



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CV4162D - _ _ - _ _ - _ _ - _

Revision	09
Engineering	Longson Yeung
Date	14 June 2013
Our Reference	4406

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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:**CV4162D- 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)

E – EBTN (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 : 16 characters x 2 lines LCD module
 Interface : 4-bit or 8-bit parallel
 Driving method : 1/16 duty, 1/5 bias
 Controller IC : Sitronix ST7066U or equivalent

For the detailed information, please refer to IC specifications.

MECHANICAL DIMENSIONS

Item	Dimension		Unit	Item	Dimension		Unit
Outline Dimension	80.0(L)x36.0(W)x (H1/H2)		mm	Character Pitch	3.53(L)x5.92(W)		mm
Viewing Area	61.0(L)x15.8(W)		mm	Dot Size	0.55(L)x0.65(W)		mm
Character Size	2.95(L)x5.55(W)		mm	—	—		—
No Backlight (N)	H1	5.0	mm	Side Backlight (L)	H1	8.0	mm
	H2	9.1	mm		H2	12.1	mm
EL Backlight (M)	H1	—	mm	Array Backlight (M)	H1	8.0	mm
	H2	—	mm		H2	12.1	mm

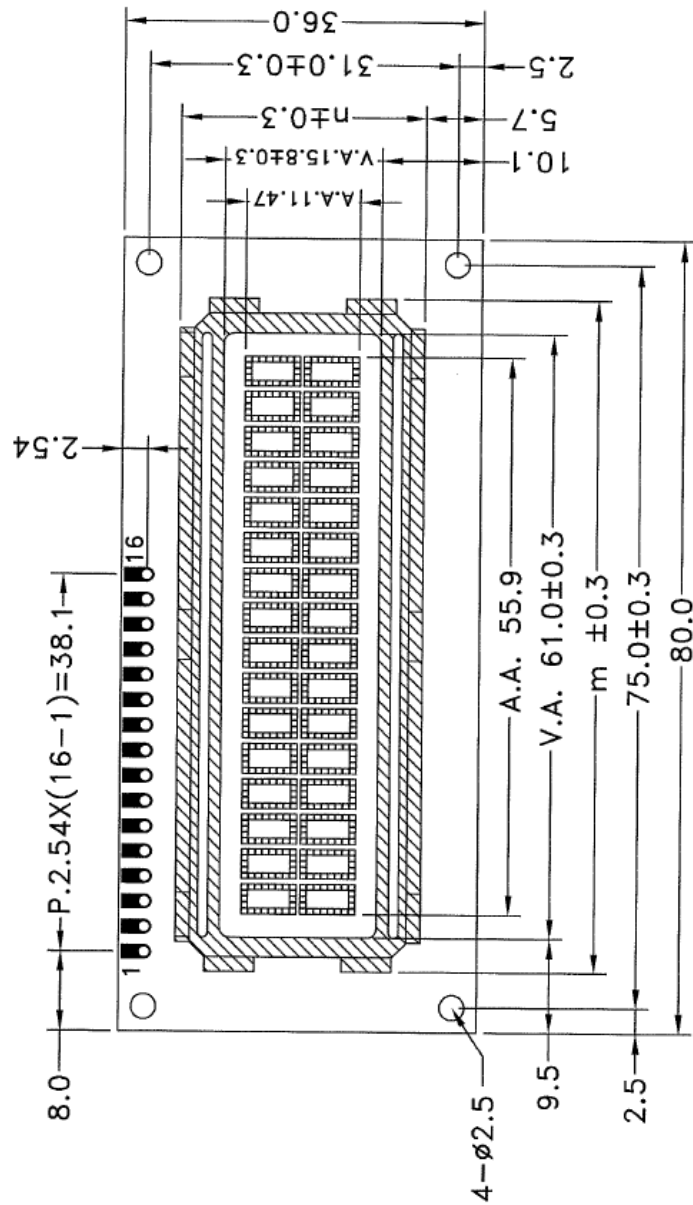
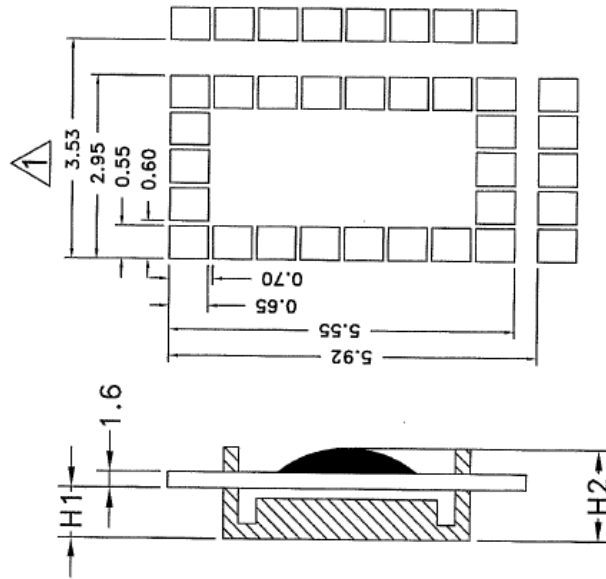
CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	VSS	Ground	9	DB2	Data Bus Line
2	VDD	Supply voltage for logic	10	DB3	Data Bus Line
3	V0	Operating voltage for LCD	11	DB4	Data Bus Line
4	RS	Register Select	12	DB5	Data Bus Line
5	R/W	Read/Write	13	DB6	Data Bus Line
6	E	Enable Signal	14	DB7	Data Bus Line
7	DB0	Data Bus Line	*15	BL+	Supply voltage for Backlight (+VE)
8	DB1	Data Bus Line	*16	BL-	Supply voltage for Backlight (-VE)

