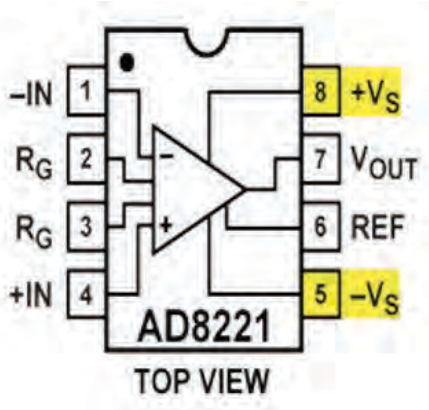
X2Y® Amplifier Decoupling

Test comparisons, X2Y® versus conventional MLCCs for amplifier decoupling

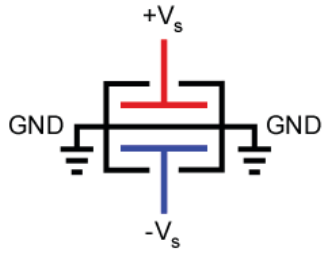
X2Y® Amplifier Decoupling

- Test #1 uses an AD8221 instrumentation amplifier
  - Pin pattern is amenable to X2Y® "circuit 1" use
    - +V / -V power pins are on the *same side* of the device

Same side

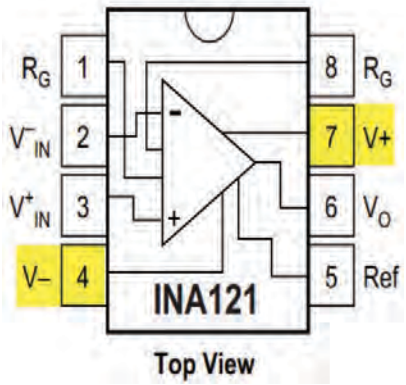


X2Y Circuit 1

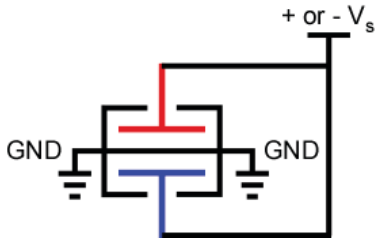


- Test #2 uses an INA121 instrumentation amplifier
  - Pin pattern is amenable to X2Y® "circuit 2" use
    - +V / -V power pins are on the *opposite sides* of the device

