

FEATURES

- (1) 10.4 XGA display size
- (2) LVDS interface with 6bit color data
- (3) Light weight and Thinner design
- (4) Digitizer easy insertion design

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)	225g
Backlight	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 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 _{DD})	3.0	3.3	3.6	V	
	(V _{FL})	540	590	640	V(rms)	I _{FL} =(5.0)mA(rms)
FL Start Voltage (Ta=0°C)	1200	---	1600	V(rms)		
Differential Input High Threshold (V _{TH})	---	---	V _{OS} +0.1	V		
Differential Input Low Threshold (V _{TL})	V _{OS} -0.1	---	---	V		
Current Consumption	*1 (I _{DD})	---	210	360	mA	
	*3 (I _{FL})	3.0	5.0	6.0	mA(rms)	
*2 *3 Power Consumption	---	(3.68)	---	W	@150 cd/m ²	

*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)	---	30	---	deg.
	(Left+Right)	---	60	---	deg.
Luminance	---	150	---	cd/m ²	I _{FL} =(5.0)mA(rms)

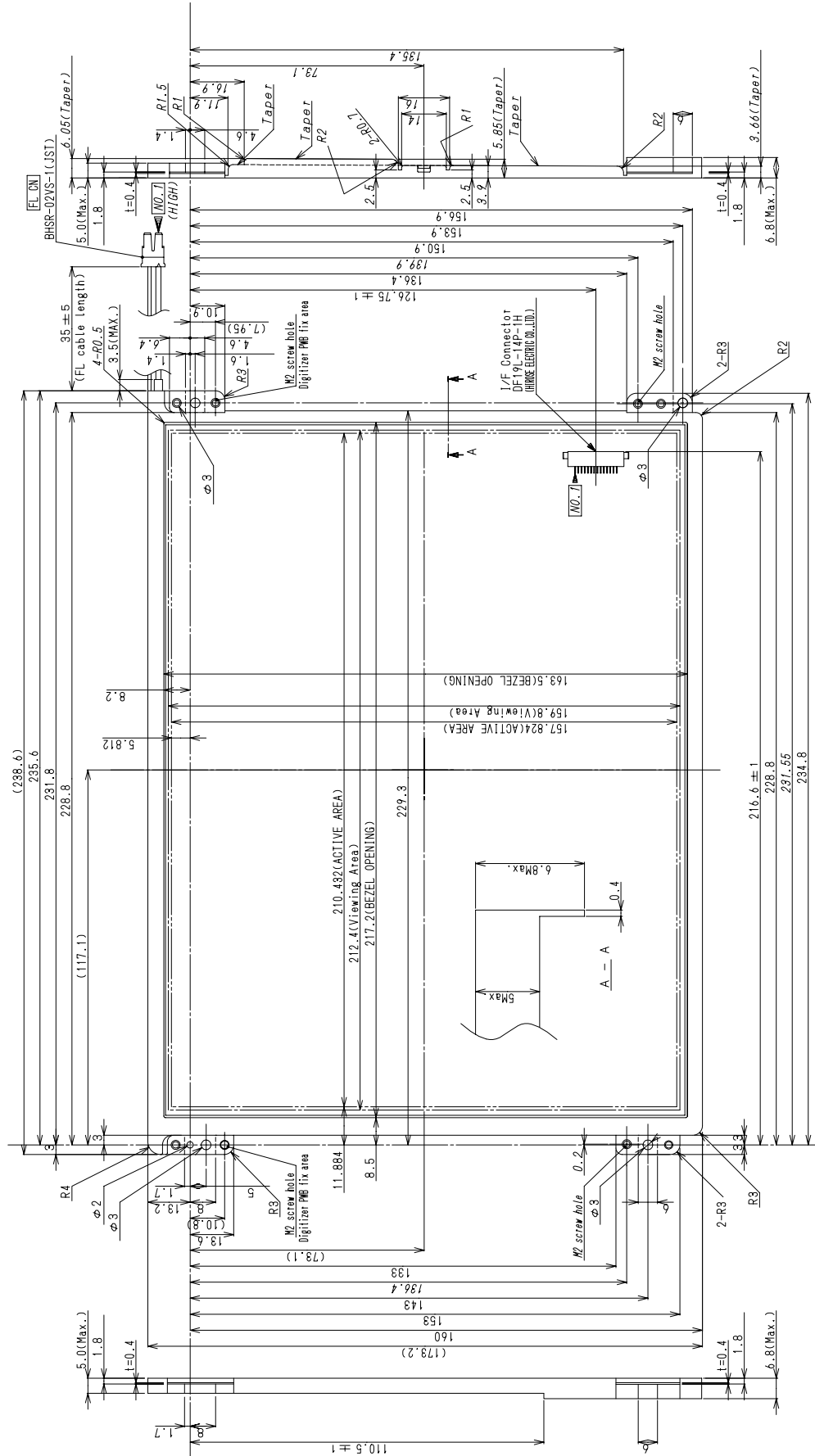
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*The information contained herein may be changed without prior notice. It is therefore advisable to contact Toshiba before proceeding with the design of equipment incorporating this product.

