Integrated Device Technology

Smart Power Management
Superior Transient Response

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Content Overview

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  - Summary

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Comparison: ZSPM1000 versus Analog Controller

Comparison: True-digital ZSPM1000 PWM Controller vs Traditional Analog Controller

ZSPM1000

True-digital control loop enables design flexibility and configurability

Best-in-class transient performance enabled by **IDT's** **Tru-Sample™ Technology**

Most compact controller solution enabled by application specific IC architecture

…and more.

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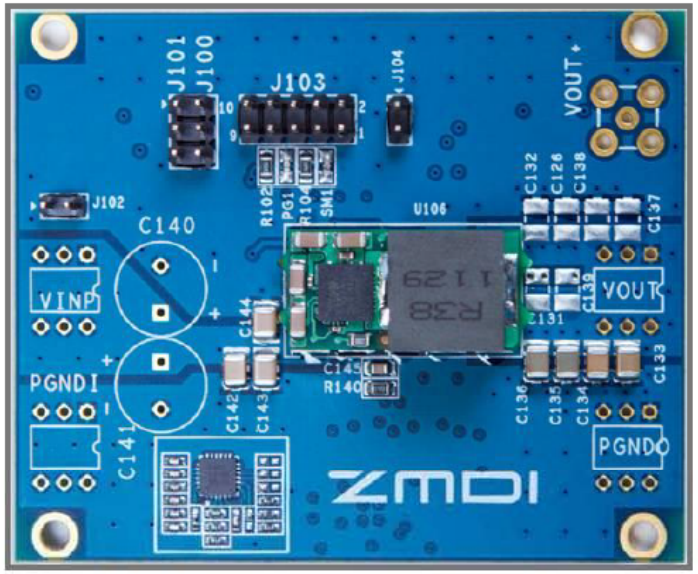
Test Setup

Test Setup



POL Solution with 35A Power Block

- 35A POL Solution
  - Version 1: with analog controller
  - Version 2: with ZSPM1000 PWM controller
  - Same power stage
  - Same characteristic (bandwidth, phase margin)
- System Parameters:
  - VIN = 12V
  - VOUT = 1.2V
  - COUT = 300µF
  - FSW = 500kHz
- Performed Test:
  - Transient Response
    - 10A load step at 500A/µs

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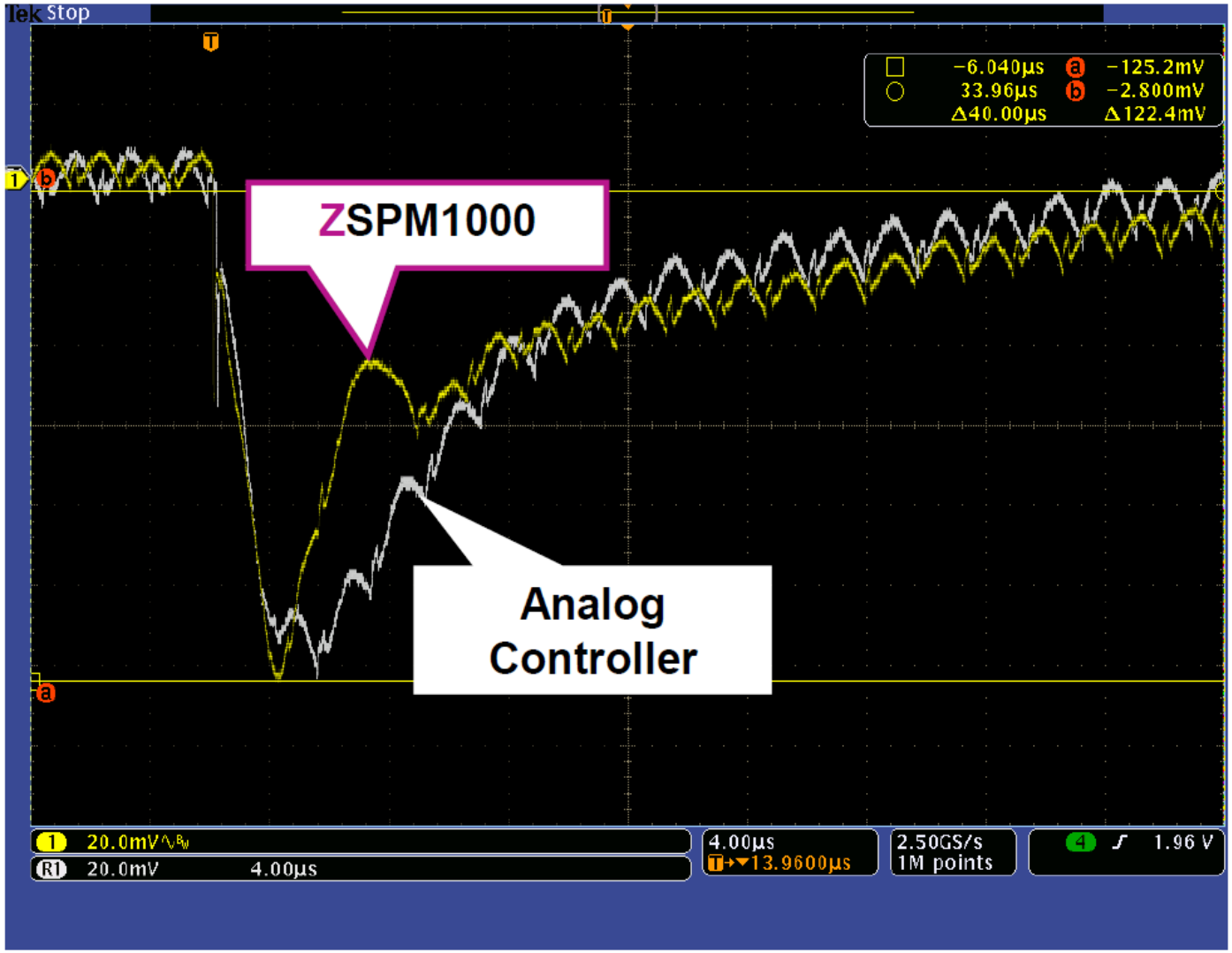
Results

