CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CG12832A - _ _ - _ _ - _ _ - _

Revision	00
Engineering	Jackson Fung
Date	24 April 2015
Our Reference	V9059

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:

<u>CG12832A</u>- <u>N</u> <u>N</u> - <u>S</u> <u>R</u> - <u>N</u> <u>6</u> – <u>T</u>
    | | | | | | | |
  (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
        G – Green
        R – Red
*(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)

GENERAL DESCRIPTION

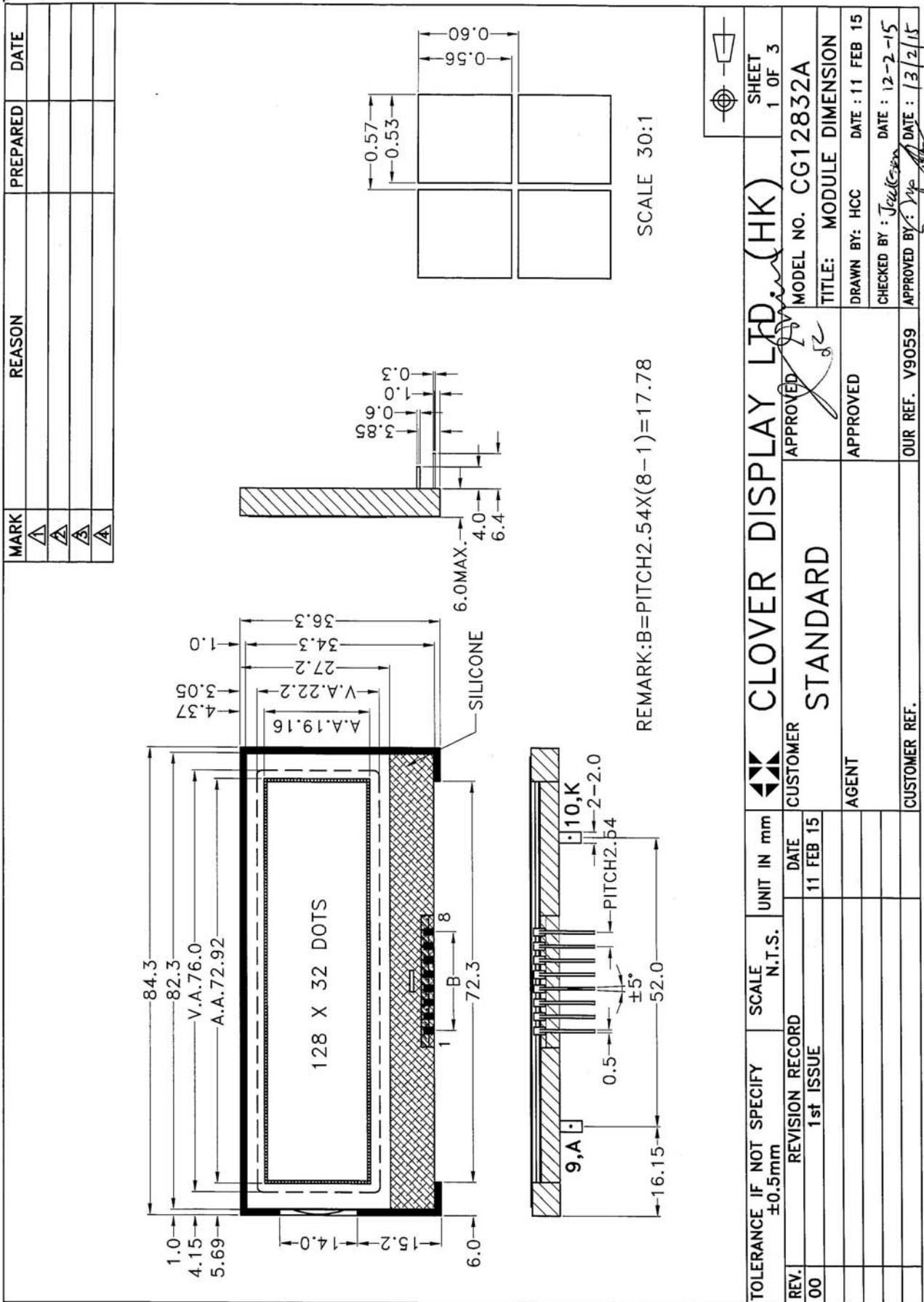|		
Display mode	:	128 x 32 dots, Graphic COG LCD module
Interface	:	I^2C
Driving method	:	1/33 duty, 1/7 bias
Controller IC	:	Sitronix ST7029 or equivalent
		For the detailed information, please refer to the IC specifications

MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	84.3(L)x36.3(W)x6.0max(H)	mm	Dot Size	0.53(L)x0.56(W)	mm
Viewing Area	76.0(L)x22.2 (W)	mm	Dot Pitch	0.57(L)x0.60(W)	mm

CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function
1	VG	Output of VG regulator
2	XV0	Output of XV0 regulator
3	VLCD	Power Supply for LCD
4	VSS	Ground
5	VDD	Power Supply for logic
6	SDA	Serial data input
7	SCL	Serial clock input
8	RSTB	Reset pin input
9	A	Supply voltage for backlight (+)
10	K	Supply voltage for backlight (-)

COUNTER DRAWING OF MODULE DIMENSION

SCALE 30:1

128 X 32 DOTS

SILICONE

REMARK: B=PITCH2.54X(8−1)=17.78

CLOVER DISPLAY LTD.(HK)

CUSTOMER	APPROVED	MODEL NO.	CG12832A
STANDARD		TITLE:	MODULE DIMENSION
AGENT	APPROVED	DRAWN BY: HCC	DATE : 11 FEB 15
		CHECKED BY :	DATE : 12-2-15
CUSTOMER REF.		OUR REF. V9059	APPROVED BY: DATE : 13/2/15

SHEET
1 OF 3

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

REV.	REVISION RECORD	DATE
00	1st ISSUE	11 FEB 15

MARK	REASON	PREPARED	DATE
1			
2			
3			
4			

COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM

PIN NO.	SYMBOL	FUNCTION
1	VG	Output of VG regulator
2	XV0	Output of XV0 regulator
3	VLCD	Power Supply for LCD
4	VSS	Ground
5	VDD	Power Supply for logic
6	SDA	Serial data input
7	SCL	Serial clock input
8	RSTB	Reset pin input
9	A	Supply voltage for backlight (+)
10	K	Supply voltage for backlight (−)

128 X 32 DOTS
LCD PANEL

COM2~32 (EVEN NO.)

COM1~31 (ODD NO.)

S1~128

ST7029

SIDE−LITED LED BACKLIGHT

(1)VG
(2)XV0
(3)VLCD
(4)VSS
(5)VDD
(6)SDA
(7)SCL
(8)RSTB
(9)A
(10)K

CLOVER DISPLAY LTD. (HK)

MODEL NO. CG12832A

TITLE: PIN OUT & BLOCK DIAGRAM

| | SHEET 2 OF 3 |

STANDARD

CUSTOMER

APPROVED

AGENT

APPROVED

CUSTOMER REF.

OUR REF. V9059

DRAWN BY: HCC   DATE : 11 FEB 15

CHECKED BY : Jewison   DATE : 12-2-15

APPROVED BY :   DATE : 13/2/15

| TOLERANCE IF NOT SPECIFY ±0.5mm | | SCALE N.T.S. | UNIT IN mm | DATE 11 FEB 15 |

| REV. | REVISION RECORD | | | |
| 00 | 1st ISSUE | | | |

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, @Ta=25℃

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	3.05	3.3	3.55	V
Supply Current for Logic	IDD	–	0.66	–	mA
Operating Voltage for LCD (*)	V0	10.4	11.0	11.5	V
'High' Level Input Voltage	VIH	0.7VDD	–	VDD	V
'Low' Level Input Voltage	VIL	VSS	–	0.3VDD	V

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

Side BL:

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White	I_{BL}	–	90	104	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	V_{DD}	-0.3 to 4.0	-0.3 to 4.0	V
Input Voltage	Vi	-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	℃

