



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



TFT Display 檢驗規範

(TFT Display Inspection Specification)



Winstar Display Co.,

華凌光電股份有限公司

MODLE NO :

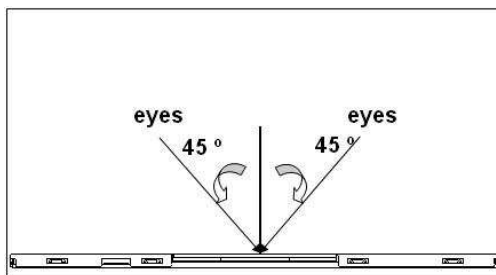
RECORDS OF REVISION

DOC. FIRST ISSUE

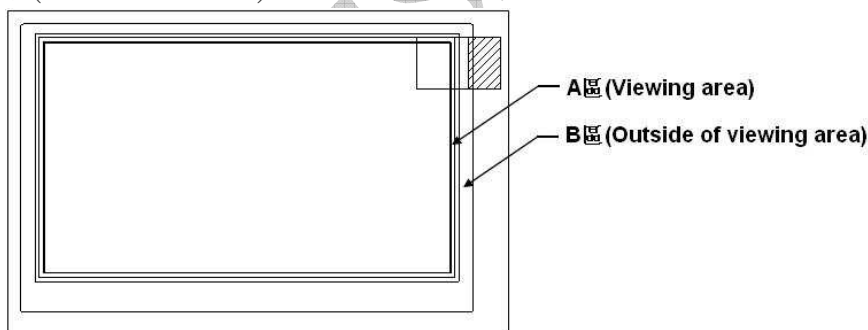
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2013/04/23		First issue
A	2013/09/24	5	Correct the inspection standard of no 5 scratch contamination Line type $0.01\text{mm} < W \leq 0.05\text{mm}$
B	2018/09/10	6	Mura through 5% transmission ND Filter and 50% gray to check.
C	2019/7/30	7	Distance from the edge of 0.5mm regardless of control
D	2021/07/06	3,4,8	Add the judgment of adjacent 2 bright dot.

檢驗規範(Inspection Specification)

1. 範圍(Scope)：適用於本公司 TFT-LCD 模塊(The document shall be applied to TFT-LCD Module)
2. 檢驗標準(Inspection Standard)：MIL-STD-105E 正常單次抽樣水平 II(MIL-STD-105E Table Normal Inspection Single Sampling Level II)
3. 缺陷水平(Defect Level)：主要缺陷 AQL：0.65;次要缺陷 AQL：2.5(Major Defect AQL:0.65;Minor Defect AQL:2.5)
4. 檢驗條件(Test conditions):
 - (1)溫度(Temperature)：15°C~25°C；溼度(Humidity)：55 ±15%
 - (2)外觀檢驗(Visual inspection)：光照強度：500 Lux 以上;檢查距離：20cm~30cm (Illumination：More than 500 Lux; Inspection Distance: 20cm~30cm)
 - (3)電性檢驗(Electrical inspection)：光照強度：100Lux~300Lux;檢查距離：20cm~30cm(Illumination：100Lux~300Lux; Inspection Distance: 20cm~30cm)
 - (4)目視角度(Visual angle)：檢查目視的角度是法線方法的 45 °(The test direction is base on about around 45° of Vertical line)



- (5)定義區域(Definition of area):



5. 象素定義 (Pixel Definition):

R	G	B	R	G	B	R	G	B		Dot Defect
R	G	B	R	G	B	R	G	B		Adjacent Dot Defect
R	G	B	R	G	B	R	G	B		Cluster

註 1：如果像素或部分子像素缺陷超過受影響像素或子像素面積的 50%，則視為 1 個缺陷。
請參考 NO.11 為允許數量和亮點大小判斷標準。

Note 1: If pixel or partial sub-pixel defects exceed 50% of the affected pixel or sub-pixel area, it shall be considered as 1 defect. please refer to NO.11 for the allowable quantity and bright dot Size judgment standards.