Step-Performance Without Sub-Cycle Response™ and non-linear Control



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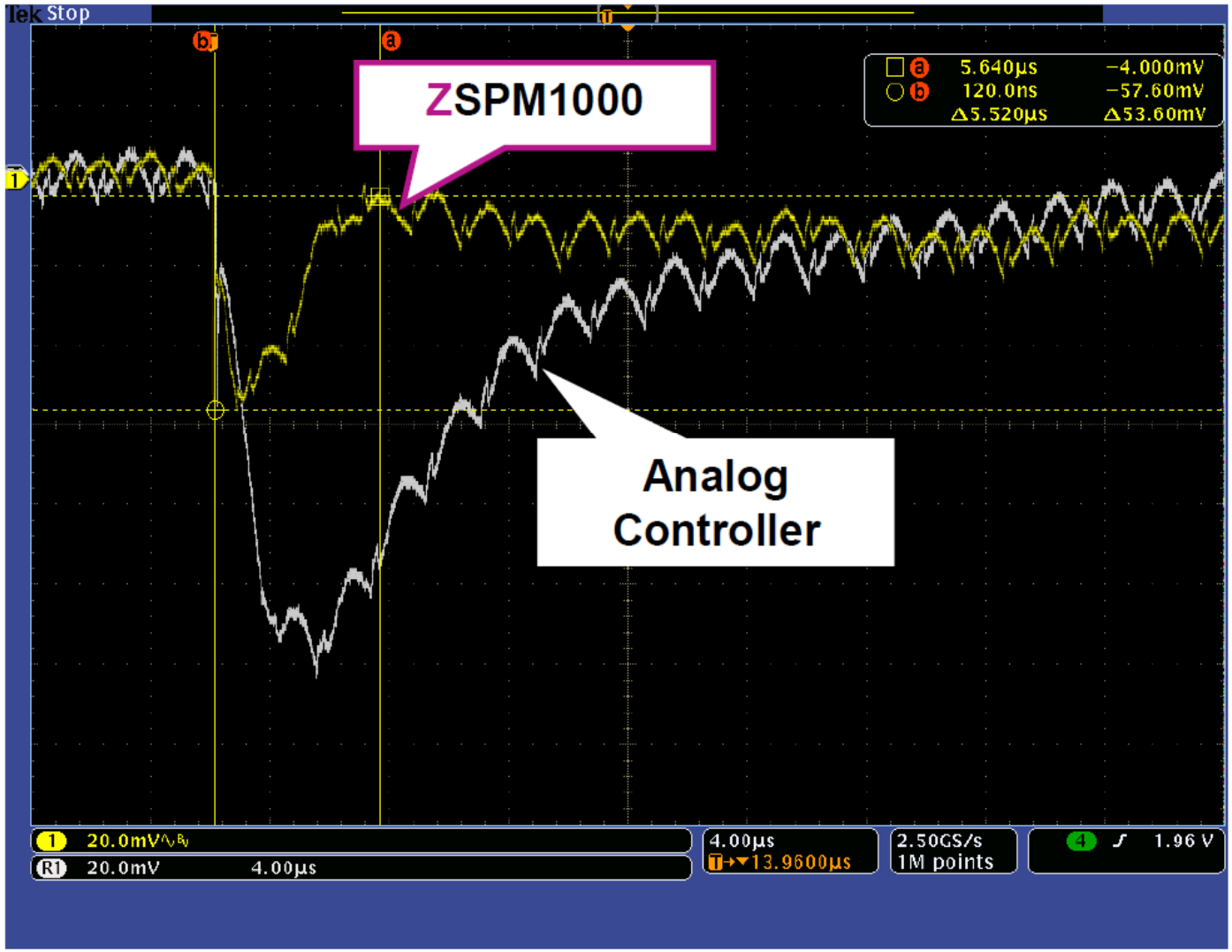
Results

