Title : Supplier Production Part Approval Process	
Document Number : SQ03-0472	**Revision :** 5

Document Details

Document Level:	Global - Level 3

Record Type:	Controlled Document
Document Category:	L3: Non-Production Work Instruction
Document Author:	Fei Sean Yong

Document Sub-Category:	Skyworks - Global
Document Description:	Skyworks Level 3 Non-Production Work Instruction
Business Unit(s):	
Department(s):	Supplier Quality
Core Business Process(es):	All
Site(s):	All
Manufacturing Area(s):	Skyworks Global

Related Documents

Document Number	Title	SharePoint URL
COURSE-0009[5]	Supplier PPAP Request Training	Click here to open document
COURSE-0009[6]	Supplier PPAP Request Training	Click here to open document

Approval History

Step	Approved By	Date Approved
Approval Step 1	Fei Sean Yong	8-Nov-2024 6:47 AM
Approval Step 1	Michael Goh	7-Nov-2024 9:17 AM
Approval Step 1	Jenny Phua	6-Nov-2024 7:51 AM
Approval Step 1	SS Park	5-Nov-2024 10:04 PM

Revision History

Revision Number	Changes	Effective Date

4	Provide clarity on the supplier PPAP requirements. 1) Update 4.2.9 To enforce Cpk should be based on automo-tive flow and/or spec limit. 2) Update 4.2.13, a complete PSW shall include SQE (Foundry/OSAT/Bump) approval sign off. 3) Update 4.3 PPAP Decision / approval in system should involve a double-checking process.	6-Jun-2024
3	N/A	29-Jan-2024

1. Purpose

The purpose of this procedure is to determine if all Skyworks engineering design record and specification requirements are properly understood and that a supplier's manufacturing process has the potential to produce product consistently meeting those requirements during an actual production run at the quoted production rates.

2. Scope

This specification is applicable when a PPAP submissions is required by Skyworks.

3. Responsibility

• Business Unit – If a die is fabricated by an external foundry or if assembly, test, tape and reel is performed by an external manufacturing partner, it is the responsibility of the Business Unit to ensure an approved supplier PPAP is on file or if not, to request the supplier PPAP through Supplier Quality per SQ03-0472 Supplier Production Part Approval Process as early on as possible.
• Supplier Quality Engineer (SQE) – Responsible for reviewing and ensuring that the data is adequate. The final PPAP cannot be submitted until the supplier PPAPs are approved by Supplier Quality. Suppliers' PFMEA, Control Plan and Gage R &R studies are considered proprietary and are not included in the PPAP submission. It will only be incorporated in the PPAP package if there's an approved Customer Specific Requirements (CSR).
[Note: Supplier PPAP request for a part or process category should be created to include only one applicable part or process (e.g., PACKAGE: Si8233BB-AS1 SOIC-16 narrow body- 150 mil; Si8234AD-AS SOIC-16 wide body -300 mil; Si8641EB-AU 16-QSOP-150mils; TEST: Si8631BD-AS SOIC -16 wide body -300 mil) to avoid perplexity in processing the completion of the request.]

4. Definitions

Terminology	Definition
Critical Parameter	Parameter with higher-than-normal probability of occurrence (i.e. occurrence ranking of 5 or higher) and that may affect operator or end user safety or compliance with legal and regulatory requirements (i.e. severity ranking of 9 or higher). These parameters will require ongoing monitoring to ensure capability.
Significant Production Run	300 parts taken from three consecutive lots
Cpk	Capability index for a stable process
ANOVA	Analysis of variance

5. Work Instruction Steps

A PPAP is a set of documents and records that is submitted to Skyworks in order to provide objective evidence that the supplier is able to consistently produce a part that meets design specifications at the quoted production rate. It is similar to a qualification report however it contains additional elements.
When defining a PPAP, the emphasis needs to be placed on Production Part Approval Process whereas the parts used for qualification and testing should be representative of the actual production environment (i.e. production tooling, production operators, work instructions, test equipment, etc.). This provides a level of confidence that the information provided in the PPAP submission will be representative of what Skyworks will be receiving once the product is released to manufacturing.
As such, product used for PPAP qualification and testing shall be taken from a *significant production run*. All items shall be submitted electronically.

