DRIVING CIRCUIT DESIGN GUIDE

FOR BACKLIGHT AND DC-DC CONVERTER

Rev.1.1
2024-02-05

This document is applied for the Riverdi HB, IPS, 7.0" RGB series:

PRODUCT NAME	DESCRIPTION
RVT70HSTNWN00	HB, IPS, 7.0", 1024x600, 1000cd/m^2, RGB, No touch panel,
RVT70HSTFWN00	HB, IPS, 7.0", 1024x600, 1000cd/m^2, RGB, No touch panel, Metal frame
RVT70HSTNWC00-B	HB, IPS, 7.0", 1024x600, 850cd/m^2, RGB, uxTouch, Optical bonding
RVT70HSTNWC00	HB, IPS, 7.0", 1024x600, 800cd/m^2, RGB, uxTouch, Air bonding
RVT70HSTNWCA0	HB, IPS, 7.0", 1024x600, 800cd/m^2, RGB, aTouch, Air bonding
RVT70HSTFWCA0	HB, IPS, 7.0", 1024x600, 800cd/m^2, RGB, aTouch, Air bonding, Metal frame

1. REVISION RECORD

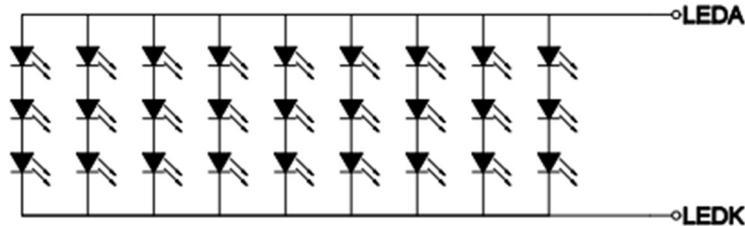| REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2022-09-05	Initial Release	
1.1	2024-02-05	Change R23 value to 30.9k and change R21 value to 22k to have VGL voltage -6V. Correct MIN and MAX values of VGL	

2. CONTENTS

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,

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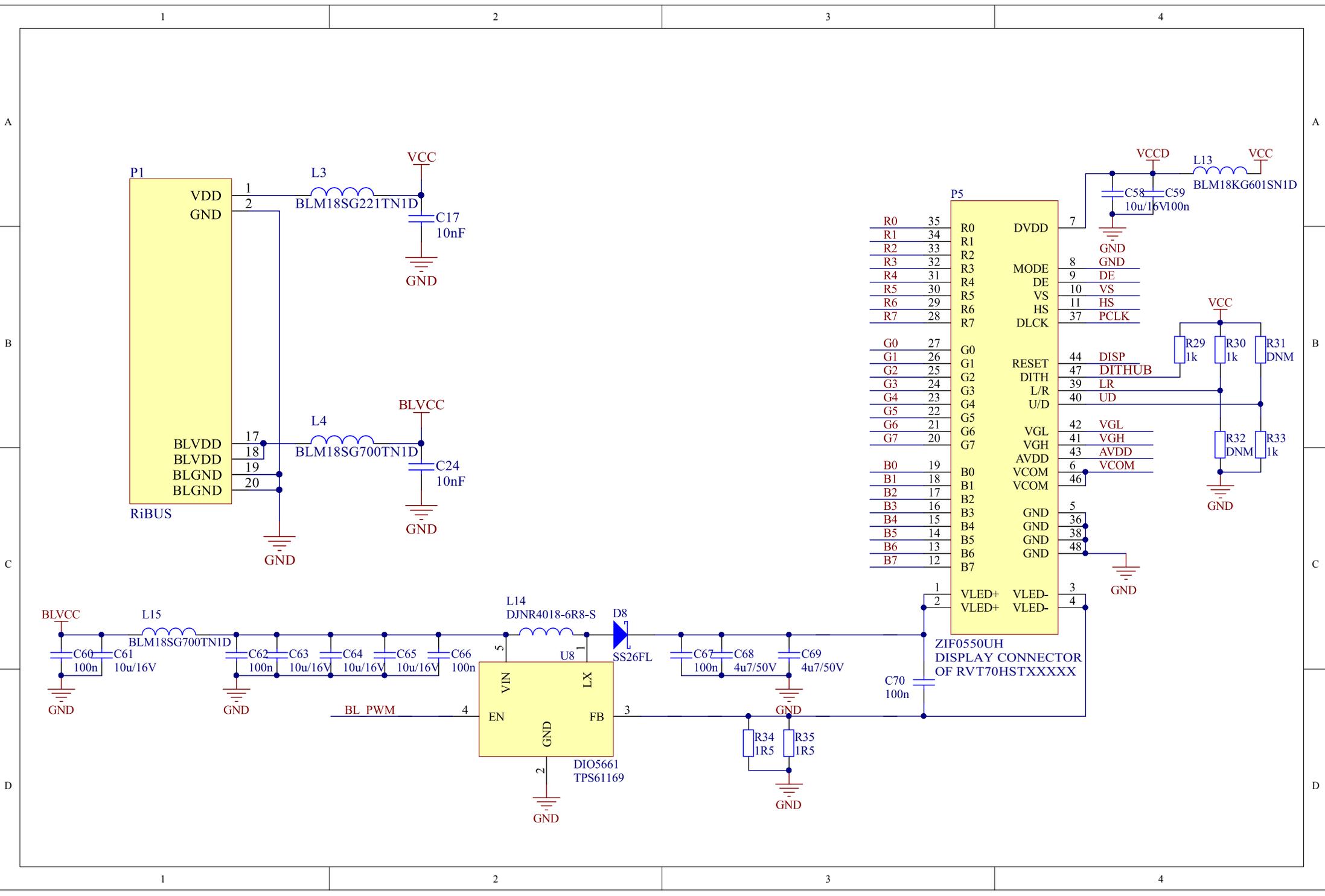
I_F (max)=V_{FB} (max)/ R_{FB}