Opposite sides



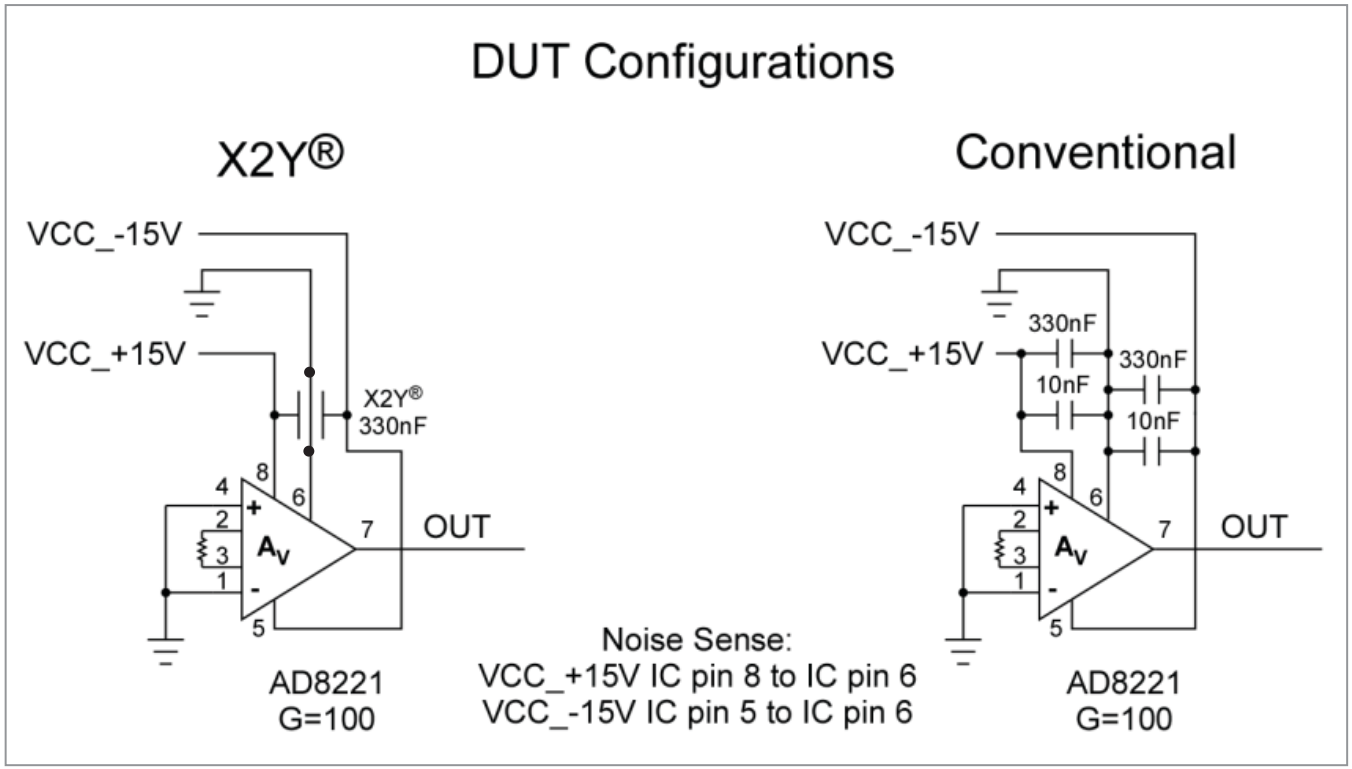
X2Y Circuit 2



Compare Bypass Conventional MLCC vs. X2Y

Test #1

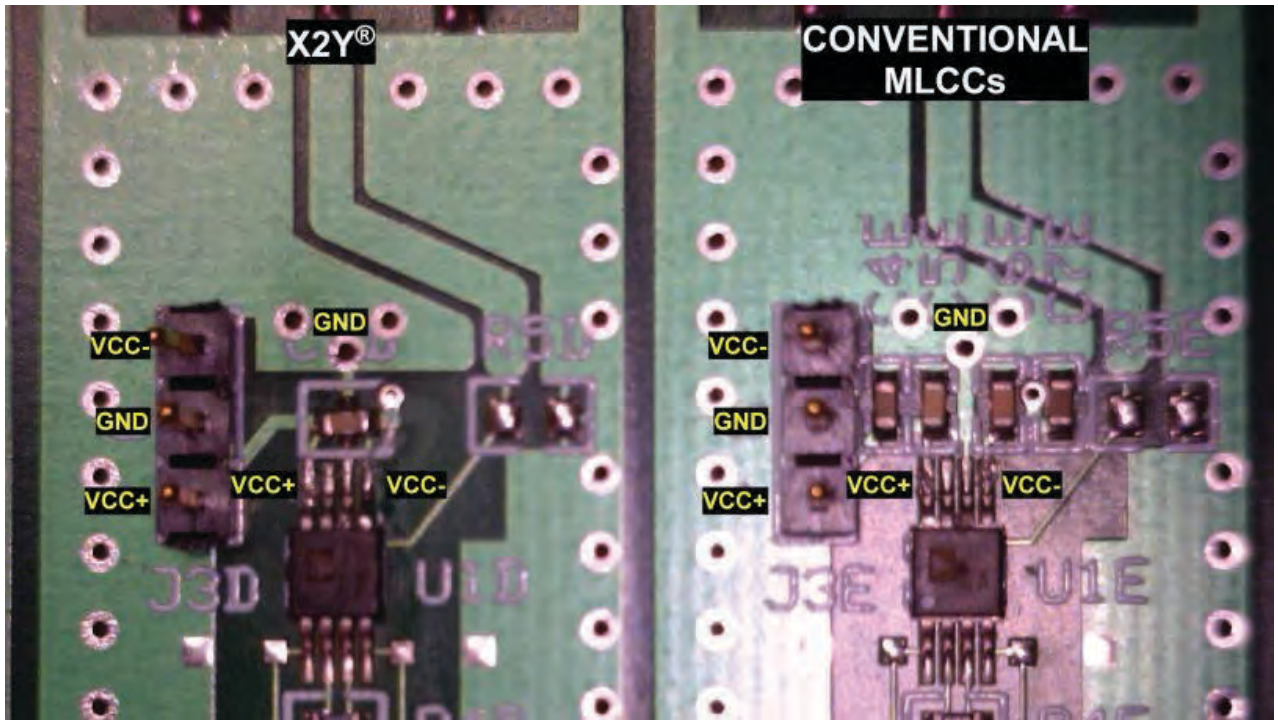
- Compares external noise rejection of power bypass networks
  - Single X2Y® 330nF rated part, versus four total MLCCs
- Noise voltage measured directly across IC pins



