



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CV14412A - _ _ - _ _ - _ _

Revision	01
Engineering	Timmy Kwan
Date	13 December 2009
Our Reference	X4952

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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:

CV14412A - 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)

*(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 : 144 X 12 dots, graphic COB LCD module

Fonts type built in : Chinese Traditional & Simplified, English, Europeans Eastern & Western, Japanese, Korean, Latin, Greek, Arabic & Symbol

Interface : 4 bits parallel

Driving method : 1/24 duty, 1/5 bias

Driver IC : CHIPMAST ET7010 or equivalent

For the detailed information, please refer to the IC specifications.

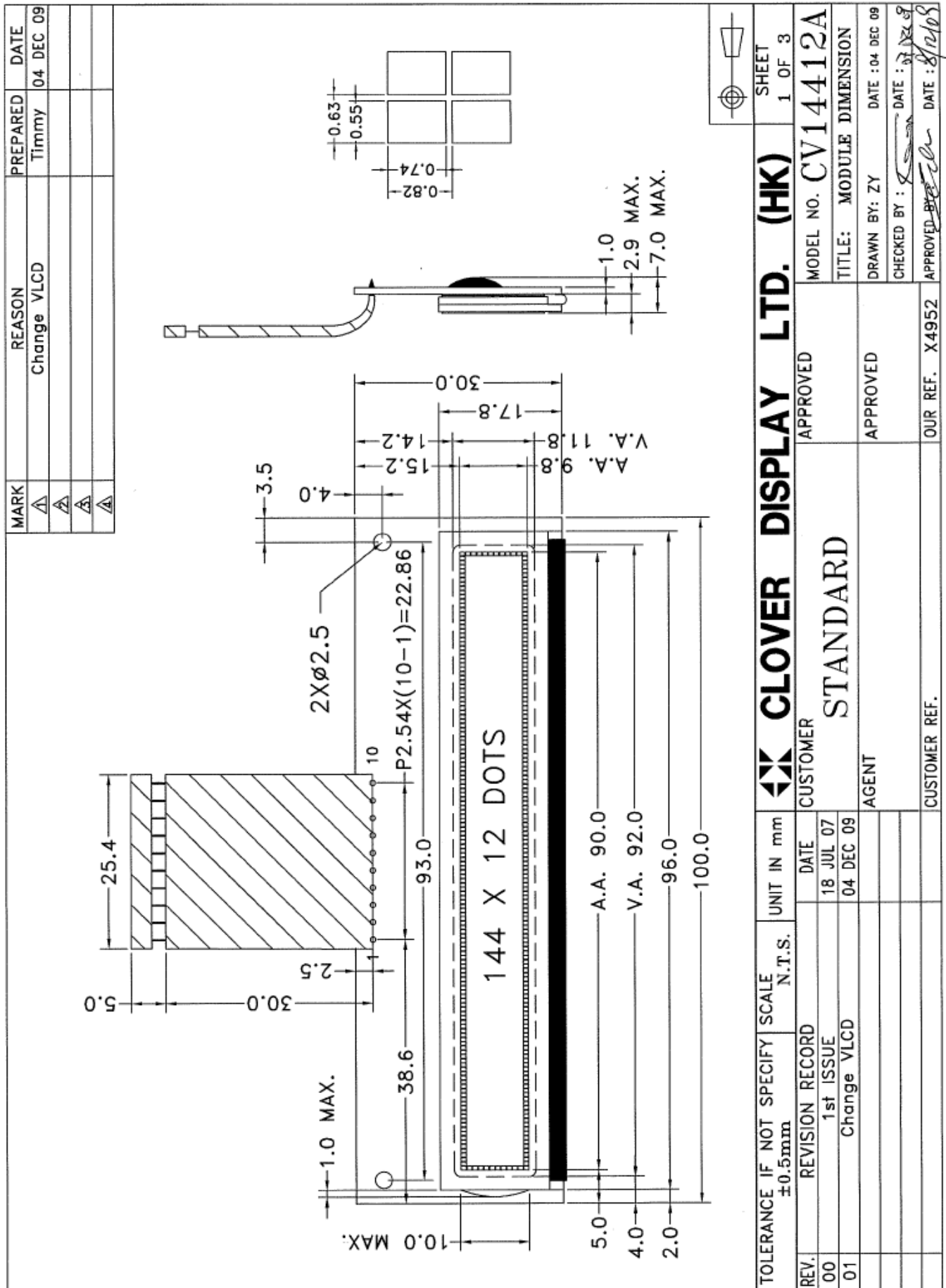
MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	100.0(L) X 30.0(W) X 7.0MAX.(H)	mm	Viewing Area	92.0 (L)x11.8 (W)	mm
Dot Pitch	0.63 (L)x0.82(W)	mm	Dot Size	0.55(L)x0.74(W)	mm

