CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model : CV240160B - _ _ - _ _ - _ _ - _

Revision	00
Engineering	Hermus Leung
Date	17 August 2004
Our Reference	4940

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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:

CV240160B- MY - S F - 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)
T – Touch panel (Analog)
P – Touch panel (Digital)

GENERAL DESCRIPTION

Display mode	:	240 x 160 dots, graphic TAB with Side-lited LED backlight LCD module
Interface	:	4-bit parallel
Driving method	:	1/160 duty, 1/13 bias
Driver IC	:	Novatek NT7701, NT7702 or equivalent For the detailed information, please refer to the IC specifications.

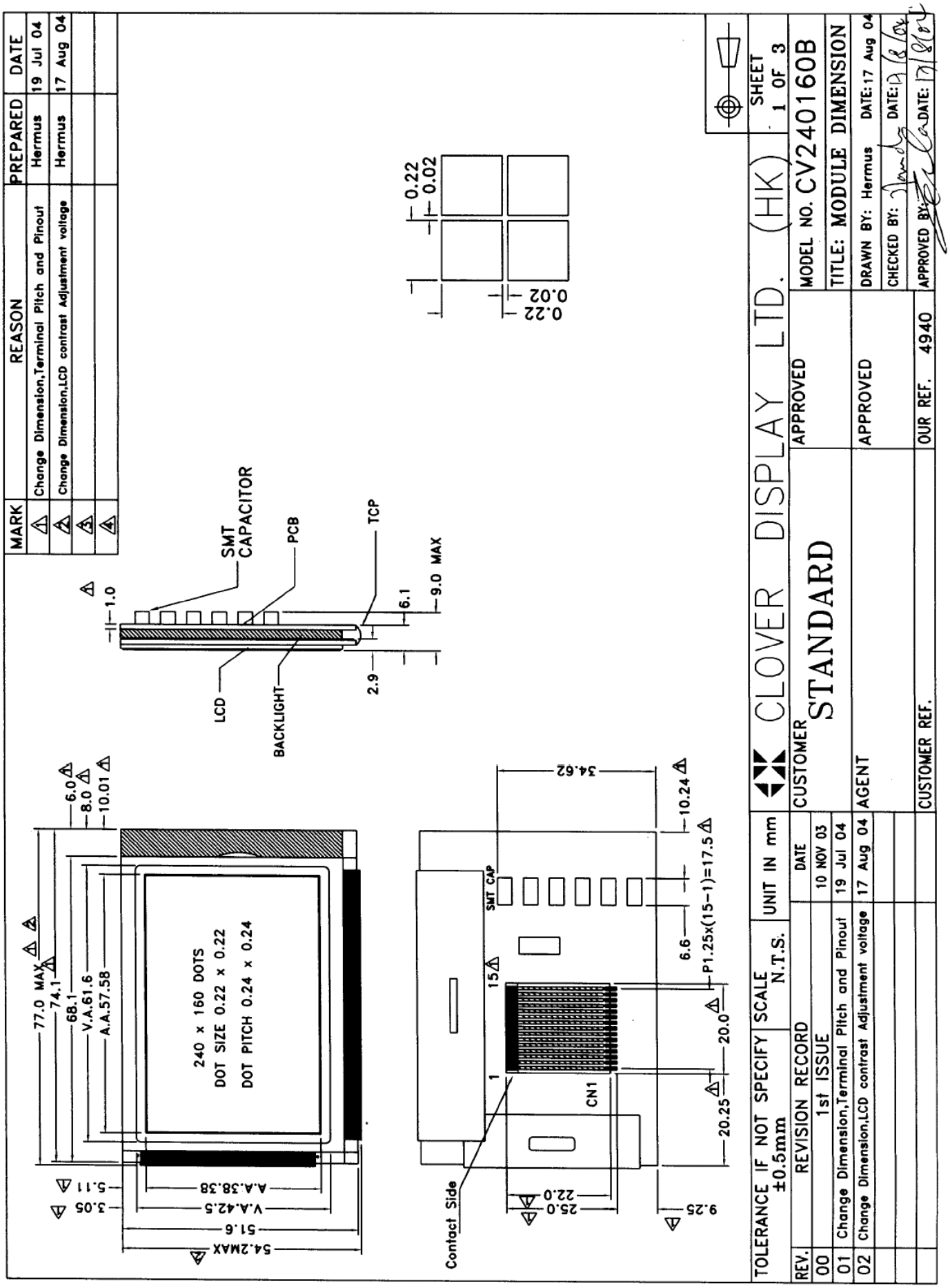
MECHANICAL DIMENSIONS

Item	Dimension	Unit
Outline Dimension	77.0 MAX (L) x 54.2 MAX (W) x 9.0 MAX (H)	mm
Viewing Area	61.6(L)x42.5(W)	mm
Dot Pitch	0.24(L)x0.24(W)	mm
Dot Size	0.22(L)x0.22(W)	mm

