

Preliminary Product Specification

Module name: C0240QGLA-T

Issue date: 2007/08/09

Version: 2.6

| | | |
|-----------------------------|---------------------|----------------|
| Customer | | |
| | | |
| Approved by Customer | | |
| | | |
| Approved by CMEL | | |
| PD Division | ENG Division | QA Dept |
| | | |

Note:

1. The information contained herein may be change without prior notice. It is therefore advisable to contact Chi MEI ELCorp before designed your product based on this specification.

Reversion History

| Version | Date | Page | Description |
|----------------|-------------|--------------------|--|
| Ver.2.0 | 2007/07/20 | All | Preliminary specification was first issued |
| Ver.2.1 | 2007/08/09 | 4 & 10 &17 | Operation temp. & modify optical characteristic & RA |
| Ver.2.2 | 2007/11/13 | 3 19 21 | RoHS Compatible Expression Mod External Dimension Drawing Add Package Drawing |
| Ver.2.3 | 2007/11/20 | 4 9 11 13 | Mod Absolute Max. Ratings Add Image Data Fomat Add RS Note Add Image Data Fomat |
| Ver.2.4 | 2007/11/22 | 17 14 15 | Mod Pin Assignment Mod test Condition Add viewing angle test condition note |
| Ver.2.5 | 2007/11/28 | 14 22 | Mod Electro-Optical Characteristic Mod Package Drawing |
| Ver.2.6 | 2007/12/04 | 14 21 | Mod Electro-Optical Characteristic Mod Reliability Test |

1. Purpose:

This documentation defines general product specification for OLED module supplied by CMEL. The information described in this technical specification is tentative. Please Contact CMEL’s representative while your product is modified.

2. General Description:

- Driving Mode: Active Matrix.
- Color Mode: Full Color (262K color)
- Driver IC: S6E63D6, COG Assembly
- Interface:
 1. MPU i80-system 18-/16-/9-/8-bit bus interface
 2. MPU i68-system 18-/16-/9-/8-bit bus interface
 3. Serial data transfer interface
 4. RGB 18-/16-/6-bit bus interface (DOTCLK,VSYNC,HSYNC,DE,DB17-0)
- Application: Cell phone etc..
- RoHS Compatible

3. Mechanical Data:

| No. | Items | Specification | Unit |
|-----|---------------------|---------------|------|
| 1 | Diagonal Size | 2.4” | Inch |
| 2 | Resolution | 240 xRGBx320 | |
| 3 | Pixel Pitch | 0.051x0.153 | mm |
| 4 | Active Area | 36.72x48.96 | mm |
| 5 | Outline Area(Glass) | 42x58.6 | mm |
| 6 | Thickness | 1.65 (Typ) | mm |
| 7 | Weight | 12 (Typ) | g |

4. Absolute Maximum ratings:

(VSS=0V)

| Item | Symbol | Unit | Value | Note |
|------------------------|--------|------|----------------|------|
| Power supply voltage 1 | VDD3 | V | -0.3 ~ + 5.0 | |
| Power supply voltage 2 | VCI | V | -0.3 ~ + 5.0 | |
| Input Voltage range | Vin | V | -0.3 ~ VDD+0.5 | |
| Operating temperature | Topr | C | -20 ~ + 60 | |
| Storage temperature | Tstg | C | -40~ + 85 | |

Notes:

(1) Absolute maximum rating is the limit value. When the IC is exposed operation environment beyond this range, the IC do not assure operations and may be damaged permanently, not be able to be recovered.

(2) Absolute maximum rating is guaranteed only when our company's package used.

5. Electrical Characteristic:

5.1 DC Characteristic

(Ta = -40℃ ~ 85℃, VSS = 0V)

| Characteristic | Symbol | CONDITION | MIN | TYP | MAX | Unit | Note |
|---|--------|---|--------|--------|--------|------|------|
| Driving voltage | VGH | - | 3.0 | - | 8.0 | V | |
| | VGL | - | -8.0 | - | -3.0 | V | |
| | VINT | - | -4.0 | - | -1.0 | V | |
| Logic Operating Voltage | RVDD | - | 1.45 | 1.5 | 1.55 | V | |
| Operating frequency | fosc | Frame frequency = 60Hz Display line = 320 line | 1161.1 | 1290.2 | 1419.3 | kHz | |
| 1st booster input voltage | VCI1 | - | 2.1 | - | 2.75 | V | |
| 1st booster output voltage | VLOUT1 | Without load | +4.6 | - | +5.5 | V | |
| 1st booster output efficiency | VLOUT1 | I _{VLOUT1_LOAD} = 2.3mA | 90 | 95 | - | % | |
| 2nd booster output voltage | VLOUT2 | Without load | - | 7.8 | - | V | |
| 2nd booster output efficiency | VLOUT2 | I _{VLOUT2_LOAD} = 0.1mA | 90 | 93 | - | % | |
| 3rd booster output voltage | VLOUT3 | Without load | - | -10.6 | - | V | |
| 3rd booster output efficiency | VLOUT3 | I _{VLOUT3_LOAD} = 0.1mA | 90 | 93 | - | % | |
| Source Output voltage deviation (channel to channel) | - | - | - | ±5 | - | mV | |
| Source Output voltage difference (nearest channel) | - | 20 Gray Pattern | - | 5 | - | mV | |
| Output voltage deviation (Chip to Chip) | - | - | - | ±15 | - | mV | |
| Output voltage deviation (Chip to Chip) | - | - | - | ±15 | - | mV | |
| Source driver output voltage range | Vso | - | 0.3 | - | 4.2 | V | |
| Driving voltage | dVGH | voltage deviation | - | - | 300 | mV | |
| | dVGL | voltage deviation | - | - | 300 | mV | |
| Current consumption during normal operation | IVDD3 | No load, Ta = 25 °C | - | 1.0 | 5.0 | uA | *1 |
| | IVCI | | - | 3.5 | 4.0 | mA | |
| Stand by mode current | IVDD3 | Ta = 25 °C | - | 0.1 | 5.0 | uA | |
| | IVCI | | - | 10 | 20 | uA | |

Note

1. VDD3=1.8V, VCI=2.8V, fosc=1290.2KHz (320 display line), NL[5:0]="10_1000", SAP[2:0]="101", DC22[2:0]="100", DC12[2:0]="010", BT[1:0]=10, VC[3:0]="1000", VGH[4:0]="10100", VGL[4:0]="10100", VINT[3:0]="0101"

| Characteristic | Symbol | CONDITION | MIN | TYP | MAX | Unit | Note |
|----------------------------------|---------------------|--------------------|----------|-----|----------|------|------|
| Power Supply Voltage | VCI | Operating Voltage | 2.5 | 2.8 | 3.3 | V | |
| Power Supply Voltage | VDD3 | I/O supply Voltage | 1.65 | 1.8 | 3.3 | V | |
| Logic High level input voltage | V _{IH} | | 0.7*VDD3 | | VDD3 | V | |
| Logic Low level input voltage | V _{IL} | | 0.0 | | 0.3*VDD3 | V | |
| Logic High level output voltage | V _{OH} | IOUT = -1mA | 0.8*VDD3 | | VDD3 | V | |
| Logic Low level output voltage | V _{OL} | IOUT = +1mA | 0.0 | | 0.2*VDD3 | V | |
| Analog High level output voltage | EL_ON _{OH} | 8uA | 1.8 | | VCI | V | |
| Analog Low level output voltage | EL_ON _{OL} | 8uA | 0 | | 0.3 | V | |

