Product Specification For

LCD Module

HW240160-G123B

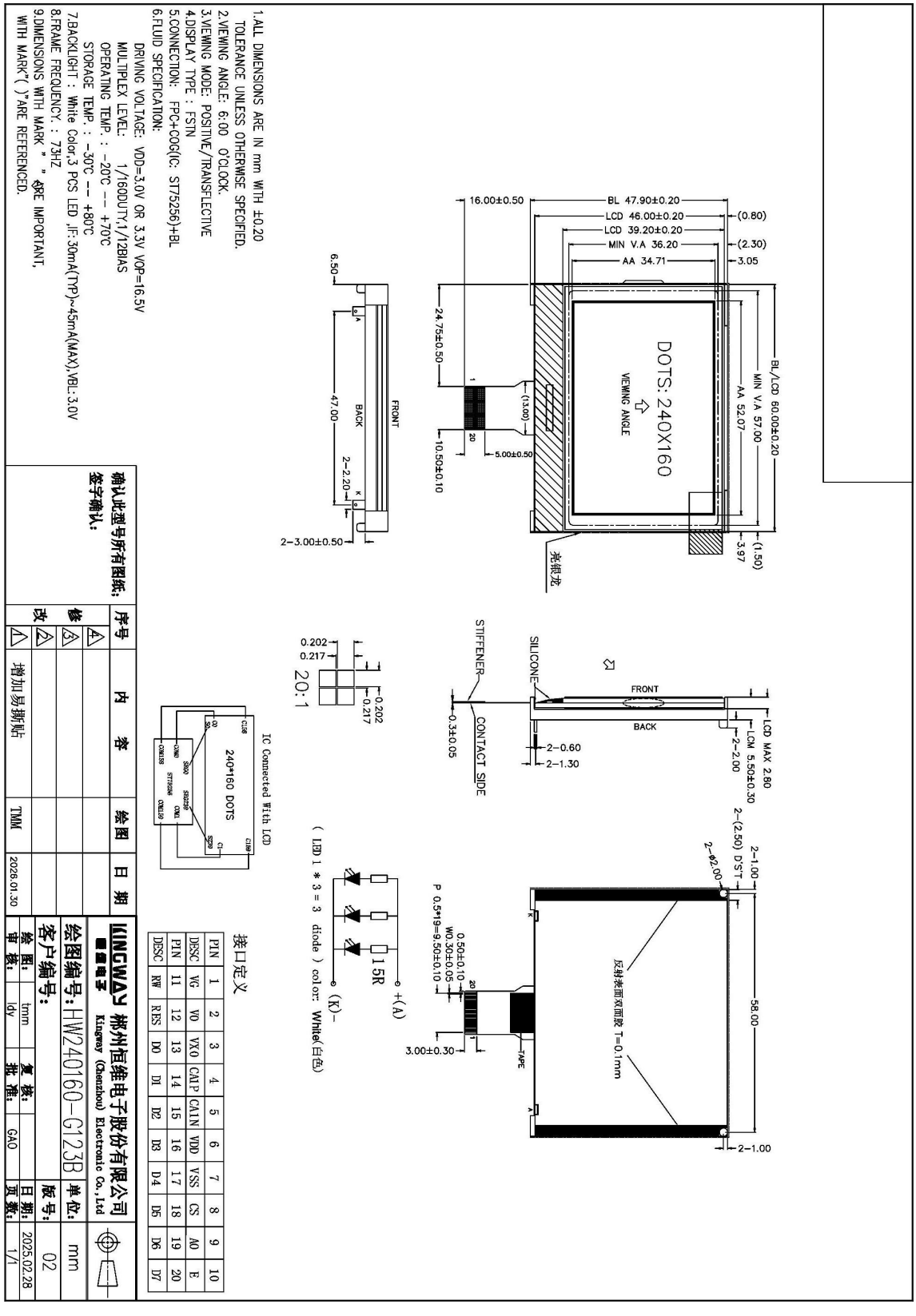
Website: https://docs.we-con.com.cn/bin/view/Home/
Email: support@we-con.com.cn

TABLE OF CONTENTS

GENERAL SPECIFICATION

ITEM	CONTENTS
Module Size	60.00(W) × 47.90(H) × 5.50(T) mm
Viewing Area	57.00 (W) × 36.20(H) mm
LCD Type	FSTN / POSITIVE/TRANSFLECTIVE
View Angle	6:00 O'clock
Driver Method	1/160DUTY，1/12BIAS， VOP=16.5V，VDD=3.3V
Controller IC	ST75256
Backlight	White Color,3 PCS LED ,IF:30mA~45mA,VBL:3.0V(TYP)
Weight	TBD

