



TF200-11规格书V01

Preliminary Technical Product Specification

**2.0" Transflective
Normally Black
QVGA LTPS**

| | |
|-----------------------------------|--|
| Customer Ref. : | RFQ Ref. : |
| Customer : Address : City : | Contact Person : Telephone : Fax : E-mail: Mobile: |
| Project Manager : | Telephone : Fax : e-mail: |

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1 Introduction

Product consists of a 2.0" diagonal 240RGBx320 LTPS TFT normally black display with a single chip-on-glass driver IC. A backlight incorporating 4pcs white LED's is included to illuminate the display. The LCD module can interface to the application via flex foil with a board-to-board connector.

2 General specifications

2.1 Main display

| Parameter | Value | Unit |
|--------------------------------|------------------------------|-------------------------|
| LCD type | Transflective, LTPS TFT | |
| Image mode | Normally Black | |
| Driver IC | JBT6K71 | |
| Interface method | 8 bit parallel CPU I/F (i80) | |
| Number of colors | 262K Colors | |
| Display resolution active area | 240RGB x 320 | Pixels (rows x columns) |
| LCD panel dimensions: | | |
| Width | 35.04 | mm |
| Height | 49.42 | mm |
| Active area dimensions: | | |
| Width | 30.24 | mm |
| Height | 40.32 | mm |
| Pixel pitch (HxW) | 0.126x(3x0.042) | mm |
| Pixel configuration | RGB vertical stripe | |
| Glass thickness | 0.3 | mm |
| Surface treatment | HC | |
| Viewing direction | 6 o'clock | |

2.1 Backlight

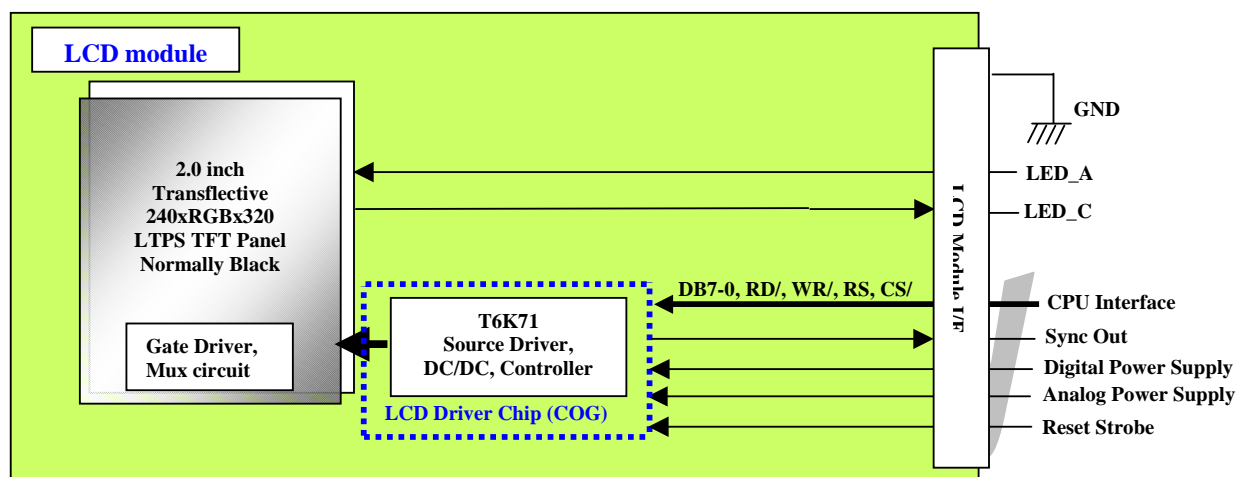
| Parameter | Value | Unit |
|---|----------------------------|---------|
| LED type | Nichia NSSW020BT U2/V1, B5 | 4 LED's |
| LED current supplied by external current source | | |
| -LED current | 15 | mA |
| Luminance uniformity | 75% (min) | |

2.2 Module

| Parameter | Value | Unit |
|-------------------|-------|------|
| Module dimensions | | |
| Width | 36.7 | mm |
| Height | 52.5 | mm |
| Thickness | 2.55 | mm |
| Weight | TBD | gram |
| No. of I/O pins | 20 | |

