

INTELLIGENCE

ACCELERATED

sherlock

AUTOMATED DESIGN ANALYSIS™

DfR Solutions Open House

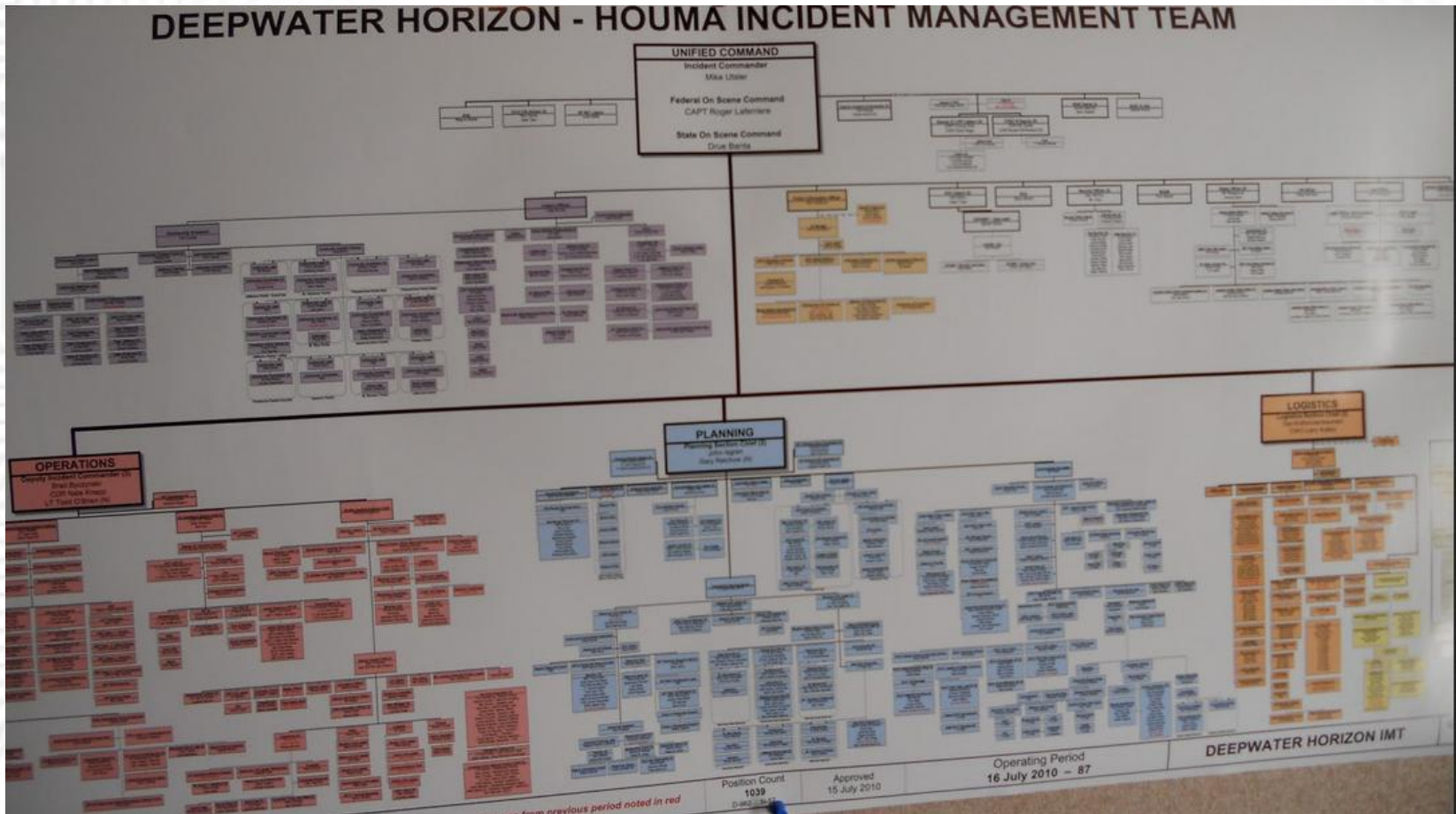
Sherlock: Where it's Been &
Where its Going

Presented by: Tom O'Connor
Nate Blattau, PhD

Date: March 18, 2013

DfR Solutions
reliability designed, reliability delivered

Is this your Engineering Department??



