

图形点阵液晶显示模块使用手册

LMC-12864JYY-GB

深圳市锦华电子有限公司

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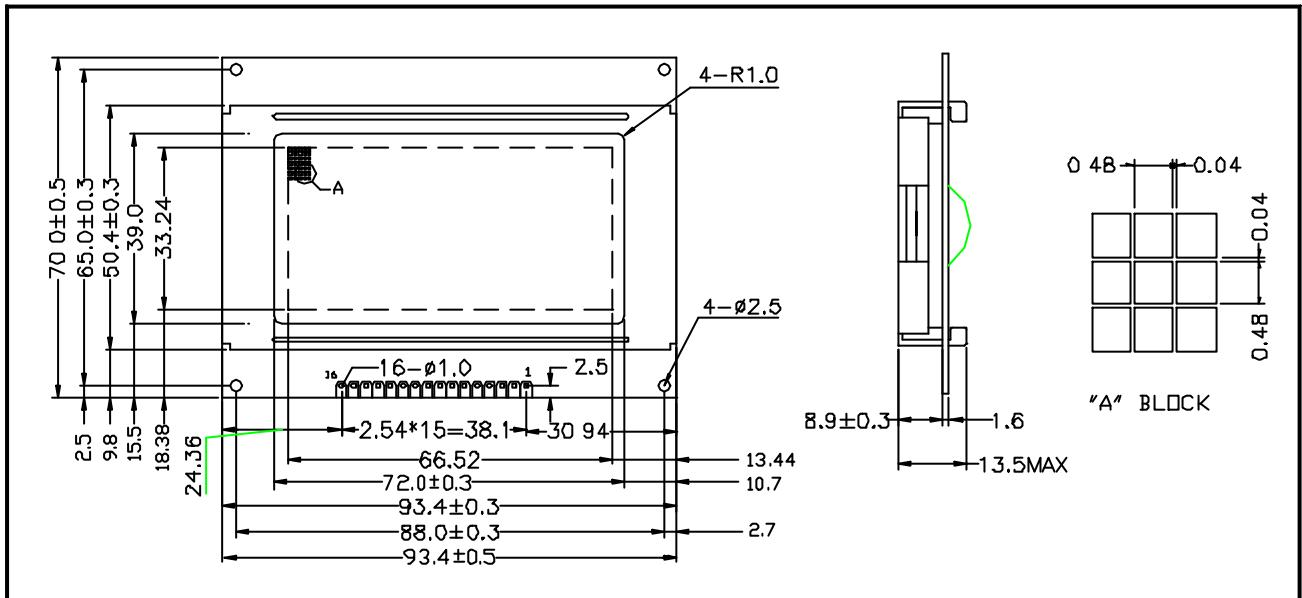
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1. Mechanical Specification

ITEM	STANDARD VALUE				UNIT
NUMBER OF CHARACTERS	8 CHARACTERS X 4 LINES (16*16 中文字)				--
CHARACTER FORMAT	16 X 16 DOTS				--
MODULE DIMENSION	93.4 (W) X 70.0 (H) X 13.5 (T)				mm
VIEWING DISPLAY AREA	72.0 (W) X 39.0 (H)				mm
ACTIVE DISPLAY AREA	66.52 (W) X 33.24 (H)				mm
DOT SIZE	0.48 (W) X 0.48 (H)				mm
DOT PITCH	0.52 (W) X 0.52 (H)				mm
APPROX. WEIGHT	80				g
LCD TYPE	STN , Yellow Green , 1/32 DUTY , 6 O'clock				
BACKLIGHT TYPE	LED		USE INVERTER		
BACKLIGHT INPUT	DC +5V	V	300	mA	Hz
INVERTER INPUT		V		mA	Hz
BACKLIGHT HalfLift TIME	30,000				HR.

2. Mechanical Diagram



3. Interface Pin Connections

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	VSS	--	GND (0V)	9	DB2	H/L	Data Bit 2
2	VDD	H/L	DC +5V	10	DB3	H/L	Data Bit 3
3	N.C	--	N.C	11	DB4	H/L	Data Bit 4
4	RS	H/L	Register select	12	DB5	H/L	Data Bit 5
5	R/W	H/L	Read/Write	13	DB6	H/L	Data Bit 6
6	E	H,H→L	Enable signal	14	DB7	H/L	Data Bit 7
7	DB0	H/L	Data Bit 0	15	A(+)	DC +5V	LED Backlight +
8	DB1	H/L	Data Bit 1	16	K(-)	0V	LED Backlight -

4. Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	TOP	0	--	+50	
STORAGE TEMPERATURE	TST	-10	--	+60	
INPUT VOLTAGE	V1	VSS	--	VDD	V
SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	--	5.0	6.5	V
SUPPLY VOLTAGE FOR LCD	VDD-VO	--	--	6.5	V
STATIC ELECTRICITY	Be sure that you are grounded when handing LCM.				

