



TOSHIBA MATSUSHITA DISPLAY TECHNOLOGY

31cm COLOUR TFT-LCD MODULE

(12.1 TYPE)

LTD121KM2M

(p-Si TFT)

PRODUCT INFORMATION

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 IN(ACIT) for wide viewing angle

TENTATIVE

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 (R×V _{CM}) *1		0.5	1.2	1.5	V	
Differential Input Common Potential Difference (R×ΔV _{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 ≥ 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)

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*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.

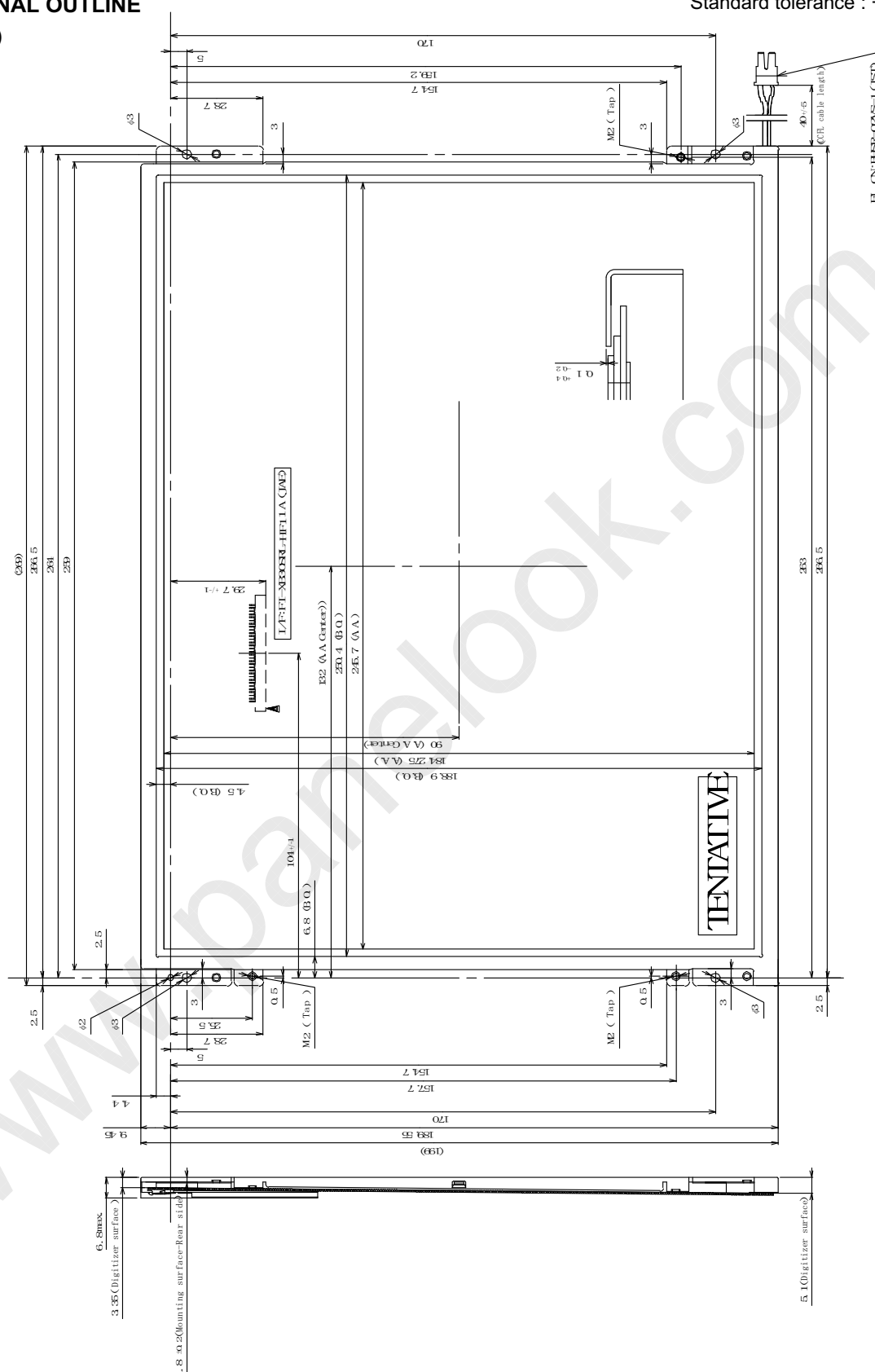
TENTATIVE

Unit : mm

Standard tolerance : +/-0.5

DIMENSIONAL OUTLINE

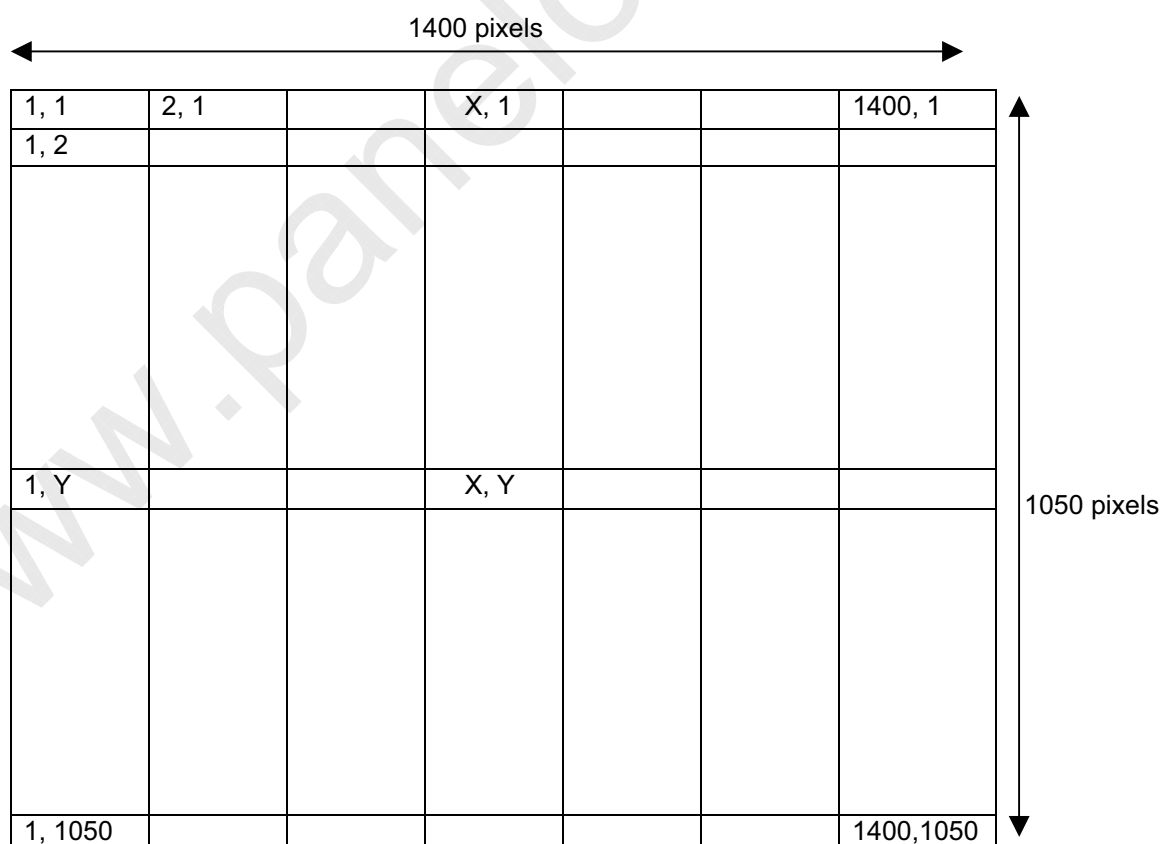
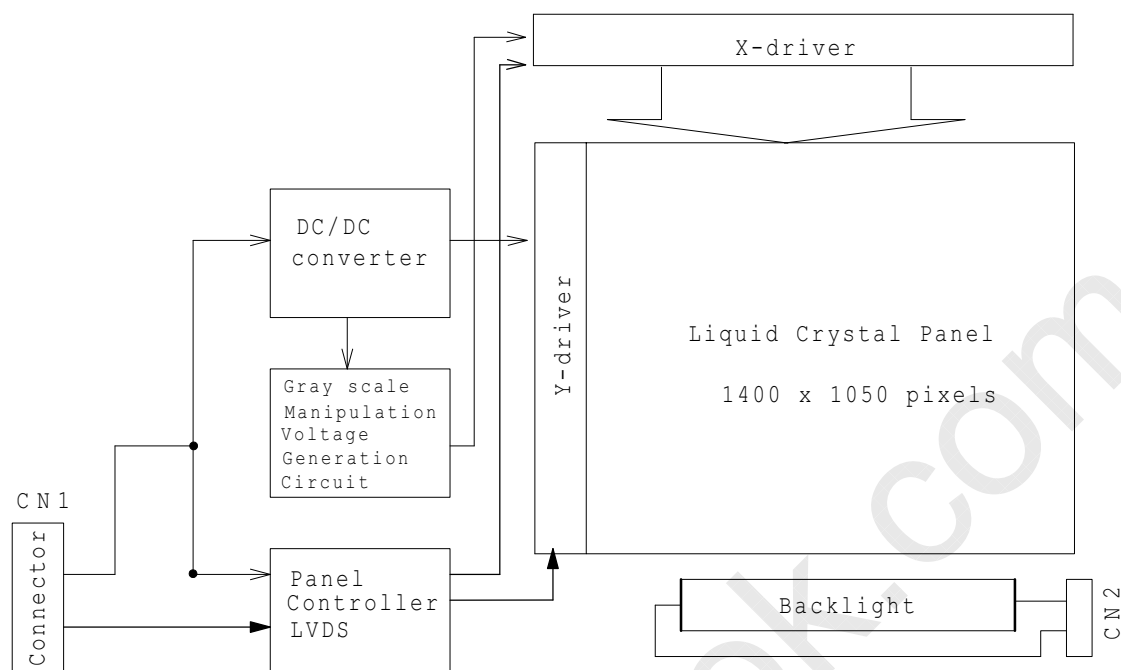
(Front Side)



