CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CV240128A - _ _ - _ _ - _ _ - _

Revision	05
Engineering	Timmy Kwan
Date	03 June 09
Our Reference	X4913

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:

CV240128A- <u>MY</u> - <u>S</u> <u>F</u> - <u>N</u> <u>6</u> – <u>T</u>
     | | | | | | | |
  (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)
    T – Touch panel (Analog)
    P – Touch panel (Digital)

GENERAL DESCRIPTION

Display mode   : 240 X 128 dots, Graphic LCD module

Interface   : 8-bit parallel

Driving method   : 1/128 duty, 1/12 bias

Controller IC   : Toshiba T6963C or equivalent
       For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension (No backlight)	144.0(L)x104.0(W)x9.0(H)	mm	Outline Dimension (Array LED backlight)	144.0(L)x104.0(W)x14.5(H)	mm
Outline Dimension (CCFL backlight)	155.0(L)x104.0(W)x14.5(H)	mm	Dot Pitch	0.45(L)x0.45(W)	mm
Viewing Area	114.0(L)x64.0(W)	mm	Dot Size	0.4(L)x0.4(W)	mm

CONNECTOR PIN ASSIGNMENT (CN1)

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	FG	Frame Ground	11	DB1	
2	GND	Ground	12	DB2	
3	VDD	Supply Voltage For Logic	13	DB3	
4	V0	Input Voltage For LCD	14	DB4	Data Bus Line
5	/WR	Write Signal	15	DB5	
6	/RD	Read Signal	16	DB6	
7	/CE	Chip Enable	17	DB7	
8	C/D	Register Select Input	18	FS	Font Select Input
9	/RST	Reset	19	(*)BL-	Supply voltage for backlight (-)
10	DB0	Data Bus Line	20	(*)BL+	Supply voltage for backlight (+)

Note: (*) For LED Backlight Only.

CONNECTOR PIN ASSIGNMENT FOR CCFL BACKLIGHT (CN3)

Pin No.	Symbol	Function
1	BL1	Supply voltage for backlight (CCFL HV)
2	NC	No Connection
3	BL2	Supply voltage for backlight (CCFL GND)

COUNTER DRAWING OF MODULE DIMENSION
(NO BACKLIGHT AND ARRAY LED BACKLIGHT VERSION)

	H1	H2
No Backlight (N)	4.9	9.0
Array LED Backlight (M)	10.4	14.5

240 X 128 DOTS

No backlight & Array LED backlight version

144.0
138.0±0.3
133.2±0.3
V.A. 114.0
R1.0

15.0
17.0
V.A. 64.0
79.8
97.0
104.0

35.1
P2.54x(18−1)=43.18
2.5
CN1
18

4Xø3.0

1.6
H1
H2

0.4
0.05
0.05
0.4

19
20

CLOVER DISPLAY LTD. (HK)
STANDARD

UNIT IN mm	CUSTOMER	APPROVED
		MODEL NO. CV240128A
	AGENT	APPROVED
		TITLE: MODULE DIMENSION
	CUSTOMER REF.	DRAWN BY: MEN DATE: 02 JUN 09
		CHECKED BY:
		OUR REF. X4913 APPROVED BY: DATE: 2/6/09

SHEET 1 OF 4

TOLERANCE IF NOT SPECIFY ±0.5mm   SCALE N.T.S.

REV.	REVISION RECORD	DATE
00	1st ISSUE	09 APR 05
01	Correct input voltage for LCD	02 JUN 09

MARK	REASON	PREPARED	DATE
⚠	Correct input voltage for LCD	Timmy	02 JUN 09
⚠			
⚠			
⚠			

COUNTER DRAWING OF MODULE DIMENSION (CCFL BACKLIGHT VERSION)

CCFL backlight version

240 X 128 DOTS

R1.0

155.0
144.0
138.0±0.3
133.2±0.3
V.A. 114.0

15.0
17.0
V.A. 64.0
79.8
97.0
104.0

P2.54x(18−1)=43.18
35.1
2.5
18
1
CN1

10.4
14.5
1.6

89.5
7.7
7.3
P2.5X(3−1)=5.0
CN3
65.0±15.0
11.0
4XØ3.0

0.4
0.05
0.05

MARK	REASON	PREPARED	DATE
	Correct input voltage for LCD	Timmy	02 JUN 09

CLOVER DISPLAY LTD. (HK)

