



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CG12864H - _ _ - _ _ - _ _ - _

Revision	00
Engineering	Timothy Chan
Date	25 November 2021
Our Reference	X9073B

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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:CG12864H- N N - S R - 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)

GENERAL DESCRIPTION

Display mode : 128 X 64 dots, graphic COG LCD module
 Interface : Parallel/serial
 Driving method : 1/65 duty, 1/9 bias
 Controller IC : Sitronix ST7567 or equivalent
 For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension			Dot Pitch	0.52(L)x0.52(W)	mm
No backlight	77.0(L) x50.6 (W) x2.9 (H)(MAX)	mm	Dot Size	0.49(L)x0.49(W)	mm
LED side-lited backlight	78.4(L) x53.0 (W) x 7.0(H)	mm	Viewing Area	70.6(L)x38.6(W)	mm

CONNECTOR PIN ASSIGNMENT

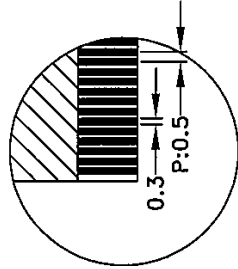
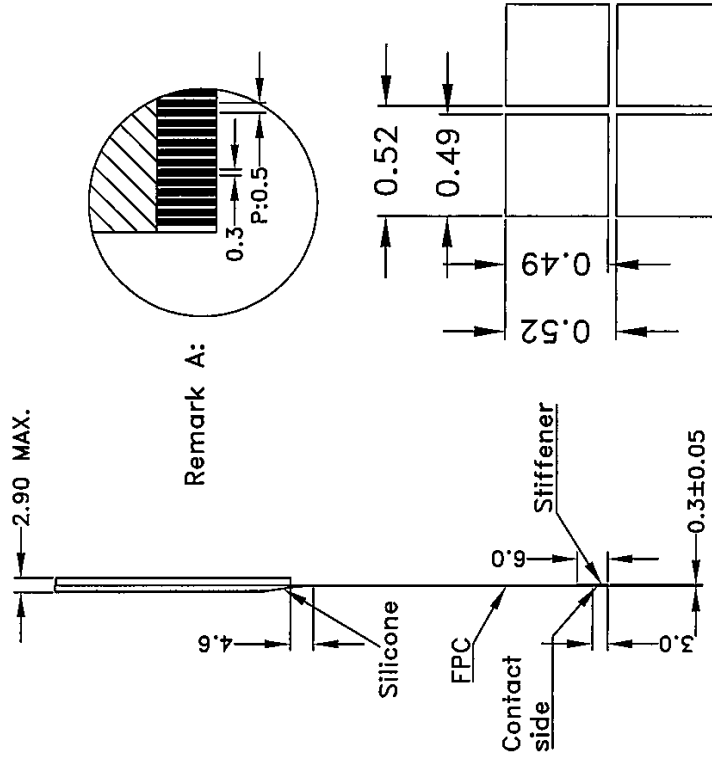
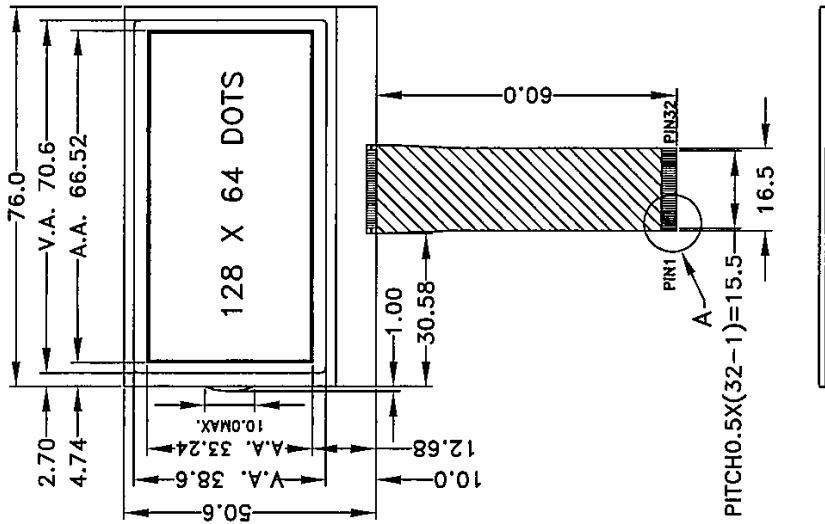
Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	NC	No connection	18	D7 (SDA)	Data bus (serial data input)
2	NC	No connection	19	D6 (SCL)	Data bus (serial clock input)
3	PSB	Parallel / serial data input select	20	D5	Data bus
4	C86	Mode select	21	D4	
5	NC	No connection	22	D3	
6	NC		23	D2	
7	NC		24	D1	
8	NC		25	D0	
9	VG	LCD driving voltage for segment circuits	26	RD (EN)	Read/Write execution control pin
10	NC	No connection	27	WR(R/W)	Read/Write execution control pin
11	NC		28	A0	Control instruction
12	XV0	LCD driving voltage for common circuits	29	RSTB	Reset
13	V0	LCD driving voltage for common circuits	30	CSB	Chip select
14	NC	No connection	31	NC	No connection
15	NC		32	NC	No connection
16	VSS	Ground	*33	A	Supply voltage for backlight(+VE)
17	VDD	Supply voltage for logic	*34	K	Supply voltage for backlight(-VE)

Note (*): Pin 33, 34 are used for backlight version

SPEC. REV.00

[illegible]

No backlight version




Remark A:

* Recommend FPC connector: LECO 0514S32UT00

TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 2 OF 4	
REV.	REVISION RECORD	DATE	CUSTOMER	APPROVED		MODEL NO. CG12864H	
00	1st ISSUE	24 NOV 21	AGENT	APPROVED		TITLE: MODULE DIMENSION 2	
				APPROVED		DRAWN BY: JFHUNAG DATE: 24 NOV 21	
				APPROVED		CHECKED BY: <i>Wong</i> DATE: 24 Nov 21	
				APPROVED		APPROVED BY: <i>Wong</i> DATE: 24 Nov 21	
			CUSTOMER REF.	OUR REF. X9073			

