# DP-0351-11A
# Datasheet



# 1 Introduction

The DP-0351-11A is a 3.5-inch TFT-LCD module featuring a resolution of 320 × 240 pixels. It incorporates a TFT-LCD panel, driver IC (NV3035), flexible printed circuit (FPC), backlight unit, and resistive touch panel (RTP).

Engineered to display 16.7 million colors via an RGB interface, the DP-0351-11A delivers excellent image quality, stable performance, and reliable operation for various embedded display applications.

## 1.1   Features

- 3.5" TFT-LCD with 320 × 240 resolution and resistive touch panel (RTP)
- Supports 16.7M colors for vivid and accurate display output
- RGB interface for reliable signal transmission
- Compliant with RoHS environmental requirements

## 2  Part Numbers/Ordering Information

| Part No. | Description |
|---|---|
| DP-0351-11A | TFT Display 3.5 inch (320* 240 resolution) with Resistive Touch Panel |

**Table 1 - Part Number/Ordering Information**

## Table of Contents

# 3  General Specifications

| Item | Specification | Unit | Note |
|---|---|---|---|
| LCD Type | TFT | - | |
| LCD Size | 3.5 | inch | |
| Number of Pixels | 320(H) x 240(V) | pixels | |
| Viewing Direction | 12 | o'clock | |
| Gray Scale Inversion Direction | 6 | o'clock | |
| Interface | 24-bit RGB | | |
| Display Colors | 16.7M Colors (RGB 8 bit) | colors | |
| Module Size | 76.90(H) x 64.00(V) x 4.25(D) | mm | Note 2 |
| Active Area | 70.08(H) x 52.56(V) | mm | |
| Display Driver IC | NV3035 | - | |
| Touch Panel | Resistive Touch Panel | - | |
| Operation Temperature | -20~+70°C | °C | |
| Storage Temperature | -30~+80°C | °C | |

**Table 2 - General Specifications**

**Note:**

1. Complies with environmental protection requirements and is RoHS compliant.
2. Module size excludes FPC and solder; with RTP.

# 4  Hardware Description

The DP-0351-11A features a 3.5-inch TFT-LCD with a 320 × 240 resolution, integrated with a resistive touch panel.

## 4.1 TFT-LCD Interface Pin Assignment

The interface connector pin configuration is described below.

| Pin no | Symbol | Type | Description |
|--------|--------|------|-------------|
| 1 | VLED- | P | LED backlight (Cathode) |
| 2 | VLED- | P | LED backlight (Cathode) |
| 3 | VLED+ | P | LED backlight (Anode) |
| 4 | VLED+ | P | LED backlight (Anode) |
| 5 | NC | - | No Connection |
| 6 | NC | - | No Connection |
| 7 | NC | - | No Connection |
| 8 | RESET | I | Reset the display |
| 9 | SPENA | I | Chip select |
| 10 | SPCK | I | SPI clock |
| 11 | SPDA | I | Serial Data Pin |
| 12 | R0 | I | Red Data Input |
| 13 | R1 | I | Red Data Input |
| 14 | R2 | I | Red Data Input |
| 15 | R3 | I | Red Data Input |
| 16 | R4 | I | Red Data Input |
| 17 | R5 | I | Red Data Input |
| 18 | R6 | I | Red Data Input |
| 19 | R7 | I | Red Data Input |
| 20 | G0 | I | Green Data Input |
| 21 | G1 | I | Green Data Input |
| 22 | G2 | I | Green Data Input |
| 23 | G3 | I | Green Data Input |
| 24 | G4 | I | Green Data Input |
| 25 | G5 | I | Green Data Input |
| 26 | G6 | I | Green Data Input |
| 27 | G7 | I | Green Data Input |
| 28 | B0 | I | Blue Data Input |
| 29 | B1 | I | Blue Data Input |
| 30 | B2 | I | Blue Data Input |
| 31 | B3 | I | Blue Data Input |
| 32 | B4 | I | Blue Data Input |
| 33 | B5 | I | Blue Data Input |
| 34 | B6 | I | Blue Data Input |
| 35 | B7 | I | Blue Data Input |
| 36 | HSYNC | I | Line Sync Signal |

