

# Test Report

No.: SHAEC24017558415

Date: Aug 20, 2024

Page 1 of 15

Client Name: Suzhou Goodark Electronics Co.,Ltd

Client Address: No.200 Huajin Road, TongAn Economic Development Zone, Suzhou, P.R. China

Sample Name: TO220AB(AMBR40250S) product

Model No.: TO220AB(AMBR40250S)

Client Ref. Information: PPAK Package(TO263,TO220,ITO220,TO252,TO262, TO247,PQFN,PDFN)

Main Substance: Cu,Sn,Epoxy Resin

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

SGS Job No.: SUP24-002437

Sample Receiving Date: Aug 02, 2024

Testing Period: Aug 02, 2024 ~ Aug 16, 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
EU RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU - Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE), Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP)	See Results
EU RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU- Lead, Mercury, Cadmium and Hexavalent chromium	See Results
Element(s)	See Results
Halogen	See Results
Hexabromocyclododecane (HBCDD)	See Results

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

Jenny Lan  
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	A11	SHA24-0175584-0001.C011	Black body
SN2	A12	SHA24-0175584-0001.C012	Silver plating
SN3	A13	SHA24-0175584-0001.C013	Silver metal
SN4	A14	SHA24-0175584-0001.C014	Black solid

Remarks:

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

**EU RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU - Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE), Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP)**

**Test Method:** With reference to IEC 62321-4:2013+AMD1:2017, IEC 62321-5:2013, IEC 62321-7-2:2017, IEC 62321-6:2015 and IEC 62321-8:2017, analysis was performed by ICP-OES/AAS, UV-Vis and GC-MS.

Test Item(s)	Limit	Unit(s)	MDL	A11	A14
Lead (Pb)	1000	mg/kg	2	4153 <sup>▲</sup>	ND
Mercury (Hg)	1000	mg/kg	2	ND	-
Cadmium (Cd)	100	mg/kg	2	ND	-
Hexavalent Chromium (Cr(VI))	1000	mg/kg	8	ND	-
Polybromobiphenyl (PBB)	1000	mg/kg	-	ND	-
Monobrominated biphenyl (MonoBB)	-	mg/kg	5	ND	-
Dibrominated biphenyl (DiBB)	-	mg/kg	5	ND	-
Tribrominated biphenyl (TriBB)	-	mg/kg	5	ND	-
Tetrabrominated biphenyl (TetraBB)	-	mg/kg	5	ND	-
Pentabrominated biphenyl (PentaBB)	-	mg/kg	5	ND	-
Hexabrominated biphenyl (HexaBB)	-	mg/kg	5	ND	-
Heptabrominated biphenyl (HeptaBB)	-	mg/kg	5	ND	-
Octabrominated biphenyl (OctaBB)	-	mg/kg	5	ND	-
Nonabrominated biphenyl (NonaBB)	-	mg/kg	5	ND	-
Decabrominated biphenyl (DecaBB)	-	mg/kg	5	ND	-
Polybromodiphenyl ether (PBDE)	1000	mg/kg	-	ND	-
Monobrominated diphenyl ether (MonoBDE)	-	mg/kg	5	ND	-
Dibrominated diphenyl ether (DiBDE)	-	mg/kg	5	ND	-
Tribrominated diphenyl ether (TriBDE)	-	mg/kg	5	ND	-
Tetrabrominated diphenyl ether (TetraBDE)	-	mg/kg	5	ND	-
Pentabrominated diphenyl ether (PentaBDE)	-	mg/kg	5	ND	-



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No.: SHAEC24017558415

Date: Aug 20, 2024

Page 3 of 15

Test Item(s)	Limit	Unit(s)	MDL	A11	A14
Hexabrominated diphenyl ether (HexaBDE)	-	mg/kg	5	ND	-
Heptabrominated diphenyl ether (HeptaBDE)	-	mg/kg	5	ND	-
Octabrominated diphenyl ether (OctaBDE)	-	mg/kg	5	ND	-
Nonabrominated diphenyl ether (NonaBDE)	-	mg/kg	5	ND	-
Decabrominated diphenyl ether (DecaBDE)	-	mg/kg	5	ND	-
Bis(2-ethylhexyl) phthalate (DEHP)	1000	mg/kg	50	ND	-
Butyl benzyl phthalate (BBP)	1000	mg/kg	50	ND	-
Dibutyl phthalate (DBP)	1000	mg/kg	50	ND	-
Diisobutyl phthalate (DIBP)	1000	mg/kg	50	ND	-

**Notes:**

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) IEC 62321 series is equivalent to EN 62321 series.
- (3) The restriction of DEHP, BBP, DBP and DIBP shall apply to medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021.

**EU RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU- Lead, Mercury, Cadmium and Hexavalent chromium**

**Test Method:** With reference to IEC 62321-4:2013+AMD1:2017, IEC 62321-5:2013 and IEC 62321-7-1:2015, analysis was performed by ICP-OES/AAS and UV-Vis.

Test Item(s)	Limit	Unit(s)	MDL	A12
Lead (Pb)	1000	mg/kg	10	31
Mercury (Hg)	1000	mg/kg	10	ND
Cadmium(Cd)	100	mg/kg	10	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm <sup>2</sup>	0.10	ND

**Notes:**

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) IEC 62321 series is equivalent to EN 62321 series.
- (3) ▼ =
  - a. The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 µg/cm<sup>2</sup>. The sample coating is considered to contain Cr(VI).
  - b. The sample is negative for Cr(VI) if Cr(VI) is ND (concentration less than 0.10 µg/cm<sup>2</sup>). The coating is considered a non-Cr(VI) based coating.
  - c. The result between 0.10 µg/cm<sup>2</sup> and 0.13 µg/cm<sup>2</sup> is considered to be inconclusive-unavoidable coating variations may influence the determination.

Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.



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# Test Report

No.: SHAEC24017558415

Date: Aug 20, 2024

Page 4 of 15

**Test Method:** With reference to IEC 62321-4:2013+AMD1:2017, IEC 62321-5:2013 and IEC 62321-7-1:2015, analysis was performed by ICP-OES/AAS and UV-Vis.

Test Item(s)	Limit	Unit(s)	MDL	A13
Lead (Pb)	1000	mg/kg	2	8
Mercury (Hg)	1000	mg/kg	2	ND
Cadmium (Cd)	100	mg/kg	2	ND
Hexavalent Chromium (Cr(VI)) <sup>▼</sup>	-	µg/cm <sup>2</sup>	0.10	ND

**Notes:**

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.
- (2) IEC 62321 series is equivalent to EN 62321 series.
- (3) <sup>▼</sup> =
  - a. The sample is positive for Cr(VI) if the Cr(VI) concentration is greater than 0.13 µg/cm<sup>2</sup>. The sample coating is considered to contain Cr(VI).
  - b. The sample is negative for Cr(VI) if Cr(VI) is ND (concentration less than 0.10 µg/cm<sup>2</sup>). The coating is considered a non-Cr(VI) based coating.
  - c. The result between 0.10 µg/cm<sup>2</sup> and 0.13 µg/cm<sup>2</sup> is considered to be inconclusive-unavoidable coating variations may influence the determination.

Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.

**Element(s)**

**Test Method:** With reference to US EPA 3052:1996, analysis was performed by ICP-OES/AAS.

Test Item(s)	Unit(s)	MDL	A13
Beryllium(Be)	mg/kg	5	ND

**Halogen**

**Test Method:** With reference to EN 14582:2016, analysis was performed by IC.

Test Item(s)	Unit(s)	MDL	A11
Fluorine(F)	mg/kg	20	ND
Chlorine(Cl)	mg/kg	50	ND
Bromine(Br)	mg/kg	50	ND
Iodine(I)	mg/kg	50	ND

**Hexabromocyclododecane (HBCDD)**

**Test Method:** With reference to US EPA 3550C:2007, analysis was performed by GC-MS.

Test Item(s)	CAS No.	Unit(s)	MDL	A11
Hexabromocyclododecane (HBCDD)	134237-50-6 /134237-51-7 /134237-52-8 /25637-99-4 /3194-55-6	mg/kg	10	ND

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## Test Report

No.: SHAEC24017558415

Date: Aug 20, 2024

Page 5 of 15

▲ According to the declaration from the client, Lead (Pb) is exempted by EU RoHS directive 2011/65/EU based on [ANNEX III 7(a)]: Lead in high melting temperature type solders (i.e. lead-based alloys containing 85 % by weight or more lead).