Note (*) : Pin 15, 16 are used for backlight version

MARK	REASON	PREPARED	DATE
A	Change IC & modify dimension	Timmy	17 MAR 08
A			
A			
A			

Model	H1	H2	m	n
No backlight (N)	5.0	9.1	66.2	25.0
Array backlight (M)	8.0	12.1	77.2	24.6
Side backlight (L)	8.0	12.1	77.2	24.6



SCALE 10 : 1

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. CV4162D TITLE: MODULE DIMENSION
00	1st ISSUE		06 JUN 06			
01	Change IC & LCD dot size		17 MAR 08	AGENT	APPROVED	DRAWN BY: SHUN DATE : 17 MAR 08 CHECKED BY : DATE : APPROVED BY: <i>[Signature]</i> DATE : 17 Mar 08 DATE : 19/3/08
				CUSTOMER REF.	OUR REF. X4406	

Block diagram showing the connection between the ST7066U OR EQUIVALENCE, LCD PANEL, ST7065C OR EQUIVALENCE, and LED BACKLIGHT.

The ST7066U OR EQUIVALENCE block has pins (1) VSS, (2) VDD, (3) VO, (4) RS, (5) R/W, (6) E, and DB0..DB7 (7..14). It connects to the LCD PANEL block, which has COM1 to COM8, COM9 to COM16, S1 to S40, and S41 to S80. The LCD PANEL also connects to the ST7065C OR EQUIVALENCE block, which has pins (15) BL+ and (16) BL-. The ST7065C OR EQUIVALENCE block connects to the LED BACKLIGHT block.

(*)NOTE: Pin 15, 16 are used for backlight versions only.

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. CV4162D	
00	1st ISSUE		06 JUN 06	STANDARD		TITLE: PIN OUT & BLOCK DIAGRAM	
01	Change IC & LCD dot size		17 MAR 08			DRAWN BY: SHUN	DATE : 17 MAR 08
						CHECKED BY :	DATE : 17 May 08
				AGENT	APPROVED		
				CUSTOMER REF.	OUR REF. X4406	APPROVED BY :  DATE : 18/3/08	

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, @Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.75	5.00	5.25	V
Supply Current	IDD	—	0.88	1.20	mA
Input Voltage for LCD (*)	V0	-0.2	0	0.2	V
Input Voltage for EBTN LCD (*)	V0	-4.45-	-4.00	-3.55	V
“H”Level Input Voltage	VIH	0.7VDD	—	VDD	V
“L”Level Input Voltage	VIL	-0.3	—	0.6	V

Note (*): There is tolerance in optimum LCD driving voltage during production and it will be within the specified range. The corresponding LCD voltage = VDD –V0, is 5V or 9V for optimum contrast.

