MTBF & Reliability Toolkit

for

Altium Designer

Quick Start Guide

Rev 1.2
April 2024

Table of Contents

MTBF & Reliability Toolkit for Altium

1. Introduction

1.1. BQR MTBF calculation solutions

BQR provides several software options for calculating MTBF:

- Online web application (www.bqr-digital.com)

- MTBF & Reliability Toolkit (ECAD extension covered by this User Manual)

- fiXtress Pro

The following table compares the solutions' capabilities:

	MTBF Web Application	MTBF & Reliability Toolkit (MTBF Prediction integrated in Altium)	MTBF Power User (fiXtress Pro)
Unique Feature	No Installation required	Supports: Altium Designer, Mentor Expedition and OrCad	Combine all available MTBF prediction methods in one analysis +
Operating System	Web Application	Under the ECAD tool (Windows 10/11)	Windows 10/11
System Level	No (only 1 PCB)	No (only 1 PCB)	Yes (Multi PCBs in hierarchic levels)
Import BOM	From any format	Integrated in ECAD	Directly from ECAD and any text/Excel files
Reusable component libraries	Yes	Yes	Yes + Powerful components editor and link to web library
Components in supplied library	-	-	Up to 50,000
MIL-HDBK-217F2	Parts Count	Parts Count	Parts Count & Stress
MIL-HDBK-217F2 With VITA 51.1	-	-	Parts Stress
Telcordia-3	-	Parts Count & Stress	Parts Count & Stress
FIDES	-	-	Parts Count & Stress
IEC 62380	-	-	Parts Count & Stress
SN 29500	-	-	Parts Count & Stress
HRD 5	-	-	Parts Count & Stress
NSWC	-	-	Yes
MIL-HDBK-217G	-	-	Parts Count & Stress
Reports	Yes	Yes	Yes, including graphs

1.2. MTBF & Reliability Toolkit

The MTBF & Reliability Toolkit provides several functions:

- A "Parts Count" MTBF Prediction according to the MIL-HDBK-217F Notice 2 standard

- A "Parts Count" or a "Parts Stress" MTBF Prediction according to the Telcordia SR-332 Issue 3 standard

- Assign component stresses directly on the schematic: Used for component derating.

- "Derating Lite" – simple component derating directly on the schematic.

- Additional functionalities that operate with BQR's fiXtress Pro and FMECA Pro software

  - BOM verification and export to fiXtress for MTBF prediction and/or schematic review and electrical stress analyses

  - Full component derating including temperature dependent derating curves

  - Assign components to functions and failure modes: Used for FMECA

  - Net name generator: used for consistent net name conventions and advanced analysis using fiXtress

2. Demo Mode (no license)

2.1. Goal

The goal of the demo mode (no license) is to allow the user to experience the MTBF & Reliability Toolkit by providing the following functionality:

- "Parts Count" MTBF Prediction according to the MIL-HDBK-217F Notice 2 standard (report and saving is disabled)

- "Parts Count" and "Parts Stress" MTBF Prediction according to the Telcordia SR-332 Issue 3 standard (report and saving is disabled)

- Additional functionalities that operate with BQR's fiXtress Pro and FMECA Pro software
  - Assign component stresses directly on the schematic: Used for component derating as well as for stress based MTBF prediction (Realistic MTBF) for various prediction standards and multi-board systems (saving is disabled)
  - Assign components to functions and failure modes: Used for FMECA (saving is disabled)

The following sections detail the steps needed to setup the MTBF & Reliability Toolkit in order to experience the functions detailed above.

2.2. Installation

1. In Altium Designer go to "Help" → "About" → "Extensions and Updates".
2. Add BQR's MTBF and Reliability Toolkit as shown in the figure below:
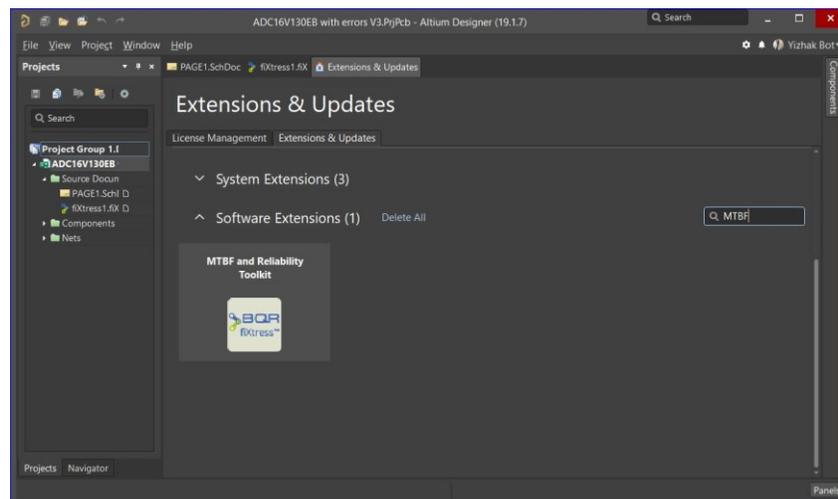
3. The extension is now installed in demo mode (limited functionality).

2.3. Component libraries

BQR software is based on component libraries that maximize reuse of data. The libraries are organized by part number. The component libraries include parameters that are specific for MTBF calculation, therefore these libraries are separate from the Altium components database. The following libraries are noted:

1. Toolkit component library for MTBF prediction according to MIL HDBK 217F2 Parts Count method (see section 2.5)

2. Toolkit component library for MTBF prediction according to Telcordia method (see section2.6)

3. Fully licensed fiXtress Pro includes many libraries for additional prediction methods and component derating (see section 5.1)

2.4. Toolkit Operation

2.4.1. Creating a fiXtress Document

4.   Open a PCB **project** (Altium Designer's *"*.PrjPcb"* file)

5.   Open one of its Schematic documents (double click a *"*.SchDoc"* in the *Projects* side panel)
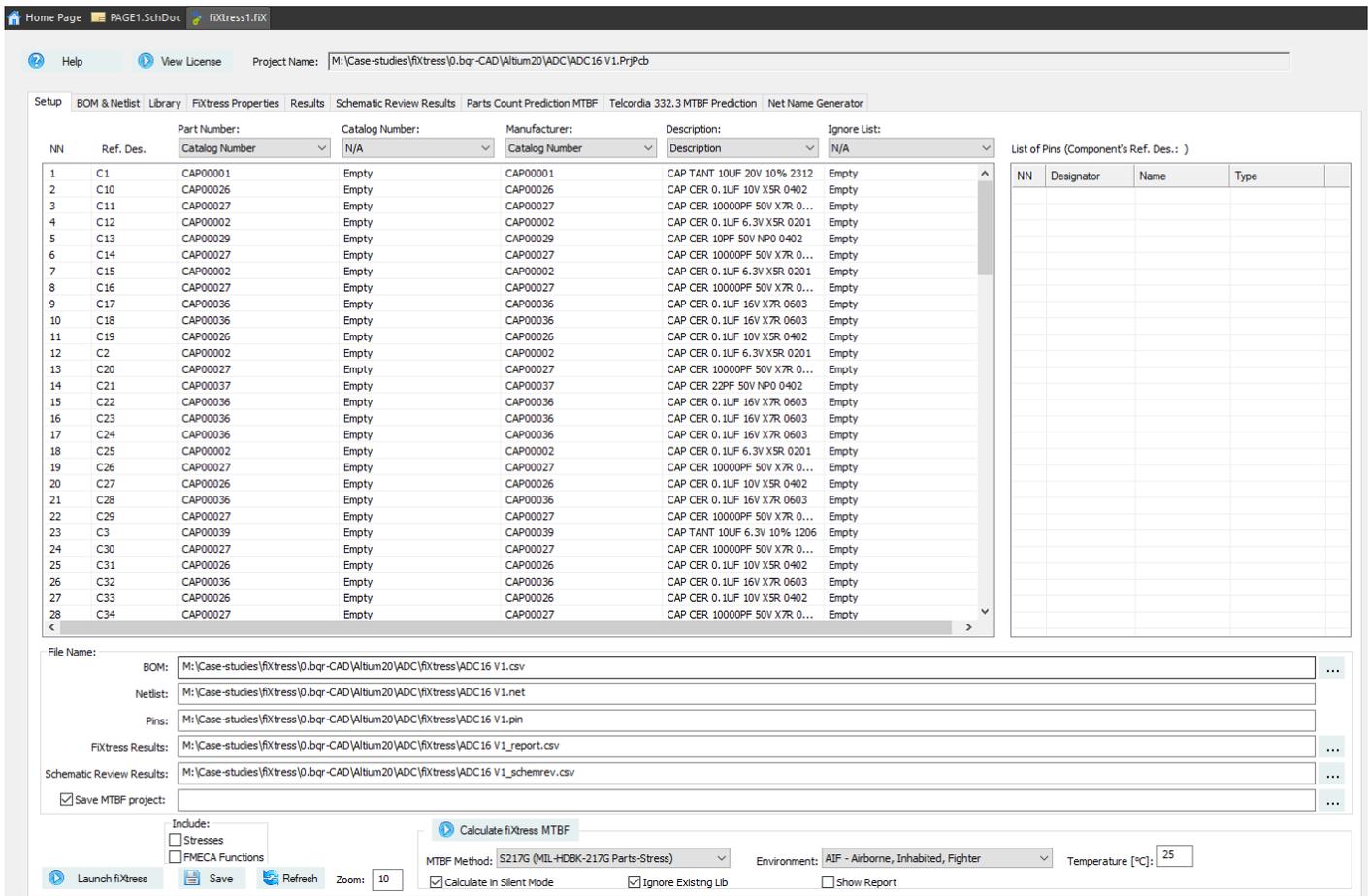
6.   In the top menu, choose *File → New → fiXtress*:
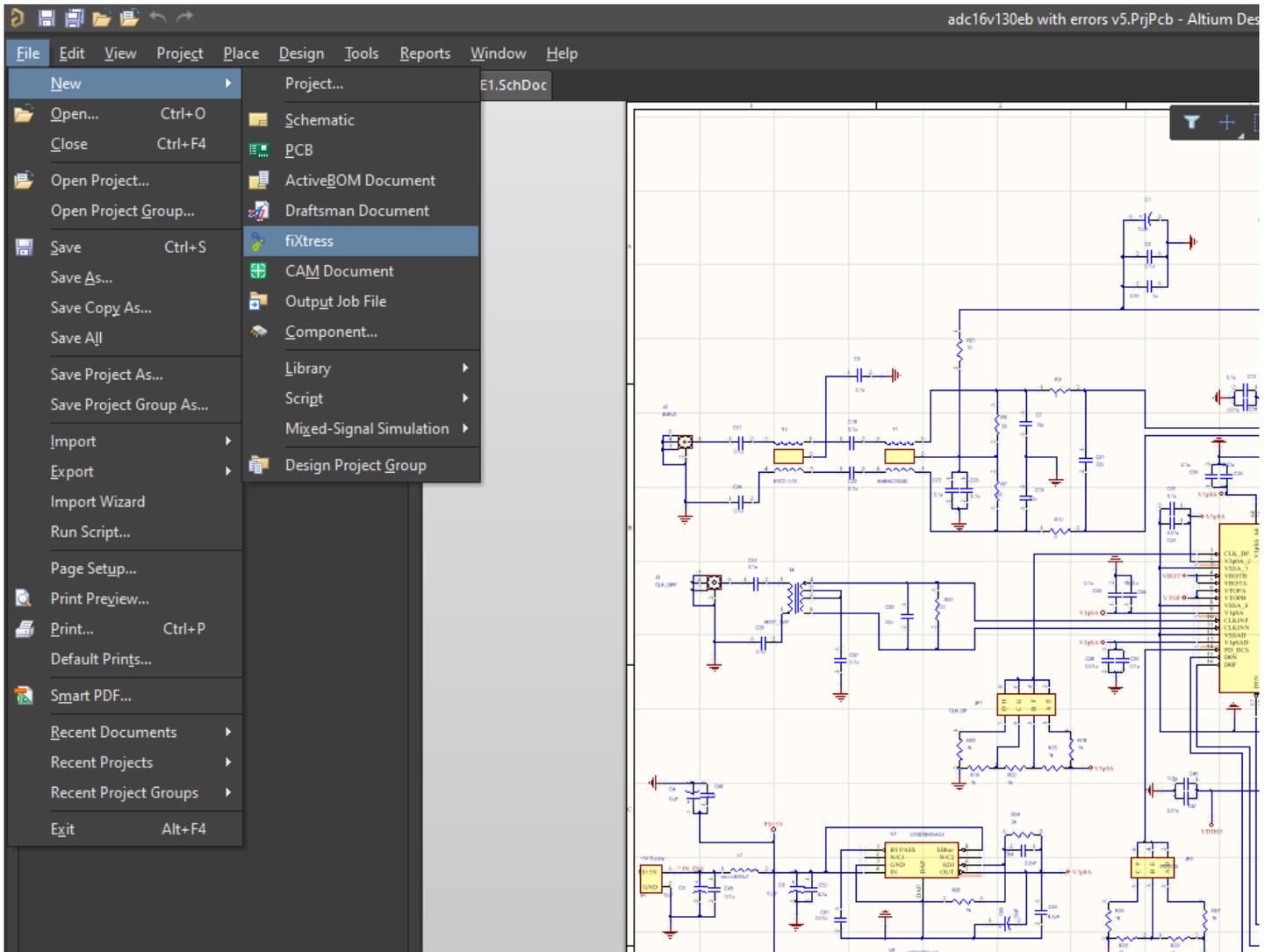
7. A new fiXtress document will be created.

