

LVDS Interface ICs

# 56bit LVDS Transmitter

## 56:8 Serializer

**BU7988KVT**

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**●Description**

LVDS Interface IC of ROHM "Serializer" "Deserializer" operate from 8MHz to 150MHz wide clock range, and number of bits range is from 35 to 70. Data is transmitted seven times (7X) stream and reduce cable number by 3(1/3) or less. The ROHM's LVDS has low swing mode to be able to expect further low EMI.

**●Features**

- Wide dot clock range : Single(112MHz)/Dual(224MHz)(NTSC, VGA, SVGA, WXGA UXGA)
- Support spread spectrum clock generator.
- Clock edge selectable.
- Support reduced swing LVDS for low EMI.
- Power down mode.
- Package TQFP100V

**●Applications**

Flat Plane Display

**●Precaution**

- This chip is not designed to protect from radioactivity.

● Block Diagram

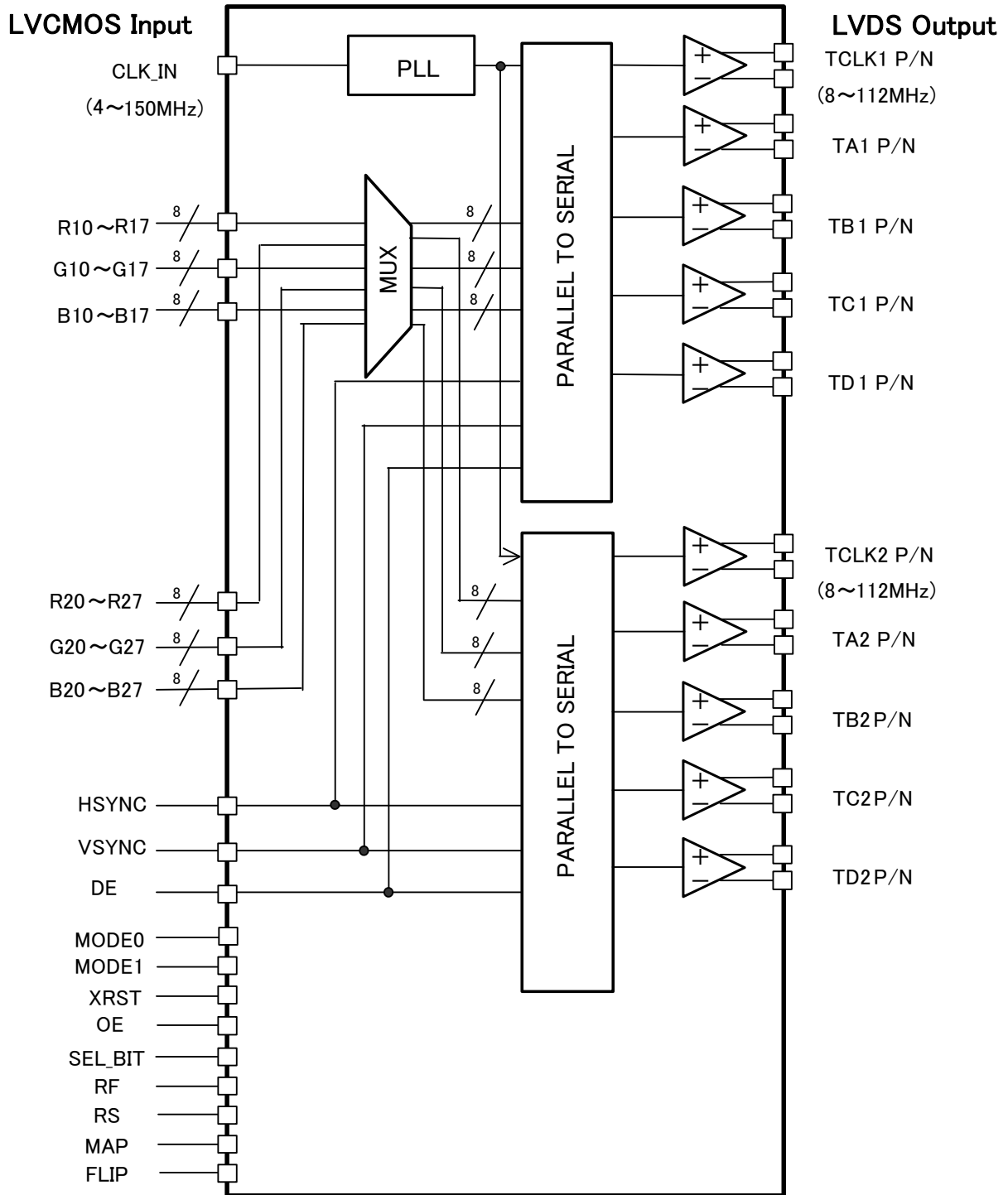


Figure-1 Block Diagram

●TQFP100V Package Outline and Specification

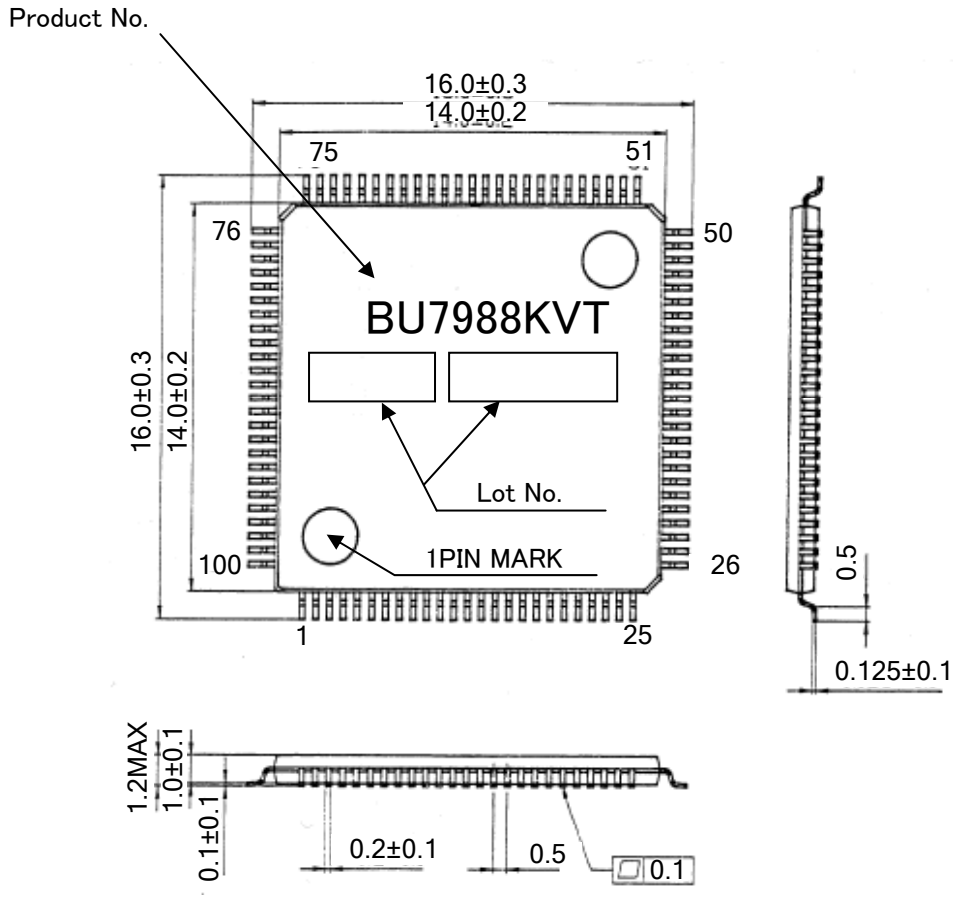


Figure-2 TQFP100V Package Outline and Specification

## ● Pin configuration

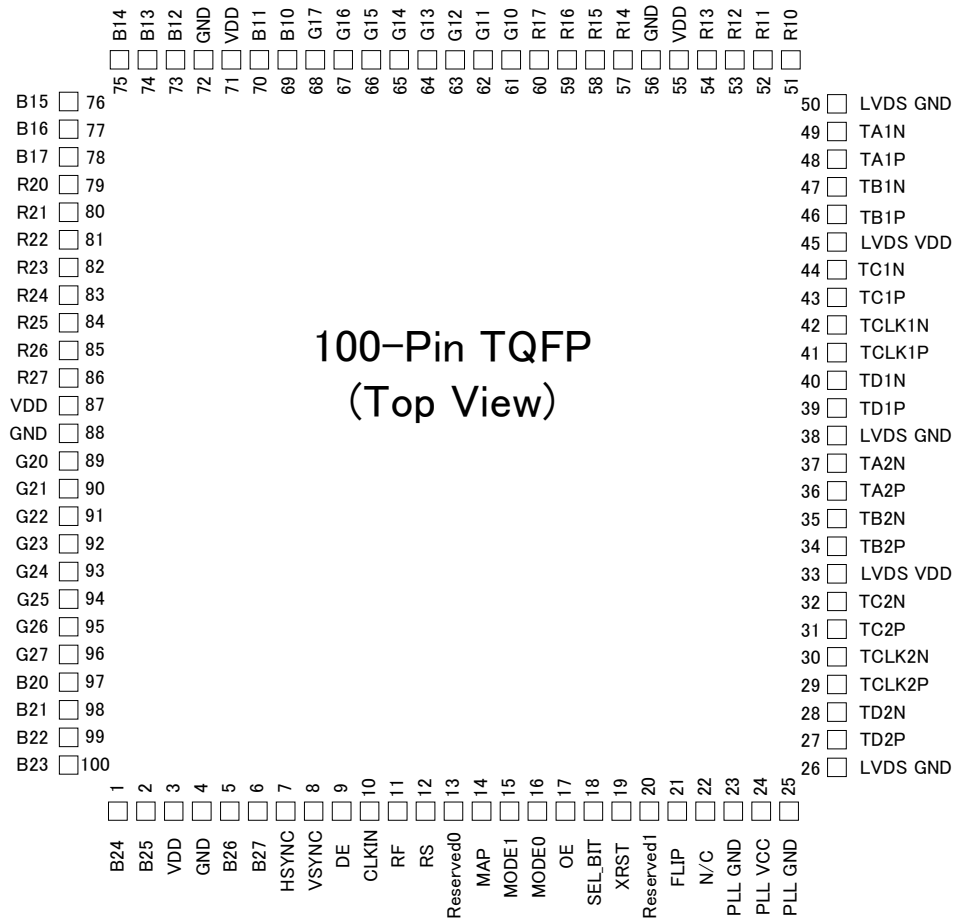


Figure-3 Pin Diagram (Top View)

