		CLOV	ER DISPLA	Y LTD.
		LCD MODULE	<b>SPECIFICA</b>	ΓΙΟΝ
		Model: CG12864	A	_ • _
			Revision	02
			Engineering	Timmy Kwan
			Date	18 July 2011
			Our Reference	X9040
ΓEL	k : (	<sup>st</sup> FLOOR, EFFICIENCY HOUSE, KOWLOON, HONG KONG. 852) 2341 3238 (SALES OFFICE)	(852) 2342 8228 (GE	
TEL FAX	k : (( : ()	KOWLOON, HONG KONG. 852) 2341 3238 (SALES OFFICE) 852) 2357 4237 (SALES OFFICE)	(852) 2342 8228 (GE	
ADDRES FEL FAX E-MAIL URL	• • • • • • • • • • • • • • • • • • •	KOWLOON, HONG KONG. 852) 2341 3238 (SALES OFFICE)	(852) 2342 8228 (GE	

## **MODE OF DISPLAY**

#### **Display mode Display condition** STN : Yellow green Reflective type Grey

Blue (negative)

**FSTN** positive **FSTN** negative

- Transflective type
- Transmissive type
- Others

# **Viewing direction**

- 6 O' clock
- $\square$  12 O' clock
- $\Box$  3 O' clock
- 9 O' clock

# **LCD MODULE NUMBER NOTATION:**

<u>CG12864A</u> -	N	N	- <u>S</u>	<u>R</u>	- <u>N 6</u>	– <u>T</u>	
1							

- (1) (2) (3) (4) (5) (6) (7) (8)
- \*(1)---Model number of standard LCD Modules
- \*(2)---Backlight type
  - N No backlight
  - E EL backlight
  - L Side-lited LED backlight
  - M– Array LED backlight
  - C CCFL

\*(3)---Backlight color

- N No backlight
- A Amber
- B Blue
- O– Orange
- W-White
- Y Yellow green
- M Mutli Colour
- \*(4)---Display mode
  - T TN
    - V TN (Negative)
    - S STN Yellow green
    - G STN Grey
    - B STN Blue (Negative)
    - F-FSTN
    - N FSTN (Negative)
- \*(5)---Rear polarizer type
  - **R** Reflective
  - F Transflective
  - T Transmissive
- \*(6)---Temperature range
  - N Normal
  - W– Extended
- \*(7)---Viewing direction
  - 6 6 O'clock
    - 2 12 O'clock
    - 3 3 O'clock
    - 9-9 O'clock
- \*(8)---Special code for other requirements
  - (Can be omitted if not used)

#### **GENERAL DESCRIPTION**

Display mode	:	128 X 64 dots, Graphic COG LCD module
Interface	:	Parallel/serial
Driving method	:	1/65 duty, 1/9 bias
Controller IC	:	Ultrachip UC1701X or equivalent For the detailed information, please refer to the IC specifications.

## **MECHANICAL DIMENSIONS**

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension			Dot Pitch	0.27(L)x0.27(W)	mm
No backlight	43.0(L) x29.14 (W) x2.1 (H)(MAX)	mm	Dot Size	0.255(L)x0.255(W)	mm
LED side-lited backlight	44.3(L) x30.14 (W) x 7.9(H)	mm	Viewing Area	37.04(L)x20.24(W)	mm

#### **CONNECTOR PIN ASSIGNMENT**

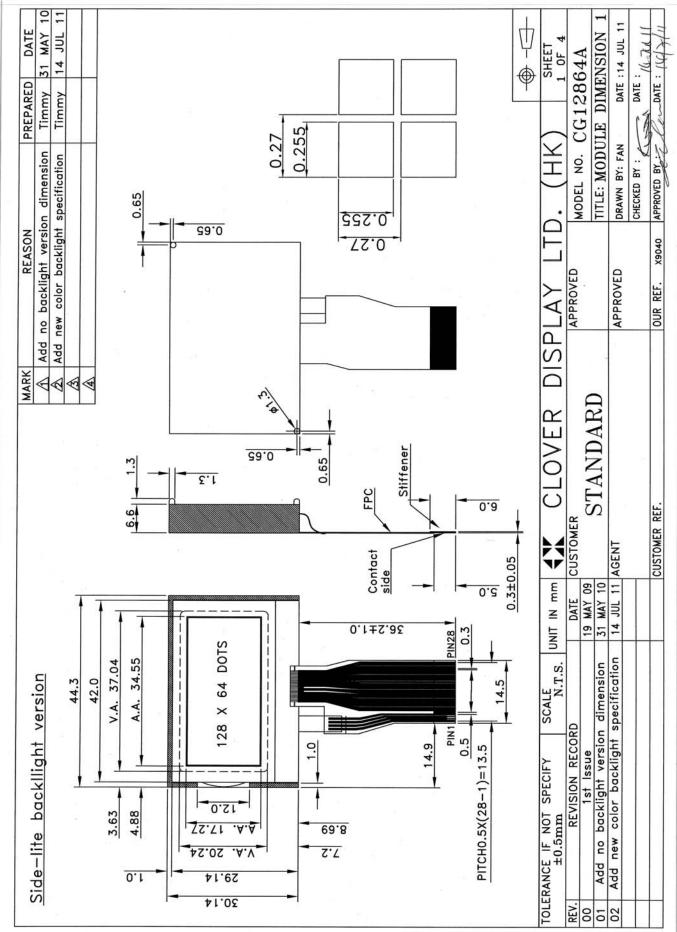
			-		
Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	А	Supply voltage for backlight(+VE)	15	VDD	Power supply for logic(VDD)
2	K1	Supply voltage for backlight(-VE)	16	D7(SID)	Data bus(serial data)
3	*K2	For RGB	17	D6(SCK)	Data bus(serial clock)
4	*K3	For RGB	18	D5	
5	NC	No connection	19	D4	
6	BM1		20	D3	
7	BM0	Bus mode select	21	D2	Data bus
8	VLCDOUT	Main LCD assure suggla	22	D1	
9	VLCDIN	Main LCD power supply	23	D0	
10	VB1+		24	WR1	Dead/write exerction control
11	VB1-		25	WR0	Read/write operation control
12	VB0-	LCD bias voltage	26	CD	Register select
13	VB0+		27	RST	Reset
14	VSS	Power supply (0V)	28	CS0	Chip select

