

# Failure Analysis Report



TI Information - Selective Disclosure

## Device Analysis Services

FA QEM-CCR-1706-01197

ACTION-0053471

<b>Customer:</b>	TSMT	<b>Assy Site:</b>	CU6
<b>Customer Tracking ID:</b>		<b>Fab Site:</b>	CUA
<b>Customer Part ID:</b>		<b>Technology:</b>	CMOS
<b>Customer Contact:</b>	Johnny.Liang	<b>Analyst:</b>	Eric Yeh
<b>Device Type:</b>	LM4670SD/NOPB	<b>TI Contact:</b>	Wendy Huang
		<b>Qty Submitted:</b>	1
<b>Flow Type:</b>	Customer Return	<b>Date Submitted:</b>	2017-06-30
<b>Reviewer:</b>	Owen Ko	<b>Approval:</b>	Owen Ko

### Summary

Failure Analysis	Results
<b>Customer Reported Failure Mode</b>	1. Production line functional test failure. 2. SPK AMP output shorted to GND.
<b>TI Failure Description</b>	Pin5 (VO1) shorted to pin4 (GND).
<b>What effect does the defect or damage cause?</b>	Short failure between fail pin.
<b>Where and what is the defect/damage?</b>	EOS damage in the form of degraded mold compound was observed.
<b>Did the identified physical defect/damage explain the TI reported failure mode?</b>	YES.

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TI Unit #	Cust. Unit #	Lot Trace Code	Symbolization	Wafer Fab Lot #	Assembly Lot #
1		5BA0X5U		5001234	5390701EM5

- **Customer Reported Problem Description:**

1. Production line functional test failure.
2. SPK AMP output shorted to GND.

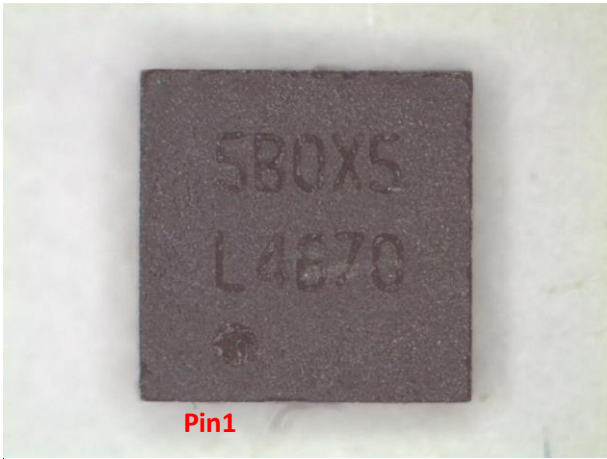
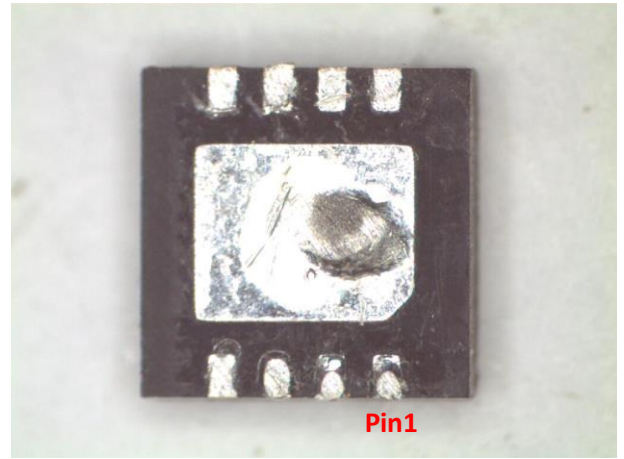
- **TI Problem Description:**

Pin5 (VO1) shorted to pin4 (GND).

