Shown by WWW.LCD-SCREEN.COM.UA

**TOSHIBA MATSUSHITA DISPLAY TECHNOLOGY**

PRODUCT INFORMATION

31cm COLOUR TFT-LCD MODULE
(12.1 TYPE)

# LTD121KM2M
# (p-Si TFT)

**TENTATIVE**

## FEATURES

(1) 12.1"SXGA+(1400x1050 pixels, 145ppi) optimal resolution for Tablet PC
(2) 2ch LVDS interface system (H-Sync, V-Sync)
(3) Digitizer Easy Insertion & Assembly by "Kangaroo" Solution
(4) Anti-Color Inversion with TN(ACIT) for wide viewing angle

## MECHANICAL SPECIFICATIONS

| Item | Specifications |
|---|---|
| Dimensional Outline (typ.) | 269.0(*W*) x 199.0 (*H*) x 6.8max (*D*) mm |
| Number of Pixels | 1400(*W*) x 1050(*H*) pixels |
| Active Area | 245.8(*W*) x 184.3(*H*) mm |
| Pixel Pitch | 0.1755(*W*) x 0.1755(*H*) |
| Weight (approximately) | 305 g |
| Backlight | Single CCFL, Sidelight type |

## ABSOLUTE MAXIMUM RATINGS

| Item | | Min. | Max. | Unit |
|---|---|---|---|---|
| Supply Voltage | ($V_{DD}$) | -0.3 | 4.0 | V |
| | ($V_{FL}$) | - | 2.0 | kV(rms) |
| FL Driving Frequency ($f_{FL}$) | | - | 100 | kHz |
| Input Signal Voltage ($V_{IN}$) | | -0.3 | $V_{DD}$+0.3 | V |
| Operating Temperature | | 0 | 50 | °C |
| Storage Temperature | | -20 | 60 | °C |
| Storage Humidity | | 10 | 90 | %(RH) |

## ELECTRICAL SPECIFICATION

| Item | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Supply Voltage | ($V_{DD}$) | 3.0 | 3.3 | 3.6 | V | |
| | ($V_{FL}$) | --- | (620) | --- | V(rms) | $I_{FL}$=6.0 mA(rms) |
| FL Start Voltage (*Ta*=0°C) | | 1550 | --- | --- | V(rms) | |
| Differential Input Voltage ($V_{ID}$) *1 | | 0.1 | --- | 0.6 | V | |
| Differential Input Common Voltage (Rx$V_{CM}$) *1 | | 0.5 | 1.2 | 1.5 | V | |
| Differential Input Common Potential Difference (Rx$\Delta V_{CM}$) *1 | | -50 | --- | +50 | mV | |
| Current Consumption | *2 ($I_{DD}$) | --- | (360) | --- | mA | |
| | *3 ($I_{FL}$) | --- | 6.0 | --- | mA(rms) | |
| *2 *3 Power Consumption | | --- | (4.8) | --- | W | $I_{FL}$=6.0 mA(rms) |

*1 : Refer to THC63LVDF84A-85 Specification by THine Electronics,Inc.
*2 : 8 color bars pattern
*3 : Excepting the efficiency FL inverter

## OPTICAL SPECIFICATION (*Ta*=25°C)

| Item | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Contrast Ratio (*CR*) | | 100 | 250 | --- | --- | |
| Viewing Angle ($CR \geq 10$) | (Upper / Lower) | --- | (45 / 50) | --- | ° | |
| | (Left / Right) | --- | (50 / 50) | --- | ° | |
| Response Time | ($t_{ON}$) | --- | --- | 50 | ms | |
| | ($t_{OFF}$) | --- | --- | 50 | ms | |
| Luminance (*L*) | | --- | (160) | --- | cd/m$^2$ | $I_{FL}$=6.0mA(rms) |

*The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by Toshiba Matsushita Display Technology or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Toshiba Matsushita Display Technology or others.

*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba Matsushita Display Technology before proceeding with the design of equipment incorporating this product.

