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	SPECIFICATION	APPLICABLE GROUP DISPLAY DEVICE BUSINESS GROUP

DEVICE SPECIFICATION FOR

TFT-LCD Module

MODEL No.

LQ150X1LW12

These parts have corresponded with the RoHS directive.

☐ CUSTOMER'S APPROVAL

BY _____

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RECORDS OF REVISION

LQ150X1LW12

SPEC No.	DATE	REVISED No	PAGE	SUMMARY	NOTE
LD-24702A	2012/7/19			–	

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1. Application

This specification applies to the color TFT-LCD module LQ150X1LW12.

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The device listed in this specification was designed and manufactured for use in general electronic equipment.

In case of using the device for applications such as control and safety equipment for transportation (controls of 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 not 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.

SHARP assumes no responsibility for any damage resulting from the use of the device which does not comply with the instructions and the precautions specified in this specification .

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2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit and a White-LED Backlight unit. Graphics and texts can be displayed on a 1024×RGB×768dots panel with about 10 million colors by using LVDS (Low Voltage Differential Signaling) and supplying +3.3V DC supply voltages for TFT-LCD panel driving and supply voltage for backlight.

It is a wide viewing-angle-module (Vertical viewing angle:170° Horizontal viewing angle:170° ,CR≧10).

3. Mechanical technical literatures

Parameter	technical literatures	Unit
Display size	38(15inch)Diagonal	cm
Active area	304.1(H)×228.1(V)	mm
Pixel format	1024(H)×768(V) (1pixel=R+G+B dot)	pixel
Aspect ratio	4:3	
Pixel pitch	0.297(H)×0.297(V)	mm
Pixel configuration	R,G,B vertical stripe	
Display mode	Normally black	
Unit outline dimensions 【*1】	331.6(W)×254.7(H)×9.3(D)	mm
Mass	950 (Max.)	g
Surface treatment	Anti-glare and hard-coating 3H	

【*1】 Excluding the protrusion of the connector cover from thickness.

Outline dimensions are shown in Fig.1.

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (Interface signals and +3.3V power supply)

Using connectors : DF14H-20P-1.25H(56) (Hirose Electric Co., Ltd.)

Corresponding connectors : DF14-20S-1.25C(conector) (Hirose Electric Co., Ltd.)

: DF14-2628SCFA(terminal) (Hirose Electric Co., Ltd.)

Using LVDS receiver : Building into cotrol IC (THC63LVDF84B (Thine electronics) or Compatible product)

Corresponding LVDS transmitter : THC63LVDM83D (Thine electronics) or Compatible product

CN1

Pin	Symbol	Function	Remark
1	VCC	+3.3V Power supply	
2	VCC	+3.3V Power supply	
3	GND	GND	
4	GND	GND	
5	RxIN0-	LVDS receiver signal CH0 (-)	LVDS
6	RxIN0+	LVDS receiver signal CH0 (+)	LVDS
7	GND	GND	
8	RxIN1-	LVDS receiver signal CH1 (-)	LVDS
9	RxIN1+	LVDS receiver signal CH1 (+)	LVDS
10	GND	GND	
11	RxIN2-	LVDS receiver signal CH2 (-)	LVDS
12	RxIN2+	LVDS receiver signal CH2 (+)	LVDS
13	GND	GND	
14	CK IN-	LVDS receiver signal CK (-)	LVDS
15	CK IN+	LVDS receiver signal CK (+)	LVDS
16	GND	GND	
17	RxIN3-	LVDS receiver signal CH3 (-)	LVDS
18	RxIN3+	LVDS receiver signal CH3 (+)	LVDS
19	RL/UD	Horizontal/Vertical display mode select signal	【*1】
20	SELLVDS	LVDS SET	【*2】

【*1】 RL/UD = LOW

RL/UD = HIGH

【*2】 SELLVDS is shown in 4-2.

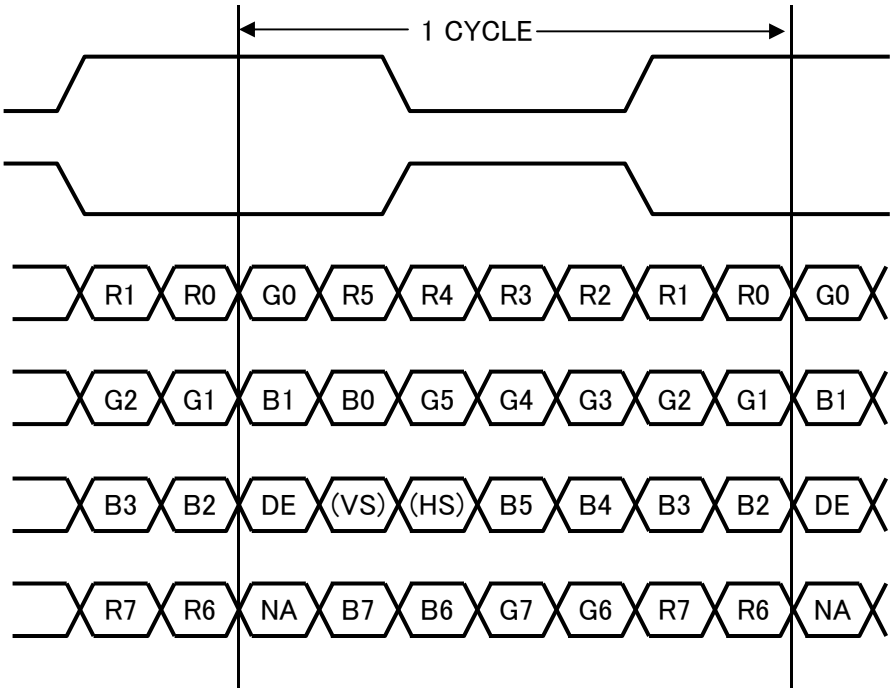
4-2. Data Mapping

1) 8 bit input

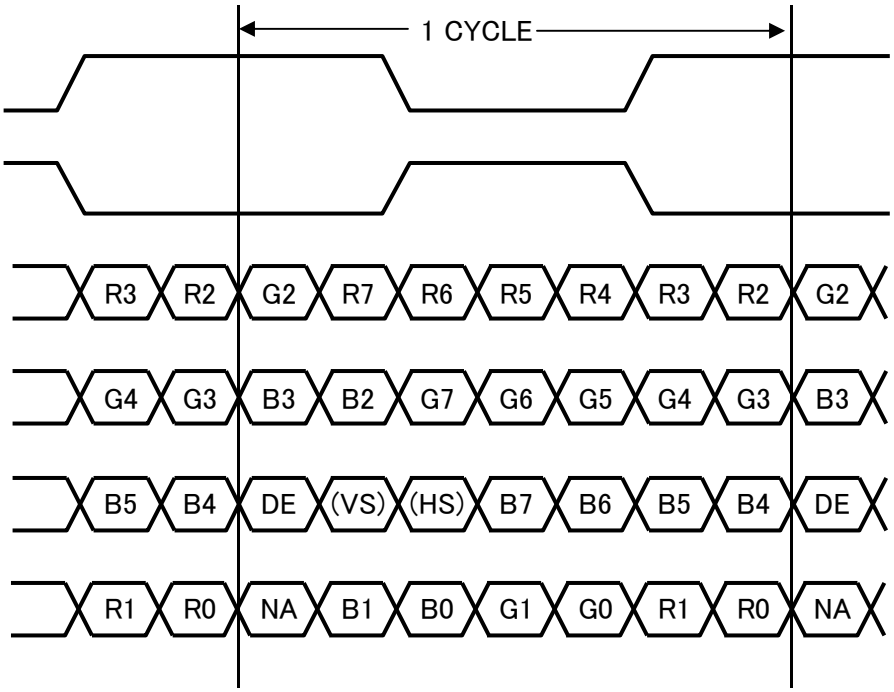
pin assignment with SELLVDS pin (THC63LVDM83D(Thine electronics) or Compatible product)

Transmitter		20Pin SELLVDS	
Pin No	Data	= L(GND) or Open	= H(3.3V)
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	(HS)	(HS)
28	TC5	(VS)	(VS)
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 = L(GND) or Open >



