TIDA-00275 TI Design Test Data
Automotive Cluster Wide VIN Power Supply

1 Introduction

The following test data was collected using TPS65320EVM, TLV62065EVM-719, and LP2998EVAL hardware. These evaluation modules are utilized in the TIDA-00275 TI Design and are available for order from Texas Instruments. Please refer to the respective EVM User Guide for detailed configuration and operation instructions.

2 TPS65320EVM Test Data

Figure 1 through Figure 17 present performance data for the TPS65320EVM. Actual performance data can be affected by measurement techniques and environmental variables. Therefore, the following data is presented for reference and may differ from actual results obtained by some users.

2.1 Efficiency

Figure 1 and Figure 2 illustrate the efficiency performance for the TPS65320EVM.

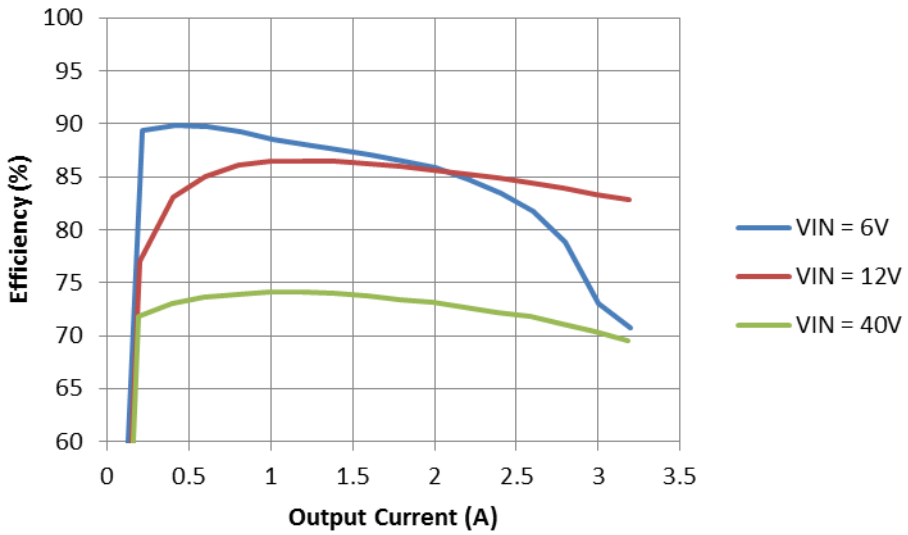

Figure 1. TPS65320EVM Efficiency vs Load Current (f_{sw} = 2.1MHz)

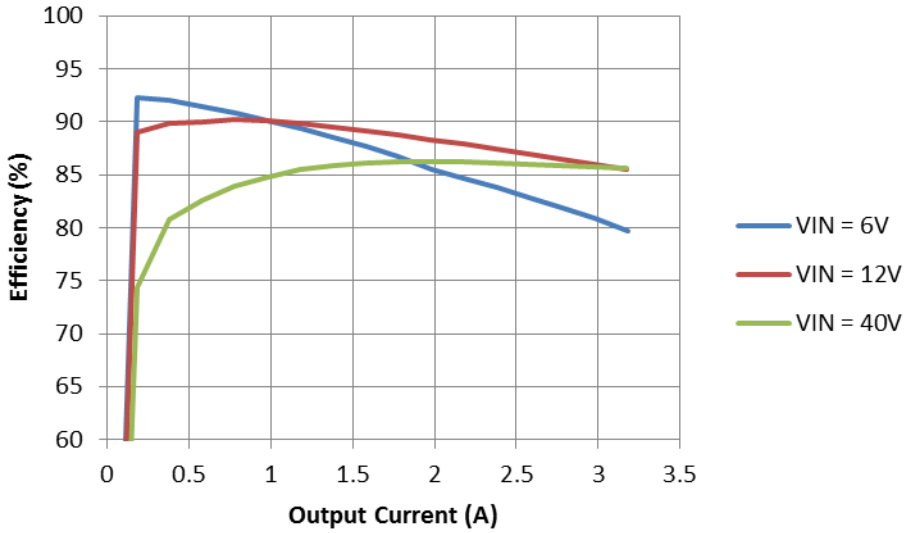

Figure 2. TPS65320EVM Efficiency vs Load Current (f_{sw} = 400kHz)

2.2 Load Regulation

Figure 3 and Figure 4 illustrate the load regulation performance for the TPS65320EVM.

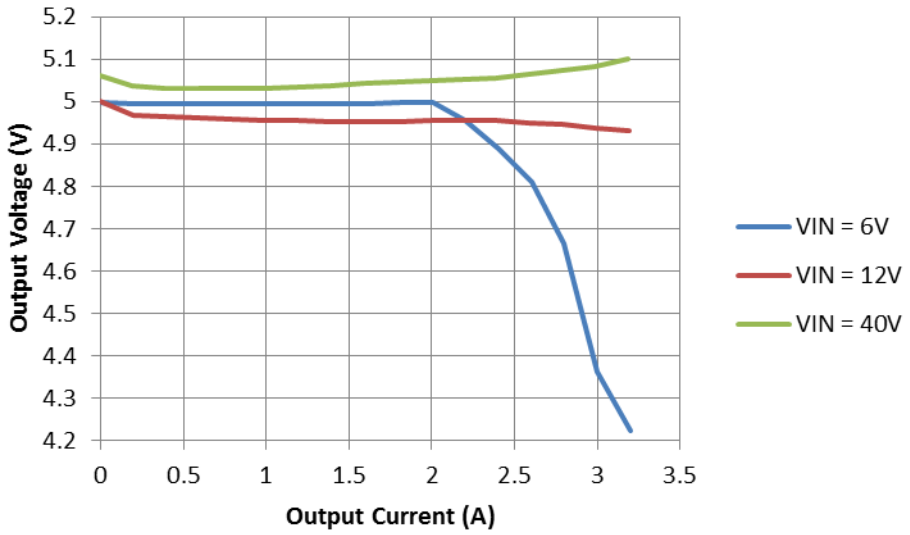

Figure 3. TPS65320EVM Output Voltage Regulation vs Load Current (f_{sw} = 2.1MHz)

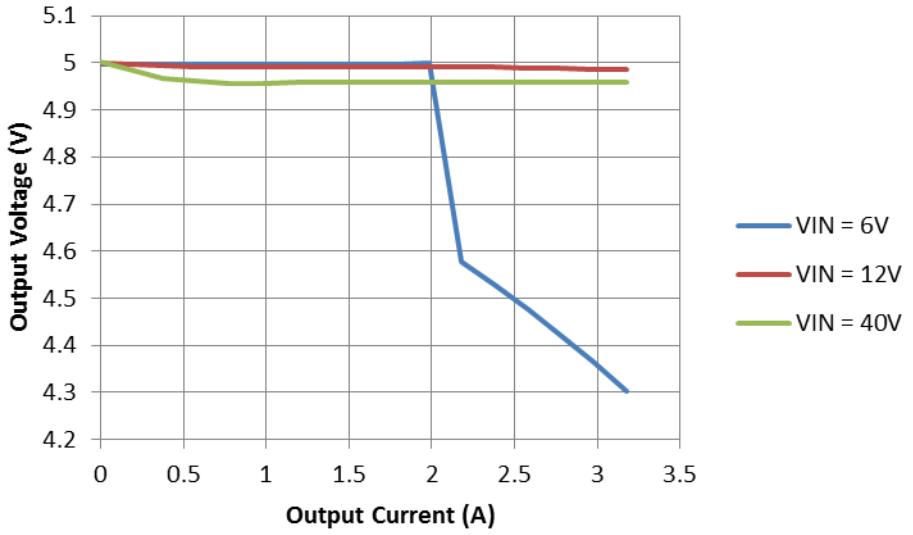

Figure 4. TPS65320EVM Output Voltage Regulation vs Load Current (f_{sw} = 400kHz)

2.3 Start-up

Figure 5 and Figure 6 illustrate the start-up performance for the TPS65320EVM.