註 2：在 2 秒的檢查時間內，通過 5% ND 濾光片不應有明顯的不均勻。



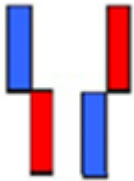
Note 2: There should be no distinct non-uniformity visible through 5% ND Filter within 2 sec inspection times.

註 3：Mura 和亮點通過 5% ND 濾光片檢查。

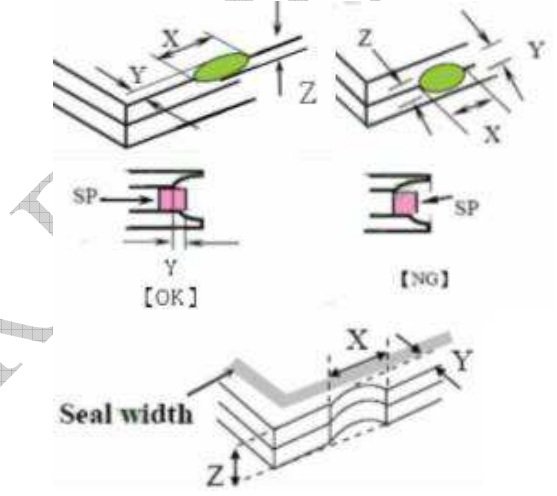
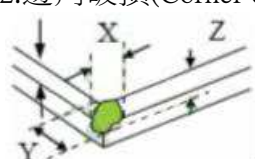
Note 3: Mura and bright dot inspected through 5% transmission ND Filter as following.

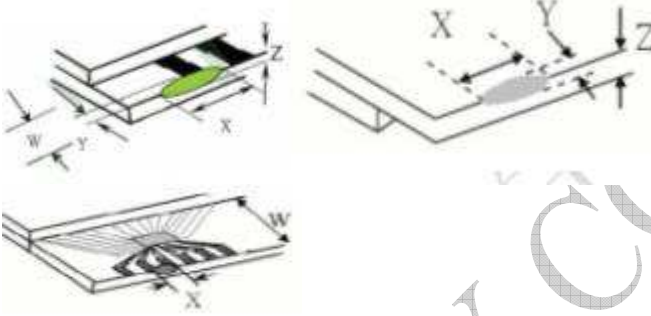
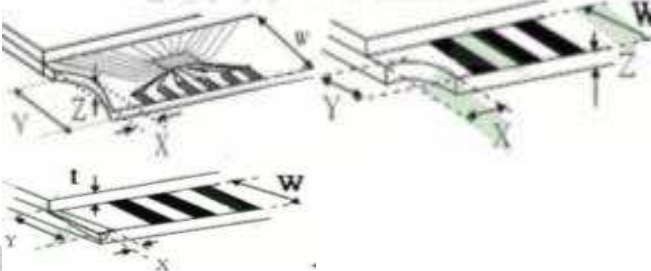
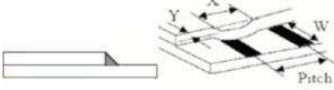
註 4：相鄰 2 個亮點排列的判斷標準如下，請參考 NO.11 為允許數量和亮點大小判斷標準。

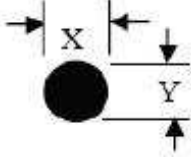
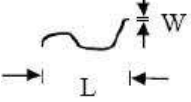
Note 4: The judging criteria for the arrangement of 2 adjacent bright dots are as follows, please refer to NO.11 for the allowable quantity and bright dot size judgment standards.

