

Guidelines for Returns

(SPRAC01A – SEPTEMBER 2017)



Introduction

Texas Instruments (TI) strives to provide quality products and is continuously improving products, processes and services.

To enable an efficient and effective quality review process, and to avoid unnecessary false failures, it is critical that TI understand the customer's alleged issue with a suspect TI part, separate from the any application issue that the customer may be experiencing. It is equally crucial that the suspect TI part not incur damage during removal, handling, or shipping.

In this document, TI has combined established guidelines and best practices describing verification and handling processes targeted to achieve this objective.

Nothing in these guidelines gives rise to any obligation on the part of TI to conduct verification or analysis. See TI's [Terms of Sale](#).

Handling Overview

These following guidelines must be followed when suspect parts are being returned to TI:

- *Verify and confirm the issue*
- *Carefully de-solder the part from the PCB/board*
- *Return parts free of mechanical damage and in a testable condition*
- *Ensure that there is no obvious electrical overstress (EOS) damage*
- *Affix and return the part in a proper container*
- *Pack the part in a shielding (S) bag or container for return shipment*
- *Include a detailed description of the alleged issue with the TI part*

Failure to observe these guidelines may cause technical issues and and/or render a proper quality review impossible. TI reserves the right to reject requests for review, verification, or analysis if a customer is unable to demonstrate compliance with these guidelines.

Handling Process Requirements

- *Verify and confirm the issue*

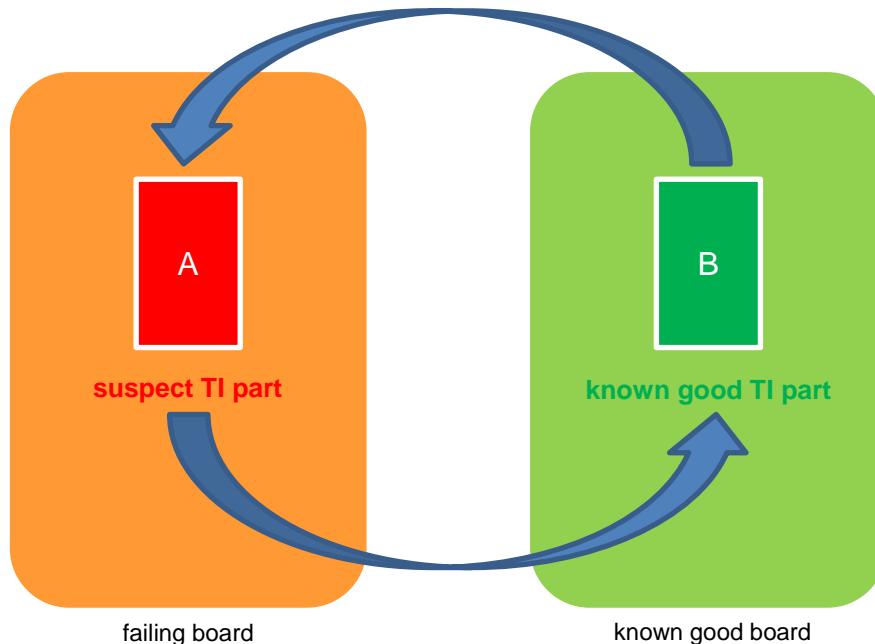
Only return suspect TI parts that have been tested through by A-B-A swap cross check to confirm the observed issue is not system related.

A-B-A Swap Method:

To perform the A-B-A swap:

- (A) Remove the suspect TI part (A) from the original failing board.
- (B) Replace the suspect TI part (A) with a known good TI part (B) and check if the original failing board is now working correctly.
- (A) Mount the suspect TI part (A) to a known good board and see if the observed issue continues to occur.

The last step is critical to exclude the possibility that the issue is caused by an interaction with another part on the board.



- *Carefully de-solder the part from the PCB/board*

All suspect TI parts returned for TI verification and analysis must be carefully removed from the customer printed circuit board (PCB) prior to shipping.

TI will advise customers in advance in rare cases where a complete PCB with the TI part(s) mounted is required!