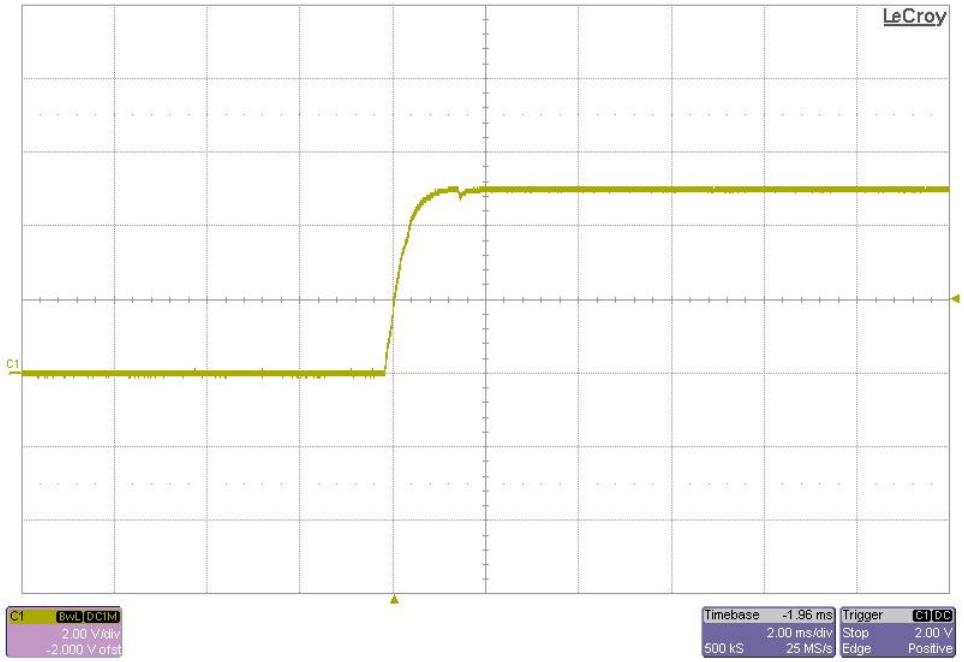

Figure 5. TPS65320EVM Start-up into 2Ω Load (VIN = 12V, C1 = BUCK_VOUT)

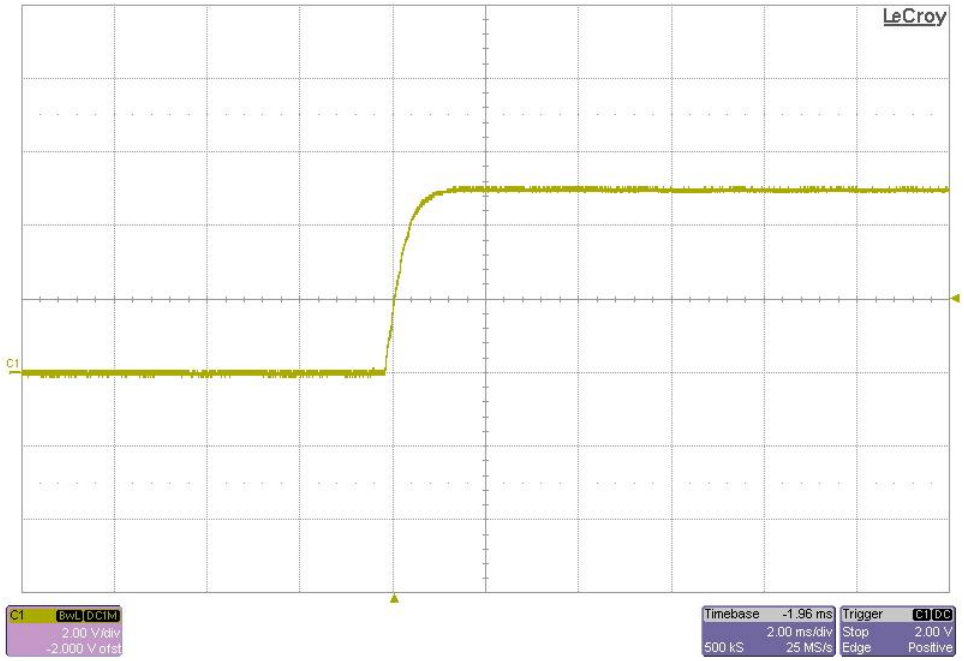

Figure 6. TPS65320EVM Start-up with No Load (VIN = 12V, C1 = BUCK_VOUT)

2.4 Shutdown

Figure 7 illustrates the shutdown behavior for the TPS65320EVM.

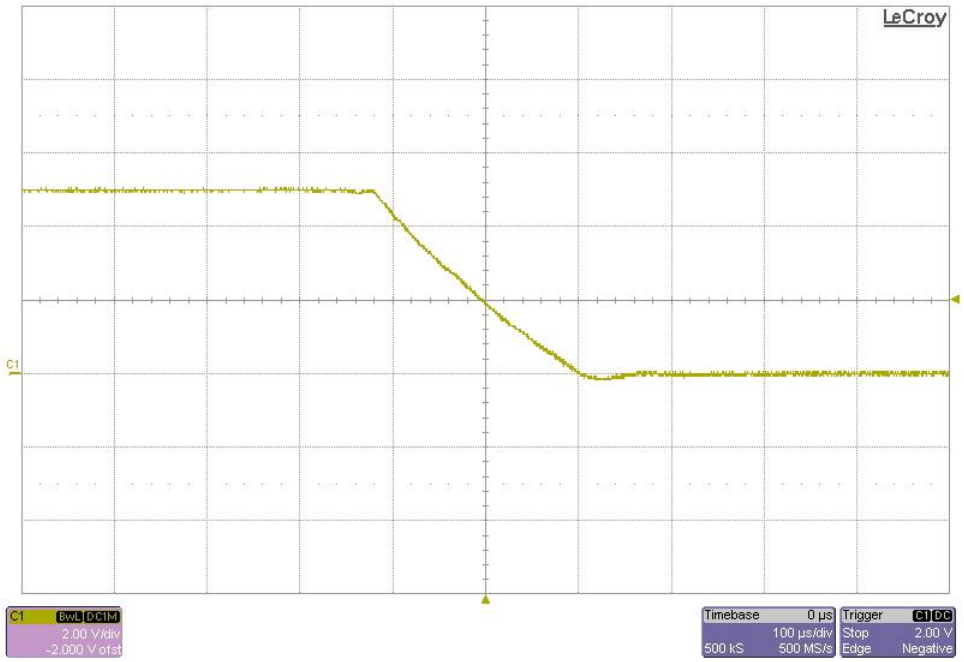

Figure 7. TPS65320EVM Shutdown with 2Ω Load (VIN = 12V, C1 = BUCK_VOUT)

2.5 Output Voltage Ripple

Figure 8 through Figure 11 illustrate the output voltage ripple for the TPS65320EVM.

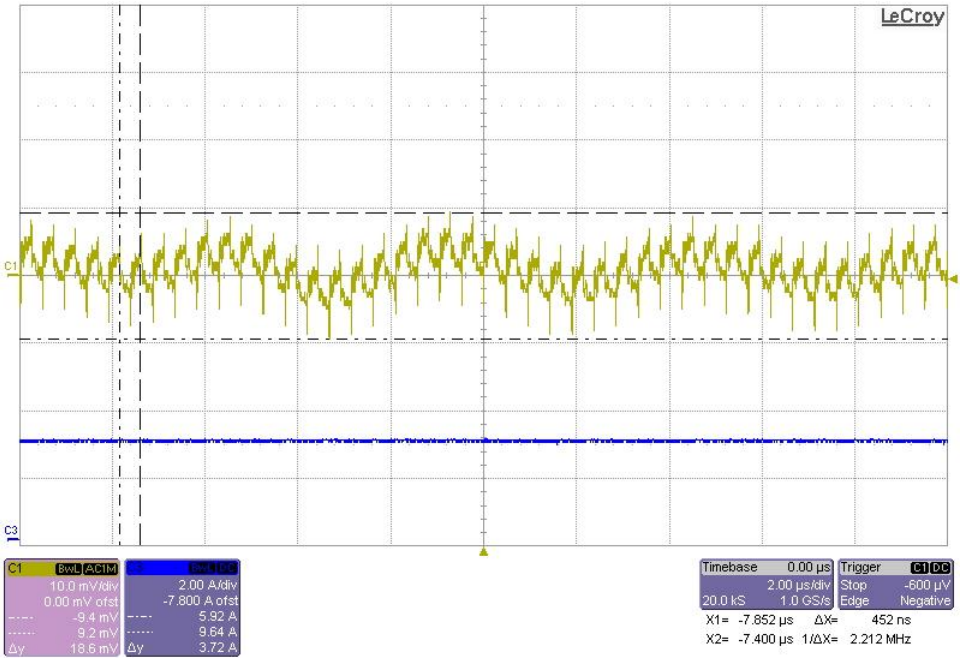

Figure 8. TPS65320EVM AC Coupled Output Voltage Ripple with 3A Load (f_{sw} = 2.1MHz, VIN = 12V, C1 = BUCK_VOUT, C3 = BUCK_IOUT)

