

# **PCN Assessment Sheet Tutorial**

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## ■ Overview

PCN Assessment Sheet is a tool that describes the evaluation level and tests for changes in the manufacturing process.

- Used as a communication tool for semiconductor makers, ECU makers, and Car makers.
- This document follows the international standards (such as AEC Q10x, IEC 60810, and ZVEI).

The evaluation item matrix which is based on the ZVEI – Delta Qualification Matrix (DeQuMa) is to identify the impact by the change points and evaluation items.

Base on the following contents, it will clarify the scope of evaluation required for change approval and applicable tested product(s).

- Connection between the change points from 4M1E point of view and evaluation items
- Visualization of the impact of the changes on ECU and systems in the table “Confirmation of design changes due to product changes”
- Connection between evaluation results / production results under changed manufacturing conditions and evaluation items required for PCN.
- Connection between combination element, actual result, failure mechanism, representative product, and evaluation items

## ■ Purpose

- Optimization of evaluation item selection based on failure risk due to the process change
- Throughput improvement, man-hour reduction for PCN preparation by using a common form
- Reduction of time and effort required for PCN evaluation

# Structure of PCN Assessment Sheet

# PCN Assessment Sheet

PCN Assessment Sheet (BE)

Application: PCN														
Reason of change	Production requirement in transfer site	Technical aspect	Change details	Operator skill tool degradation (Yes/No)	Tool change (Yes/No)	Material change (Yes/No)	Process change (Yes/No)	Characteristics change (Yes/No)	Any correction to mitigate the change risk to product (Y/N/No/NA)	Form (Discussion)	Characteristics (inc. Mechanical strength)	Initial Process Study (PPS)	Measurement System Analysis (MSA)	
Description Guide	Select from publisher	Use item from publisher menu for "Change details" if "Others" is selected, describe details in "Additional comments for change contents"	Describe "C Change", "E (Equivalent)" or "N (No change)" for change or experimental status. Describe explanation for change contents with number "N", if additional contents is needed.							Items to be shown up along with "Technical aspect"		Describe expected completion schedule if "No problem" is selected, specify the reference about date.		
Stable product supply	Production requirement for Automotive products - exception - One or more steps	BE common Wire bonding	Change bonding wire material (change No. on Cu)	Y	Y	Y	Y	Y	Y	No	Lockup dimension, wire flow, etc. Ball and loop shape	Binding strength (force, g)	Expected completion date	Expected completion date
Additional comments for change contents			Additional comments for correction											

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## Sheet Structure

### "1. Confirmation of changes points due to production related changes"

This section is to identify the technical aspects and change points from 4M1E point of view and to confirm its process capability.

### "2. Confirmation of design changes due to production changes"

This section is to clarify the impact by the change points from product specification point of view and to confirm the equivalency on electronic characteristics.

2a. Verification of Change point for design (BE)										
Function	Specification category	Item	Parameter	Specification change (Yes/No)	Need of change impact verification (Yes/No)	Need of correction impact verification (Yes/No)	Assessment item	Assessment result		
Electrical characterization	Specification	AC	Frequency	No	No	No	Electrical characterization	OK		
			Output	No	No	No	Electrical characterization	OK		
			Breakdown voltage	No	No	No	Electrical characterization	OK		
			Leakage	No	No	No	Electrical characterization	OK		
			Flash memory characterization	Write/erase time	No	No	No	Electrical characterization	OK	
			Data retention time	No	No	No	Electrical characterization	OK		
EMC	Equivalency	No	No	No	Electrical characterization	OK				
Additional requirements										

2a

With the above results,

### "2b. Confirmation of interaction of combined changes and selection of qualification test items"

This section is to identify qualification test items and reason of selection for representative qualification product(s) and to confirm the required qualification test results.

2b. Verification of combination risk and definition of evaluation items (BE)									
Technical aspect	Changes	Combination risk	Combination sequence	Failure mechanism	Representative product	Representative product	Representative product	Representative product	Representative product
BE common	X	X	X	Total Reliability	Condition to define the representative product	Representative product	Representative product	Representative product	Representative product
Wire bonding	X	X	X	Local Reliability	Condition to define the representative product	Representative product	Representative product	Representative product	Representative product
Additional comments for selected items (if needed)									

2b

## Assessment Approach

PCN evaluation can be OK only when process capability results for 1, equivalency on electronic characteristics for 2, and qualification test results selected by 2b are all OK.