| 37 | VSYNC | I | Frame Sync Signal |
|----|-------|---|-------------------|
| 38 | PCLK | I | Data Clock |
| 39 | NC | - | No Connection |
| 40 | NC | - | No Connection |
| 41 | VCC | P | Power Supply |
| 42 | VCC | P | Power Supply |
| 43 | NC | - | No Connection |
| 44 | NC | - | No Connection |
| 45 | NC | - | No Connection |
| 46 | NC | - | No Connection |
| 47 | NC | - | No Connection |
| 48 | XR | O | Touch Panel Control Pin |
| 49 | YD | O | Touch Panel Control Pin |
| 50 | XL | O | Touch Panel Control Pin |
| 51 | YU | O | Touch Panel Control Pin |
| 52 | DE | I | Data Enable Pin |
| 53 | GND | P | Ground |
| 54 | GND | P | Ground |

**Table 3 - TFT-LCD Interface Pin Definition**

# 5  Specifications

## 5.1 Absolute Maximum Ratings

### 5.1.1  Electrical Absolute Maximum Ratings

Condition: $V_{SS}$=0V, $T_a$=25°C

| Item | Symbol | MIN. | MAX. | Unit | Note |
|---|---|---|---|---|---|
| Power Supply Voltage | VCC | -0.3 | 3.6 | V | Note 1, 2 |

**Table 4 - Electrical Absolute Maximum Ratings**

<u>**Note:**</u>

1. Permanent damage to the LCD module may occur if operated beyond the specified limits. Operation beyond the specified electrical characteristics may lead to malfunction or reduced reliability.
2. VCC must always be greater than Vss.

### 5.1.2  Environmental Absolute Maximum Ratings

| Item | Storage | | Operating | | Note |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| Ambient Temperature | -30°C | 80°C | -20°C | 70°C | Note 1, 2 |
| Humidity | - | - | - | - | Note 3 |

**Table 5 - Environmental Absolute Maximum Ratings**

<u>**Note:**</u>

1. Response time decreases at low operating temperatures.
2. Background color may vary slightly with ambient temperature; this phenomenon is reversible.
3. Ta<=40°C: 85%RH MAX
   Ta>=40°C: Absolute humidity must not exceed the equivalent of 85% RH at 40°C.

## 5.2 Electrical Specifications

### 5.2.1 Electrical Characteristics

Condition: Vss=0V, $T_a$=25°C

| Item | | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Power Supply | | VCC | 3.0 | 3.3 | 3.6 | V | |
| Input Voltage | 'H' | $V_{IH}$ | 0.8*Vcc | - | Vcc | V | Vcc=3.3V |
| | 'L' | $V_{IL}$ | 0 | - | 0.2*Vcc | V | Vcc=3.3V |
| Current Consumption | | $I_{cc1}$ | - | 20 | 30 | mA | Normal mode, Note 2 |
| | | $I_{cc2}$ | - | 0.05 | 0.1 | mA | Sleep mode, Note 2 |
| Clock Frequency | | $f_{clk}$ | - | 6 | 12 | MHz | |

**Table 6 - Electrical Characteristics**

<u>**Note:**</u>

1. Measured at optimum contrast in transmissive mode.
2. Tested in 1x1 chessboard pattern.

## 5.2.2 LED Backlight Specification

The backlight consists of 6 white LEDs, providing uniform illumination across the display.

Condition: $V_{SS}$=0V, $T_a$=25°C

| Item | Symbol | Min. | Typ. | Max. | Unit | Condition |
|------|--------|------|------|------|------|-----------|
| Supply Voltage | Vf | - | 18 | - | V | If=20mA |

**Table 7 - LED Backlight Specification**

**Note:**

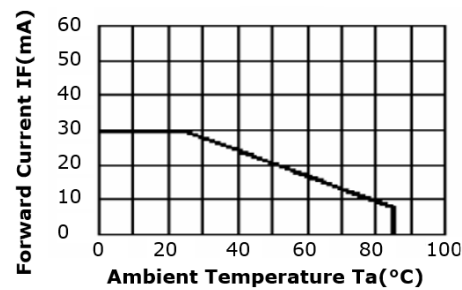The forward current versus ambient temperature characteristics shown in Figure 1 are specified per LED string.