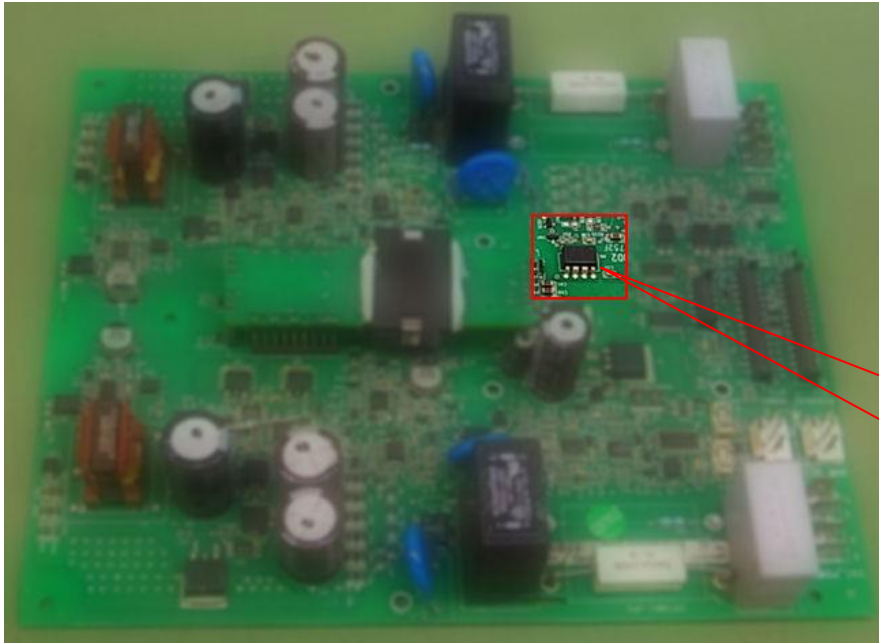
De-Soldering:

The plastic mold compound of the part package is soaking humidity to some extent. Therefore, all TI parts, including MSL1 classified TI parts, must be dry-baked according to IPC/JEDEC J-STD-033 before de-soldering.

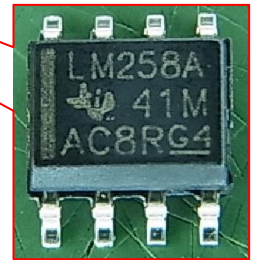
Manual de-soldering of any electronic part is not recommended. Instead, use a rework station allowing control of the soldering temperature according to the JEDEC soldering profile. Uncontrolled de-soldering may damage the part and induce, e.g., plastic package delamination and popcorn effect.

Do not cut off the pins / leads from the TI part, as that will prevent any further electrical testing.

Note on best practice: An application report “Surface Mount Package Removal Application Note” has been published (slva439a) on our website: <http://focus.ti.com/lit/an/slva439a/slva439a.pdf>.



customer board with TI part mounted

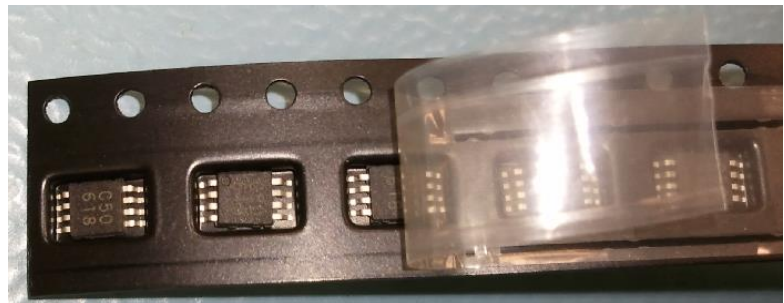


de-soldered TI part

Fresh / Virgin Parts:

Do not return fresh/virgin TI parts unless explicitly requested to do so by TI. There might be special cases where TI would like to get back fresh/virgin TI parts, such as:

- solderability issues
- generic tape & reel, tray or tube related issues
- reel cover tape issues



fresh / virgin units within a tape & reel stripe

- *Return parts free of mechanical damage and in a testable condition*

Suspect parts must be carefully removed and appropriately handled to allow for a proper root cause analysis.

Unacceptable / untestable conditions such as:

- mechanical damages to the part package,
- remainder of coating material,
- cut-off / broken or bent leads / pins, or
- excessive solder residues in-between the leads / pins

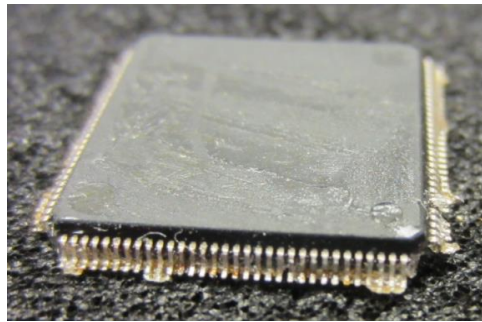
are in most cases a result of inappropriate part handling. TI may reject the analysis of such parts and label them as “**NAC - non-actionable cases.**”

Below are examples of customer returns that were received in an unacceptable condition. TI does not accept such parts for verification / analysis because the original issue may be masked.

