

Record of Letter Ballot Review by TC Chapter for Procedural Review

Region/Locale: **North America**

Global Technical Committee: **3D Packaging & Integration**

TC Chapter Cochairs: **William Kerr / Evergreen Enhancement, Chris Moore / Consultant**

Standards Staff: **Laura Nguyen**

	Scheduled in Background Statement	Actual
Date	02/12/2026	02/12/2026
Location	OVTCCM	OVTCCM
Reason for Change of Date and/or Location (if changed)		

Note: Refer to *Regulations* ¶ 9.5 Exceptions for allowable reason to change.

I. Document Number and Title

Document Number	Document Title
7331	New Standard: Guide for Peel Testing of RDLs and Other Traces Used Within Advanced Packages and Structures

II. Tally

Voting Tally: **As-cast tally after close of voting period**

Note: A minimum of 60% of the Voting Interests that have TC Members within the global technical committee that issued the Letter Ballot must return Votes. (*Regulations* ¶ 9.6.2.1.1)

Note: Refer to *Regulations* § 3.2.1 for definition of Voting Interest.

Voting Interest:	Returned Votes	Distribution	Return Rate	
Letter Ballot	61	÷ 95	= 64.21%	≥60%
Intercommittee Ballot	41			
Voting Interest Reject(s)	0	Total Voters with Rejects		0
Voting Interest Accept(s)	69			

III. Rejects

None

IV. Other Technical Issues

None

V. Comments

Commenter 1 (Mei-Chien Lu / Monte Rosa Technology) - Comment 1

Comment	*TF/TC Chapter to fill in section/paragraph #, if necessary.	
	section 6.2, materials properties also vary based on processing conditions. suggest to add as such -- Ideally look for materials properties based on similar dimensional sizes, processing conditions,	
Action	The TC Chapter agreed to do one of the following actions.	
	*No motion is required in this step.	
	<input type="checkbox"/>	Already addressed by Commenter #, Comment #
	<input checked="" type="checkbox"/>	No further action was taken by the TC Chapter.
	<input type="checkbox"/>	Refer to the TF for more consideration.
	<input type="checkbox"/>	New Business
	<input type="checkbox"/>	Editorial Change

This table is needed for each Comment accompanied a Vote

Commenter 2 (Clark Cao / NAURA) - Comment 1

Comment	*TF/TC Chapter to fill in section/paragraph #, if necessary.	
	This document is appropriately positioned as a Guide. To avoid misapplication, please emphasize that peel test results are intended for relative comparison within the same structure and process, and should not be used as absolute acceptance criteria across different advanced packaging platforms.	
Action	The TC Chapter agreed to do one of the following actions.	
	*No motion is required in this step.	
	<input type="checkbox"/>	Already addressed by Commenter #, Comment #
	<input checked="" type="checkbox"/>	No further action was taken by the TC Chapter.
	<input type="checkbox"/>	Refer to the TF for more consideration.
	<input type="checkbox"/>	New Business
	<input type="checkbox"/>	Editorial Change

V- (i) Voters' Comments
None

V-(ii) Comments Created by Handling Negative
None

VI. Editorial Changes Other than Those Voted on in § V
None

VII. Approval Conditions Check
VII. - (i). Approval Rate

APPROVAL CONDITION 1: All Negatives have been discussed and were withdrawn, found not related, found not persuasive, or addressed by a technical change. (*Regulations ¶ 9.6.2.1.2*)

APPROVAL CONDITION 2: At least 90% of the sum of valid Voting Interest Accept and Voting Interest Reject Votes must be Accept. (*Regulations ¶ 9.6.2.1.3*)

Note: If both approval conditions are not satisfied, the Document fails.

		Accepts	(Accepts + Valid Rejects)			
Approval Rate	=	69	69	=	100%	≥90%

VII. – (ii) Approval Level (check one)

Note: Refer to *Regulations § 9.6.2* for further information.

- Globally Approved (No Ratification Ballot needed):**
 The Letter Ballot meets the Letter Ballot approval conditions for the global technical committee.
- Need a Ratification Ballot:**
 The Letter Ballot meets the Letter Ballot approval conditions for the TC Chapter and a Ratification Ballot will be issued to validate technical changes.

