



**CLOVER DISPLAY LTD.**

## **LCD MODULE SPECIFICATION**

**Model : CG9162J - \_ \_ - \_ \_ - \_ \_**

Revision	01
Engineering	Timothy Chan
Date	19 OCT 2018
Our Reference	X9063

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**MODE OF DISPLAY****Display mode**☐ TN positive☐ TN negativeSTN : ☐ 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:**CG9162J- 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

\*(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 : 16 characters x 2 line COG LCD module

Interface : 4 bit parallel

Driving method : 1/16 duty, 1/5 bias

Controller IC : Sitronix ST7032 or equivalent

For the detailed information, please refer to the IC specification

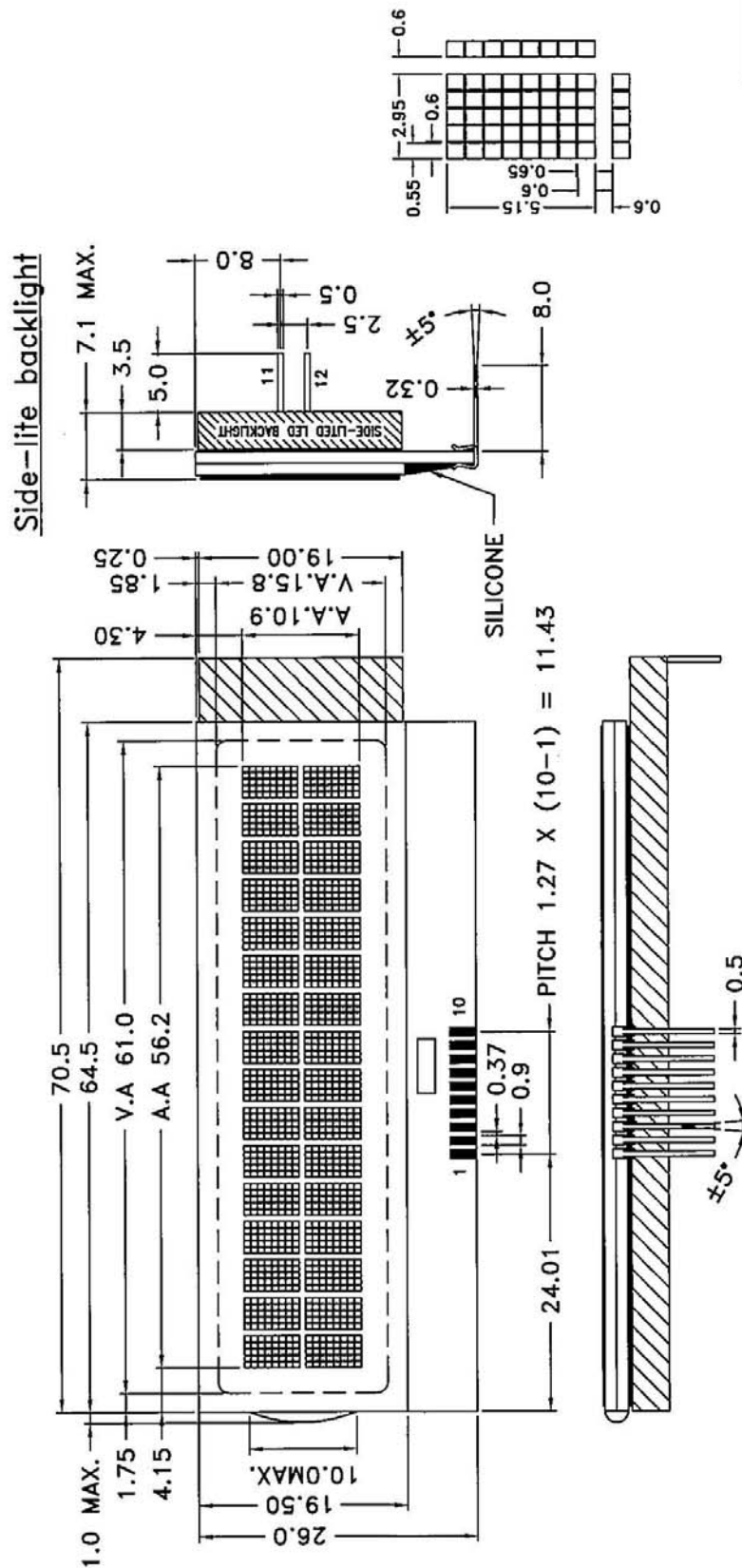
**MECHANICAL DIMENSIONS**

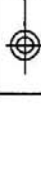
Item	Dimension	Unit	Item	Dimension	Unit
No Backlight (N)	64.5(L)x26.0(W)x2.9MAX.(H)	mm	Viewing Area	61.0(L)x15.8(W)	mm
LED Sided Backlight(L)	70.5(L)x26.0(W)x7.1(MAX)(H)	mm	Dot Pitch	0.6(L)x0.65(W)	mm
Array Backlight (M)	64.5(L)x26.0(W)x7.4(MAX)(H)	mm	Dot Size	0.55(L)x0.6(W)	mm

**CONNECTOR PIN ASSIGNMENT**

Pin No.	Signal	Function
1	VLCD	Operating Voltage for LCD
2	VDD	Supply voltage for logic
3	VSS	Ground
4	DB7	Data bus
5	DB6	Data bus
6	DB5	Data bus
7	DB4	Data bus
8	E	Enable signal
9	RW	Read/write select
10	RS	Register select
11	BL(+/-)	Supply voltage for logic (-VE) for side-lited backlight version (+VE) for array backlight version
12	BL(-/+)	Supply voltage for logic (+VE) for side-lited backlight version (-VE) for array backlight version

