



DISPLAY DEVICES

UG-32F05-B

date : 21.06.06

승 인 원

Specifications for Approval

고객명
customer

:

모델명
model name

:

UG-32F05-FEBT8-B

품명
discription

:

32" TFT-LCD DISPLAY MODULE

검 토 (proposed by)		승 인 (approved by)
기 안 designed	승 인 approved	

SAMSUNG DISPLAY DEVICES CO.,LTD.

CONTENTS

1. SCOPE
2. WARRANTY
3. FEATURE
4. MECHANICAL SPECIFICATION
5. MAXIMUM RATING
6. ELECTRICAL CHARACTERISTICS
7. ELECTRO-OPTICAL CHARACTERISTICS
8. I/O TERMINAL
9. UNIT DRIVING METHOD
10. DIMENSIONAL OUTLINE
11. QUALITY LEVEL
12. RELIABILITY
13. PACKING SPECIFICATION
14. HANDLING PRECAUTIONS
15. PRECAUTION FOR USE

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REF. NO :

REV. 1B

3/24

1. SCOPE

THIS SPECIFICATION DEFINES GENERAL PROVISIONS AS WELL AS INSPECTION STANDARDS FOR LCD MODULE SUPPLIED BY SAMSUNG ELECTRON DEVICES.

IN THE EVENT OF UNFORESEEN PROBLEM OR UNSPECIFIED ITEMS MAY OCCUR, MUTUALLY SHALL NEGOTIATE AND AGREE TO SOLUTION.

2. WARRANTY

MODULE PRODUCTS MANUFACTURED TO THIS SPECIFICATION SHALL BE CAPABLE OF MEETING ALL CHARACTERISTICS FOR A MINIMUM PERIOD OF 12 MONTHS FROM THE DATE OF SHIPPING FROM SDD WHEN STORED OR USED AS SPECIFIED UNDER NORMAL CONDITIONS WITHIN THE CONTENTS OF THESE SHEETS.

IF MODULE PRODUCTS IS NOT STORED OR USED AS SPECIFIED HEREIN, IT WILL BE VOID THE 12 MONTHS WARRANTY.

3. FEATURES

DISPLAY MODE	:	[TRANSFLECTIVE AND POSITIVE TYPE BLACK AND WHITE MODE LCD
DISPLAY COLOR	:	[DISPLAY DOTS : BLACK BACK GROUND : WHITE
DISPLAY FORMAT	:	320 (W) x 240 (H) FULL DOTS
INPUT DATA	:	4-BITS PARALLEL DATA INPUT FROM A LCD CONTROLLER
MULTIPLEXING RATIO	:	1/240 DUTY
VIEWING DIRECTION	:	0 ° CLOCK
BACK LIGHT	:	E/L (WHITE)
CONTROLLER	:	RECOMMENDED LCD CONTROLLERS ARE AS BELOW • HD64646F (HITACHI) • MSM6255 (OKI)

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REF. NO :

REV. : B

4/24

4. MECHANICAL SPECIFICATION

I T E M	SPECIFICATIONS	UNIT
DIMENSIONAL OUTLINE	143.0(W) x 96.3(H) x 12.0 MAX. (T)	mm
NUMBER OF DOTS	320 (W) x 240 (H) DOTS	-
NUMBER OF CHARACTERS	40C x 30L (1200) IN CASE OF 8 x 8 FONTS	-
VIEWING AREA	104.0 (W) x 79.3 (H)	mm
ACTIVE AREA	95.97 (W) x 71.97 (H)	mm
DOT PITCH	0.30 (W) x 0.30 (H)	mm
DOT SIZE	0.27 (W) x 0.27 (H)	mm
WEIGHT	APPROX. 170	g

5. MAXIMUM RATING

[V_{ss}=0V]

I T E M		SYMBOL	MIN.	MAX.	UNIT	NOTE
SUPPLY VOLTAGE	LOGIC	V _{DD}	0	6.5	V	
	LCD DRIVE	V _{DD} - V _{EE}	0	26	V	
INPUT VOLTAGE		V _i	0	V _{DD}	V	
OPERATING TEMPERATURE		T _{OP}	0	40	°C	
STORAGE TEMPERATURE		T _{STG}	-20	60	°C	
HUMIDITY		-	-	90	%RH	1)

NOTE 1) WET BULB TEMPERATURE SHOULD BE 29°C MAX., AND NO CONDENSATION OF WATER.

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REF. NO :

REV. : B

5/24

B. ELECTRICAL CHARACTERISTICS

6-1. ELECTRICAL CHARACTERISTICS

[V_{ss}=0V]

I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
SUPPLY VOLTAGE	LOGIC	V _{DD}	—	4.75	5.0	5.25	V
	LCD DRIVE	V _{DD} -V _{EE}		—	—	28.0	
INPUT VOLTAGE	"H" LEVEL	V _{IH}	V _{DD} = 5V±5%	0.8 V _{DD}	—	V _{DD}	V
	"L" LEVEL	V _{IL}		0	—	0.2 V _{DD}	
FRAME FREQUENCY		f _{FLM}	V _{DD} = 5V	70	75	80	Hz
CURRENT CONSUMPTION	LOGIC	I _{DD}	V _{DD} = 5V V _{DD} -V _O = 22.2V f _{FLM} =75Hz	—	4.0	8.0	mA
	LCD DRIVE	I _{EE}		—	3.5	5.2	
LCD DRIVE VOLTAGE (RECOMMENDED VOLTAGE)		V _{DD} -V _O	T _a = 0℃ φ=0°, θ=0°	—	(23.2)	(23.7)	V
			T _a = 25℃ φ=0°, θ=0°	(21.7)	(22.2)	(22.7)	
			T _a = 40℃ φ=0°, θ=0°	(20.9)	(21.4)	—	

NOTE 1) DUTY = 1/240
2) ALL DOTS ON STATE

0.0. SPEC FOR E/L BACK LIGHT

I T E M	UNIT	STANDARD VALUE			CONDITION
		MIN.	TYP.	MAX.	
SUPPLY VOLTAGE	V	—	100	125	
SUPPLY FREQUENCY	Hz	—	400	400	
INITIAL BRIGHTNESS	cd/m ² (NIT)	40	—	—	AC100Vrms, 400Hz, DARK ROOM
CURRENT	mA	9.0 ±30%			AC100Vrms, 400Hz, DARK ROOM
LIFE TIME	Hrs	3000			NOTE 1
LUMINOUS COLOR	—	WHITE			AC100Vrms, 400Hz, DARK ROOM
OPERATING TEMP.	℃	-20 ~ 50			—
STORAGE TEMP.	℃	-20 ~ 60			—

[NOTE 1] HALF VALUE OF INITIAL BRIGHTNESS AT 20℃ 60% RH

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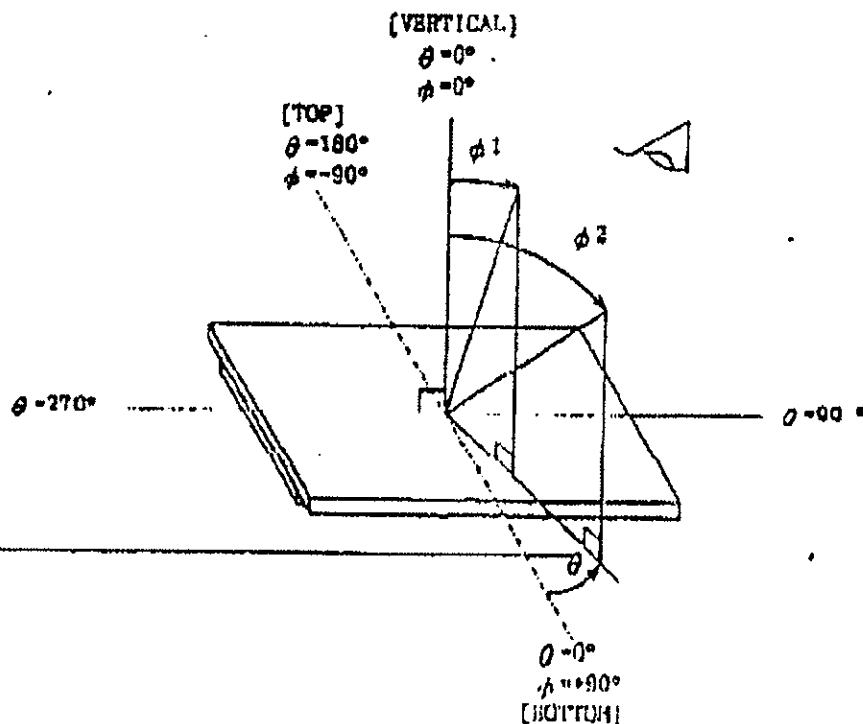
REV. : B

