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Sunlight Readable LCD!

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DURApixel™ by LITEMAX Wide Temp LED Backlight

RoHS·WEEE LITEMAX COMPLIANT

LITEMAX SP0835E

Sunlight readable 8.4” LED B/L LCD

(Preliminary specification 5/15/2008)

All information is subject to change without notice.

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Record of Revision

Version and Date	Page	Old Description	New Description	Remark
May, 15, 2008	-	-	Preliminary specification	

Contents

General Description

Overview

SP0835E is a 8.4” TFT Liquid Crystal Display module with LED backlight unit and 20-pin-and-1ch LVDS interface. Graphics and texts can be displayed on a 800*RGB*600 dots panel with 16 million colors by using LVDS and supplying +3.3V DC supply voltages for TFT-LCD panel driving.

Features

- Excellent brightness (1000 nits)
- Ultra high contrast ratio (600:1)
- SVGA (800 x 600 pixels) resolution
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Wide operating temperature.
- RoHs compliance

Application

- High brightness, multi-applications display
- In case of using the device for applications such as control and safety equipment for transportation (aircraft, trains, automobiles, etc.), rescue and security equipment and various safety related equipment which require higher reliability and safety, take into consideration that appropriate measures such as fail-safe functions and redundant system design should be taken.
- Do net use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment (trunk lines), nuclear power control equipment and medical or other equipment for life support.

General Specificati0ns

Item	Specification	Unit	Note
Active Area	170.4 (H) x 127.8 (V)	mm	(1)
Bezel Opening Area	175.5 (H) x 133 (V)	mm	
Pixel Number	800 x R.G.B. x 600	pixel	-
Pixel Pitch(Sub Pixel)	0.213 (H) x 0.213 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.2 M	color	-
Display Mode	Normally white	-	-
Surface Treatment	Anti-Glare coating (Haze 25%) Hard coating (3H)	-	-

Mechanical Specifications

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	199.0	199.5	200.0	mm	(1)
	Vertical(V)	149.0	149.5	150.0	mm	
	Depth(D)	-	11.6	12.1	mm	-
Weight		350	375	400	g	-

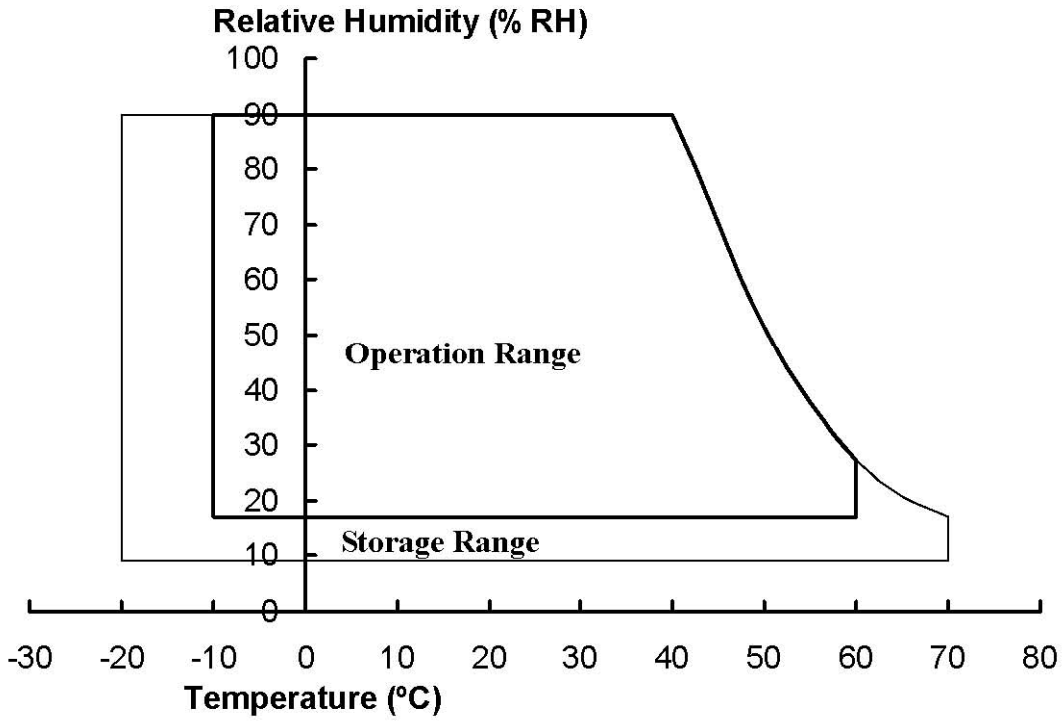
Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Absolute Maximum Ratings

Absolute Ratings Of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	TBD	TBD	ºC	(1)
Operating Ambient Temperature	T_{OP}	TBD	TBD	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	TBD	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	TBD	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.
(a) 90 %RH Max. (Ta ≦ 40 ºC).
(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).
(c) No condensation.
Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 80 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in your product design to prevent the surface temperature of display area from being over 80 ºC. The range of operating temperature may degrade in case of improper thermal management in your product design.
Note (3) 2 ms, half sine wave, 1 time for ± X, ± Y, ± Z.
Note (4) 10 ~ 300 Hz, 10 min, 1 time each X, Y, Z.
Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



