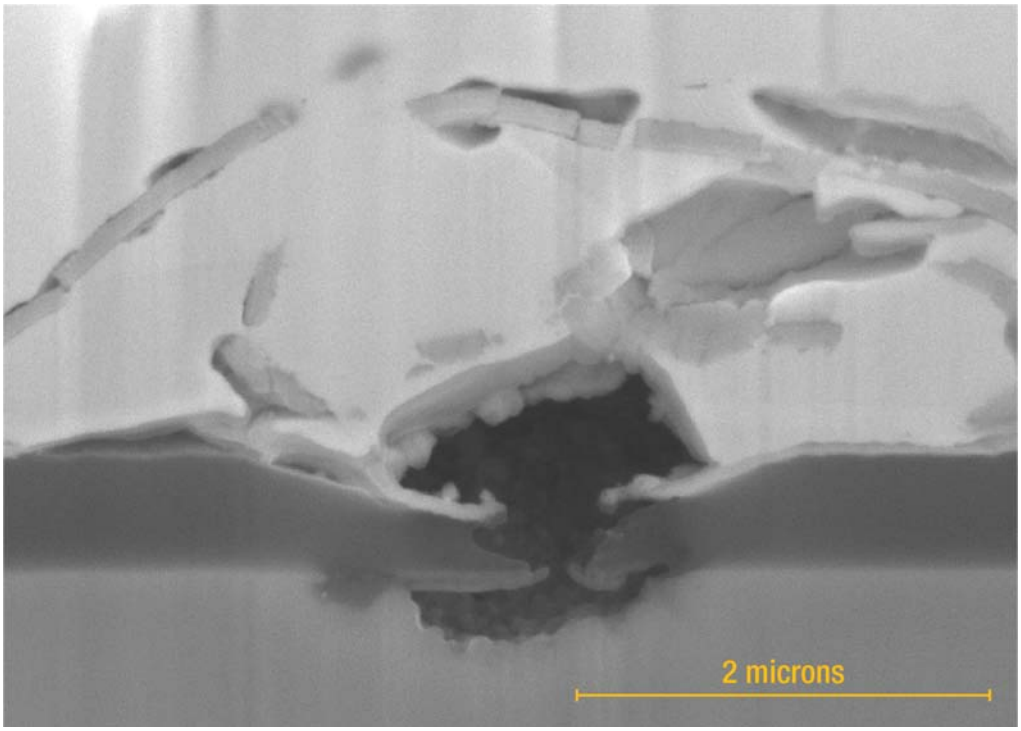
National Aeronautics and Space Administration

EEE Parts Bulletin

Electrical, Electronic, and Electromechanical

A periodic newsletter of the JPL/OSMS Assurance Technology Program Office (ATPO), NASA EEE Parts Assurance Group (NEPAG), and Section 514, of the Jet Propulsion Laboratory.

January/May 2014 • Volume 6 • Issue 1 (Published since 2009)



This scanning electron microscope (SEM) cross-section image shows the damage done by a worker forgetting to wear a grounding wrist strap while performing a reverse-bias test on a tunnel diode. The part was observed to drop out of specification, and JPL helped with the failure analysis. Apparently, –600 V of electrostatic discharge (ESD) burned a hole into the part. Furthermore, the surface of the roughened area surrounding the hole experienced an unknown degree of melting and reforming of the alloy.

PIDTPs for Qualifying New Packaging Technologies

There are a number of non-traditional assembly/package technologies that are being considered for space applications. How should the space community address the unique manufacturability, test, quality, and reliability issues specific to non-hermetic packages (e.g., Class Y), flip-chip assemblies, and solder terminations?

Military Performance Specification 38535, Revision K (MIL-PRF-38535K), Para B.3.11 now mandates that each manufacturer develop a Package Integrity Demonstration Test Plan (PIDTP). Such a PIDTP shall address issues unique to any non-hermetic construction and materials a manufacturer might propose using for space applications. Issues to be addressed include potential materials degradation, interconnect reliability, thermal management, resistance to processing stresses, thermo-mechanical stresses, and shelf life. Each PIDTP shall be approved by the qualifying activity (DLA Land and Maritime) after consultation with the space community.

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OSMA Introduces Class Y Microcircuits

The NASA Headquarters Office of Safety and Mission Assurance (OSMA) has published an article, “Class Y: A New Class of Microcircuits for Space and Military,” at:

https://sma.nasa.gov/news/news/2014/05/14/class-y-a-new-class-of-microcircuits-for-space-and-military

NASA Effort to Baseline Electronic Counterfeit Parts Detection Capability

An agency-wide effort led by the NASA OSMA Non-Destructive Evaluation Program is currently under way to assess NASA's collective ability to detect and prevent counterfeit electronic parts, a severe and growing threat to NASA missions.