MARK	REASON	PREPARED	DATE
①			
②			
③			
④			

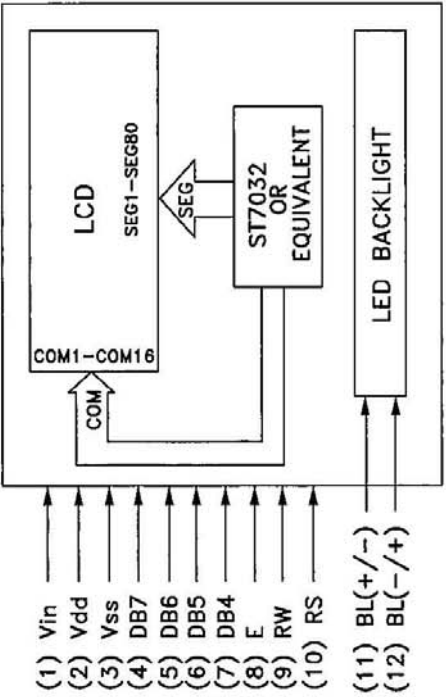


TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)			
REV.	REVISION RECORD		DATE	CUSTOMER	APPROVED	MODEL NO. CG9162J	SHEET 1 OF 4
00	1st ISSUE		08 MAY 18		<i>[Signature]</i>	TITLE: MODULE DIMENSION	
				AGENT	APPROVED	DRAWN BY: MYWANG	DATE: 08 MAY 18
						CHECKED BY: <i>[Signature]</i>	DATE: <i>[Signature]</i>
				CUSTOMER REF.	OUR REF. X9063	APPROVED BY: <i>[Signature]</i>	DATE: <i>[Signature]</i>
						<i>[Signature]</i> 10 May 18	

[illegible]

TOLERANCE IF NOT SPECIFY ±0.5mm	SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 2 OF 4
REV.	REVISION RECORD	DATE	CUSTOMER	APPROVED	MODEL NO. CG9162J
00	1st ISSUE	08 MAY 18		<i>[Signature]</i>	TITLE: MODULE DIMENSION
			AGENT	APPROVED	DRAWN BY: MYWANG DATE: 08 MAY 18
					CHECKED BY: <i>[Signature]</i> DATE: 08 MAY 18
			CUSTOMER REF.	OUR REF. X9063	APPROVED BY: <i>[Signature]</i> DATE: 08 MAY 18

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



PIN No.	SYMBOL	FUNCTION
1	VLCD	Operating Voltage for LCD
2	VDD	Supply voltage for logic
3	VSS	Ground
4	DB7	Data bus
5	DB6	Data bus
6	DB5	Data bus
7	DB4	Data bus
8	E	Enable signal
9	RW	Read/write select
10	RS	Register select
11	BL(+/-)	Supply voltage for backlight (-VE) for side-lit backlight version (+VE) for array backlight version
12	BL(-/+)	Supply voltage for backlight (+VE) for side-lit backlight version (-VE) for array backlight version

TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 3 OF 4
REV.	REVISION RECORD	DATE	CUSTOMER	APPROVED	MODEL NO. CG9162J	
00	1st ISSUE	08 MAY 18	AGENT	APPROVED	TITLE: BLOCK DIAGRAM	
					DRAWN BY: MYWANG	DATE: 08 MAY 18
					CHECKED BY: <i>[Signature]</i>	DATE: 08 MAY 18
					APPROVED BY: <i>[Signature]</i>	DATE: 08 MAY 18
				OUR REF. X9063		

**ELECTRICAL CHARACTERISTICS**

Conditions: VSS=0V, @Ta=25℃

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.75	5.0	5.25	V
Supply Current	IDD	—	0.43	0.53	mA
Operating Voltage for LCD (*)	VLCD	4.3	4.5	4.7	V
“H” Level Input Voltage	VIH	0.7VDD	—	VDD	V
“L” Level Input Voltage	VIL	-0.3	—	0.55	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	I <sub>BL</sub>	15	18	21	mA	V <sub>BL</sub> = 3.5V
Yellow green	I <sub>BL</sub>	30	35	40	mA	V <sub>BL</sub> = 5.0V
Blue	I <sub>BL</sub>	30	35	40	mA	V <sub>BL</sub> = 5.0V

**Array LED**

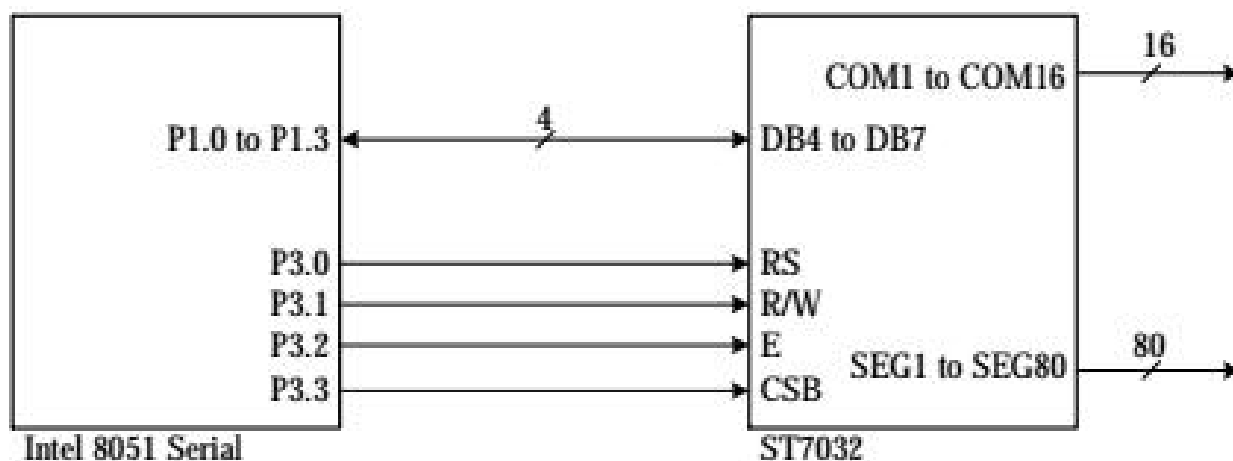
Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Amber	V <sub>BL</sub>	3.7	3.9	4.2	V	I <sub>BL</sub> = 100mA

**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	-0.3 to 7.0	V
Input Voltage	VT	-0.3 to VDD +0.3	-0.3 to VDD +0.3	V
Operating Temperature	T <sub>opr</sub>	0 to 50	-20 to 70	℃
Storage Temperature	T <sub>stg</sub>	-10 to 60	-30 to 80	℃

**REFERENCE CIRCUIT EXAMPLE**

## INSTRUCTIONS

(when "EXT" option pin connect to VSS, the instruction set follow below table)