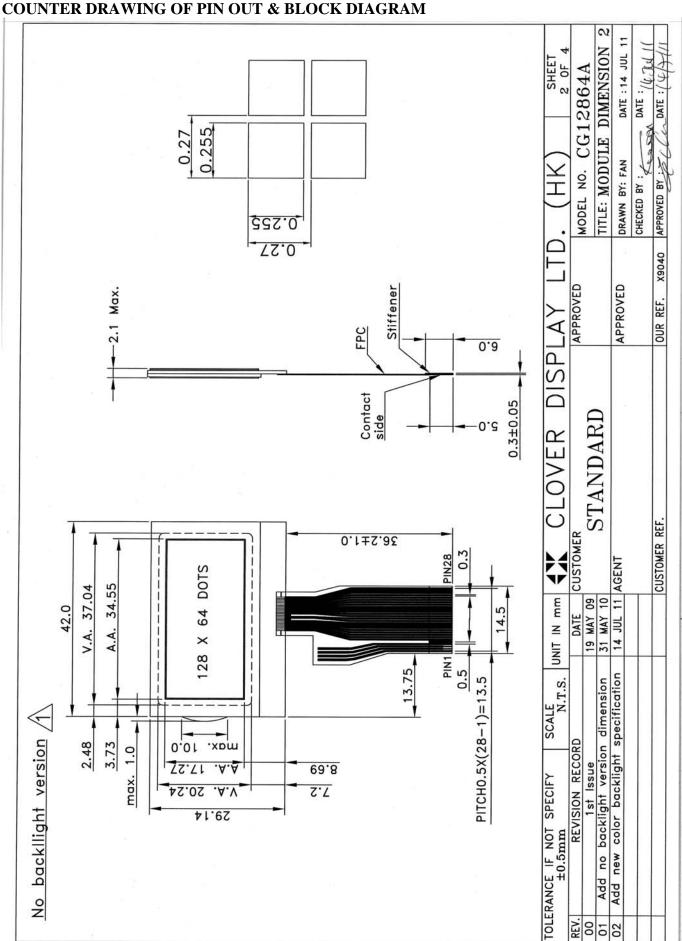
Note (\*): Pin 3, 4 are used for RGB backlight version



CG12864A

#### COUNTER DRAWING OF MODULE DIMENSION





128X64 DOTS LCD PANEL 60 COM 564 DOTS LCD PANEL 60 00 561 to scora scora 52 00 561 to scora 561 to scora 571 to scora	FUNCTION	Supply voltage for backlight (+VE)	Supply voltage for backlight (-VE)	CB	connection	mode select	ICD power supply		LCD bias voltage		(AO) Alddns .	Power supply for logic(VDD)	Data bus (Serial data) Data hus (Serial alaat)			Sud		Read/write operation control	er select	select	22	( ILK ) SHEET	• (111)   3 0F 4 MODEL NO. CG12864A	TITLE: PIN OUT & BLOCK DIAGRAM	DRAWN BY: FAN DATE : 14 JUL 11 CHECKED BY : DATE :	
128X64 DOTS LCD PANEL LCD PANEN LD SIGURA LD SIGURA		Supply	Supply For B	For R		Bus	Koin				Power			+			1	Read/	Register	Chip			<u>ه</u> . ۲	=	DRA	
128X64 DOTS LCD PANEL LCD PANEL LCD PANEL SEGI to SEGI28 SEGI to SEGI28 SEGI to SEGI28 COM35 to COM64 Table COM64 SEGI to SEGI28 COM35 to COM64 Table COM64 SEGI to SEGI28 COM35 to COM64 Table COM65 Table COM65	SYMBOL	A	ΣS	X	NC N	BM1 BM0	VLCDOU	VLCDIN VR1+	VB1-	VB0+	VSS	DDD DDD	nic)/n	חס(סרו	D4 D3	D2	6	WR1 WR0	CD	CSO					ROVED	
128X64 DOTS LCD PANEL LCD PANEL sect to sect28 sect to sect28 OUC1701X OR EQUIVALENCE WIT Normal Sectors *RGB backlight write and any UNT IN mm CLOVER DISE write and any write any write and any write any w	PIN NO.	*1	*2	**4	5	9	80	6 10	11	13	14	15	17	18	19	21	23	24	26	28		<		_	APPR	
ון הרופון או איז	178V61 DOTO		LCU PANEL	00	<u>ot 1</u>		SEG128	/ .			•		• UC1701X				side-lifed				de-lite backlight version only 38 side-lite backlight version only		DATE CUSTOMER	ton dimension 31 MAY 10	14 JUL 11	

SPEC. REV.02

CG12864A

## **ELECTRICAL CHARACTERISTICS**

Conditions: VSS=0V, Ta=25°C

ELECTRICAL CHARACT	ERISTICS		C	onditions: $VSS=0V$ ,	Ta=25 ()
Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	3.05	3.3	3.55	V
Supply Current for Logic	IDD	_	0.29	0.43	mA
Operating Voltage for LCD (*)	VLCD	8.55	9.0	9.45	V
'High' Level Input Voltage	VIH	0.8VDD	—	_	v
'Low' Level Input Voltage	VIL	_		0.2VDD	V

Note (\*): There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

#### Side-lited LED BL:

Constant voltage driving:

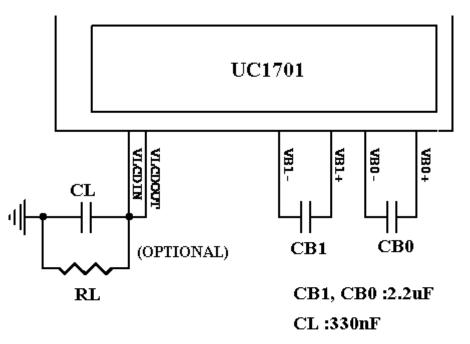
Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Backlight current (White)	$I_{BL}$	—	15	20	mA	$V_{BL} = 3.3V$
Backlight current (Blue)	$I_{BL}$	—	15	20	mA	$V_{BL} = 3.3V$
Backlight current (Yellow Green)	$I_{BL}$	—	24	30	mA	$V_{BL} = 3.3V$
Backlight current (Red)	$I_{BL}$	_	24	30	mA	$V_{BL} = 3.3V$
Backlight current (Amber)	$I_{BL}$	—	24	30	mA	$V_{BL} = 3.3V$
Backlight current (Orange)	$I_{BL}$	_	24	30	mA	$V_{BL} = 3.3V$

#### **RGB BL:**

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Backlight current (Red)	I <sub>BL</sub>	—	10	15	mA	$V_{BL} = 4.0V$
Backlight current (Green)	I <sub>BL</sub>	—	15	20	mA	$V_{BL} = 4.0V$
Backlight current (Blue)	I <sub>BL</sub>	—	15	20	mA	$V_{BL} = 4.0V$

## **REFERENCE CIRCUIT EXAMPLE**



CG12864A

#### ABSOLUTE MAXIMUM RATINGS

Please make sure not to exceed the following maximum rating values under the worst application conditions

		<u> </u>	**	
Item	Symbol	Rating (for normal temperature)	Rating (for wide temperature)	Unit
Supply Voltage	Vdd	-0.3 to +4.0	-0.3 to +4.0	V
Input Voltage	VT	-0.4 to VDD +0.3	-0.4 to VDD +0.3	V
Operating Temperature	Topr	0 to 50	-20 to 70	°C
Storage Temperature	Tstg	-10 to 60	-30 to 80	°C

