勝華科技股份有限公司
WINTEK CORPORATION

SPECIFICATIONS FOR LCD MODULE

214 237 6240

CUSTOMER:	ASIA WINTEK(ONTARIO)
MODEL:	WM-C1602M-1YLY
ACCEPTED BY:	
DATE:	

APPROVED BY:	CHECKED BY:	ORGANIZED BY:
研發課 21.03.'97 劉湘怡	研發課 21.03.'97 潘繼哲	研發課 21.03.'97 [illegible]

☐ APPROVAL FOR SPECIFICATIONS ONLY
☑ APPROVAL FOR SPECIFICATIONS AND SAMPLE

PHIL HUGHES
734 477-5480

NOTE:1.WINTEK'S SAMPLE SERIAL CODE: c
2.VERSION OF SPECIFICATIONS: 3
3.OTHERS:

台中縣潭子鄉427台中加工出口區建國路9號之2
9-2, CHIEN-KUO RD.,TEPZ TANTZU, TAICHUNG 427, TAIWAN, R.O.C.
TEL:886-4-5347288, FAX:886-4-5310868

Contents

1.Precautions in Use of LCM

1.1 Handling of LCM

- Don't give external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.

1.2 Storage

- Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
- Storage in a clean environment, free from dust, active gas, and solvent.
- Store in anti-static electricity container.
- Store without any physical load.

1.3 Soldering

- Use the high quality solder. (60-63% tin mixed with lead)
- Iron: no higher than 260°C and less than 3-4 sec during soldering.
- Soldering: only to the I/O terminals.
- Rewiring: no more than 3 times.

2. Introduction

Liquid Crystal Displays (LCDs) have widely used in many applications such as industrial measurements, office mechanisms, and household electronic-equipment, etc. LCM (LCD Module) integrates with LCD and driving circuit that is easily to be interfaced by user. This LCM contains a standard built-in dot-matrix font set.

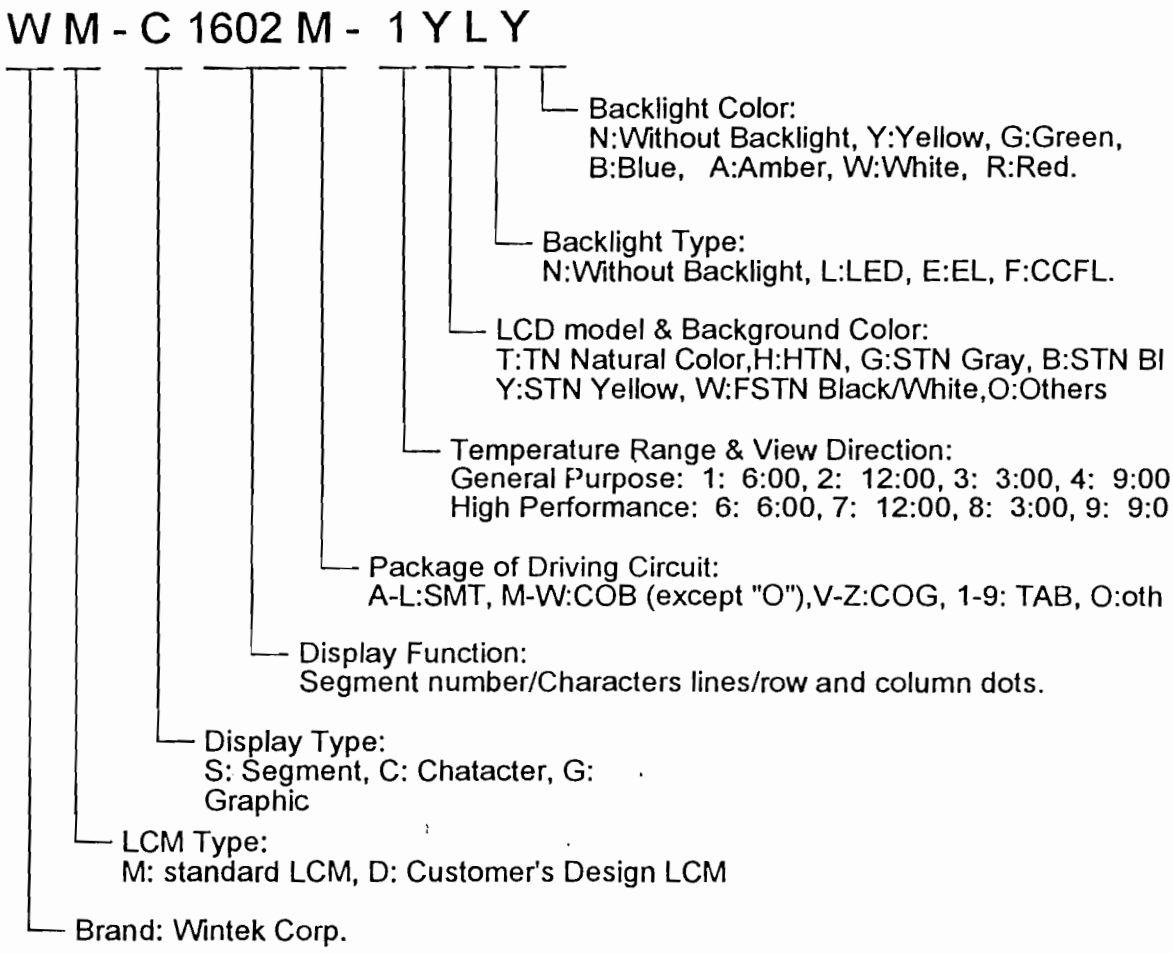
2.1 Applications of LCM

- Telephone.
- Fasimile Mechanism.
- Electronic Typewriter.
- Word Processor.
- Electronic Memo Pads.
- Remote Controller.
- Other Electronic Equipment.

2.2 Features of LCM

- Compact, Thin, and Light.
- Wide View Angle.
- Low Power Consumption.
- High Contrast Image.
- Wide Operating Temperature.
- Various Backlight Available.
- High Reliability.
- Easy interface control.

