

# 9 Component Damage

The following topics are addressed in this section:

### 9.1 Loss of Metallization

### 9.2 Chip Resistor Element

### 9.3 Leaded/Leadless Devices

### 9.4 Ceramic Chip Capacitors

### 9.5 Connectors

### 9.6 Relays

### 9.7 Transformer Core Damage

### 9.8 Connectors, Handles, Extractors, Latches

### 9.9 Edge Connector Pins

### 9.10 Press Fit Pins

### 9.11 Backplane Connector Pins

### 9.12 Heat Sink Hardware

## 9 Component Damage

### 9.1 Loss of Metallization

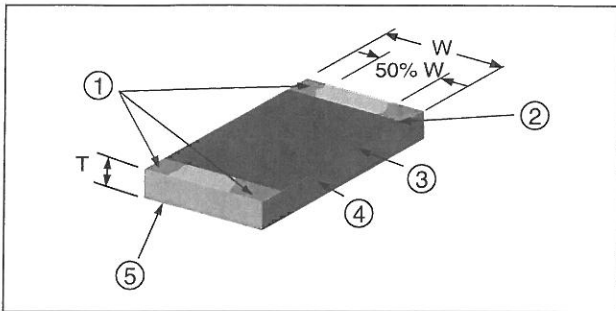


Figure 9-1

1. Metallization missing
2. Adhesive coating
3. Resistive element
4. Substrate (ceramic/alumina)
5. Terminal end

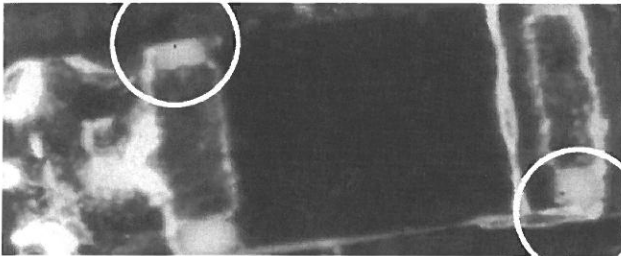


Figure 9-2

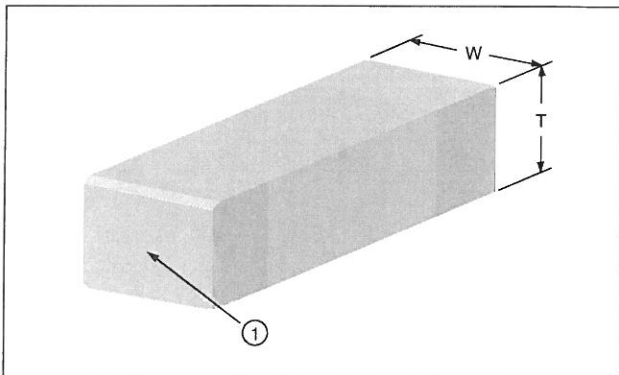


Figure 9-3

1. Leaching

#### Acceptable - Class 1,2,3

- Metallization loss on any termination side (not the end face) of a 5-sided termination component, up to 25% of the component width (W) or the component thickness (T).
- Maximum of 50% of metallization loss of top metallization area (for each terminal end) of a 3-sided termination component, Figures 9-1,2.

#### Defect - Class 1,2,3

- Metallization loss on the terminal end face exposing the ceramic, Figure 9-3 (1).
- Metallization loss on any termination side (not the end face) on a five-sided termination component greater than 25% of component width (W) or component thickness (T), Figures 9-4 and 9-5.
- Metallization loss greater than 50% of the top area on a 3-sided termination component, Figures 9-5 and 9-6.
- Irregular shapes exceeding maximum or minimum dimensions for that component type.

## 9.1 Loss of Metallization (cont.)

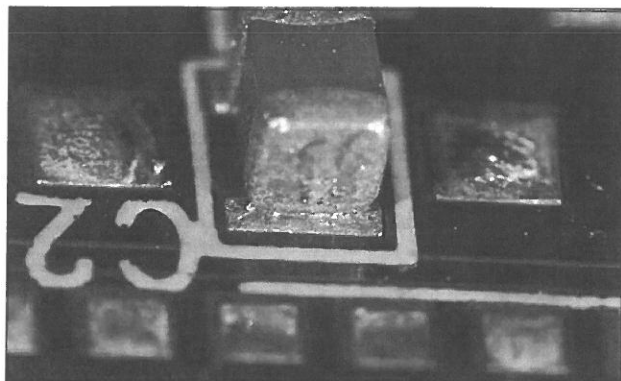


Figure 9-4

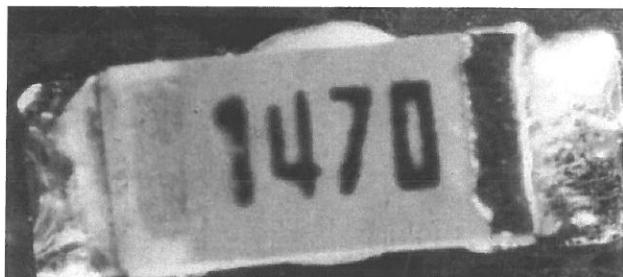


Figure 9-5



Figure 9-6

## 9.2 Chip Resistor Element

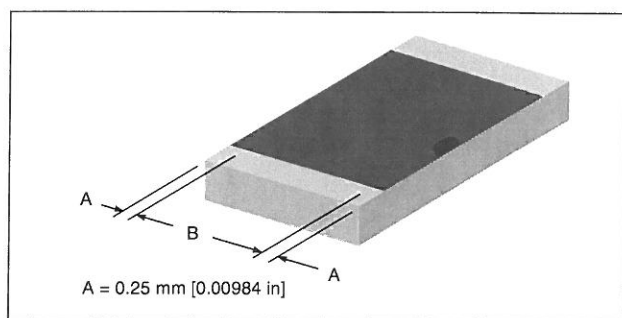


Figure 9-7

### Acceptable - Class 1,2,3

- For chip resistors, any chip-out (nick) of the top surface (adhesive coating) of 1206 and larger component is less than 0.25 mm [0.00984 in] from the edge of the component.
- No damage to the resistive element in area B.

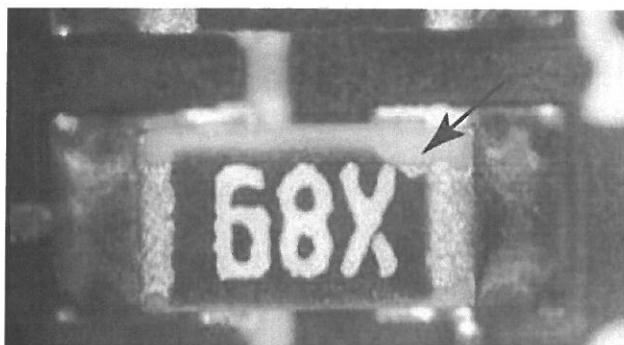


Figure 9-8

### Defect - Class 1,2,3

- Any chip-outs in resistive elements.

