OrCAD Oriented Pre-Simulation

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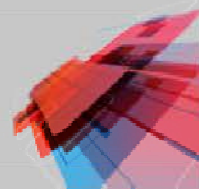
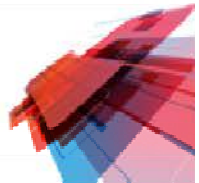
Graser®

Simplify The Complexity of Product Design Function Verification - OrCAD PSpice



Topic

- Design Challenges
- Production Challenges
- How to help developing new design faster and more stable
- Mechatronics integration Design
- Modularized simulation
- How to help your customer to get more powerful support

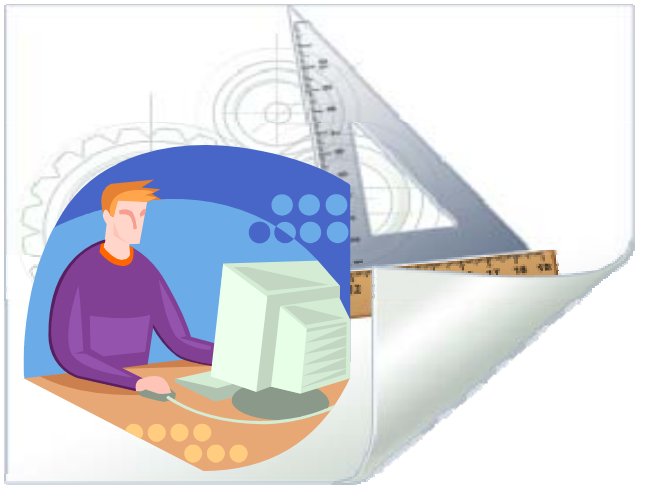


Design Challenges

Step 1 :

Make circuit design on your system

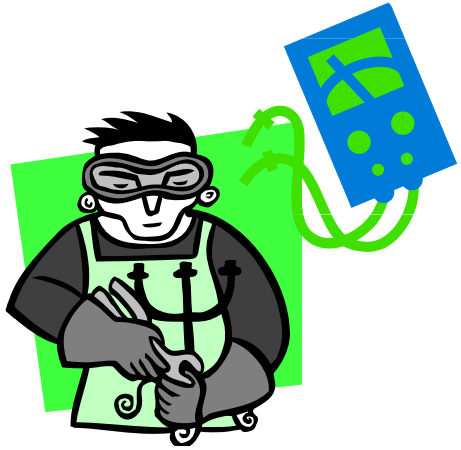
- Does it work ?
- Is it stable ?



Step 2 :

Make a Prototype in Laboratory

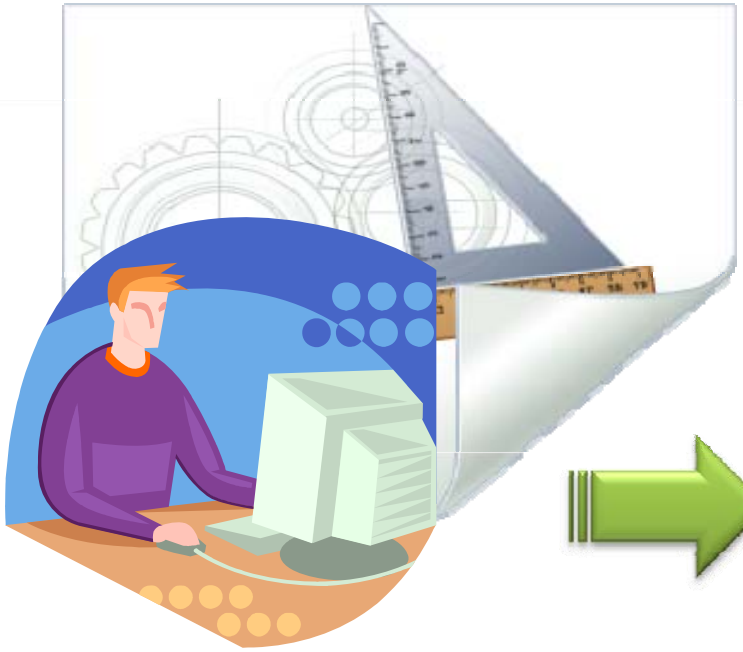
- Prepare equipment
- Connect system in between
- Does it work ?
- Is it stable ?



Traditional Design Flow

- Schematic drawing in your design
- Make prototype
- Measurement in Laboratory
- **Repeatedly try and error**

A Virtual Laboratory – OrCAD PSpice

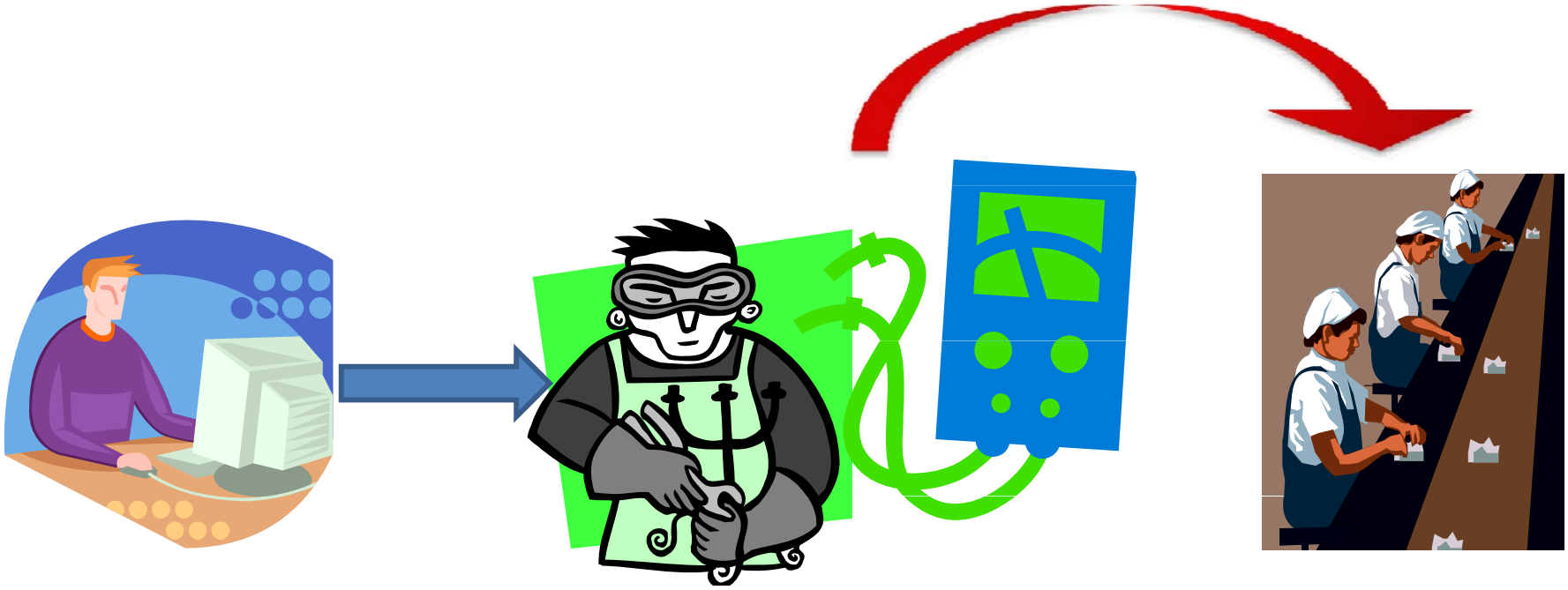


OrCAD PSpice

- Curve Tracer
- Logical Analyzer
- Statistical Analysis
- Oscilloscope
- Measurement Expression
- Network Analyzer
- Function Generator
- Spectrum Analyzer
- Power Supply

Virtual Design Flow

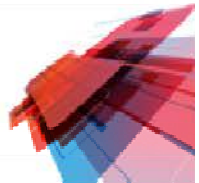
- Schematic drawing
- Simulate and results confirmation
- PCB layout



Manufacture

A Quality Analysis Laboratory

- **Mass Production Issues**
  - Complexity
  - Stability
  - Components Specification
  - Cost



Mass Production Challenges

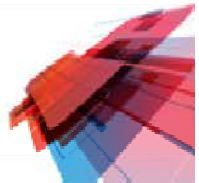
Prototype

- It works
- It is stable

How about Mass Production ?

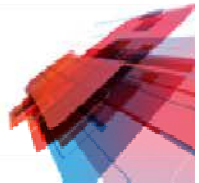
- Parts specification ?
  - Tolerance
  - Temperature issue

Is it stable ?



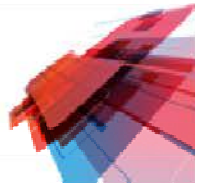
Enhance Circuit Design Stability

- Is simple best ?
- Using Parts with high accuracy and stable specification to improve stability.
- Enhance stability with compensate circuit design.
- Using other structure design.

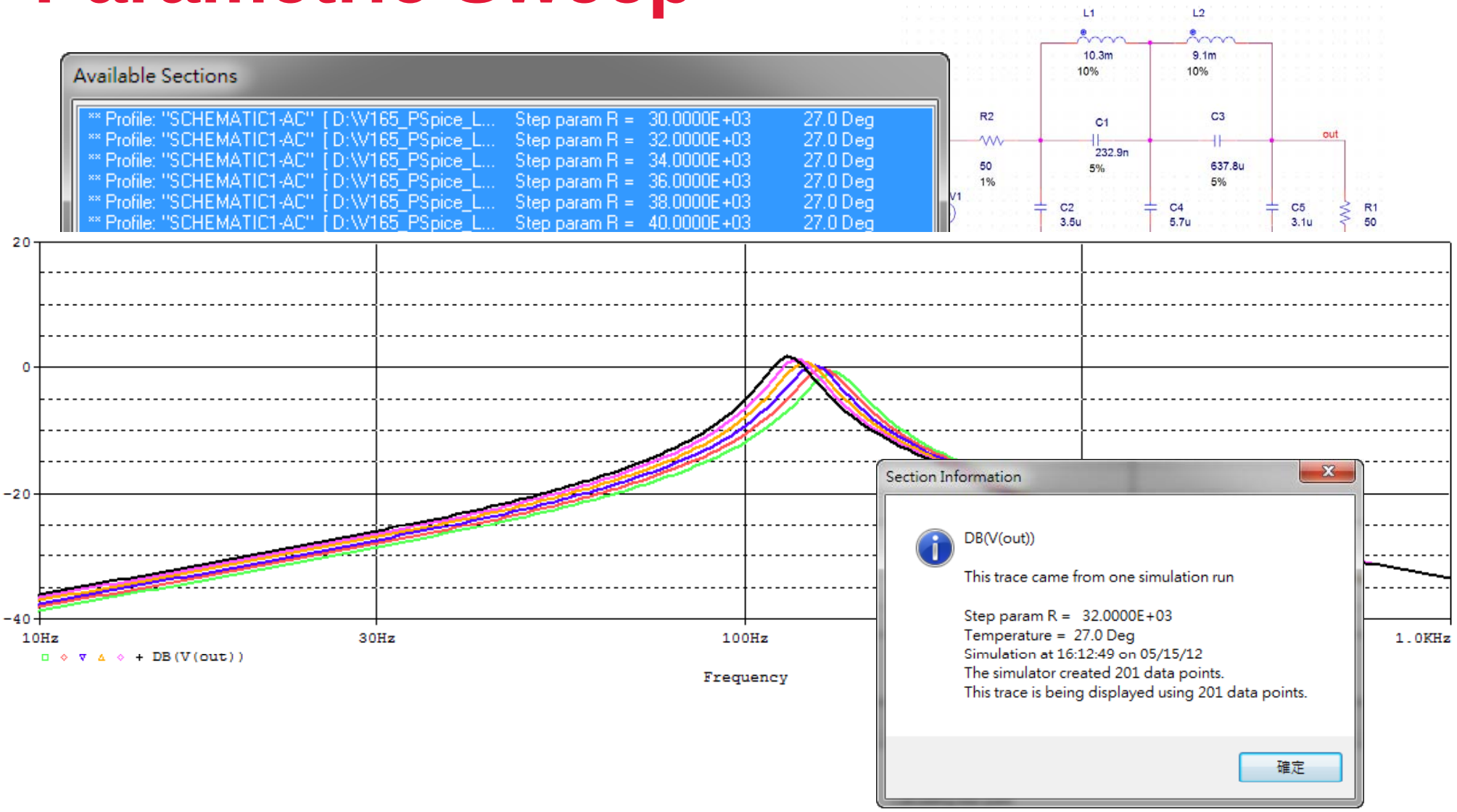


Design Flow for Mass Production

- Get a standard system design from origin
- Measure and find out better structure
- Include tolerance and temperature parameters
  - Parametric Sweep
  - Worst Case Analysis
  - Monte Carlo Analysis (Yield)



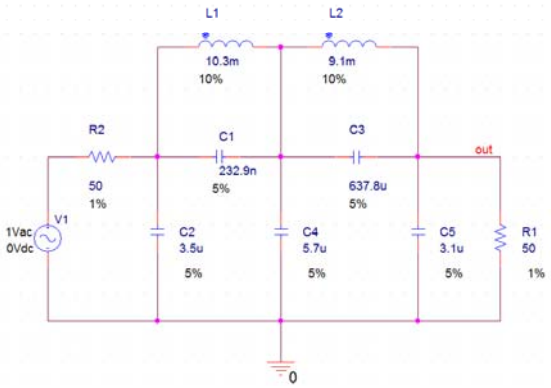
Parametric Sweep

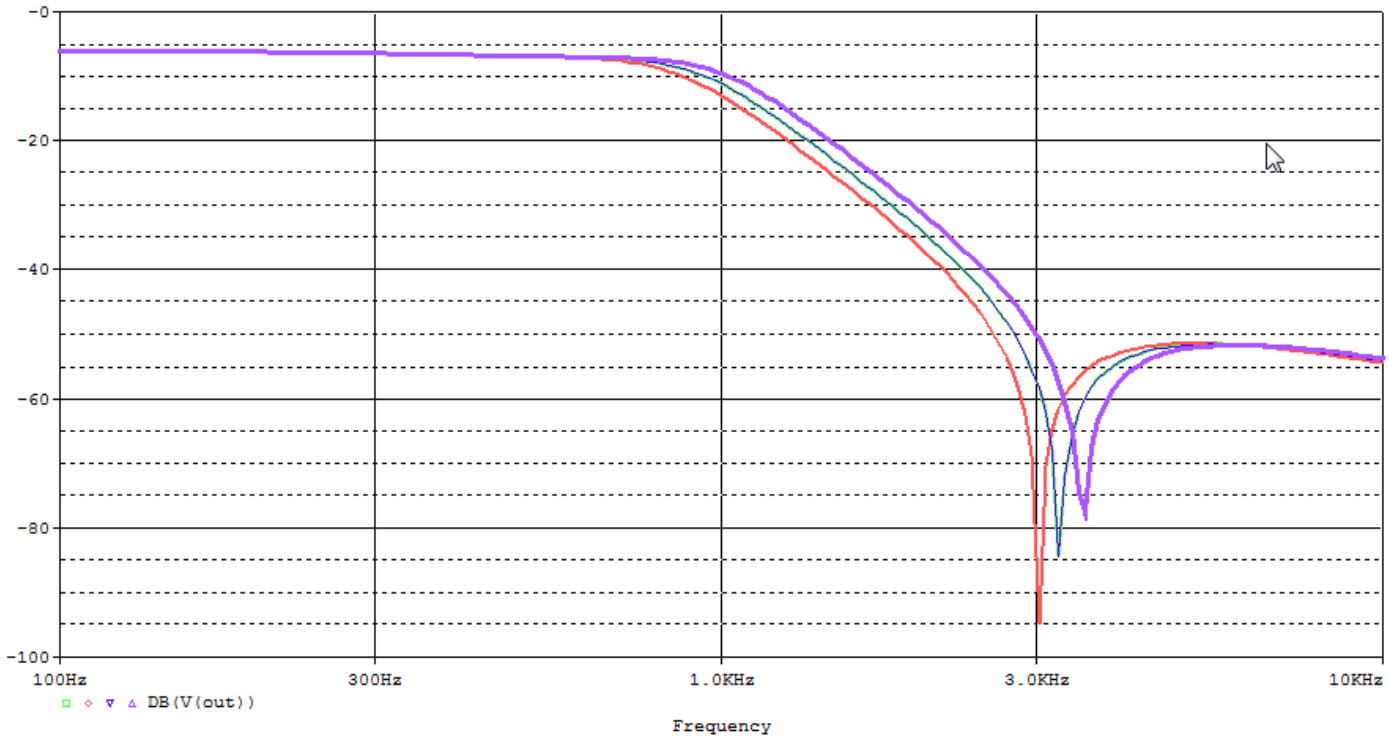


- Make sure structure and parts are good for design.

