Microphonics Testing

‘Shock’ Testing

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X2Y® for Reduced Microphonics

- Background: in late 2012, X2Y sought a standardized test method for microphonics, but could not find a test method accepted by both the passive component industry and OEMs. Test methods vary widely in PCBs used and parameters applied to the DUT.

- Piezoelectric induced noise from mechanical stress can occur in all ferroelectric dielectrics. In this presentation, X2Y uses a 'Shock' test method to explore microphonic performance differences among various MLCC technologies.

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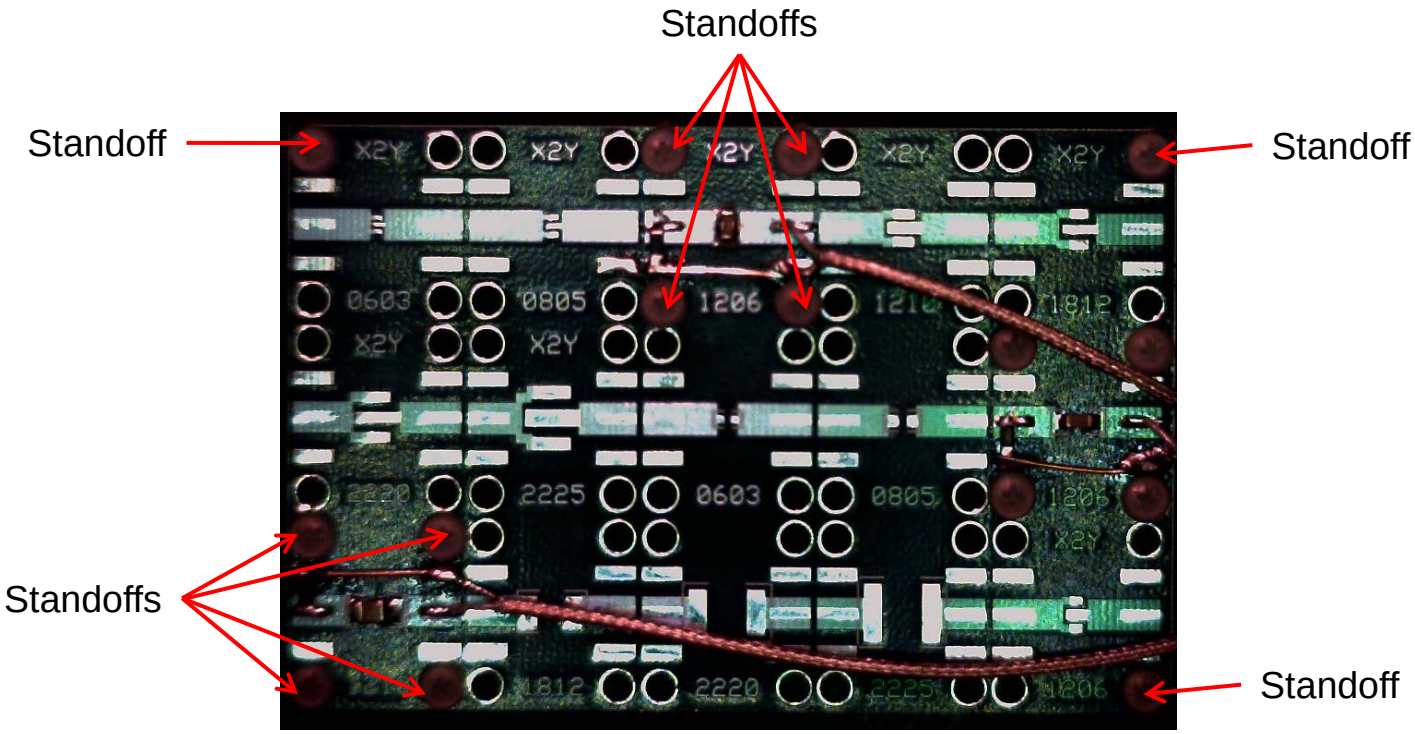
Test Setup

- Test board used:
  - The PCB has standoffs at each corner for support, each DUT test location is also supported by four standoffs



