CLOVER DISPLAY LTD.

LCD MODULE SPECIFICATION

Model: CV320240D - _ _ - _ _ - _ _ - _

Revision	05
Engineering	LONGSON YEUNG
Date	20 AUG 12
Our Reference	4947

ADDRESS : 1st FLOOR, EFFICIENCY HOUSE, 35 TAI YAU STREET, SAN PO KONG, KOWLOON, HONG KONG.

TEL : (852) 2341 3238 (SALES OFFICE) (852) 2342 8228 (GENERAL OFFICE)

FAX : (852) 2357 4237 (SALES OFFICE)

E-MAIL : cdl@cloverdisplay.com

URL : http://www.cloverdisplay.com

1. *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		

2. *LCD MODULE NUMBER NOTATION:*

CV320240D- 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)

3. GENERAL DESCRIPTION

Display mode : 320 x 240 dots, graphic TAB LCD module

Interface : 4-bit Parallel

Driving method : 1/240 duty, 1/15 bias

Backlight : Side-lited LED

Driver IC : Integrated Solutions Technology IST3025, IST3026 or equivalence
For the detailed information, please refer to the IC specifications.

4. MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension					
No Backlight (N)	100(L)x77.7(W)x7.5(H)	mm	Dot Pitch	0.24(L)x0.24(W)	mm
Side Backlight (L)	97.5(L)x76.7(W)x9.05(H)	mm	Viewing Area	81.38(L)x62.18(W)	mm
EL Backlight (E)	99.7(L)x77.5(W)x7.5(H)	mm	Dot Size	0.21(L)x0.21(W)	mm

