

Display Elektronik GmbH

DATA SHEET

TFT MODULE

DEM 080160A VMH-PW-N

0,96“ TFT

Product Specification

Ver.: 2

16.07.2019

Revision History

| VERSION | DATE | REVISED PAGE NO. | Note |
|----------------|-------------|-------------------------|---------------------------|
| 0 | 25.06.2018 | | First Issue |
| 1 | 19.09.2018 | | Modify Contour Drawing |
| 2 | 16.07.2019 | | Modify Backlight |

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1. Summary

DEM 080160A VMH-PW-N is a color active matrix thin film transistor (TFT) liquid crystal empty cell. This model is composed of amorphous silicon TFT as a switching device. It is a transmissive IPS type display operating in the normally black mode.

This TFT LCD has a 0.96-inch diagonally measured active display area with 80 x 160 dot (80 horizontal by 160 vertical pixel) resolution. Each pixel is divided into Red, Green, Blue dots which are arranged in vertical stripes.

2. General Specifications

- n Size: 0.96 Inch
- n Dot Matrix: 80 x RGB x 160 Dots
- n Module Dimension: 13.50 x 27.95 x 1.54 mm
- n Active Area: 10.80 x 21.70 mm
- n Dot Pitch: 0.135 x 0.1356 mm
- n LCD Type: TFT, IPS, Normally Black, Transmissive
- n Viewing Angle: Full View, 80°/80°/80°/80°
- n Aspect Ratio: 1:2
- n IC: ST7735S (Sitronix)
- n Interface: SPI
- n Backlight Type: LED, Normally White
- n With /Without TP: No Touch
- n Surface: Glare

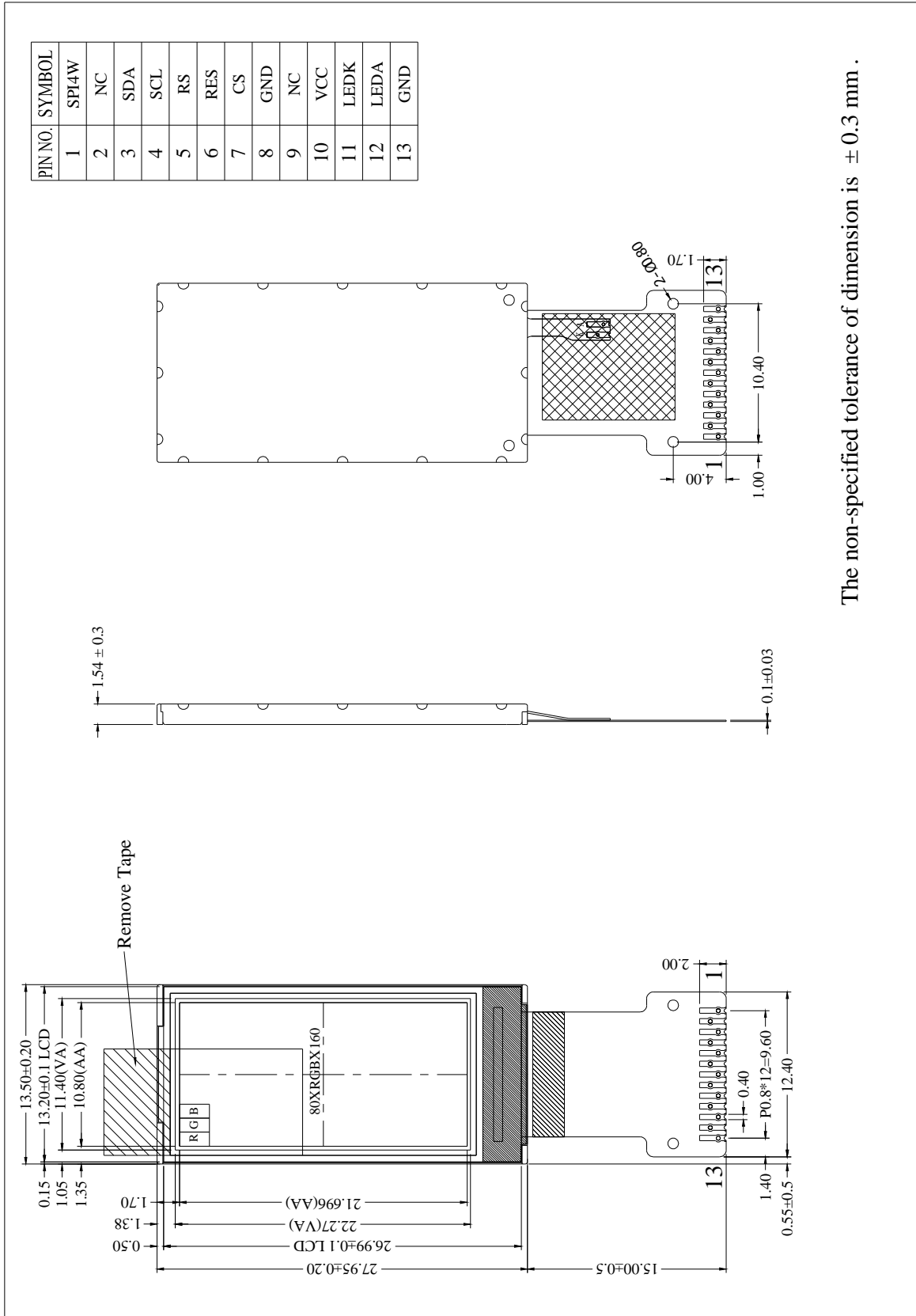
*Color tone slight changed by temperature and driving voltage.

