



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CV12864C - _ _ - _ _ - _ _ - _ _

Revision	06
Engineering	Timmy Kwan
Date	27 OCT 10
Our Reference	X4961

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:**CV12864C- M Y - 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 : 128 X 64 dots, Graphic COB LCD module
 Interface : 8-bit parallel
 Driving method : 1/64 duty, 1/9 bias
 Controller IC : RAIO RA6963 or equivalent
 For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

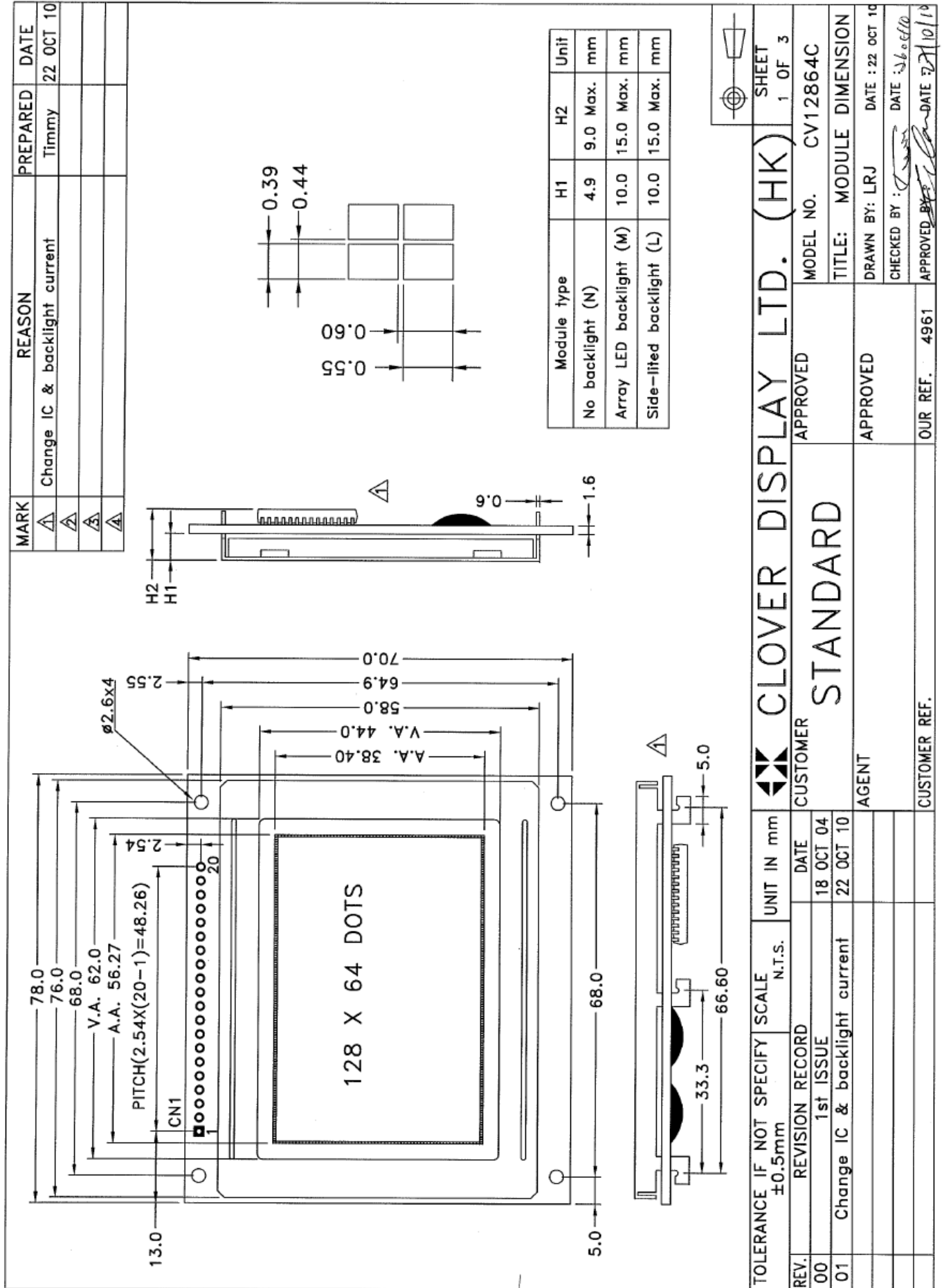
Item	Dimension		Unit	Item	Dimension		Unit
Outline Dimension	78.0(L)x70.0(W)x H1/H2(H)		mm	Dot Pitch	0.44(L)x0.60(W)		mm
Viewing Area	62.0(L)x44.0(W)		mm	Dot Size	0.39(L)x0.55(W)		mm
No Backlight (N)	H1	4.9	mm	Side Backlight (L)	H1	10.0	mm
	H2	9.0 (MAX)	mm		H2	15.0 (MAX)	mm
Array Backlight (M)	H1	10.0	mm				mm
	H2	15.0(MAX)	mm				mm

CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	FG	Frame Ground	11	DB1	Data Bus Line
2	GND	Ground	12	DB2	
3	VDD	Supply voltage for logic	13	DB3	
4	Vo	Input voltage for LCD	14	DB4	
5	/WR	Write	15	DB5	
6	/RD	Read	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 (-VE)
10	DB0	Data Bus Line	*20	BL+	Supply Voltage for Backlight (+VE)

Note (*) : Pin 19, 20 are used for backlight version

COUNTER DRAWING OF MODULE DIMENSION

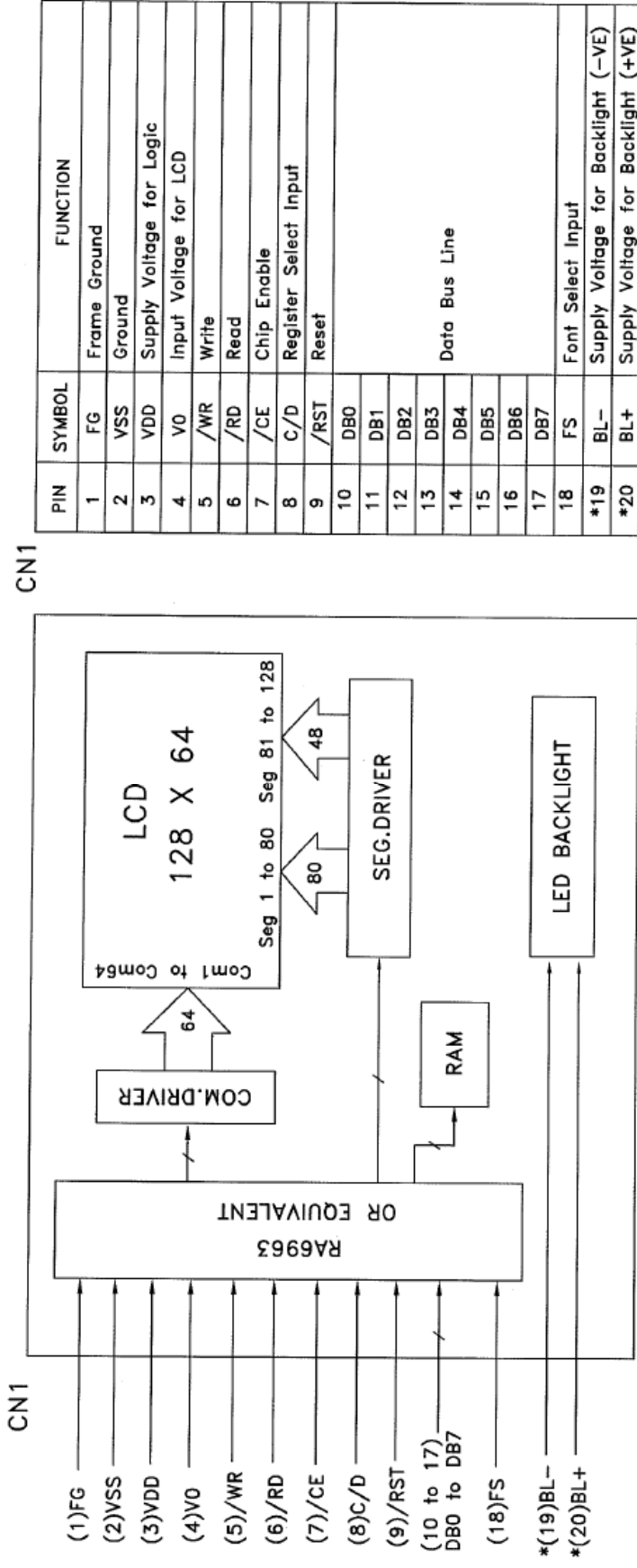


TOLERANCE IF NOT SPECIFY SCALE ±0.5mm N.T.S. UNIT IN mm

REV. 00	REVISION RECORD	DATE	18 OCT 04
01	Change IC & backlight current	DATE	22 OCT 10
		DATE	
		DATE	

