PREPARED BY:	*Multiband Imaging Photometer for SIRTF*	NUMBER M12P90
C. DAVIDSON		TYPE PROCEDURE
APPROVALS	University of Arizona Steward Observatory, IR Group	
ENGINEERING		DATE 07/09/97
QUALITY	**SPECIFICATION**	SUPERSEDES SPEC. DATED
PI/DEPUTY PI		REV. NEW — PAGE 1 of 18

TITLE

WEDGE (WIRE) BONDING OF GE:GA FOCAL PLANE ARRAY ASSEMBLIES, PROCEDURE FOR

1.0 SCOPE

This specification defines the requirements and procedure for wire bonding of component parts of the MIPS Ge:Ga focal plane arrays (FPA) and for bond strength testing of the wire bonding interconnections. Specifically addressed are the wire-bonding of:

-the Detector Assembly (PIN MIPSD-070-1, -2, -3, -4),
-the 4x32 Module Frame Block (PIN MIPSD-085), and
-the 4x32 Module Assembly (PIN MIPSD-089).

This document provides applicable visual inspection criteria and bond strength pull testing acceptance criteria extracted from MIL-STD-883 and MIL-M-38510.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents. The following specification and standard form a part of this document to the extent specified herein. Unless otherwise specified, the issue of the documents shall be the most recent.

Military Specifications

MIL-M-38510J 15 November 1991	Microcircuits, General Specification For

Military Standards

MIL-STD-883D 15 November 1991	Test Methods and Procedures for Microelectronics

2.2 Non-Government Documents. The following documents form a part of this specification to the extent specified herein. In the event of conflict between this document and the manuals and engineering drawings called out, the requirements of the manuals and drawings shall take precedence.

M43P60	MIPS Electrostatic Discharge (ESD) Protection Procedures

Manuals

	University of Arizona Safety Manual
Part No. 94129-9001-000 November 1991	Model 4129 Wedge Bonder Operation and Maintenance Manual, Kulicke and Soffa Industries
Version 11 January 1992	BT22 Microtester Technical Manual, Dage Precision Industries, Incorporated

Drawings
University of Arizona, Steward Observatory, IR Group

MIPSD-070	Detector Assembly
MIPSD-085	4x32 Module Frame Block
MIPSD-089	4x32 Module Assembly

3.0 REQUIREMENTS

3.1 Equipment

Acceptable results are contingent upon the use the recommended equipment listed below or equivalent equipment. Equivalent equipment may be substituted for the recommended equipment if and only if effectiveness and accuracy are not decreased by its use. Written approval must be received from the MIPS Process Lead Engineer prior to use of equivalent equipment.

Item	Quantity	Description
1	1 each	Bonder, wedge, deep access, Kulicke and Soffa, Model 4129, equipped with tungsten carbide wedge
2	1 each	Microscope, inspection and measuring, 3-axes, Nikon
3	1 each	Blow gun
4	1 each	Tester, wire bond strength, BT22 Microtester, Dage Precision Industries, Incorporated

3.2 Materials

Item	Quantity	Description
1	1 each	Ceramic Multilayer Board Assembly, PIN MIPSD-030
2	1 each	Detector Assembly, MIPSD-070
3	1 each	4x32 Detector Block Assembly, MIPSD-080
4	1 each	4x32 Module Frame Block, MIPSD-085
5	1 each	4x32Module Assembly, MIPSD-089
6	as required	Nitrogen, gaseous (dry) or air (dry)
7	as required	Tweezers
8	as required	Wire, aluminum (1%Si), 99.99% purity, .001 inch diameter, 1-3% elongation, MWR Wire Industries
9	1 each	Fixture, brass PIN ?, with screws (to secure assemblies which comprise a 4x32 module frame PIN MIPSD-049 to the mounting chuck for wire bonding)
10	as required	Adhesive, mounting, (to secure CMLB assembly to mounting chuck for wire bonding)

3.3 General Procedural and Operational Requirements

Note: This specification presumes that all wire bonding will be performed using the Kulicke & Soffa Model 4129 deep access wedge bonder. The bonding schedule, wedge and platform identified herein for the various wire bond interconnections were established using this bonder and 1-mil diameter aluminum alloy (99% Al, 1% Si) wire. If an alternate wire bonder or wire other than the cited aluminum wire is to be used, the appropriate bonding machine parameters will need to be established per this document (with appendices A and B updated accordingly) prior to wire bonding of flight-like and flight hardware.

