

晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AT-240160B (Pure Driver)
APPROVED BY	
DATE	

AMPIRE CO., LTD.

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RECORD OF REVISION

Revision Date	Contents	Editor
2006/9/6	New Release	Tony

1 FEATURES

- (1) Display format : 240 × 160 dot-matrix
- (2) Construction : FSTN LCD, TAB type driver IC and PCB
- (3) Option : EL back-light, EL driver, Touch Panel.
- (4) Common driver is LH1560F3 and Segment is LH1562F4.
- (5) Built-in M signal circuit.
- (6) 5V or 3.3V single power input. Built-in DC/DC converter for LCD driving. (Special order if not need the DC/DC converter)
- (7) Normal / Extended temperature type.
- (8) Landscape or Portrait Display Type selectable by Jumper Setting (Default : Landscape)

2 NUMBERING SYSTEM

AT-240160B _ _ _ _ - _ - _
1 2 3 4 5 6

No	Code Value	Description	Remark
1	F	FSTN type LCD	LCD Type
2	A	Reflective type / 6:00 view	Polarizer / Viewing Angel
	B	Reflective type / 12:00 view	
	I	Transflective type / 6:00 view	
	J	Transflective type / 12:00 view	
	T	Negative type / 6:00 view	
	U	Negative type / 12:00 view	
3	None	Without backlight	Backlight type
	E	EL	
4	None	Without backlight	Backlight color
	B	Blue	
	W	White	
5	50	None	EL driver & Touch Panel option
	52	With EL driver	
	T50	With Touch Panel	
	T52	With EL driver & Touch Panel	
6	None	Normal temperature type	LCM temperature type
	H	Extended temperature type	

3 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.225(W) × 0.225(H)	mm
Dot pitch	0.24(W) × 0.24(H)	mm
Viewing area	67.6(W) × 47.5(H)	mm
Module size	74.6(W) × 54.9(H) × 7.0 max (T)	mm
Module size (EL back-light)	74.6(W) × 54.9(H) × 7.6 max (T)	mm
Module size (w/ Touch panel)	74.6(W) × 54.9(H) × 8.5 max (T)	mm

4 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Min	Max	Unit
Logic Circuit Supply Voltage		VDD-VSS	-0.3	7.0	V
LCD Driving Voltage		VADJ-VSS	-0.3	26.0	V
Input Voltage		Vi	-0.3	VDD+0.3	V
Normal temp. type	Operating Temp.	TOP	0	50	°C
	Storage Temp.	TSTG	-20	70	°C
Extended temp. type	Operating Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

5 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.7	--	5.5	V	
LCD Driving Voltage	VADJ-VSS	25°C	--	19.5	--	V	
Input Voltage	VIH	--	0.8 VDD	--	VDD	V	
	VIL	--	VSS	--	0.2 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	20	--	mA	
Supply Current for EL driver		VDD = 5V	--	40	--	mA	
----- Optical Characteristics -----							
Contrast	CR	25°C	4.19	4.28	4.33		Note 1
Rise Time	Tr	25°C	216	242	269	ms	Note 2
Fall Time	Tf	25°C	95	113	125	ms	
Viewing Angle Range	θ1	25°C & CR≥2	37	37	38	Deg.	Note 3
	θ2		30	30	30		
	φ1		37	38	40		
	φ2		35	37	39		
Frame Frequency	fF	25°C	--	64	--	Hz	

