5	WR	Write signal
6	RD	Read signal
7	CE	Chip enable signal
8	C/D	Instruction(C/D=H) or Data(C/D=L) select signal
9	NC	N/C or VEE by solder short J6-2 on PCB.
10	RST	Reset signal
11-18	DB0~DB7	Data bus line
19	FS	Font selection terminal
20	NC	N/C or VEE by solder short J6-1 on PCB.
LEDA	LEDA	Power supply for Backlight(+) :3.0V~3.4V (Typ:3.2V), 120mA
LEDK	LEDK	Power supply for Backlight(-) (White color)

LCDvop spec:

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	Ta = -20C	12.2	12.5	12.8	V
		Ta = 25°C	11.7	**12.0**	12.3	
		Ta = 70C	11.2	11.5	11.8	



N/Voltage 공급원

A) LCD Pin 9 (VEE): J6-1 Solder short

B) LCD Pin 20(VEE) : J6-2 Solder short

C) Negative voltage from customer system board

LCDvop 는 상기의 A,C,B 중에 한 가지만 반드시 공급해야 하며 Contrast 조절 Volume 으로 조절하여 LCD 의 Vo pin(pin 4)에 12V 정도를 공급하면 적절한 밝기의 Contrast 가 될 것입니다.

LCD 내부 N/V 사용시 LCD Pin 9, 20 을 확인하시어 J6 Solder short 하여 사용하시기 바랍니다.

LCD 외부의 N/V 사용시 J6 을 모두 Open 하시기 바랍니다.

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5. PIN DESCRIPTION

No.	Symbol	Function
1	FG	Frame GND
2	VSS	GND(0V)
3	VDD	Power supply for the logic (+5V)
4	V0	Power supply for the LCD drive
5	WR	Write signal
6	RD	Read signal
7	CE	Chip enable signal
8	C/D	Instruction(C/D=H) or Data(C/D=L) select signal
9	NC	No Connection or VEE by J6 on PCB.
10	RST	Reset signal
11-18	DB0~DB7	Data bus line
19	FS	Font selection terminal
20	NC	No Connection or VEE by J6 on PCB.
LEDA	LEDA	Power supply for Backlight(+)
LEDK	LEDK	Power supply for Backlight(-)

6. MAXIMUM ABSOUTE LIMIT

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	V_{DD}	-0.3	7.0	V
Input Voltage	Vin	-0.3	V_{DD}+0.3	V
Supply Current for Backlight	V_F(Ta = 25°C)	---	140	mA
Reverse Voltage for Backlight	V_R(Ta = 25°C)	---	---	V(AC)
Operating Temperature	Top	-20	70	℃
Storage Temperature	Tst	-30	80	℃

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7. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V_{DD}-V_{SS}	Ta = 25°C	4.75	5.0	5.25	V
Input High Voltage	V_{IH}	Ta = 25°C	V_{DD}-2.2	---	V_{DD}	V
Input Low Voltage	V_{IL}	Ta = 25°C	0	---	0.8	V
Output High Voltage	V_{OH}	Ta = 25°C	V_{DD}-0.3	---	V_{DD}	V
Output Low Voltage	V_{OL}	Ta = 25°C	0	---	0.3	V
Supply Current	I_{DD}	Ta = 25°C	---	15	20	mA

8. ELECTRICAL CHARACTERISTICS

Ta = 25°C

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=120mA	3.0	3.2	3.4	V
Wave length	λρ	---	---	---	---	nm
Color	White					

9. ELECTRO-OPTICAL CHARACTERISTICS

(VDD=5.0V, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	Ta = -20C	12.2	12.5	12.8	V
		Ta = 25°C	11.7	12.0	12.3	
		Ta = 70C	11.2	11.5	11.8	
Response time	Tr	Ta = 25°C	---	185	---	ms
	Tf		---	200	---	ms
Contrast	Cr	Ta = 25°C	---	4	---	---
Viewing angle range	θ	Cr≥2	-40	---	+40	deg
	Φ		-40	---	+40	deg

