Toshiba Mobile Display Mobile Display Co., Ltd

LIQUID CRYSTAL DISPLAY DIVISION
PRODUCT INFORMATION

31cm COLOUR TFT-LCD MODULE
(12.1 TYPE)

LT121AC62000
(p-Si TFT)

TENTATIVE

FEATURES

(1) 12.1"XGA display size
(2) LVDS interface system
(3) Light weight(170gTYP) design
(4) LED Backlight (with LED Driver)
(5) Anti-Glare (AG)
(6) EDID

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	255.0(*W*) x 198.0(*H*) x 2.55/4.365(*D*) mm
Number of Pixels	1024(*W*) x 768(*H*) pixels
Active Area	245.76(*W*) x 184.32(*H*) mm
Pixel Pitch	0.24(*W*) x 0.24(*H*)
Weight (approximately)	170g
Backlight	LED (8 series x5 parallel)

ABSOLUTE MAXIMUM RATINGS

Item		Min.	Max.	Unit
Supply Voltage	(V_{DD})	-0.3	3.0	V
	(V_{LED})	0	35	V
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 *1

Item		Min.	Typ.	Max.	Unit	Remarks
Supply Voltage	V_{DD}	2.35	2.5	2.7	V	
Common Mode Input Voltage	V_{CM}	0.9	1.2	1.75	V	LVDS
Differential input amplitude	V_{ID}	0.1	---	0.6	V	LVDS
Supply LED Driver input Voltage	V_{LED}	7.0	12.0	19.0	V	
PWM input voltage		3.0	3.3	3.6	V	
PWM frequency		150	200	1000	Hz	
Power Consumption	*2 (I_{DD})	---	220	265	mA	
	*3 (I_{LED})		TBD		mA	

*1 : This LCD module conforms to LVDS standard (TIA/EIA-644)
*2 : 8 color bars pattern
*3 : PWM frequency 200Hz

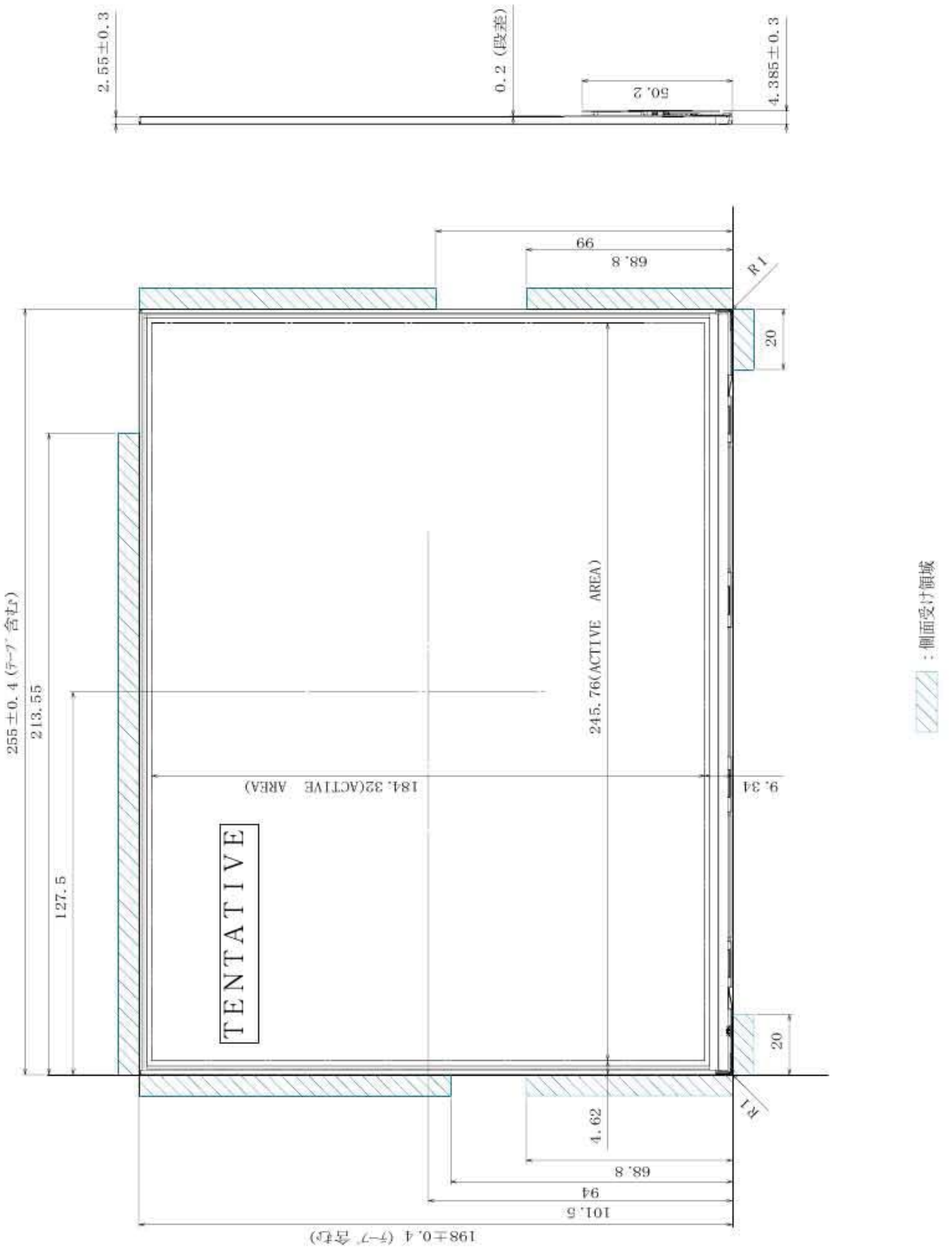
OPTICAL SPECIFICATION (*Ta*=25°C)

