SLG47011V Demo Board

The SLG47011V Demo Board # is a compact, easy-to-use, USB Type-C powered hardware tool for measuring voltage, current, power, and temperature. The SLG47011 IC performs the measurements using PGA/ADC, and the Renesas MCU RL78G13 handles the operation of the display.

Specifications

The SLG47011V Demo Board #1 operates under the following conditions:

- USB Type-C up to 3.2 Gen 2
- (5 V…28 V, 5 A (max))

Features

- Power Delivery compatible (up to 28 V, 5 A)
- Voltage, Current, Power, and Temperature measurements
- Measurements in both directions (plug and receptacle connection)
- 128 x 32 OLED monochrome display
- Button for flipping display and changing screen.

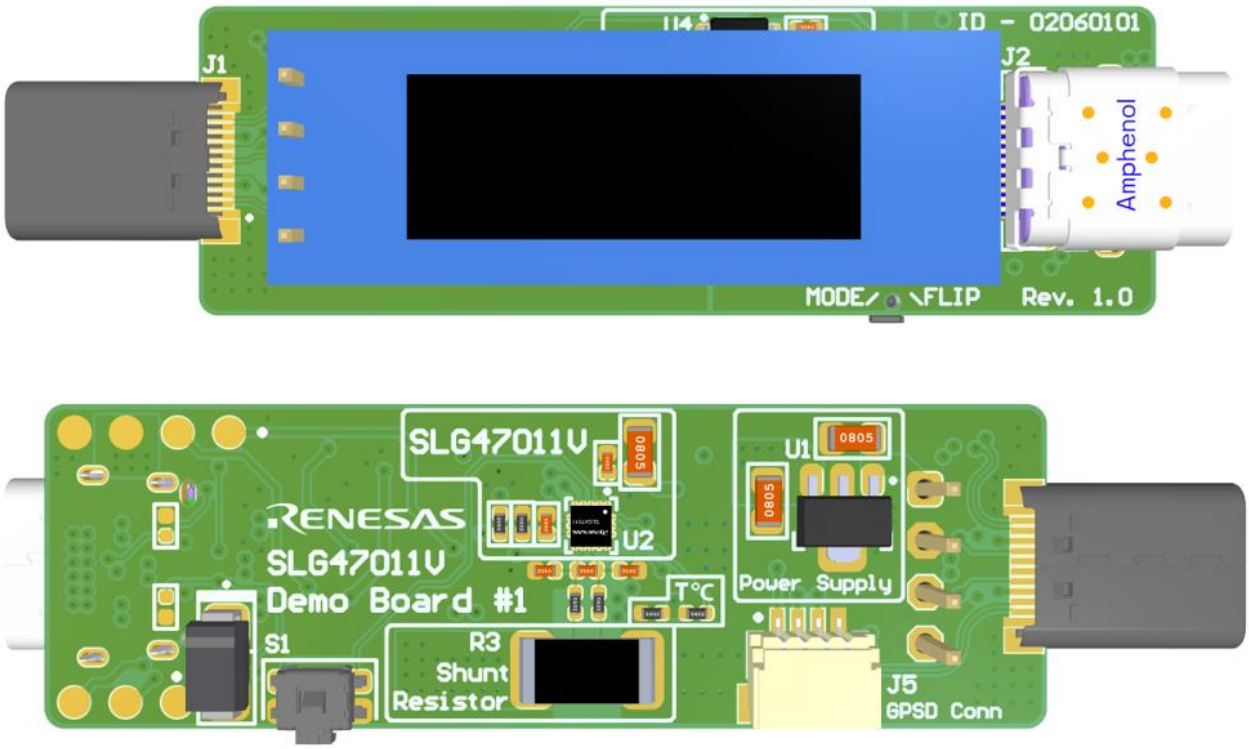

Figure 1. SLG47011V Demo Board #1

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1. Functional Description

The SLG47011V Demo Board #1 is a Type-C power meter based on the GreenPAK SLG47011V IC. It features plug/receptacle Type-C connectors and provides measurements in both directions. The information is displayed on a 128 x 32 OLED display and can show five different screens: all measurements, voltage, current, temperature, and power. You can change the screen by pressing the “MODE/FLIP” button or flip the display by holding the button for more than 1 second.

A simplified functional diagram is shown in Figure 2.

