



**CLOVER DISPLAY LTD.**

## **LCD MODULE SPECIFICATION**

**Model : CG1212A - \_ \_ \_ - \_ \_ \_ - \_ \_ \_ - \_ \_**

Revision	00
Engineering	Longson Yeung
Date	11 Oct 2011
Our Reference	9045

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**MODE OF DISPLAY****Display mode**

- STN :  Yellow green  
 Grey  
 Blue (negative)  
 FSTN positive  
 FSTN negative

**Display condition**

- Reflective type  
 Transflective type  
 Transmissive type  
 Others

**Viewing direction**

- 6 O' clock  
 12 O' clock  
 3 O' clock  
 9 O' clock

**LCD MODULE NUMBER NOTATION:****CG1212A- N N - S R - N 6 - T**

(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 – RGB

\*(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 : 12 X 12 dots, COG LCD module  
 Interface : 8-bit parallel  
 Driving method : static  
 Controller IC : ST7045 or equivalent  
 For the detailed information, please refer to the IC specifications.

**MECHANICAL DIMENSIONS**

Item	Dimension		Unit	Item	Dimension		Unit
Outline Dimension	56.0(L)x65.2(W)x (H1/H2)		mm	Dot Pitch	3.96(L)x3.96(W)		mm
Viewing Area	52.0(L)x52.0(W)		mm	Dot Size	3.46(L)x3.46(W)		mm
No Backlight (N)	H1	-	mm	Side Backlight RGB (LM)	H1	8.7MAX	mm
	H2	-	mm		H2	-	mm
EL Backlight (E)	H1	-	mm	Array Backlight (M)	H1	-	mm
	H2	-	mm		H2	-	mm

**CONNECTOR PIN ASSIGNMENT(CN1)**

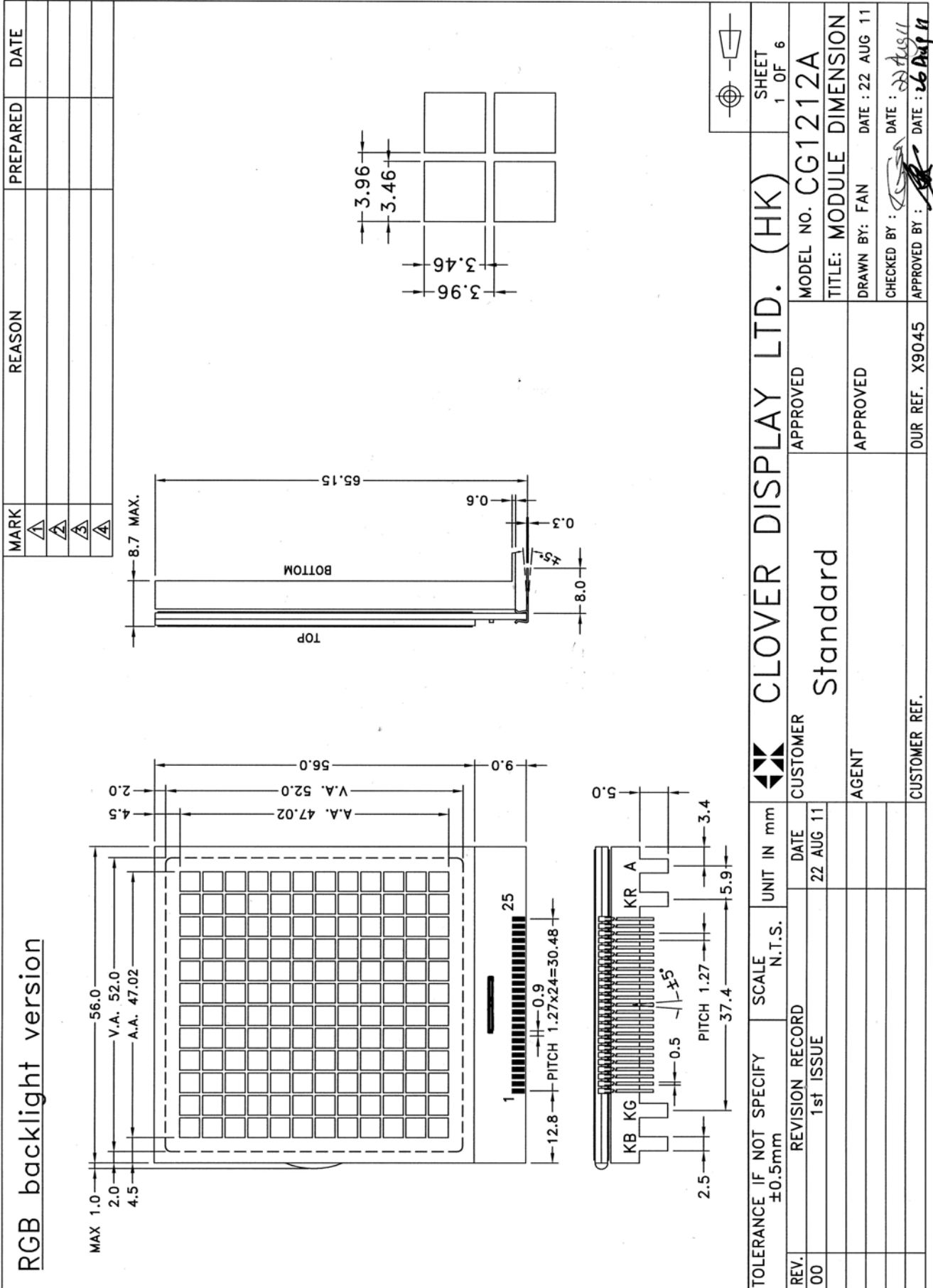
Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	GND	Ground	14	D1	Data bus line
2	VLCD	Operating voltage for LCD	15	D0	
3	CAP1P	X2 voltage stepup	16	A0	Register select input pin
4	CAP1N		17	/RD	Data read control pin
5	V0	Input voltage for LCD	18	/WR	Data write control pin
6	VSS	Ground	19	/CS	Chip select input pin
7	VDD	Supply voltage for logic	20	/RST	Reset input pin
8	D7	Data bus line	21	LEDB	RGB LED pulse signal output
9	D6		22	LEDG	
10	D5		23	LEDR	
11	D4		24	VSS	Ground
12	D3		25	GND	Ground
13	D2				