Side-lited LED

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White Backlight current	I _{BL}	—	20	23	mA	V _{BL} = 3.5V
White Backlight current (For EBTN Version)	I _{BL}	—	40	46	mA	

Constant current driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Yellow Green Backlight Voltage	V _{BL}	—	2.0	2.4	V	I _{BL} = 40mA

Array LED

Constant current driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Yellow Green Backlight Voltage	V _{BL}	—	4.05	4.25	V	I _{BL} =110mA

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	-0.3 to 7	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

INSTRUCTIONS

Instruction	Instruction Code										Description	Description Time (270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52 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.	1.52 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.	37 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	37 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	37 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 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	37 us

Note:

Be sure the ST7066U is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

DISPLAY DDRAM AND CHARACTER POSITION

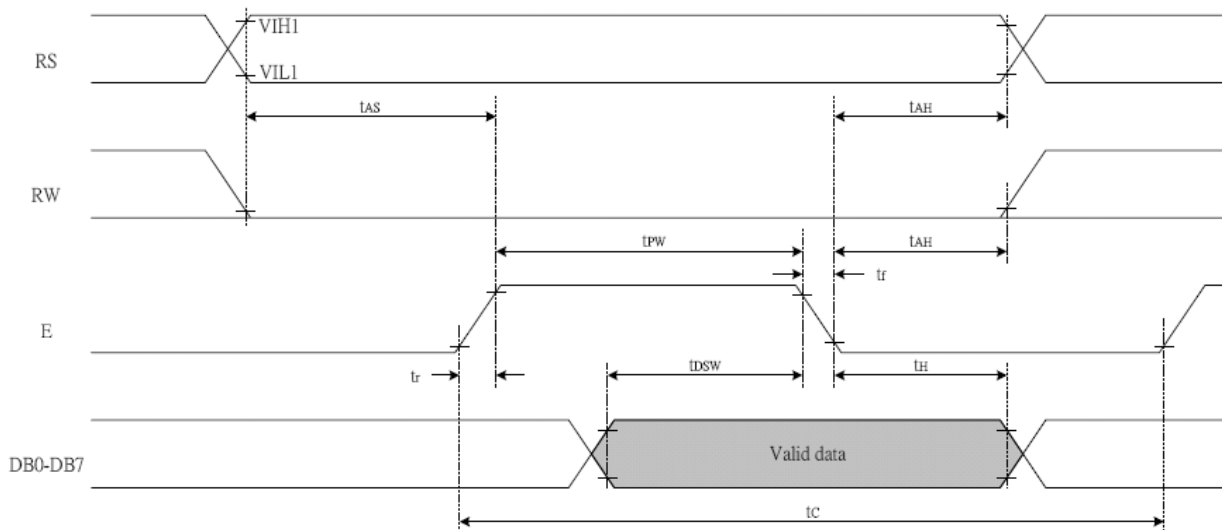
