



CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CG160160A - _ _ _ - _ _ _ - _ _ _ - _ _

Revision	00
Engineering	Ronald Leung
Date	26 June 2007
Our Reference	X9030

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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:

CG160160A- 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 : 160 X 160 dots, COG Graphic LCD module
 Interface : 4 bit parallel
 Driving method : 1/160 duty, 1/13 bias
 Controller IC : SUNPLUS SPLC560C or equivalent
 For the detailed information, please refer to the IC specifications.

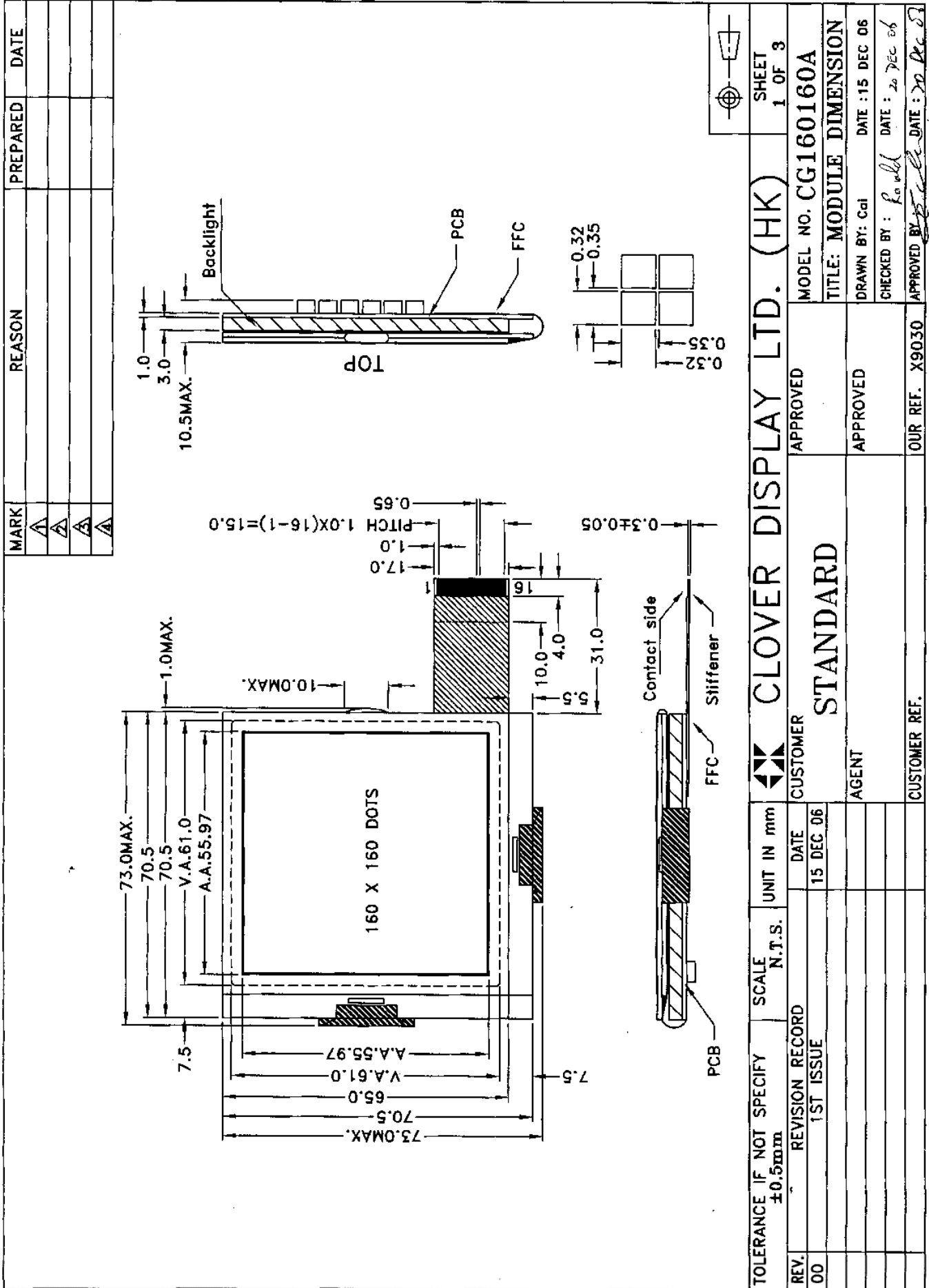
MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension			Viewing Area	61.0(L)x61.0(W)	mm
Non Backlight (N)	-	mm	Dot Pitch	0.35(L)x0.35(W)	mm
LED Sided Backlight(L)	73.0(L)x73.0(W)x 10.5MAX(H)	mm	Dot Size	0.32(L)x0.32(W)	mm