Table 81. DC Characteristics 3

(VDD3 = 1.65~3.3V, VCI = 2.5~3.3V, Ta = 25°C)

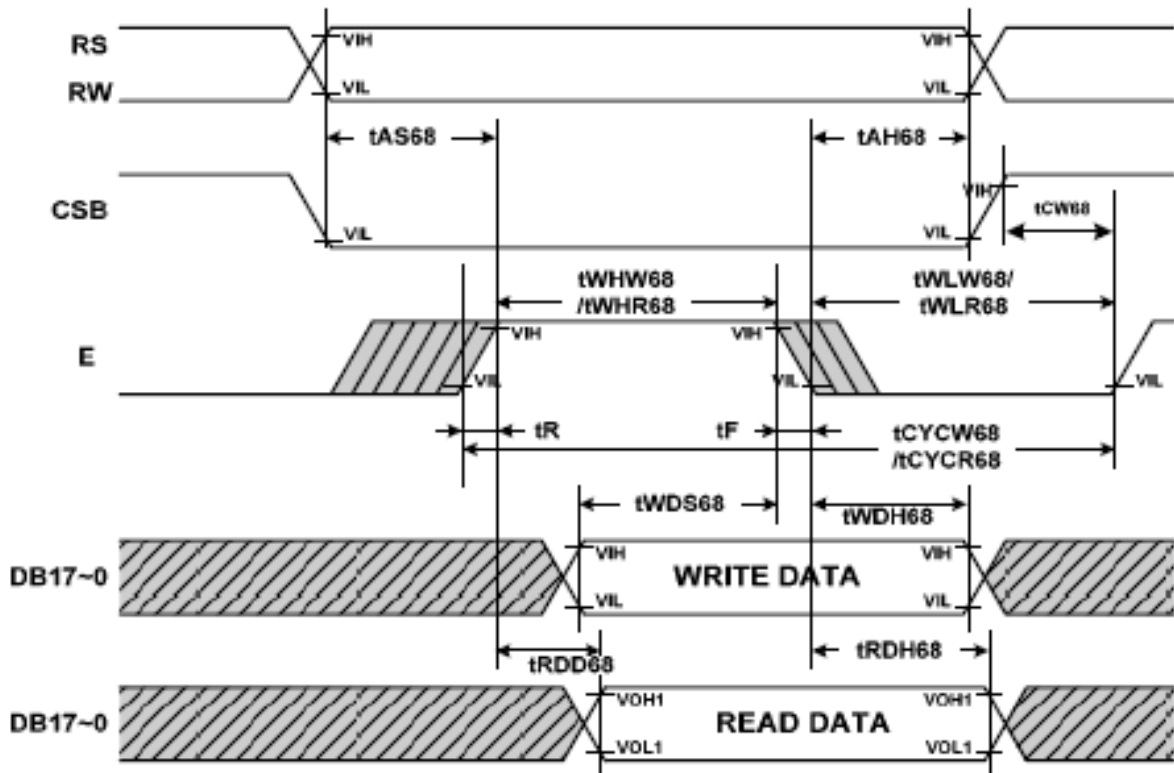
| Characteristic | Symbol | CONDITION | MIN | TYP | MAX | Unit | Note |
|----------------|--------|-----------|-------|-----|-------|------|------|
| VREG1OUT | | | 4.185 | 4.2 | 4.215 | V | |

5.2 AC Characteristic

5.2.1 CPU interface M68

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, TA = -40 to +85°C)

| Characteristic | Symbol | Specification | | Unit | |
|----------------------------|--------|---------------|------|------|----|
| | | Min. | Max. | | |
| Cycle time | Write | tCYCW68 | 85 | - | ns |
| | Read | tCYCR68 | 500 | - | ns |
| Pulse rise / fall time | | tR, tF | - | 15 | ns |
| Pulse width low | Write | tWLW68 | 27.5 | - | ns |
| | Read | tWLR68 | 250 | - | ns |
| Pulse width high | Write | tWHW68 | 27.5 | - | ns |
| | Read | tWHR68 | 250 | - | ns |
| RS,RW to CSB, E setup time | | tAS68 | 10 | - | ns |
| RS,RW to CSB, E hold time | | tAH68 | 2 | - | ns |
| CSB to E time | | tCW68 | 15 | - | ns |
| Write data setup time | | tWDS68 | 40 | - | ns |
| Write data hold time | | tWDH68 | 15 | - | ns |
| Read data delay time | | tRDD68 | - | 200 | ns |
| Read data hold time | | tRDH68 | 5 | - | ns |

