



**SPECIFICATIONS  
FOR LCD MODULE**

ACMMI PART NO.	MOP-GL12864F
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DOCUMENT REVISION HISTORY:

DATE	PAGE	DESCRIPTION
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# 1. Module Classification Information

**AMC 1602AR - B - B6WTDW - SP**  
 1 2 3 4 5 6 7 8 9 10 11 12 13

1	Internal Code	
2	Display Type□C→ Character Type, G→ Graphic Type, NONE→ Custom-made	
3	Display Font□Characters X Lines / Rows X Columns /Others	
4	Model serials no.	
5	RoHS compliant: R→YES NONE→ NO	
6	IC Package Type□	M→ SMT Type B→ COB Type T→ TAB Type G→ COG Type F→ COF Type S→ Special
7	LCD Mode□	P→TN Positive N→TN Negative Y→ STN Positive, Yellow Green B→ STN Negative, Blue G→ STN Positive, Gray W→ FSTN Positive T→ FSTN Negative F→ FFSTN Negative S→ Special
8	Viewing direction	6→ 6:00,12→12:00, S→Special
9	Temperature range	N → Normal Temperature W→ Wide Temperature S→ Special
10	LCD Polarizer Type	R→ Reflective T→ Transmissive F→ Transflective S→ Special
11	Backlight Type	N→ None D→ LED E→ EL F→ CCFL S→ Special

12	Backlight Color	Y→ Yellow-green B→ Blue A→ Amber W→ White G→ Green R→ Red S→ Special
13	Internal Code	

## **2. Precautions in use of LCD Modules**

- (1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.
- (2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
- (3) Don't disassemble the LCM.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't drop, bend or twist LCM.
- (6) Soldering: only to the I/O terminals.
- (7) Storage: please storage in anti-static electricity container and clean environment.

## **3. General Specification**

Item	Dimension	Unit
Number of Dots	128 x 64	□
Module dimension(No Backlight or EL )	75.0 x 52.7 x 8.0□MAX□	mm
Module dimension(With White Backlight )	75.0 x 52.7 x 9.0□MAX□	mm
View area	60.0 x 32.0	mm
Active area	55.0 x 27.5	mm
Dot size	0.39x 0.39	mm
Dot pitch	0.43 x 0.43	mm
LCD type	STN	
Duty	1/64	
View direction	6 o'clock or 12 o'clock	
Backlight Type	None, EL backlight, White Backlight	

## **4. Absolute Maximum Ratings**

Item		Symbol	Min	Max	Unit
Input Voltage		$V_I$	-0.3	VDD+0.3	V
Supply Voltage For Logic		VDD-V <sub>SS</sub>	-0.3	7.0	V
Supply Voltage For LCD		V <sub>DD</sub> -V <sub>0</sub>	Vdd-13.5	0	V
Standard Temperature LCM	Operating Temp.	Top	0	50	□
	Storage Temp.	Tstr	-10	60	□
Wide Temperature LCM	Operating Temp.	Top	-20	70	□
	Storage Temp.	Tstr	-30	80	□

## **5. Electrical Characteristics**

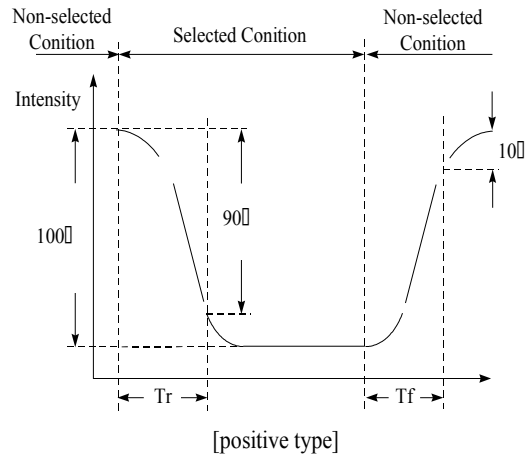
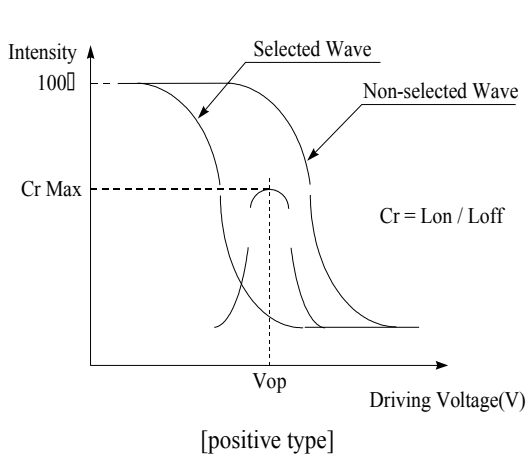
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V <sub>DD</sub> -V <sub>SS</sub>	□	4.5	5.0	5.5	V
Supply Voltage For LCD	V <sub>DD</sub> -V <sub>0</sub>	Ta=25□	8.2	8.4	8.7	V
Input High Volt.	V <sub>IH</sub>	□	0.7 V <sub>DD</sub>	□	V <sub>DD</sub>	V
Input Low Volt.	V <sub>IL</sub>	□	V <sub>SS</sub>	□	0.3 V <sub>DD</sub>	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =5V	4.0	□	4.5	mA
Lamp Frequency	F <sub>OSC</sub>	Vf=100V		400		Hz
Supply Voltage of White backlight	VLED	Forward current  =45 mA  Number of LED die 1x3= 3	2.8	3.0	3.2	V

