



## **TO-220**

# **RoHS Compliance Document**

Contents:

1. Composition
2. Tin Whisker Report



**TO-220 BOM 1**

Component	Material Name	Material Mass (g)	Element Name Composition	CAS #	Substance Mass (g)	Material Analysis Weight (%)	% of Total Weight
Chip	Silicon	0.01960	Si	7440-21-3	0.01960	100%	1.0%
Encapsulant	Epoxy Resin	0.52430	SiO <sub>2</sub>	7631-86-9	0.44041	84%	22.6%
			Epoxy	90598-46-2	0.03670	7%	1.9%
			Other	-	0.04718	9%	2.4%
Lead Frame	Copper	1.37530	Cu	7440-50-8	1.37324	100%	70.3%
			Sn	7440-31-5	0.00206	0%	0.1%
Die Attach	J-Alloy	0.01150	Sn	7440-31-5	0.00748	65%	0.4%
			Ag	7440-22-4	0.00288	25%	0.1%
			Sb	7440-36-0	0.00115	10%	0.1%
Wire Bond	Aluminum	0.00580	Al	7429-90-5	0.00580	100%	0.3%
Lead Finish	Matte Tin Over Nickel*	0.01520	Ni	7440-02-0	0.00213	14%	0.1%
			Sn	7440-31-5	0.01307	86%	0.7%

Total Weight  
(g)

**1.95170**

\*Tin whisker mitigation strategy is nickel under-plate.



**TO-220 BOM 2**

Component	Material Name	Material Mass (g)	Element Name Composition	CAS #	Substance Mass (g)	Material Analysis Weight (%)	% of Total Weight
Chip	Silicon	0.01960	Si	7440-21-3	0.01960	100%	1.0%
Encapsulant	Epoxy Resin	0.52430	SiO <sub>2</sub>	7631-86-9	0.44041	84%	22.6%
			Epoxy	90598-46-2	0.03670	7%	1.9%
			Other	-	0.04718	9%	2.4%
Lead Frame	Copper	1.37530	Cu	7440-50-8	1.37324	100%	70.4%
			Sn	7440-31-5	0.00206	0%	0.1%
Die Attach	J-Alloy	0.01150	Sn	7440-31-5	0.00748	65%	0.4%
			Ag	7440-22-4	0.00288	25%	0.1%
			Sb	7440-36-0	0.00115	10%	0.1%
Wire Bond	Aluminum	0.00580	Al	7429-90-5	0.00580	100%	0.3%
Lead Finish	Matte Tin*	0.01520	Sn	7440-31-5	0.01520	100%	0.7%

Total Weight  
(g)

**1.95170**

\*Tin whisker mitigation strategy is 150 °C, 1 hour anneal within 24 hours of tin plating.

This part is compliant with EU Directive 2002/95/EC (RoHS) and does not contain lead, mercury, cadmium (0.01%), hexavalent chromium, PBB or PBDE in concentrations greater than 0.1%, except as permitted by Annex (7).



**TO-220 BOM 3**

Component	Material Name	Material Mass (g)	Element Name Composition	CAS #	Substance Mass (g)	Material Analysis Weight (%)	% of Total Weight
Chip	Silicon	0.01960	Si	7440-21-3	0.01960	100%	1.0%
Encapsulant	Epoxy Resin	0.52430	SiO <sub>2</sub>	7631-86-9	0.44041	84%	22.6%
			Epoxy	90598-46-2	0.03670	7%	1.9%
			Other	-	0.04718	9%	2.4%
Lead Frame	Copper	1.37530	Cu	7440-50-8	1.37324	100%	70.4%
			Sn	7440-31-5	0.00206	0%	0.1%
Die Attach	Soft Solder	0.01150	Pb	7439-92-1	0.01098	95.5%	0.4%
			Sn	7440-31-5	0.00023	2%	0.1%
			Ag	7440-22-4	0.00029	2.5%	0.1%
Wire Bond	Aluminum	0.00580	Al	7429-90-5	0.00580	100%	0.3%
Lead Finish	Matte Tin*	0.01520	Sn	7440-31-5	0.01520	100%	0.7%

Total Weight

(g)

**1.95169**

\*Tin whisker mitigation strategy is 150 °C, 1 hour anneal within 24 hours of tin plating.



**TO-220 BOM 4**

Component	Material Name	Material Mass (g)	Element Name Composition	CAS #	Substance Mass (g)	Material Analysis Weight (%)	% of Total Weight
Chip	Silicon	0.01960	Si	7440-21-3	0.01960	100%	1.0%
Encapsulant	Epoxy Resin	0.52430	SiO <sub>2</sub>	7631-86-9	0.44041	84%	22.6%
			Epoxy	90598-46-2	0.03670	7%	1.9%
			Other	-	0.04718	9%	2.4%
Lead Frame	Copper	1.37530	Cu	7440-50-8	1.37324	100%	70.3%
			Sn	7440-31-5	0.00206	0%	0.1%
Die Attach	Soft Solder	0.01150	Pb	7440-92-1	0.01098	95.5%	0.4%
			Sn	7440-31-5	0.00023	2%	0.1%
			Ag	7440-22-4	0.00029	2.5%	0.1%
Wire Bond	Aluminum	0.00580	Al	7429-90-5	0.00580	100%	0.3%
Lead Finish	Matte Tin Over Nickel*	0.01520	Ni	7440-02-0	0.00213	14%	0.1%
			Sn	7440-31-5	0.01307	86%	0.7%

Total Weight

(g)

**1.95169**

\*Tin whisker mitigation strategy is nickel under-plate.

This part is compliant with EU Directive 2002/95/EC (RoHS) and does not contain lead, mercury, cadmium (0.01%), hexavalent chromium, PBB or PBDE in concentrations greater than 0.1%, except as permitted by Annex (7).

The information contained in this document is provided without any warranty, either expressed or implied, and IR specifically disclaims any and all liability, including but not limited to consequential or indirect damages.



**TO-220 IR**

Test Definition	Test Conditions	Inspection Interval Class 1 and 2 Products	Total Duration Class 1 and 2 Products	Maximum Whisker Length (µm)
<b>Room Temperature Humidity</b>	30± 2°C/60± 3% RH	1000 hours	4000 hours	20
<b>Temperature Humidity Unbiase</b>	55± 3°C/85± 3% RH	1000 hours	4000 hours	20
<b>Temperature Cycling</b>	-40 to 55°C to 80 to 95°C, air to air, 10 min soak, approx 3	500 cycles	1500 cycles	45

Tin Whisker testing per JESD201, Environmental Acceptance Requirements for Tin Whisker Susceptibility of Tin and Tin Alloy Surface Finish

Tin Whisker Results (number of failing whiskers)

Test	1000 Hours	2000 Hours	3000 Hours	4000 Hours
<b>Room Temperature Humidity Storage</b>	0/40	0/40	0/40	0/40
<b>Temperature Humidity</b>	0/40	0/40	0/40	0/40
Test	500 Cycles	1000 Cycles	1500 Cycles	
<b>Temperature Cycling</b>	0/40	0/40	0/40	