## ● Pin Description

Table 1 : Pin Description

| Pin Name       | Pin No.                        | Type     | Descriptions                                                   |
|----------------|--------------------------------|----------|----------------------------------------------------------------|
| TA1P, TA1N     | 48, 49                         | LVDS OUT | LVDS data out                                                  |
| TB1P, TB1N     | 46, 47                         | LVDS OUT |                                                                |
| TC1P, TC1N     | 43, 44                         | LVDS OUT |                                                                |
| TD1P, TD1N     | 39, 40                         | LVDS OUT |                                                                |
| TCLK1P, TCLK1N | 41, 42                         | LVDS OUT | LVDS clock out                                                 |
| TA2P, TA2N     | 36, 37                         | LVDS OUT | LVDS data out                                                  |
| TB2P, TB2N     | 34, 35                         | LVDS OUT |                                                                |
| TC2P, TC2N     | 31, 32                         | LVDS OUT |                                                                |
| TD2P, TD2N     | 27, 28                         | LVDS OUT |                                                                |
| TCLK2P, TCLK2N | 29, 30                         | LVDS OUT | LVDS clock out                                                 |
| R17~R10        | 60, 59, 58, 57, 54, 53, 52, 51 | IN       | 1st Pixel data input.                                          |
| G17~G10        | 68, 67, 66, 65, 64, 63, 62, 61 | IN       |                                                                |
| B17~B10        | 78, 77, 76, 75, 74, 73, 70, 69 | IN       |                                                                |
| R27~R20        | 86, 85, 84, 83, 82, 81, 80, 79 | IN       | 2st Pixel data inputs.                                         |
| G27~G20        | 96, 95, 94, 93, 92, 91, 90, 89 | IN       |                                                                |
| B27~B20        | 6, 5, 2, 1, 100, 99, 98, 97    | IN       |                                                                |
| DE             | 9                              | IN       | DATA-ENABLE input.                                             |
| VSYNC          | 8                              | IN       | VSYNC input.                                                   |
| HSYNC          | 7                              | IN       | HSYNC input.                                                   |
| CLKIN          | 10                             | IN       | Clock Input.                                                   |
| MAP            | 14                             | IN       | LVDS mapping table select.<br>See Table11-14 and Figure11-14.  |
| XRST           | 19                             | IN       | H : Normal operation,<br>L : Power down (all outputs are Hi-Z) |
| FLIP           | 21                             | IN       | LVDS output pin select. See Table10.                           |

| Pin Name     | Pin No.       | Type                 | Descriptions                                                                                                                                                                                                                                                                                                                                              |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
|--------------|---------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|------|-------|-----|------------------|---|---|--------------------|---|---|--------------------|---|---|----------------------|
| RS           | 12            | IN                   | LVDS swing mode, RS select.<br><table border="1"> <tr> <td>RS</td> <td>LVDS Swing</td> </tr> <tr> <td>VDD</td> <td>350mV</td> </tr> <tr> <td>GND</td> <td>200mV</td> </tr> </table>                                                                                                                                                                       | RS    | LVDS Swing | VDD  | 350mV | GND | 200mV            |   |   |                    |   |   |                    |   |   |                      |
| RS           | LVDS Swing    |                      |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| VDD          | 350mV         |                      |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| GND          | 200mV         |                      |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| MODE1, MODE0 | 15, 16        | IN                   | Pixel Data Mode<br><table border="1"> <tr> <th>MODE1</th> <th>MODE0</th> <th>Mode</th> </tr> <tr> <td>L</td> <td>L</td> <td>Dual-in/Dual-out</td> </tr> <tr> <td>L</td> <td>H</td> <td>Dual-in/Single-out</td> </tr> <tr> <td>H</td> <td>L</td> <td>Single-in/Dual-out</td> </tr> <tr> <td>H</td> <td>H</td> <td>Single-in/Single-out</td> </tr> </table> | MODE1 | MODE0      | Mode | L     | L   | Dual-in/Dual-out | L | H | Dual-in/Single-out | H | L | Single-in/Dual-out | H | H | Single-in/Single-out |
| MODE1        | MODE0         | Mode                 |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| L            | L             | Dual-in/Dual-out     |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| L            | H             | Dual-in/Single-out   |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| H            | L             | Single-in/Dual-out   |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| H            | H             | Single-in/Single-out |                                                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| SEL_BIT      | 18            | IN                   | 6bit/8bit color select.<br>H : 6bit (TDxP/N*1 are Hi-Z), L : 8bit.                                                                                                                                                                                                                                                                                        |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| OE           | 17            | IN                   | Outputs enable.<br>H : Outputs enable,<br>L : Output disable (all outputs are Hi-Z)                                                                                                                                                                                                                                                                       |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| RF           | 11            | IN                   | Input Clock Triggering Select<br>H : Rising edge,<br>L : Falling edge                                                                                                                                                                                                                                                                                     |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| N/C          | 22            |                      | Must be open                                                                                                                                                                                                                                                                                                                                              |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| Reserved1    | 20            | IN                   | Must be tied to GND                                                                                                                                                                                                                                                                                                                                       |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| Reserved0    | 13            | IN                   | Must be open                                                                                                                                                                                                                                                                                                                                              |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| VDD          | 3, 55, 71, 87 | Power                | Power Supply Pins for CMOS inputs, output and digital circuitry.                                                                                                                                                                                                                                                                                          |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| GND          | 4, 56, 72, 88 | Ground               | Ground Pins for CMOS inputs, outputs and digital circuitry.                                                                                                                                                                                                                                                                                               |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| LVDS VDD     | 33, 45        | Power                | Power Supply Pins for LVDS Outputs.                                                                                                                                                                                                                                                                                                                       |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| LVDS GND     | 26, 38, 50    | Ground               | Ground Pins for LVDS Outputs.                                                                                                                                                                                                                                                                                                                             |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| PLL VDD      | 24            | Power                | Power Supply for PLL circuitry.                                                                                                                                                                                                                                                                                                                           |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |
| PLL GND      | 23, 25        | Ground               | Ground Pin for PLL circuitry.                                                                                                                                                                                                                                                                                                                             |       |            |      |       |     |                  |   |   |                    |   |   |                    |   |   |                      |

\*1: X=1,2

## ● Electrical characteristics

### ■ Rating

Table 2 : Absolute Maximum Rating

| Parameter                 | Symbol | Rating |         | Units |
|---------------------------|--------|--------|---------|-------|
|                           |        | Min    | Max     |       |
| Supply Voltage            | VDD    | -0.3   | 4.0     | V     |
| Input Voltage             | VIN    | -0.3   | VDD+0.3 | V     |
| Output Voltage            | VOUT   | -0.3   | VDD+0.3 | V     |
| Storage Temperature Range | Tstg   | -55    | 125     | °C    |

Table 3 : Package Power

| PACKAGE  | Power Dissipation (mW) | De-rating (mW/°C)*1 |
|----------|------------------------|---------------------|
| TQFP100V | 900                    | 9.0                 |
|          | 1400*2                 | 14.0*2              |

\*1:At temperature Ta >25°C

\*2:Package power when mounting on the PCB board.

The size of PCB board :70 × 70 × 1.6 (mm<sup>3</sup>)

The material of PCB board : The FR4 glass epoxy board.(3% or less copper foil area)

(It is recommended to apply the above package power requirement to PCB board when the small swing input mode is used)

Table 4 : Recommended Operating Conditions

| Parameter                   | Symbol          | Rating |     |     | Units | Conditions                              |
|-----------------------------|-----------------|--------|-----|-----|-------|-----------------------------------------|
|                             |                 | Min    | Typ | Max |       |                                         |
| Supply Voltage              | V <sub>DD</sub> | 3.0    | 3.3 | 3.6 | V     | VDD,LVDSVDD,PLLVD                       |
| Operating Temperature Range | Topr            | -20    | -   | 85  | °C    | Clock frequency from 8MHz up to 90MHz   |
|                             |                 | 0      | -   | 70  | °C    | Clock frequency from 90MHz up to 112MHz |

## ■ DC characteristics

**Table 5 : CMOS DC Specifications** (VDD=3.0V~3.6V, Ta=-20°C~+85°C)

| Symbol           | Parameter                | Rating    |     |           | Units | Conditions                 |
|------------------|--------------------------|-----------|-----|-----------|-------|----------------------------|
|                  |                          | Min       | Typ | Max       |       |                            |
| V <sub>IH</sub>  | High Level Input Voltage | VDD × 0.8 | –   | VDD       | V     | 0V ≤ V <sub>IN</sub> ≤ VDD |
| V <sub>IL</sub>  | Low Level Input Voltage  | GND       | –   | VDD × 0.2 | V     |                            |
| I <sub>INC</sub> | Input Leak Current       | -10       | –   | +10       | μA    |                            |

**Table 6 : LVDS Transmitter DC Specifications** (VDD=3.0V~3.6V, Ta=-20°C~+85°C)

| Symbol          | Parameter                                         | Rating |      |       | Units | Conditions                              |  |
|-----------------|---------------------------------------------------|--------|------|-------|-------|-----------------------------------------|--|
|                 |                                                   | Min    | Typ  | Max   |       | RL=100Ω                                 |  |
| VOD             | Differential Output Voltage                       | 250    | 350  | 450   | mV    |                                         |  |
|                 |                                                   | 120    | 200  | 300   | mV    | Reduced<br>swing<br>RS=GND              |  |
| ΔVOD            | Change in VOD between complementary output states | –      | –    | 35    | mV    | RL=100Ω                                 |  |
| VOC             | Common Mode Voltage                               | 1.125  | 1.25 | 1.375 | V     |                                         |  |
| ΔVOC            | Change in VOC between complementary output states | –      | –    | 35    | mV    |                                         |  |
| I <sub>OS</sub> | Output Short Circuit Current                      | –      | –    | -24   | mA    | V <sub>OUT</sub> =0V, RL=100Ω           |  |
| I <sub>OZ</sub> | Output TRI-STATE Current                          | -10    | –    | +10   | μA    | XRST=0V,<br>V <sub>OUT</sub> =0V to VDD |  |



