

## PRODUCT INFORMATION

## FEATURES

- (1) 10.4 XGA display size
- (2) LVDS interface with 6bit color data
- (3) Light weight(195g Typical) and Thinner design(6.8mm Max.)
- (4) Digitizer easy insertion design
- (5) Mechanical Compatible with LTM10C321K/T Series

**TENTATIVE**

## MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	238.6(W) x 173.2(H) x 6.8max(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)	195g
Backlight	CCFL, Sidelight type

## ABSOLUTE MAXIMUM RATINGS

Item	Min.	Max.	Unit	
Supply Voltage	(V <sub>DD</sub> )	-0.3	4.0	V
	(V <sub>FL</sub> )	0	2.0	kV(rms)
FL Driving Frequency (f <sub>FL</sub> )	-	100	kHz	
Input Signal Voltage (V <sub>IN</sub> )	-0.3	V <sub>DD</sub> +0.3	V	
Operating Ambient 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 <sub>DD</sub> )	3.0	3.3	3.6	V	
	(V <sub>FL</sub> )	495	550	605	V(rms)	I <sub>FL</sub> =5.0mA(rms)
FL Start Voltage (T <sub>a</sub> =0°C)	1450	---	1600	V(rms)		
Differential Input High Threshold (V <sub>TH</sub> )	---	---	V <sub>OS</sub> +0.1	V		
Differential Input Low Threshold (V <sub>TL</sub> )	V <sub>OS</sub> -0.1	---	---	V		
Current Consumption	*1 (I <sub>DD</sub> )	---	180	300	mA	
	*3 (I <sub>FL</sub> )	3.0	5.0	6.0	mA(rms)	
*2 *3 Power Consumption	---	3.34	---	W	@170 cd/m <sup>2</sup>	

\*2 : 8 color bars pattern

\*3 : Excepting the efficiency FL inverter

OPTICAL SPECIFICATION (T<sub>a</sub>=25°C)

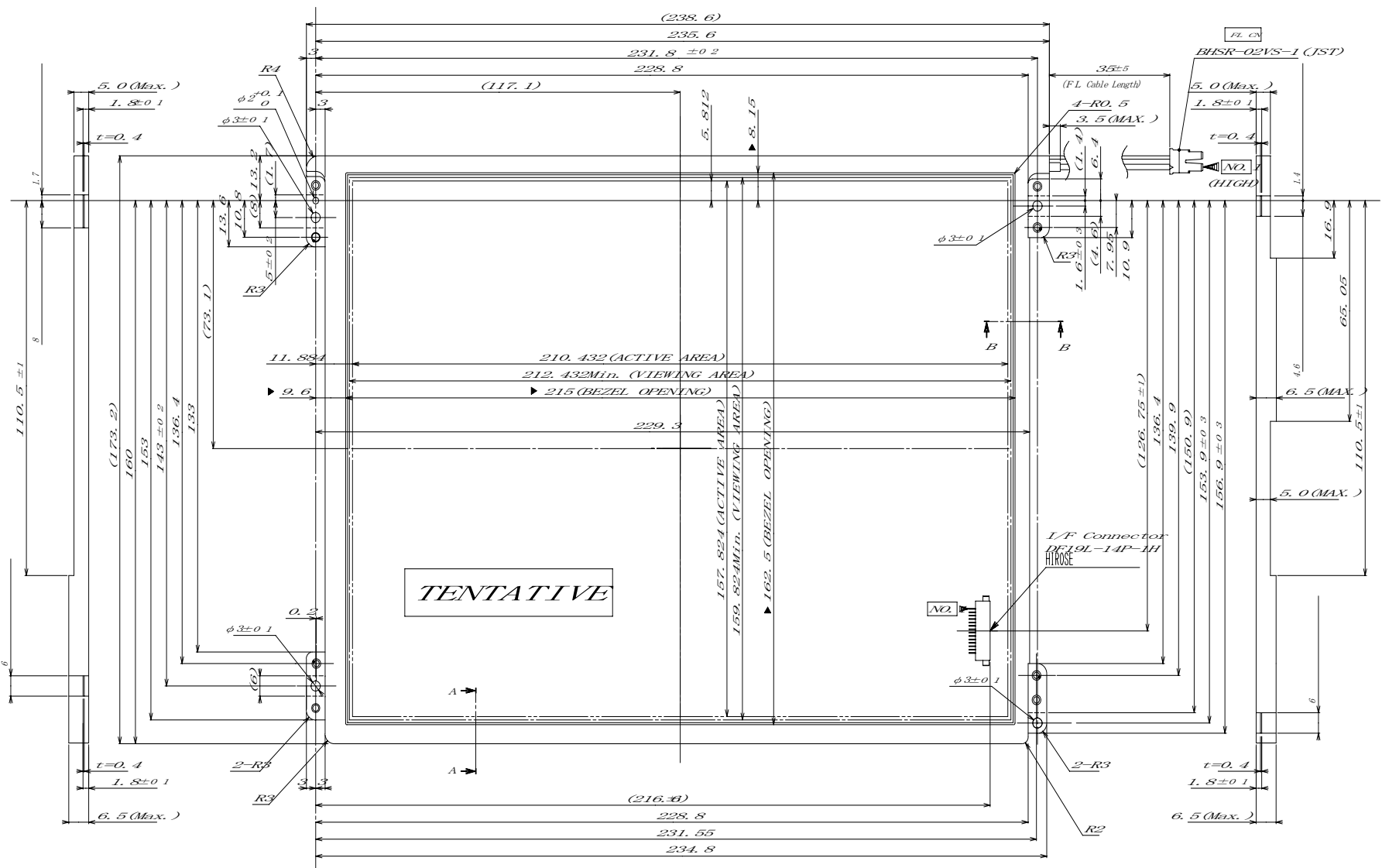
Item	Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (CR)	100	250	---	---	
Viewing Angle (CR>=10)	(Upper+Lower)	---	50	---	deg.
	(Left+Right)	---	90	---	deg.
Luminance	---	170	---	cd/m <sup>2</sup>	I <sub>FL</sub> =5.0mA(rms)

