Winstar Display Co., LTD

CUSTOMER		
MODEL	**WG320240D-FMC-N**	
APPROVAL	**BY:**	**DATE: 30.5.2001**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

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Contents

1.Module Classification Information

WG 320240 D－FMC－N

①② ③ ④ ⑤⑥⑦ ⑧

① Brand：WINSTAR DISPLAY CORPORATION

② Display Type：H→Character Type, G→Graphic Type

③ Display Font：320 * 240 Dots

④ Model serials number

⑤ Backlight Type：

	N→Without backlight	
	B→EL, Blue green	A→LED, Amber
	D→EL, Green	R→LED, Red
	W→EL, White	O→LED, Orange
	F→CCFL, White	G→LED, Green
	Y→LED, Yellow Green	

⑥ LCD Mode：

B→TN Positive, Gray	T→FSTN Negative
N→TN Negative,	
G→STN Positive, Gray	
Y→STN Positive, Yellow Green	
M→STN Negative, Blue	
F→FSTN Positive	

⑦ LCD Polarize Type/ Temperature range/ View direction

A→Reflective, N.T, 6:00	H→Transflective, W.T,6:00
D→Reflective, N.T, 12:00	K→Transflective, W.T,12:00
G→Reflective, W. T, 6:00	C→Transmissive, N.T,6:00
J→Reflective, W. T, 12:00	F→Transmissive, N.T,12:00
B→Transflective, N.T,6:00	I→Transmissive, W. T, 6:00
E→Transflective, N.T.12:00	L→Transmissive, W.T,12:00

⑧ Special Code N: Without builtin Negative Voltage

2.Precautions in Use of LCD Module

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD Module.

(3)Don't disassemble the LCM.

(4)Don't operate it above the absolute maximum rating.

(5)Don't drop, bend or twist LCM.

(6)Soldering: only to the I/O terminals.

(7)Storage: please storage in anti-static electricity container and clean environment.

3.General Specification

ITEM	STANDARD VALUE	UNIT
Number of dots	320x240	dots
Outline dimension	156.7(W)x 98.0(H)x 11.4max(T)	mm
View area	106.0(W)x 80.6(H)	mm
Active area	95.98(W)x 71.98(H)	mm
Dot size	0.27(W)x 0.27(H)	mm
Dot pitch	0.3(W)x 0.3(H)	mm
LCD type	STN ,negative, blue, transmissive	
View direction	6 o'clock	
Backlight	CCFL	

4.Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Temperature	T_{OP}	0	—	+50	℃
Storage Temperature	T_{ST}	-10	—	+60	℃
Input Voltage	V_I	0	—	V_{DD}	V
Supply Voltage For Logic	V_{DD}	0	—	6.5	V
Supply Voltage For LCD	V_{DD}-V_{EE}	0	—	32	V

5.Electrical Characteristics

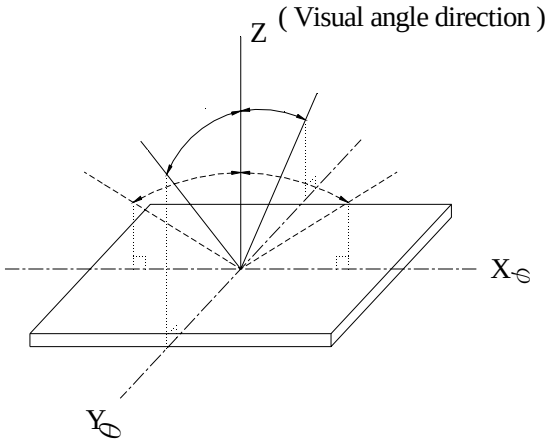
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	V_{DD}-V_{SS}	—	—	5.0	5.5	V
Supply Voltage For LCD	V_{DD}-V_O	Ta=0℃	—	—	22.6	V
		Ta=25℃	—	21.6	—	V
		Ta=+50℃	20.6	—	—	V
Input High Volt.	V_{IH}	—	0.8V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	0	—	0.2V_{DD}	V
Output High Volt.	V_{OH}	—	V_{DD} –0.4	—	—	V
Output Low Volt.	V_{OL}	—	—	—	0.4	V
Supply Current	I_{DD}	—	—	10.8	12	mA

