DATA MODUL

SPECIFICATION

KYOCERA

TN0227ANVNANN-GN*03

2.27" - MIP TFT

Version:
Date: 14.04.2022

Note: This specification is subject to change without prior notice

www.data-modul.com

TYPE : TN0227ANVNANN-GN*03

< 2.27 inch Reflective (slightly transmissive)
Dot Matrix Memory LC Display>

CONTENTS

1. Application
2. Construction and Outline
3. Mechanical Specifications
4. Absolute Maximum Ratings
5. Optical Characteristics
6. Electrical Characteristics
7. Address Mapping
8. Interface Signals
9. Input Timing Characteristics
10. Warranty
11. Precautions for Use
12. Reliability test data
13. Outline drawing

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Apr 28, 2022
KYOCERA Corp.

KYOCERA CORPORATION

Original Issue Date	Designed by: Engineering dept.			Confirmed by: QA dept.	
	Prepared	Checked	Approved	Checked	Approved
April 13, 2022	*M. Yamada*	*M. Iwasaki*	*A. Iwasaki*	*Y. Aritsubo*	*M. Kinouchi*

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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.

2. Please note that we may not be able to respond to new environmental regulations after receiving the final mass production order for this product.

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 TN0227ANVNANN-GN*03. (RoHS Compliant)

2. Construction and Outline

LCD	: Reflective (slightly transmissive) dot matrix memory LC display The display should be readable with polarized sunglasses in portrait mode.
Backlight System	: None
Polarizer	: Glare type
Additional circuit	: 1-bit pixel memory function in LCD

3. Mechanical Specifications

Item	Specification	Unit
Outline dimensions 1)	41.65(W) × 48.5(H)	mm
Glass thickness	0.5 + 0.5	mm
Active area	36.00(W) × 45.00(H) (Diagonal 2.27 inch)	mm
Dot format	240(W) × 300(H)	Dot
Dot pitch	150(W) × 150(H)	μm
Color	Black-and-White (Binary)	-
LC Mode	ECB mode(Normally black)	-
Weight	TBD	g

1) FPC is not included. Please refer to the drawing for details.

4. Absolute Maximum Ratings

4-1. Electrical absolute maximum ratings

Item		Symbol	Min.	Max.	Unit
Supply voltage		V_{DD}	-0.3	4.0	V
Input signal voltage	1)	V_{IN}	-0.3	4.0	V

　　1)　Input signals : SCLK, SI, SCS, RST, VCOM

4-2. Environmental absolute maximum ratings

Item		Symbol	Min.	Max.	Unit
Operating temperature	1)	T_{OP}	-25	80	℃
Storage temperature	2)	T_{STO}	-30	85	℃
Operating humidity	3)	H_{OP}	10	4)	%RH
Storage humidity	3)	H_{STO}	10	4)	%RH

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

5. Optical Characteristics

Temp. = 25℃

Item		Symbol	Temp.	Unit	Min.	Typ.	Max.
Contrast ratio　1)		CR	25℃	-	-	(40)	-
Reflectance		-	25℃	%	-	(18)	-
Response time 2)3)	Rise	τr	-20℃	msec	-	(16)	-
			25℃		-	(12)	-
			40℃		-	(12)	-
	Fall	τf	-20℃	msec	-	(34)	-
			25℃		-	(13)	-
			40℃		-	(12)	-
Viewing angle CR≧2 4)5)	θupper		25℃	deg.	-	(60)	-
	θlower				-	(60)	-
	θleft				-	(60)	-
	θright				-	(60)	-
Chromaticity coordinates	Wx	-	25℃	-	-	(0.31)	-
	Wy	-			-	(0.34)	-

