

**Bump Site Transfer and Qualification of Select 6L and 8L SOT23
Flip Chip on Lead Packages**

**Automotive Qualification Plan Summary for
6-SOT_23 at CARSEM**

TEST	SPECIFICATION	SAMPLE SIZE	EXPECTED COMPLETION DATE
Temperature Cycle (TC)*	JEDEC <i>JESD22-A104</i>	3 x 77	Sept 2018
Solder Heat Resistance (SHR)*	JEDEC/IPC <i>J-STD-020</i>	3 x 11	Sept 2018
High Temperature Storage Test (HTS)	JEDEC <i>JESD22-A103</i>	1 x 77	Sept 2018
Temperature, Humidity and Bias Test (THB)*	JEDEC <i>JESD22-A101</i>	3 x 77	Sept 2018
Unbiased Highly Accelerated Stress Test (UHAST)*	JEDEC <i>JESD22-A118</i>	3 x 77	Sept 2018
Electrostatic Discharge <i>Field Induced Charge Device Model</i>	ANSI/ESDA/JEDEC <i>JS-002</i>	3/voltage	Sept 2018

* These samples will be subjected to preconditioning (per J-STD-020 Level 3) prior to the start of the stress test. Level 3 preconditioning consists of the following: 1. Bake – 24 hours at 125°C; 2. Soak – unbiased soak for 192 hours at 30°C, 60%RH; 3. Reflow – three passes through a reflow oven with a peak temperature of 260°C. TC samples will be subjected to wire-pull test after 500 cycles where results should be within specification limits.

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**Qualification Plan Summary for
SOT at CARSEM**

TEST	SPECIFICATION	SAMPLE SIZE	EXPECTED COMPLETION DATE
Temperature Cycle (TC)*	JEDEC <i>JESD22-A104</i>	3 x 77	Sept 2018
Solder Heat Resistance (SHR)*	JEDEC/IPC <i>J-STD-020</i>	3 x 11	Sept 2018
Temperature, Humidity and Bias Test (THB)*	JEDEC <i>JESD22-A101</i>	3 x 77	Sept 2018
High Temperature Storage (HTS)	JEDEC <i>JESD22-A103</i>	1 x 77	Sept 2018
Electrostatic Discharge <i>Field Induced Charge Device Model</i>	ANSI/ESDA/JEDEC <i>JS- 002-2014</i>	3/voltage	Sept 2018

* Preconditioned per JEDEEC/IPC J-STD0020.

PCN 18_0064

PCN Title: Bump Site Transfer and Qualification of Select 6L and 8L SOT23 Flip Chip on Lead Packages

Change Items	From	To
Bumping Site	Amkor Taiwan (AT5)	Chipbond, Taiwan (CB4)
Die Level Bumping	High Lead Bumping	Cu Pillar/SnAg Bumping
Assembly	High Lead bumped die Flip Chip on Lead assembly with Solder Screen Printing on leadframe step before Flip Chip attachment on leadframe	Cu Pillar/SnAg bumped die Flip Chip on Lead assembly process where the Solder Screen Printing on leadframe step is replaced with Flux Dip step before Flip Chip attachment on the leadframe

Bump Site Transfer and Qualification of Select 6L and 8L SOT23 Flip Chip on Lead Packages

Automotive Qualification Results Summary for SOT at CARSEM

TEST	SPECIFICATION	SAMPLE SIZE	RESULT
Temperature Cycle (TC)*	JEDEC <i>JESD22-A104</i>	3 x 77	PASS
Solder Heat Resistance (SHR)*	JEDEC/IPC <i>J-STD-020</i>	3 x 11	PASS
Temperature, Humidity and Bias Test (THB)*	JEDEC <i>JESD22-A101</i>	3 x 77	PASS
High Temperature Storage (HTS)	JEDEC <i>JESD22-A103</i>	1 x 77	PASS
Unbiased Highly Accelerated Stress Test (UHAST)*	JEDEC <i>JESD22-A118</i>	3 x 77	PASS
Electrostatic Discharge <i>Field Induced Charge Device Model</i>	ANSI/ESDA/JEDEC <i>JS-002-2014</i>	3/voltage	PASS +/1250V

* These samples will be subjected to preconditioning (per J-STD-020 Level 1) prior to the start of the stress test. Level 1 preconditioning consists of the following: 1. Bake – 24 hours at 125°C; 2. Soak – unbiased soak for 168 hours at 85°C, 85%RH; 3. Reflow – three passes through a reflow oven with a peak temperature of 260°C.

