Toshiba Mobile Display Co., Ltd.

33.2cm COLOUR TFT-LCD MODULE
(13.1 TYPE)

LT131DEVHV00
(p-Si TFT)

PRODUCT INFORMATION

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

FEATURES

(1) 13.1" HD(1366x768 pixels) display size for notebook PC
(2) High-Color Gamut (82%), LED Backlight with LED controller IC
(3) Fast Response (8ms)
(4) Anti-glare + WV film Surface
(5) Bezel less structure
(6) EDID

TENTATIVE

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	299.1 (W) x 184.3 (H) x 3.69 (D) mm
Number of Pixels	1366 (W) x 768 (H) pixels
Active Area	288.9 (W) x 162.4 (H) mm
Pixel Pitch	0.2115 (W) x 0.2115 (H) mm
Weight (approximately)	162 g
Backlight	LED type (60p: 10series x 6parallel, with LED Driver)

ABSOLUTE MAXIMUM RATINGS

Item		Min.	Max.	Unit
Supply Voltage	(V_{DD})	-0.3	4.0	V
	(V_{LED})	5.0	21.0	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

Item		Min.	Typ.	Max.	Unit	Remarks
Supply Voltage	(V_{DD})	3.0	3.3	3.6	V	
Supply LED Driver Input Voltage	(V_{LED})	6.0	12.0	20.0	V	
Common Mode Input Voltage	(V_{CM})	0.8	1.2	1.75	V	
Differential Input Amplitude	(V_{ID})	100	---	600	mV	
Current Consumption	*1 (I_{DD})	---	270	340	mA	
	*2 (I_{LED})	---	18	---	mA	
Power Consumption		---	(4.5)	---	W	PWM=100%:18mA

*1 : 8 color bars pattern is considered typical condition.
*2 : The current value of each row should be the same value.

OPTICAL SPECIFICATION (Ta=25°C)

Item		Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio	(CR)	250	500	---	---	
Response Time	(t_{ON})+ (t_{OFF})	---	(8)	(20)	ms	t=25°C
Luminance (5point)	(L)	300	410	---	cd/m^2	PWM=100%

DIMENSIONAL OUTLINE

(Front side)

TENTATIVE

Unit : mm

Standard tolerance : ±0.5

184.3

166.86

2.32

Radiation Sheet (t=1)

3.34

1.8Max.(Coil part)

3.69

183.1

177.5

(4.95)

4.225

162.4 (Active Area)

288.9(Active Area)

184.3

299.1

(149.55)

4.95

(85.56)

177.5

183.1

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DIMENSIONAL OUTLINE

(Back side)

TENTATIVE

Unit : mm
Standard tolerance : ±0.5

NPL.75 — *******

THIS NUMBER MAY BE COVERED BY "JUMP & SEAL OFF".

LED PRINT LABEL

BLOCK DIAGRAM

DC/DC converter	
Gray scale Manipulation Voltage Generation Circuit	
CN1 Connector	**Panel Controller LVDS include**
	Gate driver — **Liquid Crystal Panel 1366 x 768 pixels** — **Gate driver**
	Source driver
LED Driver Circuit	LED LED LED LED LED LED