6.Optical Characteristics

ITEM	SYMBAL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) θ	CR≧3	10	—	105	deg.
	(H) φ	CR≧3	-30	—	30	deg.
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	150	200	ms

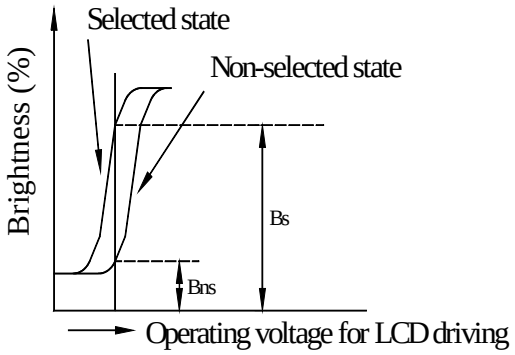
6.1 Definitions

■View Angles

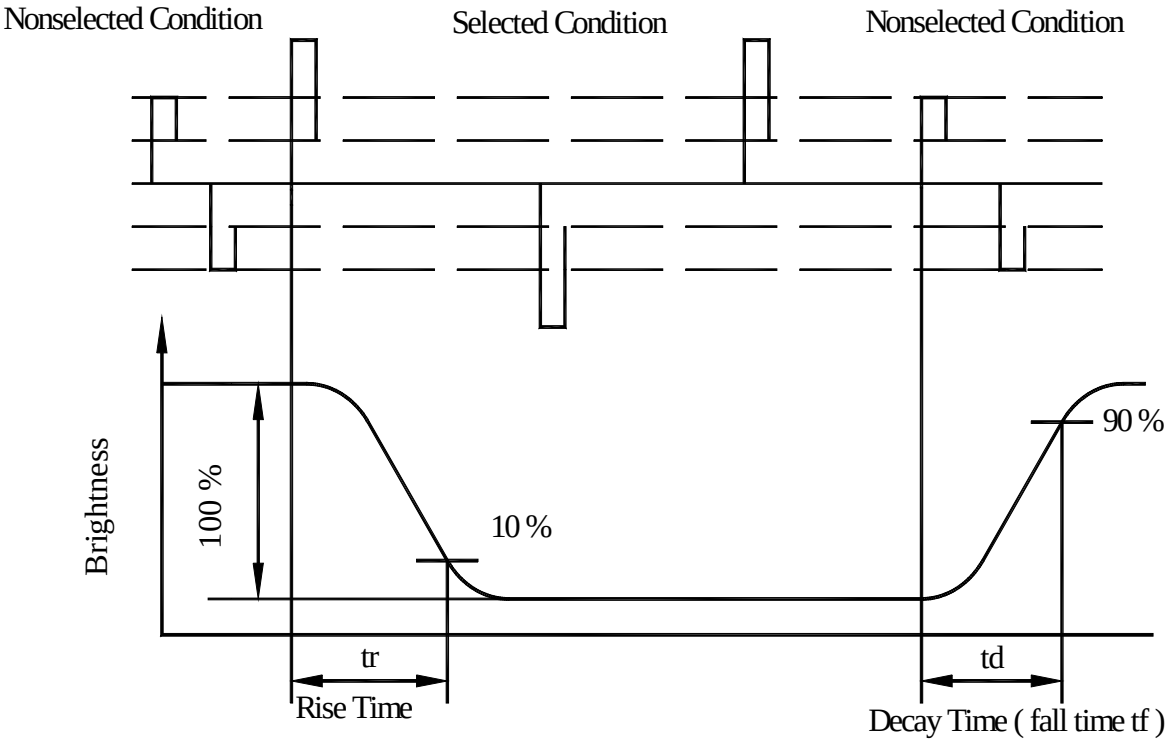


■Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



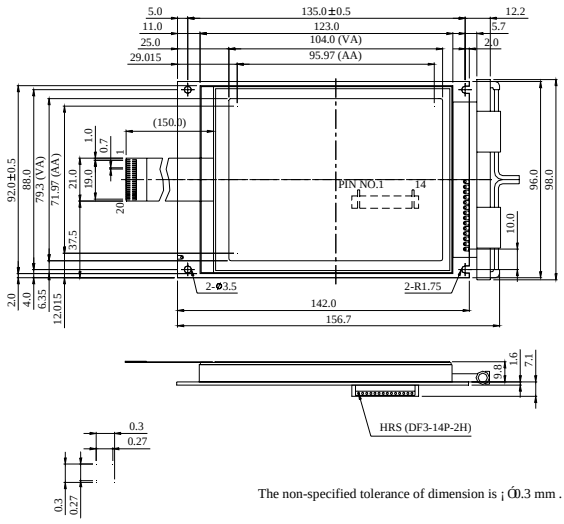
■Response time



7.Interface Description

Pin No.	Symbol	Level	Description
1	FRAME	H/L	Scan start-up signal
2	DF(M)	H/L	Frame reverse signal(alternate signal)
3	LOAD(CL1)	H to L	Data latch pulse
4	CP(CL2)	H to L	Data shift pulse
5	$\overline{\text{DISPOFF}}$	H/L	H: Display ON, L: Display OFF
6	D0	H/L	Display data, bit0
7	D1	H/L	Display data, bit1
8	D2	H/L	Display data, bit2
9	D3	H/L	Display data, bit3
10	V_{DD}	5.0V	Power supply for Logic
11	V_{SS}	0V	Ground
12	V_{EE}		NC
13	V_O	(Variable)	Driving voltage for LCD
14	FG		Frame Ground

