





1. REVISION RECORD

| REV NO. | REV DATE   | CONTENTS  | REMARKS |
|---------|------------|---|---------|
| 1.0     | 2022-09-05 | Initial Release   |         |
| 1.1     | 2024-02-05 | Change R23 value to 30.9k and change R21 value to 22k to have VGL voltage -6V.<br>Correct MIN and MAX values of VGL |         |
| 1.2     | 2024-03-08 | Added information about input voltage for BLVCC.  |         |



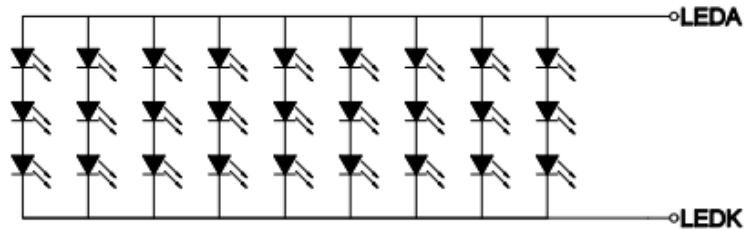
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### 3. BACKLIGHT DRIVING CIRCUIT

Internal backlight circuit of Riverdi HB, IPS 7.0" RGB Series is built with 9x3 (3LEDs in a row) LED matrix.



LED Diagram Circuit

**Backlight parameters of Riverdi 7.0" HB, IPS series:**

| PARAMETER                   | SYMBOL   | MIN | TYP    | MAX  | UNIT  | NOTE   |
|-----------------------------|----------|-----|--------|------|-------|--------|
| Backlight Driving Voltage   | $V_F$    | 9.0 | 9.6    | 10.2 | V     |        |
| Backlight Driving Current   | $I_F$    | -   | 270    | -    | mA    |        |
| Backlight Power Consumption | $W_{BL}$ | -   | 2592   | -    | mW    |        |
| LED Lifetime                | -        | -   | 50,000 | -    | hours | Note 1 |

To get the full brightness, the driving current ( $I_F$ ) needs to reach 270 mA.

The recommended LED driver is TPS61169 or DIO566,

**The input voltage for BLVCC is in range 2.7 to 5.5V.**

For example, the feedback voltage of TPS61169:  $V_{FB} (max)=204mV$

In our design, R34, R35 connected in parallel as a feedback resistor ( $R_{FB}$ ) is set to 0.75R to achieve the full brightness.