LCM DRAWING



接口定义

PIN	1	2	3	4	5	6	7	8	9	10
DESC	VG	VO	VX0	CA1P	CA1N	VDD	VSS	CS	A0	E
PIN	11	12	13	14	15	16	17	18	19	20
DESC	R/W	RES	D0	D1	D2	D3	D4	D5	D6	D7

确认此型号所有图纸:
签字确认:

修改	序号	内 容	绘图	日 期
	3			
	2			
	1	增加易撕贴	TNM	2026.01.30

KINGWAY 郴州恒维电子股份有限公司
Kingway (Chenzhou) Electronic Co.,Ltd

绘图编号:	HW240160-G123B	单位:	mm
客户编号:		版号:	02
绘 图:	tmm	复 核:	
审 核:	ldy	批 准:	GAO
		日 期:	2025.02.28
		页 数:	1/1

ABSOLUTE MAXIMUM RATING(Ta=25℃ VSS=0V)

Item	Symbol	Min.	Type	Max.	Unit	Humidity
Power supply for logic	VDD	3.1	3.3	3.5	V	
Power Supply for LCD	VLCD	16.3	16.5	16.7	V	
Input voltage	Vin	-	-	-	V	
Operating Temperature	Top	-20	-	+70	℃	Note1
Storage Temperature	Tst	-30	-	+80	℃	Note2

Note1: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

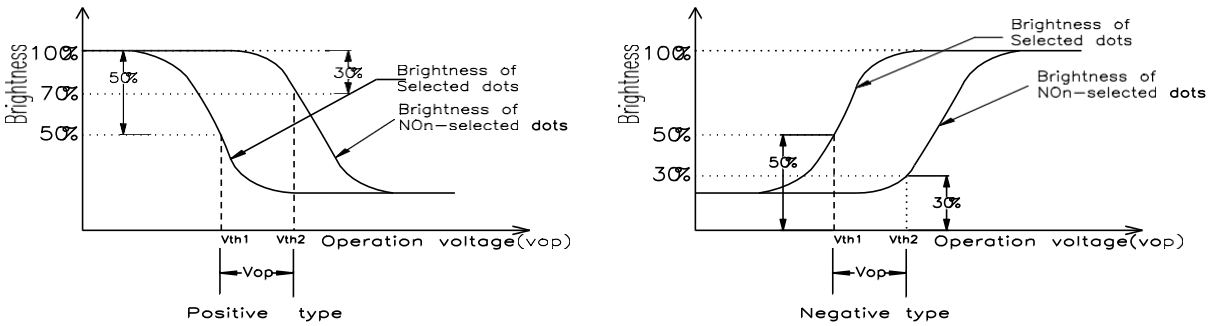
Note2: Ta at -20℃ will be <48hrs, at 80 ℃ will be <120hrs when humidity is higher than 75%RH.

ELECTRO-OPTICAL CHARACTERISTICS (Ta＝25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply for LCD	VLCD	Ta＝25℃	16.3	16.5	16.7	V
Backlight Driver Voltage	VF	Ta＝25℃	3.1	3.3	3.5	V
Power Supply Current for Backlight	IF	VF=3.0V	--	30	45	mA

OPTICAL CHARACTERISTICS

Item		Symbol	Min.	Typ.	Max.	Unit	Condition	Note
Viewing Angle Cr ≧2	ψ=0°	θ1	40	45	50	deg.	T=25° C	1.2
	ψ=180°	θ2	40	45	50			
	ψ=90°	θ3	15	20	25			
	ψ=270°	θ4	45	50	55			
Contrast Ratio		Cr	8	10	12	--	T=25° C	3
Operating Frequency		f	--	73	--	Hz	T=25° C	
Response Time (rise)		Tr	80	120	160	ms	T=25° C	4
Response Time (fall)		Tf	80	120	160	ms	T=25° C	4



Note1. Definition of operation voltage (Vop)

Conditions

Vth1: (1)Temperature: See Individual Specification

(2) Viewing Angle (θ): Minimum Value Individual Specification

(3) Driving Frequency: Maximum Value In Individual Specification

(4) Waveform: Selected Waveform

Vth2: (1)Temperature: See Individual Specification

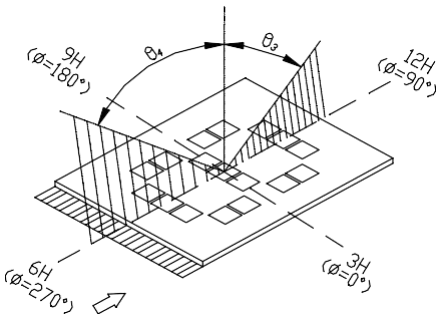
(2) Viewing Angle(θ): Maximum Value In Individual Specification

