22.6cm COLOUR TFT-LCD MODULE
(8.9 TYPE)

LTD089EXWS
(p-Si TFT)

TENTATIVE

Transflective Type

FEATURES

(1) 8.9"WIDE-XGA(1280x768 pixels) display size for notebook PC
(2) LED Backlight (7pcs. LEDs serial connection and 6 parallel circuits)
(3) Transflective Type
(4) Glare Surface Treatment
(5) Wedge Shape

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	224.0(*W*) x 133 (*H*) x 3.5/5.15 max(*D*) mm *)
Number of Pixels	1280 (*W*) x 768(*H*) pixels
Active Area	193.920(*W*) x 116.352(*H*) mm
Pixel Pitch	0.1515(*W*) x 0.1515(*H*) mm
Weight (approximately)	130 g
Backlight	LED

*) Exclude mounting hole

ABSOLUTE MAXIMUM RATINGS

Item		Min.	Max.	Unit
Supply Voltage	(V_{DD})	-0.3	4.0	V
	(V_{LED})	0	5.0	V
LED Currency (I_{LED})		-	30	mA
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 Voltage	(V_{LED})	18.5	22.4	25.7	V	@1 parallel
Common Mode Input Voltage	(V_{CM})	0.9	1.20	1.75	V	
Differential Input Amplitude	(V_{ID})	250	---	450	mV	
Current Consumption	*1 (I_{DD})	---	280		mA	
	*2 (I_{LED})	---	15	20	mA	
Power Consumption		---	2.94	---	W	I_{LED}=15 mA

*1 : 8 color bars pattern
*2 : The current value of each row should be the same value.
*3 : The LED drive recommends to use the PWM drive.

OPTICAL SPECIFICATION (*Ta*=25°C)

Item		Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (*CR*)		80	140	---	---	
Response Time	(t_{ON})	---	---	50	ms	
	(t_{OFF})	---	---	50		
Luminance (*L*)		150	225	---	cd/m^2	I_{LED}=15mA
Reflectance (%)		---	7.0	---	**%**	**B/L OFF**
Viewing Angle CR>10	Top/Bottom	---	20/30	---	°	
	Left/Right	---	25/25	---	°	

