



DOCUMENT NUMBER AND REVISION

VL-FS-MGLS12864T-73 REV. A  
(MGLS12864T-FSTN-LED05W)

DOCUMENT TITLE:

SPECIFICATION

OF

LCD MODULE TYPE

MODEL NUMBER: MGLS12864T-73

| DEPARTMENT  | NAME        | SIGNATURE        | DATE       |
|-------------|-------------|------------------|------------|
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## VARITRONIX LIMITED

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### Specification of LCD Module Type Model No.: MGLS12864T-73

#### 1. General Description

- 128 x 64 dots FSTN Positive Black & White Transflective LCD graphic module.
- Driving scheme: 1:64 multiplexed drive, 1/9 bias.
- Viewing direction: 6 O'clock.
- 'TOSHIBA' T6963C flat pack or equivalent LCD controller.
- 'TOSHIBA' T6A39 flat pack or equivalent LCD segment drivers.
- 'TOSHIBA' T6A40 flat pack or equivalent LCD common driver.
- 8K bytes display SRAM.
- 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 | 78.0(W) x 70.0(H) x 13.5 MAX.(D) (Excluded cable) | mm   |
| Viewing area       | 62.0(W) x 44.0(H)                                 | mm   |
| Active area        | 56.27(W) x 38.35(H)                               | mm   |
| Display format     | 128(Horizontal) x 64(Vertical)                    | dots |
| Dot size           | 0.39(W) x 0.55(H)                                 | mm   |
| Dot spacing        | 0.05(W) x 0.05(H)                                 | mm   |
| Dot pitch          | 0.44(W) x 0.60(H)                                 | mm   |
| Weight             | TBD   | gram |





### 3. Interface signals

Table 2

| Pin No. | Symbol        | Description  |
|---------|---------------|--|
| 1       | FG            | Frame ground (see note 1)  |
| 2       | VSS           | Ground (0V)  |
| 3       | VDD           | Power supply for logic (+5V)   |
| 4       | V0            | Power supply for LCD drive   |
| 5       | /WR           | Command/Data write to module when "Low"  |
| 6       | /RD           | Command/Data read from module when "Low"   |
| 7       | /CE           | Chip enable of controller when "Low"   |
| 8       | C / $\bar{D}$ | Command/Data read/write.<br>"High" for command read/write and<br>"Low" for data read/write |
| 9       | /RST          | Controller reset when "Low"  |
| 10      | DB0           | Data input/output (LSB)  |
| 11      | DB1           | Data input/output  |
| 12      | DB2           | Data input/output  |
| 13      | DB3           | Data input/output  |
| 14      | DB4           | Data input/output  |
| 15      | DB5           | Data input/output  |
| 16      | DB6           | Data input/output  |
| 17      | DB7           | Data input/output (MSB)  |
| 18      | FS            | Font select.<br>"High" for 6 x 8 font &<br>"Low" for 8 x 8 font.                           |
| -       | K             | Cathode of backlight   |
| -       | A             | Anode of backlight   |

Note 1: This pin is electrically connected to the metal bezel (frame).  
User can choose to connect this pin to VSS or leave it open.



#### 4. Absolute Maximum Ratings

##### 4.1 Electrical Maximum Ratings (Ta = 25 °C)

Table 3

| Parameter                       | Symbol        | Min. | Max.     | Unit |
|---------------------------------|---------------|------|----------|------|
| Supply voltage<br>(Logic & LCD) | VDD - VSS     | -0.3 | +7.0     | V    |
| Supply voltage (LCD drive)      | VLCD=VDD - V0 | -0.3 | +28.0    | V    |
| Input voltage                   | Vin           | -0.3 | VDD +3.0 | V    |

Note:

The modules may be destroyed if they are used beyond the absolute maximum ratings.

All voltage values are referenced to VSS = 0V.

