Generic RH Dice Spec Document

1.0 SCOPE

This specification documents the detailed requirements for an internally defined equivalent flow per MIL-PRF-38535 Level V except as modified herein.

This document will apply to all space grade RH products found in Table I herein.

This document is replacing all Legacy LTC Spec # documents listed within Table I herein.

2.0 Applicable Documents:

2.1. Government Specifications and Standards: the following documents listed in the Department of Defense Index of Specifications and Standards, of the issue in effect on the date of solicitation, form a part of this specification to the extent specified herein.

Specifications:

MIL-PRF-38535	General Specifications for Integrated Circuits (Microcircuits) Manufacturing
MIL-STD-883	Test Method for Standard Microcircuits
MIL-STD-1835	Electronic Component Case Outlines

3.0 Requirements

3.1. General Description: This specification details the requirements for the RH products listed in Table I processed to space level V manufacturing flow.

3.2. Product Name:

TABLE I – RH PRODUCTS

Generic	Product Name	Legacy LTC Spec #
RH1085	RH1085MKDICE	05-08-5140
RH1086M	RH1086BHKDICE	05-08-5134
	RH1086BKDICE	05-08-5134
	RH1086KDICE#7 AB-1	05-08-5134
RH117	RH117HDICE	05-08-5116
	RH117KDICE	05-08-5116
RH1185	RH1185AMKDICE	05-08-5232
RH137	RH137HDICE	05-08-5113

Generic	Product Name	Legacy LTC Spec #
RH137	RH137KDICE	05-08-5113
RH1573K	RH1573KDICE	05-08-5223
RH1965	RH1965MKDICE	05-08-5246
RH3080MK	RH3080MKDICE	05-08-5246
RH3083	RH3083MILDICE	05-08-5744
	RH3083MKDICE	05-08-5744
RH3845MK	RH3845MKDICE	05-08-5742
RH1011	RH1011DICE	05-08-5149

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Generic	Product Name	Legacy LTC Spec #
RH1016M	RH1016DICE	05-08-5149
RH119	RH119DICE	05-08-5145
RH1013M	RH1013DICE	05-08-5112
RH101A	RH101ADICE	05-08-5154
RH1028M	RH1028MDICE	05-08-5238
RH1056A	RH1056ADICE	05-08-5212
RH1078M	RH1078MDICE	05-08-5209
RH108A	RH108ADICE	05-08-5111
RH1128M	RH1128MDICE	05-08-5238

Generic	Product Name	Legacy LTC Spec #
RH6200M	RH6200MDICE	05-08-5250
RH1009	RH1009DICE	05-08-5115
RH1021-10	RH1021C-10DICE	05-08-5118
RH1021-5	RH1021C-5DICE	05-08-5117
RH1084	RH1084MKDICE	05-08-5227
RH1498M	RH1498DICE	05-08-5208
RH1814M	RH1814DICE	05-08-5220
RH27C	RH27CDICE	05-08-5114

3.3. Special Handling of Dice: Rad Hard dice require special handling as compared to standard IC dice. Rad Hard Dice are susceptible to surface damage due to the absence of silicon nitride passivation that is present on most standard dice. Silicon nitride protects the dice surface from scratches by its hard and dense properties. The passivation on Analog Devices Rad Hard dice is silicon dioxide which is much “softer” than silicon nitride, During the visual and preparation for shipment, ESD safe tweezers are used and only the edges of the die are touched.

Analog Devices recommends that dice handling be performed with extreme care so as to protect the die surface from scratches. If the need arises to move the die in or out of the chip shipment tray (waffle pack). Use an ESD safe plastic tipped bent metal vacuum prove, preferably .020” OD x .010” ID (for use with tiny parts). The wand should be compatible with continuous air vacuums. The tip material should be static dissipative Delrin (or equivalent) plastic.

During the die attach, care must be exercised to ensure no tweezers, or other equipment, touch the top of the dice.

3.4. Electrical Test Requirements: Screening requirements shall be in accordance with 4.3 herein and as specified in Table II herein.

