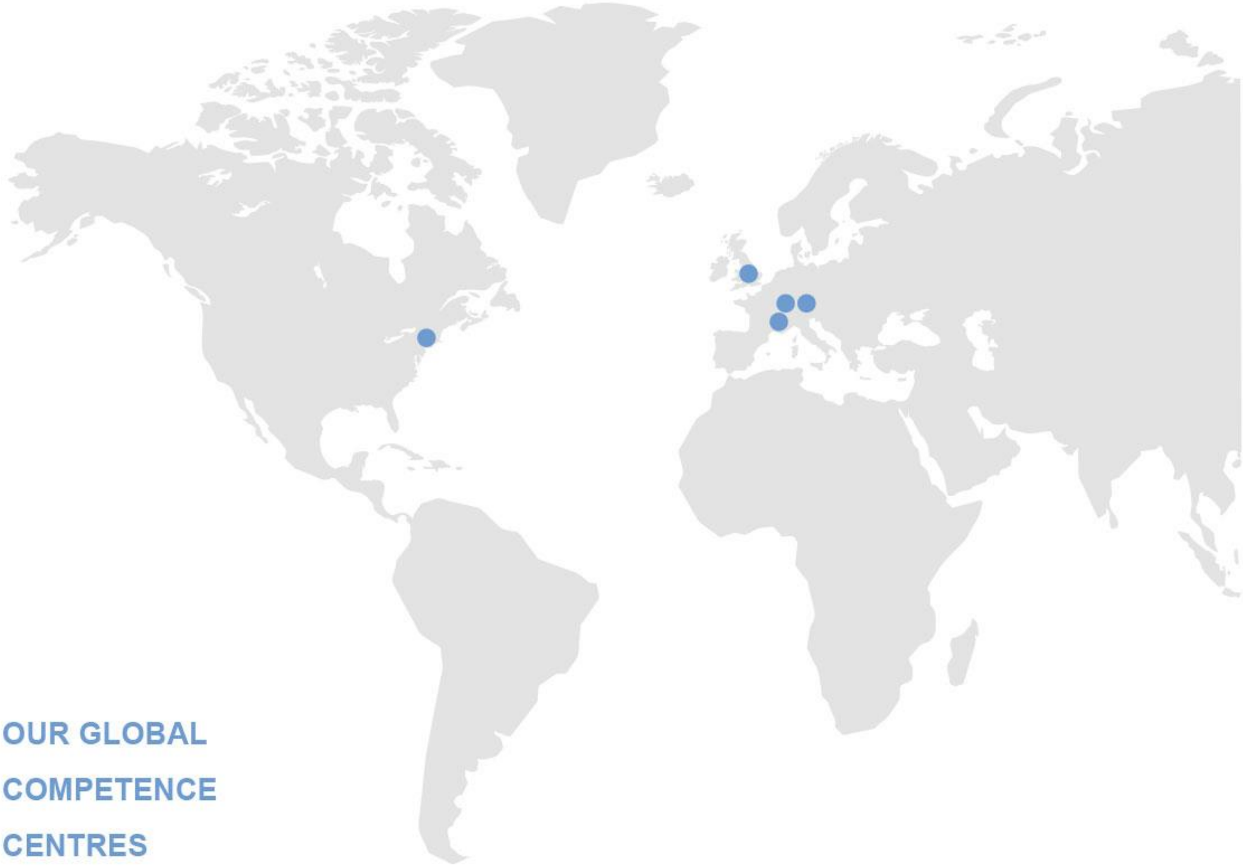
FORTEC
ELEKTRONIK AG



OUR GLOBAL
COMPETENCE
CENTRES

APOLLO DISPLAY TECHNOLOGIES

DISTEC

DISPLAY TECHNOLOGY

Datasheet

Kyocera

TCG121SVLQEPNN-AN20

KY-01-011

The information contained in this document has been carefully researched and is, to the best of our knowledge, accurate. However, we assume no liability for any product failures or damages, immediate or consequential, resulting from the use of the information provided herein. Our products are not intended for use in systems in which failures of product could result in personal injury. All trademarks mentioned herein are property of their respective owners. All specifications are subject to change without notice.

SPEC

Spec No.	TQ3C-8EAF0-E1YAC67-00
Date	February 28, 2013

TYPE : TCG121SVLQEPNN-AN20

< 12.1 inch SVGA transmissive color TFT with LED backlight>

CONTENTS

1. Application
2. Construction and outline
3. Mechanical specifications
4. Absolute maximum ratings
5. Electrical characteristics
6. Optical characteristics
7. Interface signals
8. Input timing characteristics
9. Lot number identification
10. Warranty
11. Precautions for use
12. Reliability test data
13. Outline drawing

Issued
Date: Mar 25, 2013
KYOCERA
Hayato LCD Division

KYOCERA CORPORATION
SHIGA YASU PLANT
LCD DIVISION

This specification is subject to change without notice.
Consult Kyocera before ordering.

Original Issue Date	Designed by: Engineering dept.			Confirmed by: QA dept.	
	Prepared	Checked	Approved	Checked	Approved
February 28, 2013	R.Nakao	H. Mori	M.FujiTani	I.Hamada	

Warning

1. This Kyocera LCD module has been specifically designed for use only in electronic devices and industrial machines in the area of audio control, office automation, industrial control, home appliances, etc. The module should not be used in applications where the highest level of safety and reliability are required and module failure or malfunction of such module results in physical harm or loss of life, as well as enormous damage or loss. Such fields of applications include, without limitation, medical, aerospace, communications infrastructure, atomic energy control. Kyocera expressly disclaims any and all liability resulting in any way to the use of the module in such applications.

2. Customer agrees to indemnify, defend and hold Kyocera harmless from and against any and all actions, claims, damages, liabilities, awards, costs, and expenses, including legal expenses, resulting from or arising out of Customer's use, or sale for use, or Kyocera modules in applications.

Caution

1. Kyocera shall have the right, which Customer hereby acknowledges, to immediately scrap or destroy tooling for Kyocera modules for which no Purchase Orders have been received from the Customer in a two-year period.

Revision record

Date	Designed by : Engineering dept.			Confirmed by : QA dept.	
	Prepared	Checked	Approved	Checked	Approved

Rev.No.	Date	Page	Descriptions

1. Application

This document defines the specification of TCG121SVLQEPNN-AN20. (RoHS Compliant)

2. Construction and outline

LCD : Transmissive color dot matrix type TFT
Backlight system : LED
Polarizer : Anti-Glare treatment
Interface : LVDS
Additional circuit : Timing controller, Power supply (3.3V input)
: Constant current circuit for LED Backlight(12V input)

3. Mechanical specifications

Item	Specification	Unit
Outline dimensions 1)	265(W)×(207.7)(H)×9.6(D)	mm
Active area	246(W)×184.5(H) (30.8cm/12.1 inch(Diagonal))	mm
Dot format	800×(R,G,B)(W)×600(H)	dot
Dot pitch	0.1025(W)×0.3075(H)	mm
Base color 2)	Normally Black	-
Mass	670	g

1) Projection not included. Please refer to outline for details.
2) Due to the characteristics of the LCD material, the color varies with environmental temperature.

4. Absolute maximum ratings

4-1. Electrical absolute maximum ratings

Item		Symbol	Min.	Max.	Unit
Supply voltage(+3.3V)		V_{DD}	-0.3	4.0	V
Supply voltage(+12V)		V_{IN}	-0.3	14.0	V
Input signal voltage 1)	RxINi+, RxINi- (i= 0,1,2,3)	V_{I1}	-0.3	2.8	V
	CK IN+, CK IN-	V_{I2}	-0.3	2.8	V
	SELLVDS	V_{I3}	-0.3	V_{DD}+0.5	V
	BLBRT, BLEN	V_{I4}	-0.3	V_{IN}	V

1) V_{DD} must be supplied correctly within the range described in 5-1.

4-2. Environmental absolute maximum ratings

Item		Symbol	Min.	Max.	Unit
Operating temperature	1)	T_{OP}	-20	70	°C
Storage temperature	2)	T_{STO}	-30	80	°C
Operating humidity	3)	H_{OP}	10	4)	%RH
Storage humidity	3)	H_{STO}	10	4)	%RH
Vibration		-	5)	5)	-
Shock		-	6)	6)	-

1) Operating temperature means a temperature which operation shall be guaranteed. Since display performance is evaluated at 25°C, another temperature range should be confirmed.

2) Temp. = -30°C＜48h , Temp. = 80°C＜168h
Store LCD at normal temperature/humidity. Keep them free from vibration and shock.
An LCD that is kept at a low or a high temperature for a long time can be defective due to other conditions, even if the low or high temperature satisfies the standard.
(Please refer to “Precautions for Use” for details.)

3) Non-condensing

4) Temp.≦40°C, 85%RH Max.
Temp.＞40°C, Absolute humidity shall be less than 85%RH at 40°C.