##### 4.2 Environmental Condition

Table 4

| Item   | Operating Temperature<br>(Topr)  |       | Storage Temperature<br>(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)<br>cells must be mounted<br>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)<br>Half-sine pulse shape                               | Pulse duration : 11 ms<br>Peak acceleration: 981 m/s <sup>2</sup> = 100g<br>Number of shocks : 3 shocks in 3<br>mutually perpendicular axes. |       |                               |       | 3 directions    |



## 5. Electrical Specifications

### 5.1 Typical Electrical Characteristics

At  $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{DD} = 5V \pm 5\%$ ,  $V_{SS} = 0V$ .

Table 5

| Parameter                               | Symbol                   | Conditions   | Min.           | Typ. | Max.     | Unit |
|---|--------------------------|--|----------------|------|----------|------|
| Supply voltage (Logic)                  | $V_{DD} - V_{SS}$        |  | 4.75           | 5.00 | 5.25     | V    |
| Supply voltage (LCD)                    | $V_{LCD} = V_{DD} - V_0$ | $V_{DD} = 5V$ , Note 1   | 9.7            | 10.2 | 10.7     | V    |
| Input signal voltage                    | $V_{IN}$                 | “H” level  | $V_{DD} - 2.2$ | -    | $V_{DD}$ | V    |
|   |                          | “L” level  | 0              | -    | 0.8      | V    |
| Supply current (Logic & LCD)            | $I_{DD}$                 | Character mode, $V_{DD} = 5V$ , Note 1                             | -              | 6.5  | 9.8      | mA   |
|   |                          | Checker board mode, $V_{DD} = 5V$ , Note 1                         | -              | 6.6  | 9.9      | mA   |
| Supply current (LCD)                    | $I_0$                    | Character mode, $V_{DD} = 5V$ , Note 1                             | -              | 2.2  | 3.3      | mA   |
|   |                          | Checker board mode, $V_{DD} = 5V$ , Note 1                         | -              | 2.2  | 3.3      | mA   |
| Supply voltage of white LED05 backlight | $V_{LED05}$              | Forward current = 40 mA<br>Number of LED dies = $1 \times 2 = 2$ . | 3.1            | 3.4  | 3.6      | V    |

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





## 5.2 Timing Specifications

At  $T_a = 0^\circ\text{C}$  To  $+50^\circ\text{C}$ ,  $V_{DD} = 5V \pm 5\%$ ,  $V_{SS} = 0V$

Refer to Fig. 2, the bus timing diagram.

Table 6

| Parameter                 | Symbol                   | Min. | Max. | Unit |
|---------------------------|--------------------------|------|------|------|
| C/D Set-up time           | $t_{CDS}$                | 100  | -    | ns   |
| C/D Hold Time             | $t_{CDH}$                | 10   | -    | ns   |
| /CE, /RD, /WR Pulse Width | $t_{CE}, t_{RD}, t_{WR}$ | 80   | -    | ns   |
| Data Set-up Time          | $t_{DS}$                 | 80   | -    | ns   |
| Data Hold Time            | $t_{DH}$                 | 40   | -    | ns   |
| Access Time               | $t_{ACC}$                | -    | 150  | ns   |
| Output Hold Time          | $t_{OH}$                 | 10   | 50   | ns   |

