

Specification				
Part Number:		MCT035K6W320240LML		
Version:				
Date:				
Revision				
No.	Date	Description	Item	Page

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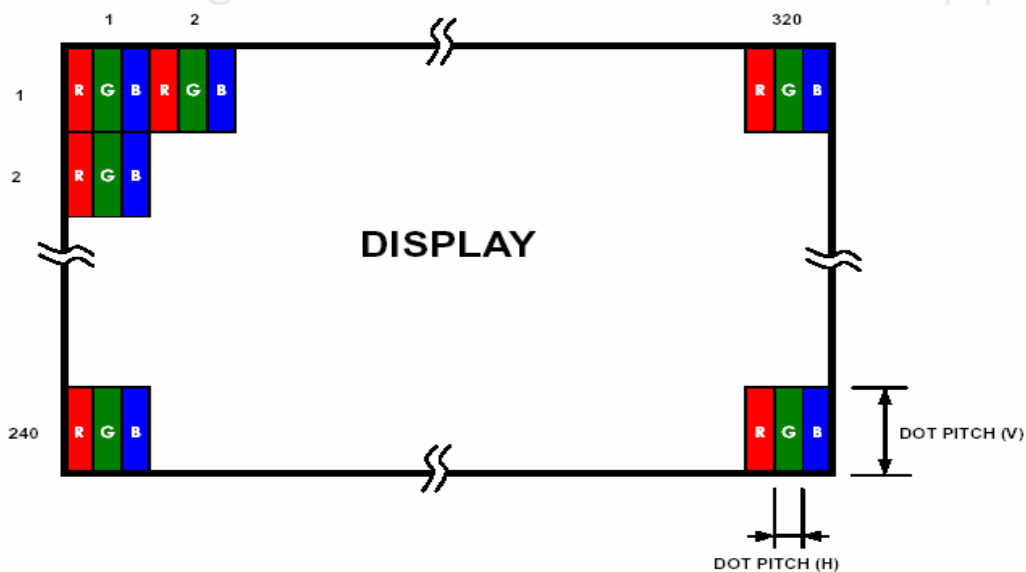
2. General Specification

This product is composed of a TFT LCD panel, driver ICs, FPC, Control Board and a backlight unit. The following table described the features of MCT035K6W320240LML.

- Dot Matrix: 320 x RGB x240
- Module dimension: 93.5 x 66.44 x 7.96 (max.) mm³
- View area: 73.1x55.6 mm²
- Active area: 70.08 x 52.56 mm²
- Dot size: 0.073 x 0.219 mm²
- LCD type: TFT, Negative, Transmissive
- View direction: 6 o'clock
- Backlight Type: LED, Normally White
- Controller IC: SSD1963
- Driving IC package: COG

*Expose the IC number blaze (Luminosity over than 1 cd) when using the LCM may cause IC operating failure.

*Color tone slight changed by temperature and driving voltage.



Midas Active Matrix Display Part Number System

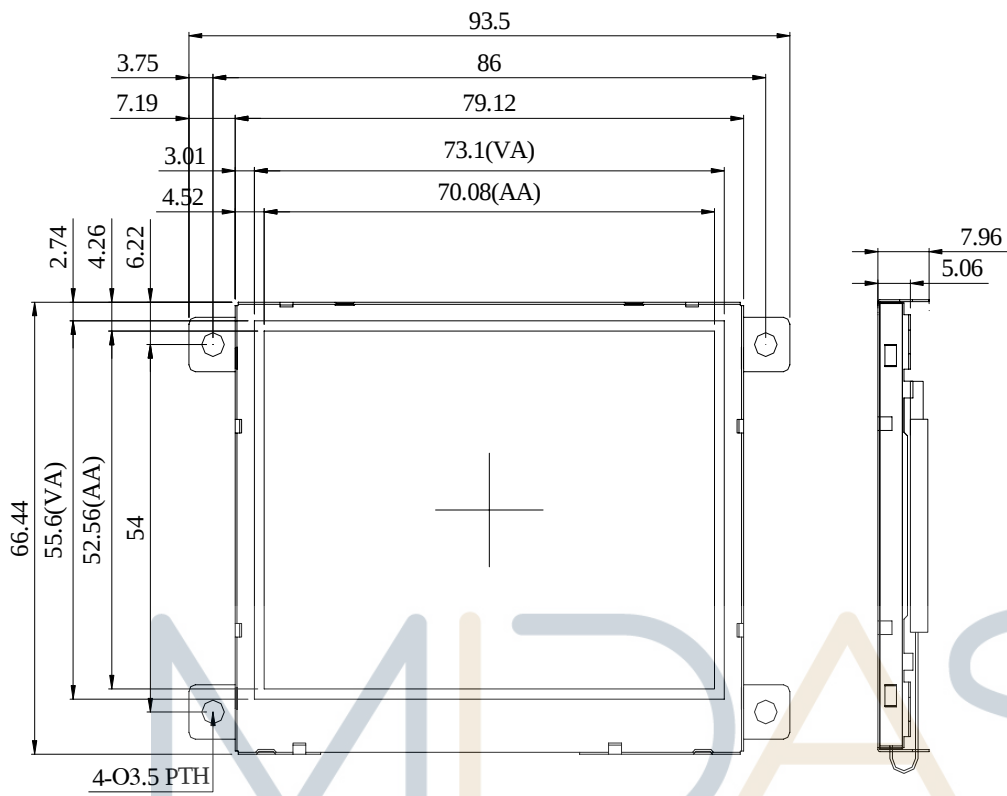
MC	T	057	A	6	*	W	320240	L	M	L	*	*	*	*	*
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

- | | | | |
|----|---|---|-----------------------------------|
| 1 | = | MC: Midas Components | |
| 2 | = | T: TFT | A: Active Matrix OLED |
| 3 | = | Size | |
| 4 | = | Series | |
| 5 | = | Viewing Angle: 6: 6 O'clock 12: 12 O'clock O: All round | |
| 6 | = | Blank: No Touch T: Resistive Touchscreen C: Capacitive Touchscreen | |
| 7 | = | Operating Temp Range: S: 0 to 50Deg C B: -20+60Deg C
W: -20+70Deg C E: -30+85Deg C | |
| 8 | = | No of Pixels | |
| 9 | = | Orientation: P: Portrait L: Landscape | |
| 10 | = | Mode: R: Reflective M: Transmissive T: Transflective
S: Sunlight Readable (transmissive)
W: White on Black (Monochrome) | |
| 11 | = | Backlight: Blank: None | L: LED C: CCFL |
| 12 | = | Blank: No Module/board | C: Controller board module |
| 13 | = | Blank: None | V: Video |
| 14 | = | Blank: None | B: Bracket |
| 15 | = | Blank: None | H: Host Cable |
| 16 | = | Blank: None | K: Keyboard |

