

HITACHI

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FOR MESSRS. _____

DATE. Apr.23.'01

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

SP14Q002-C2A

C O N T E N T S

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14	DIGITIZER TECHNICAL SPECIFICATLION	7B64PS 2714- SP14Q002-C2A-2	14-1/4~4/4

* WHEN PRODUCT WILL BE DISCONTINUED , CUSTOMER WILL BE INFORMED BY HITACHI WITH TWELVE MONTHS PRIOR ANNOUNCEMENT.

ACCEPTED BY; _____

PROPOSED BY; H.T. Chen

KAOHSIUNG HITACHI ELECTRONICS CO.,LTD.	Sh. No.	7B64PS 2701- SP14Q002-C2A-2	PAGE	1-1/1
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RECORD OF REVISION

DATE	SHEET No.	SUMMARY
Apr.23.'01	7B64PS2703- SP14Q002-C2A-2 PAGE 3-1/1	CHANGED : TRANSPARENCY 78% min → 76% min
	7B64PS2705- SP14Q002-C2A-2 PAGE 6-2/2	CHANGED : BRIGHTNESS TYP. 140 cd/m ² → 110 cd/m ²
	7B63PS2709- SP14Q002-C2A-2 PAGE 9-1/2	CHANGED : DETAIL A FFC CONDUCTIVE AND STIFFENER LENGTH..
	7B64PS2709- SP14Q002-C2A-2 PAGE 9-2/2	ADDED : TOUCH PANEL INTERFACE PIN CONNECTION.
	7B64PS2714- SP14Q002-C2A-2 PAGE 14-1/3~3/3	ADDED : 14 DIGITIZER TECHNICAL SPECIFICATION.

3. GENERAL SPECIFICATIONS

(1) PART NAME	SP14Q002-C2A
(2) OUTER DIMENSIONS	167.0(W)mm×109.0(H)mm×11.4 (D)mm(max.)
(3) EFFECTIVE DISPLAY AREA	120 mm min. × 89 mm min
(4) DOT SIZE	0.345(W)min. × 0.345(H)min
(5) DOT PITCH	0.360(W)mm × 0.360(H)mm
(6) DOT NUMBER (RESOLUTION)	320 (W) × 240 (H)
(7) DUTY RATIO	1/240
(8) LCD TYPE	TRANSMISSIVE TYPE F-STN WITH GLARE TYPE UPPER POLARIZER
(9) VIEWING DIRECTION	6 O'CLOCK
(10) BACK LIGHT TYPE	COLD CATHODE FLUORESCENT LAMP.
(11) TOUCH PANEL	ANALOG RESISTANCE 4wires TRANSPARENCY : 76% min SURFACE TYPE : ANTI GLARE

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

VSS=0V:STANDARD

ITEM	SYMBOL	MIN.	MAX.	UNIT	COMMENT
POWER SUPPLY FOR LOGIC	VDD-VSS	0	7.0	V	
POWER SUPPLY FOR LC DRIVE	VDD-VEE	0	30	V	
INPUT VOLTAGE	V_i	-0.3	VDD+0.3	V	NOTE 1
INPUT CURRENT	I_i	0	1	A	
STATIC ELECTRICITY	VESD0	-	+/-100	V	NOTE 2,3,4
	VESD1	-	+/-10	KV	NOTE 2,3,5

NOTE (1) : $\overline{\text{DISP.OFF}}$, FRAME , LOAD , CP , D0~D3.

NOTE (2) : MAKE CERTAIN YOU ARE GROUNDED WHEN HANDLING LCM.

NOTE (3) : ENERGY STORAGE CAPACITANCE 200PF , DISCHARGE RESISTANCE 250Ω
 $T_a=25^\circ\text{C}$, 60%RH.

NOTE (4) : CONTACT DISCHARGE TO I/F CONNECTOR PINS.

NOTE (5) : CONTACT DISCHARGE TO FRONT METAL BEZEL.

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

ITEM	OPERATING		STORAGE		OMMNT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0°C	60°C	-20°C	70°C	NOTE 2,3
HUMIDITY	NOTE 1		NOTE 1		WITHOUT CONDENSATION
VIBRATION	-	2.45m/s ² (0.25G)	-	11.76m/s ² (1.2G) NOTE 5	NOTE 4 1 HOUR MAX.
SHOCK	-	29.4m/s ² (3 G)	-	490.0m/s ² (50 G) NOTE 5	XYZ DIRECTIONS
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (1) $T_a \leq 40^\circ\text{C}$: 85%RH max.

$T_a > 40^\circ\text{C}$: ABSOLUTE HUMIDITY MUST BE LOWER.
 THAN THE HUMIDITY OF 85%RH AT 40°C

NOTE (2) T_a AT -20°C ——< 48HRS, AT 60°C < 168HRS.

NOTE (3) BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE. THIS PHENOMENON IS REVERSIBLE.

NOTE (4) 5Hz~100Hz (EXCEPT RESONANCE FREQUENCY)

NOTE (5) THIS MODULE SHOULD BE OPERATED NORMALLY AFTER FINISH THE TEST.

NOTE (6) WHEN LCM WILL BE OPERATED AT 0°C , THE LIFE TIME OF CFL WILL BE REDUCED. NEED TO MAKE SURE OF VALUE OF THE CHARACTERISTICS OF INVERTER. ALSO THE RESPONSE TIME AT 0°C WILL BE SLOWER.

NOTE (7) THERE ARE POSSIBILITY THAT COLOR UN-UNIFORMITY HAPPENED WHILE OPERATING AT OVER 40°C .

5. ELECTRICAL CHARACTERISTICS

5.1 ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	-	5.0-5%	5.0	5.0+5%	V
			3.3-5%	3.3	3.3+5%	
POWER SUPPLY VOLTAGE FOR LC DRIVING	VEE-VSS	-	-23.1	-22.0	-20.9	V
INPUT VOLTAGE NOTE 1	VI	H LEVEL	0.8VDD	-	VDD	V
		L LEVEL	0	-	0.2VDD	V
POWER SUPPLY CURRENT FOR LOGIC NOTE 4	IDD	VDD-VSS=5.0V VEE-VSS= -22.0V	-	6.0	-	mA
POWER SUPPLY VOLTAGE FOR LC DRIVING NOTE 4	IEE	VDD-VSS=5.0V VEE-VSS= -22.0V	-	5.0	-	mA
RECOMMENDED LC DRIVING VOLTAGE NOTE 3	VDD-V0	Ta= 0°C , ϕ = 0°	-	22.0	-	V
		Ta=25°C , ϕ = 0°	-	21.0	-	V
		Ta=50°C , ϕ = 0°	-	19.0	-	V
FRAME FREQUENCY	fFRAME	-	70	75	80	Hz

NOTE 1 $\overline{\text{DISP.OFF}}$, FRAME , LOAD , CP , D0~D3.

NOTE 2 RECOMMENDED LC DRIVING VOLTAGE MAY FLUCTUATE ABOUT +/-1.0V BY EACH MODULE.

NOTE 3 NEED TO MAKE SURE OF FLICKERING AND RIPPLING OF DISPLAY WHEN SETTING THE FRAME FREQUENCY IN YOU SET.
TEST PATTERN IS ALL "Q"

NOTE 4 fFRAME=75Hz ,TEST PATTERN IS ALL "Q".
VDD-V0=21.0V , Ta=25°C

5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LAMP VOLTAGE	VL	-	(300)	-	Vrms	Ta=25°C
FREQUENCY	fL	-	70	85	kHz	Ta=25°C
LAMP CURRENT	IL	4	5	6	mA _{rms}	Ta=25°C
STARTING DISCHARGE VOLTAGE	VS NOTE 2	(1000)	-	-	Vrms	Ta=25°C

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

NOTE 1 PLEASE MAKE SURE THAT YOUR INVERTER IS DESIGNED TO MEET THE ABOVE SPECIFICATIONS.

