



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CG12864B - _ _ _ - _ _ _ - _ _

Revision	02
Engineering	Jackson Fung
Date	25 January 2016
Our Reference	X9042

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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:

CG12864B- 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 ST7565P or equivalent
 For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

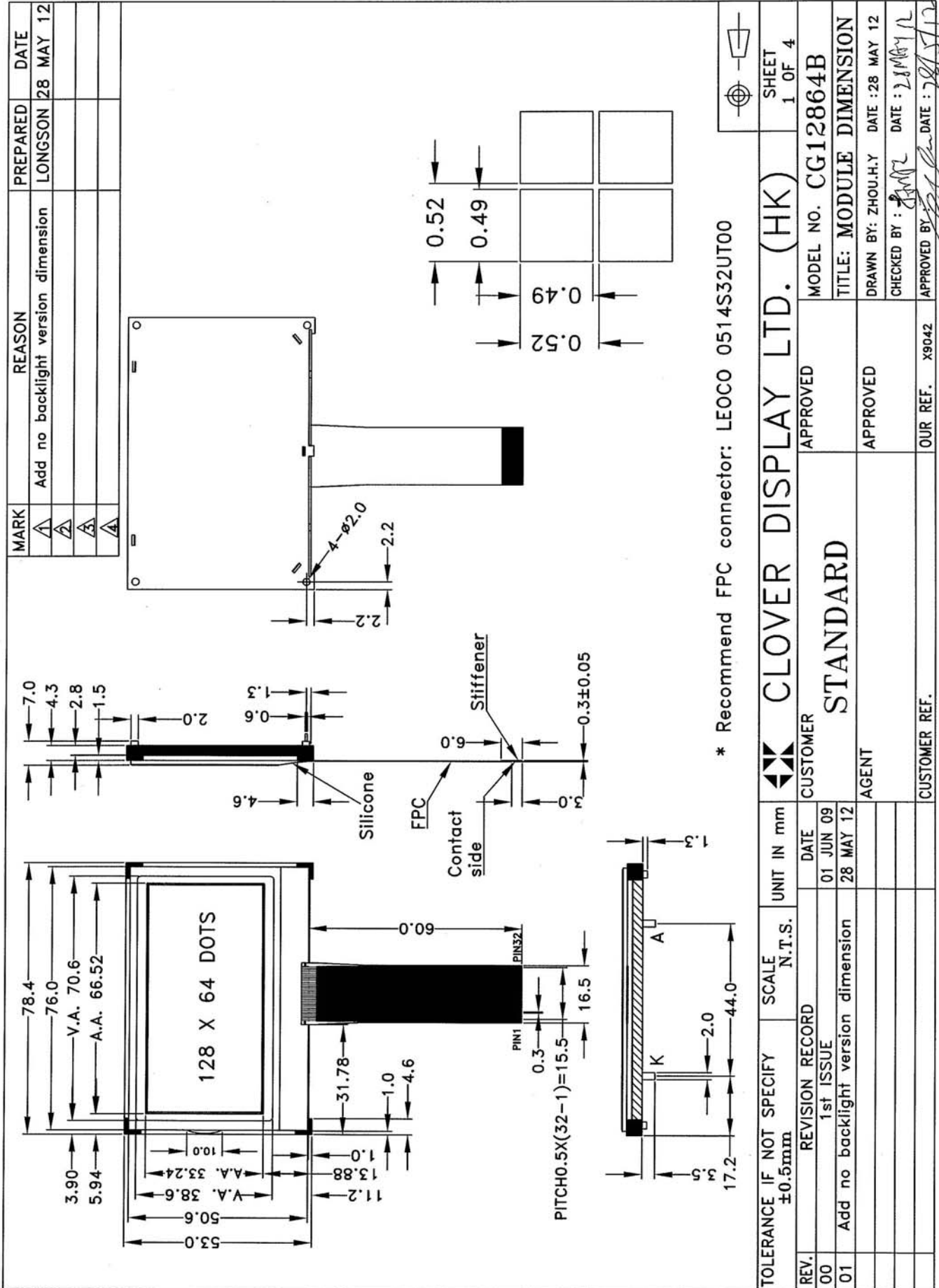
Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension			Dot Pitch	0.52(L)x0.52(W)	mm
No backlight	77.0(L) x50.6 (W) x2.9 (H)(MAX)	mm	Dot Size	0.49(L)x0.49(W)	mm
LED side-lited backlight	78.4(L) x53.0 (W) x 7.0(H)	mm	Viewing Area	70.6(L)x38.6(W)	mm

