

Supply Bypassing

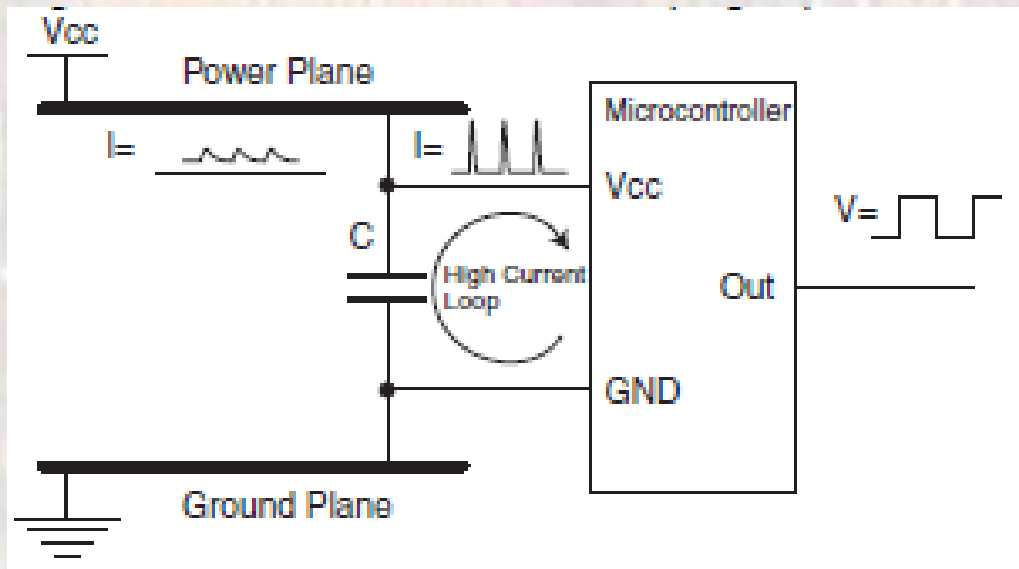
Last updated 4/25/22

Supply Bypassing

- Supply Bypassing
 - Digital circuits create current spikes on the supply pins
 - Shoot through current
 - Charging and discharging current
 - I/O switching
 - While the average supply current may be a few tens of milliamps, spikes associated with an 8 bit I/O switching can be hundreds of milliamps and a few nanoseconds wide
 - Power supplies and realistic circuit board traces cannot support these current spikes → noise on the supply voltage
 - Supply voltage noise can disrupt the normal operation of the processor or other circuits

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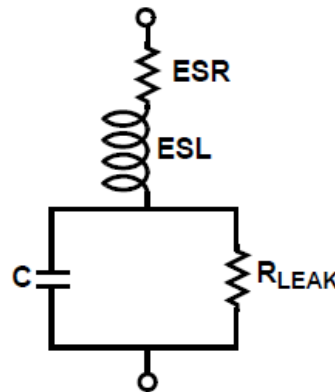
- Supply Bypassing
- Bypass capacitors are used to supply these spikes of current, preventing noise on the supply voltage pins



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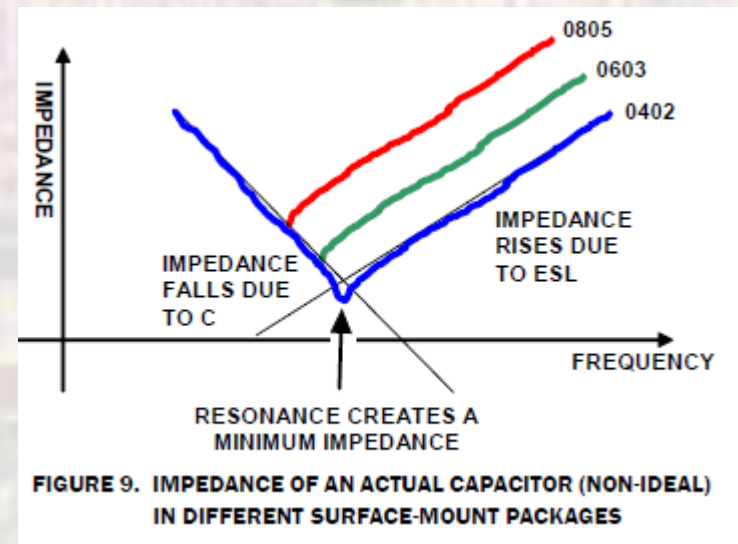
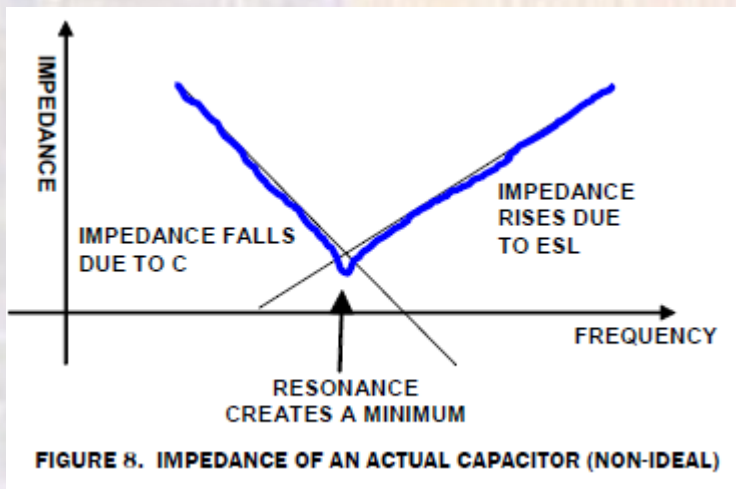
- Realistic capacitor model

