Electronics
Analog and Digital Grounds

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Wilfrid Laurier University

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- digital noise; fast, lots of current
- analog noise; slow, low current

Connection resistance

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Consider a trace on a circuit board.

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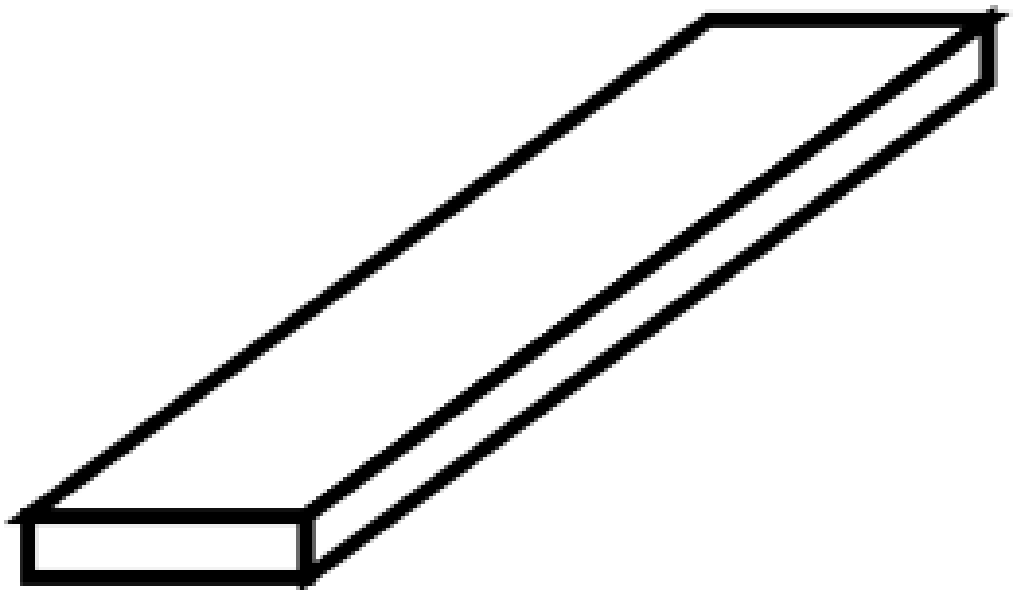

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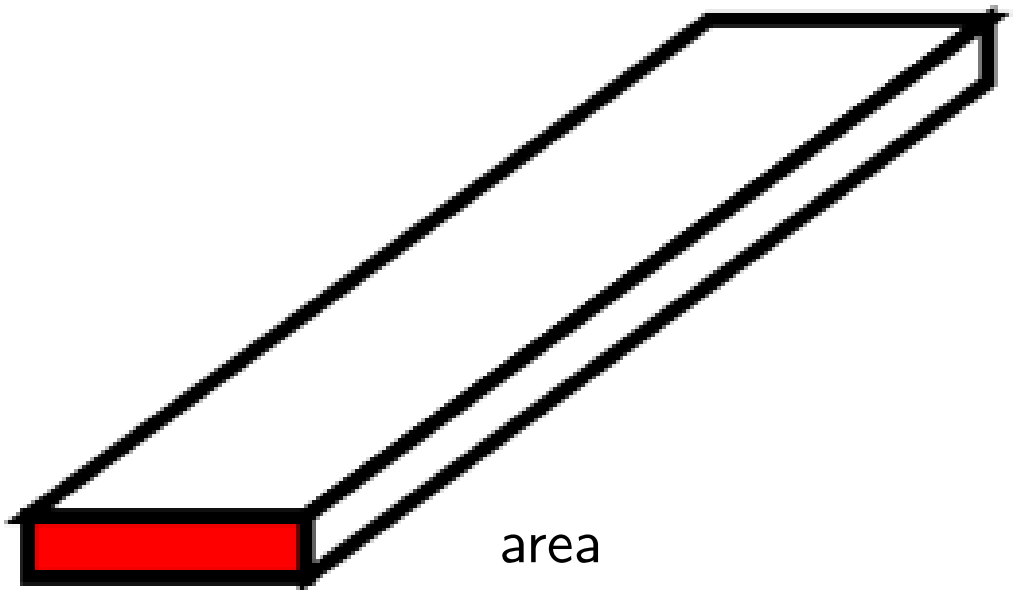