Shown by WWW.LCD-SCREEN.COM.UA



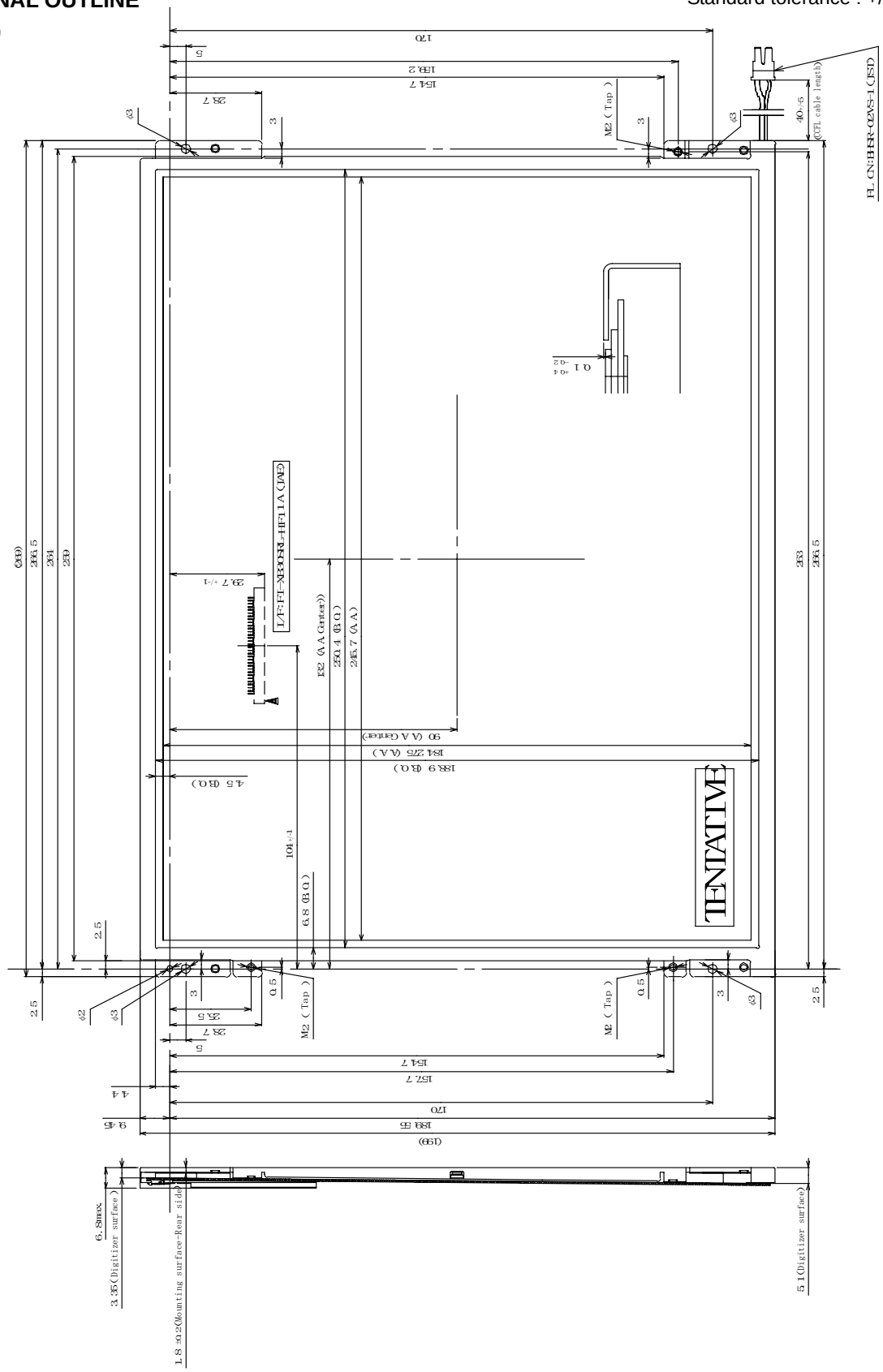
# TENTATIVE

Unit : mm

Standard tolerance : +/-0.5

**DIMENSIONAL OUTLINE**

(Front Side)