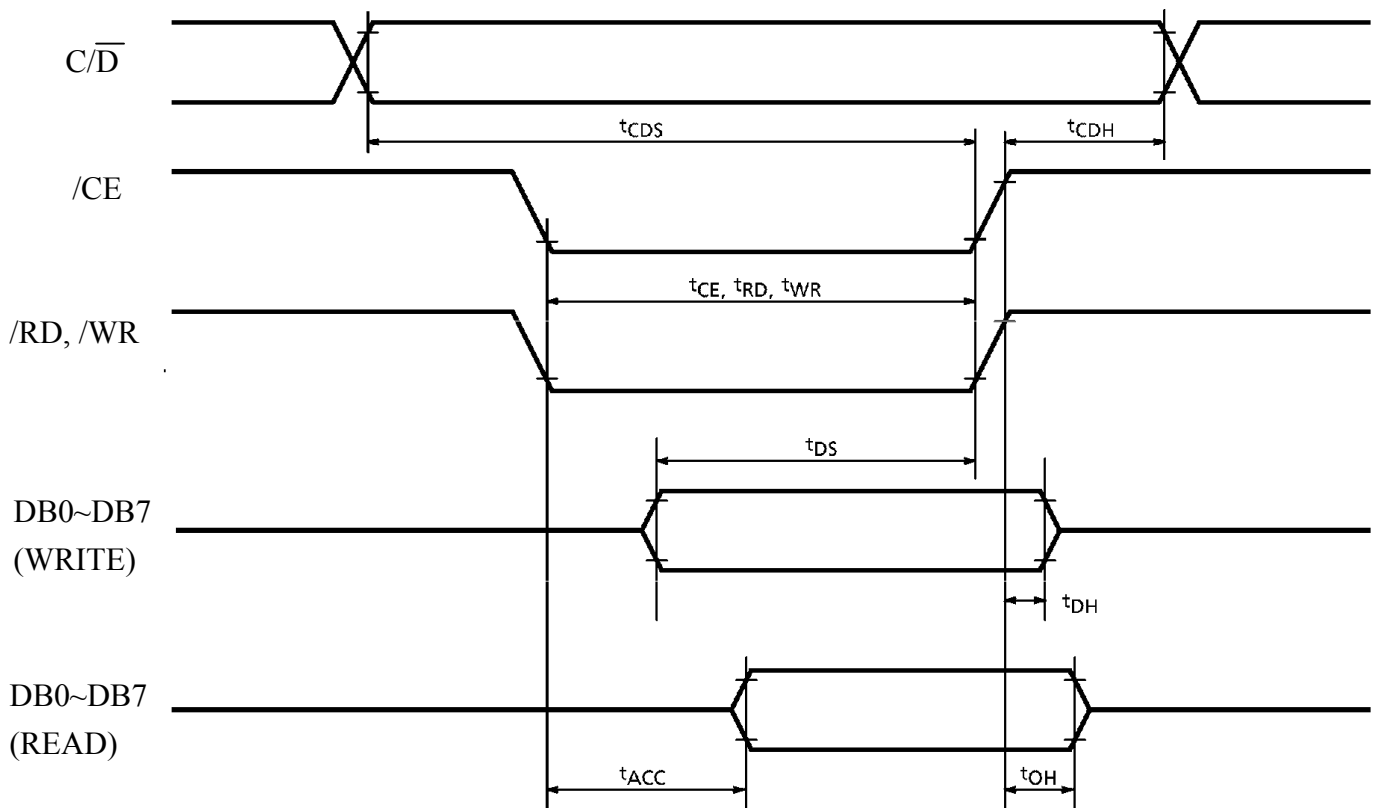


Figure 2: Bus Timing Diagram



### 5.3 Timing Diagram of VDD Against V0.

Power on sequence shall meet the requirement of Figure 3, the timing diagram of VDD against V0.

