



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CG240160C - _ _ - _ _ - _ _ - _

Revision	00
Engineering	Jackson Fung
Date	26 June 2015
Our Reference	X9057

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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:

CG240160C- 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
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)

*(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	:	240 x 160 dots, Graphic COG LCD module
Interface	:	8-bit parallel or 4-line serial
Driving method	:	1/160 duty, 1/14 bias
Controller IC	:	Sitronix ST75256 or equivalent For the detailed information, please refer to the IC specifications

MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension			Dot Size	0.295(L)x0.335(W)	mm
No backlight	94.0(L)x75.8(W)x2.9max(H)	mm	Dot Pitch	0.32(L)x0.36 (W)	mm
	94.0(L)x75.8(W)x4.7max(H)(with touch panel)		Viewing Area	86.0(L)x62.8(W)	mm
LED backlight	96.4(L)x78.2(W)x6.2max(H)			80.9(L)x60.98(W)	
	96.4(L)x78.2(W)x8.0max(H) (with touch panel)		(with touch panel)		

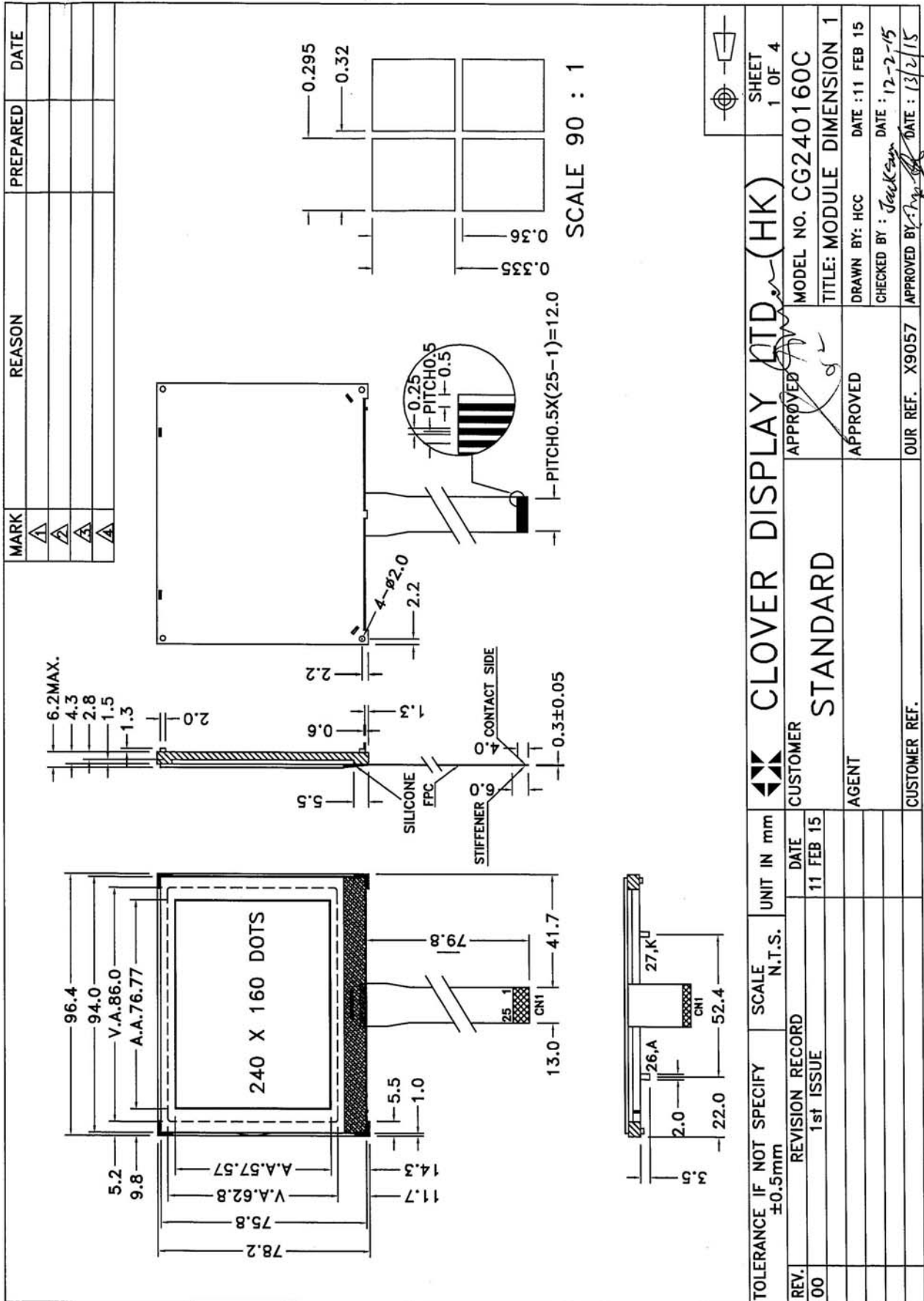
CONNECTOR PIN ASSIGNMENT**CN1:**

Pin No.	Symbol	Function
1	GND	Connect to GND
2~9	D7~D0	Data bus
10	RSTB	Reset
11	RWR	Read/Write execution control
12	ERD	
13	A0	Data/command display control
14	CSB	Chip select
15	IF0	Interface operation mode select
16	IF1	
17	VD1S	Digital power source select
18	VSS	Ground
19	VDD	Supply voltage for logic
20	CA1N	DC/DC voltage converter
21	CA1P	
22	XV0	Negative operating voltage of COM-drivers
23	V0	Positive operating voltage of COM-drivers
24	VG	Power of SEG-drivers
25	GND	Connect to GND
26	A	Supply voltage for backlight(+)
27	K	Supply voltage for backlight(-)

