

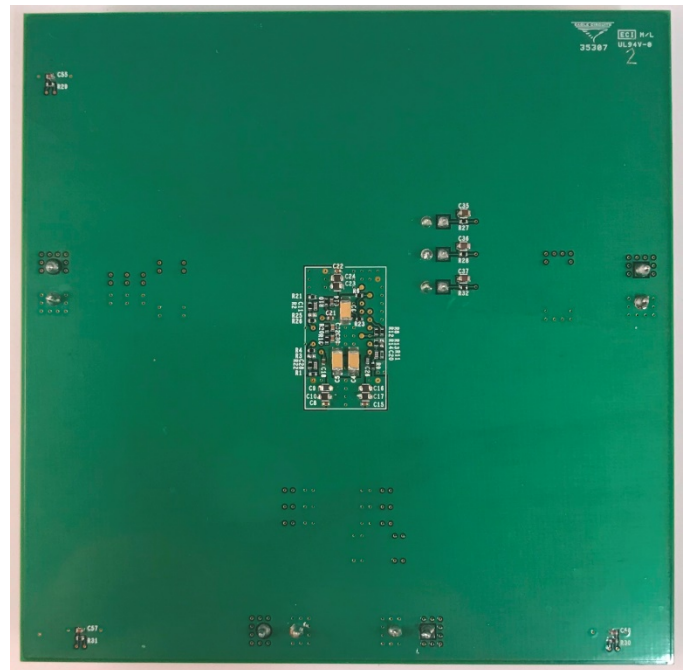
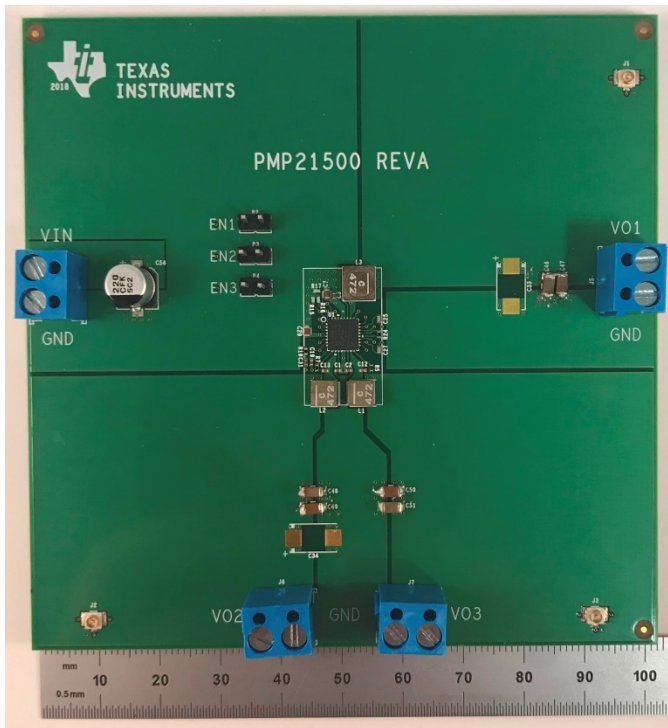
Test Report: PMP21500

A compact, triple output 3-A/2-A/2-A buck regulator reference design



Description

This reference design is a triple output 3A/2A/2A point-of-load converter in a tiny 0.5"x0.875" (12.7mmx22.2mm) solution size. TPS65261-1 fully integrates three 3A/2A/2A buck regulators into a small 5mmx5mm QFN package. It features dedicated enable and soft-start pins. The layout is size-optimized. It is a triple output building block for size-constrained applications.



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1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1. Voltage and Current Requirements

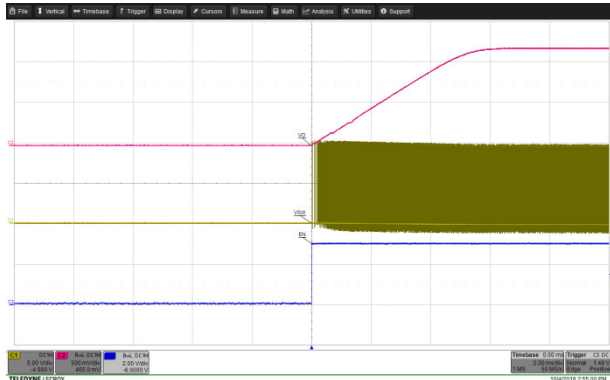
PARAMETER	SPECIFICATIONS
Input voltage, V_{in}	7V~14V
Output Voltage, V_{o1}	1.2V/3A
Output Voltage, V_{o2}	1.8V/2A
Output Voltage, V_{o3}	2.5V/2A

1.2 Required Equipment*

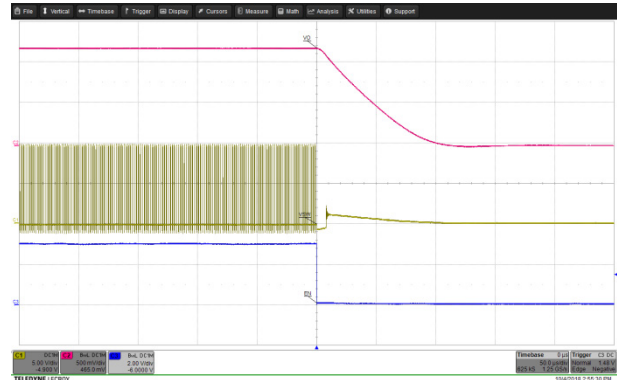
- Power Supply, 0~20V, 0~2A
- 3A Load 1
- 2A Load 2
- 2A Load 3