   Note: Once created, you can re-open the project's fiXtress document by double clicking it in the *Projects* side panel:
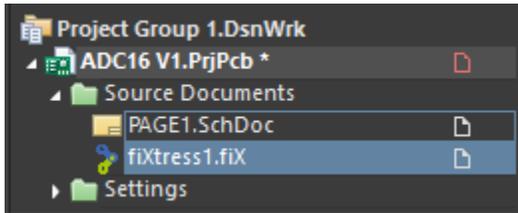
2.4.2. Project Setup

The toolkit compiles the design information and presents the user with the following:
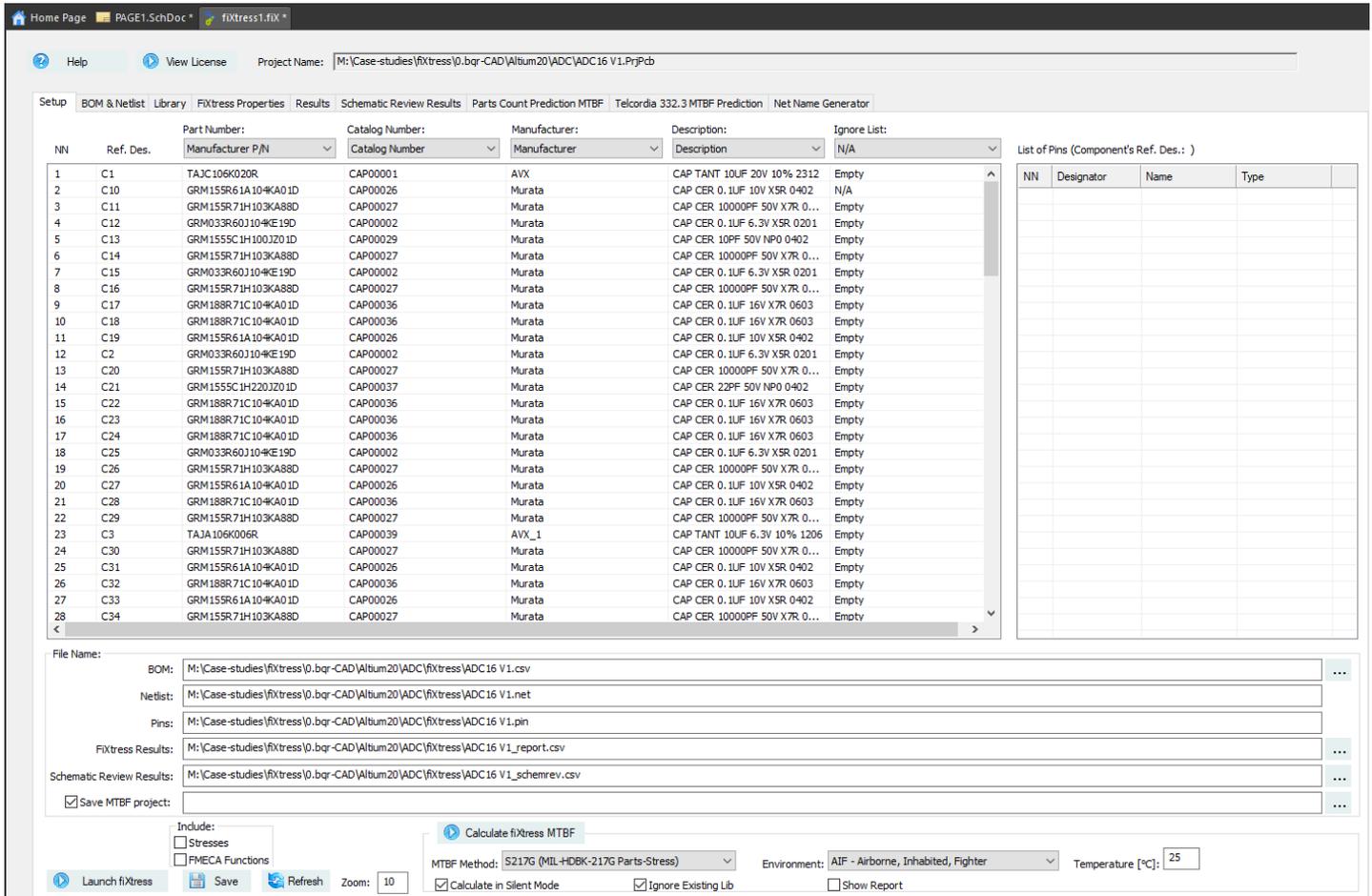

Note: In the demo mode some buttons are disabled, and they are colored in gray. In the licensed mode all buttons are enabled.

To set up the project correctly, follow the next steps:

Assign the appropriate information in each column according to the correct *Parameter* name in the Altium Designer project, by using the drop-down menu for each column:

- The **Part Number** column refers to the Manufacturer Part Number (MPN), a unique number that is issued by manufacturers to identify individual components.
- The **Catalog Number** column (optional) refers to your company's catalog number for the component. Several MPNs can be grouped under one Catalog Number as second source.
- The **Manufacturer** column (optional)refers to the manufacturer **name** of the component.
- The **Description** column refers to the description of the component.
- The **Ignore List** column (optional) should be set according to your project parameter which designates components not to be assembled/populated. For example, "N/A" or "DNP".

If all is set correctly, you will be presented with the following:

Save the document (by pressing Ctrl+S or by using Altium Designer's save button in the top left).

2.5. MIL-HDBK-217F2 Parts Count MTBF Prediction

The MTBF & Reliability Toolkit provides a convenient way to predict the MTBF of defense, aerospace and automotive equipment using the MIL-HDBK-217F Notice 2 "Parts Count" method.

Please note that the toolkit calculates the MTBF of one PCB only. If you need a system level MTBF analysis you will need the fiXtress Pro, see section 5.1.

Note that before using this feature, you must set up the project according to the instructions in the *Project Setup* section 2.4.2 above.

