

PRODUCT INFORMATION

FEATURES

- (1) 2.4" 240x320 display size for mobile phones.
- (2) Reflective LCD with built-in LED Front light and touch panel.
- (3) High resolution (164 pixel per inch).
- (4) 4096-colors.

TENTATIVE

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (TYP.)	46.8(W) x 70.4(H) x 4.8(MAX.) (D) mm
Number of Pixels	240(x RGB)(W) x 320 (H) pixels
Active Area	37.08(W) x 49.44 (H) mm
Pixel Pitch	0.1545(W) x 0.1545(H)
Weight (TYP.)	(45) g (approximately)
Front Light	2 White LED, Sidelight type

ABSOLUTE MAXIMUM RATINGS

Item	Min.	Max.	Unit	
Supply Voltage	VI_IN	-0.5	10.5	V
	VI_2	-2.5	5.0	V
	VI_5	-0.5	10.5	V
	VI_10	-0.5	10.5	V
	VI_15	-0.5	10.5	V
LED Current (ILED)	(0)	(25)	MA	
Operating Temperature	0	+50	°C	
Storage Temperature	-20	+60	°C	
Storage Humidity (Max. wet bulb temp. = 39°C)	10	90	%RH	

ELECTRICAL SPECIFICATION

Item	Min.	Typ.	Max.	Unit	Remarks	
Supply Voltage	VIH_IN	2.7	3.0	---	V	
	VIL_IN	---	0	0.4	V	
	VIH_10	9.5	10.0	---	V	
	VIL_10	---	0	0.5	V	
	VIH_15	14.25	15.0	---	V	
	VIL_15	---	0	0.75	V	
Current Consumption	*1(ILED)	(0)	(20)	(20)	mA	
*1*2 Power Consumption		TBD	(80)	TBD	mW	ILED=0mA
		TBD	(224)	TBD	mW	ILED=@20mAx2, VLED=(3.6)V

*1 : Except the efficiency of LED Driver.
*2 : 8 color bars pattern

OPTICAL SPECIFICATION (Ta=25°C)

Item	Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (CR)	TBD	(20)	---	---	Front Light OFF
	TBD	(15)	---	---	Front Light ON
Response Time	(tON)	---	50	Ms	
	(tOFF)	---	50	Ms	
Luminance (L)	TBD	(20)	---	cd/m ²	ILED=@20mAx2, VLED=(3.6)V
Optimum view angle	---	6'oclock	---	---	

