*EVM User's Guide: TLV61047QEVM-165*

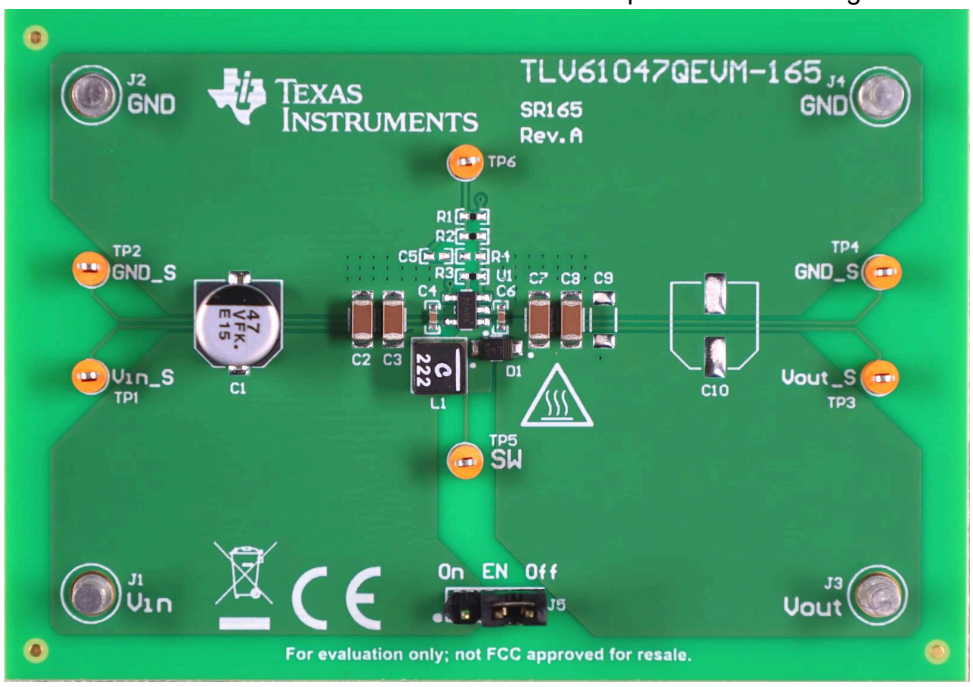
# *TLV61047QEVM-165 Evaluation Module*

## Description

The TLV61047-Q1 is a non-synchronous boost converter with 2.2A peak switching current capability. This EVM is designed with 2V to 9V input voltage and 12V output voltage applications. The feedback divider can be modified for other application conditions, according to the data sheet.

## Features

- Output current 0.6A ($V_{IN}$ >= 5V to $V_{OUT}$ = 12V)
- Up to 89.7% efficiency at $V_{IN}$ = 5V to $V_{OUT}$ = 12V, and $I_{OUT}$ = 0.25A
- Typical 2.2A peak switching current limit
- Typical 25µA quiescent current
- Typical 2.4MHz switching frequency
- PFM operation mode at light load




**TLV61047QEVM-165**

# 1 Evaluation Module Overview

## 1.1 Introduction

This user's guide describes the setup, schematic, and layout of the evaluation module (EVM) for the TLV61047-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 2V to 9V input voltage and 12V output voltage applications. The EN jumper (J5) controls the ON and OFF of the device. This EVM has test points of TP5 and TP6 for SW voltage and loop measurement, respectively. The feedback divider can be modified for other application conditions as per the data sheet.

## 1.2 Kit Contents

**Table 1-1. Kit List**

| Designator | Quantity | Description | Material Type | Packaging |
|---|---|---|---|---|
| PCB1 | 1 | TLV61047QEVM-165, circuit board | EEE | Bag, ESD |
| BOX1 | 1 | Box, cardboard | Cardboard | Box |
| FM1 | 2 | Foam, antistatic | Plastic | Foam |
| LBL1 | 2 | Label, small and large standard labels | Paper, card stock | Paper |
| LIT1 | 1 | Literature, EVM Disclaimer Read Me | Paper, card stock | Paper |

## 1.3 Specification

Table 1-2 provides the summary of the TLV61047QEVM-165 performance specifications. All the specifications are given for an ambient temperature of 25°C.

**Table 1-2. Performance Specification**

| Parameter | Value | Unit |
|---|---|---|
| Input voltage | 2 – 9 | V |
| Output voltage | 12 | V |
| Typical peak current limit | 2.2 | A |
| Default switching frequency | 2.4 | MHz |
| Output current | 0 – 100 (When Vin > = 2V)<br>0 – 600 (When Vin > = 5V) | mA |

## 1.4 Device Information

The TLV61047-Q1 is a high voltage, non-synchronous boost converter with a 200mΩ low side power switch to provide a high efficiency and small size design. The TLV61047-Q1 has a wide input voltage range of 1.8V to 20V and the output voltage covers up to 28V with a typical peak current limit 2.2A. The TLV61047-Q1 has internal compensation, 2.5ms soft-start time, and thermal shutdown protection.