3. Module Classification Information

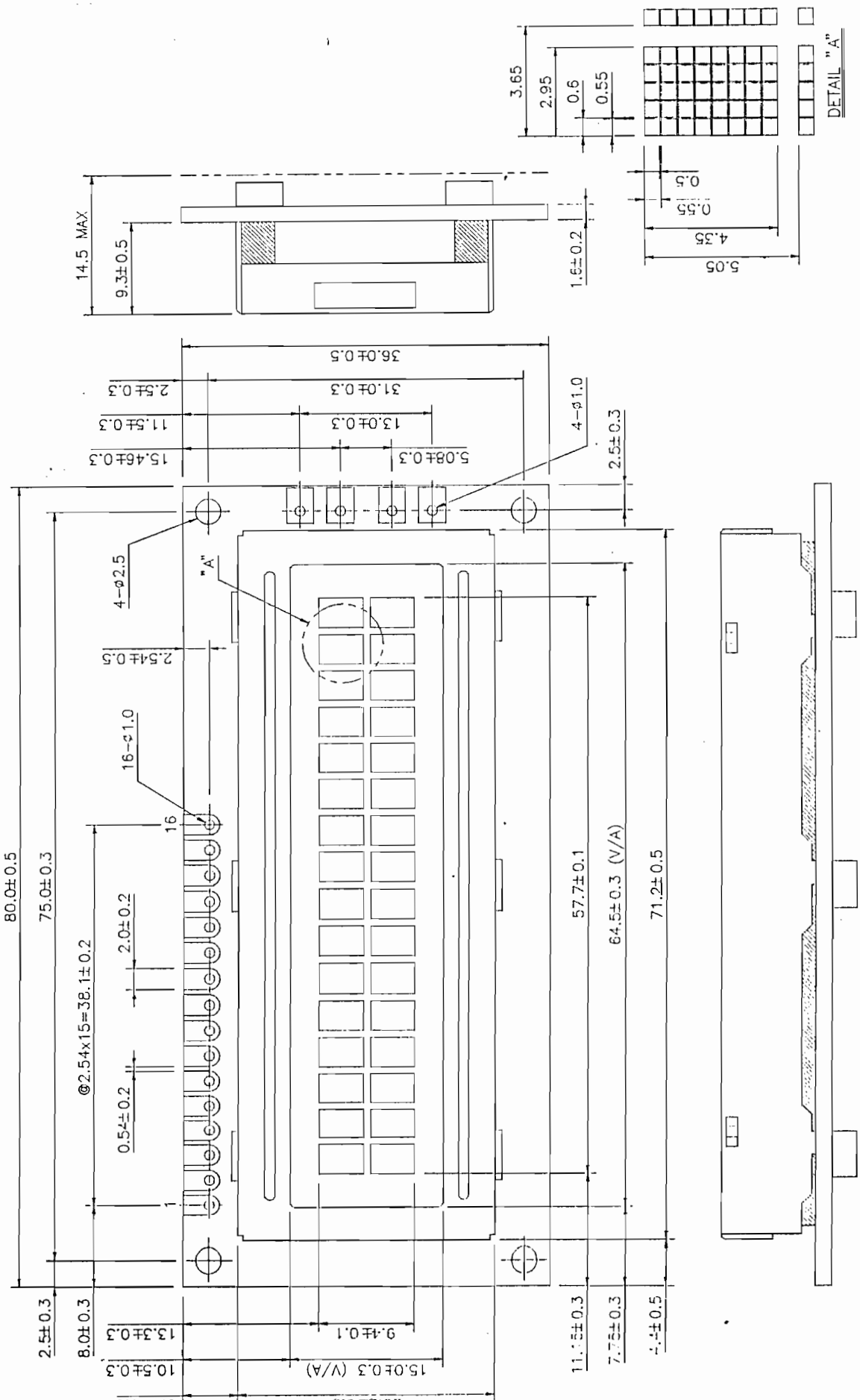


4. Mechanical Specification & Diagram

4.1 Mechanical Specification

ITEM	STANDARD VALUE	UNIT
NUMBER OF CHARACTERS	16 CHARACTERS × 2 LINE	-
CHARACTER FORMAT	5 × 7 DOTS with CURSOR	-
MODULE DIMENSION	80.0(W) × 36.0(H) × 14.5(T)	mm
EFFECTIVE DISPLAY AREA	64.5(W) × 15.0(H)	mm
CHARACTER SIZE	2.95(W) × 4.35(H)	mm
CHARACTER PITCH	3.65(W) × 5.05(H)	mm
DOT SIZE	0.55(W) × 0.50(H)	mm
DOT PITCH	0.60(W) × 0.55(H)	mm
APPROX. WEIGHT	36	g
LCD TYPE	STN (Yellow mode)	
DUTY	1/16	
VIEWING DIRECTION	6 O'clock	
BACK LIGHT	YELLOW-GREEN LED	

4.2 Mechanical Diagram



5. Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
OPERATING TEMPERATURE	T_{OP}	0	-	+50	°C
STORAGE TEMPERATURE	T_{ST}	-20	-	+70	°C
INPUT VOLTAGE	V_I	V_{SS}	-	V_{DD}	V
SUPPLY VOLTAGE FOR LOGIC	V_{DD}-V_{SS}	-0.3	-	6.5	V
SUPPLY VOLTAGE FOR LCD	V_{DD}-V_0	-0.3	-	6.5	V
STATIC ELECTRICITY	Be sure that you are grounded when handing LCM .				

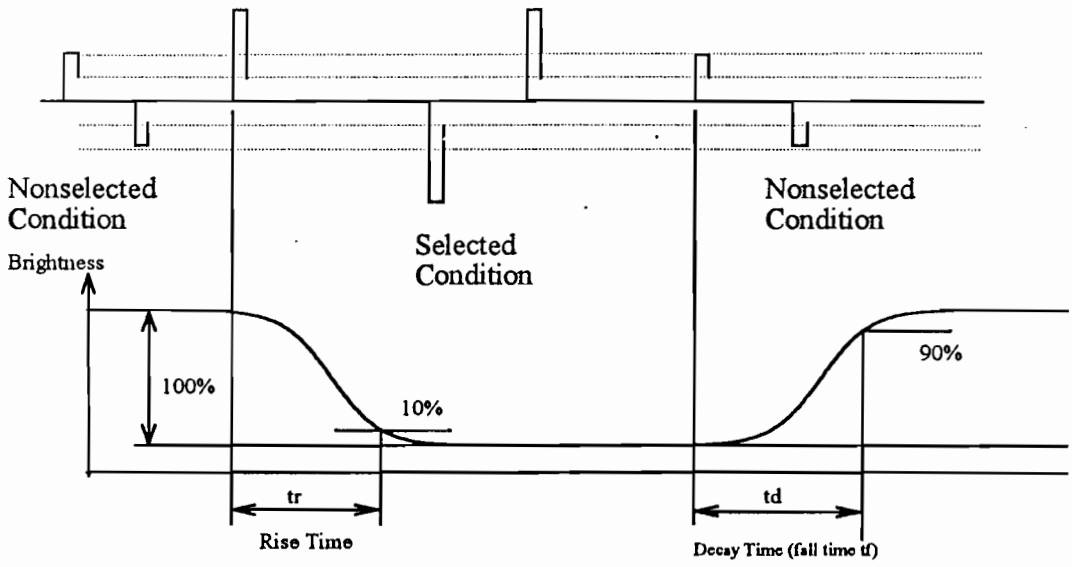
6. Electrical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	V_{DD}-V_{SS}	-	4.7	5.0	5.3	V
SUPPLY VOLTAGE FOR LCD	V_{DD}-V_0	Ta=0 °C	-	4.8	-	V
		Ta=25 °C	-	4.5	-	V
		Ta=50 °C	-	4.2	-	V
INPUT HIGH VOL.	V_{IH}	-	2.2	-	V_{DD}	V
INPUT LOW VOL.	V_{IL}	-	-	-	0.6	V
OUTPUT HIGH VOL	V_{OH}	-	2.4	-	-	V
OUTPUT LOW VOL.	V_{OL}	-	-	-	0.4	V
SUPPLY CURRENT	I_{DD}	V_{DD}=5 V	-	2.0	3.0	mA

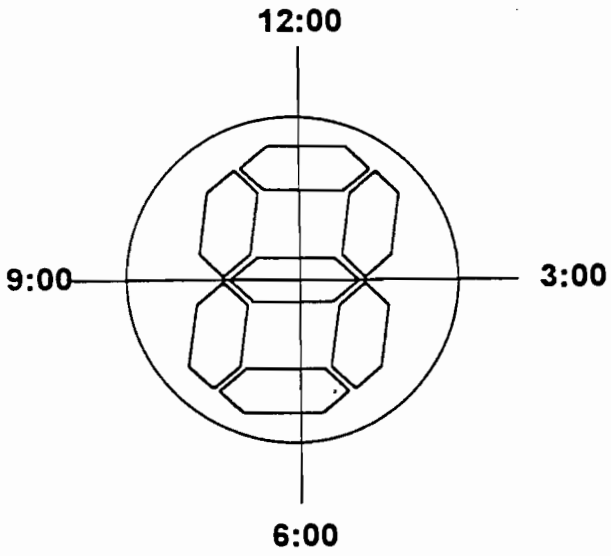
7. Optical Characteristics

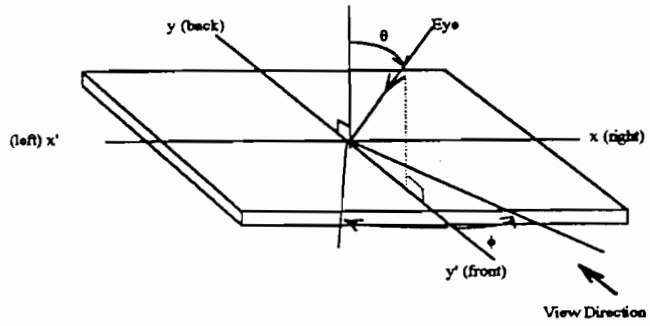
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
VIEW ANGLE (V)	θ	CR ≥ 2	10	-	40	deg.
VIEW ANGLE (H)	ϕ	CR ≥ 2	-30	-	30	deg.
CONTRAST RATIO	CR	——	-	5	-	-
RESPONSE TIME	T_{ON}	——	-	200	300	mS
RESPONSE TIME	T_{OFF}	——	-	200	300	mS

8. Optical Definitions

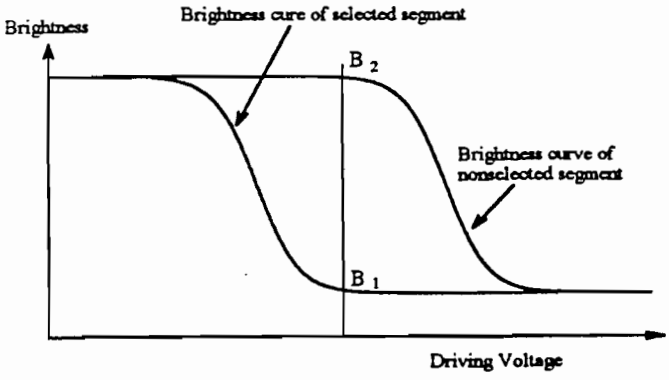


Response Time





View Angle



Perpendicular line (θ=90°)

$$\text{Contrast ration} = \frac{\text{Brightness at nonselected segment (B2)}}{\text{Brightness at selected segment (B1)}}$$

Contrast ration (C R)

9. Interface Pin Function

NO	SYMBOL	LEVEL	FUNCTION
1	V_{SS}	-	GND (0 V)
2	V_{DD}	-	VCC (+5 V ± 5%)
3	V_0	-	CONTRAST ADJUSTMENT
4	RS	H/L	REGISTER SELECT SIGNAL
5	R/W	H/L	READ/WRITE SELECTION
6	E	H,H→L	ENABLE SIGNAL
7	DB 0	H/L	DATA BIT 0
8	DB 1	H/L	DATA BIT 1
9	DB 2	H/L	DATA BIT 2
10	DB 3	H/L	DATA BIT 3
11	DB 4	H/L	DATA BIT 4
12	DB 5	H/L	DATA BIT 5
13	DB 6	H/L	DATA BIT 6
14	DB 7	H/L	DATA BIT 7
15	NC	-	-
16	NC	-	-

10. Display Address

Relations between DD RAM addresses and positions on the LCD are shown below. The DD RAM address (ADD)is set in the address counter (AC) and is represented in hexadecimal.

