

481-610

HITACHI

KAOSIUNG HITACHI
ELECTRONICS CO., LTD
P.O. BOX 28-27
2, 12TH EAST ST. K. E. P. Z.
KAOSIUNG TAIWAN R.O.C.
TEL: (07) 8211101 (10 LINE)
TELEX: 81903 KHE
FAX: (07) 8419211

TENTATIVE

For Messrs: _____

Date: JUN.06.'94

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

LMG9520RPCC

CONTENTS

NO.	Item	Sheet No.	Page
1	COVER	3284PS 2701-LMG9520RPCC-1	1-1/1
2	RECORD OF REVISION	3284PS 2702-LMG9520RPCC-1	2-1/1
3	MECHANICAL DATA	3284PS 2703-LMG9520RPCC-1	3-1/1
4	ABSOLUTE MAXIMUM RATINGS	3284PS 2704-LMG9520RPCC-1	4-1/1
5	ELECTRICAL CHARACTERISTICS	3284PS 2705-LMG9520RPCC-1	5-1/2~2/2
6	OPTICAL CHARACTERISTICS	3284PS 2706-LMG9520RPCC-1	6-1/3~3/3
7	BLOCK DIAGRAM	3284PS 2707-LMG9520RPCC-1	7-1/1
8	INTERFACE TIMING CHART	3284PS 2708-LMG9520RPCC-1	8-1/4~4/4
9	DIMENSIONAL OUTLINE	3284PS 2709-LMG9520RPCC-1	9-1/2~2/2
10	APPEARANCE STANDARD	3284PS 2710-LMG9520RPCC-1	10-1/5~5/5
11	PRECAUTION IN DESIGN	3284PS 2711-LMG9520RPCC-1	11-1/4~4/4
12	DESIGNATION OF LOT MARK	3284PS 2712-LMG9520RPCC-1	12-1/1
13	PRECAUTION FOR USE	3284PS 2713-LMG9520RPCC-1	13-1/1

Accepted by: _____

Proposed by: W. J. Hwang

Kaohsiung Hitachi Electronics Co., Ltd.	Sh. No.	3284PS 2701-LMG9520RPCC-1	Page	1-1/1
--	------------	---------------------------	------	-------

3. MECHANICAL DATA

(1) PART NAME	LMG9520RPCC
(2) MODULE SIZE	160.0 (W)mm × 120.0 (H)mm × 8.5max(D)mm
(3) EFFECTIVE DISPLAY AREA	120.0 min × 90.0 min
(4) DOT SIZE	0.12 (W)mm × 0.34 (H)mm
(5) DOT PITCH	0.14 (W)mm × 0.36 (H)mm
(6) NUMBER OF DOTS	320 × 3 (R.G.B)(W) × 240 (H)DOTS
(7) DUTY	1/240
(8) LCD	COLOR STN (8 COLORS)
(9) VIEWING DIRECTION	6 O'CLOCK
(10) BACK LIGHT	COLD CATHODE FLUORESCENT LAMP

KHE-R-1417

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS. VSS=0V:STANDARD

I T E M	SYMBOL	MIN.	MAX.	UNIT	COMMENT
POWER SUPPLY FOR LOGIC	VDD-VSS	0	7.0	V	
POWER SUPPLY FOR LC DRIVE	VEE-VSS	0	32.0	V	
INPUT VOLTAGE	V_i	-0.3	VDD+0.3	V	NOTE 1
INPUT CURRENT	I_i	0	1	A	

NOTE 1 FLM, CL1, CL2, U00~UD3, L00~LD3, DISP. OFF.

NOTE 2 MAKE CERTAINS YOU ARE GROUNDED WHEN HANDLING LCM

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

I T E M	OPERATING		STORAGE		C O M M E N T
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	10℃	40℃ NOTE 6	-20℃	60℃	NOTE 1, 2
HUMIDITY	NOTE 3		NOTE 3		WITHOUT CONDENSATION
VIBRATION	—	2.45m/s ² (0.25G)	—	11.76m/s ² (1.2 G) NOTE 4	NOTE 5
SHOCK	—	29.4m/s ² (3 G)	—	490.0m/s ² (50 G)	XYZ DIRECTIONS
CORROSIVE GAS	NOT ACCEPTABLE		NOTE 4 NOT ACCEPTABLE		

NOTE 1 Ta AT -20℃ -----<48HRS, AT 60℃ -----<168HRS

NOTE 2 BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.

NOTE 3 Ta ≤ 40℃: 85%RH max.

Ta > 40℃: ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 85%RH AT 40℃

NOTE 4 THIS MODULE SHOULD BE OPERATED NORMALLY AFTER FINISH THE TEST.

NOTE 5 5Hz~100Hz (EXCEPT RESONANCE FREQUENCY)

NOTE 6 THE CHANGE OF COLOR OF LCD, DECREASE OF CONTRAST RATIO AND NON-UNIFORMITY OF DISPLAY QUALITY MAY BE SEEN AT HIGHER TEMPERATURE(40℃~50℃), IT'S REVERSIBLE MODE.

KHE-R-1413

5.1 ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	-	2.7	5.0 3.0	5.25	V
POWER SUPPLY VOLTAGE FOR LC DRIVING	VEE-VSS	-	-23.0	-	-	V
INPUT VOLTAGE NOTE 1	VI	H LEVEL	0.8VDD	-	VDD	V
		L LEVEL	0	-	0.2VDD	V
POWER SUPPLY CURRENT FOR LOGIC NOTE 2	IDD	VDD-VSS=5.0V VDD-VEE=(22.7)V	-	(6.0)	-	mA
POWER SUPPLY CURRENT FOR LC DRIVING NOTE 2	IEE	VDD-VSS=5.0V VDD-VEE=(22.7)V	-	(5.0)	-	mA
RECOMMENDED LC DRIVING VOLTAGE NOTE 3	VDD-VEE	Ta=10°C, $\phi=0^\circ$	-	(23.4)	-	V
		Ta=25°C, $\phi=0^\circ$	-	(22.7)	-	V
		Ta=40°C, $\phi=0^\circ$	-	(22.0)	-	V
FRAME FREQUENCY	fFRAME	-	70	75	80	Hz

NOTE 1 FLM, CL1, CL2, UD0~UD3, LD0~LD3, DISP.OFF.

NOTE 2 fFLM=75Hz, VDD-VEE=(22.7)V, Ta=25°C, DISPLAY:"CF" PATTERN

NOTE 3 RECOMMENDED LC DRIVING VOLTAGE FLUCTUATE ABOUT $\pm 1.0V$ BY EACH MODULE.

TEST PATTERN IS ALL "0".

5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LAMP VOLTAGE	VL	-	(460)	-	V	Ta=25℃
FREQUENCY	fL	(30)	(70)	(85)	KHz	Ta=25℃
LAMP CURRENT	IL	(4)	(6)	(6.5)	mA	Ta=25℃
STARTING DISCHARGE VOLTAGE	VS	(1000)	-	-	V	Ta=10℃

PLEASE CERTAINLY INFORM HITACHI BEFORE DESIGNING
LAMP DRIVE CIRCUIT ACCORDING TO THE ABOVE SPECIFICATIONS.