#### **INSTRUCTIONS TABLE**

The following is a list of host commands supported by UC1701x

C/D:	0: Control,	1: Data
W/R:	0: Write Cycle,	1: Read Cycle

# Useful Data bits – Don't Care

	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
1.	Write Data Byte	1	0	#	#	#	#	#	#	#	#	Write 1 byte	N/A
2.	Read Data Byte	1	1	#	#	#	#	#	#	#	#	Read 1 byte	N/A
3.	Get Status	0	1	ΒZ	MX	DE	RST	0	0	0	0	Get Status	
4.	Set Column Address LSB	0	0	0	0	0	0	#	#	#	#	Set CA [3:0]	0
4.	Set Column Address MSB	0	0	0	0	0	1	#	#	#	#	Set CA [7:4]	0
5.	Set Power Control	0	0	0	0	1	0	1	#	#	#	Set PC[2:0]	000b
6.	Set Scroll Line	0	0	0	1	#	#	#	#	#	#	Set SL[5:0]	0
7.	Set Page Address	0	0	1	0	1	1	#	#	#	#	Set PA[3:0]	0
8.	Set V <sub>LCD</sub> Resistor Ratio	0	0	0	0	1	0	0	#	#	#	Set PC[5:3]	100b
9.	Set Electronic Volume	0	0	1	0	0	0	0	0	0	1		
9.	(double-byte command)	0	0	0	0	#	#	#	#	#	#	Set PM[5:0]	20H
10.	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0b
11.	Set Inverse Display	0	0	1	0	1	0	0	1	1	#	Set DC[0]	0b
12.	Set Display Enable	0	0	1	0	1	0	1	1	1	#	Set DC[2]	0b
13.	Set SEG Direction	0	0	1	0	1	0	0	0	0	#	Set LC[0]	0b
14.	Set COM Direction	0	0	1	1	0	0	#	-	-	-	Set LC[1]	0b
15.	System Reset	0	0	1	1	1	0	0	0	1	0	System Reset	N/A
16.	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A
17.	Set LCD Bias Ratio	0	0	1	0	1	0	0	0	1	#	Set BR	0b
18.	Set Cursor Update Mode	0	0	1	1	1	0	0	0	0	0	AC3=1, CR=CA	N/A
19.	Reset Cursor Update Mode	0	0	1	1	1	0	1	1	1	0	AC3=0, CA=CR.	N/A
20.	Set Static Indicator OFF	0	0	1	0	1	0	1	1	0	0	NOP	N/A
21.	Set Static Indicator ON	0	0	1	0	1	0	1	1	0	1	NOP	N/A
21.	Set Static Indicator	0	0	-	-	-	-	-	-	-	-	NOF	N/A
22.	Set Booster Ratio	0	0	1	1	1	1	1	0	0	0	NOP	00b
22.	(double-byte command)	0	0	0	0	0	0	0	0	#	#	NOF	000
23.	Set Power Save (compound command)	0	0	#	#	#	#	#	#	#	#	Display OFF & All Pixel ON	N/A
24.	Set Test Control	0	0	1	1	1	1	1	1	Т	T	For UCI only	N/A
24.	(double-byte command)	0	U	-	#	#	#	#	#	#	#	Do NOT use	IN/A
25.	Set Adv. Program Control 0	0	0	1	1	1	1	1	0	1	0		
	(double-byte command)	0	0	#	0	0	1	0	0	#	#	Set TC, WA[1:0]	90H
26.	Set Adv. Program Control 1	0	0	1	1	1	1	1	0	1	1	For UCI only	
	(double-byte command)	0	0	#	#	#	#	#	#	#	#	Set APC1	N/A

\* Other than commands listed above, all other bit patterns result in NOP (No Operation).

#### **RECOMMENDED INITIAL SETTINGS**

Set ADV. Program Control (double-byte command) : FAH, 90H Set SEG Direction : A0H Set COM Direction : C8H Set LCD Bias Ratio : A2H Set VLCD Resistor Ratio : 25H Set Power Control : 2FH Set Electronic Volume(double-byte command) : 81H , 19H Set Cursor Update Mode: E0H Set Page Address (page=0): B0H Set Scroll Line (row=0): 40H Set Column Address (column=0) (double-byte command) : 00H(LSB), 10H(MSB) Set Display Enable: AFH