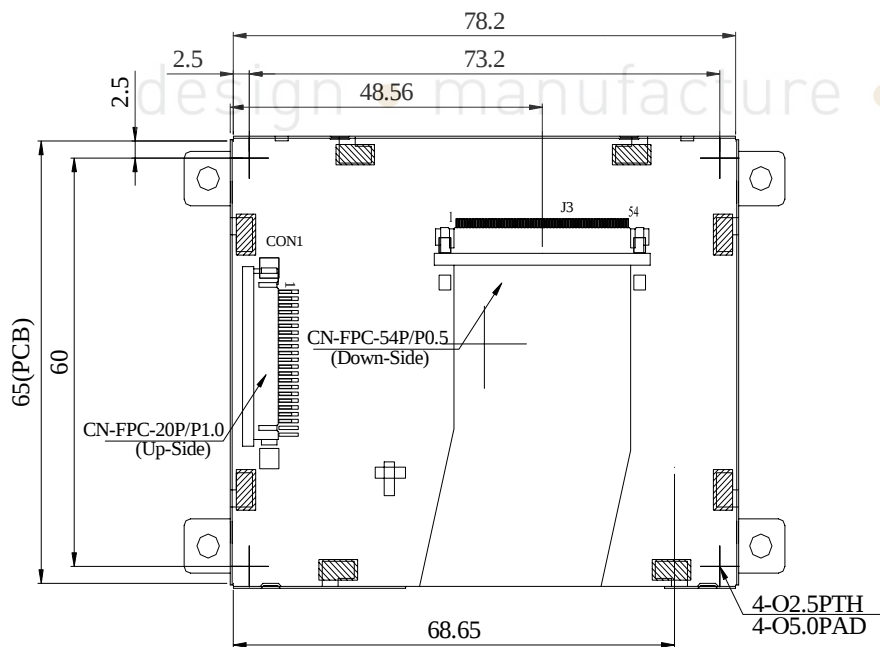
Pins Connection to Control Board

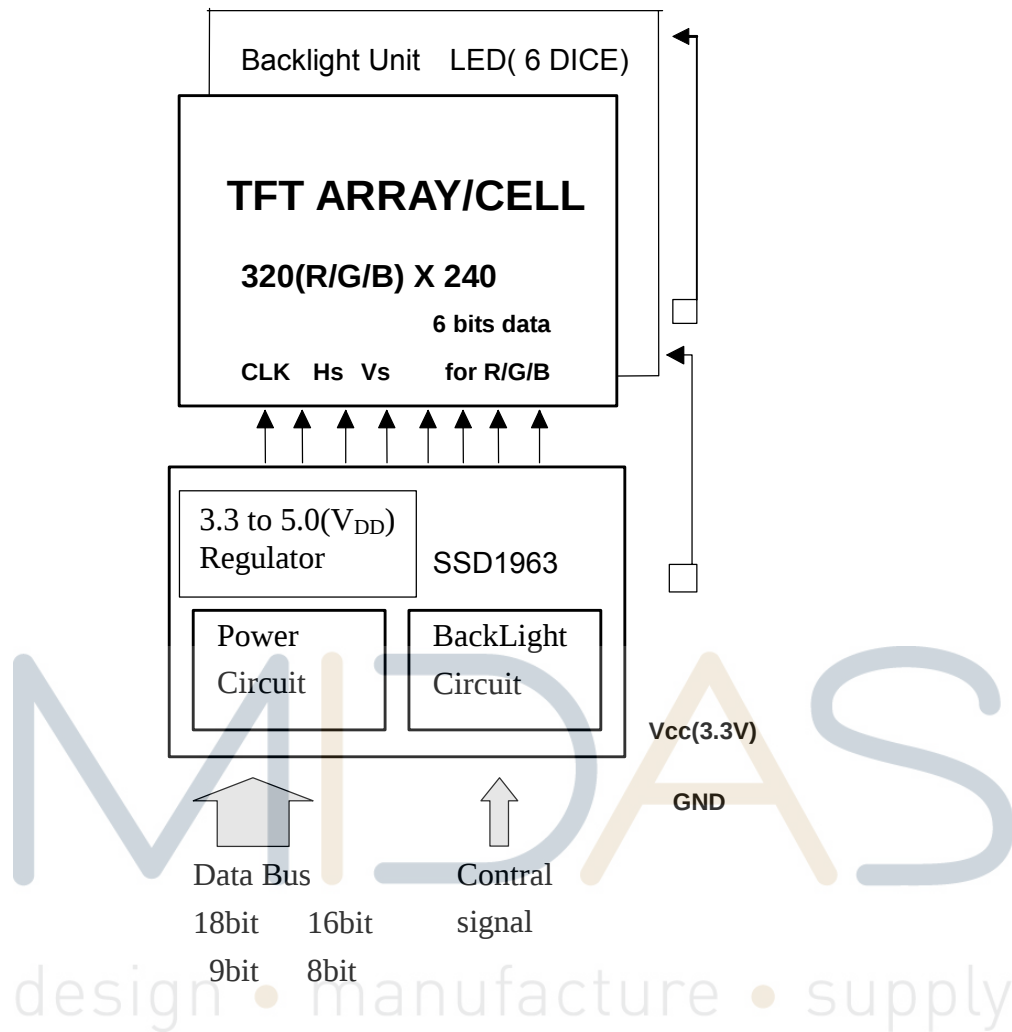
P/N	Symbol	8BIT Function
1	GND	Ground
2	VCC	Power supply for Logic
3	BL_E	Backlight control (H: On \ L: Off)
4	RS	Command/Data select
5	WR	8080 family MPU interface : Write signal
6	RD	8080 family MPU interface: Read signal
7	DB0	Data bus
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	CS	Chip select
16	RES	REST
17	NC	No connection
18	FGND	Frame Gnd
19	NC	No connection
20	NC	No connection

5. Outline Dimension & Block Diagram



CON1	
PIN NO.	SYMBOL
1	VSS
2	VCC
3	BL_E
4	RS
5	WR
6	RD
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	CS
16	RES
17	NC
18	FGND
19	NC
20	NC





6. Display Control Instruction

6.1 Data transfer order Setting

Pixel Data Format

Both 6800 and 8080 support 8-bit, 9-bit, 16-bit, 18-bit and 24-bit data bus. Depending on the width of the data bus, the display data are packed into the data bus in different ways.

