*EVM User's Guide: TPS61129Q1EVM*

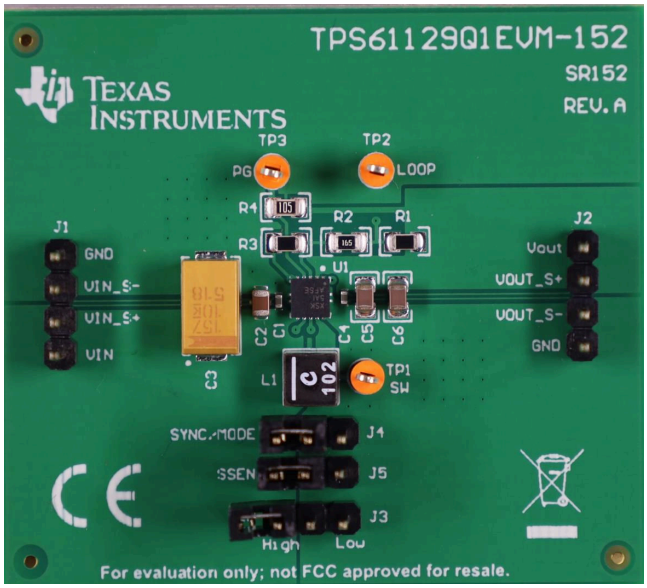
# *TPS61129-Q1 Evaluation Module*

## Description

The TPS61129Q1EVM facilitates thorough evaluation of the TPS61129-Q1 behavior and performance across various operating conditions, including different input voltages (ranging from 0.9V to 5.5V), output voltages, and load scenarios. The module allows output voltage adjustment from 2.6V to 5.5V through an external feedback resistor configuration and features three strategic jumpers that enable testing of the EN, SSEN, and SYNC/MODE pin functions.

## Features

- AEC-Q100 qualified for automotive applications
  - Device temperature grade 1: –40°C to 125°C ambient operating temperature range
- Output voltage: 2.6V to 5.5V
  - Fixed 5V or adjustable Vout: TPS61129-Q1
- Typical 5µA quiescent current into VOUT pin
- Output discharge and windowed power good (PGOOD)
- Peak switching current limit: 3.0A minimum, 3.5A typical
- Auto PFM, forced PWM mode, SYNC selectable




**TPS61129Q1EVM**


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# 1 Evaluation Module Overview

## 1.1 Introduction

This user's guide describes the setup, schematic, and layout of the evaluation module (EVM) for the TPS61129-Q1. The EVM helps to evaluate the behavior and performance of the device at different input voltages, output voltages, and load conditions.

This EVM is designed for 0.9V to 5.5V input voltage and 5V output voltage applications. The SYNC/MODE jumper (J4) controls the operating mode of the device. At light load, the device has two operating modes that can be selected through the SYNC/MODE pin. When SYNC/MODE is connected to Low, the device works in pulse frequency modulation (auto PFM) mode to improve light-load efficiency. When SYNC/MODE is connected to High, the device works in forced PWM mode to avoid audible noise and to improve light-load ripple performance. The SYNC/MODE pin can also be used to synchronize the device switching frequency with an external clock signal from 1.5MHz to 3.3MHz. This EVM has test points of TP1, TP2, and TP3 for SW voltage, loop voltage, and power-good indicator voltage measurement, respectively. The peak inductor current limit is typically 3.5A. The feedback divider and compensation network can be modified for other application conditions as per the datasheet. For fixed 5V output operation, the FB pin can be connected directly to VOUT.

The TPS61129-Q1 features an additional spread spectrum function through the SSEN jumper (J5), and uses a triangle waveform to spread the switching frequency with ±6% of normal frequency. These features mean that with the normal 2.2MHz switching frequency, the spread spectrum function modulates the switching frequency in the range of 2.07MHz to 2.33MHz in a triangle profile with a 9kHz rate. When SSEN is high, the spread spectrum function is enabled. When SSEN is low, the spread spectrum function is disabled.