3.3.1 Wire bonding and bond strength testing are to be performed by an experienced operator familiar with the safety precautions and operation of the equipment as described in the Model 4129 Wedge Bonder Operation and Maintenance Manual, and the BT22 Microtester Technical Manual, respectively. These manuals are to be retained at the appropriate workstations for ready access by the operator.

3.3.2 Cleanroom gloves or finger cots are to worn when handling hardware (reference paragraph 3.3.3 for electrostatic discharge sensitive hardware) and equipment.

3.3.3 **Caution:** The CRC 696 readouts are susceptible to damage by electrostatic discharge (ESD).

ESD precautionary procedures as defined in the MIPS Electrostatic Discharge (ESD) Protection Procedure are to be followed when handling readouts and assemblies which comprise the readouts. As a minimum, personnel shall wear a verified-operable ground strap and ESD protective gloves.

3.3.4 The operation of the wire bonder is to be verified by the Quality Assurance Representative on a regular schedule. The operator shall ensure that the wire bonder operation has been verified prior to wire bonding of flight-like or flight hardware.

For verification of the operation of the equipment, rejected parts of the same configuration (and, where possible, from the same lot as the flight or flight-like parts intended to be bonded) are to be wire bonded using identical bonding machine parameters and in the same manner as flight hardware. The results of visual examination and destructive pull testing of the wire bonds are to be used to verify acceptable operation of the bonder.

Note: Parts which were rejected due to contaminated bond pads or to lifting, peeling or missing bond pad metalization are not to be used for verification of the wire bonder operation.

3.3.5 Pull testing of the wire bonds shall be done in accordance with Condition D of MIL-STD-883 Method 2011.7 for double bond wire. The pull is to be applied by inserting a hook under the lead wire with the device clamped and the pulling force applied approximately in the center of the wire in a direction approximately 90° to the die or substrate. The hook is to be in a fixed position that restricts motion along a straight line between each bond, so that it will not rise to the highest point and potentially result in a test of only one of the two bonds under test.

A hard copy printout of the pull testing results is to be attached to the manufacturing traveler.

3.3.6 Rebonding and element replacement may be done in accordance with MIL-M-38510J paragraph 3.7.1.1 and paragraph 3.7.1.2. Salient features of the cited paragraphs are recorded below for convenience.

a. No rebond is to lie along side or be partially on top of another bond, bond wire tail or residual segment of wire when the overlap width is greater than 25%.

b. One scratched, open or discontinuous substrate metalization path or conductor pattern may be repaired by addition of a minimum of two bonding wires.

c. No rebonds shall be made over intended bonding areas in which the top layer metalization has lifted, peeled, or has been damaged such that the underlying metalization or substrate is exposed.

d. The total number of rebond attempts (exclusive of total element replacement) shall be limited to 10% of the total number of bonds in the microcircuit. A bond shall be defined as a wire to post or wire to pad bond (i.e., for a 28 lead wire bonded package there are 56 bonds). Bond-offs required to clear the bonder after an unsuccessful first bond attempt need not be considered as rebond attempts, provided the bond-offs are readily identifiable. A replacement of one wire bonded at one end or an unsuccessful bond attempt at one end of the wire counts as one rebond attempt. A replacement of a wire bond at both ends, or an unsuccessful bond attempt of a wire already bonded at the other end counts as two rebond attempts.

e. Compound bonds (where a compound bond is defined as one bond on top of another) shall not be allowed.

f. The total number of times a multi-chip microcircuit may be subjected to interconnection bonding or element placement is limited to three cycles (i.e., after the completion of the first bonding or element replacement cycle, the microcircuits cannot be exposed to these conditions more than two additional times). Rebonding to a substrate pad when performed to effect element replacement shall not be counted against the rebond limitation of 3.3.6d.

g. Regardless of the number of allowable rebonds or element replacements in the microcircuit, the rework shall be accomplished in no more than two recycles of any single micro-circuit.

4.0 PROCEDURE

4.1 Verification of Wire Bonder Operation/Bond Parameter Settings.

4.1.1 Perform the basic setup operation for wire bonding per the deep access wedge bonder operations manual. Use the wedge and adjust the bonding machine settings in accordance with the table in Appendix A appropriate for the particular parts to be wedge bonded.