CLOVER DISPLAY LTD. (HK)	APPROVED	MODEL NO. CV12864C	SHEET 1 OF 3
STANDARD	APPROVED	TITLE: MODULE DIMENSION	
CUSTOMER	AGENT	DRAWN BY: LRJ	DATE: 22 OCT 10
		CHECKED BY: <i>[Signature]</i>	DATE: 26 Oct 10
		APPROVED BY: <i>[Signature]</i>	DATE: 27 Oct 10
CUSTOMER REF.	OUR REF. 4961		

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



* Pin 19 & 20 are used for LED backlight versions

TOLERANCE IF NOT SPECIFY SCALE ±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.	CV12864C
00	1st ISSUE	18 OCT 10	22 OCT 10		TITLE:	PIN OUT & BLOCK DIAGRAM
01	Change IC & backlight current			APPROVED	DRAWN BY:	LRJ
					CHECKED BY:	DATE : 22 OCT 10
					APPROVED BY:	DATE : 27/10/10
				OUR REF.	4961	
				CUSTOMER REF.		

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	—	12.0	20.7	mA	“L”Level Input Voltage	VIL	0	—	0.2VDD	V
Input Voltage for LCD(*)	VO	-3.8	-3.6	-3.4	V	—	—	—	—	—	—

Note(*):The corresponding LCD voltage = VDD-VO, is $8.6V \pm 5\%$ for optimum contrast.

Side-lited Backlight:

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White Backlight Current	I _{BL}	51	60	69	mA	V _{BL} = 3.20V

Array Backlight:

Constant current driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Yellow Green Backlight Voltage	V _{BL}	3.85	4.05	4.25	V	I _{BL} = 240mA

ABSOLUTE MAXIMUM RATINGS

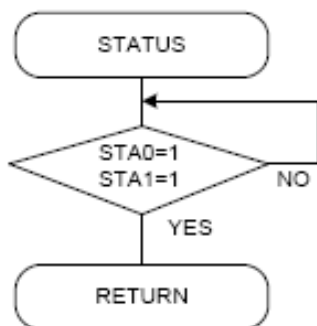
Please make sure not to exceed the following maximum rating values under the worst application conditions

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 _{opr}	0 to 50	-20 to 70	°C
Storage Temperature	T _{stg}	-10 to 60	-30 to 80	°C

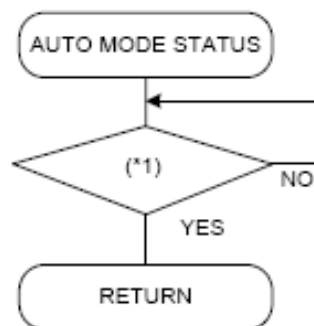
FLOWCHART OF COMMUNICATIONS WITH MPU

Status Checking Flow

a)



b)



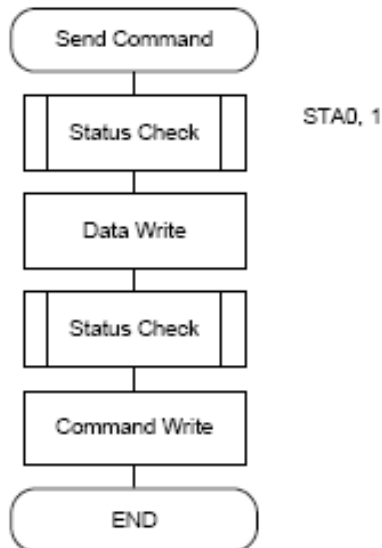
(*1)
STA2=1 (Read)
or
STA3=1(Write)

Setting Data

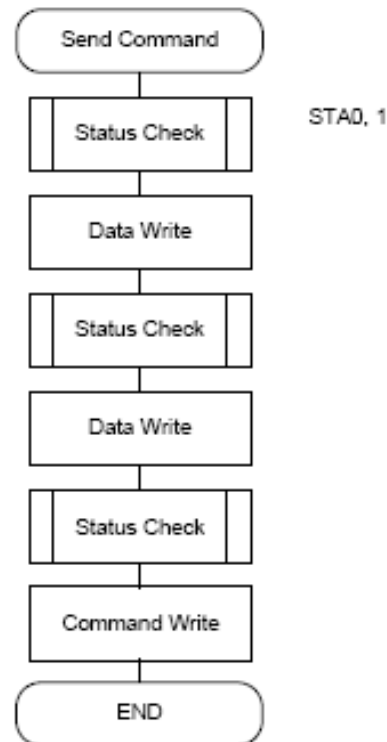
When using the RA6963, first set the data, then set the command.