## 1.2 Kit Contents

**Table 1-1. Kit List**

| Designator | Quantity | Description | Material Type | Packaging |
|---|---|---|---|---|
| PCB1 | 1 | TPS61129Q1EVM; Circuit Board | EEE | Bag, ESD |
| BOX1 | 1 | Box, Cardboard | Cardboard | Box |
| FM1 | 2 | Foam, Antistatic | Plastic | Foam |
| LBL1 | 1 | Label, Small and Large standard labels | Paper, card stock | Paper |
| LIT1 | 1 | Literature, EVM Disclaimer Read Me | Paper, card stock | Paper |
| LIT2 | 1 | Literature, EVM Disclaimer Read Me | Paper, card stock | Paper |

## 1.3 Specification

Table 1-2 provides the summary of the TPS61129Q1EVM performance specifications. All specifications are given for an ambient temperature of 25°C.

**Table 1-2. Performance Specification**

| Parameter | Value | Unit |
|---|---|---|
| Input voltage | 0.9 – 5.5 | V |
| Output voltage | 5 | V |
| Typical peak current limit | 3.5 | A |
| Default switching frequency | 2.2 | MHz |



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### 1.4 Device Information

The TPS61129-Q1 is a low voltage, synchronous boost converter with a 125mΩ low side power switch and a 145mΩ high side rectifier switch to provide a high-efficiency and compact design. The TPS61129-Q1 has a 3.5A (typical) peak switch current limit and employs peak current mode control with a fixed switching frequency 2.2MHz. The TPS61129-Q1 has a wide input voltage range of 0.9V to 5.5V and the output voltage range is from 2.6V to 5.5V and supports selectable auto PFM, forced PWM mode, or synchronization to an external clock. In addition, the TPS61129-Q1 has output overvoltage protection and overcurrent protection to prevent the device from overheating. The TPS61129-Q1 is intended for portable equipment and smart devices powered by batteries or other low-voltage power sources. The TPS61129-Q1 uses the spread spectrum of the internal clock to improve EMI performance in FPWM mode. There is an internal soft-start time to limit the inrush current.

## 2 Hardware

### 2.1 Test Setup

| Jumper | Description |
|---|---|
| J1 | Input voltage positive connection and input voltage return connection |
| J2 | Output voltage positive connection and output voltage return connection |
| J3 | EN pin input jumper. Connect the jumper between EN and the High pin to turn on the IC. Place a jumper across EN and Low to turn off the IC. |
| J4 | SYNC/MODE pin input jumper. Place a jumper across SYNC/MODE and bode High to set the device in forced PWM mode. Connect the jumper between SYNC/MODE and Low to set the device in auto PFM mode. The jumper can also be removed and the external clock can be synchronized through SYNC/MODE. |
| J5 | SSEN pin input jumper. Place a jumper across SSEN and High to enable spread spectrum modulation. Connect the jumper between SSEN and Low to disable spread spectrum modulation. |
| TP1 | Test point to measure SW pin waveform |
| TP2 | Test point for bode plot measurement |
| TP3 | Test point to measure power-good indicator voltage |

### 2.2 Modification

The external components of the TPS61129-Q1 device can be modified to adjust the output voltage and output ripple for specific application requirements.

### 2.3 Input Capacitor C3

The 150µF, 10V TAN capacitor C3 is added as the input capacitor in the EVM. This capacitor is included on the EVM for evaluation purposes and can not be required in the end application.


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# 3 Hardware Design Files

## 3.1 Schematic

Figure 3-1 shows the TPS61129-Q1 EVM schematic.