16x2, 1/16 DUTY CYCLE

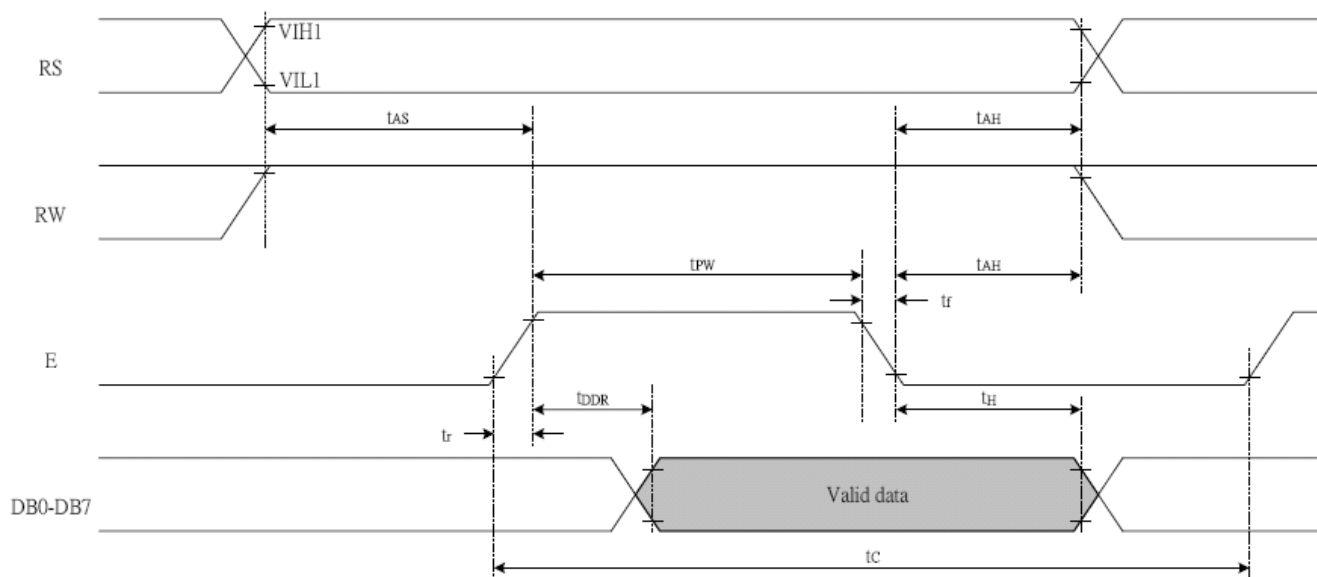
	1	2																16	DISPLAY POSITION DD RAM ADDRESS
line 1	00	01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0F	
line 2	40	41	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4F	

TIMING CHARACTERISTICS OF COMPATIBLE CONTROLLER CHIPS

TA = 25°C, VCC = 5V

<i>Write Mode (Writing data from MPU to ST7066U)</i>						
T _C	Enable Cycle Time	Pin E	1200	-	-	ns
T _{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T _R , T _F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T _{AS}	Address Setup Time	Pins: RS, RW, E	0	-	-	ns
T _{AH}	Address Hold Time	Pins: RS, RW, E	10	-	-	ns
T _{DSW}	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
T _H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns
<i>Read Mode (Reading Data from ST7066U to MPU)</i>						
T _C	Enable Cycle Time	Pin E	1200	-	-	ns
T _{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T _R , T _F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T _{AS}	Address Setup Time	Pins: RS, RW, E	0	-	-	ns
T _{AH}	Address Hold Time	Pins: RS, RW, E	10	-	-	ns
T _{DDR}	Data Setup Time	Pins: DB0 - DB7	-	-	100	ns
T _H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

