

Ongine 制品规格书

机种名: OPD01M Ongine Projection
机种略号: OPD01M
文件编号: OG-WI-03-005
日期: 2013/12/31

发注: 迅达光电(深圳)有限公司

| 总经理 | 制造中心 | | 研发中心 | | |
|-----|------|----|------|----|-----|
| | 工厂 | 品质 | 承认 | 审核 | 作成 |
| | | | | | Jay |

受注: _____

| 总经理 | 制造中心 | | 研发中心 | | |
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| | 工厂 | 品质 | 承认 | 审核 | 作成 |
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1、Revision History

| Rev | Date | Approved | Description | Notes |
|-------|------------|----------|--|-------|
| Ver.1 | 2012.11.27 | 朱耀春 | First Version | |
| Ver.2 | 2012.12.28 | Jay | Update the brightness data | |
| Ver.3 | 2013.03.05 | Jay | Pin46,Pin48 definition update | |
| Ver.4 | 2013.05.14 | Jay | Max thickness update(7.5mm ---->7.85mm) | |
| Ver.5 | 2013.05.30 | Allen | 1. 6pin power connector pitch update(1.0mm pitch---->0.8mm pitch) 2. Cancel the 3pin connector of fan&thermal | |
| Ver.6 | 2013.10.22 | Sunny | Include Fasten Hole | |
| Ver.7 | 2013.12.31 | Allen | 1.Update system voltage range 2. Update power on sequencing and power off sequencing 3. Current adjustment range | |
| | | | | |
| | | | | |

2、Optical Engine function

Optical specification

| | |
|--------------------------------|------------------------------------|
| Display Technology | 0.3" DMD EM |
| Light Source | LED(R,G,B) |
| Resolution | 854X480 (WVGA) |
| Lens Focus Length | 8.0 mm |
| Focusing | Manual focus in sliding adjustment |
| Throw Ratio | 1.19:1 (Distance/Width) |
| Image Size | 1m---37.8" |
| Brightness(Typical) | 25 Lm@1W 49 Lm@3W |
| Contrast (Full on/off) | 1000 : 1 |
| Distortion(Abs) | <1.0% |
| Uniformity | >85% |
| Color Gamma(comparing to NTSC) | >100% |
| System Voltage | 3.5V-5V |
| LED Life | >20,000 hours |

NOTE:

DMD IQC spec reference document "DMD Artifact Illustration" for PASS/FAIL

3、Appearance

3.1 Module Dimension

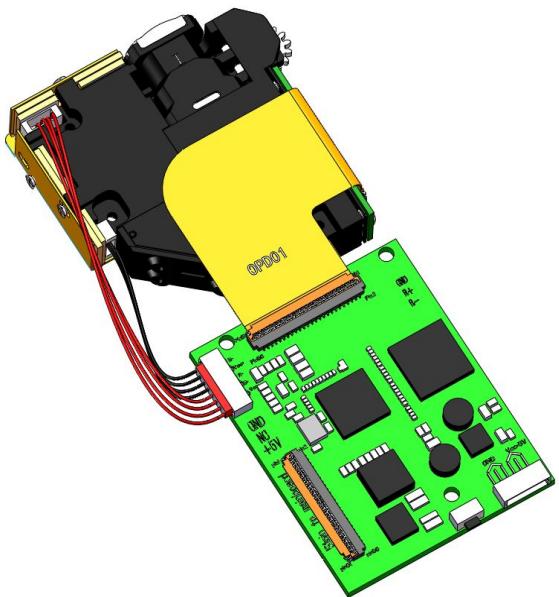


Figure 1

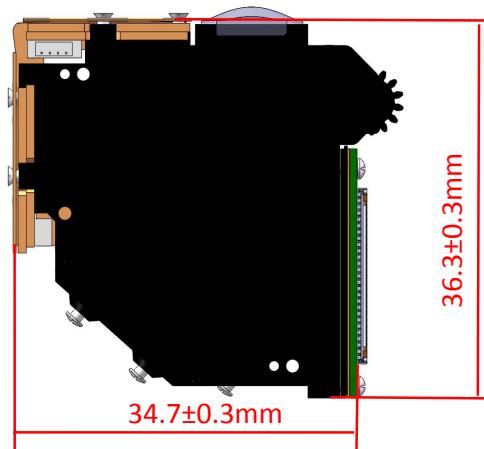


Figure 2

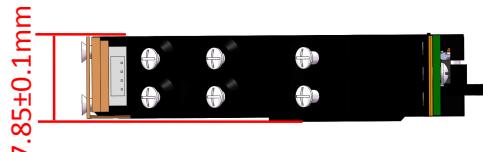


Figure 3

3.2 Module Fasten Screw

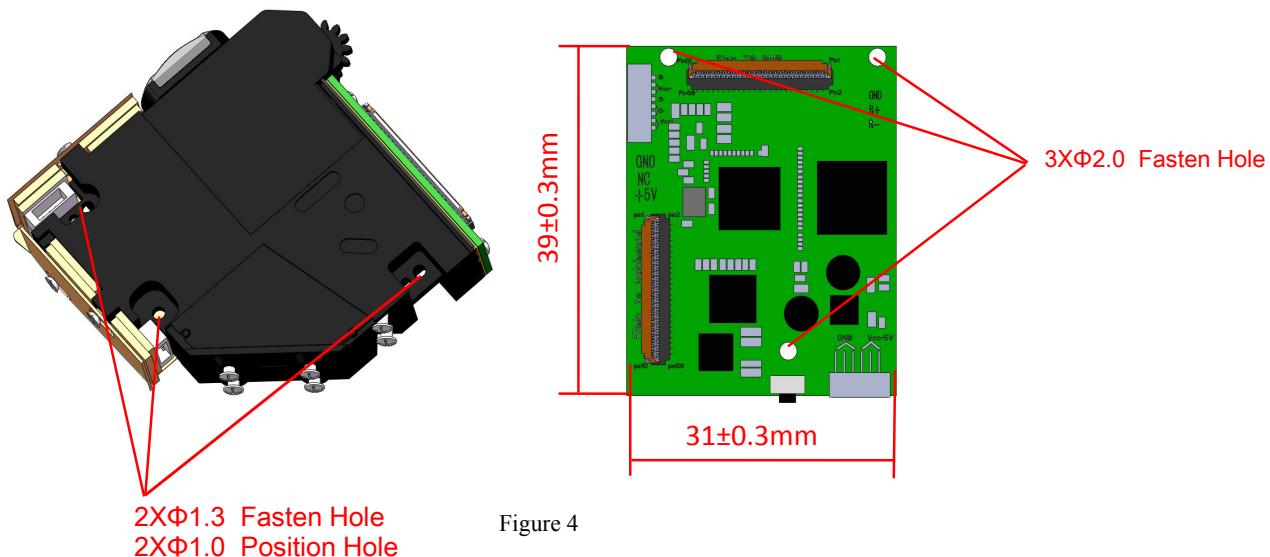


Figure 4

3.3 Connection Port

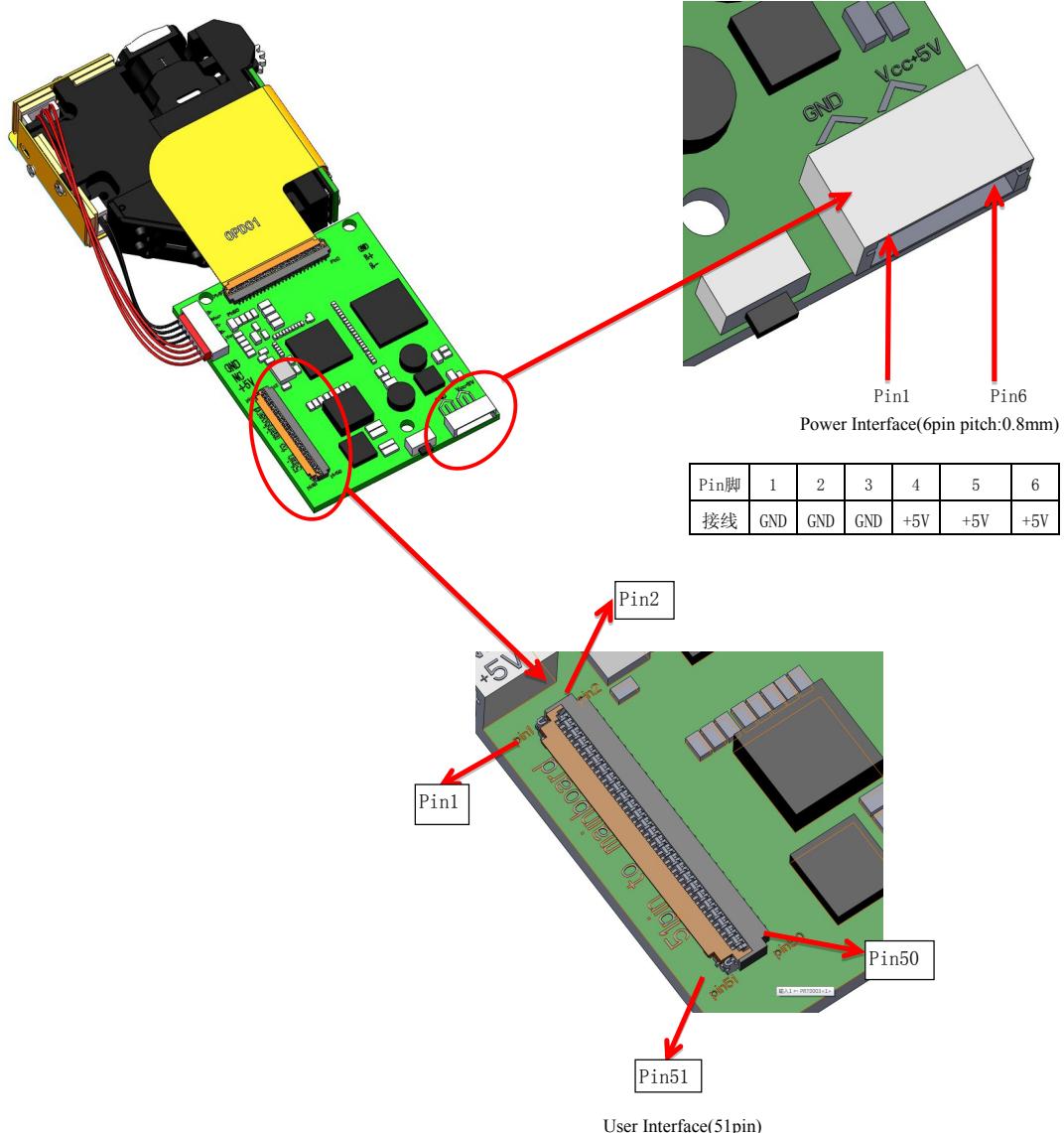


Figure 5

4、Electronic function

4.1 Block diagram

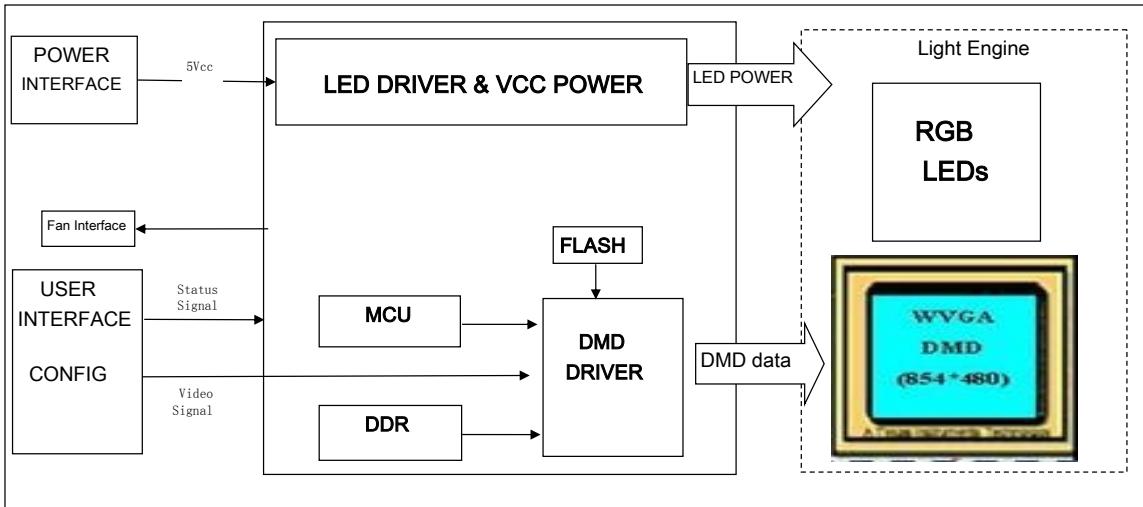


Figure 6

5、Electrical Interfaces

5.1 Features

- 1.Display image resolution: WVGA (854x480)
- 2.Input image bus mode: Parallel bus(RGB888/RGB666/CPU I/F)
- 3.Input image sizes of WVGA (864x480/854x480/800x480)
- 4.Current Adjustment
- 5.Support image horizontal and vertical flip
- 6.Frame rate choice(60Hz/50Hz)
- 7.Vsync, Hsync, Pixel clock and DATEN polarity control

5.2 Input image interface

Parallel bus (RGB888/RGB666/CPU I/F) input format

Assignment of User Interface Connector (51pin)

Black font indicates the default input data

| User Interface Connector Signal Definitions | | | | | | | | |
|---|------------|-----|---------------------|---------------------------|----------|-------|------------------------|-------|
| PIN# | PIN NAME | I/O | Description | RGB888 | RGB666 | BT656 | CPU I/F | NOTE |
| PIN1 | CPUVSYNC | I/O | CPU SYNC(CPU I/F) | PullDown | PullDown | | | note1 |
| PIN2 | DATEN CMD | I | Active data | DAT EN | DAT EN | | | note2 |
| PIN3 | PCLK | I | Pixel Clock | CLK | CLK | | | note2 |
| PIN4 | VSYNC WE | I | Vertical sync. Clk | VSYNC | VSYNC | | | note2 |
| PIN5 | Hsync CS | I | Horizontal sync.Clk | Hsync | Hsync | | | note2 |
| PIN6 | GND | GND | Ground | GND | GND | | | |
| PIN7 | PDATA0 | I | RGB DATA | Blue D0 | Blue D0 | | | note3 |
| PIN8 | PDATA1 | I | RGB DATA | Blue D1 | Blue D1 | | | |
| PIN9 | PDATA2 | I | RGB DATA | Blue D2 | Blue D2 | | | |
| PIN10 | PDATA3 | I | RGB DATA | Blue D3 | Blue D3 | | | |
| PIN11 | PDATA4 | I | RGB DATA | Blue D4 | Blue D4 | | | |
| PIN12 | PDATA5 | I | RGB DATA | Blue D5 | Blue D5 | | | |
| PIN13 | PDATA6 | I | RGB DATA | Blue D6 | GREEN D0 | | | |
| PIN14 | PDATA7 | I | RGB DATA | Blue D7 | GREEN D1 | | | |
