# DATA IMAGE CORPORATION

## TFT Module Specification
### Preliminary
ITEM NO.: FG050052DSSWBGT1

**Table of Contents**

| Customer Companies | R&D Dept. | Q.C. Dept. | Eng. Dept. | Prod. Dept. |
|---|---|---|---|---|
| | JACK | ERIC | KEN | HUANG |
| Approved by | Version: | Issued Date: | Sheet Code: | Total Pages: |
| | 3 | 2009/02/09 | | 25 |

## 2. RECORD OF REVISION

| Rev | Date | Item | Page | Comment |
|---|---|---|---|---|
| 1 | 17/JUN/08 | | | Initial preliminary |
| 2 | 13/AUG/08 | 16,17 | 24,25 | 1. Modify OUTLINE DRAWING from Rev:1 to Rev:2<br>2. Add PACKAGE INFORMATION. |
| 3 | 09/FEB/09 | 17 | 25 | Modify PACKAGE INFORMATION |
| | | | | |

## 3. APPLICATION

Digital equipments which need color display, such as P.O.S, medical equipments and industrial equipments.

## 4. GENERAL SPECIFICATIONS

| Parameter | Specifications | Unit |
|---|---|---|
| Display resolution | (800X R.G.B) (W) x480(H) | dot |
| Active area | 108(W) x 64.8(H) | mm |
| Screen size | 5.0(Diagonal) | inch |
| Dot pitch | 0.045(W) x 0.135(H) | mm |
| Color configuration | R.G.B. Stripe | |
| Overall dimension | 118.1(W) x 77(H) x 4.36 (T) | mm |
| Weight | 87 | g |
| Surface treatment | Anti-Glare | |
| View Angle direction | 6 o'clock | |
| Our components and processes are compliant to RoHS standard | | |

## 5. ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | MIN. | MAX. | Unit | Remark |
|---|---|---|---|---|---|
| Power supply voltage | Vcc | -0.3 | 5.0 | V | |
| Logic input voltage | VI | -0.3 | 5.0 | V | |
| LED Power Supply voltage | $V_{LED}$ | -0.3 | 6 | V | |
| Operating temperature | Top | -20 | +70 | °C | Ambient temperature |
| Storage temperature | Tst | -30 | +80 | °C | Ambient temperature |

## 6. ELECTRICAL CHARACTERISTICS

GND=0V,CLK=33.26MHz,Ta=25°C

| Parameter | Symbol | MIN. | Typ. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|
| Power Supply voltage for LCD | $V_{CC}$ | +3.0 | +3.3 | +3.6 | V | |
| Power Supply Current for LCD | $I_{CC}$ | | 95 | 125 | mA | $V_{CC}$ =3.3V |
| Power Supply voltage for LED | $V_{LED}$ | 4.5 | 5 | 5.5 | V | |
| Power Supply Current for LED | $I_{LED}$ | -- | 300 | 390 | mA | $V_{LED}$ =5.0V |
| Ripple voltage | $V_{RF}$ | -- | -- | 100 | $mV_{P-P}$ | |
| "H" level logical input voltage | $V_{IH}$ | 0.7Vcc | -- | Vcc | V | |
| "L" level logical input voltage | $V_{IL}$ | 0 | -- | 0.3Vcc | V | |
| ADJ frequency | | 19K | 20K | 21K | Hz | |
| ADJ input voltage | VIH | 3.0 | - | 3.3 | V | |
| | VIL | 0 | - | 0.3 | V | |
| LED dice life time | | -- | 50000 | -- | Hr | Note 1 |

Note 1: The "LED dice life time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25 and ADJ = 3.3V.