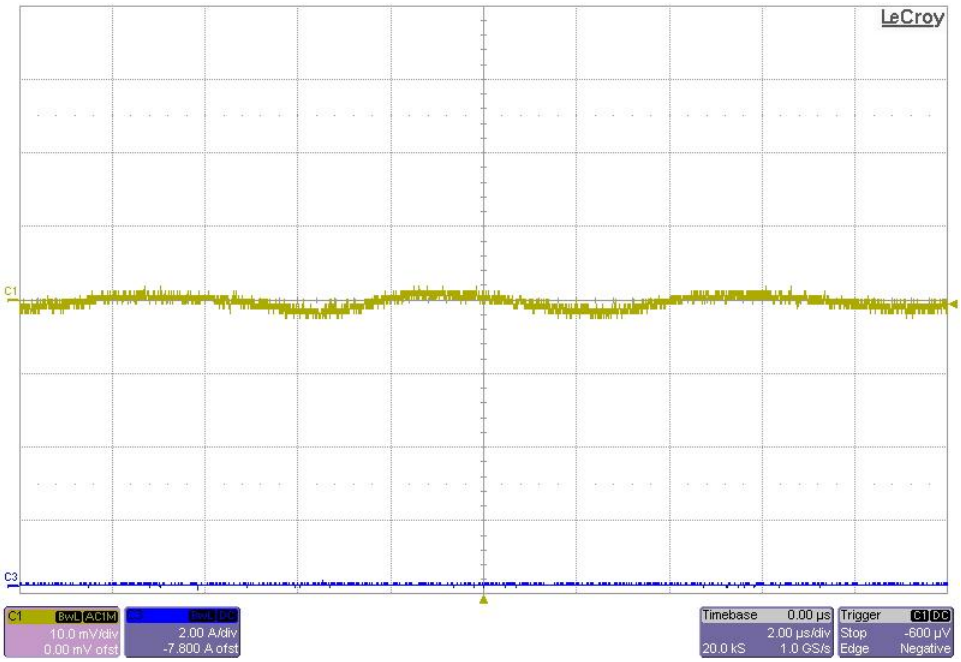

Figure 9. TPS65320EVM AC Coupled Output Voltage Ripple with No Load (f_{sw} = 2.1MHz, VIN = 12V, C1 = BUCK_VOUT, C3 = BUCK_IOUT)

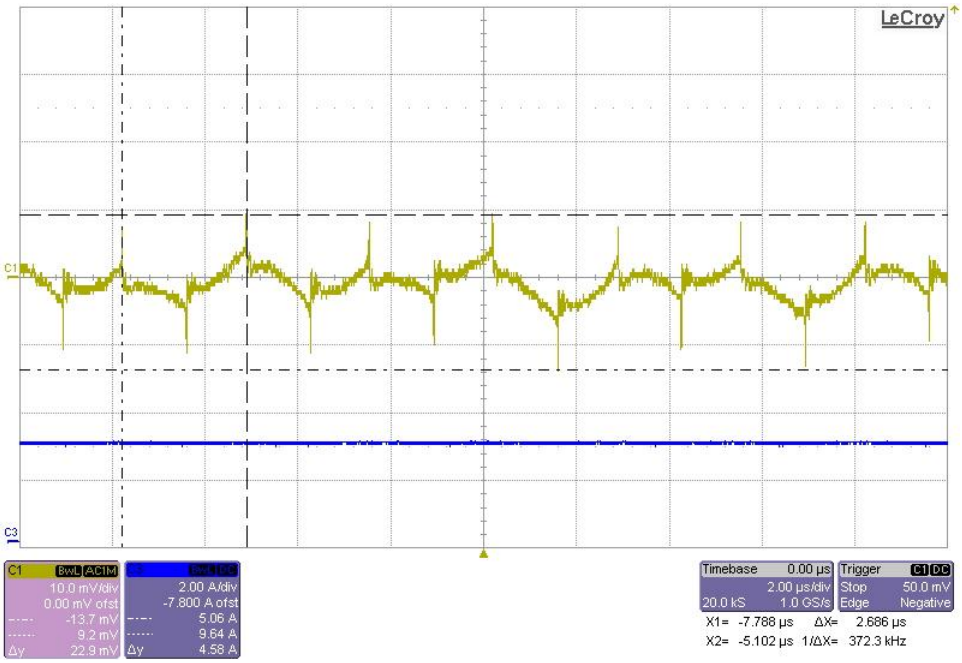

Figure 10. TPS65320EVM AC Coupled Output Voltage Ripple with 3A Load (f_{sw} = 400kHz, VIN = 12V, C1 = BUCK_VOUT, C3 = BUCK_IOUT)

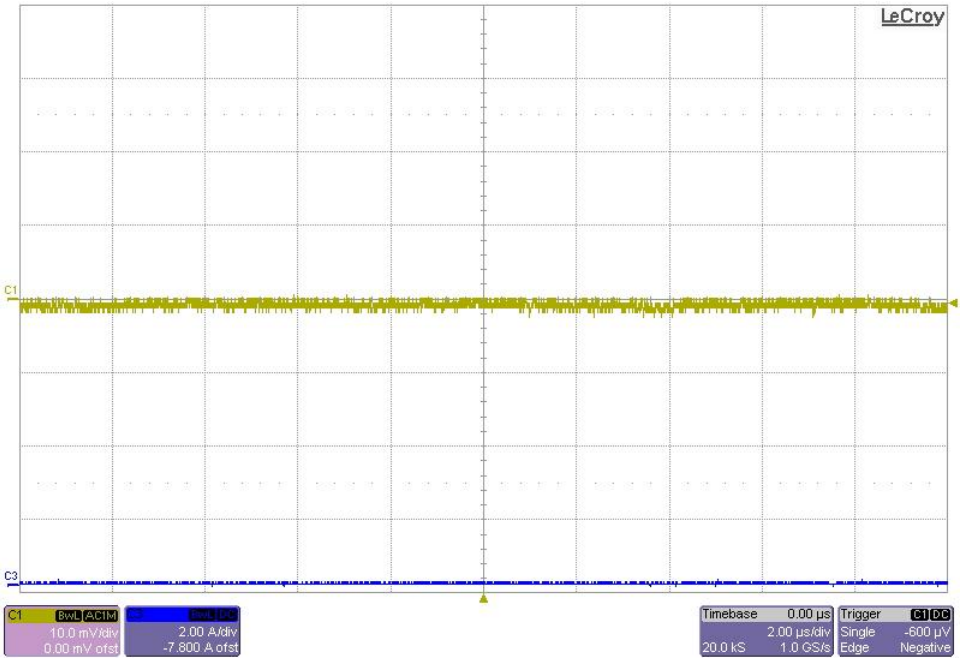

Figure 11. TPS65320EVM AC Coupled Output Voltage Ripple with No Load (f_{sw} = 400kHz, VIN = 12V, C1 = BUCK_VOUT, C3 = BUCK_IOUT)

2.6 Switch Node

Figure 12 and Figure 13 illustrate the switch node performance for the TPS65320EVM.

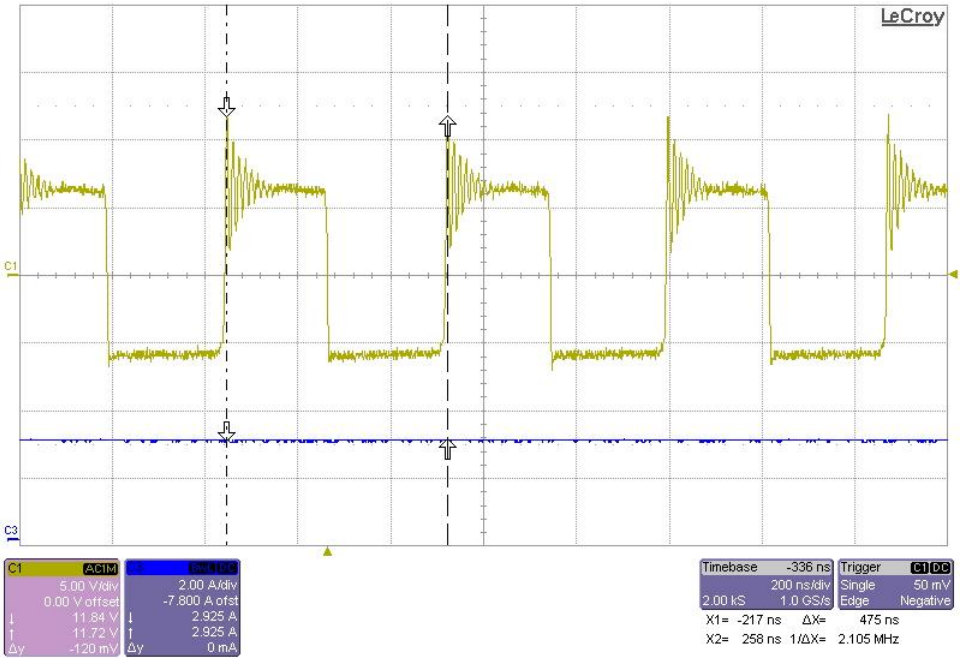

Figure 12. TPS65320EVM AC Coupled Switch Node with 3A Load (f_{sw} = 2.1MHz, VIN = 12V, C1 = BUCK_VSW, C3 = BUCK_IOUT)

