

# PRODUCT SPECIFICATIONS

For Customer: STD

LCD No. : DT20G05A-A

Date: 2007.06.12

Version : 00

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## For Customer's Acceptance

| Accepted by | Comment |
|-------------|---------|
|             |         |
| Date:       |         |

This specification is proposed by Arima Display Corporation.

| Approved by | Checked by | Organized by |
|-------------|------------|--------------|
|             |            |              |

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## 2. History of Specification Revision

| Date       | Rev.   | Page | Contents                  |
|------------|--------|------|---------------------------|
| 2007.06.12 | Ver.00 |      | First revision(Tentative) |

### 3. LCD Panel

#### 3.1 General specification of Single Panel

| No.  | Item                    | Specification                 | Unit |
|------|-------------------------|-------------------------------|------|
| (1)  | Part Name               | DT20G05A-A                    | -    |
| (2)  | Display Diagonal Size   | 2.0"                          | inch |
| (3)  | Display Mode            | Transmissive & Normally White | -    |
| (4)  | CF Glass Dimension      | 34.76(H) x 45.08(V) x 0.5(T)  | mm   |
| (5)  | TFT Glass Dimension     | 34.76(H) x 49.52(V) x 0.5(T)  | mm   |
| (6)  | Active Area Dimension   | 30.96(H) x 41.28(V)           | mm   |
| (7)  | Resolution              | 240 x 3(RGB)(H) x 320(V)      | dots |
| (8)  | Pixel Pitch             | 0.129(H) x 0.129(V)           | mm   |
| (9)  | Color Pixel Arrangement | RGB Vertical Stripe           | -    |
| (10) | Viewing Direction       | 12 o'clock                    | -    |
| (11) | LCD Driver IC           | ILI9320 / R61505U             | -    |

#### 3.2 Environmental Absolute Maximum Ratings

| Item                | Storage |      | Operating |      | Remark          |
|---------------------|---------|------|-----------|------|-----------------|
|                     | MIN.    | MAX. | MIN.      | MAX. |                 |
| Ambient Temperature | -30°C   | 80°C | -20°C     | 70°C | Note1, 2,       |
| Humidity            | Note 3  |      | Note 3    |      | No Condensation |

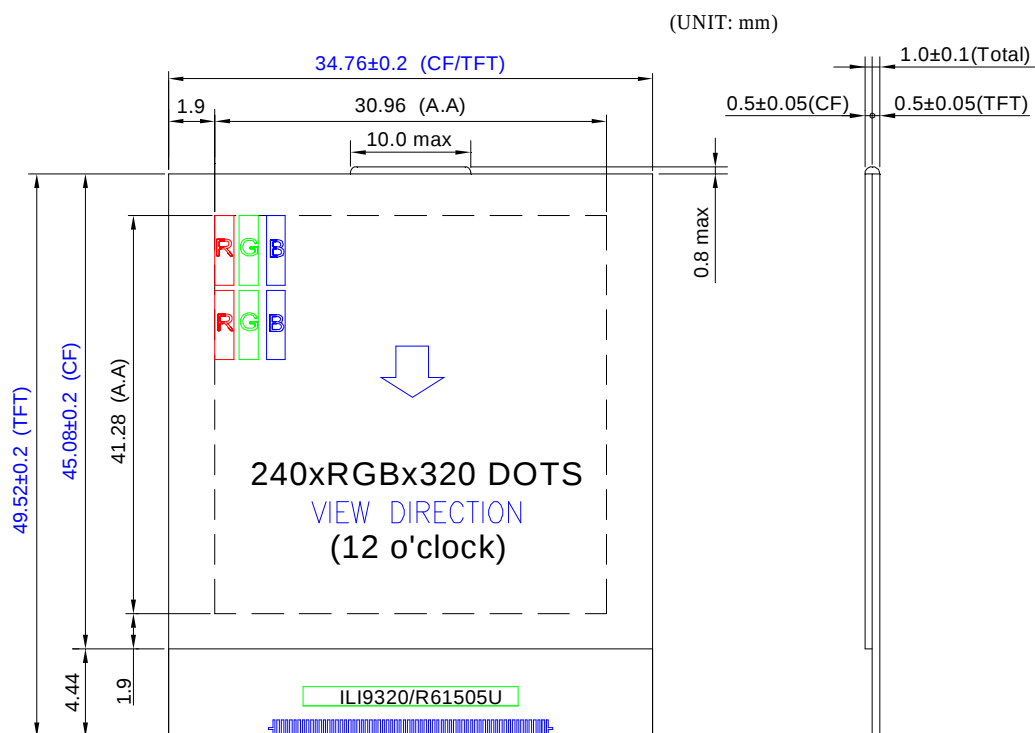
Note 1. The response time will become slow when operated at low temperature.

Note 2. Background color changes slightly depending on ambient temperature.  
The phenomenon is reversible.

Note 3. Ta≤40°C : 85%RH MAX.

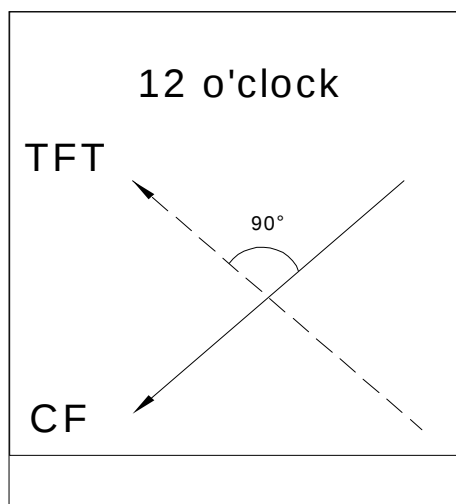
Ta> 40°C : Absolute humidity must be lower than the humidity of 85% RH at 40°C.