6/24

7. ELECTRO-OPTICAL CHARACTERISTICS

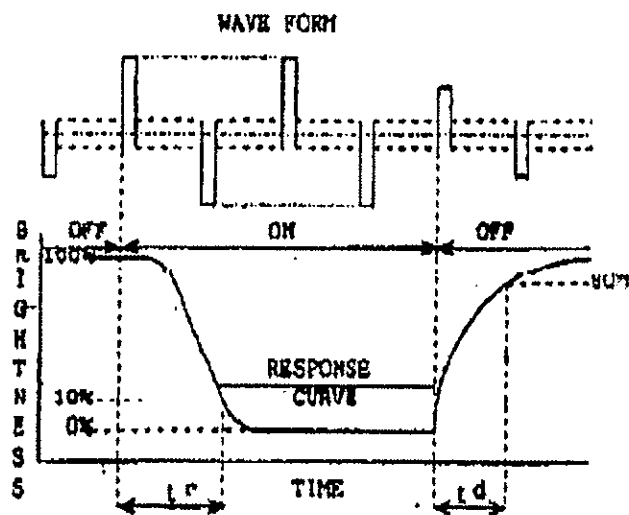
NO	ITEM	SYMBOL	TEMP	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
1	LED DRIVING VOLTAGE (RECOMMENDED VOLTAGE)	V _{OP}	0°C	$\theta=0^\circ, \phi=0^\circ$		(20.0)	(20.7)	V	1, 2, 6
			25°C		(21.7)	(22.2)	(22.7)		
			40°C		(20.9)	(21.4)	-		
2	RESPONSE TIME	t _r	0°C	$\theta=0^\circ, \phi=0^\circ$	-	800	1000	ms	1, 2, 6
			25°C		-	800	800		
		t _d	0°C		-	1000	1200		
			25°C		-	300	350		
3	VIEWING ANGLE	$\Delta\phi$	25°C	$\theta=0^\circ$	40	-	-	deg.	1, 4, 6
				$\theta=90^\circ$	40	-	-		
4	CONTRAST RATIO	K	25°C	$\theta=0^\circ, \phi=0^\circ$	2.0	3.0	-	-	1, 5, 6

NOTE 1) DEFINITION OF θ AND ϕ



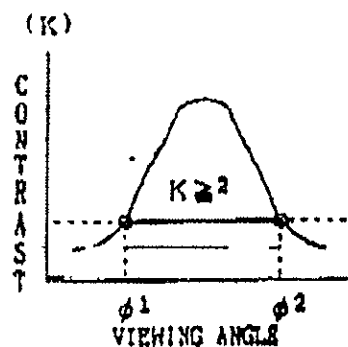
NOTE 2) CONTRAST RATIO HIGHER THAN 2 (K ≥ 2) CAN BE OBTAINED IN THIS VOLTAGE RANGE.

NOTE 3) DEFINITION OF RESPONSE TIME



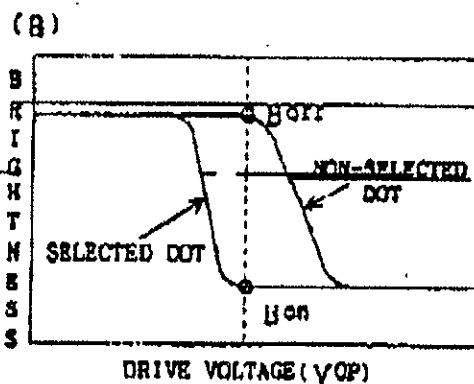
NOTE 4) DEFINITION OF VIEWING ANGLE ($\Delta\phi$)

$$\Delta\phi = |\phi_1 - \phi_2|$$

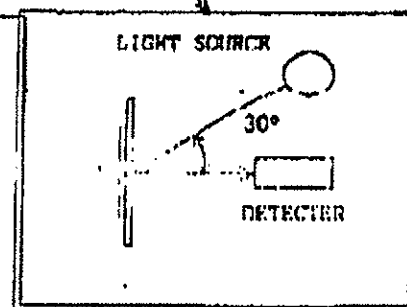


NOTE 5) DEFINITION OF CONTRAST RATIO (K)

NOTE 6) OPTICAL MEASURING SYSTEM
TEMP. REGULATED CHAMBER



TEMP. REGULATED CHAMBER



MEASURING EQUIPMENT : DMS
(MADE IN AUTRONIC)

$$\text{CONTRAST RATIO (K)} = \frac{\text{BRIGHTNESS OF NON-SELECTED DOT (Boff)}}{\text{BRIGHTNESS OF SELECTED DOT (Bon)}}$$

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8/24

8. I/O TERMINAL

8-1. I/O CONNECTION

VS
MOP
HS
VCLK

PIN NO.	SYMBOL	FUNCTION
1	FLM	THE SIGNAL INDICATE THE BEGINNING OF EACH FRAME
2	NC	NO CONNECTION
3	CL1	DATA LATCH PULSE
4	CL2	DATA SHIFT CLOCK PULSE
5	DOFF	DISPLAY OFF ("H" - ON, "L" - OFF)
6	D0	DISPLAY DATA
7	D1	DISPLAY DATA
8	D2	DISPLAY DATA
9	D3	DISPLAY DATA
10	VDD	POWER SUPPLY FOR LOGIC (+5V)
11	VSS	SIGNAL GROUND (GND)
12	VEE	POWER SUPPLY FOR LCD DRIVING (-V)
13	V0	OPERATING VOLTAGE FOR LCD DRIVE (VARIABLE)
14	FG	FRAME GROUND

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9/24

8-2. CIRCUIT BLOCK DIAGRAM

THE VARIOUS SIGNALS RELATING TO VDD, VSS, VEE, V0, AND THE BUS NUMBER INDICATE THE POWER SOURCES VDD FOR LOGIC AND VEE FOR LCD DRIVE.