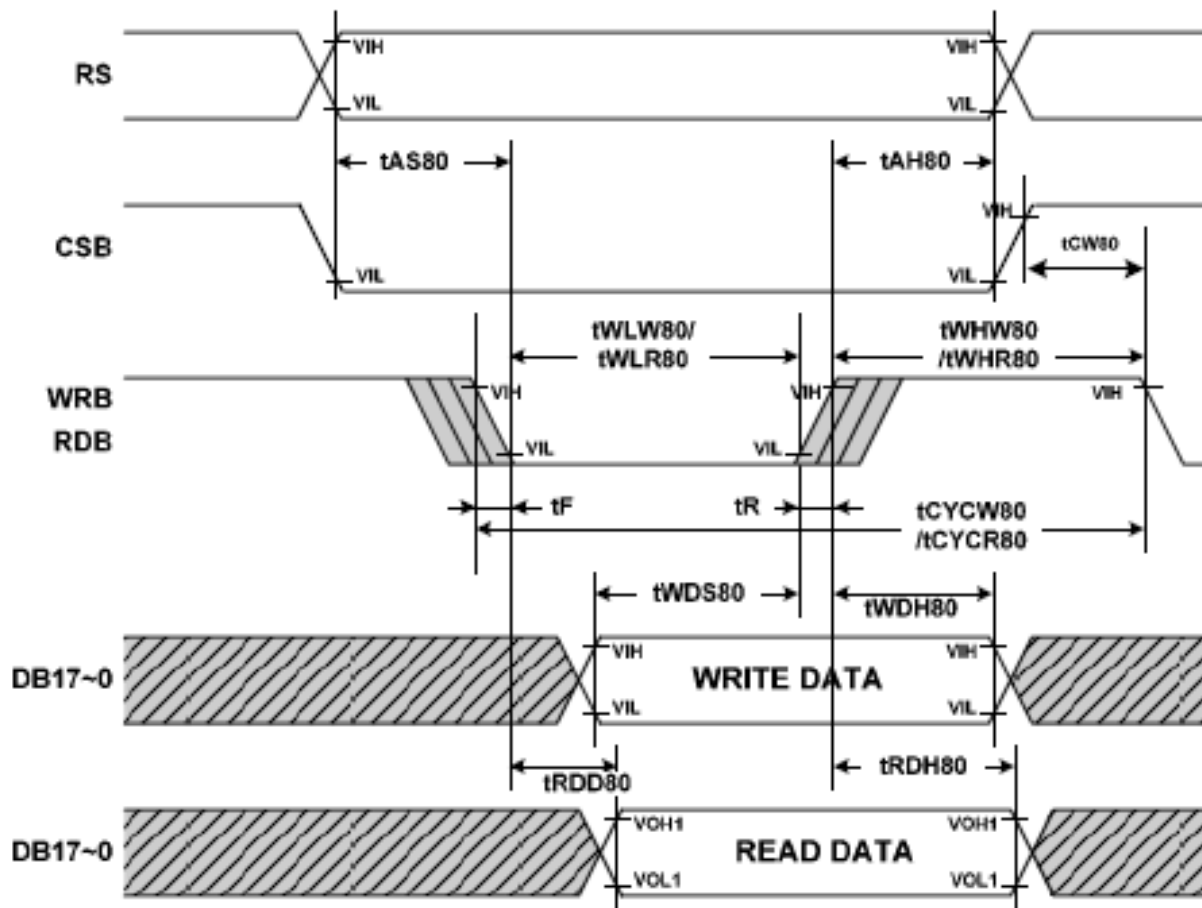


Note : tWHW68 and tWHR68 are determined by the overlap period of low CSB and high E

5.2.2 CPU interface M80

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, TA = -40 to +85°C)

| Characteristic | | Symbol | Specification | | Unit |
|--------------------------------|-------|---------|---------------|------|------|
| | | | Min. | Max. | |
| Cycle time | Write | tCYCW80 | 85 | - | ns |
| | Read | tCYCR80 | 500 | - | ns |
| Pulse rise / fall time | | tR, tF | - | 15 | ns |
| Pulse width low | Write | tWLW80 | 27.5 | - | ns |
| | Read | tWLR80 | 250 | - | ns |
| Pulse width high | Write | tWHW80 | 27.5 | - | ns |
| | Read | tWHR80 | 250 | - | ns |
| RS to CSB, WRB(RDB) setup time | | tAS80 | 10 | - | ns |
| RS to CSB, WRB(RDB) hold time | | tAH80 | 2 | - | ns |
| CSB to WRB(RDB) time | | tCW80 | 15 | - | ns |
| Write data setup time | | tWDS80 | 40 | - | ns |
| Write data hold time | | tWDH80 | 15 | - | ns |
| Read data delay time | | tRDD80 | - | 200 | ns |
| Read data hold time | | tRDH80 | 5 | - | ns |



Note : tWLW80 and tWLR80 are determined by the overlap period of low CSB and low WRB or low CSB and low RDB

Image Data format for 18bit CPU interface (262k color)

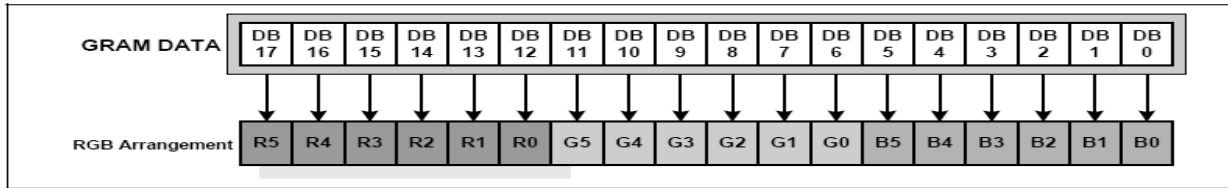


Image Data format for 16bit CPU interface (65k color)

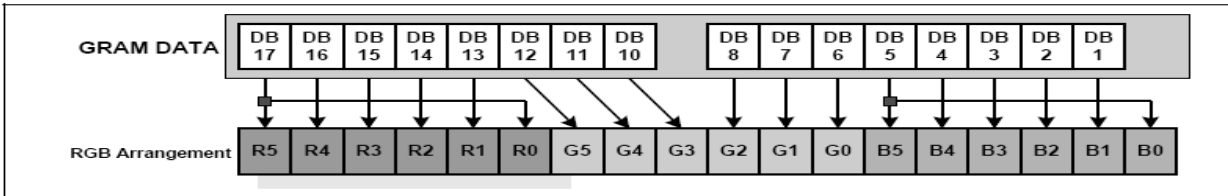


Image Data format for 9bit CPU interface (262k color)

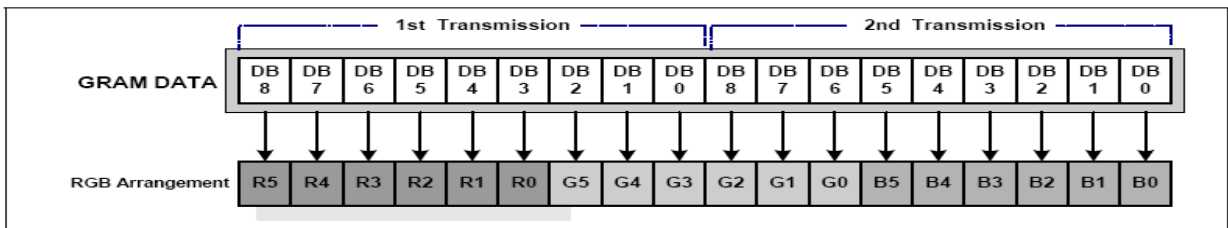
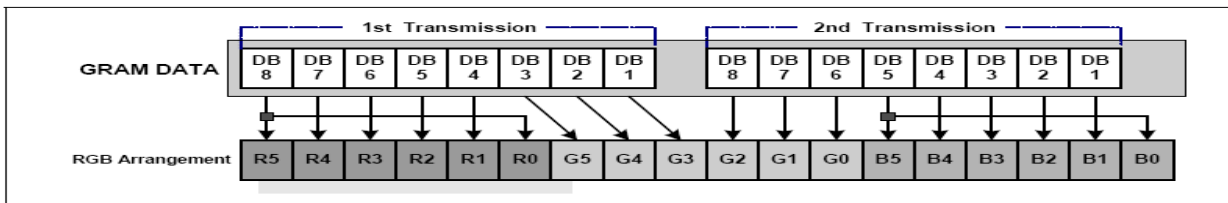


Image Data format for 8bit CPU interface (65K color)

Case 1:



Case 2:

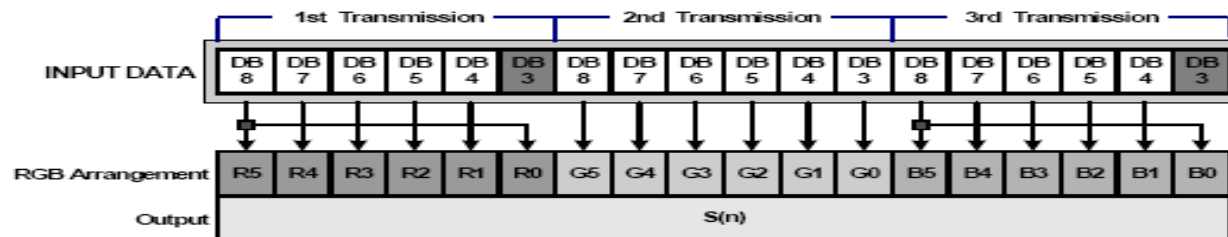
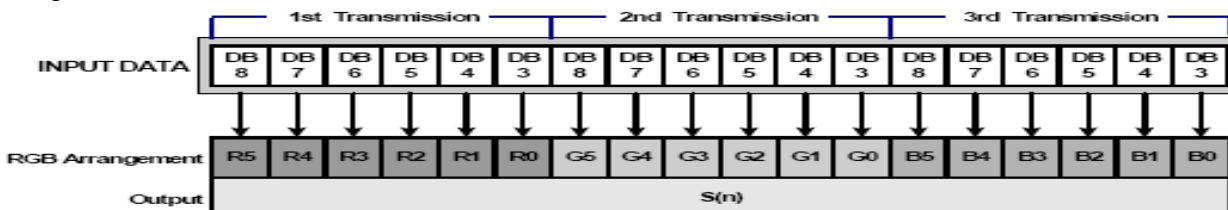


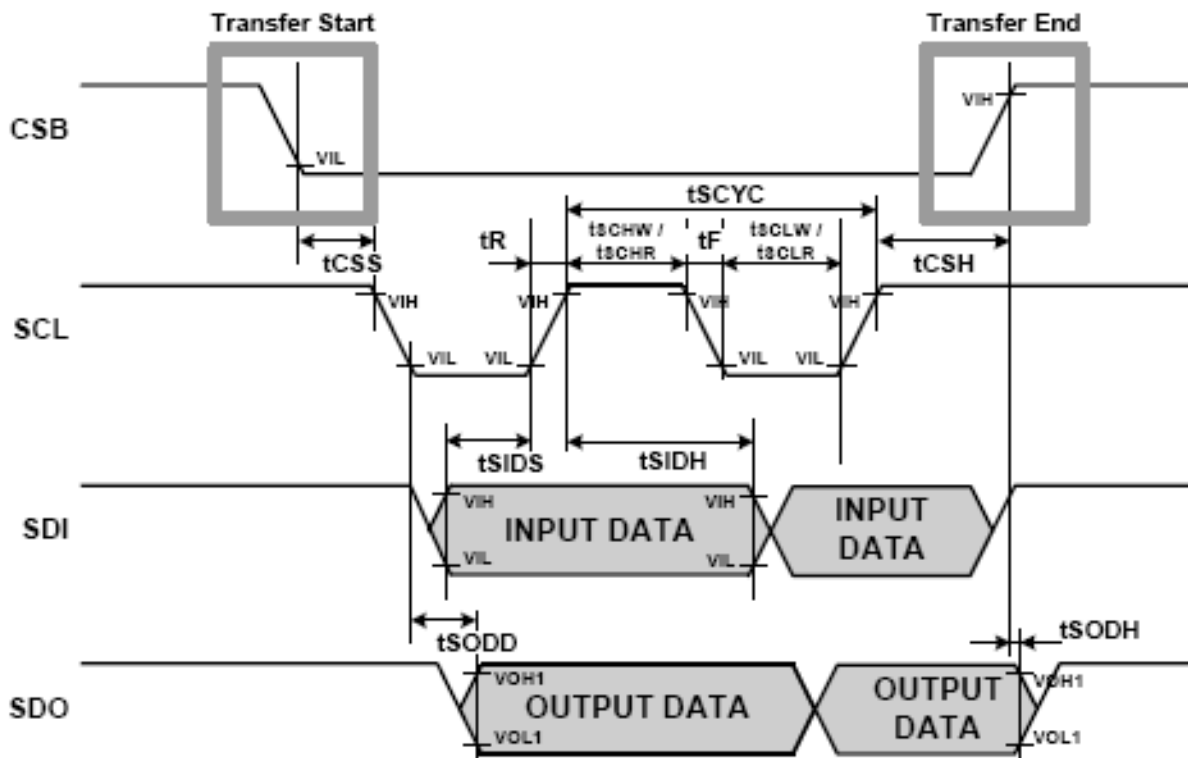
Image Data format for 8bit CPU interface (262K color)

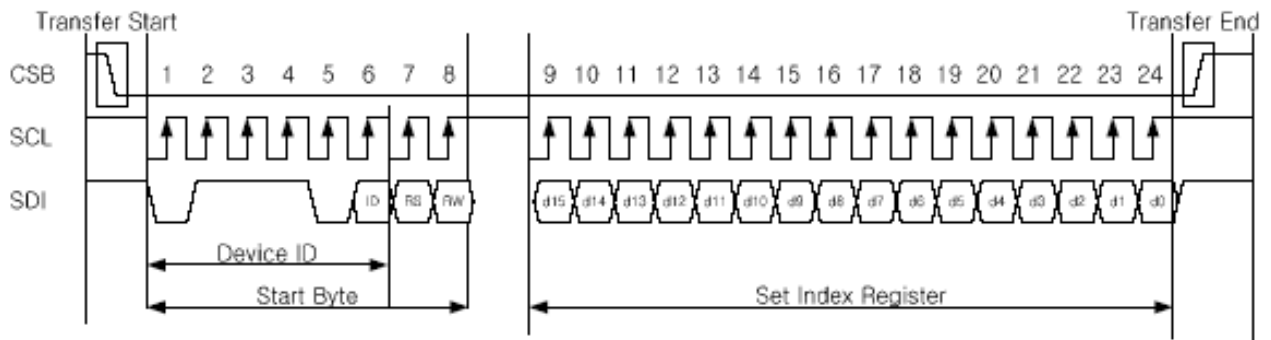


5.2.3 SPI

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, TA = -40 to +85°C)

| Characteristic | Symbol | Specification | | Unit |
|-------------------------------|--------|---------------|------|------|
| | | Min. | Max. | |
| Serial clock write cycle time | tSCYC | 130 | - | ns |
| Serial clock read cycle time | tSCYC | 250 | - | ns |
| Serial clock rise / fall time | tR, tF | - | 15 | ns |
| Pulse width high for write | tSCHW | 50 | - | ns |
| Pulse width high for read | tSCHR | 110 | - | ns |
| Pulse width low for write | tSCLW | 50 | - | ns |
| Pulse width low for read | tSCLR | 110 | - | ns |
| Chip select setup time | tCSS | 20 | - | ns |
| Chip select hold time | tCSH | 60 | - | ns |
| Serial input data setup time | tSIDS | 30 | - | ns |
| Serial input data hold time | tSIDH | 30 | - | ns |
| Serial output data delay time | tSODD | - | 130 | ns |
| Serial output data hold time | tSODH | 5 | - | ns |