NOTE 2 STARTING DISCHARGE VOLTAGE IS INCREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE
PLEASE CHECK THE CHARACTERISTICS OF YOUR INVERTER BEFORE APPLING TO YOUR SET.

NOTE 3 AVERAGE LIFE TIME OF CFL WILL BE DECREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE.

NOTE 4 UNDER LOWER DRIVING FREQUENCY OF AN INVERTER ,A CERTAIN BACKLIGHT SYSTEM (CFL & CFL REFLECTION SHEET) MAY GENERATE A SOUND NOISE.

NOTE 5 WHEN ICFL IS USED OVER 5.5mA ,IT MAY CAUSE UNEVEN CONTRAST NEAR CFL LOCATION ,DUE TO HEAT DISPERSION FROM CFL.

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS

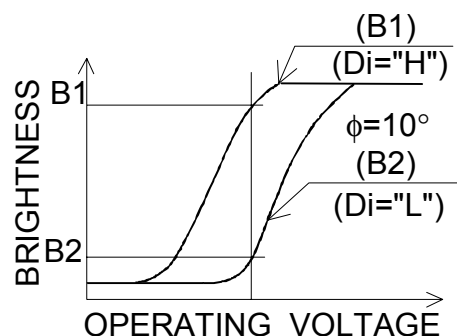
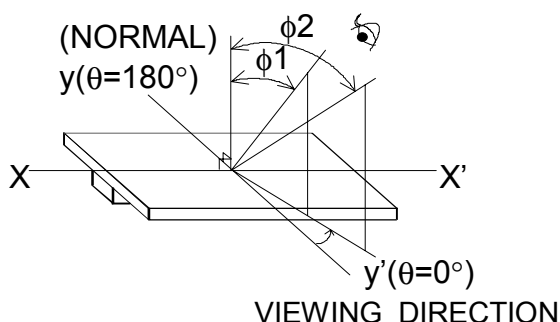
Ta=25°C(BACKLIGHT ON)

ITEM	SYMBOL	CONDITIONAL	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA	$\phi 2-\phi 1$	$K \geq 2.0$	-	40	-	deg	1,2
CONTRAST RATIO	K	$\phi = 0^\circ, \theta = 0^\circ$	-	25	-	-	3
RESPONSE TIME (RISE)	tr	$\phi = 0^\circ, \theta = 0^\circ$	-	120	-	ms	4
RESPONSE TIME (FALL)	tf	$\phi = 0^\circ, \theta = 0^\circ$	-	150	-	ms	4

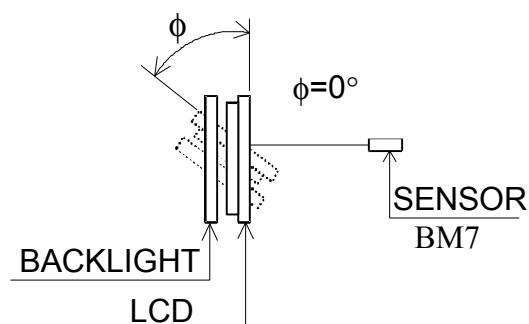
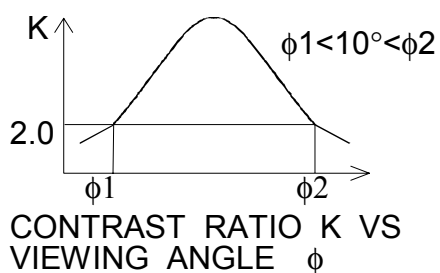
(MEASURE CONDITION BY HITACHI)

NOTE 3. DEFINITION OF CONTRAST "K"

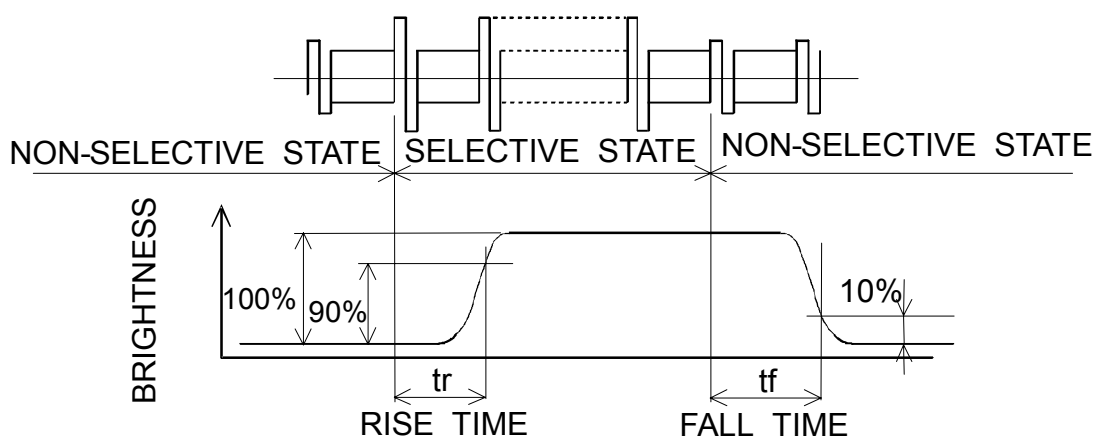
$$K = \frac{\text{BRIGHTNESS ON SELECTED DOT (B1)}}{\text{BRIGHTNESS ON NON-SELECTED DOT (B2)}}$$



NOTE 2. DEFINITION OF VIEWING ANGLE $\phi 1$ AND $\phi 2$.



NOTE 4. DEFINITION OF OPTICAL RESPONSE



6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

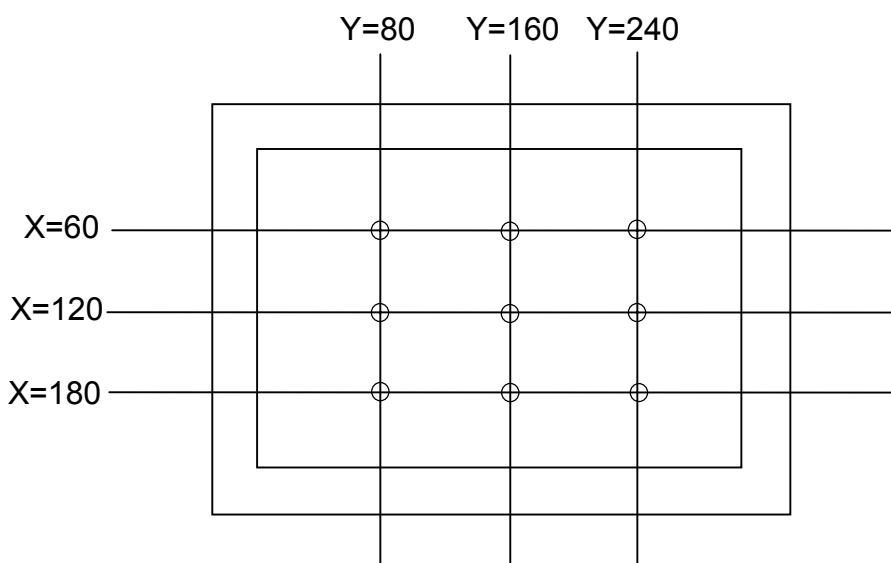
I T E M	MIN.	TYP.	MAX.	UNIT	NOTE
BRIGHTNESS	-	110	-	cd/m ²	IL=5mA NOTE 1,2
RISE TIME	-	5	-	MINUTE	IL=5mA BRIGHTNESS 80%
BRIGHTNESS UNIFORMITY	-	-	+/-30	%	UNDERMENTIONED NOTE 1,3

CFL : INITIAL, Ta=25°C, VDD-V0=21.0V
DISPLAY DATA SHOULD BE ALL "ON".

NOTE 1. MEASUREMENT AFTER 10 MINUTES OF CFL OPERATING.