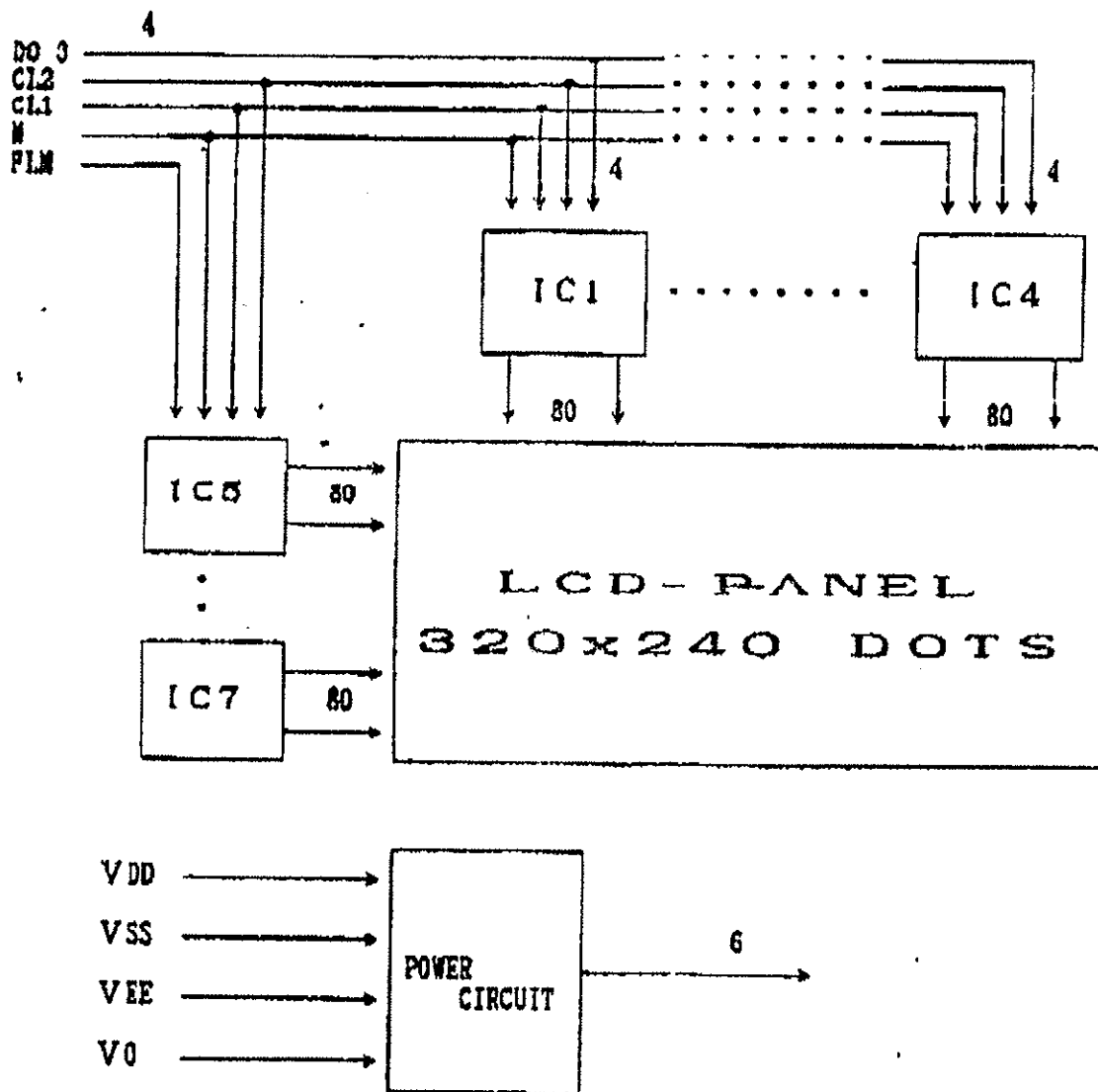


FIG. 8-1 BLOCK DIAGRAM

NOTE : IT IS NECESSARY TO GUARD ALL SIGNAL FROM EXTERNAL NOISE AS SIGNAL LINES ARE DIRECTLY CONNECTED TO C-MOS AND ARE NOT PULL-UP OR PULL-DOWN INTERNALLY

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REF. NO :

REV. : A

10/24

8-3. SIGNAL TIMING DIAGRAM

ITEM	SYMBOL	CONDITION	MIN.	MAX.	UNIT
MAX. CLOCK FREQUENCY	f_{CL2}	$V_{DD} = 5V \pm 5\%$ $V_{SS} = 0V$ $T_a = 25^\circ C$	3.4 <i>W</i>	-	MHz
CL1/CL2 PULSE WIDTH	t_W		100	-	ns
RISE/FALL TIME	t_r, t_f		-	50 <i>✓</i>	
DATA SET-UP TIME	t_{DSU}		50	-	
DATA HOLD TIME	t_{DHD}		80	-	
CL2 → CL1 TIME	t_{CL}		200 <i>✓</i>	-	
CL1 SET-UP TIME	t_{LSU}		90 <i>✓</i>	-	
CL1 → CL2 TIME	t_{LC}		200 <i>✓</i>	-	
FLM SET-UP TIME	t_{FSU}		100	-	
FLM HOLD TIME	t_{FH}		100	-	
M SIGNAL DELAY TIME	t_{DF}		-	200	

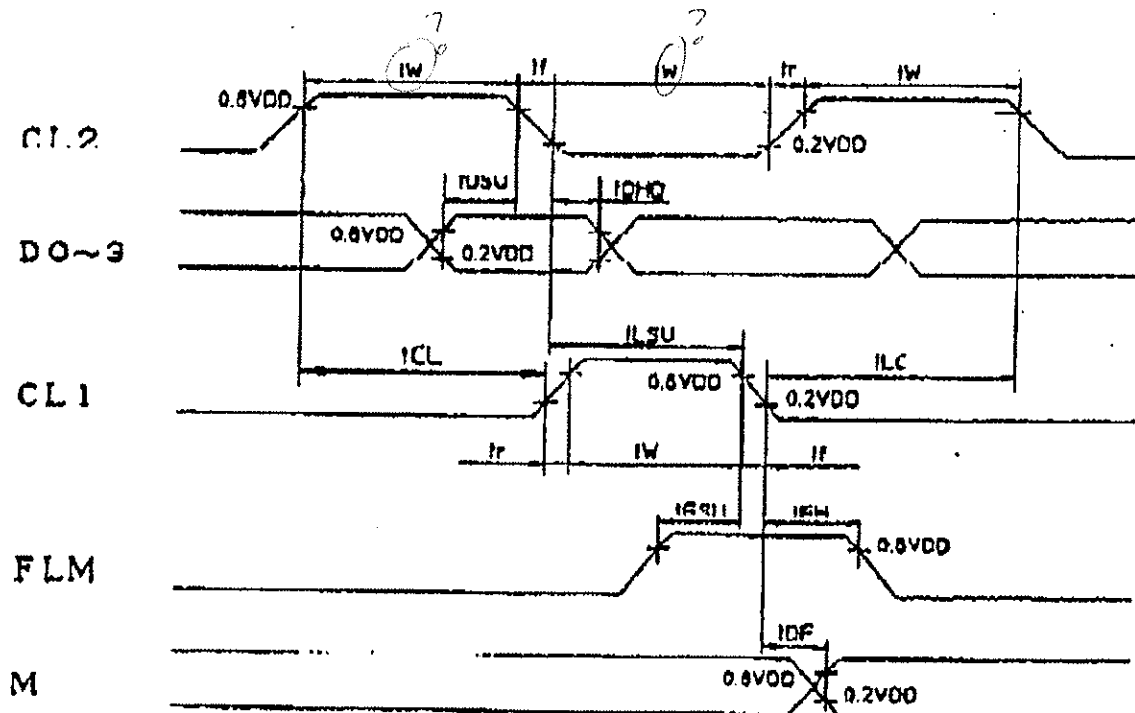


FIG. 8-2 SIGNAL TIMING (1)

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REF. NO :

REV. : A

11/24

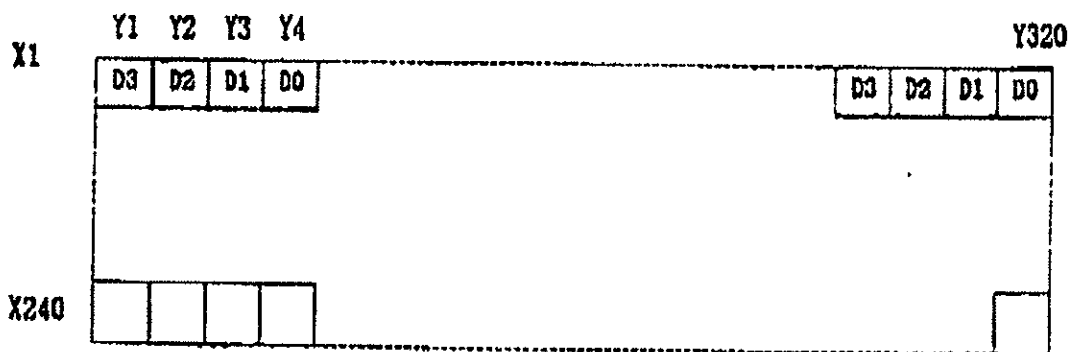
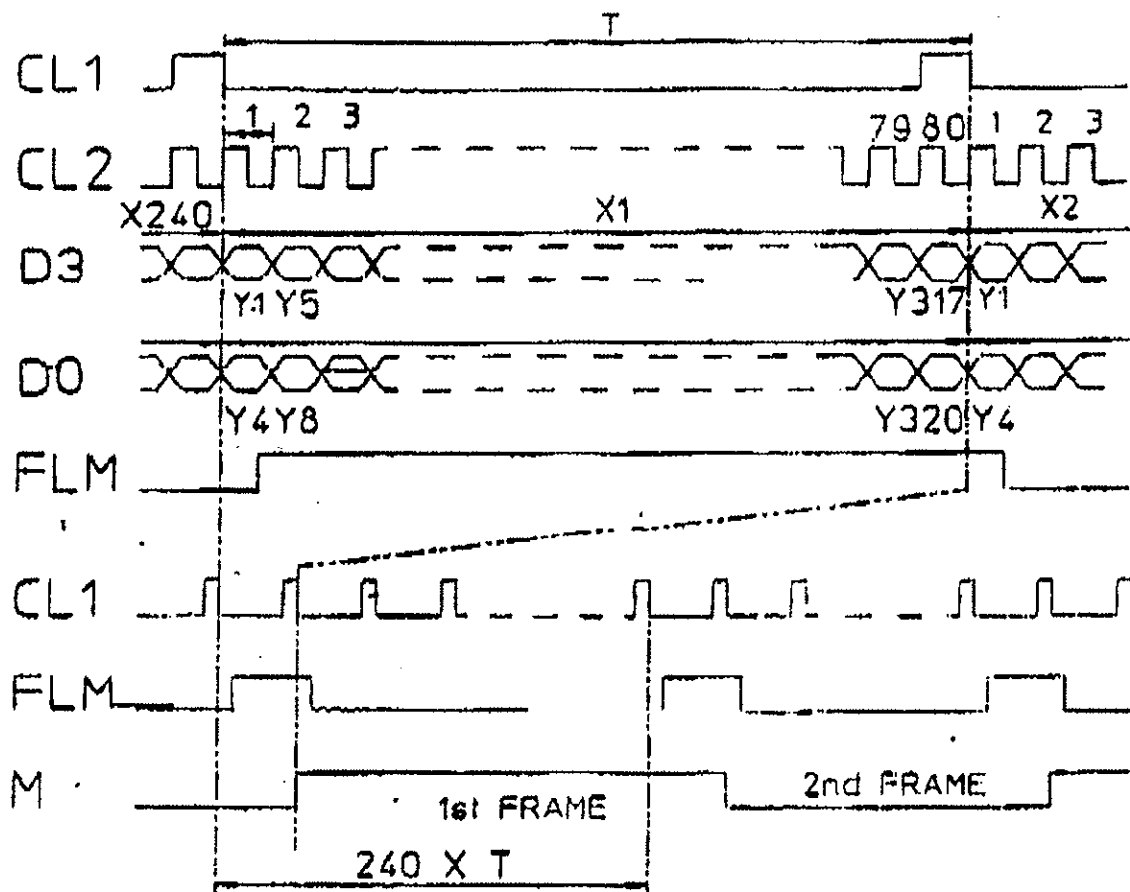


