

TPS62852X-Q1 Buck Converter Evaluation Module



Description

The TPS628523HAQEVM-070 is designed to help users easily evaluate and test the operation and functionality of the TPS628521-Q1, TPS628522-Q1 and TPS628523-Q1 buck converters. This EVM converts a 2.7V to 6V input voltage to a regulated 1.8V output voltage that delivers up to 3A maximum. The IC fitted on the EVM is TPS628523HAWDLRQ1, which operates in a forced PWM mode (FPWM) across the whole load current range. The TPS628523HAQEVM-070 is available with IC in a 2.0mm × 1.5mm QFN package.

Get Started

1. Order the [TPS628523HAQEVM070](#) on ti.com.
2. Download the data sheet ([SLUSFK0](#)).

3. Use the data sheet to adjust the BOM with the device for desired output voltage.

Features

- Input voltage range 2.7V to 6V
- Adjustable output voltage range 0.6V to 5.5V
- 100% mode operation
- Quiescent current < 17 μ A
- Feedback accuracy 1% (-40°C to 150°C)
- Switching frequency 2.25MHz (PWM)
- Power save mode or PWM option available (with different OPN)

Applications

- [Front camera](#)
- [Surround view system ECU](#)
- [Automotive cluster display](#)



TPS628523HAQEVM-070

1 Evaluation Module Overview

1.1 Introduction

The TPS62852X-Q1 automotive synchronous step-down buck DC-DC converter is optimized for high efficiency and compact solution-size. The TPS62852X-Q1 delivers an output current up to 3A and has multiple OPNs based on mode of operation and different output current. Check the data sheet for the correct orderable part number (OPN). This user's guide describes the characteristics, operation, and use of TI's TPS62852X-Q1 evaluation module (EVM). The document includes setup instructions for the following:

- Hardware
- A printed-circuit board (PCB) layout
- Schematic diagram
- Bill of materials (BOM)

Throughout this document, TPS62852XQEVM-070 is used as an abbreviation representing the all OPNs of TPS628521-Q1, TPS628522-Q1 and TPS628523-Q1.

1.2 Kit Contents

Table 1-1. TPS628523HAQEVM-070 Kit Contents

| Item | Description | Quantity |
|---------------------|-------------|----------|
| TPS628523HAQEVM-070 | PCB | 1 |

1.3 Specification

Table 1-2. Performance Specification Summary

| Specification | Test Conditions | MIN | TYP | MAX | Unit |
|----------------|---------------------|-----|-----|-----|------|
| Input voltage | | 2.7 | | 6 | V |
| Output voltage | | | 1.8 | | V |
| Output current | TPS628523HAQEVM-070 | 0 | | 3 | A |

1.4 Device Information

The PCB for this EVM is designed to accommodate the adjustable voltage version of this IC. On the EVM, desired output voltage can be set by adjusting the resistor divider branch with the feedback pin. Additional input and output capacitors can also be added. The TPS628523HA-Q1 operates in FPWM. The switching frequency of the device in FPWM mode is 2.25MHz.

2 Hardware

2.1 Setup

This section describes how to properly use the TPS628523HAQEVM-070.

2.1.1 Connector Descriptions

| | |
|--------------------------------|---|
| J1, Pin 1 and 2 – VIN | Positive input voltage connection from the input supply for the EVM |
| J1, Pin 3 and 4 – S+/S– | Input voltage sense connections, measure the input voltage at this point |
| J1, Pin 5 and 6 – GND | Input return connection from the input supply for the EVM |
| J2, Pin 1 and 2 – VOUT | Positive output voltage connection |
| J2, Pin 3 and 4 – S+/S– | Output voltage sense connections, measure the output voltage at this point |
| J2, Pin 5 and 6 – GND | Output return connection |
| J3 – PG/GND | The PG output appears on pin 1 of this header with a convenient ground on pin 2. |
| JP1 – EN | EN pin jumper. Place the supplied jumper across ON and EN to turn on the IC. Place the jumper across OFF and EN to turn off the IC. |
| J4 – GND | Ground connections |

2.1.2 Hardware Setup

To operate the EVM, set jumper JP1 to the desired positions per [Section 2.1.1](#). Connect the input supply to J1 and connect the load to J2.

2.2 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate some modifications by the user. Additional input and output capacitors or a feedforward capacitor according to the output voltage can be added. Also, the output voltage can be changed with the help of resistor divider.

2.2.1 Input and Output Capacitors

C4, C5, C5 is provided for an additional input capacitor. This capacitor is not required for proper operation but can be used to reduce the input voltage ripple.

