SPEC

Spec No.	TQ3C-8EAF0-E1YAL28-00
Date	July 30, 2015

TYPE : TCG121XGLP*PC*-AD*54

< 12.1 inch XGA transmissive color TFT with LED backlight
and constant current circuit for LED backlight
and Touch panel>

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Issued
Aug 8, 2015
KYOCERA Display Corp.

KYOCERA DISPLAY CORPORATION

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
July 30, 2015	M. Koyama	M. Fukuo	Y. Yamazaki	O. Sato	I. Hamada

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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 TCG121XGLP*PC*-AD*54. (RoHS Compliant)

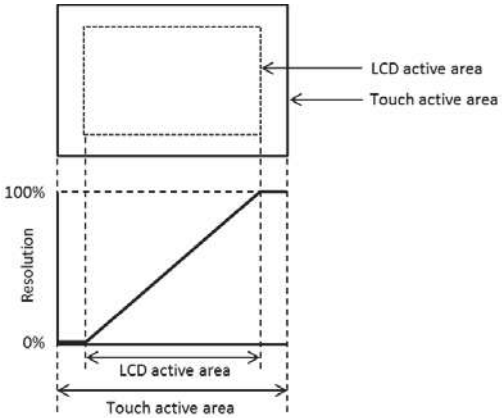
2. Construction and outline

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) With constant current circuit for LED Backlight(12V input)
Touch panel	: Projected capacitive touch panel
Touch panel I/F	: USB (Equipped Touch panel IC)
Surface film	: Anti-Glare anti-finger print treatment

3. Mechanical specifications

Item	Specification	Unit
Outline dimensions 1)	260.5(W)×203(H)×12.135(D)	mm
LCD active area 2)	246(W)×184.5(H) (30.8cm/12.1 inch(Diagonal))	mm
Touch active area 2)	(250)(W)×(188.5)(H)	mm
Effective viewing area	249(W)×187.5(H)	mm
Dot format	1,024×(B,G,R)(W)×768(H)	dot
Dot pitch	0.08(W)×0.24(H)	mm
Base color 3)	Normally Black	-
Surface hardness 4)	3H	-
Mass	TBD	g

1) Projection not included. Please refer to outline for details.
2) Relation between active area and resolution is as follows. Please refer to outline for details.



3) Due to the characteristics of the LCD material, the color varies with environmental temperature.
4) Conforms to JIS K5600-1999 5.4

4. Absolute maximum ratings

4-1. Electrical absolute maximum ratings

Item		Symbol	Min.	Max.	Unit
Supply voltage(+3.3V)		V_{DD}	-0.3	3.95	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	V_{DD}+0.3	V
	CK IN+, CK IN-	V_{I2}	-0.3	V_{DD}+0.3	V
	MODE, SC	V_{I3}	-0.3	V_{DD}+0.3	V
	BLBRT, BLEN	V_{I4}	-0.3	V_{IN}	V
Touch panel Supply voltage (+5V)		V_{TVDD}	-0.3	(5.25)	V
Touch panel Input signal voltage 2)		V_{TPS}	-0.3	3.6	V

1) V_{DD} must be supplied correctly within the range described in 5-1.
2) Input signal : D+, D-

4-2. Environmental absolute maximum ratings

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

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) Panel surface temperature (all the surface).
3) 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.)
4) Non-condensing
5) Temp.≦40°C, 85%RH Max.
Temp.＞40°C, Absolute humidity shall be less than 85%RH at 40°C.

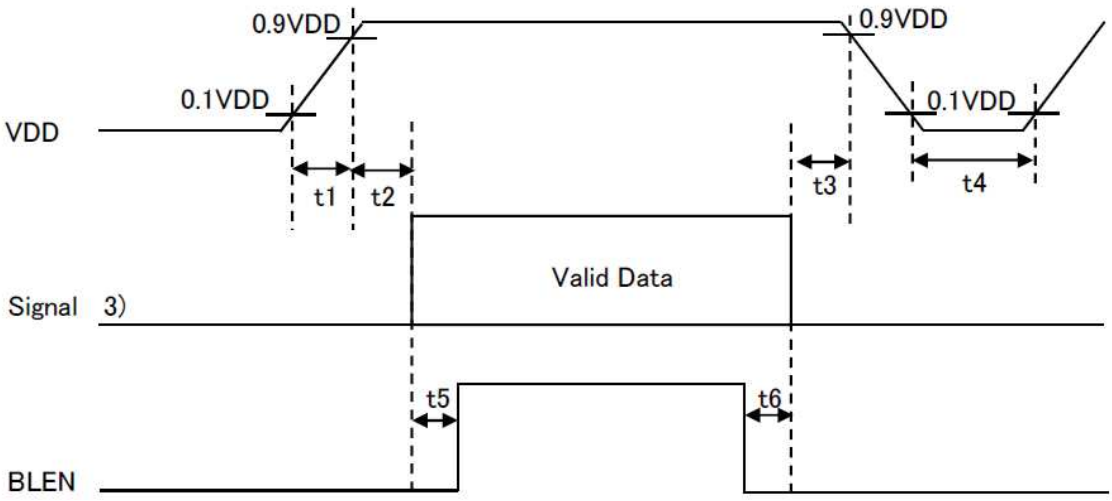
5. Electrical characteristics

5-1. LCD

Temp. = -30～80°C

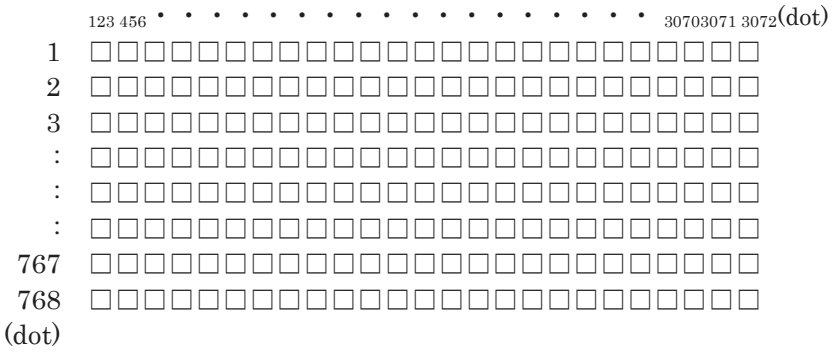
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	1)	V_{DD}	-	3.0	3.3	3.6	V
Current consumption		I_{DD}	2)	-	300	390	mA
Permissive input ripple voltage		V_{RP}	V_{DD}=3.3V	-	-	100	mVp-p
Input signal voltage	3)	V_{IL}	"Low" level	0	-	0.3V_{DD}	V
		V_{IH}	"High" level	0.7V_{DD}	-	V_{DD}	V
Input 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		V_{ID}	-	200	-	600	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	-	20	ms
		t2	-	10	-	-	ms
		t3	-	0	-	-	ms
		t4	-	2	-	-	s
		t5	-	200	-	-	ms
		t6	-	200	-	-	ms

1) V_{DD}-turn-on conditions



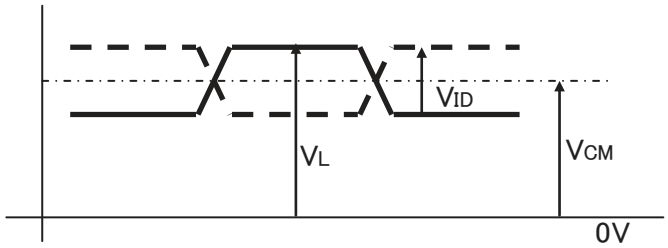
2) Display pattern:

V_{DD} = 3.3V, Temp. = 25°C



3) Input signal : MODE, SC

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



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

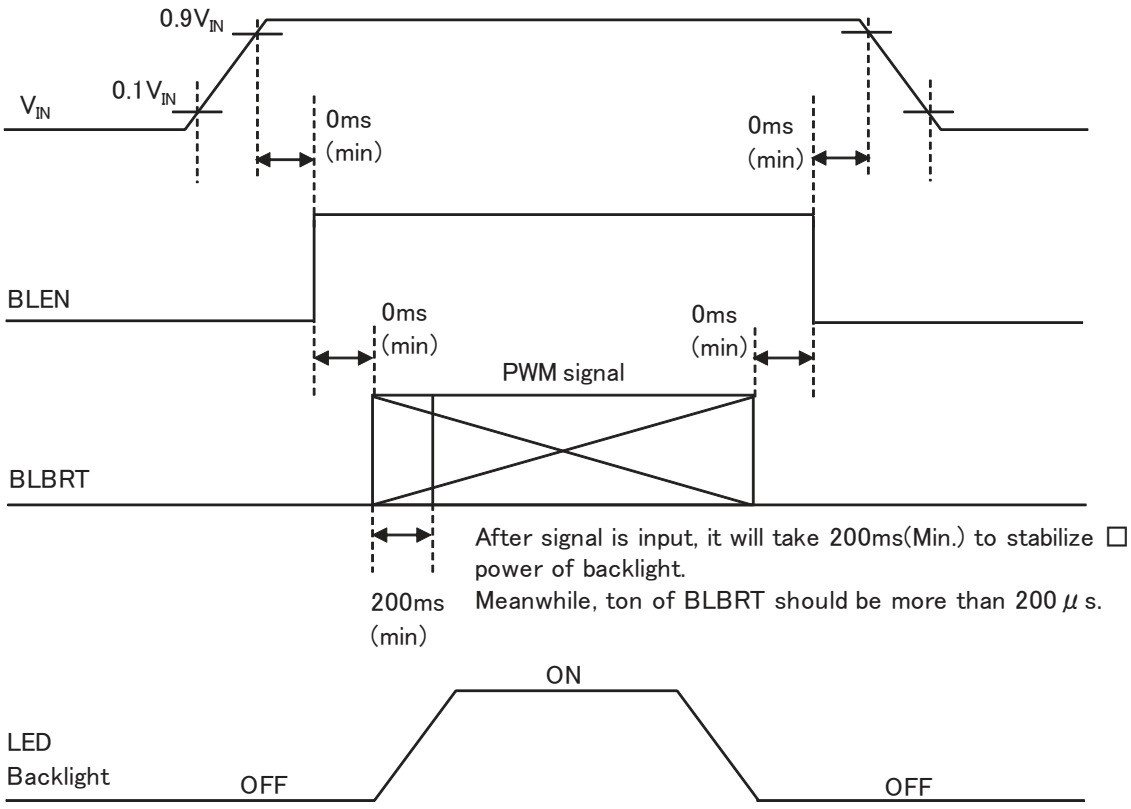
6) Please power on LVDS transmitter at the same time as VDD, or LVDS transmitter should be powered on first.

5-2. Constant current circuit for LED Backlight

Temp. = -30～80°C

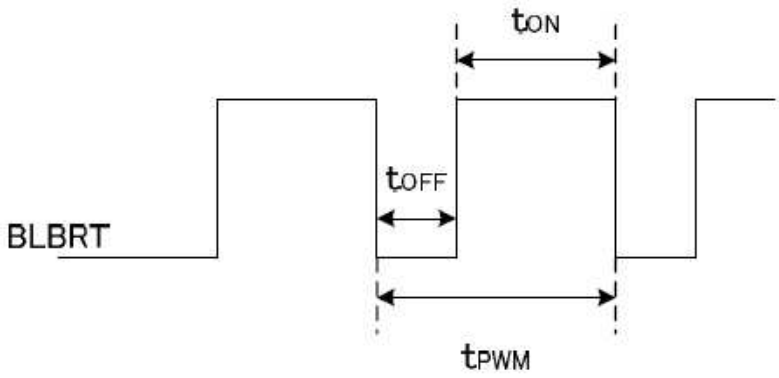
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage 1)	V_{IN}	-	10.8	12.0	13.2	V
Current consumption	I_{IN}	2)	-	900	1,110	mA
Permissive input ripple voltage	V_{RP_BL}	V_{IN}=12.0V	-	-	100	mVp-p
BLBRT Input signal voltage	V_{IL_BLBRT}	"Low" level	0	-	0.8	V
	V_{IH_BLBRT}	"High" level	2.3	-	V_{IN}	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



2) V_{IN} = 12V, Temp. = 25℃, 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=(75)mA, Ta=25℃ in chamber).

5-3. Touch panel

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{TVDD}	—	(4.75)	(5.0)	(5.25)	V
Current consumption	I_{TVDD}	1)	—	(60)	TBD	mA
USB Signal 2)	V_{TPS}	—	USB2.0 compliant			-

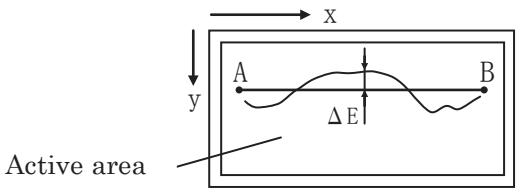
1) Condition : V_{TP}=3.3V
Temp. = 25℃, 2 point touch

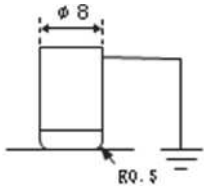
2) Accommodation : D+, D-

6 . Specification of function

Item	Description	Note
Resolution	4096 × 4096	—
Starting point	upper left	1)
Input 2)	finger	—
Recommended touch sensor area	φ10.0mm	—
Number of touch point	2 point	—
Linearity	less than ±2.0%	3) 4) 5)
Interface	USB2.0 / Fullspeed 12Mbps	—
OS	Windows 7, Linux, Android	—

1) Please refer LCD drawing.
2) As for input with gloves, separate discussion for feasibility is needed.
3) Test Definition
Measure the output when grounded conductive material is moved on any AB straight line which is in parallel to X(Y) axis.





metal pointer

Using metal pointer like written above, the pointer is contacted to active area.
Measure the output when the pointer is moved at 25±5mm/sec on the straight line to X,Y direction, then calculate value using following formula.
Formula: Linearity % =ΔE ÷ AB

4) The performance of linearity is under the condition without noise.
5) Linearity value is not guaranteed but only for reference.
6) We recommend you to take into considerations to design, using common GND for each touch panel and LCD panel.

7. Optical characteristics

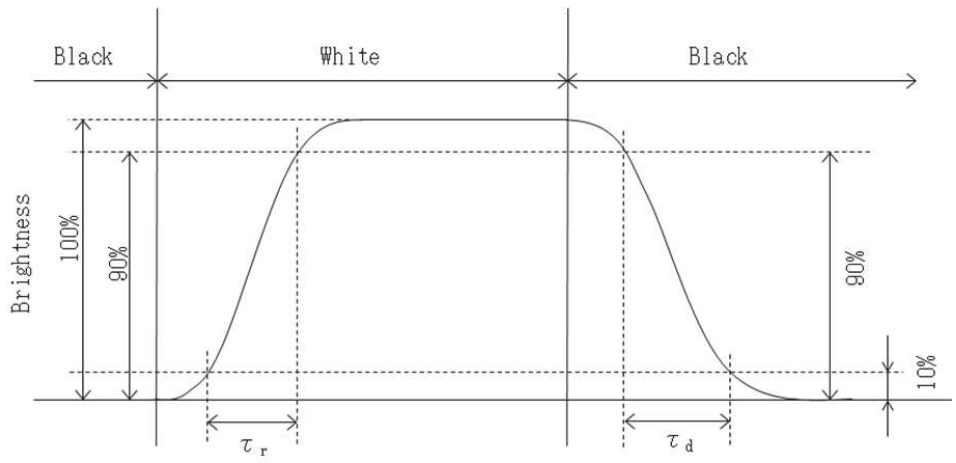
Measuring spot = ϕ 6.0mm, Temp. = 25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Response time	Rise	τ_r	$\theta = \phi = 0°$	-	18	-	ms
	Down	τ_d	$\theta = \phi = 0°$	-	12	-	ms
Viewing angle range View direction		θ UPPER	CR≧10	-	85	-	deg.
		θ LOWER		-	85	-	
		ϕ LEFT		-	85	-	deg.
		ϕ RIGHT		-	85	-	
Contrast ratio		CR	$\theta = \phi = 0°$	(500)	(750)	-	-
Brightness		L	IF=(75)mA/Line	(670)	(960)	-	cd/m²
Chromaticity coordinates	Red	x	$\theta = \phi = 0°$	0.550	0.600	0.650	-
		y		0.300	0.350	0.400	
	Green	x	$\theta = \phi = 0°$	0.285	0.335	0.385	
		y		0.520	0.570	0.620	
	Blue	x	$\theta = \phi = 0°$	0.100	0.150	0.200	
		y		0.070	0.120	0.170	
	White	x	$\theta = \phi = 0°$	0.270	0.320	0.370	
		y		0.295	0.345	0.395	