Sherlock the Engineering Communications Tool

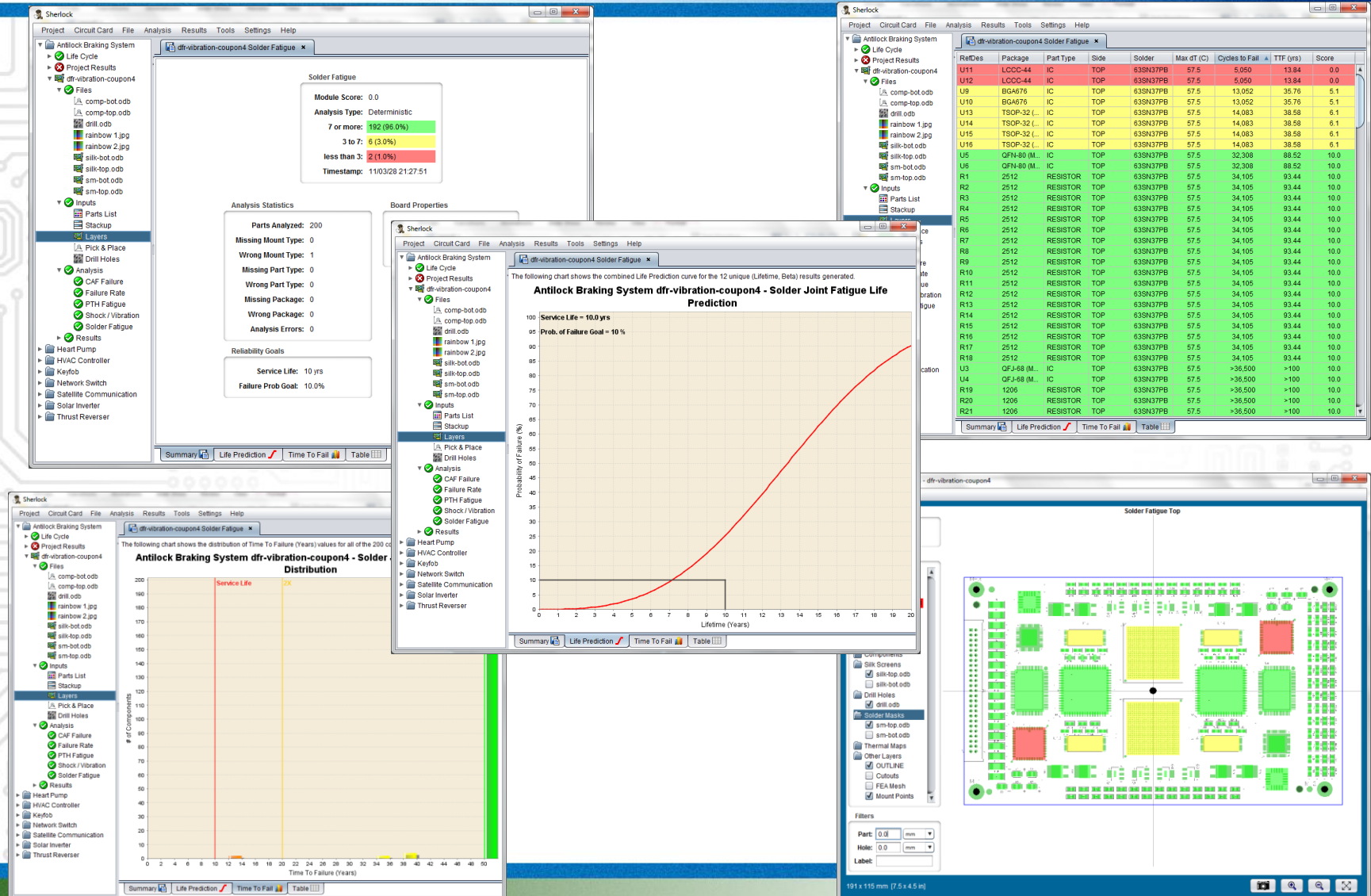
Thanks to our customers Sherlock is being used in all areas

- Program Management
- Component Engineering
- Mechanical Engineering
- Layout
- Thermal Engineering
- Test Engineering
- Supply Chain
- Reliability
- Risk Management/Safety

How Do You Use Sherlock?

- Lifetime Prediction
- Supply Chain Management
- Test Plan Development
- ICT Stress Analysis
- DFMEA
- Design Improvement
- Concept Development
- Communications Tool
- Other ??

Lifetime Prediction



Supply Chain Management



- Capture of the right information at the right time is stymied by lack of appropriate channels, lack of internal resources and IP protection concerns



Test Plan Development

The screenshot displays the Sherlock software interface for Test Plan Development. The main window features a project tree on the left, a central 'Thermal Event Editor', and two side panels for 'Shock Pulse Profile' and 'Random Vibe Profile'.

Project Tree (Left):

- Antilock Braking System
- Heart Pump
- HVAC Controller
- Keyfob
- Network Switch
- Satellite Communication
- Solar Inverter
- Thrust Reverser
 - Life Cycle (checked)
 - Phase 1
 - 1 - Mechanical Shock
 - 2 - Flight Thermal Cycle (selected)
 - 3 - Diurnal Profile
 - 4 - In flight Random Vibration
 - Project Results
 - Annunciator
 - Files
 - Inputs
 - Analysis
 - Results
 - CONTROLLER

Thermal Event Editor (Center):

Modify any of the following properties and press the Save button to update the current Thermal Event.

Identification:

- Name: 2 - Flight Thermal Cycle
- Description:

Thermal Event Settings:

- # of Cycles: 730 PER YEAR

Thermal Profile:

Profile #1

Graph: Temperature (C) vs Time (min). The profile shows a constant temperature of -25°C from 0 to 125 minutes, followed by a ramp up to 75°C at 125 minutes, and then a constant temperature of 75°C until 250 minutes.

Shock Pulse Profile (Right):