Step-Performance using Sub-Cycle Response™ and non-linear Control



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Summary

Best in class transient performance

- The transient performance of a synchronous buck converter can be dramatically improved using the ZSPM1000 over a traditional, state-of-the-art controller.

- In ZMDI POL Solution Test Setup, the ZSPM1000 PWM Controller using Sub-Cycle Response™ and non-linear control features showing:

  - **50% reduced output voltage undershoot**
  - **75% improved settling time**

- Superior step-response performance can be used to reduce output capacitance of the power stage and results into a cost and PCB area saving

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Superior Transient Response Considerations

Superior Transient Response Considerations

ZSPM1000

True-digital control loop enables design flexibility and configurability

Best-in-class transient performance enabled by **IDT's** **Tru-Sample™ Technology**

Most compact controller solution enabled by application specific IC architecture

…and more.

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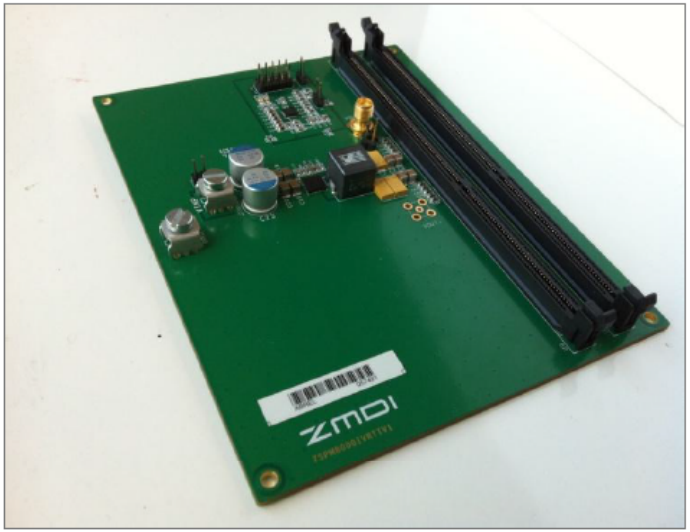
Test Setup

Test Setup

- Test Board
  - ZSPM1000 PWM Controller
  - Single-phase synchronous buck stage
  - DDR3 sockets to use INTEL's DDR Voltage Regulator Test Tool (VRTT)
- System Parameters:
  - VIN = 12V
  - VOUT = 1.2V
  - FSW = 500kHz
- Performed Test:
  - Transient Response (3A to 12A)
    - 9A load step at 10A/µs and 30A/µs
- System Spec Requirements:
  - **VOUT accuracy needs to be ±3% (±36mV)**



ZMDI Test Board using INTEL's DDR Regulator Test Tool (VRTT)

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Test Setup

Output Components

Reference	Part Description	Quantity	Manufacturer	Manuf. P/N
C1,C2,C3,C4	470uF, 2V5, Case D	4	Kemet	T530D477M2R5ATE006
C5,C6,C7,C8	47u, X5R, 6V3	4	Kemet	C1210C476M9PACTU
L1	470nH	1	Wurth	7443320047

