



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CG320240B - _ _ - _ _ - _ _ - _

Revision	00
Engineering	TIMMY KWAN
Date	08 APR 2011
Our Reference	X9052

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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>CG320240B</u> - <u>L</u> <u>W</u> - <u>F</u> <u>F</u> - <u>N</u> <u>D</u> - <u>T</u>	
|	*(1)---Model number of standard LCD Modules
(1)	*(2)---Backlight type
|	N – No backlight
|	E – EL backlight
|	L – Side-lited LED backlight
|	M– Array LED backlight
|	C – CCFL
(2)	*(3)---Backlight color
(3)	N – No backlight
(4)	A – Amber
(5)	B – Blue
(6)	O– Orange
(7)	W–White
(8)	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 : 320 X 240 dots, Graphic COG LCD module
 Interface : 4 line serial
 Driving method : 1/240 duty, 1/16 bias
 Controller IC : IST3088 or equivalent
 For the detailed information, please refer to the IC specifications.

MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	96.4(L)x 78.2(W) x 7.0(H)	mm	Dot Pitch	0.22(L)x 0.22(W)	mm
Viewing Area	86.0(L)x 62.8(W)	mm	Dot Size	0.2(L)x 0.2(W)	mm
Active Area	70.38(L)x 52.78(W)	mm			

TOUCH PANEL VERSION

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	96.4(L)x78.2(W) x 8.3(H)	mm	Dot Pitch	0.22(L)x 0.22(W)	mm
Viewing Area	80.9(L)x60.98(W)	mm	Dot Size	0.2(L)x 0.2(W)	mm
Active Area	70.38(L)x 52.78(W)	mm			

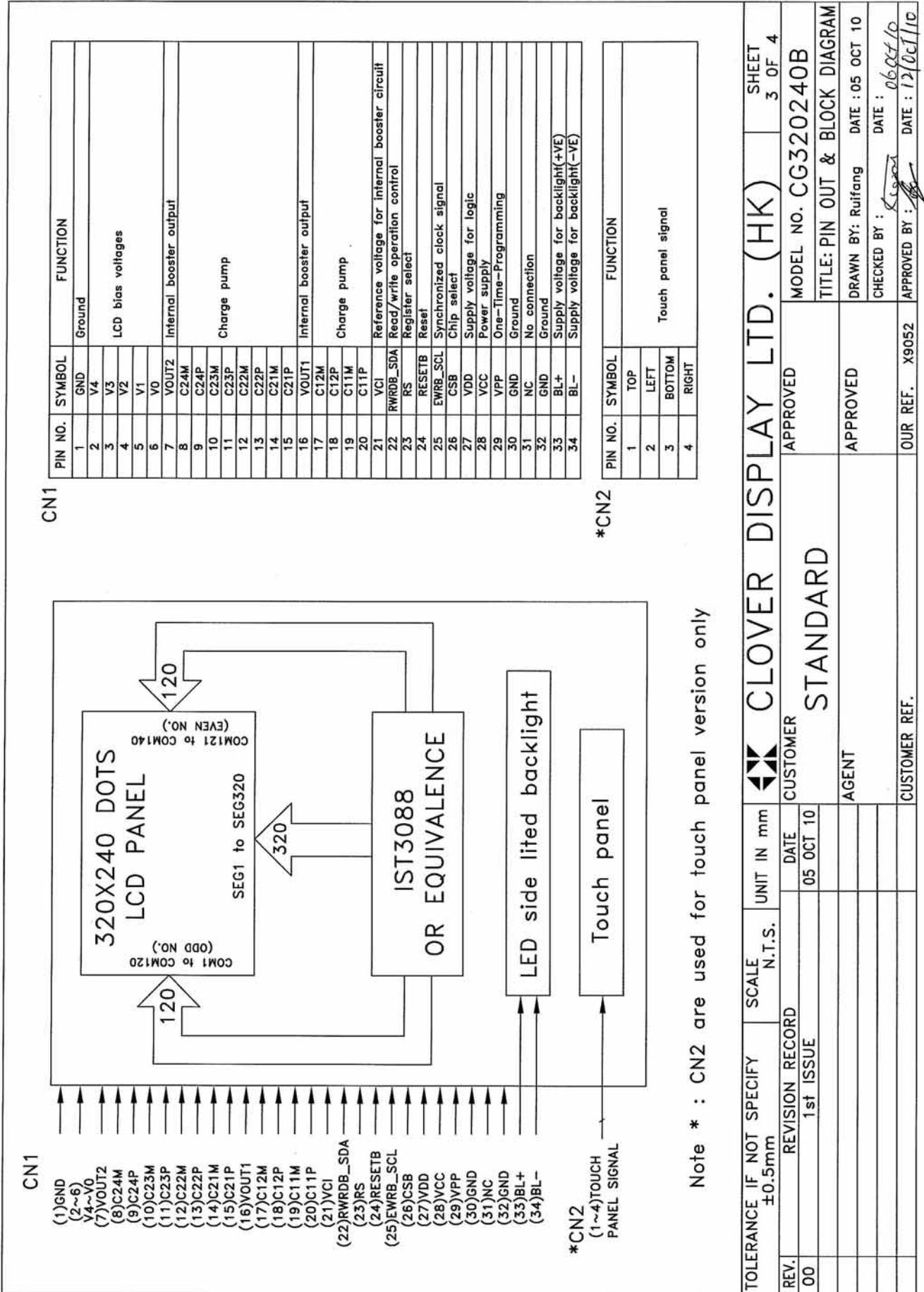
CONNECTOR PIN ASSIGNMENT(CN1)