## ■ Supply Current

Table 7 : Supply Current (VDD=3.3V, Ta=25°C)

| Symbol            | Parameter                                          | Rating |     |     | Units | Conditions |               |                               |
|-------------------|----------------------------------------------------|--------|-----|-----|-------|------------|---------------|-------------------------------|
|                   |                                                    | Min    | Typ | Max |       |            |               |                               |
| I <sub>TCCG</sub> | Transmitter Supply Current<br>(Gray Scale Pattern) | -      | TBD | -   | mA    | RS=H       | MODE[1:0]=H H | f=112MHz<br>RL=100Ω<br>CL=5pF |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=H L |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L H |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L L |                               |
|                   |                                                    | -      | TBD | -   | mA    | RS=L       | MODE[1:0]=H H |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=H L |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L H |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L L |                               |
| I <sub>TCCW</sub> | Transmitter Supply Current<br>(Worst Case pattern) | -      | TBD | -   | mA    | RS=H       | MODE[1:0]=H H | f=112MHz<br>RL=100Ω<br>CL=5pF |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=H L |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L H |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L L |                               |
|                   |                                                    | -      | TBD | -   | mA    | RS=L       | MODE[1:0]=H H |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=H L |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L H |                               |
|                   |                                                    | -      | TBD | -   |       |            | MODE[1:0]=L L |                               |
| I <sub>TCCS</sub> | Transmitter Power Down Supply Current              | -      | -   | 10  | μA    | XRST=L     |               |                               |

## Gray Scale Pattern

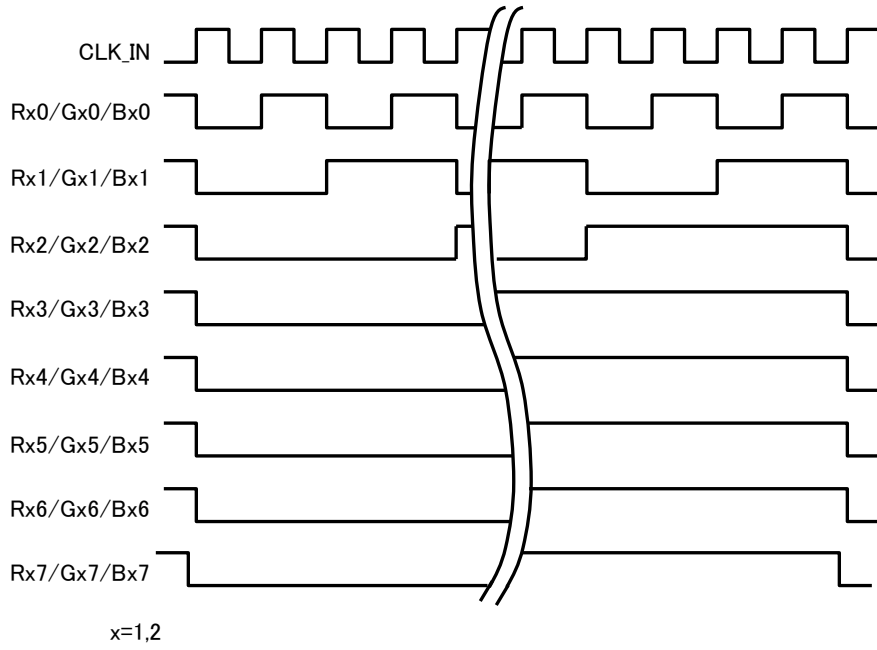


Figure-4 Gray scale pattern

## Worst Case Pattern (Maximum Power condition)

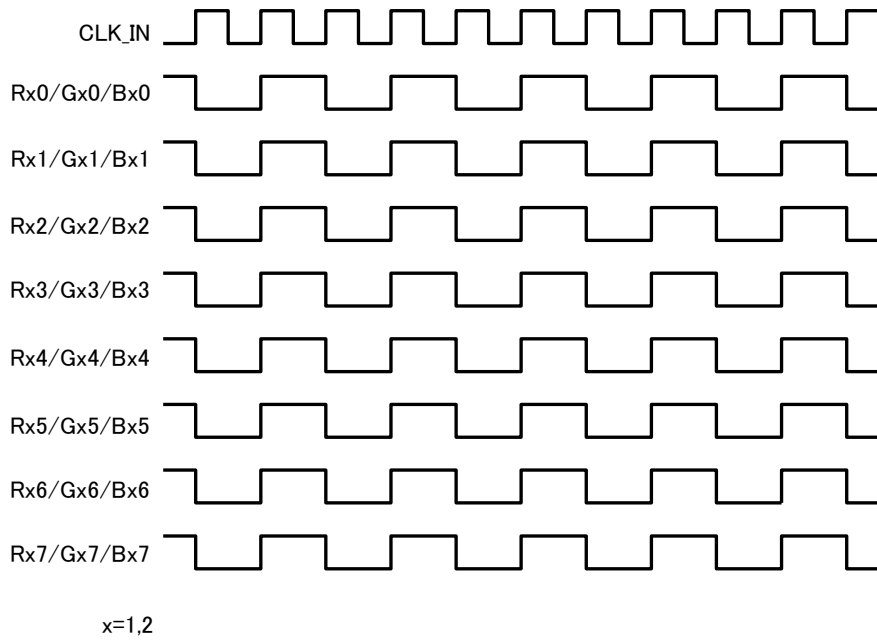


Figure-5 Worst Case Pattern

## ■ AC characteristics

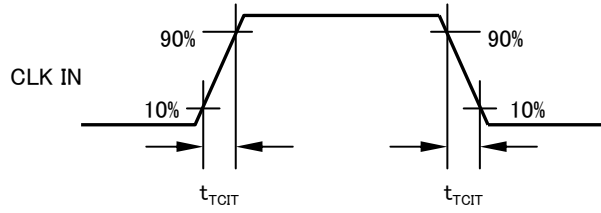
**Table 8 : Switching Characteristics (VDD=3.3V, Ta=25°C)**

| Symbol     | Parameter                              |                                           | Min                         | Typ                   | Max                         | Units |
|------------|----------------------------------------|-------------------------------------------|-----------------------------|-----------------------|-----------------------------|-------|
| $t_{TClT}$ | CLK IN Transition time                 |                                           | –                           | –                     | 5.0                         | ns    |
| $t_{TCP}$  | CLK IN Period                          | Dual In /Dual Out                         | 8.9                         | –                     | 125.0                       | ns    |
|            |                                        | Dual In / Single Out                      | 17.8                        | –                     | 62.5                        |       |
|            |                                        | Single In / Dual Out                      | 6.7                         | –                     | 250.0                       |       |
|            |                                        | Single In / Single Out                    | 8.9                         | –                     | 125.0                       |       |
| $t_{TCH}$  | CLK IN High Time                       |                                           | $0.35t_{TCP}$               | $0.5t_{TCP}$          | $0.65t_{TCP}$               | ns    |
| $t_{TCL}$  | CLK IN Low Time                        |                                           | $0.35t_{TCP}$               | $0.5t_{TCP}$          | $0.65t_{TCP}$               | ns    |
| $t_{TCD}$  | CLK IN to<br>TCLK+/-Delay              | Dual In /Dual Out<br>Single In/Single Out | –                           | TBD                   | –                           | ns    |
|            |                                        | Dual In / Single Out                      | –                           | TBD                   | –                           |       |
|            |                                        | Single In / Dual Out                      | –                           | TBD                   | –                           |       |
| $t_{TS}$   | CMOS Data Setup to CLK IN              |                                           | 2.5                         | –                     | –                           | ns    |
| $t_{TH}$   | CMOS Data Hold from CLK IN             |                                           | 0                           | –                     | –                           | ns    |
| $t_{TCOP}$ | CLK OUT Period                         | Dual In /Dual Out                         | 8.9                         | –                     | 125.0                       |       |
|            |                                        | Dual In / Single Out                      | 8.9                         | –                     | 125.0                       |       |
|            |                                        | Single In / Dual Out                      | 13.3                        | –                     | 125.0                       |       |
|            |                                        | Single In / Single Out                    | 8.9                         | –                     | 125.0                       |       |
| $t_{LVT}$  | LVDS Transition Time                   |                                           | –                           | 0.6                   | 1.5                         | ns    |
| $t_{TOP1}$ | Output Data Position 0                 |                                           | –0.2                        | 0.0                   | +0.2                        | ns    |
| $t_{TOP0}$ | Output Data Position 1                 |                                           | $\frac{t_{TCP}}{7} - 0.2$   | $\frac{t_{TCP}}{7}$   | $\frac{t_{TCP}}{7} + 0.2$   | ns    |
| $t_{TOP6}$ | Output Data Position 2                 |                                           | $2 \frac{t_{TCP}}{7} - 0.2$ | $2 \frac{t_{TCP}}{7}$ | $2 \frac{t_{TCP}}{7} + 0.2$ | ns    |
| $t_{TOP5}$ | Output Data Position 3                 |                                           | $3 \frac{t_{TCP}}{7} - 0.2$ | $3 \frac{t_{TCP}}{7}$ | $3 \frac{t_{TCP}}{7} + 0.2$ | ns    |
| $t_{TOP4}$ | Output Data Position 4                 |                                           | $4 \frac{t_{TCP}}{7} - 0.2$ | $4 \frac{t_{TCP}}{7}$ | $4 \frac{t_{TCP}}{7} + 0.2$ | ns    |
| $t_{TOP3}$ | Output Data Position 5                 |                                           | $5 \frac{t_{TCP}}{7} - 0.2$ | $5 \frac{t_{TCP}}{7}$ | $5 \frac{t_{TCP}}{7} + 0.2$ | ns    |
| $t_{TOP2}$ | Output Data Position 6                 |                                           | $6 \frac{t_{TCP}}{7} - 0.2$ | $6 \frac{t_{TCP}}{7}$ | $6 \frac{t_{TCP}}{7} + 0.2$ | ns    |
| $T_{ck12}$ | Skew Time between<br>TCLKXP and TCLKYP |                                           | –                           | –                     | 0.5                         | ns    |
| $t_{PLL}$  | Phase Lock Loop Set Time               |                                           | –                           | –                     | 10.0                        | ms    |

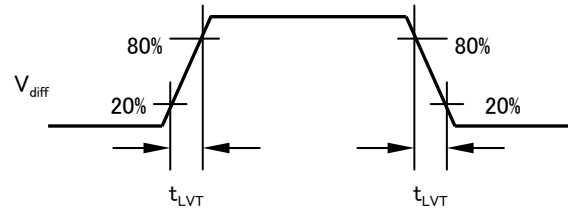
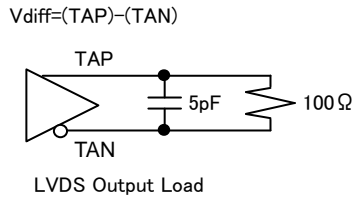
# ● AC Timing

