36cm COLOUR TFT-LCD MODULE
(14.1 TYPE)

# LTD141ECGA
# (p-Si TFT)

**TENTATIVE**

## FEATURES

(1) 14.1"XGA(1024x768 pixels) display size for notebook PC
(2) LVDS interface system (H-Sync, V-Sync, DE)
(3) Light weight design (0.4mmt glass)
(4) Glare polarizer

## MECHANICAL SPECIFICATIONS

| Item | Specifications |
|---|---|
| Dimensional Outline (typ.) | 298.5(*W*) x 226.5 (*H*) x 5.5max(*D*) mm<br>I/F Connector part : 6.0max(*D*) mm |
| Number of Pixels | 1024(*W*) x 768(*H*) pixels |
| Active Area | 285.696(*W*) x 214.272(*H*) mm |
| Pixel Pitch | 0.279(*W*) x 0.279(*H*) |
| Weight (approximately) | 375g |
| Backlight | Single CCFL, Sidelight type |

## ABSOLUTE MAXIMUM RATINGS

| Item | | Min. | Max. | Unit |
|---|---|---|---|---|
| Supply Voltage | ($V_{DD}$) | -0.3 | 4.0 | V |
| | ($V_{FL}$) | 0 | 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 | |
| | ($V_{FL}$) | --- | 700 | --- | V(rms) | $I_{FL}$=6.0 mA(rms) |
| FL Start Voltage (*T*a=0°C) | | 1500 | --- | --- | V(rms) | |
| Receiver Input Voltage | | 0 | --- | 2.4 | V | |
| Differential Input High Threshold($V_{TH}$)*1 | | --- | --- | $V_{OC}$+0.1 | V | $V_{OC}$=+1.2V *4 |
| Differential Input Low Threshold($V_{TL}$)*1 | | $V_{OC}$-0.1 | --- | --- | V | $V_{OC}$=+1.2V *4 |
| Current Consumption | *2 ($I_{DD}$) | --- | 220 | --- | mA | |
| | *3 ($I_{FL}$) | 3.0 | --- | 6.0 | mA(rms) | |
| *2 *3 Power Consumption | | --- | 4.9 | --- | 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
*4 : $V_{OC}$ : Common Mode Voltage