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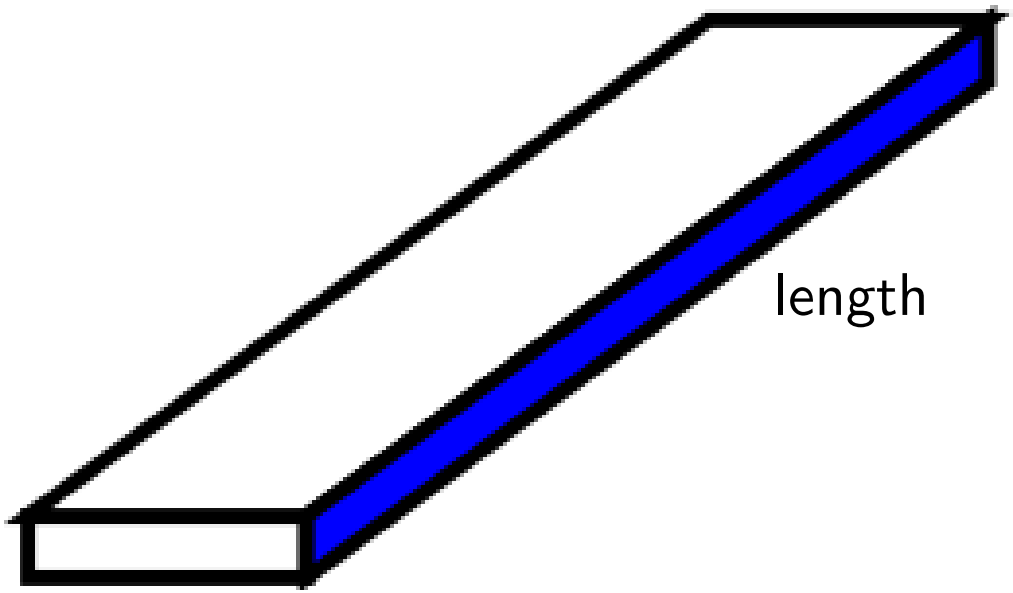

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Thus mA fluctuation$\rightarrow$mV/m fluctuation. *This includes fluctuations on power and ground lines.* The farther you get from power and ground connections, the more noise you get on power and ground lines.

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Digital

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Digital

May produce glitches.

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Digital and analog grounds should be separated to minimize problems with analog signals due to digital noise on power and ground lines.

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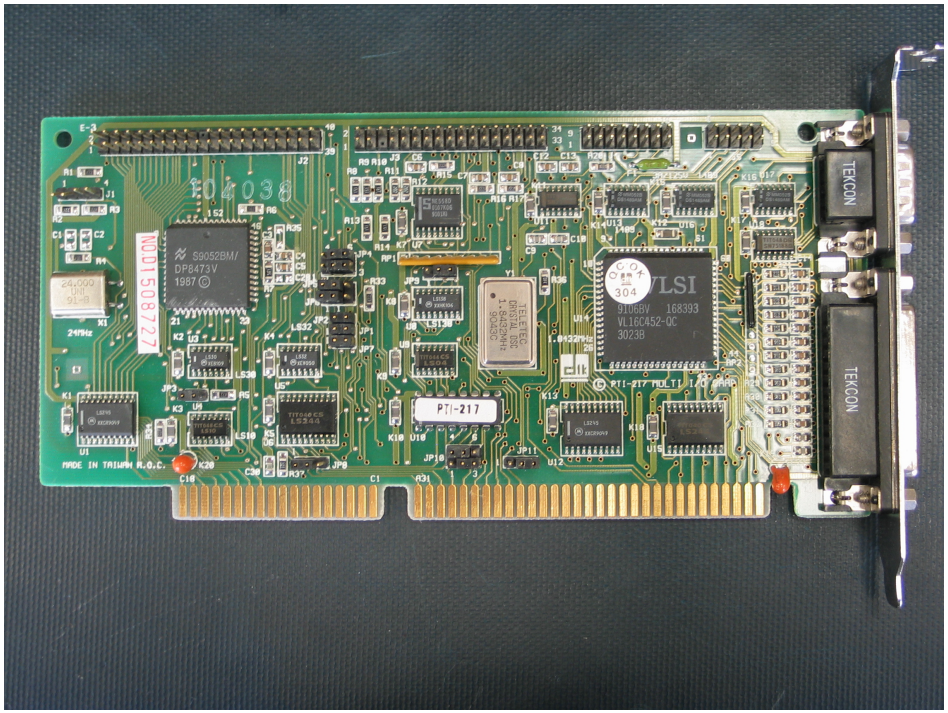
Use filter capacitors from V_{cc} to ground near IC to smooth the fluctuations as close to the device as possible;