\*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 Co.,Ltd 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 Co.,Ltd or others.

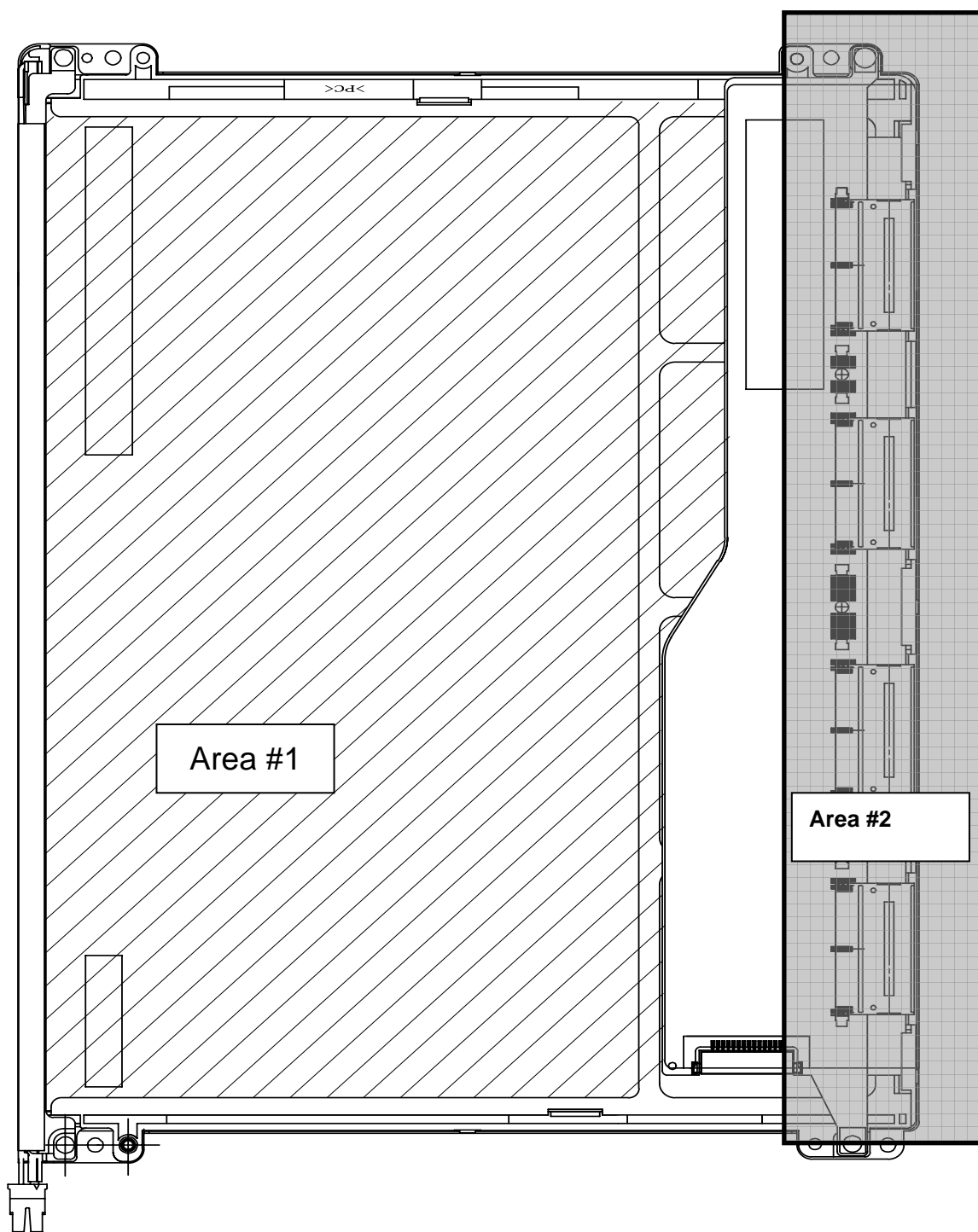
\*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba Matsushita Display technology Co.,Ltd before proceeding with the design of equipment incorporating this product.