Instruction	Instruction Code										Description	Instruction Execution Time		
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		OSC=380KHz	OSC=540kHz	OSC=700KHz
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.08 ms	0.76 ms	0.59 ms
Return Home	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.	1.08 ms	0.76 ms	0.59 ms
Entry Mode Set	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.	26.3 us	18.5 us	14.3 us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	26.3 us	18.5 us	14.3 us
Function Set	0	0	0	0	1	DL	N	DH	*0	IS	DL: interface data is 8/4 bits N: number of line is 2/1 DH: double height font IS: instruction table select	26.3 us	18.5 us	14.3 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	26.3 us	18.5 us	14.3 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	0	0
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM/ICONRAM)	26.3 us	18.5 us	14.3 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM/ICONRAM)	26.3 us	18.5 us	14.3 us

Note \*: this bit is for test command , and must always set to "0"

## Instruction table 0(IS=0)

Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	S/C and R/L: Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	26.3 us	18.5 us	14.3 us
Set CGRAM	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	26.3 us	18.5 us	14.3 us

## Instruction table 1(IS=1)

Internal OSC frequency	0	0	0	0	0	1	BS	F2	F1	F0	BS=1:1/4 bias BS=0:1/5 bias F2~0: adjust internal OSC frequency for FR frequency.	26.3 us	18.5 us	14.3 us
Set ICON address	0	0	0	1	0	0	AC3	AC2	AC1	AC0	Set ICON address in address counter.	26.3 us	18.5 us	14.3 us
Power/ICON control/Contrast set	0	0	0	1	0	1	Ion	Bon	C5	C4	Ion: ICON display on/off Bon: set booster circuit on/off C5,C4: Contrast set for internal follower mode.	26.3 us	18.5 us	14.3 us
Follower control	0	0	0	1	1	0	Fon	Rab 2	Rab 1	Rab 0	Fon: set follower circuit on/off Rab2~0: select follower amplified ratio.	26.3 us	18.5 us	14.3 us
Contrast set	0	0	0	1	1	1	C3	C2	C1	C0	Contrast set for internal follower mode.	26.3 us	18.5 us	14.3 us



**RECOMMENDED INITIAL SETTINGS**

```
delay_ms(40);           //wait for power on  default 40
TR_CMD(0x29);           //function set
delay_ms(5);            // delay 5 ms
TR_CMD(0x29);           //function set
delay_ms(5);            // delay 5 ms
TR_CMD(0x29);           //function set
delay_ms(5);            // delay 5 ms
TR_CMD(0x10);           //Bias selection/Internal OSC frequency adjust
delay_ms(5);            // delay 5 ms
TR_CMD(0x70);           //Contrast set(low byte)
delay_ms(5);            // delay 5 ms
TR_CMD(0x50);           //Power/ICON control/Contrast set(high byte)
delay_ms(5);            // delay 5 ms
TR_CMD(0x68);           //Follower control          1+Rb/Ra=3
delay_ms(200);          // delay 200 ms
TR_CMD(0x01);           //CLR DISPLAY
delay_ms(5);            // delay 5 ms
TR_CMD(0x0c);           //DISPLAY ON ,00001DCB ,D=1:Display on; 0:off
delay_ms(5);            // delay 5 ms
```

**DISPLAY DATA RAM****➤ 2-line display (N = 1) (Figure 10)**

Case 1: When the number of display characters is less than 40 , 2 lines, the two lines are displayed from the head. Note that the first line end address and the second line start address are not consecutive. See Figure 10.

Display Position	1	2	3	4	5	6		38	39	40
DDRAM Address	00	01	02	03	04	05	.....	25	26	27
(hexadecimal)	40	41	42	43	44	45	.....	65	66	67