REFERENCE CIRCUIT EXAMPLE
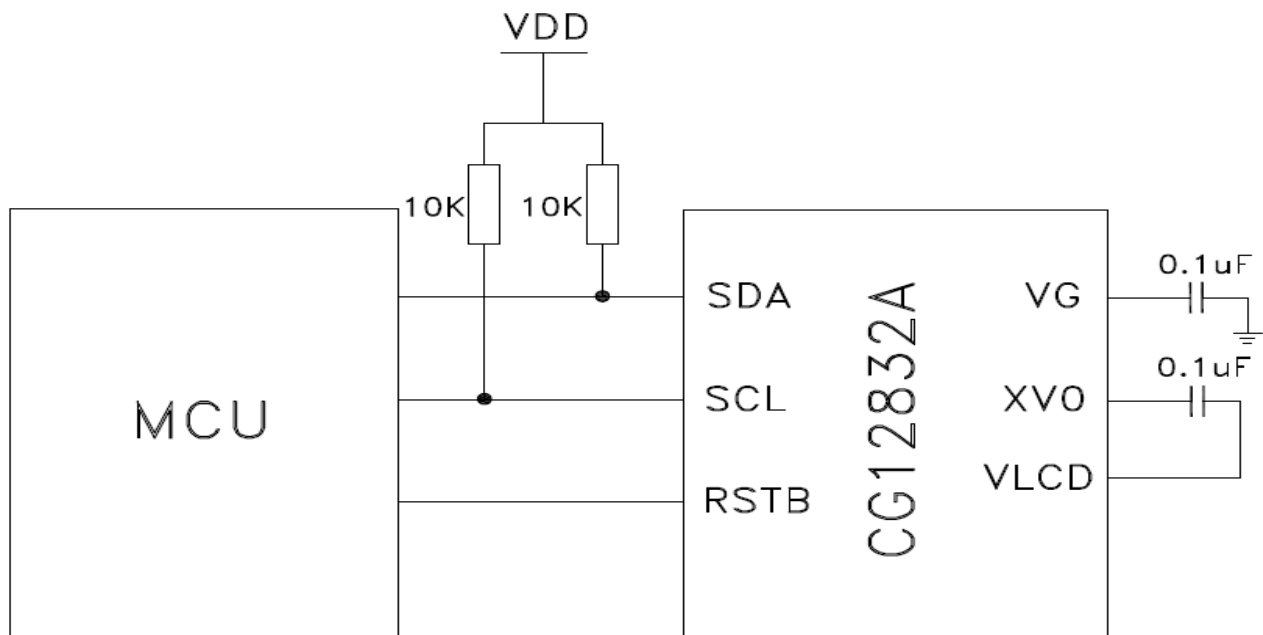
INSTRUCTION TABLE

INSTRUCTION	A0	R/W	D7	D6	D5	D4	D3	D2	D1	D0	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 colum address (MSB)
	0	0	0	0	0	0	X3	X2	X1	X0	Set colum address (LSB)
(5) Read Status	0	1	0	MX	D	RST	ID3	ID2	ID1	ID0	Read IC Status(ID only for I2C)
(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, noemal display
(11) Read-modify-Write	0	0	1	1	1	0	0	0	0	0	Column address increment: Read: +0 , Write: +1
(12) END	0	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(13) RESET	0	0	1	1	1	0	0	0	1	0	Software reset
(14) COM Direction	0	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(15) Power Control	0	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(16) Regulation Ratio	0	0	0	0	1	0	0	RR2	RR1	RR0	Select regulation resistor ratio
(17) Set EV	0	0	1	0	0	0	0	0	0	1	Double command!! Set
	0	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	electronic volume (EV) level
(18) Set Booster	0	0	1	1	1	1	1	0	0	0	Double command!! Set Set booster level:
	0	0	0	0	0	0	0	0	0	BL	BL=0: 4X BL=1: 5X
(19) Power Save	0	0	Compound Command								Display OFF+ All Pixel ON
(20) NOP	0	0	1	1	1	0	0	0	1	1	No operation
(21) 4SPI Read Status	0	0	1	1	1	1	1	1	0	0	4SPI read status command
	0	0	0	MX	D	RST	ID3	ID2	ID1	ID0	4SPI read data
(22) 4SPI Read DDRAM	0	0	1	1	1	1	1	1	0	1	4SPI read DDRAM command
	1	0	D7	D6	D5	D4	D3	D2	D1	D0	4SPI read DDRAM data
(23) Enhance Power ON	0	0	1	1	1	1	1	1	1	1	Enhance Power:
	0	0	0	1	1	1	0	0	EP	0	EP=1, Enhance Power ON
	0	0	1	1	1	1	1	1	1	0	EP=0, Enhance Power OFF
(24) Duty Selection	0	0	1	1	0	1	DT3	DT2	DT1	DT0	Select 9 Duty, 17Duty and 33Duty
(25) Bias Selection	0	0	1	0	0	1	0	BA2	BA1	BA0	Set Bias: 1/4Bias, 1/5Bias, 1/6Bias,1/7Bias
(26) Frame Rate Selectio	0	0	1	0	0	1	1	FR2	FR1	FR0	Set Framerate 75Hz~300Hz