Pixel Data Format :

Interface	Cycle	D[23]	D[22]	D[21]	D[20]	D[19]	D[18]	D[17]	D[16]	D[15]	D[14]	D[13]	D[12]	D[11]	D[10]	D[9]	D[8]	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]
24 bits	1 st	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
18 bits	1 st							R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
16 bits (565 format)	1 st									R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1
16 bits	1 st									R5	R4	R3	R2	R1	R0	X	X	G5	G4	G3	G2	G1	G0	X	X
	2 nd									B5	B4	B3	B2	B1	B0	X	X	R5	R4	R3	R2	R1	R0	X	X
	3 rd									G5	G4	G3	G2	G1	G0	X	X	B5	B4	B3	B2	B1	B0	X	X
9 bits	1 st																R5	R4	R3	R2	R1	R0	G5	G4	G3
	2 nd																G2	G1	G0	B5	B4	B3	B2	B1	B0
8 bits	1 st																	R5	R4	R3	R2	R1	R0	X	X
	2 nd																	G5	G4	G3	G2	G1	G0	X	X
	3 rd																	B5	B4	B3	B2	B1	B0	X	X

X: Don't Care

6.2 Register Depiction

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Please consult the spec of SSD1963

7. Optical Characteristics

$T_a=25\pm2^{\circ}\text{C}$, $I_{LED}=20\text{mA}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	10		ms	Note 3,5
	Tf		-	15		ms	
Contrast ratio	CR	At optimized viewing angle	300	400	-	-	Note 4,5
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	(0.26)	(0.31)	(0.36)	Note 2,6,7
		Wy		(0.28)	(0.33)	(0.38)	
	Red	Rx	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$				
		Ry					
	Green	Gx	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$				
		Gy					
	Blue	Bx	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$				
		By					
Viewing angle	Hor.	Θ_R	$CR \geq 10$	(50)	(60)	Deg.	Note 1
		Θ_L		(50)	(60)		
	Ver.	Φ_T		(40)	(50)		
		Φ_B		(45)	(55)		
Brightness	-	-	200	250	-	cd/m ²	Center of display

$T_a=25\pm2^{\circ}\text{C}$, $I_L=20\text{mA}$

Note 1: Definition of viewing angle range

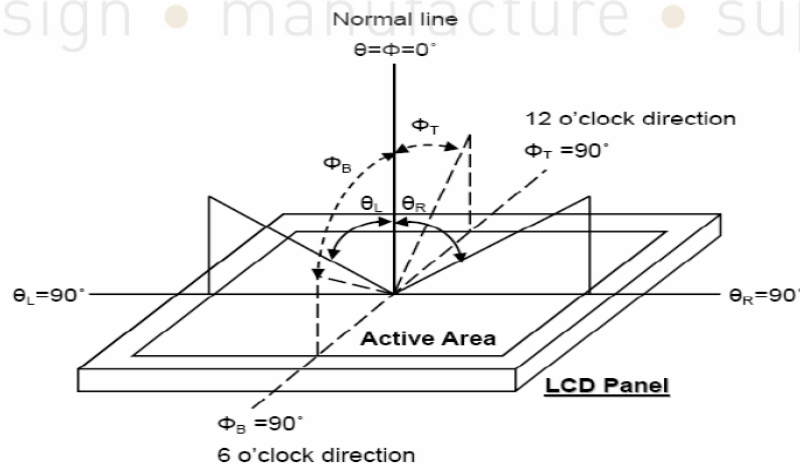


Fig. 8-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

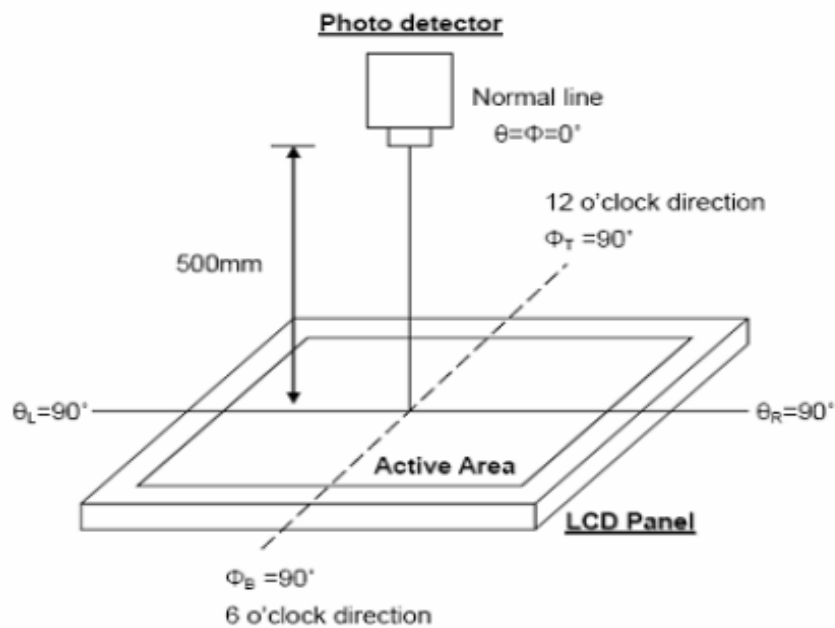
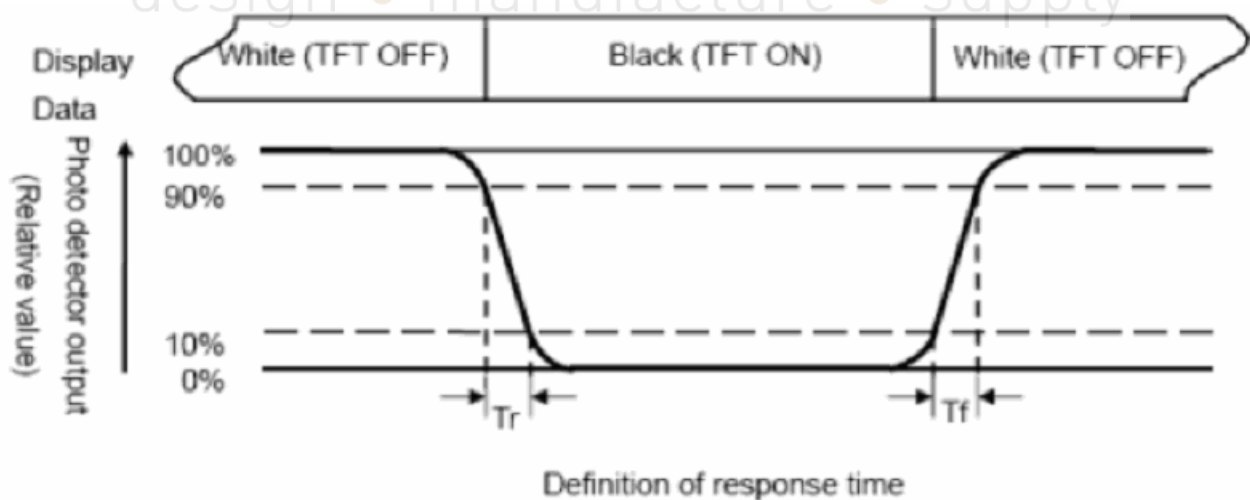


Fig. 8-2 Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%.



