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SPEC

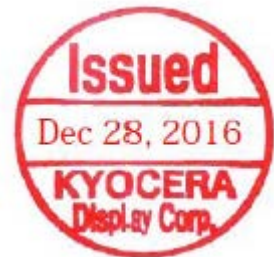
Spec No.	TQ3C-8EAF0-E1YAA216-00
Config Ver.	E2
Date	December 20, 2016

**TYPE : TCG070WVLSJPPB-GA20**

< 7.0 inch WVGA transmissive color TFT with LED backlight and constant current circuit for LED backlight and touch panel >

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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
Dec 20, 2016	M. Koyama	S. Ohtaka	Y. Matsumoto	O. Sato	I. Hamano

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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.

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**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 TCG070WVLSJPPB-GA20. (RoHS Compliant)

## 2. Construction and outline

LCD	: Transmissive color dot matrix type TFT
Backlight system	: LED
Polarizer	: Glare treatment
LCD Interface	: LVDS
Additional circuit	: Timing controller, Power supply (3.3V input) With Constant current circuit for LED Backlight
Touch panel	: Projected capacitive touch panel
Touch panel Interface	: I <sup>2</sup> C (Equipped Touch panel IC)
Cover glass	: Soda glass (0.7mmt)
Surface film	: Anti-Glare treatment

## 3. Mechanical specifications

Item	Specification	Unit
Outline dimensions 1)	169.8(W)×109.7(H)×(10.25)(D)	mm
Active area (LCD)	152.4(W)×91.44(H) (17.8cm/7.0 inch(Diagonal))	mm
Active area (Touch panel)	152.4(W)×91.44(H)	mm
Dot format	800×(R,G,B)(W)×480(H)	dot
Dot pitch	0.0635(W)×0.1905(H)	mm
Base color 2)	Normally Black	-
Surface hardness 3)	3H	-
Mass	305	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.

3) Conforms to JIS K54000 8-4

## 4. Absolute maximum ratings

### 4-1. Electrical absolute maximum ratings

Item		Symbol	Min.	Max.	Unit
Supply voltage(+3.3V)		V <sub>DD</sub>	-0.3	4.0	V
Supply voltage(+12V)		V <sub>IN</sub>	-0.3	14.0	V
Input signal voltage 2)	RxIN <sub>i</sub> +, RxIN <sub>i</sub> - 1)	V <sub>I1</sub>	-0.3	2.8	V
	CK IN+, CK IN-	V <sub>I2</sub>	-0.3	2.8	V
	SELLVDS, BITSEL, SC	V <sub>I3</sub>	-0.3	V <sub>DD</sub> +0.5	V
	BLBRT, BLEN	V <sub>I4</sub>	-0.3	V <sub>IN</sub>	V
Supply voltage for touch panel		V <sub>TP</sub>	-0.3	3.6	V
Input signal voltage for touch panel 3)		V <sub>TPS</sub>	-0.3	V <sub>TP</sub> +0.3	V

1) i=0,1,2,3

2) V<sub>DD</sub> must be supplied correctly within the range described in 5-1.

3) Accommodation : /RESET,SDA,SCL(Open drain , pull-up inside PCB)

### 4-2. Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	Unit
Operating temperature 1)	T <sub>OP</sub>	-20	70	°C
Storage temperature 2)	T <sub>STO</sub>	-30	80	°C
Operating humidity 3)	H <sub>OP</sub>	10	4)	%RH
Storage humidity 3)	H <sub>STO</sub>	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.)

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)

Frequency	10~55 Hz	Acceleration value (0.3~9 m/s <sup>2</sup> )
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<sup>2</sup>, Pulse width: 11 ms

