

DeltaQualifikationsMatrix

Allgemeines

Kurze Produkt- und Technologiezyklen elektronischer Bauelemente sowie neue Umweltauflagen führen häufig zu prozess- und werkstofftechnischen Änderungen an Bauelementen, Leiterplatten, Verbindungstechnik und Schaltung, welche evaluiert werden müssen. Eine geeignete Methodik zur Handhabung von Änderungen an elektronischen Bauelementen beschreibt die ZVEI "Guideline for Customer Notifications of Product and/or Process Changes (PCN) of Electronic Components specified for Automotive Applications". Ein wesentlicher Teil dieser Guideline sind die hier vorliegenden Matrizen, welche sich als Empfehlungen für die Evaluierung von typischen Änderungen an elektronischen Bauelementen verstehen. Dies sollte Teil des offenen und risikobewussten Dialoges zwischen Lieferant und Kunden sein.
Diese DeltaQualifikationsMatrizen wurden durch den Industriearbeitskreis "PCN DeltaQualifikationsMatrix" und den Bautelexperten des ZVEI Arbeitskreis "PCN-Methodik" erarbeitet. Der Inhalt wurde basierend auf dem aktuellen Stand der Technik erstellt und erhebt keinen Anspruch auf Vollständigkeit. Im Einzelfall ist ggf. ein abweichendes Vorgehen abzustimmen, da kundenspezifische Vereinbarungen zur Qualifikation zu berücksichtigen sind.

Anwendung der DeltaQualifikationsMatrix (auszufüllen durch den Bauelementhersteller)

- a) Diese Tabelle ist nur bei Änderungen anzuwenden. Neuqualifikationen und Sonderqualifikation (z.B. Verguß von Modulen) sowie Information Notes bleiben von diesen Matrizen unberührt.
- b) Ist eine Änderung in dieser Tabelle nicht aufgeführt, so ist der Qualifikationsumfang zwischen Kunde und Lieferant abzustimmen.
- c) Die Matrix der Aktiven Bauelemente ist so aufgebaut, dass zwischen integrierten Halbleitern (AEC-Q100 Rev. H) und diskreten Halbleitern (AEC-Q101 Rev. D1) auszuwählen ist (Zelle D4). Für passive Bauelemente gilt die AEC-Q200. Für LED's gilt die AEC-Q102. Für Multi-Chip-Module gilt die AEC-Q104.
- d) Alle Änderungen in der PCN sind in der Spalte B durch ein Kreuz (x) zu markieren und werden dadurch farblich hervorgehoben. Sofern dies geschehen ist, werden im Feld "Tests, which should be considered for the appropriate process change" alle in Betracht zu ziehenden Zuverlässigkeitstests angezeigt.
- e) In "Tests, which should be considered for the appropriate process change after selection of condition table" wird die Anpassung der in Betracht zu ziehenden Tests in Folge der Relevanz bezüglich der Änderung berücksichtigt.
- Dazu ist die Tabelle "Conditions" entsprechend der Auswahl (A/B/C) mit einem (x) zu bewerten.
- f) In "Suppliers performed tests" dokumentiert der Bauelementhersteller die durchgeführten bzw. geplanten Tests.
- g) Falls von der Testempfehlung abgewichen wird, so sollten diese Abweichungen vom Bauelementhersteller angezeigt und kommentiert werden. Hierzu ist der Bereich "Reason for exception of tests" zu verwenden. Werden die in Betracht zu ziehenden Tests durch generische Daten (G) belegt, ist dies ebenfalls hier anzugeben und zu begründen.

Die Einstufung des Untersuchungslevel erfolgt in folgende Kategorien

- "C: Component level": Die Evaluierung der Änderung am Bauelement ist durch Untersuchungen ausschließlich am Bauelement beim Bauelementhersteller durchführbar. Zur Evaluierung der Änderung dürfen Ergebnisse aus bereits durchgeführten Untersuchungen herangezogen werden, wenn diese zu einem ähnlichen Bauelement bereits vorliegen (**Generische Daten**).
- "B: Board level": Die beschriebene Änderung hat möglicherweise Einfluss auf die Verarbeitbarkeit des Bauelements im Steuergerät. Die Evaluierung der Änderung wird wie unter C beim Bauelementhersteller durchgeführt. Zusätzlich ist durch den Kunden/Steuergerätehersteller die Verarbeitbarkeit zu prüfen, die z.B. abhängig von der Änderung, Zuverlässigkeitstests untersuchungen auf applikationsrelevanten Testboards erforderlich.
- "A: Application level": Die beschriebene Änderung hat möglicherweise Einfluss auf die Applikation/ das Steuergerät. Die Evaluierung der Änderung wird wie unter C oder B durchgeführt. Zusätzlich ist vom Kunden/Steuergerätehersteller der Einfluss der Änderung im Steuergerät durch geeignete Untersuchungen zu bewerten. Dieses Vorgehen ist mit dem OEM abzustimmen. Hierbei ist zu berücksichtigen, ob die Steuergeräte-/ Baugruppenanforderungen durch andere Qualifikationen bereits hinreichend abgesichert sind (**applikationspezifische Risikobetrachtung**).