## OPTICAL SPECIFICATION (*T*a=25°C)

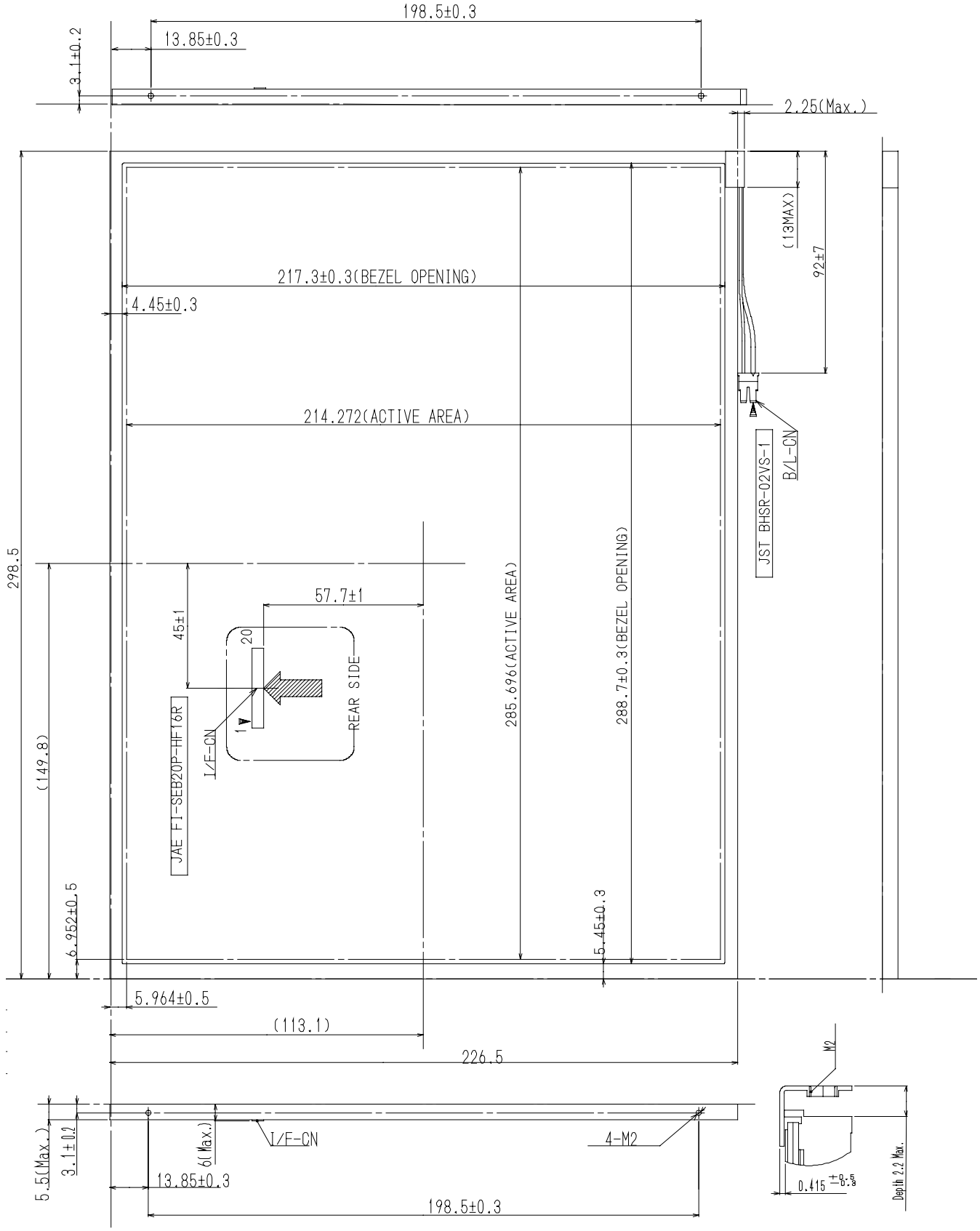
| Item | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Contrast Ratio (*CR*) | | 150 | 250 | --- | --- | |
| Response Time | ($t_{ON}$) | --- | --- | 50 | ms | |
| | ($t_{OFF}$) | --- | --- | 50 | ms | |
| Luminance (*L*) | | --- | 245 | --- | cd/m$^2$ | $I_{FL}$=6.0mA(rms) |