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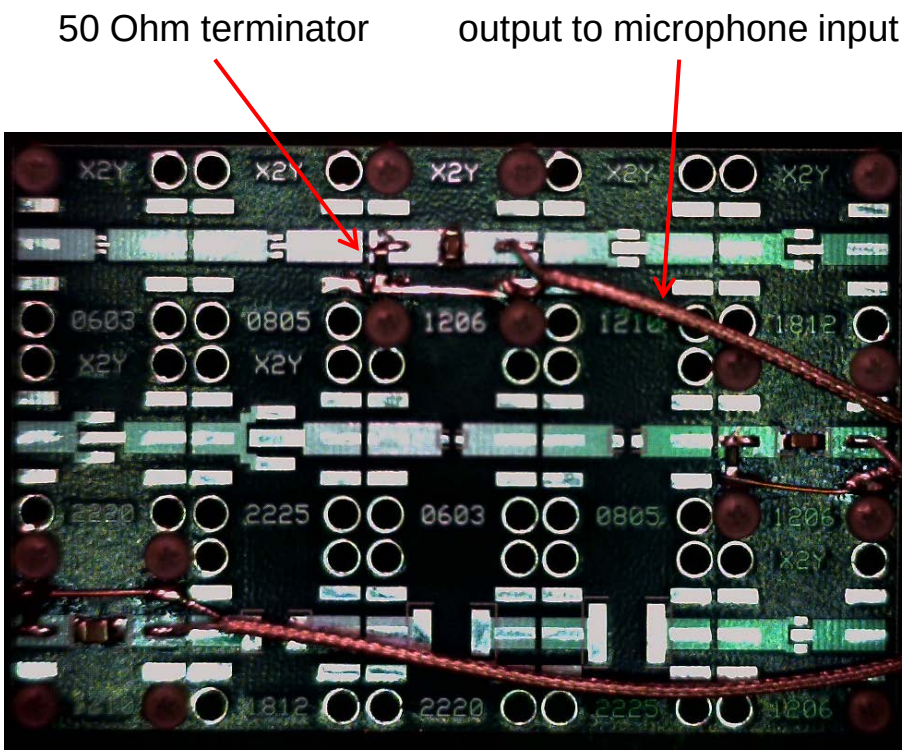
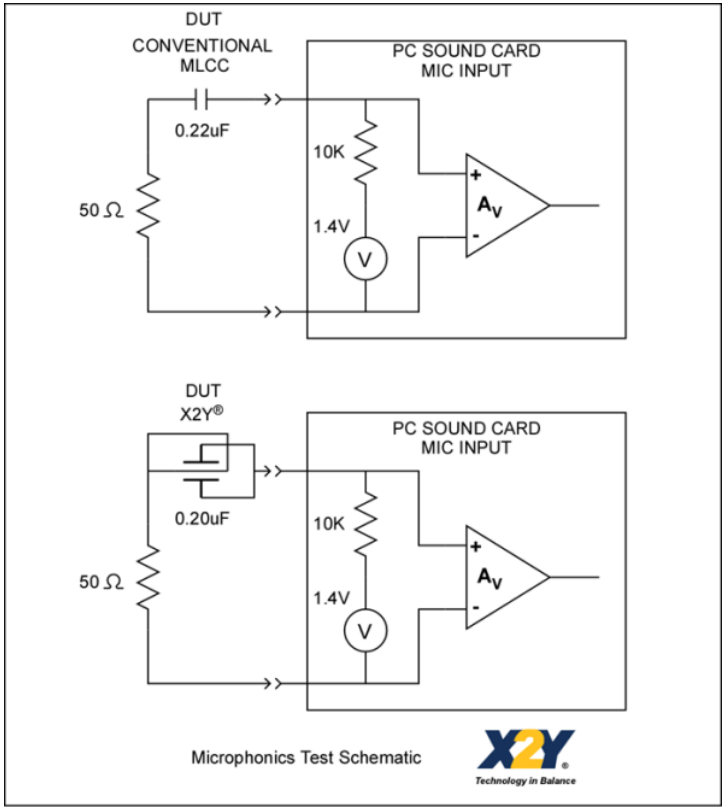
Test Setup

- Test method used:
  - The input side of each DUT is connected to a 50 Ohm terminator
  - The output side feeds the microphone input of a laptop computer