PCB Configuration

Test #1

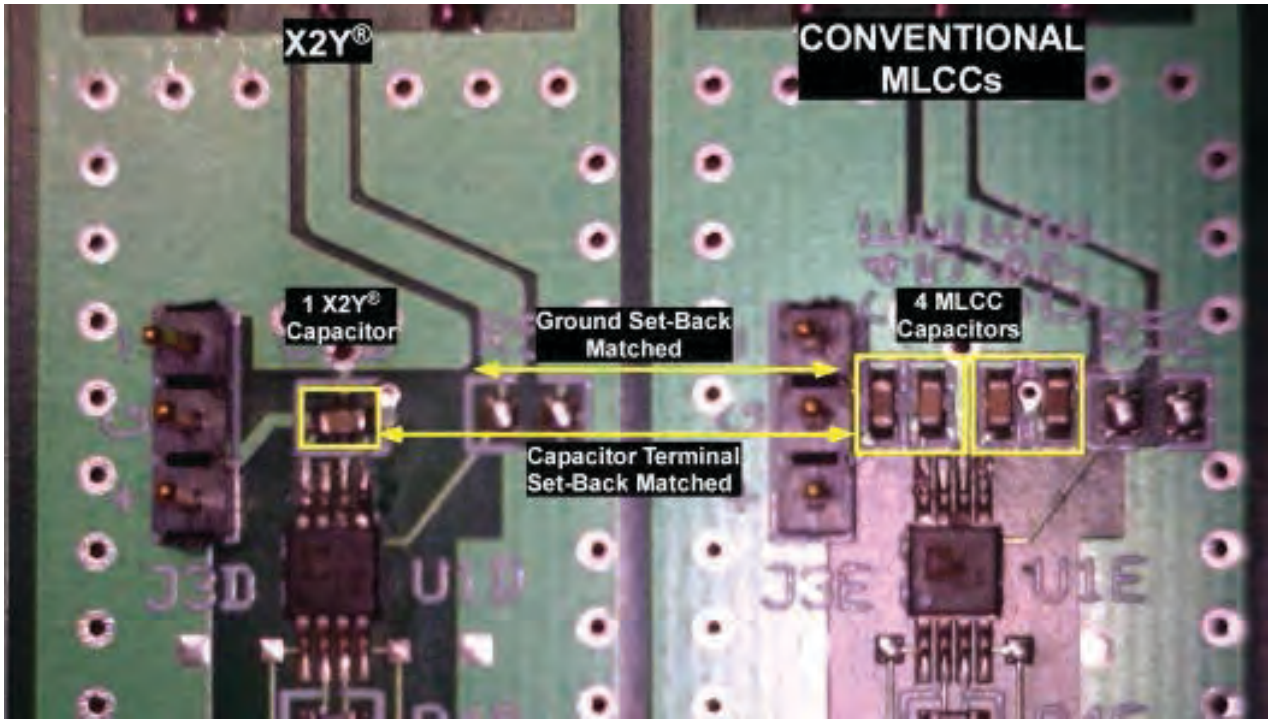
- Two layer 1.5mm PCB
- Single X2Y® 330nF rated part, versus four total MLCCs
- Noise voltage probed directly across IC pins at IC body



