

TOSHIBA MATSUSHITA DISPLAY TECHNOLOGY

26cm COLOUR TFT-LCD MODULE
(10.4 TYPE)**LTD104EA5S**
(p-Si TFT)

PRODUCT INFORMATION

All information is subject to change without notice. Please read bottom**FEATURES**

- (1) 10.4XGA(1024x768 pixels) display size for notebook PC
- (2) LVDS interface system
- (3) Light weight and Thinner design

TENTATIVE**MECHANICAL SPECIFICATIONS**

Item	Specifications
Dimensional Outline (typ.)	237.7(W) x 173.2(H) x 4.9max(D) mm
Number of Pixels	1024(W) x 768(H) pixels
Active Area	210.432(W) x 157.824(H) mm
Pixel Pitch	0.2055(W) x 0.2055(H)
Weight (approximately)	(195) g
Backlight	Single CCFL, Sidelight type

*1 : Excepting the FL cable width

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})	---	(600)	---	V(rms)	I _{FL} =5.0mA(rms)
FL Start Voltage (T _a =0°C)		1200	---	---	V(rms)	
Differential Input Voltage(High)	(V _H)	(V _{IS})+0.1	---	---	V	
Differential Input Voltage(Center)	(V _S)	0.5	1.2	1.5	V	
Differential Input Voltage(Low)	(V _L)	---	---	(V _{IS})-0.1	V	
Current Consumption	*2 (I _{DD})	---	250	---	mA	
	*3 (I _{FL})	2.0	4.5	5.0	mA(rms)	
*2 *3 Power Consumption		---	(3.7)	---	W	I _{FL} =5.0mA(rms)

*1 : Refer to "Timing Chart" and LVDS (THC63LVDF84A-85) specifications by THine Electronics, Inc. corporation.

*2 : 8 color bars pattern

*3 : Excepting the efficiency FL inverter

OPTICAL SPECIFICATION (T_a=25°C)

Item	Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (CR)	100	250	---	---	
Response Time	(t _{ON})	---	50	ms	
	(t _{OFF})	---	50	ms	
Luminance (L)	140	(180)	---	cd/m ²	I _{FL} =5.0mA(rms)

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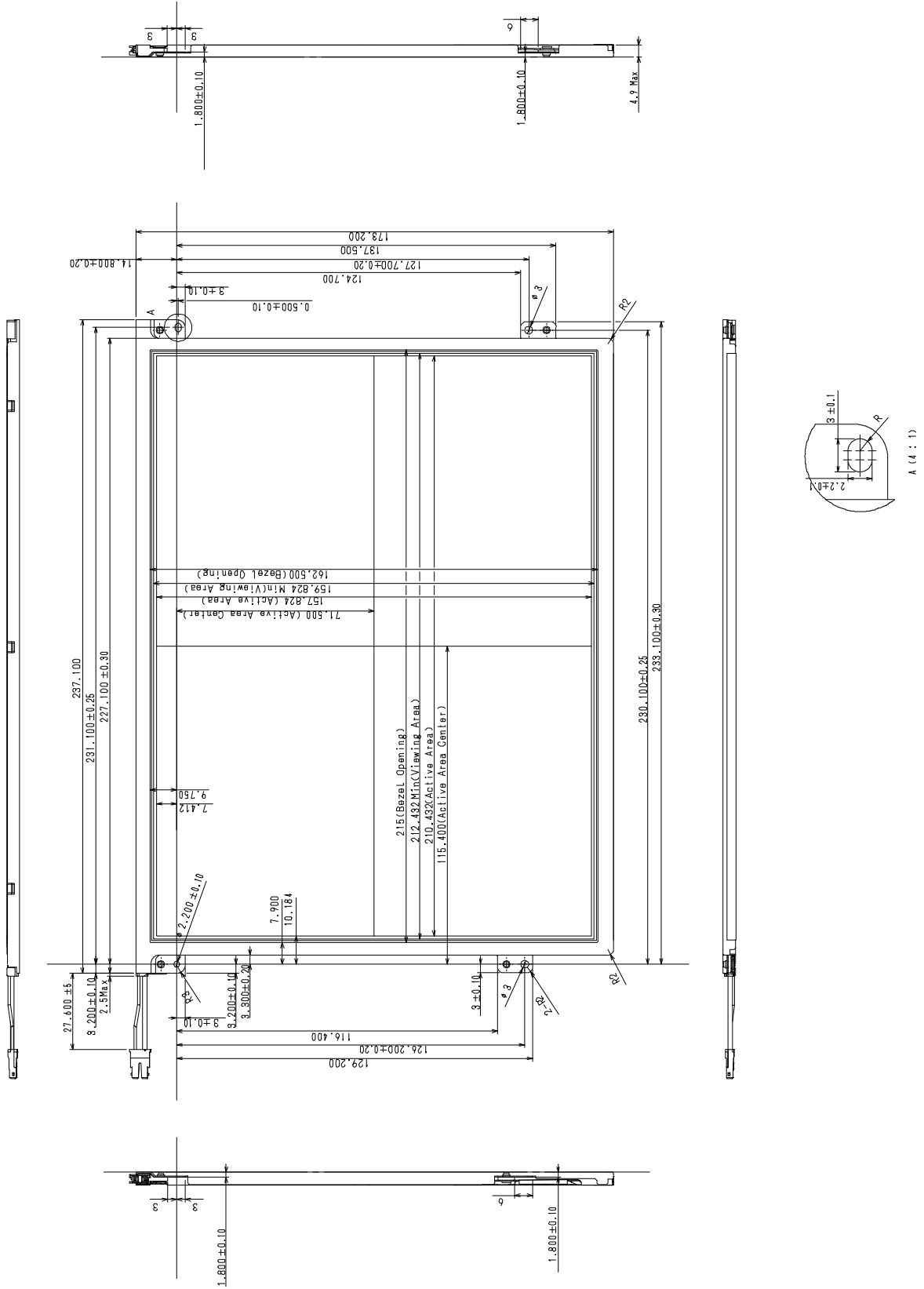
*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba Matsushita Display Technology before proceeding with the design of equipment incorporating this product.