SCHEDULE

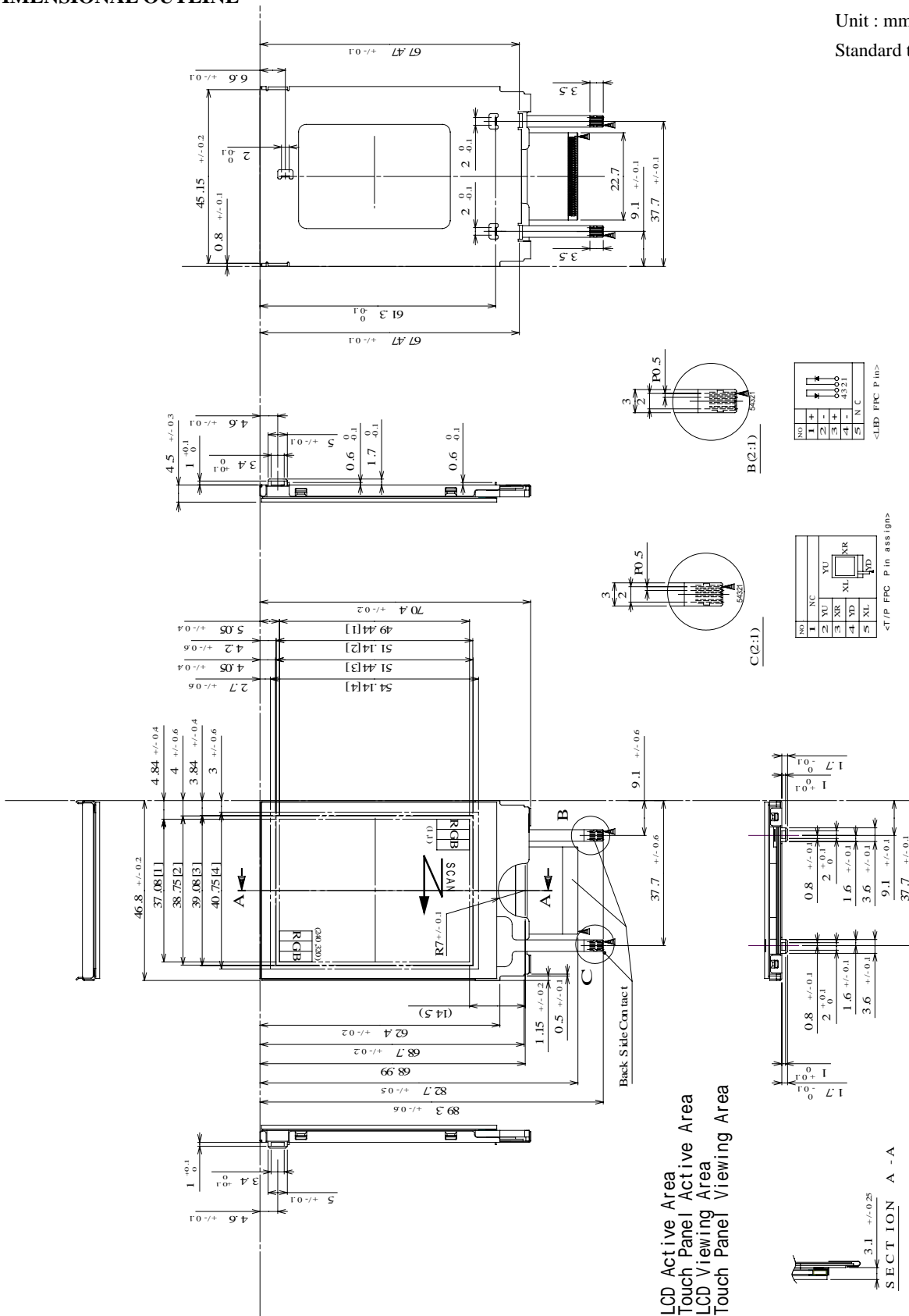
ES : '02/3/E MP : '02/8/M

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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.

