

Test Report

No.: SHAEC24006435405

Date: Apr 12, 2024

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Client Name: SK HYNIX SYSTEM IC(WUXI) CO.,LTD

Client Address: 702 ZHIDE RD, XINWU DISTRICT, WUXI, JIANGSU CHINA

Sample Name: 200mm wafer

The above sample(s) and information were provided by the client.

SGS Job No.: TIC1020240403115131Z8XJ

Sample Receiving Date: Apr 03, 2024

Testing Period: Apr 03, 2024 ~ Apr 12, 2024

Test Requested: Select test(s) as requested by the client.

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

Test Result(s): Please refer to next page(s).

Test Requirement	Conclusion
European Regulation POPs (EU) 2019/1021 Annex I and its amendments	Pass

Signed for and on behalf of
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

Carol Luo

Carol Luo
Approved Signatory

scan to see the report



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Test Result(s):

Test Part Description:

SN ID	Sample No.	SGS Sample ID	Description
SN1	A2	SHA24-0064354-0001.C002	Colorful solid sheet

Remarks:

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected (< MDL)
- (4) “-“ = Not Regulated

European Regulation POPs (EU) 2019/1021 Annex I and its amendments

Test Method: SGS In-House method, analysis was performed by GC-MS, GC-NCI-MS, GC-ECD and HPLC-DAD/MS or LC-MS/MS.

Test Item(s)	CAS No.	Limit	Unit(s)	MDL	A2
Tetrabromodiphenyl ether	40088-47-9 and others	-	mg/kg	5	ND
Pentabromodiphenyl ether	32534-81-9 and others	-	mg/kg	5	ND
Hexabromodiphenyl ether	36483-60-0 and others	-	mg/kg	5	ND
Heptabromodiphenyl ether	68928-80-3 and others	-	mg/kg	5	ND
Decabromodiphenyl ether; (decaBDE)	1163-19-5	-	mg/kg	5	ND
Sum of PBDEs*	-	500	mg/kg	-	ND
PFOS, its salts and related compounds					
Perfluorooctane sulfonates (PFOS), its salts^	1763-23-1	-	mg/kg	0.010	ND
N-ethylperfluoro-1-octanesulfonamide (N-EtFOSA)	4151-50-2	-	mg/kg	0.010	ND
N-methylperfluoro-1-octanesulfonamide (N-MeFOSA)	31506-32-8	-	mg/kg	0.010	ND
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol (N-EtFOSE)	1691-99-2	-	mg/kg	0.010	ND
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol (N-MeFOSE)	24448-09-7	-	mg/kg	0.010	ND
Perfluorooctane sulfonamide (PFOSA), its salts^	754-91-6	-	mg/kg	0.010	ND
Perfluorooctane sulfonates (PFOS) and its derivatives	-	1000	mg/kg	-	ND
DDT(1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane)	50-29-3	Prohibited	mg/kg	0.05	ND
Chlordane	57-74-9	Prohibited	mg/kg	0.05	ND
Hexachlorocyclohexanes, including lindane	58-89-9, 319-84-6, 319-85-7,	Prohibited	mg/kg	0.05	ND