CN2:

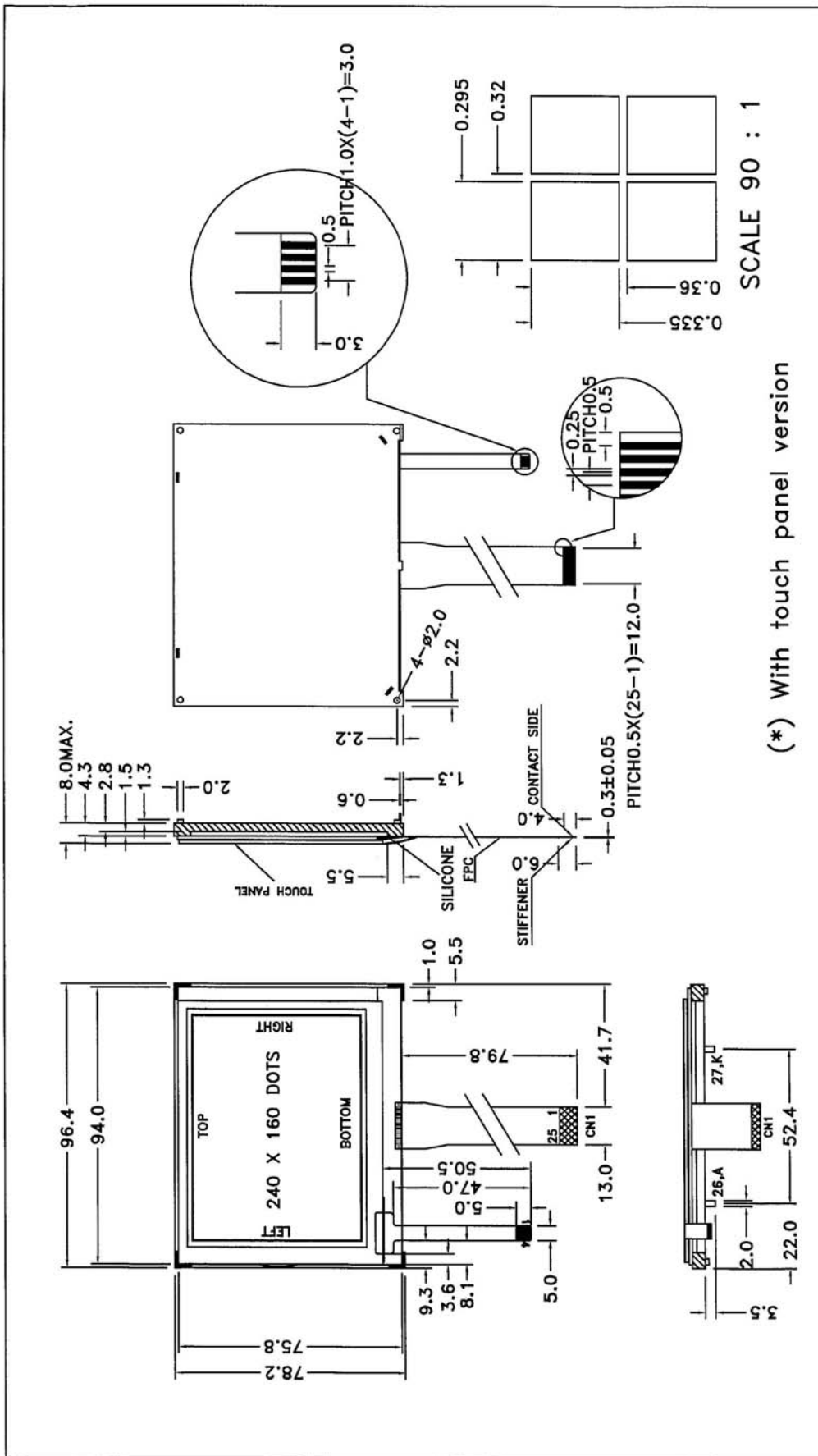
Pin No.	Symbol	Function
1	TOP	Touch panel signal
2	LEFT	
3	BOTTOM	
4	RIGHT	