CONNECTOR PIN ASSIGNMENT

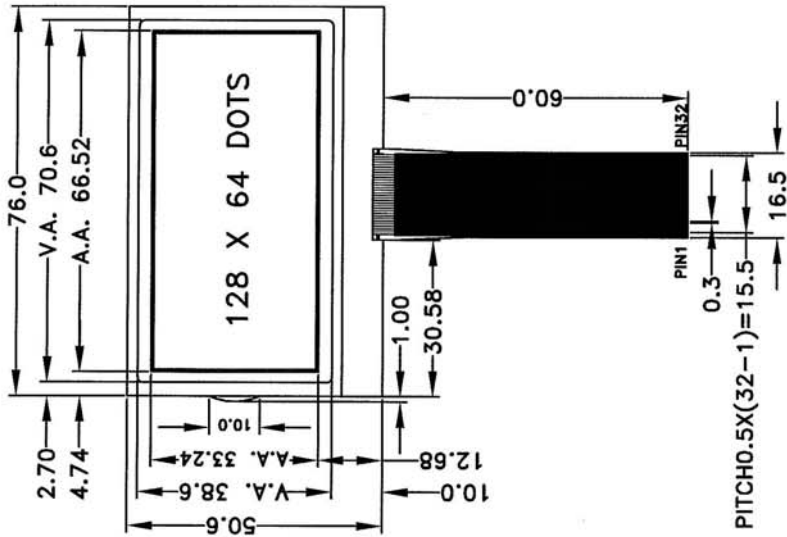
Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	NC	No connection	18	D7 (SDA)	Data bus (serial data input)
2	NC	No connection	19	D6 (SCL)	Data bus (serial clock input)
3	P/S	Parallel / serial data input select	20	D5	Data bus
4	C86	Mode select	21	D4	
5	V0	Power supply for LCD	22	D3	
6	V1		23	D2	
7	V2		24	D1	
8	V3		25	D0	
9	V4		26	RD (EN)	Read signal(enable input signal for 6800 mode)
10	CAP2N	Voltage converter	27	WR(R/W)	Write signal(read/write signal for 6800mode)
11	CAP2P		28	A0	Control instruction
12	CAP1P		29	RES	Reset
13	CAP1N		30	CS1	Chip select
14	CAP3P		31	NC	No connection
15	VOUT		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