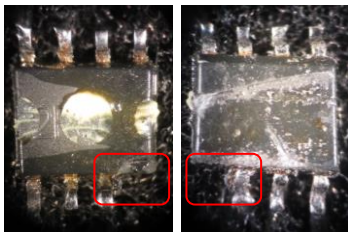
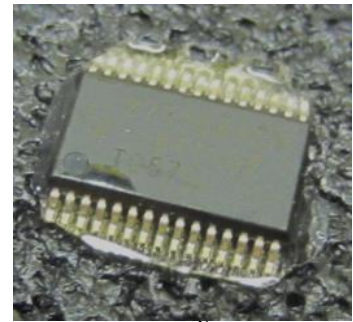
To improve the effective quality analysis, TI focuses on verification / analysis of returns that can give value to our customers and TI as part of TI's Lean Six Sigma methodology.



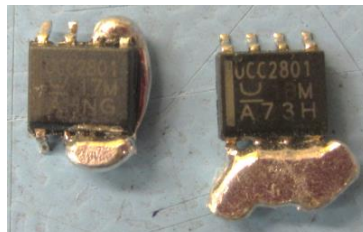
heavily bent leads/pins²⁾



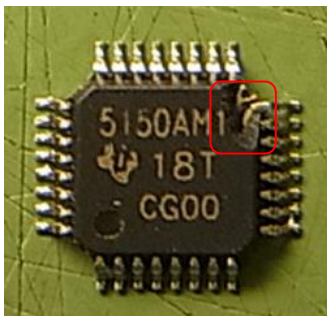
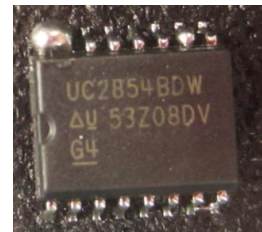
covered with lacquer, silicone or coating @ package and/or pins¹⁾



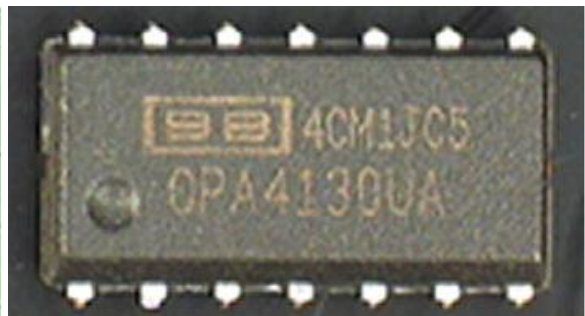
missing leads / pins²⁾



excessive solder residues resulting in bridging neighboring pins / leads²⁾



severe package defects & cut-off pins / leads²⁾



¹⁾ Unfortunately just ultrasonic cleaning using acetone in most cases cannot remove the coating. It's up on the customer to deliver the unit in testable condition, since TI will not be in the position to clean the parts.

²⁾ Mechanical damage will disqualify the parts from further TI verification & analysis. (e.g. performing a re-test using automated test equipment (ATE)).

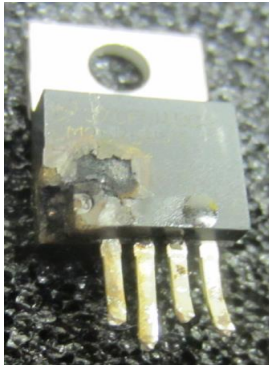
Note: BGA TI parts must be re-balled adequately. This is needed for the customer A-B-A swap exercise.

- Ensure that there is no obvious electrical overstress (EOS) damage

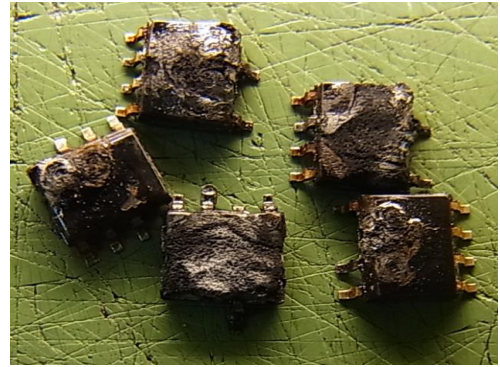
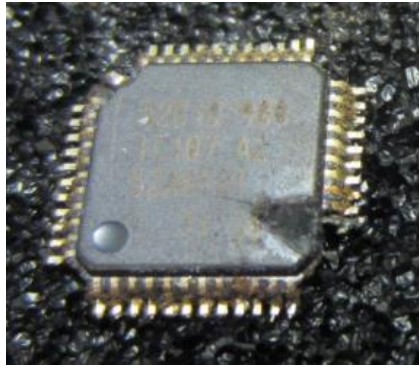
In cases where the issue seems to be induced by electrical overstress (EOS) with visible signs of damages, a TI failure analysis will have a limited chance to find the true root cause.