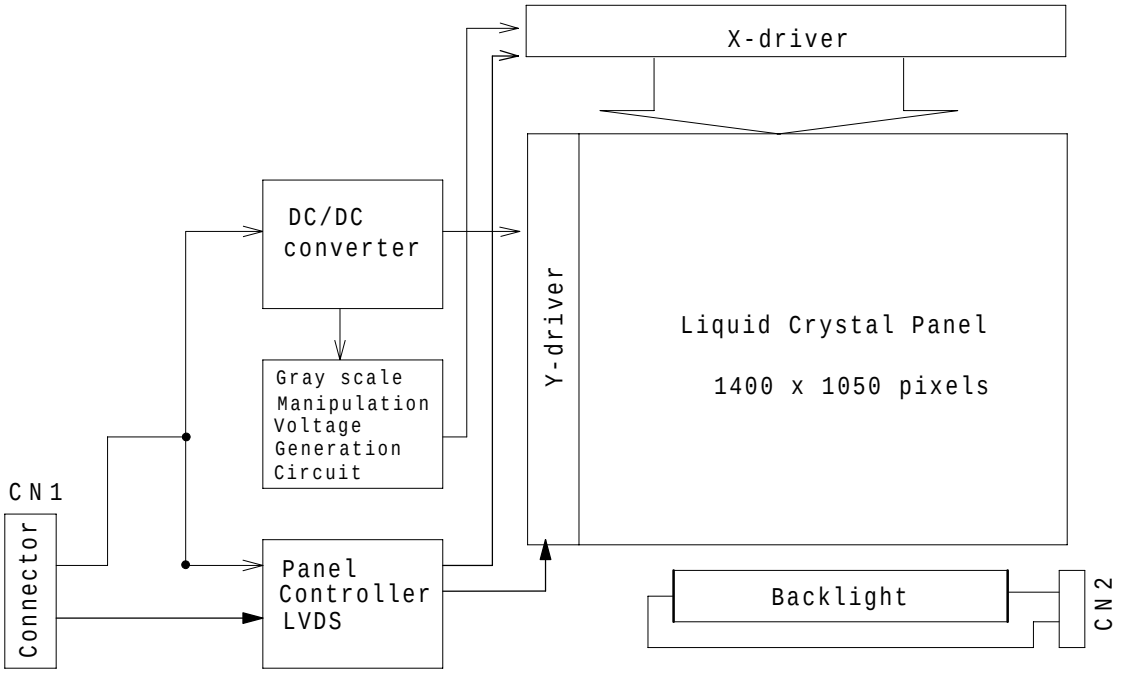


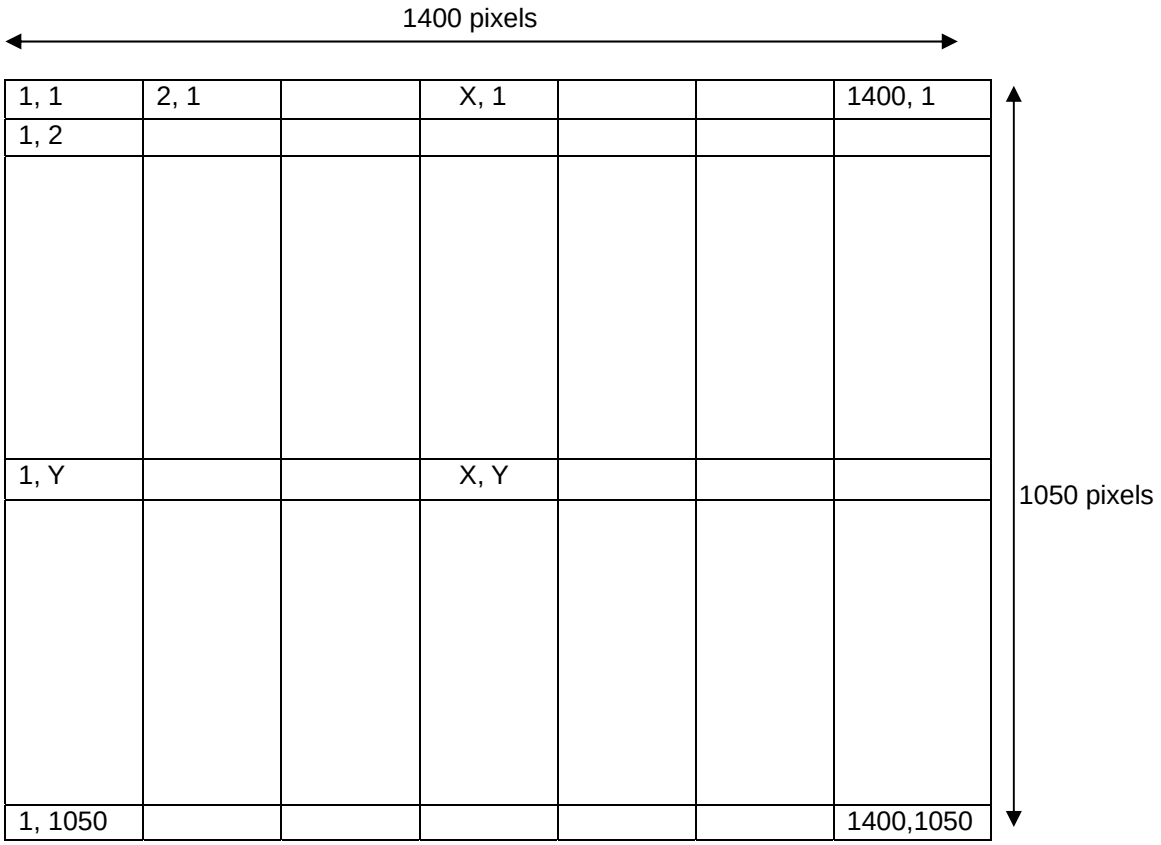

**Important : Recommendable mating digitizer is Wacom SU-012/021 Series.**
**Digitizer should be assembled by Set maker side.**
**Digitizer sensor board thickness should be 0.5mm/0.75mm max..**

