



ONation Corporation

TFT COLOR LCD MODULE

MODEL: OT040ZGDDDN-00
(Complied with RoHS)

WVGA
TTL interface

Version: P0.1

| |
|----------------------------|
| Customer : _____ |
| Approved By : _____ |
| Date: _____ |

| ONATION | | |
|------------|-------------|------------|
| APPROVAL | CHECKER | PREPARE |
| <i>Jan</i> | <i>Josh</i> | <i>Jan</i> |

All information is subject to change without notice.
Please confirm the sales representative before starting to design your system

C O N T E N T S

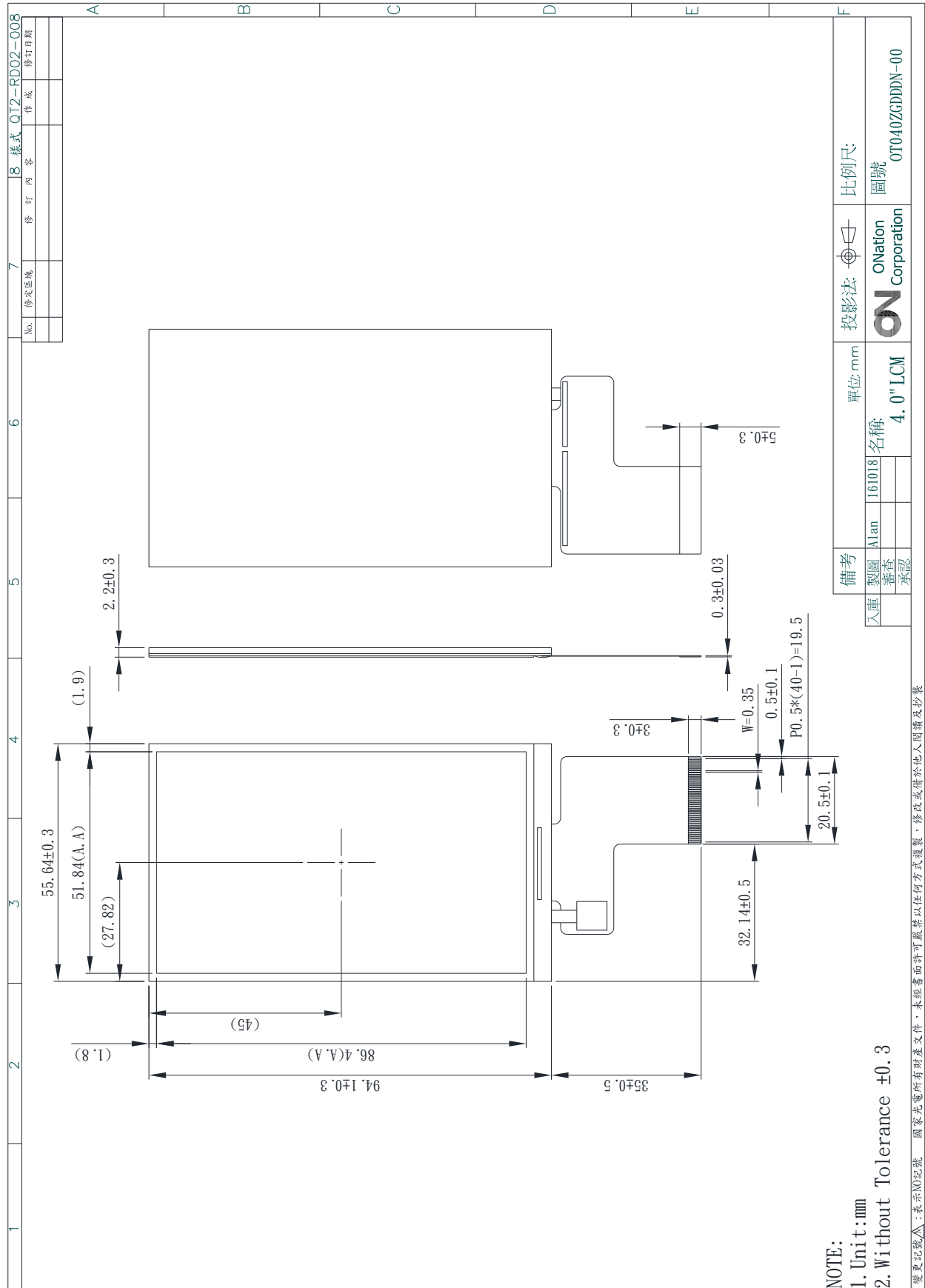
| NO. | ITEM | PAGE |
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2.MECHANICAL SPECIFICATIONS

| | | |
|------|-----------------------|---|
| (1) | Number Of Dots (Dots) | 480(R.G.B) X 800 |
| (2) | Module Size(mm) | 55.64(H) X 94.1(V) X22D) ** |
| (3) | Active Area(mm) | 51.84(H) X 86.4(V) |
| (4) | Pixel Pitch(mm) | 0.108 (H) X 0.108(V) |
| (5) | LCD / Polarizer Model | TFT , Transmissive, Normally black |
| (6) | Backlight Color | White, LED |
| (7) | Viewing Direction | Wide Viewing Angle Horizontal : Right side 80°(typ.), Left side 80°(typ.) Vertical : Up side 80°(typ.), Down side 80°(typ.) |
| (8) | Electrical Interface | TTL Interface |
| (9) | Drive IC | NT35512 |
| (10) | Color Configuration | R.G.B Stripe |
| (11) | Module Weight(g) | TBD±5% |