**DIMENSIONAL OUTLINE**  
**(Front)**

Unit : mm  
Standard tolerance : ±0.5



(Rear)

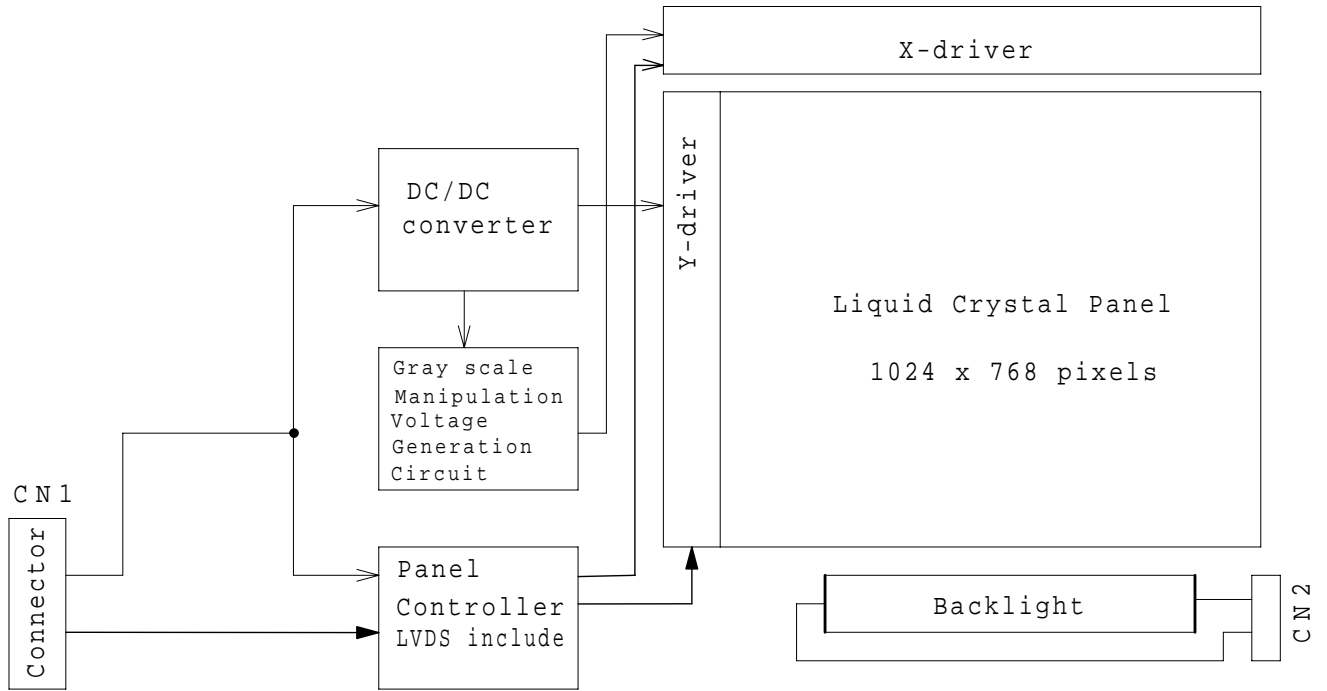
**Caution :**

To keep space between LCD module and cabinet or circuit board is necessary due to avoid uniformity phenomenon by shock & vibration. Especially at shade area(#1), it is important to take care about the space at set design stage.

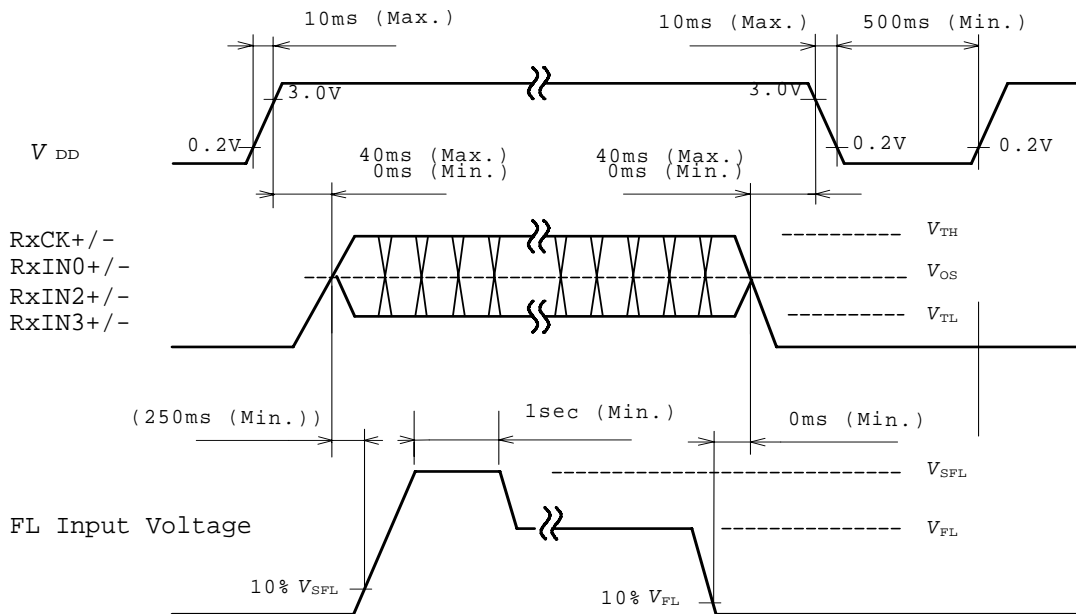
When LCD assembly into set, LCD handling care at area #2 is required. If not, TAB disconnection might be happened.

Recommendable digitizer should be Wacom "SU-001"(0.5mm max. thickness). When the other type of digitizer will be applied, engineering discussion is strongly required before start tooling design.