3. Interface

3.1. LCM PIN Definition

| Pin | Symbol | Function | Remark |
|-----|--------|--|--------|
| 1 | SPI4W | SPI4W='0', 3-wire SPI. SPI4W='1', 4-wire SPI. | - |
| 2 | NC | No Connection | - |
| 3 | SDA | Serial Interface Data | - |
| 4 | SCL | Serial Interface Clock | - |
| 5 | RS | Data/Command Selection Pin (4-Wire SPI use) | - |
| 6 | RES | Reset Pin (Low Active) | - |
| 7 | CS | Chip Selection Pin (Low Active) | - |
| 8 | GND | Ground | - |
| 9 | NC | No Connection | - |
| 10 | VCC | Power Supply. | - |
| 11 | LEDK | Backlight Cathode | - |
| 12 | LEDA | Backlight Anode | - |
| 13 | GND | Ground | - |

4. Counter Drawing



The non-specified tolerance of dimension is ± 0.3 mm .

5. Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|-----------------------|-----------------|------------|------------|------------|-------------|
| Operating Temperature | T _{OP} | -20 | — | +70 | °C |
| Storage Temperature | T _{ST} | -30 | — | +80 | °C |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$,
Absolute humidity shall be less than 90% RH at 60°C .

6. Electrical Characteristics

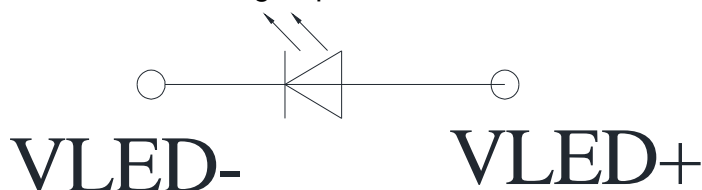
6.1. Operating conditions:

| Item | Symbol | Min | Typ | Max | Unit |
|--------------------|--------|-----|-----|-----|------|
| Supply Voltage | VCC | 3.0 | 3.3 | 3.6 | V |
| Supply LCM Current | ICC | — | — | 2 | mA |

6.2. LED driving conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---------------------|------------------|------|-------|------|------|------------|
| LED Current | I _{LED} | — | 20 | — | mA | |
| LED Voltage | V _{LED} | 2.8 | 3.1 | 3.3 | V | Note 1 |
| LED Lifetime (25°C) | | — | 50000 | — | Hr | Note 2,3,4 |