# 2 Hardware

## 2.1 Test Setup

| Jumper | Description |
|---|---|
| J1 | Input voltage positive connection |
| J2 | Input voltage return connection |
| J3 | Output voltage positive connection |
| J4 | Output voltage return connection |
| J5 | EN pin input jumper. Place a jumper across EN and On to turn on the IC. Place a jumper across EN and Off to turn off the IC. |
| TP1 | Input voltage positive sensing node for measuring efficiency |
| TP2 | Input voltage negative sensing node for measuring efficiency |
| TP3 | Output voltage positive sensing node for measuring efficiency |
| TP4 | Output voltage negative sensing node for measuring efficiency |
| TP5 (SW) | Test point to measure SW pin waveform |
| TP6 | Test point to measure bode plot |

## 2.2 Modification

The external components of the TLV61047-Q1 device can be modified to adjust the output voltage of real applications.

## 2.3 Input Capacitor C1

The 47µF, 35V aluminum capacitor C1 is added as the input capacitor in the EVM. The capacitor is not necessary and can be removed in a real application.

## 2.4 Precautions

**WARNING**

Hot surface.
Contact can cause burns.
Do not touch!

# 3 Hardware Design Files

## 3.1 Schematic

Figure 3-1 shows the TLV61047QEVM-165 schematic.

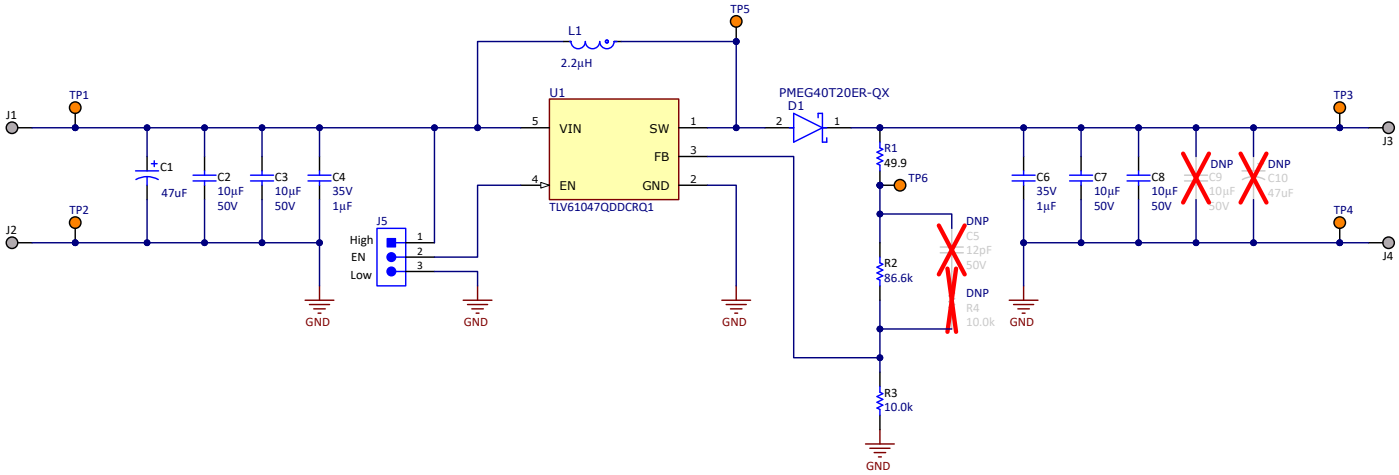



**Figure 3-1. Schematic**

## 3.2 PCB Layout

The TLV61047QEVM-165 board is a 2-layer, 1-oz copper thick PCB. All the components are placed on the top layer. Figure 3-2 and Figure 3-3 show the top view and bottom view, respectively.