An analysis of such parts (examples shown next page) will only be able to illustrate eventually melted metallization lines inside the Die, fused open bond wires or combinations of it.

Heavy EOS damage masks the issue. TI is not in a position to know the customer's operating, environmental and temperature conditions at the time of the issue to determine what may have caused the EOS damage. There is no useful action TI can take in such cases.



burnt package



carbonized mold compound

- *Affix and return the part in a proper container*

When returning a suspect TI part for analysis, always:

- Select a suitable shielding (**S**) shipping container, and
- Fix parts properly to prevent them from moving around or touching one another.

The following methods should not be used to ship or fix the TI parts:



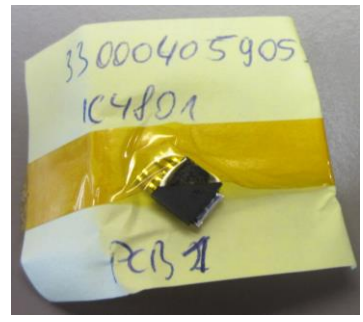
“Blue tape” end plug @ tubes



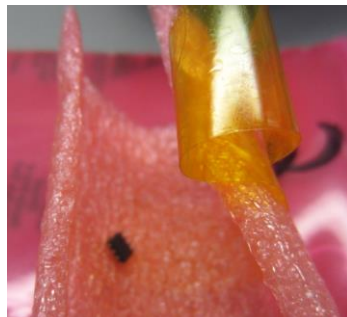
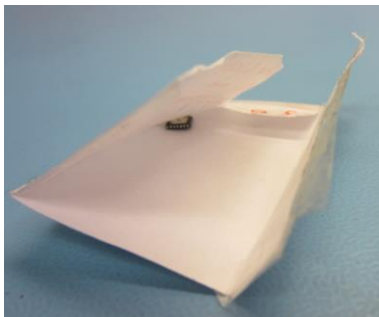
parts in tray not fixed



sticky polymer film tape (e.g. std. 3M, Scotch or TESA tape) used to fix parts³⁾

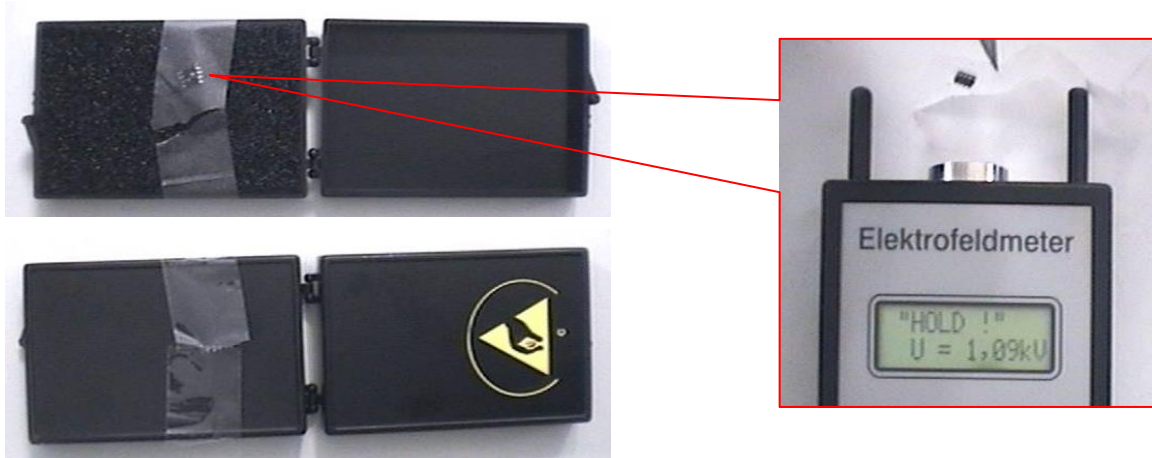


part wrapped in paper or into a styrofoam /foam



multiple unit loose in bag

3) The TI Freising Device Analysis Lab (FDAO) checked the charging of submitted parts after pulling a TI part from a polymer film tape with an electro-field meter and measured a voltage >1kV. Thus the origin electrical issue can be masked by damages due to improper ESD protection.



part fixed with polymer film tape inside a conductive box

- Pack the part in a shielding (S) bag or container for return shipment

Electronic parts must be handled, packed and shipped appropriately. Shipments might go through rough uncontrolled areas and might be exposed to high electrical fields, for example, when a shipment is inspected by customs or when the shipment is exposed to high electrical fields from conveyor belt motor drives in logistic centers.