Item		Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (*CR*)		(200)	(350)	---	---	
Response Time	(t_{ON})	---	(15)	(20)	ms	
	(t_{OFF})	---	(30)	(35)	ms	
Luminance (*L*)		195	280	---	cd/m^2	I_{LED}=16mA Duty=100%

DIMENSIONAL OUTLINE (front figure)

Unit : mm

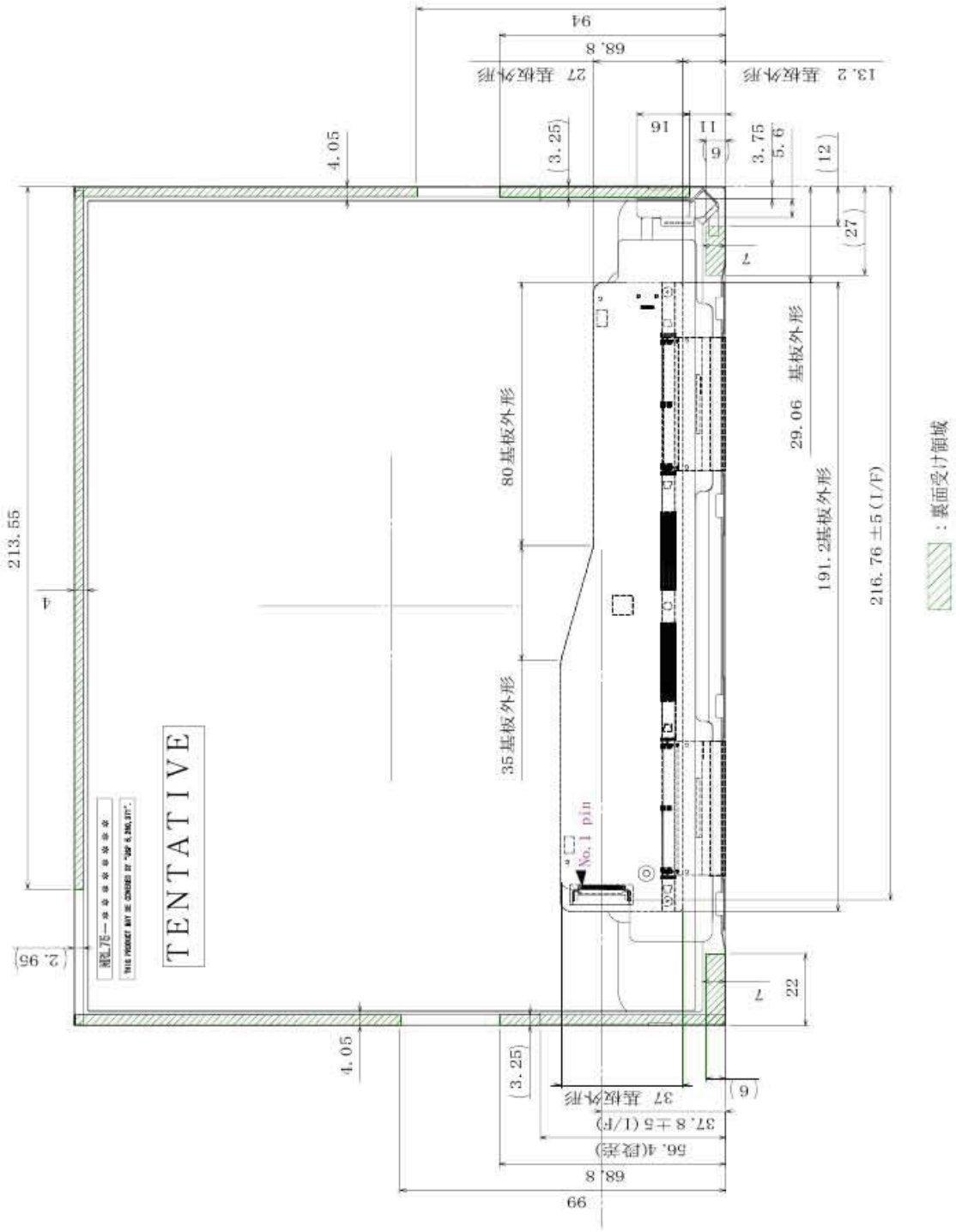
Standard tolerance : ±0.5



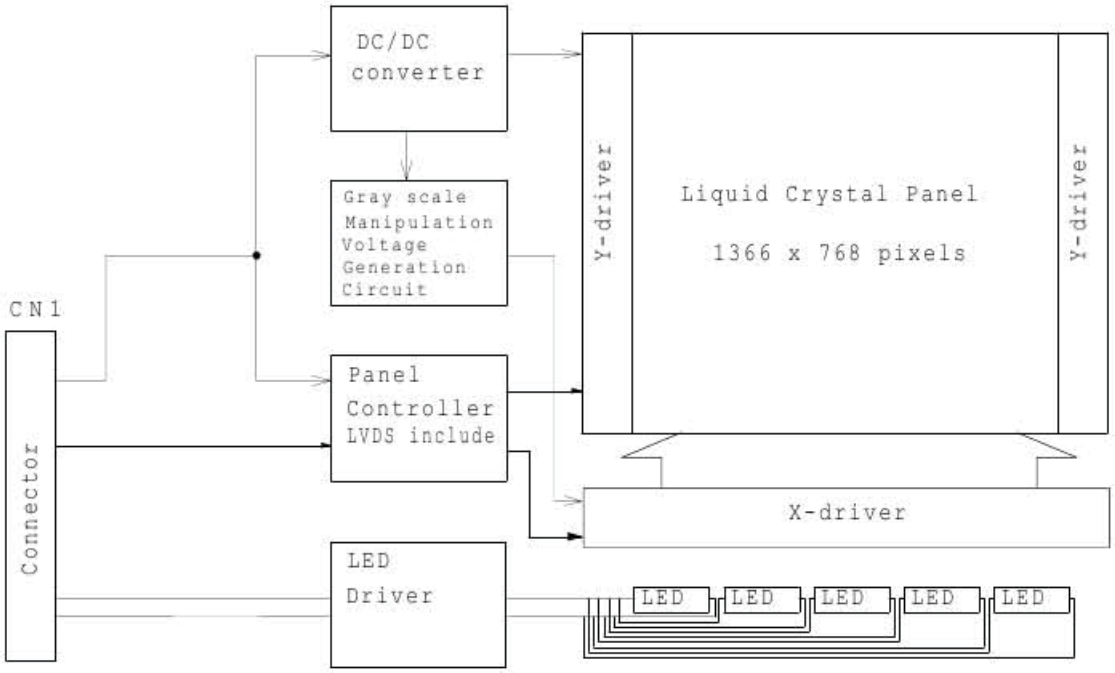
DIMENSIONAL OUTLINE (Rear figure)