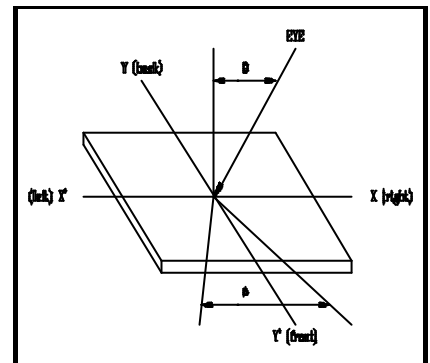
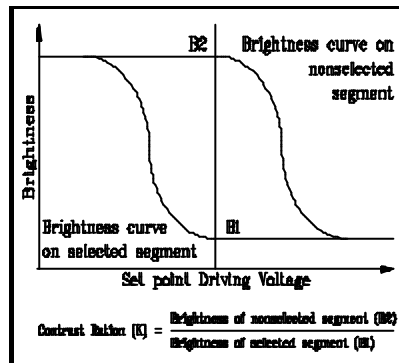
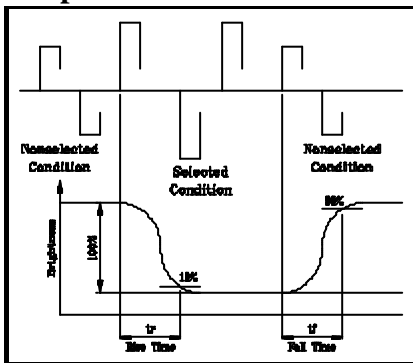
5. Electrical Characteristics

ITEM	SYN	CONDITION	MIN.	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	--	4.5	5.0	5.5	V
SUPPLY VOLTAGE FOR LCD	VDD-VO	Ta= 0	--	6.1	--	V
		Ta=+25	--	5.8	--	V
		Ta=+50	--	5.5	--	V
INPUT HIGH VOLTAGE	VIH	--	2.2	--	VDD	V
INPUT LOW VOLTAGE	VIL	--	0	--	0.6	V
OUTPUT HIGH VOLTAGE	VOH	--	2.4	--	--	V
OUTPUT LOW VOLTAGE	VOL	--	--	--	0.4	V
SUPPLY CURRENT	IDD	VDD=+5V	--	3.0	4.5	mA

6. Optical Characteristics

ITEM	SYN	CONDITION	MIN.	TYPE	MAX.	UNIT
VIEW ANGLE (V)		CR? 2	-10	--	40	deg.
VIEW ANGLE (H)		CR? 2	-30	--	30	deg.
CONTRAST RATIO	CR	--	--	5	--	--
RESPONSE TIME	TON	--	--	180	230	mS
RESPONSE TIME	TOFF	--	--	100	150	mS

7. Optical Definitions

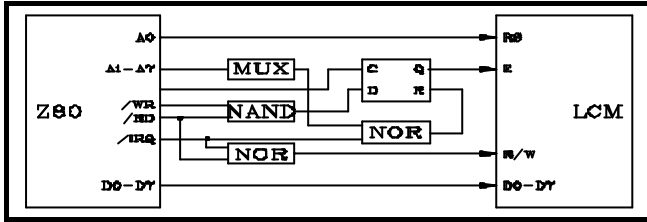


8. Display Address

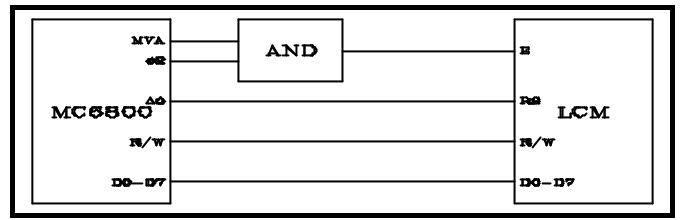
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Line 1	80H		81H		82H		83H		84H		85H		86H		87H	
Line 2	90H		91H		92H		93H		94H		95H		96H		97H	
Line 3																
Line 4																
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Line 1																
Line 2																
Line 3																
Line 4																