DIMENSIONAL OUTLINE
(front figure)

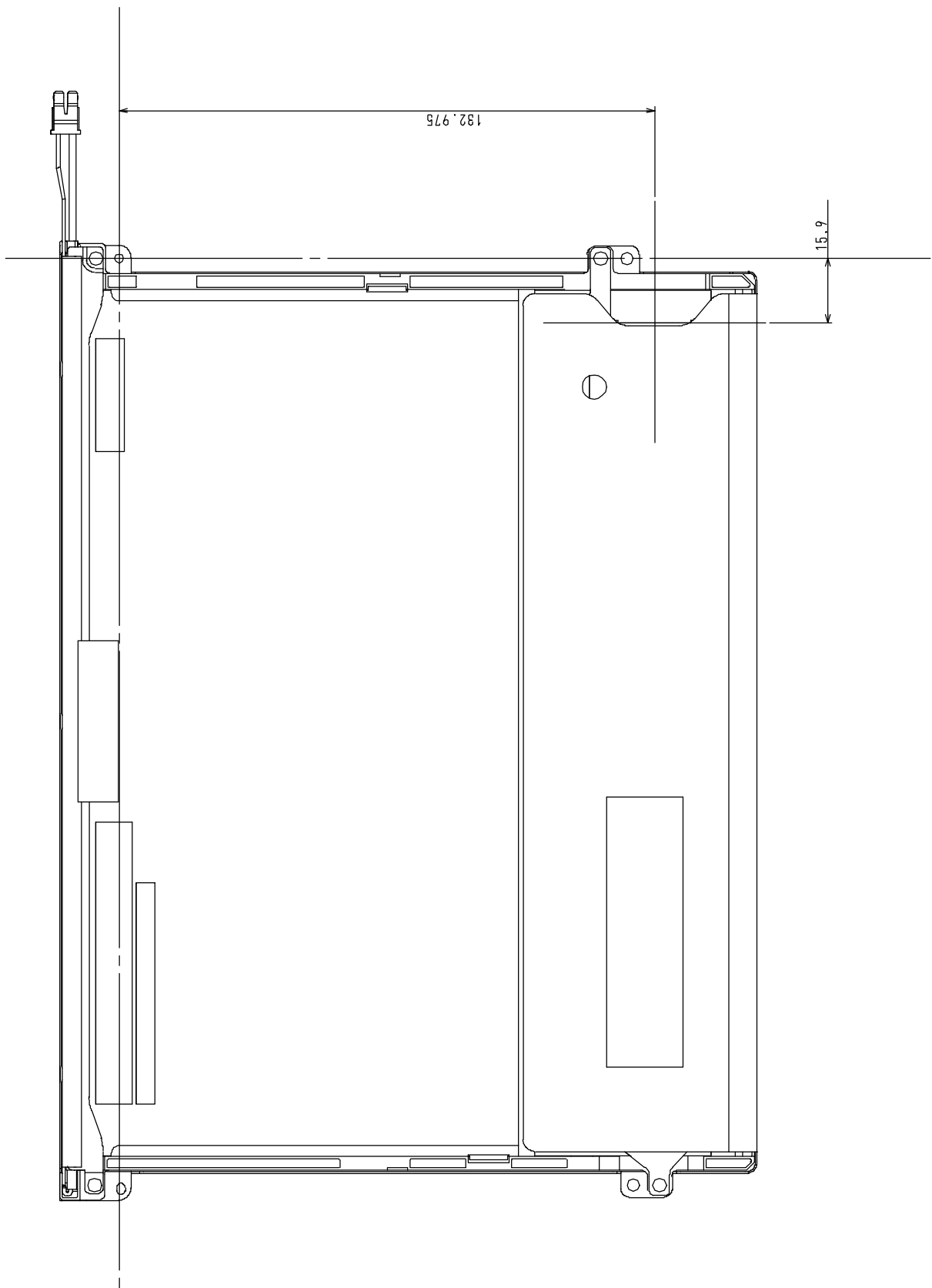
TENTATIVE

Unit : mm

