



# LITEMAX AU1744

## Sunlight Readable 17" LED B/L LCD

(1st Edition 6/3/2007 )

All information is subject to change without notice.

| Approved by | Checked by | Prepared by |
|-------------|------------|-------------|
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## Record Revision

| Version and Date | Page | Old Description | New Description | Remark |
|------------------|------|-----------------|-----------------|--------|
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## Contents

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|   |    |
|---|----|
| Record Revision   | 2  |
| Contents  | 3  |
| Handling Precautions  | 4  |
| General Description   | 5  |
| Display Characteristics   | 5  |
| Optical Characteristics   | 6  |
| Optical Test  | 6  |
| Reliability   | 6  |
| Test Mode :   | 6  |
| Functional Block Diagram  | 8  |
| Absolute Maximum Ratings  | 9  |
| TFT LCD Module  | 9  |
| Backlight Unit  | 9  |
| Absolute Ratings of Environment   | 9  |
| Electrical characteristics  | 10 |
| TFT LCD Module  | 10 |
| Signal Characteristic   | 12 |
| Pixel Format Image  | 12 |
| The Input Data Format   | 12 |
| Signal Description  | 13 |
| Timing Characteristics  | 15 |
| Connector & Pin Assignment  | 18 |
| TFT LCD Module  | 18 |
| Backlight Unit  | 19 |
| Reliability Test  | 20 |
| LED Backlight Dimming & Power Consumption and Temperature Relationship Test |    |
| Report  | 21 |
| Mechanical Characteristics  | 23 |

## Handling Precautions

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- 1) Since front polarizer is easily damaged, be extremely careful when handling panel.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connectors.
- 3) Wipe off water immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on a hard surface.
- 6) Since CMOS LSI is used in this module, be careful of static electricity by grounding those handling the display.
- 7) Do not open nor modify the module assembly.
- 8) Do not press or touch the panel surface with hands or tools.
- 9) Do not press or move the reflector sheet at the back of the module in any direction.
- 10) \*\*At the insertion or removal of the signal Interface Connector, be sure not to rotate nor tilt the interface connector of the TFT module.
- 11) After installation of the TFT module into an enclosure (Desktop monitor Bezel, for example), do not twist nor bend the TFT Module even momentarily. Design the enclosure so that no bending/twisting forces are applied to the TFT module. Otherwise the TFT module may be damaged.

## General Description

This specification applies to the 17 inch Color TFT-LCD Module M170EG01 VD.

The display supports the WSXGA+ (1280(H) x 1024(V)) screen format and 16.7M colors (RGB 6-bits+Hi-RFC data).All input signals are 2 Channel LVDS interface compatible. This module does not contain an LED driving board for backlight.

## Display Characteristics

The following items are characteristics summary on the table under 25 °C condition:

| Items   | Unit                 | Specifications                       |
|---|----------------------|--------------------------------------|
| Screen Diagonal                                     | [mm]                 | 432 (17.0")                          |
| Active Area   | [mm]                 | 337.920(H) ×270.336(V)               |
| Pixels H x V  |                      | 1280 × 3(RGB) ×1024                  |
| Pixel Pitch   | [mm]                 | 0.264(per one triad) ×0.264          |
| Pixel Arrangement                                   |                      | R.G.B. Vertical Stripe               |
| Display Mode  |                      | Normally White                       |
| White Luminance                                     | [cd/m <sup>2</sup> ] | 1000 (center,Typ)                    |
| Contrast Ratio                                      |                      | 1000 : 1 (Typ)                       |
| Optical ResponseTime                                | [msec]               | 5 (Typ)                              |
| Nominal Input Voltage VDD                           | [Volt]               | +5.0 (Typ)                           |
| Power Consumption                                   | [Watt]               | 34.5W (Typ) (PDD=6W, PBL=28.5W )     |
| Weight  | [Grams]              | 2120                                 |
| Physical Size (H x V x D)                           | [mm]                 | 358.5*296.5*15.8                     |
| Electrical Interface                                |                      | Dual Channel LVDS                    |
| Surface Treatment                                   |                      | Anti-glare type, Hardness 3H         |
| Support Color                                       |                      | 16.7M colors (RGB 6-bits + FRC data) |
| Temperature Range Operating Storage (Non-Operating) | [°C] [°C]            | 0 to +50<br>-20 to + 60              |
| RoHS Compliance                                     |                      | RoHS Compliance                      |

### Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

#### Optical Test

##### Optical

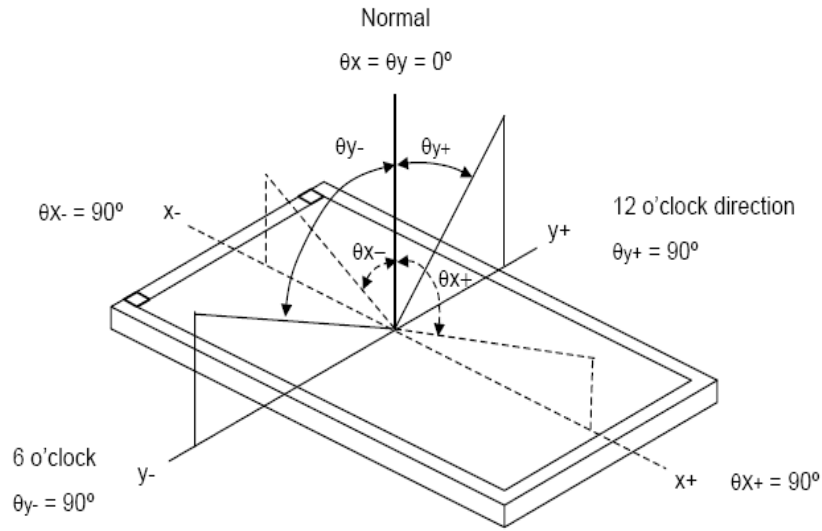
| Item               |                           | Symbol        | Condition                                  | Data   | Unit              | Note                       |
|--------------------|---------------------------|---------------|--|--------|-------------------|----------------------------|
| Color chromaticity | Red                       | Rx            | $\theta_x=0$<br>$\theta_y=0$<br>BM-7       | 0.6386 | -                 | Test Mode :<br>(1) (2) (3) |
|                    |                           | Ry            |  | 0.3548 | -                 |                            |
|                    | Green                     | Gx            |  | 0.3356 | -                 |                            |
|                    |                           | Gy            |  | 0.598  | -                 |                            |
|                    | Blue                      | Bx            |  | 0.1438 | -                 |                            |
|                    |                           | By            |  | 0.0724 | -                 |                            |
|                    | White                     | Wx            |  | 0.3236 | -                 |                            |
|                    |                           | Wy            |  | 0.3533 | -                 |                            |
|                    | Center Luminance of White |               |  | Lc     |                   |                            |
| Average            |                           | La            |  | 880    | cd/m <sup>2</sup> |                            |
| Uniform            |                           | Lu            |  | 76     | %                 |                            |
| Contrast Ratio     |                           | CR            | $\theta_x=0$<br>$\theta_y=0$<br>Klein K-10 | 1000   | -                 | Test Mode :<br>(1) (4)     |
| Color Saturation   |                           | NTSC          |  | 75     | %                 |                            |
| Viewing Angle      | Horizontal                | $\theta_{x+}$ | $CR \geq 10$                               | 80     | Deg               | Test Mode :<br>(1) (3)     |
|                    |                           | $\theta_{x-}$ |  | 80     |                   |                            |
|                    | Vertical                  | $\theta_{y+}$ |  | 80     |                   |                            |
|                    |                           | $\theta_{y-}$ |  | 80     |                   |                            |

#### Reliability

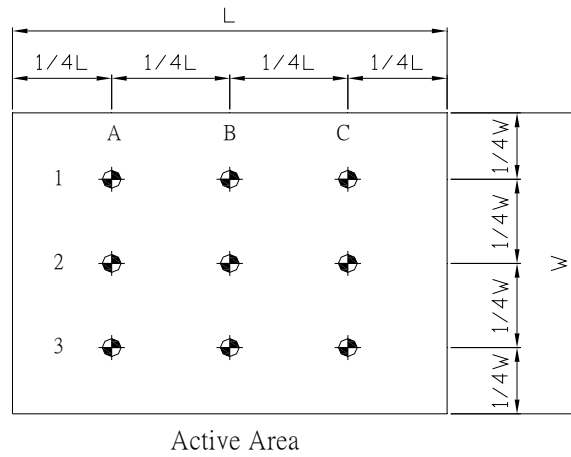
| Item                        | Fill the Bill   | Note            |
|-----------------------------|---|-----------------|
| Storage Temperature         | Max : 60°C  | Time : 24hours  |
|                             | Min : -20°C   |                 |
| Operating Temperature       | Max : 50°C  | Time : 24hours  |
|                             | Min : -10°C   |                 |
| High Temperature & Humidity | 50°C , RH 80% , 24 hours                                    |                 |
| Thermal Shock               | -20°C , 0.5hour to 60°C , 0.5hour<br>100cycle , 1hour/cycle |                 |
| Life                        | -----°C-----hours   | Test Mode (6)   |
| Vibration                   | 1.5G , 10-200-10Hz , 30Min<br>each Axis (X,Y,Z)             | Test Mode : (7) |
| Shock (white carton)        | 50G , 20ms ,<br>Half-sine wave (X,Y,Z)                      | Test Mode : (7) |
| Drop (white carton)         | Height: 60 cm<br>1corner,3edges,6surfaces<br>(ASTMD4169-I)  |                 |

#### Test Mode :

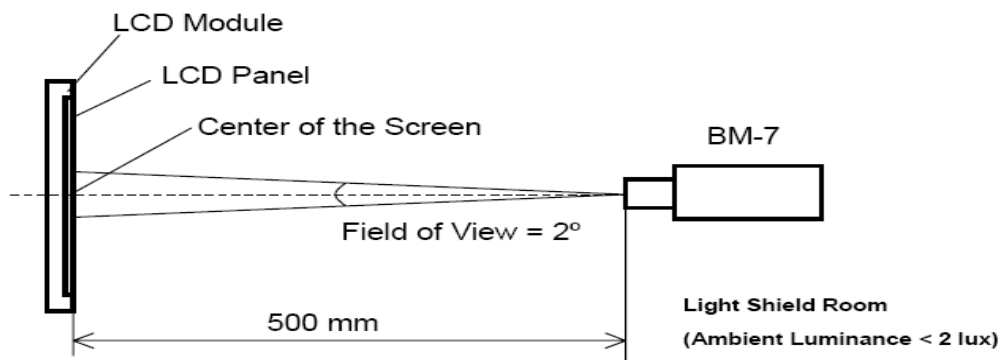
(1) ( $\theta_x$  ,  $\theta_y$ ) /Definition of Viewing Angle ( $\theta_x$  ,  $\theta_y$ ) :



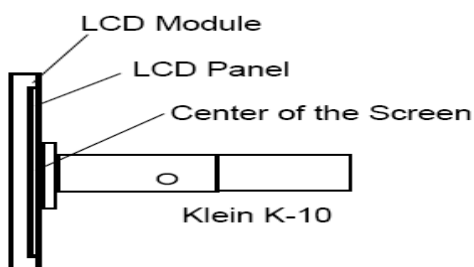
(2) Definition of Test Point :



(3) BM-7 Measurement Setup:

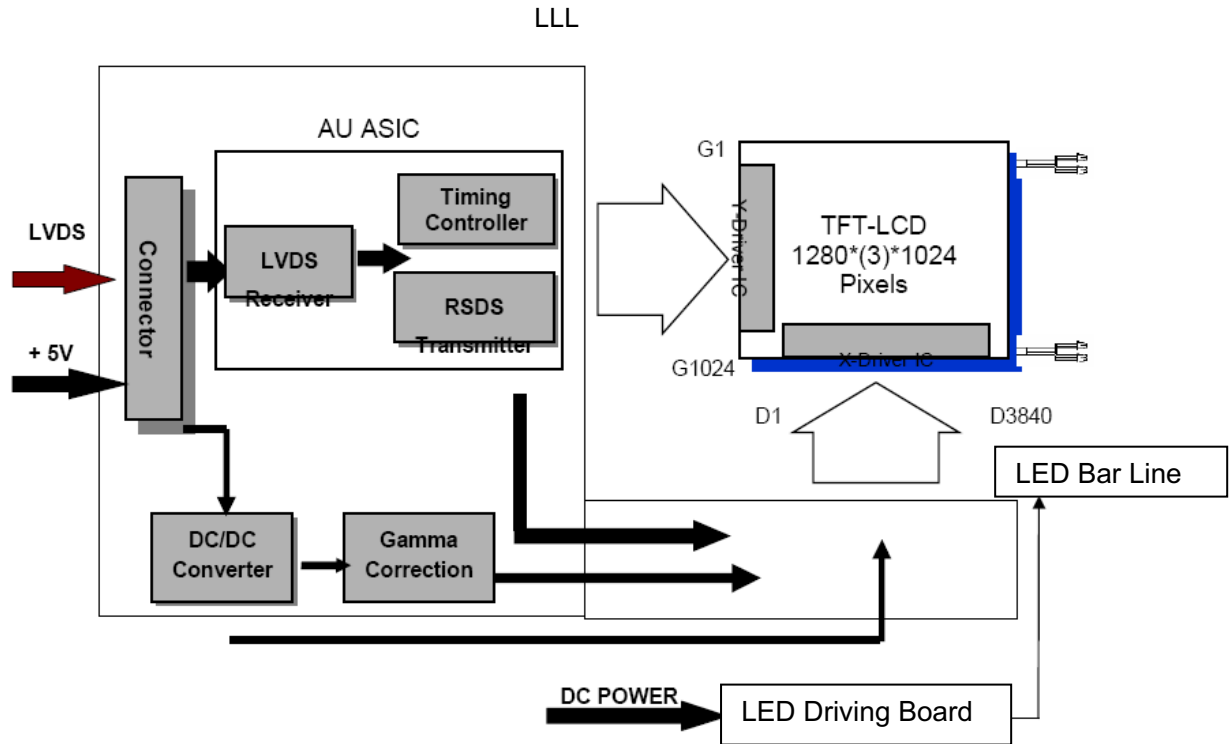


(4) Klein K-10 Measurement Setup:



## Functional Block Diagram

The following diagram shows the functional block of the 17.0 inches Color TFT-LCD Module:



## Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

### TFT LCD Module

| Item            | Symbol | Min  | Max | Unit   | Conditions |
|-----------------|--------|------|-----|--------|------------|
| Logic/LCD Drive | VIN    | -0.3 | 6   | [Volt] | Note 1,2   |

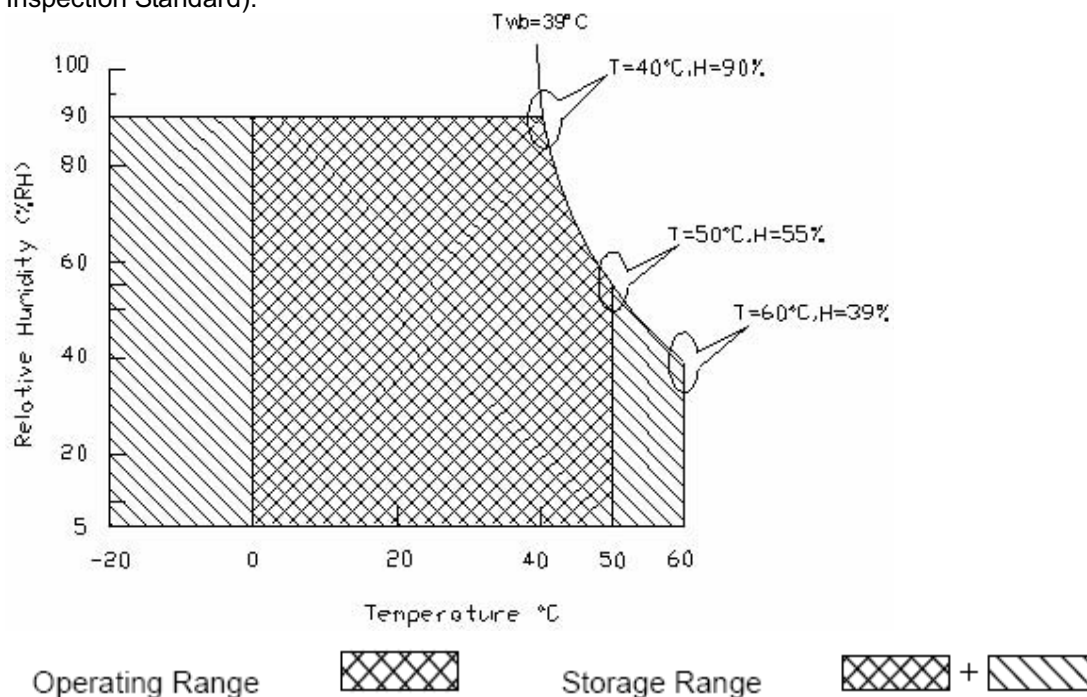
### Backlight Unit

| Item                  | Symbol | Min | Max | Unit     | Conditions |
|-----------------------|--------|-----|-----|----------|------------|
| LED Light bar Current | ILED   | -   | 800 | [mA] rms | Note 1,2   |

### Absolute Ratings of Environment

| Item                | Symbol | Min | Max | Unit  | Conditions |
|---------------------|--------|-----|-----|-------|------------|
| Operating Humidity  | HOP    | 5   | 90  | [%RH] | Note 3     |
| Storage Temperature | TST    | -20 | +60 | [°C]  |            |
| Storage Humidity    | HST    | 5   | 90  | [%RH] |            |

Note 1: With in Ta (25°C ) Note 2: Permanent damage to the device may occur if exceed maximum values Note 3: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).



Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: For quality performance, please refer to LiteMax IIS (Incoming Inspection Standard).

## Electrical characteristics

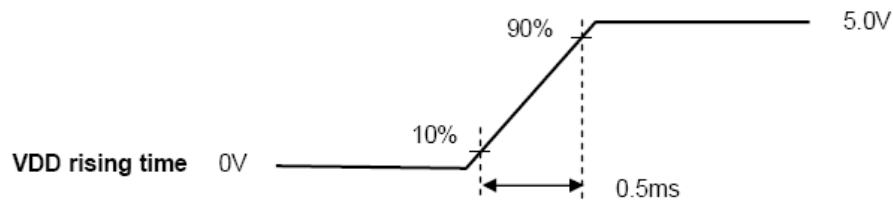
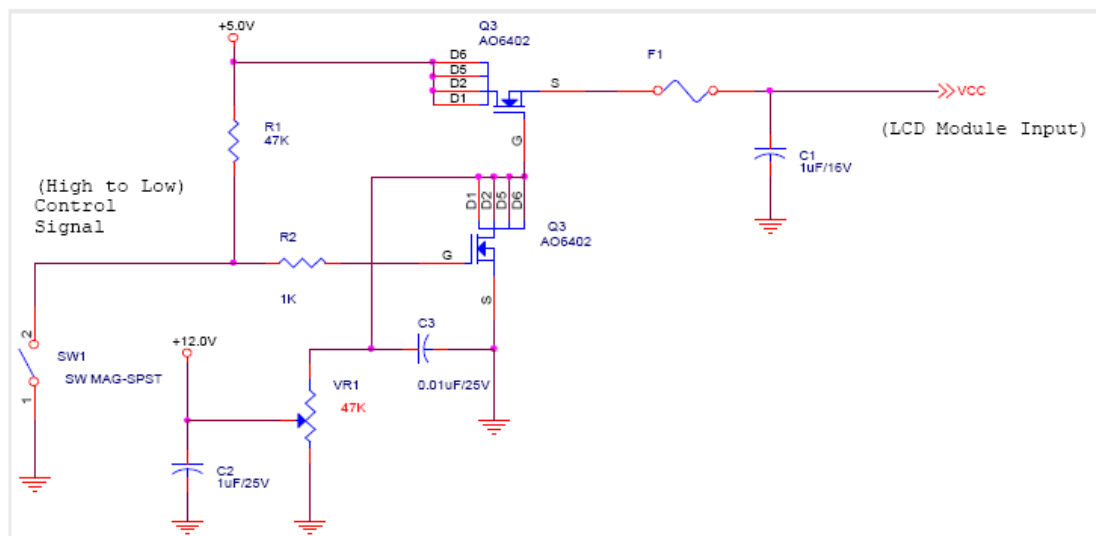
### TFT LCD Module

#### Power Specification

Input power specifications are as follows:

| Symbol | Parameter               | Min. | Typ. | Max. | Unit   | Condition  |
|--------|-------------------------|------|------|------|--------|--|
| VCC    | Logic/LCD Drive Voltage | 4.5  | 5.0  | 5.5  | [Volt] | ± 10%  |
| ICC    | Input Current           | -    | 1.2  | 1.56 | [A]    | V <sub>in</sub> =5V , All Black Pattern, at 75Hz |
| IRush  | Inrush Current          | -    | -    | 3.0  | [A]    | Note   |
| PCC    | VCCPower                | -    | 6    | 7.8  | [Watt] | V <sub>in</sub> =5V , All Black Pattern, at 75Hz |

Note: Measurement conditions:

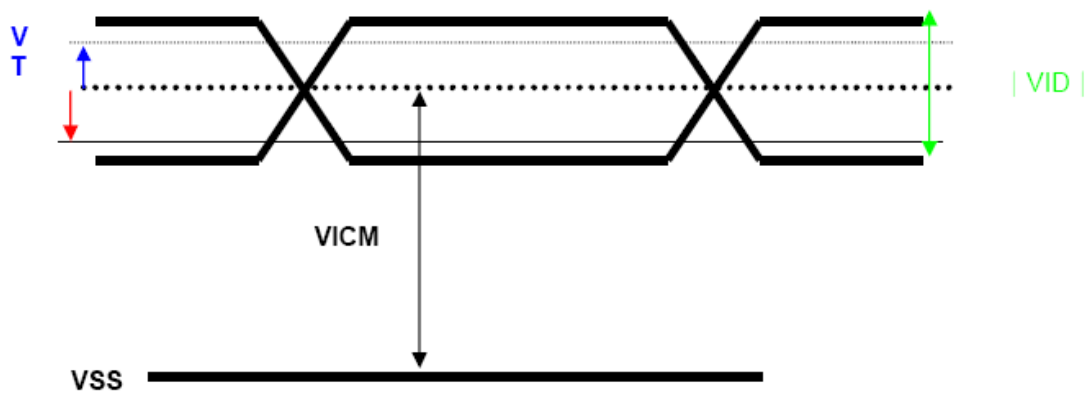


### Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when  $V_{in}$  is off It is recommended to refer the specifications of SN75LVDS82DGG (Texas Instruments) in detail. Each signal characteristics are as follows;

| Symbol    | Parameter                              | Min  | Typ  | Max  | Units | Condition                               |
|-----------|--|------|------|------|-------|---|
| $V_{TH}$  | Differential Input High Threshold      | -    | -    | +100 | [mV]  | $V_{ICM} = 1.2V$ <i>Note</i>            |
| $V_{TL}$  | Differential Input Low Threshold       | -100 | -    | -    | [mV]  | $V_{ICM} = 1.2V$ <i>Note</i>            |
| $ VID $   | Input Differential Voltage             | 100  | 400  | 600  | [mV]  | <i>Note</i>                             |
| $V_{ICM}$ | Differential Input Common Mode Voltage | +1.0 | +1.2 | +1.5 | [V]   | $V_{TH}/V_{TL} = \pm 100MV$ <i>Note</i> |

