TPS2HCS05-Q1 5mΩ, Automotive Dual-Channel, SPI Controlled High-Side Switch With Integrated I2T Wire Protection and Low Power Mode

ADVANCE INFORMATION

1 Features

- AEC-Q100 qualified for automotive applications
  - Temperature grade 1: –40°C to 125°C
  - Withstands 36V load dump
- Dual-channel SPI controlled smart high-side switch with integrated nFETs.
- Integrated wire-harness protection without MCU involvement and a SPI programmable fuse curve
  - Protection against persistent overload condition
- User programmable EEPROM
- Improve system level reliability through SPI programmable adjustable overcurrent protection
- SPI configurable capacitive charging mode to drive a wide range of capacitive input ECUs load current needs.
- Low quiescent current, low power ON-state to supply always-ON loads with automatic wake on load current increase with wake signal to MCU
- Robust integrated output protection:
  - Integrated thermal protection
  - Protection against short-to-ground
  - Protection against reverse battery events including automatic switch on of FET with reverse supply voltage
  - Automatic shut off on loss of battery and ground
  - Integrated output clamp to demagnetize inductive loads
- Digital sense output via SPI can be configured to measure:
  - Load current accurately with integrated ADC
  - Output or supply voltage, FET temperature
- Provides full fault diagnostics through SPI interface and indication through FLT pin
  - Detection of open load and short-to-battery

2 Applications

- Automotive zone ECU
- Power distribution modules
- Body control modules

3 Description

The TPS2HCS05-Q1 device is a dual channel, smart high-side switch controlled through a serial peripheral interface (SPI) and is intended for power distribution and actuator drive applications. The device integrates robust protection to ensure output wire and load protection against short circuit or overload conditions. The device features overcurrent protection configurable via SPI with sufficient flexibility to support loads that require large inrush currents and provide improved protection. The device also integrates a programmable fuse profile (current versus time) that turns off the switch under persistent overload condition. The two features together allow optimization of the wire harness for any load profile with full protection.

The device supports a SPI-configurable capacitive charging mode for ECU loads in power distribution switch applications. The device also includes two low power mode (LPM) states, an auto entry mode or a manual entry mode, that enables the device to provide current to the load ECU while only consuming about 10–20µA of current.

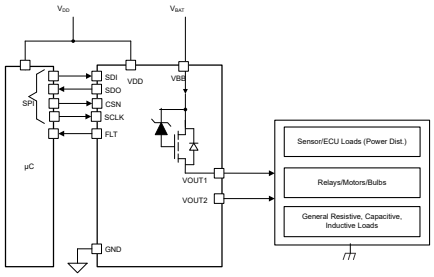
The TPS2HCS05-Q1 device also provides a high accuracy digital current sense over SPI that allows for improved load diagnostics. By reporting load current and the channel output voltage and output FET temperature to a system MCU, the device enables diagnosis of switch and load failures.

The TPS2HCS05-Q1 is available in a HTSSOP package which allows for reduced PCB footprint.

Package Information

PART NUMBER	PACKAGE(1)	PACKAGE SIZE(2)
TPS2HCS05-Q1	PWC (HTSSOP, 18)	7.8mm x 6.4mm

(1) For all available packages, see Section 6.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.



Simplified Schematic

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4 Device and Documentation Support

4.1 Third-Party Products Disclaimer

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4.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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4.4 Trademarks

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4.5 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

4.6 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

5 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
December 2025	*	Product Preview Release

6 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGE OPTION ADDENDUM

PACKAGING INFORMATION

Orderable part number	Status(1)	Material type(2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/Ball material(4)	MSL rating/Peak reflow(5)	Op temp (°C)	Part marking(6)
PTPS2HCS05AQPWPRQ1	Active	Preproduction	HTSSOP (PWP) | 18	3000 | LARGE T&R	-	Call TI	Call TI	-40 to 125	

(1) **Status:** For more details on status, see our product life cycle.
(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.
(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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