Solution to noise problems - digital

Use filter capacitors from V_{cc} to ground near IC to smooth the fluctuations as close to the device as possible; The value is typically $0.01 \rightarrow 0.1 \mu F$

Filter capacitors



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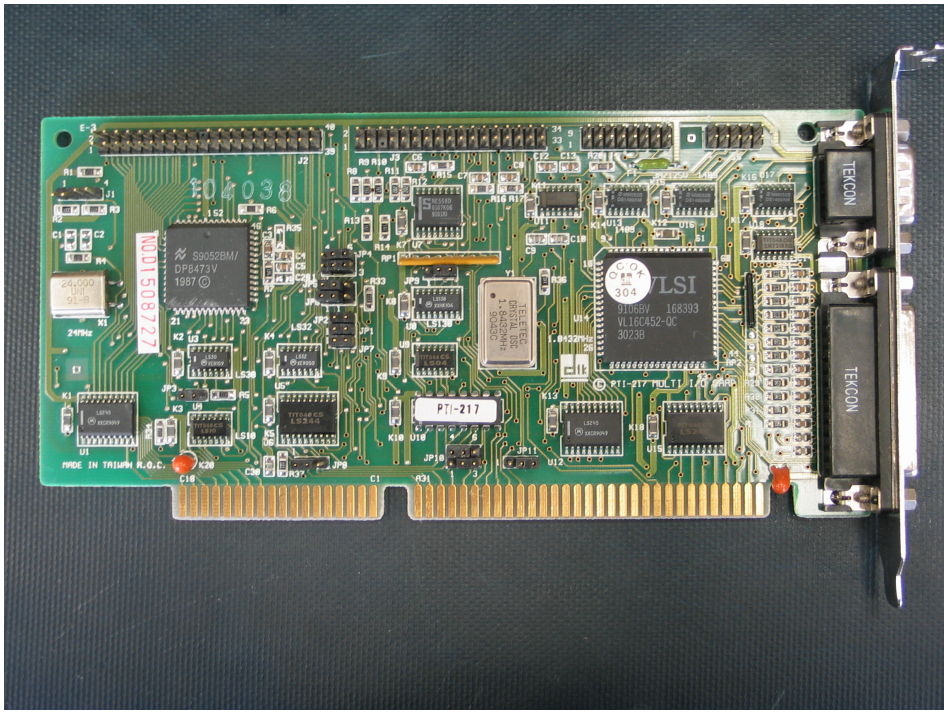

Here's an ordinary circuit board.

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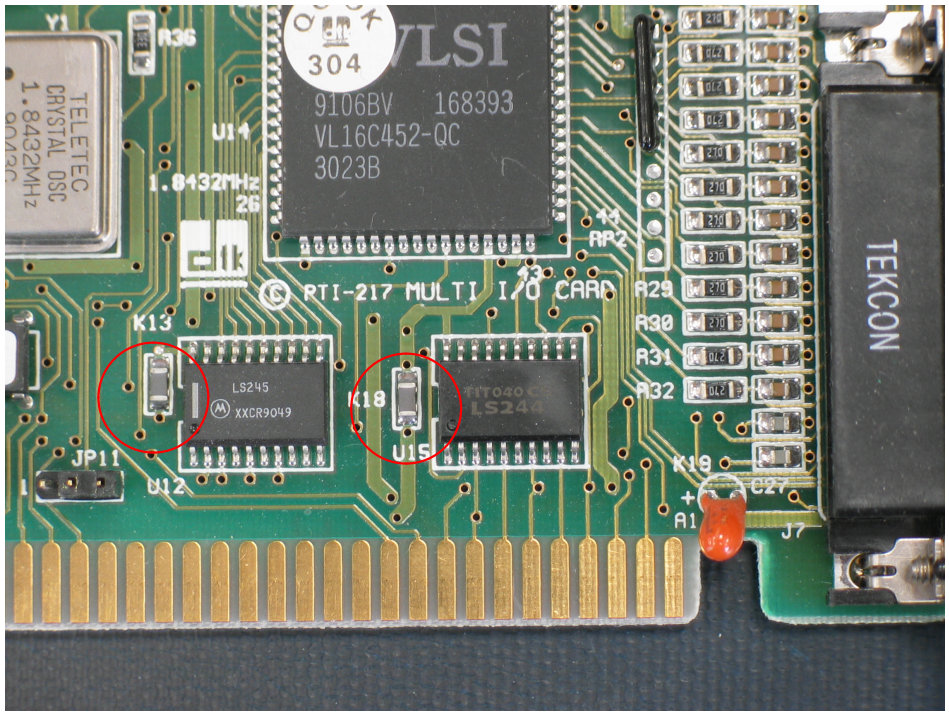

