

Würth Electronics Midcom Inc.

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STATEMENT ON HALOGEN-FREE, POLYVINYLCHLORIDE (PVC), AND OZONE-DEPLETING SUBSTANCES (ODS)

Halogen is a chemical term for the family of elements that includes fluorine, chlorine, bromine, iodine, and astatine. For common use, halogens will not be present in their elemental forms, but in bound condition as part of molecules, or as ions. Excepting astatine, they may be used individually or in mixture as PVC plastic, processing chemicals like solvents and refrigerants (some are ODS), and many more materials.

Awareness of human and environmental consequences has brought halogenated materials under critical evaluation, resulting in restriction of uses.

Halogen content standards take into account the component type, like chips, printed circuit boards and laminates, or plastics, and consider whether halogen is present by natural means or intentional addition, or is part of a recognized flame retardant, or excludes fluorine and iodine. Halogen concentrations are defined as the criteria for “halogen-free,” “low-halogen,” and “BFR/CFR/PVC-free.” See table below for an incomplete list of halogen-free definitions and standards. Occasionally, references equivocate halogens with halogenated flame retardants (HFR); this is a mistake as halogens are elements and HFRs are molecules and will lead to error in judging concentration.

Table: Abbreviated Examples of Halogen-free Definitions and Standards

Standard	Concentration, % (ppm)				
	Br	Cl	Br + Cl	BFR	CFR + PVC polymers
1	≤ 0.09 (900)	≤ 0.09 (900)	< 0.15 (1500)	n/a	n/a
2	n/a	n/a	n/a	< 0.1 (1000)	< 0.1 (1000)
3	< 0.1 (1000)	< 0.1 (1000)	n/a	n/a	n/a

Bromine (Br), Chlorine (Cl), Brominated Flame Retardant (BFR), Chlorinated Flame Retardant (CFR), Polyvinylchloride (PVC)

- 1) JPCA-ES-01-1999 (boards), IEC 61249-2-21:2003 (boards), IPC-4101 (boards), iNEMI (board, laminates, non-halogenated epoxide)
- 2) iNEMI (plastics), IBM Halogenated Flame Retardants and Polyvinylchloride Material Substances Specification, EC P17844
- 3) JEDEC 709B (all product contents, as HFRs)

Not all halogens present risks in Würth Electronics Midcom products. Astatine is exceedingly rare and radioactive, so it is absent from use. Iodine compounds are generally unsuitable for electronics operating conditions due to instability; iodine is detectable with common tests and has not been found in Würth Electronic Midcom components. Fluorine occurs in fluoropolymers as wire insulation and modifiers in injection molding compounds; its compounds are very stable. Halides, the ion form of halogens, are only present in low and fugitive amounts, the very small remnants of soldering or other processes and pose low, or no, health risk. The halogens astatine, iodine, and fluorine, and all halides are, therefore, not of concern in Würth Electronics Midcom products.

However, chlorine and bromine as flame retardant additives in tapes, coatings, and resin materials, such as adhesives, potting, and molding compounds, may be of concern. This is due to potential human exposure

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under special circumstances. The intentional use of halogens chlorine and bromine is of interest in Würth Electronics Midcom products, but excludes unintentional trace amounts.

Products manufactured by Würth Electronics Midcom may contain halogenated materials by application of current technology to provide flame retardancy and insulation safety, these to meet safety standard requirements in cooperation with customer demand for operating efficiency and package dimensions. Design changes are available to accommodate halogen restrictions, but will also require balancing subsequent changes of safety ratings or package dimensions.

For Würth Electronics Midcom, halogen-free means that concentrations of intentionally added chlorine and bromine within each homogeneous material of a product meet IEC 61249-2-21 criteria (regardless of scope applicability) and, therefore, also meet the low-halogen criteria of JEDEC JS709.

Additionally, products manufactured by Würth Electronics Midcom do not contain PVC or ODS, have not been processed using ODS, and comply with various regional implementations of the Montreal Protocol, such as Regulation (EU) 2019/1021.

A handwritten signature in black ink, reading 'John L. Hauber'. The signature is written in a cursive style with a large, prominent 'J' and 'H'.

John Hauber
Materials Compliance Engineer

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