1366 pixels

1, 1	2, 1		X, 1			1366, 1
1, 2						
1, Y			X, Y			
1, 768						1366,768

768 pixels

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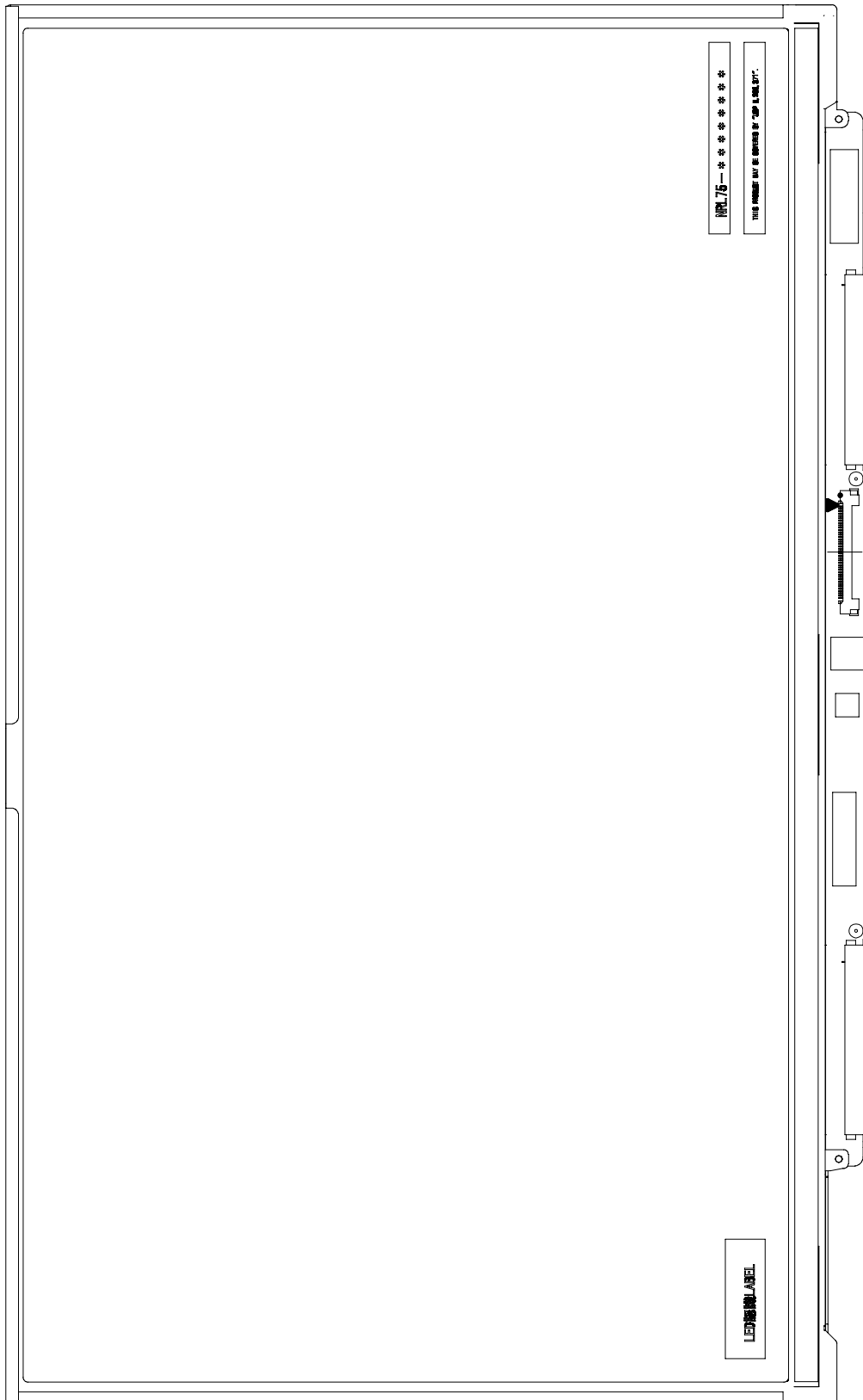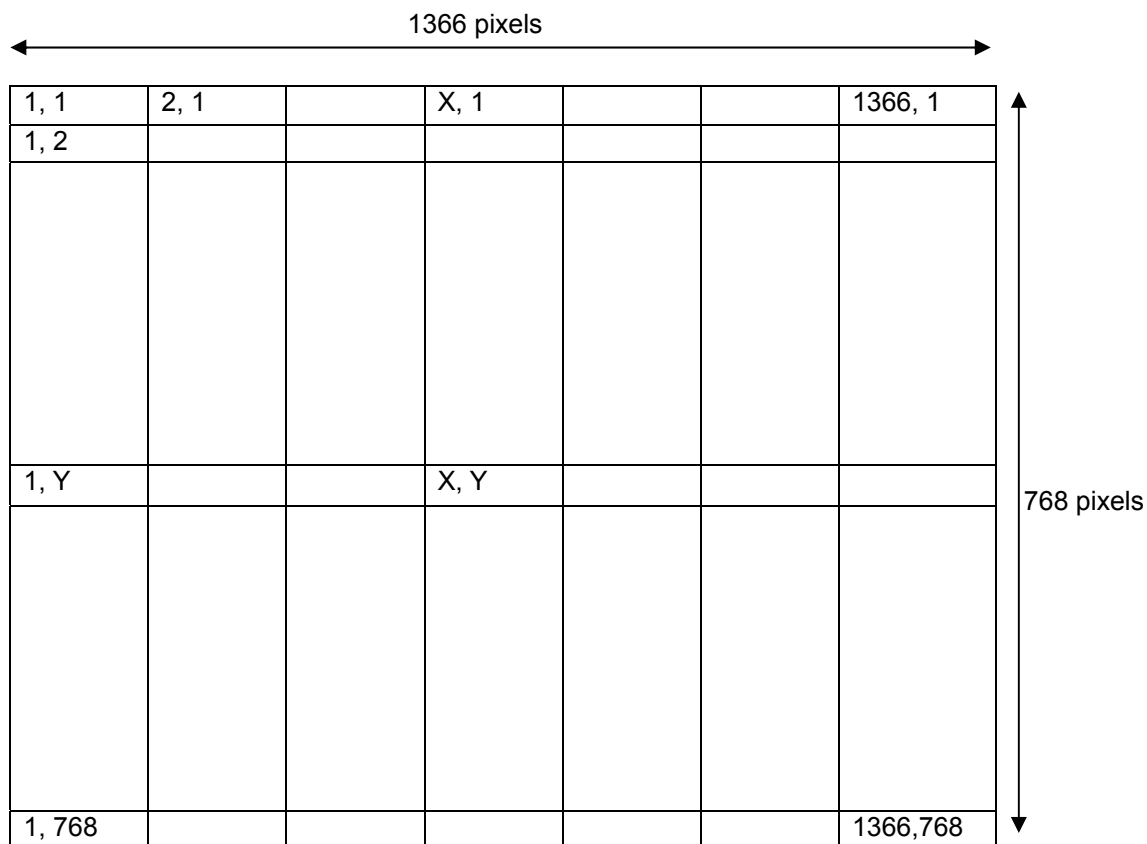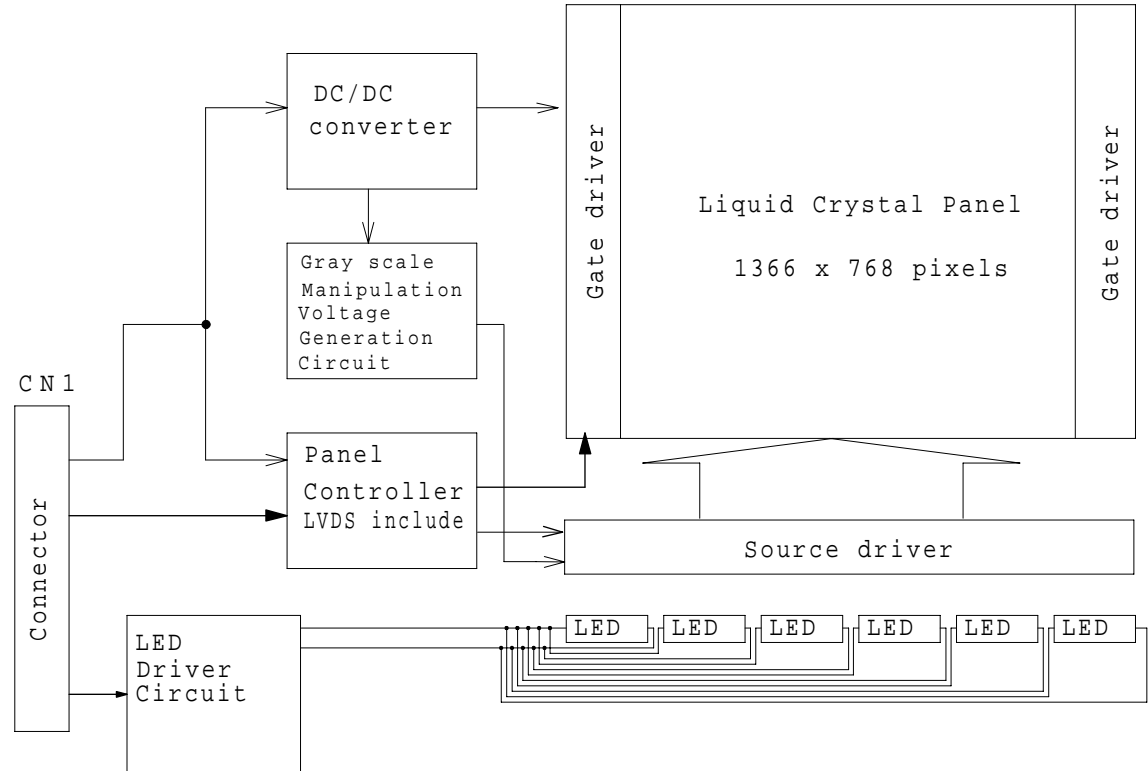
TIMING CHART

