

SPECIFICATION

OF

LIQUID CRYSTAL DISPLAY MODULE



CUSTOMER : U.R.T. STANDARD

Model No. : UMNH-7760MD-T

Model version : 0

Document Revision : 0

CUSTOMER APPROVED SIGNATURE			

This specification need to be signed by purchaser or customer as a specification of products production and delivery from URT. Without signature of this specification , any purchase order for this model no. will be treated and considered that this specification is automatically acknowledged and accepted by purchaser or customer.

 **U.R.T.**  **UNITED RADIANT TECHNOLOGY CORP.**

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28-Oct-2005
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Revision record

Document Revision	Model No. Version No.	Description	Revision by
0	UMNH-7760MD-T (UFNH-K028EY-FT) Version No. 0		Waykiy LIN Hunter CHENG 28-Oct-2005
 U.R.T.	Revision 0 ; UMNH-7760MD-T Ver. 0 ; 28-October-2005		Page: 2

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1. BASIC SPECIFICATION

1.1 Mechanical specifications

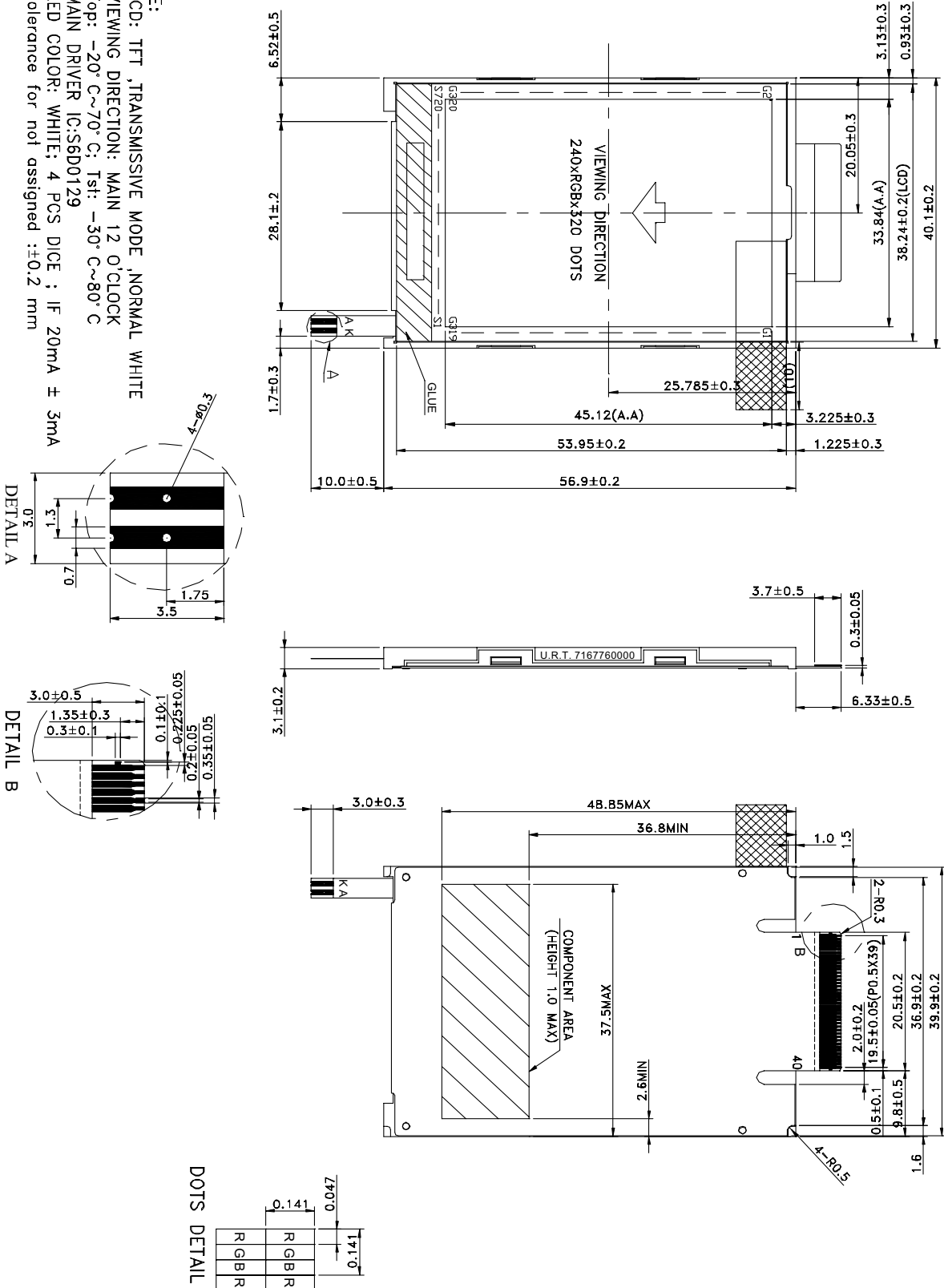
Items	Nominal Dimension	Unit
Dot Matrix	240 x RGB x 320	dots
Module Size (W x H x T)	40.1 x 73.23 x 3.1	mm.
Viewing Area (W x H)	38.24 x 53.95	mm.
Active Area (W x H)	33.84 x 45.12	mm.
Dot Pitch (W x H)	0.141 x 0.141	mm.
Driving method	1/320	Duty
Driving IC Package	COG	