2 VOUT1=1.2V

2.1 Startup and shutdown

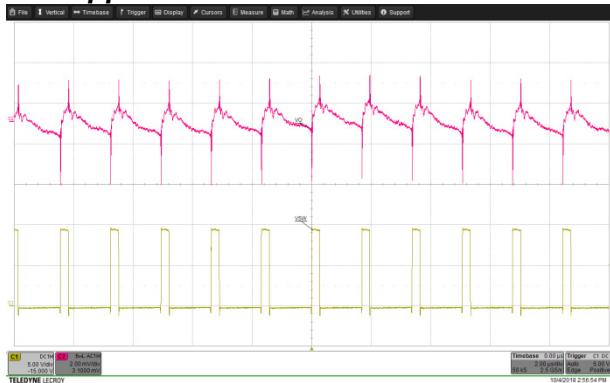


Turn-on, 10Vin, 1.2Vout1

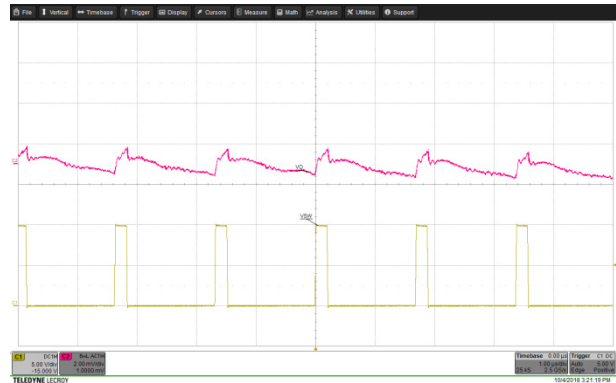


Turn-off, 10Vin, 1.2Vout1

2.2 Ripple

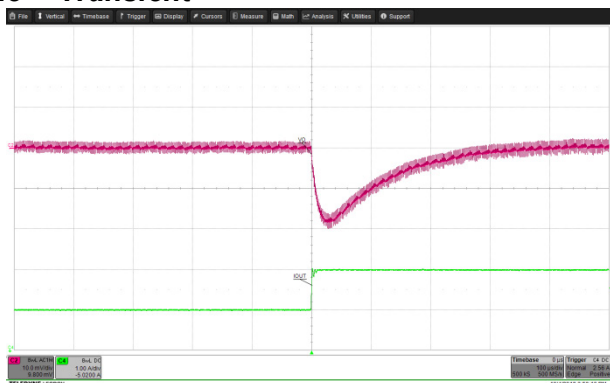


10Vin, 1.2Vout1, 3A Load

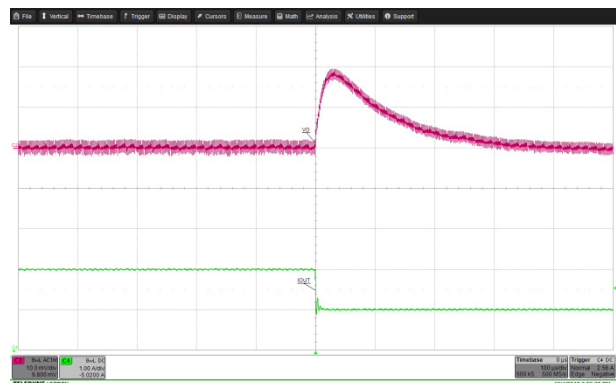


10Vin, 1.2Vout1, 0A Load

2.3 Transient

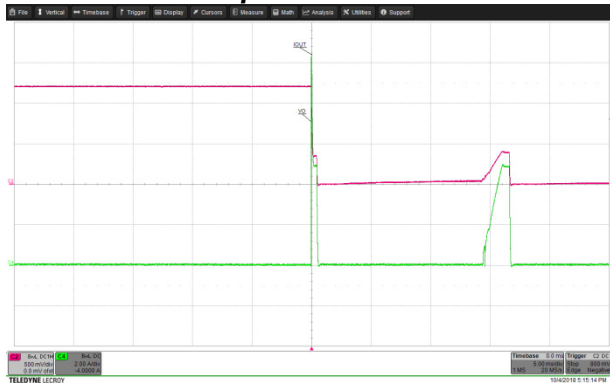


10Vin, 1.2Vout1, 2A to 3A Load Step (1x470uF, 2.5V, 4.5mohm+2x100uF,6.3V,1206)

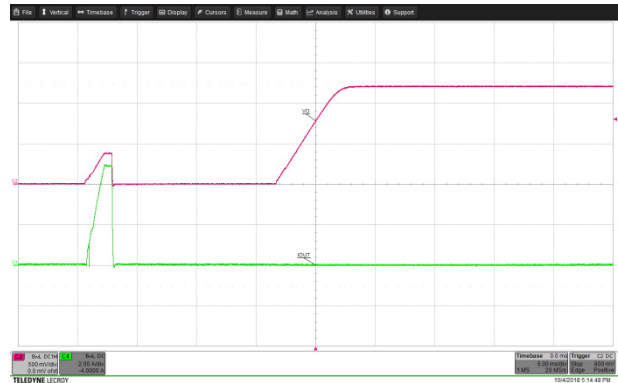


10Vin, 1.2Vout1, 3A to 2A Load Step (1x470uF, 2.5V, 4.5mohm+2x100uF,6.3V,1206)