**CONNECTOR PIN ASSIGNMENT OF BACKLIGHT (CN2)**

Pin No.	Symbol	Function	Pin No.	Symbol	Function
(*)26	A	Supply Voltage for Backlight (+VE)	(*)28	KG	Supply Voltage for Backlight (-VE)
(*)27	KR	Supply Voltage for Backlight (-VE)	(*)29	KB	Supply Voltage for Backlight (-VE)

Note (\*) : KR , KG, KB are used for RGB backlight version only

COUNTER DRAWING OF MODULE DIMENSION

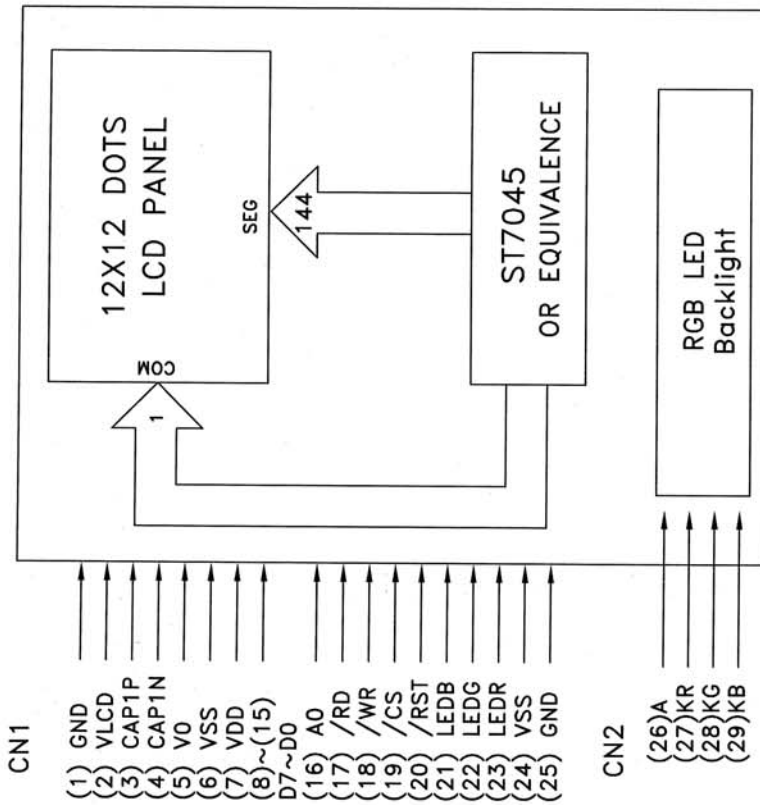


COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM

for FSC module only

PIN NO.	SYMBOL	FUNCTION
1	GND	Ground
2	VLCD	Operating voltage for LCD
3	CAP1P	X2 voltage stepup
4	CAP1N	
5	V0	Input voltage for LCD
6	VSS	Ground
7	VDD	Supply voltage for logic
8	D7	Data bus line
9	D6	
10	D5	
11	D4	
12	D3	
13	D2	
14	D1	
15	D0	
16	A0	Register select input pin
17	/RD	Data read control pin
18	/WR	Data write control pin
19	/CS	Chip select input pin
20	/RST	Reset input pin
21	LEDB	RGB LED pulse signal output
22	LEDG	
23	LEDR	
24	VSS	Ground
25	GND	Ground