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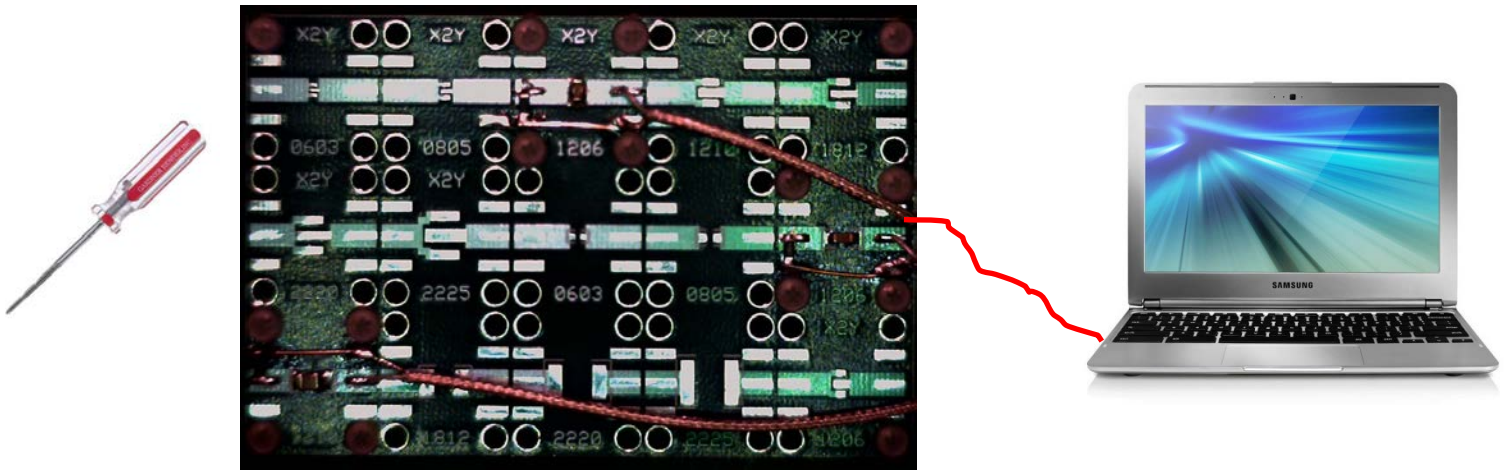
Test Setup

- Test method used:
  - The handle of a screwdriver is used to generate microphonic disturbances with a series of four successive ‘taps’ adjacent to each DUT location on the PCB



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Device Under Test (DUT)

MLCC_1210_NP0_220nF

MLCC_0603_X7R_220nF

X2Y_0603_X7R_200nF

Feedthru_0603_X7R_220nF

- While tapping on the test board, the electrical disturbances are recorded by the laptop
- The audio files are used to plot the relative Amplitude (mV) and Waveform (dB)