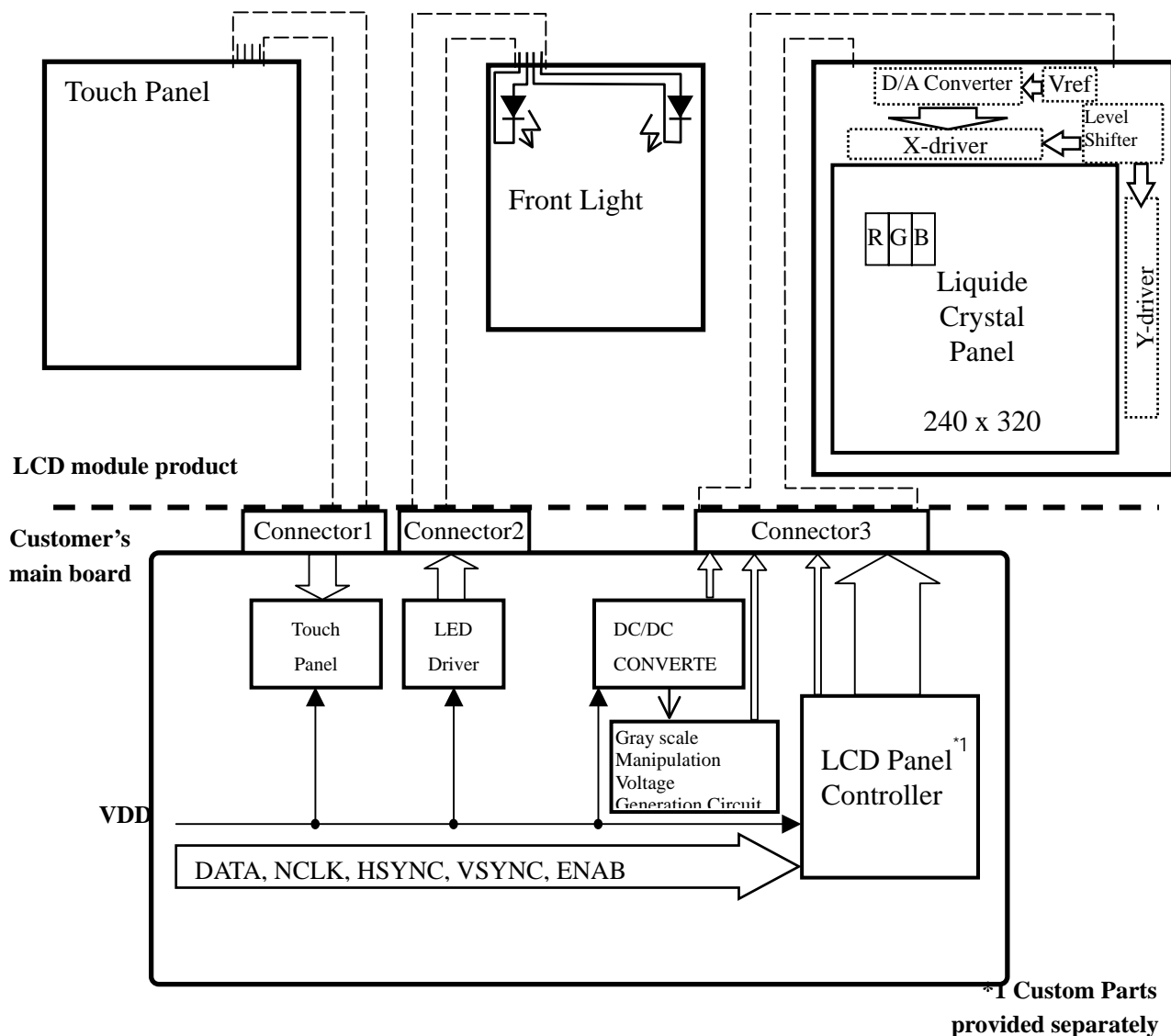
DIMENSIONAL OUTLINE

Unit : mm
Standard tolerance : +/- 0.3

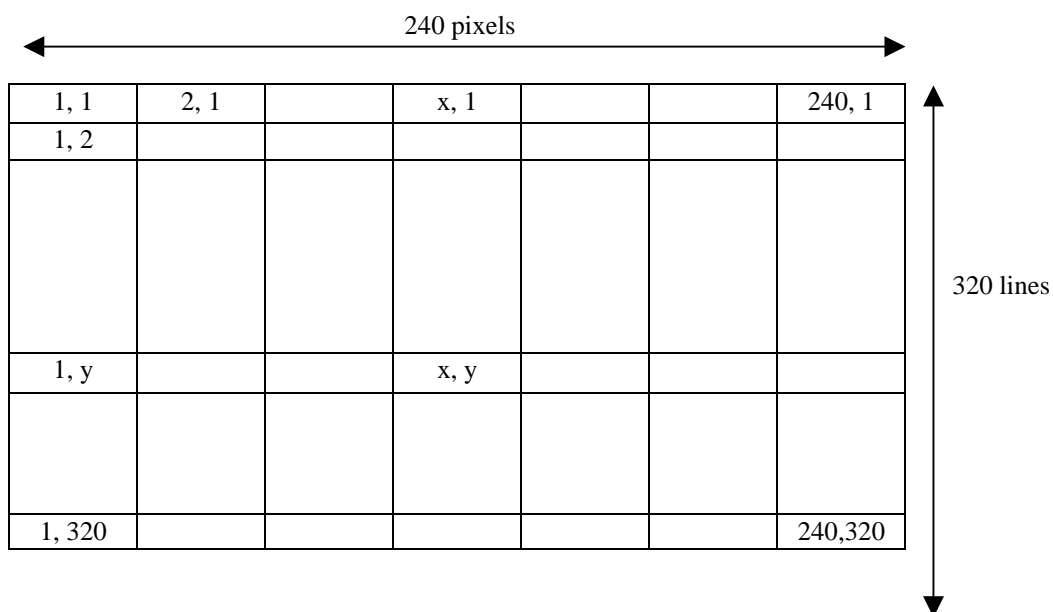


- [1] : LCD Active Area
- [2] : Touch Panel Active Area
- [3] : LCD Viewing Area
- [4] : Touch Panel Viewing Area