7-1. Definition of contrast ratio

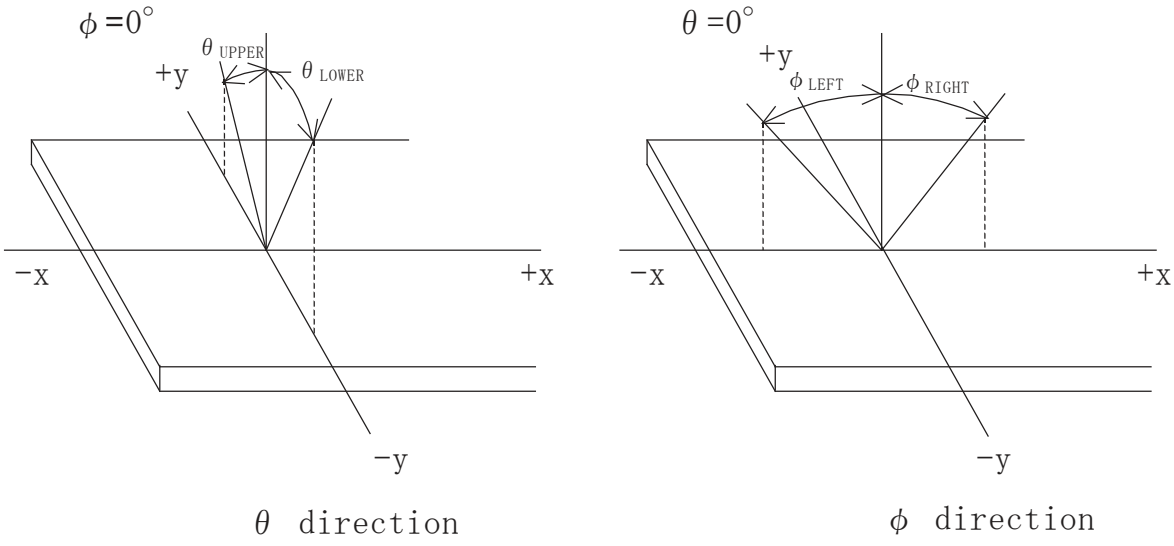
$$\text{CR(Contrast ratio)} = \frac{\text{Brightness with all pixels "White"}}{\text{Brightness with all pixels "Black"}}$$

7-2. Definition of response time

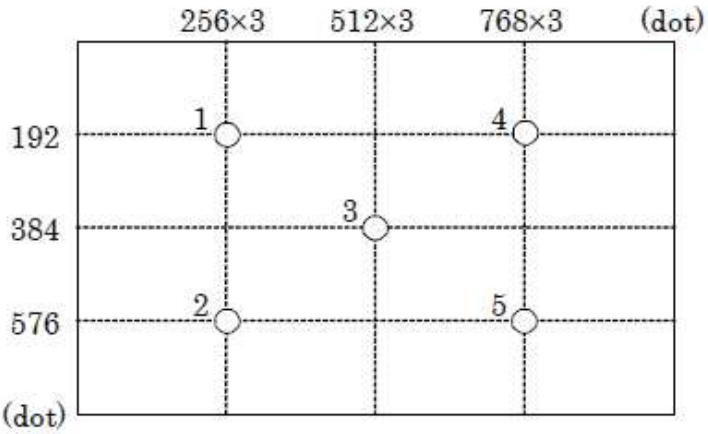


7-3. Definition of viewing angle

【FPC side】



7-4. Brightness measuring points



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℃)

8. Interface signals

8-1. Interface signals

No.	Symbol	Description	Note
1	V_{DD}	+3.3V power supply	
2	V_{DD}	+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 IN1-	LVDS receiver signal CK(-)	LVDS
15	CK IN1+	LVDS receiver signal CK(+)	LVDS
16	GND	GND	
17	RxIN3-	LVDS receiver signal CH3(-)	LVDS
18	RxIN3+	LVDS receiver signal CH3(+)	LVDS
19	MODE	Bit data select signal(GND: 6bit mode、High: 8bit mode)	
20	SC	Scan direction control(GND: Normal、High: Reverse)	1)

LCD connector : 20186-020E-11F (I-PEX)
Matching connector : 20197-020U-F (I-PEX)
: 20197-T20U-F (I-PEX)

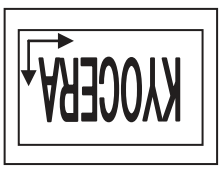
LVDS receiver : Embedded in ASIC

Matching LVDS transmitter : THC63LVDM83R(THine Electronics) or compatible

1) Scanning

SC : GND

SC : High



8-2. LED

No.	Symbol	Description	Note
1	V_{IN}	+12V power supply	
2	V_{IN}	+12V power supply	
3	BLBRT	PWM signal(Brightness adjustment)	
4	BLEN	ON/OFF terminal voltage	
5	GND	GND	
6	GND	GND	

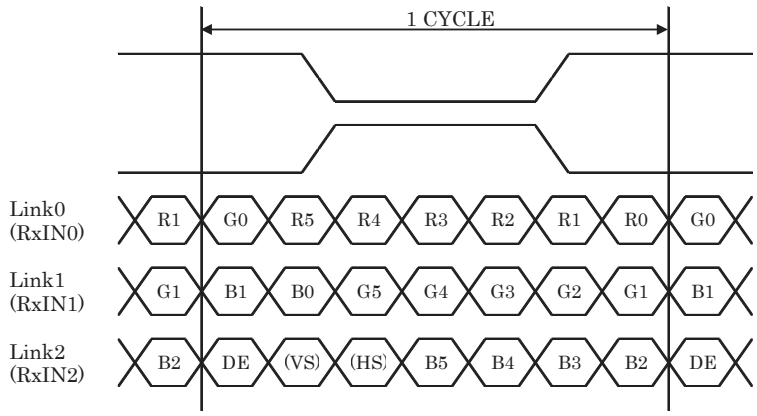
LCD connector : SM06B-SHLS-G-TF(LF)(SN) (JST)
Matching connector : SHLP-6V-S-B (JST)

8-3. Data mapping(6bit input)

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

Transmitter		MODE
Pin No.	Data	= L(GND)
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)

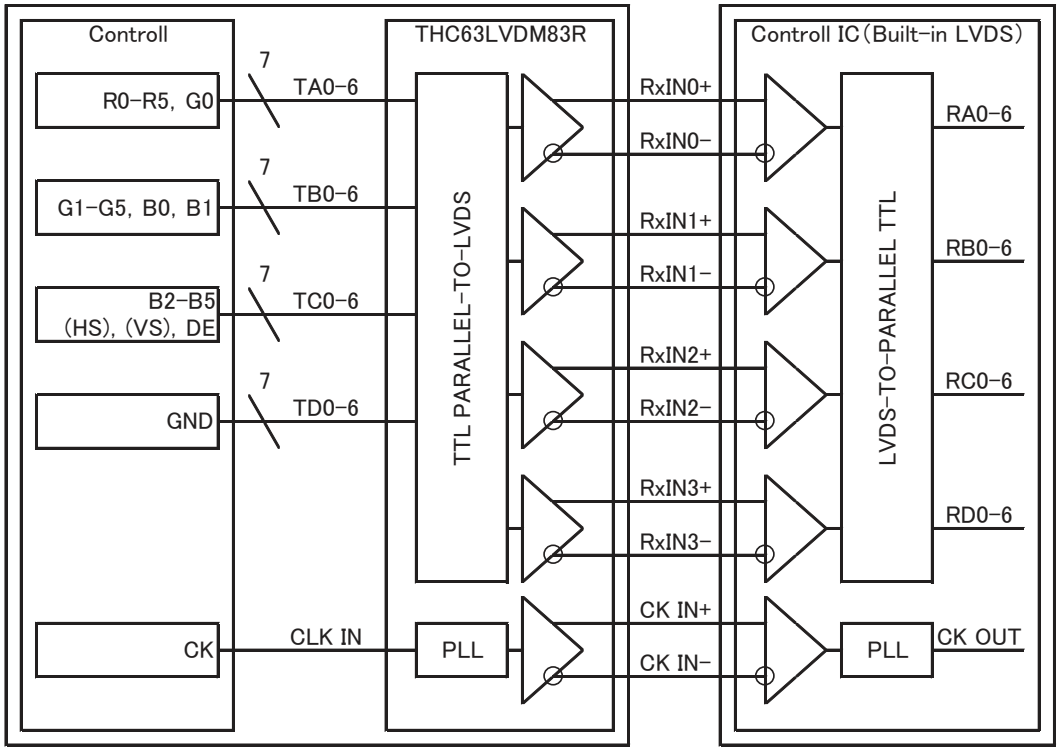
MODE=L(GND)