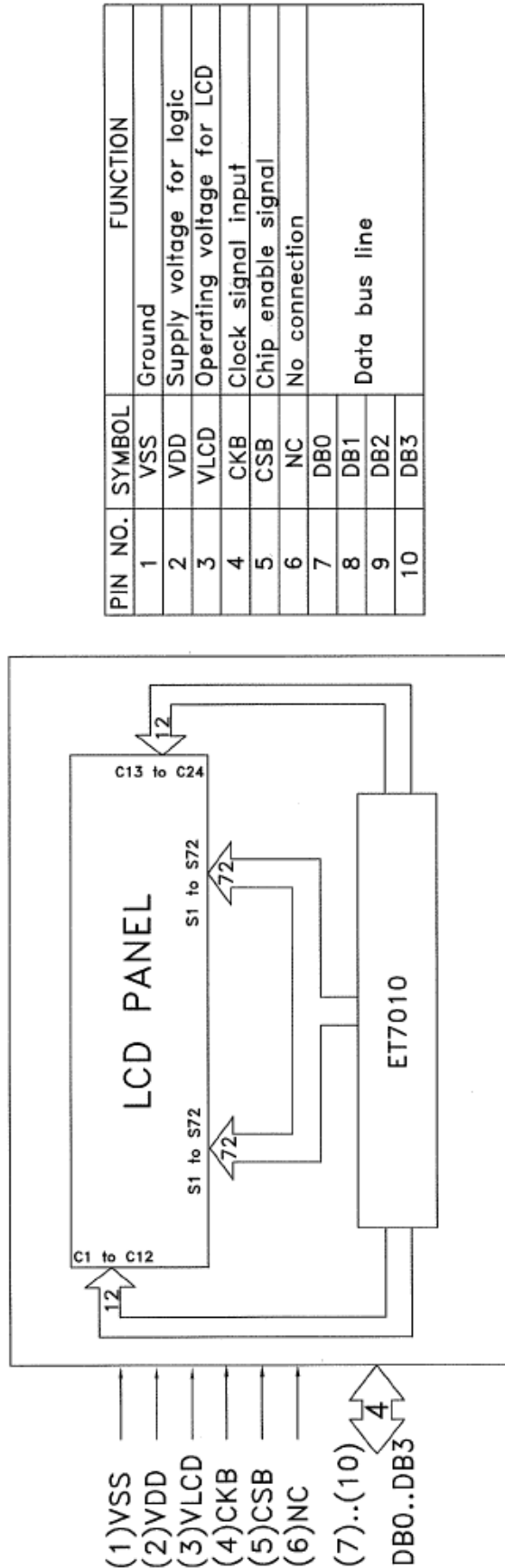
CONNECTOR PIN ASSIGNMENT

PIN NO.	SYMBOL	FUNCTION
1	VSS	Ground
2	VDD	Supply voltage for logic
3	VLCD	Operating voltage for LCD
4	CKB	Clock signal input
5	CSB	Chip enable signal
6	NC	No connection
7	DB0	Data bus line
8	DB1	
9	DB2	
10	DB3	

