



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CV12032A - _ _ - _ _ - _ _ - _

Revision	06
Engineering	Roger Yip
Date	6 October 2006
Our Reference	4908

ADDRESS : ROOM 1006, 10/F WESTIN CENTRE, 26 HUNG TO ROAD, KWUN TONG,
KOWLOON, HONG KONG.

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

FAX : (852) 2357 4237 (SALES OFFICE) (852) 2341 8785 (GENERAL OFFICE)

E-MAIL : cdl@cloverdisplay.com

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

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:

CV12032A- 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 : 120 X 32 dots, Graphic LCD module
 Interface : 8-bit parallel
 Driving method : 1/32 duty, 1/5 bias
 Controller IC : Epson S1D1520 or equivalent
 For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

Item	Dimension		Unit	Item	Dimension		Unit
Outline Dimension	84.0(L)x44.0(W)x (H1/H2)		mm	Dot Pitch	0.47(L)x0.58(W)		mm
Viewing Area	62.5(L)x23.5(W)		mm	Dot Size	0.39(L)x0.50(W)		mm
No Backlight (N)	H1	6.8	mm	Side Backlight (L)	H1	10.1	mm
	H2	10.9	mm		H2	14.0	mm
EL Backlight (E)	H1	6.8	mm	Array Backlight (M)	H1	10.1	mm
	H2	10.9	mm		H2	14.0	mm

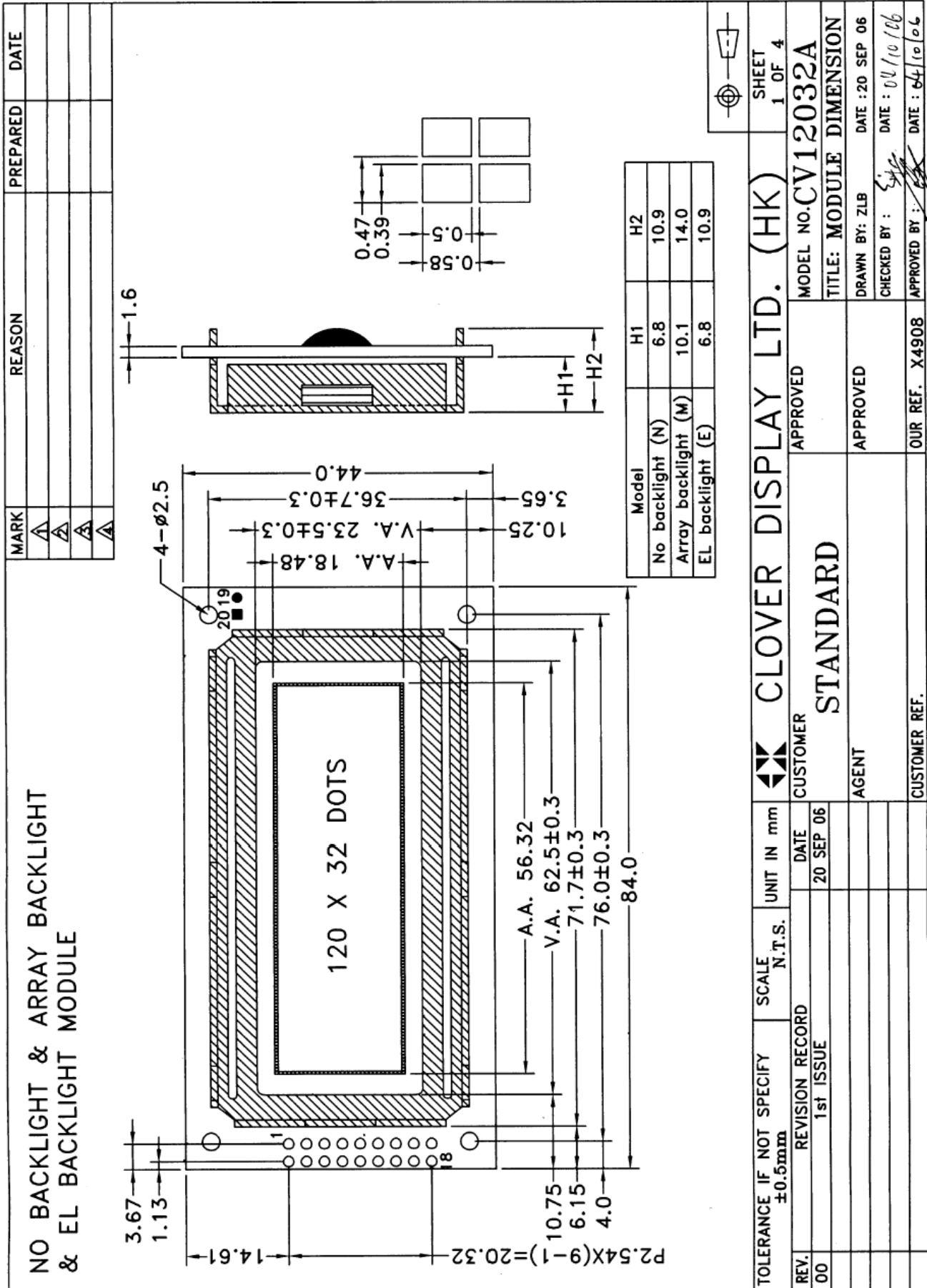
CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	VSS	0V Power Supply	11	DB1	Data Bus Line
2	VDD	5.0V Power Supply	12	DB0	Data Bus Line
3	VO	LCD Drive, 0V to VDD (5.0V)	13	RW2	Read/Write **
4	RST	Reset Signal	14	RW1	Read/Write *
5	DB7	Data Bus Line	15	E2	Enable Signal **
6	DB6	Data Bus Line	16	E1	Enable Signal *
7	DB5	Data Bus Line	17	A02	Register Select Input **
8	DB4	Data Bus Line	18	A01	Register Select Input *
9	DB3	Data Bus Line	19	BL-	Backlight Terminal (-VE)
10	DB2	Data Bus Line	20	BL+	Backlight Terminal (+VE)