NO.	ITEM	CRITERIA				A	B
L	CONTRAST	AVERAGE DIAMETER	CONTRAST	MAXIMUM NUMBER	DISTANCE	○	-
	IRREGULARITY (SPOT)	D(mm)	TO BE JUDGED BY HITACHI LIMIT SAMPLE	ACCEPTABLE			
	(NOTE 2)	$D \leq 0.25$		IGNORE	-		
	(NOTE 3)	$0.25 < D \leq 0.35$		≤ 10	20mm		
		$0.35 < D \leq 0.5$		≤ 4	20mm		
		$0.5 < D$		NONE	-		
C	CONTRAST	THICKNESS	LENGTH L(mm)	MAXIMUM NUMBER	DISTANCE	○	-
	IRREGULARITY (A PAIR OF SCRATCH)	T(mm)		ACCEPTABLE			
	(NOTE 2)	$T \leq 0.25$	$L \leq 1.2$	≤ 2	20mm		
	(NOTE 3)	$T \leq 0.2$	$L \leq 1.5$	≤ 3	20mm		
		$T \leq 0.15$	$L \leq 2.0$	≤ 3	20mm		
		$T \leq 0.1$	$L \leq 3.0$	≤ 4	20mm		
	THE WHOLE			≤ 6			
RUBBING	TO BE JUDGED BY HITACHI LIMIT SAMPLE						
SCRATCH							

11.3 CAUTION AGAINST STATIC CHARGE

AS THIS MODULE IS PROVIDED WITH C-MOS LSI, THE CARE TO TAKE SUCH A PRECAUTION AS TO GROUNDING THE OPERATOR'S BODY IS REQUIRED WHEN HANDLING IT.

11.4 POWER ON SEQUENCE

INPUT SIGNALS SHOULD NOT BE APPLIED TO LCD MODULE BEFORE POWER SUPPLY VOTAGE IS APPLIED AND REACHES TO SPECIFIED VOLTAGE (VDD). IF ABOVE SEQUENCE IS NOT KEPT, C-MOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH UP PROBLEM.

11.5 PACKAGING

(1) NO. LEAVING PRODUCTS IS PREFERABLE IN THE PLACE OF HIGH HUMIDITY FOR A LONG PERIOD OF TIME. FOR THEIR STORAGE IN THE PLACE WHERE TEMPERATURE IS 35°C OR HIGHER, SPECIAL CARE TO PREVENT THEM FROM HIGH HUMIDITY IS REQUIRED. A COMBINATION OF HIGH TEMPERATURE AND HIGH HUMIDITY MAY CAUSE THEM POLARIZATION DEGRADATION AS WELL AS BUBBLE GENERATION AND POLARIZER PEEL-OFF. PLEASE KEEP THE TEMPERATURE AND HUMIDITY WITHIN THE SPECIFIED RANGE FOR USE AND STORING.

(2) SINCE UPPER POLARIZERS AND LOWER ALUMINUM PLATES TEND TO BE EASILY DAMAGED, THEY SHOULD BE HANDLED WITH FULL CARE SO AS NOT TO GET THEM TOUCHED, PUSHED OR RUBBED BY A PIECE OF GLASS. TWEEZERS AND ANYTHING ELSE WHICH ARE HARDER THAN A PENCIL LEAD 3H.

(3) AS THE ADHESIVES USED FOR ADHERING UPPER/LOWER POLARIZERS AND ALUMINUM PLATES ARE MADE OF ORGANIC SUBSTANCES WHICH WILL BE DETERIORATED BY A CHEMICAL REACTION WITH SUCH CHEMICALS AS ACETONE, TULUENE ETHANOLE AND ISOPROPYLALCOHOL. THE FOLLOWING SOLVENTS ARE RECOMMENDED FOR USE:

NORMAL HEXANE

PLEASE CONTACT US WHEN IT IS NECESSARY FOR YOU TO USE CHEMICALS OTHER THAN THE ABOVE.

(4) LIGHTLY WIPE TO CLEAN THE DIRTY SURFACE WITH ABSORBENT COTTON WASTE OR OTHER SOFT MATERIAL LIKE CHAMOIS, SOAKED IN THE CHEMICALS RECOMMENDED WITHOUT SCRUBBING IT HARDLY. TO PREVENT THE DISPLAY SURFACE FROM DAMAGE AND KEEP THE APPEARANCE IN GOOD STATE, IT IS SUFFICIENT, IN GENERAL, TO WIPE IT WITH ABSORBENT COTTON.

- (5) IMMEDIATELY WIPE OFF SALIVA OR WATER DROP ATTACHED ON THE DISPLAY AREA BECAUSE ITS LONG PERIOD ADHERANCE MAY CAUSE DEFORMATION OR FADED COLOR ON THE SPOT.
- (6) FOGY DEW DEPOSITED ON THE SURFACE AND CONTACT TERMINALS DUE TO COLDENESS WILL BE A CAUSE FOR POLARIZER DAMAGE ,STAIN AND DIRT ON PRODUCT.WHEN NECESSARY TO TAKE OUT THE PRODUCTS FROM SOME PLACE AT LOW TEMPERATURE FOR TEST, ETC. IT IS REQUIRED FOR THEM TO BE WARMED UP IN A CONTAINER ONCE AT THE TEMPERATURE HIGHER THAN THAT OF ROOM.
- (7) TOUCHING THE DISPLAY AREA AND CONTACT TERMINALS WITH BARE HANDS AND CONTAMINATING THEM ARE PROHIBITED, BECAUSE THE STAIN ON THE DISPLAY AREA AND POOR INSULATION BETWEEN TERMINALS ARE OFTEN CAUSED BY BEING TOUCHED BY BARE HANDS.

(THERE ARE SOME COSMETICS DETRIMENTAL TO POLARIZERS.)
- (8) IN GENERAL THE QUALITY OF GLASS IS FRAGILE SO THAT IT TENDS TO BE CRACKED OR CHIPPED IN HANDLING, SPECIALLY ON ITS PERIPHERY. PLEASE BE CAREFUL NOT TO GIVE IT SHARP SHOCK CAUSED BY DROPPING DOWN, ETC.

11.6 CAUTION FOR OPERATION

- (1) IT IS AN INDISPENSABLE CONDITION TO DRIVE LCD'S WITHIN THE SPECIFIED VOLTAGE LIMIT SINCE THE HIGHER VOLTAGE THAN THE LIMIT CAUSES THE SHORTER LCD LIFE.AN ELECTROCHEMICAL REACTION DUE TO DIRECT CURRENT CAUSES LCD'S UNDESIRABLE DETERIORATION, SO THAT THE USE OF DIRECT CURRENT DRIVER SHOULD BE AVOIDED.
- (2) 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 BULE 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.
- (3) IF THE DISPLAY AREA IS PUSHED HARD DURING OPERATION,SOME FONT WILL BE ABNORMALLY DISPLAYED BUT IT RESUMES NORMAL CONDITION AFTER TURNING OFF ONCE.

- (4) A SLIGHT DEW DEPOSITING ON TERMINALS IS A CAUSE FOR ELECTROCHEMICAL REACTION RESULTING IN TERMINAL OPEN CIRCUIT. USAGE UNDER THE RELATIVE CONDITION OF 40°C 50%RH OR LESS IS REQUIRED

11.7 STORAGE

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

- (1) STORAGE IN A PLOYETHYLENE BAG WITH THE OPENING SEALED SO AS NOT TO ENTER FRESH AIR OUTSIDE IN IT, AND WITH NO DESICCANT.
- (2) PLACING IN A DARK PLACE WHERE NEITHER EXPOSURE TO DIRECT SUNLIGHT NOR LIGHT IS, KEEPING TEMPERATURE IN THE RANGE FROM 0 °C TO 35 °C
- (3) STORING WITH NO TOUCH ON POLARIZER SURFACE BY ANYTHING ELSE.
(IT IS RECOMMENDED TO STORE THEM AS THEY HAVE BEEN CONTAINED IN THE INNER CONTAINER AT THE TIME OF DELIVERY FROM US.)