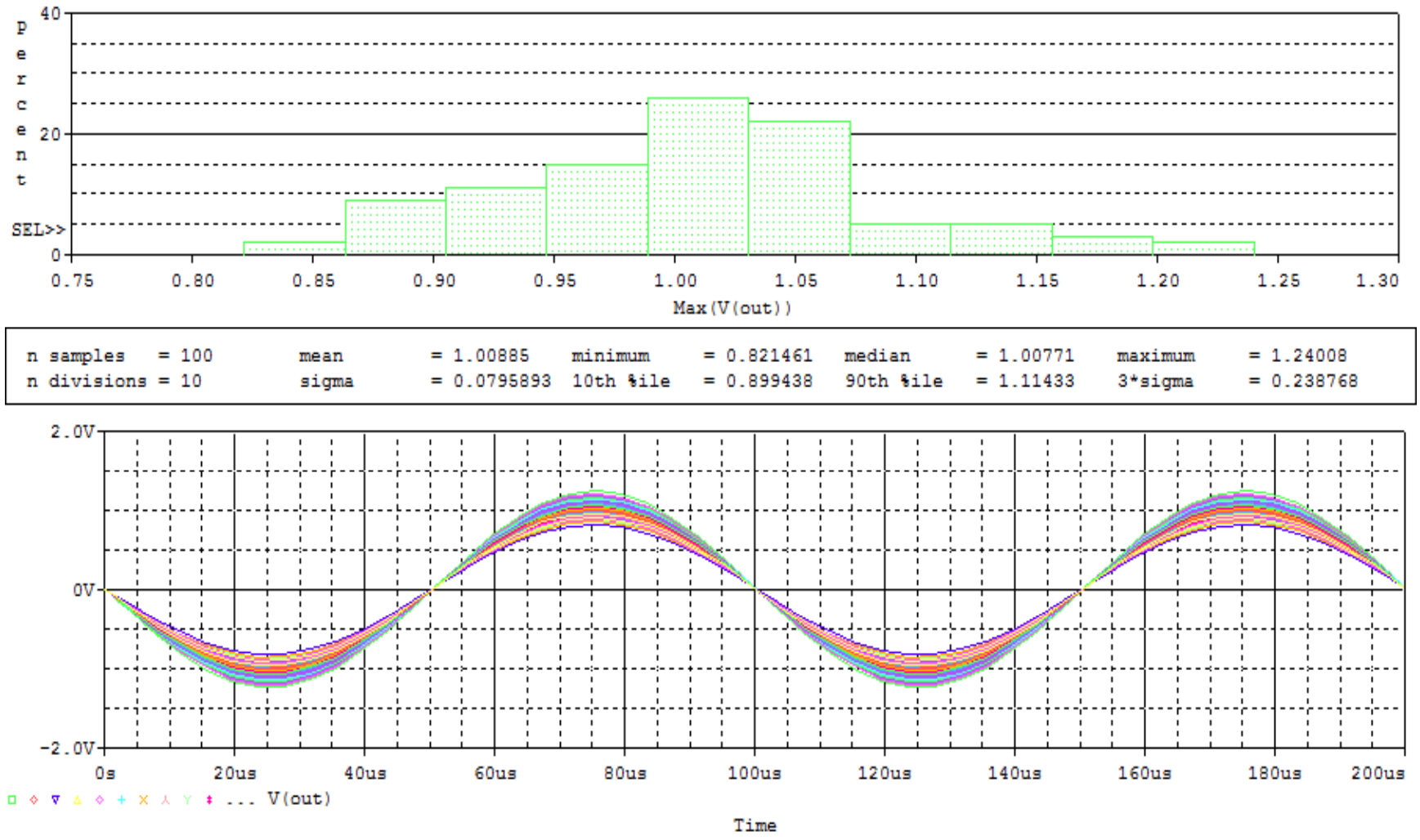
Worst Case Analysis

- Effects of Components Tolerance Limitation on Worst-Case Analysis





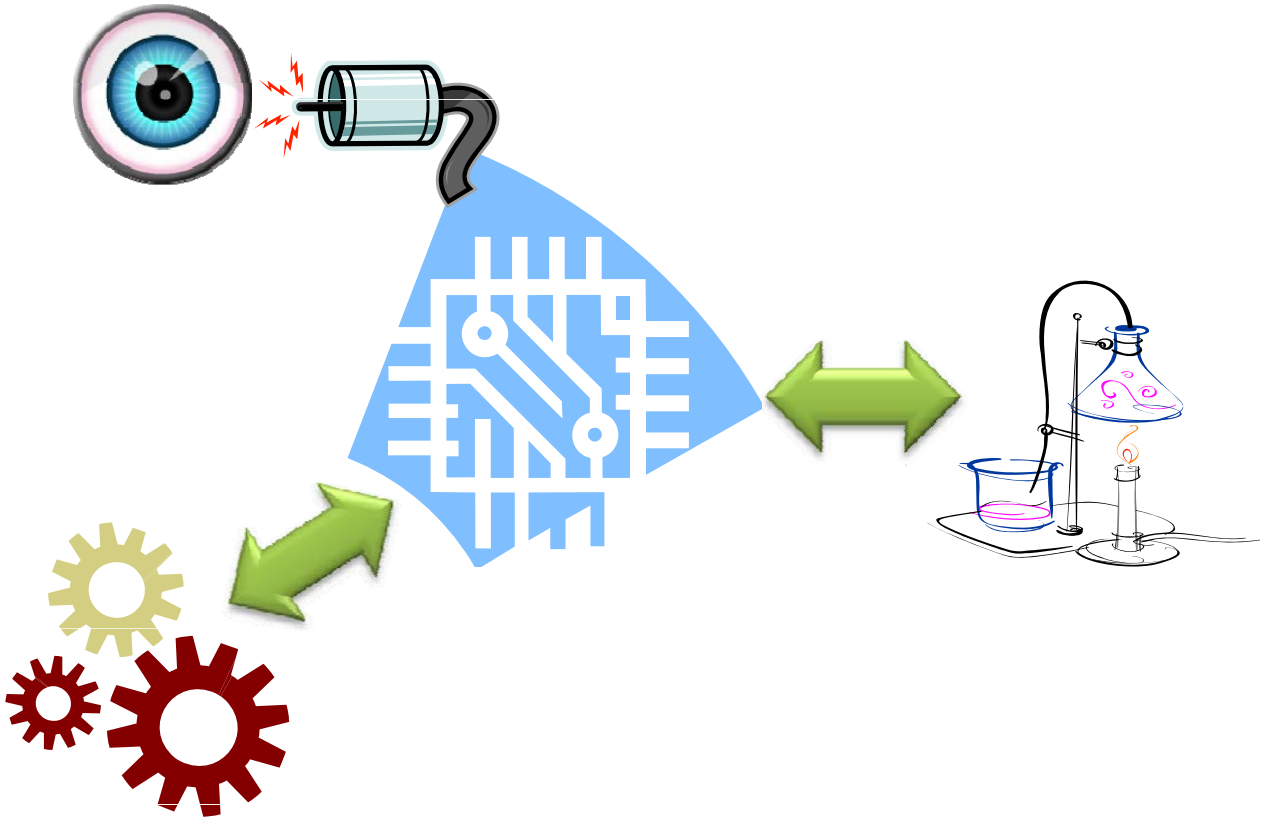
Monte Carlo Analysis



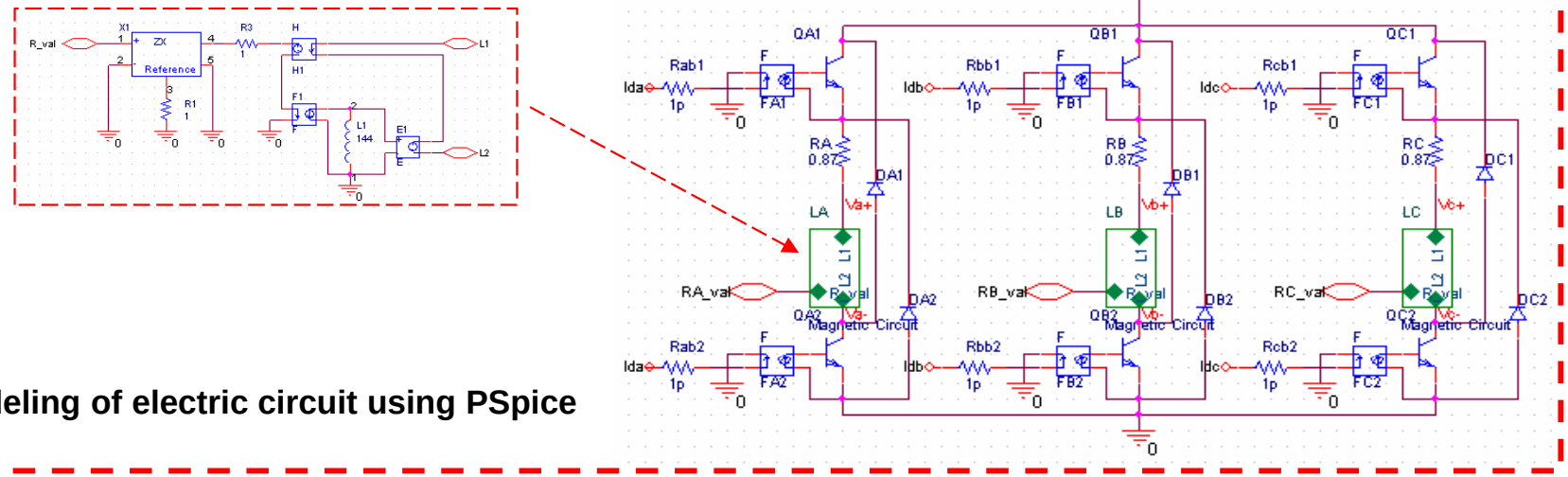
Mechatronics Integration Design

Automotive Safety System

- Passive mode：ABS、Airbag、Reversing radar
- Active mode：DSTC , ROPS , EBD , CWFAB , PDFAB , DAC , LDW

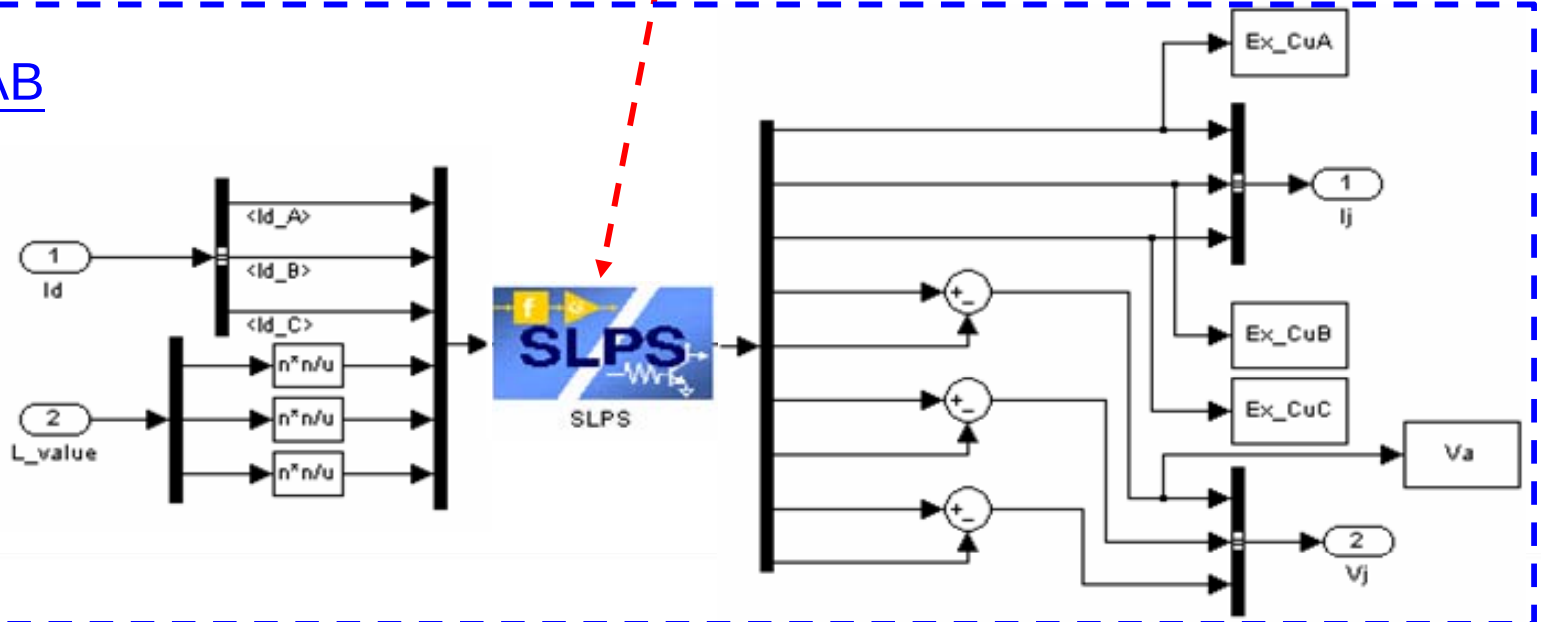


SLPS Option

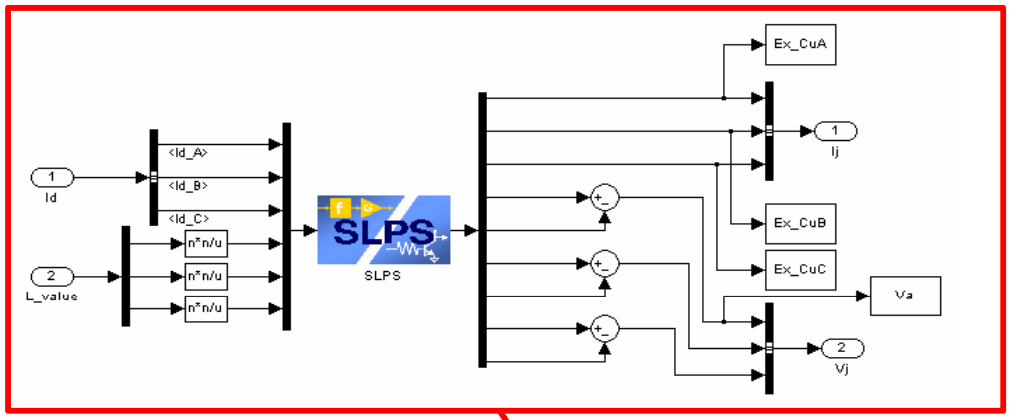


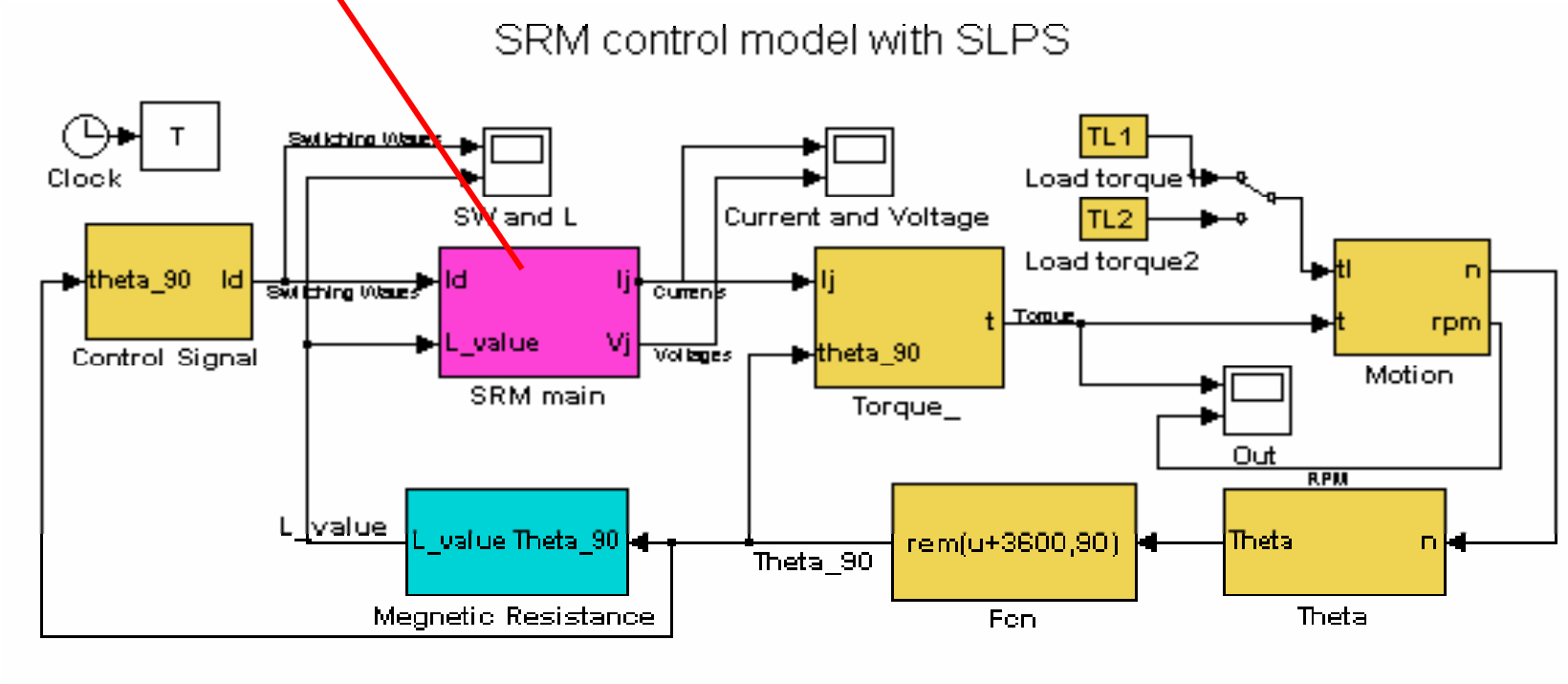
Modeling of electric circuit using PSpice