4 Electrical characteristics

4.1 Block Diagram



4.2 Pin assignment

| Pin no. | Symbol | I/O | Description | Remark |
|---------|--------|-----|--------------------------|--|
| 1 | DB7 | I/O | Data Bus Bit 7 | MSB |
| 2 | DB6 | I/O | Data Bus Bit 6 | |
| 3 | DB5 | I/O | Data Bus Bit 5 | |
| 4 | DB4 | I/O | Data Bus Bit 4 | |
| 5 | DB3 | I/O | Data Bus Bit 3 | |
| 6 | DB2 | I/O | Data Bus Bit 2 | |
| 7 | /RD | I | Read Strobe | Active low |
| 8 | /WR | I | Write Strobe | Active low |
| 9 | VSS | - | GND | |
| 10 | WSYNC | O | Output frame sync signal | Picture sync against tearing effect |
| 11 | LED_A | - | Backlight LED Anode | Positive terminal for serial string of 4 LED's |
| 12 | LED_C | - | Backlight LED Cathode | Negative terminal for serial string of 4 LED's |
| 13 | /CS | I | Chip Select | Active low |
| 14 | VCC1 | - | Digital Power Supply | |
| 15 | VCC2 | - | Analog Power Supply | |
| 16 | RS | I | Register Select | Data = high; Command = low |
| 17 | VSS | - | GND | |
| 18 | DB0 | I/O | Data Bus Bit 0 | LSB |
| 19 | DB1 | I/O | Data Bus Bit 1 | |
| 20 | /RST | I | Reset Strobe | Active low |

4.3 Absolute Maximum Ratings

| PARAMETER | SYMBOL | Rating | UNIT | NOTE |
|------------------------------|------------------|-------------------------------|------|------|
| Digital power supply voltage | V _{CC1} | -0.3 to 4.6 | V | |
| Analog power supply voltage | V _{CC2} | -0.3 to 4.6 | V | |
| Input voltage | V _{in} | -0.3 to V _{CC1} +0.3 | V | |
| Operating temperature | T _{opr} | -20 to 60 | °C | |
| Storage temperature | T _{stg} | -30 to 70 | °C | |

4.4 DC Characteristics

| SYMBOL | DESCRIPTION | CONDITION | MIN. | TYP | MAX | UNIT | NOTE |
|--------------------------------------|----------------------------|---|------------------------|----------|----------------------|----------|------|
| V _{CC1} | Digital power supply | | 1.7 | 1.8 | 3.1 | V | |
| V _{CC2} | Analog power supply | | 2.6 | 2.8 | 3.1 | V | |
| | Ripple on V _{CC2} | | | | ±50 | mV | 1 |
| V _{IHD} | Input high voltage | | V _{CC1} -0.35 | | V _{CC1} | V | |
| V _{ILD} | Input low voltage | | 0 | | 0.35 | V | |
| V _{OHD} | Output high voltage | | V _{CC1} -0.4 | | V _{CC1} | V | |
| V _{OLD} | Output low voltage | | 0 | | 0.2 V _{CC1} | V | |
| I _{CC2} I _{CC1} | Normal mode | Full screen, 262k colors, 60 Hz, White picture | | 7.3 1 | | mA μA | |
| I _{CC2} | 8 Color Partial mode | 40 lines., 8 colors, 45 Hz, White picture | | 1.3 | | mA | |

Note 1 visibility of ripple is very dependent of frequency. Frequencies below 1kHz will be faster give visible artefacts than high frequencies.

