

Guidelines for Returns

(SPRAC01B – FEBRUARY 2025)



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 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:

1. **Verify and confirm the issue**
2. **Include a detailed description of the alleged issue with the TI part**
3. **Carefully de-solder the part from the PCB/board**
4. **Return parts free of mechanical damage and in a testable condition**
5. **Ensure that there is no obvious electrical overstress (EOS) damage**
6. **Pack the part in a shielding (S) bag and container for return shipment**
7. **Include a Reference unit**

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.

Note: TI strongly recommends our customers purchase directly from TI or an [authorized distributor](#).

Note: TI does not provide full warranty coverage (including returns or exchanges) or customer support for semiconductor products purchased outside of authorized sources.

Note: TI is not responsible for the shipping costs of the returned units.

Handling Process Requirements

1. Verify and confirm the issue

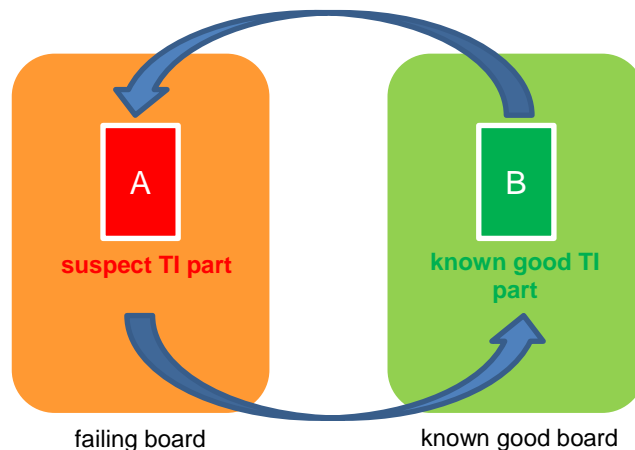
Only return suspect TI parts that have been tested through by A-B-A swap cross check to confirm the observed issue is not system related.

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.



2. 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
- Schematic drawing of the application circuitry including set-up, voltage and current conditions of the suspect TI part in the customer application, in order for TI to be able to stimulate the reported issue.
- Include non-conformance statement in respect to data-sheet values of reported out-of-range parameters.
- A-B-A cross swap verification and provide test data/test wave form during A-B-A cross swap verification
- For Automotive applications, please include the end customer (carOEM) name for 0km / field returns and the Customer failure location (e.g. 0km, Production, etc).

Failure to include the required information could jeopardize an efficient and successful analysis. Dependent on the TI device and TI site, additional questionnaire could be requested to be filled in by customer in order to provide more detailed information for returned unit.

Additionally, it is important to include the Quality Event Management (QEM) number on the shipped package or a print out of Customer Product Return (CPR) approval email in the package.

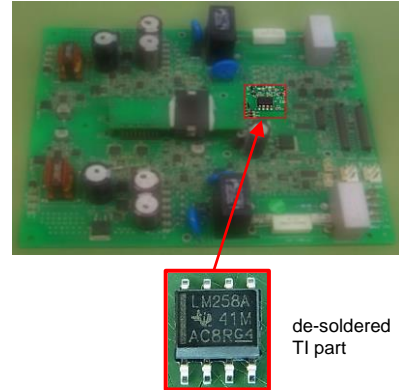
3. Carefully de-solder the part from the PCB/board

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 popcorning 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>.