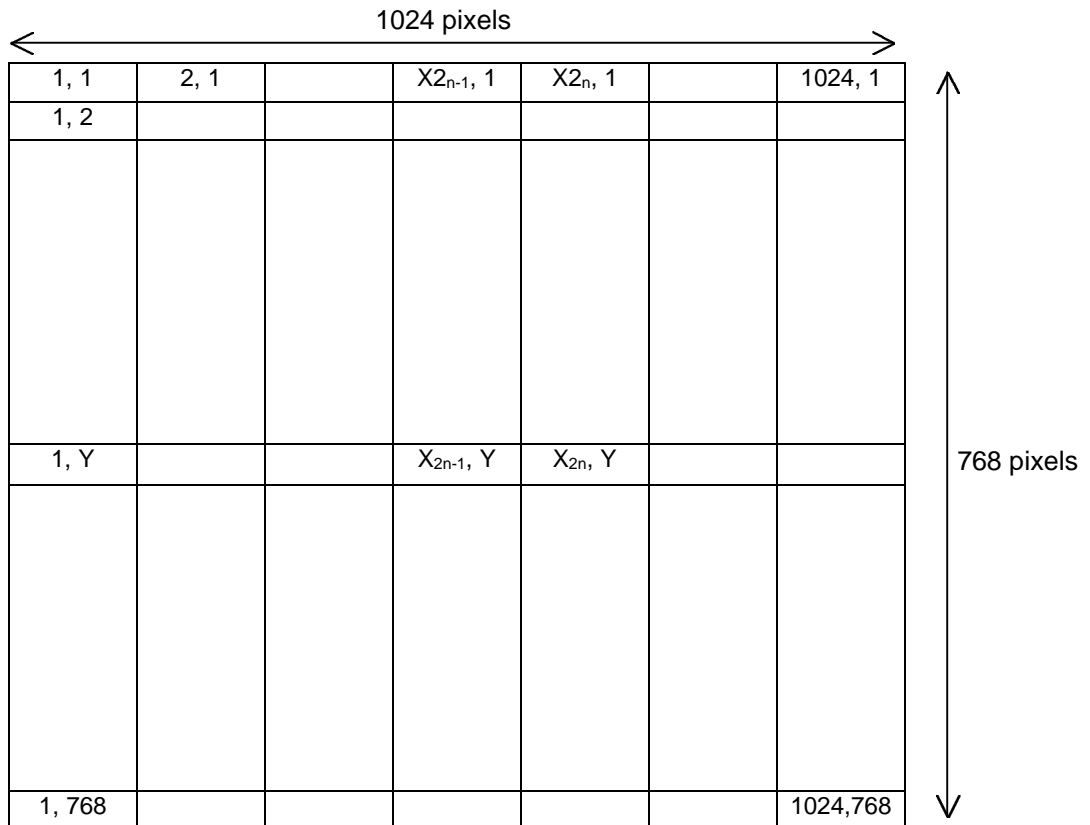
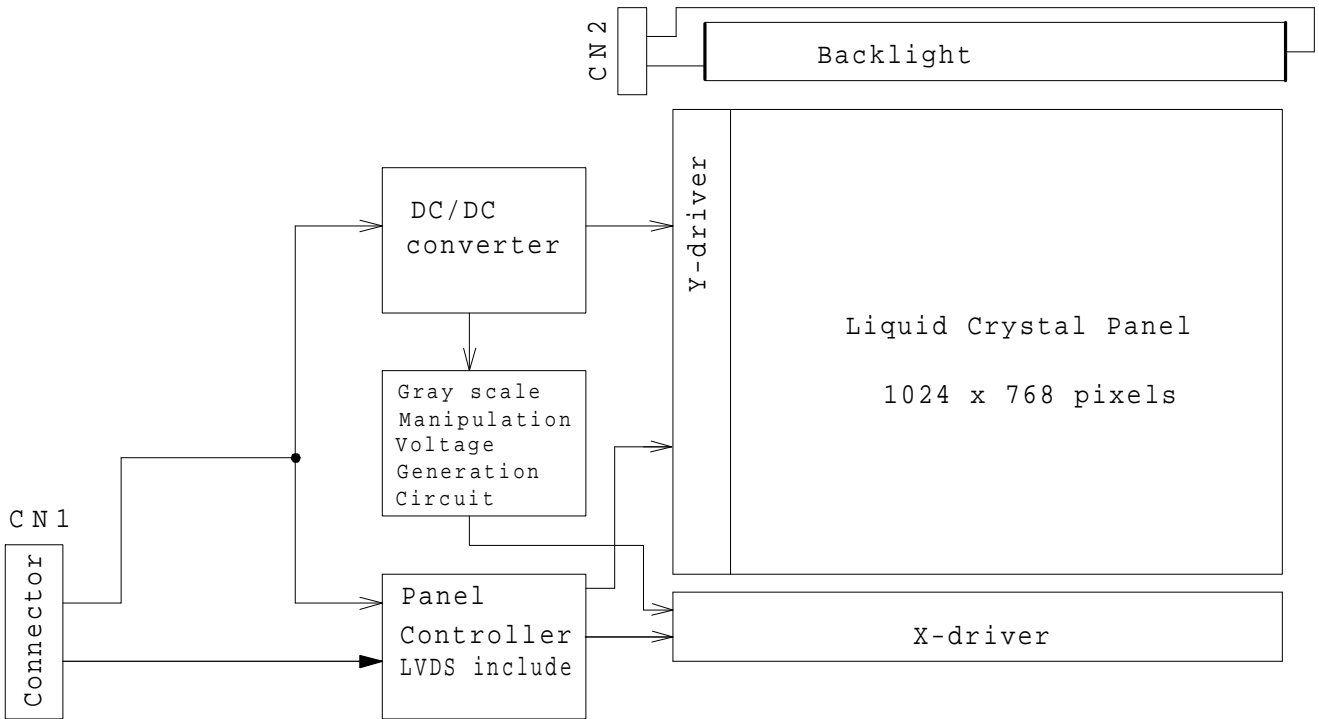
Standard tolerance : 0.5