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	GND	Ground	18	C12P	Charge pump
2	V4	LCD bias voltage	19	C11M	
3	V3		20	C11P	
4	V2		21	VCI		Reference voltage for internal booster circuit
5	V1		22	RWRDB_SDA	Read/write operation control
6	V0	Internal booster output	23	RS	Register select
7	VOOUT2		24	RESETB	Reset
8	C24M	Charge pump	25	EWRB_SCL	Synchronized clock signal
9	C24P		26	CSB	Chip select
10	C23M		27	VDD	Supply voltage for logic
11	C23P		28	VCC	Power supply
12	C22M		29	VPP	One Time Programming
13	C22P		30	GND	Ground
14	C21M		31	NC	No connection
15	C21P		32	GND	Ground
16	VOOUT1	Internal booster output	33	BL+	Supply voltage for backlight(+VE)
17	C12M	Charge pump	34	BL_	Supply voltage for backlight(+VE)

CONNECTOR PIN ASSIGNMENT OF TOUCH PANEL (CN2)

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

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 05 OCT 10	CUSTOMER STANDARD	APPROVED	MODEL NO. CG320240B	TITLE: PIN OUT & BLOCK DIAGRAM
			AGENT	APPROVED	DRAWN BY: Ruifang	DATE : 05 OCT 10
			CUSTOMER REF.	OUR REF. X9052	CHECKED BY: <i>[Signature]</i>	DATE : 06 Oct 10
					APPROVED BY: <i>[Signature]</i>	DATE : 12 Oct 10

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	3.2	3.3	3.5	V
Supply Current for Logic	IDD	-	0.7	1.05	mA
Power supply for LCD control (*)	VOUT	20.9	22	23.1	V
'High' Level Input Voltage	VIH	0.8VDD	-	VDD	V
'Low' Level Input Voltage	VIL	GND	-	0.2VDD	V