CN1



CN2

PIN NO.	SYMBOL	FUNCTION
26	A	Supply voltage for backling (+VE)
27	KR	Supply voltage for backling (-VE)
28	KG	Supply voltage for backling (-VE)
29	KB	Supply voltage for backling (-VE)

TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 5 OF 6
REV. 00	REVISION RECORD 1st ISSUE	DATE 31 OCT 11	CUSTOMER	APPROVED	MODEL NO. CG1212A	
			AGENT	APPROVED	TITLE: PINOUT & BLOCK DIAGRAM(2)	
			CUSTOMER REF.	OUR REF. 9045	DRAWN BY: FAN	DATE : 31 OCT 11
					CHECKED BY: <i>[Signature]</i>	DATE : 31 OCT 11
					APPROVED BY: <i>[Signature]</i>	DATE : 31 OCT 11

**ELECTRICAL CHARACTERISTICS**

Conditions: VSS=0V, Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	—	3.0	—	V
Supply Current for Logic	IDD	—	0.88	1.32	mA
Operating Voltage for LCD (*)	VLCD	—	5.0	—	V
'High' Level Input Voltage	VIH	0.7VDD	—	VDD	V
'Low' Level Input Voltage	VIL	VSS	—	0.2VDD	V

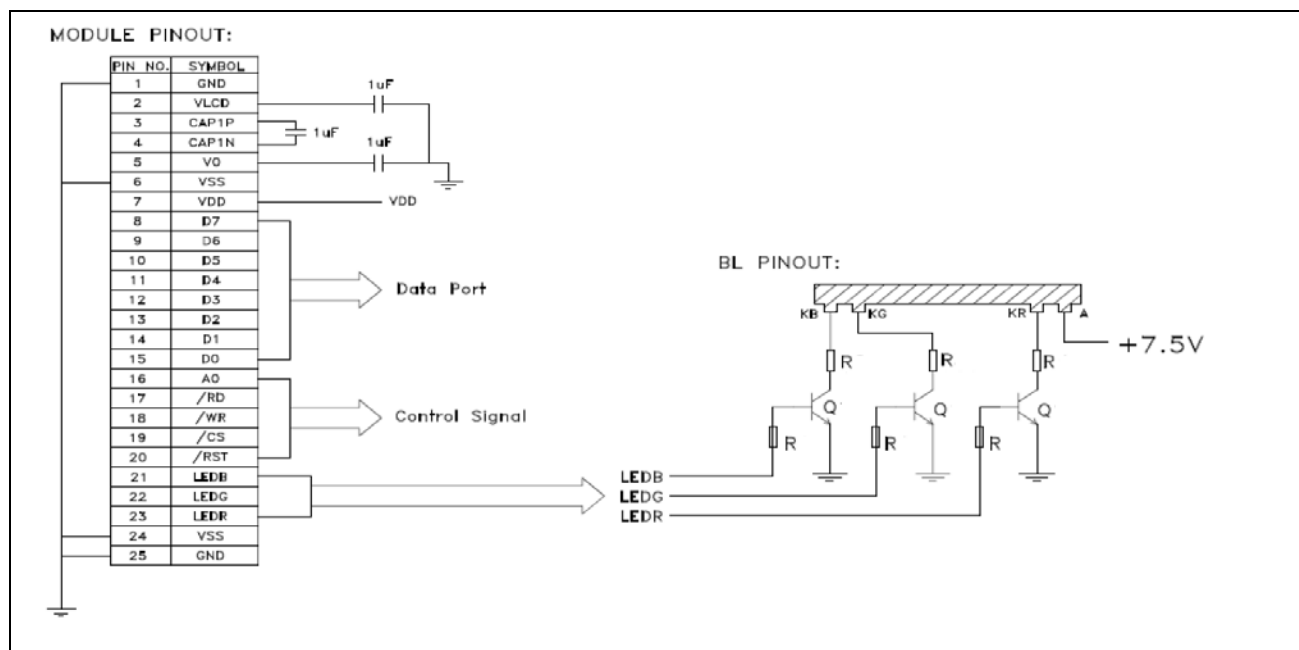
Note (\*): There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

