

TPS22958/58N 5.5-V, 4-A/6-A, 14-mΩ On-Resistance Load Switch

The TPS22958EVM and TPS22958NEVM evaluation modules (EVM) allow the user to connect power to and control the TPS22958 and TPS22958N 5.5-V, 14-mΩ On-Resistance Load Switches. [Table 1](#) summarizes the available EVMs and Package Options; refer to the device datasheet [SLVSCX7](#) for more details.

Table 1. Device and Package Configurations

EVM Orderable	Device	Device Package	Exposed Thermal Pad	Maximum Voltage	Maximum Continuous Current	Quick Output Discharge
TPS22958EVM	U1	TPS22958DGK	No	5.5V	4A	Yes
	U2	TPS22958DGN	Yes	5.5V	6A	Yes
TPS22958NEVM	U1	TPS22958NDGK	No	5.5V	4A	No
	U2	TPS22958NDGN	Yes	5.5V	6A	No

Contents

1	Introduction	2
1.1	Typical Applications	3
1.2	Features.....	3
2	Electrical Performance	3
3	Schematic.....	3
4	EVM Connections.....	4
4.1	J1/J3 – VIN Power Connections	4
4.2	J2/J4 – VOUT Power Connections	4
4.3	JP1/JP3 – VBIAS Power	4
4.4	JP2/JP4 – ON Control.....	4
4.5	TP1/TP10 – VIN Sense	4
4.6	TP5/TP15 – VOUT Sense	4
4.7	TP4/TP13 – ON	4
4.8	TP2/TP6/TP7/TP8/TP9/TP11/TP16/TP17 – GND.....	4
4.9	List of Connections	4
5	Test Setup	5
5.1	RON Test Procedure	5
5.2	AC Parameter Test Procedure (tR, tON, tF, tOFF, tD)	6
6	Board Assembly and Layout	7
7	TPS22958EVM Bill of Materials	9
8	TPS22958NEVM Bill of Materials	10

1 Introduction

The TPS22958EVM and TPS22958NEVM evaluation modules (EVM) allow the user to connect power to and control the both package versions of the TPS22958 and TPS22958N 5.5-V, 4-A/6-A, 14-mΩ On-Resistance Load Switches. This allows for easy evaluation of ON Resistance and Adjustable Slew Rate.

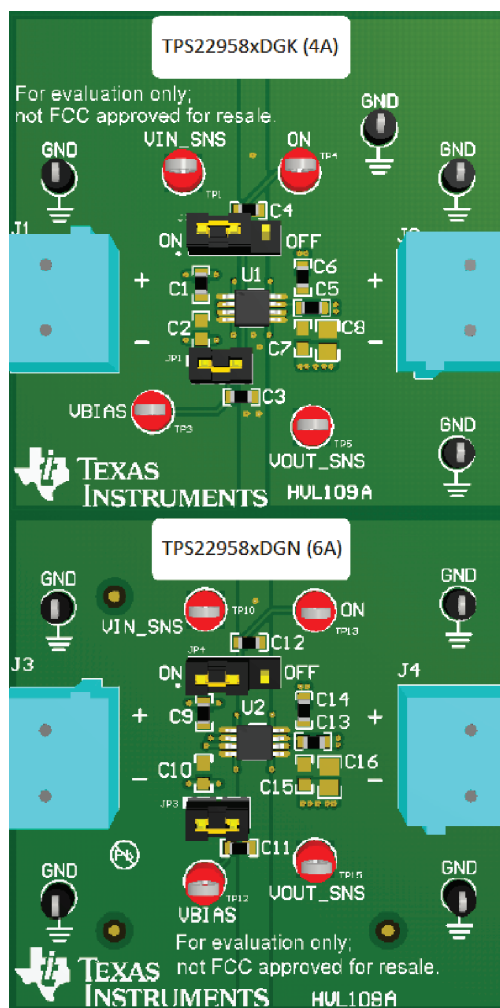


Figure 1. 3D Rendering of EVM

1.1 Typical Applications

- EPOS
- Factory Automation/Control
- Building Automation
- Printers
- Prototype Boards
- Wave Soldering Manufacturing

1.2 Features

- VBIAS voltage range: 2.5 V to 5.5 V
- VIN input voltage range: 0.6 V to 5.5 V
- External capacitor for adjustable rise time
- High current connection terminals available for 6A maximum continuous switch current operation
- Test Point Connections to VIN, VOUT, VBIAS, and ON Pins
- SENSE connections for accurate measurement of VIN and VOUT voltages used for Voltage Drop and ON Resistance Calculations

2 Electrical Performance

Refer to the datasheet [SLVSCX7](#) for detailed electrical characteristics of the TPS22958 and TPS22958N.