## 9 Component Damage

### 9.3 Leaded/Leadless Devices

These criteria are applicable to leaded and leadless devices.

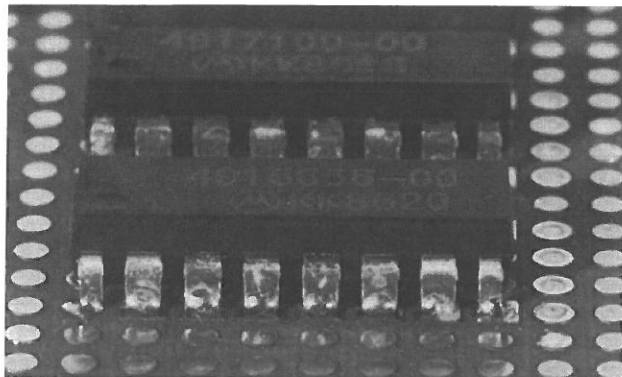


Figure 9-9

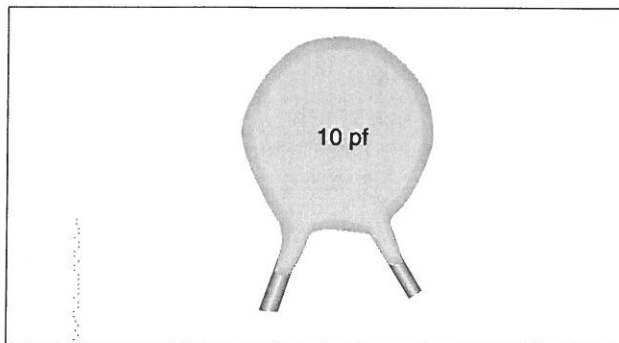


Figure 9-10

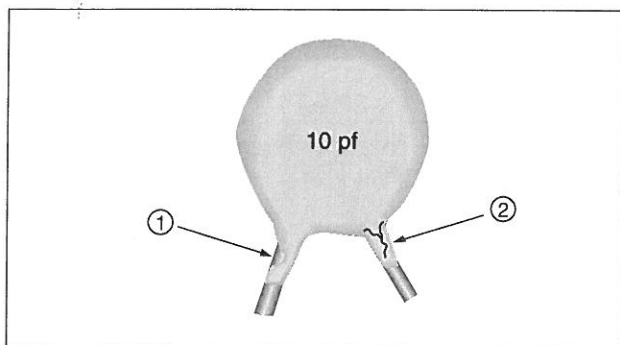


Figure 9-11

1. Chip
2. Crack

#### Target - Class 1,2,3

- Finish not damaged.
- Component bodies are free of scratches, cracks, chips, and crazing.
- ID markings are legible.

#### Acceptable - Class 1,2,3

- Chips or scratches that do not expose the component substrate or active element, or affect structural integrity, form, fit, or function.
- Chips or cracks in component meniscus that do not expose the component substrate or active element, or affect structural integrity, form, fit, or function.
- Structural integrity is not compromised.
- No evidence of cracks or damage to the lid or lead seals of a component.
- Dents, scratches do not affect form, fit & function and do not exceed manufacturer's specifications.
- No burned, charred components.