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

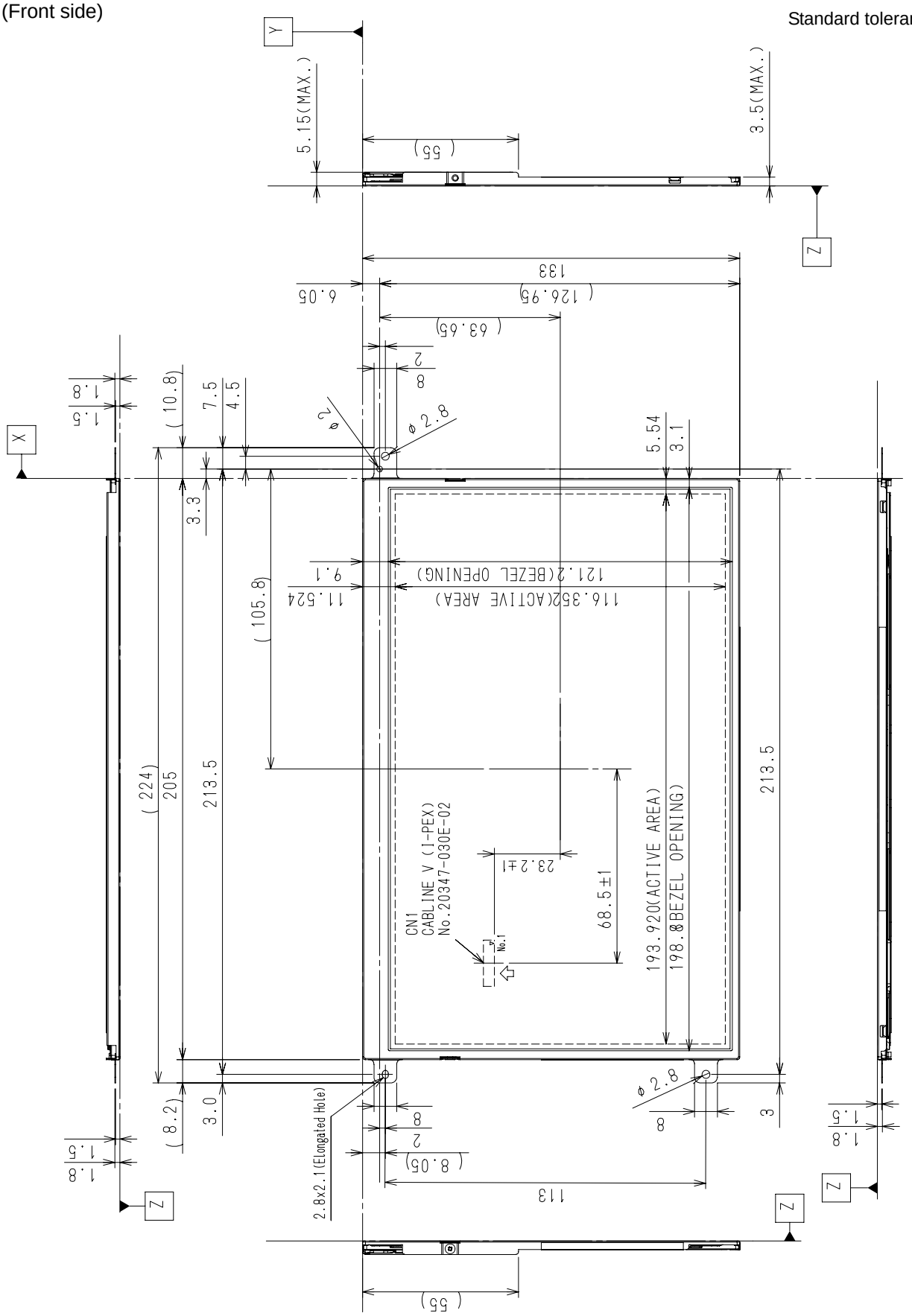
TENTATIVE

DIMENSIONAL OUTLINE

(Front side)