COUNTER DRAWING OF MODULE DIMENSION



COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



PIN NO.	SYMBOL	FUNCTION
1	VSS	Ground
2	VDD	Supply voltage for logic
3	VLCD	Operating voltage for LCD
4	CKB	Clock signal input
5	CSB	Chip enable signal
6	NC	No connection
7	DB0	Data bus line
8	DB1	
9	DB2	
10	DB3	

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	CUSTOMER	APPROVED	MODEL NO. CV14412A	
00	1st ISSUE	18 JUL 07	STANDARD			
01	Change VLCD	04 DEC 09	AGENT	APPROVED	TITLE: PIN OUT & BLOCK DIAGRAM	
					DRAWN BY: ZY	DATE : 04 DEC 09
					CHECKED BY: <i>[Signature]</i>	DATE : 27 DEC 09
					APPROVED BY: <i>[Signature]</i>	DATE : 27 DEC 09
			CUSTOMER REF.	OUR REF. X4952		

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	4.75	5.0	5.25	V	“H”Level Input Voltage	VIH	0.8VDD	—	VDD	V
Supply Current for Logic	IDD	—	60	90	μA	“L”Level Input Voltage	VIL	VSS	—	0.2VDD	V
Operating voltage for LCD (*)	VLCD	4.7	6.0	6.3	V	—	—	—	—	—	—

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

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 range	V _{DD}	-0.3 to 7.0	-0.3 to 7.0	V
	V _{LCD}	-0.3 to 8.0	-0.3 to 8.0	V
Input voltage range	V _{IN}	-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

COMMANDS TABLE

1-byte CMD

Name	CMD code										Function
	R/W	Hex	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	
Continue	W	00H	0	0	0	0	0	0	0	0	Continue to access the DDRAM or CGROM data
Reset	W	01H	0	0	0	0	0	0	0	1	Device reset; the device will ready after 4 system clocks.
Write++	W	20H	0	0	1	0	0	0	0	0	Writing data to memory then auto increment address
Read++	W	21H	0	0	1	0	0	0	0	1	Reading data from memory then auto increment address
RDTWR++	W	22H	0	0	1	0	0	0	1	0	The first Reading data from memory, second writing to memory then auto increment address
WRTRD++	W	23H	0	0	1	0	0	0	1	1	The first writing data to memory, second reading from memory then auto increment address
LPage	W	1xH	0	0	0	1	P ₃	P ₂	P ₁	P ₀	DDRAM page address setting
LColumn	W		1	A ₆	A ₅	A ₄	A ₃	A ₂	A ₁	A ₀	DDRAM column address setting

2-byte CMD

Name	CMD code																PWR initial	Function		
	R/W	Hex	First byte								Second byte									
			b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂			b ₁	b ₀
SYS0	W	30H	0	0	1	1	0	0	0	0	-	-	-	-	-	LRM	UDM	---- -xxx	System control register0	
SYS1	W	31H	0	0	1	1	0	0	0	1	-	-	-	-	CA	-	DT[1:0]	---- 0-xx	System control register1	
SYS2	W	32H	0	0	1	1	0	0	1	0	M[1:0]	-	BO	-	-	-	-	00-0 ----	System control register2	
STARTL	W	33H	0	0	1	1	0	0	1	1	-	-	St5	St4	St3	St2	St1	St0	--00 0000	LCD scan starting line
Frame	W	34H	0	0	1	1	0	1	0	0	Fr[7:0]								1111 1111	Frame rate counter
CLine	R	3DH	0	0	1	1	1	1	0	1	RD	-	L5	L4	L3	L2	L1	L0	---- ----	Current-line

