

MTBF & Reliability Toolkit for Altium Designer Quick Start Guide

Rev 1.2
April 2024



Table of Contents

MTBF & Reliability Toolkit for Altium	3
1.Introduction	3
1.1. BQR MTBF calculation solutions	3
1.2.MTBF & Reliability Toolkit.....	4
2.Demo Mode (no license)	5
2.1.Goal.....	5
2.2.Installation.....	5
2.3.Component libraries	6
2.4.Toolkit Operation	7
2.4.1.Creating a fiXtress Document.....	7
2.4.2.Project Setup	8
2.5.MIL-HDBK-217F2 Parts Count MTBF Prediction	11
2.6.Telcordia SR-332.3 MTBF Prediction	13
2.7.Component Stress Assignment	16
2.7.1.Based on Net Names	16
2.7.2.Based on connectivity.....	17
2.8.Functions and Failure Modes Assignment	19
3.Purchasing a License	24
4.Activating a License (after purchase)	25
5.BQR Software Preview	27
5.1.fiXtress Pro	27
5.2.FMECA Pro.....	28
5.3.fiXtress Stress Simulator	29

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

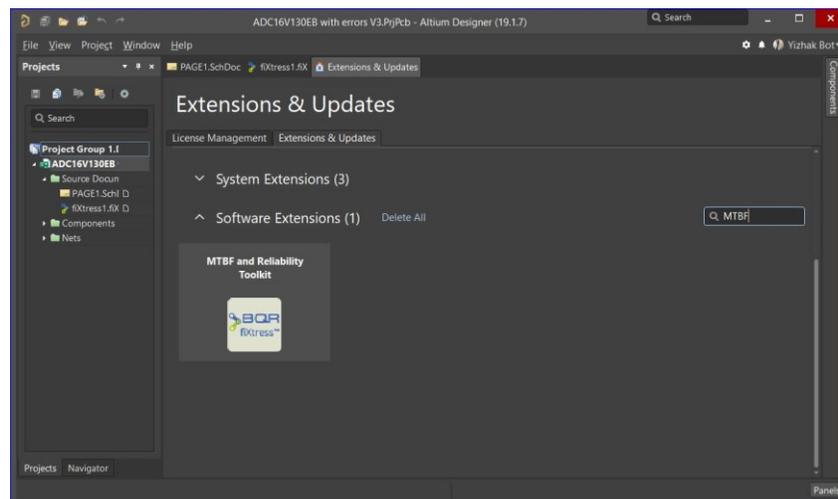
The goal of the demo mode (no license) is to allow the user to experience the MTBF & Reliability Toolkit by providing the following functionality:

- “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.

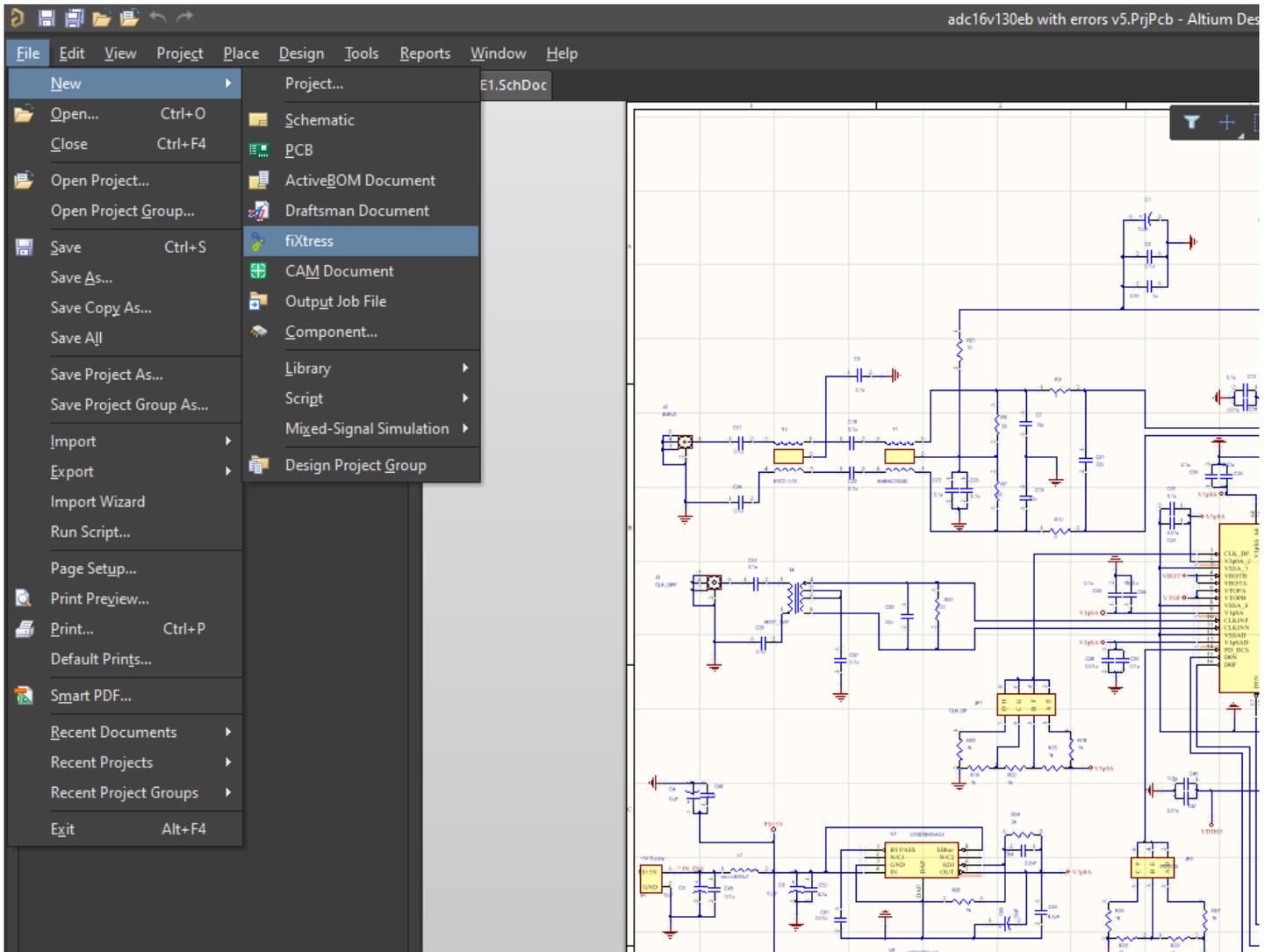
The following libraries are noted:

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 section 2.6)
3. Fully licensed fiXtress Pro includes many libraries for additional prediction methods and component derating (see section 5.1)

2.4. Toolkit Operation

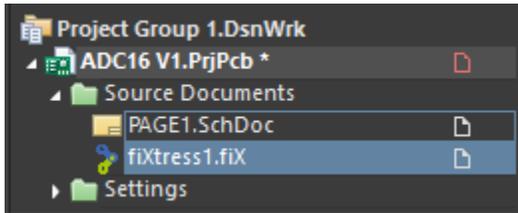
2.4.1. Creating a fiXtress Document

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*:



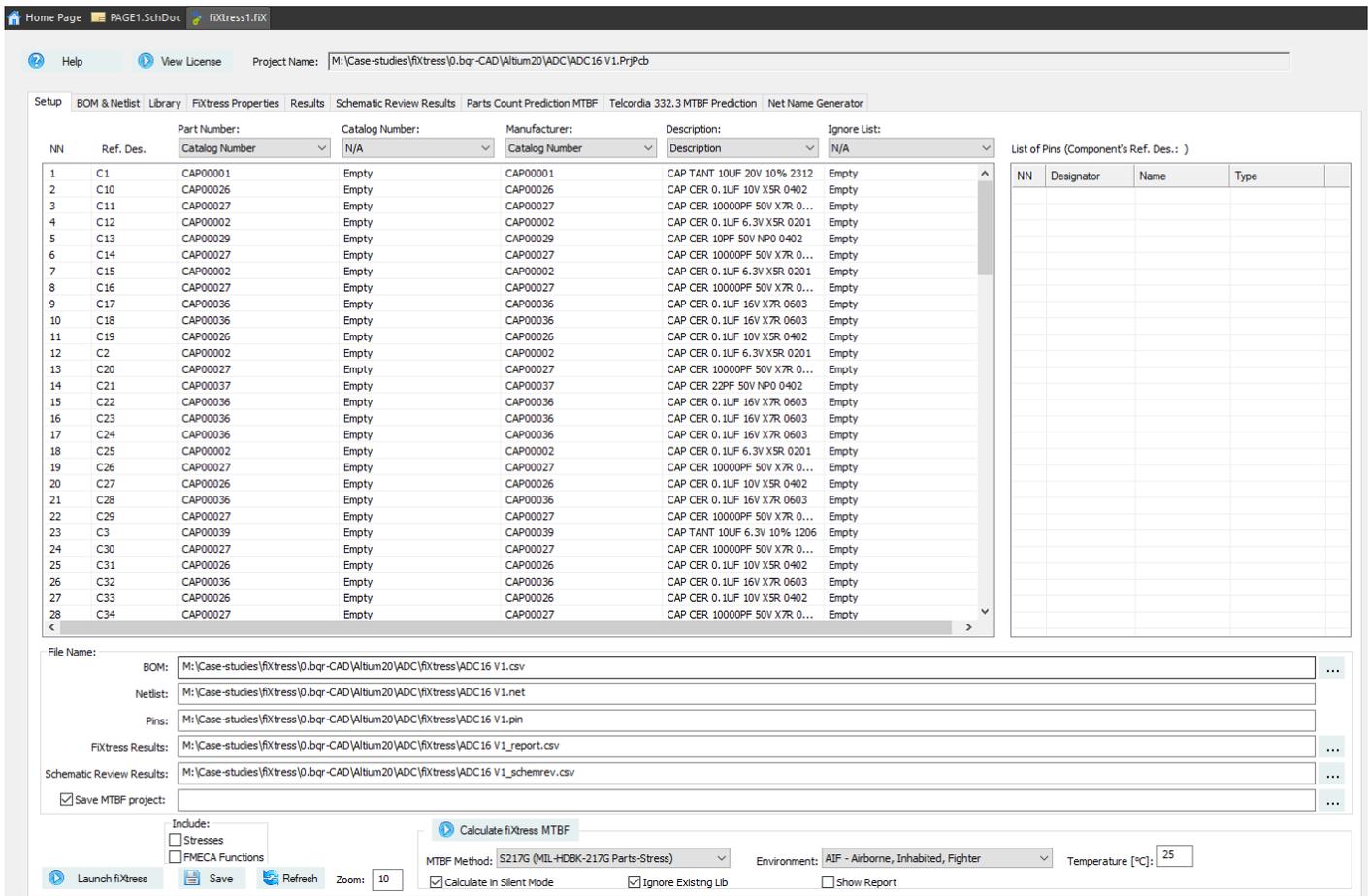
7. A new fixtress document will be created.