**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..**

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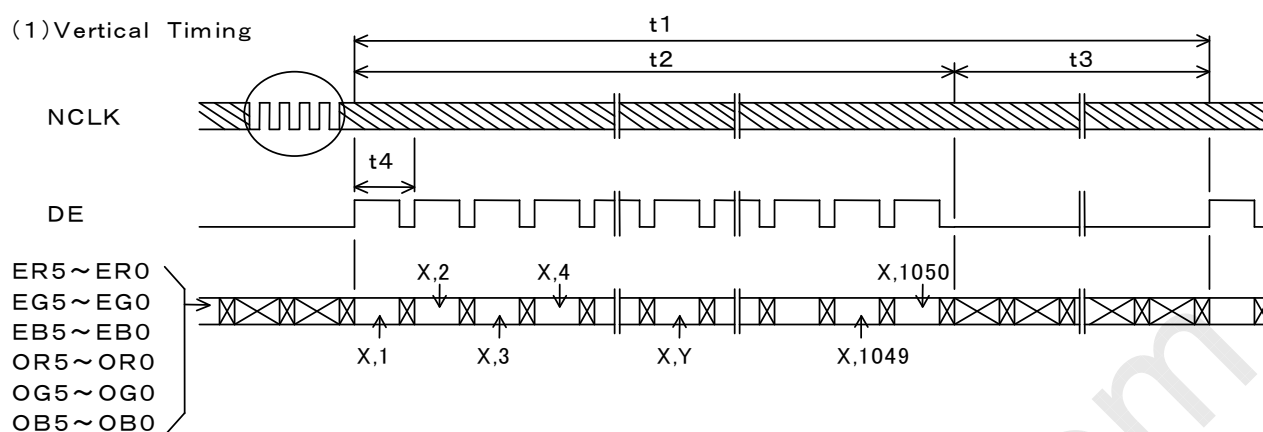
BLOCK DIAGRAM