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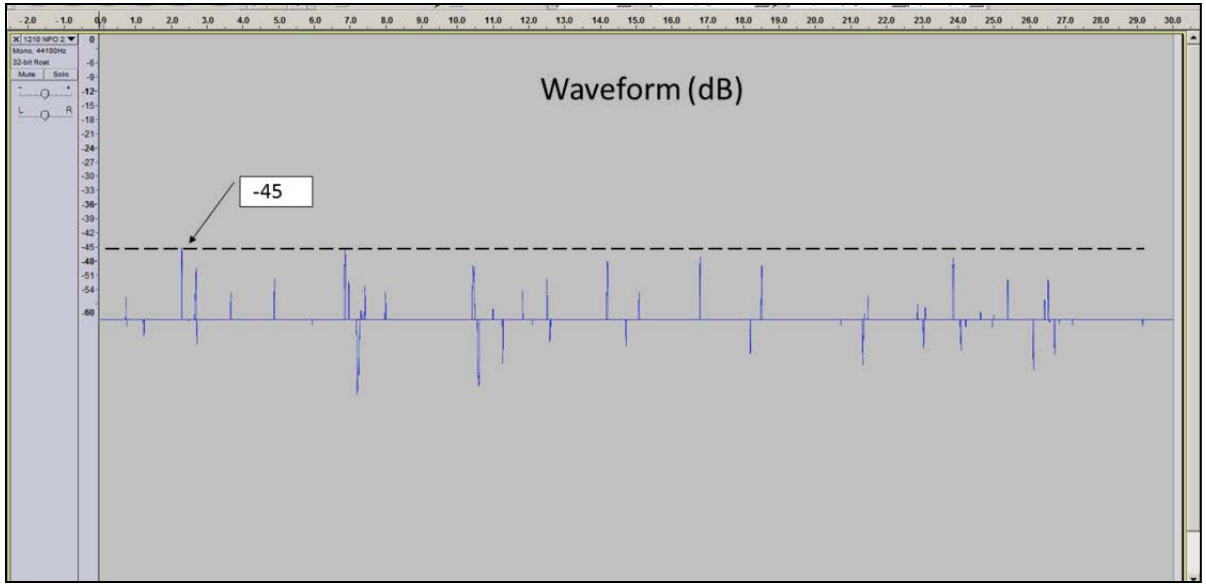
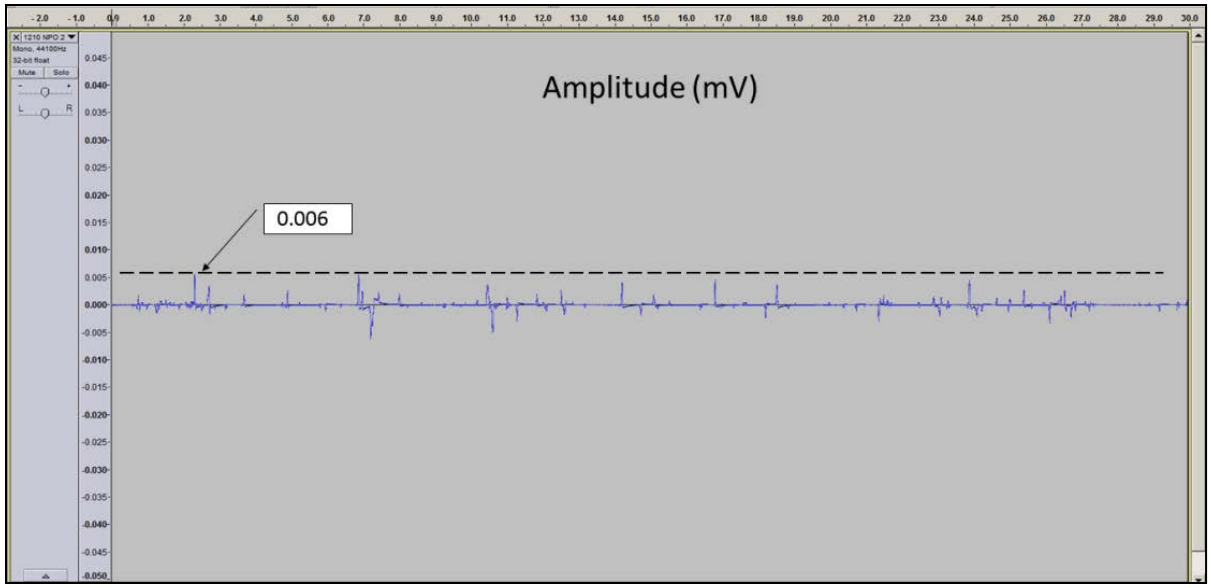
MLCC_1210_NP0_220nF