1.2 Display specification

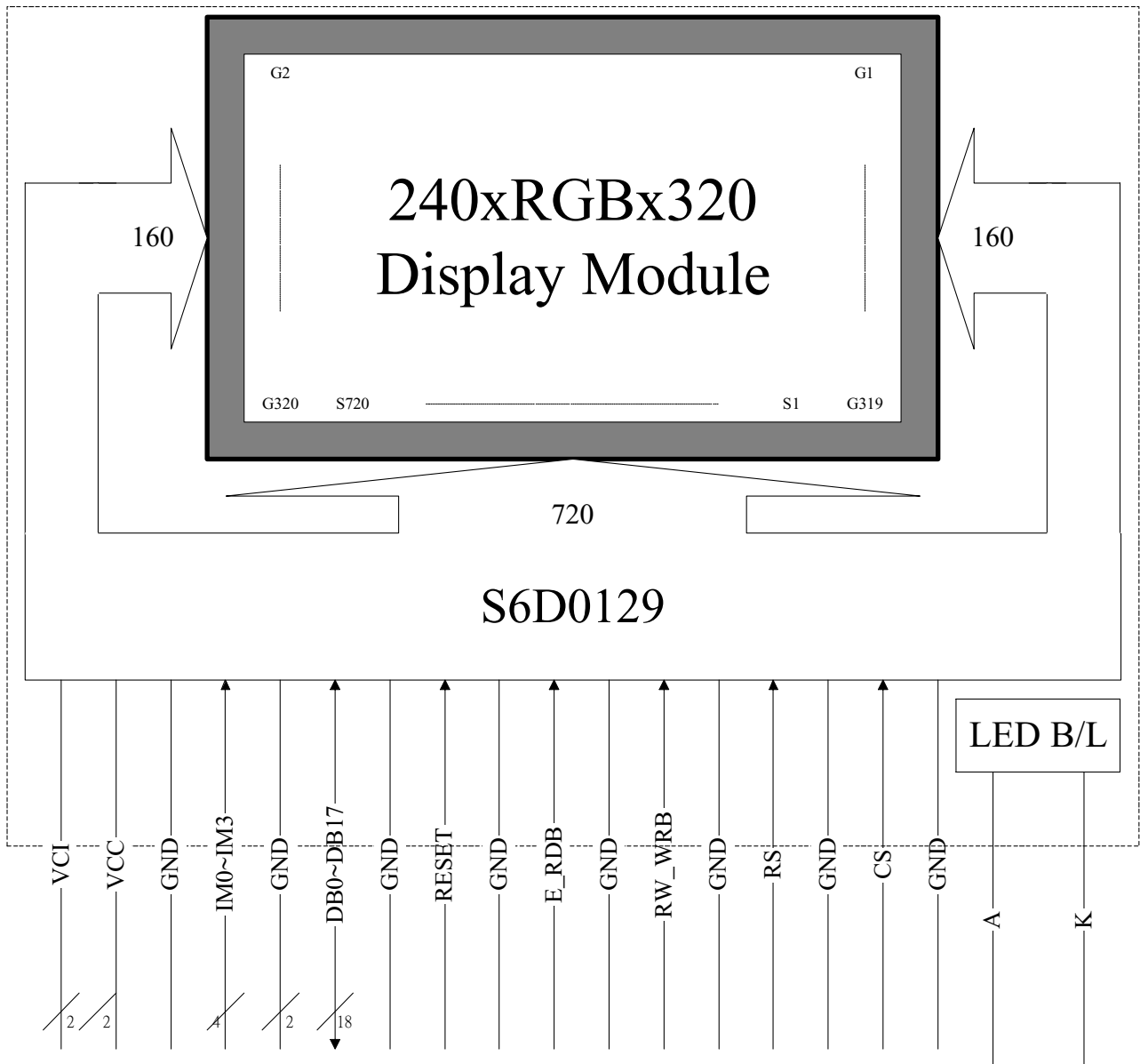
Display	Descriptions	Note
LCD Type	TFT	
LCD Mode	Negative	
Polarizer Mode	Transmissive	
Polarizer UV-Cutting	With	
Polarizer Surface	Normal	
Background Color	Black	
Backlight Type	LED	
Backlight Color	White	
Viewing Direction	12 O'clock Direction	

1.3 Outline dimension

- NOTE:-
1. LCD: TFT ,TRANSMISSIVE MODE ,NORMAL WHITE
 2. VIEWING DIRECTION: MAIN 12 O'CLOCK
 3. Top: -20° C~70° C; Tst: -30° C~80° C
 4. MAIN DRIVER IC:S6D0129
 5. LED COLOR: WHITE; 4 PCS DICE ; IF 20mA ± 3mA
 6. Tolerance for not assigned :±0.2 mm



