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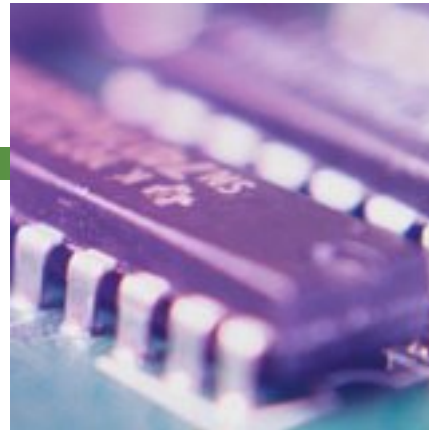


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Question

- What's the criteria for lead protrusion?
- Does it impact lead clinching?
- What does violate minimum Electrical Spacing mean?

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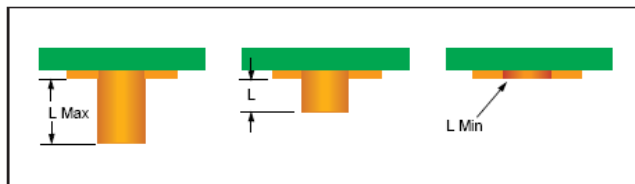
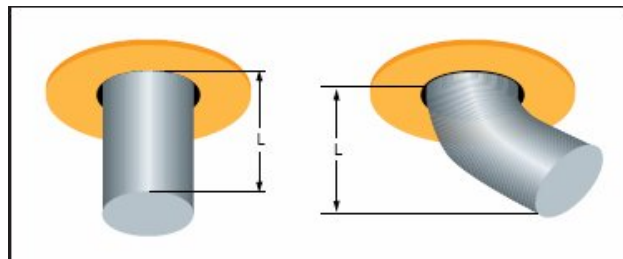


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IPC-A-610 Criteria 7.4.3 Unsupported Holes



Target - Class 1,2,3

- The protrusion of leads and wires beyond the conductive surface is (L) or as specified on the specification or drawing.

Acceptable - Class 1,2,3

- The leads protrude beyond the land within the specified minimum and maximum (L) of Table 7-2, provided there is no danger of violating minimum electrical clearance.

Defect - Class 1,2,3

- Lead protrusion does not meet Table 7-2 requirements.
- Lead protrusion violates minimum electrical clearance.
- Lead protrusion exceeds maximum design height requirements.

Table 7-2 Protrusion of Leads in Unsupported Holes

	Class 1	Class 2	Class 3
(L) min	End is discernible in solder		Sufficient to clinch
(L) max	No danger of shorts	2.5 mm [0.0984 in]	No danger of shorts

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IPC-A-610 Criteria 7.5.3 Supported Holes

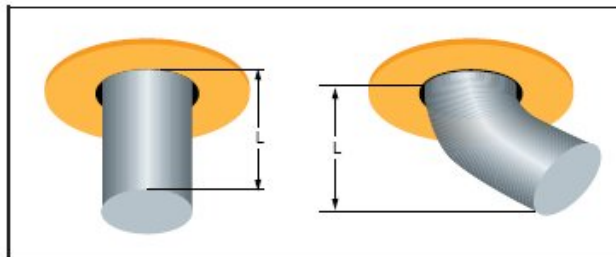
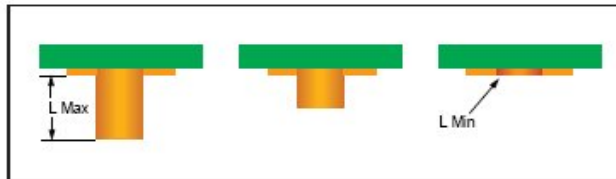


Figure 7-96



Target - Class 1,2,3

- The protrusion of leads and wires beyond the conductive surface is (L) or as specified on the specification or drawing.

Acceptable - Class 1,2,3

- The leads protrude beyond the land within the specified minimum and maximum (L) of Table 7-5, provided there is no danger of violating minimum electrical clearance.

Defect - Class 1,2,3

- Lead protrusion does not meet the requirements of Table 7-5.
- Lead protrusion violates minimum electrical clearance.
- Lead protrusion exceeds maximum design height requirements.