**DIMENSIONAL OUTLINE**

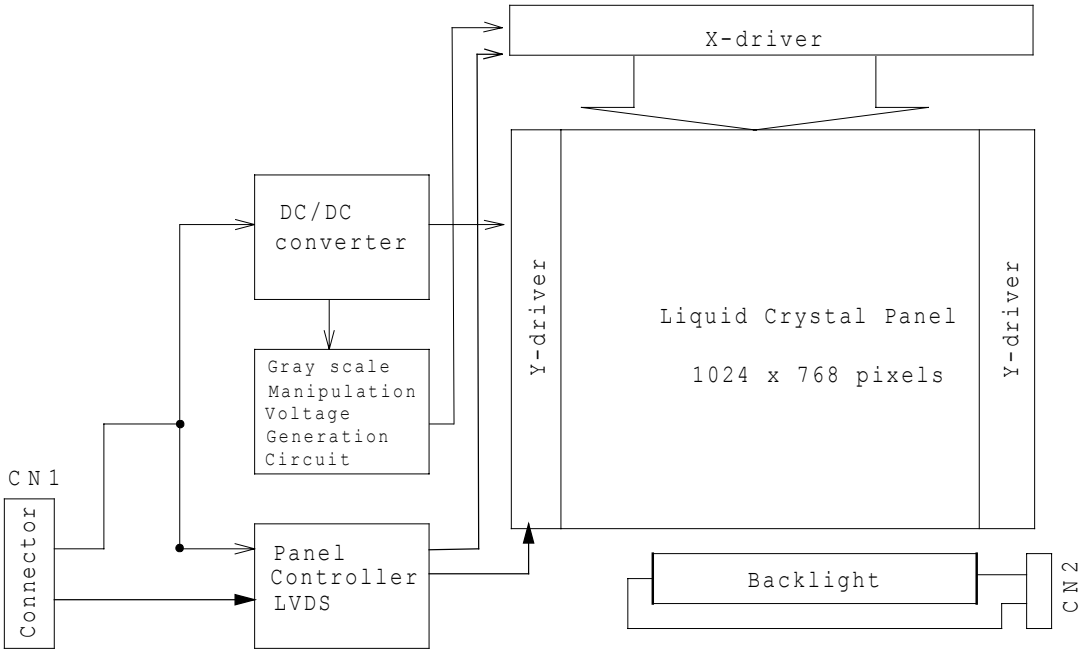
**TENTATIVE**

Unit : mm

Standard tolerance : ±0.5



**BLOCK DIAGRAM**

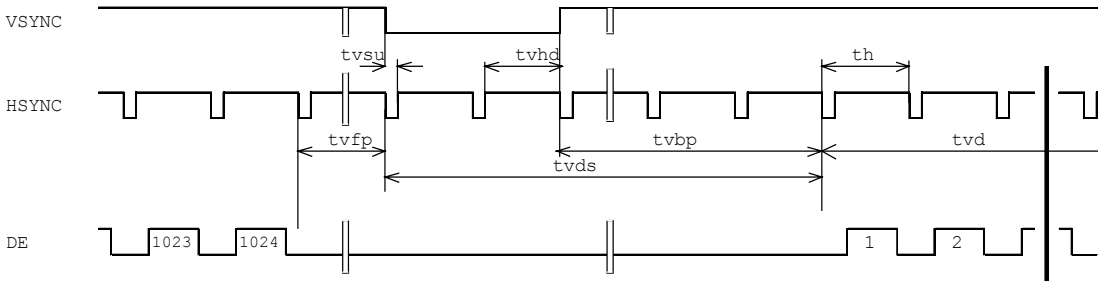


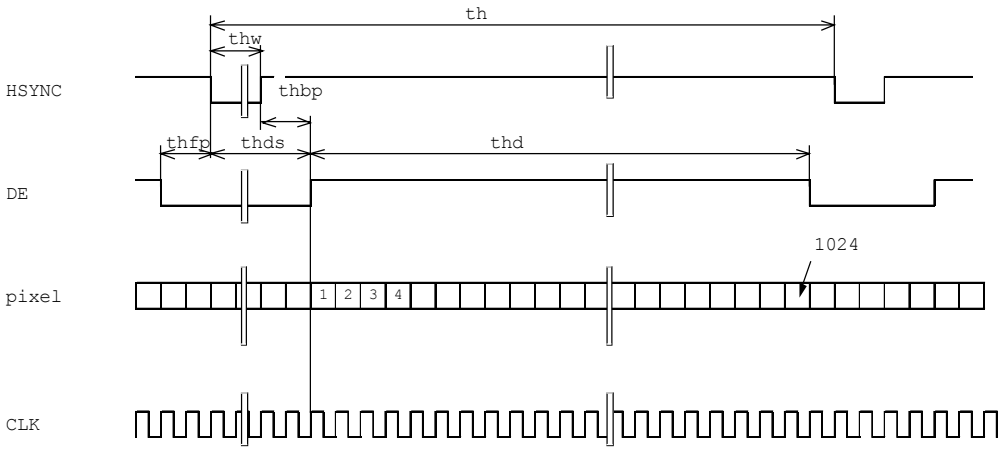

1024 pixels

| | | | | | | |
|---|---|---|---|---|---|---|
| 1, 1 | 2, 1 | | $X2_{n-1}$, 1 | $X2_n$, 1 | | 1024, 1 |
| 1, 2 | | | | | | |
| | | | | | | |
| 1, Y | | | $X_{2n-1}$, Y | $X_{2n}$, Y | | |
| | | | | | | |
| 1, 768 | | | | | | 1024,768 |