11.8 SAFETY

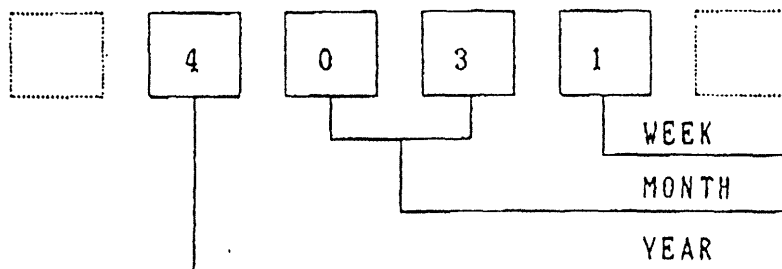
- (1) IT IS RECOMMENDABLE TO CRASH DAMAGED OR UNNECESSARY LCD'S INTO PIECES AND WASH OFF LIQUID CRYSTAL BY EITHER OF SOLVENTS SUCH AS ACETONE AND ETHANOL, WHICH SHOULD BE BURNED UP LATER.
- (2) WHEN ANY LIQUID LEAKED OUT OF A DAMAGED GLASS CELL COMES IN CONTACT WITH YOUR HANDS, PLEASE WASH IT OFF WELL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

KHE-R-1417

12. DESIGNATION OF LOT MARK

LOT MARK

LOT MARK IS CONSISTED OF 4 DIGIT NUMBER.



NOTE.1 SOME PRODUCTS HAVE ALPHABET
AT THE END OR THE FIRST.

MONTH	FIGURE IN LOT MARK	MONTH	FIGURE IN LOT MARK
JAN.	01	JULY	07
FEB.	02	AUG.	08
MAR.	03	SEPT.	09
APR.	04	OCT.	10
MAY.	05	NOV.	11
JUNE.	06	DEC.	12

YEAR	FIGURE IN LOT MARK
1 9 9 4	4
1 9 9 5	5
1 9 9 6	6
1 9 9 7	7
1 9 9 8	8

WEEK (DAY IN CALENDAR)	FIGURE IN LOT MARK
21 ~ 27	1
28 ~ 3	2
4 ~ 10	3
11 ~ 17	4
18 ~ 20	5

LOCATION OF LOT MARK : ON THE BACK SIDE OF LCM

4 0 3 1 T

T: MADE IN TAIWAN.

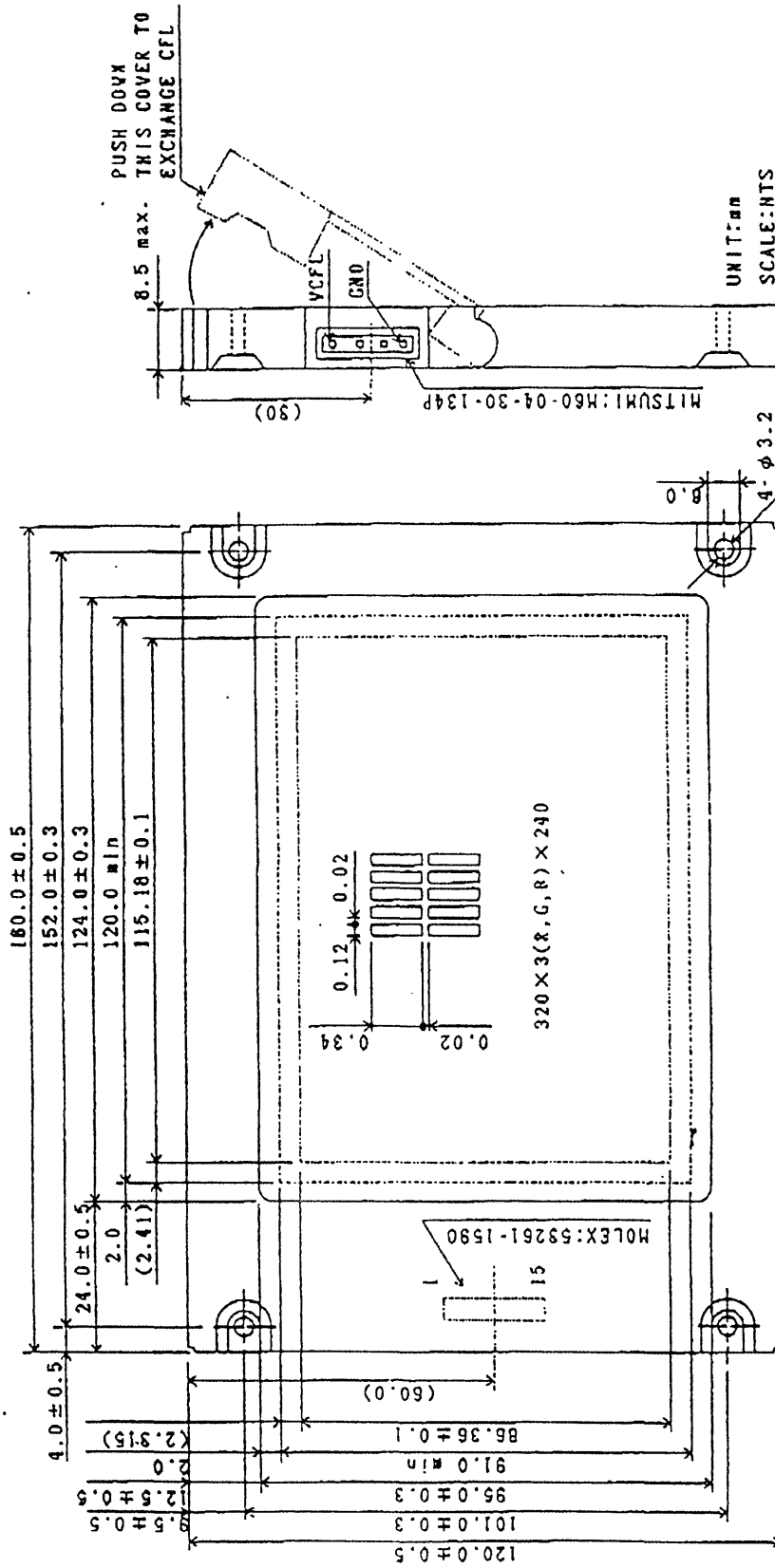
13. PRECAUTION FOR USE

- (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.
- (2) ON THE FOLLOWING OCCASIONS, THE HANDLING OF THE PROBLEM SHOULD BE DECIDED THROUGH DISCUSSION AND AGREEMENT BETWEEN RESPONSIBLE PERSONS OF THE BOTH PARTIES.
 - (1) WHEN A QUESTION IS ARISEN IN THE SPECIFICATIONS.
 - (2) WHEN A NEW PROBLEM IS ARISEN WHICH IS NOT SPECIFIED IN THIS SPECIFICATIONS.
 - (3) WHEN AN INSPECTION SPECIFICATIONS CHANGE OR OPERATING CONDITION CHANGE IN CUSTOMER IS REPORTED TO HITACHI, AND SOME PROBLEM IS ARISEN IN THIS SPECIFICATION DUE TO THE CHANGE.
 - (4) WHEN A NEW PROBLEM IS ARISEN AT THE CUSTOMER'S OPERATING SET FOR SAMPLE EVALUATION IN THE CUSTOMER SITE.

THE PRECAUTION THAT SHOULD BE OBSERVED WHEN HANDLING LCM HAVE BEEN EXPLAIND ABOVE. IF ANY POINTS ARE UNCLEAR OR IF YOU HAVE ANY REQUESTS, PLEASE CONTACT HITACHI.

