

Toshiba Matsushita Display Technology Co., Ltd.

31cm COLOUR TFT-LCD MODULE
(12.1 TYPE)

PRODUCT INFORMATION

LTD121EDFS
(p-Si TFT)**FEATURES**

- (1) 12.1"XGA(1024x768 pixels) display size for notebook PC
- (2) LED Backlight (LED 44pcs : 11 Serial connection x 4)
- (3) Low reflection, Anti-Glare
- (4) Light weight design : 165g(typ)

TENTATIVE**MECHANICAL SPECIFICATIONS**

Item	Specifications
Dimensional Outline (typ.)	255.0(W) x 198.0 (H) x 2.9/4.6(D) mm
Number of Pixels	1024 (W) x 768(H) pixels
Active Area	245.76(W) x 184.32(H) mm
Pixel Pitch	0.240(W) x 0.240(H)
Weight (approximately)	165 g (typ)
Backlight	LED side-light-sysytem

ABSOLUTE MAXIMUM RATINGS

Item	Min.	Max.	Unit	
Supply Voltage	(V _{DD})	-0.3	4.0	V
	(V _{LED})	0	5.0	V
LED Currency (I _{LED})	-	30	mA	
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	
Supply LED Currency	(I _{LED})	---	---	18	mA	*2
Supply LED Voltage	(V _{LED})	25.413	34.59	43.73	V	@1parallel
Common Mode Input Voltage	(V _{CM})	1.0	1.25	2.0	V	
Differential Input Amplitude	(V _{ID})	100	---	600	mV	
Current Consumption	*1 (I _{DD})	---	(200)	(320)	mA	
Power Consumption		---	(3.2)	---	W	I _{LED} =18mA

*1 : 8 color bars pattern

*2 : The current value of each row should be the same value.

LED driver supply should be constant current type.**OPTICAL SPECIFICATION (T_a=25°C)**

Item	Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (CR)	200	(250)	---	---	
Response Time	(t _{ON})	---	40	ms	
	(t _{OFF})	---	40	ms	
Luminance (L)	140	200	---	cd/m ²	I _{LED} =18mA

*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.

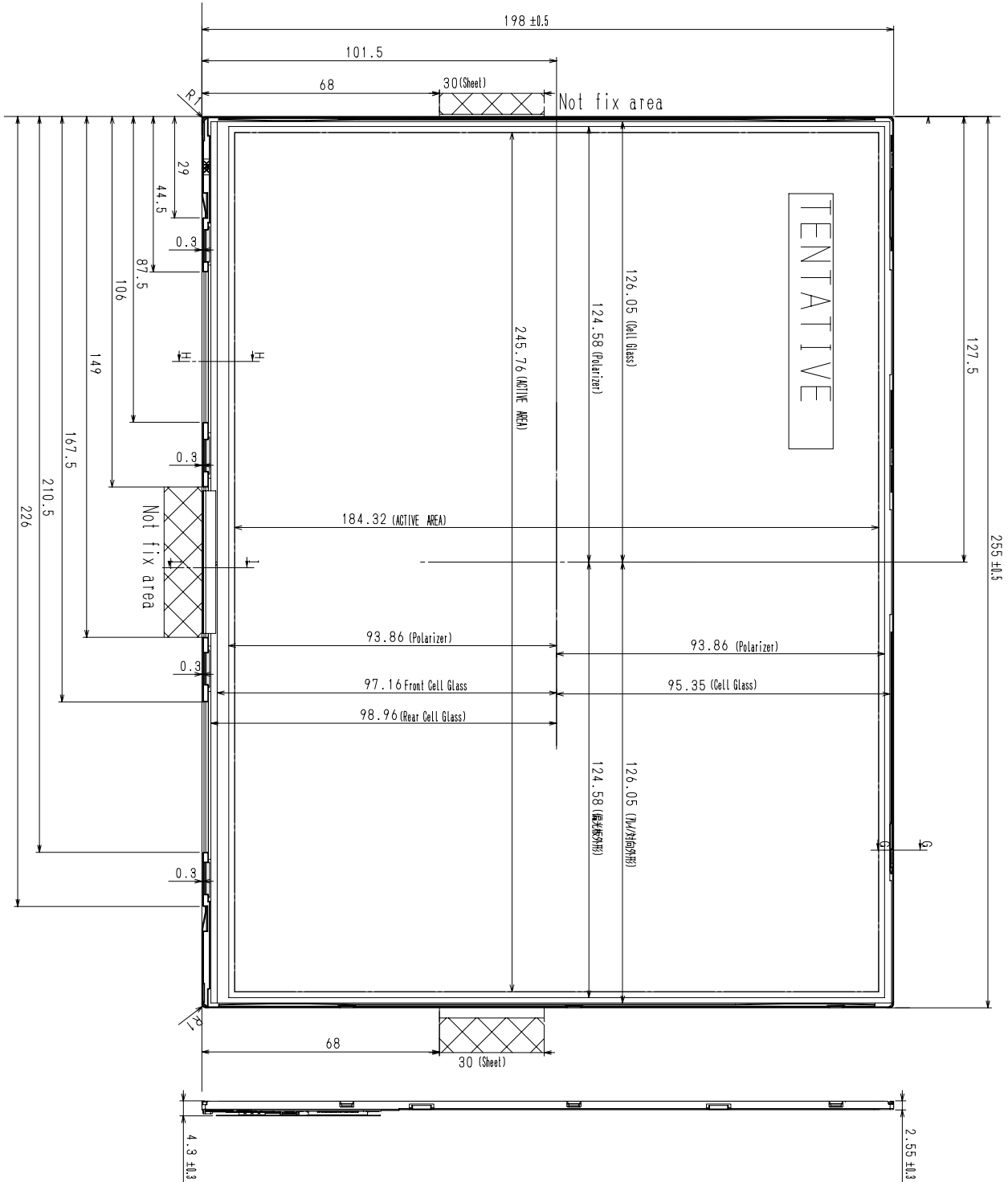
*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba Matsushita Display technology before proceeding with the design of equipment incorporating this product.