8.Contour Drawing & Block diagram



PIN LAYOUT

PIN NO.	SYMBOL
1	FRAME
2	DF
3	LOAD
4	CP
5	D•OFF
6	D0
7	D1
8	D2
9	D3
10	VDD
11	VSS
12	VEE
13	V0
14	FG

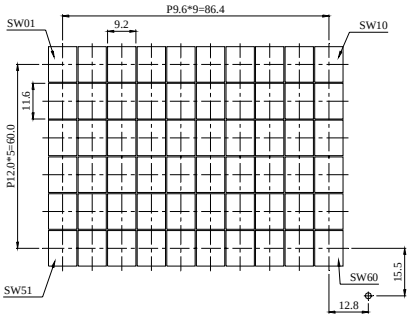
The non-specified tolerance of dimension is ¡ Ó0.3 mm .

DOT SIZE
SCALE 20/1

TRANSPARENT SW PIN LAYOUT

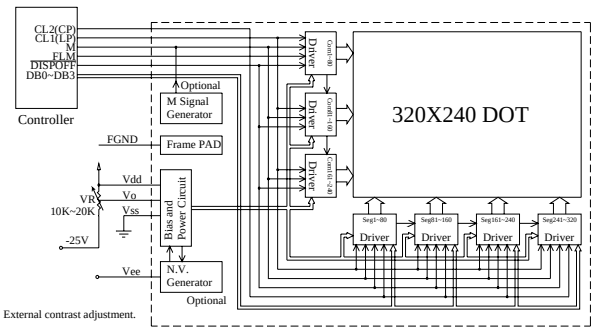
NO.	SYMBOL	NO.	SYMBOL
1	DUMMY	1	R4
2	DUMMY	2	R5
3	C10	3	R6
4	C9	4	C1
5	C8	5	C2
6	C7	6	C3
7	C6	7	C4
8	R1	8	C5
9	R1	9	DUMMY
10	R3	10	DUMMY

KEY LAYOUT

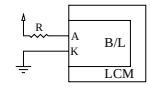


KEY MATRIX

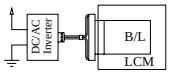
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
R1	SW01	SW02	SW03	SW04	SW05	SW06	SW07	SW08	SW09	SW10
R2	SW11	SW12	SW13	SW14	SW15	SW16	SW17	SW18	SW19	SW20
R3	SW21	SW22	SW23	SW24	SW25	SW26	SW27	SW28	SW29	SW30
R4	SW31	SW32	SW33	SW34	SW35	SW36	SW37	SW38	SW39	SW40
R5	SW41	SW42	SW43	SW44	SW45	SW46	SW47	SW48	SW49	SW50
R6	SW51	SW52	SW53	SW54	SW55	SW56	SW57	SW58	SW59	SW60