2 dot adjacent is OK	2 dot adjacent vertical is NG	2 dot adjacent slant is NG
		

5. 檢驗標準(Inspection Standard) :

項次 (No)	檢驗項目(Inspection item)	檢驗標準(Inspection Standard)	缺陷等級 (Defect Level)									
1	PACKING & INDICATE	1.1.不可有混入其他型號產品的現象(Mixde product types). 1.2.不可有產品漏工序的現象(The part number is inconsistent with work order of production). 1.3.不可有部件裝反方向的現象(Assembled in inverse direction). 1.4.不可有數量與實際要求不一致的現象(The quantity is inconsistent with work order of production).	主缺 (Maj)									
2	尺寸(Size)	产品尺寸和结构必须符合结构图(Product size and structure must meet the structure diagram)	主缺 (Maj)									
3	玻璃裂纹(The crack of glass)	<p>符號(Symbols): X:破裂長度(Symbols) Y:破裂寬度(The width of crack). Z:破裂厚度(The thickness of crack). W:出電極區寬度(Terminal length) T:玻璃厚度(The thickness of glass). a:LCD 側面長度(LCD side length).</p> <p>3.1.一般玻璃破損(General glass chip): 3.1.1.玻璃表面或上、下玻璃組合縫隙之間破損(Chip on panel surface and crack between panels);</p>  <table border="1" data-bbox="526 1590 1276 1814"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>裂紋進入 VA 區(Crack can't enter viewing area)</td> <td>$\leq 1/2t$</td> </tr> <tr> <td>$\leq a$</td> <td>裂紋超過 SP 一半的寬度(Crack can't exceed the half of SP width)</td> <td>$1/2t < Z \leq 2t$</td> </tr> </tbody> </table> <p>3.1.2.邊角破損(Corner crack) :</p> 	X	Y	Z	$\leq a$	裂紋進入 VA 區(Crack can't enter viewing area)	$\leq 1/2t$	$\leq a$	裂紋超過 SP 一半的寬度(Crack can't exceed the half of SP width)	$1/2t < Z \leq 2t$	次缺 (Min)
X	Y	Z										
$\leq a$	裂紋進入 VA 區(Crack can't enter viewing area)	$\leq 1/2t$										
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項次 (No)	檢驗項目 (Inspection item)	檢驗標準 (Inspection Standard)	缺陷等級 (Defect Level)									
3	玻璃裂紋 (The crack of glass)	<table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 1/5a$</td> <td>裂紋進入 VA 區 (Crack can't enter viewing area)</td> <td>$\leq 1/2t$</td> </tr> <tr> <td>$\leq 1/5a$</td> <td>裂紋超過 SP 一半的寬度 (Crack can't exceed the half of SP width)</td> <td>$1/2t < Z \leq 2t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 1/5a$	裂紋進入 VA 區 (Crack can't enter viewing area)	$\leq 1/2t$	$\leq 1/5a$	裂紋超過 SP 一半的寬度 (Crack can't exceed the half of SP width)	$1/2t < Z \leq 2t$	次缺 (Min)
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<p>3.2. 出電极端破損 (Protrusion over terminal): 3.2.1. 电极墊上破損 (Chip on electrode pad):</p>  <table border="1"> <thead> <tr> <th>位置 (Position)</th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>正面 (Front)</td> <td>$\leq a$</td> <td>$\leq 1/2W$</td> <td>$\leq t$</td> </tr> <tr> <td>背面 (Back)</td> <td>$\leq a$</td> <td>$\leq W$</td> <td>$\leq 1/2t$</td> </tr> </tbody> </table>	位置 (Position)	X	Y	Z	正面 (Front)	$\leq a$	$\leq 1/2W$	$\leq t$	背面 (Back)	$\leq a$	$\leq W$	$\leq 1/2t$
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背面 (Back)	$\leq a$	$\leq W$	$\leq 1/2t$									
<p>3.2.2. 出電极端非電極破損 (Non-conductive portion):</p>  <table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 1/3a$</td> <td>$\leq W$</td> <td>$\leq t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 1/3a$	$\leq W$	$\leq t$						