- **Package Analysis:**

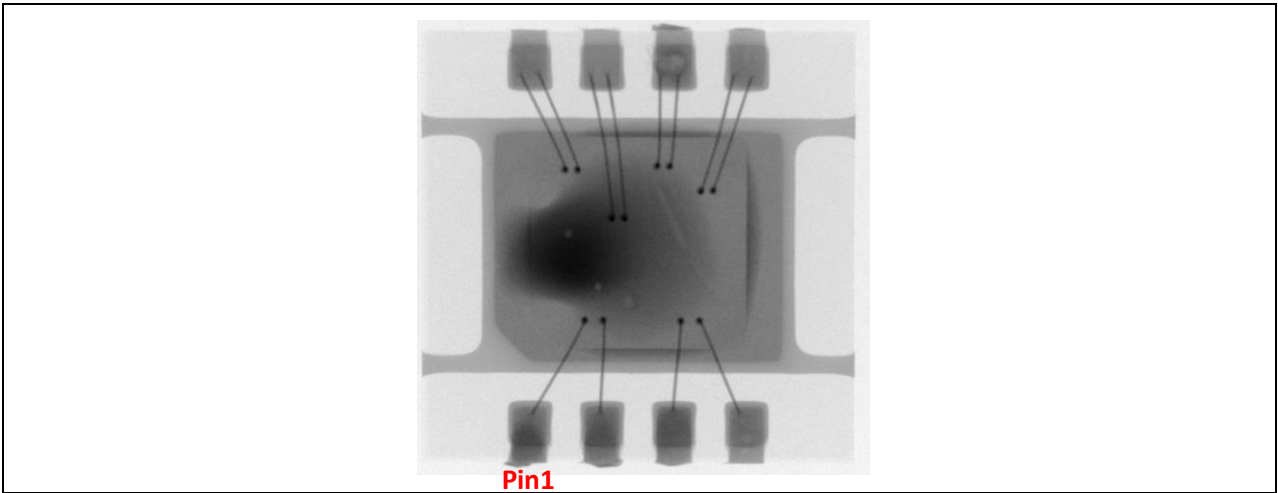
- **External Package Examination:**

The failing unit was inspected optically. No anomaly was observed.

 <p style="text-align: center; color: red;">Pin1</p>	 <p style="text-align: center; color: red;">Pin1</p>
<p><b>Figure 1.</b> Optical image of the top of the device. No anomaly was observed.</p>	<p><b>Figure 2.</b> Optical image of the bottom of the device. No anomaly was observed.</p>

- **X-Ray Analysis:**

The failing unit was inspected by X-ray. No anomaly was observed.

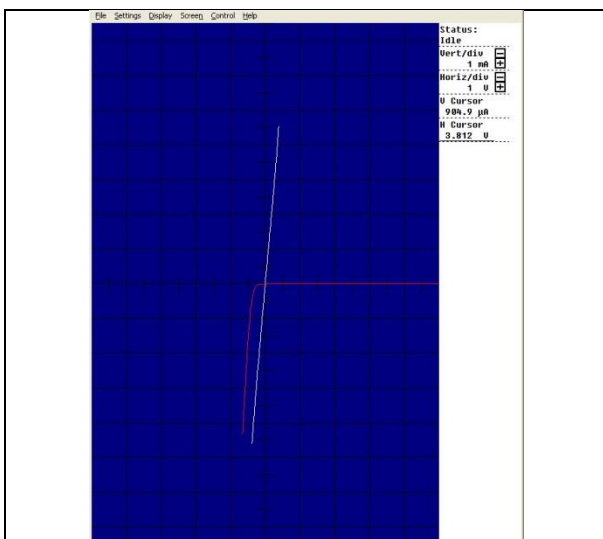


**Figure 3.**

Top view by X-ray. No anomaly was observed.

- **Electrical Characterization:**

Measurement result for returned unit through curve tracer was as below:  
Pin5 (VO1) shorted to pin4 (GND).



**Figure 4:**

IV curve revealed pin5 shorted to pin4 (GND).

