シャープ株式会社
通信システム事業本部
ビジネスソリューション事業統轄
ビジネスソリューション NB 事業推進センター
A1274プロジェクトチーム Bグループ 御中

仕様書番号	LD-25808A
作成日付	2013年11月06日

《新規・変更》

納入仕様書

品名　TFT-LCDモジュール
型名　LQ101R1JX02
シャープ部品コード　RUITKB063AFZZ

【受領印欄】　2013年 12月 10日
この書類を受領しました。

シャープ株式会社 ビジネスソリューション事業統轄
ビジネスソリューションNB事業推進センター
A1274プロジェクトチーム Bグループ

チーフ	副参事	係長	担当	担当
原	原			

上記対象商品に、オゾン層破壊物質は使用しておりません。
※この仕様書は、付属書等を含めて全30項で構成されております。
当仕様書について異議があれば発注時点までにお申し出ください。

DPデバイス(事本) 第2事業部 開発部 '13.12.05 発行 シャープ株式会社

シャープ株式会社
ディスプレイデバイス事業本部
ディスプレイデバイス第2事業部　第2開発部

部門長	副参事	係　長/主事	担　当
伊藤	松浦	宮下	松田

RECORDS OF REVISION

LQ101R1JX02

SPEC No.	DATE	REVISED No.	PAGE	SUMMARY	NOTE
LD-25808A	Nov. 06. 2013	–	–		1^{st} Issue

NOTICE

The application circuit examples in these specification sheets are provided to explain the representative applications of SHARP's devices and are not intended to guarantee any circuit design or permit any industrial property right or other rights to be executed. SHARP takes no responsibility for any problems related to any industrial property right or a third party resulting from the use of SHARP's devices, except for those resulting directly from device manufacturing processes.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that occur in equipment using any of SHARP's devices, shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP's device.

SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structures and other contents described herein at any time without notice in order to improve design or reliability. Contact SHARP in order to obtain the latest specification sheets before using any SHARP's device. Manufacturing locations are also subject to change without notice.

Observe the following points when using any device in these specification sheets. SHARP takes no responsibility for damage caused by improper use of the devices.

The devices in these specification sheets are designed for general electronic equipment use.

The appropriate design measures should be taken to ensure reliability and safety when SHARP's devices are used for equipment such as:

- Transportation control and safety equipment(i.e.,aircraft, trains, automobiles, etc.)
- Traffic signals - Gas leakage sensor breakers - Alarm equipment - Various safety devices etc.

SHARP's devices shall not be used for equipment that requires extremely high level of reliability, such as:

- Military and space applications - Nuclear power control equipment - Medical equipment for life support

Contact a SHARP representative, in advance, when intending to use SHARP’s devices for any “specific” applications other than those recommended by SHARP.

Contact and consult with a SHARP representative if there are any questions about the contents of these specification sheets.

Any problems arising out of, or in connection with this technical literature herein shall be settled each time upon consultation to improve between both parties with good faith. SHARP reserves the right to make changes in the specifications and other contents described herein with notice to get an approval in order to improve quality or reliability.

Table of contents

1. Application

This technical literature applies to a color TFT-LCD module, LQ101R1JX02.

2. Overview

This technical literature applies to a color TFT-LCD module, LQ101R1JX02.This module is a color active matrix LCD module incorporating Oxide TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, a control circuit and power supply circuit, and a backlight unit. Graphics and texts can be displayed on a 2560×3×1600 dots panel(300ppi) with (16,777,216) colors by using eDP(Embedded Display Port) Ver.1.3 interface, supplying +3.3V DC supply voltage for TFT-LCD panel driving and supplying DC supply voltage for LED Backlight.. (Backlight-driving DC/DC converter is not built in this module.)

3. Features

- Wide view angle display
- 24bit (RGB 8bit) True Color display (16,777,216 colors)
- Low power consumption for the whole system: it is achieved by adopting high transparent panel, CABC function and PSR function.
- High picture quality: greater color rendering properties is achieved by Color Enhancement Function.
- Backlight-driving LED controller is not built in this Module.
- eDP Transfer rate Specification : 2.7Gbps / lane×4

4. Mechanical Specifications

Parameter	Specifications	Unit
Display size	25.6 (10.07") Diagonal	cm
Active area	216.96 (H)×135.6 (V)	mm
Pixel format	2560 (H)×1600 (V) (1 pixel = R+G+B dots)	pixel
Pixel pitch	0.08475 (H)×0.08475 (V)	mm
Pixel configuration	R,G,B vertical stripe	-
Display mode	Normally black	
Surface treatment	Clear hard coating	

Outline dimensions

Parameter		Min.	Typ.	Max.	Unit	Remark
Unit outline dimensions [Note 4-1]	Width	227.90	228.20	228.50	mm	
	Height	148.30	148.60	148.90	mm	
	Depth	1.775	2.075	2.375	mm	
		-	-	4.295	mm	Components top
Mass		-	125	138	g	

[Note 4-1] Outline dimensions is shown in Fig.19-1

5. Input Terminals

5-1. Symbol

CN1 (eDP signals, +3.3V DC power supply, and B/L power supply)

・P : Power , I : Input , O : Output

Pin No.	Symbol	I/O	Function	Remark
1	NC	-	-	[Note 5-1-1]
2	H_GND	P	High Speed GND	
3	Lane3_N	I	Complement Signal Link	
4	Lane3_P	I	True Signal Link	
5	H_GND	P	High Speed GND	
6	Lane2_N	I	Complement Signal Link	
7	Lane2_P	I	True Signal Link	
8	H_GND	P	High Speed GND	
9	Lane1_N	I	Complement Signal Link	
10	Lane1_P	I	True Signal Link	
11	H_GND	P	High Speed GND	
12	Lane0_N	I	Complement Signal Link	
13	Lane0_P	I	True Signal Link	
14	H_GND	I	High Speed GND	
15	AUX_CH_P	I	True Signal Auxiliary Channel	
16	AUX_CH_N	I	Complement Signal Auxiliary Channel	
17	H_GND	P	High Speed GND	
18	NC	-	-	[Note 5-1-1]
19	NC	-	-	[Note 5-1-1]
20	VDD	P	LCD logic and driver power	
21	VDD	P	LCD logic and driver power	
22	VDD	P	LCD logic and driver power	
23	VDD	P	LCD logic and driver power	
24	VDD	P	LCD logic and driver power	
25	NC	-	-	[Note 5-1-1]
26	LCD_GND	P	LCD logic and driver GND	
27	LCD_GND	P	LCD logic and driver GND	
28	LCD_GND	P	LCD logic and driver GND	
29	LCD_GND	P	LCD logic and driver GND	
30	LCD_GND	P	LCD logic and driver GND	

Pin No.	Symbol	I/O	Function	Remark
31	HPD	O	HPD signal pin	
32	NC	-	-	[Note 5-1-1]
33	PWM_OUT	O	PWM_OUT	[Note 5-1-2]
34	PWM_IN	I	PWM_IN	[Note 5-1-2]
35	NC	-	-	[Note 5-1-1]
36	NC	-	-	[Note 5-1-1]
37	NC	-	-	[Note 5-1-1]
38	VBL2	P	LED Anode	
39	VBL2	P	LED Anode	
40	NC	-	-	[Note 5-1-1]
41	LED_C1	P	LED Cathode 1	
42	LED_C2	P	LED Cathode 2	
43	LED_C3	P	LED Cathode 3	
44	LED_C4	P	LED Cathode 4	
45	LED_C5	P	LED Cathode 5	
46	LED_C6	P	LED Cathode 6	
47	NC	-	-	[Note 5-1-1]
48	NC	-	-	[Note 5-1-1]
49	NC	-	-	[Note 5-1-1]
50	NC	-	-	[Note 5-1-1]

CN:20455-050E-02(I-PEX)

[Note 5-1-1] Don’t input any signals or any powers into a NC pin. Keep the NC pin open.

