



TOSHIBA

LIQUID CRYSTAL DISPLAY DIVISION

PRODUCTS INFORMATION

26cm COLOR TFT-LCD MODULE
(10.4 Type)
LTM10C209A

TENTATIVE

FEATURES

- (1) High Luminance and long life, Twin CCFL Backlight
- (2) Low reflection and clear 256k-colors (K=1024)
- (3) Thin and light weight design.
- (4) Full compatible with LTM10C273 (SVGA)
- (5) 640x480 pixels color display.
- (6) Lamp replaceable structure
- (7) Fast response.

APPLICATIONS

- (1) FA Equipment.
- (2) OA Equipment.
- (3) Display Terminals.
- (4) Measuring Instrument.
- (5) New Media Equipment.

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline	265.0(W) × 188.8(H) × 12max(D) mm
Number of Pixels	640 (W) × 480 (H) Pixels
Active Area	211.2(W) × 158.4(H) mm
Pixel Pitch	0.33 (W) × 0.33 (H) mm
Weight(Approx.)	590 g
Backlight	CCFL, Side-light type (Twin Lamps)

ABSOLUTE MAXIMUM RATINGS

Item		Min.	Max.	Unit
Supply Voltage	(V _{DD})	-0.3	7.0	V
	(V _{FL})	0	2000	Vrms
FL Driving Frequency	(f _{FL})	0	100	kHz
Input signal Voltage	(V _{IN})	-0.3	VDD+0.3	V
Operating Temperature		0	50	°C
Storage Temperature		-20	60	°C
Storage Humidity		10	90	%RH
(Max.Wet bulb temp. = 39°C)				

ELECTRICAL SPECIFICATIONS (Ta=25°C)

Item		Min.	Typ.	Max.	Unit
Supply Voltage	(V _{DD})	4.75	5.0	5.25	V
	(V _{FL})	500	550	600	Vrms
FL Start Voltage(Ta=0℃)		1500	—	1800	Vrms
High Level Input Voltage	(V _{IH})	3.5	—	V _{DD}	V
Low Level Input Voltage	(V _{IL})	0	—	1.5	V
Current Consumption	*1) (I _{DD})	—	125	250	mA
	(I _{FL})	3.0	6.0	7.0	mA _{rms}
*1, *2) Power Consumption		—	7.2	—	W

*1):8 Color Bars Pattern

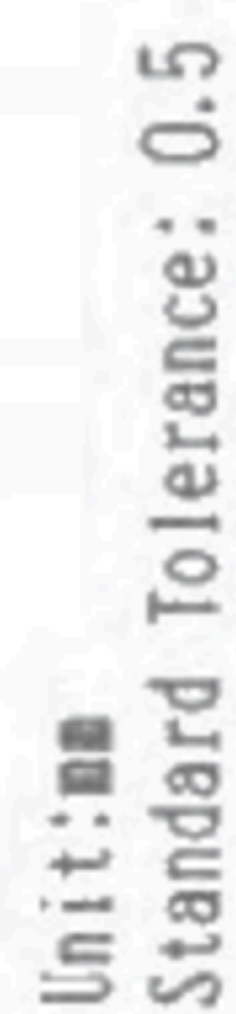
*2):Excepting the efficiency of FL Inverter

OPTICAL SPECIFICATIONS (Ta=25°C)