16×2 line display

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	→ Display Position
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	→ DD RAM Address
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	

11.Description in Block Diagram

a. **Data Resistor (DR):** DR is a register used for temporary storage of the date read/write from/into DD RAM and CG RAM.

b. **Instruction Register (IR):** IR is a register available for storing the instruction codes and address information of display data (DD) RAM and character generator (CG) RAM.

c. **BUSY FLAG (BF):** When the BUSY FLAG is "1", it shows that LCM is in internal operation and it can not accept the next instruction.

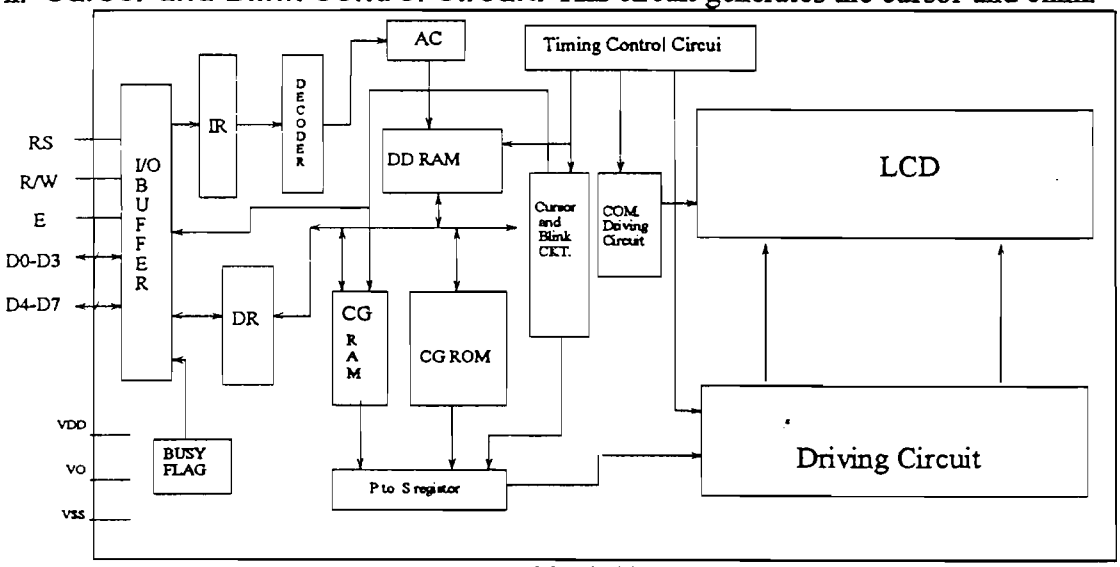
d. **Character Generator (CG) ROM:** This ROM generates character pattern from 8-bit character . code and provides 192 character patterns.

e. **Character Generator (CG) RAM:** This RAM allows the user to rewrite the character patterns freely according to the program.

f. **Address Counter (AC):** This address counter is used to give the address information of DD RAM and CG RAM.

g. **Display Data (DD) RAM:** This display data RAM is used to store the display data expressed by 8-bit character code. The capacity is 80×8 bits and data for 80 characters can be storage.

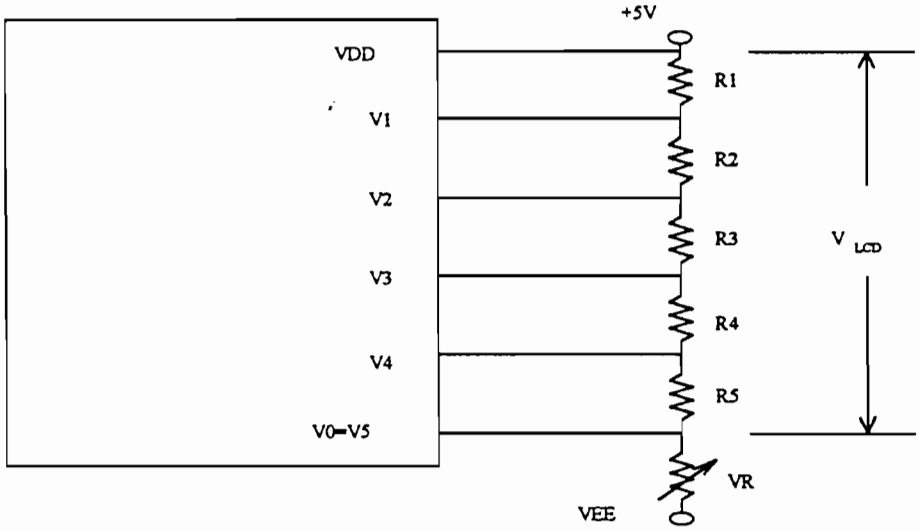
h. **Cursor and Blink Control Circuit:** This circuit generates the cursor and blink.