Electrical Absolute Ratings

TFT LCD Module

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+0.3	V	(1)
Input Signal Voltage	V_{IN}	0	5.5	V	

Note1: CK, R0~R5, G0~G5, B0~B5 and ENAB

Electrical Characteristics

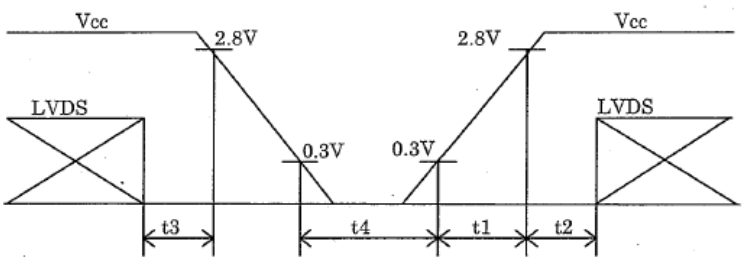
TFT LCD Module

Ta = 25 ± 2 ℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage		Vcc	+3.0	+3.3	+3.6	V	【Note1】
Current dissipation		Icc	—	T.B.D.	T.B.D.	mA	【Note2】
Input voltage ("High" state)		V_{RIH}	Vcc×0.7			V	【Note3】
Input voltage ("Low" state)		V_{RIL}			Vcc×0.3	V	
Permissive input ripple voltage		V_{RF}	—	—	100	mVp-p	
Terminal resistor		R_T	—	100	—	Ω	Differential input
Differential input threshold voltage	High	V_{IH}	—	—	100	mV	
	Low	V_{IL}	–100	—	—	mV	

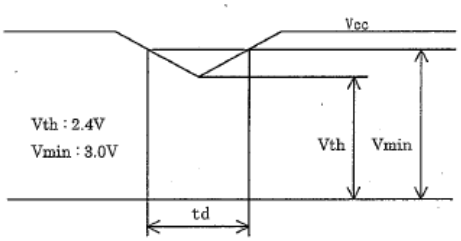
【Note1】
On-off sequences of Vcc and data

0 <t1≤15ms
0 <t2≤50ms
0 <t3≤50ms
1s≤t4



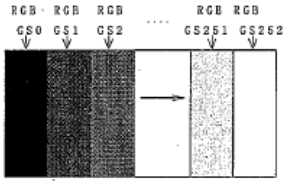
Dip conditions for supply voltage
Vmin,Vth=3.0V,2.4V
1) Vth ≦ Vcc < Vmin
Td≦ 10ms
2) Vcc<Vth

Vcc-dip conditions should also follow the on-off conditions.



【Note2】 Typical current situation : 253-gray-bar pattern
Vcc=+3.3V, fck=65MHz, Ta=25℃
The explanation of each gray scale is described below section 8.

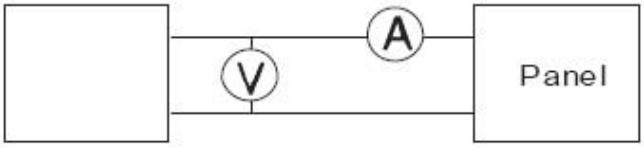
【Note3】 Terminal : REV



Backlight Unit

CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Input Voltage	V_L	-	24.0	-	V	-
LED Current	I_L	-	300	-	mA	-
Power Consumption	P_L	-	7.2	-	W	-



Interface Pin Connection

TFT-LCD Panel Driving

CN1 (Interface signals and +3.3V DC power supply)

Using connectors : 20186-020E-11 (I-PEX)

Corresponding connectors : FI-SE20ME(Japan Aviation Electronics Industry, Ltd.)
FI-SE20S (Japan Aviation Electronics Industry, Ltd.)

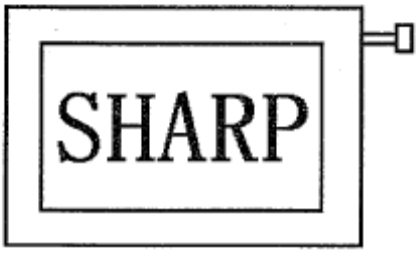
Using LVDS Receiver : Contained in a control IC. [THC63LVDF84A(Thine) compatible]

Corresponding LVDS Transmitter : THC63LVDM83R(Thine) or DSC90C385AMT(NS) or compatible

