BATRON

# Specification for
# BTHQ 128064AVC1-FSTF-06-LEDWHITE -COG

**Version October 2004**

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**DOCUMENT REVISION HISTORY 1:**

| DOCUMENT REVISION FROM TO | DATE | DESCRIPTION | CHANGED BY | CHECKED BY |
|---|---|---|---|---|
| A | 2004.10.13 | First Release.<br><br>Based on<br>a.) Test Specification:<br>VL-TS-COG-BTC12864-05 REV A,<br>2004.09.22<br>b.) VL-QUA-012B REV.W<br>2004.03.20<br><br>According to VL-QUA-012B, LCD size is small because Unit Per Laminate=18 which is more than 6pcs/Laminate. | ZHANG YAN FANG | LIN RONG SHOU |

# CONTENTS

# Specification
# of
# LCD Module Type
# Item No.: COG-BTC12864-05

## 1. General Description

- 128 x 64 dots FSTN Black & White Positive Transflective LCD Graphic Module.
- Viewing Direction: 6 O'clock.
- Driving duty: 1/65 Duty, 1/9 bias.
- "ULTRA CHIP" UC1601 (COG) LCD Controller-Driver or equivalent.
- Logic Power Supply: +3V.
- FPC connector.
- White LED05 Backlight.

## 2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

| Parameter | Specifications | Unit |
|---|---|---|
| Outline dimensions | 76.5(W) x 82.5(H) x 8.5(D)(Include FPC and Backlight) | mm |
| Viewing area (V.A.) | 60.00 MIN.(W) x 40.00 MIN.(H) | mm |
| Active area (A.A.) | 56.945(W) x 37.425(H) | mm |
| Display format | 128 x 64 | dots |
| Dot size | 0.43(W) x 0.57(H) | mm |
| Dot spacing | 0.015(W) x 0.015(H) | mm |
| Dot pitch | 0.445(W) x 0.585(H) | mm |
| Weight: | TBD | grams |