< SELLVDS = H(3.3V) >



DE : DATA ENABLE

HS : Hsync

VS : Vsync

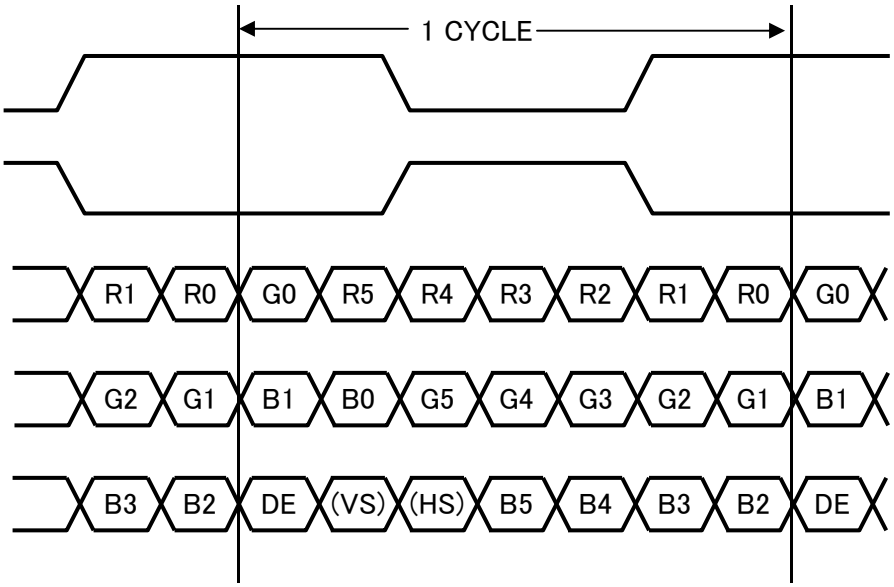
NA : Non Available

1) 6bit input

pin assignment with SELLVDS (THC63LVDM83D(Thine electronics) or Compatible product)

Transmitter		20Pin SELLVDS	
Pin No	Data	= L(GND) or Open	= H(3.3V)
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	−	(HS)
28	TC5	−	(VS)
30	TC6	−	DE
50	TD0	−	GND
2	TD1	−	GND
8	TD2	−	GND
10	TD3	−	GND
16	TD4	−	GND
18	TD5	−	GND
25	TD6	−	(NA)

< SELLVDS = H(3.3V) >



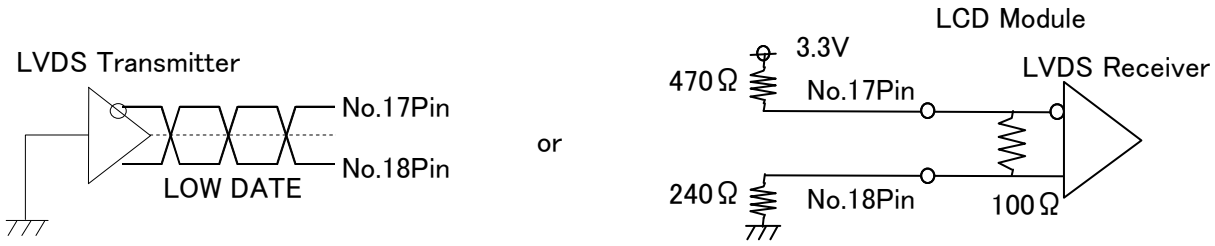
DE : DATA ENABLE

HS : Hsync

VS : Vsync

NA : Non Available

Recommended input (17pin, 18pin at 6bit)



4-3. LED backlight

LED backlight connector

CN2 Used connector : SM06B-SHLS-TF (J.S.T. Mfg. Co. Ltd)

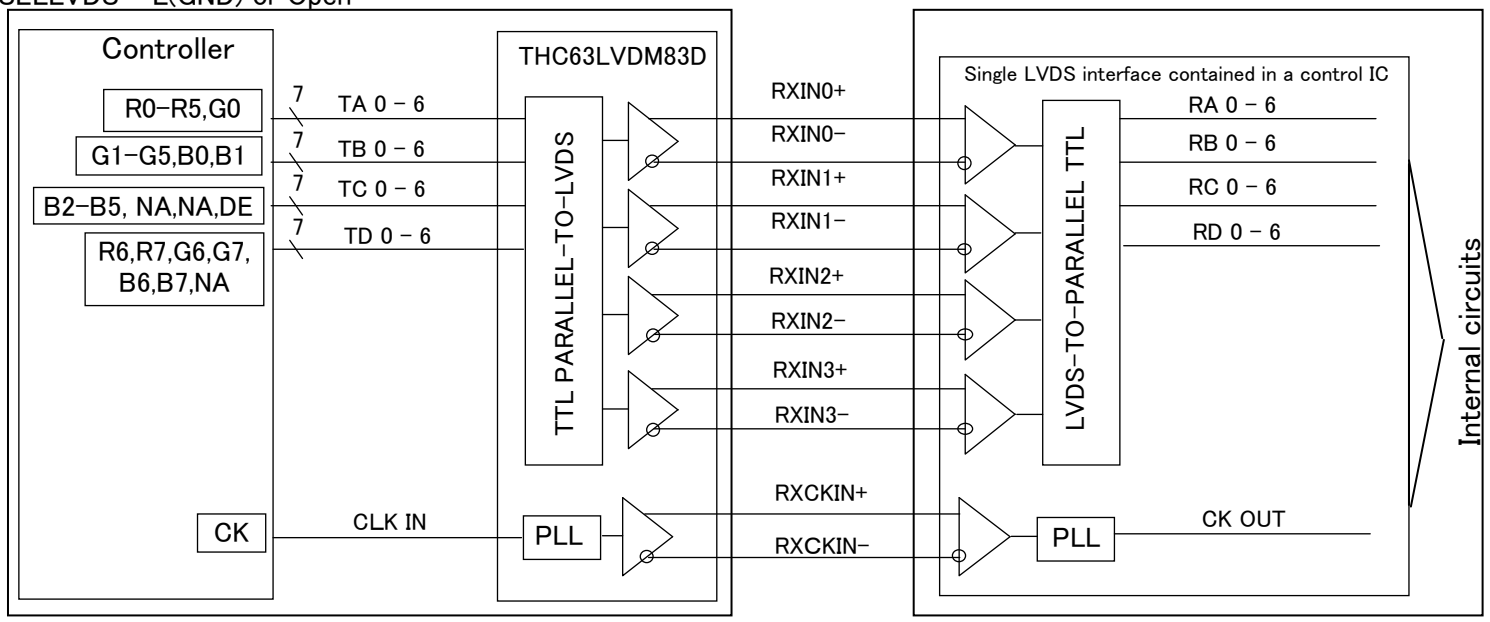
Corresponding connector : SHLP-06V-S-B (J.S.T. Mfg. Co. Ltd)

Connector No.	Pin No.	symbol	function
CN2	1	VDD	+12V power supply
	2	VDD	+12V power supply
	3	GND	GND
	4	GND	GND
	5	XSTABY	Backlight ON/OFF signal
	6	VBR	PWM signal

