



D.J. Broderick

Purpose

Symbols

Net to Net
Connections

Net to
Component

Designations/A

Reference
Positions

Global
Connectors

Multi-part
Packages

General
Design Advice

Off-board
Signal and
Power

Title Block

Schematic Guidelines

David J. Broderick, Ph.D.

Central Connecticut State University
New Britain, Connecticut 06050

broderick@ccsu.edu



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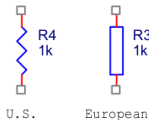
- 1 Schematic/Essay Analogy
- 2 Standardization leads to clarity
- 3 Industry/Military wide standards exist such as:
 - IEEE Standard 91
 - IEEE Standard 315
 - IEEE Standard 991
 - IPC-2612-2010
 - MIL-STD-100A
- 4 Follow the standards including company specific standards
- 5 Somebody else should be able to fabricate your design with the information provided on your schematic

This presentation was adapted from *Guidelines for Drawing Schematics*, Tim J. Sobering

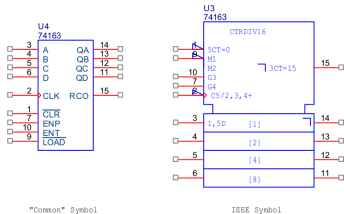


Schematic Symbols

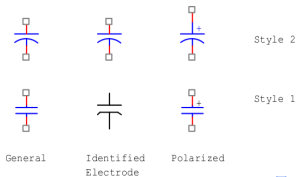
- US vs International



- Common vs IEEE



- Capacitors



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Connecting Nets

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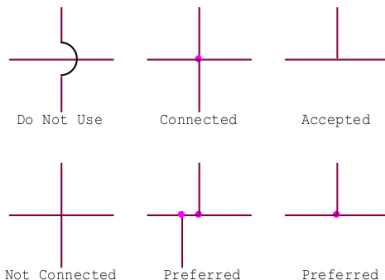
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Connecting components correctly is imperative



- CAD Software won't draw the hop
- Photocopiers eat the dots



Net to Component Connections

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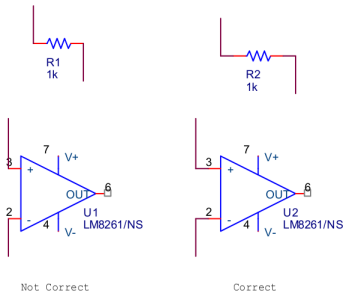
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- Not a standard per se but good style
- Exit a pin Straight for at least one grid square before changing direction



- Avoids overlap
- Avoids placing symbols too closely together



References and Designations

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- References: R1, R2, D1, T1, etc.
- Designation: The letter refers to the type of component

Table 1. Common reference designators

Code	Package	Code	Package
C	Capacitor	P	Connector, Plug
D or CR	Diode	PS	Power Supply
D or VR	Zener or Breakdown Diode	Q	BJT, SCR, SCS
D	LED	R	Resistor
F	Fuse	S	Switch
J	JFET, Connector, Jack, Jumper	T	Transformer
K	Relay	TP	Testpoint
L	Inductor	U or IC	IC
M	MOSFET	X or Y	Crystal

- References should be common between the schematic, Bill of Materials, and the silkscreen



Reference Positions

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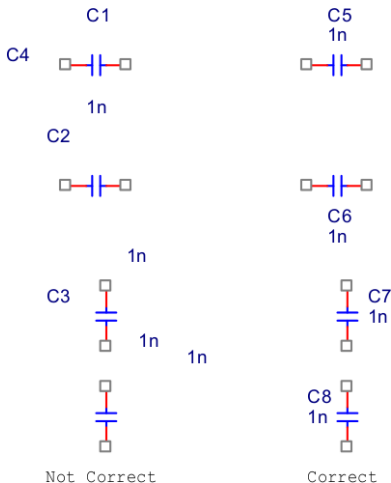
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- Keep them together
- Keep them near by
- Reference, then part value
- Use standard values
- Significant digits start to matter 10 k Ω vs 10.0 k Ω





Global Connectors

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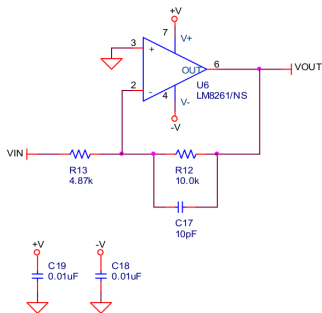
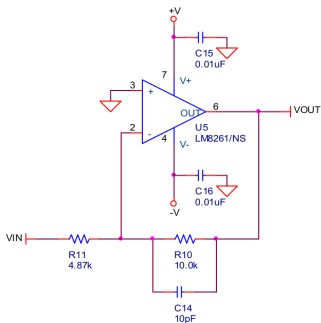
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Power and Ground Symbols

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0



GND



GND_EARTH



GND_FIELD SIGNAL



GND_POWER



GND_SIGNAL



Style Points

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- Signal flow left to right
- Use buses whenever possible
- Explicit net names
- Operational amplifiers, keep the positive supply up.
- Use notes and boxes wherever they provide clarity



Use the Title Block

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David Broderick, Ph.D. CET246 Electronic Design Automation Central Connecticut State University		
Sheet: / File: SMPS Design.sch		
Title: CET246 Buck Converter Demo		
Size: USLetter	Date: 2017-10-29	Rev: 0
KiCad E.D.A. kicad 4.0.7		Id: 1/1

- For attribution
- For version control
- For professionalism