Block Diagram

12. Power Supply for LCD Module

12.1 LCD Driving Source (1/5 Bias)



$$V_1 = V_{DD} - \frac{1}{5}V_{LCD}$$

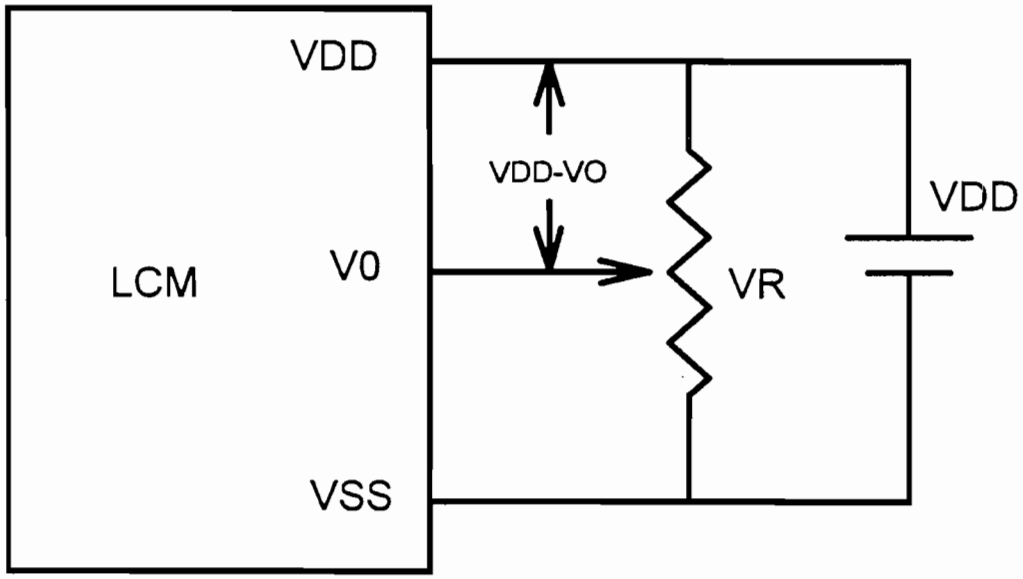
$$V_2 = V_{DD} - \frac{2}{5}V_{LCD}$$

$$V_3 = V_{DD} - \frac{3}{5}V_{LCD}$$

$$V_4 = V_{DD} - \frac{4}{5}V_{LCD}$$

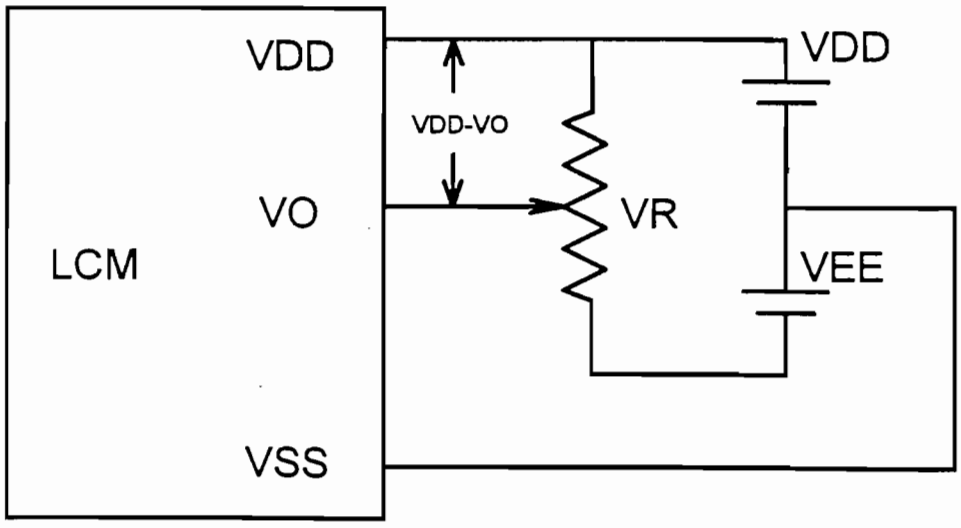
$$V_5 = V_{DD} - V_{LCD}$$

12.2 Single Supply Voltage Types



V_{DD}-V_0 : LCD Driving Voltage

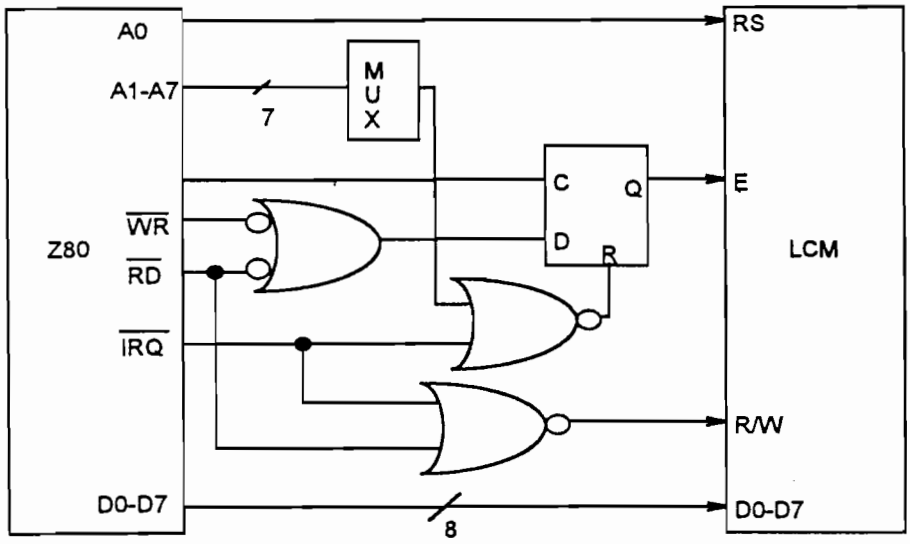
12.3 Dual Supply Voltage Types



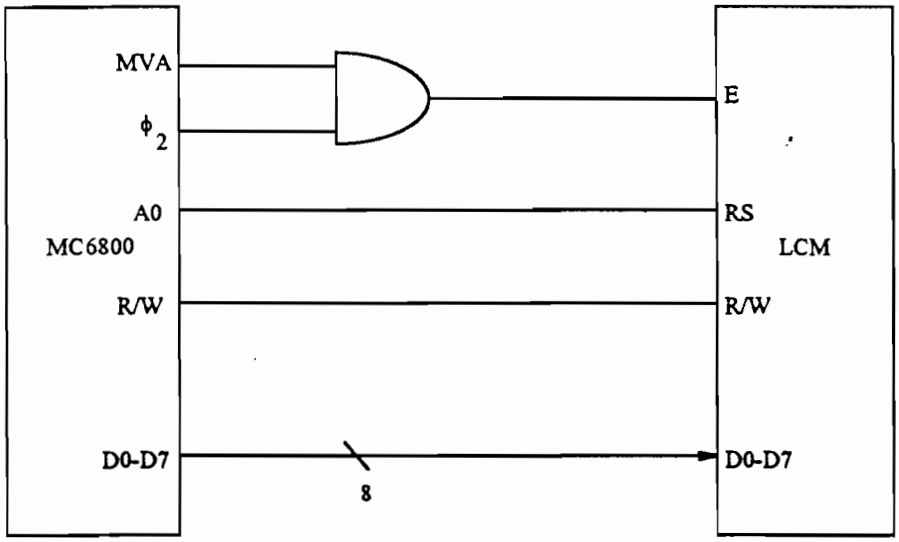
V_{DD}-V_0 : LCD Driving Voltage

13. Interface to MPU

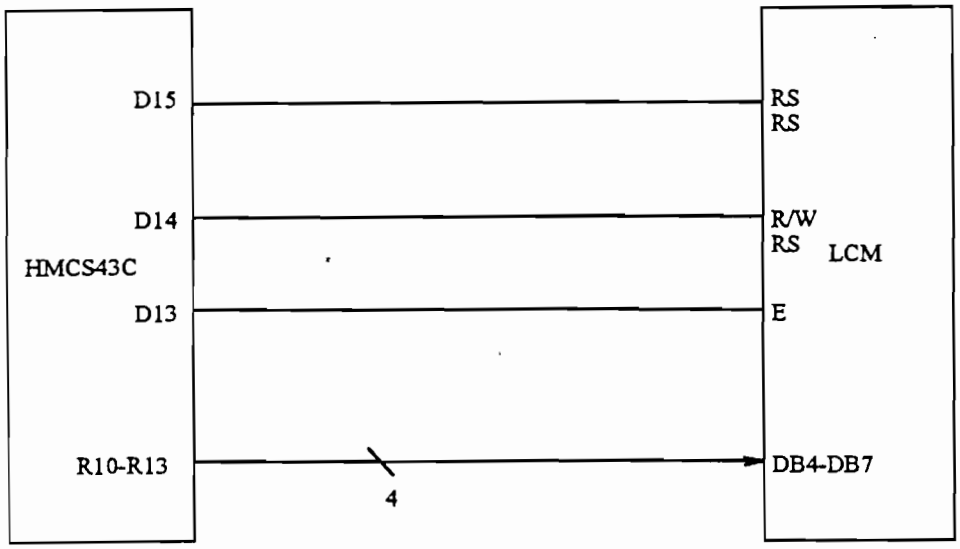
13.1 Interface to Z-80 CPU



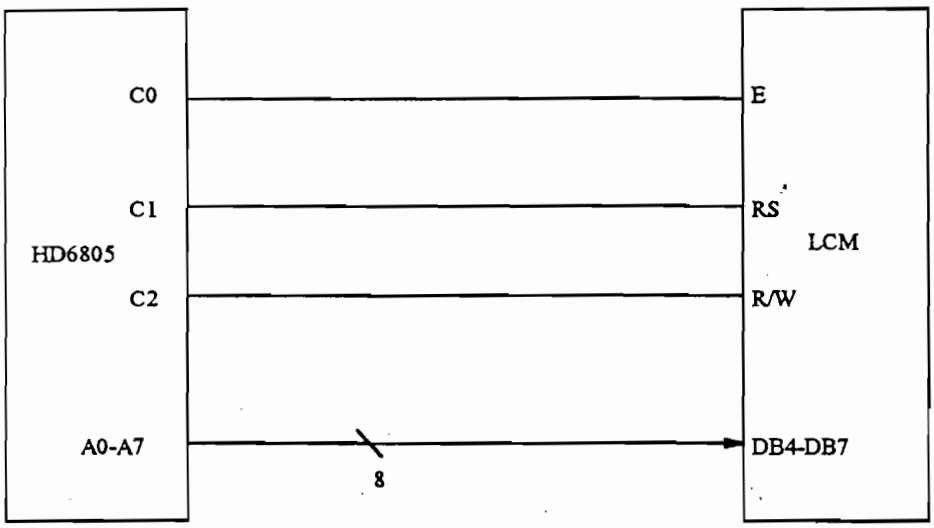
13.2 Interface to MC6800 CPU



13.3 Interface to 4-bit CPU (HMCS43C)

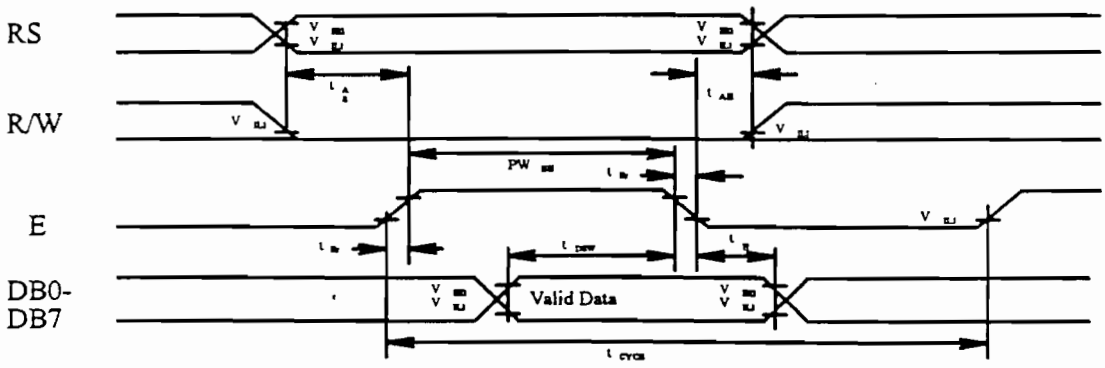


13.4 Interface to HD6805 MP



14. Timing Control