CONNECTOR PIN ASSIGNMENT

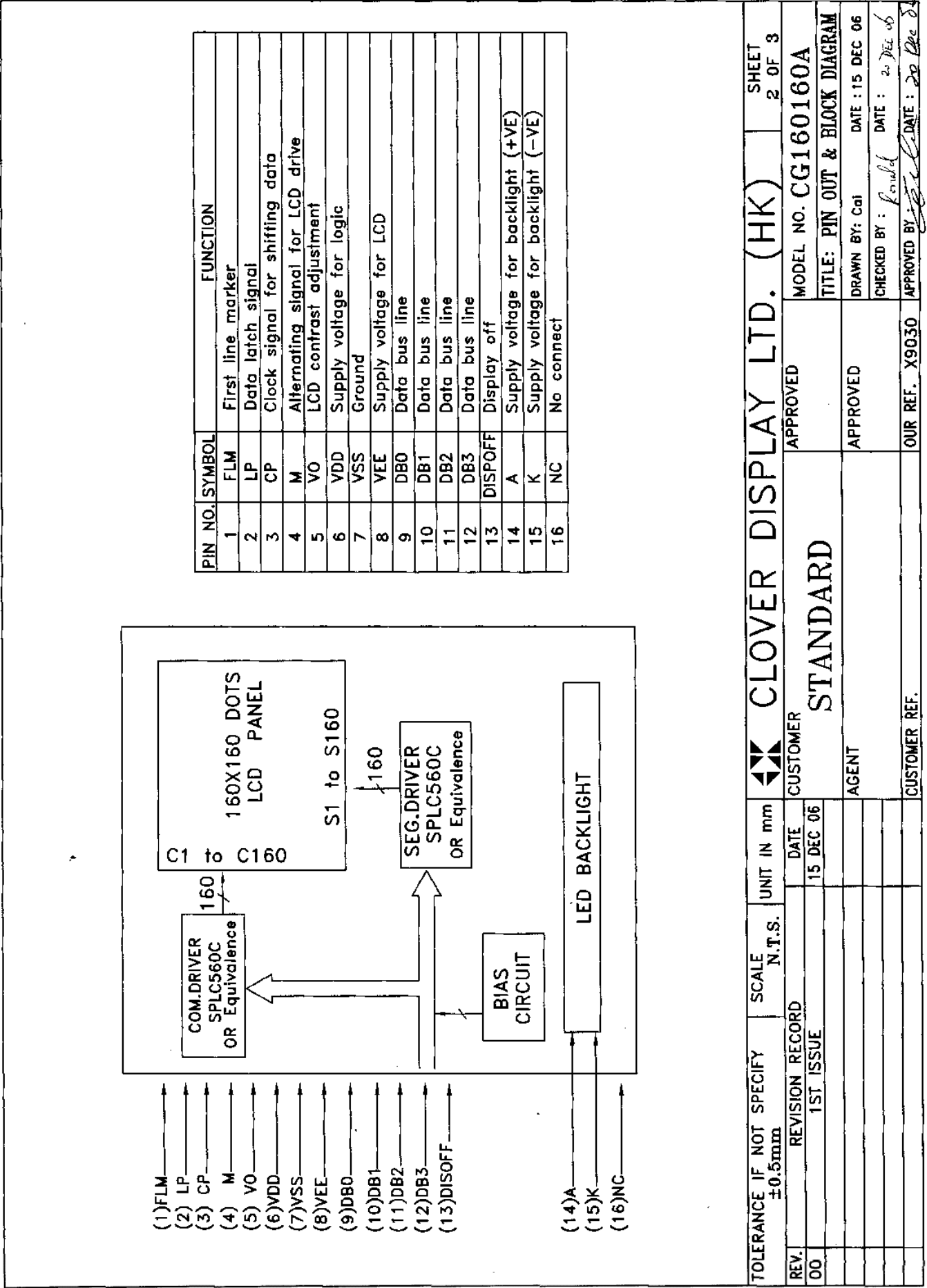
Pin No	Symbol	Function
1	FLM	First line marker
2	LP	Data latch signal
3	CP	Clock signal for shifting data
4	M	Alternating signal for LCD drive
5	V0	LCD contrast adjustment
6	VDD	Supply voltage for logic
7	VSS	Ground
8	VEE	Supply voltage for LCD
9	DB0	Data bus line
10	DB1	
11	DB2	
12	DB3	
13	DISPOFF	Display off
14	A	Supply voltage for backlight(+VE)
15	K	Supply voltage for backlight(-VE)
16	NC	No connect

