# ILD8150/E 80 V high-side buck in constant voltage mode

## Description, design guide

## About this document

### Scope and purpose

ILD8150/E 80 V is a high-side LED buck regulator with an integrated MOSFET optimized for constant output current. The IC can operate in constant voltage with elementary feedback change. This document explains how to convert the feedback loop. The solution can be used in many industrial and telecom solutions with an absolute maximum voltage of up to 80 V.

### Intended audience

This document is intended for engineers and students who design industrial DC-DC buck.

## Table of contents

# 1 Introduction

This application note explains the operation of Infineon's high-side MOSFET buck LED driver IC ILD8150 in constant voltage mode. It's possible to switch the IC into constant voltage mode in a simple way. The circuit is shown in **Figure 1**.

The resistive divider R1 and R2 set the output voltage.

$R_{OCP}$ and $D_{OCP}$ are responsible for overcurrent protection.

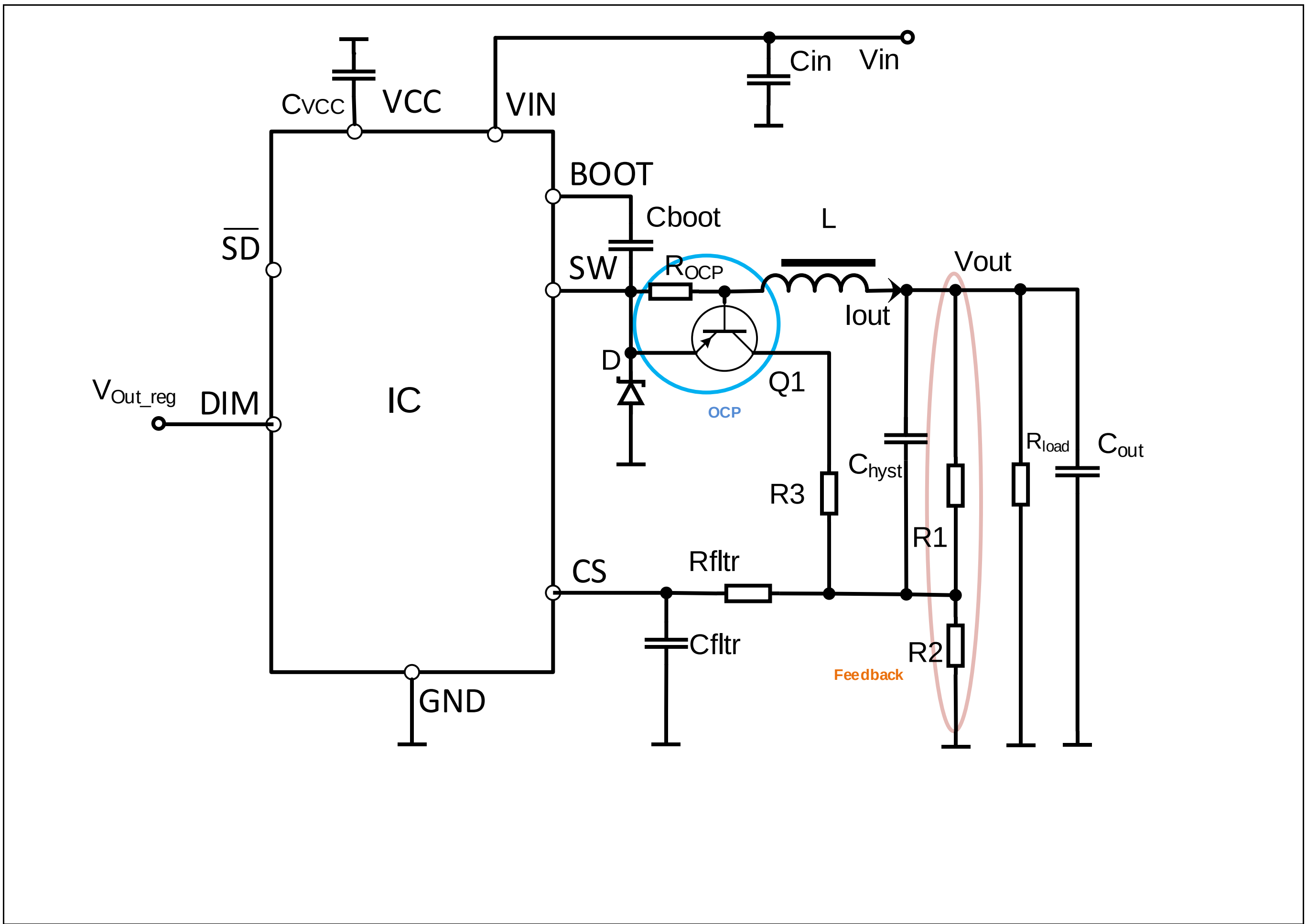


**Figure 1 ILD8150 in voltage mode**

## 1.1 Voltage regulation

**Figure 1** shows the typical application circuit. The output voltage is controlled by the CS pin, which compares the voltage drop on R2 to internal references. The output voltage is proportional to the voltage drop on R2. When the CS voltage drops below $V_{CSL}$, the MOSFET switches on. The output voltage and voltage on R2 rise accordingly. When the CS voltage achieves $V_{CSH}$, the MOSFET switches off, and the stored energy in inductor L discharges through diode D. This way, the system maintains a constant average output voltage as shown in **Figure 2**.

