# RT9746 VBUS OVP with a PTVS Diode

## *Purpose*

The RT9746 is a VBUS OVP protector switch. This document explains the function and use of the RT9746 evaluation board (EVB), and provides information to enable operation, output voltage setting of the evaluation board.

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## Introduction

### General Product Information

The RT9746 is an overvoltage protection devices feature a low 35mΩ (typ) RON internal FET with PTVS diode. The PTVS also protects the devices from surges up to 100V. When the input voltage exceeds the overvoltage threshold, the internal FET is turned off to prevent damage to the protected down stream components. The internal Over Voltage Thresholds (OVP) are preset to 6.8V typical. The RT9746 also feature an over-current protection and up to 4.5A. The RT9746 is offered in a small WL-CSP-12B (BSC) package provides small PCB area applications.

### Product Feature

- **PTVS Diode Embedded for VBUS Surge Protection**
- **Warning Indicator for OVP or UVP**
- **28V Maximum Rating for DC Adapt**
- **Integrated Over-Voltage and Over Current Protection FET on VBUS for Fault Isolation**

### Key Performance Summary Table

| Key Features | Evaluation Board Number: PCB083_V1 |
|---|---|
| **Default Input Voltage** | 5V |
| **Max Output Over Current** | 4.5A |
| **Default Marking & Package Type** | RT9746WSC, WL-CSP-12B 1.92x1.27 (BSC) |

## Bench Test Setup Conditions
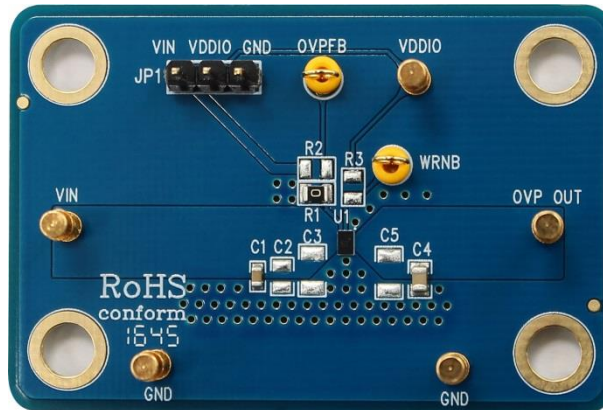


Carefully inspect all the components used in the EVB according to the following Bill of Materials table, and then make sure all the components are undamaged and correctly installed. If there is any missing or damaged component, which may occur during transportation, please contact our distributors or e-mail us at evb_service@richtek.com.

## Test Points

The EVB is provided with the test points and pin names listed in the table below.

| Test point/ Pin name | Signal | Comment (expected waveforms or voltage levels on test points) |
| --- | --- | --- |
| **VIN** | Input voltage | VBUS from Power Adaptor. |
| **OVP OUT** | Output voltage | Output from VBUS Load-Switch. |
| **OVPFB** | External OVP Adjustment Setting | If no used, be surely tied to GND. |
| **GND** | Ground | Ground. |
| **WRNB** | Inverse Warning Signal | OCP,OTP, OVP, UVLO Flag Output (Open-Drain) |

## Power-up

The RT9746 has a threshold of 2.7V power on reset (POR) with a built-in hysteresis of 100mV. Before the input voltage reaches the POR threshold, the RT9746 is off. When the input voltage is over the POR threshold, the VOUT of RT9746 will delay for 32ms which includes soft-start time of 8ms.

## Input Over-Voltage Protection

The RT9746 provides input over-voltage protection via internal or external resistor to set OVP level.

- If OVPFB is connected to GND, the RT9746 uses the internal OVP level setting.

- If an external resistor-divider is connected to OVPFB and VOVPFB exceeds the VOVP_SEL voltage, the RT9746 will adopt external OVP level setting. The OVP level VOVP is set as below.

$$V_{OVP} = V_{REF\_EXT} \times \left(1 + \frac{R2}{R1}\right)$$
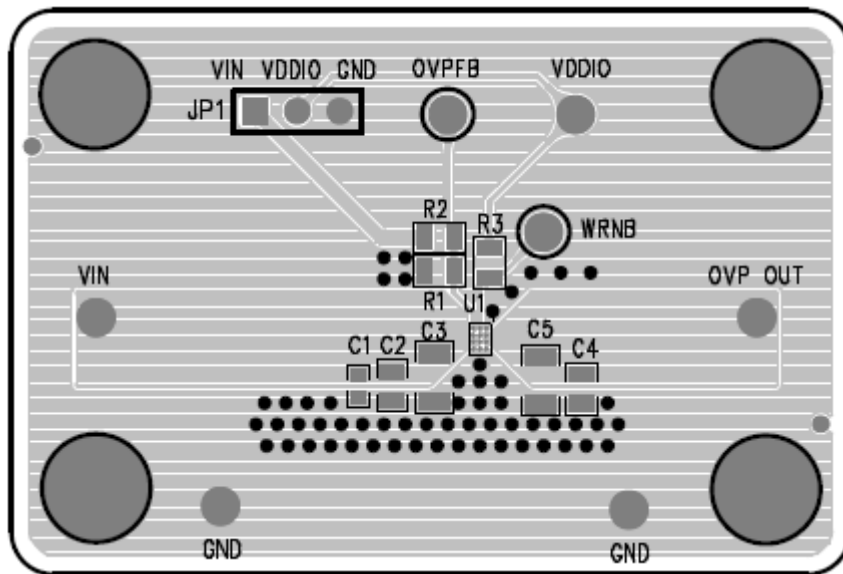
## Schematic, Bill of Materials & Board Layout

