*User's Guide*

# *TPS22916 Evaluation Module User's Guide*


## ABSTRACT

The TPS22916ALLEVM evaluation module (EVM) allows the user to connect power to and control the 4-pin YFP package load switch. Parameters such as the on-resistance, rise time and output pull-down resistance can be easily evaluated. Table 1-1 lists a short description of the TPS22916 load switch performance specifications. For additional details on load switch performance, application notes, and the data sheet see *Load Switches*.


**Table 1-1. TPS22916 Rise Time, Output Current Rating, Enable, and Output Discharge Characteristics**

| EVM | Device | Rise Time Typical | VIN (V) | Maximum Continuous Current | Enable (ON Pin) | Quick Output Discharge |
|---|---|---|---|---|---|---|
| PSIL189-001 | TPS22916C | 1400 µs | 5.5 | 2 A | Active High | Yes |
| | TPS22916B | 105 µs | 5.5 | 2 A | Active High | Yes |
| | TPS22916CL | 1400 µs | 5.5 | 2 A | Active Low | Yes |
| | TPS22916CN | 1400 µs | 5.5 | 2 A | Active HIgh | No |
| | TPS22916CNL | 1400 µs | 5.5 | 2 A | Active Low | No |
| | TPS22916BL | 105 µs | 5.5 | 2 A | Active Low | Yes |

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## Trademarks

# 1 Introduction

## 1.1 Description

The TPS22916ALLEVM is a two-sided PCB containing the TPS22916C, TPS22916B, TPS22916CL,TPS22916CN, TPS22916CNL and TPS22916BL load switch devices. The VIN and VOUT connections to the device and the PCB layout routing are capable of handling high continuous currents and provide a low resistance pathway into and out of the device under test. Test point connections allow the EVM user to control the device with user defined test conditions and make accurate $R_{ON}$ measurements.

## 1.2 Features

- VIN input voltage range: 1 V to 5.5 V
- EVM allows access to the VIN, VOUT, GND, and ON pin of the *TPS22916 Load Switch Devices*
- On-board $C_{IN}$ and $C_{OUT}$ capacitors
- 2-A maximum continuous current operation
- This evaluation module comes with the TPS22916C, TPS22916B, TPS22916CL TPS22916CN, TPS22916CNL, and TPS22916BL

# 2 Electrical Performance

See the TPS22916 data sheet, *TPS22916xx 1-V – 5.5-V, 2-A, 60-mΩ Ultra-Low Leakage Load Switch*, for detailed electrical characteristics.