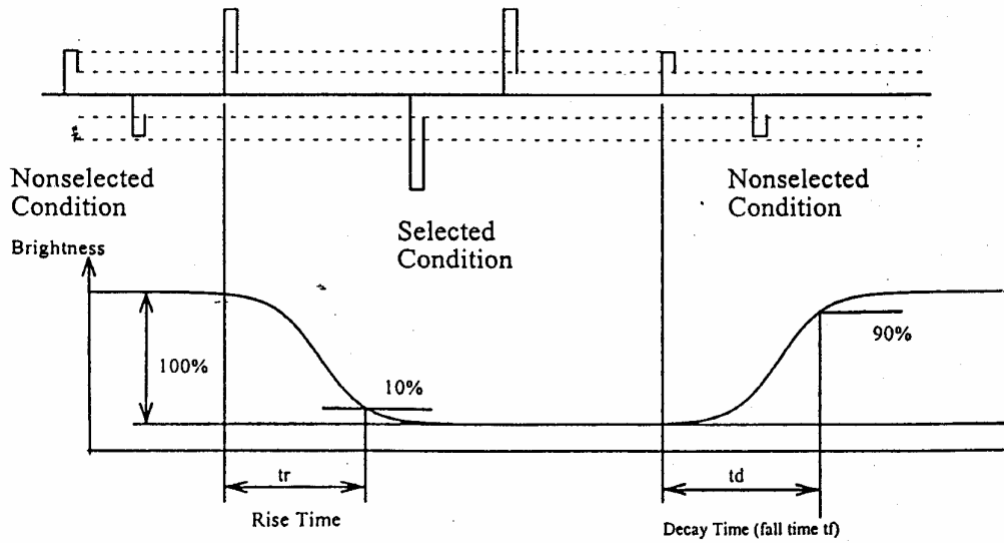
5.1 EL Back-light Electrical Specification

Parameter	Specification	Unit
Color	Blue / White	-
Voltage	Vrms = 60	V(AC)
Frequency	Sine Wave = 380	Hz
Current Density	0.12	mA / cm ²
Bare EL Initial Brightness	15	cd / m ²
LCM Initial Brightness	5	cd / m ²

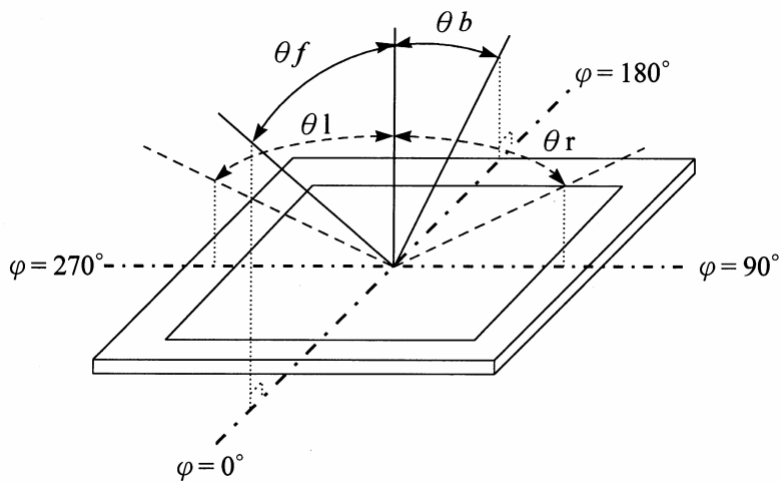
(NOTE 1) Contrast ratio :

CR = (Brightness in OFF state) / (Brightness in ON state)

(NOTE 2) Response time :