768 pixels

**TIMING CHART**



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

| Item | Symbol | min. | typ. | max. | unit |
|---|---|---|---|---|---|
| Horizontal Scanning Term | *t*h | 1334 x *t*c | 1344 x *t*c | - | clock |
| H-sync Pulse Width | *t*hw | 4 x *t*c | 136 x *t*c | - | clock |
| Horizontal Front Porch | *t*hfp | 4 x *t*c | 24 x *t*c | - | clock |
| Horizontal Back Porch | *t*hbp | 24 x *t*c | 160 x *t*c | - | clock |
| Horizontal Data Sync Period | *t*hds | 32 x *t*c | 296 x *t*c | - | clock |
| Horizontal Display Term | *t*hd | 1024 x *t*c | 1024 x *t*c | 1024 x *t*c | clock |
| Frame Period | *t*v | 778 x *t*h | 806 x *t*h | 860 x *t*h | line |
| V-sync Pulse Width | *t*vw | 2 x *t*h | 6 x *t*h | - | line |
| V-sync Set Up Time (to H-sync) | *t*vsu | 8 x *t*c | - | - | clock |
| V-sync Hold Time | *t*vhd | (thbp+16) x *t*c | - | - | clock |
| Vertical Front Porch | *t*vfp | 1 x *t*h | 3 x *t*h | - | line |
| Vertical Back Porch | *t*vbp | 2 x *t*h | 29 x *t*h | - | line |
| Vertical Data Sync Period | *t*vds | 8 x *t*h | 35 x *t*h | - | line |
| Vertical Display Term | *t*vd | 768 x *t*h | 768 x *t*h | 768 x *t*h | line |
| Clock Period | *t*c | 15.0 | 15.38 | - | ns |

Note 1) Refer to “Timing Chart” and LVDS (THC63LVDF64A) specifications by Thine Electronics,Inc.

Note 2) If NCLK is fixed to "H" or "L" level for certain period while DE is supplied, the panel may be damaged.

Note 3) 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 3.

Note 4) Do not make *tv*, *t*vhd and tvds fluctuate.
If *t*v, *t*vhd, and *t*vds are fluctuate, the panel displays black.

Note 5) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note 6) 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.

**CONNECTOR PIN ASSIGNMENT FOR INTERFACE**

CN1 INPUT SIGNAL

Connector : FI-SEB20P-HF16R / JAE

Mating Connector : FI-S20S(Housing), FI-C3-A1-15000(Contact) or FI-SE20M(FRC Type) / JAE

| Terminal No. | Symbol | Function |
|---|---|---|
| 1 | $V_{DD}$ | Power Supply : +3.3V |
| 2 | $V_{DD}$ | Power Supply : +3.3V |
| 3 | GND | GND |
| 4 | GND | GND |
| 5 | RxIN0- | Negative LVDS differential data input (R0-R5,G0) |
| 6 | RxIN0+ | Positive LVDS differential data input (R0-R5,G0) |
| 7 | GND | GND |
| 8 | RxIN1- | Negative LVDS differential data input (G1-G5, B0-B1) |
| 9 | RxIN1+ | Positive LVDS differential data input (G1-G5, B0-B1) |
| 10 | GND | GND |
| 11 | RxIN2- | Negative LVDS differential data input (B2-B5, HS, VS, DE) |
| 12 | RxIN2+ | Positive LVDS differential data input (B2-B5, HS, VS, DE) |
| 13 | GND | GND |
| 14 | CLK- | Clock Signal(-) |
| 15 | CLK+ | Clock Signal(+) |
| 16 | GND | GND |
| 17 | NC | |
| 18 | NC | |
| 19 | GND | GND |
| 20 | GND | GND |

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

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.