3 times in each direction: ±X, ±Y, ±Z

EIAJ ED-2531

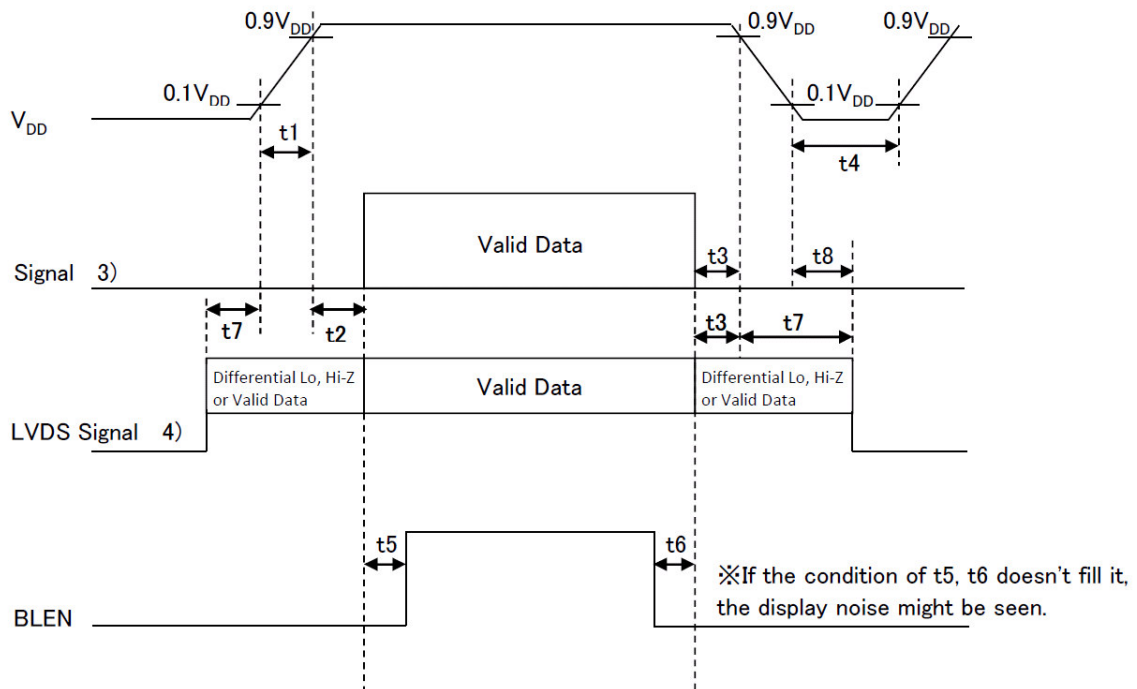
## 5. Electrical characteristics

### 5-1. LCD

Temp. = -20~70°C

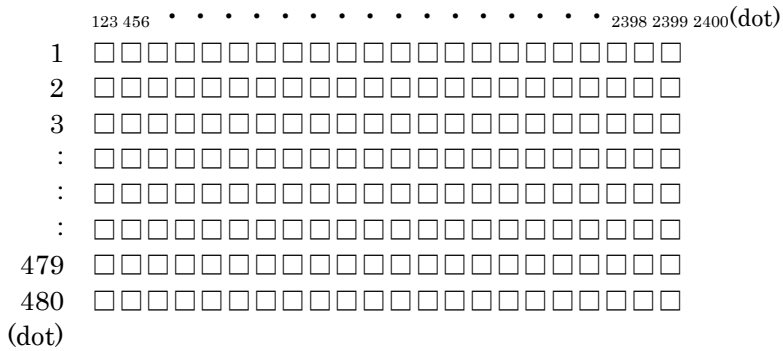
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage 1)	$V_{DD}$	-	3.0	3.3	3.6	V
Current consumption	$I_{DD}$	2)	-	200	260	mA
Permissible input ripple voltage	$V_{RP}$	$V_{DD}=3.3V$	-	-	100	mVp-p
Input signal voltage 3)	$V_{IL}$	"Low" level	0	-	0.8	V
	$V_{IH}$	"High" level	2.0	-	$V_{DD}$	V
Input leak current	$I_{OL}$	$V_{I3}=0V$	-10	-	10	$\mu A$
	$I_{OH}$	$V_{I3}=3.3V$	-	-	400	$\mu A$
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	-	$\Omega$
$V_{DD}$ -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



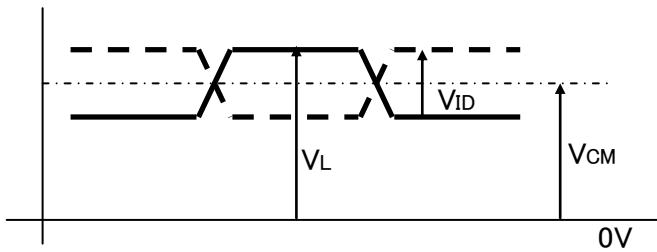
2) Display pattern:

$V_{DD} = 3.3V$ , Temp. =  $25^{\circ}C$



3) Input signal : SELLVDS, BITSEL, 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.

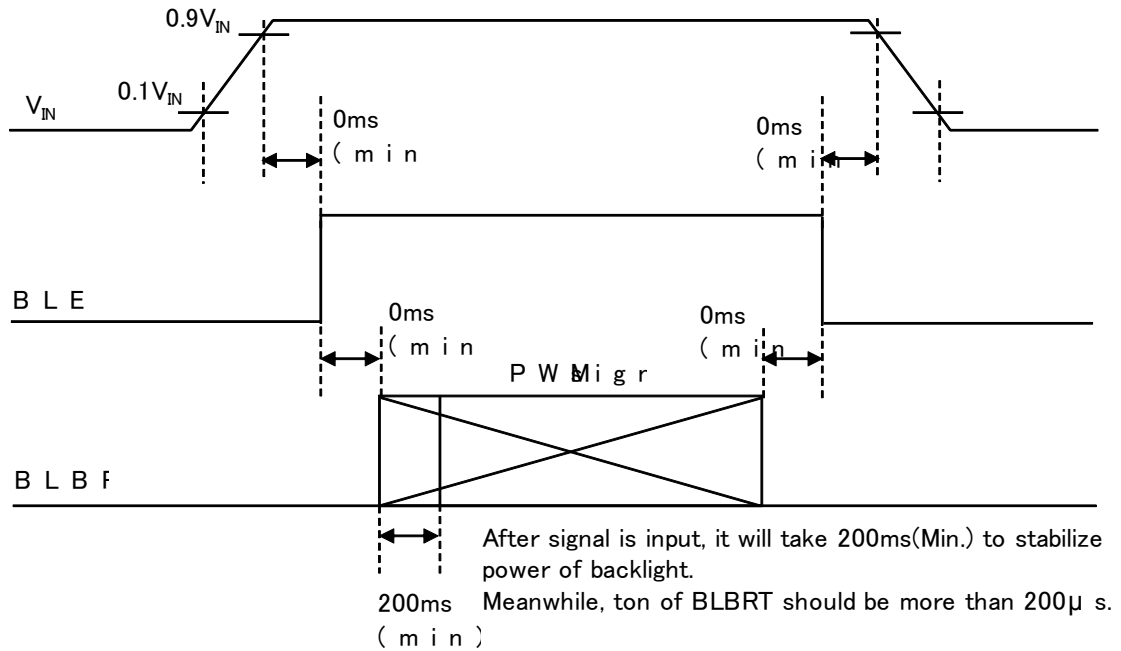


5-2. Constant current circuit for LED Backlight

Temp. = -20~70°C

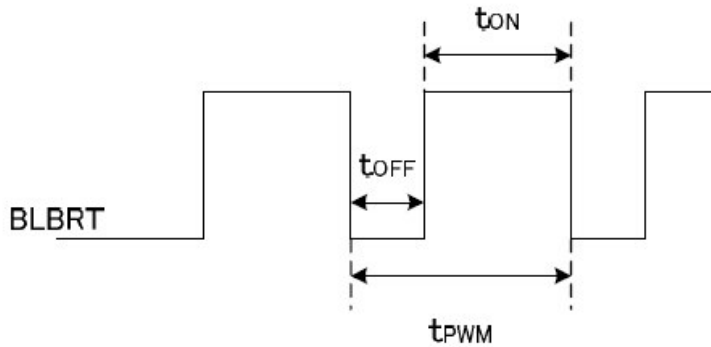
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage 1)	$V_{IN}$	-	10.8	12.0	13.2	V
Current consumption	$I_{IN}$	2)	-	195	310	mA
Permissive input ripple voltage	$V_{RP\_BL}$	$V_{IN}=12.0V$	-	-	100	mVp-p
BLBRT Input signal voltage	$V_{IL\_BLBRT}$	"Low" level	0	-	0.8	V
	$V_{IH\_BLBRT}$	"High" level	2.3	-	$V_{IN}$	V
BLBRT Input pull-down resistance	$R_{IN\_BLBRT}$	-	100	300	500	k $\Omega$
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	k $\Omega$
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. =  $25^{\circ}C$ ,  $D_{PWM} = 100\%$

3) PWM Timing Diagram



$t_{ON}, t_{OFF} \geq 50 \mu s$ .

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 :  $I_F=60mA$ ,  $T_a=25^{\circ}C$  in chamber).