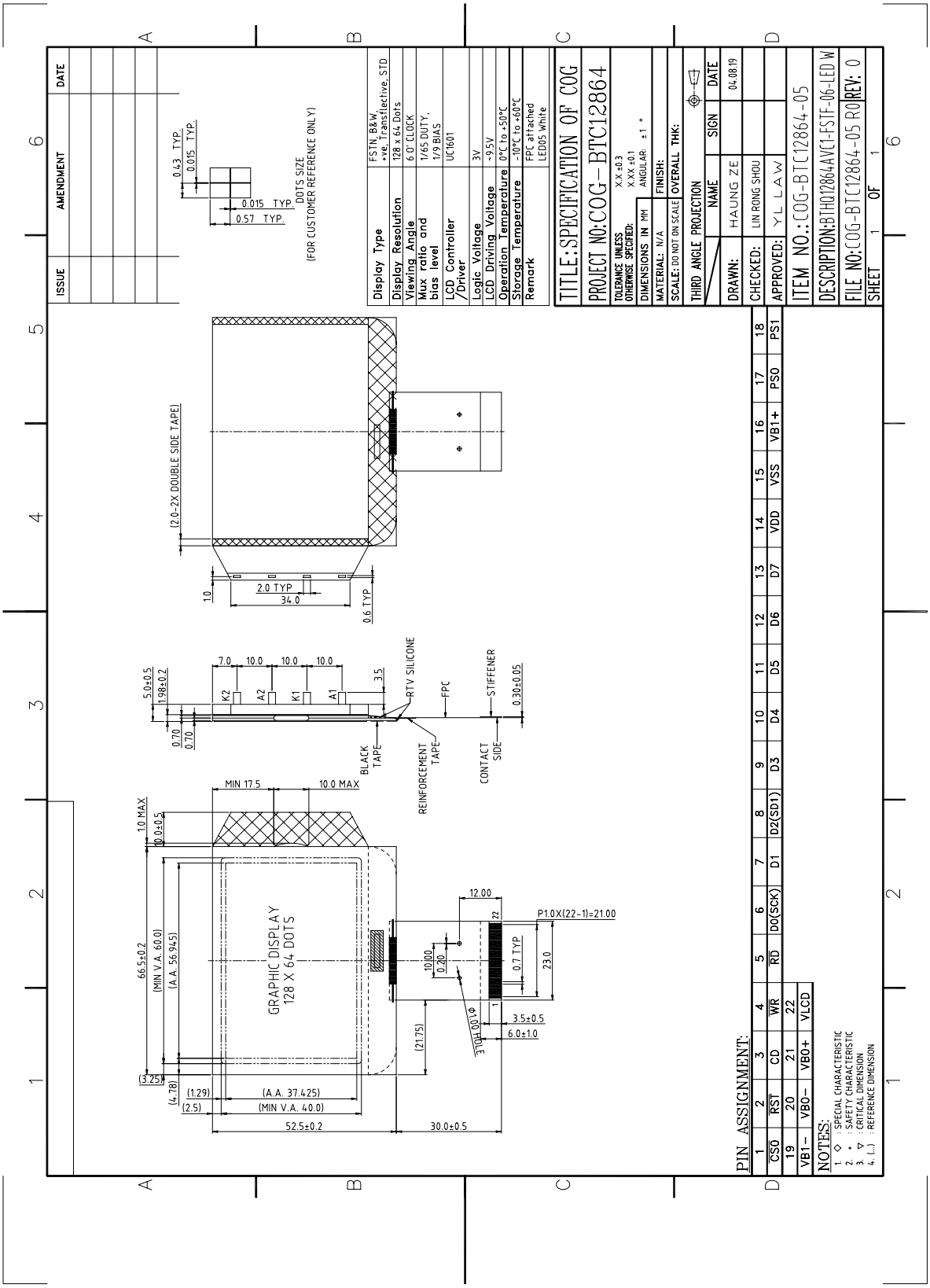



Figure 1: Module Specification

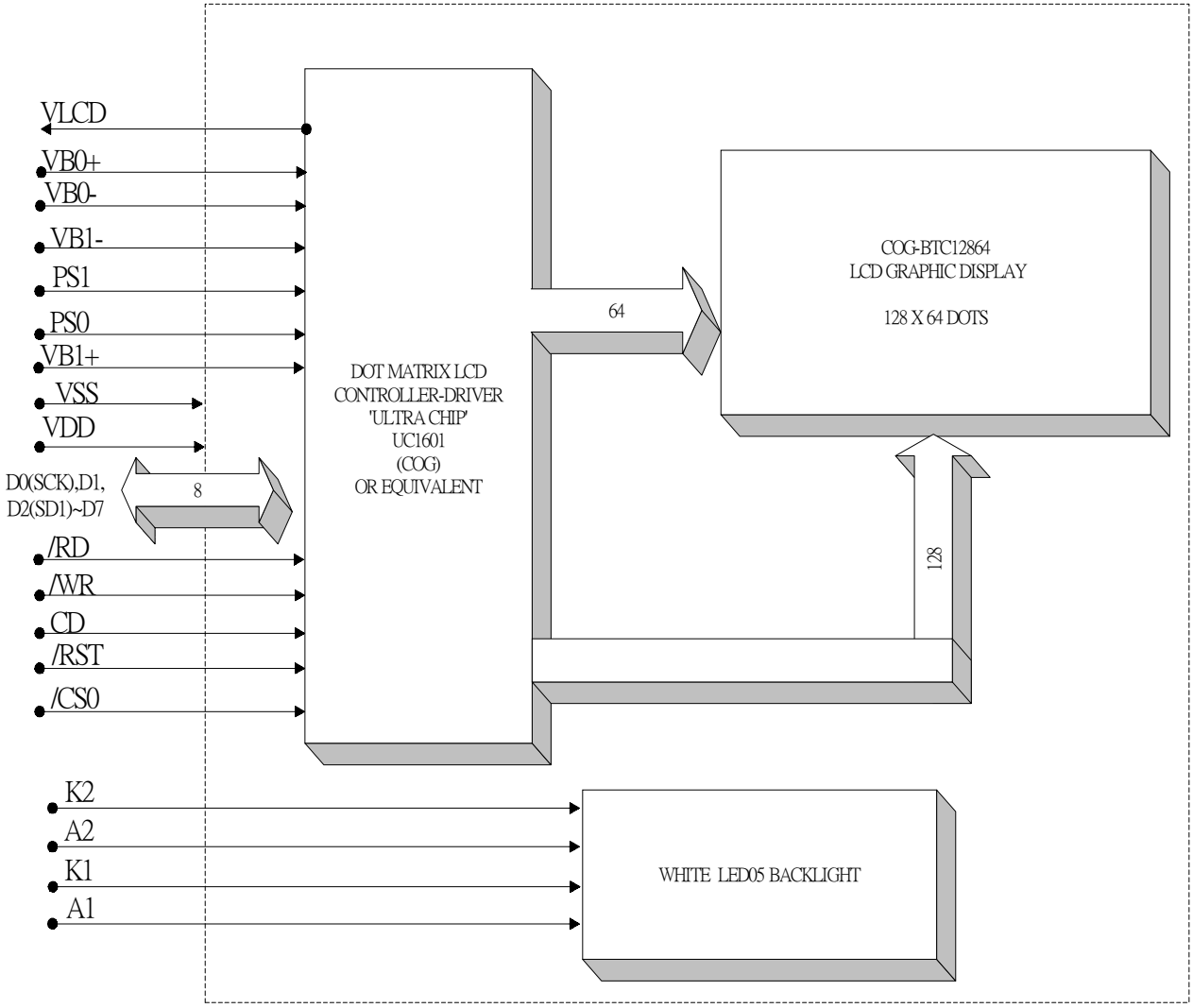



Figure 1(b): Block diagram

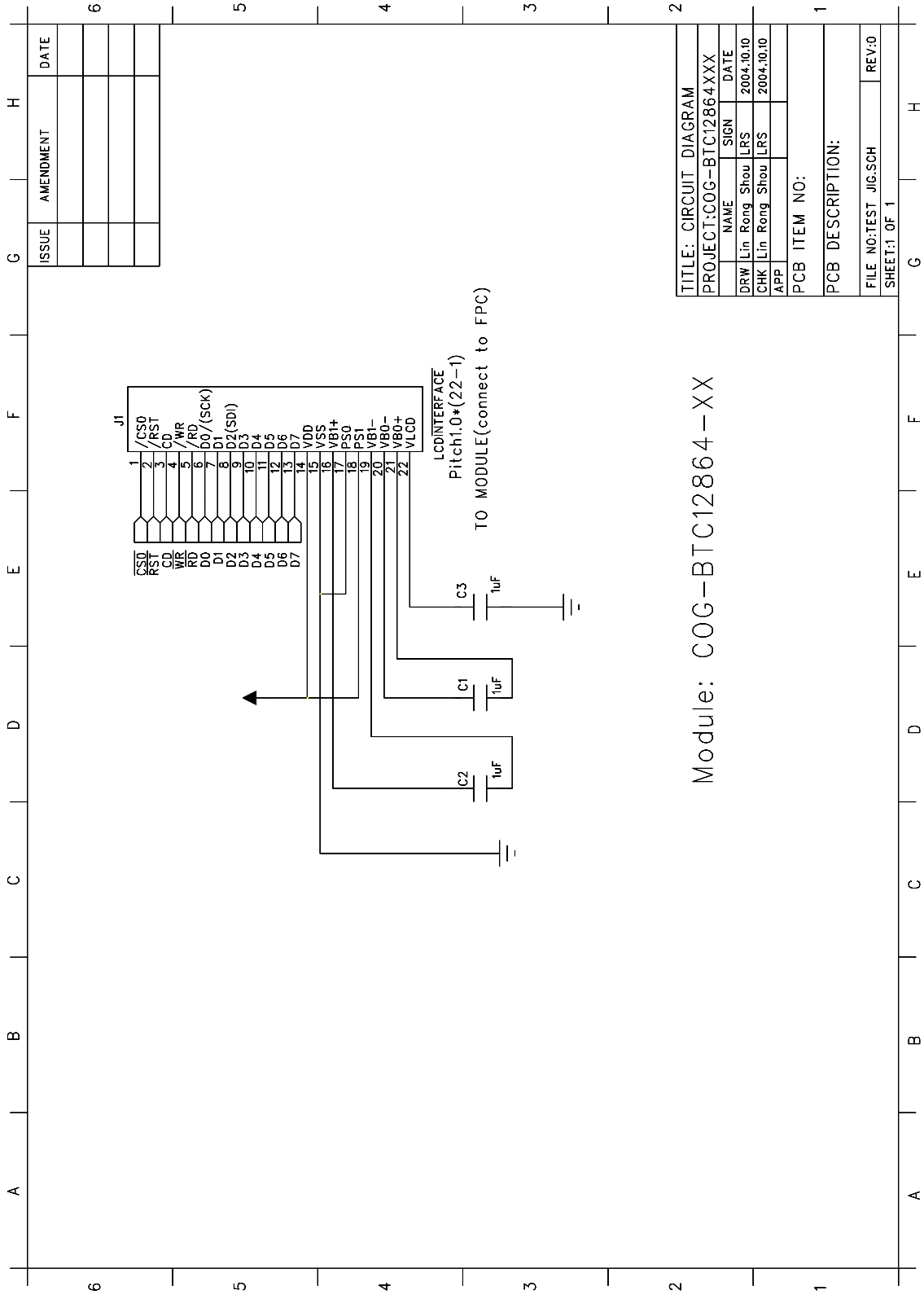



Figure 2: Application Circuit

## 3. Interface signals

Table 2

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Description</th></tr>
<tr><td>1</td><td>$\overline{CS0}$</td><td>Chip Select. In parallel mode and S8 mode, chip is selected when $\overline{CS0}$=”L” and CS1=”H”. When the chip is not selected, D[7:0] may be high impedance.</td></tr>
<tr><td>2</td><td>$\overline{RST}$</td><td>When $\overline{RST}$ =”L”, all control registers are re-initialized by their default states. When $\overline{RST}$ is not used, connect the pin to VDD.</td></tr>
<tr><td>3</td><td>CD</td><td>Select Command or Display Data for read/write operation.<br>“L”: Command ”H”: Display data</td></tr>
<tr><td>4</td><td>$\overline{WR}$</td><td rowspan="2">$\overline{RD}$/$\overline{WR}$(WR[1:0]) controls the read/write operation of the host interface.<br>In parallel mode, RD/WR(WR[1:0]) meaning depends on whether the interface is in the 6800 mode or the 8080 mode. In serial interface modes, these two pins are not used. Connect to VSS.</td></tr>
<tr><td>5</td><td>$\overline{RD}$</td></tr>
<tr><td>6</td><td>D0(SCK)</td><td rowspan="8">Bi-directional bus for both serial and parallel host interfaces.<br>In S8 and S9 mode, connect unused pins to VDD or VSS.
<table>
<tr><th></th><th>PS=1x</th><th>Ps=0x</th></tr>
<tr><td>D0</td><td>D0</td><td>SCK</td></tr>
<tr><td>D1</td><td>D1</td><td></td></tr>
<tr><td>D2</td><td>D2</td><td>SD1</td></tr>
<tr><td>D3</td><td>D3</td><td></td></tr>
<tr><td>D4</td><td>D4</td><td></td></tr>