2.4 Short-circuit protection

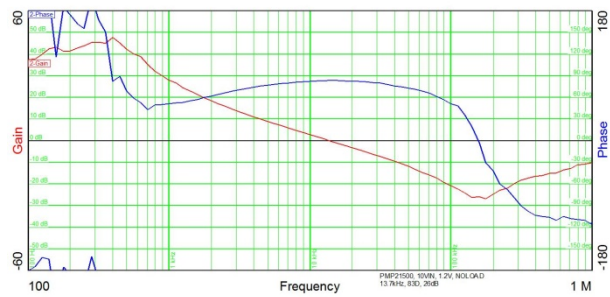


10Vin, 1.2Vout1, Short circuit applied

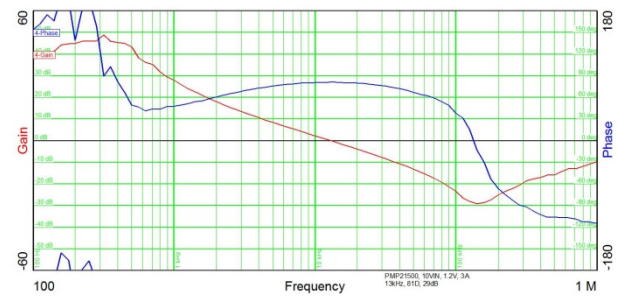


10Vin, 1.2Vout1, Short circuit released

2.5 Bode Plot

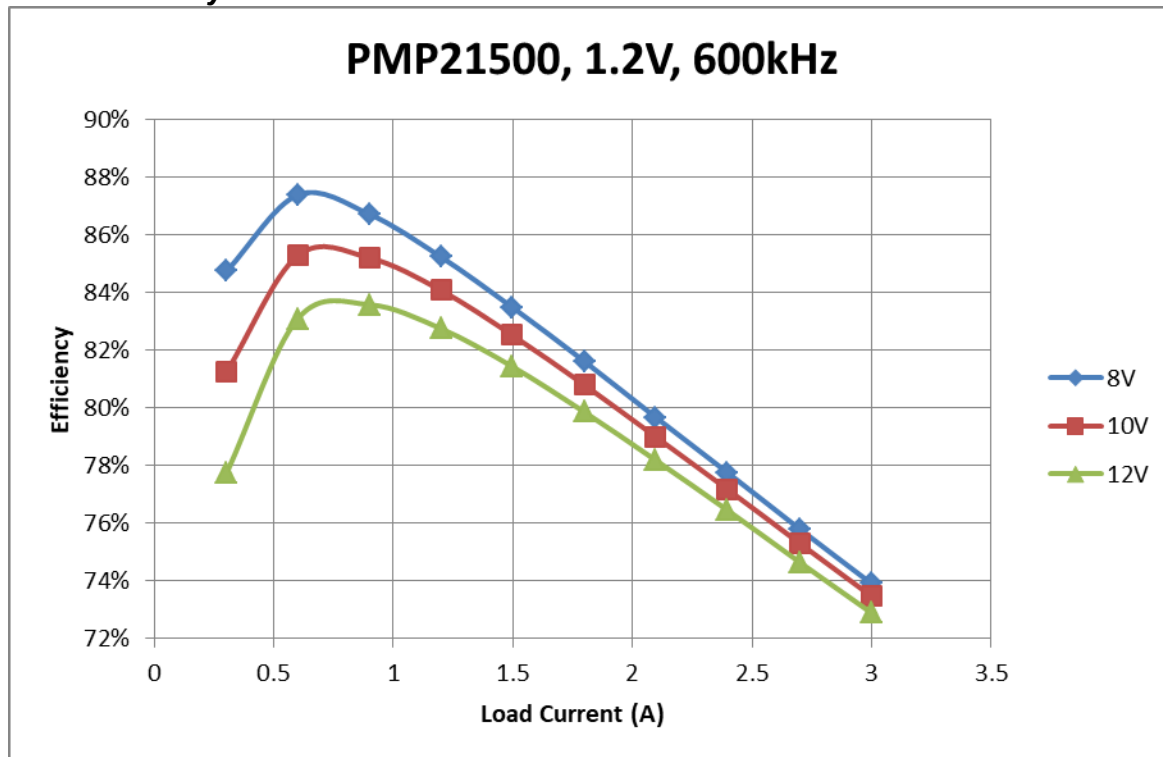


10Vin, 1.2Vout1, No Load, BW=13.7kHz, PM=83deg, GM=26dB



10Vin, 1.2Vout1, 3A Load, BW=13kHz, PM=81deg, GM=29dB

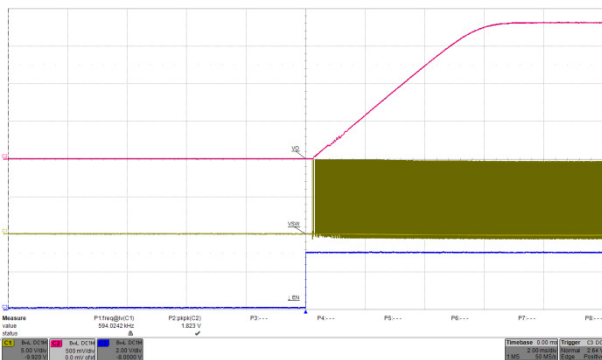
2.6 Efficiency



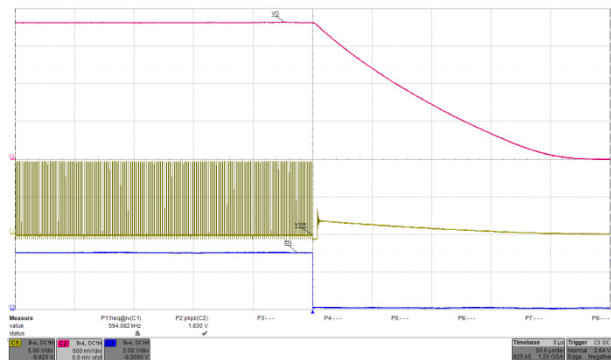