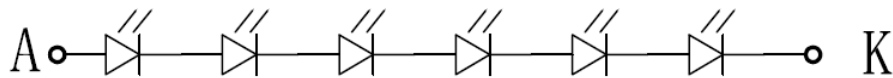
**Figure 1 - Forward Current vs Ambient Temperature**


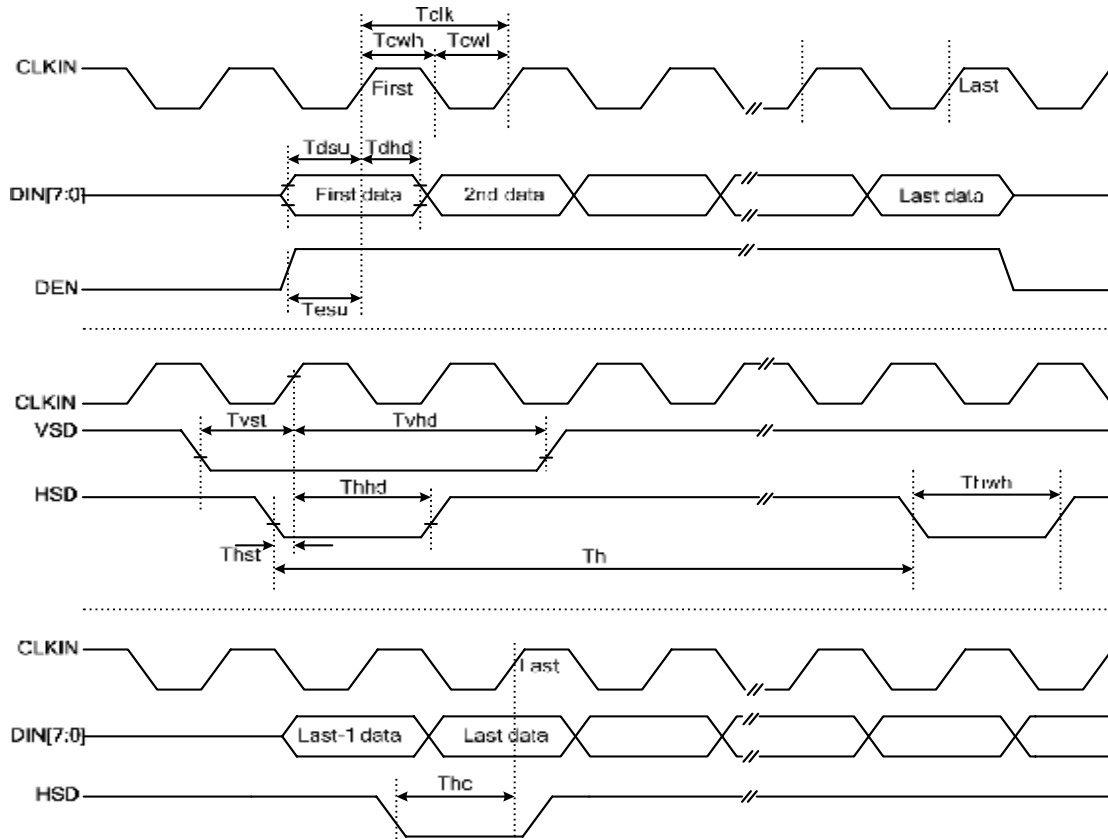
**Figure 2 - Backlight LED Circuit**

## 5.3 Input Data Timing
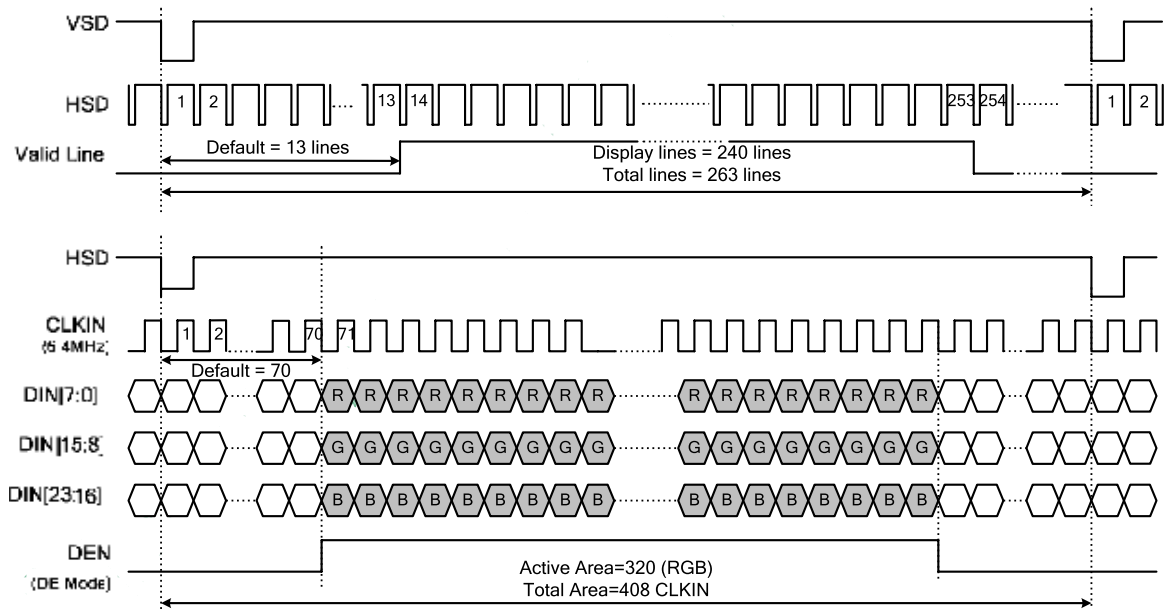


**Figure 3 - Clock and Data Input Timing Diagram**



**Figure 4 - RGB Input Data Timing**

| Parameter | Symbol | Value | | | Unit | Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| CLKIN | $F_{CLK}$ | 6.1 | 6.4 | 8.0 | MHz | VDD=3.0~3.6V |
| CLKIN cycle time | Tclk | 125 | 156 | 164 | ns | |
| CLKIN pulse duty | Tcwh | 40 | 50 | 60 | % | Tclk |
| Time that HSD to 1st data input(NTSC) | Ths | 40 | 70 | 255 | CLKIN | DDLY=70,Offset=0 (fixed) |
| HSD to CLKIN | Thc | - | - | 1 | CLKIN | |
| HSD width | Thwh | 1 | - | - | CLKIN | |
| VSD width | Tvwh | 1 | - | - | Th | |
| HSD period time | Th | 60 | 63.56 | 67 | us | |
| VSD setup time | Tvst | 8 | - | - | ns | |
| VSD hold time | Tvhd | 10 | - | - | ns | |
| HSD setup time | Thst | 8 | - | - | ns | |
| HSD hold time | Thhd | 10 | - | - | ns | |
| Data setup time | Tdsu | 8 | - | - | ns | DIN[23:0] to CLKIN |
| Data hold time | Tdhd | 10 | - | - | ns | DIN[23:0] to CLKIN |
| Time that VSD to 1st line data input | Tvs | 2 | 13 | 127 | Th | |

**Table 8 - Data Input Timing**

## 5.4 Optical Specifications

All optical specifications are measured under typical condition (Note 1, 2)