### 9.3 Leaded/Leadless Devices (cont.)

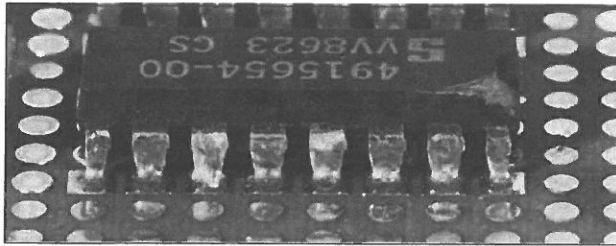


Figure 9-12

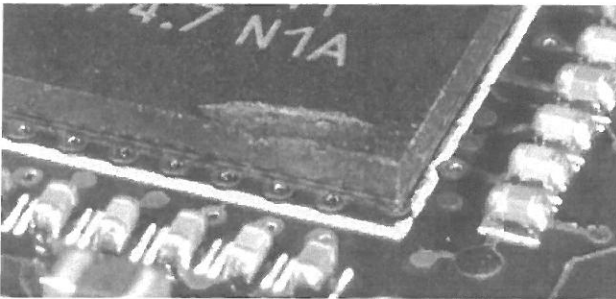


Figure 9-13

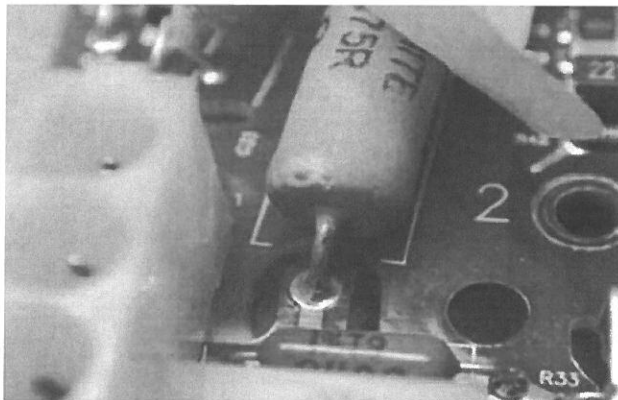


Figure 9-14

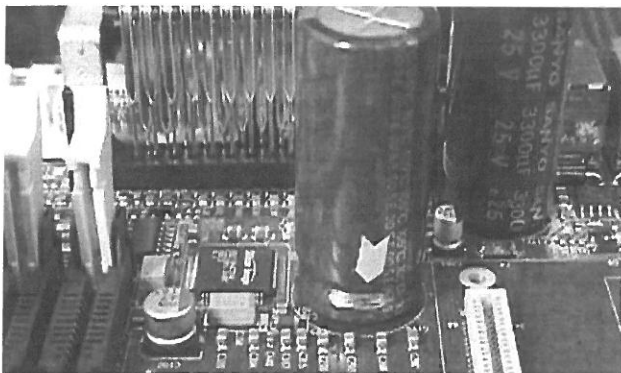


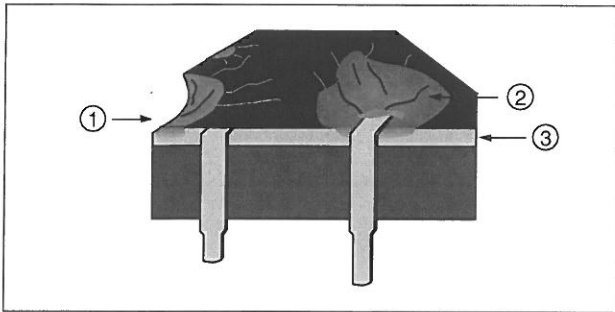
Figure 9-15

#### Acceptable - Class 1

#### Process Indicator - Class 2,3

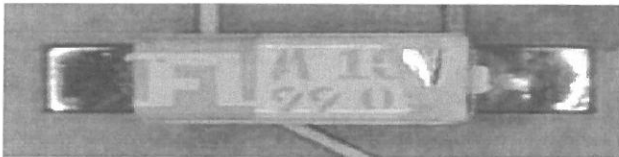
- Indentations or chipouts on **plastic** body components do not enter lead seal or lid seals or expose an internal functional element, Figures 9-12,13,14.
- Component damage has not removed required identification.
- Component insulation/sleeving has damage provided that:
  - Damaged area shows no evidence of increasing, e.g., rounded edges of the damage with no cracks, sharp corners, brittle material from heat damage, etc., Figures 9-13, 14.
  - Exposed component conductive surface provides no danger of shorting to adjacent components or circuitry, Figure 9-15.

### 9.3 Leaded/Leadless Devices (cont.)

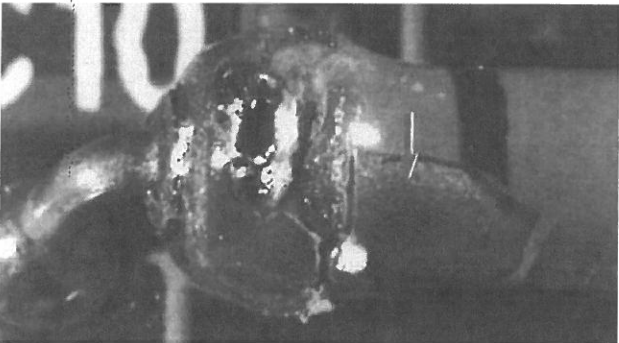


**Figure 9-16**

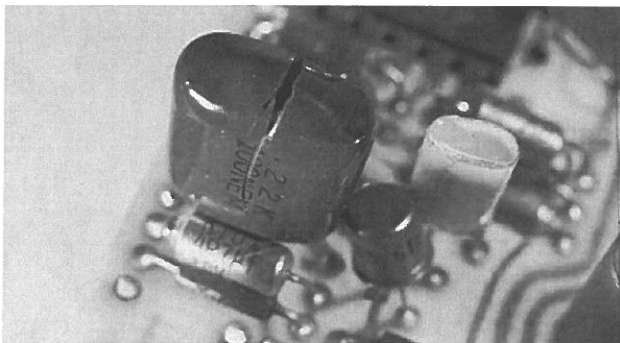
1. Chip enters seal
2. Exposed lead
3. Seal



**Figure 9-17**



**Figure 9-18**



**Figure 9-19**

#### Defect - Class 1,2,3

- Chip out or crack that enters into the seal, Figure 9-16.
- There are cracks leading from the chipout on a ceramic body component, Figure 9-16.
- Chip or crack that exposes the component substrate or active element, or affects hermeticity, integrity, form, fit, or function; Figures 9-17,18,19,20. Chips or cracks in glass body, Figures 9-21,22.
- Cracked or damaged glass bead beyond part specification (not shown).
- Required identification is missing due to component damage, Figure 9-23.
- The insulating coating is damaged to the extent that the internal functional element is exposed or the component shape is deformed (not shown).
- Damaged area shows evidence of increasing, for instance from cracks, sharp corners, brittle material from heat, etc., Figure 9-24.
- Damage permits potential shorting to adjacent components or circuitry.
- Flaking, peeling, or blistering of plating.
- Burned, charred components (the charred surface on a component has black, dark brown appearance due to excessive heat), Figure 9-25.
- Dents, scratches in the component body that affect form, fit & function or exceed component manufacturer's specifications, not shown.
- Cracks in shield material, Figure 9-26.