BLOCK DIAGRAM

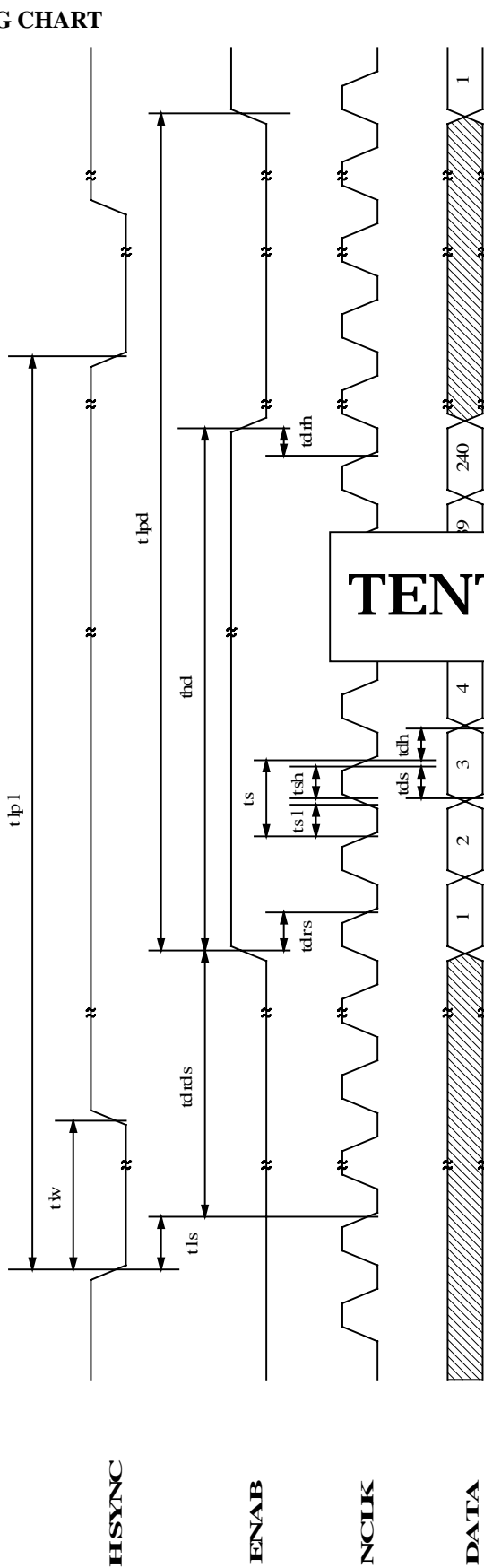


Pixels Location

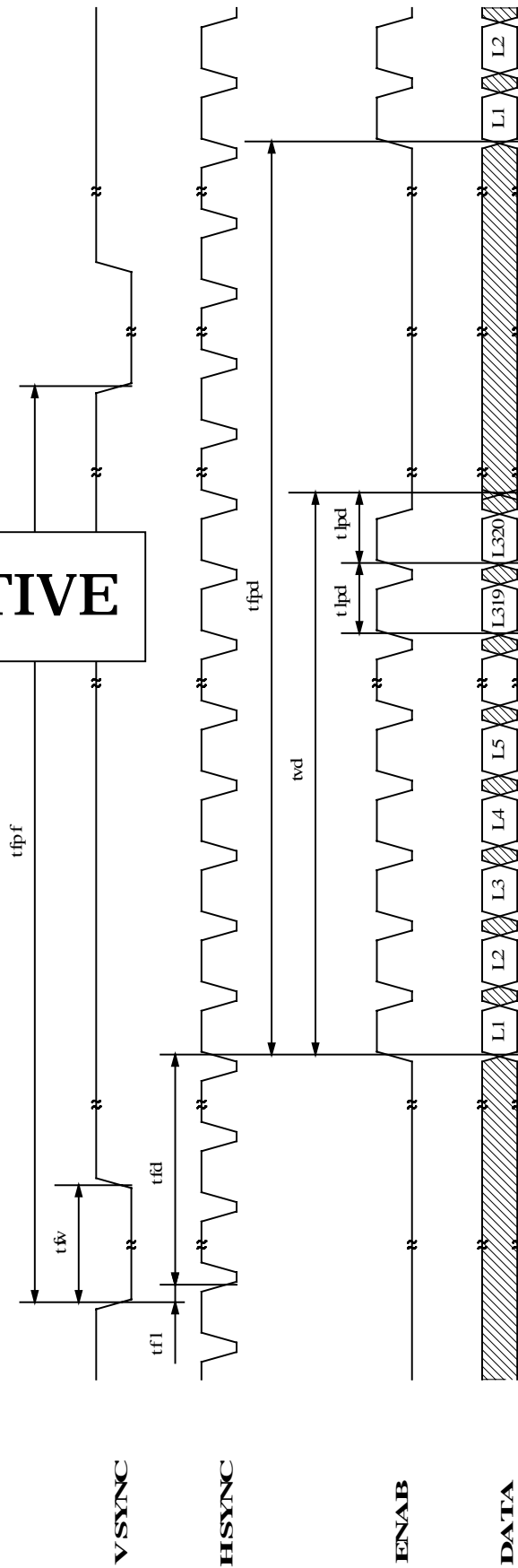


TIMING CHART

Horizontal Data Timing



Vertical Data Timing



TIMING SPECIFICATION ¹⁾²⁾³⁾ (LCD panel controller input signal)**TENTATIVE**

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
NCLK	Frame Period	t_s	TBD	249	-	ns	4)
	Frequency	$1/t_s$	-	4.01	TBD	MHz	
	High Time	t_{sh}	80	$0.5 \times t_s$	-	ns	
	Low Time	t_{sl}	80	$0.5 \times t_s$	-	ns	
HSYNC	Setup to NCLK	t_{ls}	100	$0.5 \times t_s$	-	ns	
	Pulse Width	t_{lw}	$9 \times t_s$	$10 \times t_s$	$16 \times t_s$	-	
VSYNC	Pulse Width	t_{fw}	TBD	$2 \times t_{lpd}$	-	-	
	VSYNC to DATA	t_{fd}	TBD	$6 \times t_{lpd}$	-	-	
	Setup to HSYNC	t_{fl}	0	-	-	ns	
