



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-240160DFIEW-50
APPROVED BY	
DATE	

AMPIRE CO., LTD.

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RECORD OF REVISION

Revision Date	Contents	Editor
2004/7/6	New Release	Rosaline

1 FEATURES

- (1) Display format : 240 × 160 dot-matrix
- (2) Construction : LCD, TAB IC ,White EL backlight, .and FPC.
- (3) Display type : FSTN , Transfletive .
- (4) Common driver is NT7701 and Segment is NT7702.
- (5) 5V or 3.3V for driver IC. LCD bias voltage is supplied by end user.
- (6) Normal temperature type.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.23(W) × 0.23(H)	mm
Dot pitch	0.24(W) × 0.24(H)	mm
Viewing area	61.6(W) × 42.5(H)	mm
Module size	83.8(W) × 56.2(H) × 4.0 max (T)	mm

3 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Logic Circuit Supply Voltage	VDD-VSS	-0.3	7.0	V
LCD Driving Voltage	VDD-VO	-0.3	26.0	V
Input Voltage	VI	-0.3	VDD+0.3	V
Operating Temp.	TOP	0	50	°C
Storage Temp.	TSTG	-20	70	°C

4 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	V0-VSS	0°C	--	20.2	--	V	
		25°C	--	19.5	--	V	
		50°C	--	18.8	--	V	
Input Voltage	VIH	--	0.8 VDD	--	VDD	V	
	VIL	--	VSS	--	0.2 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	2	--	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	θ f	25°C & CR≥2	37	37	38	Deg.	Note 3
	θ b		30	30	30		
	θ l		37	38	40		
	θ r		35	37	39		
Frame Frequency	fF	25°C	--	64	--	Hz	

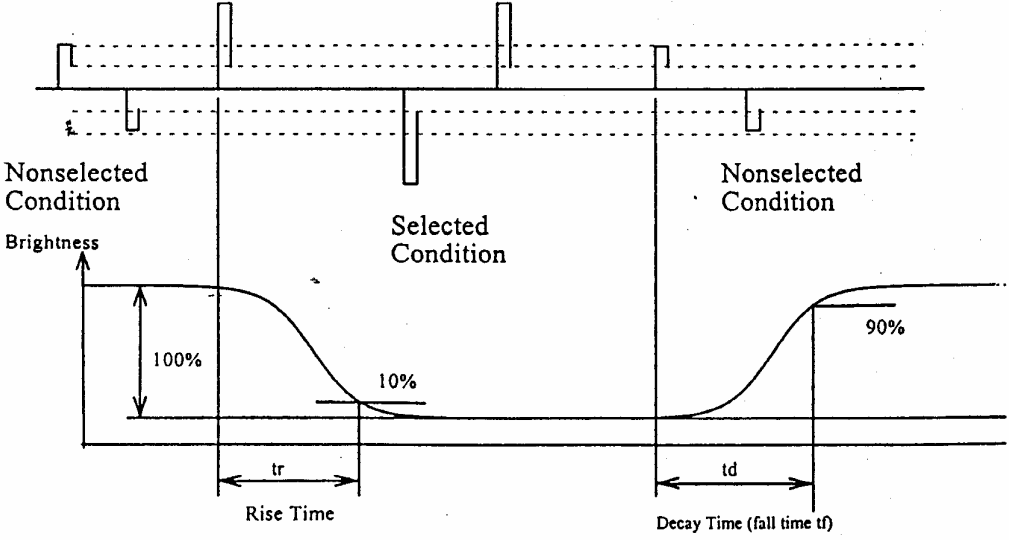
4.1 EL Back-light Electrical Specification

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

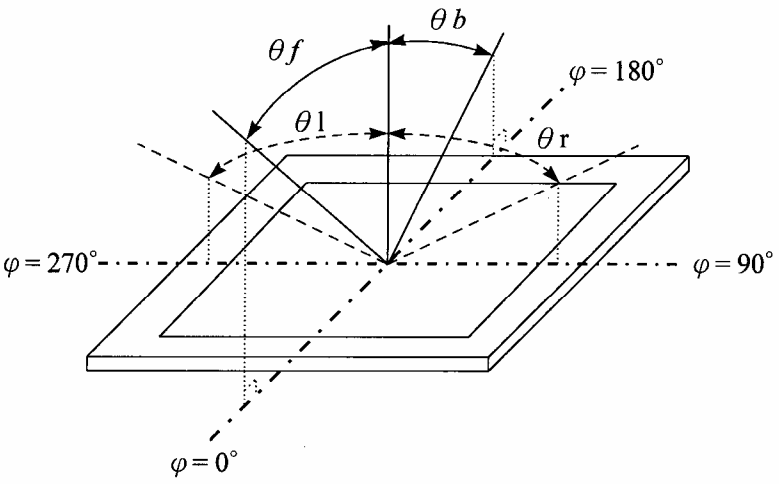
(NOTE 1) Contrast ratio :