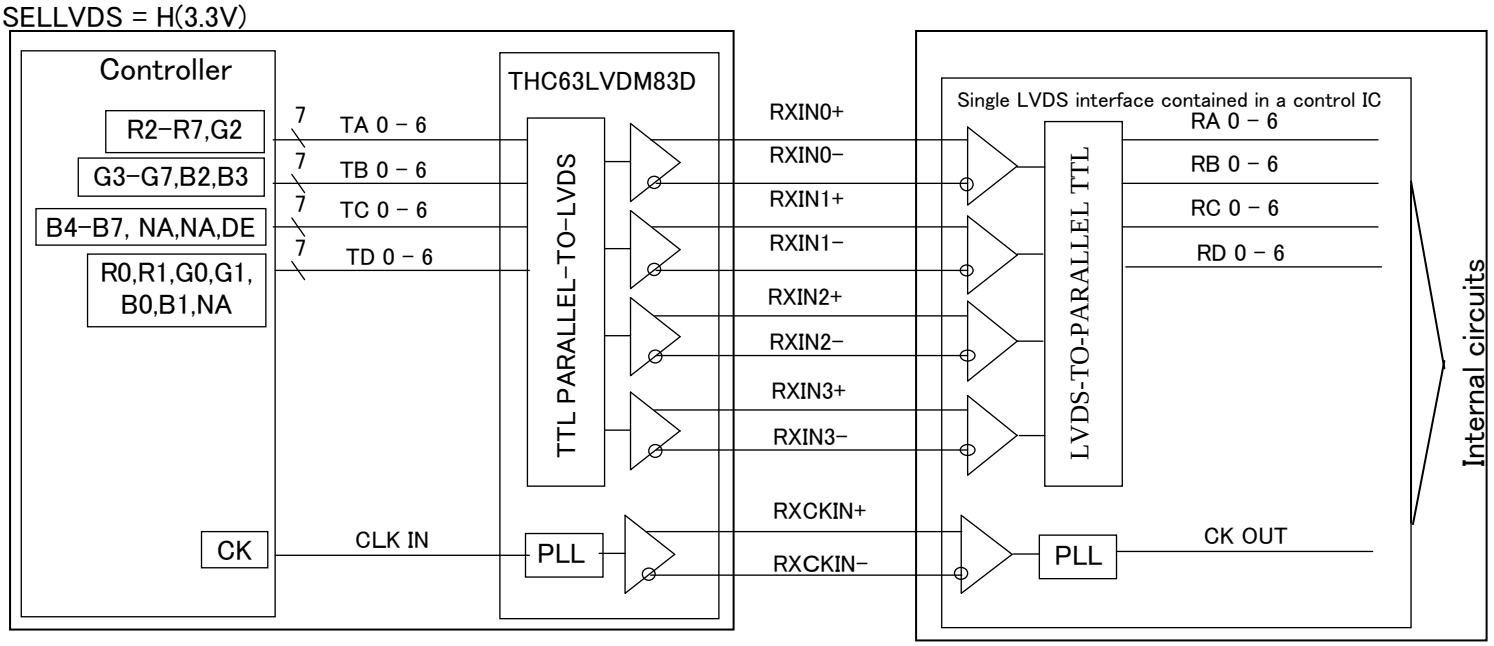
4-4. Interface block diagram

(Computer Side) (TFT-LCD side)

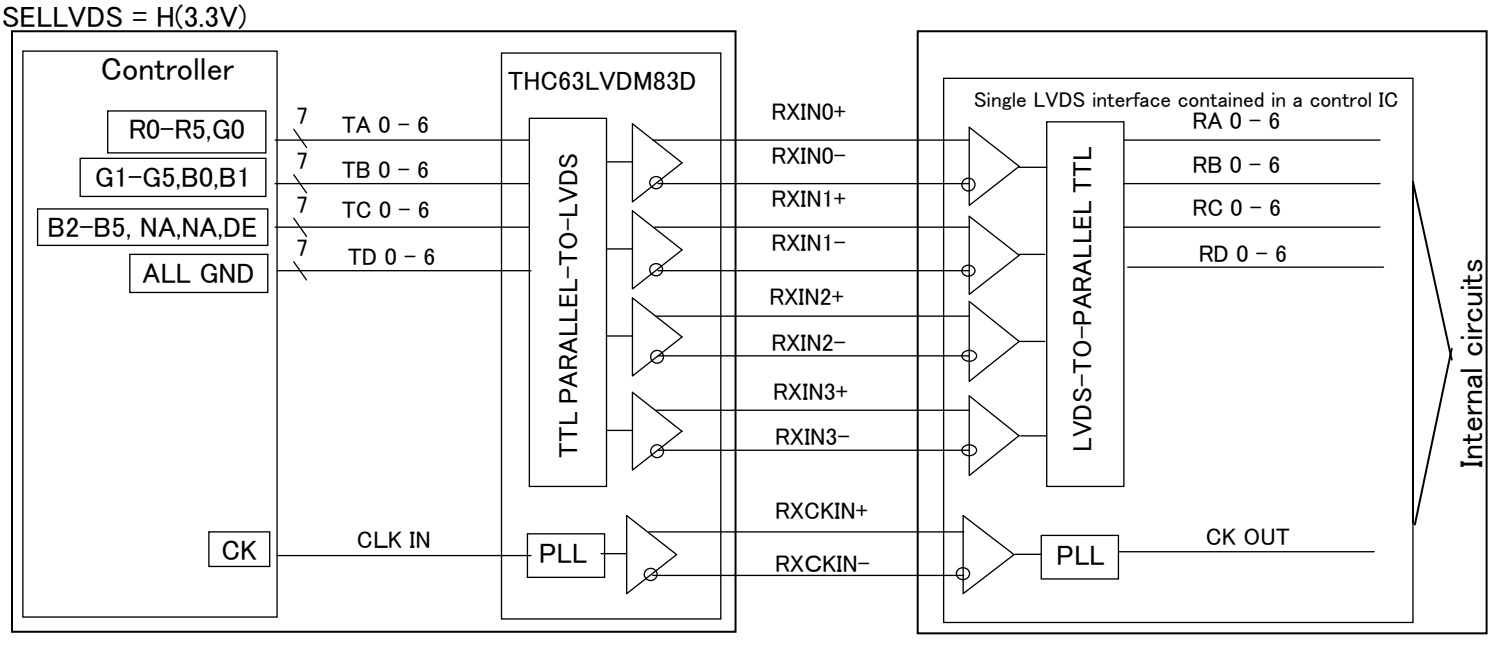
①8 bit input
SELLVDS = L(GND) or Open



②8 bit input
SELLVDS = H(3.3V)



③6 bit input
SELLVDS = H(3.3V)



5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Pin	Ratings	Unit	Remark
Supply voltage	Vcc	Ta=25℃	VCC	−0.3 ～ +4.0	V	【*1,2】
	V_{DD}	Ta=25℃	VDD	−0.3 ～ +15.0	V	【*1,2】
Input voltage	V_{I1}	Ta=25℃	RxINi−/+ CK IN−/+	−0.3～Vcc+0.3	V	i=0,1,2,3
	V_{I2}	Ta=25℃	RL/UD,SELLVDS	−0.3～Vcc+0.3	V	
	V_{I4}	Ta=25℃	XSTABY, VBR	−0.3～V_{DD}	V	
Storage temperature	T_{STG}	—	−	−25 ～ +65	℃	【*1】
Operating temperature	T_{OPA}	—	−	0 ～ +65	℃	【*1,3,4】

【*1】 Humidity：95%RH Max.(Ta≦40℃) Note static electricity.

Maximum wet-bulb temperature at 39℃ or less. (Ta>40℃) No condensation.

【*2】 The Vcc power supply capacity must use the one of 3.5A or more.

The V_{DD} power supply capacity must use the one of 3.5A or more.

【*3】 There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at 60～65℃.

【*4】 In the operating temperature item, the low temperature side is the ambient temperature regulations.

The high temperature side is the panel surface temperature regulations.