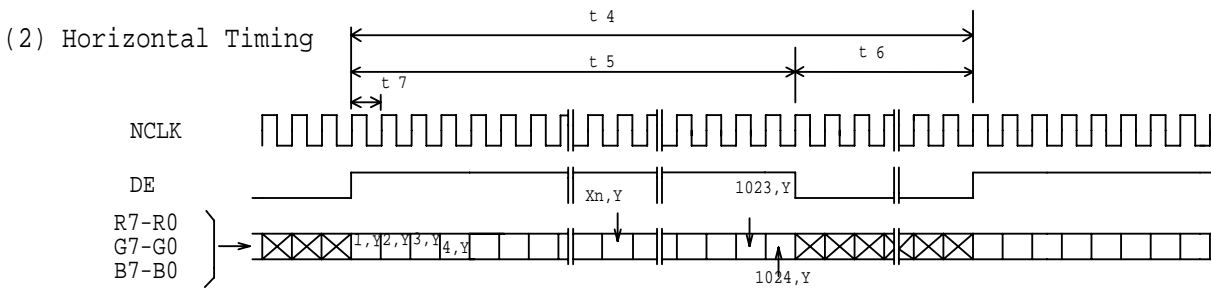
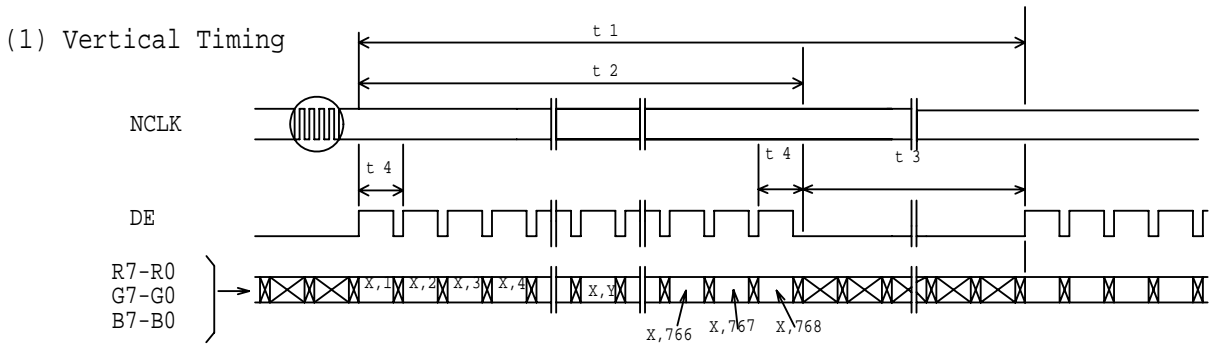
**BLOCK DIAGRAM**



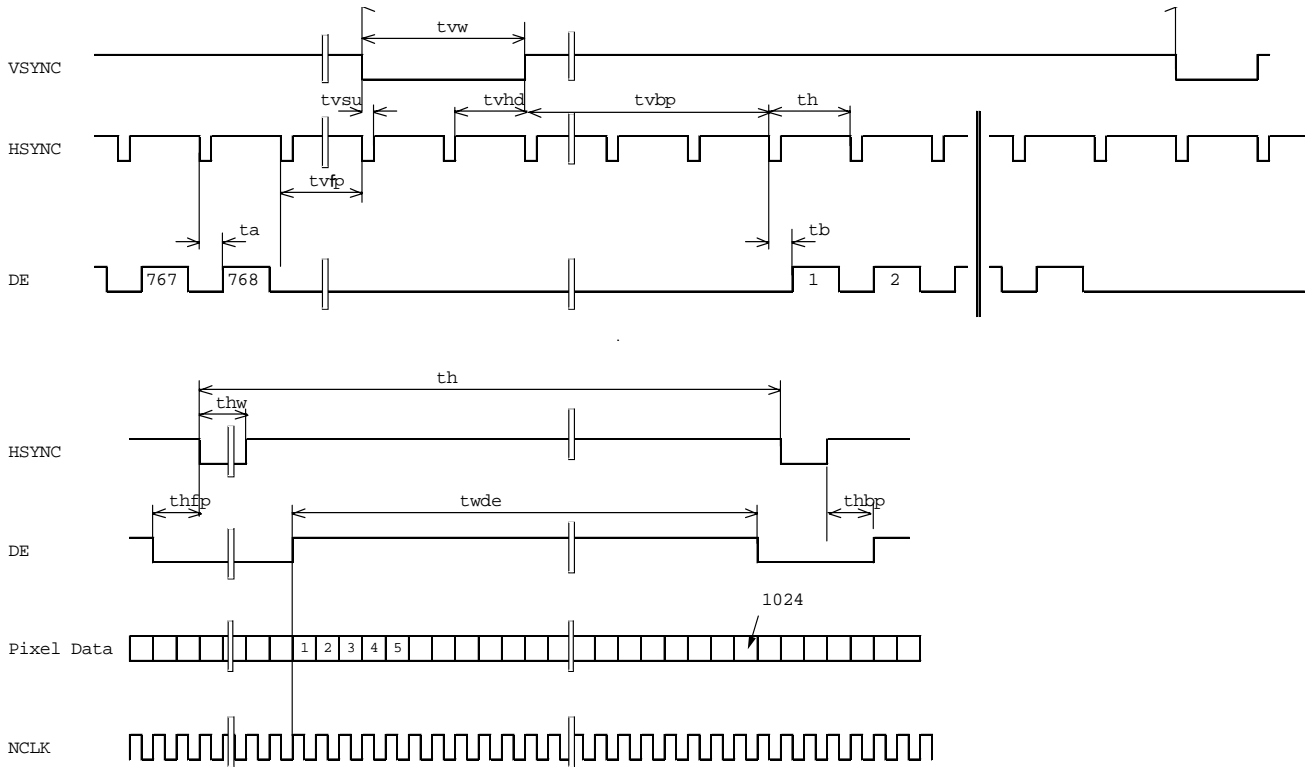
**Sequence of Power Supplies and Signals**