1.4 Block diagram:



1.5 Interface pin :

Pin.No.	Pin Symbol	I/O	Description
1` 3` 5` 7` 9` 11` 30` 31` 36	GND	P	Ground for logic.
2	CS	I	Input pin for chip selection signal
4	RS	I	Register select pin. Low : Index/status , High : Control
6	RW_WRB	I	68-system Read/Write operation selection pin. 80-system Write strobe signal (Input pin) Serial peripheral The synchronous clock signal.
8	E_RDB	I	68-system Read/Write operation enable pin. 80-system Read strobe signal (Input pin)
10	RESET	I	Reset pin. Initializes the IC, when this signal is low. Must be reset after power is stable.
12~29	DB0~DB17	DO	Bi-directional data bus. 18-bit interface: DB 17-0 16-bit interface: DB 17-10, DB 8-1 9-bit interface: DB 17-9 8-bit interface: DB 17-10 Fix DB0 to the VDD3 or VSS level, if the pin is not in use. For a serial peripheral interface (SPI), input data is fetched at the rising edge of SCL signal.
32~35	IM0~IM3	I	Selects the MPU interface mode
37` 38	VCC	P	Power supply for logic. (+2.8V)
39` 40	VCI	P	Power supply for analog (+2.8V)

1	K	-	Ground pin for backlight.
2	A	-	Power supply input pin for backlight.

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Supply voltage	VDD	-0.3	+5.0	V
LCD supply voltage range	VGH	7.0	16.5	V
	VGL	-13.5	-7.0	
Operate temperature range	T _{OP}	-20	70	°C
Storage temperature range	T _{ST}	-30	80	°C

2.2 DC Characteristics

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply voltage (Logic)	VCC	2.5	2.8	3.3	V	
Supply voltage (LCD)	VGH	7.0	---	16.5	V	*NOTE1
	VGL	-13.5	---	-7.0		
Input high level voltage	V _{IH}	---	---	---	V	
Input low level voltage	V _{IL}	---	---	---	V	
Power supply current	I _{DD}	---	---	27	mA	*NOTE2

*NOTE1 : Min. and Max. Voltage is mean within the range will has optimum contrast at Ta:25°C Typ. Voltage is specified as module driving condition: Ta=25°C, V_{OP} at Optimum Contrast, the measuring condition as below, this value is URT recommend when customer change the set condition , the V_{LCD} will be change.

*NOTE2 :

Measuring Condition:

Standard Value MAX.

T_a = 25°C

V_{DD} - V_{SS} = 2.8V

V_{DD} - V_O = V_{OP} at optimum contrast

f_{OSC} =

Duty = 1/320 Duty

Display Pattern = Checkered pattern

2.2.1 Back-light Specification :

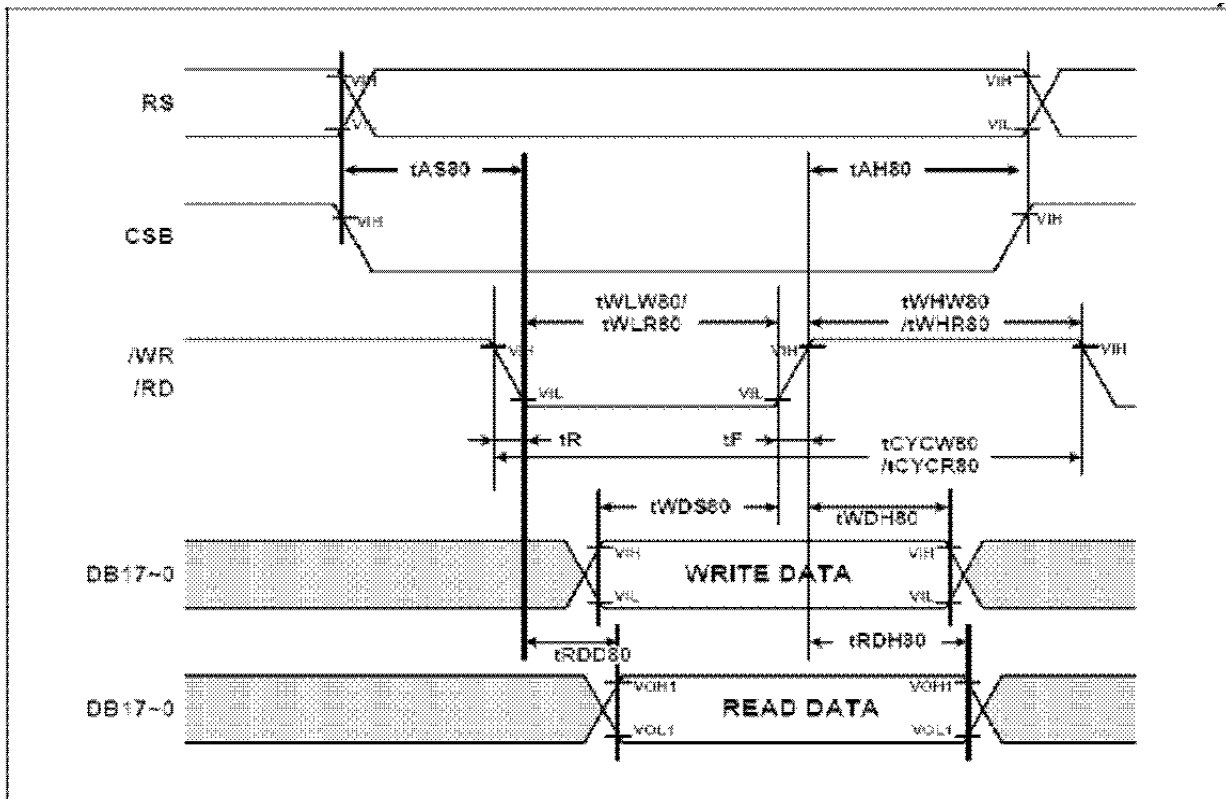
PARAMETER	SYMBOL	MIN	TYP	MAX	Unit	Test Condition	NOTE
Supply Current	I _f	17	20	23	mA	Ta=25°C	-
Supply Voltage	V _s	-	12.8	-	V	Ta=25°C	-
Brightness	Br	3500	4000	-	cd/m ²	Ta=25°C I _f =20mA	-
Half-Life Time	L _f	-	10000	-	hrs	Ta=25°C	3

