Electronic Specialty Test
Materials/Failure Analysis
Environmental Test
Product Package Test
Shock/Vibration

LAB ANALYSIS REPORT

Company:	RVI 304 Industrial Drive Redwood Falls, MN 56283	**Date:**	April 20, 2010
		Report No.:	10-0238
Submitted by: **Ph.**	Doug Houle 507-644-3227	**P. O. No.:**	012622-001
		Page 1 of 5	

IDENTIFICATION

Vendor:

Part Number:

Description:

Quantity Received: 2

Request No.: N/A

BACKGROUND INFORMATION

Received two (Q7, Q21/TO-247AD package) for analysis.

Package markings: 20N60CFD GHD840

SUMMARY OF ANALYSIS PROCESS (Numbered in Order Completed)

___	Electrical Test	3	Detailed Internal/External Analysis
1	Curve Tracer	5	Scanning Electron Microscope (SEM)
___	Bake and Retest 2 Hours at 180°C	___	Energy Dispersive X-Ray (EDX) Analysis
___	X-Ray	___	Cross-Section
2	Decapsulate ___ Mechanical X Chemical	4	Delayer Die Surface for SEM Analysis

PREPARED BY:

REVIEWED BY:

THIS TEST REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT WRITTEN APPROVAL FROM THE SPECIALTY LAB, INC
The tests indicated in the applicable plan and purchase order were performed using standard laboratory techniques, due care in performance and reasonable technical judgment. However, The Specialty Lab, Inc. assumes no responsibility or liability for any use made of this data by the purchaser.

ANALYSIS

Both MOSFETS were verified as having a gate, source, drain short.

Decap revealed severe EOS/localized heat damage beneath the source wire bond on the die surface.

The MOSFETS were delayered on the die surface for SEM analysis.

CONCLUSION/COMMENTS

Both MOSFETS were shorted due to EOS/localized heat damage on the die surface, originating beneath the source wire bond.

Three possible causes are: 1) excessive current flow, 2) partially turned on gate and/or 3) inadequate cooling/heatsinking of the MOSFETS.

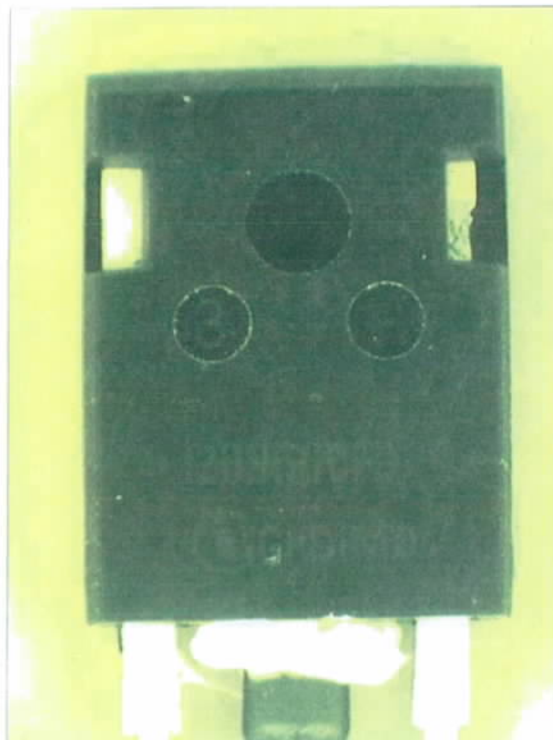

Figure 1.

Overall view of the MOSFET package.

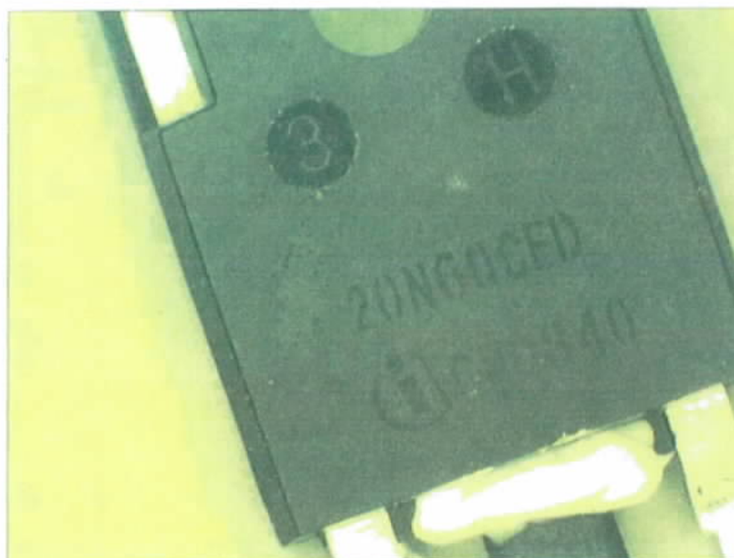

Figure 2.

View of the package markings including the vendor logo. Same on both MOSFETS.