# 7. BLOCK DIAGRAM
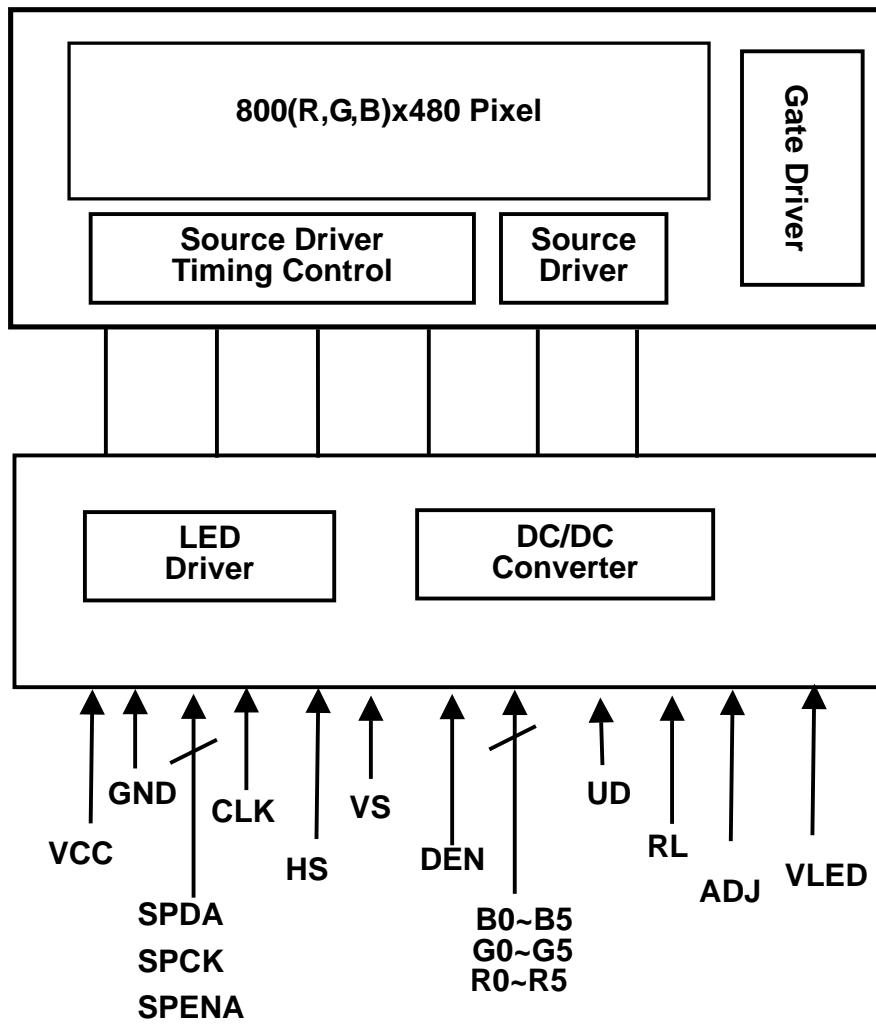
## 8. PIN CONNECTIONS

| No | Symbol | I/O | Description |
|---|---|---|---|
| 1 | GND | I | Ground. |
| 2 | VCC | I | Digital power. 3V – 3.6V. |
| 3 | VCC | I | Digital power. 3V – 3.6V. |
| 4 | RESETB | I | Hardware global reset. Low active. Default pull high. |
| 5 | UD | I | UP/Down scan setting.<br>When UD="H", down to up.<br>When UD="L", up to down. |
| 6 | RL | I | The shift direction of device internal shift register is controlled by this Pin as shown below:<br>RL="H", left to right<br>RL="L", right to left |
| 7 | SPENA | I | Serial port data enable signal. Default pull high. |
| 8 | SPCK | I | Serial port clock. Default pull high. |
| 9 | SPDA | I | Serial port data input. Default pull high |
| 10 | GND | I | Ground. |
| 11 | B5 | I | Blue data(5:0). B5 is MSB, B0 is LSB. |
| 12 | B4 | I | |
| 13 | B3 | I | |
| 14 | B2 | I | |
| 15 | B1 | I | |
| 16 | B0 | I | |
| 17 | GND | I | Ground. |
| 18 | G5 | I | Green data (5:0).G5 is MSB, G0 is LSB. |
| 19 | G4 | I | |
| 20 | G3 | I | |
| 21 | G2 | I | |
| 22 | G1 | I | |
| 23 | G0 | I | |
| 24 | GND | I | Ground. |
| 25 | R5 | I | Red data (5:0).R5 is MSB, R0 is LSB. |
| 26 | R4 | I | |
| 27 | R3 | I | |
| 28 | R2 | I | |
| 29 | R1 | I | |
| 30 | R0 | I | |

| No | Symbol | I/O | Description |
|----|--------|-----|-------------|
| 31 | GND | I | Ground. |
| 32 | CLK | I | Clock signal. |
| 33 | HS | I | Horizontal sync. |
| 34 | VS | I | Vertical sync. |
| 35 | DEN | I | Input data enable control. Normally pull low. |
| 36 | STB | I | Standby mode control. Default pull high<br>When STB="L", TCON and source driver are off .<br>When STB="H", all the functions are on. |
| 37 | VLED | I | Power supply of LED back light. |
| 38 | VLED | I | Power supply of LED back light. |
| 39 | ADJ | I | Brightness control for LED B/L. |
| 40 | GND | I | Ground. |

Note1: ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.
Note2: ADJ signal is 0~3.3V.Operation frequency is 20KHz.
Note3: GND PIN must be grounding, can not be floating.
Note 4: UD and LR control Function

| LR | UD | Function |
|----|----|----------|
| 1 | 0 | Normally display |
| 0 | 0 | Left and Right opposite |
| 1 | 1 | Up and Down opposite |
| 0 | 1 | Left and Right opposite    Up and Down opposite |

Note 5: If DEN signal is fixed low, SYNC mode is used. Otherwise, DE mode is used.

**8.1 Power Signal Sequence**
Remarks:
*1) Power Signal sequence:
t1 ≤10ms : 1 sec≤ t5
50ms≤ t2 : 200ms ≤t6
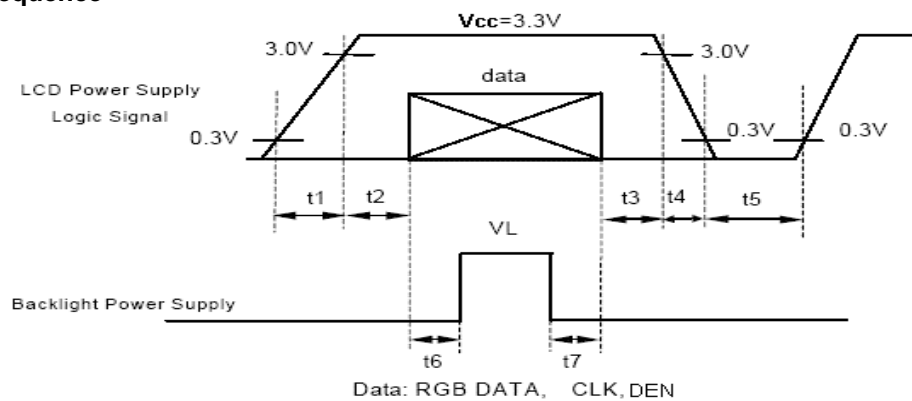0<t3 ≤50ms: 200ms≤ t7
0<t4 ≤10ms



*2) VCC-dip condition:
  (1) 2.7 V  ≤VCC <3.0V,td ≤ 10 ms
  (2) VCC  3.0V,VCC-dip
    condition should be the same
    with VCC-turn-on condition
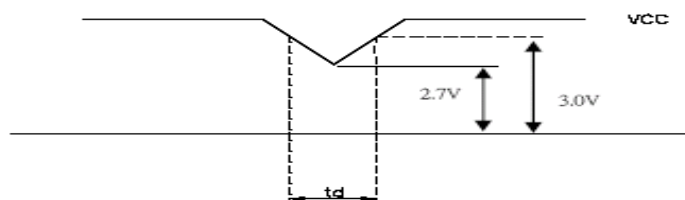
# 9. INTERFACE SPECIFICATIONS

### 9.1 Input Signal Characteristics

#### 9.1.1 AC Electrical Characteristics

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| HS setup time | $T_{hst}$ | 6 | - | - | ns |
| HS hold time | $T_{nhd}$ | 6 | - | - | ns |
| VS setup time | $T_{vst}$ | 6 | - | - | ns |
| VS hold time | $T_{vhd}$ | 6 | - | - | ns |
| Data setup time | $T_{dsu}$ | 6 | - | - | ns |
| Data hold time | $T_{dhd}$ | 6 | - | - | ns |
| DEN setup time | $T_{esu}$ | 6 | - | - | ns |
| DEN setup time | $T_{esu}$ | 6 | - | - | ns |

