Toshiba Mobile Display Co., Ltd.

PRODUCT INFORMATION

36cm COLOUR TFT-LCD MODULE
(14.1 TYPE)

LTD141EM5F
(p-Si TFT)

FEATURES

(1) 14.1"SXGA+(1400x1050 pixels) display size for notebook PC
(2) 2ch-LVDS interface system (H-Sync, V-Sync, DE)

TENTATIVE

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	298.5(W) x 226.5 (H) x 5.5max(D) mm
Number of Pixels	1400 (W) x 1050 (H) pixels
Active Area	285.6 (W) x 214.2 (H) mm
Viewing Area	287.6 (W) x 216.2 (H) mm
Pixel Pitch	0.204 (W) x 0.204 (H)
Weight (approximately)	400g
Backlight	Single CCFL, Sidelight type

ABSOLUTE MAXIMUM RATINGS

Item		Min.	Max.	Unit
Supply Voltage	(V_{DD})	-0.3	4.0	V
	(V_{FL})	0	2.0	kV(rms)
FL Driving Frequency (f_{FL})		-	100	kHz
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	
	(V_{FL})	---	(625)	---	V(rms)	I_{FL}=6.0 mA(rms)
FL Start Voltage (Ta=0°C)		(1500)	---	---	V(rms)	
Differential Input Voltage	(V_{ID})	100	---	600	mV	
Common Mode Input Voltage	(V_{CM})	0.8	1.2	1.75	V	
Current Consumption	*2 (I_{DD})	---	(360)	---	mA	
	*3 (I_{FL})	3.0	---	6.0	mA(rms)	
*2 *3 Power Consumption		---	(5.0)	---	W	I_{FL}=6.0 mA(rms)

*1 : Refer to THC63LVDF84A-85 Specification by Thine Electronics,Inc.
*2 : 8 color bars pattern
*3 : Excepting the efficiency FL inverter

OPTICAL SPECIFICATION (Ta=25°C)

Item		Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (CR)		100	250	---	---	
Response Time	---	---	---	50	ms	
	---	---	---	50	ms	
Luminance (L)		---	200	---	cd/m^2	I_{FL}=6.0mA(rms)

DIMENSIONAL OUTLINE

TENTATIVE

Unit : mm

Standard tolerance : ±0.5

198.5±0.3

13.85±0.3

3.1±0.2

2.25(Max.)

(13MAX)

9.2±7

217.3±0.3(BEZEL OPENING)

4.45±0.3

214.272(ACTIVE AREA)

JST BHSR-02VS-1

B/L-CN

298.5

(149.8)

57.7±1

45±1

30

REAR SIDE

285.696(ACTIVE AREA)

288.7±0.3(BEZEL OPENING)

VF-CN

JAE FI-XB30SRL-HF11

1

6.952±0.5

5.45±0.3

5.964±0.5

(113.1)

226.5

M2

5.5(Max.)

3.1±0.2

6(Max.)

VF-CN

4-M2

13.85±0.3

198.5±0.3

Depth2.2Max.