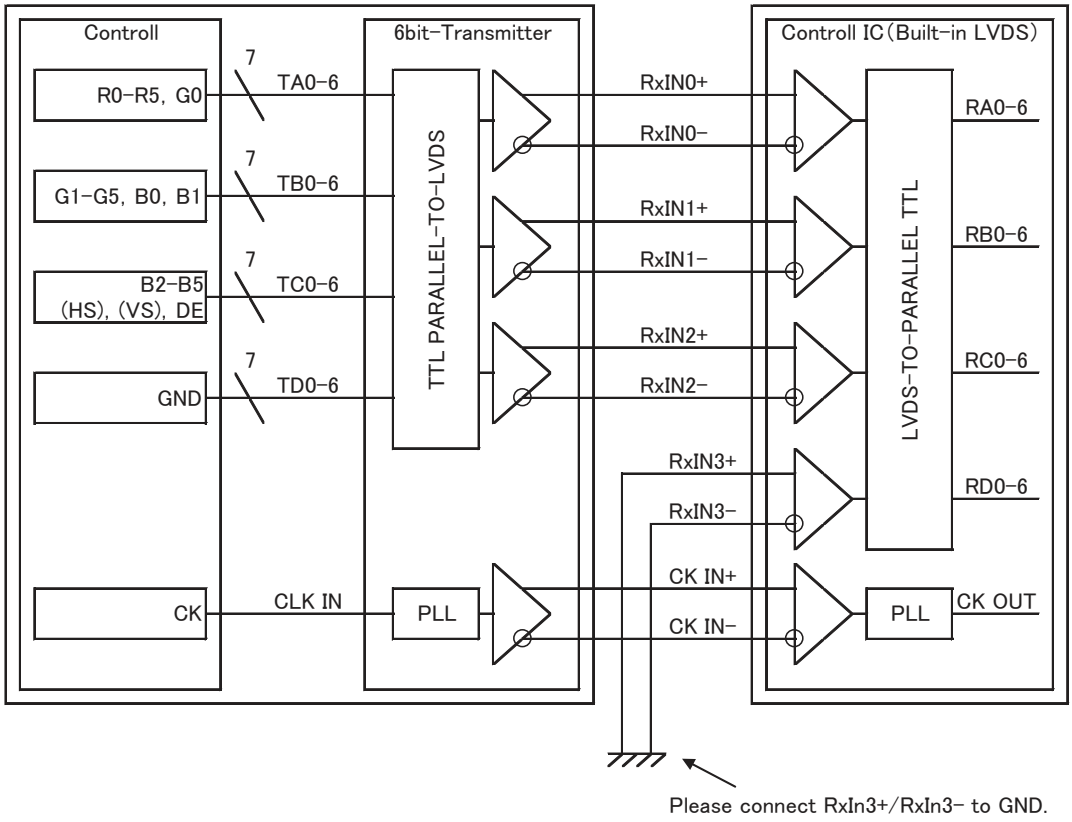
DE : DATA ENABLE
HS : H_{SYNC}
VS : V_{SYNC}

2) Block Diagram

MODE=L(GND)



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

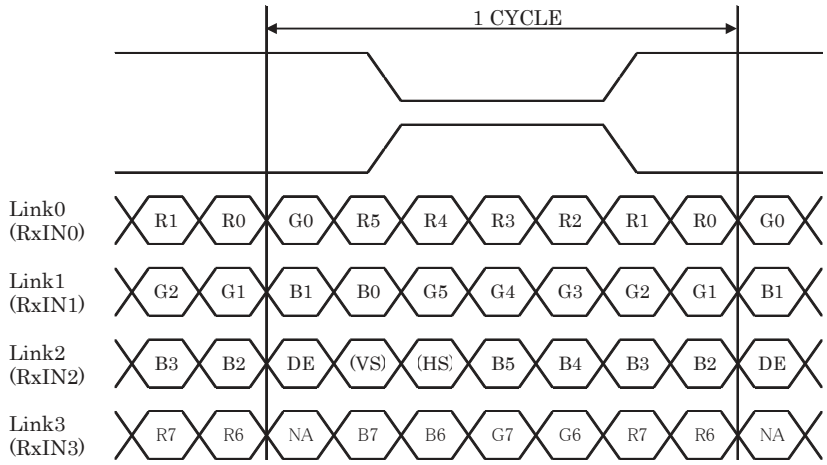


8-4. Data mapping(8bit input)

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

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

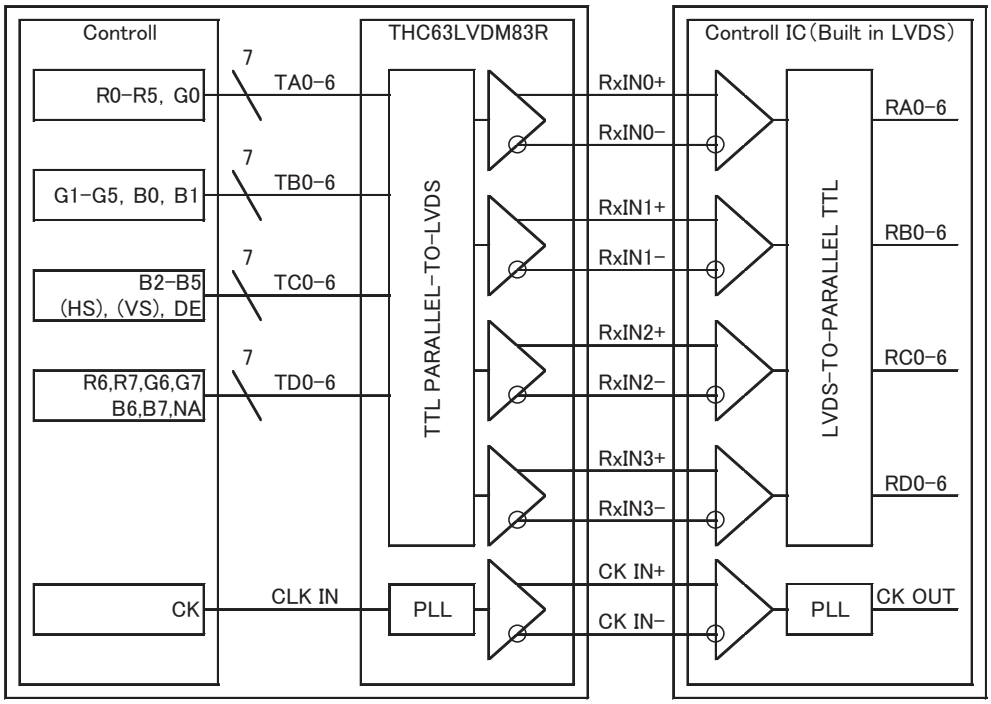
MODE= H(3.3V)



DE : DATA ENABLE
HS : HSYNC
VS : VSYNC

2) Block Diagram

MODE= H(3.3V)



8-5. Touch panel

No.	Symbol	Description	I/O
1	GND	GND	P
2	NC	No Connect	
3	NC	No Connect	
4	V_{TVDD}	Supply voltage (+5.0V)	P
5	NC	No Connect	
6	NC	No Connect	
7	GND	GND	P
8	NC	No Connect	
9	NC	No Connect	
10	D-	USBDM	I/O
11	D+	USBDP	I/O
12	GND	GND	P

FPC : 0.5mm pitch
Matching connector : 04 6806 012 000 846+ (KYOCERA Connector Products)

1) Please contact to us for the detail such as timing

9. Input timing characteristics

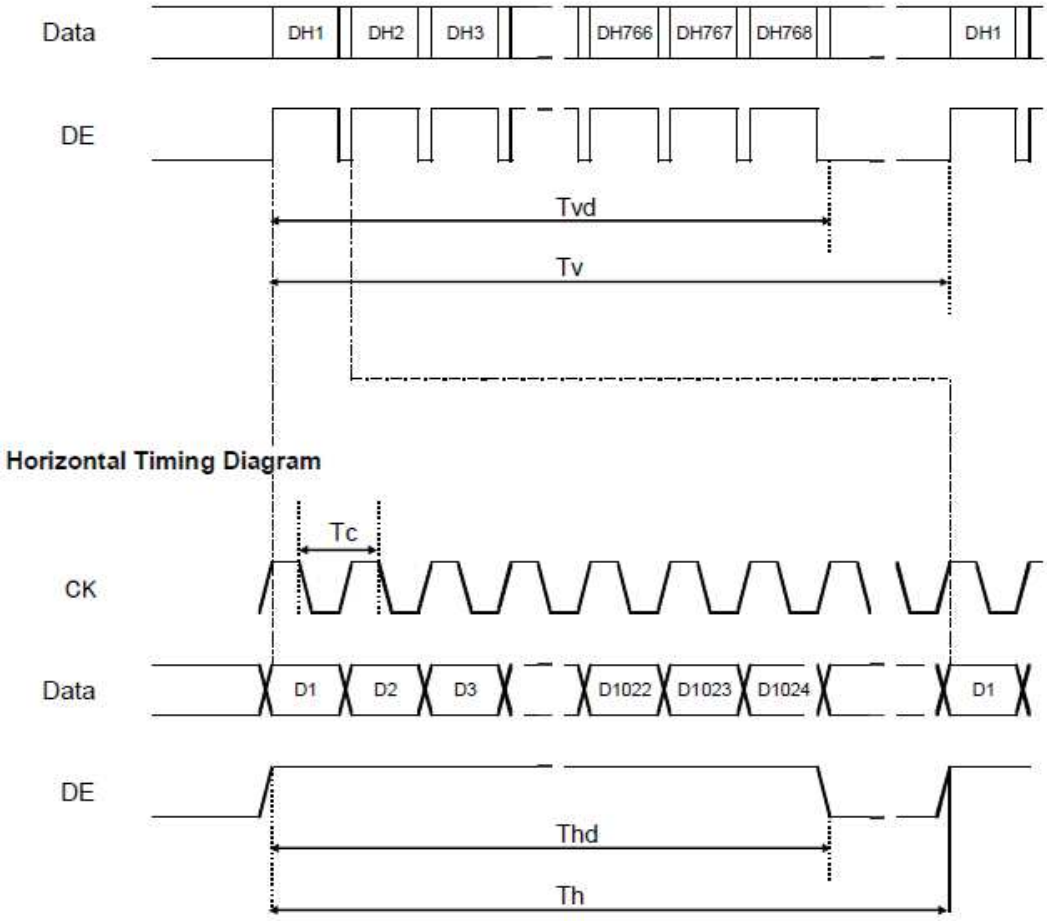
9-1. Timing characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Clock (CK)	Frequency	1/Tc	52	65	71	MHz	
Enable signal (DE)	Horizontal Period	Th	1,114	1,344	1,400	Dot	
			15.7	20.7	23.7	μs	1)
	Horizontal display period	Thd	1,024			Tc	
	Vertical Period	Tv	778	806	845	Line	
	Vertical display period	Tvd	768			Th	
Refresh rate		fv	50	60	82	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.