(3) Driving Frequency: Maximum Value In Individual Specification

(4) Waveform: Non-selected Waveform

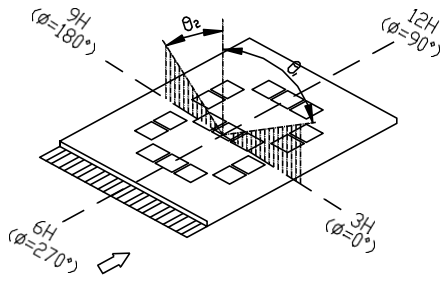
OPTICAL CHARACTERISTICS DEFINITION

Note 1. Definition of angle θ 3& θ 4



Viewing Direction

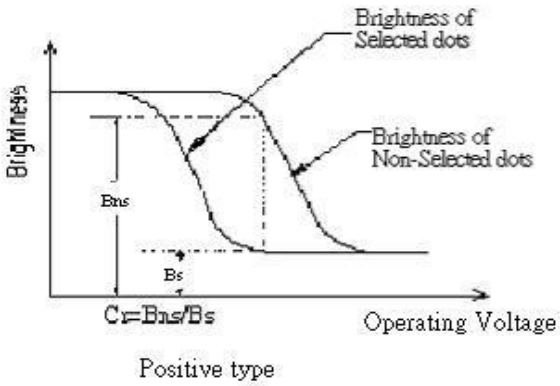
Note 2. Definition of angle θ 1& θ 2



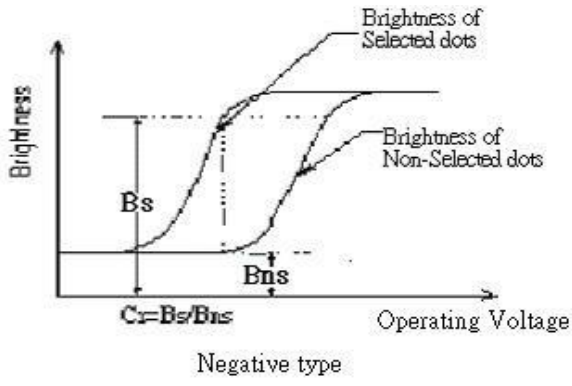
Viewing Direction

LCD Panel

Note 3. Definition of contrast ratio (Cr)

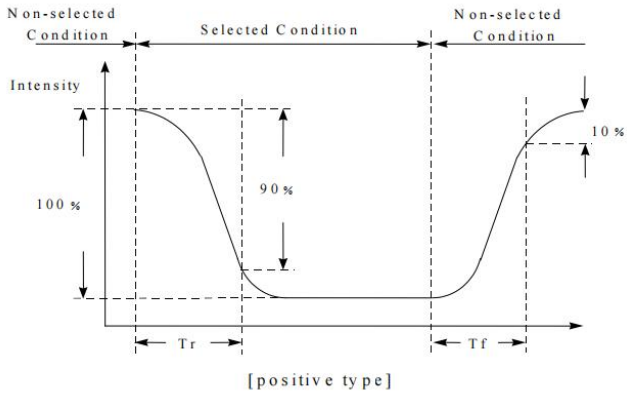


Positive type

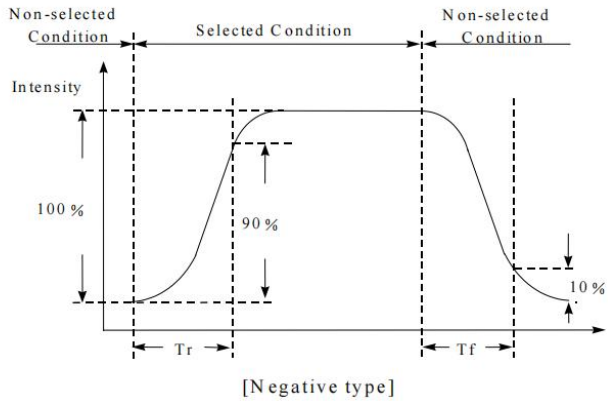


Negative type

Note 4. Definition of response time



[positive type]