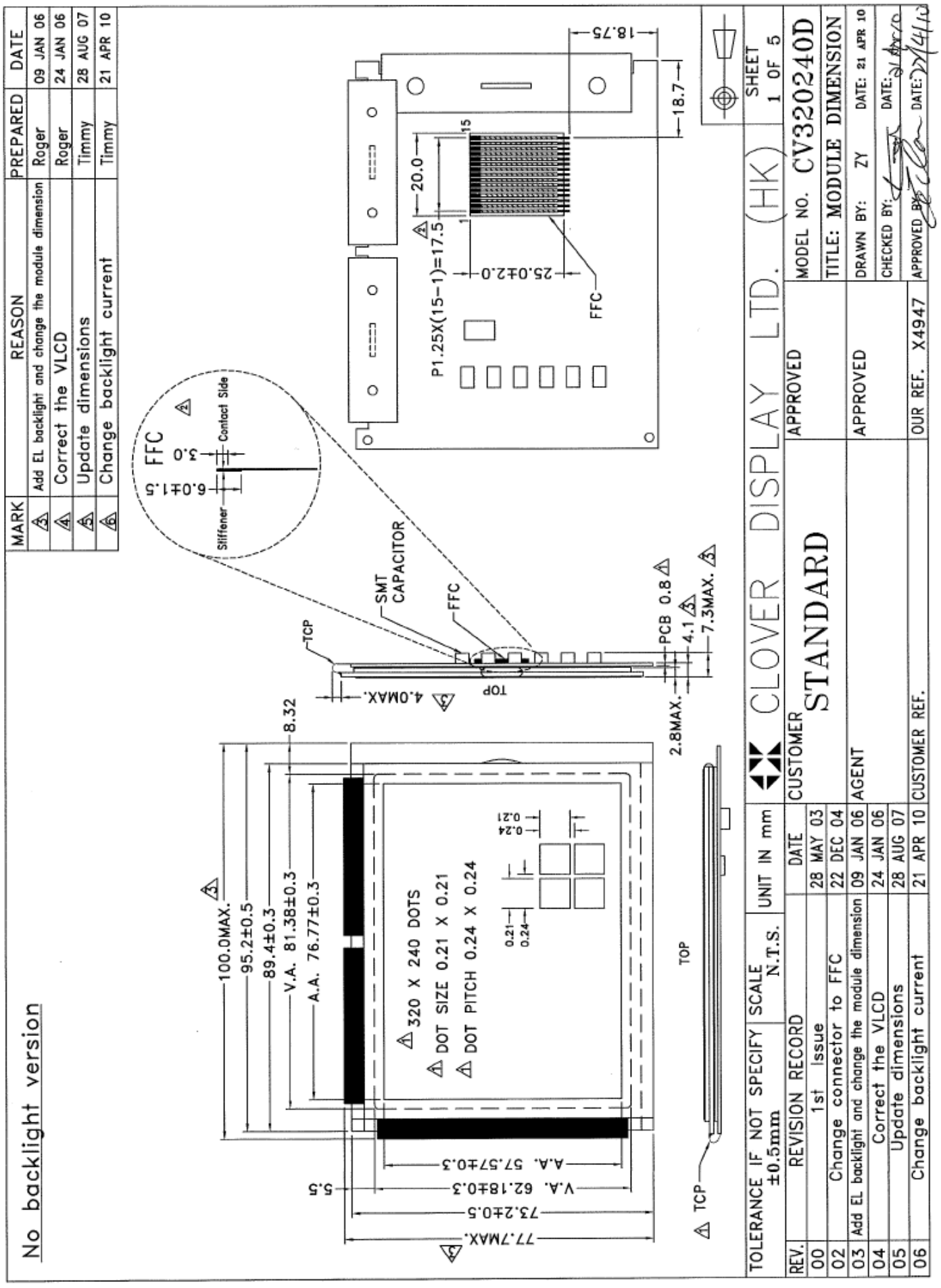
5. CONNECTOR PIN ASSIGNMENT

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	Contrast Adjustment for LCD	13	DISPOFF	Display On/Off
6	VDD	Supply Voltage for Logic	14	BL+	Supply voltage for backlight(+)
7	VSS	Ground	15	BL-	Supply voltage for backlight (-)
8	VEE	Power supply for LCD	–	–	–

CN 2

Pin No.	Symbol	Function
1	EL1	Backlight supply terminal
2	EL2	Backlight supply terminal

6. COUNTER DRAWING OF MODULE DIMENSION (WITHOUT BACKLIGHT)



MARK	REASON	PREPARED	DATE
3	Add EL backlight and change the module dimension	Roger	09 JAN 06
4	Correct the VLCD	Roger	24 JAN 06
5	Update dimensions	Timmy	28 AUG 07
6	Change backlight current	Timmy	21 APR 10

REV.	REVISION RECORD	DATE
00	1st Issue	28 MAY 03
02	Change connector to FFC	22 DEC 04
03	Add EL backlight and change the module dimension	09 JAN 06
04	Correct the VLCD	24 JAN 06
05	Update dimensions	28 AUG 07
06	Change backlight current	21 APR 10

