

APPROVAL

PART NO.	DESCRIPTION	REMARKS
HT7005L	LCD MODULE (800 × RGB × 480)	* ROHS compliant

CUSTOMER APPLICATION P/N	
APPROVED BY	
DATE	

PLEASE KINDLY FIND AND APPROVE THE SPECIFICATIONS INSERTED
HEREIN AND RETURN ONE COPY HERE OF WITH YOUR SIGNATURE OF APPROVAL.

PERPARED BY	CHECKED BY	CONFIRMED BY



HYES Optoelectronics, Inc.

2000 Wyatt Drive Suite 6
Santa Clara, CA 95054 USA

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No.	Item
1	BASIC SPECIFICATION 1.1 Mechanical Specification 1.2 Display Specification 1.3 Outline Dimension 1.4 Block Diagram 1.5 Interface Pin
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7	PACKING & LOTNO
8	INSPECTION STANDARD

Date	Rev. No.	Page	Summary
11-Sep-08	-	ALL	- 1'st Issue
June 04, 2009	A	3	- Changed Color depth and interface
		8	- Changed supply Voltage and Half-Life time for B/L

Date : June 04, 2009

TECHNICAL SPECIFICATION

The logo for HYES, consisting of the word "HYES" in white capital letters on a dark orange rectangular background.

LCM

HT7005L

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1. BASIC SPECIFICATION

1.1 Mechanical specifications

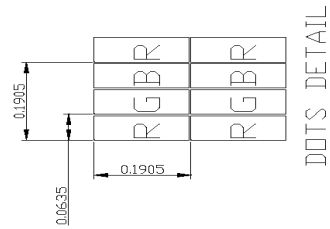
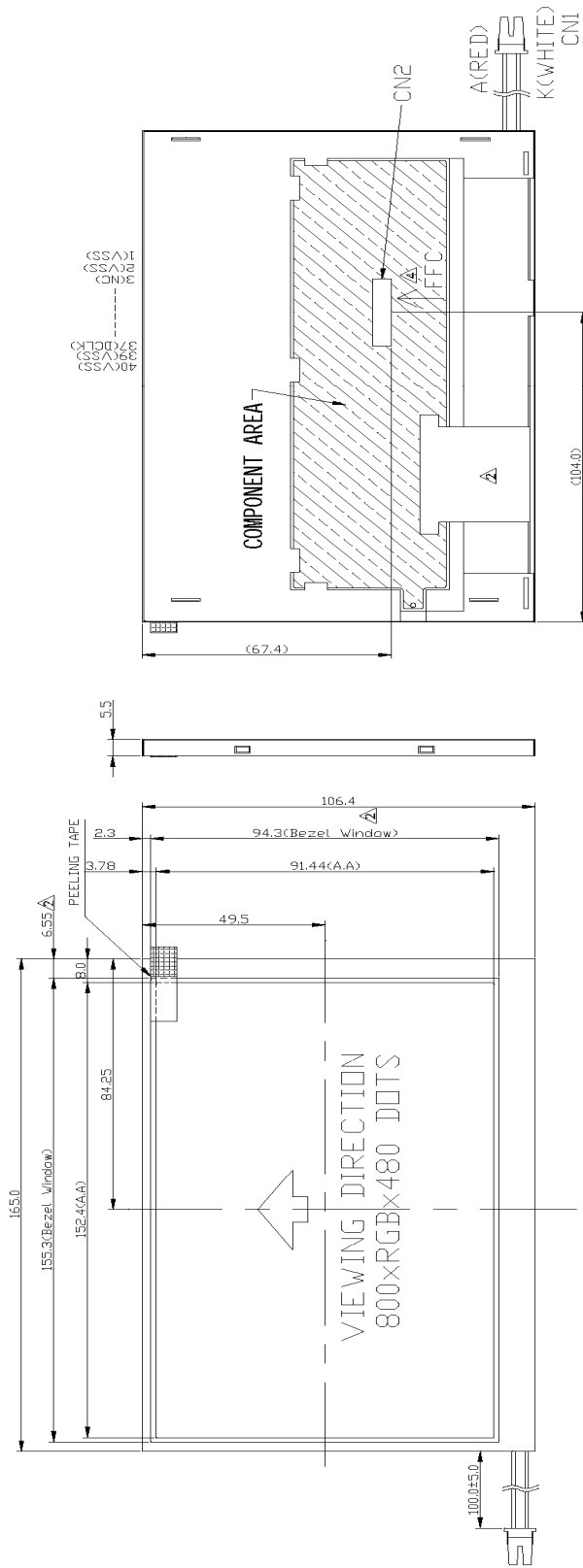
Items	Nominal Dimension	Unit
Active screen size	7" diagonal	-
Dot Matrix	800 x RGB x 480	dots
Module Size (W x H x T)	165.0 x 106.4 x 5.5	mm.
Active Area (W x H)	152.4 x 91.44	mm.
Dot Pitch (W x H)	0.1905 x 0.1905	mm.
Color depth	262K	color
Interface	Parallel 18-bit RGB	-
Driving IC Package	COG	-
Module weight	129	g

1.2 Display specification

Display	Descriptions	Note
LCD Type	a-Si TFT	
LCD Mode	TN / Normal white	
Polarizer Mode	Transmissive	
Polarizer Surface	Normal	
Background Color	RGB-stripe	
Backlight Type	LED	
Viewing Direction	6 O'clock Direction	

* Color tone is slightly changed by temperature and driving voltage.