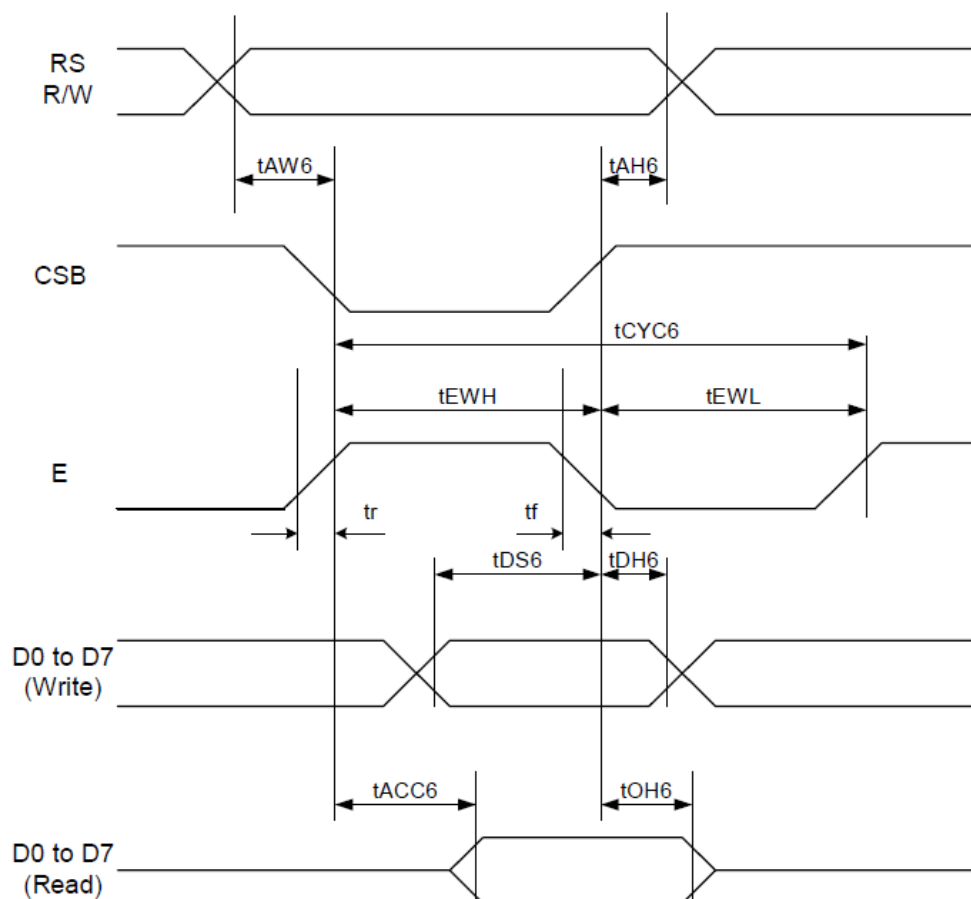
**Figure 10. 2-Line Display**

Case 2: For a 16-character , 2-line display See Figure 11.  
When display shift operation is performed, the DDRAM address shifts. See Figure 11.

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DDRAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
For Shift Left	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10
	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50
For Shift Right	27	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E
	67	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E

**Figure 11. 2-Line by 16-Character Display Example**

## INTERFACE TIMING DIAGRAM &amp; CHARACTERISTICS



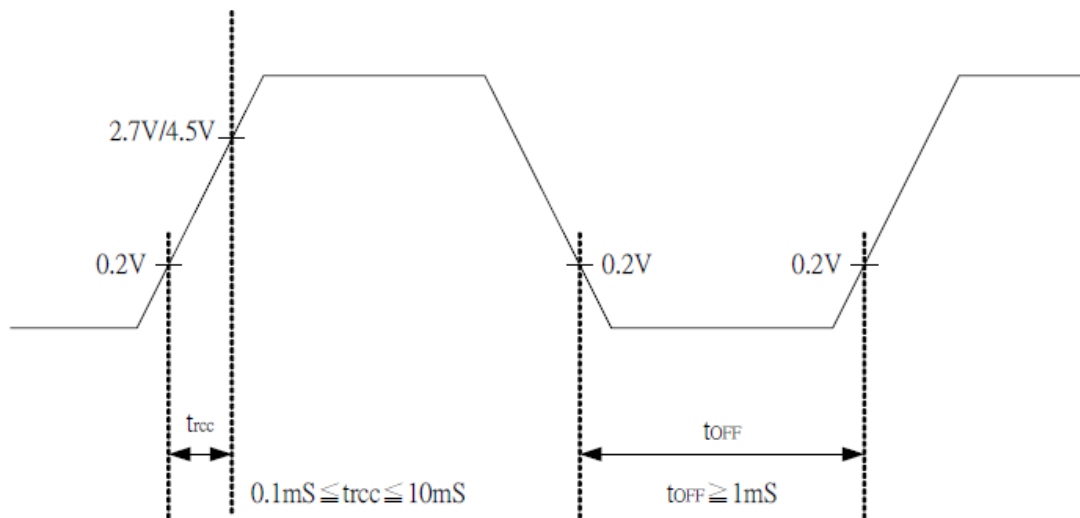
(Ta = 25°C)