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

CUSTOMER | APPROVED

AGENT | APPROVED

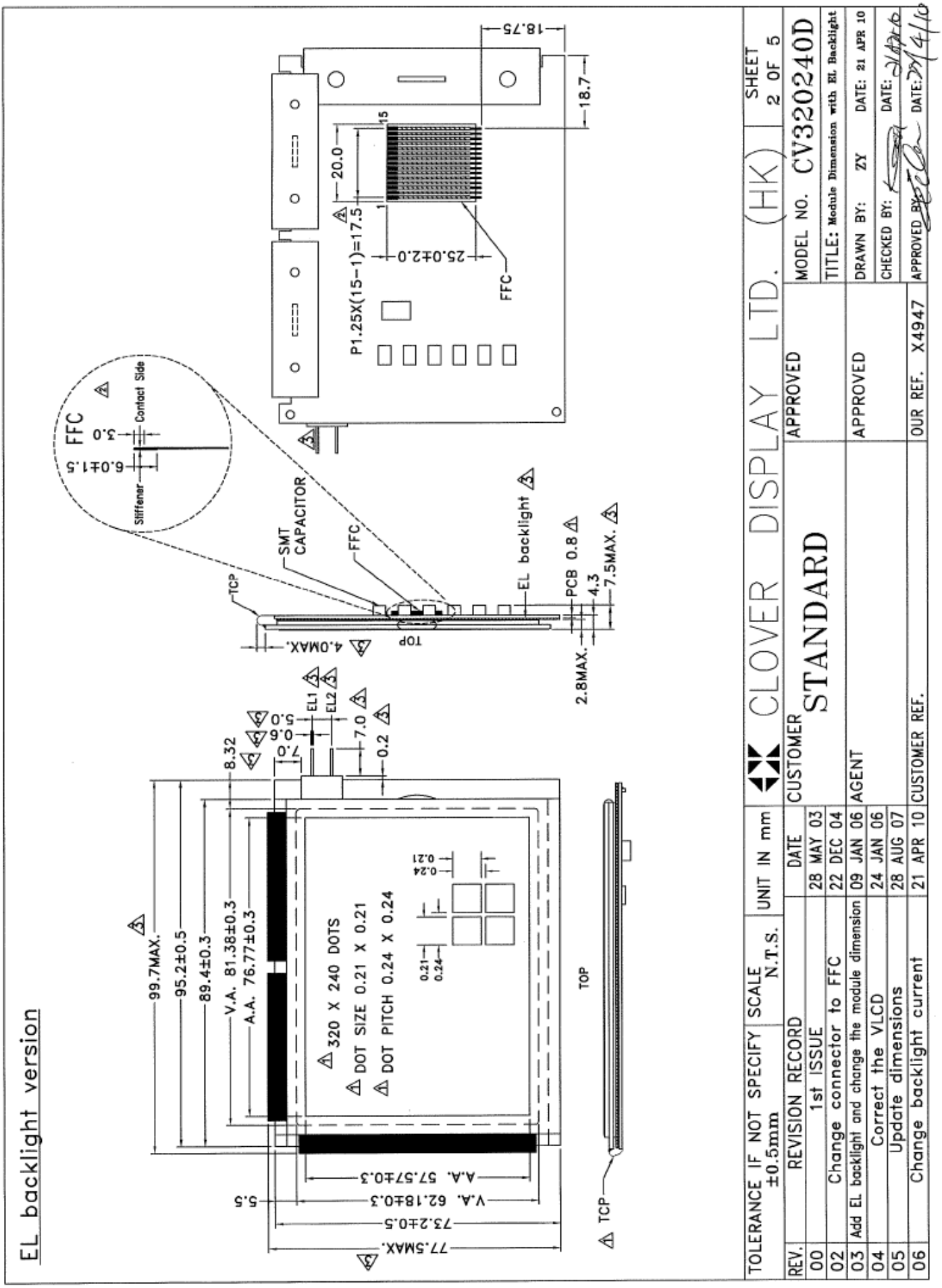
DRAWN BY: ZY DATE: 21 APR 10

CHECKED BY: DATE:

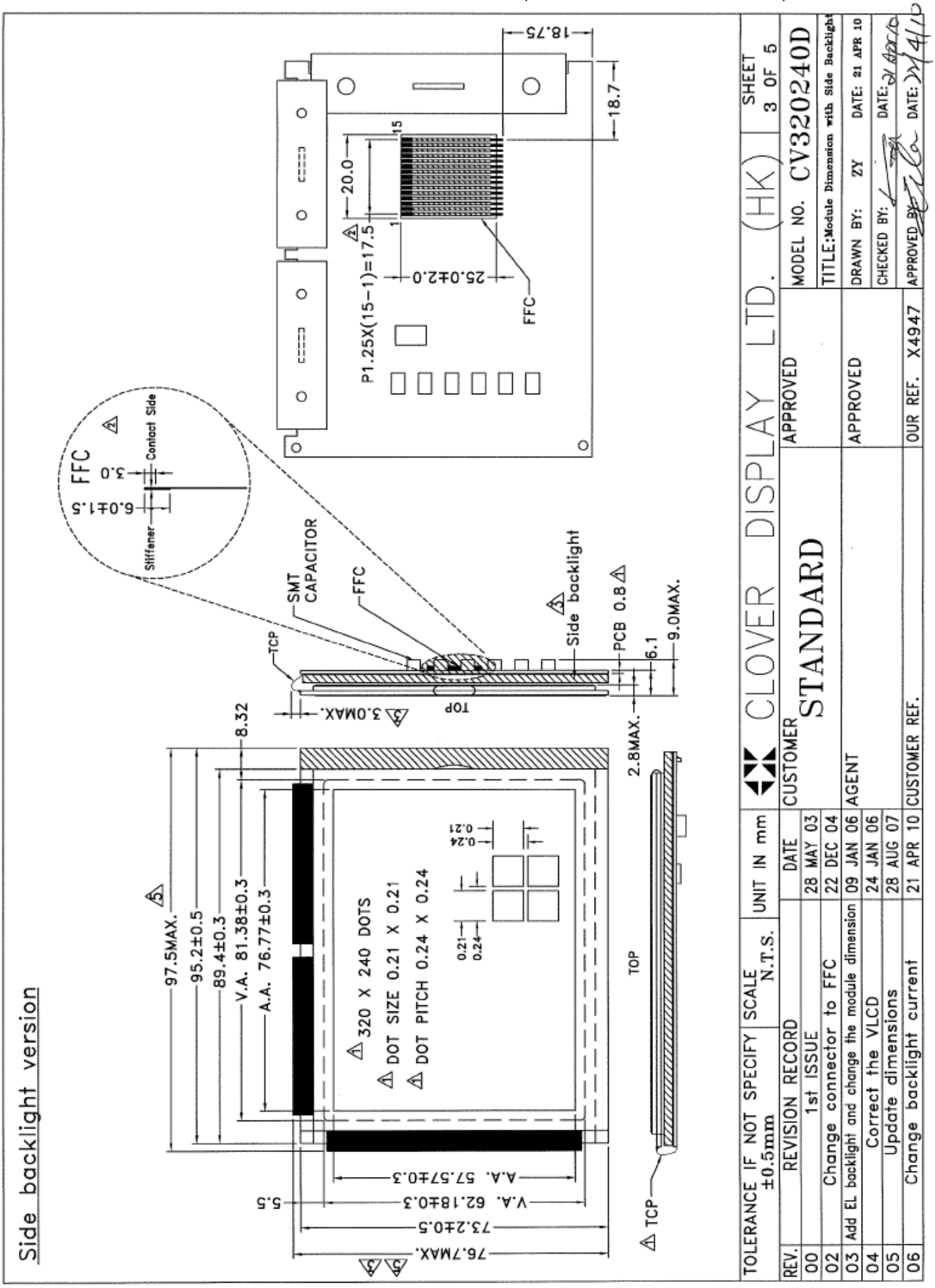
APPROVED BY: DATE:

CUSTOMER REF. | OUR REF. X4947

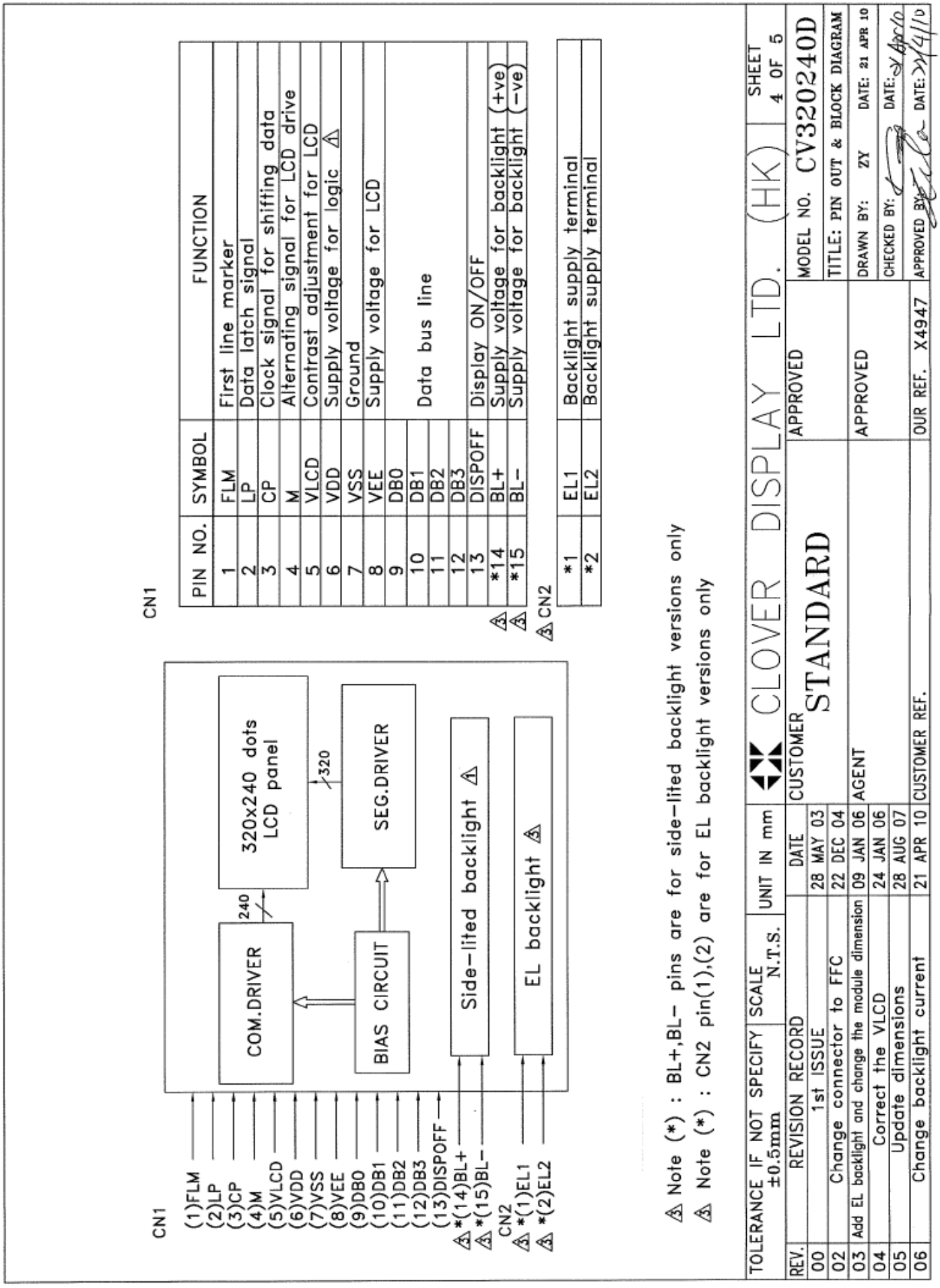
6.1 COUNTER DRAWING OF MODULE DIMENSION (WITH EL BACKLIGHT)