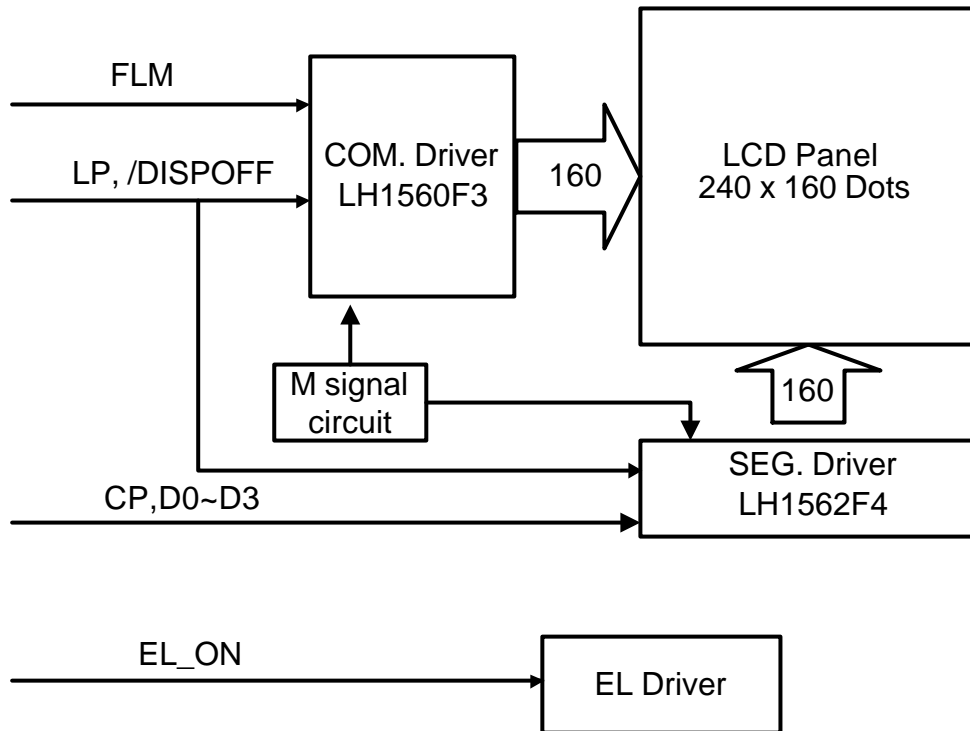
(NOTE 3) Viewing angle



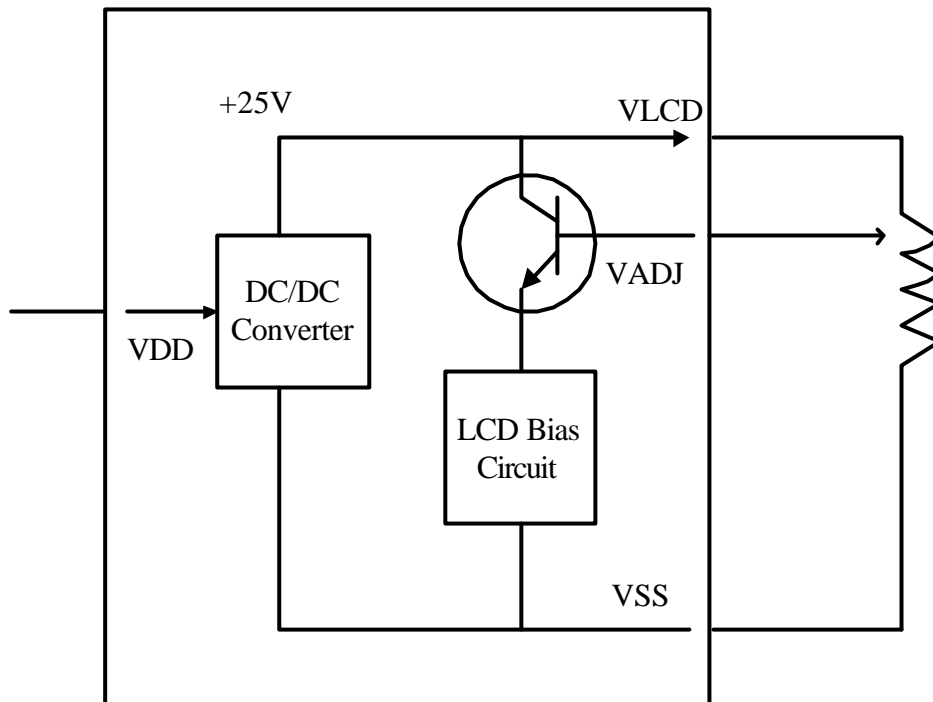
5.2 Touch Panel Electrical Specification

Parameter	Specification	Condition
ON Resistance	351 Ω ~ 702 Ω	X Axis
	154 Ω ~ 893 Ω	Y Axis
Insulating Resistance	More than 20M Ω	DC 25 V
Chattering	Less Than 10 ms	DC 5V, Load of resistance(1mA), switching Time 2m/sec
Endurable Voltage	25 V for 1 min	