COUNTER DRAWING OF MODULE DIMENSION



No backlight version

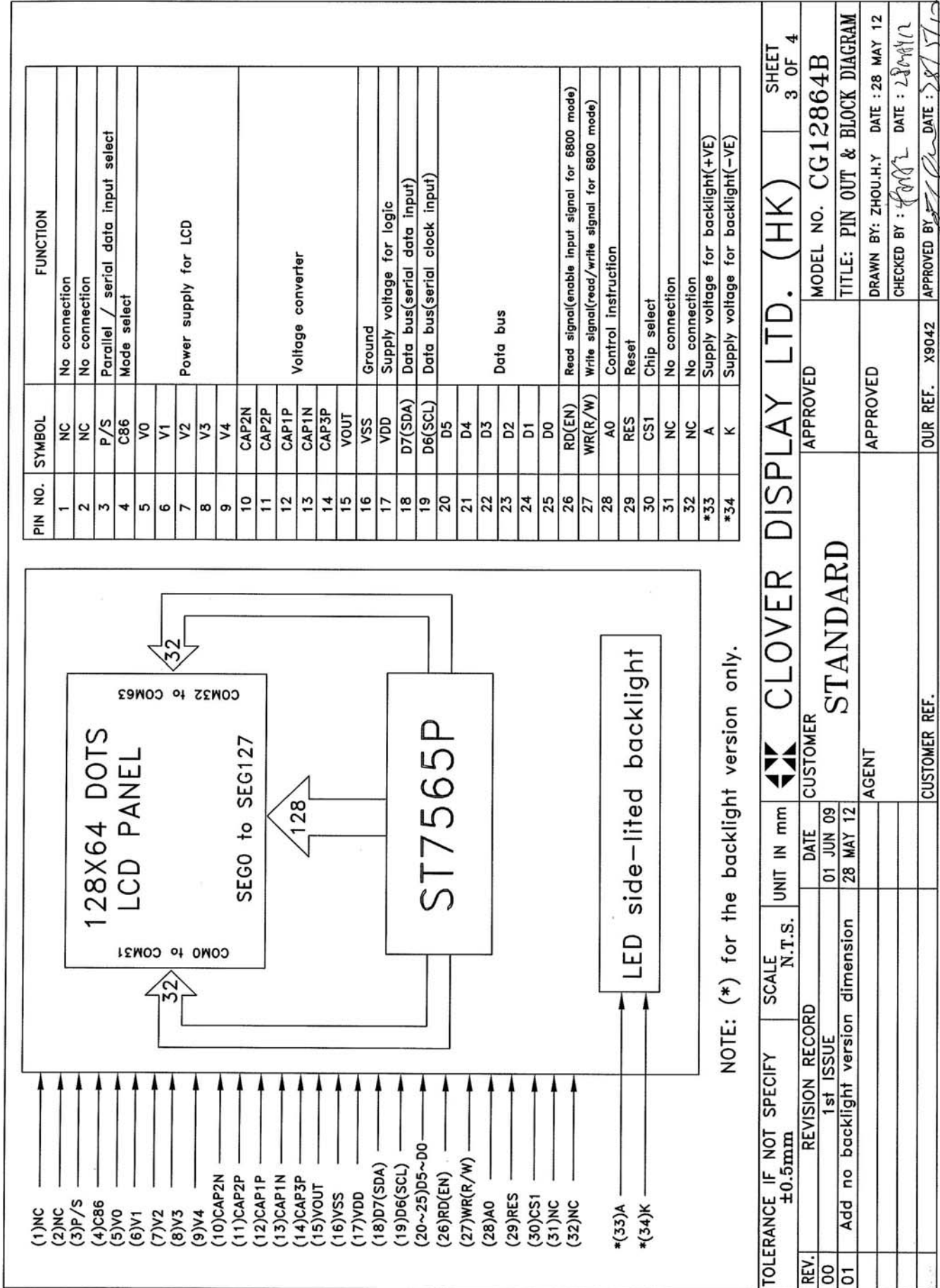


* Recommend FPC connector: LEOCO 0514S32UT00



TOLERANCE IF NOT SPECIFY ±0.5mm		SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)		MODEL NO. CG12864B	SHEET 2 OF 4
REV.	REVISION RECORD	DATE	CUSTOMER	STANDARD		APPROVED	
00	1st Issue	01 JUN 09	AGENT			APPROVED	
01	Add no backlight version dimension	28 MAY 12	CUSTOMER REF.			OUR REF. X9042	
						TITLE: MODULE DIMENSION 2	
						DRAWN BY: ZHOU.H.Y DATE: 28 MAY 12	
						CHECKED BY: <i>[Signature]</i> DATE: 28 MAY 12	
						APPROVED BY: <i>[Signature]</i> DATE: 28 MAY 12	

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



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. CG12864B	
00	1st ISSUE	01 JUN 09	STANDARD		TITLE: PIN OUT & BLOCK DIAGRAM	
01	Add no backlight version dimension	28 MAY 12	AGENT	APPROVED	DRAWN BY: ZHOU.H.Y DATE: 28 MAY 12	
					CHECKED BY: <i>YML</i> DATE: 28 May 12	
					APPROVED BY: <i>YML</i> DATE: 28 May 12	
				OUR REF. X9042		
				CUSTOMER REF.		

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	—	0.23	0.34	mA
Operating voltage for LCD (*)	VLCD	8.8	9.0	9.2	V
“H”Level Input Voltage	VIH	0.8VDD	—	VDD	V
“L”Level Input Voltage	VIL	VSS	—	0.2VDD	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

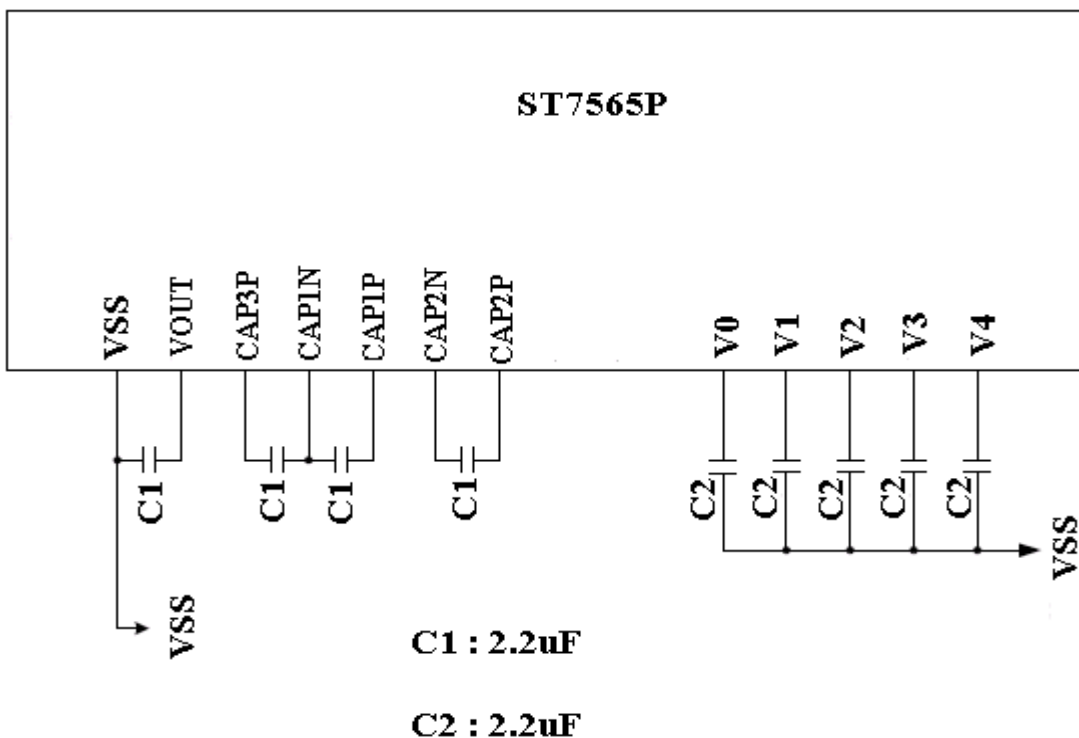
ABSOLUTE MAXIMUM RATINGS

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 +3.6	-0.3 to +3.6	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

4x boosting circuit.



