
TPS65633, 633A, 633B High V_I Operation (4.5 V to 4.8 V)

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Display Power Application

ABSTRACT

The device can support V_I voltages up to 4.8 V. While the AVDD and ELVSS converter do not change their operation modes for $V_I > 4.5$ V the ELVDD boost converter operates in “Diode-Mode” to support a lower output voltage than its input voltage.

ELVDD Boost Converter Operation for $V_I \geq V_{(ELVDD)}$

During standard operation the $V_{(ELVDD)}$ boost converter operates in CCM (Continuous Conduction Mode). The closer V_I gets to the $V_{(ELVDD)}$ voltage of 4.6 V the shorter the on-time of the main switch. The converter can support a minimum on-time of 14 ns which is equal to 2 % duty cycle. To be able to support extremely low duty cycles < 2 % a “Diode-Mode” is implemented.

For $V_{(ELVDD)} - V_I < 70$ mV the $V_{(ELVDD)}$ boost converter enters “Diode-Mode”. In this mode, the converter increases its high level voltage of the switching pin by increasing the voltage drop across the rectifier power transistor.

During “Diode-Mode” the converter works as an asynchronous converter; therefore, CCM operation for light load cannot be obtained. The device operates in DCM (Discontinuous Conduction Mode) and PFM (Pulse Frequency Modulation) with minimum on-time to regulate. $V_{(ELVDD)}$ regulates to 4.6 V for an output load of 1 mA to 300 mA.

Hysteresis is built in to prevent the converter toggling between normal operation and “Diode-Mode” operation. For rising V_I the converter enters “Diode”-Mode when $V_{(ELVDD)} - V_{IN} < 70$ mV, for falling V_{IN} it leaves the mode for $V_{(ELVDD)} - V_{IN} > 140$ mV.

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