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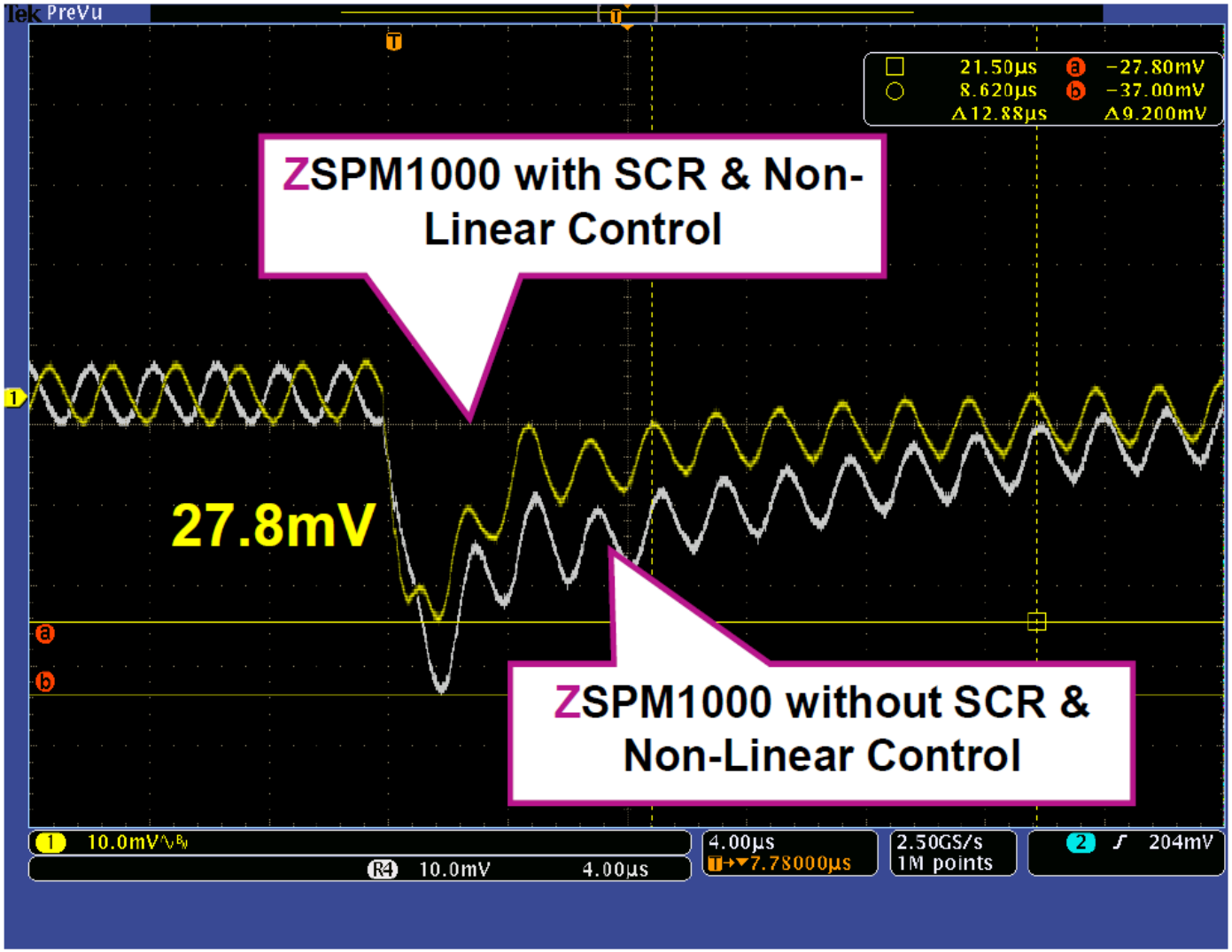
Results