# 1. Confirmation of changes points due to production related changes (1/2) PCN Assessment Sheet

\*There are two types of PCN Assessment Sheets: “Front End” and “Back End (includes Test and following process) “. Make sure to use the applicable sheet.

## PCN Assessment Sheet (BE)

ApplicationPCN1-11-6

1. Verification of Change point for production (BE)

Reason of change	Production experience in transfer site	Technical aspect	Change details	Comment	change items									
					Man		Machine		Material		Method		Environment	
					Operator skill degradation (Yes/No)	Comment	Tool change (Yes/No)	Comment	change (Yes/No)	Comment	change (Yes/No)	Comment	change (Yes/No)	Comment
1-2	1-3	1-4	1-5		Describe "C (Change)", "E (Equivalent)" or "N (No change)" for change or experienced status (Describe explanation for change contents with number (*#), if additional comment is needed)									
Description Guide		Select from pulldown	Use item from pulldown menu for "Change details" If "Others" is selected, describe details in "Additional comment for change contents"											
Stable product supply	Production experience for Automotive products yyyy/mm ~ Over xx Mpcs	BE_common	Site change	*1	E (Equivalent)	*2	E (Equivalent)	*1	C (Change)	*3	C (Change)	*3	E (Equivalent)	*4
		Wire_bonding	Change bonding wire material change (Au => Cu)	*3	E (Equivalent)	*2	C (Change)	*3	C (Change)	*3	C (Change)	*3	E (Equivalent)	*4
		1-7	Additional comment for change contents											
					[a] Experienced Automotive production									
					*1 Comment: OSAT (plant B) is added to the current assembly plant A. Plant B is IATF 16949 certified. Long business relations with the OSAT and outsourcing management has been implemented. Equivalent Process/Machines except the wire material change.									
					*2 [a] Experienced Automotive production									
					Comment: Equivalent training system is available.									
					*3 [a] Experienced Automotive production									
					Comment: Bonding wire material is changed from Au to Cu. Dedicated bonding machine is used for Cu wire. Not new technology. Over 1 billion parts of products with the same process/package with Cu wire have been shipped and no quality defect related with the Cu wire has occurred as of									
					*4 [a] Experienced Automotive production									
					Comment: Same ISO cleanliness standard									

\*The above is a sample from the “Back End” sheet

- 1-1) Select “PCN” or “PCI” referring to the “List” sheet
- 1-2) Select “Reason of Change” from the drop-down lists. If “Others” is selected, add a comment No. in 1-5) & 1-6) and write explanatory comments on 1-7).
- 1-3) Write production experience
- 1-4) Select “Technical aspect” from the drop-down lists. If there is no applicable one, select “Others” and write change details in the 1-7) “additional comment”.
- 1-5) Select “Change details” from the drop-down lists. If additional explanation is required, add a comment No. and write comments on 1-7).
- 1-6) As to 4M1E change points, select from  
“C” for Change “E” for Equivalent  
“No” for No-change  
Refer to the “4M1E STD” sheet for each definition.
- 1-7) Write additional comments for 1-2 to 1-6.  
Link each comment No. to the No. added in 1-5) and/or 1-6). If “E” for Equivalent is selected in 1-6), make sure to write its justification.

## 1. Confirmation of changes points due to production related changes (2/2) PCN Assessment Sheet

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**1-8)** If “Any correction to mitigate the change risk in product” occurs, select “Yes”, if not select “No”. Add comment in 1-9) if additional explanation is required by adding a comment No.

**1-9) Add explanations for 1-8)**

**1-10)** Select from the drop-down lists which link with the selected “Technical aspect”.

**1-11) If “C” or “E” is selected in 1-6), process capability results need to be submitted as summarized evidence documents. (Also refer to the “Example#1” Sheet”)**

If the result is not yet available at the time of planning announcement, write the expected completion date. If already completed, write the reference document name and page #.