Composite Shock Pulse

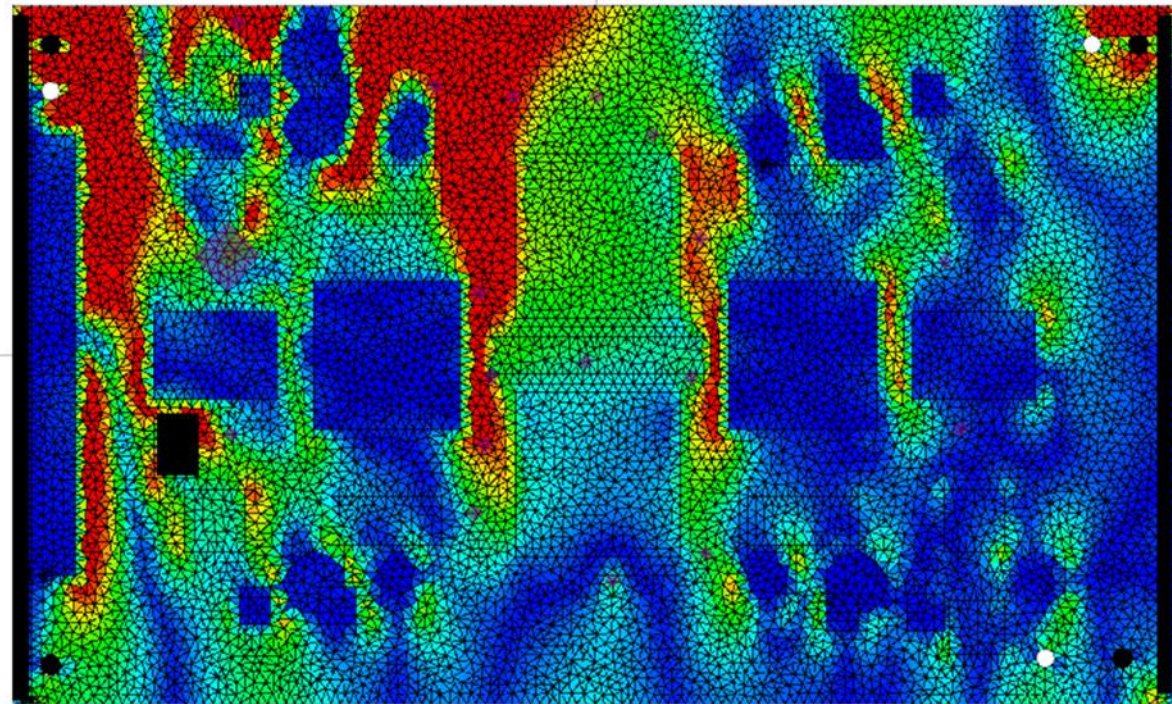
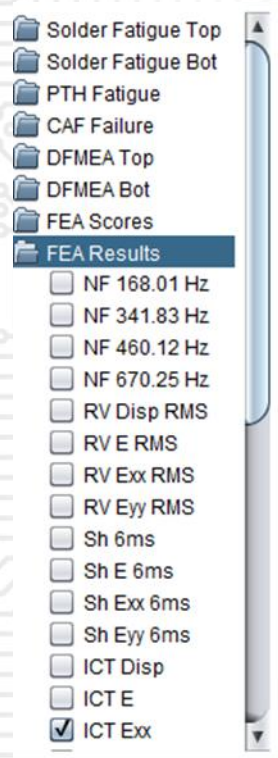
Graph: Load (G) vs Time (ms). The graph shows a series of peaks and troughs, representing a composite shock pulse.

Random Vibe Profile (Right):

Operation_Random_Radial6

Graph: Amplitude (G/Hz) vs Frequency (Hz). The graph shows a series of peaks, representing a random vibration profile.

ICT Module (optional)



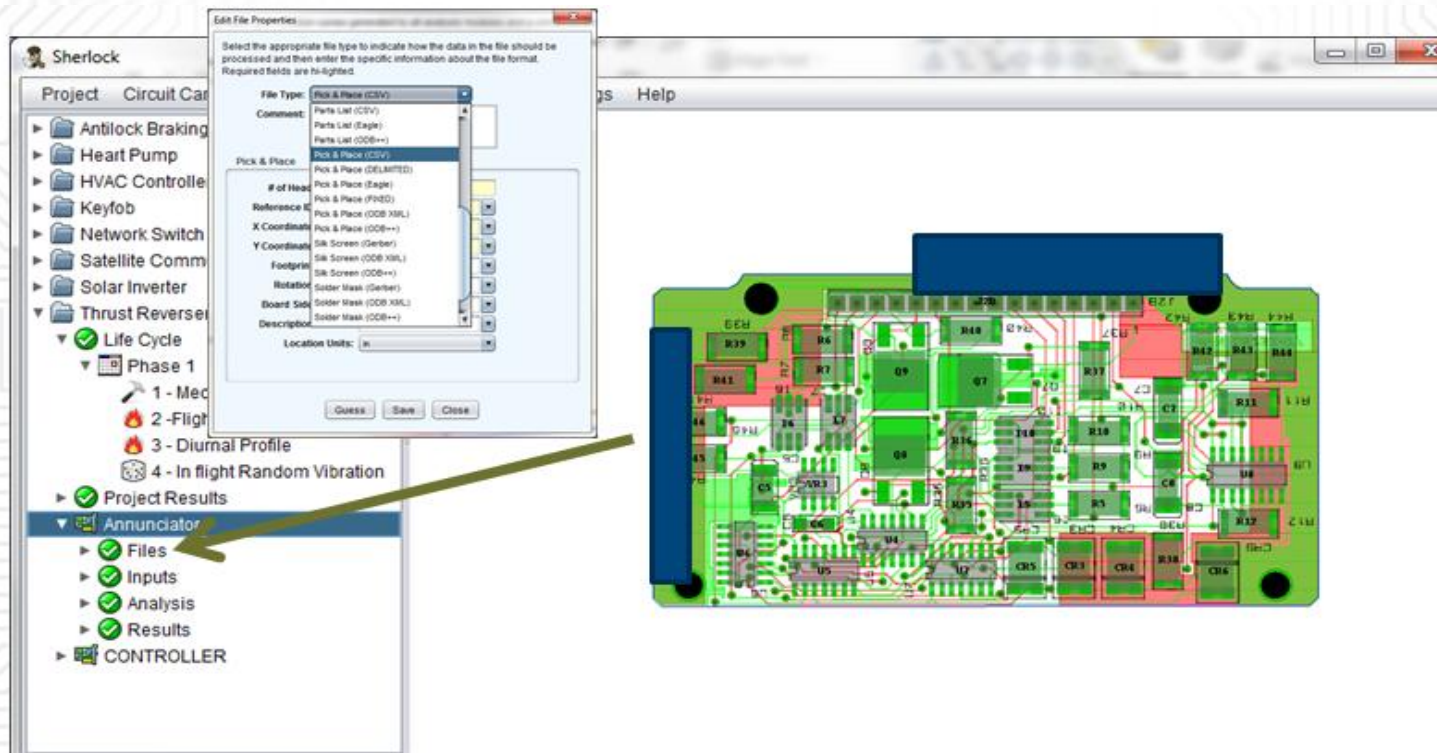
Uses embedded FEA engine to compute board deflection and strain cause by ICT fixture or any other force on the assembly