### 5-3. Touch panel

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	$V_{TP}$	—	3.0	3.3	3.6	V
Current consumption	$I_{TP}$	1)	—	15	52	mA
Permissible input ripple voltage	$V_{TPRP}$	—	—	—	$\pm 50$	mVp-p
Input signal voltage 2)	$V_{TPSIL}$	"Low" level	-0.3	—	$0.3V_{TP}$	V
	$V_{TPSIH}$	"High" level	$0.7V_{TP}$	—	$V_{TP}+0.3$	V
Output signal voltage 3)	$V_{TPSOL}$	"Low" level	—	—	$0.2V_{TP}$	V
	$V_{TPSOH}$	"High" level	$0.8V_{TP}$	—	—	V

- 1) Condition :  $V_{TP}=3.3V$   
Temp. =  $25^{\circ}C$ , 1 point touch
- 2) Accommodation : /RESET,SDA,SCL(Open drain , pull-up inside PCB)
- 3) Accommodation : /CHG(Open drain output , pull-up inside PCB)

## 6 . Specification of function

Item	Description	Note
Resolution	800 × 480	-
Starting point	upper left	1)
Input 2)	finger	-
Recommended touch sensor area	φ10.0 mm	-
Number of touch point	2 point	-
Linearity	less than ±2.0mm	3) 4)
Interface	I <sup>2</sup> C	-
Device Address	0x4A	-

- 1) Please refer to outline drawing in details.
- 2) As for input with gloves, separate discussion for feasibility is needed.
- 3) Performance of linearity is under the environment of no noise.
- 4) Linearity is not guaranteed. It is for reference only.
- 5) Structure which has common GND for touch panel and LCD is recommended.

## 7. Optical characteristics

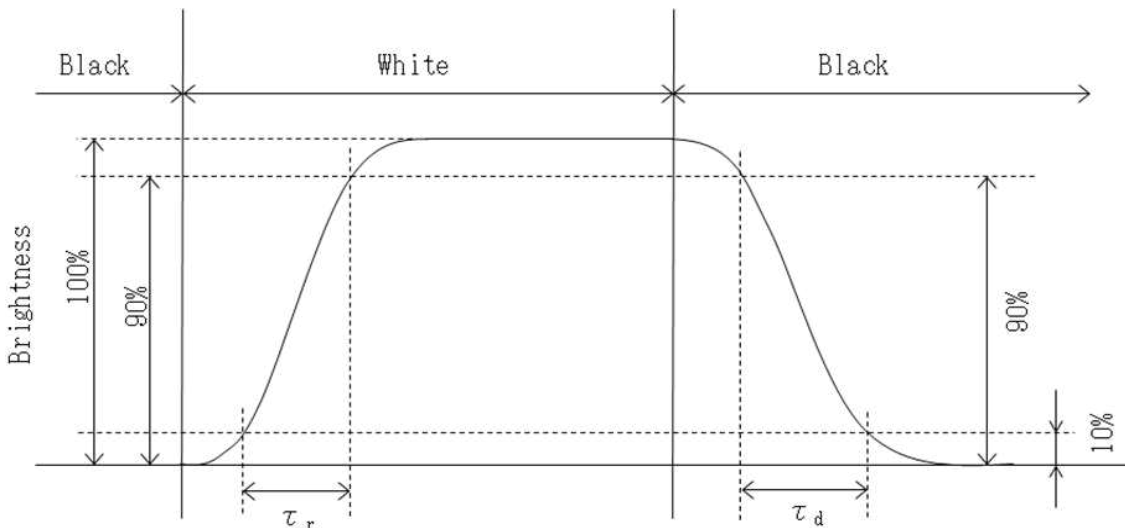
Measuring spot =  $\phi$  6.0mm, Temp. = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Response time	Rise	$\tau_r$	$\theta = \phi = 0^\circ$	-	18	-	ms
	Down	$\tau_d$	$\theta = \phi = 0^\circ$	-	12	-	ms
Viewing angle range View direction	$\theta$ UPPER	CR $\geq$ 10	-	85	-	deg.	
	$\theta$ LOWER		-	85	-		
	$\phi$ LEFT		-	85	-	deg.	
	$\phi$ RIGHT		-	85	-		
Contrast ratio	CR	$\theta = \phi = 0^\circ$	450	650	-	-	
Brightness	L	IF=60mA/Line	350	500	-	cd/m <sup>2</sup>	
Chromaticity coordinates	Red	x	$\theta = \phi = 0^\circ$	0.550	0.600	0.650	-
		y		0.300	0.350	0.400	
	Green	x	$\theta = \phi = 0^\circ$	0.285	0.335	0.385	
		y		0.520	0.570	0.620	
	Blue	x	$\theta = \phi = 0^\circ$	0.100	0.150	0.200	
		y		0.070	0.120	0.170	
	White	x	$\theta = \phi = 0^\circ$	0.270	0.320	0.370	
		y		0.295	0.345	0.395	

