CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CG1212A - _ _ - _ _ - _ _ - _

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

MODE OF DISPLAY

Display mode	**Display condition**	**Viewing direction**
STN : ☐ Yellow green	☐ Reflective type	☐ 6 O' clock
☐ Grey	☐ Transflective type	☐ 12 O' clock
☐ Blue (negative)	☐ Transmissive type	☐ 3 O' clock
☐ FSTN positive	☐ Others	☐ 9 O' clock
☐ FSTN negative		

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 H		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)	H	2.9Max	mm	Side Backlight (RGB)	H	8.7MAX	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)

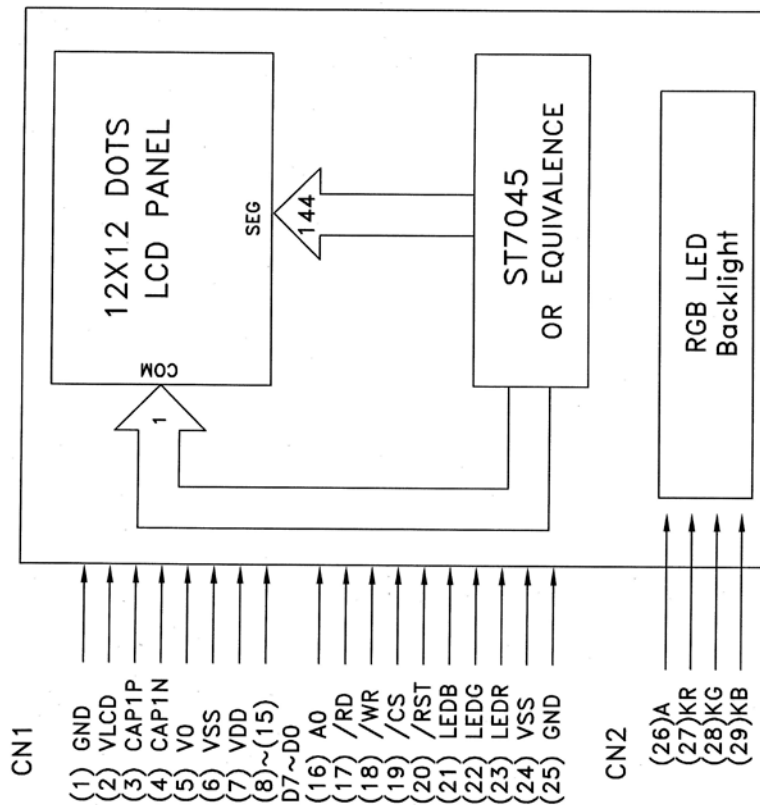| Pin No.	Symbol	Function	Pin No.	Symbol	Function
(*)26	A	Supply Voltage for Backlight (+VE)	(*)28	KG	Supply Voltage for Backlight (-VE)
(*)27	KR	Supply Voltage for Backlight (-VE)	(*)29	KB	Supply Voltage for Backlight (-VE)

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

COUNTER DRAWING OF MODULE DIMENSION

RGB backlight version

3.96
3.46
3.46
3.96

65.15
8.7 MAX.
BOTTOM
TOP
0.6
0.3
4.5°
8.0

56.0
9.0
2.0
V.A. 52.0
4.5
A.A. 47.02
56.0
V.A. 52.0
A.A. 47.02
MAX 1.0
2.0
4.5

5.0
3.4
5.9
KR A
25
1
0.9
PITCH 1.27x24=30.48
12.8
2.5
KB KG
0.5
PITCH 1.27
37.4
±5°

MARK	REASON	PREPARED	DATE
1			
2			
3			
4			

CLOVER DISPLAY LTD. (HK)

Standard

MODEL NO. CG1212A
TITLE: MODULE DIMENSION
DRAWN BY: FAN   DATE : 22 AUG 11
CHECKED BY :
APPROVED BY :   DATE :