6.2 COUNTER DRAWING OF MODULE DIMENSION (WITH SIDE BACKLIGHT)



6.3 COUNTER DRAWING OF BLOCK DIAGRAM



7. ELECTRICAL CHARACTERISTICS

Conditions: VSS=0V, @Ta=25℃

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.5	5.0	5.5	V
Supply Current	IDD	–	0.19	0.29	mA
Power supply for LCD	VEE	25.0	–	30.0	V
"H"Level Input Voltage	VIH	0.8VDD	–	VDD	V
"L"Level Input Voltage	VIL	0	–	0.2 VDD	V
LCD Contrast Adjustment	V0	22.8	24.0	25.2	V

Side Backlight:

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White Backlight current	I_{BL}	—	102	108	mA	V_{BL} = 3.6V
Blue Backlight current	I_{BL}	—	102	108	mA	V_{BL} = 3.6V

EL Backlight:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Backlight Voltage	V_{EL}	—	100	150	Vrms	Frequency= 400Hz

7.1. 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 7.0	-0.3 to 7.0	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	℃

8. TIMING CHART OF SEGMENT MODE

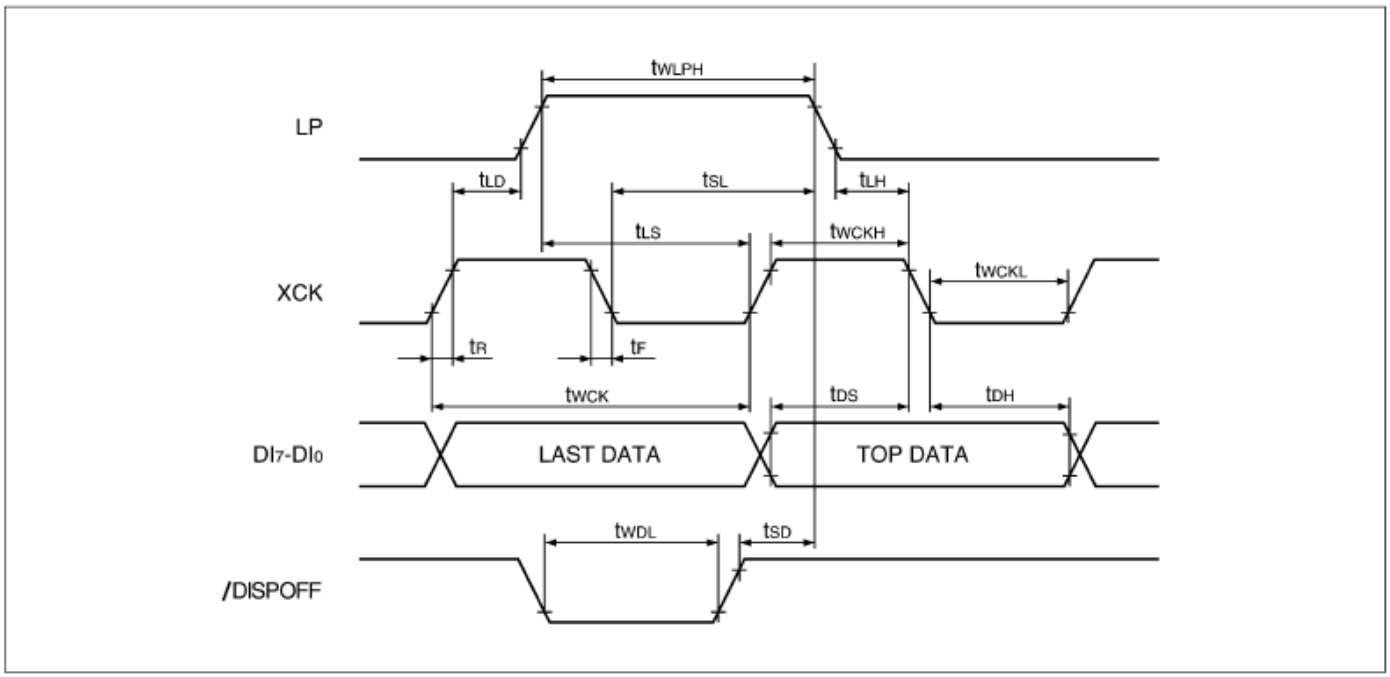


Fig. 6 Timing Characteristics (1)