INSTRUCTIONS TABLE

(Note) *: disabled data

Command	Command Code										Function	
	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1		D0
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address					Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data							Writes to the display RAM	
(7) Display data read	1	0	1	Read data							Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	Sets the LCD display normal/reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565P)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0	1	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
(17) Vo voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the Vo output voltage electronic volume register
Electronic volume register set				0	0	Electronic volume value						
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver												Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

RECOMMENDED INITIAL SETTINGS

Display Start Line Set : 40H

ADC Select : A0H

LCD Bias Set : A2H

Common Output Mode Select : C0H

Power Control Set: 2FH

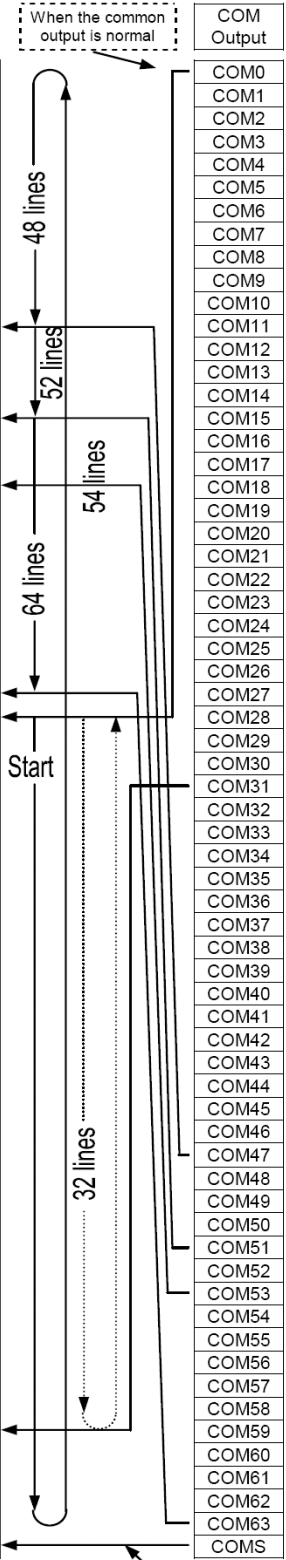
V0 Voltage Regulator Internal Resistor Ratio Set : 26H