PIN NO.	SYMBOL	FUNCTION
1	NC	No connection
2	NC	No connection
3	PSB	Parallel / serial data input select
4	C86	Mode select
5	NC	No connection
6	NC	No connection
7	NC	No connection
8	NC	No connection
9	VG	LCD driving voltage for segment circuits
10	NC	No connection
11	NC	No connection
12	XV0	LCD driving voltage for common circuits
13	V0	LCD driving voltage for common circuits
14	NC	No connection
15	NC	No connection
16	VSS	Ground
17	VDD	Supply voltage for logic
18	D7(SDA)	Data bus(serial data input)
19	D6(SCL)	Data bus(serial clock input)
20	D5	
21	D4	
22	D3	
23	D2	
24	D1	
25	D0	
26	RD(EN)	Read/Write execution control pin
27	WR(R/W)	Read/Write execution control pin
28	A0	Control instruction
29	RSTB	Reset
30	CSB	Chip select
31	NC	No connection
32	NC	No connection
*33	A	Supply voltage for backlight(+VE)
*34	K	Supply voltage for backlight(-VE)

NOTE: (*) for the backlight version only.

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. CG12864H
00	1st ISSUE		24 NOV 21	STANDARD		TITLE: PIN OUT & BLOCK DIAGRAM
				AGENT	APPROVED	DRAWN BY: JFHUNAG DATE : 24 NOV 21
						CHECKED BY : <i>Amity</i> DATE : 24 Nov 21
				CUSTOMER REF.	OUR REF. X9073	APPROVED BY : <i>Amity</i> DATE : 24 Nov 21

1. General specification

Display mode : 128 X 64 dots graphic COG LCD module
 Interface : Parallel/ Serial
 Driving method : 1/65 duty , 1/9 bias

2. Electrical specification

Supply voltage for logic (VDD) : 3.3V
 Operating voltage for LCD (VLCD) : 9.0V

3. Mechanical specification

Dot size : 0.49(L) X 0.49(W)
 Dot pitch : 0.52(L) X 0.52(W)
 Viewing area : 70.6(L) X 38.6(W)
 Module dimension : 77.0(L) X 50.6(W) X 2.9MAX.(H) (No backlight)
 : 78.4(L) X 53.0(W) X 7.0(H) (LED backlight)

4. Backlight specification

Backlight type	Backlight color	Supply voltage
LED side-lited	White	3.3V@60mA

TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		SHEET 4 OF 4
REV.	REVISION RECORD	DATE		CUSTOMER	APPROVED	MODEL NO. CG12864H
00	1st ISSUE	24 NOV 21		STANDARD		TITLE: SPECIFICATION
				AGENT	APPROVED	DRAWN BY: JFHUNAG DATE: 24 NOV 21
				CUSTOMER REF.	OUR REF. X9073	CHECKED BY: <i>Jimmy</i> DATE: 24 Nov 21
						APPROVED BY: <i>Wai San</i> DATE: 24 Nov 21

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	3.05	3.3	3.55	V
Supply Current for Logic	IDD	—	0.3	—	mA
Operating voltage for LCD (*)	VLCD	8.55	9.0	9.45	V
“H”Level Input Voltage	VIH	0.7VDD	—	VDD	V
“L”Level Input Voltage	VIL	VSS	—	0.VDD	V

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

Side Backlight

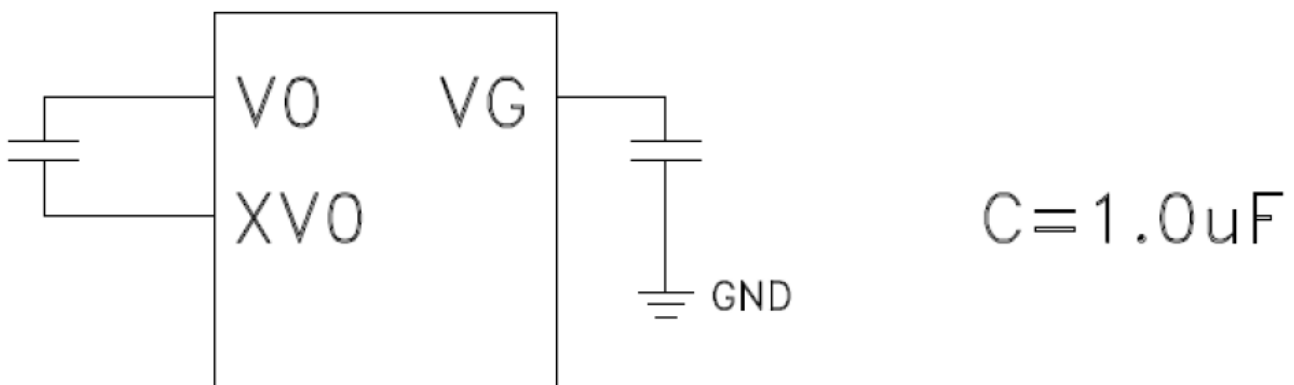
Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White Backlight current	I _{BL}	—	60	80	mA	V _{BL} = 3.3V

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 +4.0	-0.3 to +4.0	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

REFERENCE CIRCUIT EXAMPLE

INSTRUCTIONS TABLE

INSTRUCTION	A0	R/W (RWR)	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4) Set Column Address	0	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP=0, normal display
(11) Bias Select	0	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0, Write:+1
(13) END	0	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	0	1	1	1	0	0	0	1	0	Software reset
(15) COM Direction	0	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	0	0	0	1	0	0	RR2	RR1	RR0	Select regulation resistor ratio
(18) Set EV	0	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	0	1	1	1	1	1	0	0	0	Double command Set booster level: BL=0: 4X BL=1: 5X
	0	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	0	1	1	1	0	0	0	1	1	No operation
(22) Test	0	0	1	1	1	1	1	1	1	TE	Test Command Moe TE=0: releasing test command mode TE=1: entering test command mode

Note: Symbol “-” means this bit can be “H” or “L”.