Assuming the project setup is complete, follow the next steps to perform the MTBF prediction:

1. Open the "Parts Count MTBF Prediction" tab.
   You will be presented with a screen similar to the following:

2. Fill in the missing cells according to the following table:

Property	Type	Description
Group	Drop-down	The component Group classification according to the MIL-HDBK-217F2 standard (1)
Type	Drop-down	The component type classification according to the Group. If the *Type* is left as "Default", the *Type* will be assigned according to the "Parts Count Default Settings" Table (which may also be modified by clicking the "Default Settings" button). (1)
Quality Level	Drop-down	The Quality Level of the component according to the MIL-HDBK-217F2 standard
GBT	Editable Cell	The approximate number of transistors, gates, or memory size according to the MIL-HDBK-217F2 standard
Production Year	Editable Cell	The component first year of production
Reliability Factor	Editable Cell	Component failure rate multiplication factor (based on user experience, default value should be 1).

Note 1: You can define a default value for this property using the "Default Settings" button below.

3. Use the following controls / fields to run the calculation and view the results:

Button/Field name	Type	Description
Calculate	Button	Calculates the MTBF according to the conditions entered at the bottom of the screen. It also saves the MTBF data properties in the components library file.
Default Settings	Button	Opens the Default Settings Window
Environment	Drop-down	Selects the MIL-HDBK-217F MTBF2 Environment
FR Measurement Units	Radio buttons	Sets the Failure Rates display units. FIT (Failures per billion hours) or FPMH (Failures per million hours)
Total Results	Result field	Total FR - the total failure rate of the design. Total MTBF (hours) - the total MTBF in hours. Total MTBF (years) - the total MTBF in years.

2.6. Telcordia SR-332.3 MTBF Prediction

The MTBF & Reliability Toolkit provides a convenient way to predict the MTBF of commercial equipment such as Telecom, medical and industrial equipment using the Telcordia SR-332.3 standard, without purchasing the fiXtress standalone software.
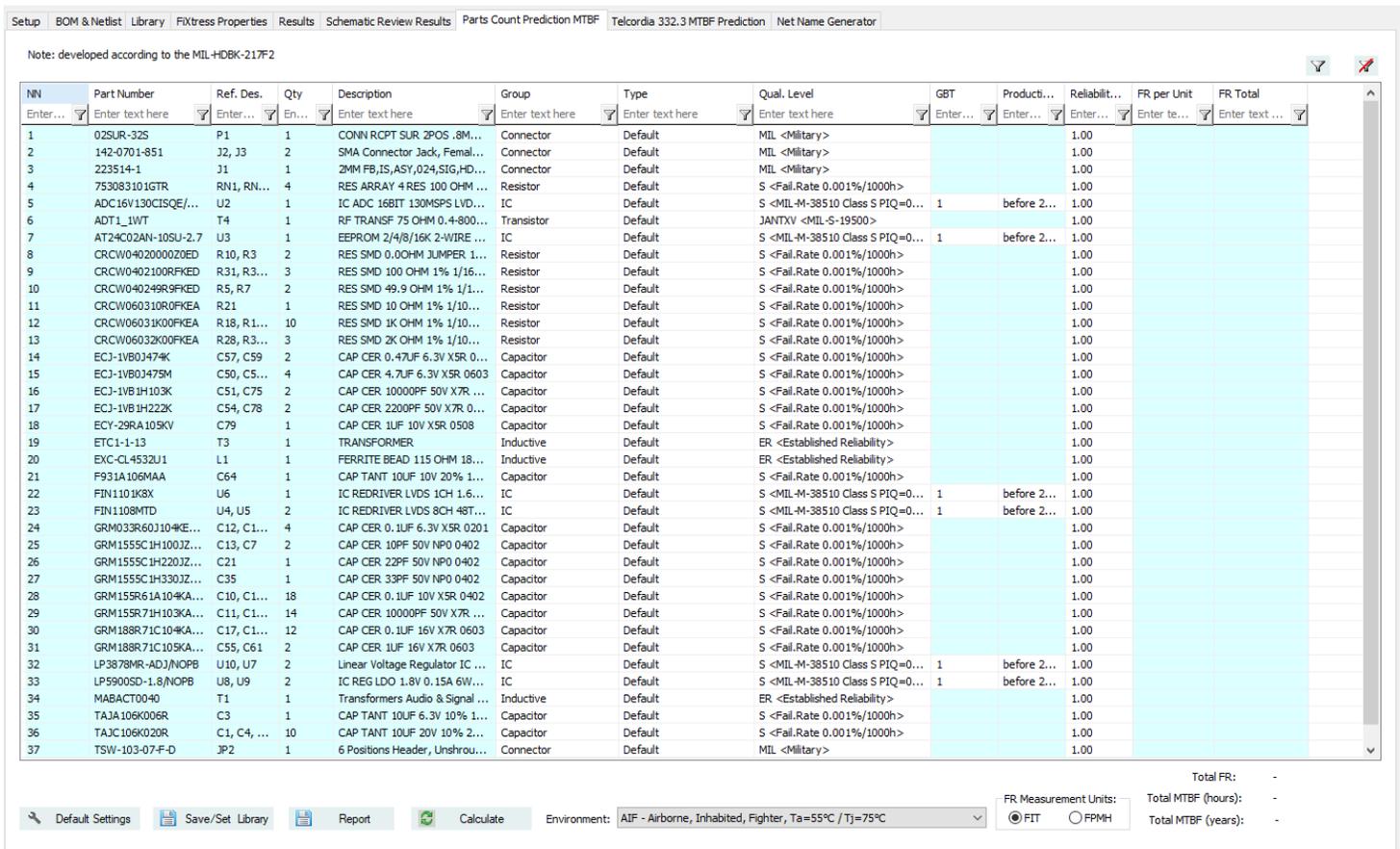
Please note that this toolkit calculates the MTBF of one PCB only, if you need a system level MTBF analysis you will need the fiXtress Pro, see section 5.1.

Note that before using this feature, you must set up the project according to the instructions in the *Project Setup* section 2.4.2 above.

Assuming the project setup is complete, follow the next steps to perform the MTBF prediction:

1. Open the "Telcordia 332.3 MTBF Prediction" tab.

   You will be presented with a screen similar to the following:

As you can see, it consists of three tables (Component List, Library Properties and Count Properties) and additional controls (buttons, statistics info, etc.).
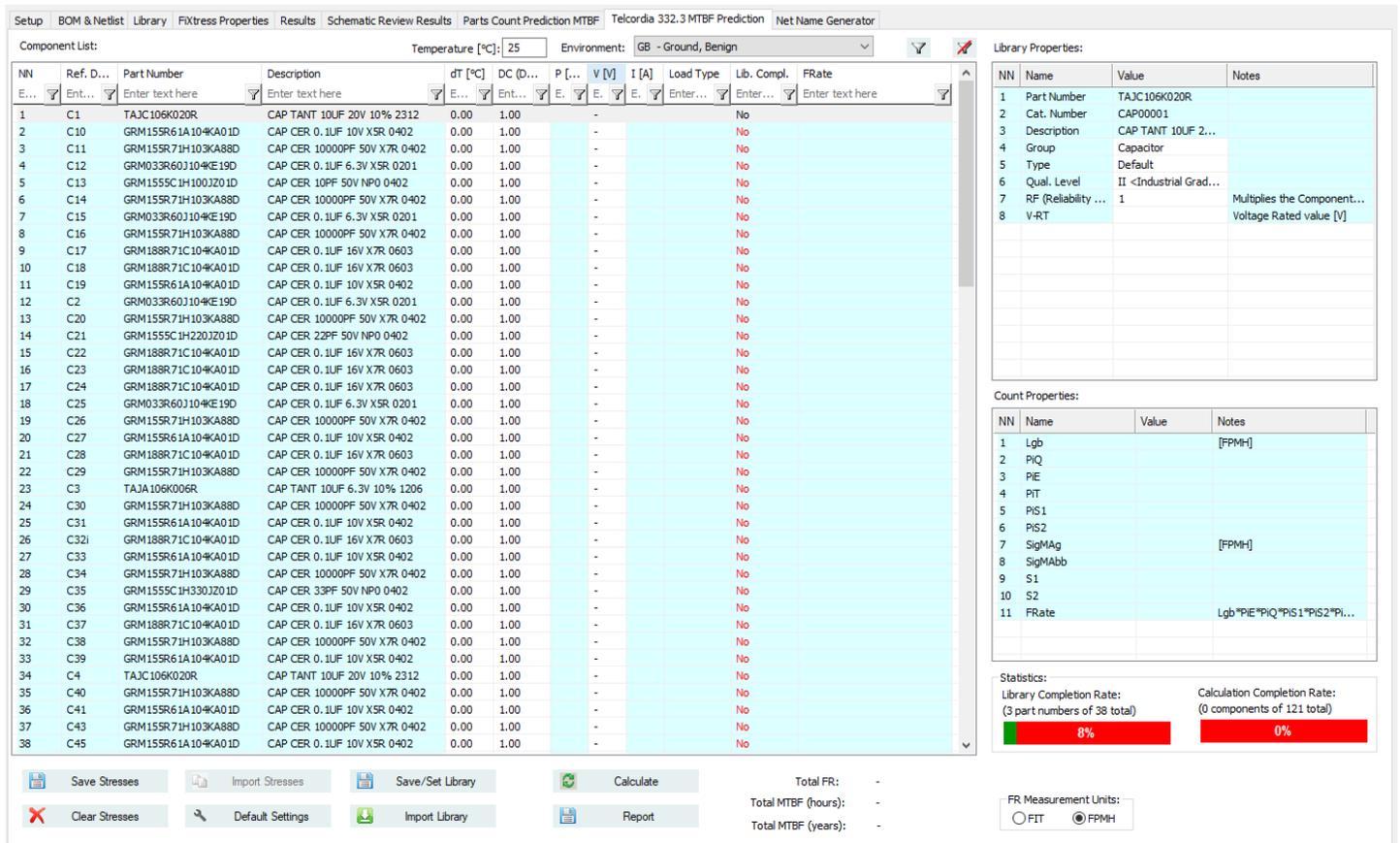
2. The Component List table includes component ID, parameters group (RefDes, Part Number, Description), group of editable parameters (dT, duty cycle, stresses, load type), library completion info and failure rate as a prediction result. All the Component List Table columns allow filtering according to a free text that may be entered in a column header cell.
Fill in the cells in the Component List table. The editable parameters are enabled based on component library group and type, and are described in the following table:

Property	Description
dT [C]	Difference of component temperature from board mean temperature
DC	Operational Duty Cycle. 1= operate all the time, 0.5=operate only 50% of the time and 50% of the time the component is not operated
P [W]	Actual Power Stress in Watts
V [V]	Actual Voltage Stress in Volts
I [A]	Actual Current Stress in Ampere
Load Type	Load Type (resistor, capacitor, inductive) for some component groups

3. The Library Properties table includes the component library properties (parameters) for the selected Part Number in the Component List. These are described in the following table:

Property	Description
Part Number	The component Manufacturer Part Number - non editable
Cat. Number	The component Internal Catalog Number - non editable
Description	The component description - non editable
Group	Drop-down, the component Group
Type	Drop-down, the component Type in the selected Group
Quality Level	Drop-down (Commercial, Industrial, etc.)
RF (Reliability Factor)	By default, "1". Enter a number < 1 for a component with increased reliability
P-RT, V-RT, I-RT	Rated Values of Properties, based on the component Group and Type

The *Count Properties* table lists the Pi factors included in the selected component Failure Rate prediction.

4. Use the following controls / fields to run the calculation and view the results:

Button/Field name	Type	Description
Temperature	Edit Window	The mean temperature of the board
Environment	Drop-down	Selects the Telcordia T332.3 MTBF Environment
Save Stresses	Button	Saves stress parameters in the CAD design database
Clear Stresses	Button	Clears stress parameters in the CAD design database
Default Settings	Button	Opens the Default Settings Window
Import Library	Button	Imports the MTBF data properties from an outside components library (stored in a file) and merges them with the current library.
Calculate	Button	Calculates the MTBF according to the conditions entered at the top of the page. It also saves the MTBF data properties in a components library. Note: some component library parameters do not have default values. The calculation will ignore the components for which the library parameters are incomplete. Library status for each component is presented in the "Lib. Compl." Column.
FR Measurement Units	Radio-buttons	Selects the Unit for the Failure Rate, FIT (Failures in Billion Hours) or FPMH (Failures in Million Hours)

Statistics Fields

Field name	Type	Description
Library Completion Rate	Non-editable	Total Board Components Library Completion Rate (with colors)
Calculation Completion Rate	Non-editable	Total Board Calculation Completion Rate (with colors)
Total Results	Result field	Total FR - the total Failure Rate Total MTBF (hours) - the total MTBF in hours Total MTBF (years) - the total MTBF in years

2.7. Component Stress Assignment

The MTBF & Reliability Toolkit provides a convenient way to assign component stresses in a semi-automatic manner which saves a lot of time and prevents user errors.

If you need a more automated tool which calculates the electrical stress of all components, you need the fiXtress stress simulator, see section 5.3.

Note that before using this feature, you must set up the project according to the instructions in the *Project Setup* section above.

2.7.1. Based on Net Names

Open the "FiXtress Properties tab". Next, click the "Rapid Stress Assignment" button on the bottom of the screen. A dialog will appear, similar to the following:
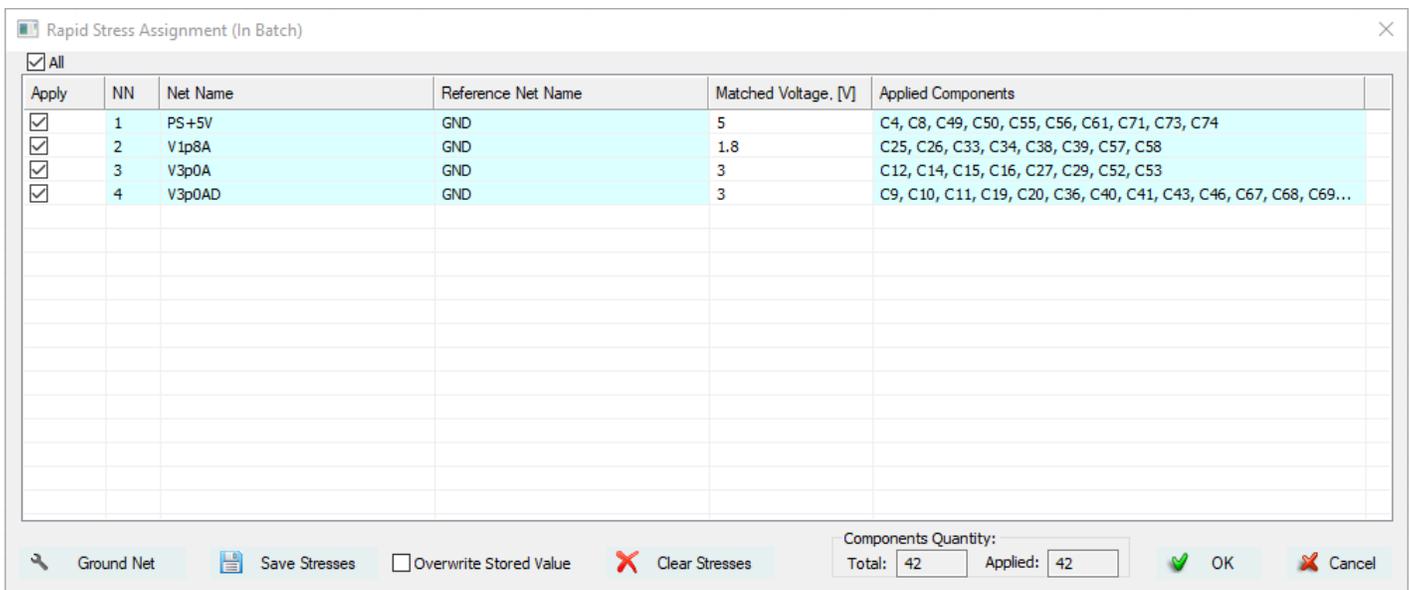
Apply	NN	Net Name	Reference Net Name	Matched Voltage, [V]	Applied Components
☑	1	PS+5V	GND	5	C4, C8, C49, C50, C55, C56, C61, C71, C73, C74
☑	2	V1p8A	GND	1.8	C25, C26, C33, C34, C38, C39, C57, C58
☑	3	V3p0A	GND	3	C12, C14, C15, C16, C27, C29, C52, C53
☑	4	V3p0AD	GND	3	C9, C10, C11, C19, C20, C36, C40, C41, C43, C46, C67, C68, C69...

Rapid Stress Assignment (In Batch) — ☑ All

Ground Net | Save Stresses | ☐ Overwrite Stored Value | ✖ Clear Stresses | Components Quantity: Total: 42 Applied: 42 | ✔ OK | ✖ Cancel

If no ground net is selected, click the "Ground Net" button and assign a ground net.

The dialog presents a list of nets that are connected to the ground net via simple components such as capacitors and resistors. The net voltage is parsed from the net name. You can update the matched voltage.
This is an easy way for quick assignment of many components based on the net names.

2.7.2. Based on connectivity

Select components for stress assignments in one of the following ways:

- Open the "FiXtress Properties tab". Next, select the component for stress assignment, and click the "Stress Editor" button.