COUNTER DRAWING OF MODULE DIMENSION



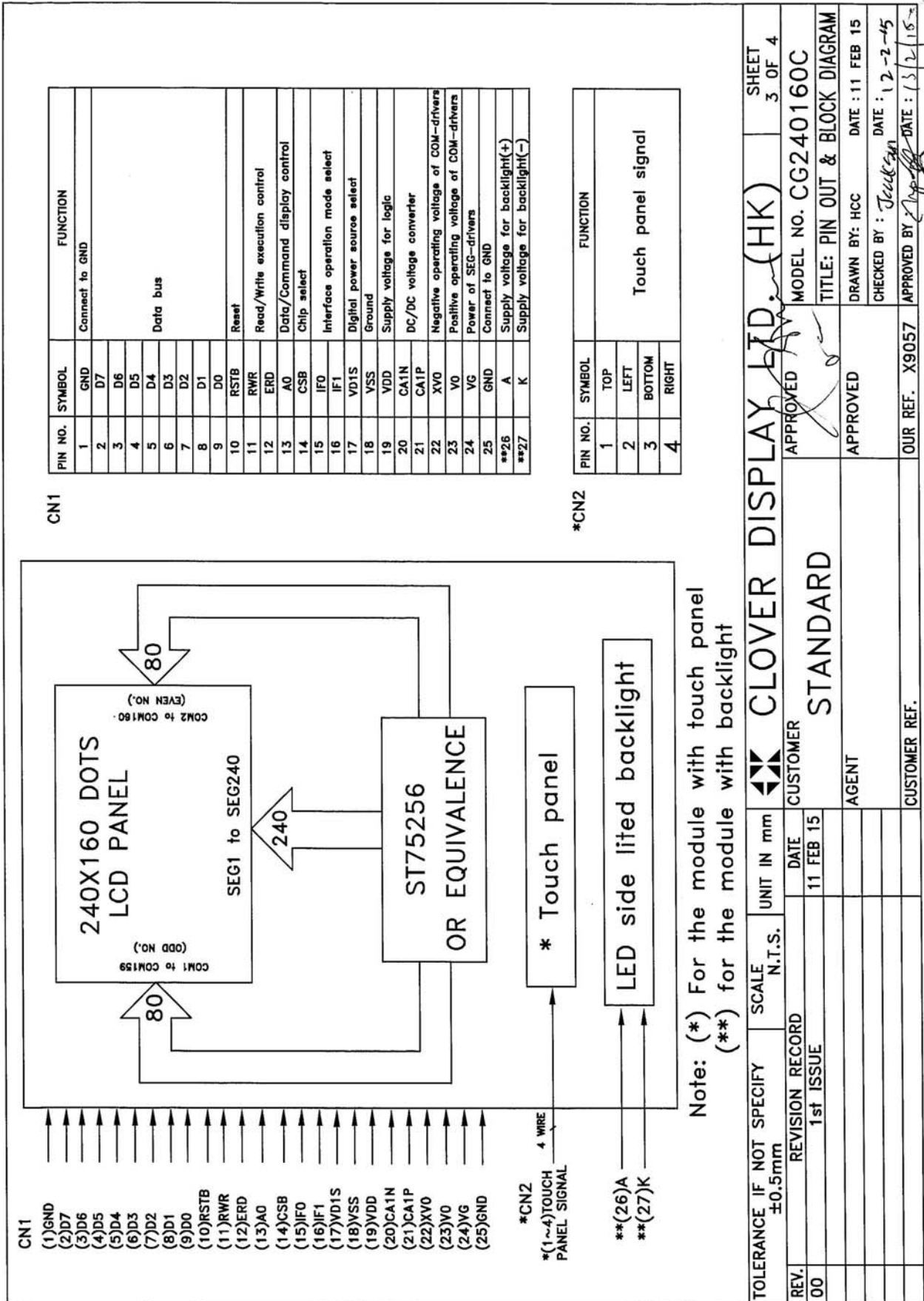
TOLERANCE IF NOT SPECIFY ±0.5mm	SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)	SHEET 1 OF 4
REV. 00	REVISION RECORD 1st ISSUE	DATE 11 FEB 15	APPROVED <i>[Signature]</i>	MODEL NO. CG240160C
			APPROVED <i>[Signature]</i>	TITLE: MODULE DIMENSION 1
			OUR REF. X9057	DRAWN BY: HCC DATE: 11 FEB 15
			CUSTOMER REF.	CHECKED BY: <i>[Signature]</i> DATE: 12-2-15
				APPROVED BY: <i>[Signature]</i> DATE: 13/2/15

COUNTER DRAWING OF MODULE DIMENSION



TOLERANCE IF NOT SPECIFY ±0.5mm	SCALE N.T.S.	UNIT IN mm	CLOVER DISPLAY LTD. (HK)	SHEET 2 OF 4
REV. 00	REVISION RECORD 1st ISSUE	DATE 11 FEB 15	APPROVED <i>[Signature]</i>	MODEL NO. CG240160C
			APPROVED <i>[Signature]</i>	TITLE: MODULE DIMENSION 2
				DRAWN BY: HCC DATE: 11 FEB 15
				CHECKED BY: <i>[Signature]</i> DATE: 12-2-15
				APPROVED BY: <i>[Signature]</i> DATE: 13/2/15
			OUR REF. X9057	
			CUSTOMER REF.	
			CUSTOMER	
			AGENT	
			CUSTOMER REF.	

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. 00	REVISION RECORD 1st ISSUE	DATE 11 FEB 15	CUSTOMER	MODEL NO. CG240160C		TITLE: PIN OUT & BLOCK DIAGRAM
			AGENT	APPROVED	DATE: 11 FEB 15	CHECKED BY: Jocky
			CUSTOMER REF.	OUR REF. X9057	DATE: 12-2-15	APPROVED BY: [Signature]
					DATE: 13/2/15	

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	—	2.5	—	mA
Operating Voltage for LCD (*)	V0	15.67	16.5	17.33	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:

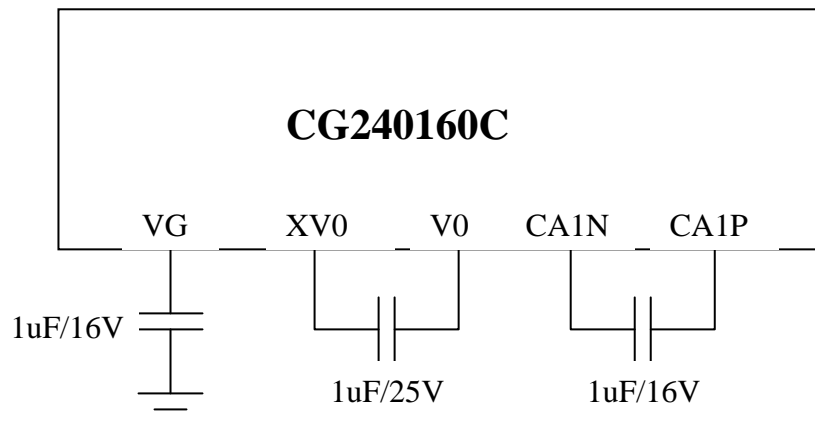
Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White	I _{BL}	—	60	90	mA	V _{BL} = 3.3V
Blue	I _{BL}	—	90	120	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	V _i	-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

INSTRUCTION TABLE

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
1.Extension Command	0	0	0	0	1	1	EXT1	0	0	EXT0	Set extension instruction
Ext[1:0]=0,0 (Extension Command 1)											
2.Display ON/OFF	0	0	1	0	1	0	1	1	1	DSP	Set LCD display DSP=0: Display off DSP=1: Display on
3.Inverse Display	0	0	1	0	1	0	0	1	1	INV	Set inverse display INV=0: Normal display INV=1: Inverse display
4.All Pixel ON/OFF	0	0	0	0	1	0	0	0	1	AP	Set all pixel on mode AP=0: All pixel off mode AP=1: All pixel on mode
5.Display Control	0	0	1	1	0	0	1	0	1	0	Set display control CLD :Set CL dividing ratio LF[4:0] : Set N-line inversion counter DT[7:0] : Set the number of duty FI : Set the inversion type of frame at the end of common scan cycle
	1	0	0	0	0	0	0	CLD	0	0	
	1	0	DT7	DT6	DT5	DT4	DT3	DT2	DT1	DT0	
	1	0	0	0	LF4	FI	LF3	LF2	LF1	LF0	
6.Power Save	0	0	1	0	0	1	0	1	0	SLP	Set power save mode SLP=0: Sleep out mode SLP=1: Sleep in mode
7.Set Page Address	0	0	0	1	1	1	0	1	0	1	Set Page Address Starting Page address: $00h \leq YS \leq 28h$ Ending Page address: $YS \leq YE \leq 28h$
	1	0	YS7	YS6	YS5	YS4	YS3	YS2	YS1	YS0	
	1	0	YE7	YE6	YE5	YE4	YE3	YE2	YE1	YE0	
8.Set Column Address	0	0	0	0	0	1	0	1	0	1	Set Column Address Starting Column address: $00h \leq XS \leq FFh$ Ending Column address: $XS \leq XE \leq FFh$
	1	0	XS7	XS6	XS5	XS4	XS3	XS2	XS1	XS0	
	1	0	XE7	XE6	XE5	XE4	XE3	XE2	XE1	XE0	
9.Data Scan Direction	0	0	1	0	1	1	1	1	0	0	Set normal/ inverse display of address and address scan direction
	1	0	0	0	0	0	0	C/L	MX	MY	
10.Write Data	0	0	0	1	0	1	1	1	0	0	Write data to DDRAM
	1	0	D7	D6	D5	D4	D3	D2	D1	D0	
11.Read Data	0	0	0	1	0	1	1	1	0	1	Read data from DDRAM
	1	1	D7	D6	D5	D4	D3	D2	D1	D0	
12.Partial In	0	0	1	0	1	0	1	0	0	0	Set partial area Starting partial display address: $00h \leq PTS \leq A1h$ Ending partial display address: $00h \leq PTE \leq A1h$
	1	0	PTS7	PTS6	PTS5	PTS4	PTS3	PTS2	PTS1	PTS0	
	1	0	PTE7	PTE6	PTE5	PTE4	PTE3	PTE2	PTE1	PTE0	