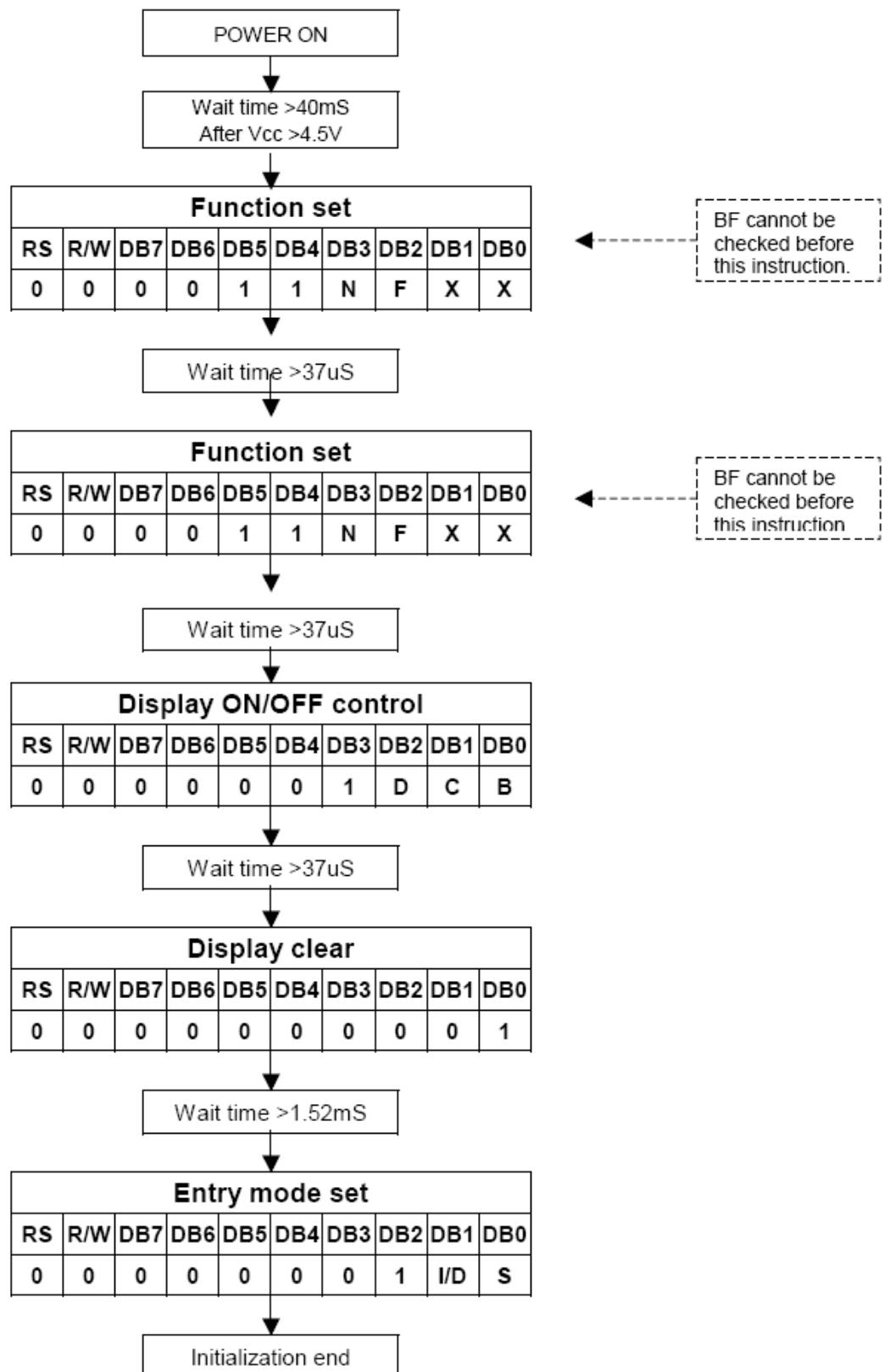
Write Mode Timing Diagram (Writing Data from MPU to ST7066U)

Read Mode Timing Diagram (Reading Data from ST7066U to MPU)**INITIALIZATION METHOD**