1.3 Outline dimension



- NOTE :
1. LCD : TFT TRANSMISSIVE TYPE , NORMAL WHITE
 2. VIEWING DIRECTION : 6 O'CLOCK
 3. Top : -20~70°C , Tst : -30~80°C
 - △4. LED COLOR : WHITE , 21 PCS DICE
CONSTANT CURRENT : 210mA ; Vled=9.9V(TYP)
 - △5. LCM MODULE BRIGHTNESS : 500 cd/m² (TYP)
 6. GENERAL TOLERANCE:±0.3
 7. CN1:BHSR-02VS-1(JST)
 8. CN2:9681-(IROS0)

Date : June 04, 2009

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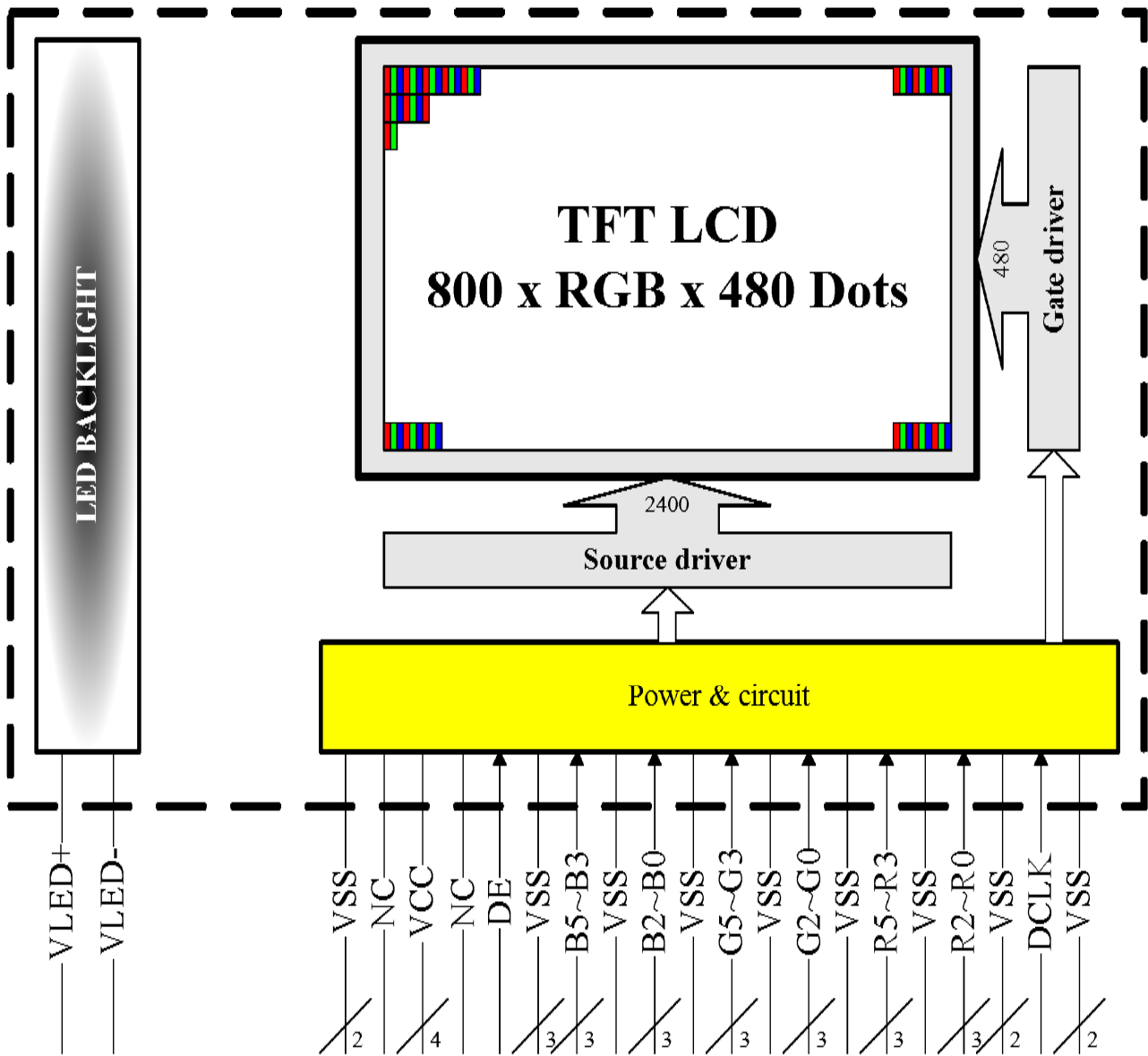
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1.4 Block diagram:



1.5 Interface pin :

Pin No.	Pin Symbol	I/O	Description
1~2	VSS	P	GND
3	NC	-	No connection
4~7	VCC	P	Power supply for Module (+3.3V)
8	NC	-	No connection
9	DE	I	Data enable
10~12	VSS	P	GND
13~15	B5~B3	I	Blue data input
16	VSS	P	GND
17~19	B2~B0	I	Blue data input
20	VSS	P	GND
21~23	G5~G3	I	Green data input
24	VSS	P	GND
25~27	G2~G0	I	Green data input
28	VSS	P	GND
29~31	R5~R3	I	Red data input
32	VSS	P	GND
33~35	R2~R0	I	Red data input
36~37	VSS	P	GND
38	DCLK	I	Dot clock
39~40	VSS	P	GND

B/L interface pin :

Pin No.	Pin Symbol	I/O	Description
1	VLED+	P	Power supply for LED+
2	VLED-	P	Power supply for LED-

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2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Power supply voltage	VCC	-0.3	7.0	V
Input voltage	V _{in}	-0.3	VCC+0.3	V
Operate temperature range	T _{OP}	-20	70	°C
Storage temperature range	T _{ST}	-30	80	°C

2.2 DC Characteristics

T_a = 25°C

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply voltage	VCC	-	3.3	-	V	-
Input Voltage	V _{IL}	0	-	0.3VCC	V	L level
	V _{IH}	0.7VCC	-	VCC	V	H level
Current consumption	I _{VCC}	-	160	250	mA	Note 1

*Note1 :

Measuring Condition:

Standard Value MAX.

T_a = 25°C

VCC -GND = 3.3V

Display Pattern = Check pattern



0 gray black pattern

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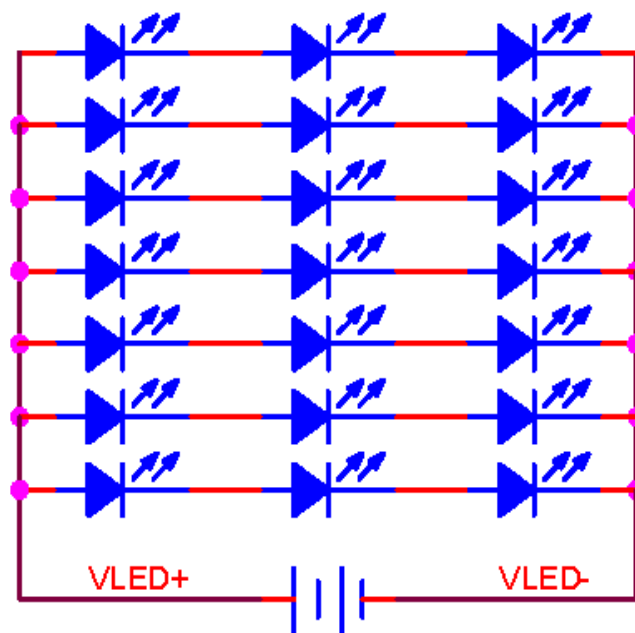
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2.3 Back-light Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	Unit	Test Condition	NOTE
Supply Current	If	-	30	35	mA	Ta=25°C	single serial
Supply Voltage	Vf	-	9.9	-	V	Ta=25°C	single serial
Half-Life Time	Lf	-	50000	-	hrs	Ta=25°C	1

Note 1 : The " Half-Life Time" is defined as the LED chip brightness decreases to 50% than original brightness, Based on Ta 25±2°C ,60±10% RH condition .

Note 2 : LED backlight is 21 LEDs.



2.4 AC Characteristics

Switching characteristics

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Data setup time	T_{dsu}	6	-	-	ns
Data hold time	T_{dhd}	6	-	-	ns
DE setup time	T_{esu}	6	-	-	ns
Source output settling time	T_{ST}	-	-	15	μ s
Source output loading R	R_{SL}	-	2	-	K ohm
Source output loading C	C_{SL}	-	60	-	pF

Parallel RGB Input Timing Requirement

DE mode

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	-	33.26	-	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}
DE pulse width	T_{DEH}	-	800	-	T_{CPH}
DE frame blanking	T_{DEB}	10	45	110	$T_{DEH}+T_{DEL}$
DE frame width	T_{DE}	-	480	-	$T_{DEH}+T_{DEL}$