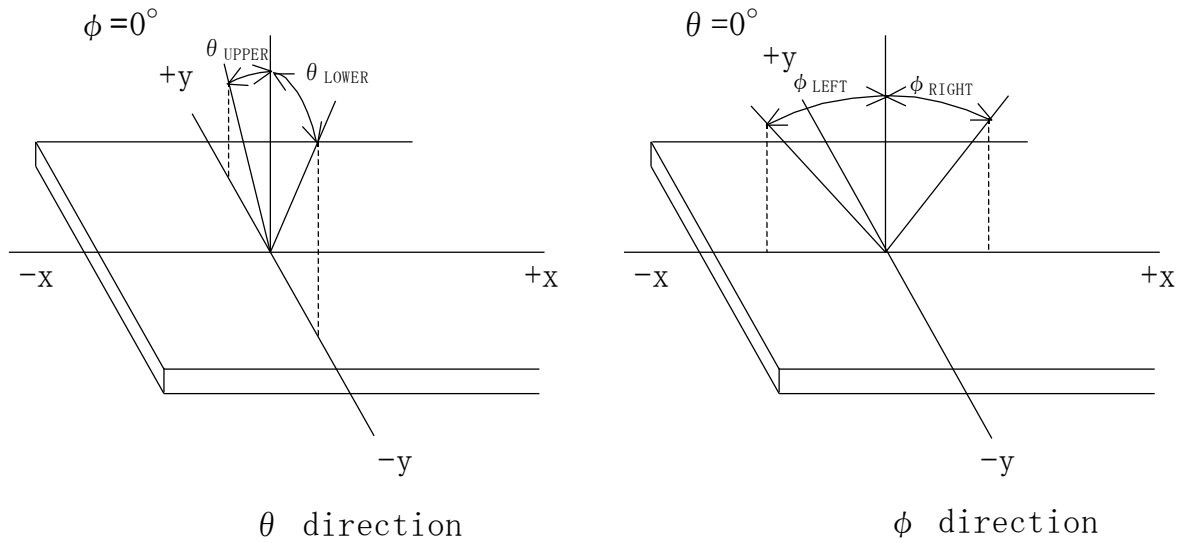
### 7-1. Definition of contrast ratio

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

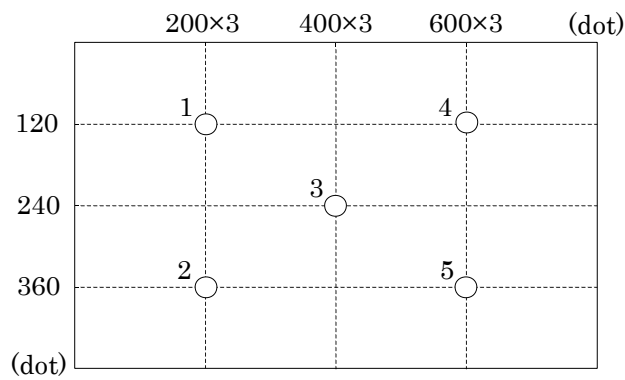
### 7-2. Definition of response time



7-3. Definition of viewing angle



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°C)

## 8. Interface signals

### 8-1. Interface signals

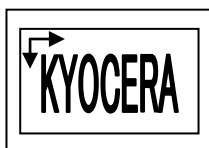
No.	Symbol	Description	Note
1	BITSEL	Bit data select signal(GND or Open: 8bit mode、High: 6bit mode)	
2	SELLVDS	Mode select signal(LVDS Data mapping)	
3	GND	GND	
4	GND	GND	
5	RxIN3+	LVDS receiver signal CH3(+)	LVDS
6	RxIN3-	LVDS receiver signal CH3(-)	LVDS
7	GND	GND	
8	CK IN+	LVDS receiver signal CK(+)	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 <sub>DD</sub>	+3.3V power supply	
22	V <sub>DD</sub>	+3.3V power supply	
23	SC	Scan direction control(High or Open: Normal、GND: Reverse)	1)
24	BLBRT	PWM signal(Brightness adjustment)	
25	BLEN	ON/OFF terminal voltage	
26	NC	NC	
27	V <sub>IN</sub>	+12V power supply	
28	V <sub>IN</sub>	+12V power supply	
29	GNDB	GND (Backlight)	
30	GNDB	GND (Backlight)	

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

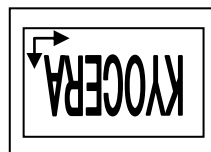
LVDS receiver : Embedded in ASIC  
 Matching LVDS transmitter : THC63LVDM83R(THine Electronics) or compatible

#### 1) Scanning

SC : High or Open



SC : GND



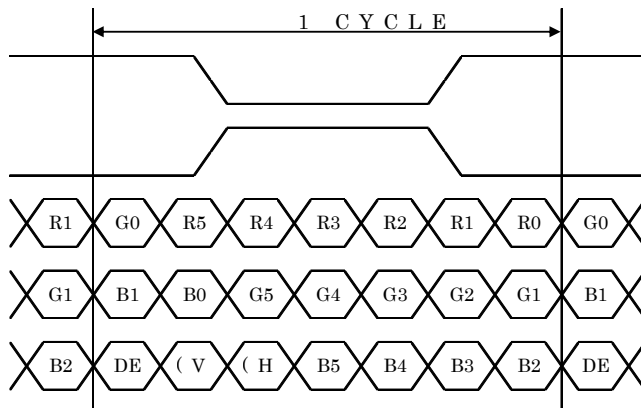
8-2. Data mapping (6bit input / 8bit mode)

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

Transmitter		1Pin BITSEL = "L" or OPEN	1Pin BITSEL = "L" or OPEN
Pin No.	Data	2Pin SELLVDS = "L" or OPEN	2Pin SELLVDS = "H"
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

BITSEL=L(GND) or OPEN

SELLVDS=H(3.3V)