RECOMMENDED INITIAL SETTINGS

Initial Display Line : 40H

LCD Bias Select : A2H

Power Control : 2FH

SHL Select : C0H

ADC Select : A0H

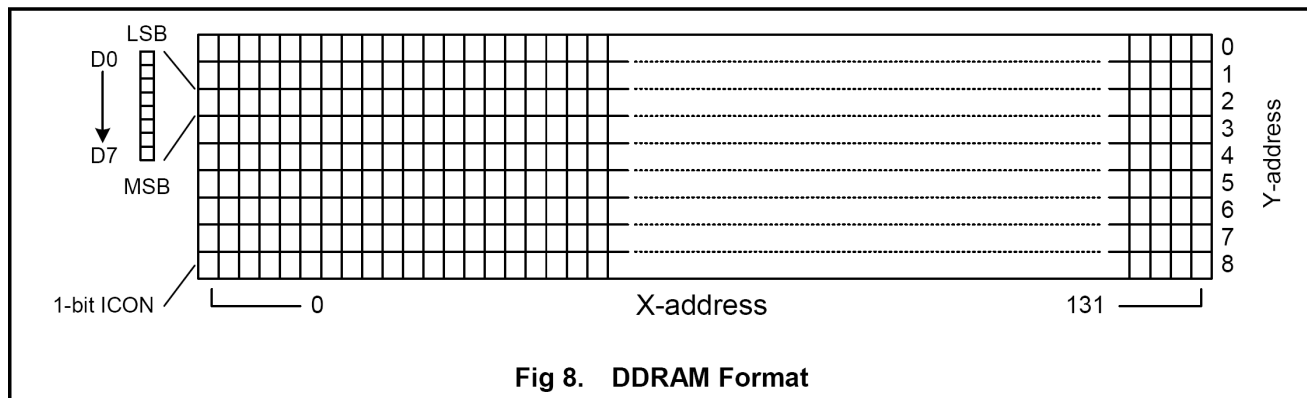
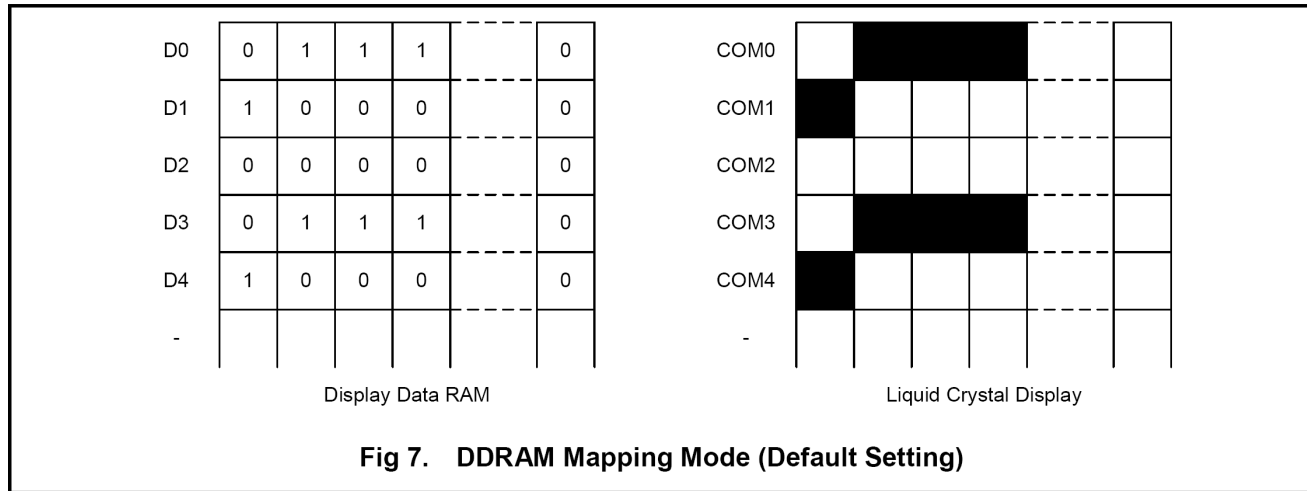
Regulator Resistor Select : 26H

Set Reference Voltage Register : 81H,12H

Set Display On : AFH

DISPLAY DATA RAM (DDRAM)

ST7567 is built-in a RAM with 65X132 bit capacity which stores the display data. The display data RAM (DDRAM) store the dot data of the LCD. It is an addressable array with 132 columns by 65 rows (8-page with 8-bit and 1-page with 1-bit). The X-address is directly related to the column output number. Each pixel can be selected when the page and column addresses are specified (please refer to Fig 7 for detailed illustration). The rows are divided into: 8 pages (Page-0 ~ Page-7) each with 8 lines (for COM0~63) and Page-8 with only 1 line (COMS, for icon). The display data (D7~D0) corresponds to the LCD common-line direction and D0 is on top. All pages can be accessed through D[7:0] directly except icon page. Icon RAM uses only 1-bit of data bus (D0). Refer to Fig 8 for detailed illustration. The microprocessor can write to and read from (only Parallel interfaces) DDRAM by the I/O buffer. Since the LCD controller operates independently, data can be written into DDRAM at the same time as data is being displayed without causing the LCD flicker or data-conflict.



Line Address Circuit

The Line Address Circuit incorporates a counter and a Line Address register which is changed only by the “Display Start Line Set” instruction. This circuit assigns DDRAM a Line Address corresponding to the first display line (COM0). Therefore, by setting Line Address repeatedly, ST7567 can realize the screen scrolling without changing the contents of DDRAM as shown in Fig 10. The last common is always the COMS (common output for the icons). That means the icons will never scroll with the general display data.