FIG. 8-3 SIGNAL TIMING (2)

8-4. VOLTAGE SUPPLY AND OPERATIONAL PRECAUTIONS

FOLLOW THE POWER ON/OFF SEQUENCE SHOWN IN FIG. 8-4 TO PREVENT A LATCH-UP OR DC OPERATION OF THE LCD PANEL.

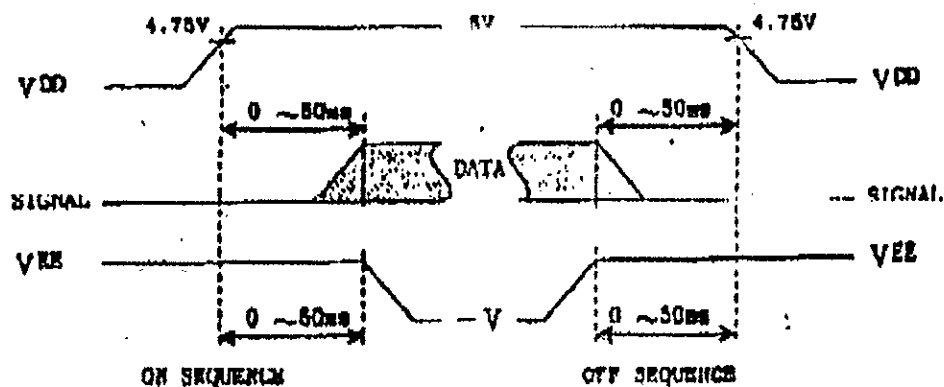


FIG. 8-4 POWER ON/OFF SEQUENCE

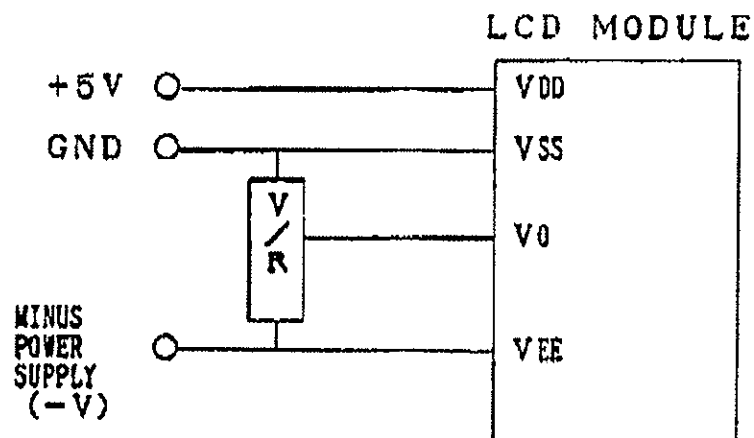


FIG. 8-5 EXAMPLE OF POWER SUPPLY

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REV. NO.

REV. : A

13/24

9. UNIT DRIVING METHOD

9-1. CIRCUIT CONFIGURATION

FIG. 8-2 SHOWS THE BLOCK DIAGRAM OF THE UNIT'S CIRCUITRY.

9-2. INPUT DATA AND CONTROL SIGNAL

THE LCD DRIVER IS 80 BITS LSI, CONSISTING OF SHIFT REGISTERS, LATCH CIRCUITS AND LCD DRIVER CIRCUITS.

DISPLAY DATA WHICH ARE EXTERNALLY DIVIDED INTO DATA FOR EACH ROW (320 DOTS) WILL BE SEQUENTIALLY TRANSFERRED IN THE FORM OF 4-BIT PARALLEL DATA THROUGH SHIFT REGISTERS BY CLOCK SIGNAL CLK FROM THE LEFT TOP OF THE DISPLAY FACE.

WHEN DATA OF ONE ROW (320 DOTS) HAVE BEEN INPUT, THEY WILL BE LATCHED IN THE FORM OF PARALLEL DATA FOR 320 LINES OF SIGNAL ELECTRODES BY LATCH SIGNAL CL1.

THEN THE CORRESPONDING DRIVE SIGNAL WILL BE TRANSMITTED TO THE 320 LINES OF COLUMN ELECTRODES OF THE LCD PANEL BY THE LCD DRIVE CIRCUITS.

AT THIS TIME, SCAN START-UP SIGNAL FL1 HAS BEEN TRANSFERRED FROM THE SCAN SIGNAL DRIVER TO THE 1ST ROW OF SCAN ELECTRODES, AND THE CONTENTS OF THE DATA SIGNALS ARE DISPLAYED ON THE 1ST ROWS OF THE DISPLAY FACE ACCORDING TO THE COMBINATIONS OF VOLTAGES APPLIED TO THE SCAN AND SIGNAL ELECTRODES OF THE LCD.