Note 1: There are 1 groups LED



Circuit diagram

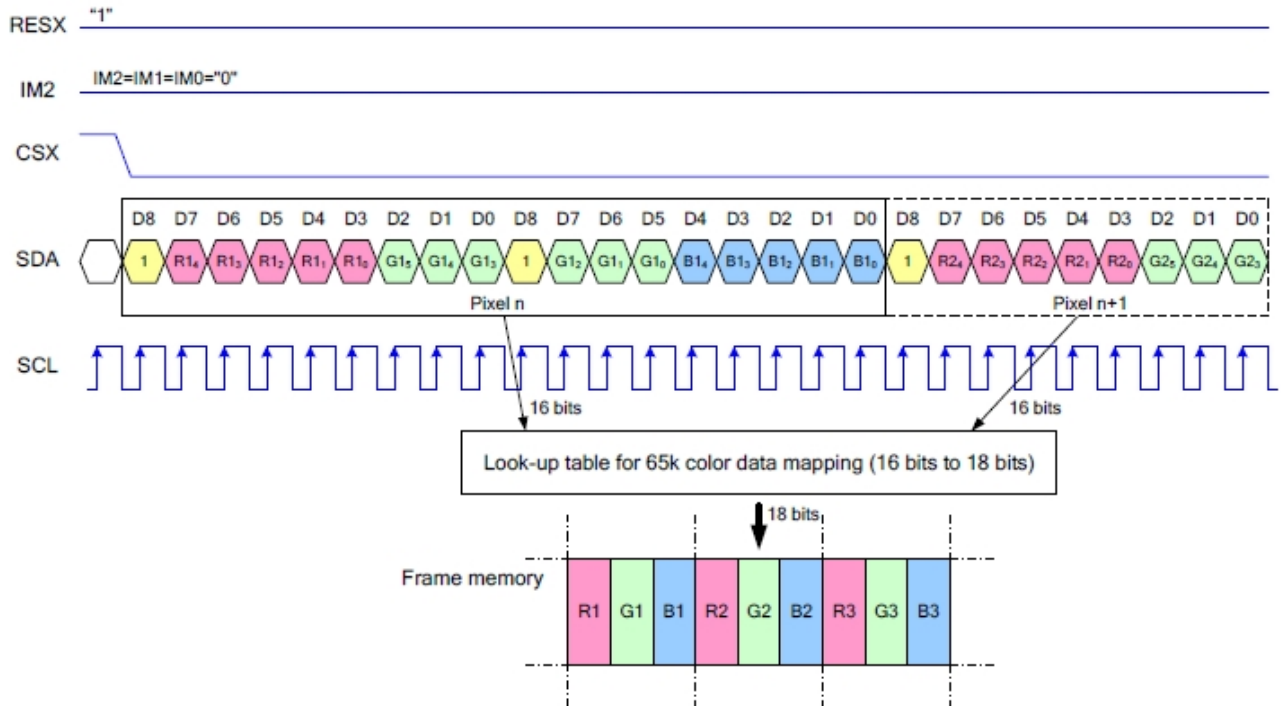
Note 2: Ta = 25°C

Note 3: Brightness to be decreased to 50% of the initial value

Note 4: The single LED lamp case

7. Data Color Coding

7.1. 3-Wire SPI Mode: RGB 5-6-5-Bit Input, 65k-Colors, 3AH="05h"

