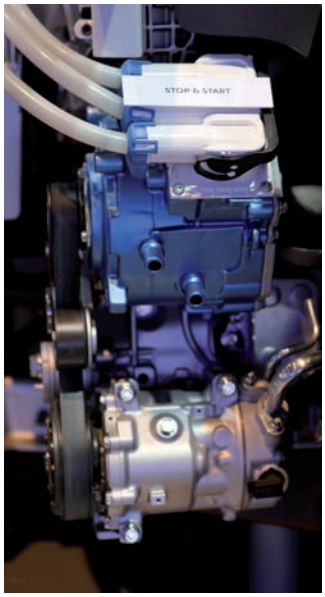
ZVEI:
Die Elektroindustrie

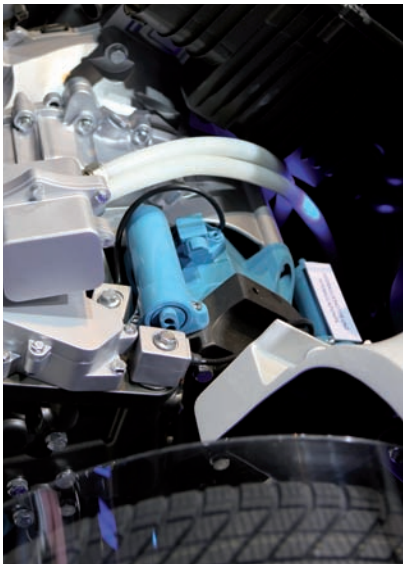
Progress Report

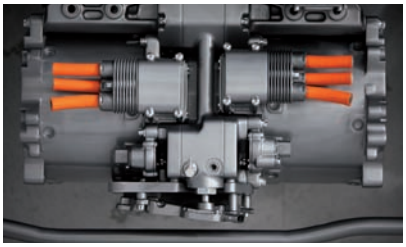
Application Group Automotive

2013/2014







Zentralverband Elektrotechnik- und Elektronikindustrie

ZVEI:
Die Elektroindustrie

Progress Report
Application Group Automotive 2013/2014

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December 2013

Application Group Automotive

Organisation Chart of the Application Group Automotive

Application Group Automotive
J. Weyer, Freescale Halbleiter Deutschland

Steering Committee APG
K. Meder, Robert Bosch

QUALIFICATION

Ad-hoc Group
Failure Parts Analysis[1)]
S. Jegl, Marquardt

Working Group
Robustness Validation Forum[1) 2)]
Dr. J. Breibach, Robert Bosch

Working Group
Quality – Zero Defect Strategy[5)]
I. Trojok, Epcos

SUPPLY CHAIN

Ad-hoc Group
Part Change Notification Method
W. Ratering, Hella KGaA Hueck[7)]

Working Group
Component Cleanliness[1)]
Dr. M. Nikolussi, Robert Bosch

Working Group
Supply Chain Management[1)]
H. Ehm, Infineon Technologies

TECHNOLOGY

Working Group
Electro-Mechanical Interfaces
S. Hauptenbuchner, Kostal

Working Group
Process Reliability[1)]
Prof. H.-J. Albrecht, Siemens

Ad-hoc Group
High Voltage Cables and Interconnection Technology[3)]
Dr. H. Kalb, Leoni Kabel

Working Group
Software Release
H.-G. Frischkorn, ESG

Working Group
First-Mate-Last-Break
Ch. Thienel, Robert Bosch

Working Group
High Temperature & Power Electronics[6)]
Dr. M. Rittner, Robert Bosch

Task Force
End of Life Vehicles[4)]
B. Eilken, Infineon Technologies

Working Group
Functional Safety
B. Arends, Marquardt

[1)] Working Group of the Technical Committee reports to the APG
[2)] In collaboration with the SAE
[3)] Committee of the ZVEI Cable Division that also reports to the APG
[4)] ZVEI delegation to CLEPA Working Group
[5)] Zero Defect Strategy is covered by the Working Group Quality of the Technical Committee and reports also to the APG
[6)] Sub-Groups: Team High Temperature Electronics (Dr. M. Rittner, Robert Bosch) and Team Power Electronics (M. Münzer, Infineon Technologies) in collaboration with the ECPE (European Centre for Power Electronics)
[7)] Former Chairman until 11/2013: Dr. O. Autzen, Robert Bosch

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Preface by the Chairman of the Steering Committee APG

Klaus Meder
Chairman of the APG Steering Committee

Source: Robert Bosch

In 2014 the ZVEI Application Group Automotive (APG) is celebrating its 10th anniversary. Started in 2004 with a group of Tier-1 and automotive component suppliers, the APG has constantly grown and is an accepted partner within the automotive community nowadays. Within this decade the global automotive industry has faced dramatic changes – a still ongoing process.

While the business opportunities for the Tier-1 and component suppliers have steadily grown over this period – underlining their importance within the automotive value chain – automotive suppliers are facing new challenges with an increasing number of risks that have to be monitored.

The ongoing transfer of sales and production towards Asia, especially China, and emerging markets, with stagnation in Europe, is confronting automotive suppliers with underutilization of structural resources that require capacity adjustments in the western European markets. Fortunately the German OEMs and the premium segment are gaining relative importance, due to the high export ratio – thus a volume slowdown in key markets like China would have a global impact for the suppliers that may be difficult to compensate.

Driven by the OEMs and the demands of emerging markets, suppliers are forced to establish a global footprint (in vicinity to the local production sites of the OEMs), resulting in increasing investment e. g. in global R&D accompanied by growing management complexity and coordination needs.

New business opportunities with higher margins are possible due to platform strategies and modular toolkit approaches by the OEMs. Thus the automotive suppliers are facing higher risks due to strengthened OEM negotiation position and increasing financial investments in the predevelopment phase.

This trend is also driven by new technologies. Automated driving, electric mobility and increasing connectivity of the vehicle are challenging the position of suppliers within the automotive value chain with new players entering the market and new business models.

To meet all these future challenges and trends within the automotive value chain the APG has focused its activities on three thematic areas: Quality, Supply Chain and Technology. The main goals are the optimization of processes, the coordination of quality topics along the entire value chain at a precompetitive level or the standardization of requirements and the development of best practice recommendations.

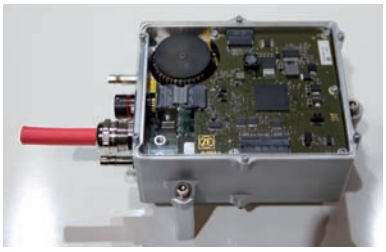
Primarily focused on hardware- and quality-related topics the APG has broadened its activities over the years with the foundation of the ZVEI Centre of Excellence (CoE) in electric mobility in 2008 opening for new players (e. g. engineering service providers) and across industries. In 2012 the new working group 'Automotive Software' was established to meet the increasing importance of Automotive Software as a key enabling technology for the development of new complex functionalities with higher innovation cycles (closer to the classical consumer electronic industry).

One major topic in 2014 will be the consolidation of all automotive activities – APG, Electric Mobility and Automotive Software – into a new organizational structure within the ZVEI.

Finally, I would like to thank all working group members for their efforts and their contribution to the achievement of outstanding results in the recent years.

Klaus Meder
Chairman of the APG Steering Committee

History of the Application Group Automotive – Visions and Goals



Source: ZVEI

History of the APG

Due to the increasing complexity and variety of the automotive electrical components in recent years, the ZVEI, as one of the largest association in Germany, has broadened its activities in automotive electronics on a competitively neutral basis. Already existing activities, mostly driven by the ZVEI Division Electronics Components and Systems, were bundled in the APG in 2004. Meanwhile the APG is a common board of the Electronic Components and Systems Division and the PCB and Electronic Systems Division within the ZVEI.

Under the lead of Dr. Martin Stark, Freudenberg, the APG developed in an outstanding way. Since 2007 Peter Gresch, Brose Fahrzeugteile, has continued this work successfully. Thus the APG has found a broader recognition and acceptance within the automotive community by intensifying its public relations activities. In 2011 Jürgen Weyer, Freescale Freescale Halbleiter Deutschland, became Chairman of the APG.

The increasing application of automotive electronics in recent years caused a substantial shift of development tasks toward the component and system manufacturers, a trend that is also seen in the work of the APG. The enduring growth of the APG in terms of members and tasks created a powerful committee authorized to act in the name of its represented companies. The APG generates an increased awareness for electronic problems and the development of a common understanding with the car manufacturers since 2004.

Additionally, a Steering Committee with top managing directors of important component manufacturers and system suppliers has been established in 2005. This Steering Committee supports and accompanies the structuring process of the tasks within the APG.

Source: Robert Bosch

The APG working groups, focussing on specific topics in detail, are the basis of the common activities under the roof of the APG. The final results of these activities are published in form of brochures, recommendations or guidelines.

Vision and Goals

Our goal is to concentrate and coordinate all automotive-specific activities within the ZVEI mainly represented by the Electronic Components and Systems Division and the PCB and Electronic Systems Division.

