

Troubleshooting Tips: Quality

A-B-A Swap

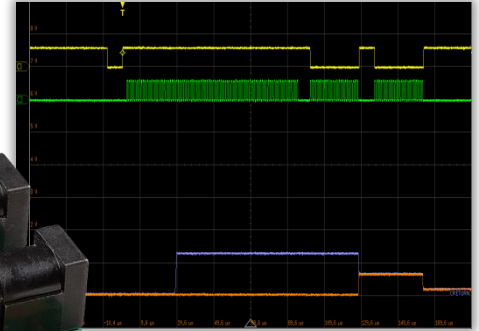
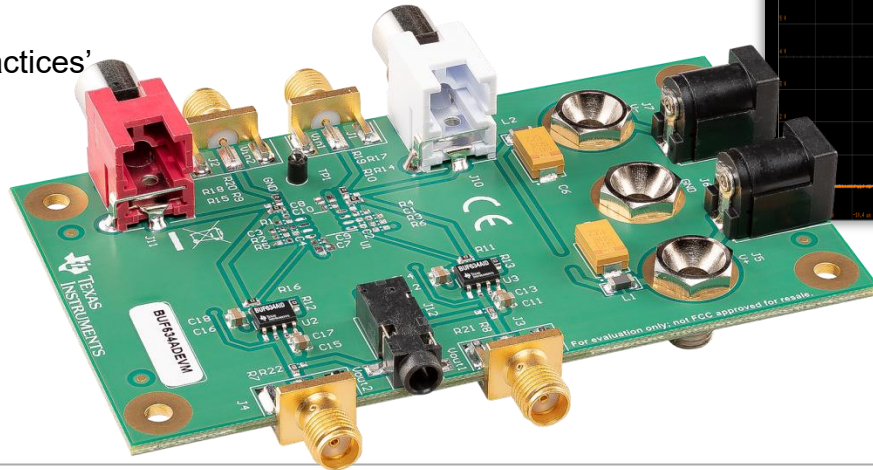
Presented by: Joseph Serritella

Prepared by: Joseph Serritella, Ian Williams, Tim Green, Paul Rheinheimer

General troubleshooting tips

Application troubleshooting:

- Board level troubleshooting techniques and handling best practices should be completed before, or in parallel, to completing electrical characterization.
 - This series covers common tips which expedite the troubleshooting process
- The General troubleshooting series will review the following topics:
 - **A-B-A Swap**
 - WCSP Handling (Wafer Chip Scale Package)
 - Flux Contamination
 - Oscilloscope images – ‘best practices’
 - Curve trace analysis
 - Digital Multi Meter (DMM)
 - Board Cleaning
 - Application Questionnaires
 - EOS prevention Techniques
 - And more...



Board level troubleshooting: A-B-A swap

Overview:

- **A-B-A Swap** is a verification technique that is crucial during the application troubleshooting process
- Provides confirmation that non-conforming behavior follows the **Device Under Test (DUT)**
- Completion of an A-B-A swap is required prior to returning a DUT to TI devices for analysis

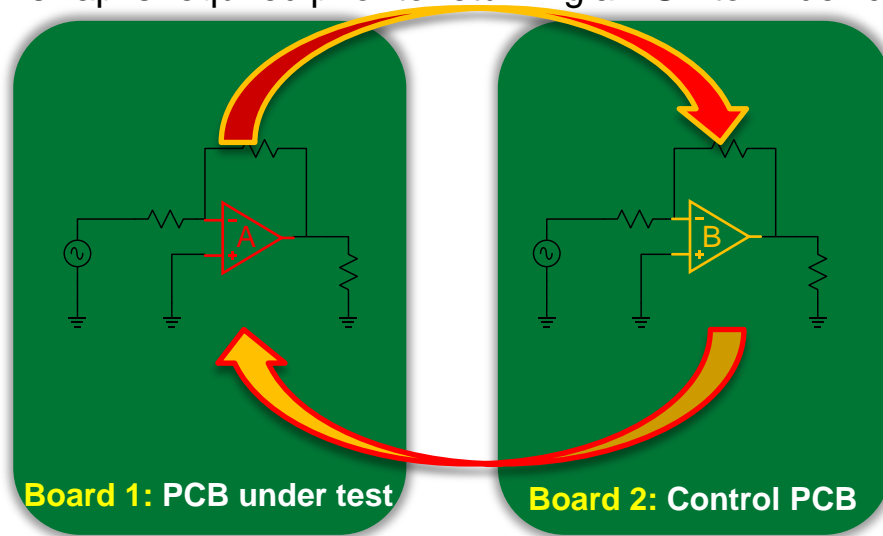
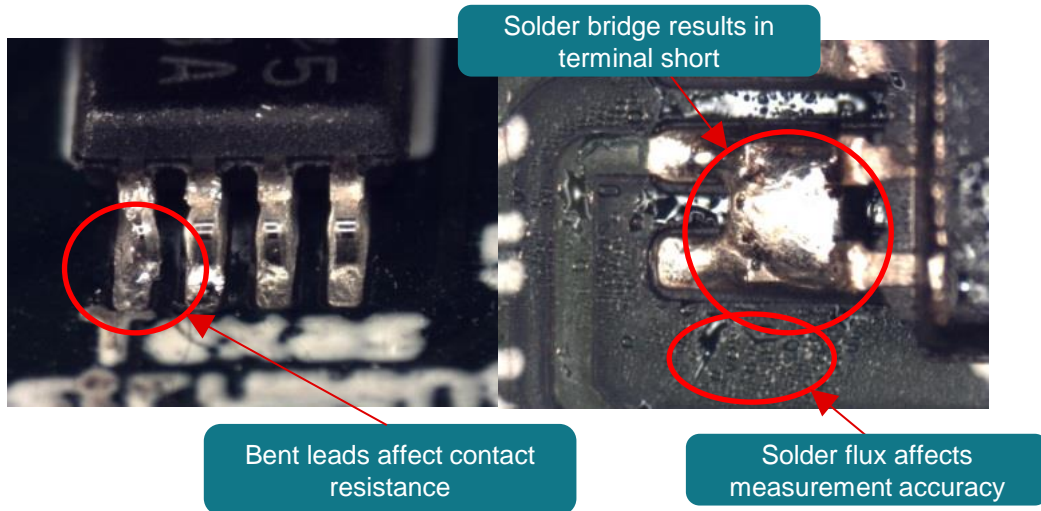