NOTE 2. BRIGHTNESS CONTROL : 100%

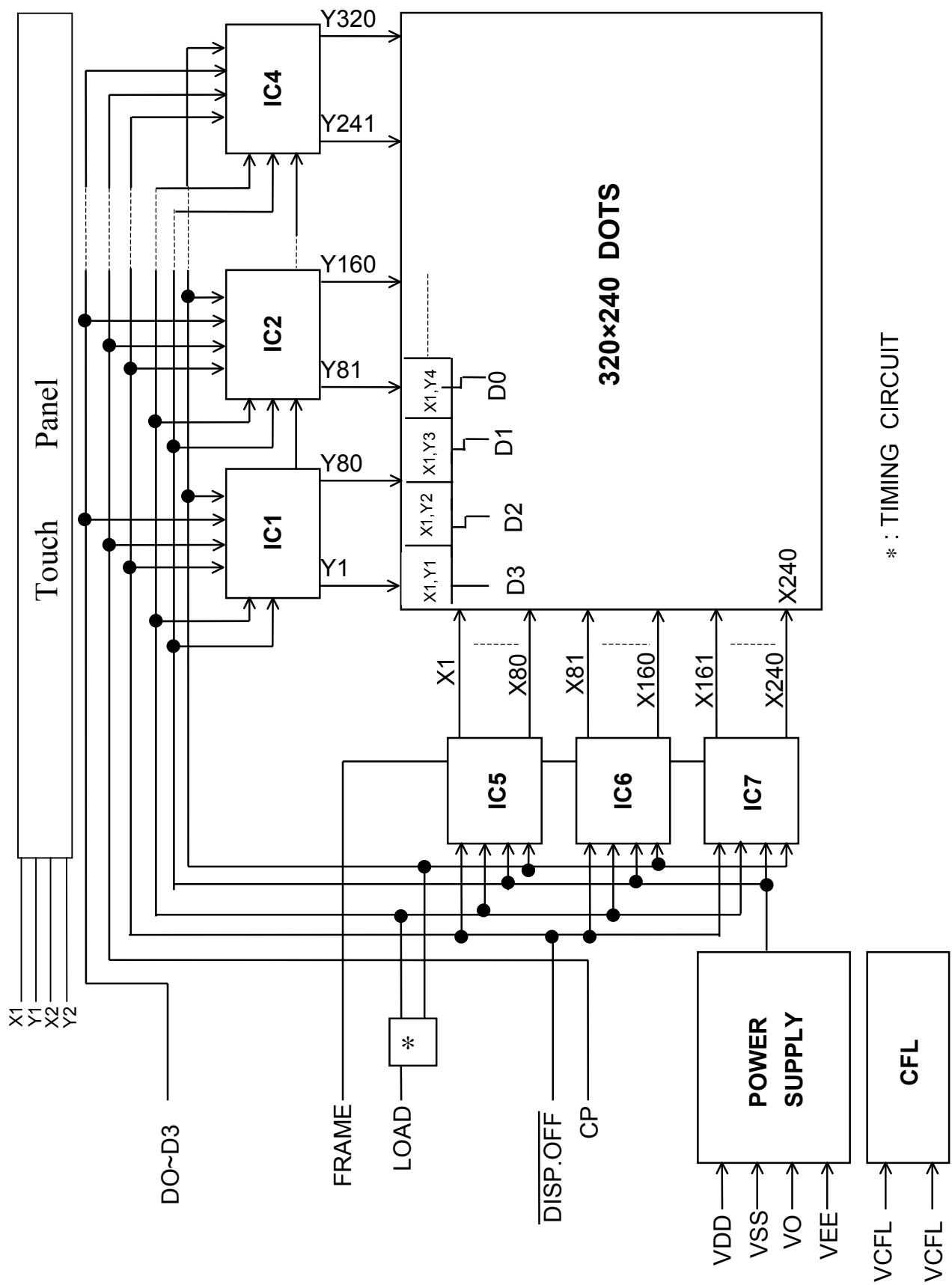
NOTE 3. MEASURE OF THE FOLLOWING 9 PLACES ON THE DISPLAY.



DEFINITION OF THE BRIGHTNESS TOLERANCE.

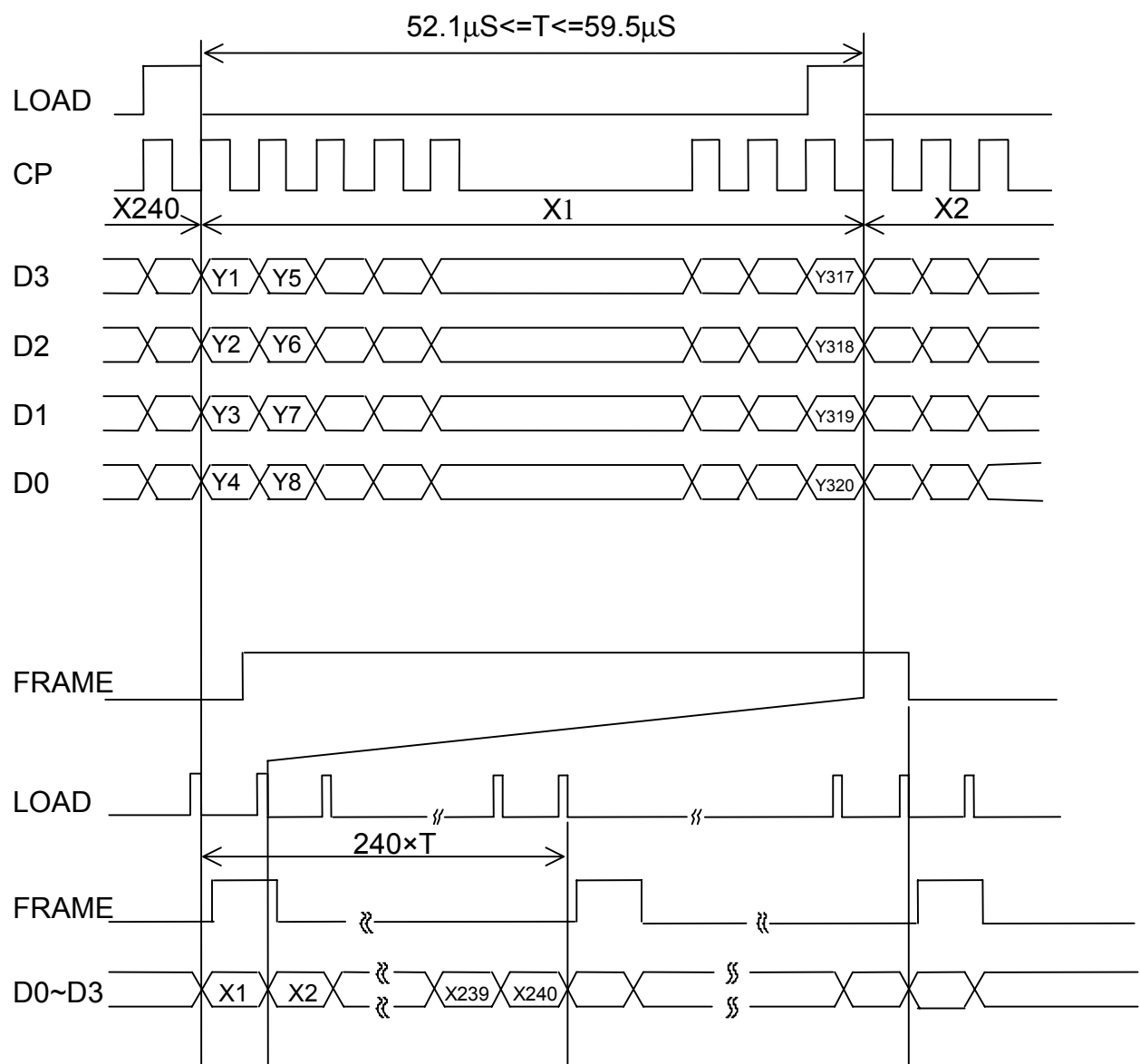
$$\left(\frac{\text{MAX OR MIN BRIGHTNESS} - \text{AVERAGE BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right) \times 100\%$$