3.5. Radiation Hardness Assurance (RHA):

3.5.1 The manufacturer shall perform a wafer/ wafer-lot Total Ionizing Dose (TID) qualification. The qualification test is performed with MIL-STD-883 TM1019 Condition A as a guideline.

3.5.2 For guaranteed radiation performance to MIL-STD-883, Method 1019, total dose irradiation, the manufacturer will provide certified RAD testing with a report when required as a customer purchase line item.

3.6. Wafer (or Dice) Probe: Dice shall be 100% probed at Ta = +25˚C to the limits shown within their appropriate datasheet. All reject dice shall be removed from the lot. This testing is normally performed prior to dicing the wafer into chips. Final specification after assembly are sample tested during the element evaluation.

3.7. Wafer Lot Acceptance Report: SEM is performed per MIL-STD-883, Method 2018 and copies of SEM photographs shall be supplied with the Wafer Lot Acceptance Report as part of a Space Data Pack when specified as a customer purchase order line item.

3.8. Traceability: Wafer Diffusion Lot and Wafer traceability shall be maintained through Quality Conformance Inspection.

4.0 Verification (Quality Assurance Provisions)

4.1. Quality Assurance Provisions: Quality Assurance Provisions shall be in accordance with MIL-PRF-38535. Analog Devices Gen. Trias, Cavite, and Philippines are QML certified, and all Rad Hard candidates are assembled on qualified Class Level S manufacturing lines.

4.2. Sampling and Inspection: Sampling and Inspection shall be in accordance with MIL-STD-883, Test Method 5005 with QML allowed and TRB approved deviations in conjunction with sections 3.1, 3.1.1, and 3.4 of the Test Method 5005.

4.3. Screening: Screening requirements shall be in accordance with MIL-STD-883, Test Method 5004 with QML allowed and TRB approved deviations in conjunction with sections 3.1, 3.1.1, and 3.4 of the Test Method 5004. Electrical testing shall be as specified in Table II herein.

4.3.1 Analysis of catastrophic (open/short) failures from burn-in will be conducted only when a lot fails the burn-in or re-burn in PDA requirements.

TABLE II – ELECTRICAL TEST REQUIREMENTS

Test Requirements	Subgroups (in accordance with MIL-PRF-38535, Table III)
Interim Electrical Parameters	1, 4
Final Electrical Parameters	1, 4
Group A Test Requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters	1, 4
Group E end-point electrical parameters	1, 4

TABLE II Note:
1/ PDA applies to subgroup 1

4.4. Quality Conformance Inspection: Quality Conformance Inspection shall be in accordance with section 4.2 herein and as follows:

4.4.1 Group A Inspection: Group A Inspection shall be performed in accordance with 4.1 herein, per MIL-STD-883, Method 5005, and specified in Table II herein.

4.4.2 Group B Inspection: Group B subgroups 1, 4, and 6 are performed within Group D. Group B subgroup 5 is performed within Group C. Group B subgroups 2 and 3 are being performed per MIL-PRF-38535.

4.4.3 Group C Inspection: Group C is performed per MIL-PRF-38535, Table IV with attributes and variables.

4.4.4 Group E Inspection is performed per MIL-STD-883 TM 1019. Electrical characteristics are outlined in each respective product datasheet. Group E will be performed on a wafer-lot level.

4.5. Sample Element Evaluation: A sample from each wafer supplying dice shall be assembled and subjected to element evaluation per Table III herein.

4.5.1 100 Percent Visual Inspection: All dice supplied to this specification shall be inspected in accordance with MIL-STD-883, Method 2010, Condition A. All reject dice shall be removed from the lot.

4.5.2 Electrical Performance Characteristics for Element Evaluation: The electrical performance characteristics shall be as specified in the respective part datasheet.

4.5.3 Sample Testing: Each wafer supplying dice for delivery to this specification shall be subjected to element evaluation sample testing. No dice shall be delivered until all the lot sample testing has been performed and the results found to be acceptable unless the customer supplies a written approval for shipment prior to completion of wafer qualifications as specified in this specification.