## ■ AC Timing Diagrams

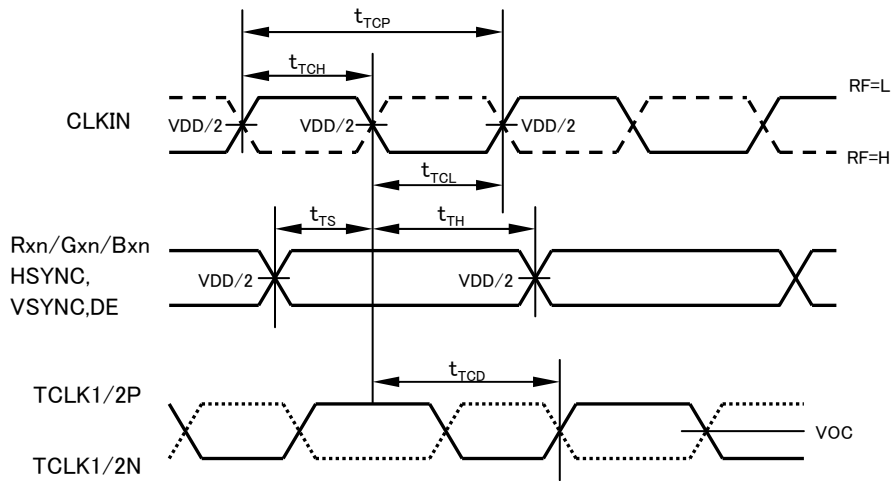
LVCMOS Input



LVDS Output



LVCMOS Input



x=1, 2  
y=0-7

Figure-6 AC Timing Diagrams

## ■ AC Timing Diagrams

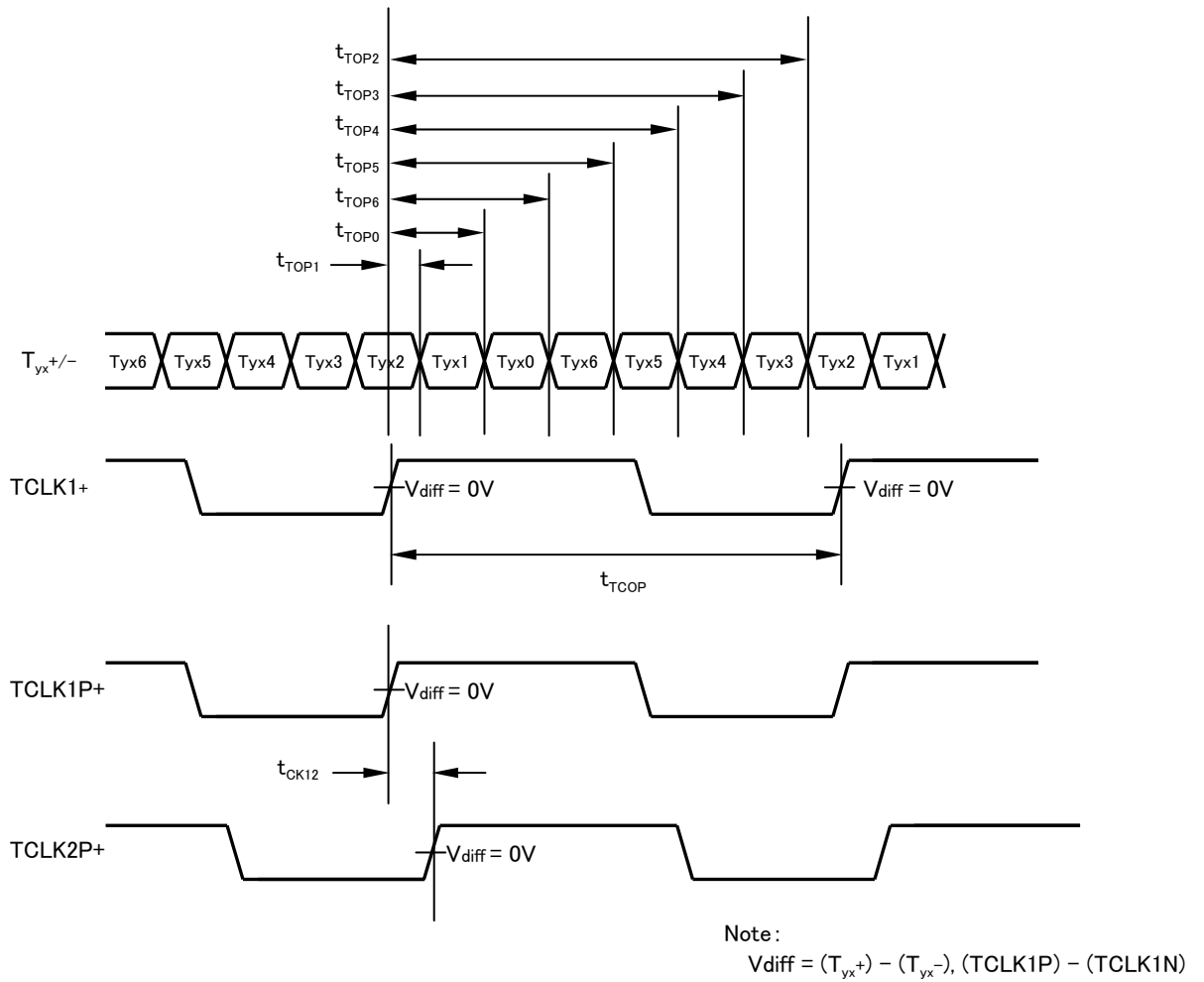


Figure-7 AC Timing Diagrams

X=1,2  
 Y=A,B,C,D

## ■ Phase Lock Loop Set Time

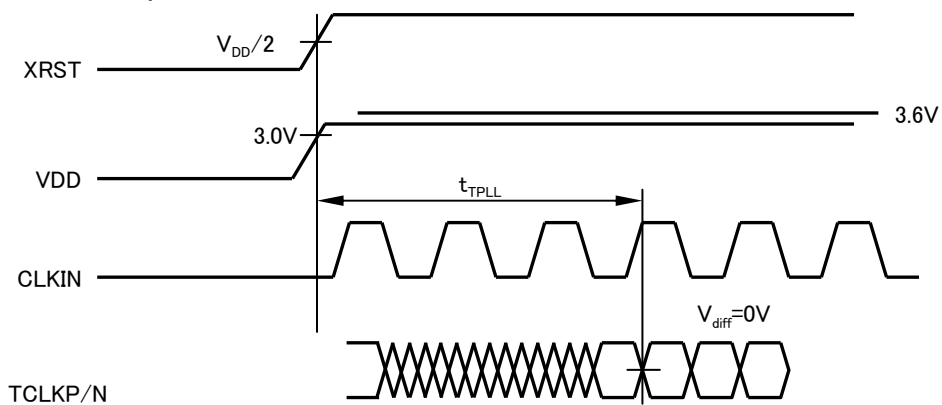


Figure-8 Phase Lock Loop Set Time

● Pixel Map Table for Dual Link

Table 9 : Pixel Map Table for Dual Link

| 1st Pixel Data |       |       |                 | 2nd Pixel Data |       |       |                 |
|----------------|-------|-------|-----------------|----------------|-------|-------|-----------------|
| TFT Panel Data |       |       | BU7988KVT Input | TFT Panel Data |       |       | BU7988KVT Input |
|                | 24Bit | 18Bit |                 |                | 24Bit | 18Bit |                 |
| LSB            | R10   | –     | R10             | LSB            | R20   | –     | R20             |
|                | R11   | –     | R11             |                | R21   | –     | R21             |
|                | R12   | R10   | R12             |                | R22   | R20   | R22             |
|                | R13   | R11   | R13             |                | R23   | R21   | R23             |
|                | R14   | R12   | R14             |                | R24   | R22   | R24             |
|                | R15   | R13   | R15             |                | R25   | R23   | R25             |
|                | R16   | R14   | R16             |                | R26   | R24   | R26             |
| MSB            | R17   | R15   | R17             | MSB            | R27   | R25   | R27             |
| LSB            | G10   | –     | G10             | LSB            | G20   | –     | G20             |
|                | G11   | –     | G11             |                | G21   | –     | G21             |
|                | G12   | G10   | G12             |                | G22   | G20   | G22             |
|                | G13   | G11   | G13             |                | G23   | G21   | G23             |
|                | G14   | G12   | G14             |                | G24   | G22   | G24             |
|                | G15   | G13   | G15             |                | G25   | G23   | G25             |
|                | G16   | G14   | G16             |                | G26   | G24   | G26             |
| MSB            | G17   | G15   | G17             | MSB            | G27   | G25   | G27             |
| LSB            | B10   | –     | B10             | LSB            | B20   | –     | B20             |
|                | B11   | –     | B11             |                | B21   | –     | B21             |
|                | B12   | B10   | B12             |                | B22   | B20   | B22             |
|                | B13   | B11   | B13             |                | B23   | B21   | B23             |
|                | B14   | B12   | B14             |                | B24   | B22   | B24             |
|                | B15   | B13   | B15             |                | B25   | B23   | B25             |
|                | B16   | B14   | B16             |                | B26   | B24   | B26             |
| MSB            | B17   | B15   | B17             | MSB            | B27   | B25   | B27             |

● LVDS Data Output Table for Function of FLIP pin

Table 10 : LVDS Data Output Pin Name

| Pin No | Output Pin Names |        |
|--------|------------------|--------|
|        | FLIP=L           | FLIP=H |
| 49     | TA1N             | TD2P   |
| 48     | TA1P             | TD2N   |
| 47     | TB1N             | TCLK2P |
| 46     | TB1P             | TCLK2N |
| 44     | TC1N             | TC2P   |
| 43     | TC1P             | TC2N   |
| 42     | TCLK1N           | TB2P   |
| 41     | TCLK1P           | TB2N   |
| 40     | TD1N             | TA2P   |
| 39     | TD1P             | TA2N   |
| 37     | TA2N             | TD1P   |
| 36     | TA2P             | TD1N   |
| 35     | TB2N             | TCLK1P |
| 34     | TB2P             | TCLK1N |
| 32     | TC2N             | TC1P   |
| 31     | TC2P             | TC1N   |
| 30     | TCLK2N           | TB1P   |
| 29     | TCLK2P           | TB1N   |
| 28     | TD2N             | TA1P   |
| 27     | TD2P             | TA1N   |

● LVC MOS Data Input Timing for Dual Link

Example : SXGA+(1400 × 1050)