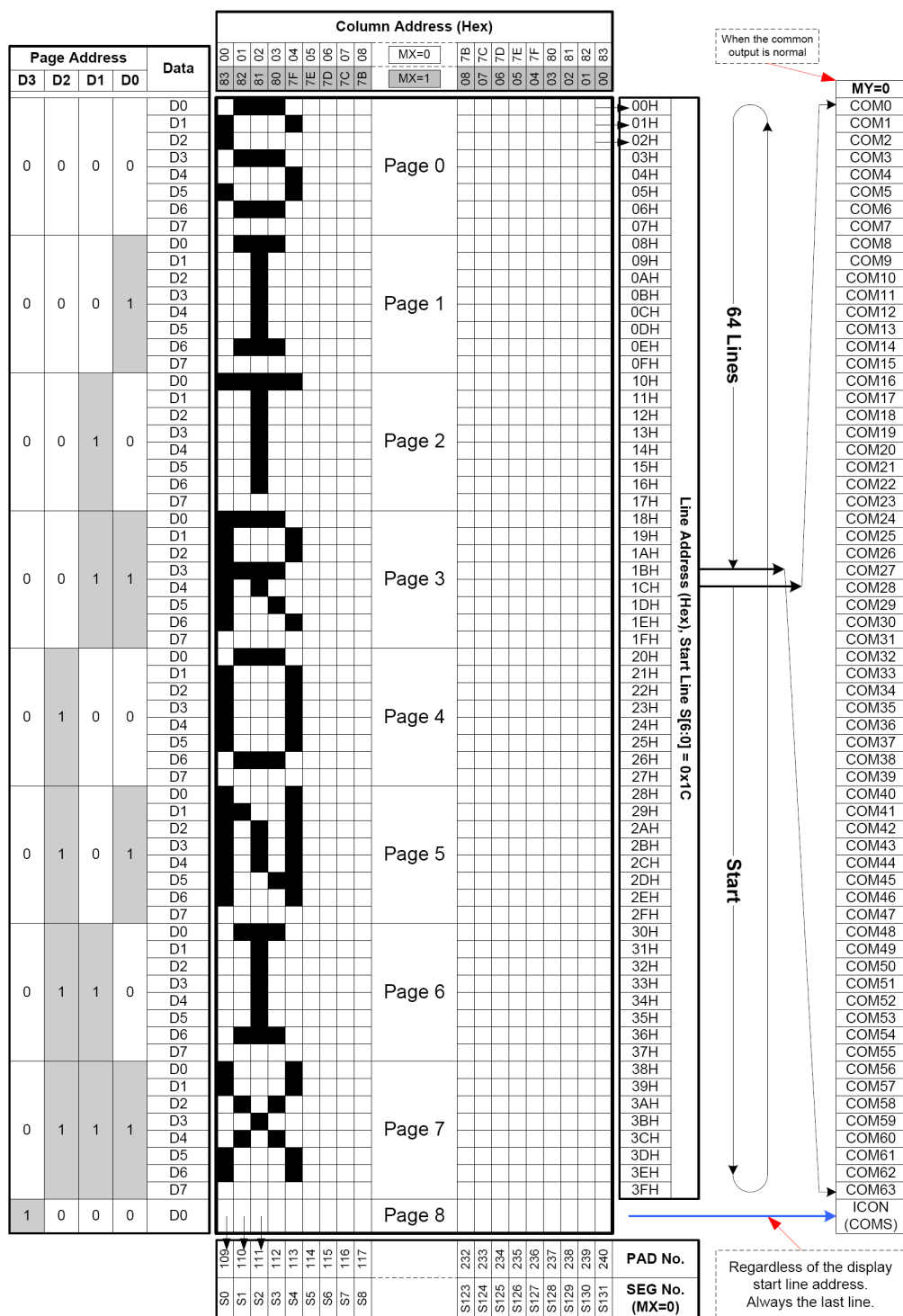


Fig 10. Start Line Function

DISPLAY DATA RAM MAP

The relation between DDRAM and outputs with different MX or MY setting is shown below.