** Include connector thickness

3. OUTLINE DIMENSIONS



4. INTERFACE PIN CONNECTION

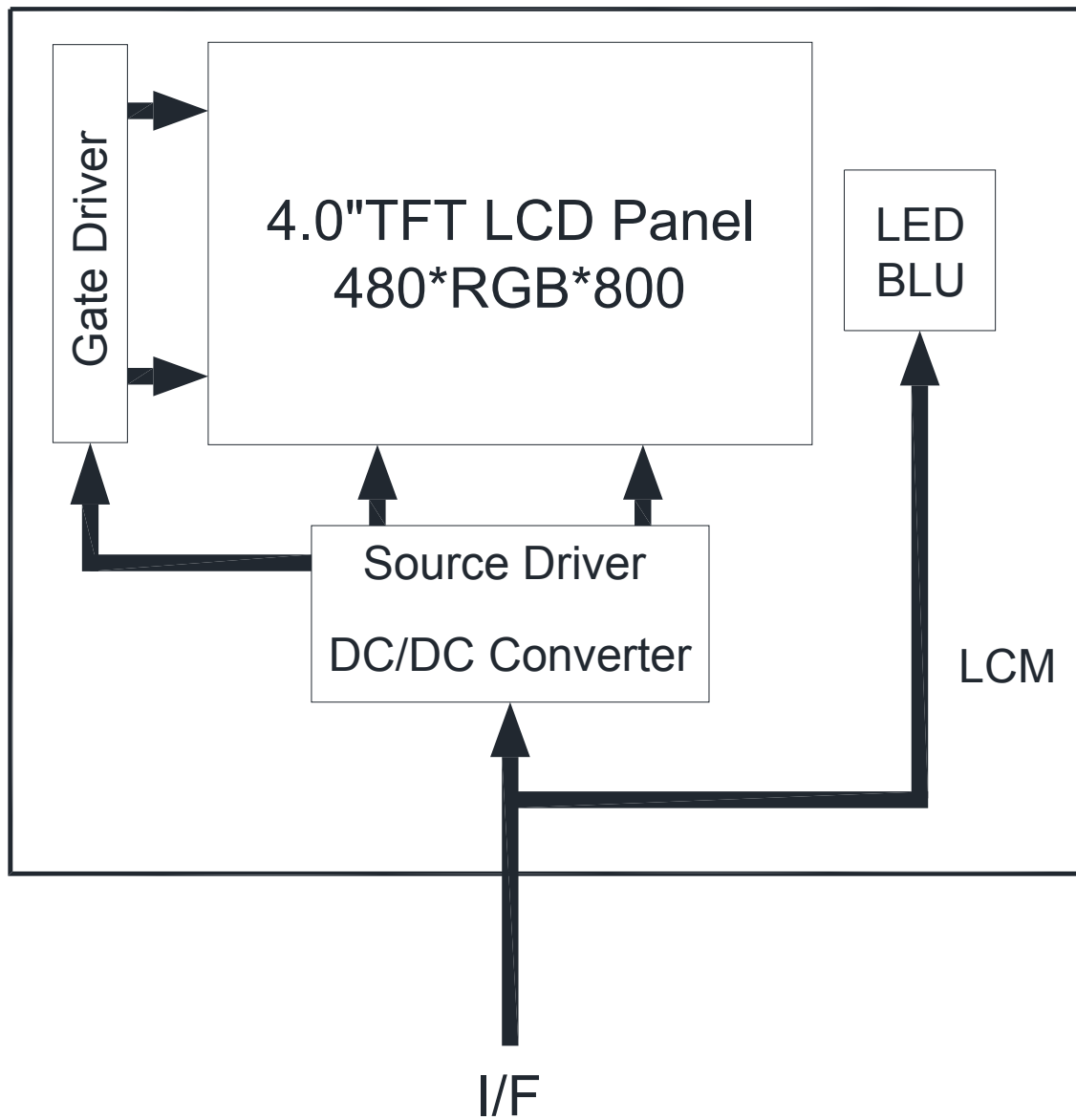
4.1 LCM PANEL DRIVING SECTION

FPC 40PIN PITCH=0.5

| PIN NO. | SIGNAL | FUNCTION |
|---------|--------|---|
| 1 | GND | Power Ground |
| 2 | RESET | Reset signal of the driver IC.(Active Low) |
| 3 | VCI | Power supply for the analogy circuit.(3.3V) |
| 4 | IOVCC | Power supply for the logic circuit.(1.8V) |
| 5 | GND | Power Ground |
| 6 | GND | Power Ground |
| 7 | GND | Power Ground |
| 8 | R0 | Red signal data bus (LSB) |
| 9 | R1 | Red signal data bus |
| 10 | R2 | Red signal data bus |
| 11 | R3 | Red signal data bus |
| 12 | R4 | Red signal data bus |
| 13 | R5 | Red signal data bus (MSB) |
| 14 | G0 | Green signal data bus (LSB) |
| 15 | G1 | Green signal data bus |
| 16 | G2 | Green signal data bus |
| 17 | G3 | Green signal data bus |
| 18 | G4 | Green signal data bus |
| 19 | G5 | Green signal data bus (MSB) |
| 20 | B0 | Blue signal data bus (LSB) |
| 21 | B1 | Blue signal data bus |
| 22 | B2 | Blue signal data bus |
| 23 | B3 | Blue signal data bus |
| 24 | B4 | Blue signal data bus |
| 25 | B5 | Blue signal data bus (MSB) |
| 26 | DE | Data Enable |
| 27 | DCLK | Clock Signals; Latch Data at the Falling Edge |
| 28 | HS | Horizontal SYNC |
| 29 | VS | Vertical SYNC |
| 30 | NC | Not connect |
| 31 | CS | Chip select signal. |
| 32 | SCL | Serial clock signal |

| PIN NO. | SIGNAL | FUNCTION |
|---------|--------|----------------------------------|
| 33 | SDI | Serial input signal. |
| 34 | SDO | Not connect |
| 35 | LEDA | Power supply for Backlight (+) |
| 36 | LEDA | Power supply for Backlight (+) |
| 37 | LEDK | P Power supply for Backlight (-) |
| 38 | LEDK | P Power supply for Backlight (-) |
| 39 | GND | Power Ground |
| 40 | GND | Power Ground |

5. BLOCK DIAGRAM



6. ABSOLUTE MAXIMUM RATINGS

6.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

| ITEM | SYMBOL | MIN. | MAX. | UNIT | REMARK |
|----------------|--------|------|------|------|--------|
| Supply Voltage | VCI | -0.3 | +4.5 | V | |
| | IOVCC | -0.3 | +4.5 | V | |

Note: The absolute maximum rating values of this product not allowed to be exceeded at any times. Should be module be used with any of absolute maximum ratings exceeded. The characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

6.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM | OPERATING | | STORAGE | | REMARK |
|-------------------------|-----------|------|---------|------|----------|
| | MIN. | MAX. | MIN. | MAX. | |
| Ambient Temperature(°C) | -20 | 70 | -30 | 80 | Note 1,2 |
| Humidity(% RH) | 5 ~ 90 | | 5 ~ 90 | | Note 3 |

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

Note 2 : Background color changes slightly depending on ambient temperature.