4.1.2 Referencing paragraph 3.3.4, select and mount the test parts onto the brass fixture or adhesive tape, as appropriate. Position the mounted parts onto the mounting chuck. Secure the brass fixture to the chuck by inserting screws into holes in the brass fixture and tightening the each screw finger tight.

4.1.3 Position the mounted parts onto the platform identified in the applicable table of Appendix A, and make a minimum of 10 wire bonding interconnections. The direction of the wire bonding (that is, first bond to second bond) is to be per the applicable table.

4.1.4 Examine the wire bonds under 30X to 60X magnification to the inspection acceptance criteria of appendix B.

If at visual inspection the wire bonds fail to meet acceptance criteria, notify the lead engineer. No flight or flight-like parts are to be bonded until the cause for failure of the wire bonding is identified and corrective action is demonstrated effective.

If the wire bonds are visually acceptable, proceed to paragraph 4.1.5.

4.1.5 Following the operational instructions provided in the Dage BT22 Microtester Technical Manual, perform destructive pull testing on each of the wire bonds. A minimum pull force for an acceptable wire bond of 1-mil diameter Al wire shall be 4.0 grams-force (gf).

Note 1. The minimum 4.0 gf requirement exceeds the 2.5 gf specified in MIL-STD 883D, Method 2011.7, Table I for acceptance. The intent in imposing the more rigid requirement for acceptance is to ensure acceptable results of non-destructive pull testing (2.0 gf per MIL-Std-883) of bonds made on flight and flight-like hardware using the same interconnect wire and bonding conditions and settings.

Note 2: Any destructive bond pull, which results in separation under an applied stress less than the specified minimum, shall constitute a failure. When a failure occurs, the stress causing the failure, the type of the failure and, as applicable, the component part (fanout, readout, CMLB flex cable etc.) on which the failure occurred are to be recorded on the appropriate manufacturing traveler. Typical failures and codes to be used to simplify recording of the failures are:

Code	Failure
A	Wire break
B	Failure in the bond at the interface between the wire and the metalization on the component part on which the bond was made
C	Lifted metalization
D	Fracture of the component part on which the bond was made

4.1.6 If the wire bond pull testing results are acceptable, record this result on the manufacturing traveler and proceed to wire bond the flight or flight-like parts.

If necessary, rebonding may be done in accordance with paragraph 3.3.6. Inspect and pull test the rebond wires per paragraphs 4.1.4 through 4.1.5. If the reworked wire bonds are acceptable, record this result on the traveler and attach to the traveler the printout of the test results, and proceed to wire bond the flight or flight-like parts.

If the wire bond(s) fail the pull testing, record on the traveler the identification of the pads on which the bond failed, the force at which the failure occurred, and the category of the failure (reference Appendix B). Notify the Lead Engineer of the pull test results.

Note: No wire bonding of flight or flight-like parts is to be done until the cause of the wire bond failure is identified and implemented corrective action is demonstrated effective, that is, it results in acceptable wire bonds at visual inspection and pull testing. Acceptable pull test results coupled with acceptable visual inspection of the wire bonds are sufficient to verify proper operation of the wire bonder.

4.1.7 Record on the traveler the information requested regarding the verification of the operation of the wire bonder. Document bonding machine parameters used to verify proper operation of the wire bonder, if these differ from the ones identified in the appropriate table of Appendix A.

4.2 Wire Bond the Flight or Flight-like Parts.

4.2.1 Using the bonding machine parameters verified in paragraph 4.1, wire bond the flight or flight-like parts. Reference the appropriate engineering drawing to determine which pads are to be wire bonded one to another. Be certain the pad-to-pad (first bond to second bond) direction in which the wire bond is made is in accordance with the appropriate table

in Appendix A. Record on the applicable manufacturing traveler bonding parameters used which are different than those shown in the table for the particular types of part bonded on the specified subassembly or assembly.

4.2.2. Visually Examine Wire Bonds. Under 30X to 60X microscope magnification, visually examine the wire bonds to the acceptance criteria of appendix A and to the applicable engineering drawing to verify that the pad-to-pad wire bond interconnects are per the drawing.