| PIN15 | GND | GND | Ground | GND | GND | | | |
| PIN16 | PDATA8 | I | RGB DATA | GREEN D0 | GREEN D2 | | | |
| PIN17 | PDATA9 | I | RGB DATA | GREEN D1 | GREEN D3 | | | |
| PIN18 | PDATA10 | I | RGB DATA | GREEN D2 | GREEN D4 | | | |
| PIN19 | PDATA11 | I | RGB DATA | GREEN D3 | GREEN D5 | | | |
| PIN20 | PDATA12 | I | RGB DATA | GREEN D4 | RED D0 | | | |
| PIN21 | PDATA13 | I | RGB DATA | GREEN D5 | RED D1 | | | |
| PIN22 | PDATA14 | I | RGB DATA | GREEN D6 | RED D2 | | | |
| PIN23 | PDATA15 | I | RGB DATA | GREEN D7 | RED D3 | | | |
| PIN24 | GND | GND | Ground | GND | GND | | | |
| PIN25 | PDATA16 | I | RGB DATA | RED D0 | RED D4 | | | |
| PIN26 | PDATA17 | I | RGB DATA | RED D1 | RED D5 | | | |
| PIN27 | PDATA18 | I | RGB DATA | RED D2 | NC | | | |
| PIN28 | PDATA19 | I | RGB DATA | RED D3 | NC | | | |
| PIN29 | PDATA20 | I | RGB DATA | RED D4 | NC | | | |
| PIN30 | PDATA21 | I | RGB DATA | RED D5 | NC | | | |
| PIN31 | PDATA22 | I | RGB DATA | RED D6 | NC | | | |
| PIN32 | PDATA23 | I | RGB DATA | RED D7 | NC | | | |
| PIN33 | GND | GND | Ground | GND | | | | |
| PIN34 | NC | - | NC | NC | | | | |
| PIN35 | NC | - | NC | NC | | | | |
| PIN36 | NC | - | NC | NC | | | | |
| PIN37 | LED CTL | I | Control LED on/off | 1: Open LED | | | 0: Close LED | note4 |
| PIN38 | PWR ENB | I | PWR ENB | 1: Power on enable | | | 0: Power off | note5 |
| PIN39 | NC | - | NC | NC | | | | |
| PIN40 | NC | - | NC | NC | | | | |
| PIN41 | DMD Status | O | DMD working status | 1: DMD turn on | | | | |
| PIN42 | IIC SDA | I | IIC SDA | iic | | | | |
| PIN43 | IIC SCL | I | IIC SCL | iic | | | | |
| PIN44 | GND | GND | Ground | GND | | | | |
| PIN45 | FAN ERR | O | FAN STATUS | NC | | | | |
| PIN46 | Standby | I | Standby Enable | 1: Normal Mode | | | 0: Standby Mode | note8 |
| PIN47 | RSTZ | I | NC | NC | | | | |
| PIN48 | PROJ ON | I | NC | NC | | | | |
| PIN49 | NC | - | NC | NC | | | | |
| PIN50 | GND | GND | Ground | GND | | | | |
| PIN51 | GND | GND | Ground | GND | | | | |

Figure 7. Signal interface diagram

5.3 Notes:

- (1) CPUVSYNC : the signal be used in CPU I/F mode ,other mode please pull down.
- (2) Video control signals, please pay special attention to the polarity, and see the default settings.