Note 3 : Storage Ta=60°C & RH=90% ≤ 240Hrs.

7. ELECTRICAL CHARACTERISTICS

7.1 ELECTRICAL CHARACTERISTICS OF LCD

Ta=25°C

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|------------------------------|--------|-----------|------|-----------|------|--------|
| Analog power supply | VCI | 3.0 | 3.3 | 3.6 | V | |
| | ICI | - | TBD | - | mA | Note 1 |
| I/O pin Power Supply Voltage | IOVCC | 1.65 | 1.8 | 3.3 | V | |
| Logic input signal Voltage | VIH | 0.7 IOVCC | - | IOVCC | V | |
| | VIL | 0 | - | 0.3 IOVCC | V | |
| Logic output signal Voltage | VOH | 0.8 IOVCC | - | IOVCC | V | |
| | VOL | 0 | - | 0.2 IOVCC | V | |

Note 1 : Test condition : VCI=3.3V ; Test Pattern : White.

7.2 BACKLIGHT UNITS

Ta=25°C

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---------------------|--------|------|------|------|------|
| LED Driving Voltage | VLED | - | 16.0 | - | V |
| | ILED | - | 40 | - | mA |

8. OPTICAL CHARACTERISTICS

Ta=25°C

| ITEM | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNIT | REMARK |
|----------------------|--------|---|------|------|------|-------------------|--------|
| Contrast Ratio | CR | Viewing Normal Angle $\Theta_x=\Theta_y=0^\circ$ | - | 900 | - | - | Note 1 |
| Response Time | TR+TF | | - | 35 | - | ms | Note 2 |
| Chromaticity | White | x | TBD | TBD | TBD | - | Note 4 |
| | | y | TBD | TBD | TBD | - | |
| Viewing Angle | Hor. | θ_{x+} | 70 | 80 | - | Deg. | Note 3 |
| | | θ_{x-} | 70 | 80 | - | | |
| | Ver. | θ_{y+} | 70 | 80 | - | | |
| | | θ_{y-} | 70 | 80 | - | | |
| Luminance | L | ILED=40mA | - | 400 | - | cd/m ² | |
| Luminance Uniformity | YU | ILED=40mA | - | 80 | - | % | Note 5 |

Note 1 : Definition of Contrast Ratio (CR) :

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63}/L_0$$

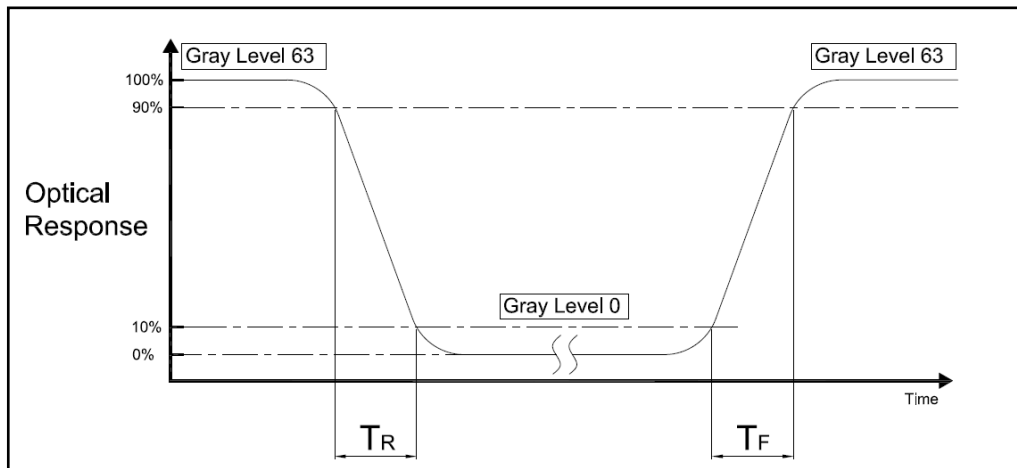
L63 : Luminance of gray level 63

L0 : Luminance of gray level 0

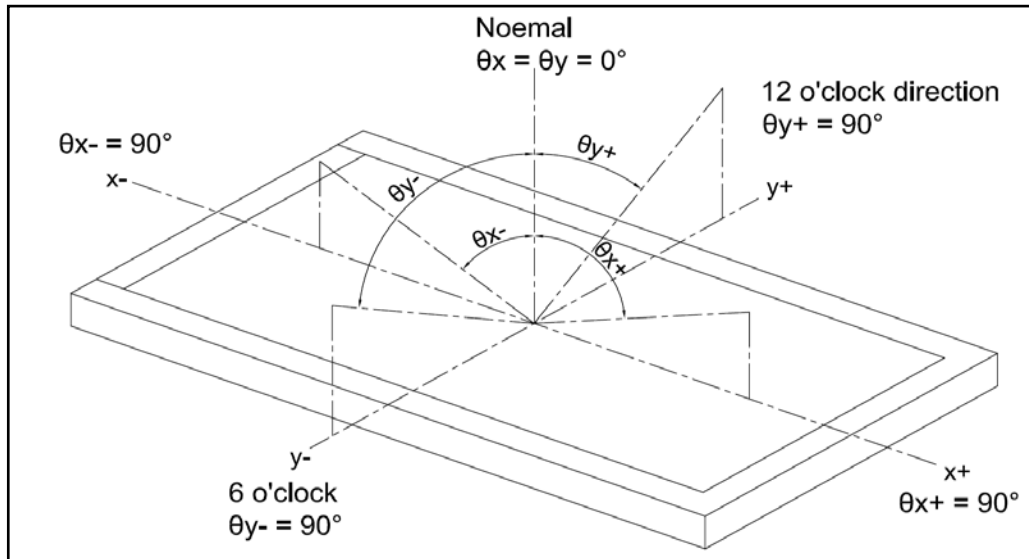
$$CR = CR(5)$$

CR(X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5

Note 2 : Definition of Response Time (TR.TF)