### 3.3 Outline Dimension

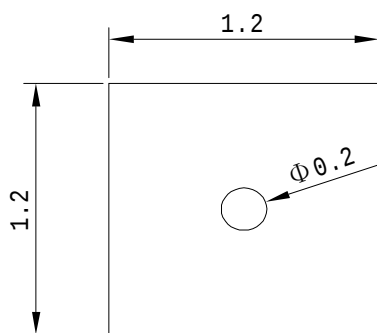
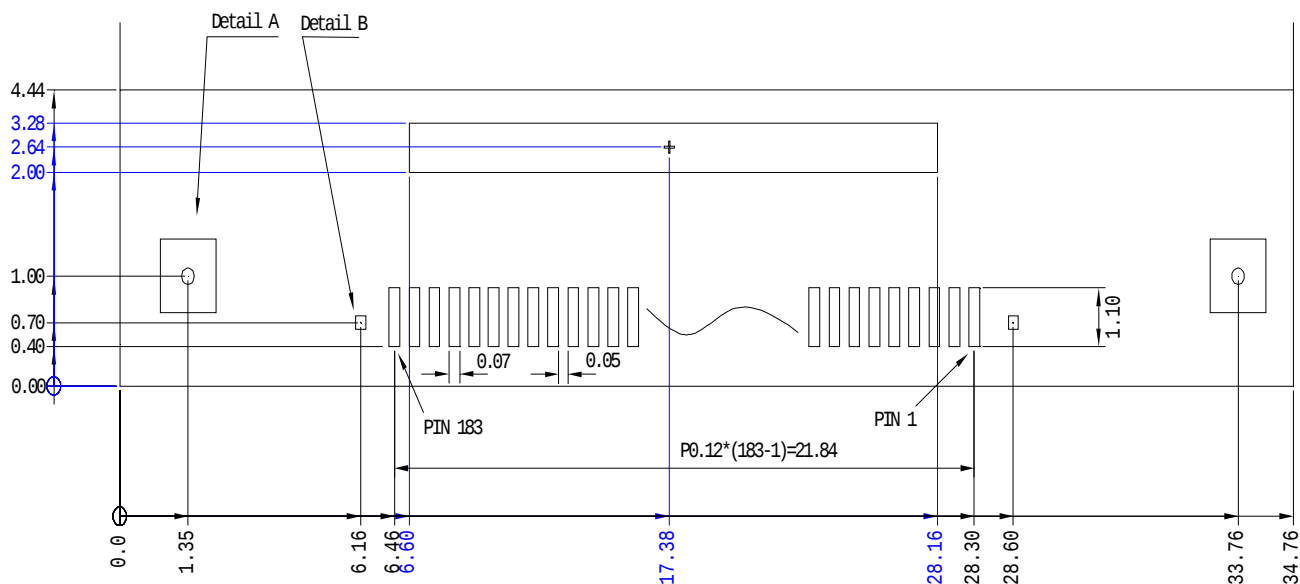


| Item     | Specification | Unit |
|----------|---------------|------|
| Cell Gap | 4.4±0.4       | um   |

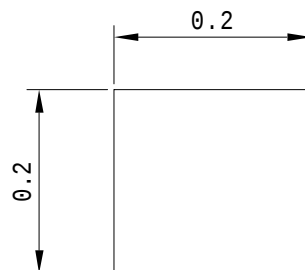
### 3.4 Rubbing Direction



### 3.5 FPC&IC Pad (Array)



Detail A



Detail B

### 3.6.1 FPC Pin Assignment (Renesas R61505U)

| Pin NO. | SYMBOL      | Pin NO. | SYMBOL    | Pin NO. | SYMBOL    |
|---------|-------------|---------|-----------|---------|-----------|
| 1       | dummy(1)    | 41      | DB4       | 81      | TESTO15   |
| 2       | dummy(2)    | 42      | DB3       | 82      | VREFC     |
| 3       | Vcom-LCD(1) | 43      | DB2       | 83      | TESTO16   |
| 4       | Vcom-LCD(2) | 44      | DB1       | 84      | VDDTEST   |
| 5       | Vcom-LCD(3) | 45      | DB0       | 85      | AGND-p1   |
| 6       | DMY-R1      | 46      | SDO       | 86      | AGND(1)   |
| 7       | DMY-R2      | 47      | SDI       | 87      | AGND(2)   |
| 8       | VPP1        | 48      | RD*       | 88      | AGND-p2   |
| 9       | VPP2(1)     | 49      | WR*/SCL   | 89      | GND-p1    |
| 10      | VPP2(2)     | 50      | RS        | 90      | GND(1)    |
| 11      | VPP3        | 51      | CS*       | 91      | GND-p2    |
| 12      | TEST4       | 52      | TESTO8    | 92      | RGND-p1   |
| 13      | TEST5       | 53      | TESTO9    | 93      | RGND(1)   |
| 14      | TEST3       | 54      | FMARK     | 94      | RGND-p2   |
| 15      | IM0/ID      | 55      | TS8       | 95      | TESTO17   |
| 16      | IM1         | 56      | OSC1DUM2  | 96      | VTEST     |
| 17      | IM2         | 57      | OSC1      | 97      | TESTO18   |
| 18      | IM3         | 58      | OSC1DUM3  | 98      | VGS       |
| 19      | TESTO4      | 59      | OSC1DUM4  | 99      | TESTO19   |
| 20      | TESTO5      | 60      | OSC2      | 100     | V0T       |
| 21      | RESET       | 61      | OSC2DUM1  | 101     | TESTO20   |
| 22      | VSYNC       | 62      | IOGND-p1  | 102     | VMON      |
| 23      | HSYNC       | 63      | ioGND(1)  | 103     | TESTO21   |
| 24      | DOTCLK      | 64      | IOGND-p2  | 104     | V31T      |
| 25      | ENABLE      | 65      | IOVCC-p1  | 105     | VCOM(1)   |
| 26      | DB17        | 66      | ioVcc(1)  | 106     | VCOM(2)   |
| 27      | DB16        | 67      | IOVCC-p2  | 107     | VCOMH(1)  |
| 28      | DB15        | 68      | VCC-p1    | 108     | VCOMH(2)  |
| 29      | DB14        | 69      | Vcc(1)    | 109     | VCOML(1)  |
| 30      | DB13        | 70      | Vcc(2)    | 110     | VCOML(2)  |
| 31      | DB12        | 71      | VCC-p2    | 111     | TESTO23   |
| 32      | DB11        | 72      | VDDOUT-p1 | 112     | VREG1OUT  |
| 33      | DB10        | 73      | VDD(1)    | 113     | TESTO24   |
| 34      | DB9         | 74      | VDD(2)    | 114     | TESTO25   |
| 35      | DB8         | 75      | VDD(3)    | 115     | VCOMR     |
| 36      | TESTO6      | 76      | VDD-p1    | 116     | TESTO26   |
| 37      | TESTO7      | 77      | TESTO13   | 117     | VCL-p1    |
| 38      | DB7         | 78      | VREFD     | 118     | VCL-p1    |
| 39      | DB6         | 79      | TESTO14   | 119     | VCL-p2    |
| 40      | DB5         | 80      | VREF      | 120     | VLOUT1-p1 |

