SPEC

Spec No.	TQ3C-8EAF0-E1YAE14-00
Date	December 12, 2011

TYPE : TCG084VGLAAANN-AN50

< 8.4 inch VGA transmissive color TFT
with LED backlight>

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Issued
Date: Dec 21, 2011
KYOCERA
Hayato LCD Division

KYOCERA CORPORATION
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
December 12, 2011	R. Nakao	K. Mori	M. FujiTani		

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 TCG084VGLAAANN-AN50. (RoHS Compliant)

2. Construction and outline

LCD	: Transmissive color dot matrix type TFT
Backlight system	: LED
Polarizer	: Anti-Glare treatment
Additional circuit	: Timing controller, Power supply (3.3V input) (without constant current circuit for LED Backlight)

3. Mechanical specifications

Item	Specification	Unit
Outline dimensions 1)	199.5(W)×(147.4)(H)×9(D)	mm
Active area	170.88(W)×128.16(H) (21.3cm/8.4 inch(Diagonal))	mm
Dot format	640×(R,G,B)(W)×480(H)	dot
Dot pitch	0.089(W)×0.267(H)	mm
Base color 2)	Normally White	-
Mass	(320)	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	V_{DD}	0	4.0	V
Input signal voltage 1)	V_{IN}	-0.3	6.0	V
LED forward current 2) 3)	IF	-	(100)	mA

1) Input signal : CK, R0~R5, G0~G5, B0~B5, H_{SYNC}, V_{SYNC}, ENAB, R/L, U/D
2) For each "AN-CA"
3) Do not apply reversed voltage.

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/s²)
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

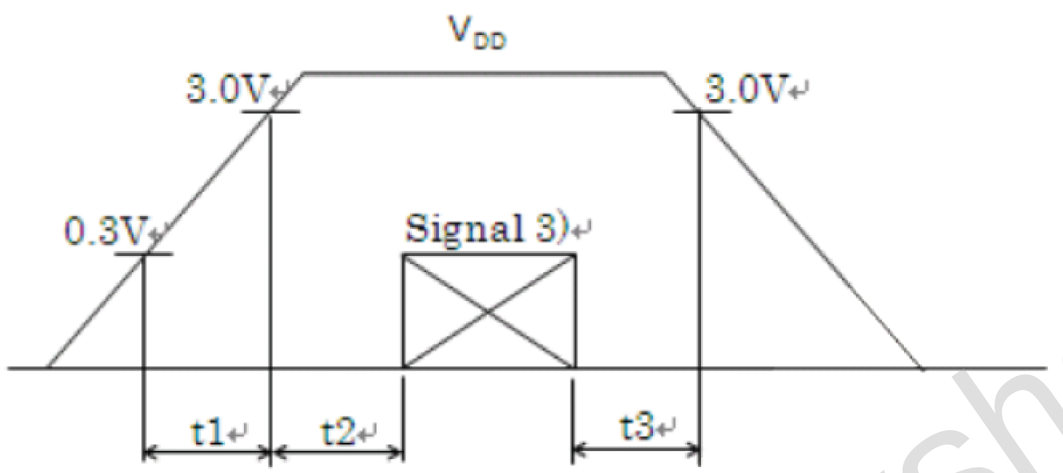
6) Acceleration: 490 m/s², Pulse width: 11 ms
3 times in each direction: ±X, ±Y, ±Z
EIAJ ED-2531

5. Electrical characteristics

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)	-	(160)	(240)	mA
Permissive input ripple voltage	V_{RP}	-	-	-	(100)	mVp-p
Input signal voltage 3)	V_{IL}	"Low" level	0	-	0.8	V
	V_{IH}	"High" level	2.0	-	V_{DD}	V