" *: Not relevant for qualification matrix": Änderungen(en), die nicht in A, B oder C eingestuft werden können und somit nicht relevant für die DeQuMa sind

Information Notes

Änderungen die nur eine Information Note benötigen (bei der Bewertung Risk on Supply Chain als "I" gekennzeichnet), dürfen nicht in der DeQuMa angekreuzt werden, da Sie ansonsten den erforderlichen Evaluierungslevel verfälschen. Für als "I" bewertete Änderungen ist das Information Note Formblatt zu verwenden.

Wichtige Hinweise

- Zur formgerechten Anwendung der DeltaQualifikationsMatrizen steht auf der Homepage des ZVEI AK ein Tutorial bereit (ZVEI-Tutorial).
- ID Nummer: ist eine eindeutige Identifikationsnummer für jede angegebene Änderung, die in den ZVEI PCN DeltaQualifikationsMatrizen identifiziert ist. Die gleiche ID Nummer wird zur Identifizierung der Änderung im PCN Form Sheet verwendet.
- Die mittels Matrix identifizierten Tests sind in **Betracht zu ziehen**, d.h. es ist zu prüfen, ob der jeweilige Test für die spezifische Änderung in dieser Form notwendig ist. Abweichungen oder generische Daten sind im Detail zu begründen.
- Die Spalte "Further applicable conditions", Bemerkungen und Fußnoten sind unbedingt zu beachten, da sie wichtige Hinweise und Einschränkungen enthalten.
- Zur Nutzung aller Funktionen muss in Excel die Anwendung von Makros freigegeben sein.

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.
- d) 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 level by the component manufacturer is sufficient. Generic data from other relevant evaluations can be used.

"B: Board level": The intended change described in the PCN may influence processability / manufacturability of the component at board level. Therefore additional evaluation by customer may be necessary, for example reliability tests on application relevant testboards, depending on change.

"A: Application level": The intended change described in the PCN may influence the properties of the application (e.g. Electronic Control Unit). 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. The scope of the evaluation has to be aligned with the OEM. 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, 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.

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 Excel-File, where changes are indicated by underlining
4.1	LED worksheet: Content of columns had been swapped due to rearrangement and omission of columns.

Tests, which should be considered for the appropriate process change

• • - • • E• M - • • J E• E• - - - • • • E• E• E• • - - - H - - H - - • • •

Tests, which should be considered for the appropriate process change after selection of condition tabs

Suppliers performed tests (mark with an 'X' for done or 'G' for generic)

G G G G G G G G G G X X X X G

None of the products uses copper wire.

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- Not required.
- Information Note required.
- PCN required.

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Worked on (Name, Function)	Max Mustermann
Date:	
PCN number:	
Signature:	

Device evaluation

Device evaluation

Tests, which should be considered for the appropriate process change.

Tests, which should be considered for the appropriate process change after selection of condition table.

Suppliers performed tests (mark with an "X" for done or "G" for generic)

Permit for exception or total waiver usage of generic data:

Worked on: (Name, Function)	Max Mustermann
Date:	
PCN number:	
Signature:	