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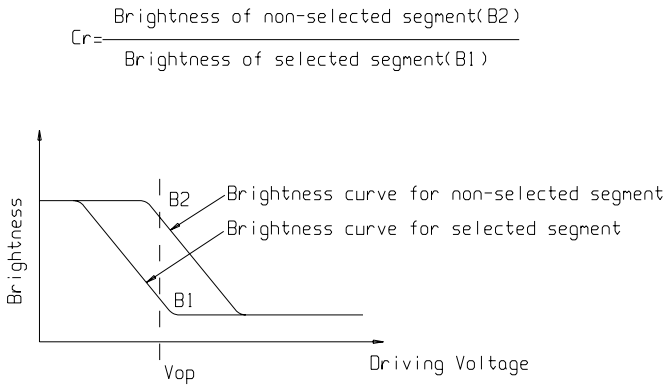
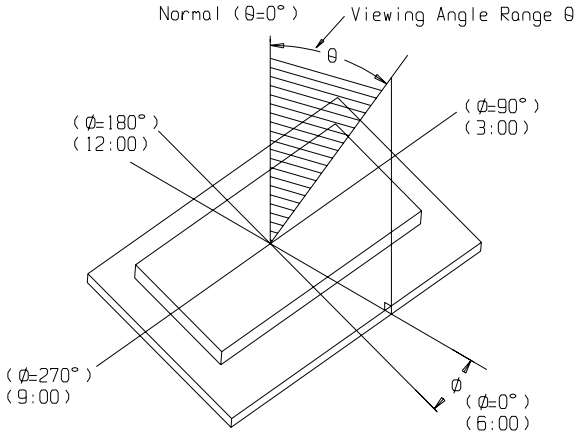
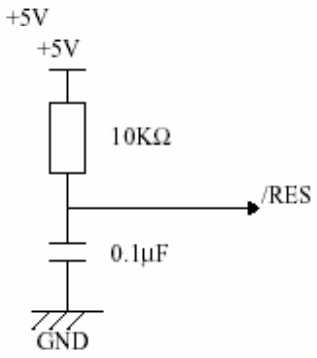




10. The /RES (RESET) Terminal

The T6963 may be reset by an external active low TTL signal from a MPU or other logic device or it may be reset using the following circuit.