DFMEA Module (optional)

Navigation		Subcircuit Properties	
- Open - Pin 17 (N127243) - Open - Pin 18 (N127703) - Open - Pin 19 (N127703) - Open - Pin 20 (GND) - Short - Pins 1 (PLCC20-1) & 2 - Short - Pins 1 (PLCC20-1) & 20 - Short - Pins 5 (N124525) & 6 - Short - Pins 7 (N124972) & 8 - Short - Pins 9 (N125421) & 10 - Short - Pins 11 (N125875) & 12 - Short - Pins 15 (N126785) & 16 - Short - Pins 17 (N127243) & 18 - Short - Pins 19 (N127703) & 20	- U2 - Logic Failure - Open - Pin 1 (PLCC20-2) - Open - Pin 2 (N131610) - Open - Pin 3 (N131610) - Open - Pin 4 (N131614) - Open - Pin 5 (N131614) - Open - Pin 6 (N131618) - Open - Pin 7 (N131618) - Open - Pin 8 (N131622)	Subcircuit Name: UNASSIGNED Description:	Part Properties Part Designator: U2 Description: IC ADV PWM MOTOR CTRL LCCC-20
		Failure Mode Properties Failure Mode: Logic Failure Potential Cause: Device failure Potential Effect:	
		SEV: 8 OCC: 2 DET: 2 RPN: 32	

- Uses ODB++ data including net list to create board level DFMEA
- Includes customizable spreadsheets for export

Design the PWBA



Timely feedback to the design layout - daily

Concept Stage

What's available in Sherlock to do this quickly?

- Automated input
 - Extract as much information from the board files as possible
 - Use intelligent parsers to recognize parts
- Parts database
- Laminate database
- Layer Editor
- Environmental conditions

Involving Engineering Team earlier in the project

Yields more knowledge earlier in the process = more robust product

Where is Sherlock Going?

- Latest Developments
- Future Developments
- Watch Sherlock in Action

- Map existing information contained in the ODB++ archive into Sherlock



Component Property Mapping

The following component properties are defined in the ODB++ files being processed. Please indicate how each property should be used by Sherlock when constructing the parts list.

ALT_SYMBOLS:	Ignore	(NSOD123)
DESCRIPTION:	Part Description	SCHOTTY RECTIFIER IN SOD-123 PACKA
MAX_POWER DISS:	Ignore	0.062W
NOTECODE:	Ignore	0 08G3032 BLANK LABEL
NO_POP:	Ignore	TRUE
PARENT_PART_TYPE:	Ignore	DIODESCHTKYA
PARENT_PPT:	Ignore	DIODESCHTKYA
PARENT_PPT_PART:	Ignore	DIODESCHTKYA-77P1414
PART_NAME:	Part Description	DIODESCHTKYA
PART_NUMBER:	Part Number	77P1414
SIGNAL_MODEL:	Ignore	DEFAULT_RESISTOR_2.210HM_2_1
TOLERANCE:	Ignore	5%
VALUE:	Part Description	2.2
VENDOR:	Ignore	STMICROELECTRON
VENDOR_PN:	Ignore	STPS0530ZE