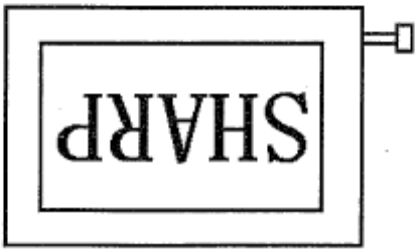
Pin No.	Symbol	Function	Remark
1	Vcc	+3.3V Power supply	
2	Vcc	+3.3V Power supply	
3	GND	Ground	
4	GND	Ground	
5	RxIN0-	LVDS CH0 data signal (-)	LVDS
6	RxIN0+	LVDS CH0 data signal (+)	LVDS
7	GND	Ground	
8	RxIN1-	LVDS CH1 data signal (-)	LVDS
9	RxIN1+	LVDS CH1 data signal (+)	LVDS
10	GND	Ground	
11	RxIN2-	LVDS CH2 data signal (-)	LVDS
12	RxIN2+	LVDS CH2 data signal (+)	LVDS
13	GND	Ground	
14	RxCLKIN-	LVDS CK- data signal (-)	LVDS
15	RxCLKIN+	LVDS CK+ data signal (+)	LVDS
16	GND	Ground	
17	RxIN3-	LVDS CH3 data signal (-)	LVDS
18	RxIN3+	LVDS CH3 data signal (+)	LVDS
19	REV	Reversing terminal	
20	LVDS_SET	SELLVDS.	【Note1】

【Note1】

REV : High



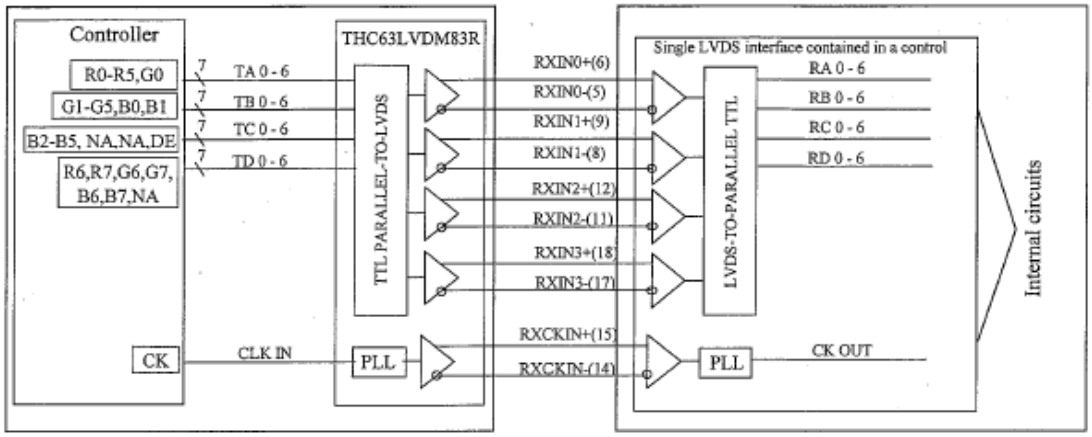
REV:Low



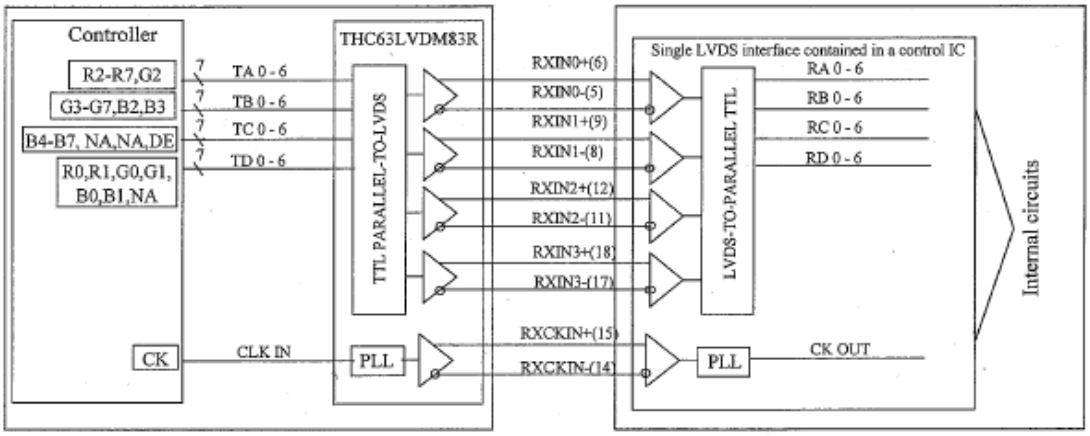
Block Diagram Of Interface

(Computer Side) (TFT-LCD side)