7. BLOCK DIAGRAM



8. INTERFACE TIMING CHART

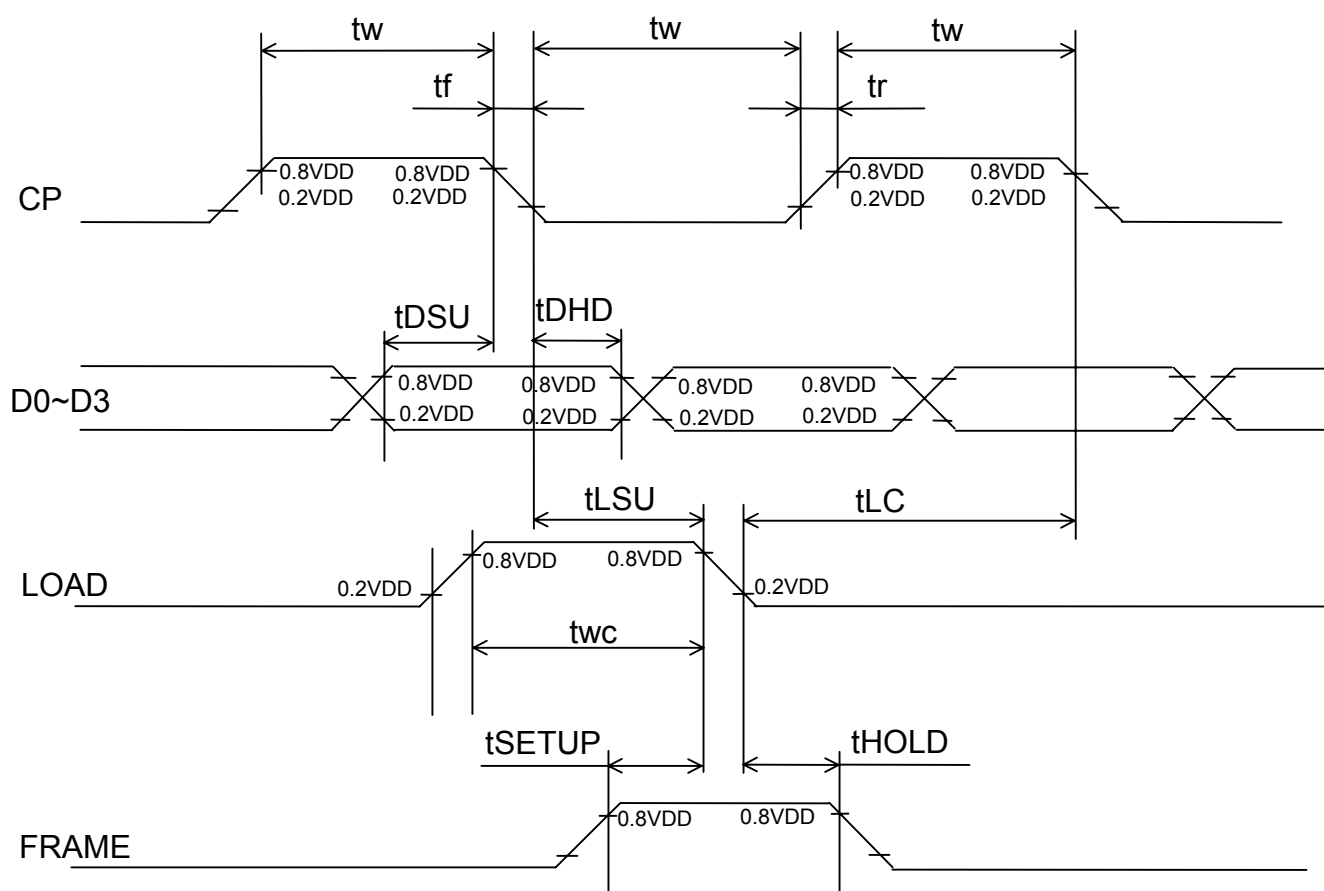
8.1 INTERFACE TIMING CHART



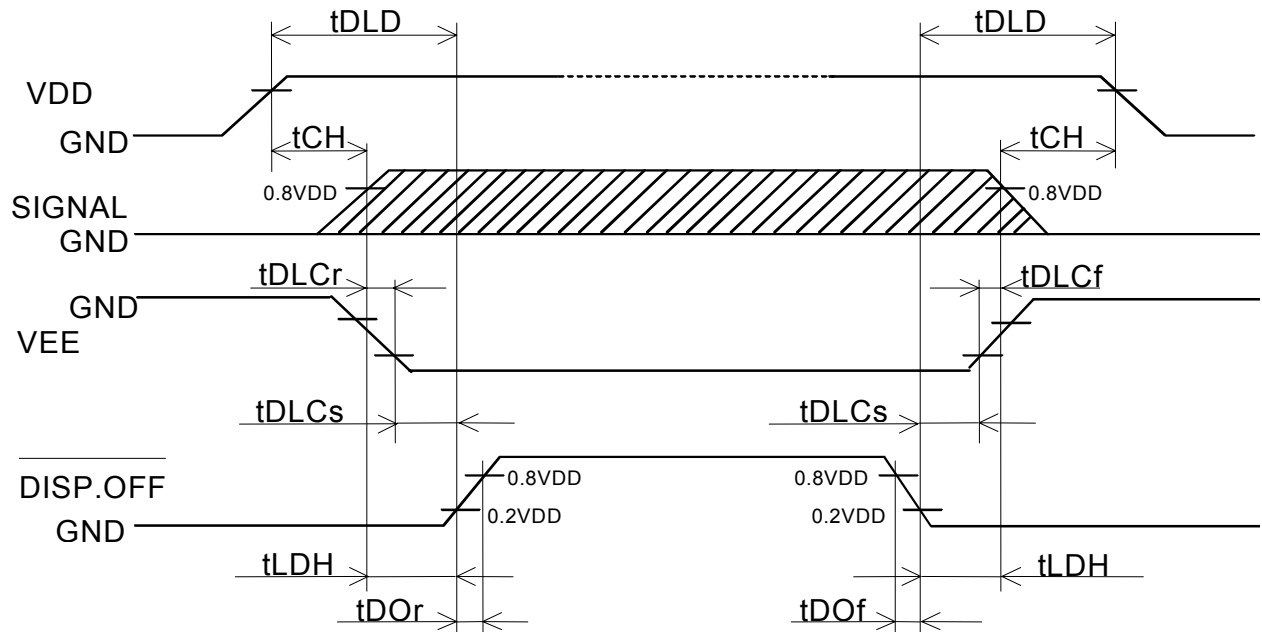
8.2 TIMING CHARACTERISTICS

0°C ≤ Ta = 50°C, VDD = 5.0V ± 5%

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK FREQUENCY	fCP	-	-	6.5	MHz
CLOCK PULSE WIDTH	tW	45	-	-	ns
CLOCK RISE, FALL TIME	tr,tf	-	-	15	ns
DATA SET UP TIME	tDSU	30	-	-	ns
DATA HOLD TIME	tDHD	30	-	-	ns
LOAD SET UP TIME	tLSU	80	-	-	ns
LOAD CLOCK TIME	tLC	120	-	-	ns
"FRAME" SET UP TIME	tSETUP	100	-	-	ns
"FRAME" HOLD TIME	tHOLD	100	-	-	ns
"LOAD" PULSE WIDTH	tWC	125	-	-	ns