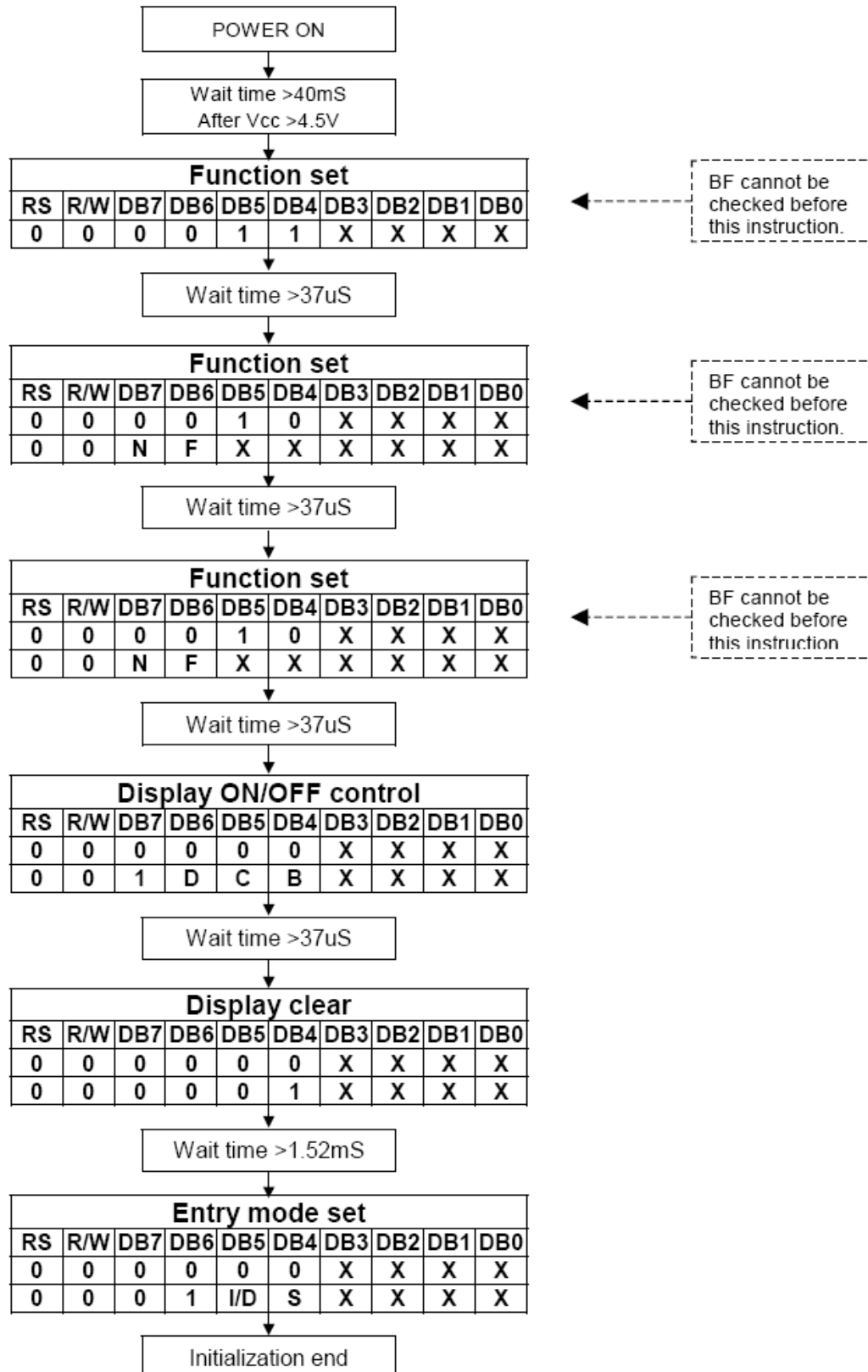
An internal reset circuit automatically initializes the ST7066U when the power is turned on. The following instructions are executed during the initialization. The busy flag (BF) is kept in the busy state until the initialization ends ($BF = 1$). The busy state lasts for 40 ms after VCC rises to 4.5 V.

1. Display clear
2. Function set:
 - DL = 1; 8-bit interface data
 - N = 0; 1-line display
 - F = 0; 5x8 dot character font
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

Initialization for 8-Bit Interface



Initialization for 4-Bit Interface



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. TN	TYP. STN	TYP. EBTN
RESPONSE TIME	Ton	ms	130	150	60
	Toff	ms	170	190	80
CONTRAST RATIO	Cr	-	8	15	500
VIEWING ANGLE (6 O'clock) (Cr ≥ 2)	V3:00	$^{\circ}$	70	45	80
	V6:00	$^{\circ}$	45	70	80
	V9:00	$^{\circ}$	70	45	80
	V12:00	$^{\circ}$	5	60	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.