1) V_{DD}-turn-on conditions


VDD
3.0V
3.0V
0.3V
Signal 3)
t1
t2
t3

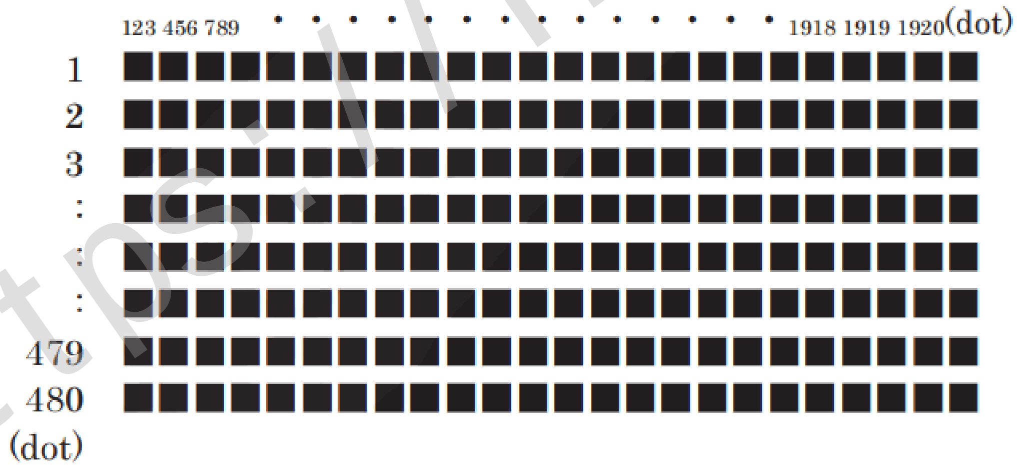
$0 < t1 \leqq 20ms$

$0 < t2 \leqq 50ms$

$0 < t3 \leqq 1s$

2) Display pattern:

V_{DD} = 3.3V, Temp. = 25°C


123 456 789 ・・・・・・・・・・・・・ 1918 1919 1920(dot)
1
2
3
:
:
:
479
480
(dot)

3) Input signal : CK, R0～R5, G0～G5, B0～B5, H_{SYNC}, V_{SYNC}, ENAB, R/L, U/D

https://linvshop.com

6. Optical characteristics

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

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Response time	Rise	τ_r	$\theta=\phi=0°$	-	(10)	-	ms
	Down	τ_d	$\theta=\phi=0°$	-	(20)	-	ms
Viewing angle range View direction : 6 o'clock (Gray inversion)		θ_{UPPER}	CR≧10	-	(60)	-	deg.
		θ_{LOWER}		-	(65)	-	
		ϕ_{LEFT}		-	(65)	-	deg.
		ϕ_{RIGHT}		-	(65)	-	
Contrast ratio		CR	$\theta=\phi=0°$	(350)	(500)	-	-
Brightness		L	IF=60mA/Line	(590)	(850)	-	cd/m^2
Uniformity		LU	-	(70)	-	-	%
Chromaticity coordinates	Red	x	$\theta=\phi=0°$	(0.550)	(0.600)	(0.650)	-
		y		(0.285)	(0.335)	(0.385)	
	Green	x	$\theta=\phi=0°$	(0.290)	(0.340)	(0.390)	
		y		(0.500)	(0.550)	(0.600)	
	Blue	x	$\theta=\phi=0°$	(0.105)	(0.155)	(0.205)	
		y		(0.055)	(0.105)	(0.155)	
	White	x	$\theta=\phi=0°$	(0.255)	(0.305)	(0.355)	
		y		(0.265)	(0.315)	(0.365)	