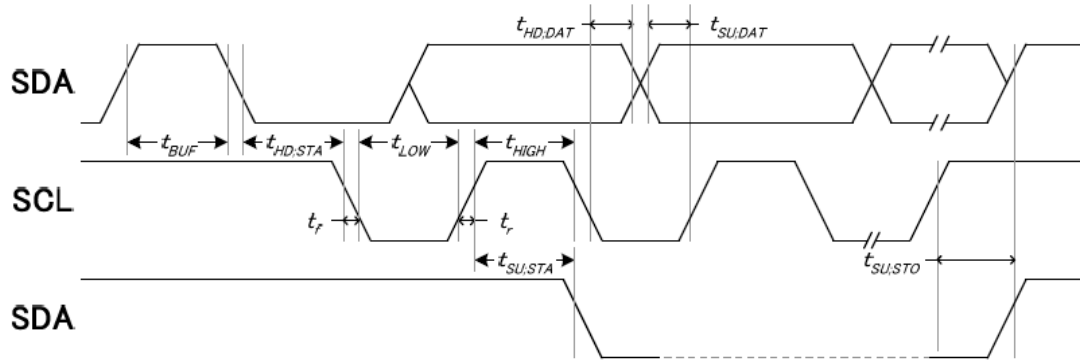Note: Symbol "-" means this bit can be "H" or "L".

RECOMMENDED INITIAL SETTINGS

Set Start Line : 00H
Set Page Address : B0H
Set Column Address : 10H,00H
Set COM Direction : C0H
Set SEG Direction : A0H
Set LCD Bias Select : 91H
Set LCD Duty Select : D6H
Frame Rate Selection: 9EH
Set Power Control : 2FH
Set Regulation Ratio : 27H
Set Electronic volume register : 81H   1DH
Set Display On : AFH

DISPLAY DATA RAM (DDRAM)

Page Address					Column Address (Hex)																				COM Output Map		
D3	D2	D1	D0		0	1	2	3	4	5	6	7	8	MX=0	7B	7C	7D	7E	7F	80	81	82	83		1/33 Duty		PAD
					83	82	81	80	7F	7E	7D	7C	7B	MX=1	8	7	6	5	4	3	2	1	0	Line Address	MY=0	MY=1	No.(COM)
0	0	0	0	D0										Page0										00H	COM0	COM31	97
				D1																				01H	COM1	COM30	231
				D2																				02H	COM2	COM29	96
				D3																				03H	COM3	COM28	232
				D4																				04H	COM4	COM27	95
				D5																				05H	COM5	COM26	233
				D6																				06H	COM6	COM25	94
				D7																				07H	COM7	COM24	234
0	0	0	1	D0										Page1										08H	COM8	COM23	93
				D1																				09H	COM9	COM22	235
				D2																				0AH	COM10	COM21	92
				D3																				0BH	COM11	COM20	236
				D4																				0CH	COM12	COM19	91
				D5																				0DH	COM13	COM18	237
				D6																				0EH	COM14	COM17	90
				D7																				0FH	COM15	COM16	238
0	0	1	0	D0										Page2										10H	COM16	COM15	89
				D1																				11H	COM17	COM14	239
				D2																				12H	COM18	COM13	88
				D3																				13H	COM19	COM12	240
				D4																				14H	COM20	COM11	87
				D5																				15H	COM21	COM10	241
				D6																				16H	COM22	COM9	86
				D7																				17H	COM23	COM8	242
0	0	1	1	D0										Page3										18H	COM24	COM7	85
				D1																				19H	COM25	COM6	243
				D2																				1AH	COM26	COM5	84
				D3																				1BH	COM27	COM4	244
				D4																				1CH	COM28	COM3	83
				D5																				1DH	COM29	COM2	245
				D6																				1EH	COM30	COM1	82
				D7																				1FH	COM31	COM0	246
1	0	0	0	D0										Page8											ICON(COMS1,COMS2)		253, 98
					99	100	101	102	103	104	105	106	107		222	223	224	225	226	227	228	229	230	PAD No. (SEG)			