**TIMING CHART**



(3) Vertical / Horizontal Sync Timing



**TIMING SPECIFICATION** <sup>1) 2) 3) 4) 5) 6) 7)</sup>

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 operaTxING signal timing and FL driving frequency, to optimize the display quality.

There is a possibility that flicker is observed by the interference of LCD operaTxING signal timing and FL driving condition (especially driving frequency), even if the condition satisfies above timing specifications and recommended operaTxING 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

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

Mating Connector(Corresponding 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 <sup>1)</sup>	
4	GND <sup>1)</sup>	
5	IN0-	Transmission Data of Pixels(Differential data) 0 (Negative : - )
6	IN0+	Transmission Data of Pixels(Differential data) 0 (Positive : + )
7	IN1-	Transmission Data of Pixels(Differential data) 1 (Negative : - )
8	IN1+	Transmission Data of Pixels(Differential data) 1 (Positive : + )
9	IN2-	Transmission Data of Pixels(Differential data) 2 (Negative : - )
10	IN2+	Transmission Data of Pixels(Differential data) 2 (Positive : + )
11	CLK-	Sampling Clock (Negative : - )
12	CLK+	Sampling Clock (Positive : + )
13	GND <sup>1)</sup>	
14	GND <sup>1)</sup>	

### CN2 CCFL POWER SOURCE

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

Mating Connector(Corresponding Connector)

: SM02B-BHSS-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)

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

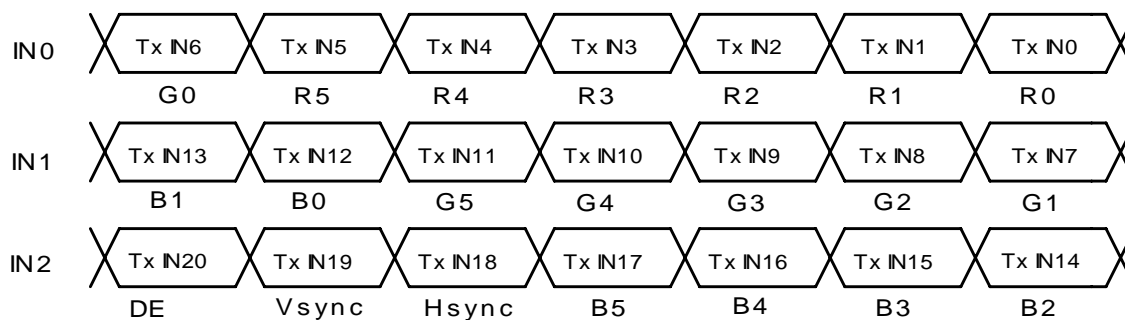
Please connect GND to ground. Don't use it as no-connect nor connection with high impedance.