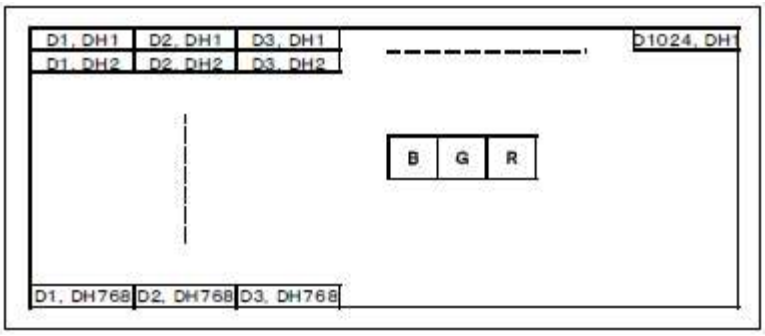
2) If the refresh rate reach less than Min. value, the deterioration of the display quality, flicker etc., may occur.(fv=1/Tv)

Vertical Timing Diagram



Horizontal Timing Diagram

9-2. Input Data Signals and Display position on the screen



10. Lot number identification

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

TCG121XGLP*PC*-AD*54 - □□ - □□ - □ 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	2015	2016	2017	2018	2019	2020
Code	5	6	7	8	9	0

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

11. Warranty

11-1. Incoming inspection

Please inspect the LCD within one month after your receipt.

11-2. 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.

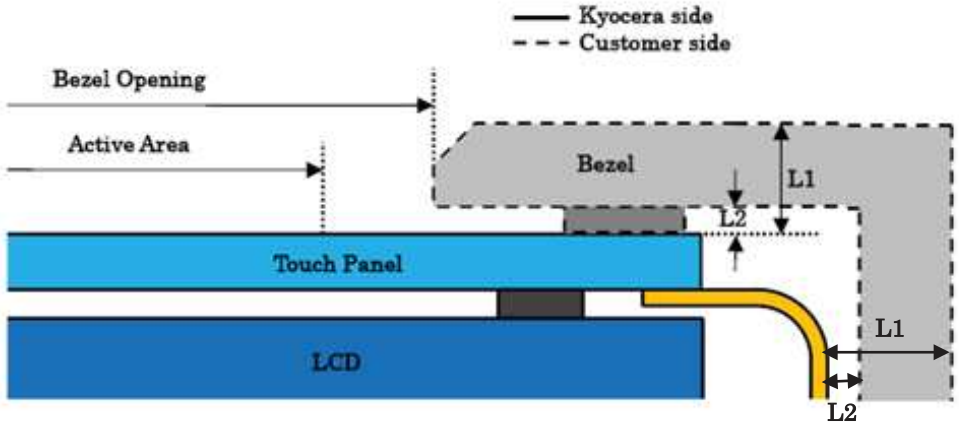
11-3. Agreement of Product Discontinuation

Kyocera will make announcement of last time buy before 6 months when decided to discontinue the product. For detail information, need to be discussed separately.

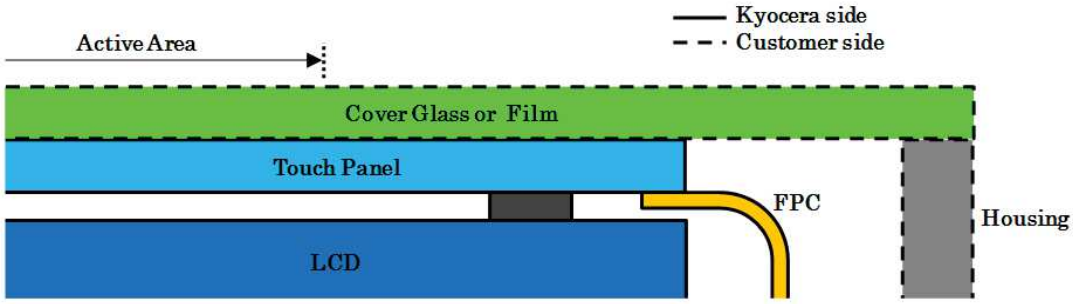
12. Precautions for use

12-1. Installation of the LCD

1) The LCD shall be installed so that there is no pressure on the LSI chips.
2) 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.
3) When LCD is installed, power shall be put off. Same applies to plug in/out of FFC/FPC/Cable.
4) When handling connector, please do not make any excessive pressure than needed. It may damage the LCD.
5) For the protection of touch panel, protection film is added. Please peel off the protection film slowly before the use of LCD with the caution against static electricity.
6) Touch location is detected by the change of capacitance. Therefore, if there is any factor close to LCD which may change electric field, malfunction may be caused as it may give adverse effect on coordinate detecting mechanism. To avoid such malfunctions, please assemble correctly.
7) When designing your case, using material composed with insulating resin is recommended for bezel of touch panel. When metal plate is used, malfunction may be caused by the occurrence of capacitance coupling on the periphery of active area.
8) In case of using materials composed with insulating resin of upper part of touch panel, please keep distance at more than 2mm (L1) between a surface of touch panel, and surface of bezel, and between a touch panel`s FPC and a surface bezel. When gap is changed by touch panel pressing or aging, malfunctions may be occurred.
9) In case of using bezel of upper touch panel is metal case, please keep a distance at more than 2mm (L2) between a surface of touch panel and bezel`s rear side, and between touch panel`s FPC and bezel`s rear side.
10) Please be careful to design not to interfere a metal sheet of LCD with FPC.



11) This product is designed with an assumption to use without a cover glass, without a cover film. If following structure is considered to use, please contact us in advance for our feasibility study. Conductive material shall not be used. In case of using cover glass cover film, please be sure not to put air between surface of touch panel and coverglass, cover film.



12-2. 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.

12-3. LCD operation

1) The product shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.
2) This product shall be operated in the atmosphere free from high temperature, high humidity, condensation and chemical atmospheres such as salt, acid and alkaline, which may cause gas corrosion, in order to prevent damage of this product and electrification.
3) Please select the best display pattern based on your evaluation because flicker, lines or nonuniformity or unevenness can be visible depending on display patterns.
4) There is possibility to cause malfunction by using the touch panel with droplets or conductive this product on the surface of touch panel.
5) It is simulated that input for this product will be done by fingers. Please separate discussion for feasibility is needed if you need to input by gloves.

12-4. Storage

1) The product shall be stored within the temperature and humidity limits specified.
   Store in a dark area, and protect the product from direct sunlight or fluorescent light.
2) Always store the product so that it is free from external pressure onto it.
3) Please store the product board in a location that is free of dust, corrosive elements, or environmental gas (such as acid and alkali salts).

12-5. 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) Do not push or rub the panel's surface with hard to sharp objects such as knives, or the touch panel may be scratched.
3) In case a surface of touch panel gets dirty, please wipe gently with soft cotton by soaking in a neutral detergent or small amount of ethyl alcohol. Please exercise caution in when handling hazardous chemicals.

