

TPS22965WDSGQ1EVM 5.7-V, 4-A, 16-mΩ On-Resistance Load Switch

The TPS22965WDSGQ1EVM evaluation module (EVM) allows the user to connect power to and control the TPS22965W-Q1 and TPS22965NW-Q1 5.7-V, 4-A, 16-mΩ on-resistance load switches. [Table 1](#) summarizes the available EVMs and package options; refer to the device datasheet [SLVSCI3](#) for more details.

Table 1. Device and Package Configurations

EVM Orderable	Device	Device Package	Maximum Voltage	Maximum Continuous Current	Quick Output Discharge
TPS22965WDSGQ1EVM	U1	TPS22965QWDSG-Q1	5.7 V	4 A	Yes
	U2	TPS22965NQWDSG-Q1	5.7 V	4 A	No

Contents

1	Introduction	1
	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/JP7 – VBIAS Power	4
	4.4 JP2/JP8 – EN Control	4
	4.5 TP3/TP13 – VIN Sense	4
	4.6 TP5/TP15 – VOUT Sense	4
	4.7 TP2/TP12 – EN	4
	4.8 TP7/TP8/TP9/TP10/TP17/TP18/TP19/TP20 – GND	4
	4.9 List of Connections	4
5	Test Setup	5
	5.1 R _{ON} Test Procedure	5
	5.2 AC Parameter Test Procedure (t _R , t _{ON} , t _F , t _{OFF} , t _D)	5
6	Board Assembly and Layout	7
7	TPS22965WDSGQ1EVM Bill of Materials	8

1 Introduction

The TPS22965WDSGQ1EVM evaluation module (EVM) allows the user to connect power to and control the both versions of the TPS22965W-Q1 5.7-V, 4-A, 16-mΩ on-resistance load switch. This allows for easy evaluation of on-resistance and adjustable slew rate.