5.1 Customer Notification and Submission Requirements

5.1.1 Changes requiring customer notification

A PPAP shall be provided if requested by Skyworks after a PCN has been issued. Reference **SQ02-0001 - Managing Product and Process Changes and Customer Notifications**.

5.1.2 Levels of Evidence

Unless otherwise specified in writing by Skyworks, the default submission level for all PPAP requests is three. Items noted as "Submit" in the table below shall be included in the PPAP submission package as evidence of compliance to this production part approval process. The PPAP submission is considered Proprietary / Confidential as defined in our non-disclosure agreement.

Para	Item	Submit	File	N/A
5.2.1	Design Records	●		
5.2.2	Engineering Change Documents	●		
5.2.3	Customer Engineering Approval			●
5.2.4	Design FMEA (if supplier is product design responsible)	●		
5.2.5	Process Flow Diagrams	●		
5.2.6	Process FMEA	●		
5.2.7	Dimensional Results	●		
5.2.8	Material / Performance Test Results	●		
5.2.9	Process Capability Studies	●		
5.2.10	Measurement System Analysis	●		
5.2.11	Qualified Laboratory Documentation	●		
5.2.12	Control Plans	●		
5.2.13	Part Submission Warrant	●		
5.2.14	Appearance Approval / Cosmetic Requirements			●
5.2.15	Bulk Material Requirements Checklist			●
5.2.16	Sample Production Parts	●		
5.2.17	Master Samples		●	
5.2.18	Compliance with Customer Requirements		●	
5.2.19	Checking Aids			●
5.2.20	Run At Rate Speed			●
5.2.21	Controlled and Reportable Materials Disclosure	●		
5.2.22	Die Fabrication Reliability Tests		●	

5.2 PPAP Required Elements

5.2.1 Design Records

The latest Skyworks specification or drawing shall be included in the PPAP submission package. If Skyworks is purchasing a catalogue part, the supplier's drawing or datasheet shall be used in lieu of the Skyworks design record. All revisions entered in the PPAP (i.e. performance report, design records and part submission warrant, etc.) shall match.

5.2.2 Engineering Change Documents

Any authorized engineering change that has not yet been incorporated into the design records shall be referenced and included in the PPAP submission package. This change may be in the form of an ECR, ECO, PCN or other change format. Unauthorized changes shall not be included.

5.2.3 Customer Engineering Approval

Does not apply to Skyworks products.

5.2.4 Design FMEA

If the supplier is design responsible, a design FMEA developed in accordance with the **AIAG FMEA Manual** shall be included in the PPAP submission package. A single design FMEA may be applied to a family of similar packages, processes, or parts.

5.2.5 Process Flow Diagrams

A process flow chart that clearly defines the high-level manufacturing process steps and sequence shall be included in the PPAP submission package. A process flow diagram may be applied to a family of similar packages, processes, or parts.

5.2.6 Process FMEA

A process FMEA developed in accordance with **AIAG FMEA Manual** shall be included in the PPAP submission package. Any parameter exhibiting a severity ranking of 9 or higher and an occurrence ranking of 5 or higher shall be classified as critical in the FMEA as well as the process control plan (see paragraph 4.2.12). A single process FMEA may be applied to a family of similar packages, processes or parts if reviewed for commonality by the supplier.

5.2.7 Dimensional Results

Evidence that dimensional verification of every dimension specified by the design record and the process control plan have been completed and indicate compliance with specified requirements shall be included in the PPAP submission package. The supplier shall record, with the actual results all dimensions (except reference dimensions), characteristics, and specifications as noted on the design record including geometric dimensional tolerancing features. Use of a ballooned drawing is encouraged to record these results.

5.2.8 Material / Performance Test Results

The supplier shall have records of material and/or performance test results for test specified on the design record or control plan.

5.2.8.1 Material Test Results

The supplier shall perform tests for all product materials when physical, or metallurgical requirements are specified on the design records. These results shall be included in the PPAP submission package.