<tr><td>D5</td><td>D5</td><td></td></tr>
<tr><td>D6</td><td>D6</td><td></td></tr>
<tr><td>D7</td><td>D7</td><td></td></tr>
</table></td></tr>
<tr><td>7</td><td>D1</td></tr>
<tr><td>8</td><td>D2(SD1)</td></tr>
<tr><td>9</td><td>D3</td></tr>
<tr><td>10</td><td>D4</td></tr>
<tr><td>11</td><td>D5</td></tr>
<tr><td>12</td><td>D6</td></tr>
<tr><td>13</td><td>D7</td></tr>
<tr><td>14</td><td>VDD</td><td>VDD1 is the digital power supply and it should be connected to a voltage source that is no higher than VDD2&3.<br>VDD2&3 is the analog power supply and it should be connected to the same power source. Minimize the trace resistance for VDD2&3.</td></tr>
<tr><td>15</td><td>VSS</td><td>Ground.</td></tr>
<tr><td>17</td><td>PS0</td><td rowspan="2">PS[1:0] Parallel/Serial.<br>Serial modes: “LL”: serial (S8) “LH”: serial (S9)<br>Parallel modes: “HL”: 8080 “HH”: 6800</td></tr>
<tr><td>18</td><td>PS1</td></tr>
<tr><td>16</td><td>VB1+</td><td rowspan="4">LCD Bias Voltages. These are the voltage sources to provide SEG driving currents. These voltages are generated internally. Connect capacitors of CBX value between VBX+ and VBX–. The resistance of these four traces directly affects the SEG driving strength of the resulting LCD module. Minimize the trace resistance is critical in achieving high quality image.</td></tr>
<tr><td>19</td><td>VB1-</td></tr>
<tr><td>20</td><td>VB0-</td></tr>
<tr><td>21</td><td>VB0+</td></tr>
<tr><td>22</td><td>VLCD</td><td>Main LCD Power Supply. A by-pass capacitor CL is optional. When CL is used, connect CL between VLCD and VSS, and keep the trace resistance under 300 Ohm.</td></tr>
<tr><td>-</td><td>A</td><td>Anode of LED Backlight.</td></tr>