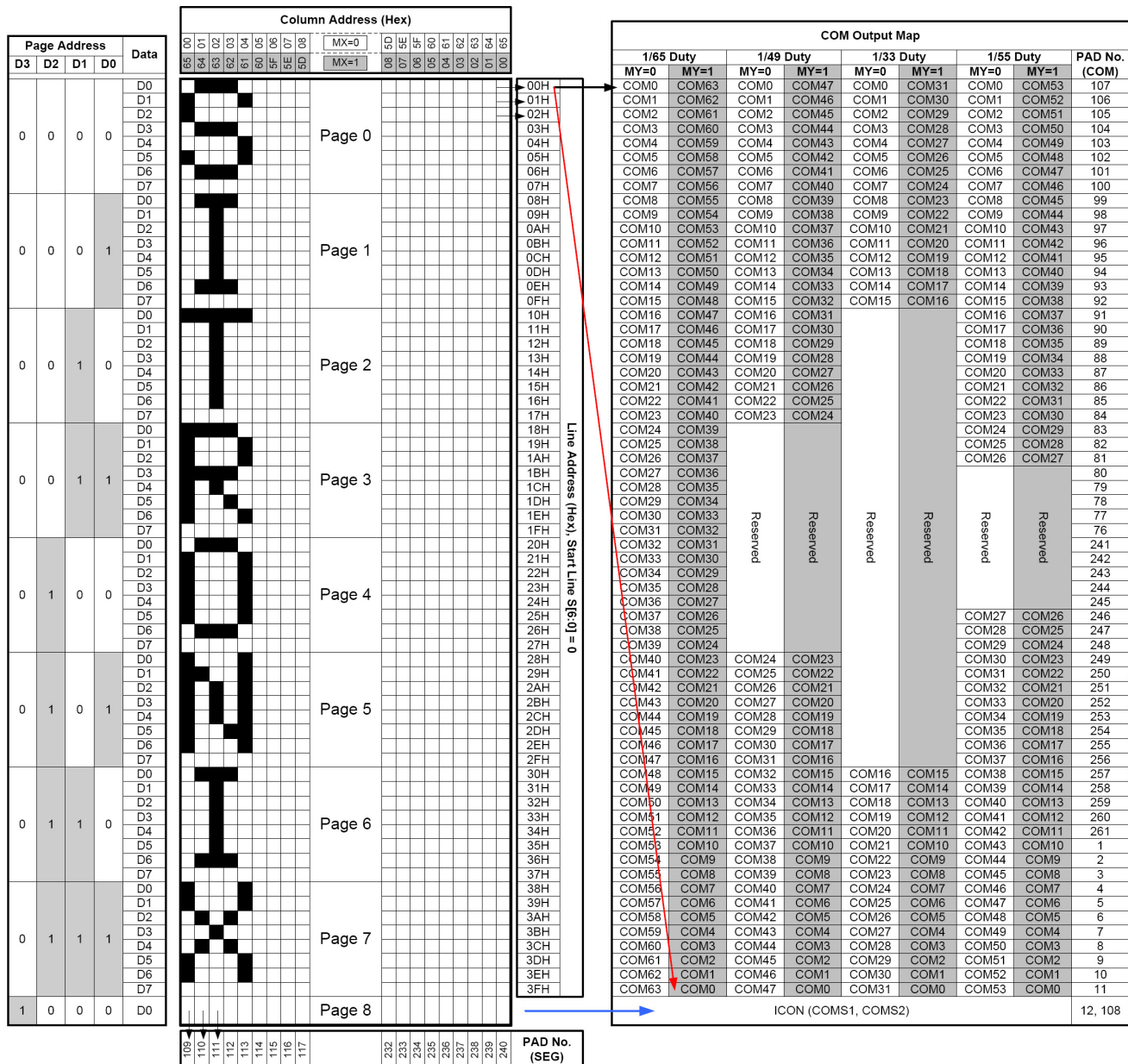
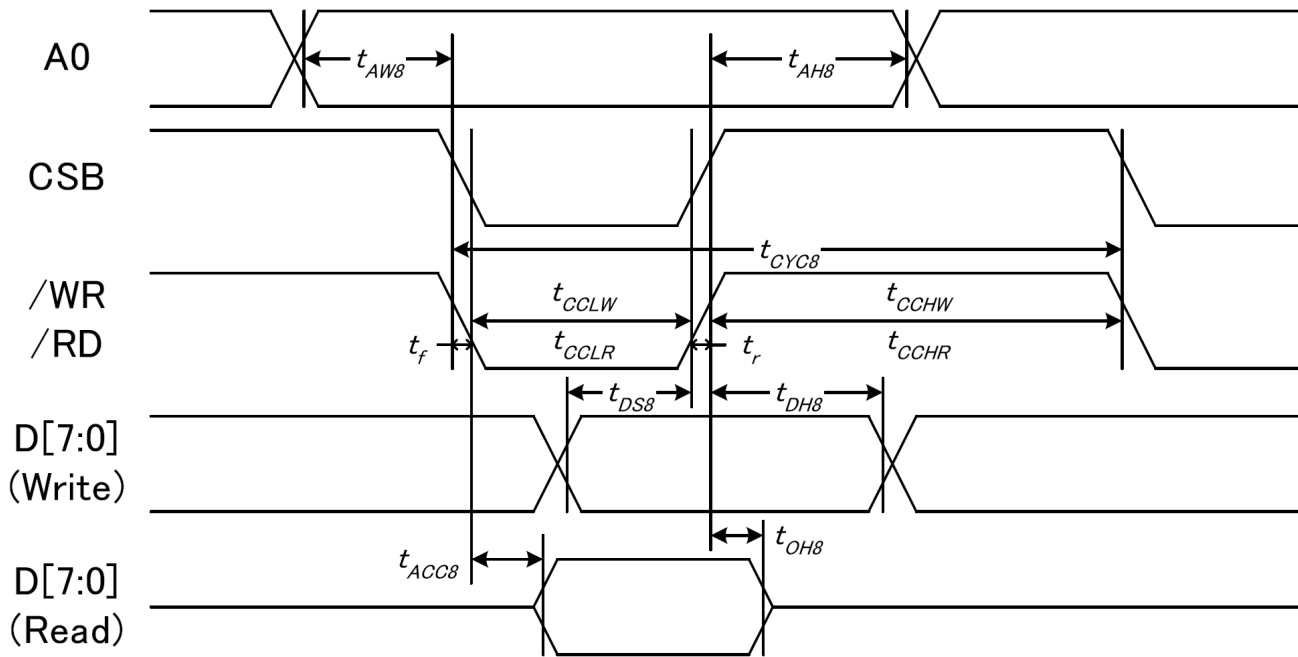
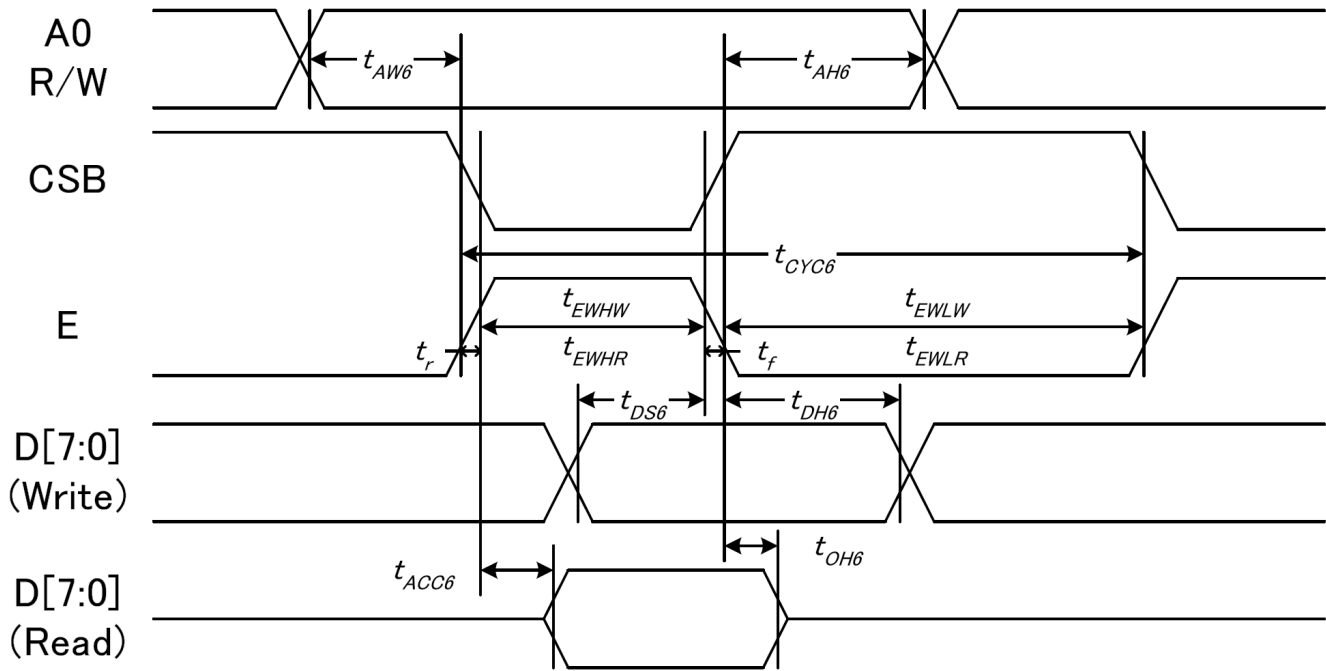