# 3 Schematic

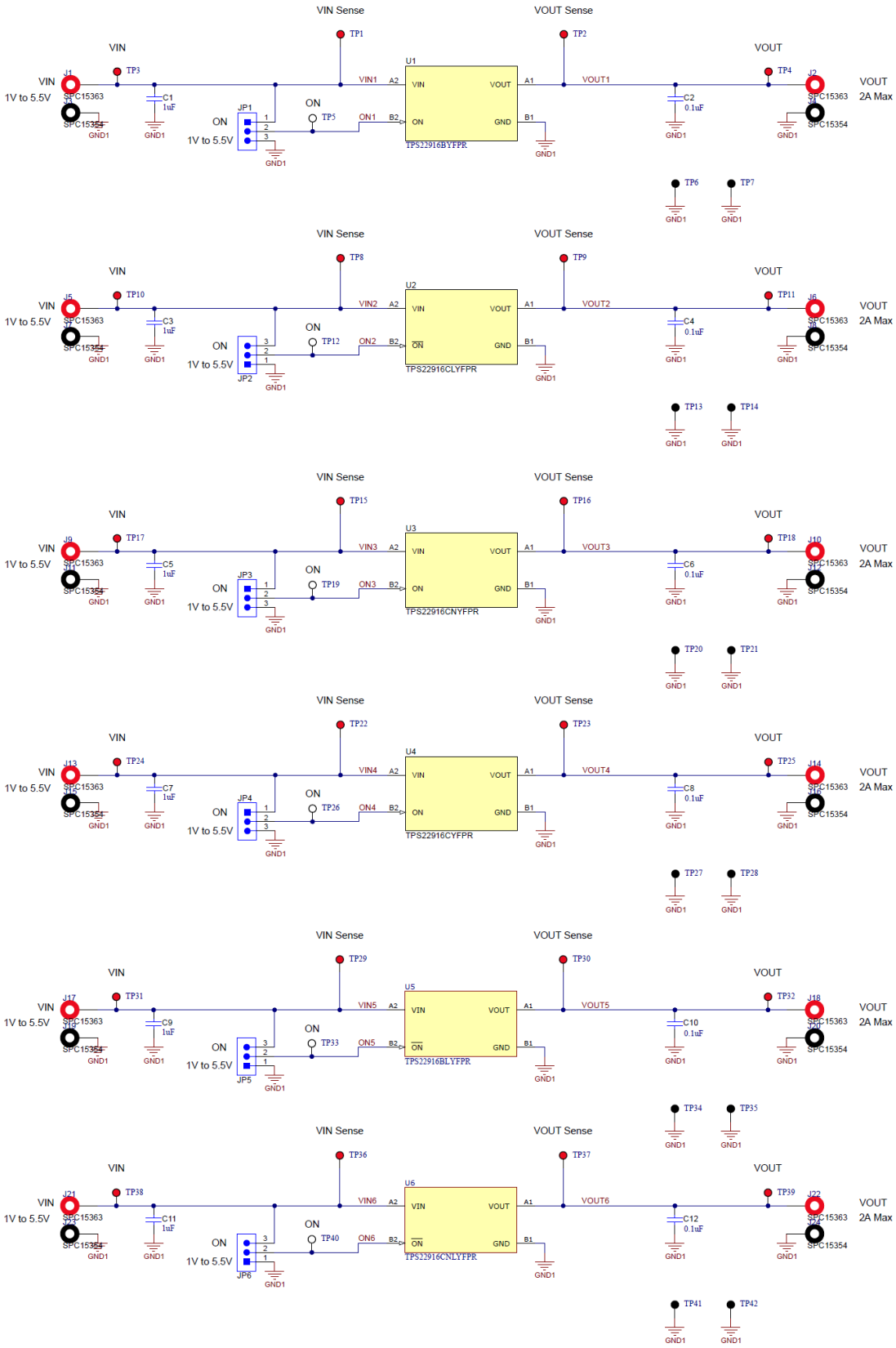


**Figure 3-1. TPS22916ALLEVM Schematic**

# 4 Layout

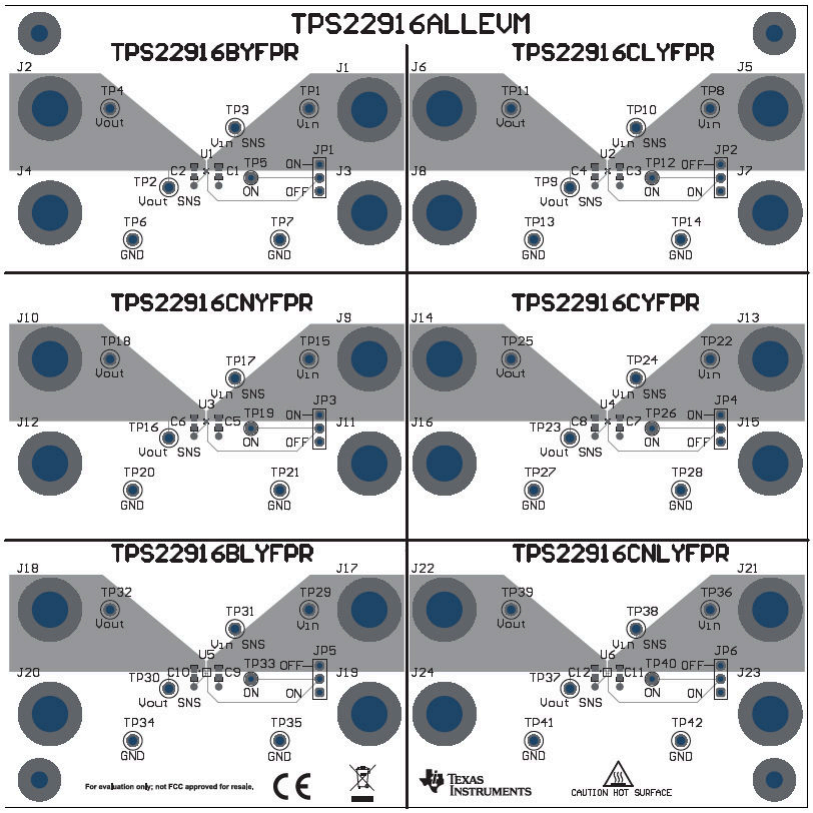


**Figure 4-1. TPS22916ALLEVM Top Layout**

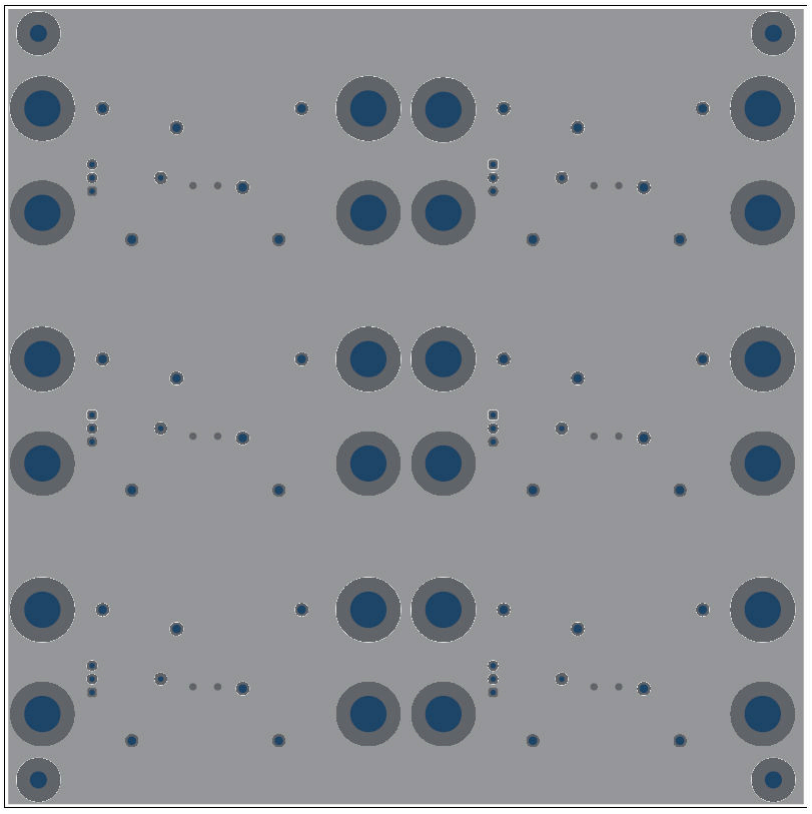

**Figure 4-2. TPS22916ALLEVM Bottom Layout**

## 4.1 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, setup, and use the EVM.

### 4.1.1 J1/J3/J5/J9/J13/J17/J21 – Input Connection

The input connection is the connection for the leads from the input source. Connect the positive lead to the J1/J3/J5/J9/J13/J17/J21 "+" terminal and the negative lead to the "–" terminal (GND).

### 4.1.2 J2/J6/J10/J14/J18/J22 – Output Connection

The output connection is the connection for the output of the EVM. Connect the positive lead to the J2/J6/J10/J14/J18/J22 "+" terminal and the negative lead to the "–" terminal (GND).

### 4.1.3 JP1/JP2/JP3/JP4/JP5/JP6 – ON

The ON is the enable input for the device. A shorting jumper must be installed on JP1/JP2/JP3/JP4/JP5/JP6 in either the ON or OFF position. The TPS22916C/B/CN is active high, and the TPS22916CL/CNL/BL is active low. ON must not be left floating. An external enable source can be applied to the EVM by removing the shunt and connecting a signal to TP5/TP12/TP19/TP26/TP33/TP40. Refer to the data sheet for proper ON and OFF voltage level settings. A switching signal can also be used and connected at this point.

### 4.1.4 TP3/TP10/TP17/TP24/TP31/TP38 – VIN Sense, TP2/TP9/TP16/TP23/TP30/TP37 – VOUT Sense

These two connections are used when very accurate measurements of the input or output are required. RON measurements must be made using these sense connections when measuring the voltage drop from VIN to VOUT to calculate the resistance.