**Side Backlight for RGB (LM):**

Constant current driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Red BL Voltage	V <sub>R</sub>	1.8	2.0	2.2	V	I <sub>R</sub> = 80mA
Green BL Voltage	V <sub>G</sub>	2.9	3.15	3.3	V	I <sub>G</sub> = 40mA
Blue BL Voltage	V <sub>B</sub>	2.7	3.1	3.2	V	I <sub>B</sub> = 20mA

**REFERENCE CIRCUIT EXAMPLE**



**ABSOLUTE MAXIMUM RATINGS**

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

Item	Symbol	Rating (for normal temperature)	Unit
Supply Voltage	VDD	-0.3to 3.6	V
Input Voltage	VT	-0.3 to VDD +0.5	V
Operating Temperature	Topr	0 to 50	°C
Storage Temperature	Tstg	-10 to 60	°C

## INSTRUCTIONS TABLE

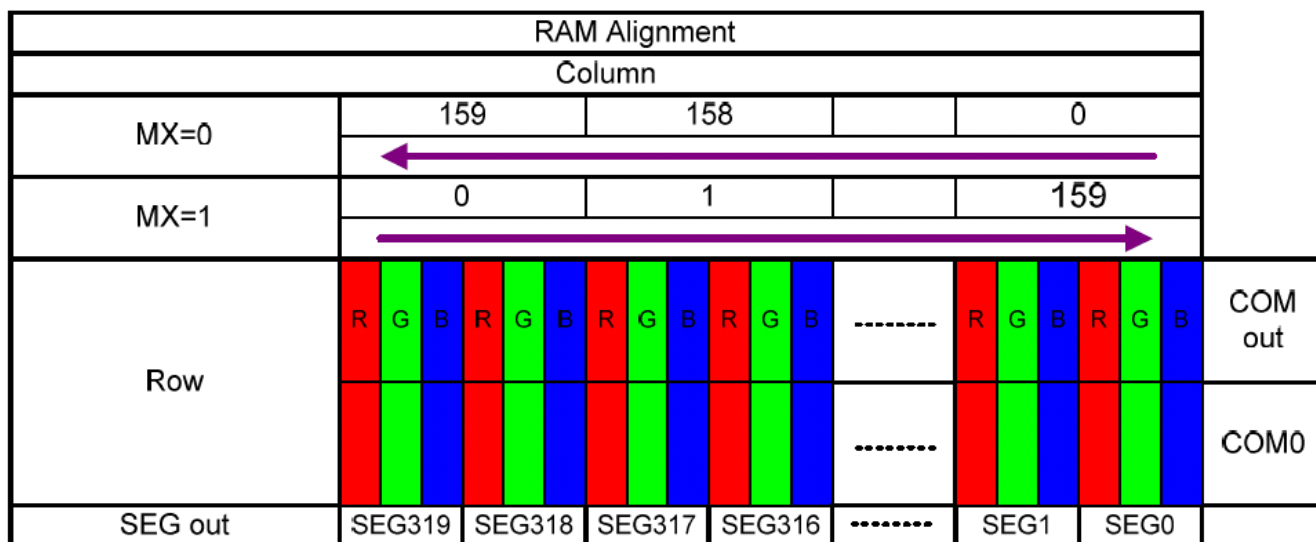
COMMAND	CODE										DESCRIPTION
	HEX	A0	D7	D6	D5	D4	D3	D2	D1	D0	
NOP	00	0	0	0	0	0	0	0	0	0	No Operation
Software reset	01	0	0	0	0	0	0	0	0	1	Software reset
Sleep in	10	0	0	0	0	1	0	0	0	0	Sleep in mode
Sleep out	11	0	0	0	0	1	0	0	0	1	Sleep out mode
Inverse display off	20	0	0	0	1	0	0	0	0	0	Display Inversion off
Inverse display on	21	0	0	0	1	0	0	0	0	1	Display Inversion on
Exit all point on	22	0	0	0	1	0	0	0	1	0	Exit all point on
Enter all point on	23	0	0	0	1	0	0	0	1	1	Enter all point on
Display off	28	0	0	0	1	0	1	0	0	0	Display off
Display on	29	0	0	0	1	0	1	0	0	1	Display on
Column address set	2A	0	0	0	1	0	1	0	1	0	Column address set
	-	1	CS7	CS6	CS5	CS4	CS3	CS2	CS1	CS0	Column start address
	-	1	CE7	CE6	CE5	CE4	CE3	CE2	CE1	CE0	Column end address
Memory write	2C	0	0	0	1	0	1	1	0	0	Write data to memory