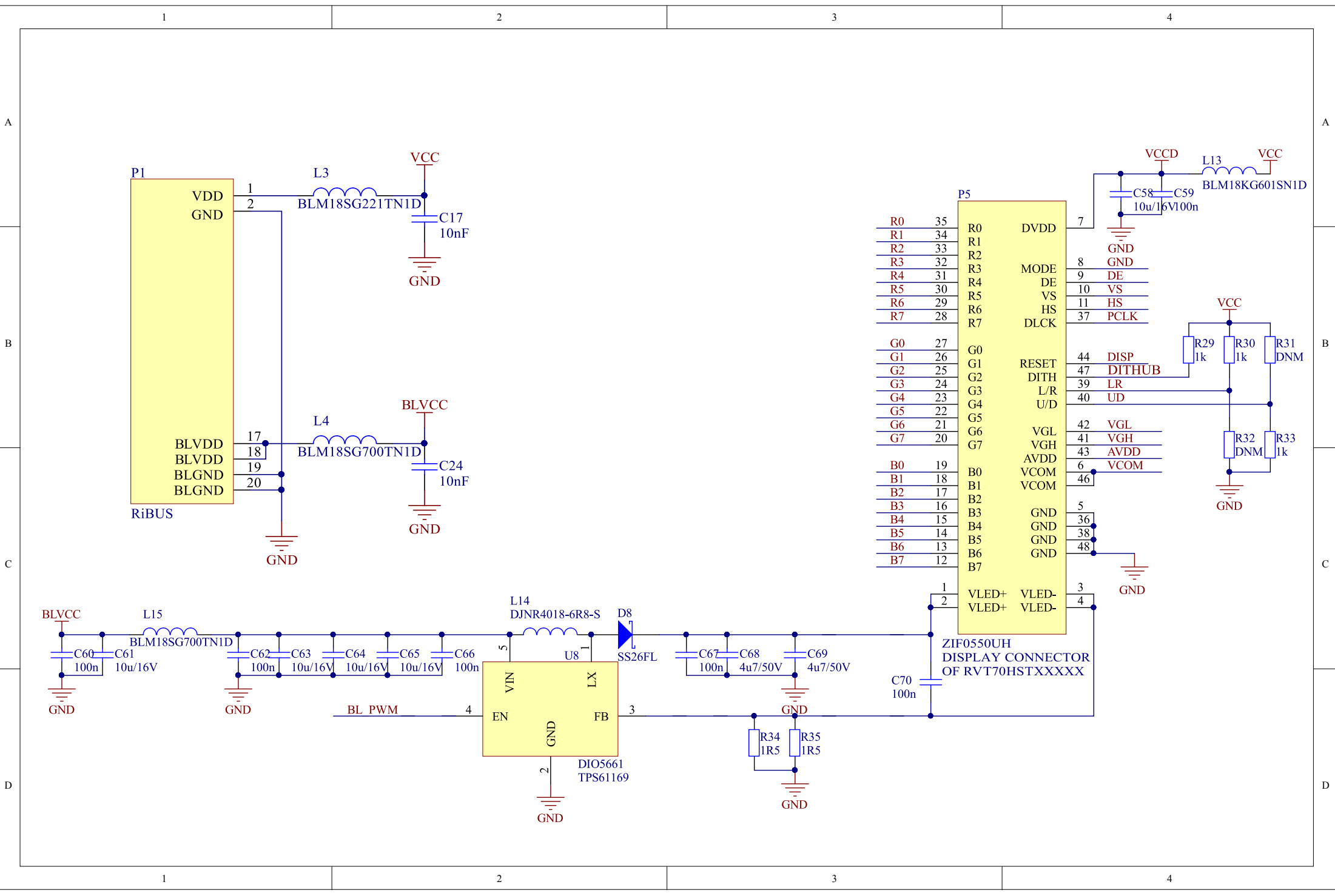
$$I_F (max)=V_{FB} (max)/ R_{FB}$$

$$I_F (max)=204mV/0.75R= 272 \text{ mA.}$$

Both TPS61169 and DIO5661 have PWM dimming control input to drive the LED current. TPS61169 and DIO5661 have built-in low-pass filter which changes internal feedback voltage. By that, inverter is not switched on-off with PMW signal but change LEDs current effectively in continuous way which cause low EMI emissions.

Please note that all Riverdi displays are designed to have low emission, that's why many LC components like beads and capacitors are on the schematic. They are not necessary but strongly recommended.

Recommended PMW frequency is 5kHz – 100kHz for TPS61169 or 200Hz - 200kHz for DIO5661.





#### 4. DRIVING CIRCUIT OF VGH/VGL/ AVDD/VCOM

Riverdi HB, IPS, 7.0” RGB series TFT require VGH, VGL, AVDD and VCOM voltages to drive the TFT glass driver properly.

Below tables are the VGH, VGL, VCOM, and AVDD specifications for Riverdi HB, IPS, 7.0” RGB series.

**Absolute maximum ratings:**

| PARAMETER                 | SYMBOL | MIN   | MAX   | UNIT |
|---------------------------|--------|-------|-------|------|
| Power for Circuit Driving | VDD    | -0.3  | 3.96  | V    |
|                           | AVDD   | -0.5  | 14.85 |      |
|                           | VGH    | -0.3  | 40    |      |
|                           | VGL    | -20.0 | 0.3   |      |

**Electrical specifications:**

| PARAMETER                 | SYMBOL | MIN  | TYP  | MAX  | UNIT | NOTE        |
|---------------------------|--------|------|------|------|------|-------------|
| Supply Voltage for Module | VGH    | 17   | 18   | 19   | V    |             |
|                           | VGL    | -5.4 | -6.0 | -6.6 |      |             |
|                           | AVDD   | 9.4  | 9.6  | 9.8  |      |             |
|                           | VCOM   | 3.6  | 3.8  | 4.0  |      |             |
| Current of Power Supply   | IAVDD  | -    | 35   | 45   | mA   | AVDD = 9.6V |
|                           | IGH    | -    | 0.5  | 1    | uA   | VGH = 18V   |
|                           | IGL    | -    | 0.5  | 1    | mA   | VGL= -6V    |

The schematic of VGH, VGL, AVDD and VCOM circuit with AP3012KTR-E1 DC-DC converter.

Hi, I am here to help you!  
 If you have any additional questions, please contact our support via email:  
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