Shown by WWW.LCD-SCREEN.COM.UA



**BLOCK DIAGRAM**



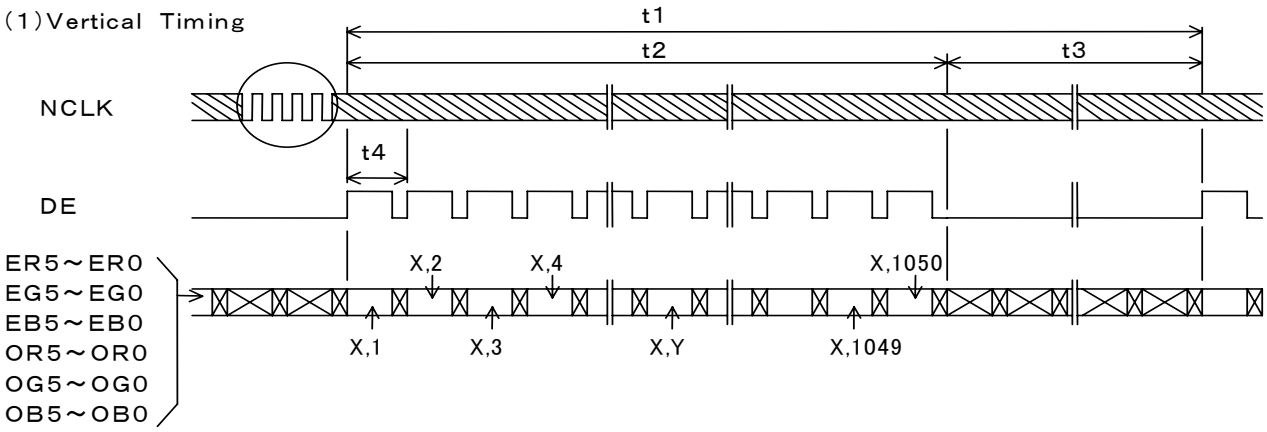



Shown by WWW.LCD-SCREEN.COM.UA

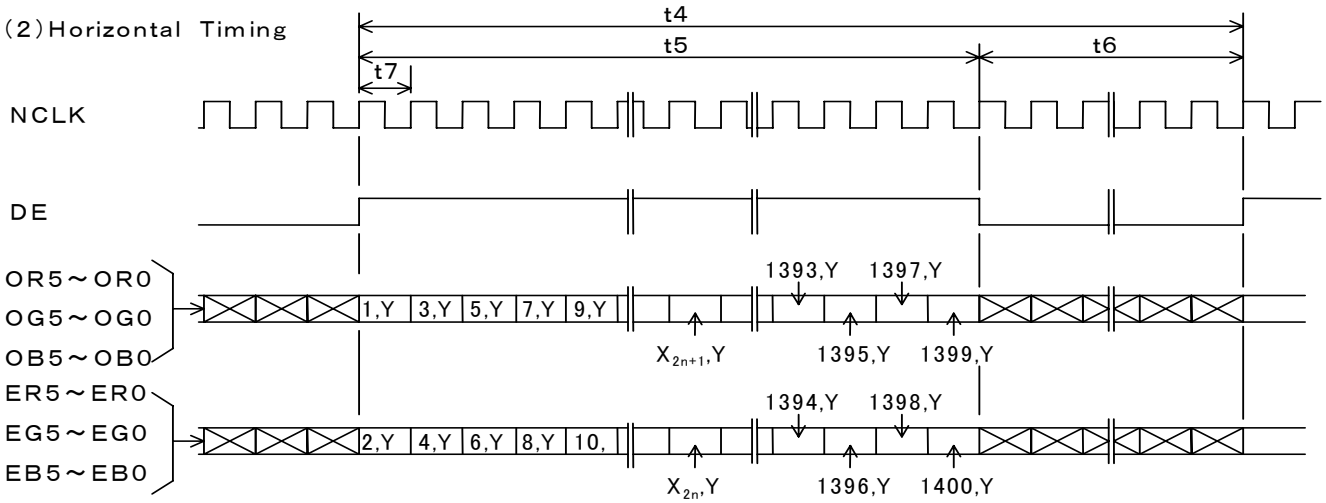


**TIMING CHART**

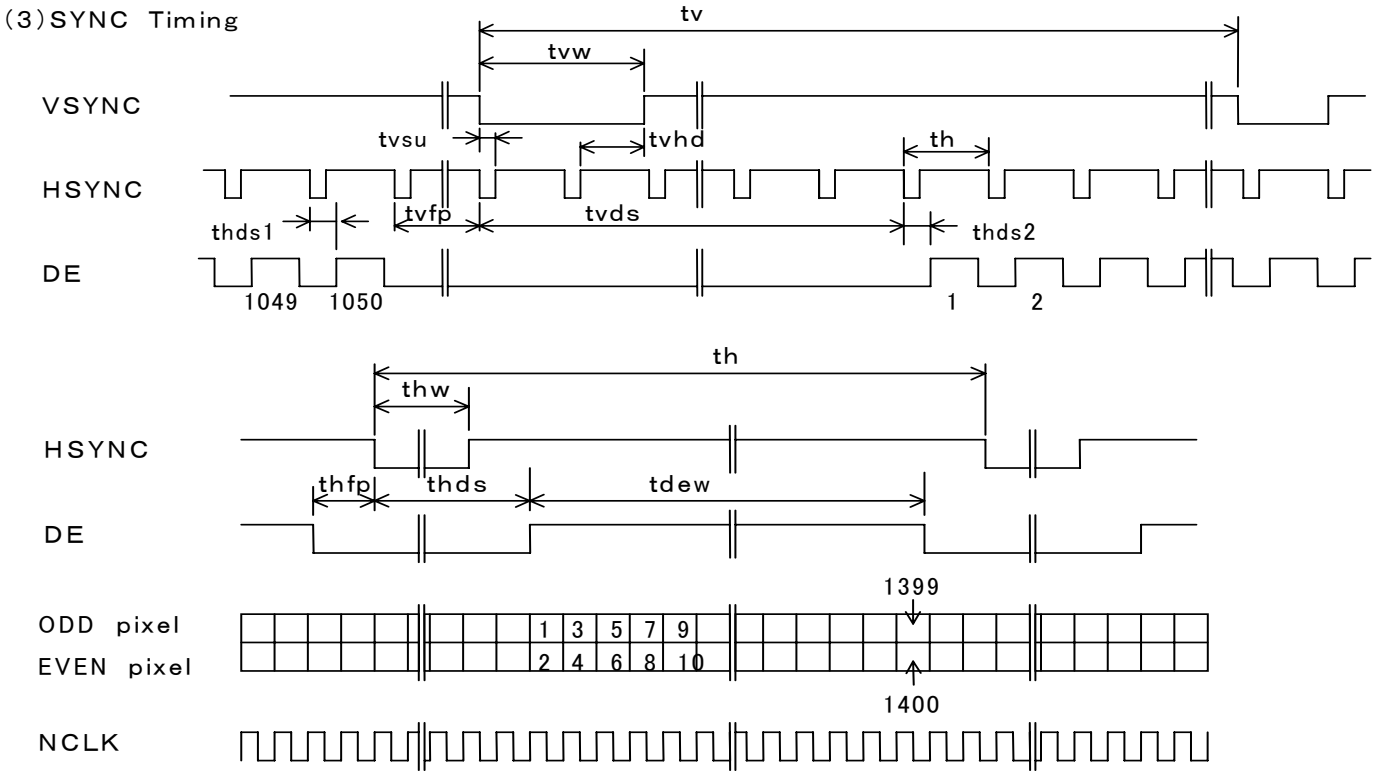
(1)Vertical Timing




(2)Horizontal Timing




(3)SYNC Timing



Shown by WWW.LCD-SCREEN.COM.UA



**TIMING SPECIFICATION** [1) 2) 3) 4) 5) 6) 7)]

| Item | Symbol | min. | typ. | max. | unit |
|---|---|---|---|---|---|
| Horizontal Scanning Term | *t4*=*t*h | 836 x *t7* | 844 x *t7* | 850 x *t7* | - |
| H-sync Pulse Width | *t*hw | 8 x *t7* | - | - | - |
| Horizontal Front Porch | *t*hfp | 8 x *t7* | - | - | - |
| Horizontal Blanking Period | *t6* | 136 x *t7* | 144 x *t7* | 150 x *t7* | - |
| Horizontal Display Term | *t5* | 700 x *t7* | 700 x *t7* | 700 x *t7* | - |
| Horizontal Data Sync term | *thds* | t6 - thfp | t6 - thfp | t6 - thfp | |
| Frame Period | *t1* | 1060 x *t4* | 1066 x *t4*<br>16.66 | 1070 x *t4*<br>17.69 | ms |
| V-sync Period | *tv* | 1060 x t4 | 1066 x t4 | 1070 x t4 | |
| V-sync Pulse Width | *t*vw | 2 x *t4* | - | - | - |
| V-sync Set Up Time (to H-sync) | *t*vsu | 8 x *t7* | - | - | - |
| V-sync Hold Time | *t*vhd | 8 x *t7* | - | - | - |
| Vertical Front Porch | *t*vfp | 0 | - | - | - |
| Vertical Data Sync Term | *t*vds | 8 x *t4* | - | - | - |