Procedure for Sending a Command

a) The case of 1 data



b) The case of 2 data



< Figure 6-3 >

Note: When sending more than two data, the last datum (or last two data) is valid.

INSTRUCTIONS TABLE

Command	Code	D1	D2	Function
Registers Setting	00100001	X address	Y address	Set cursor pointer
	00100010	Data	00h	Set Offset Register
	00100100	Low address	High address	Set Address pointer
Set Control Word	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00h	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00h	Set Graphic Area
Mode Set	1000X000	--	--	OR mode
	1000X001	--	--	EXOR mode
	1000X011	--	--	AND mode
	1000X100	--	--	Text Attribute mode
	10000XXX	--	--	Internal CG ROM mode
	10001XXX	--	--	External CG RAM mode
Display Mode	10010000	--	--	Display off
	1001XX10	--	--	Cursor on, blink off
	1001XX11	--	--	Cursor on, blink on
	100101XX	--	--	Text on, graphic off
	100110XX	--	--	Text off, graphic on
	100111XX	--	--	Text on, graphic on
Cursor Pattern Select	10100000	--	--	1-line cursor
	10100001	--	--	2-line cursor
	10100010	--	--	3-line cursor
	10100011	--	--	4-line cursor
	10100100	--	--	5-line cursor
	10100101	--	--	6-line cursor
	10100110	--	--	7-line cursor
	10100111	--	--	8-line cursor
Data Read/Write	11000000	Data	--	Data Write and Increment ADP
	11000001	--	--	Data Read and Increment ADP
	11000010	Data	--	Data Write and Decrement ADP
	11000011	--	--	Data Read and Decrement ADP
	11000100	Data	--	Data Write and Non-variable ADP
	11000101	--	--	Data Read and Non-variable ADP
Data auto Read/Write	10110000	--	--	Set Data Auto Write
	10110001	--	--	Set Data Auto Read
	10110010	--	--	Auto Reset
Screen Peek	11100000	--	--	Screen Peek
Screen Copy	11101000	--	--	Screen Copy
Bit Set/Reset	11110XXX	--	--	Bit Reset
	11111XXX	--	--	Bit Set
	1111X000	--	--	Bit 0 (LSB)
	1111X001	--	--	Bit 1
	1111X010	--	--	Bit 2
	1111X011	--	--	Bit 3
	1111X100	--	--	Bit 4
	1111X101	--	--	Bit 5
	1111X110	--	--	Bit 6
	1111X111	--	--	Bit 7 (MSB)

Screen Reverse	11010000	Data	Data (Don't care) (Note)	Whole screen reverse Data Bit 0 0 : Normal 1 : Reverse
Blink Time	01010000	Data	Data (Don't care) (Note)	If Frame = 60Hz Data Bit 2:0 000 : 0.066s 001 : 0.25s 010 : 0.5s (Default) 011 : 0.75s 100 : 1s 101 : 1.25s 110 : 1.5s 111 : 2s
Cursor Auto Moving	01100000	Data	Data (Don't care) (Note)	Data Bit 0 0 : Disable.(Default) 1 : Enable.
CGROM Font Select	01110000	Data	Data (Don't care) (Note)	Data Bit 1:0 00 : Do not care.(Default) 01 : Do not care. 10 : CGROM Font-01. 11 : CGROM Font-02.

Note : In these functions, it must be sent two data before sending the command, but the contents of the second datum (D2) can be any values.

ADDRESS CONFIGURATION OF DISPLAY DATA RAM

(1) TEXT HOME ADDRESS SET

The starting address in the external display RAM for text display is defined by this command. The text home address indicates the leftmost and uppermost position.

The Relationship between Display RAM Address and Display Position

< Table 6-8 >

TH	.....	TH + CL
TH + TA	.....	TH + TA + CL
(TH + TA) + TA	.....	TH + 2TA + CL
(TH + 2TA) + TA	.....	TH + 3TA + CL
⋮	⋮	⋮
⋮	⋮	⋮
⋮	⋮	⋮
TH + (n-1) TA	.....	TH + (n-1) TA + CL

TH: Text home address

TA: Text area number (columns)

CL: Columns are fixed by hardware (pin-programmable).