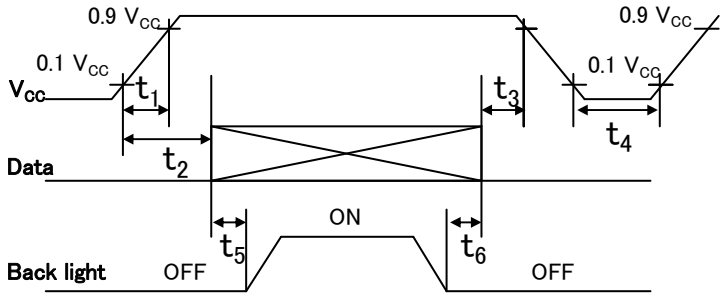
6. Electrical Characteristics

6-1. TFT-LCD panel driving

T_a＝+25℃

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Supply voltage		V_{CC}		3.0	3.3	3.6	V	【*1】
Current dissipation		I_{CC}	Vcc=3.3V	-	360	800	mA	【*2】
Input voltage width for LVDS receiver		V_L		0	—	2.4	V	
Permissive input ripple voltage		V_{RP}		—	—	200	mV_{P-P}	Vcc = 3.3V
Differential input Threshold voltage	High	V_{TH}		—	—	V_{CM} +100	mV	V_{CM} =+1.2V 【*3】
	Low	V_{TL}		V_{CM} -100	—	—	mV	
Input voltage		V_{IH}		2.1	—	—	V	【*4】
		V_{IL}		—	—	0.8	V	
Input reak current		I_{OH}		—	—	400	μA	V_{I2} = +3.3V【*4】
		I_{OL}		-10	—	+10	μA	V_{I2} =0V 【*4】
Terminal resistor		R_T		—	100	—	Ω	Differential input

【*1】 On-off conditions for supply voltage



$20\mu s < t_1 \leqq 10ms$

$0 < t_2 \leqq 20ms$

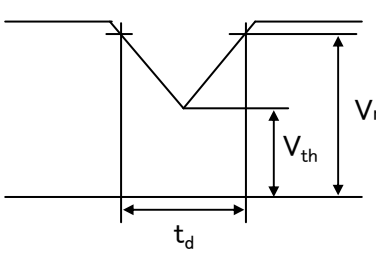
$0 < t_3 \leqq 1s$

$1s \leqq t_4$

$300ms \leqq t_5$

$200ms \leqq t_6$

Vcc-dip conditions



$V_{th} = 2.5V$

$V_{min} = 3V$

- $V_{th} < V_{CC} \leqq V_{min}$
  $t_d \leqq 10ms$
- $V_{CC} < V_{th}$

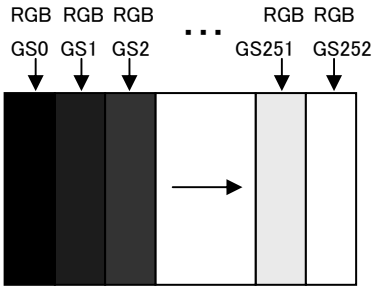
Vcc-dip conditions should also follow the On-off conditions for supply voltage

- Hsync/Vsync need not be input so that this model may drive only by the ENAB signal.
  Even if Hsync/Vsync is input, it doesn't become a malfunction.
- The relation between the data input and the backlight lighting will recommend the above-mentioned input sequence.
  When the backlight is turned on before the panel operates, there is a possibility of abnormally displaying.
  The liquid crystal module is not damaged.

【*2】 Current dissipation

Typical current situation : 253-gray-bar pattern

（ Vcc=+3.3V、fck = 65MHz、Ta=25℃）



【*3】 V_{CM} : LVDS common mode voltage

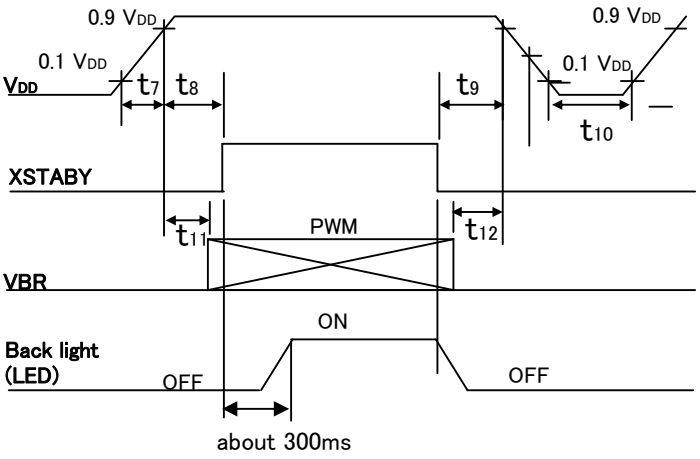
【*4】 RL/UD , SELLVDS

6-2. LED backlight

Ta＝+25℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage		V_{DD}	10.2	12.0	13.8	V	【*1】
Current dissipation		I_{DD1}	–	750	1200	mA	【*2】
		I_{DD2}	–	–	10.0	μA	
Permissive input ripple voltage		V_{RP_BL}	–	–	200.0	mV_{P-P}	VDD=+12.0V
XSTABY	High voltage	V_{IH_BL1}	2.1	–	VDD	V	【*3】
	Low voltage	V_{IL_BL1}	–	–	0.4	V	【*3】
VBR	High voltage	V_{IH_BL2}	2.1	–	VDD	V	【*4】
	Low voltage	V_{IL_BL2}	–	–	0.4	V	【*4】
PWM frequency		f_{PWM}	50.0	–	1k	Hz	【*4,5】
PWM duty		D_{PWM}	1.0	–	100.0	%	【*4,5】
Life time		L	–	(50,000) (Module)	–	h	【Reference】 【*6】

【*1】 On-off conditions for supply voltage



20 μs ≦ t_7 ≦ 200ms

0ms ≦ t_8

0ms ≦ t_9

1sec ≦ t_{10}

0ms ≦ t_{11}

0ms ≦ t_{12}

【*2】 Current dissipation

Typ. value： V_{DD}= +12V、Duty=100%

Max. value： V_{DD}= +10.2V、Duty=100%

【*3】 XSTABY is connected by the pull-up resistor of 100kΩ.

【*4】 VBR is connected by the pull-up resistor of 33kΩ.

【*5】 PWM

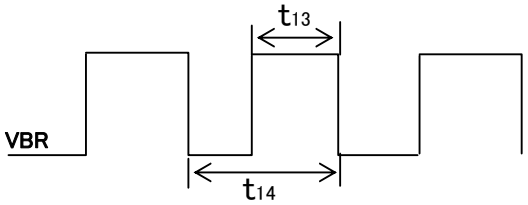
f_{PWM} = $1/t_{14}$

Duty 1% : Min. Luminance

Duty 100% : Max. Luminance

Luminance changes in proportion to the duty ratio. (t_{13}≧10 μs)

When the frequency slows, the display fineness might decrease.



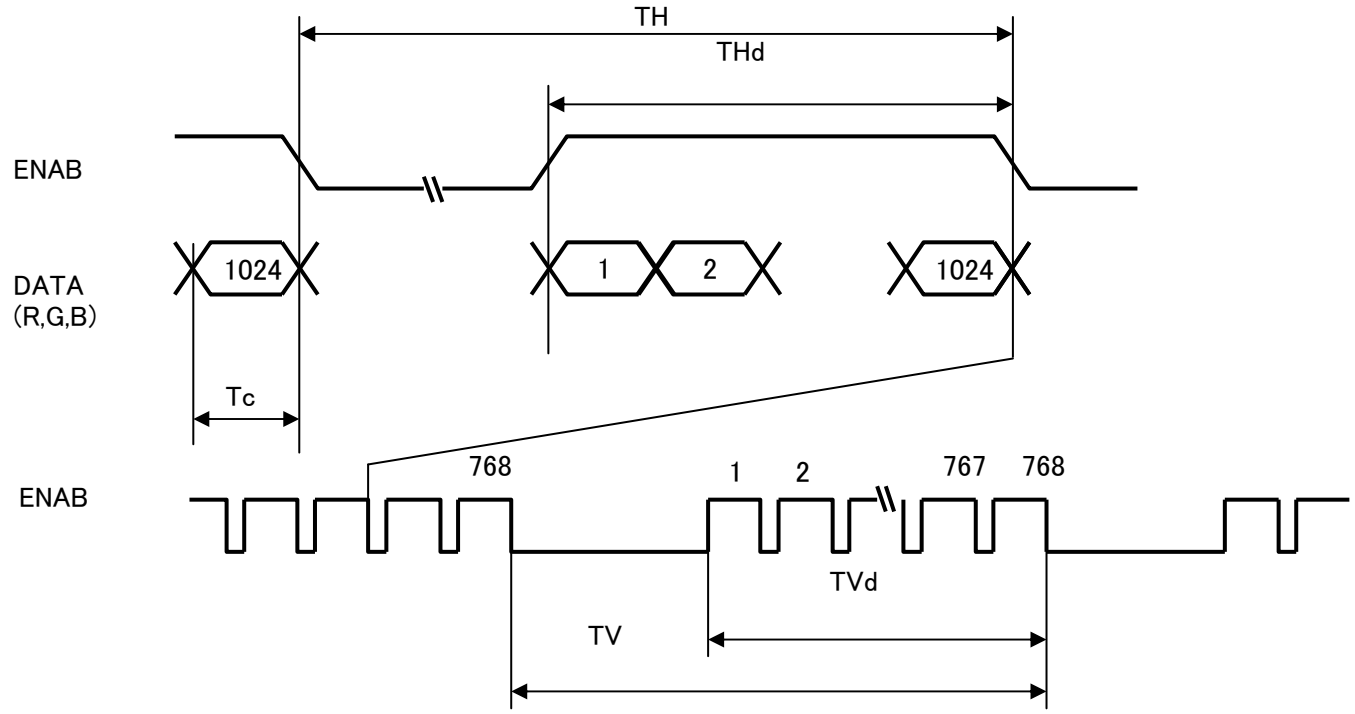
【*6】 Luminance becomes 50% of an initial value. (Ta＝25℃, PWM=100%)