### 9.3 Leaded/Leadless Devices (cont.)

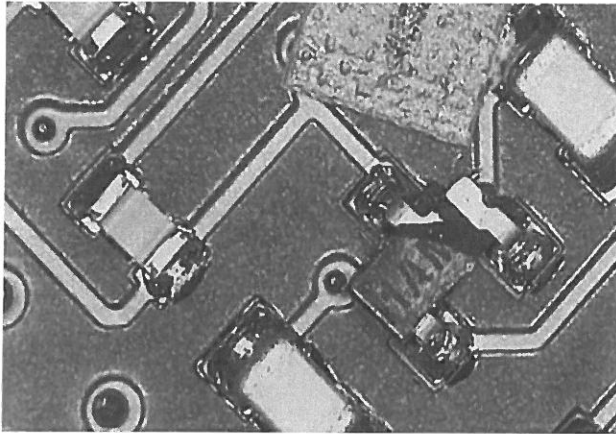


Figure 9-20

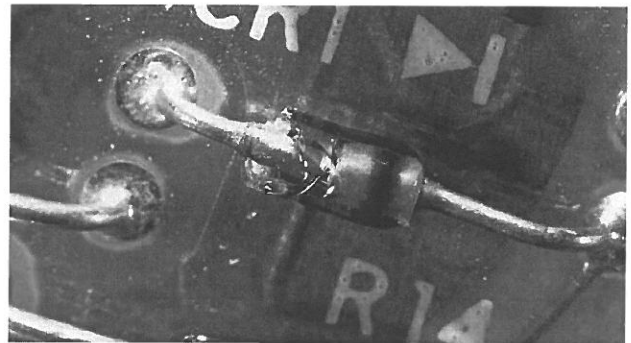


Figure 9-21

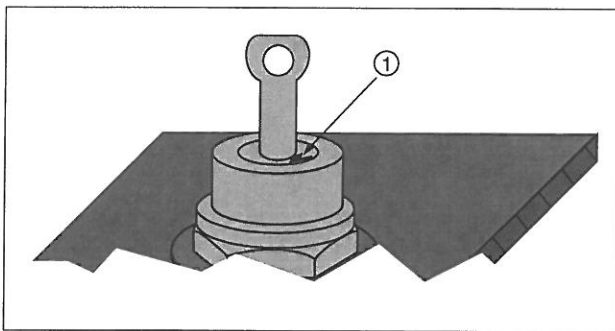


Figure 9-22

1. Cracked insulator

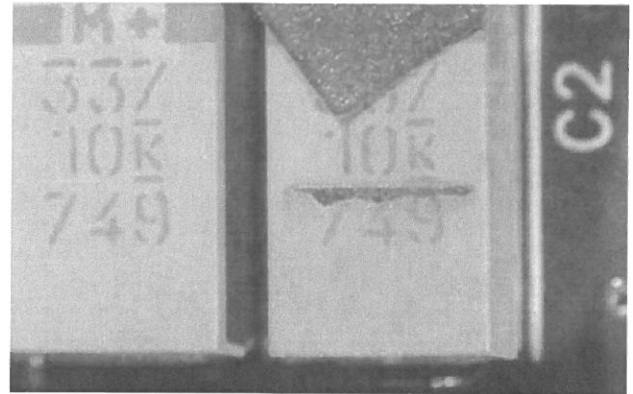


Figure 9-23

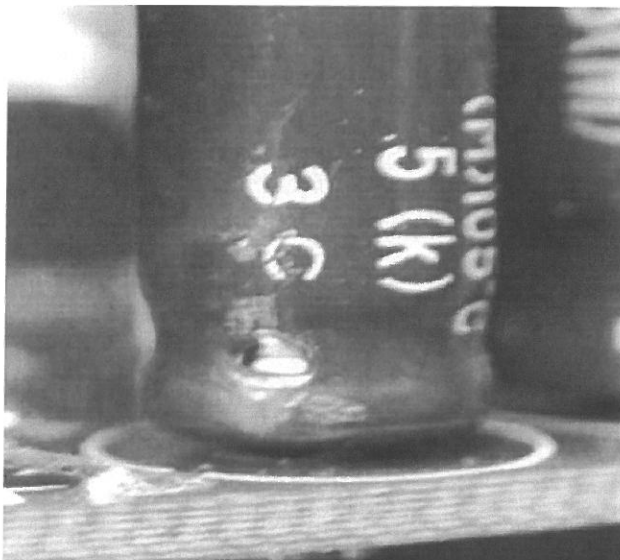


Figure 9-24

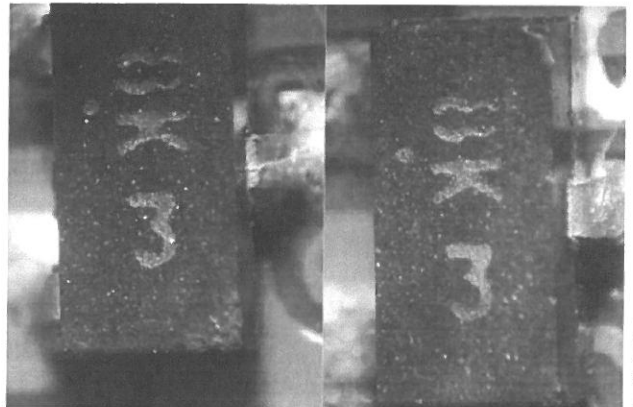


Figure 9-25

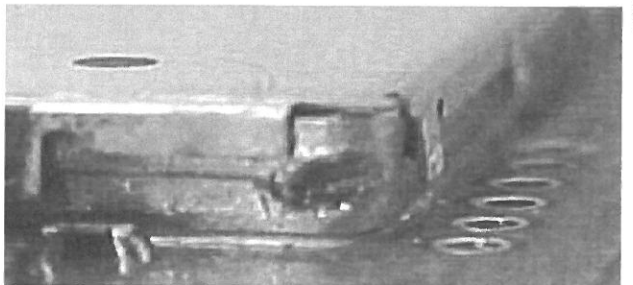


Figure 9-26

### 9.4 Ceramic Chip Capacitors

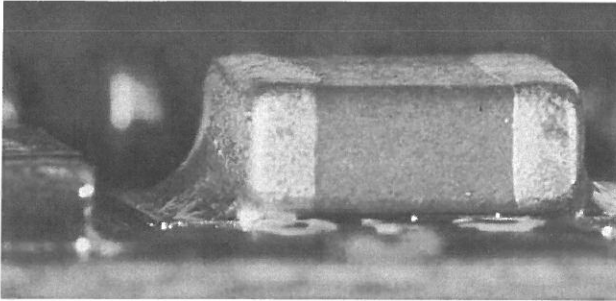


Figure 9-27

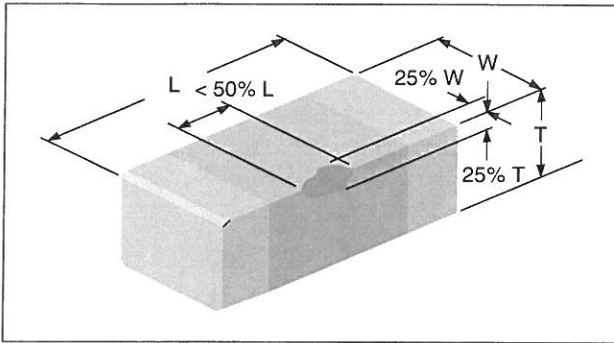


Figure 9-28

#### Target - Class 1,2,3

- No nicks, cracks, or stress fractures.

#### Acceptable - Class 1,2

- Nicks or chip-outs not greater than dimensions stated in Table 9-1, each considered separately.

Table 9-1 Chip-Out Criteria

(T)	25% of the thickness
(W)	25% of the width
(L)	50% of the length

#### Acceptable - Class 1,2,3

- Component color change due to thermal exposure in the reflow process.

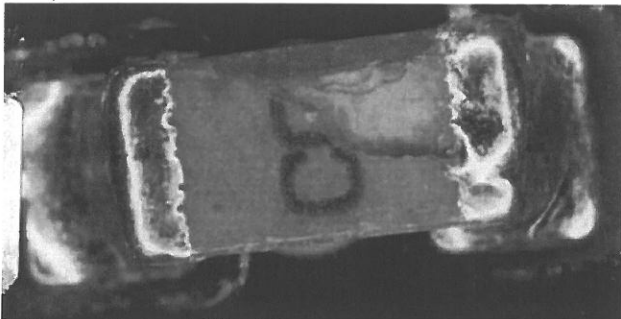


Figure 9-29

#### Defect - Class 1,2,3

- Any nick or chip-out in the termination area, or exposing an electrode.
- Any cracks or stress fractures.
- Damage in excess of Table 9-1.