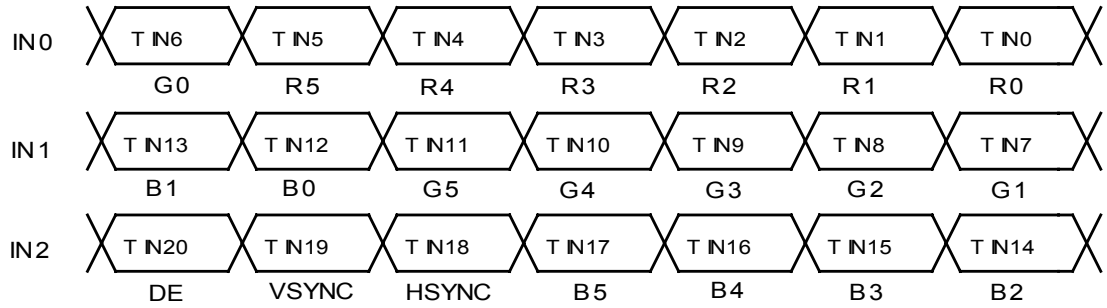
| Terminal No. | Symbol | Function |
|---|---|---|
| 1 | $V_{FLH}$ | CCFL Power Supply ( high voltage) |
| 2 | $V_{FLL}$ | CCFL Power Supply (low voltage) |

**RECOMMENDED TRANSMITTER (THC63LVDM63A) TO LTD141ECGA INTERFACE ASSIGNMENT**

## Case1: 6bit Transmitter

| Input Terminal No. | | Input Signal (Graphics controller output signal) | | Output Signal Symbol | **LTD141ECGA Interface** (CN1) | |
|---|---|---|---|---|---|---|
| Symbol | Terminal | Symbol | Function | | Terminal | Symbol |
| TIN0 | 44 | R0 | Red Pixels Display Data (LSB) | TOUT0- TOUT0+ | No.5 No.6 | IN0- IN0+ |
| TIN1 | 45 | R1 | Red Pixels Display Data | | | |
| TIN2 | 47 | R2 | Red Pixels Display Data | | | |
| TIN3 | 48 | R3 | Red Pixels Display Data | | | |
| TIN4 | 1 | R4 | Red Pixels Display Data | | | |
| TIN5 | 3 | R5 | Red Pixels Display Data (MSB) | | | |
| TIN6 | 4 | G0 | Green Pixels Display Data (LSB) | | | |
| TIN7 | 6 | G1 | Green Pixels Display Data | TOUT1- TOUT1+ | No.8 No.9 | IN1- IN1+ |
| TIN8 | 7 | G2 | Green Pixels Display Data | | | |
| TIN9 | 9 | G3 | Green Pixels Display Data | | | |
| TIN10 | 10 | G4 | Green Pixels Display Data | | | |
| TIN11 | 12 | G5 | Green Pixels Display Data (MSB) | | | |
| TIN12 | 13 | B0 | Blue Pixels Display Data (LSB) | | | |
| TIN13 | 15 | B1 | Blue Pixels Display Data | | | |
| TIN14 | 16 | B2 | Blue Pixels Display Data | TOUT2- TOUT2+ | No.11 No.12 | IN2- IN2+ |
| TIN15 | 18 | B3 | Blue Pixels Display Data | | | |
| TIN16 | 19 | B4 | Blue Pixels Display Data | | | |
| TIN17 | 20 | B5 | Blue Pixels Display Data (MSB) | | | |
| TIN18 | 22 | HSYNC | H-Sync | | | |
| TIN19 | 23 | VSYNC | V-Sync | | | |
| TIN20 | 25 | DE | Compound Synchronization Signal | | | |
| CLK IN | 26 | CLK | Data Sampling Clock | TCLK OUT- TCLK OUT+ | No.14 No.15 | CLK- CLK+ |