3-byte CMD

Name	CMD code																								Function	
	R/W	First byte								Second byte								Third byte								
		b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁		b ₀
MAddress	W	0	1	-	-	A ₁₉	A ₁₈	A ₁₇	A ₁₆	A ₁₅	A ₁₄	A ₁₃	A ₁₂	A ₁₁	A ₁₀	A ₉	A ₈	A ₇	A ₆	A ₅	A ₄	A ₃	A ₂	A ₁	A ₀	Setting CGROM memory started address

System Control Register0 (30H)

Name	CMD code																PWR initial	Function	
	R/W	First byte								Second byte									
		b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁			b ₀
SYS0	W	0	0	1	1	0	0	0	0	-	-	-	-	-	LRM	UDM	---- -xxx	System control register0	

UDM: Common mirror select

0: Normal

1: Common mirror (Common will scroll to 0 if Cn+# > 63)

Duty	Common						
16	Cn	Cn+1	Cn+2	-----	Cn+13	Cn+14	Cn+15
	Cn+15	Cn+14	Cn+13	-----	Cn+2	Cn+1	Cn
24	Cn	Cn+1	Cn+2	-----	Cn+21	Cn+22	Cn+23
	Cn+23	Cn+22	Cn+21	-----	Cn+2	Cn+1	Cn
32	Cn	Cn+1	Cn+2	-----	Cn+29	Cn+30	Cn+31
	Cn+31	Cn+30	Cn+29	-----	Cn+2	Cn+1	Cn
48	Cn	Cn+1	Cn+2	-----	Cn+45	Cn+46	Cn+47
	Cn+47	Cn+46	Cn+45	-----	Cn+2	Cn+1	Cn
64	Cn	Cn+1	Cn+2	-----	Cn+61	Cn+62	Cn+63
	Cn+63	Cn+62	Cn+61	-----	Cn+2	Cn+1	Cn

2: Data mirror (mirror every 8 common, n=0~56)

Duty	Common							
16/24/32	Cn	Cn+1	Cn+2	Cn+3	Cn+4	Cn+5	Cn+6	Cn+7
48/64	Cn+7	Cn+6	Cn+5	Cn+4	Cn+3	Cn+2	Cn+1	Cn

3: Reserved

LRM: This option ***inverts*** relation of assignment between Display data RAM ***column*** address and segment outputs.

0: Normal

1: Segment mirror

Duty	SEG0	SEG1	SEG2	---	SEG62	SEG63	---	SEG70	SEG71	---	SEG78	SEG79
16	SEG79	SEG78	SEG77	---	SEG17	SEG16	---	SEG9	SEG8	---	SEG1	SEG0
24	SEG71	SEG70	SEG69	---	SEG9	SEG8	---	SEG1	SEG0	X	X	X
32	SEG63	SEG62	SEG61	---	SEG1	SEG0	X	X	X	X	X	X

System Control Register1 (31H)

Name	CMD code																PWR initial	Function	
	R/W	First byte								Second byte									
		b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁			b ₀
SYS1	W	0	0	1	1	0	0	0	1	-	-	-	-	CA	-	DT[1:0]	---- 0-xx	System control register1	

CA & DT[1:0]: Duty select (include cascading)

CA	DT[1:0]	Duty	SEGxCOM
0	00	1/16	80x16
0	01	1/24	72x24
0	10	1/32	64x32
1	00	1/32	160x32
1	01	1/48	144x48
1	10	1/64	128x64

Ps. DT[1:0]=11 is reserved.

System Control Register2 (32H)

Name	CMD code																PWR initial	Function
	R/W	First byte								Second byte								
		b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	
SYS2	W	0	0	1	1	0	0	1	0	M[1:0]	-	BO	-	-	-	-	00-0 ----	System control register2

BO: LCD ON/OFF

0: OFF

1: ON

Oscillator table M[1:0] :

M1	M0	Oscillating method
0	0	Disable
0	1	External R & Built-in C (35KHz)
1	0	Crystal 32768Hz
1	1	Reserved

LCD Scan starting line (33H)

Name	CMD code																PWR initial	Function	
	R/W	First byte								Second byte									
		b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁			b ₀
StartL	W	0	0	1	1	0	0	1	1	-	-	St5	St4	St3	St2	St1	St0	--00 0000	LCD scan starting line

St[5:0]: This register is a pointer which determines the start line corresponding to COM0 for display of data in the Display Data RAM.