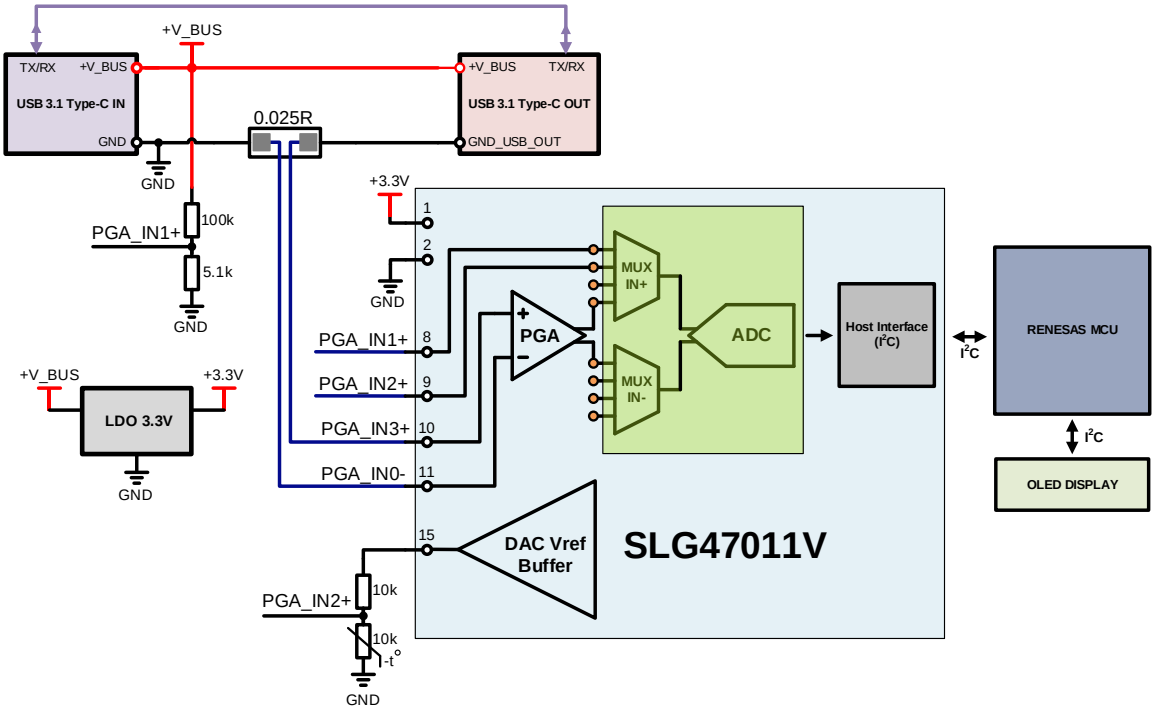


Figure 2. Functional Block Diagram of SLG47011V Demo Board #1 R1.0

2. Electrical Characteristics

Table 1. Demo Board Electrical Characteristics

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage [1]	Plug and Receptacle Connection to Host Device	5	--	28	V
Output Current [1]	Plug Connection to Host Device	0	--	5	A
	Receptacle Connection to Host Device	0	--	4	A
Power Ratings [1]	Plug Connection to Host Device	0	--	140	W
	Receptacle Connection to Host Device	0	--	80	W

[1] The plug and receptacle connections to the host device are shown in Figure 3 and Figure 4.

3. USB Type-C Specification

Table 2. USB Specification

USB Parameters	
USB-C Version	up to USB 3.2 Gen 2
Data Transfer Speed	up to 10 Gbps
USB Power Delivery 2.0/3.0 [2]	28 V, 5 A
[2] Requires specially rated 140 W USB-C charging cable.	

4. Measurement Accuracy

Voltage and current measurements were performed on three different boards to gather statistics on accuracy (see Table 3 and Table 4).

Table 3. Voltage Measurements Data

Demo Board #1		Demo Board #2		Demo Board #3	
Applied Voltage, V	Measured Voltage, V	Applied Voltage, V	Measured Voltage, V	Applied Voltage, V	Measured Voltage, V
4.989	4.99	4.985	4.99	4.988	4.98
8.986	9.00	8.985	9.00	8.987	8.99
11.987	12.02	11.986	12.01	11.987	12.00
19.990	20.06	19.987	20.05	19.990	20.03