1) Definition of contrast ratio

$$CR(\text{Contrast ratio}) = \frac{\text{Brightness with all pixels "White"}}{\text{Brightness with all pixels "Black"}}$$
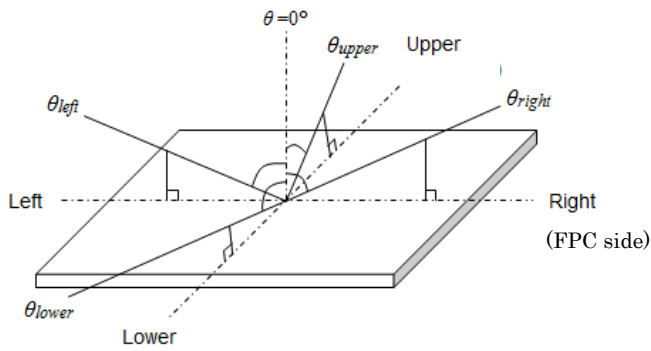
2) Definition of response time
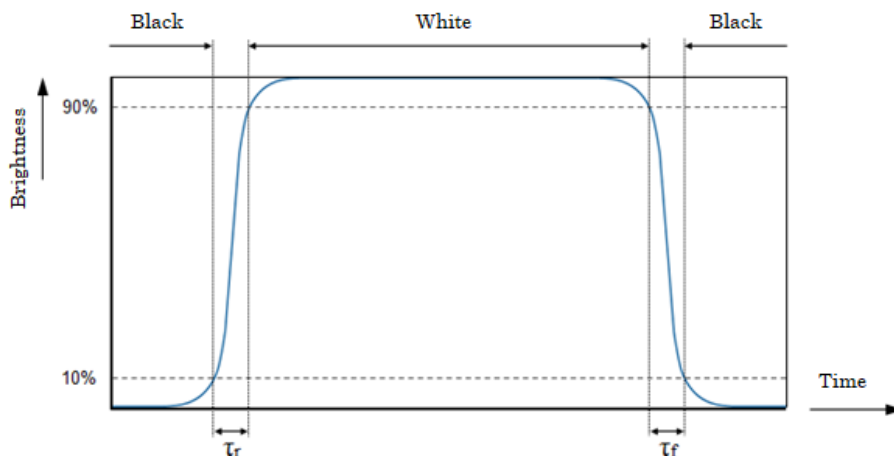
3) About the measurement of Response time
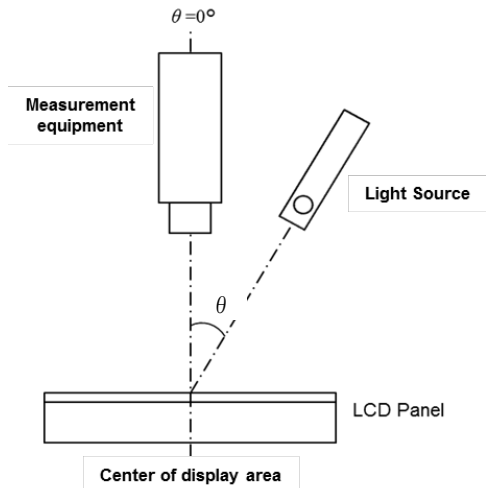   Measurement Equipment (LCD-5200)
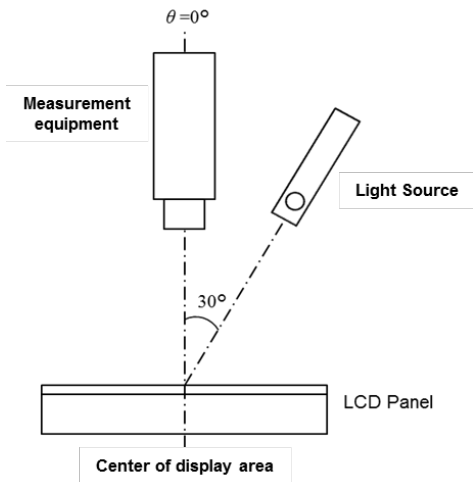
4) Definition of viewing angle

5) About the measurement of viewing angle
   Measurement Equipment (LCD-5200)
   The viewing angle is measured by changing the angle of the light source.

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6. Electrical Characteristics

6-1. LCD driving characteristics

Temp. = 25℃

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage		V_{DD}	－	3.0	3.3	3.6	V
Input signal voltage 1) 2)		V_{IL}	"Low" level	GND-0.2	－	VDD*0.25	V
		V_{IH}	"High" level	VDD*0.75	－	VDD+0.2	V
Input leak current 1)		I_{IN}	T_{OP}=25℃	－	5	20	nA
Current consumption 3)		I_{DD_opr}	4)	－	TBD	TBD	μA
		I_{DD_stb}	5)	－	TBD	TBD	μA
Input capacitance 1)		C_{IN1}	－	－	5	10	pF

1) SCLK, SI, SCS, RST, VCOM

2) Since input leakage current is less than 20 nA, please control voltage so that V_{IL}=GND and V_{IH}=VDD in static state.

3) Value of the current consumption is without smoothing capacitor.

4) 1Hz full display rewriting (Without backlight)