Table 7-5 Protrusion of Leads in Supported Holes

	Class 1	Class 2	Class 3
(L) min.	End is discernible in the solder. ¹		
(L) max.	No danger of shorts	2.5 mm [0.0984 in]	1.5 mm [0.0591 in]

Note 1. For boards greater than 2.3 mm [0.0906 in] thick with components having pre-established lead lengths, e.g., DIPs, sockets, connectors, lead protrusion may not be discernible, see 1.4.2.5.

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Example of Lead Protrusion



Lead to hole size ratio.

Hole should be:

.006" (0,2mm) to

.015" (0,4mm)

larger than the lead in the
hole for solder to flow
into plated through hole.

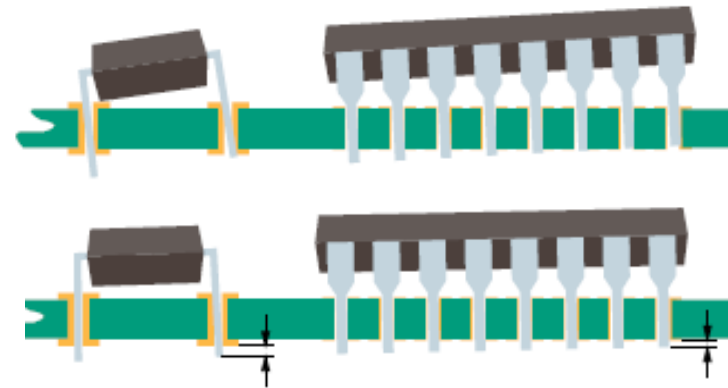
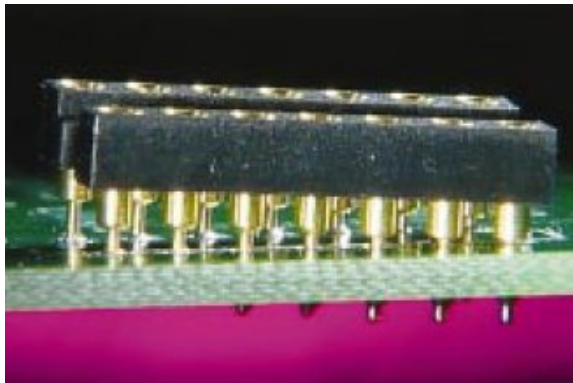


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Example of Lead Protrusion



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Lead Clinching

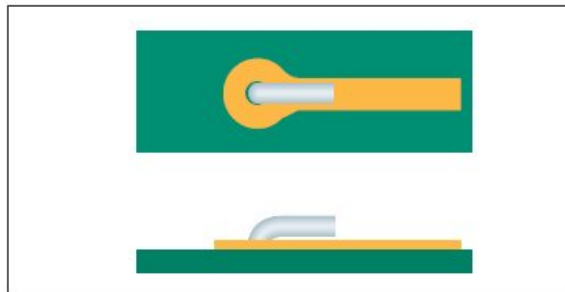


Figure 7-98

Target - Class 1,2,3

- Lead end is parallel to the board and direction of the clinch is along the connecting conductor.

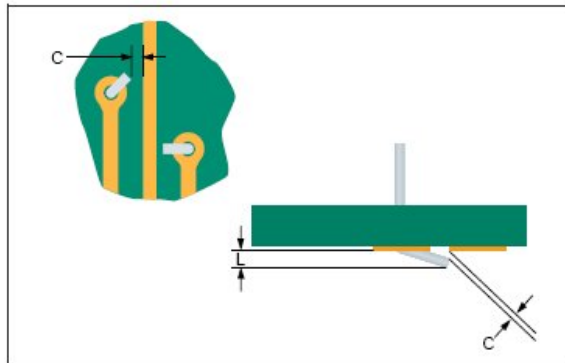


Figure 7-99

Acceptable - Class 1,2,3

- The clinched lead does not violate the minimum electrical clearance (C) between noncommon conductors.
- The protrusion (L) beyond the land is not greater than the similar length allowed for straight-through leads. See Figure 7-99 and Table 7-5.