| Item | Symbol | | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Brightness | Bp | | $\theta=0°$ $\Phi=0°$ | 480 | 530 | - | Cd/m$^2$ | Note 1 |
| Uniformity | ⊿Bp | | | 80 | - | - | % | Note 1 Note 2 |
| Viewing Angle | 3:00 | | Cr≥10 | - | 60 | - | Deg | Note 3 |
| | 6:00 | | | - | 45 | - | | |
| | 9:00 | | | - | 60 | - | | |
| | 12:00 | | | - | 60 | - | | |
| Contrast Ratio | Cr | | $\theta=0°$ $\Phi=0°$ | 300 | 500 | - | - | Note 4 |
| Response Time | $T_r$ | | | - | 10 | - | ms | Note 5 |
| | $T_f$ | | | - | 10 | - | ms | |
| Color of CIE Coordinate | W | x | $\theta=0°$ $\Phi=0°$ | | 0.28 | | - | Note 1 Note 6 |
| | | y | | | 0.33 | | - | |
| | R | X | | | 0.51 | | - | |
| | | y | | | 0.34 | | - | |
| | G | x | | | 0.31 | | - | |
| | | y | | | 0.56 | | - | |
| | B | x | | | 0.15 | | - | |
| | | y | | | 0.14 | | - | |
| NTSC Ratio | S | | | 50 | 60 | - | % | |

**Table 9 - Optical Specifications**

**Remark:** *Parameters may vary slightly depending on temperature, driving voltage, and material.*

**Note:**

1.  Data are measured after the LEDs are turned on for 5 minutes with the LCM displaying full white. Brightness is the average value of 9 measured points. Measurement equipment: PR-705 (Φ8mm)

    Measuring Conditions:

    *   Environment: Dark room
    *   Temperature: Ta=25**°**C
    *   Operating voltage adjusted for optimum contrast at the center of the display
    *   Values measured at the center point of the LCD panel after more than 5 minutes of backlight operation



**Figure 5 - Measurement Setup**

2.  The luminance uniformity is calculated using the following formula:

$$\varDelta Bp = \frac{Bp\ (Min.)}{Bp\ (Max.)} \times 100\%$$

Bp (Max.) = Maximum brightness in 9 measured spots
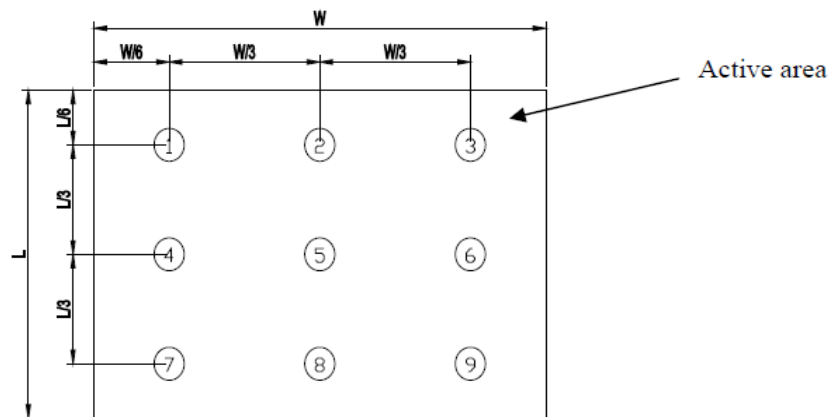Bp (Min.) = Minimum brightness in 9 measured spots



**Figure 6 - Measurement Point**

3.  Definition of viewing angle: Refer to the figure below, indicated by θ and Φ.
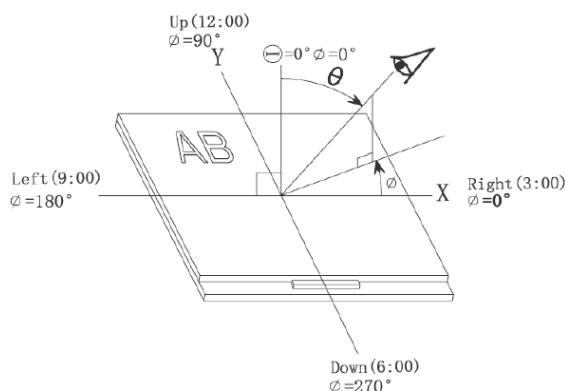
**Figure 7 - Viewing Angle**
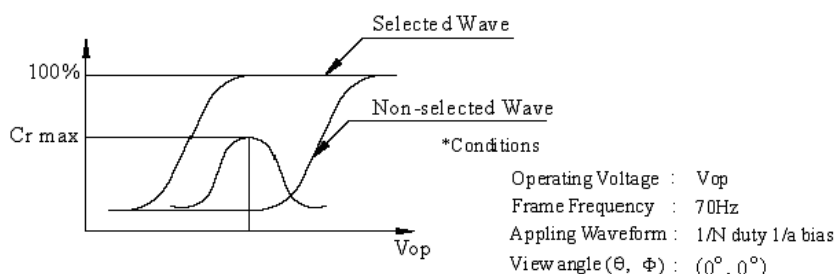
4. Definition of Contrast ratio. (Test equipment: DMS501)



**Figure 8 - Contrast Ratio**

$$\text{Contrast ratio, Cr} = \frac{\textbf{Brightness of selected dots}}{\textbf{Brightness of non−selected dots}}$$

5. Definition of response time. (Test equipment: DMS501)

The output signals of the photo detector are measured when the input signal changes from "black" to "white" (falling time) and from "white" to "black" (rising time). Response time is defined as the time interval between 10% and 90% of the signal amplitude. Refer to the figure below for illustration.
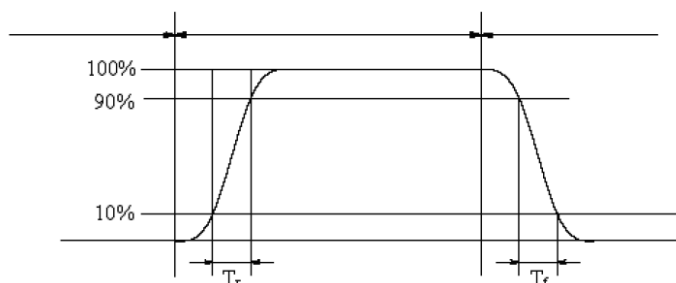