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
OEV pulse width	T_{OEV}	-	150	-	T_{CPH}
CKV pulse width	T_{CKV}	-	133	-	T_{CPH}
DE(internal)-STV time	T_1	-	4	-	T_{CPH}
DE(internal)-CKV time	T_2	-	40	-	T_{CPH}
DE(internal)-OEV time	T_3	-	23	-	T_{CPH}
DE(internal)-POL time	T_4	-	157	-	T_{CPH}
STV pulse width	-	-	1	-	T_H

(i). $T_{HS}+T_{HA}<T_H$

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TECHNICAL SPECIFICATION

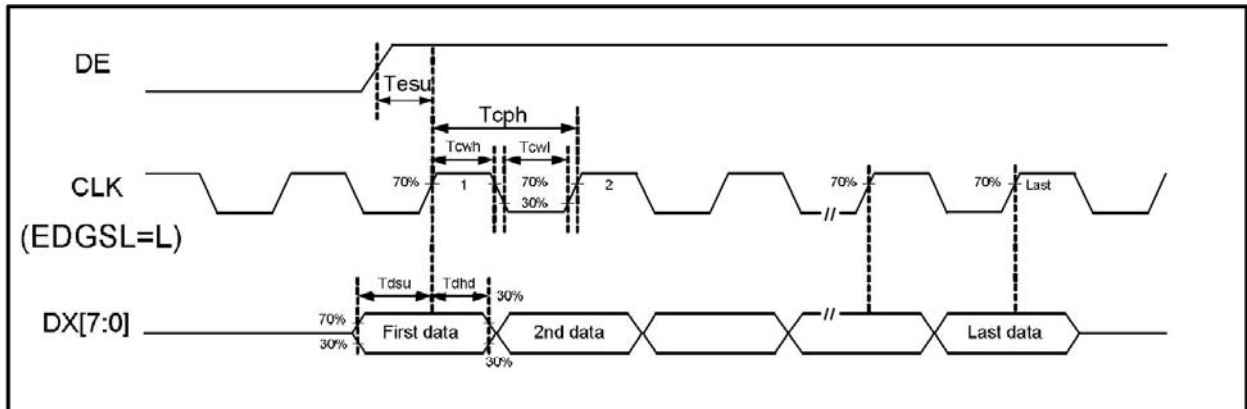
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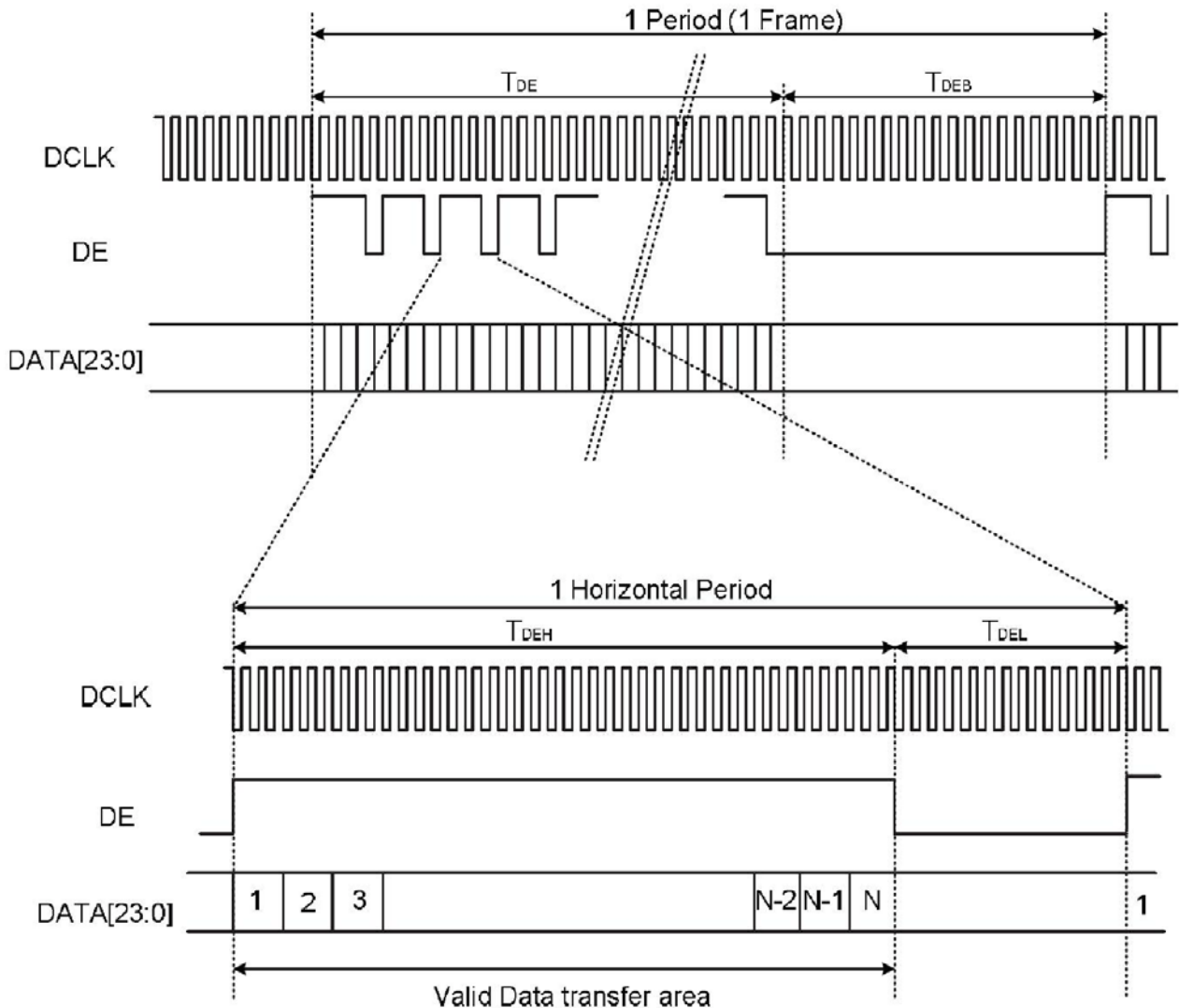
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Timing Controller Timing Chart