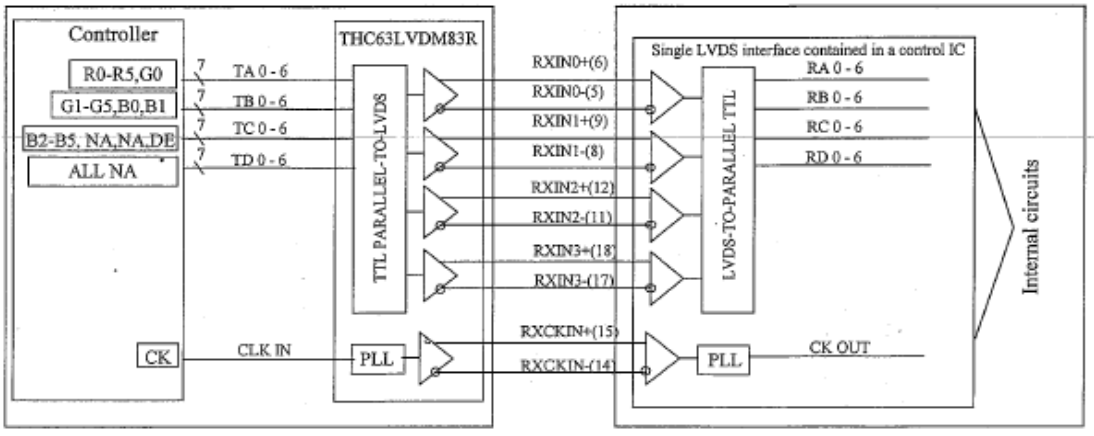
①8Bit Mode
SELLVDS=H (20 pin=3.3V)



②8Bit Mode
SELLVDS=L(GND or OPEN])



③6Bit Mode
SELLVDS=L (GND or OPEN])



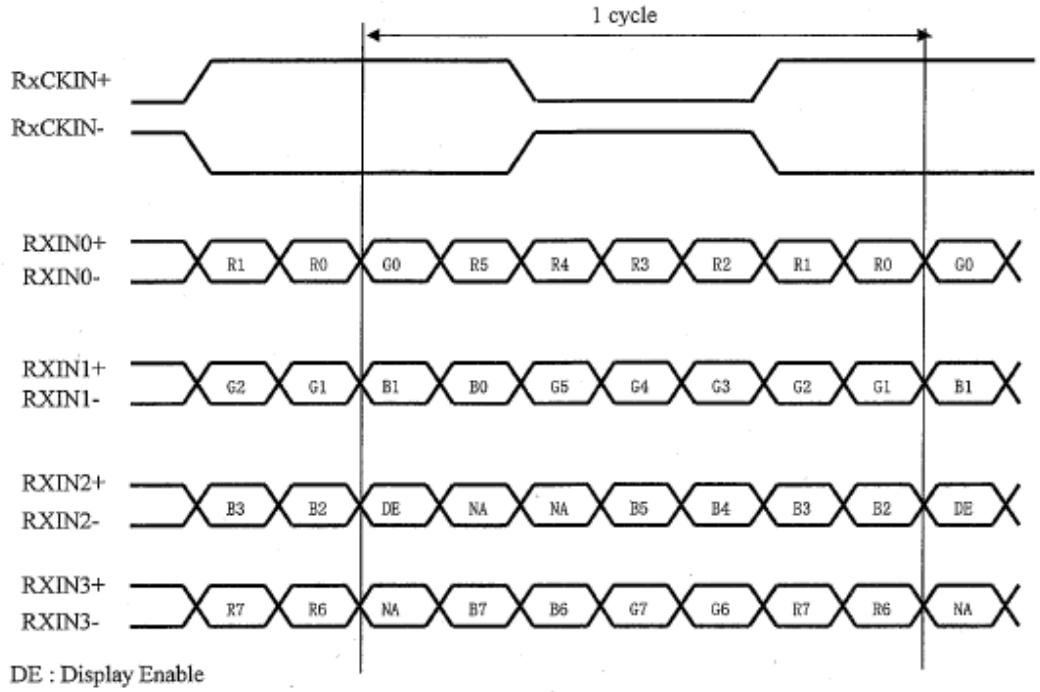
Data Mapping

1) 8 bit input

【Note1】 pin assignment with LVDS_SET pin (Thine:THC63LVDM83R)