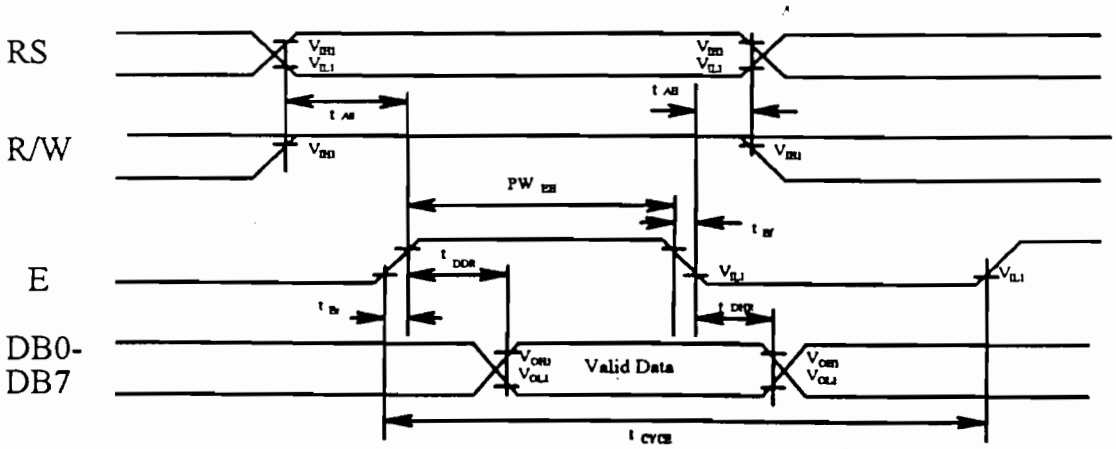
14.1 Write Operation



(Writing data from MPU to LCM)

Item	Symbol	Limit (Min.)	Limit (Max.)	Unit
Enable Cycle Time	t_{CYCE}	666	-	nS
Enable Pulse Width (High level)	PW_{EH}	300	-	nS
Enable Rise/Fall Time	t_{Er}, t_{Ef}	-	25	nS
Address Set-Up Time (RS,R/W, E)	t_{AS}	100	-	nS
Address Hole Time	t_{AH}	10	-	nS
Data Set-Up Time	t_{DSW}	100	-	nS
Data Hold Time	t_H	10	-	nS

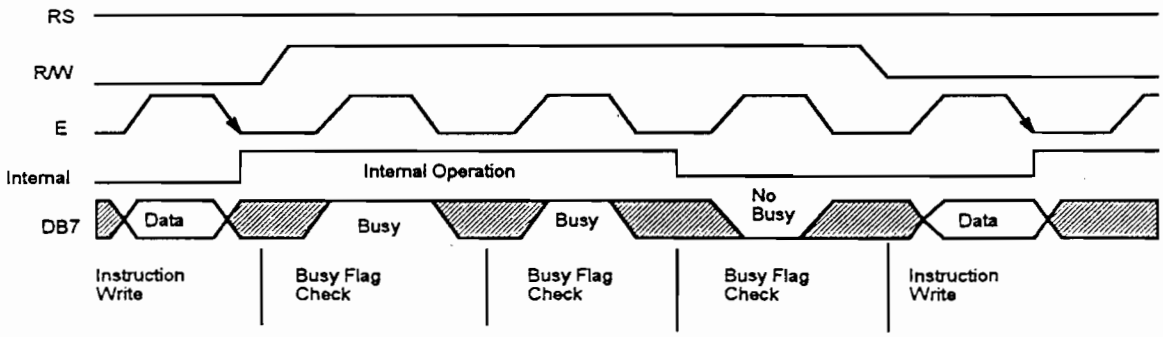
14.2 Read Operation



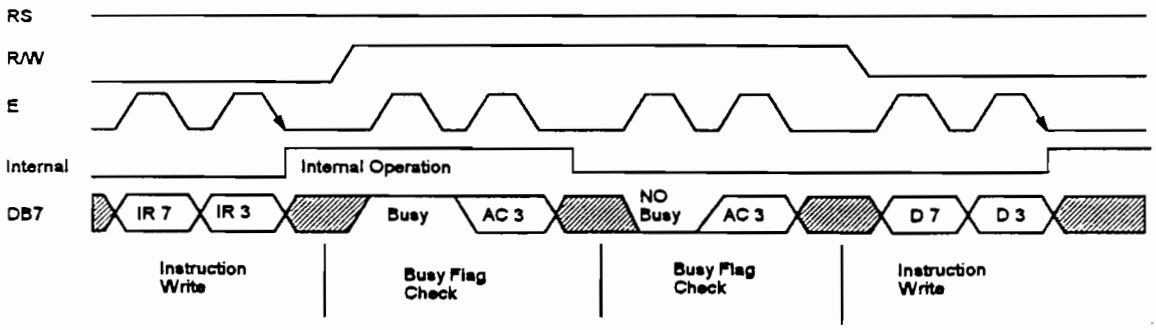
(Reading data from LCM to MPU)

Item	Symbol	Limit (Min.)	Limit (Max.)	Unit
Enable Cycle Time	t_{CYCE}	666	-	nS
Enable Pulse Width (High level)	PW_{EH}	300	-	nS
Enable Rise/Fall Time	t_{Er}, t_{Ef}	-	25	nS
Address Set-Up Time (RS,R/W, E)	t_{AS}	100	-	nS
Address Hole Time	t_{AH}	10	-	nS
Data Delay Time	t_{DDR}	-	190	nS
Data Hold Time	t_{DHR}	20	-	nS