| Vertical Display Term | *t2* | 1050 x *t4* | 1050 x *t4* | 1050 x *t4* | - |
| Vertical Blanking Term | *t3* | 8 x t4 | 16 x t4 | 16 x t4 | - |
| Clock Period | *t*7 | 17.544 | 18.519 | 19.597 | ns |
| Clock Frequency | *1/t7* | 51 | 54 | 57 | MHz |
| DE Pulse Width | *tdew* | 700 x t7 | 700 x t7 | 700 x t7 | - |

Note 1) Refer to “Timing Chart” and LVDS (THC63LVDF84A-85) specifications by THine Electronics,Inc.

Note 2) If DE is fixed to "H" or "L" level for certain period while NCLK is supplied, the panel displays black with some flicker.

Note 3) If NCLK is fixed to "H" or "L" level for certain period while DE is supplied, the panel may be damaged.

Note 4) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality.
There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency), even if the condition satisfies above timing specifications and recommended operating conditions shown in Electrical Specification.

Note5 ) Do not make *tv*, *t*vhd and tvds fluctuate.
If *t*v, *t*vhd, and *t*vds are fluctuate, the panel displays black.

Note6) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note7) NCLK count of each Horizontal Scanning Time should be always the same.
V-Blanking period should be “*n*” X “Horizontal Scanning Time”. (*n*: integer)
Frame period should be always the same.