Unit : mm

Standard tolerance : ±0.5



BLOCK DIAGRAM



Display area address

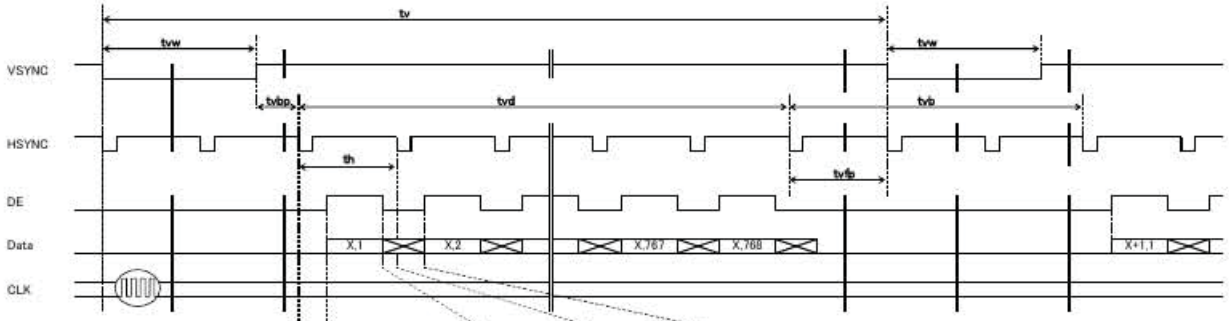
1024 pixels

1, 1	2, 1		$X2_{n-1}$, 1	$X2_n$, 1		1024, 1
1, 2						
1, Y			X_{2n-1}, Y	X_{2n}, Y		
1, 768						1024,768