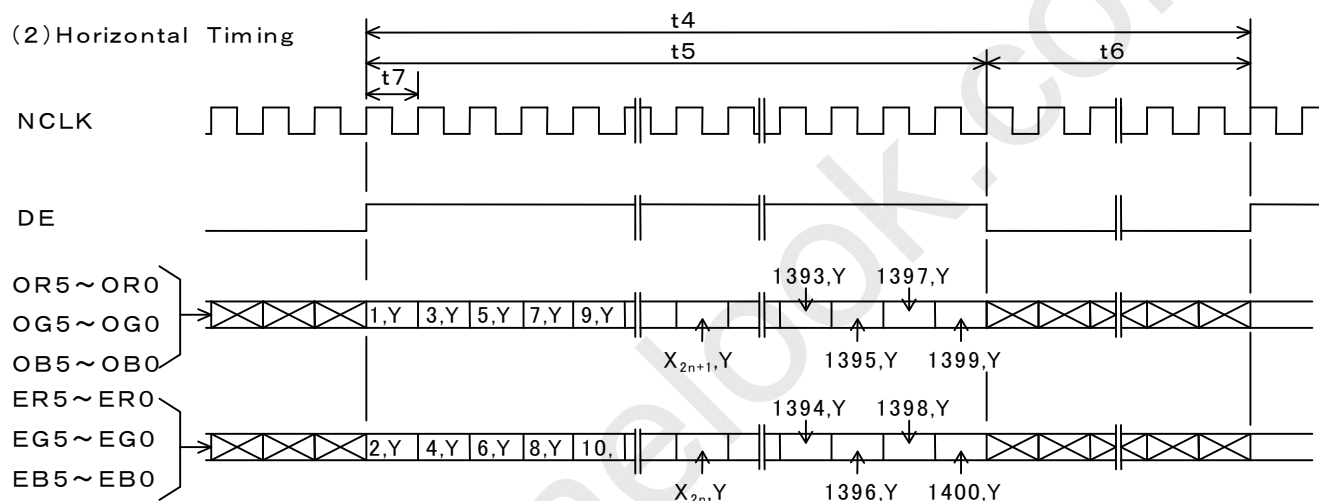
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TIMING CHART