The first stage of this effort is to compile an Agency-wide inventory of detection methods and associated equipment available at each NASA center. Table 1 shows a matrix of the information captured to date.

The columns list test methods and associated equipment that coincide with recommended test methods outlined in Society of Automotive Engineers (SAE) document AS6171, *Test Methods Standard; Counterfeit Electronic Parts*. AS6171 was developed over the past two years by leading Government and industry experts to provide comprehensive and proven testing requirements for the detection of counterfeit electronic parts.

The majority of the equipment in Table 1 was procured before this effort was initiated for general line inspections or failure analysis. Leveraging these capabilities, developing increased NASA competencies for counterfeit parts detection, and providing increased awareness of available Agency-wide resources for counterfeit parts detection are considered essential components of the Agency's counterfeit parts avoidance program. While the Agency could opt to procure services of private test laboratories, these sources have not yet demonstrated sufficient expertise to reliably detect counterfeit parts. In addition to heightened assurance for NASA missions, maintaining resident expertise and capability to conduct its own authentication testing translates into potential savings in cost and time. In the end, this helps assure that each NASA spacecraft, instrument payload, and critical equipment is free of counterfeit parts.

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Table 1. NASA Center for Counterfeit Parts Detection Capability matrix.

	EQUIPMENT/DETECTION METHOD													
NASA CENTER	SOLVENTS TESTING	FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIR)	SCANNING ACOUSTIC MICROSCOPY (SAM)	REAL TIME RADIOGRAPHY	X-RAY FLUORESCENCE (XRF)	BASIC DC TESTING	SCANNING ELECTRON MICROSCOPY (SEM) WITH ENERGY DISPERSIVE SPECTROSCOPY (EDS/EDX)	FULL FUNCTIONAL WITH EXTENDED TEMPERATURE TESTING	PARTICLE IMPACT NOISE DETECTION (PIND)	ELECTRONIC COMPONENT LEAK TEST	DESTRUCTIVE PHYSICAL ANALYSIS (DPA)	COMPUTED TOMOGRAYPHY (CT) SCAN	THERMOGRAVIMETRIC ANALYSIS (TGA)	RAMAN SPECTROSCOPY
AFRC	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
GRC	NO	YES	NO	YES	YES	NO	YES	NO	NO	NO	NO	YES	YES	NO
GSFC	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO
JPL	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
JSC	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES
KSC	YES	YES	NO	YES	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES
LARC	YES	NO	NO	NO	YES	YES	YES	YES	NO	NO	YES	YES	NO	NO
MSFC	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
WSTF	NO	YES	NO	YES	YES	YES	NO	NO	NO	YES	NO	NO	NO	NO

The equipment status is as of June 10, 2014. The NASA centers cited are Armstrong Flight Research Center, Glenn Research Center, Goddard Space Flight Center, Jet Propulsion Laboratory, Johnson Space Center, Kennedy Space Center, Langley Research Center, Marshall Space Flight Center, and White Sands Test Facility.

NASA Parts Specialists Recent Support for DLA Land and Maritime Audits:

Audits performed at

- American Technical Ceramics Corp, Huntington Station, NY
- Analytical Solutions, Albuquerque, NM; CA
- Aeroflex RAD, Colorado Springs, CO
- Crane Electronics Corp.; Kaohsiung, Taiwan
- Crane Electronics Corp., Redmond, WA
- Data Device Corporation, Bohemia, NY
- Delta Electronic, Inc., Taoyuan Shien, Taiwan
- G&H Technology, Inc., Camarillo, CA
- Hamby Corporation, Valencia, CA
- International Rectifier, San Jose, CA
- IsoVac Engineering, Inc., Glendale, Microsemi-Philippines, Laguna, PH
- Linear Technology Corp., Milpitas, CA
- Micropac Industries, Inc., Garland, TX
- Microsemi Lawrence, Lawrence, MA
- Microsemi-Philippines, Laguna, PH
- Natel Engineering Co., Chatsworth, CA
- Peregrine Semiconductor, San Diego, CA
- Sanmina – SCI, Costa Mesa, CA
- Silanna, Sydney, AU
- Six Sigma, Milpitas, CA
- USA MicroCraft Inc., Placentia, CA
- Viasystems North America, Inc., Anaheim, CA

Upcoming Meetings

- 2014 NEPP Electronics Technology Workshop (ETW), Goddard Space Flight Center, Greenbelt, MD, June 17–19, 2014
- EEE Parts for Small Missions, Goddard Space Flight Center, Greenbelt, MD, Sept. 10–11, 2014
- JC-13 / G-12 / G-11 Committee Meetings; Columbus Renaissance, Columbus, OH, Sept. 15–18, 2014

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Public Link (best with Internet Explorer):
http://trs-new.jpl.nasa.gov/dspace/handle/2014/41402

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