<tr><td>-</td><td>K</td><td>Cathode of LED Backlight.</td></tr>
</table>

## 4. Absolute Maximum Ratings

### 4.1 Electrical Maximum Ratings – for IC Only

Table 3

| Parameter | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Logic supply voltage | $V_{DD}$ | -0.3 | +4.0 | V |
| LCD generator supply voltage | $V_{DD2}$ | -0.3 | +4.0 | V |
| Analog circuit supply voltage | $V_{DD3}$ | -0.3 | +4.0 | V |
| Voltage difference between $V_{DD}$ and $V_{DD2/3}$ | $V_{DD2/3}$ - $V_{DD}$ | | 1.2 | V |
| LCD generated voltage | $V_{LCD}$ | -0.3 | +12 | V |
| Any input/output | $V_{IN/}$ / $V_{OUT}$ | -0.4 | $V_{DD}$ +0.3 | V |
| Operating temperature range | $T_{OPR}$ | -30 | +85 | °C |
| Storage temperature | $T_{STR}$ | -55 | +125 | °C |

Note:

1. $V_{DD}$ is based on $V_{SS}$ = 0V.
2. Stress values listed above may cause permanent damages to the device.

### 4.2 Environmental Condition

Table 4

| Item | Operating Temperature (Topr) | | Storage Temperature (Tstg) | | Remark |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | |
| Ambient Temperature | 0°C | +50°C | -10°C | +60°C | Dry |
| Humidity | 95% max. RH for Ta ≤ 40°C<br>< 95% RH for Ta > 40°C | | | | no condensation |
| Vibration (IEC 68-2-6) cells must be mounted on a suitable connector | Frequency: 10 ~ 55 Hz<br>Amplitude: 0.75 mm<br>Duration: 20 cycles in each direction. | | | | 3 directions |
| Shock (IEC 68-2-27) Half-sine pulse shape | Pulse duration : 11 ms<br>Peak acceleration: 981 $m/s^2$ = 100g<br>Number of shocks : 3 shocks in 3 mutually perpendicular axes. | | | | 3 directions |

## 5. Electrical Specifications

### 5.1 Typical Electrical Characteristics

At Ta = 25 °C, VDD = 3V±5%, VSS=0V.