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
13.Partial Out	0	0	1	0	1	0	1	0	0	1	Exit the partial mode
14.Read/Modify/Write In	0	0	1	1	1	0	0	0	0	0	Enable read modify write
15.Read/Modify/Write Out	0	0	1	1	1	0	1	1	1	0	Disable read modify write
16.Scroll Area	0	0	1	0	1	0	1	0	1	0	Set scroll area
	1	0	TL7	TL6	TL5	TL4	TL3	TL2	TL1	TL0	
	1	0	BL7	BL6	BL5	BL4	BL3	BL2	BL1	BL0	
	1	0	NSL7	NSL6	NSL5	NSL4	NSL3	NSL2	NSL1	NSL0	
17.Set Start Line	1	0	0	0	0	0	0	0	SCM1	SCM0	Set scroll start address 00h ≤ SL ≤ A1h
	0	0	1	0	1	0	1	0	1	1	
18.OSC ON	0	0	1	1	0	1	0	0	0	1	Turn on the internal oscillator
19.OSC OFF	0	0	1	1	0	1	0	0	1	0	Turn off the internal oscillator
20.Power Control	0	0	0	0	1	0	0	0	0	0	Power circuit operation VB=0: OFF, VB=1: ON VF=0: OFF, VF=1: ON VR=0: OFF, VR=1: ON
	1	0	0	0	0	0	VB	0	VF	VR	
21.Set Vop	0	0	1	0	0	0	0	0	0	1	Set Vop
	1	0	0	0	Vop5	Vop4	Vop3	Vop2	Vop1	Vop0	
	1	0	0	0	0	0	0	Vop8	Vop7	Vop6	
22.Vop Control	0	0	1	1	0	1	0	1	1	VOL	Control Vop VOL=0: Vop increase one step VOL=1: Vop decrease one step
23.Read Register Mode	0	0	0	1	1	1	1	1	0	REG	Set read register mode REG=0: read the register value of VPR[5:0] REG=1: read the register value of VPR[8:6]
24.Nop	0	0	0	0	1	0	0	1	0	1	No operation
25.Read Status	0	1	D7	D6	D5	D4	D3	D2	D1	D0	Read status byte
26.Data Format Select	0	0	0	0	0	0	1	DO	0	0	DO=0; LSB on bottom (Default) DO=1; LSB on top
27. Display Mode	0	0	1	1	1	1	0	0	0	0	Set display mode DM=0 :Mono(Default) DM=1 :4Gray Scale Mode
	1	0	0	0	0	1	0	0	0	DM	
28.ICON Control	0	0	0	1	1	1	0	1	1	ICON	Enable/Disable ICON ICON=1 ; Enable ICON=0 ; Disable

INSTRUCTION	A0	R/W	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
Ext[1:0]=0,1 (Extension Command 2)											
29.Analog Circuit Set	0	0	0	0	1	1	0	0	1	0	Set analog set BE[1:0]: Booster efficiency set BS[2:0]: Set bias ratio
	1	0	0	0	0	0	0	0	0	0	
	1	0	0	0	0	0	0	0	BE1	BE0	
	1	0	0	0	0	0	0	BS2	BS1	BS0	
30.Booster Level	0	0	0	1	0	1	0	0	0	1	Set booster level
	1	0	1	1	1	1	1	0	1	BST	
31. Driving Select	0	0	0	1	0	0	0	0	0	DS	Power type DS=0: Internal (Default) DS=1 :External
32.High Power Mode	0	0	0	1	0	0	1	0	0	HPM	Set high power mode HPM=0 ; Normal Mode HPM =1 ; High Power Mode
33.Auto Read Control	0	0	1	1	0	1	0	1	1	1	Set auto-read instruction XARD=0: Enable auto read XARD=1: Disable auto read
	1	0	1	0	0	XARD	1	1	1	1	
34.OTP WR/RD Control	0	0	1	1	1	0	0	0	0	0	OTP WR/RD control WR/RD=0: Enable OTP read WR/RD=1: Enable OTP write
	1	0	0	0	WR/RD	0	0	0	0	0	
35.OTP Control Out	0	0	1	1	1	0	0	0	0	1	OTP control out
36.OTP Write	0	0	1	1	1	0	0	0	1	0	OTP write
37.OTP Read	0	0	1	1	1	0	0	0	1	1	OTP read
38.OTP Selection Control	0	0	1	1	1	0	0	1	0	0	OTP selection control Ctrl=1: Disable OTP Ctrl=0: Enable OTP
	1	0	1	Ctrl	0	1	1	0	0	1	
39.OTP Programming Setting	0	0	1	1	1	0	0	1	0	1	OTP programming setting
	1	0	0	0	0	0	1	1	1	1	
40.Frame Rate	0	0	1	1	1	1	0	0	0	0	Frame rate setting in different temperature range
	1	0	0	0	0	FRA4	FRA3	FRA2	FRA1	FRA0	
	1	0	0	0	0	FRB4	FRB3	FRB2	FRB1	FRB0	
	1	0	0	0	0	FRC4	FRC3	FRC2	FRC1	FRC0	
	1	0	0	0	0	FRD4	FRD3	FRD2	FRD1	FRD0	
41.Temperature Range	0	0	1	1	1	1	0	0	1	0	Temperature range setting
	1	0	0	TA6	TA5	TA4	TA3	TA2	TA1	TA0	
	1	0	0	TB6	TB5	TB4	TB3	TB2	TB1	TB0	
	1	0	0	TC6	TC5	TC4	TC3	TC2	TC1	TC0	