0.415 $^{+0.5}_{-0.3}$

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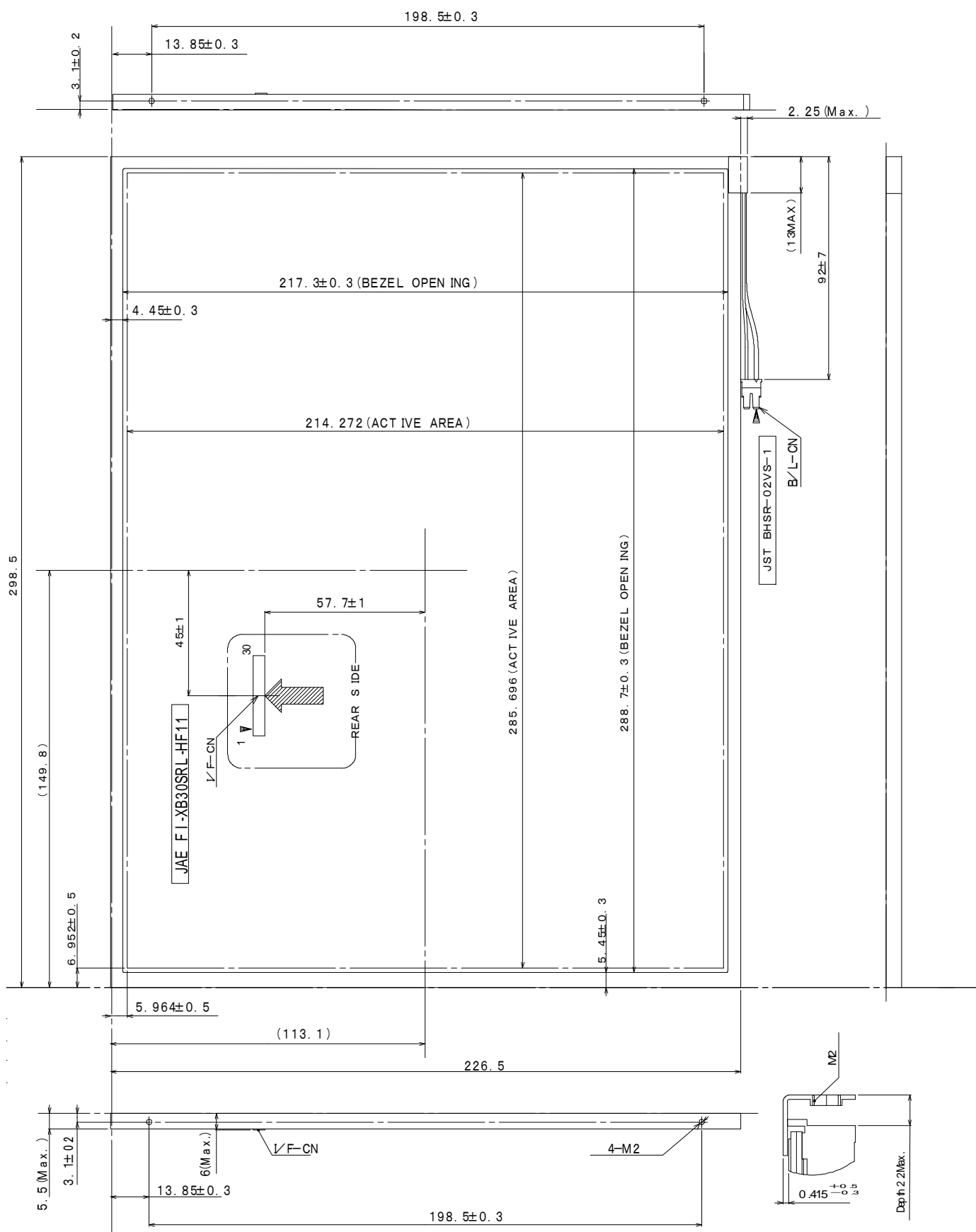
BLOCK DIAGRAM
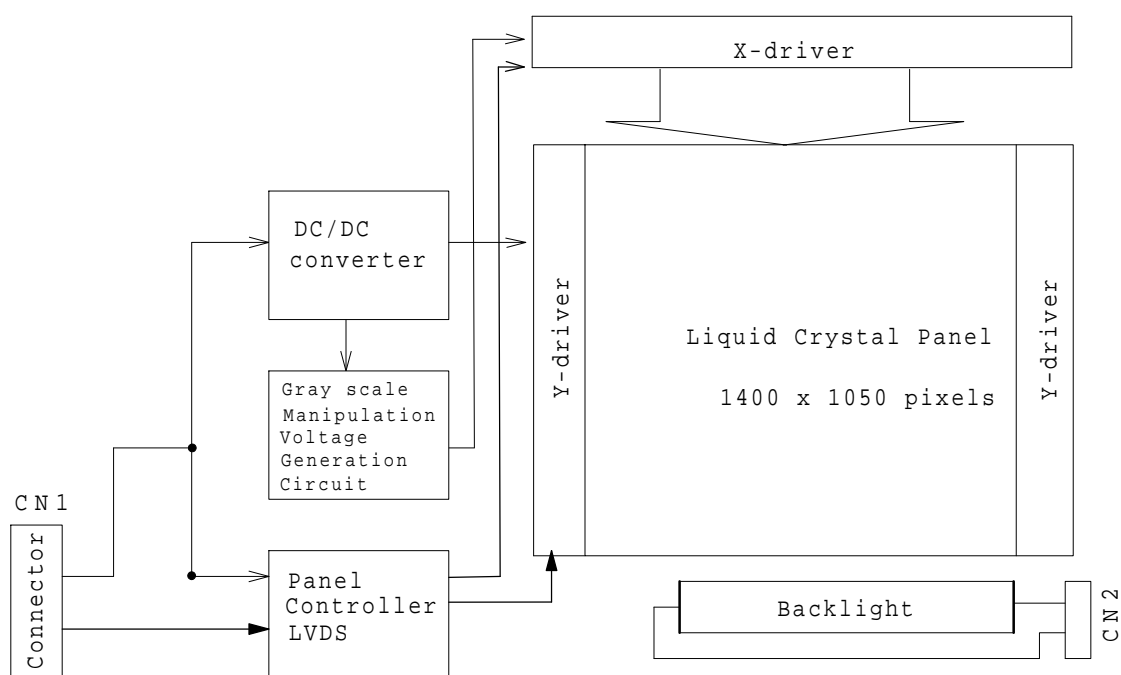
SEQUENCE OF POWER SUPPLIES AND SIGNALS