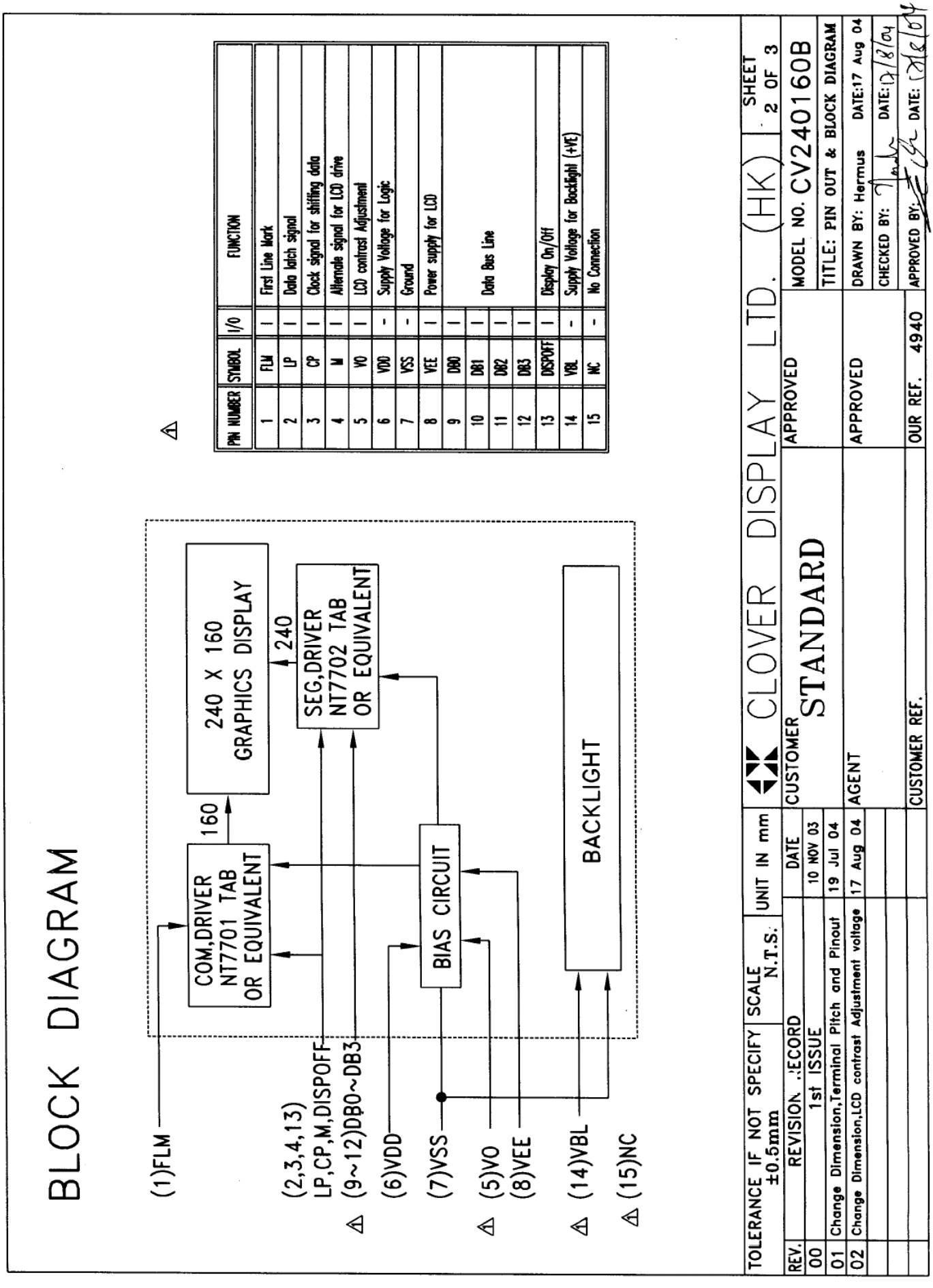
CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	FLM	First Line Marker	9	DB0	Data Bus Line
2	LP	Data latch signal	10	DB1	
3	CP	Clock signal for shifting data	11	DB2	
4	M	Alternate signal for LCD drive	12	DB3	
5	VO	LCD contrast adjustment	13	DISPOFF	Display On/Off
6	VDD	Supply voltage for logic	14	VBL	Supply Voltage for backlight (+VE)
7	VSS	Ground	15	NC	No Connection
8	VEE	Power supply for LCD	—	—	—