DIMENSIONAL OUTLINE
(Front side)

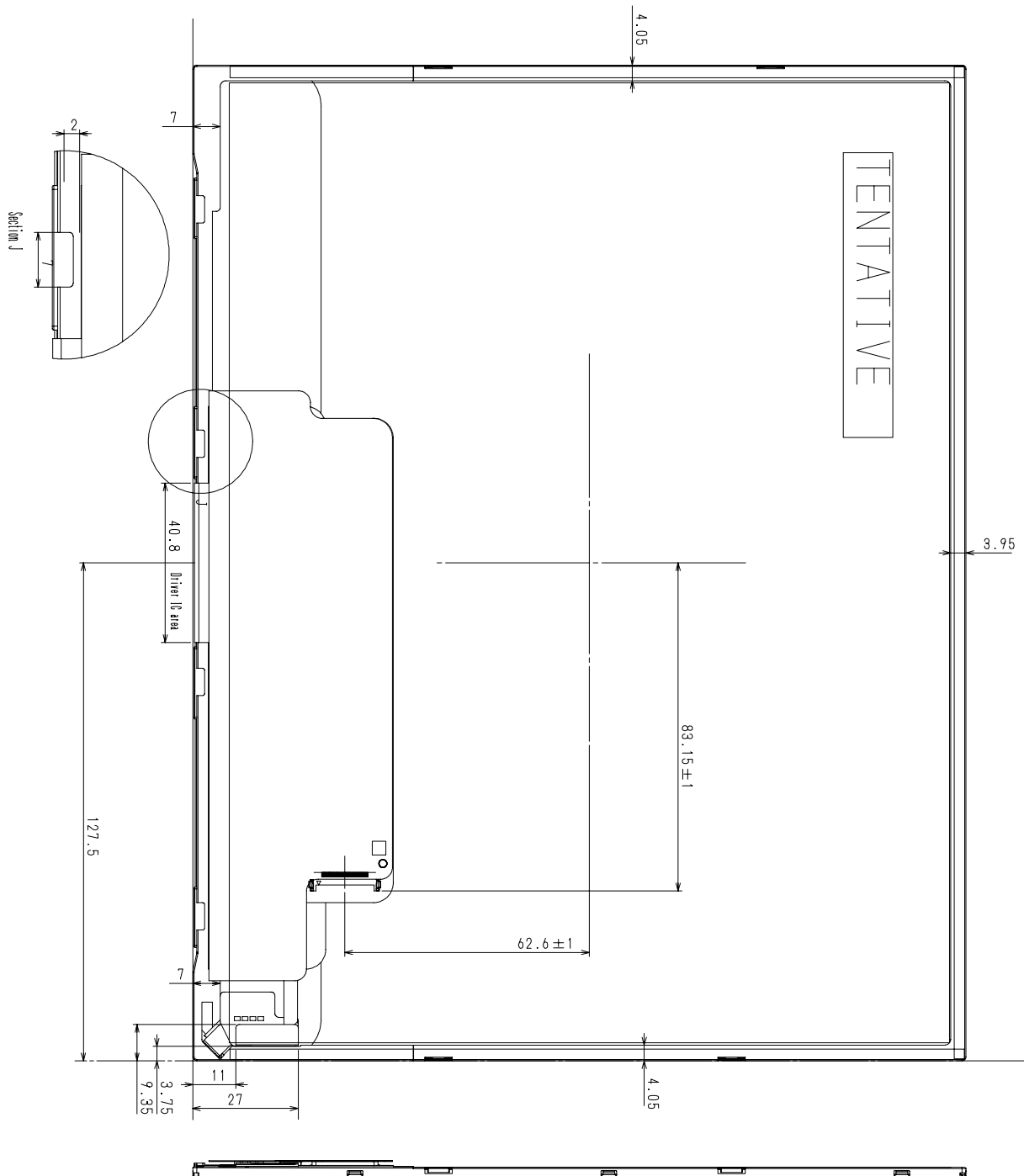