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

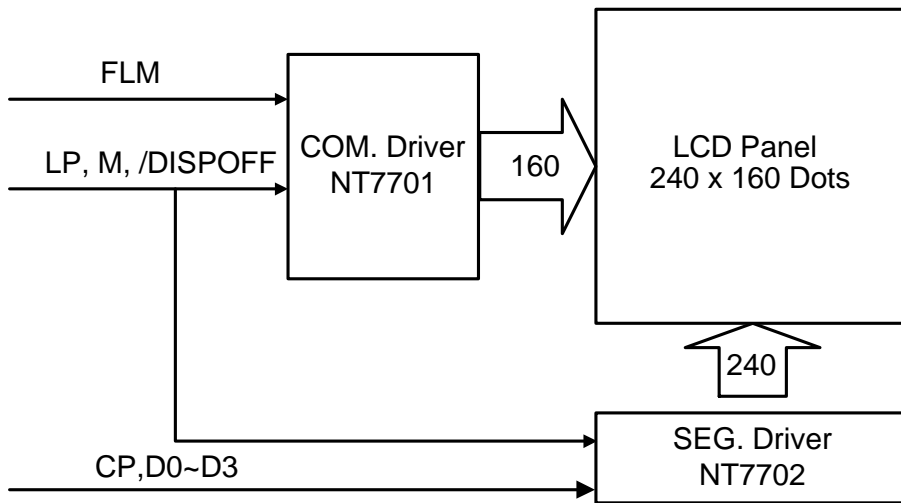
(NOTE 2) Response time :