TIMING CHART
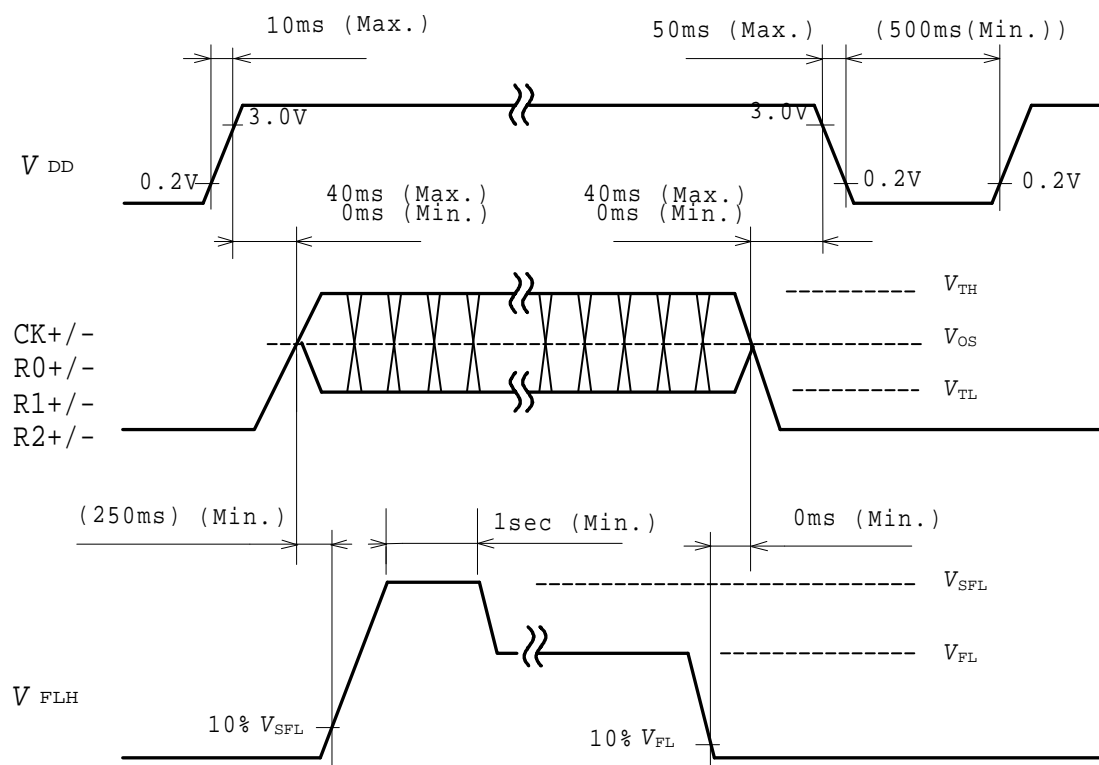
TIMING SPECIFICATION [1] [2] [3] [4] [5] [6] [7]