[Note 5-1-2] If you don’t use CABC function, it is not necessary to connect to this pin.

5-2. eDP Interface

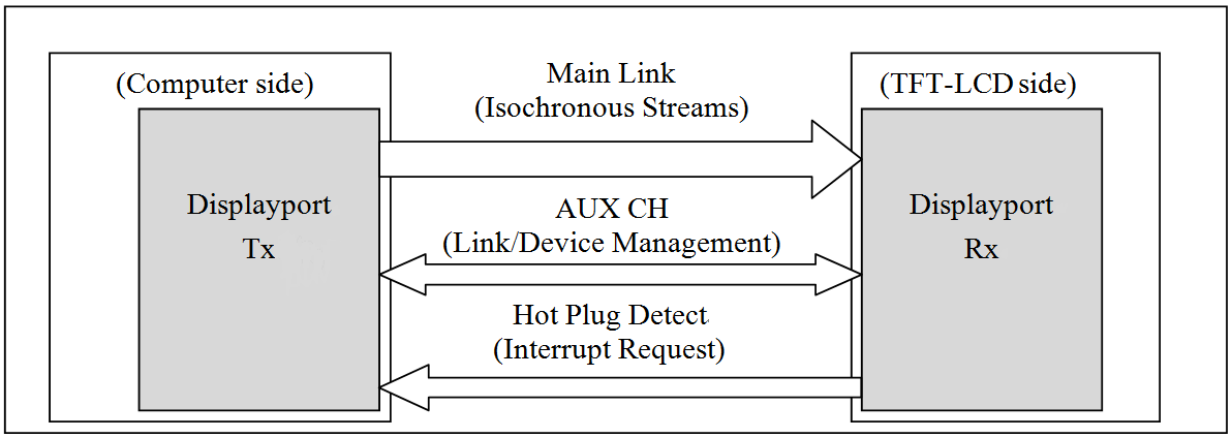


Fig.5-2-1 DP architecture

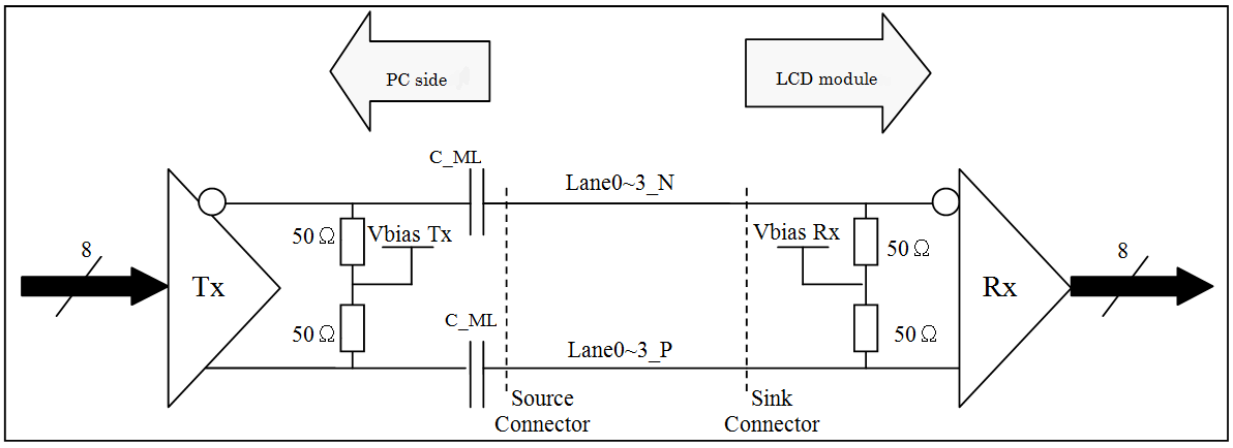


Fig.5-2-2 Main Link differential pair

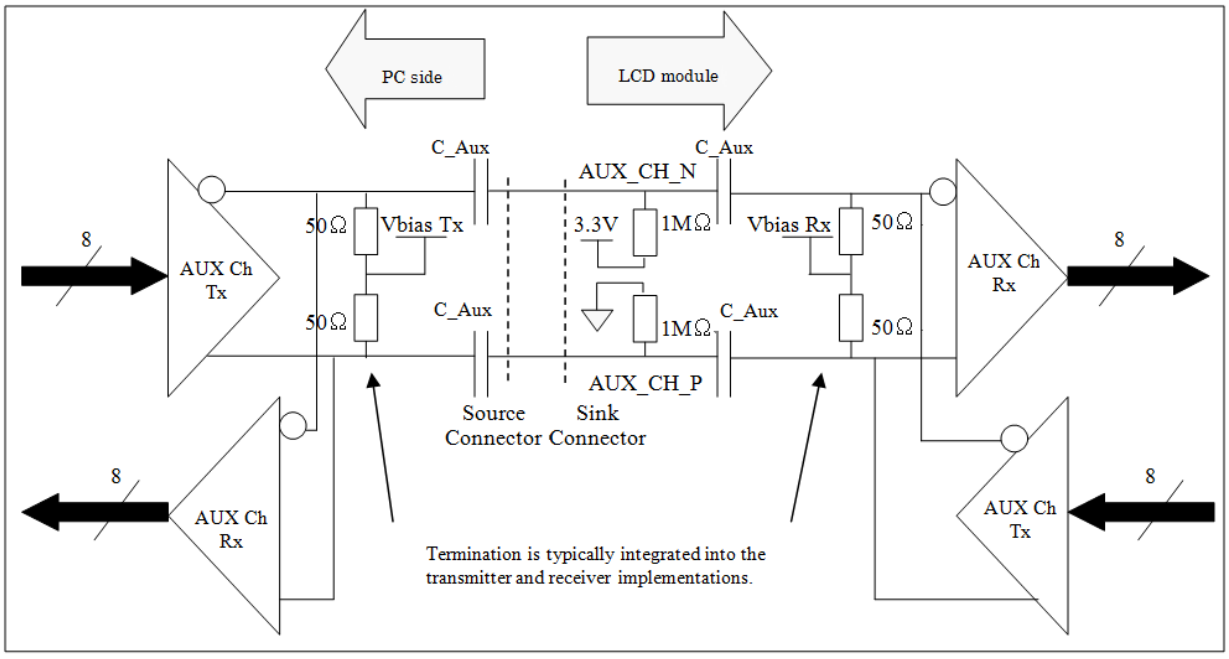


Fig.5-2-3 AUX Link differential pair

5-3. eDP 4 lane 8 bit input data mapping

Lane0	Lane1	Lane2	Lane3
R0-7:0	R1-7:0	R2-7:0	R3-7:0
G0-7:0	G1-7:0	G2-7:0	G3-7:0
B0-7:0	B1-7:0	B2-7:0	B3-7:0
R4-7:0	R5-7:0	R6-7:0	R7-7:0
G4-7:0	G5-7:0	G6-7:0	G7-7:0
B4-7:0	B5-7:0	B6-7:0	B7-7:0
R8-7:0	R9-7:0	R10-7:0	R11-7:0
G8-7:0	G9-7:0	G10-7:0	G11-7:0
B8-7:0	B9-7:0	B10-7:0	B11-7:0

6. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings		Unit	Remark
			Min.	Max.		
+3.3V supply voltage	VDD	Ta=25 deg.	-0.3	+4.0	V	
Input voltage(eDP)	VI	Ta=25 deg.	-0.3	+1.8	V	[Note 6-1]
Input voltage(BL)	PWM_IN	Ta=25 deg.	-0.3	+4.0	V	[Note 6-2]
LED forward current	ILED	Ta=25 deg.	-	30	mA	[Note 6-3]
Operating temperature(ambient)	Topa	-	0	+50	degree	[Note 6-4]
Storage temperature (ambient)	Tstg	-	-20	+70	degree	

[Note 6-1] eDP signals

[Note 6-2] Back light control signals (PWM_IN)

[Note 6-3] Current value for one channel (The LED backlight is composed of 6 cannnels)

[Note 6-4] Humidity：90%RH Max. at Ta≦+40 degree.