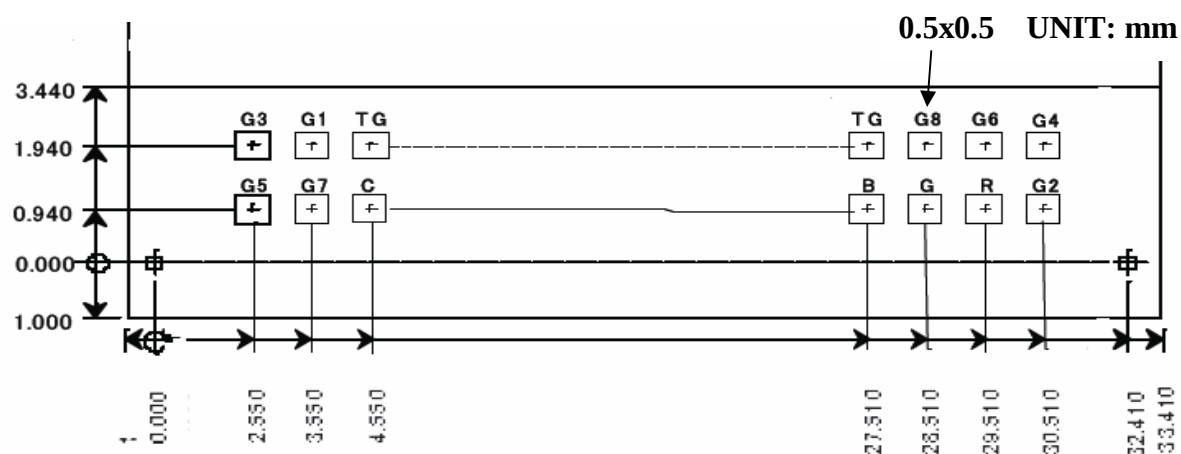
| Pin NO. | SYMBOL    | Pin NO. | SYMBOL      |
|---------|-----------|---------|-------------|
| 121     | DDVDH(1)  | 161     | C13-(2)     |
| 122     | DDVDH(2)  | 162     | C13+(1)     |
| 123     | DDVDH(3)  | 163     | C13+(2)     |
| 124     | DDVDH-p1  | 164     | C21-(1)     |
| 125     | VciOUT-p1 | 165     | C21-(2)     |
| 126     | VCI1(1)   | 166     | C21+(1)     |
| 127     | VCI1(2)   | 167     | C21+(2)     |
| 128     | VCI1(3)   | 168     | C22-(1)     |
| 129     | VciOUT-p2 | 169     | C22-(2)     |
| 130     | VCILVL(1) | 170     | C22+(1)     |
| 131     | VCILVL(2) | 171     | C22+(2)     |
| 132     | Vci(1)    | 172     | C23-(1)     |
| 133     | Vci(2)    | 173     | C23-(2)     |
| 134     | Vci(3)    | 174     | C23+(1)     |
| 135     | C12-(1)   | 175     | C23+(2)     |
| 136     | C12-(2)   | 176     | TESTO30     |
| 137     | C12-(3)   | 177     | DMY-R5      |
| 138     | C12+(1)   | 178     | DMY-R6      |
| 139     | C12+(2)   | 179     | Vcom-LCD(4) |
| 140     | C12+(3)   | 180     | Vcom-LCD(5) |
| 141     | C11-(1)   | 181     | Vcom-LCD(6) |
| 142     | C11-(2)   | 182     | dummy(5)    |
| 143     | C11-(3)   | 183     | iPS-GND     |
| 144     | C11+(1)   |         |             |
| 145     | C11+(2)   |         |             |
| 146     | C11+(3)   |         |             |
| 147     | AGNDDUM1  |         |             |
| 148     | VLOUT3-p1 |         |             |
| 149     | VGL(1)    |         |             |
| 150     | VGL(2)    |         |             |
| 151     | VGL(3)    |         |             |
| 152     | VGL(4)    |         |             |
| 153     | VGL-p1    |         |             |
| 154     | AGNDDUM2  |         |             |
| 155     | AGNDDUM4  |         |             |
| 156     | dummy(3)  |         |             |
| 157     | VGH(1)    |         |             |
| 158     | VGH(2)    |         |             |
| 159     | dummy(4)  |         |             |
| 160     | C13-(1)   |         |             |

### 3.6.2 FPC Pin Assignment (ILITEK ILI9320)

| Pin NO. | SYMBOL  | Pin NO. | SYMBOL   | Pin NO. | SYMBOL   |
|---------|---------|---------|----------|---------|----------|
| 1       | DUMMY   | 41      | DB4      | 81      | TESTO15  |
| 2       | DUMMY   | 42      | DB3      | 82      | VREFC    |
| 3       | VCOMLCD | 43      | DB2      | 83      | TESTO16  |
| 4       | VCOMLCD | 44      | DB1      | 84      | VDDTEST  |
| 5       | VCOMLCD | 45      | DB0      | 85      | AGND     |
| 6       | DUMMYR1 | 46      | SDO      | 86      | AGND     |
| 7       | DUMMYR2 | 47      | SDI      | 87      | AGND     |
| 8       | VPP1    | 48      | nRD      | 88      | AGND     |
| 9       | VPP2    | 49      | nWR/SCL  | 89      | GND      |
| 10      | VPP2    | 50      | RS       | 90      | GND      |
| 11      | VPP3    | 51      | nCS      | 91      | GND      |
| 12      | TEST4   | 52      | TESTO8   | 92      | GND      |
| 13      | TEST5   | 53      | TESTO9   | 93      | GND      |
| 14      | TEST3   | 54      | FMARK    | 94      | GND      |
| 15      | IM0/ID  | 55      | TS8      | 95      | TESTO17  |
| 16      | IM1     | 56      | OSC1DUM2 | 96      | VTEST    |
| 17      | IM2     | 57      | OSC1     | 97      | TESTO18  |
| 18      | IM3     | 58      | OSC1DUM3 | 98      | VGS      |
| 19      | TESTO4  | 59      | OSC1DUM4 | 99      | TESTO19  |
| 20      | TESTO5  | 60      | OSC2     | 100     | V0T      |
| 21      | nRESET  | 61      | OSC2DUM1 | 101     | TESTO20  |
| 22      | VSYNC   | 62      | IOGND    | 102     | VMON     |
| 23      | HSYNC   | 63      | IOGND    | 103     | TESTO21  |
| 24      | DOTCLK  | 64      | IOGND    | 104     | V31T     |
| 25      | ENABLE  | 65      | IOVCC    | 105     | VCOM     |
| 26      | DB17    | 66      | IOVCC    | 106     | VCOM     |
| 27      | DB16    | 67      | IOVCC    | 107     | VCOMH    |
| 28      | DB15    | 68      | VCC      | 108     | VCOMH    |
| 29      | DB14    | 69      | VCC      | 109     | VCOML    |
| 30      | DB13    | 70      | VCC      | 110     | VCOML    |
| 31      | DB12    | 71      | VCC      | 111     | TESTO23  |
| 32      | DB11    | 72      | VDD      | 112     | VREG1OUT |
| 33      | DB10    | 73      | VDD      | 113     | TESTO24  |
| 34      | DB9     | 74      | VDD      | 114     | TESTO25  |
| 35      | DB8     | 75      | VDD      | 115     | VCOMR    |
| 36      | TESTO6  | 76      | VDD      | 116     | TESTO26  |
| 37      | TESTO7  | 77      | TESTO13  | 117     | VCL      |
| 38      | DB7     | 78      | VREFD    | 118     | VCL      |
| 39      | DB6     | 79      | TESTO14  | 119     | VCL      |
| 40      | DB5     | 80      | VREF     | 120     | VLOUT1   |