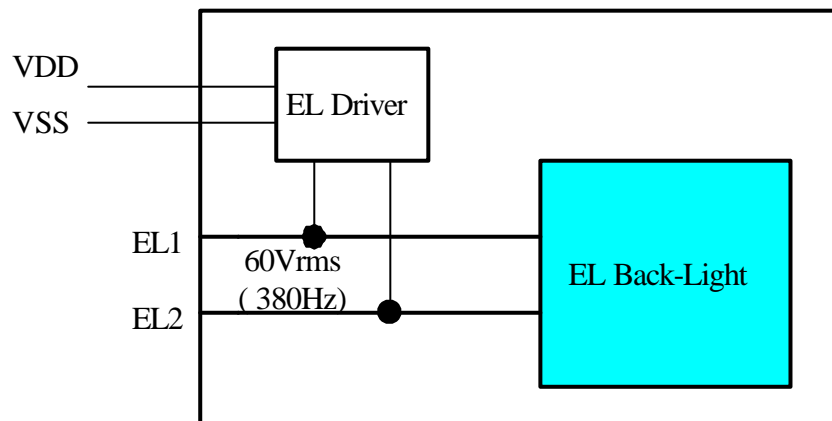
6 BLOCK DIAGRAM



7 POWER SUPPLY CIRCUIT



While using EL back-light



8 INTERFACE DEFINITION

CN1: Interface of pure driver

PIN NO.	SIGNAL	LEVEL	FUNCTION
1~4	D0~D3	H/L	Data Input(4 bits)
5	/DISPOFF	H/L	H: Display ON(default) L: Display OFF
6	FLM	H/L	First Line Marker
7	NC (M)	--	No Connection (M signal input while not built-in M signal circuit)
8	LP	H/L	Data Latch Signal
9	CP	H/L	Clock Signal
10	VDD	-	Power Supply for Logic(+5V)
11	VSS	-	Power Supply(Ground:0V)
12	VLCD	-	Positive voltage output (+25V)
13	VADJ		Contrast Adjustment Input (VADJ-VSS = LCD driving voltage)
14	EL_ON	H/L	EL On/Off Signal; H: EL On L: EL Off
15	Y1	-	Touch Panel Upper Signal in Y Axis
16	X2	-	Touch Panel Right Signal in X Axis
17	Y2	-	Touch Panel Lower Signal in Y Axis
18	X1	-	Touch Panel Left Signal in X Axis
19,20	NC / EL1,EL2	--	No Connection(default) / EL power supply for choosing no built-in EL driver

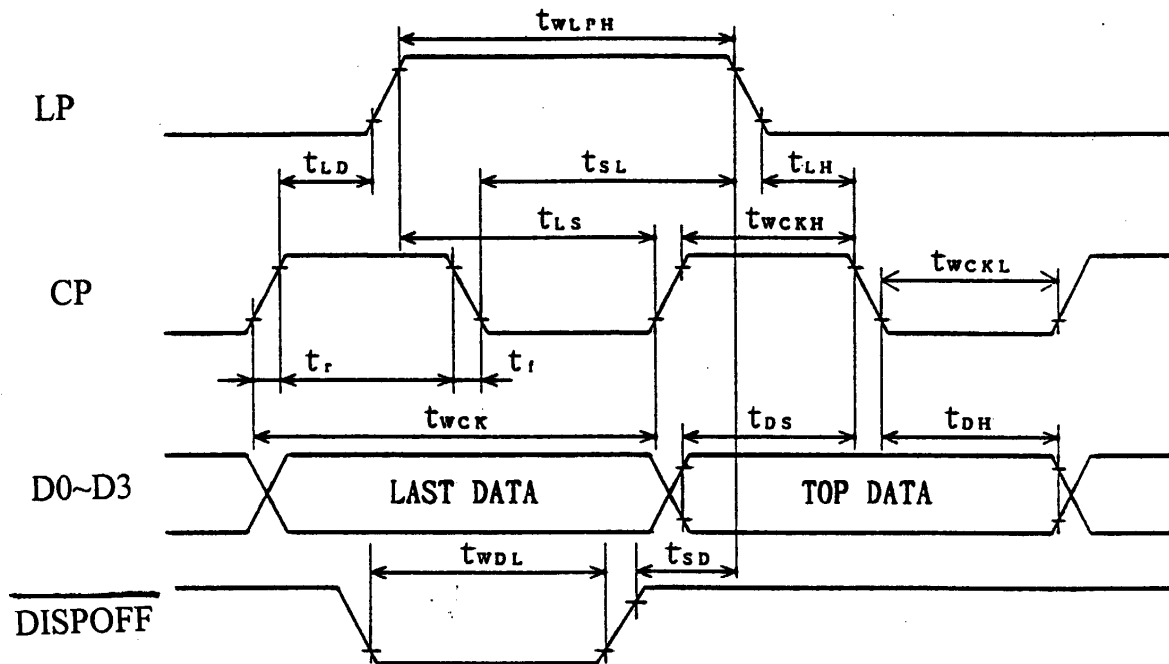
CN2: LCM with Built-In Controller(* No Use in this LCM)