8. DIMENSIONAL OUTLINE

8.1 DIMENSIONAL OUTLINE



K4E-R-1417

KHE-R-1413

1/28

9. 2 INTERNAL PIN CONNECTION

INTERFACE		PIN NO.	SIGNAL	LEVEL	FUNCTION
LCM	I/F1	1	FLM	H	FIRST LINE MARKER
		2	CL1	H → L	DATA LATCH
		3	CL2	H → L	DATA SHIFT
		4	DISP-OFF	H / L	H : ON / L : OFF
		5	VDD	-	POWER SUPPLY FOR LOGIC
		6	VSS	-	GND
		7	VEE	-	POWER SUPPLY FOR LC
		8	UD0	H / L	DISPLAY DATA
		9	UD1		
		10	UD2		
		11	UD3		
		12	LD0		
		13	LD1		
		14	LD2		
		15	LD3		

I/F 1 : MOLEX/53261-1510

(SUITABLE CONNECTOR : MOLEX/51021-1500)

INTERFACE		PIN NO.	SIGNAL	LEVEL	FUNCTION
CFL	CFL I/F	1	V _{CFL}	-	POWER SUPPLY FOR CFL
		2	N . C	-	-
		3	N . C	-	-
		4	VSS	-	CFL GND

CFL I/F: MITSUMI M60-04-30-1349

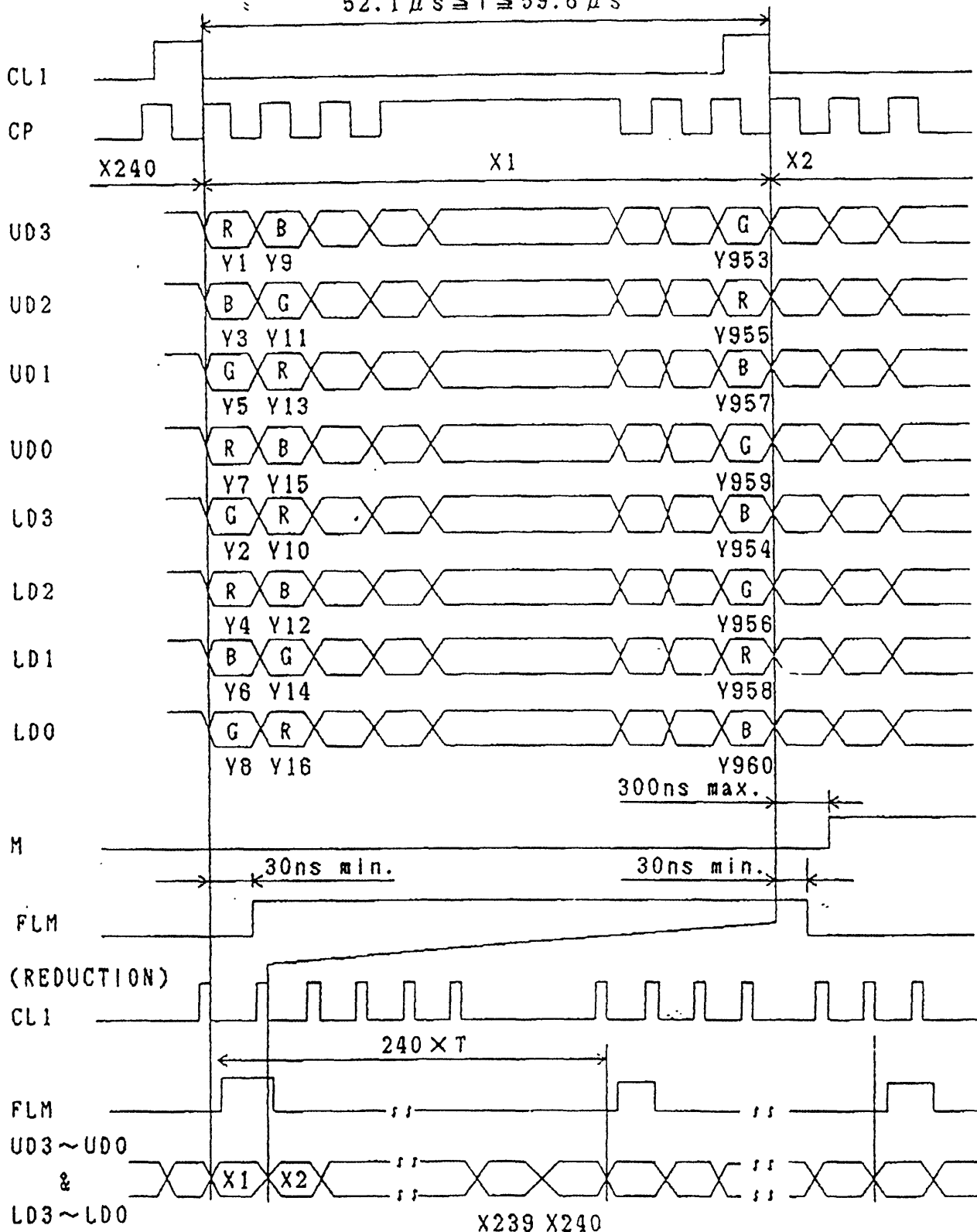
(SUITABLE CONNECTOR : MITSUMI M83M83-04)

KE-R-1417

8. INTERFACE TIMING CHART

8.1 TIMING CHART

$$52.1 \mu s \leq T \leq 59.6 \mu s$$



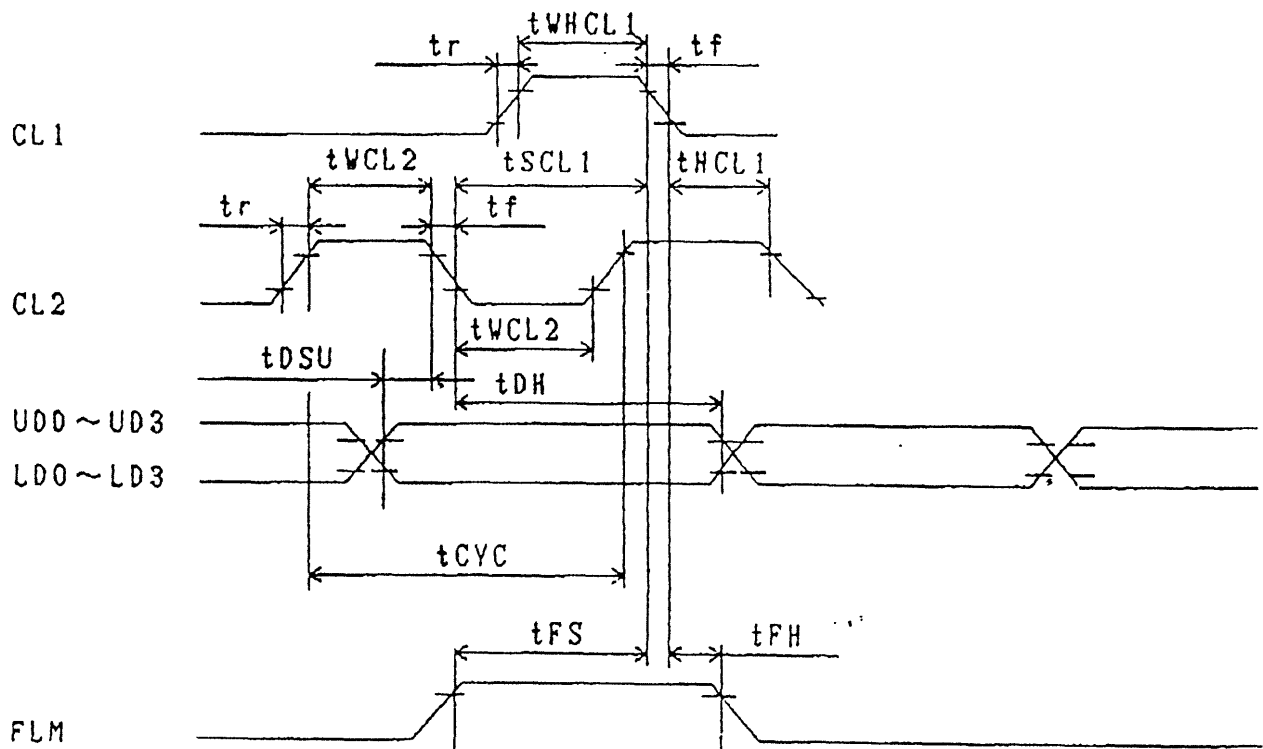
NOTE 1 DO NOT INPUT OVER 240 PULES TO CL1