9. Interface to MPU

9.1 Interface to Z-80 CPU



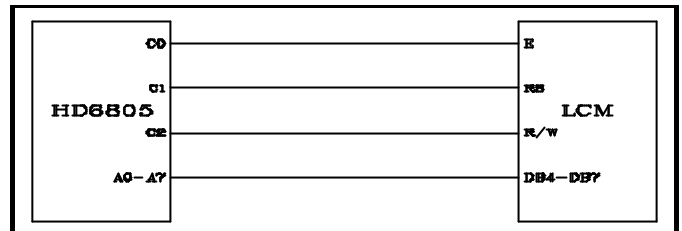
9.2 Interface to MC6800 CPU



9.3 Interface to 4-bit CPU (HMCS43C)



9.4 Interface to HD6805 MP

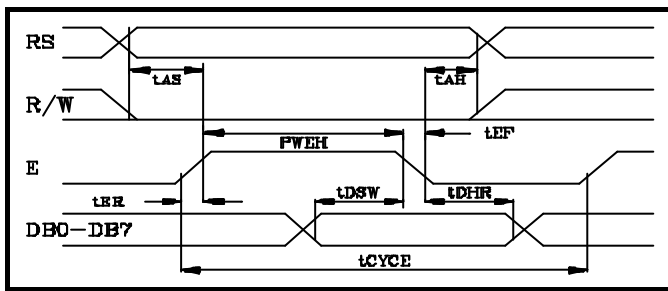


10. Timing Control

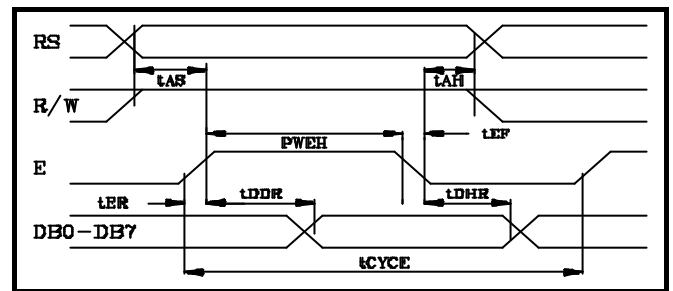
10.1

Write and Read Operation

Write Operation

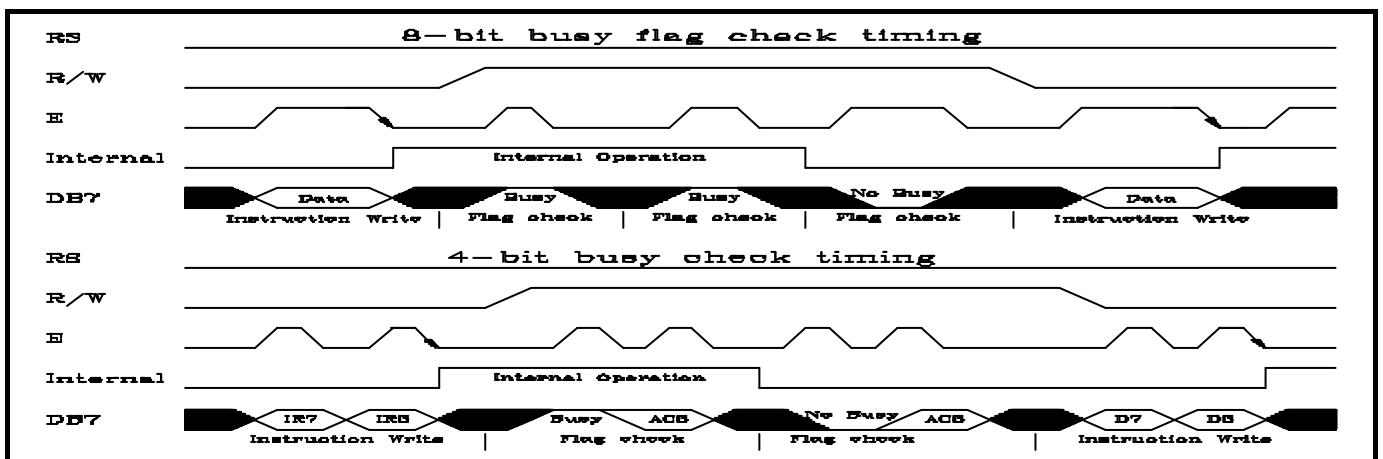


Read Operation



Item	Symbol	Limit (Min.)	Limit (Max.)	Unit
Enable Cycle Time	tCYCE	1000	--	ns
Enable Pules Width (High level)	PWEH	450	--	ns
Enable Rise/Fall Time	tER,tEF	--	25	ns
Address Set-Up Time (RS,R/W,E)	tAS	100	--	ns
Address Hole Time	tAH	10	--	ns
Data Set-Up Time	tDSW	100	--	ns
Data Delay Time	tDDR	--	190	ns
Data Hold Time	tDHR	20	--	ns