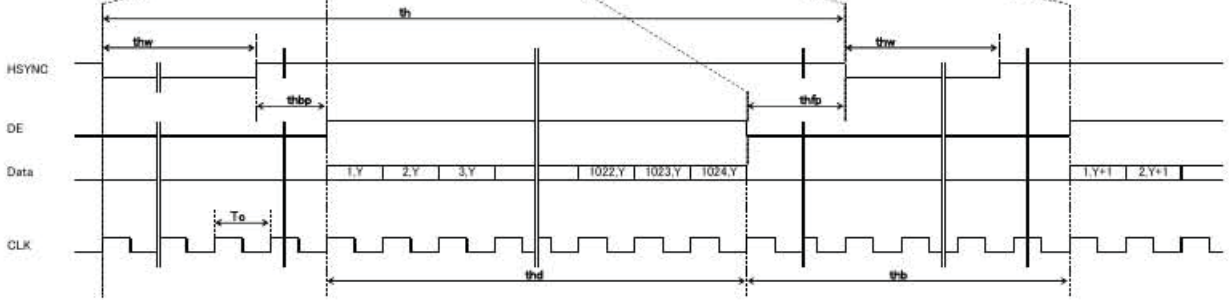
768 pixels

TIMING CHART

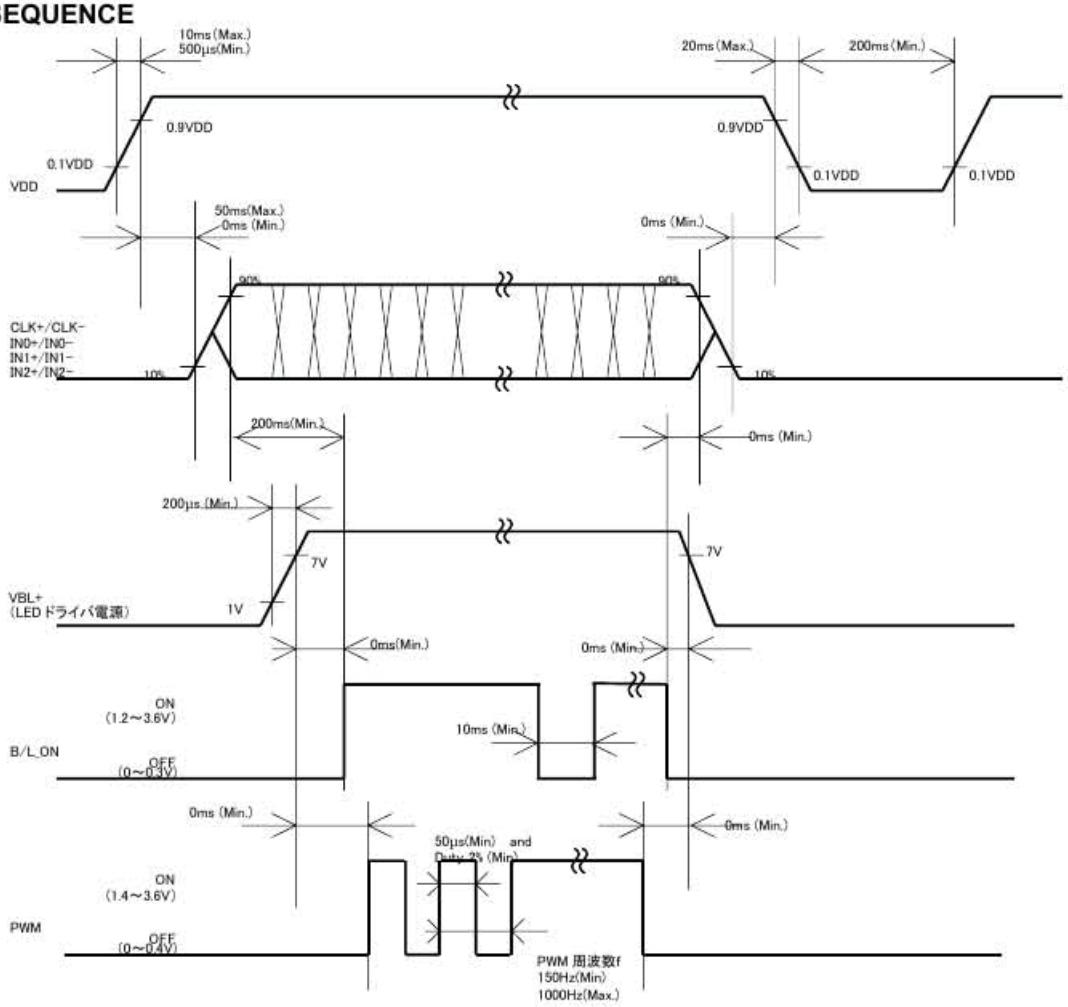
(1) Vertical Timing



(2) Horizontal Timing



POWER SEQUENCE



TIMING SPECIFICATION 1) 2) 3) 4) 5) 6)

Item	Symbol	min.	typ.	max.	Unit
Frame Period	*Tv*	778	806	860	th
		16.67	16.67	-	ms
Vertical Display Term	*Tvd*	768	768	768	th
Vertical Blanking Period	*Tvb*	10	38	-	th
Horizontal Scanning Term	*Th*	1334	1344		tc
		21.42	20.68		μs
Horizontal Display Term	*Thd*	1024	1204	1024	tc
Horizontal Blanking Period	*Thb*	310	320	424	tc
Clock Period	*Tc*	62.27	65	66.7	MHz
		16.059	15.385		ns
V-sync Pulse Width	*Tvw*	2	6	-	th
Vertical Front Porch	*Tvfp*	1	3	-	th
Vertical Back Porch	*Tvbp*	2	29	-	th
H-sync Pulse Width	*Thw*	4	136	-	tc
Horizontal Front Porch	*Thfp*	4	24	-	tc
Horizontal Back Porch	*thbp*	24	160	-	tc
DE Pulse Width	*Thd*	1024	1024	1024	tc

Note 1) This LCD module conforms to LVDS standard (TIA/EIA-644)

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) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note 5) 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.