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

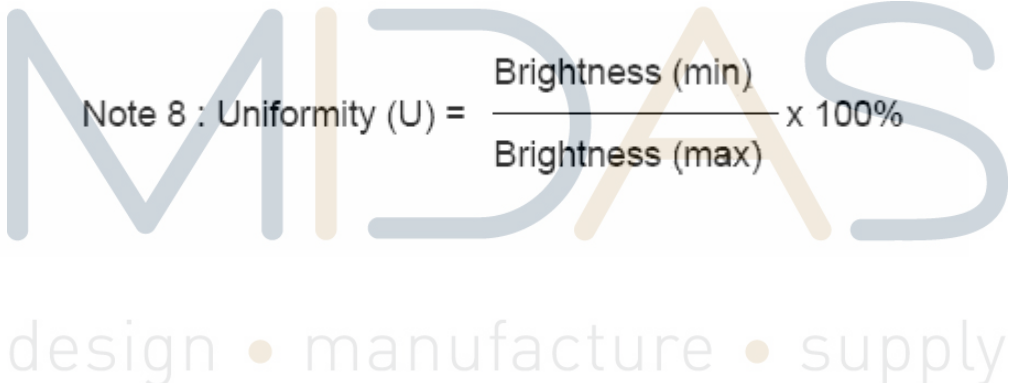
“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.



Note 8 : Uniformity (U) = $\frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$

8. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	°C
Storage Temperature	T_{ST}	-30	—	+80	°C
Power Voltage	V_{GH}	-0.3	—	32.0	V
	V_{GL}	-22.0	—	0.3	V
	$V_{GH} - V_{GL}$	-0.3	—	+45	V
Input voltage	V_{in}	-0.5	—	4.6	V
Logic output Voltage	V_{OUT}	-0.5	—	4.6	V

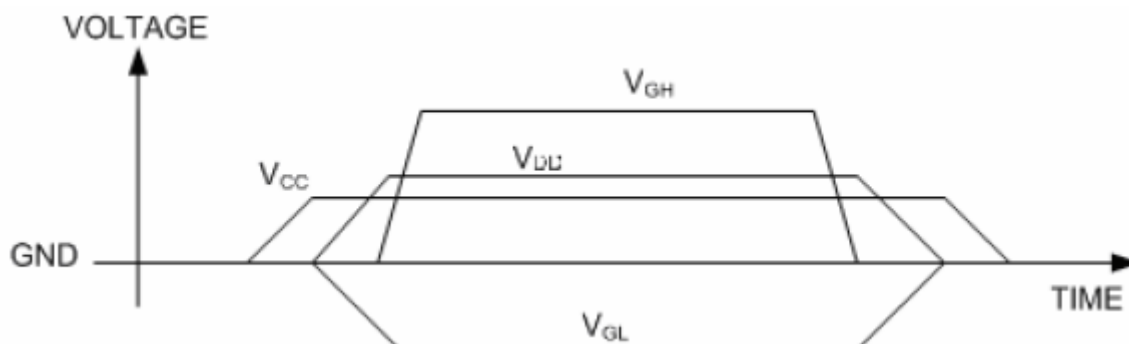
Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

9. Electrical Characteristics

Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	VCC	—	3.0	3.3	3.6	V
Power Supply Voltage	V_{GH}	$T_a=25^{\circ}\text{C}$		15		V
	V_{GL}	$T_a=25^{\circ}\text{C}$		-10		V
Supply Current	I_{cc}	$V_{CC}=3.3$		213		mA (*NOTE1)

*Note1 : VcomH& VcomL : Adjust the color with gamma data.



■ DC CHARACTERISTICS

Conditions:

Voltage referenced to VSS

VDDD, VDDPLL = 1.2V

VDDIO, VDDLCD = 3.3V

TA = 25°C

DC Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
PSTY	Quiescent Power			300		uW
IIZ	Input leakage current		-1		1	uA
IOZ	Output leakage current		-1		1	uA
VOH	Output high voltage		0.8VDDIO			V
VOL	Output low voltage				0.2VDDIO	V
VIH	Input high voltage		0.8VDDIO		VDDIO + 0.5	V
VIL	Input low voltage				0.2VDDIO	V

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■ AC Characteristics

Conditions:

Voltage referenced to V_{SS}

$V_{DDD}, V_{DDPLL} = 1.2V$

$V_{DDIO}, V_{DDLCD} = 3.3V$

$T_A = 25^\circ C$

$C_L = 50pF$ (Bus/CPU Interface)

$C_L = 0pF$ (LCD Panel Interface)

9.1 Clock Timing

Clock Input Requirements for CLK (PLL-bypass)

Symbol	Parameter	Min	Max	Units
FCLK	Input Clock Frequency (CLK)		120	MHz
TCLK	Input Clock period (CLK)	1/fCLK		ns

Clock Input Requirements for CLK (Using PLL)

Symbol	Parameter	Min	Max	Units
FCLK	Input Clock Frequency (CLK)	2.5	50	MHz
TCLK	Input Clock period (CLK)	1/fCLK		ns

Clock Input Requirements for crystal oscillator XTAL (Using PLL)

Symbol	Parameter	Min	Max	Units
FXTAL	Input Clock Frequency	2.5	10	MHz
TXTAL	Input Clock period	1/fXTAL		ns

9.2 MCU Interface Timing

9.2.1 6800 Mode

6800 Mode Timing

Symbol	Parameter	Min	Typ	Max	Unit
tcyc	Reference Clock Cycle Time	9	-	-	ns
tPWCSL	Pulse width CS# or E low	1	-	-	tCYC
tPWCSH	Pulse width CS# or E high	1	-	-	tCYC
tFDRD	First Data Read Delay	5	-	-	tCYC
tAS	Address Setup Time	1	-	-	ns
tAH	Address Hold Time	1	-	-	ns
tDSW	Data Setup Time	4	-	-	ns
tDHW	Data Hold Time	1	-	-	ns
tDSR	Data Access Time	-	-	5	ns
tDHR	Output Hold time	1	-	-	ns

Figure9-1: 6800 Mode Timing Diagram (Use CS# as Clock)