We strive for an 'integral' consideration of the electrical-electronic systems 'as a whole'. We intend to collaborate with all stakeholders beyond the borders of our association. One of our goals, that we pursue, is the avoidance of double work and divergences in the requirements by an early reconciliation between all partners of the supply chain.

For the efficiency of our work a cooperation and reconciliation with the VDA is aspired. Our priority is the consciousness-raising for problems referring to automotive electronics and since 2012 to automotive software and the search for common solutions with the OEMs. Substantial topics are: 'Reliability' and 'Qualification' of the components, series quality, delivery security, long-term supply.

By constantly pursuing these goals, we contribute to the stabilization of the competitive abilities of our member companies.

Report by the Chairman of the Application Group Automotive

Jürgen Weyer
Chairman of the APG

Source: Freescale Halbleiter Deutschland

Automotive Industry – A Challenge in Many Dimensions

Having lived through the rollercoaster ride from 2008 to 2011 we are now seeing overall single digit car volumes increases per year however, as predicted, with massive changes in mix, technology and geography in which key to success is a true global footprint for all participants.

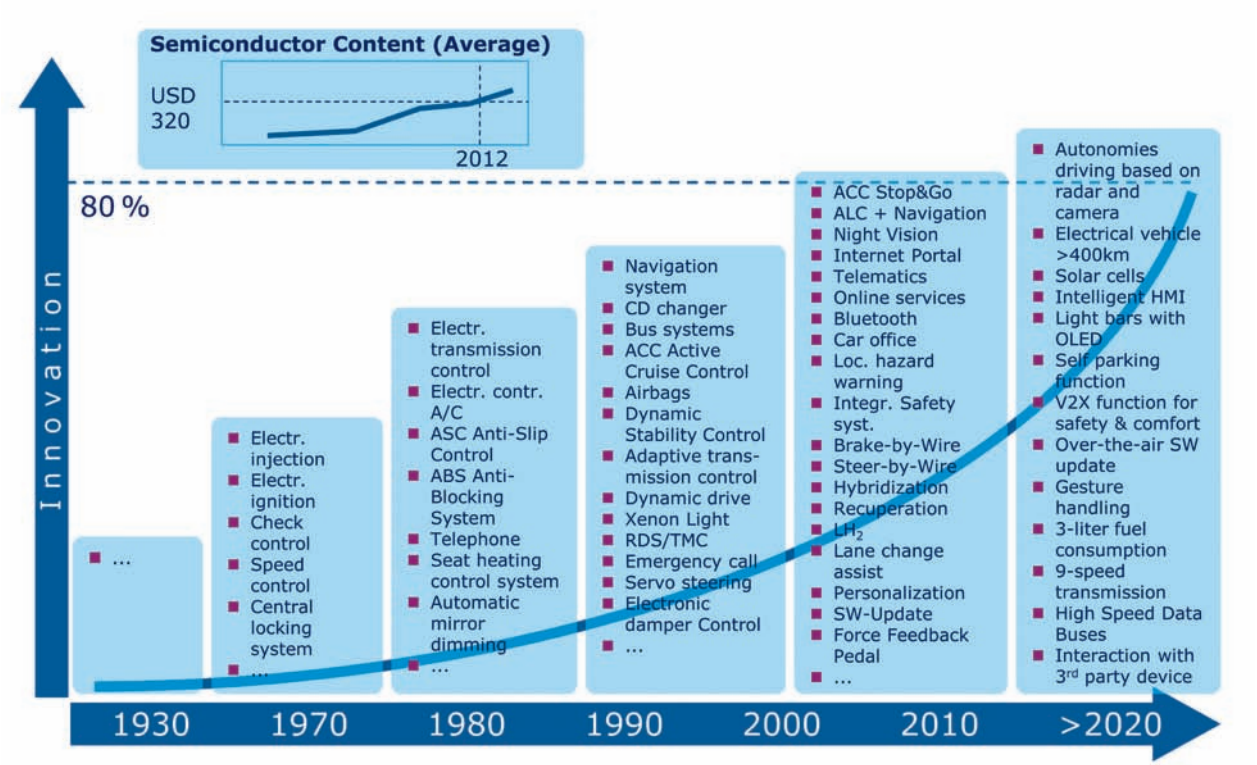
At the same time with electronics at the core of most innovations electronic content, driven by greener, safer, more comfortable, secure and interconnected vehicles, is continuously increasing – great news for our industry. The vision for the autonomous car is becoming step by step a reality over the next decade.

The growing importance of software and services is widely acknowledged throughout the entire automotive supply chain and for exactly that reason we have expanded our activities in that domain within our APG and are happy to welcome many new members helping our industry to cope with those massive challenges.

A Top Priority Remains – Quality –

Our quest for Zero ppm will continue and can only be accomplished by addressing the challenge along the entire value chain – and we have to accept that given, the significant increase in complexity both in hardware and software. We need to specifically address the interdependencies of all that content within the entire vehicle. However with many applications from the consumer segment getting into the vehicle we need to understand and accept potential technical and commercial trade-offs.

80 percent of new innovations in cars are enabled by semiconductors



Source: Infineon Technologies

Application Group Automotive – The Challenge Continues

Given those challenges at hand the APG will continue to drive key critical areas based on a unique combination of skill sets coming from its supporting members.

A key issue on the way to 'Zero ppm' is a fast reaction on failures and apply lessons learned to avoid recurrence. A ZVEI workgroup addresses the failure management process along the value chain and focuses on the 'No Trouble Found' (NTF), 'failures', which cannot be verified in the analysis and the root cause cannot be found. An essential aspect will not only be the failure identification and analysis but also the failure prevention.

Source: Robert Bosch

Therefore a holistic and continuous traceability will be mandatory to meet these needs. An intersectoral ZVEI working group – including members of the APG – has published a recommendation how such a traceability system can be set up.

Robustness Validation and the many derivative names of it – like 'Fit for Function' or 'Robust Design' – is becoming reality by understanding the true requirement with the application. The results of the successful joint activities of the ZVEI with international partners SAE and JSAE on the subject of Robustness Validation have been summarized in five handbooks since 2005.

The knowledge about the component, module or system behaviour within in the application (Mission Profile) is helping to prevent failing applications at start of production. Meanwhile German OEMs have encountered the benefit from the approach and introduced the Robustness Validation approach within their qualification framework.

In addition, the recently introduced white paper on 'First-Mate-Last-Break' (FMLB) has shown additional areas for future improvements with the full potential to be realized in future car architectures.

Broadening the Network – Cooperation's and Partnerships

Recent activities of the APG are on the intensification of the cooperation along the value chain – particularly on the subject of electromobility – with the ZVEI Divisions 'Batteries and Cables', 'Installation Technology' and 'Energy'. Four technical working groups (TWG) have been established to bundle and coordinate all activities of the ZVEI members in the field of components, systems and infrastructure regarding electric mobility.

Source: ZVEI

Due to successful partnerships and cooperation's with important, thematically related organization outside of Germany, like CLEPA, SAE, FIEV the APG could strengthening its influence and awareness on an international scale e. g. in the areas of Robustness Validation, Revision of ELV Annex II.

Nationally, the discussion with the German OEMs about possibilities of potential cost savings was intensified. Furthermore Robustness Validation was also integrated in the VDA-QMC training courses. The collaboration with the European Centre of Power Electronics (ECPE) within the joint working group 'Power Electronics' focuses on Robustness Validation for power electronics and the annotation of the VDA delivery specification on reliability tests for power electronics modules.

Outlook

With functional safety and security reaching a wide range of automotive applications we will continue to focus many new activities in that domain. This will – as already said – include a specific focus on software and services.

At the end all of that innovation and technology will have little value if we don't look at all ways to secure supply including scenario planning for any potential crisis or short supply situation. Our industry has been excellent to react – let's turn this knowledge into a much more proactive approach. Many topics within the APG are specifically targeted to support these challenges and provide direction for new ways of thinking.

I am excited about the opportunity and convinced that there are many areas where the ZVEI and specifically the APG – which is truly a unique way of cooperation across the industry worldwide – will enable our members to drive innovations and help the automotive industry to keep our competitive advantage.

I am looking forward to seeing you all in Munich in December andand review our progress in much more details.