5.2.8.2 Product Characterization

Product characterization shall be performed on all design record requirements and the results shall be included in the PPAP submission package.

5.2.9 Initial Process Capability Studies

Process capability shall be calculated for all design record parameters (i.e. supplier data sheet or Skyworks specification) using an acceptable measurement method (i.e. acceptable percent Gage R&R). Cpk data should be based on Automotive flow and/or spec limit. The results of these studies shall be included in the PPAP submission package.
An initial study shall be performed using an acceptable control chart method based on a minimum of 25 sub-groups containing at least 100 readings from consecutive parts of a significant production run to determine if the process is stable. This initial study can be replaced by longer term results from the same or similar process. Special causes of variation shall be identified, evaluated and wherever possible eliminated prior to PPAP submission.
The index for estimating process capability shall be *Cpk*. The minimum sample size for this study is 100 parts for normally distributed data. Sample parts shall be drawn from three lots minimum. Capability indices shall be calculated on parts after all planned, final electrical testing has been completed.
The supplier shall establish a procedure to assure that critical Cpks are ≥ 1.67 but less than 3.0. For those critical Cpks which are < 1.67 and >3.0, documented improvement plans shall be made available to Skyworks upon request.
Statistical methods described in the AIAG SPC manual shall be used.

5.2.10 Measurement System Analysis

A measurement system analysis using the *ANOVA* method shall be performed in accordance with the **AIAG MSA manual** on all measurement systems used to determine product acceptability including in process, final test, product qualification and characterization. The study shall include the following values as a minimum:

- Gage name, number, and study date
- USL and LSL
- Number of appraisers
- Number of parts
- Number of trials
- % equipment variation
- % appraiser variation
- % repeatability and reproducibility
- % part variation
- Number of distinct categories

The results of these studies shall be included in the PPAP submission package. The expectations are as follows:

- Gage R&R below 10 % is acceptable.
- Between 11 and 30 % is conditionally acceptable however, requires Skyworks approval to use.
- Above 30 % is rejected.

5.2.11 Qualified Laboratory Documentation

External laboratories used to gather data during production part approval (i.e. other than the supplier's internal laboratory) shall be accredited to ISO/IEC 17025 or other local standard. Evidence of such accreditation shall be included in the PPAP submission package.

5.2.12 Control Plans

Control plans defining all controls used for ensuring product conformity shall be developed in accordance with **AIAG APQP manual** and included in the PPAP submission package. Critical parameters (see paragraph 4.2.6) shall be identified on the control plan. Control plans for families or processes are acceptable.

5.2.13 Part Submission Warrant

A signed warrant certifying that all inspections and tests show conformance to the design record requirements shall be included in the PPAP submission package. A complete PSW shall include SQE approval sign off.

5.2.14 Appearance Approval / Cosmetic Requirements

Does not apply to Skyworks products.

5.2.15 Bulk Material Requirements Checklist

Does not apply to Skyworks products.

5.2.16 Sample Production Parts

Sample parts shall be provided with the PPAP submission package. These sample parts shall be drawn from the same significant production run that was used to perform the capability studies, qualification, and product characterization.

5.2.17 Master Samples

Representative samples shall be retained as part of the PPAP record at the supplier location.

5.2.18 Records of Compliance with Customer Specific Requirements

Does not apply to Skyworks products.

5.2.19 Checking Aids

Does not apply to Skyworks products.

5.2.20 Run At Rate Speed

Evidence or a statement indicating that manufacturing capacity is consistent with the Skyworks' projected ship quantities shall be included in the PPAP submission package. Surge capacity provisions shall be included if required.

5.2.21 Controlled and Reportable Materials Disclosure

If the product is designed as lead free and RoHS compliant, a signed certificate shall be included in the PPAP submission package.