5)

Frequency	10～55 Hz	Acceleration value (0.3～9 m/s^2)
Vibration width	0.15mm	
Interval	10-55-10 Hz 1 minutes	

2 hours in each direction X, Y, Z (6 hours total)
EIAJ ED-2531

6) Acceleration: 490 m/s^2, Pulse width: 11 ms
3 times in each direction: ±X, ±Y, ±Z
EIAJ ED-2531

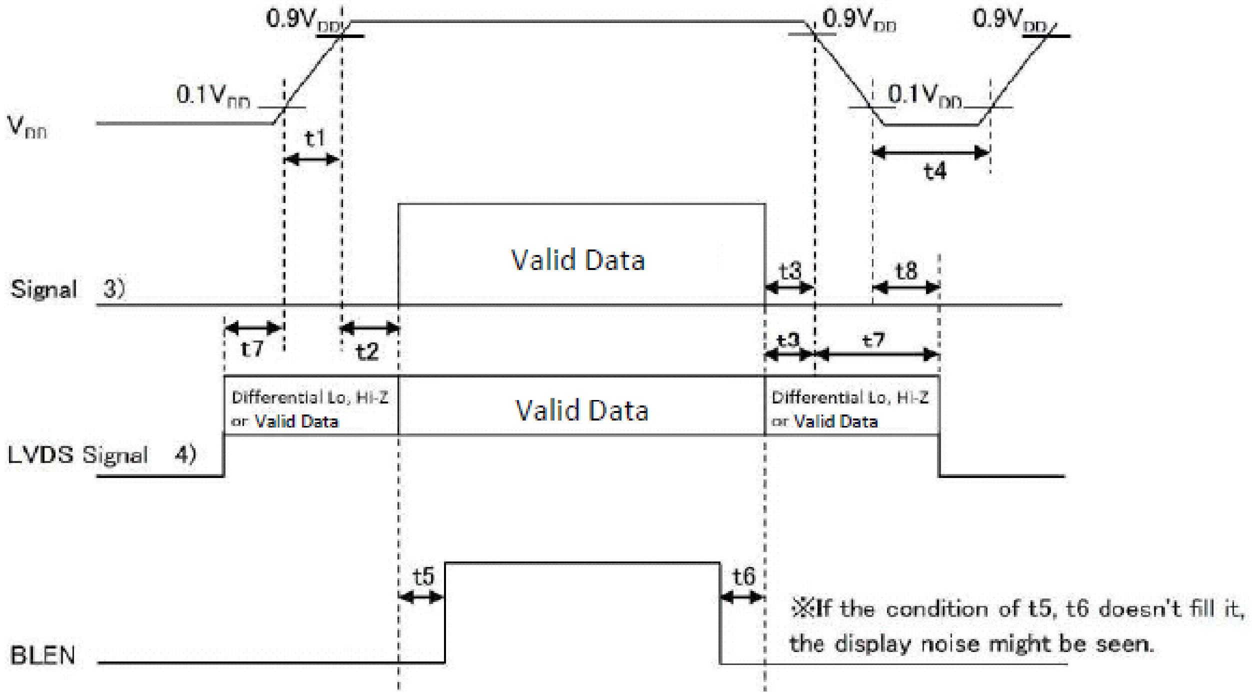
5. Electrical characteristics

5-1. LCD

Temp. = -20～70°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage 1)	V_{DD}	-	3.0	3.3	3.6	V
Current consumption	I_{DD}	2)	-	290	370	mA
Permissive input ripple voltage	V_{RP}	V_{DD}=3.3V	-	-	100	mVp-p
Input signal voltage 3)	V_{IL}	"Low" level	0	-	0.8	V
	V_{IH}	"High" level	2.0	-	V_{DD}	V
Input leak current	I_{OL}	V_{I3}=0V	-10	-	10	μA
	I_{OH}	V_{I3}=3.3V	-	-	400	μA
LVDS Input voltage 4)	V_L	-	0	-	1.9	V
Differential input voltage 4)	V_{ID}	-	250	350	450	mV
Differential input threshold voltage 4) 5)	V_{TL}	"Low" level	V_{CM}-100	-	-	mV
	V_{TH}	"High" level	-	-	V_{CM}+100	mV
Terminator	R_1	-	-	100	-	Ω
V_{DD}-turn-on conditions 1) 6)	t1	-	0.1	-	10	ms
	t2	-	0	-	-	ms
	t3	-	0	-	-	ms
	t4	-	1.0	-	-	s
	t5	-	200	--	-	ms
	t6	-	200	-	-	ms
	t7	-	0	-	10	s
	t8	-	0	-	-	ms

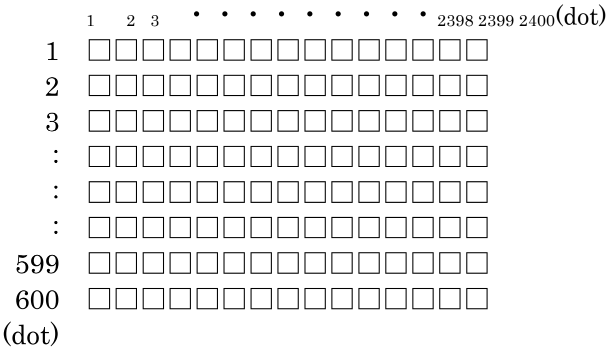
1) V_{DD}-turn-on conditions


0.9V_DD
0.1V_DD
V_DD
t1
0.9V_DD
0.1V_DD
0.9V_DD
t4
Valid Data
Signal 3)
t3
t8
t7
t2
t3
t7
Differential Lo, Hi-Z or Valid Data
Valid Data
Differential Lo, Hi-Z or Valid Data
LVDS Signal 4)
t5
t6
BLEN

※If the condition of t5, t6 doesn't fill it, the display noise might be seen.

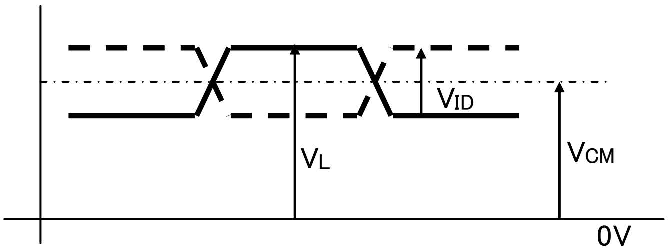
2) Display pattern:

V_{DD} = 3.3V, Temp. = 25°C


1 2 3 • • • • • • • • • 2398 2399 2400(dot)
1
2
3
:
:
:
599
600
(dot)

3) Input signal : SELLVDS

4) Input signal : RxIN3+, RxIN3-, RxIN2+, RxIN2-, RxIN1+, RxIN1-, RxIN0+, RxIN0-
CK IN+, CK IN-


VID
VL
VCM
0V

5) V_{CM} : LVDS Common mode voltage (V_{CM}=1.25V)

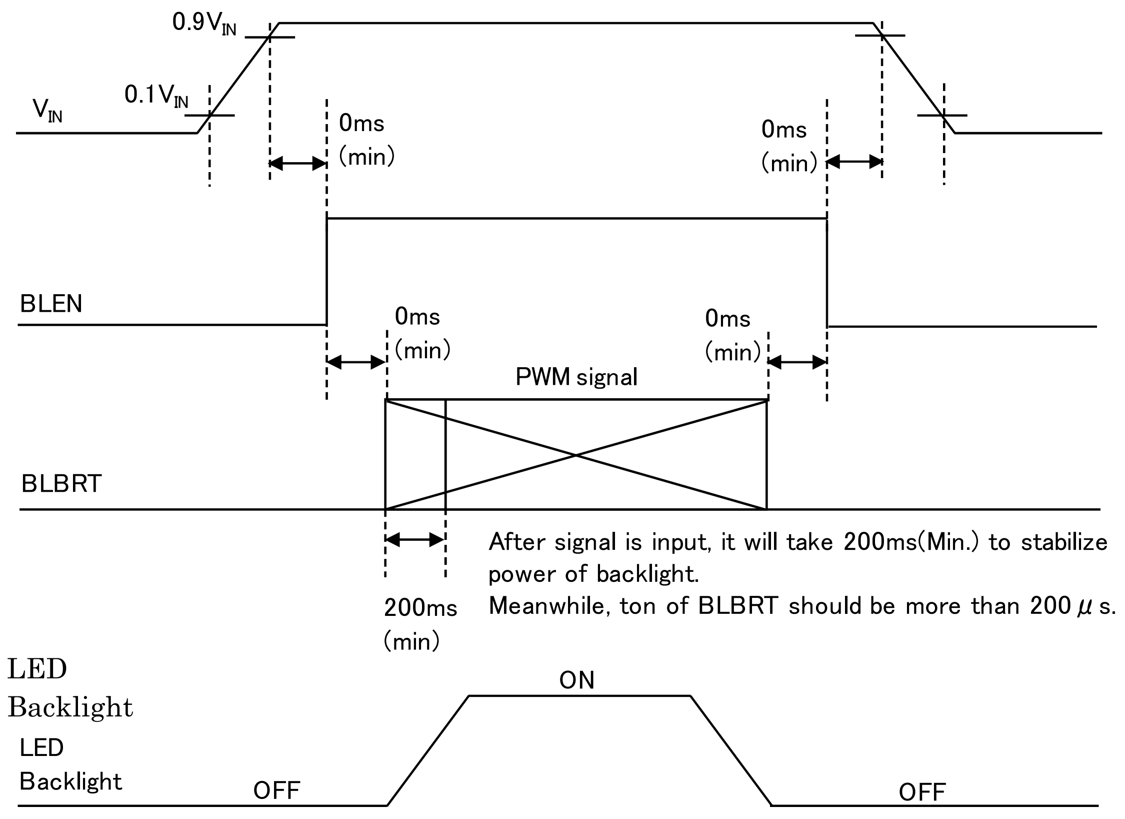
6) Please power on LVDS transmitter at the same time as VDD, or LVDS transmitter should be powered on first.