### 4.1.5 TP6/TP7/TP13/TP14/TP20/TP21/TP27/TP28/TP34/TP35/TP41/TP42 – GND

These are connections to GND.

# 5 Operation

Connect the positive input of the VIN power supply to VIN at the positive terminal of J1/J3/J5/J7/JP9/JP13/JP17/JP21. Connect the negative lead of the power supply to GND at the negative terminal of J1/J3/J5/J7/JP9/JP13/JP17/JP21. The input voltage range of the TPS22916ALLEVM is 1 V to 5.5 V.

External output loads can be applied to the switch by using J2/J6/J10/J14/J18/J22. The TPS22916ALLEVM is rated for a maximum continuous current of 2 A. Configure JP1/JP2/JP3/JP4/JP5/JP6 as required. A shunt must be installed for proper operation. When the ON pin is asserted to the ON state of the jumper, the output of the TPS22916 is enabled.

# 6 Test Configurations

## 6.1 On-Resistance (RON) Test Setup

Figure 6-1 shows a typical setup for measuring on-resistance. The voltage drop across the switch is measured using the sense connections then divided by the current into the load yielding the $R_{ON}$ resistance.

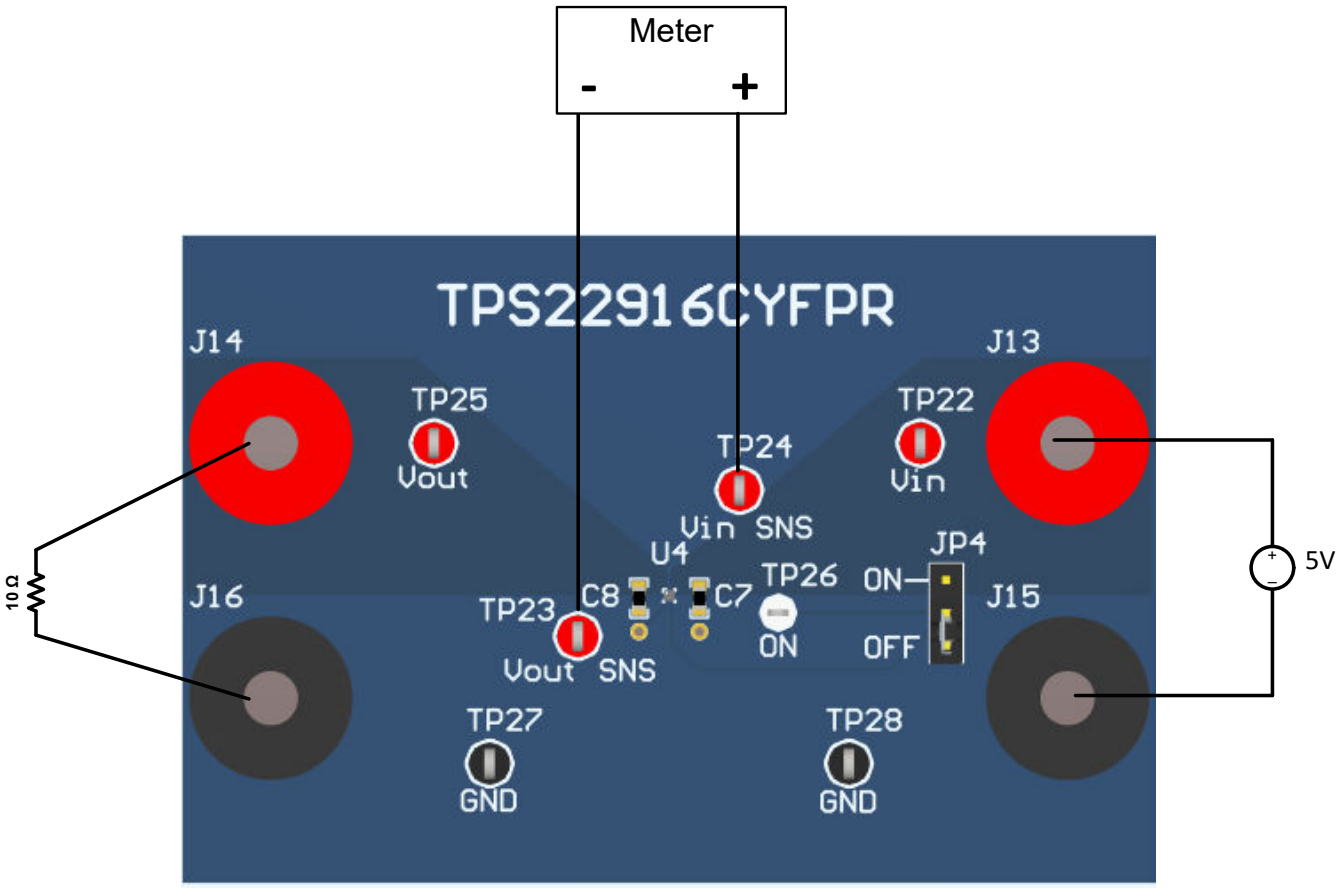


**Figure 6-1. $R_{ON}$ Setup**

## 6.2 Slew Rate Test Setup

Figure 6-2 shows a test setup for measuring the slew rate of the load switch. Apply a square wave to the ON pin of the switch using a function generator and apply a voltage to the VIN terminal using a power supply. Observe the waveform at VOUT with a scope to measure the slew rate and rise time of the switch with a given input voltage.