MATLAB

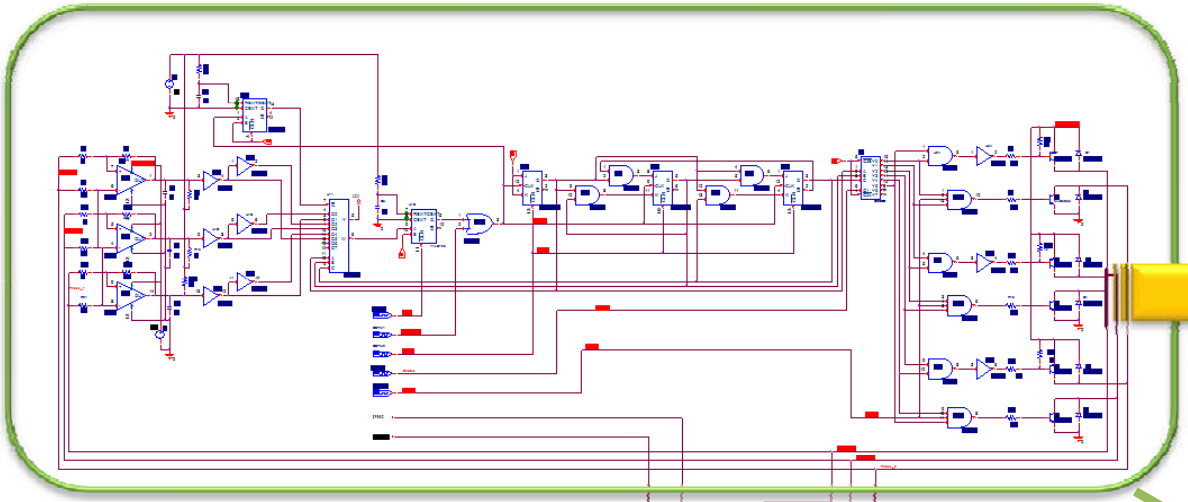


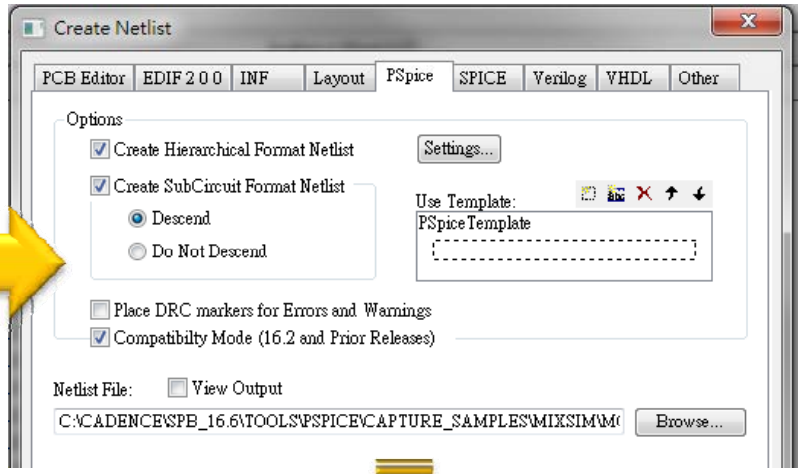
Multi-System Co-Simulation

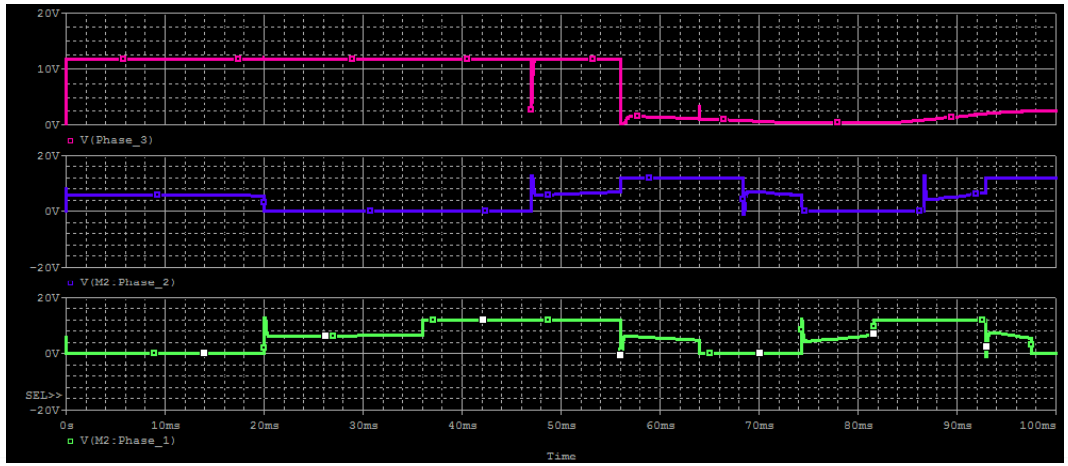


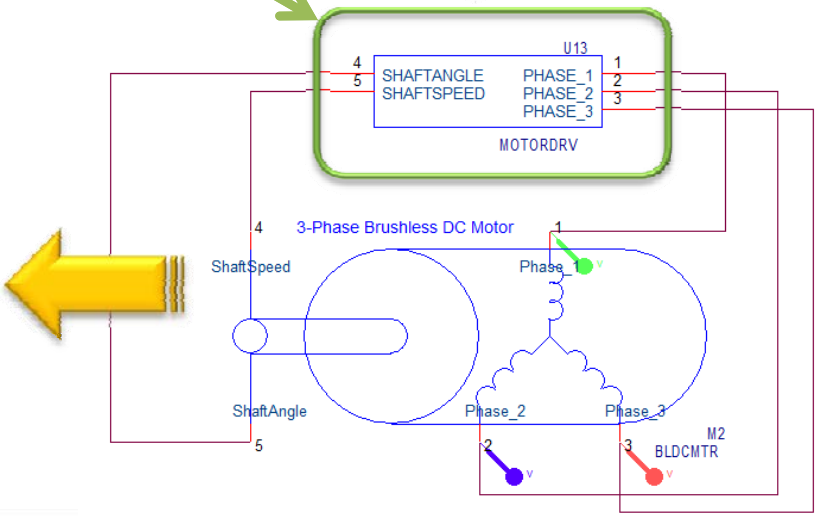


Modularized Design and Simulation

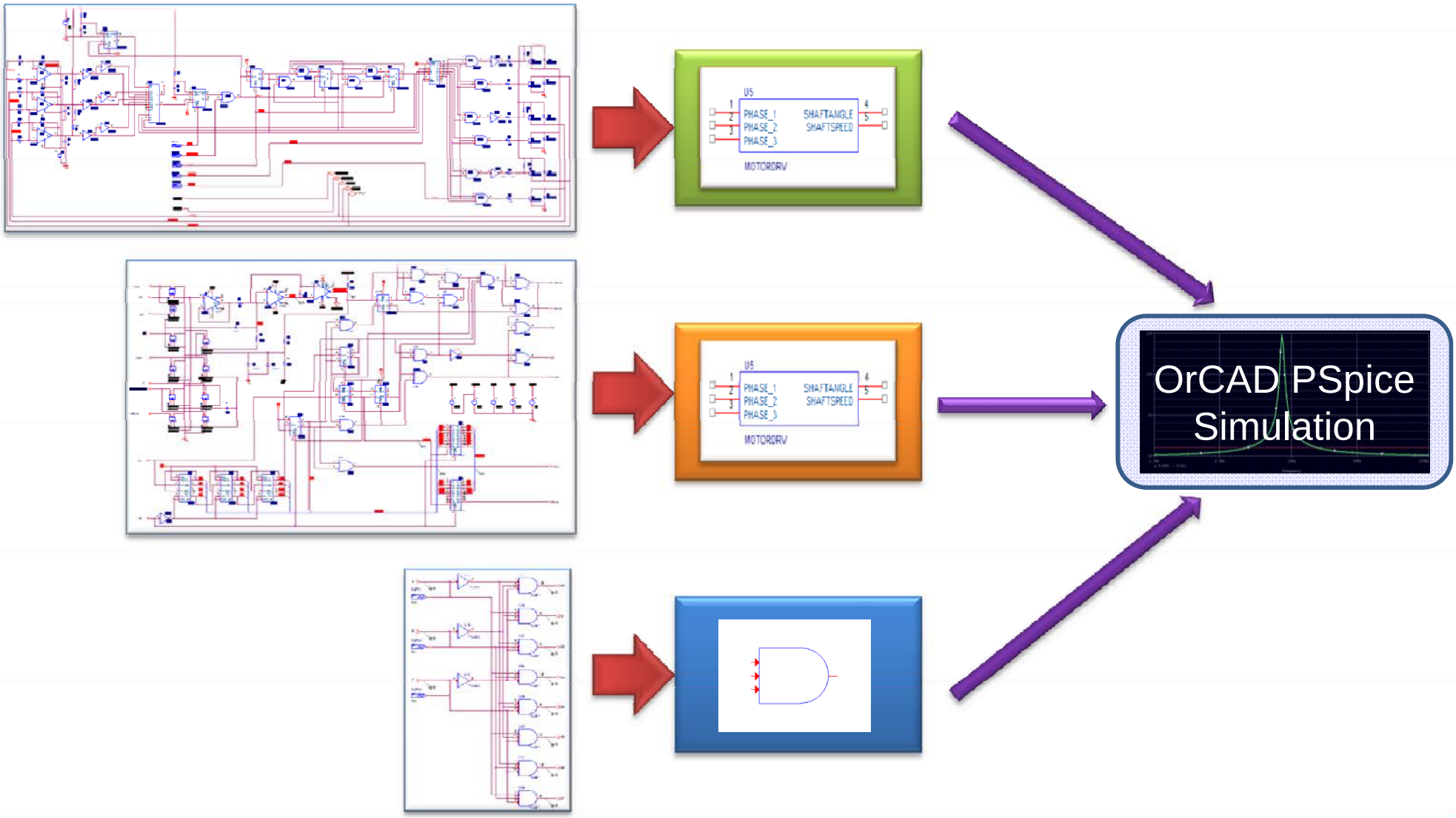








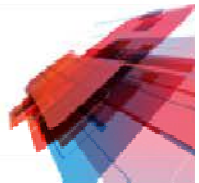
Modularized Design and Simulation



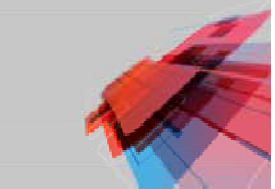
PSpice is a

- Virtual Laboratory
- Senior Application Engineer
- Quality Analysis Laboratory

- Reduce Loading in Product Design Process
- Cost Down
- Time to Market



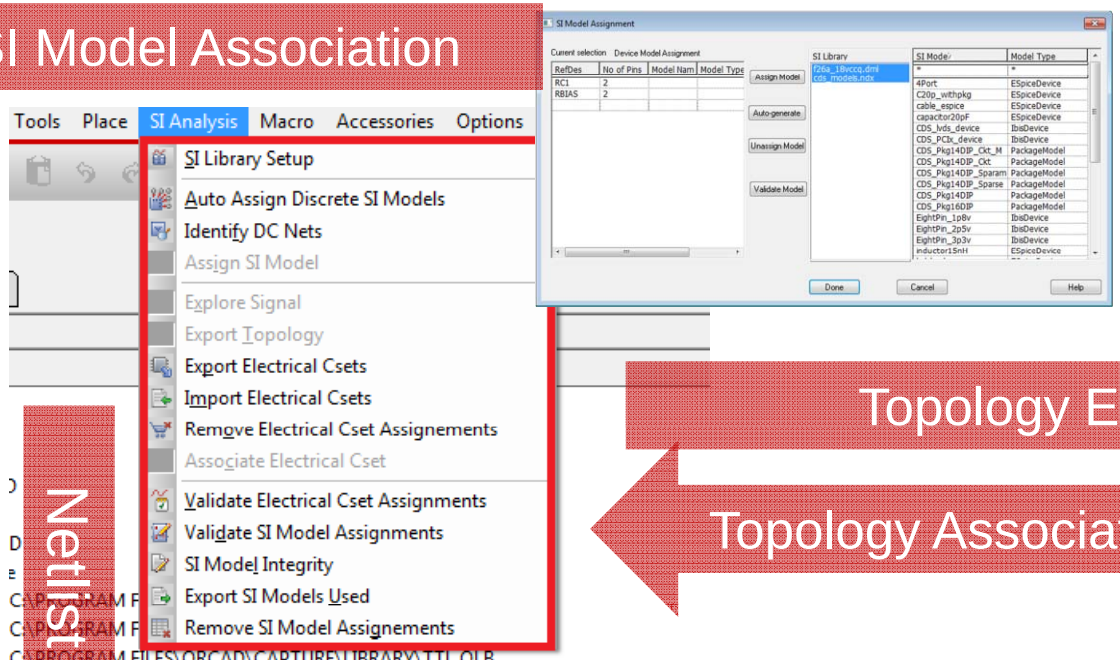
OrCAD SI



Signal Integrity Flow

OrCAD Schematic

SI Model Association

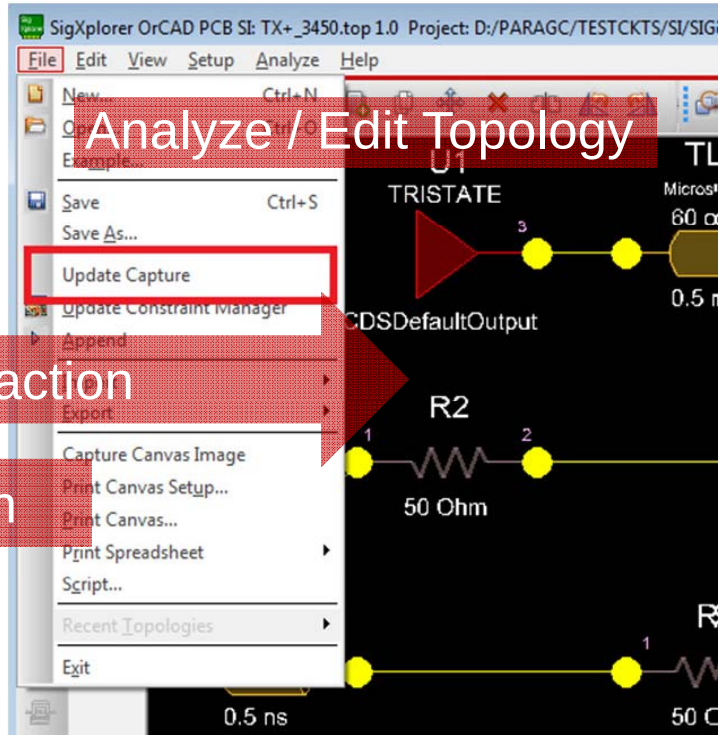


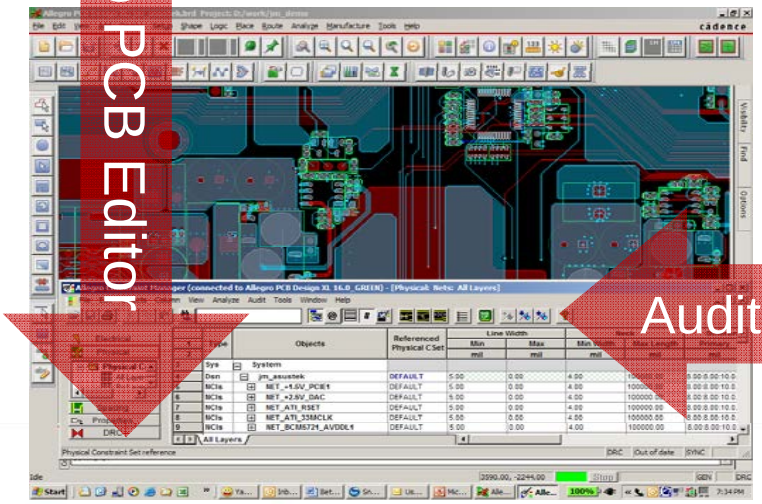
Topology Extraction

Topology Association

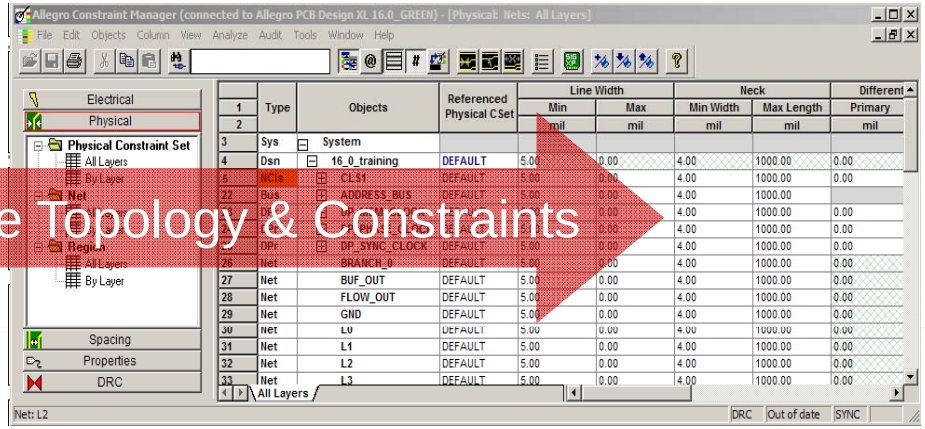
Netlist to PCB Editor

Analyze / Edit Topology

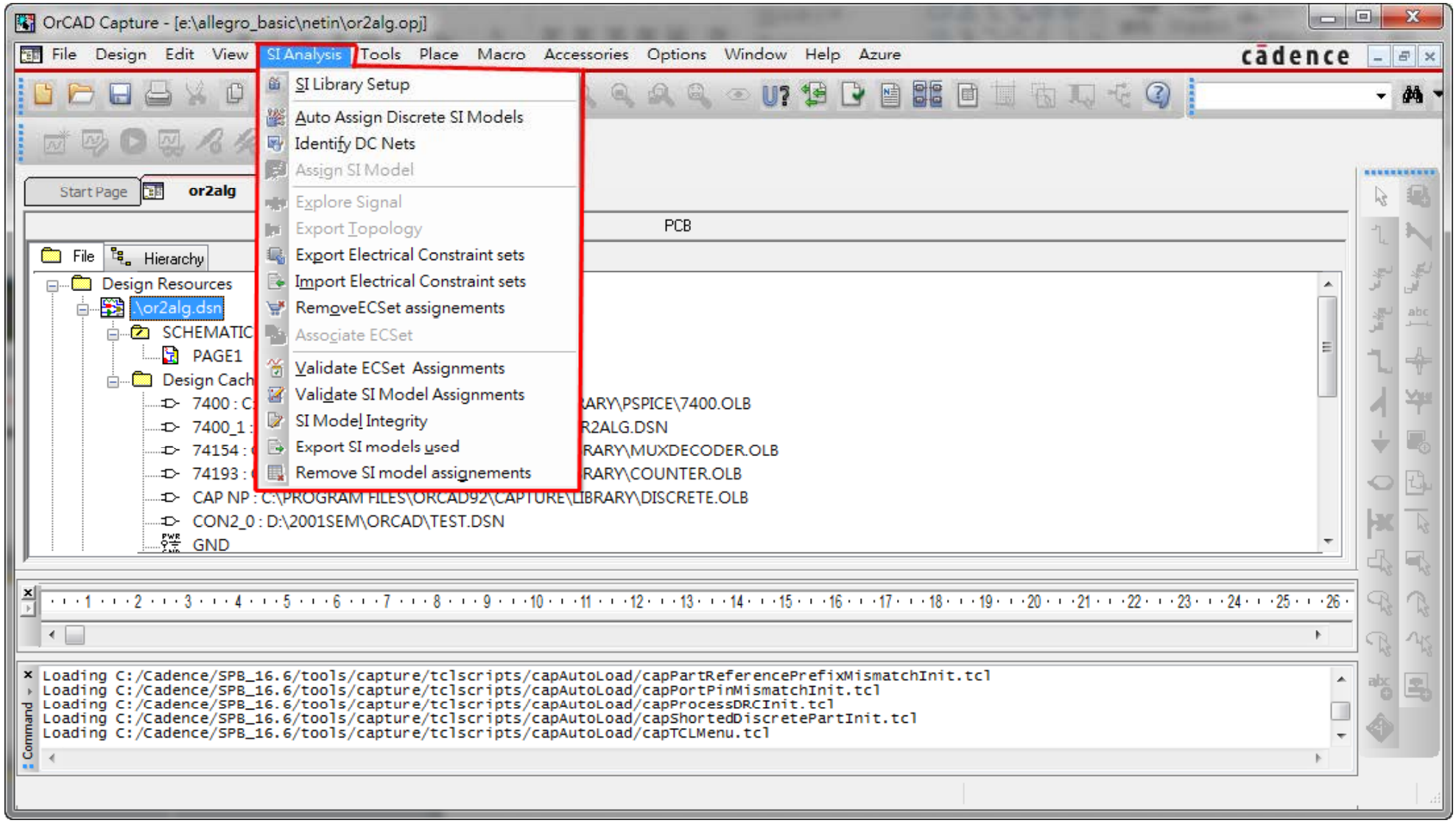




Audit / Refine Topology & Constraints

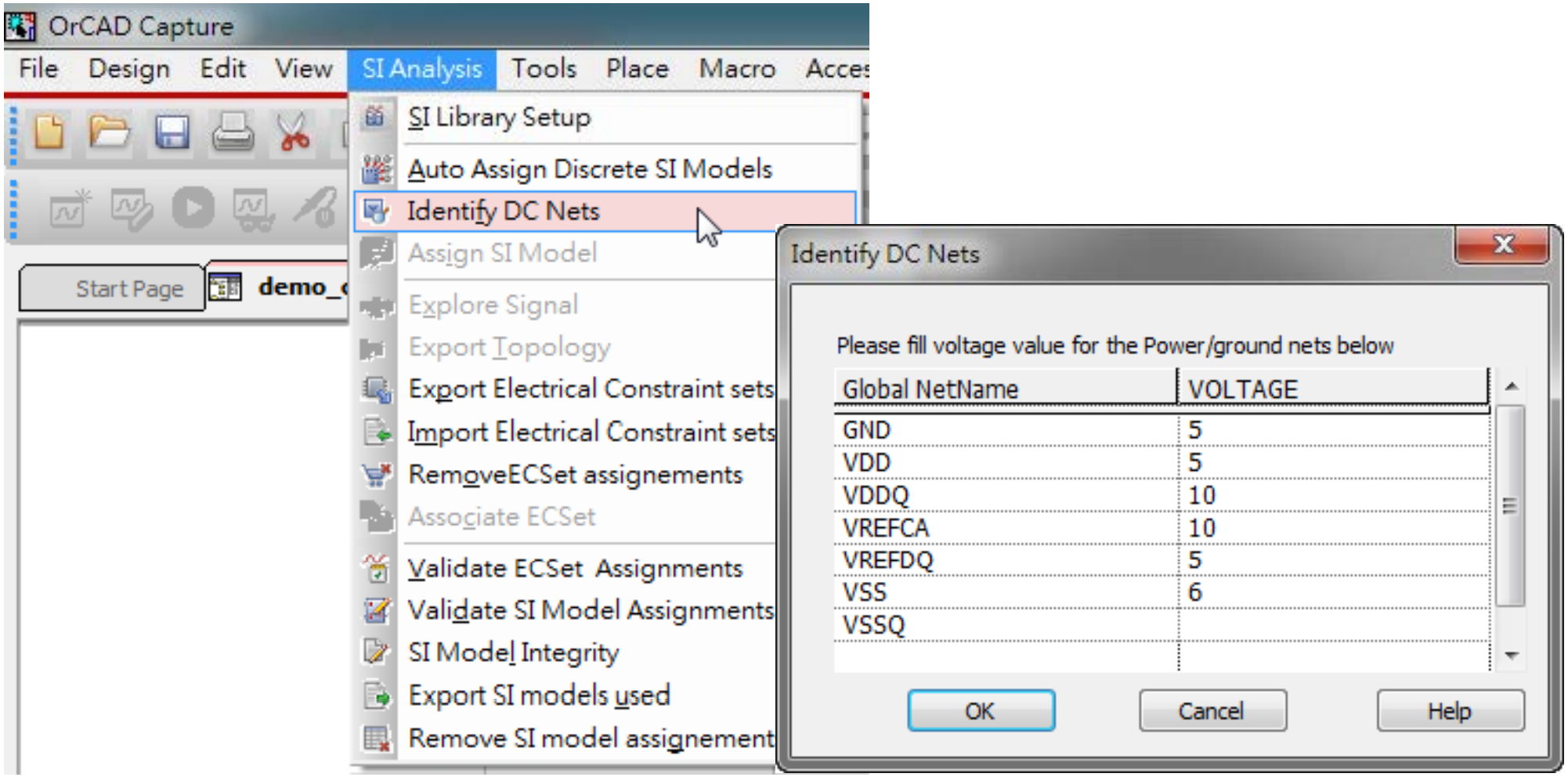


OrCAD SI Analysis Features in 16.6



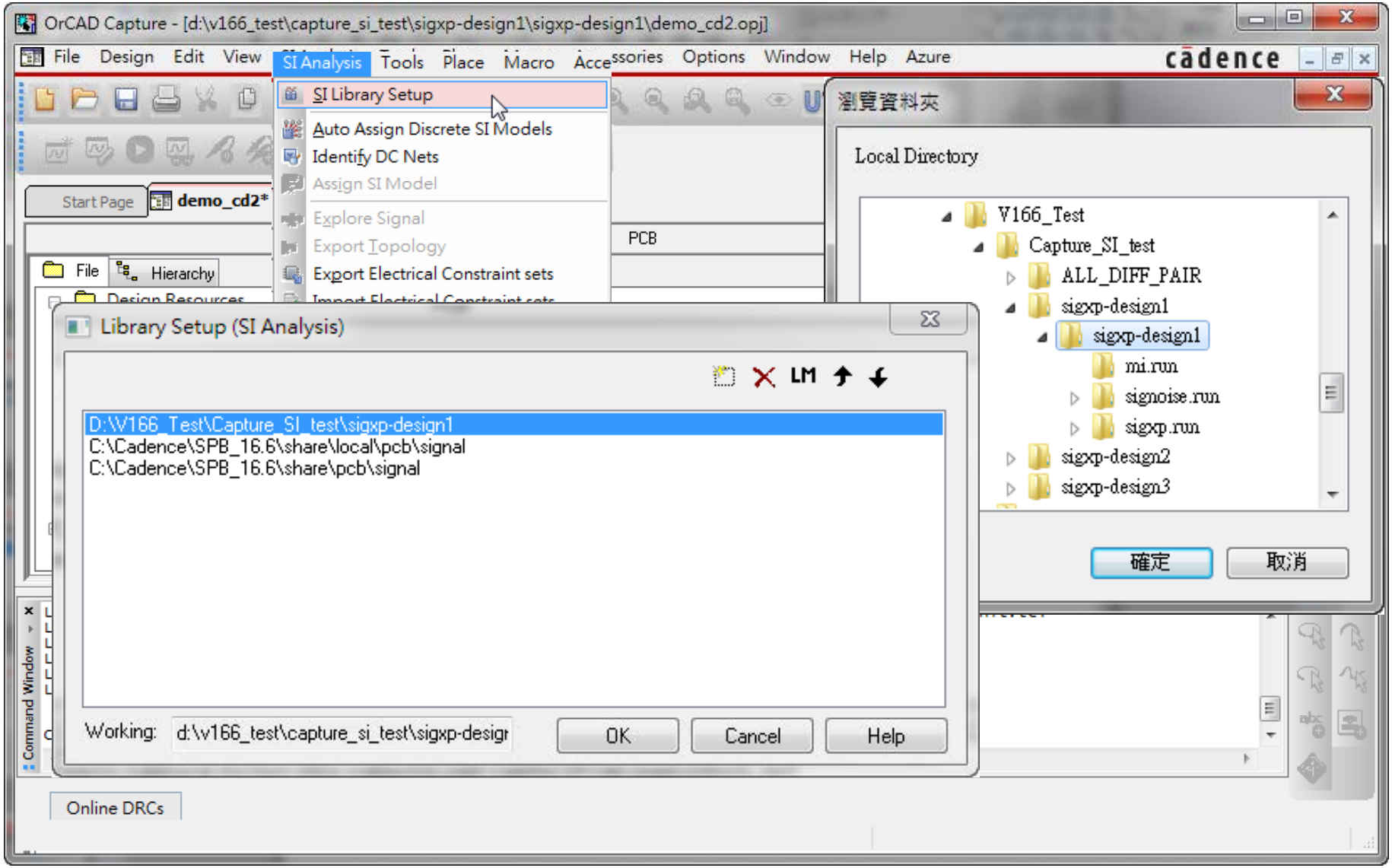
Environment Setup

DC Net Power Value Assignment



Environment Setup

SI Model Library Path Setup

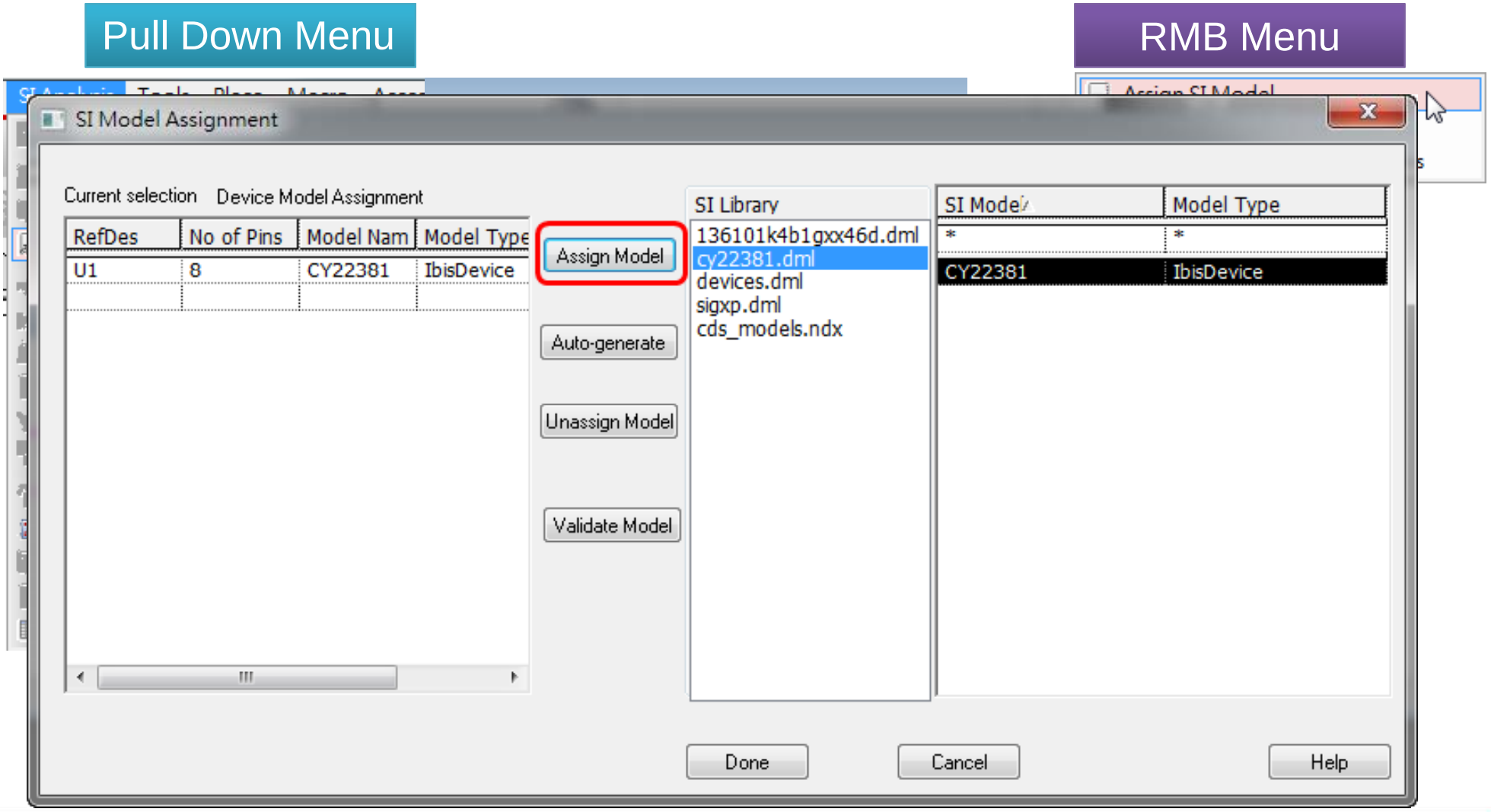


