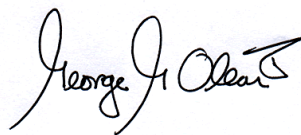


FEBRUARY 3, 2005

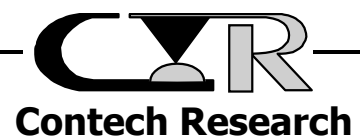
TEST REPORT #204815

HEATSINK
Accelerated Life

Calgreg Thermal Solutions



APPROVED BY: George G. Olear II
DIRECTOR OF MECHANICAL/ENVIRONMENTAL TESTING
CONTECH RESEARCH, INC.

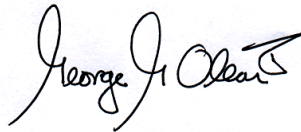


CERTIFICATION

This is to certify that the evaluation described herein was designed and executed by personnel of Contech Research, Inc. It was performed in concurrence of Calgreg who is the test sponsor.

All equipment and measuring instruments used during testing were calibrated and traceable to NIST according to ISO 10012-1 and ANSI/NCSL Z540-1, as applicable.

All data, raw and summarized, analysis and conclusions presented herein are the property of the test sponsor. No copy of this report, except in full, shall be forwarded to any agency, customer, etc., without the written approval of the test sponsor and Contech Research.



George G. Olear II
Director of Mechanical/Environmental Testing
Contech Research, Inc.

GGO:



REVISION HISTORY

DATE	REV. NO.	DESCRIPTION	ENG.
2-3-05	Rev. 1.0	Initial Issue	ggo



SCOPE

To perform qual testing on product as submitted by the test sponsors, Calgreg Thermal Solutions.

APPLICABLE DOCUMENTS

1. Unless otherwise specified, the following documents of issue in effect at the time of testing performed form a part of this report to the extent as specified herein. The requirements of sub-tier specifications and/or standards apply only when specifically referenced in this report.
2. Product Specifications:

EIA 364

TEST SAMPLES AND PREPARATION

1. The following test samples were submitted by the test sponsor for the evaluation to be performed by Contech Research, Inc.

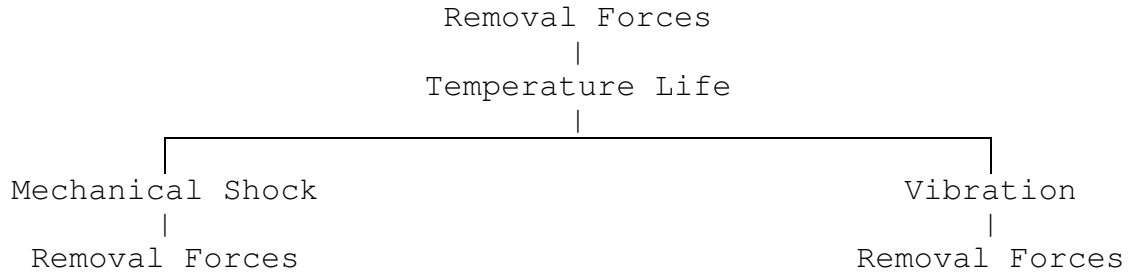
Heatsinks and Mounting Clips
2. Unless otherwise indicated, all materials were certified by the manufacturer to be in accordance with the applicable product specification.
3. All test samples were coded and identified by the test sponsor.
4. The test samples were tested in their 'as received' condition.



TEST SAMPLES AND PREPARATION - Continued

5. The following test plan was established for this program:

TEST PLAN



SAMPLE SIZE

The following number of test samples were tested:

24 Large and 24 small



EQUIPMENT LIST

ID#	Next Cal	Last Cal	Equipment Name	Manufacturer	Model #	Serial #	Accuracy	Freq. Cal
281			Vibration Power Amp	Ling Dynamics	DPA 10K	156	N/A	N/A
486	11/24/05	11/24/04	Digital Force Gage 100 lbs.	Chatillon Co.	DFIS-100	23084	±.25lbs	6 mon.
553	12/6/05	12/6/04	12 channel Power Unit	PCB Co.	483A	1303	See Cal Cert	12mon
988r			Main frame	Agilent	35650	2608A003377	See Manual	N/A
991r			Sig Processor interface	Agilent	35651B	n/a	N/A	N/A
1121	10/20/05	10/20/04	Accelerometer	PCB	353B04	57715	See Cal. Cert.	12mon
1239			Bench Oven	Blue M.	ESP400C-5	ESP-1229	See Manual	Each Test
5026	12/13/05	12/13/04	DAC Module	H.P.	35656B	3244A00342	See Cal Cert	12months
5027	12/13/05	12/13/04	8-Chan input module	H.P.	35655A	2911A02381	See Cal Cert	12months



