



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CV4202C - _ _ - _ _ - _ _ - _ _

Revision	03
Engineering	Timothy Chan
Date	8 March 2018
Our Reference	4949

ADDRESS : 1st FLOOR, EFFICIENCY HOUSE, 35 TAI YAU STREET, SAN PO KONG,
KOWLOON, HONG KONG.

TEL : (852) 2341 3238 (SALES OFFICE) (852) 2342 8228 (GENERAL OFFICE)

FAX : (852) 2357 4237 (SALES OFFICE)

E-MAIL : cdl@cloverdisplay.com

URL : <http://www.cloverdisplay.com>

MODE OF DISPLAY**Display mode**

- TN positive
 TN negative
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:

CV4202C- MY - S F - 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

*(4)---Display mode

- T – TN
V – TN (Negative)
S – STN Yellow green
G – STN Grey
B – STN Blue (Negative)
F – FSTN
N – FSTN (Negative)
E – EBTN

*(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)

- T – Touch panel (Analog)
P – Touch panel (Digital)

GENERAL DESCRIPTION

Display mode : 20 Characters x 2 Lines COB LCD module
 Interface : 8 bit parallel
 Driving method : 1/16 duty, 1/5 bias
 Controller IC : Sitronix ST7066U or equivalent
 For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

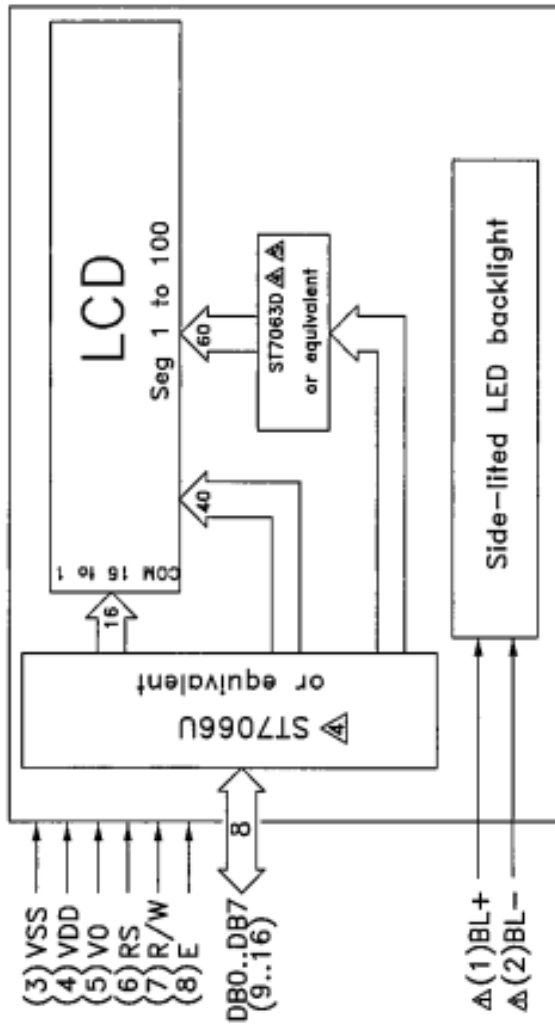
Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	116.0(L)x37.0(W)x13.1MAX.(H)	mm	Character Size	3.2(L)x5.55(W)	mm
Viewing Area	83.0(L)x18.6(W)	mm	Dot Size	0.60(L)x0.65(W)	mm
Character Pitch	3.8(L)x5.95(W)	mm	—	—	—

CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function
1	BL+	Supply Voltage for Backlight (+VE)
2	BL-	Supply Voltage for Backlight (-VE)
3	VSS	Ground
4	VDD	Supply Voltage for Logic
5	VO	Input Voltage for LCD
6	RS	Register Select Input
7	R/W	Read / Write
8	E	Enable Signal
9	DB0	Data Bus Line
10	DB1	
11	DB2	
12	DB3	
13	DB4	
14	DB5	
15	DB6	
16	DB7	

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM

PIN NO.	SYMBOL	FUNCTION
1	BL+	Supply voltage for backlight(+)
2	BL-	Supply voltage for backlight(-)
3	VSS	Supply voltage(OV,ground)
4	VDD	Supply voltage for logic
5	V0	Input voltage for LCD
6	RS	Register select input
7	R/W	Read/write
8	E	Enable signal
9	DB0	Data bus line
10	DB1	
11	DB2	
12	DB3	
13	DB4	
14	DB5	
15	DB6	
16	DB7	



TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 2 OF 3
REV.	REVISION RECORD	DATE	DATE	APPROVED	MODEL NO. CV4202C	
00	1st ISSUE	24 JUN 04	15 JAN 05	<i>[Signature]</i>	TITLE: PIN OUT & BLOCK DIAGRAM	
01	Change dimension & backlight voltage-update pinout	16 JUL 05	18 FEB 06	APPROVED	DRAWN BY: MYWANG	DATE: 07 MAR 18
02	Change backlight design and module dimension	18 FEB 06	02 NOV 17		CHECKED BY: <i>[Signature]</i>	DATE: 8 MAR 18
03	Change backlight design and module dimension	02 NOV 17	07 MAR 18		APPROVED BY: <i>[Signature]</i>	DATE: 8 MAR 18
04	Change LCD driving IC			OUR REF. 4949		
05	Change LCD driving IC					

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.75	5.0	5.25	V
Supply Current	IDD	—	1.5	2.0	mA
Input Voltage for LCD (*)	V0	-0.2	0	0.2	V
“H”Level Input Voltage	VIH	0.7VDD	—	VDD	V
“L”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

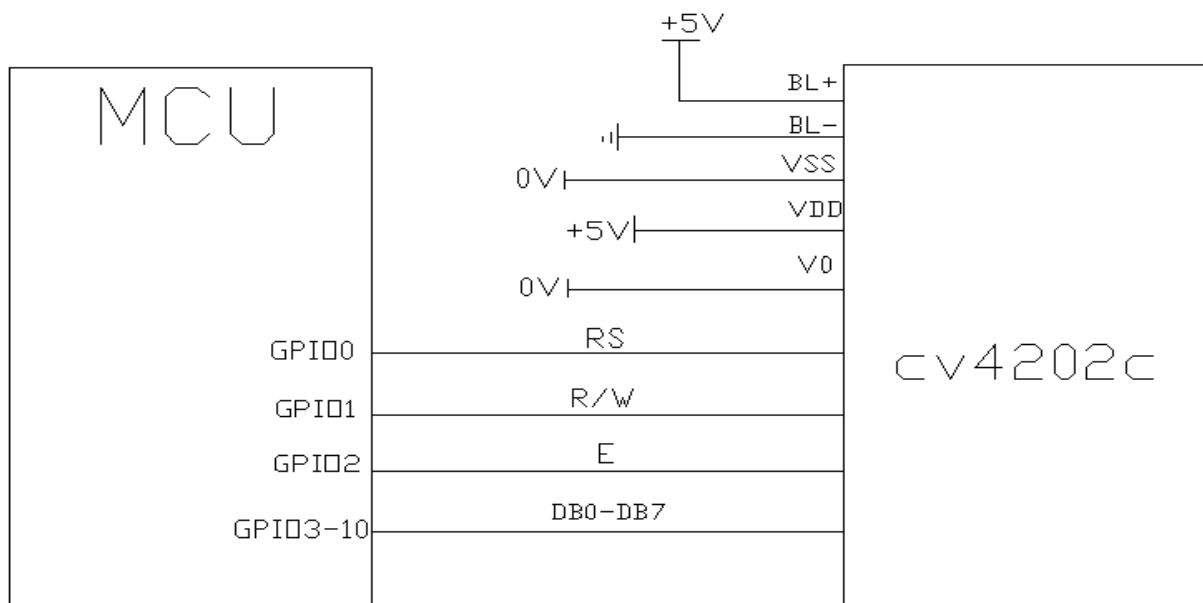
Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White Backlight current	I _{BL}	-	15	19	mA	V _{BL} = 5V

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)	Rating (for wide temperature)	Unit
Supply Voltage	VDD	-0.3 to 7	-0.3 to 7	V
Input Voltage	VIN	-0.3 to VDD +0.3	-0.3 to VDD +0.3	V
Operating Temperature	T _{opr}	0 to 50	-20 to 70	°C
Storage Temperature	T _{stg}	-10 to 60	-30 to 80	°C

REFERENCE CIRCUIT EXAMPLE

INSTRUCTIONS

Instruction Table:

Instruction	Instruction Code										Description	Description Time (270KHz)	
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Clear Display	0	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52 ms
Return Home	0	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 us
Display ON/OFF	0	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	37 us
Cursor or Display Shift	0	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x		DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0		Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0		Set DDRAM address in address counter	37 us
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0		Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0		Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0		Read data from internal RAM (DDRAM/CGRAM)	37 us

Note:

Be sure the ST7066U is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

RECOMMENDED INITIAL SETTINGS

```

Delay_ms(40);
W_CMD(0x30);
Delay_ms(5);
W_CMD(0x30);
Delay_ms(1);
W_CMD(0x30);
W_CMD(0x38);
W_CMD(0x08);
Clear();
W_CMD(0x06);
W_CMD(0x0E);
    
```

DISPLAY DD RAM AND CHARACTER POSITION

20x2, 1/16 DUTY CYCLE

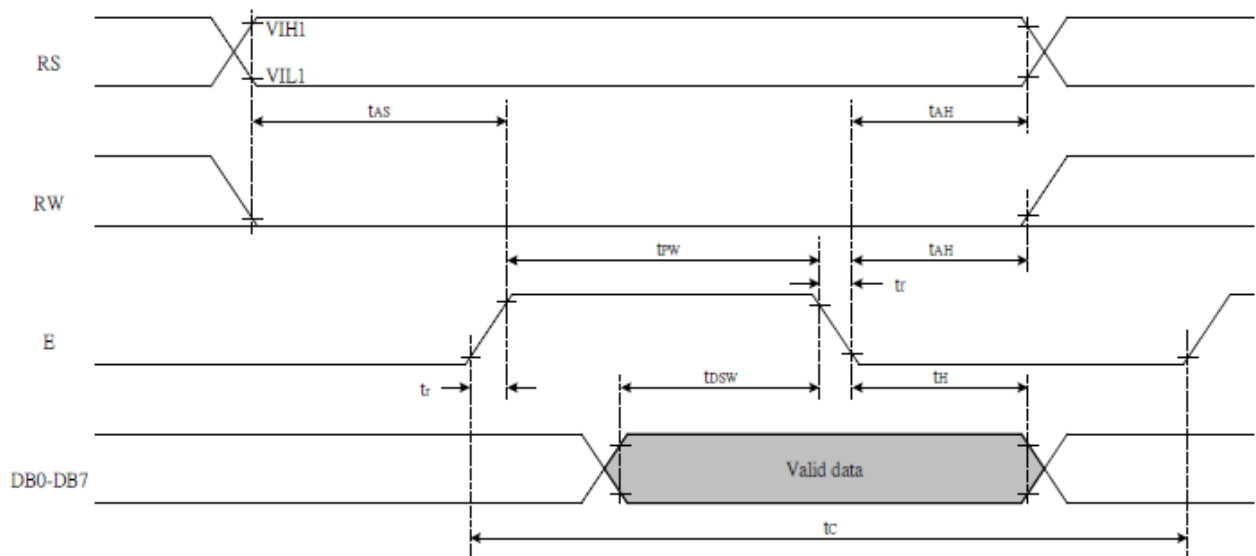
	1	2		20	DISPLAY POSITION DD RAM ADDRESS
line 1	00	01	13	
line 2	40	41	53	

WRITE MODE

<i>Write Mode (Writing data from MPU to ST7066U)</i>						
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	460	-	-	ns
T_{R,T_F}	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DSW}	Data Setup Time	Pins: DB0 - DB7	80	-	-	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