Table 4. Current Measurements Data

Demo Board #1		Demo Board #2		Demo Board #3	
Applied Current, A	Measured Current, A	Applied Current, A	Measured Current, A	Applied Current, A	Measured Current, A
0.1	0.098	0.100	0.098	0.100	0.099
0.3	0.302	0.300	0.302	0.300	0.302
0.5	0.503	0.500	0.504	0.500	0.499
1	1.010	1.000	1.002	1.000	1.006
3	3.039	3.000	3.018	3.000	3.030

5. Connection of SLG47011V Demo Board #1 to the Host Device

You could connect the Demo Board to the host device in two ways: plug or receptacle connection:

Figure 3. Plug Connection to Host Device

Figure 4. Receptacle Connection to Host Device

To start using the SLG47011V Demo Board #1, please connect the board to a USB-C power supply (for example, by plugging it into the Type-C port of a laptop) and to the Device Under Test (DUT).

Figure 5. Connection of SLG47011V Demo Boad #1 to the Type-C Port

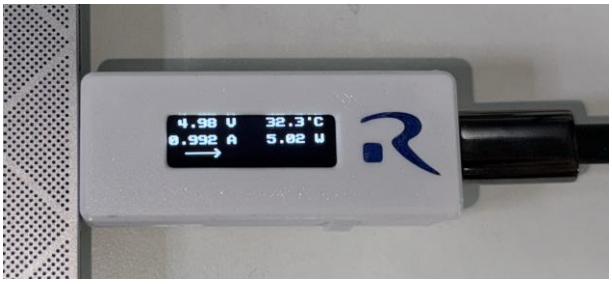


Figure 6. Connection of SLG47011V Demo Boad #1 to the DUT

Note: The board will start operating only after the DUT with pull-down resistors on the CC pins is connected.

After connecting the DUT, the start-up Renesas screen will appear for two seconds. Then, you will see the initial screen:

Figure 7. Start-up Renesas Screen

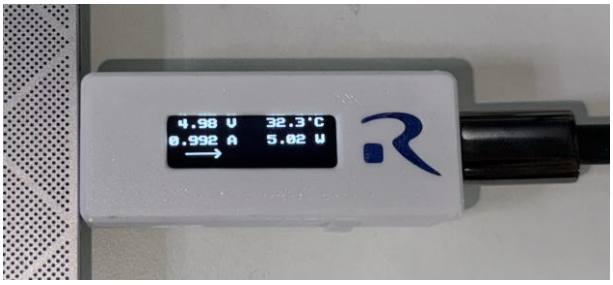


Figure 8. Initial Screen

To flip the screen, press and hold the “MODE/FLIP” button for more than one second:

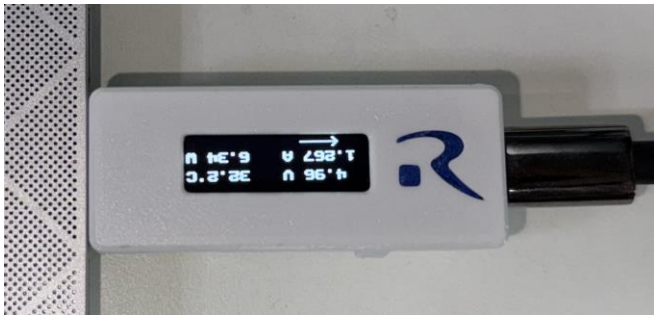
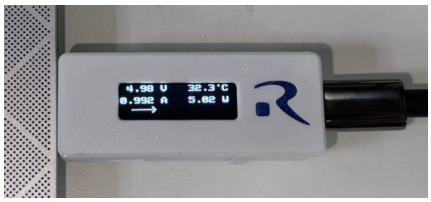


Figure 9. Flipping the Screen by Pressing the Button

To change the screen, please make a short press of the “MODE/FLIP” button. You can cycle through five screens by pressing the button five times.



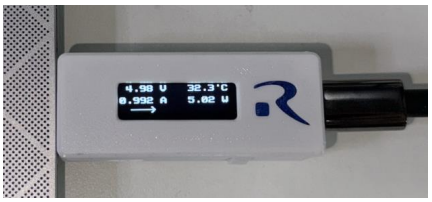
Initial Screen

Voltage Screen (One Press)

Current Screen (Two Presses)

Power Screen (Three Presses)

Temperature Screen (Four Presses)