- (3) PDATA(23:0) bus mapping is pixel format and source mode dependent.
- (4) Led control signal, we can use to open and close the lamp after system normal. recommendation client side add 3.3V pull-up resistor(47K)
- (5) Enable port of power control system can achieve power standby mode.
- (6) External control functions can be achieved by the IIC, such as image flips, resolution changes the interface mode, current adjustment.
- (7) Signal is temporarily not working, please floating this pin.
- (8) System into the non-power standby mode, the system can quickly enter the working state from the standby mode. This approach is different from the NOTE 5.

6、Input features of RGB888 RGB666

System enter RGB888 interface source mode default at power on ,if push the key on the board within one minute after power on system,system enter factory display mode, the 11 pictures be switched by push the key.

RGB666 mode source setting must be through iic interface, we will describe in auxiliary document.

6.1 Parallel Bus Mode

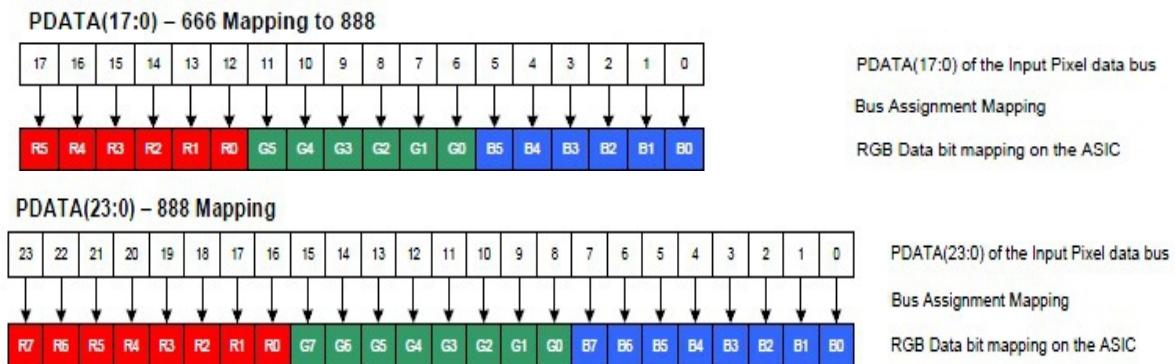


Figure 8

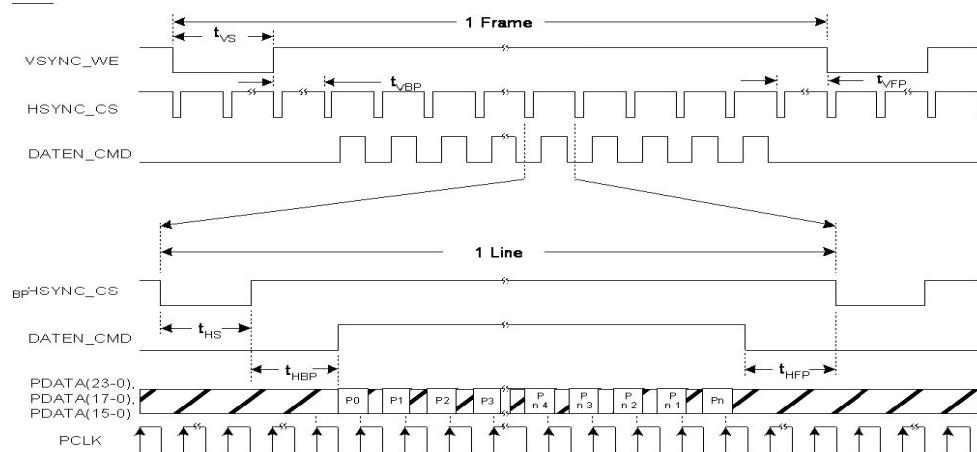


Figure 9

6.2 Note:

The description of parameters is according to following signal polarity setting.

- (1) Defines the pixel clock edge is sampled on rising edge.
- (2) Defines the polarity of the incoming VSYNC signal is Active-low
- (3) Defines the polarity of the incoming HSYNC signal is Active-low
- (4) Defines the polarity of the incoming DATEN_CMD signal is Active-high

Parallel Bus Source: WVGA-854

Resolution (HxV): 854 x 480

Max Line Rate (KHz): 33.5

7、Power and Initialization

7.1 Power On Sequencing

When OPD01 module power on ,system will running normally within 2 seconds,the port LED_CTL can be used to control LED switch time, so we have enough time preper video image singals or switch to the other source mode,resolution,frequency,light,flip mode.We advise to provide the appropriate control signal Based default setting.