Item	Symbol	min.	typ.	max.	unit
Horizontal Scanning Term	th	836 x tc	844 x tc	844 x tc	-
H-sync Pulse Width	thw	4 x tc	-	-	-
Horizontal Front Porch	$thfp$	4 x tc	-	-	-
Horizontal Back Porch	$thbp$	16 x tc	-	-	-
Horizontal Blanking Term	$thblank$	136 x tc	144 x tc	324 x tc	-
Horizontal Display Term	thd	700 x tc	700 x tc	700 x tc	-
Frame Period	tv	1060 x th	1066 x th	1066 x th	-
V-sync Pulse Width	tvw	2 x th	-	-	-
V-sync Set Up Time (to H-sync)	$tvsu$	8 x tc	-	-	-
V-sync Hold Time	$tvhd$	8 x tc	-	-	-
Vertical Front Porch	$tvfp$	2 x th	-	-	-
Vertical Back Porch	$tvbp$	6x th	-	-	-
Vertical Display Term	tvd	1050 x th	1050 x th	1050 x th	
Clock Period	tc	(18.525)	(18.525)	(18.808)	ns

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

Note 2) If ENAB 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 ENAB is supplied, the panel may be damaged.

Note 4)   Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality.
There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency), even if the condition satisfies above timing specifications and recommended operating conditions shown in 3.

Note5) Do not make tv, $tvdh$ and tvds fluctuate.
If tv, $tvdh$, and $tvds$ are fluctuate, the panel displays black.

Note6) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note7) 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.

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CONNECTOR PIN ASSIGNMENT FOR INTERFACE

CN1 INPUT SIGNAL (FI-XB30S*-HF** or FI-X30S-HF** / JAE)
　　　　[Mating Connector :Wire Type FI-X30H(Housing), FI-XC3-1-15000(Contact)
　　　　　　　　　　　　FPC Type FI-X30M or FI-X30MR
　　　　　　　　　　　　Coax Type FI-X30C or FI-X30C2(Housing), FI-X30CH-7000(Shell)]

Terminal No.	Symbol	Function
1	V_{SS}	GND
2	V_{DD}	POWER SUPPLY : +3.3V
3	V_{DD}	POWER SUPPLY : +3.3V
4	NC	Non-Connection
5	NC	Non-Connection
6	NC	Non-Connection
7	NC	Non-Connection
8	RxOIN0-	Negative LVDS differential data input (Odd), [R0-R5, G0]
9	RxOIN0+	Positive LVDS differential data input (Odd), [R0-R5, G0]
10	V_{SS}	GND
11	RxOIN1-	Negative LVDS differential data input (Odd), [G1-G5, B0-B1]
12	RxOIN1+	Positive LVDS differential data input (Odd), [G1-G5, B0-B1]
13	V_{SS}	GND
14	RxOIN2-	Negative LVDS differential data input (Odd), [B2-B5, HS, VS, DE]
15	RxOIN2+	Positive LVDS differential data input (Odd), [B2-B5, HS, VS, DE]
16	V_{SS}	GND
17	RxOCLKIN-	Negative LVDS differential clock input (Odd)
18	RxOCLKIN+	Positive LVDS differential clock input (Odd)
19	V_{SS}	GND
20	RxEIN0-	Negative LVDS differential data input (Even), [R0-R5, G0]
21	RxEIN0+	Positive LVDS differential data input (Even), [R0-R5, G0]
22	V_{SS}	GND
23	RxEIN1-	Negative LVDS differential data input (Even), [G1-G5, B0-B1]
24	RxEIN1+	Positive LVDS differential data input (Even), [G1-G5, B0-B1]
25	V_{SS}	GND
26	RxEIN2-	Negative LVDS differential data input (Even), [B2-B5, HS, VS, DE]
27	RxEIN2+	Positive LVDS differential data input (Even), [B2-B5, HS, VS, DE]
28	V_{SS}	GND
29	RxECLKIN-	Negative LVDS differential clock input (Even)
30	RxECLKIN+	Positive LVDS differential clock input (Even)

　Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

CN2 CCFL POWER SOURCE
　　　　　Connector : BHSR-02VS-1 / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.
　　　　　Mating Connector : SM02B-BHS-1 / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