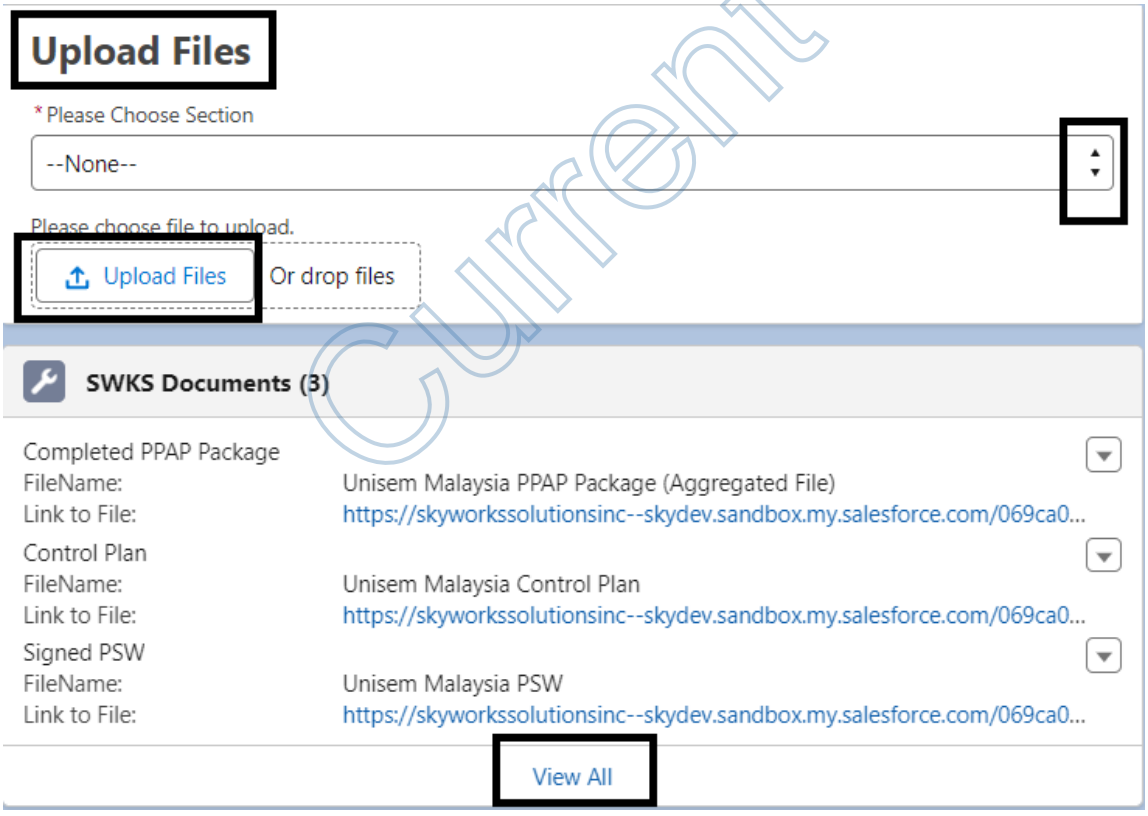
5.2.22 Die Fabrication Reliability Tests

Die used in AEC Q100 qualified products shall have evidence on file that the tests listed below were successfully completed. Results shall be made available for review if requested.