COUNTER DRAWING OF MODULE DIMENSION



TOLERANCE IF NOT SPECIFY ±0.5mm	SCALE N.T.S.	UNIT IN mm	DATE 15 DEC 06	CLOVER DISPLAY LTD. (HK)	SHEET 1 OF 3
REV. 00	REVISION RECORD 1ST ISSUE			MODEL NO. CG160160A	
				TITLE: MODULE DIMENSION	
				DRAWN BY: Cai	DATE: 15 DEC 06
				CHECKED BY: <i>Paul</i>	DATE: 20 DEC 06
				APPROVED BY: <i>Paul</i>	DATE: 20 DEC 06
				OUR REF. X9030	
				CUSTOMER REF.	
				CUSTOMER	
				AGENT	
				STANDARD	
				APPROVED	
				APPROVED	

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 2 OF 3
REV.	REVISION RECORD	DATE	CUSTOMER	APPROVED	MODEL NO. CG160160A	
00	1ST ISSUE	15 DEC 06	AGENT	APPROVED	TITLE: PIN OUT & BLOCK DIAGRAM	
					DRAWN BY: Cai	DATE: 15 DEC 06
					CHECKED BY: <i>Peniel</i>	DATE: 20 Dec 06
					APPROVED BY: <i>Peniel</i>	DATE: 20 Dec 06
			CUSTOMER REF.	OUR REF. X9030		

ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, Ta=25

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	4.75	5.0	5.25	V	“H”Level Input Voltage	VIH	0.8VDD	-	VDD	V
Supply Current for Logic	IDD	-	0.36	0.40	mA	“L”Level Input Voltage	VIL	VSS	-	0.2VDD	V
Power supply for LCD control (*)	V0	19.5	19.7	19.9	V	-	-	-	-	-	-
EL Backlight Voltage (VEL)											
EL (@ Frequency 400Hz)	VBL	-	-	-	Vrms	-	-	-	-	-	-
Side-lited LED Backlight Forward Voltage (VF)						Side-lited LED Backlight Forward Current (IF)					
White	VBL	-	5.0	-	V	White	IBL	75	90	100	mA
Blue	VBL	-	-	-	V	Blue	IBL	-	-	-	mA
Yellow Green	VBL	-	-	-	V	Yellow Green	IBL	-	-	-	mA

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	5.0	5.0	V
Input Voltage	VT	-0.3 to VDD +0.3	-0.3 to VDD +0.3	V
Operating Temperature	Topr	0 to 50	-20 to 70	
Storage Temperature	Tstg	-10 to 60	-30 to 80	