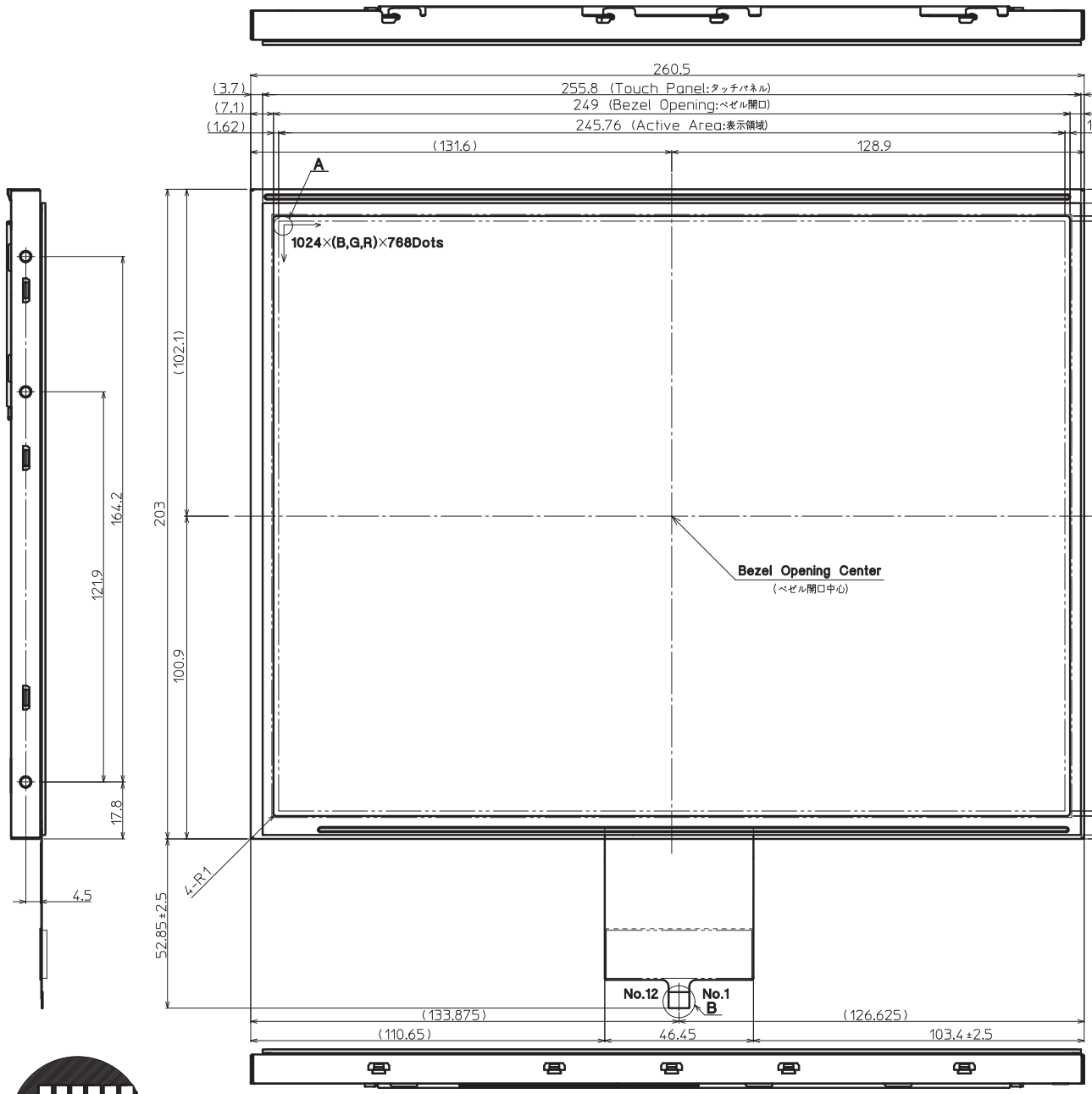
4) The product is made of glass. It may break when dropped, or vibrated excessively. Usually there is a film on the surface of the glass which would prevent broken glass from scattering, but nevertheless handle it carefully during assembly and treat it gently during use. Please take extra caution to the edge due to less strength than surface can cause glass to break。
5) Touch panel edges are sharp, so they have a possibility of cutting your body, for example your finger. Handle the touch panel with enough care to prevent cuts. When you hold the touch panel, put on the protector, for example the gloves which have a strength enough to stand sharpness of touch panel edges.
6) Do not pull the FPC tail and do not bend the root of the FPC. Housing should be designed to protect FPC tail from external stress.
7) Please implement protective countermeasures against high voltage surges such as lightning strikes. Damaged may be caused by abnormal voltage.
8) The product is not designed as anti-radiation product.
9) Always keep the LCD free from condensation during testing. Malfunction of touch panel may be caused. Condensation may permanently spot or stain the polarizer.
10) Do not make over circuit board because it will result in damage.
11) This product 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 product is supposed to be used in a special environment, evaluate the product thoroughly beforehand and do not expose the product to chemicals such as an active gas.
12) 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.
13) Liquid crystal may leak when the product 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.

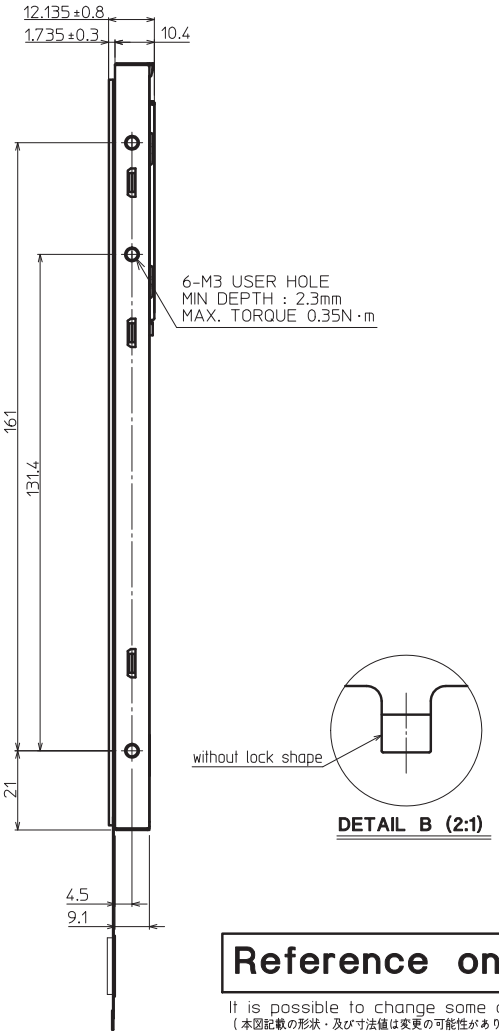
13. Reliability test data

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	80°C	500h	Display function : No defect Display quality : No defect Current consumption : No defect
ESD (atmosphere, no connect)	150pF, 330Ω, ±0kV 15mm from A.A corner, Center (Total 5points)	each 10 times	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
5) Condition of the evaluation (including room temperature cycle) in the temperature-controlled chamber; left under room temperature and humidity for Kyocera determined length of time.

No	Description	Drawn	Checked	Checked	Approved
⚠	Change Touch Panel P/N	'15.07.29 山方			'15.07.29 徳森





DETAIL B (2:1)

Reference only

It is possible to change some dimensions.
（本図記載の形状・及び寸法値は変更の可能性があります）

DETAIL A (Dot Size)
(NTS)

Note. (注記)
1. Connector CN1: 20186-020E-11F (I-PEX)
(コネクター) CN3: SM06B-SHLS-G-TF(LF)(SN) (JST)
2. Matching Connector CN1: 20197-020U-F (I-PEX)
(適合コネクター) 20197-T20U-F (I-PEX)
CN3: SHLP-6V-S-B (JST)
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 : 2.3mm
(最大ネジ長)
7. Max screw torque : 0.35N·m
(最大ネジ締め付けトルク)
8. Touch Panel P/N : CTP121ABDX-ND (14130-03929-1) ⚠ ~~CTP121ABDA-ND (14130-03929)~~