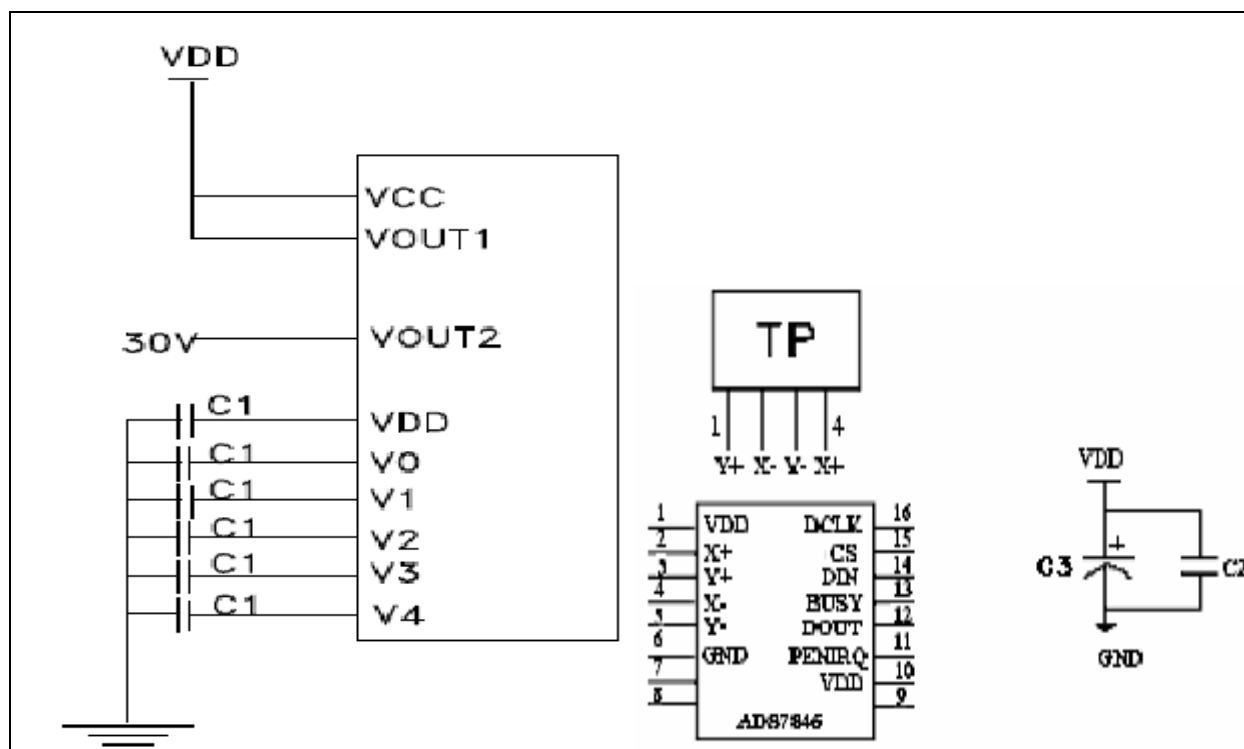
Note (*): There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

Side-lited LED BL:

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Backlight current (White)	IBL	-	60	90	mA	V _{BL} = 3.3V
Backlight current (Blue)	IBL	-	90	120	mA	V _{BL} = 3.3V