Consequently, electronic parts that are not packed in shielding (S) bags / containers can be easily damaged directly (direct discharge) or indirectly (electromagnetic pulse) by external electro static discharge (ESD) during shipment.

The following specific ESD standards for the packing of semiconductors must be applied:

- **Inside ESD Protected Area (EPA*):**

Packing used within an EPA shall consist of dissipative ("pink poly" bags) or conductive ("black" bags or boxes) material for intimate contact to the electronic part.

- dissipative (D) "pink poly" bags ($10^5 \leq R_s \leq 10^{11}$) or conductive (C) "black" bags or boxes ($10^2 \leq R_s \leq 10^5$) material for intimate contact

- **Outside ESD Protected Area (EPA*),**

Thus packing used outside an EPA shall require packing that provides both:

- dissipative (D) "pink poly" bags ($10^5 \leq R_s \leq 10^{11}$) or conductive (C) "black" bags or boxes ($10^2 \leq R_s \leq 10^5$) material for intimate contact
- electrostatic discharge shielding (S) ($E < 50\text{nJ}$)

*EPA = ESD Protected Area

ESD-safe Packaging for Shipments:

Always use packing material that provides shielding (**S**) protection as illustrated below.



various examples of shielding bags and boxes

Although dissipative (**D**) “pink / green / blue” or conductive (**C**) “black” bags or containers provide protection against tribocharging, they do not protect against electric fields. These bags (examples illustrated above) can only be used within an ESD protected area (EPA*)!

Do not use standard plastic (PE-LD) bags or containers for shipments as these bags may charge up the parts inside.

Improper Packaging for Shipments:



plastic (PE-LD) bag⁴⁾



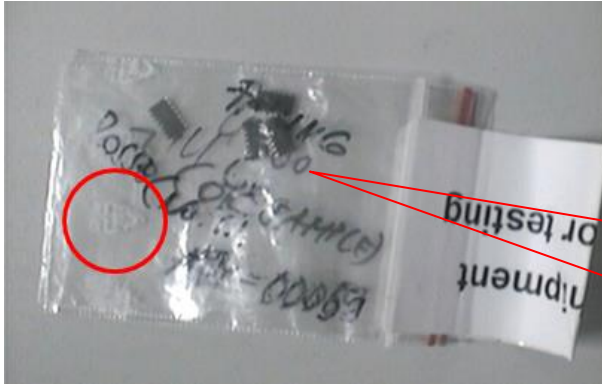
dissipative (**D**) “pink / green / blue” or conductive (**C**) “black” bags



If these types of packaging are used, the original issue may be masked by external ESD damage. Failure analysis of such a part might therefore give misleading results.

In summary, it is crucial to protect against external ESD during shipment. TI will only accept returned parts that are packed such that later damage can be ruled out. The interior of shielded bags / containers may be regarded as a “mobile EPA*”.

4) The TI Freising Device Analysis Lab (FDAO) checked the charging of submitted parts within a plastic PE-LD bag with an electro-field meter and measured a voltage of >1kV. Thus the origin electrical issue can be masked by damages due to improper ESD protection.



parts shipped within a std. plastic PE-LD bag



- *Include a detailed description of the alleged issue with the TI part*

To streamline analysis, TI requests that the following information be provided with any returns:

- Full orderable TI part number (TI P/N) and customer part number (CP/N);
- Customer reference number;
- A clear and detailed description of the alleged issue at the TI part level including, set-up and use conditions for stimulation of the alleged issue as well as software sequence, as appropriate;
- Quantity, frequency and clustering, related volumes and observed potential failure rate of suspect TI parts;
- Photos of the suspect TI parts' top and bottom marking;
- Photos of the TI labels attached to the original shipping carton/boxes/bags or reels; and
- Schematic drawing of the application circuitry including set-up, voltage and current conditions of the suspect TI part in the customer application.

Failure to include the required information could jeopardize an efficient and successful analysis.

Summary

These guidelines are meant to enable an efficient and effective issue-solving process. Thank you for your careful attention to, and compliance with, these guidelines.

References

JEDEC JESD625	Requirements for Handling Electrostatic-Discharge (ESD) Sensitive Devices
IEC/EN 61340-5-3	Electrostatics – Part 5-3: Protection of electronic devices from electrostatic phenomena – Properties and requirements classification for packaging intended for electrostatic discharge sensitive devices
ANSI/ESD S541	Packaging Materials for ESD Sensitive Items
ANSI/ESD S8.1	Symbols ESD Awareness
IPC/JEDEC J-STD-033	Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices
IPC-7711	Rework of Electronic Assemblies

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