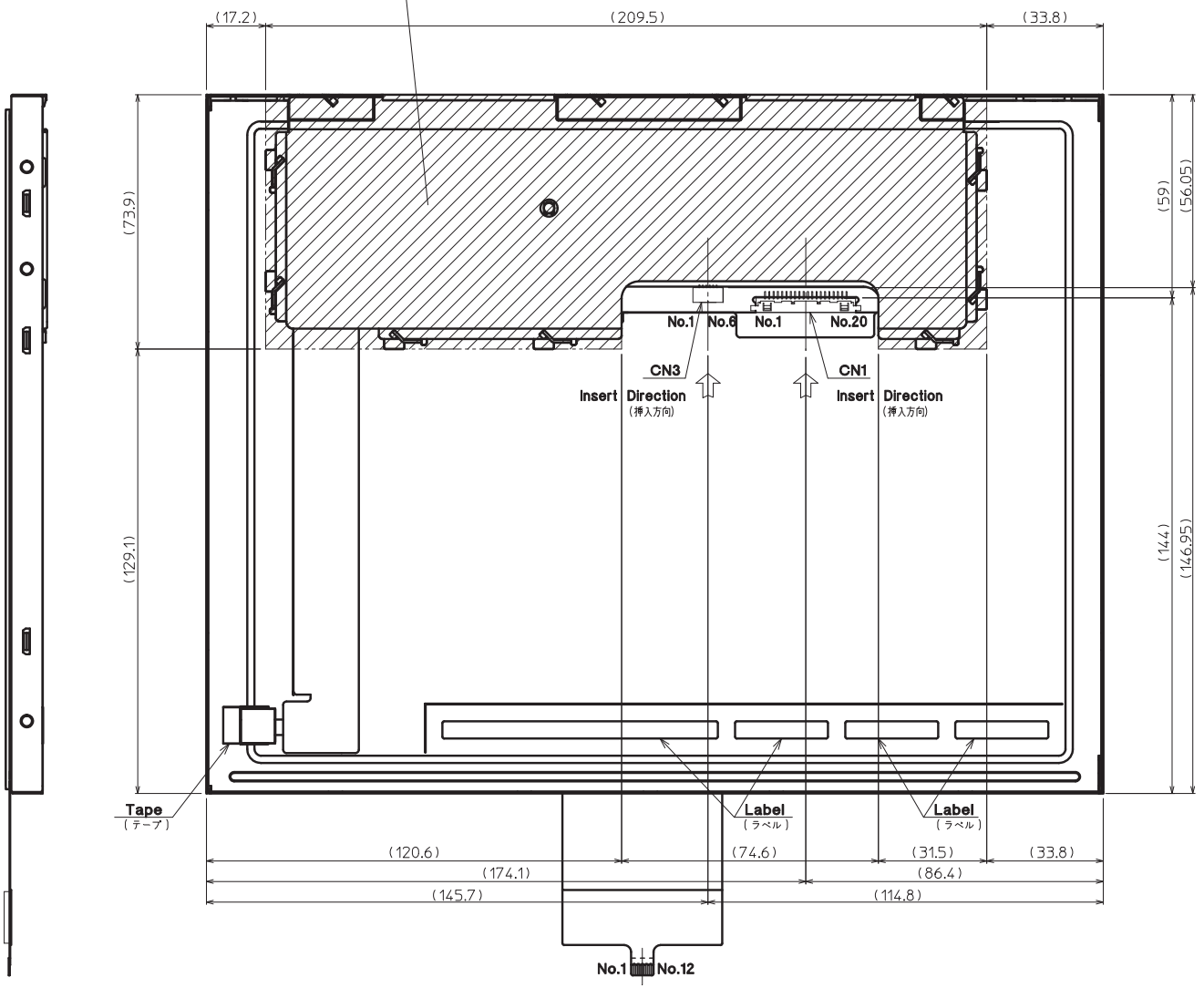
Material 材質	Treatment 処理	Approved	Checked	Checked	Drawn	Scale	Title		Year-Month-Day	Size
		'15.07.17 徳森			山方	1:1 (NTS)	TCG121XGLPBPNN-AN40+CTP-WS for Demo	KYOCERA	'15.07.17	2
Quantity 製作数	Description; 備考 RoHS						Outline Dimensions	Drawing No.	15105-10276-1	1/2

No	Description	Drawn	Checked	Checked	Approved
⚠	・1/2 Rev.UP	'15.07.29 山方			'15.07.29 徳森

※ The thickness to a metallic side of the surface is indicated. (T.P. is excluded.)
(表面側の金属面までの厚みを示しています。T.P.は除きます。)

shield cover
(シールドカバー)
10.4mm thickness.
(厚み10.4mm)

: Projected part is 10.4mm thickness.
(厚み10.4mm)



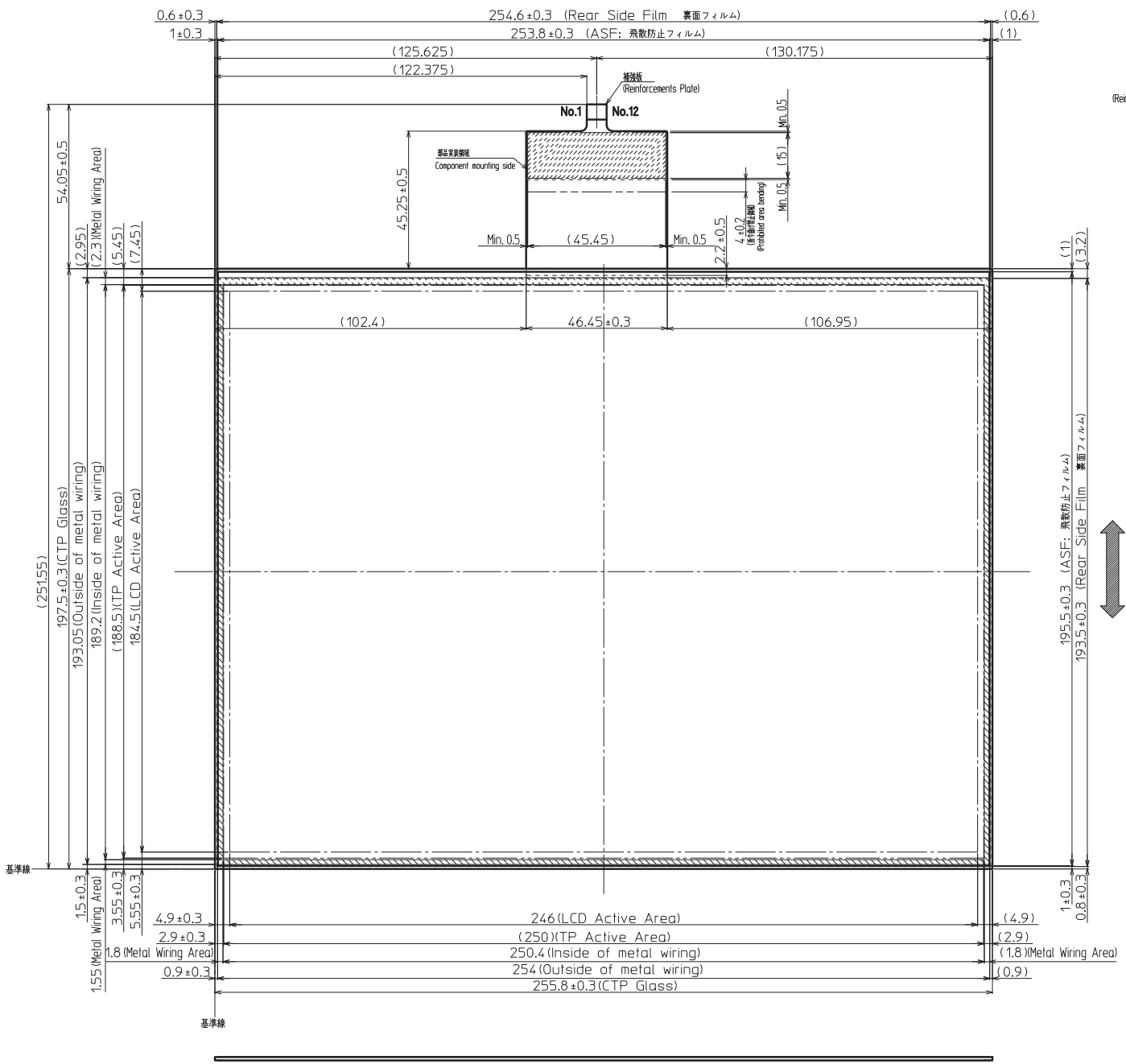
Reference only

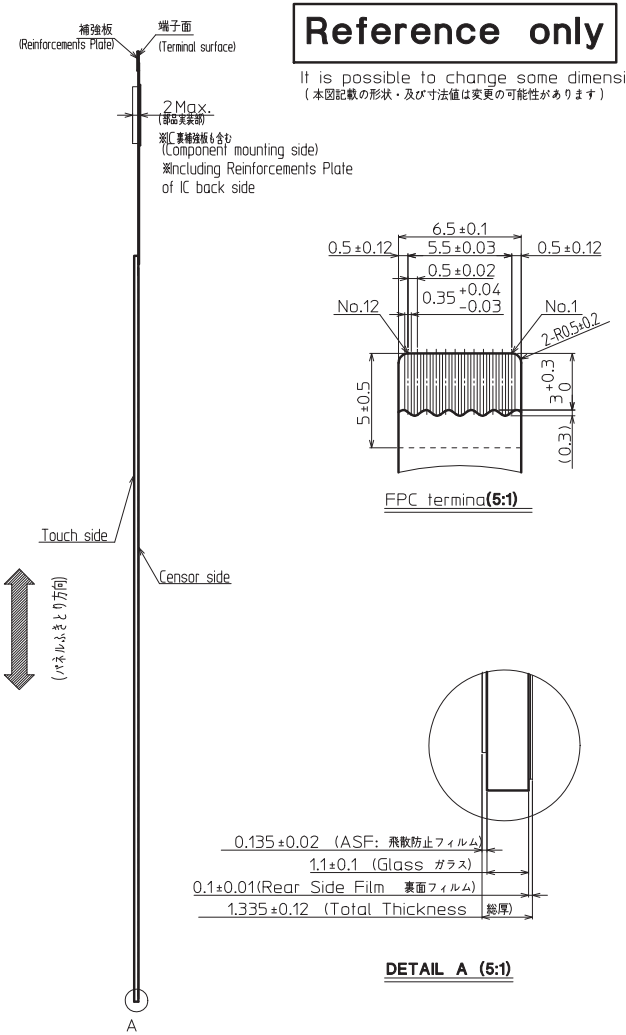
It is possible to change some dimensions.
(本図記載の形状・及び寸法値は変更の可能性があります)