Clock and Data input waveforms



DE Mode Data Format

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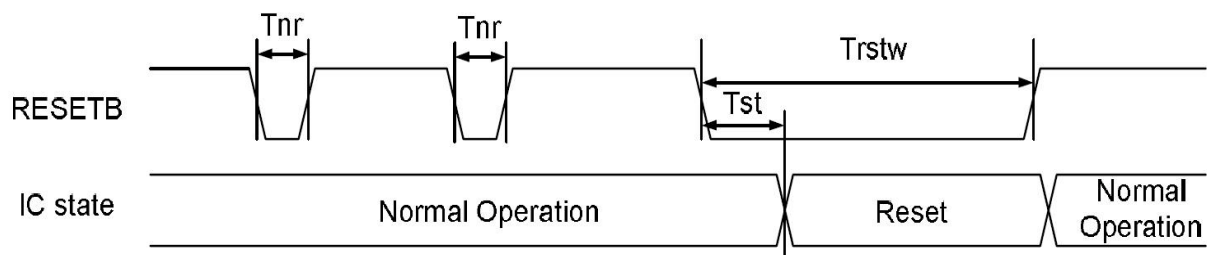
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Hardware Reset Timing

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
RESETB low pulse width	T_{rstw}	10	-	-	μs
Negative noise pulse width	T_{nr}		-	4	μs
Reset start time	T_{st}	4	-		μs



3. OPTICAL CHARACTERISTICS

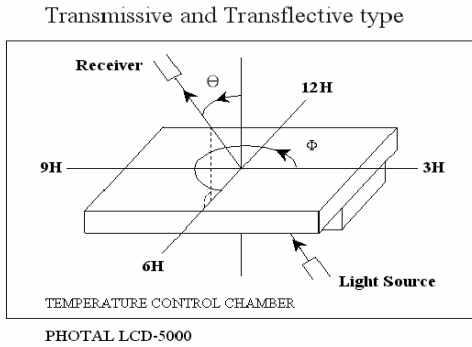
3.1 Characteristics

Electrical and Optical Characteristics

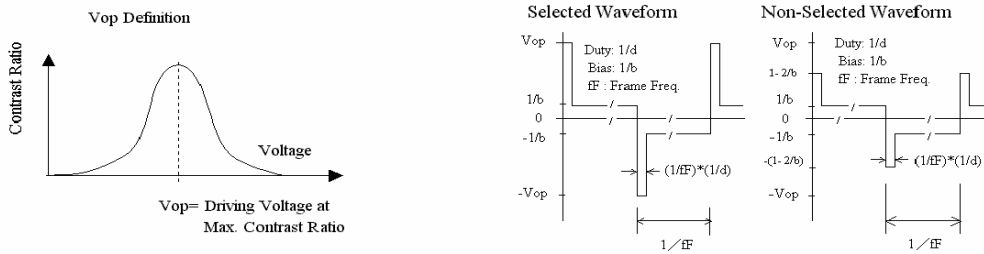
No.	Item	symbol / temp.	Min.	Typ.	Max.	Unit	Note		
1	Response Time	Tr	25 °C	NA	5	ms	2		
		Tf	25 °C	NA	15			20	
2	Viewing Angle	Hor.	Center CR>=10	Θ_{x+}	-	60	-	degree	3
				Θ_{x-}	-	60	-		
		Ver.		Θ_{y+}	-	45	-		
				Θ_{y-}	-	60	-		
3	Contrast Ratio	Cr	25 °C	700	1000	-	-	4	
4	Red x-code	Rx	25 °C	0.54	0.59	0.64	-	5	
	Red y-code	Ry		0.31	0.36	0.41			
	Green x-code	Gx		0.29	0.34	0.39			
	Green y-code	Gy		0.53	0.58	0.63			
	Blue x-code	Bx		0.10	0.15	0.20			
	Blue y-code	By		0.10	0.15	0.20			
	White x-code	Wx		0.27	0.32	0.37			
	White y-code	Wy		0.31	0.36	0.41			
	Brightness	Y		350	500	-			cd/m ²
5	Brightness Uniformity		25 °C	80	-	-	%	6	