7. Timing characteristics of input signals

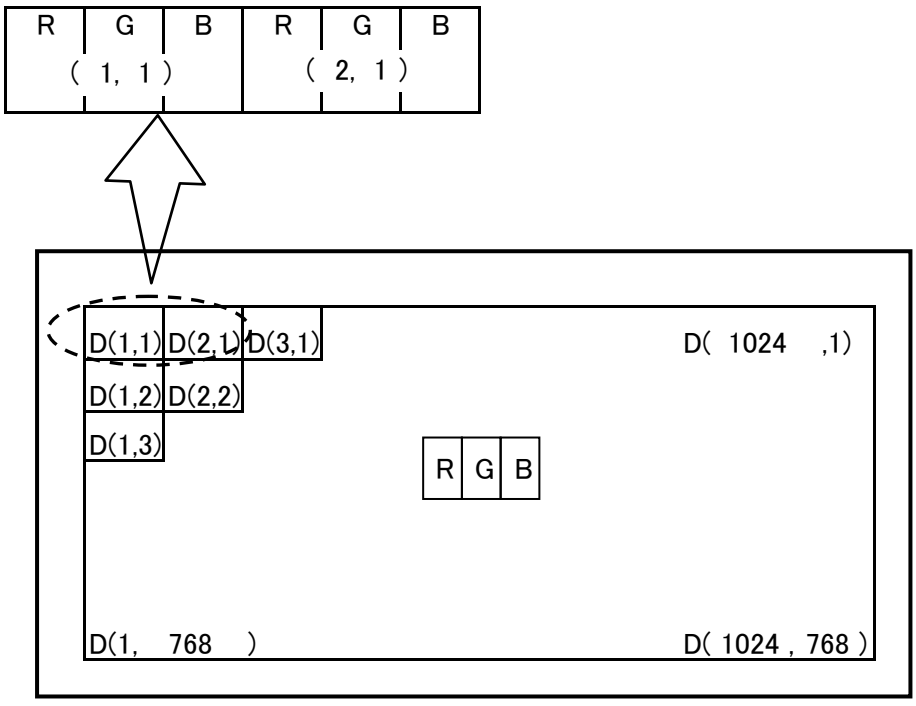
7-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	50.0	65	80.0	MHz	
ENAB	Horizontal period	TH	1094	1344	1720	clock	
			16.0	20.7	23.4	μs	
	Horizontal period (High)	THd	1024	1024	1024	clock	
	Vertical Frequency	TV	776	806	990	line	【*1】
			13.3	16.7	18.0	ms	
	Vertical period (High)	TVd	768	768	768	line	

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



7-2. Input Data Signals and Display Position on the screen



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

8-1. 8 bit input

	Colors & Gray scale	Data signal																							
		Gray Scale	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	0	1	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	0	1	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	0	1	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 200 gray scales(red), 221 gray scales(green), and 209 gray scales(blue) from 8 bit data signals. According to the combination of total 24 bit data signals, the 10-million-color display can be achieved on the screen.

※)Please refer to【Appendix A】of the end for the output gray scales of each color.

8-2. 6 bit input

	Colors & Gray scale	Data signal																	
		GrayScale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Color	Black	−	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	1	1	1	1	1	1
	Green	−	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	−	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	−	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	−	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	−	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale of Red	Black	GS0	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
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	↓				↓						↓						↓		
	↓	↓				↓						↓						↓		
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	↓	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	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
	↑	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	↑	↓				↓						↓						↓		
	↓	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	↓	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	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
	↑	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	↑	↓				↓						↓						↓		
	↓	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	↓	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144−color display can be achieved on the screen.

9. Optical Characteristics

Ta=+25℃, Vcc=＋3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ21, θ22	CR>10	70	85	－	Deg.	【*1,2,4】
	Vertical	θ11		70	85	－	Deg.	
		θ12		70	85	－	Deg.	
Contrast ratio		CR	optimized angle	600	1000	－		【*2,4】
Response Time	White Black	τr+τd	θ=0°	－	30	－	ms	【*3,4】
Chromaticity of White		Wx		0.245	0.295	0.345		【*4】
		Wy		0.270	0.320	0.370		
Chromaticity of Red		Rx		－	0.635	－		
		Ry		－	0.345	－		
Chromaticity of Green		Gx		－	0.297	－		
		Gy		－	0.625	－		
Chromaticity of Blue		Bx		－	0.145	－		
		By		－	0.080	－		
Luminance of white		Y_{L1}		280	350	－	cd/m^2	【*4】
White Uniformity				－	－	1.33		【*5】

※The measurement shall be executed 30 minutes after lighting at rating.

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.2 below.

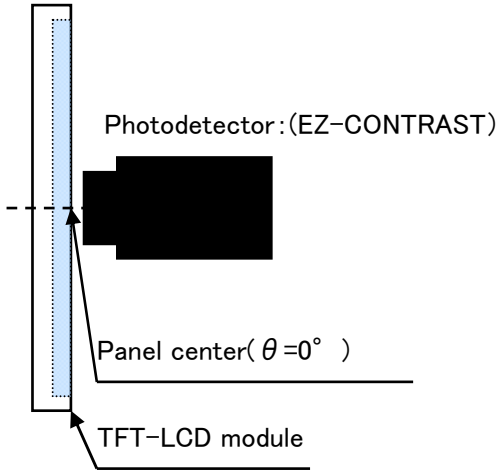


fig.2-1 Measuring method of Viewing angle range.

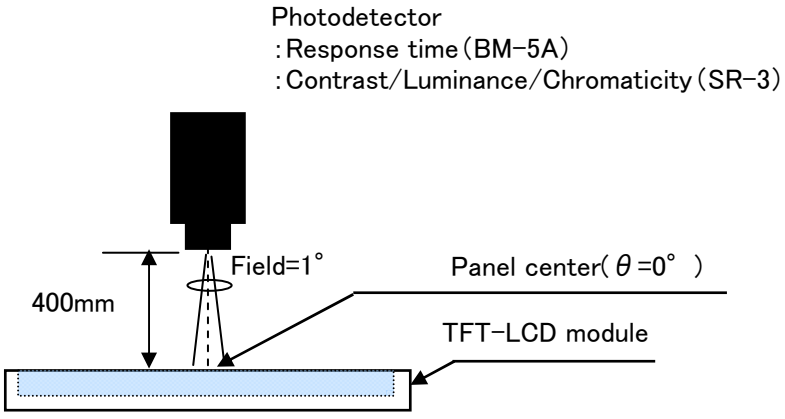
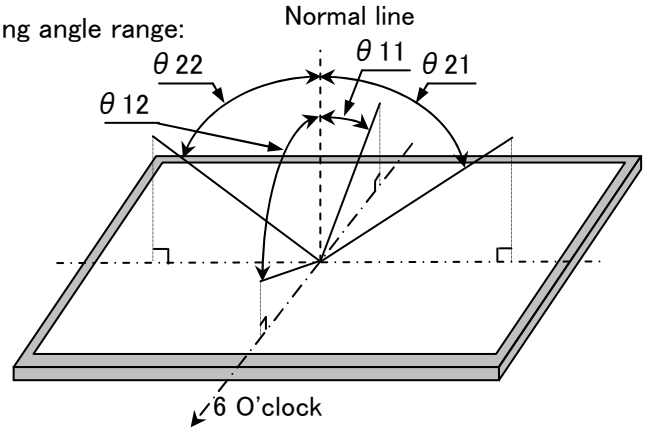


fig.2-2 Measuring method of contrast, luminance, response time, and Chromaticity.