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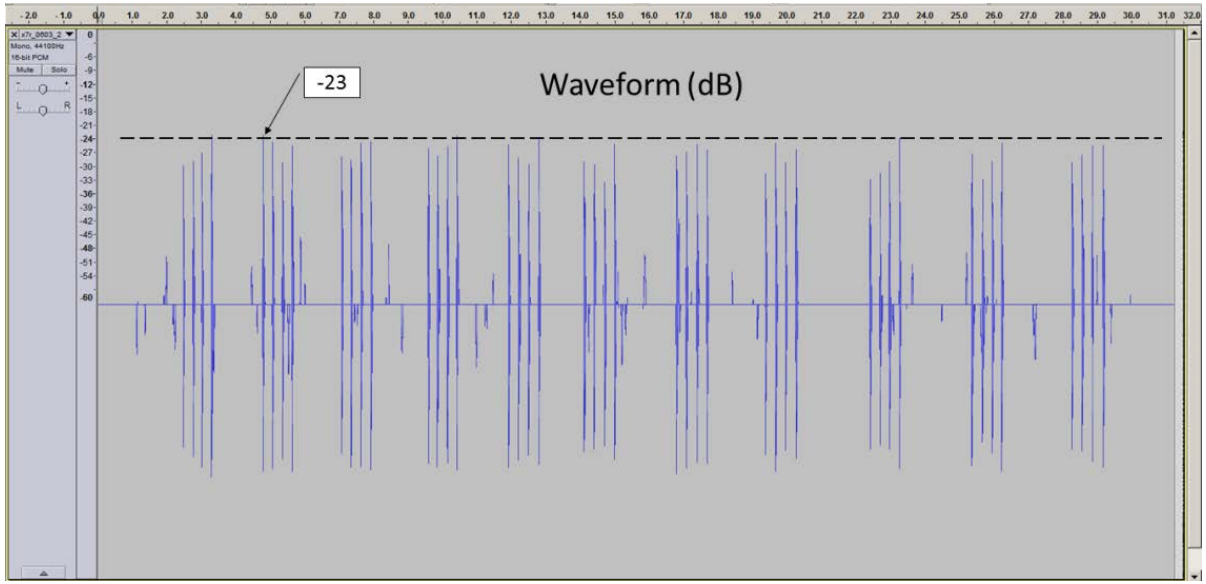
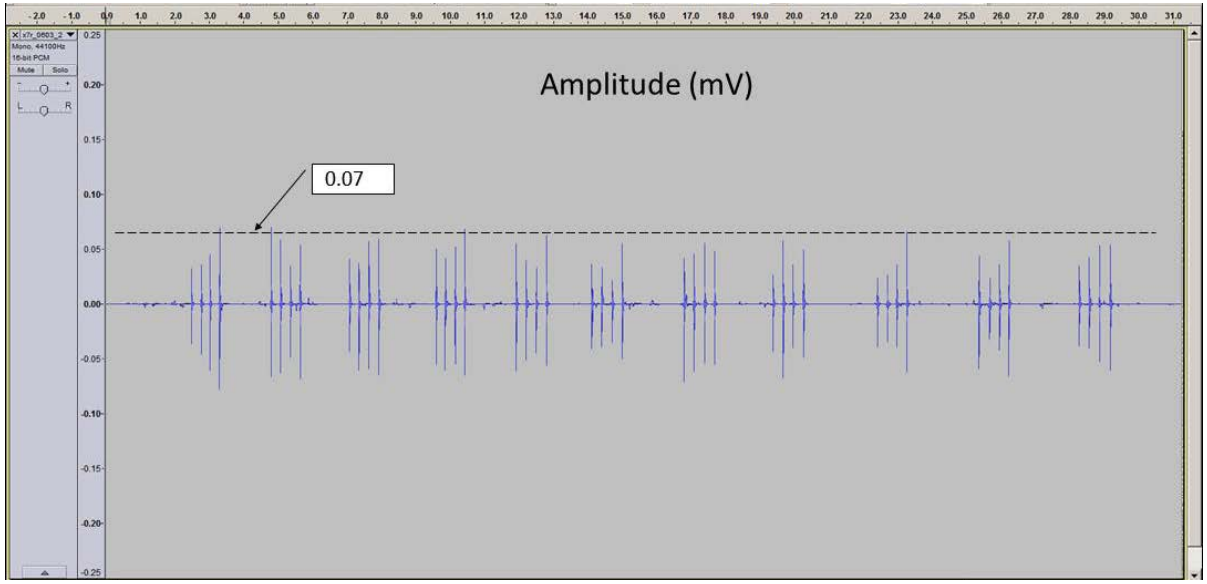
MLCC_0603_X7R_220nF