Note 3 : The “ Half-Life Time ”is defined as the module brightness decrease to 50% original brightness.

2.3 AC Characteristics

(VDD = 1.8(±0.15) V, VDD3 = 1.8 to 3.3V, T_A = -40 to +85 °C)

Characteristic		Symbol	Specification		Unit
			Min.	Max.	
Cycle time	Write	t _{CYCW80}	100	-	ns
	Read	t _{CYCR80}	500	-	
Pulse rise / fall time		t _R , t _F	-	10	
Pulse width low	Write	t _{WLW80}	40	-	
	Read	t _{WLR80}	250	-	
Pulse width high	Write	t _{WHW80}	40	-	
	Read	t _{WHR80}	200	-	
WRB and RS, CSB setup time		t _{AS80}	10	-	
WRB and RS, CSB hold time		t _{AH80}	2	-	
Write data setup time		t _{WDS80}	20	-	
Write data hold time		t _{WDH80}	10	-	
Read data delay time		t _{RDD80}	-	200	
Read data hold time		t _{RDH80}	10	-	



3. OPTICAL CHARACTERISTICS

3.1 Characteristics

Driving condition

Item	Duty	Bias	Note
Value	1/320	0	1

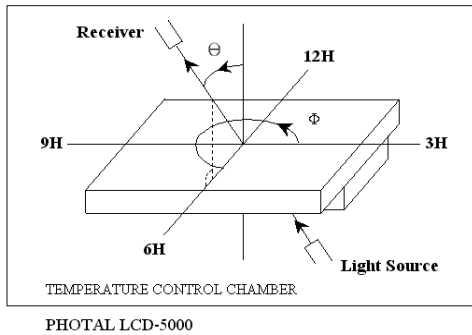
Electrical and Optical Characteristics

No.	Item	symbol / temp.	Min.	Typ.	Max.	Unit	Note		
1	Response Time	Tr	25 °C	-	15	30	ms	2	
		Tf	25 °C	-	30	60			
2	Viewing Angle	Front-Rear	$\Theta 1$	$\Phi =$ °	-15	-	45	degree	3
		Left-Right	$\Theta 2$		-45	-	45		
3	Contrast Ratio	Cr	25 °C	-	200	-	-	4	
4	Red x-code	Rx	25 °C	0.57	0.62	0.67	-	5	
	Red y-code	Ry		0.30	0.35	0.40			
	Green x-code	Gx		0.28	0.33	0.38			
	Green y-code	Gy		0.50	0.55	0.60			
	Blue x-code	Bx		0.09	0.14	0.19			
	Blue y-code	By		0.07	0.12	0.17			
	White x-code	Wx		0.27	0.32	0.37			
	White y-code	Wy		0.29	0.34	0.39			
	Brightness	Y		100	120	-			cd/m ²
5	Brightness Uniformity		25 °C	80	-	-	%	6	

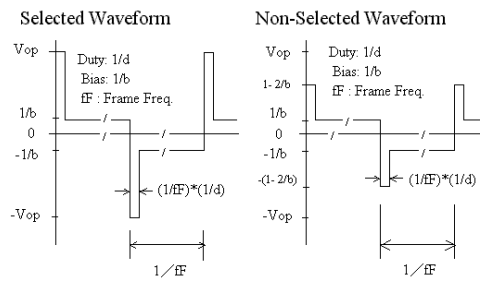
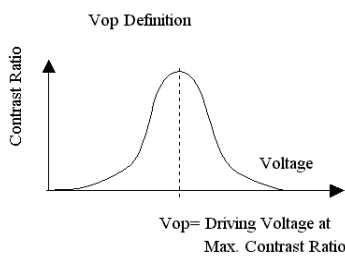
3.2 Definition of optical characteristics