OK Reset Guess

Additional information supplied in ODB archive via PRP fields

• Approved Vendor List Support

partNumber	partDescription	vendorName1	vendorPart1
3N4791	MICTOR CONNECTOR FOR HP DEBUG - SURFACE MOUNT LEAD FREE	TYCO	5767054-1
4P9616	AMBER RT. ANGLE SMT LED	AGILENT TECHN.	HSMA-C110
4P9617	ORANGE RT. ANGLE SMT LED	AGILENT TECH.	HSML-C110
19L1864	RESISTORS;11K-OHMS +0.1-0.1 PERCENT;0.2WATTS;THIN FILM;0805	VISHAY ELECTRON	PTN0805E1102BIT
24H4880	10K 0.1% 0603 1/16W RESISTOR	PANASONIC	ERA3YEB103V
24L7183	6800 PF 0402 CAPACITOR	AVX	04023C682KAT2A
24L7191	.027 UF 0402 CAPACITOR	MURATA	GRM155R71A273KA01D
29L1878	CAPACITOR CERAMIC;0.012 UF+10-10%;25 VOLTSDC;0603 PKG.;X7R;S	KEMET ELECTRONI	C0603C123K3RAC
29L1950	RESISTOR 7.5K .1% TOLERANCE 0805	VISHAY	P0805E7501BBT
29L1966	RESISTORS;.1K-OHMS +.1-.1 PERCENT;;1WATTS;THIN FILM;0805 PKG	PANASONIC	ERA6YEB101V
29L2275	4.7UH +/-20% 450MA SURFACE MOUNT INDUCTOR	MURATA	LQH32CN4R7M21L
41K0131	1.47K 0.1% 1/10W TCR=25PPM/C SMT 0805	KOA SPEER	RN732ATTD1471B25
41K0135	2.13K 0.1% 1/10W TCR=25PPM/C SMT 0805	KOA SPEER	RN732ATTD2131B25
44V3950	CONNECTOR ASSEMBLY 20 POS. RIGHT ANGLE 0.8MM PITCH SFP+	TYCO	1888247-1
44V4347	CAGE FOR RANGER L OPTICS CONNECTOR (44V3950)	TYCO	2007198-1
46K6448	MICRO HIGH SPEED INTERFACE SOCKET	SAMTEC	ERF8-025-05.0-S-DV-L-TR
48J6490	PANTHER G2 ASIC - VER 1.0	IBM ASIC	48J6490
51Y2108	CFAM-S CHIP (PB-FREE)	IBM	51Y2108
74Y5113	SAMTEC MMCX STRAIGHT SMT PLUG- 50 OHM COAX JACK	SAMTEC	MMCX-J-P-H-ST-SM1
74Y5114	HEADER 2MM SURFACE MOUNT TERMINAL STRIP VERTICAL 2 X4 POS	SAMTEC	TMM-104-01-S-D-SM
74Y5115	HEADER 2MM SURFACE MOUNT TERMINAL STRIP VERTICAL 2 X5 POS	SAMTEC	TMM-105-01-S-D-SM
74Y5116	HEADER 2MM SURFACE MOUNT TERMINAL STRIP VERTICAL 2 X 8 POS	SAMTEC	TMM-108-01-S-D-SM
74Y5117	HEADER 2MM SURFACE MOUNT TERMINAL STRIP VERTICAL 1 X 8 POS	SAMTEC	TMM-108-01-S-S-SM
74Y6372	3X16 IMPACT RA RECP W/GUIDE PINS & 4 PWR BLADES - P4 LONG	MOLEX	74Y6372
77P0218	POWER SENSE RESISTOR 0.002 OHM	VISHAY	WSL-2010-0.002-1%-R86
77P0785	.22 UF 10% 25V 0603 X7R	MURATA	GRM188R71E224KA88D
77P1267	LEAD FREE VERSION OF 77P0110; 32KBIT 1.8-5V SERIAL EEPROM	ATMEL	AT24C32AN-10SU-1.8
77P1270	16KBIT SERIAL EEPROM 2.7-5.5V	STMICRO	M24C16-WMN6
77P1277	DIODES/RECTIFIERS;SCHOTTKY DIODE;VR[MAX]= 20 VOLTS;SILICON;S - LEAD FREE	ON SEMICONDUCTO	MBR0520LT1G

- Internal Parts Database

Search Local Part Database

Search Criteria

Enter the desired search criteria and press the **List Parts** button to view all matching parts from the **Local Part Database**. You may leave the **Part Number** field empty to match all parts for a selected manufacturer.

Manufacturer:

Part Number:

Criteria:

Filters

Manufacturer	Part Number	Part Type	Description

Search Results (2)

Manufacturer	Part Number	Part Type	Description
ANALOG DEVICES	AD5306ARUZ	IC	8-BIT DAC 2.5 V TO 5.5 V 400U
INTERNAL	77P5992	IC	8-BIT DAC 2.5 V TO 5.5 V 400U

Local Part Properties - ANALOG DEVICES-AD5306ARUZ

The following properties are currently defined for the selected part:

Local Part Properties - ANALOG DEVICES-AD5306ARUZ

IC	Die	Flag	Lead	Ball	Mech	Qual
ID	Pkg	Elec	Therm	Pad		

Package Name: TSSOP-16

Package Mount: SMT

Package Units: MM

Package Length: 3

Package Width:

Package Thickness:

Corner Shape:

Corner Radius:

Material:

Seal Type:

Edit Part Wizard Pattern

Modify the pattern properties as needed and press the **Save** button to update the selected pattern.

Pattern ID:

Manufacturer:

Description:

Field ID	Type	Length	Property	Value
Chip Size	CODE	4	packageMount	SMT
Voltage	CODE	1	partDescription	CERAMIC
Temperature	CODE	1	partType	CAPACITOR
Capacitance	EXP3	3		
Tolerance	CODE	1		
Failure Rate	CODE	1		
Termination	CODE	1		
Marking	CODE	1		
Special	CODE	1		

Pattern Test

Part Number:

Test Result:

Edit Part Wizard Field

Modify the field properties as needed and press the **Save** button to update the selected field.

Field ID:

Description:

Field Type:

Pattern:

Min Length:

Max Length:

Default Units:

Mode: ☒ Required ☐ Optional

Code	Value
0402	0402
0603	0603
0805	0805
1005	1005

- Part Wizard Patterns
- Automatically Decode manufacture's part numbers

- Laminate Database
- Add your own custom materials if necessary

Stackup Properties

The following board properties are based on the currently defined board outline and the individual layer properties shown below:

Board Size: 137 x 385 mm [5.4 x 15.1 in] CTE_{xy}: 17,182 ppm/C
 Board Thickness: 2.3 mm [91.6 mil] CTE_z: 41,403 ppm/C
 Board Density: 2.8863 g/cc E_{xy}: 37,190 MPa
 Conductor Layers: 16 E_z: 4,478 MPa

Stackup Layers

Double click any row to edit the properties for that layer or select one or more rows and press the **Edit Selected** button below to edit properties for a batch of layers. Press the **Generate Stackup Layers** button to replace all layers using a given PCB thickness and default layer properties.