VIII. Safety Check

Note: Refer to *Regulations § 15* for further information.

Motion	<input checked="" type="checkbox"/>	This is not a Safety Document , when all safety-related information is removed, the Document is still technically sound and complete. (<i>Regulations ¶ 8.7.1</i>)
	<input type="checkbox"/>	This is a Safety Document , when all safety-related information is removed, the Document is not technically sound and complete. (<i>Regulations ¶ 8.7.2</i>)
	<input type="checkbox"/>	Safety Checklist (<i>Regulations ¶ 15.3</i>) is complete and has been included with the Document throughout the balloting process. (<i>Regulations ¶ 15.1.2</i>)
Motion by/2nd by		By: Steven Martell (self) Second: Richard Allen (NIST)
Discussion		None
Vote		6 Y 0 N; Motion passed.

IX. Intellectual Property (IP) Check

Note: This Letter Ballot may cover all or part of a Standard or Safety Guideline. Regardless of the coverage, this IP check applies to the entire Standard or Safety Guideline*. Refer to Regulations § 16 for further information.

X	The TC Chapter meeting chair asked those participating, if they were aware of any patented technology that might be relevant (refer to <i>Regulations</i> ¶ 16.3.1.1) to the Standard or Safety Guideline; or, any copyrighted items or trademarks that are used/reproduced (refer to <i>Regulations</i> ¶ 16.4.1.2) in the Standard or Safety Guideline. (Also refer to <i>Regulations</i> § 8.8)					
	X	The question is NOT answered in affirmative (No potentially material patented technology or use/reproduction of copyrighted items/trademarks is known.)	GO TO SECTION X.			
	X	The question is answered in affirmative	Is any of the known IPs a patented technology?	X	Yes, at least one of them is a patented technology	GO TO IX (a) "Patented Technology" subsection
				X	No	GO TO IX (b) "Copyright items" subsection

IX(b1) Total numbers of copyrighted items to be dealt with

15 Fill number	(o) Known copyrighted items that are used or reproduced to the Standard/Safety Guideline	X	o > 0 There is at least one known copyrighted items that might be relevant to the Standard/Safety Guideline	GO TO IX (b2)
			o = 0 There is no disclosed copyrighted item	GO TO IX (c)

IX(b2) Assessment of disclosed copyrighted items

Disclosed copyrighted item #1 (<i>Brief description of its use in the Document</i>): Figure 1: Diagrams showing the adhesion properties of adhesion energy and adhesion strength, which are associated with peel and shear testing, respectively.						
Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
						NO
		NO	No further action is needed for copyrighted item #1			

This table is needed for each disclosed copyrighted item.

Disclosed copyrighted item #2

(Brief description of its use in the Document): Figure 2: Digital Model Example of Trace Structure with Only 1 of 4 Sides in Contact with the Substrate

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #2			

Disclosed copyrighted item #3

(Brief description of its use in the Document): Figure 3: Example of a trace twist when the aspect ratio of the trace thickness to width is too large. Data from both model and actual test results would be inaccurate.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #3			

Disclosed copyrighted item #4

(Brief description of its use in the Document): Figure 4: Example of region, 1 to 4mm, to collect trace pull data. Ignore the first 1 mm and collecting for the next 3 mm of travel distance at minimum, as indicated by the dotted green box.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #4			

Disclosed copyrighted item #5

(Brief description of its use in the Document): Figure 5: This image is an example of a trace within the grasp of the clamping jaws.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #5			

Disclosed copyrighted item #6

(Brief description of its use in the Document): Figure 6: Images illustrate the peel angle variations for a clamped metal trace. The ideal peel angle is the encircled 90-degree case. Pull speed and substrate speed are at the same rate but in orthogonal directions.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #6			

Disclosed copyrighted item #7

(Brief description of its use in the Document): Figure 7: This image shows the preferred pull angle, 90° (+/- 5°), while the clamp jaws (pull speed) and trace sample (substrate speed) are in synchronized motion.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #7			

Disclosed copyrighted item #8

(Brief description of its use in the Document): Figure 8: Using a shear tool to prepare the trace for peel testing.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #8			