5-2. Constant current circuit for LED Backlight

Temp. = -20～70°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage 1)	V_{IN}	-	10.8	12.0	13.2	V
Current consumption	I_{IN}	2)	-	500	630	mA
Permissive input ripple voltage	V_{RP_BL}	V_{IN}=12.0V	-	-	100	mVp-p
BLBRT Input signal voltage	V_{IL_BLBRT}	"Low" level	0	-	0.8	V
	V_{IH_BLBRT}	"High" level	2.3	-	V_{IN}	V
BLBRT Input pull-down resistance	R_{IN_BLBRT}	-	100	300	500	kΩ
BLEN Input signal voltage	V_{IL_BLEN}	"Low" level	0	-	0.8	V
	V_{IH_BLEN}	"High" level	2.3	-	V_{IN}	V
BLEN Input pull-down resistance	R_{IN_BLEN}	-	100	300	500	kΩ
PWM Frequency 3)	f_{PWM}	-	200	-	10k	Hz
PWM Duty ratio 3)	D_{PWM}	f_{PWM}=200Hz	1	-	100	%
		f_{PWM}=2kHz	10	-	100	%
		f_{PWM}=10kHz	50	-	100	%
Operating life time 4), 5)	T	Temp.=25°C	-	(70,000)	-	h

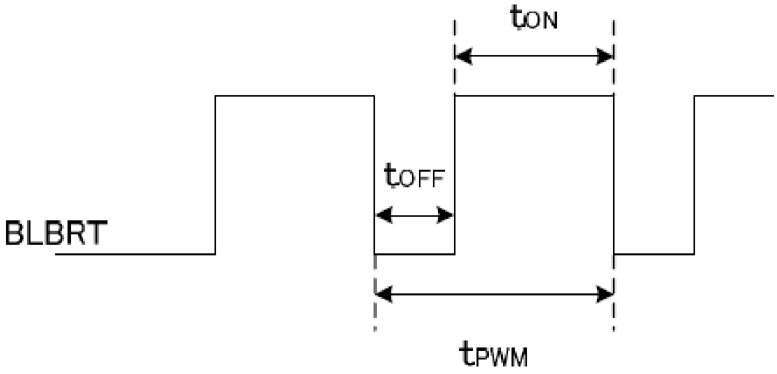
1) V_{IN}-turn-on conditions


0.9V$_{IN}$
0.1V$_{IN}$
V$_{IN}$
0ms
(min)
0ms
(min)
BLEN
0ms
(min)
0ms
(min)
PWM signal
BLBRT
200ms
(min)
LED
Backlight
ON
LED
Backlight
OFF
OFF

After signal is input, it will take 200ms(Min.) to stabilize power of backlight.
Meanwhile, ton of BLBRT should be more than 200 μ s.

2) V_{IN} = 12V, Temp. = 25°C, D_{PWM} = 100%

3) PWM Timing Diagram



t_{ON}, $t_{OFF} \geqq 50\,\mu s$.
In case of lower frequency, the deterioration of the display quality, flicker etc., may occur.

4) When brightness decrease 50% of minimum brightness.
The average life of a LED will decrease when the LCD is operating at higher temperatures.

5) Life time is estimated data.(Condition : IF=60mA, Ta=25℃ in chamber).

6. Optical characteristics

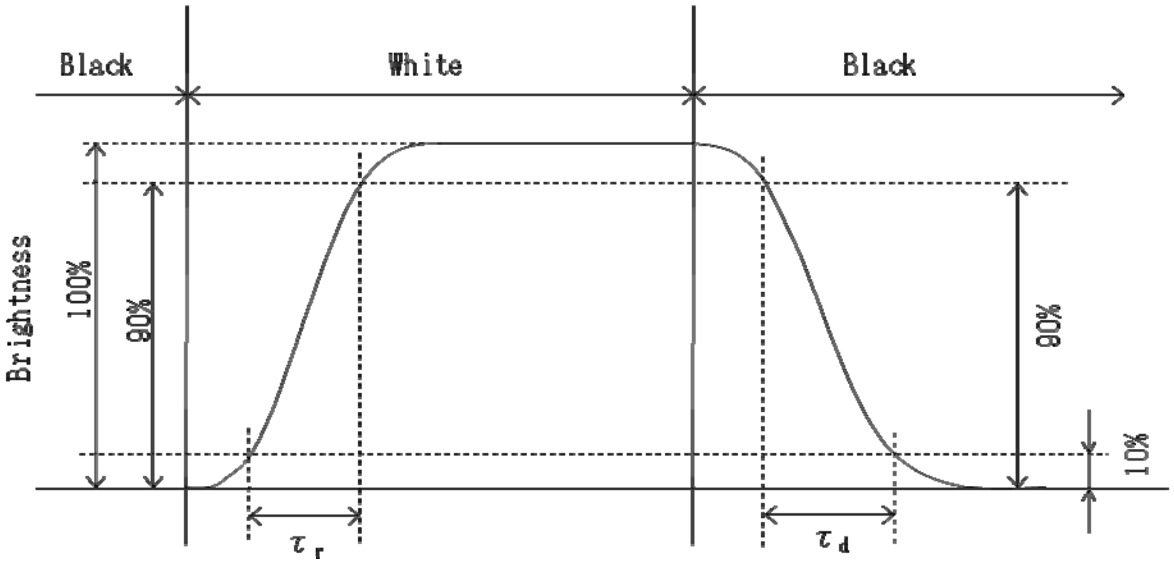
Measuring spot = ϕ6.0mm, Temp. = 25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Response time	Rise	τ_r	θ=ϕ=0°	-	18	-	ms
	Down	τ_d	θ=ϕ=0°	-	12	-	ms
Viewing angle range		θ UPPER	CR≧10	-	85	-	deg.
		θ LOWER		-	85	-	
		ϕ LEFT		-	85	-	deg.
		ϕ RIGHT		-	85	-	
Contrast ratio		CR	θ=ϕ=0°	450	650	-	-
Brightness		L	IF=60mA/Line	(315)	(450)	-	cd/m²
Chromaticity coordinates	Red	x	θ=ϕ=0°	0.550	0.600	0.650	-
		y		0.300	0.350	0.400	
	Green	x	θ=ϕ=0°	0.285	0.335	0.385	
		y		0.520	0.570	0.620	
	Blue	x	θ=ϕ=0°	0.100	0.150	0.200	
		y		0.070	0.120	0.170	
	White	x	θ=ϕ=0°	0.265	0.315	0.365	
		y		0.290	0.340	0.390	

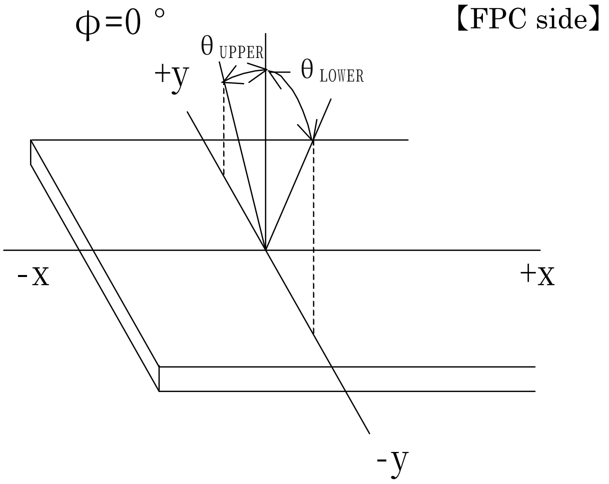
6-1. Definition of contrast ratio

$$\text{CR(Contrast ratio)} = \frac{\text{Brightness with all pixels "White"}}{\text{Brightness with all pixels "Black"}}$$

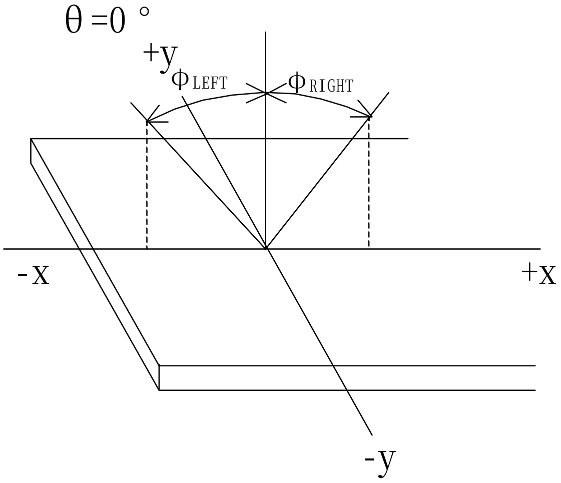
6-2. Definition of response time



6-3. Definition of viewing angle

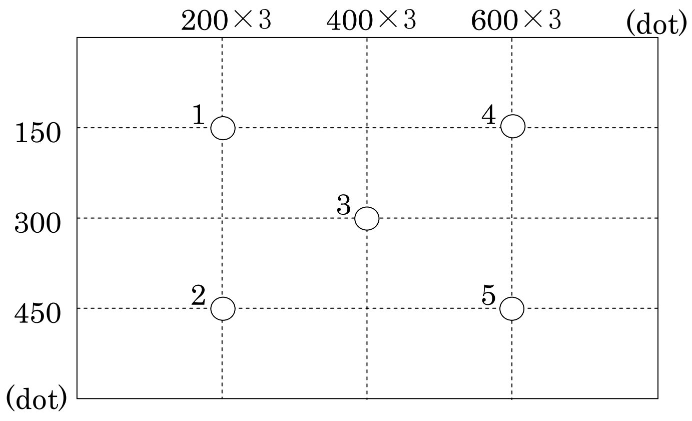

φ=0 °
【FPC side】
θ UPPER
θ LOWER
+y
-x
+x
-y

θ direction


θ =0 °
+y
φ LEFT
φ RIGHT
-x
+x
-y

φ direction

6-4. Brightness measuring points


200×3
400×3
600×3
(dot)
150
300
450
(dot)
1
2
3
4
5

1) Rating is defined as the white brightness at center of display screen(3).
2) 5 minutes after LED is turned on. (Ambient Temp.=25℃)