TIMING DIAGRAM AND CHARACTERISTICS

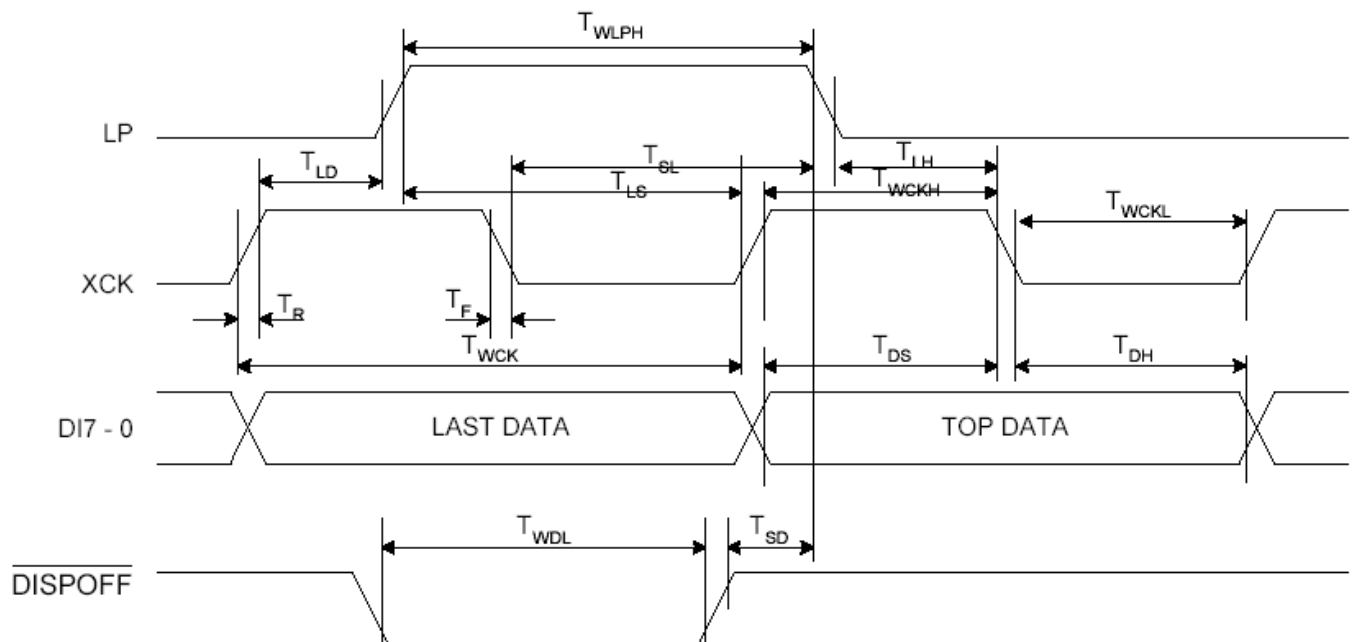
Segment mode

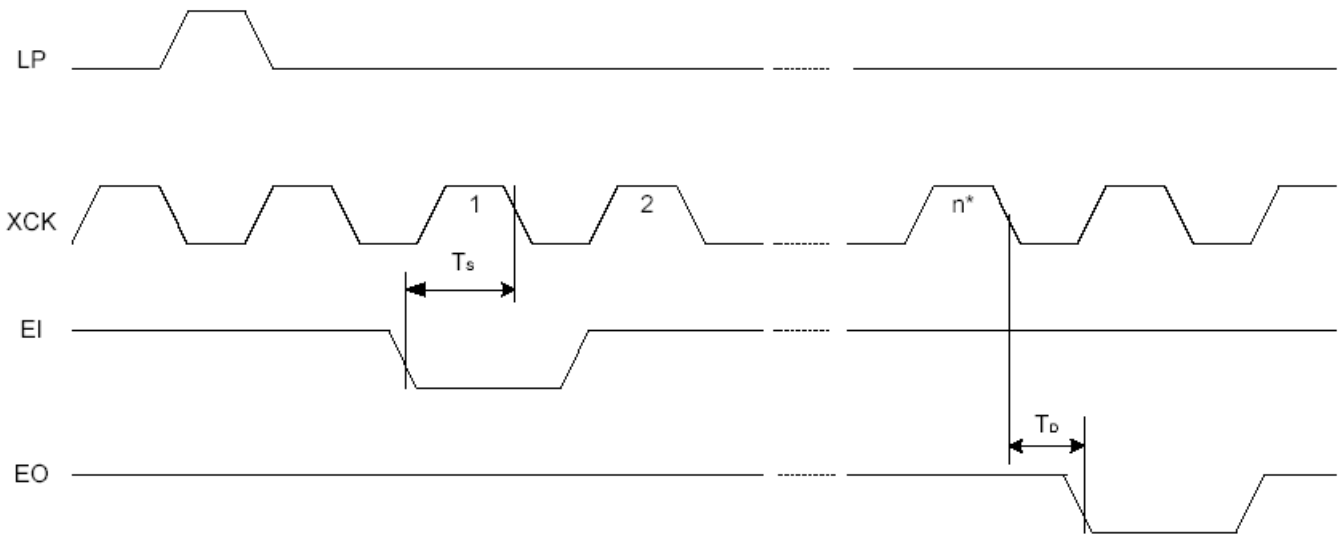
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Shift clock period *1	T_{WCK}	$T_R, T_F \leq 10\text{ns}$	71	-	-	ns
Shift clock "H" pulse width	T_{WCKH}	-	23	-	-	ns
Shift clock "L" pulse width	T_{WCKL}	-	23	-	-	ns
Data setup time	T_{DS}	-	10	-	-	ns
Data hold time	T_{DH}	-	20	-	-	ns
Latch pulse "H" pulse width	T_{WLPH}	-	23	-	-	ns
Shift clock rise to latch pulse rise time	T_{LD}	-	0	-	-	ns
Shift clock fall to latch pulse fall time	T_{SL}	-	25	-	-	ns
Latch pulse rise to shift clock rise time	T_{LS}	-	25	-	-	ns
Latch pulse fall to shift clock fall time	T_{LH}	-	25	-	-	ns
Input signal rise time *2	T_R	-	-	-	50	ns
Input signal fall time *2	T_F	-	-	-	50	ns
Enable setup time	T_S	-	21	-	-	ns
DISPOFF removal time	T_{SD}	-	100	-	-	ns
DISPOFF "L" pulse width	T_{WDL}	-	1.2	-	-	μs
Output delay time (1)	T_D	$CL = 15\text{pF}$	-	-	40	ns
Output delay time (2)	T_{PD1}, T_{PD2}	$CL = 15\text{pF}$	-	-	1.2	μs
Output delay time (3)	T_{PD3}	$CL = 15\text{pF}$	-	-	1.2	μs

Note1: Take the cascade connection into consideration.