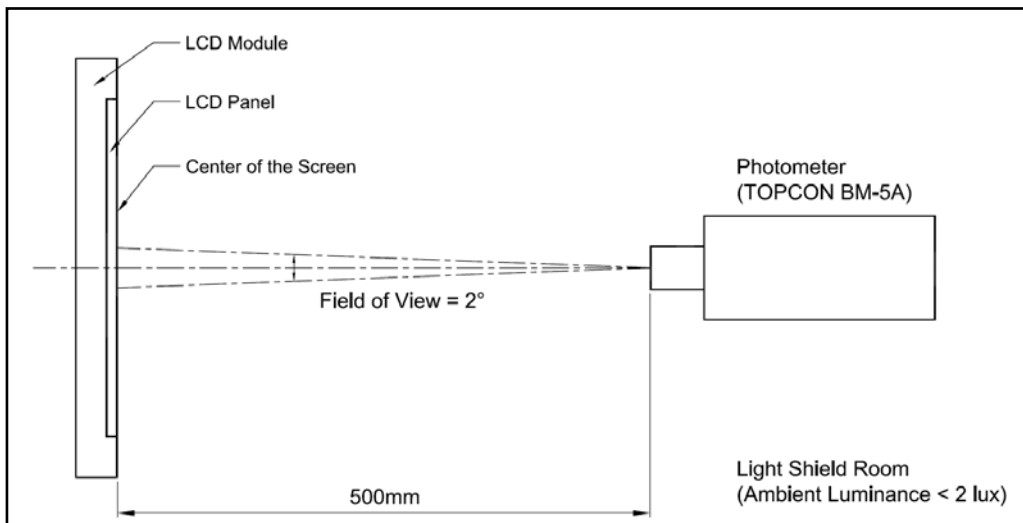


Note 3 : Definition of Viewing Angle

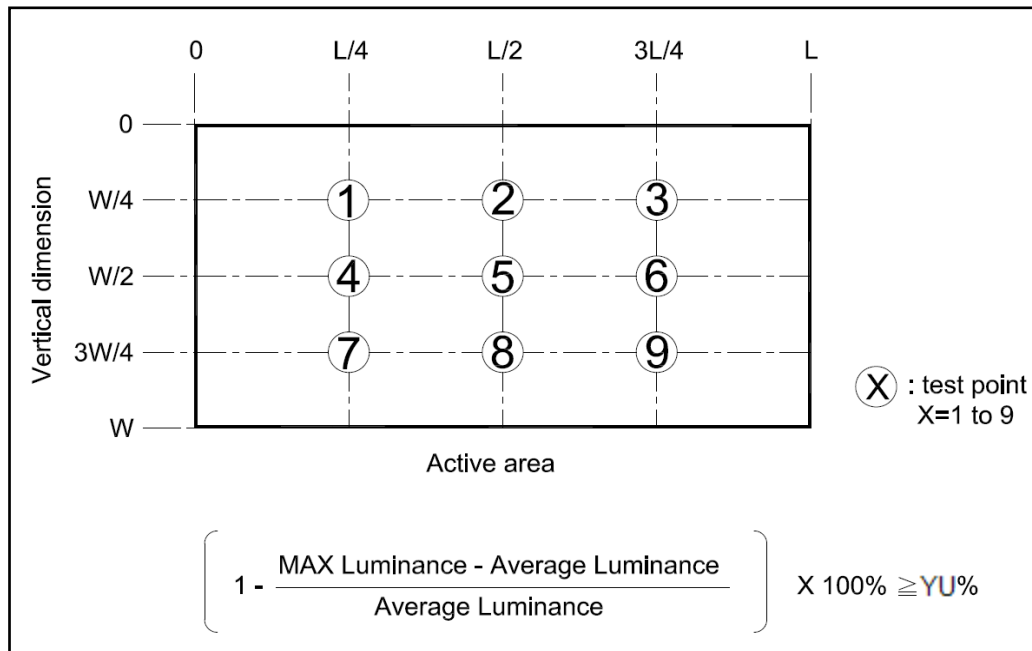


Note 4 : Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



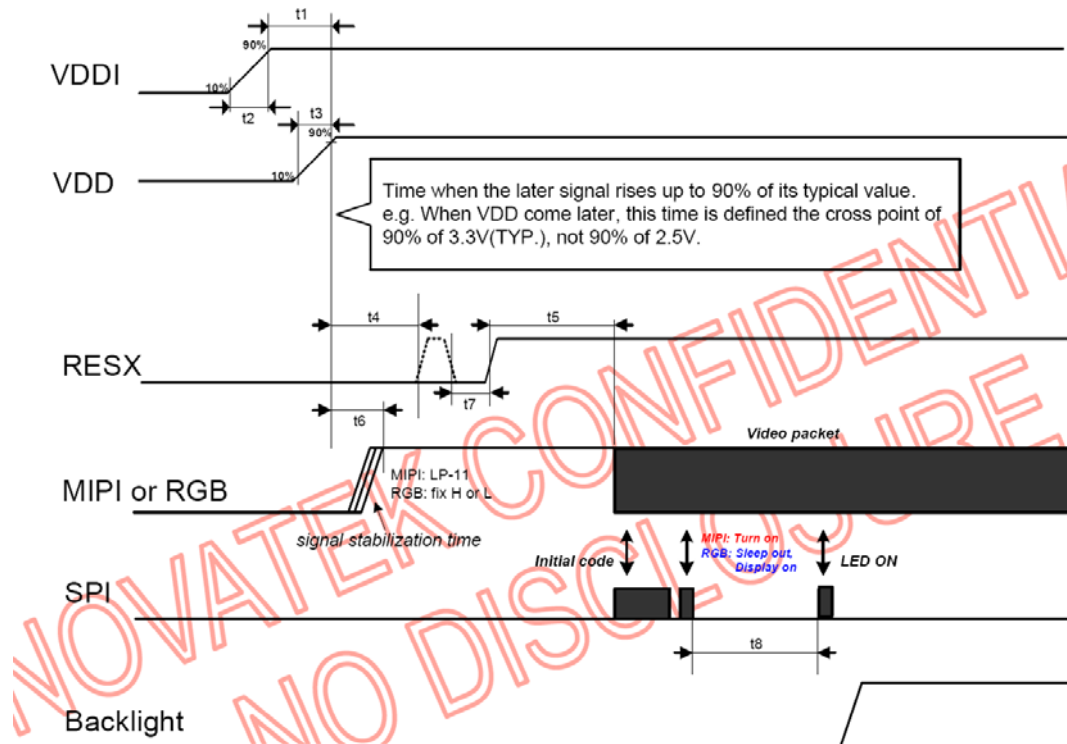
Note 5 :