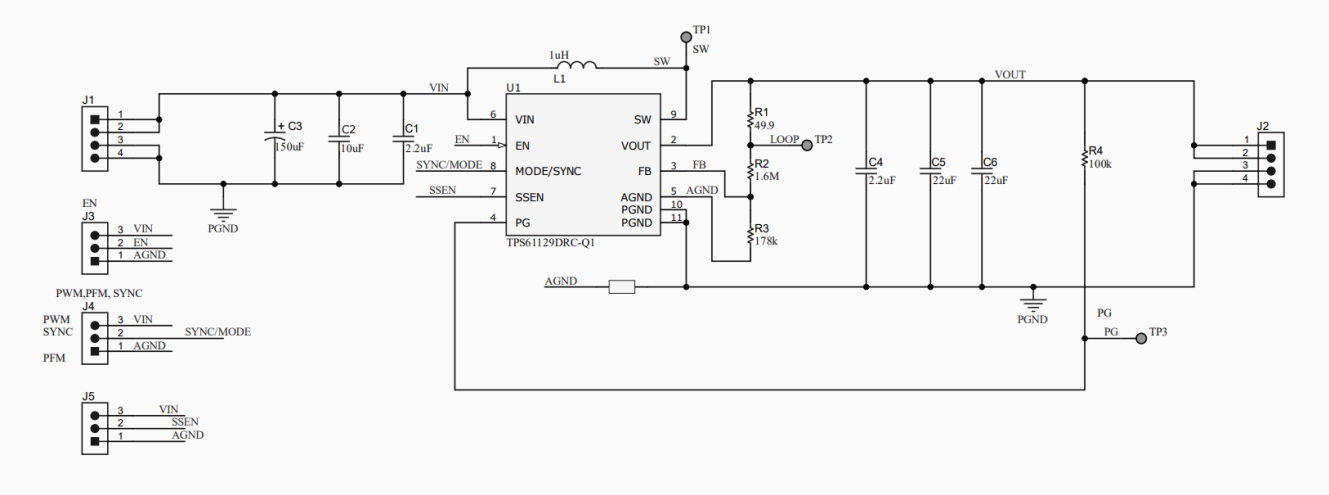



**Figure 3-1. Schematic**



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## 3.2 PCB Layout

The TPS61129-Q1 EVM board is a 2-layer, 2oz thick copper PCB. All components are placed on the top layer. Figure 3-2 and Figure 3-3 show the top view and bottom view, respectively.

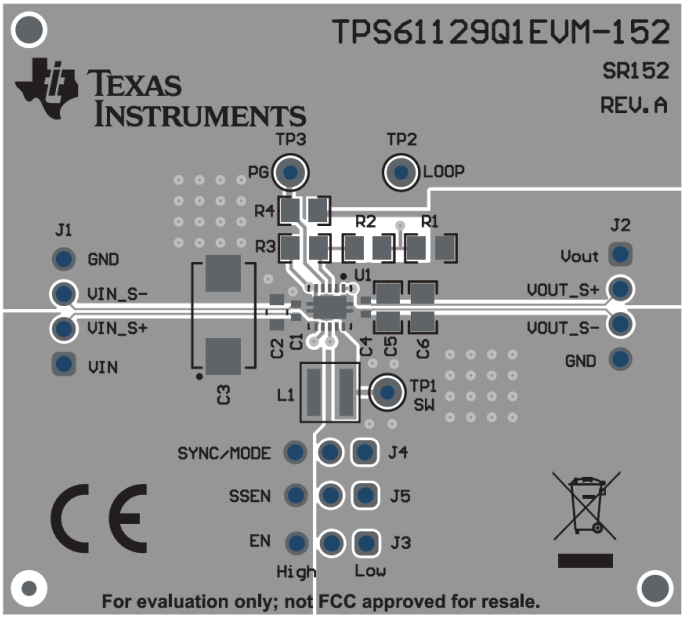



**Figure 3-2. Top-Side Layout**

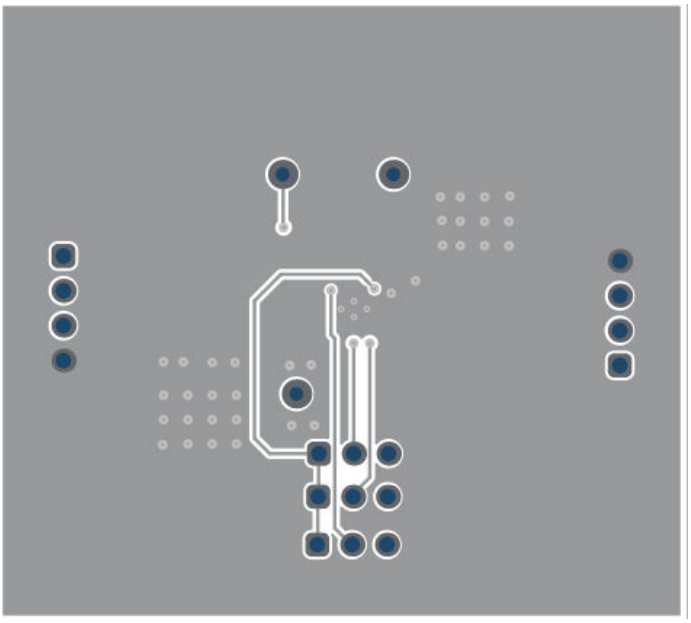


**Figure 3-3. Bottom-Side Layout**


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## 3.3 Bill of Materials

Table 3-1 lists the BOM of the TPS61129-Q1 EVM.