PCB Configuration

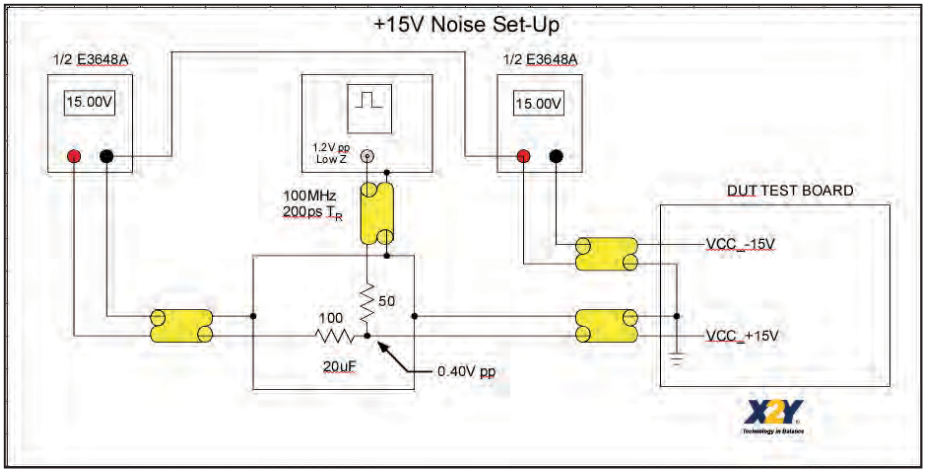
Test #1

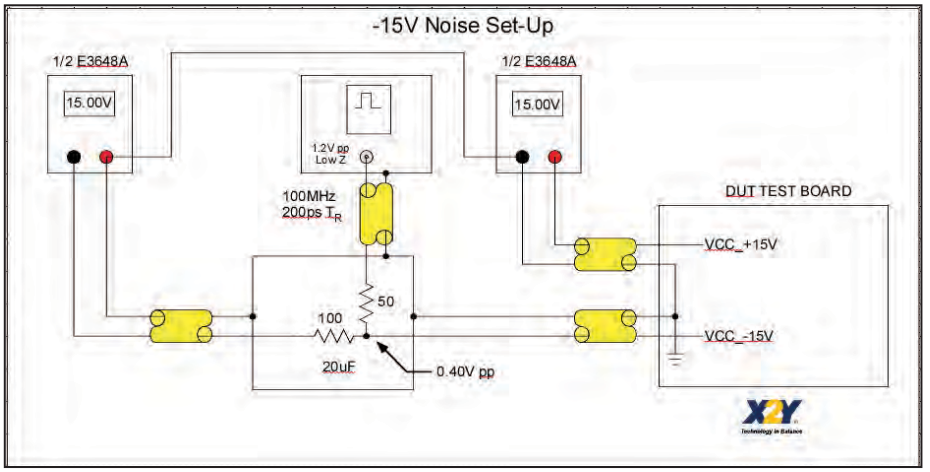
- Equalized layout parasitics
- Ground attachment matched between set-ups
- Capacitor set-backs matched between set-ups