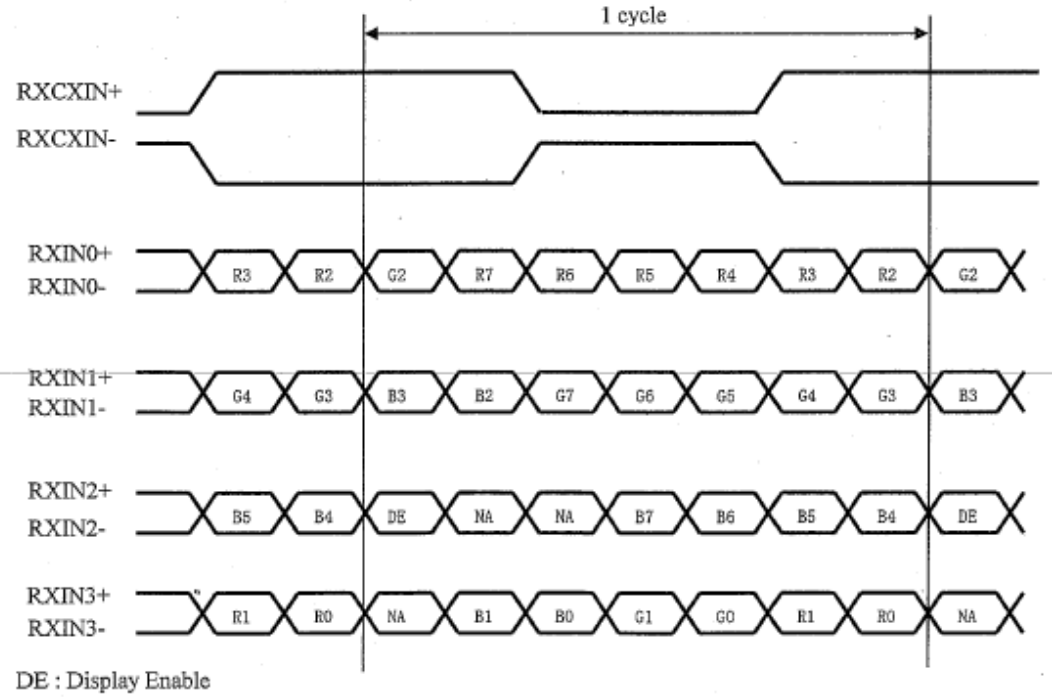
Transmitter		20pin LVDS_SET	
Pin No	Data	=H (3.3V)	=L (GND) or Open
51	TA0	R0 (LSB)	R2
52	TA1	R1	R3
54	TA2	R2	R4
55	TA3	R3	R5
56	TA4	R4	R6
3	TA5	R5	R7 (MSB)
4	TA6	G0 (LSB)	G2
6	TB0	G1	G3
7	TB1	G2	G4
11	TB2	G3	G5
12	TB3	G4	G6
14	TB4	G5	G7 (MSB)
15	TB5	B0 (LSB)	B2
19	TB6	B1	B3
20	TC0	B2	B4
22	TC1	B3	B5
23	TC2	B4	B6
24	TC3	B5	B7 (MSB)
27	TC4	(NA)	(NA)
28	TC5	(NA)	(NA)
30	TC6	DE	DE
50	TD0	R6	R0 (LSB)
2	TD1	R7 (MSB)	R1
8	TD2	G6	G0 (LSB)
10	TD3	G7 (MSB)	G1
16	TD4	B6	B0 (LSB)
18	TD5	B7 (MSB)	B1
25	TD6	(NA)	(NA)

< SELLVDS = H >



DE : Display Enable
NA : Not Available

< SELLVDS = L or Open >

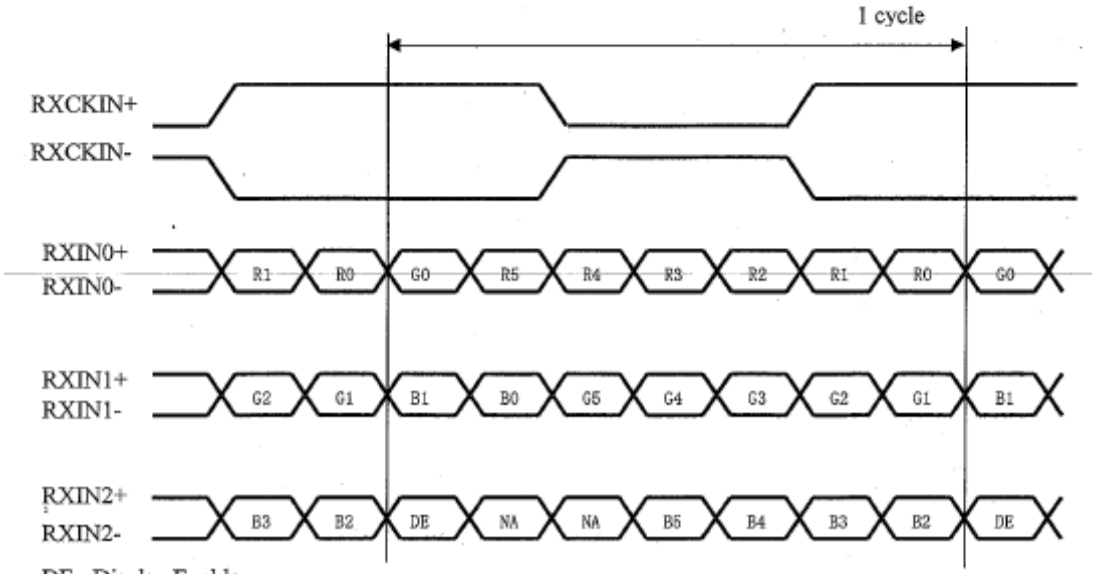


DE : Display Enable
NA : Not Available

2) 6 bit input

【Note1】 pin assignment with LVDS_SET pin (Thine:THC63LVDM83R)