Maximum wet-bulb temperature at +39 degree or less at Ta>+40 degree.

No condensation.

7. Electrical Characteristics

7-1. TFT-LCD panel driving

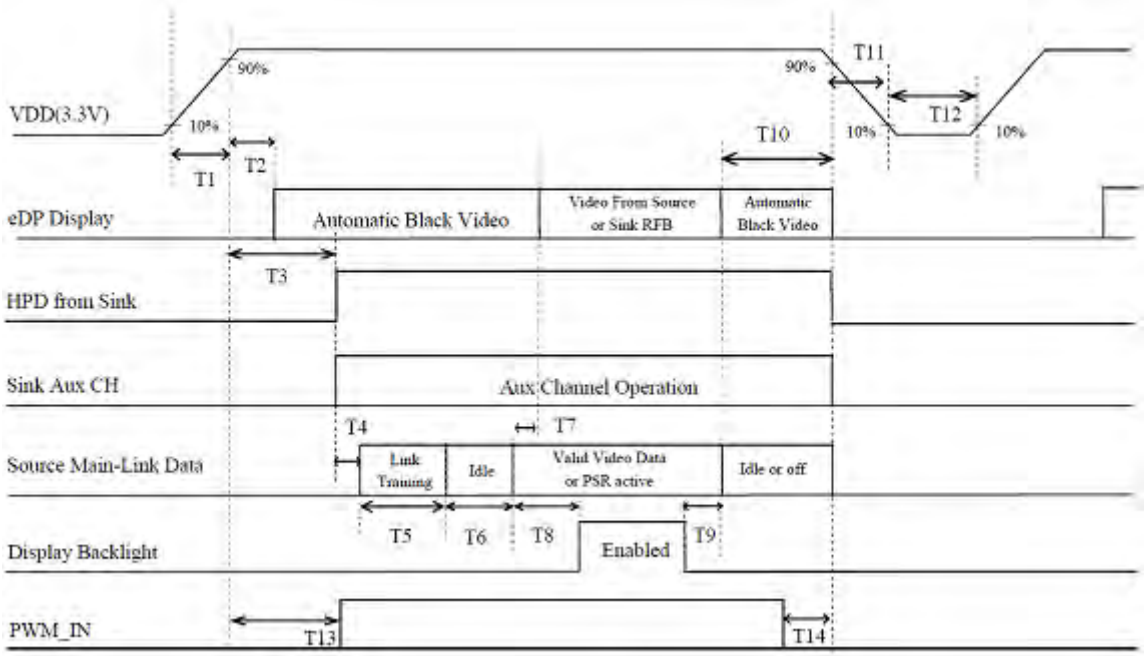
(Ta=25 degree)

DC Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Unit	Remark
Supply voltage	VDD	3.0	3.3	3.6	V	[Note 7-1-1]
Current dissipation	IDD	-	306	540	mA	[Note 7-1-2]
Permissive input ripple voltage	V_{RP}	-	-	100	mV_{P-P}	VDD=+3.3V

eDP AUX Channel Characteristics						
Parameter	Symbol	Min	Typ	Max	Unit	Remark
Unit Interval for AUX channel	UI_{AUX}	0.4	0.5	0.6	μs	
peak-to-peak voltage at TP1	$V_{AUX-DIFF-pp}$	0.32	-	1.36	V	
AUX DC Common Mode Voltage	$V_{AUX-DC-CM}$	-	0.9	-	V	VDD=+3.3V
AUX Short Circuit Current Limit	I_{AUX_SHORT}	-	-	90	mA	
AUX CH termination DC resistance	R_{AUX-_TERM}	-	100	-	Ω	
AUX AC Coupling Capacitor	C_{AUX}	75	-	200	nF	
Number of pre-charge pulses	Pre-charge pulses	10	-	16	-	

eDP Main Link Receiver Characteristics						
Parameter	Symbol	Min	Typ	Max	Unit	Remark
Link clock down spreading	Down_Spread_Amplitude	0	-	0.5	%	
Differential Peak-to-peak Input Voltage at RX package pins	VRX-DIFFp-p	90	-	1200	mV	
Differential Return Loss at 1.35 GHz at RX package pins	RLRX-DIFF	9	-	-	dB	
Differential termination resistance	VRX-TERM	-	100	-	Ω	
RX Short Circuit Current Limit	IRX-SHORT	-	-	50	mA	
Lane Intra-pair Skew at RX package pins	LRX-SKEW-INTRA-PAIR-High-Bit-Rate	-	-	60	ps	

[Note 7-1-1] ON-OFF conditions for supply voltage



[Note] Do not keep the interface signal high-impedance or unusual signal when power is on.

Symbol	Min	Max	Unit	Note
T1	0.5	10	ms	
T2	0	200	ms	
T3	0	100	ms	
T4	-	-	ms	
T5	-	-	ms	
T6	-	-	ms	
T7	0	50	ms	
T8	-	-	ms	
T9	-	-	ms	
T10	0	500	ms	
T11	10	50	ms	[Note1]
T12	500	-	ms	
T13	100		ms	
T14	0	-	ms	

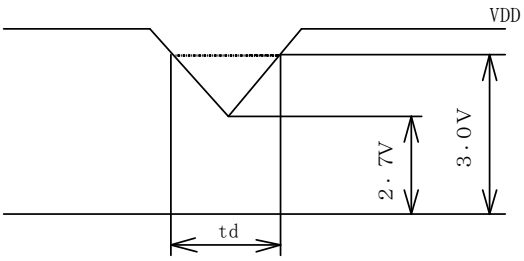
[Note1] As for the power off sequence for VDD (T11), Be sure to keep above mentioned timing.

If the VDD power off sequence timing is other than shown above, LCD may cause permanent damage.

(*)As for the power sequence for backlight, it is recommended to apply above mentioned input timing.

If the backlight is litght on and off at a timing other than shown above, displaying image may get disturbed.

VDD-dip conditions



1) 2.7 V≦VDD＜3.0 V

td≦10 ms

Under above condition, the display image should return to an appropriate figure after VDD voltage recovers.

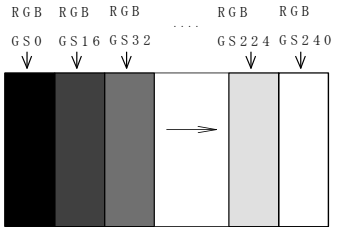
2) VDD＜2.7 V

VDD-dip conditions should also follow the ON-OFF conditions for supply voltage

[Note 7-12]

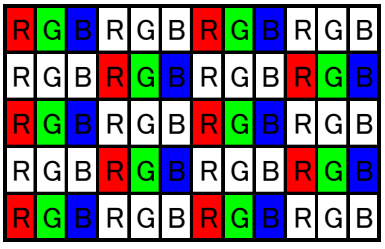
Typical current condition: 16-gray-bar pattern.