Fig 9. DDRAM and Output Map (COM/SEG)

PARALLEL INTERFACE TIMING DIAGRAM (8080 MODE)**PARALLEL INTERFACE TIMING CHARACTERISTICS (8080 MODE)**

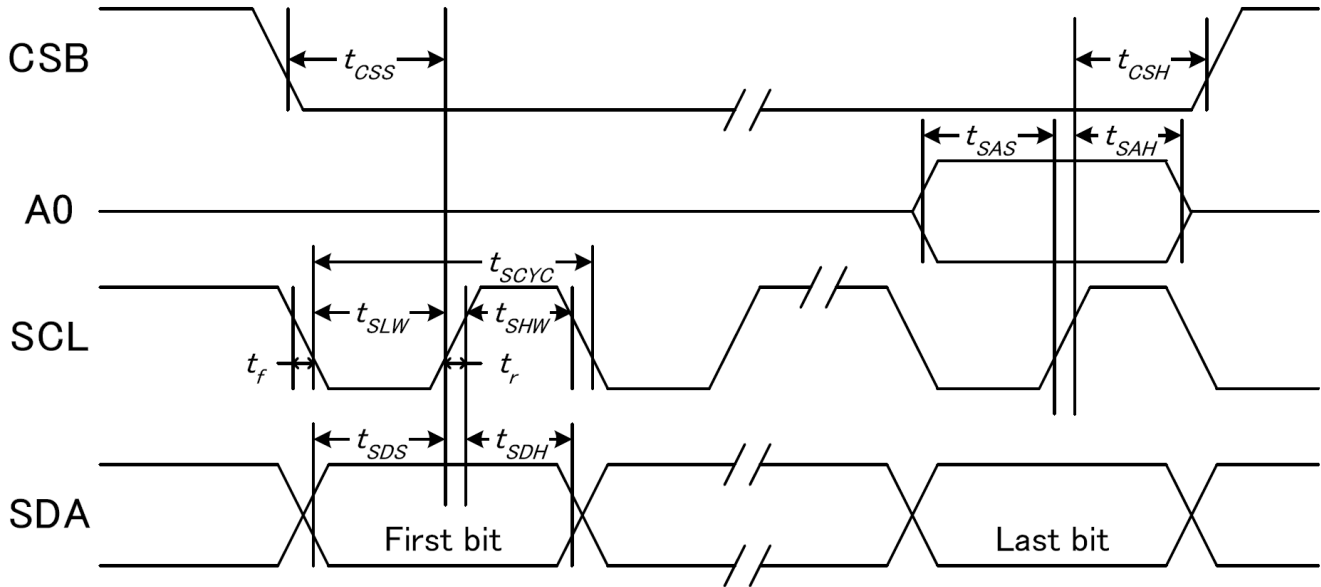
(VDD1 = 3.3V, Ta = 25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	t_{AW8}		0	—	ns
Address hold time		t_{AH8}		10	—	
System cycle time	/WR	t_{CYC8}		240	—	
/WR L pulse width (WRITE)		t_{CCLW}		80	—	
/WR H pulse width (WRITE)		t_{CCHW}		80	—	
/RD L pulse width (READ)	RD	t_{CCLR}		140	—	
/RD H pulse width (READ)		t_{CCHR}		80	—	
WRITE Data setup time	D[7:0]	t_{DS8}		40	—	
WRITE Data hold time		t_{DH8}		20	—	
READ access time		t_{ACC8}	CL = 16 pF	—	70	
READ Output disable time		t_{OH8}	CL = 16 pF	5	50	

