

Alternate Shock Pulse Width Study Small Sample Anomaly MSFC Data Review

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Agenda

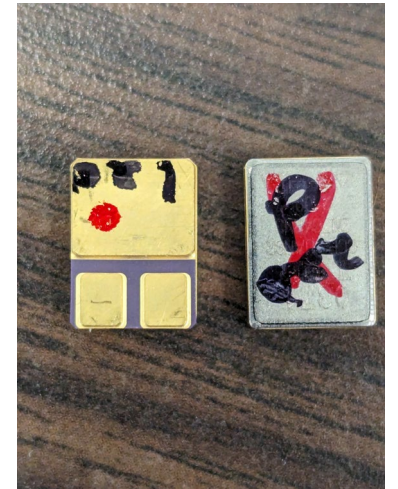
1. PIND Testing performed
2. Future plans

Small Sample Group of Packages PIND Tested By MSFC

- Received sample packages from NSWC Crane.
- MSFC used same PIND test frequencies that were used by NSWC Crane.
- Same test process used for PIND test at MSFC that was used at NSWC Crane.
- Spectral Dynamics Model 4501 PIND tester was utilized for the initial sample testing.
- Non-simultaneous (static) mode PIND testing performed.

Small Sample Group of Packages PIND Tested By MSFC

- PIND test equipment at NSWC Crane and MSFC utilizes 40 microsecond pulse width shock pulse. Purpose of this testing is to establish baseline data for currently available PIND test equipment prior to performing the proposed 100 microsecond pulse width shock pulse at the PIND equipment manufacturer.
- Similar test process used for PIND test at MSFC that was used at NSWC Crane. Same shock level and test frequency used by NSWC Crane was used by MSFC to perform the PIND test at MSFC.
- Test run # 1 simulates PIND testing at manufacturer.
- Test run # 2 simulates PIND testing at user facility.
- Tested eight (8) SMD.5 packages due to constraints.
- Four packages were known good and four packages were known PIND failures.



MSFC Standard Shock Pulse Width PIND “Static” Mode Original Test Results

Table 2. Test Facility PIND detection results for standard shock pulse width (~40 uS)

Test Facility MSFC Standard PIND Test Results

PIND Equipment Manufacturer __Spectral Dynamics__ Model 4501 cal due 08/05/2024

Device Part Number - optional	Package Type			Vibration detection (X=detect)				NOTES
		Serial number	Run #	Vib 1	Vib 2	Vib 3	Vib 4	
PKG Type SMD.5	SMD.5	112	1	X				
PKG Type SMD.5	SMD.5	112	2	X	X			
PKG Type SMD.5	SMD.5	113	1		X			
PKG Type SMD.5	SMD.5	113	2					
PKG Type SMD.5	SMD.5	114	1					
PKG Type SMD.5	SMD.5	114	2					
PKG Type SMD.5	SMD.5	117	1					
PKG Type SMD.5	SMD.5	117	2	X				
PKG Type SMD.5	SMD.5	212	1					
PKG Type SMD.5	SMD.5	212	2					
PKG Type SMD.5	SMD.5	213	1					
PKG Type SMD.5	SMD.5	213	2					
PKG Type SMD.5	SMD.5	214	1					
PKG Type SMD.5	SMD.5	214	2					
PKG Type SMD.5	SMD.5	217	1					
PKG Type SMD.5	SMD.5	217	2					

MSFC Standard Shock Pulse Width PIND “Static” Mode Original Test Results

PIND Anomalies - Mode Comparison

NSWC Crane Non-Simultaneous Mode (Static)									MSFC Non-Simultaneous Mode (Static)							
Package Type	Serial number	Run #	Vibration detection (X=detect)				NOTES		Package Type	Serial number	Run #	Vibration detection (X=detect)				NOTES
			Vib 1	Vib 2	Vib 3	Vib 4						Vib 1	Vib 2	Vib 3	Vib 4	
SMD 0.5	112	1							SMD.5	112	1	X				
SMD 0.5	112	2							SMD.5	112	2	X	X			
SMD 0.5	113	1							SMD.5	113	1		X			
SMD 0.5	113	2							SMD.5	113	2					
SMD 0.5	114	1							SMD.5	114	1					
SMD 0.5	114	2							SMD.5	114	2					
SMD 0.5	117	1		X	X				SMD.5	117	1					
SMD 0.5	117	2					no detect		SMD.5	117	2	X				
SMD 0.5	212	1							SMD.5	212	1					
SMD 0.5	212	2							SMD.5	212	2					
SMD 0.5	213	1							SMD.5	213	1					
SMD 0.5	213	2							SMD.5	213	2					
SMD 0.5	214	1							SMD.5	214	1					
SMD 0.5	214	2							SMD.5	214	2					
SMD 0.5	217	1							SMD.5	217	1					
SMD 0.5	217	2							SMD.5	217	2					

Summary of Additional PIND Tests Completed By MSFC

Observations:

1. PIND tested a small sample of one package type (SMD.5) consisting of four known good and four known packages with PIND anomalies.
2. Performed PIND using “Static” non-simultaneous mode.
3. Only three of four known package PIND anomalies were detected during PIND testing.
4. MSFC “Static” non-simultaneous mode PIND test results were similar to NSWCC Crane test results.

Longer Shock Pulse Width Task Proposal Future Plans

- Continue testing of samples at MSFC.

Thank you!

- We would like to express our appreciation to the task group members, NASA NEPAG and SLS programs, Government Working Group, and NSWC Crane for their continued support of this effort.

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Acronyms

- DLA – Defense Logistics Agency
- DLR – German Aerospace Center
- DPA – Destructive Physical Analysis
- ESA – European Space Agency
- ESD – Electrostatic Discharge
- FOD – Foreign Object Debris
- JEDEC – JEDEC Solid State Technology Association
- NASA – National Aeronautics and Space Administration
- MSFC- Marshall Space Flight Center
- NSWC Crane – Naval Surface Warfare Center, Crane Division
- PIND – Particle Impact Noise Detection

PIND Task Group Members

- PIND Task Group Work participant members represent the manufacturers, industry, and government agencies, and international partners:
 - Manufacturers: Microchip, Texas Instruments, IR Hi Rel/Infineon, VPT Components, Semicoa, Teledyne Microwave Solutions, Micropac Industries Inc.
 - Industry Test Laboratories – Hi Rel Labs, ORS Labs, Golden Altos
 - Government Agencies and their contractors – NASA, NSWC Crane Division, US Air Force, US Army, Aerospace Corporation, DLA Land and Maritime,
 - International Partners – ESA, NASAM, TESAT/DLR