3 Schematic

The schematic for the TPS22958 and TPS22958N EVMs is shown in [Figure 2](#).

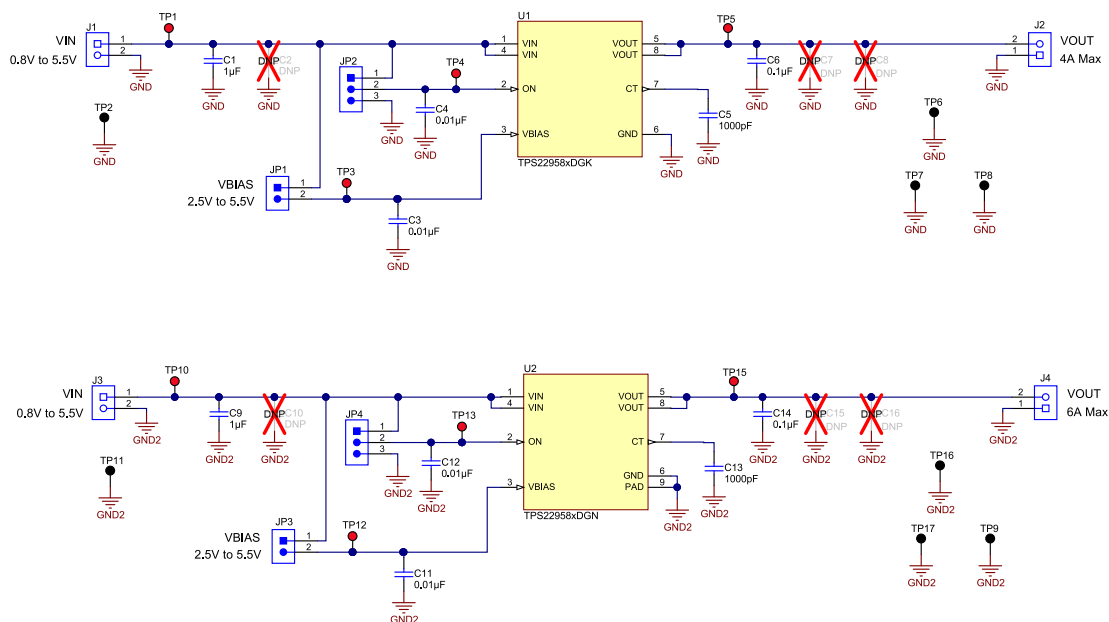


Figure 2. Schematic

4 EVM Connections

This section describes the connectors, jumpers, and test points on the EVM.

4.1 J1/J3 – VIN Power Connections

These are the high current input connections from the power supply. Connect the positive lead to the top (+) terminal and the negative lead to the bottom (–) terminal.

4.2 J2/J4 – VOUT Power Connections

These are the high current output connections for loading the EVM. Connect the positive lead of the load to the top (+) terminal and the GND of the load to the bottom (–) terminal.

4.3 JP1/JP3 – VBIAS Power

These jumpers connect VBIAS to the respective VIN voltage source. VBIAS must be maintained between 2.5 V – 5.5 V for proper operation on the TPS22958 and TPS22958N devices. If testing conditions involve taking the VIN voltage below 2.5V, remove the shunt across JP1/JP3 and connect VBIAS voltage at TP3/TP12.

4.4 JP2/JP4 – ON Control

These three pin jumpers connect the ON pin either to VIN or to GND. This allow for quickly enabling/disabling the device after power is present.

4.5 TP1/TP10 – VIN Sense

These connects provide and low current path to the input pins of the device for accurate voltage measurements. These sense connections should be used when measuring the voltage drop from VIN to VOUT which is used to calculate the ON resistance. In cases where there is a large load current, it is recommended configure the power supply to use sense connections. Connect the positive sense lead to the VIN sense point to overcome voltage drop in cabling.

4.6 TP5/TP15 – VOUT Sense

These connects provide and low current path to the output pins of the device for accurate voltage measurements. These sense connections should be used when measuring the voltage drop from VIN to VOUT which is used to calculate the ON resistance.

4.7 TP4/TP13 – ON

These test points are used to monitor the EN pin voltage. These test points can also be used to drive the ON pin independently when JP2/JP4 is removed.