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Minimum Electrical Spacing

IPC-2221 – Table 6-1 Electrical Conductor Spacing

Voltage Between Conductors (DC or AC Peaks)	Minimum Spacing						
	Bare Board				Assembly		
	B1	B2	B3	B4	A5	A6	A7
0-15	0.05 mm	0.1 mm	0.1 mm	0.05 mm	0.13 mm	0.13 mm	0.13 mm
16-30	0.05 mm	0.1 mm	0.1 mm	0.05 mm	0.13 mm	0.25 mm	0.13 mm
31-50	0.1 mm	0.6 mm	0.6 mm	0.13 mm	0.13 mm	0.4 mm	0.13 mm
51-100	0.1 mm	0.6 mm	1.5 mm	0.13 mm	0.13 mm	0.5 mm	0.13 mm
101-150	0.2 mm	0.6 mm	3.2 mm	0.4 mm	0.4 mm	0.8 mm	0.4 mm
151-170	0.2 mm	1.25 mm	3.2 mm	0.4 mm	0.4 mm	0.8 mm	0.4 mm
171-250	0.2 mm	1.25 mm	6.4 mm	0.4 mm	0.4 mm	0.8 mm	0.4 mm
251-300	0.2 mm	1.25 mm	12.5 mm	0.4 mm	0.4 mm	0.8 mm	0.8 mm
301-500	0.25 mm	2.5 mm	12.5 mm	0.8 mm	0.8 mm	1.5 mm	0.8 mm
> 500 See para. 6.3 for calc.	0.0025 mm /volt	0.005 mm /volt	0.025 mm /volt	0.00305 mm /volt	0.00305 mm /volt	0.00305 mm /volt	0.00305 mm /volt

- B1 - Internal Conductors
- B2 - External Conductors, uncoated, sea level to 3050 m
- B3 - External Conductors, uncoated, over 3050 m
- B4 - External Conductors, with permanent polymer coating (any elevation)
- A5 - External Conductors, with conformal coating over assembly (any elevation)
- A6 - External Component lead/termination, uncoated
- A7 - External Component lead termination, with conformal coating (any elevation)



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Damaged Pins and Connectors

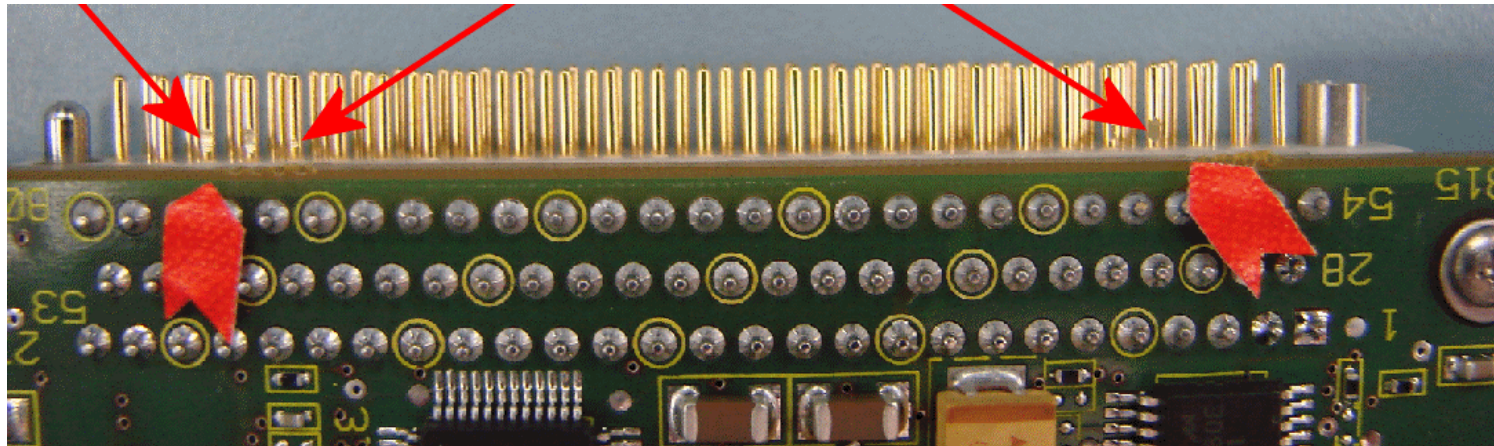


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Damaged Pins in Connector



Can they be repaired or replaced?