COUNTER DRAWING OF MODULE DIMENSION



COUNTER DRAWING OF BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, @Ta=25℃

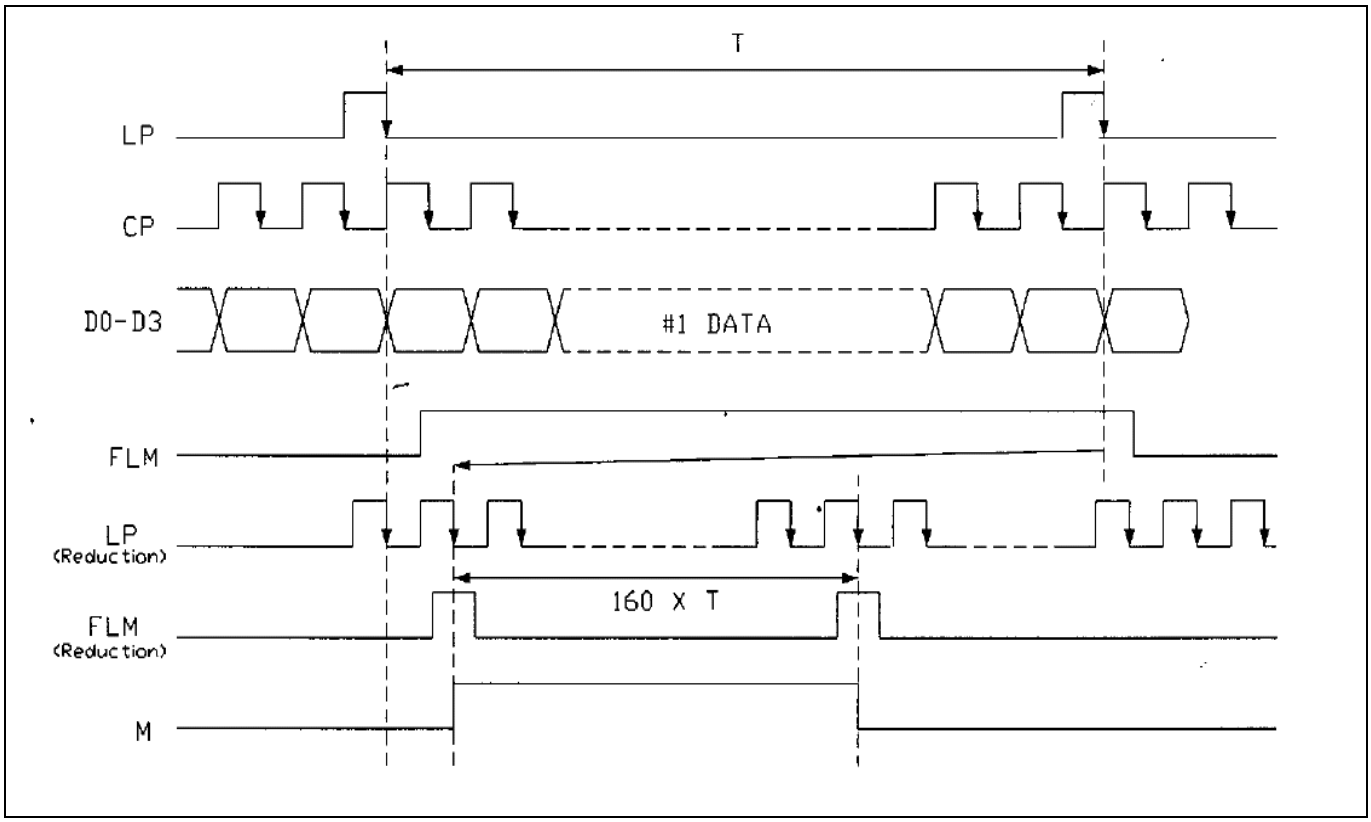
Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.5	5.0	5.5	V	"H"Level Input Voltage	VIH	0.7VDD	—	VDD	V
Supply Current	IDD	—	—	20.0	mA	"L"Level Input Voltage	VIL	0	—	0.3VDD	V
Power supply for LCD	VEE	21.0	—	25.0	V	LCD Contrast Adjustment	VO	19.9	20.1	20.3	V
Backlight Voltage						**Backlight Current**					
EL (@ Frequency 400Hz)	VEL	—	—	—	Vrms	—	—	—	—	—	—
Side-lited LED						**Side-lited LED**					
White	VBL	3.8	4.0	4.2	V	White	IBL	—	75	100	mA
Blue	VBL	—	—	—	V	Blue	IBL	—	—	—	mA
Yellow Green	VBL	—	—	—	V	Yellow Green	IBL	—	—	—	mA
Array LED						**Array LED**					
Yellow Green	VBL	—	—	—	V	Yellow Green	IBL	—	—	—	mA
Amber	VBL	—	—	—	V	Amber	IBL	—	—	—	mA
Orange	VBL	—	—	—	V	Orange	IBL	—	—	—	mA
Soft Orange	VBL	—	—	—	V	Soft Orange	IBL	—	—	—	mA
CCFL						**CCFL**					
White	VBL	—	—	—	Vrms	White	IBL	—	—	—	mArms