# 6. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) $\theta$	CR $\geq$ 2	-20	$\square$	35	deg
	(H) $\phi$	CR $\geq$ 2	-30	$\square$	30	deg
Contrast Ratio	CR	$\square$	$\square$	3	$\square$	$\square$
Response Time	T rise	$\square$	$\square$	$\square$	250	ms
	T fall	$\square$	$\square$	$\square$	250	ms

## Definition of Operation Voltage (Vop)

## Definition of Response Time (Tr, Tf)



### Conditions :

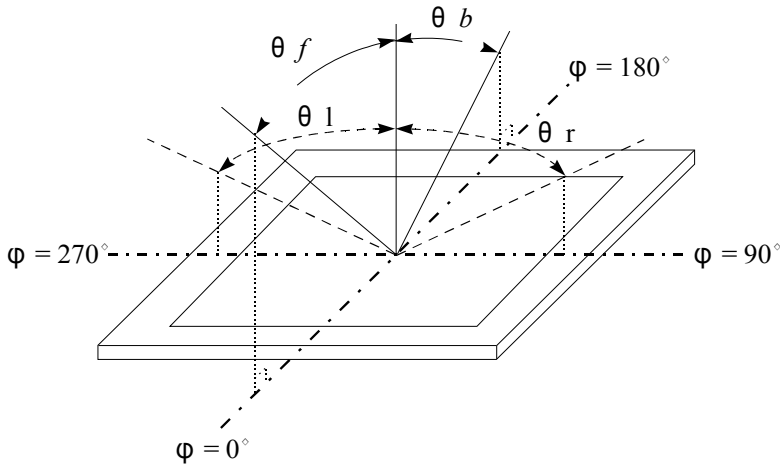
Operating Voltage : Vop

Viewing Angle( $\theta$ / $\phi$ ) : 0°  $\square$  0°

Frame Frequency : 64 HZ

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

### Definition of viewing angle(CR $\geq$ 2)

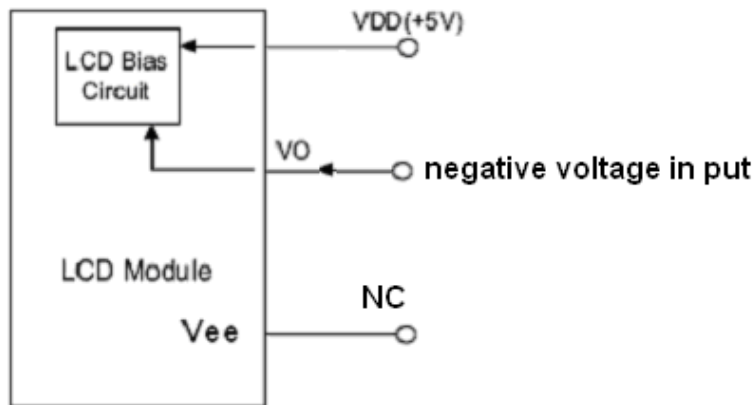


## **7. Interface Pin Function**

<b>Pin No.</b>	<b>Symbol</b>	<b>Level</b>	<b>Description</b>
1	V <sub>DD</sub>	5.0V	Supply Voltage for logic
2	V <sub>SS</sub>	0V	Ground
3	V <sub>0</sub>		Supply voltage for LCD