Step-Performance meeting ±3% VOUT Accuracy



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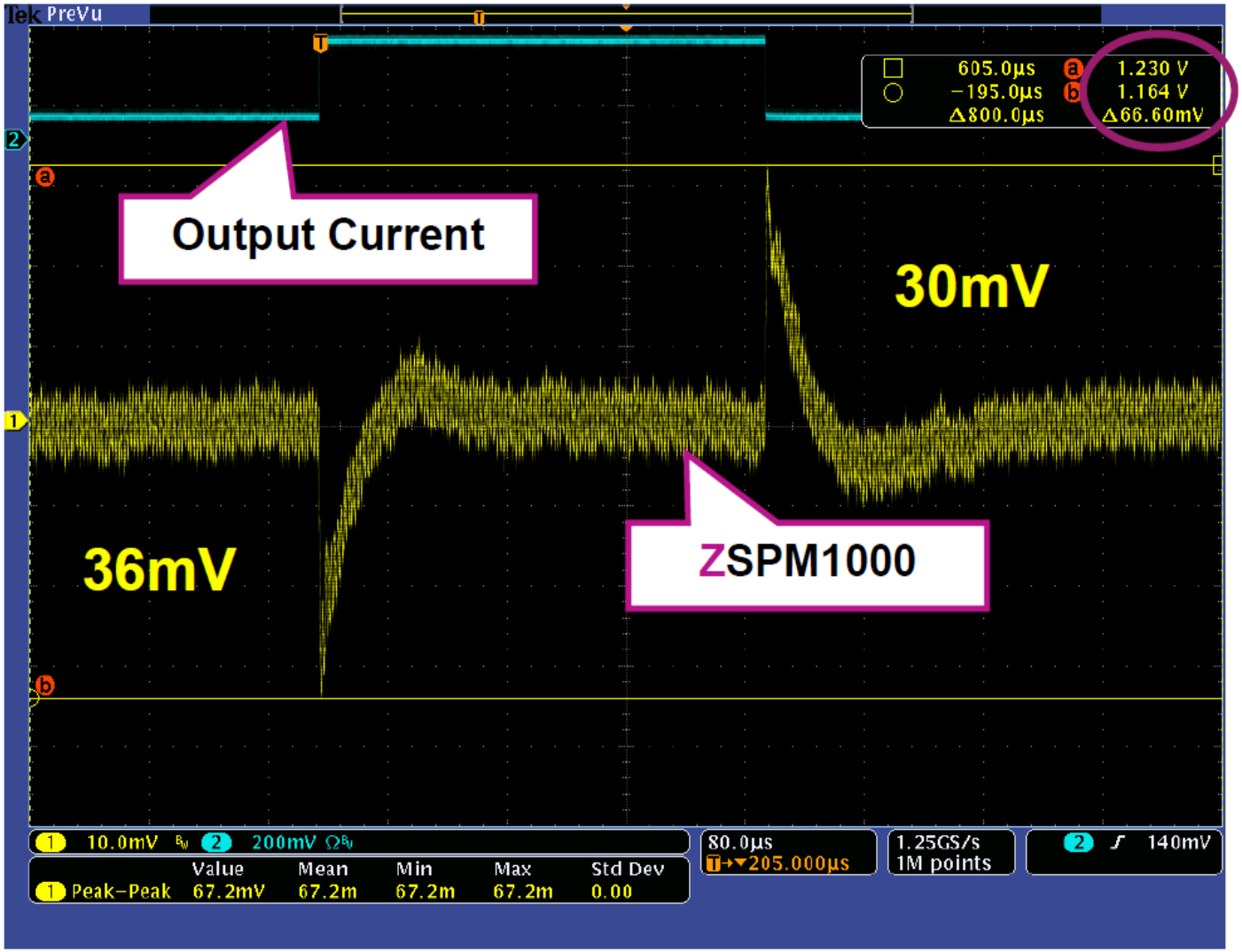
Results

Peak-Peak Transient Performance (4x 470µF)



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Test Setup

Changed Output Components

Reference	Part Description	Quantity	Manufacturer	Manuf. P/N
C1,C2,C3,C4	470uF, 2V5, Case D	2	Kemet	T530D477M2R5ATE006
C5,C6,C7,C8	47u, X5R, 6V3	4	Kemet	C1210C476M9PACTU
L1	470nH	1	Wurth	7443320047