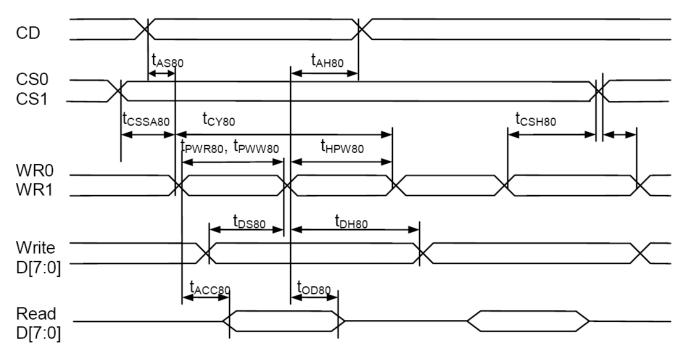
CG12864A

#### **DISPLAY DATA RAM**

PA(50)         0         AddeCas         Subsection         Subsection       <			Line																Ν	1Y=0		M	/=1	
101         011 <td>PA[3:0]</td> <td>-</td> <td></td> <td>_</td> <td></td>	PA[3:0]	-																					_	
0000         03         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         052         051         051         052         051 <td></td>																								
0000         03         03H         04H         04         CS2         CS1         C44         CS2         CS1         C45         CS2																				_				
0000         64         64         64         64         621         621           66         684         68         64         621         621         64         621         621         64         621         64         621         64         621         64         621         64         621         621         64         621         64         621         64         621         64         621         64         621         64         621         64         621         626         628         642         611         620         641         621         626         638         641         611         636         656         638         641         611         636         636         638         631 <td></td>																								
06         08H 07         07 <th< td=""><td>0000</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Page 0</td><td>-</td><td></td><td></td><td></td><td></td><td></td><td>_</td><td></td><td></td><td></td><td></td></th<>	0000												Page 0	-						_				
06         08H         0         0         0         08         0         0         08         0         0         08         0 </td <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td>																				_				
D0         C8H         C																				_				
01         09H         02         0AH         02         0AH         02         0BH         02         0CH		D7																	C8	_		C41		
02         0.0H         0.0 <td></td> <td>D0</td> <td>08H</td> <td></td> <td>C9</td> <td>C57</td> <td>C56</td> <td>C40</td> <td>C17</td> <td>C1</td>		D0	08H																C9	C57	C56	C40	C17	C1
0001         03         08H         0 </td <td></td> <td>D1</td> <td>09H</td> <td></td> <td>C10</td> <td>C58</td> <td>C55</td> <td>C39</td> <td>C16</td> <td></td>		D1	09H																C10	C58	C55	C39	C16	
0001         D4         CCH         C13         CE1         CE3         CE3 <td></td> <td>D2</td> <td>0AH</td> <td></td> <td>C11</td> <td>C59</td> <td>C54</td> <td></td> <td>C15</td> <td></td>		D2	0AH																C11	C59	C54		C15	
D4         OCH         OCH         CH         C	0001	D3	OBH										Page 1						C12	C60			C14	
DS         DEF																								
07         02         03         13H         0 </td <td></td>																								
D0         10H         D2         10H         D2         10H         D2         10H         D2         12H         D2														_						_				
D1         11111 D2         D2         1121 D3         D3		_						_		_														
D2         12H         D4         13H         D4         13H         C46         C30         C7         C46         C30         C7         C46         C30         C7         C46         C30         C7         C40         C46         C30         C7         C40         C46         C30         C7         C40         C46         C30         C4         C46         C30         C4         C40         C30         C44         C40         C30         C44         C41         C32         C6         C44         C30         C4         C1         C22         C6         C41         C23         C30         C41         C31         C46         C30         C4         C1         C22         C6         C41         C21         C41         C22         C61         C42         C22         C61         C41         C22         C61         C41         C23         C11         C33         C41         C31         C41         C31         C41         C31         C41         C31         C41         C31         C41         C31<																				_				
0010         D3         13H D6         15H D7         17H D7											_		1 F					-		_				
0010       D4       144       1																				_				
D5         16H D7         C </td <td>0010</td> <td></td> <td>Page 2</td> <td>-</td> <td></td> <td></td> <td></td> <td><math>\square</math></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td>	0010												Page 2	-				$\square$		_				
D6         16H         C <thc< th="">         C         C         C</thc<>																				_				
D7         17H D1         D7         17H D1         D7         18H D1         D7         18H D1 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>																								
D0         18H D2         19H D3         18H D4         12H D4																				_				
D1         19H D3         18H D4         10H D4         10H D4         10H D4         10H D4         10H D5         10H D6         10H D7         10H D7 <td></td> <td>Í</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td>														Í						_				
0011         03         18H D6         1														L						_				C48*
0011       04       1CH       0 </td <td></td> <td>D2</td> <td>1AH</td> <td></td> <td>C27</td> <td>C11</td> <td>C38</td> <td>C22</td> <td>C63</td> <td>C47</td>		D2	1AH																C27	C11	C38	C22	C63	C47
D4         1CH         C23         C13         C35         C29         C14         C25         C19         C60         C44           D6         1EH         D7         1FH         D         C14         C25         C14         C25         C14         C25         C14         C25         C19         C60         C44           D0         20H         D1         C14         <	0011	D3	1BH										Page 3						C28	C12	C37	C21	C62	C46
D6         1EH D7         C33         C15         C34         C18         C59         C43           D0         20H D1         21H D1         21H D2         22H D3         23H D3         C16         C51         C16         C57         C41           0100         D3         23H D5         22H D3         C16         C53         C17         C32         C16         C57         C41           05         29H D5         C33         C17         C32         C16         C57         C41           05         29H D5         C33         C17         C32         C16         C57         C41           05         29H D5         C33         C17         C32         C16         C57         C41           0101         C33         C37         C17         C32         C16         C51         C35           0101         D3         28H D1         D         D         D         D         C41         C26         C24         C28         C43         C27         C22         C6         C44         C28         C44         C28         C41         C26         C44         C28         C21         C5         C48         C33 <td< td=""><td>0011</td><td>D4</td><td>1CH</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>rageo</td><td></td><td></td><td></td><td></td><td></td><td>C29</td><td>C13</td><td>C36</td><td>C20</td><td>C61</td><td>C45</td></td<>	0011	D4	1CH										rageo						C29	C13	C36	C20	C61	C45
07         1FH           00         20H           01         21H           02         22H           01         21H           02         22H           01         21H           02         22H           0100         22H           0100         22H           0100         22H           0100         22H           0100         22H           011         21H           011         21H           011         21H           010         22H           010         22H           011         21H           011         21H           011         22H           011         22H           011         22H           011         22H           011         22H           02         2AH           011         22H           02         2AH           011         22H           02         2AH           010         30H           011         23H           021         24H           02		D5																	C30	C14	C35			
00         20H         21H         22         23H           0100         00         22         22H																								
0100         01         21H         0         0         0         03         23H         0         0         03         23H         0         0         03         23H         0         0         03         03H         03         03H         0         03         03H         0         0         03H         0         0         03H         0         0         03H         0         0         03H         0         0         0         03H         0																				_				