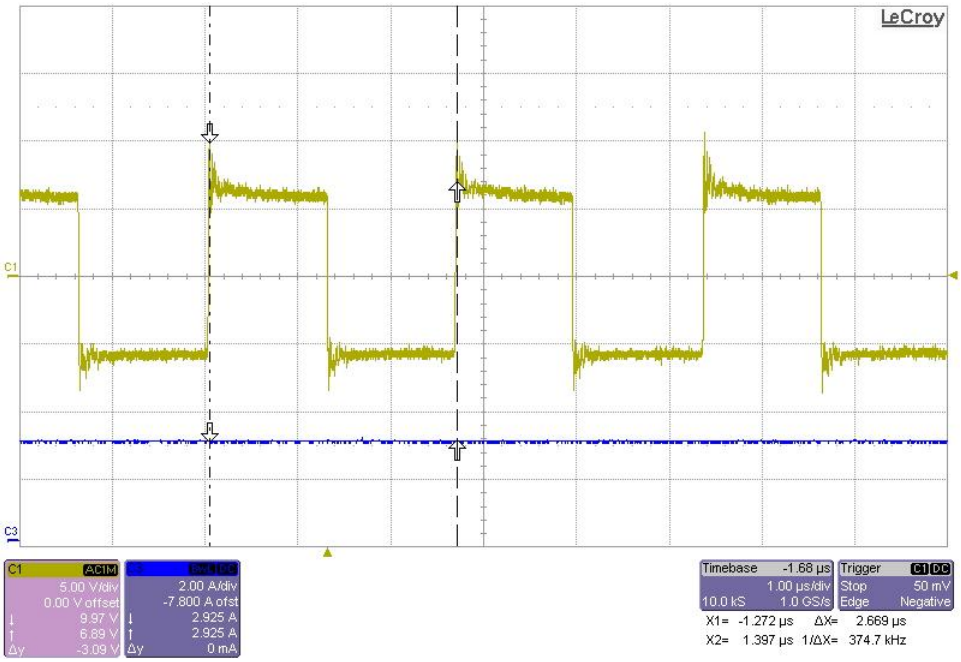

Figure 13. TPS65320EVM AC Coupled Switch Node with 3A Load (f_{sw} = 400kHz, VIN = 12V, C1 = BUCK_VSW, C3 = BUCK_IOUT)

2.7 Control Loop Bode Plot

Figure 14 illustrates TPS65320EVM gain and phase performance versus frequency.

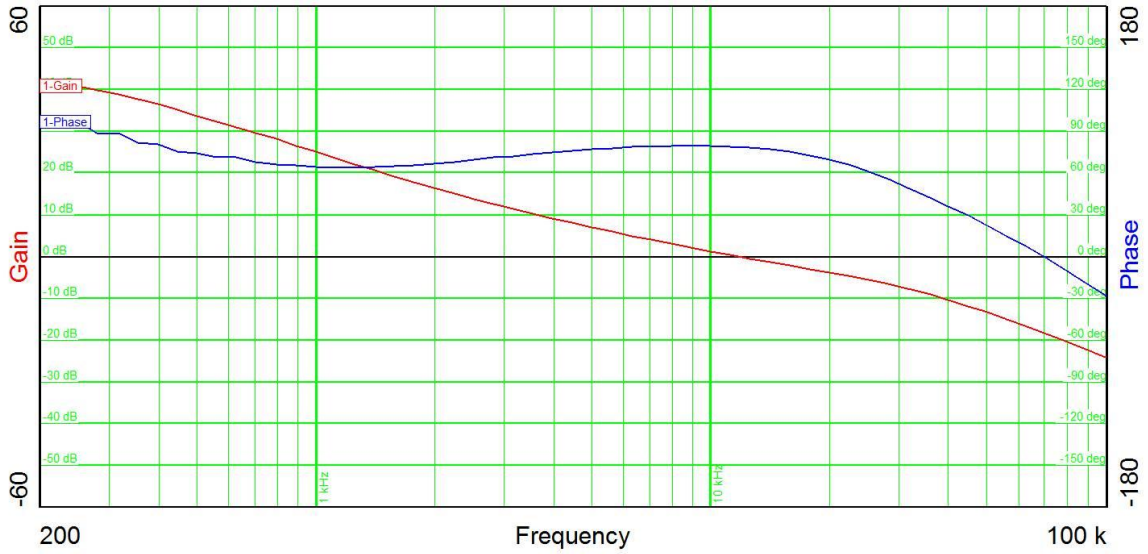

Figure 14. TPS65320EVM Gain and Phase vs Frequency

2.8 Transient Performance

Figure 15 and Figure 16 illustrate the load transient response for the TPS65320EVM.

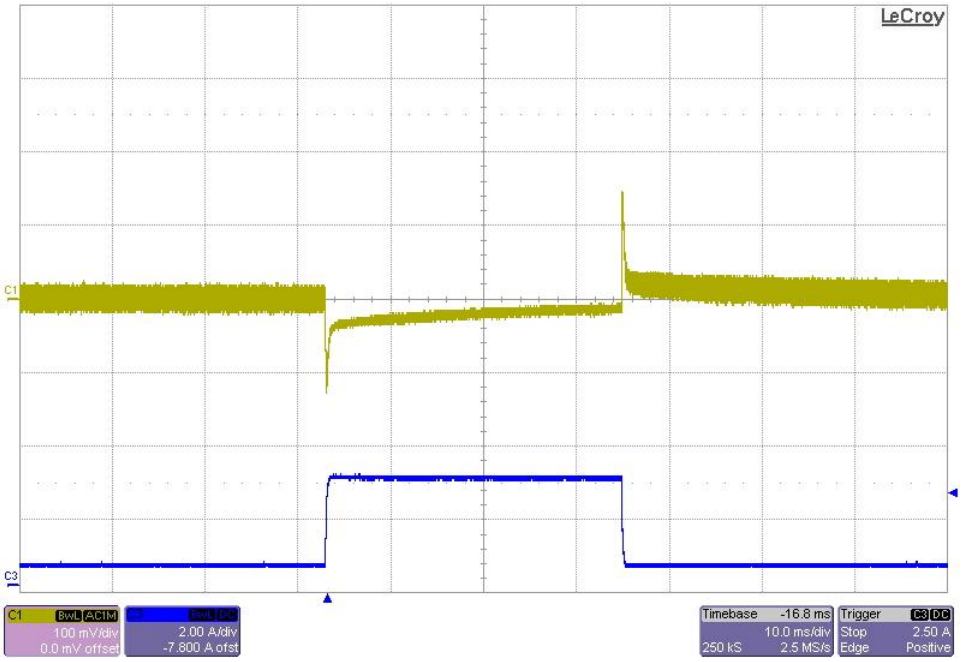

Figure 15. TPS65320EVM AC Coupled Output Voltage Transient Response with 500mA to 3A Load Step (f_{sw} = 2.1MHz, VIN = 12V, C1 = BUCK_VOUT, C3 = BUCK_IOUT)

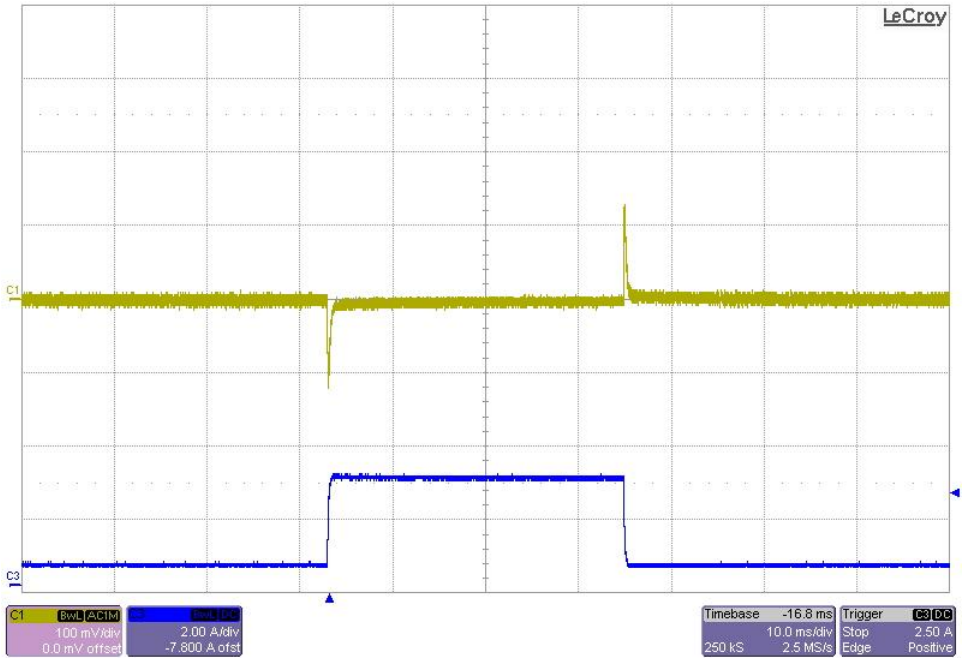

Figure 16. TPS65320EVM AC Coupled Output Voltage Transient Response with 500mA to 3A Load Step (f_{sw} = 400kHz, VIN = 12V, C1 = BUCK_VOUT, C3 = BUCK_IOUT)

2.9 Thermal Image

Figure 17 illustrates a thermal image of the TPS65320EVM.