Item	Signal	Symbol	Condition	VDD=2.7 to 4.5V Rating		VDD=4.5 to 5.5V Rating		Units
				Min.	Max.	Min.	Max.	
Address hold time	RS	$t_{AH6}$	—	20	-	20	-	ns
Address setup time	RS	$t_{AW6}$		20	-	20	-	
System cycle time	RS	$t_{CYC6}$	—	400	-	280	-	ns
Data setup time	D0 to D7	$t_{DS6}$	—	100	-	80	-	ns
Data hold time	D0 to D7	$t_{DH6}$		40	-	20	-	
Access time	D0 to D7	$t_{ACC6}$	CL = 100 pF	-	500	-	400	ns
Output disable time	D0 to D7	$t_{OH6}$		300	-	150	-	
Enable Rise/Fall time	E	$t_r, t_f$	—	-	20	-	20	ns
Enable H pulse time	E	$t_{EWH}$	—	200	-	120	-	ns
Enable L pulse time	E	$t_{EWL}$	—	150	-	130	-	ns

Note: All timing is specified using 20% and 80% of VDD as the reference.

**RESET TIMING**

- **Internal Power Supply Reset**



## Notes:

- $t_{off}$  compensates for the power oscillation period caused by momentary power supply oscillations.
- Specified at 4.5V for 5V operation, and at 2.7V for 3V operation.
- If 2.7V/4.5V is not reached during 3V/5V operation, internal reset circuit will not operate normally.

## THE RESET CIRCUIT

### Initializing by Internal Reset Circuit

An internal reset circuit automatically initializes the ST7032 when the power is turned on. The following instructions are executed during the initialization. The busy flag (BF) is kept in the busy state (BF = 1) until the initialization ends. The busy state lasts for 40 ms after VDD rises to stable.

1. Display clear
2. Function set:  
DL = 1; 8-bit interface data  
N = 0; 1-line display  
DH=0; normal 5x8 font  
IS=0; use instruction table 0
3. Display on/off control:  
D = 0; Display off  
C = 0; Cursor off  
B = 0; Blinking off
4. Entry mode set:  
I/D = 1; Increment by 1  
S = 0; No shift
5. Internal OSC frequency  
(F2,F1,F0)=(1,0,0)
6. ICON control  
Ion=0; ICON off
7. Power control  
BS=0; 1/5bias  
Bon=0; booster off  
Fon=0; follower off  
(C5,C4,C3,C2,C1,C0)=(1,0,0,0,0,0)  
(Rab2,Rab1,Rab0)=(0,1,0)

#### Note:

If the electrical characteristics conditions listed under the table Power Supply Conditions Using Internal Reset Circuit are not met, the internal reset circuit will not operate normally and will fail to initialize the ST7032.

When internal Reset Circuit not operate, ST7032 can be reset by XRESET pin from MPU control signal.



## CHARACTER CODES AND CHARACTER PATTERN

ST7032-0D (ITO option OPR1=1, OPR2=1)

b7-b4 b3-b0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	!	@	#	\$	%	&	'	(	)	*	+	,	-	.	:	;
0001	<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K
0010	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[
0011	\	]	^	_	`	a	b	c	d	e	f	g	h	i	j	k
0100	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	{
0101		~														
0110																
0111																
1000																
1001																
1010																
1011																
1100																
1101																
1110																
1111																

**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.
RESPONSE TIME	$T_{on}$	ms	150
	$T_{off}$	ms	190
CONTRAST RATIO	Cr	-	15
VIEWING ANGLE ( $Cr \geq 2$ )	V3:00	$^{\circ}$	45
	V6:00	$^{\circ}$	70
	V9:00	$^{\circ}$	45
	V12:00	$^{\circ}$	60

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°C	70°C	240 hours
2	Low temperature operating	0°C	-20°C	240 hours
3	High temperature storage	60°C	80°C	240 hours
4	Low temperature storage	-10°C	-30°C	240 hours
5	Temperature-humidity storage	40°C 90% R.H.	60°C 90% R.H.	96 hours
6	Temperature cycling	-10°C to 60°C 30 Min Dwell	-30°C to 80°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.