8. 2 TIMING CHARACTERISTICS

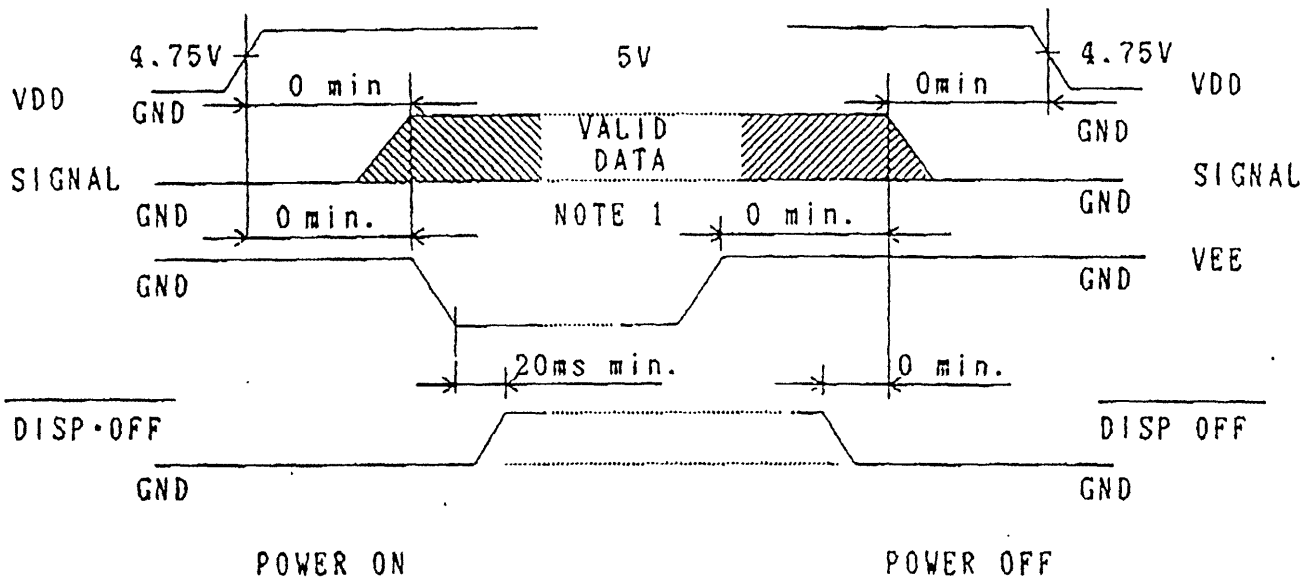
$0^{\circ}\text{C} \leq T_a \leq 50^{\circ}\text{C}$

$V_{DD}=5V \pm 5\%$

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
"CL1" PULES WIDTH	t _{WHCL1}	80	-	-	ns
CLOCK CYCLE TIME	t _{CYC}	110	-	-	ns
CLOCK PULES WIDTH	t _{WCL2}	35	-	-	ns
CLOCK SET UP TIME	t _{SCL1}	120	-	-	ns
CL1 → CLOCK TIME	t _{HCL1}	120	-	-	ns
CLOCK RISE, FALL TIME	t _r , t _f	-	-	20	ns
DATA SET UP TIME	t _{LSU}	20	-	-	ns
DATA HOLD TIME	t _{DH}	50	-	-	ns
"FLM" SET UP TIME	t _{FS}	150	-	-	ns
"FLM" HOLD TIME	t _{FH}	80	-	-	ns



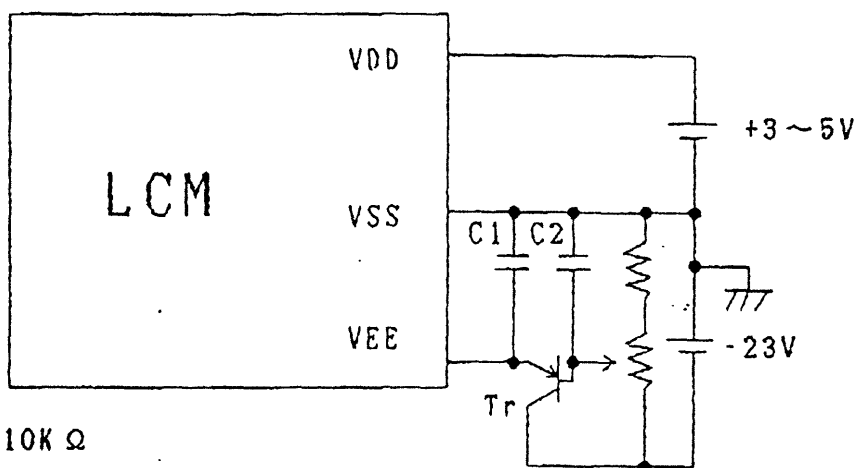
8. 3 TIMING OF POWER SUPPLY AND ININTERFACE SIGNAL



THE MISSING PIXELS MAY OCCUR WHEN THE LCM IS DRIVEN BYEOND ABOVE POWER INTERFACE TIMING SEQUENCE.

NOTE 1 IN CASE OF NOT USING DISP·OFF CONTROLING, IT SHOULD BE ABOVE 20ms IN THIS TIMING PERIOD.

8 .4 POWER SUPPLY FOR LCM(EXAMPLE)



NOTE 1 VR:10K Ω

C1:10 μ F

C2:3.3 μ F

Tr:2SA673APKC(hfe=100,IC=500mA)OR EQUIVALENT Tr.

KHE-1417

9.5 THE RELATIONSHIP OF DISPLAY PATTERN AND DATA

DATA SIGNAL	U D 3	L D 3	U D 2	L D 2	U D 1	L D 1	U D 0	L D 0	U D 3	L D 3	L D 2	L D 2		L D 2	U D 1	L D 1	U D 0	L D 0
Y X	1	2	3	4	5	6	7	8	9	10	11	12		9	9	9	9	9
														5	5	5	5	8
														6	7	8	9	0
1	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
2	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
3	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
4	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
5	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
.	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.
2 3 8	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
2 3 9	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
2 4 0	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B