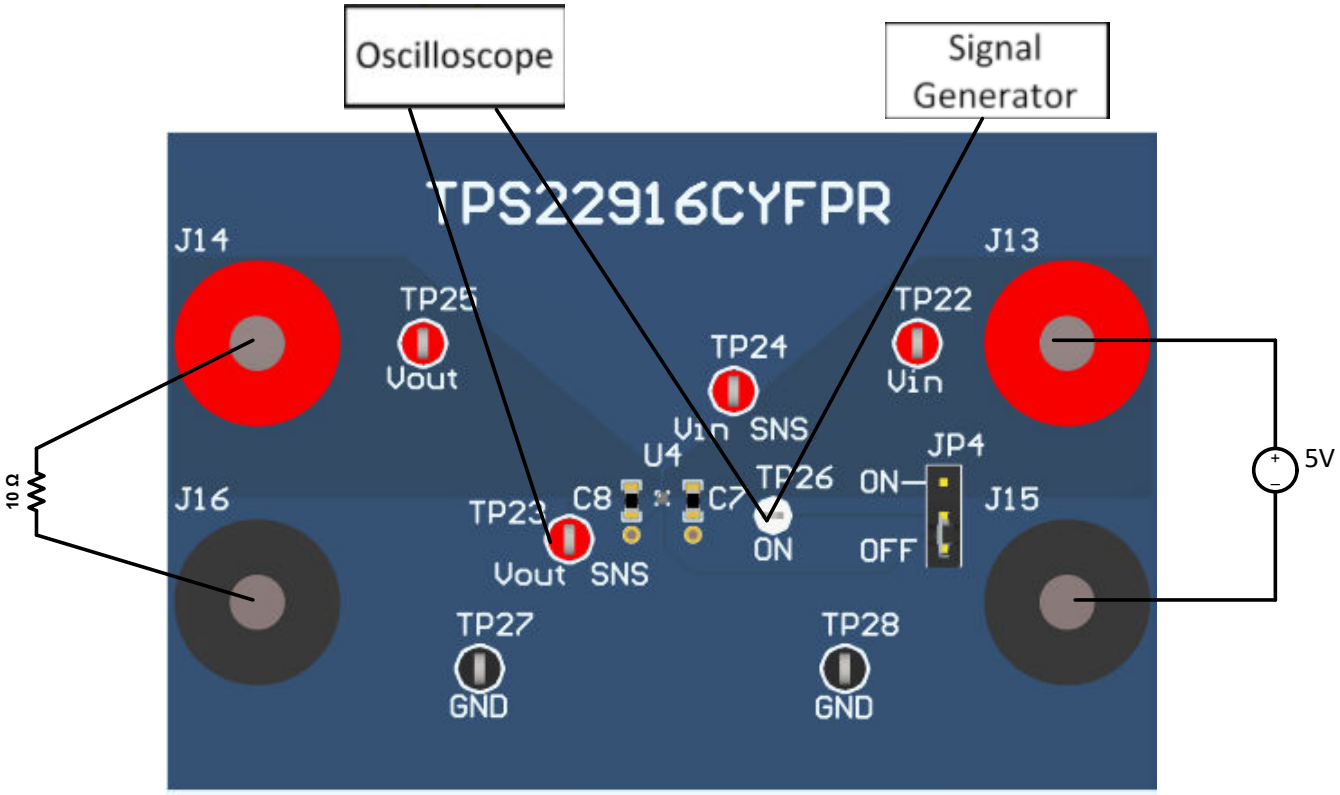


**Figure 6-2. Slew Rate Setup**

# 7 Bill of Materials (BOM)

**Table 7-1. Bill of Materials**

| Designator | Quantity | Value | Description | Package Reference | Part Number | Manufacturer |
|---|---|---|---|---|---|---|
| PCB! | 1 | | Printed Circuit Board | | PSIL189 | Any |
| C1, C3, C5, C7, C9, C11 | 6 | 1 uF | CAP, CERM, 1 uF, 25 V, +/- 10%, X7R, 0603 | 603 | 06033C105KAT2A | AVX |
| C2, C4, C6, C8, C10, C12 | 6 | 0.1 uF | CAP, CERM, 0.1 uF, 16 V, +/- 5%, X7R, 0603 | 603 | 0603YC104JAT2A | AVX |
| J1, J2, J5, J6, J9, J10, J13, J14, J17, J18, J21, J22 | 12 | | BANANA JACK, SOLDER LUG, RED, TH | Red Insulated Banana Jack | SPC15363 | Tenma |
| J3, J4, J7, J8, J11, J12, J15, J16, J19, J20, J23, J24 | 12 | | BANANA JACK, SOLDER LUG, BLACK, TH | Black Insulated Banana Jack | SPC15354 | Tenma |
| JP1, JP2, JP3, JP4, JP5, JP6 | 6 | | Header, 100mil, 3x1, Gold, TH | 3x1 Header | TSW-103-07-G-S | Samtec |
| SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6 | 6 | | Shunt, 2.54mm, Gold, Black | Shunt, 2.54mm, Black | 60900213421 | Wurth Elektronik |
| TP1, TP2, TP3, TP4, TP8, TP9, TP10, TP11, TP15, TP16, TP17, TP18, TP22, TP23, TP24, TP25, TP29, TP30, TP31, TP32, TP36, TP37, TP38, TP39 | 24 | | Test Point, Multipurpose, Red, TH | Red Multipurpose Testpoint | 5010 | Keystone |