Power on Sequencing

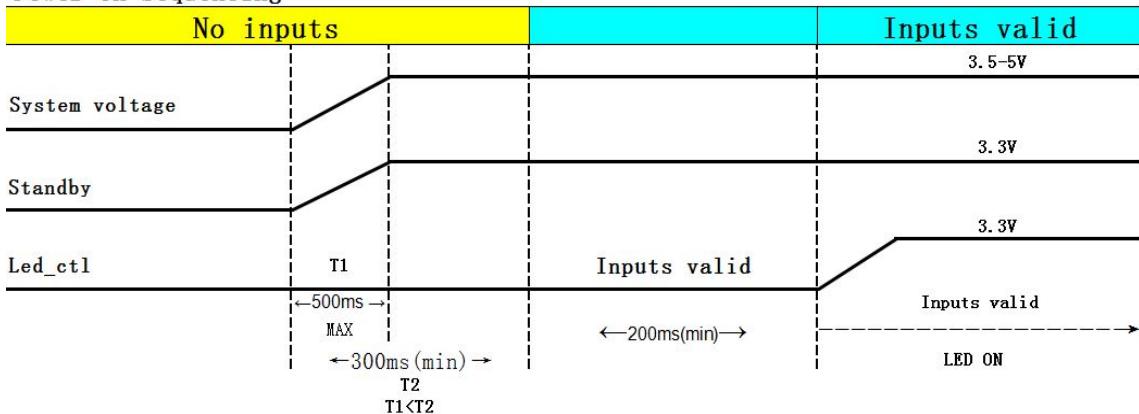


Figure 10

7.2 Power Off Sequencing

1:Must enter standby mode PIN46 ==> 0

2:Reset System voltage ==> 0

Power off Sequencing

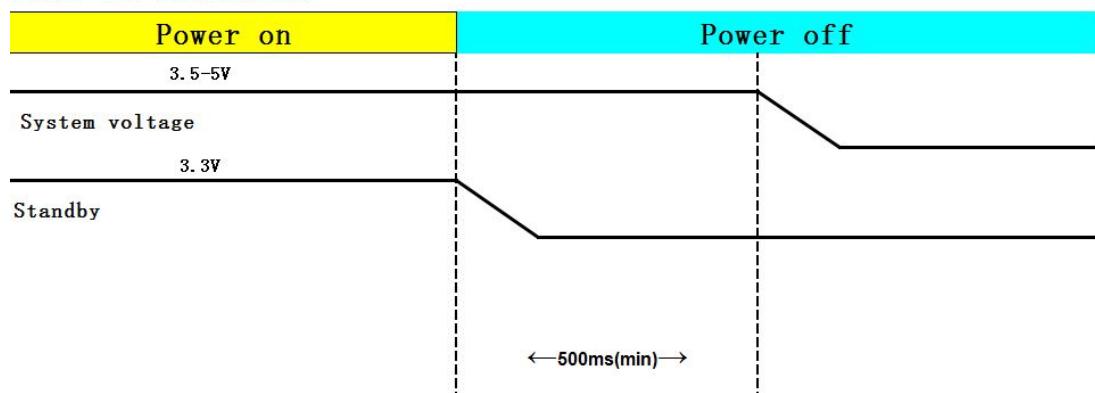


Figure 11

7.3 Electrical Interfaces voltage

Absolute maximum ratings over recommended operating free-air temperature range (unless otherwise noted)

Supply voltage range (see Note 1):

VCC_FLSH -0.5 V to 3.60 V

VCC_INTF -0.5 V to 3.60 V

Input voltage range, VI (see Note 2): 3.3V -0.5 V to 3.60 V

Operating junction temperature range, TJ -30°C to 105°C

Storage temperature range, Tstg -40°C to 125°C

Electrostatic discharge voltage using the human body model +/- 2000 V

Electrostatic discharge voltage using the charged device model..... +/- 500 V

Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device.

These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES:

1. All voltage values are with respect to GND, and at the device not at the power supply.

2. Applies to external input and bidirectional buffers.

Recommended operating conditions

| Recommended operating conditions DESCRIPTION | | CONDITION | MIN | NOM | MAX | UNIT |
|---|---|----------------------|-------|-----|------------|------|
| VCC_FLSH | Configuration & Control I/O Supply Voltage (Variable) | 3.3V LVC MOS | 3.135 | 3.3 | 3.465 | V |
| VCC_INTF | Pixel Interface Supply Voltage (Variable) | 3.3V LVC MOS | 3.135 | 3.3 | 3.465 | V |
| VI | Input voltage | | -0.3 | | VCCIO +0.3 | V |
| VO | Output voltage | | 0 | | VCCIO | V |
| VESDHBM | ESD sensitivity | Human Body Model | | | +/- 2000 | V |
| VESDCDM | ESD sensitivity | Charged Device Model | | | +/- 500 | V |
| tRamp | Power Supply Ramp time | | 10 | | | usec |
| TJ | Operating Junction temperature | | -30 | | 105 | °C |
| TA | Operating Ambient temperature | See Note 3 & 4 | -30 | | 85 | °C |

Figure 12

Notes:

1. VCCIO represents the actual supply voltage applied to the corresponding I/O.
2. ESD specifications are targets. These values will be updated when testing is completed.
3. I/O simulations (using IBIS models) are strongly recommended for operation near the extremes of the supported ambient operating temperature range to ensure that the PCB design provides acceptable signal integrity.
4. The Operating Ambient temperature range assumes zero forced air flow, a JEDEC JESD51 Junction to Ambient Thermal Resistance value at zero forced air flow (RthetaJA at 0 m/s), a JEDEC JESD51 standard test card and environment, card and environment, along with min and max estimated power dissipation across process, voltage and temperature. temperature will vary by application. Thermal conditions will vary by application which will impact RthetaJA. Thus maximum operating ambient
 - $T_a_{min} = T_j_{min} - (P_d_{min} * R_{thetaJA}) = -30^{\circ}C - (0.0W * 64.96^{\circ}C /W) = -30^{\circ}C$
 - $T_a_{min} = T_j_{max} - (P_d_{max} * R_{thetaJA}) = +105^{\circ}C - (0.3W * 64.96^{\circ}C /W) = +85^{\circ}C$

8、 Resolution setting

Module supporting 3 modes resolution ,the resolution 854*480 is default setting, we can change to other resolution by iic sequence commands.the setting method be explain in auxiliary document.

| Resolution | Pixel Clock | H/V | Frequency | Active | Sync | Back Porch | Front Porch | Total |
|------------|-------------|----------|-----------|--------|------|------------|-------------|-----------|
| 864x480 | 30.24MHz | H Timing | 31.5Khz | 864 | 6 | 40 | 50 | 960 Pixel |
| | | V Timing | 60Hz | 480 | 3 | 12 | 30 | 525 Line |
| 854x480 | 30.24MHz | H Timing | 31.5Khz | 854 | 16 | 40 | 50 | 960 Pixel |
| | | V Timing | 60Hz | 480 | 3 | 12 | 30 | 525 Line |
| 800x480 | 30.24MHz | H Timing | 31.5Khz | 800 | 70 | 40 | 50 | 960 Pixel |
| | | V Timing | 60Hz | 480 | 3 | 12 | 30 | 525 Line |

Figure 13

9、 Frequency setting and White Balance sequence select.