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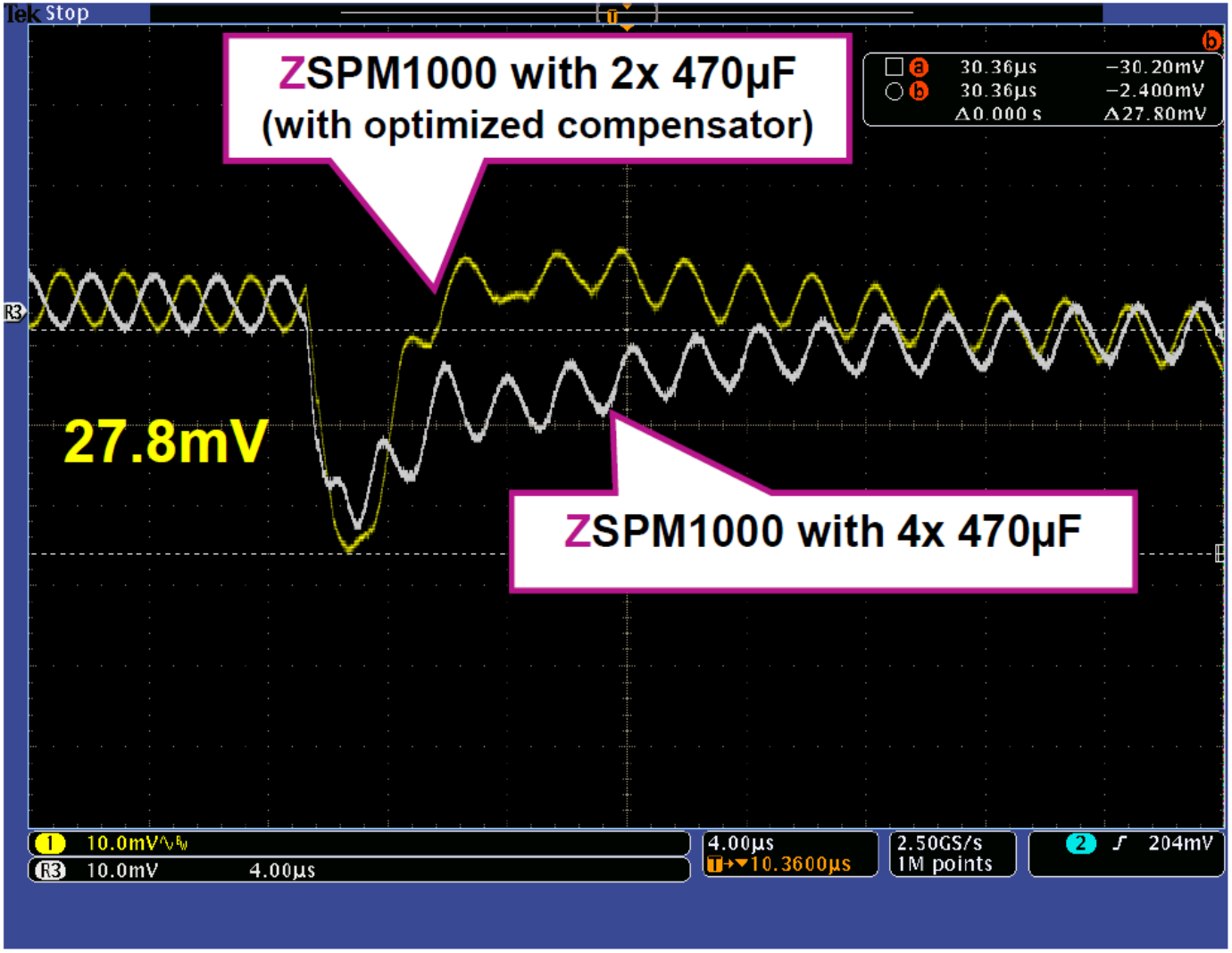
Results