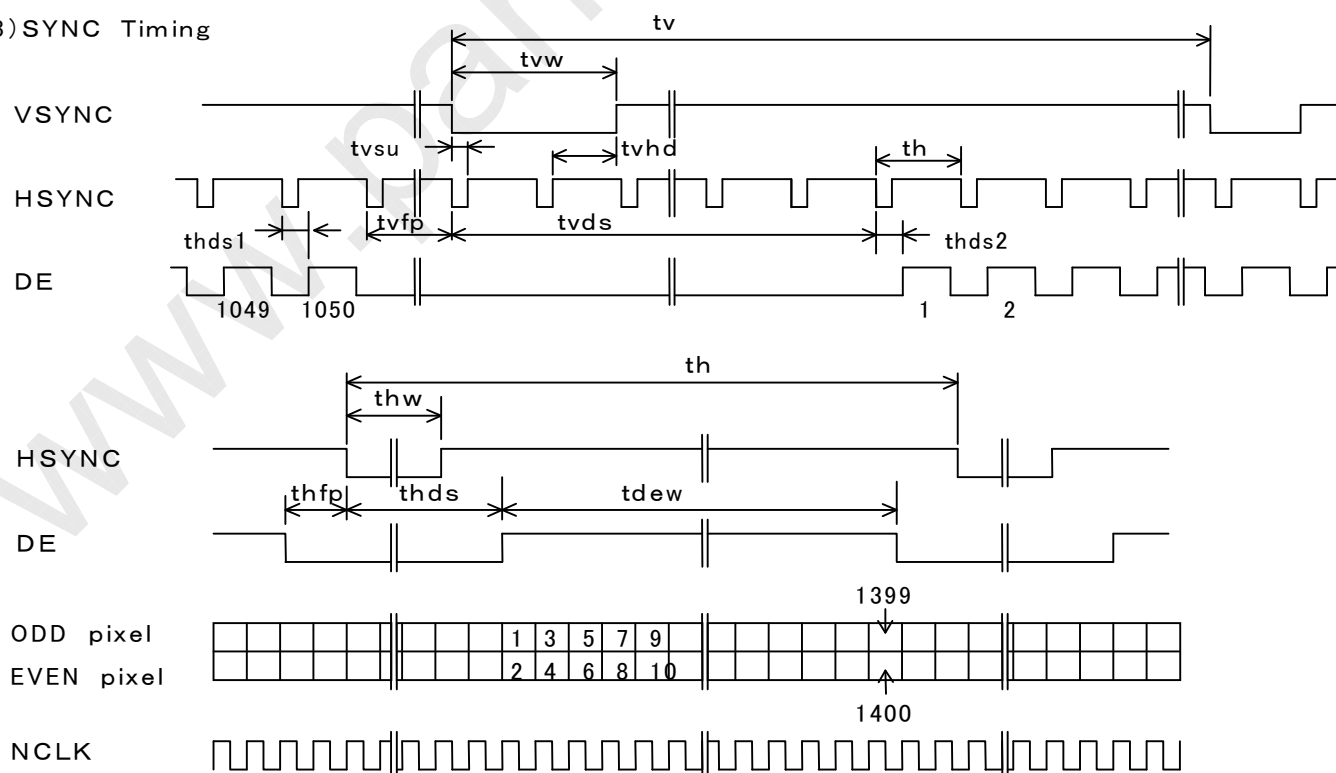
(1) Vertical Timing



(2) Horizontal Timing



(3) SYNC Timing



**TIMING SPECIFICATION** ^{1) 2) 3) 4) 5) 6) 7)}

Item	Symbol	min.	typ.	max.	unit
Horizontal Scanning Term	$t_4=th$	836 x t_7	844 x t_7	850 x t_7	-
H-sync Pulse Width	thw	8 x t_7	-	-	-
Horizontal Front Porch	$thfp$	8 x t_7	-	-	-
Horizontal Blanking Period	t_6	136 x t_7	144 x t_7	150 x t_7	-
Horizontal Display Term	t_5	700 x t_7	700 x t_7	700 x t_7	-
Horizontal Data Sync term	$thds$	$t_6 - thfp$	$t_6 - thfp$	$t_6 - thfp$	-
Frame Period	t_1	1060 x t_4	1066 x t_4 16.66	1070 x t_4 17.69	ms
V-sync Period	t_v	1060 x t_4	1066 x t_4	1070 x t_4	-
V-sync Pulse Width	twv	2 x t_4	-	-	-
V-sync Set Up Time (to H-sync)	tv_{su}	8 x t_7	-	-	-
V-sync Hold Time	tv_{hd}	8 x t_7	-	-	-
Vertical Front Porch	$tvfp$	0	-	-	-
Vertical Data Sync Term	$tvds$	8 x t_4	-	-	-
Vertical Display Term	t_2	1050 x t_4	1050 x t_4	1050 x t_4	-
Vertical Blanking Term	t_3	8 x t_4	16 x t_4	16 x t_4	-
Clock Period	t_7	17.544	18.519	19.597	ns
Clock Frequency	$1/t_7$	51	54	57	MHz
DE Pulse Width	$tdew$	700 x t_7	700 x t_7	700 x t_7	-

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 t_v , tv_{hd} and $tvds$ fluctuate.

If t_v , tv_{hd} , and $tvds$ 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.

**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	VDD	Power Supply: +3.3V
3	VDD	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.