C11 and C12 are provided for additional output capacitors. These capacitors are not required for proper operation but can be used to reduce the output voltage ripple and to improve the load transient response. The output capacitance must remain within the recommended range in the device data sheet for proper operation.

2.2.2 Feedforward Capacitor

C13 is the feedforward capacitor. This EVM has a feedforward capacitor of 10pF. TI recommends to check the requirements of feedforward capacitor in data sheet of the device according to adjusted output voltage.

3 Hardware Design Files

3.1 Schematic

Figure 3-1 illustrates the EVM schematic of TPS628523HAQEVM-070, which is also valid for the other variants. Please check the data sheet for inductor and output capacitor values used for OPN.

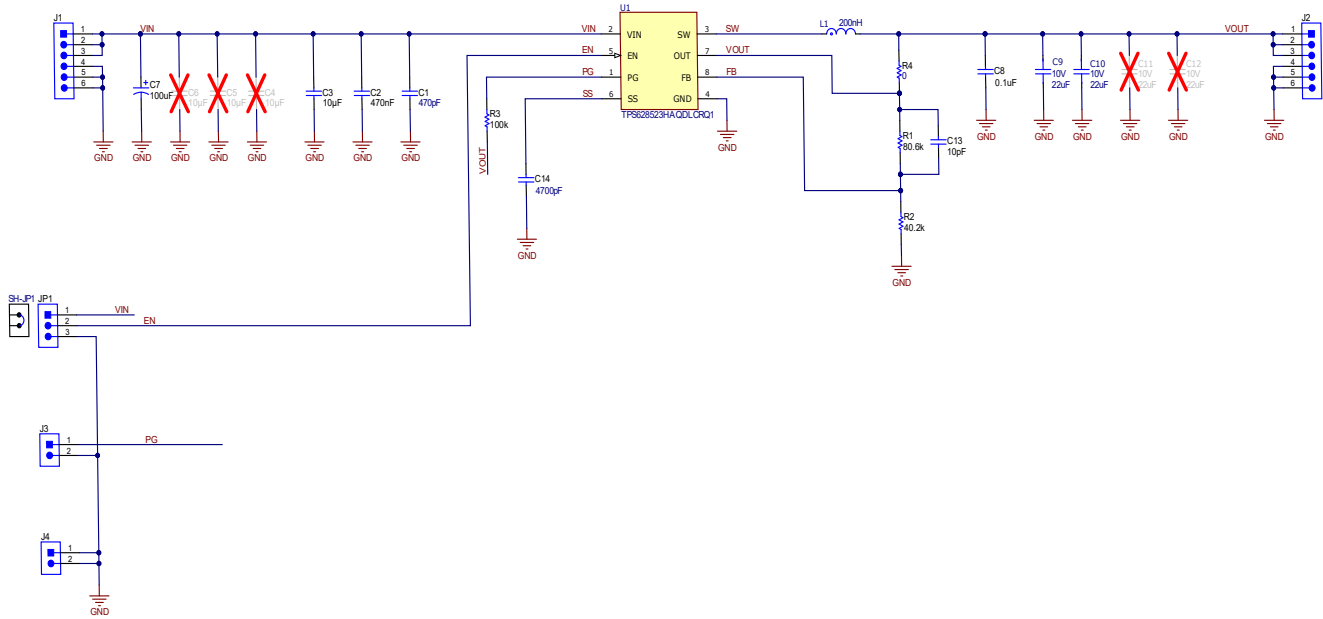


Figure 3-1. TPS628523HAQEVM-070 Schematic

3.2 PCB Layouts

This section provides the board layout and illustrations of TPS628523HAQ-070, which can be used for other OPNs of TPS628521-Q1, TPS628522-Q1 and TPS628523-Q1. Please check the recommended BOM from data sheet specified for the used OPN. TPS628523HAQ-EVM070 is a 4 layer PCB.