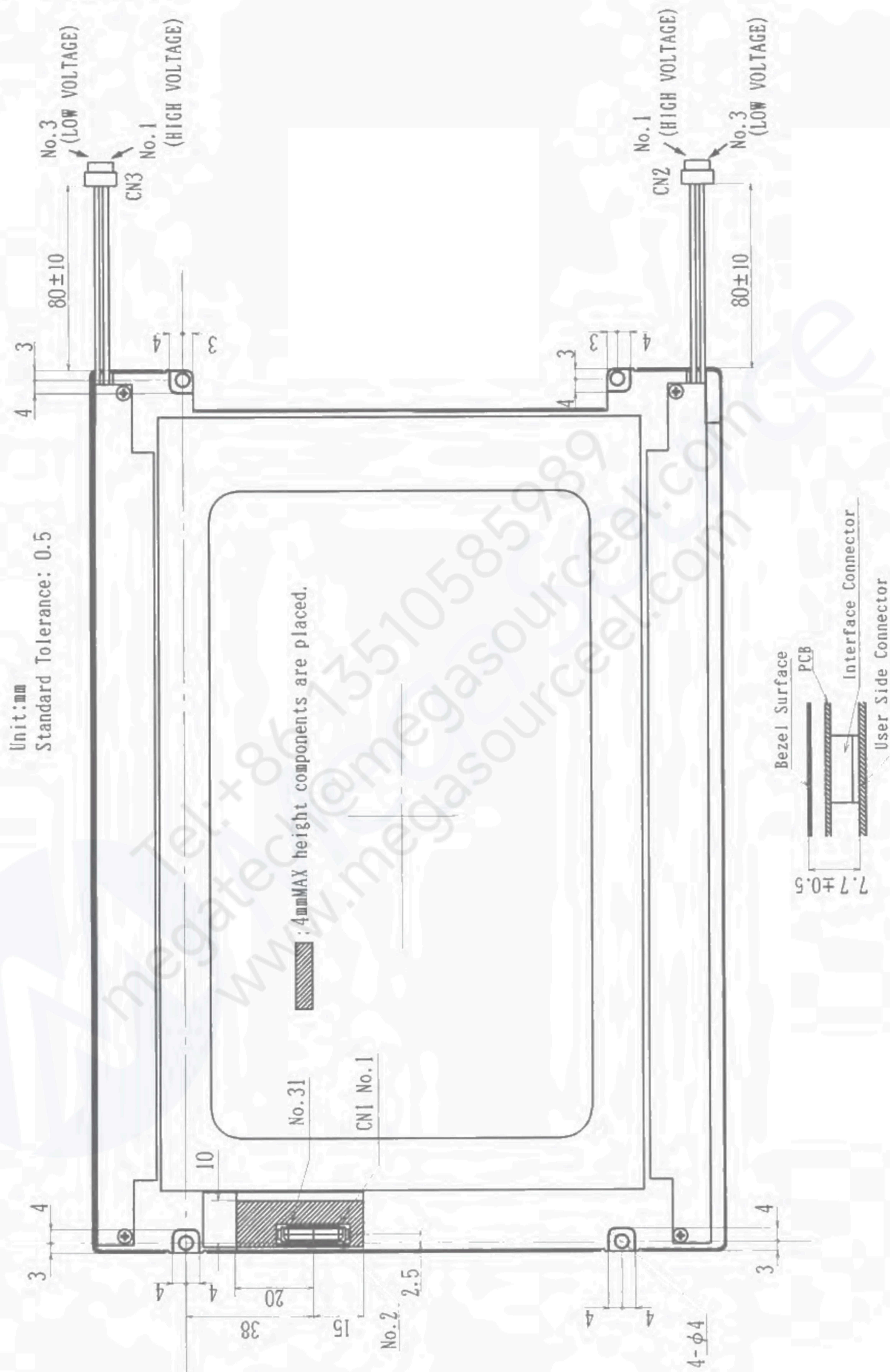
Item		Min.	Typ.	Max.	Unit
Contrast Ratio (CR)		100	—	—	—
Response Time	(t _{on})	—	—	50	ms
	(t _{off})	—	—	50	ms
Luminance (L)		—	250	—	cd/m ²

*The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents 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 or others.