14.3 8-bit busy flag check timing



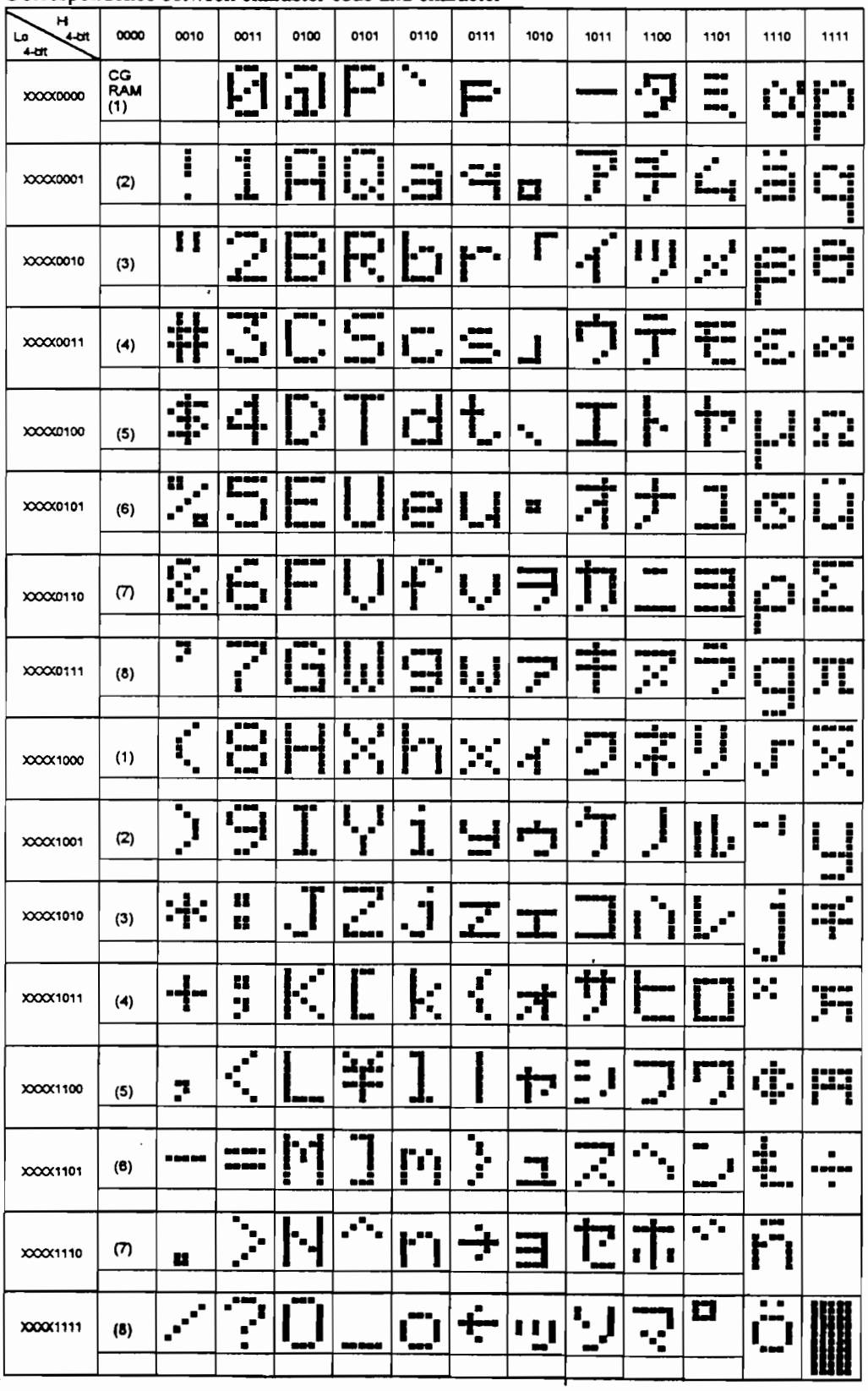
14.4 4-bit busy check timing



(Note) IR 7, IR 3: Instruction 7th bit, 3rd bit; AC3: Address Counter 3 rd bit

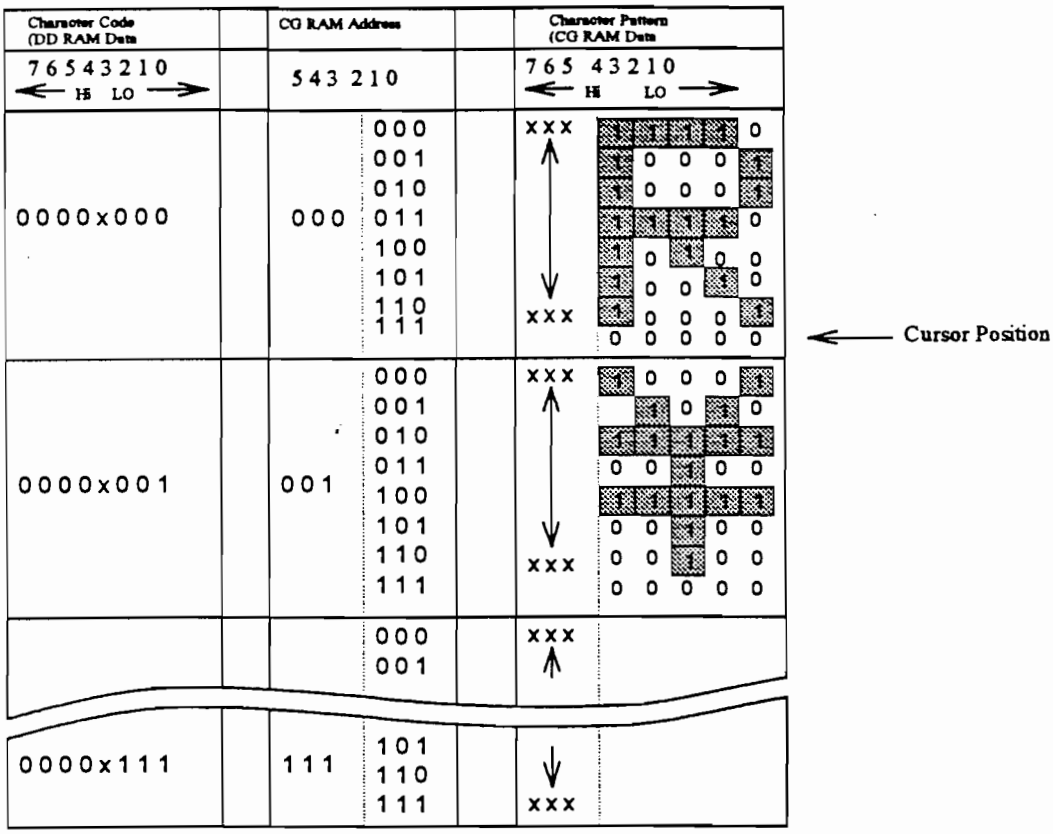
15. Character Generator ROM Map

Correspondence between character code and character



pattern.

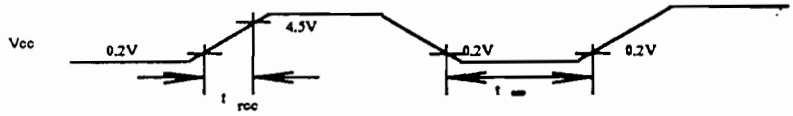
16. User Font Patterns (CG RAM Character)



17. Initialization of LCM

The LCM automatically initializes (reset) when power is turned on using the internal reset circuit. If the power supply conditions for correctly operating of the internal reset circuit are not met, initialization by instruction is required. Use the procedure in next page for initialization.

Vaild Power Supply Condition

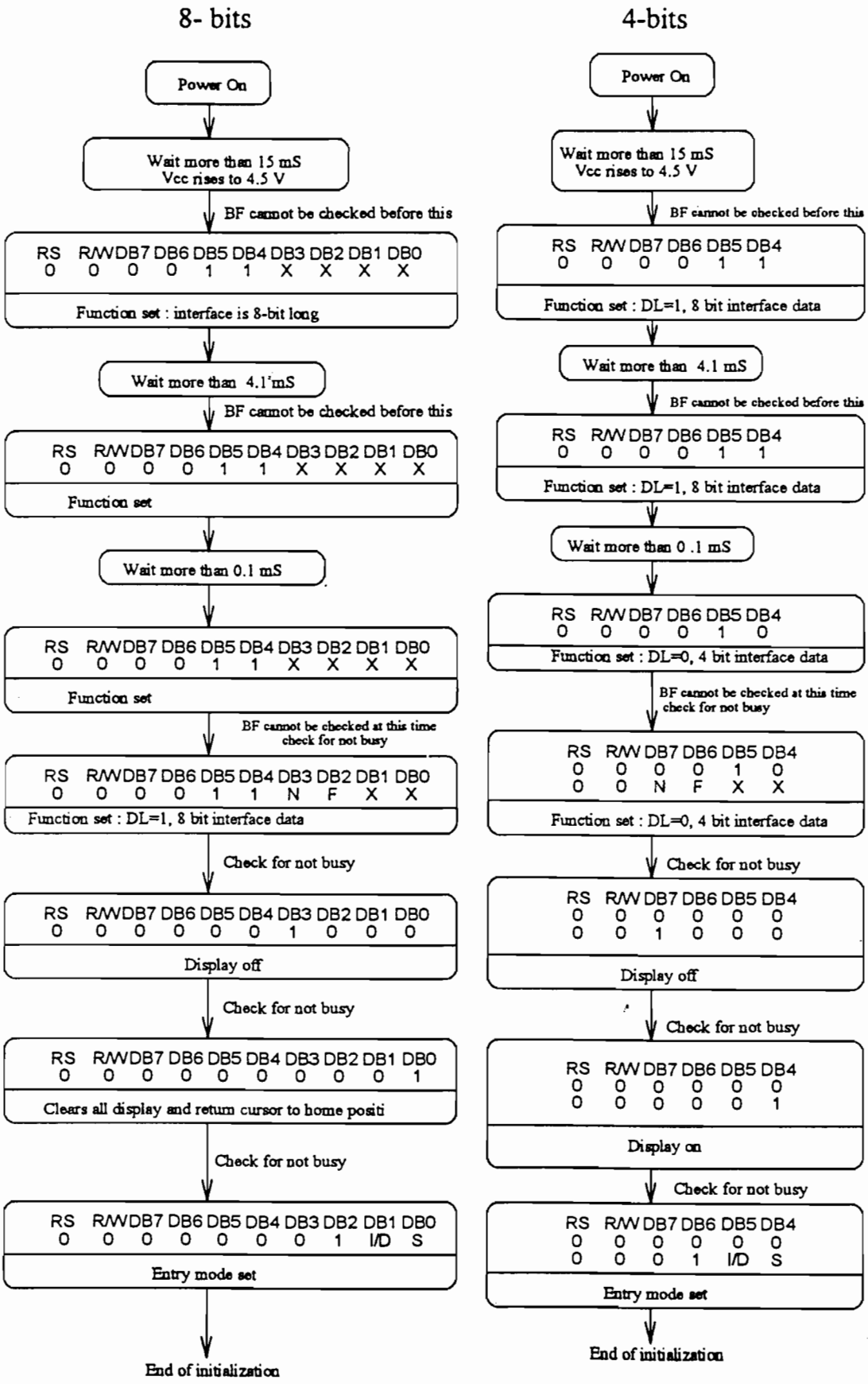


(Not1 1) 0.1 mS ≥ t_{rcc} ≥ 10 mS, t_{OFF}≥1 mS

(Note 2) t_{OFF} stipulates the time of power OFF for momentary power supply dip or when power supply cycles ON and OFF.