4.8 TP2/TP6/TP7/TP8/TP9/TP11/TP16/TP17 – GND

These are the GND connection points to the EVM.

4.9 List of Connections

The EVM Connections are summarized in [Table 2](#).

Table 2. EVM Connection Points

Connection	Name	Description
J1, J3	VIN	DC input to VIN
J2, J4	VOUT	Load connection for VOU
JP1, JP3	VBIAS Power	Connects VBIAS to VIN
JP2, JP4	ON Control	Connects EN resistors to VIN or GND

Table 2. EVM Connection Points (continued)

Connection	Name	Description
TP1, TP10	VIN Sense	Sense connection to VIN
TP3, TP12	VBIAS	VBIAS connection
TP4, TP13	ON	EN connection
TP5, TP15	VOUT Sense	Sense connection to VOUT
TP2, TPS6, TPS7, TP8, TP9, TP11, TP16, TP17	GND	Connection to board ground

5 Test Setup

This section will describe how to take key parameter measurements on the EVM.

5.1 RON Test Procedure

1. Setup the EVM per [Figure 3](#).
2. Set SOURCE1 level to 5.0 V.
3. Turn on SOURCE1.
4. Record the voltage reading from METER1 as well as the input current reading from SOURCE1.
5. Turn SOURCE1 off.
6. Calculate the Resistance of the switch by dividing the voltage reading from METER1 by the current reading from SOURCE1.

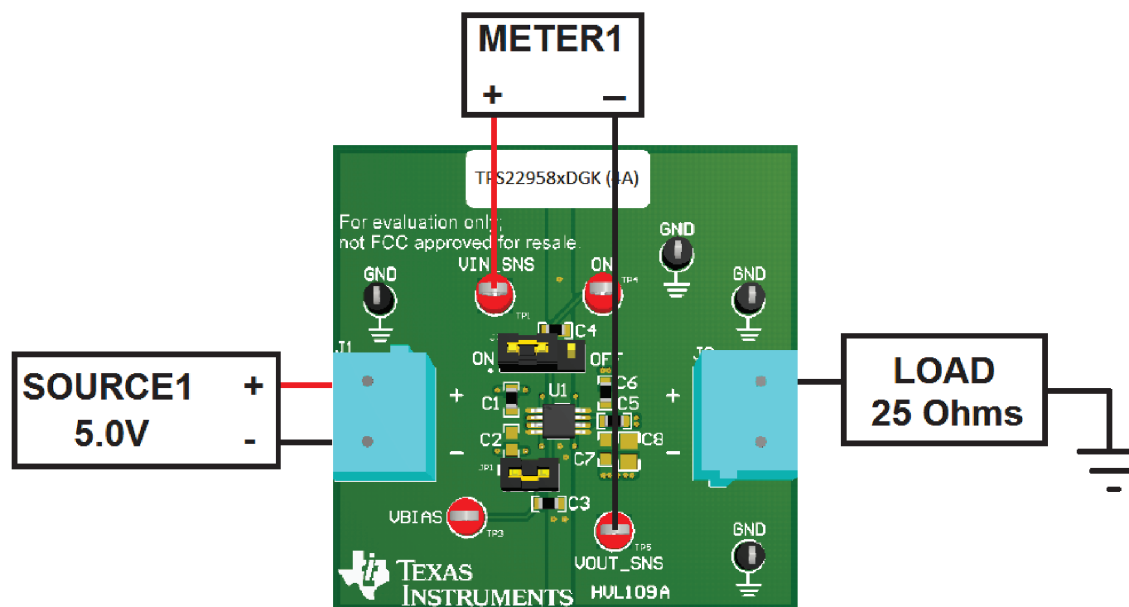


Figure 3. RON Test Setup

5.2 AC Parameter Test Procedure (t_R , t_{ON} , t_F , t_{OFF} , t_D)

1. A detailed description of t_R , t_{ON} , t_F , t_{OFF} , and t_D are listed in the TPS22958/58N Datasheet ([SLVSCX7](#)) under the Switching Characteristics Section.
2. The rise time (t_R) is selected by the CT capacitor value on each switch channel. The EVM is shipped with a default CT value of 1 nF.
3. Set up the EVM per [Figure 4](#).
4. Set SOURCE1 level to 5.0 V.
5. Set Signal Generator output to 0–2 V_{pp}, 10–100 Hz, and 25% duty cycle.
6. Turn SOURCE1 on.
7. Enable the Signal Generator output.
8. Rise time (t_R), turn-on time (t_{ON}), and delay time (t_D) can be observed with a Oscilloscope sync the scope trigger on the rising edge of the on signal..
9. Fall time (t_F) and turn-off time (t_{OFF}) can be observed from the oscilloscope by charging the scope triggering to sync with the falling edge of the ON signal..
10. Turn SOURCE1 off and disable the signal generator output.