If visual examination shows the wire bonds to be acceptable, record this on the manufacturing traveler and submit the bonded device to wire bond pull testing.

If wire bonds fail visual inspection, document on the manufacturing traveler the total number of wire bonds that fail visual inspection and identify the pads on which the wire bonds failed and the primary acceptance criteria which the bonds failed.

4.2.3 As necessary, rebond within the limitations and requirements of paragraph 3.3.6. Document on the traveler the pads on which rebond was performed, then repeat the paragraphs 4.2 2 to 4.2.3.

If rebonds fail the inspection criteria for acceptance defined in appendix B, record this result on the traveler. Place the parts into a storage/transport container. Label the container as to its content, record the work 'reject' on the label of the container's cover, and store the container in the proper area of the N_2-purged desiccator. Advise the lead engineer of the status of the parts.

If visual examination shows the rebonds to be acceptable, record this fact on the manufacturing traveler and submit the bonded device to wire bond pull testing.

4.3 Non-Destructively Pull Test Wire Bonds.

Using the Dage BT22 Microtester, perform 100% non-destructive pull testing of the wire bonds to 2 ± 0.3 grams-force.

Note: Any non-destructive bond pull which results in separation (of bonds at the bond interface or breakage of the wire or interconnect anywhere along the entire span including bond heels) at an applied stress less than the specified stress shall constitute a failure.

If the results of the pull testing are acceptable, visually inspect the parts to be certain the parts were not scratched, chipped or otherwise damage during the wire bonding or the subsequent pull testing. Record the inspection results on the traveler. Store the container of parts in the appropriate area of the N_2-purged desiccator, keeping reject parts separated from those which are acceptable for next level assembly.

Record on the traveler the total number of bond wires which fail non-destructive pull testing. Also identify the specific pads on which failure occurred. As appropriate, rebond may be performed within the limitations and requirements of paragraph 3.3.6.

If rebond is done, perform wire bond inspection and pull testing followed by final visual examination of the parts per paragraphs the rebond wires per paragraphs 4.2.2 though 4.3.1. Record the inspection and pull test results on the traveler. Attach to the traveler the hard copy printout of the pull test results. Place the bonded parts in properly labeled

storage/transport containers and store the containers appropriately within the storage desiccator.

Date and sign the manufacturing traveler to signify completion of the wire bonding operation.

APPENDIX A

Wedge Bonder Parameter Settings, Fixtures and Bonding Requirements

Specified in appendix A are the wedge bonder parameter settings, the wedge, and the platform to be used to ultrasonically wedge bond component parts on subassemblies of, and on the MIPS 4x32 module assembly. Also specified for each bonding operation is the component part on which the first bond is to be made and the component part on which the second bond is to be made.

The bonding parameter settings and fixtures identified in the following tables are for a K & S Deep Access Wedge Bonder, Model 4129, used with .001inch (1 mil) diameter aluminum alloy (99% Al, 1%Si) wire.

Table A-1 applies to wire bonding of each of the four Detector Assembly configurations PIN MIPSD-070-1, -2, -3 and -4. Tables A-2a and A-2b apply to the bonding of component parts comprising the 4x32 Module Frame Block (a.k.a., the Backend) PIN MIPSD-085. Tables A-3a through A-3d define bonding machine parameters and requirements for wire bonding the 4x32 Module Assembly PIN MIPSD-089.

Table A-1. Wedge Bonder Settings and Requirements for Bonding Detector Assembly PIN MIPSD-070 – bonding of the detector back surface to the detector bias fanout pads and of the resistor (temperature sensor) to fanout pads.

<table>
<tr><td colspan="5">BONDER FRONT PANEL SETTINGS</td></tr>
<tr><td>REVERSE</td><td>TAIL</td><td>TEAR</td><td>STEP BACK</td><td>LOOP</td></tr>
<tr><td>2.5</td><td>6</td><td>4</td><td>2</td><td>6</td></tr>
<tr><td></td><td>SEARCH</td><td>FORCE</td><td>TIME</td><td>POWER</td></tr>
<tr><td>FIRST BOND</td><td>3.9</td><td>1</td><td>4</td><td>2</td></tr>
<tr><td>SECOND BOND</td><td>2.7</td><td>2</td><td>5</td><td>2.90</td></tr>
<tr><td colspan="5">REQUIREMENTS</td></tr>
<tr><td colspan="2">PLATFORM: 000</td><td colspan="3">BONDING WEDGE: VA-HW-2025-0.75-CG</td></tr>
<tr><td colspan="5">BONDING SEQUENCE:</td></tr>
<tr><td>COMPONENT PARTS</td><td colspan="2">FIRST BOND</td><td colspan="2">SECOND BOND</td></tr>
<tr><td>Detector, Fanout</td><td colspan="2">Detector</td><td colspan="2">Fanout</td></tr>
<tr><td>Resistor, Fanout</td><td colspan="2">Resistor</td><td colspan="2">Fanout</td></tr>
</table>