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Test Item(s)	CAS No.	Limit	Unit(s)	MDL	A2
	608-73-1				
Dieldrin	60-57-1	Prohibited	mg/kg	0.05	ND
Endrin	72-20-8	Prohibited	mg/kg	0.05	ND
Heptachlor	76-44-8	Prohibited	mg/kg	0.05	ND
Endosulfan	115-29-7, 959-98-8, 33213-65-9	Prohibited	mg/kg	0.05	ND
Hexachlorobenzene	118-74-1	10	mg/kg	5	ND
Chlordecone	143-50-0	Prohibited	mg/kg	0.2	ND
Aldrin	309-00-2	Prohibited	mg/kg	0.05	ND
Pentachlorobenzene	608-93-5	Prohibited	mg/kg	5	ND
Polychlorinated biphenyls (PCBs)	1336-36-3 and others	50	mg/kg	5	ND
Mirex	2385-85-5	Prohibited	mg/kg	0.05	ND
Toxaphene	8001-35-2	Prohibited	mg/kg	0.2	ND
Hexabromodiphenyl	36355-01-8	Prohibited	mg/kg	5	ND
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α -HBCDD, β -HBCDD, γ -HBCDD)	134237-50-6, 134237-51-7, 134237-52-8, 25637-99-4, 3194-55-6	100	mg/kg	20	ND
Hexachlorobutadiene	87-68-3	Prohibited	mg/kg	5	ND
Pentachlorophenol (PCP) and its salts and esters	87-86-5 and others	5	mg/kg	0.5	ND
Polychlorinated naphthalenes (PCNs)	70776-03-3 and others	Prohibited	mg/kg	5	ND
Alkanes C10-13, chloro(short chain- chlorinated paraffins) (SCCPs)	85535-84-8 and others	1500	mg/kg	50	ND
Perfluorooctanoic acid (PFOA), its salts [^]	335-67-1	0.025	mg/kg	0.010	ND
PFOA-related compounds					
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS), its salts [^]	39108-34-4	-	mg/kg	0.010	ND
Methyl perfluorooctanoate (Me-PFOA)	376-27-2	-	mg/kg	0.100	ND
Ethyl perfluorooctanoate (Et-PFOA)	3108-24-5	-	mg/kg	0.100	ND
1H,1H,2H,2H-Perfluorodecyl acrylate (8:2 FTA)	27905-45-9	-	mg/kg	0.100	ND
1H,1H,2H,2H-Perfluorodecyl methacrylate (8:2 FTMA)	1996-88-9	-	mg/kg	0.100	ND
Perfluoro-1-iodooctane (PFOI)	507-63-1	-	mg/kg	0.100	ND



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Test Item(s)	CAS No.	Limit	Unit(s)	MDL	A2
2H,2H-Perfluorodecane Acid (H ₂ PFDA/8:2 FTCA), its salts [^]	27854-31-5	-	mg/kg	0.010	ND
1H,1H,2H,2H-Perfluoro-1-decanol (8:2 FTOH)	678-39-7	-	mg/kg	0.100	ND
1-Iodo-1H,1H,2H,2H-perfluorodecane (8:2 FTI)	2043-53-0	-	mg/kg	0.100	ND
1H,1H,2H,2H-Perfluorodecyltriethoxysilane (8:2 FTSi(OC ₂ H ₅) ₃)	101947-16-4	-	mg/kg	0.100	ND
bis(3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl) hydrogen phosphate (8:2 diPAP), its salts [^]	678-41-1	-	mg/kg	0.010	ND
2H,2H,3H,3H-Perfluoroundecanoic Acid (H ₄ PFUnDA / 8:3 FTCA), its salts [^]	34598-33-9	-	mg/kg	0.010	ND
1H,1H,2H-Heptadecafluoro-1-decene (PFDE)	21652-58-4	-	mg/kg	0.100	ND
3-Perfluoroheptyl propanoic acid (7:3 FTCA)	812-70-4	-	mg/kg	0.010	ND
Sum of PFOA-related compounds	-	1.0	mg/kg	-	ND
Dicofol	115-32-2	Prohibited	mg/kg	0.05	ND
Perfluorohexane Sulfonate (PFHxS), its salts [^]	355-46-4	0.025	mg/kg	0.010	ND
PFHxS-related compounds					
N-Methylperfluoro-1-hexanesulfonamide (N-Me-PFHxSA)	68259-15-4	1	mg/kg	0.010	ND
Perfluorohexane sulfonamide (PFHxSA)	41997-13-1	1	mg/kg	0.010	ND
N-[3-(dimethylamino)propyl]tridecafluorohexanesulphonamide (N-AP-FHxSA)	50598-28-2	1	mg/kg	0.010	ND
2-[methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl acrylate)) (N-MeFHSEA)	67584-57-0	1	mg/kg	0.500	ND
2-Propenoic acid, 2-methyl-, 2-[methyl[(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexyl)sulfonyl]amino]ethyl ester	67584-61-6	1	mg/kg	0.100	ND
2-Propenoic acid, 2-methyl-, 2-[ethyl[(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexyl)sulfonyl]amino]ethyl ester	67906-70-1	1	mg/kg	0.100	ND
1-Hexanesulfonamide, 1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-N-(2-hydroxyethyl)-N-methyl-(MeFHxSE)	68555-75-9	1	mg/kg	0.010	ND
Glycine, N-ethyl-N-[(1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexyl)sulfonyl]-	68957-32-4	1	mg/kg	0.010	ND
Sum of PFHxS-related compounds	-	1	mg/kg	-	ND
Conclusion					Pass

Notes:



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- (1) Substances in Annex I of European Regulation POPs (EU) 2019/1021 Annex I are prohibited in preparations and constituents of articles unless otherwise specified.
- (2) Exemptions: Tetrabromodiphenyl ether, pentabromodiphenyl ether, hexabromodiphenyl ether, heptabromodiphenyl ether and decabromodiphenyl ether are ≤ 10 mg/kg for substances, and Sum of tetra-, penta-, hexa-, hepta- and decaBDE ≤ 500 mg/kg for mixtures or articles, this restriction is subject to subject to review and assessment by the European by 16 July 2021.
- (3) Exemption: Tetrabromodiphenyl ether, pentabromodiphenyl ether, hexabromodiphenyl ether, heptabromodiphenyl ether and decabromodiphenyl ether in electrical and electronic equipment within the scope of Directive 2011/65/EU are exempted.
- (4) Exemption: Alkanes C10-13, chloro (short chain-chlorinated paraffins) (SCCPs) $< 1.0\%$ (w/w) in preparation, $< 0.15\%$ (w/w) for articles.
- (5) Exemptions: Perfluorooctane sulfonates (PFOS) and its derivatives (acid, metal salt, halide, amide, and other derivatives including polymers) ≤ 10 mg/kg for preparations, $< 0.1\%$ (w/w) for articles and $< 1\mu\text{g}/\text{m}^2$ for textiles and coated materials.
- (6) Exemptions: HBCDD no more than 100 mg/kg as an unintentional trace contaminant in substances, mixtures, articles or flame-retarded parts of articles.
- (7) Sum of PBDEs* Means Sum of Tetrabromodiphenyl ether, Pentabromodiphenyl ether, Hexabromodiphenyl ether, Heptabromodiphenyl ether and Decabromodiphenyl ether.
- (8) ^=Substances of PFOS, PFOA and PFOA-related compounds refer to their salts/derivatives listed in below table.

Substance Name	CAS No.
PFOS, its salts & derivatives	
Perfluorooctane sulfonates (PFOS)	1763-23-1
Potassium Perfluorooctanesulfonate (PFOS-K)	2795-39-3
Perfluorooctanesulfonic acid, lithium salt (PFOS-Li)	29457-72-5
Sodium perfluorooctanesulfonate (PFOS-Na)	4021-47-0
Ammonium perfluorooctanesulfonate (PFOS-NH ₄)	29081-56-9
Perfluorooctane sulfonate diethanolamine salt (PFOS-NH ₂ (C ₂ H ₄ OH) ₂)	70225-14-8
Perfluorooctanesulfonic acid,tetraethylammonium salt (PFOS-N(C ₂ H ₅) ₄)	56773-42-3
N-decyl-N,N-dimethyldecan-1-aminium 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonate (PFOS-N(C ₁₀ H ₂₁) ₂ (CH ₃) ₂)	251099-16-8
Perfluorooctane Sulfonyl fluoride (PFOS-F)	307-35-7
Magnesium bis(heptadecafluorooctanesulphonate) (PFOS-Mg)	91036-71-4
Piperidine 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctanesulfonate	71463-74-6
PFOSA, its salts	
Perfluorooctane Sulfonamide (PFOSA)	754-91-6
Perfluorooctanesulfonamide lithium salt (1:1) (PFOSA-Li)	76752-79-9
PFOA, its salts & derivatives	
Perfluorooctanoic acid (PFOA)	335-67-1
Sodium perfluorooctanoate (PFOA-Na)	335-95-5
Potassium perfluorooctanoate (PFOA-K)	2395-00-8
Silver perfluorooctanoate (PFOA-Ag)	335-93-3
Perfluorooctanoyl fluoride (PFOA-F)	335-66-0
Ammonium pentadecafluorooctanoate (APFO)	3825-26-1
Lithium perfluorooctanoate (PFOA-Li)	17125-58-5
8:2 FTS, its salts	