## 9.4 Ceramic Chip Capacitors (cont.)

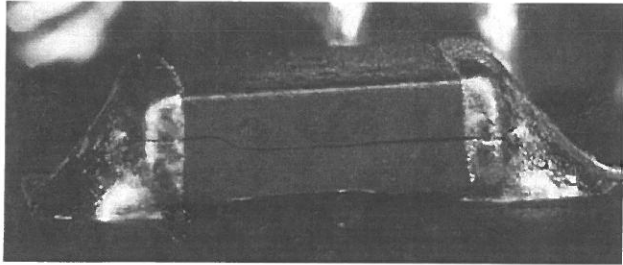


Figure 9-30

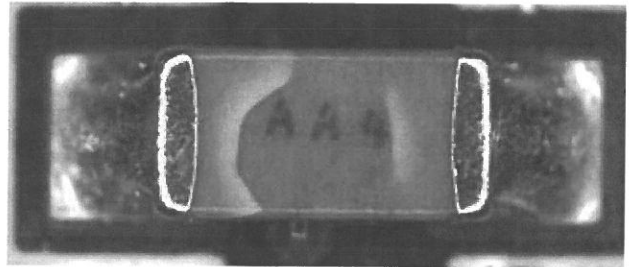


Figure 9-31

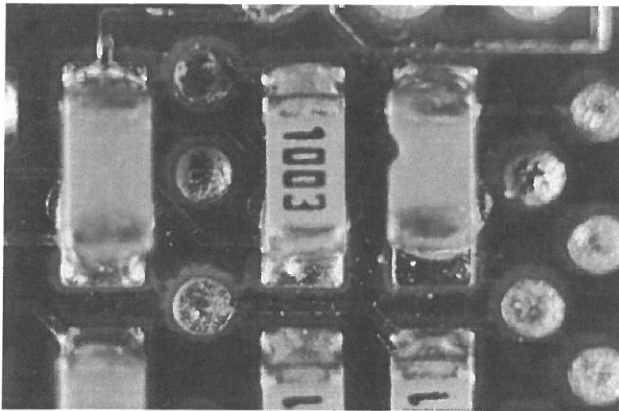


Figure 9-32

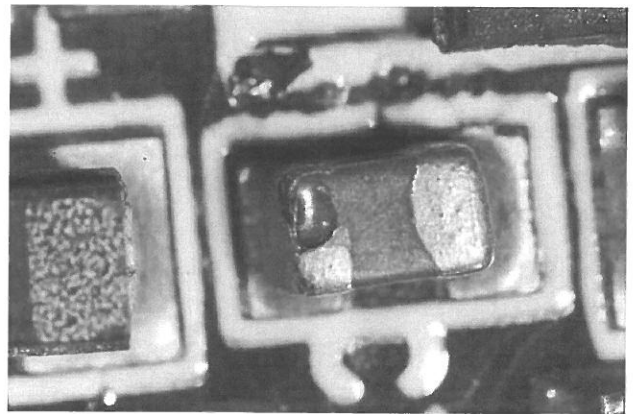


Figure 9-33

## 9 Component Damage

### 9.5 Connectors

These criteria cover the plastic molded housings/shrouds which are used primarily as a guide for the mating connector. Connector pins are typically held by interference fit in a housing. Visual inspection of housings and shrouds includes physical damage such as cracks and deformation.

#### Target - Class 1,2,3

- No discernable physical damage.
- No burrs on housing/shroud.
- No cracks in housing/shroud.
- Connector/header pins are straight.

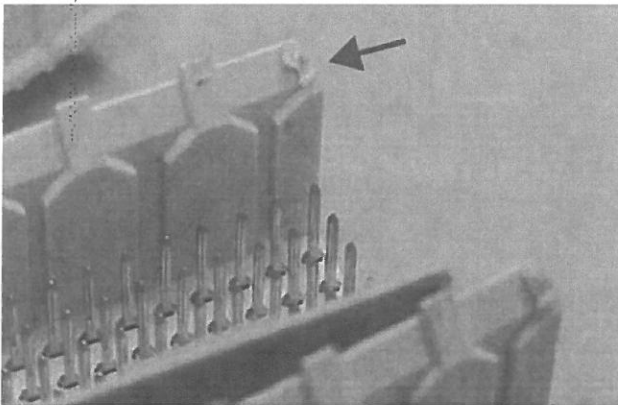


Figure 9-34

#### Acceptable - Class 1,2,3

- Burrs on housing but still attached (have not broken loose) and do not affect form, fit or function.
- Cracks in noncritical areas (do not impact integrity of the housing/shroud).
- Minor scratches, chips, or thermal deformation that do not compromise protection of the contacts or interfere with proper mating.
- Pins are bent off center by 25% pin thickness/diameter or less.

### 9.5 Connectors (cont.)

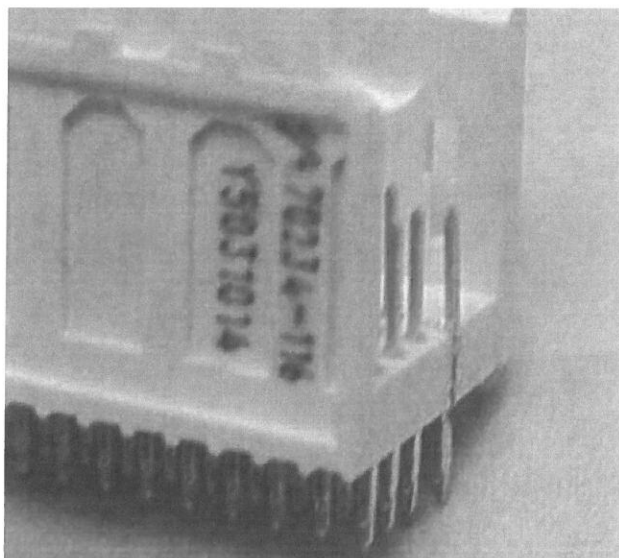


Figure 9-35

#### Defect - Class 1,2,3

Burrs, cracks or other deformations that impact the mechanical integrity or functionality of the housing.

Pins are bent off center by more than 25% pin thickness/diameter.