The answer is no, the connector must be removed and replaced.

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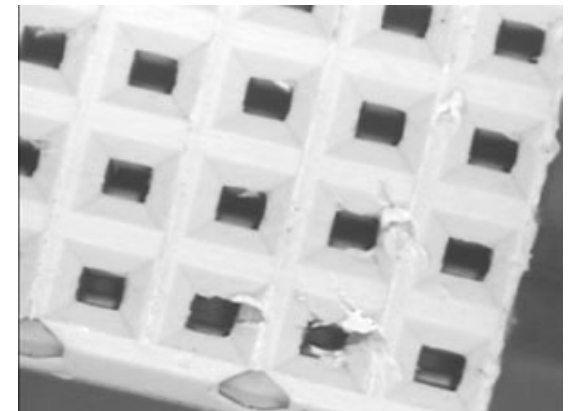
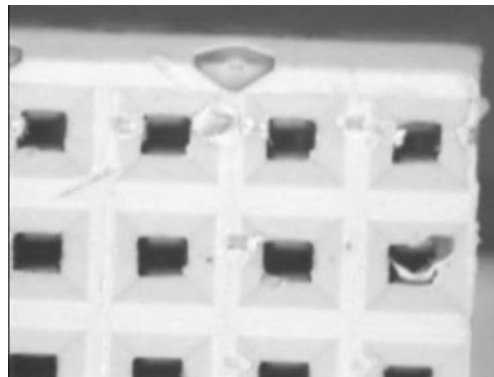
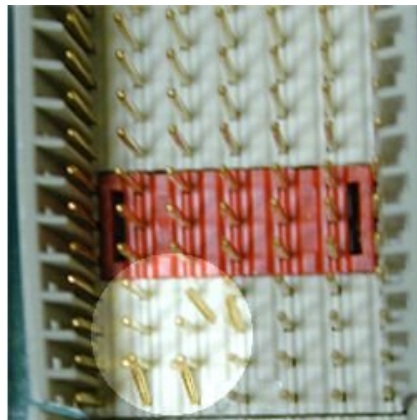


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Examples of Damaged Connectors/Contacts/Pins



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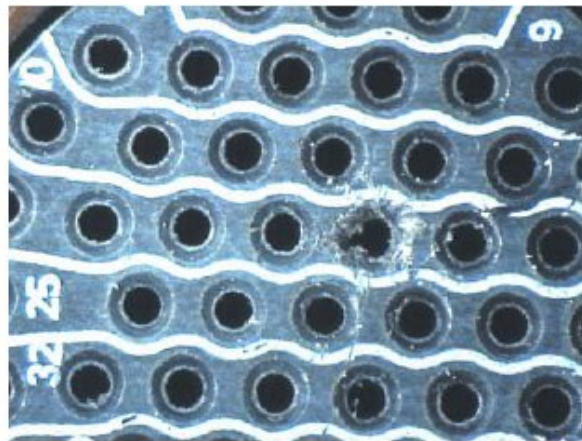


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Examples of Damaged Connectors/Contacts/Pins



Acceptable – Class 1 Process Indicator – Class 2, 3

- Connector face has been chipped but dielectric between seals is intact.
- Chipping does not extend from one cavity to the outer diameter of any adjacent cavity.

Extrapolated from IPC/WHMA/A-620



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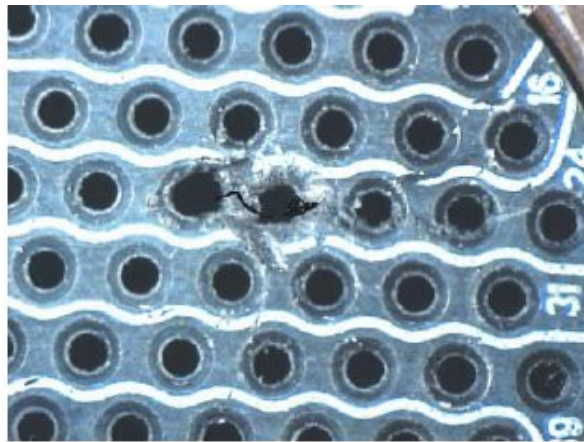


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Examples of Damaged Connectors/Contacts/Pins



Defect – Class 1,2,3

- Chipping of the dielectric extends from cavity to the outside diameter of any adjacent cavity.
- Crack extends from one cavity to another.