D2         22H         C30         C14         C35         C19         C30         C14         C55         C37           D4         24H         D5         25H         D6         26H         D6         26H         D6         26H         D6         26H         D6         22H         C22         C21         C22         C10         C51         C53         C37         C21         C28         C10         C51         C55         C37         C21         C22         C22         C21         C21         C53         C37         C21         C22         C23         C26         C10         C51         C55         C37         C24         C22         C22         C22         C22         C23         C26         C23         C26         C23         C26         C23         C27         C24         C21         C24         C21         C24         C21         C24         C22         C41         C25         C24         C23         C26         C24         C23         C26         C24         C23         C26         C24         C23         C26         C24         C24         C24         C24         C23         C26         C43         C27         C24																				_				
0100 D3 23H D4 24H D6 26H D6 28H D1 29H D1 29H D2 2AH D1 29H D2 2AH D1 29H D2 2AH D1 29H D2 2AH D1 29H D2 2AH D1 29H D4 2CH D5 20H D1 29H D4 2CH D5 20H D4 2CH D5 2BH D4 2CH D5 2BH D6 28H D1 29H D4 2CH D5 2BH D6 28H D6 28H D1 29H D4 2CH D5 20H D6 28H D6 38H D6 38H D6 38H D6 38H D6 38H D6 38H D6 38H D7 37H D1 38H D6 38H D6 38H D7 37H D0 38H D7 37H D1 38H D6 38H D7 37H D7 37H D1 38H D6 38H D7 37H D7 37H																				_				
0100       D4       24H         D5       25H         D6       26H         D7       27H         D0       28H         D1       29H         D2       28H         D1       29H         D2       28H         D2       28H         D4       20H         D2       28H         D4       20H         D5       20H         D5       20H         D5       20H         D5       20H         D5       38H         D4       20H         D5       38H         D4       20H         D5       38H         D4       34H         D5       38H         D6       38H         D7       37H         D6       38H         D7       37H <td></td> <td><math>\square</math></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td>																		$\square$		_				
D5         23H         C38         C22         C27         C11         C52         C35         C36         C23         C23         C26         C10         C51         C35           D0         28H         D2         2AH         D4         D4         D4         D4         C41         C22         C26         C23         C7         C48         C32           D1         D3         2BH         D4         D4         D4         D4         D4         D4         C44         C28         C21         C5         C46         C33         C44         C28         C21         C5         C44         C28         C21         C5         C44         C28         C21         C5         C46         C33         C44         C28         C21         C5         C46         C33         C44         C28         C21         C5         C46         C33         C47         C31         C11         C41         C25         C46         C33	0100							_					Page 4											
D6         26H         C39         C23         C26         C10         C51         C35           0101         28H         0																		-						
D7         27H         D0         28H         D1         C40         C42         C25         C9         C50         C34           D1         29H         D2         2AH         D2         2AH         D2         C40         C24         C25         C29         C50         C34         C32         C41         C25         C24         C68         C49         C33         C44         C32         C43         C27         C22         C6         C47         C31         C44         C28         C20         C44         C28         C20         C44         C28         C20         C44         C28         C29         C44         C28         C20         C44         C28         C20         C44         C28         C20         C44         C28         C21         C1         C44         C28         C21         C1         C44         C28         C21         C1         C44         C24         C26         C46         C30         C11         C44         C28         C21         C44         C22         C46         C33         C11         C23         C24         C25         C36         C11         C1         C23         C21         C1         C1         C1<														-										
D0         28H           D1         29H           D2         2AH           D3         2BH           D4         2CH           D5         2DH           D6         2EH           D7         2FH           D1         23H           D1         23H           D6         2EH           D7         2FH           D0         30H           D1         31H           D2         23H           D1         31H           D2         23H           D1         31H           D2         23H           D1         31H           D2         33H           D4         D1           D3         38H           D1         39H           D2         3AH           D1         39H           D2         3AH           D3         BH <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td><math>\square</math></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>																		$\square$						
D1         29H           D2         2AH           D4         2CH           D5         2DH           D6         2EH           D7         2FH           D7         2FH           D0         30H           D2         32H           D7         2FH           D7         2FH           D2         32H           D7         2FH           D2         33H           D2         32H           D3         33H           D2         32H           D3         33H           D2         32H           D3         33H           D2         32H           D4         2           D5         35H           D6         36H           D7         37H           D0         38H           D1         39H           D2         3AH           D2         3AH           D2         3AH           D2         3AH           D2         3AH           D3         38H           D2         3AH <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>_</td><td></td><td></td><td></td><td></td></t<>										-										_				
D2         2AH         Clip         Cl																				_				
0101 D3 2BH D4 2CH D5 2DH D6 2EH D7 2FH D0 30H D1 31H D2 32H D6 3BH D6 36H D1 38H D1 38H																								
D4       2CH       C4       C45       C29       C20       C4       C45       C29         D6       2EH       D7       2FH       D0       30H       D1       C45       C29       C20       C4       C45       C29         D0       30H       D0       30H       D0       C45       C29       C20       C4       C42       C28         D0       30H       D0       C4       C45       C29       C20       C4       C42       C28         D1       31H       D1       D1       D1       C50       C34       C15       C41       C28         D1       31H       D1       D1       D1       C50       C34       C15       C41       C28         D1       31H       D1       D1       D1       D1       C51       C35       C14       C20       C53       C37       C12       C20       C33       C21       C33       C21       C33       C21       C33       C11       C37       C22       C33       C11       C37       C21       C20       C34       C18       C20       C55       C39       C10       C33       C17       C34       C19	0404	D3											D						C44	C28		C5	C46	
D6         2EH         C47         C31         C18         C2         C43         C27           D0         30H         0	0101	D4	2CH										Page 5						C45	C29	C20	C4	C45	C29
D7         2FH         C <thc< th="">         C         C         <thc< th=""></thc<></thc<>		D5	2DH																C46	C30	C19	C3	C44	C28
D0         30H         C49         C33         C16          C41         C25           0110         D3         33H         D3         C43         C16          C40         C24           0110         D3         33H         D4         D4         A4H         D5         35H         D6         C36H		D6	2EH																C47	C31	C18	C2	C43	C27
D1         31H         C <thc< th=""> <thc< th="">         C         <thc< th=""></thc<></thc<></thc<>		D7	2FH																C48	C32	C17	C1	C42	C26
D2       32H       D3       33H       C1       C3       C3       C3       C3       C23         D110       D3       33H       D4       34H       D5       35H       C4       C3       C21         D6       36H       D7       37H       C3       C1       C3       C1       C3       C1       C3       C21         D0       38H       D1       39H       C3       C5       C4       C3       C1       C3       C1       C3       C1       C3       C21         D0       38H       D2       3AH       D2       D4       D4       D4       C6       C5       C39       C10        C36       C19         D1       39H       D2       3AH       D2       D4       D4 </td <td></td> <td></td> <td>30H</td> <td></td> <td>C49</td> <td>C33</td> <td></td> <td></td> <td>C41</td> <td>C25</td>			30H																C49	C33			C41	C25