	Line Period	$t_{lpd}=t_{lpl}$	$272 \times t_s$	$272 \times t_s$ 67.7	TBD	- μs	4)
	Horizontal Display Time	t_{hd}	$240 \times t_s$	$240 \times t_s$	$240 \times t_s$	-	
	Frame Frequency	$1/t_{fpd}$	TBD	45	-	Hz	
	Frame Period	$t_{fpd}=t_{fpf}$	TBD	$328 \times t_{lpd}$	-	-	
	Vertical Display Time	t_{vd}	$320 \times t_{lpd}$	$320 \times t_{lpd}$	$320 \times t_{lpd}$	-	
DATA	Setup	t_{ds}	20	$0.5 \times t_s$	-	ns	
	Hold	t_{dh}	20	$0.5 \times t_s$	-	ns	
ENAB	Setup	t_{drs}	20	$0.5 \times t_s$	-	ns	
	Hold	t_{drh}	20	$0.5 \times t_s$	-	ns	
	Display Start	t_{drds}	-	$16 \times t_s$	TBD	-	

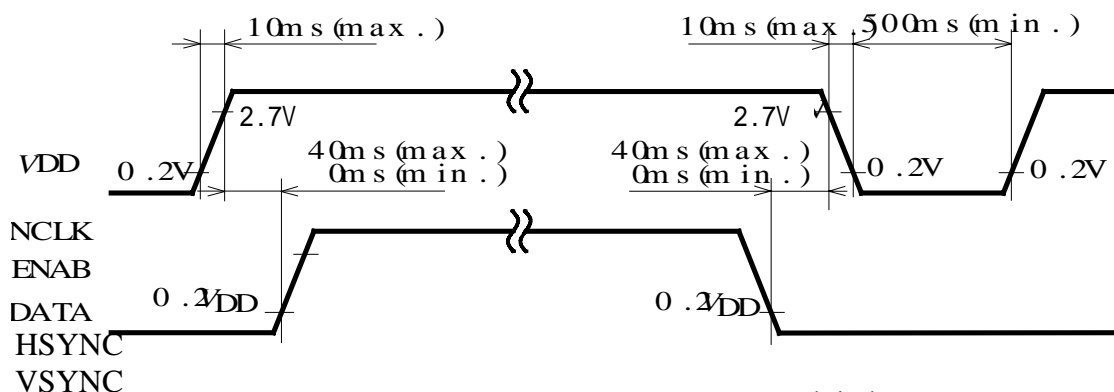
Note 1) When ENAB is fixed to "H" level or "L" level after NCLK input, the panel is displayed as black. However, it may be occurred a flicker on the display.