Step-Performance still meeting ±3% VOUT Accuracy



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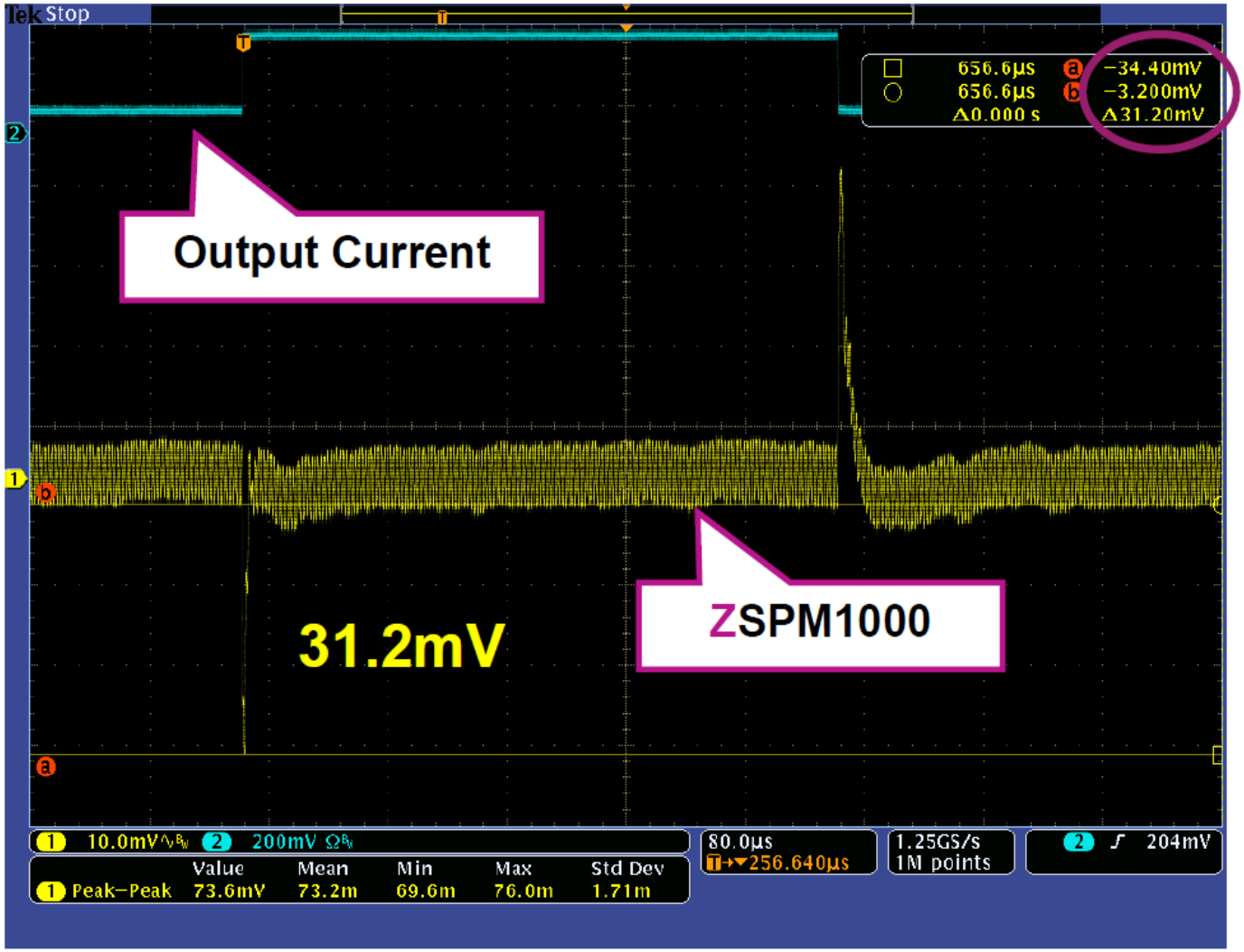
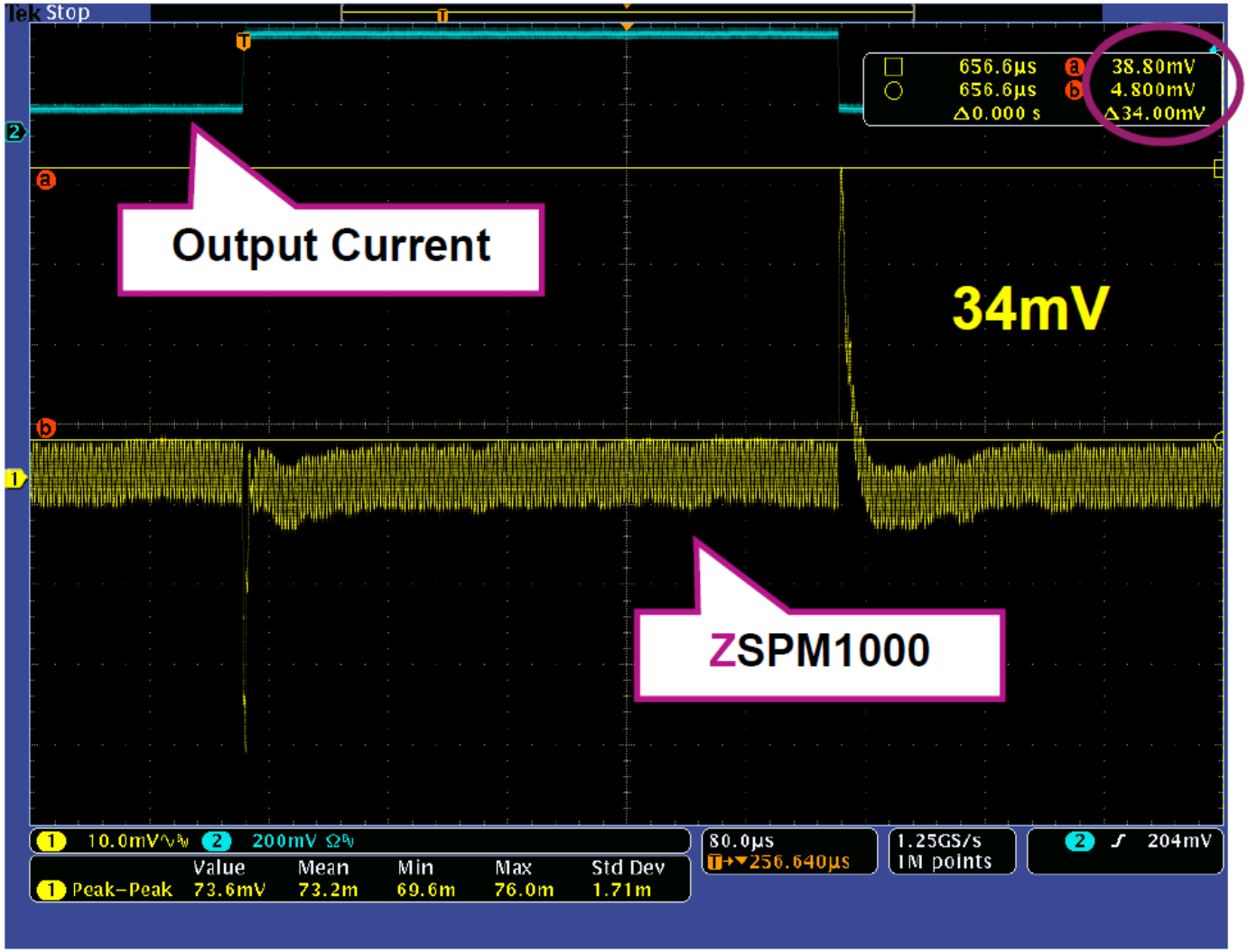
Results