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

Material 材質	Treatment 処理	Approved '15.07.17	Checked	Checked	Drawn	Scale 1:1	Title TCG121XGLPBPNN-AN40+CTP-WS for Demo	KYOCERA	Year-Month-Day '15.07.17 / Size 2
Quantity 製作数	Description; 備考 RoHS	徳森			山方		Outline Dimensions	Drawing No. 15105-10276-1	2/2

No	Description	Drawn	Checked	Checked	Approved
⚠	·Change Title name CTP121ABDA-ND→CTP121ABDX-ND	'15.07.27 山方			'15.07.27 徳森





Reference only

It is possible to change some dimensions.
（本図記載の形状・及び寸法値は変更の可能性があります）

Note. (注記)
1. Recommendation Connector(推奨コネクタ)
04-6299-612-020 846+(京セラ) One-touch lock type
04-6240-012-026 846+(京セラ) One-touch lock type
08-6260-012-340 829+(京セラ) Slide lock type

2.There is a possibility that the FPC position changes by IC.
(ICによって、FPC位置が変わる可能性があります)

3. Tolerance without indication :±0.1
(指示なき公差)

Material 材質	Treatment 処理	Approved	Checked	Checked	Drawn	Scale	Title		Year-Month-Day	Size
Quantity 製作数	Description, 備考 RoHS Ⅱ	徳森			山方	1:1(5:1)	⚠CTP121ABDX-ND Outline Dimensions	KYOCERA Drawing No. 14130-03929-1	'14.10.17	2

Spec No.	TQ3C-8EAF0-E2YAL28-00
Date	July 30, 2015

KYOCERA INSPECTION STANDARD

TYPE : TCG121XGLP*PC*-AD*54

KYOCERA DISPALY CORPORATION

Original Issue Date	Designed by : Engineering dept.			Confirmed by : QA dept.	
	Prepared	Checked	Approved	Checked	Approved
July 30, 2015	M. Koyama	M. Fukuo	Y. Yamazaki	O. Sato	I. Hamada

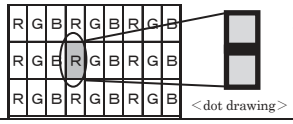
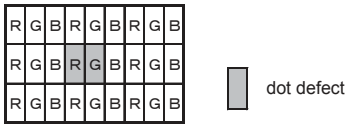
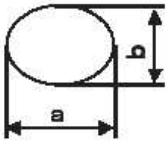
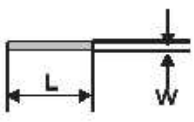
Revision record

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

Rev.No.	Date	Page	Descriptions

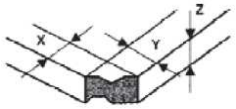
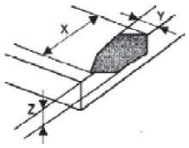
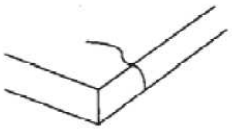
Visuals specification

1) Note

<table>
<tr><th></th><th colspan="3">Note</th></tr>
<tr><td>General</td><td colspan="3">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 effective viewing 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℃
Direction : Directly above</td></tr>
<tr><td rowspan="7">Definition of inspection item</td><td rowspan="4">Dot defect</td><td>Bright dot defect</td><td>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.
 
<dot drawing>
There is an electrode in the middle of the dot and one dot is shown in the left drawing.</td></tr>
<tr><td>Black dot defect</td><td>The dot is constantly “off” when power applied to the LCD, even when all “White” data sent to the screen.
Similar size compared to bright dot.</td></tr>
<tr><td>White dot (Circular/foreign particle)</td><td>Pixel works electrically, however, circular/foreign particle makes dot appear to be “on” even when all “Black” data is sent to the screen.</td></tr>
<tr><td>Adjacent dot</td><td>Adjacent dot defect is defined as two or more bright dot defects or black dot defects.
 
dot defect</td></tr>
<tr><td rowspan="2">External inspection</td><td>Bubble, Scratch, Foreign particle (Polarizer, Cell, Backlight)</td><td>Visible operating (all pixels “Black” or “White”) and non operating.</td></tr>
<tr><td>Appearance inspection</td><td>Does not satisfy the value at the spec.</td></tr>
<tr><td>Others</td><td>CFL wires</td><td>Damaged to the CFL wires, connector, pin, functional failure or appearance failure.</td></tr>
<tr><td>Definition of size</td><td colspan="2">Definition of circle size
 
d =(a + b)/2
Definition of linear size
  </td></tr>
</table>

2) Standard

<table>
<tr><th colspan="2">Classification</th><th colspan="2">Inspection item</th><th>Judgement standard</th></tr>
<tr><td rowspan="6">Defect (in LCD glass)</td><td rowspan="5">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 ≦ 0.2</td><td>(Neglected)</td></tr>
<tr><td>0.2 ＜ d ≦ 0.4</td><td>5</td></tr>
<tr><td>0.4 ＜ d ≦ 0.5</td><td>3</td></tr>
<tr><td>0.5 ＜ d</td><td>0</td></tr>
</table>
</td></tr>
<tr><td 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 ≦ 0.1</td><td>－</td><td>(Neglected)</td></tr>
<tr><td rowspan="2">0.1 ＜ W ≦ 0.3</td><td>L ≦ 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 ≦ 0.2</td><td>(Neglected)</td></tr>
<tr><td>0.2 ＜ d ≦ 0.3</td><td>5</td></tr>
<tr><td>0.3 ＜ d ≦ 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 ≦ 0.2</td><td>(Neglected)</td></tr>
<tr><td>0.2 ＜ d ≦ 0.4</td><td>5</td></tr>
<tr><td>0.4 ＜ d ≦ 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 ≦ 0.03</td><td>－</td><td>(Neglected)</td></tr>
<tr><td rowspan="3">0.03 ＜ W ≦ 0.1</td><td>L ≦ 2.0</td><td>(Neglected)</td></tr>
<tr><td>2.0 ＜ L ≦ 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>

<table>
<tr><th>Inspection item</th><th>Judgement standard</th></tr>
<tr><td>Scratch,
Foreign particle
(Touch screen portion)</td><td>(W = Width, L = Length, D = Diameter = (major axis＋minor axis)/ 2)
<table>
<tr><th>Item</th><th>Width(mm)</th><th>Length(mm)</th><th>Acceptable number</th></tr>
<tr><td rowspan="3">Scratch</td><td>W ≦0.1</td><td>-</td><td>Neglected</td></tr>
<tr><td rowspan="2">0.1 ＜ W ≦ 0.3</td><td>L ≦ 5</td><td>Neglected</td></tr>
<tr><td>5＜ L</td><td>0</td></tr>
<tr><td>0.3 ＜ W</td><td>-</td><td>0</td></tr>
<tr><td rowspan="2">Foreign
(line like)</td><td>W ≦ 0.05</td><td>-</td><td>Neglected</td></tr>
<tr><td>0.05 ＜ W ≦ 0.1</td><td>L ≦ 5</td><td>2pcs within ϕ30mm</td></tr>
<tr><td rowspan="4">Foreign
(circle like)</td><td colspan="2">D ≦ 0.2</td><td>Neglected</td></tr>
<tr><td colspan="2">0.2 ＜ D ≦ 0.4</td><td>5pcs</td></tr>
<tr><td colspan="2">0.4 ＜ D ≦ 0.5</td><td>3pcs</td></tr>
<tr><td colspan="2">0.5 ＜ D</td><td>0pcs</td></tr>
</table>
Above are applied to the T.P. active area.
Unless there are foreign particle and damage affected seriously to the electrical performance out of the T.P. active area, we approve of this product.</td></tr>
<tr><td>Glass crack
(Touch screen portion)</td><td>
<table>
<tr><th>Item</th><th colspan="3">Size (mm)</th><th>Acceptable number</th></tr>
<tr><td rowspan="3">Corner crack</td><td rowspan="3">  </td><td>X</td><td>≦3</td><td rowspan="3">Neglected</td></tr>
<tr><td>Y</td><td>≦3</td></tr>
<tr><td>Z</td><td>＜t</td></tr>
<tr><td rowspan="3">Crack in other area than in corner</td><td rowspan="3">  </td><td>X</td><td>≦5</td><td rowspan="3">5 pcs
/side</td></tr>
<tr><td>Y</td><td>≦1.5</td></tr>
<tr><td>Z</td><td>＜t</td></tr>
<tr><td>Progressive crack</td><td colspan="3">  </td><td>0 pcs
(NG even 1pcs)</td></tr>
</table></td></tr>
<tr><td>Dirt
(Touch screen portion)</td><td>・When I cannot see a dirt based on an inspection condition, I assume it no object.
・When I can wipe it off, I assume it no object.</td></tr>
</table>