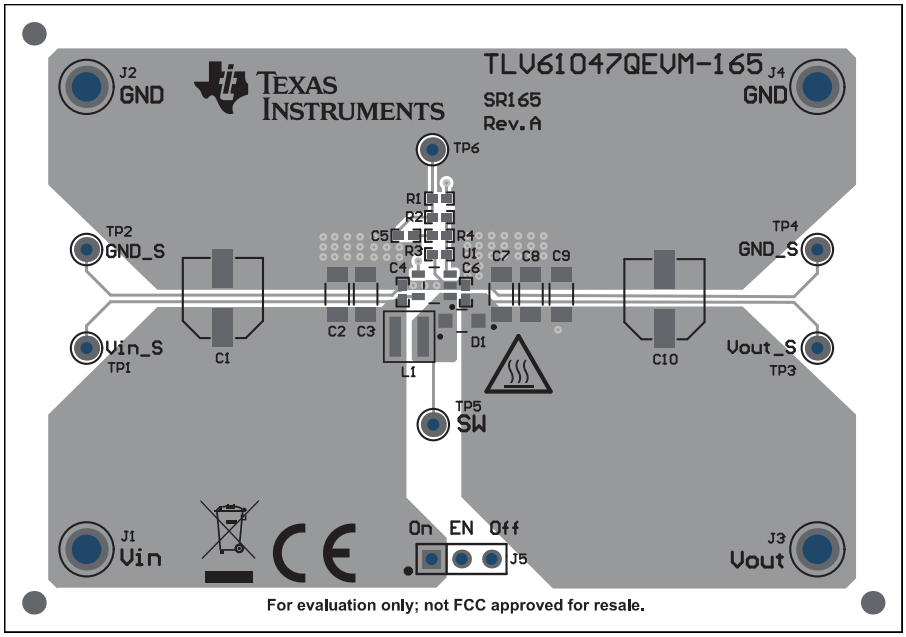



**Figure 3-2. Top-Side Layout**

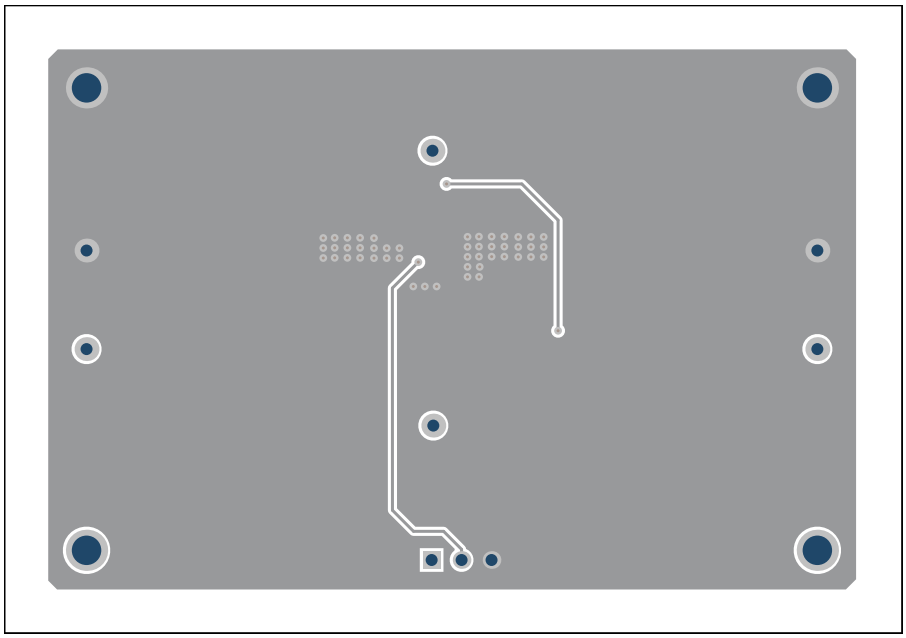


**Figure 3-3. Bottom-Side Layout**

## 3.3 Bill of Materials

Table 3-1 lists the BOM of the TLV61047QEVM-165.

**Table 3-1. TLV61047QEVM-165 Bill of Materials**

| Designator | Qty | Value | Description | Package Reference | Part Number | Manufacturer |
|---|---|---|---|---|---|---|
| C1 | 1 | 47µF | CAP, AL, 47µF, 35V, +/- 20%, 0.36 ohm, AEC-Q200 Grade 2, SMD | SMT Radial D | EEE-FK1V470P | Panasonic |
| C2, C3, C7, C8 | 4 | 10µF | CAP, CERM, 10µF, 50V,+/- 10%, X7R, AEC-Q200 Grade 1, 1206 | 1206 | CGA5L1X7R1H106K160AC | TDK |
| C4, C6 | 2 | 1µF | CAP, CERM, 1µF, 35V,+/- 10%, X5R, AEC-Q200 Grade 3, 0402 | 0402 | GRT155R6YA105KE13D | MuRata |
| D1 | 1 | | 40V, 2A low VF Trench MEGA Schottky barrier rectifier, SOD123W | SOD123W | PMEG40T20ER-QX | Nexperia |
| J1, J2, J3, J4 | 4 | | Terminal, Turret, TH, Double | Keystone1502-2 | 1502-2 | Keystone |
| J5 | 1 | | Header, 100mil, 3x1, Tin, TH | Header, 3 PIN, 100mil, Tin | PEC03SAAN | Sullins Connector Solutions |
| L1 | 1 | 2.2µH | Inductor Power Shielded Wirewound 2.2uH 20% 1MHz Composite 8.7A 15mOhm DCR Automotive T/R | SMT_IND_4MM0_4MM0 | XGL4030-222MEC | Coilcraft |
| R1 | 1 | 49.9 | RES, 49.9, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW040249R9FKED | Vishay-Dale |
| R2 | 1 | 86.6k | RES, 86.6k, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW040286K6FKED | Vishay-Dale |
| R3 | 1 | 10k | RES, 10k, 1%, 0.063W, AEC-Q200 Grade 0, 0402 | 0402 | CRCW040210K0FKED | Vishay-Dale |
| SH-J1 | 1 | | Shunt, 2.54mm, Gold, Black | Shunt, 2.54mm, Black | 60900213421 | Wurth Elektronik |
| TP1, TP2, TP3, TP4, TP5, TP6 | 6 | | Test Point, Miniature, Orange, TH | Orange Miniature Test point | 5003 | Keystone Electronics |
| U1 | 1 | | 20VIN, 28VOUT, 2.2A Non-synchronous Boost Converter | SOT-23-5 | TLV61047QDDCRQ1 | Texas Instruments |

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- *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.*
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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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