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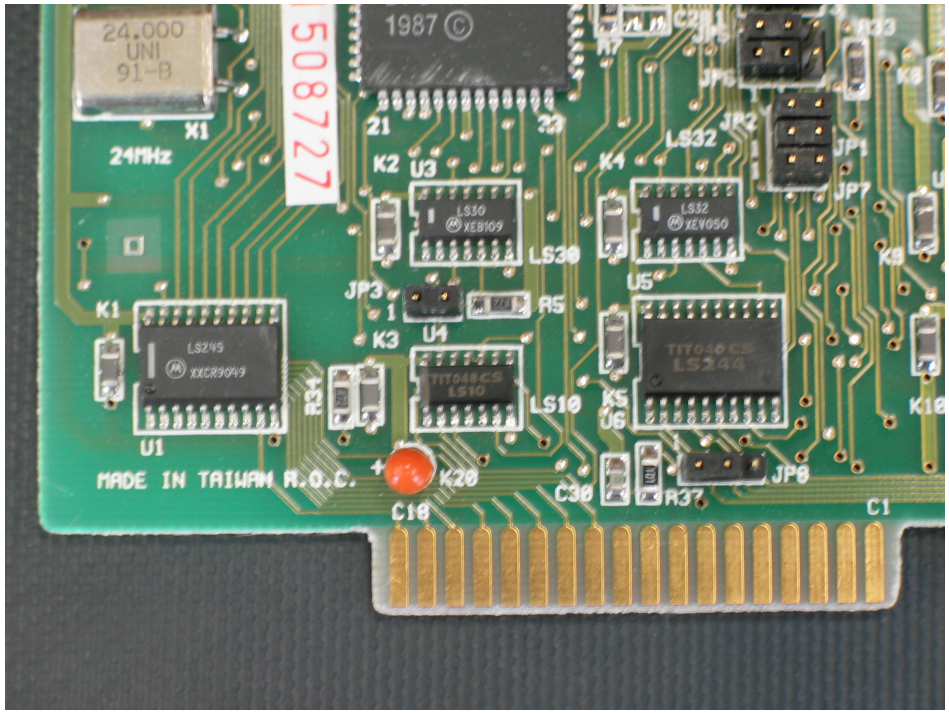

Here are more.

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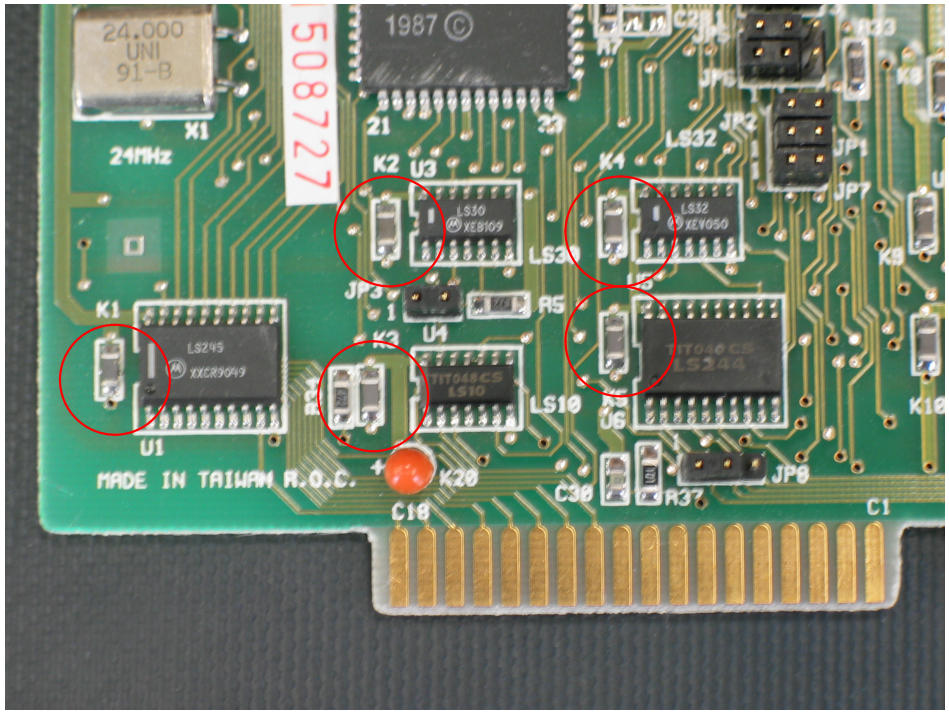