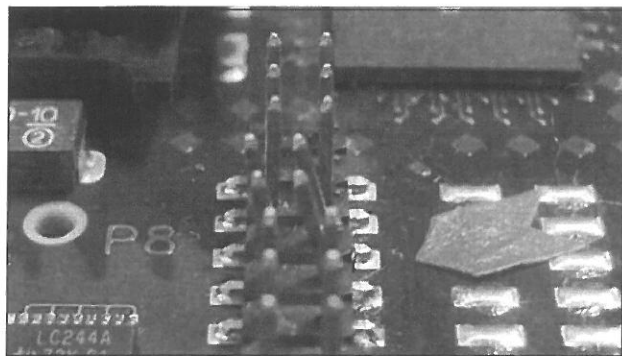


Figure 9-36

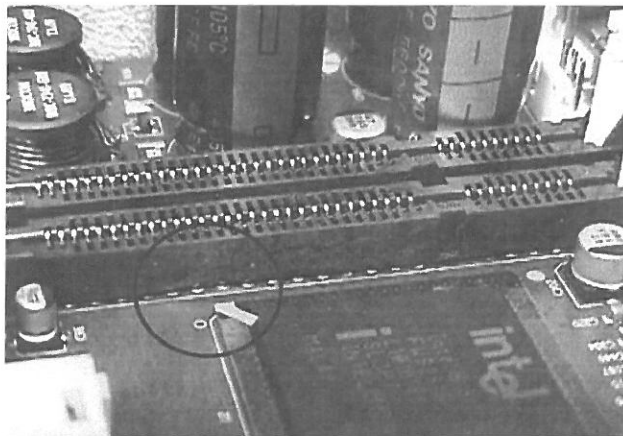


Figure 9-37

#### Acceptable - Class 1,2,3

- No evidence of burn or char.
- Minor chips, scrapes, scratches or melting that does not affect form, fit or function.

#### Process Indicator - Class 2,3

- Slight discoloration.

### 9.5 Connectors (cont.)

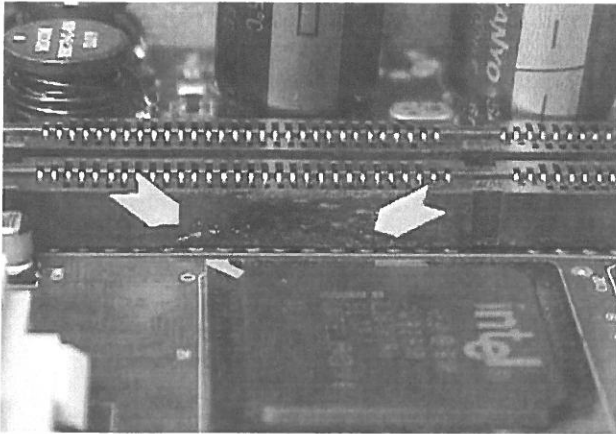


Figure 9-38

#### Defect - Class 1,2,3

- Evidence of burning or charring.
- Changes in shape, chips, scrapes, scratches, melting or other damage that affect form, fit or function.

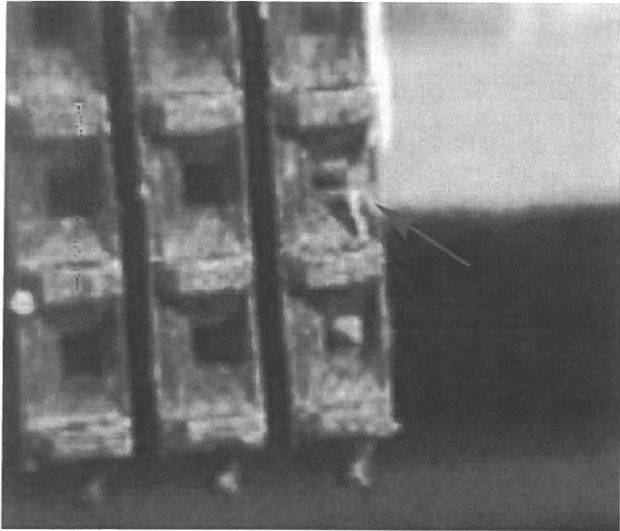


Figure 9-39

## 9 Component Damage

### 9.6 Relays

#### Acceptable - Class 1,2,3

- Minor scratches, cuts, chips, or other imperfections that do not penetrate the case or affect the seal (not shown).

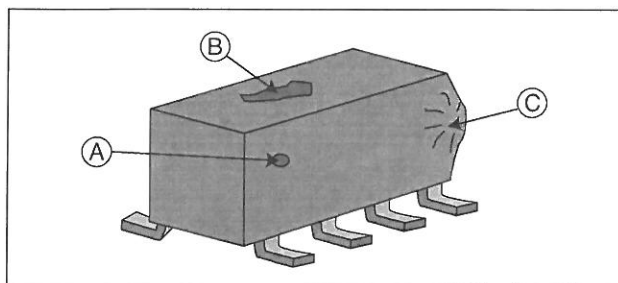


Figure 9-40

#### Defect - Class 1,2,3

- Scratches, cuts, chips, or other imperfections that penetrate the case or affect the seal, (A, B).
- The case is bulging or swollen, (C).

### 9.7 Transformer Core Damage

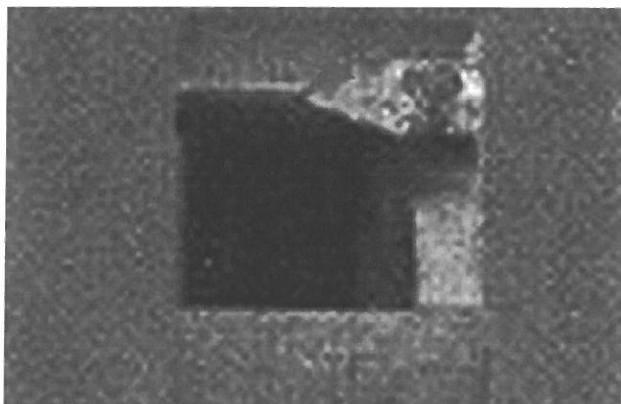


Figure 9-41

#### Acceptable - Class 1,2,3

- Chips and/or scratches on exterior edges of core are permissible, providing they do not extend into core mating surfaces and do not exceed 1/2 the thickness of the core.

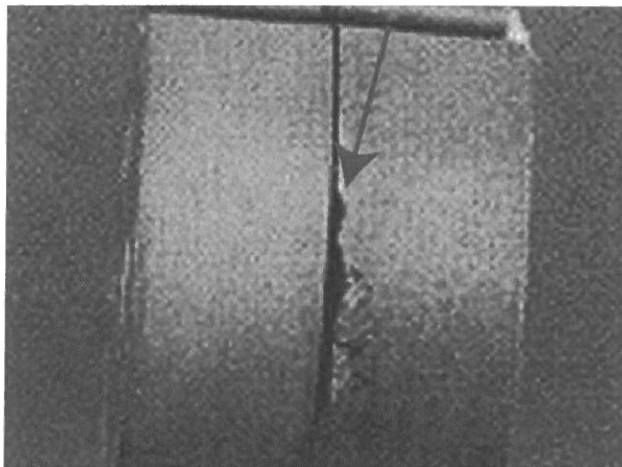


Figure 9-42

#### Defect - Class 1,2,3

- Chip in the core material is located on mating surface (arrow).
- Chip extending greater than 50% of the core thickness.
- Cracks in the core material.