Shown by WWW.LCD-SCREEN.COM.UA



## CONNECTOR PIN ASSIGNMENT FOR INTERFACE

CN1 INPUT SIGNAL

Connector : FI-XB30SRL-HF11 / JAE

Mating Connector : FI-X30M, FI-X30MR) / JAE

| Terminal No. | Symbol | Function |
|---|---|---|
| Assistant Terminal | GND | |
| 1 | GND | |
| 2 | *V*DD | Power Supply: +3.3V |
| 3 | *V*DD | Power Supply: +3.3V |
| 4 | NC | |
| 5 | NC | |
| 6 | NC | |
| 7 | NC | |
| 8 | OR0- | ODD Transmission Data of Pixels 0(Negative: -) |
| 9 | OR0+ | ODD Transmission Data of Pixels 0(Positive: +) |
| 10 | GND | |
| 11 | OR1- | ODD Transmission Data of Pixels 1(Negative: -) |
| 12 | OR1+ | ODD Transmission Data of Pixels 1(Positive: +) |
| 13 | GND | |
| 14 | OR2- | ODD Transmission Data of Pixels 2(Negative:-) |
| 15 | OR2+ | ODD Transmission Data of Pixels 2(Positive: +) |
| 16 | GND | |
| 17 | OCK- | ODD Sample Clock (Negative: -) |
| 18 | OCK+ | ODD Sample Clock (Positive: +) |
| 19 | GND | |
| 20 | ER0- | EVEN Transmission Data of Pixels 0(Negative: -) |
| 21 | ER0+ | EVEN Transmission Data of Pixels 0(Positive: +) |
| 22 | GND | |
| 23 | ER1- | EVEN Transmission Data of Pixels 1(Negative: -) |
| 24 | ER1+ | EVEN Transmission Data of Pixels 1(Positive: +) |
| 25 | GND | |
| 26 | ER2- | EVEN Transmission Data of Pixels 2(Negative: -) |
| 27 | ER2+ | EVEN Transmission Data of Pixels 2(Positive: +) |
| 28 | GND | |
| 29 | ECK- | EVEN Sample Clock (Negative: -) |
| 30 | ECK+ | EVEN Sample Clock (Positive: +) |
| Assistant Terminal | GND | |

Note 1) Please connect GND pin to ground. Don't use it as no-connect nor connection with high impedance.

Note 2) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

CN2 CCFL POWER SOURCE

Connector : BHSR-02VS-1 / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

Mating Connector : SM02B-BHS-1 / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

| Terminal No. | Symbol | Function |
|---|---|---|
| 1 | $V_{FLH}$ | CCFL Power Supply ( high voltage) |
| 2 | $V_{FLL}$ | CCFL Power Supply (low voltage) |

Shown by WWW.LCD-SCREEN.COM.UA

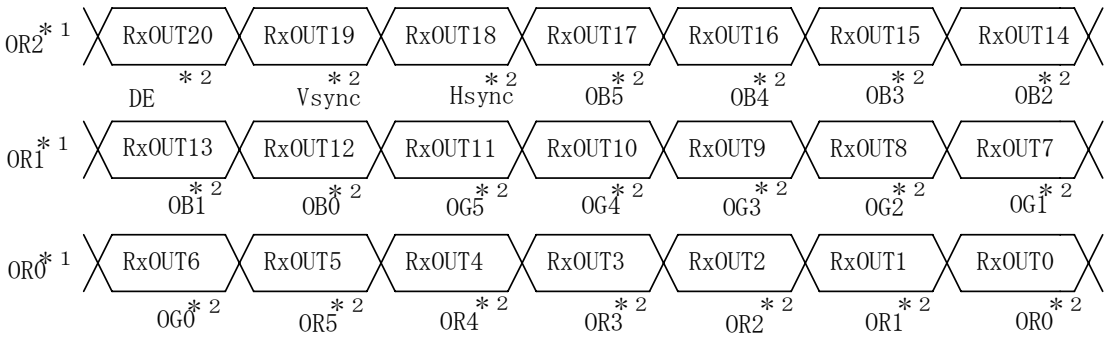


**RECOMMENDED TRANSMITTER(THC63LVDM63A,THC63LVDM63A-85) TO LTD121KM2M INTERFACE ASSIGNMENT**

## Case1: 6bit Transmitter

**ODD DATA**

| Input Terminal No. | | Input Signal (Graphics controller output signal) | | Output Signal Symbol | To LTD121KM2M Interface(CN1) | |
|---|---|---|---|---|---|---|
| Symbol | | Symbol | Function | | Terminal | Symbol |
| TA0 | 44 | R0 | Red Pixels Display Data (LSB) | TA-<br>TA+ | No.8<br>No.9 | OR0-<br>OR0+ |
| TA1 | 45 | R1 | Red Pixels Display Data | | | |
| TA2 | 47 | R2 | Red Pixels Display Data | | | |
| TA3 | 48 | R3 | Red Pixels Display Data | | | |
| TA4 | 1 | R4 | Red Pixels Display Data | | | |
| TA5 | 3 | R5 | Red Pixels Display Data (MSB) | | | |
| TA6 | 4 | G0 | Green Pixels Display Data (LSB) | | | |
| TB0 | 6 | G1 | Green Pixels Display Data | TB-<br>TB+ | No.11<br>No.12 | OR1-<br>OR1+ |
| TB1 | 7 | G2 | Green Pixels Display Data | | | |
| TB2 | 9 | G3 | Green Pixels Display Data | | | |
| TB3 | 10 | G4 | Green Pixels Display Data | | | |
| TB4 | 12 | G5 | Green Pixels Display Data (MSB) | | | |
| TB5 | 13 | B0 | Blue Pixels Display Data (LSB) | | | |
| TB6 | 15 | B1 | Blue Pixels Display Data | | | |
| TC0 | 16 | B2 | Blue Pixels Display Data | TC-<br>TC+ | No.14<br>No.15 | OR2-<br>OR2+ |
| TC1 | 18 | B3 | Blue Pixels Display Data | | | |
| TC2 | 19 | B4 | Blue Pixels Display Data | | | |
| TC3 | 20 | B5 | Blue Pixels Display Data (MSB) | | | |
| TC4 | 22 | HSYNC | H-SYNC | | | |
| TC5 | 23 | VSYNC | V-SYNC | | | |
| TC6 | 25 | DE | Compound Synchronization Signal | | | |
| CLK IN | 26 | NCLK | Data Sampling Clock | TCLK-<br>TCLK+ | No.17<br>No.18 | OCK-<br>OCK+ |