Electronic Volume Register Set : 12H

Booster Ratio Set : 00H

DISPLAY DATA RAM

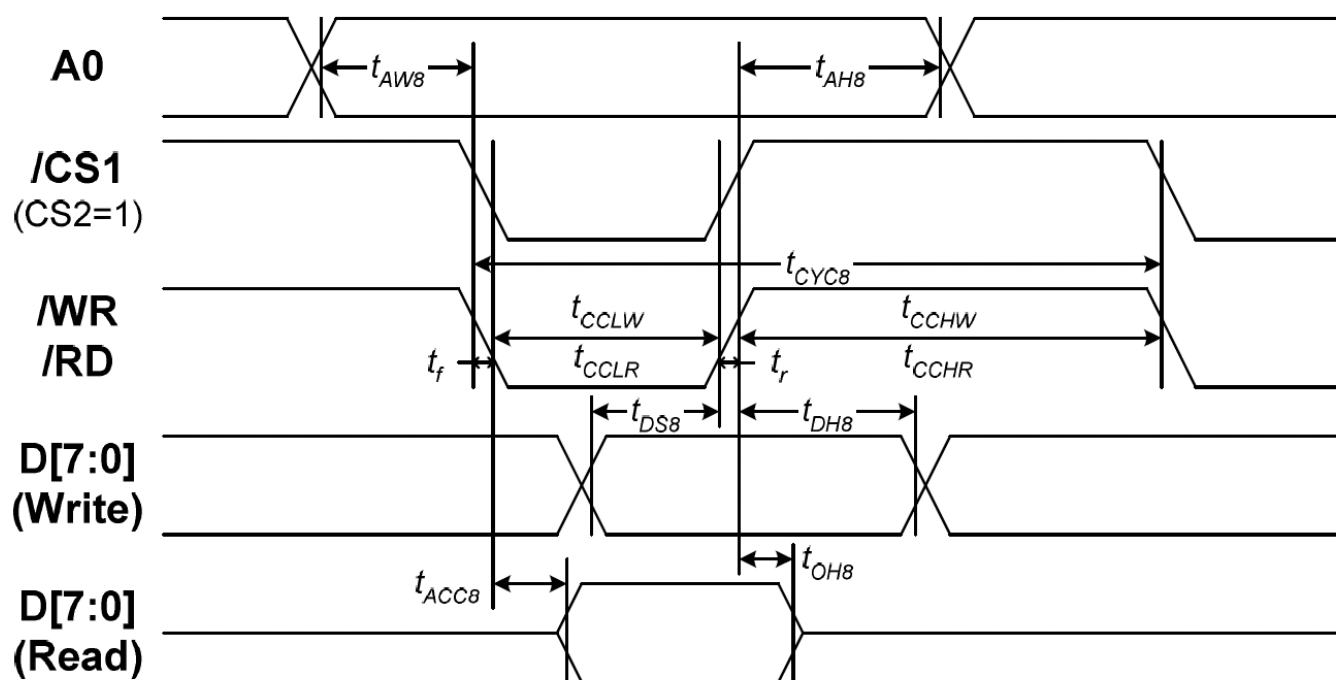
Page Address				Data		Line Address	COM Output
D3	D2	D1	D0				
0	0	0	0	D0	Page 0	00H	COM0
				D1		01H	COM1
				D2		02H	COM2
				D3		03H	COM3
				D4		04H	COM4
				D5		05H	COM5
				D6		06H	COM6
				D7		07H	COM7
0	0	0	1	D0	Page 1	08H	COM8
				D1		09H	COM9
				D2		0AH	COM10
				D3		0BH	COM11
				D4		0CH	COM12
				D5		0DH	COM13
				D6		0EH	COM14
				D7		0FH	COM15
0	0	1	0	D0	Page 2	10H	COM16
				D1		11H	COM17
				D2		12H	COM18
				D3		13H	COM19
				D4		14H	COM20
				D5		15H	COM21
				D6		16H	COM22
				D7		17H	COM23
0	0	1	1	D0	Page 3	18H	COM24
				D1		19H	COM25
				D2		1AH	COM26
				D3		1BH	COM27
				D4		1CH	COM28
				D5		1DH	COM29
				D6		1EH	COM30
				D7		1FH	COM31
0	1	0	0	D0	Page 4	20H	COM32
				D1		21H	COM33
				D2		22H	COM34
				D3		23H	COM35
				D4		24H	COM36
				D5		25H	COM37
				D6		26H	COM38
				D7		27H	COM39
0	1	0	1	D0	Page 5	28H	COM40
				D1		29H	COM41
				D2		2AH	COM42
				D3		2BH	COM43
				D4		2CH	COM44
				D5		2DH	COM45
				D6		2EH	COM46
				D7		2FH	COM47
0	1	1	0	D0	Page 6	30H	COM48
				D1		31H	COM49
				D2		32H	COM50
				D3		33H	COM51
				D4		34H	COM52
				D5		35H	COM53
				D6		36H	COM54
				D7		37H	COM55
0	1	1	1	D0	Page 7	38H	COM56
				D1		39H	COM57
				D2		3AH	COM58
				D3		3BH	COM59
				D4		3CH	COM60
				D5		3DH	COM61
				D6		3EH	COM62
				D7		3FH	COM63
1	0	0	0	D0	Page 8		COMS



00	01	02	03	04	05	06	07	08	7B	7C	7D	7E	7F	80	81	82	83
83	82	81	80	7F	7E	7D	7C	7B	08	07	06	05	04	03	02	01	00
S0	S1	S2	S3	S4	S5	S6	S7	S8	S123	S124	S125	S126	S127	S128	S129	S130	S131

Regardless of the display start line address.
 1/65duty => 64th line.
 1/49duty => 48th line.
 1/33duty => 32th line.
 1/55duty => 54th line.
 1/53duty => 52th line.

PARALLEL INTERFACE TIMING DIAGRAM (8080 MODE)