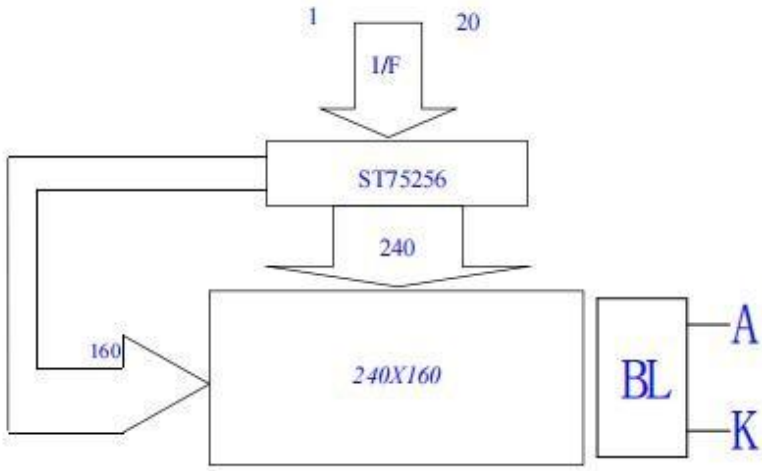


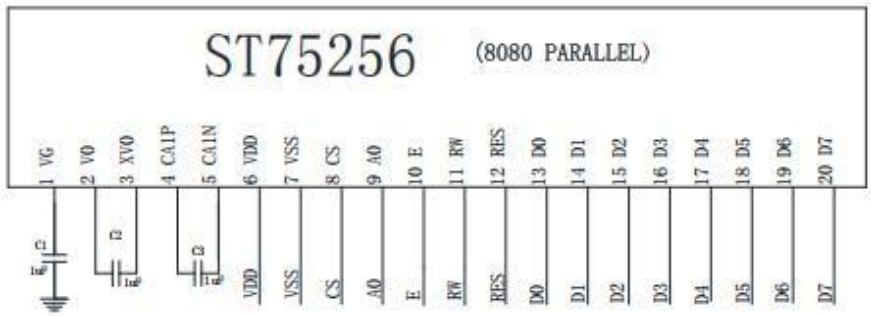
[Negative type]

INTERFACE PIN ASSIGNMENTMPU 8080

PIN	SYMBOL	FUNCTIONS
1	VG	VG is the power of SEG-drivers.
2	V0	Positive operating voltage of COM-drivers.
3	VX0	Negative operating voltage of COM-drivers.
4	CA1P	DC/DC voltage converter. Connect a capacitor between this terminal and the C1- terminal.
5	CA1N	DC/DC voltage converter. Connect a capacitor between this terminal and the C1+ terminal.
6	VDD	Logic power supply +3.3V
7	VSS	Logic Ground 0.0V
8	CS	Chip select signal, Low effective.
9	A0	A0 = “H”: Indicates that D0 to D7 are display data. A0 = “L”: Indicates that D0 to D7 are control data.
10	E_RD	Read select signal
11	RWR	Write select signal input
12	RES	When /RST is set to “L”, the register settings are initialized
13	D0	Date bus
14	D1	Date bus
15	D2	Date bus
16	D3	Date bus
17	D4	Date bus
18	D5	Date bus
19	D6	Date bus
20	D7	Date bus

BLOCK DIAGRAM





ABSOLUTE MAXIMUM RATINGS

VSS=0V

Parameter	Symbol	Conditions	Unit
Digital Power Supply Voltage	VDDI (VDD1)	–0.3 ~ 4.0	V
Analog Power supply voltage	VDDA (VDD2~VDD4)	–0.3 ~ 4.0	V
LCD Power supply voltage	VLCDIN	–0.3 ~ 20	V
LCD Power supply voltage	V0-XV0	–0.3 ~ 19	V
LCD Power supply voltage	VG	–0.3 ~ VDDA+0.3	V
LCD Power supply voltage	VM	–0.3 ~ VDDA+0.3	V
MPU Interface Input Voltage	Vin	–0.3 ~ VDDI+0.3	V
Operating temperature	TOPR	–40 to +85	°C
Storage temperature	TSTR	–55 to +125	°C

Note:

1. All voltages are respect to VSS unless otherwise noted (VSS1=VSS2=VSS3=VSS4=VSS5).
2. Insure the voltage levels of VLCDIN, V0, VG, VM, VSS and XV0 always match the correct relation while operating: VLCDIN > V0 ≥ VG > VM > VSS ≥ XV0
3. Stresses exceed the ranges listed above may cause permanent damage to IC. These values are stresses only. IC should be operated under DC/AC Characteristics condition for normal operation. If this condition is not met, IC operation may be error and the reliability may be deteriorated.
4. Parameters are valid in operating temperature range unless otherwise specified.
5. Interface input voltage range cannot exceed the maximum limitation of digital power supply voltage. Vin≦ 3.6V.