5) Keeping static image, and polarity inversion of VCOM with a period of 1 sec.
   (Without backlight)
   SCLK, SCS, SI, RST: "L" state.
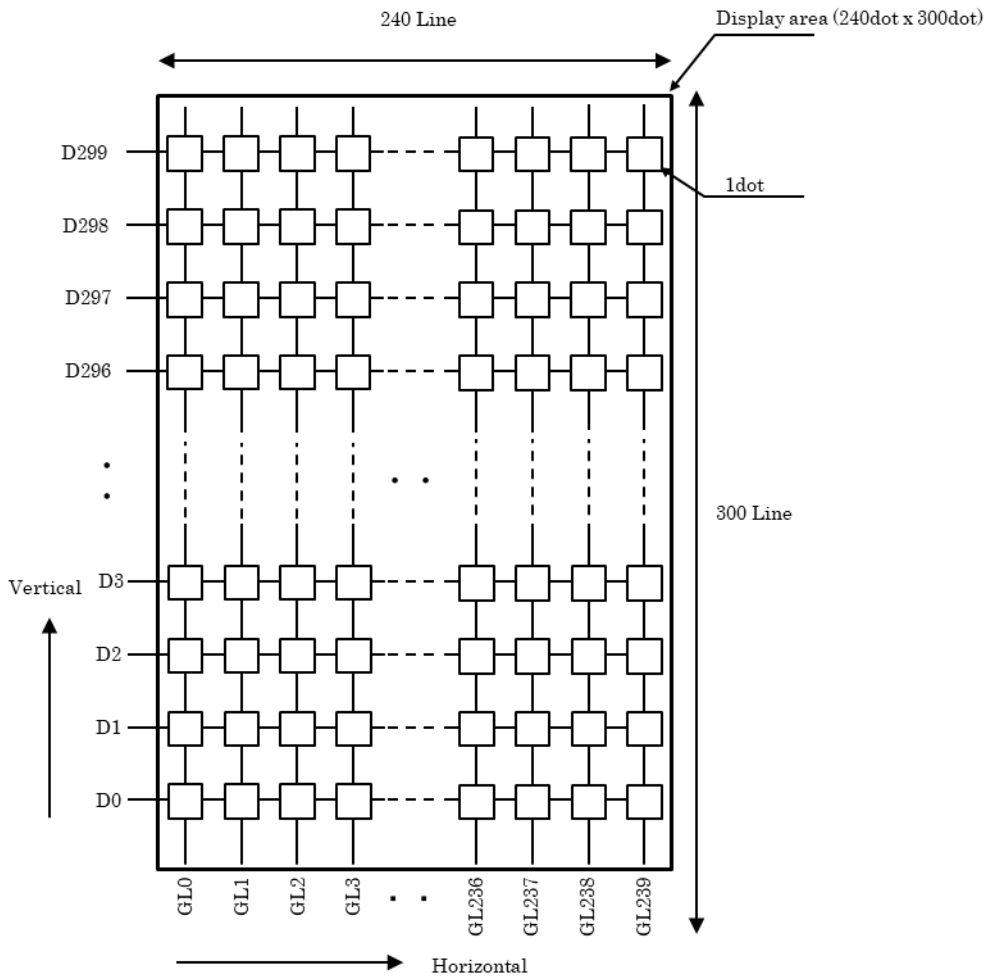
6-2. Power ON-OFF sequence
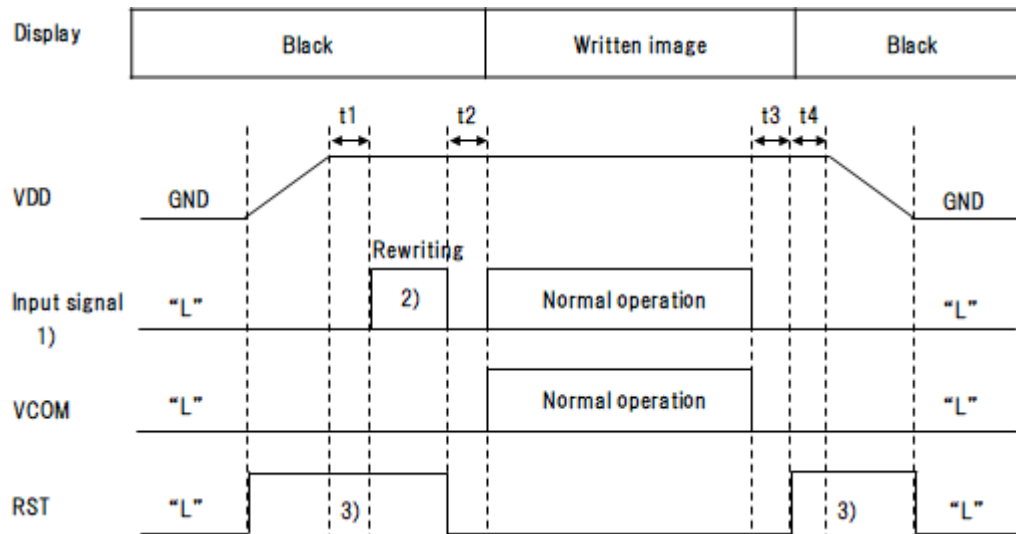
Item	Symbol	Min.	Typ.	Max.	Unit
Power ON-OFF sequence	t1	0	—	—	μsec
	t2	1	10	—	msec
	t3	1	10	—	msec
	t4	1	10	—	msec

1) SCLK, SI, SCS
2) Rewriting to black for all addresses.
3) Display OFF when RST = "H". VCOM = "L" is necessary when RST = "H". Black display when display is OFF.

Data in pixel memory is random with black or white at power ON.
Possible to prevent black-white random data display by black display when RST = "H".

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7. Address Mapping

240 Line — Display area (240dot x 300dot)

D299 · D298 · D297 · D296 · · · · D3 · D2 · D1 · D0

1dot

300 Line

Vertical

GL0 GL1 GL2 GL3 · · · GL236 GL237 GL238 GL239

Horizontal

Addressing of Gate line (GL*) to be selected is necessary for horizontal direction.
Rewriting data for one line is necessary for vertical direction due to rewriting one line at once.