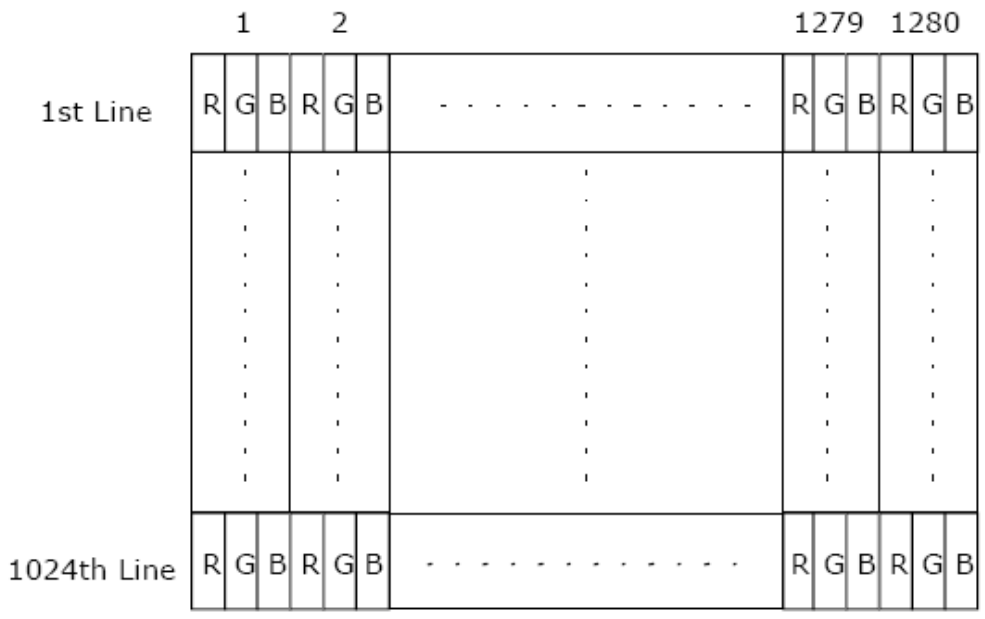
*Note:* LVDS Signal Waveform



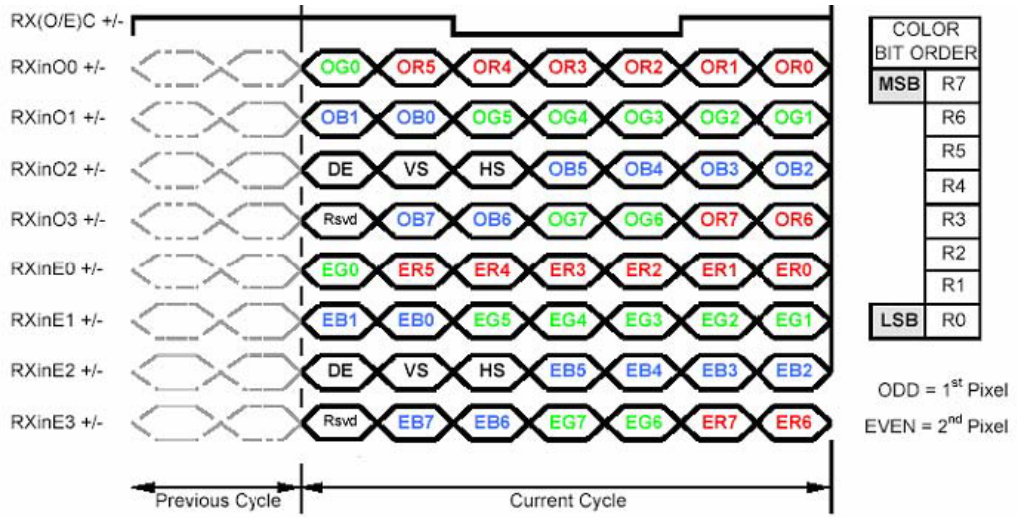
## Signal Characteristic

### Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



### The Input Data Format



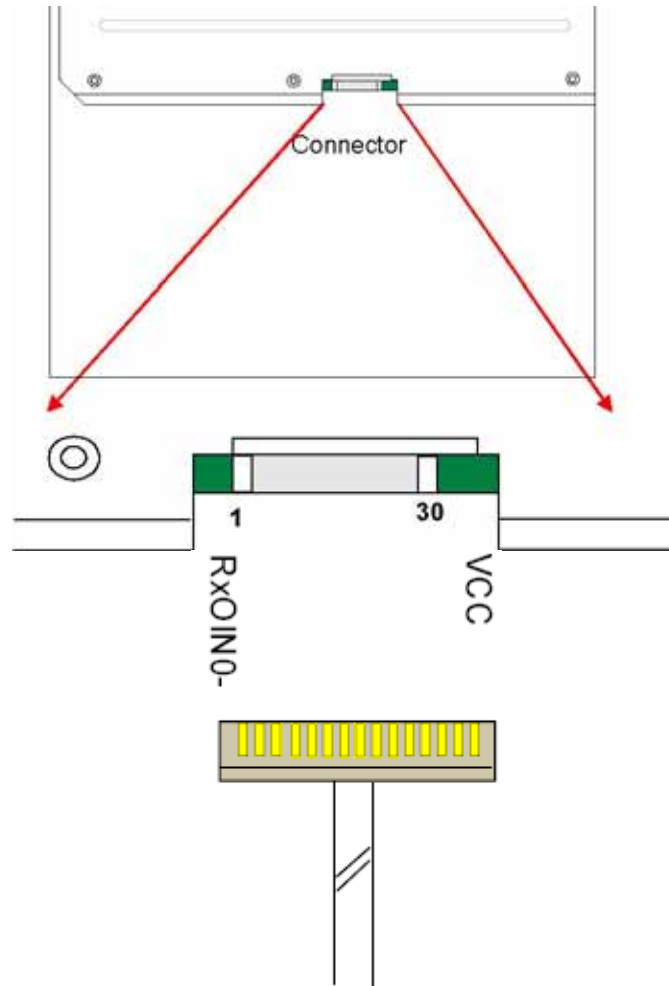
- Note1: Normally, DE, VS, HS on EVEN channel are not used.
- Note2: Please follow PSWG.
- Note3: 8-bit in