Environment Setup

SI Model Assignment

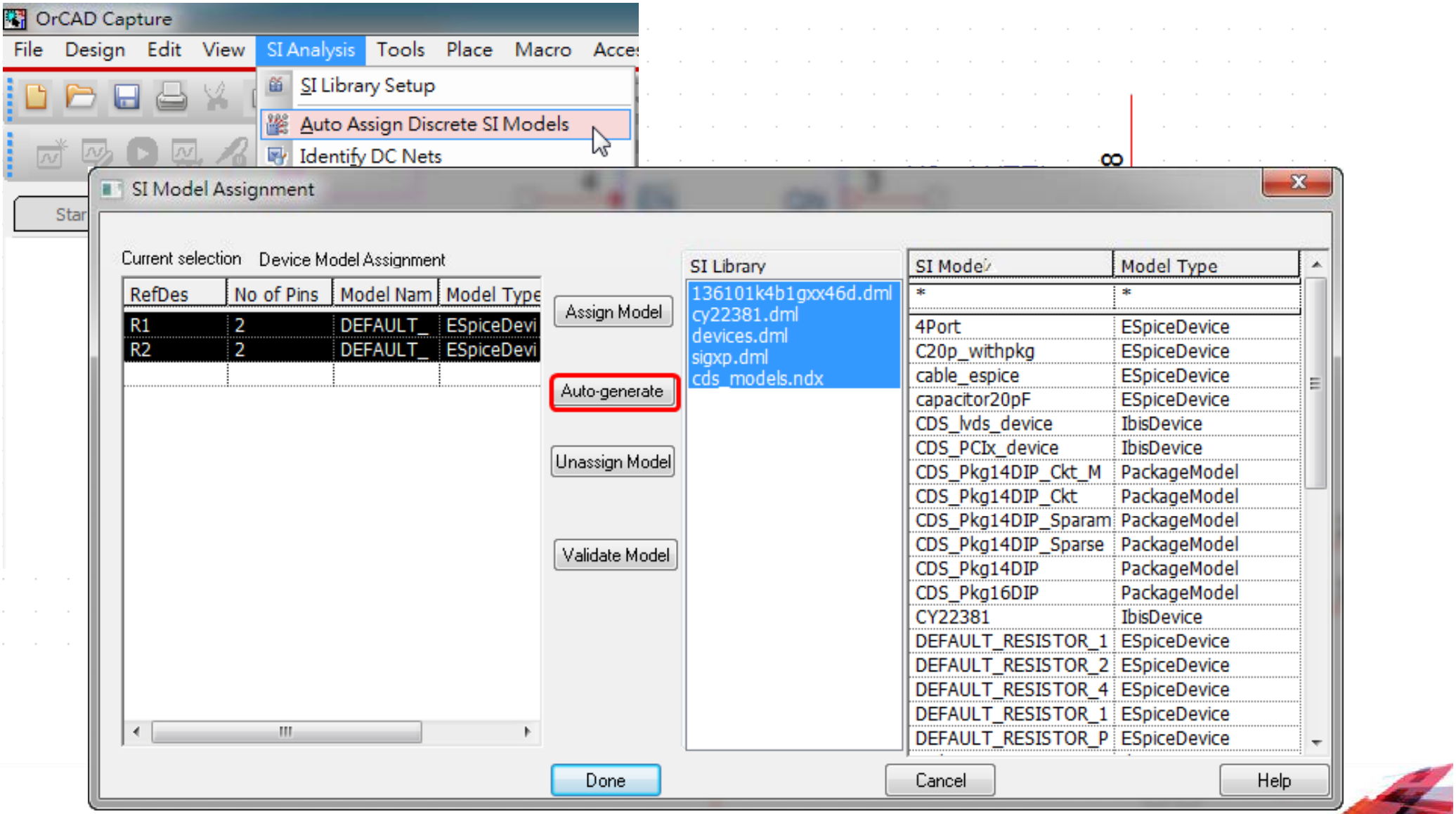
Pull Down Menu

RMB Menu

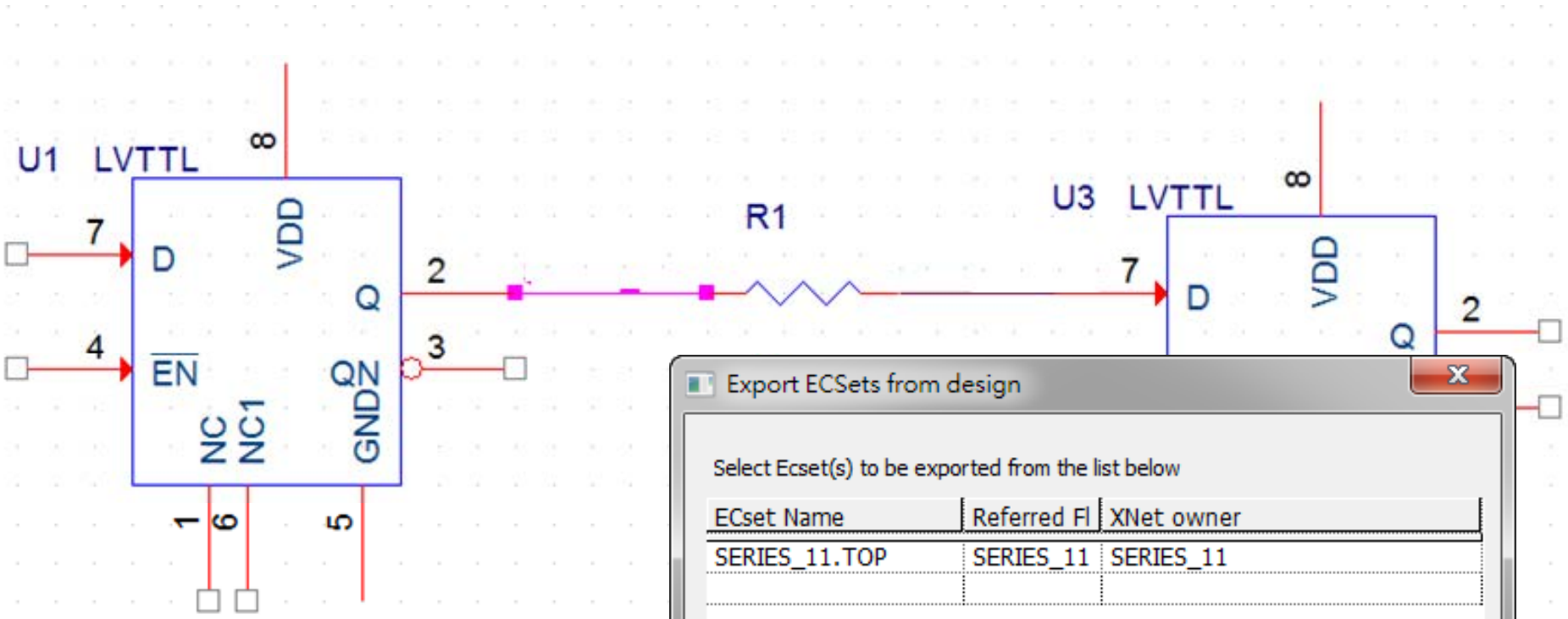


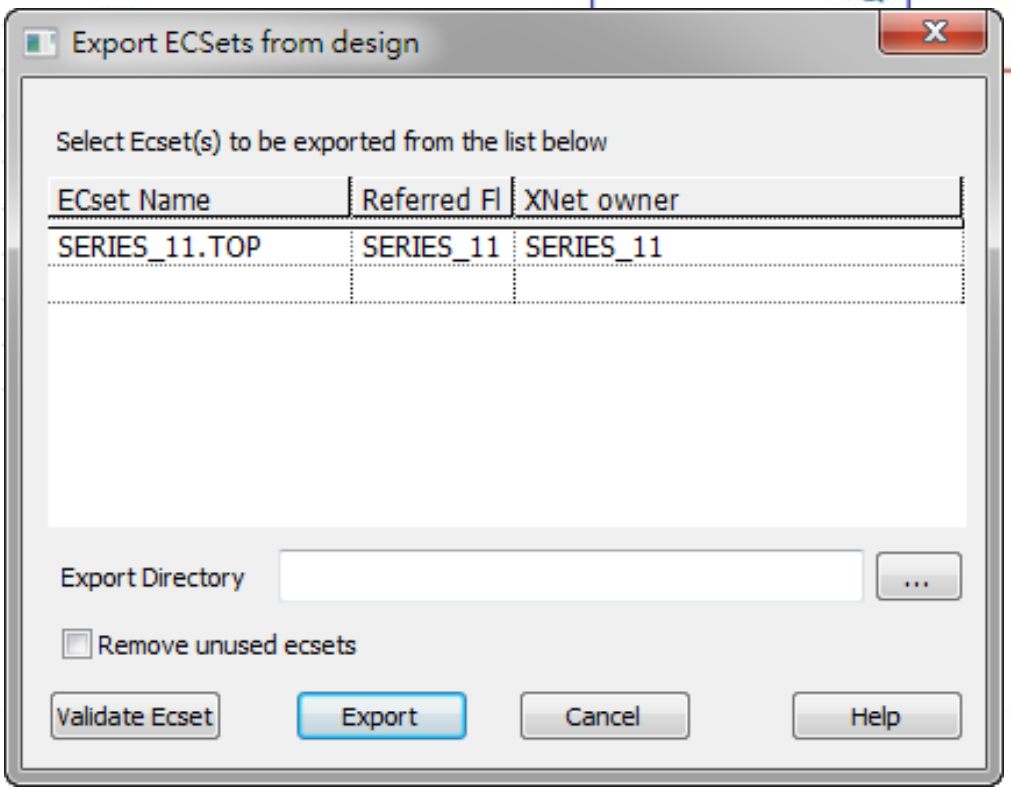
Environment Setup

Auto Model Assignment for Discrete parts



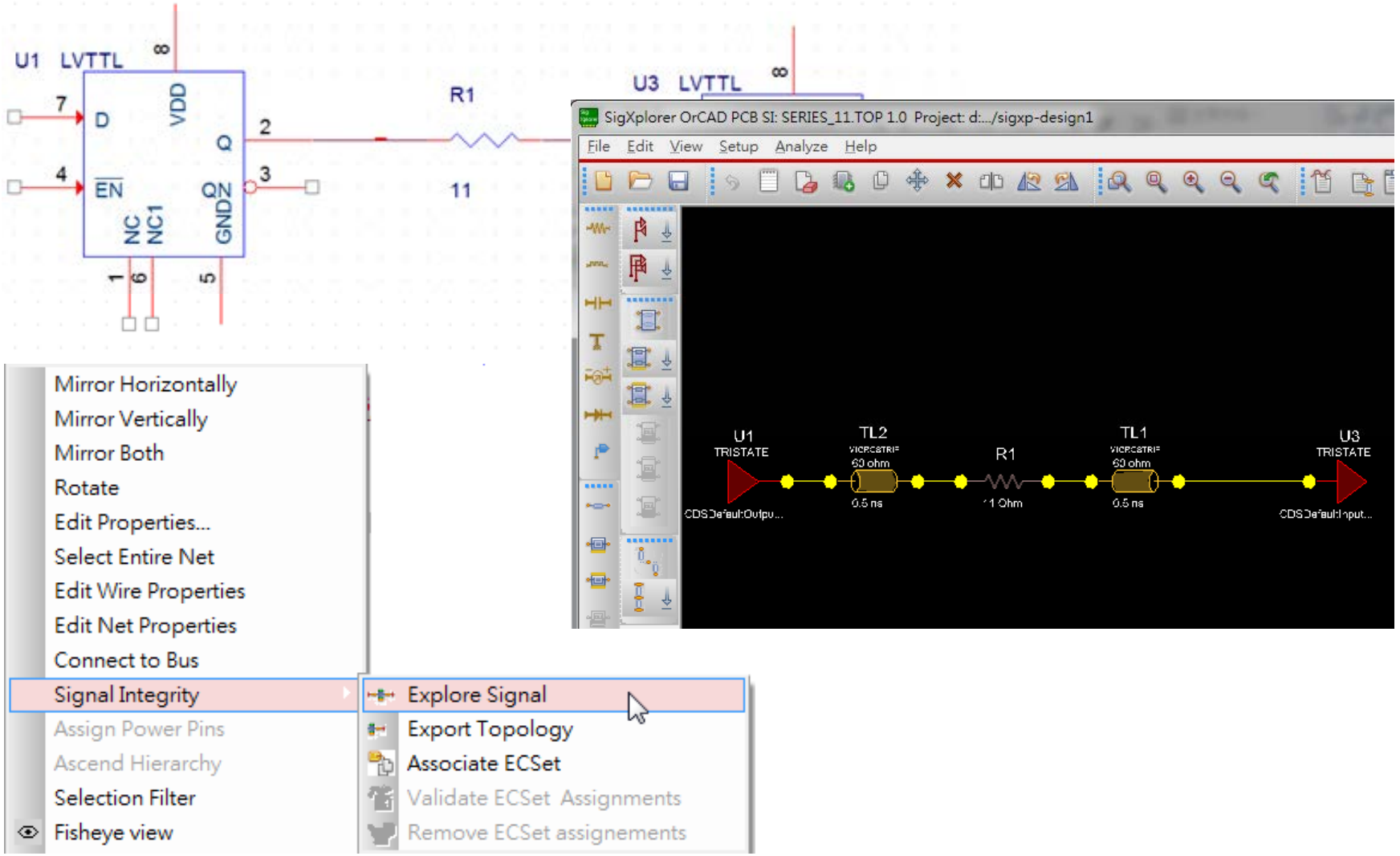
Xnet Generation Solution



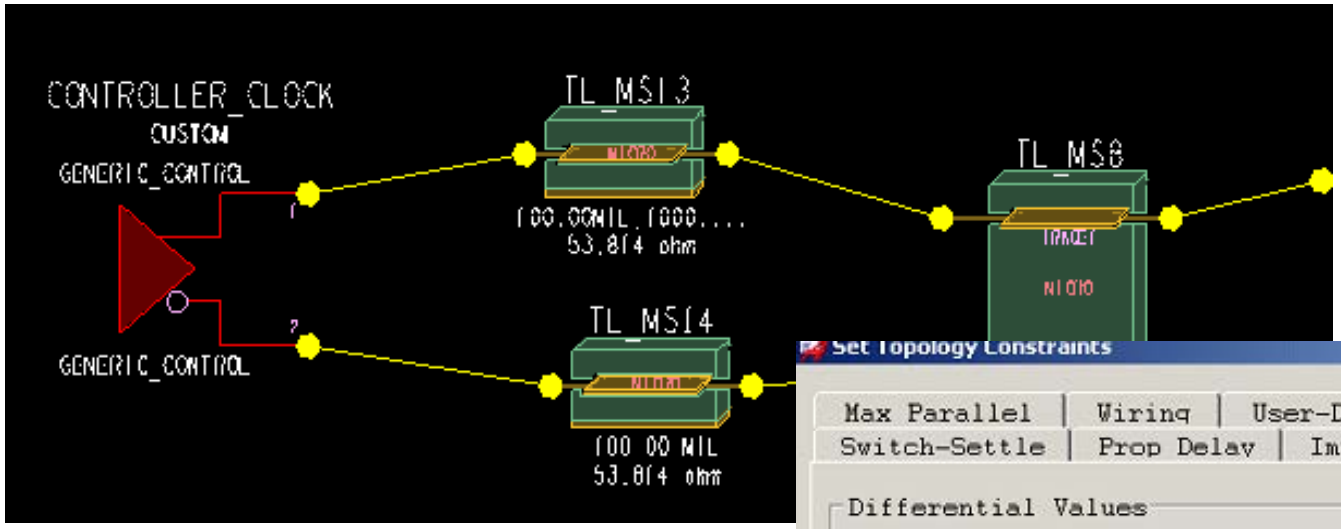


Extract Topology

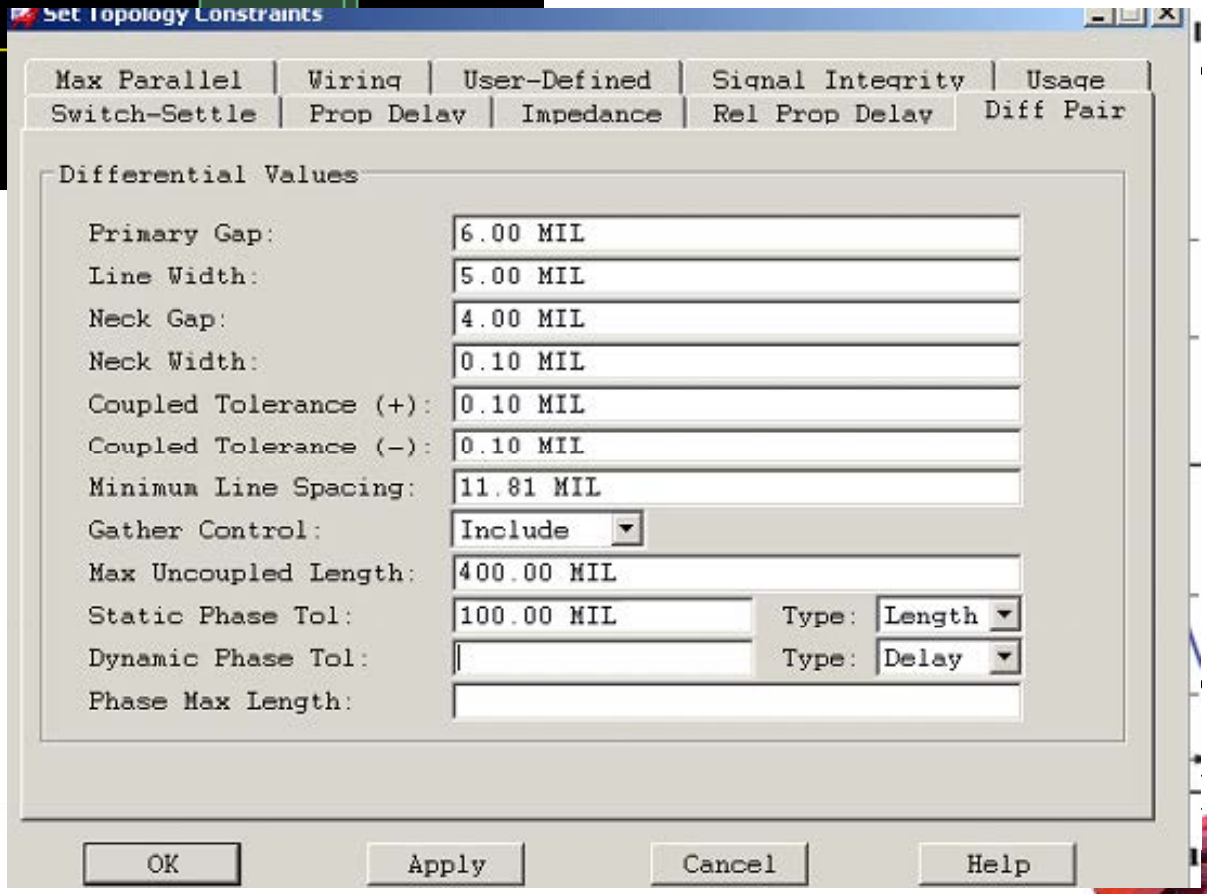
Extract Signal Net Topology



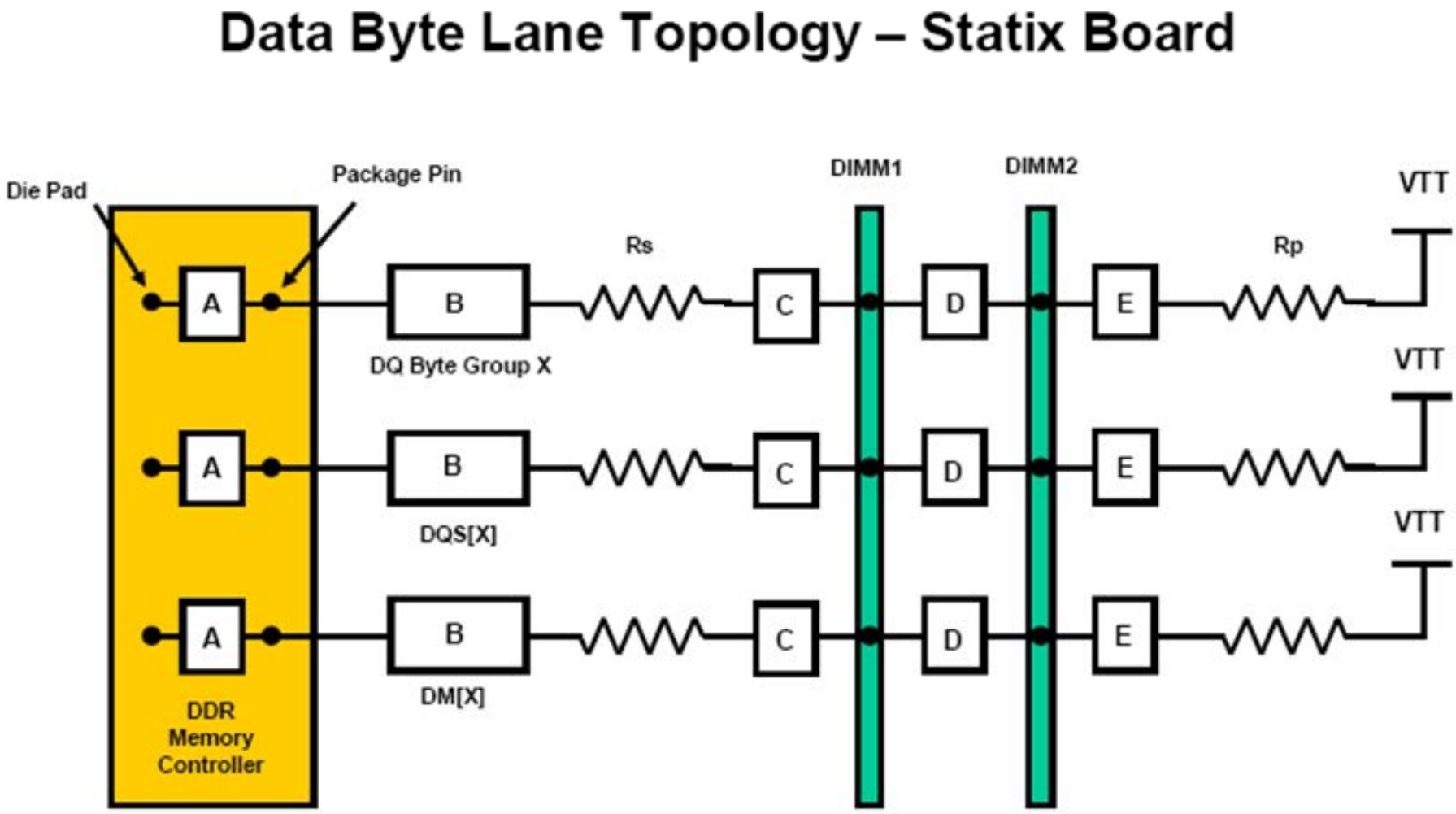
Differential



- Max uncoupled parallel length
- Max Static phase

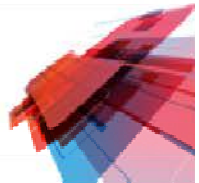


Data Byte Lane Topology



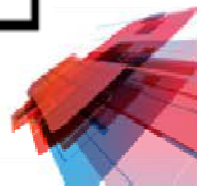
Data Group Routing Rules

Parameter	Min	Typical	Max
A	Obtain from controller vendor		
B	2.0 inches		3.0 inches
C	0.5 inches		1.0 inches
D	0.2 inches		0.6 inches
Total Length (A + B+ C)	3.0 inches		4.6 inches
Trace Impedance	45 ohms	50 ohms	55 ohms
Trace Width		5 MIL	
Trace Space (A, B, C, D)		15 MIL	
Trace Spacing from DIMM pins		7 MIL	
Trace Spacing from other signal groups		20 MIL	
Length Matching for Data in the Byte Lane		+/- 100 MIL	
Length Matching Byte Lane to Byte Lane	+/- 0.5 inches of clock length		
Termination Voltage	1.00 V	1.25 V	1.50 V