4	DB0	H/L	Data bit 0
5	DB1	H/L	Data bit 1
6	DB2	H/L	Data bit 2
7	DB3	H/L	Data bit 3
8	DB4	H/L	Data bit 4
9	DB5	H/L	Data bit 5
10	DB6	H/L	Data bit 6
11	DB7	H/L	Data bit 7
12	CS1	H/L	Chip1 select signal, Active High, Left Part
13	CS2	H/L	Chip2 select signal, Active High, Right Part
14	RST	H/L	Reset Signal
15	R/W	H/L	Read/Write
16	RS	H/L	Register Select
17	E	H/L	Enable
18	V <sub>out</sub>		Negative Voltage Output
19	EL1/LED(+)		EL1/Anode of LED Backlight
20	EL2/LED(-)		EL2/Cathode of LED Backlight

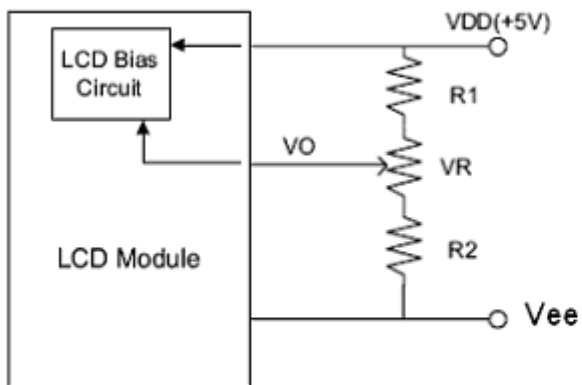
## **8. POWER SUPPLY**

### **Without Negative Power on PCB**



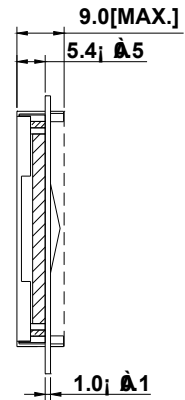
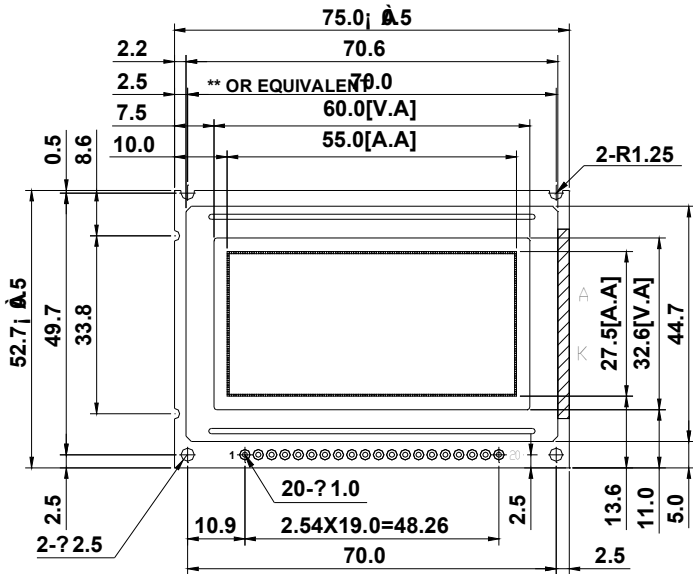
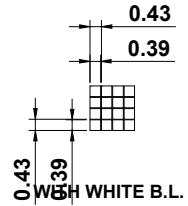
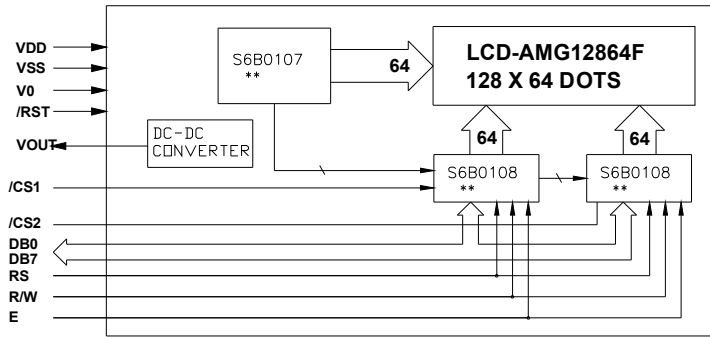
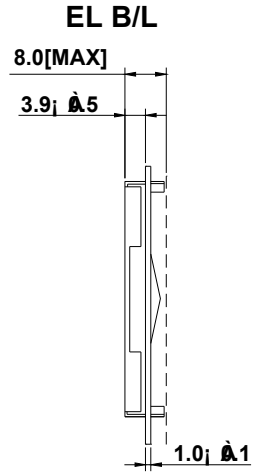
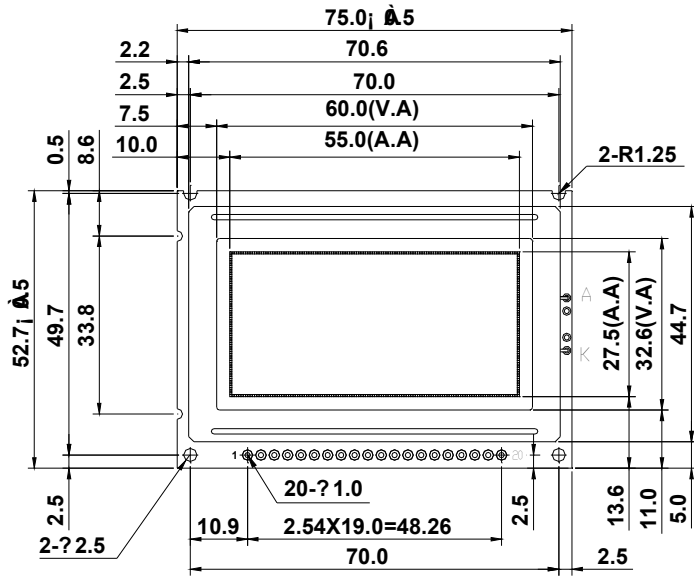
without DC-DC converter