-Addressing table for vertical direction

AG7	AG6	AG5	AG4	AG3	AG2	AG1	AG0	Selected GL
0	0	0	0	0	0	0	0	GL0
0	0	0	0	0	0	0	1	GL1
0	0	0	0	0	0	1	0	GL2
0	0	0	0	0	0	1	1	GL3
·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·
1	1	1	0	1	1	0	1	GL237
1	1	1	0	1	1	1	0	GL238
1	1	1	0	1	1	1	1	GL239

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8. Interface Signals

No.	Symbol	Description	I/O 1)	Voltage	Unit	Note
1	VDD	Power supply(3.3V)	P	3.3	V	
2	VSS	GND	P	0.0	V	
3	SCLK	Clock signal for serial input	I	0.0/3.3	V	3)
4	SCS	Chip select signal	I	0.0/3.3	V	3)
5	SI	Serial input signal	I	0.0/3.3	V	
6	RST	Display ON/OFF signal	I	0.0/3.3	V	2)3)
7	VCOM	Common power supply control	I	0.0/3.3	V	
8	VSS	GND	P	0.0	V	
9	VDD	Power supply(3.3V)	P	3.3	V	
10	NC	NC	—	—	—	

Matching connector: 04 6824 610 000 846+   (KYOCERA)

1) P: Power supply

   I: Input

2) RST = "L": Display ON

   RST = "H": Display OFF (Black display keeping pixel memory)

   VCOM = "L" is necessary when RST = "H"

   (When VCOM="H", Display does not turn to black, and current consumption increases by shoot-through-current in panel. (several mA)

3) Need to guard from signal noise

   If there is an abnormal signal not described in the timing chart on these signals, display may be distorted. Please carefully guard these signals since even if signal noise with small pulse width may cause malfunction.

9. Input Timing Characteristics

9-1. Rewriting timing <SCS activating period: 1 line>
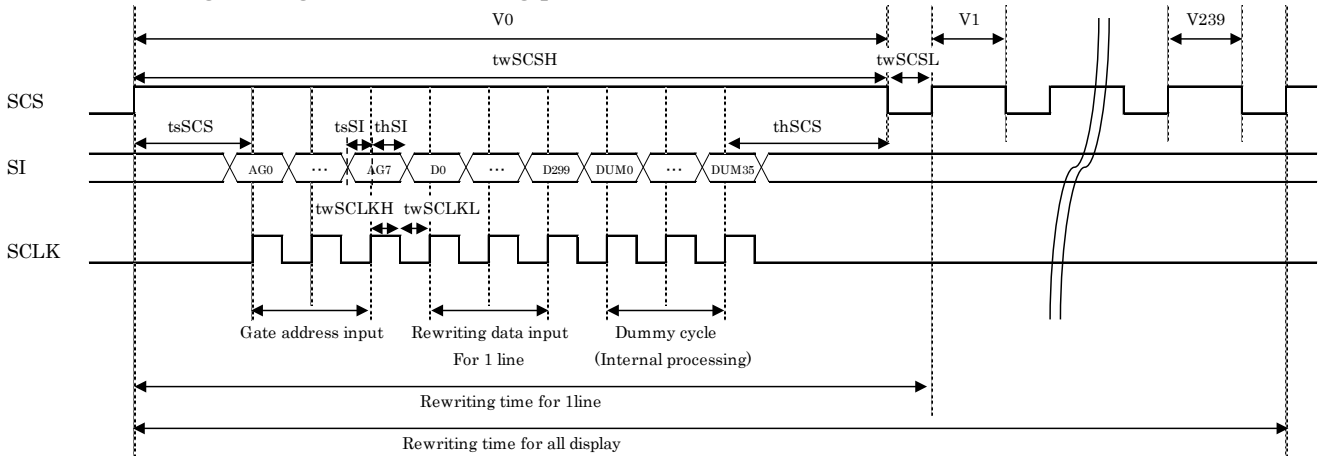
3 lines (SCS, SCLK, and SI) are control signals to rewrite.

Rewriting 1 gate line by 1 gate line.