10.2 Busy flag check timing



12. Instruction Set

Instruction Table: (RE=0: Enable basic instruction.)

Instruction	Instruction Code										Description	Ex. Time 540KHz	
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Clear Display	0	0	0	0	0	0	0	0	0	1	Clear entire display and return the cursor to home position (address0).	4.6ms	
Return Home	0	0	0	0	0	0	0	0	0	1	X	Return cursor to the home position. Also returns the display being shifted to the original position. DDRAM contents remain unchanged.	4.6ms
Entry Mode Set	0	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operation are performed during data write/read. For normal operation. I/D=1 : increment; 0 :decrement; S=1 : accompanies display shift when data is written, for normal operation, set to zero.	72us
Display ON/OFF Control	0	0	0	0	0	0	0	1	D	C	B	D=1: ON display; 0:OFF display. C=1: ON cursor; 0: OFF cursor. B=1: ON blink cursor; 0: OFF blink cursor.	72us
Cursor or Display Shift	0	0	0	0	0	0	1	S/C	R/L	X	X	S/C=1: Interface data is 8 bits. DL=0: Interface data is 4 bits. N=1&RE=0:3 line setting. Others: 2 line setting. G=1: Graphic display ON. G=0: Graphic display OFF. RE=0: Normal instruction setting. RE=1: Extended instruction setting.	72us
Function Set (Modify)	0	0	0	0	1	DL	N	0	RE	G	X	D=1: Interface data is 8 bits. DL=0: Interface data is 4 bits. N=1&RE=1:4 line setting. Others: 2 line setting. G=1: Graphic display ON. G=0: Graphic display OFF. RE=0: Normal instruction setting. RE=1: Extended instruction setting.	72us
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	72us	
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	72us	
Read Busy Flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0us	
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM. (DDRAM/CGRAM/IRAM/GRAM)	72us	
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	READ data from internal RAM. (DDRAM/CGRAM/IRAM/GRAM)	72us	

Instruction Table (RE=1: Enable extension instruction.)

Instruction	Instruction Code										Description	Ex. Time 540KHz
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Standby Mode	0	0	0	0	0	0	0	0	0	1	Enter standby mode, only Icon areas display Standby mode can be released by any other instructions.	72us
Start Row Enable	0	0	0	0	0	0	0	0	1	SR	SR=1: Allow change start display Row. SR=0: Disable start display Row change.	72us
Reverse Line select	0	0	0	0	0	0	0	1	R1	R0	Choice one of 4 line which data is reverse Display.	72us
Sleep mode And set GRAM page	0	0	0	0	0	0	1	SL	GD	GW	SL=0: Enter sleep mode. SL=1: Wake-up from sleep mode. GD: Display graphic page 0 or 1. GW: Write data to graphic page 0 or 1. (Effective while GP=1)	72us
Display Shift By dot	0	0	0	0	0	1	OA	LR	L1	L0	OA=1: One of 4 lines shift enable. OA=0: All lines shift enable. LR=1: Dot by dot shift right. LR=0: Dot by dot shift left. L1, L0: Choice one of 4 lines shift.	72us
Function Set (Modify)	0	0	0	0	1	CL	N	1 RE	G	GP	CL=1: Select 16 character line. CL=0: Select 8 character line. N=1&RE=1: 4 line display. RE=1: Extended instruction setting. RE=0: Normal instruction setting. G=1: Graphic display ON. G=0: Graphic display OFF GP=1: Two page GRAM. GP=0: One page GRAM.	72us
Set IRAM or Start Row address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	SR=1: AC5 - AC0 is start Row. SR=0: AC - AC0 is ICON RAM address.	72us
Set Graphic RAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set graphic RAM address in address Counter. Execute once set the address of Display row. Execute again set the address Of display column. Each address of display Column has data of 16 bits. Therefore write data should execute 2 times.	72us