### 9.1.2 Resolution 800x480

● **Sync mode**

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| CLK frequency | $F_{CPH}$ | - | 33.26 | - | MHz |
| CLK period | $T_{CPH}$ | - | 30.06 | - | ns |
| CLK pulse duty | $T_{CWH}$ | 40 | 50 | 60 | % |
| HS period | $T_H$ | - | 1056 | - | $T_{CPH}$ |
| HS pulse width | $T_{WH}$ | 1 | 128 | - | $T_{CPH}$ |
| HS-first horizontal data time | $T_{HS}$ | STHD[7:0]+88(i) | | | $T_{CPH}$ |
| HS Active Time | $T_{HA}$ | - | 800 | - | $T_{CPH}$ |
| VS period | $T_V$ | - | 525 | - | $T_H$ |
| VS pulse width | $T_{WV}$ | 1 | 2 | - | $T_H$ |
| VS-DEN time | $T_{VS}$ | STVD[6:0]+8 | | | $T_H$ |
| VS Active Time | $T_{VA}$ | - | 480 | - | $T_H$ |

● **DE mode**

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| CLK frequency | $F_{CPH}$ | - | 33.26 | - | MHz |
| CLK period | $T_{CPH}$ | - | 30.06 | - | ns |
| CLK pulse duty | $T_{CWH}$ | 40 | 50 | 60 | % |
| DEN period | $T_{DEH}+T_{DEL}$ | 1000 | 1056 | 1200 | $T_{CPH}$ |
| DEN pulse width | $T_{DH}$ | - | 800 | - | $T_{CPH}$ |
| DEN frame blanking | $T_{DEB}$ | 10 | 45 | 110 | $T_{DEH}+T_{DEL}$ |
| DEN frame width | $T_{DE}$ | - | 480 | - | $T_{DEH}+T_{DEL}$ |

(i)$T_{VS} + T_{VA} < T_H$

DATA IMAGE

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## . Timing Controller Timing Chart

### .. Clock and Data Input Waveforms

**Figure  Clock and Data input waveforms.**

FGDSSWBGT  REV:      Page:    /
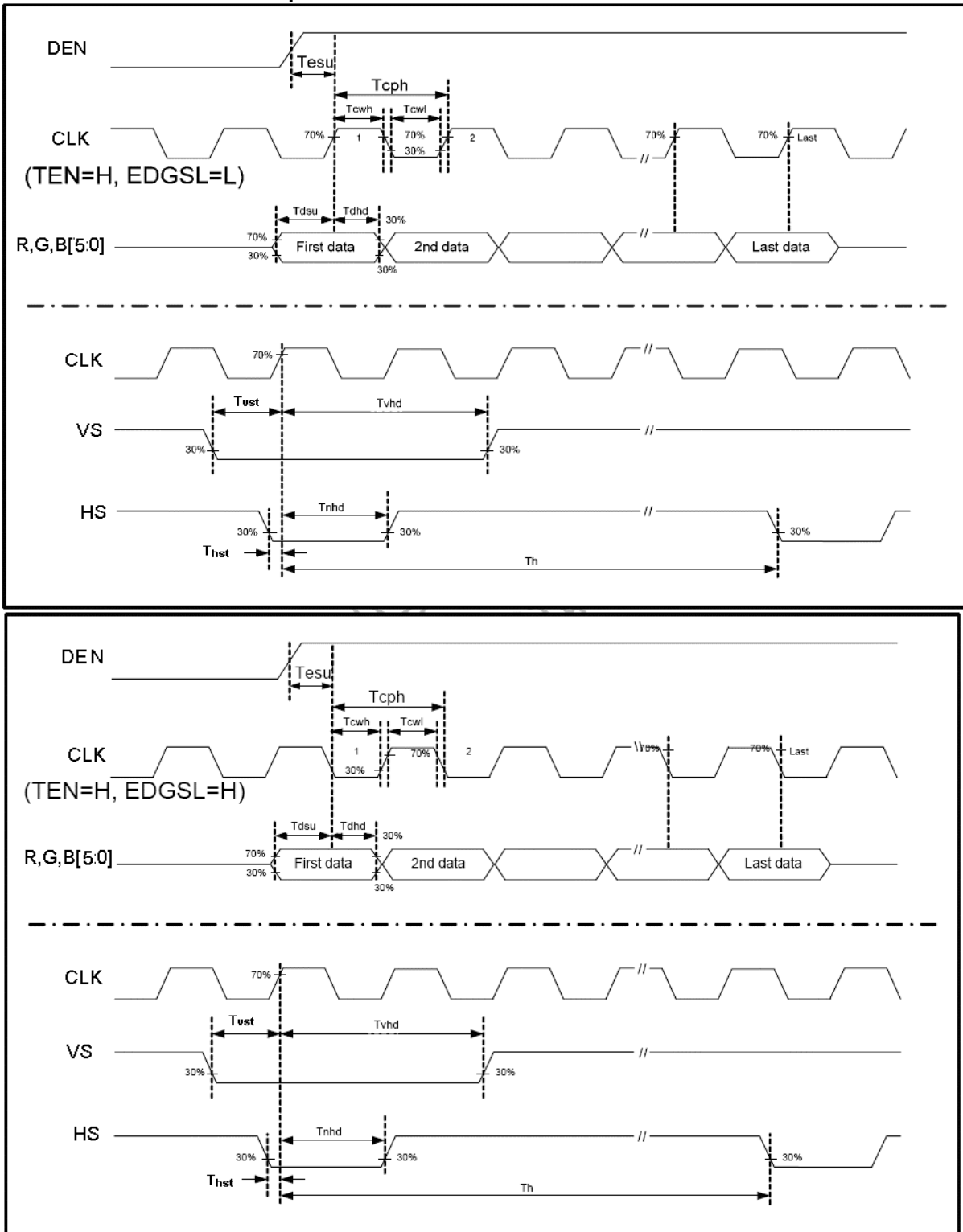
**9.2.2 Data input format**
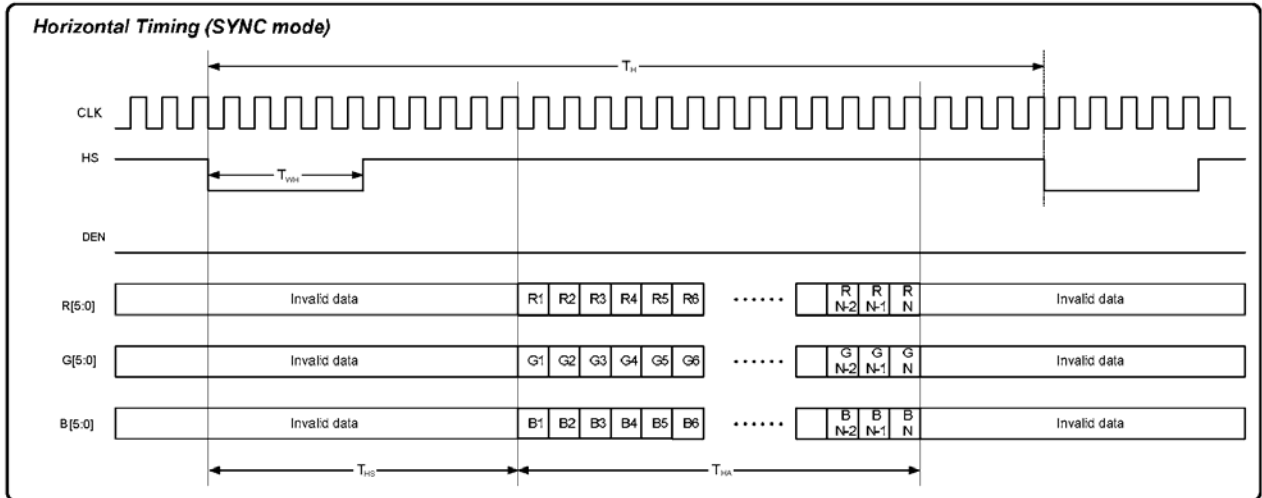