Fig.2 Optical characteristics measurement method

【*1】Definitions of viewing angle range:

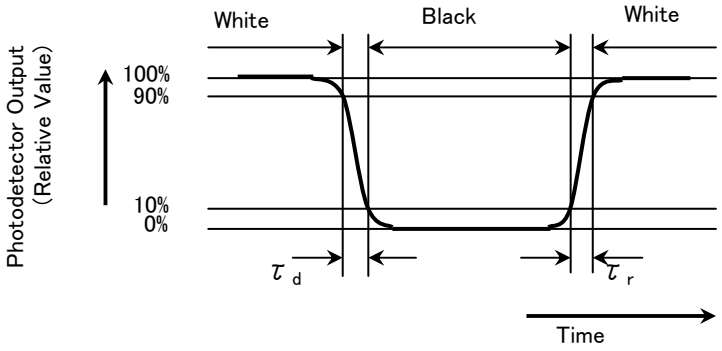


【*2】Definition of contrast ratio:

The contrast ratio is defined as the following. Contrast (CR) = $\frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$

【*3】Definition of response time:

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

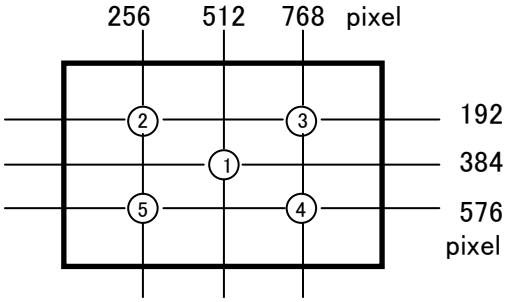


【*4】This shall be measured at center of the screen.

【*5】Definition of white uniformity:

White uniformity is defined as the following with five measurements.
(①～⑤)

$$\delta_w = \frac{\text{Maximum luminance of 5 points(①～⑤).}}{\text{Minimum luminance of 5 points(①～⑤).}}$$



10. Handling Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable.

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

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

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

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

f) 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.

g) Since there is a circuit board in the module back, stress is not added at the time of a design assembly. Please make it like. If stress is added, there is a possibility that circuit parts may be damaged.

h) It causes an irregular display and the defective indication, etc., when always put constant pressure on the back of the module.
Please do not make the structure to press the back of the module.

i) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.

j) Connect GND to stabilize against EMI and external noise.

k) When handling LCD modules and assembling them into cabinets, please avoid that long-terms 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 modules. Do not use the LCD module under such environment.

l) 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.

m) Be careful when using it for long time with fixed pattern display as it may cause accidential image.

n) Adjusting volume have been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.

o) 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.

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

q) Notice : Never take to pieces the module , because it will cause failure.
Please do not peel off the Black tape pasted to the product.

r) An abnormal display by changing in quality of the polarizing plate might occur regardless of contact or no contact to the polarizing plate, because of epoxy resin (amine system curing agent) that comes out from the material and the packaging material used for the set side, the silicon adhesive (dealcoholization system and oxime system), and the tray blowing agents (azo-compound), etc.
Please confirm adaptability with your employed material.

11. Packing form

a) Piling number of cartons : MAX. 6

b) Package quantity in one carton: 10pcs

c) Carton size(TYP): 450mm(W) × 313mm(D)×406mm(H)

d) Total mass of one carton filled with full modules(10pcs): 10.5kg

12. Reliability test items

No.	Test item	Conditions	Remark
1	High temperature storage test	Ambient temperature 65℃ 240H	【Note1】
2	Low temperature strage test	Ambient temperature -25℃ 240H	【Note1】
3	High temperature & high humidity operation test	Ambient temperature 40℃、Humidity 95% RH 240H (No condensation.)	【Note1】
4	High temperature operation test	Panel surface 65℃ 240H	【Note1】
5	Low temperature operation test	Ambient temperature 0℃ 240H	【Note1】
6	Vibration test (non-operating)	＜Sin wave＞ Frequency :10～57Hz／Vibration width (one side) :0.076mm :57～500Hz／Gravity:9.8m/s2 Sweep time:11minutes Test period :3H(X, Y, Z direction 1H)	【Note1】
7	Shock test (non-operating)	Max. gravity:490m/s2 Pulse width:11ms Direction:±X,±Y,±Z Test period :1time／1direction	【Note1】
8	Thermal shock test	-25℃[0.5h]～65℃[0.5h]／50cycles	【Note1】

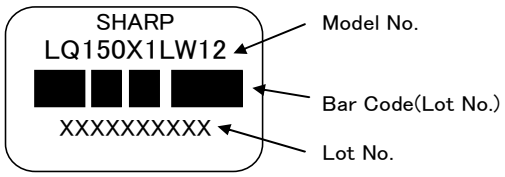
【Note1】 Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function. (normal operation state:Temperature:15～35℃, Humidity:45～75%, Atmospheric pressure:86～106kpa)

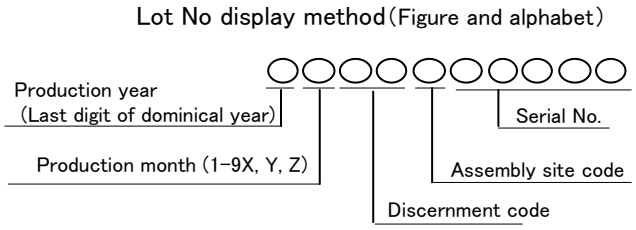
13. Others

13-1. Lot No Label:

A) Module serial label

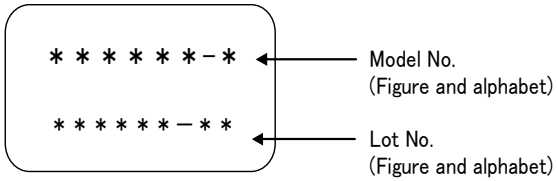
The label that displays SHARP・Model No.(LQ150X1LW12)・Lot No. is stuck on the back of the module.





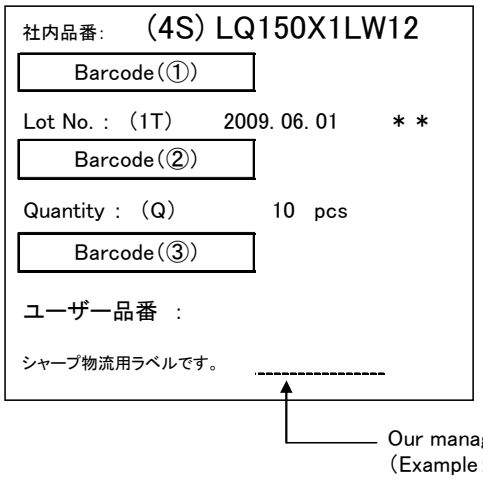
B) Backlight serial label

The label that displays the model No. and lot No. for the backlight is stuck on the back of the module.



13-2. Packing box Label:

The label that displays ①Model number(LQ150X1LW12) ②Lot number ③Quantity of module is stuck on the packing box. Moreover, the display of bar code also applies to this.



① Model number(LQ150X1LW12)

② Lot number (DATA)

③ Quantity of module

A right picture is written to the packing box of module for the RoHS restriction.

※R.C.(RoHs Compliance)means these parts have corresponded with the RoHs directive.

This module corresponds from the first sample to RoHS Directive.

R C

13-3. The ozone-depleting substances is not used.

13-4. If any problem occurs in relation to the description of this specification , it shall be resolved through discussion with spirit of cooperation.

14. Storage conditions

Environmental condition range of storage temperature and humidity

Temperature 0 to 40 degrees Celsius

Relative humidity 95% and below

【Note】Please refer below as a mean value of the environmental conditions.