### **With Negative Power on PCB**



with DC-DC converter  
VR:10K-20K

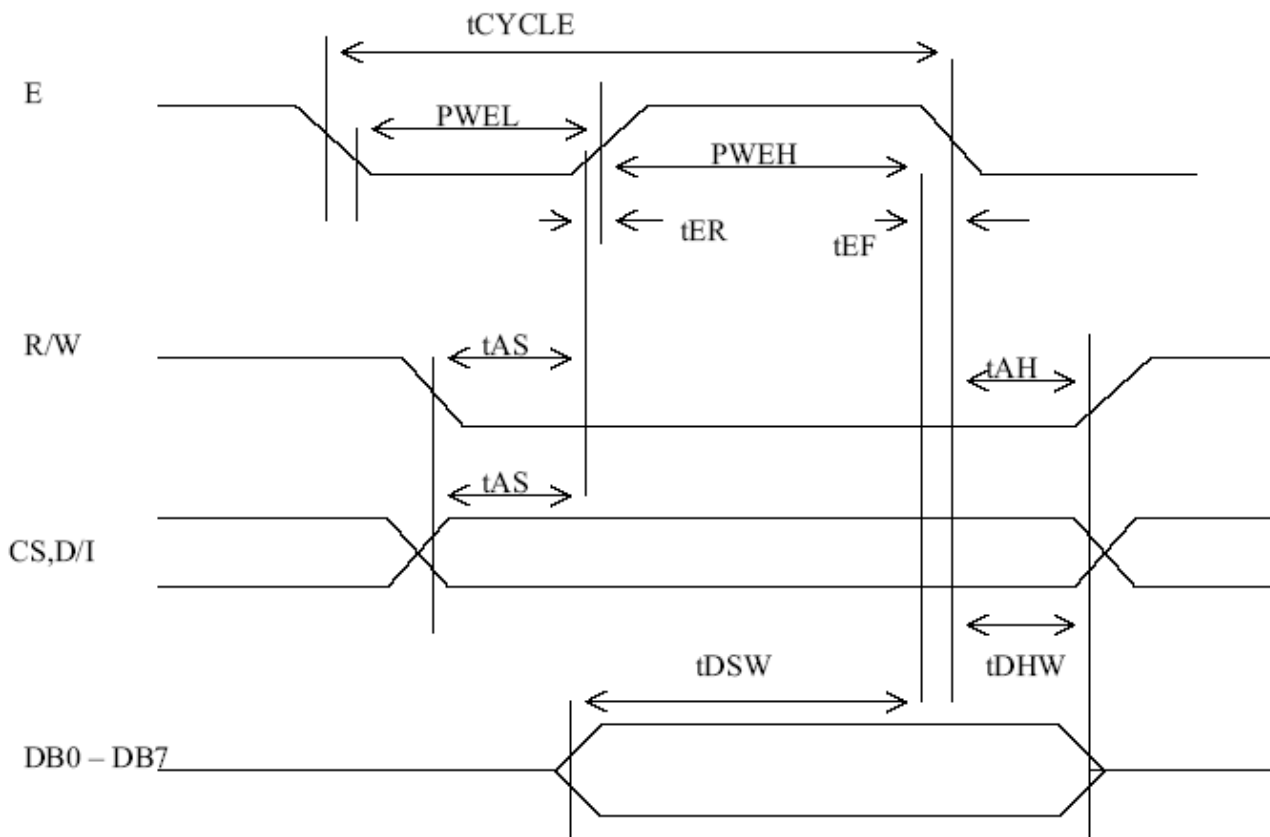
# 9. Contour Drawing & Block Diagram



# 10. Timing Characteristics

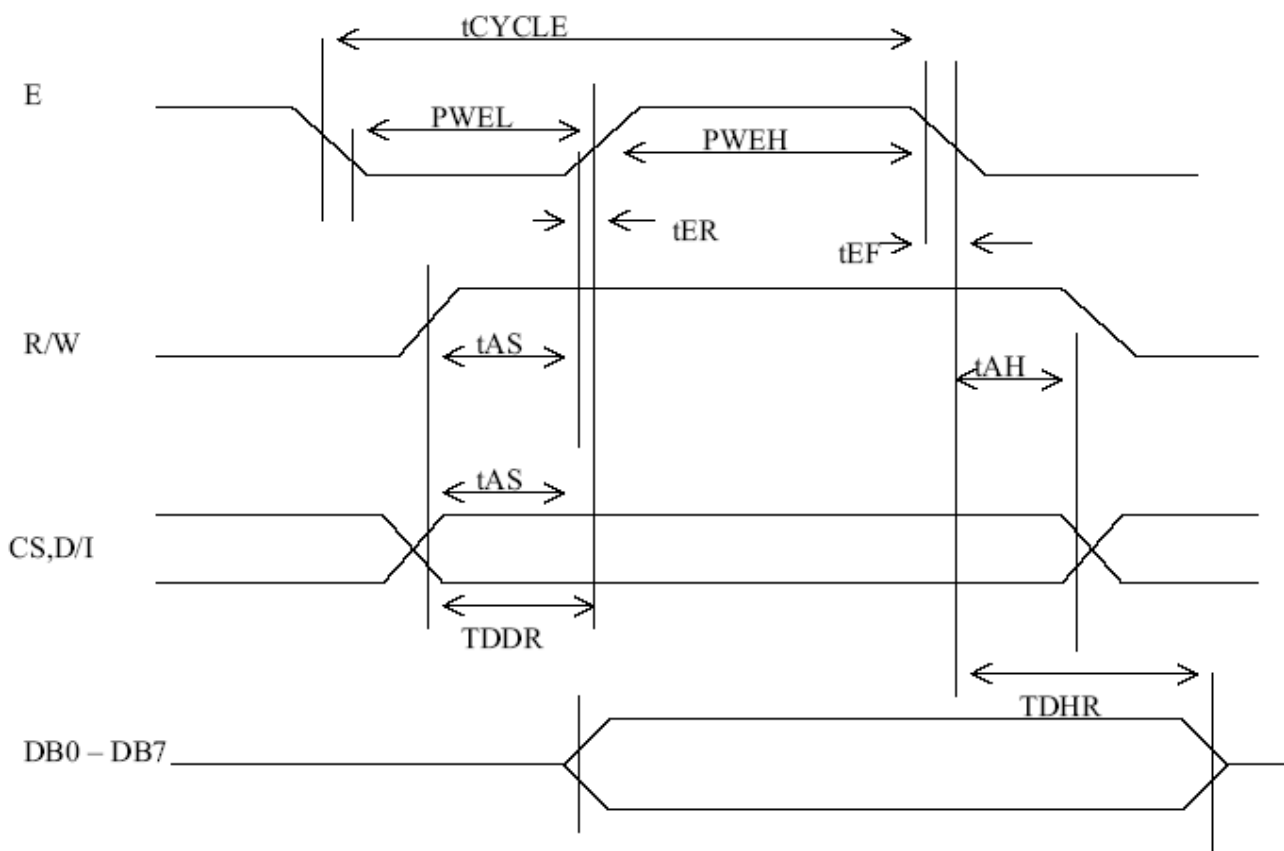
## 10.1 WRITING OPERATION

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
ENABLE CYCLE TIME	tCYCLE	1.0	-	-	us
ENABLE PULSE WIDTH	HIGH LEVEL	PWEH	450	-	ns
	LOW LEVEL	PWEL	450	-	ns
ENABLE RISE & FALL TIME	tER,tEF	-	-	25	ns
ADDRESS SET-UP TIME	tAs	140	-	-	ns
ADDRESS HOLD TIME	tAH	10	-	-	ns
DATA SET-UP TIME	tDSW	200	-	-	ns
DATA HOLD TIME	tDHW	10	-	-	ns