- Mark components for stress assignment in the schema, right click and select "fiXtress Stress Editor"
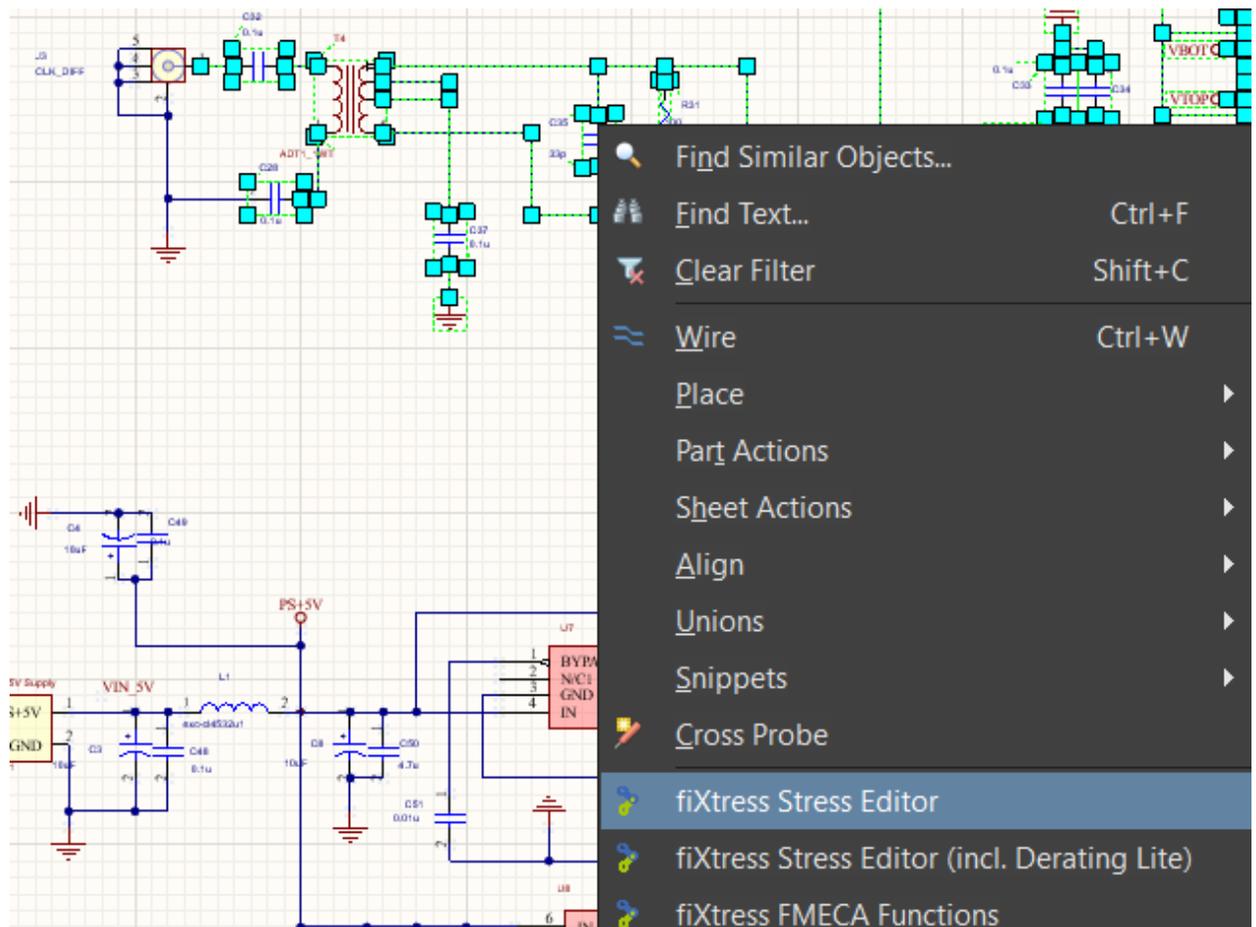
The following dialog will appear:
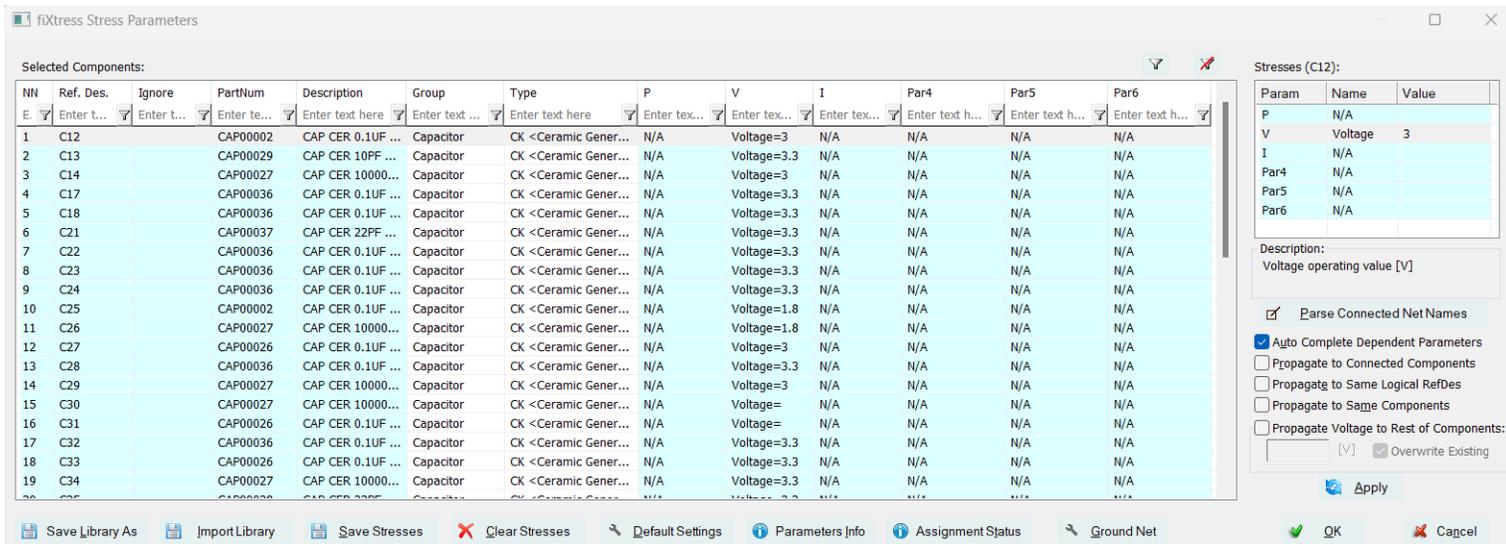
The dialog provides the following options:

- Define component group and type (default values are provided based on smart parsing of the component parameters, as well as on definitions of "Default Settings")
- Select a component and define its stresses in the top right table (stress types depend on the component type)
- Auto complete dependent parameters: example: If resistance and voltage are provided for a resistor, the current and power will be automatically completed.
- Propagate to connected components: example: if voltage is provided for a capacitor, the same voltage will be assigned to capacitors that are connected in parallel to it.
- Propagate to Same Logical RefDes: Stresses will be assigned to all physical components which are connected to the same logical component.
- Propagate to Same Components: example: use this option when many capacitors are selected and they should be assigned the same stress.
- Propagate voltage to rest of components: set a voltage value to all other selected components (usually used to assign worse case voltage to a group of components).

2.8. Functions and Failure Modes Assignment

The MTBF & Reliability Toolkit provides a convenient way to define component failure effects i.e. functions and function failure modes. This is the basis for FMECA and Testability (diagnostics) analysis.

Complete FMECA and Testability functionality is provided using the combination of the toolkit with BQR's FMECA Pro software, see section 5.2.

The toolkit supports two functions and failure mode libraries:

- Function Type library that can be used as the basis for multiple projects
- Project specific library with functions and failure modes which are tailor made for the project

Follow these steps to assign functions and failure modes to components:

1. Select the components on the schema for which you want to define functions and failure modes
2. Right click, and select "fiXtress FMECA Functions"
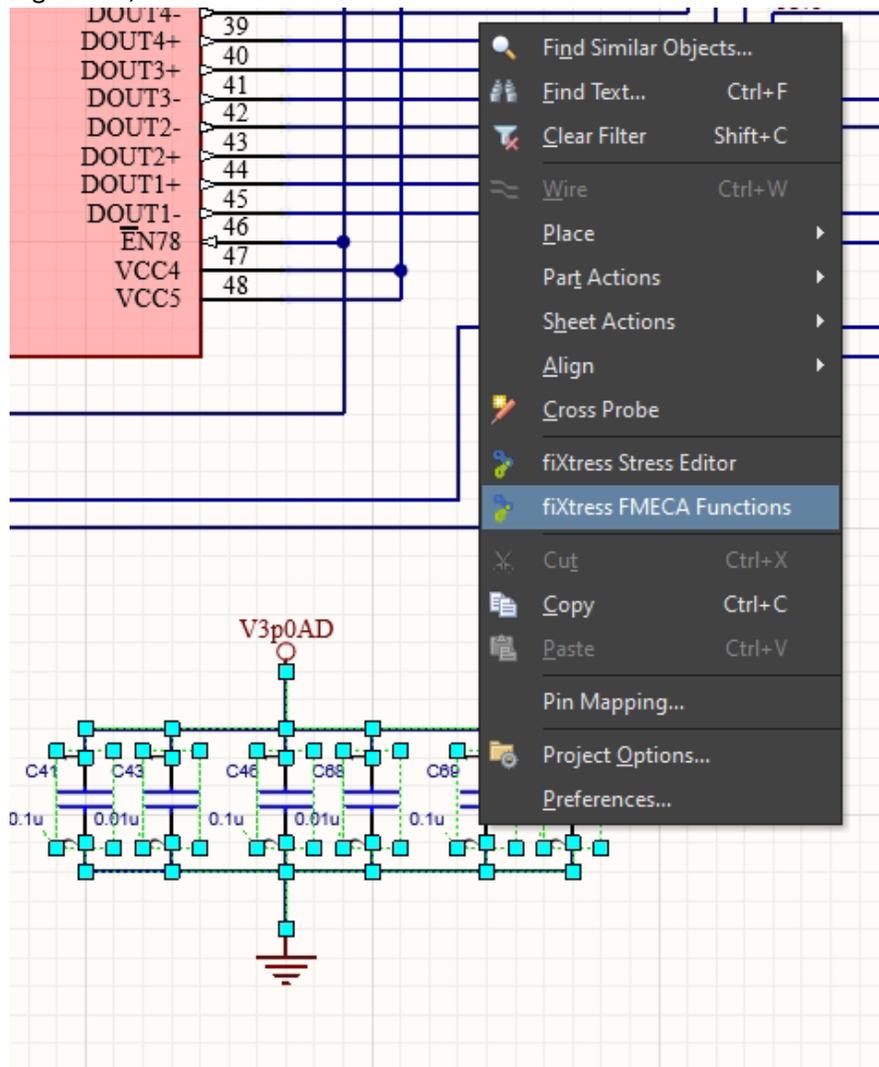
3. The following dialog will appear:
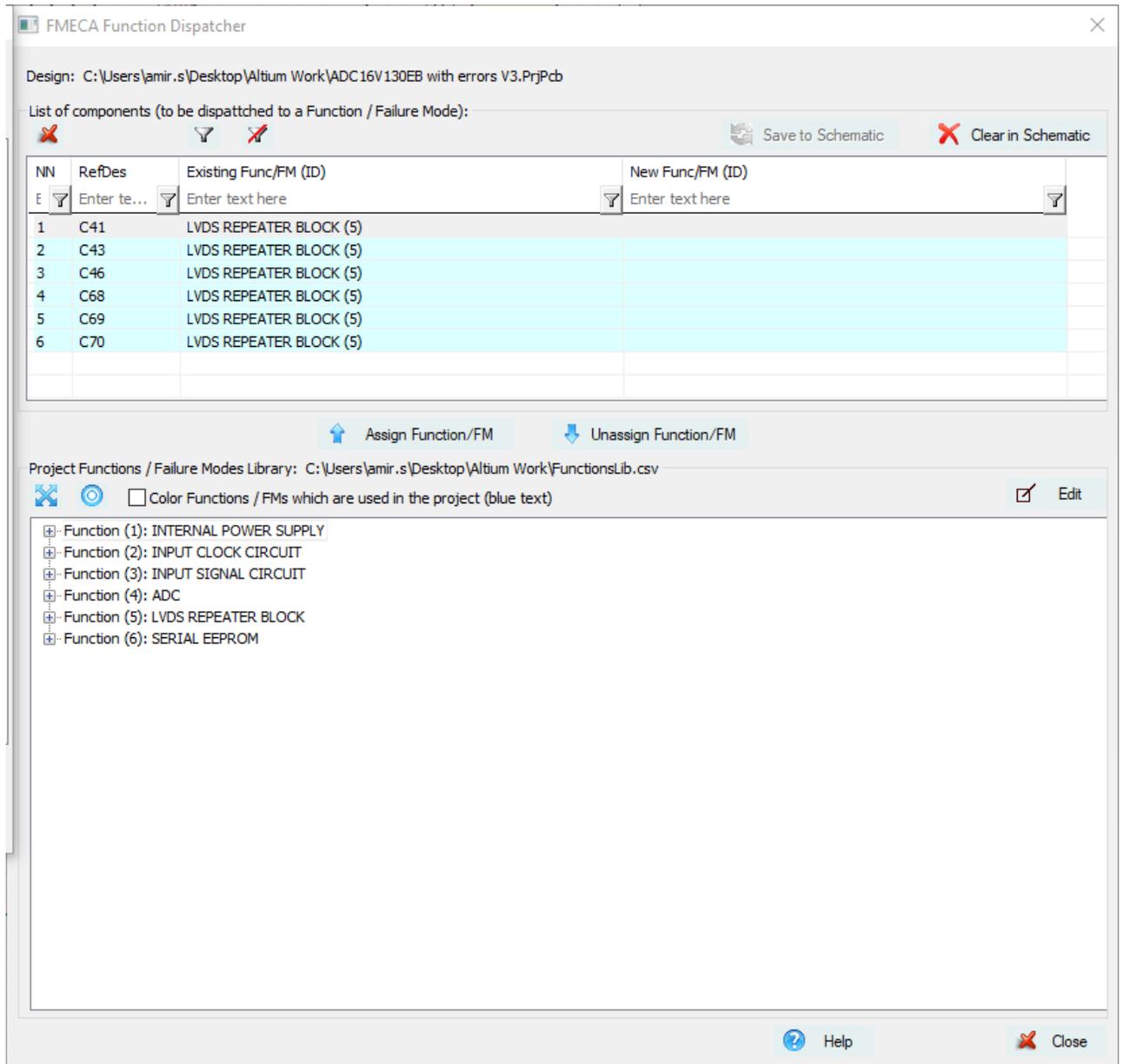
The top table presents the components for which functions and failure modes can be assigned.
The bottom tree presents the project functions and failure modes library.
Click "Edit" to edit the project library:

The library editor allows you to add functions manually or select from the "Function Type Library". Click Apply to present the updated project library in the "FMECA Function Dispatcher" dialog.

4. Select components in the top table, then select a function or failure mode from the project library (bottom tree) and click "Assign Function/FM".

Additional options:

*   Checkbox "Color Functions / FMs" will color functions and failure modes that already have components assigned to them in blue. Double click on a function / FM to see the list of assigned components.
*   Save or select a functions library file

2.9. Component Derating Lite

This option allows you to conduct a quick derating analysis to identify over-stressed components. Derating Lite regards the main Power, Voltage and/or Current stresses of each component type (full derating is possible using fiXtress-Pro).

The steps are as follows:

Complete the project setup (see section 2.4.2)

1. Select a group of components you wish to analyze
2. Right click and select: fiXtress Stress Editor (incl. Derating Lite)
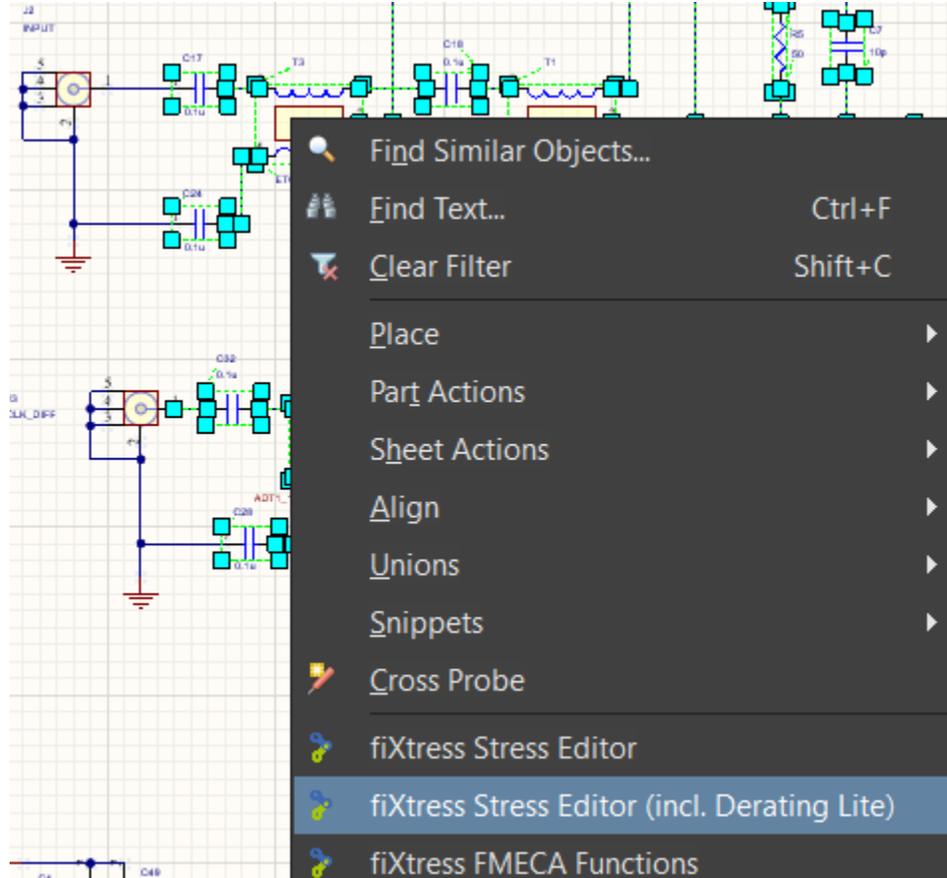
3. Define component library parameters
   a. Click "Library Editor"
   b. Option: click "Auto Fill All Missing Values" – this
   c. For each part number
      i. Define Group and Type
      ii. Set rating values in the top right table
      iii. Click Apply
   d. Click OK to save library updates
4. Assign component stresses similar to section 2.7
5. Select derating ratio and click Calculate

6. View results (over stresses will appear in red)

NN	Ref. Des.	Ignore	PartNum	Group	Type	P	V	I	Par4	Par5	Par6	P [%]	V [%]	I [%]
E.	Ente...	Ente...	Enter te...	Enter tex...	Enter tex...	Enter tex...	Enter tex...	Enter tex...	Enter tex...	Enter tex...	Enter tex...	Enter ...	Enter ...	Enter ...
1	C12		GRM033R6...	Capacitor	CK <Cerami...	N/A	Voltage=3	N/A	N/A	N/A	N/A	N/A	95.24	N/A
2	C13		GRM1555C...	Capacitor	CKR <Cera...	N/A	Voltage=3.3	N/A	N/A	N/A	N/A	N/A	13.20	N/A
3	C14		GRM155R7...	Capacitor	CKR <Cera...	N/A	Voltage=3	N/A	N/A	N/A	N/A	N/A	12.00	N/A
4	C17		GRM188R7...	Capacitor	CKR <Cera...	N/A	Voltage=3.3	N/A	N/A	N/A	N/A	N/A	41.25	N/A
5	C18		GRM188R7...	Capacitor	CKR <Cera...	N/A	Voltage=3.3	N/A	N/A	N/A	N/A	N/A	41.25	N/A
6	C21		GRM1555C...	Capacitor	CKR <Cera...	N/A	Voltage=3.3	N/A	N/A	N/A	N/A	N/A	13.20	N/A
7	C22		GRM188R7...	Capacitor	CKR <Cera...	N/A	Voltage=3.3	N/A	N/A	N/A	N/A	N/A	41.25	N/A
8	C23		GRM188R7...	Capacitor	CKR <Cera...	N/A	Voltage=3.3	N/A	N/A	N/A	N/A	N/A	41.25	N/A
9	C24		GRM188R7...	Capacitor	CKR <Cera...	N/A	Voltage=3.3	N/A	N/A	N/A	N/A	N/A	41.25	N/A
10	C25		GRM033R6...	Capacitor	CK <Cerami...	N/A	Voltage=5	N/A	N/A	N/A	N/A	N/A	158.73	N/A

Operational Stresses (C39):

Param	Name	Value
P	N/A	
V	Voltage	3.3
I	N/A	
Par4	N/A	
Par5	N/A	
Par6	N/A	

Description:
Voltage operating value [V]

Parse Connected Net Names

7. Fix over stressed components

3. Purchasing a License

1. With the toolkit open, click the "*Buy License*" button in the top left of the fiXtress document. You will be presented with the following dialog:

2. Click the buy button at the bottom of the dialog: A buy form will open in BQR's website. Fill the form, and a BQR representative will get back to you in order to complete the purchase.

4. Activating a License (after purchase)

1. With the toolkit open, click the "Buy License" button to re-open the License dialog.

2. In the License dialog, click the "Request" button.

3. This will launch a dialog with a mail template:

Mail Template   ✕

Copy the following text, complete it and send by email to info@bqr.com:

Hello BQR,

I have purchased the Altium Plug-In license and would like to activate it.
This is my computer information:
HostID: .
Ethernet:
1c697a63b514,
98af65e3dc20.

Invoice ID:_____.

Please send me the license file.