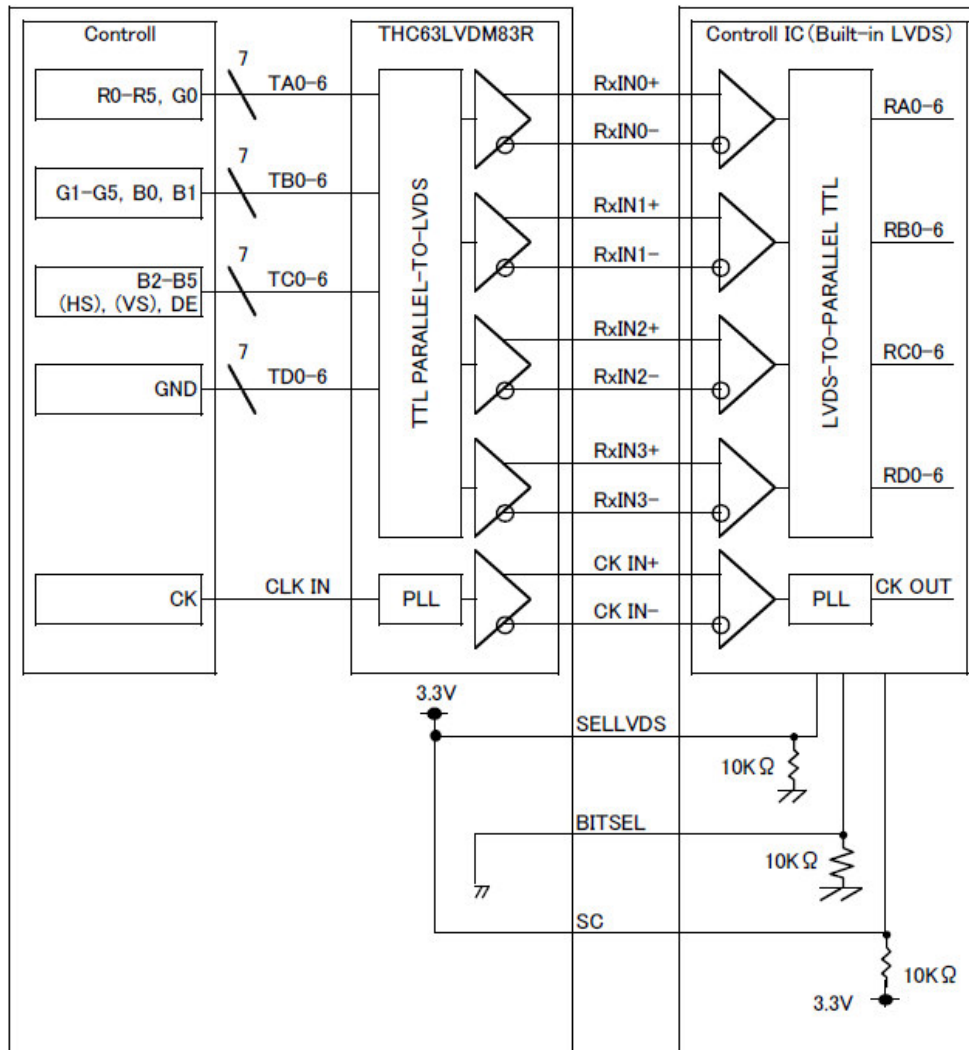
DE : DATA ENABLE

HS : H<sub>SYNC</sub>

VS : V<sub>SYNC</sub>

2) Block Diagram

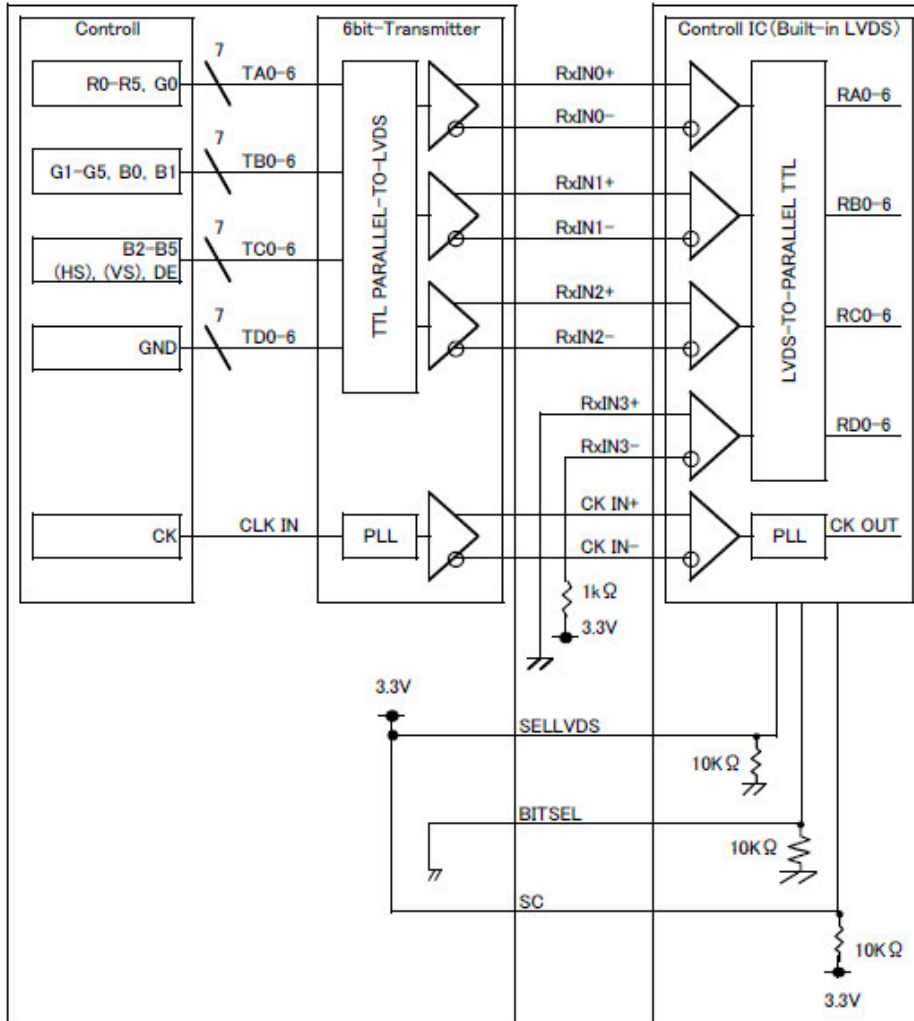
BITSEL=L(GND) or OPEN  
SELLVDS=H(3.3V)



※SELLVDS signal line has 10 k Ω pulldown resistor.



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



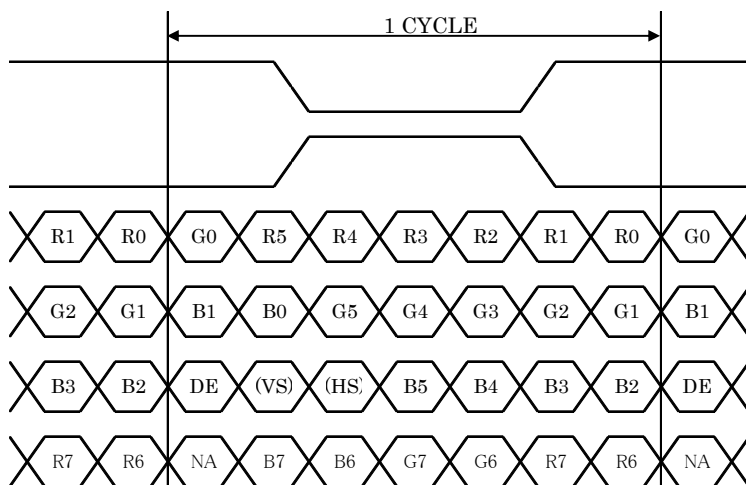
※SELLVDS signal line has 10 k Ω pulldown resistor.

8-3. Data mapping (8bit input / 8bit mode)

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

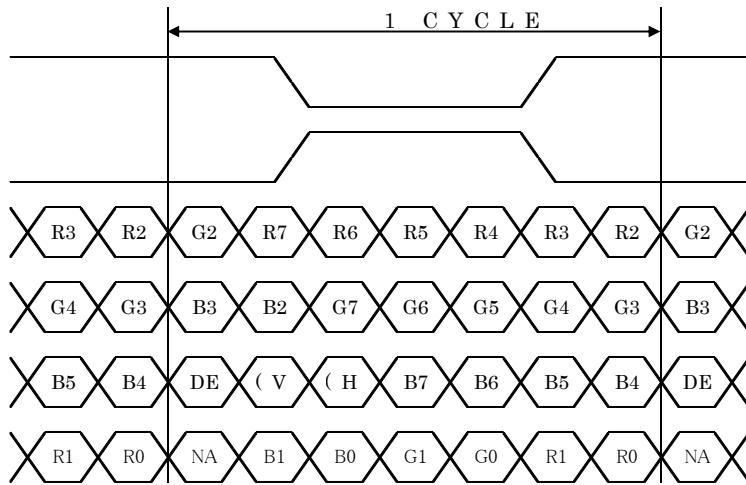
Transmitter		1Pin BITSEL = "L" or OPEN 2Pin SELLVDS = "L" or OPEN	1Pin BITSEL = "L" or OPEN 2Pin SELLVDS = "H"
Pin No.	Data		
51	TA0	R0(LSB)	R2
52	TA1	R1	R3
54	TA2	R2	R4
55	TA3	R3	R5
56	TA4	R4	R6
3	TA5	R5	R7(MSB)
4	TA6	G0(LSB)	G2
6	TB0	G1	G3
7	TB1	G2	G4
11	TB2	G3	G5
12	TB3	G4	G6
14	TB4	G5	G7(MSB)
15	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)