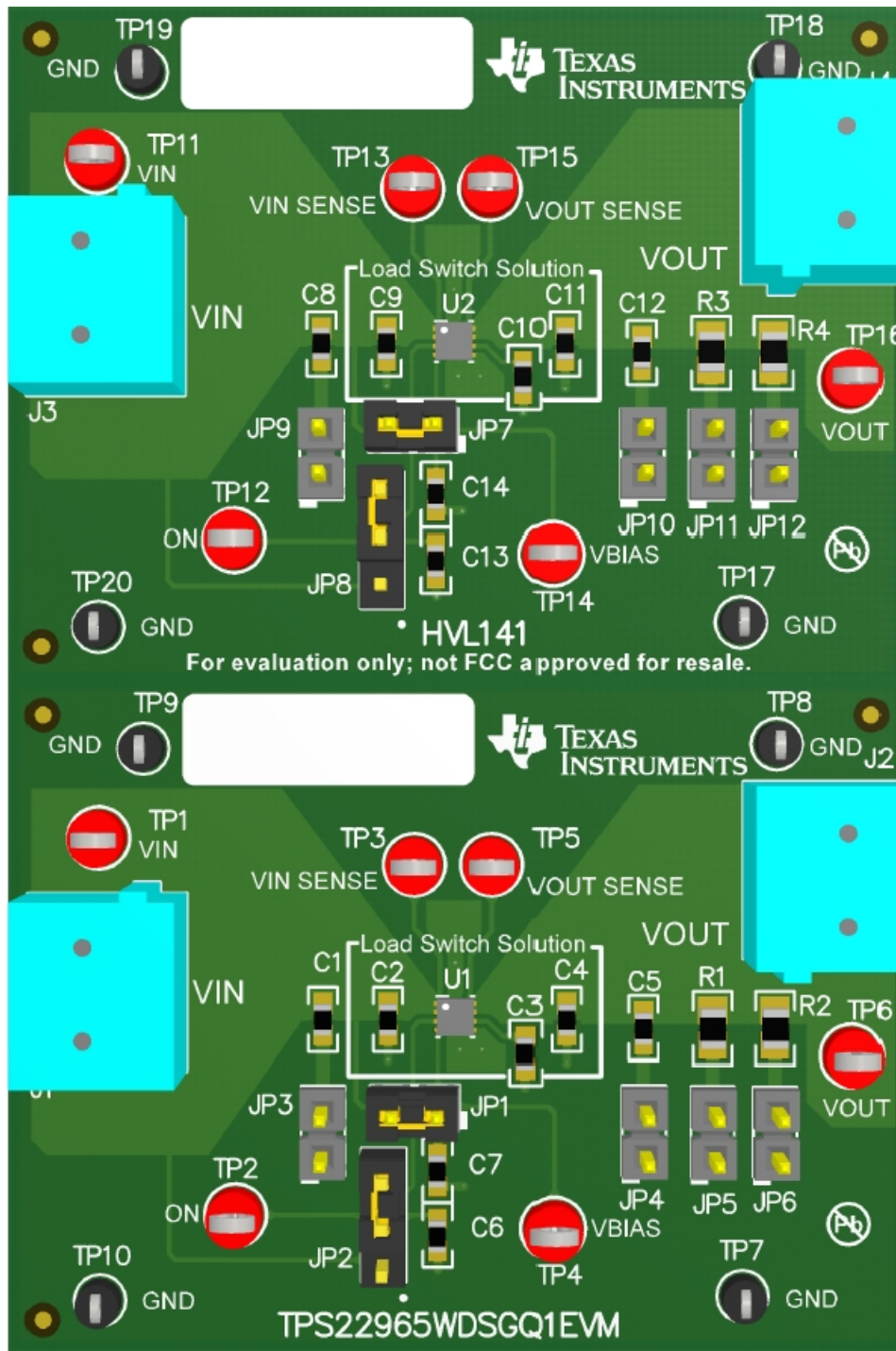


Figure 1. 3D Rendering of EVM

1.1 Typical Applications

- Automotive Electronics
- Infotainment
- ADAS (Advanced Driver Assistance Systems)

1.2 Features

- External capacitors for configurable rise time
- Connection points to VIN, VOUT, VBIAS, ON pins as well as SENSE connections for accurate measurement of VIN and VOUT voltages
- High current connection terminals available for 4 A maximum continuous switch current operation
- VIN input voltage range: 0.8 V to 5.7 V
- VBIAS voltage range: 2.5 V to 5.7 V

2 Electrical Performance

Refer to the datasheet [SLVSCI3](#) for detailed electrical characteristics of the TPS22965W-Q1.

3 Schematic

The schematic for the TPS22965WDSGQ1EVM is shown in [Figure 2](#).