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<p>備註 (Note): 如果破碎部分觸及 ITO 電極則不可超過 ITO 電極寬度的 1/3，且必須進行通電測試，不可影響顯示效果 (If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications).</p> <p>3.2.3. 玻璃破損 (Glass remain) :</p>  <table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>$\leq 1/3W$</td> <td>$\leq t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq a$	$\leq 1/3W$	$\leq t$						
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4	黑點、白點異物 (Black or white dot)Round type 	4.1 Round type(Non-display or display): <table border="1" data-bbox="528 248 1278 752"> <thead> <tr> <th>尺寸 (Size)</th> <th>判定標準(Judging standard)</th> <th>允收數量 (Acceptance(Q'ty))</th> </tr> </thead> <tbody> <tr> <td rowspan="3">1.44" ~4.9"</td> <td>$D \leq 0.1 \text{ mm}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$0.10\text{mm} < D \leq 0.4\text{mm}$</td> <td>$N \leq 3$</td> </tr> <tr> <td>$D > 0.4\text{mm}$</td> <td>$N \leq 0$</td> </tr> <tr> <td rowspan="3">5.0" ~7.0"</td> <td>$D \leq 0.25\text{mm}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$0.25\text{mm} < D \leq 0.5\text{mm}$</td> <td>$N \leq 4$</td> </tr> <tr> <td>$D > 0.5\text{mm}$</td> <td>$N \leq 0$</td> </tr> <tr> <td rowspan="3">7.1" ~12.0"</td> <td>$D \leq 0.3 \text{ mm}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$0.30\text{mm} < D \leq 0.5\text{mm}$</td> <td>$N \leq 5$</td> </tr> <tr> <td>$D > 0.5\text{mm}$</td> <td>$N \leq 0$</td> </tr> </tbody> </table>	尺寸 (Size)	判定標準(Judging standard)	允收數量 (Acceptance(Q'ty))	1.44" ~4.9"	$D \leq 0.1 \text{ mm}$	忽略不計(Ignore)	$0.10\text{mm} < D \leq 0.4\text{mm}$	$N \leq 3$	$D > 0.4\text{mm}$	$N \leq 0$	5.0" ~7.0"	$D \leq 0.25\text{mm}$	忽略不計(Ignore)	$0.25\text{mm} < D \leq 0.5\text{mm}$	$N \leq 4$	$D > 0.5\text{mm}$	$N \leq 0$	7.1" ~12.0"	$D \leq 0.3 \text{ mm}$	忽略不計(Ignore)	$0.30\text{mm} < D \leq 0.5\text{mm}$	$N \leq 5$	$D > 0.5\text{mm}$	$N \leq 0$	次缺 (Min)		
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6	POL 氣泡(Polarizer Bubble)	<table border="1" data-bbox="528 1503 1278 2033"> <thead> <tr> <th>視區(area)</th> <th>判定標準(Judging standard)</th> <th>允收數量 (Acceptance(Q'ty))</th> </tr> </thead> <tbody> <tr> <td rowspan="4">A 區(Viewing area)</td> <td>$D < 0.2 \text{ mm}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$0.2\text{mm} < D \leq 0.3\text{mm}$</td> <td>$N \leq 3$</td> </tr> <tr> <td>$0.3\text{mm} < D \leq 0.5\text{mm}$</td> <td>$N \leq 1$</td> </tr> <tr> <td>$0.5\text{mm} < D$</td> <td>$N \leq 0$</td> </tr> <tr> <td>B 區(Outside of viewing area)</td> <td>—</td> <td>忽略不計(Ignore)</td> </tr> </tbody> </table>	視區(area)	判定標準(Judging standard)	允收數量 (Acceptance(Q'ty))	A 區(Viewing area)	$D < 0.2 \text{ mm}$	忽略不計(Ignore)	$0.2\text{mm} < D \leq 0.3\text{mm}$	$N \leq 3$	$0.3\text{mm} < D \leq 0.5\text{mm}$	$N \leq 1$	$0.5\text{mm} < D$	$N \leq 0$	B 區(Outside of viewing area)	—	忽略不計(Ignore)	次缺 (Min)											
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7	POL 折痕&分層(The folding and peeled offin polarizer)	偏光片不可有折痕和分層（脫膠）的現象(The folding and peeled offin polarizer are not acceptable). 距離邊緣 0.5mm 不管控(Distance from the edge of 0.5mm regardless of control)	次缺 (Min)																																																	