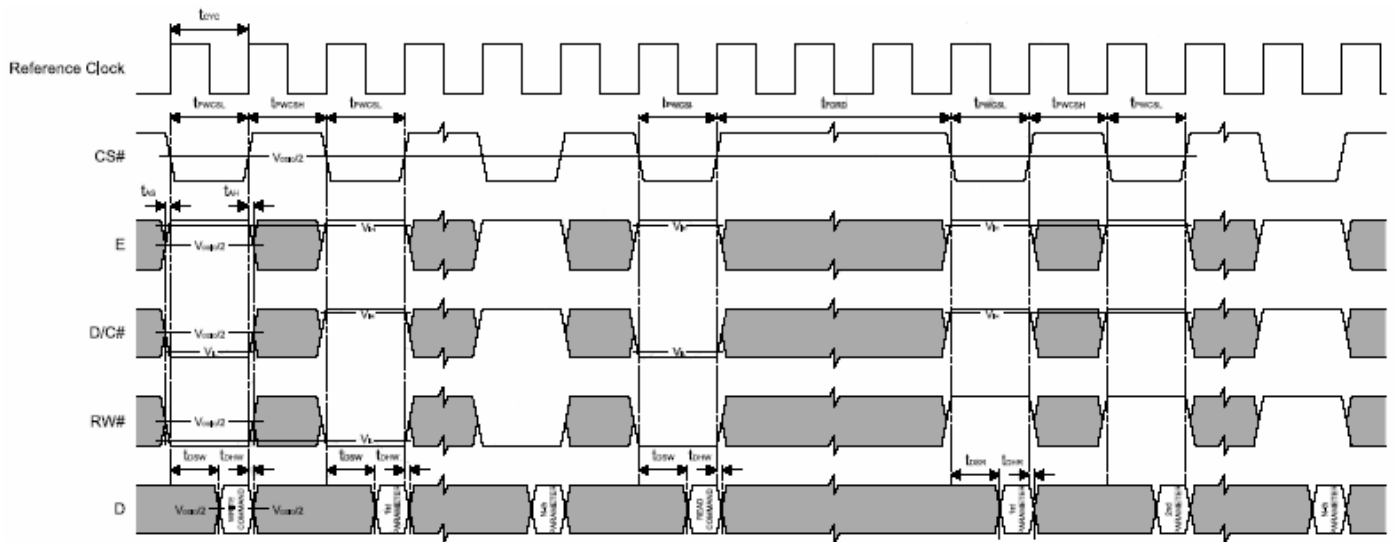
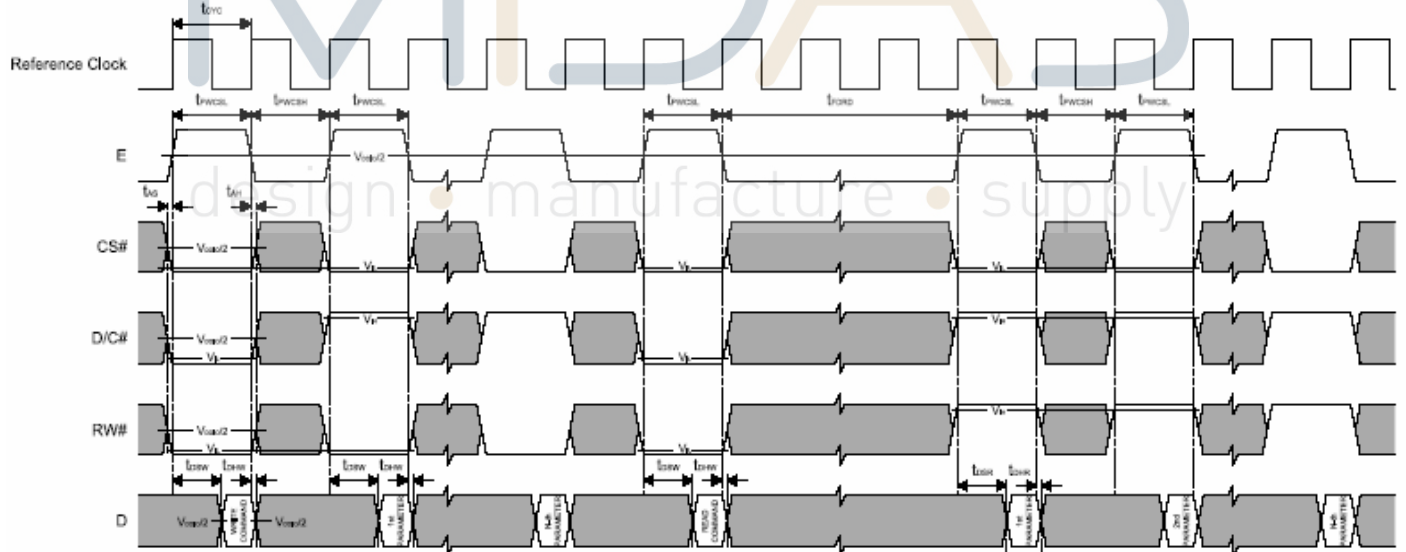


Figure 9-2: 6800 Mode Timing Diagram (Use E as Clock)

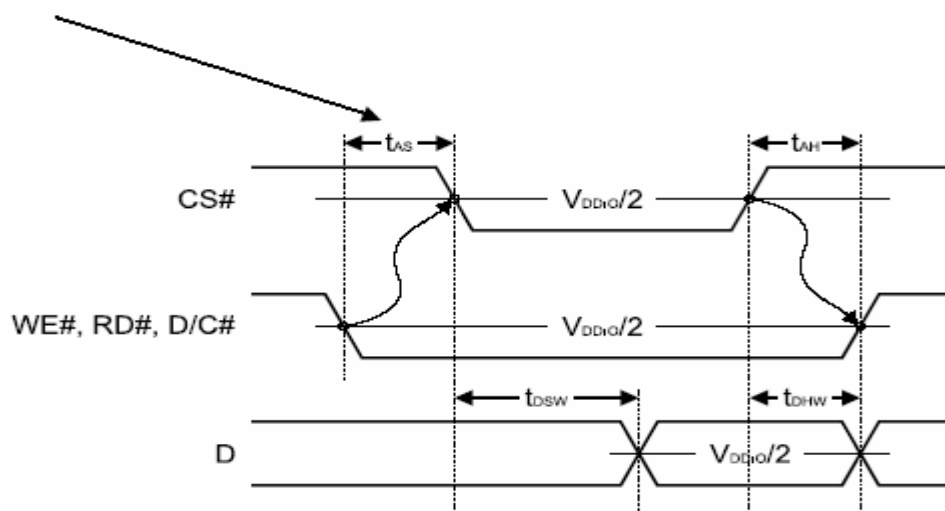
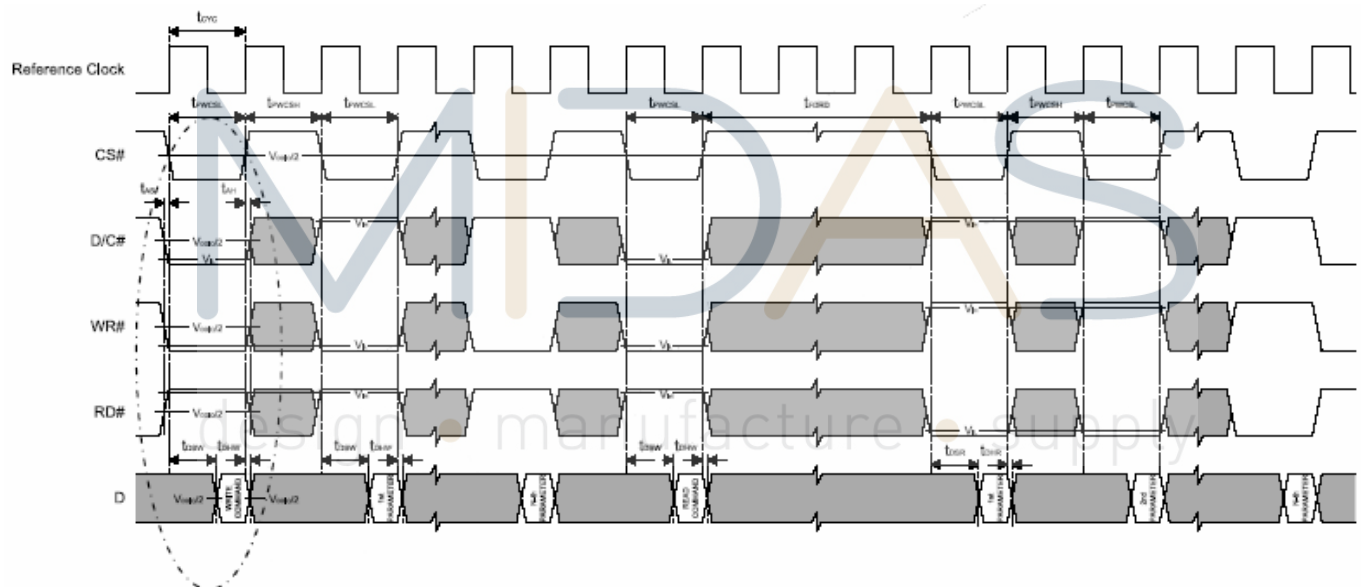