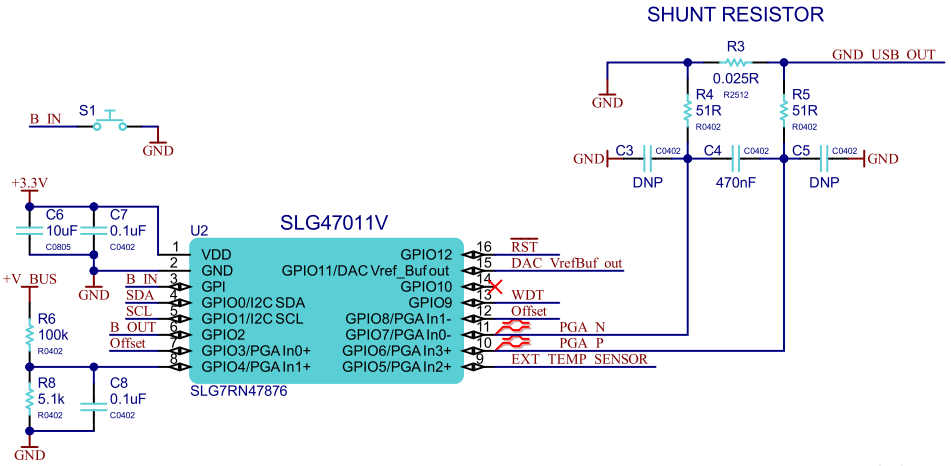


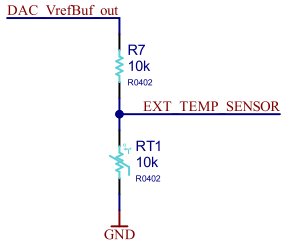
Initial Screen (Five Presses)

6. Overvoltage Protection

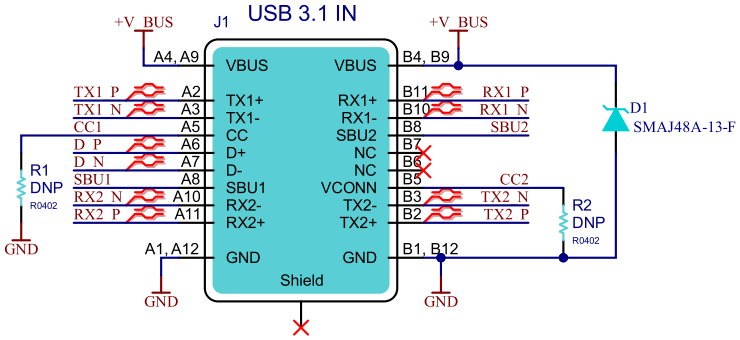
The board has overvoltage protection: if the voltage exceeds 30 V, the board shuts off and the red LED indicating overvoltage lights up. Once the voltage returns to operating limits, the board will start up again.