## 2. Confirmation of design changes due to production changes

2a. Verification of Change point for design (BE)

Function	Specification category	Item	Parameter	Specification change	Comment	Need of change impact verification	Comment	Need of correction impact verification	Comment	Assessment item	Assessment result
				(Yes/No)		(Yes/No)		(Yes/No)		Electrical characterization	Electrical characterization
Electrical characterization	Specification	AC	Frequency	No		No		No		Yes	*1 OK
		DC	Output	No		No		No		Yes	*1 OK
			Breakdown voltage	No		No		No		Yes	*1 OK
			Leakage	No		No		No		Yes	*1 OK
		Flash memory characterization	Write/erase time	No		No		No		No	
	Data retention time		No		No		No		No		
	Reference	EMC	Equivalency	No		No		No		Yes	*2 OK
Additional explanation	*1	Electrical Characterization data is confirmed and the data is attached for your review.									
	*2	EMC evaluation was performed due to the wire material change and the result is attached for your review.									

**2a-1)** Write other critical parameter from the Data Sheet besides the electrical characteristics (AC, DC) if any. (Add more depending on the change points and the subject product)

**2a-2)** If any specification change occurs on the parameter, select “Yes”, if not select “No”. If “Yes” is selected, add a comment No. and write explanation in 2a-7).

**2a-3)** If the process change affect the parameter, select “Yes”, if not select “No”.

**2a-4)** If “Any correction to mitigate the change risk in product” occurs in 1-8), select “Yes” in the applicable parameter. If not applicable, select “No”. If no correction in 1-8), “No” should be selected in all items.

**2a-5)** If electrical characterization is confirmed using samples, select “Yes” in the applicable parameter. If not, select “No”.

**2a-6)** If “Yes” is selected in any parameter in 2a-5), write electrical characterization results selecting by “OK” or “NG”.  
The actual confirmation results need to be submitted as summarized evidence documents.  
If the result is not yet available at the time of planning announcement, provide the expected completion date.

**2a-7)** If “Yes” is selected in 2a-2) to 2a-5), add a comment No. in the applicable item and provide additional explanation in 2a-7).

2b. Confirmation of interaction of combined changes and selection of qualification test items (1/2) N Assessment Sheet

2b. Verification of combination risk and definition of evaluation items (BE)

2b-1

2b-2

2b-3

2b-4

2b-5

Technical aspect	Changes			Combination risk	Combination experience (X: Experienced, -: No experience for combination)	Failure mechanism	Representative product	
	Site	4M1E	OR				Condition to define the representative product	Representative product
BE_common	X	X		X	Total Reliability	Assembly failure	N/A	N/A
					Package dimension	Assembly failure	N/A	N/A
Wire_bonding	X	X		X	IMC	Wire pull/shear failure	Same assembly line/Same package/Same materials/bigger business volume	Product A
					Lead frame	Wire peel failure		Product A
					Molding	Corrosion		Product A
							2b-6	2b-7

↑ Check if site change: X  
↑ Check if there is change: X  
↑ Check if Yes: X  
↑ OR for site, 4M1E, correction

DeQuMa ID referenced =>

PCN-Delta-Qualification-Matrix-ZVEI-4\_1.xlsm

Change of wire bonding	SEM-PA-08
Move all or parts of production to a different assembly site.	SEM-PA-18
Production from a new equipment/tool which used the same	SEM-EQ-02
Evaluation items aft	
Comment	

2b-1) Manually copy the “technical aspect” selected in 1-4)

2b-2) Site: if site changes, write “X”  
4M1E: If any “C” is applicable in the section 1, write “X”  
Correction: If any “Yes” is applicable in the section 1, write “X”  
OR: If any “X” is applicable in the 3 times, write “X”

2b-3) Write all possible combination risk for each “technical aspect”

2b-4) If the combinations has production experience, write “X”, if none, write “-”.

2b-5) Write failure mechanism

2b-6) In case of qualification by similarity using a representative product, write the selecting condition.

2b-7) In case of qualification by similarity using a representative product, write the representative product type/part number.