8.3 POWER ON/OFF TIMING SEQUENCE

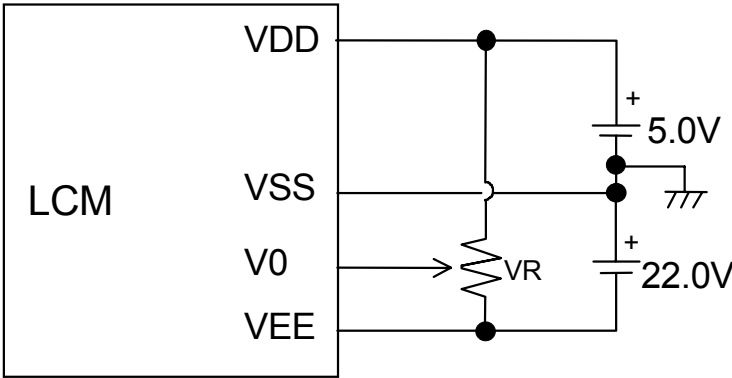


SYMBOL	MIN	MAX	UNIT	COMMENT
t_{DLD}	200	-	ms	(NOTE 1)
t_{CH}	0	200	ms	
t_{LDH}	0	-	ms	
t_{DOOr}	-	100	ns	(NOTE 2)
t_{DOF}	-	100	ns	
t_{DLCr}	0	-	ms	
t_{DLCf}	0	-	ms	
t_{DLCs}	20	-	ms	

NOTE 1 PLEASE KEEP THE SPECIFIED SEQUENCE BECAUSE WRONG SEQUENCE MAY CAUSE PERMANENT DAMAGE TO THE LCD PANEL.

NOTE 2 HITACHI RECOMMENDS YOU TO USE DISP.OFF FUNCTION. DISPLAY QUALITY MAY DETERIORATE IF YOU DON'T USE DISP.OFF FUNCTION.

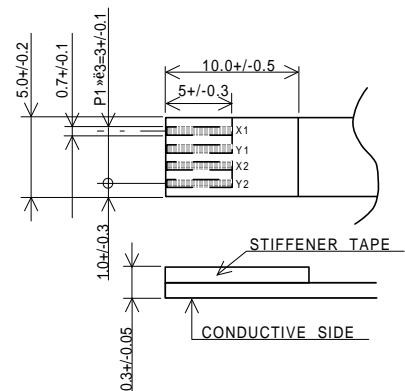
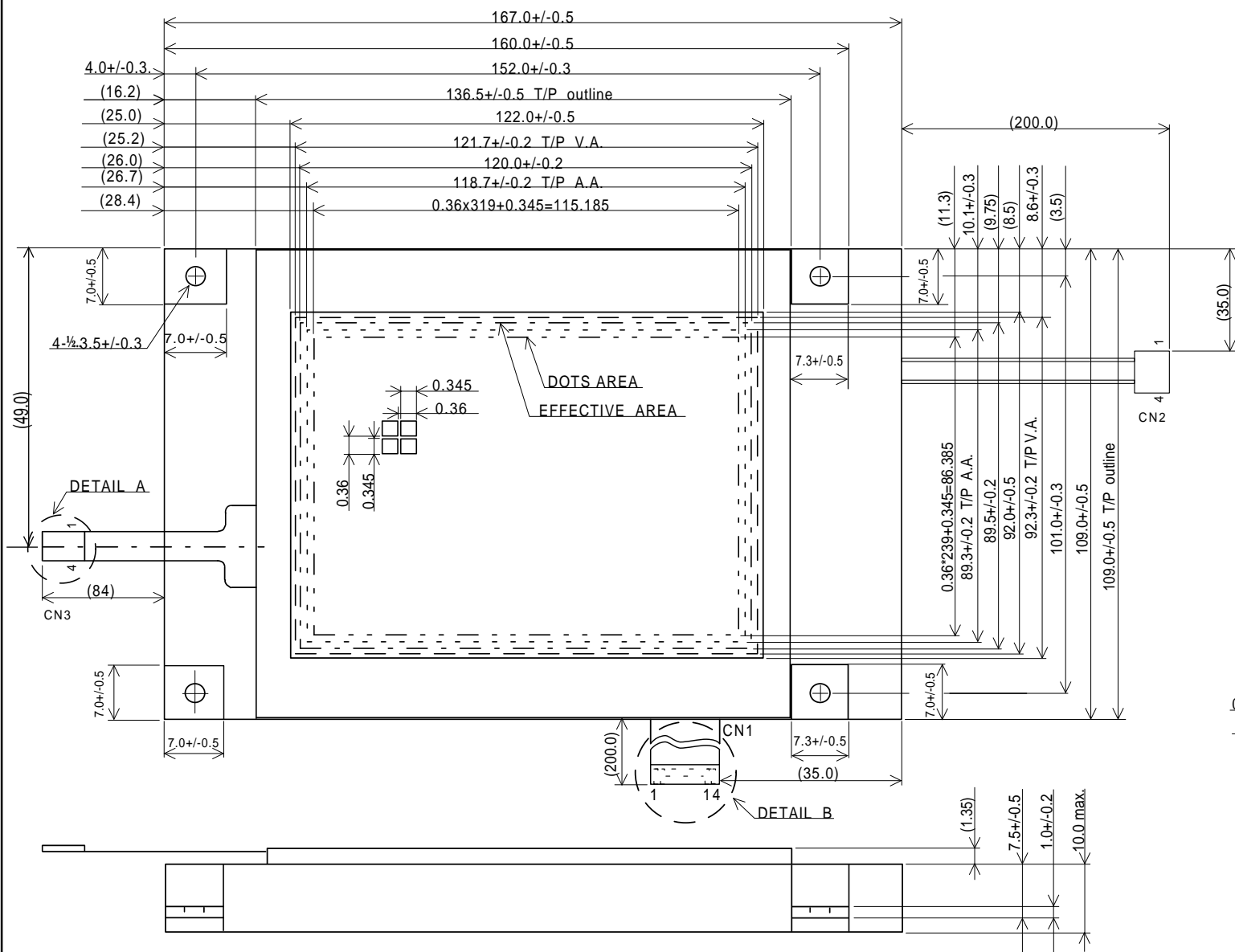
8.4 POWER SUPPLY FOR LCM (EXAMPLE)



