



TO-220 Full Pak

RoHS Compliance Document

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TO-220 Full Pak BOM 1

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|-------------|------------------------|-------------------|--------------------------|------------|--------------------|------------------------------|-------------------|
| Chip | Silicon | 0.01207 | Si | 7440-21-3 | 0.01207 | 100% | 0.6% |
| Encapsulant | Epoxy Resin | 0.99330 | SiO2 | 7631-86-9 | 0.79464 | 80% | 37.1% |
| | | | Epoxy | 90598-46-2 | 0.14900 | 15% | 7.0% |
| | | | Other | - | 0.04966 | 5% | 2.3 % |
| Lead Frame | Copper | 1.12350 | Cu | 7440-50-8 | 1.11788 | 99% | 52.2% |
| | | | Sn | 7440-31-5 | 0.00562 | 1% | 0.3% |
| Die Attach | J-Alloy | 0.00630 | Sn | 7440-31-5 | 0.00410 | 65% | 0.2% |
| | | | Ag | 7440-22-4 | 0.00158 | 25% | 0.1% |
| | | | Sb | 7440-36-0 | 0.00062 | 10% | 0.0% |
| Wire bond | Aluminum | 0.00130 | Al | 7429-90-5 | 0.00130 | 100% | 0.1% |
| Lead Finish | Matte Tin over Nickel* | 0.00510 | Ni | 7440-02-0 | 0.00071 | 14% | 0.0% |
| | | | Sn | 7440-31-5 | 0.00439 | 86% | 0.2% |

Total Weight (g) **2.14157**

* Tin whisker mitigation strategy is nickel under-plate.

TO-220 Full Pak BOM 2

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|-------------|---------------|-------------------|--------------------------|------------|--------------------|------------------------------|-------------------|
| Chip | Silicon | 0.01207 | Si | 7440-21-3 | 0.01207 | 100% | 0.6% |
| Encapsulant | Epoxy Resin | 0.99330 | SiO2 | 7631-86-9 | 0.79464 | 80% | 37.1% |
| | | | Epoxy | 90598-46-2 | 0.14900 | 15% | 7.0% |
| | | | Other | - | 0.04966 | 5% | 2.3 % |
| Lead Frame | Copper | 1.12350 | Cu | 7440-50-8 | 1.11788 | 99% | 52.2% |
| | | | Sn | 7440-31-5 | 0.00562 | 1% | 0.3% |
| Die Attach | J-Alloy | 0.00630 | Sn | 7440-31-5 | 0.00410 | 65% | 0.2% |
| | | | Ag | 7440-22-4 | 0.00158 | 25% | 0.1% |
| | | | Sb | 7440-36-0 | 0.00062 | 10% | 0.0% |
| Wire bond | Aluminum | 0.00130 | Al | 7429-90-5 | 0.00130 | 100% | 0.1% |
| Lead Finish | Matte Tin* | 0.00510 | Sn | 7440-31-5 | 0.00510 | 100% | 0.2% |

Total Weight (g) **2.14157**

* 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 Full Pak

| Test Definition | Test Conditions | Inspection Interval Class 1 and 2 Products | Total Duration Class 1 and 2 Products | Maximum Whisker Length (um) |
|--|--|---|--|------------------------------------|
| Room Temperature Humidity Storage | 30± 2°C/60± 3%RH | 1000 hours | 4000 hours | 20 |
| Temperature Humidity Unbiased | 55± 3°C/85±3% RH | 1000 hours | 4000 hours | 20 |
| Temperature Cycling | -40 to 55°C to 80 to 95°C, air to air, 10 min soak, approx 3 cycles /hours | 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 |
|--|-------------------|--------------------|--------------------|-------------------|
| Room Temperature Humidity Storage | 0/40 | 0/40 | 0/40 | 0/40 |
| Temperature Humidity Unbiased | 0/40 | 0/40 | 0/40 | 0/40 |
| Test | 500 Cycles | 1000 Cycles | 1500 Cycles | |
| Temperature Cycling | 0/40 | 0/40 | 0/40 | |