4.5 AC characteristics

Refer to driver specification of JBT6K71

5 Optical characteristics

All parameters specified at room temperature under typical driving conditions

| Table 1. Parameters specified at room temperature under typical driving conditions | | | | | | | | | | | |
|--|----------------------------|-------|------------------------|--------------|--------|----------|-----|-----|-----|------|-------------------|
| Item | | | Measurement conditions | | | | Min | Typ | Max | Unit | |
| | | | Light source type | Light source | | Detector | | | | | |
| | | | | α | ϕ | α | | | | | ϕ |
| Transmissive | Contrast ratio | | Back light | - | - | 0 | 270 | | 230 | | |
| | Luminance (average) | | Back light | - | - | 0 | 270 | | 240 | | Cd/m ² |
| | Luminance Ratio | | Back light | - | - | 0 | 270 | 75 | | | % |
| | Viewing angle range CR>=10 | | Back light | - | - | 0 | | | 55 | | deg. |
| | | | | | | 90 | | | 80 | | |
| | | | | | | 180 | | | 55 | | |
| | | | | | | 270 | | | 75 | | |
| | Response time | Tr+Tf | Back light | - | - | 0 | 270 | | 35 | | ms |
| | Chromaticity (NTSC1931) | | Back light | - | - | 0 | 270 | | 57 | | % |
| | White | x | Back light | - | - | 0 | 270 | | TBD | | |
| | | y | | | | | | | TBD | | |
| | Red | x | | | | | | | TBD | | |
| | | y | | | | | | | TBD | | |
| | Green | x | | | | | | | TBD | | |
| y | | | | | | | | TBD | | | |
| Blue | x | | | | | | | TBD | | | |
| | y | | | | | | | TBD | | | |
| Reflective | Contrast ratio | | Diffuse | - | - | 0 | 270 | | 11 | | |
| | Reflectance | | Diffuse | - | - | 0 | 270 | | 2.1 | | % |
| | Response time | Tr+Tf | Back light | - | - | 0 | 270 | | 40 | | ms |
| | Chromaticity (NTSC1931) | | Back light | - | - | 0 | 270 | | 10 | | % |
| | White | x | Back light | - | - | 0 | 270 | | TBD | | |
| | | y | | | | | | | TBD | | |
| | Red | x | | | | | | | TBD | | |
| | | y | | | | | | | TBD | | |
| | Green | x | | | | | | | TBD | | |
| | | y | | | | | | | TBD | | |
| | Blue | x | | | | | | | TBD | | |
| | | y | | | | | | | TBD | | |

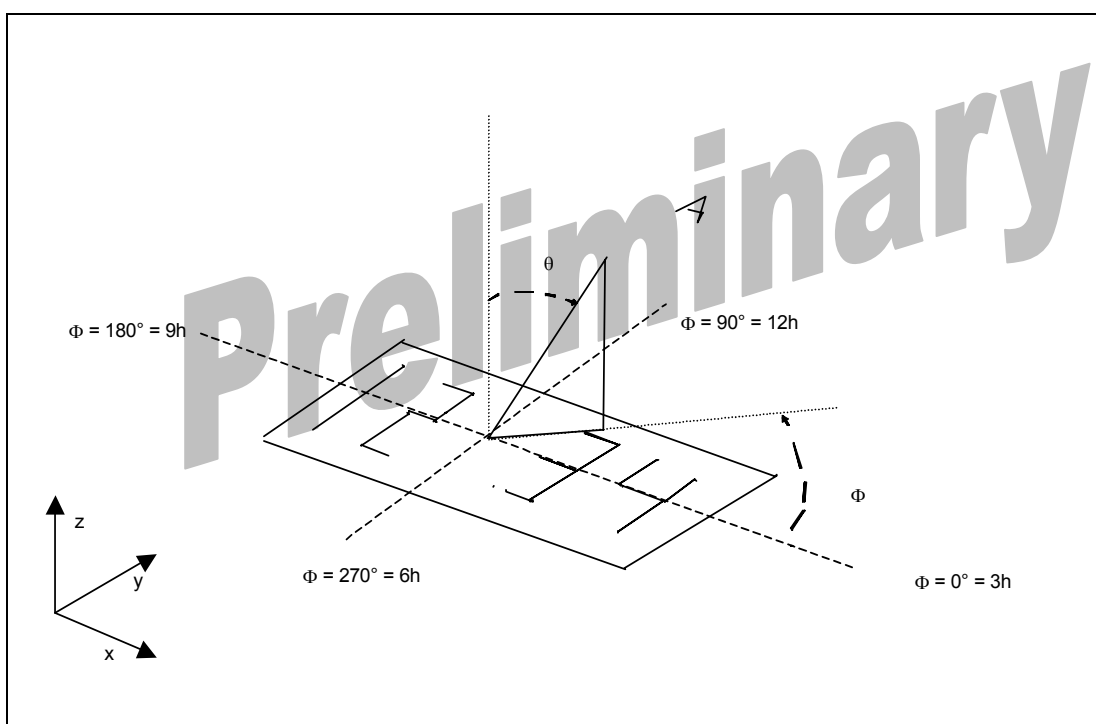
6 Definition of Optical Characteristics

6.1 Measurement device

The measurement devices used to generate product specifications within Philips MDS are the DMS systems from the firm Autronic-Melchers GmbH. Within Philips MDS DMS series 301, 703 and 803 are used.

