International Rectifier

# PQFN 5X6

# RoHS Compliance Document

Contents:

1. Composition
2. Solder Reflow
3. Tin Whisker Report

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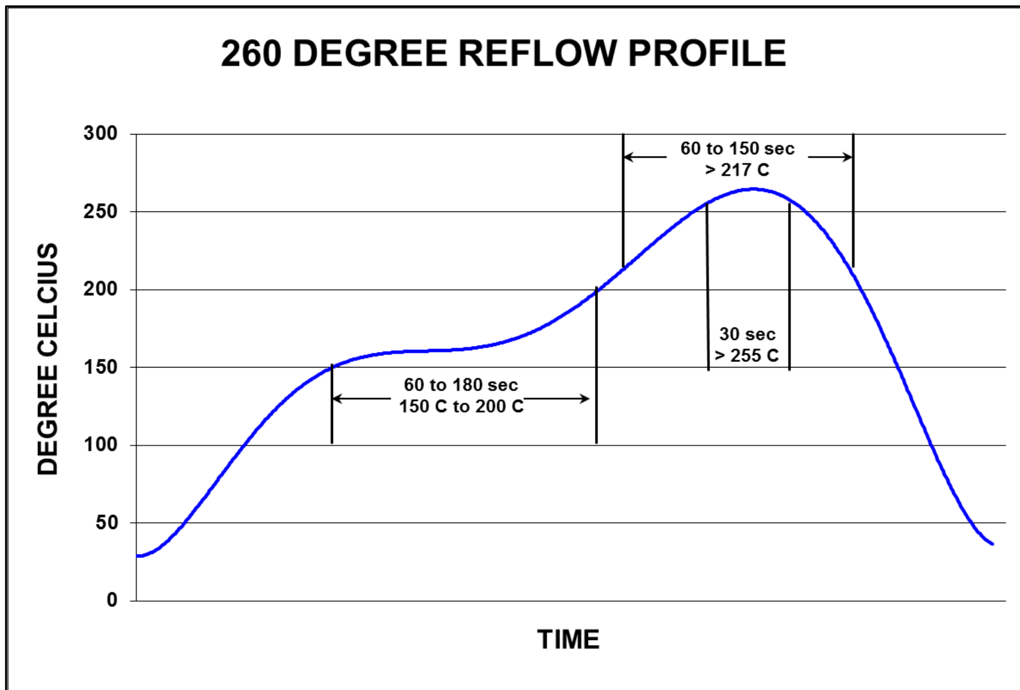
November 2015

IOR International Rectifier

## PQFN 5X6 BOM 1 Copper Clip

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.5% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 37.8% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 4.6% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 41.3% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.0% |
| Die Attach | Silver Epoxy | 0.00083 | Pb | 7439-92-1 | 0.00077 | 92.5% | 0.9% |
| | | | Sn | 7440-31-5 | 0.00004 | 5% | 0.0% |
| | | | Ag | 7440-22-4 | 0.00002 | 2.5% | 0.0% |
| Copper Clip | Copper | 0.00995 | Cu | 7440-50-8 | 0.00995 | 100% | 11.0% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.3% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.6% |
| | | | Total Weight (g) | | **0.09024** | | |