Input order of serial data
1. Input gate address
2. Input rewriting data for 1 horizontal line
3. Dummy cycle (internal processing for rewriting)
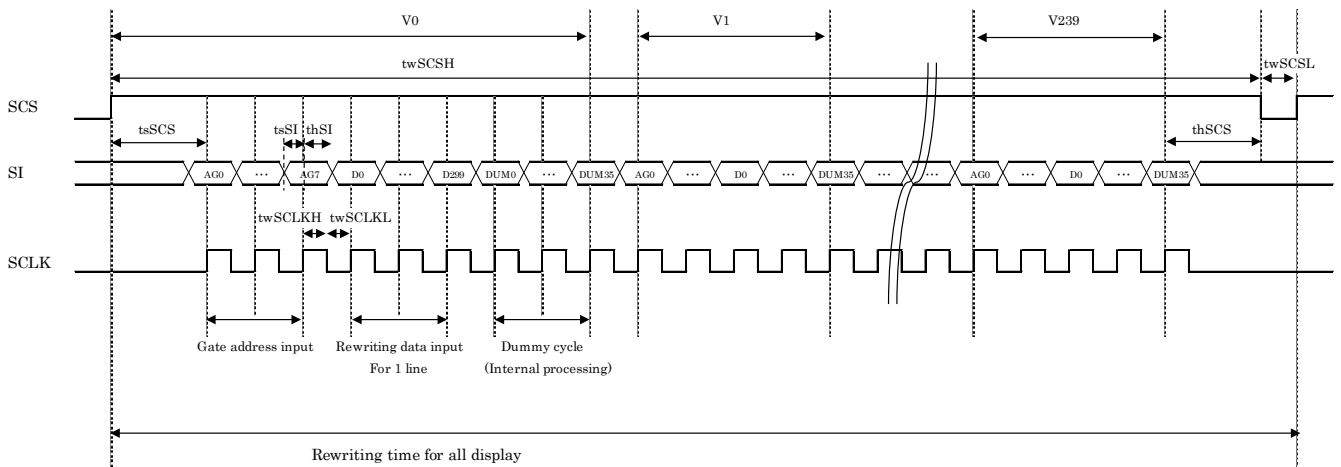
Relationship between rewriting data and display.
Data 0: Display BLACK
Data 1: Display WHITE

Time to rewrite in case of SCLK frequency = 1.5MHz (twSCLKH=twSCLKL=0.33us)

No.	Item	Parameters
Serial data input (1 line)	Gate address	AG0～AG7
	Rewriting data	D0～D299
	Dummy cycle	DUM0～DUM35
Total cycle for 1line		344 cycs
Time to rewrite 1 line		5.236 msec
Number of gate line		240 lines
Time to rewrite full display		1,256.7 msec

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9-2. Rewriting timing <SCS activating period: 1 frame>

Rewriting V_0 to V max continuously during SCS activating period

3 lines (SCS, SCLK, and SI) are control signals to rewrite.

Rewriting 1 gate line by 1 gate line.

Input order of serial data

     1. Input gate address

     2. Input rewriting data for 1 horizontal line

     3. Dummy cycle (internal processing for rewriting)

Possible to rewrite numerous lines continuously during SCS activating period.
Gate addresses for continuous rewriting of numerous lines can be set in any order.

Relationship between rewriting data and display.

     Data 0: Display BLACK

     Data 1: Display WHITE

Time to rewrite in case of SCLK frequency = 1.5MHz (twSCLKH=twSCLKL=0.33us)

No.	Item	Parameters
Serial data input (1 line)	Gate address	AG0～AG7
	Rewriting data	D0～D299
	Dummy cycle	DUM0～DUM35
Total cycle for 1line		344 cycs
Number of gate line		240 lines
Time to rewrite full display		59.3 msec

9-3. VCOM AC driving
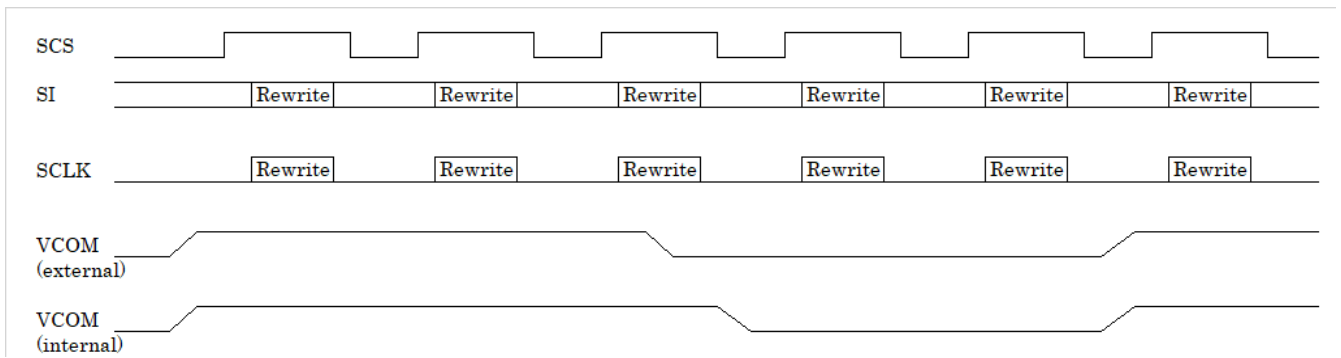
AC drive between 0 V and 3.3 V is required for VCOM signal.

External VCOM switching is reflected immediately on VCOM inside the panel when switching is performed at SCS = "L", however when switching is performed in SCS = "H", external VCOM switching is reflected at the next timing when SCS = "L".