**SAMPLING METHOD**

SAMPLING PLAN : ANSI/ASQ Z1.4

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	$MAX(a,b) \leq 1/4 W$ DOT MATRIX: IF $0.6 \leq W$ , $MAX(a,b) < 0.3 N$ IF $0.4 \leq W < 0.6$ , $MAX(a,b) < 0.25 N$ IF $W < 0.4$ , $MAX(a,b) < 0.2 N$	MINOR	1
EXCESS SEGMENT	$MAX(c,d) \leq 1/4 T$	MINOR	1
BUBBLES	$d^* \geq 0.2$ QTY=0	MINOR	2
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

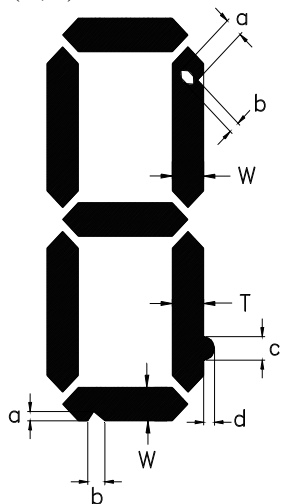
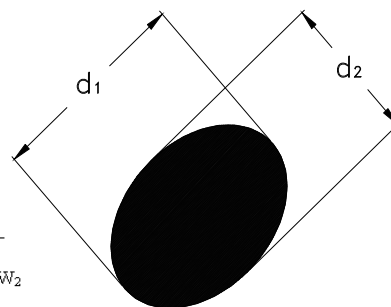
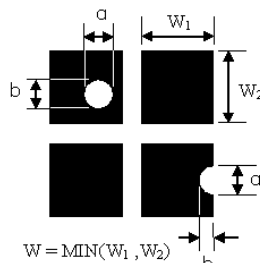
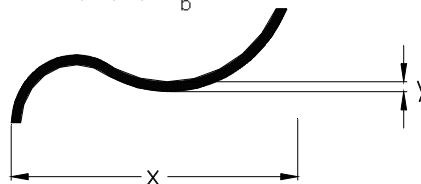


fig . 1

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	$a \leq 3.0$ $b \leq 1/2T$ $c \leq 1/3W$		5
GLASS PROTRUSION		$a \leq 1/4 W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER .

DEFECT TABLE : B

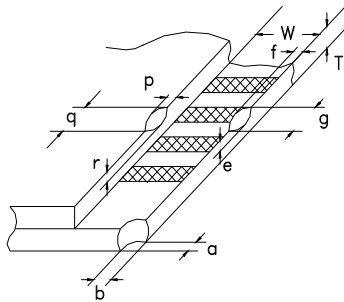


fig . 4

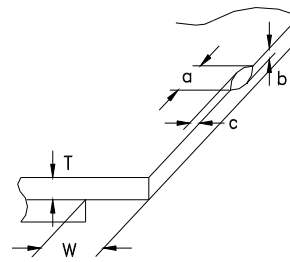


fig . 5

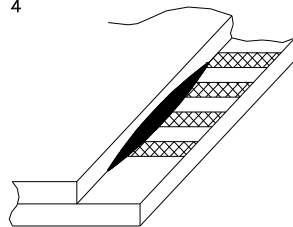


fig . 6

**QUALITY STANDARD OF LCD MODULE**

<b>1.0</b>	<b>Sampling Method</b>		
	Sampling Plan :ANSI/ASQ Z1.4 Class of AQL : Level II/Single Sampling Critical : 0.25% Major 0.65% Minor 1.5%		
<b>2.0</b>	<b>Defect Group</b>	<b>Failure Category</b>	<b>Failure Reasons</b>
	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

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.

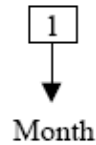
When any liquid leaked out of a damaged glass cell comes in contact with your hands, wash it off with soap and water.

## 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.

**APPENDIX****LOT INDICATION OF LCD MODULE****CODING SYSTEM:**

1 DIGIT COLOR CODE:

**COLOR CODE:**

MONTH	COLOR	
1	BROWN	棕
2	RED	紅
3	ORANGE	橙
4	YELLOW	黃
5	GREEN	綠
6	BLUE	藍
7	PURPLE	紫
8	GREY	灰
9	WHITE	白
10	BLACK	黑
11	GOLD	金
12	SILVER	銀

3 TYPES OF LOCATION AS SHOWN BELOW:

