



Restricted Chemicals Test Results

Device - RF-HDT-AJLC-G0

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TI Report Number	Component	Analysis Type	Test Date
73864618	Semiconductor Device	RoHS 10 & Halogens	05/28/2024



TI Report Number : 73864618

Component : Semiconductor Device

Analysis Type : RoHS 10 & Halogens

Analysis Date : 05/28/2024

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

This report supersedes all previous documents bearing the test report number [REDACTED]

The following sample(s) was/were submitted and identified by/on behalf of the client as:

Sample Description: Standard TI Wafer

Sample Received Date: **05/16/2024**

Testing Period: **05/16/2024 – 05/28/2024**

Revision Date : 05/28/2024

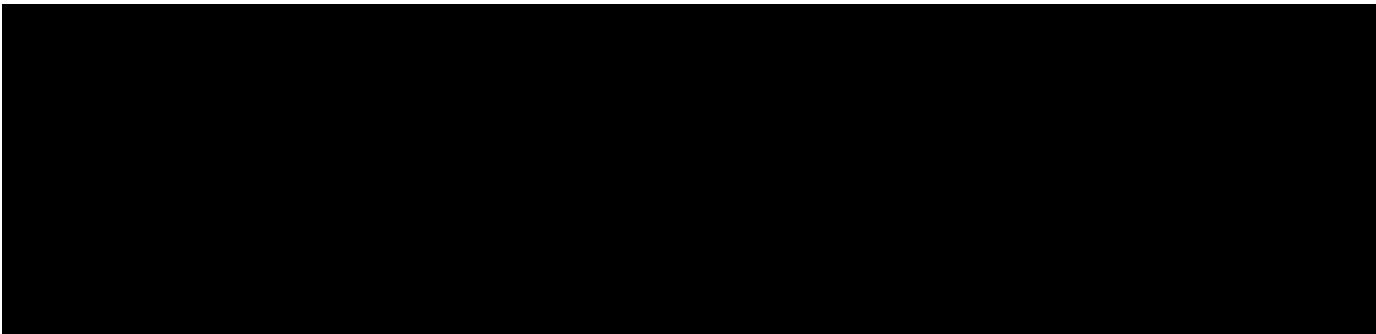
Revision Summary : Typo on Testing Period section revised from “06/16/2024 – 05/28/2024” to “05/16/2024 – 05/28/2024”.

Test Requested : Please refer to the result summary.

Test Method & Results : Please refer to next page(s).

Result Summary :

Test(s) Requested	Conclusion
1. RoHS Directive (EU) 2015/863 Amending Annex II to Directive 2011/65/EU	PASS
2. Halogen Content	See Test Results
3. Element Content (As Requested by Client)	See Test Results



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1. RoHS Directive (EU) 2015/863 Amending Annex II to Directive 2011/65/EU

Test Item(s):	Unit	Test Method	Result	MDL	Limit
			1		
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Cd and Pb by ICP-OES and /or ICP-MS)	ND	2	100
Lead (Pb)	mg/kg		ND	2	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013+A1:2017 (Determination of Hg by ICP-OES and/ or ICP-MS)	ND	2	1000
Hexavalent Chromium (CrVI) #	mg/kg	With reference to IEC 62321-7-2:2017 (Determination of CrVI by UV-VIS)	ND*	8	--
Sum of PBBs	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBB and PBDE by GC-MS)	ND	-	1000
Monobromobiphenyl	mg/kg		ND	5	-
Dibromobiphenyl	mg/kg		ND	5	-
Tribromobiphenyl	mg/kg		ND	5	-
Tetrabromobiphenyl	mg/kg		ND	5	-
Pentabromobiphenyl	mg/kg		ND	5	-
Hexabromobiphenyl	mg/kg		ND	5	-
Heptabromobiphenyl	mg/kg		ND	5	-
Octabromobiphenyl	mg/kg		ND	5	-
Nonabromobiphenyl	mg/kg		ND	5	-
Decabromobiphenyl	mg/kg		ND	5	-
Sum of PBDEs	mg/kg		ND	-	1000
Monobromodiphenyl ether	mg/kg		ND	5	-
Dibromodiphenyl ether	mg/kg		ND	5	-
Tribromodiphenyl ether	mg/kg	ND	5	-	
Tetrabromodiphenyl ether	mg/kg	ND	5	-	
Pentabromodiphenyl ether	mg/kg	ND	5	-	
Hexabromodiphenyl ether	mg/kg	ND	5	-	
Heptabromodiphenyl ether	mg/kg	ND	5	-	
Octabromodiphenyl ether	mg/kg	ND	5	-	
Nonabromodiphenyl ether	mg/kg	ND	5	-	
Decabromodiphenyl ether	mg/kg	ND	5	-	
Bis (2-ethylhexyl) Phthalate (DEHP)	mg/kg	IEC 62321-8:2017 (Determination of DEHP, BBP, DBP and DIBP by GC-MS)	ND	50	1000
Butyl Benzyl Phthalate (BBP)	mg/kg		ND	50	1000
Dibutyl Phthalate (DBP)	mg/kg		ND	50	1000
Diisobutyl Phthalate (DIBP)	mg/kg		ND	50	1000
Conclusion	/	/	PASS	/	/

Sample Description:

- Standard TI Wafer

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Note:

- (a) mg/kg = ppm ; 0.1wt% = 1000ppm
- (b) ND= not detected
- (c) MDL = Method Detection Limit
- (d) # =
 - a. The sample is positive for CrVI if the CrVI concentration is greater than 0.13 µg/cm². The sample coating is considered to contain CrVI
 - b. The sample is negative for CrVI if CrVI is ND (concentration less than 0.10 µg/cm²). The coating is considered a non-CrVI based coating.
 - c. The result between 0.10 µg/cm² and 0.13 µg/cm² is considered to be inconclusive - unavoidable coating variations may influence the determination.
 - d. For corrosion protection coatings on metals: Information on storage conditions and production date of the tested sample is unavailable and thus results of Cr(VI) represent status of the sample at the time of testing represent status of the sample at the time of testing.
- (e) - = not regulated
- (f) * = Total Chromium analysis by ICP-MS and/or ICP-OES was not detected in submitted sample. Therefore, Hexavalent Chromium determination using UV-Visible Spectroscopy was not performed.
- (g) IEC 62321 series is equivalent to EN 62321 series
http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP_ORG_ID,FSP_LANG_ID:1258637,25

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2. Halogen Content

Test Method(s): With reference to IEC 62321-3-2:2020 “Determination of certain substances in electrotechnical products – Part 3-2: Screening – Fluorine, bromine and chlorine in polymer and electronics by combustion-ion chromatography (C-IC), and/or with reference to BS EN 14582:2016 – Analysis was performed by ion chromatography.

Test Item(s):	Unit	Results (ppm)	Reporting Limit (ppm)
		1	
Chlorine (Cl)	mg/kg	ND	50
Bromine (Br)	mg/kg	ND	50
Fluorine (F)	mg/kg	ND	50

Sample Description:

1. Standard TI Wafer

- Note:
1. ppm = parts per million
 2. mg/kg = ppm
 3. 1% = 10000 ppm (mg/kg)
 4. ND = Not Detected, reported when the reading is less than the reporting limit value.

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3. Element Content (As Requested by Client)

Test Method: With reference to US EPA Method 3050B followed by analysis using ICP-MS.

Test Item	Result (mg/kg)		Reporting Limit (mg/kg)
	1		
Arsenic (As)	ND		5
Beryllium (Be)	ND		5
Antimony (Sb)	ND		5

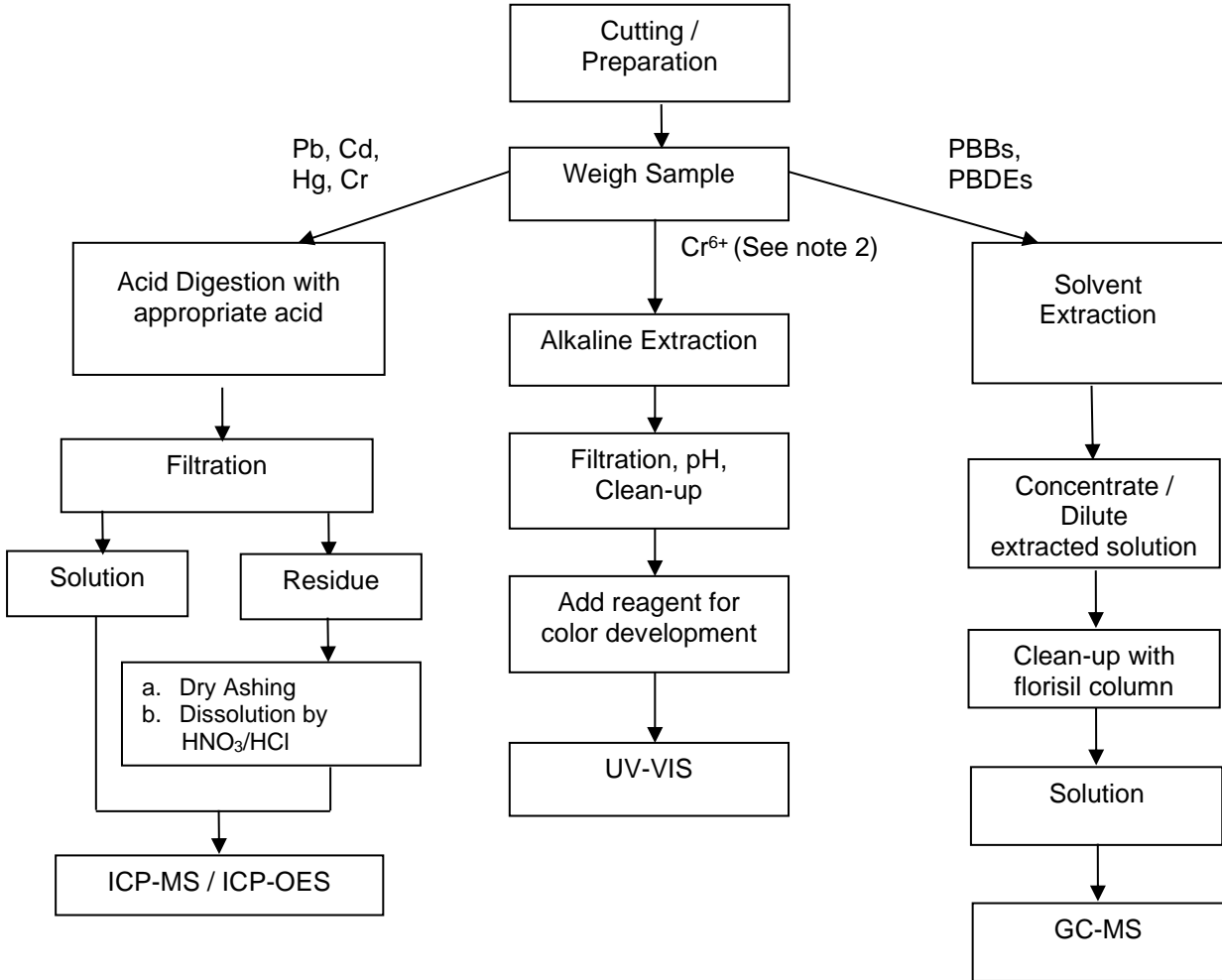
Sample Description:

- Standard TI Wafer

- Note:
1. ppm = parts per million
 2. mg/kg = ppm
 3. 1% = 10000 ppm (mg/kg)
 4. ND = Not Detected, reported when the reading is less than the reporting limit value.

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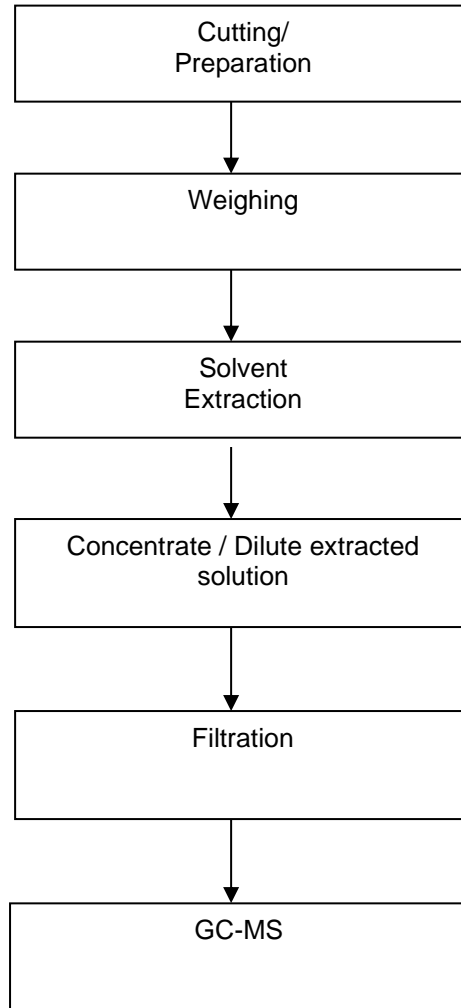
Flowchart for RoHS:



- Note : 1. The Cr, Cd, Pb and Hg contents test on polymeric samples were dissolved totally by pre-conditioning method according to above flow chart.
 2. Cr⁶⁺ is performed only when total Cr is detected

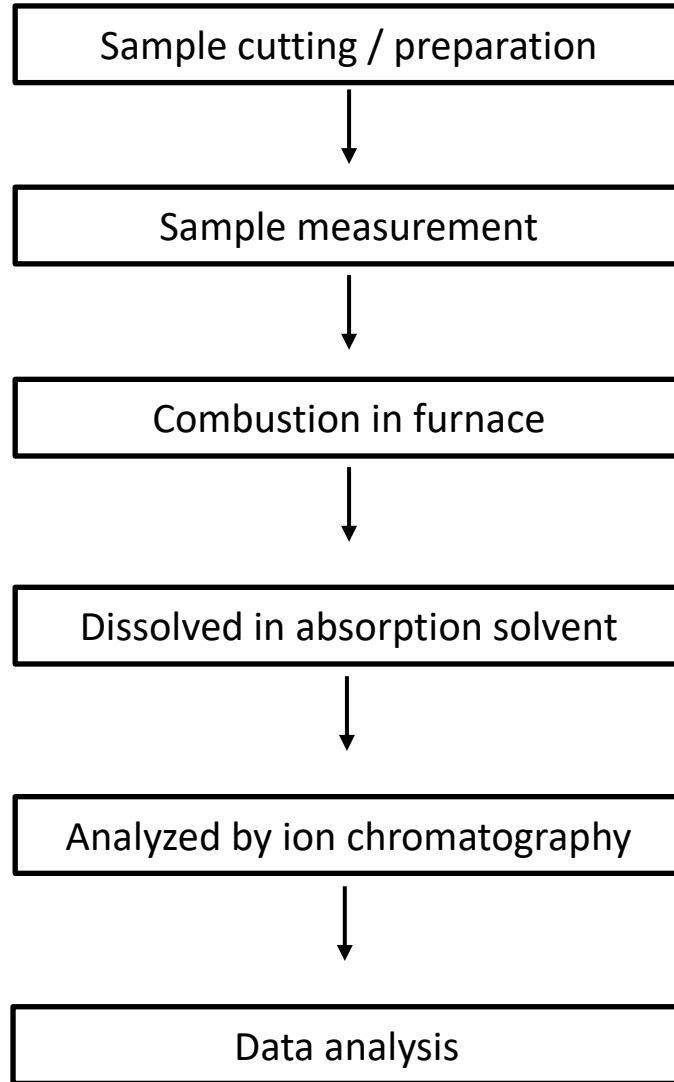
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Flowchart for Phthalates:



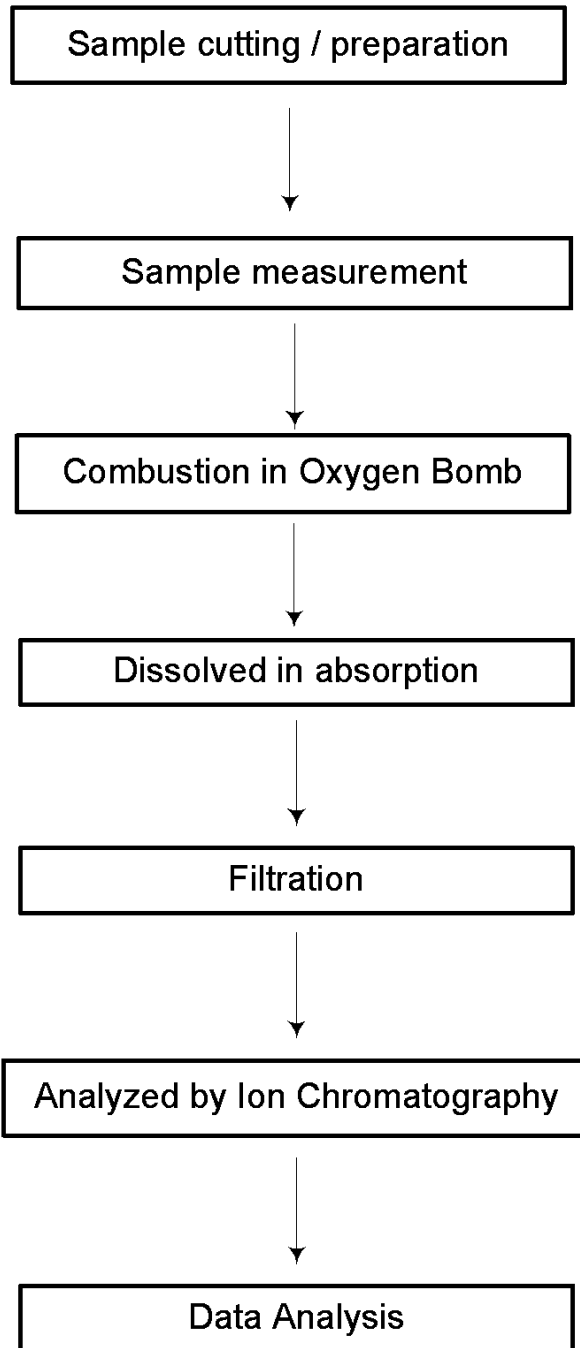
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Flow Chart of Halogen Test by Combustion Ion Chromatography:

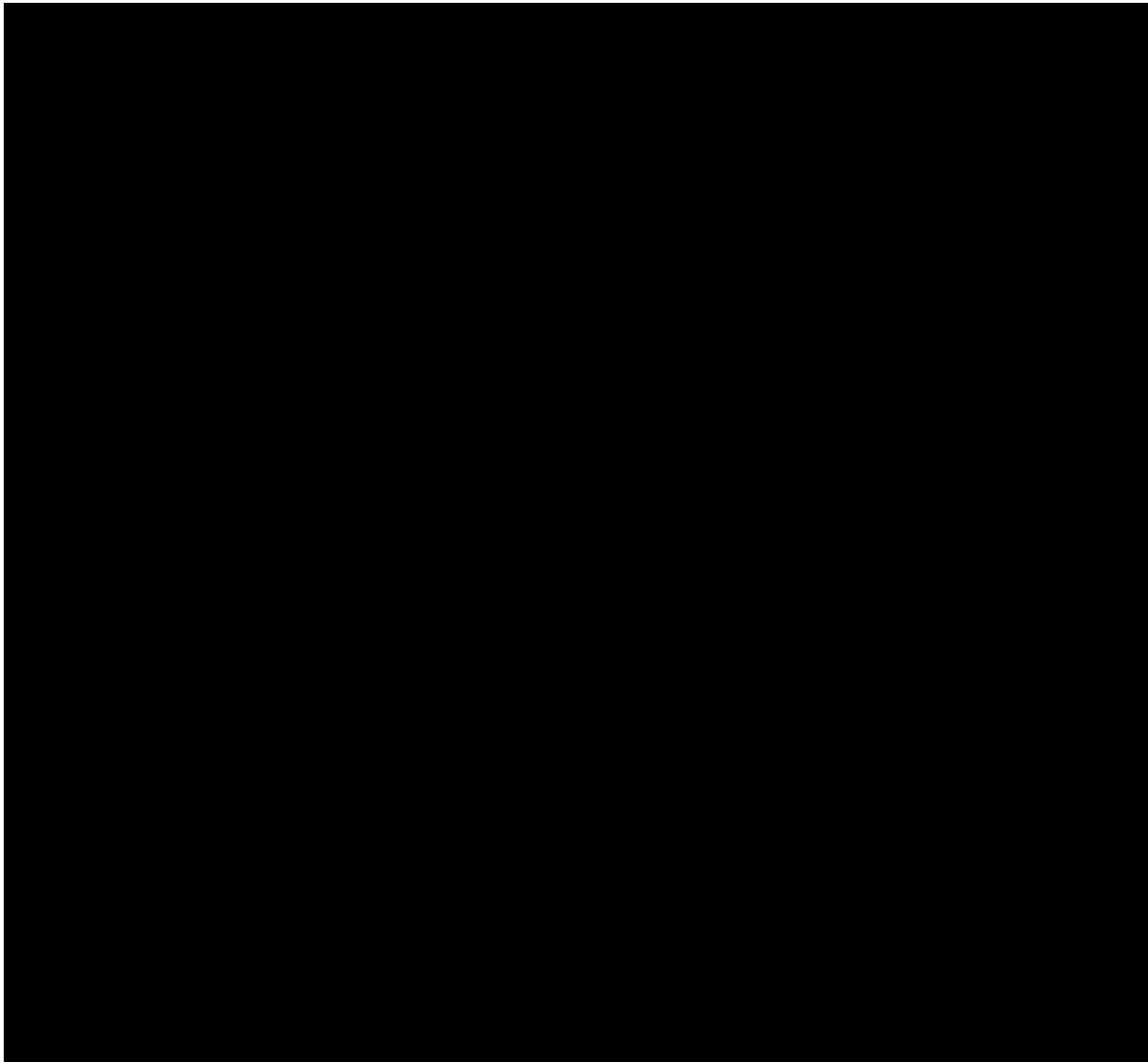


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Halogen Testing Flow Chart (EN 14582):



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