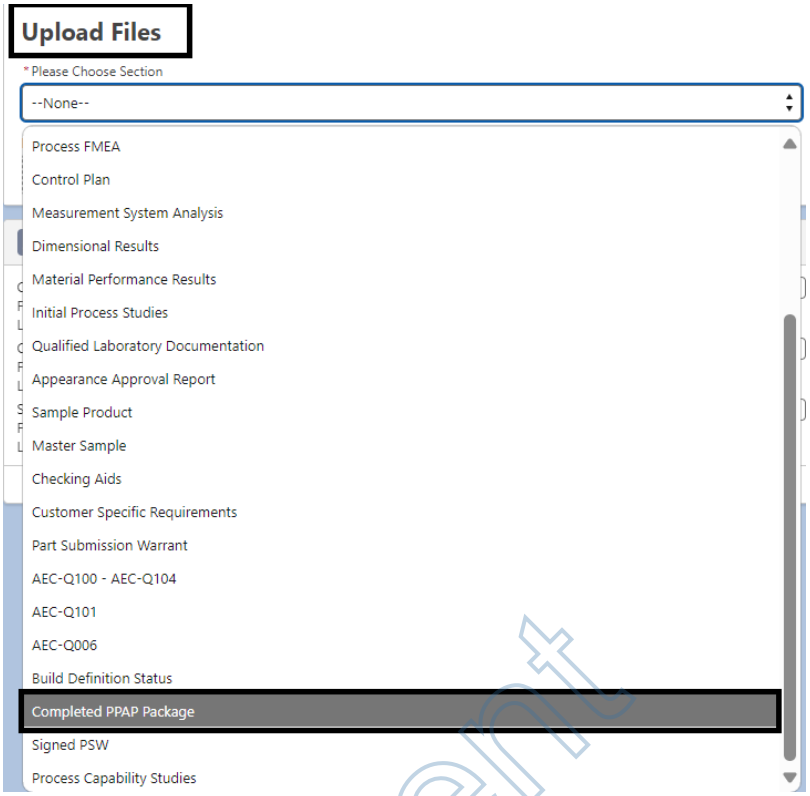
- Electro Migration
- Time Dependent Dielectric Breakdown
- Hot Carrier Injection
- Negative Bias Temperature Instability
- Stress Migration

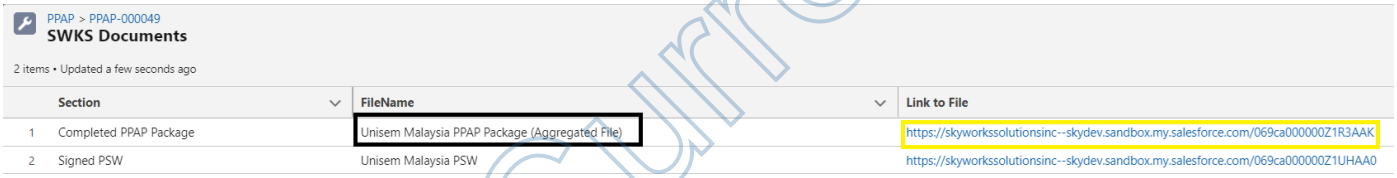
5.3 PPAP Submission

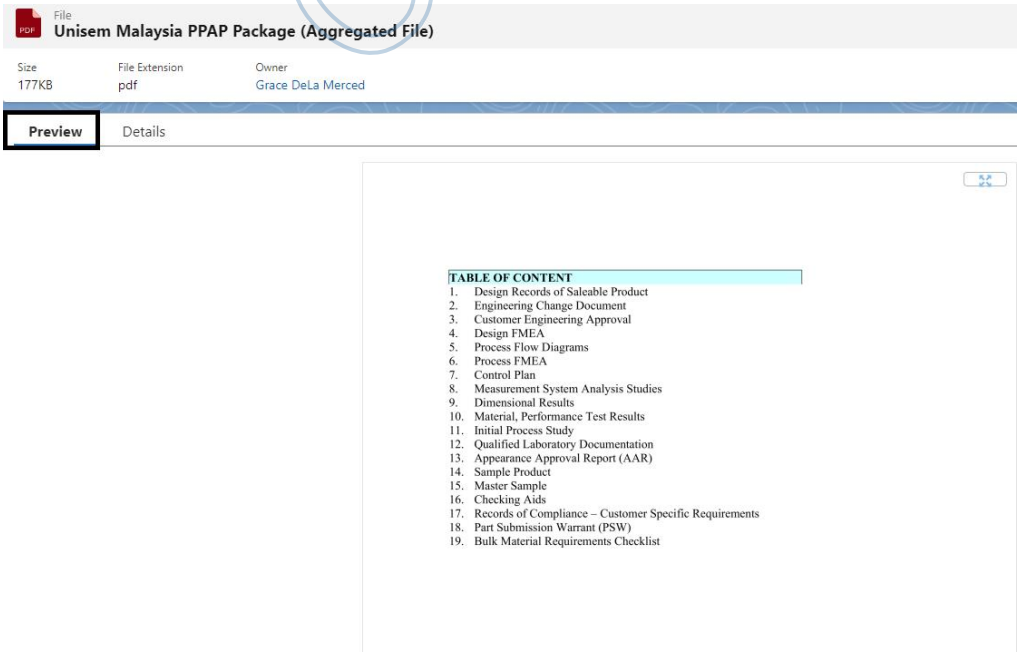
If a supplier PPAP is required to support a customer PPAP submission, a PPAP Submission record must be created. Once the PPAP submission package is received, the SQE uploads the file in the PPAP Submission record.