Jürgen Weyer

Chairmen of the Application Group Automotive

Ad-hoc Working Group Failure Parts Analysis

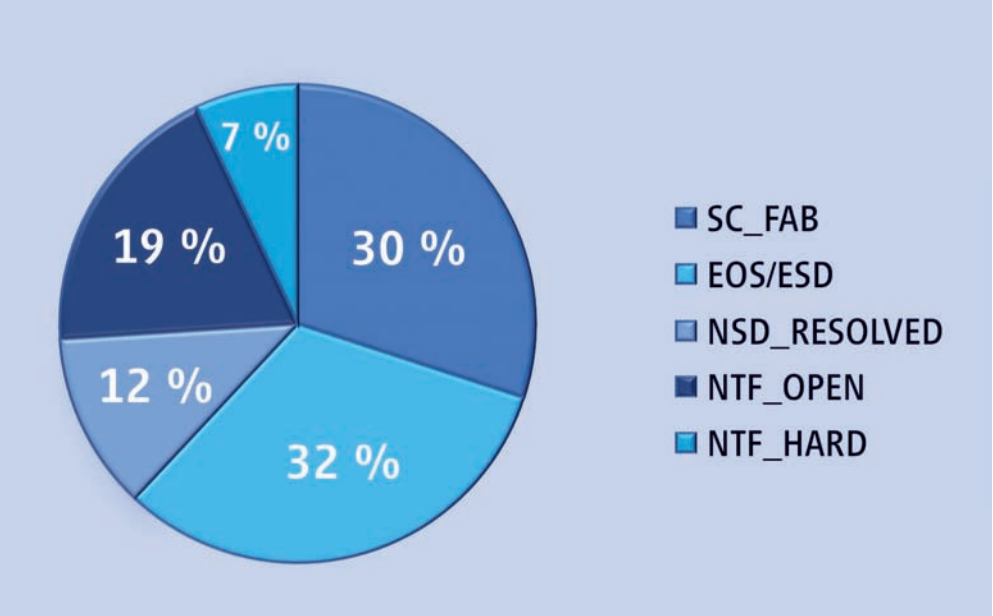
The VDA recommendations for 'Field Failure Analysis' shall be applied to the supply chain between automotive system supplier and electronics sub-supplier. A corresponding guideline has been worked out and shall be distributed by end of 2013. Several Tier-1 system suppliers have been contributing to this guideline.

Major achievements of this guideline are a clear description of the parts analysis process, the 'No-Trouble-Found' (NTF) escalation and the commitment, that every supplier and sub-supplier will actively plan the analysis during the product development process. It has also been agreed that customers will only complain such parts that have been obviously failing during their analysis and have been appropriately documented to the sub-supplier. This commitment should significantly reduce the number of NTF parts at the level of electronics manufacturers, so far estimated at 40 percent from all parts received for analysis.

The contribution of electronics sub-suppliers within the NTF investigation is continued to be discussed in the working group. Vehicle diagnostics information can be made available by the OEM, but in general only for NTF investigation. The electronics sub-supplier can be a member of the NTF team.

The VDA recommendation allows defining the exact scope of standard testing and testing under load. Special testing will only be discussed during NTF investigation.

The working group has exchanged with VDA and CLEPA members to ensure compliance with the corresponding working groups on similar subjects.



Source: STMicroelectronics Application

Working Group Robustness Validation Forum

Source: ArchMen - Fotolia

Robustness Validation: Development of Safe and Reliable Electronics

Robustness Validation (RV) allows the evaluation of the reliability and its impact on the safety of electronic systems. In addition it also enables further reduction of the average qualification effort.

Historic and formal qualification test plans (e. g. AEC Q100), which have their origin in the 70s and are designed for 'Acceptable Quality Level' in the percent range, have been appropriate at these times, but are poorly suited for today's needs.

This 'Fit for Standard' procedure is now actively replaced by a knowledge based 'Fit for Application' approach. Beside the reliability the safety of the system should be in accordance with the requirements of ISO 26262 throughout the life cycle.

The focus of the ZVEI-Forum has slightly changed from publishing general guidelines such as the handbooks into publications on specific items with stronger focus on implementation and application in the engineering process.

Due to this additional focus, the RV training concept is under evaluation. The aspects of systems safety and implementation in the engineering processes will be strengthened. The trainings will be continued with the new concept in 2014 with the established seminar providers Technische Akademie Esslingen and VDA QMC in Berlin.

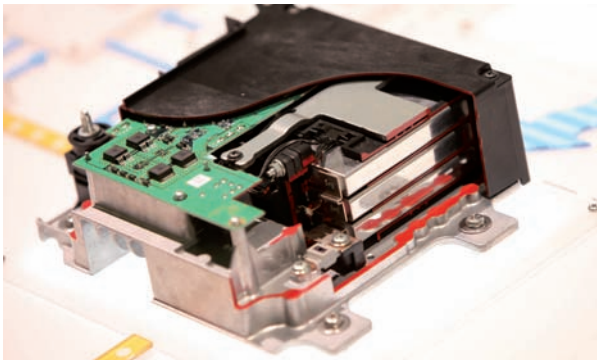
Major Achievements 2012/2013 of the Robustness Validation Forum:

- Integration of Robustness Validation in the AEC Q101: Clarification that AEC Q101 is a basic reliability test standard and is not intended to assure ppm levels and not suited for safety assessments. For these considerations the AEC recommends the RV approach.
- The RV handbooks for components and for electric and electronic modules are revised and published under free license by the ZVEI. The corresponding SAE J standards are already updated or are currently undergoing the ballot process.
- The activity for a new handbook was kicked off in order to cope with the specific demands for optoelectronic components (LEDs). For these components the Robustness Validation approach is becoming more and more common in the industry.
- New fact sheets have been published to comprehend the compendium with further topics as best practice and guidelines provided by experts from the whole supply chain.
- A brochure 'How to measure lifetime' was edited and published by the working group. This brochure contains the explanation of end of life testing, accelerated testing and field reliability prediction. Its comprehensiveness and legibility also for unexperienced readers is unique.
- Due to the technical limitations of very recent semiconductor technologies, the relation between 'Reliability' and 'Safety gains' more focus, especially in the field of driver assistance applications. In order to proactively deal with this issue, the ZVEI working groups of 'Robustness Validation' and of 'Functional Safety' concluded to cooperate on a regular basis. In a joint approach of both working groups the need for specific adoptions to the ISO 26262 was identified. Especially the reference to the AEC Q100 as state of the art reliability approach is in question.
- The interest on RV is not limited to automotive applications. The extended focus covers industry electronics, safety application as well as optoelectronics and others.

Working Group Zero Defect Strategy

Electronic applications influence special features in the automobile to a stronger and stronger extent. No longer alone the fault-free function of single components, but rather the trouble-free interaction must be the aim of all quality securing activities.

To this it is necessary, to optimize the cooperation along the complete supply chain permanently. The postulated 'zero defects' can finally be reached only by a harmonized and synchronized information and material flow. To this particularly the interfaces between customer and supplier must be coordinated exactly to avoid friction losses and misinterpretations and ensure faultlessness and at the same time economic feasibility for all involved partners.



Source: ZVEI

System and process oriented quality topics of the application group are driven in the working group 'Zero Defect Strategy'. In the working group not only electronic components manufacturers are represented, but also Tier-1 partners.

The systemic quality approach is in the foreground in dealing of the individual fields of activity. Thereby the solutions worked out can generally be used in all areas of the supply chain.

In 2011, the new VW supplier concept, which also contains a supplier Certification, was presented and discussed with representatives of the working group.

The approach also provides the punctual integration of the sub-suppliers.

In several conversations between representatives of the corporate VW quality department and the working group the emphasis of the process stability was underlined. The VDA volume 6.3 ('Process Audit') serves as assessment basis, which is also the standard for process audits in the supply chain. As the quality management systems of the suppliers are typically qualified, the possibilities for an optimization of efforts were discussed.

Resulting from this, currently it is checked whether self-evaluations can be realized based on agreed execution and assessment rules.

In the majority of cases, suppliers in the automotive supply chain have already before starting a business relationship a quality management system implemented according to ISO/TS 16949 and certified by independent third parties. Often more stringent requirements for the quality management system are agreed by the customer and supplier, typically in a quality assurance agreement.

Currently, the ZVEI quality assurance agreement is revised with the participation of working group members. By using the new version, the necessity for additional rules, which are often have to be implemented as customer specific requirements in the regulations of the supplier, shall be reduced.

The electronics supply chain is faced with a variety of reporting requirements, which often have to be implemented in different customer specific formats.

This includes the documentation of the processing of customer complaints in 8D reports. The non-value-added additional effort due to different templates and required content could be reduced by standardization.

The working group is currently considering whether the 8D reports could be unified by a best practice recommendation.

Working Group Component Cleanliness

The ZVEI working group 'Components Cleanlines' has produced a set of guidelines on component cleanliness in German to be launched at productronica 2013, with an English version scheduled for 2014.

The working group was set up by two ZVEI divisions – PCB and Electronic Systems and Electronic Components and Systems – in November 2011 with the primary aim of addressing technical cleanliness in the manufacture of electric, electronic and electro-mechanic components, circuit boards and electronic sub-assemblies. Technical cleanliness in this context refers to particle contamination on components and sub-assemblies, which can impair production processes and adversely affect their performance.