Basic		Device evaluation																	additional to AEC-Q101			
		MATERIAL PERFORMANCE TEST RESULTS on the basis of AEC-Q101 Revision - September 14, 2017																		Remarks		
PCN number: Signature:		Evaluation sheet A/A/C																		additional to AEC-Q101		
Mark change with an 'X'		Assessment of impact on Supply Chain regarding following aspects										Remaining aspects of Supply Chain?										
ID		Type of change	No	Yes	Understanding of semiconductors experts		Examples to explain		Further applicable conditions											Remarks		
ANY									Assessments made by the manufacturer													
HCM-DS-01		Any change in or impact on agreed upon electronic contractual agreements	P	I	Intended to be used as the other type of change Indicates the change differs significantly		-		AEC-Q101 Revision - September 14, 2017													
HCM-DS-02		Any change in or impact on processability/manufacturability by customer, which is not covered in the manifest	P	I	Any change which is not intended to be covered in the manifest Indicates the change differs significantly		B		Assessments made by the manufacturer													
DATA SHEET									Assessments made by the manufacturer													
HCM-DS-01		Change of datasheet parameters/electrical specification (min/max/Avg. values) and/or AC/DC specification	P	I	Update of data sheet because of technical change of the component e.g. recommendations for pull-up/pull-down or NC (No Connect)		A		Assessments made by the manufacturer													
HCM-DS-02		Correction of data sheet errors	I	I	e.g. Errors		A		Assessments made by the manufacturer													
HCM-DS-03		Specification of additional parameters	I	P	Description of a new not previously known parameter. No technical change of the product, process or test method. Indicates the change is not intended to be covered in the manifest before or which is different from initial Please indicate clearly, that this does not contain the same information as the previous point		B; e.g. adding new tested parameter;		Assessments made by the manufacturer													
DESIGN									Assessments made by the manufacturer													
HCM-DE-01		Firmware modification	I	P	Integrated software by design or memory as defined and/or function B; e.g. addition of firmwares appropriate if P; bug fix with impact on functional performance		A		Assessments made by the manufacturer													
HCM-DE-02		Change that adds or subtracts sub-components from the module BOM	P	P	e.g. addition of passive elements in filter circuit		A		Assessments made by the manufacturer													
PROCESS / ASSEMBLY / MATERIALS									Assessments made by the manufacturer													
HCM-PA-01		Replacement of any sub-component by a Non-AEC qualified sub-component	P	I	Change from an AEC-Qualified sub-component to a Non-AEC Qualified sub-component Change from a Non-AEC Qualified sub-component to an AEC-Qualified sub-component		A		Assessments made by the manufacturer													
HCM-PA-02		Replacement of any sub-component by an AEC-Q qualified sub-component	P	P	Change from one AEC-Qualified sub-component to another AEC-Qualified sub-component Change from a Non-AEC Qualified sub-component to an AEC-Q Qualifed sub-component Change with an impact on electrical robustness (ESD, latch up, ...), mechanical functionality, test coverage		A		Assessments made by the manufacturer													
HCM-PA-03		Replacement of any sub-component by an AEC-Q qualified sub-component	I	P	I.e. with not impact on electrical robustness (ESD, latch up, ...), mechanical functionality, test coverage		C		Assessments made by the manufacturer													
HCM-PA-04		Change within a sub-component that has been requested	P	P	Change within a sub-component that has been requested B; e.g. impact on electrical robustness (ESD, latch up, ...), mechanical functionality, test coverage		A		Assessments made by the manufacturer													
HCM-PA-05		Change within a sub-component that has been requested	I	P	I.e. with not impact on electrical robustness (ESD, latch up, ...), mechanical functionality, test coverage		C		Assessments made by the manufacturer													
HCM-PA-06		Substrate change affecting module material	P	P	Design changes of the substrate which have an impact to the specified electrical parameter according to the specification Change in material, thickness, dimensions, dielectric constant, ...		A		Assessments made by the manufacturer													
HCM-PA-07		Change to the processes used in module assembly (e.g., pick & place, die attach, bonding, infill, encapsulation, reworking, etc.)	-	P	If the change in process technology does not influence the integrity of the final product, the manufacturer can indicate that the change does not influence the integrity		C		Assessments made by the manufacturer													
HCM-PA-08		Process integrity tuning within specification	-	P	I.e. if the change in process technology does not influence the integrity of the final product, the manufacturer can indicate that the change does not influence the integrity		C		Assessments made by the manufacturer													
HCM-PA-09		Change of materials and/or module assembly (e.g., adhesive, underfill, encapsulates, solder, epoxy, bump, general, die attach, reworking, etc.)	P	P	Change of materials and/or module assembly (e.g., adhesive, underfill, encapsulates, solder, epoxy, bump, general, die attach, reworking, etc.)		C		Assessments made by the manufacturer													
HCM-PA-10		Change of direct material supplier	-	P	Change of supplier for direct materials which are used in assembly process (BCN, PCB, ...)		C		Assessments made by the manufacturer													
HCM-PA-11		Change to assembly location Place of origin/production is in a different assembly site	P	P	Assembly transfer or relocation Transfer of assembly to an additional location		C		Assessments made by the manufacturer													
HCM-PA-12		Change of product marking	I	P	Change of marking on device and/or change in marking of the assembly (e.g. change of appearance (additional marking))		B		Assessments made by the manufacturer													
DESCRIPTIONS									Assessments made by the manufacturer													
HCM-PS-01		Change affecting production lot size	-	P	Change affecting production lot size		-		Assessments made by the manufacturer													
HCM-PS-02		Change of requirements/lot size	-	P	Change of lot pack requirements or change of lot size		-		Assessments made by the manufacturer													
HCM-PS-03		Change of control times/lead	P	P	Change of control times/lead		B		Assessments made by the manufacturer													
HCM-PS-04		Change of labeling	I	P	Change of labeling also/relabel (e.g. Change of material label without impact on quality) (e.g. Change of material label without impact on quality)		B		Assessments made by the manufacturer													
EQUIPMENT									Assessments made by the manufacturer													
HCM-EQ-01		Production from a new equipment/technology which uses a different basic technology or which due to its unique function or function can be expected to influence the integrity of the final product	P	P	Change in process technology which is not already covered above (e.g. laser cutting, ...)		A		Assessments made by the manufacturer													
HCM-EQ-02		Production from a new equipment/technology which uses the same basic technology (replacement equipment or extension of existing equipment) without change of process	-	P	PQ required for dedicated equipment for sensitive component production (e.g. a/g. reworking of existing equipment and/or a/g. reworking of new equipment in case of new technology) PQ = Impact on product integrity is anticipated		C		Assessments made by the manufacturer													
HCM-EQ-03		Change of test platform	P	P	Change of test platform (differences in T/T or Test fixture) PQ = Impact on product integrity is anticipated		C		Assessments made by the manufacturer													
TEST FLOW									Assessments made by the manufacturer													
HCM-TF-01		Marking change with an 'X'	-	P	Marking change with an 'X'		-		Assessments made by the manufacturer													