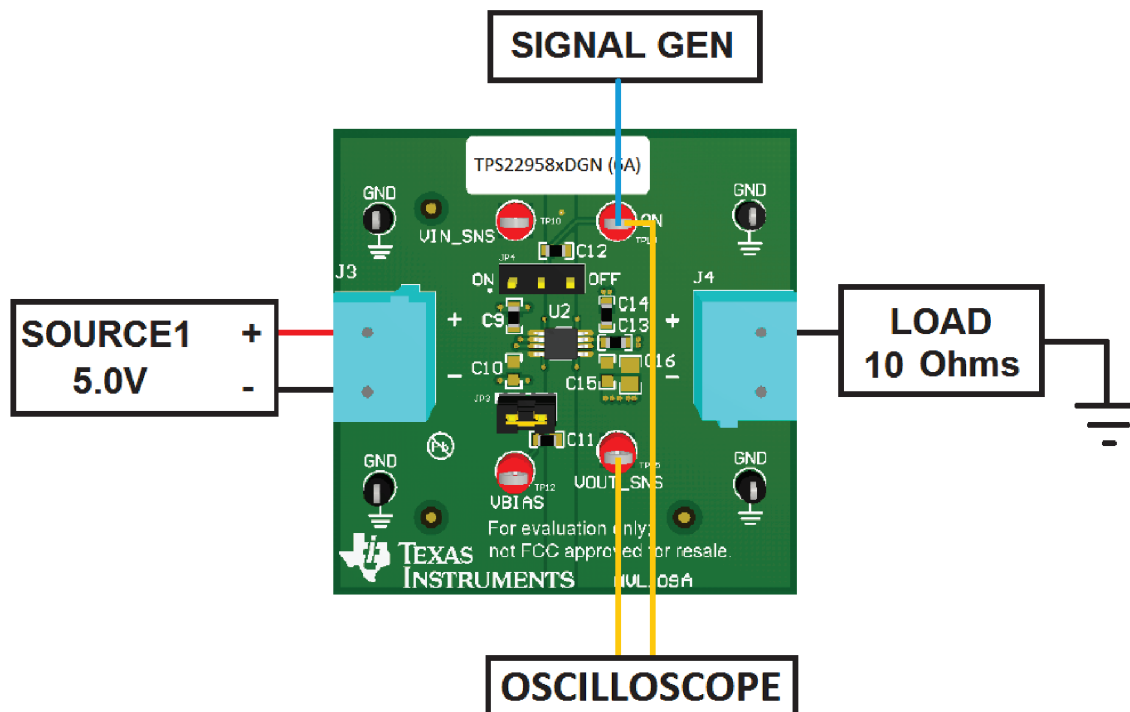


Figure 4. AC Parameter Test Setup

6 Board Assembly and Layout

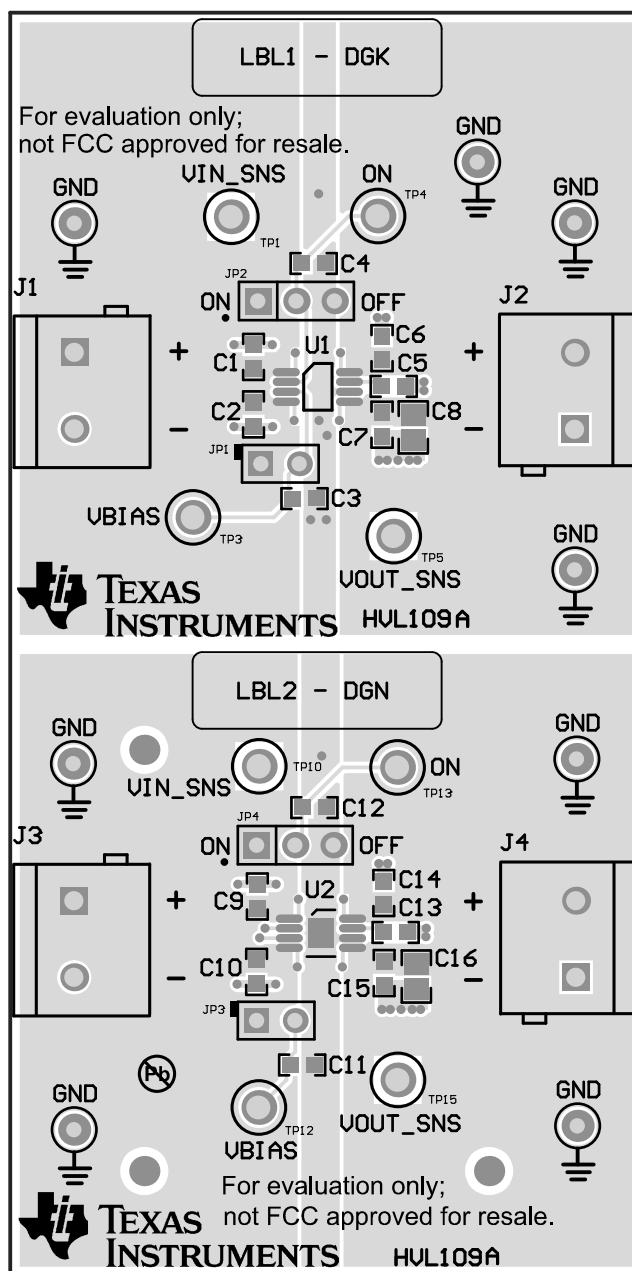


Figure 5. Top Side

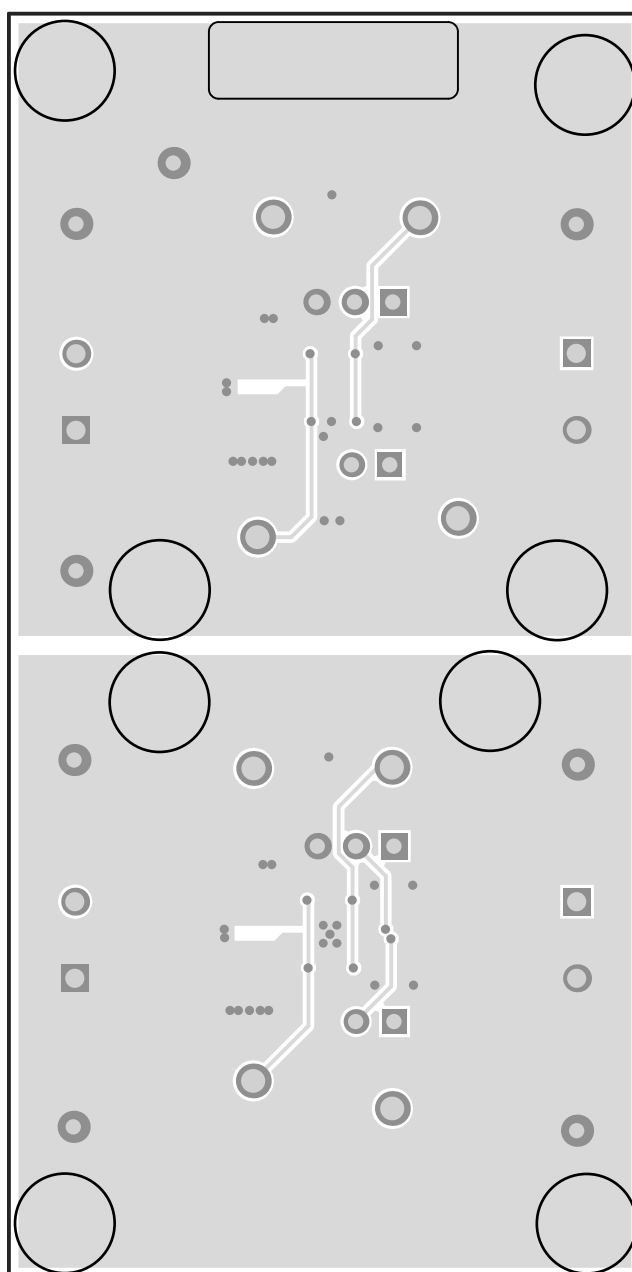


Figure 6. Bottom Side

7 TPS22958EVM Bill of Materials

This section contains details on the bill of materials for the TPS22958EVM. Unpopulated items have a quantity of 0.