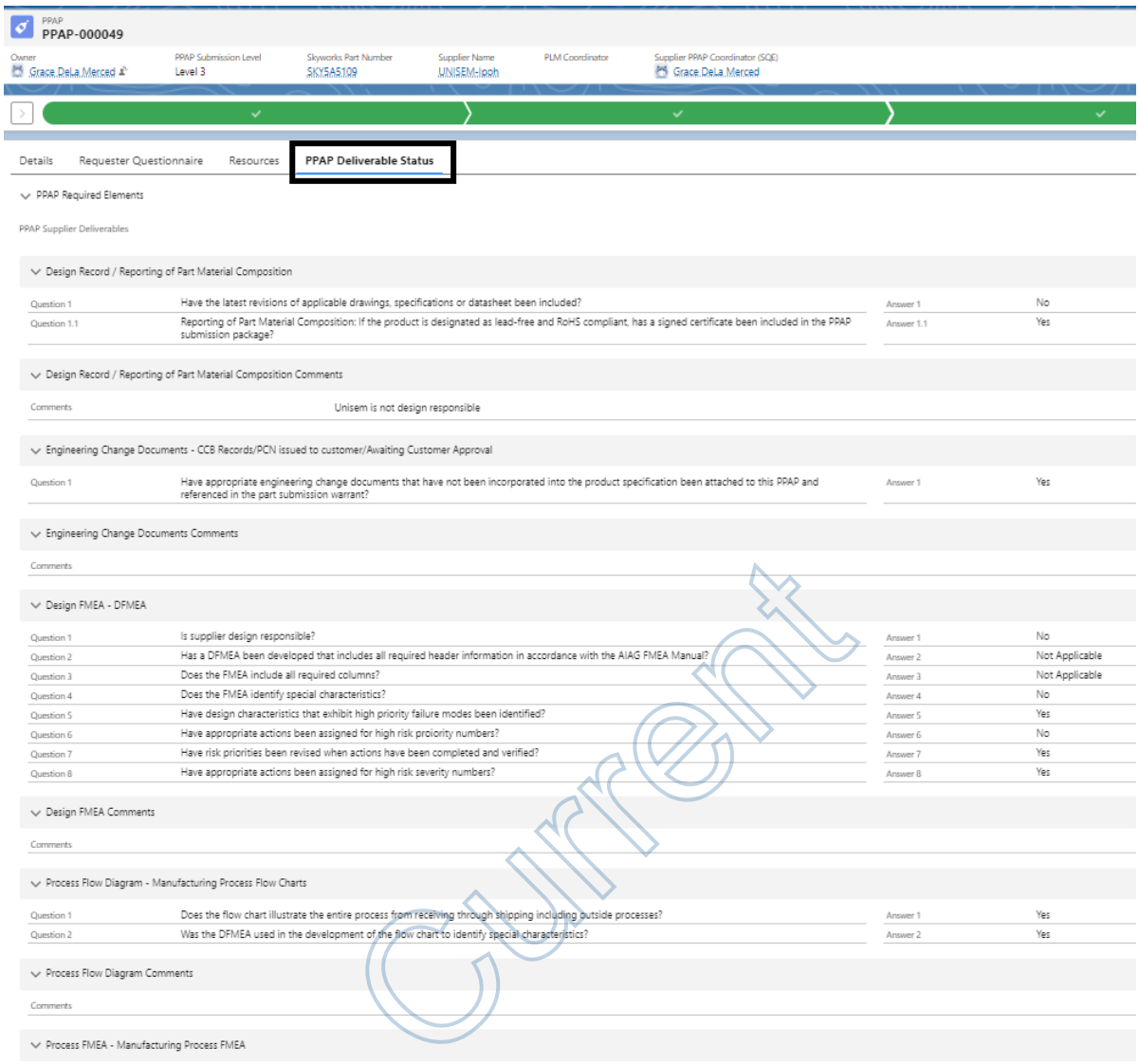
Note: There is a field for an aggregate file submission (all items in one file) or an individual field when the items are submitted as individual files.