9. TIMING SPECIFICATIONS

9.1 POWER SIGNAL SEQUENCE

POWER ON SEQUENCE



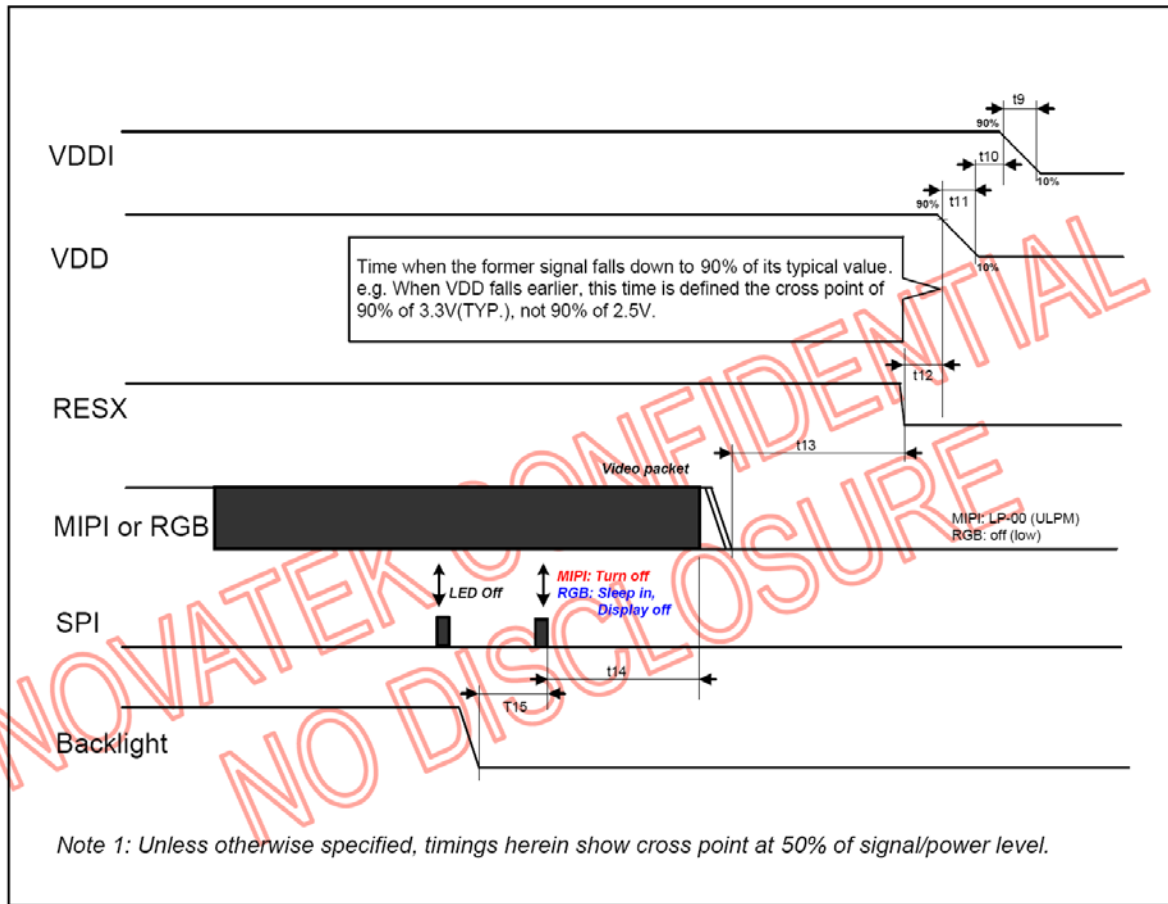
Note 1: Unless otherwise specified, timings herein show cross point at 50% of signal/power level.

Note 2: This power-on sequence is based on adding schottky diode on VGLX pin to ground.

Note 3: Reset signal H to L to H is better than only L to H.

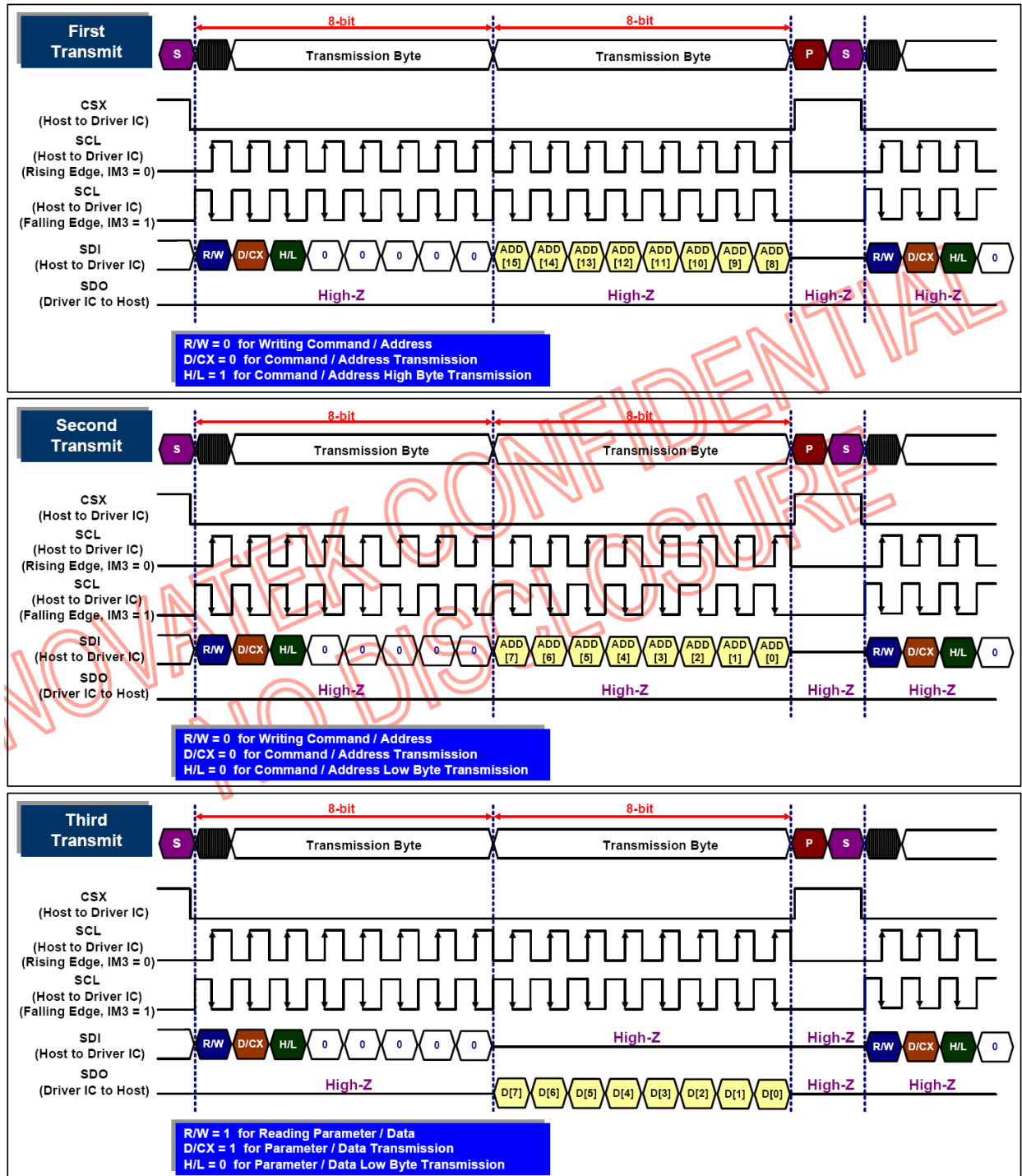
| Symbol | Value | | | Unit | Note |
|--------|-------|----------|------|------|-------------------------------------|
| | Min. | Typ. | Max. | | |
| t1 | | No limit | | ms | Schettky diode should added on VGLX |
| t2 | | | 150 | us | |
| t3 | | | 150 | us | |
| t4 | 40 | | | ms | |
| t5 | 120 | | | ms | |
| t6 | 0 | | <t4 | ms | |
| t7 | 10 | | | us | |
| t8 | 7 | | | VS | Keep data more than 7 frame (VS) |