Unit : mm

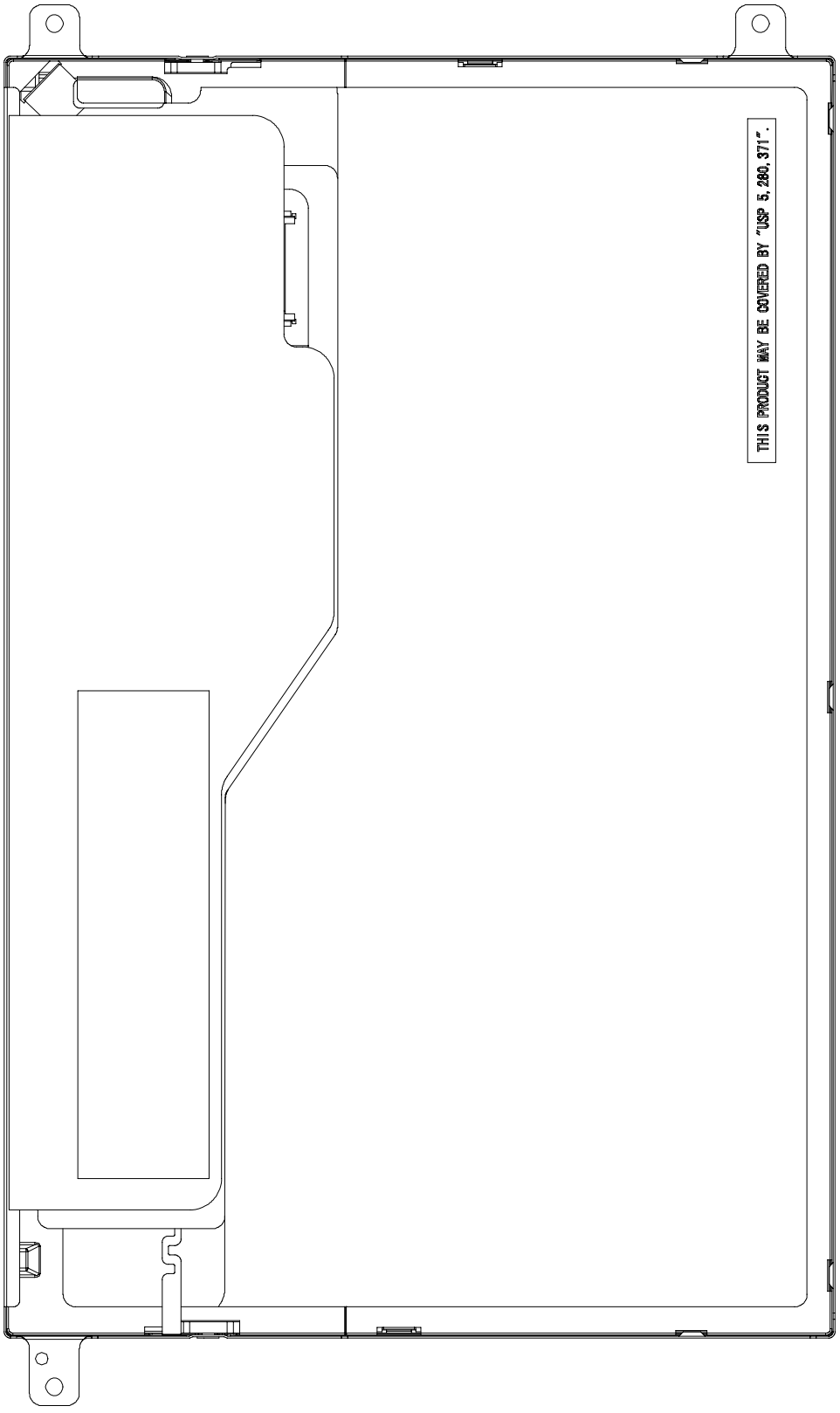
Standard tolerance : ±0.5



DIMENSIONAL OUTLINE

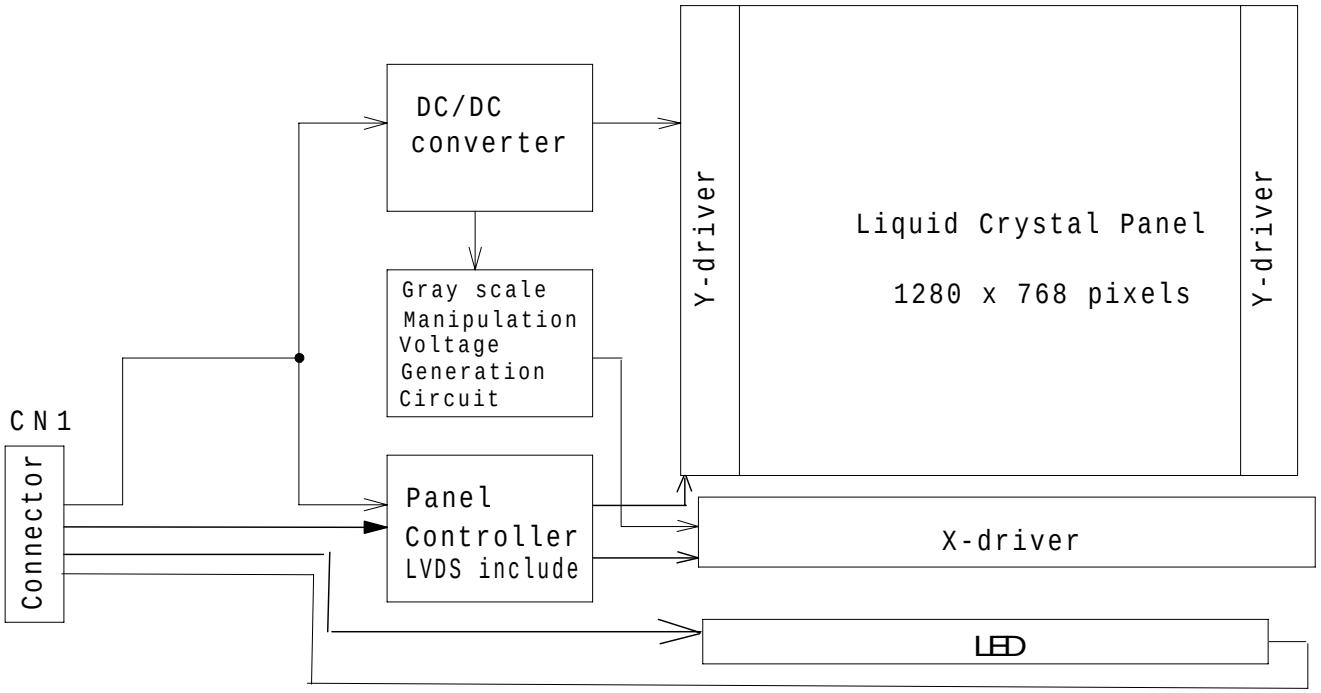
TENTATIVE

(Back side)



Note 1) Never push LCD back side. If LCD back side was pressed, It may cause damage of the back light system.