PIN NO.	SIGNAL	LEVEL	FUNCTION
1-24	NC	--	No Connection

CN3: Inter-connection of Touch Panel

PIN NO.	SIGNAL	LEVEL	FUNCTION
1	Y1	-	Touch Panel Upper Signal in Y Axis
2	X2	-	Touch Panel Right Signal in X Axis
3	Y2	-	Touch Panel Lower Signal in Y Axis
4	X1	-	Touch Panel Left Signal in X Axis

9 TIMING CHARACTERISTICS



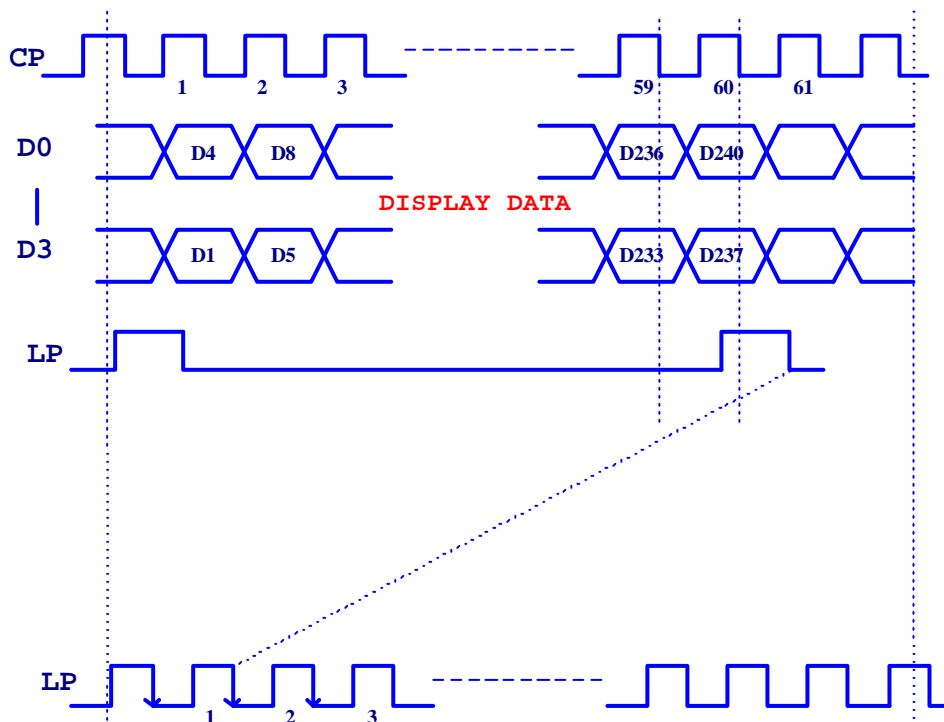
VDD = 4.5V to 5.5V

Parameter	Symbol	Condition	Min	Max	Unit
Shift Clock Period	t_{wck}	$T_r, T_f \leq 10\text{ns}$	50		ns
Clock Width "H" Pulse Width	t_{wckH}		15		ns
Clock Width "L" Pulse Width	t_{wckL}		15		ns
Data Set Up Time	t_{DS}		10		ns
Data Hold Time	t_{DH}		12		ns
Latch Pulse "H" Pulse Width	t_{WLPH}		15		ns
Shift Clock to Latch Pulse Rise Time	t_{LD}		0		ns
Shift Clock to Latch Pulse Fall Time	t_{SL}		30		ns
Latch Pulse to Shift Clock Rise Time	t_{LS}		25		ns
Latch Pulse to Shift Clock Fall Time	t_{LH}		25		ns
Input Signal Rise/Fall Time	t_r, t_f			50	ns
/DISPOFF Removal Time	t_{SD}		100		ns
/DISPOFF "L" Pulse Width	t_{WDL}		1.2		ns