RECOMMENDED INITIAL SETTINGS

Set Start Line : ABH,00H

Set Page Address : 7AH,00H,28H

Set Column Address : 1AH,00H,FFH

Set data scan Direction : BCH,00H

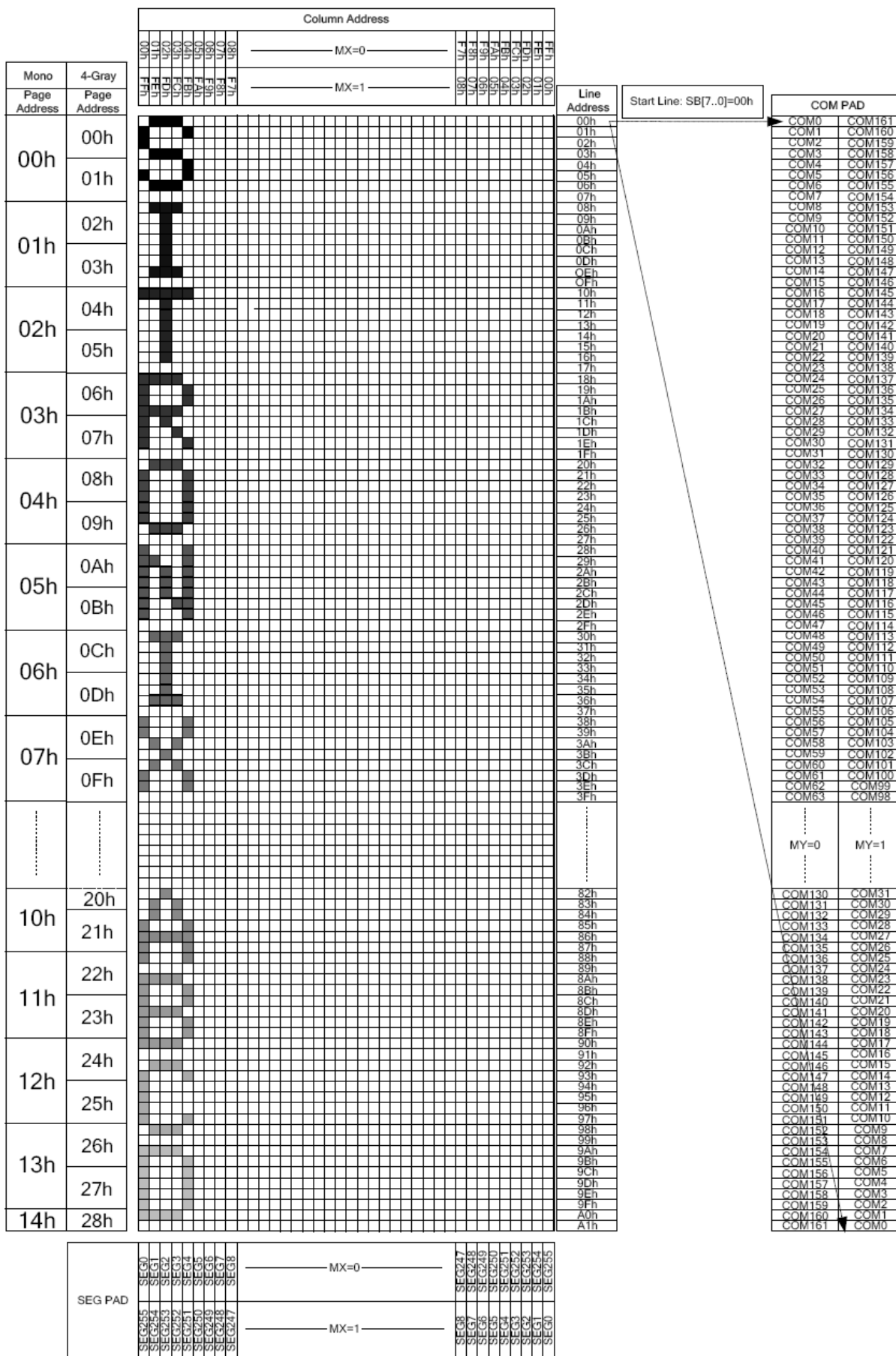
Set Power Control : 20H,0BH

Set Vop : 81H,3AH,05H

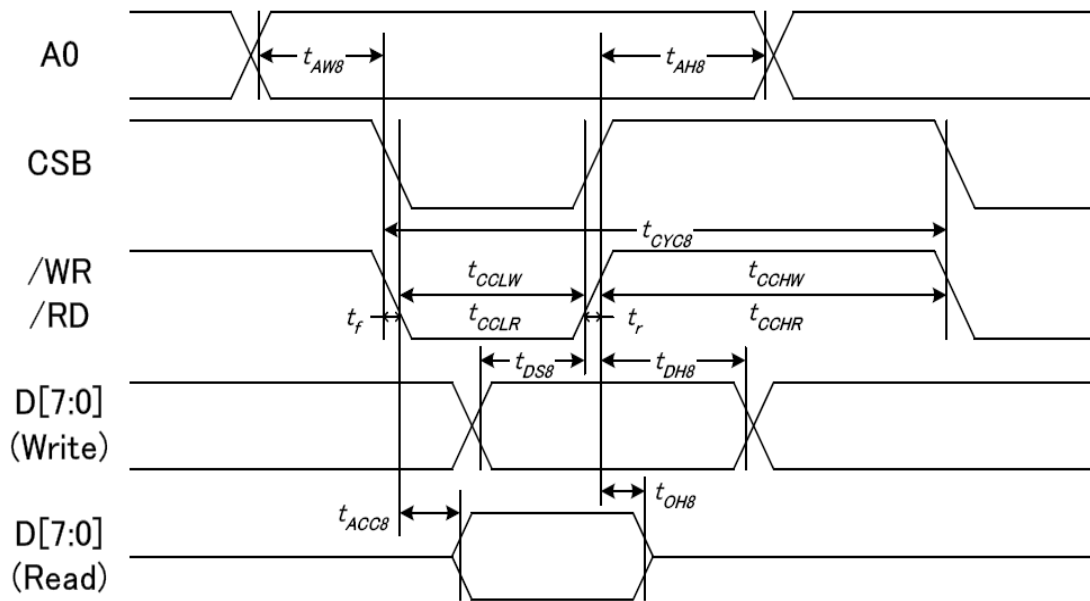
Set Vop control : C6H

Set Display On : AFH

DISPLAY DATA RAM (DDRAM)