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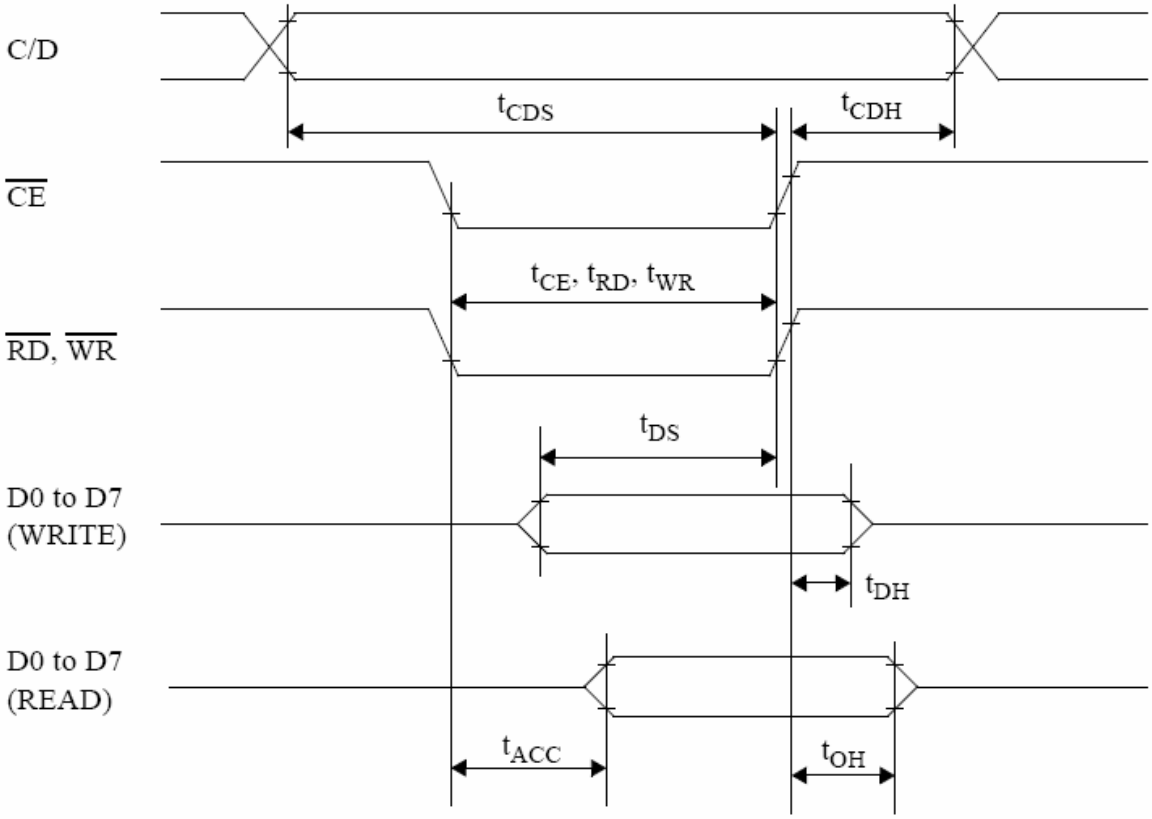
11. TIMING CHARACTERISTICS (Please refer AVANT T6963 DATASHEES)



Test Conditions(Unless Otherwise Noted, V_{DD}=5.0± 10%, V_{ss}=0V, Ta=-20 to 75℃)

Item	Symbol	Test Conditions	Min	Max	Unit
C/D Set-up Time	t_{CDS}	_	100	_	ns
C/DHold Time	t_{CDH}	_	10	_	ns
CE, RD, WR Pulse Width	t_{CE}, t_{RD}, t_{WR}	_	80	_	ns
Data Set-up Time	t_{DS}	_	80	_	ns
Data Hold Time	t_{DH}	_	40	_	ns
Access Time	t_{ACC}	_	_	150	ns
Output Hold Time	t_{OH}	_	10	50	ns

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12. CONTROL AND DISPLAY INSTRUCTION(Please refer AVANT T6963 DATASHEES)

COMMAND	CODE	D1	D2	FUNCTION
REGISTERS SETTING	00100001 00100010 00100100	X address Data Low address	Y address 00H High address	Set Cursor Pointer Set Offset Register Set Address Pointer
SET CONTROL WORD	01000000 01000001 01000010 01000011	Low address Columns Low address Columns	High address 00H High address 00H	Set Text Home Address Set Text Area Set Graphic Home Address Set Graphic Area
MODE SET	1000*000 1000*001 1000*011 1000*100 10000*** 10001***	- - - - - -	- - - - - -	OR mode EXOR mode AND mode Text Attribute mode Internal CG ROM mode External CG RAM mode
DISPLAY MODE	10010000 1001**10 1001**11 100101** 100110** 100111**	- - - - - -	- - - - - -	Display off Cusor on, blink off Cursor on, blink on Text on, graphic off Text off, graphic on Text on, graphic on
CURSOR PATTERN SELECT	10100000 10100001 10100010 10100011 10100100 10100101 10100110 10100111	- - - - - - - -	- - - - - - - -	1-line cursor 2-line cursor 3-line cursor 4-line cursor 5-line cursor 6-line cursor 7-line cursor 8-line cursor
DATA AUTO READ/ WRITE	10110000 10110001 10110010	- - -	- - -	Set Data Auto Write Set Data Auto Read Auto Reset
DATA READ/WRITE	11000000 11000001 11000010 11000011 11000100 11000101	Data - Data - Data -	- - - - - -	Data Write and Increment ADP Data Read and Increment ADP Data Write and Decrement ADP Data Read and Decrement ADP Data Write and Nonvariable ADP Data Read and Nonvariable ADP
SCREEN PEEK	11100000	-	-	Screen Peek
SCREEN COPY	11101000			Screen Copy
BIT SET/RESET	11110*** 11111*** 1111*000 1111*001 1111*010 1111*011 1111*100 1111*101 1111*110 1111*111	- - - - - - - - - -	- - - - - - - - - -	Bit Reset Bit Set Bit 0 (LSB) Bit 1 Bit 2 Bit 3 Bit 4 Bit 5 Bit 6 Bit 7 (MSB)