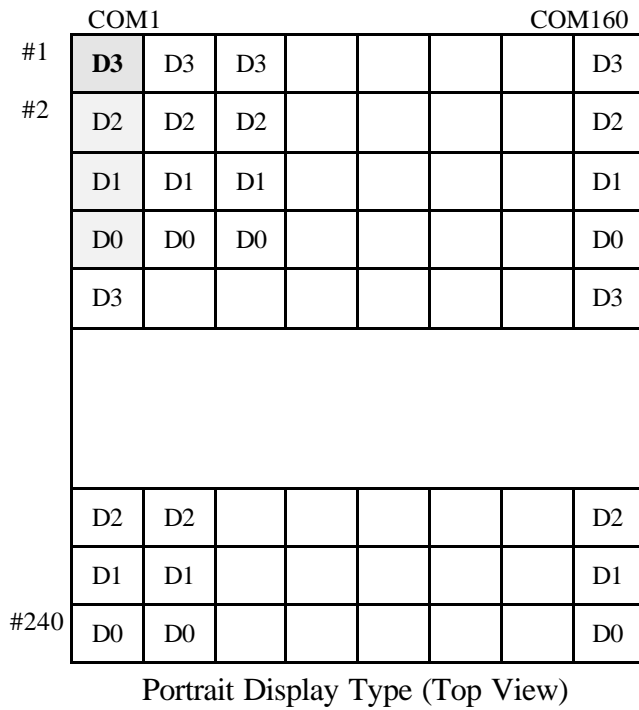
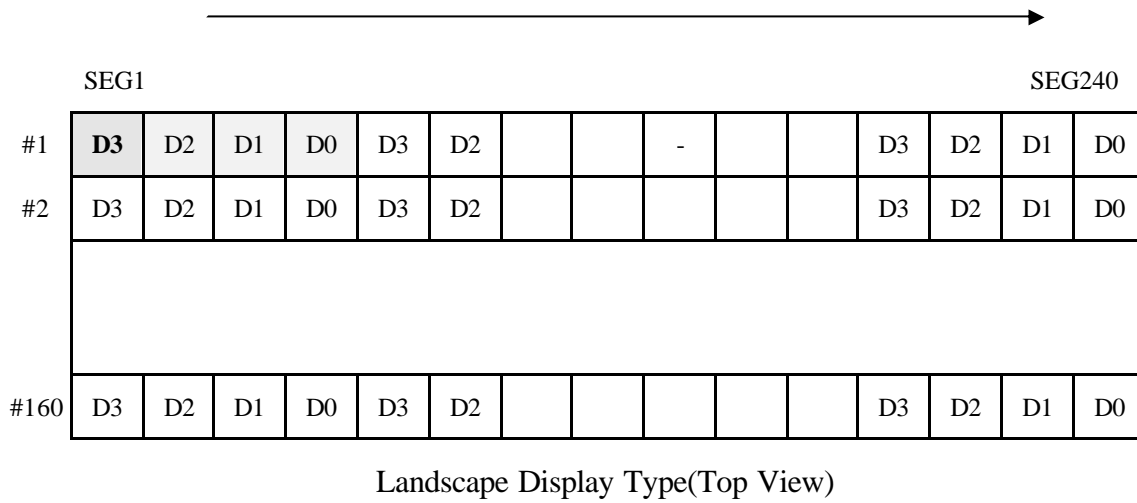
VDD = 3.0V to 4.5V

Parameter	Symbol	Condition	Min	Max	Unit
Shift Clock Period	twCK	Tr, Tf ≤ 10ns	66		ns
Clock Width "H" Pulse Width	twCKH		23		ns
Clock Width "L" Pulse Width	twCKL		23		ns
Data Set Up Time	tDS		15		ns
Data Hold Time	tDH		23		ns
Latch Pulse "H" Pulse Width	twLPH		30		ns
Shift Clock to Latch Pulse Rise Time	tLD		0		ns
Shift Clock to Latch Pulse Fall Time	tSL		50		ns
Latch Pulse to Shift Clock Rise Time	tLS		30		ns
Latch Pulse to Shift Clock Fall Time	tLH		30		ns
Input Signal Rise/Fall Time	tr,tf			50	ns
/DISPOFF Removal Time	tSD		100		ns
/DISPOFF "L" Pulse Width	twDL		1.2		ns