BITSEL=L(GND) or OPEN  
SELLVDS=L(GND) or OPEN



DE : DATA ENABLE  
HS : H<sub>SYNC</sub>  
VS : V<sub>SYNC</sub>

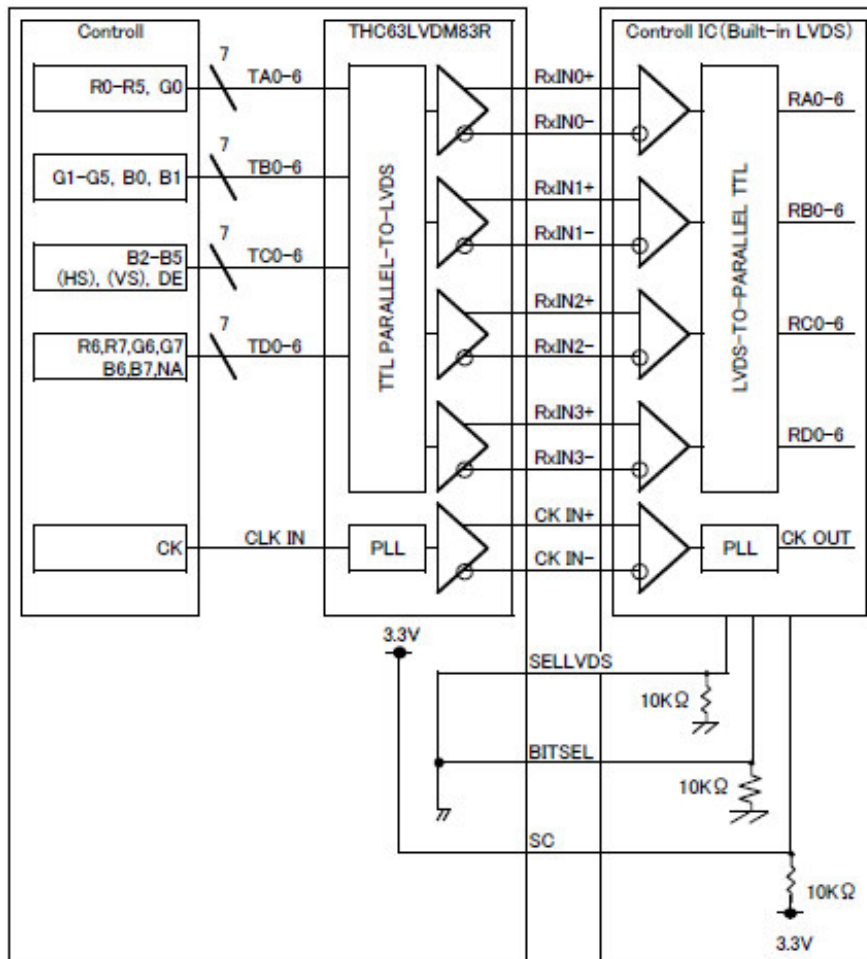
BITSEL=L(GND) or OPEN  
SELLVDS=H(3.3V)



DE : DATA ENABLE  
HS : H<sub>SYNC</sub>  
VS : V<sub>SYNC</sub>

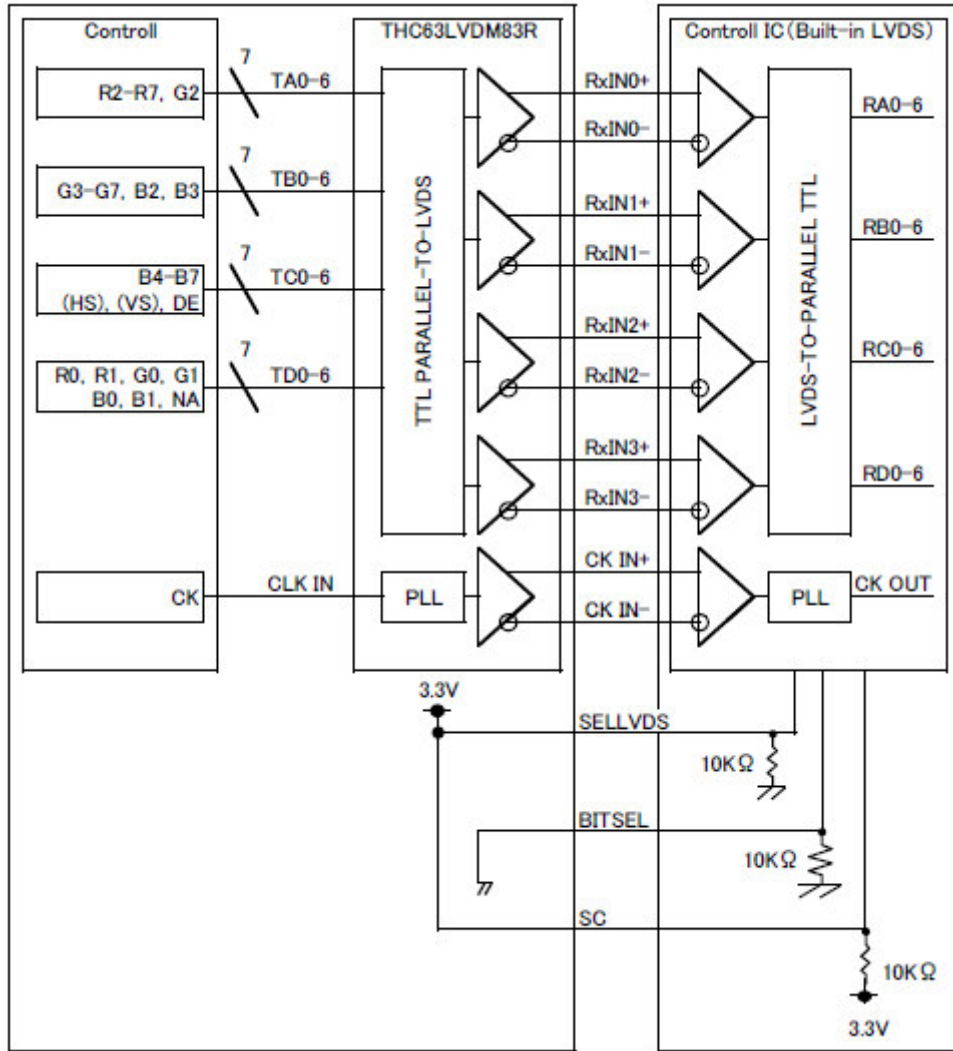
2) Block Diagram

BITSEL=L(GND) or OPEN  
SELLVDS=L(GND) or OPEN



※SELLVDS signal line has 10 k Ω pulldown resistor.