Frame rate Register (34H)

Name	CMD code																PWR initial	Function	
	R/W	First byte								Second byte									
		b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁			b ₀
Frame	W	0	0	1	1	0	1	0	0	Fr[7:0]								1111 1111	Frame rate counter

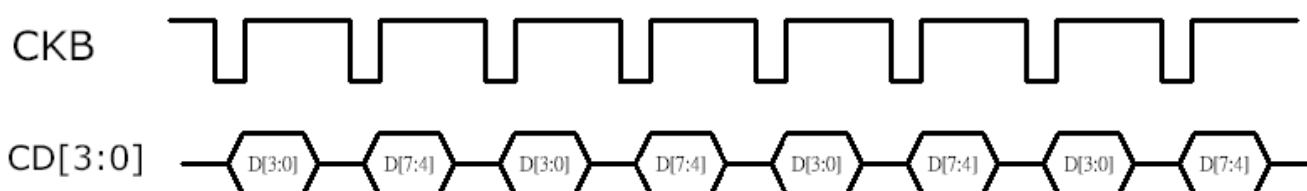
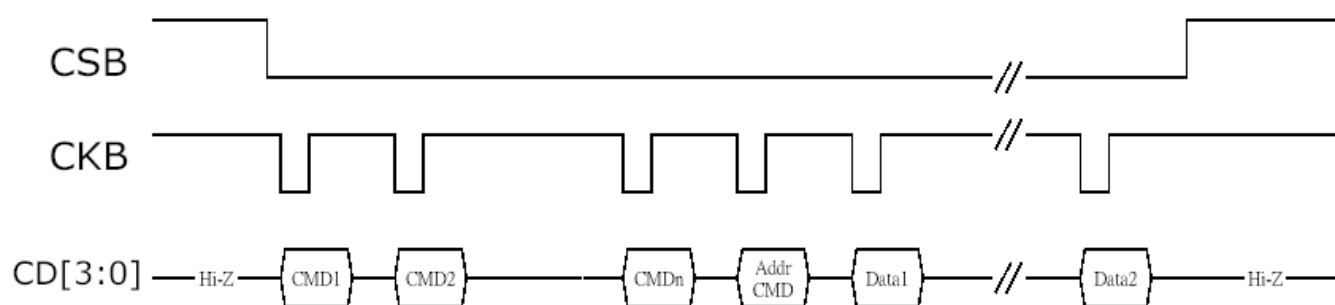
Frame Rate= 32768/(Fr+1)/duty (duty depend on R1 bit3,1,0)

Current-line Register (3DH)