APPROVED
APPROVED

CUSTOMER
AGENT
CUSTOMER REF.
OUR REF. X9045

SHEET 1 OF 6

TOLERANCE IF NOT SPECIFY ±0.5mm	UNIT IN mm	SCALE N.T.S.	DATE 22 AUG 11
REV.	REVISION RECORD		
00	1st ISSUE		

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM

for FSC module only

CN1

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	
9	D6	
10	D5	
11	D4	
12	D3	Data bus line
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	
22	LEDG	RGB LED pulse signal output
23	LEDR	
24	VSS	Ground
25	GND	Ground

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)

12X12 DOTS LCD PANEL

SEG

144

COM

1

ST7045 OR EQUIVALENCE

RGB LED Backlight

CN1
(1) GND
(2) VLCD
(3) CAP1P
(4) CAP1N
(5) V0
(6) VSS
(7) VDD
(8)~(15) D7~D0
(16) A0
(17) /RD
(18) /WR
(19) /CS
(20) /RST
(21) LEDB
(22) LEDG
(23) LEDR
(24) VSS
(25) GND

CN2
(26)A
(27)KR
(28)KG
(29)KB

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

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25℃

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	5.25	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_R	1.8	2.0	2.2	V	I_R = 80mA
Green BL Voltage	V_G	2.9	3.15	3.3	V	I_G = 40mA
Blue BL Voltage	V_B	2.7	3.1	3.2	V	I_B = 20mA

REFERENCE CIRCUIT EXAMPLE
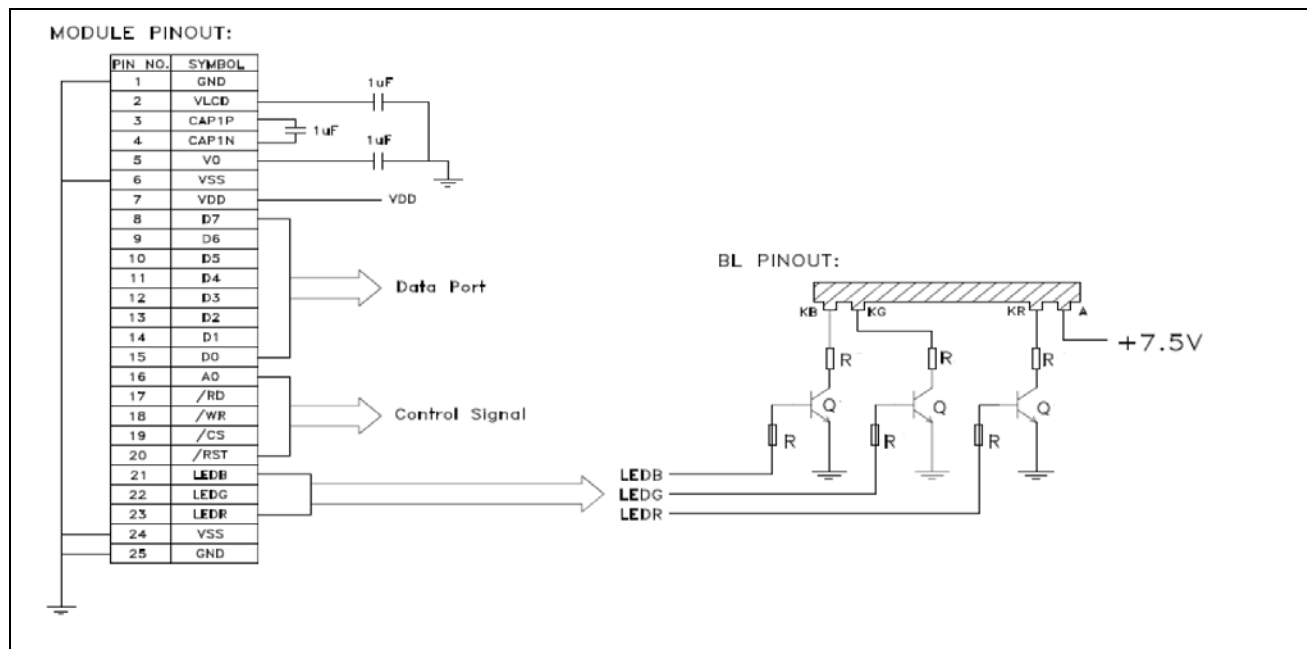
ABSOLUTE MAXIMUM RATINGS

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	℃
Storage Temperature	Tstg	-10 to 60	℃