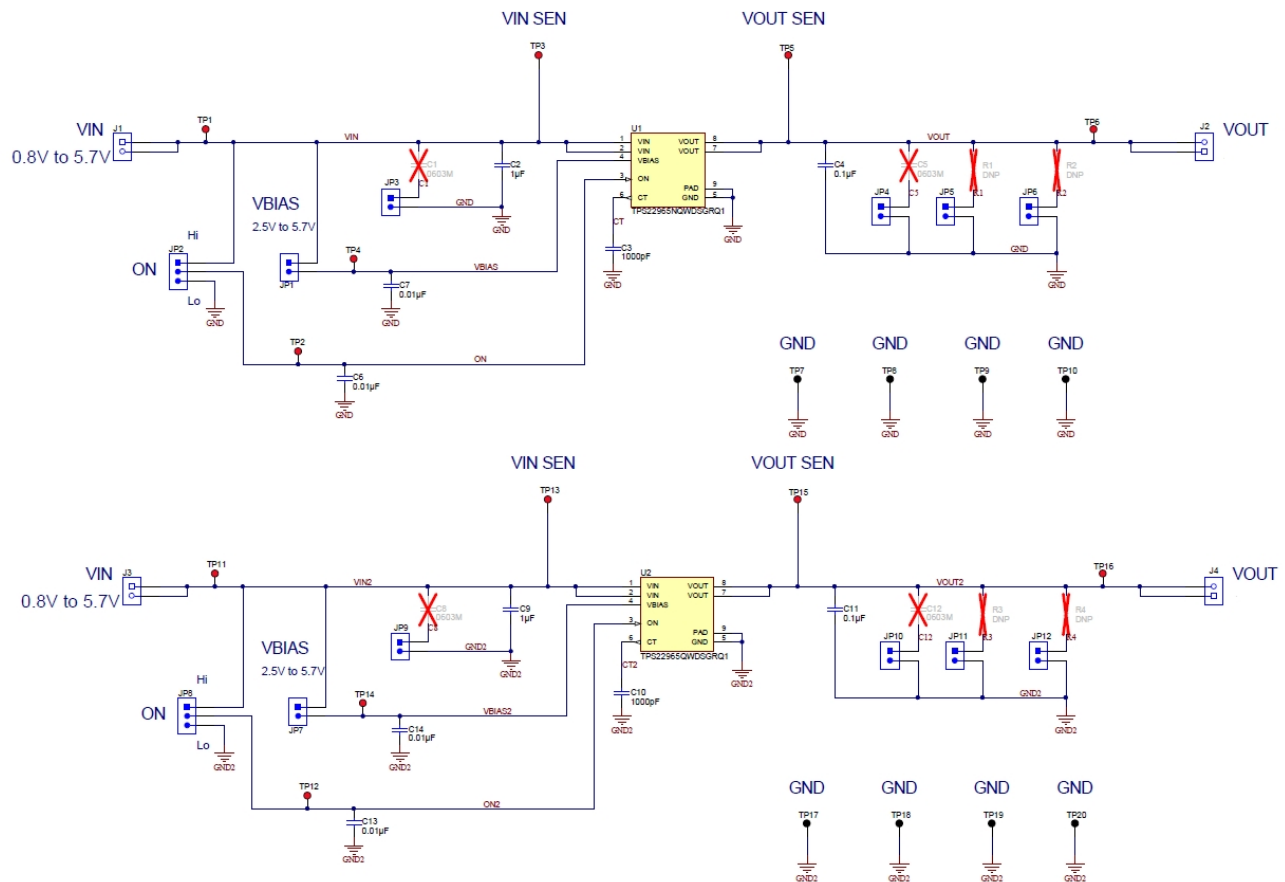


Figure 2. Schematic

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/JP7 – VBIAS Power

These jumpers connect VBIAS to the respective VIN voltage source. VBIAS must be maintained between 2.5 V–5.7 V for proper operation on the TPS22965W-Q1 devices. If testing conditions involve taking the VIN voltage below 2.5 V, remove the shunt across JP1/JP7 and connect VBIAS voltage at TP4/TP14.

4.4 JP2/JP8 – EN Control

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

4.5 TP3/TP13 – 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 TP2/TP12 – EN

These test points can be used to drive the EN pin independently when JP2/JP8 is removed.

4.8 TP7/TP8/TP9/TP10/TP17/TP18/TP19/TP20 – 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, JP7	VBIAS Power	Connects VBIAS to VIN
JP2, JP8	EN Control	Connects EN resistors to VIN or GND
TP3, TP13	VIN Sense	Sense connection to VIN
TP4, TP14	VBIAS	VBIAS connection

Table 2. EVM Connection Points (continued)

Connection	Name	Description
TP2, TP12	EN	EN connection
TP5, TP15	VOUT Sense	Sense connection to VOUT
TP7, TP8, TP9, TP10, TP17, TP18, TP19, TP20	GND	Connection to board ground