CUSTOMER	STANDARD	APPROVED	MODEL NO. CV240128A
			TITLE: MODULE DIMENSION
AGENT		APPROVED	DRAWN BY: MEN DATE: 02 JUN 09
			CHECKED BY: DATE:
CUSTOMER REF.			APPROVED BY: DATE: 3/6/09
			OUR REF. X4913

SHEET 2 OF 4

		UNIT IN mm	DATE
TOLERANCE IF NOT SPECIFY ±0.5mm	SCALE N.T.S.		
REV.	REVISION RECORD		DATE
00	1st ISSUE		09 APR 05
01	Correct input voltage for LCD		02 JUN 09

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM

CN1
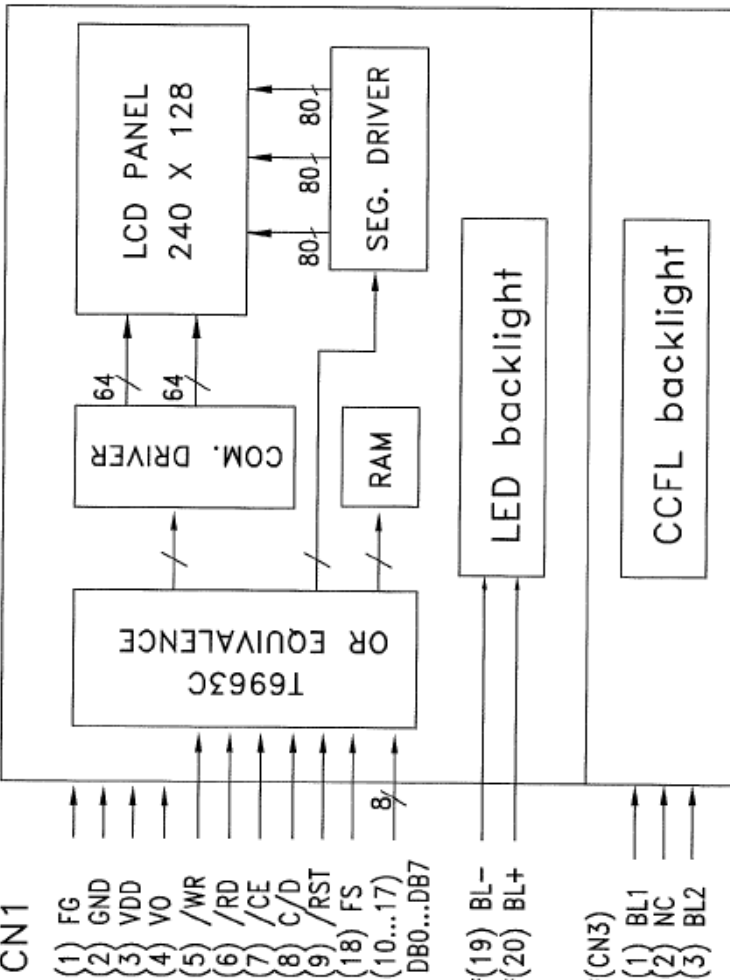
PIN NO.	SYMBOL	FUNCTION
1	FG	Frame ground
2	GND	Ground
3	VDD	Supply voltage for logic
4	VO	Input voltage for LCD
5	/WR	Write
6	/RD	Read
7	/CE	Chip enable
8	C/D	Register select input
9	/RST	Reset
10	DB0	Data bus line
11	DB1	
12	DB2	
13	DB3	
14	DB4	
15	DB5	
16	DB6	
17	DB7	
18	FS	Font select input
*19	BL−	Supply voltage for backlight(−VE)
*20	BL+	Supply voltage for backlight(+VE)

*CN3

PIN NO.	SYMBOL	FUNCTION
1	BL1	Supply voltage for backlight (CCFL HV)
2	NC	No connection
3	BL2	Supply voltage for backlight (CCFL GND)

Block diagram:

LCD PANEL 240 X 128

SEG. DRIVER

COM. DRIVER

RAM

T6963C OR EQUIVALENCE

LED backlight

CCFL backlight

CN1
(1) FG
(2) GND
(3) VDD
(4) VO
(5) /WR
(6) /RD
(7) /CE
(8) C/D
(9) /RST
(18) FS
(10...17) DB0...DB7
*(19) BL−
*(20) BL+

*(CN3)
(1) BL1
(2) NC
(3) BL2

Note(*): CN3 is used for CCFL backlight version only
Pin(19),Pin(20) is used for LED backlight version only

			CLOVER DISPLAY LTD. (HK)		SHEET
		STANDARD			3 OF 4
			MODEL NO.	CV240128A	
			TITLE: PIN OUT & BLOCK DIAGRAM		

CUSTOMER — APPROVED

AGENT — APPROVED

CUSTOMER REF.

OUR REF. X4913

DRAWN BY: MEN DATE: 02 JUN 09
CHECKED BY: DATE:
APPROVED BY: DATE: 3/6/09

TOLERANCE IF NOT SPECIFY ±0.5mm	SCALE N.T.S.		UNIT IN mm	
REV.	REVISION RECORD		DATE	
00	1st ISSUE		09 APR 05	
01	Correct input voltage for LCD		02 JUN 09	

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25℃

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	V_{DD}	4.75	5.00	5.25	V	"H"Level Input Voltage	V_{IH}	VDD-2.2	—	VDD	V
Supply Current for Logic	I_{DD}	—	15.0	28.0	mA	"L"Level Input Voltage	V_{IL}	0	—	0.8	V
Input Voltage for LCD	V0	-13.2	-13.0	-12.8	V	—	—	—	—	—	—
Array LED Backlight						**Array LED Backlight**					
Yellow Green	V_{BL}	3.8	4.0	4.2	V	Yellow Green (*)	I_{BL}	—	720	1290	mA
CCFL Backlight						**CCFL Backlight**					
White	V_{BL}	—	220	350	Vrms	White	I_{BL}	—	5.0	6.0	mArms

* The driving method of the backlight is using constant current.

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	V_{DD}	-0.3 to +7.0	-0.3 to +7.0	V
Input Voltage	V_T	-0.3 to VDD +0.3	-0.3 to VDD +0.3	V
Operating Temperature	T_{opr}	0 to 50	-20 to 70	℃
Storage Temperature	T_{stg}	-10 to 60	-30 to 80	℃

INSTRUCTIONS TABLE

Command	Code	D1	D2	Function
REGISTERS SETTING	00100001 00100010 00100100	X address Data Low address	Y address 00H High address	Set Cursor Pointer Set Offset Register Set Address Pointer
SET CONTROL WORD	01000000 01000001 01000010 01000011	Low address Columns Low address Columns	High address 00H High address 00H	Set Text Home Address Set Text Area Set Graphic Home Address Set Graphic Area
MODE SET	1000X000 1000X001 1000X011 1000X100 10000XXX 10001XXX	— — — — — —	— — — — — —	OR mode EXOR mode AND mode Text Attribute mode Internal CG ROM mode External CG RAM mode
DISPLAY MODE	10010000 1001XX10 1001XX11 100101XX 100110XX 100111XX	— — — — — —	— — — — — —	Display off Cursor on, blink off Cursor on, blink on Text on, graphic off Text off, graphic on Text on, graphic on
CURSOR PATTERN SELECT	10100000 10100001 10100010 10100011 10100100 10100101 10100110 10100111	— — — — — — — —	— — — — — — — —	1–line cursor 2–line cursor 3–line cursor 4–line cursor 5–line cursor 6–line cursor 7–line cursor 8–line cursor
DATA AUTO READ / WRITE	10110000 10110001 10110010	— — —	— — —	Set Data Auto Write Set Data Auto Read Auto Reset
DATA READ / WRITE	11000000 11000001 11000010 11000011 11000100 11000101	Data — Data — Data —	— — — — — —	Data Write and Increment ADP Data Read and Increment ADP Data Write and Decrement ADP Data Read and Decrement ADP Data Write and Nonvariable ADP Data Read and Nonvariable ADP
SCREEN PEEK	11100000	—	—	Screen Peek
SCREEN COPY	11101000			Screen Copy
BIT SET / RESET	11110XXX 11111XXX 1111X000 1111X001 1111X010 1111X011 1111X100 1111X101 1111X110 1111X111	— — — — — — — — — —	— — — — — — — — — —	Bit Reset Bit Set Bit 0 (LSB) Bit 1 Bit 2 Bit 3 Bit 4 Bit 5 Bit 6 Bit 7 (MSB)