D2       32H       D3       33H       C1       C3       C3       C3       C3       C23         D110       D3       33H       D4       34H       D5       35H       C4       C3       C21         D6       36H       D7       37H       C3       C1       C3       C1       C3       C1       C3       C21         D0       38H       D1       39H       C3       C5       C4       C3       C1       C3       C1       C3       C1       C3       C21         D0       38H       D2       3AH       D2       D4       D4       D4       C6       C5       C39       C10        C36       C19         D1       39H       D2       3AH       D2       D4       D4 </td <td></td> <td>D1</td> <td></td> <td><math>\square</math></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		D1																$\square$						
0110       D4       34H         D5       35H         D6       36H         D7       37H         D0       38H         D1       39H         D2       3AH         D2       3AH         D2       3AH         D2       3AH         D4       C63         C63       C37       C12        C36       C20         C55       C39       C10        C35       C19         C57       C41       C8        C33       C17         D2       3AH         C58       C42       C7        C33       C14         D4       3CH          C31       C15       C60       C44       C5        C33       C14         C61       C45       C4        C29       C13         C62       C46       C3        C20       C13       C62       C46       C3        C21       C64       C42       C4        C29       C13       C62       C46       C4		D2												⊢				⊢┦		_				
D4       34H         D5       35H         D6       36H         D7       37H         D0       38H         D1       39H         D2       3AH         D1       39H         D2       3AH         D1       39H         D2       3AH         D1       39H         D2       3AH         D4       3CH         D5       3DH         D4       CH         D1       39H         D2       3AH         D4       CH         D4       CH         D4       CH         D4       CH         D5       3DH         D6       SEH         D7       SFH         1000       D0         40H       CH         D7       SFH         D6       SEH         D7       SFH         D0       CH       CH         D7       SFH         D00       40H         D7       SFH         D00       CH       CH       CH         D7 <td>0110</td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td>-</td> <td></td> <td>—</td> <td></td> <td></td> <td>Page 6</td> <td>⊢</td> <td></td> <td>_</td> <td></td> <td>⊢┦</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	0110				-			-		—			Page 6	⊢		_		⊢┦						
D6       36H         D7       37H         D0       38H         D1       39H         D2       3AH         D2       3AH         D2       3AH         D3       3BH         D4       3CH         D5       3DH         D6       3EH         D7       3FH         D0       40H             Page 7       C55             C62       C40       C9        C32       C16         C63       C42       C7        C30       C14         C64       C45        C29       C13         C62       C46       C3        C29       C13         C62       C46       C3        C29       C11         C63       C47       C2        C28       C12         C63       C47       C2        C28       C12         C64       C48       C1        C26       C10         C100       D0       D0       D0       D0       D0       D0							$\vdash$		$\vdash$				-	⊢	$\vdash$		-	⊢┨						
D7       37H         D0       38H         D1       39H         D2       3AH         D2       3AH         D3       3BH         D4       3CH         D5       3DH         D6       3EH         D7       3FH         1000       D0         40H       C         D5       3DH         D7       3FH         1000       D0         40H       C         C0       C							$\vdash$							⊢			-	⊢┨						
D0         38H           D1         39H           D2         3AH           D2         3AH           D2         3AH           D3         3BH           D4         3CH           D5         3DH           D6         3EH           D7         3FH           1000         D0           40H         C           C         C           C         C           C         C           D7         3FH           1000         D0           A0H         C           C         C           C         C           C         C           C         C           D7         SFH           C         C           C         C           C         C           C         C           C         C           C         C           C         C           C         C           C         C           C         C           C         C           C         C														⊢			-	┝─┦						
D1       39H         D2       3AH         D2       3AH         D3       3BH         D4       3CH         D5       3DH         D6       3EH         D7       3FH         1000       D0         40H       Page 8         C       C1C         C1C       C1C														-			-	┝━┩						
D2       3AH         0111       D3       3BH         D4       3CH         D5       3DH         D6       3EH         D7       3FH         1000       D0         40H       C         C       C         C       C         C       C         D       C       C         D       C       C         D       C       C       C         D       C       C       C         D       <										$\vdash$				⊢			-	⊢┨						
0111       D3       3BH         D4       3CH         D5       3DH         D6       3EH         D7       3FH         1000       D0         40H       C         C       C         C       C         C       C         C       C         C       C         D6       3EH         D7       3FH         D00       D0         C       C         C       C         C       C         C       C         C       C         C       C         C       C         C       C         D100       D0         D00       W         C       C         C       C         C       C         C       C         C       C         C       C         C       C         C       C         C       C         C       C         C       C         C       C <t< td=""><td></td><td></td><td></td><td></td><td></td><td><math>\vdash</math></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>⊢</td><td></td><td></td><td>-</td><td>⊢-1</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>						$\vdash$								⊢			-	⊢-1						
0111       D4       3CH         D5       3DH         D6       3EH         D7       3FH         1000       D0         40H       D0         1000       C1         C1       C2         C2       C2         C2 <td>1</td> <td></td> <td>⊢</td> <td></td> <td></td> <td>-</td> <td>-1</td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td>	1													⊢			-	-1		_				
D5       3DH         D6       3EH         D7       3FH         1000       D0         40H       Page 8         C       C1         C1       C1         C	0111												Page 7	F				-1						
D6       3EH         D7       3FH         1000       D0         40H         V       V         0       V       V         0       V       V         0       V       V         0       V       V         0       V       V         0       V       V         0       V       V         0       V       V     <																		1		_				
D7       3FH       Image: Constraint of the constrai													1 1	F										
1000     D0     40H     Page 8     Cic     Ci																								
48 29 68 29 X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X 0 0 X X X 0 X X X 0 X X X 0 X	1000	D0											Page 8						CIC		CIC			CIC
MX         0         1         0           SEG132         SEG132         SEG1           SEG131         SEG131         SEG3           SEG132         SEG131         SEG3           SEG133         SEG31         SEG3           SEG131         SEG3         SEG3           SEG123         SEG3         SEG3           SEG123         SEG3         SEG3           SEG3         SEG128         SEG3           SEG3         SEG3         SEG3																					65			49
MX         0           SEG132         SEG           SEG131         SEG           SEG131         SEG           SEG131         SEG           SEG132         SEG           SEG133         SEG           SEG133         SEG           SEG133         SEG           SEG133         SEG           SEG126         SEG           SEG3         SEG1           SEG1         SEG1           SEG3         SEG1           SEG1         SEG1           SEG1         SEG1           SEG1         SEG1           SEG1         SEG1           SEG1         SEG1					2	5	3	4	5	9	2	8		28	29	30	3	32				M	UX	
1         1           SEG132         \$           SEG123         \$           SEG3         \$				0	ЩÜ	ЯĞ	ЩÜ	ШÜ	В	ЯÜ	ЩĞ	ЕG		ð	ð	5	õ	<u>ö</u>						
A 1 1 SEG132 SEG132 SEG131 SEG132 SEG130 SEG131 SEG130 SEG127 SEG126 SEG126 SEG126 SEG126 SEG3 SEG3 SEG3 SEG3 SEG3 SEG3 SEG3 SEG3			¥			S				S				SE	SE	SE	SE	SE						
SEG SEG SEG SEG SEG SEG SEG SEG SEG SEG			2		132	131	30	129	128	27	126	125		35	4	ŝ	2	5						7
				-	Ö	ò	ò	ò	ò	ò	ò	Ö		ЭЩ ЭЩ	ы Ш	ЭЩС С	ЭЩ.	ы Ш						
					SI	SI	SI	SL	SE	SI	SE	SE		0)	5	55	55	"						