### EVB Schematic Diagram
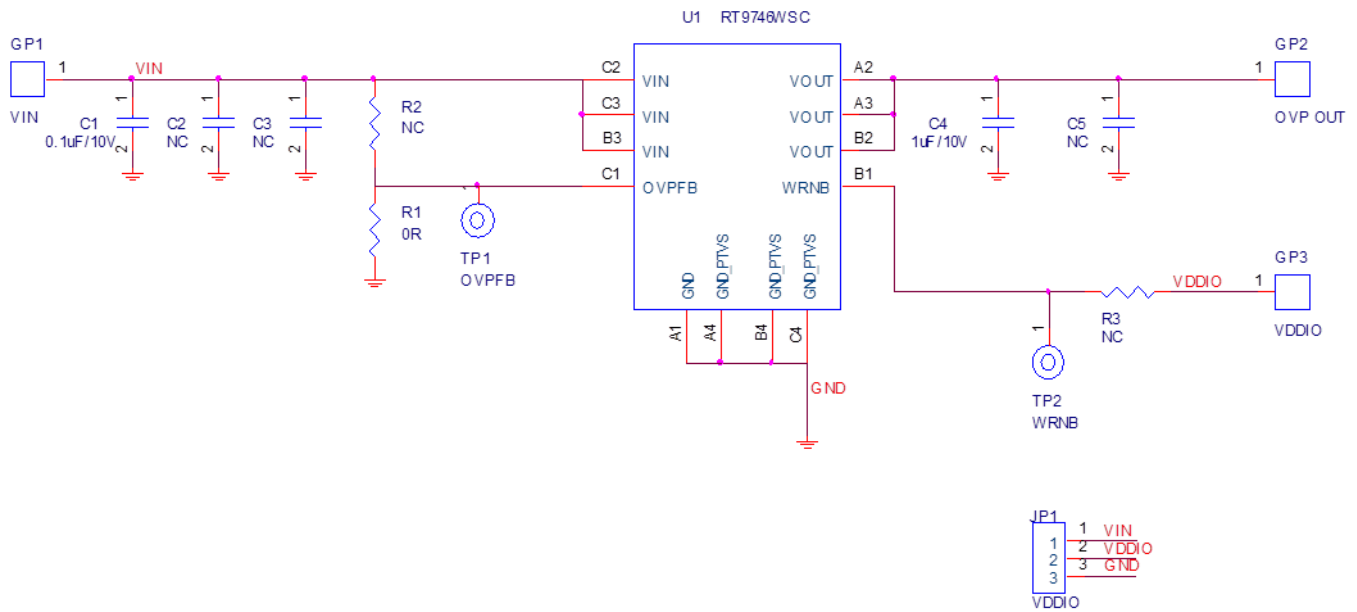


### Bill of Materials

| Reference | Qty | Part number | Description | Package | Manufacturer |
|-----------|-----|-------------|-------------|---------|--------------|
| U1 | 1 | RT9746WSC | VBUS OVP IC with PTVS Diode | WL-CSP-12B 1.92x1.27(BSC) | RICHTEK |
| C1 | 1 | C1608X7R1H104K080AA | 0.1µF/50V/X7R/0603 | C-0603 | TDK |
| C4 | 1 | C2012X7R1E105KT | 1µF/25V/X7R/0805 | C-0805 | TDK |
| R1 | 1 | 0805T-5-0R | 0R/0805 | R-0805 | RALEC |

## PCB Layout



Top View
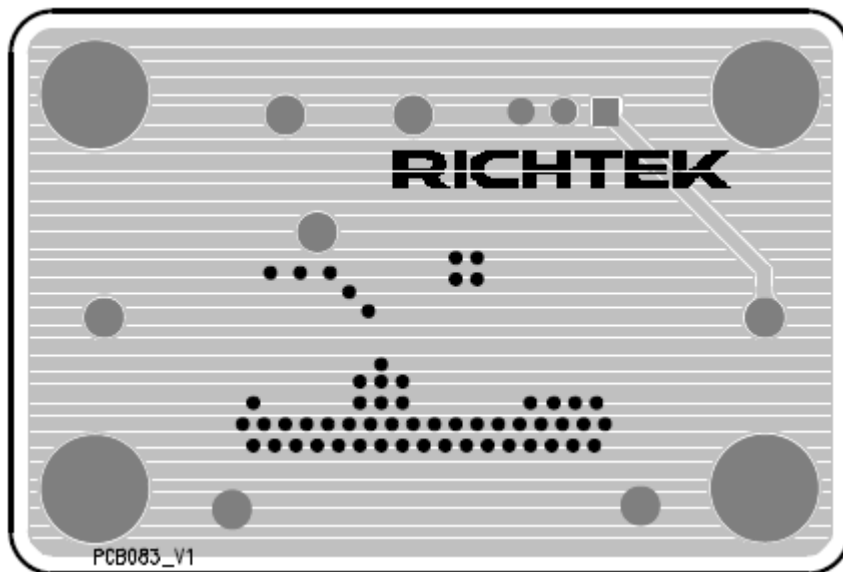


Bottom View

## More Information

For more information, please find the related datasheet or application notes from Richtek website http://www.richtek.com.

## Important Notice for Richtek Evaluation Board

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