DIMENSIONAL OUTLINE
(Front)

TENTATIVE

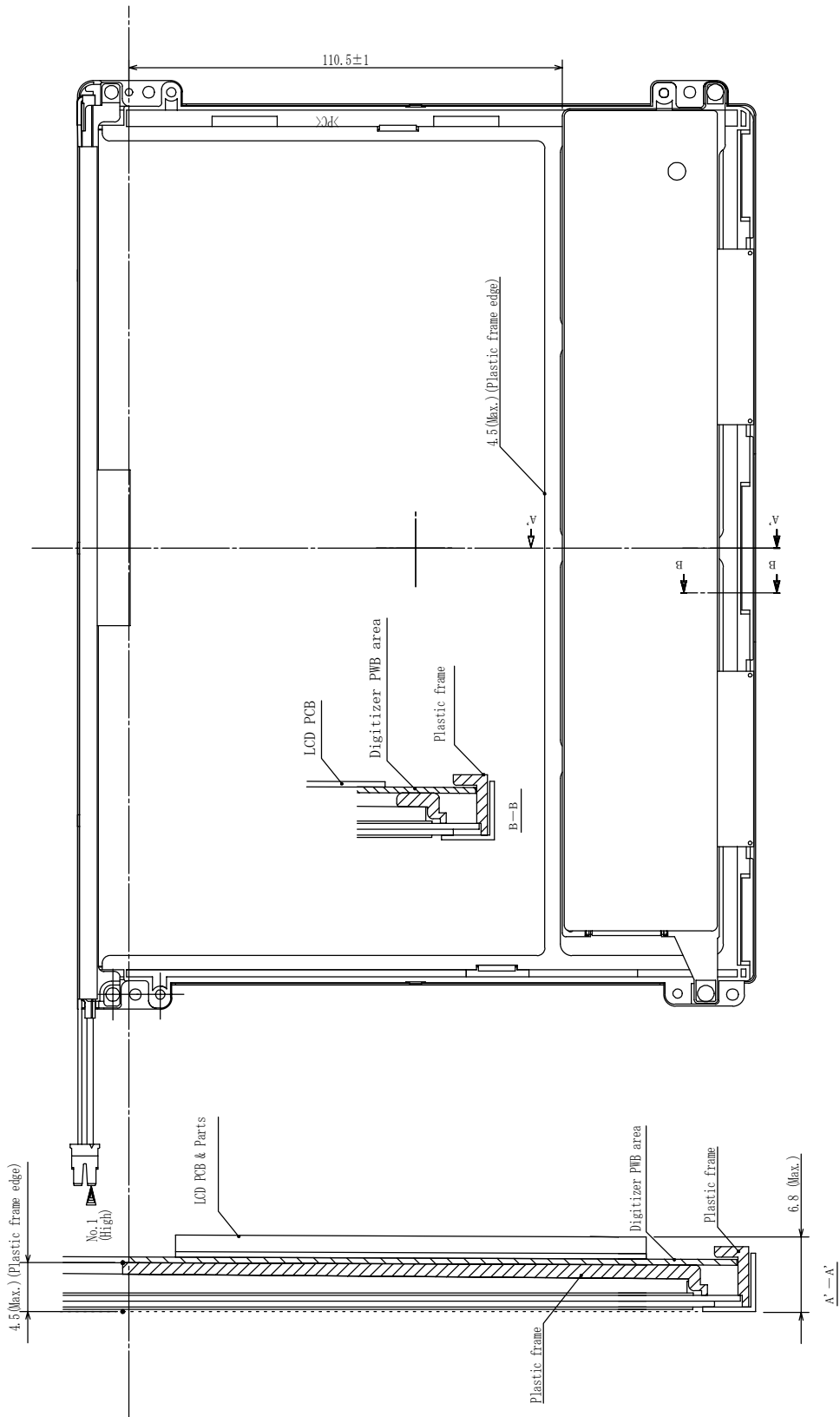
Unit : mm