TENTATIVE

Unit : mm

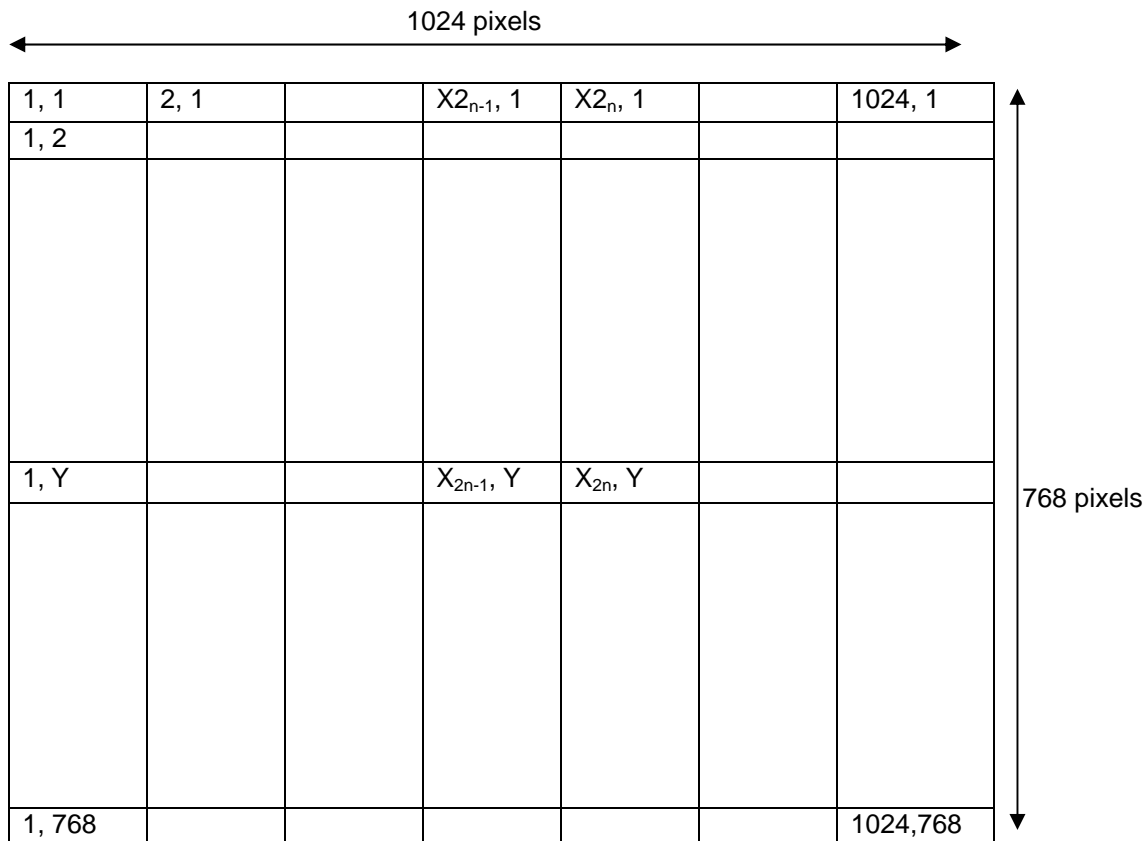