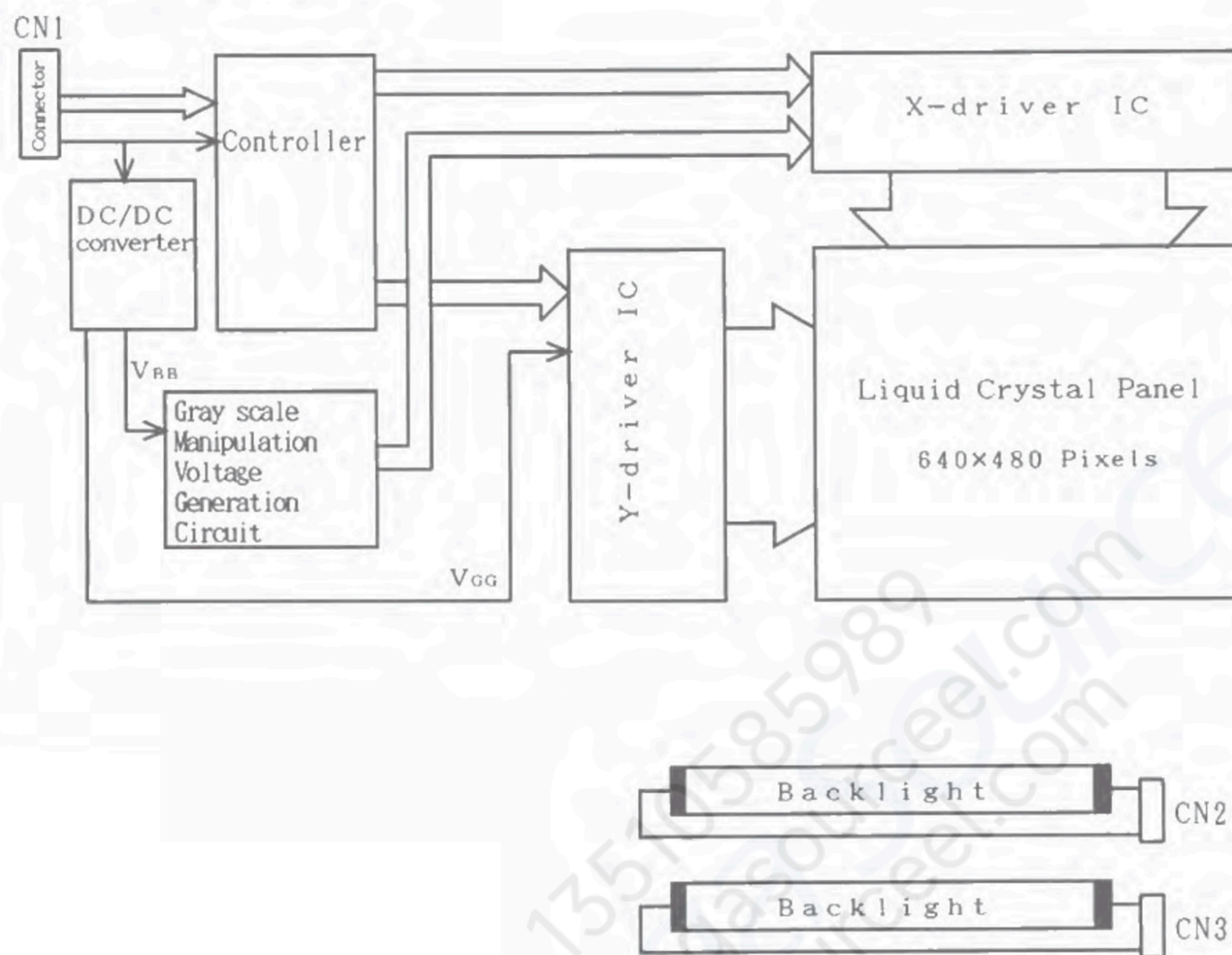
*The information contained herein may be changed without prior notice. It is therefore advisable to contact TOSHIBA before proceeding with the design of equipment incorporating this product.



(B a c k f i g u r e)