7. Interface signals

7-1. Interface signals

No.	Symbol	Description	Note
1	GND	GND	
2	SELLVDS	Mode select signal(LVDS Data mapping)	
3	GND	GND	
4	GND	GND	
5	RxIN3+	LVDS receiver signal CH3(+)	LVDS
6	RxIN3-	LVDS receiver signal CH3(-)	LVDS
7	GND	GND	
8	CK IN+	LVDS receiver signal CK(+)	LVDS
9	CK IN-	LVDS receiver signal CK(-)	LVDS
10	GND	GND	
11	RxIN2+	LVDS receiver signal CH2(+)	LVDS
12	RxIN2-	LVDS receiver signal CH2(-)	LVDS
13	GND	GND	
14	RxIN1+	LVDS receiver signal CH1(+)	LVDS
15	RxIN1-	LVDS receiver signal CH1(-)	LVDS
16	GND	GND	
17	RxIN0+	LVDS receiver signal CH0(+)	LVDS
18	RxIN0-	LVDS receiver signal CH0(-)	LVDS
19	GND	GND	
20	GND	GND	
21	V_{DD}	+3.3V power supply	
22	V_{DD}	+3.3V power supply	
23	GND	GND	
24	BLBRT	PWM signal(Brightness adjustment)	
25	BLEN	ON/OFF terminal voltage	
26	GND	GND	
27	V_{IN}	+12V power supply	
28	V_{IN}	+12V power supply	
29	GND	GND	
30	GND	GND	

LCD connector	:	FI-X30SSLA-HF	(JAE)
Matching connector	:	FI-X30HL	(JAE)
	:	FI-X30HL-T	(JAE)
	:	FI-X30C2L-NPB	(JAE)
	:	FI-X30C2L-T-NPB	(JAE)

LVDS receiver : Embedded in ASIC

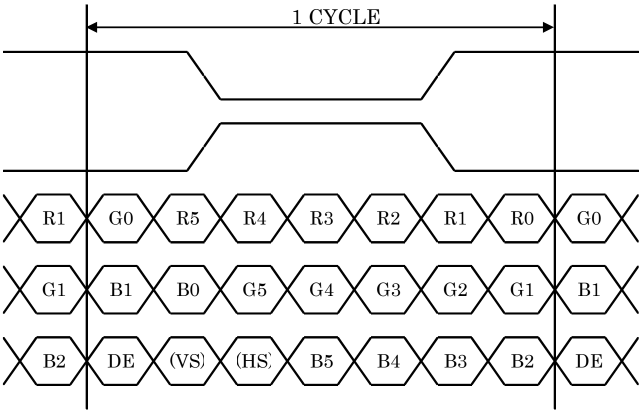
Matching LVDS transmitter : THC63LVDM83R(THine Electronics) or compatible

7-2. Data mapping(6bit RGB input)

1) Location of SELLVDS (THC63LVDM83R(THine Electronics) or compatible)

Transmitter		2Pin 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	—	GND

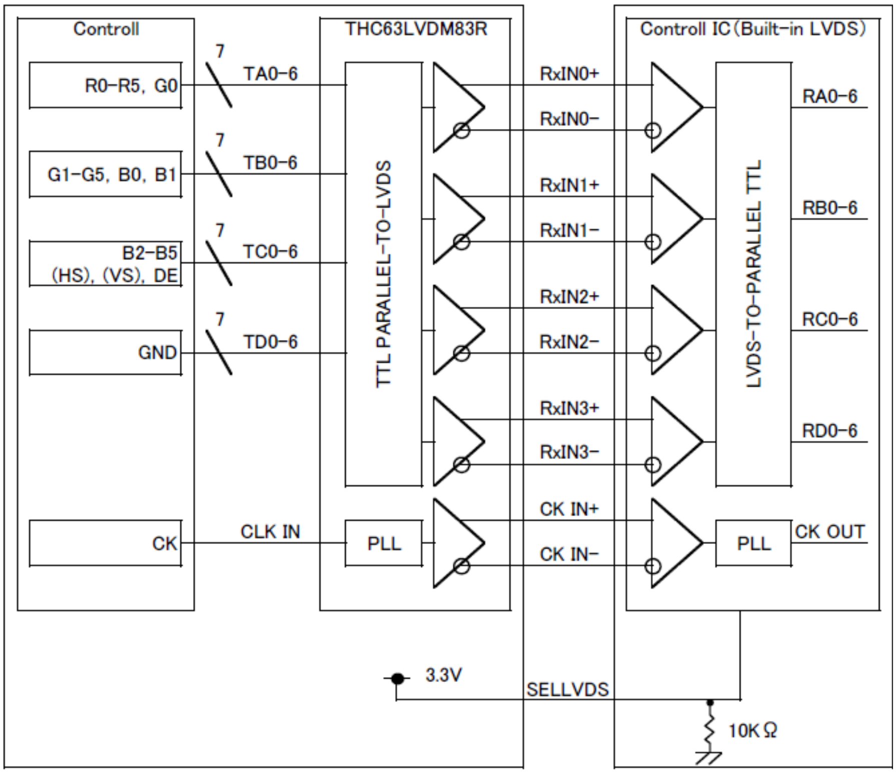
SELLVDS=H(3.3V)


1 CYCLE
R1
G0
R5
R4
R3
R2
R1
R0
G0
G1
B1
B0
G5
G4
G3
G2
G1
B1
B2
DE
(VS)
(HS)
B5
B4
B3
B2
DE

DE : DATA ENABLE
HS : HSYNC
VS : VSYNC

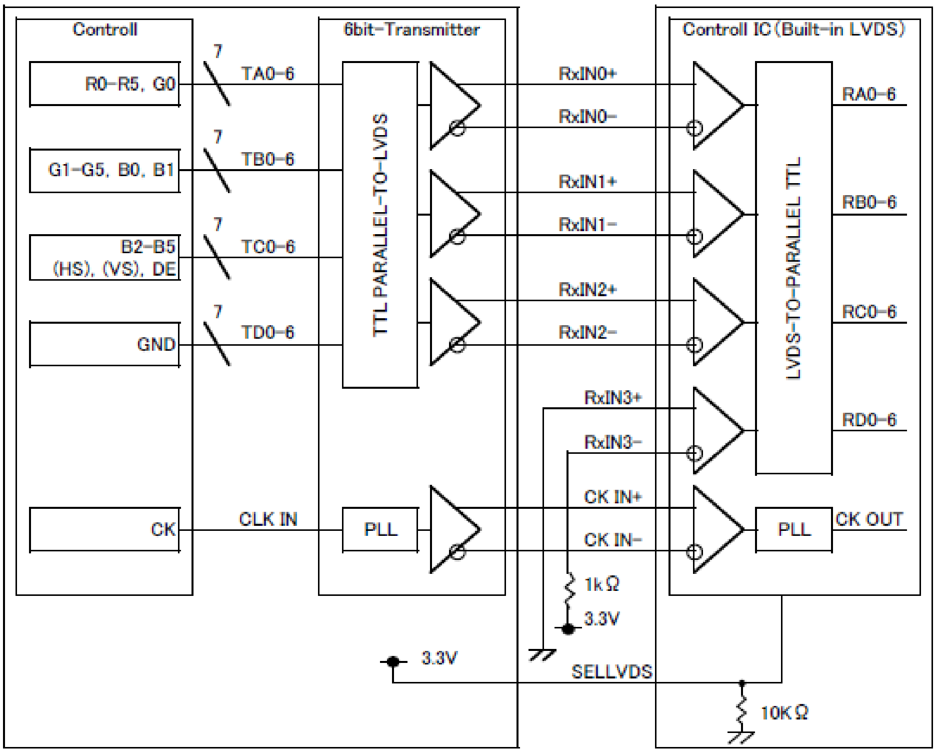
2) Block Diagram

SELLVDS=H(3.3V)


Controll
R0–R5, G0
G1–G5, B0, B1
B2–B5
(HS), (VS), DE
GND
CK
7
TA0–6
7
TB0–6
7
TC0–6
7
TD0–6
CLK IN
THC63LVDM83R
TTL PARALLEL–TO–LVDS
PLL
RxIN0+
RxIN0–
RxIN1+
RxIN1–
RxIN2+
RxIN2–
RxIN3+
RxIN3–
CK IN+
CK IN–
Controll IC (Built–in LVDS)
LVDS–TO–PARALLEL TTL
PLL
RA0–6
RB0–6
RC0–6
RD0–6
CK OUT
3.3V
SELLVDS
10KΩ

※SELLVDS signal line has 10kΩ pulldown resister.

When using “ 6-bit Transmitter ” , please connect the unused channel of the control IC receiver as described in the diagram below.