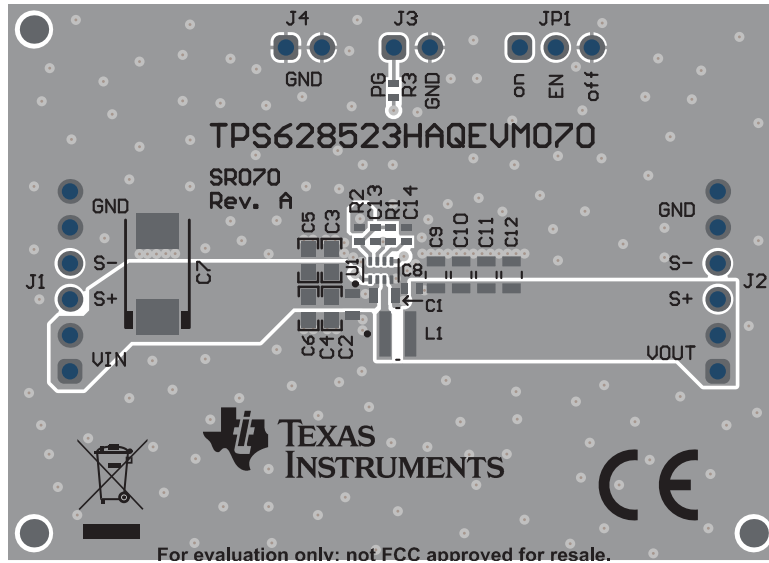


Figure 3-2. Top View Mask

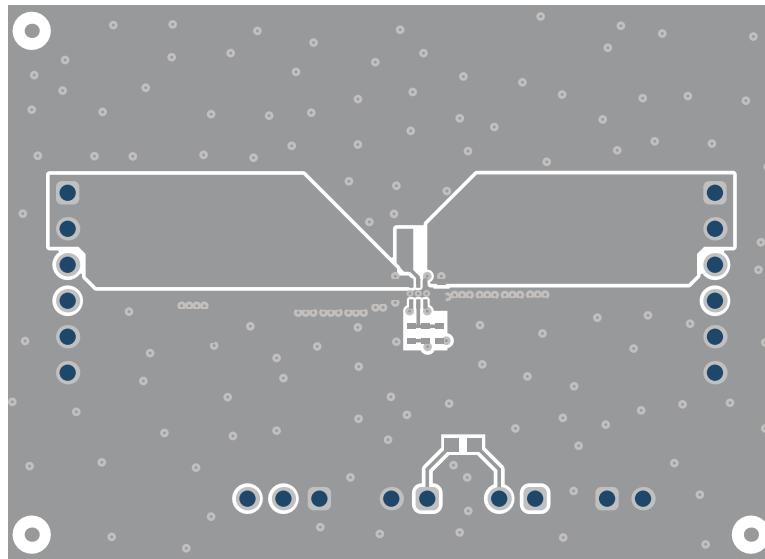


Figure 3-3. Top Layer

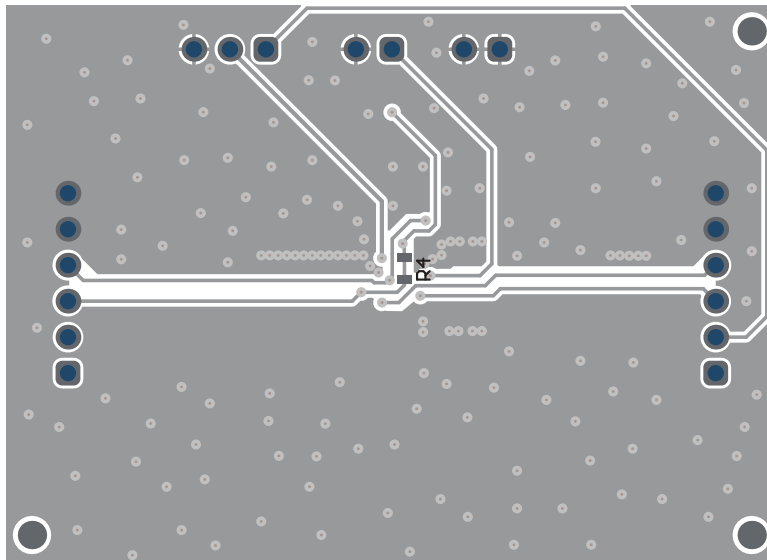


Figure 3-4. Signal Layer 1

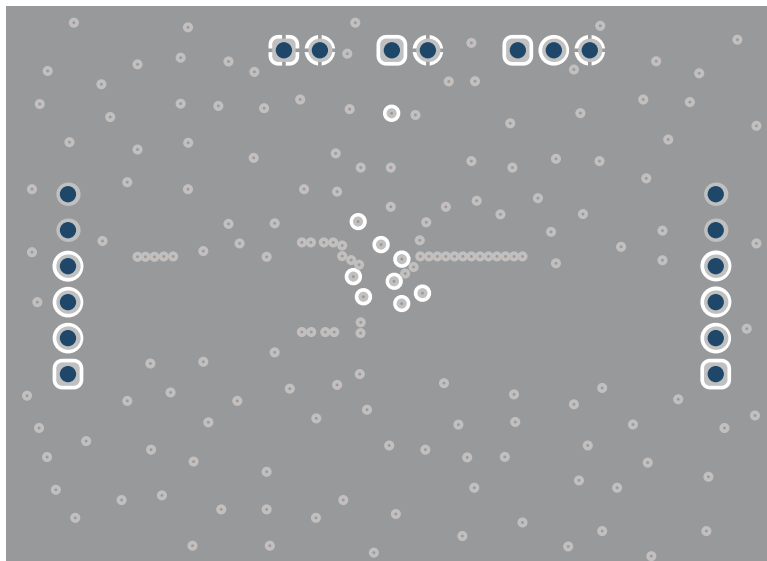


Figure 3-5. Signal Layer 2

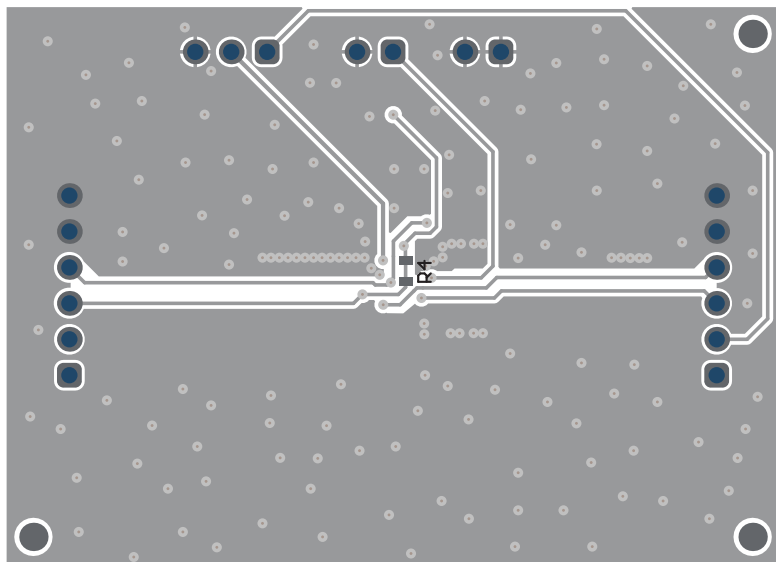


Figure 3-6. Bottom Layer

3.3 Bill of Materials (BOM)

Table 3-1 lists the bill of materials for this EVM.

Table 3-1. TPS628523HAQEVM-070 Bill of Materials

| Quantity | Ref Des | Value | Description | Size | Part Number | MFR |
|---------------------|---------|---------------------|--|---------------------|---------------------|------------|
| TPS628523HAQEVM-070 | | | | | | |
| 1 | C1 | 470pF | Capacitor, Ceramic, 50V, X7R, ±5% | 0603 | GRM1885C1H471JA01D | Murata |
| 1 | C2 | 0.47uF | Capacitor, Ceramic, 16V, X7R, ±10% | 0603 | GRM188R71C474KA88D | Murata |
| 1 | C3 | 10uF | Capacitor, Ceramic, 10V, X7R, ±20% | 0603 | GRM188Z71A106MA73D | Murata |
| 1 | C7 | 100uF | Capacitor, Tantalum Polymer, 20V, ±20% | 7.3x4.3mm | 20TQC100MYF | Panasonic |
| 1 | C8 | 0.1uF | Capacitor, Ceramic, 16V, X7R, ±10% | 0402 | C0402C104K4RACAUTO | Kem |
| 1 | C9, C10 | 22uF | Capacitor, Ceramic, 10V, X7T, ±20% | 0805 | GRT21BD71A226ME13L | Murata |