5 Test Setup

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

5.1 R_{ON} 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.

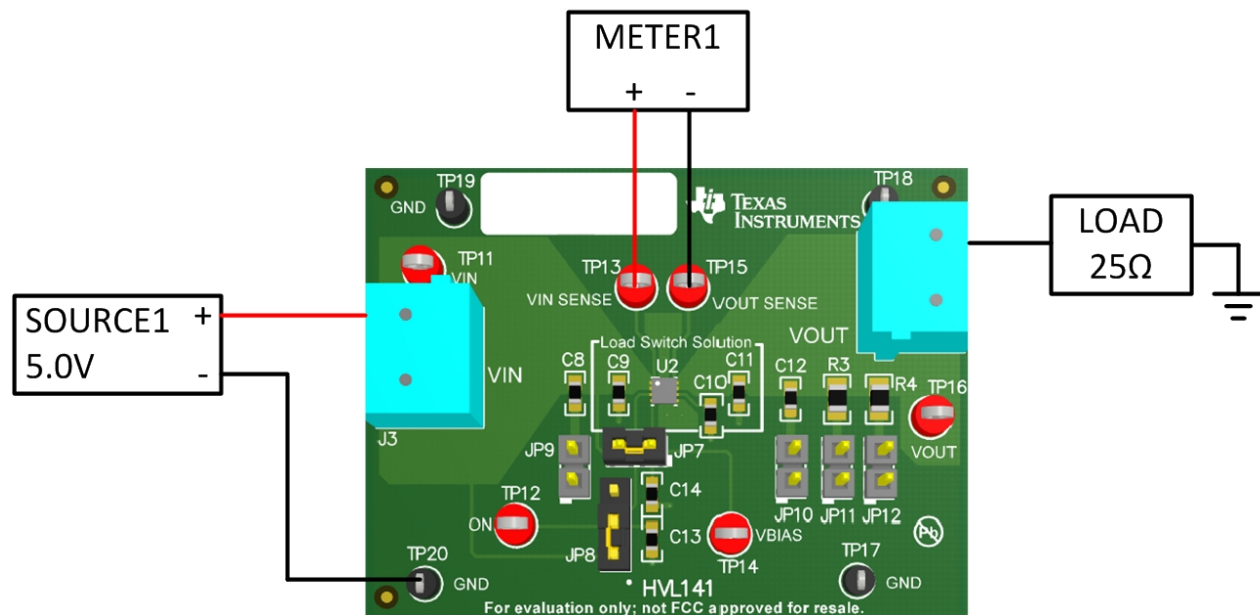


Figure 3. R_{ON} Test Setup

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 TPS22965W-Q1 Datasheet 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-of 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.