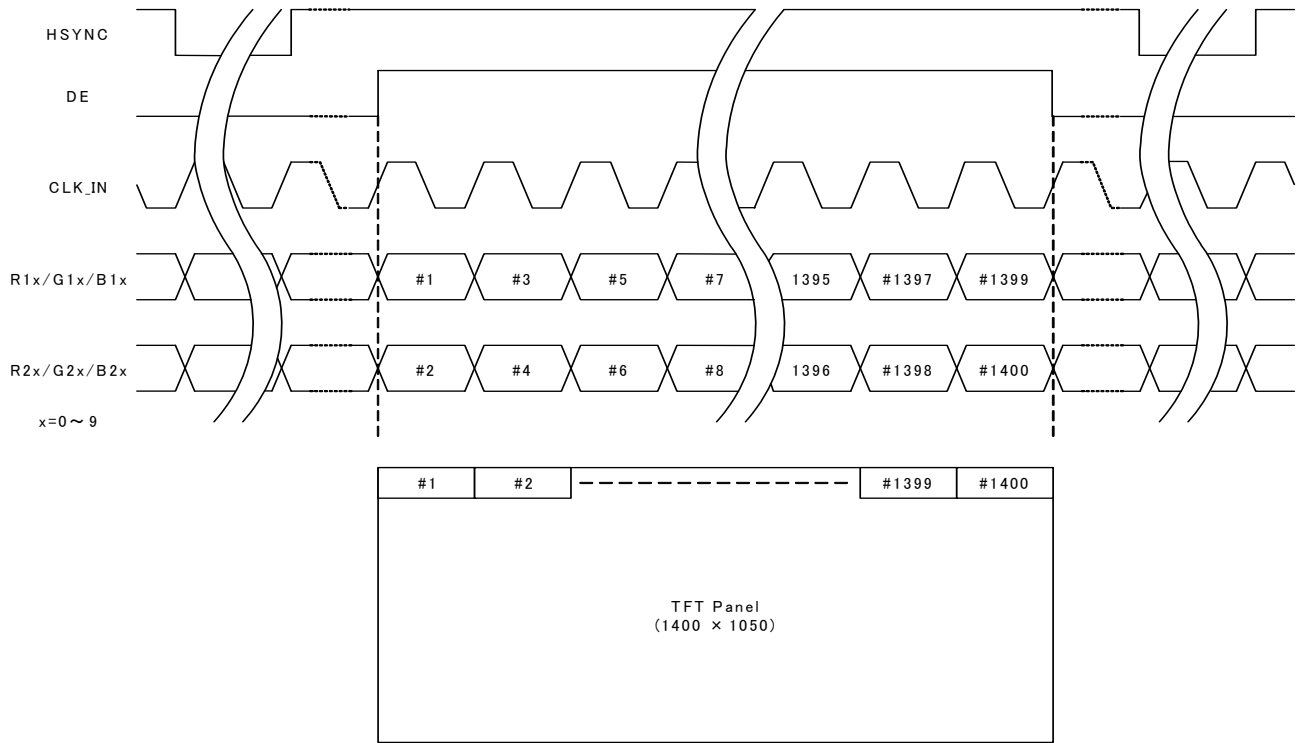


Figure-9 LVC MOS Data Input Timing for Dual Link

● LVC MOS Data Input Timing for Single Link

Example : SXGA+(1400 × 1050)

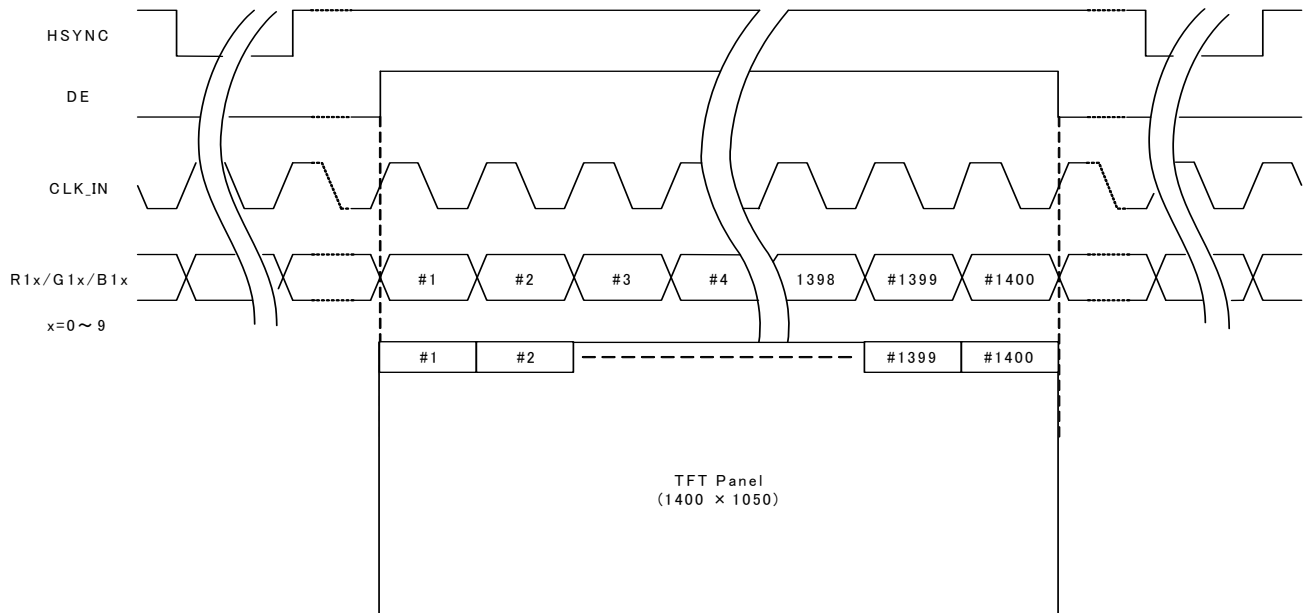
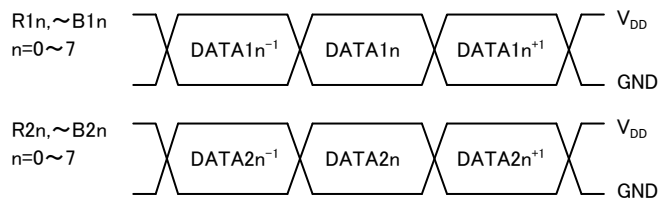
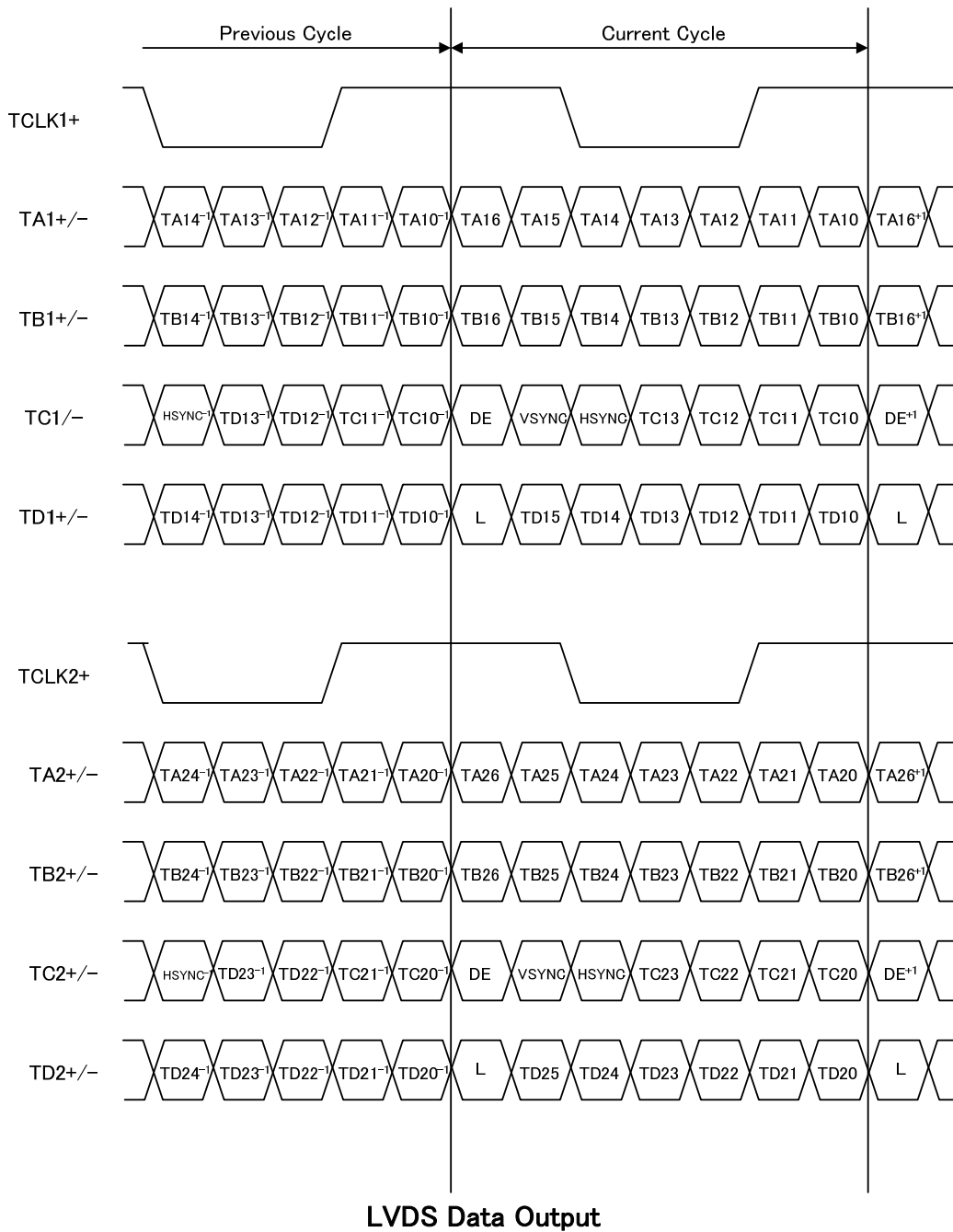


Figure-10 LVC MOS Data Input Timing for Single Link



## ● LVDS Output Data Mapping (Dual Link / Single Link)



### LVC MOS Data Input

Figure-11 LVDS Output Data Mapping

● LVCMOS Data Inputs Timing in Dual Link

Dual-in / Dual-out Mode (MODE<1:0>=LL , FLIP=L)