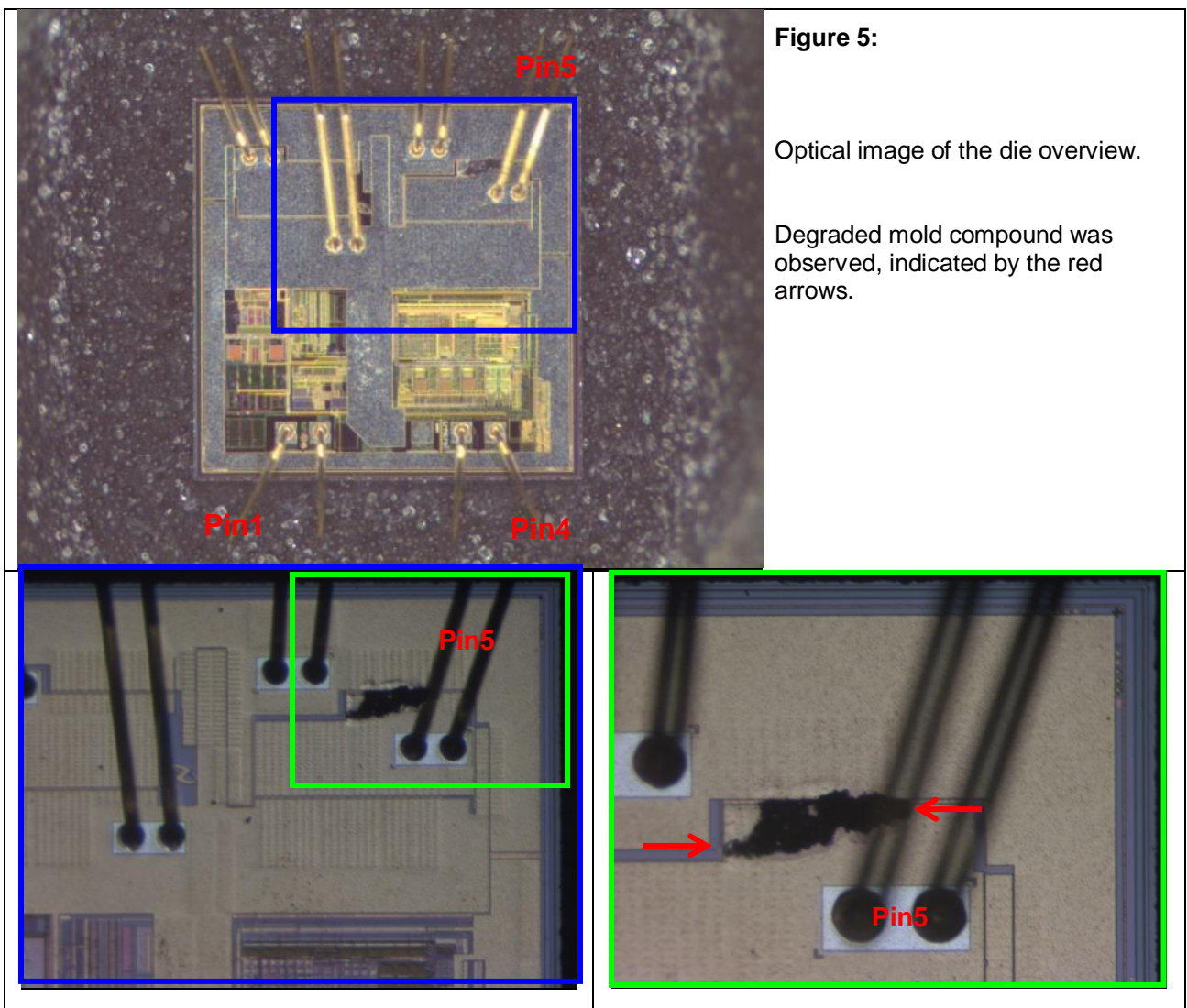
The red curve indicated a correlation unit.

- **De-capsulation:**

The unit was de-capsulated by laser ablation system followed by mixed acid fuming nitric acid 98%:sulfuric acid 96% = 2:1 on hotplate at 90 degree C.

- **Internal Optical Inspection:**

Optical inspection of the de-capsulated unit revealed EOS damage in the form of degraded mold compound was observed.