REFERENCE CIRCUIT EXAMPL FOR EXTERNAL POWER SUPPLY



Value of external Capacitance

Item	Value	Unit
C1	1.0 to 4.7	uF
C2	0.1	
C3	10	

RECOMMENDED INITIAL SETTINGS

Set Scan Direction and Duty Select : 0001H,0030H

Set Power Control(VC OFF,VR ON,VFON): 0003H,0030H

Set LCD Bias Ratio: 0004H,00761H

Set Ram Window Horizontal start/end(mono mode): 000dH, 1300H

Set Ram Window Horizontal start/end(gray mode): 000dH, 4700H

Set Ram Window vertical start/end(gray or mono mode): 000eH,ef00H

Set Frame Rate : 0028H,00C8H

Set V1/V4 level adjustment: 0037H,0001H

Set Display Mode for Mono : 0023H,0004H

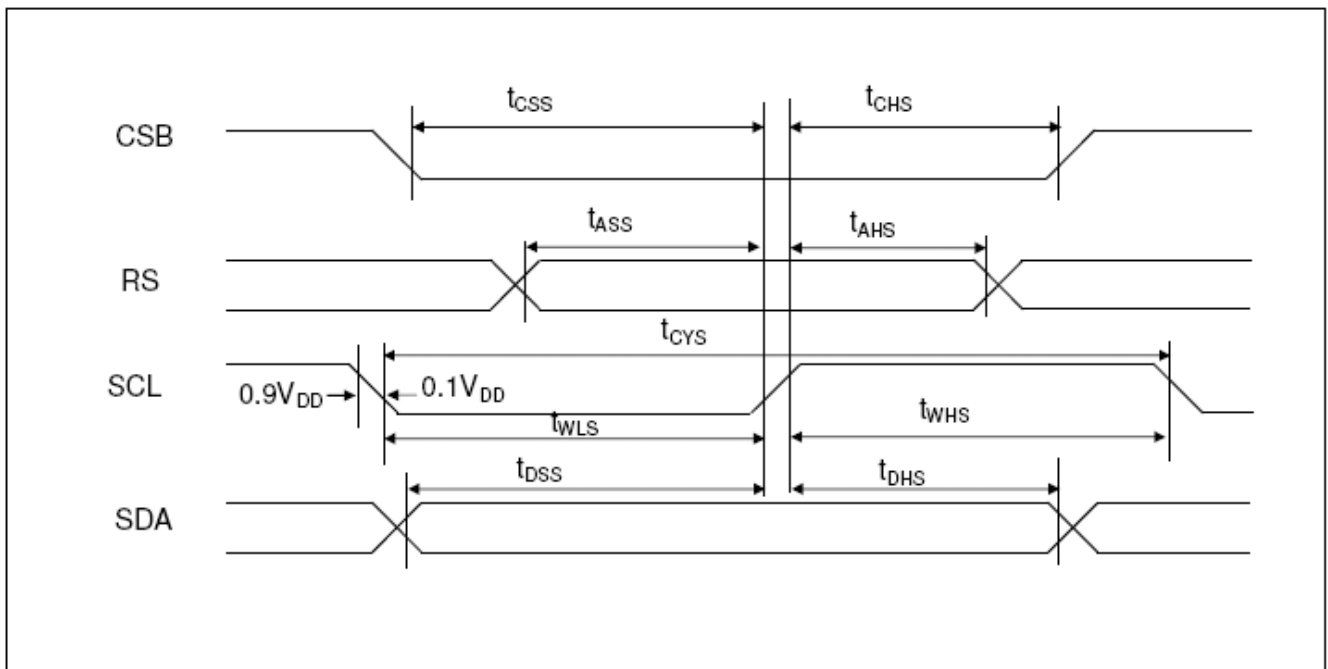
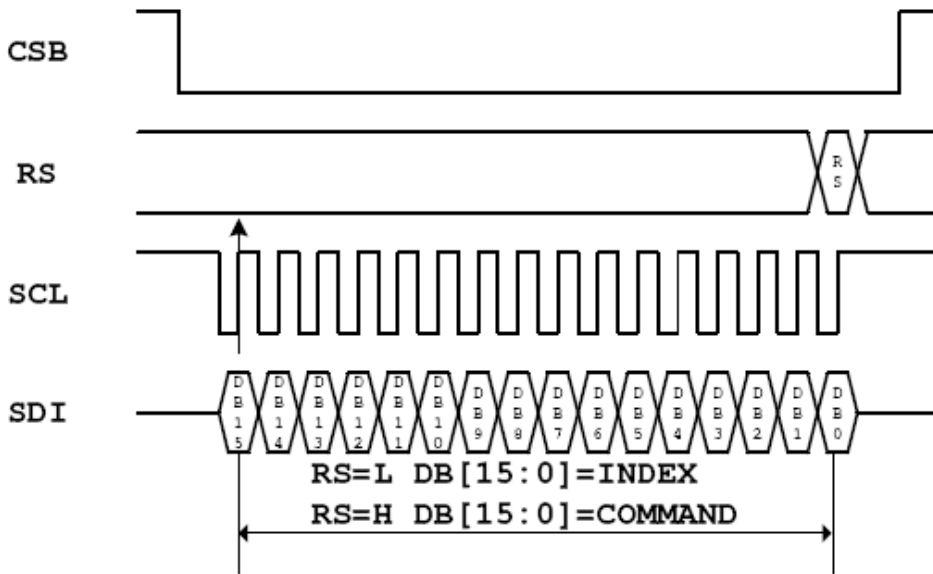
Set Display Mode for gray levels : 0023H,0003H