POWER ON SEQUENCE

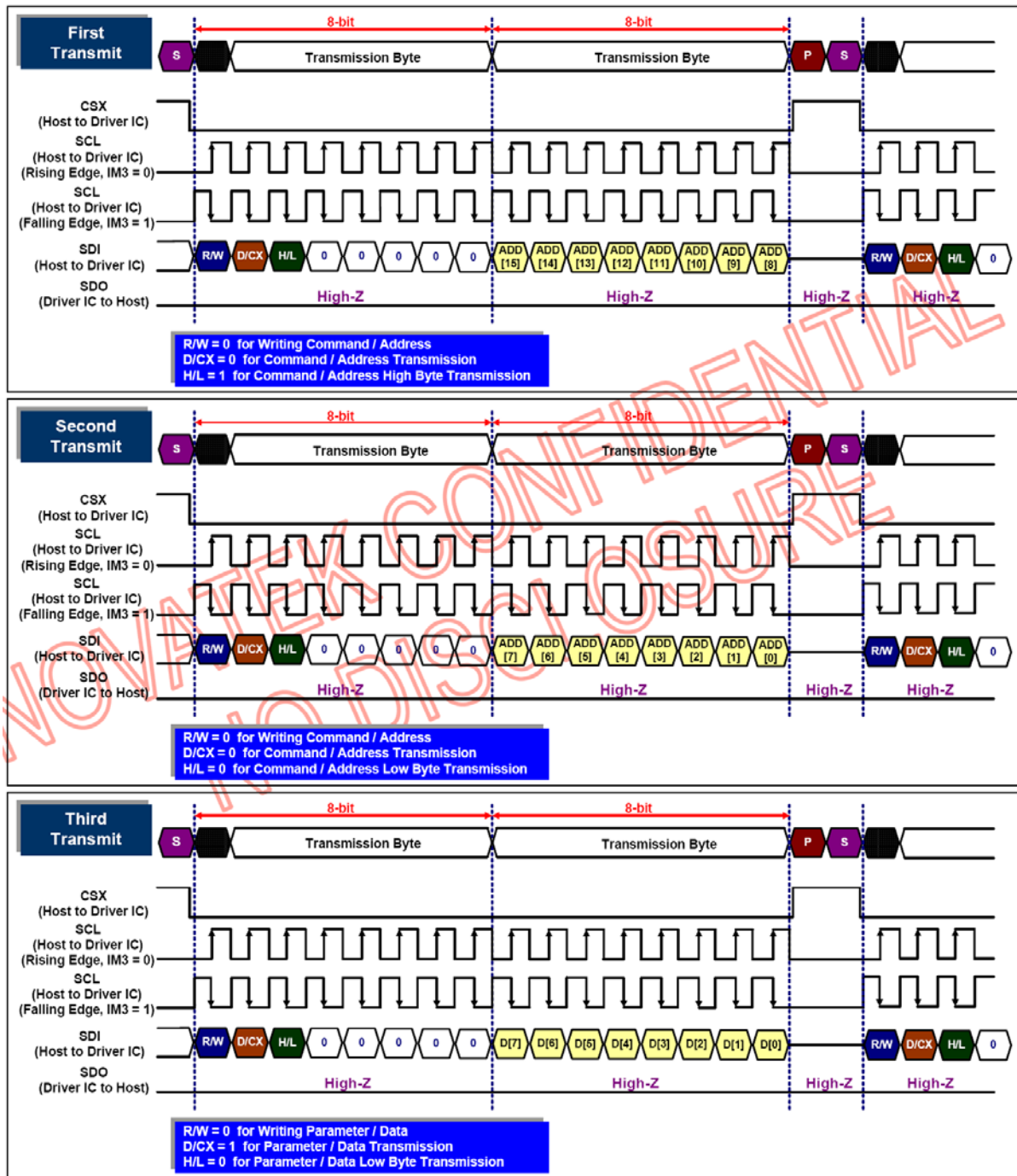


| Symbol | Value | | | Unit | Note |
|--------|-------|----------|------|------|----------------------------------|
| | Min. | Typ. | Max. | | |
| t9 | 150 | | | us | |
| t10 | | No limit | | ms | |
| t11 | 150 | | | us | |
| t12 | 0 | | | ms | |
| t13 | 0 | | | ms | |
| t14 | 4 | | | VS | Keep data more than 4 frame (VS) |
| t15 | 0 | | | ms | |