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

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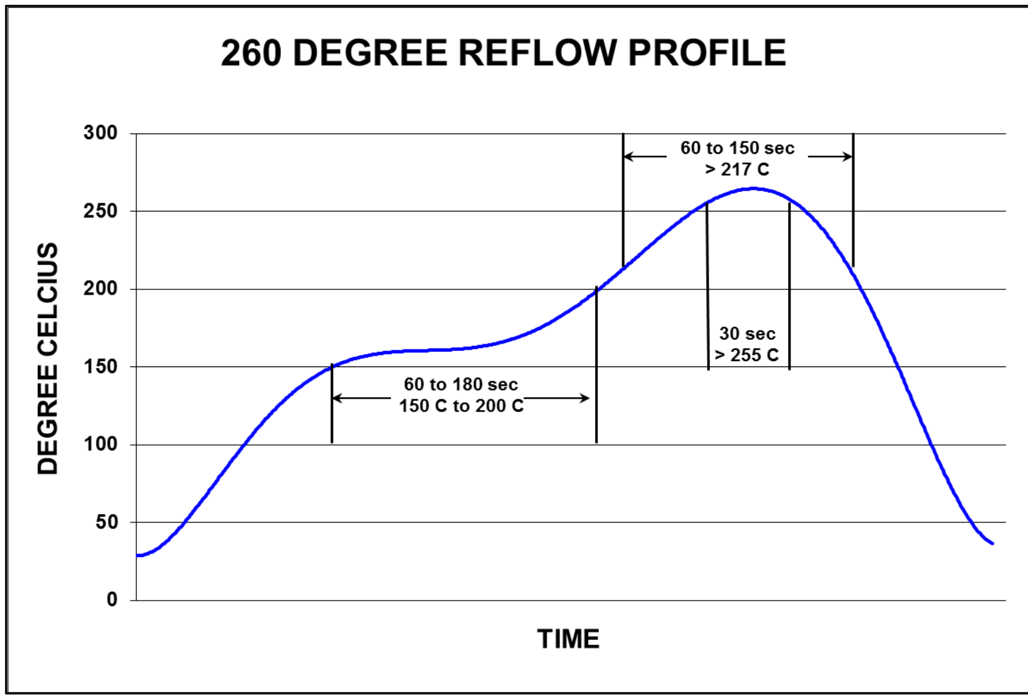
## PQFN 5X6 BOM 2 Copper Clip

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.5% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 37.8% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 4.6% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 41.3% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.0% |
| Die Attach | Sold Solder | 0.00083 | Pb | 7439-92-1 | 0.00077 | 92.5% | 0.9% |
| | | | Sn | 7440-31-5 | 0.00004 | 5% | 0.0% |
| | | | Ag | 7440-22-4 | 0.00002 | 2.5% | 0.0% |
| Copper Clip | Copper | 0.00995 | Cu | 7440-57-5 | 0.00995 | 100% | 11.0% |
| Wire Bond | Gold | 0.00031 | Au | 7440-50-8 | 0.00031 | 100% | 0.3% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.6% |
| | | | Total Weight (g) | | **0.09024** | | |

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

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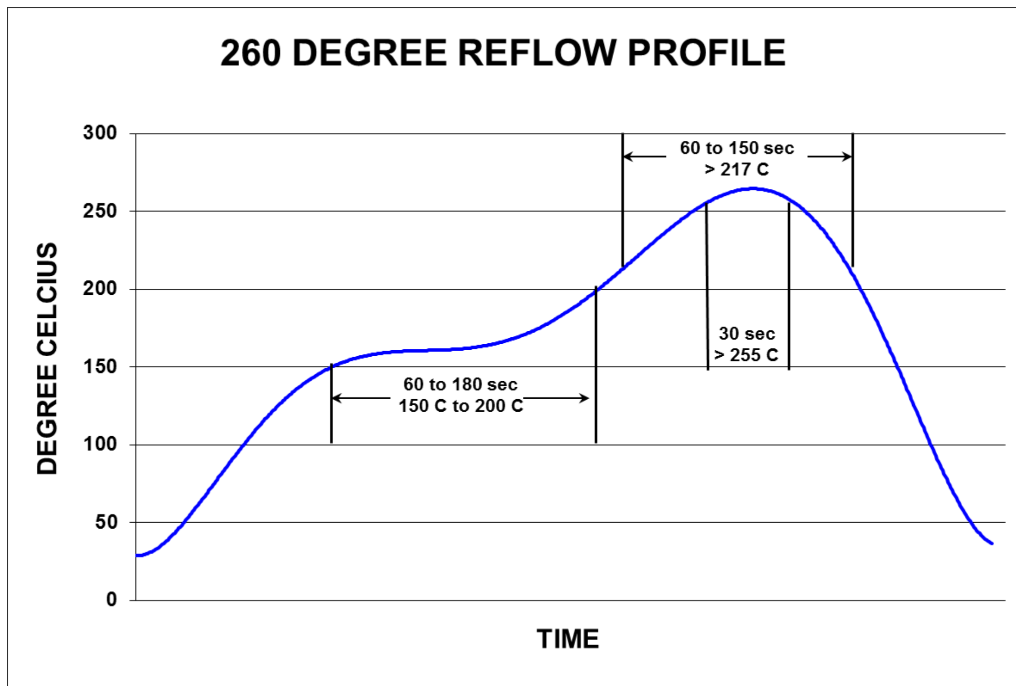
## PQFN 5X6 BOM 3 Copper Clip