Measurement condition :

Transmissive and Transflective type

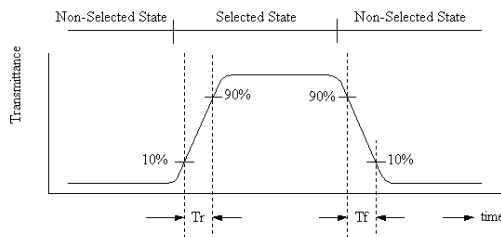


[Note 1] Definition of LCD Driving Vop and Waveform :



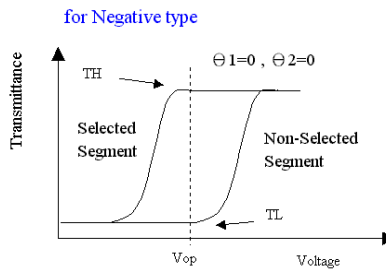
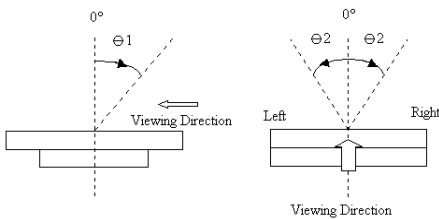
[Note 2] Definition of Response Time

for Negative type :



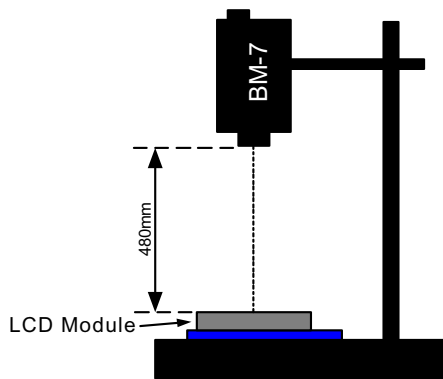
[Note 3] Definition of Viewing Angle :

[Note 4] Definition of Contrast Ratio :

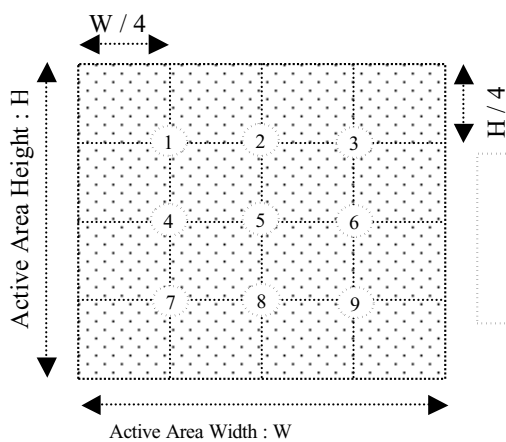


$$\text{Contrast Ratio} = \frac{TH}{TL}$$

[Note 5] Definition of measurement of Color Chromaticity and Brightness

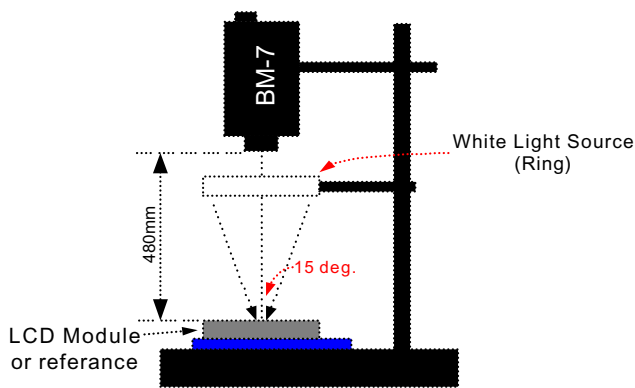


[Note 6] Definition of Brightness Uniformity



$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point 1~9}}{\text{Maximum Brightness of Point 1~9}}$$

[Note 7] Definition of Measurement of Reflectance



4. RELIABILITY :

Item No	Items	Condition	Remark
1	High temperature operating	70 °C , 200 hours	Finish product (With polarizer)
2	Low temperature operating	-20 °C , 200 hours	Finish product (With polarizer)
3	High temperature storage	80 °C , 200 hours	Finish product (With polarizer)
4	Low temperature storage	-30 °C , 200 hours	Finish product (With polarizer)
5	High temperature & humidity storage	60°C, 90%RH, 100 hours	Finish product (With polarizer)
6	Thermal Shock storage	-30°C, 30min.<=> 80°C, 30min. 10 Cycles	Finish product (With polarizer)
7	Vibration test	10 => 55 =>10 => 55 => 10 Hz , within 1 minute Amplitude : 1.5mm. 15 minutes for each Direction (X,Y,Z)	Finish product (With polarizer)
8	Drop test	Packed, 100CM free fall, 6 sides, 1 corner, 3edges	Finish product (With polarizer)
9	Life time	50,000 hours 25°C , 70%RH below , specification condition driving	Finish product (With polarizer)

* One single product test for only one item.