**Figure 2 SYNC Mode Horizontal Data Format**
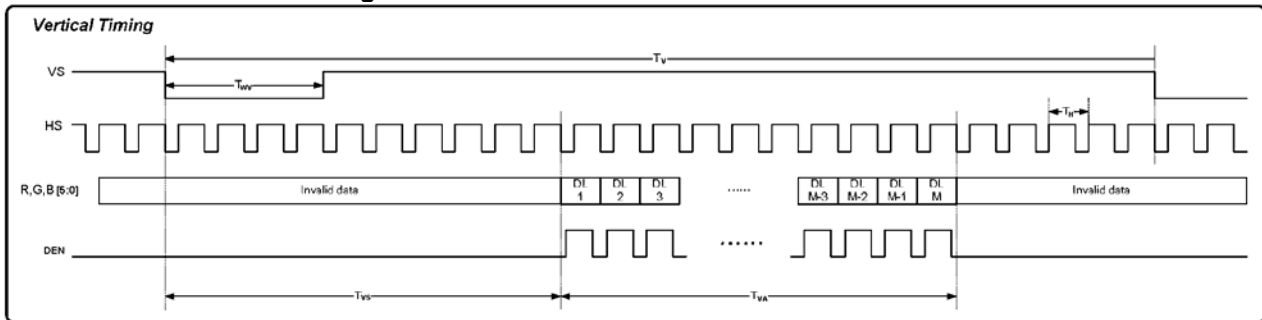


**Figure 3 SYNC Mode Vertical Data Format**
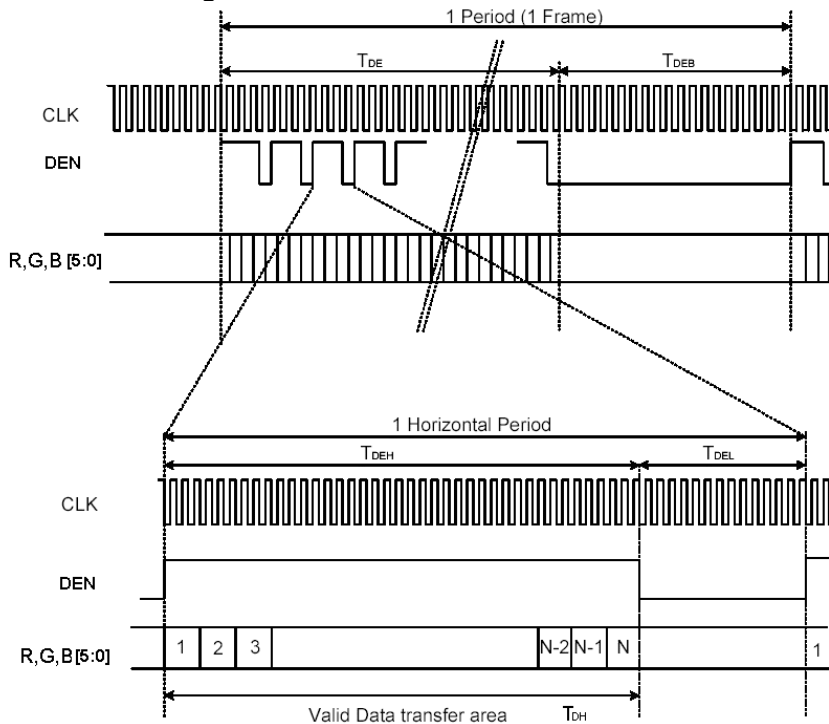


**Figure 4 DE Mode Data Format**

## 9.3 SPI Timing Characteristics

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| SPCK period | $T_{CK}$ | 60 | - | - | ns |
| SPCK high width | $T_{CKH}$ | 30 | - | - | ns |
| SPCK low width | $T_{CKL}$ | 30 | - | - | ns |
| Data setup time | $T_{SU1}$ | 12 | - | - | ns |
| Data hold time | $T_{HD1}$ | 12 | - | - | ns |
| SPENA to SPCK setup time | $T_{CS}$ | 20 | - | - | ns |
| SPENA to SPDA hold time | $T_{CE}$ | 20 | - | - | ns |
| SPENA high pulse width | $T_{CD}$ | 50 | - | - | ns |