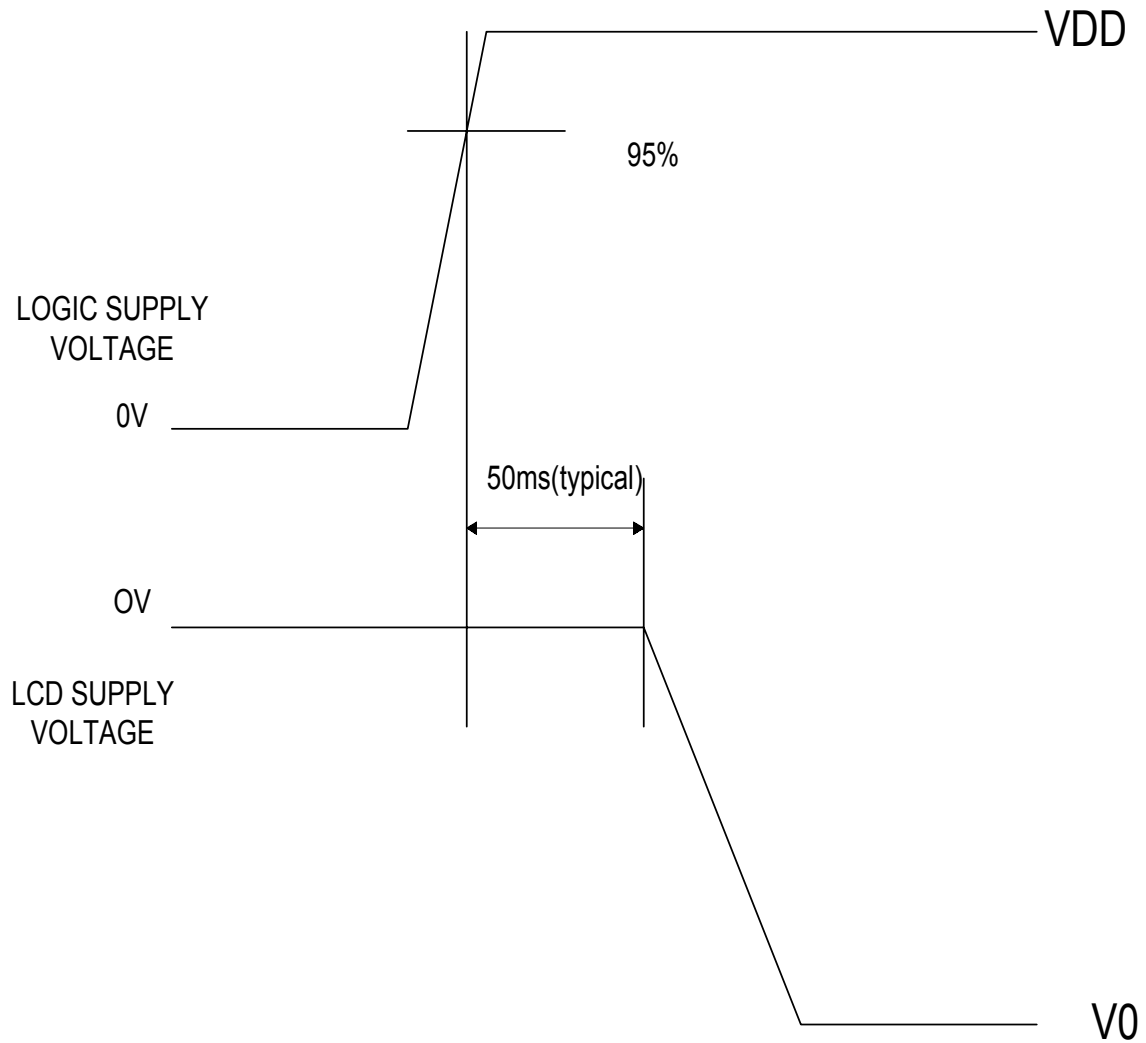
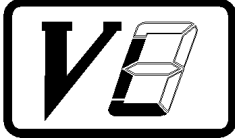


Figure 3: Timing Diagram of VDD Against V0.



6. APPENDIX – LED SPECIFICATION

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<br>Item                                     | 符号<br>Symbol | 条件<br>Conditions                                  | 值<br>Rating | 单位<br>Unit |
|--|--------------|---|-------------|------------|
| * 极限直流正向电流<br>Absolute maximum forward current | Ifm          |   | 25x2        | mA         |
| * 脉冲驱动时极限正向电流<br>Peak forward current          | Ifp          | 1 msec 脉冲, 1/10 占空比<br>1 msec Plus 10% Duty Cycle | 60x2        | mA         |
| 反向电压<br>Reverse Voltage                        | Vr           |   | 5           | V          |
| * 极限功耗<br>Power dissipation                    | Pd           |   | 75x2        | mW         |
| 工作温度<br>Operating Temperature Range            | Topr         |   | -30~+70°C   | °C         |
| 贮存温度<br>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 Current 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.