13. Icon RAM Data

Icon RAM Address				Icon RAM Data															
				High Byte								Low Byte							
AC3	AC2	AC1	AC0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
0	0	0	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
0	0	1	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
0	0	1	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
0	1	0	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
0	1	0	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
0	1	1	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
0	1	1	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	0	0	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	0	0	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	0	1	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	0	1	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	1	0	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	1	0	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	1	1	0	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG
1	1	1	1	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG	SEG

14. Software Example

14.1 8-bit operation (8 bits 2 lines)

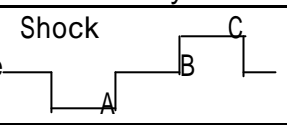
Function	R	R	D	D	D	D	D	D	D	D	Display	Description
	S	W	7	6	5	4	3	2	1	0		
Power on delay												Initialization. No display appears.
Function set	0	0	0	0	1	1	0	0	0	x		Sets to 8-bit operation and selects 2-line display character font. (Note: number of display lines and character fonts cannot be change after this.)
Display OFF	0	0	0	0	0	0	1	0	0	0		Turn off display.
Display ON	0	0	0	0	0	0	1	1	1	0	-	Turn on display and cursor
Entry Mode Set	0	0	0	0	0	0	0	1	1	0	-	Set mode to increment the address by one and to shift the cursor to the right, at the time of write, to the DD/CG RAM Display is not shifted.
Write data to CG/DD RAM	1	0	1	0	1	1	0	1	1	0	锦_	Write “锦”. Cursor incremented by one and shift to right.
Write data to CG/DD RAM	1	0	1	1	0	0	0	1	0	1	锦华	Write “华” .
Set DD RAM	0	0	1	0	1	0	0	0	0	0	锦华_	Set RAM address so that the cursor is propositioned at the head of the second line.
Write data to CG/DD RAM			*		*						锦华 CR_	Write “ C ” , and “ R ” .
Cursor or display shift	0	0	0	0	0	1	0	0	x	x	锦华 CR	Shift only the cursor position to the left.
Write data to CG/DD RAM			*		*						锦华 CO., LTD._	Write “ O., LTD.” .
Entry Mode Set	0	0	0	0	0	0	0	1	1	1	锦华 CO., LTD._	Set display mode shift at the time during writing operation.
Write data to CG/DD RAM	1	0	0	1	1	1	1	0	0	0	华 ., LTD. x_	Write “ x ” . Cursor incremented by one and shift to right. (The display move to left.)
Write data to CG/DD RAM			*		*							Write other characters.
Return Home	0	0	0	0	0	0	0	0	1	0	锦华 CO., LTD.	Return both display and cursor to the original position (Set address to zero).

14.2 4-bit operation (4-bit, 1 line)

Function	RS	R/W	D7	D6	D5	D4	Display	Description
power on delay								initialization. No display appears.
Function set	0	0	0	0	1	0		Sets to 4-bit operation. In this case, operation is handled as 8-bits by initialization, and only this instruction completes with one write.
Function set	0	0	0	0	1	0		Sets 4-bit operation and selects 1-line display character font on and resetting is needed. (number of display lines and character fonts cannot be changed hence after).
Display ON/OFF Control	0	0	0	0	0	0	-	Turn on display and cursor.
Entry Mode Set	0	0	0	0	0	0	-	Set mode to incremented the address by one and to shift the cursor to the right, at the time of write. to the DD/CG RAM display is not shifted.
Write data to CG/DD RAM	1	0	1	0	1	1	华_	Write “华”. Cursor incremented by one and shift to right.
	1	0	0	1	1	0		
	1	0	1	0	1	0		
	1	0	1	1	1	1		