R : RED

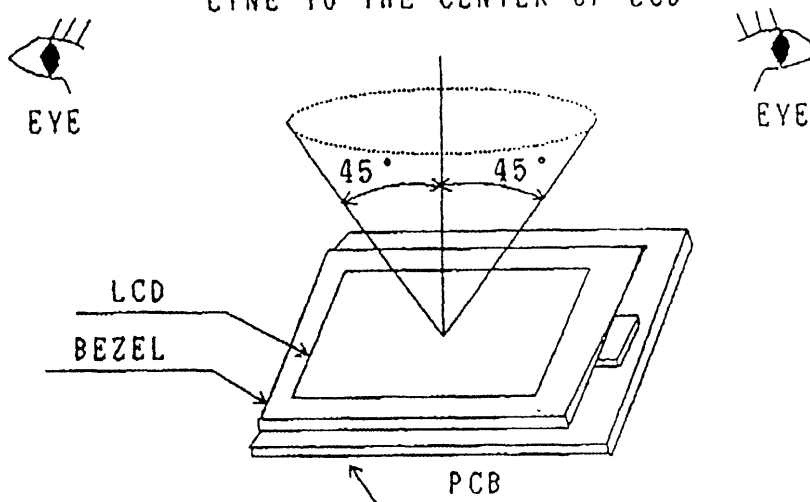
G : GREEN

B : BLUE

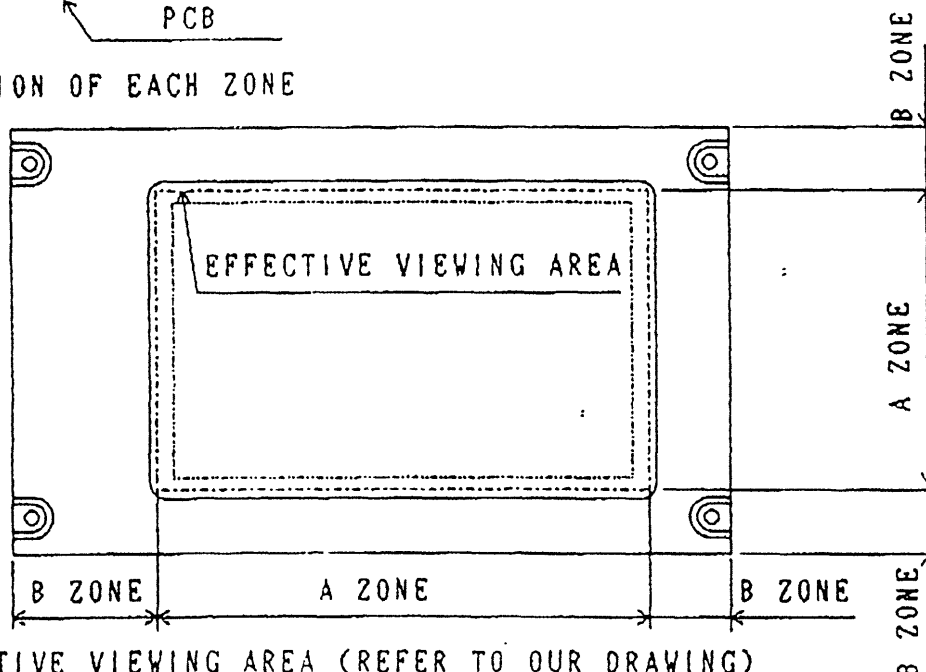
10. APPEARANCE STANDARD

10. 1 APPEARANCE INSPECTION CONDITION
VISUAL INSPECTION SHOULD BE DONE
UNDER THE FOLLOWING CONDITION.

- (1) IN THE DARK ROOM
- (2) WITH CFL PANEL LIGHTED WITH PRESCRIBED INVERTER CIRCUIT.
- (3) WITH EYES 25cm DISTAND FROM LCM
- (4) VIEWING ANGLE WITHIN 45 DEGREES FROM THE VERTICAL
LINE TO THE CENTER OF LCD



10. 2 DEFINITION OF EACH ZONE



A ZONE: EFFECTIVE VIEWING AREA (REFER TO OUR DRAWING)
B ZONE: EXCEPT A ZONE

KHE-E-1413

1/28

10. 2 APPEARANCE SPECIFICATION

※) IF THE PROBLEM OCCURES, ABOUT THIS ITEM THE RESPONSIBLE PERSON OF BOTH PARTY (CUSTOMER AND HITACHI) WILL DISCUSS MORE DETAIL.

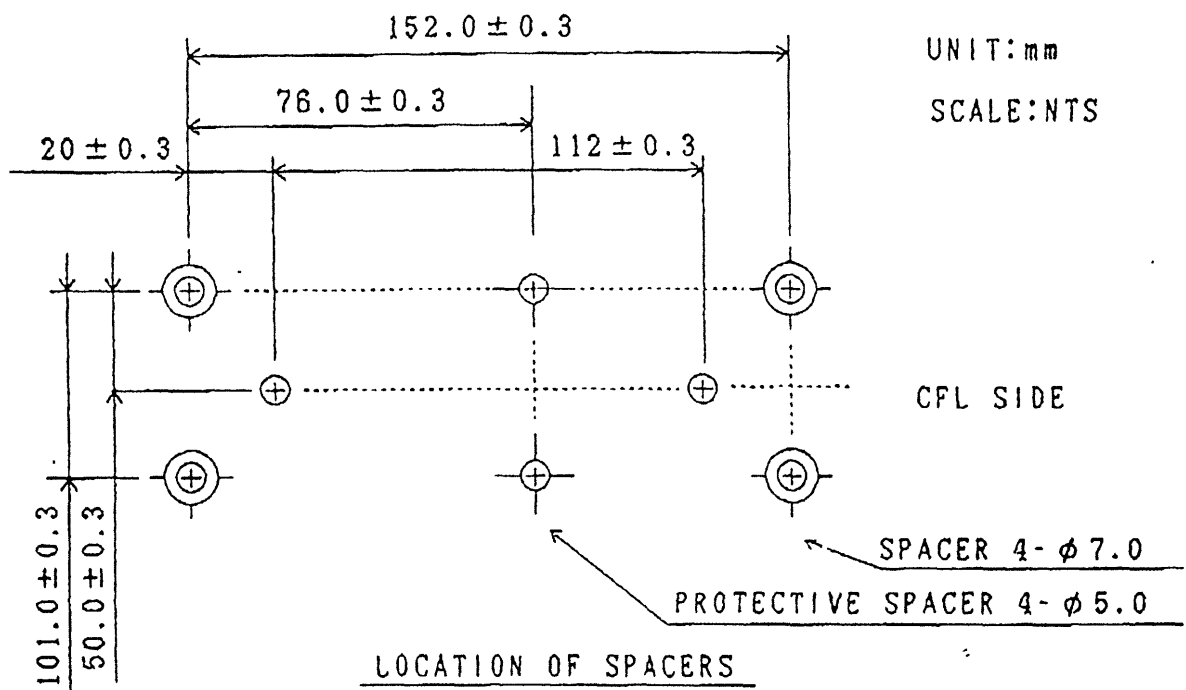
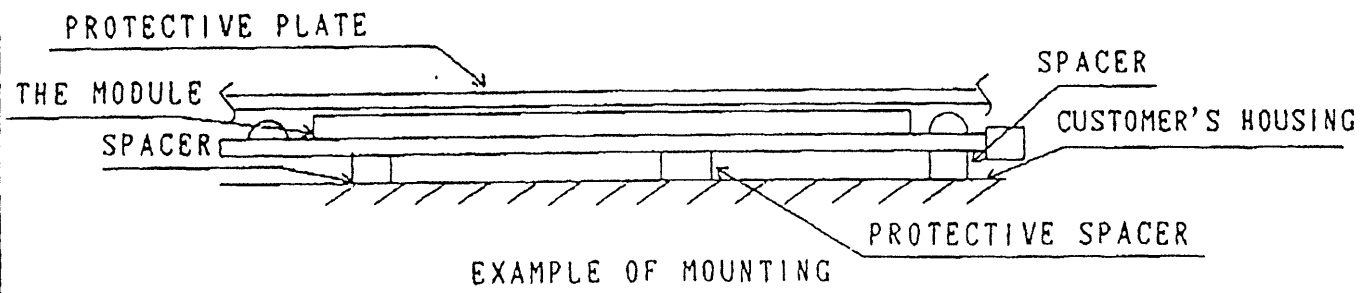
NO.	ITEM	CRITERIA			A	B	
L C D	SCRATCHES	DISTINGUISHED ONE IS NOT ACCEPTABLE (TO BE JUDGED BY HITACHI LIMIT SAMPLE)			※	-	
	DENT	SAME AS ABOVE			※	-	
	WRINKLES IN POLARIZER	SAME AS ABOVE			※		
	BUBBLES	AVERAGE DIAMETER D(mm)	MAXIMUM NUMBER ACCEPTABLE		○	-	
		$D \leq 0.2$	IGNORE				
		$0.2 < D \leq 0.3$	12				
		$0.3 < D \leq 0.5$	3				
		$0.5 < D$	NONE				
	STAINS, FOREIGN MATERIALS DARK SPOT	FILAMENTOUS			○	※	
		LENGTH L(mm)	THICKNESS T(mm)	MAXIMUM NUMBER ACCEPTABLE			
		$L \leq 2.0$	$T \leq 0.03$	IGNORE			
		$L \leq 3.0$	$0.03 < T \leq 0.05$	6			
		-	$0.05 < T$	NONE			
		ROUND			○	※	
		AVERAGE DIAMETER D(mm)	MAXIMUM NUMBER ACCEPTABLE	SPACE			
		$D < 0.2$	IGNORE	-			
		$0.2 \leq D < 0.3$	6	10mm			
		$0.3 \leq D < 0.4$	4	30mm			
		$0.4 \leq D$	NONE	-			
		THE WHOLE	FILAMENTOUS+ROUND=10				
		THOSE WIPED OUT EASILY ARE ACCEPTABLE			○	○	
		COLOR TONE	TO BE JUDGED BY HITACHI LIMIT SAMPLE			○	-
		COLOR UNIFORMITY	SAME AS ABOVE			○	-
	PINHOLE	$(A+B)/2 \leq 0.15$ MAX. NO. ACCEPTABLE IGNORE			○	-	
		$0.15 < (A+B)/2 \leq 0.3$ MAX. NO. ACCEPTABLE ≤ 10					
		$C \leq 0.03$ IGNORE					