Table 5

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Supply voltage (Logic & booster) | VDD-VSS | | 2.85 | 3.0 | 3.15 | V |
| LCD driving voltage (Built-in) | VLCD-VSS | At Ta = 0°C, Character mode, VDD = 3V,Note 1 | - | 9.5 | - | V |
| | | At Ta = +25°C, Character mode, VDD = 3V,Note 1 | 9.0 | 9.2 | 9.4 | V |
| | | At Ta = +50°C, Character mode, VDD = 3V, Note 1 | - | 8.6 | - | V |
| Input signal voltage | $V_{IH}$ | "H" level | 0.8 VDD1 | - | - | V |
| | $V_{IL}$ | "L" level | - | - | 0.2VDD1 | V |
| Supply Current (Logic & booster) | IDD | Character mode, Note 1 | - | 0.5 | 0.75 | mA |
| | | Checker board mode, Note 1 | - | 0.54 | 0.81 | mA |
| Supply Voltage of White LED05 backlight | VLED05 | Forward current =30mA | 3.4 | 3.6 | 3.8 | V |
| Luminance (on the backlight surface) of backlight | | No. of LED chips =1x2=2. | 33 | 45 | - | cd/ $m^2$ |

Note 1: There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

## 5.2 Timing Specifications

### Parallel bus timing characteristics (for 8080 MCU)

**At Ta= 0°C to +50°C**

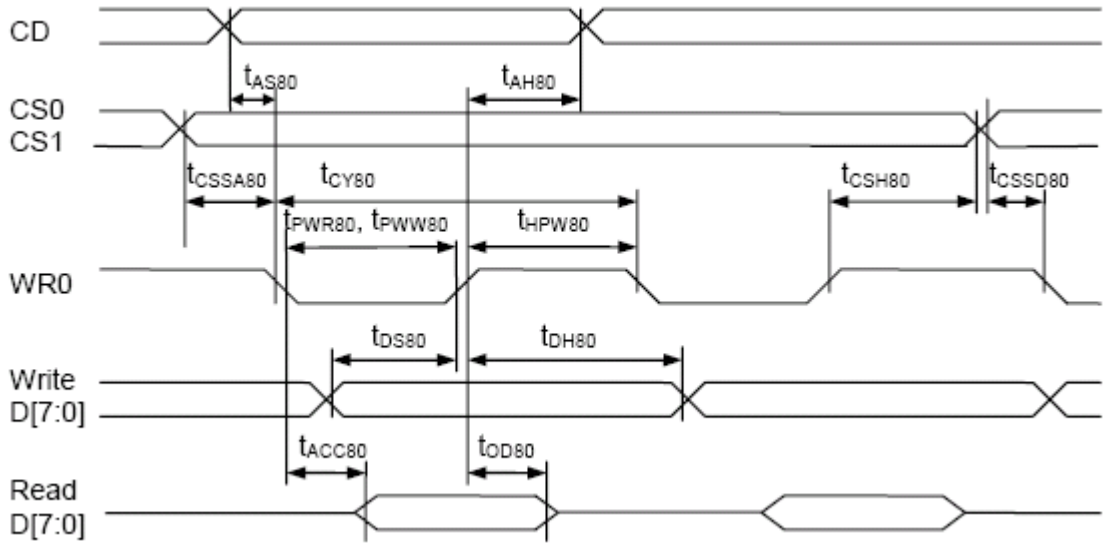



Figure: 3 Parallel Bus Timing Characteristics (for 8080 MCU)

($2.5V \leqslant V_{DD} < 3.3V$, Ta= –30 to +85°C)

| Symbol | Signal | Description | Condition | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| $t_{AS80}$<br>$t_{AH80}$ | CD | Address setup time<br>Address hold time | | 0<br>40 | – | nS |
| $t_{CY80}$ | | System cycle time | | 135 | – | nS |
| $t_{PWR80}$ | WR1 | Pulse width (read) | | 65 | – | nS |
| $t_{PWW80}$ | WR0 | Pulse width (write) | | 65 | – | nS |
| $t_{HPW80}$ | WR0, WR1 | High pulse width | | 65 | – | nS |
| $t_{DS80}$<br>$t_{DH80}$ | D0~D7 | Data setup time<br>Data hold time | | 30<br>20 | – | nS |
| $t_{ACC80}$<br>$t_{OD80}$ | | Read access time<br>Output disable time | $C_L$ = 100pF | –<br>10 | 50<br>50 | nS |
| $t_{CSSA80}$<br>$t_{CSSD80}$<br>$t_{CSH80}$ | CS1/CS0 | Chip select setup time | | 10<br>10<br>20 | | nS |