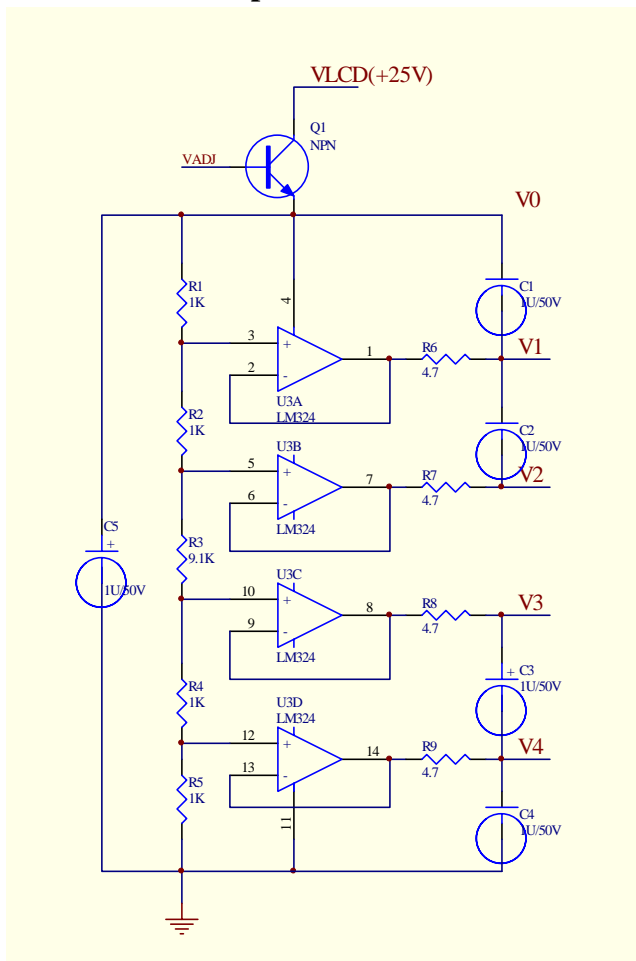
(NOTE 3) Viewing angle



BLOCK DIAGRAM



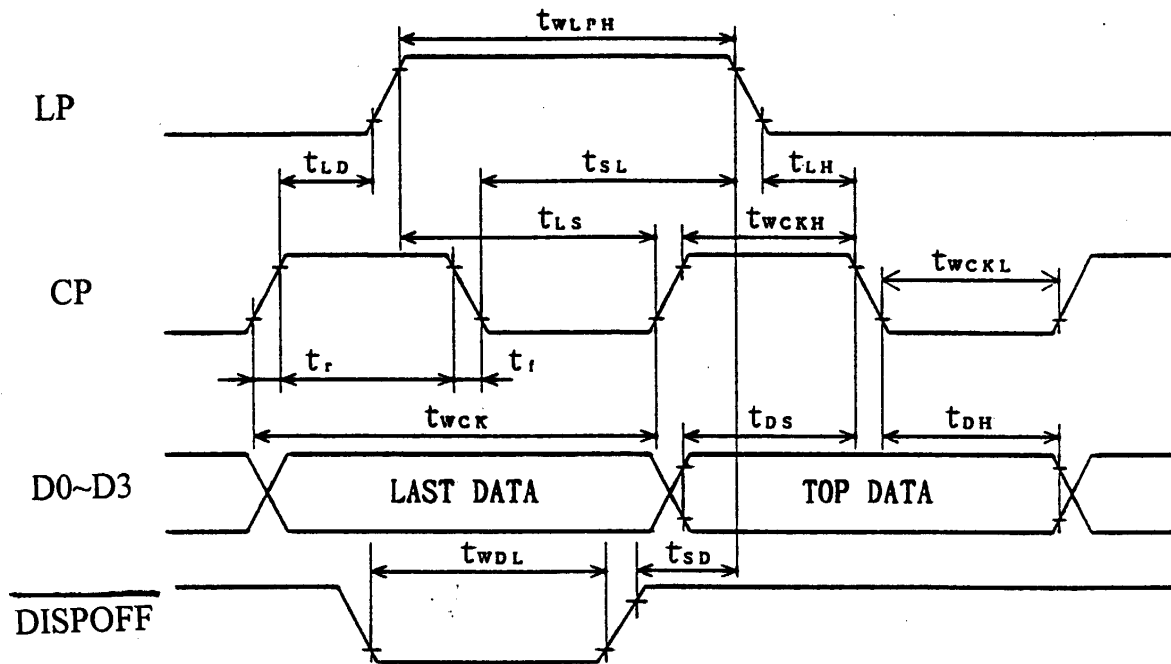
Bias Circuit example:



5 PIN CONNECTIONS

No.	Symbol	Function
1	NC	No Connection
2-5	D0-D3	Data Bus Line
6	V2	Power Supply for LCD driving voltage bias
7	V3	Power Supply for LCD driving voltage bias
8	CP	Data Shift Clock
9	/DISPOFF	Display Off Control
10	M	AC signal for LCD driver output
11	VSS	Ground (0V)
12	LP	Data Latch Clock
13	VSS	Ground (0V)
14	FLM	First Line Marker
15	VDD	Supply Voltage for Logic (+5V)
16	V0	Power Supply for LCD driving voltage bias
17	V1	Power Supply for LCD driving voltage bias
18	V4	Power Supply for LCD driving voltage bias