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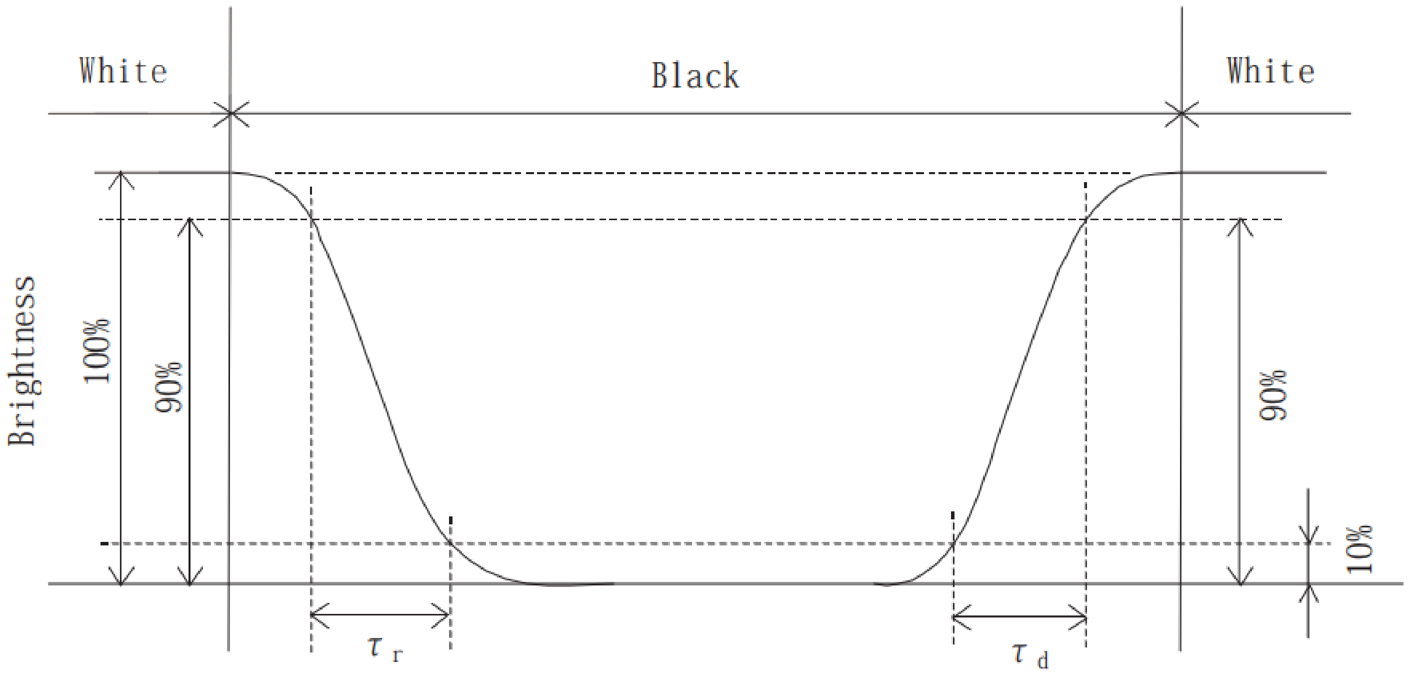
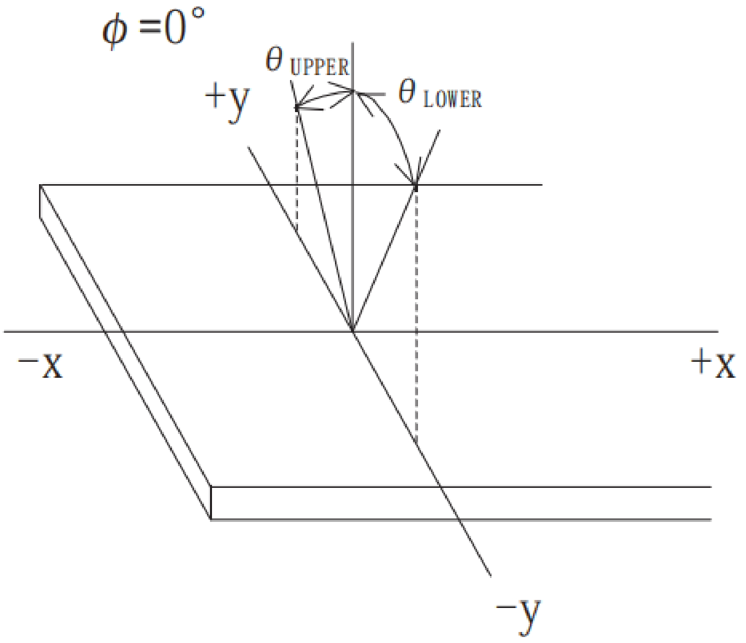
6-1. Definition of contrast ratio