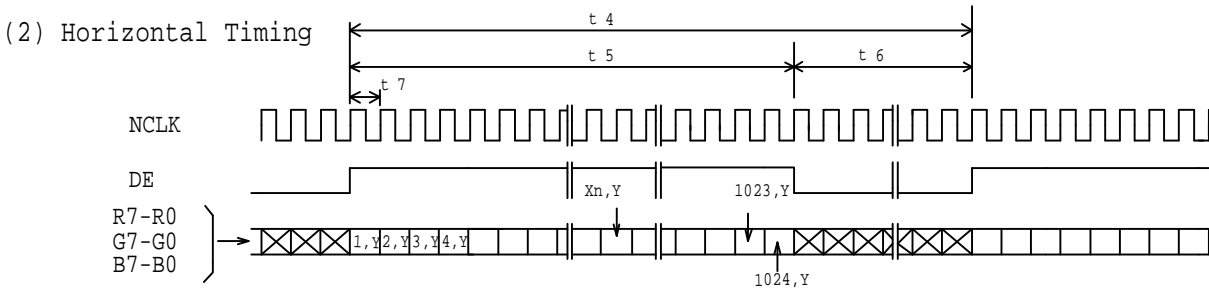
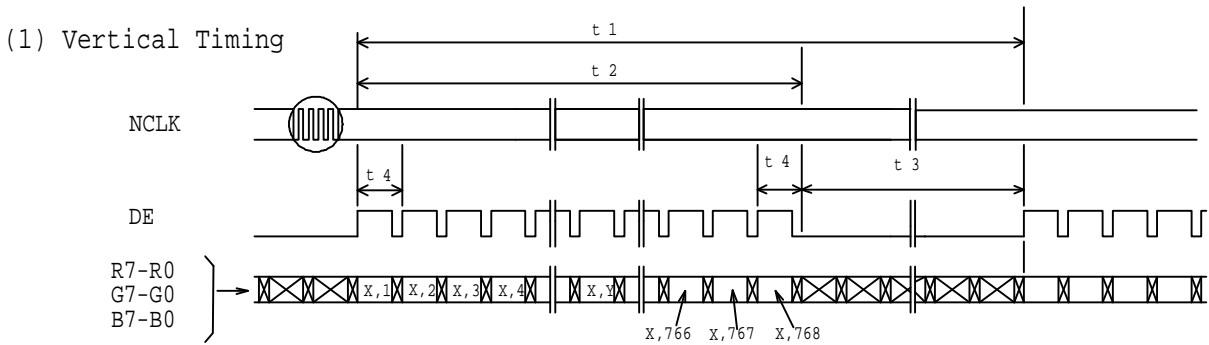
(Back figure)