Module support 2 mode white balance sequence select:

1. Freq 60Hz white balance.
 2. Freq 50Hz white balance.
- Freq,the Control method described in the auxiliary documentation.

10、Current adjustment

LED Current adjustment range: 0~900mA

The minimum input voltage needs to be $\geq 3.5V$ when LED current is 300mA

The minimum input voltage needs to be $\geq 4V$ when LED current is 900mA

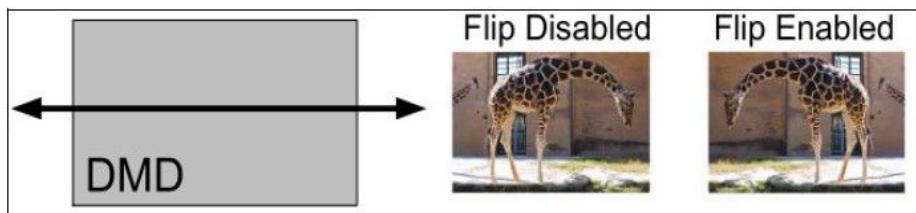
The adjustment method described in the auxiliary documentation.

11、Long&short flip setting.

Module support 2 mode flips, long axis flip(HOR.) and short axis flip.

Flip mode can select by iic commands, the explain in auxiliary document.

Long axis flip means this:



Short axis flip means this:

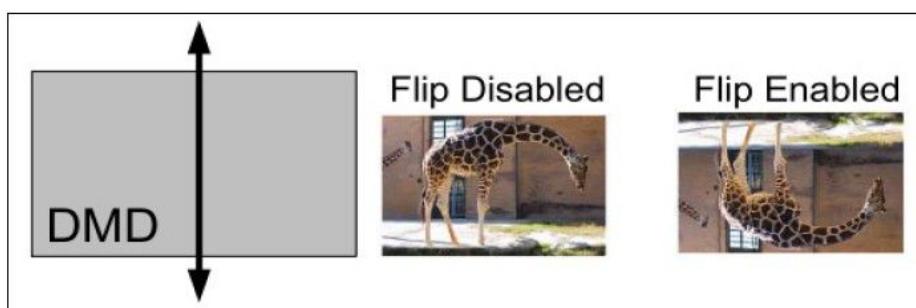


Figure 14

12、Module default setting

| Initial signal status | Factory Default Value |
|--------------------------------|----------------------------------|
| Power In (6Pin Connector) | 5V |
| Input Resolution | 854*480 |
| Data Format | RGB888 |
| Vsync,Hsync and Daten Polarity | Vsync,Hsync,Dataen(Low,Low,High) |
| PWR_ENB(Pin_38) | 1 (Power on enable) |
| LED_CTL(Pin_37) | 1 (Open LED) |

13、Electrostatic Discharge Immunity

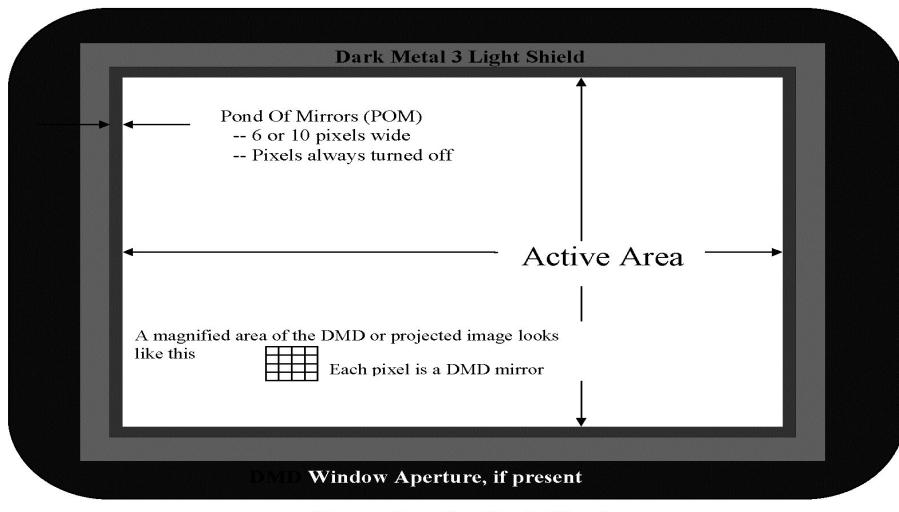
All external signals on the OPD01 module are protected from damage by electrostatic discharge, and are tested in accordance with JESD22-A114-B Electrostatic Discharge (ESD) Sensitivity Testing Human Body Model(HBM).

| Table 16. DMD ESD Protection Limits | | |
|-------------------------------------|-------------------|-------|
| Package Pin Type | Voltage (maximum) | Units |
| Input | 2000 | V |
| Output | 2000 | V |
| Power | 2000 | V |

