

Differences Between the UCC28251 and UCC28250 and Evaluation of the UCC28251 in the UCC28250EVM-564 Evaluation Module

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1 Introduction

The UCC28251 is a functional variant of the UCC28250 PWM Controller. While the same basic functionality of the UCC28250 is largely maintained, the UCC28251 is designed to operate at a lower frequency (minimum of 27 kHz when programmed by RT pin) allowing operation in 400-V input DC-to-DC converters in off-line AC-to-DC power supplies, where frequency-dependent high-voltage switching losses are an important concern. Various other enhancements, (summarized in the table below) made in UCC28251 that enhance the performance in both 400-V input and 48-V input full-bridge and half-bridge applications in server telecom power supplies.

2 UCC28251 Enhancements over UCC28250

The overall improvements that are made in UCC28251 can be summarized in [Table 1](#).

The UCC28250EVM-564 is a power converter that is designed to demonstrate the use of a UCC28250 in a secondary-side symmetrical half-bridge converter topology. Because of the limitations imposed on the converters operation by the power components (inductors, transformers, capacitors) which limit operation frequency and other things it is not possible to fully exercise the UCC28251 over its full range of operating parameters.

To evaluate the UCC28251 in this EVM, simply Follow the steps below:

1. Replace the UCC28250PW with a UCC28251PW device
2. Change the timing resistor RT (R15) on pin 2 of the controller (U3) from 75 k Ω to 37 k Ω . This is necessary to keep the operating frequency the same.

Table 1. UCC28251 Enhancements over UCC28250

NEW IN UCC28251	UCC28250	ENHANCEMENT
When synchronized to an external frequency source, the minimum switching frequency can be as low as 42 kHz. When programmed by R_T resistor, the minimum switching frequency can be as low 27 kHz (The oscillator Frequency set by the R_T Resistor will therefore be different from UCC28250 due to lower operating frequency of UCC28251)	UCC28250 does not allow support frequencies lower than 85 kHz	UCC28251 enables better power efficiency in offline (400 V_{IN}) DC-to-DC converters.
The synchronous rectifier outputs, SRA and SRB, are designed to follow after the primary outputs and have a minimum 50% duty cycle during startup. SRA and SRB continue to be active and will only be disabled when UCC28251 is disabled	The synchronous rectifier duty cycle will be equal to 0 when primary duty cycle is very narrow. This duty cycle loss can increased MOSFET V_{DS} and cause poor reverse recovery.	UCC28251 reduces MOSFET stress and enables better reverse recovery
UCC28251 startup is delayed by 10 μs after reaching V_{DD} UVLO. This 10- μs delay provides enough time for SS pin to fully discharge	No Delay, immediate startup after UVLO is reached. After startup, if the applied V_{DD} happens to drop below UVLO then rises back up above ULVO very quickly, the UCC28250's SS pin does not have enough time to discharge.	UCC28251 SS pin will fully discharge under Vdd brownout conditions
When OVP is detected, the internal current source now turn on for a minimum of 5 μs . This allows the capacitor connected to the OVP pin to be charged up sufficiently. (The internal current source has been changed to 8 μA)	In UCC28250, if the OVP comparator is triggered, the internal current source does not turn on for any minimum amount of time. In some cases this may result in the external OVP capacitor not being charged properly. This could result poor voltage hysteresis for OVP protection. (The internal current source is 11 μA)	UCC28251 allows Over Voltage Protection to have enough voltage hysteresis

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