Test conditions: 1.2Vout1, 600 kHz, XAL5030-472.

3 VOUT2=1.8V

3.1 Startup and shutdown

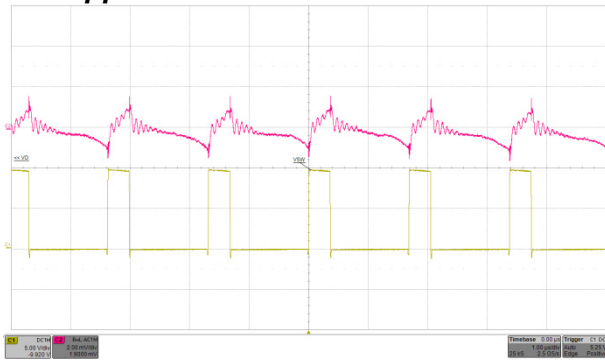


Turn-on, 10Vin, 1.8Vout2

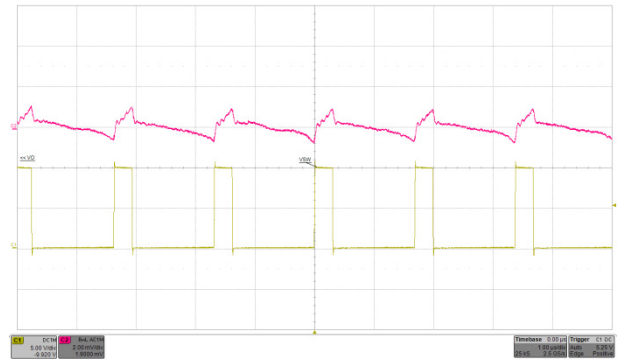


Turn-off, 10Vin, 1.8Vout2

3.2 Ripple

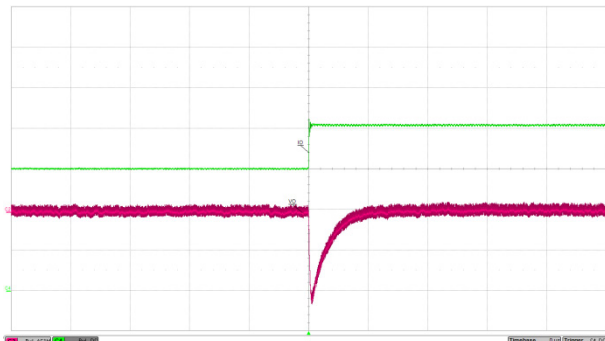


10Vin, 1.8Vout2, 2A Load

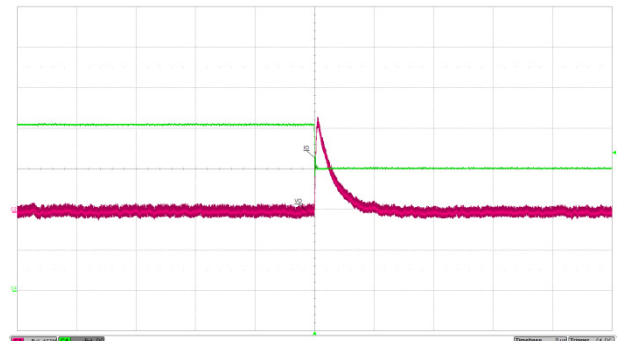


10Vin, 1.8Vout2, 0A Load

3.3 Transient

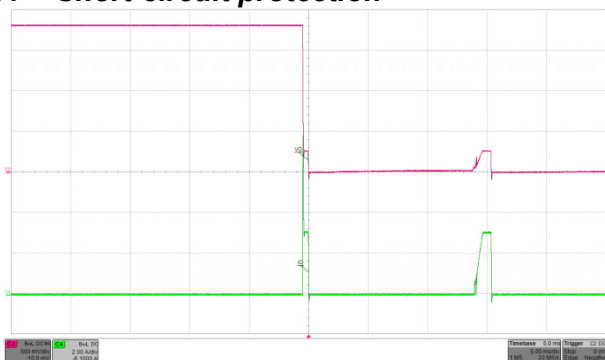


10Vin, 1.8Vout2, 1.5A to 2A Load Step (2x100uF,6.3V,1206)