Standard tolerance : ±0.5



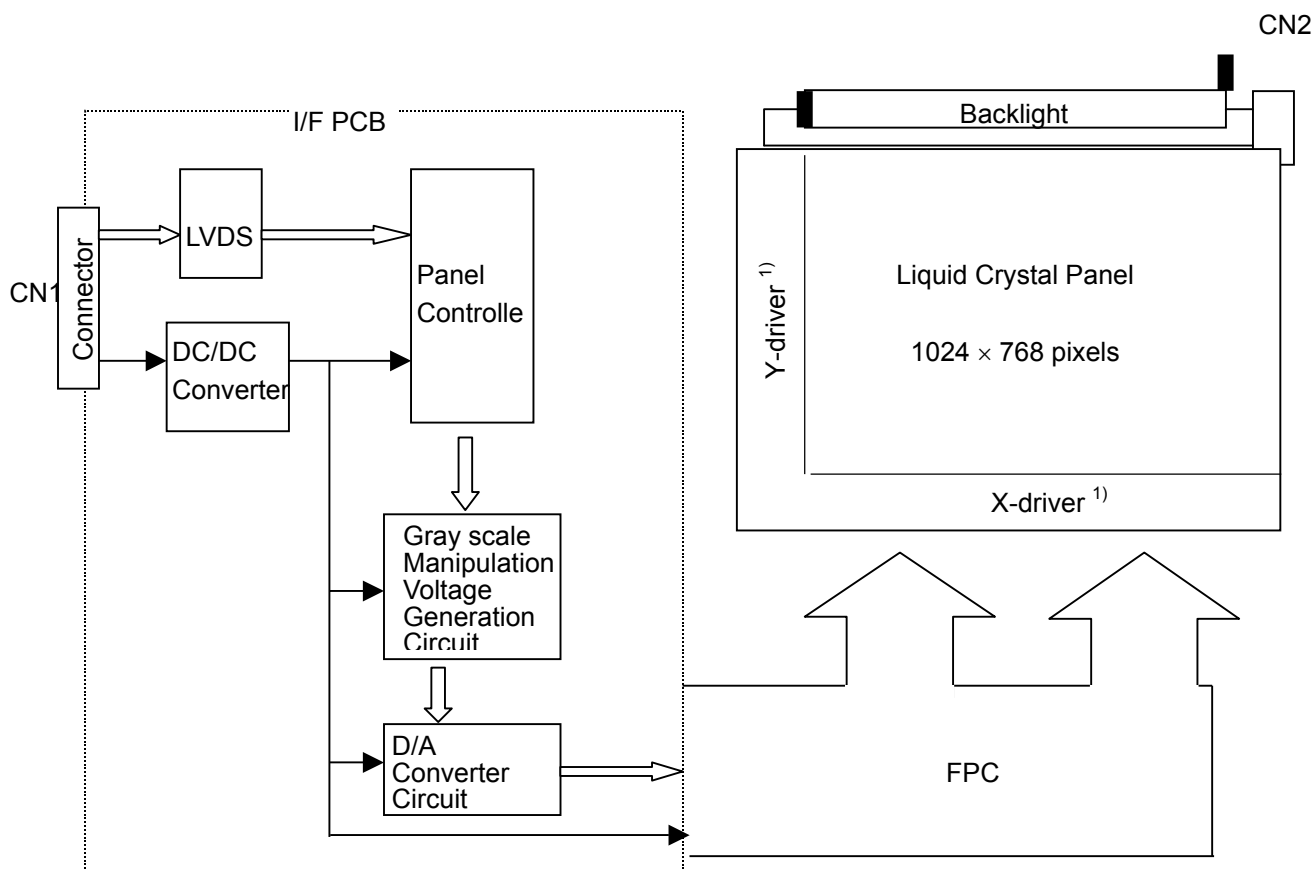
DIMENSIONAL OUTLINE
(Rear)