DeltaQualifikationsMatrix

Allgemeines

Kurze Produkt- und Technologiezyklen elektronischer Bauelemente sowie neue Umweltauflagen (Bleiverbot, Flammschutzelemente, ...) 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 Bauteilexperten des ZVEI Arbeitskreises "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)

- Diese Tabelle ist **nur** bei Änderungen anzuwenden. Neuqualifikationen und Sonderqualifikation (z.B. Vergrößerung von Modulen) sowie Information Notes bleiben von diesen Matrizen unberührt.
- Ist eine Änderung in dieser Tabelle nicht aufgeführt, so ist der Qualifikationsumfang zwischen Kunde und Lieferant abzustimmen.
- 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 (Zeile D4). Für Passive Bauelemente gilt die AEC-Q200. Für LED's gilt die IEC 60810.
- 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" (Zeile 83 für Aktive Bauelemente, Zeile 466 für Passive Bauelemente oder in Zeile 77 für LED's) alle in Betracht zu ziehenden Zuverlässigkeitstests angezeigt.
- In "Tests, which should be considered for the appropriate process change after selection of condition table" (Zeile 85 für Aktive Bauelemente, Zeile 468 für Passive Bauelemente oder Zeile 79 für LED's) 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.
- In "Suppliers performed tests" (Zeile 87 für Aktive Bauelemente, Zeile 470 für Passive Bauelemente oder Zeile 81 für LED's) dokumentiert der Bauelementhersteller die durchgeführten bzw. geplanten Tests.
- 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" (Zeile 89 für Aktive Bauelemente, Zeile 472 für Passive Bauelemente oder Zeile 83 für LED's) zu verwenden. Werden die in Betracht zu ziehenden Tests durch generische Daten (**G**) belegt, ist dies ebenfalls hier anzuzeigen 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 Bauelementes 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, Zuverlässigkeitsuntersuchungen auf anwendungsrelevanten Testboards erfordert.
- "**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 (**applikationsspezifische Risikobetrachtung**).
- "***: Not relevant for qualification matrix**": Änderung(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.

DeltaQualificationMatrix

General

Short product and technology cycles as well as new environmental regulations („Pb-free", flame retardants, ...) 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)

- 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.
- If a change is not listed in this table, the qualification plan has to be defined and agreed between customer and supplier.
- 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 IEC 60810 is used.
- 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" (row 83 for Active Components, row 466 for Passive Components, respectively in row 77 for LED's).
- In "Tests, which should be considered for the appropriate process change after selection of condition table" (see row 85 for Active Components, row 468 for Passive Components, or row 79 for LED's) 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).
- In "Suppliers performed tests" (here row 87 for Active Components, row 470 for Passive Components, or row 81 for LED's) the component manufacturer documents the planned and performed tests.
- 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" (see row 89 for Active Components, row 472 for Passive Components, or row 83 for LED's). 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,B nor C definitions

Information Notes

Changes indicated as "I" shall not be marked in the DeQuMA. For those changes the InformationNote 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.

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.

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)

Form provided by ZVEI - Revision 3.1 - December 2010Mark change
with an "X"

[illegible]

A letter of "X" indicates that performance of that stress test should be considered for the appropriate process change.	
CONDITIONS	
A	Only for peripheral routing
B	For typical routing, new core time, temp
C	If found in bathfinger
D	Design rule change
E	Thickness only
F	MIRAS element only
G	Generic Data available
H	Hermetic only
I	EEPROM or EEPROM
J	Lead free
K	For devices requiring PTC
N	Passivation and gate oxide
P	Passivation and intermetallic
Q	Wet diameter decrease
R	Only for Solder Bath DMD
S	Only from non-100% burned-in parts
T	For "burn in" changes IOL or EUPRI recommended
==> Means mark "N" with "Y", default is "YES"	
A letter or "X" indicates that performance of that stress test should be considered for the appropriate process change.	

[illegible]

[illegible]

Tests, which should be considered for the appropriate process change.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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—	Not required
†	Information Note required
p	PCN required

A letter or * indicates that performance of that stress test should be considered for the appropriate process change.	
	CONDITIONS
A	Termination equipment only
B	Ceramics only
C	Can be used (unchanged w/ change) repeat
D	Capacitive trimmers only
F	Film products only
N	Networks only
R	Resistors only
S	SMD components only
W	Wirewound products only
Y	Component not chemically sealed
Note 1:	For parts marked with this only. Laser and stamp marked parts shall be exempt.
	=> Please mark 'X' with 'Y, default is 'YES'

Basis: IEC 60810

Mark change with an "x"

[illegible][illegible]