BLOCK DIAGRAM

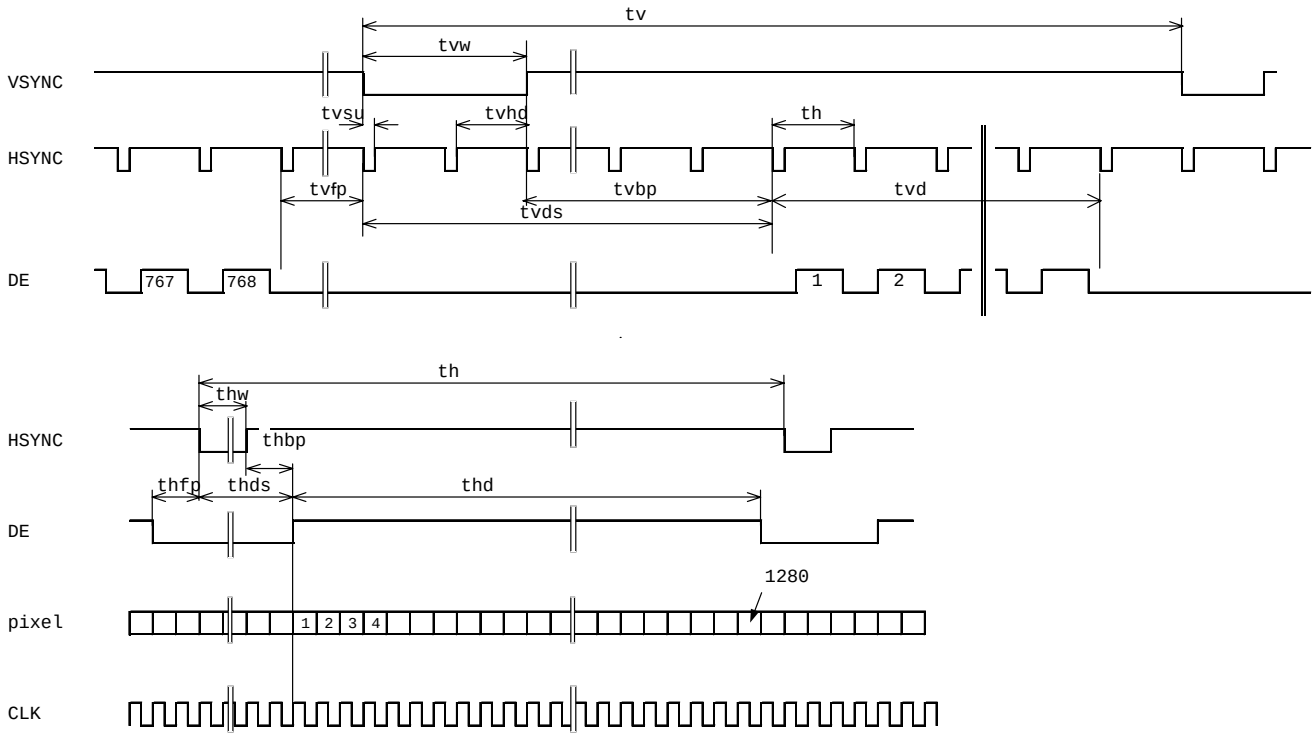


1280 pixels

1, 1	2, 1		$X2_{n-1}$, 1	$X2_n$, 1		1280, 1
1, 2						
1, Y			X_{2n-1}, Y	X_{2n}, Y		
1, 768						1280,768