Note 2) When NCLK is fixed to "H" level or "L" level, the panel becomes white stage after several seconds.

Note 3) Do not change t_s and t_{lpd} values in the operation. When t_s or t_{lpd} is changed, the panel is displayed as black.

Note 4) Please adjust LCD operating signal timing and LED driving frequency, to optimize the display quality. There is a possibility that flicker is observed by the interference of LCD operating signal timing and LED driving condition (especially driving frequency).

SEQUENCE OF POWER SUPPLIES AND SIGNALS



FPC PIN ASSIGNMENT FOR INTERFACE

<LCD I/F>

FPC : 0.3mm pitch 70pins

Mating Connector : FF0270SA1 (JAE)

TENTATIVE

Pin No.	Symbol	Connect to		Pin No.	Symbol	Connect to			
		Pin No.	Symbol			Pin No.	Symbol		
1	COM	Pow IC	2	COM	36	DB1	LCDC	82	DB1
2	/YST	LCDC	43	/YST	37	/DB2	LCDC	77	/DB2
3	YST	LCDC	44	YST	38	DB2	LCDC	78	DB2
4	/YCK	LCDC	46	/YCK	39	/DB3	LCDC	75	/DB3
5	YCK	LCDC	47	YCK	40	DB3	LCDC	76	DB3
6	YSHUT	LCDC	49	YSHUT	41	/DA0	LCDC	95	/DA0
7	/YSHUT	LCDC	48	/YSHUT	42	DA0	LCDC	96	DA0
8	YVDD	Pow IC	12	Ch3	43	/DA1	LCDC	93	/DA1
9	YVSS	GND	-	-	44	DA1	LCDC	94	DA1
10	YGVSS	Pow IC	34	Ch5	45	/DA2	LCDC	90	/DA2
11	YGVDD	Pow IC	13	Ch4	46	DA2	LCDC	92	DA2
12	CS	Pow IC	13	Ch4	47	/DA3	LCDC	86	/DA3
13	XSWST	LCDC	97	XSWST	48	DA3	LCDC	87	DA3
14	/XSWST	LCDC	98	/XSWST	49	XVSS	GND	-	-
15	XVDD	Pow IC	12	Ch3	50	XVDD	Pow IC	12	Ch3
16	XVSS	GND	-	-	51	/XCK	LCDC	103	/XCK
17	/DD0	LCDC	61	/DD0	52	XCK	LCDC	102	XCK
18	DD0	LCDC	62	DD0	53	/XST	LCDC	100	/XST
19	/DD1	LCDC	59	/DD1	54	XST	LCDC	99	XST
20	DD1	LCDC	60	DD1	55	GMA0	-	-	-
21	/DD2	LCDC	57	/DD2	56	V5N	-	-	-
22	DD2	LCDC	58	DD2	57	V9N	-	-	-
23	/DD3	LCDC	54	/DD3	58	GMA5B	-	-	-
24	DD3	LCDC	56	DD3	59	GMA5A	-	-	-
25	/DC0	LCDC	72	/DC0	60	V9P	-	-	-
26	DC0	LCDC	74	DC0	61	V5P	-	-	-
27	/DC1	LCDC	70	/DC1	62	GMA10	-	-	-
28	DC1	LCDC	71	DC1	63	REF1	LCDC	41	REF1
29	/DC2	LCDC	68	/DC2	64	/REF1	LCDC	42	/REF1
30	DC2	LCDC	69	DC2	65	XVSS	GND	-	-
31	/DC3	LCDC	66	/DC3	66	XVDD	Pow IC	12	Ch3
32	DC3	LCDC	67	DC3	67	CS	Pow IC	13	Ch4
33	/DB0	LCDC	84	/DB0	68	YGVDD	Pow IC	13	Ch4
34	DB0	LCDC	85	DB0	69	YGVSS	Pow IC	34	Ch5
35	/DB1	LCDC	81	/DB1	70	COM	Pow IC	2	COM

<Touch Panel I/F>

FPC : 0.5mm pitch 5pins

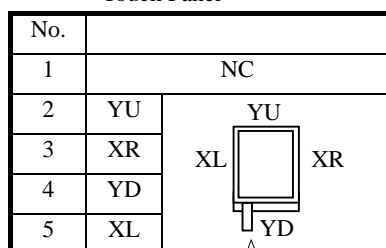
Mating Connector : 04 6249 005 000 800 (KYOCERA ELCO)