Example for memory mapping: let MX = 0, MY = 0, SL = 0, according to the data shown in the above table:

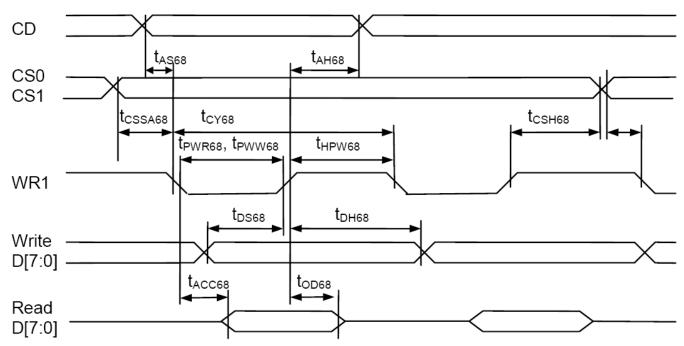
# PARALLEL INTERFACE TIMING DIAGRAM(8080 MODE)



## PARALLEL INTERFACE TIMING CHARACTERISTICS (8080 MODE)

Symbol	Signal	Descr	ription	Condition	Min.	Max.	Units	
t <sub>AS80</sub>	CD	Address	setup time		0		nS	
t <sub>AH80</sub>	CD	Address	hold time		5	_	115	
t <sub>CSSA80</sub>	CS1/CS0	Chip select	setup time		5		nS	
t <sub>CSH80</sub>	051/050	Chip select	hold time		5	_	113	
t <sub>CY80</sub>		Cycle time	read		120		nS	
LCY80		Cycle time	write		80	_	110	
t <sub>PWR80</sub>	WR1	Pulse width	read		60		nS	
t <sub>PWW80</sub>	WR0		write		40	_	no	
t <sub>HPW80</sub>	WR0, WR1	High pulse	read		60	_	nS	
CHPVV80		width	write		40	_	no	
t <sub>DS80</sub>	D7~D0	Data	setup time		30		nS	
t <sub>DH80</sub>		Data	hold time		0	_	10	
t <sub>ACC80</sub>		Read access		C <sub>L</sub> = 100pF	_	60	nS	
t <sub>od80</sub>		Output disab	le time		20	-	10	

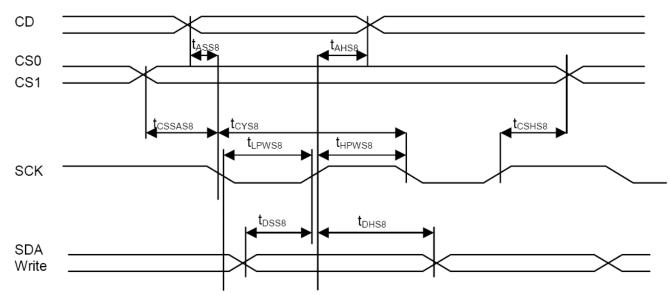
## PARALLEL INTERFACE TIMING DIAGRAM(6800 MODE)



# PARALLEL INTERFACE TIMING CHARACTERISTICS (6800 MODE)

Symbol	Signal	Desci	ription	Condition	Min.	Max.	Units
t <sub>AS68</sub>	CD	Address	setup time		0		nS
t <sub>AH68</sub>	CD	Address	hold time		0	_	110
t <sub>CSSA68</sub>	CS1/CS0	Chip select	setup time		5		nS
t <sub>CSH68</sub>	031/030	Chip select	hold time		5	_	10
t <sub>CY68</sub>		System	read		120		nS
LCY68		cycle time	write		80	_	110
t <sub>PWR68</sub>	WR1	Pulse width	read		60	_	nS
t <sub>PWW68</sub>	VVI (1		write		40		no
t <sub>HPW68</sub>		High pulse	read		60	_	nS
ULL 100		width	write		40		no
t <sub>DS68</sub>	D7~D0	Data	setup time		30	_	nS
t <sub>DH68</sub>	07 00	Data	hold time		0	_	10
t <sub>ACC68</sub>		Read access		C <sub>L</sub> = 100pF	_	60	nS
t <sub>od68</sub>		Output disab	le time		50	_	

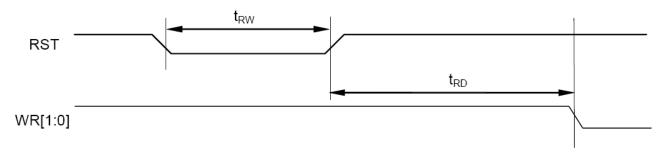
# SERIAL INTERFACE TIMING DIAGRAM (FOR S8)



#### SERIAL INTERFACE TIMING CHARACTERISTICS (FOR S8)

S	ymbol	Signal	Descri	ption	Condition	Min.	Max.	Units
	t <sub>ASS8</sub>	CD	Address	setup time		0	_	nS
	t <sub>AHS8</sub>	00	///////////////////////////////////////	hold time		0		no
to	CSSAS8	CS1/CS0	Chip select	setup time		5		nS
t	tcsHs8		Chip select	hold time		5	_	10
	t	/S8	Cycle time	read		100		nS
	t <sub>CYS8</sub>		Cycle time	write		30	_	110
	ŀ	SCK	Low pulse	read		50		nS
· ۱	t <sub>lpws8</sub>	SCK	width	write		15	_	110
+			High pulse	read		50		nS
L L	t <sub>HPWS8</sub>		width	write		15	_	110
	t <sub>DSS8</sub>	SDA	Dete	setup time		12		nS
	t <sub>DHS8</sub>		Data	hold time		0	_	110

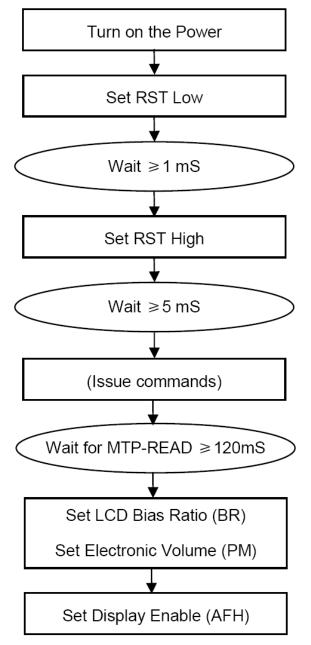
# **RESET TIMING DIAGRAM**



## **RESET TIMING**

Symbol	Signal	Description	Condition	Min.	Max.	Units
t <sub>RW</sub>	RST	Reset low pulse width		3	-	μS
t <sub>RD</sub>	RST, WR	Reset to WR pulse delay		6	-	mS

#### INITIALIZING WITHOUT THE BUILT-IN POWER SUPPLY CIRCUITS



#### **ELECTRO-OPTICAL CHARACTERISTICS**

MEASURING CONDITION:

POWER SUPPLY = Vop / 64 Hz TEMPERATURE =  $23 \pm 5$  °C RELATIVE HUMIDITY =  $60 \pm 20$  %

ITEM	SYMBOL	UNIT	TYP. STN
RESPONSE TIME	Ton	ms	220
	Toff	ms	280
CONTRAST RATIO	Cr	-	12
	V3:00	0	40
VIEWING ANGLE	V6:00	0	70
$(Cr \ge 2)$	V9:00	0	40
	V12:00	0	50

THE ELECTRO-OPTICAL CHARACTERISTICS ARE MEASURED VALUE BUT NOT GUARANTEED ONES.