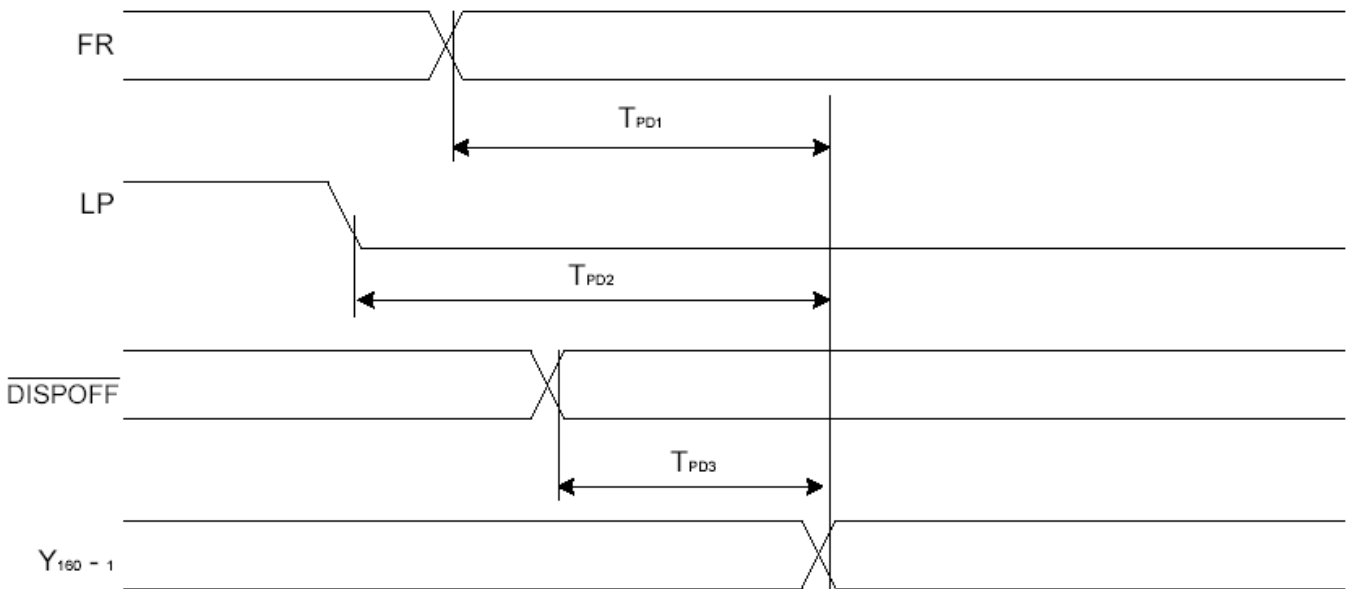
Note2: $(T_{WCK} - T_{WCKH} - T_{WCKL}) / 2$ is maximum in the case of high speed operation.