*1 : Receiver signal

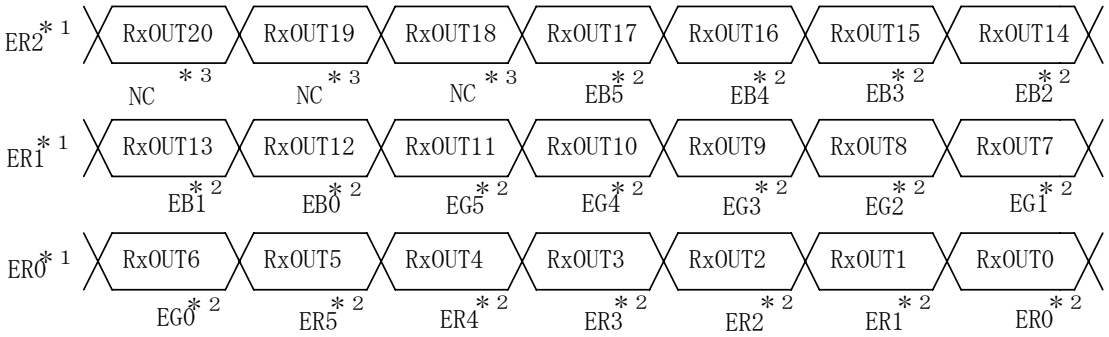
*2 : Input signal

Shown by WWW.LCD-SCREEN.COM.UA



**EVEN DATA**

| Input Terminal No. | | Input Signal (Graphics controller output signal) | | Output Signal Symbol | To LTD121KM2M Interface(CN1) | |
|---|---|---|---|---|---|---|
| Symbol | | Symbol | Function | | Terminal | Symbol |
| TA0 | 44 | R0 | Red Pixels Display Data (LSB) | TA-<br>TA+ | No.20<br>No.21 | ER0-<br>ER0+ |
| TA1 | 45 | R1 | Red Pixels Display Data | | | |
| TA2 | 47 | R2 | Red Pixels Display Data | | | |
| TA3 | 48 | R3 | Red Pixels Display Data | | | |
| TA4 | 1 | R4 | Red Pixels Display Data | | | |
| TA5 | 3 | R5 | Red Pixels Display Data (MSB) | | | |
| TA6 | 4 | G0 | Green Pixels Display Data (LSB) | | | |
| TB0 | 6 | G1 | Green Pixels Display Data | TB-<br>TB+ | No.23<br>No.24 | ER1-<br>ER1+ |
| TB1 | 7 | G2 | Green Pixels Display Data | | | |
| TB2 | 9 | G3 | Green Pixels Display Data | | | |
| TB3 | 10 | G4 | Green Pixels Display Data | | | |
| TB4 | 12 | G5 | Green Pixels Display Data (MSB) | | | |
| TB5 | 13 | B0 | Blue Pixels Display Data (LSB) | | | |
| TB6 | 15 | B1 | Blue Pixels Display Data | | | |
| TC0 | 16 | B2 | Blue Pixels Display Data | TC-<br>TC+ | No.26<br>No.27 | ER2-<br>ER2+ |
| TC1 | 18 | B3 | Blue Pixels Display Data | | | |
| TC2 | 19 | B4 | Blue Pixels Display Data | | | |
| TC3 | 20 | B5 | Blue Pixels Display Data (MSB) | | | |
| TC4 | 22 | NC | Non Connection (open) | | | |
| TC5 | 23 | NC | Non Connection (open) | | | |
| TC6 | 25 | NC | Non Connection (open) | | | |
| CLK IN | 26 | NCLK | Data Sampling Clock | TCLK-<br>TCLK+ | No.29<br>No.30 | ECK-<br>ECK+ |