More information about exemption can be found via the following link:

<https://rohs.sgsonline.com.cn/PDFLinks/en/RSTS-TP-037%20RoHS%20Exemption%20%28EN%29.pdf>

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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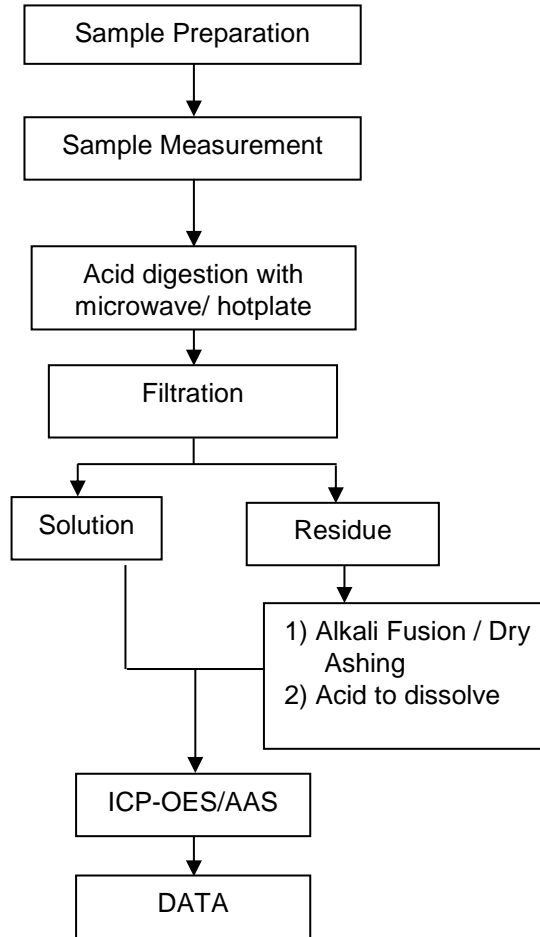
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**Elements Testing Flow Chart**

These samples were dissolved totally by pre-conditioning method according to below flow chart.