(Example)

Text Home Address : 0000h
Text Area : 0020h
MD2=H, MD3=H : 32 Columns
DUAL =H, MDS=L, MD0=L, MD1=H : 4 Lines

0000h	0001h	.....	001Eh	001Fh
0020h	0021h	.....	003Eh	002Fh
0040h	0041h	.....	005Eh	005Fh
0060h	0061h	.....	007Eh	007Fh

(2) GRAPHIC HOME ADDRESS SET

The starting address of the external display RAM used for graphic display is defined by this Command. The graphic home address indicates the leftmost and uppermost position.

The Relationship between External Display RAM Address and Display Position

< Table 6-10 >

GH	.....	GH + CL
GH + GA	.....	GH + GA + CL
(GH + GA) + GA	.....	GH + 2GA + CL
(GH + 2GA) + GA	.....	GH + 3GA + CL
⋮	⋮	⋮
⋮	⋮	⋮
⋮	⋮	⋮
GH + (n-1) GA	.....	GH + (n-1) GA + CL

GH: Graphic Home Address

GA: Graphic Area Number (columns)

CL: Columns are fixed by hardware (pin-programmable).

(Example)

Graphic Home Address : 0000h
 Graphic Area : 0020h
 MD2=H, MD3=H : 32 columns
 DUAL =H, MDS=L, MD0=H, MD1=H : 2 lines

0000h	0001h	.....	001Eh	001Fh
0020h	0021h	.....	003Eh	003Fh
0040h	0041h	.....	005Eh	005Fh
0060h	0061h	.....	007Eh	007Fh
0080h	0081h	.....	009Eh	009Fh
00A0h	00A1h	.....	00BEh	00BFh
00C0h	00C1h	.....	00DEh	00DFh
00E0h	00E1h	.....	00FEh	00FFh
0100h	0101h	.....	011Eh	011Fh
0120h	0121h	.....	013Eh	013Fh
0140h	0141h	.....	015Eh	015Fh
0160h	0161h	.....	017Eh	017Fh
0180h	0181h	.....	019Eh	019Fh
01A0h	01A1h	.....	01BEh	01BFh
01C0h	01C1h	.....	01DEh	01DFh
01E0h	01E1h	.....	01FEh	01FFh

(3) TEXT AREA SET

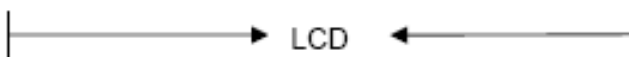
The display columns are defined by the hardware setting. This command can be used adjust the columns of the display.

(Example)

LCD Size : 20 columns, 4 lines
 Text Home Address : 0000h
 Text Area : 0014h
 MD2=H, MD3=H : 32 columns
 DUAL =H , MDS =L, MD0= L, MD1=H : 4 lines

< Table 6-12 >

0000	0001	.....	0013	0014	.....	001F
0014	0015	.....	0027	0028	.....	0033
0028	0029	.....	003B	003C	.....	0047
003C	003D	.....	004F	0050	.....	005B



(4) GRAPHIC AREA SET

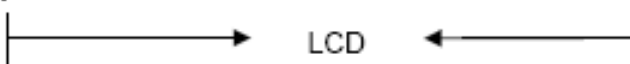
The display columns are defined by the hardware setting. This command can be used to adjust the columns of the graphic display.

(Example)

LCD Size : 20 columns, 2 lines
 Graphic Home Address : 0000h
 Graphic Area : 0014h
 MD2=H, MD3=H : 32 columns
 $\overline{\text{DUAL}} = \text{H}$, MDS=L MD0=H, MD1=H : 2 lines