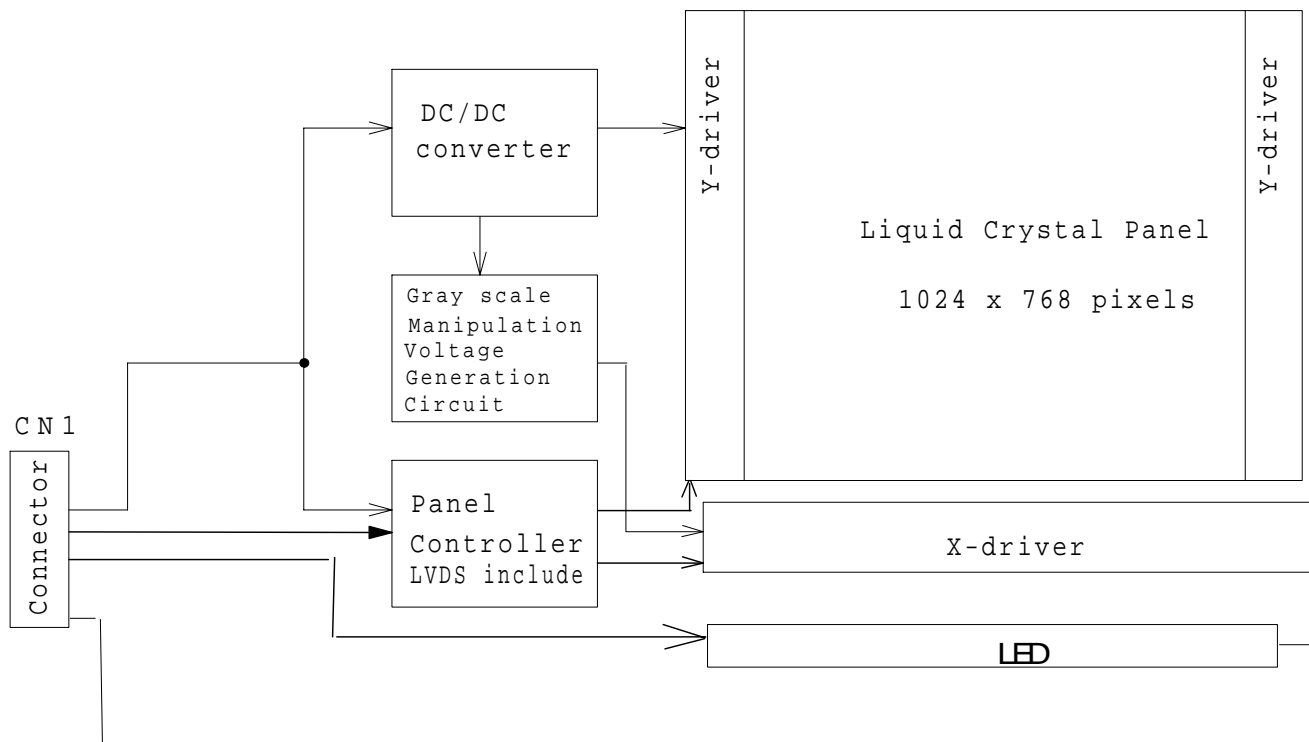
Standard tolerance : ±0.5



(Front side)