$V_{out} = \frac{(V_{CSH}+V_{CSL})\cdot(R_1+R_2)}{2R_2}$, the typical $V_{CSH}$ is 390 mV, $V_{CSL}$ is 330 mV accordingly.

## Introduction

Through changing the PWM signal on the $V_{Out\_reg}$ pin, it is possible to regulate the output voltage. Since a hysteretic buck needs voltage ripple at the CS pin, using a pure resistive divider (such as R1 and R2) would lead to a high output voltage ripple of 17 percent. $C_{hyst}$ was used to inject ripples into the feedback loop to avoid this effect and reduce output voltage ripple. Select R3, so that the voltage on the CS pin never goes beyond the CS absolute maximum voltage range. The switching frequency mostly depends on the inductance L and the capacitance $C_{hyst}$.

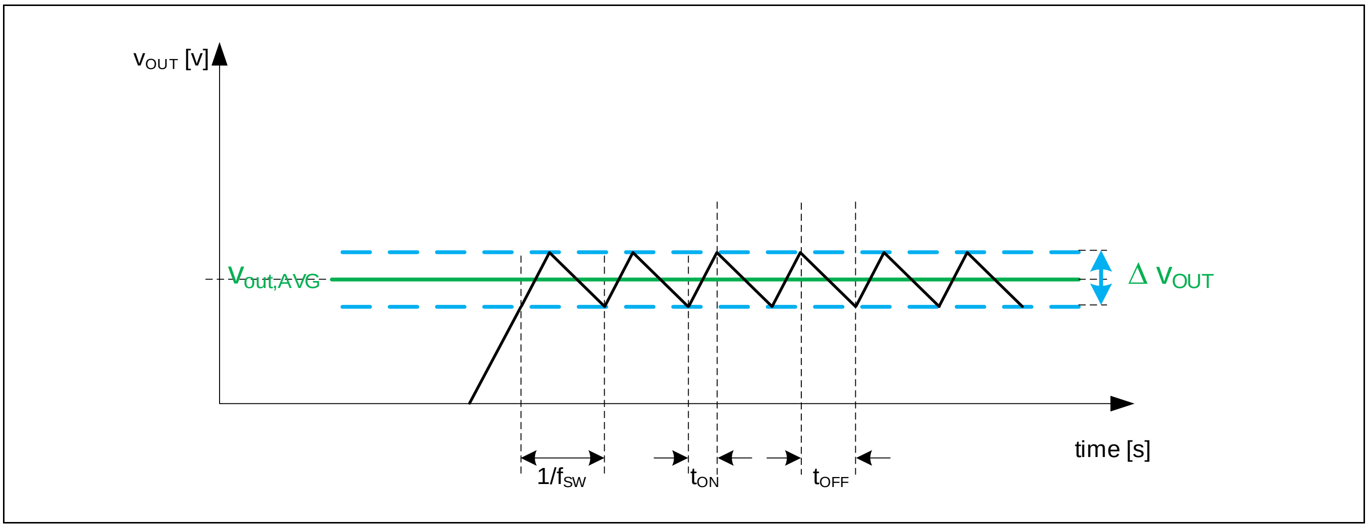


**Figure 2 Voltage regulation**

If short circuit protection is needed, it can be implemented by means of $R_{OCP}$, $Q_1$ and R3. $R_{OCP}$ is a shunt used to measure the output current and trigger at $I_{OCP}$ level.

$$R_{OCP} = \frac{V_{BE}}{I_{OCP}}$$

$V_{BE}$ is a bipolar junction transistor (BJT) base-emitter voltage, typically 0.6 V, at which the BJT starts conducting. If the voltage on the shunt is higher than $V_{BE}$, the BJT conducts and pulls up the CS pin through R3, up to $V_{CSH}$ level. So, the protection switches the high-side MOSFET off. $V_{BE}$ varies over temperature range and over different BJT types. Select the shunt that overcurrent protection would never trigger at normal operating conditions. The BJT breakdown voltage must be higher than $V_{IN}$ .

Please refer to the **ILD8150/ILD8150E datasheet** for more information.

# Revision history

| Document version | Date of release | Description of changes |
|---|---|---|
| V 1.0 | 2021-09-07 | First release |
| | | |

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**Do you have a question about this document?**

**Email:** erratum@infineon.com

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