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

- 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
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
• X2Y® 3.7mV pp, conventional 5.6mV pp
• Conventional noise is 151% of X2Y® noise
• X2Y® 5.3mV pp, conventional 8.9mV pp
• Conventional noise is 168% of X2Y® noise
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
• X2Y® 3.6mV pp, conventional 10.1mV pp
• Conventional noise is 280% of X2Y® noise
• X2Y® 4.9mV pp, conventional 17.3mV pp
• Conventional noise is 353% of X2Y® noise
Summary

• **Test #1**
  – Conventional filter using two capacitor values per power pin, four capacitors total, results in 150% of the voltage noise when using just one X2Y® for both power pins.

• **Test #2**
  – Conventional filter using one capacitor value per power pin, two capacitors total, results in 280% of the voltage noise when using one X2Y® for each power pin.

• **Benefits:** smaller space, fewer parts, better economy and performance when using X2Y® components.