Set Display On: 0007H,0001H

RAM Addressing Mapping (Mono mode, DSPM=100)

Segment Driver		AY[7:0]	SEG 1	SEG 2	SEG 3	SEG 4	SEG 5	SEG 6	SEG 7	SEG 8	SEG 9	SEG 10	SEG 11	SEG 12	SEG 13	SEG 14	SEG 15	SEG 16	SEG 17	.....	SEG 32	SEG 33	.....	SEG 48	.....	SEG 305	.....	SGE 320	
SGS -0	AX[6:0]	00H																01H			02H			13H					
	BIT	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	D15	.....	D0	D15	.....	D0	---			D15	.....	D0
SGS -1	AX[8:0]	13H																12H			11H			00H					
	BIT	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D0	.....	D15	D0	.....	D15	---			D0	.....	D15
COM1	00H	Address: "0000"H																"0001"H			"0002"H			---			"0013"H		
COM2	01H	Address: "0100"H																"0101"H			"0102"H			---			"0113"H		
COM3	02H	Address: "0200"H																"0201"H			"0202"H			---			"0213"H		
COM4	03H	Address: "0300"H																"0301"H			"0302"H			---			"0313"H		
COM5	04H	Address: "0400"H																"0401"H			"0402"H			---			"0413"H		
COM6	05H	Address: "0500"H																"0501"H			"0502"H			---			"0513"H		
COM7	06H	Address: "0600"H																"0601"H			"0602"H			---			"0613"H		
COM8	07H	Address: "0700"H																"0701"H			"0702"H			---			"0713"H		
COM9	08H	Address: "0800"H																"0801"H			"0802"H			---			"0813"H		
COM10	09H	Address: "0900"H																"0901"H			"0902"H			---			"0913"H		
COM11	0AH	Address: "0A00"H																"0A01"H			"0A02"H			---			"0A13"H		
COM12	0BH	Address: "0B00"H																"0B01"H			"0B02"H			---			"0B13"H		
COM13	0CH	Address: "0C00"H																"0C01"H			"0C02"H			---			"0C13"H		
COM14	0DH	Address: "0D00"H																"0D01"H			"0D02"H			---			"0D13"H		
COM15	0EH	Address: "0E00"H																"0E01"H			"0E02"H			---			"0E13"H		
COM16	0FH	Address: "0F00"H																"0F01"H			"0F02"H			---			"0F13"H		
COM17	10H	Address: "1000"H																"1001"H			"1002"H			---			"1013"H		
COM18	11H	Address: "1100"H																"1101"H			"1102"H			---			"1113"H		
COM19	12H	Address: "1200"H																"1201"H			"1202"H			---			"1213"H		
COM20	13H	Address: "1300"H																"1301"H			"1302"H			---			"1313"H		
---	-----																-----			-----			---			-----		
COM237	ECH	Address: "EC00"H																"EC01"H			"EC02"H			---			"EC13"H		
COM238	EDH	Address: "ED00"H																"ED01"H			"ED02"H			---			"ED13"H		
COM239	EEH	Address: "EE00"H																"EE01"H			"EE02"H			---			"EE13"H		
COM240	EFH	Address: "EF00"H																"EF01"H			"EF02"H			.....			"EF13"H		