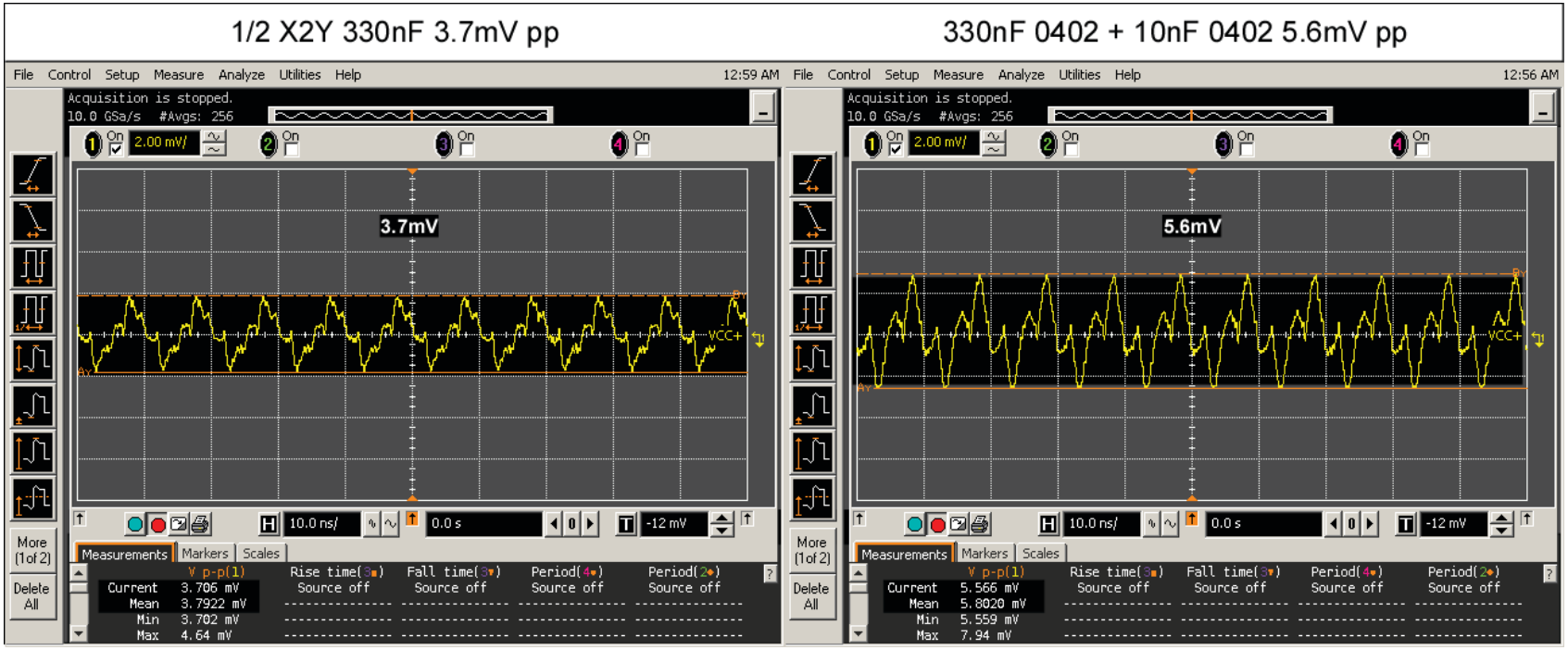
Noise Injection

- 200ps edges
  - Comparable to memory
- 100MHz pulse rate
  - Isolate any cavity / capacitor ringing
- 400mV on 15V power
  - Alternate tests:
    - +15V / -15V
  - 2.7% pp



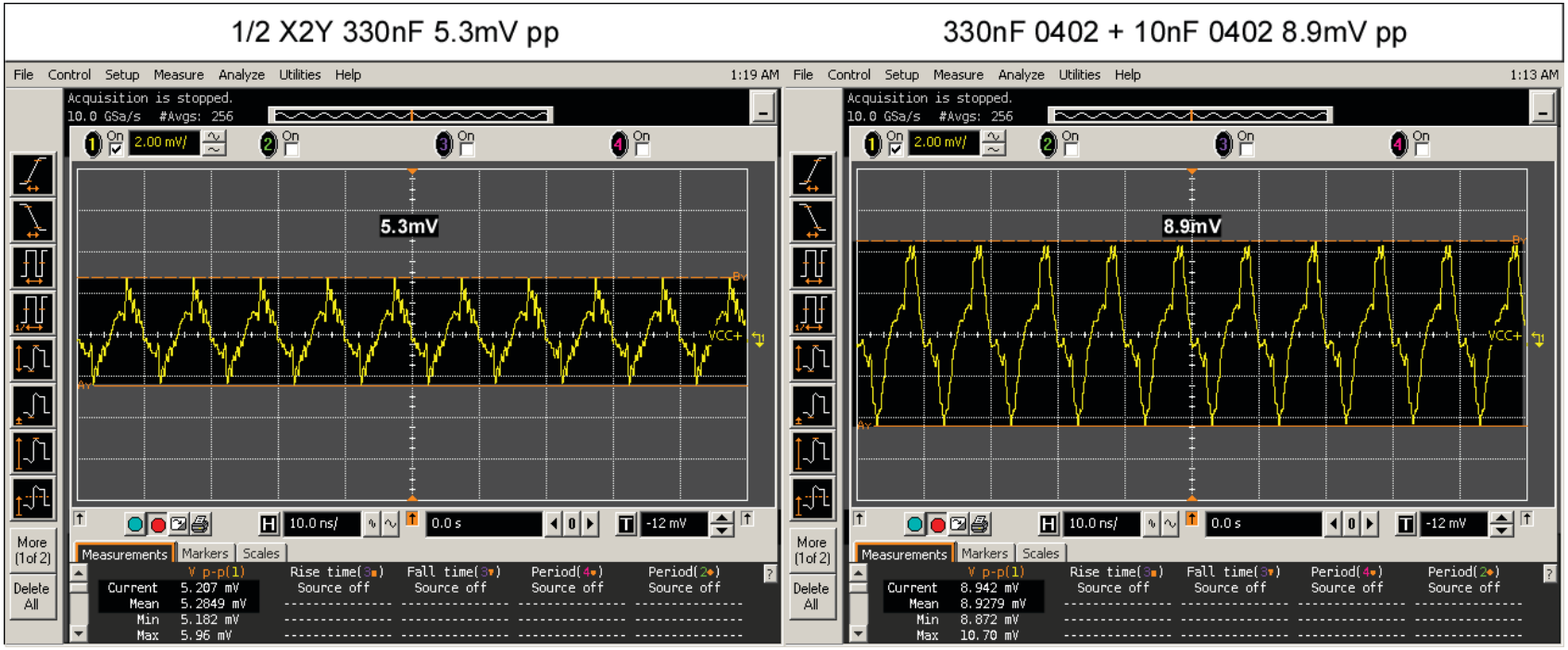


VCC_15V+



- X2Y® 3.7mV pp, conventional 5.6mV pp
- Conventional noise 151% greater than X2Y®