Transmitter		20pin LVDS_SET	
Pin No	Data	=H (3.3V)	=L (GND) or Open
51	TA0	—	R0 (LSB)
52	TA1	—	R1
54	TA2	—	R2
55	TA3	—	R3
56	TA4	—	R4
3	TA5	—	R5 (MSB)
4	TA6	—	G0 (LSB)
6	TB0	—	G1
7	TB1	—	G2
11	TB2	—	G3
12	TB3	—	G4
14	TB4	—	G5 (MSB)
15	TB5	—	B0 (LSB)
19	TB6	—	B1
20	TC0	—	B2
22	TC1	—	B3
23	TC2	—	B4
24	TC3	—	B5 (MSB)
27	TC4	—	(NA)
28	TC5	—	(NA)
30	TC6	—	DE
50	TD0	—	GND
2	TD1	—	GND
8	TD2	—	GND
10	TD3	—	GND
16	TD4	—	GND
18	TD5	—	GND
25	TD6	—	(NA)



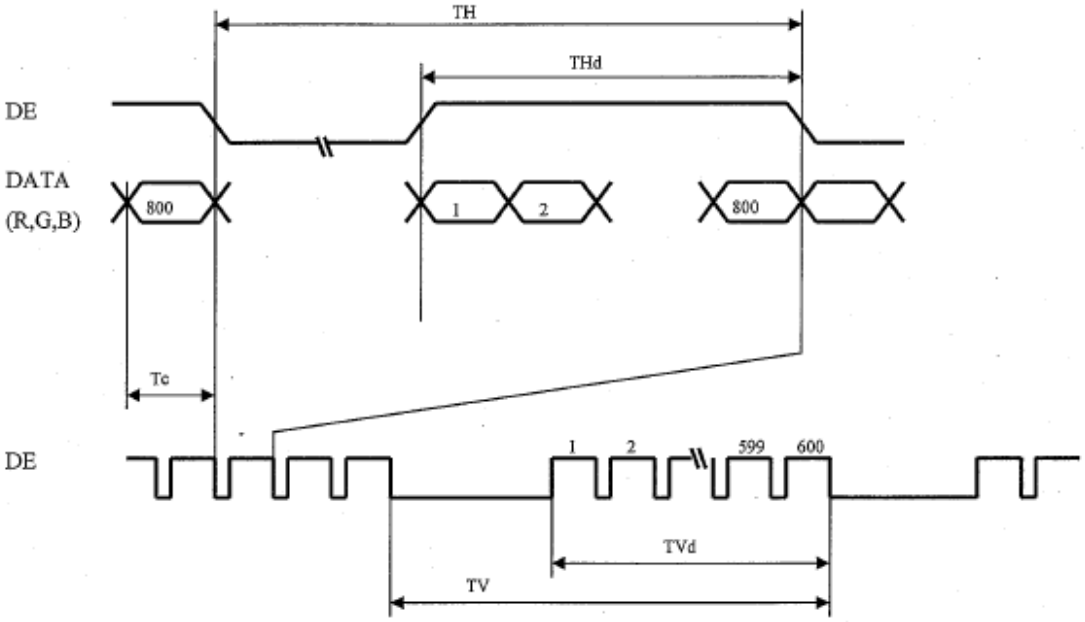
DE : Display Enable
NA : Not Available

Timing characteristics of input signals

Timing characteristics

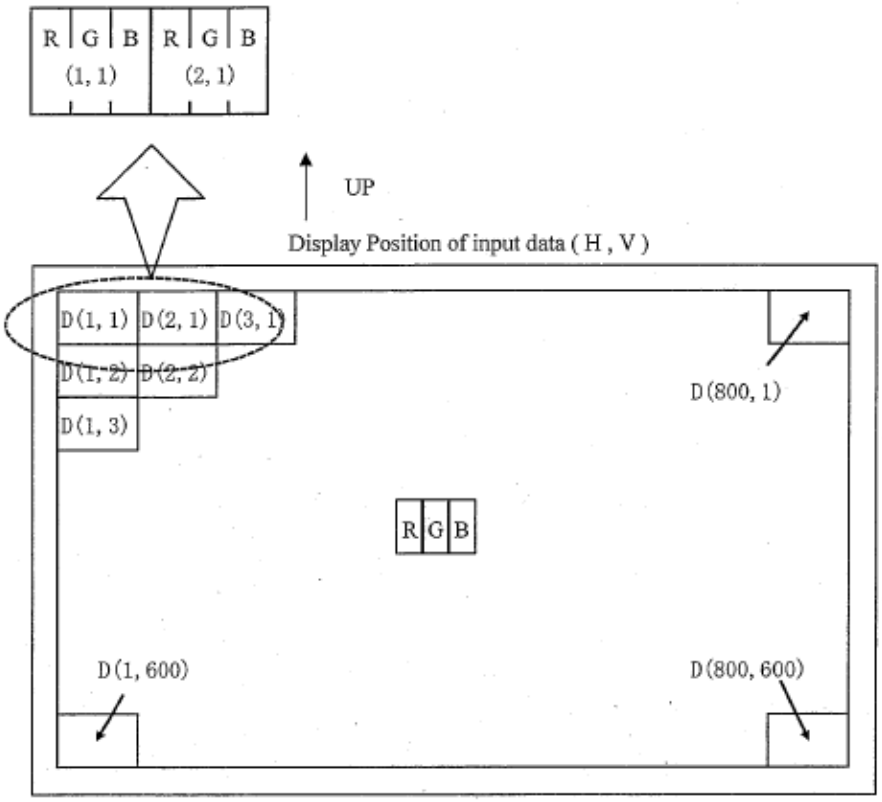
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Frequency	1/Tc	(35)	40	(42)	MHz	
Horizontal period	TH	(832)	(1056)	(1395)	clock	
		(20.8)	(26.4)	(39.9)	μs	
Horizontal period (High)	THd	800	800	800	clock	
Vertical period	TV	(628)	(666)	(798)	line	【Note】
		-	(17.6)	-	ms	
Vertical period (High)	TVd	600	600	600	line	