Item	Symbol	Test condition	limit (Min.)	limit (Max.)	Unit
Power supply rise time	t_{rcc}	-	0.1	10	ms
Power supply OFF time	t_{OFF}	-	1	-	ms

Initialization by instruction



18. Instruction Set

Instruction operation

Function	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Execu. Time* (Max.)
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears entire display and returns the cursor to home position (address 0).	1.64mS
Return Home	0	0	0	0	0	0	0	0	1	×	Return the cursor to the home position. Also returns the display being shifts to the original position. DD RAM contents remain unchanged. Set DD RAM address to zero.	1.64mS
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	Set cursor move direct and specifies or not to shift the display. These operations are performed during data write/read of DD RAM/CG RAM. For normal operation, sets S to zero. I/D=1; increment; I/D=0; decrement S=1; accompanies display shift when data is written. for normal operation, set to zero.	40μS
Display ON/OFF control	0	0	0	0	0	0	1	D	C	B	Set ON/OFF all display (D), cursor ON/OFF (C), and blink of cursor position character (B). D=1: ON display, D=0: OFF display. C=1: ON Cursor, C=0: OFF cursor, B=1: ON Blink Cursor, B=0, OFF Blink Cursor	40μS
Cursor or display shift	0	0	0	0	0	1	S/C	R/L	×	×	Move the cursor and shift the display without changing DD RAM contents. S/C=1: Display Shift, S/C=0: Cursor move, R/L=1: shift to right, R/L=0: shift to left.	40μS
Function Set	0	0	0	0	1	DL	N	F	×	×	Set the interface date length (DL), number of display lines (N) and character font (F). DL=1: 8 bits, DL=0: 4 bits N=1: 2 lines, N=0:1 lines, F=1: 5×10 dots, F=0: 5×7 dots	40μS
Set CG RAM Addr.	0	0	0	1	ACG						Set CG RAM address. CG RAM data is sent and received after this setting.	40μS
Set DD RAM Addr.	0	0	1	ADD							Set DD RAM address. DD RAM data is sent and received after this setting.	40μS
Read busy flag & Addr	0	0	BF	AC							Reads BUSY FLAG (BF) indicating internal operation is beginning performed and reads address counter contents. BF=1: internally operating. BF=0: can accept instruction.	0μS
Write Data to CG RAM	1	0	WRITE DATA								Write data into DD RAM or CG RAM.	40μS**
Read Data from CG/DD RAM	1	1	READ DATA								Read data from DD RAM or CG RAM	40μS**

* 1. When f_{CP} or f_{OSC} is 250KHz.

2. Execution time changes when frequency changes. When f_{CP} or f_{OSC} is 270KHz: $40\mu S \times \frac{250}{270} = 37\mu S$

** t_{ADD}=6μS

19. Software Examples

19.1 8-bit operation (8-bits 2 lines)

Function	RS RW D7 D6 D5 D4 D3 D2 D1 D0	Display	Description
power on delay			Initialization. No display appears.
Function set	0 0 0 0 1 1 0 0 X X		Sets to 8-bit operation and selects 2-line display and 5x7 dots 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 0 1 0 1 0 1 1 1	W	Write "W". Cursor incremented by one and shift to right
Write data to CG/DD RAM	1 0 0 1 0 0 1 0 0 1	WI	Write "I". Cursor incremented by one and shift to right
Write data to CG/DD RAM	• • •	WINTEK	Write "N", "T", "E", and "K".
Set DD address.	0 0 1 1 0 0 0 0 0 0	WINTEK	Set RAM address so that the cursor is propositioned at the head of the second line.
Write data to CG/DD RAM	• •	WINTEK CR	Write "C", and "R".
Cursor or display shift	0 0 0 0 0 1 0 0 x x	WINTEK CR	Shift only the cursor position to the left.
Write data to CG/DD RAM	• • •	WINTEK CORPORAT	Write "O", "R", "P", "O", "R", "A", and "T".
Entry Mode Set	0 0 0 0 0 0 0 1 1 1	WINTEK CORPORAT	Set display mode shift at the time during writing operation.
Write data to CG/DD RAM	1 0 0 1 0 0 1 0 0 1	INTEK ORPORATI	Write "I". 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	WINTEK CORPORATIO	Return both display and cursor to the original position (Set address to zero.

19.2 4-bit operation (4-Bit, 1 Line)

Function	RS RW D7 D6 D5	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 0 0 0 0 x x		Sets 4-bit operation and selects 1-line display and 5×7 dot 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 0 0 1 1 1 0	_	Turn on display and cursor.
Entry Mode Set	0 0 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 0 1 0 1 1 0 0 1 1 1	W_	Write "W". Cursor incremented by one and shift to right
Same as 8-bit operation			

20. Backlight

20.1 LED Backlight Styles(Bottom Side Type) :

The LED chips are distributed over the whole light area of the illumination unit, which gives the most uniform light. :

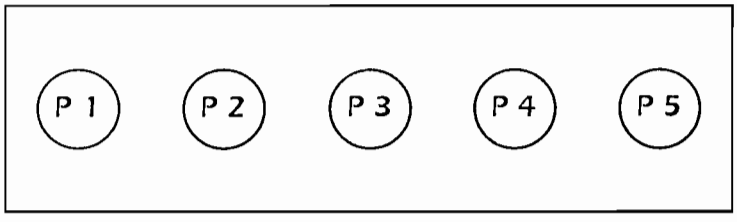
20.2 Data About LED Backlight :

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Supply Current	I	-	200	280	mA	V = 4.2 V	
Supply Voltage	V	-	4.2	4.6	V	-	
Reverse Voltage	V_R	-	-	8	V	-	
Luminous Intensity	I_V	60	-	-	cd/m²	V = 4 .2V	1,2
Luminous Intensity Tolerance		-	-	30	%	V = 4 .2V	3
Peak Emission Wavelength	λ_P	-	572	-	nm	V = 4 .2V	
Life Time		-	20000	-	Hr.	V ≦ 4 .6V	
Color	Yellow Green						

NOTE :

1. Backlight Only
2. Average Luminous Intensity Of P1 - P5
3. Luminous Intensity Tolerance = $\frac{\text{MAX - MIN}}{\text{MAX}} \times 100\ \%$

20.3 Measured Method :



(Effective spatial Destribution)
Hole Diameter ±1⌀; 1 to 5 per Position Measured Luminous Intensity,

21.Specification Of Quality Assuurance

1. Purpose

This standard for Quality Assurance should affirm the quality of LCD module products to supply to _____(Purchaser) by WINTEK CORPORATION (Supplier).

2. Standard for Quality Test

2.1 Inspection:
Before delivering,the supplier should take the following tests,and affirm the quality of product.

2.2 Electro-Optical Characteristics:
According to the individual specification (LM-S-9001) to test the product.

2.3 Test of Appearance Characteristics:
According to the standard of product test (LM-S-9001) to test the product.

2.4 Test of Reliability Characteristics:
According to the definition of reliability on the specification for testing products.

2.5 Delivery Test:
Before delivering,the supplier should take the delivery test.

2.5.1 Test method : According to MIL-STD-105D,General Inspection Level II take a single time.

2.5.2 The defects classify of AQL as following list.

Defect Classify List

Classify	Inspect Item	Nonconforming Status	AQL	Remark
Critical defect	1.Display demage	(1)Non-Display	AQL: 0.65	Product no function
		(2)Occur high current		
		(3)Segment missing		
		(4)LCD with wrong viewing direction		
		(5)Back light unlighten		

Classify	Inspect Item	Nonconforming Status	AQL	Remark
Critical defect	2.Dimension not correct	(1)PCB and bezel out of specification	AQL: 0.65	Can not assembly
Major defect	1.Display	(1)Display scanned disorder	AQL: 1.0	
		(2)display defect		
	2.Back-light	(1)Flash,duct		
		(2)Wrong color		
Minor defect	1.LCD	(1)Dust(Black spot, white spot)	AQL:2.50	Appearance defect
		(2)Polarizer scratch		
		(3)Reflective polarizer with bubble		
		(4)Display segment transfigure		
		(5)Color out of the range of sample color		
	2.COB	(1)The PAD of wire bond exposed		
		(2)Resin not enough (line of wire bonding exposured)		
		(3)Bubble,dust on the COB		
	3.PCB	(1)Dust,remineded solder on the PCB		
		(2)PAD scratch		
Total			AQL:2.50	

3. Nonconforming Analysis & Deal With Manners

3.1 Nonconforming analysis:

3.1.1 Purchaser should supply the detail data of non-conforming sample and the non-suitable state.

3.1.2 After accepting the detall data from purchaser, the analysis of nonconforming should be finished in two weeks.

3.1.2 IF supplier can not finish analysis on time, must announce purchaser before two weeks.

3.2 Disposition of nonconforming:

3.2.1 If find any product defect of supplier during assembly time, suppliermust chance the good product for every defect after recognition.

3.2.2 Both supplier and costomer should analysis the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

4. Agreement items

Both sides should discuss together when the following problems happen.

4.1 There is any problem of standard of quality assurance, and both sides think that must be modified.

4.2 There is any argument item which does not recored in the standard of quality assurance.

4.3 Any other special problem.

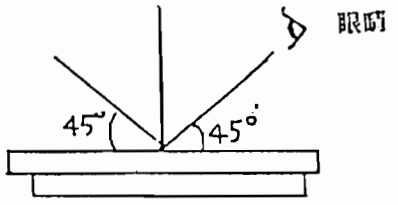
5. Standard of The Product Appearance Test

5.1 Manner of appearance test:

5.1.1 The test must be under 20W x 2 or 40W fluorescent light, and the distance of view must be at 30 cm.

5.1.2 When test the model of transmissive product must add the reflective plate.

5.1.3 The test direction is base on about around 45° of vertical line.

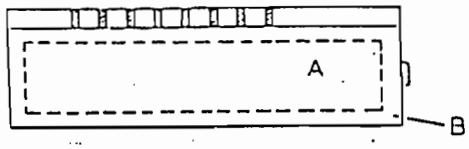


5.1.4 Definition of area:

A Area : Viewing area.