PARALLEL INTERFACE TIMING DIAGRAM (6800 MODE)**PARALLEL INTERFACE TIMING CHARACTERISTICS (6800 MODE)**

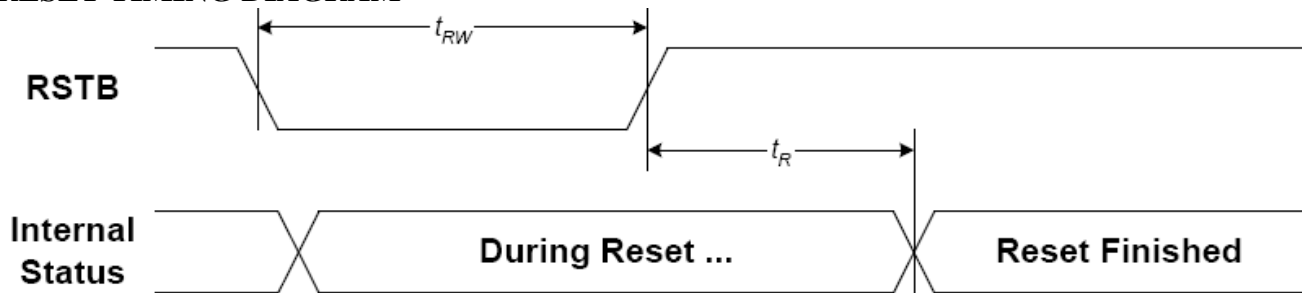
(VDD1 = 3.3V, Ta = 25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW6		0	—	ns
Address hold time		tAH6		10	—	
System cycle time	E	tCYC6		240	—	
Enable L pulse width (WRITE)		tEHLW		80	—	
Enable H pulse width (WRITE)		tEHHW		80	—	
Enable L pulse width (READ)		tEHLR		80	—	
Enable H pulse width (READ)		tEHR		140	—	
Write data setup time	D[7:0]	tDS6		40	—	
Write data hold time		tDH6		10	—	
Read data access time		tACC6	CL = 16 pF	—	70	
Read data output disable time		tOH6	CL = 16 pF	5	50	

SERIAL INTERFACE TIMING DIAGRAM(4-LINE MODE)**SERIAL INTERFACE TIMING CHARACTERISTICS(4-LINE MODE)**

(VDD1 = 3.3V , Ta =25°C)

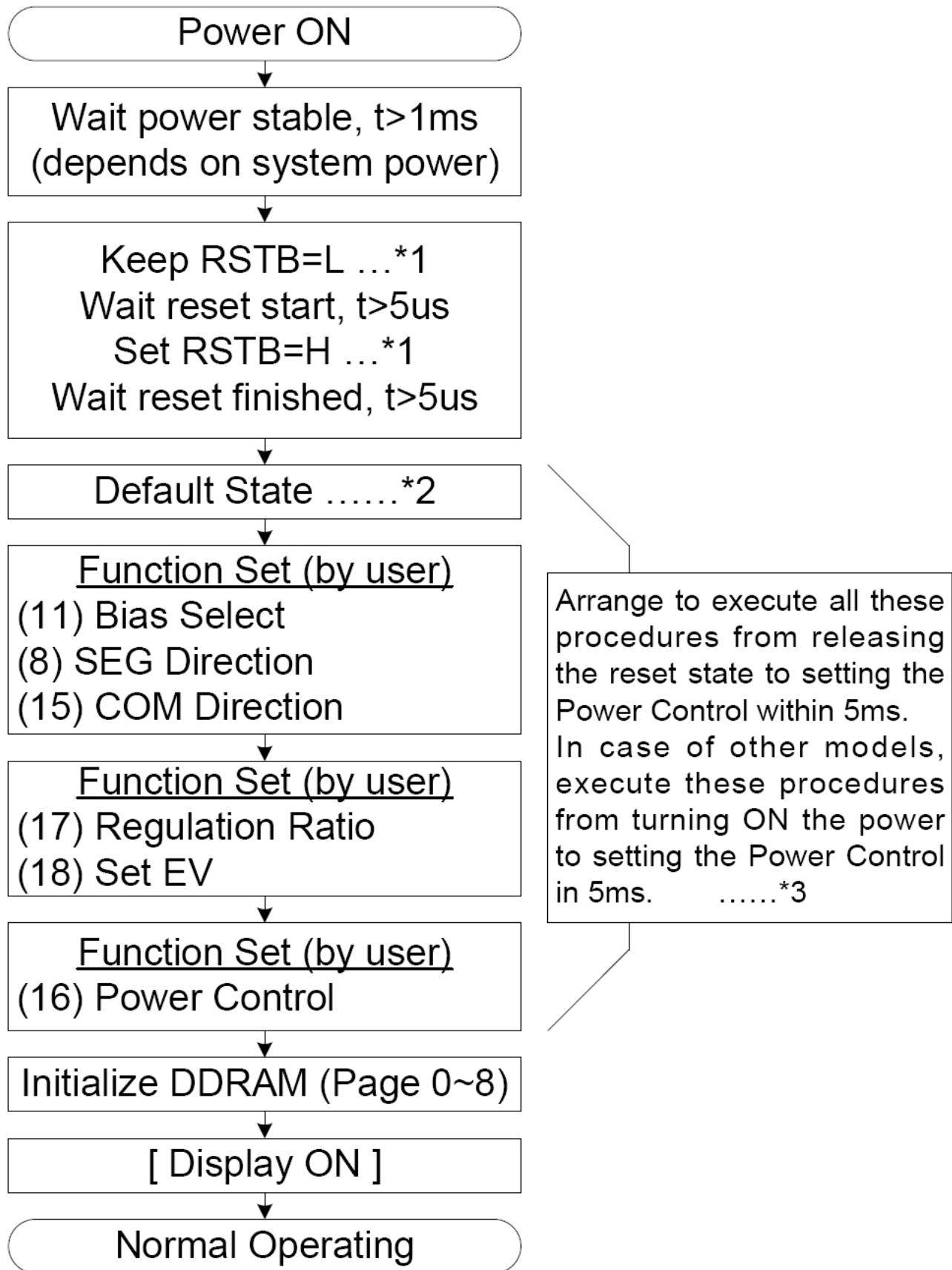
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK "H" pulse width		tSHW		25	—	
SCLK "L" pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CSB-SCLK time	CSB	tCSS		20	—	
CSB-SCLK time		tCSH		40	—	