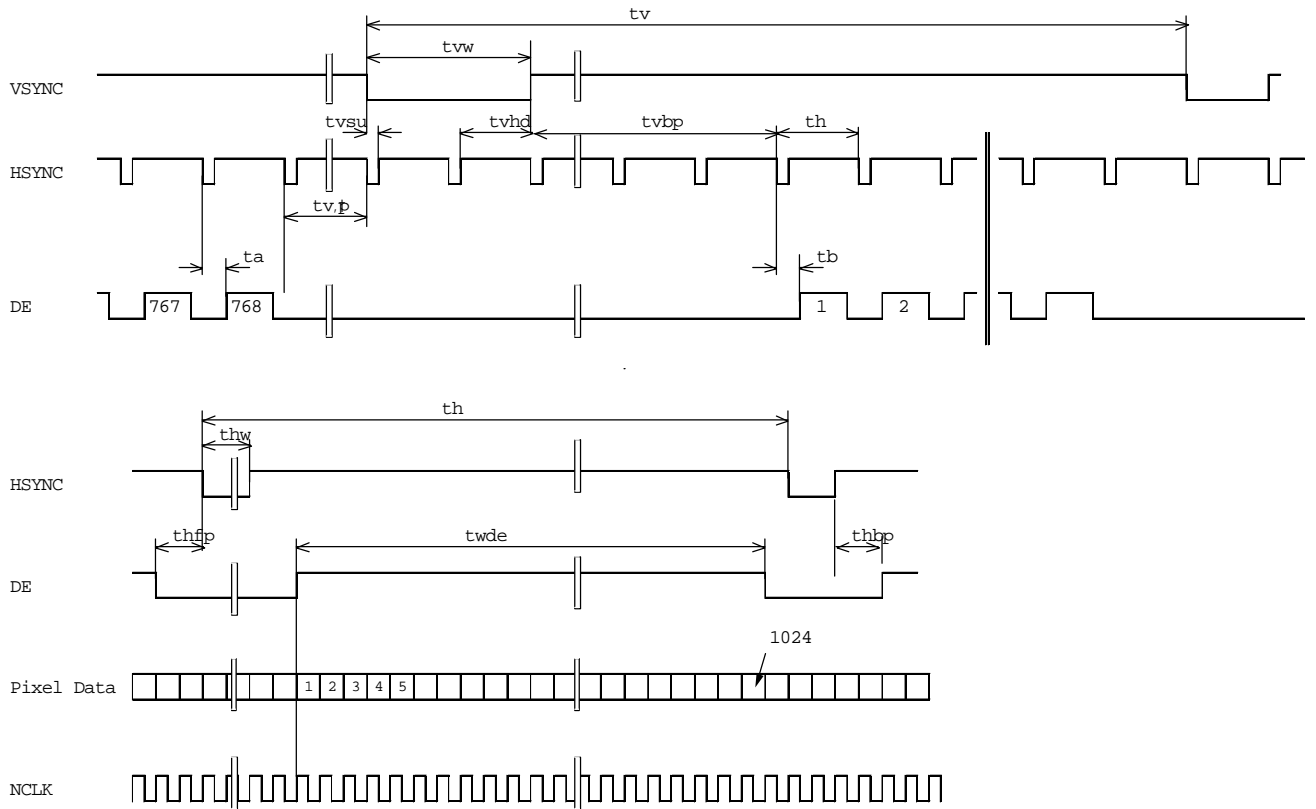
BLOCK DIAGRAM



TIMING CHART



(3) Vertical / Horizontal Sync Timing



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

Item	Symbol	min.	typ.	max.	unit
Frame Period	$t1$	778 x $t4$	-	860 x $t4$	-
					ms
Vertical Display Term	$t2$	768 x $t4$	768 x $t4$	768 x $t4$	-
Vertical Blanking Term	$t3$	10 x $t4$	-	92 x $t4$	-
1 Line Scanning Time	$t4$	1319 x $t7$	-	1600 x $t7$	-
		20.04	-	-	us
Horizontal Display Term	$t5$	1024 x $t7$	1024 x $t7$	1024 x $t7$	-
Horizontal Blanking Term	$t6$	295 x $t7$	-	500 x $t7$	-
Clock Period	$t7$	15	15.38	-	ns
V-Sync Pulse Width	tvw	3 x $t4$	-	7 x $t4$	-
V-Sync Set up Time	$tvsu$	8 x $t7$	-	-	-
V-Sync Hold Time	$tvhd$	$thbp+16$ x $t7$	-	-	-
Vertical Front Porch	$tvfp$	2 x $t4$	-	-	-
Vertical Back Porch	$tvbp$	6 x $t4$	-	-	-
Horizontal Period	th	1319 x $t7$	-	1600 x $t7$	-
		20.04	-	-	us
H-Sync Pulse Width	thw	8 x $t7$	-	-	-
Horizontal Front Porch	$thfp$	4 x $t7$	-	500 x $t7$	-
Horizontal Back Porch	$thbp$	8 x $t7$	-	492 x $t7$	-
$thw+thbp$		16 X $t7$	-	500 X $t7$	-
DE Pulse Width	$twde$	1024 x $t7$	1024 x $t7$	1024 x $t7$	-