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<br>Item                        | 符号<br>Symbol | 最小值<br>min. | 典型值<br>typ. | 最大值<br>max. | 单位<br>Unit | 测定条件<br>Condition |
|-----------------------------------|--------------|-------------|-------------|-------------|------------|-------------------|
| 正向电压<br>Forward Voltage           | Vf           | 3.3         | 3.5         | 3.8         | V          | If= 20x2 mA       |
| 反向电流<br>Reverse Current           | Ir           |             |             | 15X2        | μA         | Vr= 3 V           |
| 峰值波长<br>Peak wave length          | λP           |             |             |             | nm         | If= 20x2 mA       |
| 频谱半宽度<br>Spectral Line Half width | Δλ           |             |             |             | nm         | If= 20x2 mA       |
| * 亮度<br>Luminance                 | Lv           | 130         | 170         |             | cd/m²      | If= 20x2 mA       |

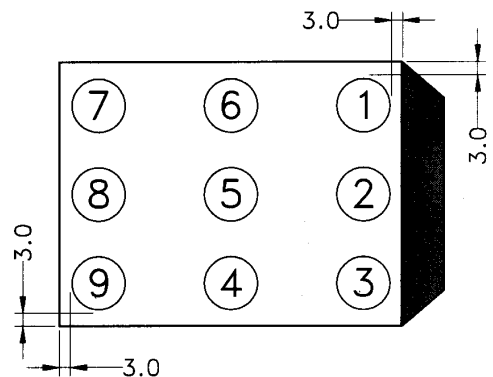
Color Ranks

|   | Rank b1 |       |       |       |
|---|---------|-------|-------|-------|
| X | 0.287   | 0.283 | 0.330 | 0.330 |
| Y | 0.295   | 0.305 | 0.360 | 0.339 |

|   | Rank b2 |       |       |       |
|---|---------|-------|-------|-------|
| X | 0.296   | 0.287 | 0.330 | 0.330 |
| Y | 0.276   | 0.295 | 0.339 | 0.318 |

\* 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 2.5 (最大 2.8). 使用 BM-7 亮度色度仪测量, 测量光圈 φ 10 mm.

The luminance is the average value of 9 points, and The Lvmax./Lvmin. is less than 2.5 Typical (max 2.8). The measurement instrument is BM-7 luminance Colorimeter. The aperture is φ 10 mm.



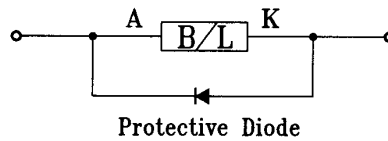


### 3. STATIC ELECTRICITY AND SURGE

- \* 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-damaged 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.