TEST RESULTS



PROJECT NO.: 204815 SPECIFICATION: EIA 540BAE

PART NO.: None PART DESCRIPTION: Heatsink

SAMPLE SIZE: 24 ea TECHNICIAN: Ggo

START DATE: 12-14-14 COMPLETE DATE: 12-14-04

ROOM AMBIENT: 23 °C RELATIVE HUMIDITY: 20

EQUIPMENT ID#: 486

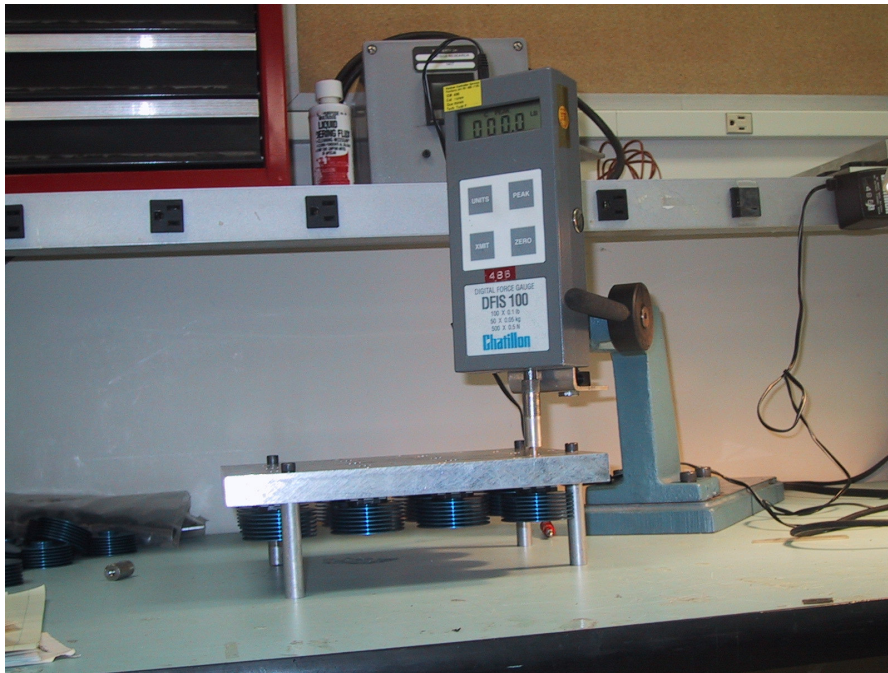
REMOVAL FORCE

PURPOSE:

To determine the mechanical forces required to remove the Heatsink, by pushing vertically from the bottom of the test die.

PROCEDURE:

The force shall be applied to the test samples from the underside of the heatsink so as to cause the heatsink to pop free. See the test setup below:



REQUIREMENTS:

1. The force required to remove the heatsink from the test die shall be measured and recorded.
2. The mounting clip shall remain on the test die.
3. After the pretest measurements are made, the mounting clips shall be removed and discarded.

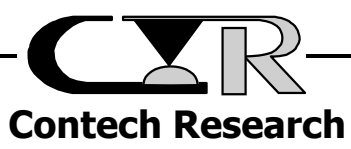
RESULTS:

1. In all cases, the mounting clips remained on the test die.
2. The following are the pre and post environment removal forces:



No.	Pre Shock		Post Shock		No.	Pre Vibration		Post Vibration	
	Large		Large			Large		Large	
	Newton's	Pounds	Newton's	Pounds		Newton's	Pounds	Newton's	Pounds
1	47.56	10.7	39.11	8.8	25	60.00	13.5	38.67	8.7
2	51.56	11.6	40.89	9.2	26	46.67	10.5	45.78	10.3
3	41.33	9.3	40.89	9.2	27	44.89	10.1	41.78	9.4
4	56.00	12.6	37.78	8.5	28	60.00	13.5	54.22	12.2
5	40.44	9.1	26.22	5.9	29	68.00	15.3	36.89	8.3
6	52.44	11.8	47.56	10.7	30	45.78	10.3	32.89	7.4
7	48.44	10.9	38.67	8.7	31	43.56	9.8	36.89	8.3
8	53.33	12	51.11	11.5	32	63.11	14.2	32.00	7.2
9	51.56	11.6	46.67	10.5	33	60.00	13.5	56.00	12.6
10	50.67	11.4	39.11	8.8	34	64.00	14.4	49.33	11.1
11	45.33	10.2	40.00	9	35	39.56	8.9	40.00	9
12	62.67	14.1	39.11	8.8	36	43.56	9.8	36.44	8.2
Avg	50.11	11.28	40.59	9.13	Avg	53.26	11.98	41.74	9.39
Std Dev	6.14	1.38	6.19	1.39	Std Dev	10.05	2.26	7.94	1.79