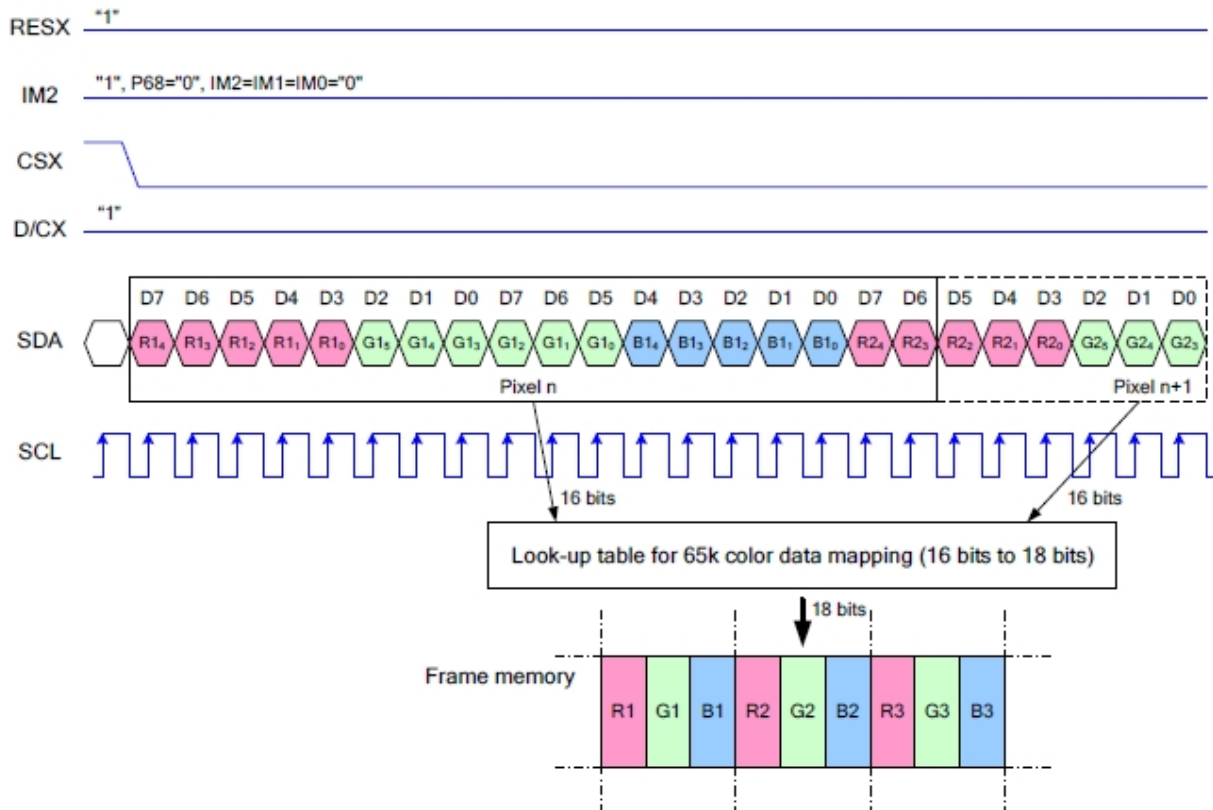


Note 1: Pixel Data with the 16-Bit Color Depth Information

Note 2: The most significant Bits are: Rx4, Gx5 and Bx4

Note 3: The least significant Bits are: Rx0, Gx0 and Bx0

7.2. 4-Wire SPI Mode: RGB 5-6-5-Bit Input, 65k-Colors, 3AH="05h"



Note 1. Pixel Data with the 16-Bit Color Depth Information

Note 2. The most significant Bits are: Rx4, Gx5 and Bx4

Note 3. The least significant Bits are: Rx0, Gx0 and Bx0

8. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark | |
|--------------------|--------|-------------------------------------|------|----------|------|-------------------|-------------------|------------|
| Response Time | Tr | $\theta=0^\circ \cdot \phi=0^\circ$ | - | 30 | 40 | .ms | Note 3 | |
| | Tf | | | | | | | |
| Contrast Ratio | CR | At optimized Viewing Angle | - | 800 | - | - | Note 4 | |
| Color Chromaticity | White | $\theta=0^\circ \cdot \phi=0$ | 0.26 | 0.31 | 0.36 | | Note 2,6,7 | |
| | | | | | | | | Wy |
| Viewing angle | Hor. | CR ≥ 10 | - | 80 | - | Deg. | Note 1 | |
| | | | | | | | | ΘL |
| | Ver. | | | ΦT | 80 | | | - |
| | | | | ΦB | 80 | | | - |
| Brightness | - | - | 400 | 500 | - | cd/m ² | Center of display | |
| Uniformity | (U) | - | 75 | - | - | % | Note 5 | |