(Note) RS="0" : Index data

RS="1" : Instruction data

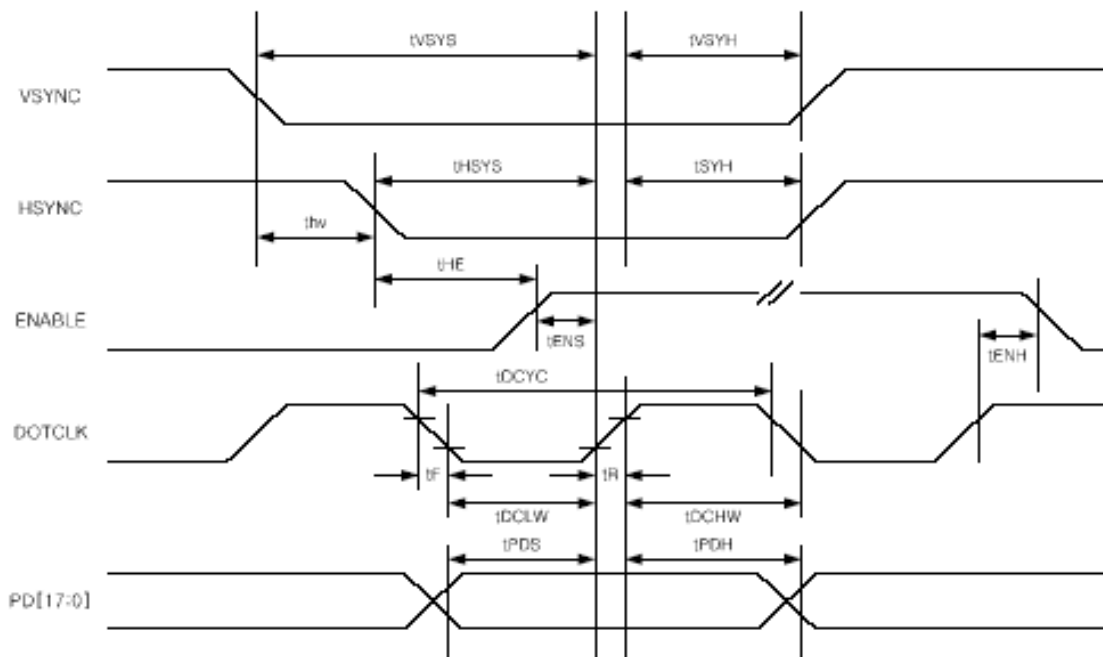
5.2.4 RGB Interface

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, TA = -40 to +85°C)

| Characteristic | Symbol | Specification | | Unit | | Unit |
|----------------------------|--------|---------------|------|------|------|-------|
| | | Min. | Max. | Min. | Max. | |
| DOTCLK cycle time | tDCYC | 100 | - | 55 | - | ns |
| DOTCLK rise / fall time | tR, tF | - | 15 | - | 15 | ns |
| DOTCLK pulse width high | tDCHW | 40 | - | 25 | - | ns |
| DOTCLK pulse width low | tDCLW | 40 | - | 25 | - | ns |
| Vertical sync setup time | tVSYH | 30 | - | 30 | - | ns |
| Vertical sync hold time | tVSYH | 30 | - | 30 | - | ns |
| Horizontal sync setup time | tHSYS | 30 | - | 30 | - | ns |
| Horizontal sync hold time | tHSYH | 30 | - | 30 | - | ns |
| ENABLE setup time | tENS | 30 | - | 30 | - | ns |
| ENABLE hold time | tENH | 20 | - | 20 | - | ns |
| PD data setup time | tPDS | 30 | - | 30 | - | ns |
| PD data hold time | tPDH | 20 | - | 20 | - | ns |
| HSYNC-ENABLE time | tHE | 1 | HBP | 1 | HBP | tDCYC |
| VSYNC-HSYNC time | tHV | 1 | 175 | 1 | 527 | tDCYC |

Note

1. HBP is horizontal back-porch.



(When VSPL=0, HSPL=0, DPL=0, EPL=1)

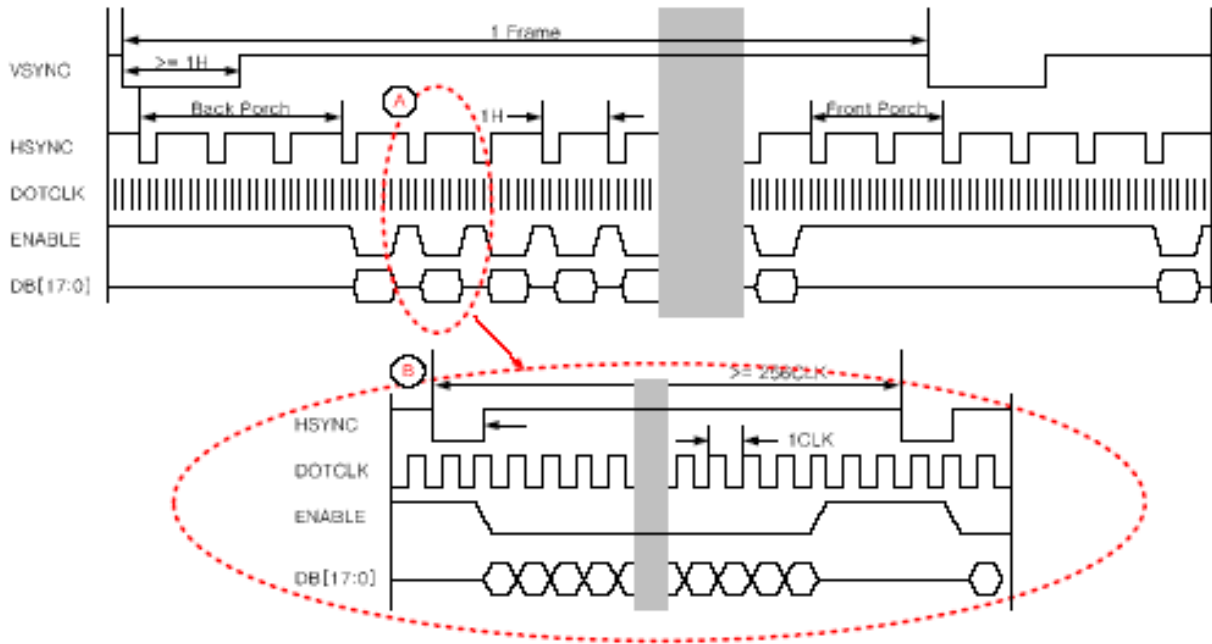


Image Data format for 18bit RGB interface (262k color)