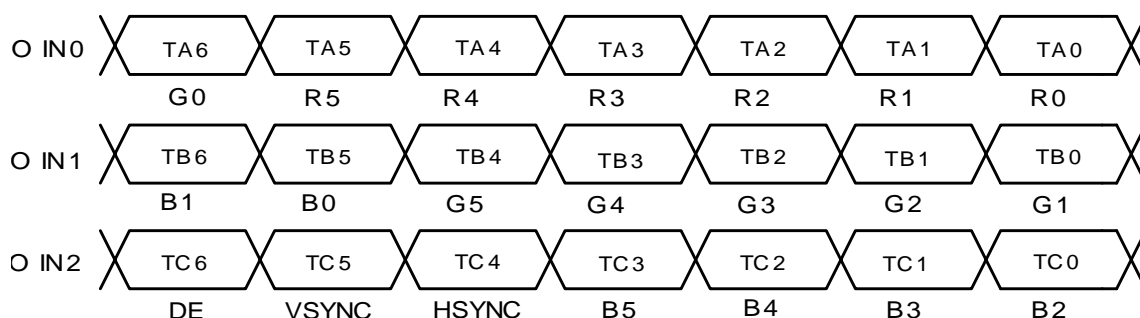| Terminal No.	Symbol	Function
1	V_{FLH}	CCFL Power Supply (high voltage)
2	V_{FLL}	CCFL Power Supply (low voltage)

RECOMMENDED TRANSMITTER(THC63LVDM63A,THC63LVDM63A-85) TO LTD141EM5F INTERFACE ASSIGNMENT

Case1: 6bit Transmitter

ODD DATA

Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	To LTD141EM5F Interface(CN1)	
Symbol		Symbol	Function		Terminal	Symbol
TA0	44	R0	Red Pixels Display Data (LSB)	TA- TA+	No.8 No.9	OIN0- OIN0+
TA1	45	R1	Red Pixels Display Data			
TA2	47	R2	Red Pixels Display Data			
TA3	48	R3	Red Pixels Display Data			
TA4	1	R4	Red Pixels Display Data			
TA5	3	R5	Red Pixels Display Data (MSB)			
TA6	4	G0	Green Pixels Display Data (LSB)			
TB0	6	G1	Green Pixels Display Data	TB- TB+	No.11 No.12	OIN1- OIN1+
TB1	7	G2	Green Pixels Display Data			
TB2	9	G3	Green Pixels Display Data			
TB3	10	G4	Green Pixels Display Data			
TB4	12	G5	Green Pixels Display Data (MSB)			
TB5	13	B0	Blue Pixels Display Data (LSB)			
TB6	15	B1	Blue Pixels Display Data			
TC0	16	B2	Blue Pixels Display Data	TC- TC+	No.14 No.15	OIN2- OIN2+
TC1	18	B3	Blue Pixels Display Data			
TC2	19	B4	Blue Pixels Display Data			
TC3	20	B5	Blue Pixels Display Data (MSB)			
TC4	22	HSYNC	H-SYNC			
TC5	23	VSYNC	V-SYNC			
TC6	25	DE	Compound Synchronization Signal			
CLK IN	26	NCLK	Data Sampling Clock	TCLK- TCLK+	No.17 No.18	OCLK- OCLK+

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

O IN0	TA6	TA5	TA4	TA3	TA2	TA1	TA0
	G0	R5	R4	R3	R2	R1	R0

O IN1	TB6	TB5	TB4	TB3	TB2	TB1	TB0
	B1	B0	G5	G4	G3	G2	G1

O IN2	TC6	TC5	TC4	TC3	TC2	TC1	TC0
	DE	VSYNC	HSYNC	B5	B4	B3	B2

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EVEN DATA

Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	To LTD141EM5F Interface(CN1)	
Symbol		Symbol	Function		Terminal	Symbol
TA0	44	R0	Red Pixels Display Data (LSB)	TA- TA+	No.20 No.21	EIN0- EIN0+
TA1	45	R1	Red Pixels Display Data			
TA2	47	R2	Red Pixels Display Data			
TA3	48	R3	Red Pixels Display Data			
TA4	1	R4	Red Pixels Display Data			
TA5	3	R5	Red Pixels Display Data (MSB)			
TA6	4	G0	Green Pixels Display Data (LSB)			
TB0	6	G1	Green Pixels Display Data	TB- TB+	No.23 No.24	EIN1- EIN1+
TB1	7	G2	Green Pixels Display Data			
TB2	9	G3	Green Pixels Display Data			
TB3	10	G4	Green Pixels Display Data			
TB4	12	G5	Green Pixels Display Data (MSB)			
TB5	13	B0	Blue Pixels Display Data (LSB)			
TB6	15	B1	Blue Pixels Display Data			
TC0	16	B2	Blue Pixels Display Data	TC- TC+	No.26 No.27	EIN2- EIN2+
TC1	18	B3	Blue Pixels Display Data			
TC2	19	B4	Blue Pixels Display Data			
TC3	20	B5	Blue Pixels Display Data (MSB)			
TC4	22	NC	Non Connection (open)			
TC5	23	NC	Non Connection (open)			
TC6	25	NC	Non Connection (open)			
CLK IN	26	NCLK	Data Sampling Clock	TCLK- TCLK+	No.29 No.30	ECLK- ECLK+