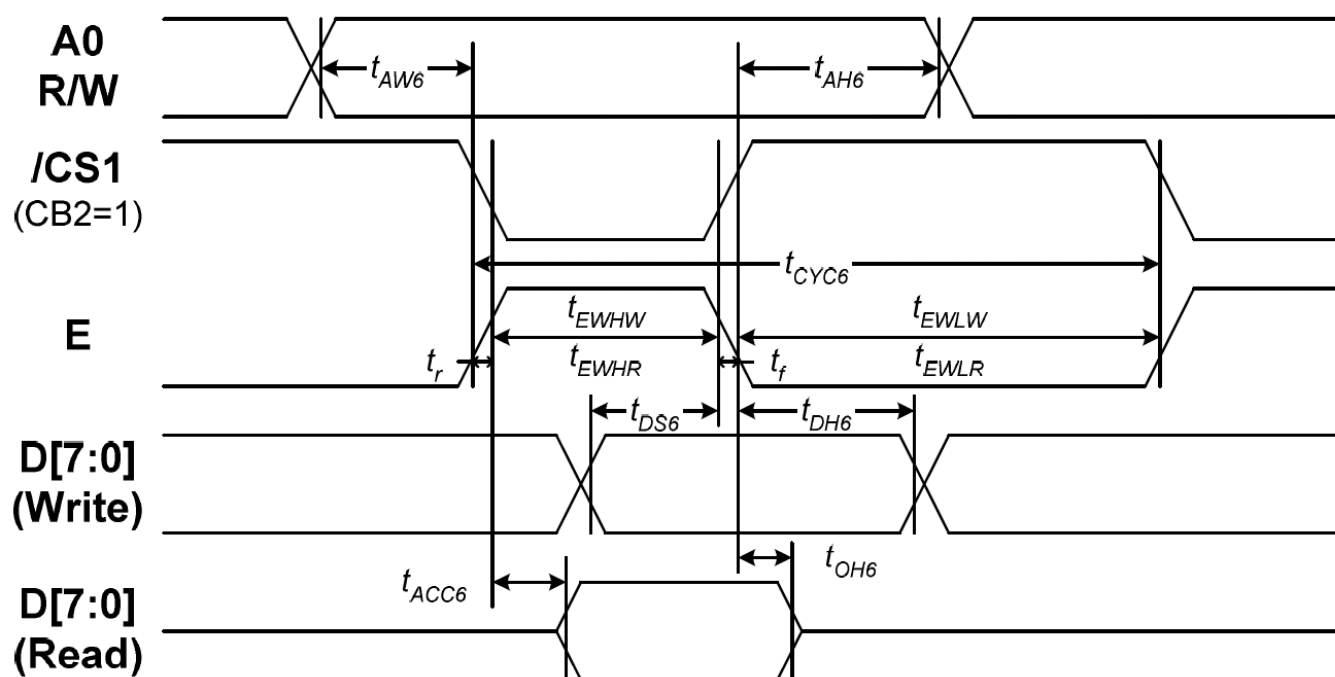


PARALLEL INTERFACE TIMING CHARACTERISTICS (8080 MODE)

(V_{DD} = 3.3V, T_a = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t _{AH8}		0	—	Ns
Address setup time		t _{AW8}		0	—	
System cycle time		t _{CYC8}		240	—	
Write L pulse width	/WR	t _{CCLW}		80	—	
Write H pulse width		t _{CCHW}		80	—	
Read L pulse width	/RD	t _{CCLR}		140	—	
Read H pulse width		t _{CCHR}		80	—	
Write Data setup time	D0 to D7	t _{DS8}		40	—	
Write Address hold time		t _{DH8}		0	—	
Read access time		t _{ACC8}	CL = 100 pF	—	70	
Read Output disable time		t _{OH8}	CL = 100 pF	5	50	

PARALLEL INTERFACE TIMING DIAGRAM (6800 MODE)

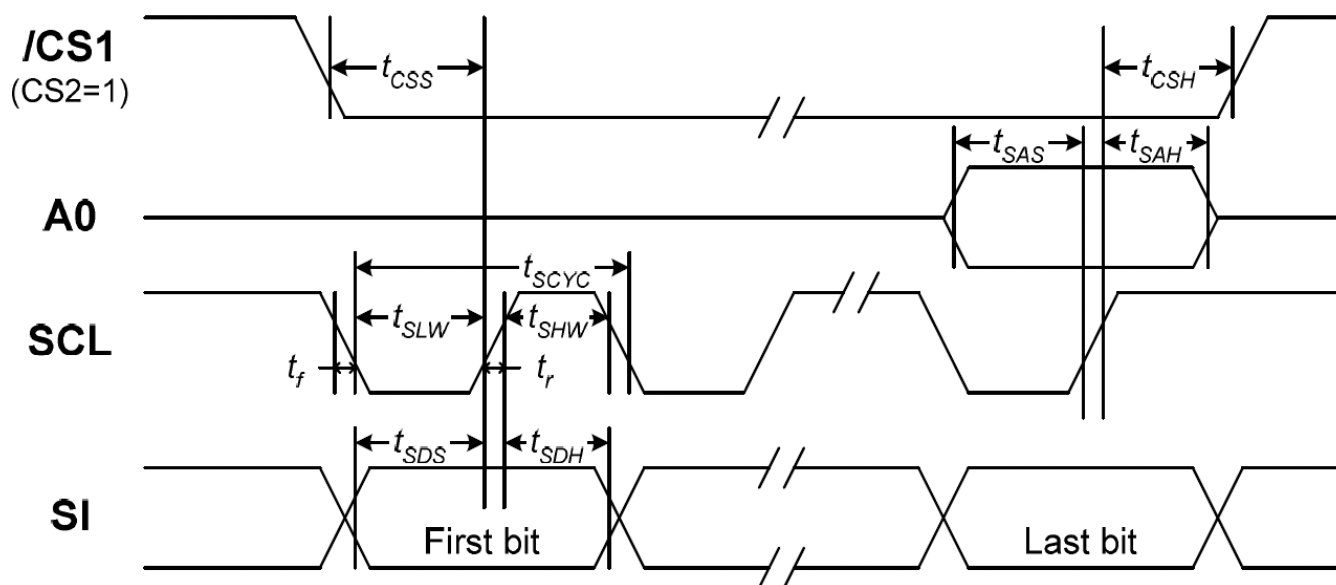


PARALLEL INTERFACE TIMING CHARACTERISTICS (6800 MODE)