ELECTRICAL CHARACTERISTICS

VSS1=VSS2=VSS3=VSS4=VSS5=0V and Ta = –40 ~ 85 °C, unless otherwise specified.

Item	Symbol	Condition		Related Pin	Rating			Unit
					Min.	Typ.	Max.	
Digital Operating Voltage	VDDI			VDD1	1.7	–	3.6	V
Analog Operating Voltage	VDDA			VDD2~5	2.6	–	3.6	V
Input High-level Voltage	V_{IH}			MPU Interface	0.7*VDD1	–	VDD1	V
Input Low-level Voltage	V_{IL}			MPU Interface	VSS1	–	0.3*VDD1	V
Output High-level Voltage	V_{OH}			D[7:0]	0.8*VDD1	–	VDD1	V
Output Low-level Voltage	V_{OL}			D[7:0]	VSS1	–	0.2*VDD1	V
Input Leakage Current	I_{IL}	Vin = VDD1 or VSS1		MPU Interface	–1.0	–	1.0	μA
ON Resistance of LCD Drivers	R_{ON}	Ta=25°C Bias=1/14	Vop=16V ΔV=10%	COM Drivers	–	1	–	KΩ
			VG=3V, ΔV=10%	SEG Drivers	–	1	–	KΩ
Frame Frequency	f_{FR}	VDDI=VDDA=3.3V, N-Line OFF, FR= 0x0D Duty=1/162, Ta = 25°C		–	66	73	80	Hz
VLCDIN Voltage Input	VLCDIN			VLCDIN	7	–	19	V
Vop Voltage Output	Vop			V0-XV0[*1,2]	7	–	18	V
VG Voltage Output	VG			VG[*1,2]	1.8	–	VDD2	V
VM Voltage Output	VM			VM[*2]	0.9	VG/2	VDD2	V

Note:

1. V0, XV0 and VG include: V0I, V0O, V0S, XV0I, XV0O, XV0S, VGI, VGO & VGS.
2. V0, XV0, VG and VM do NOT support external power supply.

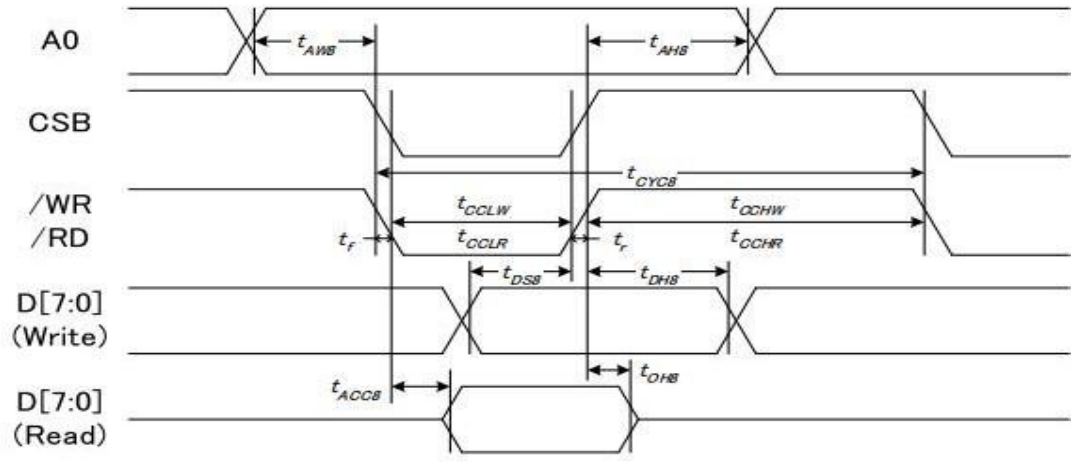
The current consumed by whole IC (bare die) with internal power system:

Item	Symbol	Condition	Rating			Unit
			Min.	Typ.	Max.	
Display ON Pattern: SNOW (Static)	ISS	VDDI=VDDA=3.3V, Vop = 14.0V, Bias=1/14 N-Line OFF, f_{FR}=73Hz, Ta=25°C	–	800	1000	μA
Sleep In	ISS	VDDI=VDDA=3.3V, Ta=25°C	–	10	20	μA