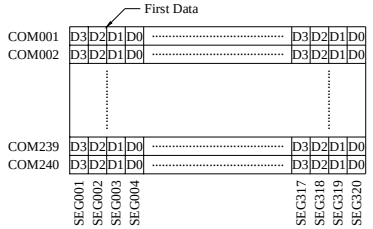


LED B/L drive directly from A,K .



CCFL B/L drive directly from connector .





9.Timing Characteristics

9.1.Common & Segment interface timing:

ITEM	symbol	Test Condition	Min.	Typ.	Max.	Units
Clock Cycle	tC	Fig.1	100	—	—	ns
CP Pulse Width	tWC	Fig.1	50	—	—	ns
LP Pulse Width	tWL	Fig.1	50	—	—	ns
Data Set Up Time	tDSU	Fig.1	30	—	—	ns
Data Hold Time	tDHD	Fig.1	30	—	—	ns
CP Rise/Fall Time	tr,tf	Fig.1	—	—	50	ns
CP to LOAD	tCL	Fig.1	80	—	—	ns
LOAD to CP	tLC	Fig.1	110	—	—	ns
LP Pulse Width	tLW	Fig.1	50	—	—	ns
CL1 Pulse Width	tCW	Fig.2	63	—	—	ns
Data Set Up Time	tDSU2	Fig.2	100	—	—	ns
Data Hold Time	tDHD2	Fig.2	100	—	—	ns
CL1 Rise/Fall Time	tr2,tf2	Fig.2	—	—	50	ns