* Judgment after test : keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value

- Contrast > 1/2 initial value

- Function : work normally

5. HANDLING PRECAUTION

PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. To avoid damage tom the LSI from static electricity generated while working,Ground your body, work/assembly areas and assembly equipment to protect the module against STATIC ELECTRICITY.
- Do not input any signal before power is turned on.
- Do not take LCM from it's packaging bag unit it is assembled.
- Peel off take LCM protective film slowly since static electricity may be generated.
- Pay attention to the humidity of the work shop, 50~60%RH is satisfactory.
- Use a non-leak iron for soldering LCM.
- Do not touch the display surface or connection terminals area with bare hands.Smudges on the display surface reduce the insulation between terminals.
- Cautions for soldering to LCM:
Condition for soldering I/O terminals:
Temperature at iron tip : $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$.
Soldering time : 3~4sec./ terminals.
Type of solder : Eutectic solder(rosin flux filled).

PRECAUTION IN USE OF LCD

- Do not contact or scratch the front surface and the contact pads of ac LCD panel with hard materials such as metal or glass or with one's nail.
- To clean the surface , wipe it gently with soft cloth dampened alcohol.
- Do not attempt to wiped off the contact pads.
- Keep LCD panels away from direct sunlight , also avoid them in high-temperature & high humidity environment for a long period.
- Do not drive LCD panels by DC voltage.
- Do not expose LCD panels to organic solvent.
- Liquid in LCD is hazardous substance , any contacts with liquid crystal materials , wash it off immediately with soap and water.
- The polarizer is easily damaged and should be handle with special care. Don't press or rub it with hard objects.

PRECAUTION FOR STORING LCM

- To avoid degradation of the device , do not store the module under the conditions of direct sunlight , high temperature or high humidity . Keep the module in bags designed to prevent static electricity charging under low temperature / normal humidity conditions(avoid high temperature / high humidity and low temperature below 0°C)

USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

- An authorization from URT is required for medical care, safety and hazardous product, application or system . URT will not be responsible of any damage or loss which caused by this products without any authorization given by URT .

6. DATE CODE OF PRODUCTS

- Date code will be shown on each product :