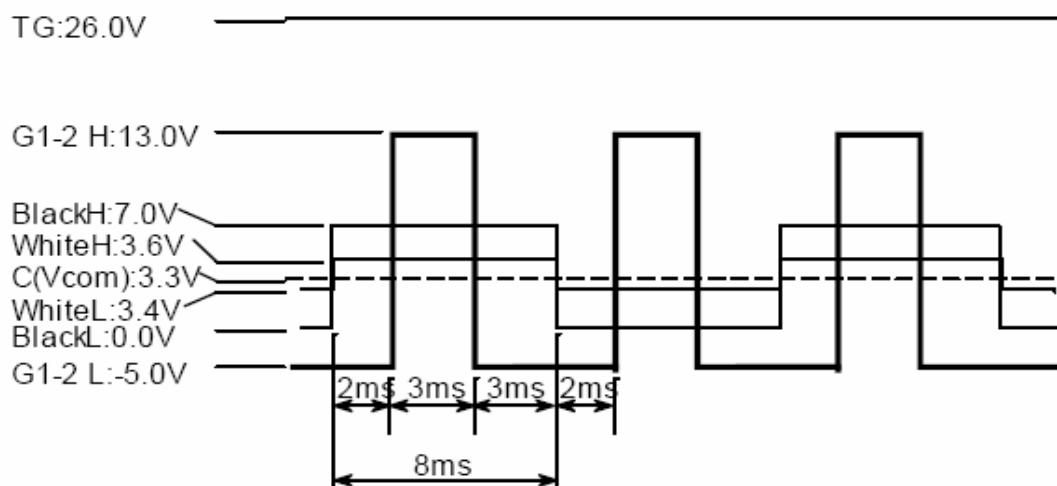
| Pin NO. | SYMBOL   | Pin NO. | SYMBOL  |
|---------|----------|---------|---------|
| 121     | VLOUT1   | 161     | C13-    |
| 122     | DDVDH    | 162     | C13+    |
| 123     | DDVDH    | 163     | C13+    |
| 124     | DDVDH    | 164     | C21-    |
| 125     | VCIOUT   | 165     | C21-    |
| 126     | VCIOUT   | 166     | C21+    |
| 127     | VCI1     | 167     | C21+    |
| 128     | VCI1     | 168     | C22-    |
| 129     | VCI1     | 169     | C22-    |
| 130     | VCILVL   | 170     | C22+    |
| 131     | VCILVL   | 171     | C22+    |
| 132     | VCI      | 172     | C23-    |
| 133     | VCI      | 173     | C23-    |
| 134     | VCI      | 174     | C23+    |
| 135     | C12-     | 175     | C23+    |
| 136     | C12-     | 176     | TESTO30 |
| 137     | C12-     | 177     | DUMMYR5 |
| 138     | C12+     | 178     | DUMMYR6 |
| 139     | C12+     | 179     | VCOMLCD |
| 140     | C12+     | 180     | VCOMLCD |
| 141     | C11-     | 181     | VCOMLCD |
| 142     | C11-     | 182     | DUMMY   |
| 143     | C11-     | 183     | IPS-GND |
| 144     | C11+     |         |         |
| 145     | C11+     |         |         |
| 146     | C11+     |         |         |
| 147     | AGNDDUM1 |         |         |
| 148     | VLOUT3   |         |         |
| 149     | VLOUT3   |         |         |
| 150     | VGL      |         |         |
| 151     | VGL      |         |         |
| 152     | VGL      |         |         |
| 153     | VGL      |         |         |
| 154     | AGNDDUM2 |         |         |
| 155     | AGNDDUM4 |         |         |
| 156     | DUMMY    |         |         |
| 157     | VLOUT2   |         |         |
| 158     | VGH      |         |         |
| 159     | DUMMY    |         |         |
| 160     | C13-     |         |         |

### 3.7 Test Pad and Test Pattern



| unit:V | TG   | C   | R       | G       | B       | G1~G8 |
|--------|------|-----|---------|---------|---------|-------|
| Gray   | 26DC | 3.3 | 5.5/1.5 | 5.5/1.5 | 5.5/1.5 | 13/-5 |
| Black  | 26DC | 3.3 | 7.0/0.0 | 7.0/0.0 | 7.0/0.0 | 13/-5 |
| White  | 26DC | 3.3 | 3.6/3.4 | 3.6/3.4 | 3.6/3.4 | 13/-5 |