Timing Characteristics of Segment Mode





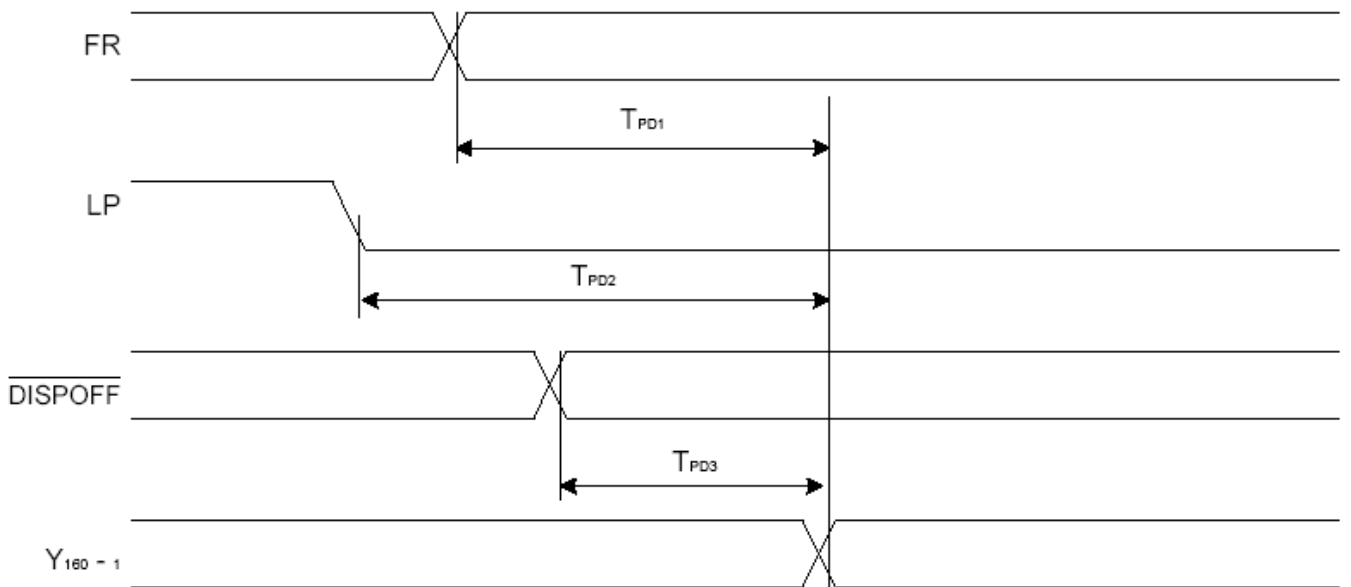
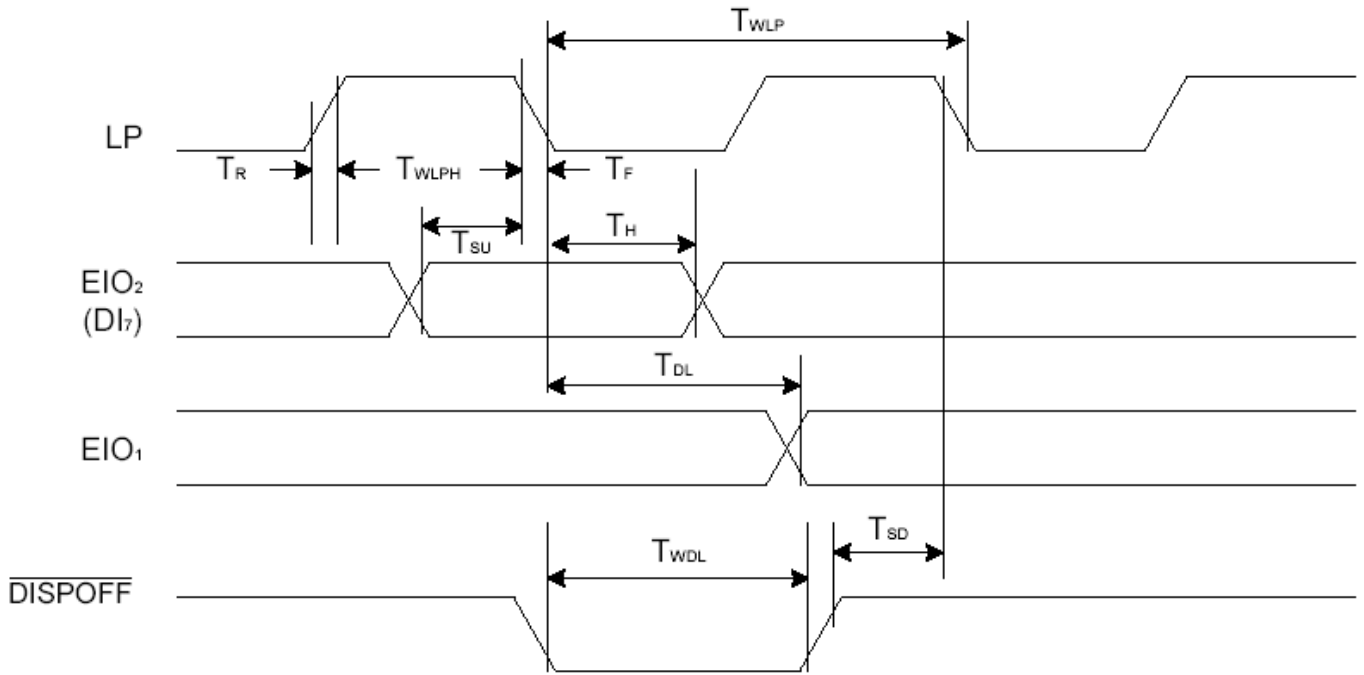
*n=40 in 4-bit parallel input mode.