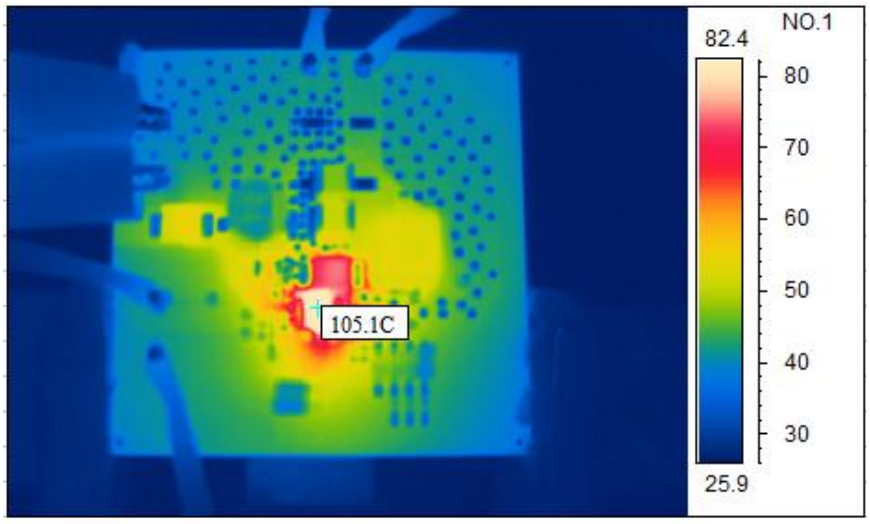

Figure 17. TPS65320EVM Thermal Image with 3A DC/DC Load and 250mA LDO Load (f_{sw} = 2.1MHz, VIN = 12V)

3 TLV62065EVM-719 Test Data

Figure 18 through Figure 32 present performance data for the TLV62065EVM-719. Actual performance data can be affected by measurement techniques and environmental variables. Therefore, the following data is presented for reference and may differ from actual results obtained by some users.

3.1 Efficiency

Figure 18 and Figure 19 illustrate the efficiency performance for the TLV62065EVM-719.

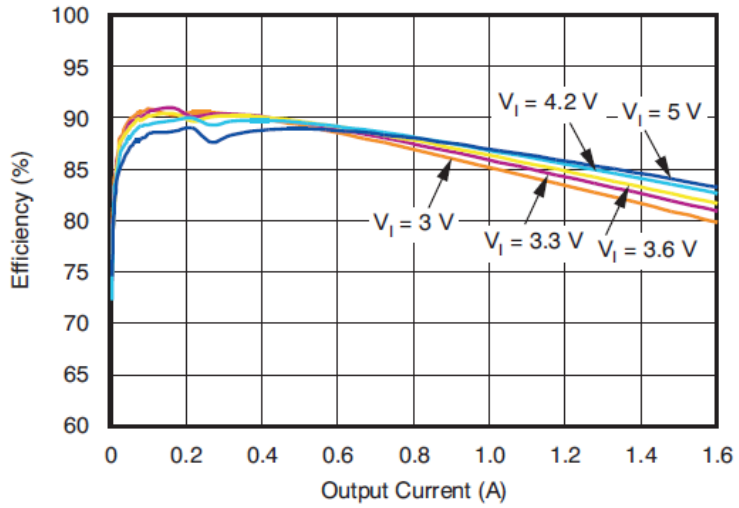

Figure 18. TLV62065EVM-719 Efficiency vs Load Current (Auto PWM/PFM Mode)

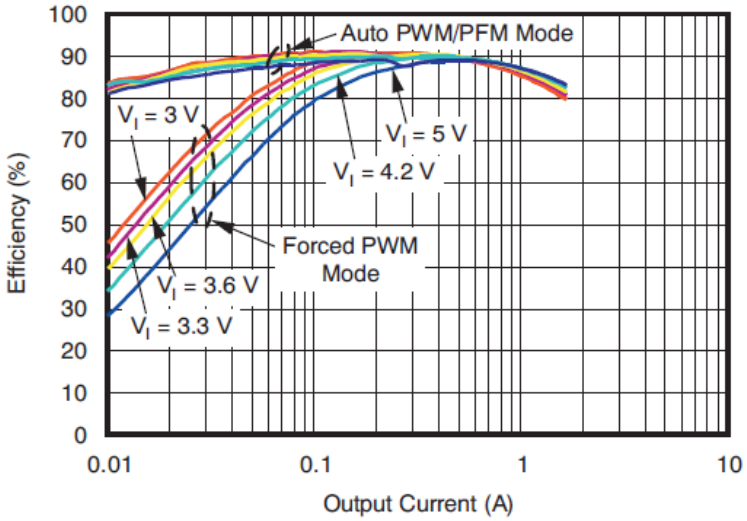

Figure 19. TLV62065EVM-719 Efficiency vs Load Current

3.2 Start-up

Figure 20 and Figure 21 illustrate the start-up performance for the TLV62065EVM-719.

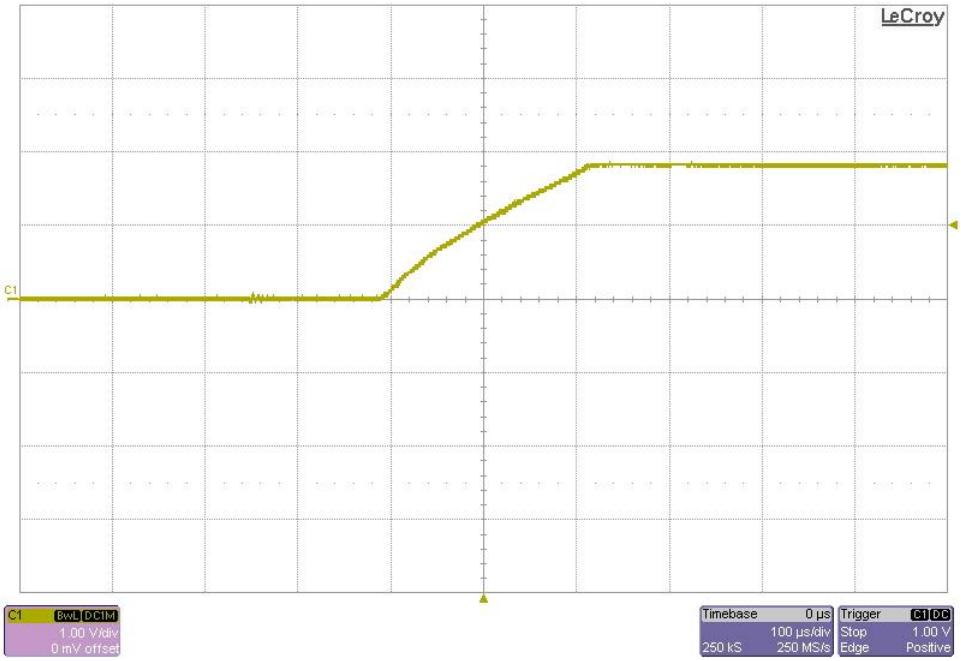

Figure 20. TLV62065EVM-719 Start-up into 2Ω Load (VIN = 5V, C1 = VOUT)

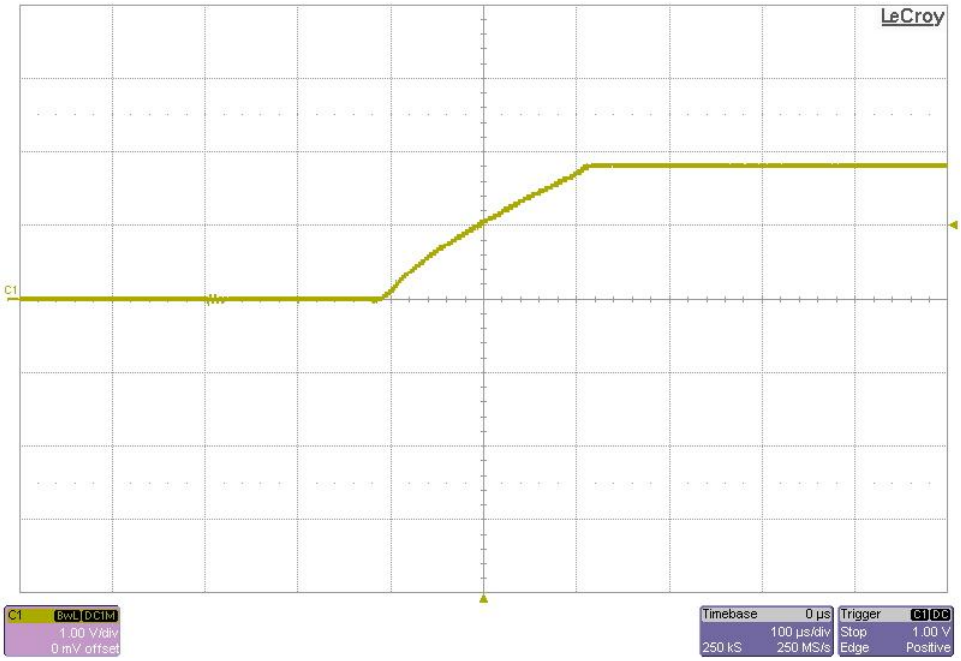

Figure 21. TLV62065EVM-719 Start-up with No Load (VIN = 5V, C1 = VOUT)

3.3 Shutdown

Figure 22 illustrates the shutdown behavior for the TLV62065EVM-719.