### 3.8 LCD Cell test light on waveform

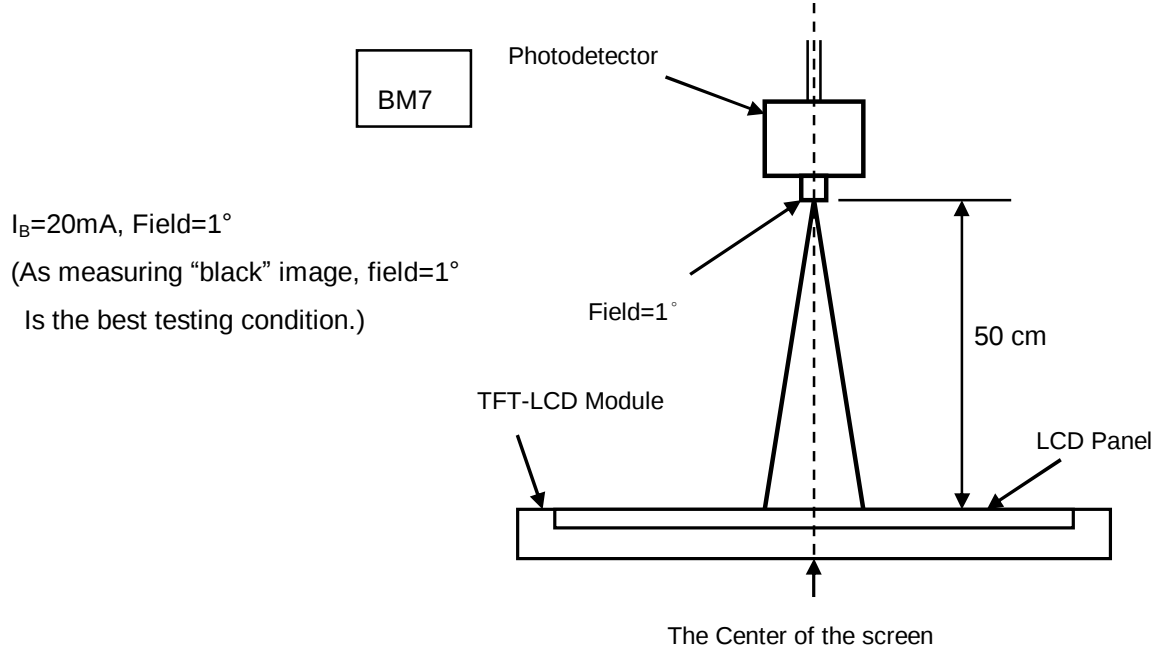


## 4. Optical Specification

1) Using Arima LCD+ TN Polarizer+ Corresponding Backlight, reference only

| Item                                |        | Symbol      | Condition                                                                                                                                           | Min.   | Typ.   | Max.   | Unit    | Note     |
|-------------------------------------|--------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|---------|----------|
| Contrast Ratio                      |        | CR          | $\theta=0^{\circ}$<br><br>Normal<br><br>viewing angle<br><br>At the center<br>of panel<br><br>Backlight On<br>Equipment:<br><br>BM7<br><br>Field=1° | (150)  | (200)  | -      | -       | (1), (2) |
| Response Time                       |        | Rising: Tr  |                                                                                                                                                     | -      | (30)   | (40)   | ms      | (3)      |
|                                     |        | Falling: Tf |                                                                                                                                                     |        |        |        |         |          |
| Transmittance                       |        | T           |                                                                                                                                                     | -      | (5.5)  | -      | %       | -        |
| Color<br>Chromaticity<br>(CIE 1931) | White  | Wx          |                                                                                                                                                     | (0.28) | (0.33) | (0.38) | -       | -        |
|                                     |        | Wy          |                                                                                                                                                     | (0.29) | (0.34) | (0.39) |         |          |
|                                     | Red    | Rx          |                                                                                                                                                     | (0.58) | (0.63) | (0.68) |         |          |
|                                     |        | Ry          |                                                                                                                                                     | (0.29) | (0.34) | (0.39) |         |          |
|                                     | Green  | Gx          |                                                                                                                                                     | (0.28) | (0.33) | (0.38) |         |          |
|                                     |        | Gy          |                                                                                                                                                     | (0.51) | (0.56) | (0.61) |         |          |
|                                     | Blue   | Bx          |                                                                                                                                                     | (0.11) | (0.16) | (0.21) |         |          |
|                                     |        | By          |                                                                                                                                                     | (0.07) | (0.12) | (0.17) |         |          |
| Color Saturation                    |        | NTSC        |                                                                                                                                                     | -      | (50)   | -      | %       | -        |
| Viewing<br>Angle                    | Top    | $\theta U$  | $CR \geq 10$<br>Backlight On<br>Equipment:<br>BM7<br>Field=1°                                                                                       | -      | (45)   | -      | Degrees | (4)      |
|                                     | Bottom | $\theta D$  |                                                                                                                                                     | -      | (15)   | -      |         |          |
|                                     | Left   | $\theta L$  |                                                                                                                                                     | -      | (35)   | -      |         |          |
|                                     | Right  | $\theta R$  |                                                                                                                                                     | -      | (35)   | -      |         |          |

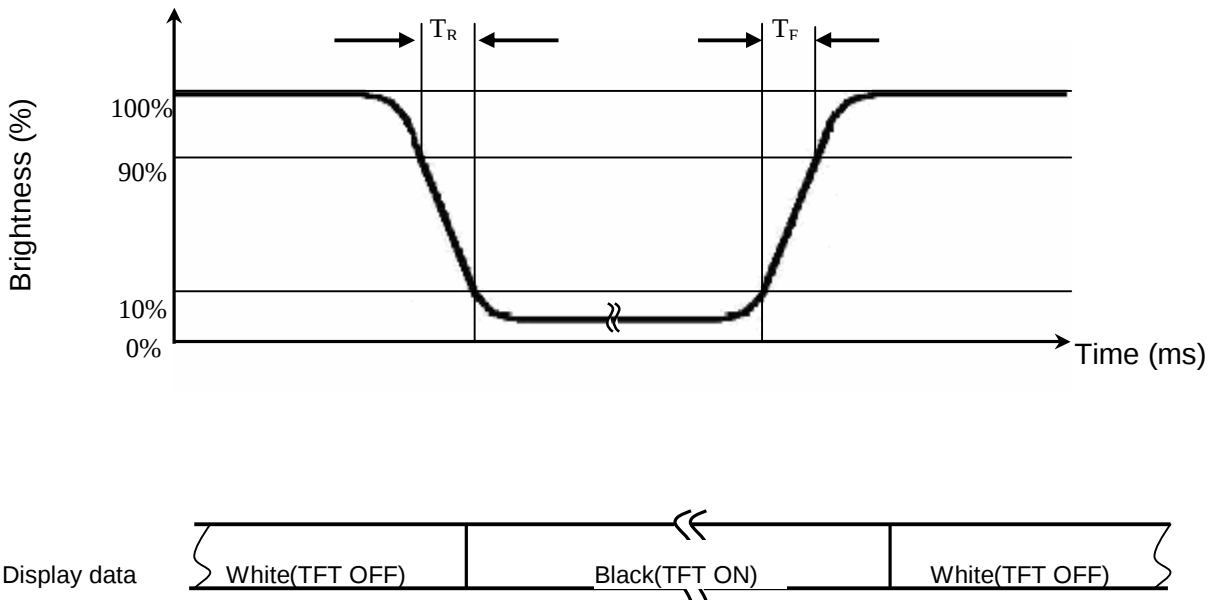
Note 1: The brightness test equipment setup