Controll
R0–R5, G0
G1–G5, B0, B1
B2–B5
(HS), (VS), DE
GND
CK
7
TA0–6
7
TB0–6
7
TC0–6
7
TD0–6
CLK IN
6bit–Transmitter
TTL PARALLEL–TO–LVDS
PLL
RxIN0+
RxIN0–
RxIN1+
RxIN1–
RxIN2+
RxIN2–
RxIN3+
RxIN3–
CK IN+
CK IN–
1kΩ
3.3V
Controll IC (Built–in LVDS)
LVDS–TO–PARALLEL TTL
PLL
RA0–6
RB0–6
RC0–6
RD0–6
CK OUT
3.3V
SELLVDS
10KΩ

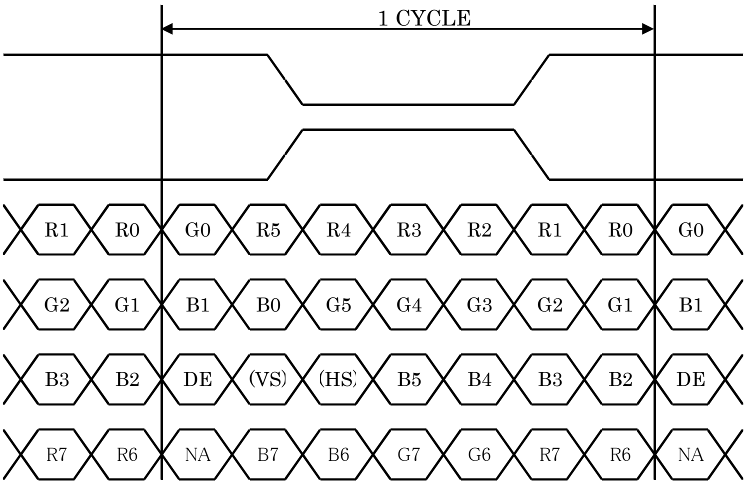
※SELLVDS signal line has 10kΩ pulldown resister.

7-3. Data mapping(8bit RGB input)

1) Location of SELLVDS (THC63LVDM83R(THine Electronics) or compatible)

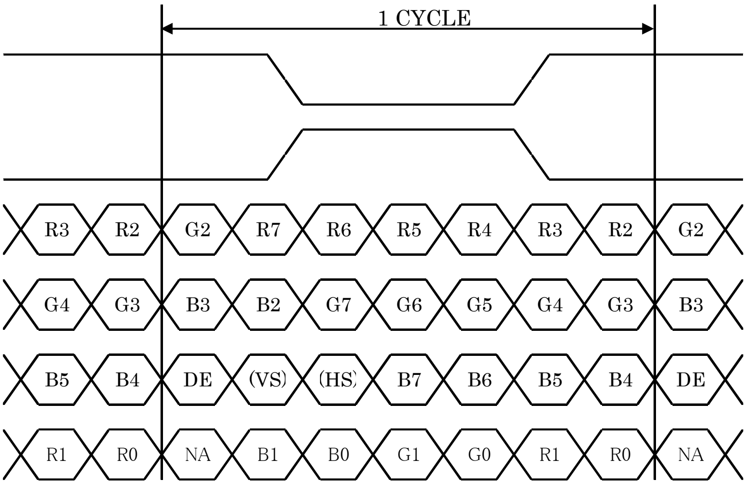
Transmitter		2Pin SELLVDS	
Pin No.	Data	= L(GND) or OPEN	= H(3.3V)
51	TA0	R0(LSB)	R2
52	TA1	R1	R3
54	TA2	R2	R4
55	TA3	R3	R5
56	TA4	R4	R6
3	TA5	R5	R7(MSB)
4	TA6	G0(LSB)	G2
6	TB0	G1	G3
7	TB1	G2	G4
11	TB2	G3	G5
12	TB3	G4	G6
14	TB4	G5	G7(MSB)
15	TB5	B0(LSB)	B2
19	TB6	B1	B3
20	TC0	B2	B4
22	TC1	B3	B5
23	TC2	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


1 CYCLE
R1 R0 G0 R5 R4 R3 R2 R1 R0 G0
G2 G1 B1 B0 G5 G4 G3 G2 G1 B1
B3 B2 DE (VS) (HS) B5 B4 B3 B2 DE
R7 R6 NA B7 B6 G7 G6 R7 R6 NA

DE : DATA ENABLE
HS : HSYNC
VS : VSYNC

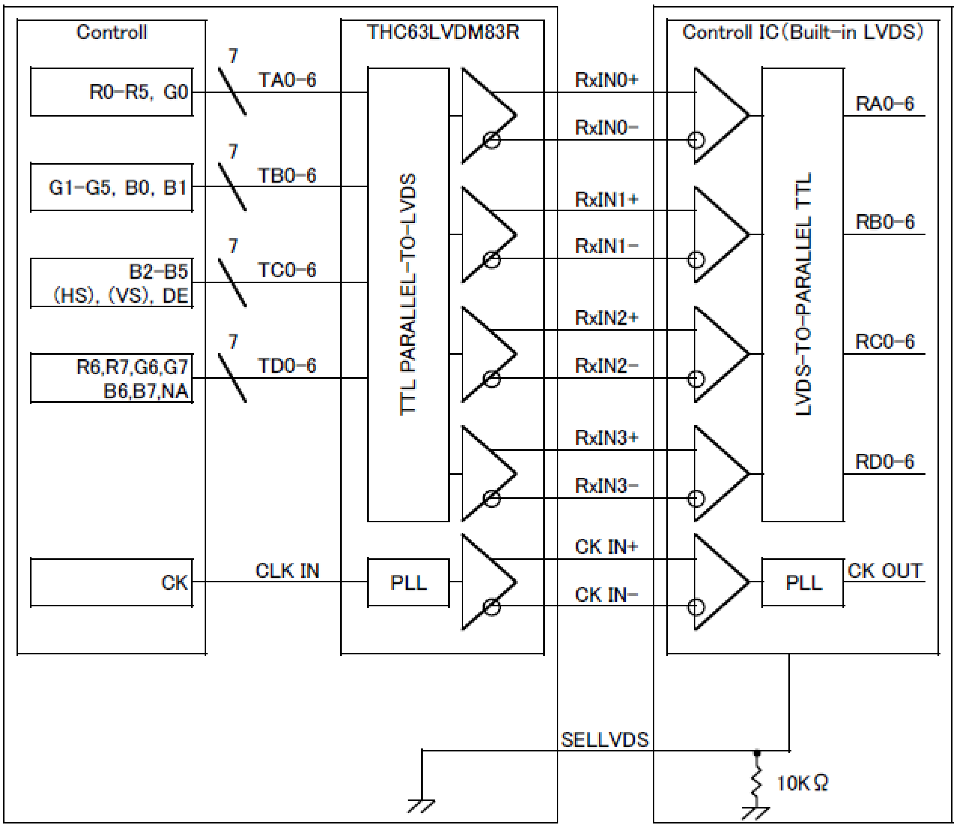
SELLVDS=H(3.3V)


1 CYCLE
R3 R2 G2 R7 R6 R5 R4 R3 R2 G2
G4 G3 B3 B2 G7 G6 G5 G4 G3 B3
B5 B4 DE (VS) (HS) B7 B6 B5 B4 DE
R1 R0 NA B1 B0 G1 G0 R1 R0 NA

DE：DATA ENABLE
HS：HSYNC
VS：VSYNC

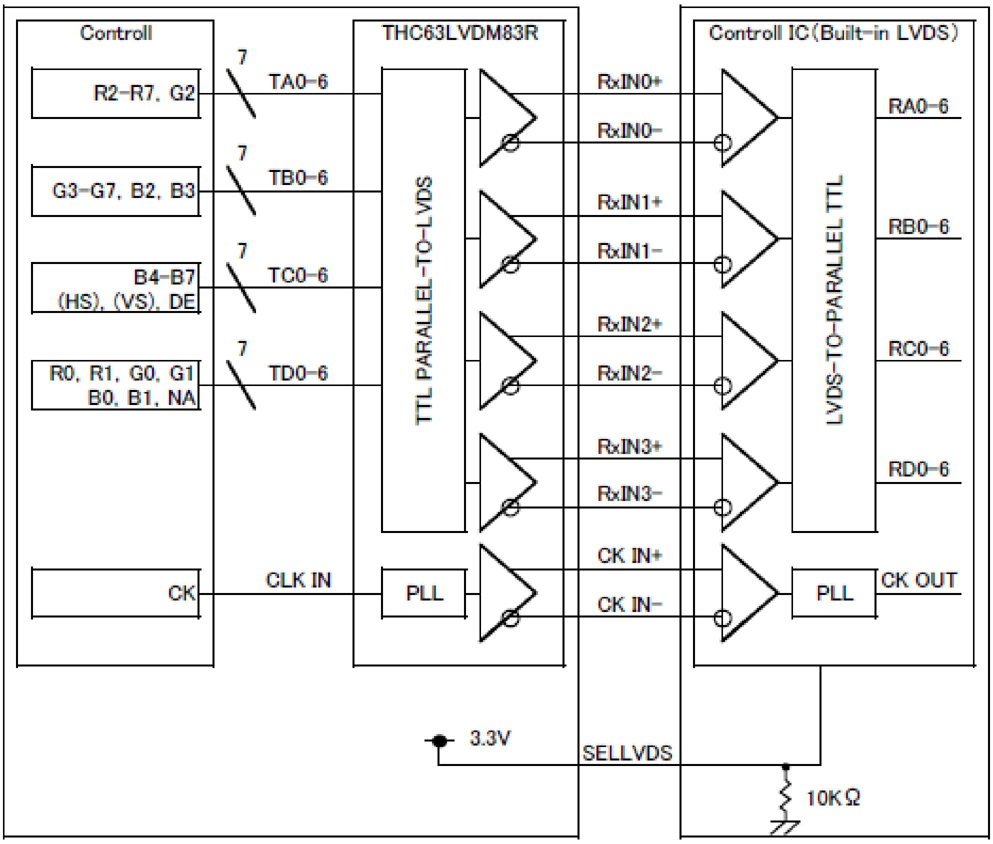
2) Block Diagram

SELLVDS=L(GND) or OPEN


Controll
R0-R5, G0
G1-G5, B0, B1
B2-B5 (HS), (VS), DE
R6,R7,G6,G7 B6,B7,NA
CK
7
TA0-6
TB0-6
TC0-6
TD0-6
CLK IN
THC63LVDM83R
TTL PARALLEL-TO-LVDS
PLL
RxIN0+
RxIN0-
RxIN1+
RxIN1-
RxIN2+
RxIN2-
RxIN3+
RxIN3-
CK IN+
CK IN-
Controll IC (Built-in LVDS)
LVDS-TO-PARALLEL TTL
RA0-6
RB0-6
RC0-6
RD0-6
PLL
CK OUT
SELLVDS
10KΩ

※SELLVDS signal line has 10kΩ pulldown resister.