| TP5, TP12, TP19, TP26, TP33, TP40 | 6 | | Test Point, Miniature, White, TH | White Miniature Testpoint | 5002 | Keystone |
| TP6, TP7, TP13, TP14, TP20, TP21, TP27, TP28, TP34, TP35, TP41, TP42 | 12 | | Test Point, Multipurpose, Black, TH | Black Multipurpose Testpoint | 5011 | Keystone |
| U1 | 1 | | 5.5V, 2A, 60mohm Low Leakage Load Switch With RCP, YFP0004ABAB (DSBGA-4) | YFP0004ABAB | TPS22916BYFPR | Texas Instruments |
| U2 | 1 | | 5.5V, 2A, 60mohm Low Leakage Load Switch With RCP, YFP0004ABAB (DSBGA-4) | YFP0004ABAB | TPS22916CLYFPR | Texas Instruments |
| U3 | 1 | | 5.5V, 2A, 60mohm Low Leakage Load Switch With RCP, YFP0004ABAB (DSBGA-4) | YFP0004ABAB | TPS22916CNYFPR | Texas Instruments |
| U4 | 1 | | 5.5V, 2A, 60mohm Low Leakage Load Switch With RCP, YFP0004ABAB (DSBGA-4) | YFP0004ABAB | TPS22916CYFPR | Texas Instruments |

**Table 7-1. Bill of Materials (continued)**

| Designator | Quantity | Value | Description | Package Reference | Part Number | Manufacturer |
|---|---|---|---|---|---|---|
| U5 | 1 | | 1-V - 5.5-V, 2-A, 60-mΩ Ultra-Low Leakage Load Switch | DSBGA4 | TPS22916BLYFPR | Texas Instruments |
| U6 | 1 | | 1-V - 5.5-V, 2-A, 60-mΩ Ultra-Low Leakage Load Switch | BGA4 | TPS22916CNLYFPR | Texas Instruments |

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