Memory read	2E	0	0	0	1	0	1	1	1	0	Read data from memory
LED Mode	B1	0	1	0	1	1	0	0	0	1	LED Mode
	-	1	0	0	0	0	0	0	LEDP	0	
Frame Frequency	B2	0	1	0	1	1	0	0	1	0	Frame Frequency
	-	1	0	0	0	1	FR3	FR2	FR1	FR0	
SEG waveform set	B4	0	1	0	1	1	0	1	0	0	SEG waveform set
	-	1	SRR3	SRR2	SRR1	SRR0	SRF3	SRF2	SRF1	SRF0	
	-	1	SGR3	SGR2	SGR1	SGR0	SGF3	SGF2	SGF1	SGF0	
	-	1	SBR3	SBR2	SBR1	SBR0	SBF3	SBF2	SBF1	SBF0	
LED waveform set	B6	0	1	0	1	1	0	1	1	0	LED waveform set
	-	1	LRS7	LRS6	LRS5	LRS4	LRS3	LRS2	LRS1	LRS0	
	-	1	LGS7	LGS6	LGS5	LGS4	LGS3	LGS2	LGS1	LGS0	
	-	1	LBS7	LBS6	LBS5	LBS4	LBS3	LBS2	LBS1	LBS0	
	-	1	LRW7	LRW6	LRW5	LRW4	LRW3	LRW2	LRW1	LRW0	
	-	1	LGW7	LGW6	LGW5	LGW4	LGW3	LGW2	LGW1	LGW0	
	-	1	LBW7	LBW6	LBW5	LBW4	LBW3	LBW2	LBW1	LBW0	
LCD scan set	B7	0	1	0	1	1	0	1	1	1	LCD scan set
	-	1	0	MX	0	0	MS	0	0	0	Master/Slave enable
Enter Read modify	B8	0	1	0	1	1	1	0	0	0	Enter Read modify
Exit Read modify	B9	0	1	0	1	1	1	0	0	1	Exit Read modify
Vop set	C0	0	1	1	0	0	0	0	0	0	Vop set Range 3V to 18V
	-	1	Vop7	Vop6	Vop5	Vop4	Vop3	Vop2	Vop1	Vop0	
	-	1	0	0	0	0	0	0	0	Vop8	
Power Control	D2	0	1	1	0	1	0	0	1	0	Power Control
	-	1	0	0	0	OSC	BST	FOL	V0	VREF	
RGB LED control	D4	0	1	1	0	1	0	1	0	0	RGB LED control
	-	1	0	0	0	0	BK	LEDR	LEDG	LEDB	

**RECOMMENDED INITIAL SETTINGS**

System Reset : 01H  
 Sleep out : 11H  
 Power control: d2H,00H  
 Vop Set: c0H,32H,00H  
 LED mode: b1H,02H  
 LCD scan set: b7H,00H  
 Seg waveform set: b4H,22H,22H,22H  
 Led waveform set: b6H,22H,22H,22H,33H,33H,33H  
 Display on: 29H