8	輝度及均勻性、色度 (Brightness and uniformity、Chroma)	應符合規範或圖紙要求規格(Shall be in accordance with the drawings and specification requirements specifications).	主缺 (Maj)																																																	
9	MURA	(5% ND Filter) Gray scale 灰階 50%																																																		
10	電性測試 (Electrical Testing)	1.顯示缺畫(Missing line character and icon). 2.無功能與無顯示(No function or no display). 3.顯示故障(Display malfunction). 4.LCD 視角缺陷(LCD viewing angle defect). 5.消耗電流超出規格(Current consumption exceeds product specifications).	主缺 (Maj)																																																	
11	<p>亮點(相鄰亮點)、 暗點 (Bright dot(Adjacent bright dot)、Dark dot)On-display Pixel: 3 dot in 1 pixel</p>  <p>亮點與連續亮點允 收總數量及尺寸請 參閱亮點判定標準 Please refer to the bright dot judgment standard for the total number and size of bright dot and adjacent bright dots allowed.</p>	<table border="1"> <thead> <tr> <th>尺寸 (Size)</th> <th>Item</th> <th>判定標準(Judging standard)</th> <th>允收數量 (Acceptance(Q'ty))</th> </tr> </thead> <tbody> <tr> <td rowspan="4">1.44" ~4.9"</td> <td rowspan="2">Bright dot</td> <td>$D \leq 1/2 \text{ Pixel}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$</td> <td>$N \leq 1$</td> </tr> <tr> <td rowspan="2">Dark dot</td> <td>$D \leq 1/2 \text{ Pixel}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$</td> <td>$N \leq 2$</td> </tr> <tr> <td colspan="3">Total</td> <td>$N \leq 2$</td> </tr> <tr> <td rowspan="4">5.0" ~7.0"</td> <td rowspan="2">Bright dot</td> <td>$D \leq 1/2 \text{ Pixel}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$</td> <td>$N \leq 2$</td> </tr> <tr> <td rowspan="2">Dark dot</td> <td>$D \leq 1/2 \text{ Pixel}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$</td> <td>$N \leq 3$</td> </tr> <tr> <td colspan="3">Total</td> <td>$N \leq 4$</td> </tr> <tr> <td rowspan="4">7.1" ~12.0"</td> <td rowspan="2">Bright dot</td> <td>$D \leq 1/2 \text{ Pixel}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$</td> <td>$N \leq 3$</td> </tr> <tr> <td rowspan="2">Dark dot</td> <td>$D \leq 1/2 \text{ Pixel}$</td> <td>忽略不計(Ignore)</td> </tr> <tr> <td>$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$</td> <td>$N \leq 4$</td> </tr> <tr> <td colspan="3">Total</td> <td>$N \leq 6$</td> </tr> </tbody> </table>	尺寸 (Size)	Item	判定標準(Judging standard)	允收數量 (Acceptance(Q'ty))	1.44" ~4.9"	Bright dot	$D \leq 1/2 \text{ Pixel}$	忽略不計(Ignore)	$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$	$N \leq 1$	Dark dot	$D \leq 1/2 \text{ Pixel}$	忽略不計(Ignore)	$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$	$N \leq 2$	Total			$N \leq 2$	5.0" ~7.0"	Bright dot	$D \leq 1/2 \text{ Pixel}$	忽略不計(Ignore)	$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$	$N \leq 2$	Dark dot	$D \leq 1/2 \text{ Pixel}$	忽略不計(Ignore)	$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$	$N \leq 3$	Total			$N \leq 4$	7.1" ~12.0"	Bright dot	$D \leq 1/2 \text{ Pixel}$	忽略不計(Ignore)	$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$	$N \leq 3$	Dark dot	$D \leq 1/2 \text{ Pixel}$	忽略不計(Ignore)	$1/2 \text{ Pixel} < D \leq 1 \text{ Pixel}$	$N \leq 4$	Total			$N \leq 6$	次缺 (Min)
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