12HE-R-1417

11. PRECAUTION IN DESIGN

11.1 MOUNTING METHOD

SINCE THE MODULE IS SO CONSTRUCTED AS TO BE FIXED BY UTILIZING FITTING HOLES IN THE PRINTED CIRCUIT BOARD AS SHOWN BELOW, IT IS NECESSARY TO TAKE CONSIDERATION THE FOLLOWING ITEMS ON ATTACHMENT TO A FRAME.

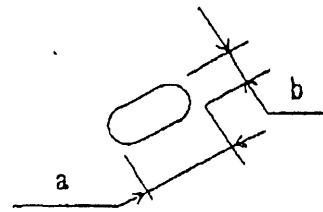
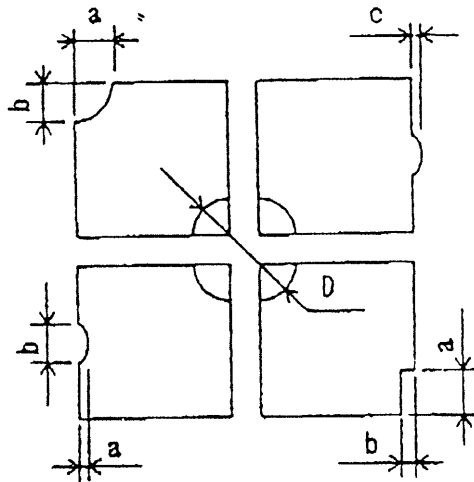


- (1) USE OF PROTECTIVE PLATE, MADE OF AN ACRYLIC PLATE, ETC, IN ORDER TO PROTECT A POLARIZER AND LC CELL.
- (2) TO PREVENT THE MODELE COVER FROM BEING PRESSED, THE SPACERS BETWEEN THE MODULE AND THE FITTING PLATES SHOUD BE LONGER THAN 0.5mm
- (3) WE RECOMMEND YOU TO USE PROTECTIVE SPACER AS FIGURE FOR PROTECTING LCD MODULE FROM ANY KIND OF SHOCK TO YOUR SET.

11.2 LC DRIVING VOLTAGE (VEE) AND VIEWING ANGLE RANGE.

SETTING VO OUT OF THE RECOMMENDED CONDITION WILL BE A CAUSE FOR A CHANGE OF VIEWING ANGLE RANGE.

NOTE 1



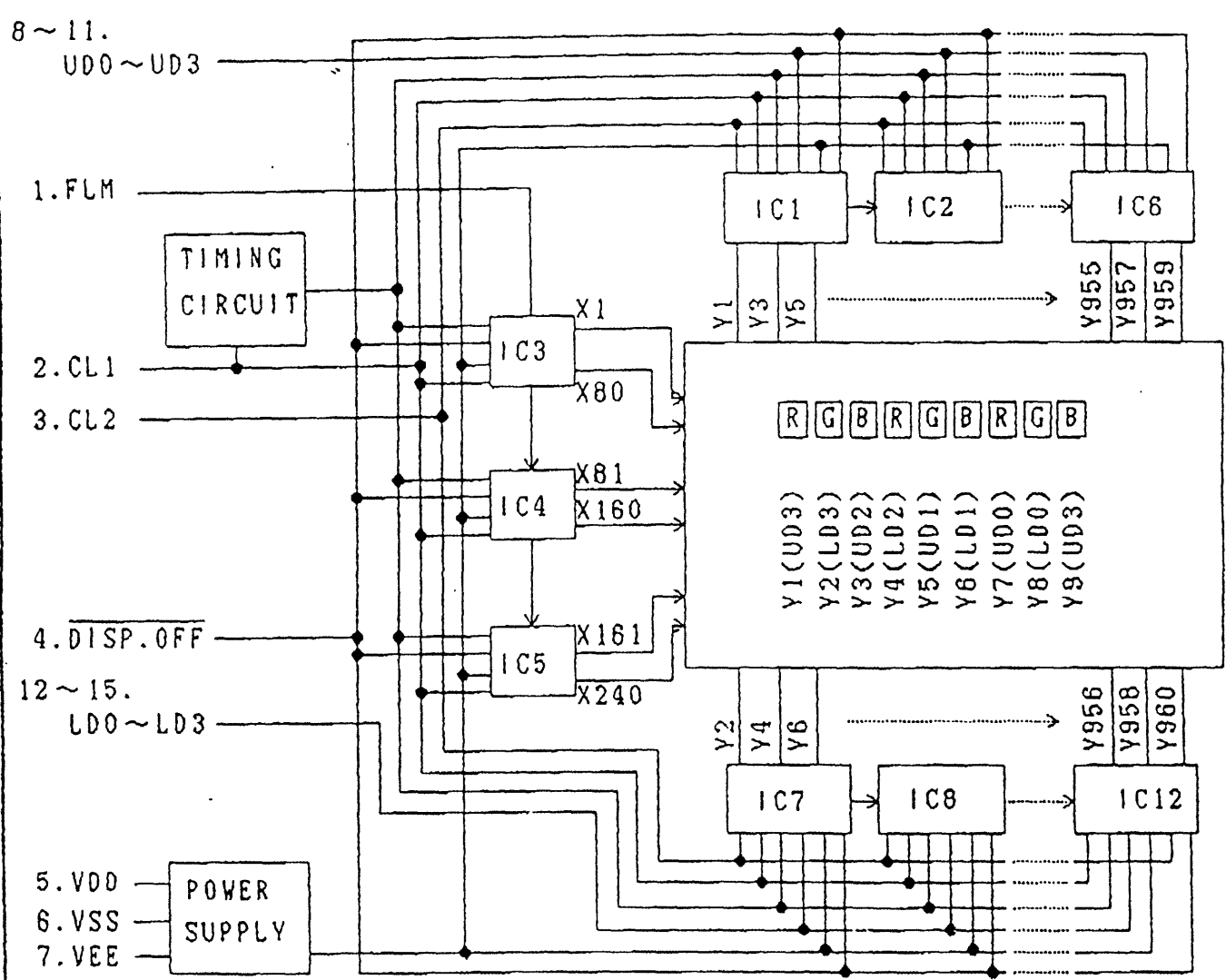
$$\frac{a+b}{2} = D \dots \text{AVERAGE DIAMETER}$$

C ... SALIENT

NOTE 2 LCM BACKLIGHT ON.

NOTE 3 THERE ARE TWO SCRATCHES IN A PAIR.