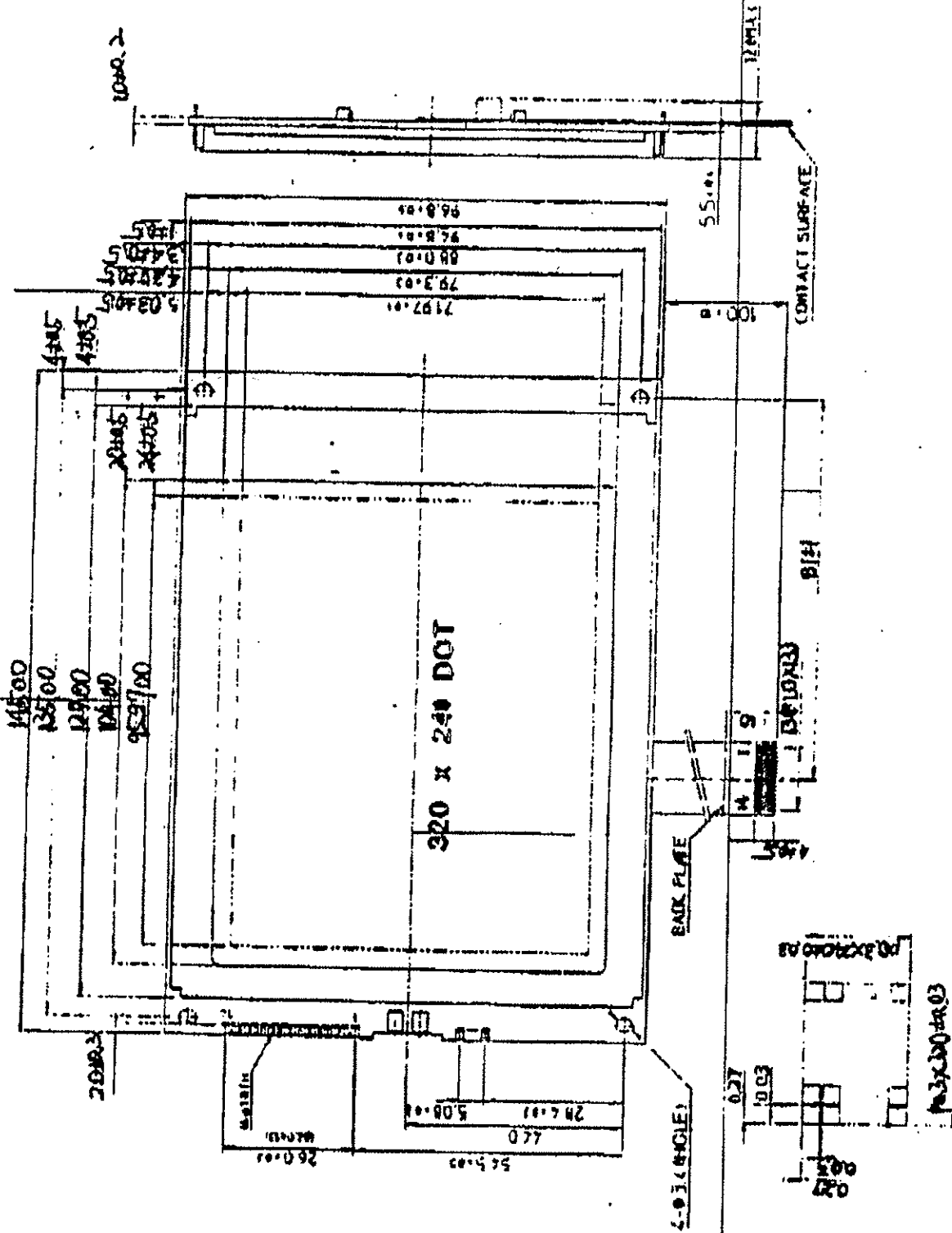
WHILE THE 1ST ROWS OF DATA ARE BEING DISPLAYED, THE 2ND ROWS OF DATA ARE ENTERED. WHEN 320 DOTS OF DATA HAVE BEEN TRANSFERRED THEN LATCHED ON THE FALLING EDGE OF CL1 CLOCK, THE DISPLAY FACE PROCEEDS TO THE 2ND ROWS OF DISPLAY. SUCH DATA INPUT WILL BE REPEATED UP TO 240TH ROW OF EACH DISPLAY SEGMENT, FROM UPPER TO LOWER ROWS, TO COMPLETE ONE FRAME OF DISPLAY BY TIME SHARING METHOD.

THEN DATA INPUT PROCEEDS TO NEXT DISPLAY PAGE. SCAN START-UP SIGNAL FL1 GENERATES SCAN SIGNAL TO DRIVE HORIZONTAL ELECTRODES. THE UNIT SHALL BE DRIVEN AT THE SPEED OF 70~80HZ/FRAME TO AVOID FLICKERING.

SINCE DC VOLTAGE, IF APPLIED TO LCD PANEL, CAUSES CHEMICAL REACTION WHICH WILL DETERIORATE LCD PANEL, DRIVE WAVEFORM SHALL BE INVERTED AT EVERY DISPLAY FRAME TO PREVENT THE GENERATION OF SUCH DC VOLTAGE. CONTROL SIGNAL M PLAYS SUCH ROLE.

BECAUSE OF THE CHARACTERISTICS OF THE CMOS DRIVER LSI, THE POWER CONSUMPTION OF THE UNIT GOES UP AS THE OPERATING FREQUENCY CL2 INCREASES.

10. DIMENSIONAL OUTLINE



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REP. NO :

REV. : A

15/24

11. QUALITY LEVEL

11-1. INSPECTION CONDITIONS

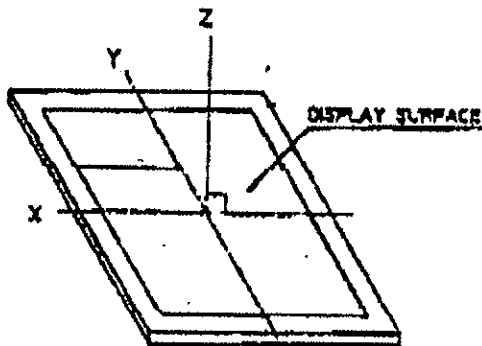
11-1-1. THE ENVIRONMENTAL CONDITIONS FOR INSPECTION SHALL BE AS FOLLOWS.

ROOM TEMPERATURE : $20 \pm 3^{\circ}\text{C}$
HUMIDITY : $65 \pm 20\text{RH}$

11-1-2. THE EXTERNAL VISUAL INSPECTION :

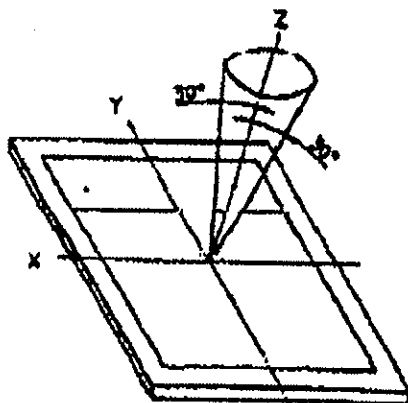
THE INSPECTION SHALL BE PERFORMED BY USING A SINGLE 20W FLUORESCENT LAMP FOR ILLUMINATION AND THE DISTANCE BETWEEN LCD AND EYES OF THE INSPECTOR SHOULD BE 30cm OR MORE.

11-1-3. (1) LIGHT METHOD



FLUORESCENT LAMP SET THE PERPENDICULAR TO THE DISPLAY SURFACE.

(2) INSPECTION DISTANCE AND ANGLE



INSPECTION SHOULD BE PERFORMED WITHIN ϕ (ϕ IS USUALLY 30°) FROM Z AXIS TO EACH X & Y AXIS.
INSPECTION DISTANCE OF ANY DIRECTION WITHIN ϕ MUST BE KEPT $30 \pm 5\text{cm}$ TO THE DISPLAY SURFACE.

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REF. NO :

REV. : A

16/24

11-2. SAMPLING PROCEDURES FOR EACH ITEM'S ACCEPTANCE LEVEL TABLE

DEFECT TYPE	SAMPLING PROCEDURES	AQL
MAJOR DEFECT	MIL-STD-105D INSPECTION LEVEL NORMAL INSPECTION SINGLE SAMPLE INSPECTION	1.0
MINOR DEFECT	MIL-STD-105D INSPECTION LEVEL NORMAL INSPECTION SINGLE SAMPLE INSPECTION	2.5

11-3. CLASSIFICATION OF DEFECTS

11-3-1. MAJOR DEFECT

A MAJOR DEFECT REFERS TO A DEFECT WHICH MAY SUBSTANTIALLY DEGRADE USABILITY FOR PRODUCT APPLICATIONS.

11-3-2. MINOR DEFECT

A MINOR DEFECT REFERS TO A DEFECT WHICH IS NOT CONSIDERED TO SUBSTANTIALLY DEGRADE PRODUCT APPLICATION, OR A DEFECT WHICH DEVIATES FROM EXISTING STANDARDS ALMOST UNRELATED TO THE EFFECTIVE USE OF THE PRODUCT OR ITS OPERATION.