Source: ZVEI

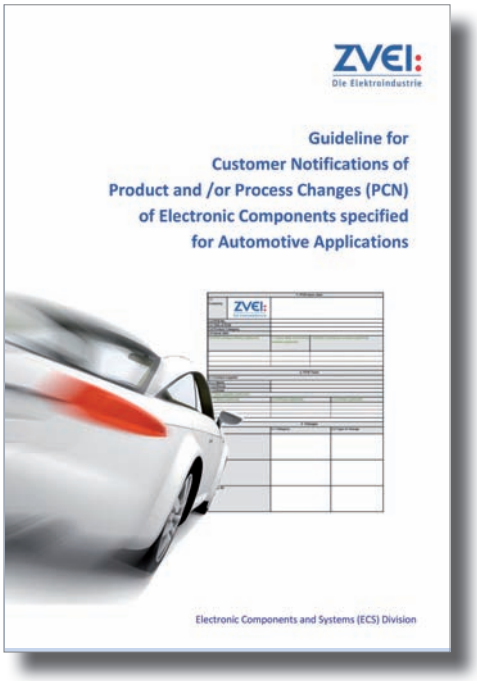
These guidelines provide information and recommendations and serve as a basis for agreements between customers and suppliers. In addition, they aim to further define VDA Volume 19 'Technical Cleanliness in the Automotive Industry – Inspection of Particulate Contamination of Components' specifically with regard to the production of electric, electronic and electro-mechanic components, circuit boards and electronic sub-assemblies.

They recommend standardised, comparable procedures for assessing component cleanliness and suggest a system for analysing the results statistically and presenting them in a comprehensible manner. Furthermore, the guidelines illustrate the degree of technical cleanliness which is to be expected with customary production techniques used in the manufacture of electric, electronic and electro-mechanic components, circuit boards and electronic sub-assemblies in terms of both product and process.

The guidelines also cover sources of particulate contamination associated with specific processes and materials, address potential corrective measures and list the potential effects of particulate contamination on performance and reliability.

Following publication of the guidelines, the working group 'Components Cleanlines' intends to continue to address current issues regarding component cleanliness.

Ad-hoc Working Group Part Change Notification Method



Source: ZVEI

The progress in the development of high-performance electrical and electronical devices can be observed daily. The electronic market provides faster and more comfortable products each day. The suppliers to the automotive industry are confronted with change requests from their electronic component suppliers at a similar rate each day. One change request per day is already a challenge for the change management teams in the automotive sector. Hence it is not surprising that through-put times from the initial change request until acceptance of the change are considerably longer than in other electrical industries.

In order to address this problem, experts from reputable electrical applications manufacturers and established manufacturers of electronic components joined forces and founded an ad-hoc workshop 'PCN Methodology' within the ZVEI. This workshop has the target to reduce the through-put time of change requests whilst retaining accuracy during change qualification.

Discussions have shown that mainly misunderstanding, missing information and/or missing transparency in communication lead to delays. In order to improve this, the workshop has updated the previous ZVEI PCN guideline and provides a standardized PCN questionnaire in an xls-file. This questionnaire contains all mandatory information and can be read electronically to support automatization of the data handling process. Finally, the PCN questionnaire can be used for both active and passive components in a similar manner. By this kind of standardization misunderstanding can be avoided and the whole process will be anticipated.

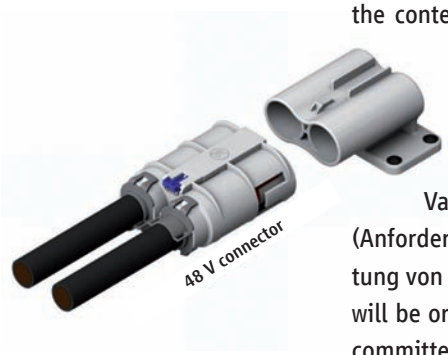
All changes must be evaluated and purposefully qualified. Therefore it is necessary to use the available expertise and infrastructure where it is most effective. For this purpose acknowledged experts from electronic component suppliers together with those from electrical application suppliers developed a detailed 'Delta Qualification Matrix' (DeQuMa). The systematics of the Delta Qualifications Matrix is based on the evaluation matrix for lead free components from the VDA workshop 'Industriearbeitskreis Bleifrei'. With the accepted automotive standards AEC-Q the matrix assign specific tests on device level, which should be considered for a specified change request. The structured change requests are identical to the standardized description in the PCN questionnaire. The Delta Qualification Matrix can be used for active and passive components in a similar manner.

The updated ZVEI PCN guideline with the PCN questionnaire and Delta Qualification Matrix was published in January 2013 and is available as freeware (www.zvei.org/pcn-methodik). These documents will standardize the PCN process for the first time. Furthermore, the VDA volume 2 refers explicitly to the ZVEI PCN guideline, 'Guideline for Customer Notifications of Product and/or Process Changes (PCN) of Electronic Components specified for Automotive Applications'.

The prevailing positive feedback from the international electronic industries and specificly from the carmakers and their suppliers makes us confident that the workshop has generated a 'Best-Practice-Description' for the change management over the whole supply chain. By early 2014 the workshop will provide also a matrix for opto-electronic components. As the next step it is necessary to implement a corresponding international standard.

Working Group Electro-Mechanical Interfaces

Source: Kostal Kontakt Systeme



Source: Kostal Kontakt Systeme

The importance of the electrical quality of connectors in modern automobiles has increased considerably over the past years. Due to the continuous escalating functionality, this aspect has made for an even larger timeliness.

The market launch of diverse hybrid and electrical vehicles has raised the requirements of the connectors regarding coping with the electrical voltage, electromagnetic compatibility and especially the security.

Against this backdrop, that these topics are very subject-specific and are therefore within the context of the APG-meetings and cannot be discussed, in 2011 a working committee (Arbeitskreis – AK) was established. This committee bears the title 'Requirement on Validation and Processing of Contracts' (Anforderung an Validierung und Verarbeitung von Kontakten = AVVK). Following topics will be or have already been discussed in this committee:

Crimping of Wires to Terminals

- Evaluation of customer specific crimping standards and their impact on the manufacturer of connector systems – standard products of the manufacturer.
- Usage of crimping tools that are not supplied by the manufacturer of the respective connector systems – warranty issues.
- Slow Motion Test/Headroom requirements in connection with small wire cross sections – application.
- Work, including relevant OEM, is still in progress.

Source: Kostal Kontakt Systeme

Non-Specified Processing Methods

The application of diverse soldering/welding processes to electrically connect wires to the terminals are only partially implemented. However they have not been tested or released by the manufacturers of the connector systems – functional/warranty issues.

In agreement with relevant OEM, the AK has therefore commissioned an institute to examine the welding stability of ultrasonic welded joints.

High Temperature Applications of Connector Systems

There are still questions that need to be answered, such as whether – in conjunction with the application of high temperature electronics – also respective requirements on the connectors can occur.

This issue was introduced to the corresponding ZVEI AK. The project was closed, after the AK Chairman did not see any need for connectors.

LV 214 (Germany only)

An evaluation of the contents regarding feasibility, cost/efficiency ratio, etc. was done – if necessary requested amendments are formulated.

The AK has worked on a coordinated, joint list with proposed amendments. A meeting to discuss the 262 points with an OEM representative has already taken place. Additional coordination between OEM and AK is necessary.

LV 214-2 Slow Motion Test (SMT)

Basically, it has to be clarified, if an SMT is necessary with large wire cross sections.

AK First-Mate-Last-Break

From this ZVEI AK the question was addressed to the AK AVVK, whether the connector manufacturers' corresponding products already exist in the market.

For approximately the past 15 years, the connectors for the engine diagnosis (OBD 2) have been equipped with an 'extended ground pin'. More recent additional applications are not known.

Task Force ELV – End of Life Vehicle

Source: BMW Group

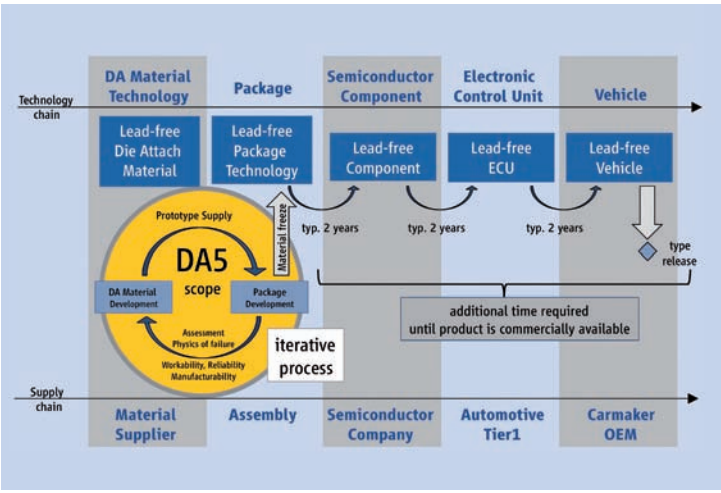
A new online Stakeholder Consultation on renewal of exemptions 8(e), 8(f), 8(g), 8(j) and 10(d) of Annex II to directive 2000/53/EC (ELV) was started by beginning of September 2013. The Consultation was announced by the EU commission on September, 9th 2013 and concluded on November, 4th 2013. That means only eight weeks for the stakeholder contributions. The goal of the EU commission was to finish the review with the final report mid of 2014.

The ACEA/CLEPA working group with it subgroups, set up in 2010, prepared the contributions for each of these exemptions. Different associations made their own contributions but in a similar direction of argumentation.