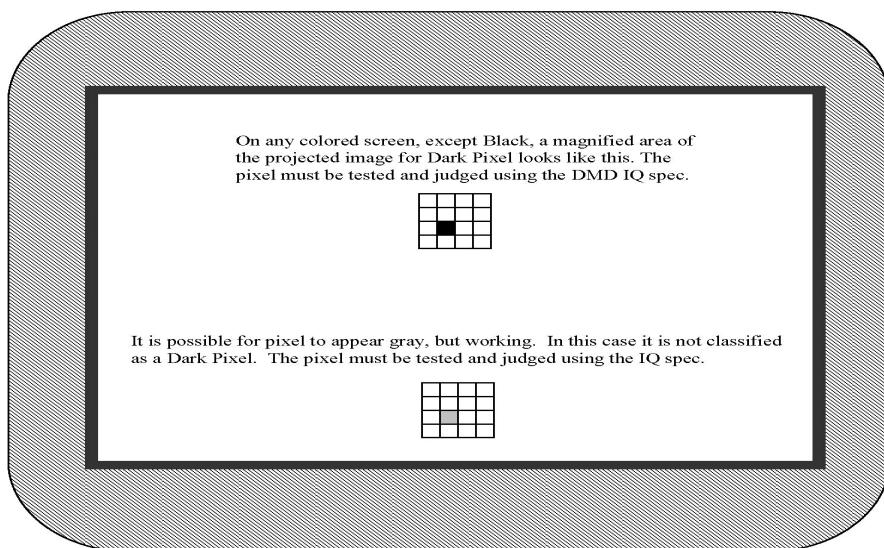
Figure 14

14、DMD Artifact Illustration

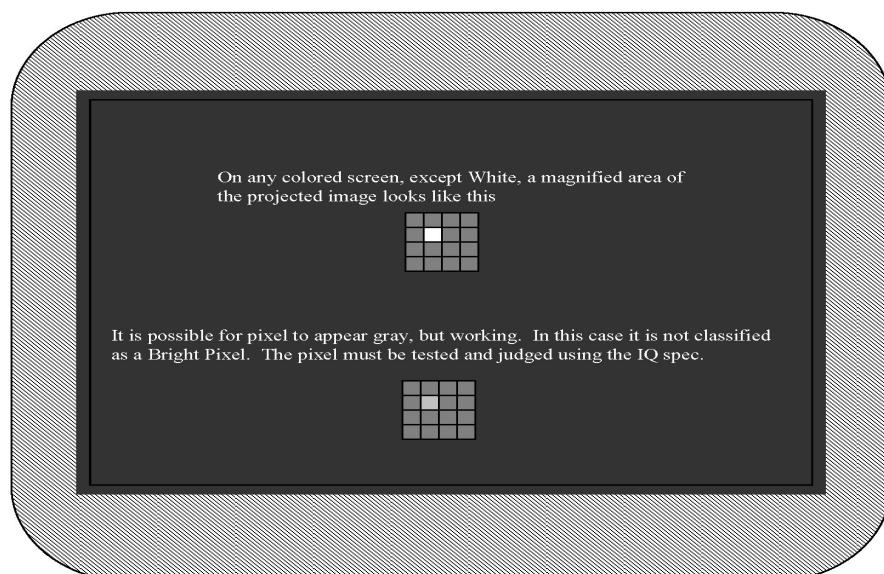
DMD Physical Characteristics



Example of a Dark Pixel
(When projected image in focus)



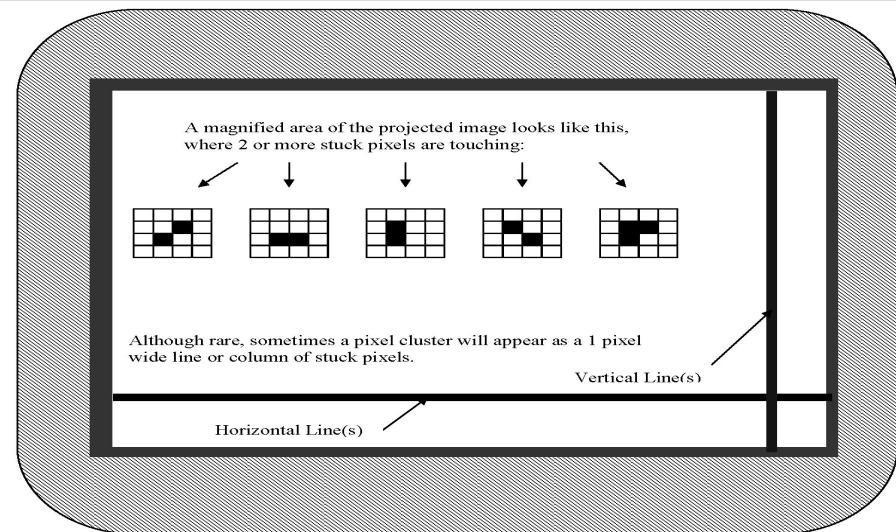
Example of a Bright Pixel
(When projected image in focus)



It is possible for pixel to appear gray, but working. In this case it is not classified as a Bright Pixel. The pixel must be tested and judged using the IQ spec.

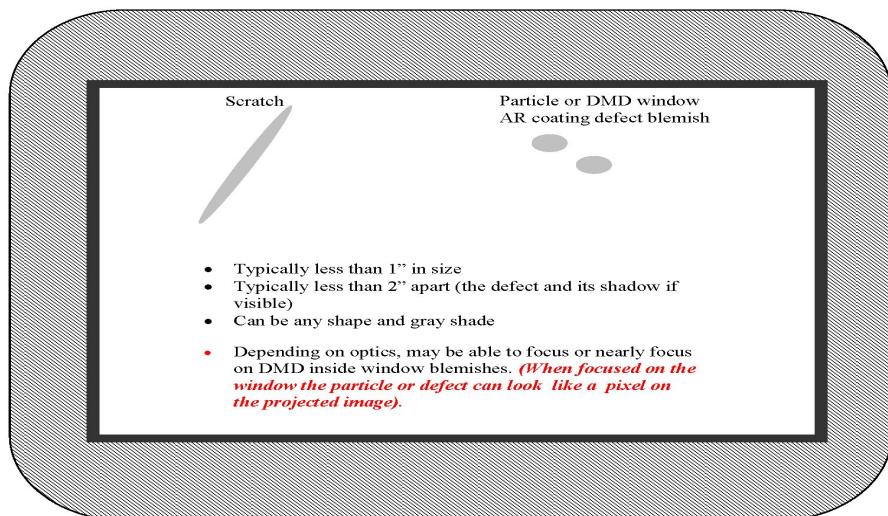


Examples of Adjacent Stuck Pixels (Also called Clusters)