Peak-Peak Transient Performance (2x 470µF): Undershoot



Results

Peak-Peak Transient Performance (2x 470µF): Overshoot



Summary

How does the superior step-response of the ZSPM1000 convert to cost savings?

- ZSPM1000 enables:
  - Improving transient performance specification without additional output capacitance OR
  - **Maintain the same performance but reducing the output capacitance up to 50%!**

2x470µF = 4-5* USD SAVING!

***Might differ based on your own cost structure.**

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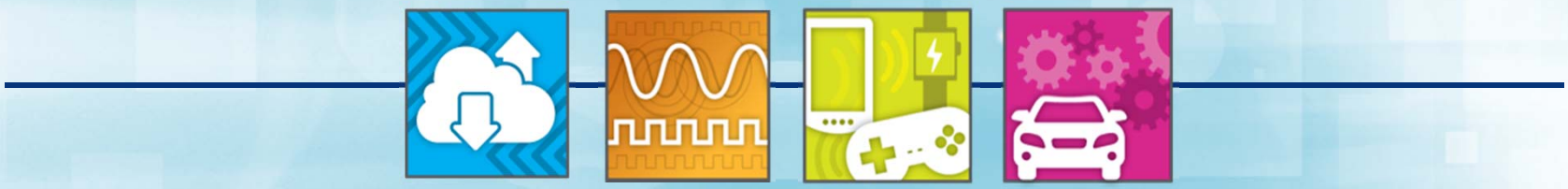
Thank You



Analog Mixed Signal Product Leadership in Growth Markets

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