Note: The bonding interconnections are to be in accordance with MIPS Drawing MIPSD-070.

Tables A-2a and A-2b apply to the interconnect bonding of component parts which comprise the 4x32 Module Frame Block PIN MIPSD-085. Table A-2a pertains to the wire bonding of the flex cable to the CMLB and to the internal wire bonding of the CMLB to connect the capacitors to the bias lines. Table A2-b addresses the bonding of the CMLB to the readouts.

The bonding of the flex cable to the CMLB is to be performed first. Bonding of the CMLB to connect the capacitors to their respective bias lines is to be performed next. Bonding of the CMLB to the readouts is to be the final set of bonding of the 4x32 Module Frame Block. All bonding is to be in accordance with the Drawing MIPSD-085.

Table A-2a. Wedge Bonder Settings and Requirements for Bonding the 4x32 Block Assembly PIN MIPSD-085 – bonding of the flex cable to the CMLB and bonding for connection of capacitors to bias lines.

BONDER FRONT PANEL SETTINGS				
REVERSE	TAIL	TEAR	STEP BACK	LOOP
3.1	5	4	4	8
	SEARCH	FORCE	TIME	POWER
FIRST BOND	2.17	3.0	5.0	2.83
SECOND BOND	2.87	3.1	5.0	2.40

REQUIREMENTS		
PLATFORM: 1842	BONDING WEDGE: VA-HW-2025-0.75-CG	
BONDING SEQUENCE:		
COMPONENT PARTS	FIRST BOND	SECOND BOND
Flex Cable, CMLB	Flex Cable Pad	CMLB Pad
CMLB (for cap. to bias line)	Upper Most Layer	Next Lower Layer

Table A-2b. Wedge Bonder Settings and Requirements for Bonding the 4x32 Block Assembly PIN MIPSD-085 – bonding of the CMLB to readout output pads.

BONDER FRONT PANEL SETTINGS				
REVERSE	TAIL	TEAR	STEP BACK	LOOP
4	5	4	4	8
	SEARCH	FORCE	TIME	POWER
FIRST BOND	1.6	3	5	2.4
SECOND BOND	4.08	3.2	5	2^{+}

REQUIREMENTS		
PLATFORM: 1829 ±	BONDING WEDGE: VA-HW-2025-0.75-CG	
BONDING SEQUENCE:		
COMPONENT PARTS	FIRST BOND	SECOND BOND
CMLB, Readouts	CMLB	Readout

Tables A-3a through A-3d define the bonding settings and requirements for wire bonding the 4x32 Module Assembly PIN MIPSD-089. Wire bonding shall be to drawing MIPSD-089. Wire bonding inspection of the wire bonds to the criteria in Appendix B, and wire bond pull testing per document MWI1020 shall be conducted in the following sequence:

1. Make all wire bonds for the 4x32 Module Assembly which are identified in drawing MIPSD-089 to interconnect detector layer one (1) of the Detector Block Assembly (a.k.a., the front end) component of the Module Assembly to the CMLB and to the readout die on the Module Frame Block (a.k.a., the back end) component of the Module Assembly. Note: The actual wire bonds that are to be made will connect metal pads on the fanout to which the detector is connected to metals pads on the readout die and on the CMLB. Bonding is to start with the interconnection of the most external pad on either end of the fanout to the CMLB, and is to proceed sequentially across the row of fanout pads associated with detector layer 1, ending with the most external pad on the opposite end of the fanout.