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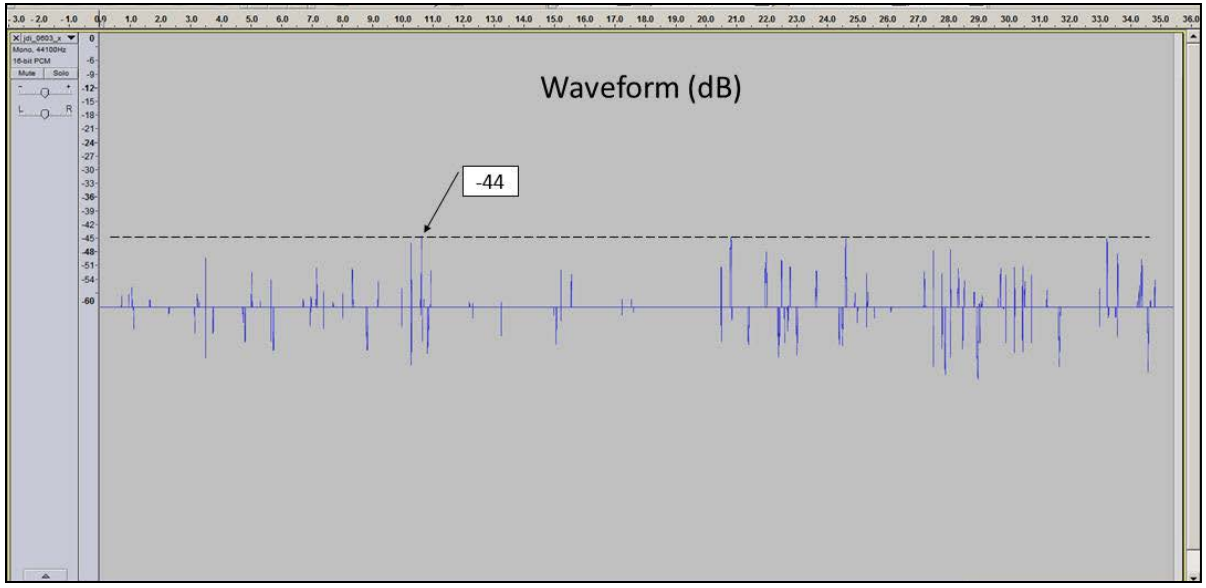
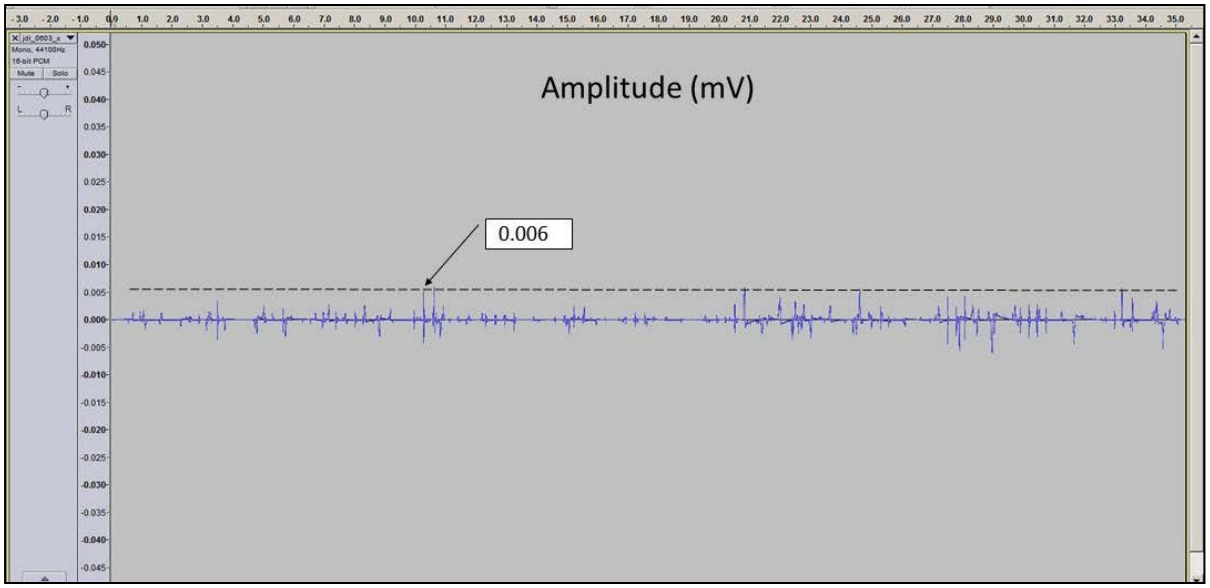
X2Y_0603_X7R_200nF