SELLVDS=H(3.3V)


Controll
R2~R7, G2
G3~G7, B2, B3
B4~B7
(HS), (VS), DE
R0, R1, G0, G1
B0, B1, NA
CK
7
TA0~6
7
TB0~6
7
TC0~6
7
TD0~6
CLK IN
THC63LVDM83R
TTL PARALLEL-TO-LVDS
PLL
RxIN0+
RxIN0-
RxIN1+
RxIN1-
RxIN2+
RxIN2-
RxIN3+
RxIN3-
CK IN+
CK IN-
Controll IC (Built-in LVDS)
LVDS-TO-PARALLEL TTL
PLL
RA0~6
RB0~6
RC0~6
RD0~6
CK OUT
3.3V
SELLVDS
10KΩ

※SELLVDS signal line has 10kΩ pulldown resister.

8. Input timing characteristics

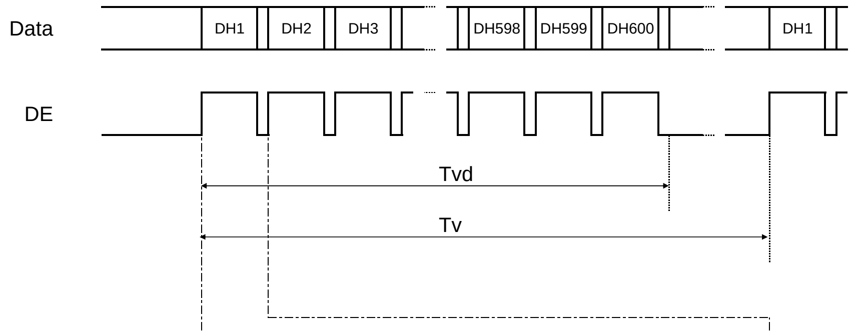
8-1. Timing characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Clock (CK)	Frequency	1/Tc	30	40	48	MHz	
Enable signal (DE)	Horizontal Period	Th	860	1056	1395	Tc	
			24.0	26.4	-	μs	1)
	Horizontal display period	Thd	800			Tc	
	Vertical Period	Tv	610	628	1024	Th	
	Vertical display period	Tvd	600			Th	
Refresh rate		fv	50	60	70	Hz	2)

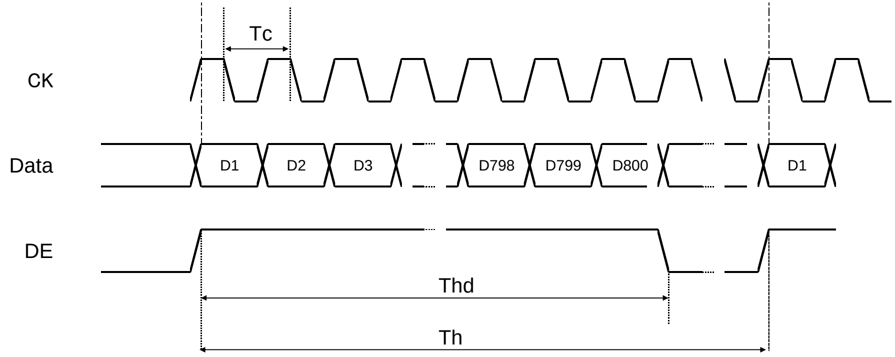
1) Please set a clock frequency, a vertical dormant period, and the horizontal dormant period so that the Horizontal Period should not reach less than Min. value.

2) If the refresh rate reach less than Min. value, the deterioration of the display quality, flicker etc., may occur.(fv=1/Tv)

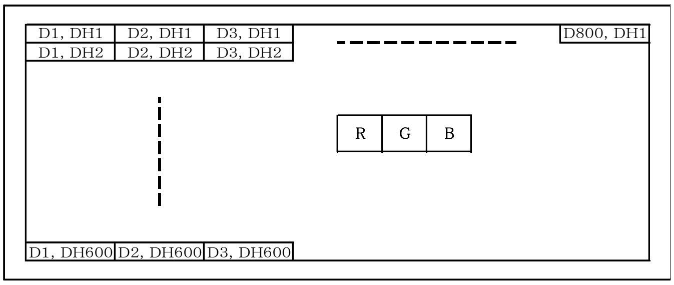
Vertical Timing Diagram


Data
DH1
DH2
DH3
DH598
DH599
DH600
DH1
DE
Tvd
Tv

Horizontal Timing Diagram


Tc
CK
Data
D1
D2
D3
D798
D799
D800
D1
DE
Thd
Th

8-2. Input Data Signals and Display position on the screen


D1, DH1
D2, DH1
D3, DH1
D800, DH1
D1, DH2
D2, DH2
D3, DH2
R
G
B
D1, DH600
D2, DH600
D3, DH600

9. Lot number identification

The lot number shall be indicated on the back of the backlight case of each LCD.

TCG121SVLQEPNN-AN20 - □□ - □□ - □ MADE IN □□□□□
↓↓ ↓ ↓ ↓
1 2 3 4 5

No1. - No5. above indicate
1. Year code
2. Month code
3. Date
4. Version Number
5. Country of origin (Japan or China)

Year	2013	2014	2015	2016	2017	2018
Code	3	4	5	6	7	8

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.
Code	1	2	3	4	5	6

Month	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Code	7	8	9	X	Y	Z

10. Warranty

10-1. Incoming inspection

Please inspect the LCD within one month after your receipt.

10-2. Production warranty

Kyocera warrants its LCD's for a period of 12 months from the ship date. Kyocera shall, by mutual agreement, replace or re-work defective LCD's that are shown to be Kyocera's responsibility.

11. Precautions for use

11-1. Installation of the LCD

1) Please ground either of the mounting (screw) holes located at each corner of an LCD, in order to stabilize brightness and display quality.
2) A transparent protection plate shall be added to protect the LCD and its polarizer.
3) The LCD shall be installed so that there is no pressure on the LSI chips.
4) Since this product is wide viewing product, occurrence level of in-plane unevenness by the external stress is different compared to current normal viewing product. So there is a possibility that in-plane unevenness will be occurred by over twist, strain giving by attaching to LCD, and over pressure to touch panel. Please be careful of stress when designing the housing.
5) A transparent protection sheet is attached to the polarizer. Please remove the protection film slowly before use, paying attention to static electricity.

11-2. Static electricity

1) Since CMOS ICs are mounted directly onto the LCD glass, protection from static electricity is required.
2) Workers should use body grounding. Operator should wear ground straps.

11-3. LCD operation

1) The LCD shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.

11-4. Storage

1) The LCD shall be stored within the temperature and humidity limits specified. Store in a dark area, and protect the LCD from direct sunlight or fluorescent light.
2) Always store the LCD so that it is free from external pressure onto it.