Table 11 : LVCMOS Data Inputs Timing Diagrams in Dual Link

| 1st Pixel Data                    |                      |                      | 2nd Pixel Data                    |                      |                      |
|-----------------------------------|----------------------|----------------------|-----------------------------------|----------------------|----------------------|
| LVDS Output Data (1st Pixel Data) | MAP=H Input Pin Name | MAP=L Input Pin Name | LVDS Output Data (2nd Pixel Data) | MAP=H Input Pin Name | MAP=L Input Pin Name |
| TA10                              | R12                  | R10                  | TA20                              | R22                  | R20                  |
| TA11                              | R13                  | R11                  | TA21                              | R23                  | R21                  |
| TA12                              | R14                  | R12                  | TA22                              | R24                  | R22                  |
| TA13                              | R15                  | R13                  | TA23                              | R25                  | R23                  |
| TA14                              | R16                  | R14                  | TA24                              | R26                  | R24                  |
| TA15                              | R17                  | R15                  | TA25                              | R27                  | R25                  |
| TA16                              | G12                  | G10                  | TA26                              | G22                  | G20                  |
| TB10                              | G13                  | G11                  | TB20                              | G23                  | G21                  |
| TB11                              | G14                  | G12                  | TB21                              | G24                  | G22                  |
| TB12                              | G15                  | G13                  | TB22                              | G25                  | G23                  |
| TB13                              | G16                  | G14                  | TB23                              | G26                  | G24                  |
| TB14                              | G17                  | G15                  | TB24                              | G27                  | G25                  |
| TB15                              | B12                  | B10                  | TB25                              | B22                  | B20                  |
| TB16                              | B13                  | B11                  | TB26                              | B23                  | B21                  |
| TC10                              | B14                  | B12                  | TC20                              | B24                  | B22                  |
| TC11                              | B15                  | B13                  | TC21                              | B25                  | B23                  |
| TC12                              | B16                  | B14                  | TC22                              | B26                  | B24                  |
| TC13                              | B17                  | B15                  | TC23                              | B27                  | B25                  |
| TC14                              | HSYNC                | HSYNC                | TC24                              | HSYNC                | HSYNC                |
| TC15                              | VSYNC                | VSYNC                | TC25                              | VSYNC                | VSYNC                |
| TC16                              | DE                   | DE                   | TC26                              | DE                   | DE                   |
| TD10                              | R10                  | R16                  | TD20                              | R20                  | R26                  |
| TD11                              | R11                  | R17                  | TD21                              | R21                  | R27                  |
| TD12                              | G10                  | G16                  | TD22                              | G20                  | G26                  |
| TD13                              | G11                  | G17                  | TD23                              | G21                  | G27                  |
| TD14                              | B10                  | B16                  | TD24                              | B20                  | B26                  |
| TD15                              | B11                  | B17                  | TD25                              | B21                  | B27                  |
| TD16                              | L                    | L                    | TD26                              | L                    | L                    |

● LVC MOS Data Inputs Timing Diagrams in Dual Link

Dual-in / Dual-out Mode (MODE<1:0>=LL, FLIP=L, MAP=H)

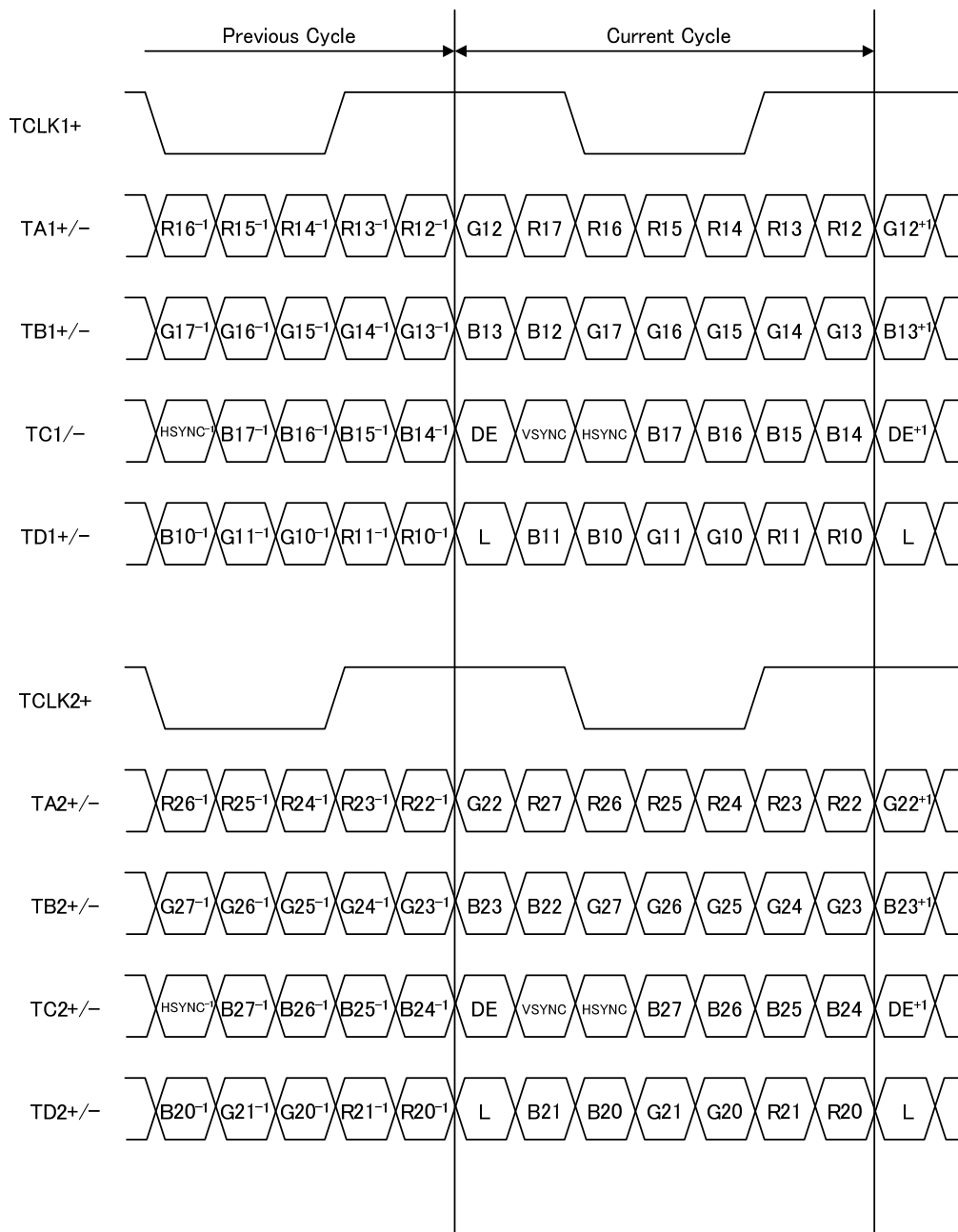


Figure-12 LVC MOS Data Inputs Timing Diagrams in Dual Link

● LVC MOS Data Inputs Timing in Single Link

Dual-in / Single-out Mode (MODE<1:0>=LH, FLIP=L)

Table 12 : LVC MOS Data Inputs Timing Diagrams in Dual Link

| LVDS Output Data (1st Pixel Data) | Mapping Mode1 (Input Pin Name) | Mapping Mode2 (Input Pin Name) |
|-----------------------------------|--------------------------------|--------------------------------|
| TA10                              | R12/R22                        | R10/R20                        |
| TA11                              | R13/R23                        | R11/R21                        |
| TA12                              | R14/R24                        | R12/R22                        |
| TA13                              | R15/R25                        | R13/R23                        |
| TA14                              | R16/R26                        | R14/R24                        |
| TA15                              | R17/R27                        | R15/R25                        |
| TA16                              | G12/G22                        | G10/G20                        |
| TB10                              | G13/G23                        | G11/G21                        |
| TB11                              | G14/G24                        | G12/G22                        |
| TB12                              | G15/G25                        | G13/G23                        |
| TB13                              | G16/G26                        | G14/G24                        |
| TB14                              | G17/G27                        | G15/G25                        |
| TB15                              | B12/B22                        | B10/B20                        |
| TB16                              | B13/B23                        | B11/B21                        |
| TC10                              | B14/B24                        | B12/B22                        |
| TC11                              | B15/B25                        | B13/B23                        |
| TC12                              | B16/B26                        | B14/B24                        |
| TC13                              | B17/B27                        | B15/B25                        |
| TC14                              | HSYNC                          | HSYNC                          |
| TC15                              | VSYNC                          | VSYNC                          |
| TC16                              | DE                             | DE                             |
| TD10                              | R10/R20                        | R16/R26                        |
| TD11                              | R11/R21                        | R17/R27                        |
| TD12                              | G10/G20                        | G16/G26                        |
| TD13                              | G11/G21                        | G17/G27                        |
| TD14                              | B10/B20                        | B16/B26                        |
| TD15                              | B11/B21                        | B17/B27                        |
| TD16                              | L                              | L                              |

● LVC MOS Data Inputs Timing Diagrams in Single Link  
 Dual-in / Single-out Mode (MODE<1:0>=LH, FLIP=L, MAP=H)