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1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2 FTS)	39108-34-4
Potassium 1H,1H,2H,2H-Perfluorodencane sulfonate (8:2 FTS-K)	438237-73-1
Ammonium 1H,1H,2H,2H-Perfluorodencane sulfonate (8:2 FTS-NH ₄)	149724-40-3
Sodium 1H,1H,2H,2H-Perfluorodencane sulfonate (8:2 FTS-Na)	27619-96-1
H₂PFDA/8:2 FTCA, its salts	
2H,2H-Perfluorodecane Acid (H ₂ PFDA/8:2 FTCA)	27854-31-5
Tetrabutylphosphonium 2H,2H-Perfluorodecanoate (8:2 FTCA-P(C ₄ H ₉) ₄)	882489-14-7
8:2diPAP, its salts	
Bis(3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl) hydrogen phosphate (8:2diPAP)	678-41-1
Sodium bis(1H,1H,2H,2H-perfluorodecyl)phosphate (8:2diPAP-Na)	114519-85-6
H₄PFUnDA/ 8:3 FTCA, its salts	
2H,2H,3H,3H-Perfluoroundecanoic acid (H ₄ PFUnDA/ 8:3 FTCA)	34598-33-9
Potassium 2H,2H,3H,3H-Perfluoroundecanoate (H ₄ PFUnDA-K)	83310-58-1

(9) PFHxS, its salts and PFHxS related compounds:

- (a) Commission Delegated Regulation (EU) 2023/1608 of May 30, 2023, amending Annex I to Regulation (EU) 2019/1021 Annex I as regards the listing of perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds, Official Journal of the EU, August 8, 2023.

Substance	Scope	Specific exemption on intermediate use or other specification	Effective Date
PFHxS and its salts	Substances, mixtures or articles	≤ 0.025 mg/kg	August 28, 2023
PFHxS-related compounds	Substances, mixtures or articles	≤ 1 mg/kg (individual or sum of all)	August 28, 2023
PFHxS, its salts and PFHxS-related compounds	Concentrated firefighting foam	≤ 0.1 mg/kg (to be reviewed within three years after entry into force of this amending regulation with a view to lower the limit)	August 28, 2023

- (b) The tested perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds in this report comes from the "Listed under the POPs Regulation" of ECHA, please find more information via below weblink: [List of substances proposed as POPs - ECHA \(europa.eu\)](https://echa.europa.eu/en/substances/proposed)

- (c) ^=Substances of PFHxS refer its salts/derivative listed in below table.

Substance Name	CAS No.
PFHxS, its salts & derivatives	
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4
1-Hexanesulfonic acid, 1,1,2,2,3,3, 4,4,5,5,6,6-tridecafluoro-, sodium salt (PFHxS-Na)	82382-12-5
Potassium perfluorohexane-1-sulphonate (PFHxS-K)	3871-99-6
Perfluorohexane Sulfonic acid, lithium salt (PFHxS-Li)	55120-77-9
Perfluorohexane Sulfonic acid, ammonium salt (PFHxS-NH ₄)	68259-08-5
Benzyltriphenylphosphonium tridecafluorohexane-1-sulfonate (PFHxS-BTPP)	1000597-52-3
N,N,N-Tributylbutan-1-aminium tridecafluorohexane-1-sulfonate (PFHxS-N(C ₄ H ₉) ₄)	108427-54-9
Tetraethylammonium perfluorohexane sulfonate (PFHxS-N(C ₂ H ₅) ₄)	108427-55-0



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Tridecafluorohexane-1-sulfonic acid-pyrrolidine (PFHxS-NC ₄ H ₉)	1187817-57-7
4-[[4-(Diethylamino)phenyl][4-(ethylamino)naphthalen-1-yl]methylidene]-N,N-diethylcyclohexa-2,5-dien-1-iminium tridecafluorohexane-1-sulfonate (PFHxS-(NC ₁₀ H ₁₄) ₃ C ₅ H ₄)	1310480-24-0
4-[[4-(Dimethylamino)phenyl][4-(ethylamino)naphthalen-1-yl]methylidene]-N,N-dimethylcyclohexa-2,5-dien-1-iminium tridecafluorohexane-1-sulfonate (PFHxS-(NC ₈ H ₁₀) ₂ C ₁₃ H ₁₂)	1310480-27-3
4-[[4-(Dimethylamino)phenyl][4-(phenylamino)naphthalen-1-yl]methylidene]-N,N-dimethylcyclohexa-2,5-dien-1-iminium tridecafluorohexane-1-sulfonate (PFHxS-(NC ₈ H ₁₀) ₂ C ₁₇ H ₁₂)	1310480-28-4
Beta-Cyclodextrin, compd. with 1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonate (PFHxS-C ₄₂ H ₇₀ O ₃₅)	1329995-45-0
Gamma-Cyclodextrin, compd. with 1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonate (PFHxS-C ₄₈ H ₈₀ O ₄₀)	1329995-69-8
Triphenylsulfanium tridecafluorohexane-1-sulfonate (TPS-PFHxS)	144116-10-9
1-(Carboxymethyl)-4-(2-{4-[4-(2,2-diphenylethenyl)phenyl]-1H,2H,3H,3aH,4H,8bH-cyclopenta[b]indol-7-yl}ethenyl)quinolin-1-ium tridecafluorohexane-1-sulfonate (PFHxS-C ₄₄ H ₃₇ N ₂ O ₂)	1462414-59-0
Diphenyliodonium tridecafluorohexane-1-sulfonate (PFHxS-I(C ₆ H ₅) ₂)	153443-35-7
Tetramethylammonium perfluorohexane sulfonate (PFHxS-TMA)	189274-31-5
Tert-butylazanium; 1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonate (PFHxS-NH ₂ (CH ₃) ₃)	202189-84-2
Bis(4-tert-butylphenyl)iodanium tridecafluorohexane-1-sulfonate (PFHxS-I(C ₆ H ₄) ₂ (C ₄ H ₉) ₂)	213740-81-9
Bis(4-methylphenyl)(phenyl)sulfanium tridecafluorohexane-1-sulfonate (PFHxS-S(C ₇ H ₇) ₂ C ₆ H ₅)	341548-85-4
Sulfonium, (thiodi-4,1-phenylene)bis[diphenyl-, salt with perfluorohexanesulfonic acid (1:2) (PFHxS-S ₃ (C ₆ H ₅) ₄ (C ₆ H ₄) ₂)	421555-73-9
Perfluorohexanesulfonic acid, Gallium(3+) salt (3:1) (PFHxS-Ga)	341035-71-0
Perfluorohexanesulfonic acid, Scandium(3+) salt (3:1) (PFHxS-Sc)	350836-93-0
Perfluorohexanesulfonic acid, Neodymium(3+) salt (3:1) (PFHxS-Nd)	41184-65-0
Perfluorohexanesulfonic acid, Yttrium(3+) salt (3:1) (PFHxS-Y)	41242-12-0
Cesium perfluorohexanesulfonate (PFHxS-Cs)	92011-17-1
Perfluorohexanesulfonic acid, Zinc salt (PFHxS-Zn)	70136-72-0
Iodonium, bis[4-(1,1-dimethylpropyl)phenyl]-, perfluorohexanesulfonate (1:1) (PFHxS-I(C ₆ H ₄) ₂ (C ₅ H ₁₁) ₂)	421555-74-0
Tris(4-tert-butylphenyl)sulfanium tridecafluorohexane-1-sulfonate (PFHxS-S(C ₆ H ₄) ₃ (C ₄ H ₉) ₃) (PFHxS-S(C ₆ H ₄) ₃ (C ₄ H ₉) ₃)	425670-70-8
Tridecafluorohexanesulphonic acid, compound with 2,2'-iminodiethanol (1:1) (PFHxS-NH(C ₂ H ₅ O) ₂)	70225-16-0
Triethylammonium perfluorohexane sulfonate (PFHxS-N(C ₂ H ₅) ₃)	72033-41-1
Iodonium, bis[(1,1-dimethylethyl)phenyl]-, salt with perfluorohexanesulfonic acid (1:1) (PFHxS-I(C ₆ H ₄) ₂ (C ₄ H ₉) ₂)	866621-50-3
(4-Methylphenyl)diphenylsulfanium tridecafluorohexane-1-sulfonate (PFHxS-S(C ₆ H ₅) ₂ C ₇ H ₇)	910606-39-2
{4-[(2-Methylprop-2-enoyl)oxy]phenyl}diphenylsulfanium tridecafluorohexane-1-sulfonate (PFHxS-S(C ₆ H ₅) ₂ C ₁₀ H ₉ O ₂)	911027-68-4
Dibenzo[k,n][1,4,7,10,13]tetraoxathiacyclopentadecinium, 19-[4-(1,1-dimethylethyl)phenyl]-6,7,9,10,12,13-hexahydro-, 1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-1-hexanesulfonate (1:1) (PFHxS-SC ₂₈ H ₃₁ O ₄)	928049-42-7