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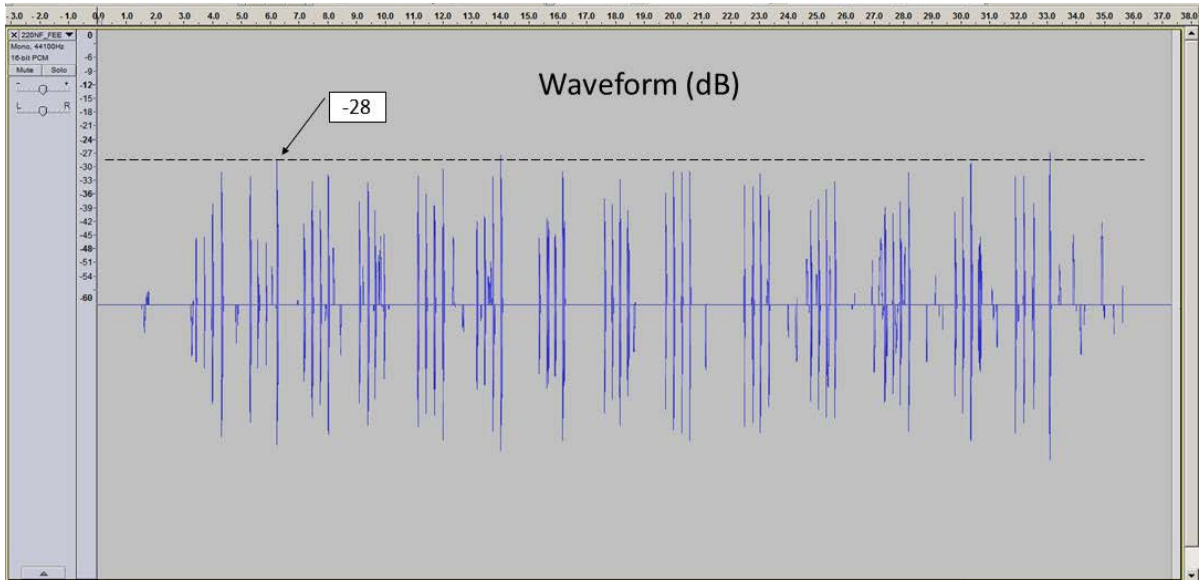
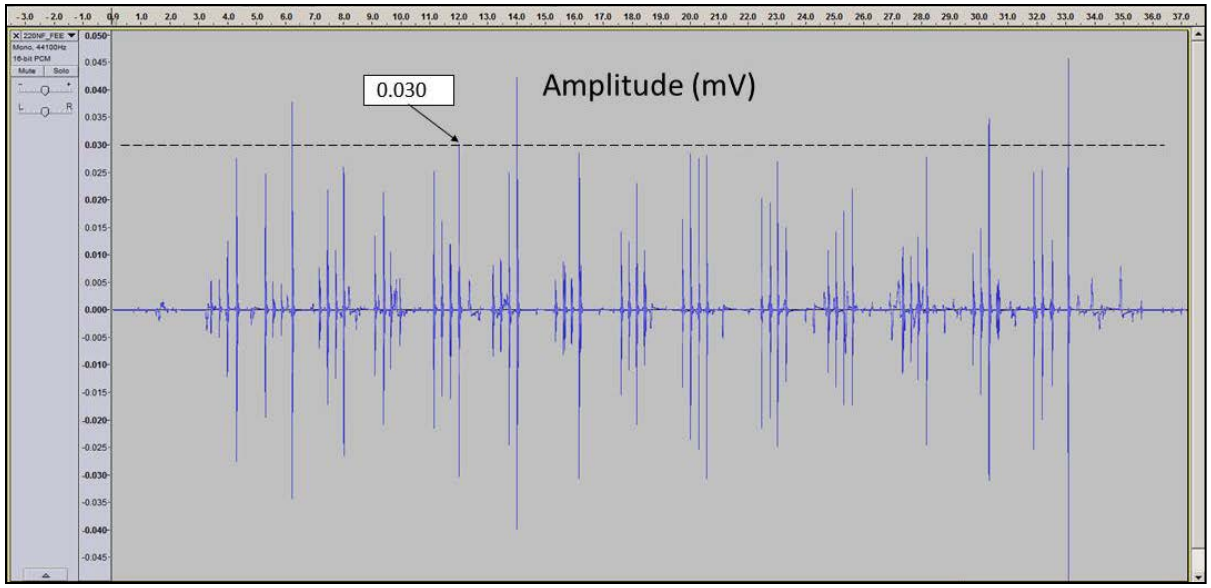
Feedthru_0603_X7R_220nF