RoHS2 Exemptions Extensions Process

Eight industry associations aimed at fostering cross-industry technical dialogue on the adaptation to scientific and technical progress of existing RoHS2 Annex III exemptions from the substance restrictions. Where necessary, the dialogue may result in joint cross industry applications to the European Commission for renewal of selected existing exemptions, or specific applications thereof, under the conditions laid down in RoHS2. Out of this activity the associations group supported the ACEA working group regarding the ELV stakeholder input.

DA5 – Automotive Release Process (ELV)



Sources: DA5 Consortium (Robert Bosch, Freescale Halbleiter Deutschland, Infineon Technologies, NXP Semiconductors Germany, STMicroelectronics Application)

Die Attach 5 Project – Pb-free Solder D/A-Technology

The 'Die Attach 5' (DA5) consortium, headed by Infineon Technologies, made their own contribution to this ELV stakeholder consultation on beginning of October 2013 to give the other stakeholders the possibility to refere to the DA5 argumentation and the technical results.

In 2nd quarter 2009, Robert Bosch (Division Automotive Electronics), Freescale Halbleiter Deutschland, Infineon Technologies, NXP Semiconductors Germany and STMicroelectronics Application formed a consortium to jointly investigate and standardize the acceptance of alternatives for high-lead solder for attaching die to semiconductor packages during manufacturing. The five company consortium is known as the DA5 (Die Attach 5). The DA5 consortium aims to lead the industry into the next phase of the lead-free semiconductor evolution. In this way the DA5 companies are also actively supporting the demands of the European Union towards reduced lead in electronics.

The DA5 consortium is working with selected material suppliers on the selection of an appropriate replacement for lead solder (DA5 scope). The properties of the needed die-attach material is specified by the DA5 (material requirement specification) and provided to the material suppliers.

Selected material suppliers offer their materials, which are evaluated by one of the DA5 companies together with the supplier. The detailed results are discussed with the material suppliers on a regular basis in face-to-face meetings. The results lead to further optimizations of the materials (development loop).

The combined results are published by DA5 (Customer Presentation, Bodo Eilken, E-mail: bodo.eilken@infineon.com). After a material is chosen and material development is frozen, another six years will be required to qualify the new material through the whole supply chain. Based on current status, DA5 cannot predict a date for customer sampling.

Working Group First-Mate-Last-Break

White Paper 'First-Mate-Last-Break Grounding Contacts in the Automotive Industry'

Source: ZVEI

Electrical Overstress is a common root cause for destroyed automotive semiconductors. Many of these failures are due to connecting under voltage: 'hot plugging'. First-Mate-Last-Break (FMLB) contacts safeguard a defined grounding concept in these cases.

The working group describes solutions for the introduction of extended ground pins in 12V/24V car area to supply quick background information. Real examples with a lot of pictures help to understand the consequences of a mechanical matter for electronics in cars. Also a scenario for introduction as well as a roughly estimation of the savings due to FMLB contacts is described. Many examples of FMLB contacts from different industries are shown, too.

Hot plugging of upcoming 48V applications will produce arcs by high involved energies and bigger damages than in traditional 12V/24V surroundings. Smaller getting semiconductor dimensions cause reduced robustness by trend. That is why FMLB contacts become more and more important.

The working group has developed a demonstrator for the helpfulness of FMLB contacts. With this demonstrator one can show and proof that FMLB contacts avoid misapplication.

The white paper is published in nine languages as Chinese, English, French, German, Japanese, Korean, Portuguese, Russian and Spanish. A version in Hindi and Italian will also be available soon.

All involved 24 companies want to contribute to a broad and fruitful discussion in the car industry and try to bring the FMLB idea forward.

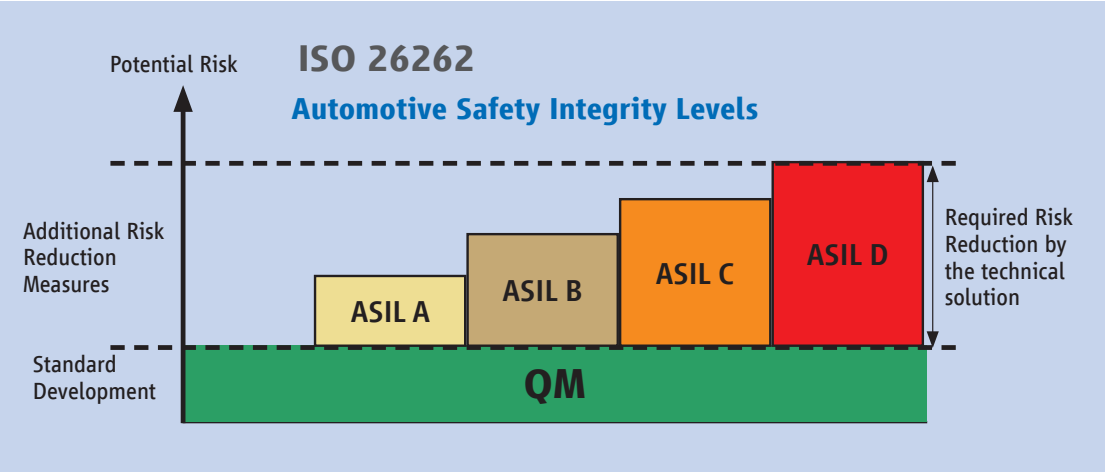
Source: Robert Bosch

Working Group Functional Safety

Functional Safety ISO 26262 – the Existing Challenge

ISO 26262 focuses on the functional safety of electrical and electronic (E/E) systems in vehicles. Functional safety in accordance with ISO 26262 affects all systems containing electrical, electronic or electromechanical components, i. e. systems from the fields of actuator and sensor technology as well as control electronics.

Further on there's one frequently misunderstood aspect of ISO 26262 concerning the ASIL classification. A fundamental principle of the ASIL classification is that it is the safety goals and not the system that are evaluated. It must also be borne in mind that a system usually has to fulfil a whole host of safety goals.



Source: Marquardt

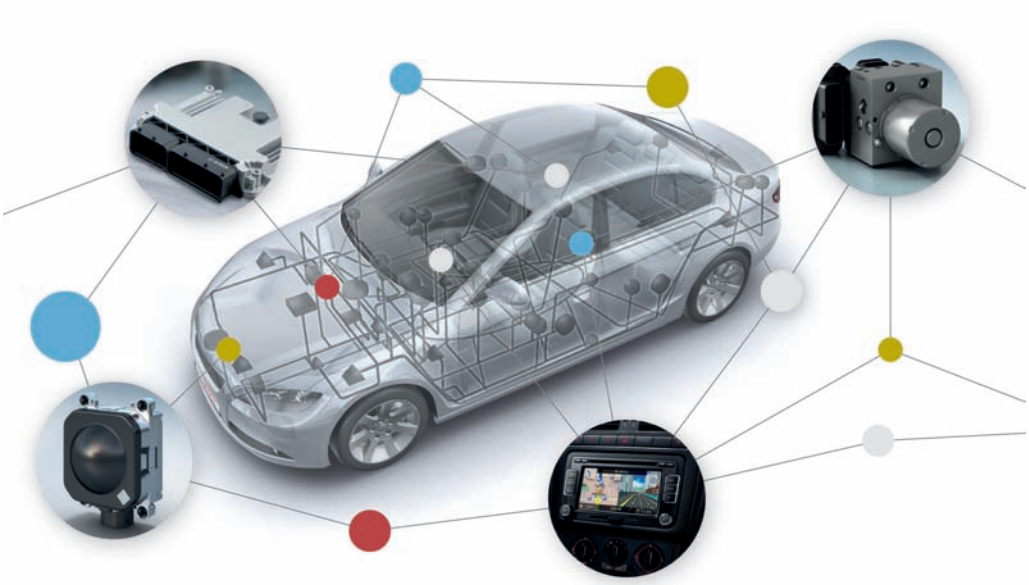
Functional safety focuses primarily on risks arising from random hardware faults as well as systematic faults in system design, in hardware or software development or in production through to the commissioning, repair and withdrawal of the system.

The normative sections of ISO 26262 as an international standard are approved since November 2011. At latest since the official approval of the international standard all safety relevant products applied to vehicles with SOP date later then November 2011 have to be developed and manufactured according to ISO 26262.

From a legal point of view ISO 26262 doesn't bring about any direct change in the legal situation. In general professional standards are deemed relevant when assessing the 'state of the art' meaning that ISO 26262 is naturally of indirect legal importance.

Topics like mentioned before and following questions 'What is functional safety in accordance with ISO 26262 and how functional safety is achieved in accordance with ISO 26262 ?' are described and answered at the executive summary published by the ZVEI working group 'Funktional Safety'. The documents can be downloaded from the ZVEI homepage.