Layer	Type	Material	Thickness	Density	CTE _{xy}	CTE _z	E _{xy}	E _z
1	SIGNAL	COPPER (24.2%) / COPPER-RESIN	0.5 oz	3.5182	42,159	42,159	29,999	29,999
2	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
3	POWER	COPPER (87.4%) / COPPER-RESIN	1.0 oz	8.0054	21,682	21,682	99,203	99,203
4	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
5	POWER	COPPER (88.3%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188
6	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
7	SIGNAL	COPPER (14.5%) / COPPER-RESIN	0.5 oz	2.8508	45,205	45,205	19,706	19,706
8	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
9	POWER	COPPER (88.3%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188
10	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
11	SIGNAL	COPPER (15.2%) / COPPER-RESIN	0.5 oz	2.8508	45,205	45,205	19,706	19,706
12	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
13	POWER	COPPER (88.3%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188
14	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
15	POWER	COPPER (86.4%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188
16	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
17	POWER	COPPER (87.5%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188
18	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
19	POWER	COPPER (88.3%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188
20	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
21	SIGNAL	COPPER (14.8%) / COPPER-RESIN	0.5 oz	2.8508	45,205	45,205	19,706	19,706
22	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
23	POWER	COPPER (88.3%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188
24	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
25	SIGNAL	COPPER (10.4%) / COPPER-RESIN	0.5 oz	2.5384	46,630	46,630	14,888	14,888
26	Laminate	R-5775K	4.9 mil	1.9000	16,000	45,000	26,182	3,650
27	POWER	COPPER (88.3%) / COPPER-RESIN	1.0 oz	8.0693	21,391	21,391	100,188	100,188

Edit Selected Layers

Enter values for each layer property.

Laminate Layer Properties

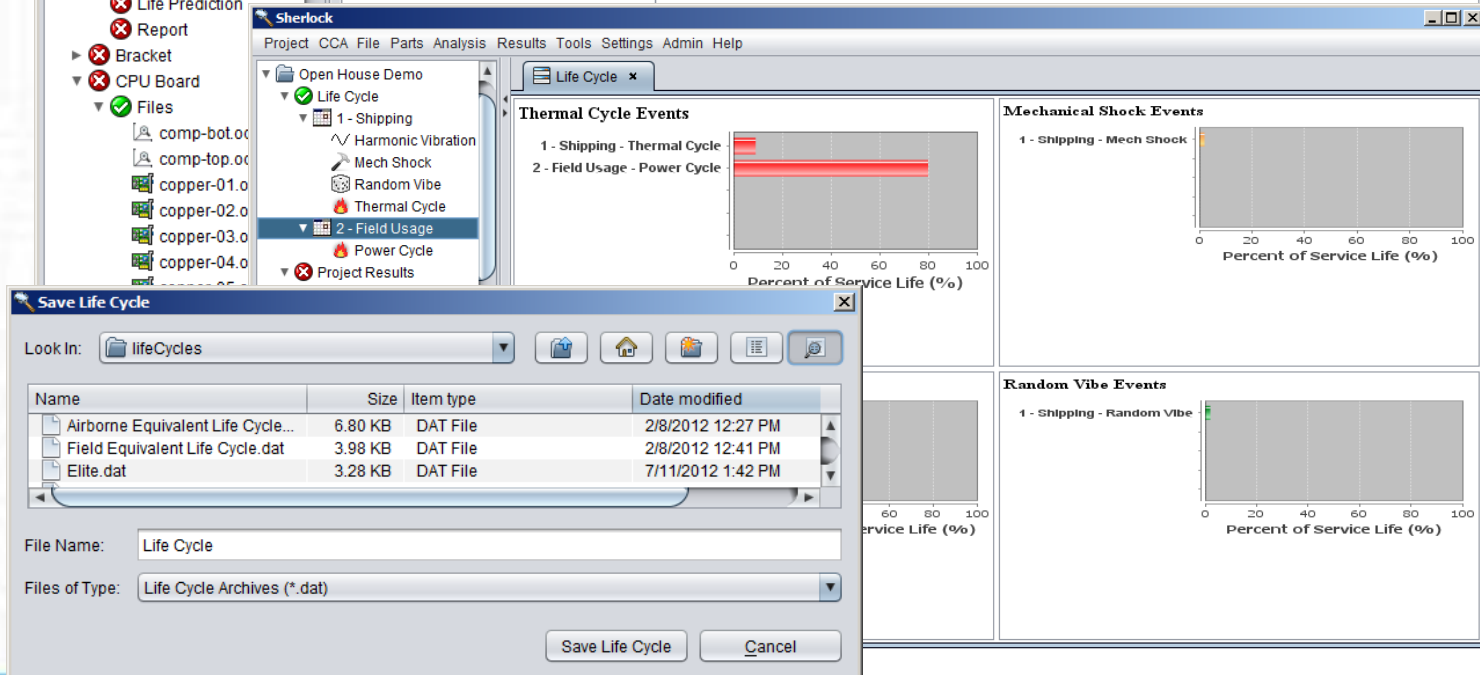
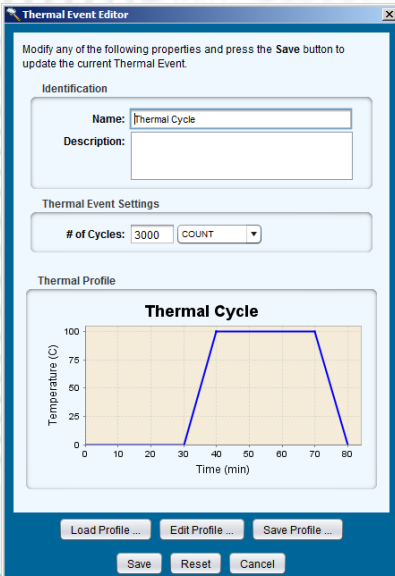
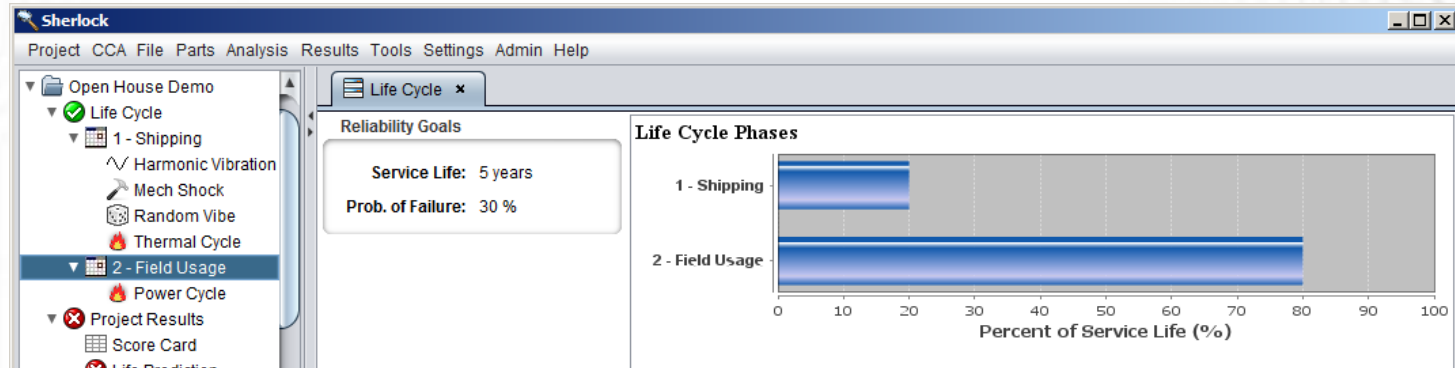
Laminate Material:

Laminate Thickness:

Company

ID	Company	Material	Product Name	Density	CTE _z	CTE _{xy}	E _z	E _{xy}	Date
99	DFR	FR-4	370HR-7628	1.9	45	13	3450	26070	8-Jun
99	DFR	FR-4	370HR-2116	1.9	45	15.4	3230	22812	8-Jun
99	DFR	FR-4	370HR-5X106	1.9	45	24	3110	17081	8-Jun
99	DFR	FR-4	370HR-2X106-1X2113	1.9	45	21	3220	19245	8-Jun
99	DFR	FR-4	370HR	1.9	45	13	3450	33800	8-Jun
98	DFR	LTCC	P51 PT	3.1	5.8	5.8	120000	120000	8-Jun
99	DFR	ALUMINUM	6061	2.7	24	24	80000	80000	8-Jun

- Environmental Conditions
- The complete Life Cycle with stresses can be stored



Here is the really good news

Everyone in the Engineering Department is now working together

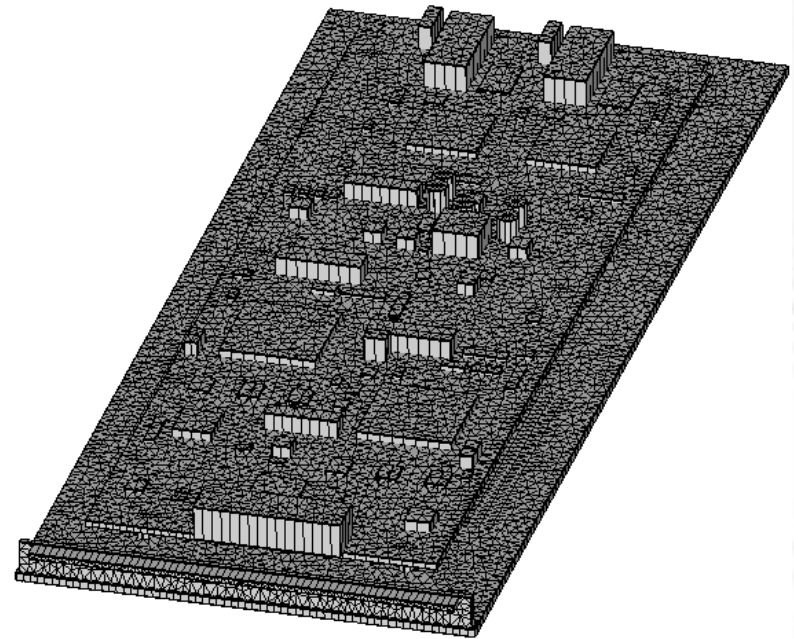
- Real Concurrent Engineering
- More Robust Design
- Completed On Time & Under Budget
- Happy Customer

Questions??