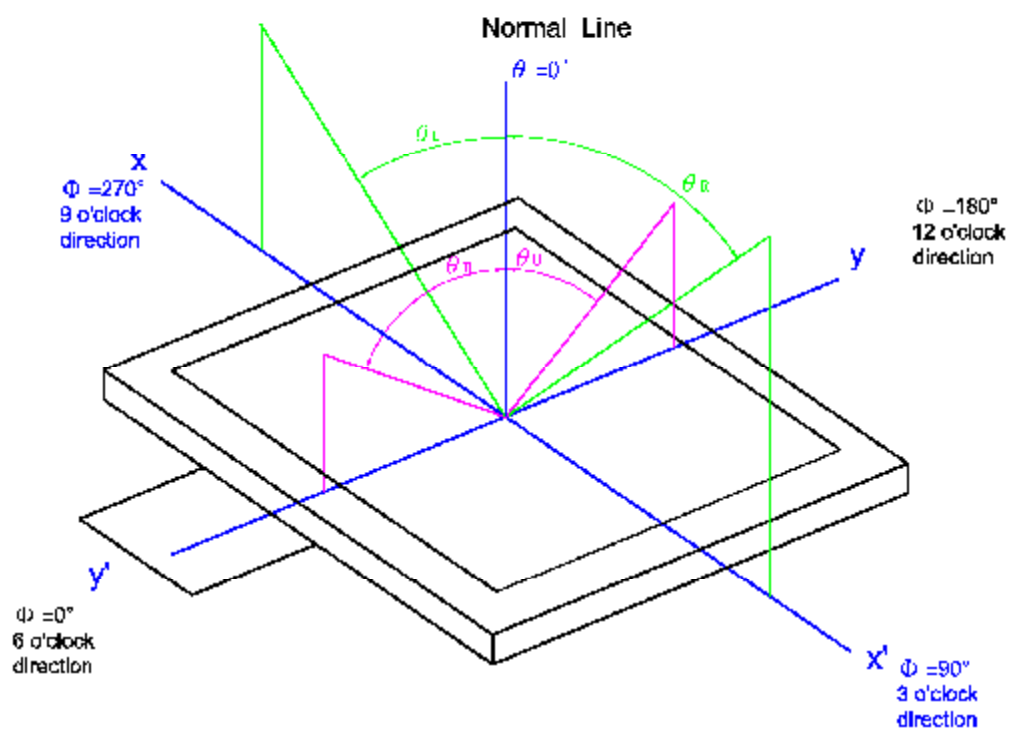
Note 2: Definition of contrast Ratio (C.R)

$$C.R = \frac{\text{Brightness When LCD is at "White" State}}{\text{Brightness When LCD is at "Black" State}}$$

Note 3: Definition of response time



#### Note 4: Definition of viewing angle

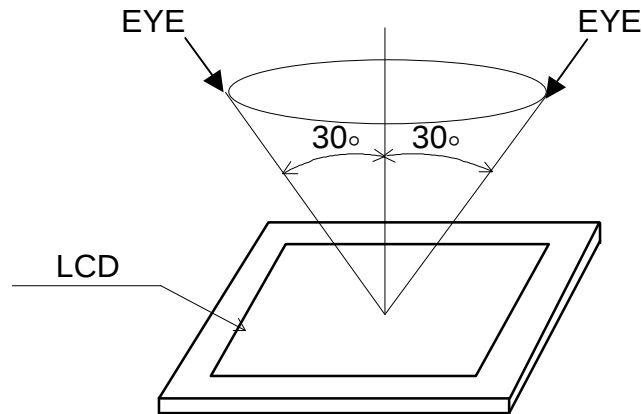


## 5. Quality Assurance

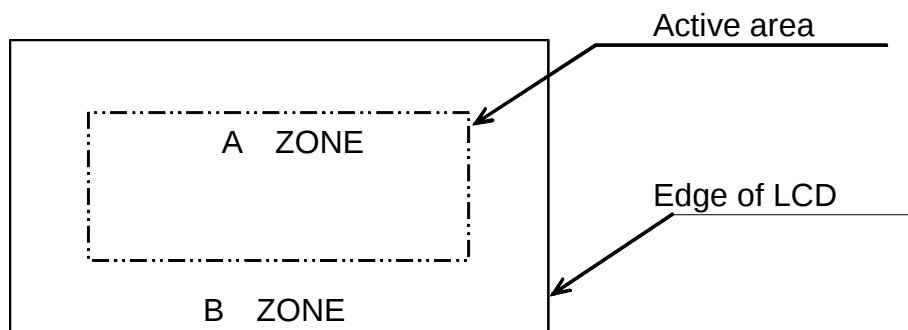
### 5.1 Appearance Inspection

Appearance inspection should be done under the following condition.

- (1) In the dark room. Done under a 20w fluorescent lamp, and the distance from lamp to LCD must be 30 cm.
- (2) The distance from eyes to LCD must be 30 cm.
- (3) Viewing direction must be within 30 degrees to vertical line of LCD center.



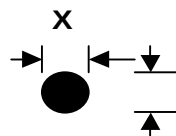
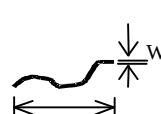
### 5.2 Definition of A zone and B zone



### 5.3 Appearance Criterion

Customer and supplier should hold a discussion when there is any problem about standard quality assurance or special quality assurance is needed.