WRITE MODE TIMING DIAGRAM

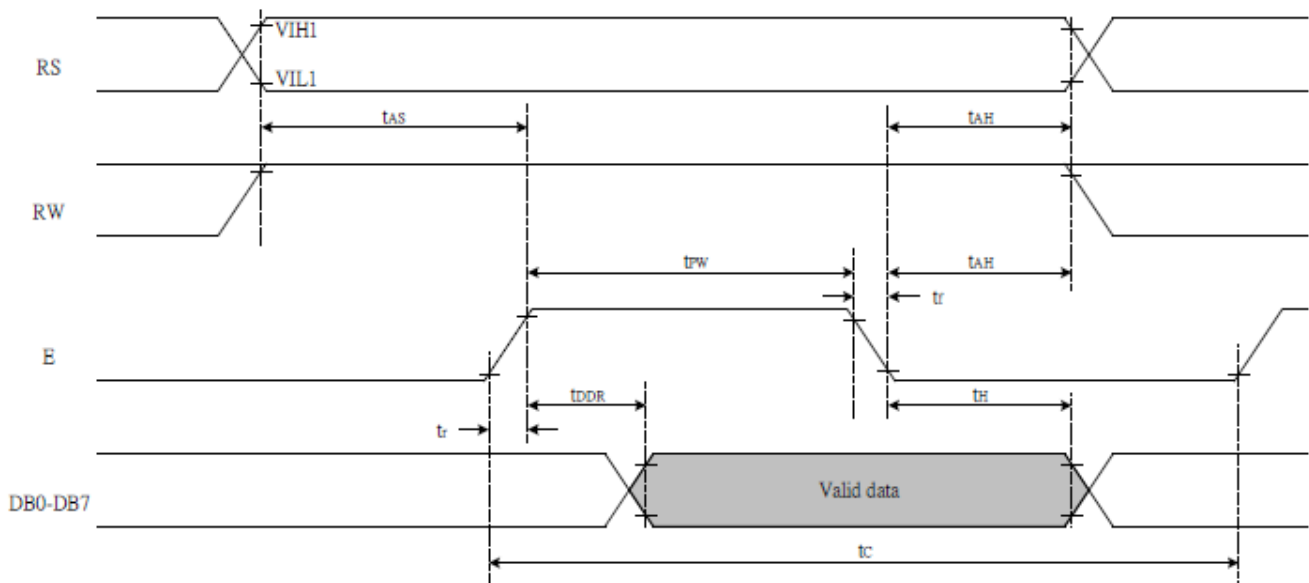
- Writing data from MPU to ST7066U



READ MODE

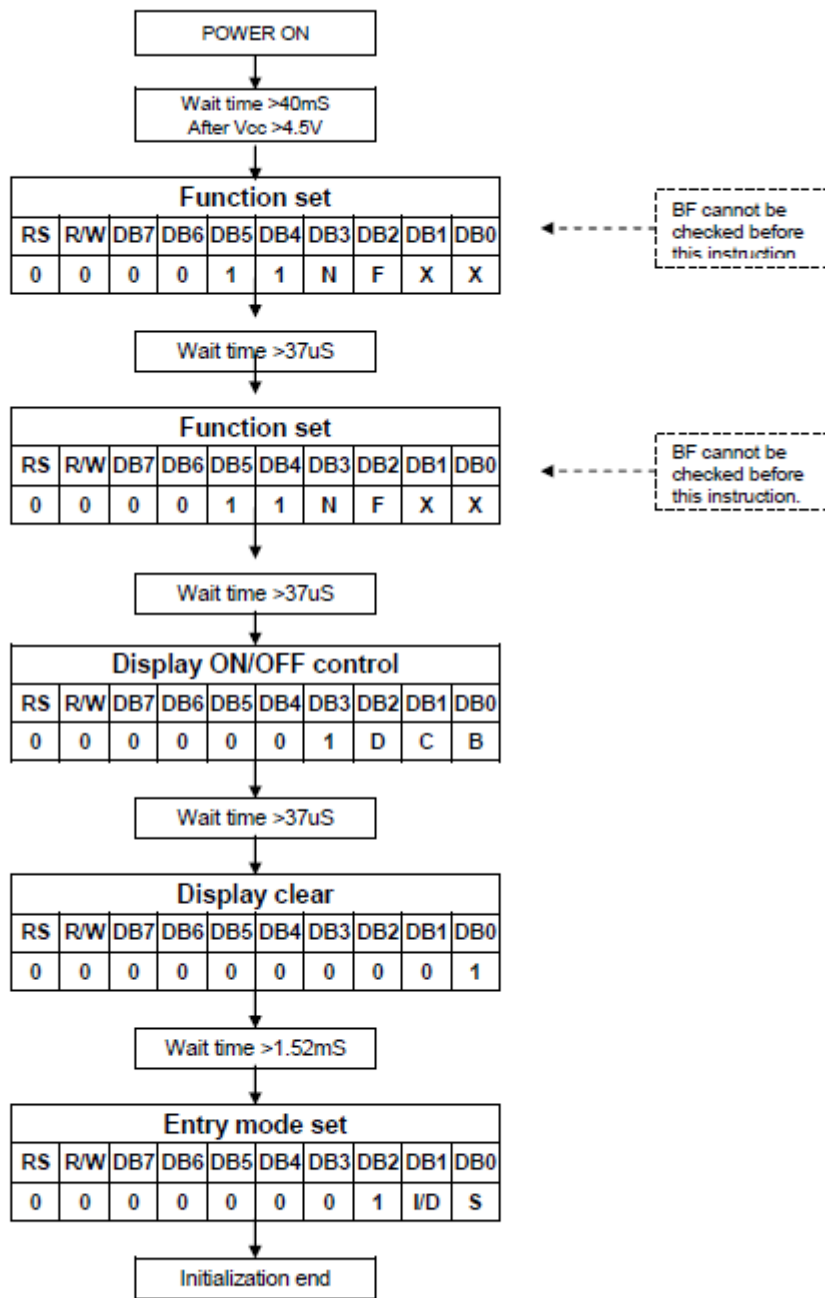
<i>Read Mode (Reading Data from ST7066U to MPU)</i>						
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	480	-	-	ns
T_{R,T_F}	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DDR}	Data Setup Time	Pins: DB0 - DB7	-	-	320	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