ABSOLUTE MAXIMUM RATINGS

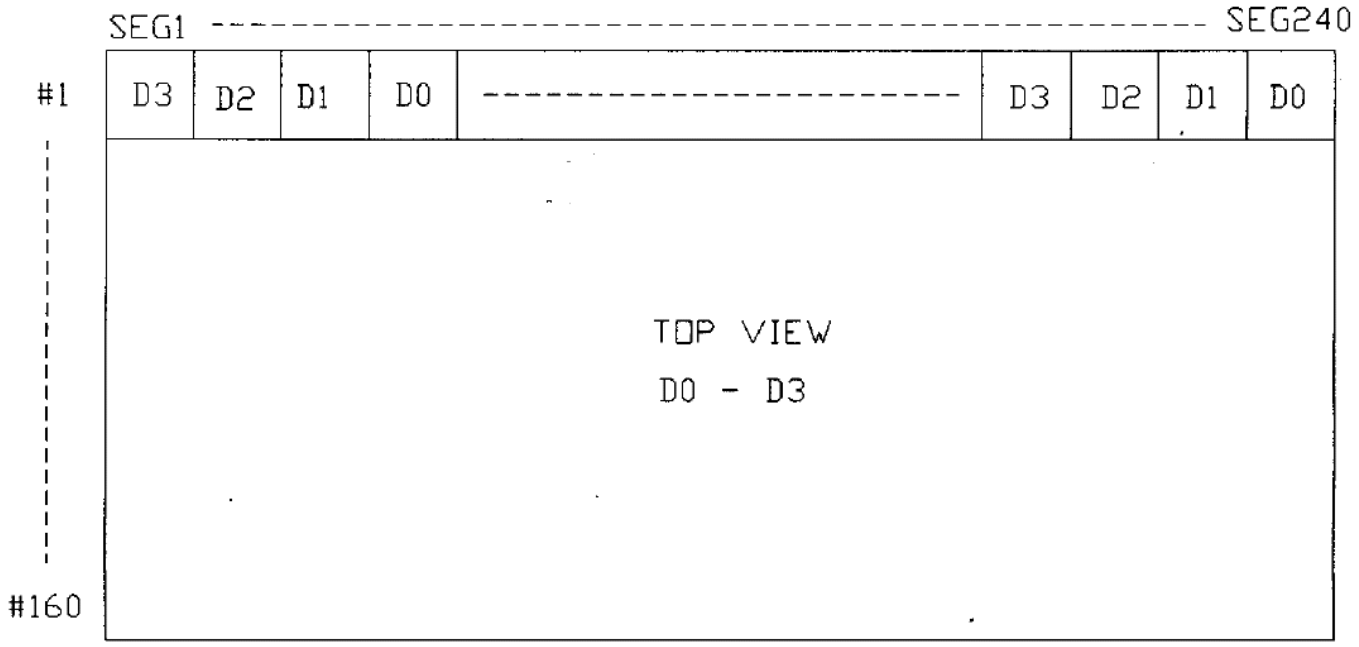
Please make sure not to exceed the following maximum rating values under the worst application conditions

Item	Symbol	Rating (for normal temperature)	Rating (for wide temperature)	Unit
Supply Voltage	VDD	7	7	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 CHART