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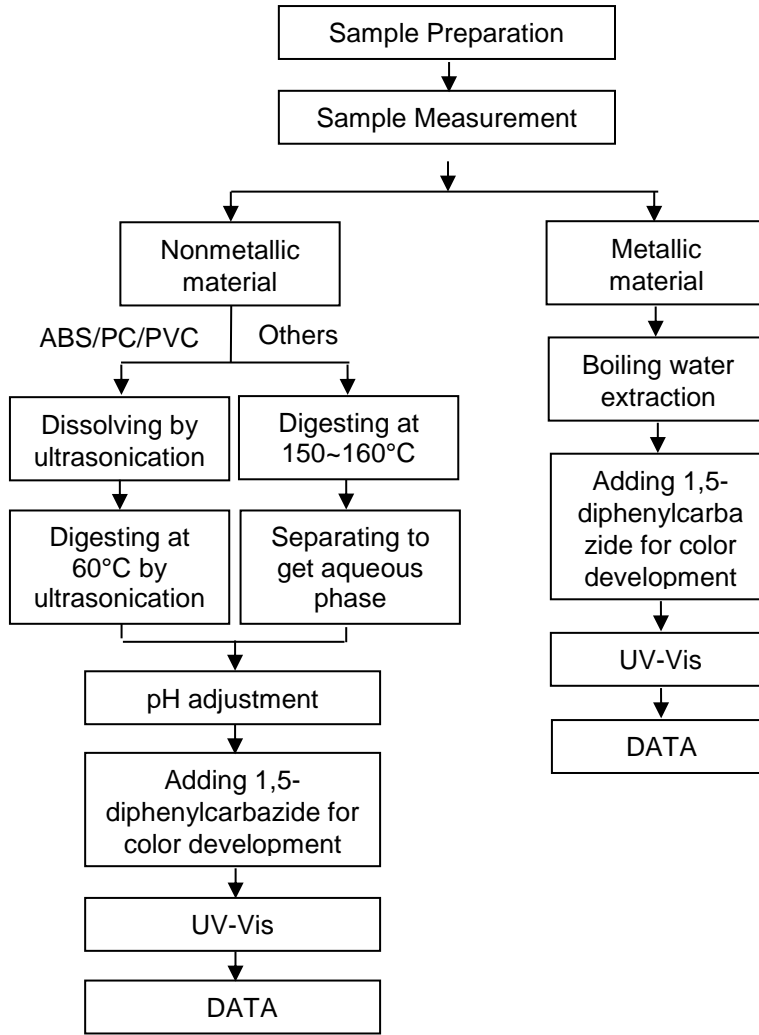
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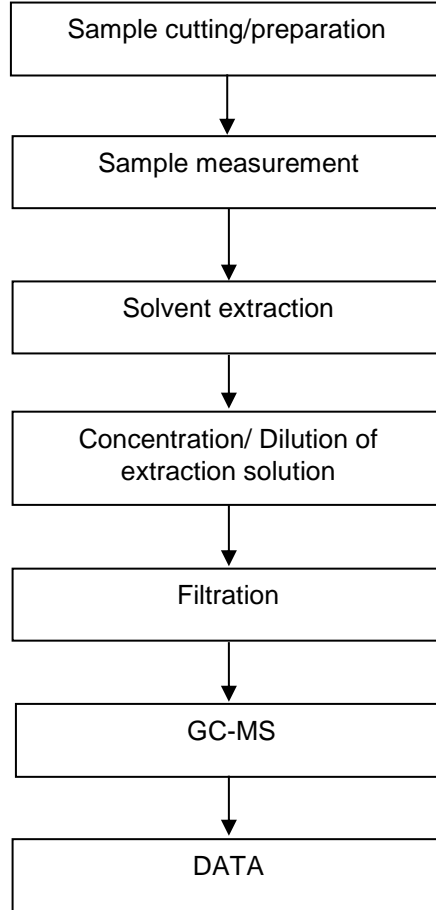
**Hexavalent Chromium (Cr(VI)) Testing Flow Chart**



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### PBB/PBDE Testing Flow Chart



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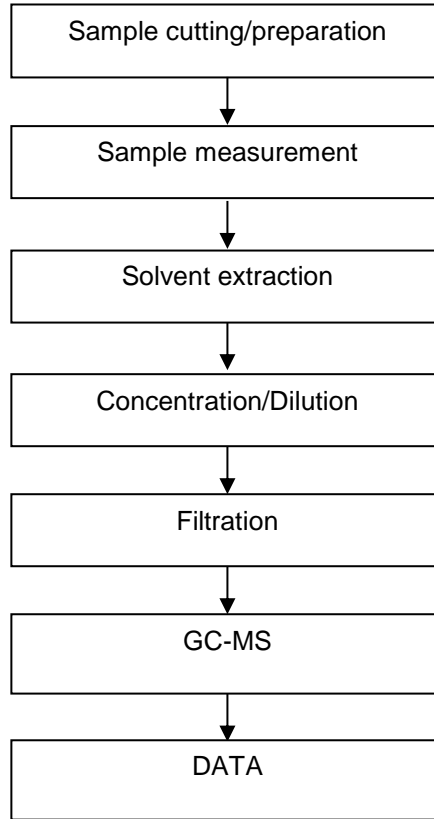
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**Phthalates Testing Flow Chart**