**Figure 9 - Definition of Response Time**

6.   Definition of color in terms of CIE coordinates and NTSC ratio.

Color gamut:    $S = \dfrac{\textbf{Area of RGB triangle}}{\textbf{Area of NTSC triangle}}$ x 100%
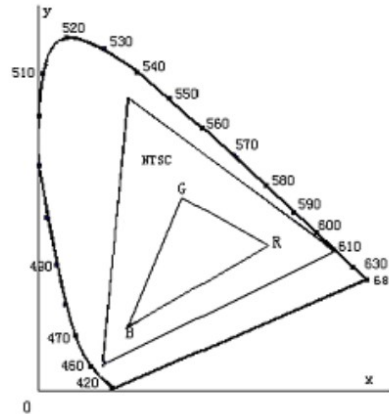


**Figure 10 - 1931 CIE Chromaticity Diagram**

7.   Definition of cross talk.

Cross talk ratio(%)= $\dfrac{|\textbf{Pattern A Brightness}-\textbf{Pattern B Brightness}|}{\textbf{Pattern A Brightness}}$ x 100%
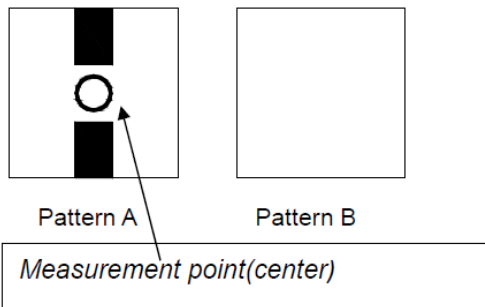
**Electric volume value=3F+/-3Hex**



**Figure 11 - Definition of Cross Talk**

# 6  Reliability Test Items

| Test Item | Test Conditions | Criterion |
|---|---|---|
| High Temperature Storage | Temperature: +80°C±2°C<br>Duration: 96hrs<br>Restoration: 2hrs at 25°C<br>Power Status: OFF | 1. No cosmetic or electrical defects shall be observed after testing.<br><br>2. Total current consumption shall not exceed twice the initial value. |
| Low Temperature Storage | Temperature: -30°C±2°C<br>Duration: 96hrs<br>Restoration: 2hrs at 25°C<br>Power Status: OFF | |
| High Temperature Operation | Temperature: +70°C±2°C<br>Duration: 96hrs<br>Restoration: 2H at 25°C<br>Power Status: ON | |
| Low Temperature Operation | Temperature: -20°C±2°C<br>Duration: 96hrs<br>Restoration: 4H at 25°C<br>Power Status: ON | |
| High Temperature and Humidity Operation | Temperature: +60°C±2°C<br>Humidity: 90% RH<br>Duration: 96hrs<br>Power Status: ON | |
| Temperature Cycle | Range: -30°C ~ +80°C<br>Cycle: 5 cycles<br>Dwell: 30 min at each extreme<br>Transfer Time:5 min<br>Restoration: 2H at 25°C<br>Power Status: OFF | |
| Vibration Test | Frequency: 10Hz ~ 150Hz<br>Acceleration:100m/s$^2$<br>Duration: 120min | Cosmetic and electrical defects are not permitted. |
| Shock Test | Waveform: Half-sine wave<br>Acceleration: 300m/s$^2$<br>Duration: 11ms | |

**Table 10 - Reliability Test Items**

**Note:** Operation : Supply 3.3 V to the logic system.

The inspection criteria after reliability testing are as follows:

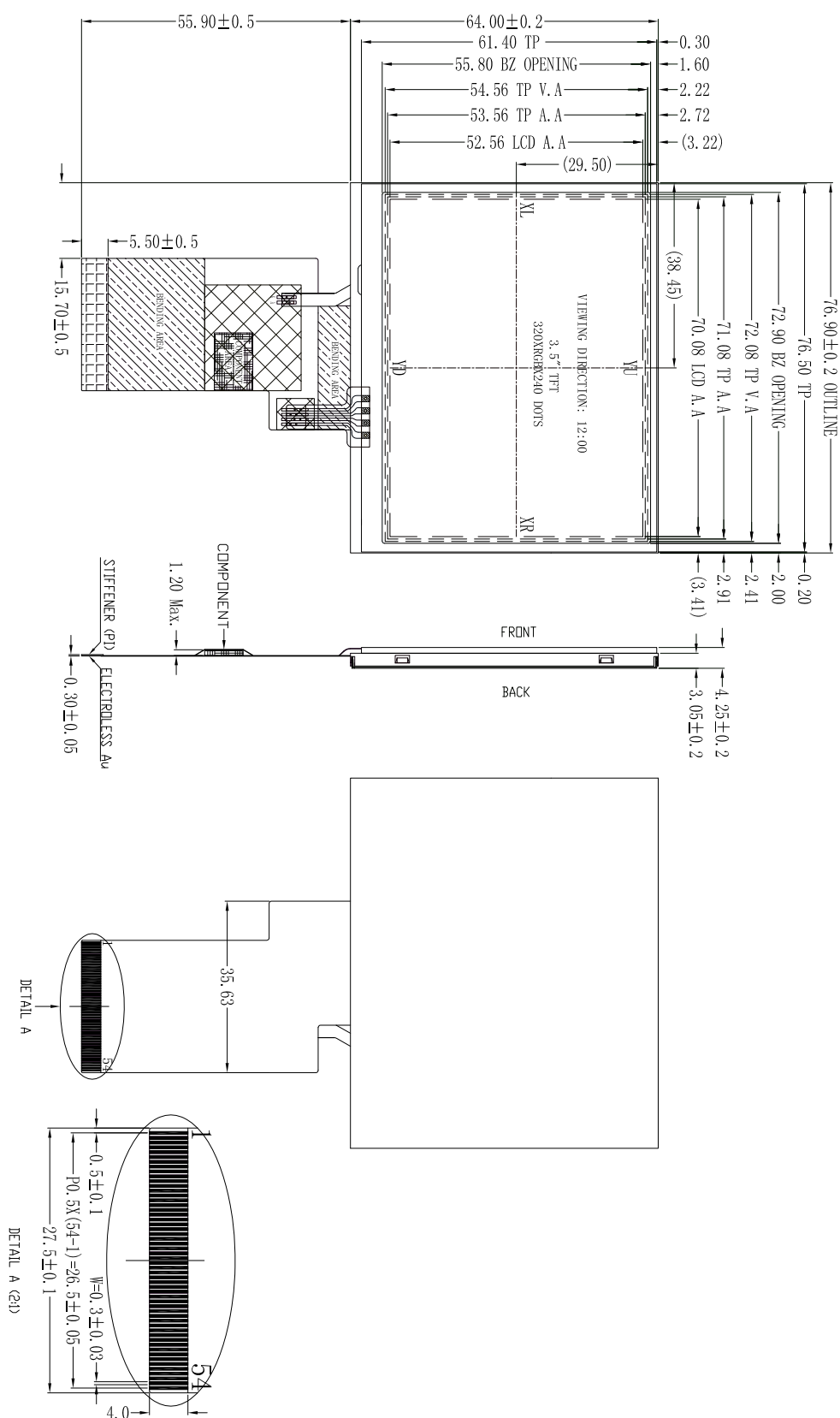| Item | Inspection |
|---|---|
| Contrast | CR > 50% |
| $I_{DD}$ | $I_{DD}$ < 200% |
| Brightness | Brightness > 60% |
| Color Tone | Color Tone ±0.05 |

# 7  Dimension



**Figure 12 - LCM Dimension**

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- The device has been disassembled, repaired, or modified by unauthorized personnel.
- Any other conditions that do not comply with our warranty policy. For details, please contact our sales team.

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# Appendix A – References

## Document References

NA

## Acronyms and Abbreviations

| Terms | Description |
|---|---|
| FPC | Flexible Printed Circuit |
| IC | Integrated Circuit |
| I2C | Inter-Integrated Circuit |
| LCD | Liquid Crystal Display |
| LCM | Liquid Crystal Module |
| LED | Light Emitting Diode |
| LEDA | Light Emitting Diode Anode |
| LEDK | Light Emitting Diode Cathode |
| RTP | Resistive Touch Panel |
| TFT | Thin Film Transistor |

# Appendix B – List of Tables & Figures

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# Appendix C – Revision History

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| Revision | Changes | Date |
|---|---|---|
| Version 1.0 | Initial Release | 10-11-2025 |