June 14, 2004

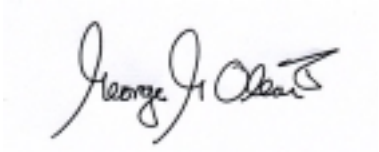
TEST REPORT # 204158 Rev 1.1

VIBRATION @ 125ºC
MECHANICAL SHOCK
THERMAL SHOCK

CGAT29-0008
(7 FIN 2.0″ Dia/.892″ HT)

CGAT29-0019
(5 Fin 2.0″ Dia/.678″ HT)

CALGREG



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

1478 - 01
ACCREDITED
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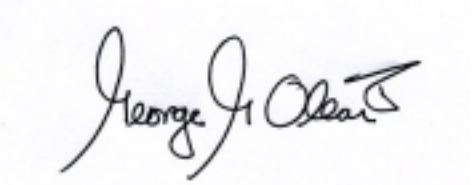
Contech Research

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 was 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.
5-5-04	Rev. 1.0	Initial Issue	ggo
6-14-04	Rev. 1.1	Add Thermal Shock	ggo

SCOPE

To perform vibration, mechanical shock and thermal shock testing on component coolers as manufactured and submitted by the test sponsor, Calgreg.

APPLICABLE DOCUMENTS

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.

Standards:

MIL-STD-810
EIA Publication 364

TEST SAMPLES AND PREPARATION

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

38 each CGAT29-0008 (2″Dia 7 Fin)
35 each CGAT29-0019 (2″Dia 5 Fin)

The test samples as submitted were certified by the manufacturer as being fabricated and assembled utilizing normal production techniques common for this type of product and inspected in accordance with the quality criteria as established for the product involved.

Simulated 29MM BGA Flip Chip package fixtures were fabricated to facilitate attachment of the test units. These fixtures were so designed as to accurately simulate the normal mounting means.

TEST SELECTION

The following test sequences were established for this program:

Group 1

Mechanical Shock
|
Vibration @ 125°C

Group 2

Thermal Shock

SAMPLE SIZE

The following number of test samples were tested:

Group 1

7 Fin – 25 w/interface, 5 wo/ interface
5 Fin – 25 w/interface, 5 wo/ interface

Group 2

7 Fin – 8 w/interface
5 Fin – 5 w/interface

DATA SUMMARY

TEST	REQUIREMENTS	RESULTS
MECHANICAL SHOCK		
CGAT29-0008 7 Fin	Remain Intact	PASS
CGAT29-0019 5 Fin	Remain Intact	PASS
VIBRATION		
CGAT29-0008 7 Fin	Remain Intact	PASS
CGAT29-0019 5 Fin	Remain Intact	PASS
THERMAL SHOCK		
CGAT29-0008 7 Fin	Remain Intact	PASS
CGAT29-0019 5 Fin	Remain Intact	PASS

EQUIPMENT LIST

ID#	Next Cal	Last Cal	Equipment Name	Manufacturer	Model #	Serial #	Accuracy	Freq.Cal
33			Vib. Power Amp	Ling Dynamics	MPA4	149	N/A	N/A
86			Shaker Table	MB Elect.	C10E	141	N/A	N/A
192			Vertical Thermal Shock	Cincinnati Sub-Zero	VTS-1-5-3	88-11094	See Cal Cert	Each Test
281			Vibration Power Amp	Ling Dynamics	DPA 10K	156	N/A	N/A
282			Vibration Shaker Table	Ling Dynamics	V-730	163	N/A	N/A
553	12/4/04	12/4/03	12 channel Power Unit	PCB Co.	483A	1303	See Cal Cert	12mon
847			D.C. Power Supply	Lambda	LK351FMV	C53885	See Manual	Each Test
988			Main frame	Agilent	35650	2608A003377	See Manual	N/A
990			8Chan input	Agilent	35655A	n/a	N/A	N/A
991			Sig Processor interface	Agilent	35651B	n/a	N/A	N/A
1271			Amplifier	Unholtz Dickie	SA15	3483	See Manual	N/A
1272			Shaker Table	Unholtz Dickie	S202PB	263	N/A	N/A
1302	9/17/04	3/17/04	Multiplexer Card	Keithley Co.	7708	0816774	See CERT	6mon
1348			Low&High Temp Oven	Curtin Matheson	Equitherm	108T-11	See Manual	Each Test
1360	8/19/04	2/19/04	Data Aquisition Multimeter	Keithley	2700	0914136	See Cal Cert	6mon
1366			Main Frame	Aiglent H.P.	8408A		N/A	N/A
1367			Interface	Aiglent H.P.	E8491A		N/A	N/A
1368	12/4/04	12/4/03	Sine/Rnd Control digitizer	Aiglent H.P.	E1432A	US35470169	See Manual	12months
1402	8/19/04	2/19/04	Multiplexer Card	Keithkry	7708	0977044	See Cal Cert	6mon