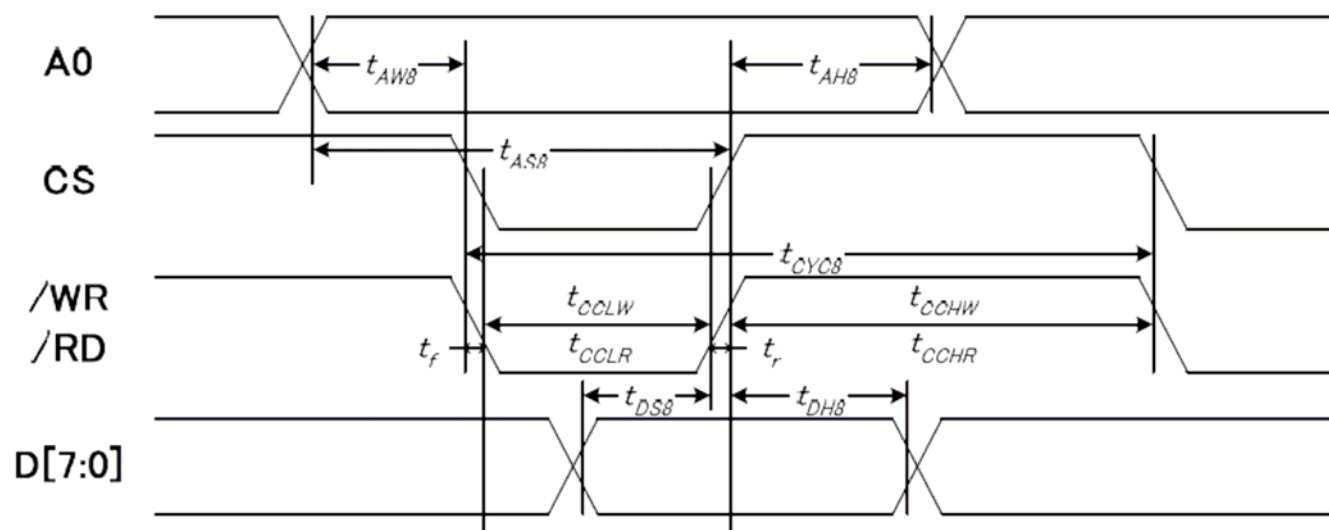
**DISPLAY DATA RAM**

It is 320 X 1 X 3 bits capacity RAM prepared for storing dot data. Refer to the following memory map for the RAM Configuration.





## PARALLEL INTERFACE TIMING DIAGRAM (For 8080-series)



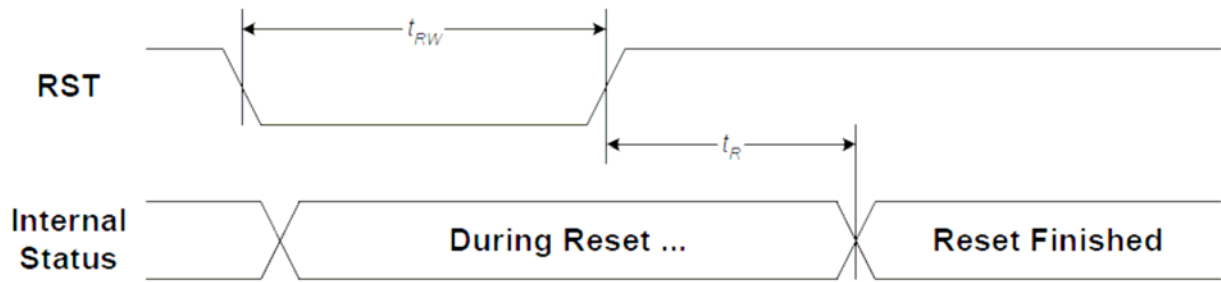
## PARALLEL INTERFACE TIMING CHARACTERISTICS((For 8080-series)

(VSS=0V, VDDI=2.4~3.3V, VDDA=3.0V, Ta = 25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		T.B.D	—	ns
Address setup time		tAS8		T.B.D	—	
Address hold time		tAH8		T.B.D	—	
System cycle time	/WR	tCYC8		T.B.D	—	
/WR L pulse width (WRITE)		tCCLW		T.B.D	—	
/WR H pulse width (WRITE)		tCCHW		T.B.D	—	
/RD L pulse width (READ)	RD	tCCLR		T.B.D	—	
/RD H pulse width (READ)		tCCHR		T.B.D	—	
WRITE Data setup time	D[7:0]	tDS8		T.B.D	—	
WRITE Data hold time		tDH8		T.B.D	—	

\*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.