6 TIMING CHARACTERISTICS



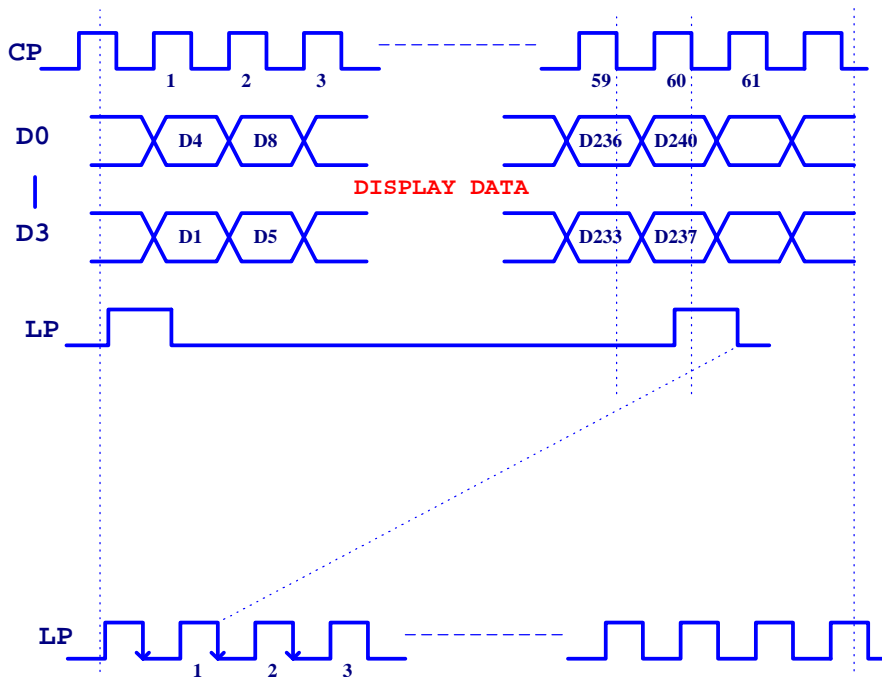
VDD = 4.5V to 5.5V

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

6.1 Controller Interface Timing Chart



7 QUALITY AND RELIABILITY

7.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $60 \pm 25\% \text{ RH}$.

7.2 SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E, inspection level II, normal inspection, and single sampling plan tables for normal, tightened, and reduced inspection.

7.3 ACCEPTABLE QUALITY LEVEL

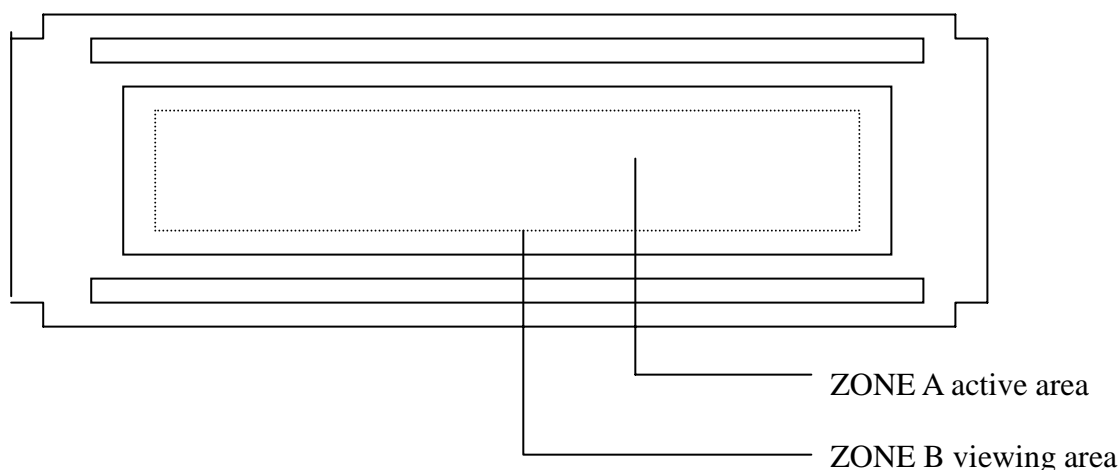
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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

7.4 APPEARANCE

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

7.5 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
	$D \leq 0.2$	Disregard			
	$0.2 < D \leq 0.3$	3	4		
	$0.3 < D \leq 0.4$	2	3		
	$0.4 < D$	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	$W \leq 0.03$	disregard			
	$0.03 < W \leq 0.05$	3	4		
	$0.05 < W \leq 0.07, L \leq 3.0$	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
Contrast ratio	See note 1			Minor	2.5
Response time	See note 2			Minor	2.5
Viewing angle	See note 3			Minor	2.5



7.6 RELIABILITY

Test Item	Test Conditions	Note
High Temperature Operation	50 ± 3°C , t=96 hrs	
Low Temperature Operation	0 ± 3°C , t=96 hrs	
High Temperature Storage	70 ± 3°C , t=96 hrs	1,2
Low Temperature Storage	-20 ± 3°C , t=96 hrs	1,2
Humidity Test	40°C , Humidity 90% , 96 hrs	1,2
Thermal Shock Test	-20°C (30 min.) ~ 25°C (5 min.) ~ 70°C (30 min.) (1 cycle) Total 5 cycle	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.

8 HANDLING PRECAUTIONS

- (1) An 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 colour.
- (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.

9 OUTLINE DIMENSION