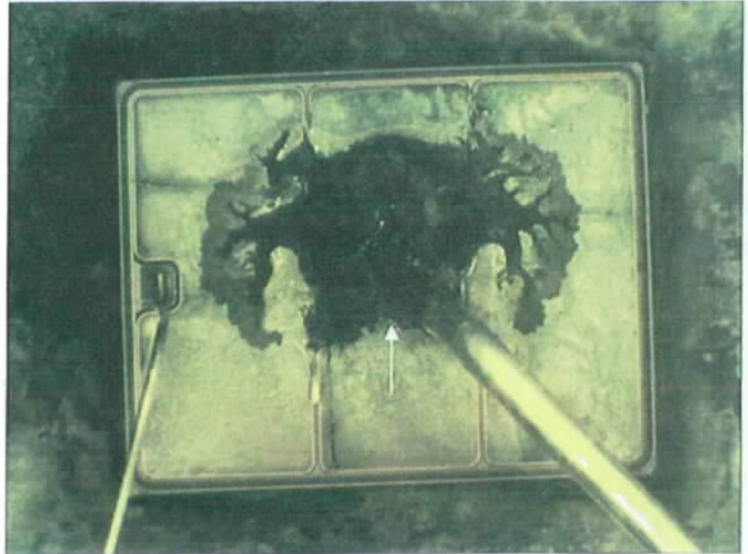

Figure 3.

Optical view of the dip surface of Q7, illustrating the EOS/localized heat damage at the source wirebond area (arrow).

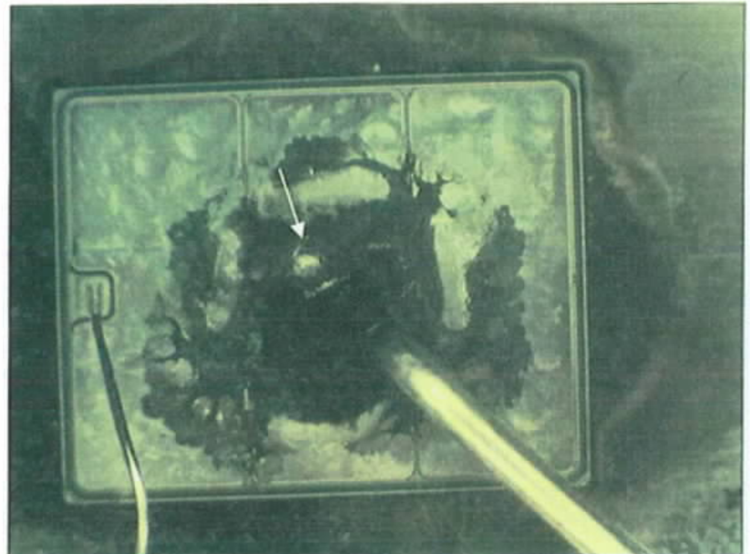

Figure 4.

View of the die surface of Q21, illustrating the EOS/localized heat damage (arrow).

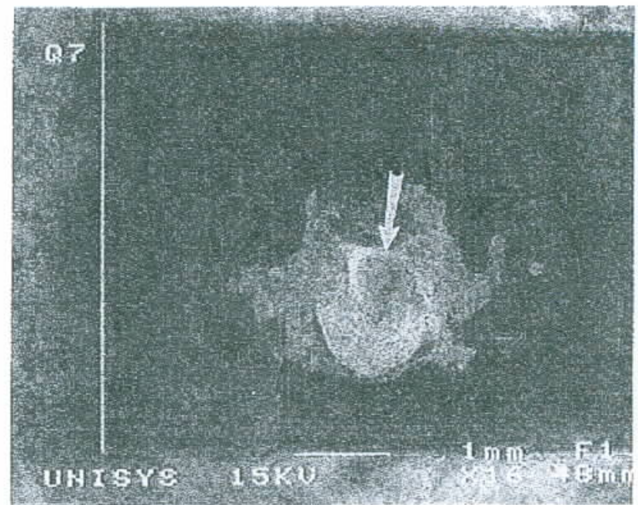

Figure 5.
16X

SEM view of the delayered die surface of Q7, illustrating the localized heat damaged area (arrow).

Figure 6.
60X

Closer SEM view of the localized heat damaged area of Q7. Intense heating caused melting of the silicon bulk.

Figure 7.
17X

SEM view of Q21, illustrating the hole in the silicon bulk (arrow) due to intense heating.

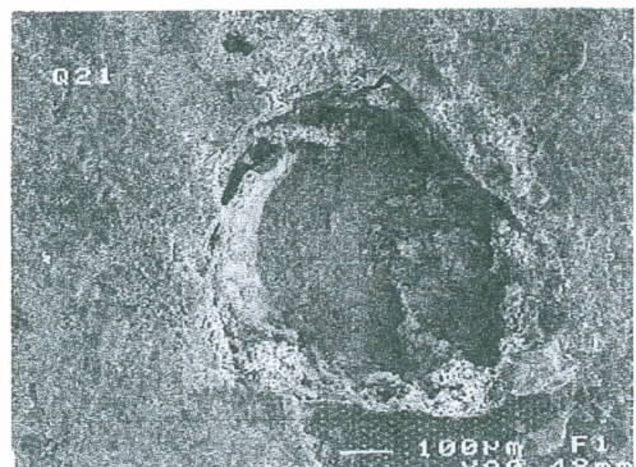

Figure 8.
90X

Closer SEM view of the localized heat damaged area of Q21.