Note 6) Please keep below equations.
tvb = tvw + tvfp + tvbp
thb = thw + thfp + thbp

Note 7) The above tables shows allowable interface timings under 60Hz refresh rate conditions.
In case of using this rate condition, some flicker may be occurred.

CONNECTOR PIN ASSIGNMENT FOR INTERFACE

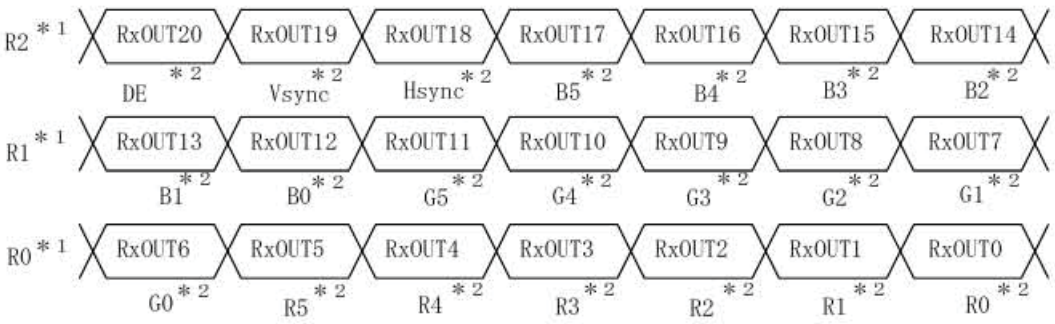
INPUT SIGNAL

Connector : CABLINE CBL 20474-030E-12 / I-PEX

Terminal No.	Symbol	Function
1	*VLED*	LED Power Supply (7-19V)
2	*VLED*	LED Power Supply (7-19V)
3	*VLED*	LED Power Supply (7-19V)
4	NC	Non-Connection
5	*VLED GND*	LED Ground
6	*VLED GND*	LED Ground
7	*VLED GND*	LED Ground
8	*PWM*	PWM for Luminance control
9	*BL Enable*	Backlight On/Off control
10	V_{DD}	Power Supply : +2.5V
11	V_{DD}	Power Supply : +2.5V
12	V_{DD}	Power Supply : +2.5V
13	NC	Non-Connection
14	V_{SS}	GND
15	V_{SS}	GND
16	V_{SS}	GND
17	RxIN0-	Negative LVDS differential data input (R0-R5,G0)
18	RxIN0+	Positive LVDS differential data input (R0-R5,G0)
19	RxIN1-	Negative LVDS differential data input (G1-G5, B0-B1)
20	RxIN1+	Positive LVDS differential data input (G1-G5, B0-B1)
21	RxIN2-	Negative LVDS differential data input (B2-B5, HS, VS, DE)
22	RxIN2+	Positive LVDS differential data input (B2-B5, HS, VS, DE)
23	CLK-	Clock Signal(-)
24	CLK+	Clock Signal(+)
25	V_{SS}	GND
26	CLK_{EDID}	DDC Clock
27	$DATA_{EDID}$	DDC Data
28	V_{EDID}	DDC 3.3V POWER SUPPLY : +3.3V
29	NC	Non-Connection
30	NC	Non-Connection

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 to nothing. Don't connect it to ground nor to other signal input.



*1) Receiver Signal

*2) Input Signal.

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	-
	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	L	H	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

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-D-001A,"CAUTIONS AND INSTRUCTIONS FOR TOSHIBA MOBILE DISPLAY 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 Mobile Display'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 Mobile Display'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 Mobile Display's published specification limits.

C) In addition, since Toshiba Mobile Display 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 Mobile Display doses 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 connector or cables in order to prevent electric shock, because high voltage is supplied to these parts from 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.

DISPOSAL

When dispose LCD module, obey to the applicable environmental regulations.