4. Return parts free of mechanical damage and in a testable condition

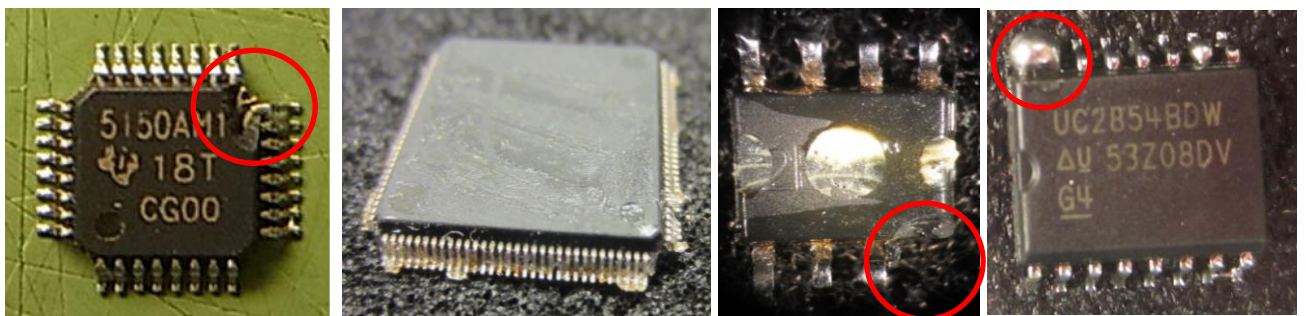
Suspect parts must be carefully removed and appropriately handled to allow for a proper root cause analysis.

Unacceptable / untestable conditions such as:

- mechanical damages to the part package¹⁾,
- remainder of coating material²⁾,
- 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", 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.



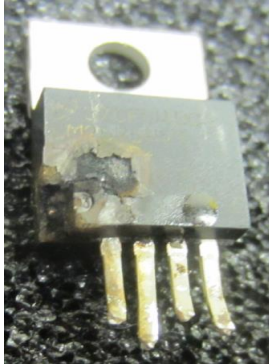
Note: BGA TI parts must be re-balled adequately. This is needed for the customer A-B-A swap exercise.

¹⁾ Mechanical damage will disqualify the parts from further TI verification & analysis. (e.g. performing a re-test using automated test equipment (ATE)).

²⁾ 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.

5. 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 below) 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

6. Pack the part in a shielding (S) bag and 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.

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 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.

When returning a suspect TI part for analysis, always:

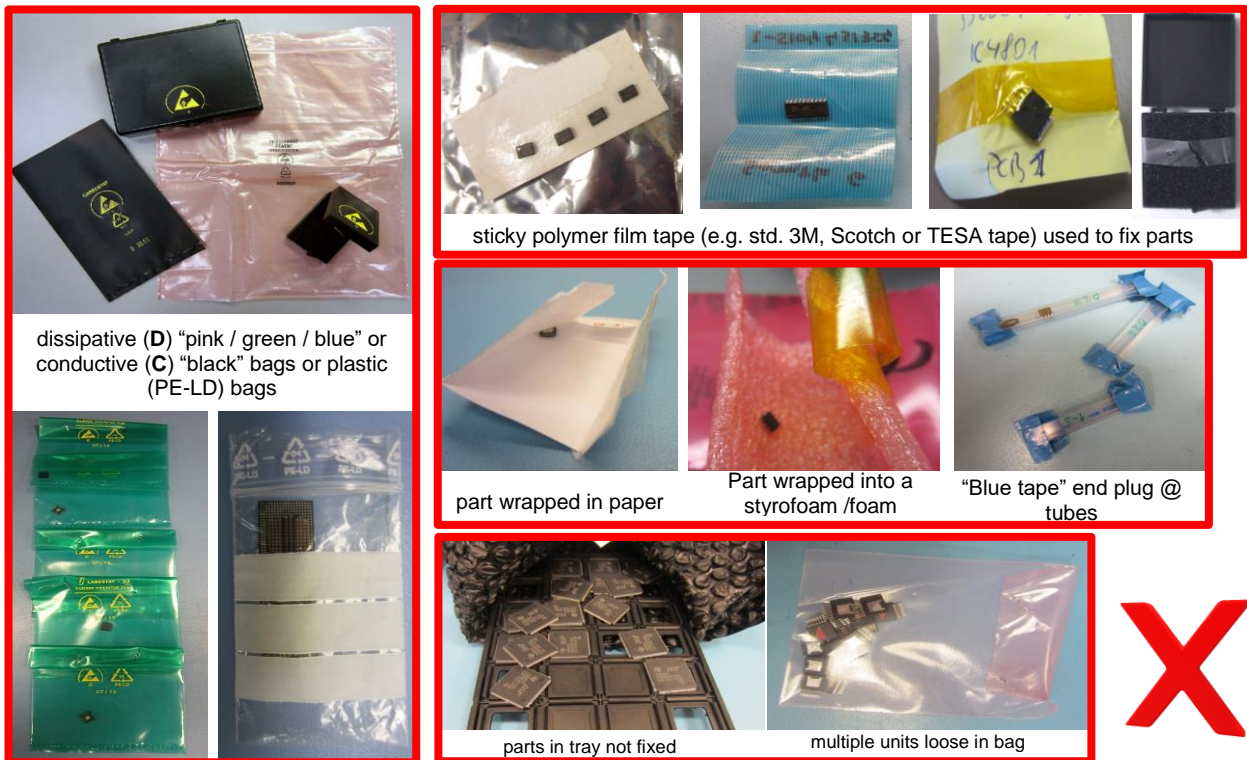
- Select a suitable **electrostatic discharge shielding (S) shipping container**, and
- Fix parts properly and individually to prevent them from moving around or touching one another.