## 10.1 READ OPERATION

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
ENABLE CYCLE TIME	$t_{\text{CYCLE}}$	1.0	-	-	us
ENABLE PULSE WIDTH	HIGH LEVEL	PWEH	450	-	ns
	LOW LEVEL	PWEL	450	-	ns
ENABLE RISE & FALL TIME	$t_{\text{ER}}, t_{\text{EF}}$	-	-	25	ns
ADDRESS SET-UP TIME	$t_{\text{AS}}$	140	-	-	ns
ADDRESS HOLD TIME	$t_{\text{AH}}$	10	-	-	ns
DATA SET-UP TIME	$t_{\text{DDR}}$	-	-	320	ns
DATA HOLD TIME	$t_{\text{DHW}}$	20	-	-	ns



# 11. Instruction Table

The display control instructions control the internal state of the KS0108B. Instruction is received from MPU to KS0108B for the display control. The following table shows various instructions.

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display ON/OFF	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L:OFF, H:ON	
Set Address (Y address)	L	L	L	H	Y address (0~63)						Sets the Y address in the Y address counter.	
Set Page (X address)	L	L	H	L	H	H	H	Page (0~7)			Sets the X address at the X address register.	
Display Start Line (Z address)	L	L	H	H	Display start line (0~63)						Indicates the display data RAM displayed at the top of the screen.	
Status Read	L	H	B U S Y	L	O N / O F F	R E S E T	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset	
Write Display Data	H	L	Write Data									Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read Display Data	H	H	Read Data									Reads data (DB0:7) from display data RAM to the data bus.

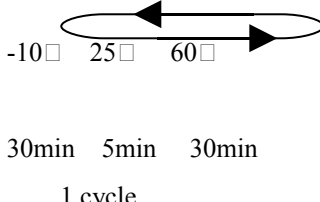
# 12.Quality Assurance

## Screen Cosmetic Criteria

Item	Defect	Judgment Criterion	Partition
1	Spots	<p>A)Clear</p> <p><u>Size: d mm</u> <u>Acceptable Qty in active area</u></p> <p>d <math>\leq</math> 0.1      Disregard</p> <p>0.1 &lt; d <math>\leq</math> 0.2      6</p> <p>0.2 &lt; d <math>\leq</math> 0.3      2</p> <p>0.3 &lt; d      0</p> <p>Note: Including pin holes and defective dots which must be within one pixel size.</p> <p>B)Unclear</p> <p><u>Size: d mm</u> <u>Acceptable Qty in active area</u></p> <p>d <math>\leq</math> 0.2      Disregard</p> <p>0.2 &lt; d <math>\leq</math> 0.5      6</p> <p>0.5 &lt; d <math>\leq</math> 0.7      2</p> <p>0.7 &lt; d      0</p>	Minor
2	Bubbles in Polarizer	<p><u>Size: d mm</u> <u>Acceptable Qty in active area</u></p> <p>d <math>\leq</math> 0.3      Disregard</p> <p>0.3 &lt; d <math>\leq</math> 1.0      3</p> <p>1.0 &lt; d <math>\leq</math> 1.5      1</p> <p>1.5 &lt; d      0</p>	Minor
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor
5	Coloration	<p>Not to be noticeable coloration in the viewing area of the LCD panels.</p> <p>Back-light type should be judged with back-light on state only.</p>	Minor

# 13. Reliability

## Content of Reliability Test

Environmental Test			
Test Item	Content of Test	Test Condition	Applicable Standard
High Temperature storage	Endurance test applying the high storage temperature for a long time.	60□ 96hrs	---
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-10□ 96hrs	---
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50□ 96hrs	---
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0□ 96hrs	---
High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60□, 90%RH 96hrs	---
High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	50□, 90%RH 96hrs	---
Temperature Cycle	Endurance test applying the low and high temperature cycle.    -10□ 25□ 60□  30min 5min 30min  1 cycle	-10□/60□  10 cycles	---
Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	---
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msdc 3 times of each direction	---

\*\*\*Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25□