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

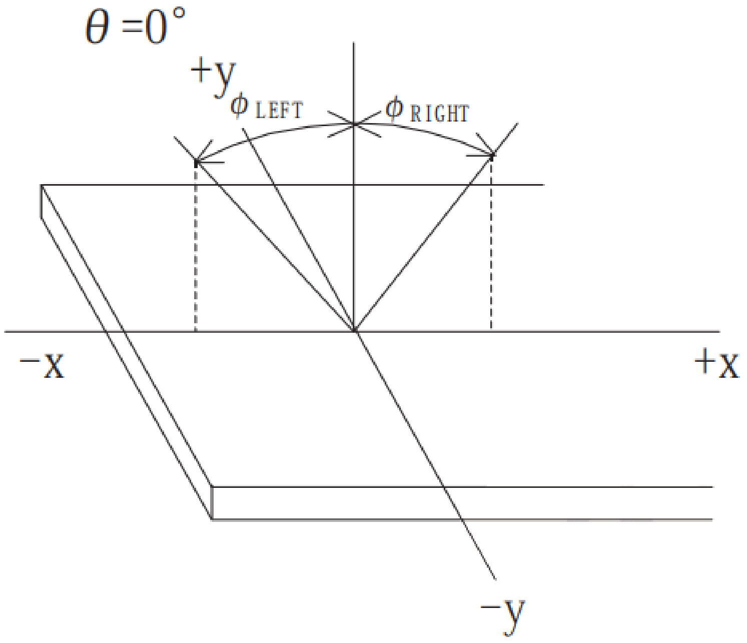
6-2. Definition of response time



6-3. Definition of viewing angle

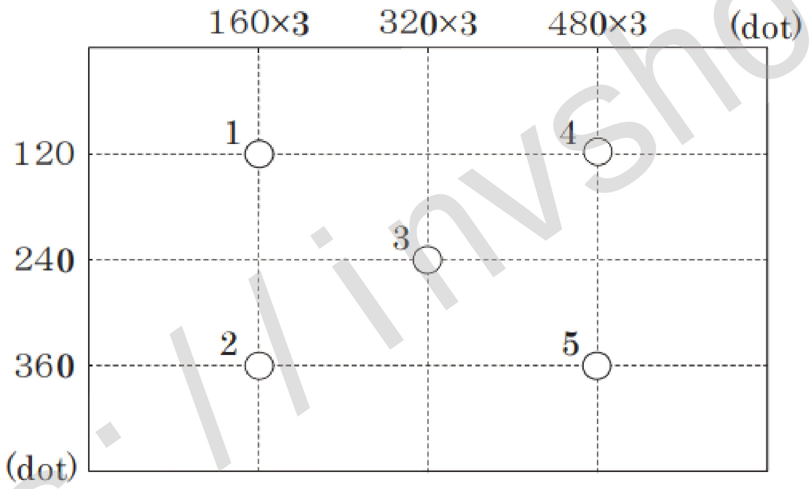

ϕ =0°
θ UPPER
θ LOWER
+y
−x
+x
−y

θ direction


θ =0°
+y
ϕ LEFT
ϕ RIGHT
−x
+x
−y

ϕ direction

6-4. Brightness measuring points


160×3
320×3
480×3
(dot)
120
240
360
(dot)
1
2
3
4
5

1) Rating is defined as the white brightness at center of display screen(3).
2) The brightness uniformity is calculated by using following formula.

$$\text{Brightness uniformity} = \frac{\text{Minimum brightness from 1 to 5}}{\text{Maximum brightness from 1 to 5}} \times 100\ [\%]$$

3) 5 minutes after LED is turned on. (Ambient Temp.=25℃)

7. Interface signals

No.	Symbol	Description	I/O	Note
1	NC	No connect	-	
2	AN3	Anode 3	-	
3	AN2	Anode 2	-	
4	AN1	Anode 1	-	
5	NC	No connect	-	
6	CA3	Cathode 3	-	
7	CA2	Cathode 2	-	
8	CA1	Cathode 1	-	
9	NC	No connect	-	
10	U/D	Vertical display mode select signal H : Normal , L : Up / Down reverse mode	I	2)
11	R/L	Horizontal display mode select signal L : Normal , H : Left / Right reverse mode	I	2)
12	V_{DD}	3.3V power supply	-	
13	V_{DD}	3.3V power supply	-	
14	ENAB	Signal to settle the horizontal display position (positive)	I	1)
15	GND	GND	-	
16	B5	BLUE data signal (MSB)	I	
17	B4	BLUE data signal	I	
18	B3	BLUE data signal	I	
19	B2	BLUE data signal	I	
20	B1	BLUE data signal	I	
21	B0	BLUE data signal (LSB)	I	
22	GND	GND	-	
23	G5	GREEN data signal (MSB)	I	
24	G4	GREEN data signal	I	
25	G3	GREEN data signal	I	
26	G2	GREEN data signal	I	
27	G1	GREEN data signal	I	
28	G0	GREEN data signal (LSB)	I	
29	GND	GND	-	
30	R5	RED data signal (MSB)	I	
31	R4	RED data signal	I	
32	R3	RED data signal	I	
33	R2	RED data signal	I	
34	R1	RED data signal	I	
35	R0	RED data signal (LSB)	I	
36	GND	GND	-	
37	V_{SYNC}	Vertical synchronous signal (negative)	I	
38	H_{SYNC}	Horizontal synchronous signal (negative)	I	
39	CK	Clock signal for sampling each data signal	I	
40	GND	GND	-	

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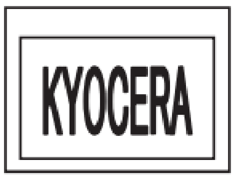
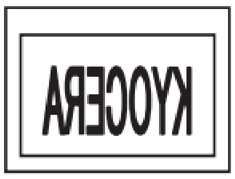
LCD connector	:	04 6240 040 023 846+ (ELCO)
Recommended matching FFC or FPC	:	0.5mm pitch

1) The horizontal display start timing is settled in accordance with a rising timing of ENAB signal.
In case ENAB is fixed "Low", the horizontal start timing is determined.
Don't keep ENAB "High" during operation.