TENTATIVE

Unit : mm
Standard tolerance : ± 0.5

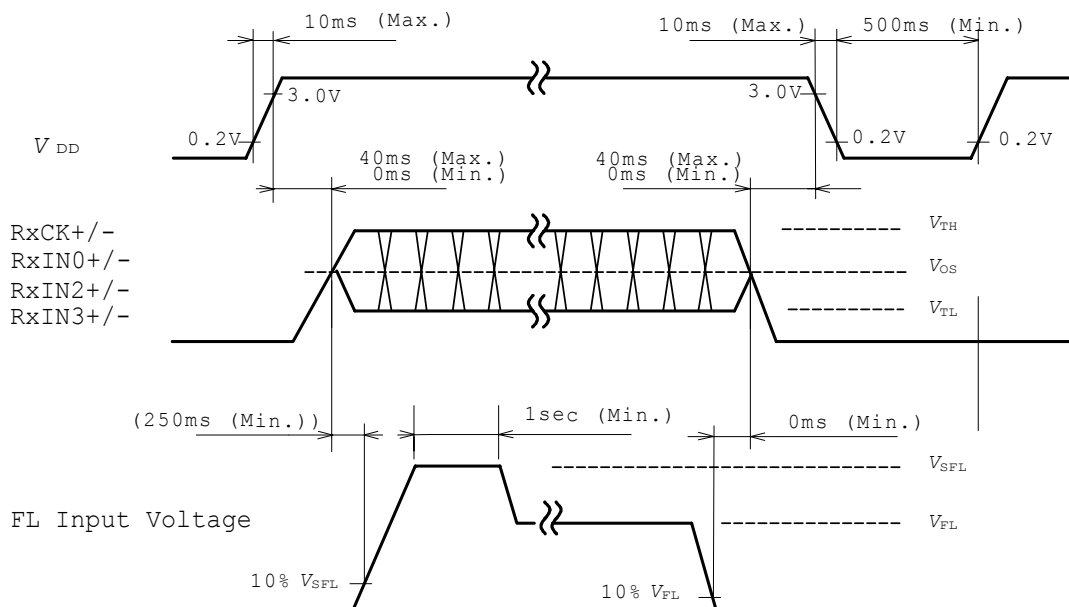


BLOCK DIAGRAM



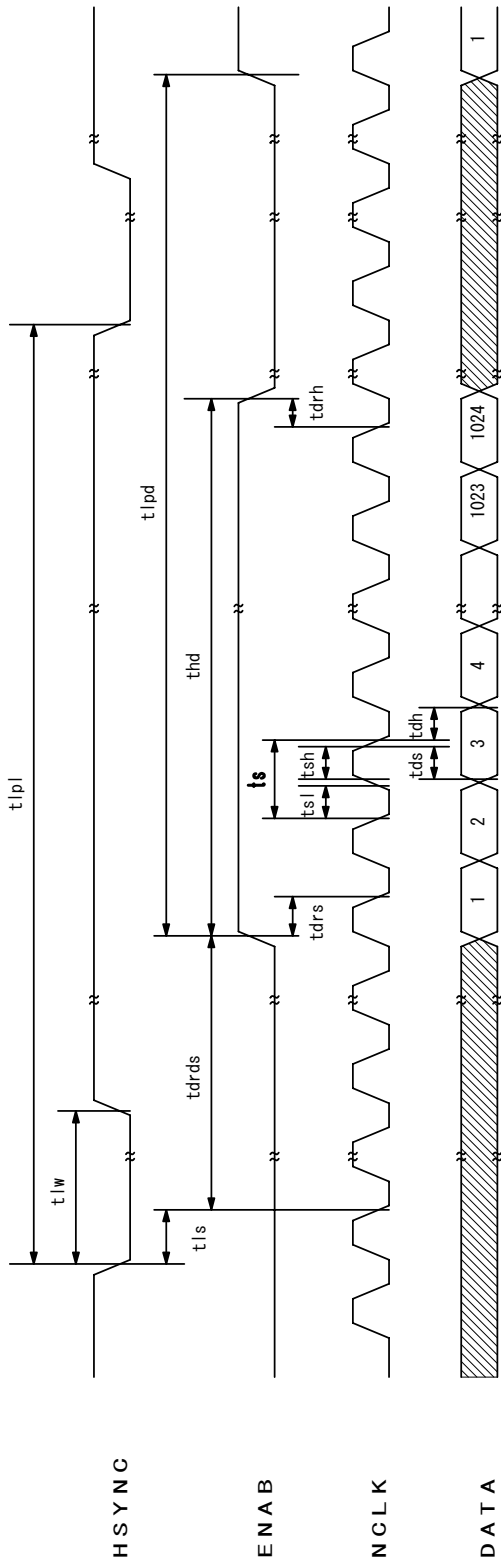
Note 1) Build up LCD drivers on the glass substrate