| 1 | C13 | 10pF | Capacitor, Ceramic, 10V, X7T, ±5% | C0G/NP0 | GCM1555C1H100JA16D | Murata |
| 1 | C14 | 4700pF | Capacitor, Ceramic, 50V, X7R, ±10% | 0402 | GCM155R71H472KA37D | Murata |
| 1 | L1 | 200nH | Inductor, Shielded, 14.8A, 5.65mΩ | 3.2mm x 2mm x 3.5mm | XEL3520-201MEC | Coil Craft |
| 1 | R1 | 80.6 k | Resistor, Chip, 0.063 W, 1% | 0402 | Std | Std |
| 1 | R2 | 40.2 k | Resistor, Chip, 0.063 W, 1% | 0402 | Std | Std |
| 1 | R3 | 100k | Resistor, Chip, 0.063 W, 1% | 0402 | Std | Std |
| 1 | U1 | TPS628523HAWDL SRQ1 | IC, 6V, 3A Step-Down Converter with forced PWM operation | 2.0x1.5mm | TPS628523HAWDL SRQ1 | TI |

4 Additional Information

4.1 Trademarks

All trademarks are the property of their respective owners.

5 Related Documentation

The data sheet and other related documentation for the device is available in the [TPS628523-Q1 product folder](#) on ti.com.

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NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

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3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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-
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