## Signal Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83 (negative edge sampling) or compatible. The first LVDS port (RxOxxx) transmits odd pixels while the second LVDS port (RxExxx) transmits even pixels.

| PIN # | SIGNAL NAME | DESCRIPTION  |
|-------|-------------|--|
| 1     | RxO0        | Negative LVDS differential data input (Odd data)                       |
| 2     | RxO0+       | Positive LVDS differential data input (Odd data)                       |
| 3     | RxO1        | Negative LVDS differential data input (Odd data)                       |
| 4     | RxO1+       | Positive LVDS differential data input (Odd data)                       |
|       | RxO2        | Negative LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG) |
| 6     | RxO2+       | Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG) |
| 7     | GND         | Power Ground   |
| 8     | RxOC-       | Negative LVDS differential clock input (Odd clock)                     |
| 9     | RxOC+       | Positive LVDS differential clock input (Odd clock)                     |
|       | RxO3        | Negative LVDS differential data input (Odd data)                       |
| 11    | RxO3+       | Positive LVDS differential data input (Odd data)                       |
| 12    | RxE0        | Negative LVDS differential data input (Even clock)                     |
| 13    | RxE0+       | Positive LVDS differential data input (Even data)                      |
| 14    | GND         | Power Ground   |
|       | RxE1        | Positive LVDS differential data input (Even data)                      |
| 16    | RxE1+       | Negative LVDS differential data input (Even data)                      |
| 17    | GND         | Power Ground   |
| 18    | RxE2        | Negative LVDS differential data input (Even data)                      |
| 19    | RxE2+       | Positive LVDS differential data input (Even data)                      |
|       | RxEC-       | Negative LVDS differential clock input (Even clock)                    |
| 21    | RxEC+       | Positive LVDS differential clock input (Even clock)                    |
| 22    | RxE3        | Negative LVDS differential data input (Even data)                      |
| 23    | RxE3+       | Positive LVDS differential data input (Even data)                      |
| 24    | GND         | Power Ground   |
|       | GND         | Power Ground   |
| 26    | NC          | No contact (For AUO test only)   |
| 27    | GND         | Power Ground   |
| 28    | VCC         | +5.0V Power Supply   |
| 29    | VCC         | +5.0V Power Supply   |
| 30    | VCC         | +5.0V Power Supply   |

Note1: Start from left side



Note2: Input signals of odd and even clock shall be the same timing. Note3: Please follow PSWG.