B Area : Out of viewing area.

(Outside viewing area



5.2.Basic principle:

5.2.1 It will accord to the AQL when the standard can not be described

5.2.2 The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

5.2.3 Must add new item on time when it is necessary.

5.3 Standard of appearance inspection:(Unit:mm)

Name：LCM	Inspection specification	Page： 3 / 7 NO：LM-S-9001

Scope — LCM

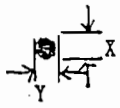
1.Electronic

(1)Display scanned must be complete.
(2)Can not non-display.
(3)The consumer current can not over the specification.
(4) Test result as the following must be reject：
1. Display incomplete
2. Occur high current
3. Display defect

2.Black spot , white spot , dust in LCD

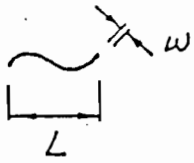
(1)Round type ：As following drawing

$\psi = (x+y) / 2$



Size	Acceptable Q'TY	
Area	A	B
ψ < 0.1	Acceppt no dense	Accept no dense
0.1 < ψ < 0.2	2	
0.2 < ψ < 0.25	1	
0.25< ψ	0	

(2)Line type ：(As following drawing)



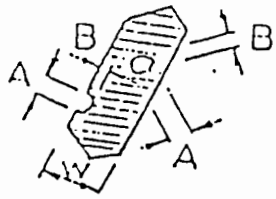
Length	Width	Acceptable Q'TY	
Area		A	B
Accept	0.02≧ L	Acceppt no dense	Accept no dense
3.0 ≧ L	0.03≧ L	2	
2.5 ≧ L	0.05≧ L		
- - -	0.05< L	As round type	

Total acceptable Q'TY (1)+(2)≦3

Set up date：1995.01.24.	Approval	Check	Organization
1996.05.04, Second version	許振昌	吳振明	林惠風

Name：LCM	Inspection specification	Page： 4 / 7 NO：LM-S-7001
Scope	LCM	
Item	Criterion	
3.Polarizer scratch	(1)Follow the dust specification of line type.	
4.Polarizer bubble	(1)Bubble could be seen by eyes evidently to be judged according to black spot specification. (2) Not allow polarizer jutting glass outside.	
5.Segmenter transfigure (Digit, word, sign)	(1)PIN hole, transfigure ：(See below) 1. Segment display ：	

Size ψ	Acceptable Q'TY	
Area	A	B
ψ < 0.20	Acceppt no dense	Accept no dense
0.20 < ψ < 0.50	3	
0.50 < ψ < 1.00	2	
1.00 < ψ	0	
Total acceptable Q·TY	3	

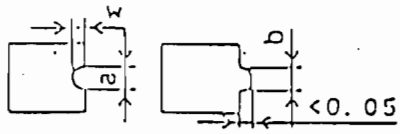
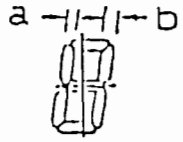
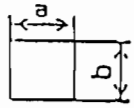


Width	Acceptable Q'TY
W < 0.4	$\psi \leq 0.20$ and $\psi \leq$ 1/2W
W ≥ 0.4	$\psi \leq 0.25$ and $\psi \leq$ 1/3W

1. W：Segment width
2. ψ :(A B) / 2
3. Only allow one defest in one segment.
4. ψ under 0.10 mm is acceptable.

Set up date：1995.01.24.	Approval	Check	Organization
1996. 05. 04, Second version	許振昌	李振明	林薰風

Name：LCM	Inspection specification	Page： 5 / 7 NO：LM-S-9001
Scope	LCM	

Item	Criterion
5.Segmenter transfigure (Digit, word, sign)	2. Dot matrix display：  (2)Segment are not same width 1.  2. Segment are not equal on lenght and size within ± 15 % of production specification. 

Size	Acceptable Q'TY
a 、b ≦ 0.10	Acceppt no dense
(a + b) ／2 ≦ 0.10	Acceppt no dense
(a + b) ／2 ≦ 0.10	3
Total acceptable Q·TY	7

a ≧ b	a/b ≦ 4/3
a < b	a/b > 3/4

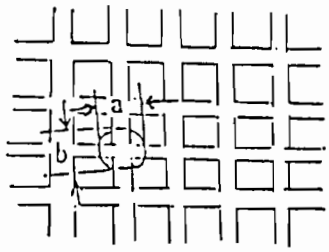
Set up date：1995.01.24.	Approval	Check	Organization
1996.05.04, Second version	許振昌	吳森明	林惠鳳

Name：LCM	**Inspection specification**	Page： 6 / 7 NO：LM-S-9001
Scope	LCM	
Item	Criterion	

5.Segmenter transfigure (Digit, word, sign)

3.Alignment layer defect ：

$\psi = (a + b) / 2$

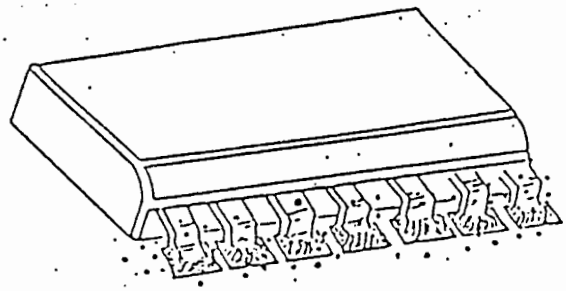


Size ψ	Acceptable Q'TY
$\psi \leq 0.40$	Acceppt no dense
$0.40 < \psi \leq 1.00$	5
$1.00 < \psi \leq 1.50$	3
$1.50 < \psi \leq 2.00$	2
Total acceptable Q'TY	7

6.Color	Sample of the lowest accpetabble quality level.
7.Back-light	(1)The color of backlight should correspond it is specification. (2)Not allow flash and unlighten on backlight. (3)Not allow larger than 0.25 mm dust on backlight.
8.COB	(1)Not allow the PAD of wire bond exposed. (2)Not allow the line type of wire bond on resin. (3)Not allow bubble and dust on resin.

Set up date：1995.01.24.	Approval	Check	Organization
1996.05.04, Second version	許振昌	張	林薰風

勝華科技股份有限公司
WINTEK CORPORATION

Name：LCM	**Inspection specification**	Page：7/7 NO：LM-S-9001
Scope	LCM	
Item	Criterion	
.PCB	(1)Not allow dirty and reminded solder on PCB.  (2)Not allow scratch on pin PAD.	

Set up date：1995.01.24.	Approval	Check	Organization
1996.05.01, Second version	許振昌	朱振明	林惠風

22.Standard Specifications For Reliability

1. Standard Specifications for Reliability of General-purpose LCM

NO	Items	Description
1.	High temperature operation	The sample should be allowed to stand at 50 ±3℃ for 240 (-0,+48) hours under driving condition. (VDD= 5.0 V)
2.	Low temperature operation	The sample should be allowed to stand at 0 ±3℃ for 240 (-0,+48) hours under driving condition.
3.	High temperature resistance	The sample should be allowed to stand at 70 ±3℃ for 240 (-0,+48) hours under no-load condition, and then returning it to normal temperature condition and allowiing it stand for 30 minutes.
4.	Low temperature resistance	The sample should be allowed to stand at -20 ±3℃ for 240 (-0,+48) hours under no-load condition, then returning it to normal temperature condition and allowing it stand for 24 hours
5.	Moisture resistance	The sample should be allowed to stand at 40 ±3℃, 90~95% RH for 240 (-0,+48) hours under no-load condition excluding the polarizer, then taking it out and drying it at normal temperature.
6.	Thermal shock resistance	The sample should be allowed to stand the following 10 cycles of operation : -20℃ for 30 minutes — normal temperature for 5 minutes — +70℃ for 30 minutes — normal temperature for 5 minutes, as one cycle.

2. Testing Conditioons and Inspection Criteria

In Order to do the final test the testing samples must be in room temperature for 24 hours, to ensure stability.

NO	IITEM	Test Model	Inspectioner Criteria
1.	Current Consumption	Refer To Specification	The current must be nuder three times of initiated test.
2.	Contrast	Refer To Specification	The contrast must be large than half of initiated test.
3.	Appearance	Visual inspection	Defect free.

3. Life Time

NO	Items	Description
1.	Life time	Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperture (25±10°C), normal humidity (45±20% RH), and in area not exposed to direct sun light . (Life time of backlight,please refer to "Data about backlight".)

Note : From our experience the life time of high humidity operation and high temperature operation as above memtioned could be achieved.