X: invalid

RECOMMENDED INITIAL SETTINGS

Text home address set(40H)：00H(LSB),00H(MSB)
Graphic home address set(42H)：00H(LSB),00H(LSB)
Text area set(41H)：30H(LSB),00H(MSB)
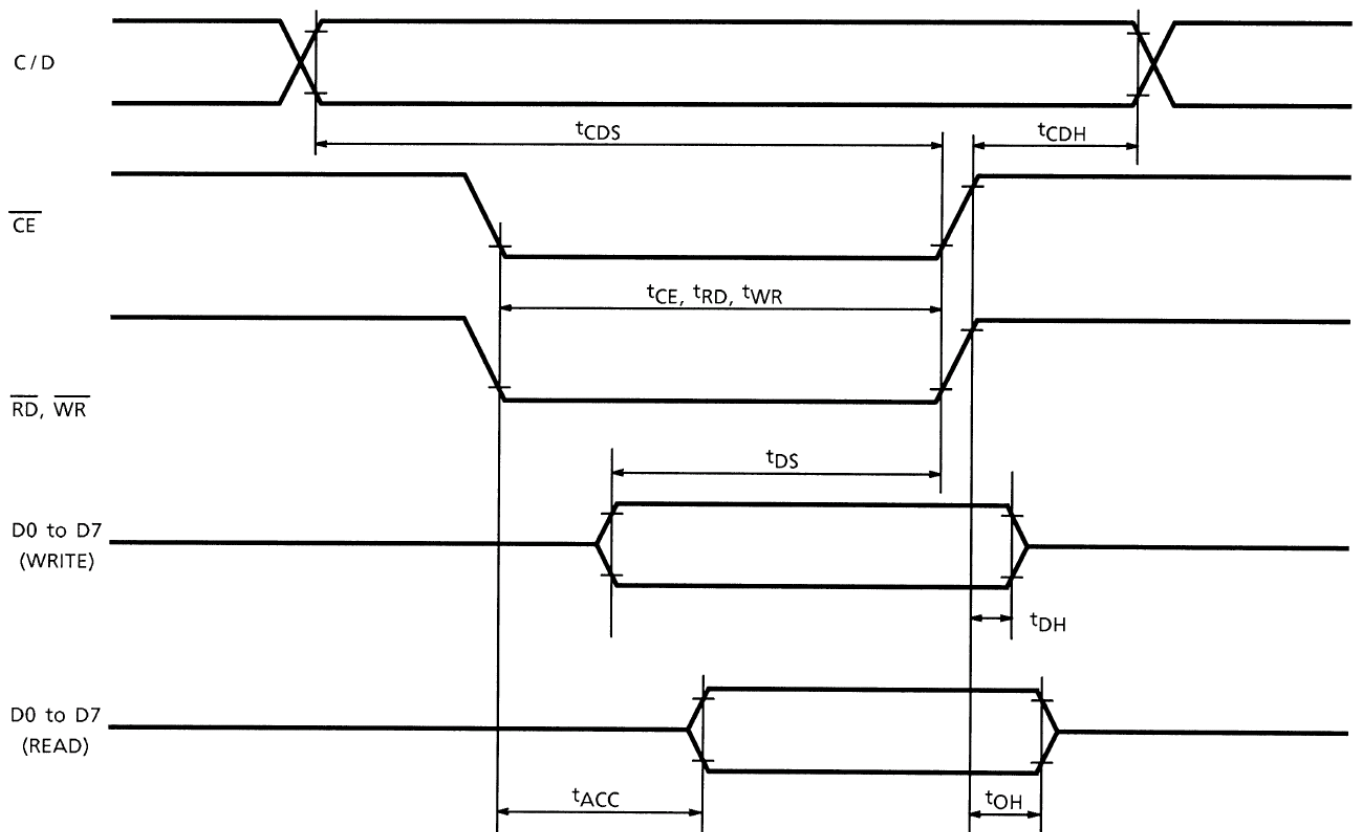Graphic area set(43H)：30H(LSB),00H(MSB)
Mode set：80H　("OR" mode)
Display mode set：98H (text off,graphic on)
Cursor pattern select：A7H (8 line cursor)