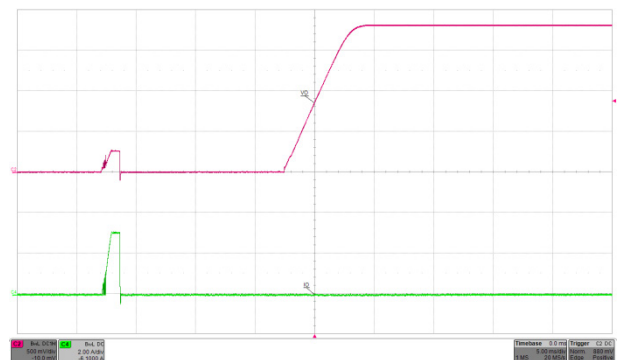


10Vin, 1.8Vout2, 2A to 1.5A Load Step (2x100uF,6.3V,1206)

3.4 Short-circuit protection

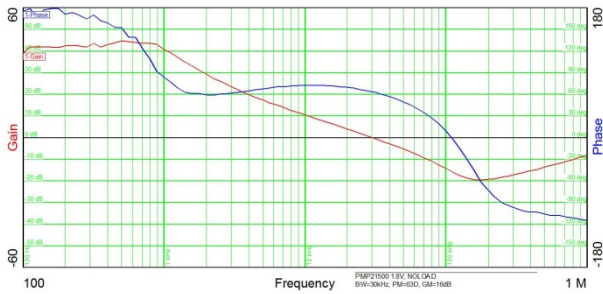


10Vin, 1.8Vout2, Short circuit applied

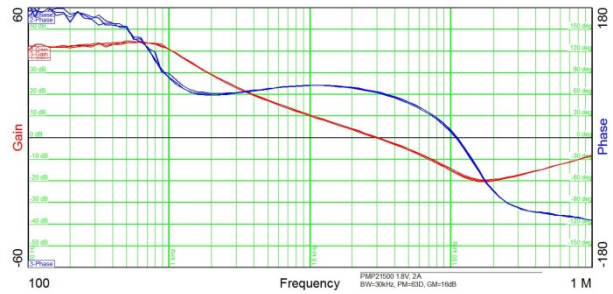


10Vin, 1.8Vout2, Short circuit released

3.5 Bode Plot

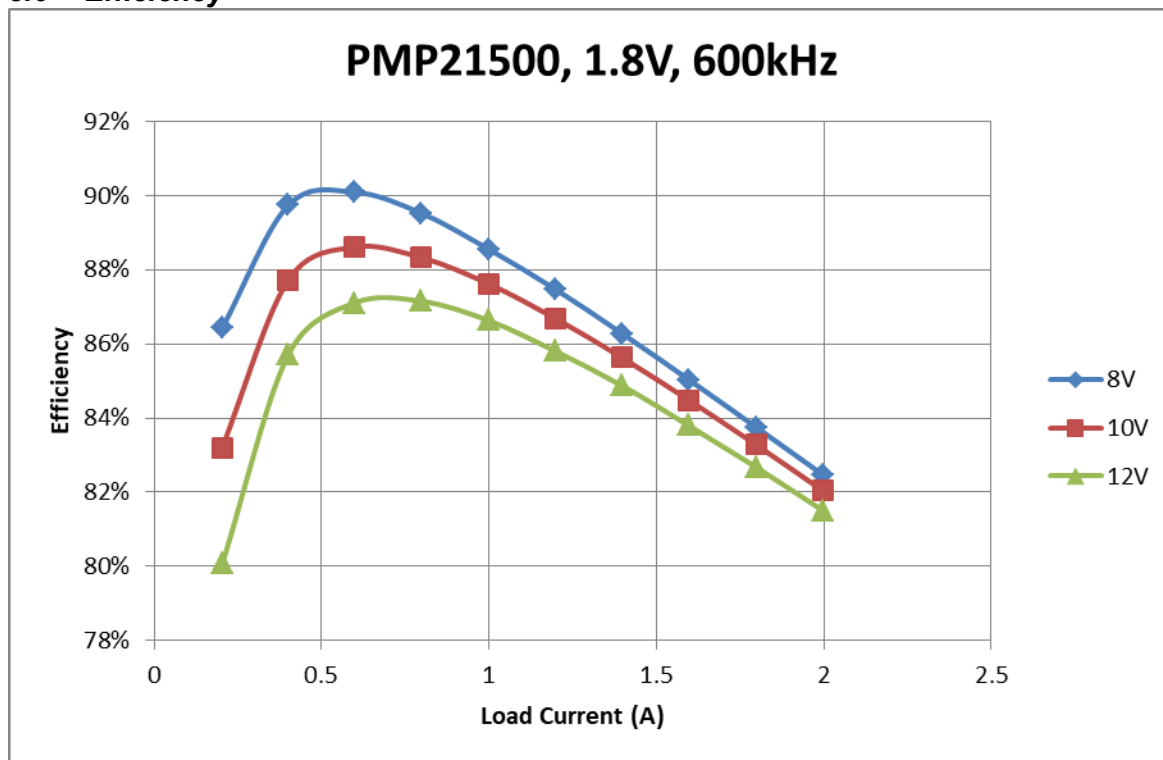


10Vin, 1.8Vout2, No Load, BW=30kHz, PM=63deg, GM=16dB



10Vin, 1.8Vout2, 2A Load, BW=30kHz, PM=63deg, GM=16dB

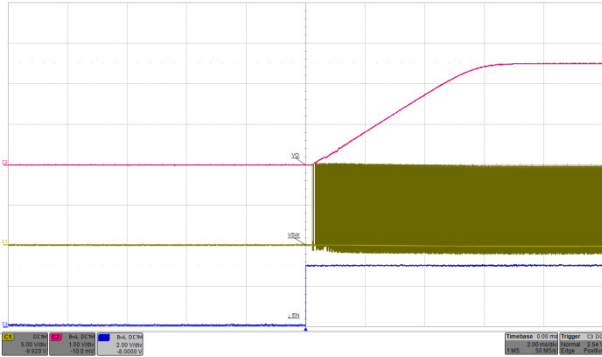
3.6 Efficiency



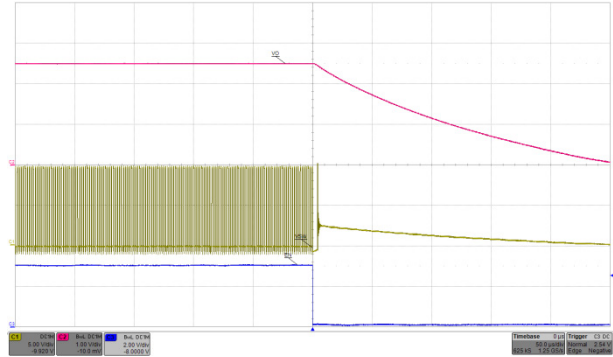
Test conditions: 1.8Vout2, 600 kHz, XEL4030-472.