INSTRUCTIONS TABLE

COMMAND	HEX	A0	D7	D6	D5	D4	D3	D2	D1	D0	DESCRIPTION
						CODE					
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
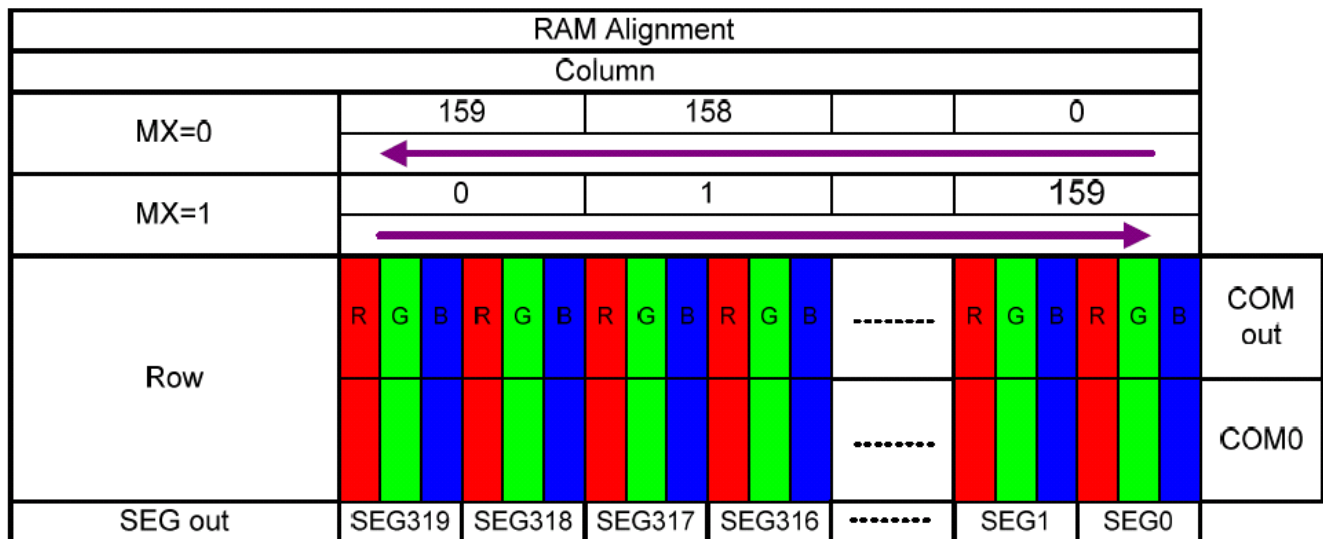Vop Set: c0H,32H,00H
LED mode: b1H,02H
LCD scan set: b7H,00H
Seg waveform set: b4H,22H,22H,22H
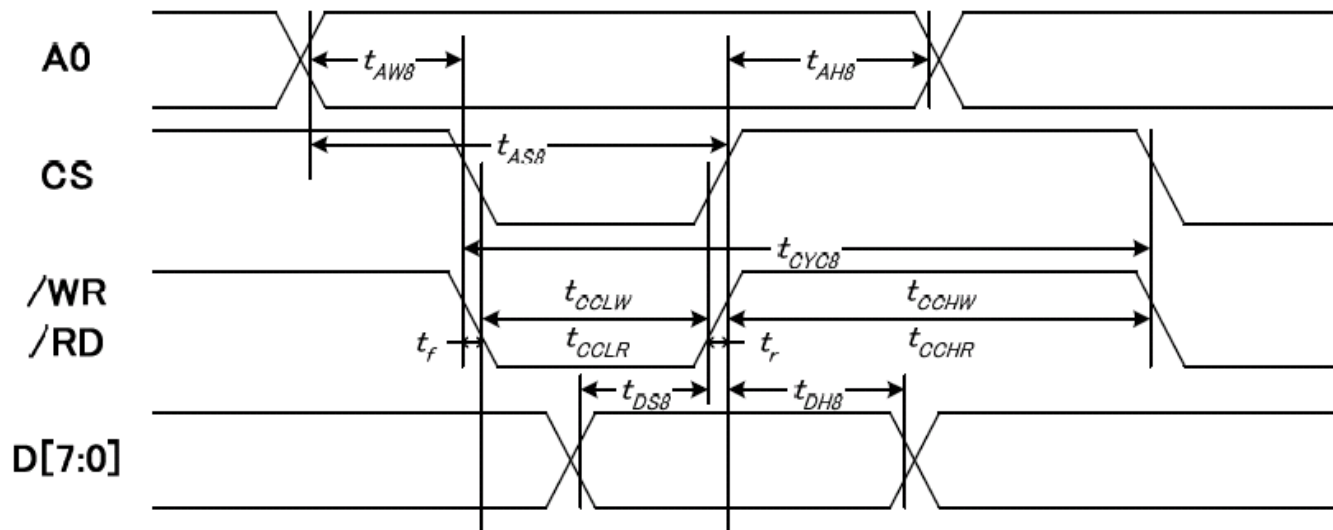Led waveform set: b6H,22H,22H,22H,33H,33H,33H
Display on: 29H