PARALLEL INTERFACE TIMING DIAGRAM

PARALLEL INTERFACE TIMING CHARACTERISTICS

Test Conditions (Unless Otherwise Noted, V_{DD} = 5.0 V ± 10%, V_{SS} = 0 V, Ta = −20 to 75°C)

Item	Symbol	Test Conditions	Min	Max	Unit
C / D Set−up Time	t_{CDS}	—	100	—	ns
C / D Hold Time	t_{CDH}	—	10	—	ns
$\overline{CE}$, $\overline{RD}$, $\overline{WR}$ Pulse Width	t_{CE}, t_{RD}, t_{WR}	—	80	—	ns
Data Set−up Time	t_{DS}	—	80	—	ns
Data Hold Time	t_{DH}	—	40	—	ns
Access Time	t_{ACC}	—	—	150	ns
Output Hold Time	t_{OH}	—	10	50	ns

ELECTRO-OPTICAL CHARACTERISTICS

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

    TEMPERATURE = 23 ± 5 °C

    RELATIVE HUMIDITY = 60 ± 20 %

ITEM	SYMBOL	UNIT	TYP. STN
RESPONSE TIME	T_{on}	ms	290
	T_{off}	ms	370
CONTRAST RATIO	C_r	-	9
VIEWING ANGLE ($C_r \geq 2$)	$V_{3:00}$	°	40
	$V_{6:00}$	°	60
	$V_{9:00}$	°	40
	$V_{12:00}$	°	40

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

RELIABILITY OF LCD MODULE

ITEM	TEST CONDITION FOR NORMAL TEMPERATURE	TEST CONDITION 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 Min Dwell	-30°C to 80°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	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	—

QUALITY STANDARD OF LCD MODULE

1.0	**Sampling Method**		
	Sampling Plan : MIL STD 105 E 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) 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.
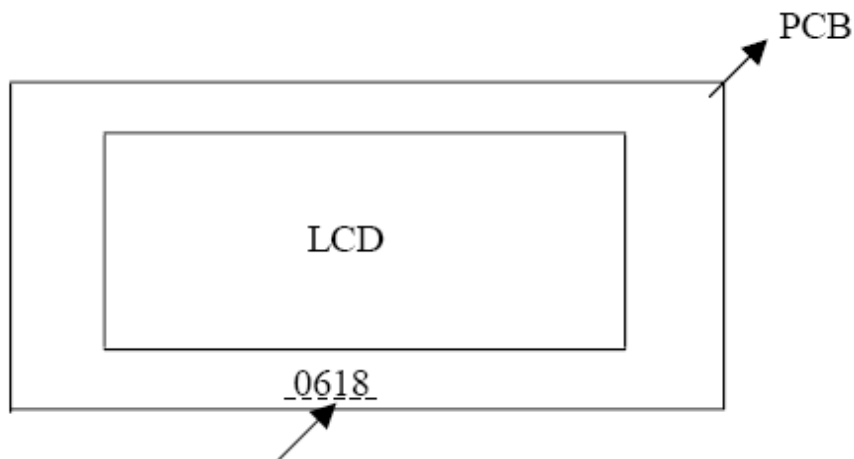
APPENDIX

LOT INDICATION OF LCD MODULE

CODING SYSTEM:

4-DIGIT CODE:

| 1 | 2 | | 3 | 4 |

YEAR   WEEK NO.
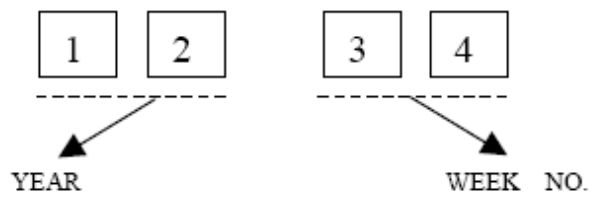
LOCATION AS SHOWN BELOW:

PCB

LCD

0618

e.g. WEEK 18 OF YEAR 2006