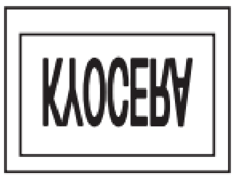
2)



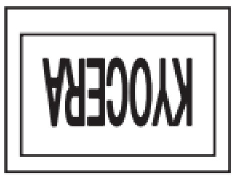
R/L = L
U/D = H



R/L = H
U/D = H



R/L = L
U/D = L



R/L = H
U/D = L

8. Input timing characteristics

8-1. Timing characteristics

Item		Symbol	Min	Typ	Max	Unit	Note
Clock	Frequency	1/Tc	(22.66)	(25.18)	(27.69)	MHz	
	Duty ratio	Tch/Tc	(40)	(50)	(60)	%	
Data	Set up time	Tds	(5)	–	–	ns	
	Hold time	Tdh	(10)	–	–	ns	
Horizontal sync. signal	Cycle	TH	(30.0)	(31.8)	–	μs	
			(770)	(800)	(850)	clock	
	Pulse width	THp	(2)	(96)	(200)	clock	
Vertical sync. signal	Cycle	TV	(515)	(525)	(560)	line	
	Pulse width	TVp	(2)	–	(34)	line	
Horizontal display period		THd	640			clock	
Hsync,-Clock phase difference		THc	(10)	–	Tc-10	ns	
Hsync-Vsync. phase difference		TVh	2Tc	–	TH-THp-1	ns	
Vertical sync. signal start position		TVs	(34)			line	
Vertical display period		TVd	480			line	

1) In case of lower frequency, the deterioration of the display quality, flicker etc., may occur.

8-2. Horizontal display position

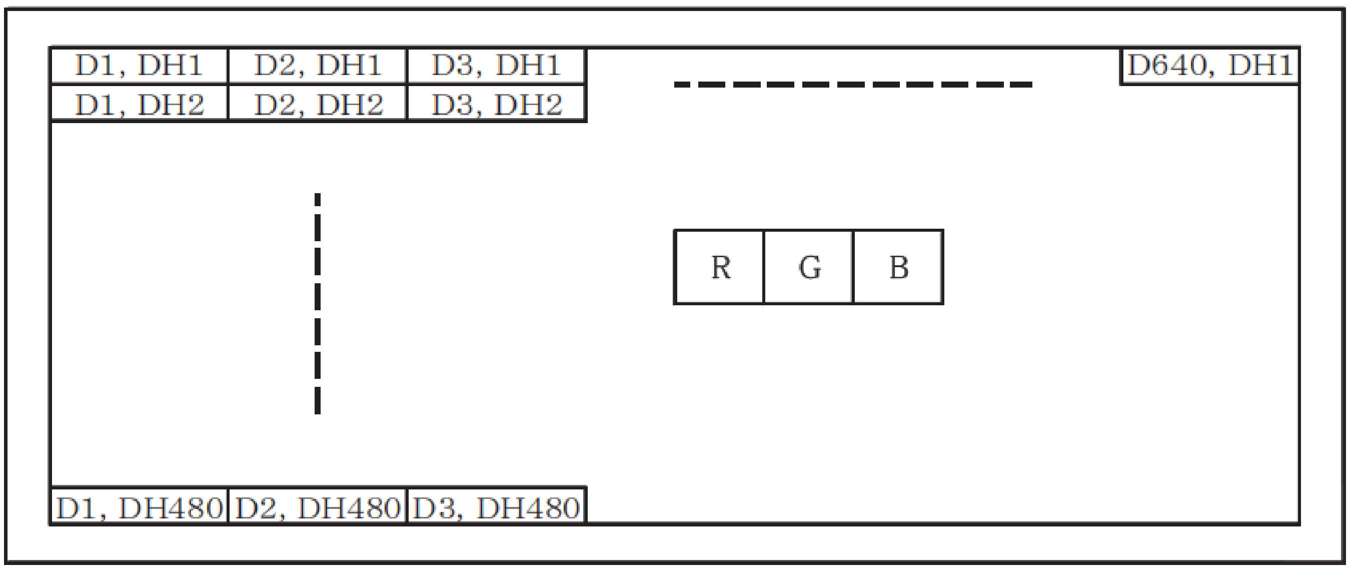
Item		Symbol	Min	Typ	Max	Unit	Note
Enable signal	Set up time	Tes	(5)	–	Tc-10	ns	
	Pulse width	Tep	(2)	640	TH-10	clock	
Hsync – Enable signal phase difference		The	(44)	–	TH-664	clock	

1) When ENAB is fixed at "Low", the display starts from the data of C104(clock) as shown in 8-5.
2) The horizontal display position is determined by ENAB signal.