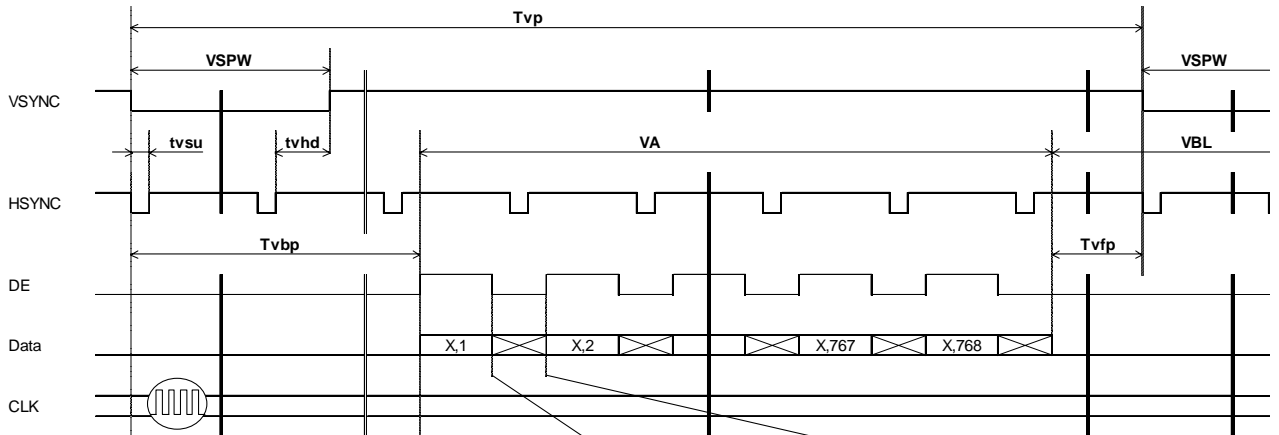


BLOCK DIAGRAM

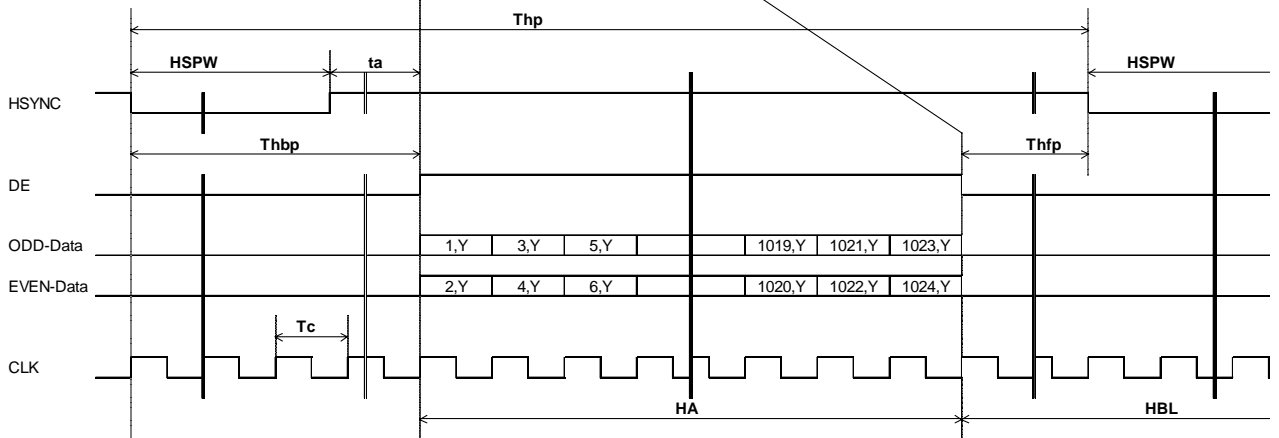


TIMING CHART

(1) Vertical Timing



(2) Horizontal Timing



TIMING SPECIFICATION ^{1) 2) 3) 4) 5) 6)}

Item	Symbol	min.	typ.	max.	unit
Horizontal Scanning Term	Th	1334	1344	1462	Tc
		-	20.68	-	us
H-sync Pulse Width		12	-	140	Tc
Horizontal Front Porch	#hfp	4	-	136	Tc
Horizontal Back Porch	ta	4	-	136	Tc
Horizontal Blanking Term		295	320	438	Tc
Horizontal Display Term	HA	1024	1024	1024	Tc
Frame Period	Tvp	778	806	860	Thp
		-	16.67	17.24	ms
V-sync Pulse Width		2	-	7	Thp
V-sync Set Up Time (to H-sync)	tv _{su}	8	-	14	Tc
V-sync Hold Time	tv _{hd}	8	-	-	-
Vertical Front Porch	tv _{fp}	2	-	8	-
Vertical Back Porch	Tv _{bp}	8	-	14	-
Vertical Blanking Term		10	38	92	Thp
Vertical Display Term	VA	768	768	768	Thp
DE Pulse Width	HA	1024	1024	1024	Tc
Clock Period	Tc	15.000	15.384	-	ns

Note 1) Refer to "Timing Chart" and LVDS (THC63LVDF84A-85) specifications by Thine Electronics, Inc.

Note 2) If CLK 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 LED driving frequency, to optimize the display quality.