BITSEL=L(GND) or OPEN  
SELLVDS=H(3.3V)



※SELLVDS signal line has 10 k Ω pulldown resistor.

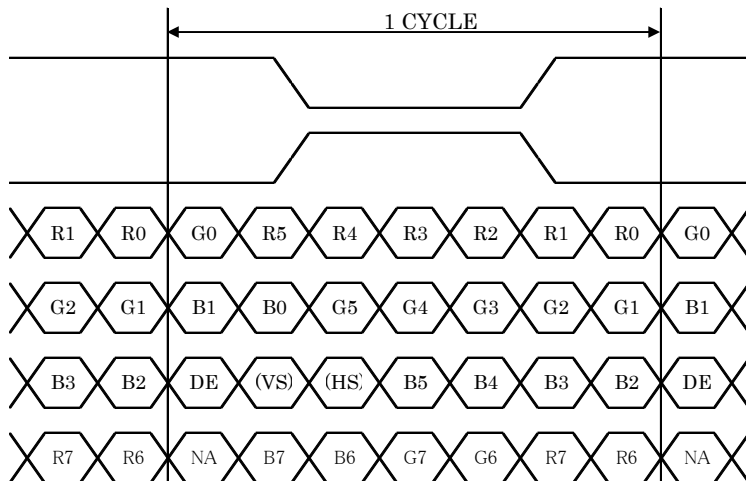
8-4. Data mapping (6bit input / 6bit mode)

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

Transmitter		1Pin BITSEL = "H" 2Pin SELLVDS = "L" or OPEN	1Pin BITSEL = "H" 2Pin SELLVDS = "H"
Pin No.	Data		
44	TA0	R0(LSB)	—
45	TA1	R1	—
47	TA2	R2	—
48	TA3	R3	—
1	TA4	R4	—
3	TA5	R5(MSB)	—
4	TA6	G0(LSB)	—
6	TB0	G1	—
7	TB1	G2	—
9	TB2	G3	—
10	TB3	G4	—
12	TB4	G5(MSB)	—
13	TB5	B0(LSB)	—
15	TB6	B1	—
16	TC0	B2	—
18	TC1	B3	—
19	TC2	B4	—
20	TC3	B5(MSB)	—
22	TC4	(HS)	—
23	TC5	(VS)	—
25	TC6	DE	—

BITSEL=H(3.3V)

SELLVDS=L(GND) or OPEN



DE : DATA ENABLE

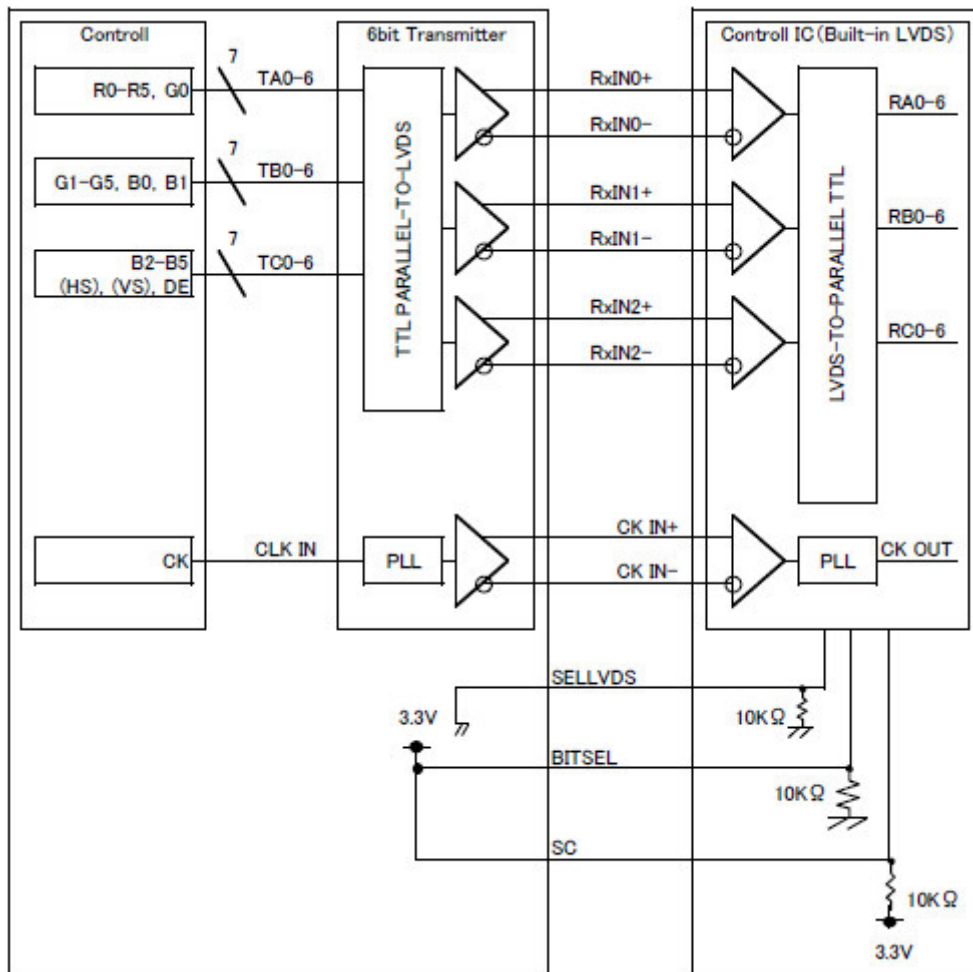
HS : H<sub>SYNC</sub>

VS : V<sub>SYNC</sub>

2) Block Diagram

BITSEL=H(3.3V)

SELLVDS=L(GND) or OPEN



※SELLVDS signal line has 10 k Ω pulldown resistor.