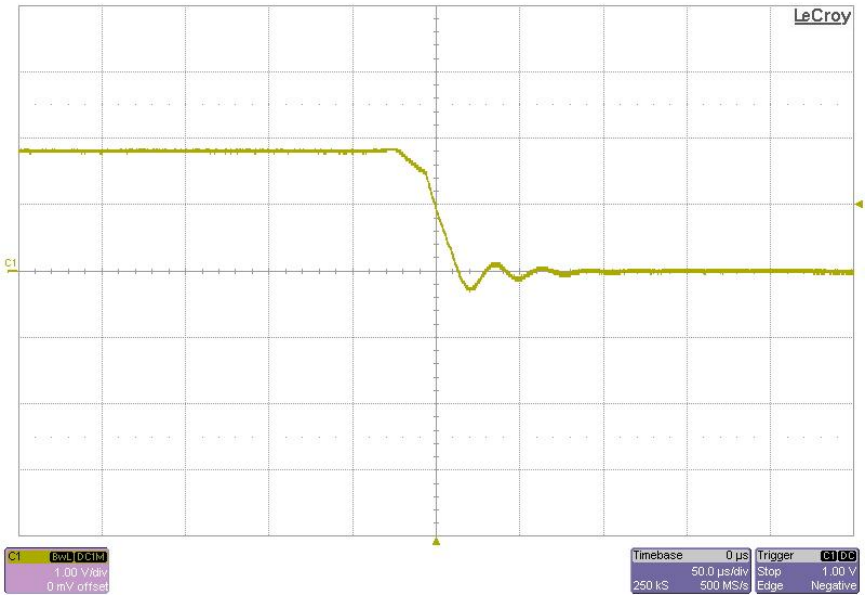

Figure 22. TLV62065EVM-719 Shutdown with 2Ω Load (VIN = 5V, C1 = VOUT)

3.4 Output Voltage Ripple

Figure 23 through Figure 26 illustrate the output voltage ripple for the TLV62065EVM-719.

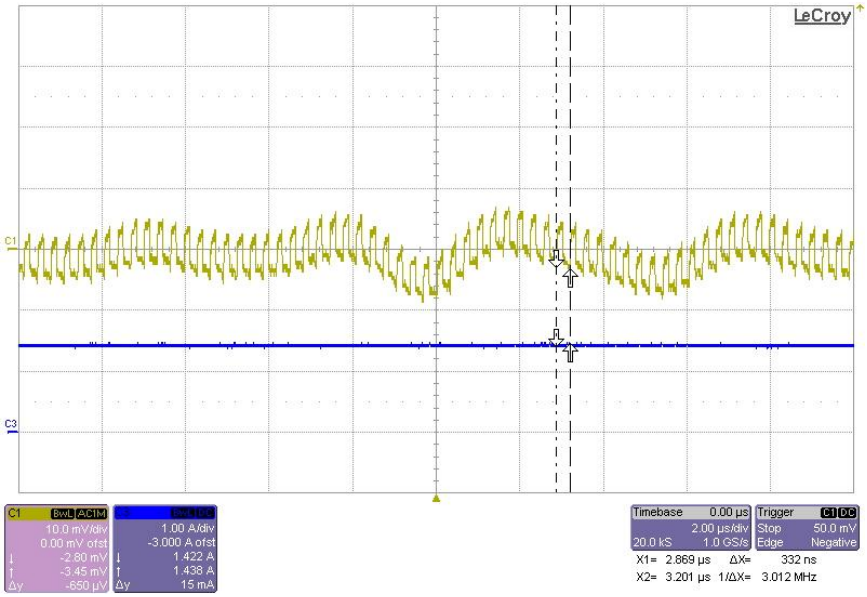

Figure 23. TLV62065EVM-719 AC Coupled Output Voltage Ripple with 1.5A Load (Forced PWM Mode, VIN = 5V, C1 = VOUT, C3 = IOUT)

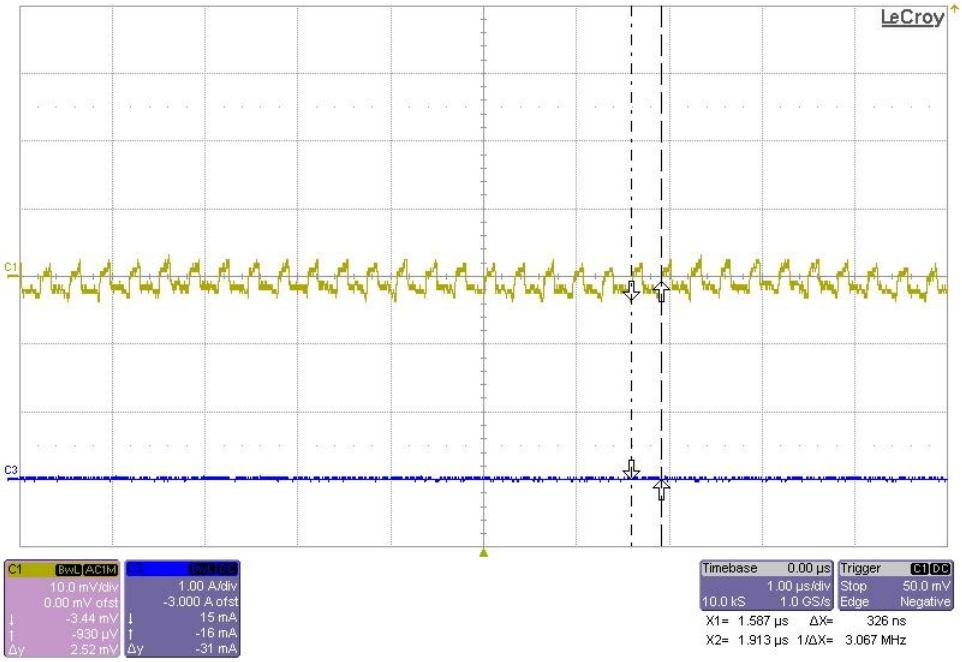

Figure 24. TLV62065EVM-719 AC Coupled Output Voltage Ripple with No Load (Forced PWM Mode, VIN = 5V, C1 = VOUT, C3 = IOUT)

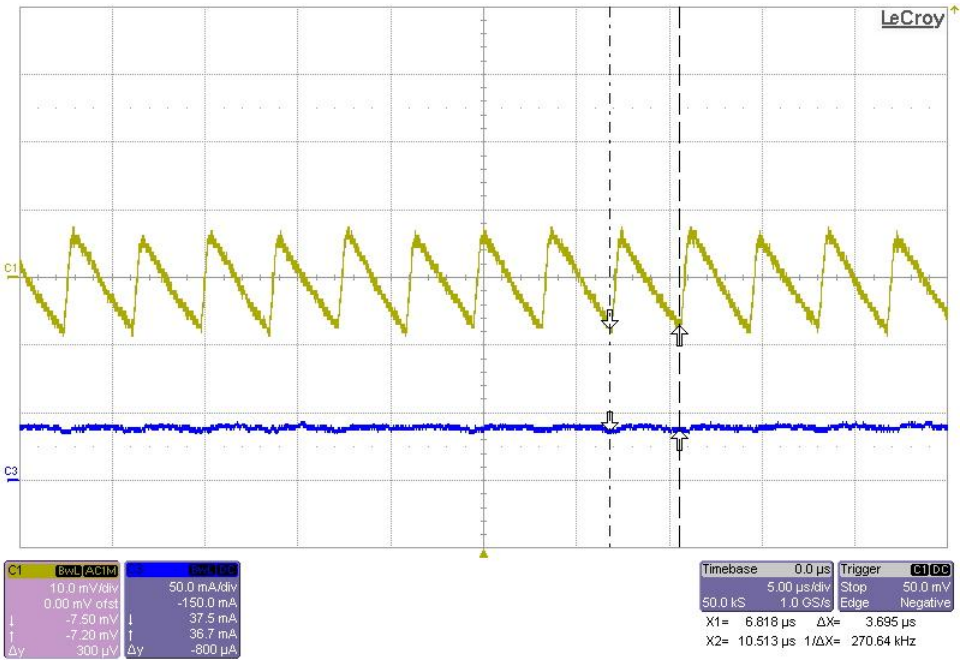

Figure 25. TLV62065EVM-719 AC Coupled Output Voltage Ripple with 30mA Load (Auto PWM/PFM Mode, VIN = 5V, C1 = VOUT, C3 = IOUT)

