Frequently asked questions regarding:

What is a PPAP?

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Abstract
Electronic content has significantly increased in automobiles. The applications are diverse including control, safety, comfort, and infotainment. As a result more and more companies are finding business opportunity involving automotive. With the increasing requirements of international quality standards such as QS-9000 and the more recent TS-16949 also comes qualification standards in the form of PPAP. This paper offers a very general overview of the PPAP requirements and is not intended to be an in depth "how to" manual.

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What is a PPAP?

Richard Tse, Principal Engineer I

Q1. ***What is a PPAP?***
A1. A PPAP (Production Part Approval Process) report is intended as an industry guideline that details the specific reports and documentation necessary to gain part approval in the automotive industry. The PPAP is governed by the PPAP manual published by the AIAG (Automotive Industry Action Group.)

Q2. ***How do you determine what to include in the PPAP?***
A2. The PPAP manual contains the PPAP checklist which details all the requirements for a complete PPAP. Each requirement is called an element.

The PPAP checklist also lists the different PPAP levels from 1 to 5. It is the PPAP levels which determine the specific requirements for each element.

Q3. ***What are the elements in the PPAP checklist?***
A3. The PPAP checklist is found in the AIAG PPAP manual. The current release is revision 4. There are 18 required documents which are referred to as PPAP elements. The required PPAP elements are:

1. Design records
2. Engineering change documents
3. Customer engineering approval
4. Design FMEA
5. Process flow diagrams
6. Process FMEA
7. Control plan
8. MSA
9. Dimensional analysis
10. Material performance results
11. Initial process studies
12. Qualified laboratory documentation
13. ARR
14. Sample product
15. Master sample
16. Checking aids
17. Records of compliance
18. PSW

Review of the PPAP checklist is the first step in a PPAP negotiation. The PPAP checklist will determine what PPAP level is required.

Q4. ***What is the meaning of the PPAP levels?***
A4. The PPAP levels determine how each element listed in the PPAP checklist is to be handled by the supplier. There are 5 PPAP levels as listed in the PPAP checklist.

Basically the PPAP levels indicate which elements need to be submitted to the customer. It is important to understand that the different PPAP levels do not change the work that is required. Regardless of PPAP level, all elements must be completed by the supplier.

As an example, a level 1 PPAP only requires the supplier to submit a PSW (part submission warrant) to the customer. Although only one document is required to be submitted to the customer, the supplier must still complete ALL elements. Any necessary terms and conditions of approval still must be negotiated and clarified before submitting even a level 1 PPAP.

Therefore it is very important to remember that regardless of PPAP level, all elements must be completed by the supplier.

Q5. ***Why is a PPAP negotiation necessary?***
A5. A PPAP negotiation is one of the most important steps of the approval process. The AIAG PPAP manual determines the essential elements but it is the direct negotiation between customer and supplier that confirms how each element is satisfied.

In some cases, the supplier will have an established report such as the control plan, FMEA, or MSA. Often if the supplier has existing formats in place and are acceptable to the final end customer, it is unnecessary to duplicate the report(s) to multiple formats.

Element 10 (Material performance results) is the one element that does require negotiation between the customer engineer and supplier engineer. The requirements in this element vary widely and are affected by factors such as product line, PPAP purpose, and application.

When negotiating the terms for element 10 it is necessary to come to a clear mutual agreement on the test plan, test methods, test matrix, and acceptance criteria.

Q6. ***How do I negotiate the terms and conditions of element 10?***
A6. The automotive electronics council specification for passive components (AEC-Q200) provides detailed test plans and criteria for qualification.

The Q200 contains qualification guidelines based on the type of change request reason. Also included are the recommended sample sizes and test methods.

Q7. ***When is a PPAP required?***
A7. A PPAP is required for each product line family intended to be supplied for automotive use. Each company and industry has their own product specific definition of a product line family. For TDK MLCCs the product line family definition is body style and TC. Examples of TDK MLCC families include 1608C0G, 1608X7R, and CKCL22C0G.

PPAPs may also be necessary if there are any changes that affect the product or of the product line values increase. (I.e. Capacitance range expansion.)
The supplier will need to notify the customer of the change and ultimately the customer will determine if a PPAP is required. Typically for TDK MLCCs if a change is made to an existing approved family, the customer only requires an abbreviated PPAP update. This is generally in the form of a modified qualification test plan represented in element 10.

Typical process changes include but are not limited to any process changes, material changes, product changes, equipment changes, and facility changes just to name a few. PPAP notification is also covered in the AIAG PPAP manual.

When a customer is requesting a PPAP, it is the direct supplier that must create and assemble the PPAP. All reports and necessary testing must be performed on the product supported by the supplier. The supplier may require a subsequent PPAP from any sub-suppliers. The sub-supplier PPAP alone is not sufficient to satisfy the customer.

Q8. ***How long does a PPAP take to complete?***
A8. Several factors determine the total PPAP approval time. The length of time needed for the PPAP negotiation, the length of time to complete all PPAP elements, and the time needed by the customer to review, approve, and return the signed PSWs.

For MLCC qualification, reliability testing per AEC-Q200 includes environmental testing up to 1000 hr and Pb free applications require Sn whisker testing up to 3000 hrs. The sample prep time, actual test time, interval measurement times, and data tabulation time constitutes the total test time.

Q9. ***What else is necessary?***
A9. After all requirements are satisfied, the supplier will submit the PPAP to the customer for review. The customer may have some additional customer specific qualification requirements. Once all requirements are satisfied and the customer has granted approval, the customer then needs to sign all accompanying PSWs and return copies to the supplier.

Q10. ***Can PPAPs be shared?***
A10. One of the benefits of industry standards such as the AIAG PPAP manual and the AEC-Q200 allow for some common reports. As long as any confidential data is removed and there is a mutual agreement between the involved parties, the remaining portions of the PPAP can be shared.

As an example, some TDK customers will accept a signed PSW from another automotive customer as sufficient evidence and they will honor a PPAP based on an existing PPAP.

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