: VDD=+3.3V



Maximum current condition

: VDD=+3.0V



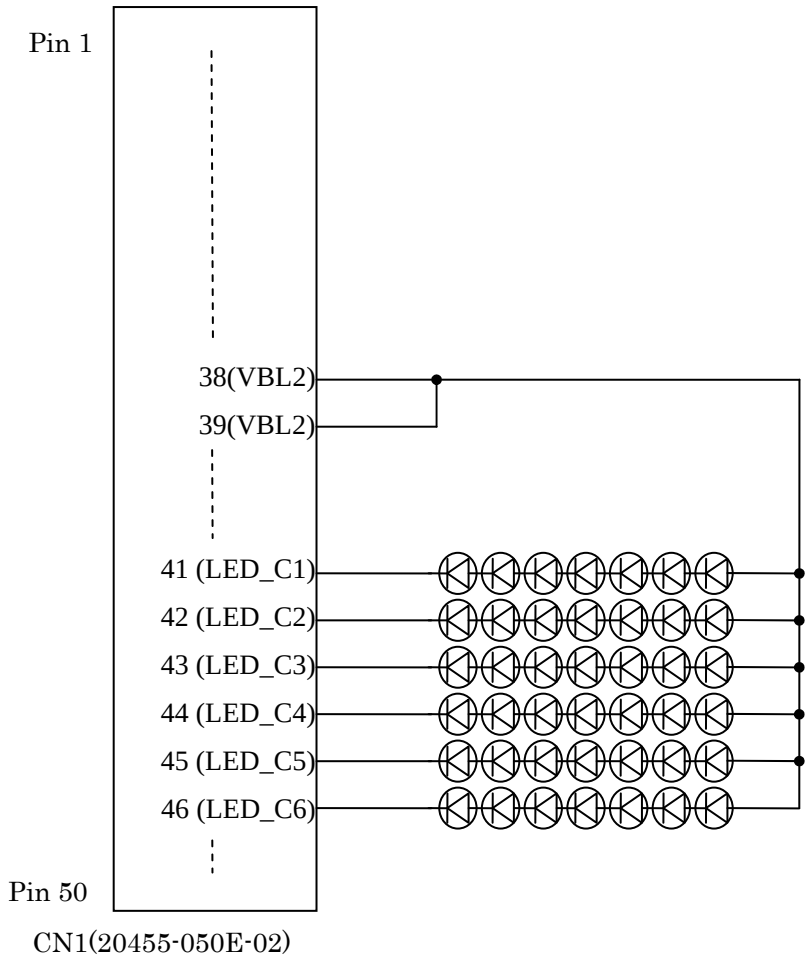
7-2. BL driving

DC Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED forward voltage	V_F	18.2	21.0	23.1	V	[Note 7-2-1]
LED Current (VBL pin)	I_F	-	20.0	21.0	mA	[Note 7-2-2]

[Note 7-2-1] Per line of 7 LEDs connected in cannels.

[Note 7-2-2] Per line 6 parallels.

7-3. LED-Circuit



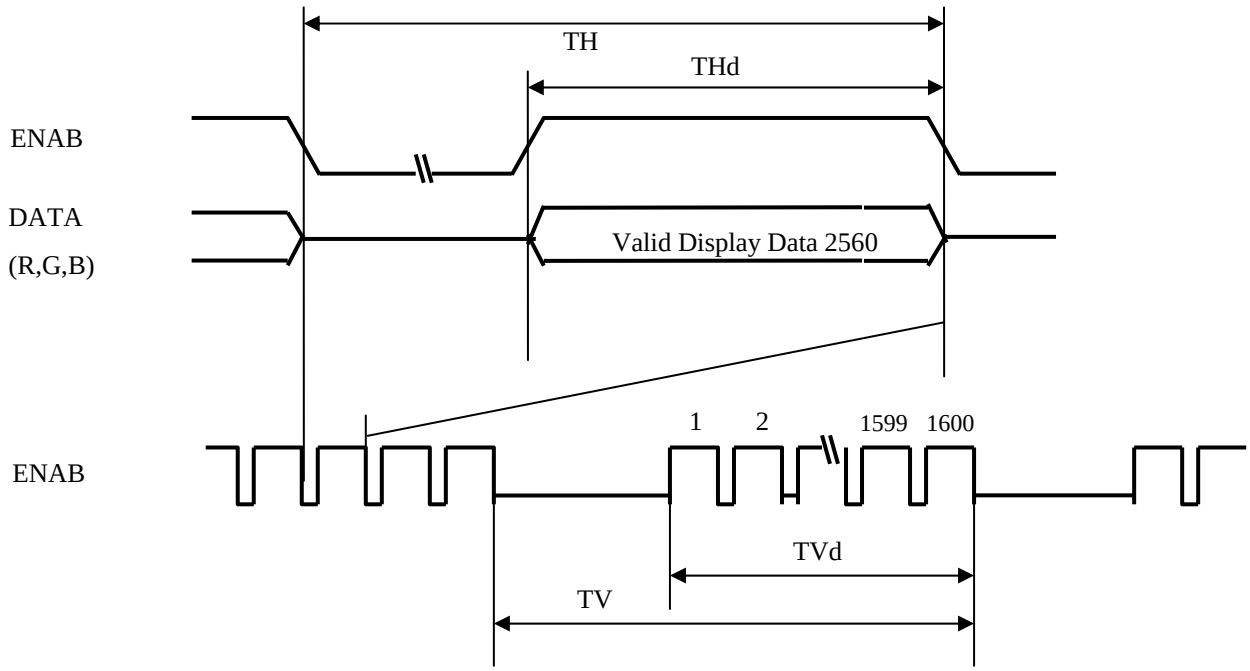
8. Timing Characteristics of Input Signals

8-1. Timing characteristics

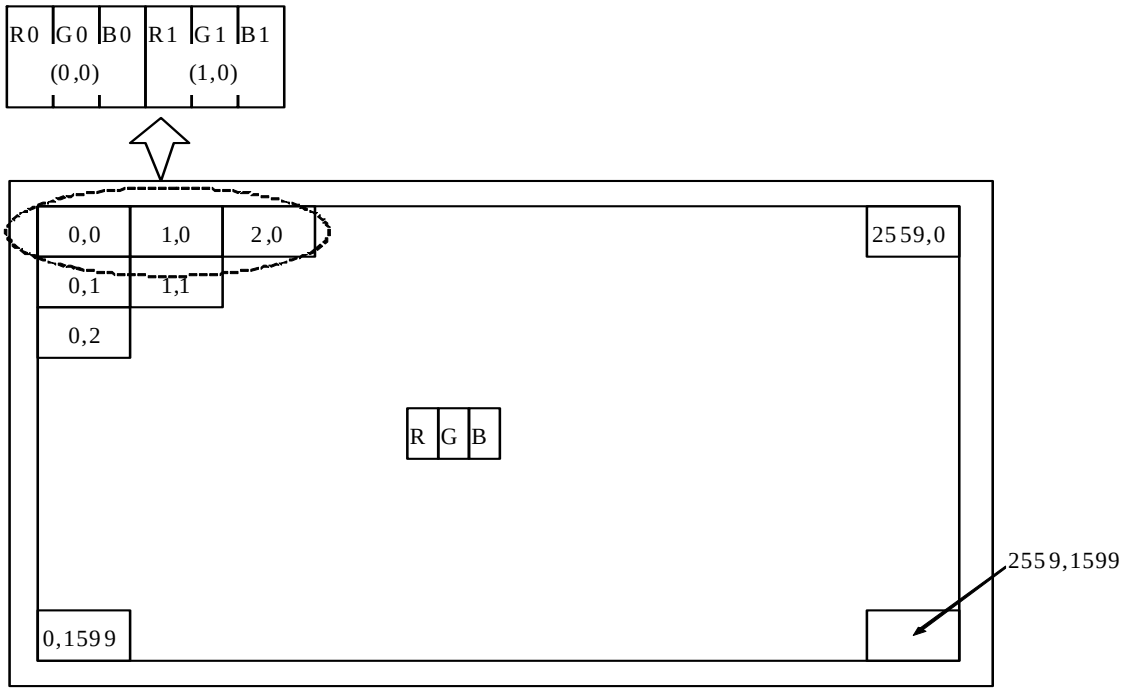
VDD=+3.0V～+3.6V, Ta＝0～+50 degree

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	-	268.5	-	MHz	[Note 8-1-1]
Data enable Signal	Horizontal period	TH	-	2720	-	clock	
				10.130		μs	
	Horizontal period (High)	THd	-	2560	-	clock	
	Vertical period	TV	-	1646	-	Line	
			-	16.675	-	ms	
	Vertical period (High)	TVd	-	1600	-	line	

[Note 8-1-1] In case of using the long vertical period, the deterioration of display quality, flicker, etc, may occur.