I2C INTERFACE TIMING

(VDD1 = 2.8V , Ta =25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
SCL clock frequency	SCL	fSCL		-	400	kHZ
SCL clock low period		tLOW		160	-	ns
SCL clock high period		tHIGH		60	-	
Data set-up time	SDA	tSU;Data		80	-	
Data hold time		tHD;Data		40	-	
Setup time for a repeated START condition	SDA	tSU;STA		90	-	
Start condition hold time		tHD;STA		220	-	
Setup time for STOP condition		tSU;STO		110	-	
Bus free time between a STOP and START		tBUF		150	-	

RESET TIMING
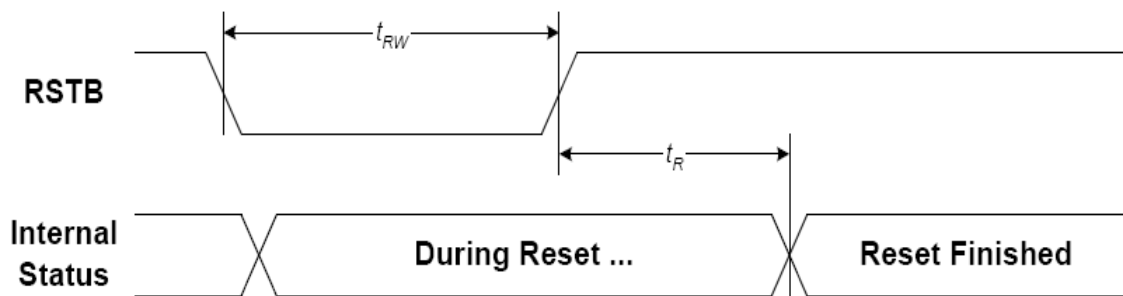
(VDD1 = 3.3V , Ta =25°C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	Us
Reset "L" pulse width	tRW		1.0	—	

I²C BIT TRANSFER

Data line stable
Data Valid

Change of data
allowed
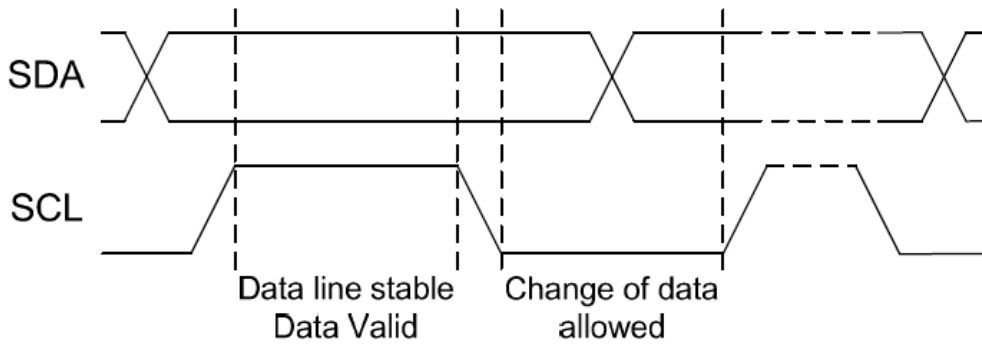
START AND STOP CONDITIONS