I_F (max)=204mV/0.75R= 272 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.

P1
RiBUS

VDD
GND
1
2

L3
BLM18SG221TN1D
VCC
C17
10nF
GND

BLVDD 17
BLVDD 18
BLGND 19
BLGND 20

L4
BLM18SG700TN1D
BLVCC
C24
10nF
GND

GND

P5

R0 35 R0
R1 34 R1
R2 33 R2
R3 32 R3
R4 31 R4
R5 30 R5
R6 29 R6
R7 28 R7

G0 27 G0
G1 26 G1
G2 25 G2
G3 24 G3
G4 23 G4
G5 22 G5
G6 21 G6
G7 20 G7

B0 19 B0
B1 18 B1
B2 17 B2
B3 16 B3
B4 15 B4
B5 14 B5
B6 13 B6
B7 12 B7

DVDD 7
MODE 8   GND
DE   9   DE
VS   10 VS
HS   11 HS
DLCK 37 PCLK

RESET 44 DISP
DITH 47 DITHUB
L/R   39 LR
U/D   40 UD

VGL   42 VGL
VGH   41 VGH
AVDD 43 AVDD
VCOM 6   VCOM
VCOM 46

GND   5
GND   36
GND   38
GND   48

VLED+ 1 VLED- 3
VLED+ 2 VLED- 4

ZIF0550UH
DISPLAY CONNECTOR
OF RVT70HSTXXXXX

VCCD L13 VCC
BLM18KG601SN1D
C58   C59
10u/16V 100n
GND

VCC
R29 R30 R31
1k   1k   DNM

R32 R33
DNM 1k
GND

GND

BLVCC L15 BLM18SG700TN1D
C60 C61
100n 10u/16V
GND

C62 C63 C64 C65 C66
100n 10u/16V 10u/16V 10u/16V 100n
GND

L14
DJNR4018-6R8-S
D8
SS26FL

5 VIN   LX 1
U8
BL_PWM 4 EN   FB 3
GND 2
DIO5661
TPS61169
GND

C67 C68 C69
100n 4u7/50V 4u7/50V
GND

R34 R35
1R5 1R5
GND

C70
100n
GND

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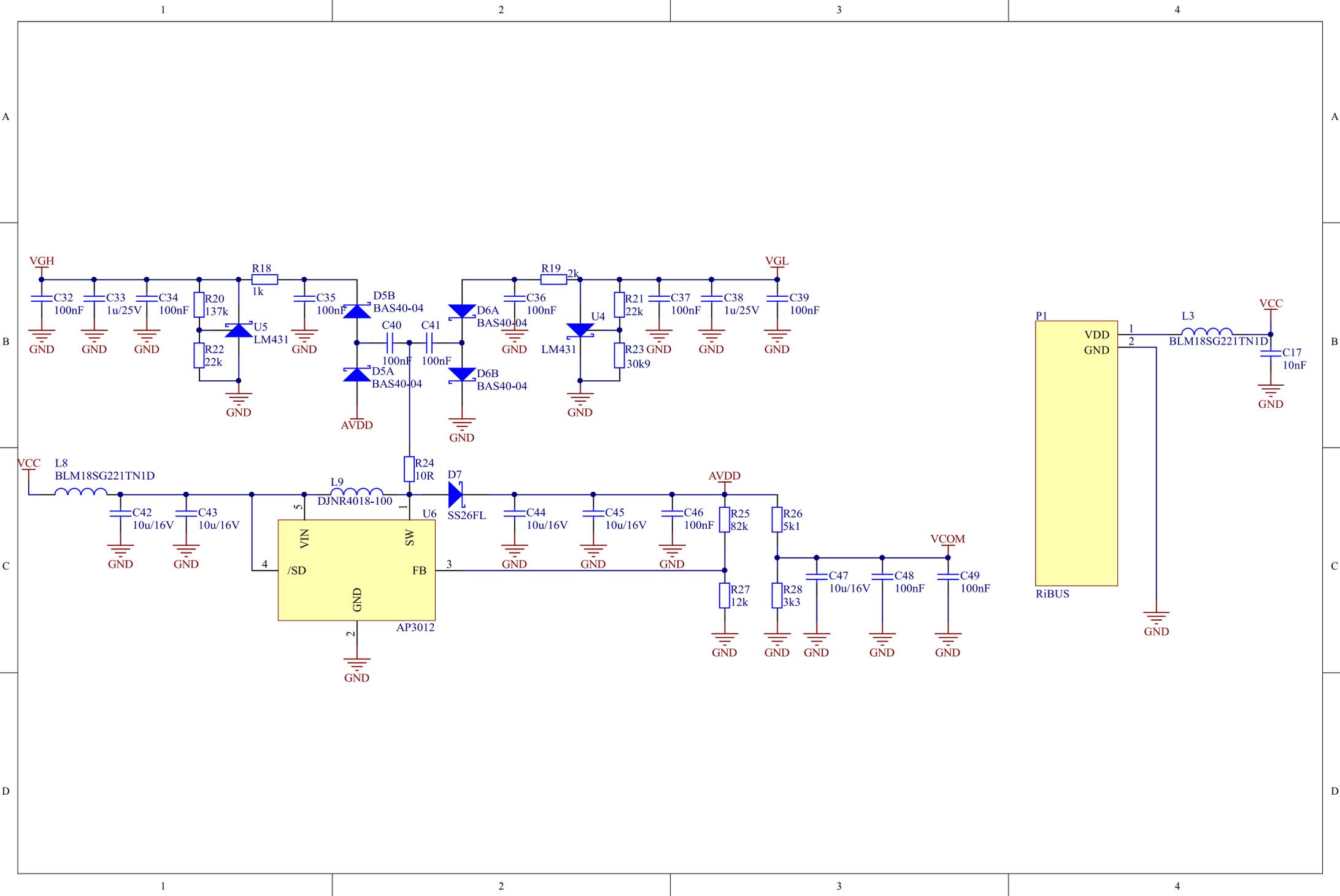
Hi, I am here to help you! If you have any additional questions, please contact our support via email: contact@riverdi.com