- **For Wafer Chip Scale Package (WCSP) handling please refer to this link: [WCSP handling guide](#)**

Accepted containers for shipping



Not accepted containers for shipping



7. Include a reference unit

It is recommended to add 1 reference device (known good unit), so as to assist the failure analysis process.

- The added reference unit should be mentioned in the CPR form.
- The reference unit must be clearly separated from the failing units and mark the container as "reference unit".
- The reported number of failing units should not include the reference unit.

Key-Points

Do's	Don'ts
Requested number of returned units for inspection is 1.	Number of returned units for inspection must not be more than 3.
Returned units must be shipped inside an electrostatic discharge shielding (S).	Returned units must not be shipped inside dissipative (D) "pink poly" bag.
If more than 1 units are shipped, please include each unit in a separate electrostatic discharge shielding bag and mark the bag accordingly (e.g. if there is a reference unit mark bag as "reference")	Please, don't ship PCB together with the suspect unit, unless it is requested from TI.
Fill in the requested information with any return and detailed failure mode. <ul style="list-style-type: none"> ➤ For Automotive applications, it is very important to add the Customer failure location (e.g. 0km, Production, etc.) ➤ For Automotive applications, please include the end customer (carOEM) name for 0km / field returns 	Returned units must be clear from 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.
Add the Quality Event Management (QEM) number on the shipped package or include a print out of CPR approval email in the package.	Returned units must be clear from EOS damages.