START condition
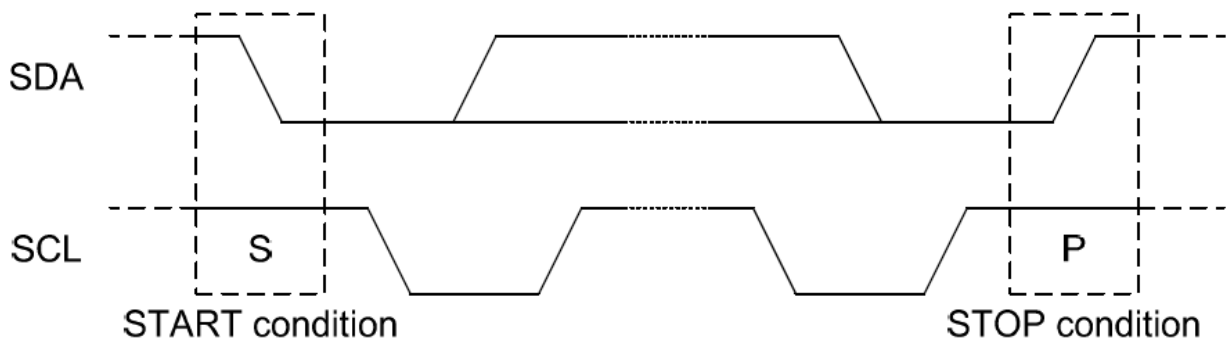
STOP condition

ACKNOWLEDGEMENT OF I2C INTERFACE

Data output by Transmitter

Not acknowledged

Data output by Receiver

Acknowledged

SCL from Master

Start Condition

Clock pulse for acknowledgement
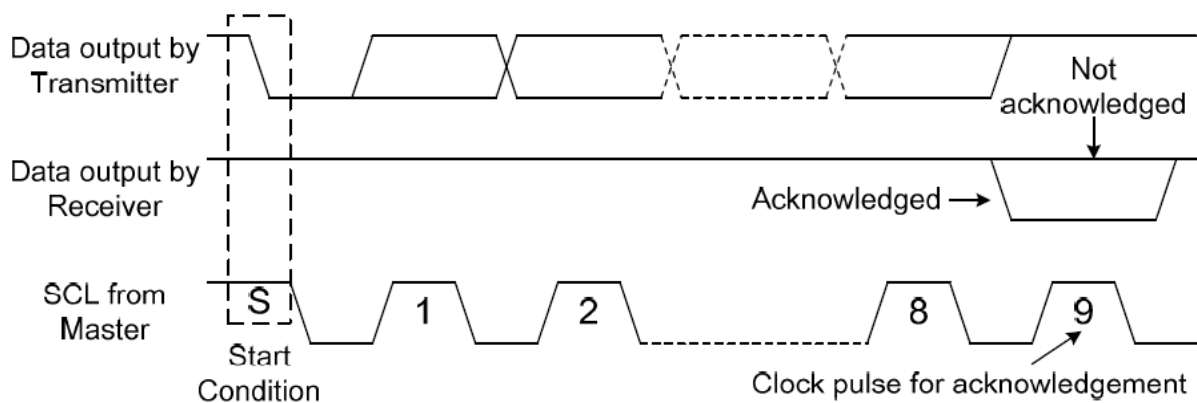
ELECTRO-OPTICAL CHARACTERISTICS

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	180
	Toff	ms	240
CONTRAST RATIO	Cr	-	12
VIEWING ANGLE (6 O'clock) 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

NO.	Item	TEST CONDITION FOR NORMAL TEMPERATURE	TEST CONDITION FOR WIDE TEMPERATURE	TIME
1	High temperature operating	50°C	70°C	240 hours
2	Low temperature operating	0°C	-20°C	240 hours
3	High temperature storage	60°C	80°C	240 hours
4	Low temperature storage	-10°C	-30°C	240 hours
5	Temperature-humidity storage	40°C 90% R.H.	60°C 90% R.H.	96 hours
6	Temperature cycling	-10°C to 60°C 30 Min Dwell	-30°C to 80°C 30 Min Dwell	5 cycle
7	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	—

Inspection condition:

No. 1 ~ 6:

The samples should be placed in room temperature for 2 hours before inspection.

Acceptance criteria:

No non-conformance found in functional and cosmetic.