* RW1, E1, A01 are used to control the left part of the display screen.

** RW2, E2, A02 are used to control the right part of the display screen.

COUNTER DRAWING OF MODULE DIMENSION
(ARRAY & EL BACKLIGHT & NO BACKLIGHT)

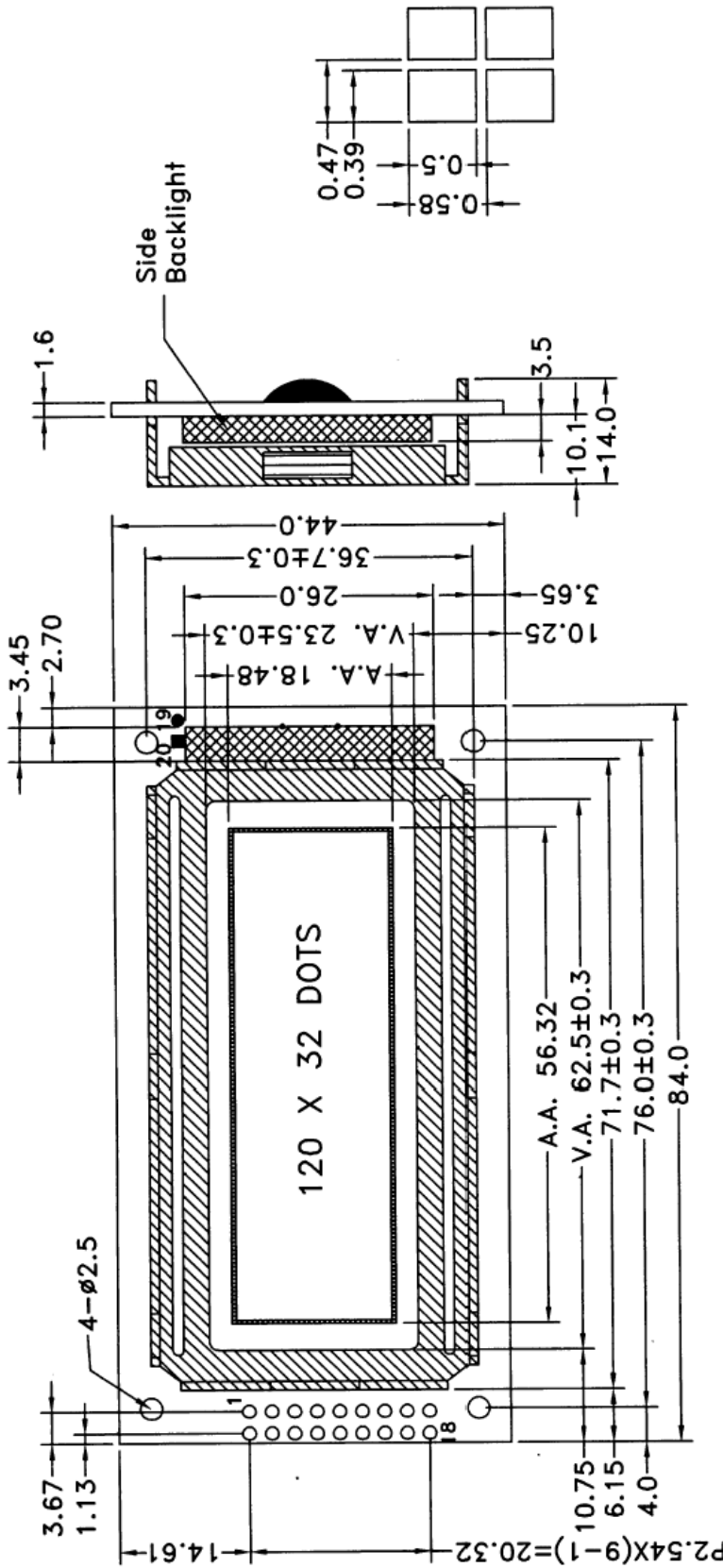


MARK	REASON	PREPARED	DATE
△			
△			
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TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 1 OF 4