The SQE then reviews the PPAP elements using the checklist built into the record itself.



PPAP
PPAP-000049

Owner	PPAP Submission Level	Skyworks Part Number	Supplier Name	PLM Coordinator	Supplier PPAP Coordinator (SQE)
Grace DeLa Merced	Level 3	SKY5A5109	UNISEM-Ipoh		Grace DeLa Merced

Details | Requester Questionnaire | Resources | **PPAP Deliverable Status**

PPAP Required Elements

PPAP Supplier Deliverables

Design Record / Reporting of Part Material Composition

Question 1	Have the latest revisions of applicable drawings, specifications or datasheet been included?	Answer 1	No
Question 1.1	Reporting of Part Material Composition: If the product is designated as lead-free and RoHS compliant, has a signed certificate been included in the PPAP submission package?	Answer 1.1	Yes

Design Record / Reporting of Part Material Composition Comments

Comments	Unisem is not design responsible

Engineering Change Documents - CCB Records/PCN issued to customer/Awaiting Customer Approval

Question 1	Have appropriate engineering change documents that have not been incorporated into the product specification been attached to this PPAP and referenced in the part submission warrant?	Answer 1	Yes

Engineering Change Documents Comments

Comments

Design FMEA - DFMEA

Question 1	Is supplier design responsible?	Answer 1	No
Question 2	Has a DFMEA been developed that includes all required header information in accordance with the AIAG FMEA Manual?	Answer 2	Not Applicable
Question 3	Does the FMEA include all required columns?	Answer 3	Not Applicable
Question 4	Does the FMEA identify special characteristics?	Answer 4	No
Question 5	Have design characteristics that exhibit high priority failure modes been identified?	Answer 5	Yes
Question 6	Have appropriate actions been assigned for high risk proiority numbers?	Answer 6	No
Question 7	Have risk priorities been revised when actions have been completed and verified?	Answer 7	Yes
Question 8	Have appropriate actions been assigned for high risk severity numbers?	Answer 8	Yes

Design FMEA Comments

Comments

Process Flow Diagram - Manufacturing Process Flow Charts

Question 1	Does the flow chart illustrate the entire process from receiving through shipping including outside processes?	Answer 1	Yes
Question 2	Was the DFMEA used in the development of the flow chart to identify special characteristics?	Answer 2	Yes

Process Flow Diagram Comments

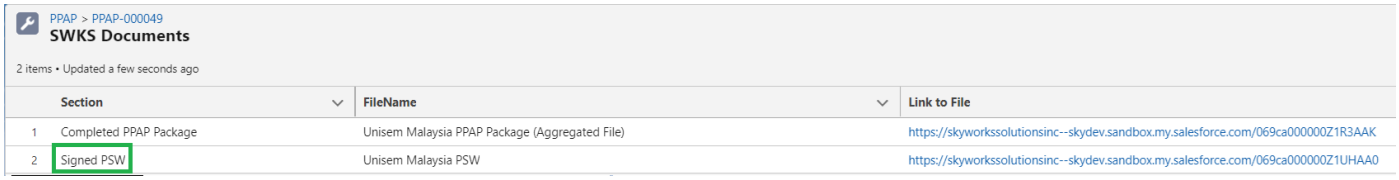
Comments

Process FMEA - Manufacturing Process FMEA

After review, the SQE indicates disposition if:

- All applicable items are acceptable, the PPAP is considered **Approved.**
- Certain items are unacceptable and would compromise production readiness, the submission is Rejected, and the supplier must correct the issues before the product can be released.

Once the PPAP submission is considered approved the SQE prints, signs, scans, and attaches the Part Submission Warrant in the record and a copy of the signed warrant is sent back to the supplier.