3.2 Definition of optical characteristics

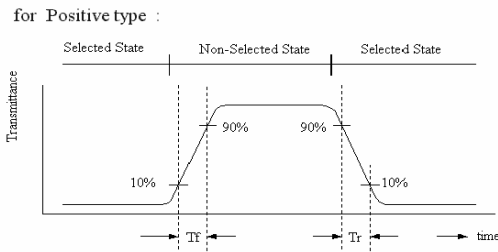
Measurement condition :



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

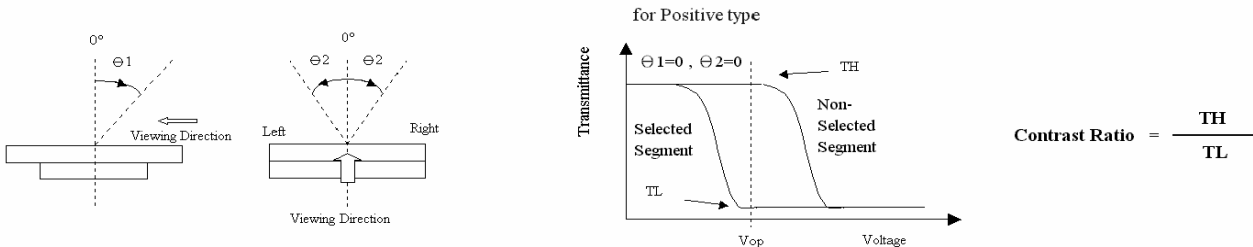


[Note 2] Definition of Response Time

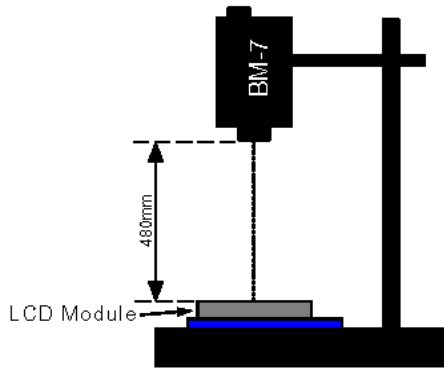


[Note 3] Definition of Viewing Angle :

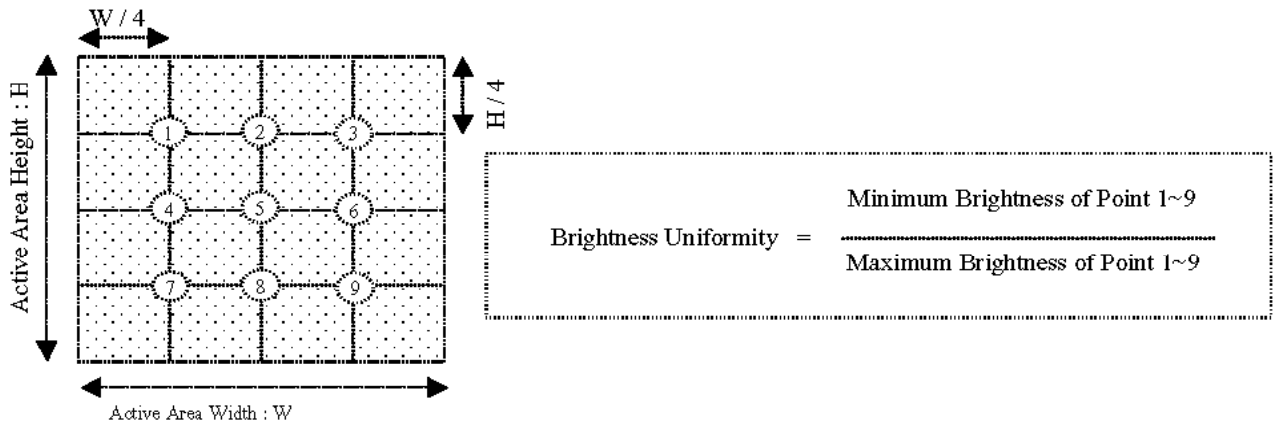
[Note 4] Definition of Contrast Ratio :