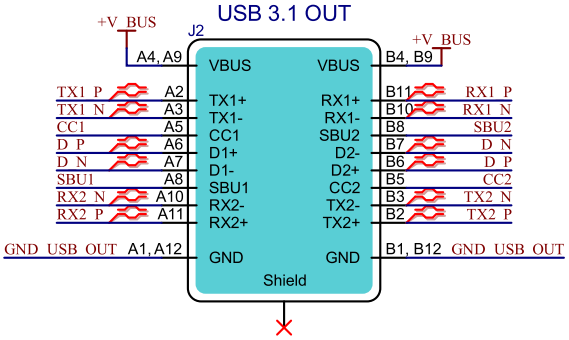
7. Schematics

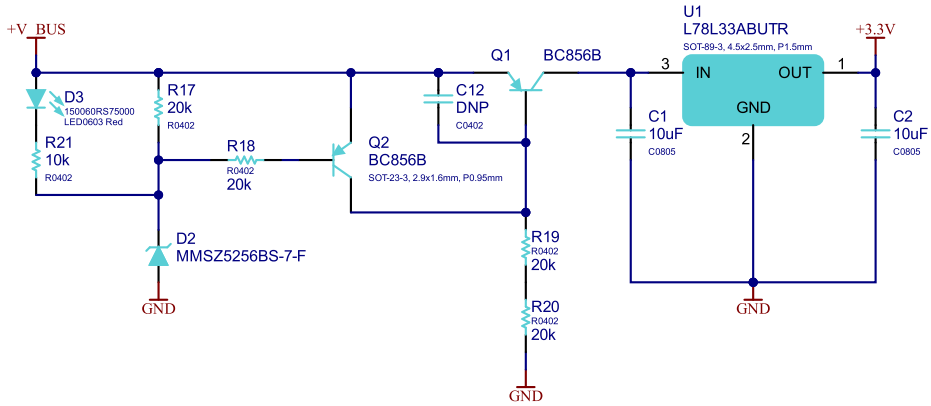


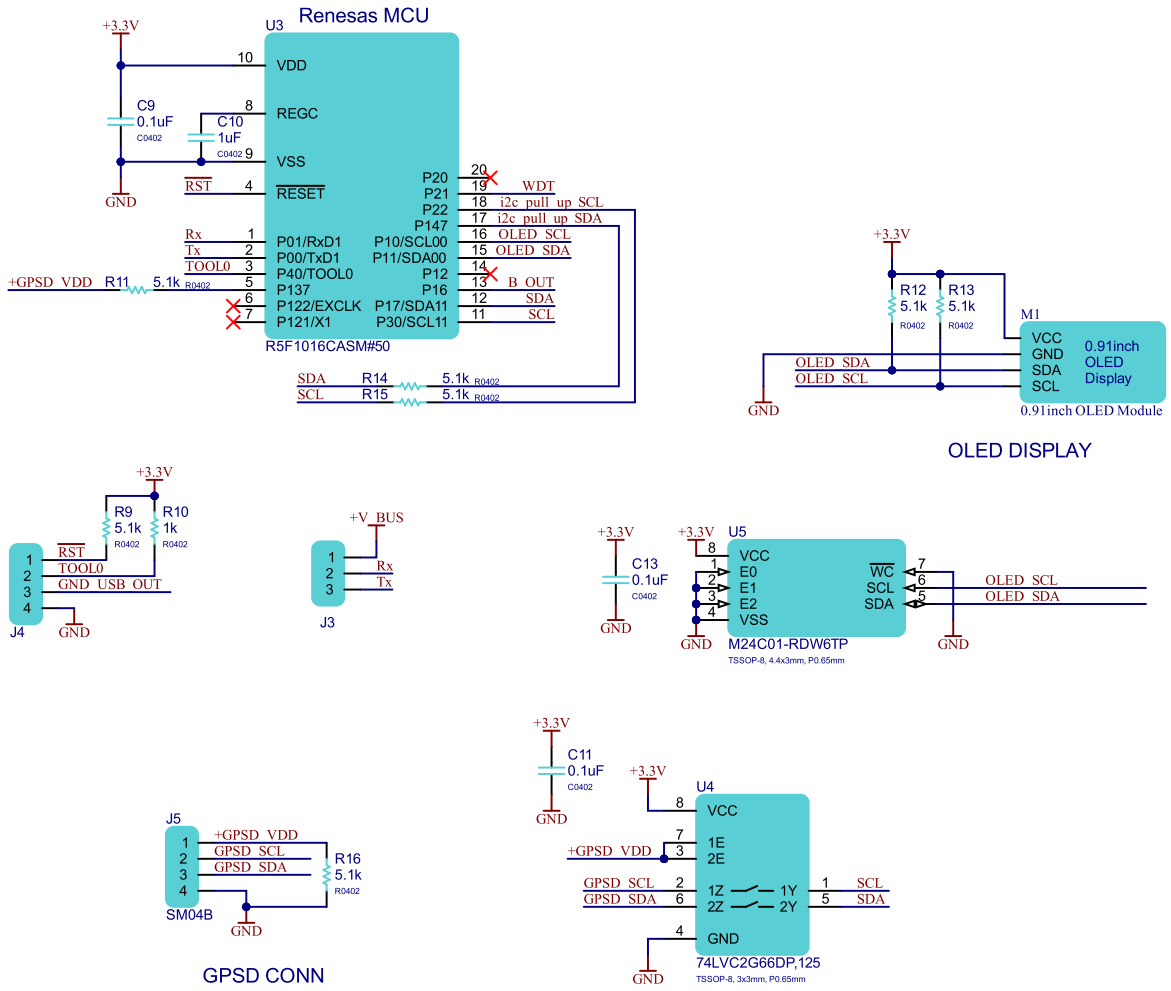


EXTERNAL TEMPERATURE SENSOR (NTC)








Renesas MCU
U3
R5F1016CASM#50
OLED DISPLAY
0.91inch OLED Module
GPSD CONN
M24C01-RDW6TP
74LVC2G66DP,125