There is a possibility that flicker is observed by the interference of LCD operating signal timing and LED 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, #h, #hbp and tv_{ds} fluctuate.

If tv, #h, #hbp and tv_{ds} 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) CLK 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.

Note 7) Please keep below equations.

$$VBL = Tv_{fp} + Tv_{bp}$$

$$HSPW = HBL - Th_{fp} - ta$$

$$Th_{bp} = HSPW + ta$$

CONNECTOR PIN ASSIGNMENT FOR INTERFACECN1 INPUT SIGNAL

Connector : FI-JH30/JAE

Terminal No.	Symbol	Function
1	VAD	LED Anode(Positive)
2	NC	Non-Connection
3	VCD1	LED Cathode(Negative)
4	VCD2	LED Cathode(Negative)
5	VCD3	LED Cathode(Negative)
6	VCD4	LED Cathode(Negative)
7	NC	Non-Connection
8	VDD	+3.3V
9	VDD	+3.3V
10	VDD	+3.3V
11	VDD	+3.3V
12	GND	
13	GND	
14	NC	Non-Connection
15	NC	Non-Connection
16	NC	Non-Connection
17	VEDID	DDC 3.3V power
18	CLKEDID	DDC clock
19	DATAEDID	DDC data
20	GND	
21	GND	
22	RxIN0-	LVDS differential data
23	RxIN0+	LVDS differential data
24	RxIN1-	LVDS differential data
25	RxIN1+	LVDS differential data
26	RxIN2-	LVDS differential data
27	RxIN2+	LVDS differential data
28	RxCLKIN-	
29	RxCLKIN+	
30	GND	

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

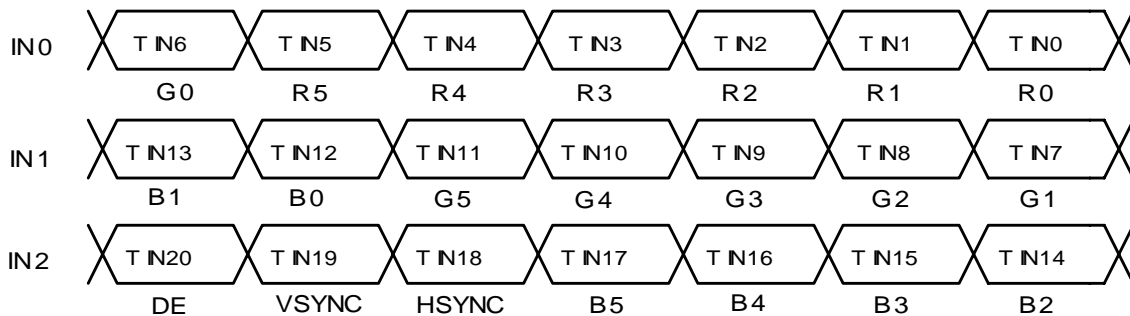
Note 2) Please connect NC to nothing. Don't connect it to ground nor to other signal input.