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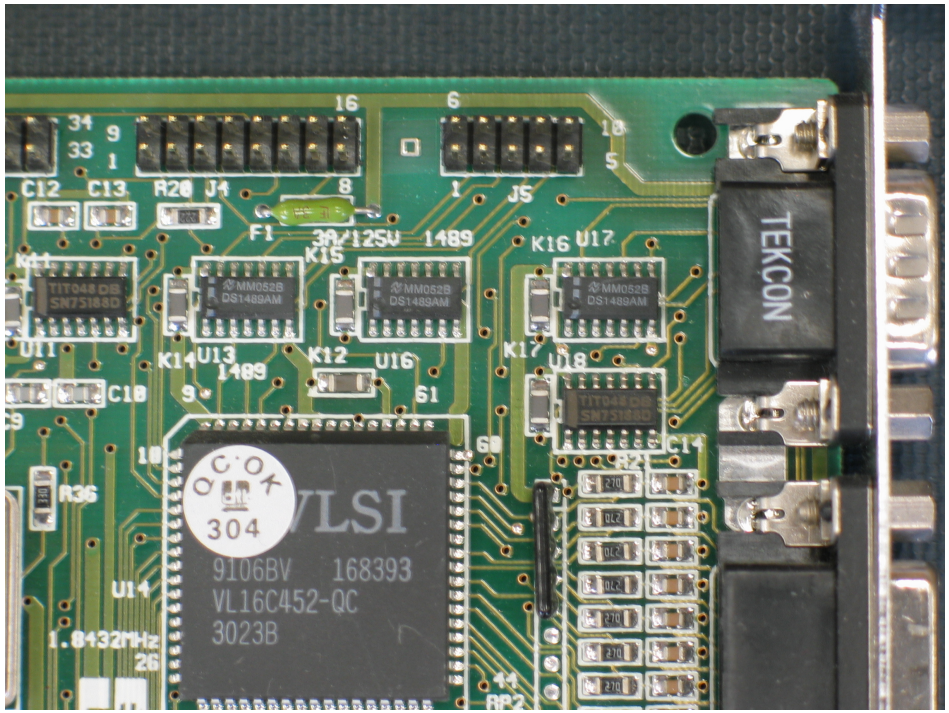

Find some more.

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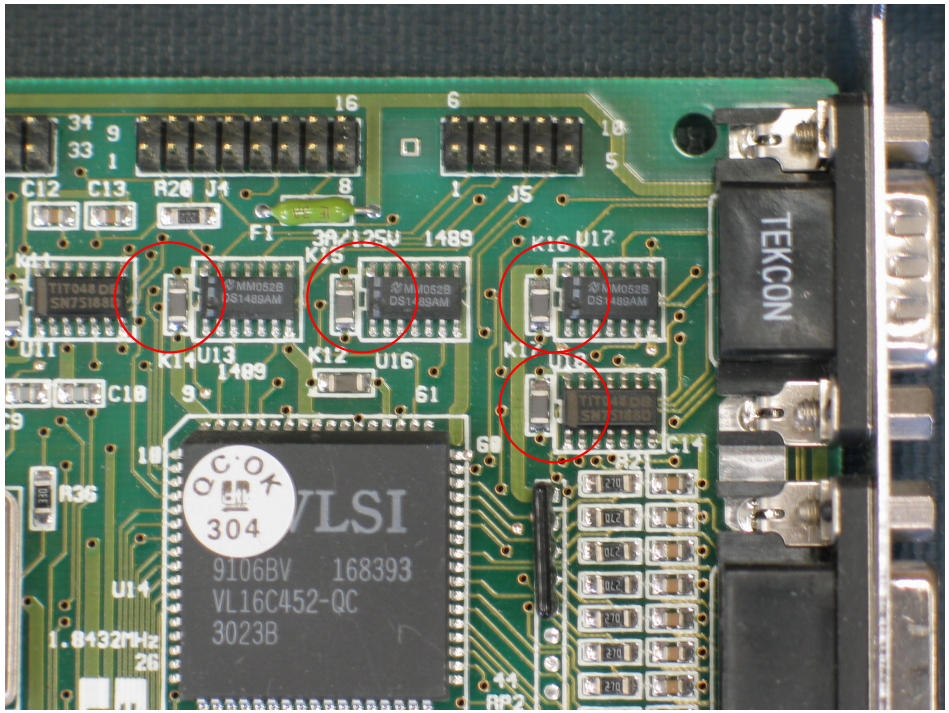

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