Source: ZVEI



Source: Robert Bosch

During the last meetings of the working group 'Functional Safety' the speaker of 'Robustness Valdiation Forum' Mr. Helmut Keller introduced the new revisions of the AEC Q100 and Q101 standards. Both revisions with sample size acceptance tests are not suitable to cover the existing low ppm requirements (state of the art):

- LTPD (Lot Tolerance Percent Defective) = one percent failures at 90 percent confidence level for AEC Q100
- LTPD = 0,4 percent failures at 60 percent confidence level for AEC Q101

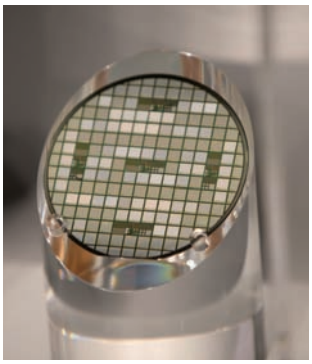
Within both standards it's mentioned that 'this sample size is NOT sufficient or intended for process control or ppm evaluation'. From a functional safety point of view this requires establishing alternative evaluation principles for electronic modules like for example robustness validation. Therefore a new sub-working group is going to create a user manual, executive summary or fact sheet in close communication with the working group 'Robustness Validation' in order to publish a clear statement from ZVEI concerning this topic.

In addition to this two further sub-working groups are working on following topics:

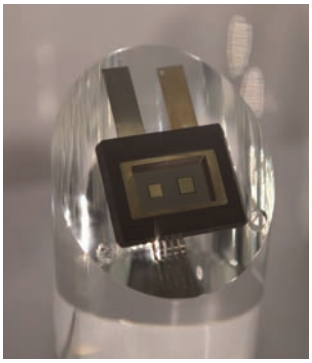
- Sub-working group 'HW-components' is working on an executive summary in order to provide additional/supplemental information as a proposed interpretation to reduce misunderstandings by providing 'Use Cases' for part 8, clause 13, table 6.
- Sub-working group 'ISO 26262 Certification' is working on a management summary in order to get to a common understanding for the topic 'Certification in accordance with ISO 26262'.

Source: ZVEI

Working Group High Temperature and Power Electronics



Source: ZVEI



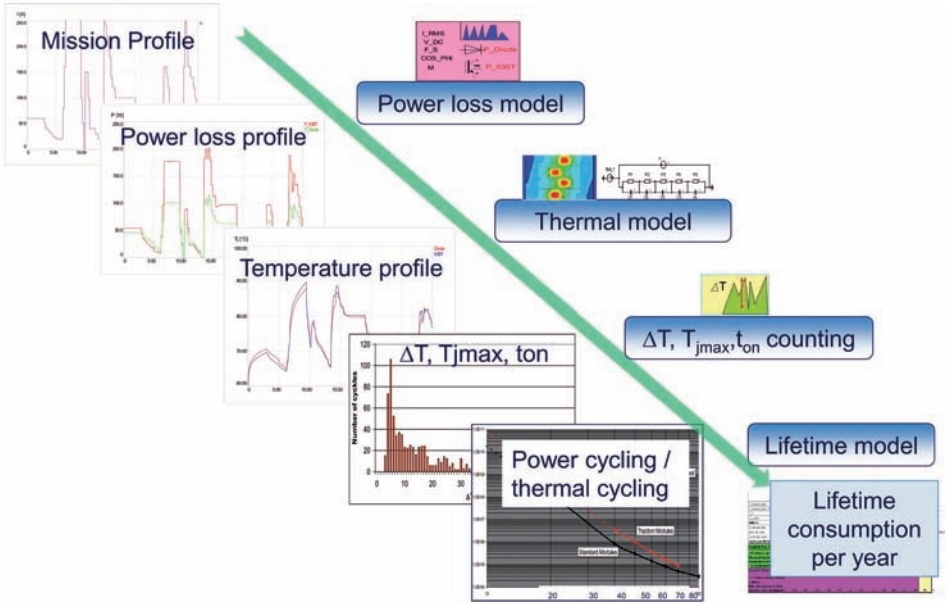
Source: ZVEI

The on-going and already rising demand on technology progress in high temperature and power electronics applications is the base for the working group 'High Temperature and Power Electronics'. Several fields are addressed: joining and assembly technologies, high temperature and high current components, thermal management, robustness evaluation, reliability methodology and prognosis, testing, qualification and manufacturing quality.

Passing several milestones and publications in the past the team 'High Temperature Electronics' prepares now a look on the future technology need for 'Electronic Control Units' (ECU) and their use in several branches, e. g. automotive, drilling, regenerative energies. Several invited presentations were held in the team meetings to sharpen the picture of technology demand for electronics under high temperature loads. Ideally this activity will lead to a high temperature electronics roadmap for ECUs.

The ZVEI-ECPE joint team 'Power Electronics' intensified their collaboration with the OEM working group 'AK 4.9' in order to finalize the first release of the so called supplier regulation 324 (LV 324) till the end of 2013. Therein the qualification and testing routines for power electronics' modules are summarized and described the first time for their use in automotive drive inverter applications. With reference to the robustness validation methodology testing procedures and attending standards are listed and all qualification routines are specified. A very special focus lies on the definition of power cycling testing routines, which aim on the core, the near-chip surrounding in power modules. But further testing routines, e. g. temperature shock cycling, high and cold temperature storage, semiconductor integrity, etc. are defined as well. After taking effect this regulation will constitute a clear technological reference to all power electronics members in the automotive supply chain.

Calculation of lifetime for power electronic devices based on mission profile – Overview of calculation steps



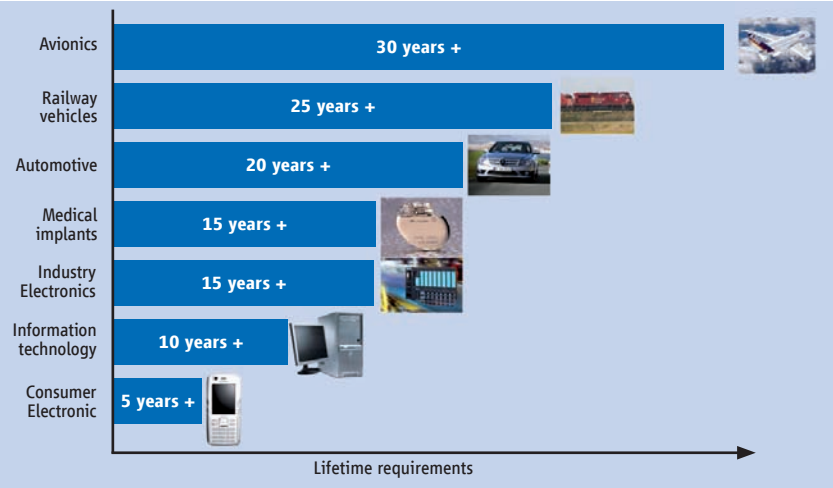
Source: Infineon Technologies

Working Group Process Reliability

TDMA – Status of a National Funded Project

The ZVEI working group 'Components, Substrates: Manufacturability, Processability of Components and Substrates for Extended Thermal Demands in Lead-Free Processes' decided immediately after the publication of the guideline, to initiate the project TDMA – by partners like Siemens and Technische Universität Dresden – to continue the evaluation for thermally stressed components.

Figure 1: Lifetime requirements for electronic assemblies by application fields



Source: TU Dresden

When reflow soldering of lead-free components with peak temperatures of up to 260 °C many components, for example electrolytic capacitors, fall by the wayside. But, costly additional processes increase manufacturing costs. This raises the following questions. Can the specification be left in the limit of such components? Can these components be soldered with all other SMD components in one pass, without a significant loss in reliability and lifetime?

Within the ZIM-project 'TDMA – Thermally induced damage mechanisms and derivation of corrective actions' these issues were examined. As part of the transition to lead-free processes, it was found that a high amount of electric components and package types are not specifiable or not specified. This applies, for example aluminium electrolytic capacitors, transformers and coils, microprocessors, power semiconductors, resonators, LED´s, relays and connectors. In particular, this applies to future devices too, e. g. MEMS.

In this case it means, after the assembly and soldering of most – lead-free specified – components, the non-specified components have to be assembled and soldered in single processes, which are time-consuming and costly. Beside the disadvantages of additional manufacturing and inspection processes, the reliability of the whole assembly will be restricted. As well known, such restrictions are not recognized in many parts of the industry (Figure 1).

The goal of the project, which was coordinated by the Electronics Packaging Laboratory of the Technische Universität Dresden, was the evaluation of structural and functional damage mechanisms at not for lead-free production technologies specified components, processed by lead-free standard-technologies up to 260 °C soldering temperature. Further aims were technical solutions for the adaption of standard technologies as well the specification of high-reliable assemblies under economically favorable conditions. Figure 2 shows the involved companies and institutes of the successful implemented project.

Since the electronics manufacturing in Germany is particularly characterized by complex, highly innovative electronic modules – with high quality standards and by a high share of exports – the TDMA-project also contributes a total macroeconomic effect to strengthen the business location Germany and the project was explicitly promoted and supported by the ZVEI. In the summary of the project the specification-specific properties of the components were classified by the results of thermo-cyclic aging.