Table III: RH Element Evaluation Table Qualification of Dice Sales

SUBGROUP	CLASS K/S	CLASS V	CLASS H/B	OPERATION	MIL-STD-883 METHOD	MIL-STD-883 CONDITION	QUANTITY (ACCEPT NUMBER)
1	X	X		SEM	2018	N/A	REF. METHOD 2018 FOR S/S
2	X	X	X	ELEMENT ELECTRICAL (WAFER SORT @ 25ºC)			100%
3	X	X	X	ELEMENT VISUAL (2nd OP)	2010	A	100%
4	X	X	X	INTERNAL VISUAL (3rd OP)	2010	A	ASSEMBLED PARTS ONLY
	X	X		DIE SHEAR MONITOR	2019		
	X	X		BOND PULL MONITOR	2011		
5	X	X		STABILIZATION BAKE	1008	C	ASSEMBLED PARTS ONLY
	X	X		TEMPERATURE CYCLE	1010	C	
	X	X		CONSTANT ACCELERATION	2001	E	
	X	X		FINE LEAK	1014	A	
	X	X		GROSS LEAK	1014	C	
6	X	X		FIRST ROOM ELECTRICAL - READ & RECORD (REPLACE ANY ASSEMBLY-RELATED REJECTS)			45(0)
	X	X		PRE BURN-IN ELECT. READ & RECORD @ +125ºC or +150ºC, -55ºC			
	X	X		BURN-IN: +125ºC/240 hrs. or +150ºC/120 hrs.	1015	+ 125ºc MINIMUM 240 HOURS	
	X	X		POST BURN-IN ELECT. READ & RECORD @ 25ºC			
	X	X		POST BURN-IN ELECT. READ & RECORD @ +125ºC or +150ºC, -55ºC			
		X		TOTAL IRRADIATION DOSE	1019	A	
	X	X		PRE OP-LIFE ELECTRICAL @ 25ºC READ & RECORD			
	X	X		OPERATING LIFE: +125ºC/1000 hrs. or +150ºC/500 hrs.	1005	+ 125ºc MINIMUM 1000 HOURS	
	X	X		POST OP-LIFE ELECT. (R & R @ 25ºC, +125ºC OR +150ºC, -55ºC			
7	X	X	X	WIRE BOND EVALUATION	2011		15(0) OR 25(1) - # of wires

NOTE: LTC is not qualified to process to MIL-PRF-38534. This is an LTC imposed element evaluation that follows MIL-STD-883 test methods and conditions. Please note the quantity and accept number from Sample Size Series of 5%, accept on 0, and note that the actual sample and accept number does not begin until Subgroup 6 OP-LIFE.

NOTE: Tests within Subgroup 5 may be performed in any sequence.

NOTE: LTC's radiation tolerance (RH) die has a topside glassivation thickness of 4KA minimum.

NOTE: Sample sizes on the travelers may be larger than that indicated in the above table; however, the larger sample size is to accommodate extra units for replacement devices in the event of equipment or operator error and for assembly related rejects in Subgroup 6, and for Wire Bond Evaluation, Surgroup 7. The larger sample size is at all times kept segregated and, if used for qualification, has all the required processing imposed.

4.6. Deliverable Data:

4.6.1 Lot Serial Number Sheets identifying all devices accepted through final inspection by serial number.

4.6.2 Screening Attributes Summary (Includes Group A Summary)

4.6.3 Burn-In Variables Data and Deltas (if applicable)

4.6.4 Group B data (4.4.2 herein)

4.6.5 SEM Photographs

4.6.6 Wafer Lot Acceptance Report

4.6.7 Radiation Report

4.6.8 Certificate of Conformance certifying that the devices meet all the requirements of this specification and have successfully completed the mandatory tests and inspections herein.

Note: Items 4.6.1 and 4.6.8 will be delivered as a minimum, with each shipment. This is noted on the Purchase Order Review Form as “No Charge Data”. Items 4.6.2 through 4.6.7 will be provided with the Space Data Pack when ordered as a separate line item on the Purchase Order.

5.0 Packaging Requitements: Packaging shall be in accordance with Appendix A. of MIL-PRF-38535. All devices shall be packaged in conductive material or packaged in anti-static material with an external conductive field shielding barrier.

Revision History	
Rev	**Date**
A	4/24/2025