$$t3 = tvfp + tvw + tvbp$$

$$t4 = th$$

$$t6 = thfp + thw + thbp$$

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

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

Note 3) If CLK 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 3.

Note5) Do not make tv , th , $thbp$ and $tvds$ fluctuate.

If tv , th , $thbp$ 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) 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.

CONNECTOR PIN ASSIGNMENT FOR INTERFACE

CN1 INPUT SIGNAL

Connector : DF19L-14P-1H / HIROSE ELECTRIC CO.,LTD.

Mating Connector : DF19G-14S-1C / HIROSE ELECTRIC CO.,LTD.

Terminal No.	Symbol	Function
1	V_{DD}	Power Supply : +3.3V
2	V_{DD}	Power Supply : +3.3V
3	GND	
4	GND	
5	IN0-	Transmission Data of Pixels 0 (Negative : -)
6	IN0+	Transmission Data of Pixels 0 (Positive : +)
7	IN1-	Transmission Data of Pixels 1 (Negative : -)
8	IN1+	Transmission Data of Pixels 1 (Positive : +)
9	IN2-	Transmission Data of Pixels 2 (Negative : -)
10	IN2+	Transmission Data of Pixels 2 (Positive : +)
11	CLK IN-	Sampling Clock (Negative : -)
12	CLK IN+	Sampling Clock (Positive : +)
13	GND	
14	GND	