11-5. Usage

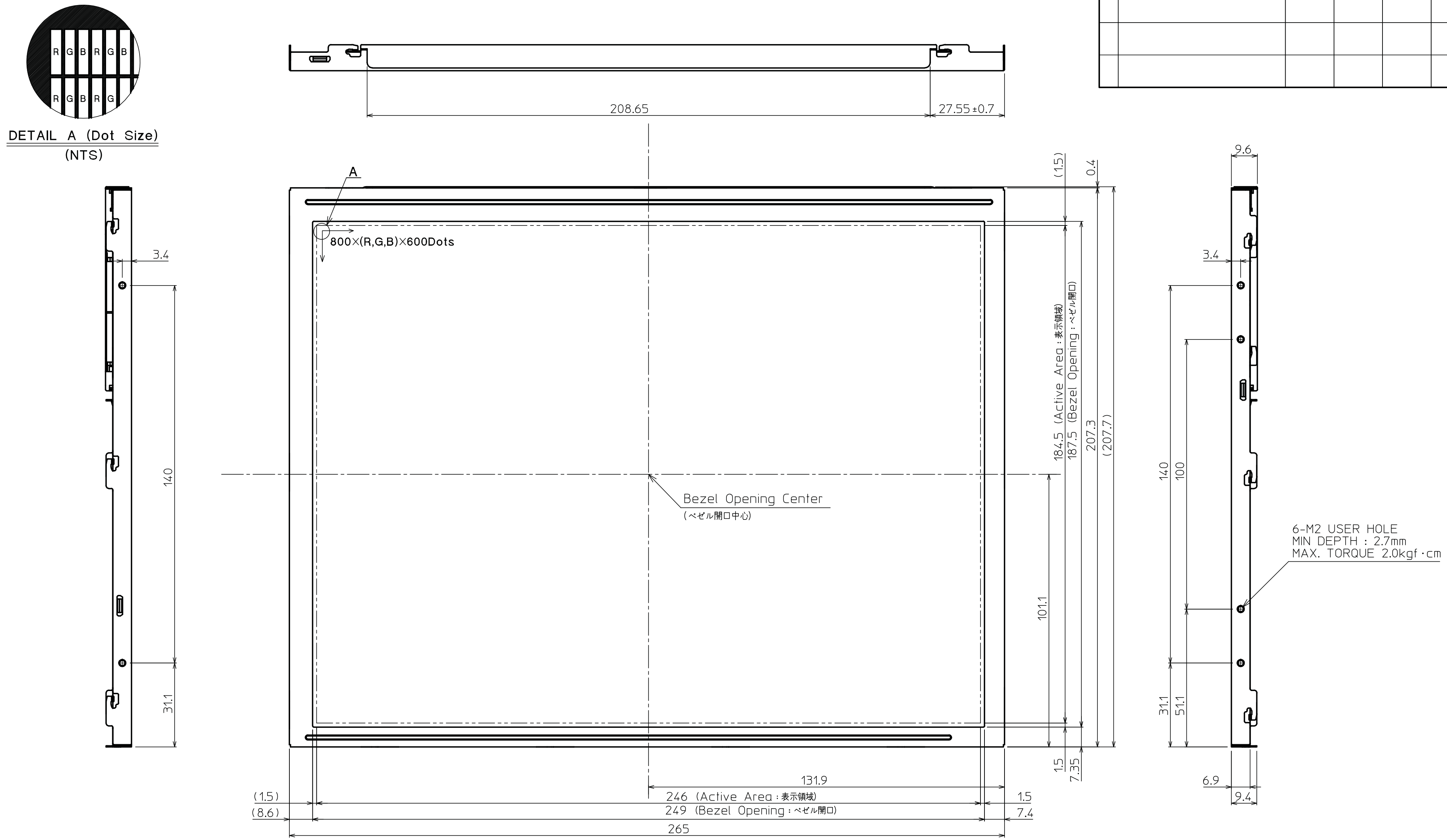
1) DO NOT store in a high humidity environment for extended periods. Polarizer degradation bubbles, and/or peeling off of the polarizer may result.
2) The front polarizer is easily scratched or damaged. Prevent touching it with any hard material, and from being pushed or rubbed.
3) The LCD screen may be cleaned by wiping the screen surface with a soft cloth or cotton pad using a little Ethanol.
4) Water may cause damage or discoloration of the polarizer. Clean condensation or moisture from any source immediately.
5) Always keep the LCD free from condensation during testing. Condensation may permanently spot or stain the polarizer.
6) Do not disassemble LCD because it will result in damage.
7) This Kyocera LCD has been specifically designed for use in general electronic devices, but not for use in a special environment such as usage in an active gas. Hence, when the LCD is supposed to be used in a special environment, evaluate the LCD thoroughly beforehand and do not expose the LCD to chemicals such as an active gas.
8) Please do not use solid-base image pattern for long hours because a temporary afterimage may appear. We recommend using screen saver etc. in cases where a solid-base image pattern must be used.
9) Liquid crystal may leak when the LCD is broken. Be careful not to let the fluid go into your eyes and mouth. In the case the fluid touches your body; rinse it off right away with water and soap.

12. Reliability test data

Test item	Test condition	Test time	Judgement
High temp. atmosphere	80°C	240h	Display function : No defect Display quality : No defect Current consumption : No defect
Low temp. atmosphere	-30°C	240h	Display function : No defect Display quality : No defect Current consumption : No defect
High temp. humidity atmosphere	40°C 90% RH	240h	Display function : No defect Display quality : No defect Current consumption : No defect
Temp. cycle	-30°C 0.5h R.T. 0.5h 80°C 0.5h	10cycles	Display function : No defect Display quality : No defect Current consumption : No defect
High temp. operation	70°C	500h	Display function : No defect Display quality : No defect Current consumption : No defect

1) Each test item uses a test LCD only once. The tested LCD is not used in any other tests.
2) The LCD is tested in circumstances in which there is no condensation.
3) The reliability test is not an out-going inspection.
4) The result of the reliability test is for your reference purpose only.
The reliability test is conducted only to examine the LCD's capability.

No	Description	Drawn	Checked	Checked	Approved

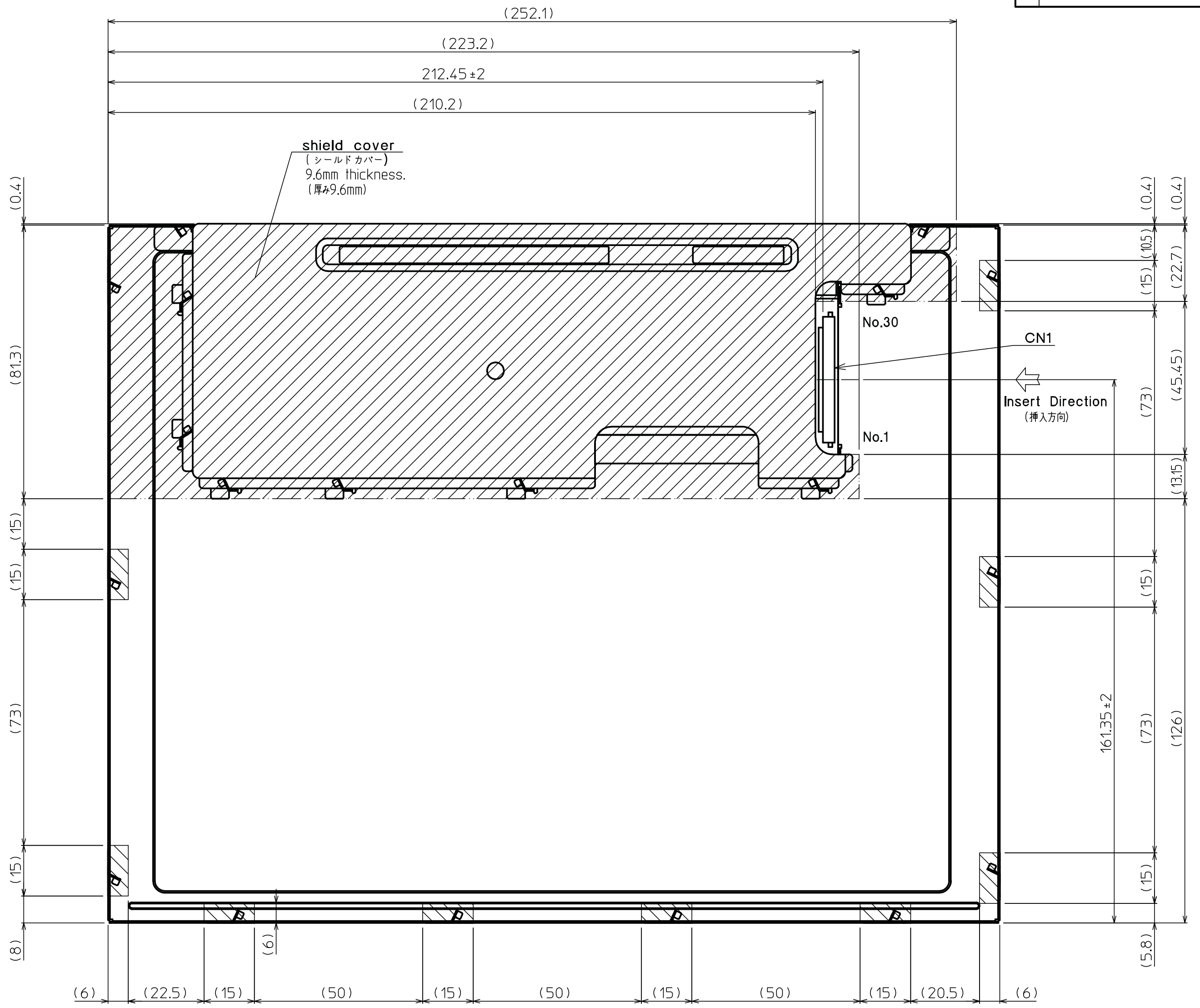

R G B R G B
R G B R G
DETAIL A (Dot Size)
(NTS)
208.65
27.55±0.7
A
800×(R,G,B)×600Dots
Bezel Opening Center
(ベゼル開口中心)
(1.5)
0.4
184.5 (Active Area：表示領域)
187.5 (Bezel Opening：ベゼル開口)
207.3
(207.7)
101.1
1.5
7.35
131.9
246 (Active Area：表示領域)
249 (Bezel Opening：ベゼル開口)
265
(1.5)
(8.6)
1.5
7.4
3.4
140
31.1
9.6
3.4
140
100
31.1
51.1
6.9
9.4
6-M2 USER HOLE
MIN DEPTH : 2.7mm
MAX. TORQUE 2.0kgf·cm

Note.（注記）

1. Connector CN1: FI-X30SSLA-HF (JAE)
   (コネクター)
2. Matching Connector CN1: FI-X30HL, FI-X30HL-T, FI-X30C2L-NPB, FI-X30C2L-T-NPB (JAE)
   (適合コネクター)
3. The Information of LCD is displayed starting at the upper left hand corner, moving right then down to the lower right hand corner.
   (LCDにおいて、画像データの表示は左上コーナーから始まり、右へ進み下へ送られ右下コーナーへ向かう。)
4. Tolerance without indication：±0.5
   (指示無き公差)
5. There is a possibility that in-plane unevenness will be occurred by over twist, stress giving by attaching to LCD, and over pressure to touch panel. Please be careful of stress when designing the housing.
   (過度な捻じり(ひずみ)、LCD固定時での応力発生、タッチパネルでの過度な押し圧によっては、パネル面内にムラが発生することがありますので、筐体設計において、事前に十分確認願います。)
6. Max screw length : 2.7mm.
   (最大ネジ長)
7. Max screw torque : 2.0kgf·cm
   (最大ネジ締付トルク)