# **RELIABILITY OF LCD MODULE**

	TEST CONDITION	TEST CONDITION		
ITEM	FOR NORMAL TEMPERATURE	FOR WIDE TEMPERATURE	TIME	
High temperature operating	50°C	70°C	240 hours	
Low temperature operating	0°C	-20°C	240 hours	
High temperature storage	60°C	80°C	240 hours	
Low temperature storage	-10°C	-30°C	240 hours	
Temperature-humidity storage	40°C 90% R.H.	60°C 90% R.H.	96 hours	
Temperature cycling	-10°C to 60°C	-30°C to 80°C	5 avala	
	30 Min Dwell	30 Min Dwell	5 cycle	
Vibration Test at LCM Level	Freq 10-55 Hz	Freq 10-55 Hz		
	Sweep rate: 10-55-10 at 1 min	Sweep rate: 10-55-10 at 1 min		
	Sweep mode Linear	Sweep mode Linear	—	
	Displacement: 2 mm p-p	Displacement: 2 mm p-p		
	1 Hour each for X, Y, Z	1 Hour each for X, Y, Z		

# QUALITY STANDARD OF LCD MODULE

1.0 Sampling M	<b>lethod</b>
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Sampling Plan : MIL STD 105 E Class of AQL : Level II/Single Sampling Critical : 0.25% Maior 0.65% Minor 1.5%

		or 0.65% Minor 1.5%	
2.0	Defect Group	Failure Category	Failure Reasons
	Critical Defect	Malfunction	Open
	0.25%(AQL)		Short
			Burnt or dead component
			Missing part/improper part P.C.B.
			Broken
	Major Defect	Poor Insulation	Potential short
	0.65%(AQL)		High current
			Component damage or scratched
			or Lying too close improper coating
		Poor Conduction	Damage joint
			Wrong polarity
			Wrong spec. part
			Uneven/intermittent contact
			Loose part
			Copper peeling
			Rust or corrosion or dirt's
	Minor Defect	Cosmetic Defect	Minor scratch
	1.5%(AQL)		Flux residue
			Thin solder
			Poor plating
			Poor marking
			Crack solder
			Poor bending
			Poor packing
			Wrong size

## SAMPLING METHOD

CLASS OF AQL: LEVEL II/ SINGLE SAMPLING MAJOR-0.65% MINOR – 1.5%

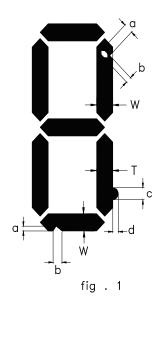
## **QUALITY STANDARD**

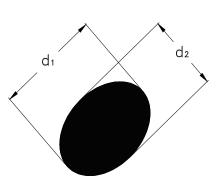
DEFECT	CRITER	RIA	ТҮРЕ	FIGURE
SHORT CIRCUIT	-		MAJOR	-
MISSING SEGMENT	-		MAJOR	-
UNEVEN / POOR CONTRAST	-		MAJOR	-
CROSS TALK	-		MAJOR	-
PIN HOLE	$MAX(a,b) \leq$	1 / 4 W	MINOR	1
EXCESS SEGMENT	$MAX(c,d) \leq$	1 / 4 T	MINOR	1
BUBBLES	d* ≥ 0.2	QTY=0	MINOR	2
BLACKS SPOTS	$d \leq 0.3$	N.A.**	MINOR	2
	0.3 <d≤0.4< td=""><td>QTY≤1</td><td></td><td></td></d≤0.4<>	QTY≤1		
	0.4 <d< td=""><td>QTY=0</td><td></td><td></td></d<>	QTY=0		
LINE SCRATCHES	x≥0.7 y≥0.05	QTY=0	MINOR	3
BLACK LINE	x≥0.7 y≥0.05	QTY=0	MINOR	3

\*d = MAX  $(d_1, d_2)$ 

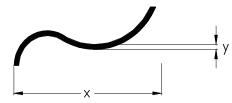
\*\* N. A . = NOT APPLICABLE

DEFECT TABLE : B





POLARIZER BUBBLES / SPOTS fig . 2



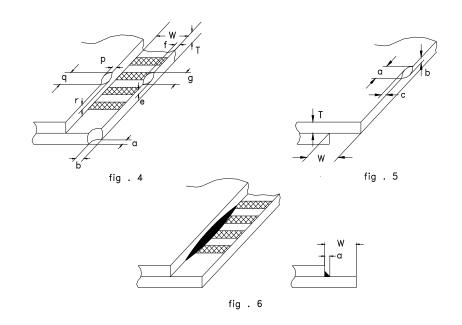
LINE SCRATCHES / BLACK LINE fig . 3

# QUALITY STANDARD ( CONT .)

DEFECT		CRITERIA	ТҮРЕ	FIGURE
	CONTACT EDGE	e≤1/2T f≤1/3W g≤3.5		4
CHIPS	BOTTOM GLASS	p≤1.0 q≤3.5 r≤1/2T	MINOR	4
	CORNER	a≤1.5 b≤W		4
	TOP GLASS	$a \le 3.0$ $b \le 1/3T$ $c \le 1/2W$		5
GLASS PROTRUSION		$a \le 1/4 W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER .

DEFECT TABLE : B



#### HANDLING PRECAUTIONS

#### (1) CAUTION OF LCD HANDLING & CLEANING

The polarizing plate on the surface of the panel is made from organic substances. Be very careful for chemicals not to touch the plate or it leads the polarizing plate to deteriorate.

If the use of a chemical is unavoidable, wipe the panel lightly with soft materials, such as gauze and absorbent cotton, soaked in a solvent.

\*Usable solvent: Alcohol (ethanol, IPA and the like) \*Appropriate solvent: Ketones, ethyl alcohol

Avoid wiping with a dry cloth, since it could damage the surface of the polarizing plate and others.

#### (2) CAUTION AGAINST STATIC CHARGE

The LCD modules use CMOS LSI drivers, so customers are recommended that any unused input terminal would be connected to  $V_{DD}$  or  $V_{SS}$ , do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

#### (3) ESD PRECAUTION

Inputs and outputs are protected against electrostatic discharge in normal handling. However, to be totally safe, it is

recommended to take normal precautions appropriate to handling LCM module. For example: product surface grounding.

Always take ESD precaution when handling the LCD Module. Components are exposed for direct finger touches and can

be damaged unless ESD precaution is taken.

#### (4) PACKAGING

Avoid intense shock and falls from a height and do not operate or store them exposed to direct sunshine or high temperature/humidity for long periods.

#### (5) CAUTION FOR OPERATION

The viewing angle can be adjusted by varying the LCD driving voltage VO.

Driving voltage should be kept within specified range, excess voltage shortens display life.

Response time increases with decrease in temperature.

Display may turn black or dark Blue at temperature above its operational range; this is however not destructive and the display will return to normal once the temperature falls back to range.

Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured". They will recover once the display is turned off.

Condensation at terminals will cause malfunction and possible electrochemical reaction. Relative humidity of the environment should therefore be kept below 60%.

#### (6) SAFETY

Liquid crystal may leak out of a damaged LCD, it is recommended to wash off the liquid crystal by using solvents such as acetone or ethanol and should be burned up later.

If any liquid leak out of a damaged glass cell comes in contact with your hands, wash it off with soap and water immediately.

#### WARRANTY

CLOVER will replace or repair any of her LCD module in accordance with her LCD specification for a period of one year from date of shipment. The warranty liability of Clover is limited to repair and/or replacement. Clover will not be responsible for any subsequent or consequential event.