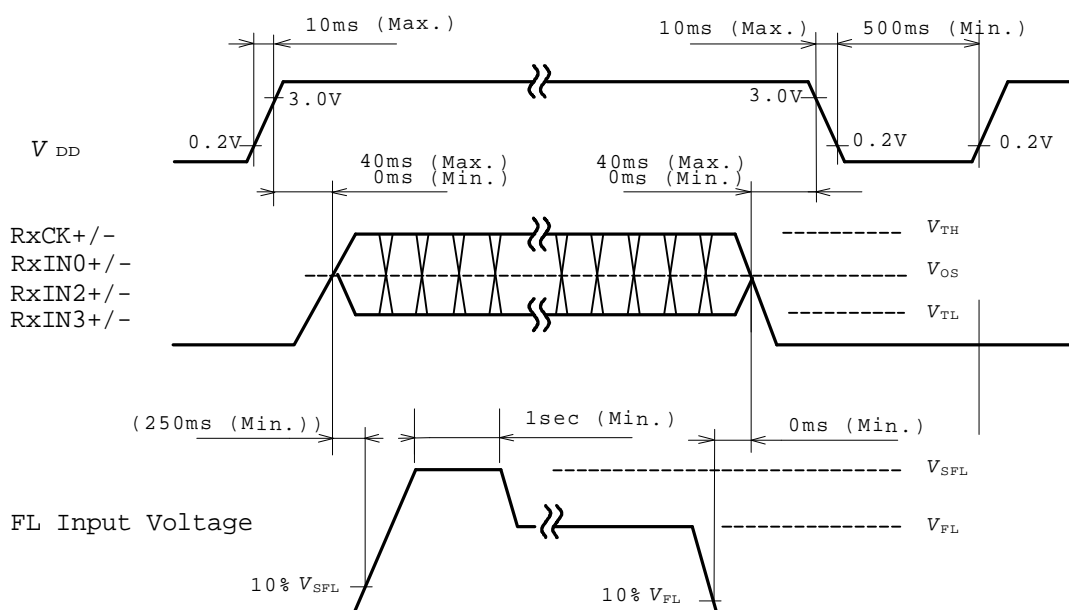
CN2 CCFL POWER SOURCE

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

Mating Connector : SM02B-BHTS-B-TB / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

Terminal No.	Symbol	Function
1	V_{FLH}	CCFL Power Supply (high voltage)
2	V_{FL}	CCFL Power Supply (low voltage)

SEQUENCE OF POWER SUPPLIES AND SIGNALS

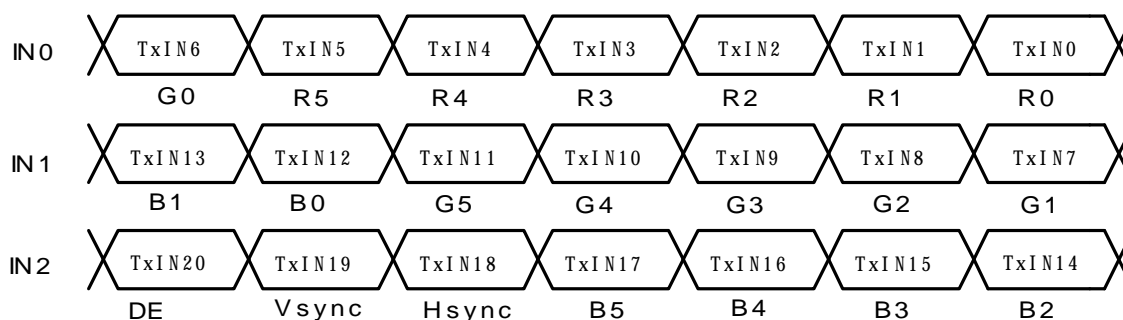


RECOMMENDED TRANSMITTER (DS90C363) TO LTD104EA5S INTERFACE ASSIGNMENT

Case1: 6bit Transmitter

DS90C363				LTD104EA5S Interface (CN1)		
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	Terminal	Symbol
Symbol	Terminal	Symbol	Function			
TxIN0	44	R0	Red Pixels Display Data (LSB)	TxOUT0- TxOUT0+	No.5 No.6	IN0- IN0+
TxIN1	45	R1	Red Pixels Display Data			
TxIN2	47	R2	Red Pixels Display Data			
TxIN3	48	R3	Red Pixels Display Data			
TxIN4	1	R4	Red Pixels Display Data			
TxIN5	3	R5	Red Pixels Display Data (MSB)			
TxIN6	4	G0	Green Pixels Display Data (LSB)	TxOUT1- TxOUT1+	No.7 No.8	IN1- IN1+
TxIN7	6	G1	Green Pixels Display Data			
TxIN8	7	G2	Green Pixels Display Data			
TxIN9	9	G3	Green Pixels Display Data			
TxIN10	10	G4	Green Pixels Display Data			
TxIN11	12	G5	Green Pixels Display Data (MSB)			
TxIN12	13	B0	Blue Pixels Display Data (LSB)	TxOUT2- TxOUT2+	No.9 No.10	IN2- IN2+
TxIN13	15	B1	Blue Pixels Display Data			
TxIN14	16	B2	Blue Pixels Display Data			
TxIN15	18	B3	Blue Pixels Display Data			
TxIN16	19	B4	Blue Pixels Display Data			
TxIN17	20	B5	Blue Pixels Display Data (MSB)			
TxIN18	22	Hsync	Horizontal Synchronization Signal	TxCLK OUT- TxCLK OUT+	No.11 No.12	CLK- CLK+
TxIN19	23	Vsync	Vertical Synchronization Signal			
TxIN20	25	DE	Compound Synchronization Signal			
TxCLK IN	26	NCLK	Data Sampling Clock			