11-4. INCOMING INSPECTION STANDARDS

ITEM	CRITERION FOR DEFECTS			DEFECT TYPE
1) DISPLAY ON INSPECTION	(1) NON DISPLAY (2) VERTICAL LINE IS DEFICIENT (3) HORIZONTAL LINE IS DEFICIENT (4) CROSS LINE IS DEFICIENT			MAJOR
2) BLACK/WHITE SPOT	SIZE ϕ (mm)	ACCEPTABLE NUMBER		MINOR
	0.2 < ϕ ≤ 0.25	IGNORE (NOTE)		
	0.25 < ϕ ≤ 0.35	2		
	0.35 < ϕ ≤ 0.5	1		
	0.5 < ϕ	0		
(NOTE) NG IF FOUR OR MORE SPOT CROWD TOGETHER				
3) BLACK/WHITE LINE	LENGTH L (mm)	WIDTH (mm)	ACCEPTABLE NUMBER	MINOR
	L ≤ 10	W ≤ 0.01	IGNORE	
	5.0 < L ≤ 10	0.01 < W ≤ 0.02	4	
	5.0 < L ≤ 10	0.02 < W ≤ 0.03	3	
	1.0 < L ≤ 5.0	0.03 < W ≤ 0.04	2	
	1.0 < L ≤ 5.0	0.04 < W ≤ 0.05	1	
	L ≤ 1.0	0.05 < W	FOLLOWS 2) POINT DEFECT	
DEFECTS SEPERATE AT INTERVAL OF 30mm EACH OTHER				

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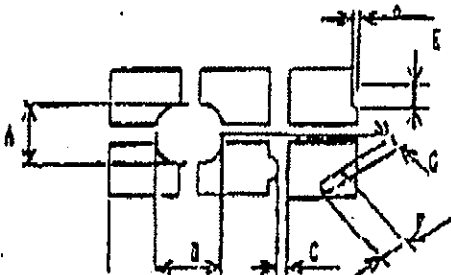
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REF. NO :

REV. : A

17/24

ITEM	CRITERION FOR DEFECTS	DEFECT TYPE										
4) DISPLAY PATTERN	 <table><tr><td>$\frac{A+B}{2} \leq 0.3$</td><td>$0 < C$</td><td>$\frac{D+E}{2} \leq 0.2$</td><td>$\frac{F+G}{2} \leq 0.2$</td></tr></table> (NOTE) ① UP TO 3 DAMAGES ACCEPTABLE ② NG IF THERE ARE TWO OR MORE PINHOLES PER ONE DIGIT.	$\frac{A+B}{2} \leq 0.3$	$0 < C$	$\frac{D+E}{2} \leq 0.2$	$\frac{F+G}{2} \leq 0.2$	MINOR						
$\frac{A+B}{2} \leq 0.3$	$0 < C$	$\frac{D+E}{2} \leq 0.2$	$\frac{F+G}{2} \leq 0.2$									
5) SPOT-LIKE CONTRAST IRREGULARITY	<table><tr><th>SIZE ϕ (mm)</th><th>ACCEPTABLE NUMBER</th></tr><tr><td>0.5 $\sim$ 0.8</td><td>IGNORE</td></tr><tr><td>0.8 $\sim$ 1.2</td><td>5</td></tr><tr><td>1.2 $\sim$ 1.5</td><td>2</td></tr><tr><td>1.5 $\sim$ 2.0</td><td>0</td></tr></table> (NOTE) ① CONFORMED TO LIMIT SAMPLES. ② DEFECTS SEPARATE AT INTERVALS OF 30mm EACH OTHER.	SIZE ϕ (mm)	ACCEPTABLE NUMBER	0.5 $\sim$ 0.8	IGNORE	0.8 $\sim$ 1.2	5	1.2 $\sim$ 1.5	2	1.5 $\sim$ 2.0	0	MINOR
SIZE ϕ (mm)	ACCEPTABLE NUMBER											
0.5 $\sim$ 0.8	IGNORE											
0.8 $\sim$ 1.2	5											
1.2 $\sim$ 1.5	2											
1.5 $\sim$ 2.0	0											
6) BUBLE IN POLARIZER	<table><tr><th>SIZE ϕ (mm)</th><th>ACCEPTABLE NUMBER</th></tr><tr><td>0.3 $\sim$ 0.5</td><td>IGNORE</td></tr><tr><td>0.5 $\sim$ 1.2</td><td>3</td></tr><tr><td>1.2 $\sim$ 1.5</td><td>1</td></tr><tr><td>1.5 $\sim$ 2.0</td><td>0</td></tr></table>	SIZE ϕ (mm)	ACCEPTABLE NUMBER	0.3 $\sim$ 0.5	IGNORE	0.5 $\sim$ 1.2	3	1.2 $\sim$ 1.5	1	1.5 $\sim$ 2.0	0	MINOR
SIZE ϕ (mm)	ACCEPTABLE NUMBER											
0.3 $\sim$ 0.5	IGNORE											
0.5 $\sim$ 1.2	3											
1.2 $\sim$ 1.5	1											
1.5 $\sim$ 2.0	0											
7) SCRATCHES AND DENT ON THE POLARIZER	(1) SCRATCHES AND DENT ON THE POLARIZER SHALL BE IN ACCORDANCE WITH "2) BLACK/WHITE SPOT. 3) BLACK/WHITE LINE".	MINOR										
8) STAINS ON LCD PANEL SURFACE	(1) STAINS WHICH CANNOT BE REMOVED EVEN WHEN WIPED LIGHTLY WITH A SOFT CLOTH OR SIMILAR CLEANING TOOL.	MINOR										
9) RAINBOW COLOR	(1) NO RAINBOW COLOR IS ALLOWED IN THE OPTIMUM CONTRAST ON STATE WITHIN THE ACTIVE AREA.	MINOR										

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REF. NO :

REV. : A

18/24

I T E M	CRITERION FOR DEFECTS	DEFECT TYPE
10) VIEWING AREA ENCHROACHMENT	(1) POLARIZER EDGE OR LINE IS VISIBLE IN THE OPENING VIEWING AREA DUE TO POLARIZER SHORTNESS OR SEALING LINE	MINOR
11) BEZEL APPEARANCE	(1) RUST AND DEEP DAMAGE WHICH ARE VISIBLE IN THE BEZEL IS REJECTABLE.	MINOR
12) DEFECT OF LAND SURFACE CONTACT (POOR SOLDERING)	(1) EVIDENT GREYICES WHICH IS VISIBLE ARE REJECTABLE	MINOR
13) PARTS MOUNTING	(1) FAILURE TO MOUNT PARTS (2) PARTS NOT IN THE SPECIFICATIONS ARE MOUNTED (3) POLARITY, FOR EXAMPLE, IS REVERSED	MAJOR " "
14) PARTS ALIGNMENT	(1) LSI IC LEAD WIDTH IS MORE THAN 50% BEYOND PAD OUTLINE (2) CHIP COMPONENT IS OFF CENTER AND MORE THAN 50% OF THE LEADS IS OFF THE PAD OUTLINE	MINOR "
15) CONDUCTIVE FOREIGN MATTER (SOLDER BALL, SOLDER CHIPS)	(1) $0.45 < \phi$, N/W 1 (2) $0.30 < \phi \leq 0.45$, N/W 1 ϕ : AVERAGE DIAMETER OF SOLDER BALL (UNIT:mm) (3) $0.5 < L$, N/W 1 L : AVERAGE LENGTH OF SOLDER CHIP (UNIT:mm)	MAJOR MINOR MINOR
16) PWB PATTERN DAMAGE	(1) DEEP DAMAGE IS FOUND ON COPPER FOIL AND THE PATTERN IS NEARLY BROKEN (2) DAMAGE ON COPPER FOIL OTHER THAN (1) ABOVE	MAJOR MINOR
17) FAULTY PWB CORRECTION	(1) DUE TO PWB COPPER FOIL PATTERN BURNOUT, THE PATTERN IS CONNECTED, USING A JUMPER WIRE FOR REPAIR: 2 OR MORE PLACES ARE CORRECTED PER PWB (2) SHORT-CIRCUITED PART IS CUT, AND NO RESIST COATING HAS BEEN PERFORMED	MINOR "
18) BEZEL CLAW	(1) BEZEL CLAW MISSING OR NOT DENT	MAJOR
19) INDICATION ON NAME PLATE (SAMPLING INDICATION LABEL)	(1) FAILURE TO STAMP OR LABEL ERROR, OR NOT LEGIBLE (ALL ACCEPTABLE IF LEGIBLE) (2) THE SEPARATION IS MORE THAN 1/3 FOR INDICATION DISCOLORATION, IN WHICH THE CHARACTERS CAN BE RECOGNIZED	MINOR "

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DOC. NO : UG-32F-005BP

REF. NO :

REV. : A

19/24

12. RELIABILITY

12-1. LIFE TIME

50,000 HRS (25°C IN THE ROOM WITHOUT RAY OF SUN)