8080 MCU INTERFACE TIMING



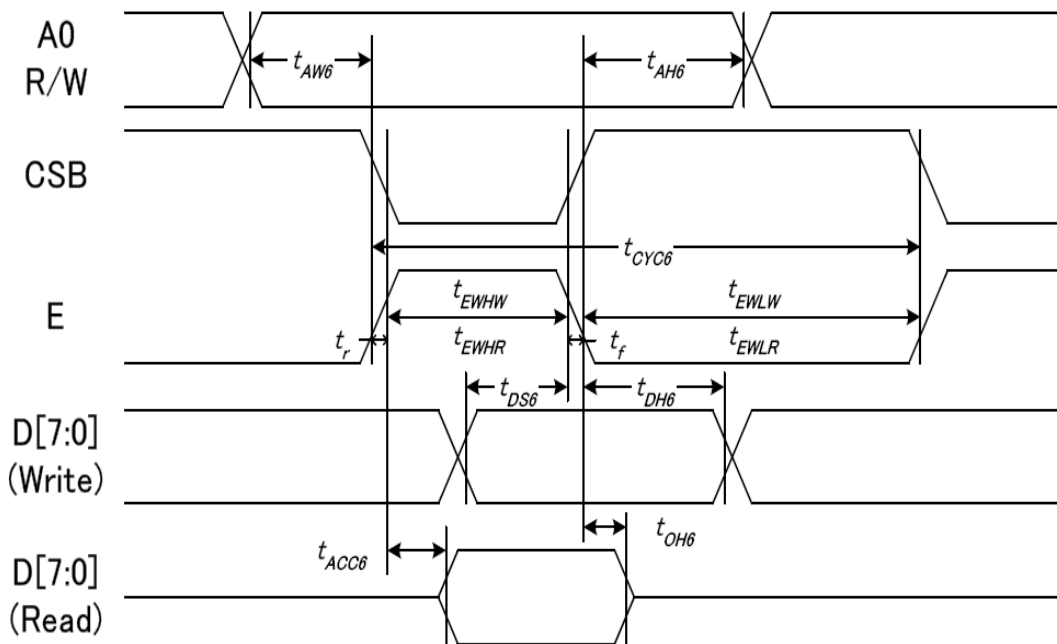
VDD1 = 1.8~3.3V, Ta = 25°C

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		20	—	ns
Address hold time		tAH8		0	—	
System cycle time (WRITE)	/WR	tCYC8		160	—	
/WR L pulse width (WRITE)		tCCLW		70	—	
/WR H pulse width (WRITE)		tCCHW		70	—	
System cycle time (READ)	RD	tCYC8		400	—	
/RD L pulse width (READ)		tCCLR		180	—	
/RD H pulse width (READ)		tCCHR		180	—	
WRITE Data setup time	D[7:0]	tDS8		15	—	
WRITE Data hold time		tDH8		15	—	
READ access time		tACC8	CL = 30 pF	—	100	
READ Output disable time		tOH8	CL = 30 pF	10	110	

Note:

- The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC8} - t_{CCLW} - t_{CCHW})$ for $(t_r + t_f) \leq (t_{CYC8} - t_{CCLR} - t_{CCHR})$ are specified.
- All timing is specified using 20% and 80% of VDD1 as the reference.
- tCCLW and tCCLR are specified as the overlap between CSB being "L" and WR and RD being at the "L" level.

6800 MCU INTERFACE TIMING



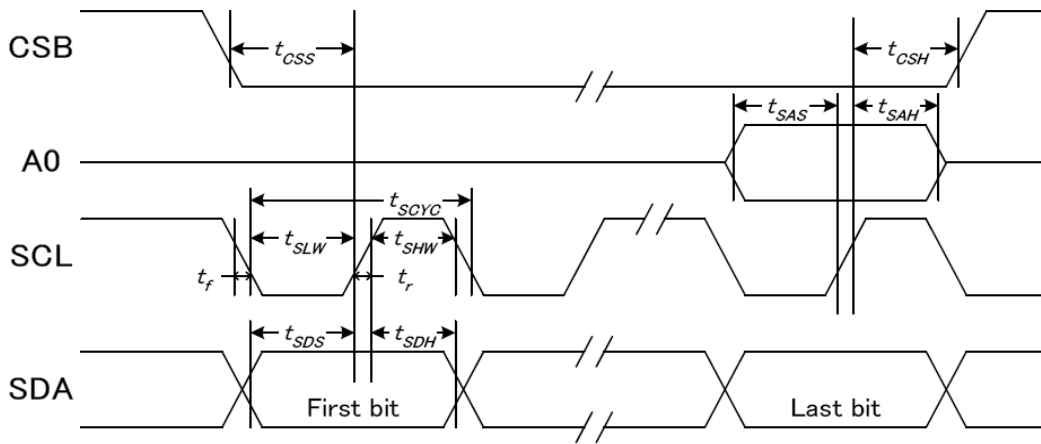
VDD1 = 1.8~3.3V, Ta = 25°C

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW6		20	—	ns
Address hold time		tAH6		0	—	
System cycle time (WRITE)	E	tCYC6		160	—	
Enable L pulse width (WRITE)		tEHLW		70	—	
Enable H pulse width (WRITE)		tEHWLW		70	—	
System cycle time (READ)		tCYC6		400	—	
Enable L pulse width (READ)	E	tEHLR		180	—	
Enable H pulse width (READ)		tEHWHR		180	—	
Write data setup time		D[7:0]	tDS6		15	
Write data hold time	tDH6			15	—	
Read data access time	tACC6		CL = 30 pF	—	100	
Read data output disable time	tOH6		CL = 30 pF	10	110	

Note:

- The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC6} - t_{EHLW} - t_{EHWLW})$ for $(t_r + t_f) \leq (t_{CYC6} - t_{EHLR} - t_{EHWHR})$ are specified.
- All timing is specified using 20% and 80% of VDD1 as the reference.
- tEHLW and tEHLR are specified as the overlap between CSB being "L" and E.