*1 : Receiver signal

*2 : Input signal

*3 : Do not use this signal

Shown by WWW.LCD-SCREEN.COM.UA



**256k (k=1024) COLORS COMBINATION TABLE**

| | Display | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 | Gray Scale Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic Color | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | - |
| | Blue | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | H | H | - |
| | Green | L | L | L | L | L | L | H | H | H | H | H | H | L | L | L | L | L | L | - |
| | Light Blue | L | L | L | L | L | L | H | H | H | H | H | H | H | H | H | H | H | H | - |
| | Red | H | H | H | H | H | H | L | L | L | L | L | L | L | L | L | L | L | L | - |
| | Purple | H | H | H | H | H | H | L | L | L | L | L | L | H | H | H | H | H | H | - |
| | Yellow | H | H | H | H | H | H | H | H | H | H | H | H | L | L | L | L | L | L | - |
| | White | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | - |
| Gray Scale of Red | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L 0 |
| | Dark ↑ ↓ Light | L | L | L | L | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L 1 |
| | | L | L | L | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L 2 |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | L3… L60 |
| | | H | H | H | H | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L61 |
| | | H | H | H | H | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L62 |
| | Red | H | H | H | H | H | H | L | L | L | L | L | L | L | L | L | L | L | L | Red L63 |
| Gray Scale of Green | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L 0 |
| | Dark ↑ ↓ Light | L | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L 1 |
| | | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | L 2 |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | L3… L60 |
| | | L | L | L | L | L | L | H | H | H | H | L | H | L | L | L | L | L | L | L61 |
| | | L | L | L | L | L | L | H | H | H | H | H | L | L | L | L | L | L | L | L62 |
| | Green | L | L | L | L | L | L | H | H | H | H | H | H | L | L | L | L | L | L | Green L63 |
| Gray Scale of Blue | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L 0 |
| | Dark ↑ ↓ Light | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L 1 |
| | | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L 2 |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | L3… L60 |
| | | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | L | H | L61 |
| | | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | H | L | L62 |
| | Blue | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | H | H | Blue L63 |
| Gray Scale of White & Black | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L 0 |
| | Dark ↑ ↓ Light | L | L | L | L | L | H | L | L | L | L | L | H | L | L | L | L | L | H | L 1 |
| | | L | L | L | L | H | L | L | L | L | L | H | L | L | L | L | L | H | L | L 2 |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | L3… L60 |
| | | H | H | H | H | L | H | H | H | H | H | L | H | H | H | H | H | L | H | L61 |
| | | H | H | H | H | H | L | H | H | H | H | H | L | H | H | H | H | H | L | L62 |
| | White | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | White L63 |

Shown by WWW.LCD-SCREEN.COM.UA



## FOR SAFETY

LCD module is generally designed with precise parts to achieve light weighted thin mechanical dimensions.
In using our Modules, make certain that you fully understand and put into practice the warnings and safety precautions detailed in Engineering Information No.EE-N001,"CAUTIONS AND INSTRUCTIONS FOR TOSHIBA LCD MODULES".
Refer to individual specifications and TECHNICAL DATA sheets (hereinafter called "TD") for more detailed technical information.

### 1) SPECIAL PURPOSES

A) Toshiba Matsushita Display Technology's Standard LCD Modules have not been customized for operation in extreme environments or for use in applications where performance failures could be life-threatening or otherwise catastrophic.

B) Since Toshiba Matsushita Display Technology's Standard LCD Modules have not been designed for operation in extreme environments, they must never be used in devices that will be exposed to abnormally high levels of vibration or shock which exceed Toshiba Matsushita Display Technology's published specification limits.

C) In addition, since Toshiba Matsushita Display Technology Standard LCD Modules have not been designed for use in applications where performance failures could be life-threatening or catastrophic, they must never be installed in aircraft navigation control systems (such as, but not limited to Traffic Collision Avoidance System and Air Traffic Indicator), in military defense or weapons systems, in critical industrial process-control systems (e.g., those involved in the production of nuclear energy), or in critical medical device or patient life-support systems.

### 2) DISASSEMBLING OR MODIFICATION

DO NOT DISASSEMBLE OR MODIFY the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display.
Toshiba Matsushita Display Technology doses not warrant the module, if customer disassembled or modified it.

### 3) BREAKAGE OF LCD PANEL

DO NOT INGEST liquid crystal material, DO NOT INHALE this material, and DO NOT CONTACT the material with skin, if LCD panel is broken and liquid crystal material spills out.
If liquid crystal material comes into mouth or eyes, rinse mouth or eyes out with water immediately.
If this material contact with skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

### 4) GLASS OF LCD PANEL

BE CAREFUL WITH CHIPS OF GLASS that may cause injuring fingers or skin, when the glass is broken.

### 5) ELECTRIC SHOCK

DISCONNECT POWER SUPPLY before handling LCD module.
DO NOT TOUCH the parts inside LCD module and the fluorescent lamp's connector or cables in order to prevent electric shock, because high voltage is supplied to these parts from the inverter unit while power supply is turned on.

### 6) ABSOLUTE MAXIMUM RATINGS AND POWER PROTECTION CIRCUIT

DO NOT EXCEED the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc., otherwise LCD module may be damaged.
Employ protection circuit for power supply, whenever the specification or TD specifies it.
Suitable protection circuit should be applied for each system design.

### 7) DISPOSAL

When dispose LCD module, obey to the applicable environmental regulations.