**Parallel bus timing characteristics (for 6800 MCU)**

**At Ta= 0°C to +50°C**

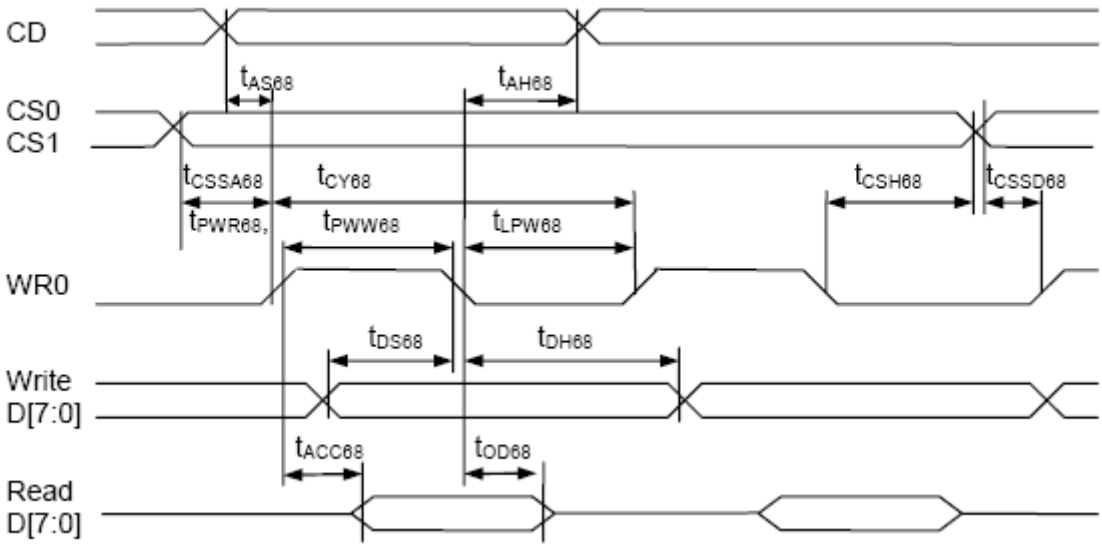



Figure: 4 Parallel Bus Timing Characteristics (for 6800 MCU)

($2.5V \leqslant V_{DD} < 3.3V$, Ta= –30 to +85°C)

| Symbol | Signal | Description | Condition | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| $t_{AS68}$<br>$t_{AH68}$ | CD | Address setup time<br>Address hold time | | 0<br>40 | – | nS |
| $t_{CY68}$ | | System cycle time | | 135 | – | nS |
| $t_{PWR68}$ | WR1 | Pulse width (read) | | 65 | – | nS |
| $t_{PWW68}$ | | Pulse width (write) | | 65 | – | nS |
| $t_{LPW68}$ | | Low pulse width | | 65 | – | nS |
| $t_{DS68}$<br>$t_{DH68}$ | D0~D7 | Data setup time<br>Data hold time | | 30<br>15 | – | nS |
| $t_{ACC68}$<br>$t_{OD68}$ | | Read access time<br>Output disable time | $C_L$ = 100pF | –<br>10 | 50<br>50 | nS |
| $T_{CSSA68}$<br>$T_{CSSD68}$<br>$T_{CSH68}$ | CS1/CS0 | Chip select setup time | | 10<br>10<br>20 | | nS |

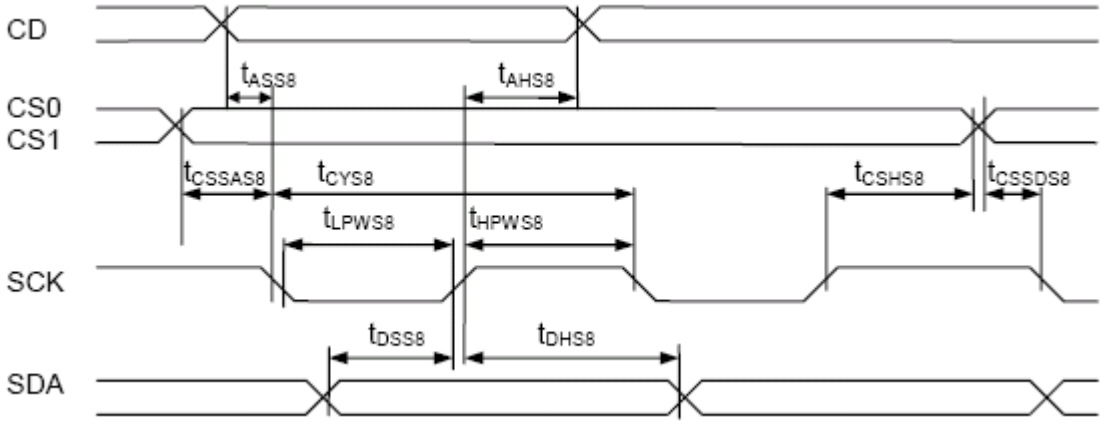



Figure: 5 Serial Bus Timing Characteristics (for S8)

($2.5V \leqslant V_{DD} < 3.3V$, Ta= –30 to +85°C)

| Symbol | Signal | Description | Condition | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| $t_{ASS8}$ | CD | Address setup time | | 0 | – | nS |
| $t_{AHS8}$ | | Address hold time | | 40 | – | nS |
| $t_{CYS8}$ | SCK | System cycle time | | 135 | – | nS |
| $t_{LPWS8}$ | | Low pulse width | | 65 | – | nS |
| $t_{HPWS8}$ | | High pulse width | | 65 | – | nS |
| $t_{DSS8}$<br>$t_{DHS8}$ | SDA | Data setup time<br>Data hold time | | 30<br>15 | – | nS |
| $t_{CSSAS8}$<br>$t_{CSSDS8}$<br>$t_{CSHS8}$ | CS1/CS0 | Chip select setup time | | 10<br>10<br>20 | | nS |