9.1 Controller Interface Timing Chart

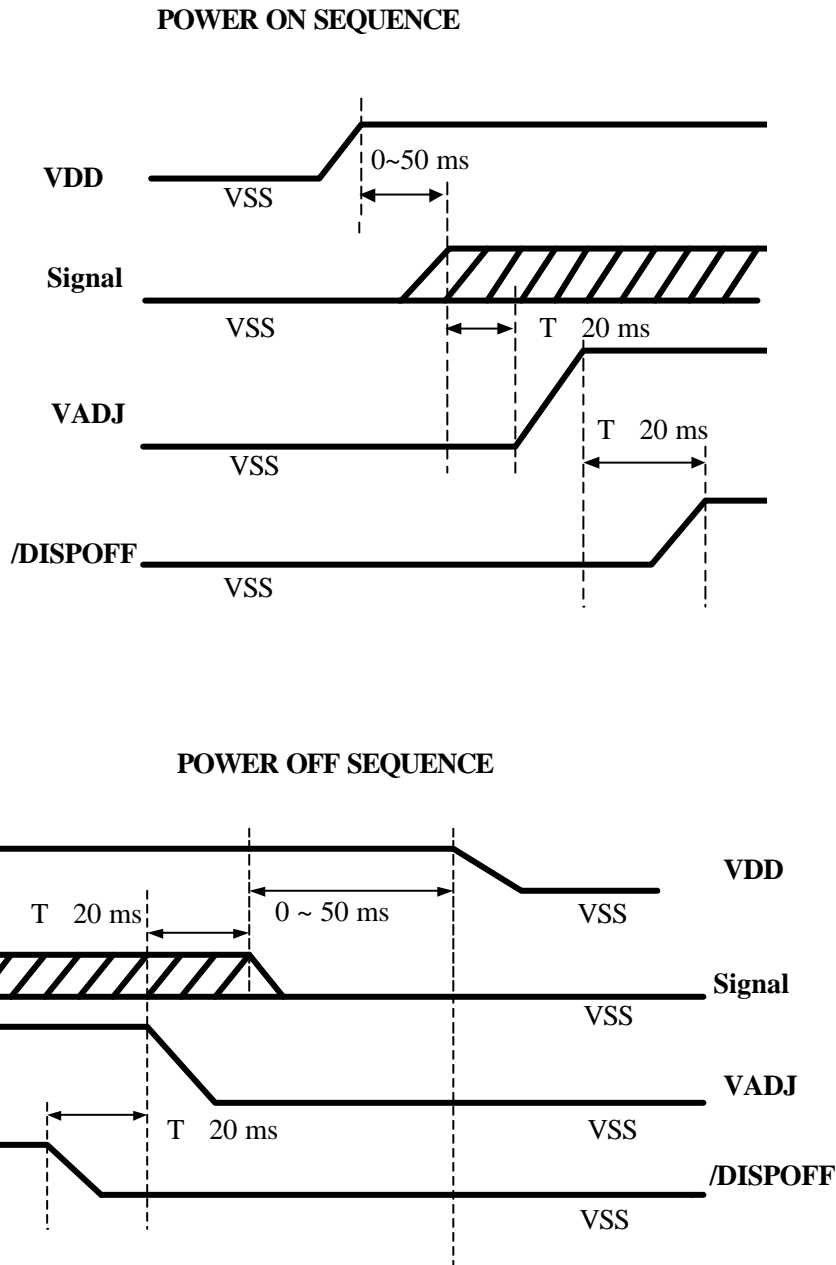


9.2 Display Data Format



9.3 Power ON/OFF Sequence

Please maintain the below sequence when turning on and off the power supply of the module. If /DISPOFF is supplied to the module while internal alter signal for LCD driving (M) is unstable, DC component will be supplied to the LCD panel. This may cause damage the LCD module.



10 JUMPER SETTING

Item	Option	Jumper Setting	Remark
Display Type	Landscape (default)	Pin 1,2 short on JP1&JP2	
	Portrait	Pin 2,3 short on JP1&JP2	
EL driver	Built-in (default)	Pin 1,2 short on EL-JP1 & EL-JP2	Pin 19,20 are NC on CN2
	Choosing not built-in	Pin 2,3 short on EL-JP1 & EL-JP2	Pin 19,20 are EL1,EL2 on CN2

11 QUALITY AND RELIABILITY

11.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : 25 \pm 5°C

Humidity : 60 \pm 5% RH.