\*2 All timing is specified using 20% and 80% of VDDI as the standard.

**RESET TIMING DIAGRAM****RESET TIMING**

(VSS=0V, VDDI=2.4~3.3V, VDDA=3.0V, Ta = 25°C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	T.B.D	us
Reset "L" pulse width	tRW		T.B.D	—	

\*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.

\*2 All timing is specified using 20% and 80% of VDDI as the standard.

**THE RESET CIRCUIT**

Setting /RST to "L" or Reset instruction can initialize internal function.

When /RST becomes "L", following procedure is occurred.

- Oscillator circuit is stopped
- The LCD power supply circuit is stopped
- Display OFF
- Display all point OFF
- Segment/Common output go to the VSS level

Display normal

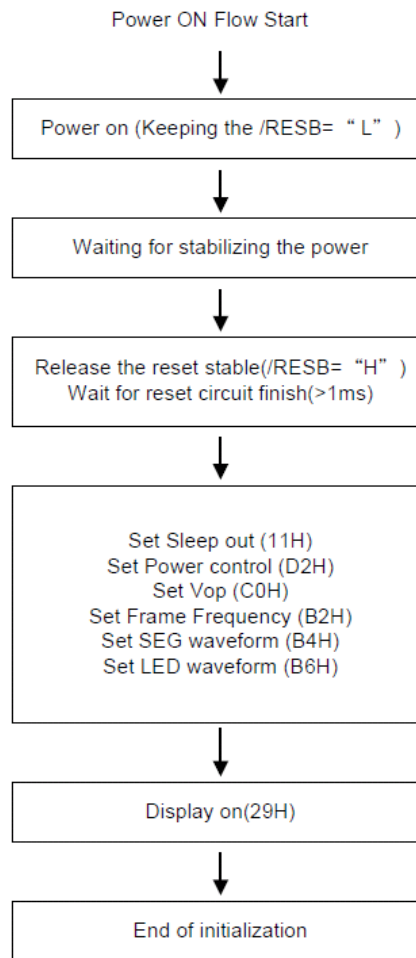
Row address : 0

Column address : 0

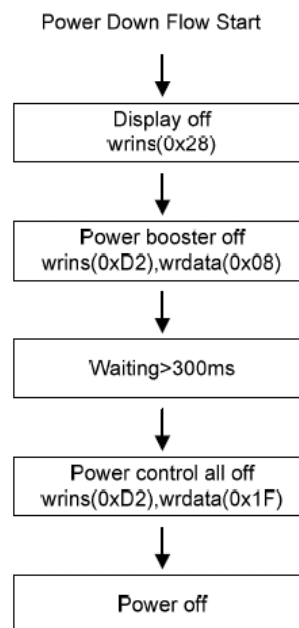
Power control [OSC BST FOL V0 VREF ] = All OFF

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

Referential instruction setup flow for power on:



Referential instruction setup flow for power down:



**ELECTRO-OPTICAL CHARACTERISTICS**

MEASURING CONDITION: POWER SUPPLY =  $V_{OP} / 64 \text{ Hz}$   
 TEMPERATURE =  $23 \pm 5 \text{ }^\circ\text{C}$   
 RELATIVE HUMIDITY =  $60 \pm 20 \%$

ITEM	SYMBOL	UNIT	TYP. TN
RESPONSE TIME	$T_{on}$	ms	60
	$T_{off}$	ms	80
CONTRAST RATIO	Cr	-	30
VIEWING ANGLE (Cr $\geq 2$ )	V3:00	$^\circ$	70
	V6:00	$^\circ$	65
	V9:00	$^\circ$	70
	V12:00	$^\circ$	25