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

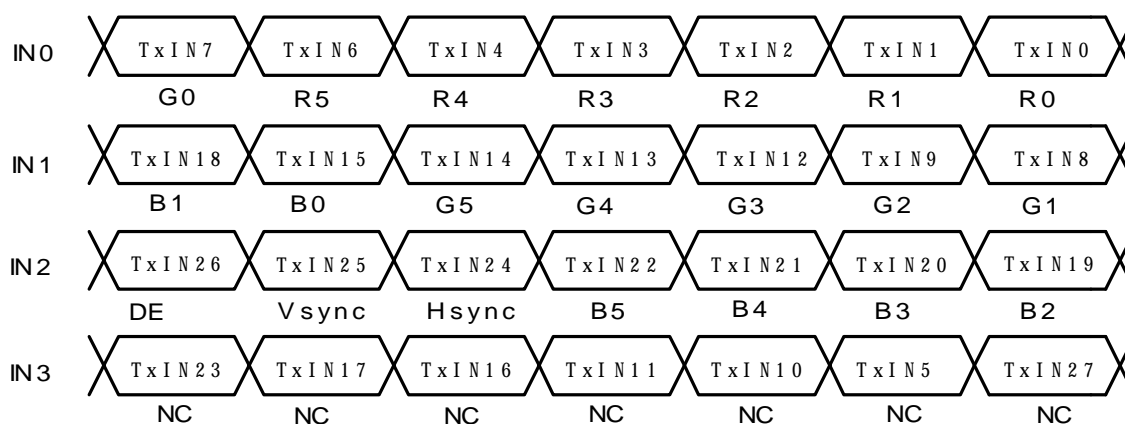


RECOMMENDED TRANSMITTER (DS90C383) TO LTD104EA5S INTERFACE ASSIGNMENT

Case2: 8bit Transmitter

DS90C383				LTD104EA5S Interface (CN1)		
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	Terminal	Symbol
Symbol	Terminal	Symbol	Function			
TxIN0	51	R0	Red Pixels Display Data (LSB)	TxOUT0- TxOUT0+	No.5 No.6	IN0- IN0+
TxIN1	52	R1	Red Pixels Display Data			
TxIN2	54	R2	Red Pixels Display Data			
TxIN3	55	R3	Red Pixels Display Data			
TxIN4	56	R4	Red Pixels Display Data			
TxIN6	3	R5	Red Pixels Display Data (MSB)			
TxIN7	4	G0	Green Pixels Display Data(LSB)	TxOUT1- TxOUT1+	No.7 No.8	IN1- IN1+
TxIN8	6	G1	Green Pixels Display Data			
TxIN9	7	G2	Green Pixels Display Data			
TxIN12	11	G3	Green Pixels Display Data			
TxIN13	12	G4	Green Pixels Display Data			
TxIN14	14	G5	Green Pixels Display Data(MSB)			
TxIN15	15	B0	Blue Pixels Display Data (LSB)	TxOUT2- TxOUT2+	No.9 No.10	IN2- IN2+
TxIN18	19	B1	Blue Pixels Display Data			
TxIN19	20	B2	Blue Pixels Display Data			
TxIN20	22	B3	Blue Pixels Display Data			
TxIN21	23	B4	Blue Pixels Display Data			
TxIN22	24	B5	Blue Pixels Display Data (MSB)			
TxIN24	27	Hsync	Horizontal Synchronization Signal	TxOUT3- TxOUT3+		
TxIN25	28	Vsync	Vertical Synchronization Signal			
TxIN26	30	DE	Compound Synchronization Signal			
TxIN27	50	NC	Non Connection (open)			
TxIN5	2	NC	Non Connection (open)			
TxIN10	8	NC	Non Connection (open)			
TxIN11	10	NC	Non Connection (open)	TxCLK OUT- TxCLK OUT+	No.11 No.12	CLK- CLK+
TxIN16	16	NC	Non Connection (open)			
TxIN17	18	NC	Non Connection (open)			
TXIN23	25	NC	Non Connection (open)			
TxCLK IN	31	NCLK	Data Sampling Clock			

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 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 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 H	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-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.