($V_{DD} = 3.3V, T_a = -30 \text{ to } 85^\circ\text{C}$)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t_{AH6}		0	—	ns
Address setup time		t_{AW6}		0	—	
System cycle time		t_{CYC6}		240	—	
Enable L pulse width (WRITE)	E	t_{EHLW}		80	—	
Enable H pulse width (WRITE)		t_{EHWLW}		80	—	
Enable L pulse width (READ)		t_{EHLR}		80	—	
Enable H pulse width (READ)		t_{EHWLR}		140	—	
WRITE Data setup time	D0 to D7	t_{DS6}		40	—	
WRITE Address hold time		t_{DH6}		0	—	
READ access time		t_{ACC6}	$CL = 100 \text{ pF}$	—	70	
READ Output disable time		t_{OH6}	$CL = 100 \text{ pF}$	5	50	

SERIAL INTERFACE TIMING DIAGRAM

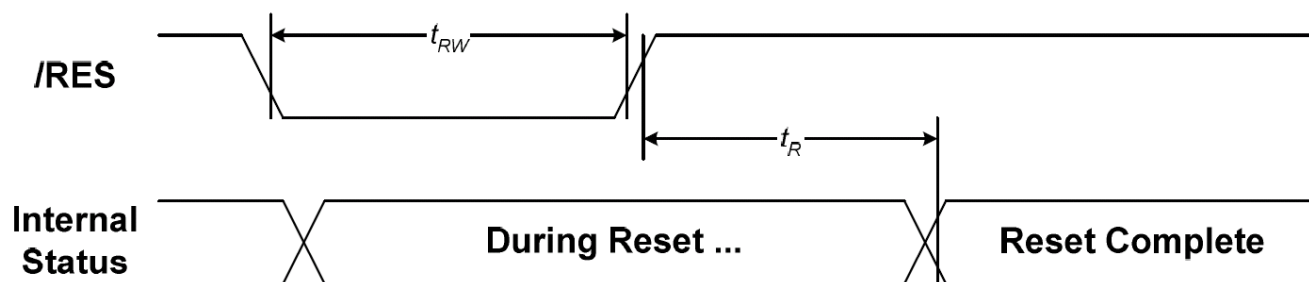


SERIAL INTERFACE TIMING CHARACTERISTICS

(VDD = 3.3V, Ta = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	t_{SCYC}		50	—	ns
SCL "H" pulse width		t_{SHW}		25	—	
SCL "L" pulse width		t_{SLW}		25	—	
Address setup time	A0	t_{SAS}		20	—	
Address hold time		t_{SAH}		10	—	
Data setup time	SI	t_{SDS}		20	—	
Data hold time		t_{SDH}		10	—	
CS-SCL time	CS	t_{CSS}		20	—	
CS-SCL time		t_{CSH}		40	—	

RESET TIMING DIAGRAM

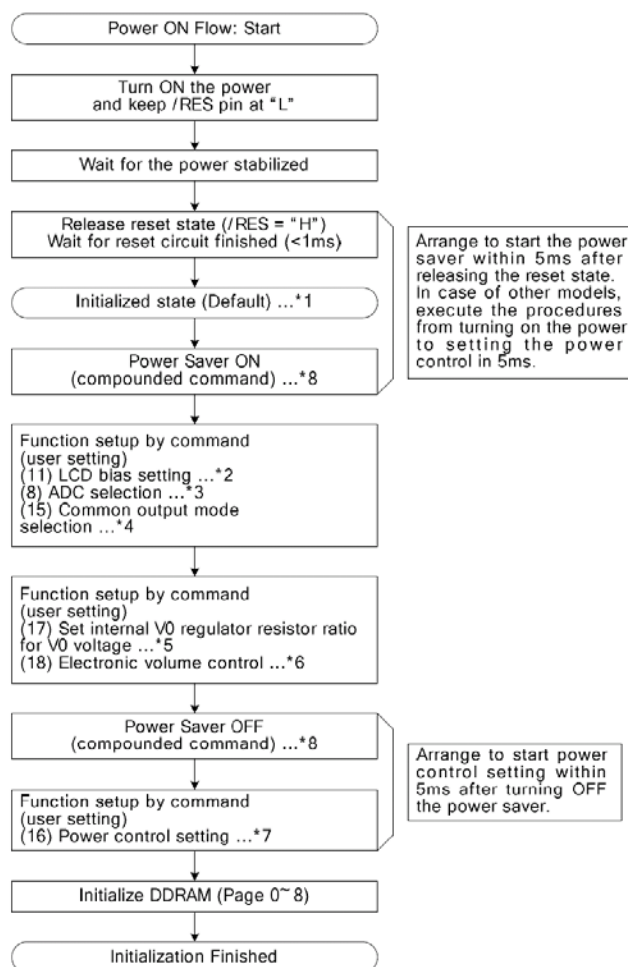


RESET TIMING

(V_{DD} = 3.3V, T_a = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time	/RES	t_R		—	—	1.0	μs
Reset "L" pulse width		t_{RW}		1.0	—	—	μs