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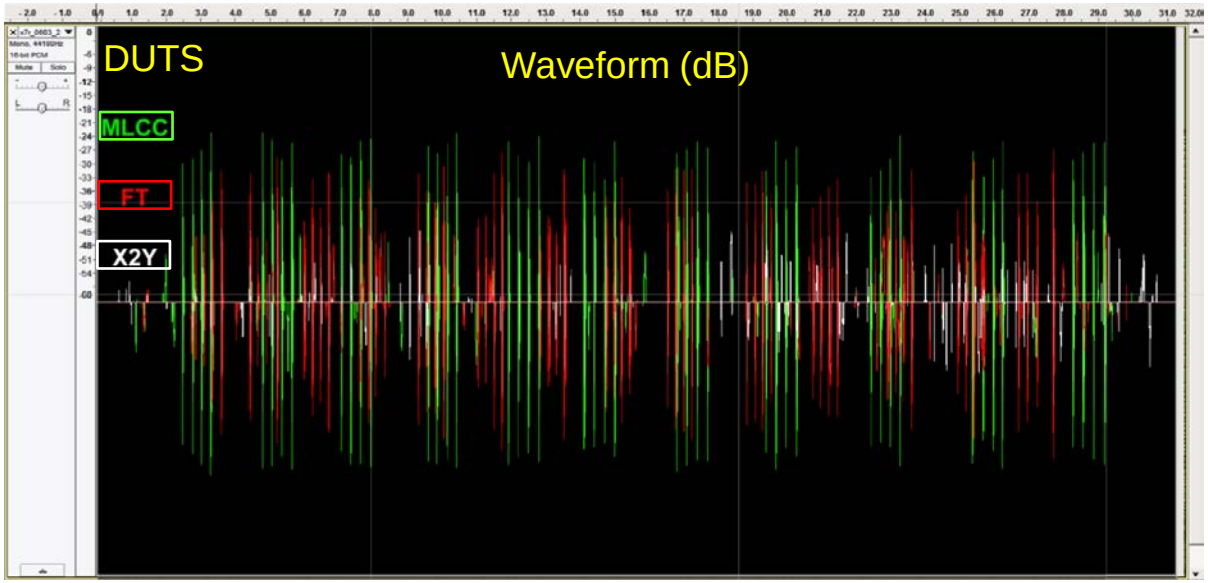
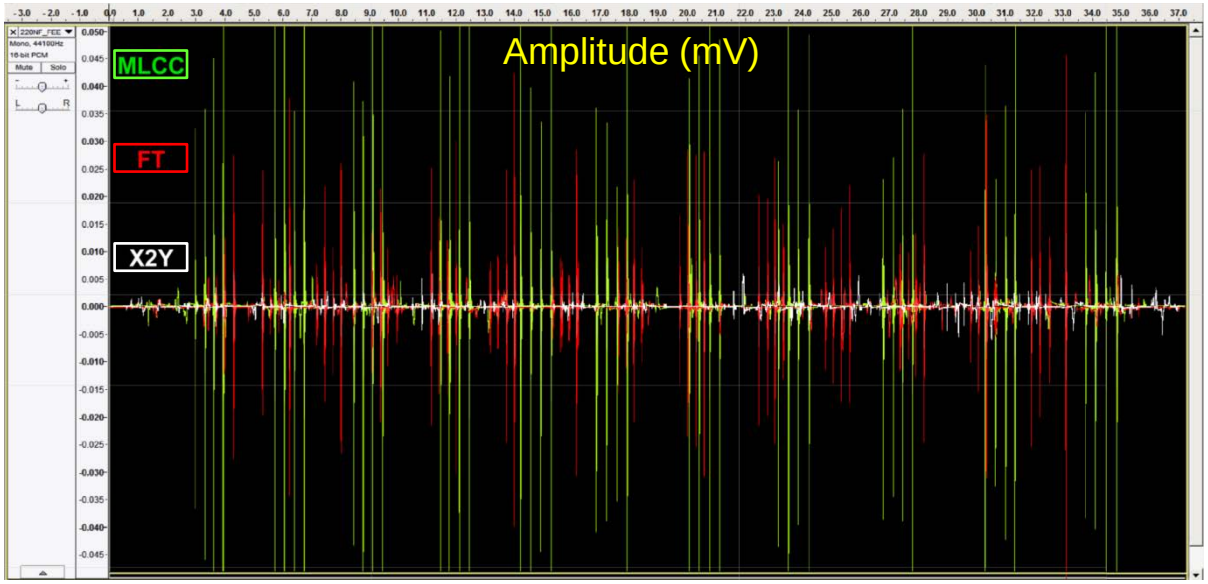
Overlay Comparisons





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Summary

- Shock test results:
  - As expected, MLCC 1210 NP0 / COG exhibited minimal disturbance and provided the benchmark performance
    - X2Y® 0603 X7R showed comparable microphonic performance to COG/NP0 dielectric
    - MLCC 0603 X7R resulted in the most microphonics
    - Feedthru 0603 X7R exhibited better performance than standard MLCCs, but performed worse than the 1210 COG/NP0 and X2Y

DUT	Waveform (dB)	Amplitude (mV)
MLCC_0603_X7R_220nF	-23	0.07
Feedthru_0603_X7R_220nF	-28	0.03
X2Y_0603_X7R_200nF	**-44**	**0.006**
MLCC_1210_NP0_220nF	-45	0.006

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