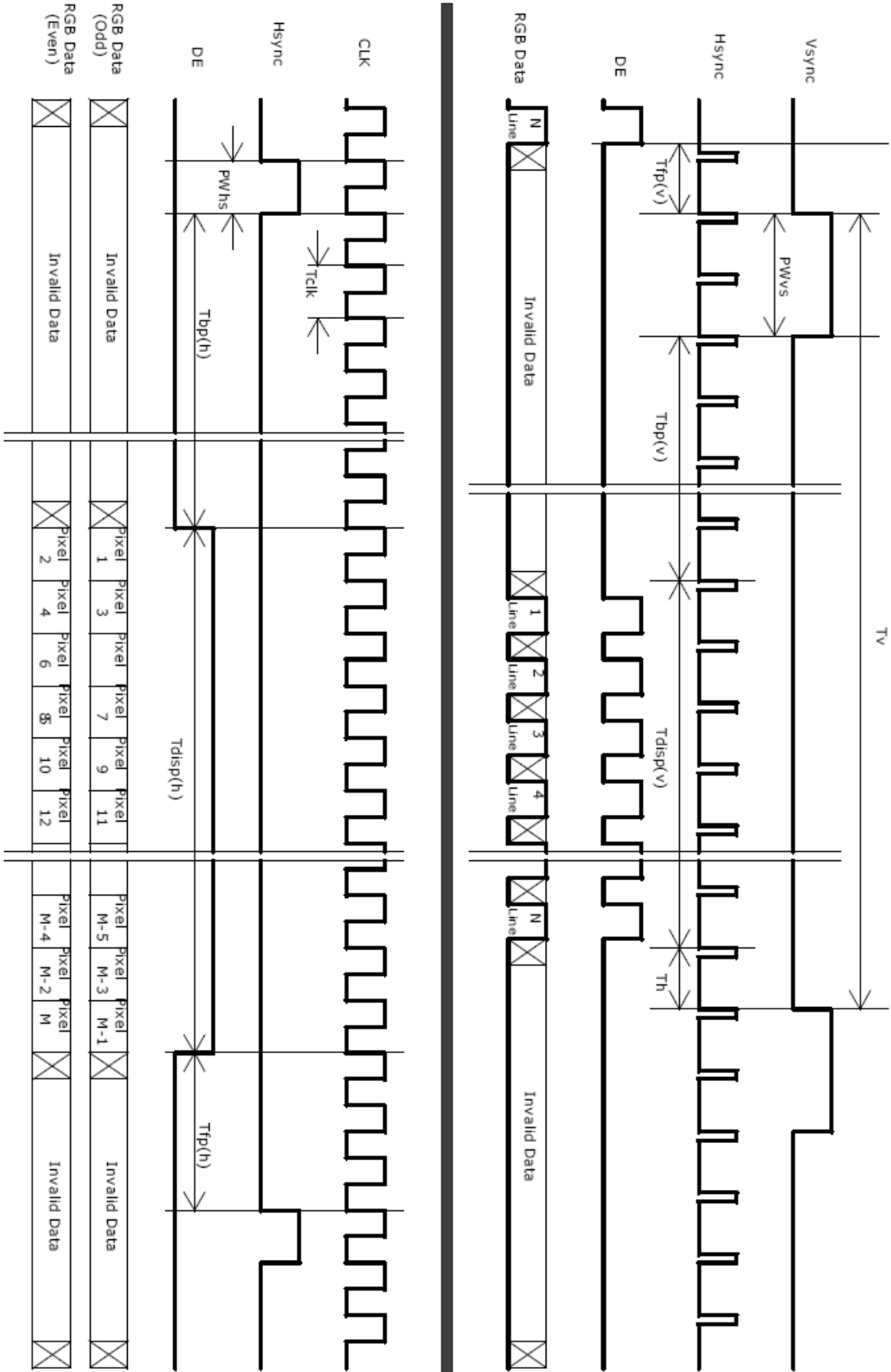
## Timing Characteristics

Basically, interface timings described here is not actual input timing of LCD module but output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

| Signal             | Item       | Symbol                        | Min   | Typ   | Max  | Unit |
|--------------------|------------|-------------------------------|-------|-------|------|------|
| Vertical Section   | Period     | $T_v$                         | 1032  | 1066  | 2048 | Th   |
|                    | Active     | $T_{disp(v)}$                 | 1024  | 1024  | 1024 | Th   |
|                    | Blanking   | $T_{bp(v)}+T_{fp(v)}+PW_{vs}$ | 8     | 42    | 1024 | Th   |
| Horizontal Section | Period     | $T_h$                         | 680   | 844   | 2048 | Tclk |
|                    | Active     | $T_{disp(h)}$                 | 640   | 640   | 640  | Tclk |
|                    | Blanking   | $T_{bp(h)}+T_{fp(h)}+PW_{hs}$ | 40    | 204   | 1408 | Tclk |
| Clock              | Period     | Tclk                          | 14.81 | 18.52 | -    | ns   |
|                    | Frequency  | Freq                          | 40    | 54    | 70   | MHz  |
| Frame rate         | Frame rate | F                             | 49    | 60    | 76   | Hz   |

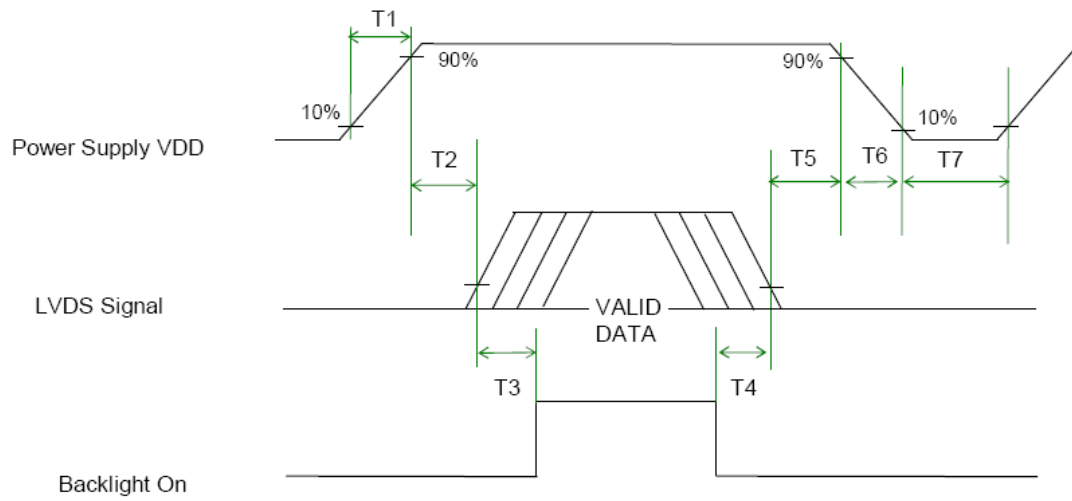
Note : DE mode only

**Timing Diagram**



## Power ON/OFF Sequence

VDD power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



## Power Sequence Timing

| Parameter | Value |      |      | Unit |
|-----------|-------|------|------|------|
|           | Min.  | Typ. | Max. |      |
| T1        | 0.5   | -    | 10   | [ms] |
| T2        | 0     | -    | 10   | [ms] |
| T3        | 200   | -    | -    | [ms] |
| T4        | 100   | -    | -    | [ms] |
| T5        | 0     | 16   | 50   | [ms] |
| T6        | -     | -    | 10   | [ms] |
| T7        | 1000  | -    | -    | [ms] |

Note: The values of the table are following PSWG.

## Connector & Pin Assignment

---

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

### TFT LCD Module

#### Connector

|                              |   |
|------------------------------|---|
| Connector Name / Designation | Interface Connector / Interface card    |
| Manufacturer                 | JAE / Hirose or compatible              |
| Type Part Number             | FI-XB30SSL-HF15 /<br>MDF76TW-30S-1H(58) |
| Mating Housing Part Number   | JAE FI-X30HL                            |

#### Pin Assignment

| Pin# | Signal Name | Pin# | Signal Name |
|------|-------------|------|-------------|
| 1    | RxOIN0      | 2    | RxOIN0+     |
| 3    | RxOIN1      | 4    | RxOIN1+     |
| 5    | RxOIN2      | 6    | RxOIN2+     |
| 7    | GND         | 8    | RxOCLKIN-   |
| 9    | RxOCLKIN+   | 10   | RxOIN3-     |
| 11   | RxOIN3+     | 12   | RxEIN0-     |
| 13   | RxEIN0+     | 14   | GND         |
| 15   | RxEIN1      | 16   | RxEIN1+     |
| 17   | GND         | 18   | RxEIN2-     |
| 19   | RxEIN2+     | 20   | RxECLKIN-   |
| 21   | RxECLKIN+   | 22   | RxEIN3-     |
| 23   | RxEIN3+     | 24   | GND         |
| 25   | NC          | 26   | NC          |
| 27   | NC          | 28   | VCC         |
| 29   | VCC         | 30   | VCC         |