VCC_15V-

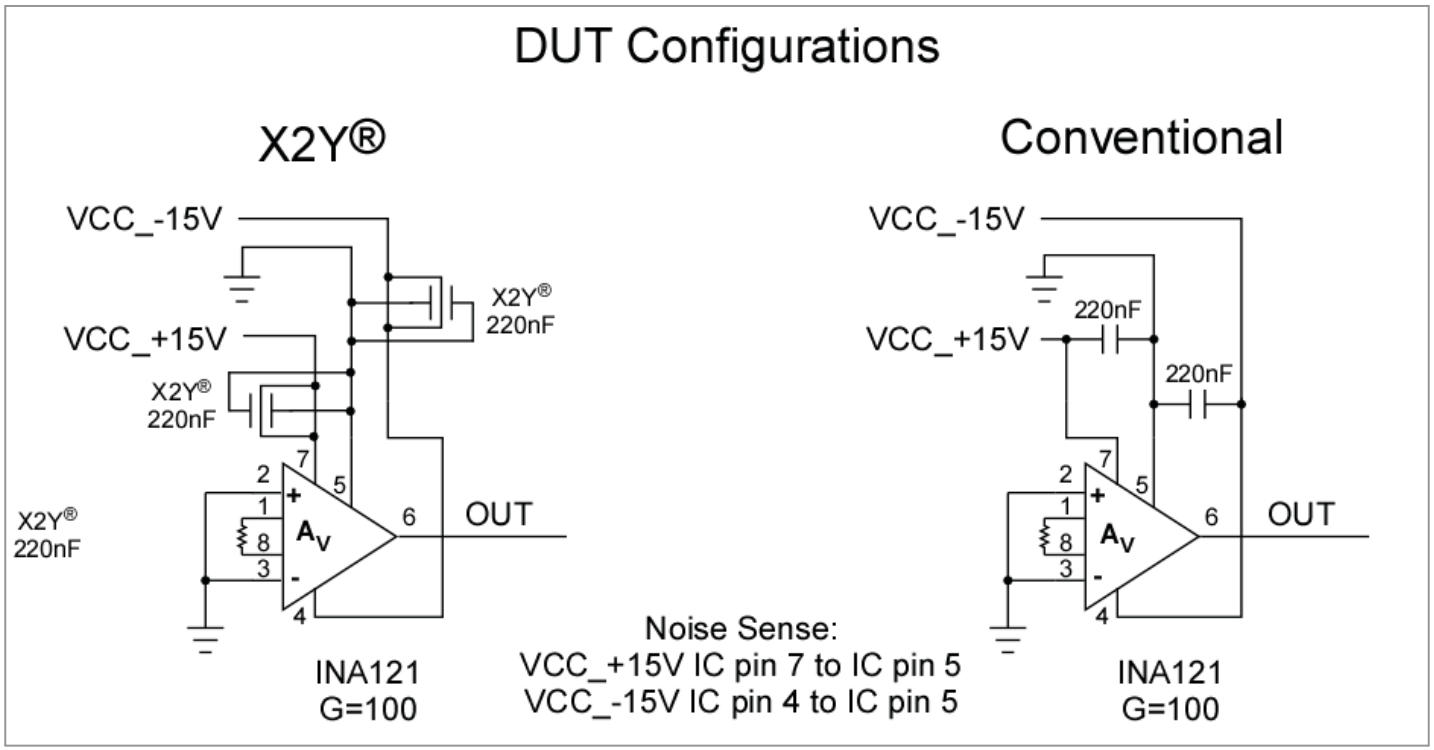


- X2Y® 5.3mV pp, conventional 8.9mV pp
- Conventional noise 168% greater than X2Y®