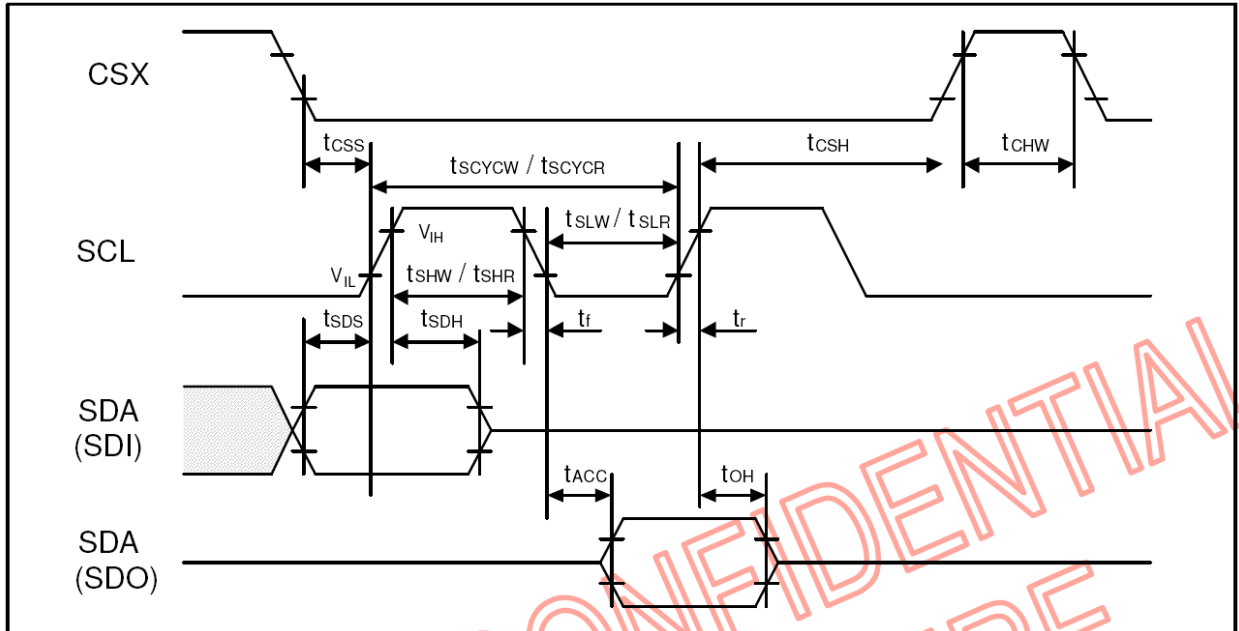
9.2 SERIAL BUS PROTOCOL FOR REGISTER READ MODE



9.3 SERIAL BUS PROTOCOL FOR REGISTER WRITE MODE



9.4 SERIAL INTERFACE CHARACTERISTICS



(VSS=VSSI=DVSS=0V, VDDI=1.65V to 3.3V, VDD=2.5V to 3.3V, Ta = -30 to 70 °C)

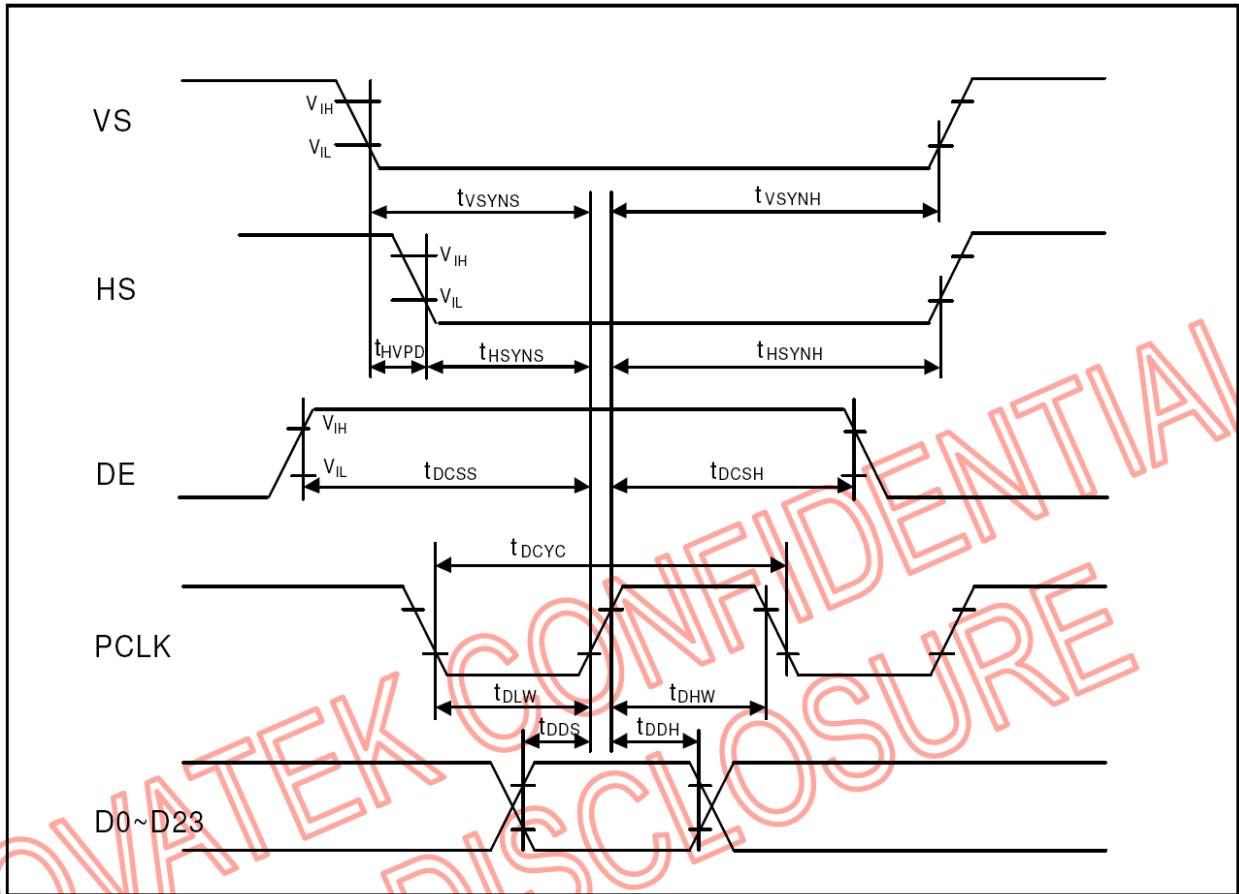
| Signal | Symbol | Parameter | MIN | MAX | Unit | Description |
|-----------|---------|-------------------------------------|-----|-----|------|-------------|
| SCL | tscycw | Serial clock cycle (Write) | 100 | - | ns | |
| | tshw | SCL "H" pulse width (Write) | 40 | - | ns | |
| | tslw | SCL "L" pulse width (Write) | 40 | - | ns | |
| | tscyrcr | Serial clock cycle (Read Register) | 300 | - | ns | |
| | tshr | SCL "H" pulse width (Read Register) | 140 | - | ns | |
| | tslr | SCL "L" pulse width (Read Register) | 140 | - | ns | |
| SDI (SDO) | tSDS | Data setup time | 20 | - | ns | |
| | tSDH | Data hold time | 20 | - | ns | |
| | tACC | Access time | - | 120 | ns | |
| | toH | Output disable time | 5 | - | ns | |
| CSX | tCHW | Chip select "H" pulse width | 45 | - | ns | |
| | tCSS | Chip select setup time | 20 | - | ns | |
| | tCSH | Chip select hold time | 50 | - | ns | |