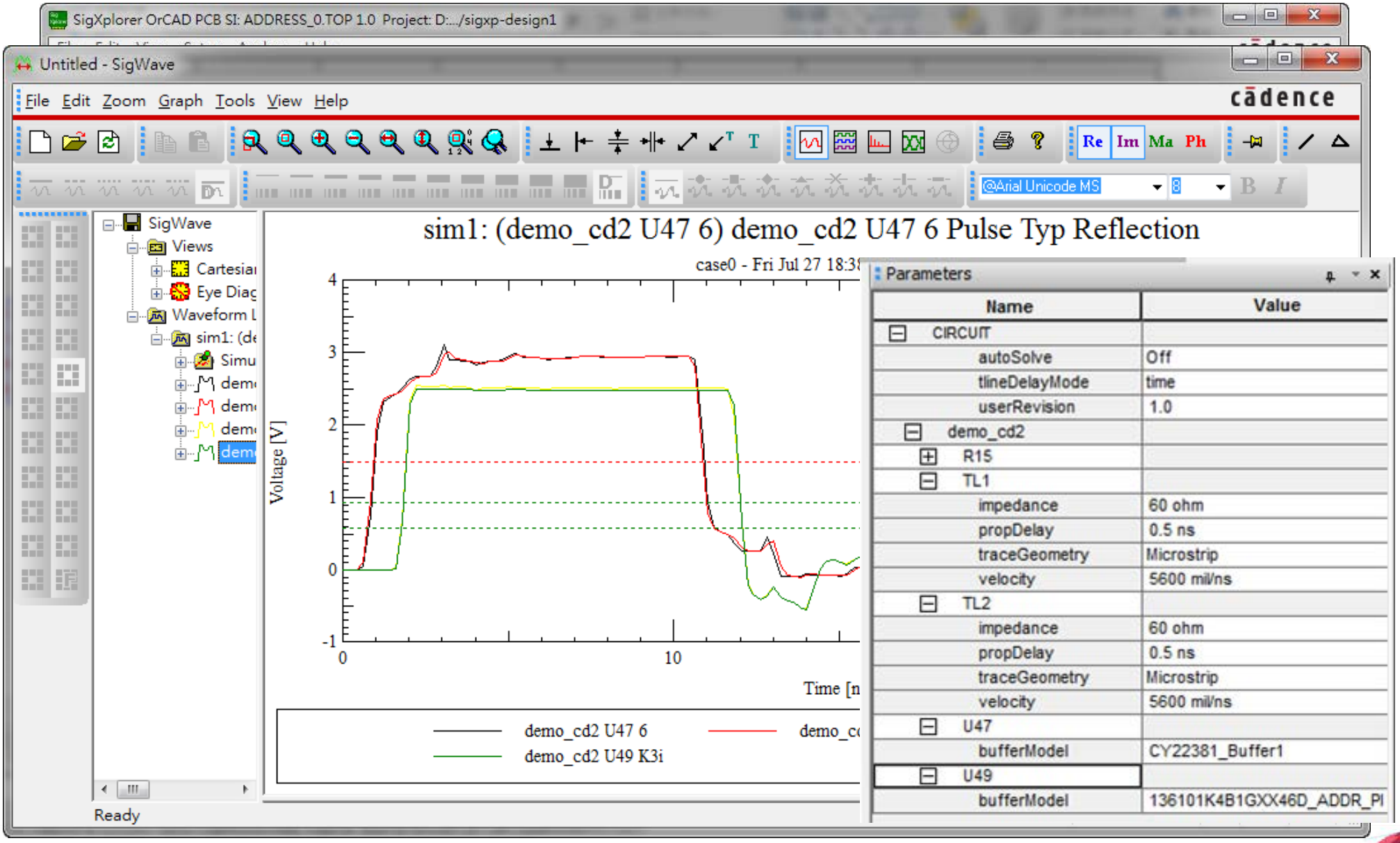


Variance Table of Design Requirements

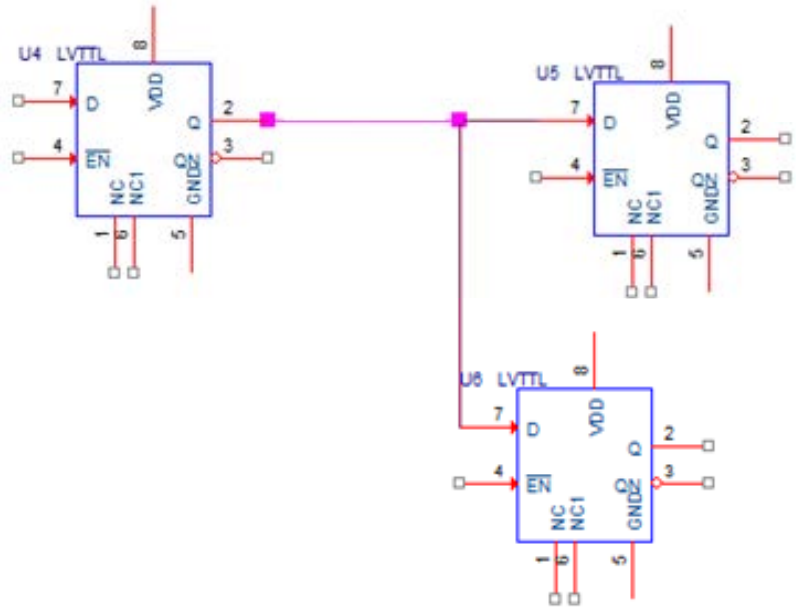
Parameter	Min	Typical	Max	# Sims
FPGA Memory Controller (U7)	Fast		Slow	2
TL1 Impedance	45 ohms	50 ohms	55 ohms	3
TL1 Velocity (microstrip)	5400 MIL/ns	5600 MIL/ns	5800 MIL/ns	3
TL1 Length (equates to D)	200 MIL	400 MIL	600 MIL	3
TL2 Impedance	45 ohms	50 ohms	55 ohms	3
TL2 Velocity (microstrip)	5400 MIL/ns	5600 MIL/ns	5800 MIL/ns	3
TL2 Length (equates to C)	500 MIL	7500 MIL	1000 MIL	3
TL3 Impedance (microstrip)	45 ohms	50 ohms	55 ohms	3
TL3 Velocity	5400 MIL/ns	5600 MIL/ns	5800 MIL/ns	3
TL3 Length (equates to B)	2000 MIL	2150 MIL	3000 MIL	3
RN11 Resistance	9 ohms	10 ohms	11 ohms	3
R32 Resistance	49 ohms	56 ohms	62 ohms	3
Termination Voltage	1.00 V	1.25 V	1.50 V	3
Total Number of Sweep Simulations				3,188,646