## Backlight Unit

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

|                              |                                 |
|------------------------------|---------------------------------|
| Connector Name / Designation | Lamp Connector / Backlight lamp |
| Manufacturer                 | JST                             |
| Type Part Number             | EHR-2 or Compatible             |
| Mating Type Part Number      | S2B-EH or Compatible            |

## Signal for LED Backlight connector

| Connector No. | Pin No. | Input | Color | Function      |
|---------------|---------|-------|-------|---------------|
| CN1           | 1       | Vcc   | RED   | Positive pole |
|               | 2       | Gnd   | Black | Negative pole |
| CN2           | 1       | Vcc   | RED   | Positive pole |
|               | 2       | Gnd   | Black | Negative pole |

## Reliability Test

Environment test conditions are listed as following table.

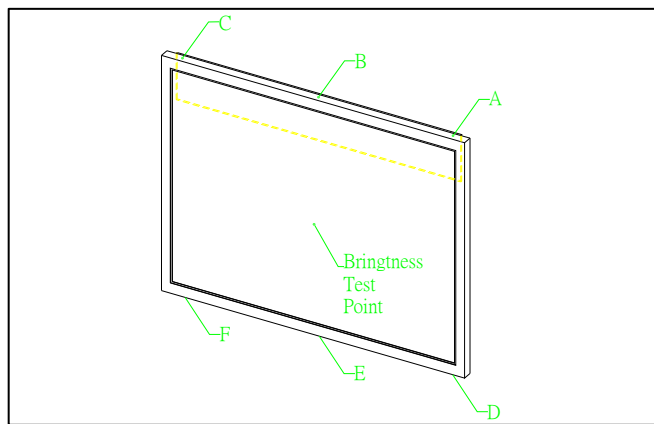
| Items                            | Required Condition   | Note |
|----------------------------------|--|------|
| Temperature Humidity Bias (THB)  | Ta= 50°C, 80%RH, 300hours  |      |
| High Temperature Operation (HTO) | Ta= 50°C, 50%RH, 300hours  |      |
| Low Temperature Operation (LTO)  | Ta= 0°C, 300hours  |      |
| High Temperature Storage (HTS)   | Ta= 60°C, 300hours   |      |
| Low Temperature Storage (LTS)    | Ta= -20°C, 300hours  |      |
| Vibration Test (Non-operation)   | Acceleration: 1.5 G Wave: Random Frequency: 10 - 200 -10 Hz Sweep: 30 Minutes each Axis (X, Y, Z)    |      |
| Shock Test (Non-operation)       | Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis) |      |
| Drop Test                        | Height: 60 cm, package test  |      |
| Thermal Shock Test (TST)         | -20°C/30min, 60°C/30min, 100 cycles  | 1    |
| On/Off Test                      | On/10sec, Off/10sec, 30,000 cycles   |      |
| ESD (ElectroStatic Discharge)    | Contact Discharge: ±8KV, 150pF(330Ω ) 1sec, 8 points, 25 times/ point.                               | 2    |
|                                  | Air Discharge: ±15KV, 150pF(330Ω ) 1sec 8 points, 25 times/ point.                                   |      |
| Altitude Test                    | Operation:10,000 ft Non-Operation:30,000 ft  |      |

Note (1) The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note (2) According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

## LED Backlight Dimming & Power Consumption and Temperature Relationship Test Report

|                       |  |
|-----------------------|--|
| Test Model            | AU1744E (M170EG01-VD)  |
| Test Date             | 2008/4/3   |
| Room Temperature      | 25° C ± 2  |
| Test Engineer         | Jacky_Kuo  |
| A/D Board Model       | AD5621GA   |
| Brightness & Contrast | B : 100% / C : 100% / (R、G、B : 100%)                             |
| Test Equipment        | DC Power Supply , BM-9 Brightness Meter , PT-3S IR Thermal Meter |



| cd/m <sup>2</sup> | Vin(V) | Iin(A) | W    | Temp A | Temp B | Temp C | Temp D | Temp E | Temp F |
|-------------------|--------|--------|------|--------|--------|--------|--------|--------|--------|
| 23                | 15.2   | 0.05   | 0.8  | 31.2   | 31.4   | 31.4   | 23.6   | 23.1   | 23.1   |
| 59                | 15.5   | 0.1    | 1.6  | 32.5   | 32.9   | 32.5   | 23.5   | 23.7   | 23.1   |
| 109               | 15.7   | 0.16   | 2.5  | 33.7   | 34.2   | 33.2   | 25.5   | 24.5   | 24.2   |
| 216               | 16.1   | 0.3    | 4.8  | 33.8   | 33.8   | 33.8   | 25.6   | 25.3   | 25.3   |
| 318               | 16.4   | 0.43   | 7.1  | 37.2   | 37.8   | 36.4   | 28.9   | 28.6   | 27.3   |
| 417               | 16.6   | 0.57   | 9.5  | 40.4   | 40.3   | 38.9   | 29.3   | 28.9   | 28.3   |
| 509               | 16.8   | 0.7    | 11.8 | 41.3   | 40.5   | 39.2   | 31.4   | 30.5   | 28.9   |
| 630               | 17     | 0.88   | 15.0 | 43.4   | 42.7   | 42.1   | 35.7   | 35.1   | 33.3   |
| 736               | 17.3   | 1.05   | 18.2 | 44.5   | 44.5   | 44.6   | 37.3   | 38.5   | 37     |
| 812               | 17.4   | 1.2    | 20.9 | 47.1   | 47     | 47     | 37     | 37.1   | 35.3   |
| 910               | 17.5   | 1.35   | 23.6 | 47     | 43     | 41     | 40     | 40     | 37     |
| 1030              | 17.8   | 1.6    | 28.5 | 45.7   | 47.2   | 44.4   | 37.7   | 37.4   | 37.8   |