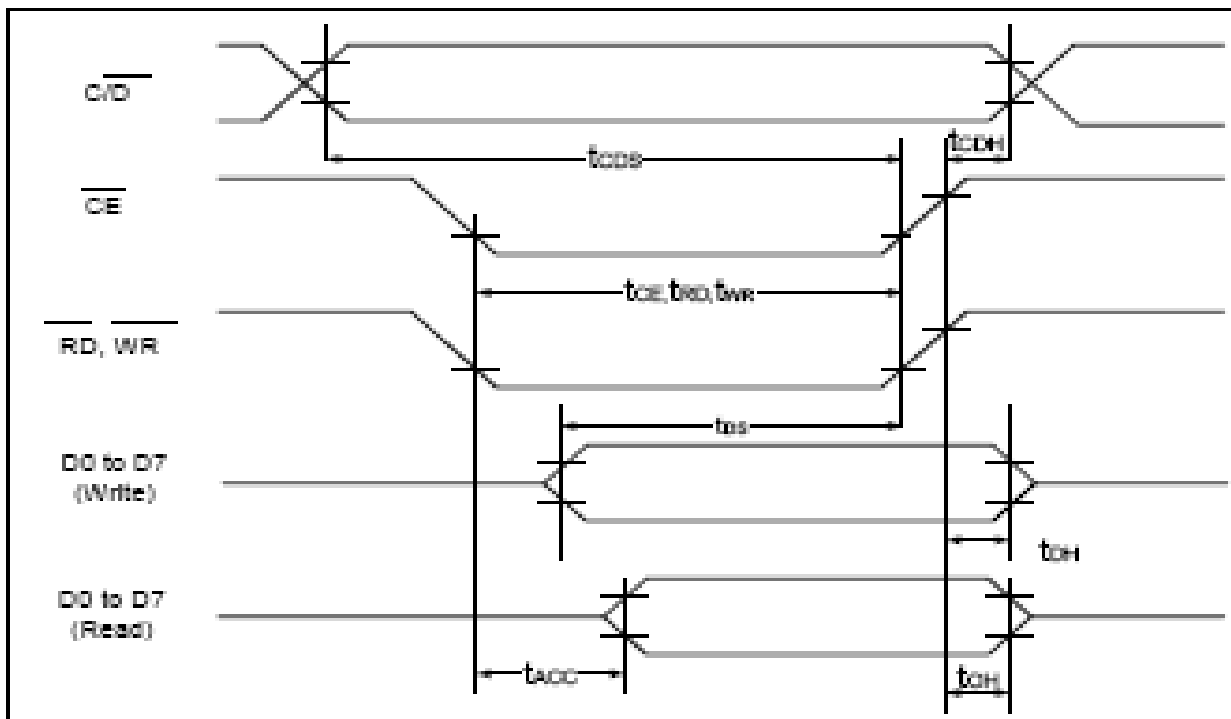
< Table 6-13 >

0000	0001	.....	0013	0014	.....	001F
0014	0015	.....	0027	0028	.....	0033
0028	0029	.....	003B	003C	.....	0047
003C	003D	.....	004F	0050	.....	005B
0050	0051	.....	0063	0064	.....	006F
0064	0065	.....	0077	0078	.....	0083
0078	0079	.....	008B	008C	.....	0097
008C	008D	.....	009F	00A0	.....	00AB
00A0	00A1	.....	00B3	00B4	.....	00BF
00B4	00B5	.....	00C7	00C8	.....	00D3
00C8	00C9	.....	00DB	00DC	.....	00E7
00DC	00DD	.....	00EF	00F0	.....	00FD
00F0	00F1	.....	0103	0104	.....	011F
0104	0105	.....	0127	0128	.....	0123
0128	0129	.....	013B	013C	.....	0147
013C	013D	.....	014F	0150	.....	015B



If the graphic area setting is set to match the desired number of columns on the LCD, the addressing scheme will be automatically modified so that the start address of each line equals the end address of the previous line +1.

SERIAL INTERFACE TIMING DIAGRAM



SERIAL INTERFACE TIMING CHARACTERISTICS

($V_{DD}=+5V\pm 5\%$, $GND=0V$, $T_a = -20$ to $+70^\circ C$)

Item	Symbol	Test Conditions	Min.	Max.	Unit
C/ \bar{D} Set Up Time	t_{cos}	--	100	--	ns
C/ \bar{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 = $22 \pm 5^\circ C$
 RELATIVE HUMIDITY = $60 \pm 15 \%$

ITEM	SYMBOL	UNIT	TYP. STN
RESPONSE TIME	T_{on}	ms	220
	T_{off}	ms	280
CONTRAST RATIO	Cr	-	12
VIEWING ANGLE ($Cr \geq 2$)	V3:00	$^\circ$	40
	V6:00	$^\circ$	70
	V9:00	$^\circ$	40
	V12:00	$^\circ$	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.

(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_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%.

(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.