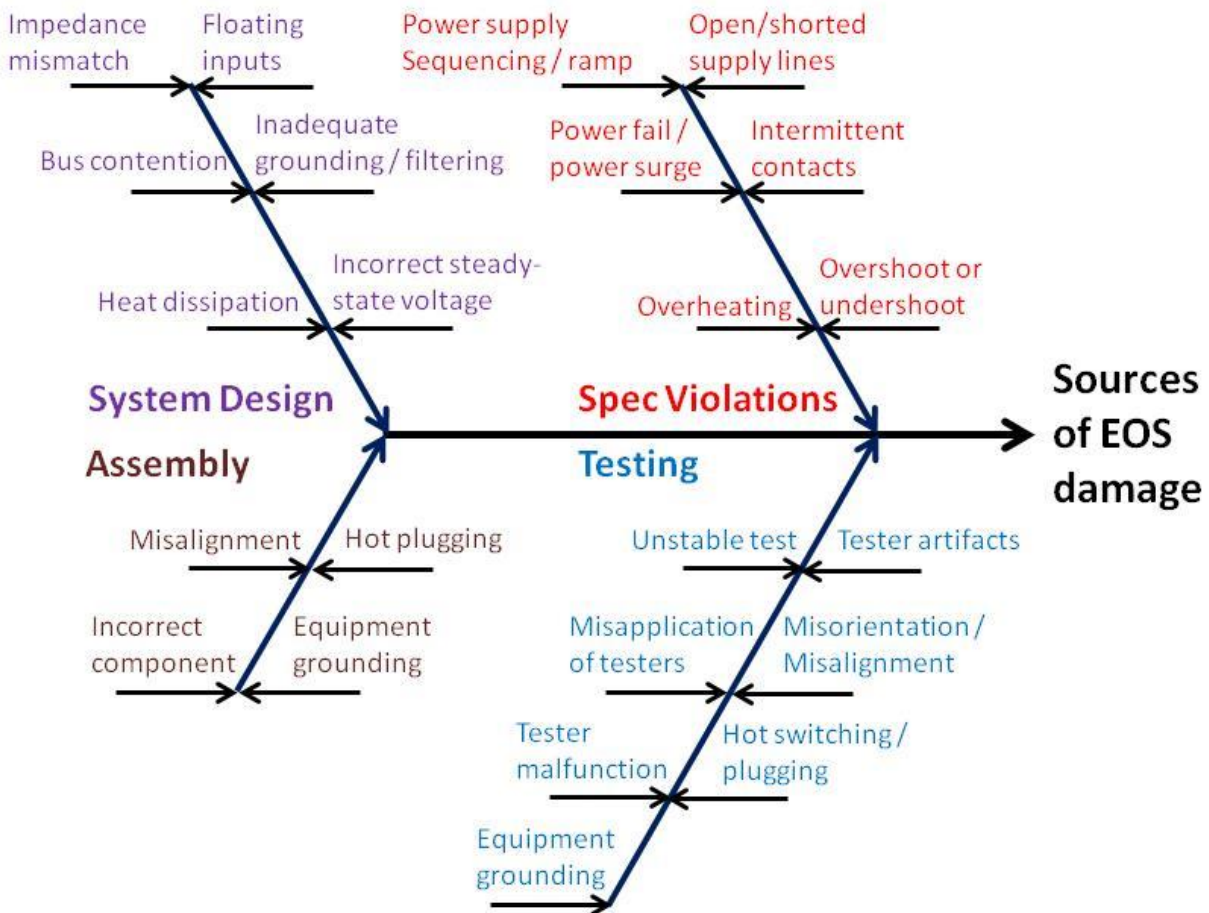


- **Physical Mechanism ID:**

EOS damage in the form of degraded mold compound was observed.

- **Conclusion:**

The unit failed due to the EOS damage observed. An over-voltage/over-current condition or event is the most likely cause of failure and we recommend that the customer evaluate the application environment for possible sources of transient or steady-state Electrical Overstress. Detailed analysis and measurement of the customer's board environment and the customer's test environment will be required to identify the specific cause of the EOS. Please consult the below fishbone diagram for a listing of such possible causes.



Note 1: Due to digital image capture, the magnification is not calibrated nor is the aspect ratio maintained. Not all tools provide a means recorded in the image for calibrating the measurements. When a calibration marker is supplied in the image, the measurements may be calibrated in the direction of the marker.