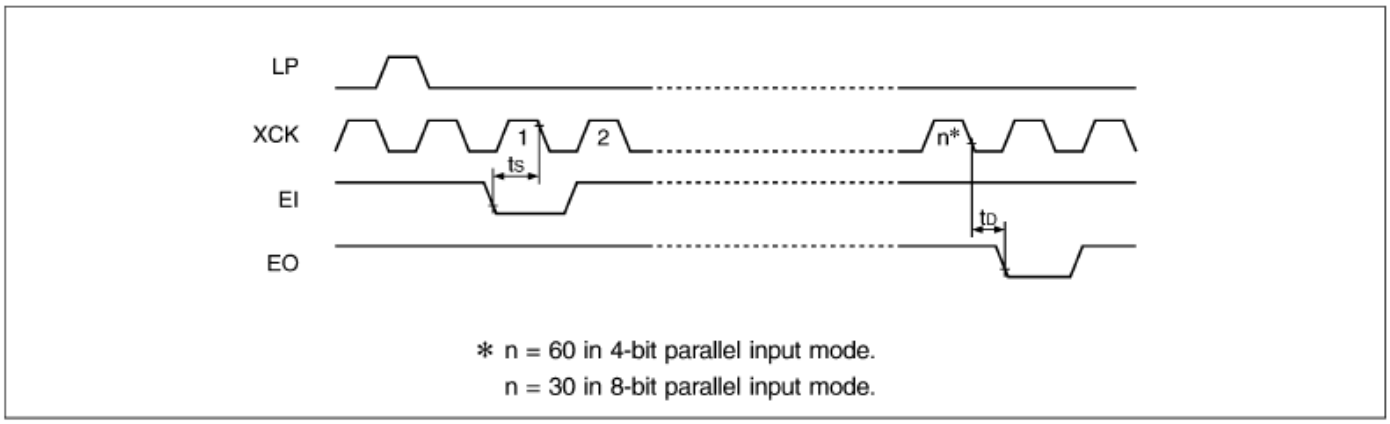


Fig. 7 Timing Characteristics (2)