2. Per Appendix B, visually Inspect the detector layer 1 wire bonds.

3. Pull test the detector layer 1 wire bonds.

4. Repeat 1-3 for detector layer 2, then for detector layer 3, and, finally, for detector layer 4.

Table A-3a. Wedge Bonder Settings and Requirements for Bonding Detector Layer 1 of the 4x32 Module Assembly PIN MIPSD-089 – wire bonding detector heater and detector bias fanout traces to the CMLB; and wire bonding detector fanout pads to readout input pads.

<table>
<tr><td colspan="5">BONDER FRONT PANEL SETTINGS</td></tr>
<tr><td>REVERSE</td><td>TAIL</td><td>TEAR</td><td>STEP BACK</td><td>LOOP</td></tr>
<tr><td>2</td><td>5</td><td>4</td><td>±6</td><td>9</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td></td><td>SEARCH</td><td>FORCE</td><td>TIME</td><td>POWER</td></tr>
<tr><td>FIRST BOND</td><td>1.56</td><td>1.0</td><td>5.0</td><td>2.6±.03</td></tr>
<tr><td>SECOND BOND</td><td>5.56</td><td>2.0</td><td>5.0</td><td>2.64</td></tr>
<tr><td colspan="5">REQUIREMENTS</td></tr>
<tr><td>PLATFORM: 1598-1600</td><td colspan="4">BONDING WEDGE: VA-HW-2025-0.75-CG</td></tr>
<tr><td colspan="5">BONDING SEQUENCE:</td></tr>
<tr><td colspan="2">COMPONENT PARTS</td><td>FIRST BOND</td><td colspan="2">SECOND BOND</td></tr>
<tr><td colspan="2">Fanout, CMLB</td><td>Fanout</td><td colspan="2">CMLB</td></tr>
<tr><td colspan="2">Fanout, Readout</td><td>Fanout</td><td colspan="2">Readout</td></tr>
</table>

Table A-3b. Wedge Bonder Settings and Requirements for Bonding Detector Layer 2 of the 4x32 Module Assembly PIN MIPSD-089 – wire bonding detector heater and detector bias fanout traces to the CMLB; and wire bonding detector fanout pads to readout input pads.

BONDER FRONT PANEL SETTINGS				
REVERSE	TAIL	TEAR	STEP BACK	LOOP
2	5	4	CMLB 8.0 Readout 6.7	9

	SEARCH	FORCE	TIME	POWER
FIRST BOND	4.2	1.0	5.0	2.6±.03
SECOND BOND	8.54	2.0	5.0	2.64

REQUIREMENTS	
PLATFORM: 1598	BONDING WEDGE: VA-HW-2025-0.75-CG
BONDING SEQUENCE:	

COMPONENT PARTS	FIRST BOND	SECOND BOND
Fanout, CMLB	Fanout	CMLB
Fanout, Readout	Fanout	Readout

Table A-3c. Wedge Bonder Settings and Requirements for Bonding Detector Layer 3 of the 4x32 Module Assembly PIN MIPSD-089 – wire bonding detector heater and detector bias fanout traces to the CMLB; and wire bonding detector fanout pads to readout input pads.

BONDER FRONT PANEL SETTINGS				
REVERSE	TAIL	TEAR	STEP BACK	LOOP
2	5	4	CMLB 8 - 8.5 Readout 7-7.5	9

	SEARCH	FORCE	TIME	POWER
FIRST BOND	7.17	1.0	5.0	2.6±.03
SECOND BOND	5.39	2.0	5.0	2.54

REQUIREMENTS	
PLATFORM: 1600	BONDING WEDGE: VA-HW-2025-0.75-CG
BONDING SEQUENCE:	

COMPONENT PARTS	FIRST BOND	SECOND BOND
Fanout, CMLB	Fanout	CMLB
Fanout, Readout	Fanout	Readout

Table A-3d. Wedge Bonder Settings and Requirements for Bonding Detector Layer 4 of the 4x32 Module Assembly PIN MIPSD-089 – wire bonding detector heater and detector bias fanout traces to the CMLB; and wire bonding detector fanout pads to readout input pads.