9-4. Timing characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Time to rewrite 1 line			5.236	—	—	msec	
Time to rewrite full display			59.34	—	—	msec	
Input signal 1)	Signal rise time	trSIG	—	—	50	nsec	2)
	Signal fall time	tfSIG	—	—	50	nsec	2)
SCLK	SCLK high width	twSCLKH	0.33	—	—	μsec	3)
	SCLK low width	twSCLKL	0.33	—	—	μsec	3)
SI	SI set-up time	tsSI	0.33	—	—	μsec	3)
	SI hold time	thSI	0.33	—	—	μsec	3)
SCS	SCS high width	twSCSH	5.226	—	—	msec	3)
	SCS low width	twSCSL	10	—	—	μsec	3)
	SCS set-up time	tsSCS	4	—	—	msec	3)
	SCS hold time	thSCS	1	—	—	msec	3)
VCOM	VCOM duty	—	—	50	—	%	
	VCOM cycle time	tcVCOM	—	1000	—	msec	3)

1) SCLK, SI, SCS, RST, VCOM
2) Time for the signal to shift from 10% and 90% or 90% to 10%
3) Defined as 50% value of the signal.

-Timing charts
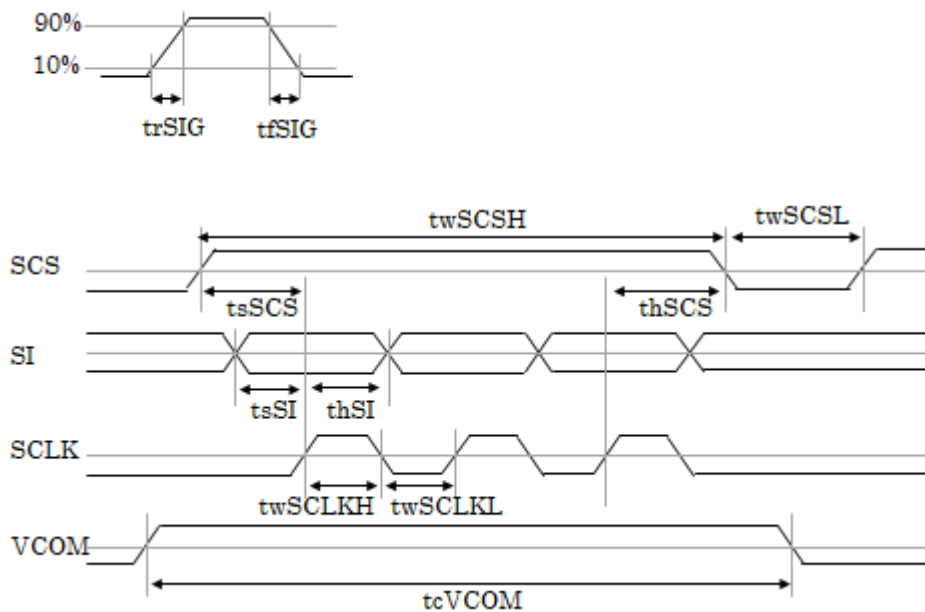
10. Warranty

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) A transparent protection plate shall be added to protect the LCD and its polarizer.
2) The LCD shall be installed flat, without twisting or bending.
3) A transparent protection sheet is attached to the polarizer. Please remove the protection film slowly before use, paying attention to static electricity.
4) FPC shall be installed after fixing the glass.
5) Do not apply a load to the FPC.
6) Do not use an assembly structure where the FPC is pulled or partially stressed.

11-2. Static electricity
1) Protect the LCD from static electricity.
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) 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.
10) Do not hold the FPC alone while working.
11) Do not scratch or damage the exposed conductor of the FPC or FPC.
12) Do not touch the exposed conductor of the FPC.
13) Do not bend the FPC toward the surface of LCD near the glass.
14) Do not bend the FPC so that stress is concentrated on the FPC.
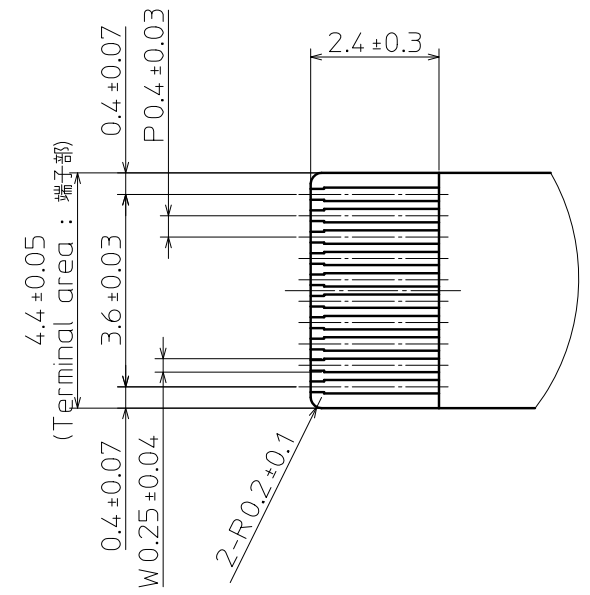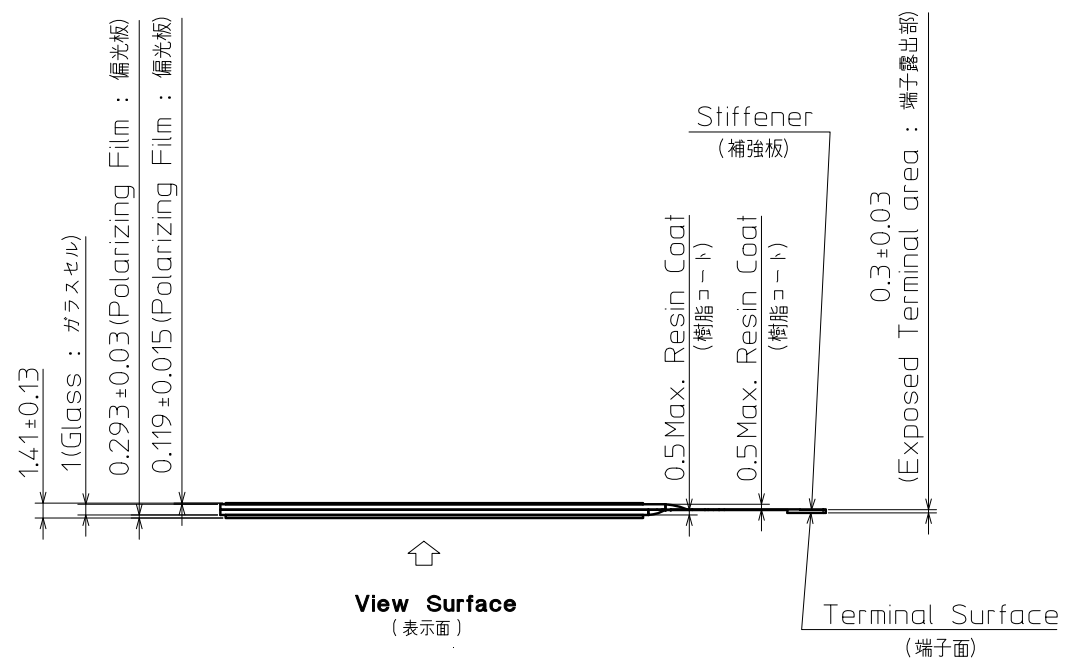
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12. Reliability Test Data