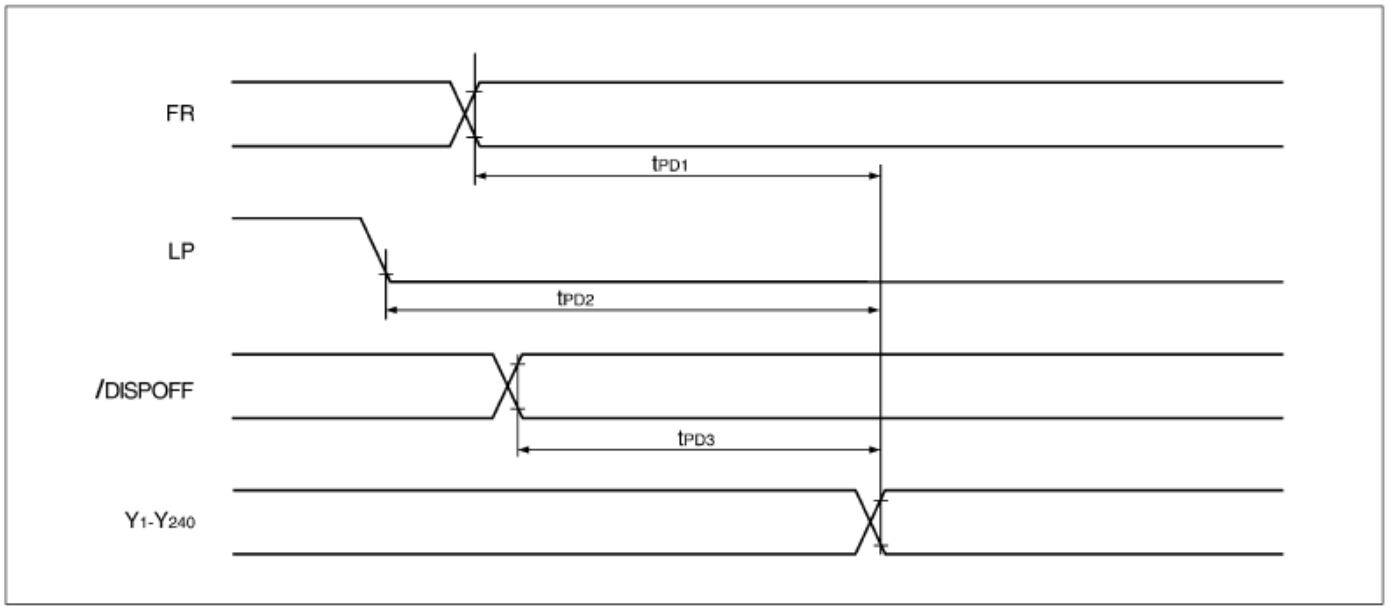
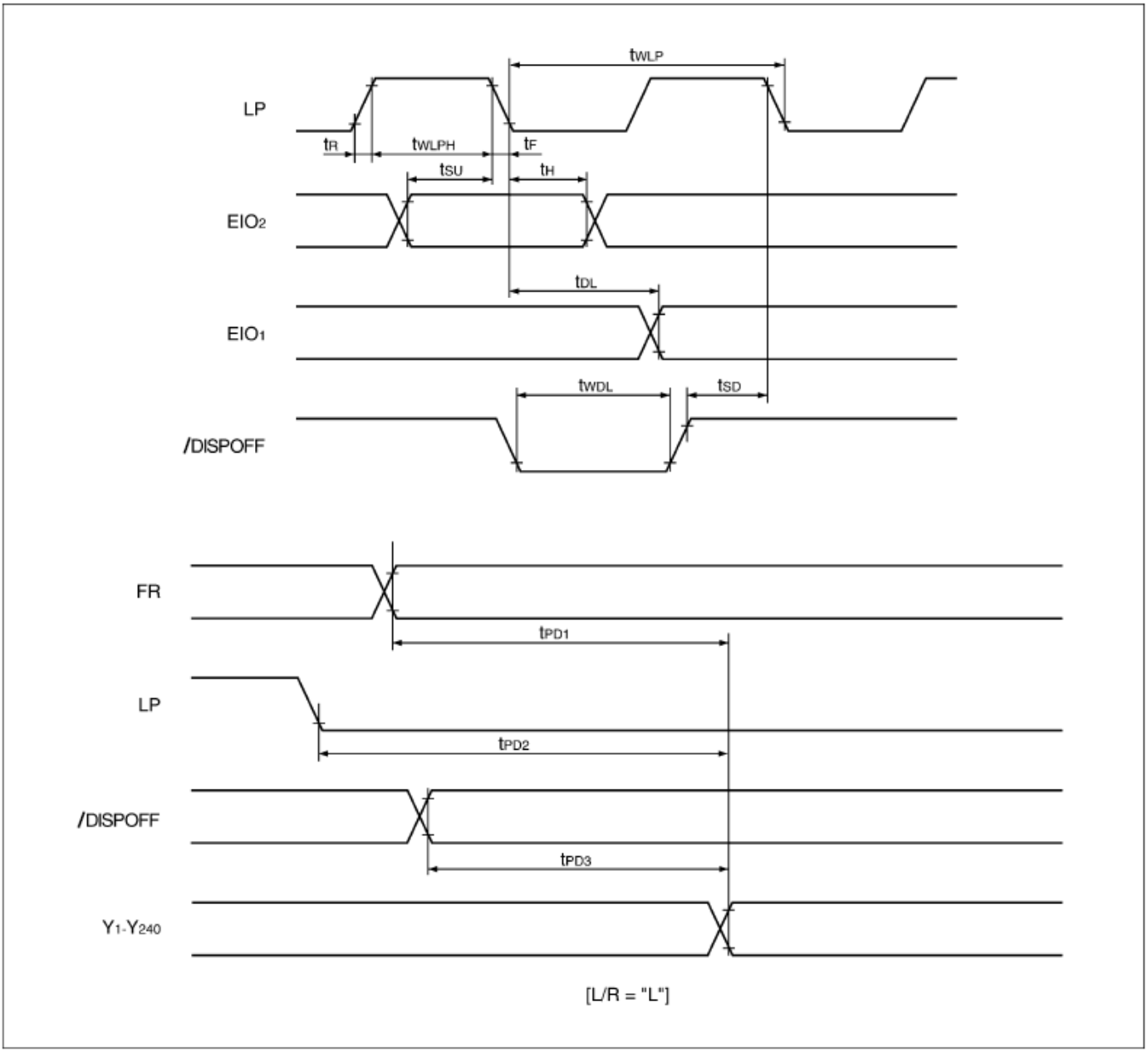


Fig. 8 Timing Characteristics (3)

9. TIMING CHART OF COMMON MODE



10. AC CHARACTERISTICS

(Segment Mode 1) (V_{SS} = V_5 = 0 V, V_{DD} = +5.0 ± 0.5 V, V_0 = +15.0 to +40.0 V, T_{OPR} = -30 to +85 ℃)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Shift clock period	t_{WCK}	t_R, t_F ≤ 10 ns	50			ns	1
Shift clock "H" pulse width	t_{WCKH}		15			ns	
Shift clock "L" pulse width	t_{WCKL}		15			ns	
Data setup time	t_{DS}		10			ns	
Data hold time	t_{DH}		12			ns	
Latch pulse "H" pulse width	t_{WLPH}		15			ns	
Shift clock rise to latch pulse rise time	t_{LD}		0			ns	
Shift clock fall to latch pulse fall time	t_{SL}		30			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	
Enable setup time	t_S		10			ns	
Input signal rise time	t_R				50	ns	2
Input signal fall time	t_F				50	ns	2
/DISPOFF removal time	t_{SD}		100			ns	
/DISPOFF "L" pulse width	t_{WDL}		1.2			µs	
Output delay time (1)	t_D	C_L = 15 pF			30	ns	
Output delay time (2)	t_{PD1}, t_{PD2}	C_L = 15 pF			1.2	µs	
Output delay time (3)	t_{PD3}	C_L = 15 pF			1.2	µs	

NOTES :

1. Takes the cascade connection into consideration.
2. (t_{WCK}- t_{WCKH}- t_{WCKL})/2 is maximum in the case of high speed operation.