Sequence of Power Supplies and Signals

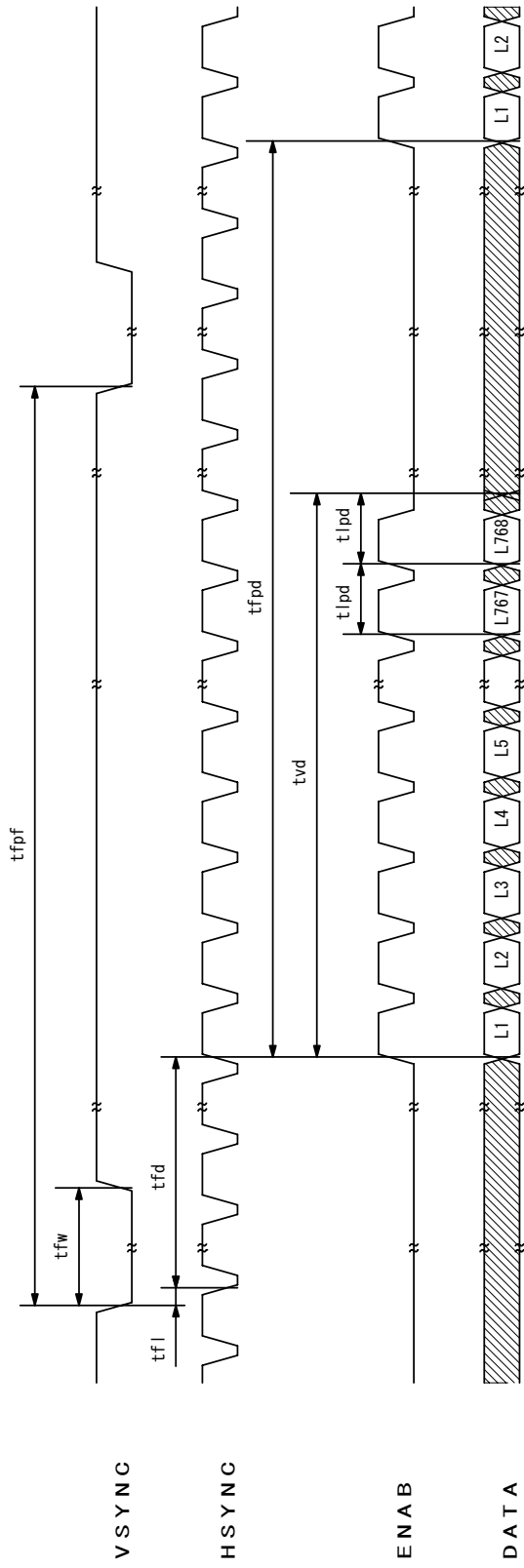


TIMING CHART

Horizontal Data Timing



Vertical Data Timing



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

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
NCLK	Clock Period	t_s	15	15.38	-	ns	
	Frequency	$1/t_s$	-	65	66.6	MHz	
	High Time	t_{sh}	6	-	-	ns	5)
	Low Time	t_{sl}	7	-	-	ns	5)
HSYNC	Setup to NCLK	t_{fs}	7	-	-	ns	5)
	Pulse Width	t_{lw}	$8 \times t_s$	-	-	-	
VSYNC	Pulse Width	t_{fw}	$3 \times t_{lpd}$	-	$7 \times t_{lpd}$	-	
	VSYNC to DATA	t_{fd}	$7 \times t_{lpd}$	-	-	-	
	Setup to HSYNC	t_{fl}	16	-	-	ns	5)
	Line Period	$t_{lpd}=t_{lpl}$	$1319 \times t_s$ 20.04	$1344 \times t_s$ 20.68	$1462 \times t_s$	- μs	
	Horizontal Display Time	t_{hd}	$1024 \times t_s$	$1024 \times t_s$	$1024 \times t_s$	-	
	Frame Frequency	$1/t_{fpd}$	58	60	-	Hz	
	Frame Period	$t_{fpd}=t_{fpf}$	$778 \times t_{lpd}$	$806 \times t_{lpd}$	$860 \times t_{lpd}$	-	
	Vertical Display Time	t_{vd}	$768 \times t_{lpd}$	$768 \times t_{lpd}$	$768 \times t_{lpd}$	-	
DATA	Setup	t_{ds}	5	-	-	ns	5)
	Hold	t_{dh}	7	-	-	ns	5)
ENAB	Setup	t_{drs}	10	-	-	ns	5)
	Hold	t_{drh}	10	-	-	ns	5)
	Display Start	t_{drds}	-	-	$400 \times t_s$	-	