REV. 00	REVISION RECORD 1st ISSUE		DATE 20 SEP 06	CUSTOMER STANDARD	APPROVED	MODEL NO. CV12032A
				AGENT	APPROVED	TITLE: MODULE DIMENSION
				CUSTOMER REF.	OUR REF. X4908	DRAWN BY: ZLB DATE: 20 SEP 06
						CHECKED BY: <i>Sy</i> DATE: 04/10/06
						APPROVED BY: <i>[Signature]</i> DATE: 04/10/06

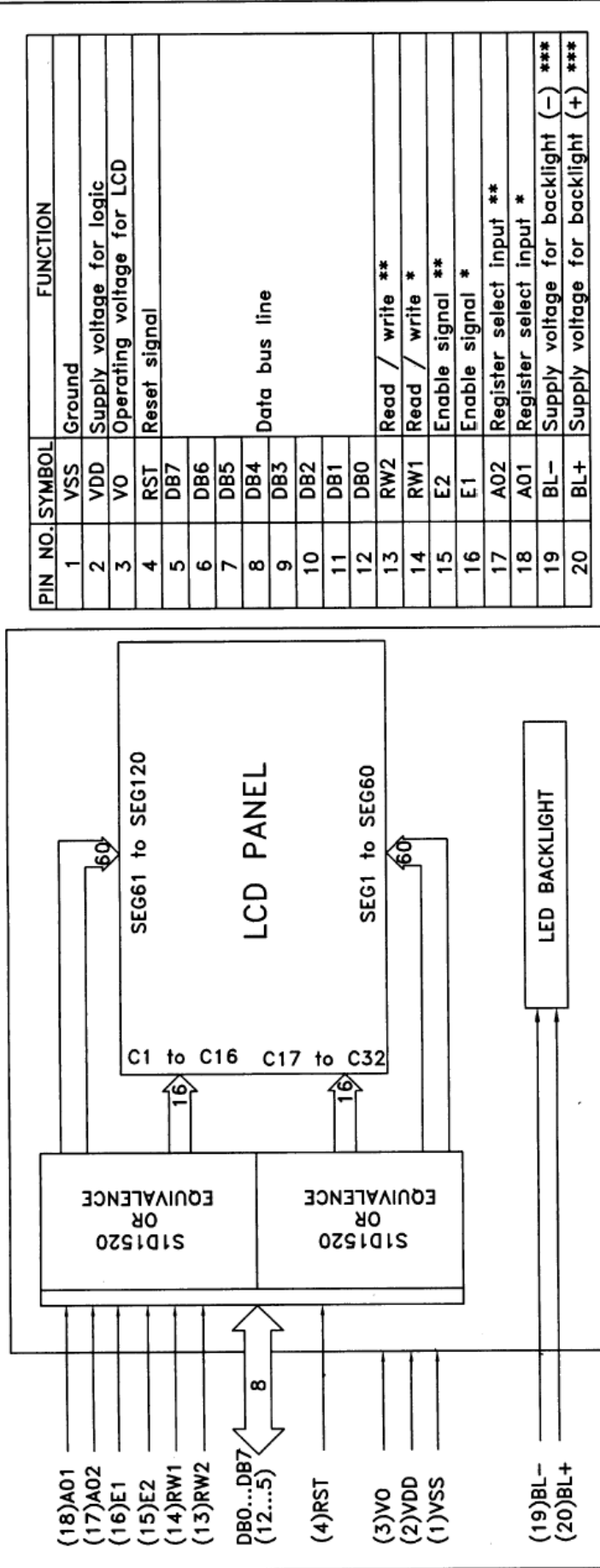
COUNTER DRAWING OF MODULE DIMENSION
(SIDE BACKLIGHT)