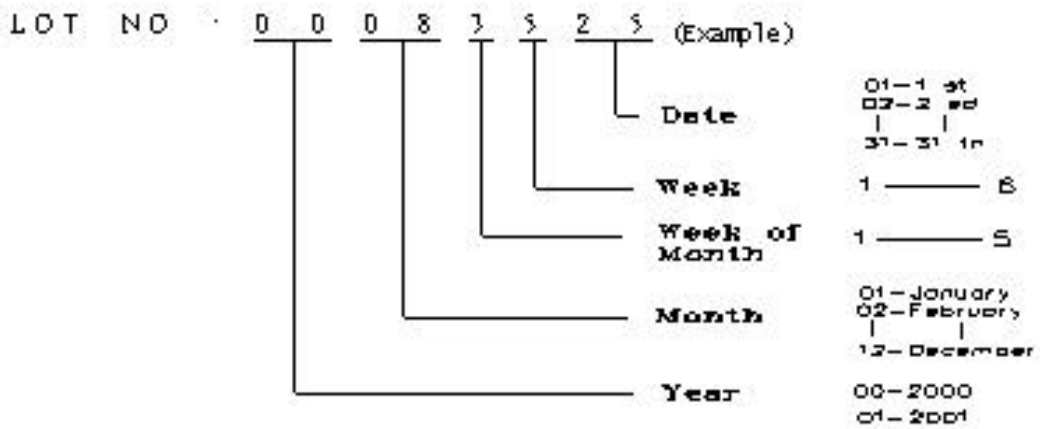
- Y MM DD - XXX

Year Month Day - Production lots

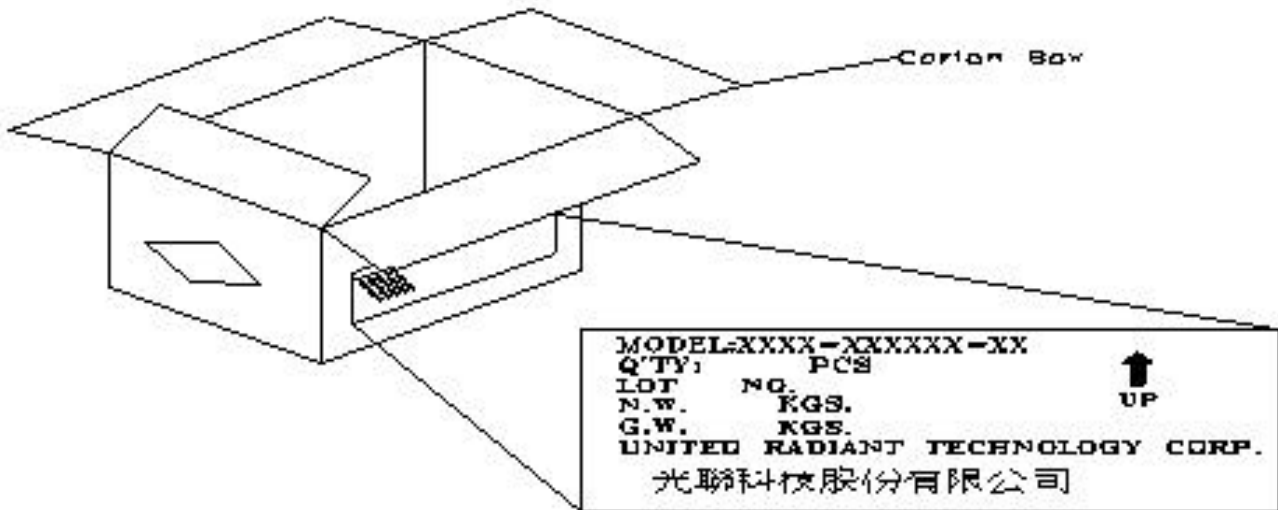
- Example: 2 1 2 2 3 - 0 0 3 ==>Year 2002, Dec.,23rd , Batch no.03

7. PACKING

Instruction of lot number:

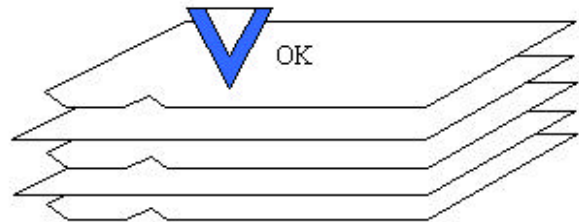
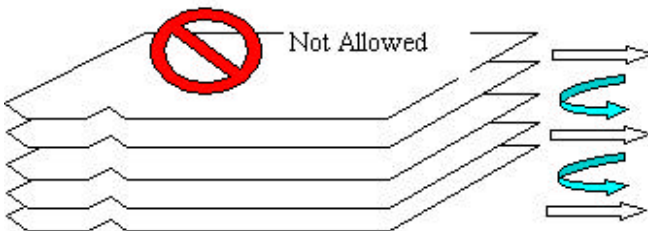


Label of carton:



Packing tray must be stacked with alternated direction to each others.

To tacks packing trays in same direction will cause product damaged.



8. INSPECTION STANDARD

8.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

8.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM U.R.T. TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

8.1.2. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 (or MIL-STD-105D), LEVEL II SINGLE PLAN.

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %
TOTAL	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

8.1.3. WARRANTY POLICY

U.R.T. WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS.

8.2. CHECKING CONDITION

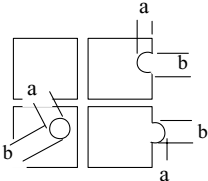
8.2.1. CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

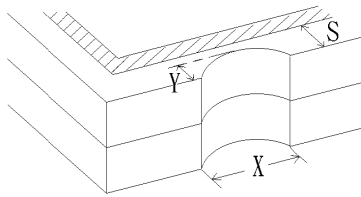
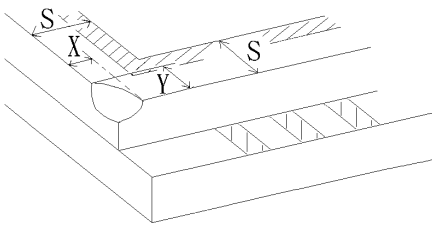
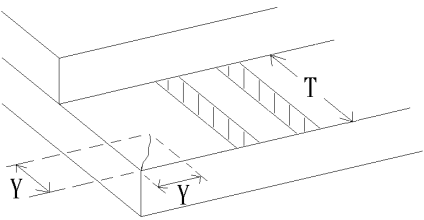
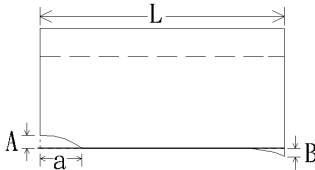
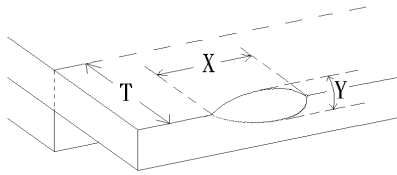
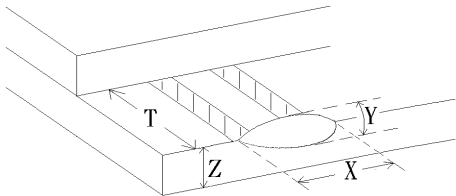
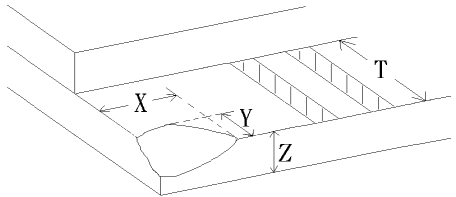
8.2.2. CHECKER SHALL SEE OVER 30 cm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