6.2 Coordinates and Viewing angles

This document adopts right-handed x-y-z Cartesian coordinates with origin at the centre of the display active area. The z-axis is perpendicular (normal) to the screen, the x-axis is the screen horizontal, and the y-axis is the screen vertical. The x and y-axis lie in the plane of the display surface.



Associated with this Cartesian system is the spherical coordinate system (r, θ, Φ), where r is the radius from the centre of the display coordinate system, θ is the inclination from the z-axis (display normal, the polar axis of the spherical coordinate system), and Φ is the counter-clockwise angle from the x-axis in the x-y-plane (the display surface) as observed from the Z-axis (Φ is a right handed rotation about the z-axis starting the x-axis).

6.3 Environment

| | |
|---------------------------|--------------------|
| Ambient Temperature: | 23 (± 4) °C |
| Ambient Air Pressure | 68 ... 106 kPa |
| Ambient Relative Humidity | 25 ... 85 %RH@25°C |

6.4 Warm-Up Time

The warm-up time is normally 20 minutes. Deviations are reported.

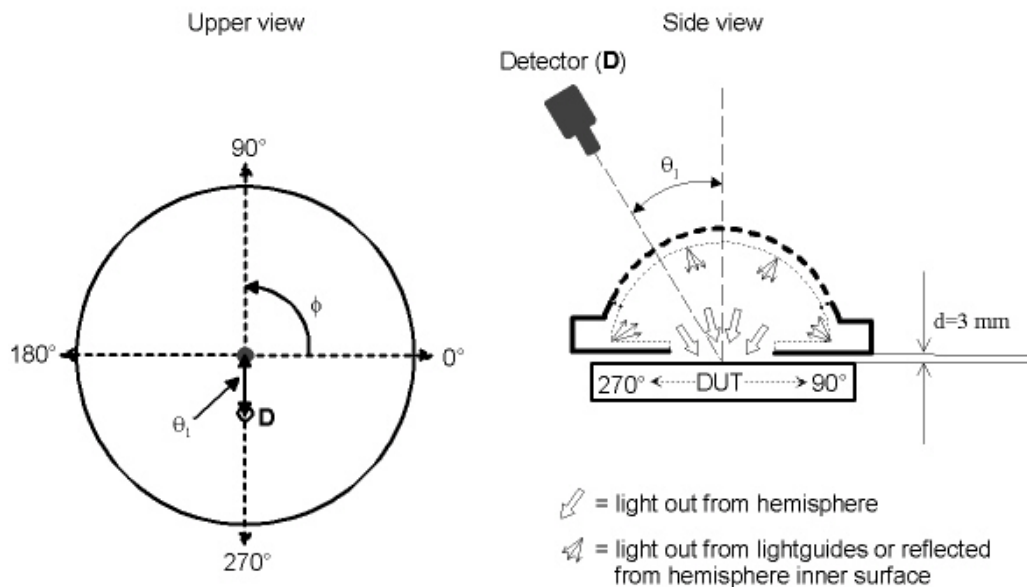
6.5 Darkroom conditions

The measurements are executed in a darkroom. The luminance is less than 1 Lux.

6.6 Measurement Set-up

Measurement Set-up for Diffuse illumination

Light source and detector configuration on DUT



Lighting: **Temperature** hemisphere, excluding specular component

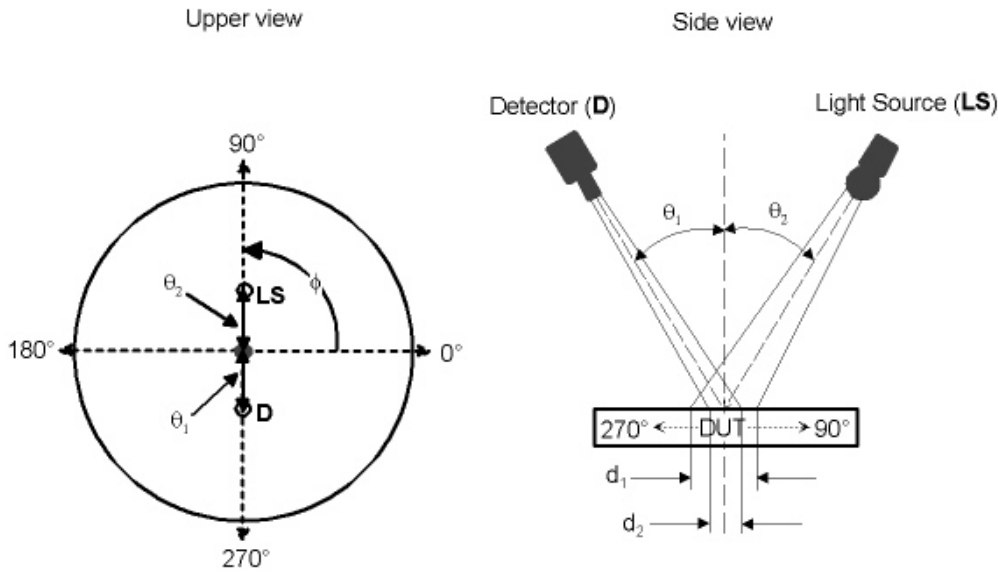
Slit Opening: **Vertical Slit ($90^\circ - 270^\circ$)**