Summer time temperature 20 to 35 degrees Celsius humidity , 85% and below

Winter time temperature 5 to 15 degrees Celsius humidity , 85% and below

Please maintain within 240 hours of accumulated length of storage time, with conditions of 40 degrees Celsius and room humidity of 95%.

Direct sun light

Please keep the product in a dark room or cover the product to protect from direct sun light.

Atmospheric condition

Please refrain from keeping the product with possible corrosive gas or volatile flux.

Prevention of dew

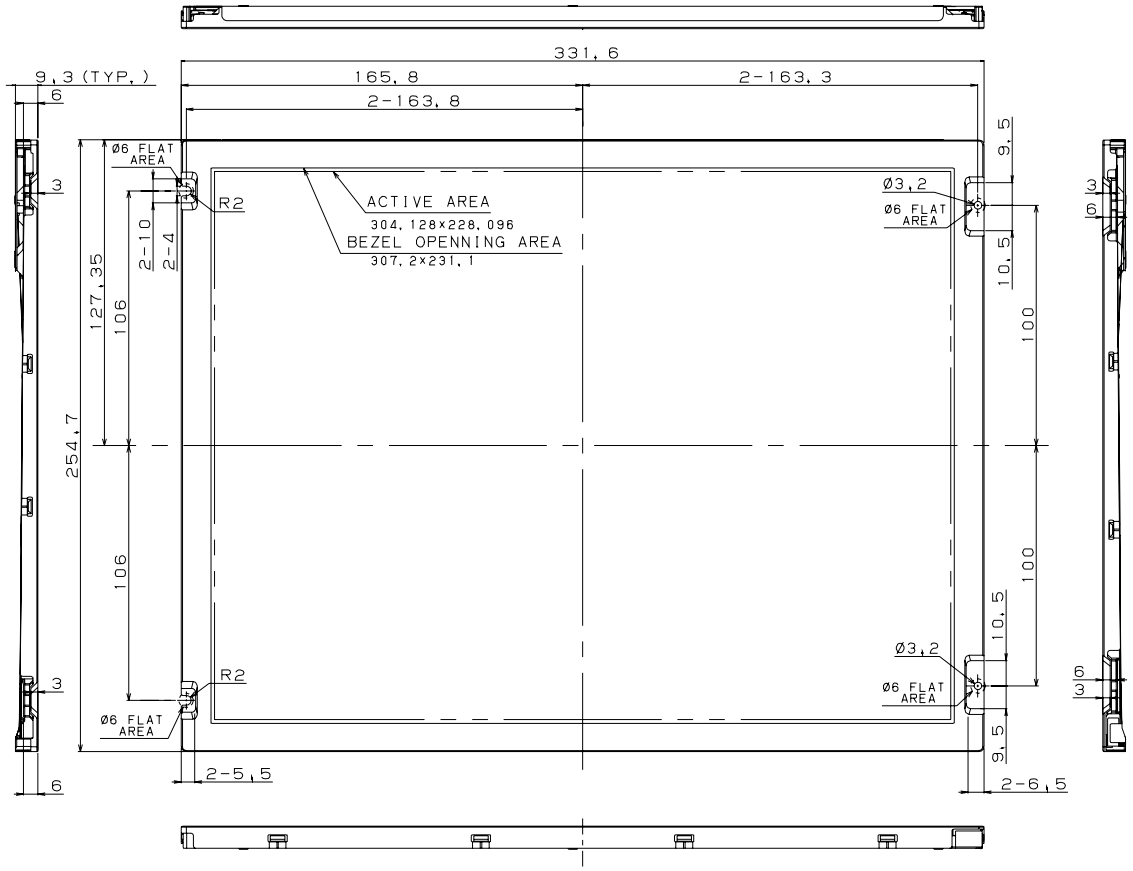
Please store the product carton either on a wooden pallet or a stand / rack to prevent dew.

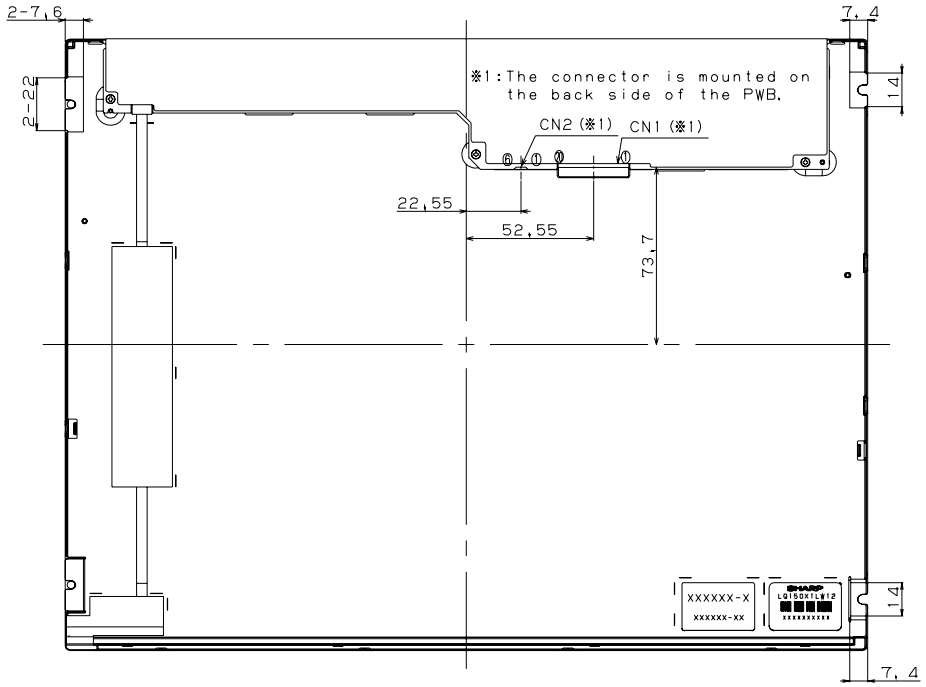
Do not place directly on the floor. In addition, to obtain moderate ventilation in between the pallet's top and bottom surfaces, pile the cartons up in a single direction and in order.

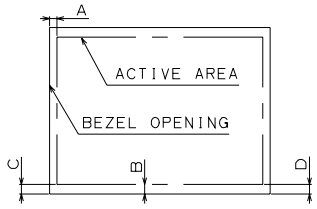
Please place the product cartons away from the storage wall.

Storage period

Within above mentioned conditions, maximum storage period should be one year.







1) TOLERANCE X-DIRECTION A:1.5±0.8
2) TOLERANCE Y-DIRECTION B:1.5±0.8
3) OBLIQUITY OF DISPLAY AREA |C-D|<0.8

【I/F Connector】
CN1:DF14H-20P-1.25H(HIROSE)
or MSB240420(STM)

【LED Backlight Connector】
CN2:SM06B-SHLS-TF(JST)

NOTES
1) UNSPECIFIED TOLERANCE TO BE ±0.5
2) TIGHTEN TORQUE(RECOMMENDATION)
0.294±0.02N・m(3.0±0.2kgf・cm)
※Please confirm whether there is the problem such as loosening of the screw in a real machine.
3) Never take to pieces the module, because it will cause failure, Please do not peel off the pwb cover, screw, tape pasted to the product.