RESET TIMING DIAGRAM**RESET TIMING**

(VDD1 = 3.3V , Ta =25°C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset “L” pulse width	tRW		1.0	—	

INITIALIZING WITHOUT THE BUILT-IN POWER SUPPLY CIRCUITS



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	Ton	ms	220
	Toff	ms	280
CONTRAST RATIO	Cr	-	12
VIEWING ANGLE (Cr ≥ 2)	V3:00	°	40
	V6:00	°	70
	V9:00	°	40
	V12:00	°	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	—

SAMPLING METHOD

SAMPLING PLAN: ANSI/ASQ Z1.4

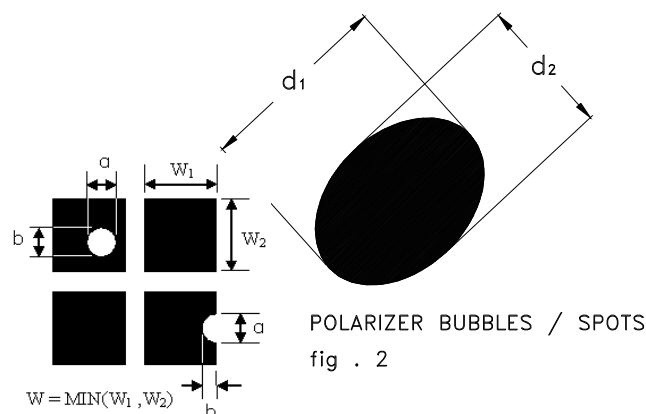
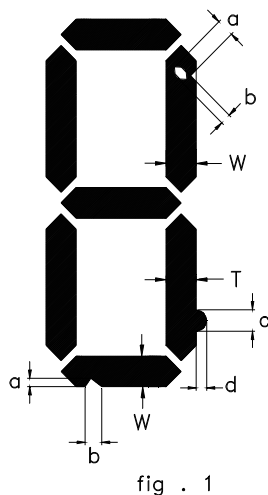
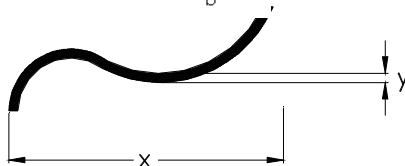
CLASS OF AQL: LEVEL II/ SINGLE SAMPLING
MAJOR-0.65% MINOR – 1.5%**QUALITY STANDARD**

DEFECT	CRITERIA	TYPE	FIGURE
SHORT CIRCUIT	-	MAJOR	-
MISSING SEGMENT	-	MAJOR	-
UNEVEN / POOR CONTRAST	-	MAJOR	-
CROSS TALK	-	MAJOR	-
PIN HOLE	$MAX(a,b) \leq 1 / 3 W$ DOT MATRIX: IF $0.6 \leq W$, $MAX(a,b) < 0.3 N.A.**$ IF $0.4 \leq W < 0.6$, $MAX(a,b) < 0.25 N.A.**$ IF $W < 0.4$, $MAX(a,b) < 0.2 N.A.**$	MINOR	1
EXCESS SEGMENT	$MAX(c,d) \leq 1 / 3 T$	MINOR	1
BUBBLES	$d^* \geq 0.7$ QTY=0	MINOR	2
BLACKS SPOTS	$d \leq 0.7$ N.A.** $0.7 < d \leq 0.8$ QTY ≤ 2 $0.8 < d$ QTY=0	MINOR	2
LINE SCRATCHES	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3
BLACK LINE	$x \geq 0.7$ $y \geq 0.05$ QTY=0	MINOR	3

*d = MAX (d₁,d₂)

** N. A . = NOT APPLICABLE

DEFECT TABLE : F

POLARIZER BUBBLES / SPOTS
fig . 2LINE SCRATCHES / BLACK LINE
fig . 3

QUALITY STANDARD (CONT .)

DEFECT		CRITERIA	TYPE	FIGURE
CHIPS	CONTACT EDGE	$e \leq T$ $f \leq 1/2W$ $g \leq N.A.$	MINOR	4
	BOTTOM GLASS	$p \leq V.A.^{***}$ $q: N.A.$ $r \leq T$		4
	CORNER	$A: N.A.$ $b \leq W$		4
	TOP GLASS	$a \leq N.A.$ $b \leq T$ $c \leq W$		5
GLASS PROTRUSION		$a \leq 1/3 W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER .

DEFECT TABLE : F

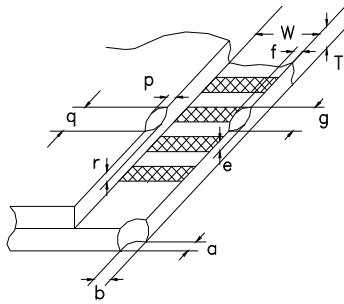


fig . 4

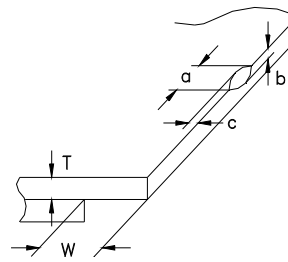


fig . 5

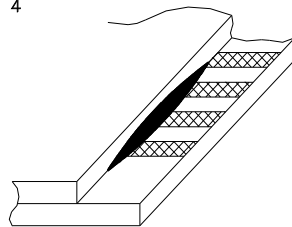


fig . 6

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 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.

For Internal Use Only
SPECIFICATION REVISION RECORD

Revision No.	Description	Date(DD/MM/YY)
00	1 st Issue	25/11/21