Table 3. TPS22958EVM Bill of Materials

Designator	Qty	Description	Package Reference	Part Number	Manufacturer
C1, C9	2	CAP, CERM, 1 μ F, 16 V, $\pm$ 10%, X5R, 0603	0603	C1608X5R1C105K	TDK
C3, C4, C11, C12	4	CAP, CERM, 0.01 μ F, 50 V, $\pm$ 5%, X7R, 0603	0603	C0603C103J5RACTU	Kemet
C5, C13	2	CAP, CERM, 1000 pF, 50 V, $\pm$ 10%, X7R, 0603	0603	C0603C102K5RACTU	Kemet
C6, C14	2	CAP, CERM, 0.1 μ F, 25 V, $\pm$ 10%, X7R, 0603	0603	C1608X7R1E104K	TDK
J1, J2, J3, J4	4	TERMINAL BLOCK 5.08MM VERT 2POS, TH	TERM_BLK, 2pos, 5.08mm	ED120/2DS	On-Shore Technology
JP1, JP3	2	Header, 100mil, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	HMTSW-102-07-G-S-240	Samtec
JP2, JP4	2	Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
SH-JP1, SH-JP2, SH-JP3, SH-JP4	4	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M
TP1, TP3, TP4, TP5, TP10, TP12, TP13, TP15	8	Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
TP2, TP6, TP7, TP8, TP9, TP11, TP16, TP17	8	Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone
U1	1	5.5-V, 4A, 14m Ω On-Resistance Load Switch, DGK0008A	DGK0008A	TPS22958DGKR	Texas Instruments
U2	1	5.5-V, 6A, 14-m Ω On-Resistance Load Switch, DGN0008D	DGN0008D	TPS22958DGNR	Texas Instruments
C2, C10	0	CAP, CERM, 1 μ F, 16 V, $\pm$ 10%, X5R, 0603	0603	C1608X5R1C105K	TDK
C7, C15	0	CAP, CERM, 0.1 μ F, 25 V, $\pm$ 10%, X7R, 0603	0603	C1608X7R1E104K	TDK
C8, C16	0	CAP, CERM, 10 μ F, 16 V, $\pm$ 10%, X6S, 0805	0805	C2012X6S1C106MT	TDK

8 TPS22958NEVM Bill of Materials

This section contains details on the bill of materials for the TPS22958NEVM. Unpopulated items have a quantity of 0.

Table 4. TPS22958NEVM Bill of Materials

Designator	Qty	Description	Package Reference	Part Number	Manufacturer
C1, C9	2	CAP, CERM, 1 μ F, 16 V, $\pm$ 10%, X5R, 0603	0603	C1608X5R1C105K	TDK
C3, C4, C11, C12	4	CAP, CERM, 0.01 μ F, 50 V, $\pm$ 5%, X7R, 0603	0603	C0603C103J5RACTU	Kemet
C5, C13	2	CAP, CERM, 1000 pF, 50 V, $\pm$ 10%, X7R, 0603	0603	C0603C102K5RACTU	Kemet
C6, C14	2	CAP, CERM, 0.1 μ F, 25 V, $\pm$ 10%, X7R, 0603	0603	C1608X7R1E104K	TDK
J1, J2, J3, J4	4	TERMINAL BLOCK 5.08MM VERT 2POS, TH	TERM_BLK, 2pos, 5.08mm	ED120/2DS	On-Shore Technology
JP1, JP3	2	Header, 100mil, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	HMTSW-102-07-G-S-240	Samtec
JP2, JP4	2	Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
SH-JP1, SH-JP2, SH-JP3, SH-JP4	4	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M
TP1, TP3, TP4, TP5, TP10, TP12, TP13, TP15	8	Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
TP2, TP6, TP7, TP8, TP9, TP11, TP16, TP17	8	Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone
U1	1	5.5-V, 4A, 14m Ω On-Resistance Load Switch, DGK0008A	DGK0008A	TPS22958NDGKR	Texas Instruments
U2	1	5.5-V, 6A, 14-m Ω On-Resistance Load Switch, DGN0008D	DGN0008D	TPS22958NDGNR	Texas Instruments
C2, C10	0	CAP, CERM, 1 μ F, 16 V, $\pm$ 10%, X5R, 0603	0603	C1608X5R1C105K	TDK
C7, C15	0	CAP, CERM, 0.1 μ F, 25 V, $\pm$ 10%, X7R, 0603	0603	C1608X7R1E104K	TDK
C8, C16	0	CAP, CERM, 10 μ F, 16 V, $\pm$ 10%, X6S, 0805	0805	C2012X6S1C106MT	TDK

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