ABBREVIATION	EXPLANATION	SOURCE AND DETAILS
ESR	Equivalent Series Resistance	Wire and connections to the plate Produces heat
ESL	Equivalent Series Inductance	Depends on package type Surface mount better Smaller SMD better
RLEAK	Leakage Resistance	Type of dielectric



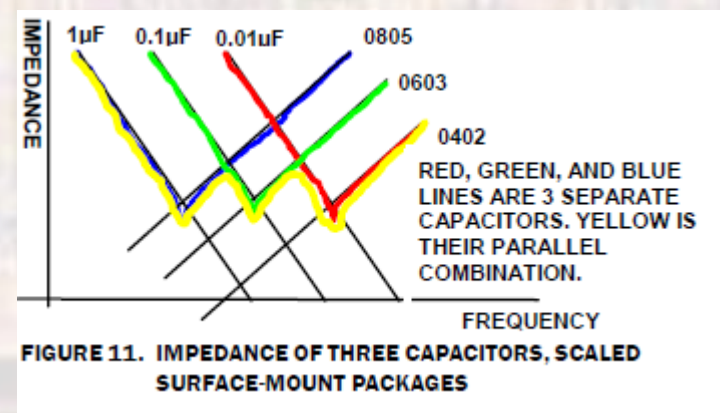
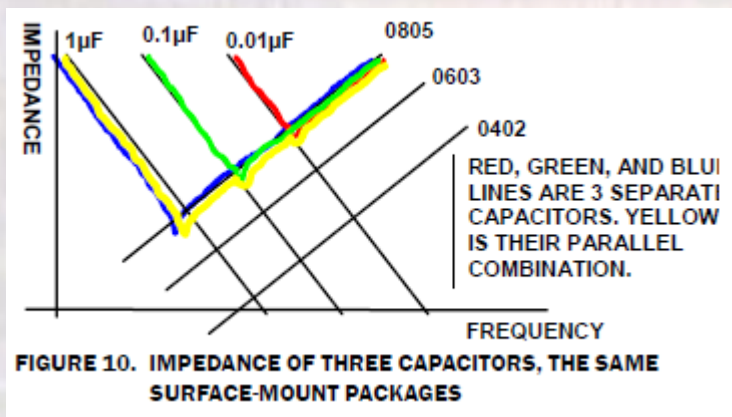
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- Realistic capacitor model



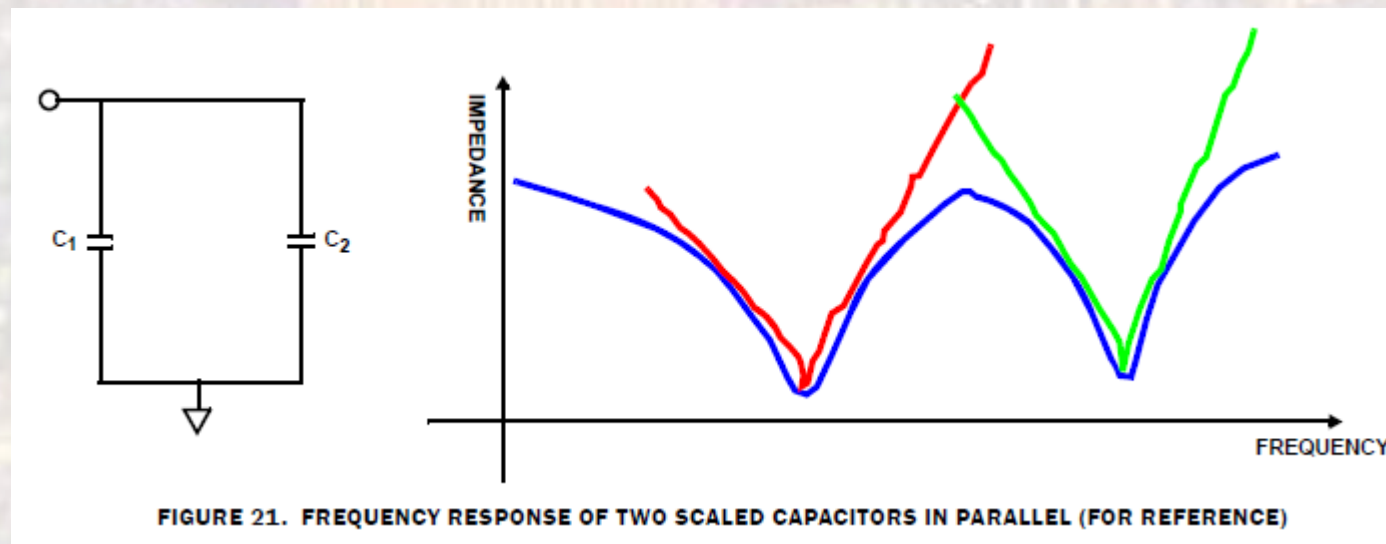
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 - Most systems use 2 bypass capacitors
 - 1 μ F - 10 μ F for low frequency high current spikes
 - .001 μ F - .01 μ F for high frequency spikes
 - Placed as close to the IC as possible to reduce inductance



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