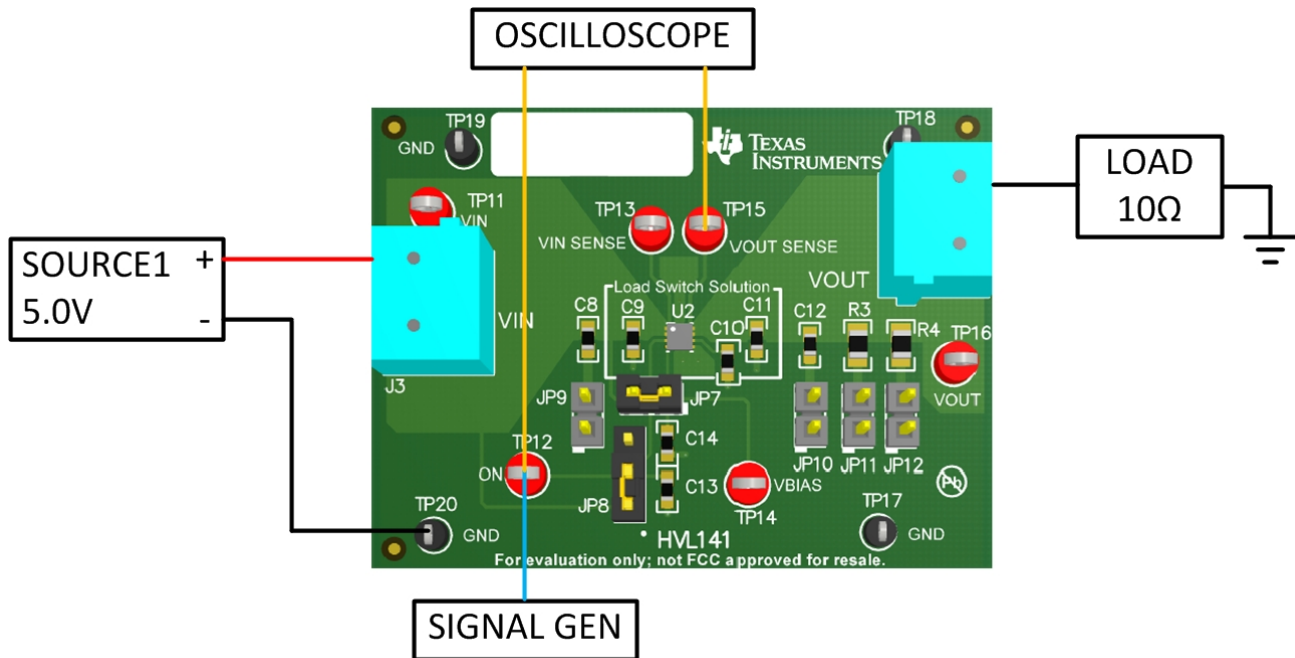


Figure 4. AC Parameter Test Setup

6 Board Assembly and Layout

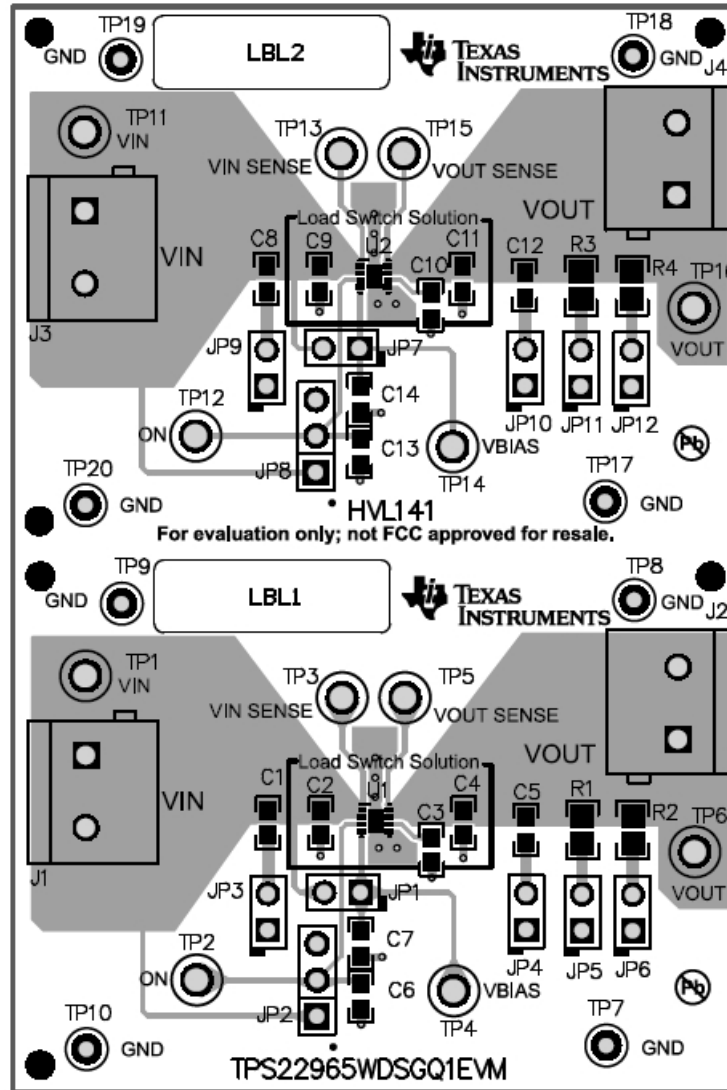


Figure 5. Top Side

7 TPS22965WDSGQ1EVM Bill of Materials

This section contains details on the bill of materials for the TPS22965WDSGQ1EVM. Unpopulated items have a quantity of 0.

Table 3. TPS22965WDSGQ1EVM Bill of Materials

Designator	Qty	Description	Package Reference	Part Number	Manufacturer
C2, C9	2	CAP, CERM, 1 μ F, 16 V, \pm 10%, X5R, 0603	0603	C1608X5R1C105K	TDK
C6, C7, C13, C14	4	CAP, CERM, 0.01 μ F, 50 V, \pm 5%, X7R, 0603	0603	C0603C103J5RACTU	Kemet
C3, C10	2	CAP, CERM, 1000 pF, 50 V, \pm 10%, X7R, 0603	0603	C0603C102K5RACTU	Kemet
C4, C11	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, JP4, JP5, JP6, JP7, JP9, JP10, JP11, JP12	10	Header, 100mil, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	HMTSW-102-07-G-S-240	Samtec
JP2, JP12	2	Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
R1, R2, R3, R4	0	RES, 1.0 k, 5%, 0.125 W, 0805	0805	CRCW08051K00JNEA	Vishay-Dale
SH-JP1, SH-JP2, SH-JP7, SH-JP8	4	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M
TP1, TP2, TP3, TP4, TP5, TP6, TP11, TP12, TP13, TP14, TP15, TP16	12	Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
TP7, TP8, TP9, TP10, TP17, TP18, TP19, TP20	8	Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone
U2	1	'5.7V, 4A, 16m Ω On-Resistance Load Switch	DSG0008A	TPS22965QWDSG-Q1	Texas Instruments
U1	1	'5.7V, 4A, 16m Ω On-Resistance Load Switch	DSG0008A	TPS22965NQWDSG-Q1	Texas Instruments
C1, C5, C8, C12	0	CAP, CERM, 1 μ F, 16 V, \pm 10%, X5R, 0603	0603	C1608X5R1C105K	Vishay-Dale

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com