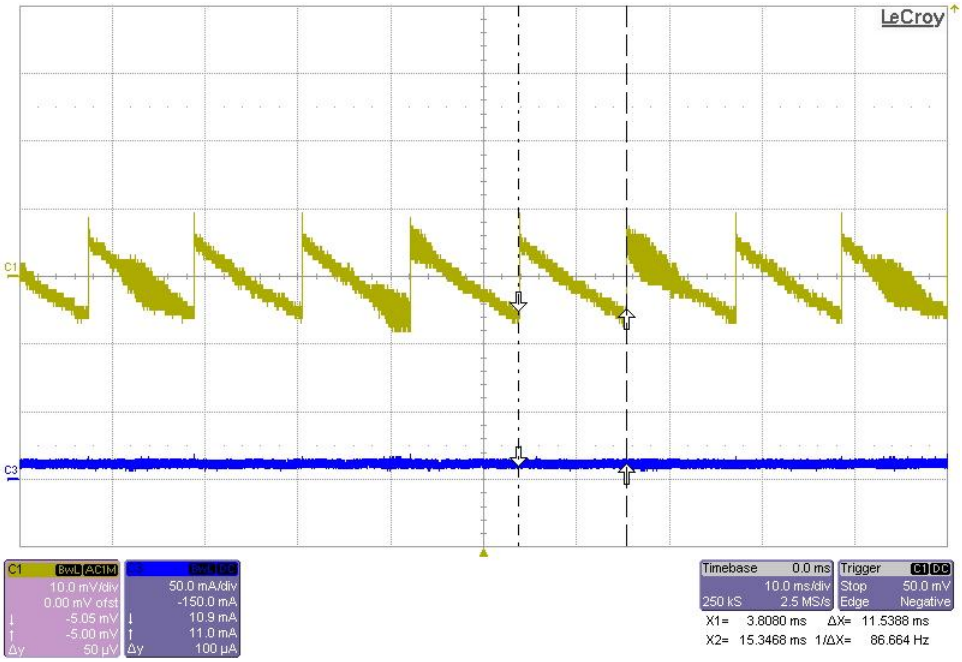

Figure 26. TLV62065EVM-719 AC Coupled Output Voltage Ripple with No Load (Auto PWM/PFM Mode, VIN = 5V, C1 = VOUT, C3 = IOUT)

3.5 Switch Node

Figure 27 and Figure 28 illustrate the switch node performance for the TLV62065EVM-719.

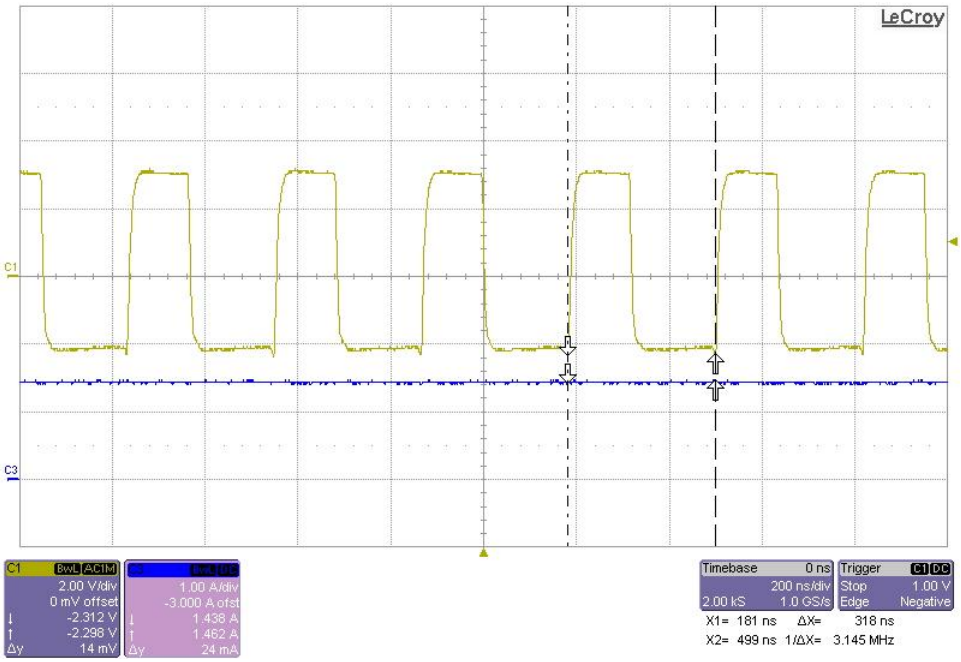

Figure 27. TLV62065EVM-719 AC Coupled Switch Node with 1.5A Load (Forced PWM Mode, VIN = 5V, C1 = VSW, C3 = IOUT)

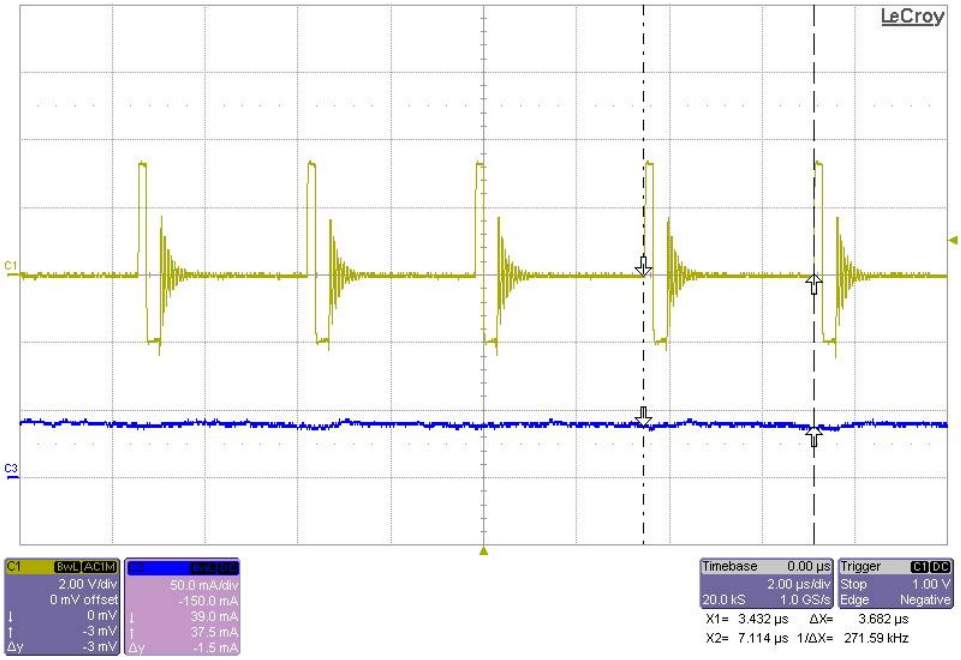

Figure 28. TLV62065EVM-719 AC Coupled Switch Node with 30mA Load (Auto PWM/PFM Mode, VIN = 5V, C1 = VSW, C3 = IOUT)

3.6 Control Loop Bode Plots

Figure 29 illustrates TLV62065EVM-719 gain and phase performance versus frequency.

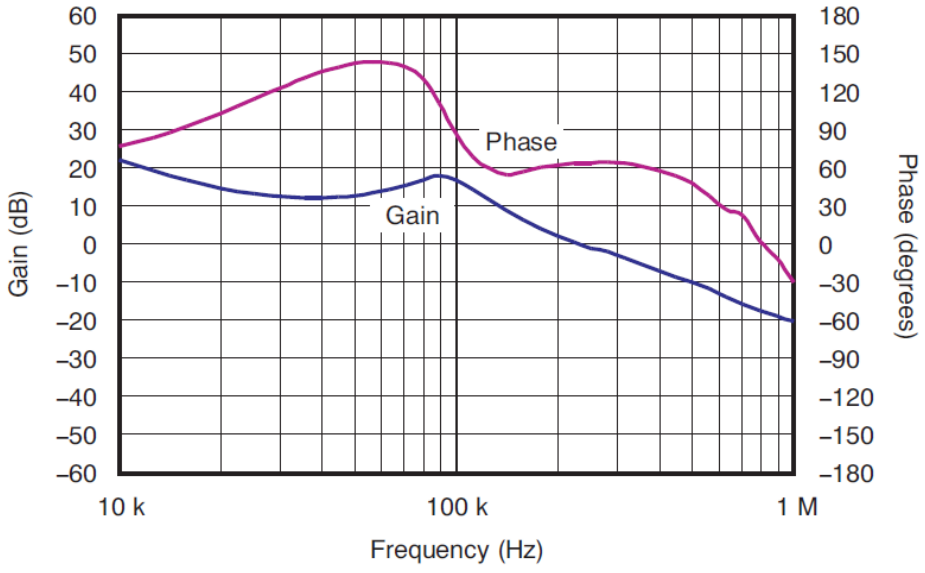

Figure 29. TLV62065EVM-719 Gain and Phase vs Frequency

3.7 Transient Performance

Figure 30 and Figure 31 illustrate the load transient response for the TLV62065EVM-719.