Note: The current is DC characteristic of a "Bare Chip"

ELECTRO-OPTICAL CHARACTERISTICS

14.1 System Bus Timing for 8080 MCU Interface

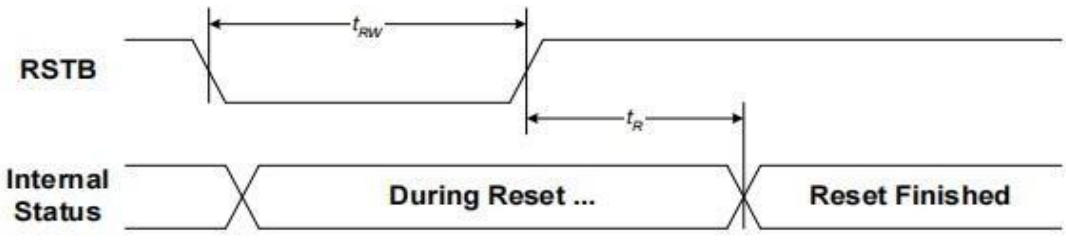


VDD1 = 1.8~3.3V, Ta = –40~85°C

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		20	—	ns
Address hold time		tAH8		0	—	
System cycle time (WRITE)	/WR	tCYC8		160	—	
/WR L pulse width (WRITE)		tCCLW		70	—	
/WR H pulse width (WRITE)		tCCHW		70	—	
System cycle time (READ)	RD	tCYC8		400	—	
/RD L pulse width (READ)		tCCLR		180	—	
/RD H pulse width (READ)		tCCHR		180	—	
WRITE Data setup time	D[7:0]	tDS8		15	—	
WRITE Data hold time		tDH8		15	—	
READ access time		tACC8	CL = 30 pF	—	100	
READ Output disable time		tOH8	CL = 30 pF	10	110	

Note:

1. The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast, (tr + tf) ≦ (tCYC8 – tCCLW – tCCHW) for (tr + tf) ≦ (tCYC8 – tCCLR – tCCHR) are specified.
2. All timing is specified using 20% and 80% of VDD1 as the reference.



VDD1 = 1.8~3.3V, Ta = –40~85°C

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1	ms
Reset "L" pulse width	tRW		1	—	ms

RELIABILITY

	No	Test Item	Content of Test	Test Condition
Environment Test	1	High Temperature Storage	Endurance test of high temperature for a long time.	80±2℃ 120H
	2	Low Temperature Storage	Endurance test of low temperature for a long time.	-30±2℃ 120H
	3	High Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the element.	70±2℃ 120H
	4	High Temperature /Humidity Storage	Endurance Test of high temperature and high humidity for a long time.	40±2℃ 60±2%RH 120H
	5	Thermal shock	Endurance test of low and high temperature cycles.(air to air) -30±2℃ ⟷ 80±2℃ (60min) ⟷ (60min) 1 cycle	-30±2℃/80±2℃ 10 cycle

Note:

1) When making the low temperature test, not to dewy.

2) Driving condition for operation test.

Failure Judgment Criterion

After the above mentioned test.(For Environmental Test, after 2 hours in room temperature.)

There should not be conspicuous failure of display quality and appearance.Contrast ratio should be 50% of the initial contrast ratio.

There should not have any abnormality of functions.

LIFE TIME

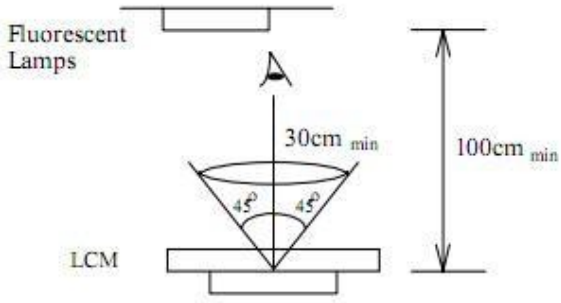
Item	Description
1.	Functions, Performance, appearance, etc. shall be free from remarkable deterioration within 30,000 hours under ordinary operating and storage conditions room temperature (25±10ºC) , normal humidity(40±20%RH),and in area not exposed to direct sun light.

INSPECTION CRITERIA

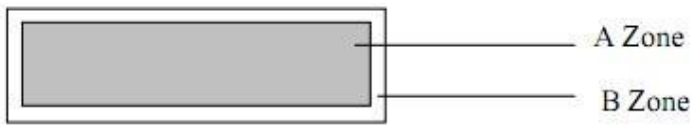
Condition for product appearance inspection

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).