12-2. ITEMS OF RELIABILITY

I T-E M	CONDITION	CRITERION
1) HIGH TEMPERATURE OPERATING	40°C. 240HRS	• NO COSMETIC FAILURE ARE ALLOWABLE. CONTRAST RATIO SHOULD BE BETWEEN INITIAL VALUE $\pm 10\%$. - TOTAL CURRENT CONSUMPTION SHOULD BE BELOW DOUBLE OF INITIAL VALUE.
2) LOW TEMPERATURE OPERATING	0°C. 240HRS	
3) HUMIDITY	40°C. 80%RH. 240HRS	• NO COSMETIC FAILURE ARE ALLOWABLE. CONTRAST RATIO SHOULD BE BETWEEN INITIAL VALUE $\pm 30\%$. - TOTAL CURRENT CONSUMPTION SHOULD BE BELOW DOUBLE OF INITIAL VALUE.
4) HIGH TEMPERATURE	60°C. 240HRS	
5) LOW TEMPERATURE	-20°C. 240HRS	
6) THERMAL SHOCK	25°C $\rightarrow$ -20°C $\rightarrow$ 25°C $\rightarrow$ 60°C (5MIN)(60MIN)(5MIN)(60MIN) 5 CYCLE	
7) TEMPERATURE HUMIDITY CYCLE	JIS. C. 5024. 1 5 CYCLE	• CONTRAST RATIO(K) SHOULD KEEP 1.4 OR MORE. - TOTAL CURRENT CONSUMPTION SHOULD BE BELOW DOUBLE OF INITIAL VALUE.
8) VIBRATION	10~55~100HZ AMPLITUDE : 1.5mm 2HRS FOR EACH DIRECTION (X, Y, Z)	• NO DEFECT IN COSMETIC AND OPERATIONAL FUNCTION ARE ALLOWABLE. - TOTAL CURRENT CONSUMPTION SHOULD BE BELOW DOUBLE OF INITIAL VALUE.
9) STATIC ELECTRICITY	25°C. 80%RH DISCHARGE $\pm 5KV$ OF STATIC ELECTRICITY 4 TIMES TO THE INSIDE OF METAL AND 3 TIMES TO THE LCD PANEL USING THE PROBE. (0ohm, 200PF)	• ALL FUNCTION SHOULD BE SAME WITH BEFORE. - NO LATCH-UP ARE ALLOWABLE.

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DOC. NO : UG-32F-005BP

REF. NO :

REV. : A

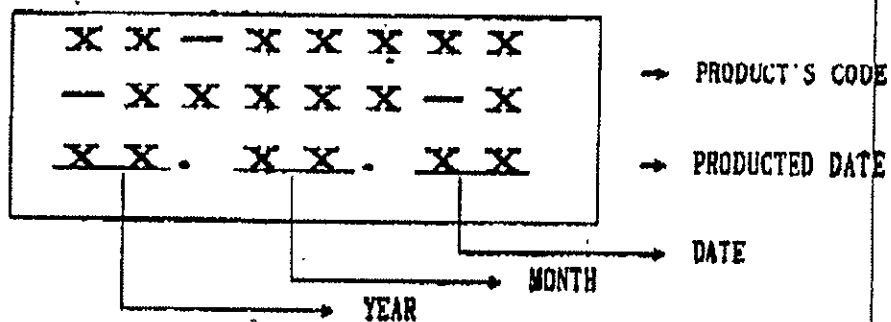
20/24

13. PACKING SPECIFICATION

13-1. SPECIFICATION

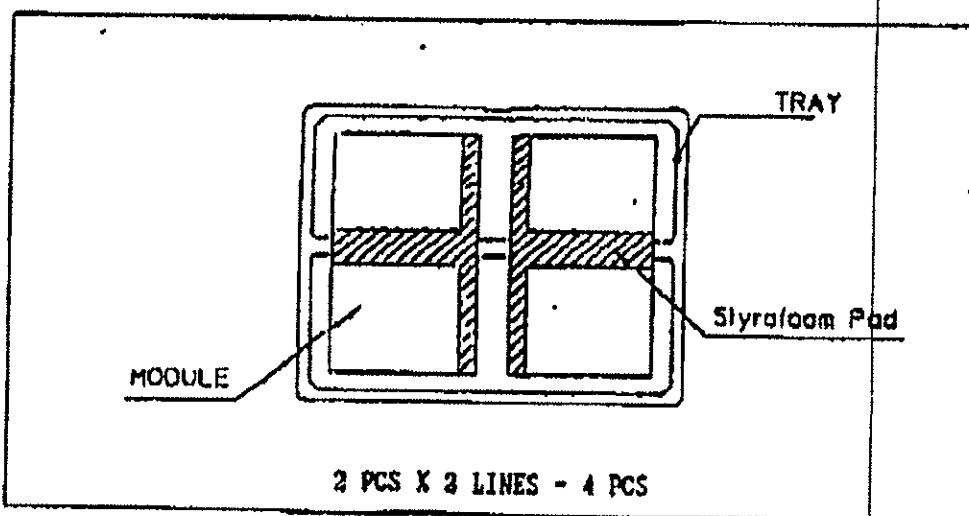
ITEM	SPECIFICATION	UNIT
CARTON SIZE	675.0 (W) X 410.0 (H) X 365.0 (T)	mm
INNER BOX SIZE	405.0 (W) X 334.5 (H) X 48.0 (T)	mm
POLYBAG SIZE	225.0 (W) X 120.0 (H) X 0.1 (T)	mm
LABEL SIZE	17.0 (W) X 12.0 (H) X 0.1 (T)	mm
PACKING Q'TY	72 PCS/CARTON	-

13-2. PRODUCT LABEL



13-3. PACKING DRAWING

13-3-1. INNER BOX



• 4 PCS/TRAY

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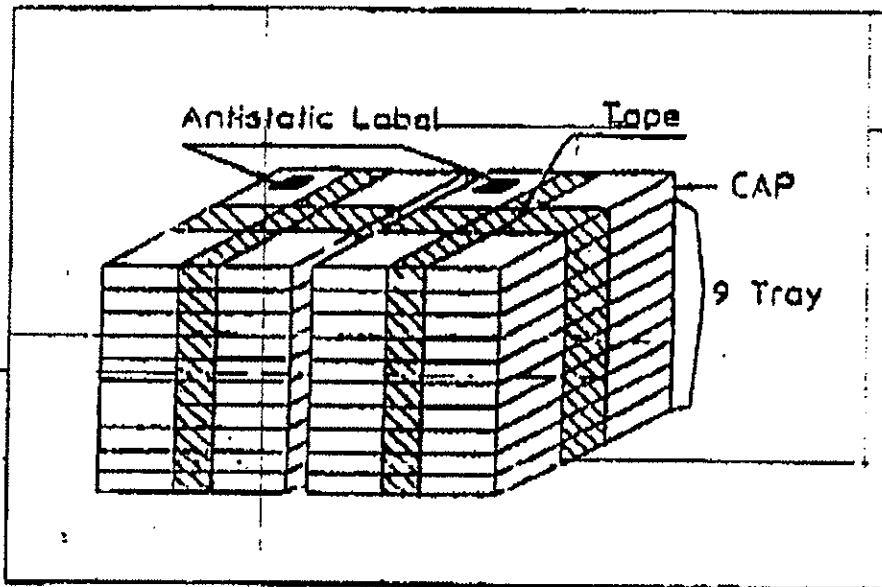
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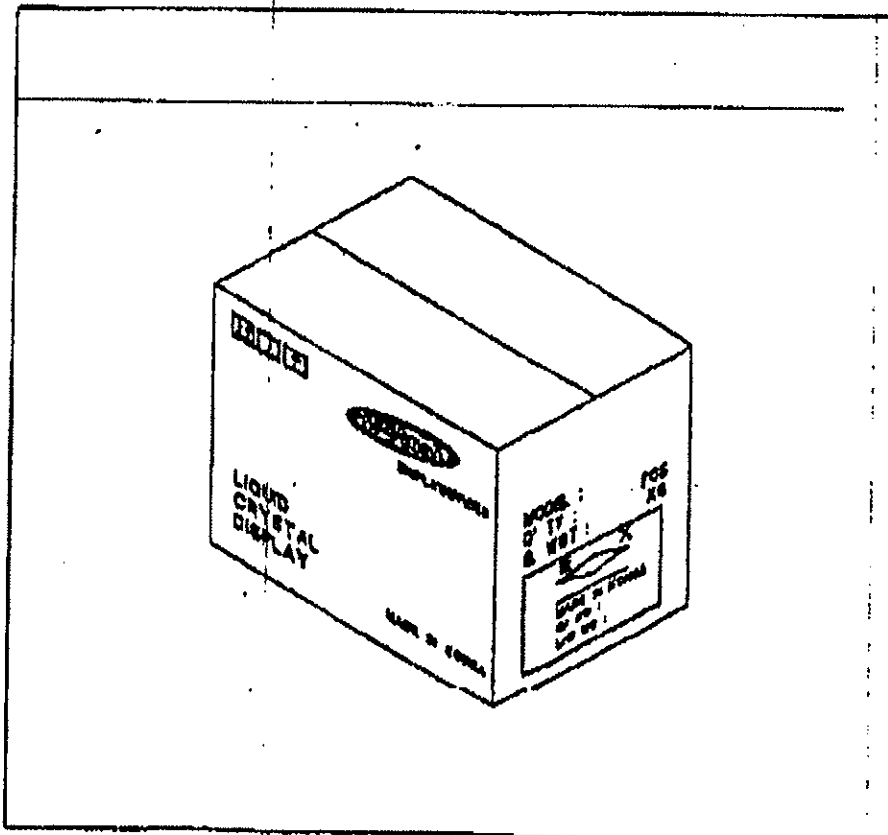
21/24