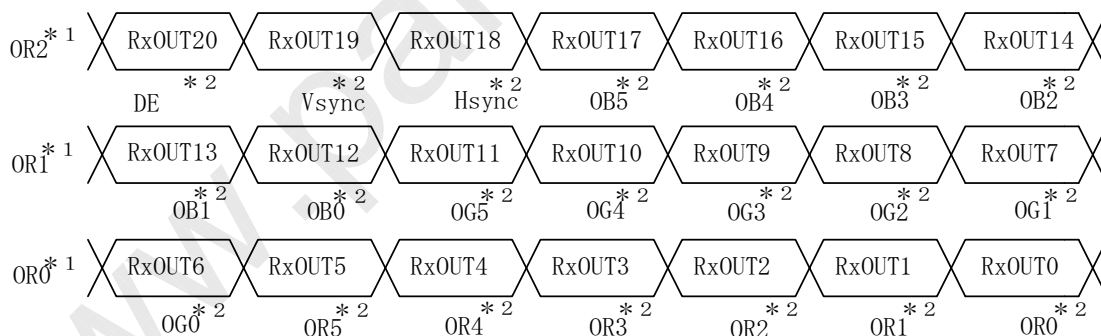
Mating Connector : SM02B-BHS-1 / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

Terminal No.	Symbol	Function
1	V _{FLH}	CCFL Power Supply (high voltage)
2	V _{FLL}	CCFL Power Supply (low voltage)

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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- TA+	No.8 No.9	OR0- 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)	TB- TB+	No.11 No.12	OR1- OR1+
TB0	6	G1	Green Pixels Display Data			
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)	TC- TC+	No.14 No.15	OR2- OR2+
TB6	15	B1	Blue Pixels Display Data			
TC0	16	B2	Blue Pixels Display Data			
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	TCLK- TCLK+	No.17 No.18	OCK- OCK+
TC5	23	VSYNC	V-SYNC			
TC6	25	DE	Compound Synchronization Signal			
CLK IN	26	NCLK	Data Sampling Clock			

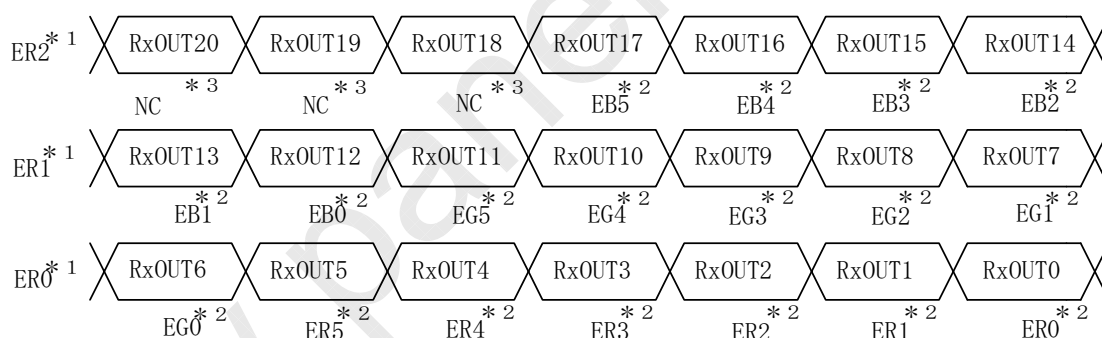


*1 : Receiver signal

*2 : Input signal

EVEN DATA

Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	To LTD121KM2S Interface(CN1)	
Symbol		Symbol	Function		Terminal	Symbol
TA0	44	R0	Red Pixels Display Data (LSB)	TA- TA+	No.20 No.21	ER0- 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)	TB- TB+	No.23 No.24	ER1- ER1+
TB0	6	G1	Green Pixels Display Data			
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)	TC- TC+	No.26 No.27	ER2- ER2+
TB6	15	B1	Blue Pixels Display Data			
TC0	16	B2	Blue Pixels Display Data			
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)	TCLK- TCLK+	No.29 No.30	ECK- ECK+
TC5	23	NC	Non Connection (open)			
TC6	25	NC	Non Connection (open)			
CLK IN	26	NCLK	Data Sampling Clock			



*1 : Receiver signal

*2 : Input signal

*3 : Do not use this signal



LTD121KM2M

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	-
Gray Scale of Red	White	H H H H H H H	H H H H H H H	H H H H H H H	-
	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 H	L L L L L L L	L L L L L L L	L 1
		L L L L L H 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	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	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	L 1
		L L L L L L L	L L L L L L L	L L L L H L 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	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	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-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 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.