8-3. Vertical display position

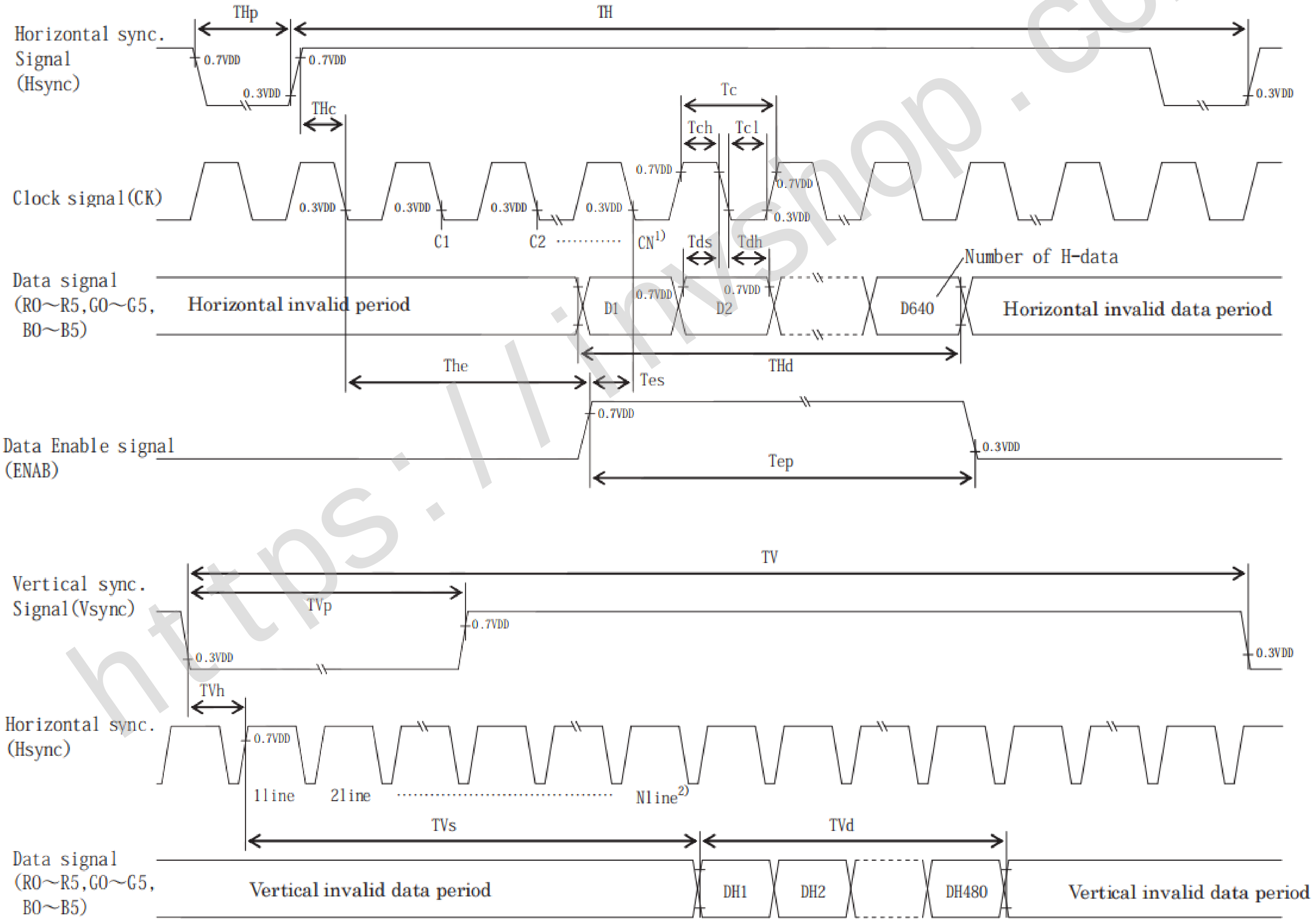
1) The vertical display position (TVs) is 34th line.
2) ENAB signal is independent of vertical display position.

8-4. Input Data Signals and Display position on the screen



D1, DH1
D2, DH1
D3, DH1
D640, DH1
D1, DH2
D2, DH2
D3, DH2
R
G
B
D1, DH480
D2, DH480
D3, DH480

8-5. Input timing characteristics



Horizontal sync. Signal (Hsync)
THp
TH
0.7VDD
0.3VDD
THc
Tc
Tch
Tcl
Clock signal(CK)
C1
C2
CN1)
Tds
Tdh
Number of H-data
Data signal (R0～R5,G0～G5, B0～B5)
Horizontal invalid period
D1
D2
D640
Horizontal invalid data period
The
Tes
THd
Data Enable signal (ENAB)
Tep
TV
Vertical sync. Signal(Vsync)
TVp
TVh
Horizontal sync. (Hsync)
1line
2line
Nline2)
TVs
TVd
Vertical invalid data period
DH1
DH2
DH480

1) When ENAB is fixed at "Low", the display starts from the data of C104(Clock).