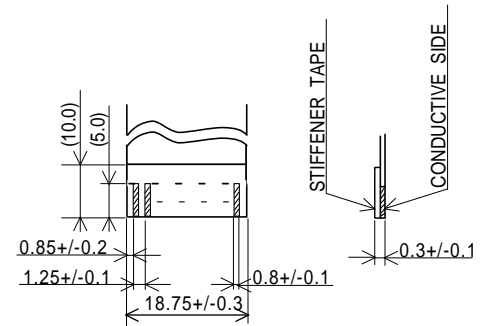
NOTE (1) : VR : 10k Ω

9.DIMENSIONAL OUTLINE

9.1DIMENSIONAL OUTLINE

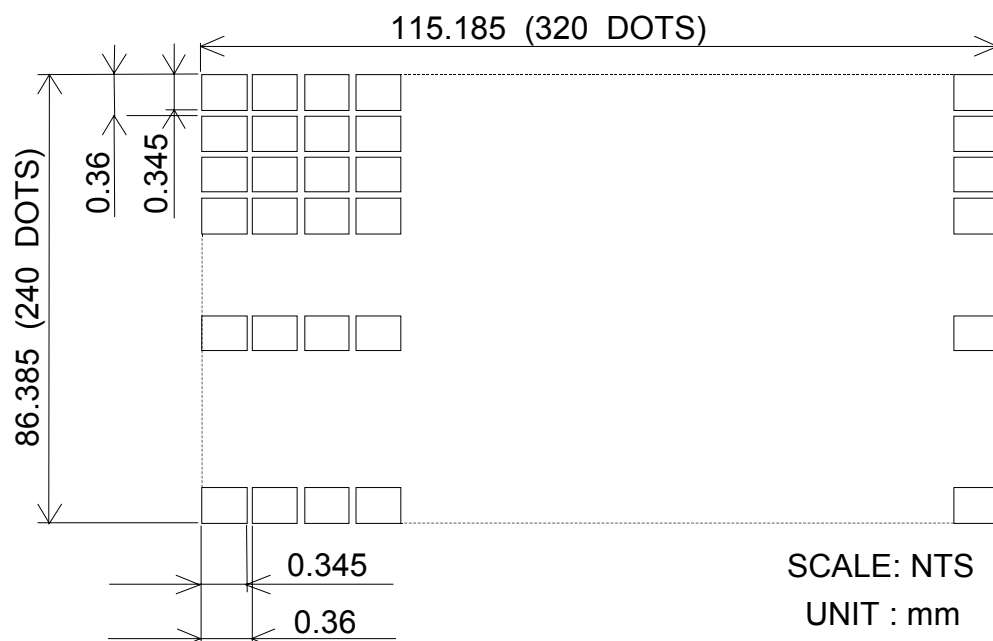


DETAIL A



DETAIL B

9.2 DISPLAY PATTERN



MEASUREMENT TOLERANCE : +/-0.1

9.3 INTERFACE PIN CONNECTION

FFC : PITCH 1.25mm 14 PINS

INTERFACE	PIN No.	SIGNAL	LEVEL	FUNCTION
LCM	CN1	1	H/L	DISPLAY DATA
		2		
		3		
		4		
		5	H/L	H : ON / L : OFF
		6	H	FIRST LINE MARKER
		7	-	-
		8	H→L	DATA LATCH
		9	H→L	DATA SHIFT
		10	-	POWER SUPPLY FOR LOGIC
		11	-	GND
		12	-	POWER SUPPLY FOR LC
		13	-	OPERATING VOLTAGE LC DRIVING
		14	-	GND

RECOMMEND SUITABLE CONNECTOR : (MOLEX) 5597-14APB

INTERFACE	PIN No.	SIGNAL	LEVEL	FUNCTION
CFL	CN2	1	-	POWER SUPPLY FOR CFL
		2	-	-
		3	-	-
		4	-	CFL GND

CFL I/F : J.A.E./ IL – G – 4S –S3C2

FPC : PITCH 1.0mm 4PINS

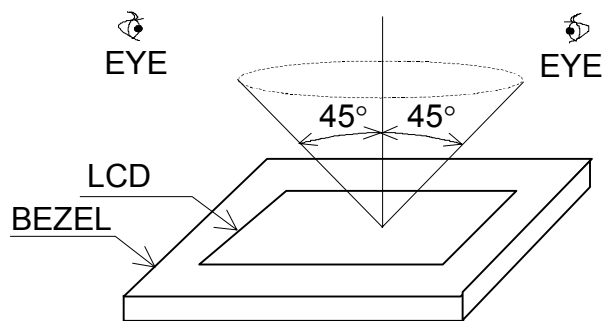
INTERFACE	PIN No.	SIGNAL	FUNCTION
T/P	CN3	1	ANALOG SIGNAL FROM DIGITIZER RIGHT
		2	ANALOG SIGNAL FROM DIGITIZER UP
		3	ANALOG SIGNAL FROM DIGITIZER LFET
		4	ANALOG SIGNAL FROM DIGITIZER BOTTOM

RECOMMEND SUITABLE CONNECTOR : (HIROSE) FH12-10(4)SA-ISH

10. APPEARANCE STANDARD

10.1 APPEARANCE INSPECTION CONDITIONS (IN THE EFFECTIVE VIEWING AREA) VISUAL INSPECTION SHOULD BE UNDER THE FOLLOWING CONDITION.

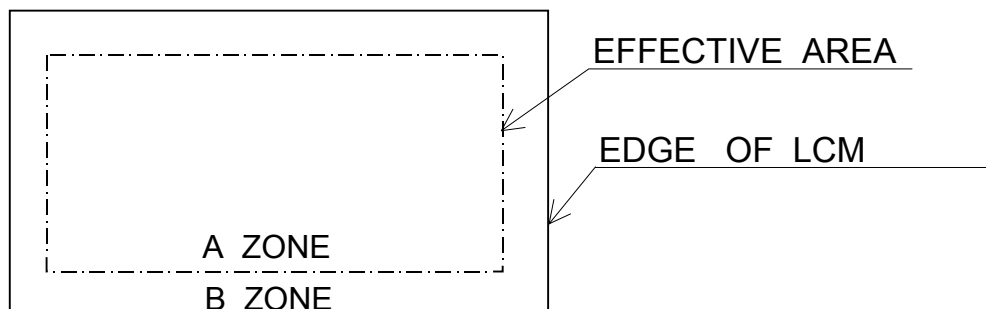
- (1) IN THE DARK ROOM.
- (2) WITH CFL PANEL LIGHTED WITH PRESCRIBED INVERTER CIRCUIT.
- (3) WITH EYE TO LCD DISTANCE IS 25CM.
- (4) VIEWING ANGLE WITHIN 45 DEGREES FROM THE PERPENDICULAR TO THE CENTER LCD.



10.2 DEFINITION OF EACH ZONE

A ZONE : WITHIN THE VIEWING AREA SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.

B ZONE : AREA BETWEEN THE EDGE LINE OF LCD GLASS AND THE VIEWING AREALINE SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.



*) IF A PROBLEM OCCURS IN RESPECT TO ANY OF THESE ITEMS ,
RESPONSIBLES OF BOTH PARTIES (CUSTOMER AND HITACHI) WILL DISCUSS
IN MORE DETAIL.

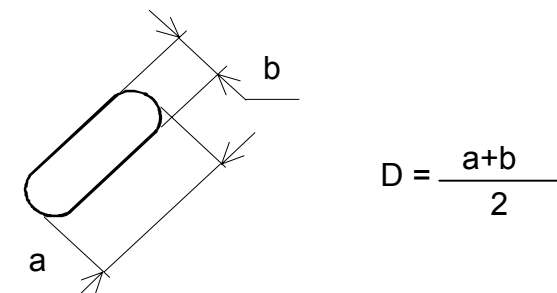
KAOSIUNG HITACHI ELECTRONICS CO.,LTD.	DATE	Apr.23.'01	Sh. No.	7B64PS 2705-SP14Q002-C2A-2	PAGE	10-2/3
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No.	ITEM	CRITERIA				A	B
L C D	CONTRAST IRREGULARITY (LINE) (FILAMENTOUS)	WIDTH D(mm)	LENGTH L(mm)	MAXIMUM NUMBER ACCEPTABLE	MINIMUM SIZE	O	-
		W<=0.25	L<=1.2	2	20mm		
		W<=0.2	L<=1.5	3	20mm		
		W<=0.15	L<=2.0	3	20mm		
		W<=0.1	L<=3.0	4	20mm		
	TOTAL			6			
	RUBBING SCRATCH	TO BE JUDGED BY HITACHI STANDARD				O	-

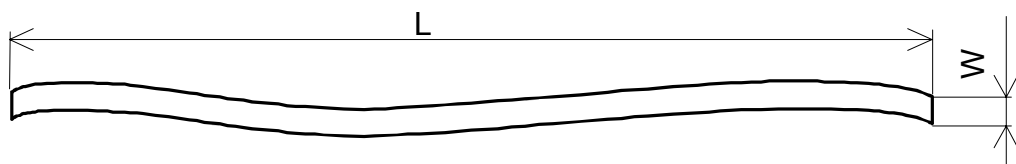
No.	ITEM	CRITERIA		
C F L B / L	DARK SPOTS, WHITE SPOTS FOREIGN MATERIALS (SPOT)	$D \leq 0.4$		IGNORE
		$D > 0.4$		NONE
	FOREIGN MATERIALS (LINE)	$W \leq 0.2$	$L \leq 2.5$	≤ 1
		$W \leq 0.2$	$L > 2.5$	NONE
		$W > 0.2$		NONE
	SCRATCHES	$W \leq 0.1$		IGNORE
		$0.1 < W \leq 0.2$	$L \leq 11.0$	≤ 1
		$0.1 < W \leq 0.2$	$L > 11.0$	NONE
		$W < 0.2$		NONE