PPAP > PPAP-000049
SWKS Documents

2 items • Updated a few seconds ago

	Section	FileName	Link to File
1	Completed PPAP Package	Unisem Malaysia PPAP Package (Aggregated File)	https://skyworkssolutionsinc--skydev.sandbox.my.salesforce.com/069ca000000Z1R3AAK
2	Signed PSW	Unisem Malaysia PSW	https://skyworkssolutionsinc--skydev.sandbox.my.salesforce.com/069ca000000Z1UHAA0

5.4 PPAP Decision

- Every PPAP submission required decision review (Approved/Rejected). PPAP acceptance should involve a double-checking process in the CQ system. It should be reviewed and approved by second owner from within the same dept.
- Assigned SQE is the owner to work with supplier to get the required PPAP doc and fill up in Compliance Quest (CQ). Upon completion, to click the button of submit for PPAP Approver. Email notification will be sent to the assigned PPAP approver (second owner) for review and decision, CC Assigned SQE, Document author (PPAP requestor) and Distribution list.

6. Quality Records

As a result of following the steps described in this document, these records are generated:

Record	Identification	Storage	Protection	Retrieval Location	Minimum Retention Time	Disposition	Responsibility
Supplier PPAP		Electronic	DS11 Skyworks IT Data Backup Schedule and Retention Standard Document (IT Only Documents)		10 Years	Destroy	Supplier Quality External Manufacturing

7. Associated Documents

INTERNAL APPLICABLE DOCUMENTS	
Document Number	**Document Title**
SQ03-0138	Supplier Qualification and Monitoring
SQ03-0139	Production Part Approval Process
COURSE-0009	Supplier PPAP Request Training
COURSE-0019	Production Part Approval Process Training
EXTERNAL REFERENCE DOCUMENTS	
Document Number	**Document Title**
PPAP	AIAG Production Part Approval Process
FMEA	AIAG Failure Mode Effects Analysis Manual
APQP	AIAG Advanced Product Quality Planning Manual
MSA	AIAG Measurement System Analysis Manual
SPC	AIAG Statistical Process Control Manual
AEC-Q100; AEC-Q101; AEC-Q104; AEC-Q006	Automotive Electronics Council Documents http://www.aecouncil.com/AECDocuments.html

8. Reason for Change

Number shall match Doc Header	*When was the change promoted?*	*Who is promoting the change?*	*Describe the change made to this document*	*Explain what triggered the change*	*Identify positive or negative consequences to the organization*	*How do you plan to deploy this change and what will be the impact to associated documents?*	*What group will be responsible to execute this change?*
Revision	**Date**	**Initiator**	**Change Description**	**Change Purpose**	**Potential Consequences**	**Deployment Strategy**	**Impacted Function**
3	07/09/2020	Daniel LeSaux	Added additional language to better describe the dimensional verification requirements in section 4.2.7.	Suppliers were not providing data on all dimensions noted on the design records	Adherence to AIAG PPAP requirements	Communication to suppliers through Agile	All suppliers and Global Supplier Quality
4	06/04/2024	Yong Fei Sean	Convert the doc to CQ format (that automatically adds header, footer, cover page). 1) Update 5.2.9 To enforce Cpk should be based on automotive flow and/or spec limit and the critical Cpks goal should be ≥ 1.67 but less than 3. 2) Update 5.2.13, a complete PSW shall include SQE approval sign off. 3) Update 5.3 PPAP Decision / approval in system should involve a double-checking process.	Provide clarity on the supplier PPAP requirements.	AIAG PPAP requirements enhancement.	Communication to all supplier quality via training materials.	All suppliers and Global Supplier Quality.

5	2024-Nov-04	Grace De La Merced	1. Removed all Lotus Notes>QSi references and replaced by Compliance Quest (CQ) 2. Added section 5.3 regarding PPAP submission details	This document outlines the Supplier PPAP requirements in CQ PPAP module after migration from Lotus Notes>QSI.	Ensure that Supplier PPAP requirements are established in Compliance Quest (CQ). Migrate to a secure platform for control of records and QMS processes	Through approval and electronic notification	Global Supplier Quality.