Best Regards

                                                                    ✗ Close
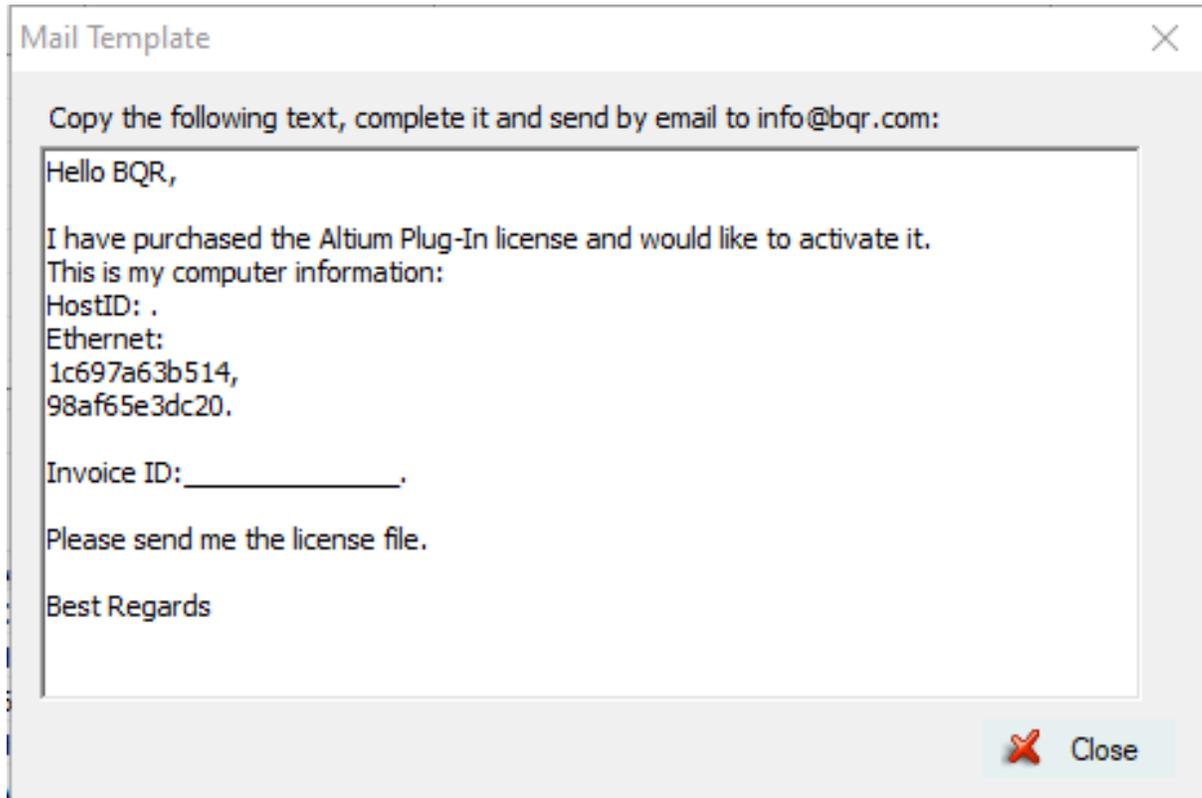
4. Copy the text from the dialog, fill in your Invoice ID, and send it over to info@bqr.com.

5. You will get a reply with a license file attached - save the file on your computer.

6. Re-open the License dialog by clicking the '*Buy License*' button.

7. In the License dialog, click the "*Activate*" button.

8. Browse to the location of the license file and open it.

9. Click 'OK' to close the dialog.

10. Restart the toolkit. You can verify that the features you purchased have become unlocked:

	License					×
License File:	C:\Program Files (x86)\BQR\Full Suite\LicenBQR.dat					...

HostID:

Ethernet:
1c697a63b514

98af65e3dc20

License Features:

NN	Feature Name	Feature Description	Availability	Expiration Date	Max Users
1	Altium_Interface	fiXtress: Interface to Altium	Yes	22-dec-2026	1
2	EDA_PartsCount	EDA program: Parts Count Prediction MTBF	Yes	22-dec-2026	1
3	EDA_T332	EDA program: Telcordia TR-332 Version 3 Pr...	Yes	22-dec-2026	1
4	EDA_NetNameGenerator	EDA program: Net Name Generator	Yes	22-dec-2026	1
5	EDA_SDTA	EDA program: Stress Derating	Yes	22-dec-2026	1
6	EDA_BackAnnotation	EDA program: Back Annotation	Yes	22-dec-2026	1
7	EDA_FMECAFunctions	EDA program: FMECA Functions Dispatch	Yes	22-dec-2026	1

License:

Buy   Request   Activate   OK   Cancel

5. BQR Software Preview

This section briefly presents BQR software modules that integrate with the MTBF & Reliability Toolkit.

5.1. fiXtress Pro

fiXtress Pro provides component derating and MTBF prediction for multi-board systems.

Toolbar: Project | External Data | Edit / View | Libraries | MTBF | SDTA | Analysis | Reports | ILS | CDB | Window | Help

- Conditions | Import | Stress Data Exchange | Components | MTBF Full Tree | Expand / Collapse | <"> Columns
- Global Data | Export | Edit/Import Pin Stresses | Check Library | Tree Field Chooser | Refresh Current Tree | Find
- Tables Editor | | Data Exchange | Parsing Rules | Block / Comp. Properties | Show Properties Panel
- Setup | BOM | Stress and Thermal | Library | Tree View & Parameters

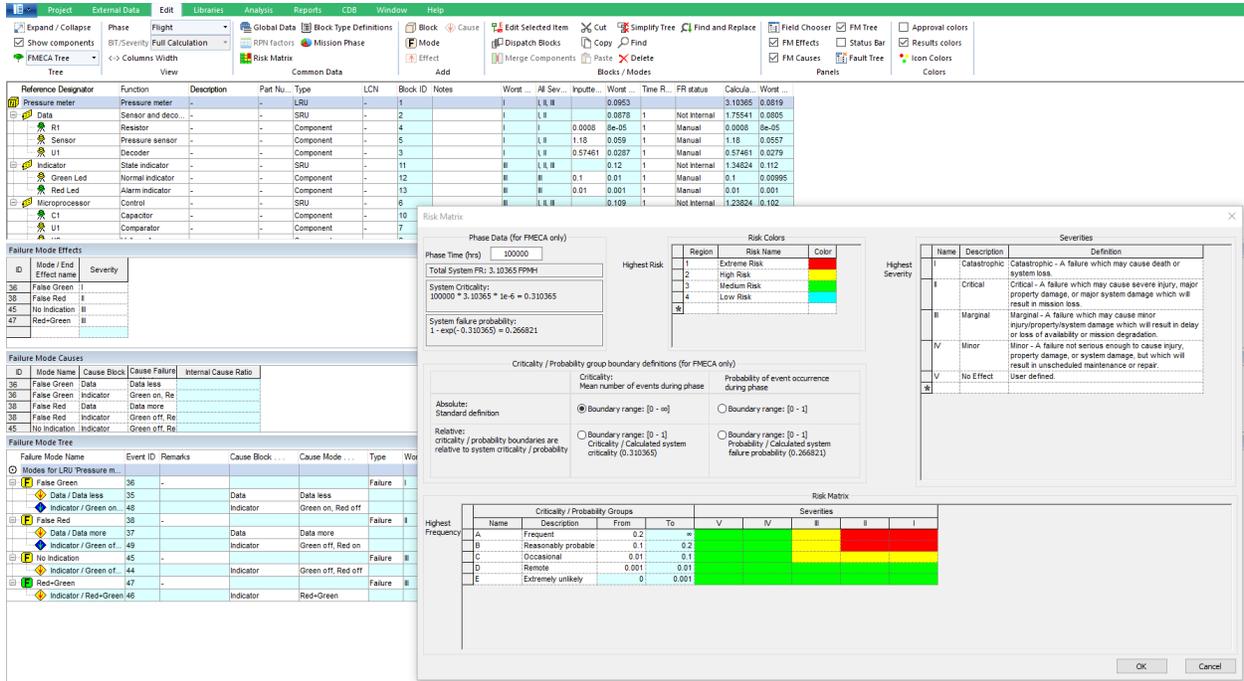| RefDes	BN/CF	Description	Part Number	Catalog Nu...	dT[°C]	T[°C]	BRF	DC	Qty	Env	Pred Method	MTBF(Hrs)	FR(1) ▽
System	PRSMT	Presure Meter	PRSMT	PRSMT		40.0	1.00	1.00	1	GB	S217F2	365,613	2.735135
A1	DATA	DATA-PCB	DATA	DATA	20.0	60.0	1.00	1.00	1	GB	<AsParent>	703,073	1.422327 52%
Q11	Transistor	NMOS_100...	2N6796	-	0.0	60.0		1.00	1			<AsParent>		0.779448 28%
U1	IC	MCSO-OP	4192-08	-	0.0	60.0		1.00	1			<AsParent>		0.337327 12%
X11	Lamp	NEON	456	-	0.0	60.0		1.00	1			<AsParent>		0.200000 7%
J11	Connector	LRE_SOCK...	S21-A1A1	-	0.0	60.0		1.00	1			<AsParent>		0.070960 3%
PRS11	Crystal	PIEZOELE...	PXE	4322_020_...	0.0	60.0		1.00	1			<AsParent>		0.021063 1%
PCB1	PCB	-	PCB-DATA	-	0.0	60.0		1.00	1			<AsParent>		0.009410
SMT1	PCB	-	DV4192-08	-	0.0	60.0		1.00	1			<AsParent>		0.002540
R11	Resistor	RES_5.62_...	RER60F5R...	-	0.0	60.0		1.00	1			<AsParent>		0.001579
A2	MICRO	MICRO-PCB	MICRO	MICRO	10.0	50.0	1.00	1.00	1	<AsParent>	<AsParent>	991,776	1.008292 37%
U21	IC	8BITMP	MC6809E	-	0.0	50.0		1.00	1			<AsParent>		0.796021 29%
U23	IC	PRECIS_V...	MC1466L	MOTOROLA	0.0	50.0		1.00	1			<AsParent>		0.125472 5%
U22	IC	V_REG	LM117	MOTOROLA	0.0	50.0		1.00	1			<AsParent>		0.069709 3%
C21	Capacitor	CAP0.1U_5...	M39014/01...	-	0.0	50.0		1.00	1			<AsParent>		0.009582
PCB1	PCB	-	PCB-MICRO	-	0.0	50.0		1.00	1			<AsParent>		0.004613
Q21	Diode	SCHOTTK...	20FQ045/D...	-	0.0	50.0		1.00	1			<AsParent>		0.002837
R21	Resistor	RES_1K_1...	RWR81S1...	-	0.0	50.0		1.00	1			<AsParent>		0.000057
A3stress	IND	INDICATIO...	IND	IND	0.0	40.0	1.00	1.00	1	<AsParent>	<AsParent>	3,283,906	0.304515 11%
RL31	Relay	LRE_RELA...	M520-U5-NL	-	0.0	40.0		1.00	1			<AsParent>		0.164488 6%
U33	IC	TRISTATE...	54HC373J	-	0.0	40.0		1.00	1			<AsParent>		0.060690 2%
U31	IC	A/DCONVE...	AD573	ANALOG_...	7.0	47.0		1.00	1			<AsParent>		0.031945 1%
D31Z	Diode	TH-DO204...	1N4678	-	0.0	40.0		1.00	1			<AsParent>		0.021690 1%
U32	IC	SO_14	74HC02	-	0.0	40.0		1.00	1			<AsParent>		0.010068
L31	Inductive	TRAFO	TT789	-	0.0	40.0		1.00	1			<AsParent>		0.006631
PCB1	PCB	-	PCB-PTH_I...	-	0.0	40.0		1.00	1			<AsParent>		0.005449
LD31	OptoDevice	LED_GREEN	NSL5250	NATION_S...	0.0	40.0		1.00	1			<AsParent>		0.001984
D31	Diode	SCHOTTK...	20FQ0668	-	0.0	40.0		1.00	1			<AsParent>		0.000535
Q31	Transistor	TRANS_NPN	JAN2N2222A	NPN_TH_...	0.0	40.0		1.00	1			<AsParent>		0.000275
C32	Capacitor	CAP F CHI...	ATC111TF...	-	3.0	43.0		1.00	1			<AsParent>		0.000263
C31	Capacitor	PHILIPS_C...	T352E106...	-	2.0	42.0		1.00	1			<AsParent>		0.000213
R32	Resistor	-	M55342K0...	-	0.0	40.0		1.00	1			<AsParent>		0.000180
R34	Resistor	Chip47ohm-...	M55342K0...	-	0.0	40.0		1.00	1			<AsParent>		0.000073
R33	Resistor	RES_1K_1...	RWR81S1...	-	0.0	40.0		1.00	1			<AsParent>		0.000020
R31	Resistor	CHIP-2.74K...	D55342E07...	-	0.0	40.0		1.00	1			<AsParent>		0.000011