Compare Bypass Conventional MLCC vs. X2Y

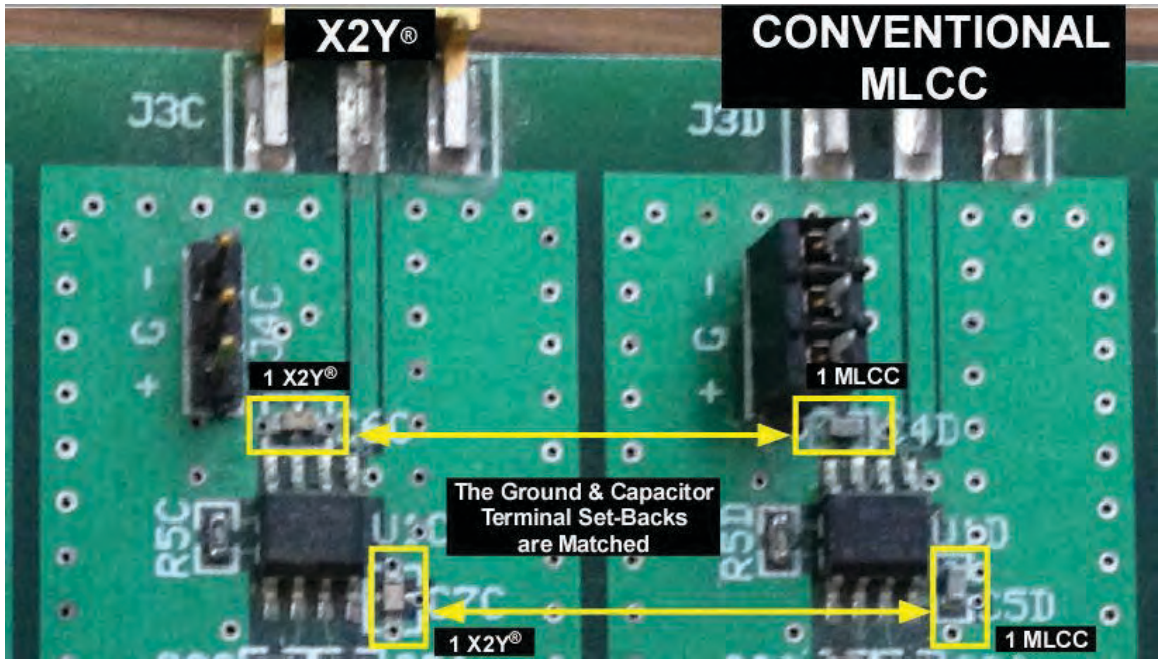
Test #2

- Amplifier power pin pattern amenable to X2Y® "circuit 2" use
  - the +/- power pins are on the *same side* of the device
- Compares single X2Y® 100nF rated (200nF total) per pin vs. a single MLCC 220nF per pin

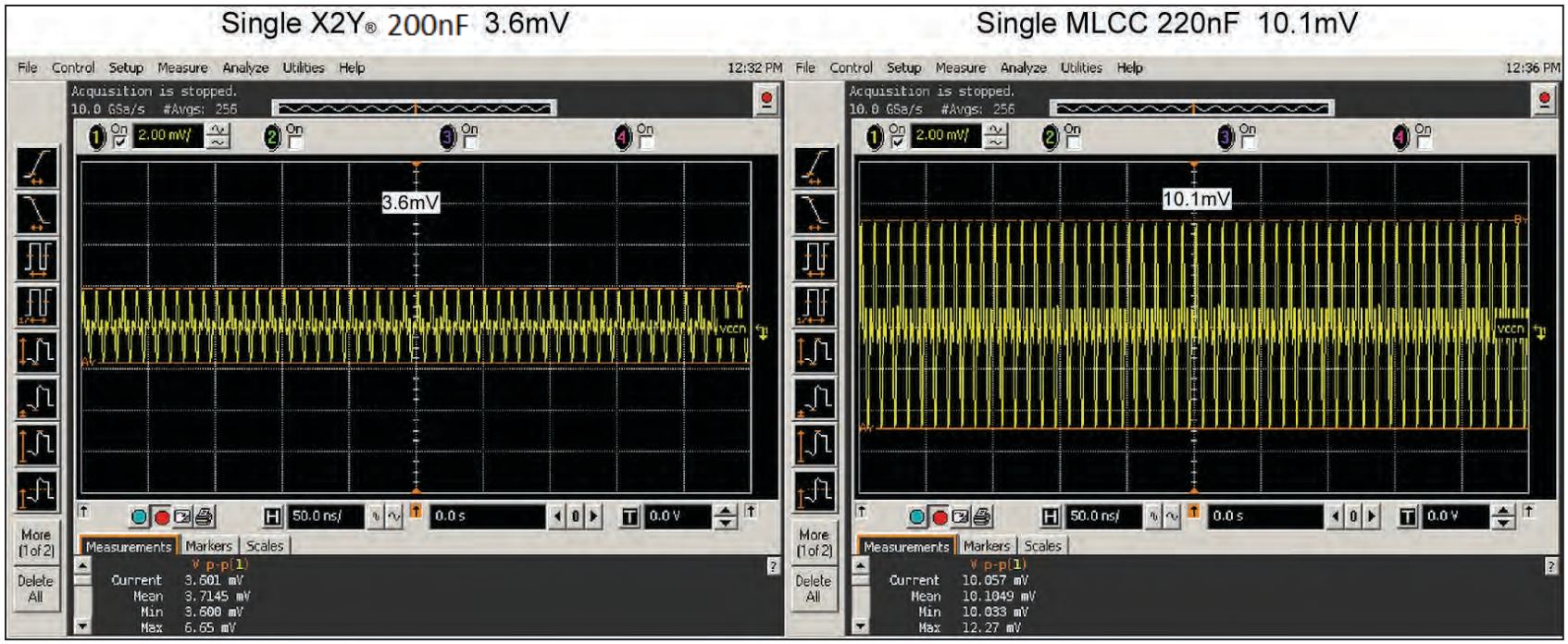


PCB Configuration

- Test #2
- Ground attachment is matched between set-ups
- Capacitor set-backs are matched between set-ups
- Compares single X2Y® 100nF rated (200nF total) per pin vs. a single MLCC 220nF per pin