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Perfluorohexylsulfonyl fluoride (PFHxS-F)	423-50-7
Perfluorohexylsulfonyl chloride (PFHxS-Cl)	55591-23-6
Sulfonium, [4-[(2-methyl-1-oxo-2-propenyl)oxy]phenyl]diphenyl-, salt with 1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-1-hexanesulfonic acid (1:1), polymer with 2-ethyltricyclo[3.3.1.1 ^{3,7}]dec-2-yl 2-methyl-2-propenoate, 3-hydroxytricyclo[3.3.1.1 ^{3,7}]dec-1-yl 2-methyl-2-propenoate and tetrahydro-2-oxo-3-furanyl 2-methyl-2-propenoate (PFHxS-Sulfonium, propenoate polymer)	911027-69-5

(10)The chemical analysis of substances is performed by means of currently available analytical techniques against substances laid down in Test Requested.

Unless otherwise stated, the decision rule for conformity reporting is based on Binary Statement for Simple Acceptance Rule (w=0) stated in ILAC-G8:09/2019.



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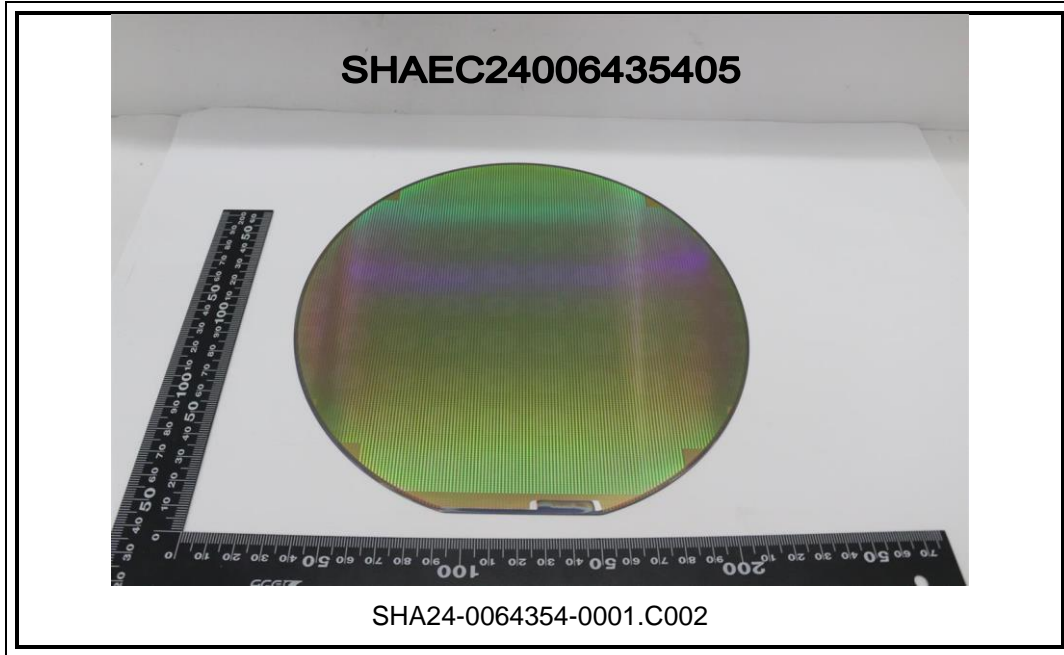
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