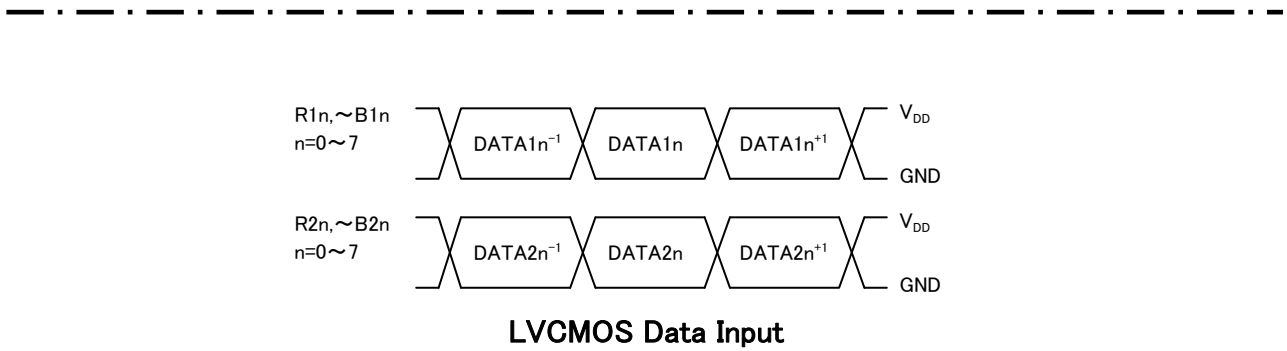
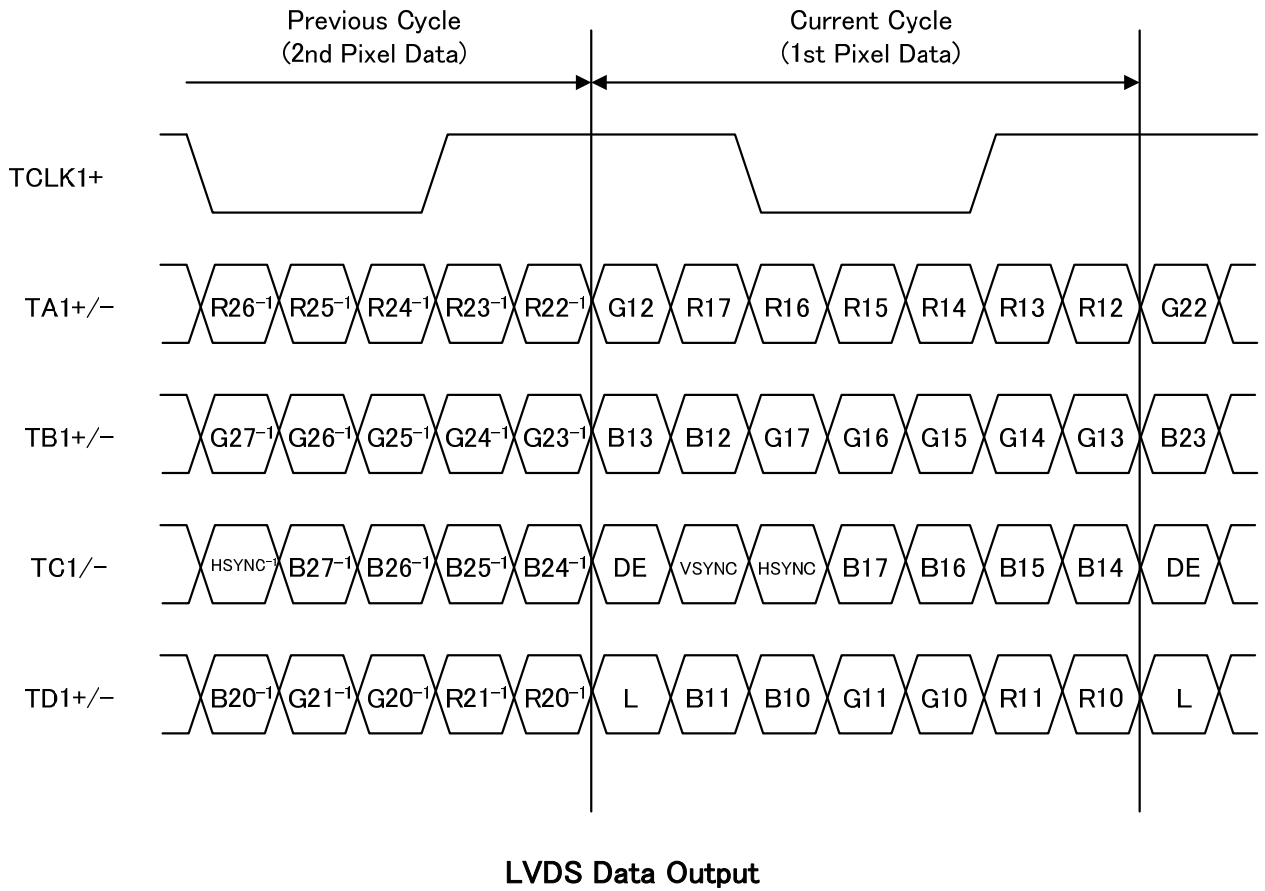


Figure-13 LVC MOS Data Inputs Timing Diagrams in Single Link

● LVCMOS Data Inputs Timing in Single Link

Single-in / Dual-out Mode (MODE<1:0>=HH, FLIP=L)

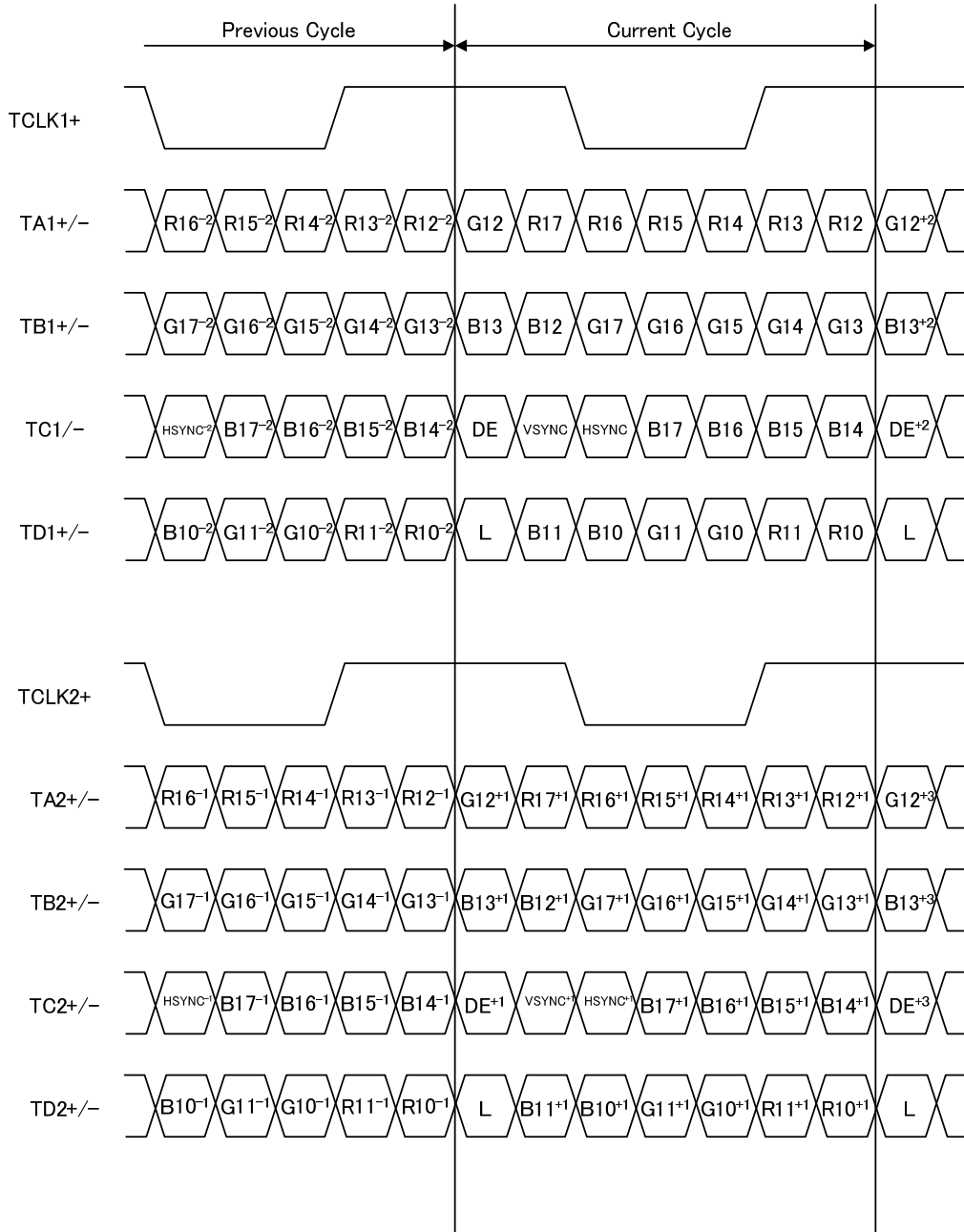
Table 13 : LVCMOS Data Inputs Timing Diagrams in Single Link

| 1st Pixel Data                    |                      |                      | 2nd Pixel Data                    |                      |                      |
|-----------------------------------|----------------------|----------------------|-----------------------------------|----------------------|----------------------|
| LVDS Output Data (1st Pixel Data) | MAP=H Input Pin Name | MAP=L Input Pin Name | LVDS Output Data (1st Pixel Data) | MAP=H Input Pin Name | MAP=L Input Pin Name |
| TA10                              | R12                  | R10                  | TA20                              | R12 <sup>+1</sup>    | R10 <sup>+1</sup>    |
| TA11                              | R13                  | R11                  | TA21                              | R13 <sup>+1</sup>    | R11 <sup>+1</sup>    |
| TA12                              | R14                  | R12                  | TA22                              | R14 <sup>+1</sup>    | R12 <sup>+1</sup>    |
| TA13                              | R15                  | R13                  | TA23                              | R15 <sup>+1</sup>    | R13 <sup>+1</sup>    |
| TA14                              | R16                  | R14                  | TA24                              | R16 <sup>+1</sup>    | R14 <sup>+1</sup>    |
| TA15                              | R17                  | R15                  | TA25                              | R17 <sup>+1</sup>    | R15 <sup>+1</sup>    |
| TA16                              | G12                  | G10                  | TA26                              | G12 <sup>+1</sup>    | G10 <sup>+1</sup>    |
| TB10                              | G13                  | G11                  | TB20                              | G13 <sup>+1</sup>    | G11 <sup>+1</sup>    |
| TB11                              | G14                  | G12                  | TB21                              | G14 <sup>+1</sup>    | G12 <sup>+1</sup>    |
| TB12                              | G15                  | G13                  | TB22                              | G15 <sup>+1</sup>    | G13 <sup>+1</sup>    |
| TB13                              | G16                  | G14                  | TB23                              | G16 <sup>+1</sup>    | G14 <sup>+1</sup>    |
| TB14                              | G17                  | G15                  | TB24                              | G17 <sup>+1</sup>    | G15 <sup>+1</sup>    |
| TB15                              | B12                  | B10                  | TB25                              | B12 <sup>+1</sup>    | B10 <sup>+1</sup>    |
| TB16                              | B13                  | B11                  | TB26                              | B13 <sup>+1</sup>    | B11 <sup>+1</sup>    |
| TC10                              | B14                  | B12                  | TC20                              | B14 <sup>+1</sup>    | B12 <sup>+1</sup>    |
| TC11                              | B15                  | B13                  | TC21                              | B15 <sup>+1</sup>    | B13 <sup>+1</sup>    |
| TC12                              | B16                  | B14                  | TC22                              | B16 <sup>+1</sup>    | B14 <sup>+1</sup>    |
| TC13                              | B17                  | B15                  | TC23                              | B17 <sup>+1</sup>    | B15 <sup>+1</sup>    |
| TC14                              | HSYNC                | HSYNC                | TC24                              | HSYNC <sup>+1</sup>  | HSYNC <sup>+1</sup>  |
| TC15                              | VSYNC                | VSYNC                | TC25                              | VSYNC <sup>+1</sup>  | VSYNC <sup>+1</sup>  |
| TC16                              | DE                   | DE                   | TC26                              | DE <sup>+1</sup>     | DE <sup>+1</sup>     |
| TD10                              | R10                  | R16                  | TD20                              | R10 <sup>+1</sup>    | R16 <sup>+1</sup>    |
| TD11                              | R11                  | R17                  | TD21                              | R11 <sup>+1</sup>    | R17 <sup>+1</sup>    |
| TD12                              | G10                  | G16                  | TD22                              | G10 <sup>+1</sup>    | G16 <sup>+1</sup>    |
| TD13                              | G11                  | G17                  | TD23                              | G11 <sup>+1</sup>    | G17 <sup>+1</sup>    |
| TD14                              | B10                  | B16                  | TD24                              | B10 <sup>+1</sup>    | B16 <sup>+1</sup>    |
| TD15                              | B11                  | B17                  | TD25                              | B11 <sup>+1</sup>    | B17 <sup>+1</sup>    |
| TD16                              | L                    | L                    | TD26                              | L                    | L                    |

