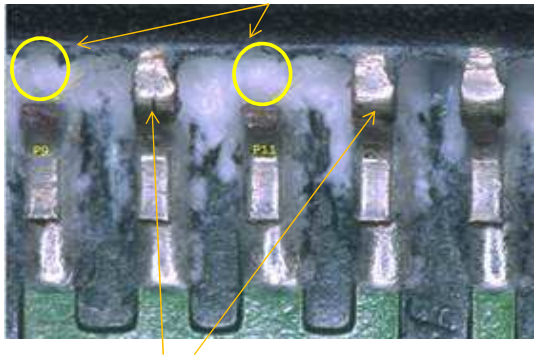
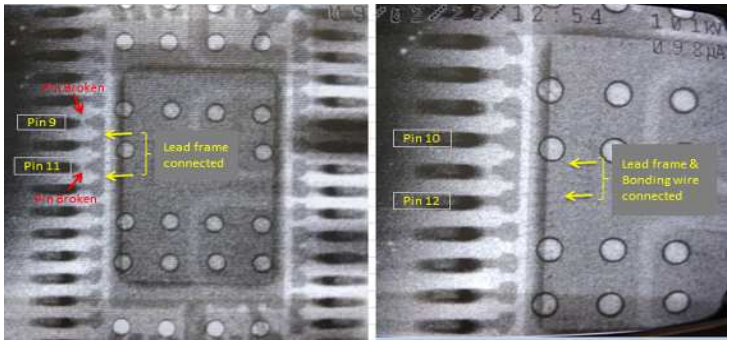
Problem :Customer encountered market feedback of D-amp IC broken(IC pin lead broken)

IC #1 : Damp IC pin 9 & 11 brokens

Photo Pin lead broken



X-ray photo shows lead frame and bonding wire of pin 9 & 11 are still connected

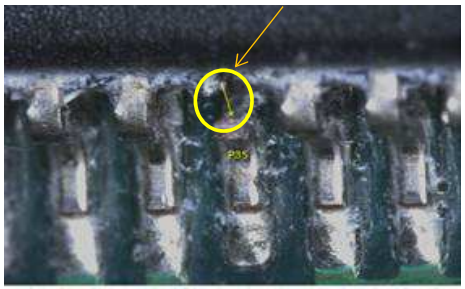


Also, adjacent pins are observed having symptom of overstress

For this IC, customer set is shut down (suspect the portion of broken pin lead caused shorting and trigger the protection).
When QA received the set and checked again, the set function normally (as pin 9 & 11 actually are GND pins which is connected with pin 10 & 12).
QA unable to find the small portion of broken pin lead.

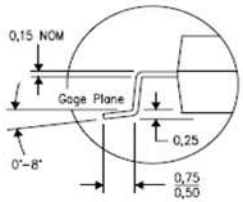
IC #2 : Damp IC pin 35 broken

Photo Pin lead broken



For this IC, pin 35 is output B pin. So it is unable to check whether the IC is still functioning.

Based on IC#1 phenomena, customer suspect the IC pin lead broken is due to pin lead overstress + the vibration of IC and heatsink



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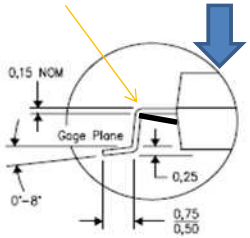
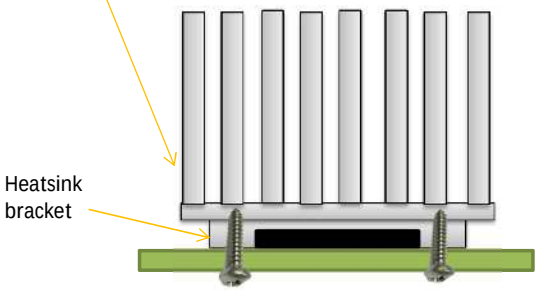
overstress

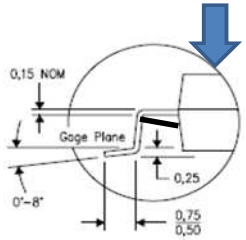


Heatsink is screwed too tight caused the pin lead overstress (currect production screw torque is 110Ncm.)



Questions:

1) Customer wants to know what is the maximum displacement of pin lead when overstress happens?
   Based on datasheet, the maximum pin lead to IC body is 0.15mm.



What is the maximum displacement before IC lead broken?
Is it possible to simulate ?

2) Is it possible the vibration of IC or heatsink at resonance frequency caused the IC pin lead broken?
   Customer actually has other model using same IC but different size of heatsink and didn't encounter the problem so far.
   So customer suspect the IC vibrate at resonance frequency and overtress condition causing the pin lead broken.
   Also current failure detected so far happened on pins at middle IC. Pins at side of IC may have less vibration due to near to screw points.

3) From the part spec, the height between pins and IC mold body is ranges 0.05 – 0.15. May I know the design purpose ? Is it for soldering or coplanity consideration ?