BONDER FRONT PANEL SETTINGS				
REVERSE	TAIL	TEAR	STEP BACK	LOOP
2.5	5	4	CMLB 9.0 Readout 8.0	8.2

	SEARCH	FORCE	TIME	POWER
FIRST BOND	5.7	1.0	5.0	2.6±.03
SECOND BOND	4.2	2.0	5.0	2.54

REQUIREMENTS	
PLATFORM: 1804	BONDING WEDGE: VA-HW-2025-0.75-CG

BONDING SEQUENCE:		
COMPONENT PARTS	FIRST BOND	SECOND BOND
Fanout, CMLB	Fanout	CMLB
Fanout, Readout	Fanout	Readout

APPENDIX B

Wedge Bond Inspection and Criteria for Acceptance

This appendix contains selected visual inspection acceptance criteria for wedge bonds extracted from MIL-STD-883D, Method 2010.10 (Class B) and is provided as a convenience to the operator. The operator should be familiar with, and periodically directly review the MIL-STD-883 acceptance criteria.

1.0 Lower Power (20X-60X) Wire Bond Inspection. This inspection and criteria shall be required for wedge bonds and locations to which they are applicable when viewed from above (see figure B-1).

Note: The criteria applicable for bonds (called “wedge bonds” or “bonds” in this test method refers to the fully or partially deformed area including the tool impression shown as “L” and “W” in figure B-1. The criteria applicable for “bond tails” or “tails” in this test method refers to resulting length of bonding wire extending beyond the bond show as “T” in figure B-1. Tail is not part of bond.

Figure B-1. Bond Dimensions

1.1 As viewed from above, no device shall be acceptable that exhibits:

a. Ultrasonic wedge bonds on the die that are less than 1.2 times or more than 3.0 times the wire diameter in width or less than 1.5 times or more than 6.0 times the wire diameter in length.
-For 1.0 mil diameter wire, the acceptable range of wedge width is 1.2 to 3 mils, and the acceptable range of wedge length is 1.5 to 6.0mils.

b. Wedge bonds where the tool impression does not cover the entire width of the wire.

c. Bonds on the die where less than 50 percent of the bond is within the unglassivated bonding pad area.

d. Bond tails that do not exhibit a line of separation between the tail and unglassivated metalization, another wire, wire bond or wire bond tail, excluding common conductors and pads.

e. Bond tails extending over glassivated metalization where the glass exhibits evidence of crazing or cracking that extends under the tail, excluding common conductors.

f. Wire bond tails that exceed 2 wire diameters in length on the die.
-For 1.0 mil diameter wire, the tail shall not exceed 2 mils in length.

g. Bonds (excluding bond tails) placed so that the horizontal distance between the bond and glassivated or unglassivated non-common metalization, scribe lines, another bonding wire or bond does not exhibit a visible line of separation.

Note: When by design, there are multiple bonds on a common bonding pad, they may not reduce the width of an adjacent bond by more than 25 percent.

h. Bonds (excluding tails) placed such that less than 2.0 mils of bond periphery (on glassivated or unglassivated areas) are exposed to an undisturbed die metalization connecting path to/from the entering/exiting metalization stripe (reference figure B-2).

Note 1: When bond tails prevent visibility of the connecting path and the metalization immediately adjacent to the bond tail is disturbed, the device shall be unacceptable.

Note 2: When a fillet area exists, it is to be considered as part of the entering/existing metalization stripe.

Note 3: This criterion is in addition to the bond placement criteria in 1.1c.

i. Bonds where more than 25 percent of the bond is located on die mounting material.

J. Bonds on foreign material.

Note: Examples of reject and acceptable bonds for the some of the criteria of 1.1 are illustrated in Figure B-2. The examples are more directly applicable to bonds on readout devices.

1.2 Internal Wires. When the requirements of this paragraph are not easily determined vertically, the device may be tilted about the x and y-axes to allow an alternate view of the wires such that the vertical separation can be verified. No device shall be acceptable that exhibits:

a. Any wire with a separation of less than one wire diameter to unglassivated operating metal, other bonds, another wire (common wires excluded), or unglassivated die area (except for wire or pads which are at the die or substrate potential).

Note: Within a 10.0mil radial distance from the perimeter of the bond on the die, a line of separation must be visible.

b. Nicks, bends, crimps, scoring or neckdown in any wire that reduces the wire diameter by more than 25 percent.

c. Tearing at the junction of the wire and bond.

d. Wire(s) not in accordance with the bonding diagram.

Figure B-2. Bonds at Entering/Exiting metalization Stripe
-taken from MIL-STD-883D, Method 2010.10, 27 July 1990