8-2. Input data signals and display position on the screen



Display position of input data(H・V)

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

	Colors & Gray Scale	Gray Scale	Date 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
			LSB							MSB	LSB							MSB	LSB							MSB
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	1	1	1	1	1	1	1	1
	Green	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	–	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	–	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	–	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	–	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	1	1	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	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	0	0	0	0	0	0	0	0	1	1	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	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	⇩	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0 : Low level voltage, 1 : High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals.

According to the combination of 24 bit data signals, the 16.7M color display can be achieved on the screen.

10. EDID Specifications

10-1. EDID data structure

This is the EDID(Extended Display Identification Data) data formats to support displays as defined in the VESA Plug & Display

Byte (decimal)	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	00	Header	00	00000000
1	01	Header	FF	11111111
2	02	Header	FF	11111111
3	03	Header	FF	11111111
4	04	Header	FF	11111111
5	05	Header	FF	11111111
6	06	Header	FF	11111111
7	07	Header	00	00000000
8	08	EISA manufacture code = SHP	4D	01001101
9	09	EISA manufacture code (Compressed ASCII)	10	00010000
10	0A	Product code (LQ101R1JX02 : 5115)	FB	11111011
11	0B	Product code (hex,LSB first)	13	00010011
12	0C	LCD module Serial No (fixed “0”)	00	00000000
13	0D	LCD module Serial No (fixed “0”)	00	00000000
14	0E	LCD module Serial No (fixed “0”)	00	00000000
15	0F	LCD module Serial No (fixed “0”)	00	00000000
16	10	Week of manufacture	05	00000101
17	11	Year of manufacture - 1990 (ex 2000 – 1990 = 10)	18	00011000
18	12	EDID structure version # = 1	01	00000001
19	13	EDID revision # = 4	04	00000100
20	14	Video i/p definition = Digital 8bit DP support	A5	10100101
21	15	Max H image size(cm) = 22cm	16	00010110
22	16	Max V image size(cm) = 14cm	0E	00001110
23	17	Display gamma (2.2×100) - 100 = 120	78	01111000
24	18	Feature support(stanby,suspend,RGB color/Prefer Time)	02	00000010
25	19	Red/Green Low bit(RxRy/GxGy)	A0	10100000
26	1A	Blue/White Low bit(BxBy/WxWy)	D0	11010000
27	1B	Red X(Rx) (written value 0.608)	9B	10011011
28	1C	Red Y(Ry) (written value 0.346)	58	01011000
29	1D	Green X(Gx) (written value 0.329)	54	01010100
30	1E	Green Y(Gy) (written value 0.567)	91	10010001

Byte (decimal)	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
31	1F	Blue X(Bx) (written value 0.152)	26	00100110
32	20	Blue Y(By) (written value 0.130)	21	00100001
33	21	White X(Wx) (written value 0.313)	50	01010000
34	22	White Y(Wy) (written value 0.329)	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Established timings 3(Manufacture's reserved timing)	00	00000000
38	26	Standard timing ID1	01	00000001
39	27	Standard timing ID1	01	00000001
40	28	Standard timing ID2	01	00000001
41	29	Standard timing ID2	01	00000001
42	2A	Standard timing ID3	01	00000001
43	2B	Standard timing ID3	01	00000001
44	2C	Standard timing ID4	01	00000001
45	2D	Standard timing ID4	01	00000001
46	2E	Standard timing ID5	01	00000001
47	2F	Standard timing ID5	01	00000001
48	30	Standard timing ID6	01	00000001
49	31	Standard timing ID6	01	00000001
50	32	Standard timing ID7	01	00000001
51	33	Standard timing ID7	01	00000001
52	34	Standard timing ID8	01	00000001
53	35	Standard timing ID8	01	00000001
54	36	Detailed timing descriptor#1 fck/10000 (=268.5MHz/10000=26850=68E2h)	E2	11100010
55	37	#1 fck	68	01101000
56	38	#1 Horizontal active 2560=A00h 00h	00	00000000
57	39	#1 Horizontal blanking 160=0A0h A0h	A0	10100000
58	3A	#1 Horizontal active/Horizontal blanking A0h	A0	10100000
59	3B	#1 Vertical active 1600=640h 40h	40	01000000
60	3C	#1 Vertical blanking 46=02Eh 2Eh	2E	00101110
61	3D	#1 Vertical active/Vertical blanking 60h	60	01100000
62	3E	#1 Horizontal sync , offset(Thfp) 48=030h 30h	30	00110000
63	3F	#1 Horizontal sync , width 32=020h 20h	20	00100000
64	40	#1 Vertical sync,offset / Vertical sync,width (offset=3h/width=6h)	36	00110110

Byte (decimal)	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
65	41	#1 Horizontal sync offset/width/Vertical sync offset/width	00	00000000
66	42	#1 Horizontal image size 216.96mm=0D9h D9h	D9	11011001
67	43	#1 Vertical image size 136mm=088h 88h	88	10001000
68	44	#1 Horizontal image size / Vertical image size 00h	00	00000000
69	45	Horizontal boader	00	00000000
70	46	Vertical boader	00	00000000
71	47	Flags(Non-interlaced=0/non 3D=00/Degital separate=11 /Horizontal polarity/Vertical polarity=00)	18	00011000
72	48	Detailed timing descriptor#2 fck/10000 (=0MHz/10000=0=0000h)	00	00000000
73	49	Dummy	00	00000000
74	4A	Dummy	00	00000000
75	4B	Dummy	A0	10100000
76	4C	Dummy	A0	10100000
77	4D	Dummy	40	01000000
78	4E	Dummy	2E	00101110
79	4F	Dummy	60	01100000
80	50	Dummy	30	00110000
81	51	Dummy	20	00100000
82	52	Dummy	36	00110110
83	53	Dummy	00	00000000
84	54	Dummy	D9	11011001
85	55	Dummy	88	10001000
86	56	Dummy	00	00000000
87	57	Dummy	00	00000000
88	58	Dummy	00	00000000
89	59	Dummy	18	00011000
90	5A	Dummy	00	00000000
91	5B	Dummy	00	00000000
92	5C	Dummy	00	00000000
93	5D	Dummy	A0	10100000
94	5E	Dummy	A0	10100000
95	5F	Dummy	40	01000000
96	60	Dummy	2E	00101110
97	61	Dummy	60	01100000
98	62	Dummy	30	00110000