## 9 Component Damage

### 9.8 Connectors, Handles, Extractors, Latches

This section shows some of the many different types of hardware mounted devices, e.g., connectors, handles, extractors and plastic molded parts.

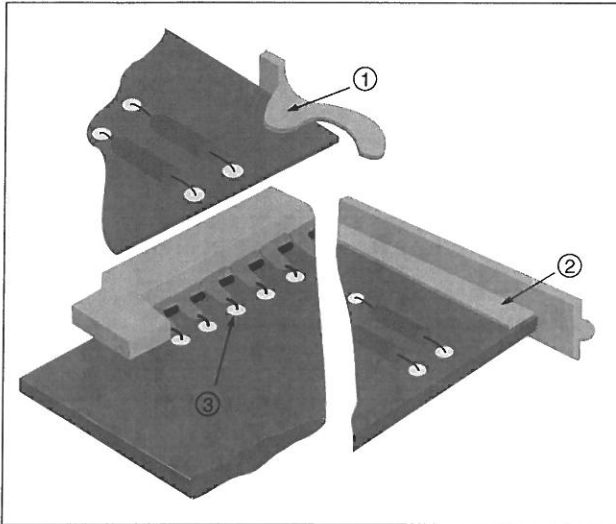


Figure 9-43

- 1. Extractor
- 2. Securing hardware
- 3. Component lead

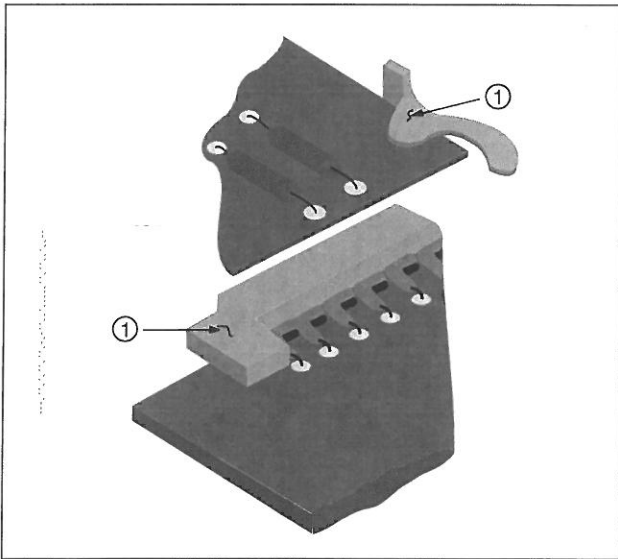


Figure 9-44

- 1. Crack

#### Target - Class 1,2,3

- No damage to part, printed board or securing hardware (rivets, screws, etc.).

#### Acceptable - Class 1

- Cracks in the mounted part extend no more than 50% of the distance between a mounting hole and a formed edge.

#### Defect - Class 1

- Cracks in the mounted part extend more than 50% of the distance between a mounting hole and a formed edge.

#### Defect - Class 2,3

- Cracks in mounted part.

#### Defect - Class 1,2,3

- Crack connects a mounting hole to an edge.
- Damage/stress to connector lead pins.

## 9 Component Damage

### 9.9 Edge Connector Pins

#### Acceptable - Class 1,2,3

- Contact is not broken or twisted.

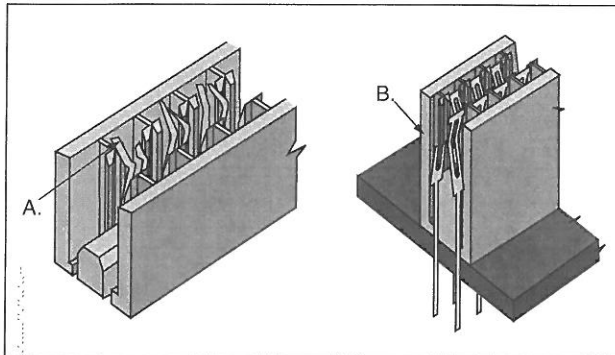


Figure 9-45

#### Defect - Class 1,2,3

- Contacts are twisted or otherwise deformed (A).
- Contact is broken (B).

## 9 Component Damage

### 9.10 Press Fit Pins

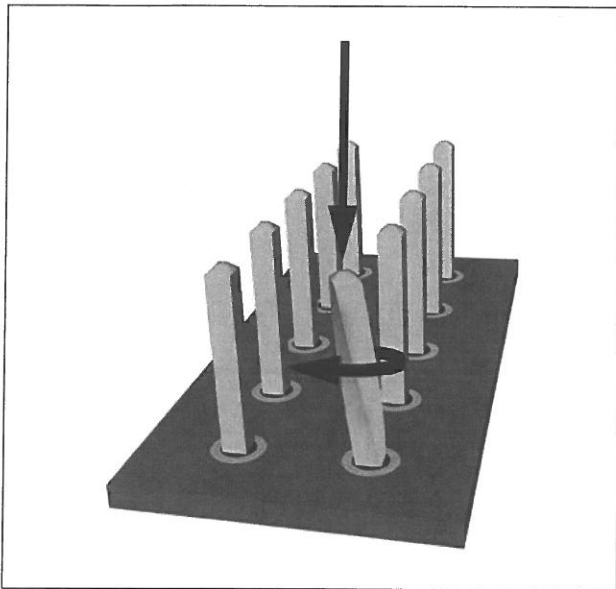


Figure 9-46

#### Defect - Class 1,2,3

- Damaged pin as a result of handling or insertion.
  - Twisted.
  - Mushroomed.
  - Bent.
  - Exposed basis metal.
  - Burr.