(1) Vertical Timing

tv

tvw

VSYNC

tvbp | tvd | tvb

HSYNC

th

tvfp

DE

Data   X,1   X,2   X,767   X,768

CLK

(2) Horizontal Timing

th

thw   thw

HSYNC

thbp   thfp

DE

Data   1,Y   2,Y   3,Y   1364,Y   1365,Y   1366,Y

Tc

CLK

thd   thb

POWER SEQUENCE

50us (Min)
10ms (Max)

40ms(Max)
0ms (Min)

200ms(Min)

2.97V   2.97V

VDD   0.2V   0.2V   0.2V

40ms(Max)   40ms(Max)
0ms(Min)   0ms(Min)

CK+/−
R0+/−
R1+/−
R2+/−

V_{IH}
V_{IM}
V_{IL}

200ms(Min)   0ms(Min)

ON

LED B/L

OFF

10ms(Min)   10ms(Min)

PWM for LED Dr

10ms(Min)   0ms(Min)

ENAB

(5/9)   2009-12-09 (Ver.0.2)
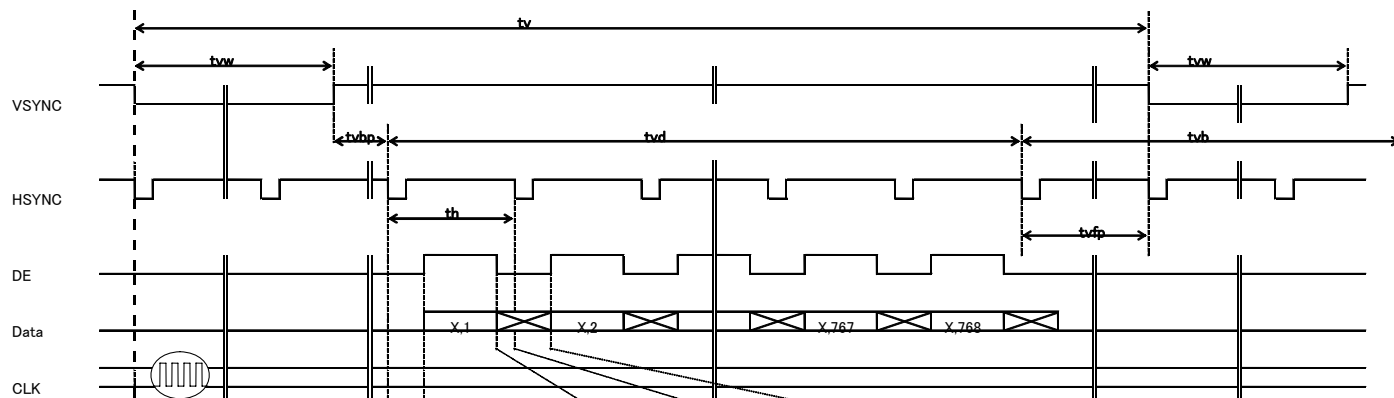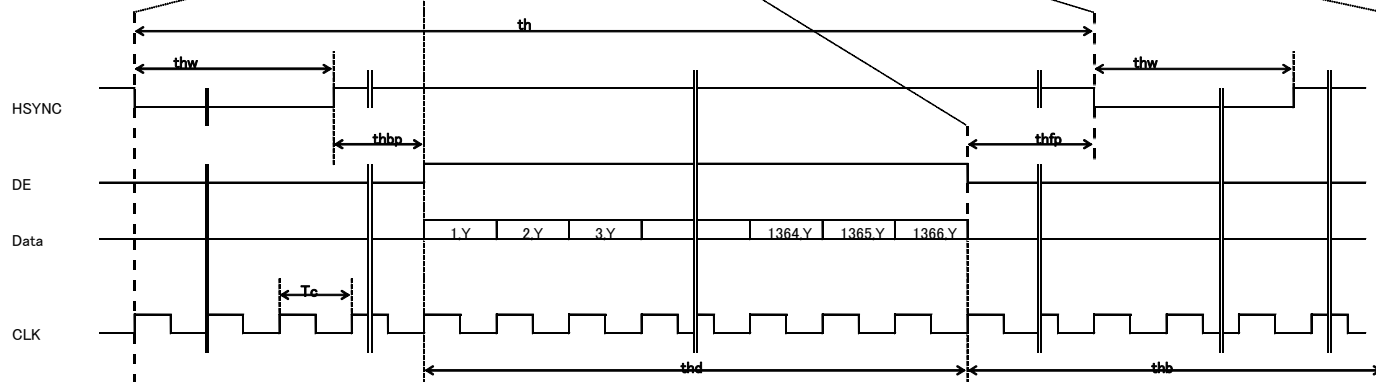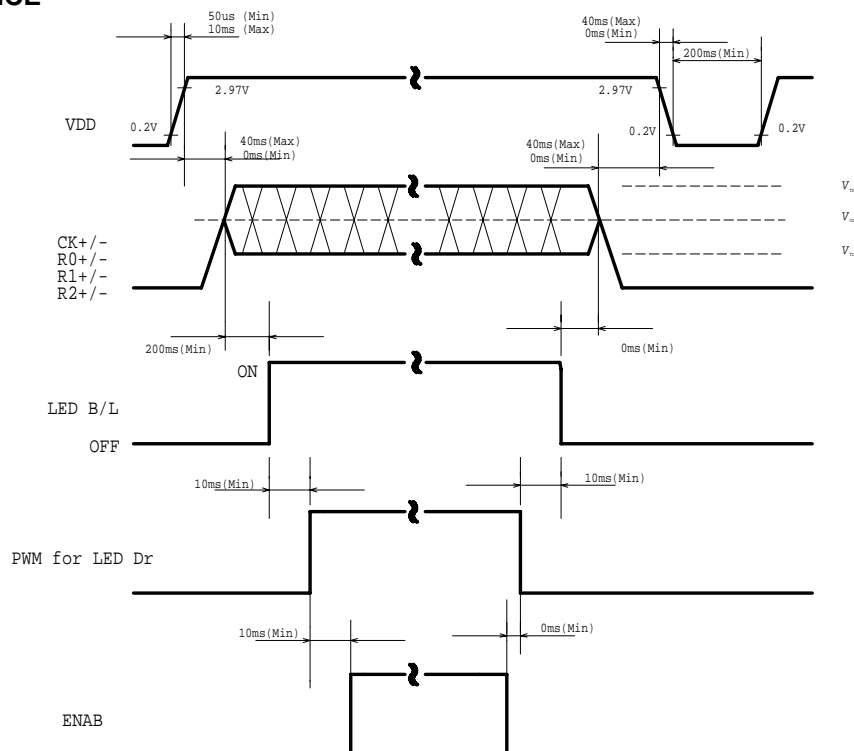
TIMING SPECIFICATION [1) 2) 3) 4) 5) 6)]

Item	Symbol	min.	typ.	max.	Unit
Frame Period	Tv	772	772	778	th
		16.55	16.67	-	ms
Vertical Display Term	Tvd	768	768	768	th
Vertical Blanking Period	Tvb	4	4	10	th
Horizontal Scanning Term	Th	1632	1634	-	tc
		21.44	21.59	-	μs
Horizontal Display Term	Thd	1366	1366	1366	tc
Horizontal Blanking Period	Thb	266	277	-	tc
Clock Period	Tc	-	76.11	76.11	MHz
		13.139	13.139	-	ns
V-sync Pulse Width	Tvw	1	1	-	th
Vertical Front Porch	$Tvfp$	1	1	-	th
Vertical Back Porch	$Tvbp$	2	2	-	th
H-sync Pulse Width	Thw	8	-	-	tc
Horizontal Front Porch	$Thfp$	8	-	-	tc
Horizontal Back Porch	$thbp$	8	-	-	tc
DE Pulse Width	Thd	1366	1366	1366	tc