(Segment Mode 2) (V_{SS} = V_5 = 0 V, V_{DD} = +3.0 to +4.5 V, V_0 = +15.0 to +40.0 V, T_{OPR} = -30 to +85 ℃)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Shift clock period	t_{WCK}	t_R, t_F ≤ 10 ns	66			ns	1
Shift clock "H" pulse width	t_{WCKH}		23			ns	
Shift clock "L" pulse width	t_{WCKL}		23			ns	
Data setup time	t_{DS}		15			ns	
Data hold time	t_{DH}		23			ns	
Latch pulse "H" pulse width	t_{WLPH}		30			ns	
Shift clock rise to latch pulse rise time	t_{LD}		0			ns	
Shift clock fall to latch pulse fall time	t_{SL}		50			ns	
Latch pulse rise to shift clock rise time	t_{LS}		30			ns	
Latch pulse fall to shift clock fall time	t_{LH}		30			ns	
Enable setup time	t_S		15			ns	
Input signal rise time	t_R				50	ns	2
Input signal fall time	t_F				50	ns	2
/DISPOFF removal time	t_{SD}		100			ns	
/DISPOFF "L" pulse width	t_{WDL}		1.2			µs	
Output delay time (1)	t_D	C_L= 15 pF			41	ns	
Output delay time (2)	t_{PD1}, t_{PD2}	C_L= 15 pF			1.2	µs	
Output delay time (3)	t_{PD3}	C_L= 15 pF			1.2	µs	

NOTES :

3. Takes the cascade connection into consideration.
4. (t_{WCK}- t_{WCKH}- t_{WCKL})/2 is maximum in the case of high speed operation.

(Segment Mode 3) (V_{SS} = V_5 = 0 V, V_{DD} = +2.5 to +3.0 V, V_0 = +15.0 to +40.0 V, T_{OPR} = -30 to +85 ℃)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Shift clock period	t_{WCK}	t_R, t_F ≤ 10 ns	82			ns	1
Shift clock "H" pulse width	t_{WCKH}		28			ns	
Shift clock "L" pulse width	t_{WCKL}		28			ns	
Data setup time	t_{DS}		20			ns	
Data hold time	t_{DH}		23			ns	
Latch pulse "H" pulse width	t_{WLPH}		30			ns	
Shift clock rise to latch pulse rise time	t_{LD}		0			ns	
Shift clock fall to latch pulse fall time	t_{SL}		65			ns	
Latch pulse rise to shift clock rise time	t_{LS}		30			ns	
Latch pulse fall to shift clock fall time	t_{LH}		30			ns	
Enable setup time	t_S		15			ns	
Input signal rise time	t_R				50	ns	2
Input signal fall time	t_F				50	ns	2
/DISPOFF removal time	t_{SD}		100			ns	
/DISPOFF "L" pulse width	t_{WDL}		1.2			μs	
Output delay time (1)	t_D	C_L= 15 pF			57	ns	
Output delay time (2)	t_{PD1}, t_{PD2}	C_L= 15 pF			1.2	μs	
Output delay time (3)	t_{PD3}	C_L= 15 pF			1.2	μs	

NOTES :

5. Takes the cascade connection into consideration.
6. (t_{WCK}- t_{WCKH}- t_{WCKL})/2 is maximum in the case of high speed operation.

11. ELECTRO-OPTICAL CHARACTERISTICS

MEASURING CONDITION: POWER SUPPLY = V_{OP} / 64 Hz
TEMPERATURE = 23 ± 5 °C
RELATIVE HUMIDITY = 60 ± 20 %

ITEM	SYMBOL	UNIT	TYP.
RESPONSE TIME	Ton	ms	370
	Toff	ms	470
CONTRAST RATIO	Cr	-	7
VIEWING ANGLE (6 O'clock) (Cr ≥ 2)	$V_{3:00}$	°	40
	$V_{6:00}$	°	50
	$V_{9:00}$	°	40
	$V_{12:00}$	°	30

THE ELECTRO-OPTICAL CHARACTERISTICS ARE MEASURED VALUE BUT NOT GUARANTEED ONES.

12. 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	—

13. 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 V0.

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 leak 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.