4-LINE SPI MCU INTERFACE TIMING



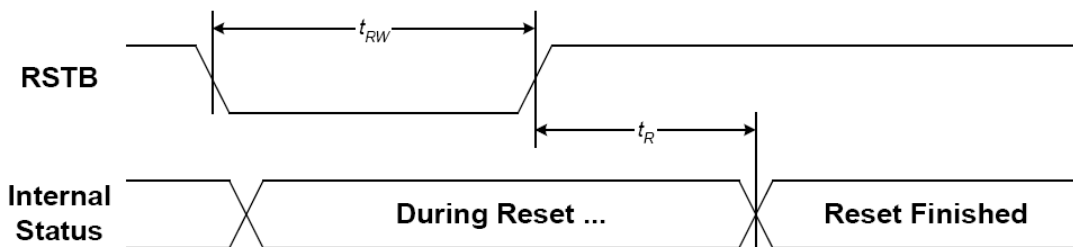
VDD1 = 1.8~3.3V, Ta = 25°C

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		60	—	ns
SCLK "H" pulse width		tSHW		30	—	
SCLK "L" pulse width		tSLW		30	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		20	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		20	—	
CSB-SCLK time	CSB	tCSS		20	—	
CSB-SCLK time		tCSH		20	—	
CS "H" pulse width		tCHW		0	-	

Note:

- The input signal rise and fall time (t_r , t_f) are specified at 15 ns or less.
- All timing is specified using 20% and 80% of VDD1 as the standard.

RESET TIMING



VDD1 = 1.8~3.3V, Ta = 25°C

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1	ms
Reset "L" pulse width	tRW		1	—	ms

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	320
	T_{off}	ms	430
CONTRAST RATIO	Cr	-	8
VIEWING ANGLE (6 O'clock) $Cr \geq 2$	V3:00	°	40
	V6:00	°	55
	V9:00	°	40
	V12:00	°	35

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%

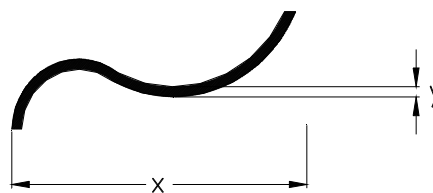
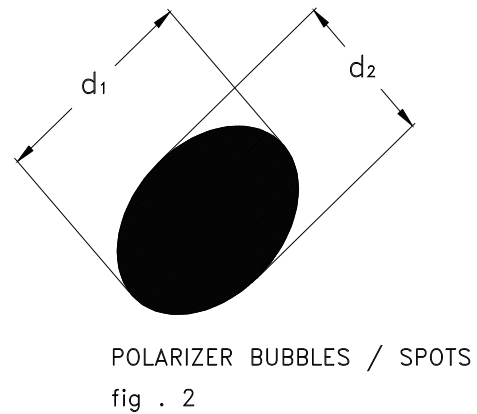
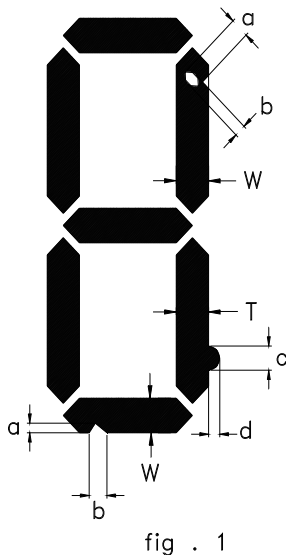
QUALITY STANDARD

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.** $0.3 < d \leq 0.4$ QTY≤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



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

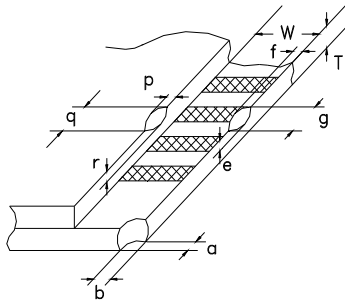


fig . 4

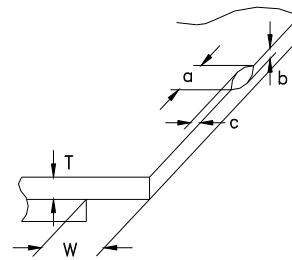


fig . 5

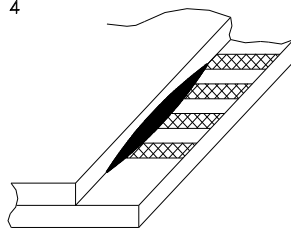


fig . 6

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, trichlorotrifluoroethane

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 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.

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 °C or hand soldering at 280 °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.