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:



The screenshot shows the application interface for 'fixtress1.fix'. At the top, there is a navigation bar with 'Home Page', 'PAGE1.SchDoc', and 'fixtress1.fix'. Below this is a menu bar with options like 'Help', 'View License', and 'Project Name: M:\Case-studies\fixtress\0_bqr-CAD\Altium20\ADC\ADC16 V1.PrjPcb'. The main area is divided into several tabs: 'Setup', 'BOM & Netlist', 'Library', 'Fixtress Properties', 'Results', 'Schematic Review Results', 'Parts Count Prediction MTBF', 'Telcordia 332.3 MTBF Prediction', and 'Net Name Generator'. The 'Setup' tab is active, displaying a table with columns for 'NN', 'Ref. Des.', 'Part Number', 'Catalog Number', 'Manufacturer', 'Description', and 'Ignore List'. The table contains 28 rows of component data. To the right of the table is a 'List of Pins (Component's Ref. Des.:)' section with columns for 'NN', 'Designator', 'Name', and 'Type'. Below the table, there are several input fields for 'File Name', 'Netlist', 'Pins', 'Fixtress Results', and 'Schematic Review Results'. At the bottom, there are checkboxes for 'Save MTBF project', 'Include Stresses', 'Include FMECA Functions', and a 'Calculate fixtress MTBF' button. Other settings include 'MTBF Method: S217G (MIL-HDBK-217G Parts-Stress)', 'Environment: AIF - Airborne, Inhabited, Fighter', and 'Temperature [°C]: 25'.

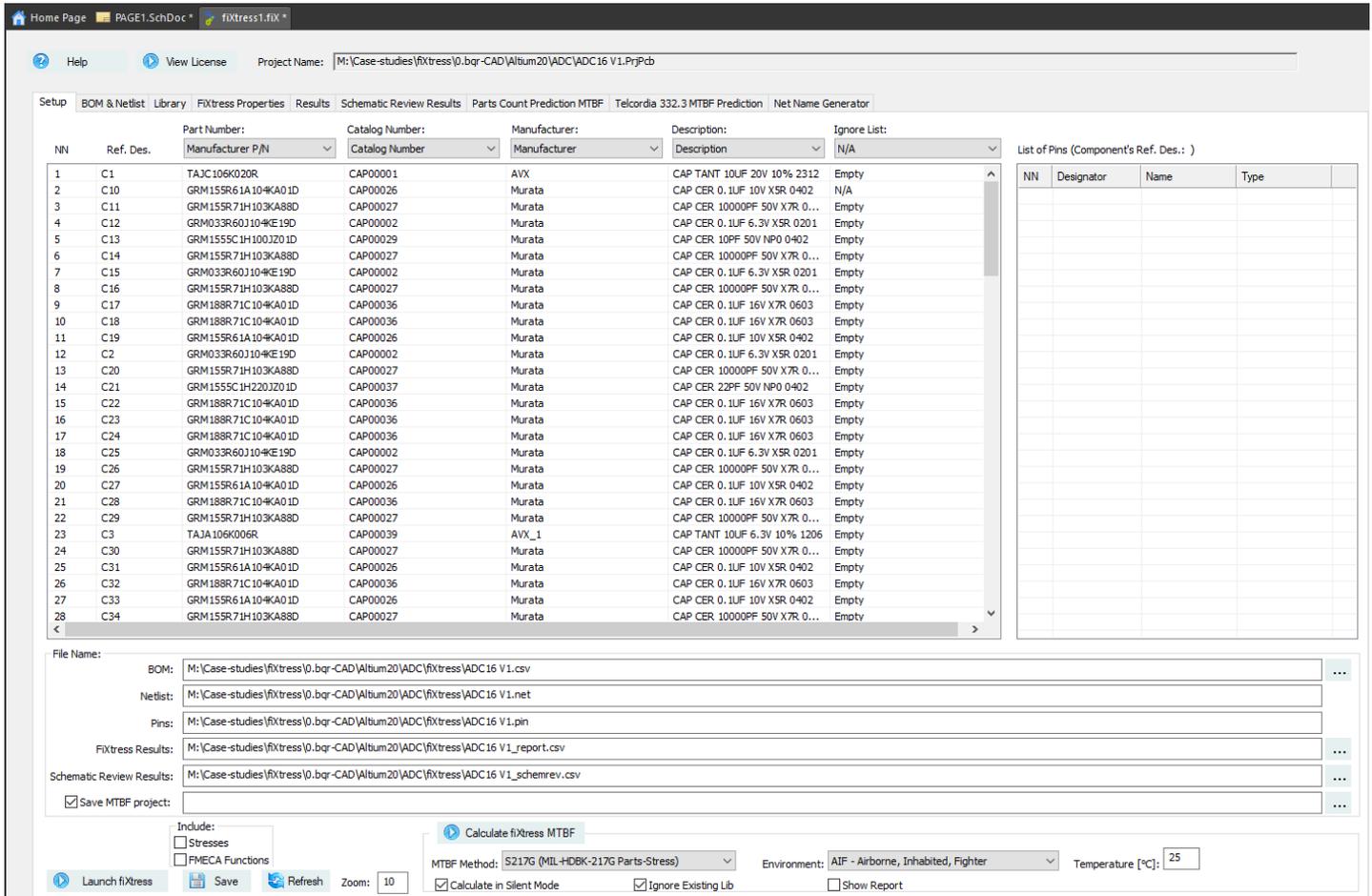
Note: In the demo mode some buttons are disabled, and they are colored in gray. In the licensed mode all buttons are enabled.

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:



Project Name: M:\Case-studies\fiXtress\0_bqr-CAD\Altium20\ADC\ADC16 V1.PrjPcb

NN	Ref. Des.	Part Number:	Catalog Number:	Manufacturer:	Description:	Ignore List:
		Manufacturer P/N	Catalog Number	Manufacturer	Description	N/A
1	C1	TAJC106K020R	CAP00001	AVX	CAP TANT 10UF 20V 10% 2312	Empty
2	C10	GRM155R61A104KA01D	CAP00026	Murata	CAP CER 0.1UF 10V XSR 0402	N/A
3	C11	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty
4	C12	GRM033R60J104KE19D	CAP00002	Murata	CAP CER 0.1UF 6.3V XSR 0201	Empty
5	C13	GRM1555C1H100J201D	CAP00029	Murata	CAP CER 10PF 50V NP0 0402	Empty
6	C14	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty
7	C15	GRM033R60J104KE19D	CAP00002	Murata	CAP CER 0.1UF 6.3V XSR 0201	Empty
8	C16	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty
9	C17	GRM188R71C104KA01D	CAP00036	Murata	CAP CER 0.1UF 16V X7R 0603	Empty
10	C18	GRM188R71C104KA01D	CAP00036	Murata	CAP CER 0.1UF 16V X7R 0603	Empty
11	C19	GRM155R61A104KA01D	CAP00026	Murata	CAP CER 0.1UF 10V XSR 0402	Empty
12	C2	GRM033R60J104KE19D	CAP00002	Murata	CAP CER 0.1UF 6.3V XSR 0201	Empty
13	C20	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty
14	C21	GRM1555C1H220J201D	CAP00037	Murata	CAP CER 22PF 50V NP0 0402	Empty
15	C22	GRM188R71C104KA01D	CAP00036	Murata	CAP CER 0.1UF 16V X7R 0603	Empty
16	C23	GRM188R71C104KA01D	CAP00036	Murata	CAP CER 0.1UF 16V X7R 0603	Empty
17	C24	GRM188R71C104KA01D	CAP00036	Murata	CAP CER 0.1UF 16V X7R 0603	Empty
18	C25	GRM033R60J104KE19D	CAP00002	Murata	CAP CER 0.1UF 6.3V XSR 0201	Empty
19	C26	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty
20	C27	GRM155R61A104KA01D	CAP00026	Murata	CAP CER 0.1UF 10V XSR 0402	Empty
21	C28	GRM188R71C104KA01D	CAP00036	Murata	CAP CER 0.1UF 16V X7R 0603	Empty
22	C29	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty
23	C3	TAJA106K006R	CAP00039	AVX_1	CAP TANT 10UF 6.3V 10% 1206	Empty
24	C30	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty
25	C31	GRM155R61A104KA01D	CAP00026	Murata	CAP CER 0.1UF 10V XSR 0402	Empty
26	C32	GRM188R71C104KA01D	CAP00036	Murata	CAP CER 0.1UF 16V X7R 0603	Empty
27	C33	GRM155R61A104KA01D	CAP00026	Murata	CAP CER 0.1UF 10V XSR 0402	Empty
28	C34	GRM155R71H103KA88D	CAP00027	Murata	CAP CER 10000PF 50V X7R 0...	Empty

File Name:

BOM: M:\Case-studies\fiXtress\0_bqr-CAD\Altium20\ADC\fiXtress\ADC16 V1.csv

Netlist: M:\Case-studies\fiXtress\0_bqr-CAD\Altium20\ADC\fiXtress\ADC16 V1.net

Pins: M:\Case-studies\fiXtress\0_bqr-CAD\Altium20\ADC\fiXtress\ADC16 V1.pin

fiXtress Results: M:\Case-studies\fiXtress\0_bqr-CAD\Altium20\ADC\fiXtress\ADC16 V1_report.csv

Schematic Review Results: M:\Case-studies\fiXtress\0_bqr-CAD\Altium20\ADC\fiXtress\ADC16 V1_schemrev.csv

Save MTBF project:

Include:

Stresses

FMECA Functions

Calculate fiXtress MTBF

MTBF Method: S217G (MIL-HDBK-217G Parts-Stress)

Environment: AIF - Airborne, Inhabited, Fighter

Temperature [°C]: 25

Calculate in Silent Mode Ignore Existing Lib Show Report

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.