Extrapolated from IPC/WHMA/A-620



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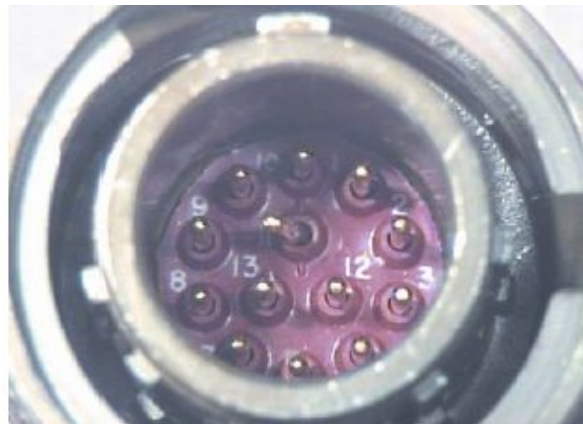


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Examples of Damaged Connectors/Contacts/Pins



Defect – Class 1, 2, 3

- Damaged contact.
- Contact is bent.

Extrapolated from IPC/WHMA/A-620



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Examples of Damaged Connectors/Contacts/Pins



Defect – Class 1, 2, 3

- Pin or socket is not seated and locked.
- Contact is not seated as visible through inspection window.

Extrapolated from IPC/WHMA/A-620

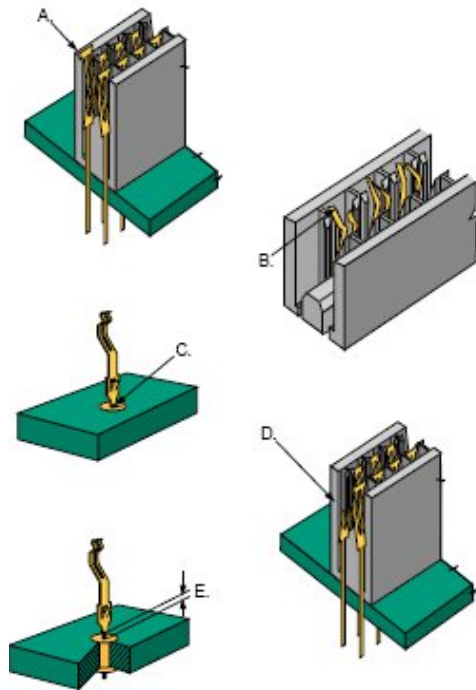


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Examples of Damaged Connectors/Contacts/Pins



Defect - Class 1,2,3

- Contact is above insulator (A).
- Contacts are twisted or otherwise deformed (B).
- Land is damaged (C).
- Contact is broken (D).
- Gap between contact shoulder and land is greater than specified (E).

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Extrapolated from IPC-A-610

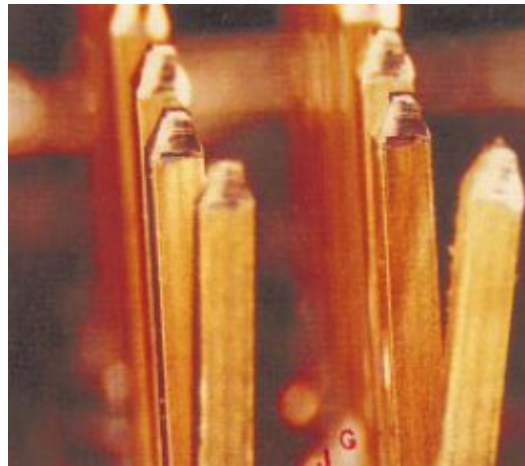


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Examples of Damaged Connectors/Contacts/Pins



Defect - Class 1,2,3

- Pin is bent out of alignment. (Pin is bent off center greater than 50% pin thickness.)

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Upcoming . . .

January 17th

- Manually Reflowing Solder Paste --
Yes or No -- and Our
Recommendations



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