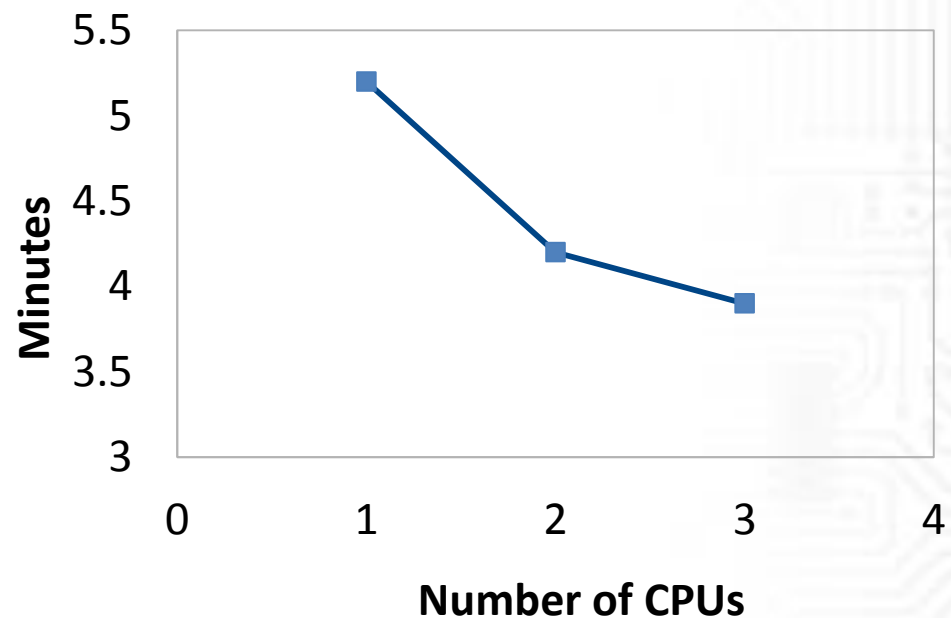
Upcoming Feature in Sherlock 3.0

- Multi-core support
- Sub Assemblies
- 3D Visualization
- Global Part Database

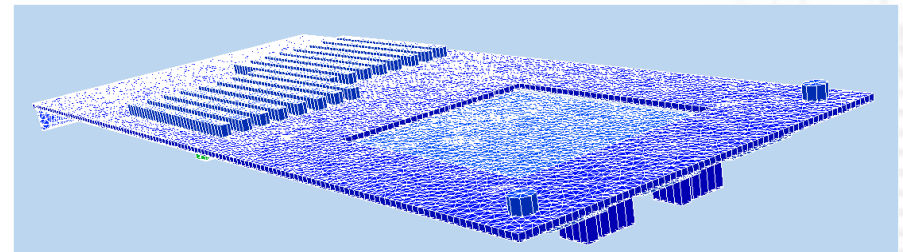
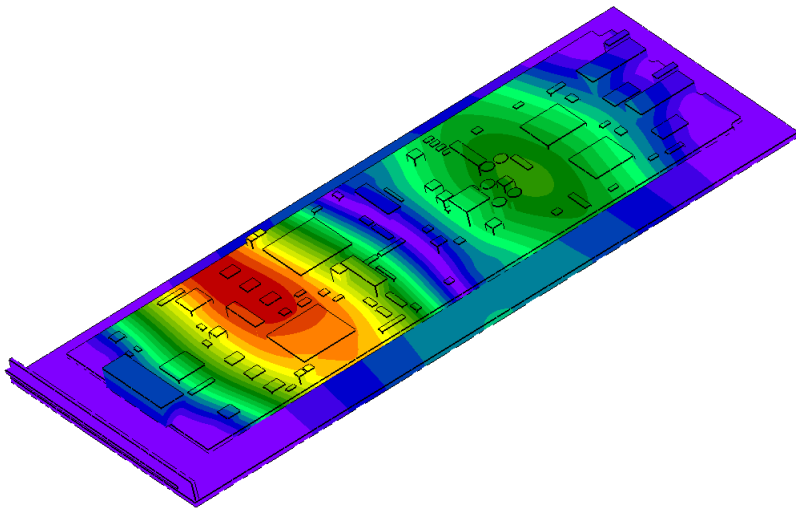
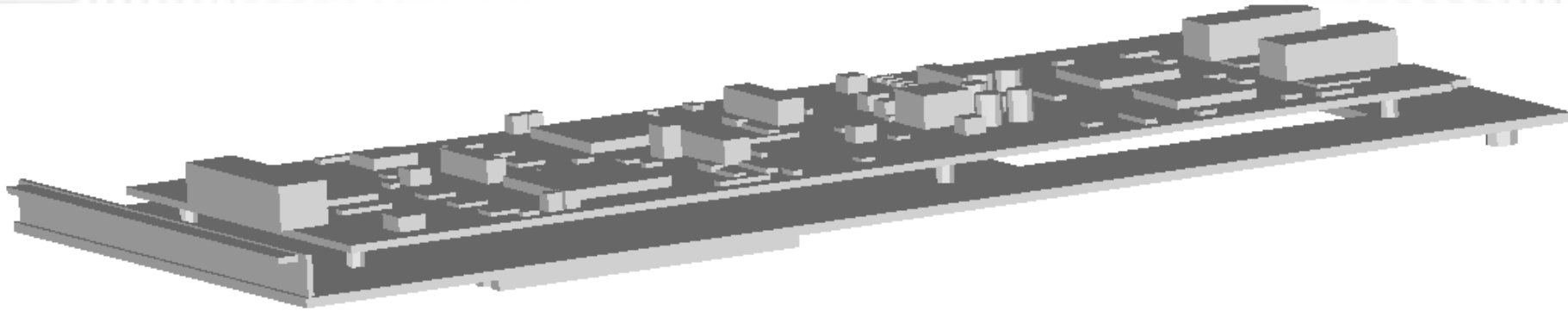
- The FEA engine behind Sherlock is full 3D
- 3D visualization
- Support for Wedge and Brick elements
- Tied elements



- Multi-core support for finite element analysis shortens analysis times
- 6400 elements
- 4 core cpu



- Subassemblies



- Global Parts Database
- Integration with commercial online parts databases
- Community based feedback on accepted part properties

Questions??

Thank you!

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