NOTE

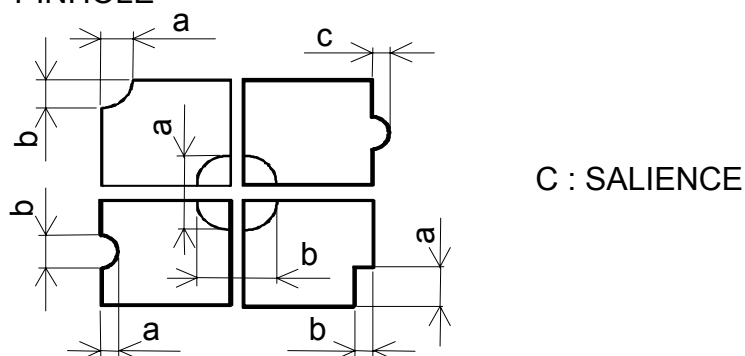
(1) DEFINITION OF AVERAGE DIAMETER D



(2) DEFINITION OF LENGTH L AND WIDTH W



(3) DEFINITION OF PINHOLE



11. PRECAUTION IN DESIGN

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

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

11.2 CAUTION AGAINST STATIC CHARGE

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

11.3 POWER ON SEQUENCE

INPUT SIGNALS SHOULD NOT BE APPLIED TO LCD MODULE BEFORE POWER SUPPLY VOLTAGE IS APPLIED AND REACHES TO SPECIFIED VOLTAGE (5V+/-0.5%).

IF ABOVE SEQUENCE IS NOT KEPT, C-MOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH UP PROBLEM.

11.4 PACKAGING

- (1) NO. LEAVING PRODUCT IS PREFERABLE IN THE PLACE OF HIGH HUMIDITY FOR A LONG PERIOD OF TIME. FOR THEIR STORAGE IN THE PLACE WHERE TEMPERATURE IS 35 DEGREE 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 STORAGE.
- (2) SINCE UPPER/BOTTOM POLARIZERS TEND TO BE EASILY DAMAGED, THEY SHOULD BE HANDLED FULL WITH CARE SO AS NOT TO GET THEM TOUCHED, PUSHED OR RUBBED.
- (3) AS THE ADHESIVES USED FOR ADHERING UPPER/BOTTOM POLERIZERS 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.
- (4) LIGHTLY WIPE TO CLEAN THE DIRTY SURFACE WITH ABSORBENT COTTON WASTE OR OTHER SOFT MATERIAL LIKE CHAMOIS , SOAKED IN THE CHAMICALS 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 COLDNESS WILL BE CAUSED FOR POLARIZER DAMAGE, STAIN AND DIRT ON PRODUCT. WHEN NECESSARY TO TAKE OUT THE PRODUCTS FORM 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. BE CAREFUL NOT TO GIVE IT SHARP SHOCK CAUSED BY DROPPING DOWN, ETC.

11.5 CAUTION FOR OPERATION

- (1) IT IS AN INDISPENSABLE CONDITION TO DRIVE LCDS 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 LCDS 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 LCDS SHOW DARK BULL COLOR IN THEM. HOWEVER THOSE PHENOMENA DO NOT MEAN MALFUNCTION OR OUT OF ORDER WITH LCDS 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 DEGREE C 50%RH OR LESS IS REQUIRED.

11.6 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 POLYETHYLENE 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 DEGREE C TO 35 DEGREE C.
- (3) STORAGE 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.)

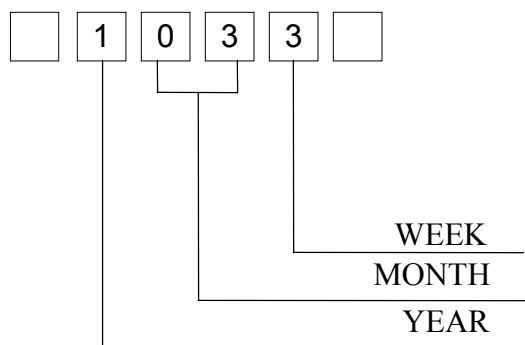
11.7 SAFETY

- (1) IT IS RECOMMENDABLE TO CRASH DAMAGED OR UNNECESSARY LCDS 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.

12. DESIGNATION OF LOT MARK

LOT MARK

LOT MARK IS CONSISTED OF 4 DIGHT NUMBER.



YEAR	FIGURE IN LOT MARK
2001	1
2002	2
2003	3
2004	4
2005	5

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

WEEK (DAY IN CALENDAR)	FIGURE IN LOT MARK
01~07	1
08~14	2
15~21	3
22~28	4
29~31	5

LOCATION OF LOT MARK : ON THE BACK SIDE OF LCM

1 0 3 3 T

T : MADE IN TAIWAN.

13. PRECAUTION FOR USE

13.1 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.

13.2 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 EXPLAINED ABOVE. IF ANY POINTS ARE UNCLEAR OR IF YOU HAVE ANY REQUEST , PLEASE CONTACT HITACHI.

14. DIGITIZER TECHNICAL SPECIFICATION

14.1 RATINGS

14.1.1 ABSOLUTE MAXIMUM RATINGS

ITEM	SPECIFICATION	COMMENT
OPERATING VOLTAGE	7V	WITHOUT CONDENSATION
CONTACT CURRENT	20mA	
OPERATING TEMPERATURE **	0~50°C 80%RH MAX	
STORAGE TEMPERATURE **	-20~70°C 90%RH MAX	