No.	Pre Shock		Post Shock		No.	Pre Vib		Post Vib	
	Small		Small			Small		Small	
	Newton's	Pounds	Newton's	Pounds		Newton's	Pounds	Newton's	Pounds
13	56.89	12.8	40.89	9.2	37	53.33	12	45.33	10.2
14	65.33	14.7	43.11	9.7	38	43.56	9.8	51.11	11.5
15	61.33	13.8	35.11	7.9	39	39.11	8.8	48.00	10.8
16	48.44	10.9	37.78	8.5	40	54.67	12.3	31.56	7.1
17	60.44	13.6	39.56	8.9	41	38.67	8.7	38.22	8.6
18	62.67	14.1	44.00	9.9	42	41.33	9.3	48.89	11
19	58.67	13.2	38.22	8.6	43	45.33	10.2	50.67	11.4
20	56.44	12.7	37.33	8.4	44	37.33	8.4	31.56	7.1
21	60.44	13.6	35.11	7.9	45	37.33	8.4	43.56	9.8
22	55.11	12.4	36.00	8.1	46	60.00	13.5	44.00	9.9
23	49.33	11.1	39.11	8.8	47	53.78	12.1	39.56	8.9
24	53.33	12	27.11	6.1	48	39.56	8.9	35.11	7.9
Avg	57.37	12.91	37.78	8.50	Avg	45.33	10.20	42.30	9.52
Std Dev	5.17	1.16	4.40	0.99	Std dev	7.98	1.80	7.03	1.58



PROJECT NO.: 204815 SPECIFICATION: EIA 540BAE

PART NO.: None PART DESCRIPTION: Heatsink

SAMPLE SIZE: 24 ea TECHNICIAN: Ggo

START DATE: 12-16-04 COMPLETE DATE: 1-5-05

ROOM AMBIENT: 21 °C RELATIVE HUMIDITY: 15

EQUIPMENT ID#: 1239

TEMPERATURE LIFE

HOT

PURPOSE:

To evaluate the mechanical stability of the mounting clip when exposed to a thermal environment.

PROCEDURE:

Test Condition:

Temperature : 85 °C ± 2 °C
Duration : 500 hours

REQUIREMENTS:

There shall be no evidence of physical damage or deterioration of the test samples so exposed.

RESULTS:

There was no evidence of visual or physical damage to the test samples as tested.



PROJECT NO.: 204815 SPECIFICATION: EIA 540BAE

PART NO.: None PART DESCRIPTION: Heatsink

SAMPLE SIZE: 24 ea TECHNICIAN: ggo

START DATE: 1-4-05 COMPLETE DATE: 1-4-05

ROOM AMBIENT: 21 °C RELATIVE HUMIDITY: 18

EQUIPMENT ID#: 988r, 991r, 5026, 5027, 281, 553, 1121

MECHANICAL SHOCK (SPECIFIED PULSE)

PURPOSE:

To determine the mechanical integrity of the heatsink attach
Subjected to shocks such as those expected from handling
transportation, etc. after thermal stress.

PROCEDURE:

Test Conditions:

'G' Level : 50 G's
Duration : 11 Milliseconds
Wave Form : ½ sine
No. of Shocks : 18

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test samples as tested.
2. All samples shall remain on the test fixture and the heatsinks still attached to the clip.

RESULTS:

1. There was no evidence of physical damage to the test samples as tested.
2. All test samples remained on the test fixture.



PROJECT NO.: 204815 SPECIFICATION: EIA 540BAE

PART NO.: None PART DESCRIPTION: Heatsink

SAMPLE SIZE: 24 ea TECHNICIAN: ggo

START DATE: 1-4-05 COMPLETE DATE: 1-4-05

ROOM AMBIENT: 21 °C RELATIVE HUMIDITY: 18 %

EQUIPMENT ID#: 988r, 991r, 5026, 5027, 281, 553, 1121

VIBRATION, RANDOM

PURPOSE:

To evaluate the integrity of the test samples relative to a severe mechanical environment after thermal stress.

PROCEDURE:

Test Conditions:

Power Spectral Density : 0.04g²/hz
G 'RMS' : 7.3
Frequency : 50-2000
Duration : 45 min/axis

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test samples as tested.
2. All samples shall remain on the test fixture and the heatsinks still attached to the clip.

RESULTS:

1. There was no evidence of physical damage to the test samples as tested.
2. All test samples remained on the test fixture.