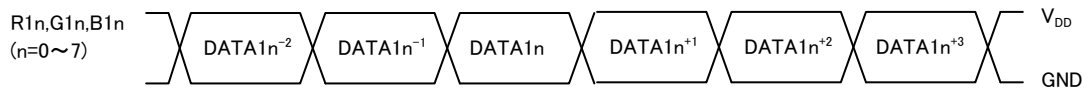
● LVC MOS Data Inputs Timing in Dual Link

Single-in / Dual-out Mode

(MODE<1:0>=HL, FLIP=L, MAP=H)



LVDS Data Output



LVC MOS Data Input

Figure-14 LVC MOS Data Inputs Timing in Dual Link

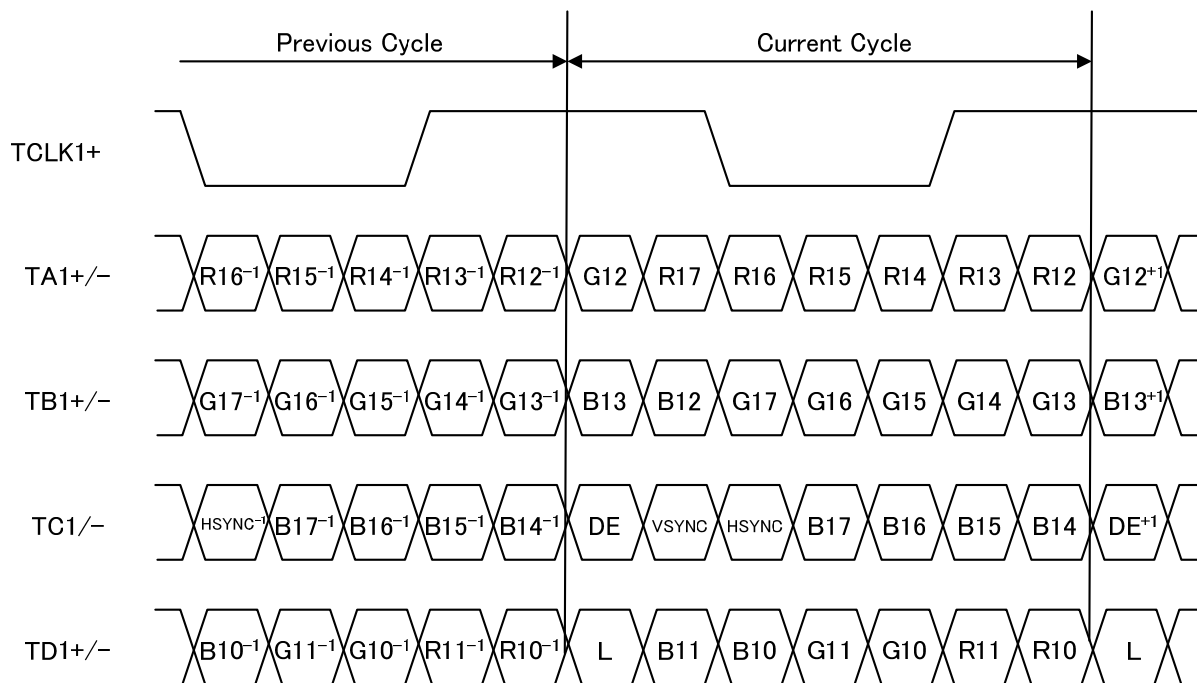
● LVC MOS Data Inputs Timing in Single Link  
 Single-in / Single-out Mode (MODE<1:0>=HH, FLIP=L)

Table 14 : LVC MOS Data Inputs Timing Diagrams in Single Link

| LVDS<br>Output Data<br>(1st Pixel Data) | MAP=H<br>Input Pin Name | MAP=L<br>Input Pin Name |
|-----------------------------------------|-------------------------|-------------------------|
| TA10                                    | R12                     | R10                     |
| TA11                                    | R13                     | R11                     |
| TA12                                    | R14                     | R12                     |
| TA13                                    | R15                     | R13                     |
| TA14                                    | R16                     | R14                     |
| TA15                                    | R17                     | R15                     |
| TA16                                    | G12                     | G10                     |
| TB10                                    | G13                     | G11                     |
| TB11                                    | G14                     | G12                     |
| TB12                                    | G15                     | G13                     |
| TB13                                    | G16                     | G14                     |
| TB14                                    | G17                     | G15                     |
| TB15                                    | B12                     | B10                     |
| TB16                                    | B13                     | B11                     |
| TC10                                    | B14                     | B12                     |
| TC11                                    | B15                     | B13                     |
| TC12                                    | B16                     | B14                     |
| TC13                                    | B17                     | B15                     |
| TC14                                    | HSYNC                   | HSYNC                   |
| TC15                                    | VSYNC                   | VSYNC                   |
| TC16                                    | DE                      | DE                      |
| TD10                                    | R10                     | R16                     |
| TD11                                    | R11                     | R17                     |
| TD12                                    | G10                     | G16                     |
| TD13                                    | G11                     | G17                     |
| TD14                                    | B10                     | B16                     |
| TD15                                    | B11                     | B17                     |
| TD16                                    | L                       | L                       |



● LVC MOS Data Inputs Timing Diagrams in Single Link  
 Single-in / Single-out Mode (MODE<1:0>=HH, FLIP=L, MAP=H)



LVDS Data Output



LVC MOS Data Input

Figure-15 LVC MOS Data Inputs Timing Diagrams in Single Link

## ● About the Power On Reset

Power On Reset is not mandatory for this device.

(The PD pin should be set to high level when Power On Reset procedure is not used.)

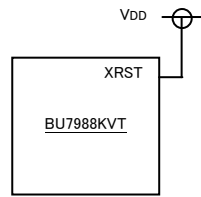


Figure-16 terminal connection when Power On Reset is not used

However, Power On Reset procedure is strongly recommend for internal logic initialization by following two methods.

- ① The method of using CR circuit.
- ② The method of using external specific IC.

It is recommend to do enough examination for target application.

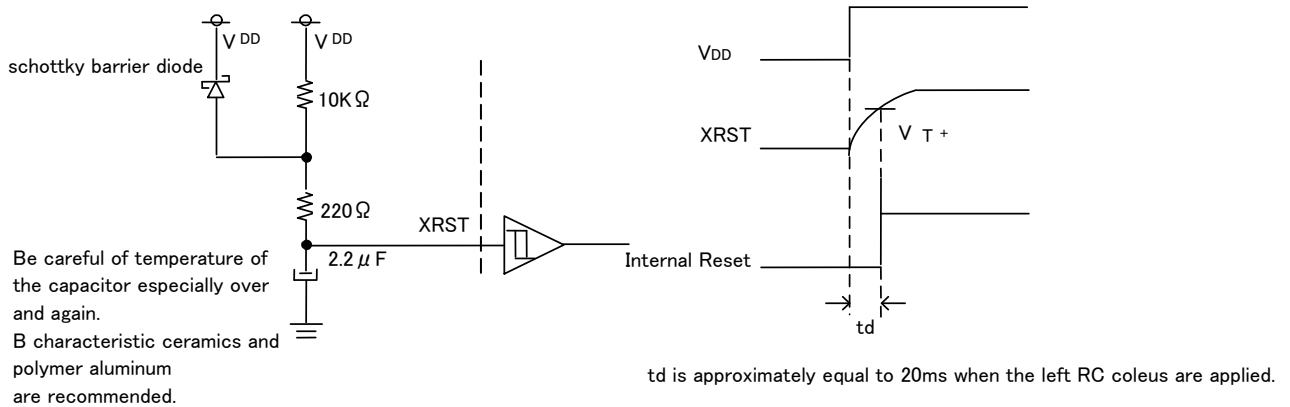


Figure-17 Power On Reset by external a CR circuit

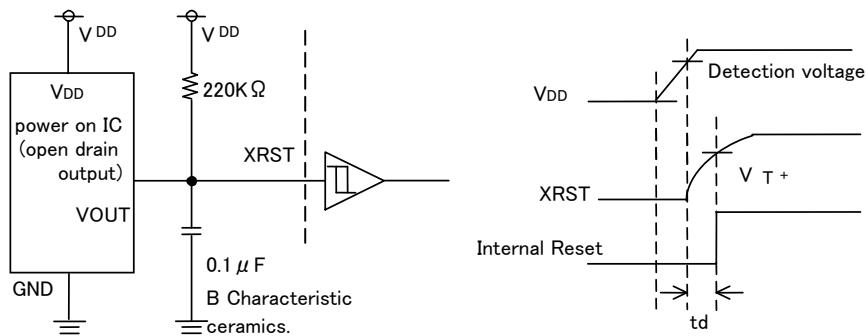
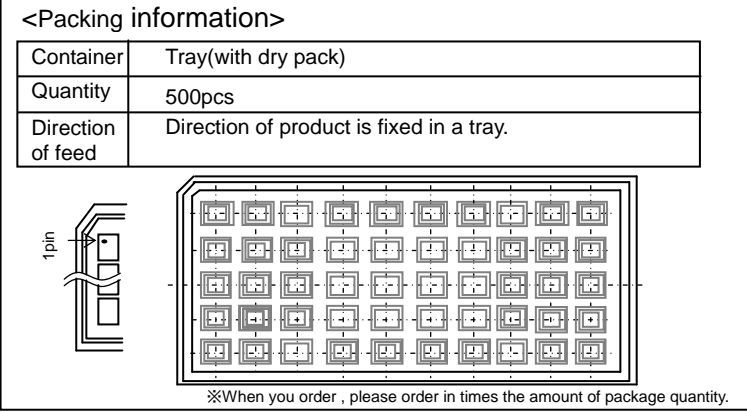
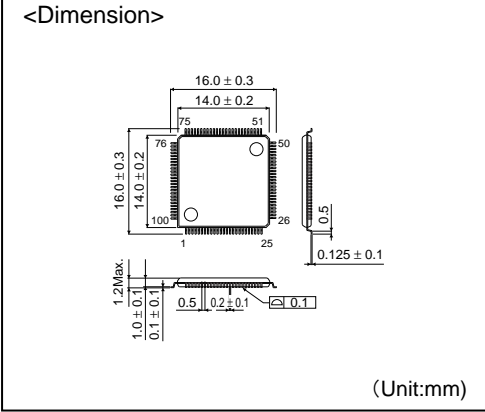


Figure-18 Power On Reset by specific IC

# TQFP100V



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| <b>Tianjin</b>        | TEL: +86-22-23029181   | FAX: +86-22-23029183   | <b>Yokohama</b>     | TEL: +81-45-476-2290   | FAX: +81-45-476-2295   |

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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