Distance: Distance between DUT and exit port of light source (working distance) is **3 mm**

Aperture size: 3mm

Measurement Set-up for Point illumination

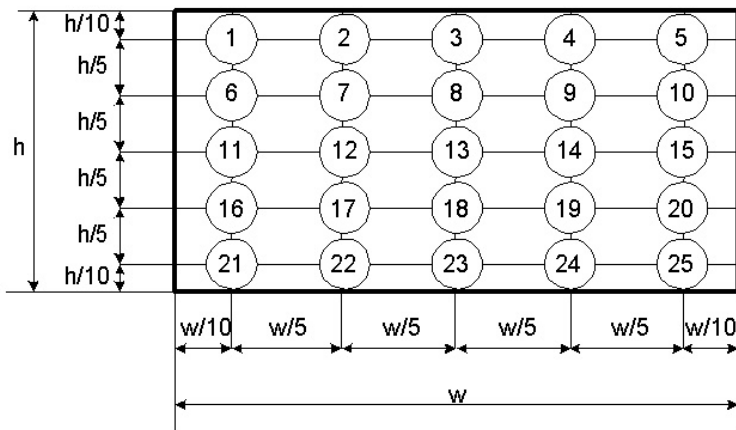
Light source and detector configuration on DUT



Lighting:
Aperture size:

PID
3mm

6.7 Measurement Points



h : height of active area
 w : width of active area

7 Environmental / Reliability Tests

| Test | Testname | Conditions | Duration | Method |
|------|--------------------------------------|---|--------------|------------------------------------|
| HOT | High temperature Operation Test. | 60 °C DRY | 96 Hrs | Method: IEC 68-2-2 / Bb Note 1 |
| LOT | Low temperature Operation Test. | -20 °C DRY | 96 Hrs | Method: IEC 68-2-1 / Ab Note 1 |
| HST | High temperature Storage Test. | 70 °C DRY | 96 Hrs | Method: IEC 68-2-2 / Bb Note 1 |
| LST | Low temperature Storage Test. | -30 °C DRY | 96 Hrs | Method: IEC 68-2-1 / Ab Note 1 |
| AHTO | Accelerated Humidity Test Operation. | 40 °C 90% RH | 96Hrs | Method: IEC 68-2-3 / Ca Note 1 |
| TST | Thermal Shock Test. | 1 cycle: -30 °C (30 min); +80 °C(30 min); transition time < 10 s | 10 cycles | Method: IEC 68-2-56 / Cb Note 1 |

Note 1: After 2 hrs recovery time at room temperature the modules are evaluated for:
cosmetic defects and electrical defects.

8 EMC requirements

8.1 Scope and application

The operational EMC requirements for Philips MDS modules, which operate in an EM environment, are provided in this *PMDS EMC specification for modules*.

The table provided in section 3 contains EMC immunity requirements and emission limits applicable to an operational module. The table provided in section 4 contains ESD requirements for handling a non-operational module.

8.2 Reference documents

EN 61000-6-1: Generic standards – Section 1: Immunity for residential, commercial and light-industrial environment.

EN 61000-6-4: Generic standards – Section 4: Emission standard for industrial environment

EN 55022: Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.

ETS 300-342-1: Radio Equipment and Systems (RES); Electromagnetic Compatibility (EMC) for European digital cellular telecommunications system (GSM 900 MHz and DCS 1800 MHz) Part 1: Mobile and portable radio and ancillary equipment.

IEC 62179: Non Operational ESD immunity, human body model (HBM).