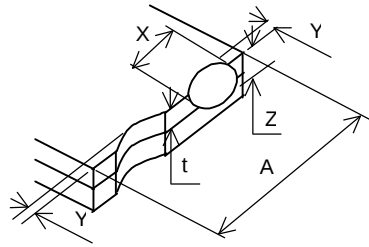
Inspection Standard: MIL-STD-105E normal inspection level II

| No.                                                                                                                                                                 | Item                                                                                                                                                                                                                                                                               | Criterion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Zone       | AQL          |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|--------------|-----------|------------|---|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------|--------------|--------------|---------------------|---------------------------------|------------|-----|---|------|
| 1                                                                                                                                                                   | Scratches<br>Black spots<br>White spots<br>Foreign particles                                                                                                                                                                                                                       | <div>Round shape:</div> <table><tr><th>Size</th><th>Acceptable</th></tr><tr><td><math>\varphi \leq 0.1</math></td><td>ignore</td></tr><tr><td><math>0.1 &lt; \varphi \leq 0.3</math></td><td>3</td></tr><tr><td><math>0.3 &lt; \varphi</math></td><td>0</td></tr></table> <div><math>\phi = (x+y)/2</math><br/>X<br/></div> <div>Line shape:</div> <table><tr><th>Length</th><th>Width</th><th>Acceptable</th></tr><tr><td>-</td><td><math>W \leq 0.02</math></td><td>ignore</td></tr><tr><td><math>L \leq 2.5</math></td><td><math>0.02 &lt; W \leq 0.05</math></td><td>3</td></tr><tr><td><math>2.5 \leq L</math></td><td><math>0.05 &lt; W</math></td><td>0</td></tr></table> <div></div> <div>*Any defect wiped out easily is acceptable</div> | Size       | Acceptable   | $\varphi \leq 0.1$                                                                                                                                                  | ignore              | $0.1 < \varphi \leq 0.3$                                     | 3                                                                                                                                                                          | $0.3 < \varphi$ | 0          | Length       | Width     | Acceptable | - | $W \leq 0.02$                                              | ignore                                                                                                                                                                                                                                                                             | $L \leq 2.5$ | $0.02 < W \leq 0.05$ | 3            | $2.5 \leq L$ | $0.05 < W$          | 0                               | A,B        | 2.5 |   |      |
| Size                                                                                                                                                                | Acceptable                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $\varphi \leq 0.1$                                                                                                                                                  | ignore                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $0.1 < \varphi \leq 0.3$                                                                                                                                            | 3                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $0.3 < \varphi$                                                                                                                                                     | 0                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| Length                                                                                                                                                              | Width                                                                                                                                                                                                                                                                              | Acceptable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| -                                                                                                                                                                   | $W \leq 0.02$                                                                                                                                                                                                                                                                      | ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $L \leq 2.5$                                                                                                                                                        | $0.02 < W \leq 0.05$                                                                                                                                                                                                                                                               | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $2.5 \leq L$                                                                                                                                                        | $0.05 < W$                                                                                                                                                                                                                                                                         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| 2                                                                                                                                                                   | Display quality                                                                                                                                                                                                                                                                    | <table><tr><th>Item</th><th>Criterion</th></tr><tr><td><ul style="list-style-type: none"><li>• Viewing angle defect</li><li>• Missing dots or missing line</li><li>• Malfunction</li><li>• Contrast ratio defect</li></ul></td><td>Not allowed</td></tr><tr><td><ul style="list-style-type: none"><li>• Bright dot</li></ul></td><td><table><tr><th>Diameter</th><th>Acceptable</th></tr><tr><td><math>D \leq 0.1</math></td><td>Disregard</td></tr><tr><td><math>0.1 &lt; D</math></td><td>0</td></tr></table></td></tr><tr><td><ul style="list-style-type: none"><li>• Dark dot</li></ul></td><td><table><tr><th>Diameter</th><th>Acceptable</th></tr><tr><td><math>D \leq 0.1</math></td><td>Disregard</td></tr><tr><td><math>0.1 &lt; D \leq 0.15</math></td><td>2<br/>Distance <math>\geq 5\text{mm}</math></td></tr><tr><td><math>0.15 &lt; D</math></td><td>0</td></tr></table></td></tr></table>                 | Item       | Criterion    | <ul style="list-style-type: none"><li>• Viewing angle defect</li><li>• Missing dots or missing line</li><li>• Malfunction</li><li>• Contrast ratio defect</li></ul> | Not allowed         | <ul style="list-style-type: none"><li>• Bright dot</li></ul> | <table><tr><th>Diameter</th><th>Acceptable</th></tr><tr><td><math>D \leq 0.1</math></td><td>Disregard</td></tr><tr><td><math>0.1 &lt; D</math></td><td>0</td></tr></table> | Diameter        | Acceptable | $D \leq 0.1$ | Disregard | $0.1 < D$  | 0 | <ul style="list-style-type: none"><li>• Dark dot</li></ul> | <table><tr><th>Diameter</th><th>Acceptable</th></tr><tr><td><math>D \leq 0.1</math></td><td>Disregard</td></tr><tr><td><math>0.1 &lt; D \leq 0.15</math></td><td>2<br/>Distance <math>\geq 5\text{mm}</math></td></tr><tr><td><math>0.15 &lt; D</math></td><td>0</td></tr></table> | Diameter     | Acceptable           | $D \leq 0.1$ | Disregard    | $0.1 < D \leq 0.15$ | 2<br>Distance $\geq 5\text{mm}$ | $0.15 < D$ | 0   | A | 0.65 |
| Item                                                                                                                                                                | Criterion                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| <ul style="list-style-type: none"><li>• Viewing angle defect</li><li>• Missing dots or missing line</li><li>• Malfunction</li><li>• Contrast ratio defect</li></ul> | Not allowed                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| <ul style="list-style-type: none"><li>• Bright dot</li></ul>                                                                                                        | <table><tr><th>Diameter</th><th>Acceptable</th></tr><tr><td><math>D \leq 0.1</math></td><td>Disregard</td></tr><tr><td><math>0.1 &lt; D</math></td><td>0</td></tr></table>                                                                                                         | Diameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Acceptable | $D \leq 0.1$ | Disregard                                                                                                                                                           | $0.1 < D$           | 0                                                            |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| Diameter                                                                                                                                                            | Acceptable                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $D \leq 0.1$                                                                                                                                                        | Disregard                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $0.1 < D$                                                                                                                                                           | 0                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| <ul style="list-style-type: none"><li>• Dark dot</li></ul>                                                                                                          | <table><tr><th>Diameter</th><th>Acceptable</th></tr><tr><td><math>D \leq 0.1</math></td><td>Disregard</td></tr><tr><td><math>0.1 &lt; D \leq 0.15</math></td><td>2<br/>Distance <math>\geq 5\text{mm}</math></td></tr><tr><td><math>0.15 &lt; D</math></td><td>0</td></tr></table> | Diameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Acceptable | $D \leq 0.1$ | Disregard                                                                                                                                                           | $0.1 < D \leq 0.15$ | 2<br>Distance $\geq 5\text{mm}$                              | $0.15 < D$                                                                                                                                                                 | 0               |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| Diameter                                                                                                                                                            | Acceptable                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $D \leq 0.1$                                                                                                                                                        | Disregard                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $0.1 < D \leq 0.15$                                                                                                                                                 | 2<br>Distance $\geq 5\text{mm}$                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |
| $0.15 < D$                                                                                                                                                          | 0                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |              |                                                                                                                                                                     |                     |                                                              |                                                                                                                                                                            |                 |            |              |           |            |   |                                                            |                                                                                                                                                                                                                                                                                    |              |                      |              |              |                     |                                 |            |     |   |      |