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

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

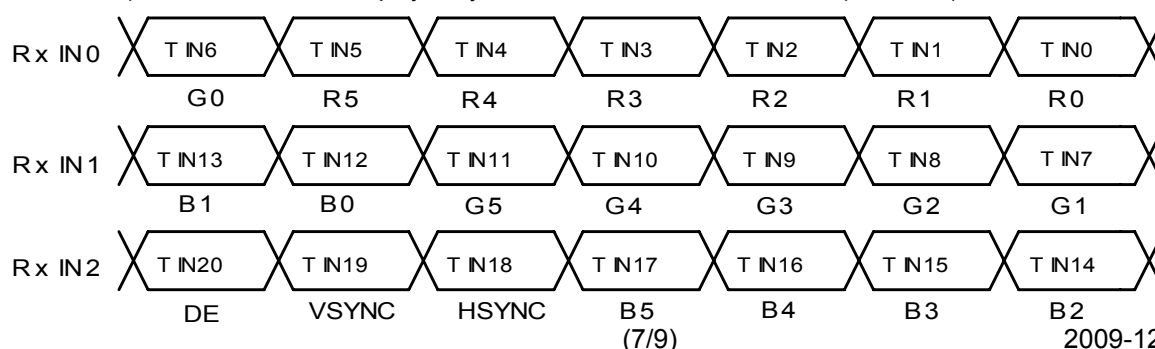CN1 INPUT SIGNAL

CN1 INPUT SIGNAL (20455-040E-12 / I-PEX)

[Mating Connector :Wire Type   20453-040T-## / I-PEX]

Terminal No.	Symbol	Function
1	NC	Non- Connection
2	V_{DD}	Power Supply, 3.3V
3	V_{DD}	Power Supply, 3.3V
4	V_{EDID}	DDC Power Supply, 3.3V
5	NC	Non-Connection
6	CLK_{EDID}	DDC Clock
7	$DATA_{EDID}$	DDC Data
8	RxIN0-	Negative LVDS differential data input (R0-R5, G0)
9	RxIN0+	Positive LVDS differential data input (R0-R5, G0)
10	V_{SS}	GND
11	RxIN1-	Negative LVDS differential data input (G1-G5, B0-B1)
12	RxIN1+	Positive LVDS differential data input (G1-G5, B0-B1)
13	V_{SS}	GND
14	RxIN2-	Negative LVDS differential data input (B2-B5, HS, VS, DE)
15	RxIN2+	Positive LVDS differential data input (B2-B5, HS, VS, DE)
16	V_{SS}	GND
17	CLK-	Clock Signal(-)
18	CLK+	Clock Signal(+)
19	V_{SS}	GND
20	NC	Non-Connection
21	NC	Non-Connection
22	V_{SS}	GND
23	NC	Non-Connection
24	NC	Non-Connection
25	V_{SS}	GND
26	NC	Non-Connection
27	NC	Non-Connection
28	V_{SS}	GND
29	NC	Non-Connection
30	NC	Non-Connection
31	GND	LED GND
32	GND	LED GND
33	GND	LED GND
34	NC	Non-Connection
35	BL_{ADJ}	PWM for luminance control (200-1kHz, 3.3V, 10-100%)
36	BL Enable	BL ON/OFF (ON: 2.25V-3.3V, OFF: 0-0.2V)
37	NC	Non-Connection
38	VLED	LED Driver POWER SUPPLY (6-20V)
39	VLED	LED Driver POWER SUPPLY (6-20V)
40	VLED	LED Driver POWER SUPPLY (6-20V)

Note 1) Please connect GND pin to ground. Don't use it as no-connect nor connectiton with high impedance.

Note 2) Please connect NC to nothing. Don't connect it to ground nor to other signal input.

Note 3) 262,144 colors are displayed by the combinations of 18 bits data. (See 2.4.6)

Rx IN0	T IN6	T IN5	T IN4	T IN3	T IN2	T IN1	T IN0
	G0	R5	R4	R3	R2	R1	R0

Rx IN1	T IN13	T IN12	T IN11	T IN10	T IN9	T IN8	T IN7
	B1	B0	G5	G4	G3	G2	G1

Rx IN2	T IN20	T IN19	T IN18	T IN17	T IN16	T IN15	T IN14
	DE	VSYNC	HSYNC	B5	B4	B3	B2

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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	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
	Light	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	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
	Light	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	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
	Light	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	L	L	H	L61
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	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	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
	Light	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

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⚠ 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.

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