4 LINE SERIAL INTERFACE TIMING DIAGRAM



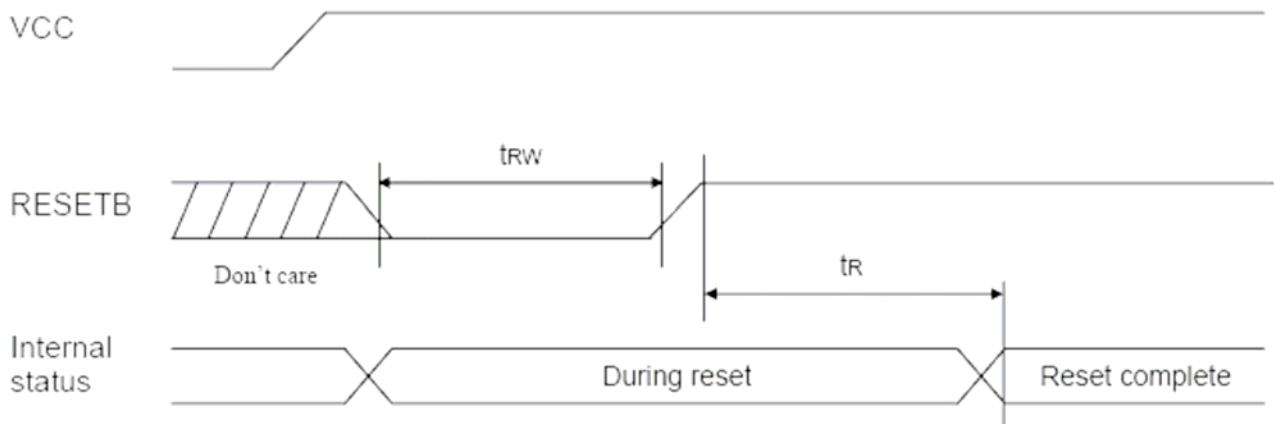
4 LINE SERIAL INTERFACE TIMING CHARACTERISTICS

VCC = 2.4 to 3.3V

Temp = -30 to +80°C

Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Serial clock cycle	SCL	t_{cys}	250	-	-	ns	
SCLK high pulse width	SCL	t_{whs}	125	-	-		
SCLK low pulse width	SCL	t_{wls}	125	-	-		
RS setup time	RS	t_{ass}	110	-	-	ns	
RS hold time	RS	t_{ahs}	110	-	-		
Data setup time	SDA	t_{dss}	110	-	-	ns	
Data hold time	SDA	t_{dhs}	110	-	-		
CSB setup time	CSB	t_{css}	110	-	-	ns	
CSB hold time	CSB	t_{chs}	110	-	-		