9.2.2 8080 Mode Write Cycle

Table 9-5: 8080 Mode Timing

Symbol	Parameter	Min	Typ	Max	Unit
t _{cyc}	Reference Clock Cycle Time	9	-	-	ns
t _{PWCSL}	Pulse width CS# low	1	-	-	t _{CYC}
t _{PWCSH}	Pulse width CS# high	1	-	-	t _{CYC}
t _{FDRD}	First Read Data Delay	5	-	-	t _{CYC}
t _{AS}	Address Setup Time	1	-	-	ns
t _{AH}	Address Hold Time	1	-	-	ns
t _{DSW}	Data Setup Time	4	-	-	ns
t _{DHW}	Data Hold Time	1	-	-	ns
t _{DSR}	Data Access Time	-	-	5	ns
t _{DHR}	Output Hold time	1	-	-	ns

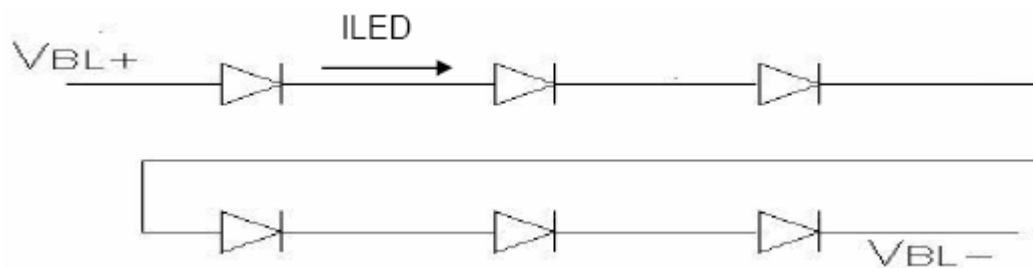
Figure9-3: 8080 Mode Timing Diagram



10. Backlight Information

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current		-	20	-	mA	
Power Consumption		-	400	420	mW	
LED voltage	VBL+	18.6	19.8	21	V	Note 1
LED Life Time	-		(50,000)-	-	Hr	Note 2,3

Note 1 : There are 1 Groups LED



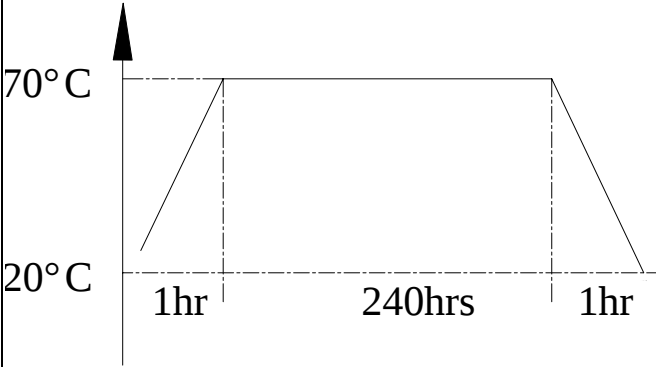
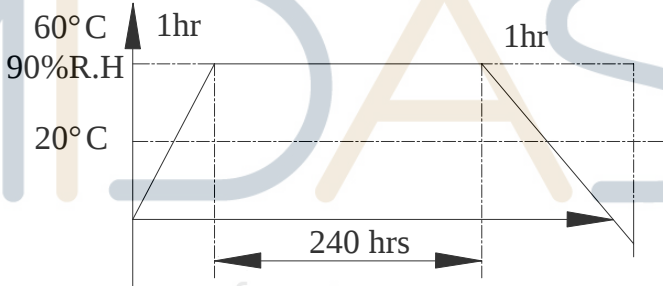
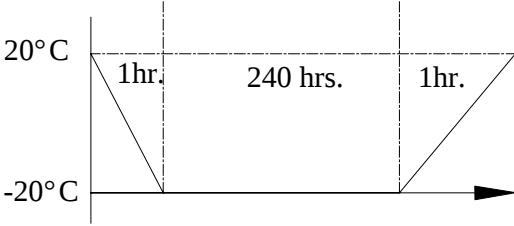
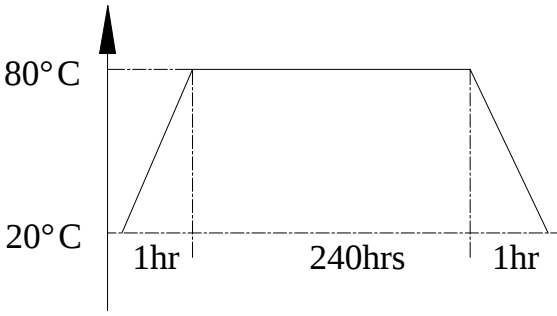
Note 2 : $T_a = 25 \text{ }^\circ\text{C}$