Additional Information

TI Quality Report

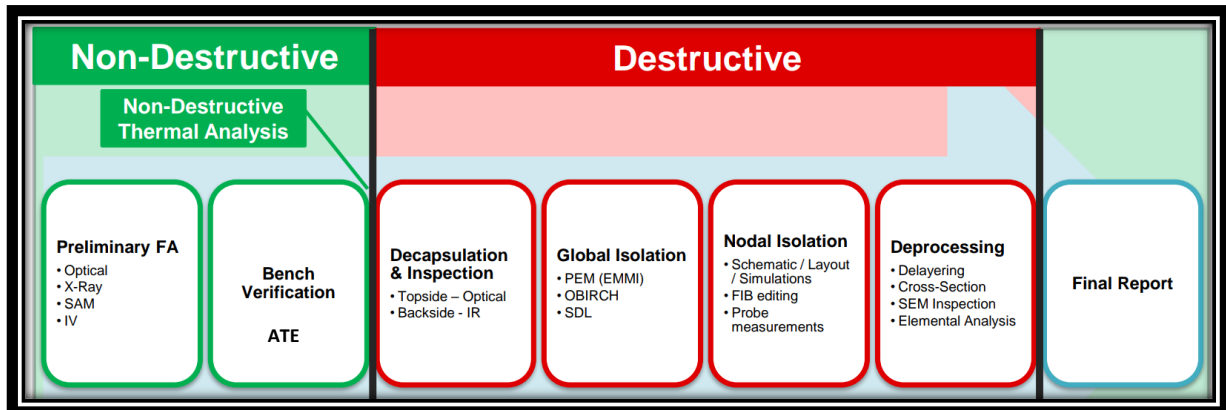
- TI uses a Quality Management Process to optimize the product returns process. By combining cutting-edge techniques with an extensive repository of device data, TI can identify trends and other critical issues.
- TI's database serves as a comprehensive tool that integrates various characteristics of each and every device, such as release-to-the-market date, wafer fabrication site, assembly site, lot history, fab and test yield, rppm, etc. By incorporating these factors in the analysis process, TI can provide quicker responses and enhance the accuracy of the product assessments.
- When TI Quality Report is provided, no shipment of the reported unit is deemed necessary.
- TI maintains an ongoing record of returns by manufacturing lot number to track the number of returned units for a TI device. TI will record this reported issue in the Quality monitor system and continue to actively monitor return trends for this device.

Signature Closure Report

- When TI receives a new failure analysis request for a component with the same failure mode previously attributed to a root cause identified by TI, TI evaluates the implementation timeline for corrective actions (CAs) taken by TI. This assessment determines if the new failures occurred prior to or subsequent to CA implementation.
- If the failures predate the CA implementation, TI typically provides a copy of the existing report from our previous analysis, which is referred to as Signature Closure Report. In such cases, further investigation is usually deemed redundant and unlikely to bring actionable insights for improving product quality or design enhancements.
- However, when the same issue persists post-CA implementation, TI proceeds with an in-depth examination to identify potential systemic issues, root causes, or other contributing factors that require attention.

Verification & Analysis Process in TI

The Verification and Analysis Process followed in TI for the investigation of the suspect units can be non-destructive and/or destructive, as depicted in the diagram below:



- The type of failure and observations as the FA progresses will dictate the diverse path to a successful analysis.
- Each Non-destructive and Destructive step is carefully considered prior to execution.
- The exact time needed for the completion of each stage in the Failure Analysis Flow will vary dependent on the complexity of each case.

Repeated EOS cases

- When recurring EOS failures are experienced on the same TI component within a specific application, a holistic approach is essential to identify and address underlying issues. This requires investigation at both the device level and the system level, as well as collaboration with the customer's design team and TI applications support engineers.
- Device-level failure analysis alone may not provide the complete picture of EOS-related problems in these situations. Rather, it is recommended that a thorough examination be conducted to consider factors such as layout, material selection, power delivery, and processing conditions in the specific application.
- In cases where the root cause of EOS failures has been previously identified to be related to the application, TI may require former investigation results before proceeding with additional device-level analysis for a second failure event.
- For further questions on applications, design, etc, please consult the [TI E2E™ design support forums](#)

Repeated TNI cases

When TI's device-level failure analysis yields a "Trouble Not Identified" (TNI) result, it is essential that customers' design teams thoroughly investigate and examine their application to determine the root cause of the issue.

To facilitate accurate diagnosis and subsequent device-level analysis by TI, TI recommends reviewing the following potential factors that might contribute to a TNI result:

- Inadequate or missing information regarding the failure mode
- Failure conditions specific to the customer's application, including operating settings and environmental parameters
- Presence of multiple devices in the affected system, where one device's fault may be misattributed to another
- Differences between testing protocols used by TI and those employed by the customer
- Requirements for specialized sequences or stimuli to induce the failure condition
- Environmental conditions not explicitly specified or accounted for in the FA report

Summary

These guidelines are meant to enable a timely and successful issue-solving process. Important part of TI's return flow and analysis is the cooperation with the customer. 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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