MARK	REASON	PREPARED	DATE
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TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 2 OF 4
REV.	REVISION RECORD	CUSTOMER	DATE	APPROVED	MODEL NO. CV12032A	
00	1st ISSUE	AGENT	20 SEP 06	APPROVED	TITLE: MODULE DIMENSION	
					DRAWN BY: ZLB	DATE: 20 SEP 06
					CHECKED BY: <i>[Signature]</i>	DATE: 04/10/06
					APPROVED BY: <i>[Signature]</i>	DATE: 04/10/06
		CUSTOMER REF.		OUR REF. X4908		

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



PIN NO.	SYMBOL	FUNCTION
1	VSS	Ground
2	VDD	Supply voltage for logic
3	V0	Operating voltage for LCD
4	RST	Reset signal
5	DB7	Data bus line
6	DB6	
7	DB5	
8	DB4	
9	DB3	
10	DB2	
11	DB1	
12	DB0	
13	RW2	Read / write **
14	RW1	Read / write *
15	E2	Enable signal **
16	E1	Enable signal *
17	A02	Register select input **
18	A01	Register select input *
19	BL-	Supply voltage for backlight (-) ***
20	BL+	Supply voltage for backlight (+) ***

* RW1,E1,A01 are used to control the left part of the display screen.
 ** RW2,E2,A02 are used to control the right part of the display screen.
 *** Pin 19,20 are used for backlight.

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.	CV12032A
00	1st ISSUE	20 SEP 06	STANDARD	APPROVED	TITLE:	PIN OUT & BLOCK DIAGRAM
			AGENT	APPROVED	DRAWN BY:	ZLB
			CUSTOMER REF.	OUR REF.	CHECKED BY:	DATE : 04/10/06
				X4908	APPROVED BY:	DATE : 04/10/06

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, @Ta=25

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.75	5.00	5.25	V	"H"Level Input Voltage	V _{IH}	2.2	-	VDD	V
Supply Current	IDD	-	2.70	3.30	mA	"L"Level Input Voltage	V _{IL}	0	-	0.6	V
Backlight Voltage						Backlight Current					
EL (@ Frequency 400Hz)	VEL	-	100	150	V _{rms}	-	-	-	-	-	-
Side-lited LED						Side-lited LED					
White	VBL	-	5.0	-	V	White	IBL	30	35	40	mA
Blue	VBL	-	-	-	V	Blue	IBL	-	-	-	mA
Yellow Green	VBL	-	-	-	V	Yellow Green	IBL	-	-	-	mA
Array LED						Array LED					
Yellow Green	VBL	3.85	4.05	4.25	V	Yellow Green	IBL	-	100	180	mA
Amber	VBL	-	-	-	V	Amber	IBL	-	-	-	mA
Orange	VBL	-	-	-	V	Orange	IBL	-	-	-	mA
Soft Orange	VBL	-	-	-	V	Soft Orange	IBL	-	-	-	mA
CCFL						CCFL					
White	VBL	-	-	-	V _{rms}	White	IBL	-	-	-	mArms

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	7	7	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