【Note1】 In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.



Input Data Signals and Display Position on the screen

Graphics and texts can be displayed on a panel with 16M colors by supplying 24 bit data signal (8bit/color [253 gray scales] × 3).



Interface Timing

Input Signals, Basic Display Colors and Gray Scale of Each Color

	Colors & Gray scale	Gray Scale	Data signal																					
			R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic Color	Black	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1
	Green	–	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	–	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1
	Red	–	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	–	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1
	Yellow	–	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	–	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS250	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS251	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS252	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS250	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS251	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS252	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1
	⇩	GS251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1
	Blue	GS252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1

0 : Low level voltage, 1 : High level voltage. X :Don't care.

Each basic color can be displayed in 253 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16-million-color display can be achieved on the screen.

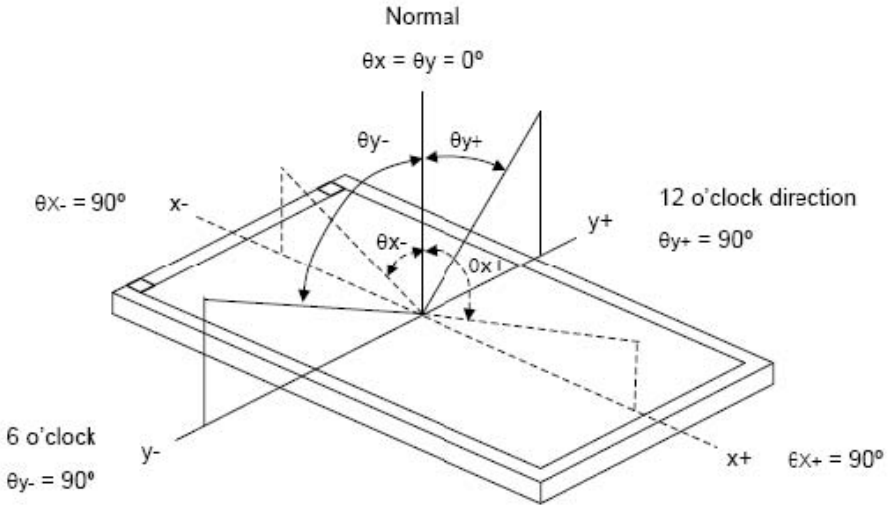
OPTICAL CHARACTERISTICS

OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle	-	600	-	-	(2), (5)
Response Time		T_R		-	10	-	ms	(3)
		T_F		-	20	-	ms	
Luminance of White		L_{AVE}		800	1000	-	cd/m2	(4), (5)
White Variation		δ W		-	-	1.25	-	(5), (6)
Color Chromaticity	Red	Rx		Typ. 0.03	0.55	Typ.+ 0.03	-	(1), (5)
		Ry			0.33		-	
	Green	Gx			0.30		-	
		Gy			0.59		-	
	Blue	Bx			0.14		-	
		By			0.13		-	
	White	Wx			0.29		-	
		Wy			0.34		-	
Viewing Angle	Horizontal	θ_x+	CR≥10	50	60	-	Deg.	(1), (5)
		θ_x-		50	60	-		
	Vertical	θ_Y+		45	55	-		
		θ_Y-		55	65	-		