Test item	Test condition	Test time	Judgement	
High temp. atmosphere	85℃	240h	Function/Display Current consumption	: No defect : No defect
Low temp. atmosphere	-30℃	240h	Function/Display Current consumption	: No defect : No defect
High temp. humidity atmosphere	60℃ 90%RH	240h	Function/Display Current consumption	: No defect : No defect
Temp. cycle	-30℃ 0.5h R.T. 0.5h 85℃ 0.5h	10cycles	Function/Display Current consumption	: No defect : No defect
High temp. operation	80℃	240h	Function/Display Current consumption	: No defect : 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.

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TENTATIVE

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）

Stiffener
（補強板）

View Surface
（表示面）

Terminal Surface
（端子面）

DETAIL A（10:1）

1.41±0.13
1(Glass：ガラスセル)
0.293±0.03(Polarizing Film：偏光板)
0.119±0.015(Polarizing Film：偏光板)
0.5Max. Resin Coat（樹脂コート）
0.5Max. Resin Coat（樹脂コート）
0.3±0.03
(Exposed Terminal area：端子露出部)

2.4±0.3
0.4±0.07
P 0.4±0.03
4.4±0.05（Terminal area：端子部）
3.6±0.03
0.4±0.07
W 0.25±0.04
2-R0.2±0.1

39.05±0.2(Polarizing Film：偏光板)
0.5±0.3
21.9±0.2
15±0.55
36(A.A.)
5±0.55
(1.75)
(18)
18
(1.75)

4.6
6.4
8
(4.4)
3.6±0.5(Stiffener：補強板)

48.5±0.2
47.5±0.2(Polarizing Film：偏光板)
(22.5)
45(A.A.)
24.25±0.2
22.5
22.5
240x300Dots
0.5±0.3

Active Area Center

Resin Coat Area
（樹脂コート領域）

1Max.
(2)
(2.3)
1.6±0.15
41.65±0.2

2Max. Resin Coat Area
（樹脂コート領域）

A
No.1
No.10

47.5±0.2(Polarizing Film：偏光板)
39.05±0.2(Polarizing Film：偏光板)
0.5±0.3
0.5±0.3

Note.（注記）
1. Tolerance without indication：±0.5
（指示無き公差）
2. FPC Bend radius(R) must be 1.5mm or larger.
（FPCの曲げはR1.5以上とする）
3. 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。）
4. Matching connector：04 6824 610 000 846+(KYOCERA)

⬜ FPC Bending Prohibited Area（FPC折り曲げ禁止領域）

| Material 材質 | Treatment 処理 | | Approved '22.03.01 | Checked | Checked '22.03.01 | Drawn | Scale 2:1(10:1) | Title TN0227ANVNANN-GN*03 | KYOCERA | Year–Month–Day '22.02.28 | Size 2 |
| Quantity 製作数 | Description; 備考 | RoHS 21052-03042 | 宇佐美 | | 本間 | 蔭山 | | Outline Dimensions | Drawing No. 22011-03024 | | |