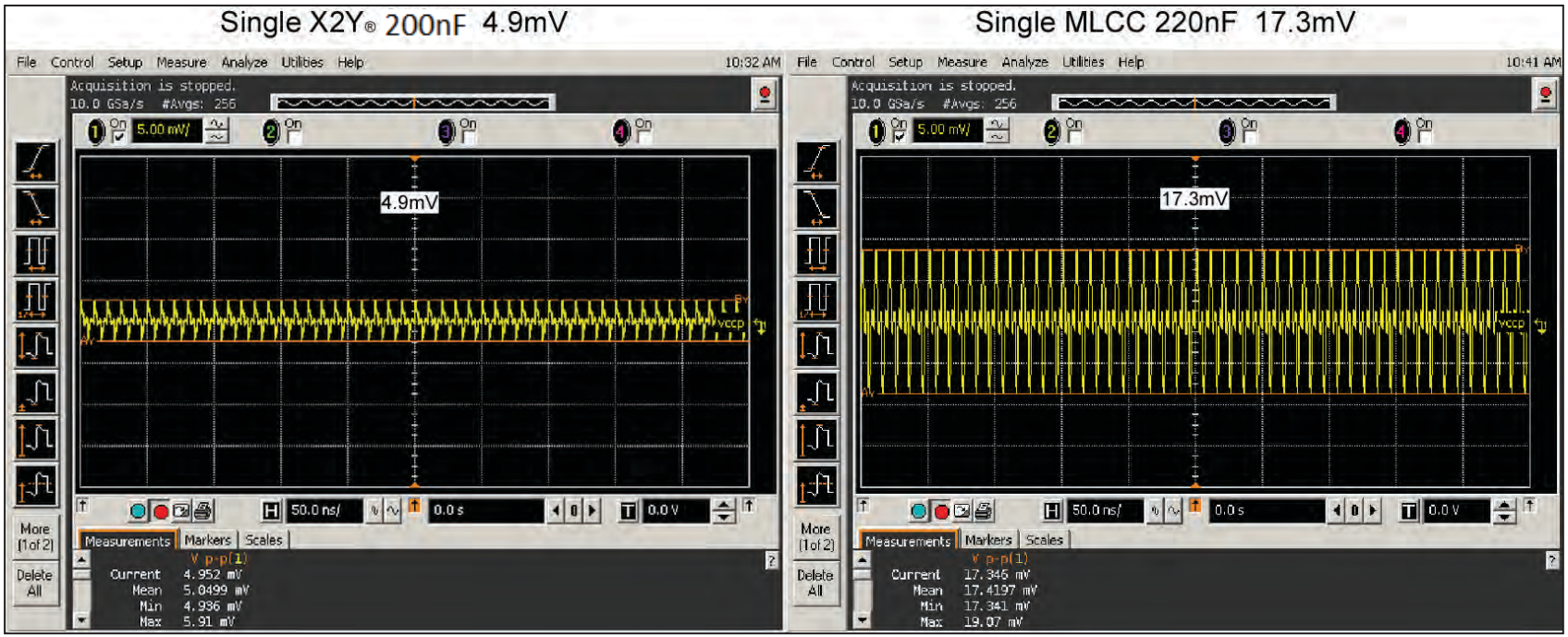


VCC_15V-



- X2Y® 3.6mV pp, conventional 10.1mV pp
- Conventional noise 280% greater than X2Y®

VCC_15V+



- X2Y® 4.9mV pp, conventional 17.3mV pp
- Conventional noise 353% greater than X2Y®

Summary

- Test #1
  - Conventional filter using two capacitor values per power pin, four capacitors total results in >= 150% voltage noise compared to just one X2Y® used for *both* power pins.
- Test #2
  - Conventional filter using one capacitor value per power pin, two capacitors total results in >= 280% voltage noise compared to one X2Y® used for *each* power pin.
- Benefits: smaller space, fewer parts, better economy and performance when using X2Y® components.