RESET TIMING DIAGRAM



RESET TIMING

VCC = 2.4 to 3.3V

Temp = -30 to +80°C

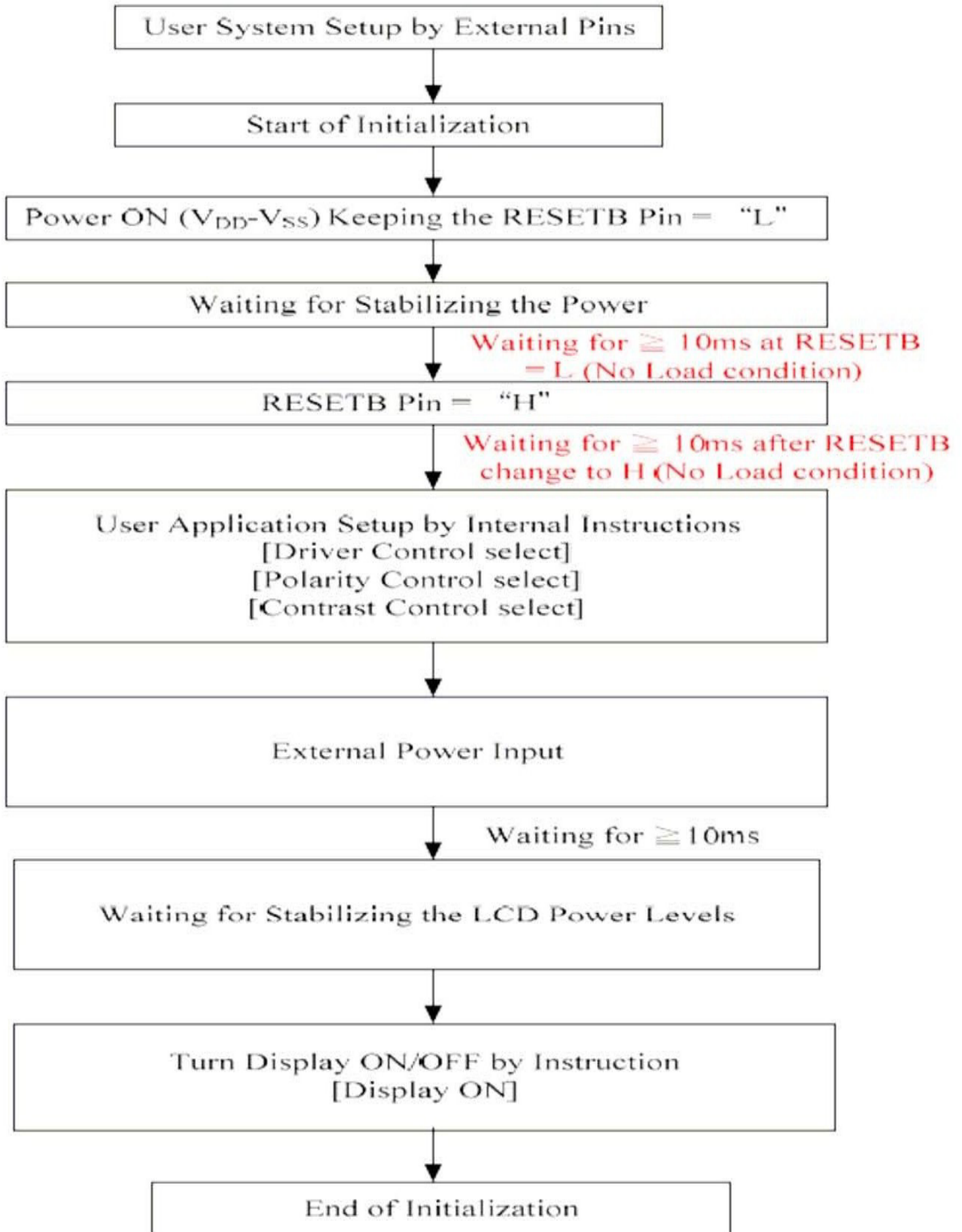
Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Reset low pulse width	RESETB	t_{RW}	2	-	-	us	
Reset time	-	t_R	10	-	-	ms	

THE RESET CIRCUIT

When the Reset input comes to the “L” level, these REG return to the default. Their default states are as follows

ID	Command	Initialization						
ID	Index	ID=00000000						
R01h	Driver control	SHL=0	SGS=0	NL=11				
R02h	Polarity control	EOR=0	BC=0	NW=00000000				
R03h	Power control (1)	VC=0	VR=0	VF=0	SLP=0	STB=0		
R04h	Power control (2)	TC=00	BS=000	BT=000	VRG=0			
R05h	Contrast control	CT=00000000						
R06h	Entry mode	AM=0	ID=11					
R07h	Display control	BW=0	REV=0	D=0				
R08h	RAM Address	AY=00000000	AX=00000000					
R09h	RAM data	DB=0						
R0Ah	Starting address	VL=00000000						
R0Dh	RAM Window H-start/end	HEA=1001111	HAS=00000000					
R0Eh	RAM Window V-start/end	VEA=11101111	VSA=00000000					
R23h	Display Mode control	DSPM=011						
R24h	Test instruction (1)	TEST=0						
R28h	Frame Rate control	CTN=0	CSEL=00	CSEL2=0				
R2Ah	Test instruction (2)	TEST=00						
R30h	OTP program enable	CTE=0						
R31h	OTP program start	PGM=0						
R36h	Contrast offset	CTO=00000000						
R37h	V1/V4 level adjustment	VFR4=00000	VFR1=00000					