2) The vertical display position(TVs) is fixed at 34th line.

9. Backlight characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward current 1)	IF	-	60	-	mA	Ta=-20～70°C
Forward voltage 1)	VF	-	(19.4)	(21.4)	V	IF=60mA, Ta=-20℃
		-	(18.4)	(20.4)	V	IF=60mA, Ta=25℃
		-	(17.8)	(19.8)	V	IF=60mA, Ta=70℃
Operating life time 2), 3)	T	-	(70,000)	-	h	IF=60mA, Ta=25℃

1) For each "AN-CA"
2) When brightness decrease 50% of minimum brightness.
The average life of a LED will decrease when the LCD is operating at higher temperatures.
3) Life time is estimated data.(Condition : IF=60mA, Ta=25℃ in chamber).
4) An input current below 15mA may reduce the brightness uniformity of the LED backlight.
This is because the amount of light from each LED chip is different. Therefore, please evaluate carefully before finalizing the input current.

10. Lot number identification

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

TCG084VGLAAANN-AN50 - □□ - □□ - □ 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	2011	2012	2013	2014	2015	2016
Code	1	2	3	4	5	6

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.

12. Precautions for use

12-1. 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) The LCD shall be installed flat, without twisting or bending.

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

12-4. 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.

12-5. Usage

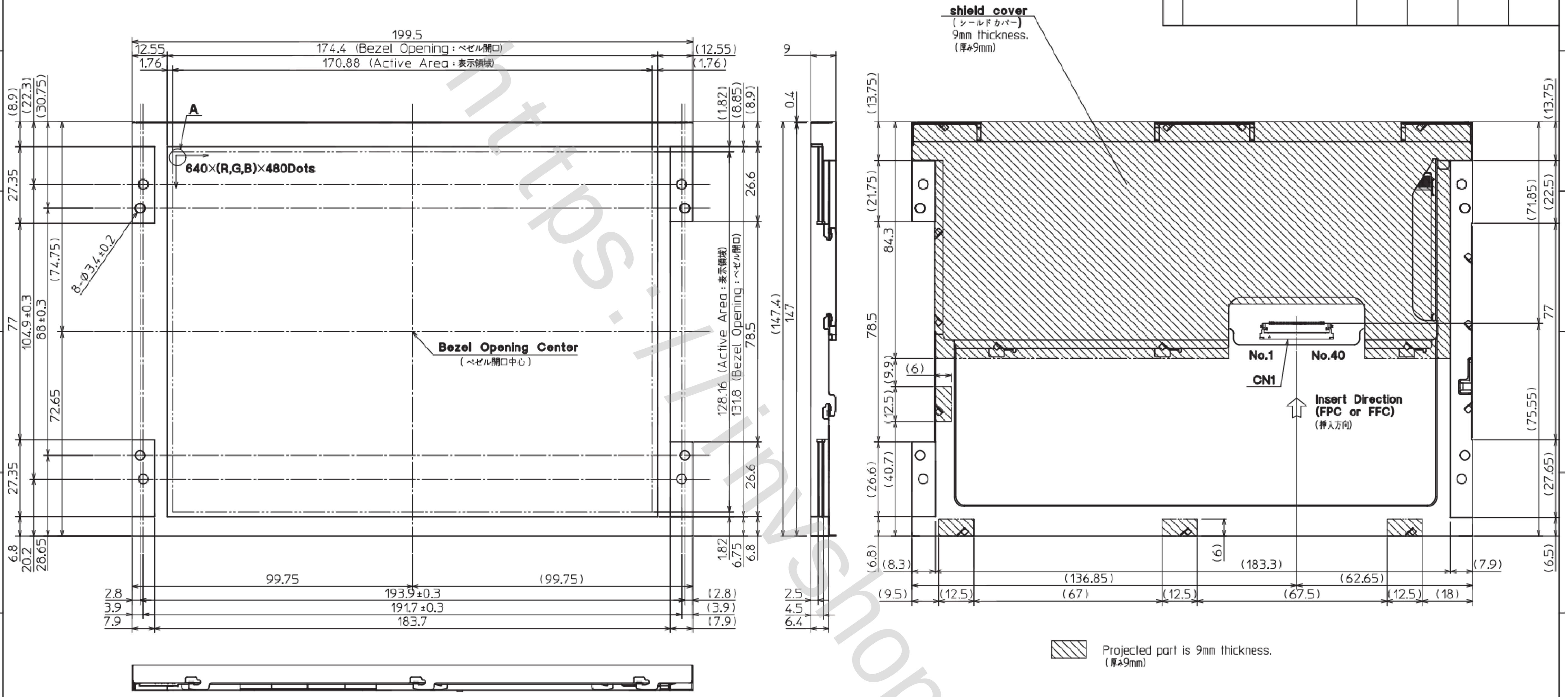
1) DO NOT store in a high humidity environment for extended periods. Polarizer degradation bubbles, and/or peeling off of the polarizer may result.
2) The front polarizer is easily scratched or damaged. Prevent touching it with any hard material, and from being pushed or rubbed.
3) The LCD screen may 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.