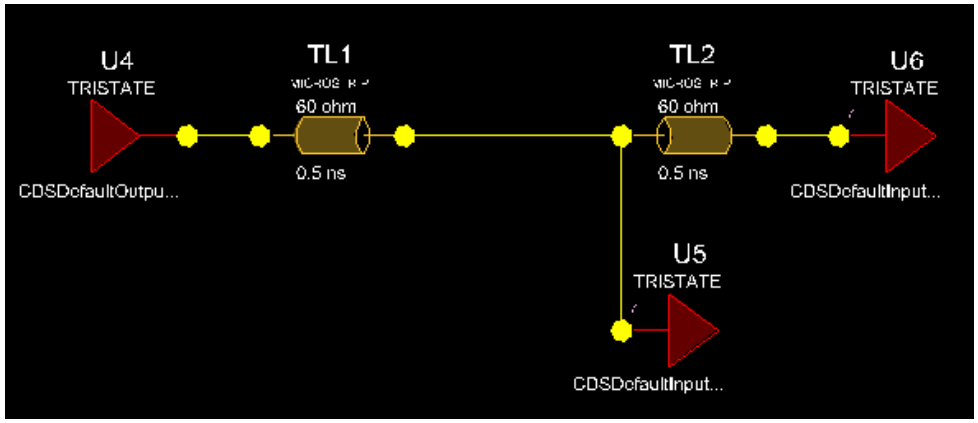


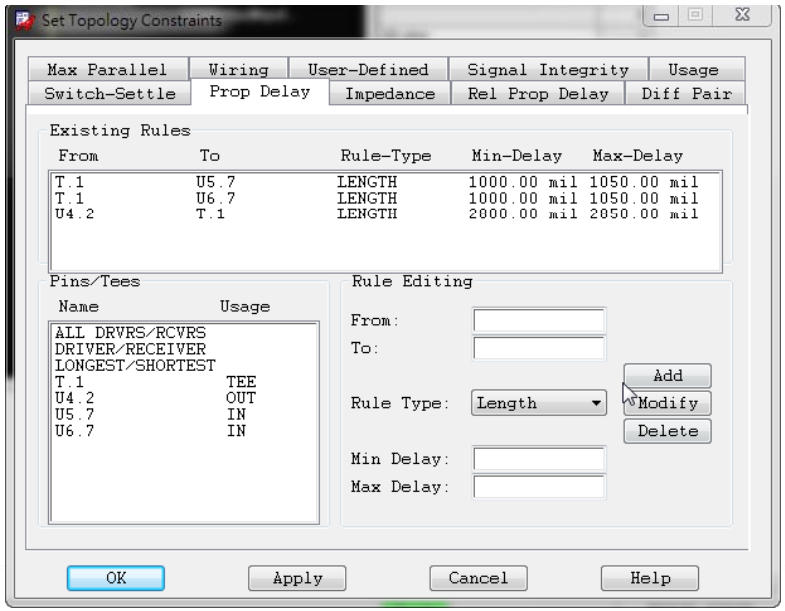
Signal Integrity Simulation

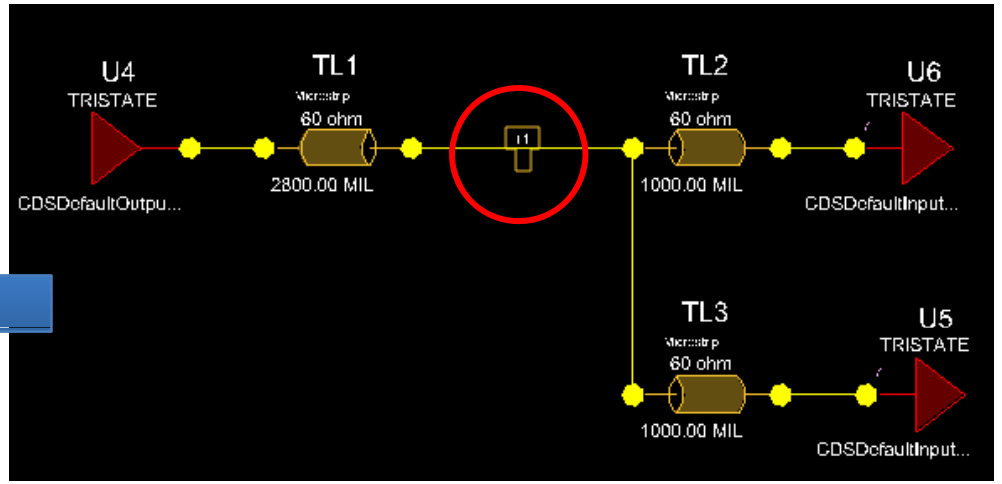


Define Constraints in OrCAD SigXpolor

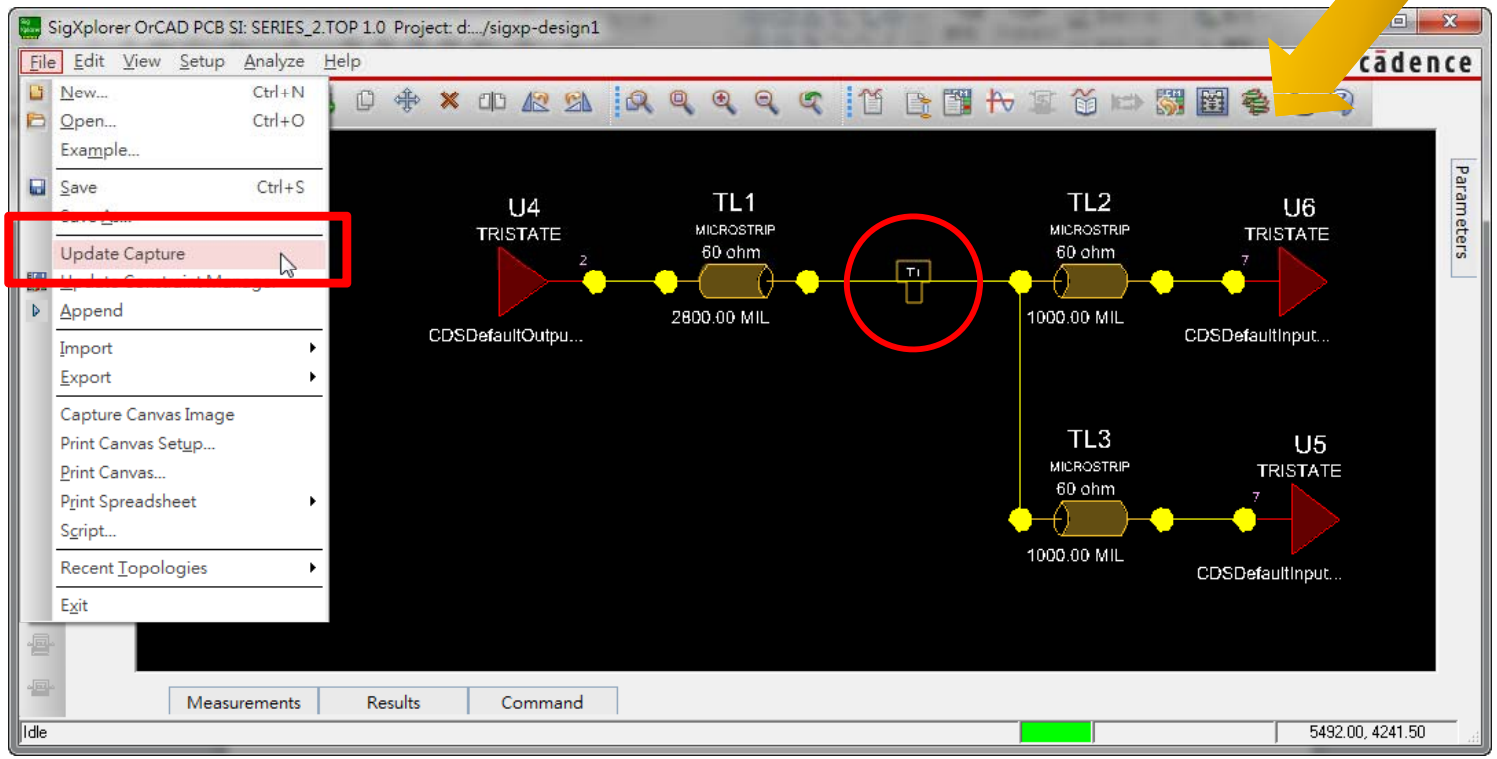


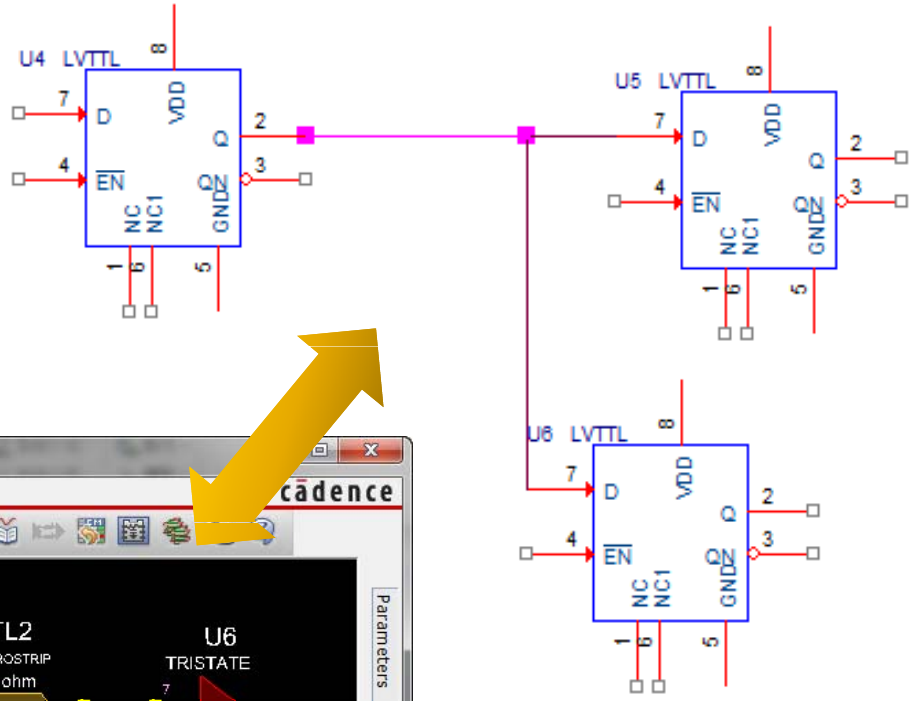




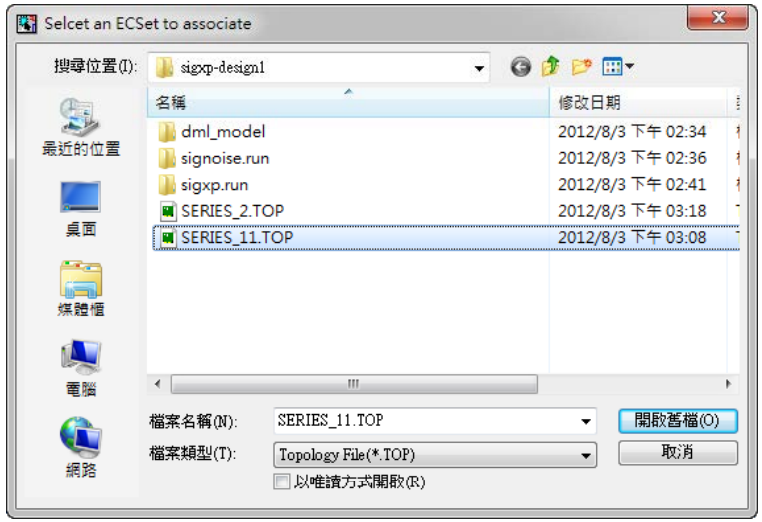


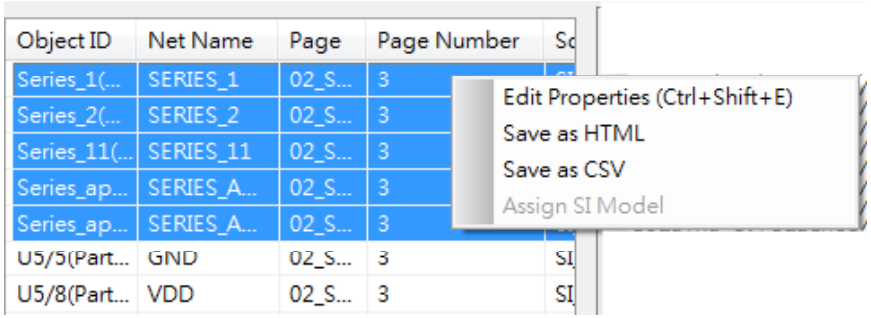
Update Capture

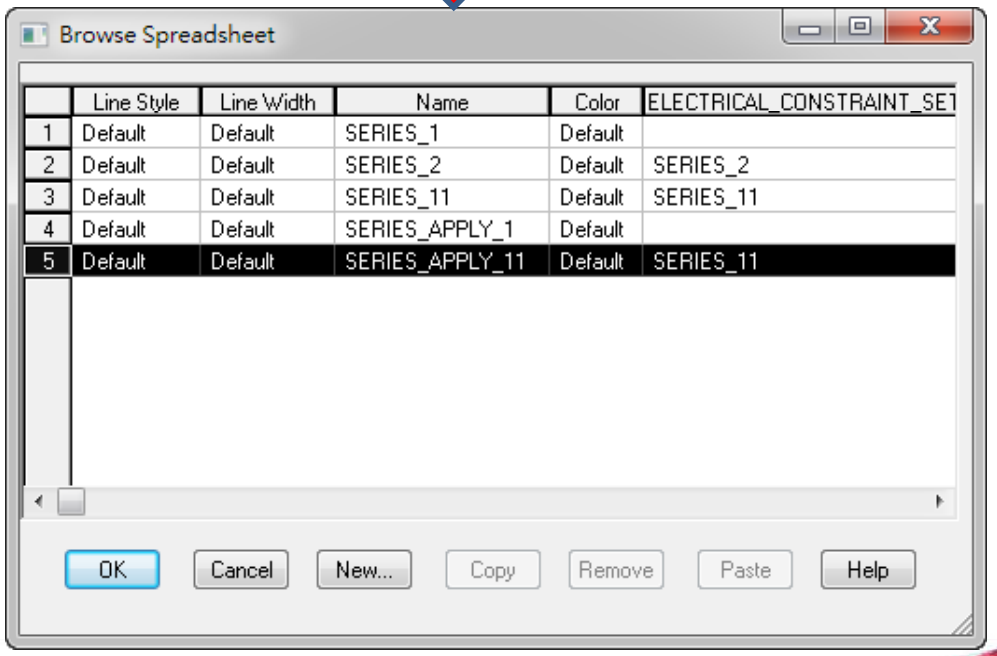




Replicate ECSet

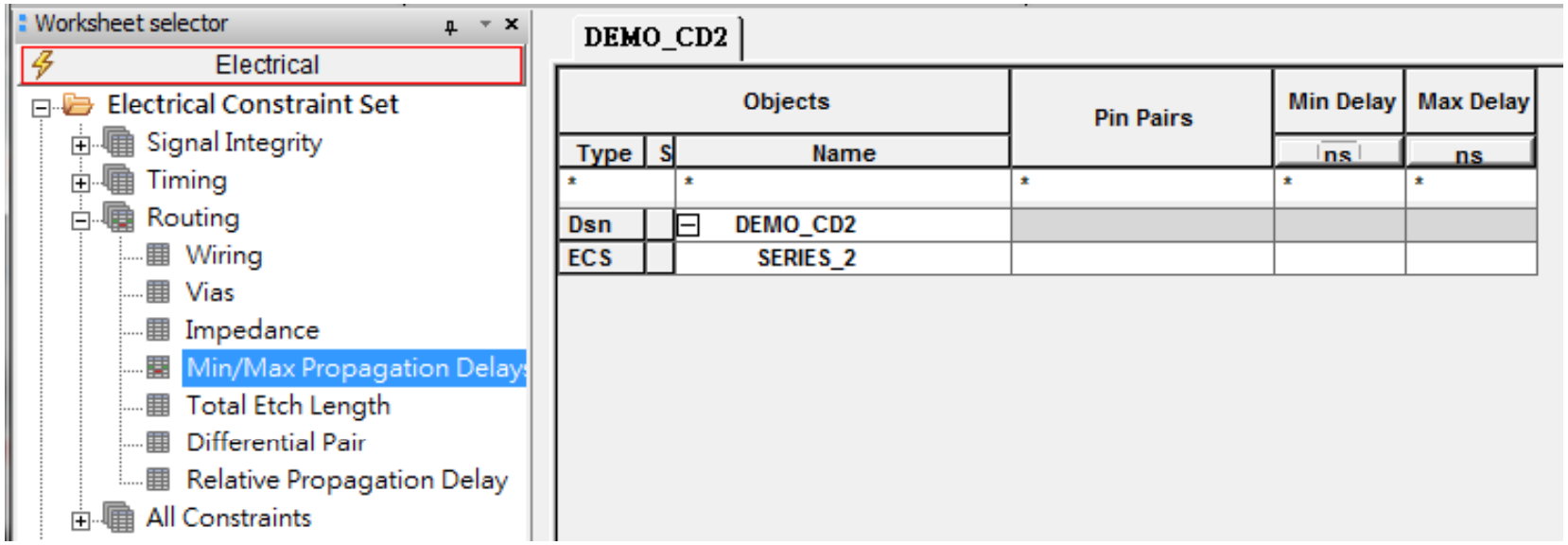


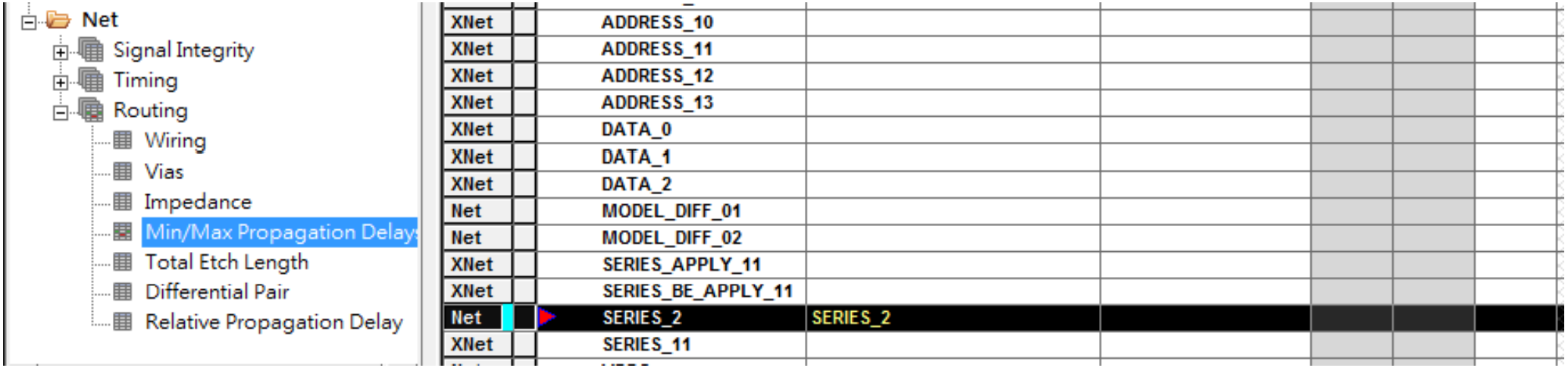




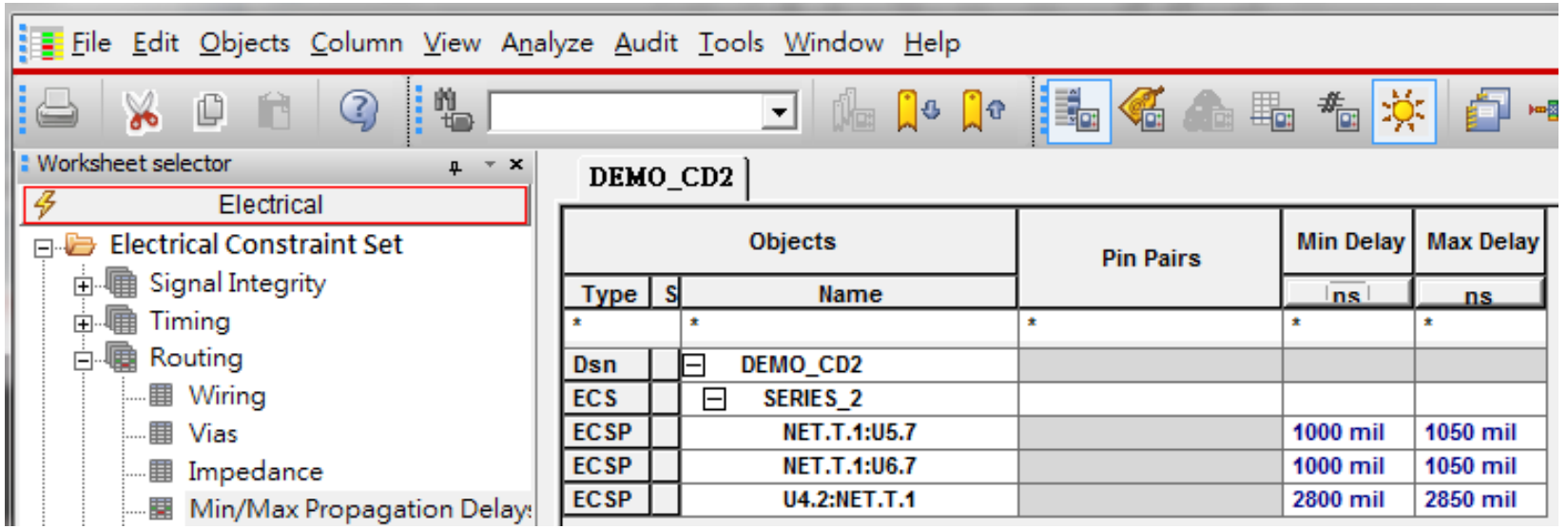
- Auto create ECSet
- Easy use to other net

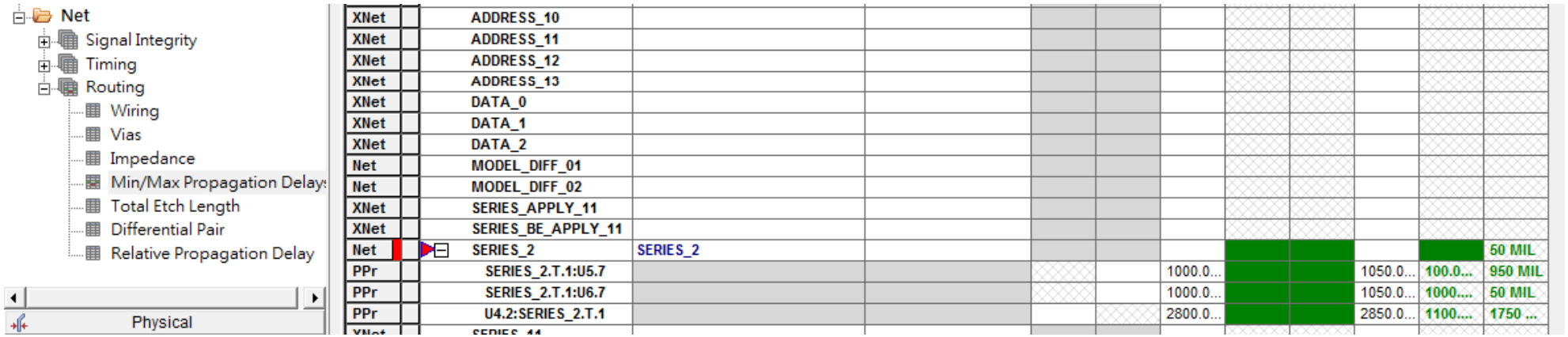
Netin to OrCAD PCB



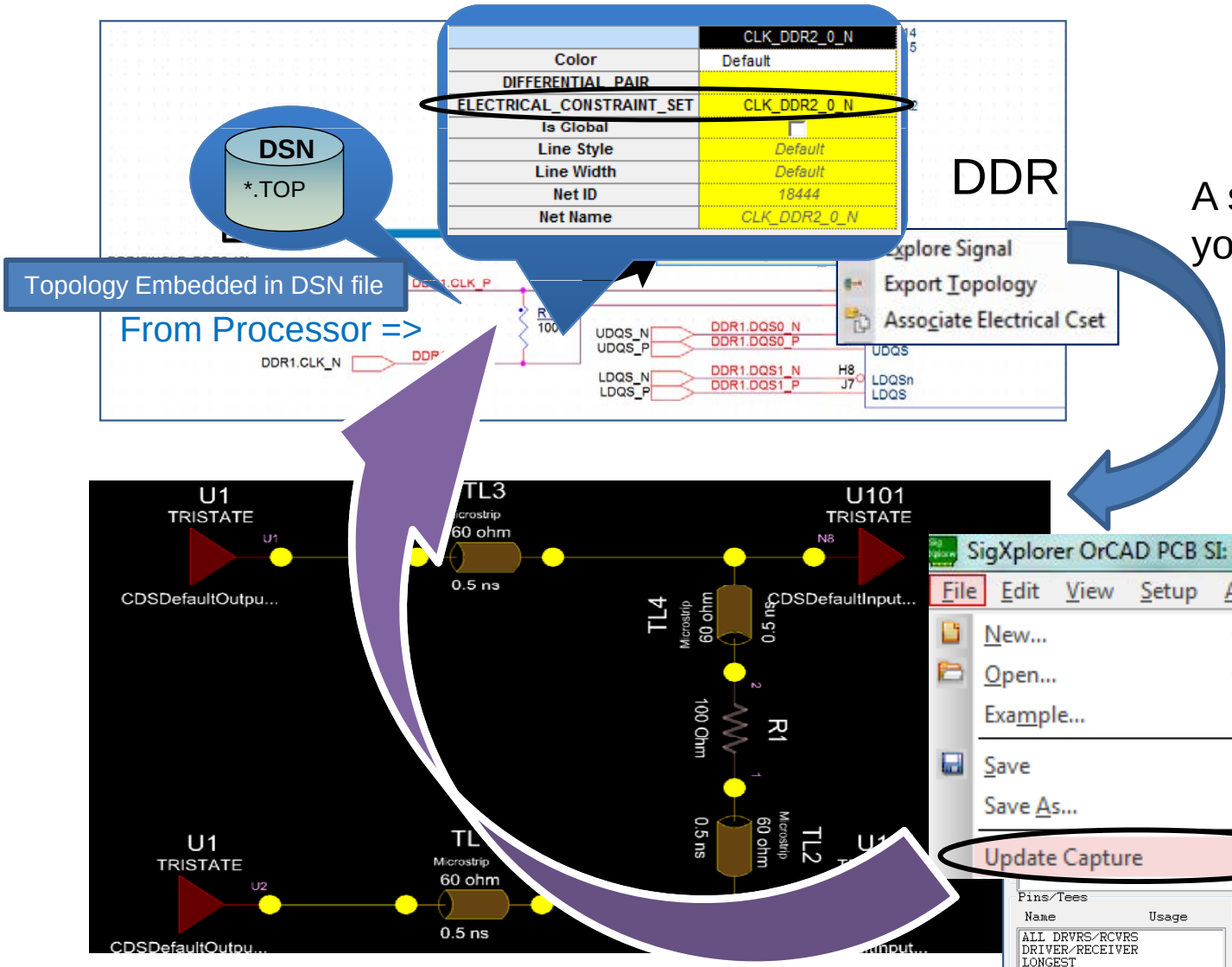


Import ECSets From Constraint Manager



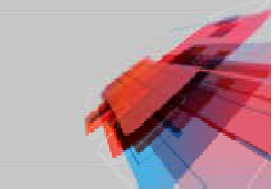


Exploring Signal from OrCAD Capture



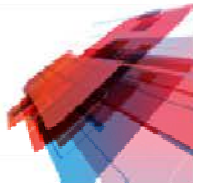
A single mouse click makes you ready for SI Analysis