TEST RESULTS

Project #	204158	Specification:	N/A
Part #:	See Page 4	Part Description:	Heat Sink
Sample Size:	24	Technician:	ggo
Start Date:	5-3-04	Completion Date:	5-3-04
Room Ambient:	24 °C	Relative Humidity:	50 %
Equipment ID#:	33, 86, 281, 282, 553, 847, 988, 990, 991, 1271, 1272, 1348, 1366, 1367, 1368		

MECHANICAL SHOCK (SPECIFIED PULSE)

PURPOSE:

To determine the mechanical integrity of devices subjected to shocks such as those expected from handling, transportation, etc.

PROCEDURE:

1. Test Conditions:

Amplitude (g's)	50
Duration (milliseconds)	11
Waveform	Halfsine
No. of Shocks	18

2. Prior to testing, the samples were cycled 3 times.

REQUIREMENTS:

There shall be no evidence of physical damage or loss of attachment.

RESULTS:

There was no evidence of physical damage or loss of attachment.

Project #	204158	Specification:	N/A
Part #:	See Page 4	Part Description:	Heat Sink
Sample Size:	24	Technician:	ggo
Start Date:	5-3-04	Completion Date:	5-5-04
Room Ambient:	24 °C	Relative Humidity:	50 %
Equipment ID#:	33, 86, 281, 282, 553, 847, 988, 990, 991, 1271, 1272, 1348, 1366, 1367, 1368		

VIBRATION @ 125°C (RANDOM)

PURPOSE:

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

PROCEDURE:

Test Conditions:

Power Spectral Density	0.04 g^2/hz
G 'RMS'	7.3
Frequency	50-2000
Temperature	125°C
Duration	45 min/axis

2. Prior to testing, the samples were cycled 3 times.

REQUIREMENTS:

There shall be no evidence of physical damage or loss of attachment.

RESULTS:

There was no evidence of physical damage or loss of attachment.

PROJECT NO.: 204158	SPECIFICATION: EIA 364
PART NO.: see page 4	PART DESCRIPTION: heat sink
SAMPLE SIZE: 13	TECHNICIAN: RT
START DATE: 5-5-04	COMPLETE DATE: 5-14-04
ROOM AMBIENT: 25 °C	RELATIVE HUMIDITY: 30 %
EQUIPMENT ID#: 192, 1302, 1360, 1402	

THERMAL SHOCK

PURPOSE:

To determine the resistance of a given electrical connector to exposure at extremes of high and low temperatures and the shock of alternate exposures to these extremes, simulating the worst probable conditions of storage, transportation and application.

PROCEDURE:

Test Conditions:

Number of Cycles	:	400 Cycles
Hot Extreme	:	+100 +3°C/-0°C
Cold Extreme	:	-0 +0°C/-3°C
Time at Temperature	:	10 Minutes

REQUIREMENTS:

There shall be no evidence of physical damage or loss of attachment to the samples as tested.

RESULTS:

There was no evidence of physical damage or loss of attachement to the samples as tested.