Worked on: (Name, Functions)	Max Mustermann
Date:	
PCN number:	
Signature:	

Device evaluation

更多資訊請到 www.104.com.tw 請到 104 線上履歷申請，或撥打 104 專線 02-2787-2222

additional to AE
Q200

0.6um BICMOS Vanguard Qualification Summary

TABLE 1A: LTC4270 QUALIFICATION RESULTS

TEST	SPECIFICATION	SAMPLE SIZE (LOTS X SAMPLE)	RESULTS
High Temperature Operating Life (HTOL)	JEDEC JESD22-A108	3 x 77	Pass
Highly Accelerated Stress Test (HAST)**	JEDEC JESD22-A110	3 x 77	Pass
Temperature Cycle (TC)**	JEDEC JESD22-A104	3 x 77	Pass
Autoclave (AC)**	JEDEC JESD22-A102	3 x 77	Pass
High Temperature Storage Life (HTSL)	JEDEC JESD22-A103	3 x 45	Pass
Early Life Failure Rate (ELFR)	MIL-STD-883, M1015	3 x 800	Pass

TABLE 1B: LTC3850 QUALIFICATION RESULTS

TEST	SPECIFICATION	SAMPLE SIZE (LOTS X SAMPLE)	RESULTS
High Temperature Operating Life (HTOL)	JEDEC JESD22-A108	3 x 77	Pass
Highly Accelerated Stress Test (HAST)**	JEDEC JESD22-A110	3 x 77	Pass
Temperature Cycle (TC)**	JEDEC JESD22-A104	3 x 77	Pass
Autoclave (AC)**	JEDEC JESD22-A102	3 x 77	Pass
High Temperature Storage Life (HTSL)	JEDEC JESD22-A103	3 x 45	Pass
Early Life Failure Rate (ELFR)	MIL-STD-883, M1015	3 x 800	Pass

TABLE 1C: LTC3112 QUALIFICATION RESULTS

TEST	SPECIFICATION	SAMPLE SIZE (LOTS X SAMPLE)	RESULTS
High Temperature Operating Life (HTOL)	JEDEC JESD22-A108	3 x 77	Pass
Highly Accelerated Stress Test (HAST)*	JEDEC JESD22-A110	3 x 77	Pass
Temperature Cycle (TC)*	JEDEC JESD22-A104	3 x 77	Pass
Autoclave (AC)*	JEDEC JESD22-A102	3 x 77	Pass
High Temperature Storage Life (HTSL)	JEDEC JESD22-A103	3 x 45	Pass
Early Life Failure Rate (ELFR)	MIL-STD-883, M1015	3 x 800	Pass