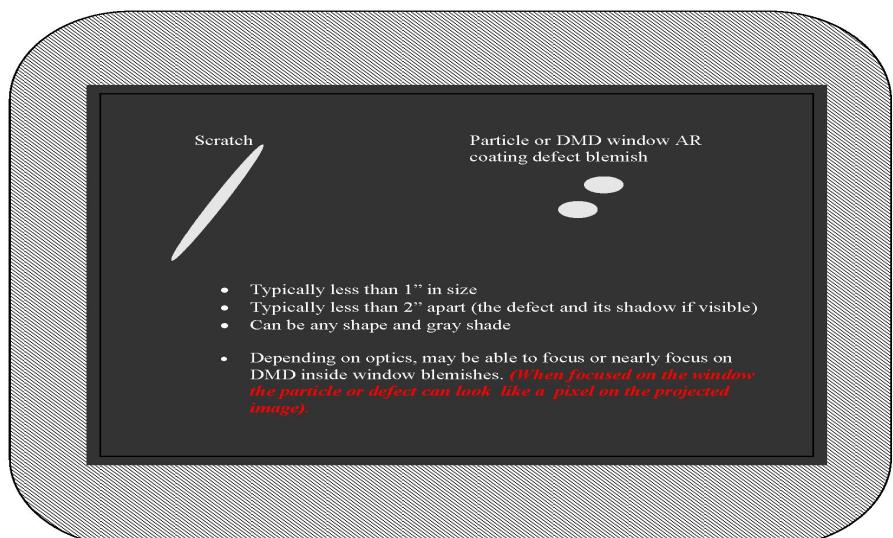


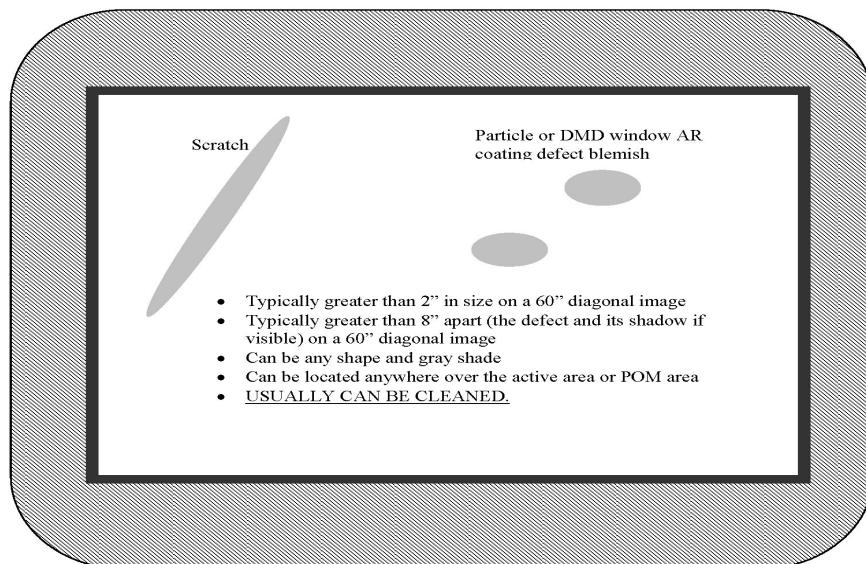
Example of Dark Blemish Inside the DMD

Blemishes can be caused by defects on the DMD window or other surfaces in the optical path to the DMD. Reference the applicable Image Quality spec for the intensity, size, and quantity, for of allowable DMD blemishes.



Example of Light Blemish Inside the DMD





- Typically greater than 2" in size on a 60" diagonal image
- Typically greater than 8" apart (the defect and its shadow if visible) on a 60" diagonal image
- Can be any shape and gray shade
- Can be located anywhere over the active area or POM area
- USUALLY CAN BE CLEANED.

If any of the example artifacts are seen, we ask you please do the following:

► **Reference IQ spec for PASS/FAIL**

1. SCOPE

This document specifies the image quality requirements applicable to the DLP® .3 WVGA Component Sets. The Component Set provides the DLP® .3 WVGA Projector with digital imaging functionality based on Digital Micromirror Device (DMD) technology.

2. Definitions

2.1 Blemish

A blemish is an obstruction, reflection, or refraction of light that is visible, but out of focus in the projected image under specified conditions of inspection (see Table 1). It is caused by a particle, scratch, or other artifact located in the image illumination path.

2.2. Dark pixel

A single pixel or mirror that is stuck in the OFF position and is visibly darker than the surrounding pixels.

2.3. Bright pixel

A single pixel or mirror that is stuck in the ON position and is visibly brighter than the surrounding pixels.

2.4. Unstable pixel

A single pixel or mirror that does not operate in sequence with parameters loaded into memory. The unstable pixel appears to be flickering asynchronously with the image.

2.5. Adjacent pixel

Two or more stuck pixels sharing a common border or common point, also referred to as a cluster.

2.6. Row or Column Defect

Dark or Light column(s) or row(s) are groups of pixels that are not operating or are not operating in sequence with the parameters loaded into memory.

2.7. Pond of Mirrors (POM)

POM is a rectangular array of off-state mirrors surrounding the active area.

3. ACCEPTANCE REQUIREMENTS

3.1. Conditions of Acceptance

All DMD image quality returns will be evaluated using the following projected image test conditions:

- a. Test Set degamma shall be linear.
- b. Test Set brightness and contrast settings shall be set to nominal.
- c. The diagonal size of the projected image shall be a minimum of 20 inches.
- d. The projection screen shall be 1X gain.
- e. The projected image shall be inspected from a 38 inch minimum viewing distance.
- f. The image shall be in focus during all Table 1 tests.
- g. Maximum Lumens on Active Array (mirrors) is 100.

Image Quality Specification

| SCREEN | ACCEPTANCE CRITERIA |
|------------|--|
| Gray 10 | <ol style="list-style-type: none">1. No Bright Pixels in Active Area2. ≤ 1 Bright Pixels in the POM |
| White | <ol style="list-style-type: none">≤ 4 Dark Pixels in the Active Area |
| Any screen | <ol style="list-style-type: none">1. No Adjacent Pixels/Clusters2. No Unstable Pixels in Active Area3. No DMD window aperture shadowing on the Active Area4. No Row or Column defects5. Blemishes are allowed6. Eyecatcher and Border Artifacts are allowed |

Notes:

1. Projected blemish numbers include the count for the shadow of the window artifact in addition to the artifact itself.
2. During all Table 1 tests, projected images shall be inspected in accordance with the conditions of inspection specified in Section 3.
3. The rejection basis for all cosmetic DMD defects (scratches, nicks, particles) will be the projected image tests referenced in Table 1.
4. Devices that meet this image quality specification but are deemed undesirable by the customer may not be returned to TI without prior approval by TI.
5. Screens < Gray10 shall not be used as a basis for rejecting a DMD for image quality.