Byte (decimal)	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
99	63	Dummy	20	00100000
100	64	Dummy	36	00110110
101	65	Dummy	00	00000000
102	66	Dummy	D9	11011001
103	67	Dummy	88	10001000
104	68	Dummy	00	00000000
105	69	Dummy	00	00000000
106	6A	Dummy	00	00000000
107	6B	Dummy	18	00011000
108	6C	Detailed timing descriptor #4	00	00000000
109	6D	Flag	00	00000000
110	6E	Reserved	00	00000000
111	6F	Display Product name	FC	11111100
112	70	Flag	00	00000000
113	71	Supplier P/N#1 (L)	4C	01001100
114	72	Supplier P/N#2 (Q)	51	01010001
115	73	Supplier P/N#3 (1)	31	00110001
116	74	Supplier P/N#4 (0)	30	00110000
117	75	Supplier P/N#5 (1)	31	00110001
118	76	Supplier P/N#6 (R)	52	01010010
119	77	Supplier P/N#7 (1)	31	00110001
120	78	Supplier P/N#8 (J)	4A	01001010
121	79	Supplier P/N#9 (X)	58	01011000
122	7A	Supplier P/N#10 (0)	30	00110000
123	7B	Supplier P/N#11 (2)	32	00110010
124	7C	Supplier P/N#12 ("Space")	0A	00001010
125	7D	(If<13 char,then terminate with ASCII code 0Ah,set remaining char 20h)	20	00100000
126	7E	Extension flag	00	00000000
127	7F	Checksum	A6	10100110

11. Optical Characteristics

Ta=+25 degree, VDD=+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ21,θ22	CR>10	80	-	-	degree	[Note 11-1, 11-3, 11-4, 11-6]
	Vertical	θ11		80	-	-	degree	
		θ12		80	-	-	degree	
Contrast ratio		CR	θ=0°	700	900	-		[Note 11-2, 11-4, 11-6]
Response time		τr+τd	θ=0°	-	25	-	ms	[Note 11-2, 11-5, 11-6]
Chromaticity of white		x		0.283	0.313	0.343		[Note 11-2, 11-6] Normal operation (PWM Duty=100%)
		y		2.299	0.329	0.359		
Chromaticity of red		x		-	0.608	-		
		y		-	0.346	-		
Chromaticity of green		x		-	0.329	-		
		y		-	0.567	-		
Chromaticity of blue		x		-	0.152	-		
		y		-	0.130	-		
Luminance of white		YLI		320	400	-	cd/m^2	
White Uniformity		δW	θ=0°	-	1.24	1.52		[Note 11-2, 11-7]

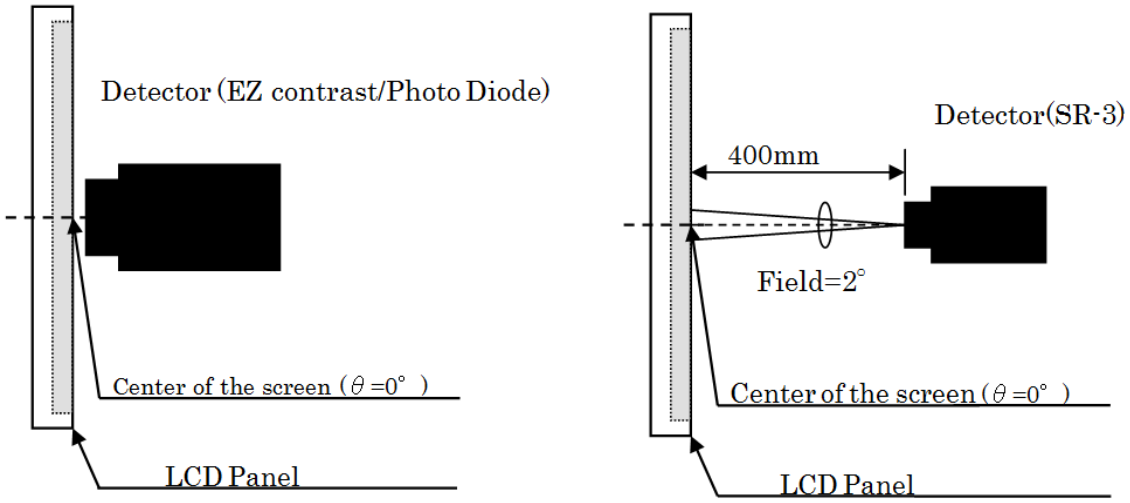
[Note 11-1] Measurement of viewing angle range.

[Note 11-2] Measurement of luminance and and Response time, Chromaticity and Contrast.

* The measurement shall be taken 30 minutes after lighting the module at the following rating:

Condition: PWM Duty = 100%

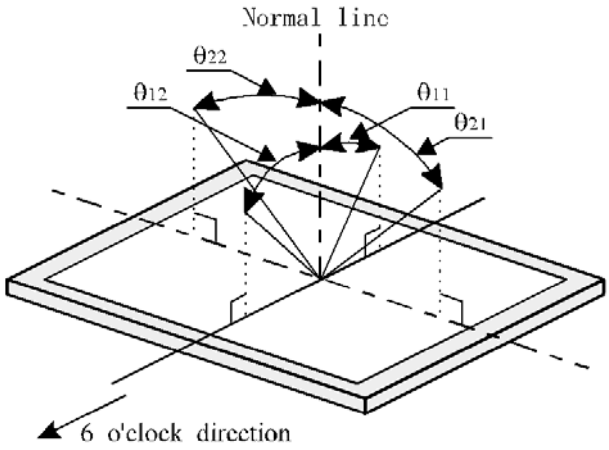
The optical characteristics shall be measured in a dark room or equivalent.



Viewing angle range:EZ-CONTRAST

/Response time: Photo diode)

[Note 11-3] Definitions of viewing angle range:

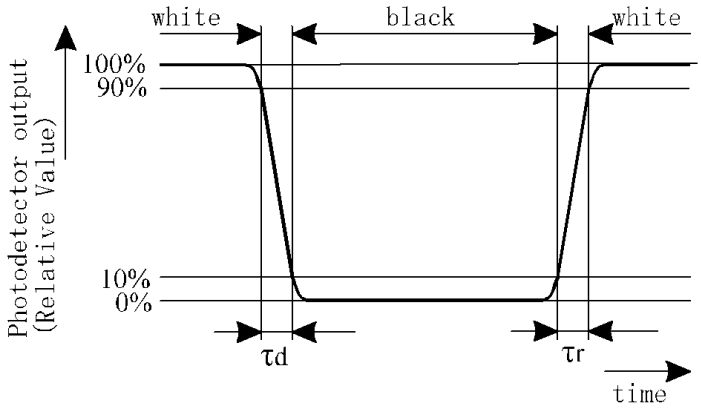


[Note 11-4] Definition of contrast ratio : The contrast ratio is defined as the following.

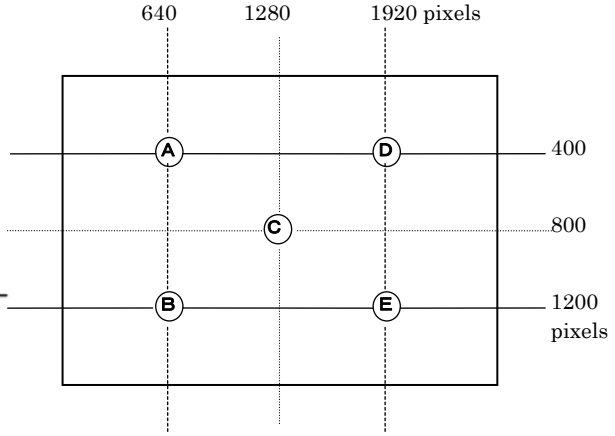
$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

[Note11-5]Definitionofresponsetime :

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white" .