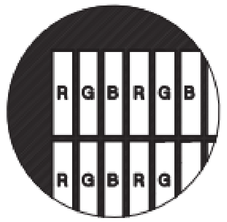
13. Reliability test data

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	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


shield cover
（シールドカバー）
9mm thickness.
（厚み9mm）
199.5
12.55
(12.55)
174.4 (Bezel Opening：ベゼル開口)
170.88 (Active Area：表示領域)
1.76
(1.76)
A
640×(R,G,B)×480Dots
8-Ø3.4±0.2
Bezel Opening Center
（ベゼル開口中心）
128.16 (Active Area：表示領域)
131.8 (Bezel Opening：ベゼル開口)
(8.9)
(22.3)
(30.75)
27.35
(74.75)
77
104.9±0.3
88±0.3
72.65
6.8
20.2
28.65
(1.82)
(8.85)
(8.9)
26.6
78.5
1.82
6.75
6.8
99.75
(99.75)
2.8
3.9
7.9
193.9±0.3
191.7±0.3
183.7
(2.8)
(3.9)
(7.9)
9
0.4
(147.4)
147
2.5
4.5
6.4
(13.75)
(21.75)
84.3
(6)
(9.9)
(12.5)
(40.7)
(26.6)
(6.8)
(8.3)
(9.5)
(136.85)
(67)
(183.3)
(62.65)
(67.5)
(18)
(7.9)
(6.5)
(71.85)
(22.5)
(75.55)
(27.65)
No.1
No.40
CN1
Insert Direction
(FPC or FFC)
（挿入方向）
▨ Projected part is 9mm thickness.
（厚み9mm）


R G B R G B
R G B R G

DETAIL A (Dot Size)
(NTS)

Note.（注記）
1. Connector CN1：04 6240 040 023 846+
（コネクター）
2. 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。）
3. Tolerance without indication：±0.5
（指示無き公差）

Material 材質	Treatment 処理	Approved '11.11.25 朝倉	Checked	Checked '11.11.25 車	Drawn 倉元	Scale 1:1 (NTS)	Title TCG084VGLAAANN	KYOCERA	Year-Month-Day '11.11.22	Size 2
Quantity 製作数	Description; 備考 RoHS 11059-06448-2						Outline Dimensions	Drawing No. 121A8051700		

Spec No.	TQ3C-8EAF0-E2YAE14-00
Date	December 12, 2011

KYOCERA INSPECTION STANDARD

TYPE : TCG084VGLAAANN-AN50

KYOCERA CORPORATION
LCD DIVISION

Original Issue Date	Designed by : Engineering dept.			Confirmed by : QA dept.	
	Prepared	Checked	Approved	Checked	Approved
December 12, 2011	R. Nakao	K. Mori	M. FujiTani		

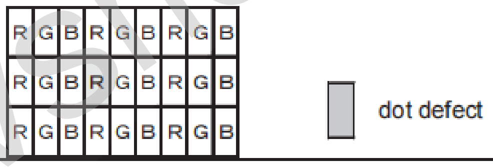
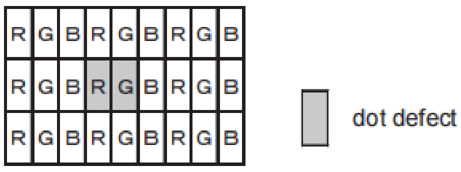
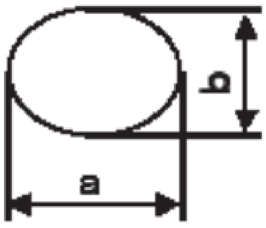
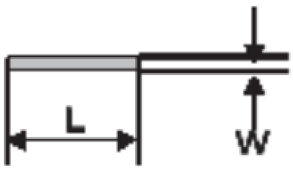
Revision record

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℃ 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.  R G B R G B R G B R G B R G B R G B R G B R G B R G B dot defect
		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.  R G B R G B R G B R G B R G B R G B R G B R G B R G B dot defect
	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 ≦ 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" 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>

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