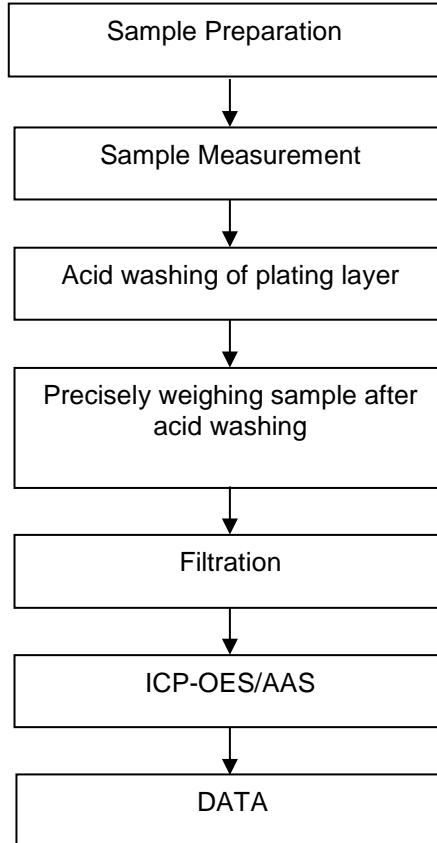
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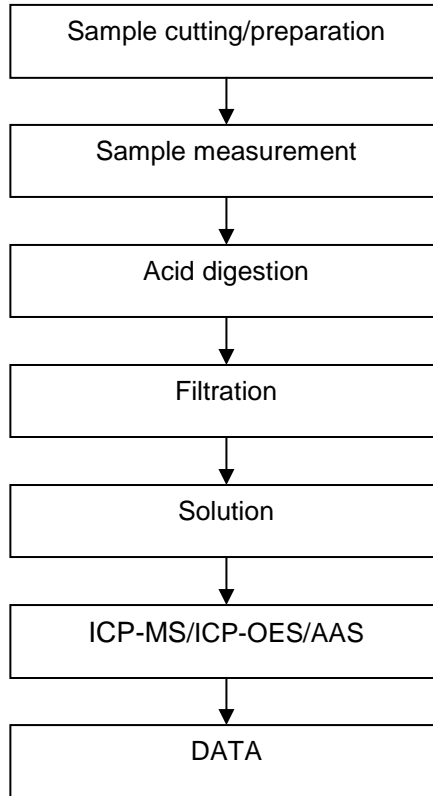
**Plating Element Testing Flow Chart**



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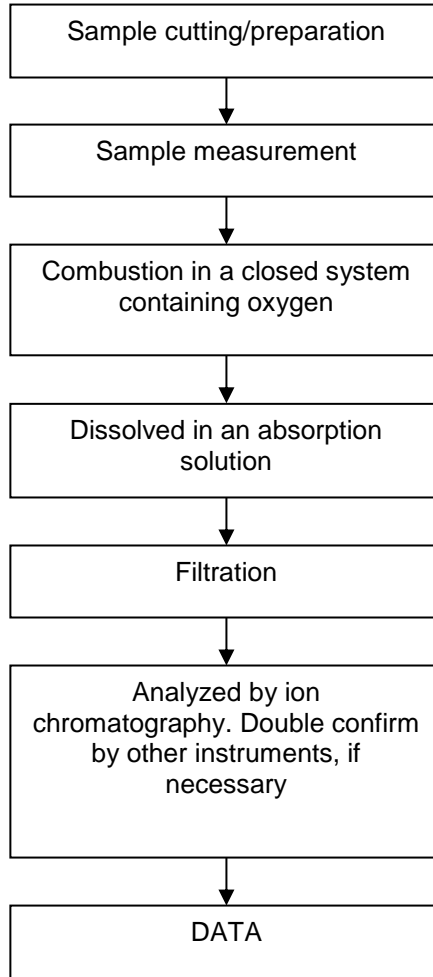
### Elements Testing Flow Chart