### 9.3.1 SPI Timing (Write Data)

● SPI timing
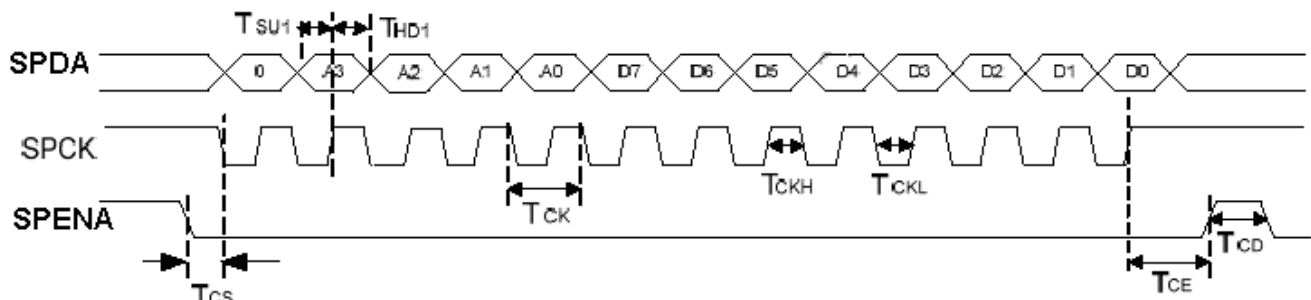


**Figure 5 SPEN must keep low more than 13 clock after SDI starting to write data.**

## 9.4 SPI Register Description

| Register Name | Test RW | Address A3 | A2 | A1 | A0 | Data D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R0 | 0 | 0 | 0 | 0 | 0 | | | | | | PSC | STB | RESETB |
| | | | | | | | | | | | 0 | 0 | 1 |
| R2 | 0 | 0 | 0 | 1 | 0 | STHD7 | STHD6 | STHD5 | STHD4 | STHD3 | STHD2 | STHD1 | STHD0 |
| | | | | | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R3 | 0 | 0 | 0 | 1 | 1 | | STVD6 | STVD5 | STVD4 | STVD3 | STVD2 | STVD1 | STVD0 |
| | | | | | | | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| R4 | 0 | 0 | 1 | 0 | 0 | | EDGSL | LR | UD | CS | FRC | VS_POL | HS_POL |
| | | | | | | | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| R5 | 0 | 0 | 1 | 0 | 1 | | | | A_TIME1 | A_TIME0 | B_TIME2 | B_TIME1 | B_TIME0 |
| | | | | | | | | | 0 | 1 | 0 | 1 | 0 |

RW must always keep low.
"_"= don`t care.

● **Register R0**

| Bit | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|
| Name | reserved | reserved | reserved | reserved | reserved | PSC | STB | RESETB |
| Default | - | - | - | - | - | 0 | 0 | 1 |

**Table 1 Register R0 setting**

PSC: Operating mode setting by input pin or SPI register.
    PSC="L", set STB, CS, EDGSL, LR, UD by input pin.
    PSC="H", set STB, CS, EDGSL, LR, UD by SPI register.
STB: Standby mode setting.
    STB="L", TCON and source driver are off.
    STB="H", all the functions are on.
RESETB: Global reset.
    RESETB="L", global reset the whole chip.
    RESETB="H", Normal operation.

● **Register R2**

| Bit | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|
| Name | STHD7 | STHD6 | STHD5 | STHD4 | STHD3 | STHD2 | STHD1 | STHD0 |
| Default | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 2 Register R2 setting**

STHD [7:0]: adjust first dot data position, $T_{HS}$= **STHD [7:0]+ N (N depend on resolution)**.

| STHD7 | STHD6 | STHD5 | STHD4 | STHD3 | STHD2 | STHD1 | STHD0 | STH position adjust | Unit |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $T_{CPH}$ |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | $T_{CPH}$ |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | $T_{CPH}$ |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | $T_{CPH}$ |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | $T_{CPH}$ |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 5 | $T_{CPH}$ |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 6 | $T_{CPH}$ |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 7 | $T_{CPH}$ |
|  |  |  |  |  |  |  |  |  |  |
| 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 88 | $T_{CPH}$ |
| 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 89 | $T_{CPH}$ |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 90 | $T_{CPH}$ |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 126 | $T_{CPH}$ |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 127 | $T_{CPH}$ |
| *1* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *128* | *$T_{CPH}$* |
|  |  |  |  |  |  |  |  |  |  |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 248 | $T_{CPH}$ |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 249 | $T_{CPH}$ |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 250 | $T_{CPH}$ |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 251 | $T_{CPH}$ |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 252 | $T_{CPH}$ |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 253 | $T_{CPH}$ |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 254 | $T_{CPH}$ |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 255 | $T_{CPH}$ |

**Table 3 Adjust start pulse position by dot**

● **Register R3**

| Bit | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|
| Name | reserved | STVD6 | STVD5 | STVD4 | STVD3 | STVD2 | STVD1 | STVD0 |
| Default | | 0 | 0 | 1 | 1 | 0 | 1 | 1 |

**Table 4 Register R3 setting**

STVD [6:0]: adjust first line position, **T$_{VS}$= STVD [6:0] + N (N depend on resolution)**.

| STVD6 | STVD5 | STVD4 | STVD3 | STVD2 | STVD1 | STVD0 | STV position adjust | Unit |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | T$_H$ |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | T$_H$ |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | T$_H$ |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | T$_H$ |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | T$_H$ |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 5 | T$_H$ |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 6 | T$_H$ |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 7 | T$_H$ |
| | | | | | | | | |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 24 | T$_H$ |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 25 | T$_H$ |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 26 | T$_H$ |
| *0* | *0* | *1* | *1* | *0* | *1* | *1* | *27* | *T$_H$* |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 28 | T$_H$ |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 29 | T$_H$ |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 30 | T$_H$ |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 31 | T$_H$ |
| | | | | | | | | |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 120 | T$_H$ |
| 1 | 1 | 1 | 1 | 0 | 0 | 1 | 121 | T$_H$ |
| 1 | 1 | 1 | 1 | 0 | 1 | 0 | 122 | T$_H$ |
| 1 | 1 | 1 | 1 | 0 | 1 | 1 | 123 | T$_H$ |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 124 | T$_H$ |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 125 | T$_H$ |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 126 | T$_H$ |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 127 | T$_H$ |

**Table 5 Adjust first line position by line**

● **Register R4**

| Bit | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|
| Name | reserved | EDGSL | LR | UD | CS | FRC | VS_POL | HS_POL |
| Default | | 0 | 1 | 0 | 1 | 1 | 0 | 0 |

**Table 6 Register R4 setting**

EDGSL: Define input clock polarity.
EDGSL="L", CLK polarity is not inverted, latch data at CLK rising edge.
EDGSL="H", CLK polarity is inverted, latch data at CLK falling edge.
LR: Shift direction control.
LR=H: DIO1->SO1->•••••->SO1200->DIO2
LR=L: DIO2->SO1200->•••••->SO1->DIO1
UD: Gate Driver Up/down scan setting.
UD=H, reverse scan.
UD=L, normal scan.
CS: Charge share function control.
CS=L, disable charge share function.
CS=H, enable charge share function.
FRC: Dithering ON/OFF control.
FRC=L, Dithering function disable.
FRC=H, Dithering function enable
VS_POL: VS polarity setting.
VS_POL=L, negative polarity.
VS_POL=H, positive polarity.
HS_POL: HS polarity setting.
HS_POL=L, negative polarity.
HS_POL=H, positive polarity.

● **Register R5**

| Bit | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|
| Name | reserved | reserved | reserved | A_TIME1 | A_TIME0 | B_TIME2 | B_TIME1 | B_TIME0 |
| Default | | | | 0 | 1 | 0 | 1 | 0 |

**Table 7 Register R5 setting**

A_TIME [1:0]: The blank image display time is decided by A_TIME

00: blank image display time is 4 VS time.