768 pixels

TIMING CHART



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

Item	Symbol	min.	typ.	max.	unit
Horizontal Scanning Term	*t*h	1560 x *t*c	1664 x *t*c	1712 x *t*c	clock
H-sync Pulse Width	*t*hw	4 x *t*c	128 x *t*c	-	clock
Horizontal Front Porch	*t*hfp	8 x *t*c	64 x *t*c	-	clock
Horizontal Back Porch	*t*hbp	8 x *t*c	192 x *t*c	-	clock
Horizontal Data Sync Period	*t*hds	12 x *t*c	320 x *t*c	-	clock
Horizontal Display Term	*t*hd	1280 x *t*c	1280 x *t*c	1280 x *t*c	clock
Frame Period	*t*v	771 x *t*h	798 x *t*h	825 x *t*h	line
V-sync Pulse Width	*t*vw	1 x *t*h	7 x *t*h	-	line
V-sync Set Up Time (to H-sync)	*t*vsu	4 x *t*c	-	-	clock
V-sync Hold Time	*t*vhd	4 x *t*c	-	-	clock
Vertical Front Porch	*t*vfp	1 x *t*h	3 x *t*h	-	line
Vertical Back Porch	*t*vbp	1 x *t*h	20 x *t*h	-	line
Vertical Data Sync Period	*t*vds	2 x *t*h	27 x *t*h	-	line
Vertical Display Term	*t*vd	768 x *t*h	768 x *t*h	768 x *t*h	line
Clock Period	*t*c	12.20 (82.0MHz)	12.58 (79.5MHz)	13.33 (75.0MHz)	ns

Note 1) Refer to “Timing Chart” and LVDS specifications in 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.

Note4) tvb = tvw + tvfp + tvbp
thb = thw + thfp + thbp

Note5) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note6) 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.