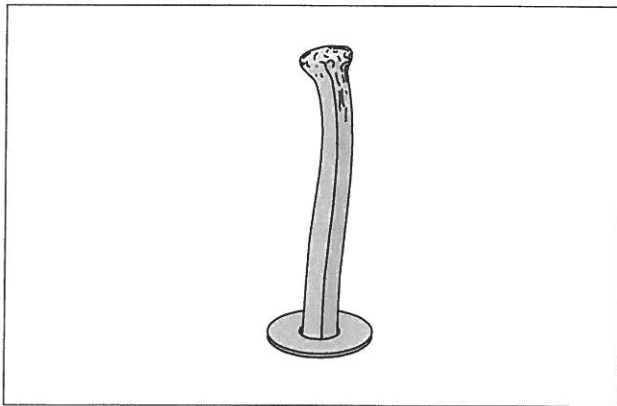


Figure 9-47

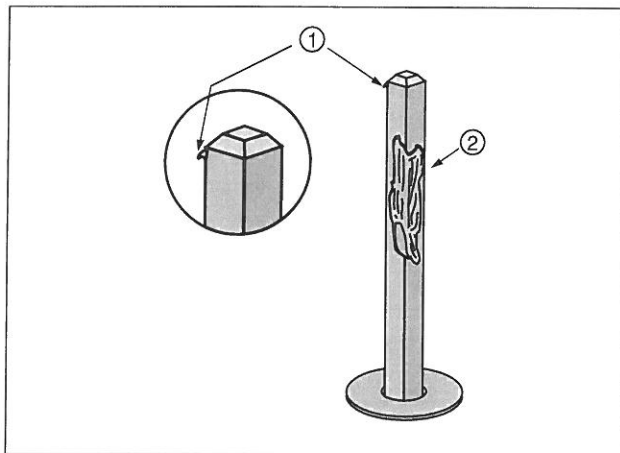


Figure 9-48

1. Burr
2. Plating missing



## 9.11 Backplane Connector Pins

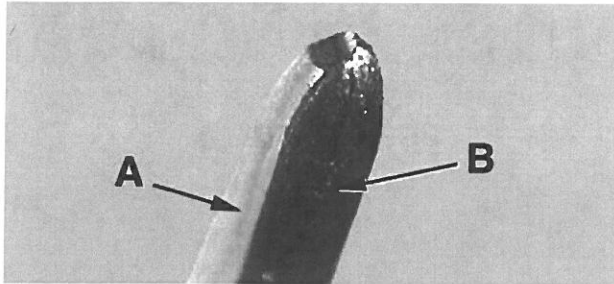


Figure 9-49

A. Sheared/nonmating surface of connector pin  
B. Coined/mating surface of connector pin

### Acceptable - Class 1,2,3

- Chip on non-mating surface of separable connector pin.
- Burnish on mating surface of separable connector pin, providing that plating has not been removed.
- Chip that encroaches the mating surface of separable connector pin which will not be in the mating connector contact wear path.

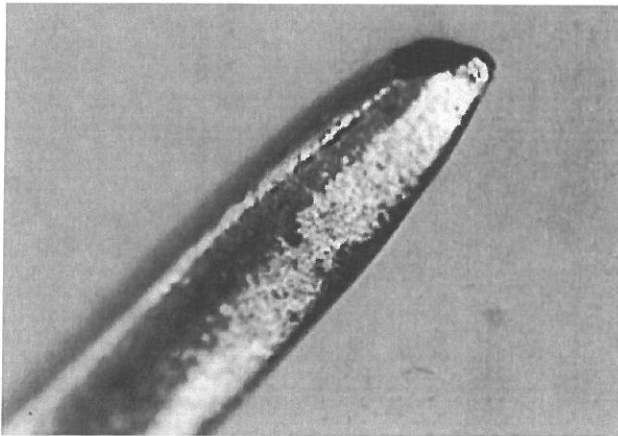


Figure 9-50

### Defect - Class 1,2,3

- Chipped pin on mating surface of separable connector, Figure 9-50.
- Scratched pin that exposes non-precious plating or basis metal.
- Missing plating on required areas.
- Burr on pin, Figure 9-51.
- Cracked PCB substrate.
- Pushed out barrel as indicated by copper protruding from bottom side of PCB.

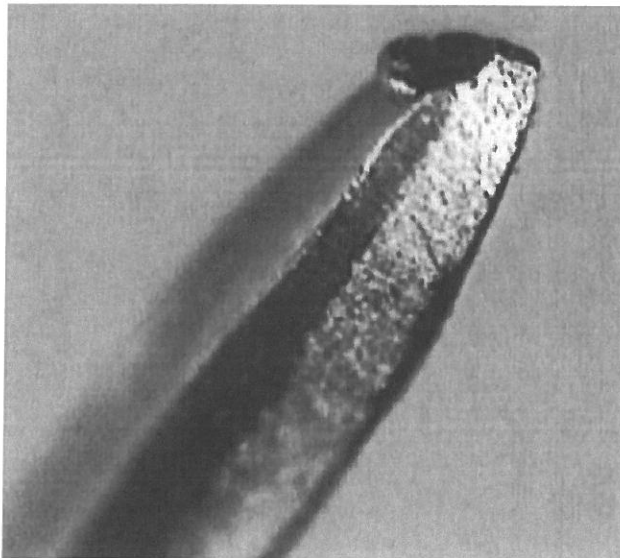


Figure 9-51

## 9 Component Damage

### 9.12 Heat Sink Hardware

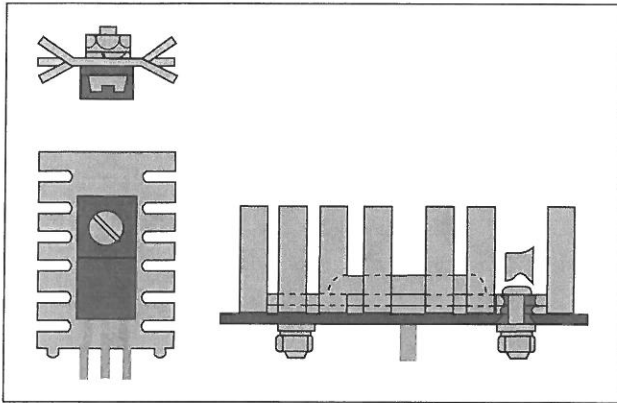


Figure 9-52

#### Acceptable - Class 1,2,3

- No damage or stress on heat sink hardware.

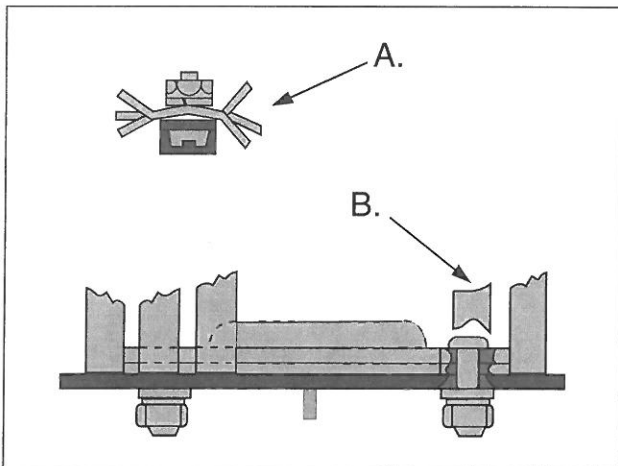


Figure 9-53

#### Defect - Class 1,2,3

- Bent heatsink (A).
- Missing fins on heatsink (B).
- Damage or stress to heat sink hardware.