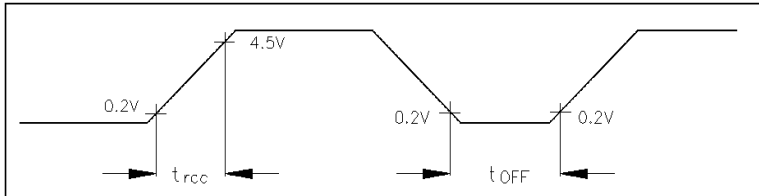
Instruction	Code										Description	
	A0	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Display On/Off	0	0	1	0	1	0	1	1	1	0/1	Whole display On/Off. 1: On, 0: Off	
Display Start Line	0	0	1	1	0	Display Start Address (0-31)					Determine the display line correspond to the COM0	
Page Address Set	0	0	1	0	1	1	1	0	Page (0-3)		Set the page of display data Ram to the page register.	
Column Address Set	0	0	0	Column Address (0-59)							Set the column address of display data RAM to the column register.	
Status Read	0	1	Busy	ADC	ON/OFF	RESET	0	0	0	0	Read the status. BUSY 1: Working 0: Ready ADC 1: Clockwise output 0: Counterclockwise ON/OFF 1: Display Off 0: Display On RESET 1: Reset 0: Normal	
Write Display Data	1	0	Write Data									Write the data to the display data RAM *
Read Display Data	1	1	Read Data									Read the data from the display data RAM *
ADC Select	0	0	1	0	1	0	0	0	0	0/1	Determine the clockwise or counterclockwise reading of the display data RAM. 0: Clockwise output 1: Counterclockwise output	
Static Drive On/Off	0	0	1	0	1	0	0	1	0	0/1	Select the dynamic or static driving. 1: Static driving 0: Dynamic driving	
Duty Ratio Select	0	0	1	0	1	0	1	0	0	0/1	Select the duty ratio. 1: 1/32 duty 0: 1/16 duty	
Read Modify Write	0	0	1	1	1	0	0	0	0	0	Increment the column address register when writing but no-change when reading	
End	0	0	1	1	1	0	1	1	1	0	Release from the read modify write mode.	
Reset	0	0	1	1	1	0	0	0	1	0	Set the display start line register to 1st line, column add. counter and page add. register to "0"	

*note: Access the predetermined address of the display data RAM. The column address increment "1" after read or write.

TIMING CHARACTERISTICS OF COMPATIBLE CONTROLLER CHIPS

Parameters	Symbol	Recommended timing	Parameters	Symbol	Recommended timing
Enable Cycle Time	tC (min)	1000ns	Set-up Time	tB(min)	20ns
Enable Pulse Width	tW(min)	100ns	Data Set-up Time	tI (min)	80ns
			High level	tL (min)	100ns
Low level	tL (min)	100ns	Address Hold Time	tA(min)	10ns
Enable Raise Time	tr (max)	15ns	Input Data Hold Time	tH (min)	10ns
Enable Fall Time	tf (max)	15ns	Output Data Hold Time	tD (min)	10ns

Figure 1 Power On Timing Diagram



Note: Power on initialization depends on the rise time of the power supply when it is turned on. When the above power supply conditions is not met, the internal reset circuit will not operate normally and initialization will not be performed. Initialization by manual instruction is required.