Figure: A-B-A swap diagram

Board level troubleshooting: Optical inspection

Visual inspections:

- A thorough visual inspection should be completed prior to the initiation of an A-B-A swap
- Visual inspection improves the detection rate of inconspicuous (hidden) anomalies which may be overlooked:
 - Utilization of a microscope is highly recommended



Board level troubleshooting: Benefits of A-B-A

Why complete an A-B-A swap:

- The A-B-A technique applies to troubleshooting both complex and simplistic electronic applications
 - Valuable analysis data is obtained from an A-B-A

Rule out the device under test

Assembly anomalies can be solved by re-soldering

Cleaning solder flux residues

Reflowing cold solder joints

Figure: Key benefits of the A-B-A swap

Board level troubleshooting: A-B-A process

A-B-A methodology:

- A. Remove the suspect TI part (**A**) from the original failing board.
 - Use of a rework station allowing control of the soldering temperature according to the JEDEC soldering profile
 - 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 issue is observed
- The last step is critical to exclude the possibility that the issue is caused by an interaction with another part on the board.
 - It is recommended to re-solder part (**A**) to the original PCB to confirm if the original setup passes or does not function properly:
 - Cold solder joint, flux contamination, etc..

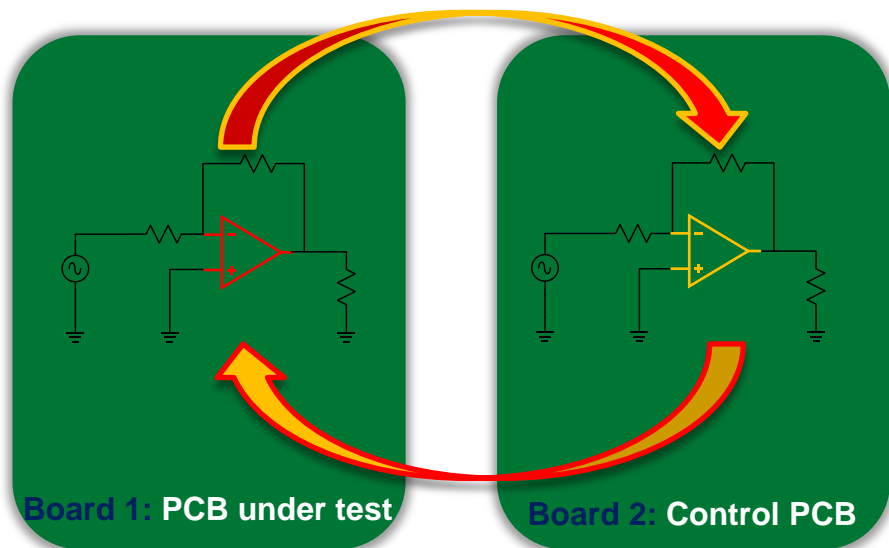


Figure: A-B-A swap diagram: Unit **A** | Unit **B**. Units must be carefully de-soldered and re-soldered. Take care to prevent thermal damage to the units.

Important information

General troubleshooting: A-B-A swap

- The A-B-A swap is a common board level troubleshooting technique
- Review of the following prerequisites is recommended before proceeding

Prerequisites:

TI's Quality policies and processes:

Quality and Reliability

ti.com/quality

TI E2E Support Forum:

Find expert answers to your technical questions

ti.com/e2e

TI Precision Labs:

TI Precision Labs: Overview

ti.com/PrecisionLabs

Simulation tools:

Simulations are presented within TI troubleshooting tips series. It is recommended to install TINA-TI

TINA-TI can be downloaded for free on ti.com: <http://www.ti.com/tool/tina-ti>