Figure 2: The TDMA-Consortium

Fraunhofer IZFP
Fraunhofer IWM
FROLYT
IMA DRESDEN
IMM
infineon
ruwel international
SANMINA-SCI
Seho
SIEMENS
STANNOL
ZENTRUM FÜR MIKROTECHNISCHE PRODUKTION

Project coordination TDMA:
Prof. Dr.-Ing. habil. Klaus-Jürgen Wolter
(E-mail: klaus-juergen.wolter@tu-dresden.de)
Institut für Aufbau- und Verbindungstechnik der Elektronik (Electronics Packaging Lab)
Technische Universität Dresden

Working Group Automotive Software

Source: ESG Elektroniksystem- und Logistik

Today's cars are providing more and more SW- and electronics-based functionality causing a dramatic increase of electronic components and embedded systems in our cars. This development significantly increases the importance of software in the automotive world. To master the complexity of these embedded systems, efficient 'Software Development' processes are essential. 'Software Release' is a key element for efficiency in the cooperation between OEMs and their partners.

The working group 'Automotive Software' has identified the topics development processes, operating models, functional safety and automotive 'IT Security' as critical topics in the field of 'Automotive Software'

As a first step a working group has been established to write a 'Best Practice Guideline' for software release.

The guideline will focus on the 'Software Release' process, documentation of a release (artifacts), metrics, standard criteria for approval of a release, challenges, solutions, definitions and terminology.

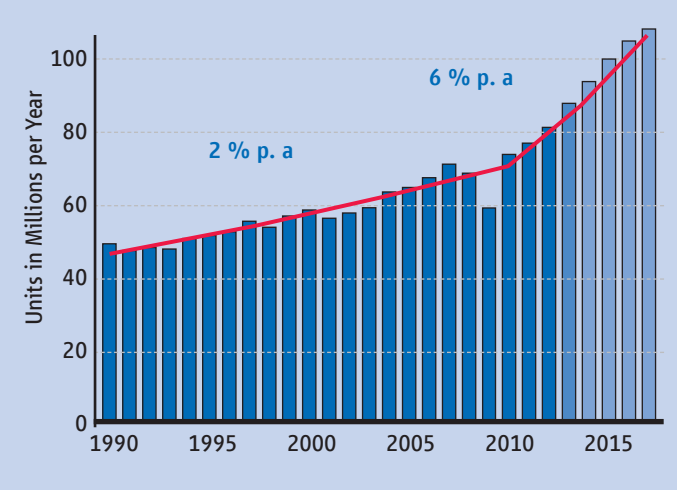
The 'Best Practice Guideline' shall help to build a common understanding between OEMs and partners according to 'Software Development' processes and 'Software Release' processes. This shall improve the teamwork between OEMs and partners. Taking into account the critical factors and the identified optimization potential in the 'Software Release' processes, efficiency, safety and quality of embedded systems can be increased.

Source: ESG Elektroniksystem- und Logistik

Automotive Electronics Market

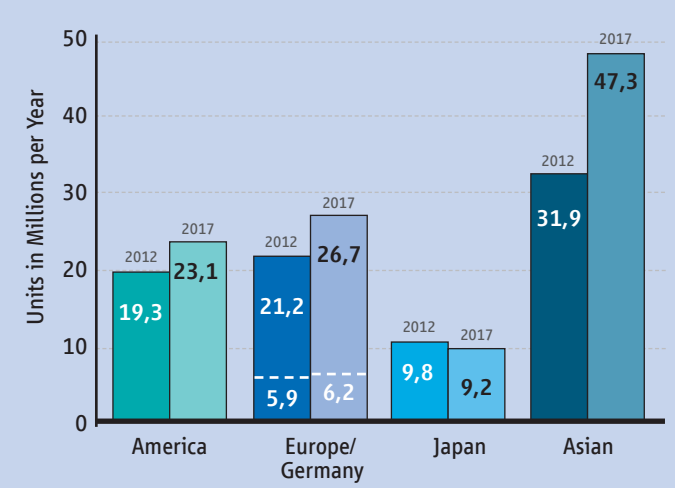
An in-depth study of the automotive electronics market from the perspective of semiconductors can be found in the ZVEI 'Mikroelektronik – Trendanalyse bis 2017'. Published since 2001, this report enjoys an excellent reputation in the professional world and contemplates the automotive electronics industry in detail due to the special significance of this market segment in Germany. The following is an excerpt of the 'Mikroelektronik – Trendanalyse bis 2017'.

Figure 1: Car Production Worldwide



Source: ZVEI

Figure 2: Car Production by Fabrication Side



Source: ZVEI

Regional Distribution of Automobile Production

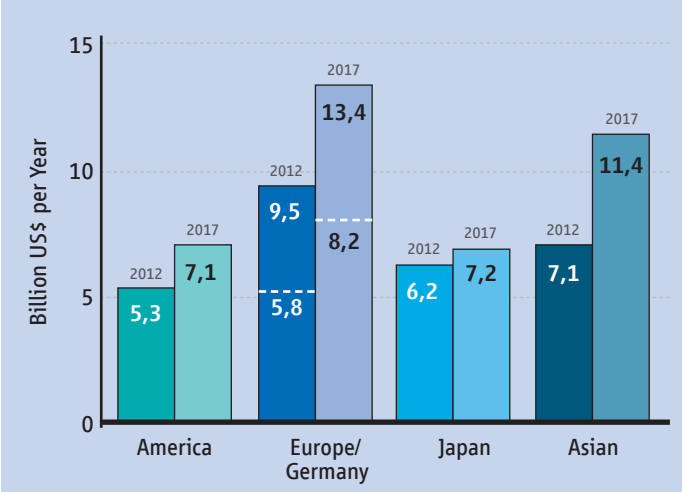
From the 4th Quarter of 2008 the global automotive production recorded a year of sharp decline (-19 percent) due to the economic crisis. Thereby an even sharper decline was avoided by government stimulus programs. A market recovery started from the end of 2009 and already in 2010 the production figures for 2007 were exceeded again. Thus, the average growth of the vehicle production by two percent per year till 2010 will increase to the six percent per year until 2017 (Figure 1).

The total annual production worldwide (including commercial vehicles) will therefore increase from 82 million units in 2012 to 106 million in 2017. It is assumed that the longer-term trend remains unchanged. In the years after 2016, the growth will be back to normal at about three percent per year.

The increased growth after the crisis is a result of the very strong demand from emerging markets, especially in China and India. Europe has lost its position as the largest automotive region in the world. The highest growth in vehicle production in Asia is largely due to the production expansion of European and Japanese companies in China for the Asian market (Figure 2).

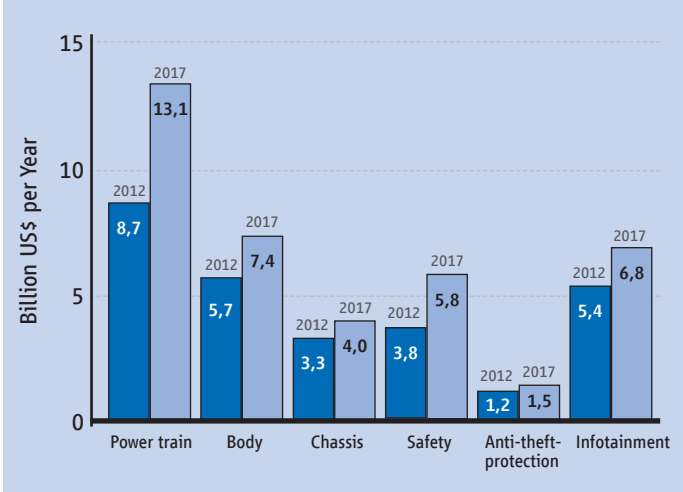
However, considering the regional development of vehicle production by domicile of the company, Japanese companies show the highest growth due to the drop in 2011 (caused by the natural disaster and the loss of production sites). Also, more than a third of all cars will be produced by European companies in 2017. Until then the Asian car manufacturers will have overtaken the Japanese companies, despite an incipient consolidation of manufacturers in China. In 2017 the lowest growth rates are expected for the American companies.

Figure 3: Demand of Microelectronic for Car Production by Region



Source: ZVEI

Figure 4: Demand of Microelectronic for each Applikation



Source: ZVEI

Regional Demand for Microelectronics

Since the number of electronically controlled systems within a vehicle will continue to increase over the next five years, in the longer term a good growth of the microelectronics sales for motor vehicle can be expected. Here, on average, growth rates of nearly seven percent per year are to be expected (Figure 3).

Also it must be mentioned that the last economic crisis has hit the automotive electronics considerably more than any other industry segments. In 2009, sales dropped by almost twenty percent. However, in the following years the automotive electronics was up far above average. Among other things, this was driven by legal requirements in respect of energy consumption and occupant protection.

Asia – particularly China – has the highest production growth in automotive electronics. Thus Asia is now second in the world. But this still does not correspond to the fact that in Asia are now more cars produced than in any other regions. But, since output growth is there well above the average, the electronics production – and thus the need for microelectronics – continues to increase until the end of 2017. Nevertheless, in 2017 the share of electronics manufactured in Asia remains well below the needs of the motor vehicles manufactured there.