**RECOMMENDED TRANSMITTER (THC63LVDF63A,THC63LVDM63A,THC63LVDM63A-85)
TO LTD121EDFS INTERFACE ASSIGNMENT**

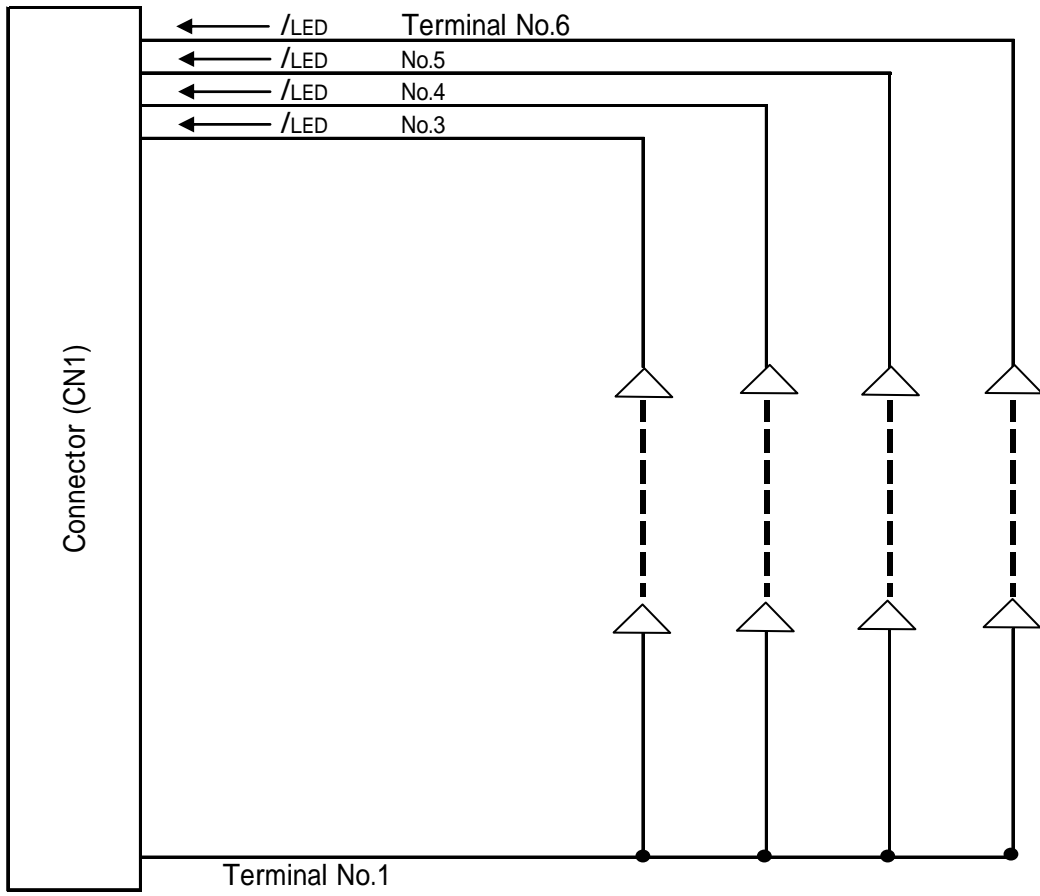
Case1: 6bit Transmitter

THC63LVDF63A,THC63LVDM63A,THC63LVDM63A-85				LTD121EDFS Interface (CN1)		
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	Terminal	Symbol
Symbol	Terminal	Symbol	Function			
TIN0	44	R0	Red Pixels Display Data (LSB)	TOUT0- TOUT0+	No.22 No.23	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)	TOUT1- TOUT1+	No.24 No.25	IN1- IN1+
TIN6	4	G0	Green Pixels Display Data (LSB)			
TIN7	6	G1	Green Pixels Display Data			
TIN8	7	G2	Green Pixels Display Data			
TIN9	9	G3	Green Pixels Display Data			
TIN10	10	G4	Green Pixels Display Data	TOUT2- TOUT2+	No.26 No.27	IN2- IN2+
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			
TIN15	18	B3	Blue Pixels Display Data	TCLK OUT- TCLK OUT+	No.28 No.29	CLK- CLK+
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			

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



EQUIVALENT CIRCUIT OF LED



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 L L L	-
	Blue	L L L L L L L	L L L L L L L	H H H H H H H	-
	Green	L L L L L L L	H H H H H H H	L L L L L L L	-
	Light Blue	L L L L L L L	H H H H H H H	H H H H H H H	-
	Red	H H H H H H H	L L L L L L L	L L L L L L L	-
	Purple	H H H H H H H	L L L L L L L	H H H H H H H	-
	Yellow	H H H H H H H	H H H H H H H	L 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 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 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 L L	L 1
		L L L L L L L	L 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 L L	L61
	H H H H H L	L L L L L L L	L L L L L L L	L62	
Red	H H H H H H H	L L 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 L L	L 0
	Dark ↑ ↓ Light	L L L L L L L	L L L L L L H	L L L L L L L	L 1
		L L L L L L L	L L L L L H L	L L L L L L L	L 2
		⋮	⋮	⋮	L3... L60
		L L L L L L L	H H H H L H	L L L L L L L	L61
	L L L L L L L	H H H H H L	L L L L L L L	L62	
Green	L L L L L L L	H H H H H H H	L 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 L L	L 0
	Dark ↑ ↓ Light	L L 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 L L H L	L 2
		⋮	⋮	⋮	L3... L60
		L L 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 L L	H H H H H L	L62	
Blue	L L L L L L L	L L L L L L L	H 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 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 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 MATSUSHITA DISPLAY TECHNOLOGY CO., LTD 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 does 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.