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

**RELIABILITY OF LCD MODULE**

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

**SAMPLING METHOD**

SAMPLING PLAN: MIL-STD 105E

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

**QUALITY STANDARD**

DEFECT	CRITERIA	TYPE	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	$d^* \geq 0.2$ QTY=0	MINOR	2
BLACKS SPOTS	$d \leq 0.3$ N.A.** $0.3 < d \leq 0.4$ QTY $\leq$ 1 $0.4 < d$ QTY=0	MINOR	2
LINE SCRATCHES	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3
BLACK LINE	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3

\*d = MAX (d<sub>1</sub>,d<sub>2</sub>)

\*\* N. A . = NOT APPLICABLE

DEFECT TABLE : B

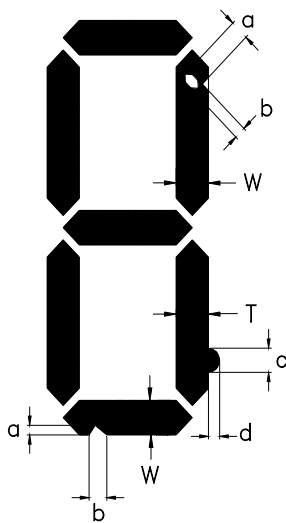
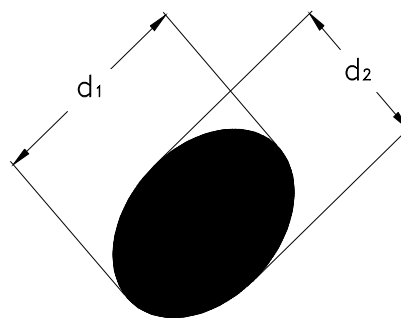
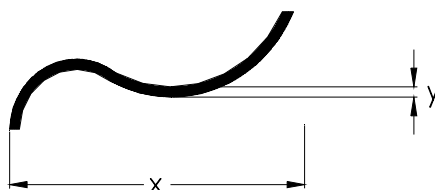


fig . 1



POLARIZER BUBBLES / SPOTS

fig . 2



LINE SCRATCHES / BLACK LINE

fig . 3

QUALITY STANDARD ( CONT . )

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

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER .

DEFECT TABLE : B

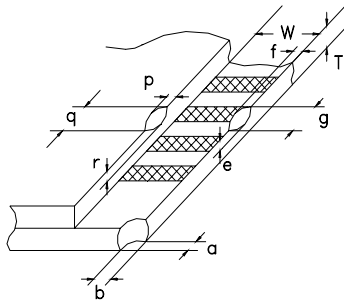


fig . 4

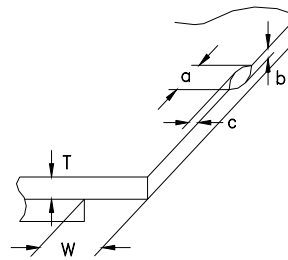


fig . 5

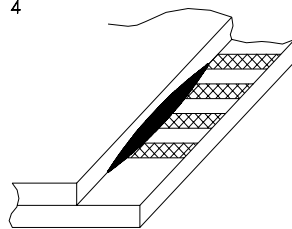


fig . 6

## HANDLING PRECAUTIONS

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

Use soft cloth with solvent (recommended below) to clean the display surface and wipe lightly.

- Isopropyl alcohol, ethyl alcohol, trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent;

-water, ketone, aromatics

### (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.

Remove the protective film slowly and, if possible, under ESD control device like ion blower and humidity of working room should be kept over 50%RH to reduce risk of static charge.

### (3) PACKAGING

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

### (4) CAUTION FOR OPERATION

It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life. The use of direct current drive should be avoided because an electrochemical reaction due to direct current causes LCD's undesirable deterioration.

Response time will be extremely delayed at low temperature, and LCD's show dark color at high temperature. However those phenomena do not mean malfunction or out of order with LCD's.

Some font will be abnormally displayed when the display area is pushed hard during operation. But it resumes normal condition after turning off once.

### (5) SOLDERING (for Pin type)

It is recommended to complete dip soldering at 270 °C or hand soldering at 280 °C within 3 seconds. The soldering position is at least 3mm apart from the pin head. Wave or reflow soldering are not recommended. Metal pins should not be soldered for more than 3 times and each soldering should be done after cool down of metal pins

### (6) SAFETY

For crash damaged or unnecessary LCD's, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.

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

## 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.