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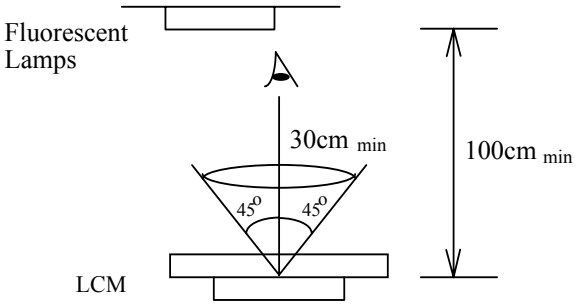
13.QUALITY SPECIFICATIONS

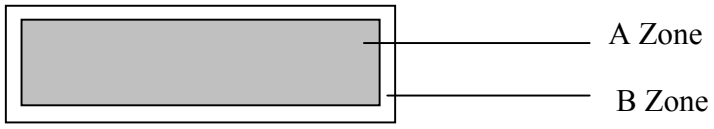
13.1 Standard of the product appearance test

Manner of appearance test: The inspection should be performed in using 20W x 2 fluorescent lamps. Distance between LCM and fluorescent lamps should be 100 cm or more. Distance between LCM and inspector eyes should be 30 cm or more.

Viewing direction for inspection is 45° from vertical against LCM.



Definition of zone:



A Zone: Active display area (minimum viewing area).
B Zone: Non-active display area (outside viewing area).

13.2 Specification of quality assurance

AQL inspection standard

Sampling method: MIL-STD-105E, Level II, single sampling

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Defect classification **(Note: * is not including)**

Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction		
		Contrast defect (dim, ghost)	2	
		Back-light	1,8	
	Non-display	Flat cable or pin reverse	10	
		Wrong or missing component	11	
Minor	Display state	Background color deviation	2	1.0
		Black spot and dust	3	
		Line defect, Scratch	4	
		Rainbow	5	
		Chip	6	
		Pin hole	7	
	Polarizer	Protruded	12	
		Bubble and foreign material	3	
	Soldering	Poor connection	9	
	Wire	Poor connection	10	
	TAB	Position, Bonding strength	13	

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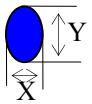
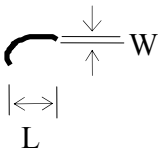
Note on defect classification

<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td rowspan="6">1</td><td>Short or open circuit</td><td rowspan="6">Not allow</td></tr>
<tr><td>LC leakage</td></tr>
<tr><td>Flickering</td></tr>
<tr><td>No display</td></tr>
<tr><td>Wrong viewing direction</td></tr>
<tr><td>Wrong Back-light</td></tr>
<tr><td rowspan="2">2</td><td>Contrast defect</td><td rowspan="2">Refer to approval sample</td></tr>
<tr><td>Background color deviation</td></tr>
<tr><td>3</td><td>Point defect,
Black spot, dust
(including Polarizer)

ϕ = (X+Y)/2</td><td> 

<table>
<tr><th>Point
Size</th><th>Acceptable Qty.</th></tr>
<tr><td>ϕ≤0.10</td><td>Disregard</td></tr>
<tr><td>0.10<ϕ≤0.20</td><td>3</td></tr>
<tr><td>0.20<ϕ≤0.25</td><td>2</td></tr>
<tr><td>0.25<ϕ≤0.30</td><td>1</td></tr>
<tr><td>ϕ>0.30</td><td>0</td></tr>
</table>
Unit： mm</td></tr>
<tr><td>4</td><td>Line defect,