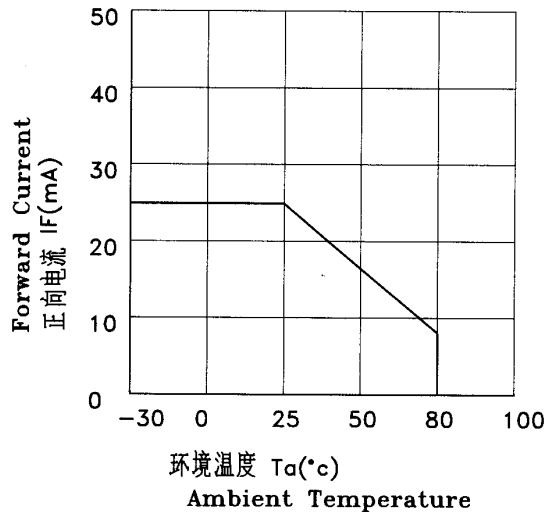
### 4. RECOMMEND CONNECTION OF STATIC-ELECTRICITY RESISTANCE

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

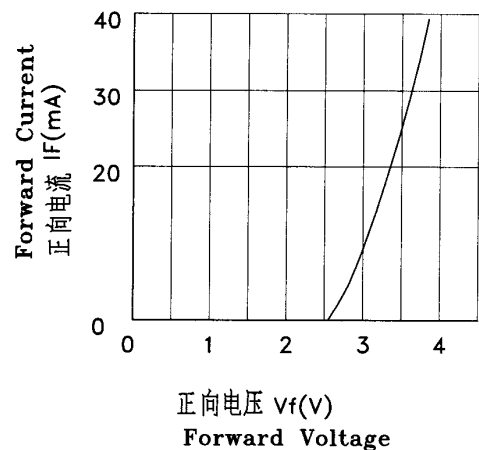


### 5. LED ELECTRICAL CHARACTERISTICS

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