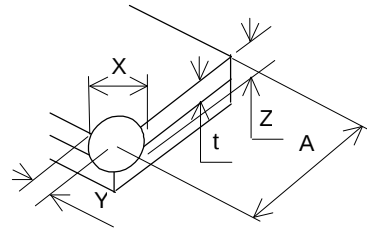
3

Chips

(1) On panel surface



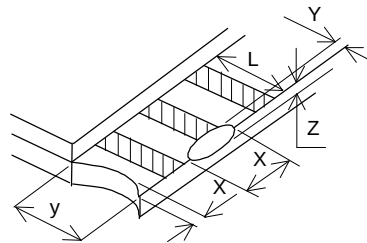
(2) On corner



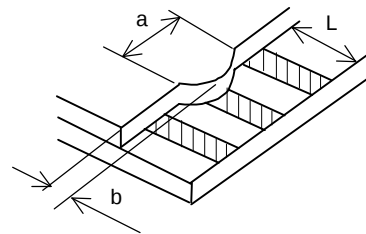
| Z                  | Y                          | X             |
|--------------------|----------------------------|---------------|
| $Z \leq 1/2t$      | Not injure<br>AU/Seal/mark | $X \leq 1/8A$ |
| $1/2t < Z \leq 2t$ |                            |               |

\*X is total length if there are 2 or more chips.

(3) On electrode pad



(4) Substrate protuberance



| Y            | X             | Z              |
|--------------|---------------|----------------|
| $Y \leq 0.5$ | $X \leq 1/8A$ | $0 < Z \leq t$ |

| a                   | b                     |
|---------------------|-----------------------|
| $a \leq 3\text{mm}$ | $b \leq 0.3\text{mm}$ |

| y          | X             | Z              |
|------------|---------------|----------------|
| $y \leq L$ | $X \leq 1/8A$ | $0 < Z \leq t$ |

\* Extensive crack is not acceptable

2.5

## 6. Reliability Tests

This standard reliability test is done only for the first lot of MP products. Customer and supplier must hold a discussion if other reliability test is requested by customer.

|   |                                                       |                                                                                                                                                                                                                                                                                                              |
|---|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Thermal shock<br>(under storage)                      | $-30^{\circ}\text{C} \xleftarrow{\hspace{1cm}} 25^{\circ}\text{C} \xleftarrow{\hspace{1cm}} 80^{\circ}\text{C}$<br>$30\text{min} \xrightarrow{\hspace{1cm}} 5\text{min} \xrightarrow{\hspace{1cm}} 30\text{min}$<br>$\xleftarrow{\hspace{1.5cm}} \xrightarrow{\hspace{1.5cm}}$<br>1 cycle<br>total 30 cycles |
| 2 | High temperature and high humidity<br>Under operation | $60^{\circ}\text{C}$ , 90%RH<br>240hrs                                                                                                                                                                                                                                                                       |
| 3 | High temperature under storage                        | $80^{\circ}\text{C}$ , 240hrs                                                                                                                                                                                                                                                                                |
| 4 | Low temperature under storage                         | $-30^{\circ}\text{C}$ , 240hrs                                                                                                                                                                                                                                                                               |
| 5 | Drop test<br>(Packing box with full samples inside)   | (X,Y,Z) x2 total 6 directions<br>drop from 80cm to ground                                                                                                                                                                                                                                                    |

## 7. Precautions for Operation and Storage

### 7.1 Precautions for Operation

- (1) Since LCD panel is made of glass, in order to prevent from glass broken or color tone change, please do not apply any mechanical shock or impact or excessive force to it when installing the LCD module.
- (2) If LCD panel is broken and liquid crystal substance leaks out and contact your skin or clothes, please immediately wash it off by using soap and water.
- (3) If LCD surface becomes contaminated, please wipe it off gently by using moisten soft cloth with normal hexane, do not use acetone, ketone, ethanol, isopropyl alcohol or water. If there is saliva or water on the LCD surface, please wipe it off immediately.
- (4) When handling LCD panel, please be sure that the body and the tools are properly grounded. And do not touch ITO terminals with bare hands or contaminate ITO terminals.
- (5) LCD panel should be used under recommended operating conditions shown in chapter 4.
- (6) Response time will be extremely slower at lower temperature than at specified temperature and LCD will show different color when at higher temperature. The phenomenon will disappear when returning to specified condition.
- (7) It is a characteristic of LCD to maintain the displaying pattern when the pattern is applied for a long time. To prevent image retention, please do not apply the fixed pattern for a long time by pre-installing such programs at your side.
- (8) This phenomenon (image retention) is not deterioration of LCD. If it happens, you can remove it by applying different patterns.

### 7.2 Precautions for Storage

- (1) Please store LCD panel in a dark place, avoid exposure to sunlight, the light of fluorescent lamp or any ultraviolet ray.
- (2) Keep the environment temperature at between 10°C and 35°C and at normal humidity (about 60%RH). Avoid high temperature, high humidity or temperature below 0°C.
- (3) That keeps the LCD panel stored in the container shipped from supplier before using them is recommended.
- (4) Do not leave any article on the LCD surface for an extended period of time.