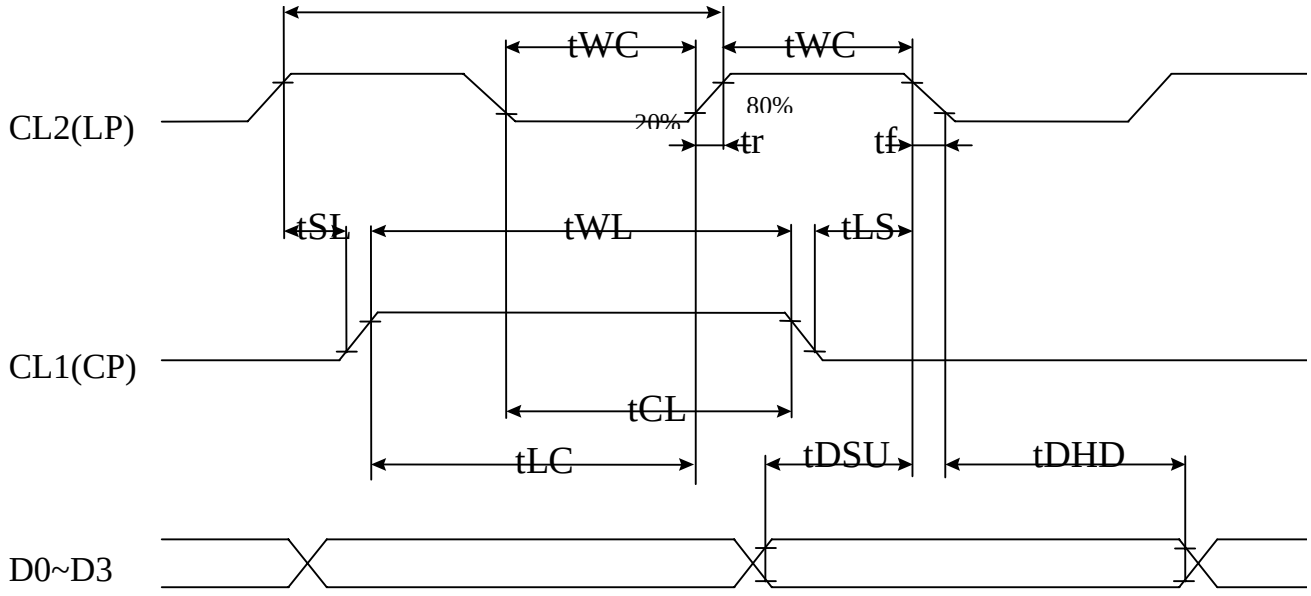


Fig 1. SEGMENT TIMING

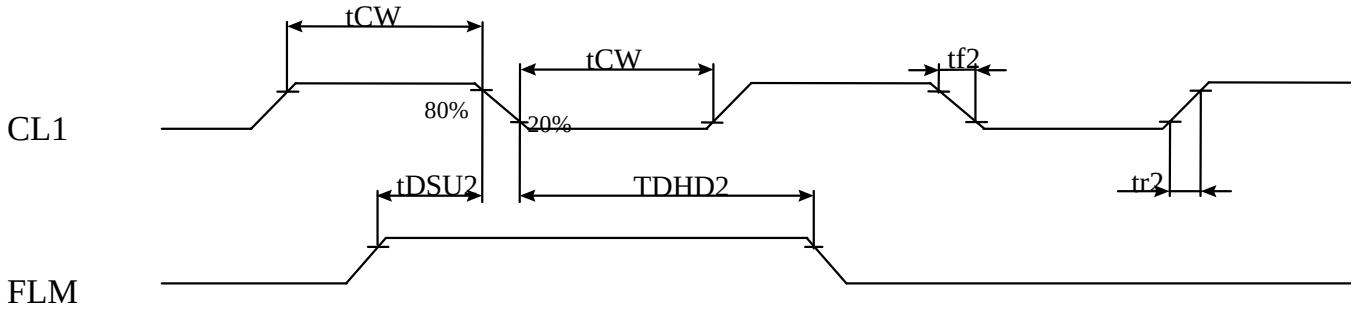


Fig 2 COMMON TIMING

10. Quality Assurance

◆ Screen Cosmetic Criteria

No.	Defect	Judgement Criterion	Partition
1	Spots	A)Clear Size: d mm Acceptable Qty in active area d ≦0.1 Disregard 0.1<d≦0.2 6 0.2<d≦0.3 2 0.3<d 0 Note: Including pin holes and defective dots which must be within one pixel size. B)Unclear Size: d mm Acceptable Qty in active area d ≦0.2 Disregard 0.2<d≦0.5 6 0.5<d≦0.7 2 0.7<d 0	Minor
2	Bubbles in Polarize	Size: d mm Acceptable Qty in active area d≦0.3 Disregard 0.3<d≦1.0 3 1.0<d≦1.5 1 1.5<d 0	Minor
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor
5	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only.	Minor

11.RELIABILITY

■Content of Reliability Test

Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	60℃ 200hrs	——
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-10℃ 200hrs	——
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50℃ 200hrs	——
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0℃ 200hrs	——
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60℃,90%RH 96hrs	——
6	High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	50℃,90%RH 96hrs	——
7	Temperature Cycle	Endurance test applying the low and high temperature cycle. -10℃ 25℃ 60℃ → ← 30min 5min 30min 1 cycle	-10℃/60℃ 10 cycles	——
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	——
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msedc 3 times of each direction	——
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	——
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	——

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25℃

12. Backlight Information

(Ta=25℃)

CCFL backlight Specification **(Ta=25℃)**

Item	Symbol	Specification			Unit	Condition
		Min	Typ	Max		
Driving Voltage	V_{FL}	—	278	—	Vrms	—
Input current	I_{FL}	3.0	5.0	6.0	mArms	—
Power consumption	W	—	1.35	—	W	—
Starting Voltage	V_{FLS}	—	530	—	Vrms	—
Luminance	L	—	550	—	Cd/m^2	φ , θ =0 deg, I_{FL} =5.0mArms
Chromaticity	x	—	0.340	—	—	—
	y	—	0.370	—	—	—
Luminance Uniformity (Testing 9 point)	—	75%	—	—	%	φ , θ =0 deg, I_{FL} =5.0mArms
Life time	—	15000	—	—	hrs	