Note 1) VDDI=1.65 to 3.3V, VDD=2.5 to 3.3V, VSS=VSSI=DVSS=0V, Ta=-30 to 70 °C (to +85 °C no damage)

VDD means VDDA, VDDR, Vddb and VSS means VSSA, VSSR, VSSB

Note 2) The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

9.5 RGB INTERFACE CHARACTERISTICS



(VSS=VSSI=DVSS=0V, VDDI=1.65V to 3.3V, VDD=2.5V to 3.3V, Ta = -30 to 70 °C)

| Signal | Symbol | Parameter | MIN | TYP | MAX | Unit | Description |
|--------|-------------|---------------------------------|-----|-----|-----|------|-------------|
| VS | t_{VSYNS} | VS SYNC setup time | 5 | - | - | ns | |
| | t_{VSYNH} | VS SYNC hold time | 5 | - | - | ns | |
| HS | t_{HSYNS} | HS SYNC setup time | 5 | - | - | ns | |
| | t_{SCYCR} | HS SYNC hold time | 5 | - | - | ns | |
| | t_{HVPD} | HS SYNC to VS SYNC falling edge | 0 | - | - | ns | |
| PCLK | t_{DCYC} | PCLK cycle time | 33 | - | 125 | ns | |
| | t_{DLW} | PCLK "L" pulse width | 11 | - | - | ns | |
| | t_{DHW} | PCLK "H" pulse width | 11 | - | - | ns | |
| | f_{DFREQ} | PCLK frequency | 8 | - | 30 | MHz | |
| DE | t_{DCSS} | DE setup time | 5 | - | - | ns | |
| | t_{DCSH} | DE hold Time | 5 | - | - | ns | |
| D0~D23 | t_{DDS} | RGB Data setup time | 5 | - | - | ns | |
| | t_{DDH} | RGB Data hold time | 5 | - | - | ns | |

Note 1) VDDI=1.65 to 3.3V, VDD=2.5 to 3.3V, VSS=VSSI=DVSS=0V, Ta=-30 to 70 °C (to +85 °C no damage)

VDD means VDDA, VDDR, Vddb and VSS means VSSA, VSSR, VSSB

Note 2) The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less.

10. RELIABILITY TEST

| ENVIRONMENTAL TEST | | | | |
|--------------------|-----------------------------------|---|-------------|--------|
| NO. | ITEM | CONDITIONS | TIME PERIOD | REMARK |
| 1 | High Temperature Storage | 80°C | 240HRS | |
| 2 | Low Temperature Storage | -30±3°C | 240HRS | |
| 3 | High Temperature Operation | 70°C | 240HRS | |
| 4 | Low Temperature Operation | -20°C | 240HRS | |
| 5 | Temperature Cycle | -20°C ← 25°C → 70°C (30min) (5min) (30min) | 10CYCLE | |
| 6 | High Temperature Humidity Storage | 60°C 90%RH (No condensation) | 240HRS | |

Note 1: a. The module should work properly.

b. Before and after function test, The difference of consumptive current. Should be within 10%

Note 2: a. The module should work properly.

b. The module won't be deformative, Color changeable or broken.

c. The modules can't be apart.

Note 3: a. Before cosmetic and function test, The product must have enough recovery time, At least 2 hours at room temperature.

10.1 VIBRATION TEST :

10.1.1 STATE LABORATORY ENVIRONMENT :

Room temperature : $25\pm 3^{\circ}\text{C}$
Relative humidity : $55\pm 20\% \text{RH}$

10.1.2 TEST METHOD / SPECIFICATION :

Sample Status : Non-packaged single state
Waveform : Sine
Frequency : 10~55~10Hz
Full amplitude : 1.5mm
Vibration direction : X,Y,Z Axis (3 Axial)
Test time : Each 2Hour / X,Y,Z Axis , Altogether 6 Hour

10.2 MECHANICAL SHOCK TEST :

10.2.1 STATE LABORATORY ENVIRONMENT :

Room temperature : $25\pm 3^{\circ}\text{C}$
Relative humidity : $55\pm 20\% \text{RH}$

10.2.2 TEST METHOD / SPECIFICATION :

Sample Status : Non-packaged single state
Waveform : Half-sine
Acceleration : 5G
Shock Time : 6ms
Impact direction : 6 Directions ($\pm X, \pm Y, \pm Z$ axes)
Number of shocks : Each direction 3 Secondary , Altogether 18 Secondary

11. LCM INSPECTION STANDARD

Inspection specifications refer ONation Corporation LCM INSPECTION STANDARD Document.
Document Number : TBD

12. PACKAGE INFORMATION

| LCM Model | LCM Qty. in the box | Inner Box Size (mm) | Weight | REMARK |
|----------------|------------------------|------------------------|--------|--------|
| OT040ZGDDDN-00 | TBD | TBD | TBD | |

13. PRECAUTIONS FOR USE

13.1 SAFETY

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

13.2 STORAGE CONDITIONS

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\%\text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.

13.3 HANDLING PRECAUTIONS

- (1) Avoid static electricity which can damage the CMOS LSI.
- (2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the Surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) When the module is assembled, it should be attached to the system firmly, Be careful not to twist and bend the module.
- (10) Wipe off water droplets or oil immediately . If you leave the droplets for a long time, staining and discoloration may occur.
- (11) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

13.4 WARRANTY

- (1) Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- (2) Applicable warrant period
The period is within 12 months since the date of shipping out under normal using and storage conditions.