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.

RAM Alignment						
Column						
MX=0	159	158		0		
	←					
MX=1	0	1		159		
	→					
Row	R G B R G B R G B R G B			--------	R G B R G B		COM out
	R G B R G B R G B R G B			········	R G B R G B		COM0
SEG out	SEG319	SEG318	SEG317	SEG316	········	SEG1	SEG0

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℃)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time		tAW8		T.B.D	—	
Address setup time	A0	tAS8		T.B.D	—	
Address hold time		tAH8		T.B.D	—	
System cycle time		tCYC8		T.B.D	—	
/WR L pulse width (WRITE)	/WR	tCCLW		T.B.D	—	
/WR H pulse width (WRITE)		tCCHW		T.B.D	—	ns
/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
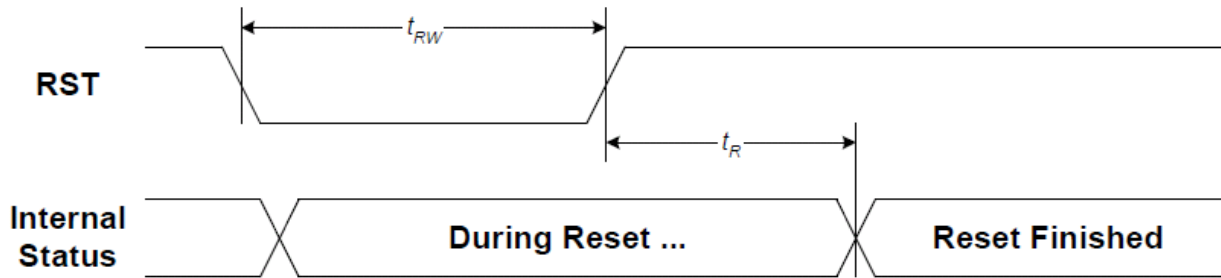
RESET TIMING

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

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:

Power ON Flow Start

Power on (Keeping the /RESB= "L")

Waiting for stabilizing the power

Release the reset stable(/RESB= "H")
Wait for reset circuit finish(>1ms)

Set Sleep out (11H)
Set Power control (D2H)
Set Vop (C0H)
Set Frame Frequency (B2H)
Set SEG waveform (B4H)
Set LED waveform (B6H)

Display on(29H)

End of initialization

Referential instruction setup flow for power down:

Power Down Flow Start

Display off
wrins(0x28)

Power booster off
wrins(0xD2),wrdata(0x08)

Waiting>300ms

Power control all off
wrins(0xD2),wrdata(0x1F)

Power off
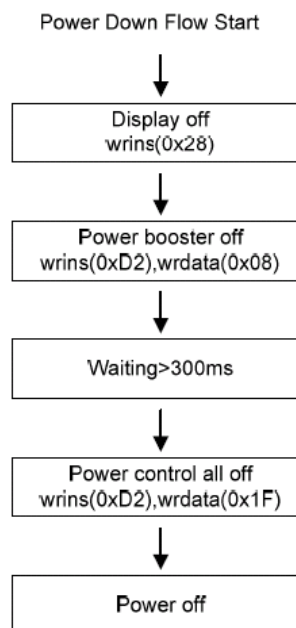
ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = V_{OP} / 64 Hz