**Table 3-1. TPS61129Q1EVM Bill of Materials**

| Designator | Quantity | Value | Description | Package Reference | Part Number | Manufacturer |
|---|---|---|---|---|---|---|
| C1, C4 | 2 | 2.2µF | CAP, CERM, 2.2µF, 10V, +/- 10%, X5R, 0402 | 0402 | CL05A225KP5NNNC | Samsung Electro-Mechanics |
| C2 | 1 | 10µF | CAP, CERM, 10µF, 10V, +/- 10%, X5R, 0805 | 0805 | CL21A106KPFNNNE | Samsung Electro-Mechanics |
| C3 | 1 | 150µF | CAP, TA, 150µF, 10V, +/- 10%, 0.1ohm, SMD | 7132-28 | T495D157K010ATE100 | Kemet |
| C5, C6 | 2 | 22µF | CAP, CERM, 22µF, 25V, +/- 20%, X5R, 0805 | 0805 | CL21A226MAQNNNE | Samsung Electro-Mechanics |
| FID1, FID2, FID3 | 3 | | Fiducial mark. There is nothing to buy or mount. | N/A | N/A | N/A |
| J1, J2 | 2 | | Header, 2.54mm, 4x1, Gold, TH | Header, 2.54mm, 4x1 | 61300411121 | Wurth Elektronik |
| J3, J4, J5 | 3 | | Header, 2.54mm, 3x1, Gold, TH | Header, 2.54mm, 3x1 | 61300311121 | Wurth Elektronik |
| L1 | 1 | 1µH | Power Inductor, shielded, composite, 1uH 20% tol, DCR 7.2mOhms, SRF 65MHz, Isat 4.8A, Irms 13A, AEC-Q200 | SMD——INDUCTOR | XGL4030-102MEC | Coilcraft |
| R1 | 1 | 49.9Ω | RES, 49.9, 1%, 0.125W, 0805 | 0805 | CRCW080549R9FKEA | Vishay-Dale |
| R2 | 1 | 1.6MΩ | RES, 1.6M, 1%, 0.125W, 0805 | 0805 | CRCW08051M60FKEA | Vishay-Dale |
| R3 | 1 | 178kΩ | RES, 178k, 1%, 0.125W, 0805 | 0805 | CRCW0805178KFKEA | Vishay-Dale |
| R4 | 1 | 100kΩ | RES, 100k, 1%, 0.125W, 0805 | 0805 | CRCW0805100KFKEA | Vishay-Dale |
| TP1, TP2, TP3 | 3 | | Test Point, Miniature, Orange, TH | Orange Miniature Testpoint | 5003 | Keystone Electronics |
| U1 | 1 | | Adjustable, 3.5A Switch, 96% Efficient Boost Converter with Down-Mode, QFN-11, DRC0010J (VSON-11) | VSON-11 | TPS61129DRC-Q1 | Texas Instruments |



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# 4 Additional Information

## 4.1 Trademarks

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# 5 Revision History

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

| Changes from Revision A (April 2026) to Revision B (October 2026) | Page |
|---|---|
| • Changed from MODE pin to SYNC/MODE pin throughout the document and from PFM to Auto PFM throughout the document | 1 |
| • Updated the top view with component markings in *PCB Layout* | 5 |
| • Updated capacitors C2 and C5 part number and manufacturer in the BOM list (no package change) in *Bill of Materials* | 6 |
| • Changed resistors from R3, R4, R5, R6 to R1, R2, R3, R4 in the BOM list in *Bill of Materials* | 6 |

| Changes from Revision * (March 2026) to Revision A (April 2026) | Page |
|---|---|
| • Changed from 10kHz to 9kHz spread spectrum function in the *Introduction* | 2 |
| • Changed from 80mΩ low side power switch and a 120mΩ high side rectifier switch to 125mΩ low side power switch and a 145mΩ high side rectifier switch in *Device Information* | 3 |
| • Changed from QFN-10 and VSON-10 to QFN-11 and VSON-11 in the U1 row of the *Bill of Materials* | 6 |



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   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

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NOTE:

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**FCC NOTICE:** This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

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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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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