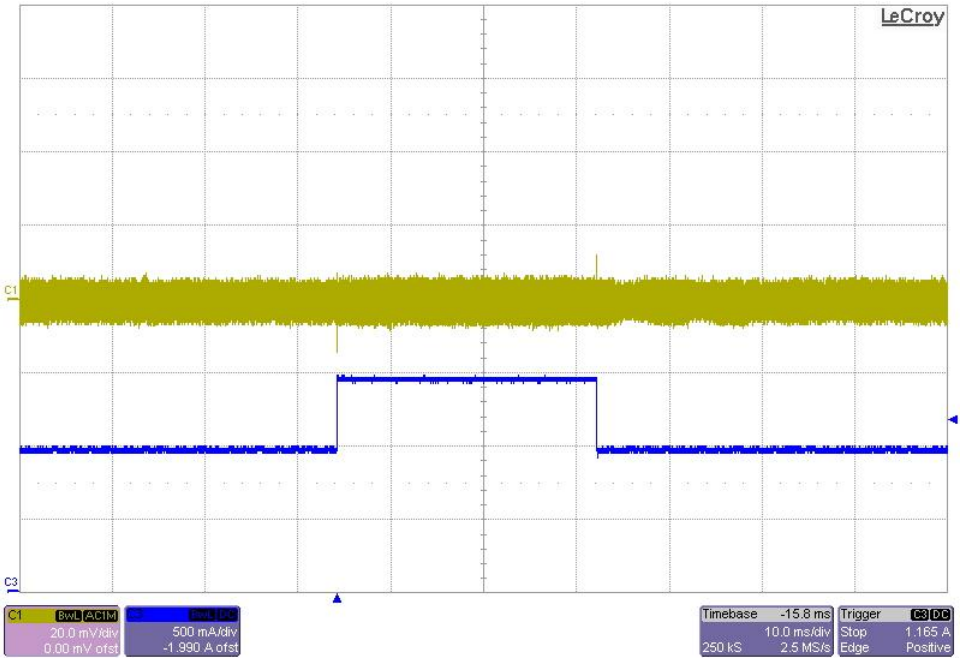

Figure 30. TLV62065EVM-719 AC Coupled Output Voltage Transient Response with 1A to 1.5A Load Step (Forced PWM Mode, VIN = 5V, C1 = VOUT, C3 = IOUT)

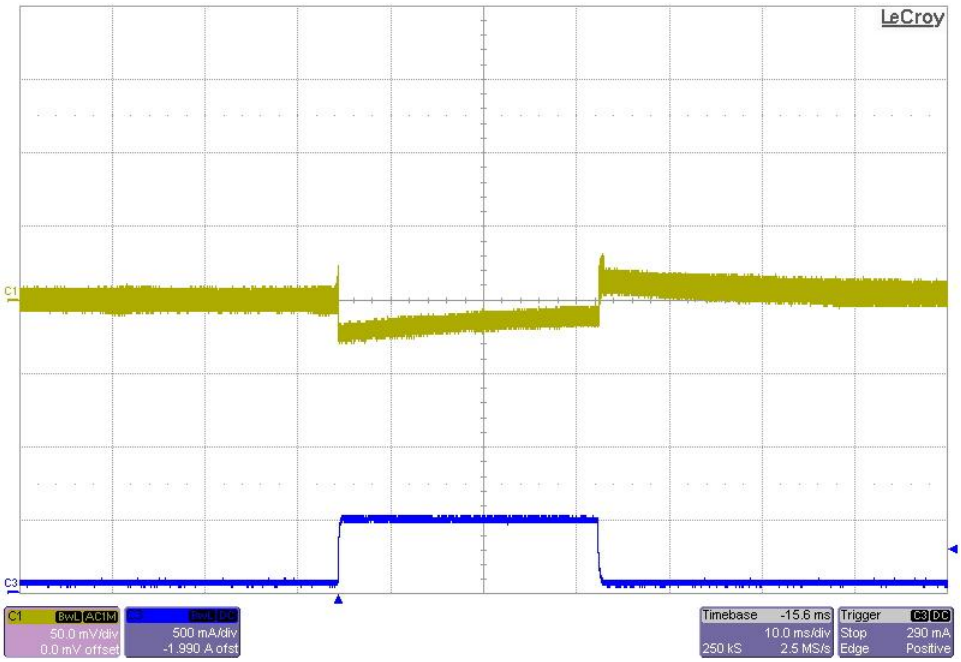

Figure 31. TLV62065EVM-719 AC Coupled Output Voltage Transient Response with 30mA to 500mA Load Step (Auto PWM/PFM Mode, VIN = 5V, C1 = VOUT, C3 = IOUT)

3.8 Thermal Image

Figure 32 illustrates a thermal image of the TLV62065EVM-719.

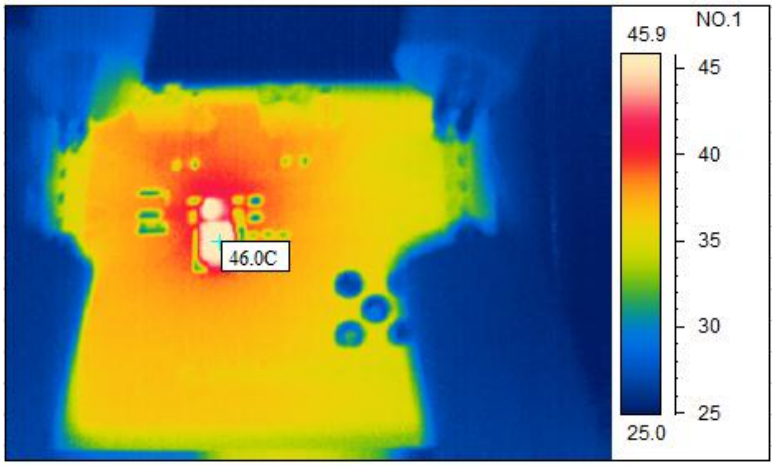

Figure 32. TLV62065EVM-719 Thermal Image with 2A Load (VIN = 5V)

4 LP2998EVAL Test Data

Figure 33 and Figure 34 present performance data for the LP2998EVAL. Actual performance data can be affected by measurement techniques and environmental variables. Therefore, the following data is presented for reference and may differ from actual results obtained by some users.

4.1 Start-up

Figure 33 illustrates the start-up performance for the LP2998EVAL. Start-up assumes high-impedance at the termination point of DDR memory. Termination regulators will typically sink/source current while data is being transmitted and not while the data lines are idle.

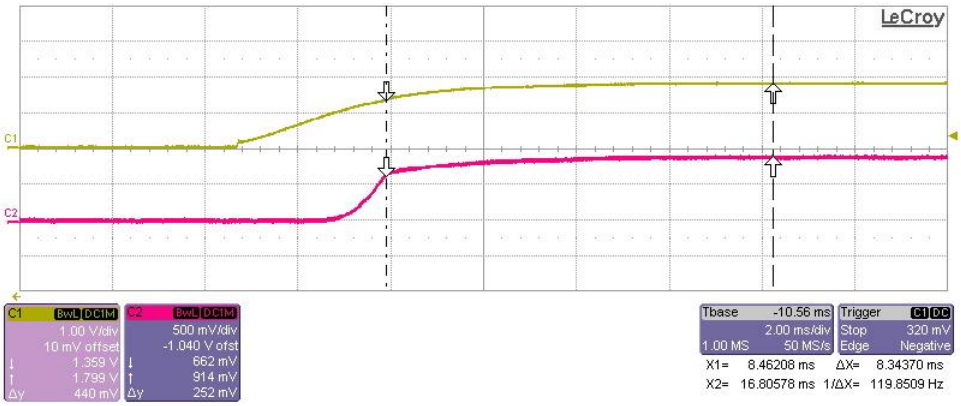

Figure 33. LP2998EVAL Start-up with No Load (AVIN = 3.3V, PVIN = 1.8V, VDDQ = 1.8V, VS connected to VTT, C1 = VDDQ, C2 = VTT)

4.2 Thermal Image

Figure 34 illustrates a thermal image of the LP2998EVAL. The thermal image shown represents a condition during continuous data transmission when the LP2998 is used to terminate multiple DDR data lines.

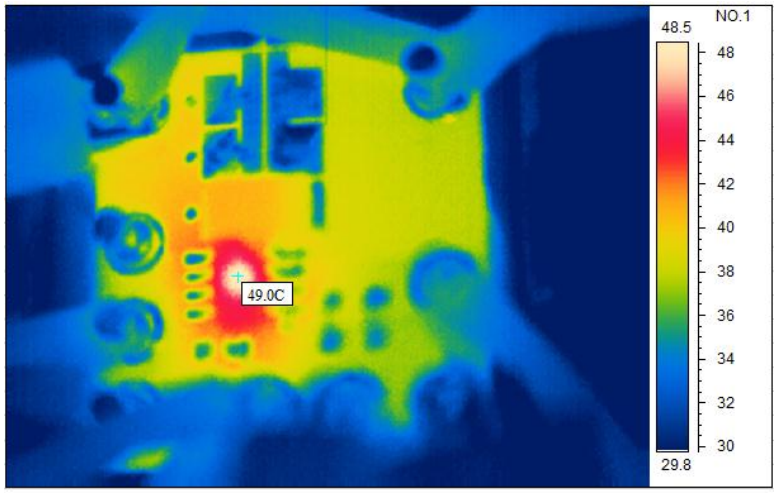

Figure 34. LP2998EVAL Thermal Image with 750mA Load (AVIN = 3.3V, PVIN = 1.8V, VDDQ = 1.8V, VS connected to VTT)

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