same as 8-bit operation

15. Reliability Condition

		TN Type		STN Type		
		Normal Temp.	Wide Temp	Normal Temp.	Wide Temp.	
Viewing Angle	Horizontal	± 30 °	± 30 °	± 30 °	± 30 °	
	Vertical (mm)	10 ° to 30 °	10 ° to 30 °	-10 ° to 40 °	-10 ° to 40 °	
Operating Temperature		-10 ° to 70	-250 ° to 80	0 ° to 50	*-20 ° to 70	
Storage Temperature		-20 ° to 80	-350 ° to 90	-20 ° to 70	*-30 ° to 80	
High Temperature (Power Off)		240 Hours @ -70	240 Hours @ -90	240 Hours @ 650	240 Hours @ 75	
Low Temperature (Power Off)		240 Hours @ -20	240 Hours @ -35	240 Hours @ -15	240 Hours @ -25	
High Temperature (Power On)		240 Hours @ -70	240 Hours @ 80	240 Hours @ 60	240 Hours @ 70	
Low Temperature (Power On)		240 Hours @ -10	240 Hours @ -25	240 Hours @ -10	240 Hours @ -20	
Low Temperature & High Humidity		55 /90%RH 240 Hours	75 /90%RH 240 Hours	45 /90%RH 240 Hours	65 /90%RH 240 Hours	
Thermal Shock 5 cycle		A	60min@-20	60min@-35	60min@-20	60min@-30
		B	5min@-25	5min@-25	5min@-25	5min@-25
		C	60min@70	60min@90	60min@70	60min@80
Expected Lift		50,000 Hours	50,000 Hours	50,000 Hours	50,000 Hours	

*Wide temp. version may not available for some products, please consult our sales engineer or representative.

16. Functional Test & Inspection Criteria

16.1 Sample plan

Sample plan according to MLL-'STD- 105D level 2, and acceptance/rejection criteria is.

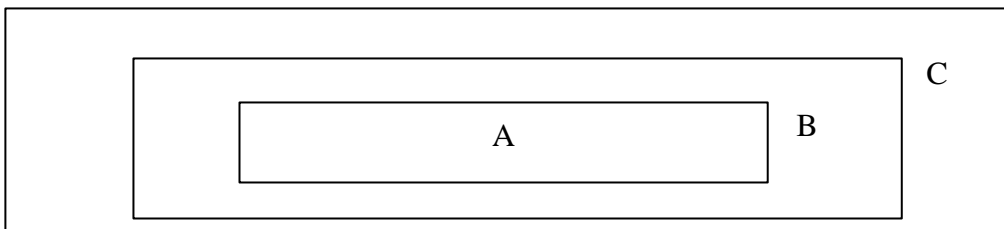
Base on : Major defect : AQL 0.65 Minor defect : AQL 2.5

16.2 Inspection condition

Viewing distance for cosmetic inspection is 30cm with bare eyes, and under an environment of 800 lus (20W)

light intensity. All direction for inspecting the sample should be within 45° against perpendicular line.

16.3 Definition of Inspection Zone in LCD



Zone B : Viewing area except Zone A (Zone A + Zone B = minimum Viewing area)

Zone C : Outside viewing area (invisible area after assembly in customer' s product)

Note : As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer' s product.

16.4 Major Defect

All functional defects such as open (or missing segment), short, contrast differential, excess power consumption, smearing, leakage, etc, and overall outline dimension beyond the drawing. Are classified as major defects.

16.5 Minor Defect

Except the Major defects above, all cosmetic defects are classified as minor defects.

Item No.	Item to be Inspected	Inspection Standard			Classification of defects		
1.	Spot defect (Defects in spot from)	Zone size (mm)	Acceptable Qty			Minor	
			A	B	C		
		0.15	Acceptable (clutering of spot not allowed)		Acceptable		
		0.15 0.20	1	2			
		0.20 0.25	0	1			
		> 0.25	0	0			
Remarks : for dark/white spot, size is defined as $=1/2(X+Y)$							
2.	Line defect (Defects in spot from)	Size(mm)		Acceptable Qty			Minor
		L	W	Zone			
		Length	Width	A	B	C	
		Accep- table	W 0.02	Accep- table	Accep- table		
		L 3.0	W 0.03	2			
		L > 2.5	W 0.03	0			
		L 3.0	0.03 < W 0.05	2			
		L 2.5	0.03 < W 0.05	0			
			W > 0.05	Counted as spot defect (Follows item 16.5.1)			
Remarks: The total of spot defect and line defect shall not exceed four.							
3.	Orientation defect (such as misalignment of L/C)	Not allowed inside viewing area (Zone A or Zone B)			Minor		
4.	Polarizing	16.5.4.1 Polarizer Position				Minor	
		1. Shifting in Position Should not exceed the glass outline dimension.					
		2. Incomplete covering of the viewing area due to Shifting is not allowed.					
		Size (mm)	Acceptable Qty				
			Zone				
			A	B	C		
	0.20	Acceptable		Accep- table			
0.20 <	0.50	3					
0.50 <	1.00	2					
>	1.00	1					