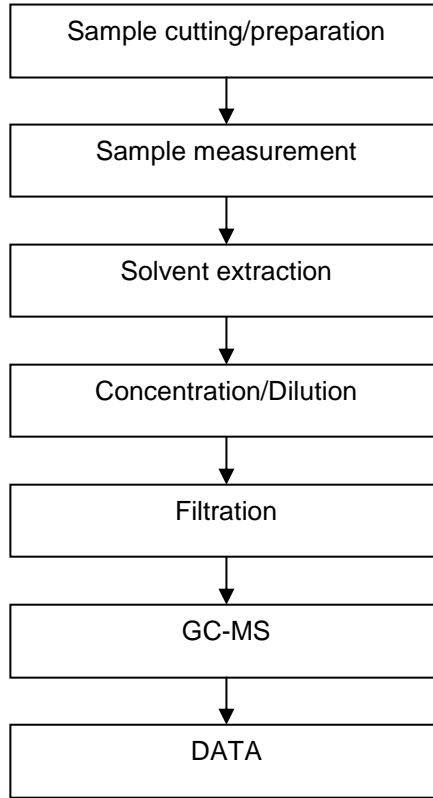
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### Halogen Testing Flow Chart



**HBCDD Testing Flow Chart**



SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.  
Testing Center-Chemical Laboratory

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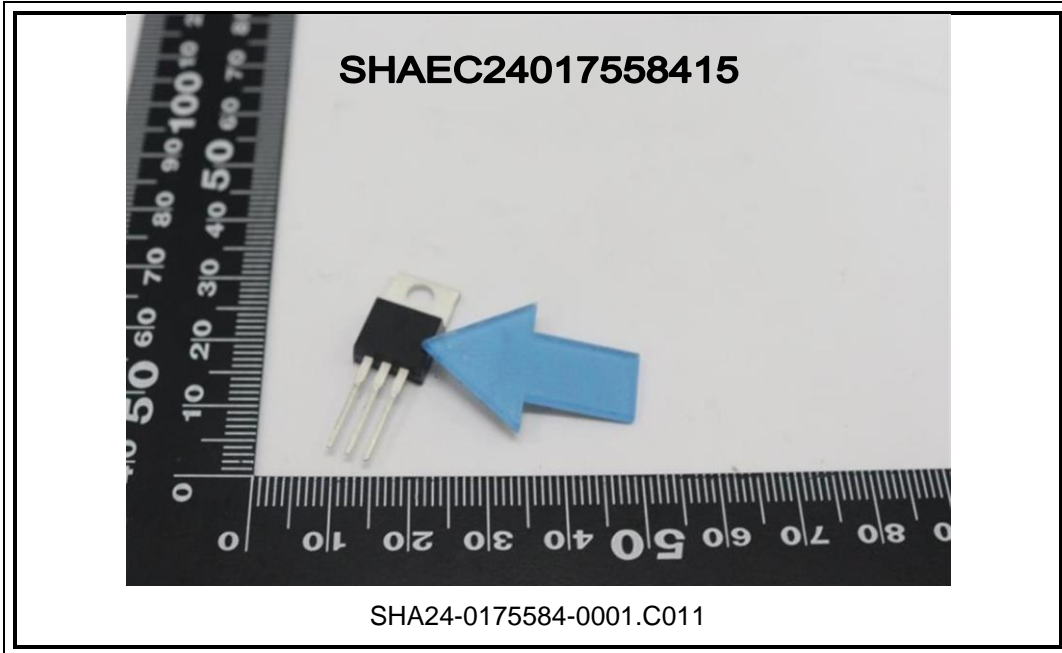
## Test Report