01: blank image display time is 8 VS time.

10: blank image display time is 16 VS time.

11: blank image display time is 32 VS time.

B_TIME [2:0]: When into STB mode, the blank image display time is decided by B_TIME.

000: blank image display time is 3 VS time.

001: blank image display time is 4 VS time.

010: blank image display time is 5 VS time.

011: blank image display time is 6 VS time.

100: blank image display time is 7 VS time.

101: blank image display time is 8 VS time.

110: blank image display time is 9 VS time.

111: blank image display time is 10 VS time

**9.5 Color Data Input Assignment**

| | | Data Signal | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | Green | | | | | | Blue | | | | | | |
| Color | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale of Red | Red(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(61) | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(62) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of Green | Green(0)/ Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(61) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(62) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of Blue | Blue(0)/ Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue (61) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue (62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue (63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

Correspondence between Data and Display Position

# 10. OPTICAL CHARACTERISTIC

| Parameter | | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remarks |
|---|---|---|---|---|---|---|---|---|
| Viewing Angle | Horizontal | $\theta_x+$ | Center CR≥10 | 60 | 70 | -- | deg | Note 1,4 |
| | | $\theta_x-$ | | 60 | 70 | -- | | |
| | Vertical | $\theta_Y+$ | | 40 | 50 | -- | | |
| | | $\theta_Y-$ | | 60 | 70 | -- | | |
| Contrast Ratio | | CR | at optimized viewing angle | 300 | 400 | | | Note 1,3 |
| Response time | Rise | Tr | Center | - | 15 | 30 | ms | Note 1,6 |
| | Fall | Tf | $\theta x=\theta y =0°$ | - | 35 | 50 | ms | |
| Uniformity | | B-uni | $\theta x=\theta y =0°$ | 70 | 80 | -- | % | Note1,5 |
| Center Brightness | | L | $\theta x=\theta y =0°$ ADJ=3.3V | 280 | 320 | -- | cd/ | Note 1,2 |
| Chromaticity | | $x_W$ | Center $\theta x=\theta y =0°$ | 0.273 | 0.323 | 0.373 | | Note 1,7 |
| | | $y_W$ | | 0.267 | 0.317 | 0.367 | | |
| | | $x_R$ | | 0.569 | 0.619 | 0.669 | | |
| | | $y_R$ | | 0.303 | 0.353 | 0.403 | | |
| | | $x_G$ | | 0.307 | 0.357 | 0.407 | | |
| | | $y_G$ | | 0.473 | 0.523 | 0.573 | | |
| | | $x_B$ | | 0.100 | 0.150 | 0.200 | | |
| | | $y_B$ | | 0.050 | 0.100 | 0.150 | | |
| Image sticking | | tis | 2 hours | | | 2 | Sec | Note 8 |

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C. The measurement method is shown in Note1.

Note1: The method of optical measurement:
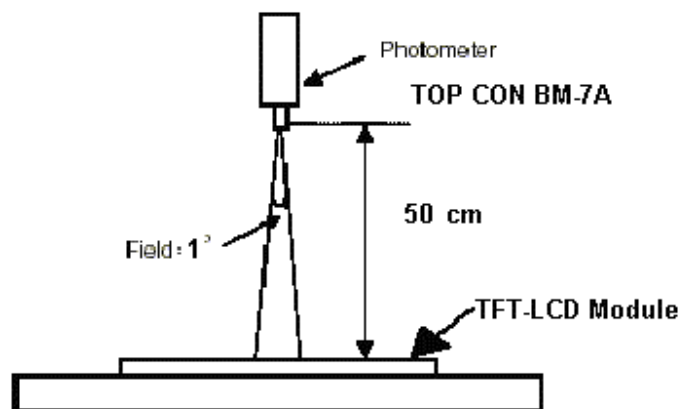
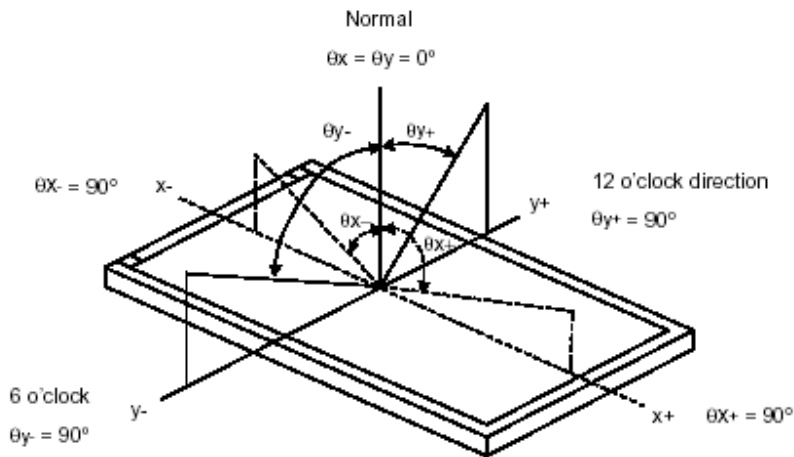Note2: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°
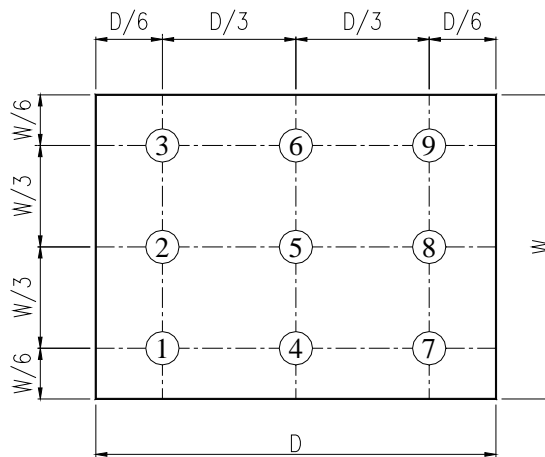
Note3: Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in Black state}}$$

Note4: Definition of Viewing Angle



Note 5: Definition of Brightness Uniformity (B-uni):



$$\text{B-uni} \quad \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9points}} \quad (\text{Note 5}).$$

Note6: Definition of Response Time:

The Response Time is set initially by defining the "Rising Time (Tr)" and the "Falling Time (Tf)" respectively. Tr and Tf are defined as following figure.