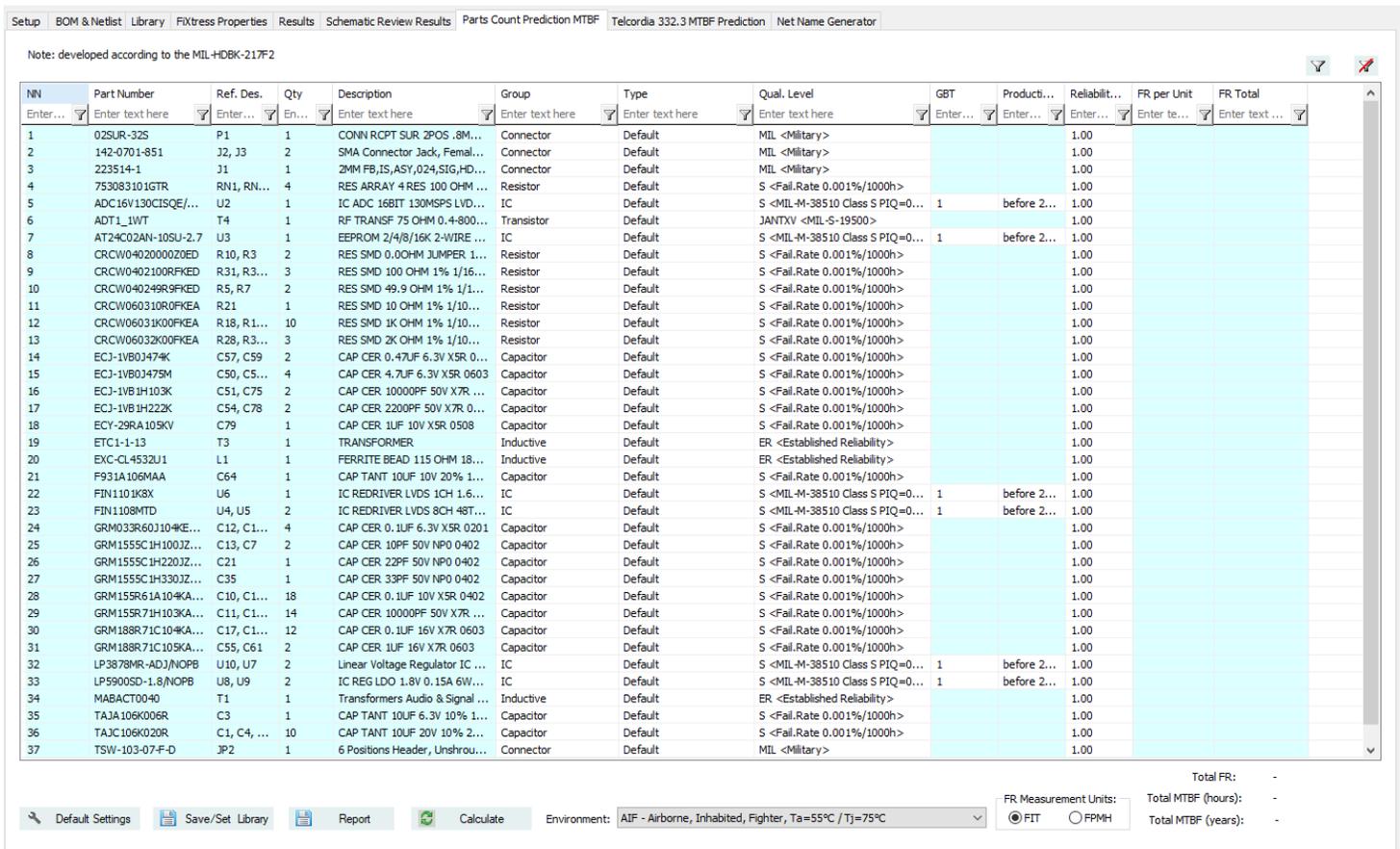
Please note that the toolkit calculates the MTBF of one PCB only. If you need a system level MTBF analysis you will need the fiXtress Pro, see section 5.1.

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:



NN	Part Number	Ref. Des.	Qty	Description	Group	Type	Qual. Level	GBT	Product...	Reliabil...	FR per Unit	FR Total
1	02SUR-32S	P1	1	CONN RCPT SUR 2POS .8M...	Connector	Default	MIL <Military>			1.00		
2	142-0701-851	J2, J3	2	SMA Connector Jack, Femal...	Connector	Default	MIL <Military>			1.00		
3	223514-1	J1	1	2MM FB, IS, ASY, 024, SIG, HD...	Connector	Default	MIL <Military>			1.00		
4	753083101GTR	RN1, RN...	4	RES ARRAY 4 RES 100 OHM ...	Resistor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
5	ADC16V130CISQE/...	U2	1	IC ADC 16BIT 130MSPS LVD...	IC	Default	S <MIL-M-38510 Class S PIQ=0...	1	before 2...	1.00		
6	ADT1_1WT	T4	1	RF TRANSF 75 OHM 0.4-800...	Transistor	Default	JANTXV <MIL-S-19500>			1.00		
7	AT24C02AN-10SU-2.7	U3	1	EEPROM 2/4/8/16K 2-WIRE ...	IC	Default	S <MIL-M-38510 Class S PIQ=0...	1	before 2...	1.00		
8	CRCW04020000Z0ED	R10, R3	2	RES SMD 0.00HM JUMPER 1...	Resistor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
9	CRCW0402100RFKED	R31, R3...	3	RES SMD 100 OHM 1% 1/16...	Resistor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
10	CRCW0402499RFKED	R5, R7	2	RES SMD 49.9 OHM 1% 1/1...	Resistor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
11	CRCW0603100RFKEA	R21	1	RES SMD 10 OHM 1% 1/10...	Resistor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
12	CRCW06031K00PFKEA	R18, R1...	10	RES SMD 1K OHM 1% 1/10...	Resistor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
13	CRCW06032K00PFKEA	R28, R3...	3	RES SMD 2K OHM 1% 1/10...	Resistor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
14	ECJ-1VB03474K	C57, C59	2	CAP CER 0.47UF 6.3V XSR 0...	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
15	ECJ-1VB03475M	C50, C5...	4	CAP CER 4.7UF 6.3V XSR 0603	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
16	ECJ-1VB1H103K	C51, C75	2	CAP CER 10000PF 50V X7R ...	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
17	ECJ-1VB1H222K	C54, C78	2	CAP CER 22000PF 50V X7R 0...	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
18	ECY-29RA105KV	C79	1	CAP CER 1UF 10V XSR 0508	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
19	ETC1-1-13	T3	1	TRANSFORMER	Inductive	Default	ER <Established Reliability>			1.00		
20	EXC-CL4532U1	L1	1	FERRITE BEAD 115 OHM 18...	Inductive	Default	ER <Established Reliability>			1.00		
21	F931A106MAA	C64	1	CAP TANT 10UF 10V 20% 1...	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
22	FIN1101K8X	U6	1	IC REDRIVER LVDS 1CH 1.6...	IC	Default	S <MIL-M-38510 Class S PIQ=0...	1	before 2...	1.00		
23	FIN1108MTD	U4, U5	2	IC REDRIVER LVDS 8CH 48T...	IC	Default	S <MIL-M-38510 Class S PIQ=0...	1	before 2...	1.00		
24	GRM03R6031014KE...	C12, C1...	4	CAP CER 0.1UF 6.3V XSR 0201	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
25	GRM1555C1H100JZ...	C13, C7	2	CAP CER 10PF 50V NPO 0402	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
26	GRM1555C1H220JZ...	C21	1	CAP CER 22PF 50V NPO 0402	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
27	GRM1555C1H30JZ...	C35	1	CAP CER 33PF 50V NPO 0402	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
28	GRM155R61A104KA...	C10, C1...	18	CAP CER 0.1UF 10V XSR 0402	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
29	GRM155R71H103KA...	C11, C1...	14	CAP CER 10000PF 50V X7R ...	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
30	GRM188R71C104KA...	C17, C1...	12	CAP CER 0.1UF 16V X7R 0603	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
31	GRM188R71C105KA...	C55, C61	2	CAP CER 1UF 16V X7R 0603	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
32	LP3878MR-ADJ/NOPB	U10, U7	2	Linear Voltage Regulator IC ...	IC	Default	S <MIL-M-38510 Class S PIQ=0...	1	before 2...	1.00		
33	LP5905D-1.8/NOPB	U8, U9	2	IC REG LDO 1.8V 0.15A 6W...	IC	Default	S <MIL-M-38510 Class S PIQ=0...	1	before 2...	1.00		
34	MABACT0040	T1	1	Transformers Audio & Signal ...	Inductive	Default	ER <Established Reliability>			1.00		
35	TAJA106K006R	C3	1	CAP TANT 10UF 6.3V 10% 1...	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
36	TAJC106K020R	C1, C4, ...	10	CAP TANT 10UF 20V 10% 2...	Capacitor	Default	S <Fail.Rate 0.001%/1000h>			1.00		
37	TSW-103-07-F-D	JP2	1	6 Positions Header, Unshrou...	Connector	Default	MIL <Military>			1.00		

Total FR: -
Total MTBF (hours): -
Total MTBF (years): -

FR Measurement Units: FIT FPMH

Environment: AIF - Airborne, Inhabited, Fighter, Ta=55°C / Tj=75°C

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 <i>Type</i> is left as "Default", the <i>Type</i> 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.

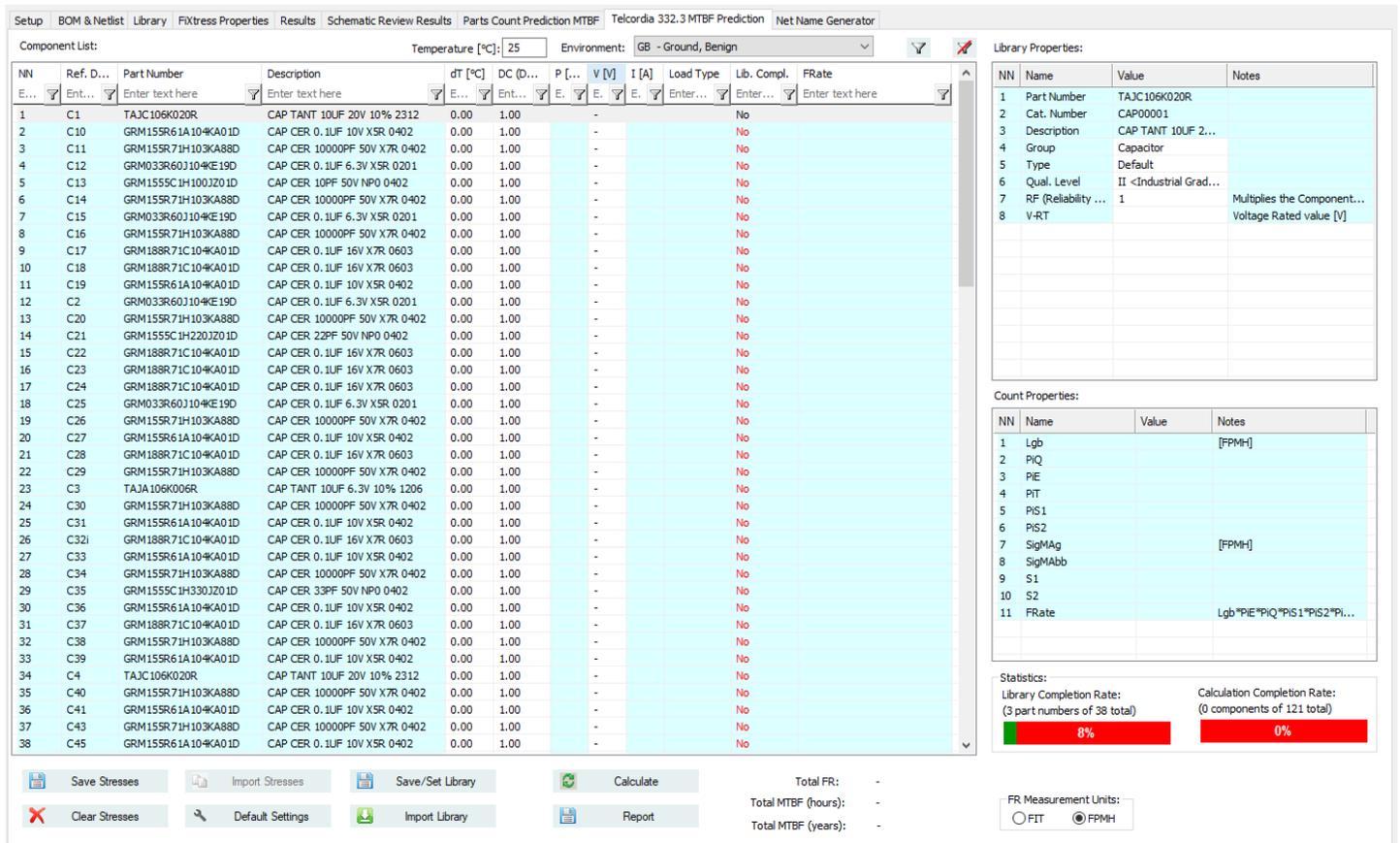
Please note that this toolkit calculates the MTBF of one PCB only, if you need a system level MTBF analysis you will need the fiXtress Pro, see section 5.1.

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:



NN	Ref. D...	Part Number	Description	dT [°C]	DC (D...	P [...]	V [V]	I [A]	Load Type	Lib. Compl.	FRate
1	C1	TAJC106K020R	CAP TANT 10UF 20V 10% 2312	0.00	1.00	-	-	-	-	No	-
2	C10	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
3	C11	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
4	C12	GRM033R60J104KE19D	CAP CER 0.1UF 6.3V XSR 0201	0.00	1.00	-	-	-	-	No	-
5	C13	GRM1555C1H100J201D	CAP CER 10PF 50V NP0 0402	0.00	1.00	-	-	-	-	No	-
6	C14	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
7	C15	GRM033R60J104KE19D	CAP CER 0.1UF 6.3V XSR 0201	0.00	1.00	-	-	-	-	No	-
8	C16	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
9	C17	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
10	C18	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
11	C19	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
12	C2	GRM033R60J104KE19D	CAP CER 0.1UF 6.3V XSR 0201	0.00	1.00	-	-	-	-	No	-
13	C20	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
14	C21	GRM1555C1H220J201D	CAP CER 22PF 50V NP0 0402	0.00	1.00	-	-	-	-	No	-
15	C22	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
16	C23	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
17	C24	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
18	C25	GRM033R60J104KE19D	CAP CER 0.1UF 6.3V XSR 0201	0.00	1.00	-	-	-	-	No	-
19	C26	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
20	C27	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
21	C28	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
22	C29	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
23	C3	TAJA106K006R	CAP TANT 10UF 6.3V 10% 1206	0.00	1.00	-	-	-	-	No	-
24	C30	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
25	C31	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
26	C32	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
27	C33	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
28	C34	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
29	C35	GRM1555C1H330J201D	CAP CER 33PF 50V NP0 0402	0.00	1.00	-	-	-	-	No	-
30	C36	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
31	C37	GRM188R71C104KA01D	CAP CER 0.1UF 16V X7R 0603	0.00	1.00	-	-	-	-	No	-
32	C38	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
33	C39	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
34	C4	TAJC106K020R	CAP TANT 10UF 20V 10% 2312	0.00	1.00	-	-	-	-	No	-
35	C40	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
36	C41	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-
37	C43	GRM15SR71H103KA88D	CAP CER 10000PF 50V X7R 0402	0.00	1.00	-	-	-	-	No	-
38	C45	GRM15SR61A104KA01D	CAP CER 0.1UF 10V XSR 0402	0.00	1.00	-	-	-	-	No	-

NN	Name	Value	Notes
1	Part Number	TAJC106K020R	
2	Cat. Number	CAP00001	
3	Description	CAP TANT 10UF 2...	
4	Group	Capacitor	
5	Type	Default	
6	Qual. Level	II <Industrial Grad...	
7	RF (Reliability ...	1	Multiplies the Component...
8	V-RT		Voltage Rated value [V]

NN	Name	Value	Notes
1	Lgb		[FPMH]
2	PIQ		
3	PIE		
4	PIT		
5	PIS1		
6	PIS2		
7	SigMag		[FPMH]
8	SigMabb		
9	S1		
10	S2		
11	FRate		Lgb*PIE*PIQ*PIS1*PIS2*Pl...

Statistics:

Library Completion Rate: 8% (3 part numbers of 38 total)

Calculation Completion Rate: 0% (0 components of 121 total)

FR Measurement Units: FIT FPMH

As you can see, it consists of three tables (Component List, Library Properties and Count Properties) and additional controls (buttons, statistics info, etc.).

- 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

- 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

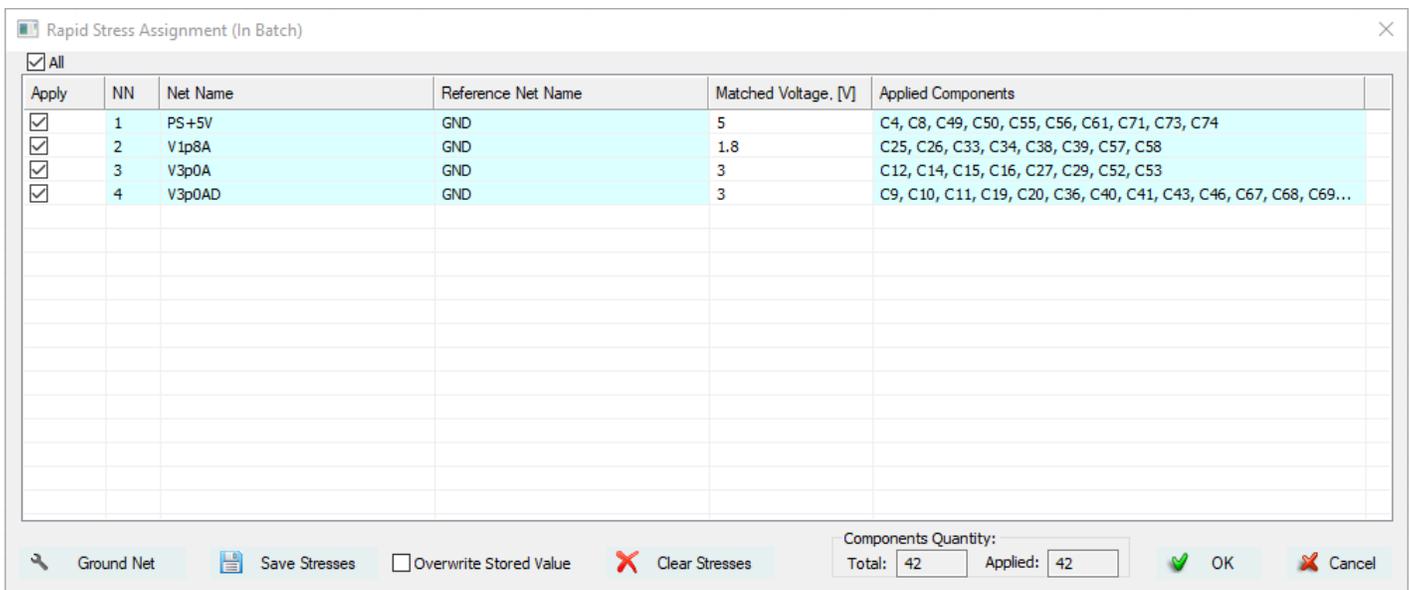
The MTBF & Reliability Toolkit provides a convenient way to assign component stresses in a semi-automatic manner which saves a lot of time and prevents user errors.

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
<input checked="" type="checkbox"/>	1	PS+5V	GND	5	C4, C8, C49, C50, C55, C56, C61, C71, C73, C74
<input checked="" type="checkbox"/>	2	V1p8A	GND	1.8	C25, C26, C33, C34, C38, C39, C57, C58
<input checked="" type="checkbox"/>	3	V3p0A	GND	3	C12, C14, C15, C16, C27, C29, C52, C53
<input checked="" type="checkbox"/>	4	V3p0AD	GND	3	C9, C10, C11, C19, C20, C36, C40, C41, C43, C46, C67, C68, C69...

Components Quantity:
Total: 42 Applied: 42

Buttons: Ground Net, Save Stresses, Overwrite Stored Value, Clear Stresses, OK, Cancel

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

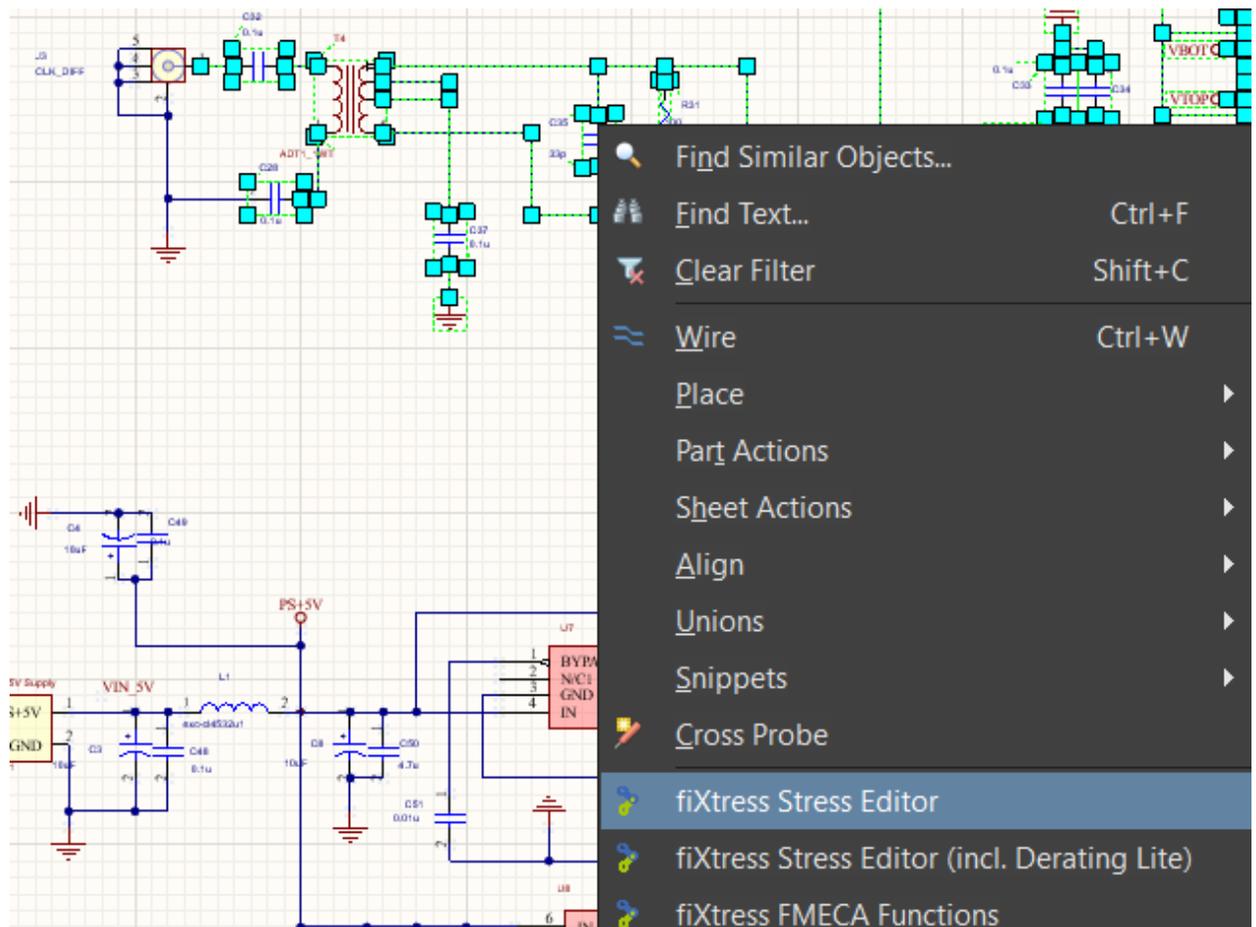
The dialog presents a list of nets that are connected to the ground net via simple components such as capacitors and resistors. The net voltage is parsed from the net name. You can update the matched voltage.

This is an easy way for quick assignment of many components based on the net names.

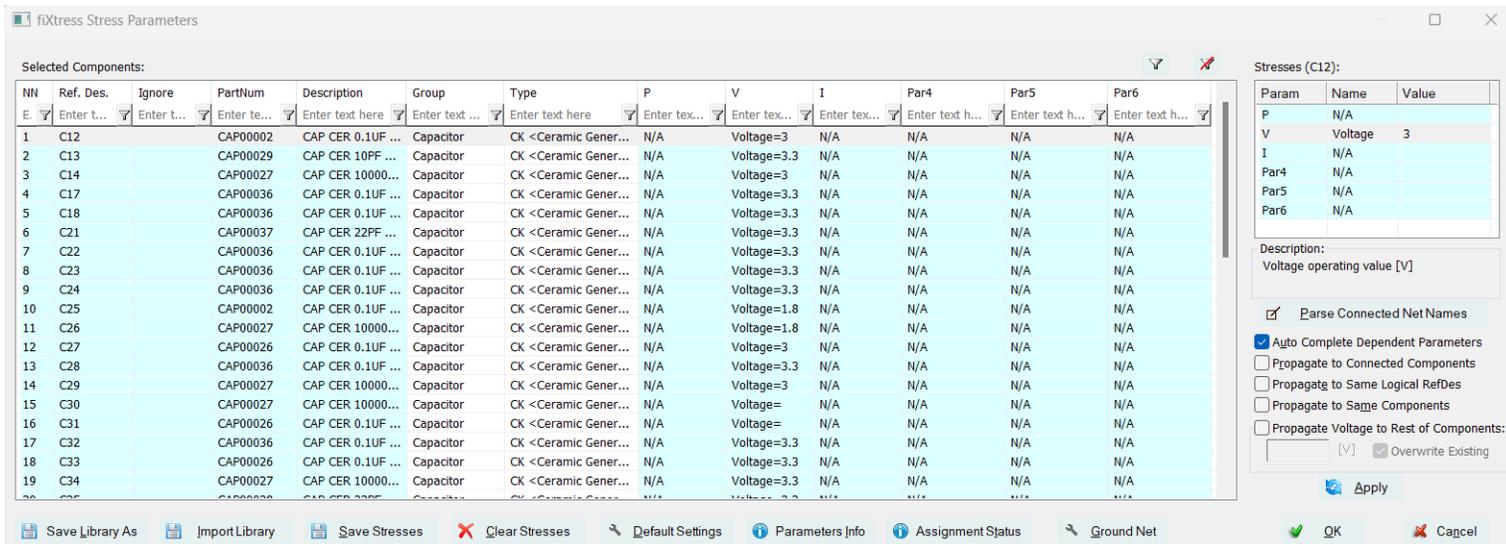
2.7.2. Based on connectivity

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.

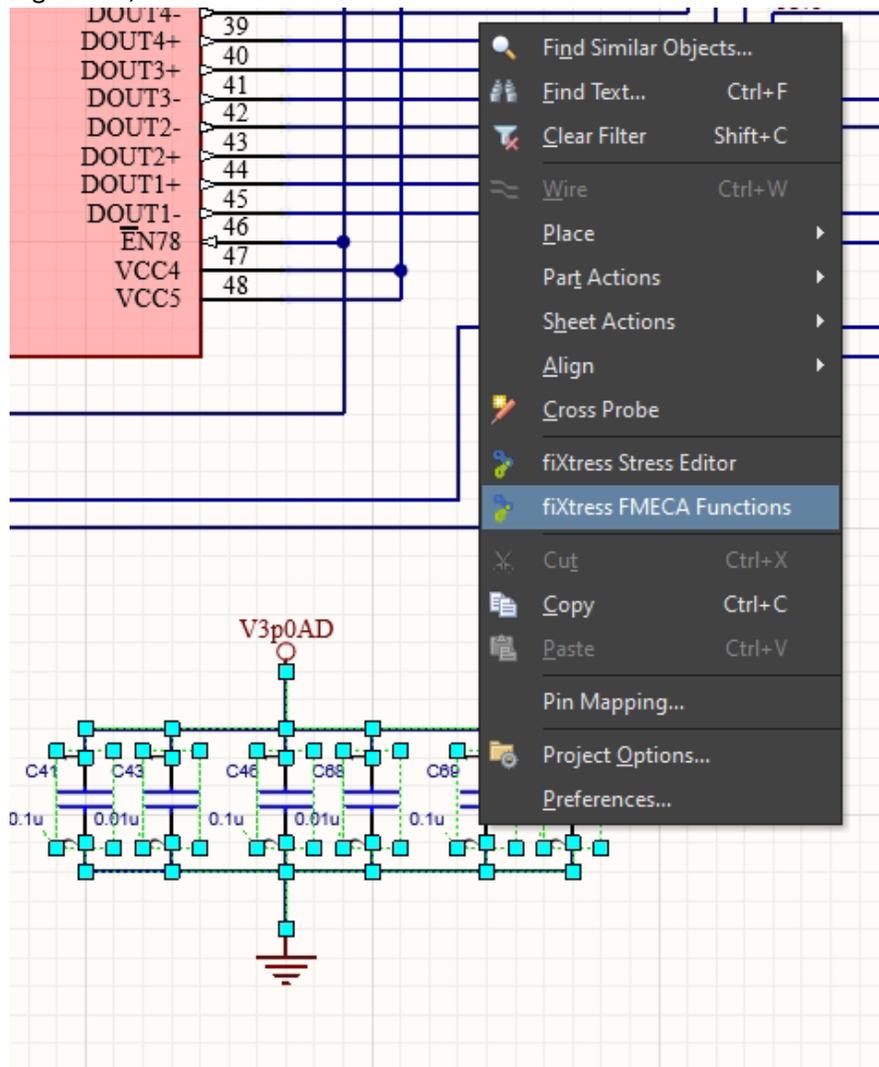
Complete FMECA and Testability functionality is provided using the combination of the toolkit with BQR's FMECA Pro software, see section 5.2.

The toolkit supports two functions and failure mode libraries:

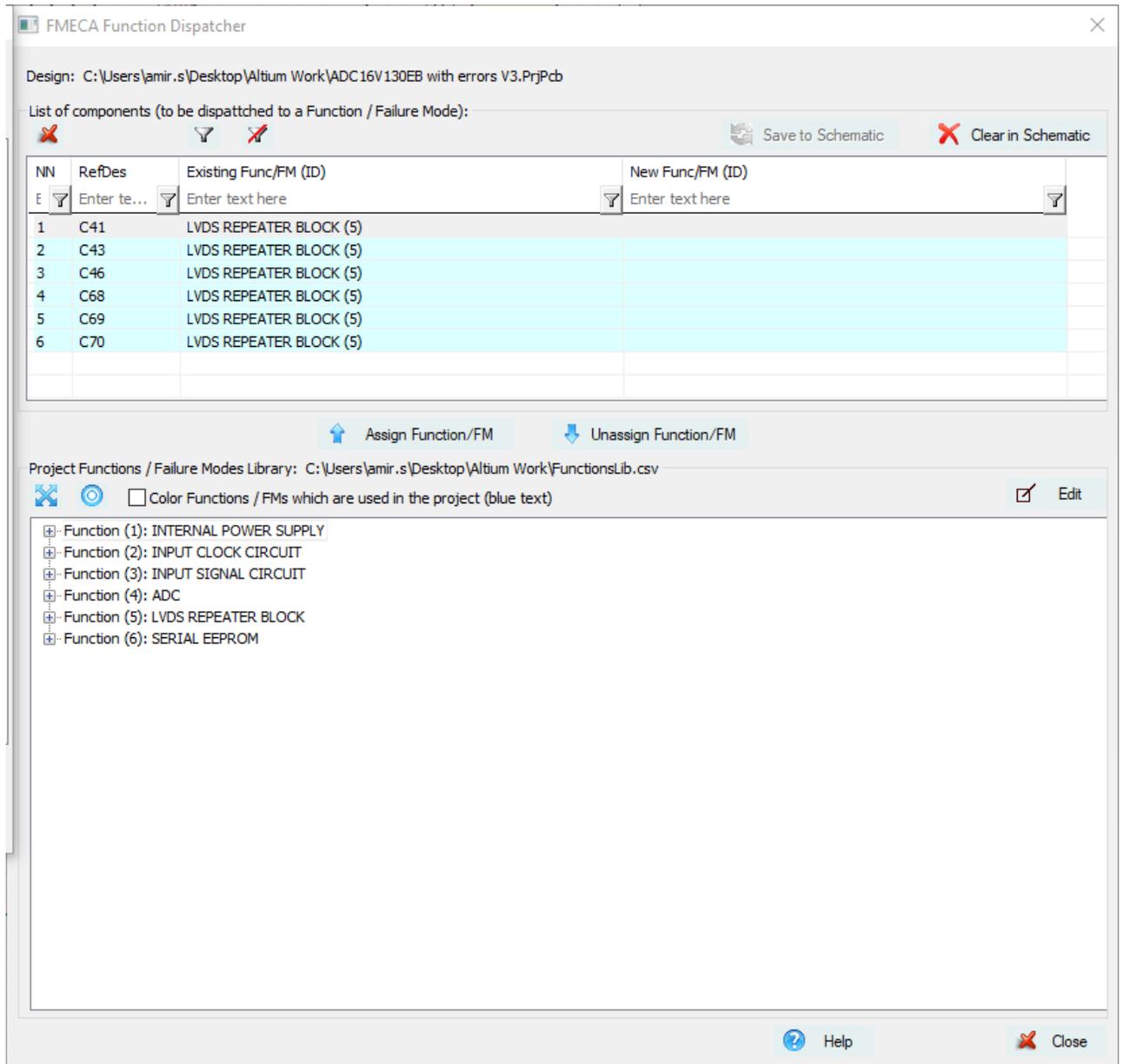
- Function Type library that can be used as the basis for multiple projects
- Project specific library with functions and failure modes which are tailor made for the project

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:

Library Editor

Library Path: C:\Users\amir.s\Desktop\Altium Work\FunctionsLib.csv

Functions:

NN	Function Name	ID
E	Enter text here	En...
1	INTERNAL POWER SUPPLY	1
2	INPUT CLOCK CIRCUIT	2
3	INPUT SIGNAL CIRCUIT	3
4	ADC	4
5	LVDS REPEATER BLOCK	5
6	SERIAL EEPROM	6

Failure Modes of selected Function (INTERNAL POWER SUPPLY, 1):

NN	Failure Mode Name	ID
E	Enter text here	En...
1	No ADC power	1
2	Bad ADC power signals	2

Note: The Function ID field should be formatted as integers, separated by dots (e.g., '1.23.34').

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.

- 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

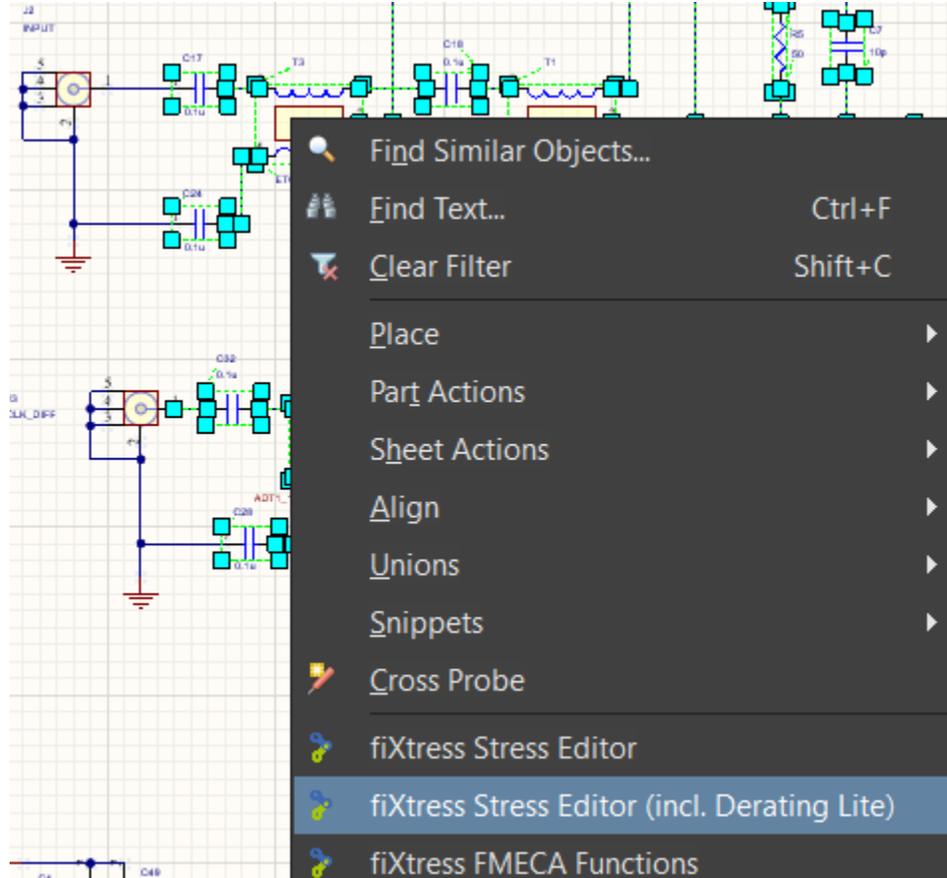
2.9. Component Derating Lite

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)

fiXtress Stress Parameters (incl.Derating Lite)

Selected Components:													Operational Stresses (C39):				
Item	Ref. Des.	Ignore	PartNum	Group	Type	P	V	I	Par4	Par5	Par6	P [%]	V [%]	I [%]	Param	Name	Value
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	C12		GRM033R6...	Capacitor	CK <Cerami...	N/A	Voltage=3	N/A	N/A	N/A	N/A	N/A	95.24	N/A	P	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	V	Voltage	3.3
3	C14		GRM155R7...	Capacitor	CKR <Cera...	N/A	Voltage=3	N/A	N/A	N/A	N/A	N/A	12.00	N/A	I	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	Par4	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	Par5	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	Par6	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	Description: Voltage operating value [V]		
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 <Cera...	N/A	Voltage=5	N/A	N/A	N/A	N/A	N/A	158.73	N/A			