Material 材 質	Treatment 処 理	Approved '12.09.05 朝倉	Checked	Checked '12.09.05 倉元	Drawn 車	Scale 1:1 (NTS)	Title TCG121SVLQEPNN	KYOCERA	Year–Month–Day '12.09.04	Size 2
Quantity 製作数	Description; RoHS 備 考						Outline Dimensions	Drawing No. 121A8063200		1/2

No	Description	Drawn	Checked	Checked	Approved


(252.1)
(223.2)
212.45±2
(210.2)
shield cover
(シールドカバー)
9.6mm thickness.
(厚み9.6mm)
(0.4)
(81.3)
(15)
(15)
(73)
(15)
(8)
(6)
(0.4)
(0.4)
(10.5)
(15)
(22.7)
(73)
(45.45)
(13.15)
No.30
CN1
Insert Direction
(挿入方向)
No.1
(15)
161.35±2
(73)
(126)
(15)
(5.8)
(6)
(22.5)
(15)
(50)
(15)
(50)
(15)
(50)
(15)
(20.5)
(6)

▨ : Projected part is 9.6mm thickness.
(厚み9.6mm)

▧ : Projected part is 9.4mm thickness.
(厚み 9.4mm)

Note. (注記)
1. Tolerance without indication : ±0.5
(指示無き公差)

Material 材質	Treatment 処理	Approved	Checked	Checked	Drawn	Scale	Title		Year–Month–Day	Size
		'12.09.05 朝倉		'12.09.05 倉元	車	1:1 (NTS)	TCG121SVLQEPNN	KYOCERA	'12.09.04	2
Quantity 製作数	Description; 備考 RoHS						Outline Dimensions	Drawing No. 121A0863200		2/2

Spec No.	TQ3C-8EAF0-E2YAC67-00
Date	February 28, 2013

KYOCERA INSPECTION STANDARD

TYPE : TCG121SVLQEPNN-AN20

KYOCERA CORPORATION
SHIGA YASU PLANT
LCD DIVISION

Original Issue Date	Designed by : Engineering dept.			Confirmed by : QA dept.	
	Prepared	Checked	Approved	Checked	Approved
February 28, 2013	R. Nakao	K. Mori	M. Fujitani	I. Hamada	

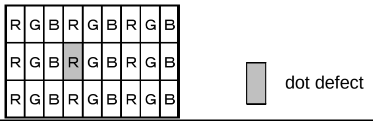
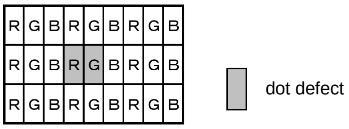
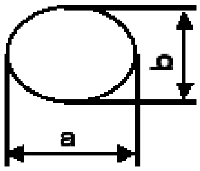
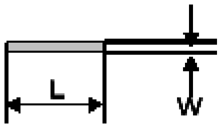
Revision record

Date	Designed by：Engineering dept.			Confirmed by：QA dept.	
	Prepared	Checked	Approved	Checked	Approved

Rev.No.	Date	Page	Descriptions

Visuals specification

1) Note

	Note		
General	1. Customer identified anomalies not defined within this inspection standard shall be reviewed by Kyocera, and an additional standard shall be determined by mutual consent. 2. This inspection standard about the image quality shall be applied to any defect within the active area and shall not be applicable to outside of the area. 3. Inspection conditions Luminance : 500 Lux min. Inspection distance : 300 mm. Temperature : 25 ± 5°C Direction : Directly above		
Definition of inspection item	Dot defect	Bright dot defect	The dot is constantly "on" when power applied to the LCD, even when all "Black" data sent to the screen. Inspection tool: 5% Transparency neutral density filter. Count dot: If the dot is visible through the filter. Don't count dot: If the dot is not visible through the filter. 
		Black dot defect	The dot is constantly "off" when power applied to the LCD, even when all "White" data sent to the screen.
		Adjacent dot	Adjacent dot defect is defined as two or more bright dot defects or black dot defects. 
	External inspection	Bubble, Scratch, Foreign particle (Polarizer, Cell, Backlight)	Visible operating (all pixels "Black" or "White") and non operating.
		Appearance inspection	Does not satisfy the value at the spec.
	Definition of size	Definition of circle size  $d=(a+b)/2$	Definition of linear size 

2) Standard

<table>
<tr><th colspan="2">Classification</th><th colspan="2">Inspection item</th><th>Judgement standard</th></tr>
<tr><td rowspan="7">Defect
(in LCD glass)</td><td rowspan="6">Dot defect</td><td colspan="2">Bright dot defect</td><td>Acceptable number : 4
Bright dot spacing : 5 mm or more</td></tr>
<tr><td colspan="2">Black dot defect</td><td>Acceptable number : 5
Black dot spacing : 5 mm or more</td></tr>
<tr><td rowspan="2">2 dot join</td><td>Bright dot defect</td><td>Acceptable number : 2</td></tr>
<tr><td>Black dot defect</td><td>Acceptable number : 3</td></tr>
<tr><td colspan="2">3 or more dots join</td><td>Acceptable number : 0</td></tr>
<tr><td colspan="2">Total dot defects</td><td>Acceptable number : 5 Max</td></tr>
<tr><td>Others</td><td colspan="2">White dot, Dark dot
(Circle)</td><td><table>
<tr><th>Size (mm)</th><th>Acceptable number</th></tr>
<tr><td>$d \leqq 0.2$</td><td>(Neglected)</td></tr>
<tr><td>$0.2 < d \leqq 0.4$</td><td>5</td></tr>
<tr><td>$0.4 < d \leqq 0.5$</td><td>3</td></tr>
<tr><td>$0.5 < d$</td><td>0</td></tr>
</table></td></tr>
<tr><td colspan="2" rowspan="4">External inspection
(Defect on Polarizer or between Polarizer and LCD glass)</td><td colspan="2">Polarizer (Scratch)</td><td><table>
<tr><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr>
<tr><td>$W \leqq 0.1$</td><td>—</td><td>(Neglected)</td></tr>
<tr><td rowspan="2">$0.1 < W \leqq 0.3$</td><td>$L \leqq 5.0$</td><td>(Neglected)</td></tr>
<tr><td>$5.0 < L$</td><td>0</td></tr>
<tr><td>$0.3 < W$</td><td>—</td><td>0</td></tr>
</table></td></tr>
<tr><td colspan="2">Polarizer (Bubble)</td><td><table>
<tr><th>Size (mm)</th><th>Acceptable number</th></tr>
<tr><td>$d \leqq 0.2$</td><td>(Neglected)</td></tr>
<tr><td>$0.2 < d \leqq 0.3$</td><td>5</td></tr>
<tr><td>$0.3 < d \leqq 0.5$</td><td>3</td></tr>
<tr><td>$0.5 < d$</td><td>0</td></tr>
</table></td></tr>
<tr><td colspan="2">Foreign particle
(Circular shape)</td><td><table>
<tr><th>Size (mm)</th><th>Acceptable number</th></tr>
<tr><td>$d \leqq 0.2$</td><td>(Neglected)</td></tr>
<tr><td>$0.2 < d \leqq 0.4$</td><td>5</td></tr>
<tr><td>$0.4 < d \leqq 0.5$</td><td>3</td></tr>
<tr><td>$0.5 < d$</td><td>0</td></tr>
</table></td></tr>
<tr><td colspan="2">Foreign particle
(Linear shape)
Scratch</td><td><table>
<tr><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr>
<tr><td>$W \leqq 0.03$</td><td>—</td><td>(Neglected)</td></tr>
<tr><td rowspan="3">$0.03 < W \leqq 0.1$</td><td>$L \leqq 2.0$</td><td>(Neglected)</td></tr>
<tr><td>$2.0 < L \leqq 4.0$</td><td>3</td></tr>
<tr><td>$4.0 < L$</td><td>0</td></tr>
<tr><td>$0.1 < W$</td><td>—</td><td>(According to circular shape)</td></tr>
</table></td></tr>
</table>

Our company network supports you worldwide with offices in Germany, Austria, Switzerland, the UK and the USA. For more information please contact:

Headquarters

Germany

FORTEC Elektronik AG
Lechwiesenstr. 9
86899 Landsberg am Lech

Phone: +49 8191 91172-0
E-Mail: sales@fortecag.de
Internet: www.fortecag.de

Fortec Group Members

Austria

FORTEC Elektronik AG
Office Vienna
Nuschinggasse 12
1230 Wien

Phone: +43 1 8673492-0
E-Mail: office@fortec.at
Internet: www.fortec.at

Germany

Distec GmbH
Augsburger Str. 2b
82110 Germering

Phone: +49 89 894363-0
E-Mail: info@distec.de
Internet: www.distec.de

Switzerland

ALTRAC AG
Bahnhofstraße 3
5436 Würenlos

Phone: +41 44 7446111
E-Mail: info@altrac.ch
Internet: www.altrac.ch

United Kingdom

Display Technology Ltd.
Osprey House, 1 Osprey Court
Hichingbrooke Business Park
Huntingdon, Cambridgeshire, PE29 6FN

Phone: +44 1480 411600
E-Mail: info@displaytechnology.co.uk
Internet: www. displaytechnology.co.uk

USA

Apollo Display Technologies, Corp.
87 Raynor Avenue,
Unit 1Ronkonkoma,
NY 11779

Phone: +1 631 5804360
E-Mail: info@apollodisplays.com
Internet: www.apollodisplays.com