OrCAD Capture Apps
GraserWARE FrontendPack



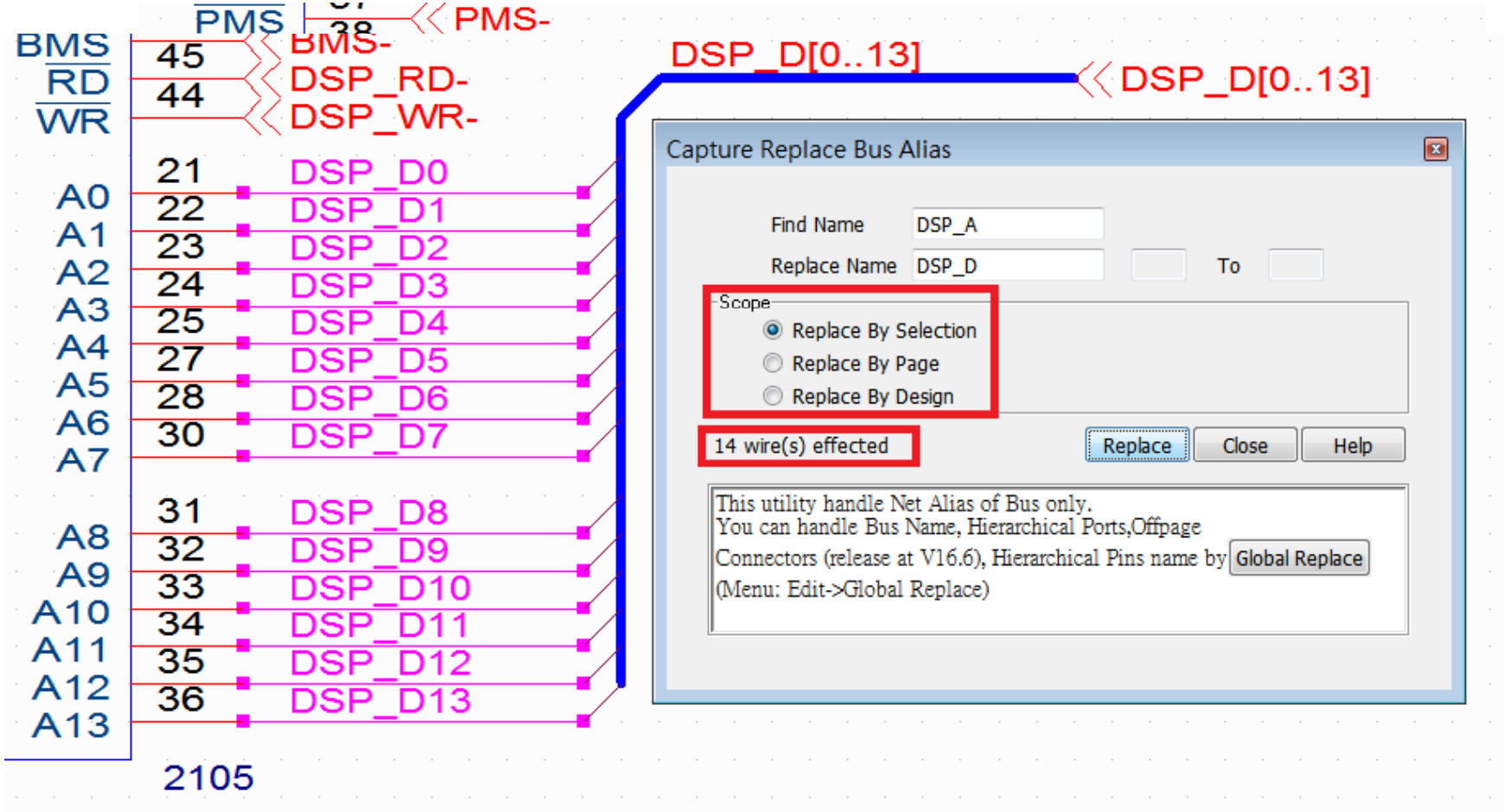
GraserWARE FrontendPack

- Replace BUS Alias
- Import/Export Properties
- Design Compare
- Reference Edit

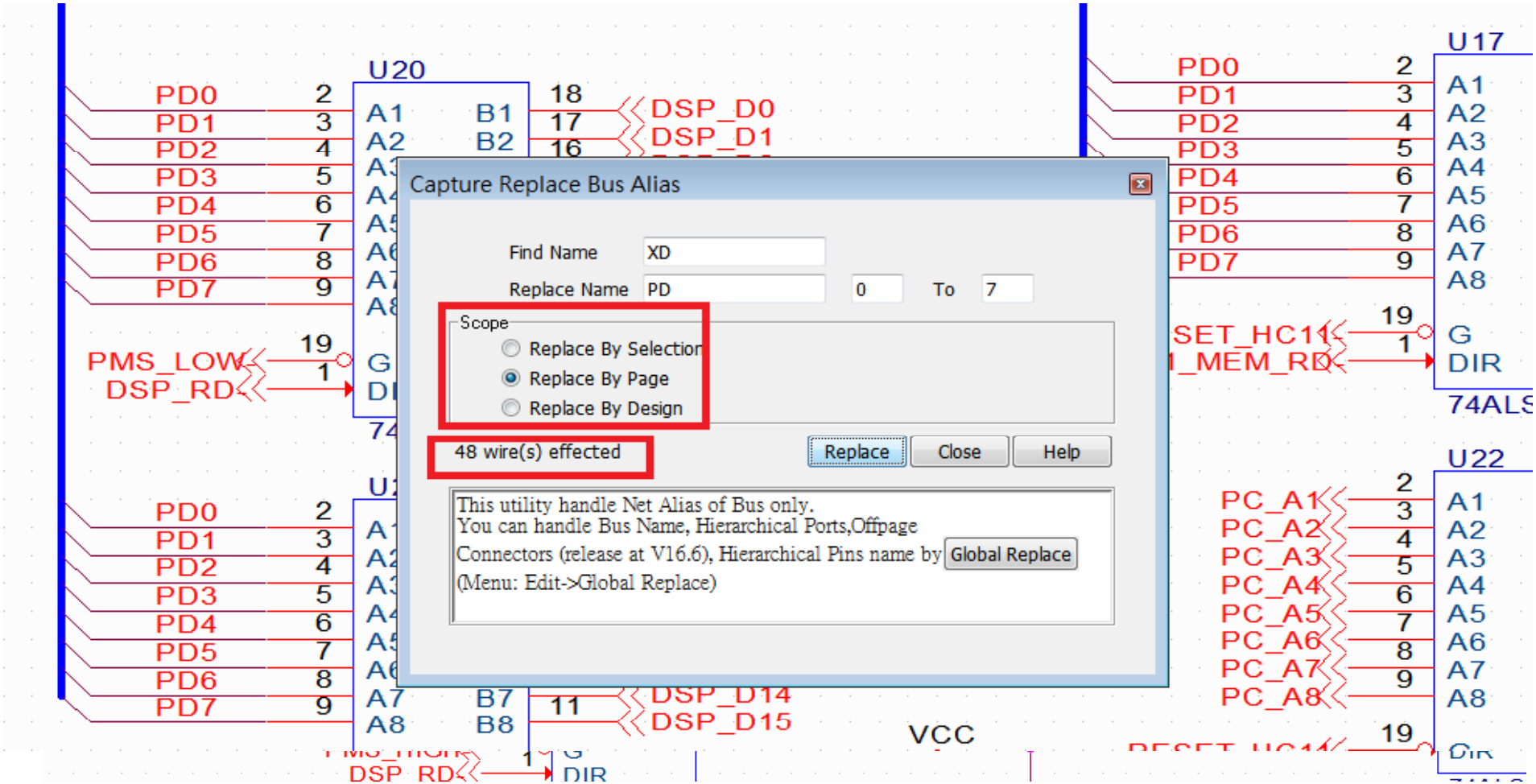


Replace BUS Alias

- Replace Bus alias
  - By Selection
  - By Page
  - By Design

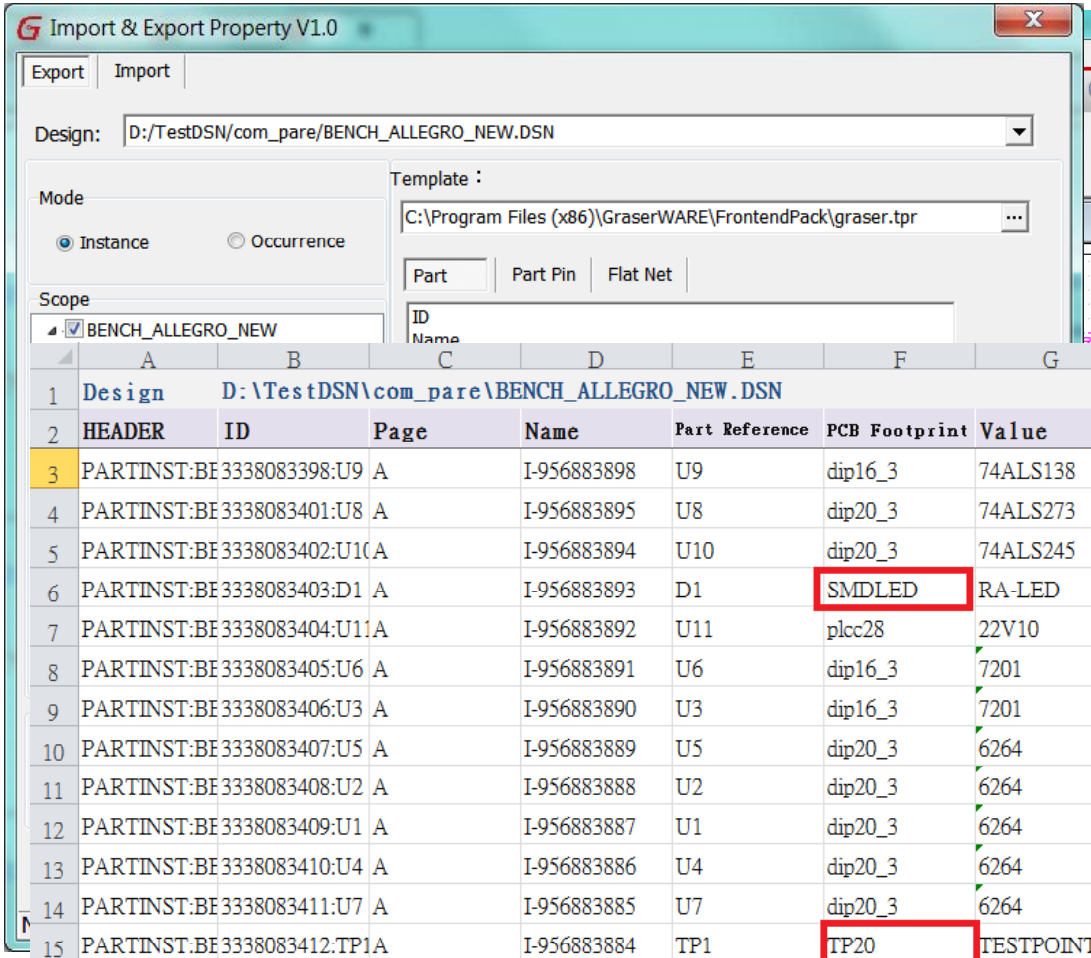


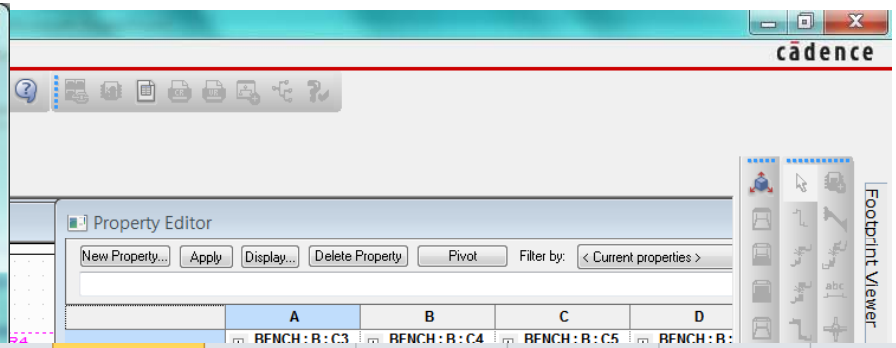
Replace BUS Alias



Import/Export Properties

Export Design Properties to Excel

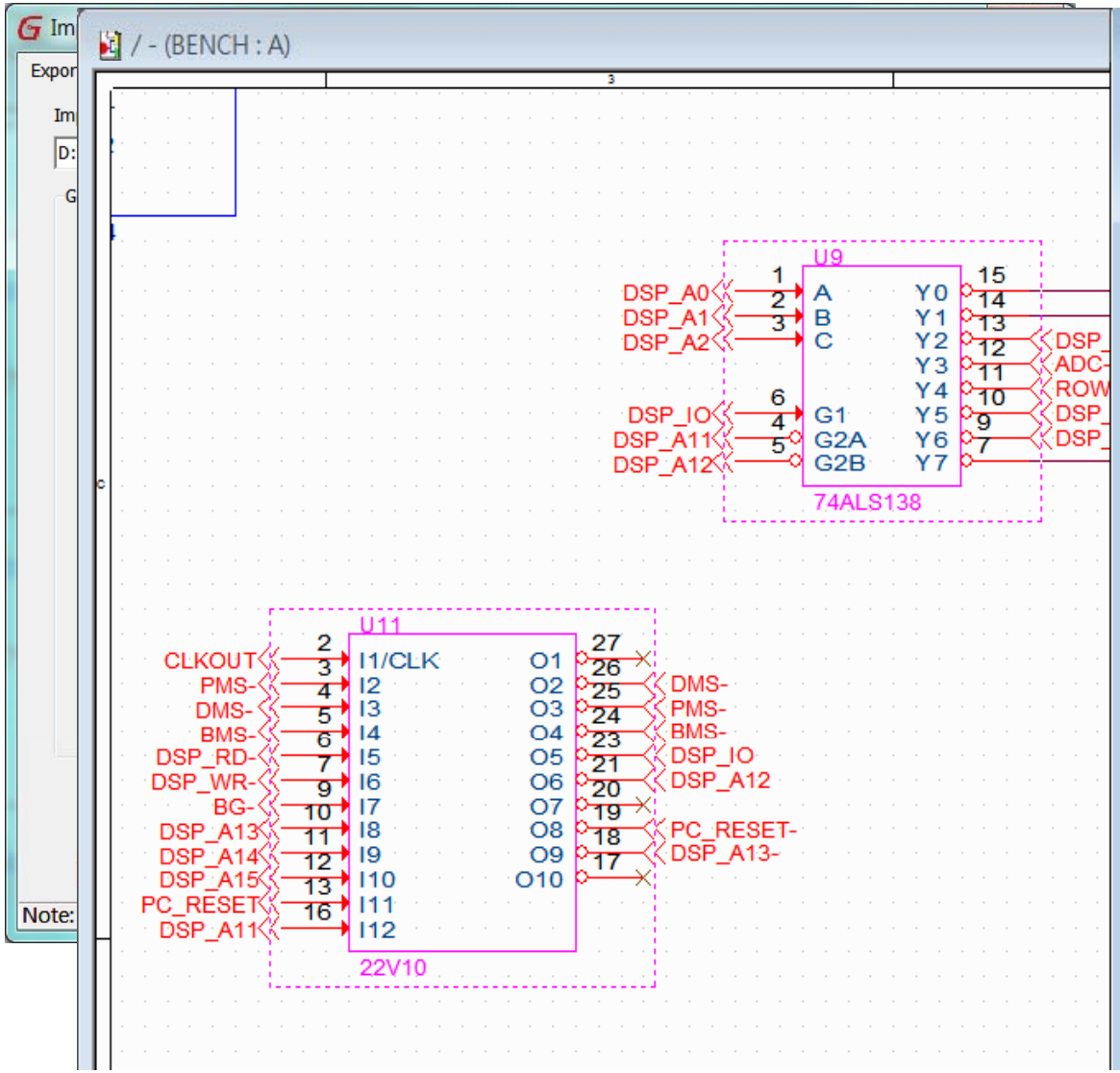


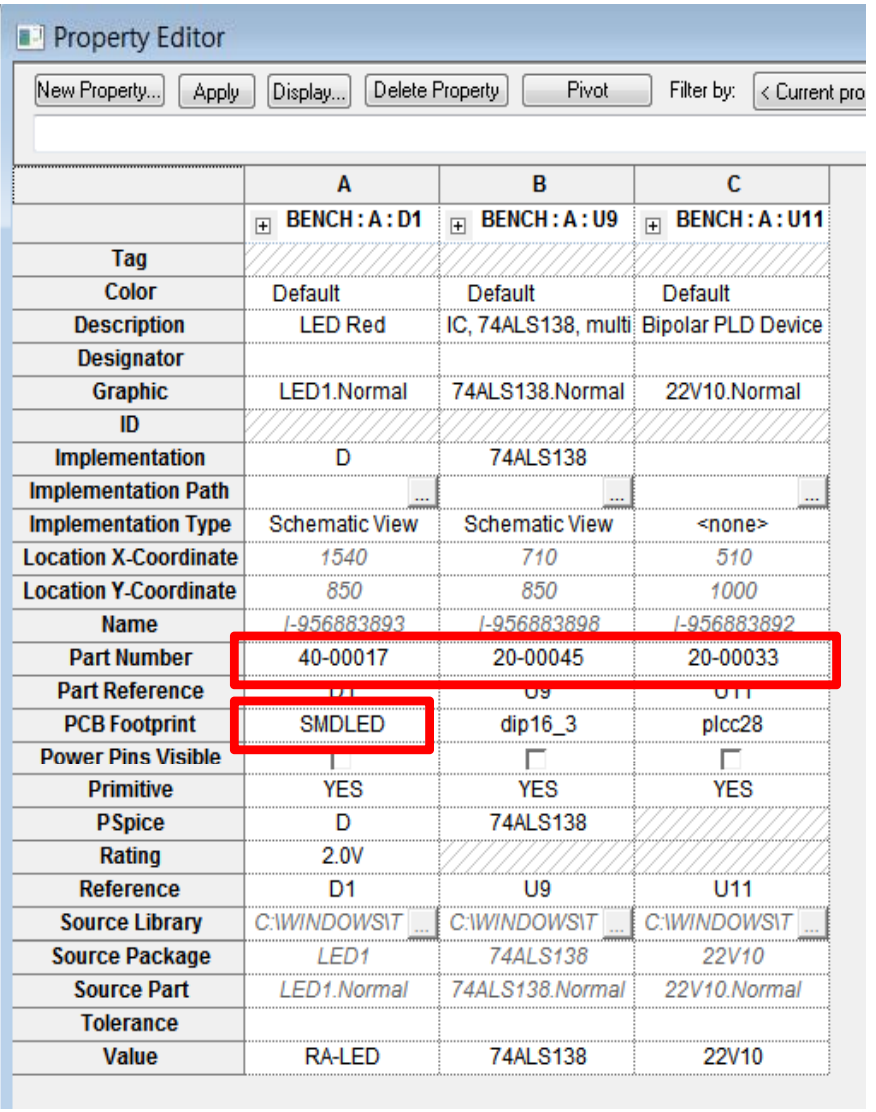


	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Design	D:\TestDSN\com_pare\BENCH_ALLEGRO_NEW.DSN											
2	HEADER	ID	Page	Name	Part Reference	PCB Footprint	Value	Part Number	Tolerance	Description			
3	PARTINST:BE	3338083398:U9	A	I-956883898	U9	dip16_3	74ALS138	20-00045		IC, 74ALS138, multiplexer, Standard input, Inverted, totem ouput			
4	PARTINST:BE	3338083401:U8	A	I-956883895	U8	dip20_3	74ALS273	20-81432		IC, 74ALS273 OCTAL D POS EDGE TRIGG 20 DIP			
5	PARTINST:BE	3338083402:U10	A	I-956883894	U10	dip20_3	74ALS245	20-003297		IC, 74ALS245 (N)OCTL TRI-ST TRANSCVR 20DIP			
6	PARTINST:BE	3338083403:D1	A	I-956883893	D1	SMDLED	RA-LED	40-00017		LED Red			
7	PARTINST:BE	3338083404:U11	A	I-956883892	U11	plcc28	22V10	20-00033		Bipolar PLD Device			
8	PARTINST:BE	3338083405:U6	A	I-956883891	U6	dip16_3	7201	20-00042		FIFO Status Flag Expandable 512x9			
9	PARTINST:BE	3338083406:U3	A	I-956883890	U3	dip16_3	7201	20-00042		FIFO Status Flag Expandable 512x9			
10	PARTINST:BE	3338083407:U5	A	I-956883889	U5	dip20_3	6264	20-00062		CMOS Static RAM 8Kx8			
11	PARTINST:BE	3338083408:U2	A	I-956883888	U2	dip20_3	6264	20-00062		CMOS Static RAM 8Kx8			
12	PARTINST:BE	3338083409:U1	A	I-956883887	U1	dip20_3	6264	20-00062		CMOS Static RAM 8Kx8			
13	PARTINST:BE	3338083410:U4	A	I-956883886	U4	dip20_3	6264	20-00062		CMOS Static RAM 8Kx8			
14	PARTINST:BE	3338083411:U7	A	I-956883885	U7	dip20_3	6264	20-00062		CMOS Static RAM 8Kx8			
15	PARTINST:BE	3338083412:TP1	A	I-956883884	TP1	TP20	TESTPOINT	60-00038		Header, 1 row, 1 pin			
16	PARTINST:BE	3338083413:P1	A	I-956883883	P1	headx12x45	HEADER12	60-00037		Header, 2 row x 6 pin			
17	PARTINST:BE	3338083414:R2	A	I-956883882	R2	smdres	100	ERJ-2GEJ101X	5%	Carbon Film Resistor 100 OHM 1/16W 5% 0402 SMD			
18	PARTINST:BE	3338083415:R1	A	I-956883881	R1	smdres	100	ERJ-2GEJ101X	5%	Carbon Film Resistor 100 OHM 1/16W 5% 0402 SMD			
19	PARTINST:BE	3338083416:R3	A	I-956883880	R3	res400	10K	ERJ-8GEYJ103	5%	Carbon Film Resistor 10K OHM 1/8W 5% 1206 SMD			

Import/Export Properties

Import Part Properties from Excel to Design

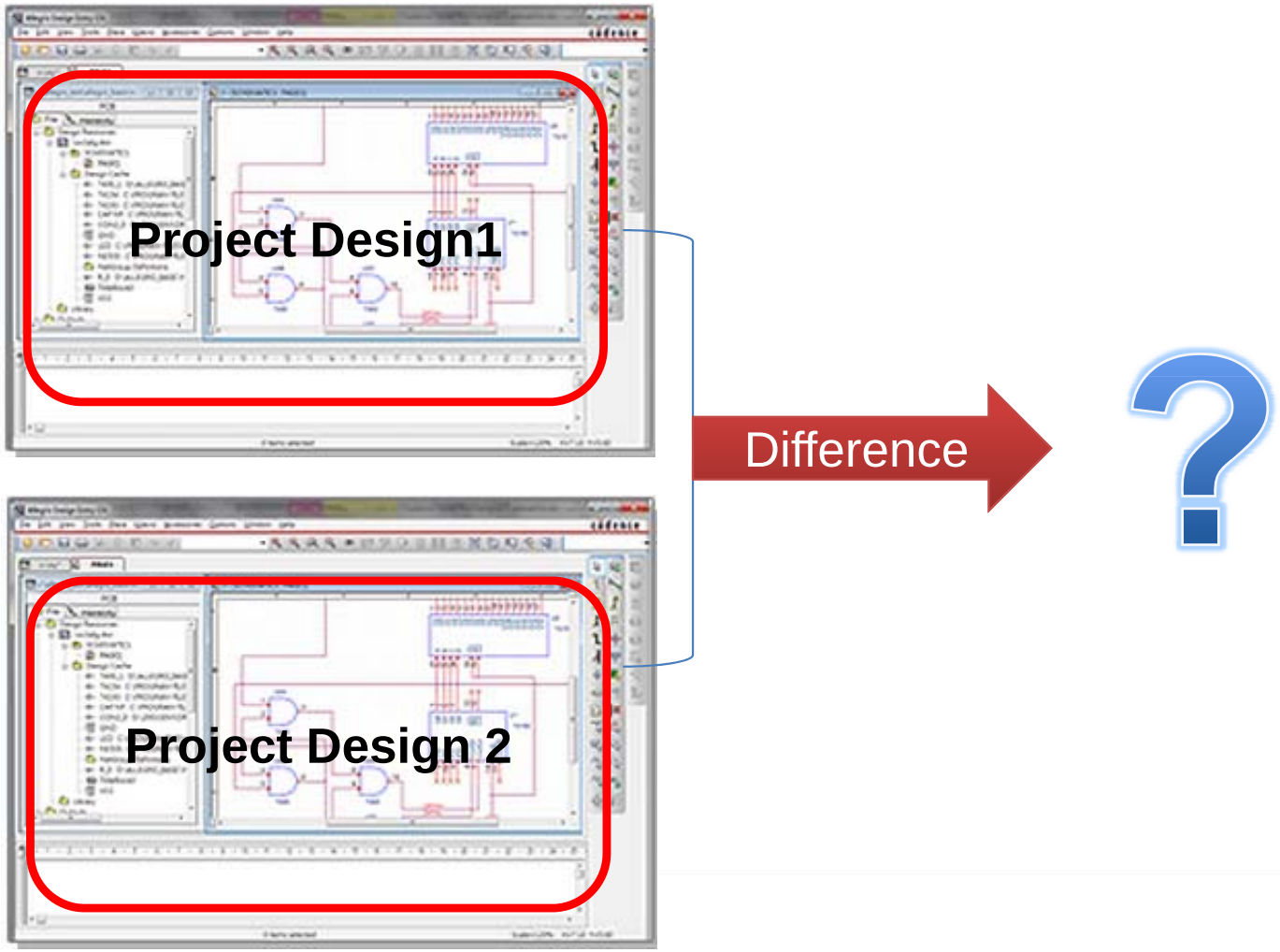




	A	B	C
	BENCH : A : D1	BENCH : A : U9	BENCH : A : U11
Tag			
Color	Default	Default	Default
Description	LED Red	IC, 74ALS138, multi	Bipolar PLD Device
Designator			
Graphic	LED1.Normal	74ALS138.Normal	22V10.Normal
ID			
Implementation	D	74ALS138	
Implementation Path			
Implementation Type	Schematic View	Schematic View	<none>
Location X-Coordinate	1540	710	510
Location Y-Coordinate	850	850	1000
Name	I-956883893	I-956883898	I-956883892
Part Number	40-00017	20-00045	20-00033
Part Reference	D1	U9	U11
PCB Footprint	SMDLED	dip16_3	plcc28
Power Pins Visible			
Primitive	YES	YES	YES
PSpice	D	74ALS138	
Rating	2.0V		
Reference	D1	U9	U11
Source Library	C:\WINDOWS\T	C:\WINDOWS\T	C:\WINDOWS\T
Source Package	LED1	74ALS138	22V10
Source Part	LED1.Normal	74ALS138.Normal	22V10.Normal
Tolerance			
Value	RA-LED	74ALS138	22V10

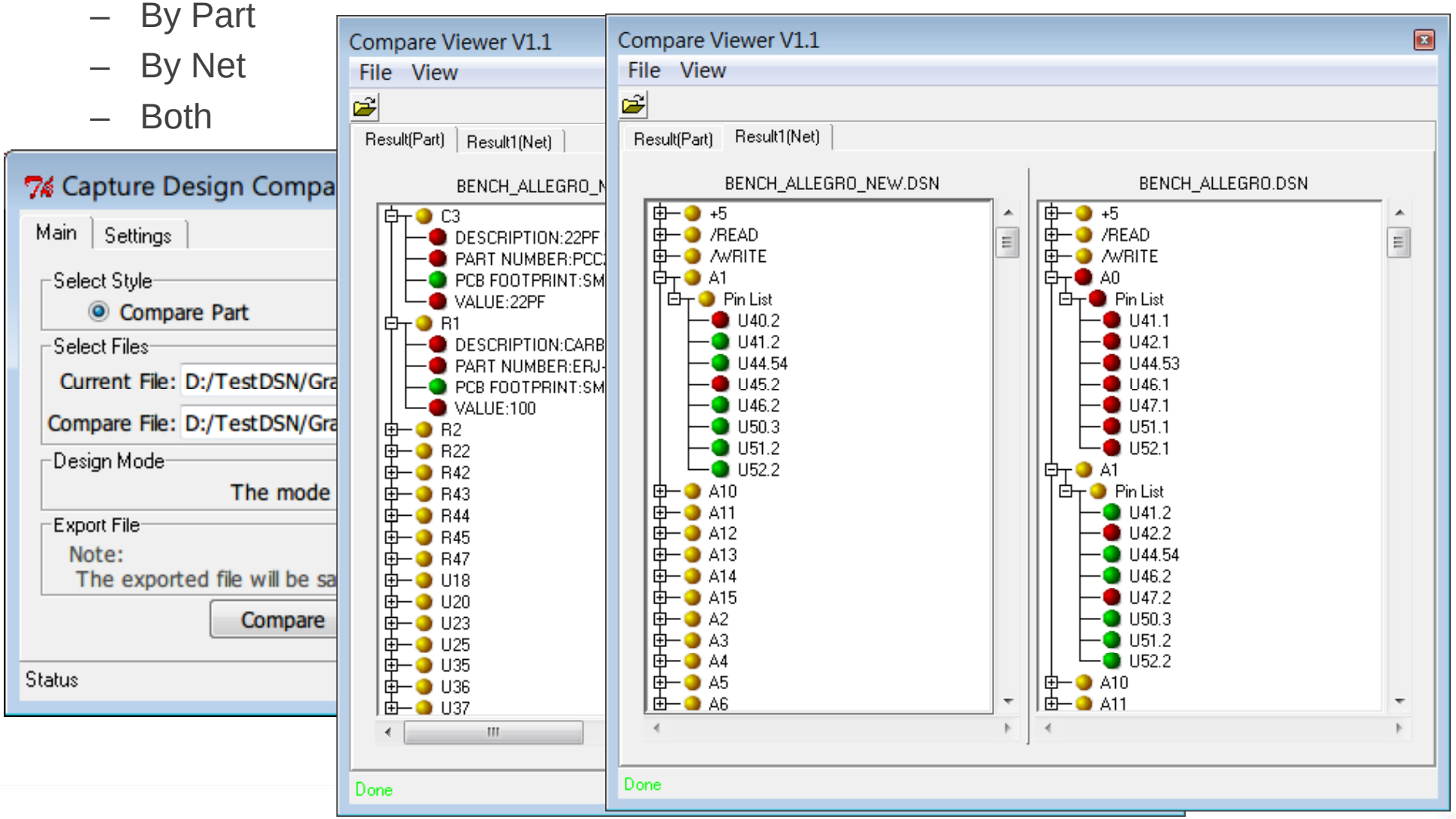
Capture Design Compare

- Design version1 and version 2
- How do you know which part or Net-list is different??