<Front Light I/F>

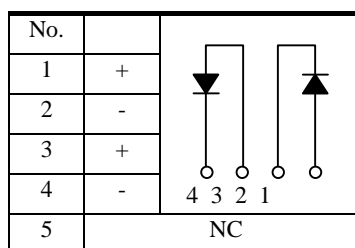
FPC : 0.5mm pitch 5pins

Mating Connector : 04 6249 005 000 800 (KYOCERA ELCO)

Touch Panel



Front Light



4k (k=1024) COLORS COMBINATION TABLE

	Display	R3 R2 R1 R0	G 3 G 2 G 1 G 0	B 3 B 2 B 1 B 0	Gray Scale Level
Basic Color	Black	L L L L	L L L L	L L L L	-
	Blue	L L L L	L L L L	H H H H	-
	Green	L L L L	H H H H	L L L L	-
	Light Blue	L L L L	H H H H	H H H H	-
	Red	H H H H	L L L L	L L L L	-
	Purple	H H H H	L L L L	H H H H	-
	Yellow	H H H H	H H H H	L L L L	-
	White	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	L0
	Dark ↑ ↓ Light	L L L H	L L L L	L L L L	L1
		L L H L	L L L L	L L L L	L2
		: :	: :	: :	L3... L12
		H H L H	L L L L	L L L L	L13
	H H H L	L L L L	L L L L	L14	
Red	H H H H	L L L L	L L L L	Red L15	
Gray Scale of Green	Black	L L L L	L L L L	L L L L	L0
	Dark ↑ ↓ Light	L L L L	L L L L	L L L L	L1
		L L L L	L L H L	L L L L	L2
		: :	: :	: :	L3... L12
		L L L L	H H L H	L L L L	L13
	L L L L	H H H L	L L L L	L14	
Green	L L L L	H H H H	L L L L	Green L15	
Gray Scale of Blue	Black	L L L L	L L L L	L L L L	L0
	Dark ↑ ↓ Light	L L L L	L L L L	L L L H	L1
		L L L L	L L L L	L L H L	L2
		: :	: :	: :	L3... L12
		L L L L	L L L L	H H L H	L13
	L L L L	L L L L	H H H L	L14	
Blue	L L L L	L L L L	H H H H	Blue L15	
Gray Scale of White & Black	Black	L L L L	L L L L	L L L L	L0
	Dark ↑ ↓ Light	L L L H	L L L H	L L L H	L1
		L L H L	L L H L	L L H L	L2
		: :	: :	: :	L3... L12
		H H L H	H H L H	H H L H	L13
	H H H L	H H H L	H H H L	L14	
White	H H H H	H H H H	H H H H	White L15	

Revision History

Date	Ver	Page (new)	Item	Old	New	Reason
2002-1-7	0.1	---		---	---	---
2002-1-22	0.2	6	Touch Panel I/F	04 6249 005 800	04 6249 005 000 800	Miss Print
		6	Front Light I/F	04 6249 005 800	04 6249 005 000 800	Miss Print
		6	Touch Panel I/F	XU	YU	Miss Print
		6	Touch Panel I/F	YL	XL	Miss Print
2002-2-19	0.3	1	Absolute Maximum Ratings	VI_IN	VI_3	Revise
		1	Absolute Maximum Ratings	10.5	15.75	Miss Print
		1	Electrical specification	VI_IN	VI_3	Revise
		1	Electrical specification	VI_IN	VI_3	Revise
		1	Electrical specification	2.5	2.7	Miss Print
		2	Dimensional Outline	-	[1],[2],[3]	Added
2002-5-16	0.4	1	Company name	TOSHIBA	TOSHIBA MATSUSHITA	Change
		1	Operating Temperature	-20 ~ +70	0 ~ +50	Revise
		1	Storage Temperature	-25 ~ +70	-20 ~ +60	Revise
2002-5-28	0.5	6	Mating Connector	SS0270SA1	FF0270SA1	Miss Print
2002-5-28	0.5	7	Mating Connector	SS0270SA1	FF0270SA1	Miss Print



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 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 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.