INITIALIZING WITHOUT THE BUILT-IN POWER SUPPLY CIRCUITS



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.
RESPONSE TIME	T_{on}	ms	370
	T_{off}	ms	470
CONTRAST RATIO	Cr	-	7
VIEWING ANGLE (Cr \geq 2)	V3:00	$^\circ$	40
	V6:00	$^\circ$	50
	V9:00	$^\circ$	40
	V12:00	$^\circ$	30

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%

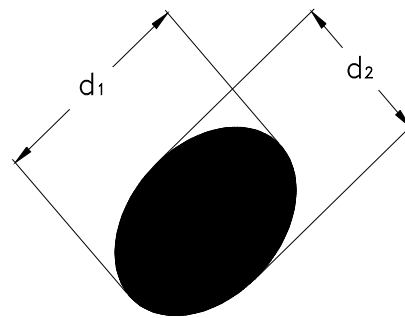
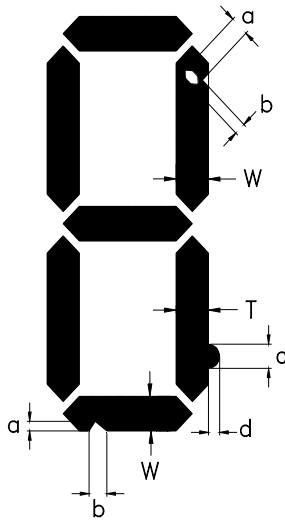
QUALITY STANDARD

DEFECT	CRITERIA	TYPE	FIGURE
SHORT CIRCUIT	-	MAJOR	-
MISSING SEGMENT	-	MAJOR	-
UNEVEN / POOR CONTRAST	-	MAJOR	-
CROSS TALK	-	MAJOR	-
PIN HOLE	$MAX(a,b) \leq 1/3 W$	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 \leq 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

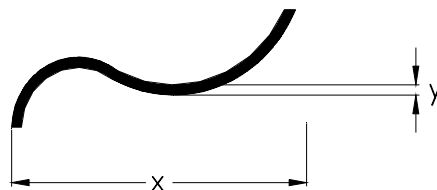
*d = MAX (d₁,d₂)

** N. A . = NOT APPLICABLE

DEFECT TABLE : F



POLARIZER BUBBLES / SPOTS
 fig . 2



LINE 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	$p \leq V.A.$ *** $q \leq N.A$ $r \leq T$		4
	CORNER	$a \leq N.A.$ $b \leq W$		4
	TOP GLASS	$a \leq N.A.$ $b \leq T$ $c \leq W$		5
GLASS PROTRUSION		$a \leq 1/3W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE , ALL UNIT ARE IN MILLIMETER . ***CANNOT EXTEND IN V.A. DEFECT TABLE : F

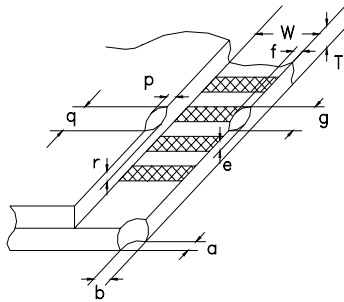


fig . 4

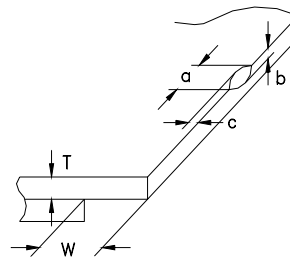


fig . 5

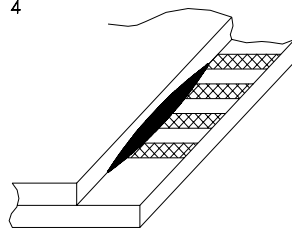


fig . 6

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.