KYOCERA INSPECTION STANDARD

TYPE : TN0227ANVNANN-GN*03

KYOCERA CORPORATION

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April 13, 2022	M. Yamada	M. Iwasaki	A. Iwasaki	Y. Aritsubo	M. Kinouchi

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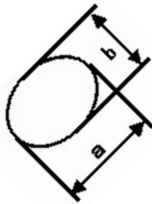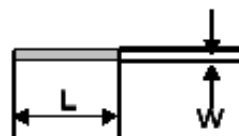
Visuals specification
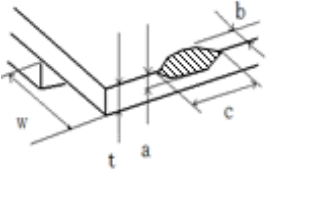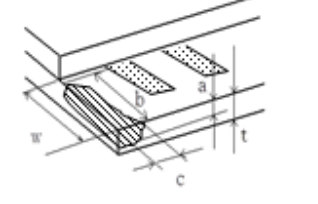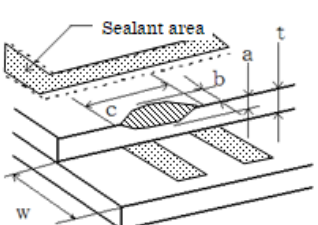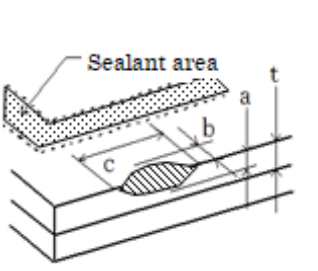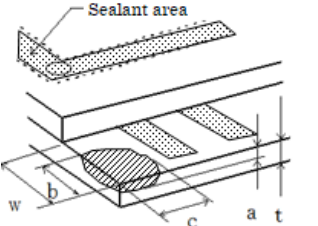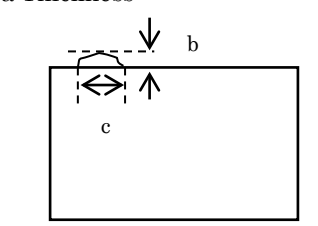
1) Note

	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. Dot defect and external inspection about the image quality shall be applied to any defect within the active area and shall not be applicable to outside of the active 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.

D(1,1)	D(2,1)	D(3,1)	D(4,1)	D(5,1)
D(1,2)	D(2,2)	D(3,2)	D(4,2)	D(5,2)
D(1,3)	D(2,3)	D(3,3)	D(4,3)	D(5,3)

☐ dot defect

		Black dot defect (Included circular shape)	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. For circular shape black dot, refer to inspection item of White dot, Black dot (Circular shape).
		White dot (Circular shape)	Pixel works electrically, however, circular/foreign particle makes dot appear to be "on" even when all "Black" data is sent to the screen.
	External inspection	Bubble, Scratch, Foreign particle	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　　　　　　Definition of linear size a: major axis, b: minor axis d = (a + b) / 2	

2) Standard

Classification		Inspection item	Judgement standard
Defect (In LCD glass)	Dot defect	Bright dot defect	Acceptable number　　　: 0
		Black dot defect	Acceptable number　　　: 0
		Total dot defects	Acceptable number　　　: 0
	Others	White dot, Black dot (Circular shape)	
External inspection (Defect on Polarizer or between Polarizer and LCD glass)		Foreign particle Scratch (Linear shape)	
		Foreign particle Bubble Scratch (Circular shape)	
		Color variation (Mura)	Determination of color variation: Invisible with ND 5% filter Distance between LCD and ND filter: 150mm Inspection time: 1 second Consultation shall be held as necessary.

White dot, Black dot (Circular shape):

Size (mm)	Acceptable number
d ≦ 0.1	Neglected
0.1 < d ≦ 0.15	2
0.15 < d	0

Foreign particle Scratch (Linear shape):

Width (mm)	Length (mm)	Acceptable number
W ≦ 0.02	−	Neglected
W ≦ 0.03	L ≦ 2.0	2
W ≦ 0.05	L ≦ 0.5	1
0.05 < W	−	0

Foreign particle Bubble Scratch (Circular shape):

Size (mm)	Acceptable number
d ≦ 0.1	Neglected
0.1 < d ≦ 0.2	2
0.2 < d	0

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Inspection item	Judgement standard				
Glass crack	(t = Glass Thickness)				

(t = Glass Thickness)

Item	Size (mm)				Judgement
Back side of the terminal		a	b	c	
		≦t	≦w	≦2.0	Neglected
Terminal		a	b	c	
		≦t	≦w	≦2.0	Neglected
Display side glass		a	b	c	
		≦t	＜Sealant area inner boundary	≦3.0	Neglected
Double glass		a	b	c	
		-	-	≦0.2	
		≦t	＜Sealant area inner boundary	≦3.0	Neglected
		＞t	＜Sealant area outer boundary	≦2.0	
Corner		a	b	c	
		≦t	≦w	≦2.0	Neglected
Projection	a:Thickness	a	b	c	
		≦t	≦0.3	-	Neglected

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