Figure 2 Timing Characteristics of Write Operation

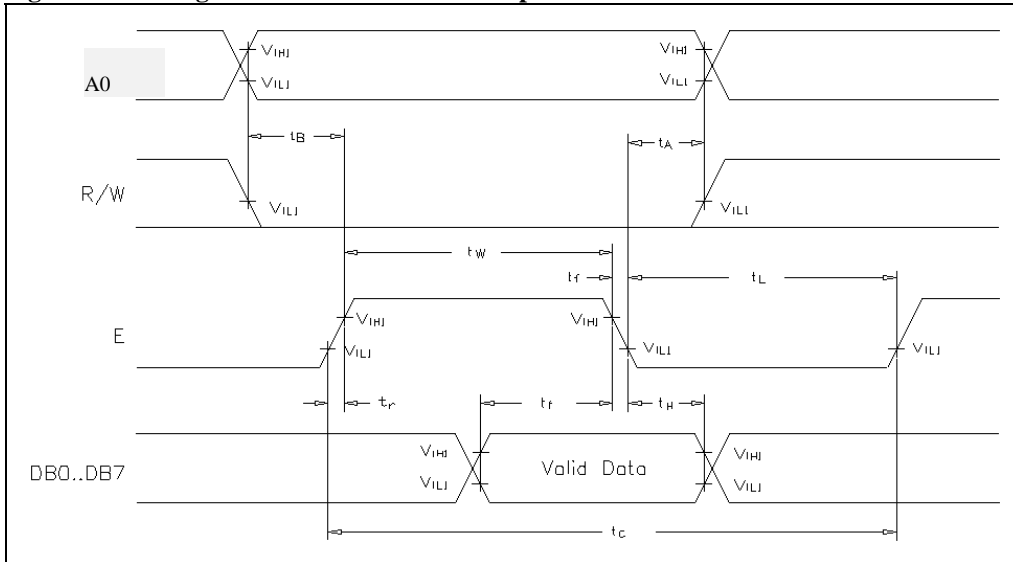
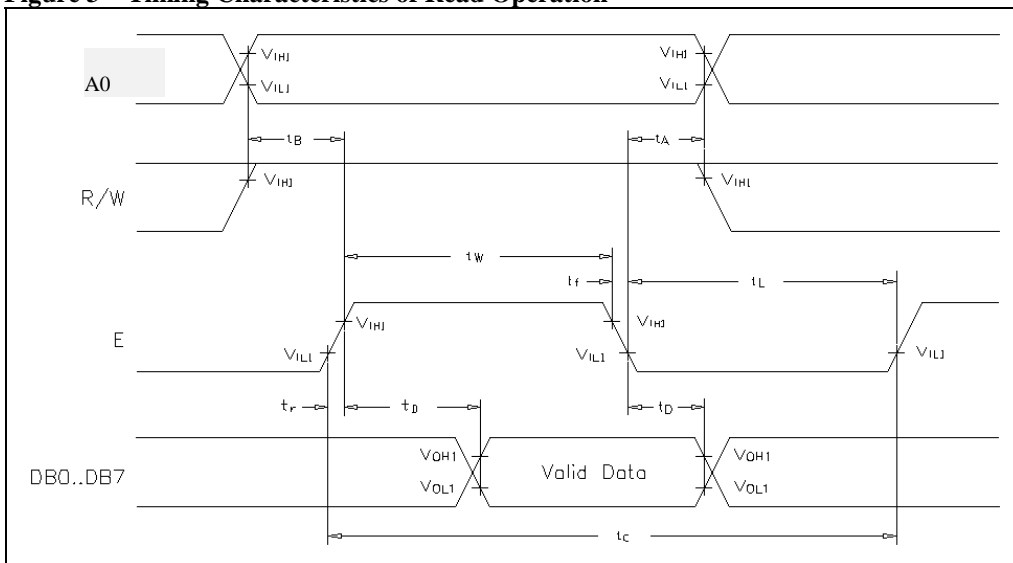


Figure 3 Timing Characteristics of Read Operation



INITIALIZATION METHOD

The module will automatically perform initialization by detecting the rising or falling edge of the RST input after the power is turned on. The following instructions are executed during initialization.

1. Display Off
2. Set the 1st line to the display start register
3. Static drive Off
4. Set the address "0" to the column address counter
5. Set the page "3" to the page address register
6. Select the 1/32 duty
7. Select the ADC : Clockwise output
8. Read modify write mode Off

DISPLAY DD RAM POSITION

Page Address D0,D1	Data								
0,0	DB0 to DB7	Page 0							
0,1	DB0 to DB7	Page 1							
1,0	DB0 to DB7	Page 2							
1,1	DB0 to DB7	Page 3							
Column Address	ADC DB0=0	00	01	02	39	3A	3B	
	ADC DB0=1	3B	3A	39	02	01	00	

ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = VOP / 64 Hz
 TEMPERATURE = 22 ± 5 °C
 RELATIVE HUMIDITY = 60 ± 15 %

ITEM	SYMBOL	UNIT	TYP. TN	TYP. STN
RESPONSE TIME	Ton	ms	100	200
	Toff	ms	80	200
CONTRAST RATIO	Cr	-	10	10
VIEWING ANGLE (6 O'clock) (Cr ≥ 2)	V3:00	°	20	20
	V6:00	°	20	40
	V9:00	°	20	20
	V12:00	°	10	10

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 cycles

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.