## Serial bus timing characteristics

**At Ta= 0°C to +50°C**

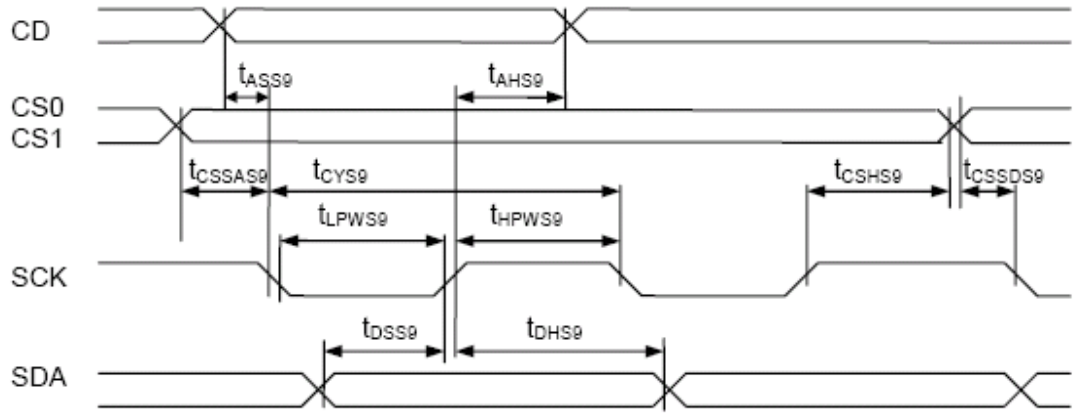



Figure: 6 Serial Bus Timing Characteristics (for S9)

($2.5V \leqslant V_{DD} < 3.3V$, Ta= –30 to +85°C)

| Symbol | Signal | Description | Condition | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| $t_{ASS9}$ | CD | Address setup time | | 0 | – | nS |
| $t_{AHS9}$ | | Address hold time | | 40 | – | nS |
| $t_{CYS9}$ | SCK | System cycle time | | 135 | – | nS |
| $t_{LPWS9}$ | | Low pulse width | | 65 | – | nS |
| $t_{HPWS9}$ | | High pulse width | | 65 | – | nS |
| $t_{DSS9}$<br>$t_{DHS9}$ | SDA | Data setup time<br>Data hold time | | 30<br>15 | – | nS |
| $t_{CSSAS9}$<br>$t_{CSSDS9}$<br>$t_{CSHS9}$ | CS1/CS0 | Chip select setup time | | 10<br>10<br>20 | | nS |

## Serial bus timing characteristics

**At Ta= 0°C to +50°C**

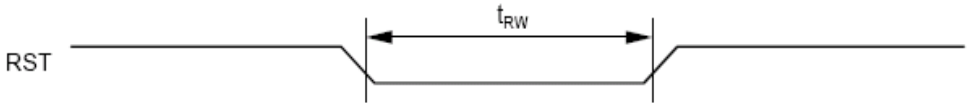



Figure: 7 Reset Characteristics

($2.4V \leqslant V_{DD} < 3.3V$, Ta= –30 to +85°C)

| Symbol | Signal | Description | Condition | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| $t_{RW}$ | RST | Reset low pulse width | | 1 | – | µS |

## 6. Appendix –LED Specifications

### 6.1. 极限参数 ABSOLUTE MAXIMUM RATINGS

(除非特别说明,环境温度 Ta=25°C. Unless specified,The Ambient temperature Ta=25°C)

| 项目 Item | 符号 Symbel | 条件 Conditions | 值 Rating | 单位 Unit |
|---|---|---|---|---|
| * 极限直流正向电流 Absolute maximum forward current | Ifm | | 25x2 | mA |
| * 脉冲驱动时极限正向电流 Peak forward current | Ifp | 1 msec脉冲,1/10占空比 1 msec Plus 10% Duty Cycle | 60x2 | mA |
| 反向电压 Reverse Voltage | Vr | | 5 | V |
| * 极限功耗 Power dissipation | Pd | | 100x2 | mW |
| 工作温度 Operating Temperature Range | Topr | | -30~+70°C | °C |
| 贮存温度 Storage Temperature Range | Tstg | | -40~+80°C | °C |

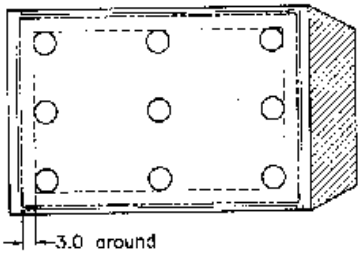
* 当工作温度高于25°C 时,Ifm,Ifp 和Pd 必须降低;电流降低率是-0.36x2 mA/°c(直流驱动),或-0.86x2 mA/°c(脉冲驱动),功耗降低率是 -0.75x2 mW/°C.产品的工作电流不能大于对应工作温度条件 Ifm或Ifp的 60 %.
For operation above 25°C,The Ifm Ifp & Pd must be derated,the Curent derating is -0.36x2 mA/°c for DC drive and -0.86x2 mA/°c for Pulse drive,the Power dissipation is -0.75x2 mW/°c. The product working current must not more than the 60 % of the Ifm or Ifp according to the working temperature.