8-5. Touch panel

No.	Symbol	Description	I/O	Note
1	V <sub>TP</sub>	Supply voltage(+3.3V)	P	
2	/RESET	Reset	I	4)
3	/CHG	State change interrupt	O	
4	SDA	Serial Interface Data	I/O	4)
5	SCL	Serial Interface Clock	I/O	4)
6	GND	GND	P	

- 1) Please contact to us for the detail such as timing.
- 2) /RESET : Pull-up inside PCB (10kΩ)  
SDA,SCL : Pull-up inside PCB (2kΩ)  
/CHG : Pull-up inside PCB (100kΩ)
- 3) For the reset of hardware, “L” pulse of higher than 90nsec in power on condition is needed.
- 4) Open drain

Touch panel connector : DF57H-6P-1.2V (HIROSE)  
Matching connector : DF57H-6S-1.2C (HIROSE)

## 9. Input timing characteristics

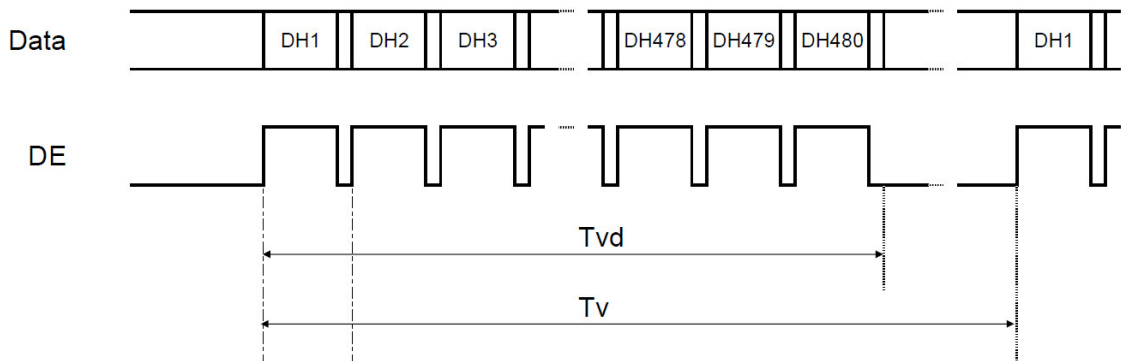
### 9-1. Timing characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Clock (CK)	Frequency	1/Tc	29.88	33.20	36.52	MHz	
Enable signal (DE)	Horizontal Period	Th	1,024	1,056	1,088	Tc	
			-	31.8	-	$\mu s$	1)
	Horizontal display period	Thd	800			Tc	
	Vertical Period	Tv	487	525	550	Th	
	Vertical display period	Tvd	480			Th	
Refresh rate		fv	50	60	70	Hz	2)

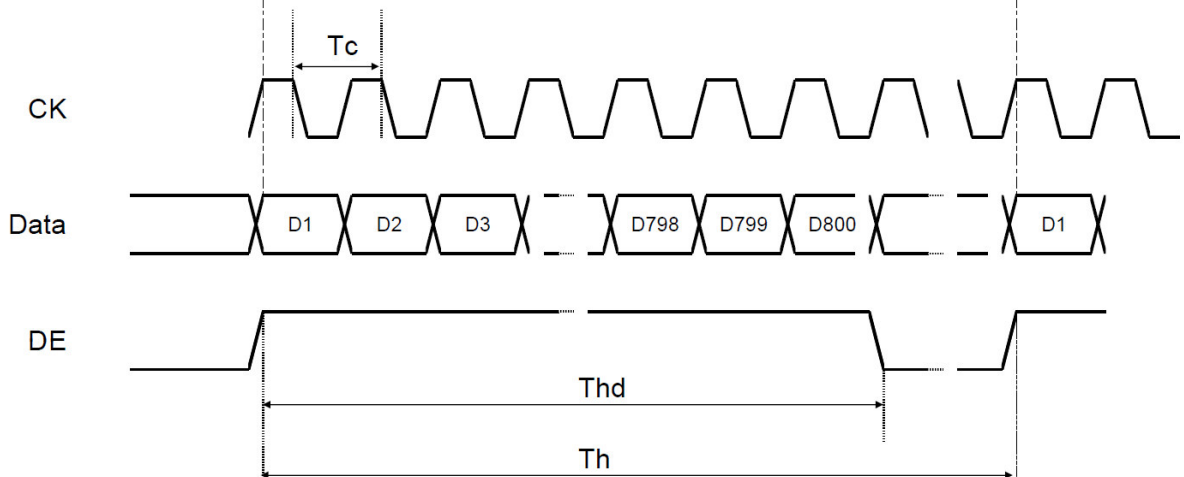
1) Please set a clock frequency, a vertical dormant period, and the horizontal dormant period so that the Horizontal Period should not reach less than Min. value.

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

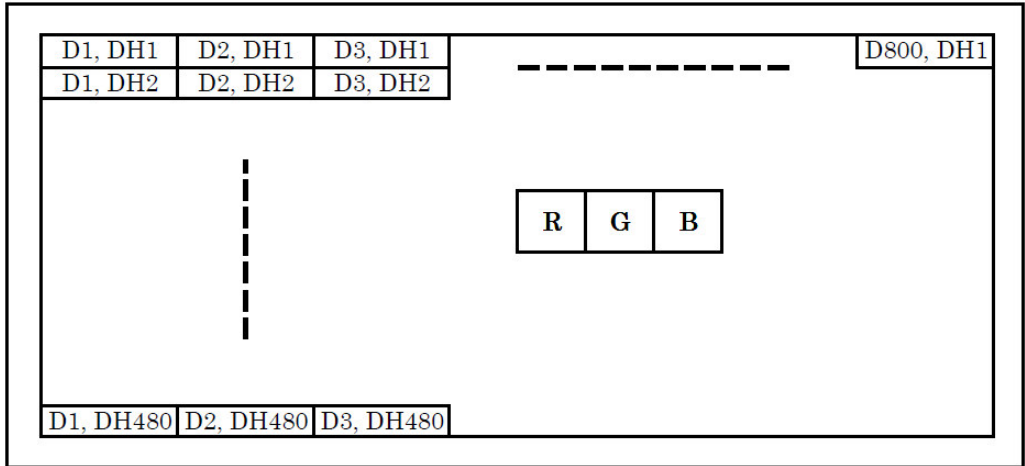


#### Horizontal Timing Diagram





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.

TCG070WVLRJQPB-GA20 - □□ - □□ - □□ - □ MADE IN □□□□□

↓      ↓↓      ↓      ↓                      ↓  
 1      2 3      4      5                                  6

No1. – No6. above indicate

1. Version Number
2. Year code
3. Month code
4. Date
5. Version Number
6. Country of origin (Japan or China)

Year	2016	2017	2018	2019	2020	2021
Code	6	7	8	9	0	1

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.