4 VOUT3=2.5V

4.1 Startup and shutdown

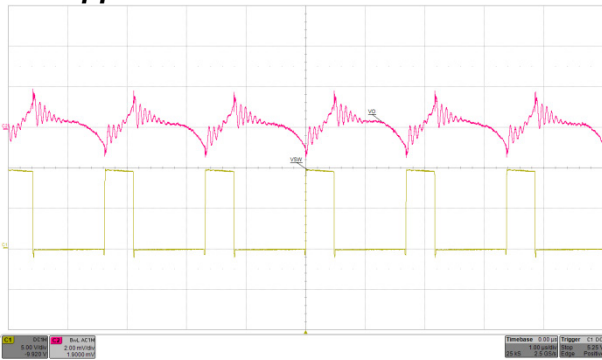


Turn-on, 10Vin, 2.5Vout3

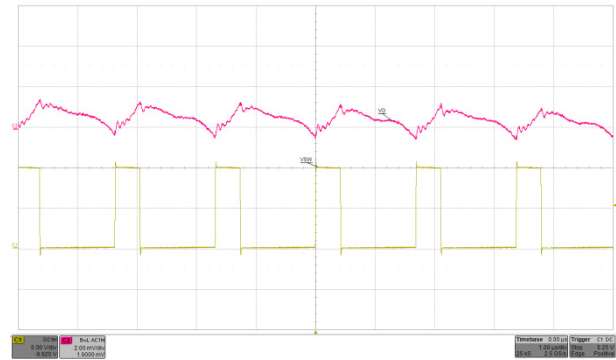


Turn-off, 10Vin, 2.5Vout3

4.2 Ripple

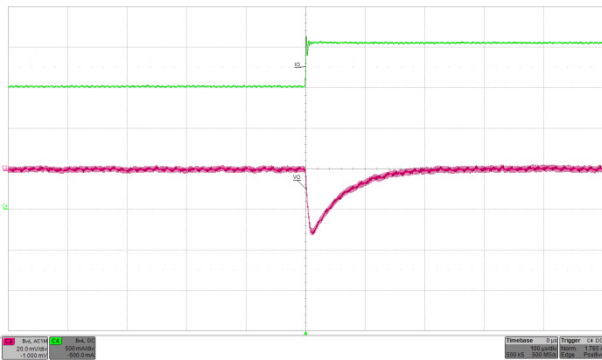


10Vin, 2.5Vout3, 2A Load

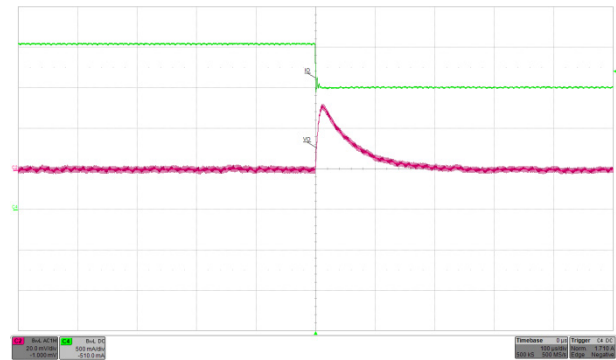


10Vin, 2.5Vout3, 0A Load

4.3 Transient

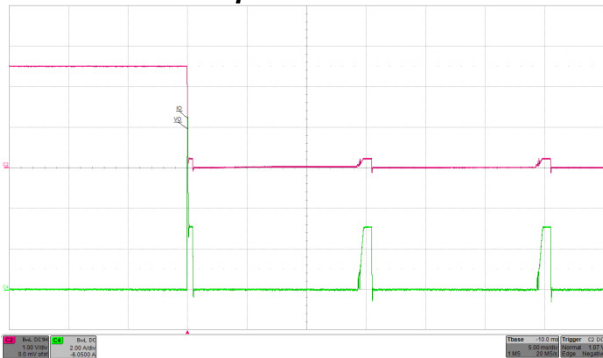


10Vin, 2.5Vout3, 1.5A to 2A Load Step (2x100uF, 6.3V, 1206)

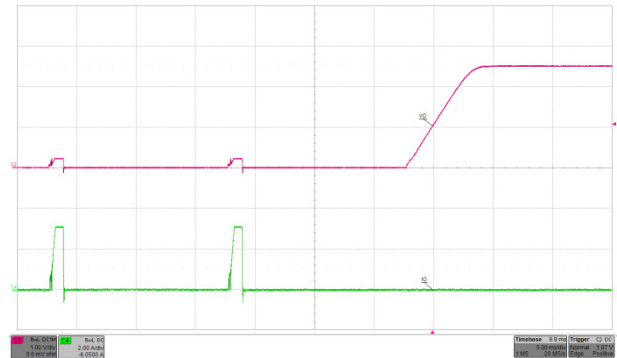


10Vin, 2.5Vout3, 2A to 1.5A Load Step (2x100uF, 6.3V, 1206)