Common mode

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Shift clock period	T_{WLP}	$T_R, T_F \leq 20\text{ns}$	250	-	-	ns
Shift "H" pulse width	T_{WLPH}	$VDD = +5.0V \pm 10\%$	15	-	-	ns
		$VDD = +2.5V \sim +4.5V$	30	-	-	ns
Data setup time	T_{SU}	-	30	-	-	ns
Data hold time	T_H	-	50	-	-	ns
Input signal rise time	T_R	-	-	-	50	ns
Input signal fall time	T_F	-	-	-	50	ns
$\overline{\text{DISPOFF}}$ removal time	T_{SD}	-	100	-	-	ns
$\overline{\text{DISPOFF}}$ "L" pulse width	T_{WDL}	-	1.2	-	-	μs
Output delay time (1)	T_{DL}	$C_L = 15\text{pF}$	-	-	200	ns
Output delay time (2)	T_{PD1}, T_{PD2}	$C_L = 15\text{pF}$	-	-	1.2	μs
Output delay time (3)	T_{PD3}	$C_L = 15\text{pF}$	-	-	1.2	μs

Timing characteristics of common mode



[L/R = "L"]

ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = $V_{OP} / 64 \text{ Hz}$
 TEMPERATURE = $22 \pm 5 \text{ }^\circ\text{C}$
 RELATIVE HUMIDITY = $60 \pm 15 \%$

ITEM	SYMBOL	UNIT	TYP. TN	TYP. STN
RESPONSE TIME	T_{on}	ms	-	320
	T_{off}	ms	-	430
CONTRAST RATIO	Cr	-	-	8
VIEWING ANGLE ($Cr \geq 2$)	V3:00	$^\circ$	-	40
	V6:00	$^\circ$	-	55
	V9:00	$^\circ$	-	40
	V12:00	$^\circ$	-	35

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

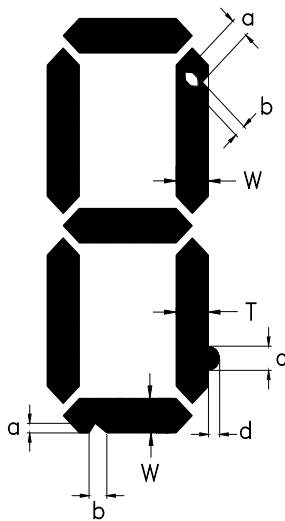
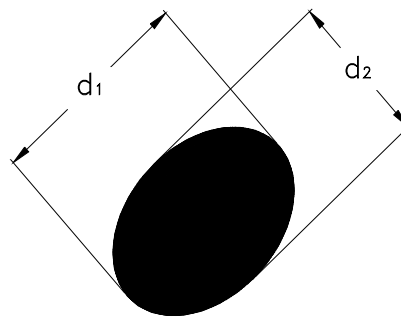
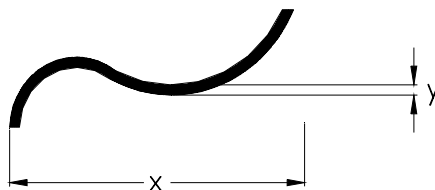


fig . 1



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

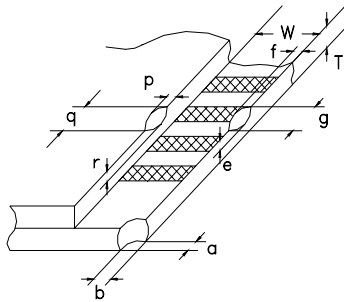


fig . 4

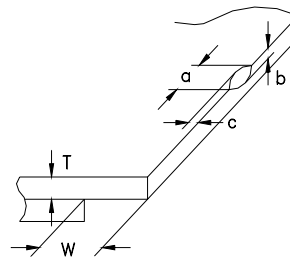


fig . 5

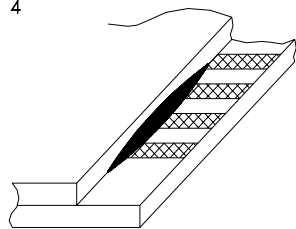


fig . 6

HANDLING PRECAUTIONS

(1) CAUTION OF LCD HANDLING & CLEANING

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) 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.