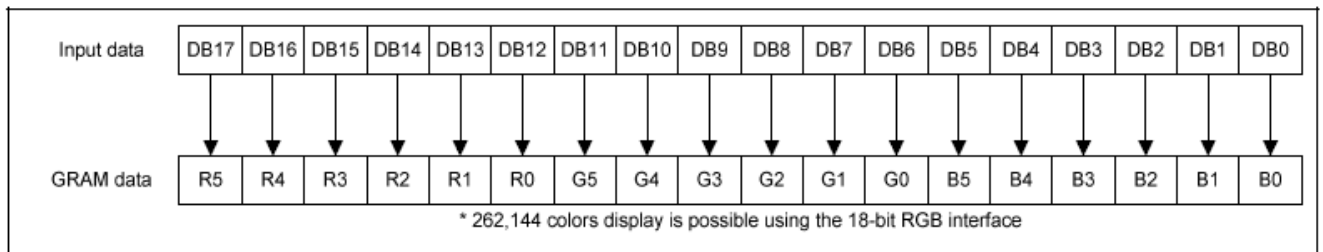


Image Data format for 16bit RGB interface (65k color)

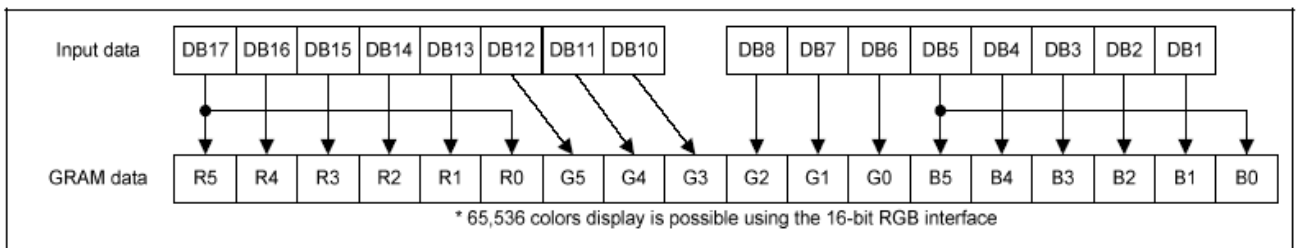
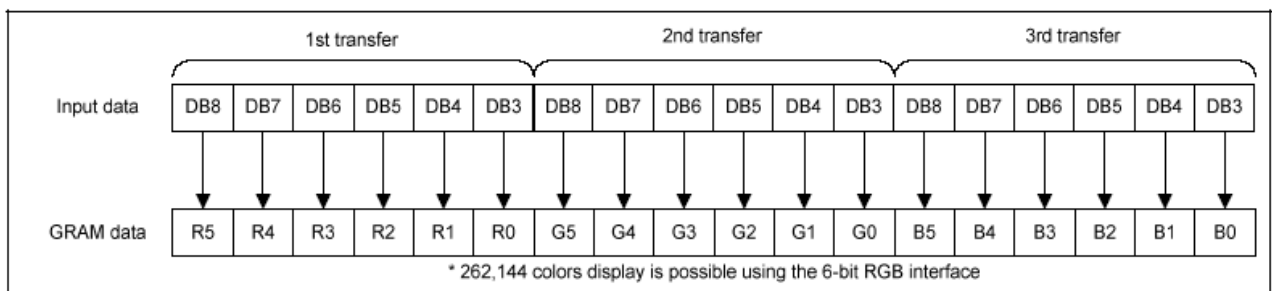


Image Data format for 6bit RGB interface (262k color)



6. Electro-Optical Characteristic:

| Items | Symbol | Min | Typ. | Max | Unit | Remark |
|--------------------------|----------------|--------|---------|------|-------------------|-------------------|
| Operating Luminance | L | 170 | 200 | 230 | Cd/m ² | (1)(5) |
| Power Consumption | Pon | - | 260 | 300 | mW | 30% pixels on (1) |
| Response Time | Tres | - | - | 50 | us | (2) |
| CIE _x (White) | W _x | 0.26 | 0.31 | 0.36 | - | (5) |
| CIE _y (White) | W _y | 0.28 | 0.33 | 0.38 | - | (5) |
| CIE _x (Red) | R _x | 0.62 | 0.66 | 0.70 | | (5) |
| CIE _y (Red) | R _y | 0.30 | 0.34 | 0.38 | | (5) |
| CIE _x (Green) | G _x | 0.25 | 0.29 | 0.33 | | (5) |
| CIE _y (Green) | G _y | 0.61 | 0.65 | 0.69 | | (5) |
| CIE _x (Blue) | B _x | 0.11 | 0.15 | 0.19 | | (5) |
| CIE _y (Blue) | B _y | 0.12 | 0.16 | 0.20 | | (5) |
| Viewing Angle | VA | 160 | 170 | - | Degree | (3) |
| Contrast | CR | 5000:1 | 10000:1 | | | (4) |
| Operation Lifetime | LTop | 20000 | | | Hrs | (1)(6) |

Note:

Measuring surrounding: dark room

Surrounding temperature: 25°C

IOVCC = 1.65V ~ 3.3V

1. Test condition:

a. AR_VDD= 4.6V+/- 0.03V, AR_VSS= -4.4V+/- 0.03V

b. IC Initial Register Setting:

R03: 0x0030 // 16bit mode
R10: 0x0000 // IC stand by off
R18: 0x0028 // Frame Rate=80Hz
RF8: 0x000F // VGH=+5V
RF9: 0x000F // VGL=-5V
R05: 0x0001 // Display On

Gamma Register Setting:

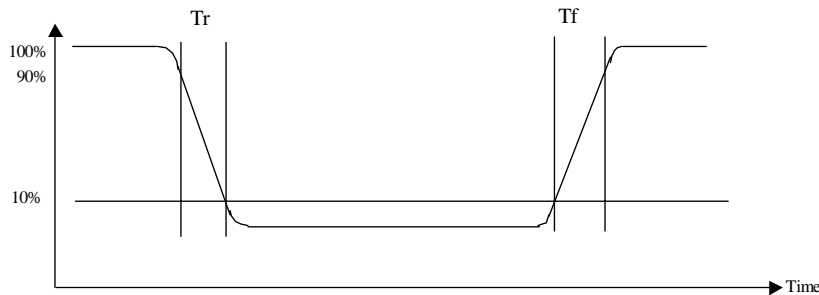
R70: 0x1F00
R71: 0x2380
R72: 0x2A80
R73: 0x1511
R74: 0x1C11
R75: 0x1B15

R76: 0x1A15

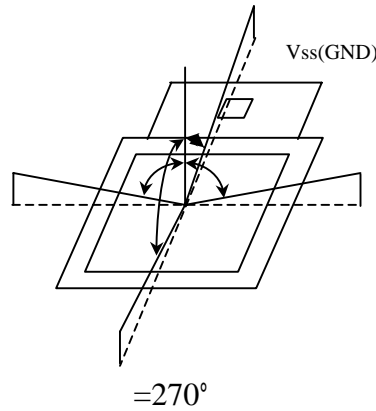
R77: 0x1C18

R78: 0x2115

2.response Time test condition



3.Viewing angle test condition:



Viewing Angle= CR>10

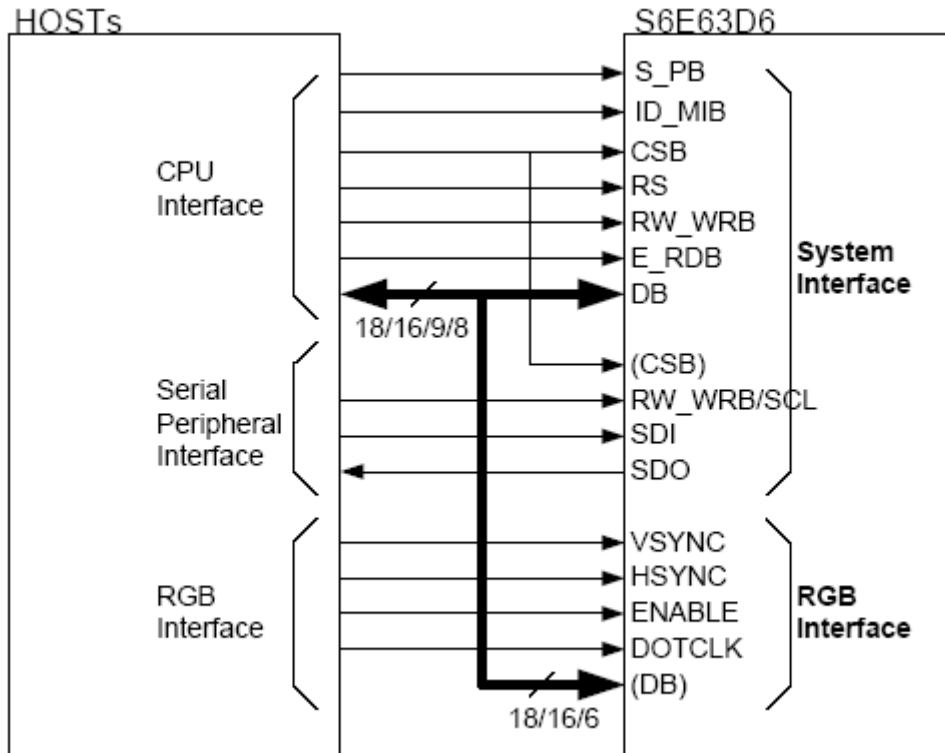
4.Contrast

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

5.Optical tester: CA210

6. Brightness of 30% power consumption. Operating Life Time is defined when the luminance has decayed to less than 50% of the initial measured luminance before life test.

7. System Diagram:



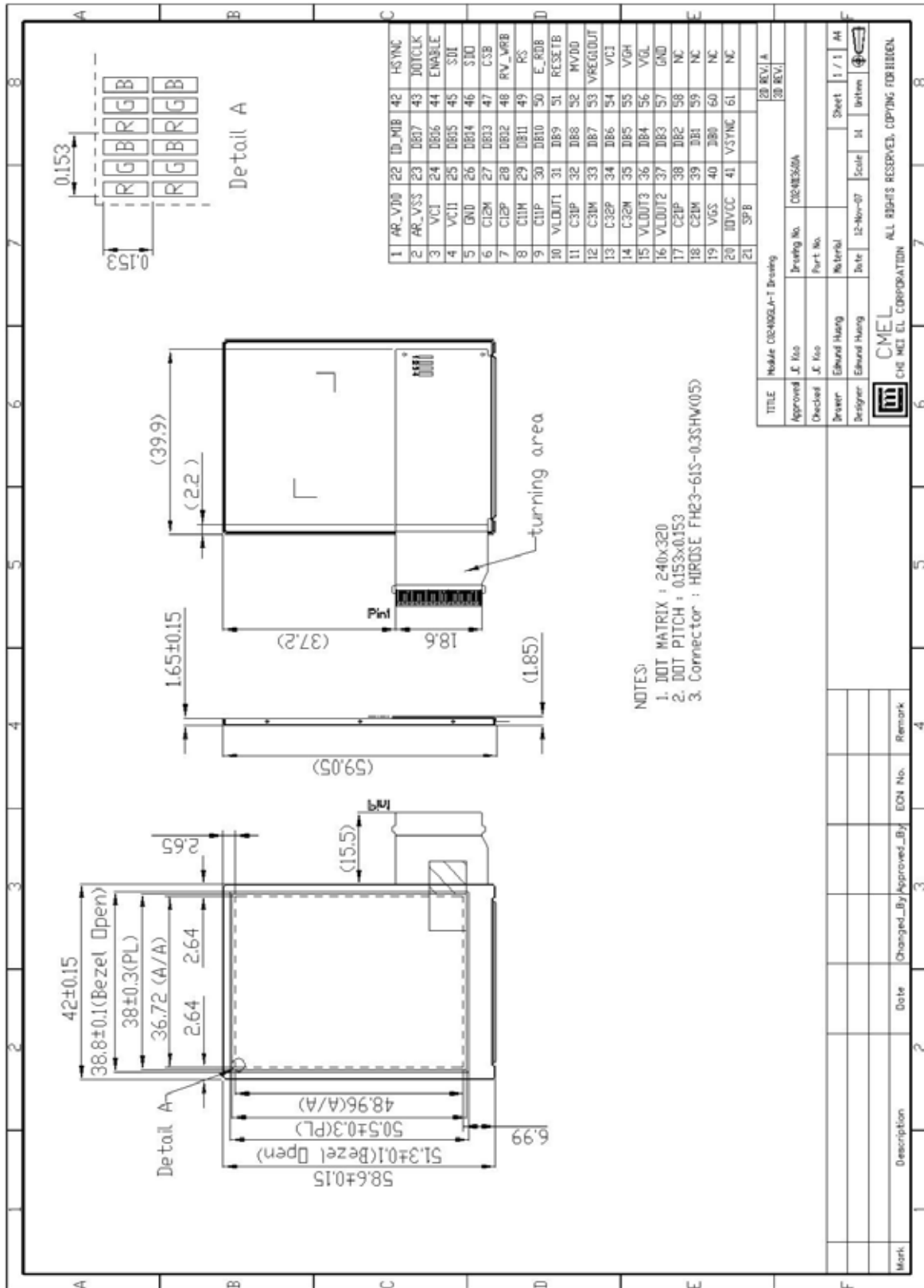
8. Pin Assignment:

| PIN | Symbol | I/O | Description | Remarks |
|-----|--------|-----|---|---------|
| 1 | AR_VDD | I | Positive voltage for OLED | |
| 2 | AR_VSS | I | Negative voltage for OLED | |
| 3 | VCI | I | Power supply for analog circuit(2.5v~3.3v) | |
| 4 | VCI1 | O | A reference voltage for 1 st booster r(connect a 1u/10v capacitance to gnd) | |
| 5 | GND | I | Ground | |
| 6 | C12M | I | External capacitance connect pin between C12M and C12P (1u/10V) | |
| 7 | C12P | I | | |
| 8 | C11M | I | External capacitance connect pin between C11M and C11P (1u/10V) | |
| 9 | C11P | I | | |
| 10 | VLOUT1 | O | 1 st booster output pin. (1u/10V) | |
| 11 | C31P | I | External capacitance connect pin between C31M and C31P (1u/10V) | |
| 12 | C31M | I | | |
| 13 | C32P | I | External capacitance connect pin between C32M and C32P (1u/10V) | |
| 14 | C32M | I | | |
| 15 | VLOUT3 | O | 3 rd booster output pin. (1u/16V) | |
| 16 | VLOUT2 | O | 2 nd booster output pin. (1u/16V) | |
| 17 | C21P | I | External capacitance connect pin between C21M and C21P. (1u/10V) | |
| 18 | C21M | I | | |
| 19 | VGS | I | A reference level for the grayscale voltage generation circuit. (connect to gnd) | |
| 20 | IOVCC | I | I/O power supply | |
| 21 | SPB | I | Select the CPU interface mode. (0=parallel interface 1=serial interface) | |
| 22 | ID_MIB | I | Select the CPU type (0=intel 80x-system 1=motorola 68x-system) | |
| 23 | DB17 | I/O | BI-directional data bus. When CPU I/F, 18-bit interface : DB 17-0 16-bit interface : DB 17-10 , DB 8-1 9-bit interface : DB 8-0 8-bit interface : DB 8-1 When RGB I/F 18-bit interface : DB 17-0 16-bit interface : DB 17-10, DB 8-1 6-bit interface : DB 8-3 Fix unused pin to the VSS level | |
| 24 | DB16 | I/O | | |
| 25 | DB15 | I/O | | |
| 26 | DB14 | I/O | | |
| 27 | DB13 | I/O | | |
| 28 | DB12 | I/O | | |
| 29 | DB11 | I/O | | |
| 30 | DB10 | I/O | | |
| 31 | DB9 | I/O | | |
| 32 | DB8 | I/O | | |
| 33 | DB7 | I/O | | |

| | | | | | | |
|--|--------|-------|---|-----------|--|--------------|
| 34 | DB6 | I/O | | | | |
| 35 | DB5 | I/O | | | | |
| 36 | DB4 | I/O | | | | |
| 37 | DB3 | I/O | | | | |
| 38 | DB2 | I/O | | | | |
| 39 | DB1 | I/O | | | | |
| 40 | DB0 | I/O | | | | |
| 41 | VSYNC | I | Frame-synchronizing signal. (VSPL=0 Low active, VSPL=1 High active) FIX this pin at VSS level if the pin is not used | | | |
| 42 | HSYNC | I | Line-synchronizing signal. (HSPL=0 Low active, HSPL=1 High active) FIX this pin at VSS level if the pin is not used | | | |
| 43 | DOTCLK | I | Input pin for clock signal of external interface : dot clock. DPL=0 Display data is fetched at DOTCLK's rising edge DPL=1 Display data is fetched at DOTCLK's falling edge Fix this pin at VSS level if the pin is not used. | | | |
| 44 | ENABLE | I | Data enablesignal pin for RGB interface. | | | |
| | | | EPL | ENABLE | GRAM write | GRAM address |
| | | | 0 | 0 | Valid | Updated |
| | | | 0 | 1 | Invalid | Held |
| | | | 1 | 0 | Invalid | Held |
| 1 | 1 | Valid | Updated | | | |
| 45 | SDI | I | For a serial peripheral interface(SPI), input data is fetched at the rising edge of the SCL signal, Fix SDI pin at VSS level if the pin is not used. | | | |
| 46 | SDO | I | For a serial peripheral interface (SPI), serves as the serial data output pin(SDO), Successive bits are output at the falling edge of the SCL signal. | | | |
| 47 | CSB | I | Chip select signal input pin. 0= driver IC is selected and can be accessed. 1= driver IC is not selected and cannot be accessed. | | | |
| 48 | RW_WRB | I | Pin function | CPU type | Pin description | |
| | | | RW | 68-system | Read/Write operation selection pin 0=write 1=read | |
| | | | WRB | 80_system | Write strobe signal.(Input pin) Data is fetched at the rising edge. | |
| | | | SCL | SPI | The synchronous clock signal | |
| 49 | RS | I | Register select pin. 0=Index/status, 1=instruction parameter, GRAM data Must be fixed at VDD3 level when not used. | | | |
| 50 | E_RDB | I | Pin Function | CPU type | Pin description | |
| | | | E | 68-system | Read/Writeoperation enable pin | |
| | | | RDB | 80_system | Read strobe signal. Read out data at the low level | |
| When SPI mode is selected , fix this pin at VDD3 levle | | | | | | |

| | | | | |
|----|----------|---|---|--|
| 51 | RESETB | I | Reset pin initializes the IC when low. Should be reset after power-on. | |
| 52 | MVDD | O | Internal power for RAM. Connect a capacitance to gnd. Connect a capacitance(1u/10v) to gnd. | |
| 53 | VREG1OUT | O | A reference level for the grayscale voltage. Connect a capacitance(1u/10v) to gnd. | |
| 54 | VCI | I | Power supply for analog circuit(2.5v~3.3v) | |
| 55 | VGH | O | The positive voltage used in the gate driver. Connect a capacitance(1u/10v) to gnd. | |
| 56 | VGL | O | The negative voltage used in the gate driver. Connect a capacitance(1u/10v) to gnd. | |
| 57 | GND | | Ground | |
| 58 | X- | | For touch screen | |
| 59 | Y- | | For touch screen | |
| 60 | X+ | | For touch screen | |
| 61 | Y+ | | For touch screen | |

9. External Dimension:



10. Reliability Test:

| No. | Items | Specification |
|-----|--------------------------------|--|
| 1 | High Temp. Storage | 85°C, 240hrs |
| 2 | Low Temp. Storage | -40°C, 240hrs |
| 3 | High Temp. Operation | 60°C, 240hrs |
| 4 | Low Temp. Operation | -20°C, 240hrs |
| 5 | High Temp / Humidity Storage | 85°C, 85%RH, 240hrs |
| 6 | High Temp / Humidity Operation | 60°C, 90%RH, 240hrs |
| 7 | Thermal shock | -40°C ~85°C (-40°C /30min; transit/3min; 85°C /30min; transit /3min) 1cycle: 66min, 100 cycles |
| 8 | Vibration | Frequency: 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z |
| 9 | Drop | Height: 76cm Sequence : 1 angle、 3 edges and 6 faces Cycles: 1 |
| 10 | ESD | Air discharge model, ±8kV, 10 times |

Evaluation Criteria

- No damage to glass or encapsulation
- No drastic change to display
- Defects / Mura follow product specification
- Luminance: Within +/-50% of initial value
- Current consumption: within +/-50% of initial value

11. Package:

