

DeltaQualificationMatrix

General

Short product and technology cycles as well as new environmental regulations frequently result in process and material changes of components, printed circuit boards, assembly techniques and circuit layout which have to be evaluated. The ZVEI "Guideline for Customer Notifications of Product and/or Process Changes (PCN) of Electronic Components specified for Automotive Applications" describes an appropriate methodology for dealing with changed electronic components. The qualification matrices in this guideline are recommendations for how to assess typical changes of electronic components. These recommendations promote an open risk-based discussion between supplier and customer regarding qualifications.

The DeltaQualificationMatrices were developed by the Industry Task Force Team "PCN DeltaQualificationMatrix" together with component experts from the ZVEI Working Group "PCN-Methodology". Actual content represents state-of-the-art technology and does not claim to be comprehensive. Deviation from proposed guideline should be mutually agreed as customer specific requirements have to be considered.

DeltaQualificationMatrix Application (completion by component manufacturer)

- a) This table has to be used for changes only. The matrices are not applicable for new product, special qualifications (for instance for encapsulation of module) or Information Notes.
- b) If a change is not listed in this table, the qualification plan has to be defined and agreed between customer and supplier.
- c) The matrix for Active Components requires the user to choose between integrated circuits (AEC-Q100 Rev. H) and discrete semiconductors (AEC-Q101 Rev. D1) (cell D4).
For Passive Components AEC-Q200 is used. For LED'S the AEC-Q102 is used.
For Multi-Chip-Modules the AEC-Q104 is used.
- d) All changes as listed in the PCN have to be marked by a cross (x) in column B and will appear colored. The relevant reliability tests are then shown in "Tests, which should be considered for the appropriate process change".
- e) In "Tests, which should be considered for the appropriate process change after selection of condition table" is for modification of the found relevant tests under consideration of the weight of change.
Related table "Conditions" has to be assessed per proposed letters with an (x).
- f) In "Suppliers performed tests" the component manufacturer documents the planned and performed tests.
- g) In case of deviations from tests, which should be considered this should be notified and commented by the component manufacturer in the area "Reason for exception of tests".
Test results in form of generic data (G) are allowed when notified and justified.

Evaluation Levels are categorized as follows

"C: Component level": The evaluation of a change at component has to be done by the component manufacturer at the component only. Generic data from other relevant evaluations can be used.

"B: Board level": The intended change described in the PCN may influence handling/processability/manufacturability of the component at the customer. Therefore, additional evaluation by the customer may be necessary.

"A: Application level": The intended change described in the PCN may influence the properties of the application (e.g. ECU). In addition to the evaluation under C or B the influence of the change in the application is evaluated by suitable investigations by the customer. It has to be considered whether the application / assembly requirements are already sufficiently safeguarded by other qualifications (application-specific risk assessment).

* *: **Not relevant for qualification matrix**": Changes which fulfill neither A,B nor C definitions

Information Notes

Changes indicated as "I" shall not be marked in the DeQuMa. For those changes the Information Note sheet shall be used. As the DeQuMa is desired for PCN only, a marking of "I"-changes would automatically influence evaluation level and test effort.

Important Notes

- To use the matrices in the right form the ZVEI working group provides a Tutorial on its homepage (ZVEI-Tutorial)
- ID number: is a unique identification number for each indicated change defined in the ZVEI PCN DeltaQualificationMatrices. The same ID number is used in the PCN Form sheet to identify the change.
- Tests identified by the matrix have **to be considered** and checked if they are necessary to assess the specific change. Test modifications or generic data have to be justified in detail.
- "Further applicable conditions", comments and notes need attention, as they provide important hints and limitations.
- In order to use all functions in EXCEL, macros have to be allowed.

Form provided by ZVEI - Revision 5.0 - Dezember 2021

History of DeQuMa

Version	Remarks
2.0	Revised by ZVEI PCN Methodology Workgroup in March 2015
2.1	Released March 2015
2.1.1	Active Components - delete write protection in comments
2.2	Solved problems with some ActiveX configurations
2.2.2	Solved Problems in Active Components
2.2.3	Solved Problems ActiveX, Active Components SEM-DE-02 (Design changes in routing) error fixed
2.2.4	Minor fixes
3.0	General Revision by ZVEI PCN Methodology Workgroup in June 2016 Changes are indicated by underlining in the read only version named Changes_DeQuMa_rev3_vs_rev2.xlsx
3.0.4	Expert Release
3.0.5	Fixing of macro bugs
3.1	Final Release (orthographic and punctuation corrections)
4.0	General Revision by ZVEI PCN Methodology Workgroup in July 2019. Multi Chip Modules newly added to DeQuMa LED Components now based on the AEC Q102 Further Changes see separate PDF's <u>Excel-File</u> , where changes are indicated by underlining
4.1	LED worksheet: Content of columns had been swapped due to rearrangement and omission of columns.
5.0	General Revision by ZVEI PCN Methodology Workgroup in October 2021. Add MEMS pressure sensor

Worked on	Max Mustermann
Main Function	
Signature	
Date	
PCN number	

Red change with an "X"

				Device evaluation																												additional to AEC-Q104	Remarks		
				MATERIAL PERFORMANCE TEST RESULTS on the basis of AEC-Q104 Revision September 14, 2017																															
ID	Type of change	Potential Impact?	Understanding of semiconductor experts	Examples to explain	Further applicable conditions	AEC-Q104 Revision September 14, 2017																												Additional to AEC-Q104	
						1. No mechanical / electrical test / functional performance	2. Mechanical test / functional performance	3. Electrical test / functional performance	4. Thermal test / functional performance	5. Mechanical test / functional performance	6. Electrical test / functional performance	7. Thermal test / functional performance	8. Mechanical test / functional performance	9. Electrical test / functional performance	10. Thermal test / functional performance	11. Mechanical test / functional performance	12. Electrical test / functional performance	13. Thermal test / functional performance	14. Mechanical test / functional performance	15. Electrical test / functional performance	16. Thermal test / functional performance	17. Mechanical test / functional performance	18. Electrical test / functional performance	19. Thermal test / functional performance	20. Mechanical test / functional performance	21. Electrical test / functional performance	22. Thermal test / functional performance	23. Mechanical test / functional performance	24. Electrical test / functional performance	25. Thermal test / functional performance	26. Mechanical test / functional performance	27. Electrical test / functional performance	28. Thermal test / functional performance		
Assessment of impact regarding following aspects - contractual agreements - technical interface of hardware/availability/manufacturability of customer - form, fit, function, quality performance, reliability																																			
CONTRACTUAL AGREEMENTS																																			
MCM-AN-01	Any change with impact on signed up technical contractual agreements	P	P	Referenced to be used for other type of change to indicate to the change affect agreed technical contractual agreements.	-																														
MCM-AN-02	Any change with impact on processability/manufacturability of customer, which is not covered in the main table	P	P	Any change which is not covered in the main table but see assessment at customer's recommendation.	B																														
DATA SHEET																																			
MCM-DS-01	Change of data sheet parameter/qualification specification (pin, max, typ, value) and/or ACDC specification	P	P	Scope of data sheet because of technical change of the device	A																														
MCM-DS-02	Correction of data sheet errors	I	I	No technical change of product, process or test. New specification of parameter which was not specified before or which is different from latest specification. Please identify clearly that the row contains the type of change	A																														
MCM-DS-03	Specification of additional parameters	I	P	Definition of a new or previously omitted parameter. No technical change of the device. B. Definition of new parameter which was not specified before. C. No technical change. Only in combination with other changes.	B																														
DESIGN																																			
MCM-DE-01	Form factor modification	I	P	Any change in form factor or package which affects the mechanical, electrical or thermal interface of the device. B. Form factor modification or other change of functional performance of the customer (Bug fix). C. Form factor modification or other change of functional or reliability performance of the customer	A																														
MCM-DE-02	Change that adds or subtracts sub-components from the module BOM	P	P	Change that adds or subtracts sub-components from the module BOM	A																														
MCM-DE-03	Substrate change affecting module external connections (change in the number of pins, pitch, etc.)	P	P	Change that affects the electrical and mechanical interface of the device. B. Change that affects the electrical and mechanical interface of the device. C. Change that affects the electrical and mechanical interface of the device.	A																														
PROCESS / ASSEMBLY / TEST																																			
MCM-PA-01	Replacement of any sub-component by a Non-AEC qualified sub-component	P	P	Change from an AEC Qualified sub-component to a Non-AEC Qualified sub-component B. Change from a Non-AEC Qualified sub-component to an AEC Qualified sub-component	A																														
MCM-PA-02	Replacement of any sub-component by an AEC qualified sub-component	P	P	Change from an AEC Qualified sub-component to another AEC Qualified sub-component B. Change from a Non-AEC Qualified sub-component to an AEC Qualified sub-component	A																														
MCM-PA-03	Replacement of any sub-component by an AEC qualified sub-component Critical characteristics of sub-component are affected	I	P	Critical characteristics are those which have a significant effect on form, fit, function, and/or reliability. Use of DPC criteria and SPC testing are required.	C																														
MCM-PA-04	Change which a sub-component that has been qualified Critical characteristics of sub-component are affected	P	P	Critical characteristics are those which have a significant effect on form, fit, function, and/or reliability. Use of DPC criteria and SPC testing are required.	A																														
MCM-PA-05	Change which a sub-component that has been qualified Critical characteristics of sub-component are affected	I	P	Critical characteristics are those which have a significant effect on form, fit, function, and/or reliability. Use of DPC criteria and SPC testing are required.	C																														
MCM-PA-07	Change in the process used to make assembly (e.g. pick & place, die attach, bonding, solder, rework, etc.)	P	P	Change in the process used to make assembly (e.g. pick & place, die attach, bonding, solder, rework, etc.)	C																														
MCM-PA-08	Process change affecting qualification	P	P	Change in the process used to make assembly (e.g. pick & place, die attach, bonding, solder, rework, etc.)	C																														
MCM-PA-09	Change to materials used in module assembly (e.g. adhesive, underfill, encapsulant, solder, epoxy, bump, etc.)	P	P	Change of used material (e.g. bump material, die attach material, underfill, epoxy, etc.) B. Change of used material (e.g. bump material, die attach material, underfill, epoxy, etc.) C. Change of used material (e.g. bump material, die attach material, underfill, epoxy, etc.)	C																														
MCM-PA-10	Change of direct material supplier	P	P	Change of supplier for direct materials which are used in the process (BOM) B. Change of supplier for direct materials which are used in the process (BOM) C. Change of supplier for direct materials which are used in the process (BOM)	C																														See change of material.
MCM-PA-11	Change to assembly location (Move all parts of production to a different assembly site)	P	P	Assembly transfer or relocation B. Assembly transfer or relocation C. Assembly transfer or relocation	A																														Where there has to be done on mounting board AEC-Q104: The board changes that involve multiple attributes (e.g. wire, material, process), refer to section 4.3 of the appendix and section 2.2 of Q104, which allows for the selection of appropriate test vehicles to cover the process/parameter.
MCM-PA-12	Change of product marking	I	P	Change of marking on device and / or change in marking on the test process. B. Change of marking on device and / or change in marking on the test process. C. Change of marking on device and / or change in marking on the test process.	B																														
PACKAGING / TESTING																																			
MCM-PS-01	Package/technology specification change	P	P	Package/technology specification change	A																														
MCM-PS-02	Die pack requirements change	I	P	Die pack requirements change	B																														
MCM-PS-03	Change of carrier tray used	P	P	Change of carrier tray used	B																														
MCM-PS-04	Change of labeling	I	P	Change of labeling on device and / or change in marking on the test process. B. Change of labeling on device and / or change in marking on the test process. C. Change of labeling on device and / or change in marking on the test process.	B																														
EQUIPMENT																																			
MCM-EQ-01	Production from a new equipment which uses a different tool, technology or which due to its unique form or function cannot be replaced to influence the integrity of the test process	P	P	Change in process technique	A																														
MCM-EQ-02	Production from a new equipment which uses the same tool, technology (replacement equipment or replacement equipment used without change of process)	P	P	Change in process technique	C																														
MCM-EQ-03	Change in testing station (Change in test lead equipment type leading to a different test concept)	P	P	Change in testing station (Change in test lead equipment type leading to a different test concept)	C																														Change FSR1 / risks combination
TEST FLOW																																			
MCM-TF-01	Change in test flow (Change in test lead equipment type leading to a different test site)	P	P	Change in test flow (Change in test lead equipment type leading to a different test site)	C																														Change FSR1 / risks combination
DATE																																			

B	Component does not change or change required	<input type="checkbox"/>
C	Capacitive trimmers only	<input type="checkbox"/>
F	Film products only	<input type="checkbox"/>
N	Networks only	<input type="checkbox"/>
R	Resistors only	<input type="checkbox"/>
S	SMD components only	<input type="checkbox"/>
W	Wound products only	<input type="checkbox"/>
Y	Component not hermetically sealed	<input type="checkbox"/>
Note 1:	For parts marked with 'N' only. Laser and stamp marked parts shall be exempt.	<input type="checkbox"/>
=> Please mark 'N' with 'Y', default is 'YES'		