Scratch</td><td> 

<table>
<tr><th colspan="2">Line</th><th>Acceptable Qty.</th></tr>
<tr><td>L</td><td>W</td><td></td></tr>
<tr><td>---</td><td>0.015≥W</td><td>Disregard</td></tr>
<tr><td>5.0≥L</td><td>0.03≥W</td><td rowspan="2">2</td></tr>
<tr><td>5.0≥L</td><td>0.05≥W</td></tr>
<tr><td>5.0≥L</td><td>0.1＞W</td><td>1</td></tr>
<tr><td>---</td><td>0.05<W</td><td>Applied as point defect</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>5</td><td>Rainbow</td><td>Not more than two color changes across the viewing area.</td></tr>
</table>

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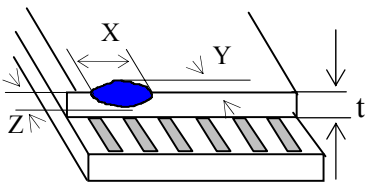
<table>
<tr><th>No</th><th>Item</th><th>Criterion</th></tr>
<tr><td>6</td><td>Chip

Remark:
X: Length direction
Y: Short direction
Z: Thickness direction
t: Glass thickness
W: Terminal Width</td><td>


Acceptable criterion
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤2</td><td>0.5mm</td><td>≤t/2</td></tr>
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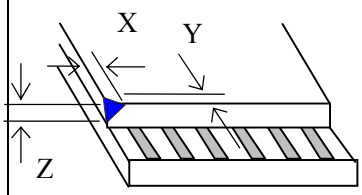
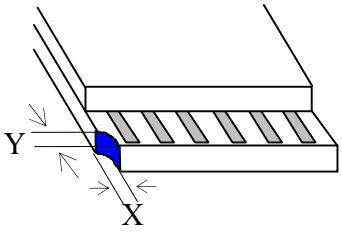
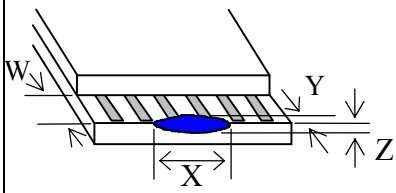
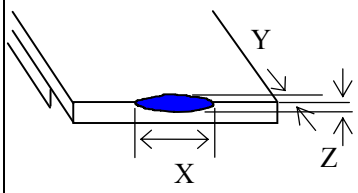


Acceptable criterion
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤3</td><td>0.5mm</td><td>≤t</td></tr>
</table>


Acceptable criterion
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤3</td><td>≤2</td><td rowspan="2">≤t</td></tr>
<tr><td colspan="2">shall not reach to ITO</td></tr>
</table>


Acceptable criterion
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>Disregard</td><td>≤0.2</td><td>≤t</td></tr>
</table>


Acceptable criterion
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤5</td><td>≤2</td><td>≤t/3</td></tr>
</table>
</td></tr>
</table>

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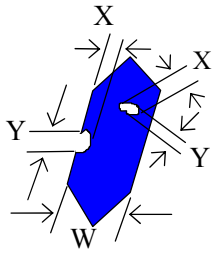
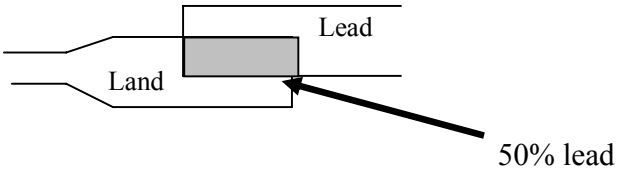
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>7</td><td>Segment
pattern
W = Segment width
ϕ = (X+Y)/2</td><td>(1) Pin hole
ϕ < 0.10mm is acceptable.
 