8.3. INSPECTION PLAN :

CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREAREJECTED	Minor
	6. BLEMISH , BLACK SPOT , WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	7. BLEMISH , BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST , VOP , CHROMATICITY ... ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING PATTERN	MISSING DOT , LINE , CHARACTERREJECTED	Critical
	12.SHORT CIRCUIT , WRONG PATTERN DISPLAY	NON DISPLAY , WRONG PATTERN DISPLAY , CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. PIN HOLE , PATTERN DEFORMITY	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

8.4. STANDARD OF VISUAL INSPECTION

NO.	CLASS	ITEM	JUDGEMENT																									
8.4.1	MINOR	<ul style="list-style-type: none"> · BLEMISH · BLACK SPOT · WHITE SPOT IN THE LCD. · BLEMISH · BLACK SPOT · WHITE SPOT AND SCRATCH ON THE POLARIZER 	<p>(A) ROUND TYPE: unit : mm.</p> <table border="1"> <thead> <tr> <th>DIAMETER (mm.)</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td>DISREGARD</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td>2</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.25$</td> <td>1</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>0</td> </tr> </tbody> </table> <p>NOTE: $\Phi = (\text{LENGTH} + \text{WIDTH}) / 2$</p> <p>(B) LINER TYPE: unit : mm.</p> <table border="1"> <thead> <tr> <th>LENGTH</th> <th>WIDTH</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td>-----</td> <td>$W \leq 0.03$</td> <td>DISREGARD</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.05 < W \leq 0.07$</td> <td>1</td> </tr> <tr> <td>-----</td> <td>$0.07 < W$</td> <td>FOLLOW ROUND TYPE</td> </tr> </tbody> </table>	DIAMETER (mm.)	ACCEPTABLE Q'TY	$\Phi \leq 0.1$	DISREGARD	$0.1 < \Phi \leq 0.2$	2	$0.2 < \Phi \leq 0.25$	1	$0.25 < \Phi$	0	LENGTH	WIDTH	ACCEPTABLE Q'TY	-----	$W \leq 0.03$	DISREGARD	$L \leq 5.0$	$0.03 < W \leq 0.05$	3	$L \leq 5.0$	$0.05 < W \leq 0.07$	1	-----	$0.07 < W$	FOLLOW ROUND TYPE
DIAMETER (mm.)	ACCEPTABLE Q'TY																											
$\Phi \leq 0.1$	DISREGARD																											
$0.1 < \Phi \leq 0.2$	2																											
$0.2 < \Phi \leq 0.25$	1																											
$0.25 < \Phi$	0																											
LENGTH	WIDTH	ACCEPTABLE Q'TY																										
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$L \leq 5.0$	$0.03 < W \leq 0.05$	3																										
$L \leq 5.0$	$0.05 < W \leq 0.07$	1																										
-----	$0.07 < W$	FOLLOW ROUND TYPE																										
8.4.2	MINOR	BUBBLE IN POLARIZER	<p style="text-align: right;">unit : mm.</p> <table border="1"> <thead> <tr> <th>DIAMETER</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td>DISREGARD</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.5$</td> <td>2</td> </tr> <tr> <td>$0.5 < \Phi$</td> <td>0</td> </tr> </tbody> </table>	DIAMETER	ACCEPTABLE Q'TY	$\Phi \leq 0.15$	DISREGARD	$0.15 < \Phi \leq 0.5$	2	$0.5 < \Phi$	0																	
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8.4.3	MINOR	PIN HOLE · PATTERN DEFORMITY	<p style="text-align: right;">unit : mm.</p> <div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>DIAMETER</th> <th>ACC. Q'TY</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td>DISREGARD</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.25$</td> <td>3</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>0</td> </tr> </tbody> </table> </div> <p>$\Phi = (a+b)/2$</p>	DIAMETER	ACC. Q'TY	$\Phi \leq 0.1$	DISREGARD	$0.1 < \Phi \leq 0.25$	3	$0.25 < \Phi$	0																	
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NO.	CLASS	ITEM	JUDGEMENT
8.4.4	MINOR	CRACK	 $Y > S$ REJ.
8.4.5	MINOR	CRACK	 $X \text{ or } Y > S$ REJ.
8.4.6	MAJOR	GLASS SCRATCH	 $Y > (1/2) T$ REJ.
8.4.7	MAJOR	SCRIBE DEFECT	 <ol style="list-style-type: none"> $a > L/3$, $A > 1.5\text{mm}$. REJ. B : ACCORDING TO DIMENSION
8.4.8	MINOR	CRACK (ON THE TERMINAL AREA)	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ REJ.
8.4.9	MINOR	CRACK (ON THE TERMINAL SURFACE)	 $Y > (1/3) T$ REJ.
8.4.10	MINOR	CRACK	 $Y > T$ REJ.