Disclosed copyrighted item #9

(Brief description of its use in the Document): Figure 9: Example of traces prepared for peel testing with staggered start positions for better access for the jaws of the peel tester.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #9			

Disclosed copyrighted item #10

(Brief description of its use in the Document): Figure 10: Example of a pressure gripping jaw or tweezer in alignment prior to gripping and peel testing a trace.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #10			

Disclosed copyrighted item #11

(Brief description of its use in the Document): Figure 11: Examples of peel data for 5, 10 and 20 um wide traces. Notice the outliers in the data for the 5 and 10 um traces.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #11			

Disclosed copyrighted item #12

(Brief description of its use in the Document): Figure 12: Example of comparing experimental data to computer modeling to help understand where the model may need to be modified for future predictions.

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #12			

Disclosed copyrighted item #13

(Brief description of its use in the Document): Figure A1-1: Initial Finite Element Model Design for Comparison to Peel Test Results

Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #13			

Disclosed copyrighted item #14						
<i>(Brief description of its use in the Document):</i> Figure A1-2: The results of the computer model after adjusting the parameters to better match the experimental data obtained for 5, 10 and 20 um wide traces.						
Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #14			

Disclosed copyrighted item #15						
<i>(Brief description of its use in the Document):</i> Figure A1-3: Example of comparing experimental data to computer modeling to help understand where the model may need to be modified for future predictions.						
Is disclosed copyrighted item #1 used or reproduced in the Standard/Safety Guideline?	X	YES	Is the use/reproduction of this copyrighted item technically justified?	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(b3)
					NO	The Document is failed and returned to the TF
		NO	No further action is needed for copyrighted item #15			

IX(b3) Copyright release status check of copyrighted item of which inclusion assessed to be justified

Copyright release Status of copyrighted item #1			
Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)

This table is needed for each copyrighted item of which use/reproduction assessed to be justified.

Copyright release Status of copyrighted item #2			
Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)

Copyright release Status of copyrighted item #3			
Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)

Copyright release Status of copyrighted item #4			
Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)

Copyright release Status of copyrighted item #5

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #6

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #7

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #8

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #9

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #10

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #11

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #12

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #13

Has the copyright release been received from its owner ?.	X	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)
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Copyright release Status of copyrighted item #14			
Has the copyright release been received from its owner ?.	<input checked="" type="checkbox"/>	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)

Copyright release Status of copyrighted item #15			
Has the copyright release been received from its owner ?.	<input checked="" type="checkbox"/>	YES	PROCEED to assess NEXT one, or if this is the last one, GO TO IX(c)

IX(c) Assessment of disclosed (identified) trademark

Is there any trademark in the Standard/Safety Guideline?	<input type="checkbox"/>	YES	Is every instance of trademark use technically justified?	<input type="checkbox"/>	YES	GO TO IX(d)
	<input type="checkbox"/>	NO		<input type="checkbox"/>	NO	The Document is failed and returned to the TF
	<input checked="" type="checkbox"/>	NO	GO TO IX(d)			

IX(d) IP check completion condition check

The co-chair checks if any Patented Technologies first become known to the TC Chapter on or after the day of the issuance of this Letter Ballot? i.e., m>0 in IX(a1)	<input type="checkbox"/>	YES	Sections IX(a2) and IX(a3) shall be completed and recorded for such patented technologies at next scheduled meeting of the TC Chapter. Until then, the TC Chapter shall NOT go to X (making motion to pass/fail this Document) (refer to Regulations ¶16.4.1.2) Until then this Letter Ballot Review is on hold.
	<input checked="" type="checkbox"/>	NO	GO TO X

X. Action for This Document

Motion	<input checked="" type="checkbox"/>	This Document passed TC Chapter review as balloted and will be forwarded to the ISC A&R SC for procedural review.
Motion by/ 2nd by	By: Richard Allen (NIST) Second: Steven Martell (self)	
Discussion	None	
Vote	5 Y 0 N	
Final Action	<input checked="" type="checkbox"/>	Motion passed
	<input type="checkbox"/>	Motion failed

Note: If the use of PMPT or copyrighted item is justified by the TC Chapter, LOA or release form must be received before publication can proceed.