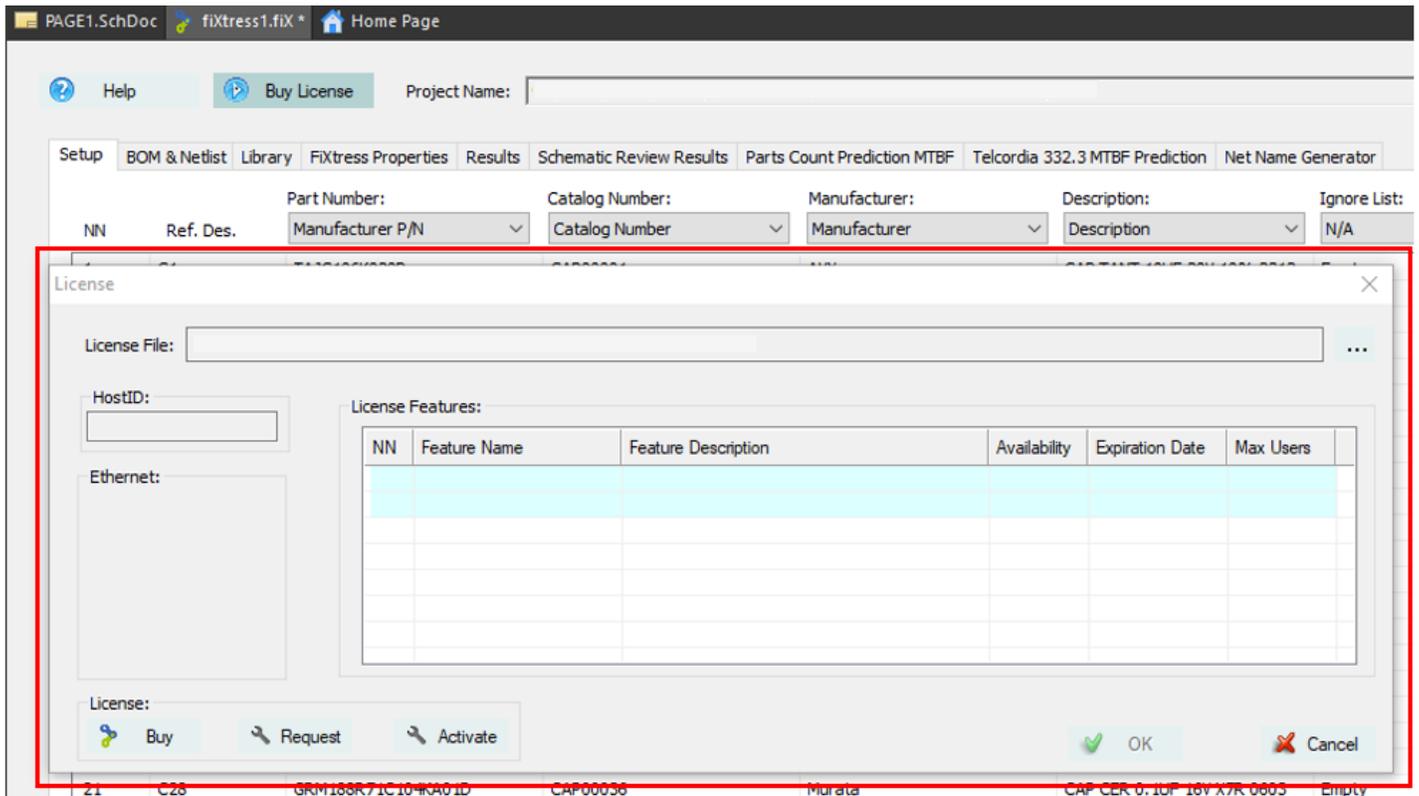
Parse Connected Net Names

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:



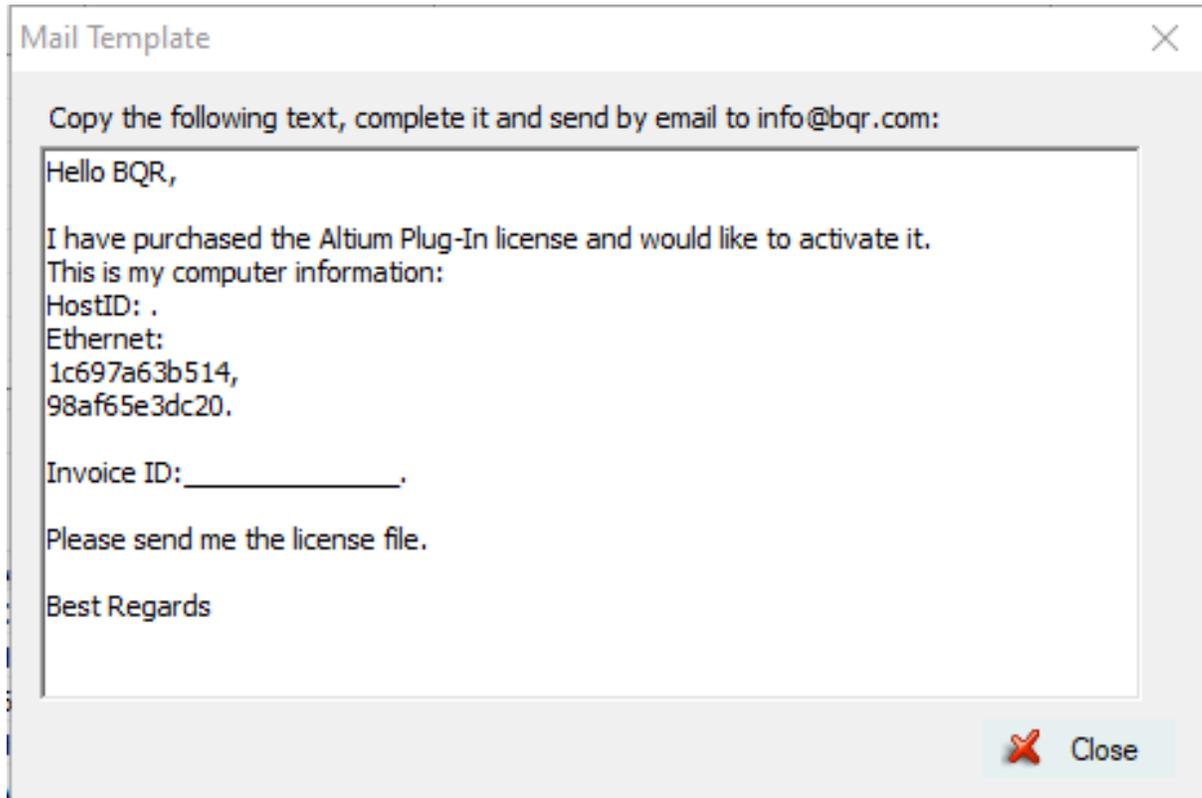
The screenshot shows the 'Buy License' dialog box. The dialog has a title bar with a close button. Below the title bar, there is a 'License File:' field with a browse button. To the left, there are 'HostID:' and 'Ethernet:' fields. To the right, there is a 'License Features' table. At the bottom, there are 'Buy', 'Request', and 'Activate' buttons, and 'OK' and 'Cancel' buttons.

NN	Feature Name	Feature Description	Availability	Expiration Date	Max Users

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:



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.

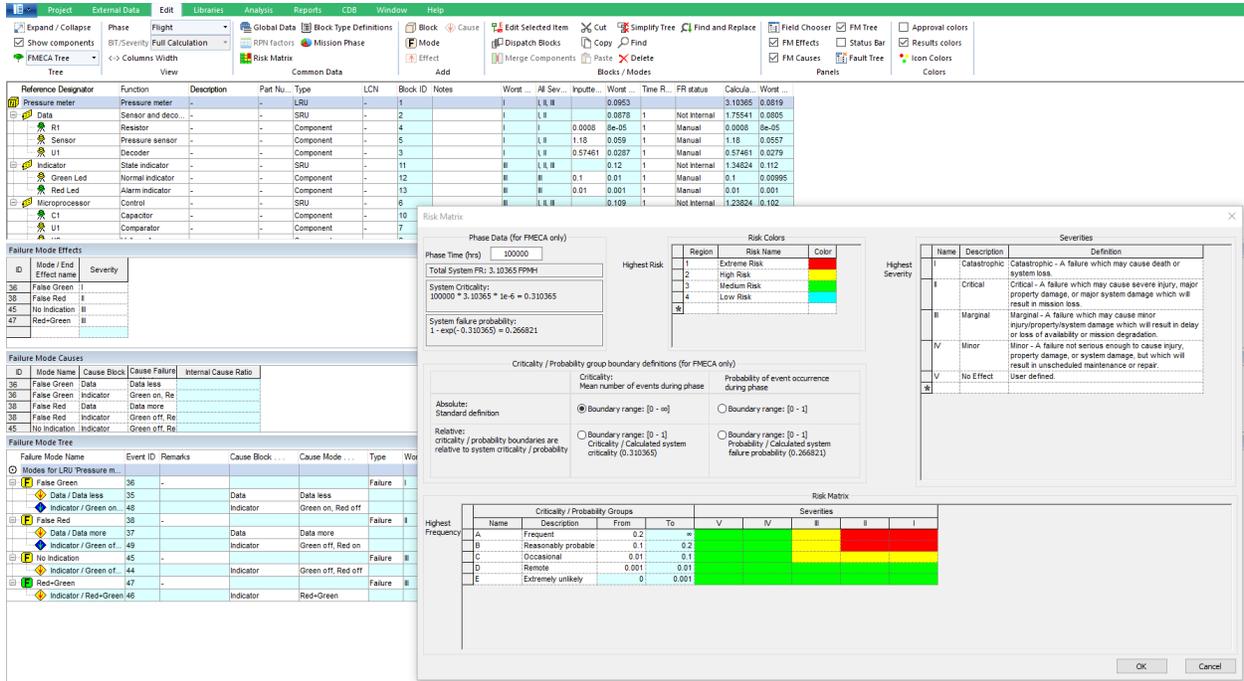
5.1. fiXtress Pro

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

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



The screenshot displays the FMECA Pro software interface. The main window shows a table of components and their associated failure modes. A dialog box titled 'Risk Matrix' is open, providing detailed analysis parameters and a risk matrix visualization.

Main Table Data (Reference Designator, Function, Description, Pat Nu., Type, LCN, Block ID, Notes, Worst, All Sev., Inpute..., Worst..., Time R., FR status, Calcula., Worst...)