Note 1) Refer to TIMING CHART and LVDS (DF90CF364) specifications by National Semiconductor.

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

Note 3) If Hsync or Vsync or ENAB is Fixed to "H" or "L" level for certain period while NCLK is supplied, the panel became display shifted.

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.

Note 5) Do not hold NCLK on "H" level nor "L" level during VDD(+3.3V) is supplied. When it holds on, DC voltage supplies to liquid crystal materials and it may cause damage to liquid crystal materials.

Note 6) In case of using the long frame period, the deterioration of

Note 7) These values are determined by the LCD module.

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 ¹⁾	
4	GND ¹⁾	
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 ¹⁾	
14	GND ¹⁾	

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.

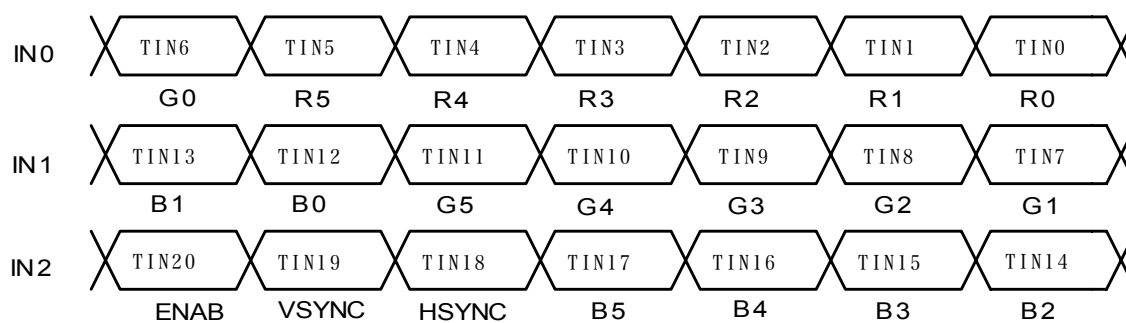
Please connect GND to ground. Don't use it as no-connect nor connection with high impedance.

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

RECOMMENDED TRANSMITTER (DS90CF363) TO LTM10C321K INTERFACE ASSIGNMENT

6bit Transmitter

DS90CF363				LTM10C321K 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.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)	TOUT1- TOUT1+	No.7 No.8	IN1- IN1+
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			
TIN11	12	G5	Green Pixels Display Data (MSB)			
TIN12	13	B0	Blue Pixels Display Data (LSB)	TOUT2- TOUT2+	No.9 No.10	IN2- IN2+
TIN13	15	B1	Blue Pixels Display Data			
TIN14	16	B2	Blue Pixels Display Data			
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	TCLK OUT- TCLK OUT+	No.11 No.12	CLK- CLK+
TIN19	23	VSYNC	V-Sync			
TIN20	25	ENAB	Compound Synchronization Signal			
CLK IN	26	CLK	Data Sampling Clock			



Colors Combination Table

	Display	R5 R4 R3 R2 R1 R0	G5 G4 G3 G2 G1 G0	B5 B4 B3 B2 B1 B0	Gray ScaleLevel
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 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
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 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 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
	Dark ↑ ↓ Light	L L L L L L H	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 L H L	L 2
		⋮	⋮	⋮	L3... L60
		L L L L L L L	H H H H L H	H H H H L H	L61
	L L L L L L L	H H H H H 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
Dark ↑ ↓ Light		L L L L L L H	L L L L L L H	L L L L L L H	L 1
		L L L L L H L	L L L L L H L	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

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 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 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.