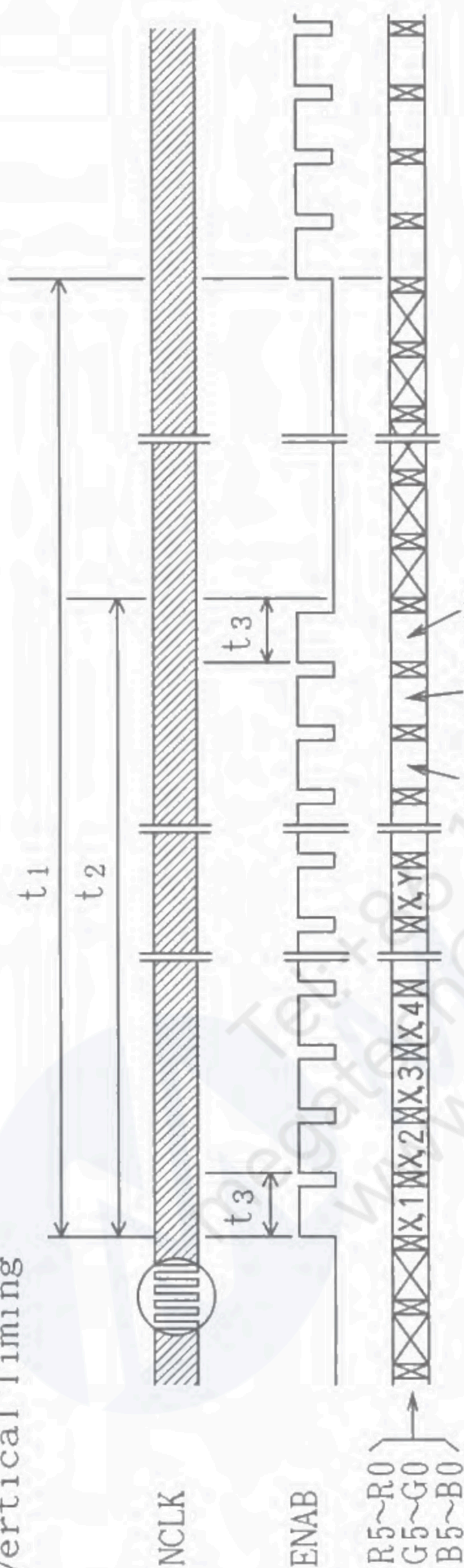


BLOCK DIAGRAM

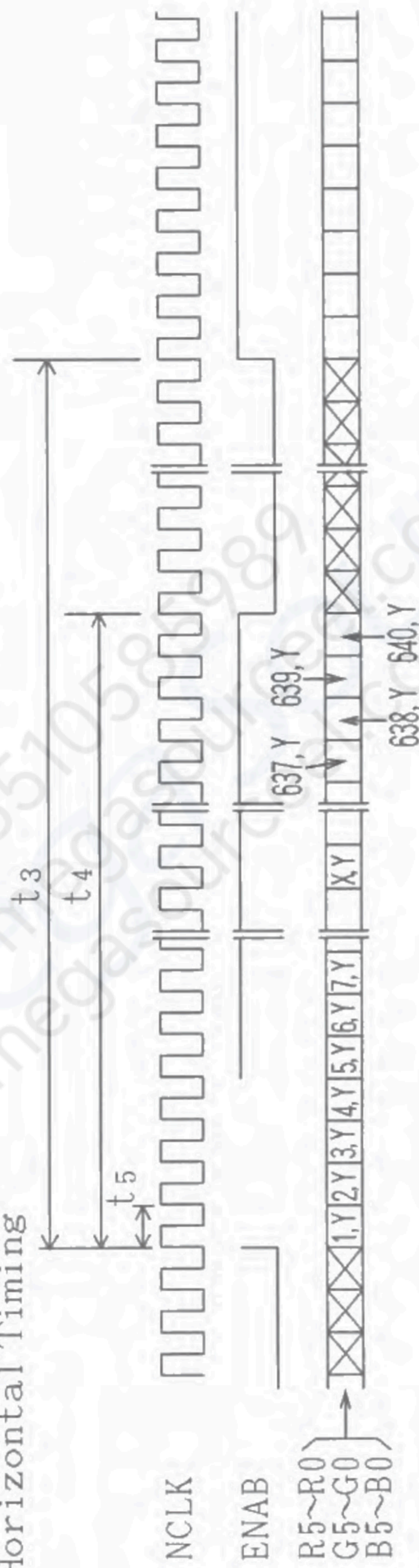


TIMING CHART

(1) Vertical Timing



(2) Horizontal Timing

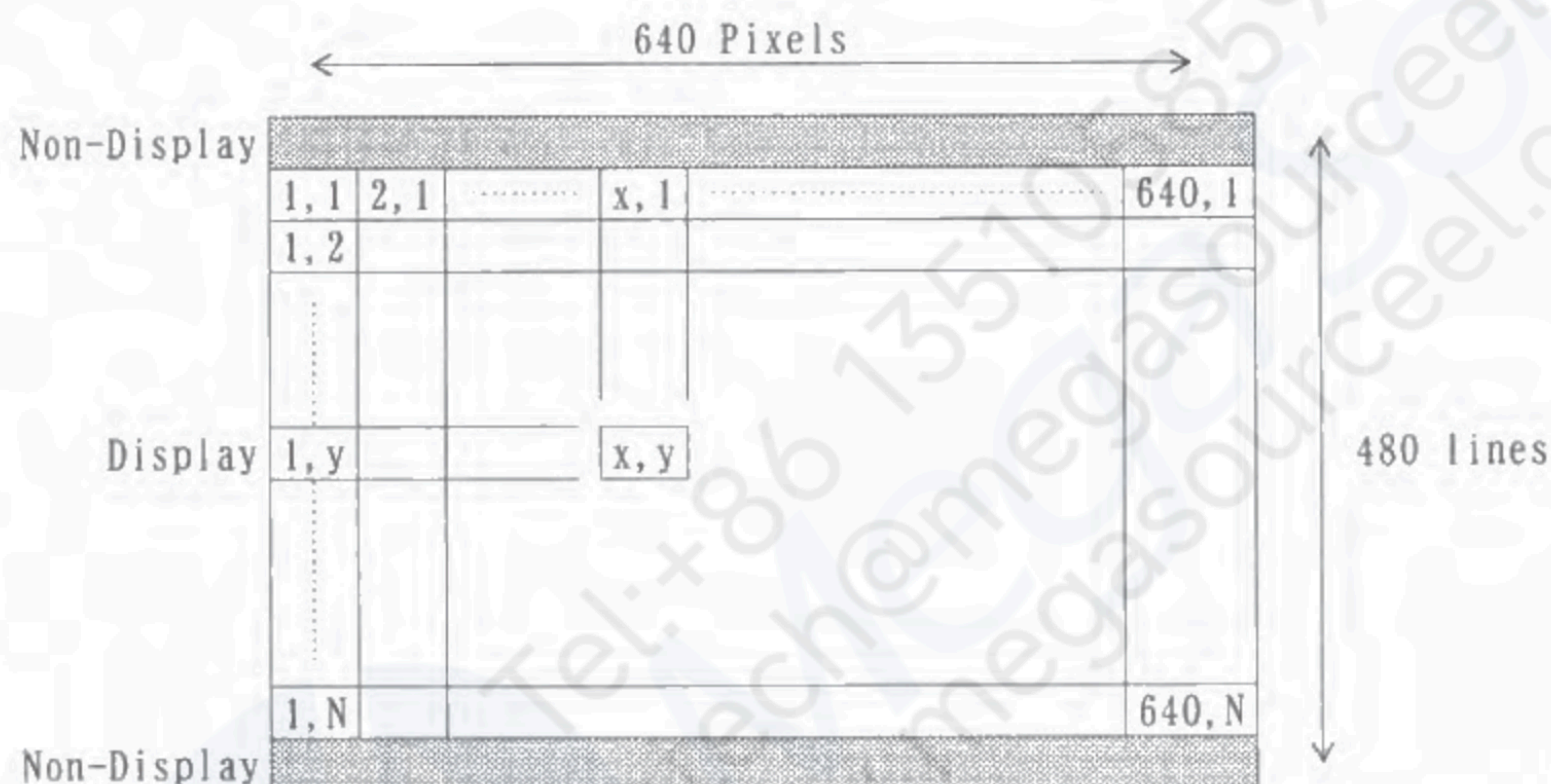




TIMING SPECIFICATION

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Frame Period	t 1	$(249+N/2) \times t3$ —	$525 \times t3$ 16.68	$525 \times t3$ 17.85	— ms	
Vertical Display Term	t 2	$300 \times t3$	$480 \times t3$	$480 \times t3$	—	$t2=N \cdot t3$
One Line Scanning Time	t 3	$684 \times t5$ 31.5	$800 \times t5$ 31.78	$860 \times t5$ —	— μs	
Horizontal Display Term	t 4	$640 \times t5$	$640 \times t5$	$640 \times t5$	—	
Clock Period	t 5	35.0	39.72	—	ns	
Clock "L" Time	t 6	10.0	—	—	ns	
Clock "H" Time	t 7	7.0	—	—	ns	
Set Up Time	t 8	5.0	—	—	ns	
Hold Time	t 9	10.0	—	—	ns	

Note : When the vertical display period(N) is shorter than 480, the actual display area is shifted to the center. Non-display area become dark as follows.



CONNECTOR PIN ASSIGNMENT FOR INTERFACE

C N 1 INPUT SIGNAL (DF9-31P-1V/HIROSE ELECTRIC CO.,LTD.)

Terminal No.	Symbol	Function
1	GND	
2	NCLK	SAMPLING CLOCK
3	GND	
4	R0 ²⁾	RED DISPLAY DATA (LSB)
5	R1 ²⁾	RED DISPLAY DATA
6	R2 ²⁾	RED DISPLAY DATA
7	GND	
8	R3 ²⁾	RED DISPLAY DATA
9	R4 ²⁾	RED DISPLAY DATA
10	R5 ²⁾	RED DISPLAY DATA (MSB)
11	GND	
12	G0 ²⁾	GREEN DISPLAY DATA (LSB)
13	G1 ²⁾	GREEN DISPLAY DATA
14	G2 ²⁾	GREEN DISPLAY DATA
15	GND	
16	G3 ²⁾	GREEN DISPLAY DATA
17	G4 ²⁾	GREEN DISPLAY DATA
18	G5 ²⁾	GREEN DISPLAY DATA (MSB)
19	GND	
20	ENAB	COMPOUND SYNCHRONIZATION SIGNAL
21	GND	
22	B0 ²⁾	BLUE DISPLAY DATA (LSB)
23	B1 ²⁾	BLUE DISPLAY DATA
24	B2 ²⁾	BLUE DISPLAY DATA
25	GND	
26	B3 ²⁾	BLUE DISPLAY DATA
27	B4 ²⁾	BLUE DISPLAY DATA
28	B5 ²⁾	BLUE DISPLAY DATA (MSB)
29	GND	
30	VDD	+5V POWER SUPPLY
31	VDD	+5V POWER SUPPLY

C N 2 CCFL POWER SOURCE (BHR-03VS-1/JAPAN SOLDERLESS TERMINAL MFG CO.,LTD.)

Terminal No.	Symbol	Function
1	VL	CCFL POWER SUPPLY (HIGH VOLTAGE)
2	NC ¹⁾	
3	GL	CCFL POWER SUPPLY (LOW VOLTAGE)

C N 3 CCFL POWER SOURCE (BHR-03VS-1/JAPAN SOLDERLESS TERMINAL MFG CO.,LTD.)

Terminal No.	Symbol	Function
1	VL	CCFL POWER SUPPLY (HIGH VOLTAGE)
2	NC ¹⁾	
3	GL	CCFL POWER SUPPLY (LOW VOLTAGE)

Note 1) NC Terminal is open. (Don't use)

Note 2) 256K colors are displayed by the combinations of 18 bits data.

	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	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
		:	:	:	L 3~
	Light	:	:	:	L 6 0
		H H H H L H	L L L L L L	L L L L L L	L 6 1
		H H H H H L	L L L L L L	L L L L L L	L 6 2
	Red	H H H H H H	L L L L L L	L L L L L L	Red L 6 3
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	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
		:	:	:	L 3~
	Light	:	:	:	L 6 0
		L L L L L L	H H H H L H	L L L L L L	L 6 1
		L L L L L L	H H H H H L	L L L L L L	L 6 2
	Green	L L L L L L	H H H H H H	L L L L L L	Green L 6 3
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	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 H L	L 2
		:	:	:	L 3~
	Light	:	:	:	L 6 0
		L L L L L L	L L L L L L	H H H H L H	L 6 1
		L L L L L L	L L L L L L	H H H H H L	L 6 2
	Blue	L L L L L L	L L L L L L	H H H H H H	Blue L 6 3
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	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
		:	:	:	L 3~
	Light	:	:	:	L 6 0
		H H H H L H	H H H H L H	H H H H L H	L 6 1
		H H H H H L	H H H H H L	H H H H H L	L 6 2
	White	H H H H H H	H H H H H H	H H H H H H	White L 6 3

FOR SAFETY

LCD module is generally designed with precise parts to achieve light weight and 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.

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