5.2. FMECA Pro

FMECA Pro is a professional tool for FMECA and Testability (diagnostics) analyses, starting from

component level, through function level, and up to system level.

5.3. fiXtress Stress Simulator

BQR's fiXtress simulator is a patent-based software for detailed stress analysis and schematic review. The software detects hard to find design errors, saving the engineers a lot of time, reducing design cycles and time to market.

	Project	External Data	Edit / View	Libraries	MTBF	SDTA	Analysis	Reports	ILS	CDB	Window	Help

Conditions	Import	Stress Data Exchange	Components	MTBF Full Tree	Expand / Collapse	Columns Width	FIDES 2009 Profiles
Global Data	Export	Edit/Import Pin Stresses	Check Library	Tree Field Chooser	Refresh Current Tree	Find	S217Plus Profiles
Tables Editor		Data Exchange	Parsing Rules	Block / Comp. Properties	Show Properties Panel		IEC62380 Profiles
Setup	BOM	Stress and Thermal	Library		Tree View & Parameters		Predictions Profiles

RefDes	BN/CF	Description	Part Number	Catalog Nu...	dT[°C]	T[°C]	BRF	DC	Qty	Env	Pred Method	P-stress	V-stress	I-stress	MTBF(Hrs)	FR(1)
System	PRSMT	Presure Meter	PRSMT	PRSMT		40.0	1.00	1.00	1	GB	S217F2				365,613	2.735135 52%
A1	DATA	DATA-PCB	DATA	DATA	20.0	60.0	1.00	1.00	1	GB	<AsParent>				703,073	1.422327 52%
Q11	Transistor	NMOS_100...	2N6796	-	0.0	60.0		1.00	1		<AsParent>	1	20	3		0.779448 28%
U1	IC	MCSO-OP	4192-08	-	0.0	60.0		1.00	1		<AsParent>	-	-	-		0.337327 12%
X11	Lamp	NEON	456	-	0.0	60.0		1.00	1		<AsParent>	-	11.5	-		0.200000 7%
J11	Connector	LRE_SOCK...	S21-A1A1	-	0.0	60.0		1.00	1		<AsParent>	-	100	0.1		0.070960 3%
PRS11	Crystal	PIEZOELE...	PXE	4322_020_...	0.0	60.0		1.00	1		<AsParent>	-	-	-		0.021063 1%
PCB1	PCB	-	PCB-DATA	-	0.0	60.0		1.00	1		<AsParent>	-	-	-		0.009410
SMT1	PCB	-	DV4192-08	-	0.0	60.0		1.00	1		<AsParent>	0.5	-	-		0.002540
R11	Resistor	RES_5.62_...	RER60F5R...	-	0.0	60.0		1.00	1		<AsParent>	4	2	-		0.001579
A2	MICRO	MICRO-PCB	MICRO	MICRO	10.0	50.0	1.00	1.00	1	<AsParent>	<AsParent>				991,776	1.008292 37%
U21	IC	8BITMP	MC6809E	-	0.0	50.0		1.00	1		<AsParent>	0.2	5	0.005		0.796021 29%
U23	IC	PRECIS_V...	MC1466L	MOTOROLA	0.0	50.0		1.00	1		<AsParent>	0.04	5	0.1		0.125472 5%
U22	IC	V_REG	LM117	MOTOROLA	0.0	50.0		1.00	1		<AsParent>	0.5	15	0.5		0.069709 3%
C21	Capacitor	CAP0.1U_5...	M39014/01...	-	0.0	50.0		1.00	1		<AsParent>	-	40	-		0.009582
PCB1	PCB	-	PCB-MICRO	-	0.0	50.0		1.00	1		<AsParent>	-	-	-		0.004613
Q21	Diode	SCHOTTK...	20FQ045/D...	-	0.0	50.0		1.00	1		<AsParent>	1	15	6		0.002837
R21	Resistor	RES_1K_1...	RWR81S1...	-	0.0	50.0		1.00	1		<AsParent>	0.3	20	-		0.000057
A3stress	IND	INDICATIO...	IND	IND	0.0	40.0	1.00	1.00	1	<AsParent>	<AsParent>				3,283,906	0.304515 11%
RL31	Relay	LRE_RELA...	M520-U5-NL	-	0.0	40.0		1.00	1		<AsParent>	---	0.0575517	0.00905464		0.164488 6%
U33	IC	TRISTATE ...	54HC373J	-	0.0	40.0		1.00	1		<AsParent>	1.5e-09	5	---		0.060690 2%
U31	IC	A/DCONVE...	AD573	ANALOG_...	7.0	47.0		1.00	1		<AsParent>	---	---	---		0.031945 1%
D31Z	Diode	TH-DO204...	1N4678	-	0.0	40.0		1.00	1		<AsParent>	0.0800062	---	---		0.021690 1%
U32	IC	SO_14	74HC02	-	0.0	40.0		1.00	1		<AsParent>	5e-10	5	8.33181e-06		0.010068
L31	Inductive	TRAFO	TT789	-	0.0	40.0		1.00	1		<AsParent>	---	---	0.0197282		0.006631
PCB1	PCB	-	PCB-PTH_I...	-	0.0	40.0		1.00	1		<AsParent>	---	---	---		0.005449
LD31	OptoDevice	LED_GREEN	NSL5250	NATION_S...	0.0	40.0		1.00	1		<AsParent>	0.000409932	0.0452732	0.00905464		0.001984
D31	Diode	SCHOTTK...	20FQ0668	-	0.0	40.0		1.00	1		<AsParent>	0.0115994	8.34245	0.00139041		0.000535
Q31	Transistor	TRANS_NPN	JAN2N2222A	NPN_TH_...	0.0	40.0		1.00	1		<AsParent>	9.80014e-05	0.00542222	0.0180741		0.000275
C32	Capacitor	CAP F CHI...	ATC111TF...	-	3.0	43.0		1.00	1		<AsParent>	---	---	---		0.000263
C31	Capacitor	PHILIPS_C...	T352E106...	-	2.0	42.0		1.00	1		<AsParent>	---	10.0272	1.00272e-06		0.000213
R32	Resistor	-	M55342K0...	-	0.0	40.0		1.00	1		<AsParent>	0.163336	9.03703	0.0180741		0.000180
R34	Resistor	Chip47ohm-...	M55342K0...	-	0.0	40.0		1.00	1		<AsParent>	0.0182907	0.927179	0.0197272		0.000073
R33	Resistor	RES_1K_1...	RWR81S1...	-	0.0	40.0		1.00	1		<AsParent>	0.0819864	9.05464	0.00905464		0.000020
R31	Resistor	CHIP-2.74K...	D55342E07...	-	0.0	40.0		1.00	1		<AsParent>	0.00021255	0.757552	0.000280575		0.000011

Please visit our website:

www.bqr.com

and let us know which software tools / professional services you need