IEC 62180: Non Operational ESD immunity, machine model (MM).

8.3 Operational EMC requirements

The operational EMC immunity requirements and emission limits for PMDS modules are provided in table 1: EMC specification for operational modules.

Table 1. EMC specification for operational modules

| EMC phenomena | REFERENCE standard | MDS EMC Procedure | Frequency range | Level/ Limit | Test specification | Performance criteria |
|-------------------------|--------------------|-------------------|-----------------|---------------|--------------------------|----------------------|
| Electromagnetic field | IEC 61000-4-3 | UZW-B1/H900-25 | 30MHz-1000MHz | 3 V/m | 1kHz sine, 80% AM | C |
| EFT/Burst | IEC 61000-4-4 | UZW-B1/H900-26 | n.a. | 10 V | -8us/50us -10ns/100ns | C C |
| Electrostatic Discharge | IEC 61000-4-2 | UZW-B1/H900-24 | n.a. | 2 kV/ 4 kV | Contact/ Air | C |
| Conducted RF signals | IEC 61000-4-6 | UZW-B1/H900-28 | 150kHz-30MHz | 1 V | 1kHz sine, 80% AM | C |
| Radiated emission | IEC 61000-6-4 | UZW-B1/H900-29 | 30 MHz-1000MHz | 47 dBuV | d = 10 m | n.a. |

8.4 Non operational ESD requirements

The non-operational ESD requirements for handling of PMDS modules are provided in table 2: Non-operational ESD requirements.

Table 2. Non operational ESD requirements

| ESD immunity | REFERENCE standard | MDS EMC Procedure | Level/ Limit | Performance criteria | Application of test |
|------------------|--------------------|-------------------|----------------------|----------------------|-------------------------------|
| Human Body Model | IEC 62179 | UZW-B1/H900-20 | 2 kV ⁽¹⁾ | No damage | All relevant pin combinations |
| Machine Model | IEC 62180 | UZW-B1/H900-20 | 200 V ⁽¹⁾ | No damage | All relevant pin combinations |

⁽¹⁾. If the component supplier may specify a lower immunity level, this level will be entered in the specification instead.

9 Quality description (TBD)

9.1 Inspection conditions

| Item | Condition |
|--|--|
| Ambient illumination Lighting | 1000 +/- 200 lux |
| Viewing Distance | 30 +/-5 cm |
| Viewing Angle | 90° +/- 30° |
| Reflections | No reflection of the light source visible in display |
| Inspection time | < 30sec |
| Inspection method | Unaided eyes only |
| Temperature | +25°C +/- 5°C |
| Driving condition: Pattern Voltage | t.b.d t.b.d |

9.2 Foreign materials and blemishes

Dot and line defects

| Item | Total number |
|--|--------------|
| Dot defect (Bright/Dark dot defect) | TBD |
| Line defect | TBD |

Sub Pixel which contains larger than 1/2 defective area is called dot defect.

Each R,G,B element of the pixel is called Sub Pixel, 1set of RGB is called a pixel.

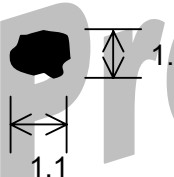


Opto-Mechanical defects

| Item | Countable defect | Reject criteria |
|---------------------------------------|--|--------------------------|
| Circular defect (Bright/Dark Spot) | $\phi \leq 0.1$ | No count |
| | $0.1 < \phi \leq 0.3$ | A ($A + B + C \leq 4$) |
| | $0.3 < \phi$ | 0 |
| Long defect (Bright/Dark line) | $T \leq 0.03$ | No count |
| | $L \leq 0.3$ | No count |
| | $0.03 < T \leq 0.05, 0.3 < L \leq 3.0$ | B ($A + B + C \leq 4$) |
| | $0.05 < T \leq 0.1, 0.3 < L \leq 2.0$ | C ($A + B + C \leq 4$) |
| | $0.05 < T \leq 0.1, 2.0 < L \leq 3.0$ | 0 |
| | $T > 0.1, L > 1.5$ | 0 |
| Dent and Bubble | $\phi \leq 0.15$ | No count |
| | $0.2 < \phi \leq 0.5$ | 2 |
| | $0.3 < \phi$ | 0 |

Remark: $\phi = (\text{Length : } L + \text{Width : } W) / 2$
 $T = \text{defect thickness, } L = \text{defect contour length}$

Circular defect



Long defect