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.
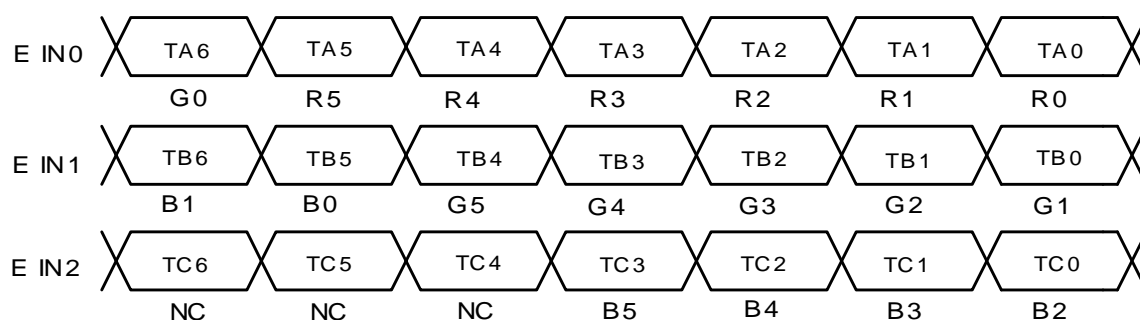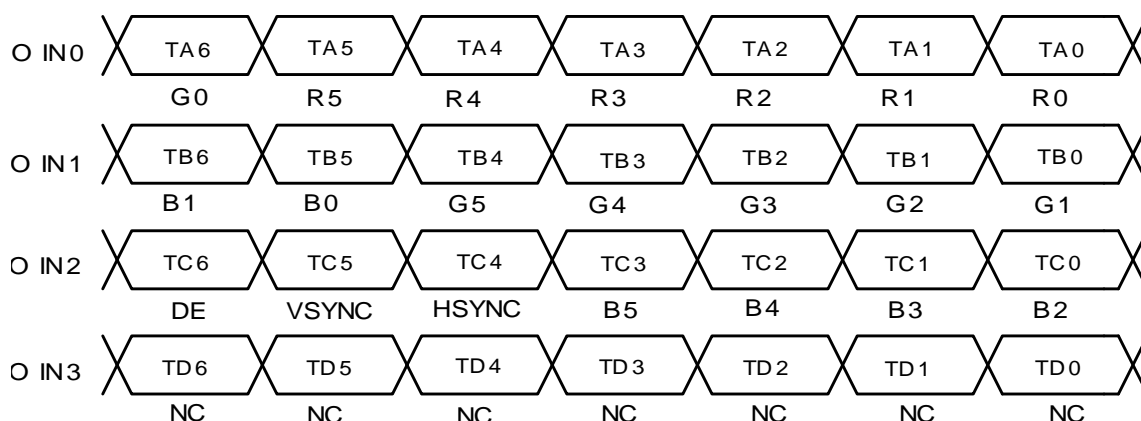
RECOMMENDED TRANSMITTER(THC63LVDM83A,THC63LVDM83A-85) TO LTD141EM5F INTERFACE ASSIGNMENT