8. Bill of Materials

#	Name	Designator	Quantity	Manufacturer 1	Manufacturer Part Number 1	Supplier 1	Supplier Part Number 1
1	10 µF 10% 25 V X5R 0805	C1, C2, C6	3	Samsung	CL21A106KAYNNNE	Digi-Key	1276-2891-1-ND
2	DNP	C3, C5	2	--	--	--	--
3	470 nF 10% 25 V X5R 0402	C4	1	Samsung	CL05A474KA5NNNC	Digi-Key	1276-1477-1-ND
4	0.1 µF 10% 25 V X5R 0402	C7, C8, C9, C11, C13	5	Samsung	CL05A104KA5NNNC	Digi-Key	1276-1043-1-ND
5	1 µF 10% 25 V X5R 0402	C10	1	Samsung	CL05A105KA5NQNC	Digi-Key	1276-1445-1-ND
6	DNP 0402	C12	1	--	--	--	--
7	SMAJ48A-13-F	D1	1	Diodes Inc.	SMAJ48A-13-F	Digi-Key	SMAJ48A-FDICT-ND
8	MMSZ5256BS-7-F	D2	1	Diodes Inc.	MMSZ5256BS-7-F	Digi-Key	MMSZ5256BS-FDICT-ND
9	150060RS75000	D3	1	Wurth Electronics	150060RS75000	Digi-Key	732-4978-1-ND
6	CX60-24S-UNIT	J1	1	Hirose	CX60-24S-UNIT	Digi-Key	H126317-ND
7	12401826E412A	J2	1	Amphenol	12401826E412A	Digi-Key	12401826E412ACT-ND
8	DNP	J3	1	--	--	--	--
9	DNP	J4	1	--	--	--	--
10	Header 4	J5	1	JST	SM04B-SRSS-TB	Digi-Key	455-SM04B-SRSS-TBCT-ND
11	0.91-inch OLED Module	M1	1	Waveshare	14657	Waveshare	14657
	BC856B-7-F	Q1, Q2	2	Diodes Inc.	BC856B-7-F	Digi-Key	BC856B-7FDICT-ND
12	DNP	R1, R2	2	-	-	-	-
13	0.025R 1% 2512	R3	1	CGS	TLRP3A30CR025FTE	Digi-Key	1712-TLRP3A30CR025FTECT-ND
14	51R 1% 0402	R4, R5	2	Yageo	RC0402FR-0751RL	Digi-Key	311-51.0LRCT-ND
15	100k 1% 0402	R6	1	Yageo	RC0402FR-07100KL	Digi-Key	311-100KLRCT-ND
16	10k 1% 0402	R7, R21	2	Yageo	RC0402FR-0710KP	Digi-Key	YAG1249CT-ND
17	5.1k 1% 0402	R8, R9, R11, R12, R13, R14, R15, R16	8	Yageo	RC0402FR-075K1L	Digi-Key	311-5.10KLRCT-ND
18	1k 1% 0402	R10	1	Yageo	RC0402FR-071KL	Digi-Key	311-1.00KLRCT-ND
	20k 1% 0402	R17, R18, R19, R20	4	Yageo	RC0402FR-0720KP	Digi-Key	13-RC0402FR-0720KPCT-ND
19	Thermistor NTC	RT1	1	Panasonic	ERT-J0EG103FA	Digi-Key	P12007CT-ND
20	Sw Tactile NO	S1	1	Panasonic	EVQ-P7C01P	Digi-Key	P16765CT-ND
21	L78L33ABUTR	U1	1	STMicroelectronics	L78L33ABUTR	Digi-Key	497-7286-1-ND
23	SLG7RN47876	U2	1	Renesas	SLG7RN47876	Renesas	SLG7RN47876

#	Name	Designator	Quantity	Manufacturer 1	Manufacturer Part Number 1	Supplier 1	Supplier Part Number 1
24	R5F1016CASM#50	U3	1	Renesas	R5F1016CASM#50	Digi-Key	559-R5F1016CASM#50CT-ND
25	74LVC2G66DP,125	U4	1	Nexperia	74LVC2G66DP.125	Digi-Key	1727-5993-1-ND
26	M24C01-RDW6TP	U5	1	STMicroelectronics	M24C01-RDW6TP	Digi-Key	497-8628-1-ND

9. Ordering Information

Part Number	Description
SLG47011V-USBPWR-DMO	SLG47011V Demo Board

10. Revision History

Revision	Date	Description
1.01	Dec 23, 2024	Updated Schematics Updated USB specification table
1.00	Oct 11, 2024	Initial release.