Note 2) 262,144 colors are displayed by the combinations of 18 bits data. (See next page)

## RECOMMENDED TRANSMITTER (DS90CF363) TO LTD104KA1S INTERFACE ASSIGNMENT

## 6bit Transmitter

DS90CF363				Output Signal Symbol	LTD104KA1S Interface (CN1)	
Input Terminal No.		Input Signal (Graphics controller output signal)			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	H-Sync			
TxIN19	23	VSYNC	V-Sync			
TxIN20	25	ENAB	Compound Synchronization Signal			
TxCLK IN	26	CLK	Data Sampling Clock	TxCLK OUT- TxCLK OUT+	No.11 No.12	CLK- CLK+



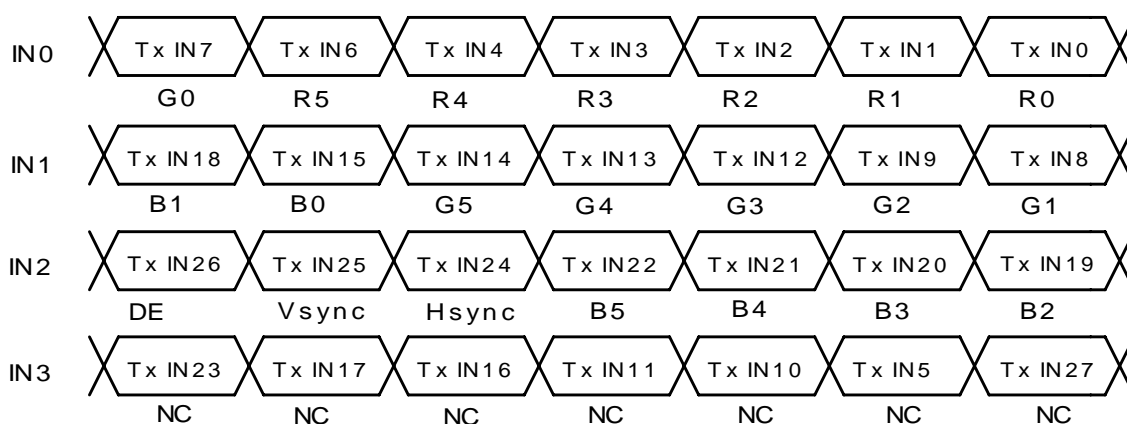


## RECOMMENDED TRANSMITTER (DS90C383 ) TO LTD104KA1S INTERFACE ASSIGNMENT

## Case2: 8bit Transmitter

DS90C383				Output Signal Symbol	LTD104KA1S Interface (CN1)	
Input Terminal No.		Input Signal (Graphics controller output signal)			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)	TxOUT1- TxOUT1+	No.7 No.8	IN1- IN1+
TxIN7	4	G0	Green Pixels Display Data(LSB)			
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	TxOUT2- TxOUT2+	No.9 No.10	IN2- IN2+
TxIN14	14	G5	Green Pixels Display Data(MSB)			
TxIN15	15	B0	Blue Pixels Display Data (LSB)			
TxIN18	19	B1	Blue Pixels Display Data			
TxIN19	20	B2	Blue Pixels Display Data			
TxIN20	22	B3	Blue Pixels Display Data	TxOUT3- TxOUT3+		
TxIN21	23	B4	Blue Pixels Display Data			
TxIN22	24	B5	Blue Pixels Display Data (MSB)			
TxIN24	27	Hsync	Horizontal Synchronization Signal			
TxIN25	28	Vsync	Vertical Synchronization Signal			
TxIN26	30	DE	Compound Synchronization Signal	TxCLK OUT- TxCLK OUT+	No.11 No.12	CLK- CLK+
TxIN27	50	NC	Non Connection (open)			
TxIN5	2	NC	Non Connection (open)			
TxIN10	8	NC	Non Connection (open)			
TxIN11	10	NC	Non Connection (open)			
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.



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 H L	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

Note1 L: Low level voltage, H: High level voltage

**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 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 Co.,Ltd'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 Co.,Ltd'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 Co.,Ltd's published specification limits.

C) In addition, since Toshiba Matsushita Display technology Co.,Ltd 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 Co.,Ltd 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.