14.1.2 OPERATING CONDITIONS

ITEM	SPECIFICATION
OPERATING VOLTAGE	5VDC
CONTACT CURRENT	10 ~ 20 mA
ACTUATION FORCE	TBD

14.2 MECHANICAL STRENGTH

14.2.1 INPUT METHOD & ACTUATION FORCE

INPUT METHOD	ACTUATION FORCE	COMMENT
PEN	80g MAX	R0.8, POLYACETAL PEN
FINGER	100MAX	R8, SILICONE RUBBER

14.2.2 SURFACE HARDNESS 2H

14.3 OPTICAL CHARACTERISTICS

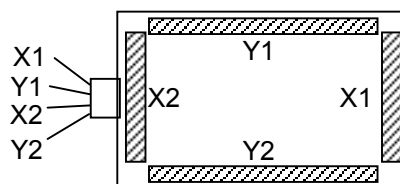
14.3.1 TRANSPARENCY : 76%.min

14.3.2 WAVE LENGTH : 450 ~ 700nm

14.4 ELECTRICAL CHARACTISTICS

14.4.1 CONDUCTIVE RESISTANCE

TERMINAL	CONDUCTIVE RESISTANCE
X1-X2	150~1300Ω
Y1-Y2	150~1300Ω



14.4.2 INSULATION RESISTINCE

TERMINAL	INSULATION RESISTANCE	TESTING VOLTAGE
X-Y	20MΩ	25VDC

14.4.3 BOUNCE CHATTERING

10msec max

14.4.4 CAPACITANCE

TBD

14.4.5 RESISTANCE FACTOR

TERMINAL	
X1-X2	10% max
Y1-Y2	10% max

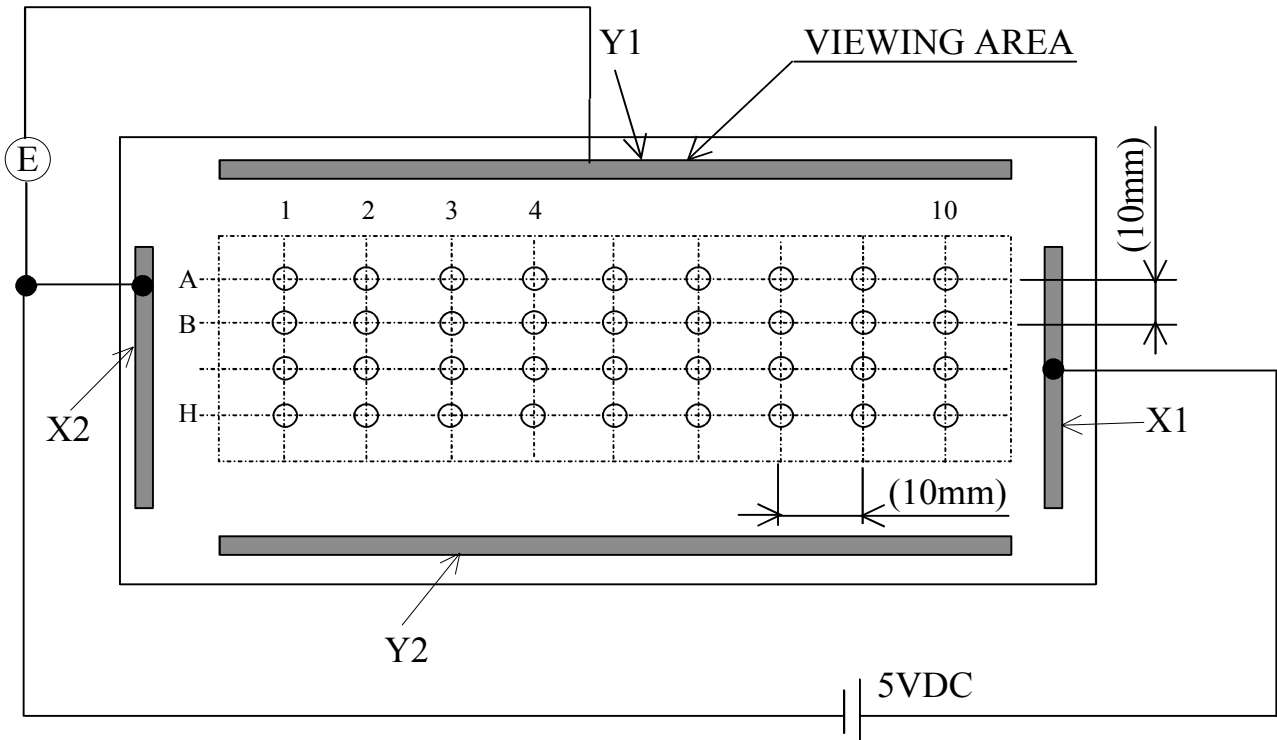
14.4.4 LINEARITY

(1) LINEARITY

LINEARITY DEVIATION : 2% max

(2) TESTING CIRCUIT

(a) Y AXIS LINEARITY TESTING METHOD , 100g , VX1-VX2=5V , VOUT=VY1.

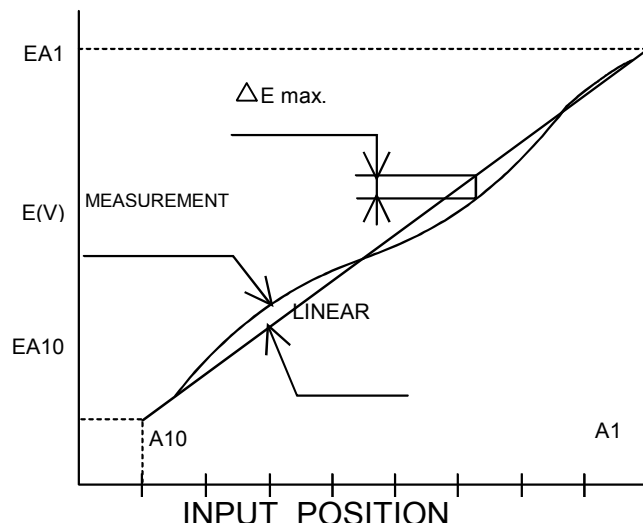


(b) X AXIS LINEARITY METHOD , VY1 –VY2=5V , VOUT=VX1

(3) CALCULATION

(a) Y AXIS LINEARITY

$$\text{LINEARITY} = \frac{\Delta E \text{ max.}}{E A1 - E A10} * 100(\%)$$



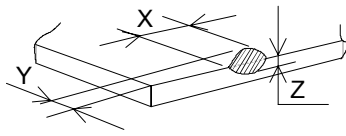
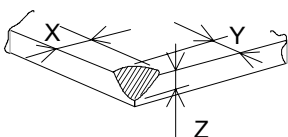
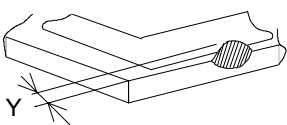
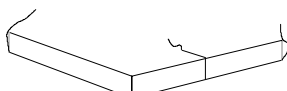
14.5 ENVIRONMENTAL TESTING

ITEM	CONDITIONS	CRITERIA
HIGH TEMPERATURE STORAGE	60°C : 120hrs & 25°C : 24hrs	AFTER TESTING MUST TO MEET THE SPECIFICATIONS OF THE ELECTRICAL, MECHANICAL & OPTICAL CHARACTERISTICS.
LOW TEMPERATURE STORAGE	-20°C : 120hrs & 25°C : 24hrs	
TEMPERATURE CYCLE	-20°C \longleftrightarrow 70°C : 10 CYCLES WITHIN (30) (60) (30) : MINUTES & 25°C : 24hrs (WITHOUT CONDENSATION)	
HUMIDITY STORAGE	60°C , 90%RH. 120hrs	
DURABILITY FOR KEYSTROKE	150g , R8, HS40 SILICON RUBBER (SPEED : 330mm/SEC) : 1000000 ACTIVATIONS	

14.6 APPEARANCE SPECIFICATION

No.	ITEM	CRITERIA			A	B
T / P	Hair Flaws	FILAMENTOUS			O	-
		LENGTH L(mm)	WIDTH W(mm)	MAXIMUM NUMBER ACCEPTABLE		
		L \leq 12	W \leq 0.05	IGNORE		
		L \leq 5	0.05<W \leq 0.1	3		
		L>2	0.1 <W	NONE		
	DOT-SHAPED IMPURITIES	AVERAGE DIAMETER D(mm)		MAXIMUM NUMBER ACCEPTABLE	O	-
		D \leq 0.1		IGNORE		
		0.1<D \leq 0.3		5		
		0.3<D		NONE		
	SCRATCH	FILAMENTOUS			O	-
		LENGTH L(mm)	WIDTH W(mm)	MAXIMUM NUMBER ACCEPTABLE		
		L \leq 12	W \leq 0.05	IGNORE		
		L \leq 12	0.05<W \leq 0.1	5		
		L>12	0.1<W	NONE		

14.6.3 GLASS INDENTATION

ITEM	SPECIFICATIONS								
COMMON INDENTATION		<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td><=5.0</td><td><=3.0</td><td><=t</td></tr></table>	X	Y	Z	<=5.0	<=3.0	<=t	BUT,INDENTATION CAN NOT INCLUDING SEAL AREA. t:GLASS THUICKNESS.
		X	Y	Z					
<=5.0	<=3.0	<=t							
CORNER BROKEN		<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td><=2.0</td><td><=5.0</td><td><=t</td></tr></table>	X	Y	Z	<=2.0	<=5.0	<=t	BUT,INDENTATION CAN NOT INCLUDING SEAL AREA.
		X	Y	Z					
<=2.0	<=5.0	<=t							
INDENTATION WITNIN PATTERN		Y<=1 IS IGNORE. BUT,MUST TO MEET THE SPECIFICATION OF CONDUCTING PATTERN INDENTATION.							
PROCEEDING CRACK		NONE							

14.6.4 BLISTERING (PUFFNES): 0.4mm max