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Date: Aug 20, 2024

Page 14 of 15

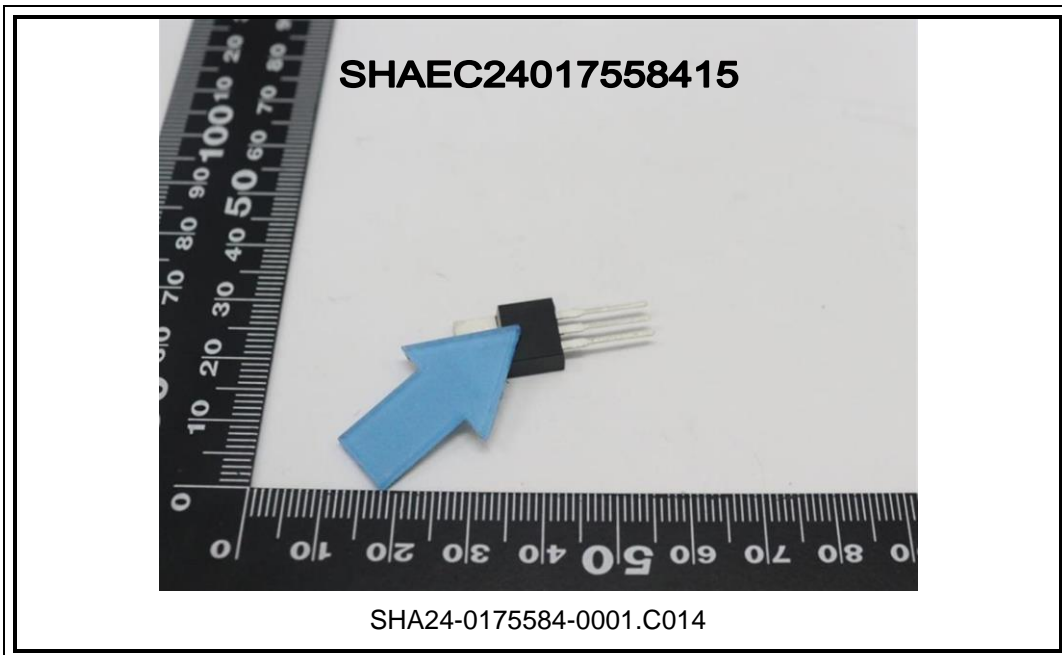
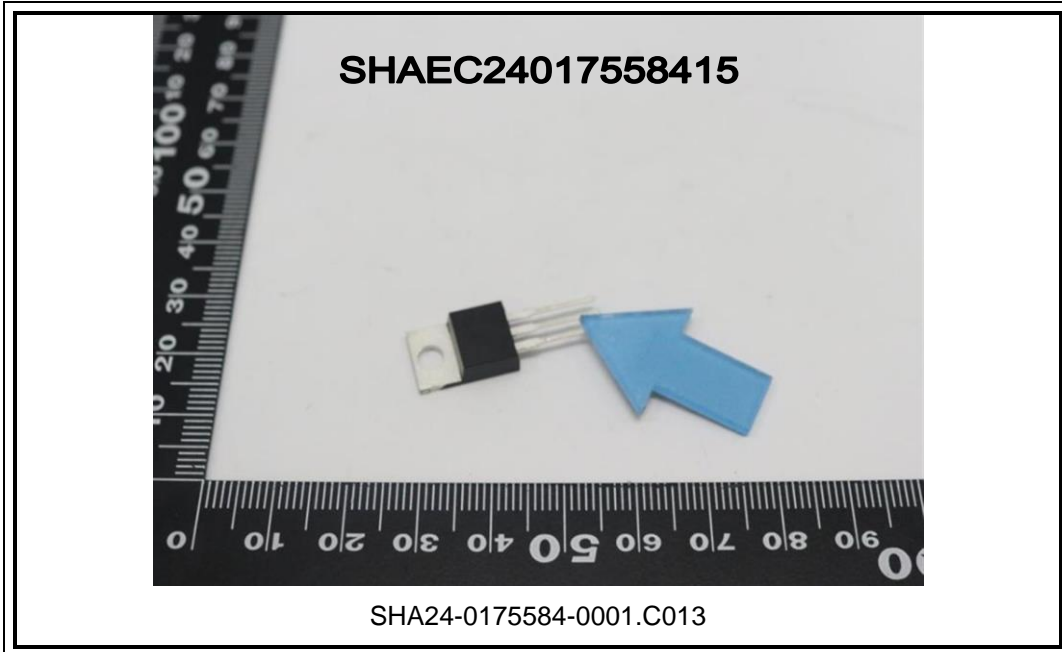
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