4.4 Short-circuit protection

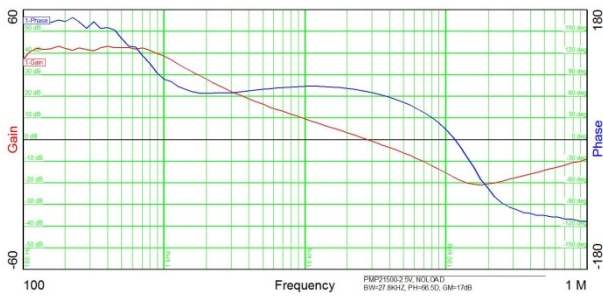


10Vin, 2.5Vout3, Short circuit applied

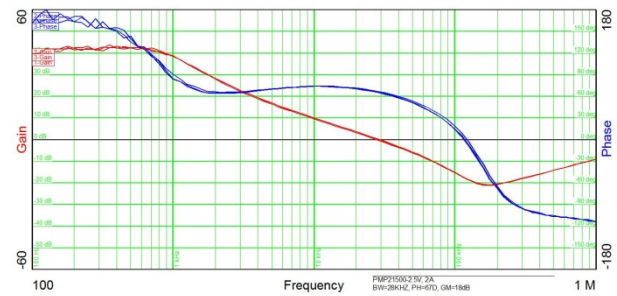


10Vin, 2.5Vout3, Short circuit released

4.5 Bode Plot

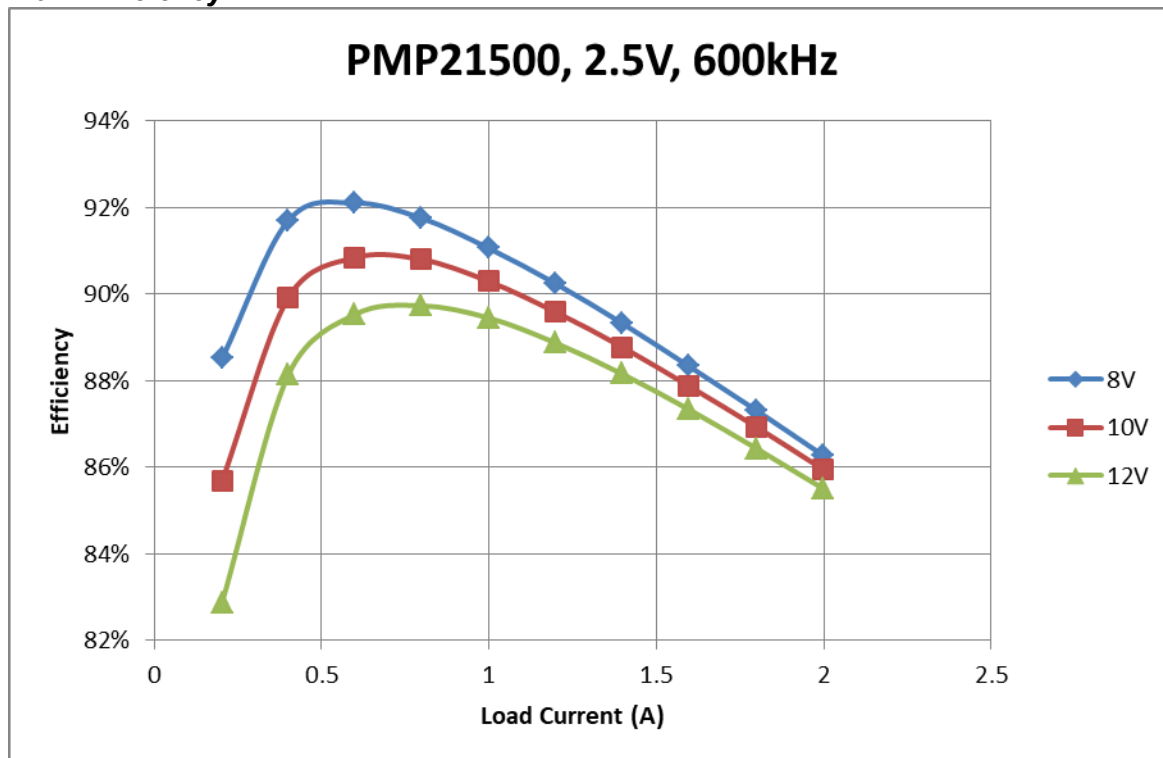


10Vin, 2.5Vout3, No Load, BW=27.8kHz, PM=66.5deg, GM=17dB



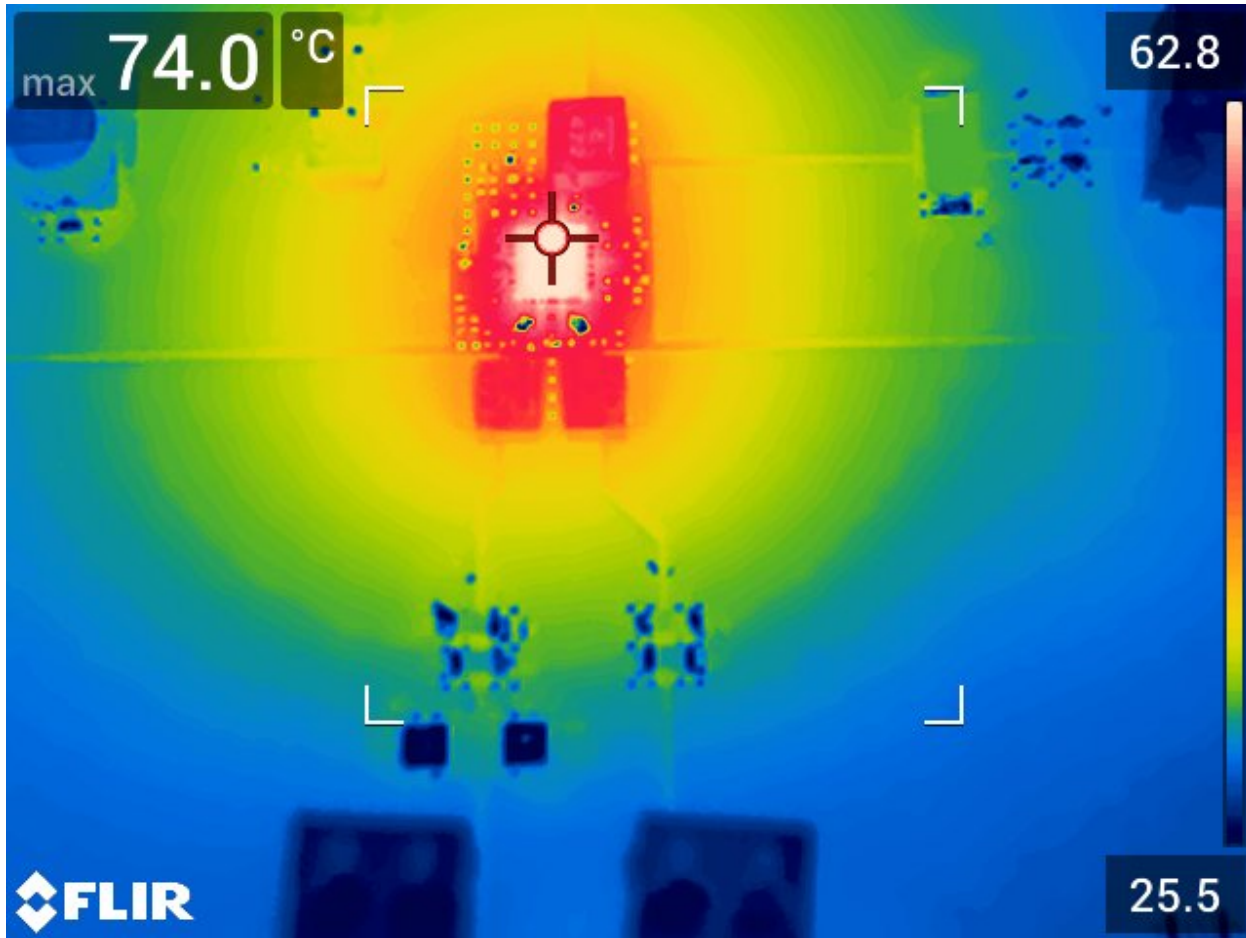
10Vin, 2.5Vout3, 2A Load, BW=28kHz, PM=67deg, GM=18dB

4.6 Efficiency



Test conditions: 2.5Vout3, 600 kHz, XEL4030-472.

5 Thermal picture



Test conditions: 10Vin, 1.2Vout1/3A, 1.8Vout2/2A, 2.5Vout3/2A, 600 kHz, room temperature, natural convection. IC=74C, Inductor=50.8C.

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