TEMPERATURE = 23 ± 5 °C

RELATIVE HUMIDITY = 60 ± 20 %

ITEM	SYMBOL	UNIT	TYP. TN
RESPONSE TIME	Ton	ms	60
	Toff	ms	80
CONTRAST RATIO	Cr	-	30
VIEWING ANGLE (Cr $\geq$ 2)	$V_{3:00}$	°	70
	$V_{6:00}$	°	65
	$V_{9:00}$	°	70
	$V_{12:00}$	°	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°C	240 hours
Low temperature operating	0°C	240 hours
High temperature storage	60°C	240 hours
Low temperature storage	-10°C	240 hours
Temperature-humidity storage	40°C 90% R.H.	96 hours
Temperature cycling	-10°C to 60°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.**	MINOR	2
	0.3<d$\leq$0.4	QTY$\leq$1		
	0.4<d	QTY=0		
LINE SCRATCHES	x$\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$_1$,d$_2$)   ** N. A . = NOT APPLICABLE   DEFECT TABLE: B
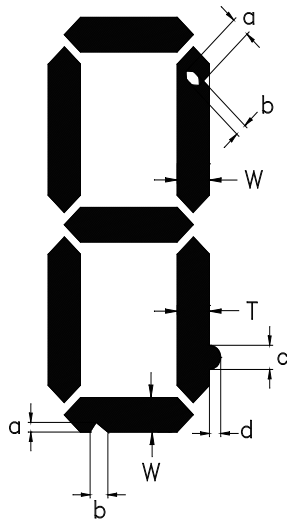
fig . 1
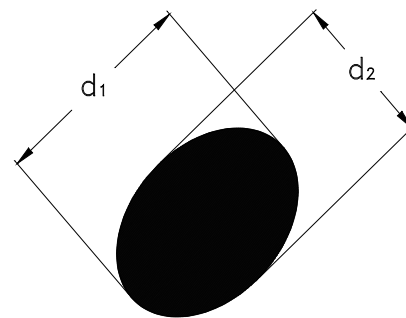
POLARIZER BUBBLES / SPOTS
fig . 2
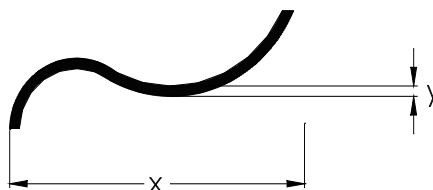
LINE SCRATCHES / BLACK LINE
fig . 3

QUALITY STANDARD (CONT .)

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

UNLESS STATE OTHERWISE, ALL UNIT ARE IN MILLIMETER.   DEFECT TABLE: B
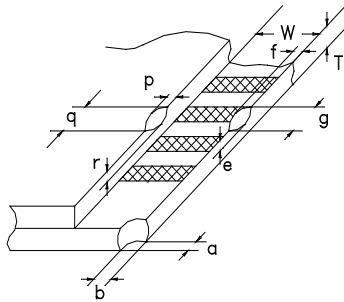
fig . 4
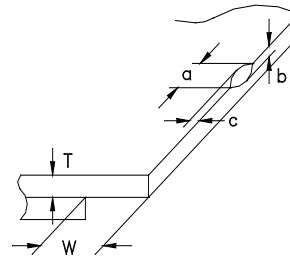
fig . 5
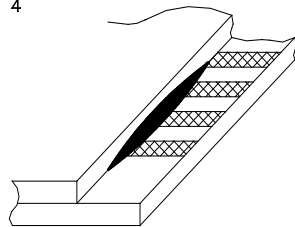
fig . 6

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, trichlorotriflorothane

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 recommend 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 ^{o}C or hand soldering at 280 ^{o}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.

FOR INTERNAL USE ONLY

SPECIFICATION REVISION RECORD

Revision No.	Description	Date(DD/MM/YY)
00	FIRST ISSUE	24/10/11