7. BLOCK DIAGRAM



KHE-R-1417

6. 2 OPTICAL CHARACTERISTICS OF BACKLIGHT

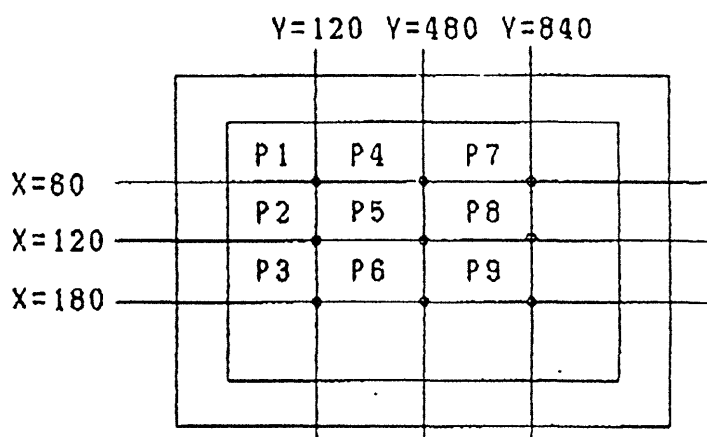
(LCM, BACKLIGHT ON, $T_a=25^\circ\text{C}$)

ITEM	MIN.	TYP.	MAX.	UNIT	NOTE
BRIGHTNESS	-	(100)	-	cd/m^2	IL=6mA NOTE 1,2
RISE TIME	-	5	-	MINUTE	IL=6mA BRIGHTNESS 80%
BRIGHTNESS UNIFORMITY	-	-	± 30	%	UNDERMENTIONED NOTE 1,3

CFL : INITIAL, $T_a=25^\circ\text{C}$, $\phi=0^\circ$

DISPLAY DATA SHOULD BE ALL "ON".

NOTE 1 MEASUREMENT AFTER 10 MINUTES OF CFL OPERATING.

NOTE 2 BRIGHTNESS CONTROL : 100%, $V_{EE}-V_{SS}=(22.7)\pm 1.0\text{V}$ NOTE 3 MEASUREMENT OF THE FOLLOWING 9 PLACES ON THE DISPLAY.
DEFINITION OF THE BRIGHTNESS TOLERANCE.

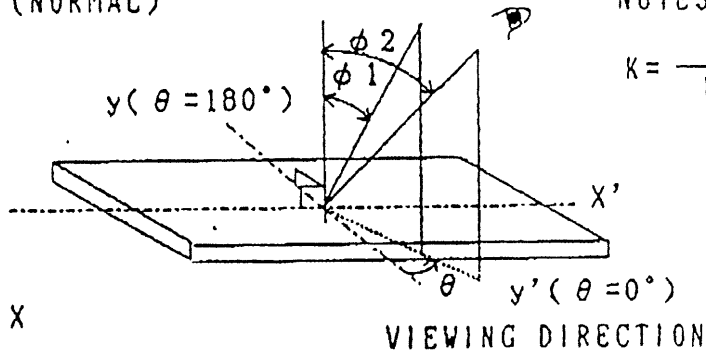
$$\left(\frac{\text{MAX BRIGHTNESS OR MIN BRIGHTNESS} - \text{AVERAGE BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right) \times 100$$

NOTE 4 MEASURE CONDITION BY HITACHI.

KHE-2-1417

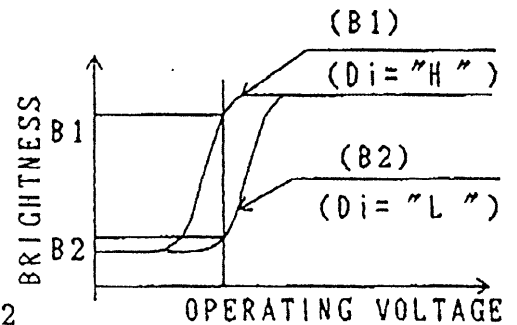
7/8

NOTE1. DEFINITION OF θ AND ϕ
(NORMAL)

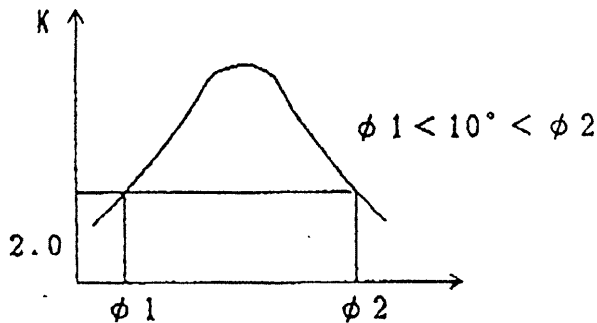


NOTE3. DEFINITION OF CONTRAST "K"

$$K = \frac{\text{BRIGHTNESS ON SELECTED DOT (B1)}}{\text{BRIGHTNESS ON NON-SELECTED DOT (B2)}}$$

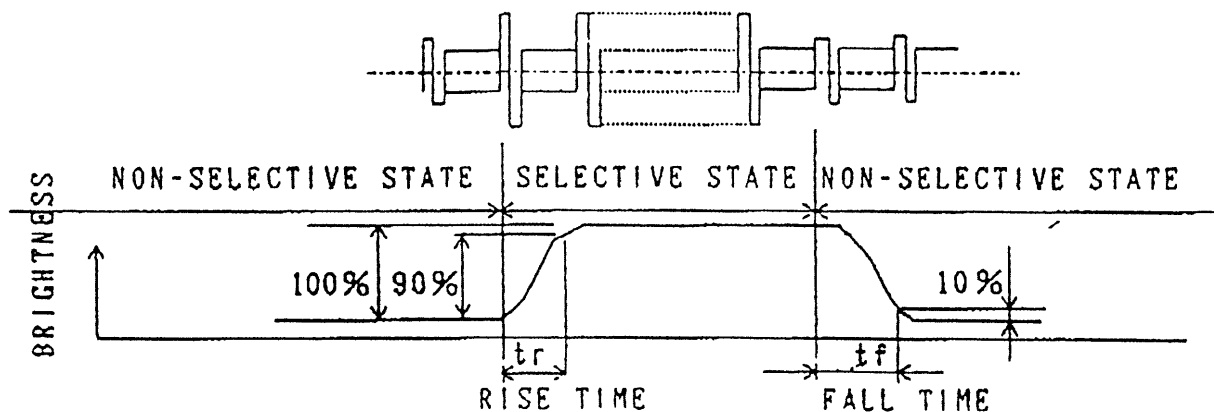
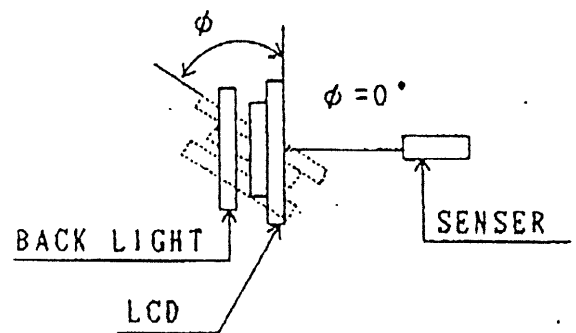


NOTE2. DEFINITION OF VIEWING ANGLE ϕ_1 AND ϕ_2



CONTRAST RATIO K VS VIEWING ANGLE ϕ

NOTE4. DEFINITION OF OPTICAL RESPONSE



NOTE 5. $T_a = 25^\circ\text{C}$, $V_{DD} - V_{EE} = (22.7)\text{V}$, DISPLAY DATA SHOULD BE ALL "ON".

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS OF LCM

Ta=25°C (BACKLIGHT ON)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA		$\phi 2 - \phi 1$	K=2.0	-	(40)	-	deg	(1)(2)
CONTRAST RATIO		K	$\phi = 0^\circ \theta = 0^\circ$	-	(10)	-	-	(3)
RESPONES TIME(RISE)		tr	$\phi = 0^\circ \theta = 0^\circ$	-		(210)	ms	(4)
RESPONES TIME(FALL)		tf	$\phi = 0^\circ \theta = 0^\circ$	-		(160)	ms	(4)
COLOR COORDINATES	RED	X	$\phi = 0^\circ \theta = 0^\circ$	-		-	-	(5)
		Y		-		-	-	
	GREEN	X		-		-	-	
		Y		-		-	-	
	BLUE	X		-		-	-	
		Y		-		-	-	
	WHITE	X		-		-	-	
		Y		-		-	-	

(MEASURE CONDITION BY HITACHI)