READ MODE TIMING DIAGRAM



INITIALIZATION FLOWCHART

- 8-bit Interface (fosc=270KHz)



ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = $V_{OP} / 64 \text{ Hz}$
 TEMPERATURE = $22 \pm 5 \text{ }^\circ\text{C}$
 RELATIVE HUMIDITY = $60 \pm 15 \%$

ITEM	SYMBOL	UNIT	TYP. TN	TYP. STN	TYP. EBTN
RESPONSE TIME	Ton	ms	130	150	60
	Toff	ms	170	190	80
CONTRAST RATIO	Cr	-	8	15	500
VIEWING ANGLE (6 O'clock) (Cr \geq 2)	V3:00	$^\circ$	70	45	50
	V6:00	$^\circ$	45	70	85
	V9:00	$^\circ$	70	45	85
	V12:00	$^\circ$	5	60	85

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

RELIABILITY OF LCD MODULE

NO.	Item	TEST CONDITION FOR NORMAL TEMPERATURE	TEST CONDITION FOR WIDE TEMPERATURE	TIME
1	High temperature operating	50 $^\circ\text{C}$	70 $^\circ\text{C}$	240 hours
2	Low temperature operating	0 $^\circ\text{C}$	-20 $^\circ\text{C}$	240 hours
3	High temperature storage	60 $^\circ\text{C}$	80 $^\circ\text{C}$	240 hours
4	Low temperature storage	-10 $^\circ\text{C}$	-30 $^\circ\text{C}$	240 hours
5	Temperature-humidity storage	40 $^\circ\text{C}$ 90% R.H.	60 $^\circ\text{C}$ 90% R.H.	96 hours
6	Temperature cycling	-10 $^\circ\text{C}$ to 60 $^\circ\text{C}$ 30 Min Dwell	-30 $^\circ\text{C}$ to 80 $^\circ\text{C}$ 30 Min Dwell	5 cycle
7	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	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	—

Inspection condition:

No. 1 ~ 6:

The samples should be placed in room temperature for 2 hours before inspection.

Acceptance criteria:

No non-conformance found in functional and cosmetic.

QUALITY STANDARD OF LCD MODULE

1.0	Sampling Method		
	Sampling Plan : ANSI/ASQ Z1.4 Class of AQL : Level II/Single Sampling Critical : 0.25% Major 0.65% Minor 1.5%		
2.0	Defect Group	Failure Category	Failure Reasons
	Critical Defect 0.25%(AQL)	Malfunction	Open Short Burnt or dead component Missing part/improper part P.C.B. Broken
	Major Defect 0.65%(AQL)	Poor Insulation	Potential short 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 1.5%(AQL)	Cosmetic Defect	Minor scratch Flux residue Thin solder Poor plating Poor marking Crack solder Poor bending Poor packing Wrong size

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) 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.

(4) CAUTION FOR OPERATION

The viewing angle can be adjusted by varying the LCD driving voltage V_0 .

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%.

(5) 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 leaks 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.