11.2 SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

11.3 ACCEPTABLE QUALITY LEVEL

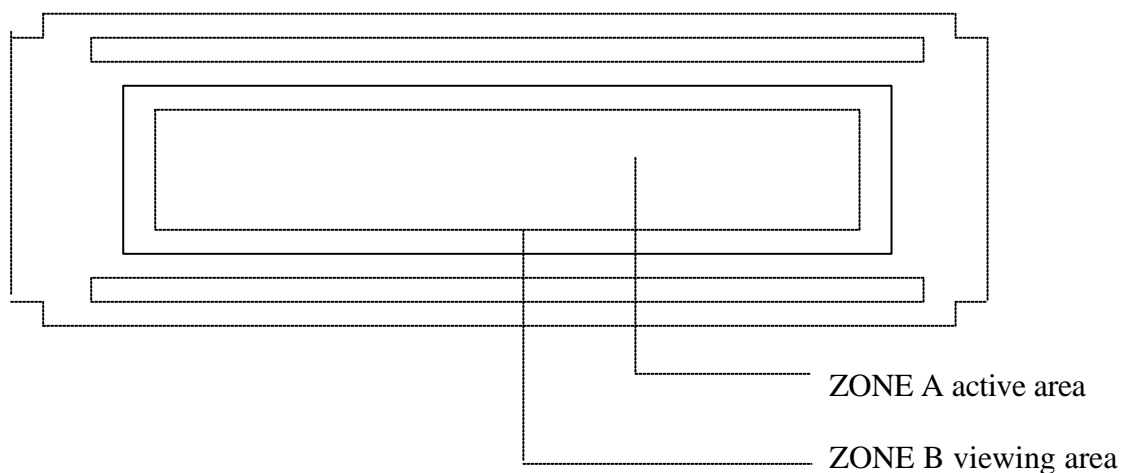
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

11.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under flourescent light. The inspection area of LCD panel shall be within the range of following limits.

11.5 INSPECTION QUALITY CRITERIA

Item	Description of defects			Class of Defects	Acceptable level (%)
Function	Short circuit or Pattern cut			Major	0.65
Dimension	Deviation from drawings			Major	1.5
Black spots	Ave . dia . D	area A	area B	Minor	2.5
	D ≤ 0.2	Disregard			
	0.2 < D ≤ 0.3	3	4		
	0.3 < D ≤ 0.4	2	3		
	0.4 < D	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	W ≤ 0.03	disregard			
	0.03 < W ≤ 0.05	3	4		
	0.05 < W ≤ 0.07 , L ≤ 3.0	1	1		
	See line criteria				
Bubbles in polarizer	Average diameter D 0.2 < D < 0.5 mm for N = 4 , D > 0.5 for N = 1			Minor	2.5
Color uniformity	Rainbow color or newton ring.			Minor	2.5
Glass Scratches	Obvious visible damage.			Minor	2.5
Viewing angle	See note 3			Minor	2.5
Contrast ratio	See note 1			Minor	2.5
Response time	See note 2			Minor	2.5



11.6 RELIABILITY

Test Item	Test Conditions		Note
	Normal Temp. type	Extended Temp. type	
High Temperature Operation	50±3°C , t=96 hrs	70±3°C , t=96 hrs	
Low Temperature Operation	0±3°C , t=96 hrs	-20±3°C , t=96 hrs	
High Temperature Storage	70±3°C , t=96 hrs	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	-30±3°C , t=96 hrs	1,2
Temperature Cycle	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	-30°C ~ 25°C ~ 80°C 30 min. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs		1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis		2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

12 HANDLING PRECAUTIONS

- (1) A LCD module is a fragile item and should not be subjected to strong mechanical shocks.
- (2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in color.
- (3) Under no circumstances should the position of the bezel tabs or their shape be modified.
- (4) Do not modify the display PCB in either shape or positioning of components.
- (5) Do not modify or move location of the zebra or heat seal connectors.
- (6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.
- (7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.
- (8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketone or aromatic is not permitted.
- (9) Prior to initial power up input signals should not be applied.
- (10) Protect the module against static electricity and observe appropriate anti-static precautions.

13 OUTLINE DIMENSION