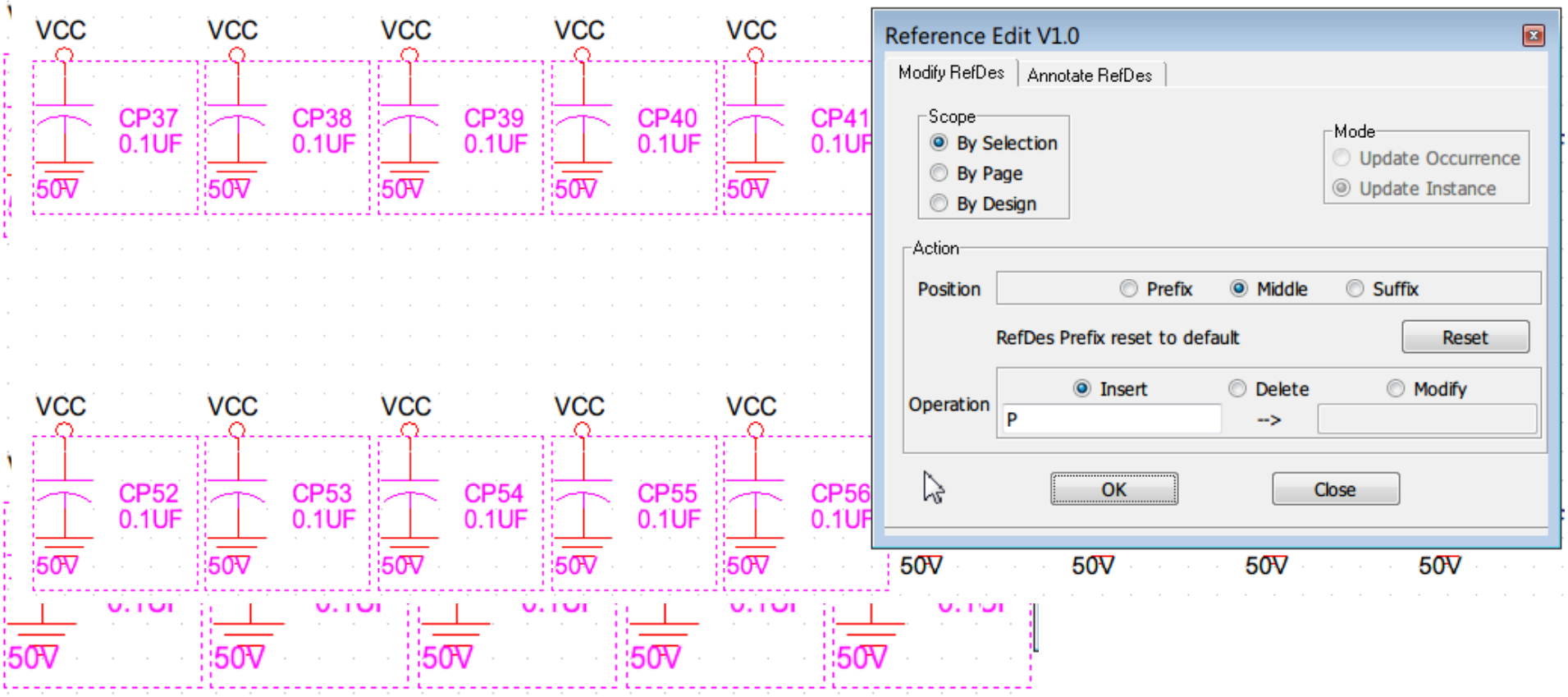
Capture Design Compare

- Design Compare
  - By Part
  - By Net
  - Both



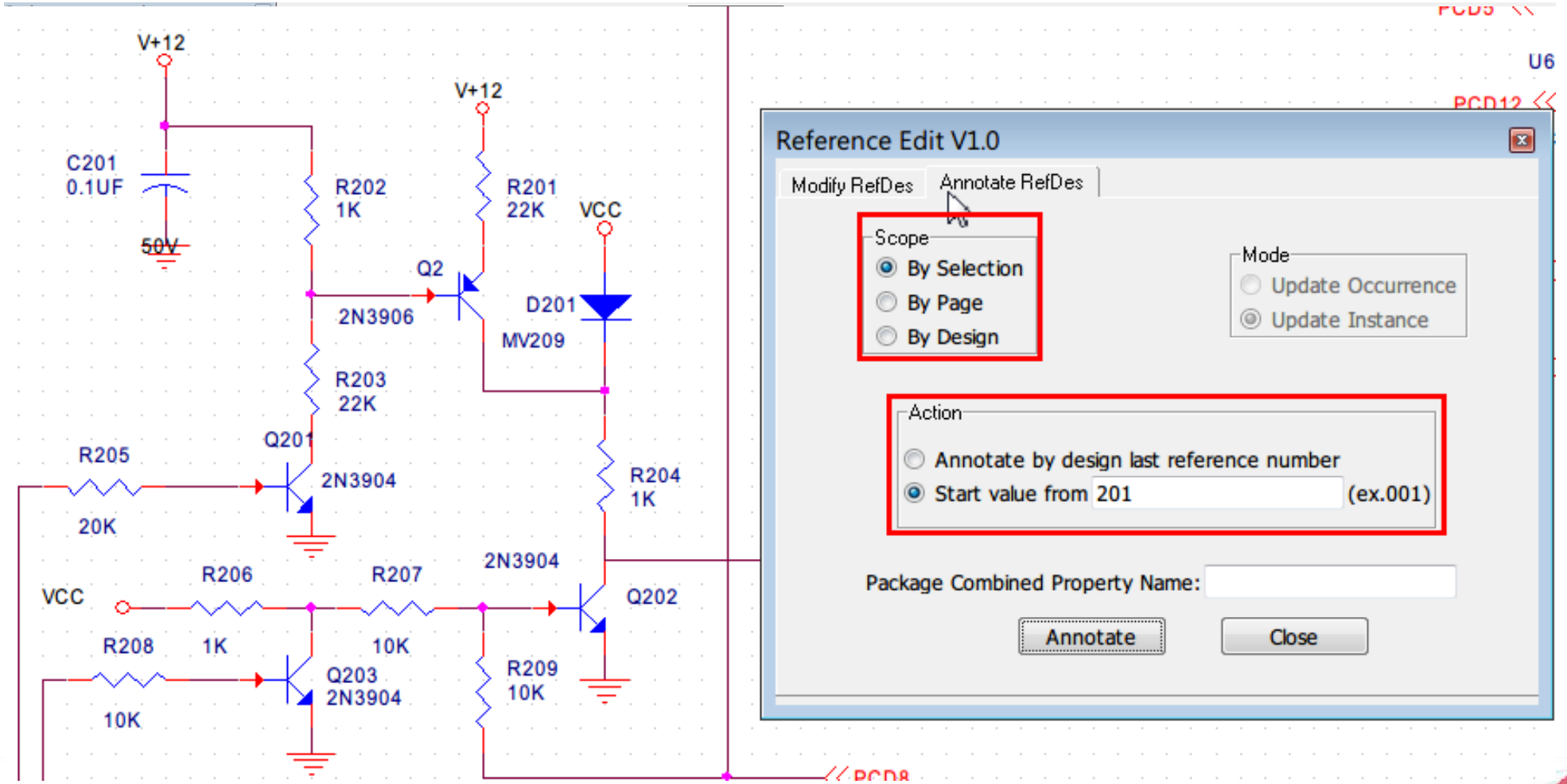
Reference Edit

- Modify RefDes
  - Insert/Delete/Modify Reference Prefix



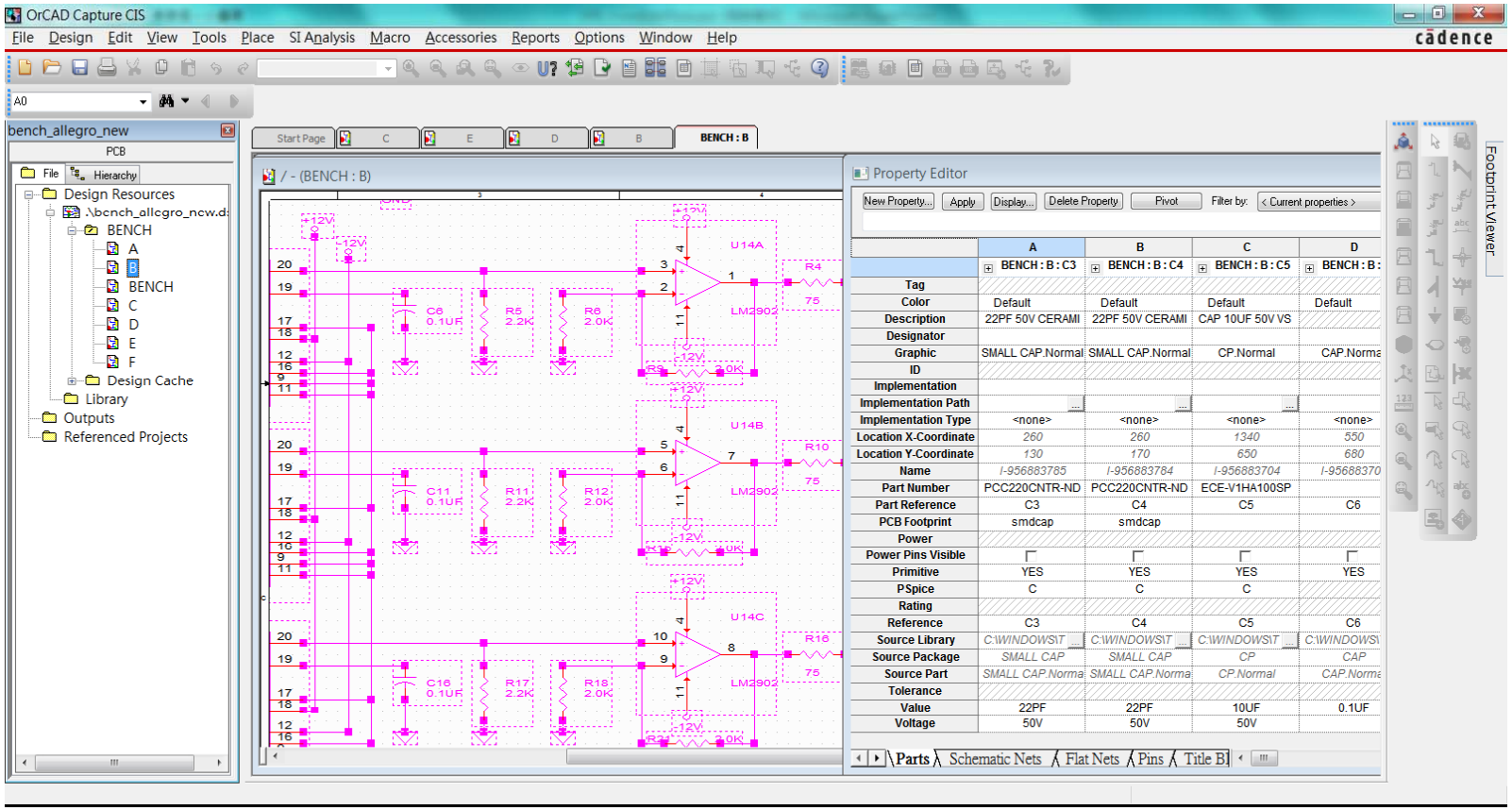
Reference Edit

- Annotate RefDes
  - Annotate Reference by page or selection



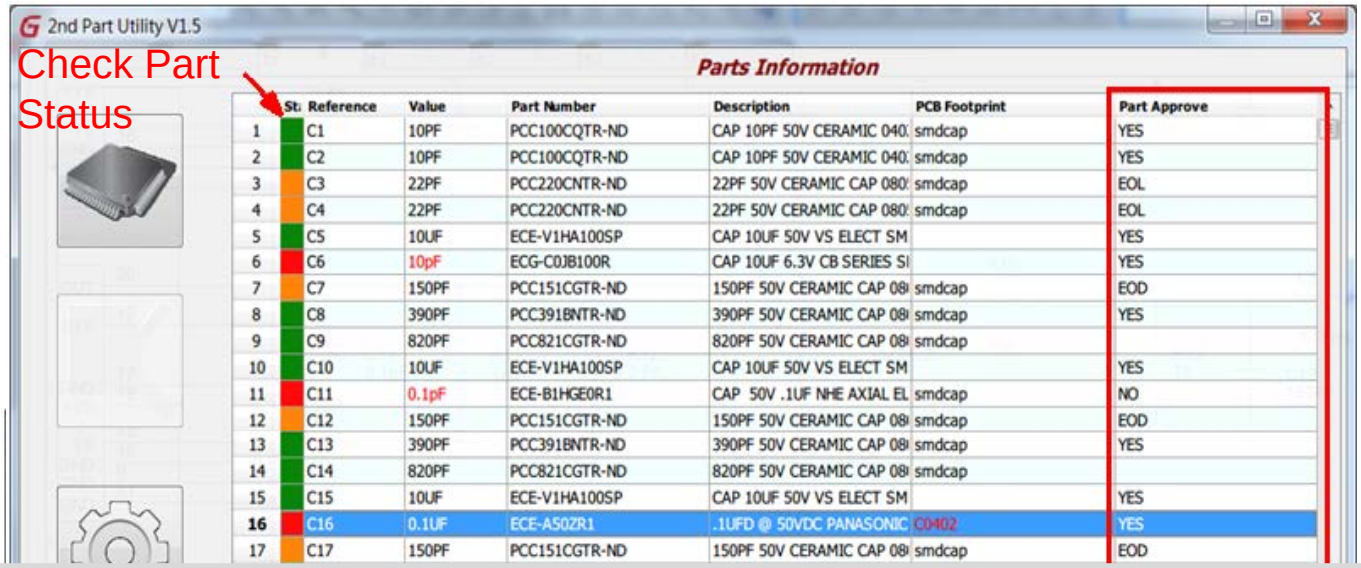
Graser WARE Front-End Pack Roadmap - Part Utility

Is the property editor in Schematic always annoying??



Graser WARE Front-End Pack Roadmap - Part Utility

- Getting Part Information from Part Database
- Check Part Status
  - EOL Part
  - DNI Part
- General BOM File



	St	Reference	Value	Part Number	Description	PCB Footprint	Part Approve
1		C1	10PF	PCC100CQTR-ND	CAP 10PF 50V CERAMIC 040	smdcap	YES
2		C2	10PF	PCC100CQTR-ND	CAP 10PF 50V CERAMIC 040	smdcap	YES
3		C3	22PF	PCC220CNTR-ND	22PF 50V CERAMIC CAP 080	smdcap	EOL
4		C4	22PF	PCC220CNTR-ND	22PF 50V CERAMIC CAP 080	smdcap	EOL
5		C5	10UF	ECE-V1HA100SP	CAP 10UF 50V VS ELECT SM		YES
6		C6	10pF	ECG-C0JB100R	CAP 10UF 6.3V CB SERIES SI		YES
7		C7	150PF	PCC151CGTR-ND	150PF 50V CERAMIC CAP 08	smdcap	EOD
8		C8	390PF	PCC391BNTR-ND	390PF 50V CERAMIC CAP 08	smdcap	YES
9		C9	820PF	PCC821CGTR-ND	820PF 50V CERAMIC CAP 08	smdcap	
10		C10	10UF	ECE-V1HA100SP	CAP 10UF 50V VS ELECT SM		YES
11		C11	0.1pF	ECE-B1HGE0R1	CAP 50V .1UF NHE AXIAL EL	smdcap	NO
12		C12	150PF	PCC151CGTR-ND	150PF 50V CERAMIC CAP 08	smdcap	EOD
13		C13	390PF	PCC391BNTR-ND	390PF 50V CERAMIC CAP 08	smdcap	YES
14		C14	820PF	PCC821CGTR-ND	820PF 50V CERAMIC CAP 08	smdcap	
15		C15	10UF	ECE-V1HA100SP	CAP 10UF 50V VS ELECT SM		YES
16		C16	0.1UF	ECE-A50ZR1	.1UFD @ 50VDC PANASONIC	C0402	YES
17		C17	150PF	PCC151CGTR-ND	150PF 50V CERAMIC CAP 08	smdcap	EOD

	A	B	C	D	E	F	G	H	I
1	Item	Quantity	Part Number	Reference	Description	Manufacturer(DB)	Manufacturer Part Number(DB)	Distributor(DB)	Distributor Part Number(DB)
2	10	6	PCC100CQTR-ND	C1,C2,C20,C21,C22,C2	CAP 10PF 50V CERAM	Panasonic - SCD	ECU-E1H100DCQ	Digi-Key	PCC100CQTR-ND
3	20	9	PCC220CNTR-ND	C3,C4,C24,C25,C26,C2	22PF 50V CERAMIC C	Panasonic - SCD	ECU-V1H220JCN	Digi-Key	PCC220CNTR-ND
4	30	5	ECE-V1HA100SP	C5,C10,C15,C123,C134	CAP 10UF 50V VS ELI	Panasonic - SCD	ECE-V1HA100SP	Digi-Key	PCE3089TR-ND
5	40	6	ECG-C0JB100R	C6,C121,C124,C126,C1	CAP 10UF 6.3V CB SE	Panasonic - SCD	ECG-C0JB100R	Digi-Key	PCS1100BTR-ND
6	50	3	PCC151CGTR-ND	C7,C12,C17	150PF 50V CERAMIC (	Panasonic - SCD	ECU-V1H151JCG	Digi-Key	PCC151CGTR-ND
7	60	3	PCC391BNTR-ND	C8,C13,C18	390PF 50V CERAMIC (	Panasonic - SCD	ECU-V1H391KBN	Digi-Key	PCC391BNTR-ND
8	70	3	PCC821CGTR-ND	C9,C14,C19	820PF 50V CERAMIC (	Panasonic - SCD	ECU-V1H821JCX	Digi-Key	PCC821CGTR-ND
9	80	13	ECE-B1HGE0R1	C11,C39,C43,C44,C46,(	CAP 50V .1UF NHE A	Panasonic - SCD	ECE-B1HGE0R1	Digi-Key	P5461-ND
10	90	1	ECE-A50ZR1	C16	.1UFD @ 50VDC PAN.	Panasonic - SCD	ECE-A50ZR1	Digi-Key	P6638-ND
11	100	10	ECE-A1HKK0R1	C29,C41,C51,C55,C61,(	CAP ELECT .1UF 50V	Panasonic - SCD	ECE-A1HKK0R1	Digi-Key	P985-ND
12	110	4	ECE-A2AGE100	C32,C36,C118,C119	NHE RADIAL ELECT	Panasonic - SCD	ECE-A2AGE100	Digi-Key	P5297-ND
13	120	1	ECE-V1EA100SR	C33	CAP 10UF 25V VS ELI	Panasonic - SCD	ECE-V1EA100SR	Digi-Key	PCE3067TR-ND
14	130	1	A104Z15Z5UFVVWN	C34	CAP 50V .1UF AXIAL	PHILIPS COMPONENT	A104Z15Z5UFVVWN	Digi-Key	1203PHTR-ND
15	140	7	ECE-V1HV100SP	C35,C116,C117,C120,C	10UF/50V SMD ALUM	Panasonic - SCD	ECE-V1HV100SP	Digi-Key	PCE1022TR-ND