Fig. 1 : LQ150X1LW12 OUTLINE DIMENSIONS

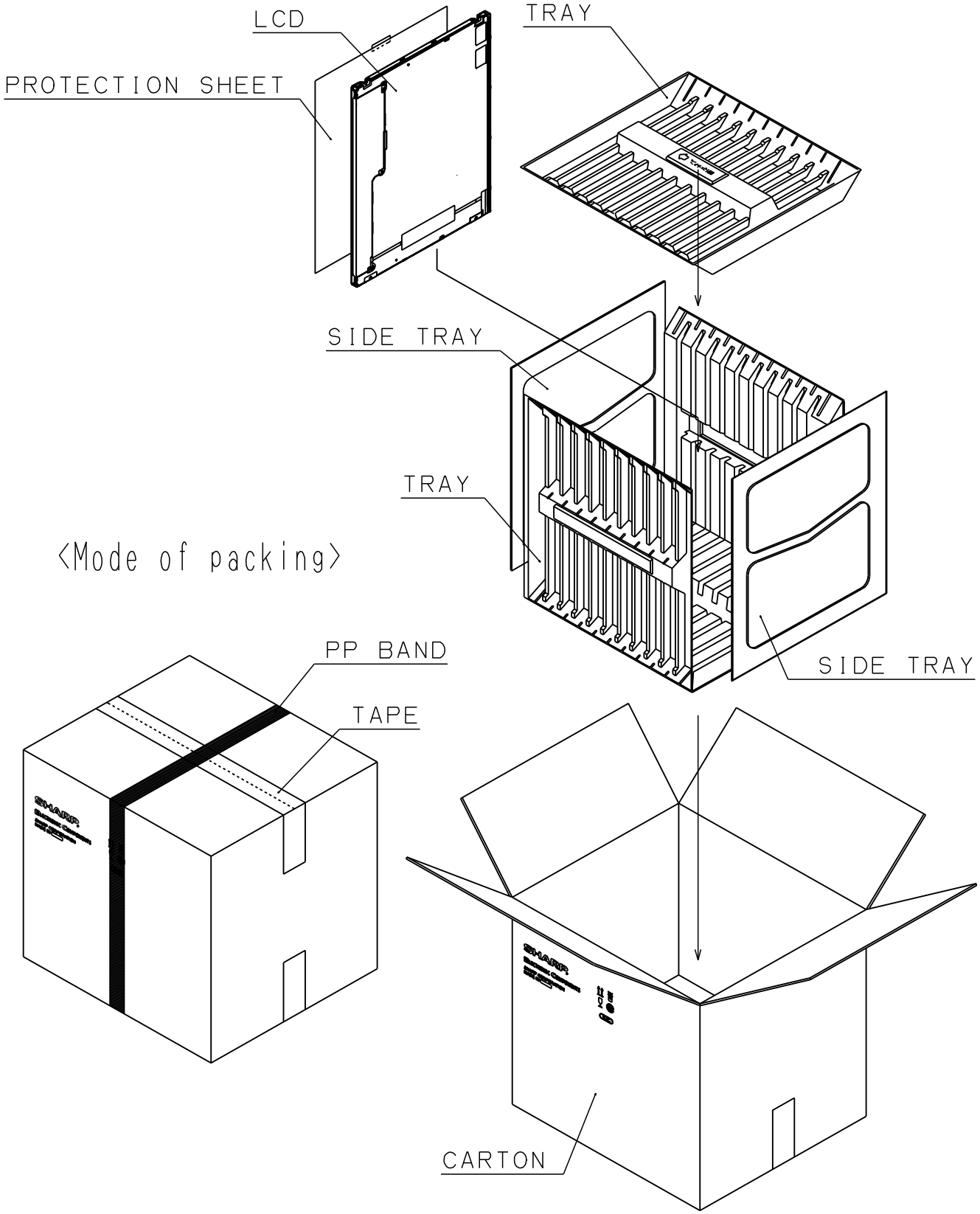


Fig.3 : PACKING FORM

【Appendix A】

Output step table to input data (P.13 8-1/8-2) of each color (R,G,B)

	R	G	B
Number of steps	200	221	209

Step value	Output step		
	R	G	B
GS0	0	0	0
GS1	0	1	0
GS2	0	2	0
GS3	0	3	0
GS4	0	4	0
GS5	0	8	0
GS6	1	12	0
GS7	6	14	0
GS8	15	14	0
GS9	18	17	0
GS10	19	19	1
GS11	23	20	2
GS12	25	22	3
GS13	26	24	4
GS14	27	25	5
GS15	28	26	7
GS16	30	28	8
GS17	31	28	9
GS18	32	30	11
GS19	33	31	12
GS20	34	32	13
GS21	35	33	15
GS22	36	34	16
GS23	37	34	17
GS24	38	35	18
GS25	39	36	19
GS26	39	37	21
GS27	40	38	22
GS28	41	39	24
GS29	42	40	25
GS30	43	41	26
GS31	43	41	27
GS32	44	42	28
GS33	45	43	29
GS34	45	44	30
GS35	46	44	32
GS36	47	45	33
GS37	47	46	34
GS38	48	47	35
GS39	49	47	36
GS40	49	48	37
GS41	50	48	38
GS42	51	49	39
GS43	51	50	40
GS44	52	51	41
GS45	52	51	42
GS46	53	52	43
GS47	54	52	44
GS48	54	53	45
GS49	55	54	46
GS50	56	54	47
GS51	56	55	48
GS52	57	56	48
GS53	58	56	49
GS54	58	57	50
GS55	59	58	50
GS56	60	58	51
GS57	60	59	52
GS58	61	60	53
GS59	62	60	53
GS60	63	61	54
GS61	63	62	55
GS62	64	63	56
GS63	65	63	57
GS64	66	64	57
GS65	67	65	58
GS66	68	66	59
GS67	69	66	60
GS68	69	67	60
GS69	70	68	61
GS70	71	69	62
GS71	72	70	63
GS72	73	71	63
GS73	73	72	64
GS74	75	72	65
GS75	76	73	65
GS76	76	74	66
GS77	78	75	67
GS78	78	76	68
GS79	79	77	68
GS80	81	77	69
GS81	82	78	70
GS82	83	79	70
GS83	83	80	71
GS84	84	81	72
GS85	85	82	73

Step value	Output step		
	R	G	B
GS86	86	83	73
GS87	87	84	74
GS88	88	85	75
GS89	90	86	75
GS90	90	87	76
GS91	92	88	77
GS92	92	89	78
GS93	93	90	78
GS94	94	91	79
GS95	96	92	80
GS96	96	93	81
GS97	98	94	81
GS98	98	95	82
GS99	99	96	83
GS100	100	97	84
GS101	101	98	85
GS102	103	99	85
GS103	104	100	86
GS104	105	101	87
GS105	106	102	88
GS106	107	103	89
GS107	108	104	89
GS108	109	105	90
GS109	110	106	91
GS110	112	106	92
GS111	113	107	93
GS112	114	108	93
GS113	115	109	94
GS114	116	110	95
GS115	116	112	96
GS116	118	112	97
GS117	119	113	97
GS118	120	114	98
GS119	121	116	99
GS120	122	117	100
GS121	123	118	101
GS122	124	119	101
GS123	125	120	102
GS124	126	121	103
GS125	127	122	104
GS126	128	123	105
GS127	129	124	106
GS128	130	125	107
GS129	131	126	108
GS130	133	127	108
GS131	134	128	109
GS132	135	129	110
GS133	136	130	111
GS134	137	132	112
GS135	138	133	113
GS136	139	134	114
GS137	140	135	115
GS138	142	136	116
GS139	142	137	116
GS140	144	138	117
GS141	145	139	118
GS142	146	140	119
GS143	147	141	120
GS144	149	142	121
GS145	150	143	122
GS146	150	145	123
GS147	152	146	124
GS148	153	147	124
GS149	154	148	125
GS150	155	149	126
GS151	156	150	127
GS152	158	151	128
GS153	159	152	129
GS154	160	153	130
GS155	160	154	130
GS156	161	155	131
GS157	163	156	132
GS158	164	157	133
GS159	165	158	134
GS160	166	159	135
GS161	167	160	136
GS162	168	161	137
GS163	169	163	137
GS164	170	164	138
GS165	172	165	139
GS166	173	166	140
GS167	173	167	141
GS168	174	168	142
GS169	175	169	143
GS170	175	171	144
GS171	176	172	145

Step value	Output step		
	R	G	B
GS172	177	173	146
GS173	178	173	147
GS174	179	174	148
GS175	180	175	149
GS176	181	176	150
GS177	181	177	151
GS178	182	177	152
GS179	183	178	153
GS180	183	179	153
GS181	185	180	154
GS182	185	181	155
GS183	186	182	156
GS184	187	182	157
GS185	188	183	158
GS186	189	184	159
GS187	189	185	160
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