[Note 11-6] This shall be measured at center of the screen.



[Note 11-7] Definition of white uniformity:

White uniformity is defined as the following with five measurements (A~E).

$$\delta w = \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$

12. Display Quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standard.

13. Handling Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable.
Please insert for too much stress not to join a connector in the case of insertion of a connector.

b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.

c) Since the front polarizer is easily damaged, pay attention not to scratch it.

d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

g) Since CMOS LSI is used in this module, take care of static electricity and injure the human earth when handling. Observe all other precautionary requirements in handling components.

h) This module has its circuitry PCBs on the side and should be handled carefully in order not to be stressed.

i) Protect sheet(Laminate film) is attached to the module surface to prevent it from being scratched. Peel the sheet off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc. Working under the following environments is desirable.

- All workers wear conductive shoes, conductive clothes, conductive fingerstalls and grounding belts without fail.
- Use Ionized blower for electrostatic removal, and peel of the protect sheet with a constant speed. (Peeling of it at over 2 seconds)

j) The polarizer surface on the panel is treated with Anti Glare . In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.

k) Do not expose the LCD module to a direct sunlight, for a long period of time to protect the module from the ultra violet ray.

l) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.

m) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.

n) Disassembling the module can cause permanent damage and should be strictly avoided.
Please don't remove the fixed tape, insulating tape etc that was pasted on the original module.
(Except for protection film of the panel.)

o) Be careful when using it for long time with fixed pattern display as it may cause afterimage.
(Please use a screen saver etc., in order to avoid an afterimage.)

p) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

q) Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series), tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or noncontact to polarizer film. Be sure to confirm the component of them.

r) Do not use polychloroprene. If you use it, there is some possibility of generating Cl_2 gas that influences the reliability of the connection between LCD panel and driver IC.

t) Do not put a laminate film on LCD module, after peeling of the original one. If you put on it, it may cause discoloration or spots because of the occurrence of air gaps between the polarizer and the film.

u) Ground module bezel to stabilize against EMI and external noise.

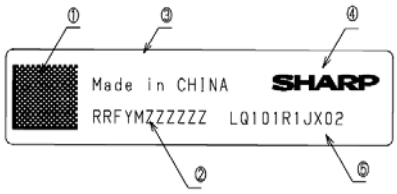
v) Please have a separately consultation when touch panel reworking.

14. Packaging Condition

Piling number of cartons	7
Package quantity in one carton	40 pcs
Carton size	570 x 486 x 235 mm
Total mass of one carton filled with full modules	14.0kg
Packing form	Fig.18-1

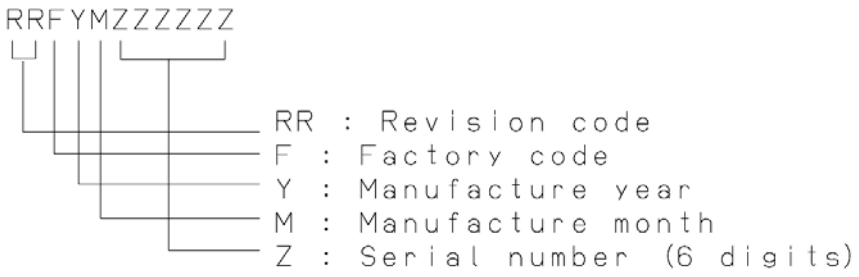
15. Label

1) Module bar code label

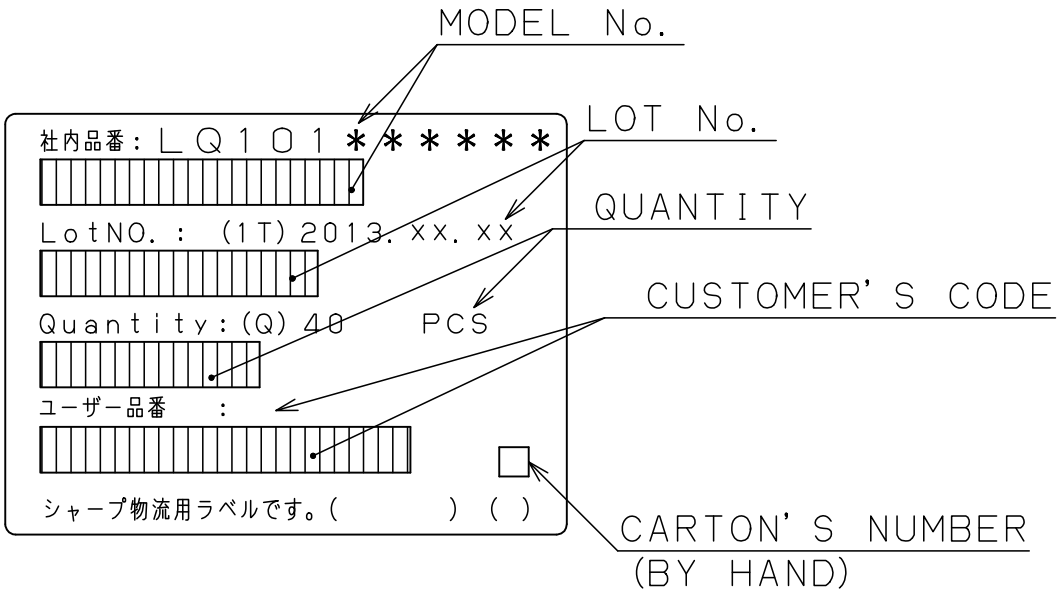


	character height	font	notes
①:2D bar code			Data Matrix ECC200 of Lot Nuber and Model Number
②Lot Number	2		Refer to "C:Detail of Lot Number"
③:Country of manufacture	2.5		
④:SHARP logo	2.5		Data:sharplogo
⑤:Model No.	2		

C:Detail of Lot Number



2) Packing bar code label



16. RoHS Directive

This LCD module is compliant with RoHS Directive.

17. Reliability Test Items

No.	Test item	Conditions
1	High temperature storage test	Ta = 70 degree 240h
2	Low temperature storage test	Ta = -20 degree 240h
3	High temperature & high humidity operation test	Ta = 40 degree ; 90%RH 240h (No condensation)
4	High temperature operation test	Ta = 50 degree 240h
5	Low temperature operation test	Ta = 0 degree 240h
6	Vibration test (non- operating)	Frequency:10~57Hz/Vibration width (one side):0.075mm :57~500Hz/acceleration:9.8m/s^2 Sweep time: 11minutes Test period: 1 hour for each direction of X,Y,Z
7	Shock test (non- operating)	Max. gravity : 490 m/s^2 Pulse width : 11 ms, half sine wave Direction : ±X,±Y,±Z once for each direction.
8	ESD	±200V, 200pF(0Ω) 1time/each terminal

[Note 17-1] Under the display quality conditions with normal operation state(*), these shall be no change which may affect practical display function.

(*)normal operation state : Temperature : 15~35degree , Humidity : 45~75% , Atmospheric pressure : 86~106KPa.