### 6.2. 电,光特性 ELECTRICAL-OPTICAL CHARACTERISTICS

(除非特别说明,环境温度 Ta=25°C. Unless specified,The Ambient temperature Ta=25°C)

| 项目 Item | 符号 Symbol | 最小值 min. | 典型值 typ. | 最大值 max. | 单位 Unit | 测定条件 Condition |
|---|---|---|---|---|---|---|
| 正向电压 Forward Voltage | Vf | 3.4 | 3.6 | 3.8 | V | If= 15x2 mA |
| 反向电流 Reverse Current | Ir | | | 15x2 | μA | Vr= 3 V |
| 峰值波长 Peak wave length | λP | | | | nm | If= 15x2 mA |
| 频谱半宽度 Spectral Line Half width | Δλ | | | | nm | If= 15x2 mA |
| * 亮度 Luminance | Lv | 33 | 45 | | cd/m² | If= 15x2 mA |

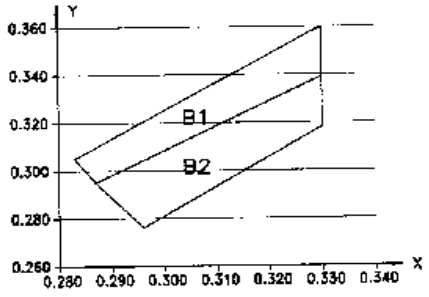
* 亮度值是 9 个测量点的平均值,亮度最大值比最小值一般小于1.5(最大 1.7).
使用BM-7亮度色度仪测量, 测量光圈φ 5 mm.
The luminance is the average value of 9 points, and The Lvmax./Lvmin. is less than 1.5 Typical (max 1.7 ). The measurement instrument is BM-7 luminance Colorimeter.The aperture is φ 5mm.



Colour Coordinate see the form.

| | Rank B1 Limiting Region | | | | Rank B2 Limiting Region | | | |
|---|---|---|---|---|---|---|---|---|
| X | 0.287 | 0.283 | 0.330 | 0.330 | 0.296 | 0.287 | 0.330 | 0.330 |
| Y | 0.295 | 0.305 | 0.360 | 0.339 | 0.276 | 0.295 | 0.339 | 0.518 |

注: 色度坐标值公差±0.01
每批出货产品的色度坐标只能在B1区或只能在B2区

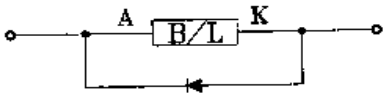



## 6.3. STATIC ELECTRICITY AND SURGE

* Static electricity and surge will damage the LEDs. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs.
* All devices, equipment and machinery must be properly grounded.
* When inspecting own final products on which LEDs were mounted, it is recommended to check also whether the mounted LEDs are damaged by static electricity or not. It is easy to find static-dimaged LEDs by light emission test at lower current (below 1mA is recommended). Damaged LEDs will show some unusual characteristics such as leak current remarkably increases, starting forward voltage becomes lower, or the LEDs get unlighted at the low current.

## 6.4. RECOMMEND CONNECTION OF STATIC-ELECTRICITY RESISTANCE

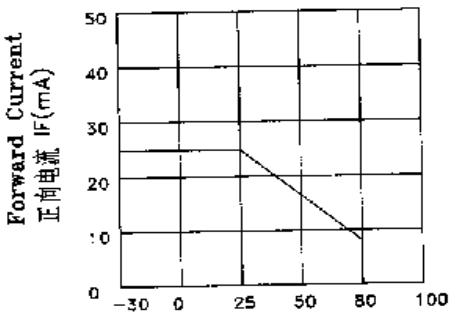
* This circuit diagram is a common ESD protection circuit for all super bright blue,white and green color LED backlight application.



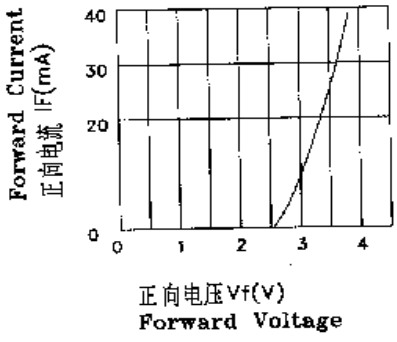

Protective Diode

## 6.5. LED ELECTRICAL CHARACTERISTICS

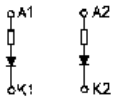
(1) 正向电流-周围温度
Forward Current VS. Ambient Temperrature




(2) 正向电流-正向电压特性
Forward Current VS. Forward Voltage




## 6.6. 电路图 CIRCUIT DIAGRAM (LED 2x(1x1)=2 dies)



**7. LCD Cosmetic Conditions**

a.) Reference document follow VL-QUA-012B.

b.) LCD size of the product is small.

**8. Remark:**

a.) Identification labels will be stuck on the module without obstructing the viewing area of display,

b.) Data Modul does not responsible for any polarizer defect after the protective film has been removed from the display.

- END -