Data input | White | Black | White

Tr | Tf

100%
90%

10%
0%
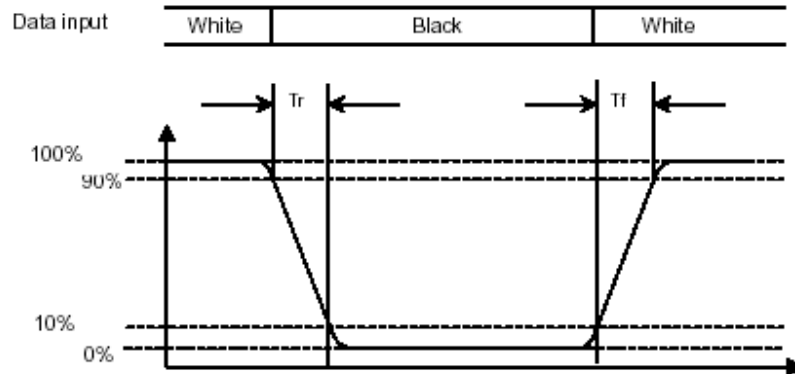
Note 7: Definition of Chromaticity:

The color coordinates $(x_W,y_W),(x_R,y_R),(x_G,y_G)$,and $(x_B,y_B)$ are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

Note 8: Definition of Image sticking (tis):

Continuously display the test pattern shown in the figure below for 2 hours. Then display a completely white screen. The previous image shall not persist more than 2 sec at 25 °C

**Image sticking pattern**

White area

Black area
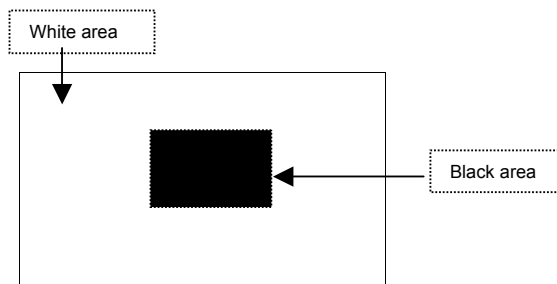
# 11. TOUCH PANEL CHARACTERISTICS

## 1. Input Method and Activation Force

| Input Method | Average Activation Force |
|---|---|
| 1.6mm dia .Silicon "finger" | 80gf Max |

## 2. Typical Optical Characteristics

| ITEM | Parameter |
|---|---|
| Visible Light Transmission | 80% (Typ) |
| Haze | 5% (Typ) |

## 3. Electrical Specification

| ITEM | | Parameter |
|---|---|---|
| Operating Voltage | | DC 7V Max |
| Contact current | | According to individual design |
| Circuit close resistance | X | 450~1500Ω |
| | Y | 70~900Ω |
| Circuit open resistance | | 20MΩ at DC 25V |
| Contact bounce | | 20ms |
| Linear Test | | 1.5% |

## 4. Linearity

| ITEM | | Parameter |
|---|---|---|
| Linear Test Specification Direction | X | 1.5% |
| | Y | 1.5% |

## 5. Specification

| ITEM | Parameter |
|---|---|
| Operating Temperature | -20°C~+70°C |
| Storage Temperature | -30°C~+80°C |

6. Durability test:

6.1 Touch panel is hit 10 millions times with a silicone rubber of R8 finger, hitting rate is by 200g at 2 times per second. The measurement must satisfy the following:
- Circuit close resistance: x450~1500Ω ; y 70~900Ω.
- Circuit open resistance: >20MΩ at DC 25V
- Contact bounce:   20ms
- Linearity test:   3.0%
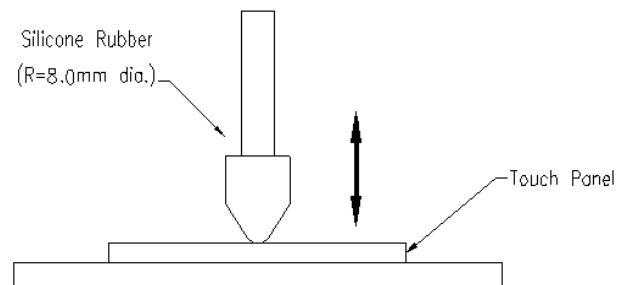


6.2 Stylus writing
Touch panel is drawn by R0.8 Darling stylus pen, at 200g forces, repeat one inch by 100k times. The measurement must satisfy the following:
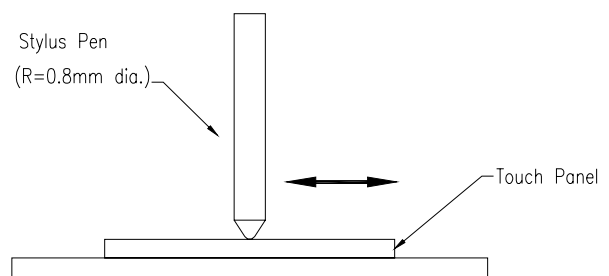- Circuit close resistance: x T450~1500Ω ; y 70~900Ω
- Circuit open resistance: >20MΩ at DC 25V
- Contact bounce:   20ms
- Linearity test:   3.0%

## 12. QUALITY ASSURANCE

### 12.1 Test Condition

12.1.1 Temperature and Humidity (Ambient Temperature)

Temperature : $25 \pm 5°C$

Humidity : $65 \pm 5\%$

12.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

12.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

12.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

12.1.5 Test Method

| No. | Reliability Test Item & Level | Test Level |
|-----|-------------------------------|------------|
| 1 | High Temperature Storage Test | T=80°C,240hrs |
| 2 | Low Temperature Storage Test | T=-30°C,240hrs |
| 3 | High Temperature Operation Test | T=70°C,240hrs |
| 4 | Low Temperature Operation Test | T=-20°C,240hrs |
| 5 | High Temperature and High Humidity Operation Test | T=60°C,90% RH,240hrs |
| 6 | Thermal Cycling Test (No operation) | -30°C → +25°C → +80°C,200 Cycles  30 min    5min      30 min |
| 7 | Vibration Test (No operation) | Frequency:0 ~ 55 Hz Amplitude:1.5 mm  Sweep Time:11min  Test Period:6 Cycles for each Direction of X,Y,Z |
| 8 | Electrostatic Discharge Test (No operation) | 150pF,330Ω  Air:± 15KV;Contact: ±8KV  10 times/point;4 points/panel face |

# 13. LOT NUMBERING SYSTEM

| 9 | 7 | 4 | 2 |

**Production week number**

**Production year**

# 14. LCM NUMBERING SYSTEM

**FG 050052 D S S W B G T1**

**VERSION: T1**

RoHS

**View direction & Temp. Range**

A– Bottom view 6H & Normal temp.

B– Bottom view 6H & Wide temp.

C–Top View & Normal temp

D–Top View & Wide temp.

J–Bottom view 6H & Super Wide temp.

**Backlight Color**

W –White   Y – Yellow Green

G - green

**Backlight**

C–CCFL B/L

S- LED B/L

**LCD Polarize type**

N–Negative   S – Super wide view or Excellent W.V

M–transmissive   F– transflective

**LCD type**

A –TFT analog

D –TFT digital

**Series code**

050052–, 5.0 inch

**Model type**

**FG–Standard TFT Module**

FX–Custom TFT Module

# 15. PRECAUTION FOR USING LCM

1.  LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handing,

(1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.

(2). Do not contact the exposed polarizers with anything harder than an HB pencil lead.   To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.

(3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.

(4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.

(5). Do not drive LCD with DC voltage.

2.  Liquid Crystal Display Modules

2.1  Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

(1). Do not tamper in any way with the tabs on the metal frame.

(2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.

(3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).

(4). When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting . Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

(5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

2.2.  Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

(1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.

(2). The modules should be kept in antistatic bags or other containers resistant to static for storage.

(3). Only properly grounded soldering irons should be used.

(4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

(5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

(6). Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2.3  Soldering

(1). Solder only to the I/O terminals.

(2). Use only soldering irons with proper grounding and no leakage.

(3). Soldering temperature :   $280°C \pm 10°C$

(4). Soldering time: 3 to 4 sec.

(5). Use eutectic solder with resin flux fill.

(6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4  Operation

(1). The viewing angle can be adjusted by varying the LCD driving voltage V0.

(2). Driving voltage should be kept within specified range; excess voltage shortens display life.

(3). Response time increases with decrease in temperature.

(4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".

(5). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

2.5  Storage

If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

2.6  Limited Warranty

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents.   The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

# 16. OUTLINE DRAWING

PRELIMINARY

118.1±0.5 (Module)
117.5 (TP outline)
110.8 (Bezel opening)
109.4 (TP A.A.) ✿: Note 7
108 (LCD A.A.)
0.6±0.5
2.2
2.9
3.6
57.6±0.5
3.3
2.6
1.9

TOP (Y+)

0.045
0.135
Scale 50/1

LEFT (X-)  RIGHT (X+)

35.7±0.5
64.8 (LCD A.A.)
66.2 (TP A.A.) ✿ Note 7
67.6 (Bezel opening)
74 (TP outline)
77±0.5(Module)

800 RGB 480 dots   BOTTOM (Y-)

4±0.5 Bending area
30±1 Area where can't be crooked
(30)
(26)
Component Area & mylar tape
H= 2.0mm MAX.
7±0.5
30±0.8
3±0.5
50±0.5
mylar tape
12±0.8
(23.3)
5±0.5
57.6±1

4.36±0.3(Total)
3.16±0.3(Module)

Up Bezel   Down Bezel
TP
Housing
Reflector
Light guide
Diffuser
Thin BEF
DBEF II
LCD
IC   PLR
LED Dice
LED FPC
TP FPC
Cover Tape
Stiffener
LCD FPC
0.3±0.05   Contact side
Stiffener
0.3±0.05   Contact side

Bar-Code

1  4
B
1    40
A
10±3   10±3

Detail A — Scale 2/1
0.1
0.5
1
0.125
0.35 +0.04 / −0.03
P0.5*(40−1)=19.5±0.1
20.5±0.1

Detail B — Scale 3/1
0.7(w)
5±0.5
1±0.1
P1.0*(4−1)=3±0.1
5±0.1

Note:
1. Center Brightness : 280 cd/m$^2$ (Min.); 320 cd/m$^2$ (Typ.)
2. Uniformity : 70% min.
3. 40 Pin Match Connector: Molex: 51296-4094 or Equivalent.
4. TP FPC Match Connector: AMP 84952-4 or Equivalent.
5. Tolerance is ±0.3 unless otherwise noted.
6. For RoHS.
7. ✿ Recommend customer's housing opening.

| TP FUNCTIONS | |
| --- | --- |
| 1 | TOP(Y+) |
| 2 | RIGHT(X+) |
| 3 | BOTTOM(Y−) |
| 4 | LEFT(X−) |

| 40 PIN FUNCTIONS | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | GND | 11 | B5 | 21 | G2 | 31 | GND |
| 2 | VCC | 12 | B4 | 22 | G1 | 32 | CLK |
| 3 | VCC | 13 | B3 | 23 | G0 | 33 | HS |
| 4 | RESETB | 14 | B2 | 24 | GND | 34 | VS |
| 5 | UD | 15 | B1 | 25 | R5 | 35 | DEN |
| 6 | RL | 16 | B0 | 26 | R4 | 36 | STB |
| 7 | SPENA | 17 | GND | 27 | R3 | 37 | VLED |
| 8 | SPCK | 18 | G5 | 28 | R2 | 38 | VLED |
| 9 | SPDA | 19 | G4 | 29 | R1 | 39 | ADJ |
| 10 | GND | 20 | G3 | 30 | R0 | 40 | GND |

DATE: 06/13/08'
DRAWN:
CHECK:
APPROVE:

TITLE: LCM OUTLINE DIMENSION
DWG. NO. FG050052S-T1
UNITS M M   REV. 2
SCALE 1 / 1   SHEET 1 OF 1
DATA IMAGE

| AUTH | DESCRIPTION | DATE | APPROVED |
| --- | --- | --- | --- |
| ⚠ | Add mylar tape. | 08/04/08' | |
| | REVISIONS | | |

## 17. PACKAGE INFORMATION

Form

Antistatic bag
Antirust
Drier
Cover tray
(Antistatic tray)
Antistatic form

LCM

Antistatic tray

Antistatic bag

Antirust
Drier

Form

Carton

Material

1  Carton + 2 Anti-static bag + 1 Form(35mm) + 1 Form(15mm)

+ 19 Anti-static tray + 2 Drier + 2 Antirust

Total pcs

1  Antistatic tray = 6  pcs

1 Anti-static bag = 9 Anti-static tray + cover tray = 9*6 +1*0 = 54 pcs

1 Anti-static bag = 8 Anti-static tray + cover tray = 8*6 +1*0 = 48 pcs

1  Carton = 2 Anti-static bag = 54+48 = 102 pcs

Carton size : 482L x 282W x 279H (mm)

Total Weight ÷ 12 kgw

## FG05005(X)  TFT LCM PACKING