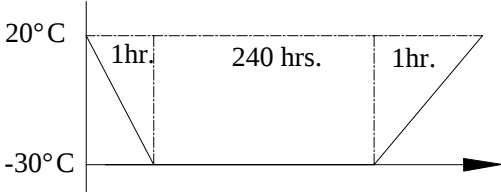
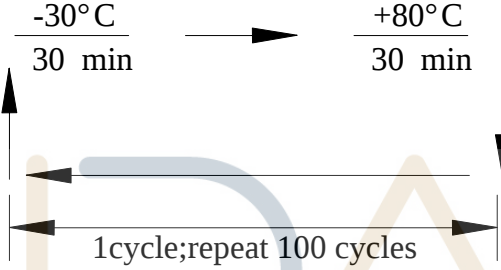
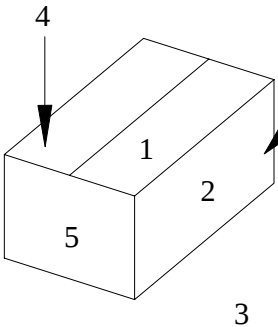
Note 3 : Brightness to be decreased to 50% of the initial value

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11. Reliability

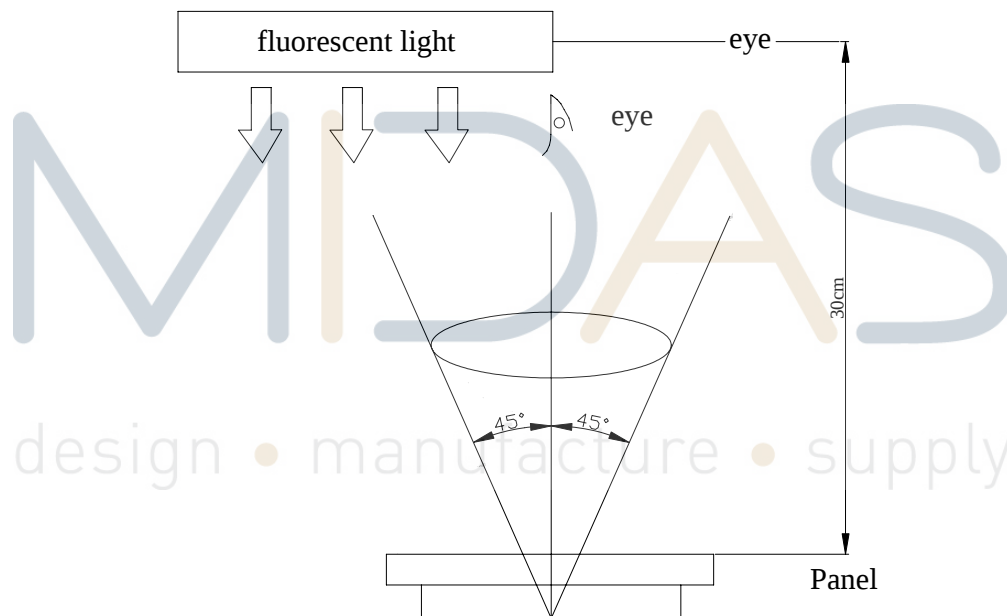
Test Item	Test Condition
High Temperature Operation	70°C for 240 hours  The graph shows a temperature profile starting at 20°C. It ramps up linearly to 70°C over a 1-hour period. It then remains constant at 70°C for 240 hours. Finally, it ramps down linearly to 20°C over another 1-hour period.
High Temperature Operation Humidity Operation	60°C, 90%RH for 240 hours  The graph shows a temperature and humidity profile starting at 20°C. It ramps up linearly to 60°C over a 1-hour period. It then remains constant at 60°C and 90%RH for 240 hours. Finally, it ramps down linearly to 20°C over another 1-hour period.
Low Temperature Operation	-20°C for 240 hours  The graph shows a temperature profile starting at 20°C. It ramps down linearly to -20°C over a 1-hour period. It then remains constant at -20°C for 240 hours. Finally, it ramps up linearly to 20°C over another 1-hour period.
High Temperature Storage	80°C for 240 hours  The graph shows a temperature profile starting at 20°C. It ramps up linearly to 80°C over a 1-hour period. It then remains constant at 80°C for 240 hours. Finally, it ramps down linearly to 20°C over another 1-hour period.

Test Item	Test Condition
Low Temperature Storage	-30°C for 240 hours 
Thermal Shock	-30°C (30min) ~ +80°C (30min) for 100 cycles 
Electrostatic Discharge (Not operation)	Discharge Resistance : 330Ω Energy Storage Capacitor : 150pF Output voltage (1)Contact Discharge ±4KV (2)Air Discharge ±8KV Polarity of the output voltage : positive and negative Discharge times : 5times
Package Vibration	Frequency(Random W Amplitude : p-p max/2.94m/s²max Orientation : X, Y , Z (3axis) Test Time : 1 hr. each axis ,total 3 hrs
Package Drop Test	100cm height natural falling Drop sequence : 1 corner,3 edges,and 6 faces,total 10 times  1)corner2-3-5 2)edge2-5 3)edge2-3 4)edge3-5 5)face5 6)face6 7)face2 8)face4 9)face3 10)face1

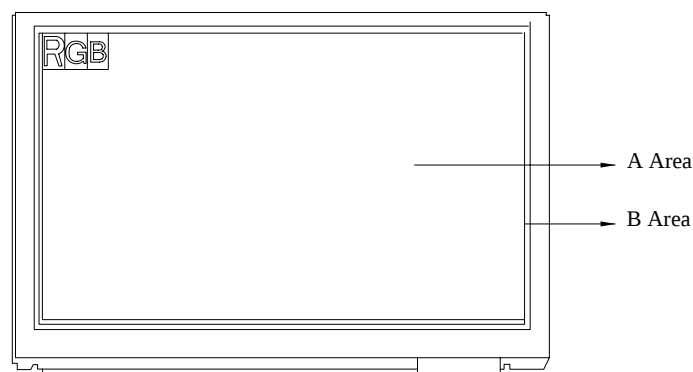
12. Cosmetic Criteria of LCD Screen

12.1 Inspection Condition

- Sample Plan: MIL-STD-105E LEVEL: II
AQL: Major (MA): 0.65% / Minor (MI): 1.5%
- Cosmetic inspect 300~500Lux fluorescent light, leaving 30~35cm between panels and eyes, and between panels and lights.
- Functional in spec under 200 Lux .
- Inspection condition is $23\pm 5^{\circ}\text{C}$, $50\pm 20\%\text{RH}$ maximum.