One reason for this is that the major Japanese and German car companies equip their abroad produced vehicles with electronics from their home countries. At least until 2017, a large part of electronics attached to the vehicle in Asia is still imported from Japan and Europe – especially from Germany. Thus, in 2017, the electronics production in Germany will be second (after Asia) and thus be greater than in America and Japan.

Overall, an annual growth rate of nearly seven percent of microelectronics in all automotive applications is expected until 2017. The world demand for automotive semiconductors thus increases from 28.1 billion Dollar in 2012 to 38.7 billion Dollar in 2017. Breaking down the microelectronics consumption for each application, again the drive train has the highest growth. Thus in the long term, the power train remains the main application for automotive electronics (hybrid car, motor control). In addition, the chassis electronics is essentially driven by the occupant protection (ABS and ESP).

Therefore, legitimately, one can speak of a success story of automotive semiconductors, since in the long term electronics and microelectronics for automotive are growing faster than the number of newly produced vehicles. An end to this trend is not to be expected before mid to late 2020s.

In the global average the value of the microelectronics per vehicle of 155 Dollars in 2000 will rise to 345 Dollars in 2012 and in the long-term growth to more than 405 in 2020.

Public Relations of the ZVEI Application Group Automotive

In recent years the APG has found a broad recognition by intensifying its public relations activities and established itself as an acknowledged partner within the automotive community. Final results of the APG and its working group activities are published in form of brochures, recommendations or guidelines to allow for a discussion within the automotive value chain.

Further activities include presentations at conferences and trade forums, and the (co) organization of symposia. APG comments on current events and trends in the form of technical articles in scientific journals. Since 2008 the APG informs regularly about its current activities on the website of the ZVEI Division Electronic Components and Systems.

In the following more examples of APG public relation activities are presented in detail:

electronica Automotive Conference 2012/ electronica Automotive Forum with APG session

In 2012 future trends in automotive electronics and electric mobility were the most innovative topics of the electronica and the electronica automotive conference. Senior executives of international automotive manufacturers and suppliers were discussing electronics technologies as well as solutions and strategies that will meet the challenges of the coming years.

For years a close cooperation between the ZVEI Division Electronic Components and Systems and the Munich International Trade Fair exists with a strong commitment to the electronica trade fair. The APG was involved in the program committee of the automotive conference and took an active part with presentation and the moderation of sessions.

For four days the APG organized the electronica Automotive Forum with lectures and discussions. Beside the classical mobility issues, the focus was also on electric mobility. Topics were 'power electronics for electric mobility', 'LEDs for automotive applications' and 'energy efficiency'.

APG 'Industry Dinner – Automotive Electronics' at the electronica in 2008, 2010 and 2012

Since the electronica 2008, the APG successfully hosted the ZVEI 'Industry Dinner – Automotive Electronics'. Managers and decision makers from supplier companies of the automotive sector were invited to inform themselves about the APG and its activities. In 2012 more than 90 participants were debating lively about current market developments and the benefits of a successful association work by the ZVEI for their companies.

8th Conference Competence in Automotive Electronics 2013

A significant increase in the external awareness of conference 'Competence in Automotive Electronics' was accomplished with the relocation of the conference to Munich and

electronica Automotive Forum: Panel discussion on power electronics with members of the APG working group 'Power Electronics'

Source: electronica 2012

Source: ZVEI

the cooperation with the Munich International Trade Fair beginning with the 'electronic 2006'. Thus the ZVEI conference observed a very promising response since 2007.

This ZVEI conference 'Competence in Automotive Electronics' illustrates the particular importance of this event for the promotion of the APG and its activities.

This year's '8th Conference Competence in Automotive Electronics 2013' focuses on key challenges of the future: the future of (electric) mobility, the automotive market in Asia, America and Europe, driver assistance and safety, automotive software and IT-Security strategies for the connected car and future power electronics.

The importance of this event is underlined through the strategic partnership with the Munich International Trade Fair, represented by the leading trade fair 'electronica 2014', and through the support by multiple sponsors. Media partners are three of the most important German journals in the automotive industry, ‚Automobil Elektronik', ‚Elektronik automotive' and ‚Hanser automotive'

Articles and Conference Papers

Since the year 2004 the 'ZVEI-Standpunkt' in the 'Automobil Elektronk' journal has become firmly established and reports six times a year on current topics of the APG and their various working groups.

In addition, reports on quality issues and current activities of our working groups were published in various journals like the 'QZ Magazin', the 'Electronics Automotive' and special issues of the 'Automobil Elektronk' and 'Hanser automotive'.

Many significant contributions to national and international conferences such as Munich, Dresden, Wiesbaden, Ludwigsburg and Baden-Baden as well as the SAE World Congress in Detroit, are a key element of the APG and the ZVEI Division Electronic Components and Systems in the marketing of their activities and working group results.

Further Activities – International Collaborations

Furthermore, the APG successfully promoted its results on an international scope by increasing the dialogue with and through the European suppliers association CLEPA and by the strengthening of the existing contacts with the French Association FIEV. In addition, the successful partnership with the SAE (Society of Automotive Engineers) and the close collaboration with the European Centre of Power Electronics (ECPE) established in 2008 were continued.

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AUTOMOBIL ELEKTRONIK

ECPE

Activities of the ZVEI Centre of Excellence in Electric Mobility

Environmentally friendly mobility is one of the most challenging tasks for the future of mankind. The ZVEI Centre of Excellence (CoE) in electric mobility was founded at the end of 2008 and has started ever since a lot of activities with different partners. Most of the work is spreading knowledge, understanding policy, spotting opportunities and bringing people together to solve problems or to make new advances.

The aim is to bundle and to coordinate all activities of the ZVEI members in the field of components, systems and infrastructure regarding electric mobility. A few technical working groups (TWG) have been established: TWG on Storage Technology, TWG on Infrastructure/Smart Grids, TWG on Standardization and latest TWG on Power Electronics. The ZVEI hereby makes an active contribution to establish a lead market in electric mobility and promotes the cooperation with the involved companies.

A further aim of the CoE is to identify the market opportunities for the member companies of the ZVEI and to provide them with the information about it. The CoE cooperates with other associations like BDEW and VDA. In close collaboration with the four German Ministries dealing with electric mobility, the CoE tries to readapt and to implement several parts of the 'National Development Plan in Electric Mobility'.

In spring 2013 the fifth symposium at the CoE took place at Cologne in collaboration with Koelnmesse. It was accompanied by the exhibition elektro:mobilia with many exhibition boots and by a driving parcour where again numerous rides were made by different CO_2-free vehicles.

Sources: ZVEI

Active Members of the ZVEI Application Group Automotive

A
ams
Analog Devices
Atmel Automotive
Automotive Lighting Reutlingen
AVX

B
Baker Hughes Inteq
Ba-Ti-Loy Gesellschaft für Lötmitteltechnik
Bertrandt
BMW Group
Brose Fahrzeugteile

C
cms electronics
Conti Temic
Continental Automotive Systems

D
Daimler
Danfoss Power Electronics
Danfoss Silicon Power
Delphi Connection Systems Deutschland
Delphi Deutschland

E
ECPE European Center
EKB Elektro- u. Kunststofftechnik
Elektrobit
Elmos Semiconductor
Epcos – ein Unternehmen der TDK-EPC Corporation
escrypt
ESG Elektroniksystem- und Logistik
ESKA Erich Schweizer
ETAS
Europe Chemi-Con (Deutschland)

F
Fairchild Semiconductor
FCI Connectors Deutschland
Feig Electronic
Franz Binder
Fraunhofer-ENAS
Fraunhofer-IISB
Fraunhofer-IPA
Fraunhofer-IZFP
Fraunhofer-IZM
Freescale Halbleiter Deutschland
Frolyt Kondensatoren und Bauelemente
Fuji Electric Europe

G
Gruner

H
Harman Becker Automotive Systems
Hella
Heraeus Materials Technology
HKR Seuffer Automotive
Hoppecke Batterien

I
ifm automotive
Infineon Technologies
Inova Semiconductors
Isabellenhütte Heusler

J
Jumatech

K
Keller Consulting Engineering Services
Kemet Electronics
Kostal Kontakt Systeme
KSG Leiterplatten

L
Lear Corporation
Leoni
Leoni Kabel
Leopold Kostal
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Lukas Varity – TRW Automotive Electronics

M
Marquardt
Mektec Europe
Melecs EWS
Melexis
Mentor – Präzisions-Bauteile
Methode Electronics International
Micronas
Microsystems Engineering
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nova media Apps & More
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Phoenix Contact Electronics
Preh

Q
Questronic

R Robert Bosch
Rohm Semiconductor
Ruwel International

S Sanmina-SCI Germany
Schweizer Electronic SEHO Systems
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Seuffer
Siegert electronic
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vancom
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Vishay BCcomponents Beyschlag
Vishay Semiconductors
Visteon Innovation & Technology
Volkswagen

W Wabco Vehicle Control Systems
Webasto
WIKA Alexander Wiegand
Würth Elektronik

X X-FAB Dresden
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