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

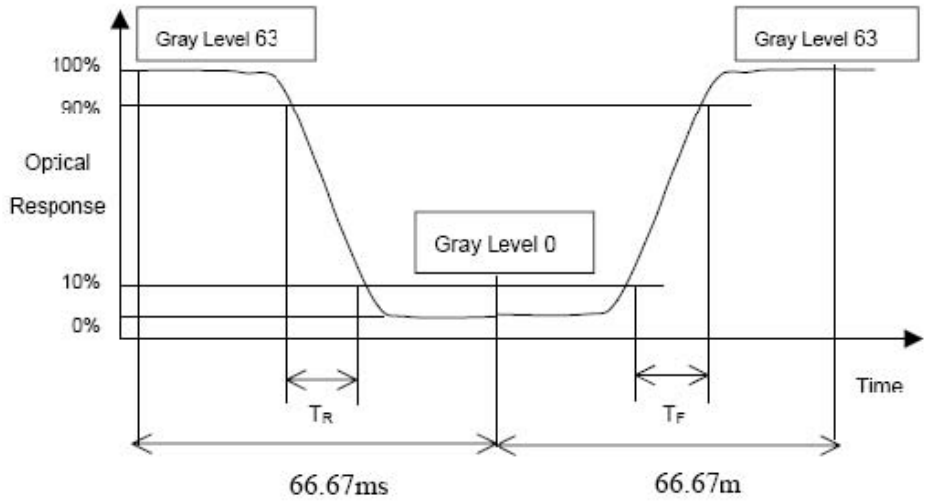
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (TR, TF):



Note (4) Definition of Average Luminance of White (L_{AVE}):

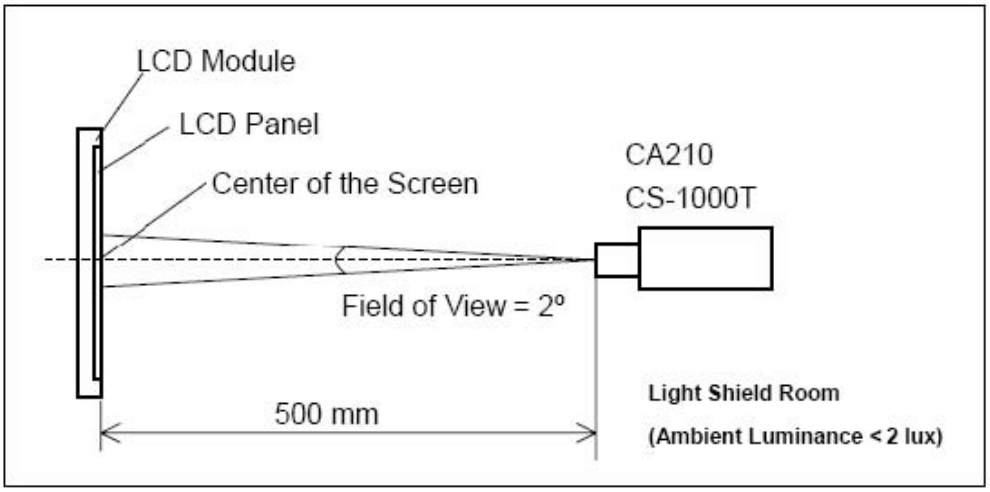
Measure the luminance of gray level 63 at 5 points

L_{AVE} = [L (1)+ L (2)+ L(3)+L (4)+ L(5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

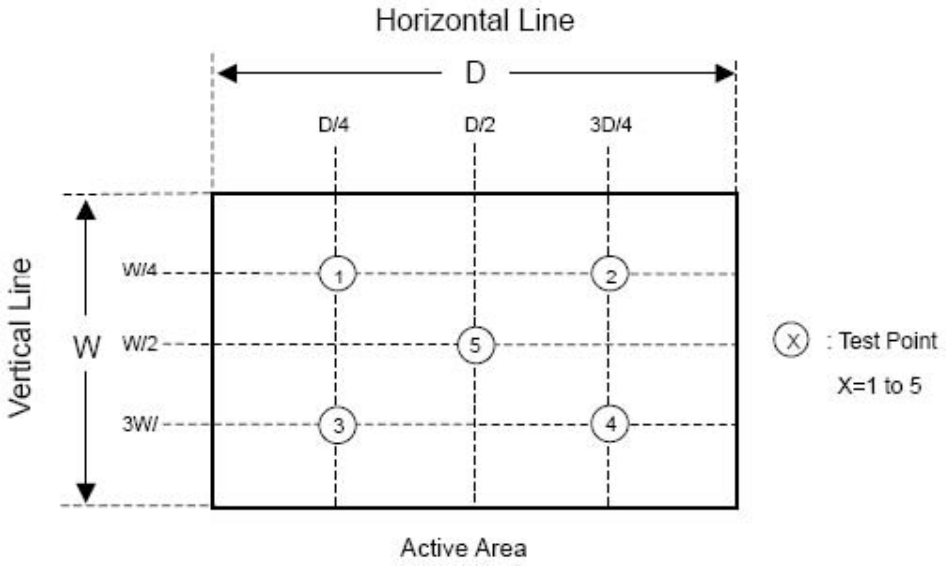
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



PRECAUTIONS

ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.
(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
(5) Do not plug in or pull out the I/F connector while the module is in operation.
(6) Do not disassemble the module.
(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.
(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

SAFETY PRECAUTIONS

Sharp Edge Requirements
There will be no sharp edges or comers on the display assembly that could cause injury.

Toxicity
There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO Toxicologist.

Flammability
All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

Capacitors
If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

MECHANICAL CHARACTERISTIC