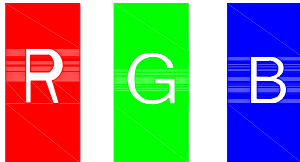
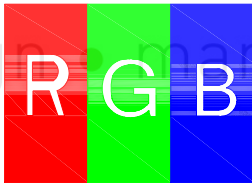
·Definition of area

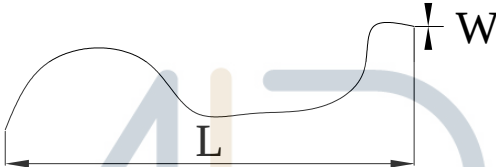
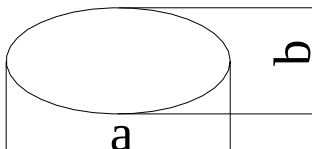


A Area: Viewing area.

B Area: Out of viewing.(Don't care cosmetic in outside viewing area)

12.2 Inspection specification

NO	Item	Acceptable specification	Judgment Criterion
1	Electrical Testing (MA)	1-1 sub pixel classification ● sub pixel: Number of sub pixel doesn't exceed Five dot.  Sub Pixel(Dot) a>Dark dot ----Four Allowed b>Bright dot---one Allowed c>The definition of dot ----The size of a defective dot over 1/2 of whole dot is regarded as one defective dot. d> Dark sub pixel: The distance more than 5mm between dot and dot. e>Bright sub pixel: The distance more than 20mm between bright dot and bright dot . ● Pixel : Three dots link together-----one allowed.  Pixel 1-2Leakage to light ● Leakage to light be not allowed. 1-3 Picture to shake ● Picture had shake ,twinkle and noise etc. instable of defect that be not allowed. 1-4 Function ● No display or No function is not allowed. ● Source Line, Gate Line is not allowed. ● Contrast Ratio exceeds product specifications. ● Current consumption exceeds product specifications. ● Display malfunction.	N≤4 N≤1 N≤1 N=0 N=0 N=0
02	Mechanical Dimension(MA)	2.1 Mechanical Dimension exceeds product specifications. 2-2 Out of frame and boss of plastic changed shape that be not allowed.	N=0

NO	Item	Acceptable specification				Judgment Criterion											
3	Cosmetic Inspection (MA)	3-1 Fiber / Line shapes of defect															
		Length	Width	Acceptable number	Mini. space	Acceptable number											
		----	$W \leq 0.05$	Ignore	5mm	Ignore											
		$L \leq 3$	$0.05 < W \leq 0.1$	3		3											
		----	$W > 0.1$	Not allowed	---	Not allowed											
		$L > 3$	----	Not allowed		Not allowed											
		L: length(mm) W: width(mm) 															
		3-2 Blemish: dot shapes of defect.															
		<table> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. space</th> </tr> <tr> <td>$\Phi \leq 0.2$</td> <td>Ignore</td> <td>---</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td>3</td> <td>5mm</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td>0</td> <td>----</td> </tr> </table>			Dimension	Acceptable number	Mini. space	$\Phi \leq 0.2$	Ignore	---	$0.2 < \Phi \leq 0.3$	3	5mm	$\Phi > 0.3$	0	----	2.5
		Dimension	Acceptable number	Mini. space													
		$\Phi \leq 0.2$	Ignore	---													
		$0.2 < \Phi \leq 0.3$	3	5mm													
		$\Phi > 0.3$	0	----													
		3-3 Bubble															
		<table> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. space</th> </tr> <tr> <td>$\Phi \leq 0.20$</td> <td>Ignore</td> <td>---</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td>3</td> <td>15mm</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td>0</td> <td>----</td> </tr> </table>			Dimension	Acceptable number	Mini. space	$\Phi \leq 0.20$	Ignore	---	$0.2 < \Phi \leq 0.3$	3	15mm	$\Phi > 0.3$	0	----	
		Dimension	Acceptable number	Mini. space													
		$\Phi \leq 0.20$	Ignore	---													
		$0.2 < \Phi \leq 0.3$	3	15mm													
$\Phi > 0.3$	0	----															
Foreign Substances																	
																	
$\Phi = (a + b) / 2$																	

NO	Item	Acceptable specification	Judgment Criterion																		
3	Cosmetic Inspection(MA)	3-4 Scratch • Impassive scratch as below. <table border="1"> <thead> <tr> <th>Length</th><th>Width</th><th>Acceptable number</th><th>Mini. space</th></tr> </thead> <tbody> <tr> <td>----</td><td>$W \leq 0.05$</td><td>Ignore</td><td rowspan="2">5mm</td></tr> <tr> <td>$L \leq 3$</td><td>$0.05 < W \leq 0.1$</td><td>3</td></tr> <tr> <td>----</td><td>$W > 0.1$</td><td>Not allowed</td><td rowspan="2">---</td></tr> <tr> <td>$L > 3$</td><td>----</td><td>Not allowed</td></tr> </tbody> </table> 3-5 Newton Ring • $D \leq 8\text{mm}$ ----allowed • $D \geq 8\text{mm}$ ----NG	Length	Width	Acceptable number	Mini. space	----	$W \leq 0.05$	Ignore	5mm	$L \leq 3$	$0.05 < W \leq 0.1$	3	----	$W > 0.1$	Not allowed	---	$L > 3$	----	Not allowed	
Length	Width	Acceptable number	Mini. space																		
----	$W \leq 0.05$	Ignore	5mm																		
$L \leq 3$	$0.05 < W \leq 0.1$	3																			
----	$W > 0.1$	Not allowed	---																		
$L > 3$	----	Not allowed																			
4	Crack/Break(MA)	Not Allowed.	N=0																		
5	Package (MI)	5-1 Mixed product types 5-2 Shipping q'ty should be the same as "shipping notice form" q'ty. 5-3 Outer box can't broken .	N=0																		

13. 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.

14. Material List of Components for RoHs

1. Midas hereby declares that all of or part of products, including, but not limited to, the LCM, accessories or packages, manufactured and/or delivered to your company (including your subsidiaries and affiliated company) directly or indirectly by our company (including our subsidiaries or affiliated companies) do not intentionally contain any of the substances listed in all applicable EU directives and regulations, including the following substances.

Exhibit A : The Harmful Material List

Material	(Cd)	(Pb)	(Hg)	(Cr6+)	PBBs	PBDEs
Limited Value	100 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm
Above limited value is set up according to RoHS.						

2. Process for RoHS requirement :

- (1) Use the Sn/Ag/Cu soldering surface ; the surface of Pb-free solder is rougher than we used before.
- (2) Heat-resistance temp. :
Reflow : 250°C , 30 seconds Max. ;
Connector soldering wave or hand soldering : 320°C , 10 seconds max.
- (3) Temp. curve of reflow, max. Temp. : 235±5°C ;
Recommended customer's soldering temp. of connector : 280°C , 3 seconds.