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

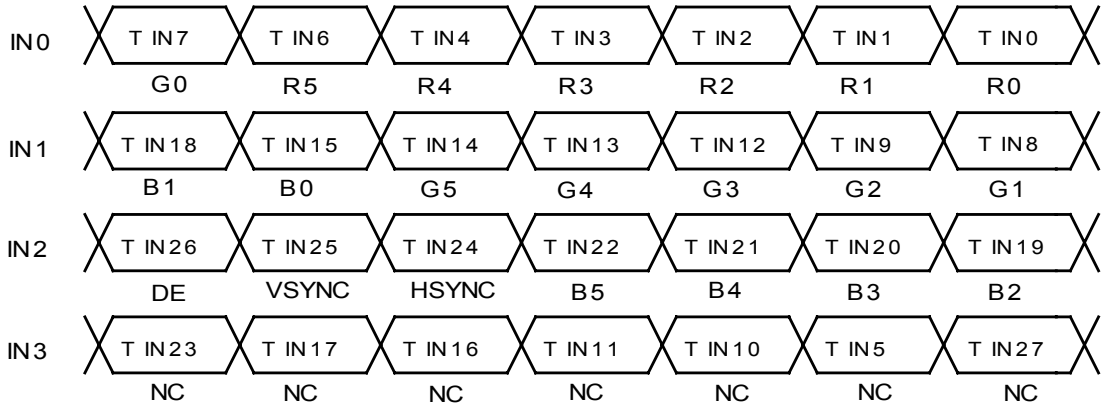


**RECOMMENDED TRANSMITTER (THC63LVDM83A) TO LTD141ECGA INTERFACE ASSIGNMENT**

## Case2: 8bit Transmitter

| Input Terminal No. | | Input Signal (Graphics controller output signal) | | Output Signal Symbol | **LTD141ECGA Interface** (CN1) | |
|---|---|---|---|---|---|---|
| Symbol | Terminal | Symbol | Function | | Terminal | Symbol |
| TIN0 | 51 | R0 | Red Pixels Display Data (LSB) | TOUT0- TOUT0+ | No.5 No.6 | IN0- IN0+ |
| TIN1 | 52 | R1 | Red Pixels Display Data | | | |
| TIN2 | 54 | R2 | Red Pixels Display Data | | | |
| TIN3 | 55 | R3 | Red Pixels Display Data | | | |
| TIN4 | 56 | R4 | Red Pixels Display Data | | | |
| TIN6 | 3 | R5 | Red Pixels Display Data (MSB) | | | |
| TIN7 | 4 | G0 | Green Pixels Display Data(LSB) | | | |
| TIN8 | 6 | G1 | Green Pixels Display Data | TOUT1- TOUT1+ | No.8 No.9 | IN1- IN1+ |
| TIN9 | 7 | G2 | Green Pixels Display Data | | | |
| TIN12 | 11 | G3 | Green Pixels Display Data | | | |
| TIN13 | 12 | G4 | Green Pixels Display Data | | | |
| TIN14 | 14 | G5 | Green Pixels Display Data(MSB) | | | |
| TIN15 | 15 | B0 | Blue Pixels Display Data (LSB) | | | |
| TIN18 | 19 | B1 | Blue Pixels Display Data | | | |
| TIN19 | 20 | B2 | Blue Pixels Display Data | TOUT2- TOUT2+ | No.11 No.12 | IN2- IN2+ |
| TIN20 | 22 | B3 | Blue Pixels Display Data | | | |
| TIN21 | 23 | B4 | Blue Pixels Display Data | | | |
| TIN22 | 24 | B5 | Blue Pixels Display Data (MSB) | | | |
| TIN24 | 27 | HSYNC | H-Sync | | | |
| TIN25 | 28 | VSYNC | V-Sync | | | |
| TIN26 | 30 | DE | Compound Synchronization Signal | | | |
| TIN27 | 50 | NC | Non Connection (open) | TOUT3- TOUT3+ | | |
| TIN5 | 2 | NC | Non Connection (open) | | | |
| TIN10 | 8 | NC | Non Connection (open) | | | |
| TIN11 | 10 | NC | Non Connection (open) | | | |
| TIN16 | 16 | NC | Non Connection (open) | | | |
| TIN17 | 18 | NC | Non Connection (open) | | | |
| TIN23 | 25 | NC | Non Connection (open) | | | |
| CLK IN | 31 | CLK | Data Sampling Clock | TCLK OUT- TCLK OUT+ | No.14 No.15 | CLK- CLK+ |

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.



**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 |

## 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-D-001A,"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'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'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's published specification limits.

C) In addition, since Toshiba 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 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.