DISPLAY AND DATA



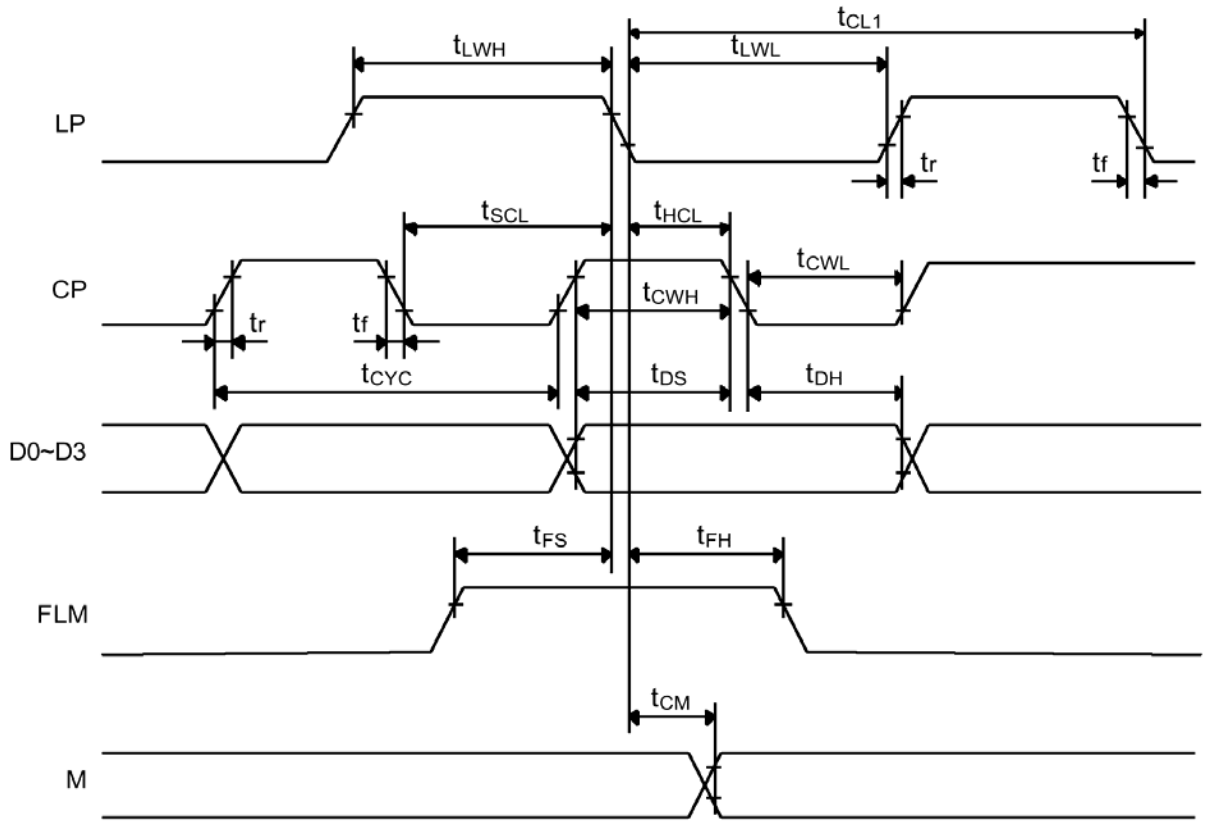
AC CHARACTERISTICS

Parameter	Symbol	Min.	Max.	Units
Clock Pulse Cycle Time	t_{CYC}	71	—	ns
Clock Pulse High Level Width	t_{CWH}	23	—	ns
Clock Pulse Low Level Width	t_{CWL}	23	—	ns
Clock Pulse Setup Time	t_{SCL}	25	—	ns
Clock Pulse Hold Time	t_{HCL}	25	—	ns
Clock Pulse Rise/Fall Time	tr, tf	—	50	ns
LP High Level Width	t_{LWH}	15	—	ns
LP Low Level Width	t_{LWL}	15	—	ns
LP Cycle Time	t_{CL1}	250	—	ns
Data Setup Time	t_{DS}	30	—	ns
Data Hole Time	t_{DH}	40	—	ns
FLM Data Setup Time	t_{FS}	30	—	ns
FLM Data Hole Time	t_{FH}	50	—	ns
M Phase Difference	t_{CM}	—	200	ns

Note : Please satisfy the following conditions (1), (2) in the same time.

(1) $tr, tf < (t_{CYC} - t_{CWH} - t_{CWL}) / 2$

(2) $tr, tf \leq 50$



ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = V_{OP} / 64 Hz
TEMPERATURE = 22 ± 5 °C
RELATIVE HUMIDITY = 60 ± 15 %

ITEM	SYMBOL	UNIT	TYP.
RESPONSE TIME	Ton	ms	320
	Toff	ms	430
CONTRAST RATIO	Cr	-	8
VIEWING ANGLE (6 O'clock) (Cr ≥ 2)	$V_{3:00}$	°	40
	$V_{6:00}$	°	55
	$V_{9:00}$	°	40
	$V_{12:00}$	°	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 cycles
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

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) 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.

(4) CAUTION FOR OPERATION

The viewing angle can be adjusted by varying the LCD driving voltage VO.

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%.

(5) 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 leaks 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.