Case2: 8bit Transmitter

ODD DATA

Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol	To LTD141EM5F Interface(CN1)	
Symbol		Symbol	Function		Terminal	Symbol
TA0	51	R0	Red Pixels Display Data (LSB)	TA- TA+	No.8 No.9	OIN0- OIN0+
TA1	52	R1	Red Pixels Display Data			
TA2	54	R2	Red Pixels Display Data			
TA3	55	R3	Red Pixels Display Data			
TA4	56	R4	Red Pixels Display Data			
TA5	3	R5	Red Pixels Display Data (MSB)			
TA6	4	G0	Green Pixels Display Data(LSB)			
TB0	6	G1	Green Pixels Display Data	TB- TB+	No.11 No.12	OIN1- OIN1+
TB1	7	G2	Green Pixels Display Data			
TB2	11	G3	Green Pixels Display Data			
TB3	12	G4	Green Pixels Display Data			
TB4	14	G5	Green Pixels Display Data(MSB)			
TB5	15	B0	Blue Pixels Display Data (LSB)			
TB6	19	B1	Blue Pixels Display Data			
TC0	20	B2	Blue Pixels Display Data	TC- TC+	No.14 No.15	OIN2- OIN2+
TC1	22	B3	Blue Pixels Display Data			
TC2	23	B4	Blue Pixels Display Data			
TC3	24	B5	Blue Pixels Display Data (MSB)			
TC4	27	HSYNC	H-SYNC			
TC5	28	VSYNC	V-SYNC			
TC6	30	DE	Compound Synchronization Signal			
TD0	50	NC	Non Connection (open)	TD- TD+	- 	-
TD1	2	NC	Non Connection (open)			
TD2	8	NC	Non Connection (open)			
TD3	10	NC	Non Connection (open)			
TD4	16	NC	Non Connection (open)			
TD5	18	NC	Non Connection (open)			
TD6	25	NC	Non Connection (open)			
CLK IN	31	NCLK	Data Sampling Clock	TCLK- TCLK+	No.17 No.18	OCLK- OCLK+

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

O IN0	TA6	TA5	TA4	TA3	TA2	TA1	TA0
	G0	R5	R4	R3	R2	R1	R0

O IN1	TB6	TB5	TB4	TB3	TB2	TB1	TB0
	B1	B0	G5	G4	G3	G2	G1

O IN2	TC6	TC5	TC4	TC3	TC2	TC1	TC0
	DE	VSYNC	HSYNC	B5	B4	B3	B2

O IN3	TD6	TD5	TD4	TD3	TD2	TD1	TD0
	NC	NC	NC	NC	NC	NC	NC

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EVEN DATA

Input Terminal No.			Input Signal (Graphics controller output signal)	Output Signal Symbol	To LTD141EM5F Interface(CN1)	
Symbol		Symbol	Function		Terminal	Symbol
TA0	51	R0	Red Pixels Display Data (LSB)	TA- TA+	No.20 No.21	EIN0- EIN0+
TA1	52	R1	Red Pixels Display Data			
TA2	54	R2	Red Pixels Display Data			
TA3	55	R3	Red Pixels Display Data			
TA4	56	R4	Red Pixels Display Data			
TA5	3	R5	Red Pixels Display Data (MSB)			
TA6	4	G0	Green Pixels Display Data(LSB)			
TB0	6	G1	Green Pixels Display Data	TB- TB+	No.23 No.24	EIN1- EIN1+
TB1	7	G2	Green Pixels Display Data			
TB2	11	G3	Green Pixels Display Data			
TB3	12	G4	Green Pixels Display Data			
TB4	14	G5	Green Pixels Display Data(MSB)			
TB5	15	B0	Blue Pixels Display Data (LSB)			
TB6	19	B1	Blue Pixels Display Data			
TC0	20	B2	Blue Pixels Display Data	TC- TC+	No.26 No.27	EIN2- EIN2+
TC1	22	B3	Blue Pixels Display Data			
TC2	23	B4	Blue Pixels Display Data			
TC3	24	B5	Blue Pixels Display Data (MSB)			
TC4	27	NC	Non Connection (open)			
TC5	28	NC	Non Connection (open)			
TC6	30	NC	Non Connection (open)			
TD0	50	NC	Non Connection (open)	TD- TD+	-	-
TD1	2	NC	Non Connection (open)			
TD2	8	NC	Non Connection (open)			
TD3	10	NC	Non Connection (open)			
TD4	16	NC	Non Connection (open)			
TD5	18	NC	Non Connection (open)			
TD6	25	NC	Non Connection (open)			
CLK IN	31	NCLK	Data Sampling Clock	TCLK- TCLK+	No.29 No.30	ECLK- ECLK+

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

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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 ↑ ↓ 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 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 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 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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