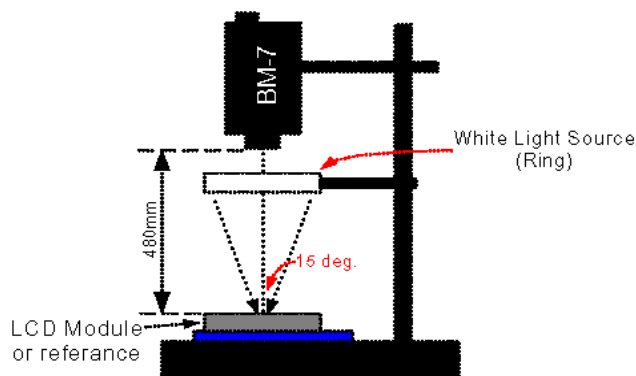
[Note 5] Definition of measurement of Color Chromaticity and Brightness



[Note 6] Definition of Brightness Uniformity



[Note 7] Definition of Measurement of Reflectance



4. RELIABILITY :

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

* 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

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5. PRODUCT HANDLING AND APPLICATION

PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection equipment to prevent ESD hurt on products.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the 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°C±10°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 a 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 by alcohol.
- Do not attempt to wipe 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. In case a contact with liquid crystal material is occurred, be sure to immediately wash such material away by 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

- For the application in medical care, safety and hazardous products or systems, an authorization from **HYES** is required. **HYES** will not responsible for any damage or loss which caused by the products without any authorization given by **HYES**.
- This product is not allowed to be designed and used for military application and/or purpose.
- The delivery of this product to the countries and/or regions where the embargoes are imposed by U.N. is prohibited.

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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 3 - 0 0 3 ==> Year 2002, Dec.,23rd , Batch no.03

MODEL NO: UM*

T.B.D pcs / Tray

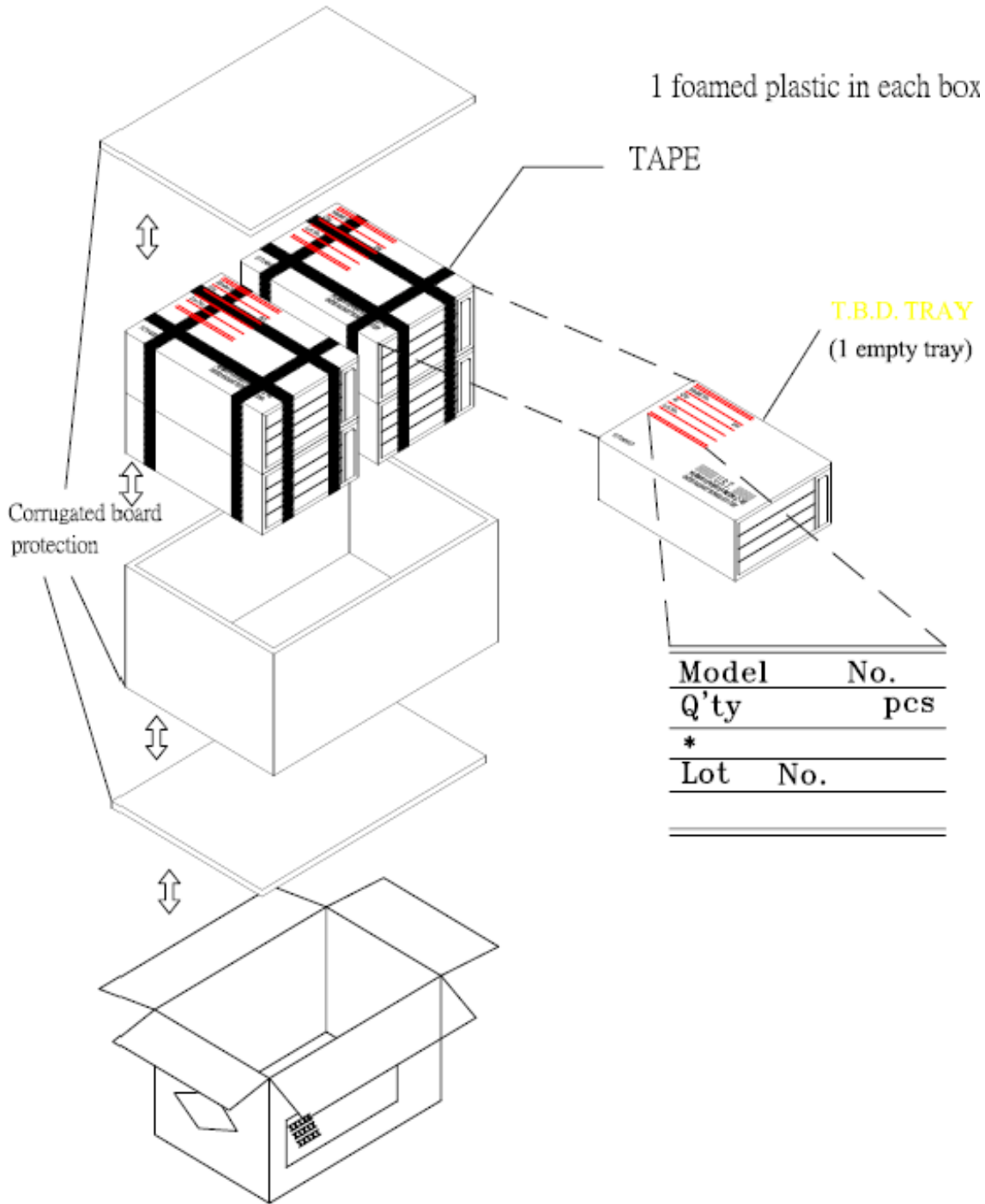
T.B.D Tray / Box

T.B.D Box / Carton

T.B.D pcs / Carton

NOTE:

- (1) Be warned, the direction of the tray has to turn it by 180 degree before stack it up. Otherwise, it will be packager's responsibility!!
- (2) Safe Stack : 5 cartons only



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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 **HYES** TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10 °C ~ 40 °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

HYES WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. **HYES** WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF **HYES**.

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.

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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 LINE	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

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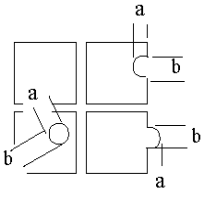
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8.4. STANDARD OF VISUAL INSPECTION

NO.	CLASS	ITEM	JUDGEMENT												
8.4.1	MINOR	· BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD. · BLEMISH、BLACK SPOT、 WHITE SPOT AND SCRATCH ON THE POLARIZER	(A) ROUND TYPE: unit : mm. <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> NOTE: $\Phi = (\text{LENGTH} + \text{WIDTH}) / 2$	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		
			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														
(B) LINER TYPE: unit : mm. <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>	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
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													
8.4.2	MINOR	BUBBLE IN POLARIZER	unit : mm. <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				
DIAMETER	ACCEPTABLE Q'TY														
$\Phi \leq 0.15$	DISREGARD														
$0.15 < \Phi \leq 0.5$	2														
$0.5 < \Phi$	0														
8.4.3	MINOR	PIN HOLE、 PATTERN DEFORMITY	unit : mm.  <table border="1"> <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> $\Phi = (a+b)/2$	DIAMETER	ACC. Q'TY	$\Phi \leq 0.1$	DISREGARD	$0.1 < \Phi \leq 0.25$	3	$0.25 < \Phi$	0				
DIAMETER	ACC. Q'TY														
$\Phi \leq 0.1$	DISREGARD														
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$0.25 < \Phi$	0														

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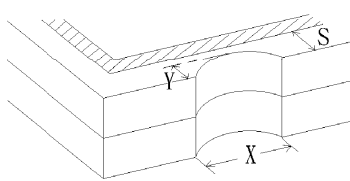
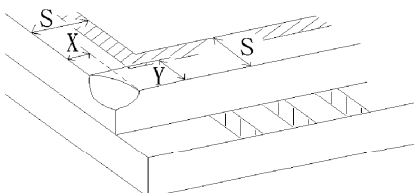
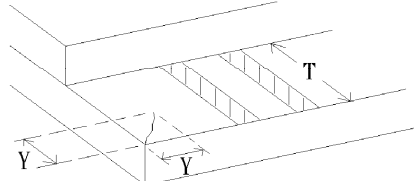
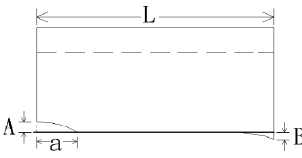
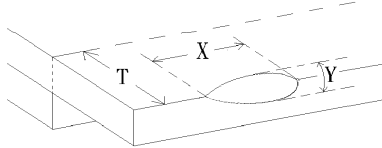
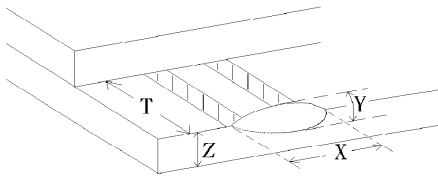
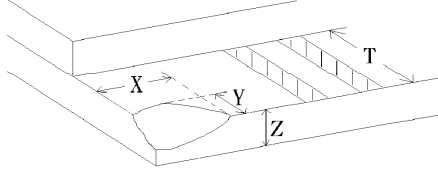
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NO.	CLASS	ITEM	JUDGEMENT
8.4.4	MINOR	CHIPPING	 $Y > S$ REJ.
8.4.5	MINOR	CHIPPING	 $X \text{ or } Y > S$ REJ.
8.4.6	MAJOR	GLASS CRACK	 $Y > (1/2) T$ REJ.
8.4.7	MAJOR	SCRIBE DEFECT	 <ol style="list-style-type: none"> $a > L/3$, $A > 1.5\text{mm}$. REJ. B : ACCORDING TO DIMENSION
8.4.8	MINOR	CHIPPING (ON THE TERMINAL AREA)	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ REJ.
8.4.9	MINOR	CHIPPING (ON THE TERMINAL SURFACE)	 $Y > (1/3) T$ REJ.
8.4.10	MINOR	CHIPPING	 $Y > T$ REJ.

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