Reference Designator	Function	Description	Pat Nu.	Type	LCN	Block ID	Notes	Worst	All Sev.	Inpute...	Worst...	Time R.	FR status	Calcula.	Worst...	
Pressure meter	Pressure meter	-	-	LRU	-	1		I	I, R, III		0.0953			3.10365	0.0819	
Data	Sensor and deco...	-	-	SRU	-	2		I	I, R		0.0878	1	Not Internal	1.75541	0.0005	
R11	Resistor	-	-	Component	-	4		I	I		0.0008	1e-05	1	Manual	0.0008	1e-05
Sensor	Pressure sensor	-	-	Component	-	5		I	I, R		1.18	0.059	1	Manual	1.18	0.0557
U1	Decoder	-	-	Component	-	3		I	I, R		0.57461	0.0257	1	Manual	0.57461	0.0279
Indicator	State indicator	-	-	SRU	-	11		III	I, R, III		0.12	1	Not Internal	1.34824	0.112	
Green Led	Normal indicator	-	-	Component	-	12		III	III		0.1	0.01	1	Manual	0.1	0.00995
Red Led	Alarm indicator	-	-	Component	-	13		III	III		0.01	0.001	1	Manual	0.01	0.001
Microprocessor	Control	-	-	SRU	-	6		III	I, R, III		0.109	1	Not Internal	1.23824	0.102	
C1	Capacitor	-	-	Component	-	10										
U1	Comparator	-	-	Component	-	7										

Risk Matrix Dialog Box Details:

- Phase Data (for FMECA only):** Phase Time (hrs) = 100000; Total System FR: 3.10365 FPMH; System Criticality: 100000 * 3.10365 = 1e-6 = 0.310365; System failure probability: 1 - exp(-0.310365) = 0.266821
- Risk Colors:**

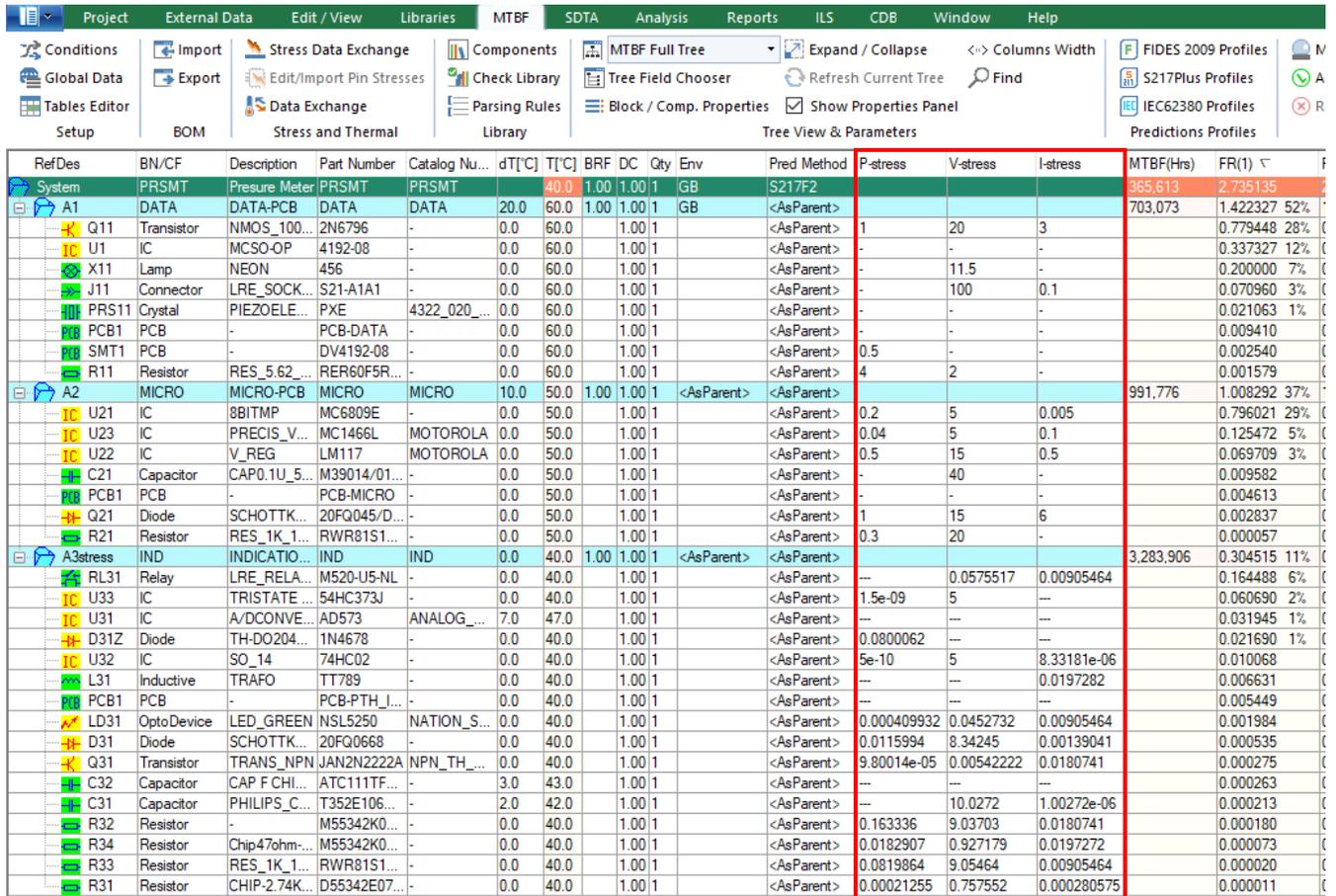
Region	Risk Name	Color
1	Extreme Risk	Red
2	High Risk	Orange
3	Medium Risk	Yellow
4	Low Risk	Green
- Severities:**

Name	Description	Definition
I	Catastrophic	Catastrophic - A failure which may cause death or system loss.
II	Critical	Critical - A failure which may cause severe injury, major property damage, or major system damage which will result in mission loss.
III	Marginal	Marginal - A failure which may cause minor injury/property/system damage which will result in delay or loss of availability or mission degradation.
IV	Minor	Minor - A failure not serious enough to cause injury, property damage, or system damage, but which will result in unscheduled maintenance or repair.
V	No Effect	User defined.
- Criticality / Probability group boundary definitions (for FMECA only):**
 - Absolute: Standard definition
 - Relative: criticality / probability boundaries are relative to system criticality / probability
 - Mean number of events during phase during phase
 - Probability of event occurrence during phase
 - Boundary ranges: [0 - ∞]
 - Boundary ranges: [0 - 1]
 - Boundary ranges: [0 - 1]
 - Boundary ranges: [0 - 1]
- Risk Matrix Visualization:**

Highest Frequency	Criticality / Probability Groups				Severities				
	Name	Description	From	To	V	IV	III	II	I
A	Frequent		0.2	∞					
B	Reasonably probable		0.1	0.2					
C	Occasional		0.01	0.1					
D	Remote		0.001	0.01					
E	Extremely unlikely		0	0.001					

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.



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	Pressure Meter	PRSMT	PRSMT	40.0	1.00	1.00	1	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	1		<AsParent>	1	20	3		0.779448	28%
U1	IC	MCSO-OP	4192-08	-	0.0	60.0	1.00	1	1		<AsParent>	-	-	-		0.337327	12%
X11	Lamp	NEON	456	-	0.0	60.0	1.00	1	1		<AsParent>	-	11.5	-		0.200000	7%
J11	Connector	LRE SOCK...	S21-A1A1	-	0.0	60.0	1.00	1	1		<AsParent>	-	100	0.1		0.070960	3%
PRS11	Crystal	PIEZOELE...	PXE	4322_020_...	0.0	60.0	1.00	1	1		<AsParent>	-	-	-		0.021063	1%
PCB1	PCB	-	PCB-DATA	-	0.0	60.0	1.00	1	1		<AsParent>	-	-	-		0.009410	
SMT1	PCB	-	DV4192-08	-	0.0	60.0	1.00	1	1		<AsParent>	0.5	-	-		0.002540	
R11	Resistor	RES_5.62_...	RER60F5R...	-	0.0	60.0	1.00	1	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	1		<AsParent>	0.2	5	0.005		0.796021	29%
U23	IC	PRECIS_V...	MC1466L	MOTOROLA	0.0	50.0	1.00	1	1		<AsParent>	0.04	5	0.1		0.125472	5%
U22	IC	V_REG	LM117	MOTOROLA	0.0	50.0	1.00	1	1		<AsParent>	0.5	15	0.5		0.069709	3%
C21	Capacitor	CAP0.1U_5...	M39014/01...	-	0.0	50.0	1.00	1	1		<AsParent>	-	40	-		0.009582	
PCB1	PCB	-	PCB-MICRO	-	0.0	50.0	1.00	1	1		<AsParent>	-	-	-		0.004613	
Q21	Diode	SCHOTTK...	20FQ045/D...	-	0.0	50.0	1.00	1	1		<AsParent>	1	15	6		0.002837	
R21	Resistor	RES_1K_1...	RWR81S1...	-	0.0	50.0	1.00	1	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_REL...	M520-U5-NL	-	0.0	40.0	1.00	1	1		<AsParent>	---	0.0575517	0.00905464		0.164488	6%
U33	IC	TRISTATE...	54HC373J	-	0.0	40.0	1.00	1	1		<AsParent>	1.5e-09	5	---		0.060690	2%
U31	IC	A/DCONVE...	AD573	ANALOG_...	7.0	47.0	1.00	1	1		<AsParent>	---	---	---		0.031945	1%
D31Z	Diode	TH-DO204...	1N4678	-	0.0	40.0	1.00	1	1		<AsParent>	0.0800062	---	---		0.021690	1%
U32	IC	SO_14	74HC02	-	0.0	40.0	1.00	1	1		<AsParent>	5e-10	5	8.33181e-06		0.010068	
L31	Inductive	TRAFO	TT789	-	0.0	40.0	1.00	1	1		<AsParent>	---	---	0.0197282		0.006631	
PCB1	PCB	-	PCB-PTH_I...	-	0.0	40.0	1.00	1	1		<AsParent>	---	---	---		0.005449	
LD31	OptoDevice	LED_GREEN	NSL5250	NATION_S...	0.0	40.0	1.00	1	1		<AsParent>	0.000409932	0.0452732	0.00905464		0.001984	
D31	Diode	SCHOTTK...	20FQ0668	-	0.0	40.0	1.00	1	1		<AsParent>	0.0115994	8.34245	0.00139041		0.000535	
Q31	Transistor	TRANS_NPN	JAN2N2222A	NPN_TH_...	0.0	40.0	1.00	1	1		<AsParent>	9.80014e-05	0.00542222	0.0180741		0.000275	
C32	Capacitor	CAP F CHI...	ATC1111TF...	-	3.0	43.0	1.00	1	1		<AsParent>	---	---	---		0.000263	
C31	Capacitor	PHILIPS_C...	T352E106...	-	2.0	42.0	1.00	1	1		<AsParent>	---	10.0272	1.00272e-06		0.000213	
R32	Resistor	-	M55342K0...	-	0.0	40.0	1.00	1	1		<AsParent>	0.163336	9.03703	0.0180741		0.000180	
R34	Resistor	Chip47ohm...	M55342K0...	-	0.0	40.0	1.00	1	1		<AsParent>	0.0182907	0.927179	0.0197272		0.000073	
R33	Resistor	RES_1K_1...	RWR81S1...	-	0.0	40.0	1.00	1	1		<AsParent>	0.0819864	9.05464	0.00905464		0.000020	
R31	Resistor	CHIP-2.74K...	D55342E07...	-	0.0	40.0	1.00	1	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