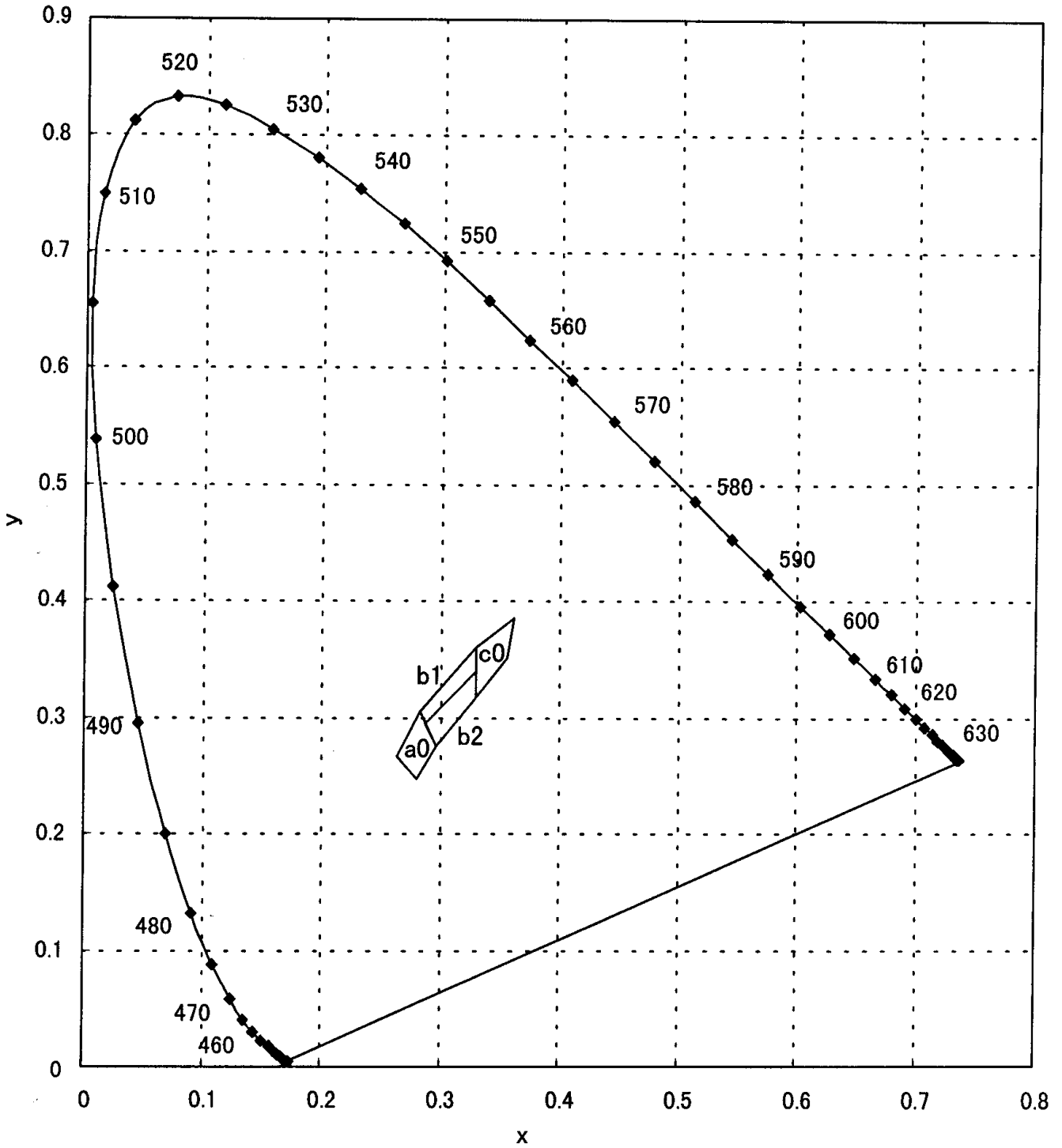


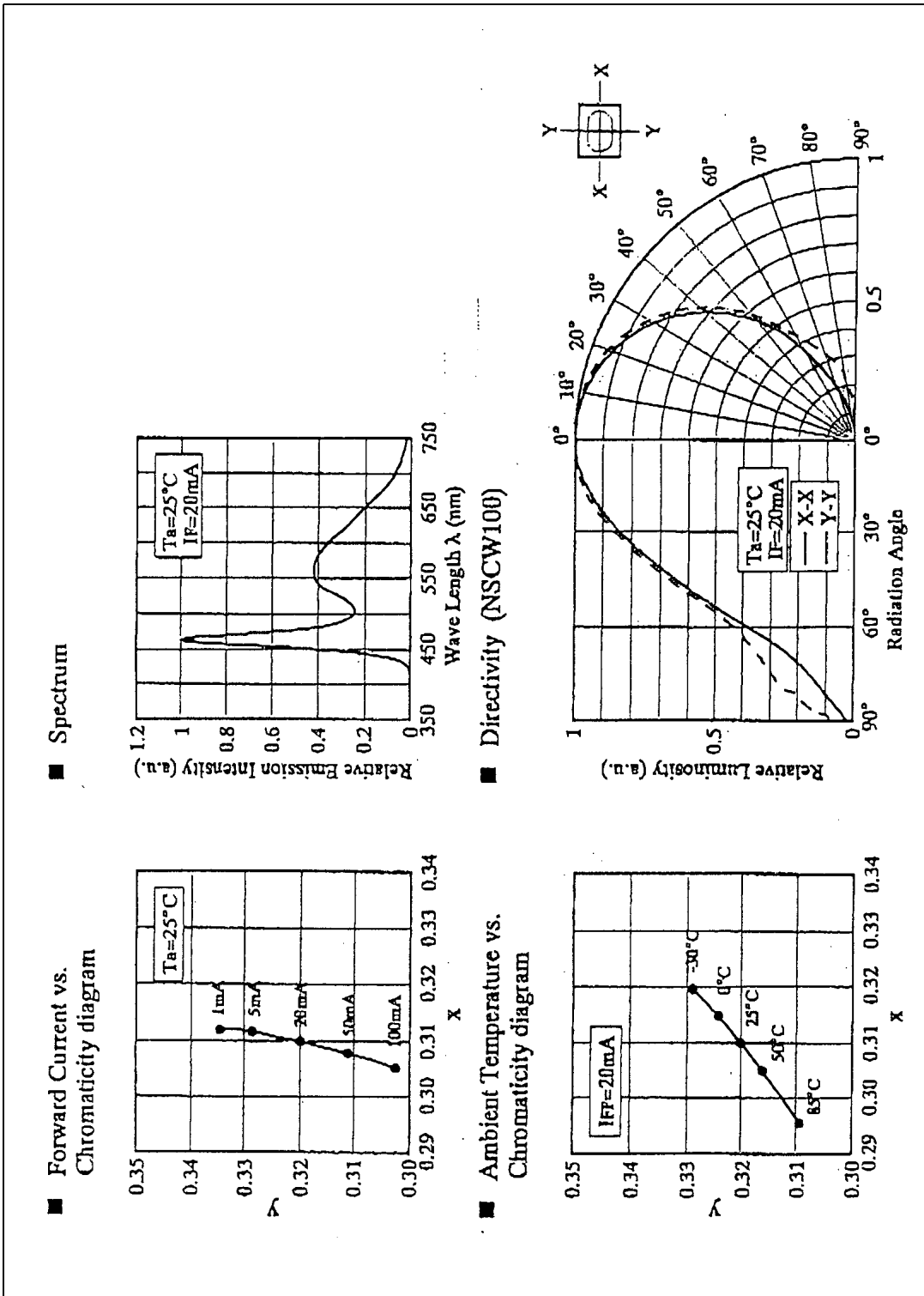
(2) 正向电流-正向电压特性  
Forward Current VS. Forward Voltage





### ICI Chromaticity Diagram





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