CONNECTOR PIN ASSIGNMENT FOR INTERFACE

CN1 INPUT SIGNAL

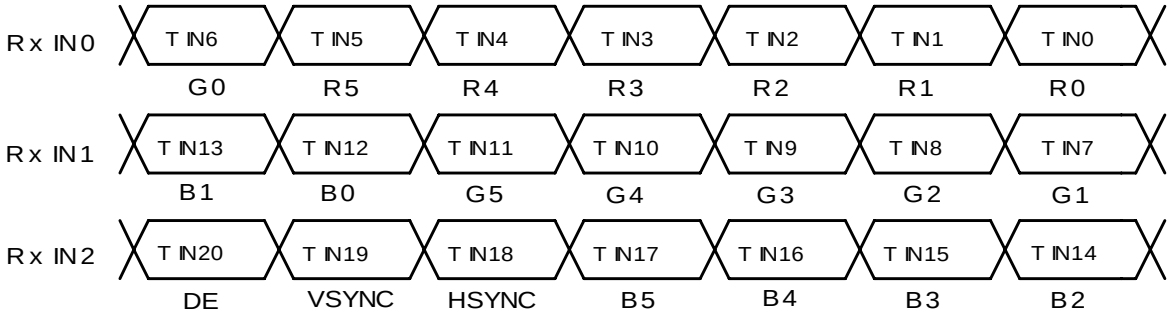
Connector : 20347-030E-02/I-PEX

Mating Connector : 20345-*30T-##/I-PEX

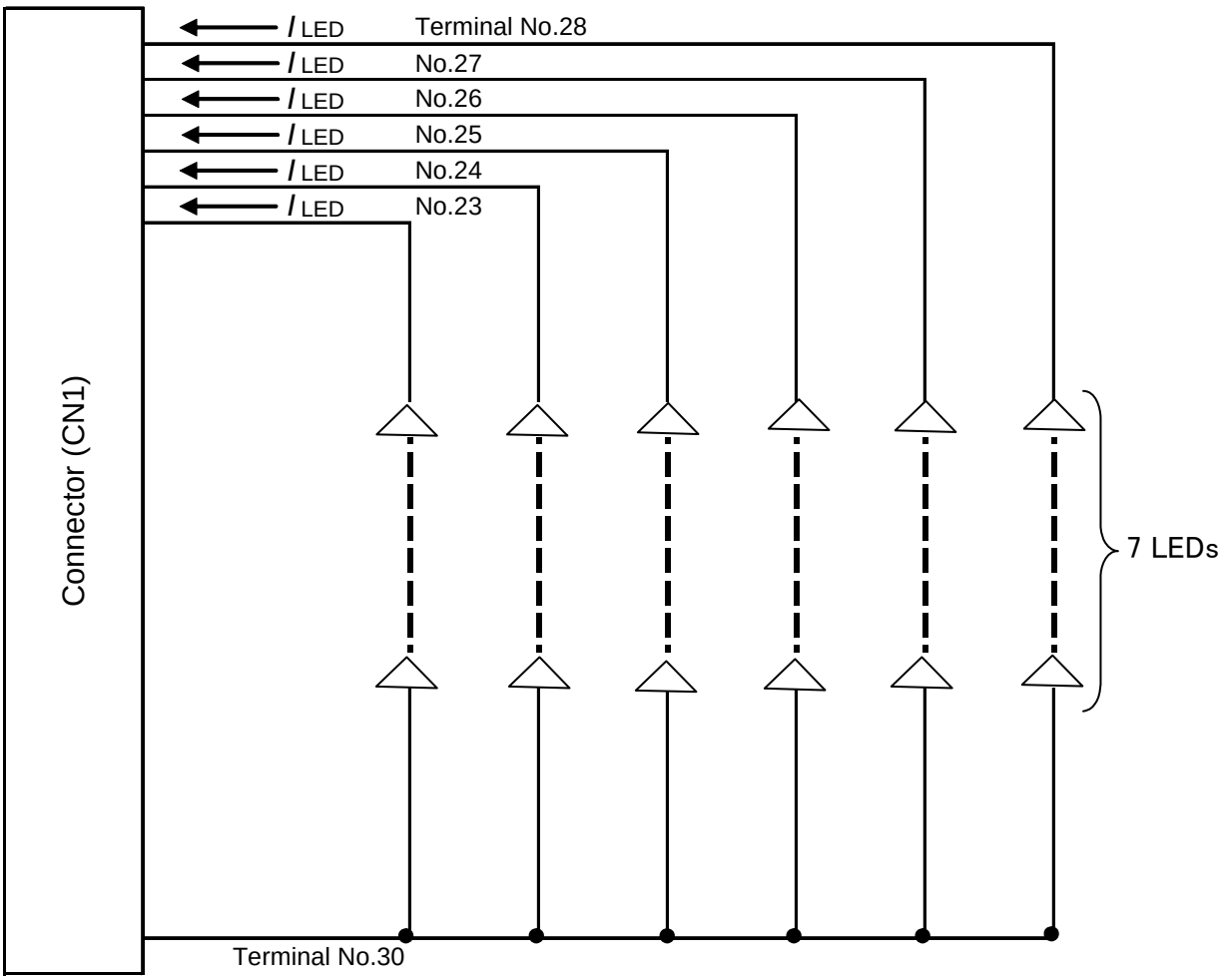
Terminal No.	Symbol	Function
1	V_{DD}	Power Supply : +3.3V
2	V_{DD}	Power Supply : +3.3V
3	V_{DD}	Power Supply : +3.3V
4	V_{DD}	Power Supply : +3.3V
5	NC	Non-Connection
6	V_{SS}	GND
7	V_{SS}	GND
8	V_{SS}	GND
9	V_{SS}	GND
10	RxIN0-	Negative LVDS differential data input (R0-R5,G0)
11	RxIN0+	Positive LVDS differential data input (R0-R5,G0)
12	V_{SS}	GND
13	RxIN1-	Negative LVDS differential data input (G1-G5, B0-B1)
14	RxIN1+	Positive LVDS differential data input (G1-G5, B0-B1)
15	V_{SS}	GND
16	RxIN2-	Negative LVDS differential data input (B2-B5, HSYNC, VSYNC, DE)
17	RxIN2+	Positive LVDS differential data input (B2-B5, HSYNC, VSYNC, DE)
18	V_{SS}	GND
19	RxCLKIN-	Clock Signal(-)
20	RxCLKIN+	Clock Signal(+)
21	V_{SS}	GND
22	NC	Non-Connection
23	VCD1	LED Cathode (Negative)
24	VCD2	LED Cathode (Negative)
25	VCD3	LED Cathode (Negative)
26	VCD4	LED Cathode (Negative)
27	VCD5	LED Cathode (Negative)
28	VCD6	LED Cathode (Negative)
29	NC	Non-Connection
30	VAD	LED Anode (Positive)

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.



EQUIVALENT CIRCUIT OF LED



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 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'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'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's published specification limits.

C) In addition, since Toshiba Matsushita Display technology 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 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.