<table>
<tr><th>Point Size</th><th>Acceptable Qty</th></tr>
<tr><td>ϕ≤1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W< ϕ≤1/2W</td><td>1</td></tr>
<tr><td>ϕ>1/2W</td><td>0</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>8</td><td>Back-light</td><td>(1) The color of backlight should correspond its specification.
(2) Not allow flickering</td></tr>
<tr><td>9</td><td>Soldering</td><td>(1) Not allow heavy dirty and solder ball on PCB.
(The size of dirty refer to point and dust defect)
(2) Over 50% of lead should be soldered on Land.
 
</td></tr>
<tr><td>10</td><td>Wire</td><td>(1) Copper wire should not be rusted
(2) Not allow crack on copper wire connection.
(3) Not allow reversing the position of the flat cable.
(4) Not allow exposed copper wire inside the flat cable.</td></tr>
<tr><td>11*</td><td>PCB</td><td>(1) Not allow screw rust or damage.
(2) Not allow missing or wrong putting of component.</td></tr>
</table>

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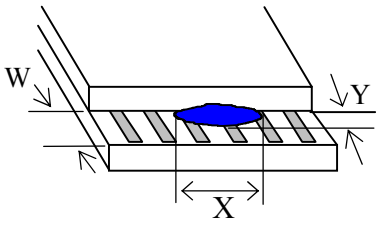
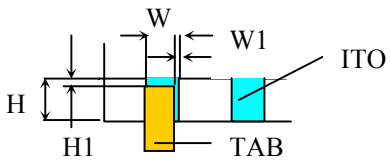
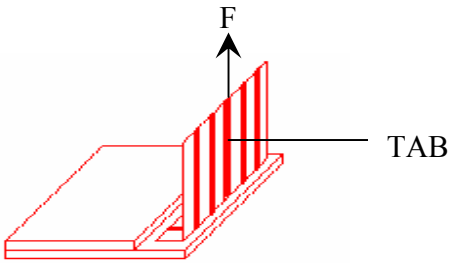
No	Item	Criterion
12	Protruded W: Terminal Width	 Acceptable criteria: Y ≤ 0.4
13	TAB	1. Position  W1≤1/3W H1≤1/3H 2 TAB bonding strength test  P (=F/TAB bonding width) ≥650gf/cm ,(speed rate: 1mm/min) 5pcs per SOA (shipment)
14	Total no. of acceptable Defect	A. Zone Maximum 2 minor non-conformities per one unit. Defect distance: each point to be separated over 10mm B. Zone It is acceptable when it is no trouble for quality and assembly in customer's end product.

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13.3 Reliability of LCM

Reliability test condition:

Item	Condition	Time (hrs)	Assessment
High temp. Storage	80°C	48	No abnormalities in functions and appearance
High temp. Operating	70°C	48	
Low temp. Storage	-30°C	48	
Low temp. Operating	-20°C	48	
Humidity	40°C/ 90%RH	48	
Temp. Cycle	0°C ← 25°C →50°C (30 min ← 5 min → 30min)	10cycles	

Recovery time should be 24 hours minimum. Moreover, functions, performance and appearance ,etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (20±8°C), normal humidity (below 45±20% RH), and in the area not exposed to direct sun light. The life time is not content the life time of the LED (for the life time of LED which decay only 50%,in the industry the experience value is 50000 hours, but there are not any experimentation data to support this)

13.4 Precaution for using LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting AV.
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

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6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: 280°C$\pm$10°C
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage Vo.
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40°C is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

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Limited Warranty

FINDLCDLCDs and modules are not consumer products, but may be incorporated by AV's customers into consumer products or components thereof, FINDLCDdoes not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of FINDLCDis limited to repair or replacement on the terms set forth below. FINDLCDwill not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between FINDLCDand the customer, FINDLCDwill only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with FINDLCDgeneral LCD inspection standard . (Copies available on request)
2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.