18. Packaging Condition

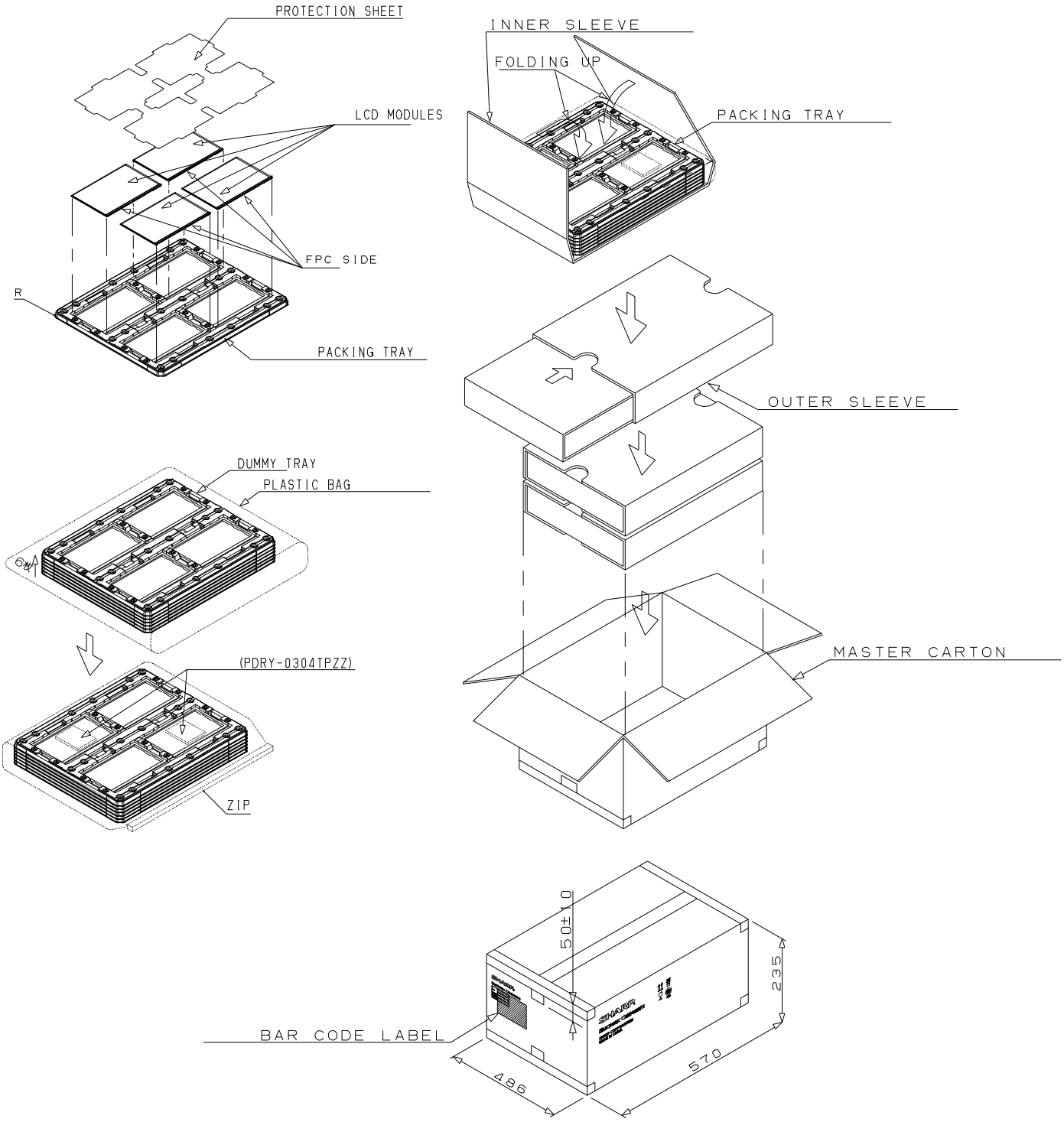
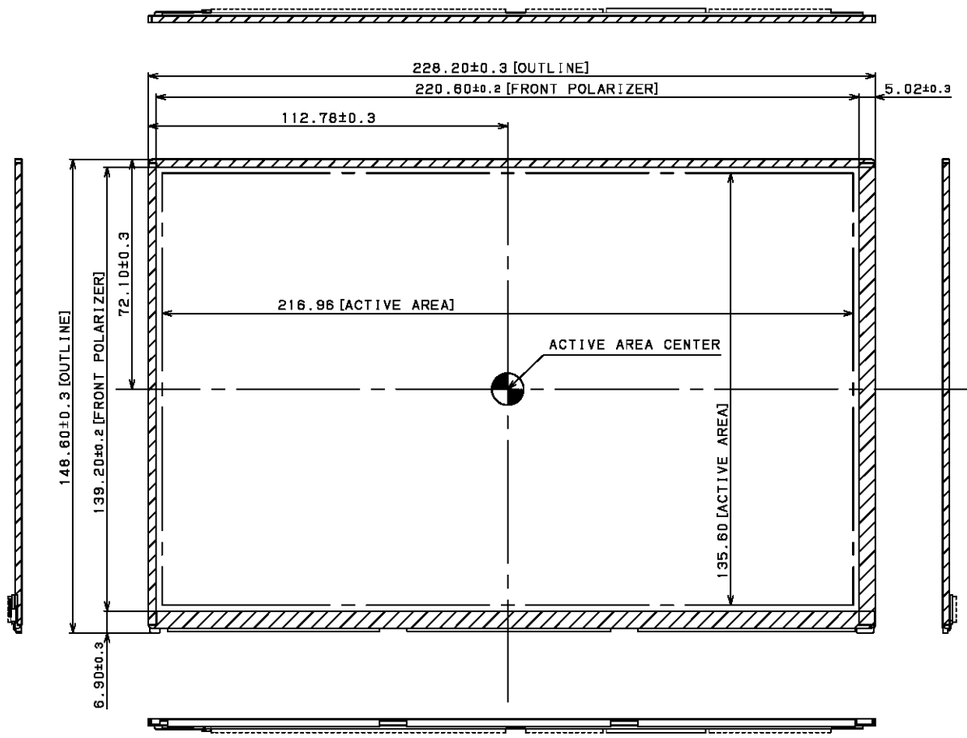
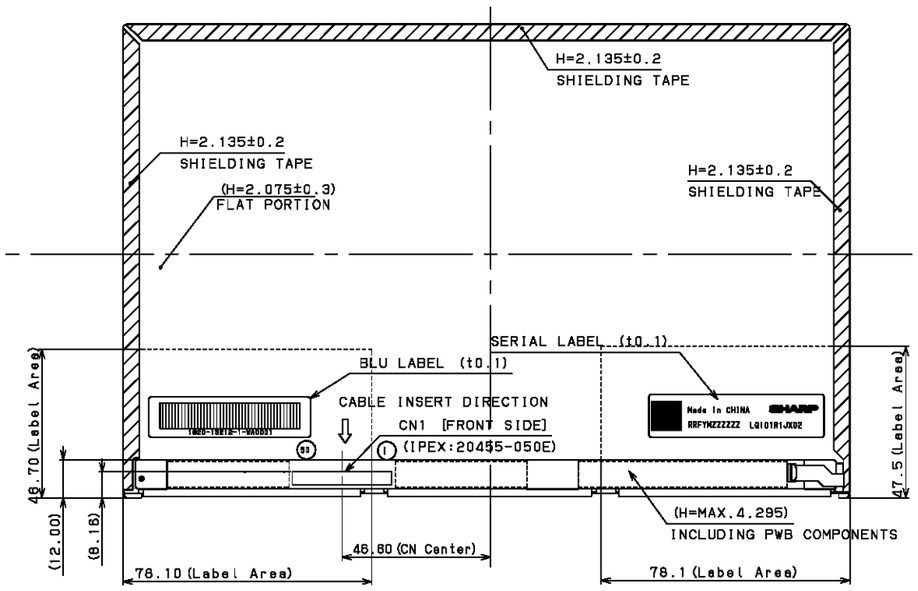


Fig. 18-1

SHARP Confidential



FRONT VIEW



REAR VIEW

Note
1.Unspecified tolerance to be 0.5.
2.Without warpage and deflection.
3.[H] means Module thickness from Front Polarizer surface to pertinent part.

Fig.19-1 Outline dimensions