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.**	MINOR	2
	0.3<d$\leq$0.4	QTY$\leq$1		
	0.4<d	QTY=0		
LINE SCRATCHES	x$\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 (d$_1$,d$_2$)   ** N. A . = NOT APPLICABLE   DEFECT TABLE : B

fig . 1
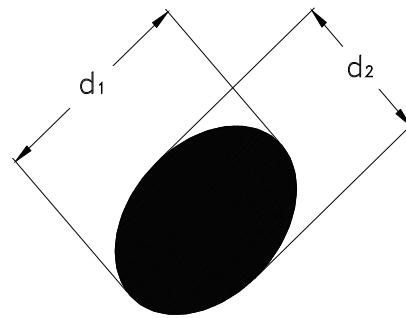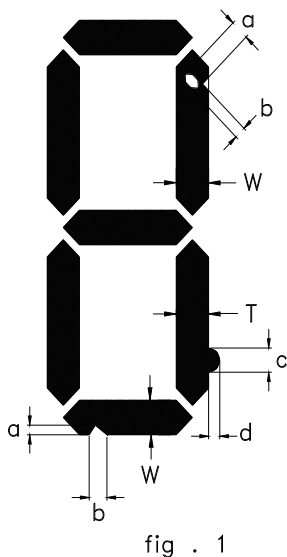
POLARIZER BUBBLES / SPOTS
fig . 2
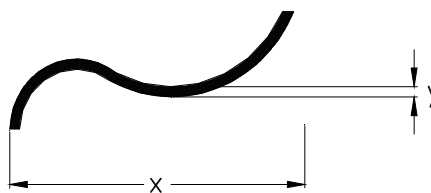
LINE SCRATCHES / BLACK LINE
fig . 3

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
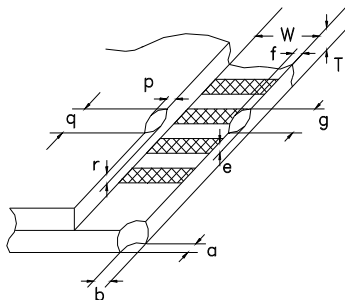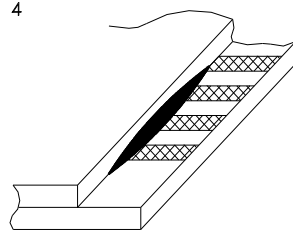
fig . 4
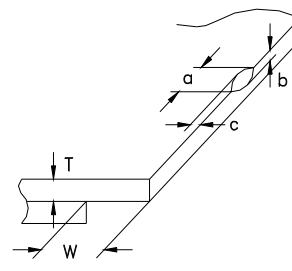
fig . 5

fig . 6

HANDLING PRECAUTIONS

(1) CAUTION OF LCD HANDLING & CLEANING

Use soft cloth with solvent (recommended below) to clean the display surface and wipe lightly.
- Isopropyl alcohol, ethyl alcohol, trichlorotriflorothane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent;
-water, ketone, aromatics

(2) CAUTION AGAINST STATIC CHARGE

The LCD modules use CMOS LSI drivers, so customers are recommend 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.

Remove the protective film slowly and, if possible, under ESD control device like ion blower and humidity of working room should be kept over 50%RH to reduce risk of static charge.

(3) PACKAGING

Avoid intense shock and falls from a height and do not operate or store them exposed direct to sunshine or high temperature/humidity.

(4) CAUTION FOR OPERATION

It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life. The use of direct current drive should be avoided because an electrochemical reaction due to direct current causes LCD's undesirable deterioration.

Response time will be extremely delayed at low temperature, and LCD's show dark color at high temperature. However those phenomena do not mean malfunction or out of order with LCD's.

Some font will be abnormally displayed when the display area is pushed hard during operation. But it resumes normal condition after turning off once.

(5) SOLDERING (for Pin type)

It is recommended to complete dip soldering at 270 ^{o}C or hand soldering at 280 ^{o}C within 3 seconds. The soldering position is at least 3mm apart from the pin head. Wave or reflow soldering are not recommended. Metal pins should not be soldered for more than 3 times and each soldering should be done after cool down of metal pins

(6) SAFETY

For crash damaged or unnecessary LCD's, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.

When any liquid leaked out of a damaged glass cell comes in contact with your hands, wash it off with soap and water.

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.