13-3-2. BOX FORMING



- 18 TRAY X 1 LOT
- 18 TRAY / CARTON BOX

13-3-3. CARTON BOX



- (18 TRAY X 4 PCS/TRAY)
- = 72 PCS / CARTON BOX

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DOC. NO : UG-32F-005BP

REF. NO :

REV. : A

22/24

14-HANDLING PRECAUTIONS

14-1. MOUNTING METHOD

THE L.C.D. PANEL OF SAMSUNG DISPLAY DEVICES L.C.D. MODULE CONSISTS OF TWO THIN GLASS PLATES WITH POLARIZERS WHICH EASILY GET DAMAGED. AND SINCE THE MODULE IS SO CONSTRUCTED AS TO BE FIXED BY UTILIZING-FITTING HOLES IN THE PRINTED CIRCUIT BOARD. EXTREME CARE SHOULD BE USED WHEN HANDLING THE L.C.D. MODULES

14-2. CAUTION OF L.C.D. HANDLING & CLEANING

WHEN CLEANING THE DISPLAY SURFACE, USE SOFT CLOTH WITH SOLVENT (RECOMMENDED BELOW) AND WIPE LIGHTLY.

- ISOPROPYL ALCOHOL
- ETHYL ALCOHOL
- TRICHLOROFLUOROMETHANE

DO NOT WIPE THE DISPLAY SURFACE WITH DRY OR HARD MATERIALS THAT WILL DAMAGE THE POLARIZER SURFACE.

DO NOT USE THE FOLLOWING SOLVENT :

- WATER
- KETONE
- AROMATICS

14-3. CAUTION AGAINST STATIC CHARGE

THE L.C.D. MODULES USE C-MOS LSI DRIVERS. SO WE RECOMMEND THAT YOU : CONNECT ANY UNUSED INPUT TERMINAL 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.

14-4. PACKAGING

- MODULES EMPLOY L.C.D. ELEMENTS, AND MUST BE TREATED AS SUCH. AVOID INTENSE SHOCK AND FALLS FROM A HEIGHT.
- TO PREVENT MODULES FROM DEGRADATION, DO NOT OPERATE OR STORE THEM EXPOSED DIRECT TO SUNSHINE OR HIGH TEMPERATURE/HUMIDITY.

14-5. CAUTION FOR OPERATION

- IT IS AN INDISPENSABLE CONDITION TO DRIVE LCD'S WITHIN THE SPECIFIED VOLTAGE LIMIT SINCE THE HIGHER VOLTAGE THAN THE LIMIT CAUSES THE SHORTER L.C.D. LIFE. AN ELECTROCHEMICAL REACTION DUE TO DIRECT CURRENT SHOULD BE AVOIDED.
- RESPONSE TIME WILL BE EXTREMELY DELAYED AT LOWER TEMPERATURE THAN THE OPERATING TEMPERATURE RANGE AND ON THE OTHER HAND AT HIGHER TEMPERATURE LCD'S SHOW DARK COLOR IN THEM. HOWEVER, THOSE PHENOMENA DO NOT MEAN MALFUNCTION OR OUT OF ORDER WITH LCD'S. WHICH WILL COME BACK IN THE SPECIFIED OPERATING TEMPERATURE RANGE.

S A M S U N G

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DOC. NO. UC-32F-005BP

REV. NO. :

REV. : A

23/24

- IF THE DISPLAY AREA IS PUSHED HARD DURING OPERATION, SOME FONT WILL BE ABNORMALLY DISPLAYED BUT IT RESUMES NORMAL CONDITION AFTER TURNING OFF ONCE.
- A SLIGHT DEW DEPOSITING ON TERMINALS IS A CAUSE FOR ELECTRO-CHEMICAL REACTION RESULTING IN TERMINAL OPEN CIRCUIT. USAGE UNDER THE MAXIMUM TEMPERATURE.

14-6. STORAGE

IN THE CASE OF STORING FOR A LONG PERIOD OF TIME (FOR INSTANCE, FOR YEARS) FOR THE PURPOSE OR REPLACEMENT USE, THE FOLLOWING WAYS ARE RECOMMENDED.

- STORAGE IN A POLYETHYLENE BAG WITH THE OPENING SEALED SO AS NOT TO ENTER FRESH AIR OUTSIDE IN IT, AND WITH NO DESICCANT.
- PLACING IN A DARK PLACE WHERE NEITHER EXPOSURE TO DIRECT SUNLIGHT NOR LIGHT IS, KEEPING THE OPERATING TEMPERATURE.
- STORING WITH NO TOUCH ON POLARIZER SURFACE BY THE ANYTHINGELSE. (IT IS RECOMMENDED TO STORE THEM AS THEY HAVE BEEN CONTAINED IN THE INNER CONTAINER AT THE TIME OF DELIVERY FROM US.)

14-7. SAFETY

- IT IS RECOMMENDABLE TO CRASH DAMAGED OR UNNECESSARY LCD'S INTO PIECES AND WASH OFF LIQUID CRYSTAL BY EITHER OF SOLVENTS SUCH AS ACETONE AND ETHANOL WHICH SHOULD BE BURNED UP LATER.
- WHEN ANY LIQUID LEAKED OUT OF A DAMAGED GLASS CELL COMES IN CONTACT WITH YOUR HANDS, PLEASE WASH IT OFF WELL WITH SOAP AND WATER.

15. PRECAUTION FOR USE

15.1. A LIMIT SAMPLE SHOULD BE PROVIDED BY THE BOTH PARTIES ON AN OCCASION WHEN THE BOTH PARTIES AGREED ITS NECESSITY. JUDGEMENT BY A LIMIT SAMPLE SHALL TAKE EFFECT AFTER THE LIMIT SAMPLE HAS BEEN ESTABLISHED AND CONFIRMED BY THE BOTH PARTIES.

15-2. ON THE FOLLOWING OCCASIONS, THE HANDLING OF PROBLEM SHOULD BE DECIDED THROUGH DISCUSSION AND AGREEMENT BETWEEN RESPONSIBLE OF THE BOTH PARTIES.

WHEN A QUESTION IS ARISEN IN THIS SPECIFICATIONS.

- WHEN A NEW PROBLEM IS ARISEN WHICH IS NOT SPECIFIED IN THIS SPECIFICATIONS.
- WHEN AN INSPECTION SPECIFICATIONS CHANGE OR OPERATING CONDITION CHANGE IN CUSTOMER IS REPORTED TO SED, AND SOME PROBLEM IS ARISEN IN THIS SPECIFICATION DUE TO THE CHANGE.
- WHEN A NEW PROBLEM IS ARISEN AT THE CUSTOMER'S OPERATING SET FOR SAMPLE EVALUATION IN THE CUSTOMER SITE.

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DOC. NO : UG-32F-005BP

REF. NO :

REV. : A

24/24