Inspection Standard

AQL inspection standard
Sampling method: MIL-STD-105E, Level II, single sampling
Defect classification :

Classify	Item	Note	AQL
Major	Short or open circuit	1	0.65
	LC leakage		
	Flickering		
	No display		
	Wrong viewing direction		
	Contrast defect (dim, ghost)	2	
	Wrong or missing component	11	
Minor	Background color deviation	2	1.0
	Black spot and dust	3	
	Line defect, Scratch	4	
	Rainbow	5	
	Chip	6	
	Pin hole	7	
	Back- light	8	
	Protruded glass	9	
	FPC Position	10	
	Polarizer bubble and foreign material	3	
	Cross talk	Refer to limited sample	

AQL inspection standard
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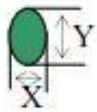
	Cross talk	Refer to limited sample	

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

$\phi = (X+Y)/2$</td><td> 

<table>
<tr><th>Point Size</th><th>Acceptable Qty.</th></tr>
<tr><td>$\phi \leq 0.10$</td><td>Disregard</td></tr>
<tr><td>$0.10 < \phi \leq 0.20$</td><td>2</td></tr>
<tr><td>$0.20 < \phi \leq 0.25$</td><td>1</td></tr>
<tr><td>$\phi > 0.25$</td><td>0</td></tr>
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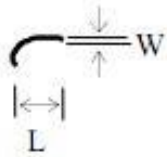
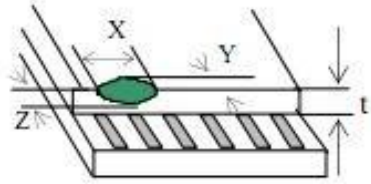
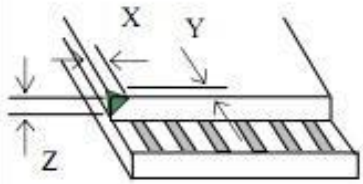
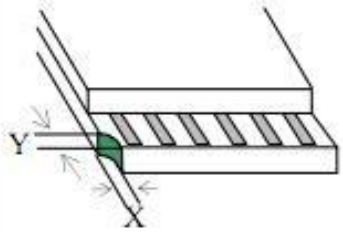
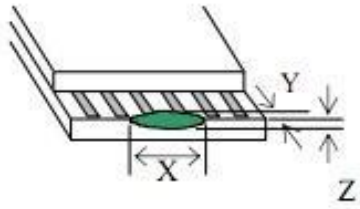
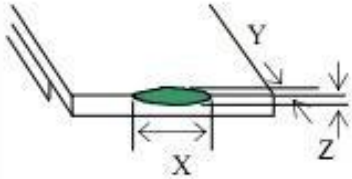
Unit: mm</td></tr>
<tr><td>4</td><td>Line defect,

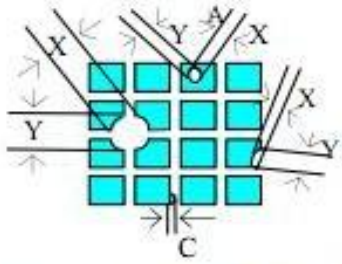
Scratch</td><td> 

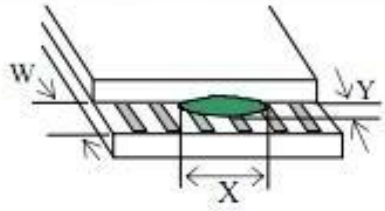
<table>
<tr><th colspan="2">Line</th><th>Acceptable Qty.</th></tr>
<tr><td>L</td><td>W</td><td></td></tr>
<tr><td>---</td><td>0.015≥W</td><td>Disregard</td></tr>
<tr><td>3.0≥L</td><td>0.03≥W</td><td rowspan="2">2</td></tr>
<tr><td>2.0≥L</td><td>0.05≥W</td></tr>
<tr><td>1.0≥L</td><td>0.1>W</td><td>1</td></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 colors change across the viewing area.</td></tr>
</table>

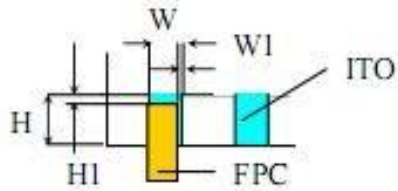
(Continued)