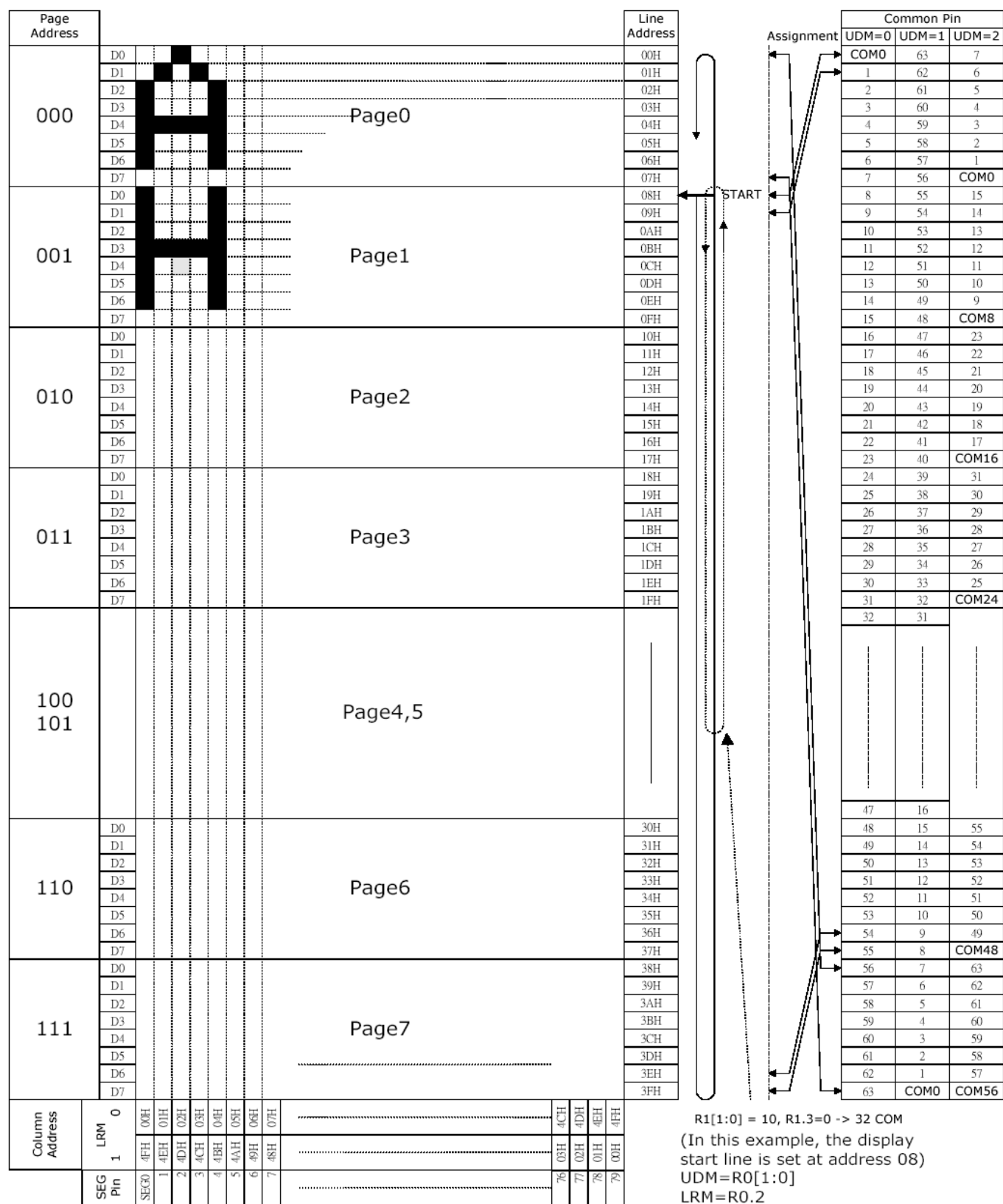
Name	CMD code																PWR initial	Function	
	R/W	First byte								Second byte									
		b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁			b ₀
CLine	R	0	0	1	1	1	1	0	1	RD	-	L5	L4	L3	L2	L1	L0	---- ----	Current line