Ta=25°C ± 2°C

Note 1: Definition of viewing angle range

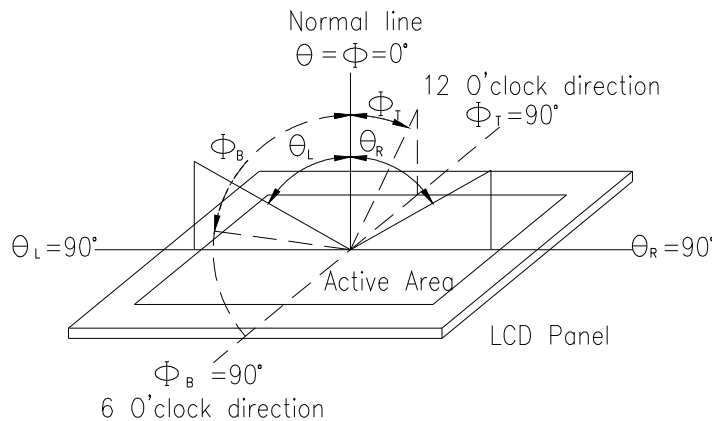


Fig.9.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

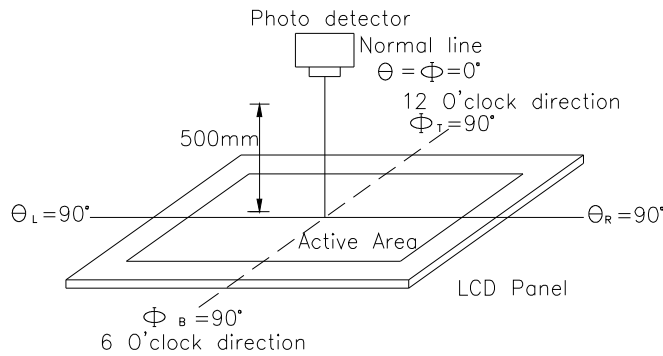
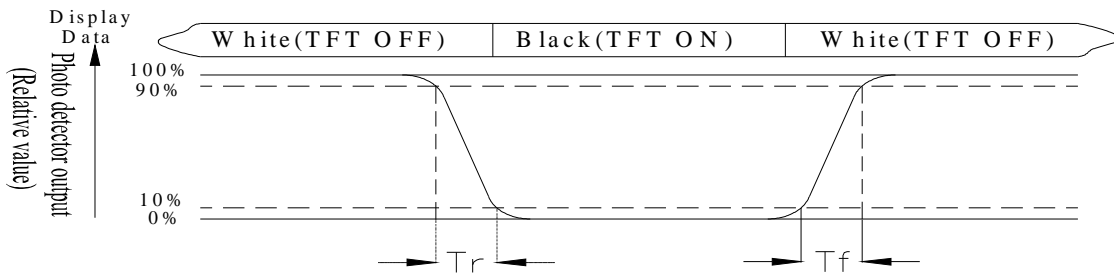


Fig. 9.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of Luminance Uniformity

Active area is divided into 3 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

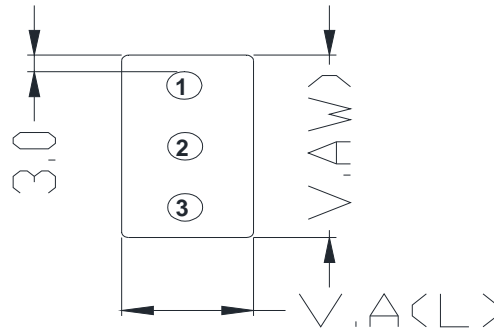


Fig9.3. Definition of uniformity

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

9. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

| Environmental Test | | | |
|---|--|---|------|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | +80°C 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C 200hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | +70°C 200hrs | — |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -20°C 200hrs | 1 |
| High Temperature/ Humidity Operation | The module should be allowed to stand at +60°C,90%RH max | +60°C,90%RH 96hrs | 1,2 |
| Thermal shock resistance | The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;"> <p style="margin: 0;">-20°C +25°C +70°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div> | -20°C/+70°C 10 cycles | — |
| Vibration test | Endurance test applying the vibration during transportation and using. | Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes | 3 |
| Static electricity test | Endurance test applying the electric stress to the terminal. | VS=±600V(Contact), ±800V(Air), RS=330Ω CS=150pF 10 times | — |

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

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