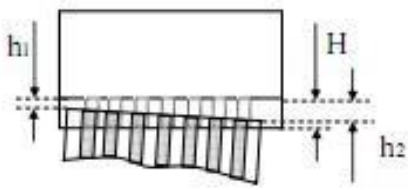
No	Item	Criterion
6	Chip Remark: X: Notch in X direction Y: Notch in Y direction Z: Notch in Z direction t: Glass thickness a: LCD length W: Terminal Width F: Seal width	 Acceptable criterion X: ⩽5mm; Y: Not reach to F/3; Z: ⩽t/2  Acceptable criterion X: ⩽3mm; Y: Not reach to F/3; Z: ⩽t  Acceptable criterion X: ⩽3mm; Y: ⩽2mm; Z: ⩽t shall not reach to ITO  Acceptable criterion X: Disregard; Y: ⩽0.2mm; Z: ⩽t  Acceptable criterion X: ⩽a/10; Y: Not reach to F/3; Z: ⩽t/3

(Continued)

<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>7</td><td>Dot-matrix pattern
$\phi = (X+Y)/2$</td><td>Pin hole
 

<table><tr><th>Size</th><th>Acceptable Qty.</th></tr><tr><td>ϕ<0.1</td><td>Disregard</td></tr><tr><td>0.10≤ϕ≤0.20</td><td>1</td></tr><tr><td>ϕ>0.20</td><td>0</td></tr></table>C: Shall not touch other dot(s).</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>Protruded
W: Terminal width</td><td> 

Acceptable criteria:
Y≤0.4</td></tr>
<tr><td>10</td><td>FPC</td><td>Position
 

W1≤1/3W
H1≤1/3H
 

Acceptable:
| h2 — h1 |≤1/8H</td></tr>
<tr><td>11</td><td>Total no. of acceptable Defect</td><td>A. Zone
Maximum 2 minor non-conformities per one unit.
Defect distance: each point to be separated over 5mm
B. Zone
It is acceptable when it is no trouble for quality and assembly in customer's end product.</td></tr>
</table>

PRECAUTION FOR USE OF LCD MODULE

Handling Precautions

1)The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
2)If the display panel is damaged and the liquid crystal substance inside it leaks out ,be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
3)Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
4)The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
5)If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
--Isopropyl alcohol
--Ethyl alcohol
Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
--Water
--Ketone
--Aromatic solvents
6)Do not attempt to disassemble or process the LCD module.

Assembling Precautions

1)When mounting the LCD module make sure that it is free of twisting, warping, and distortion. Distortion has great influence upon display quality. Also keep the stiffness enough regarding the outer case.
2)Please handle the LCD module by its side.
3)NC terminal should be open. Do not connect anything.
4)If the logic circuit power is OFF, do not apply the input signals.
5)To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
·Be sure to ground the body when handling the LCD module.
·Tools required for assembly, such as soldering irons, must be properly grounded.
· To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
·The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
6)Be careful when treating the glass panel because it has very sharpened edge.

Storage Precautions

1)When storing the LCD module, avoid exposure to direct sunlight of to the light of fluorescent

lamps and high temperature/high humidity. Whenever possible, the LCD
module should be stored in the same conditions in which they were shipped from our company.
2)Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets or a current flow in a high-humidity environment.

Design Precautions

The absolute maximum ratings represent the rated value beyond which LCD module can not
1)exceed. When the LCD modules are used in excess of this rated value, their operation characteristics may be adversely affected.
2)To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy VIL, VIH specification values including taking the precaution of using signal cables that are short.
3)The LCD exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also keep in mind that the
LCD driving voltage levels necessary for clear displays will vary according to temperature.
4)We recommended that power supply lines (VDD) have over-current protection line. (Fuse etc. Recommend Value:0.5A)
5)Sufficiently notice the mutual noise interference occurred by peripheral devices.
6)To cope with EMI, take measures basically on outputting side.
7)When installing an LCD module, fasten it at the LCD panel.
8)The display panel is made of general float glass which is not guaranteed for strength. So please consider about following.
·Do not subject panel to a mechanical shock by dropping directly.
·Do not let case to touch to panel directly

Others

1)Liquid crystal solidifies under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the LCD module is subjected to a strong shock at a low temperature.
2)If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
3)To minimize the performance degradation of the LCD module's resulting from destruction caused by static electricity, etc., exercise care to avoid touching the following section when handling this module: LCD's Terminal electrode sections.
4)Optimum voltage to obtain best contrast value depending on products. Therefore voltage adjustment with electric volume is required in each display.
5)Precaution for disposal of LCD module. When disposal of LCD module, ask specialization company of industrial waste which is permitted by the government. When burn up LCD module, obey the law of environmental hygienics.