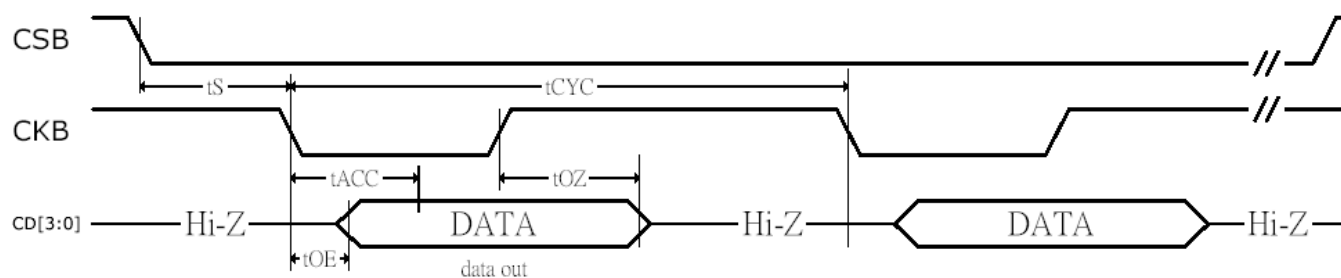
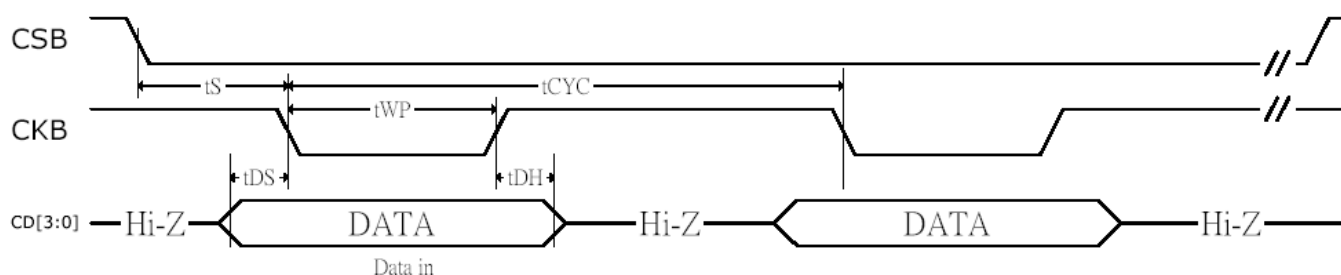
L[5:0]: This register is a pointer which line scan out now.

RD: Device Ready flag. 1: ready 0: not ready

DATA SEQUENCE MODE**COMMAND WAVEFORM**

DISPLAY DATA RAM



READ MODE DIAGRAM**WRITE MODE DIAGRAM****TIMING CHARACTERISTICS**

Name	Content	Min.	Typ.	Max.	Units
t_S	CKB setup time	0	-	-	ns
t_{OE}	Output Enable time	0	-	250	ns
t_{ACC}	Data Access time	0	-	250	ns
t_{OZ}	Data Disable time	0	-	250	ns
t_{WP}	Write pulse width time	250	-	-	ns
t_{DH}	Data Hold time	250	-	-	ns
t_{CYC}	Read/Write cycles time	1	-	-	us
t_E	The time between End of CSB and last Data	1	-	-	us
t_{BI}	Byte to Byte interval	1	-	-	us

GP6: Unicode 12(H) x 12(W) Font, contains Latin, Symbol, ..., Range 1E80H ~ 27BFH.

[illegible]

Range 3000H ~ 33FFH.

[illegible]

[illegible]

GP9: Unicode 12(H) x 12(W) Font, contains Korean, Range AC00H ~ D7A3H.

[illegible]

GP10: Unicode 12(H) x 12(W) Font, contains CJK, English, Symbol, ..., Range F900H ~ FFFCH.

[illegible]

ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = V_{OP} / 64 Hz
 TEMPERATURE = 23 ± 5 °C
 RELATIVE HUMIDITY = 60 ± 20 %

ITEM	SYMBOL	UNIT	TYP. TN	TYP. STN
RESPONSE TIME	Ton	ms	140	170
	Toff	ms	180	220
CONTRAST RATIO	Cr	-	7	15
VIEWING ANGLE (Cr ≥ 2)	V3:00	°	70	40
	V6:00	°	43	70
	V9:00	°	70	40
	V12:00	°	3	50

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.

Do not expose to direct sunlight or fluorescent light for a long time

(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 V_O .

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.