INITIALIZING WITHOUT THE BUILT-IN POWER SUPPLY CIRCUITS



* The target time of 5ms will result to vary depending on the panel characteristics and the capacitance of the smoothing capacitor. Therefore, we suggest you to conduct an operation check using the actual equipment.

Notes: Refer to respective sections or paragraphs listed below.

*1: Description of functions; Resetting circuit

*2: Command description; LCD bias setting

*3: Command description; ADC selection

*4: Command description; Common output state selection

*5: Description of functions; Power circuit & Command description; Setting the built-in resistance ratio for regulation of the V0 voltage

*6: Description of functions; Power circuit & Command description; Electronic volume control

*7: Description of functions; Power circuit & Command description; Power control setting

*8: The power saver ON state can either be in sleep state or stand-by state.

Command description; Power saver START (multiple commands)

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. 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

SAMPLING METHOD

SAMPLING PLAN: MIL-STD 105E

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	$MAX(a,b) \leq 1/4 W$	MINOR	1
EXCESS SEGMENT	$MAX(c,d) \leq 1/4 T$	MINOR	1
BUBBLES	$d^* \geq 0.2$ QTY=0	MINOR	2
BLACKS SPOTS	$d \leq 0.3$ N.A.** $0.3 < d \leq 0.4$ QTY \leq 1 $0.4 < d$ 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 : B

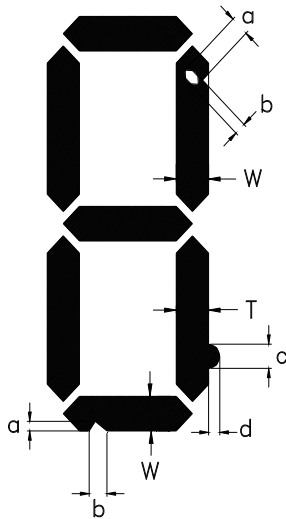
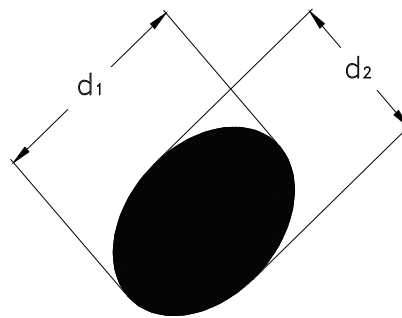
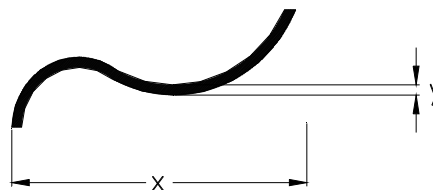


fig . 1



POLARIZER BUBBLES / SPOTS

fig . 2



LINE SCRATCHES / BLACK LINE

fig . 3

QUALITY STANDARD (CONT .)

DEFECT		CRITERIA	TYPE	FIGURE
CHIPS	CONTACT EDGE	$e \leq 1/2T$ $f \leq 1/3W$ $g \leq 3.5$	MINOR	4
	BOTTOM GLASS	$p \leq 1.0$ $q \leq 3.5$ $r \leq 1/2T$		4
	CORNER	$a \leq 1.5$ $b \leq W$		4
	TOP GLASS	$a \leq 3.0$ $b \leq 1/3T$ $c \leq 1/2W$		5
GLASS PROTRUSION		$a \leq 1/4 W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER .

DEFECT TABLE : B

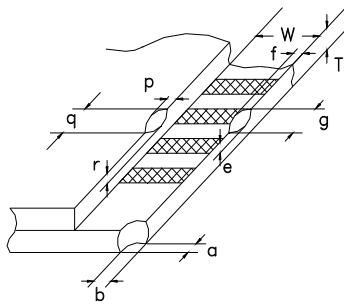


fig . 4

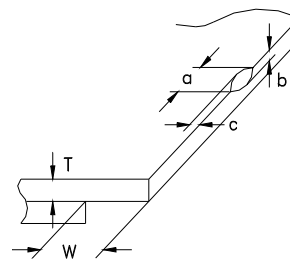


fig . 5

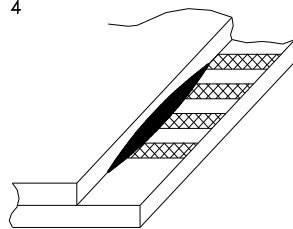
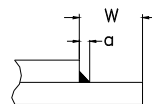


fig . 6



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.