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.5% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 37.8% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 4.6% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 41.3% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.0% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00079 | 95% | 0.9% |
| | | | Sn | 7440-31-5 | 0.00004 | 5% | 0.0% |
| Copper Clip | Copper | 0.00995 | Cu | 7440-50-8 | 0.00995 | 100% | 11.0% |
| Wire Bond | Gold | 0.00031 | Au | 7440-57-5 | 0.00031 | 100% | 0.3% |
| Lead Finish | Ni/Pd/Au | 0.00146 | Ni | 7440-02-0 | 0.00135 | 92.4% | 1.7% |
| | | | Pd | 7440-05-3 | 0.00009 | 6.3% | 0.1% |
| | | | Au | 7440-57-5 | 0.00002 | 1.3% | 0.0% |
| | | | Total Weight (g) | | **0.09024** | | |

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

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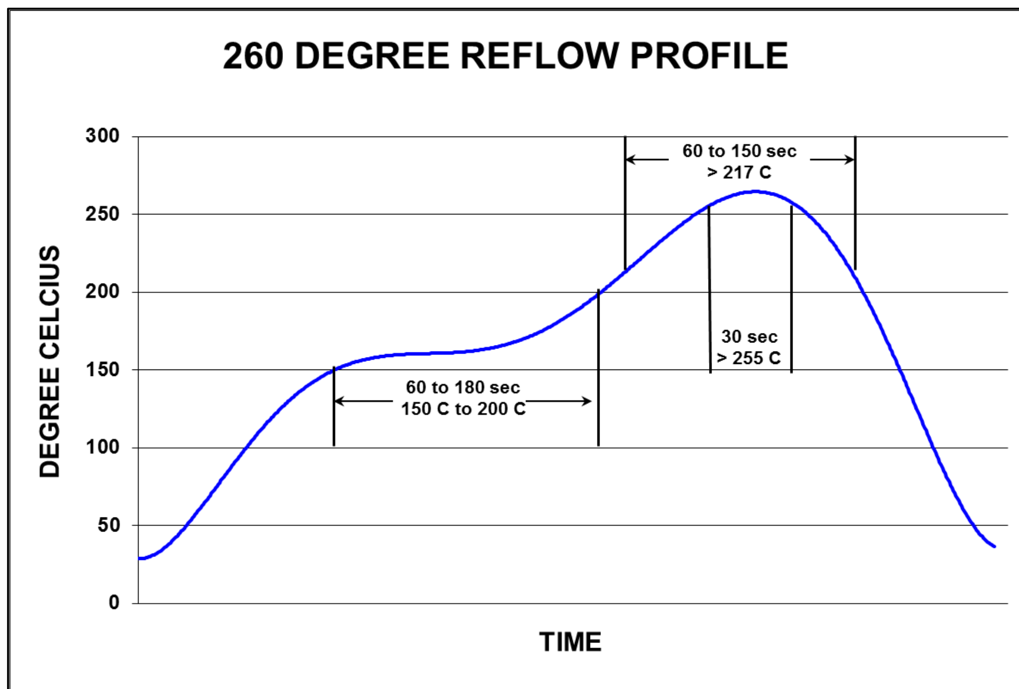
## PQFN 5X6 BOM 4 Copper Clip

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.5% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 37.8% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 4.6% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 41.3% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.0% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00079 | 95% | 0.9% |
| | | | Sn | 7440-31-5 | 0.00004 | 5% | 0.0% |
| Copper Clip | Copper | 0.00995 | Cu | 7440-50-8 | 0.00995 | 100% | 11.0% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.3% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.6% |
| | | | Total Weight (g) | | **0.09024** | | |

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

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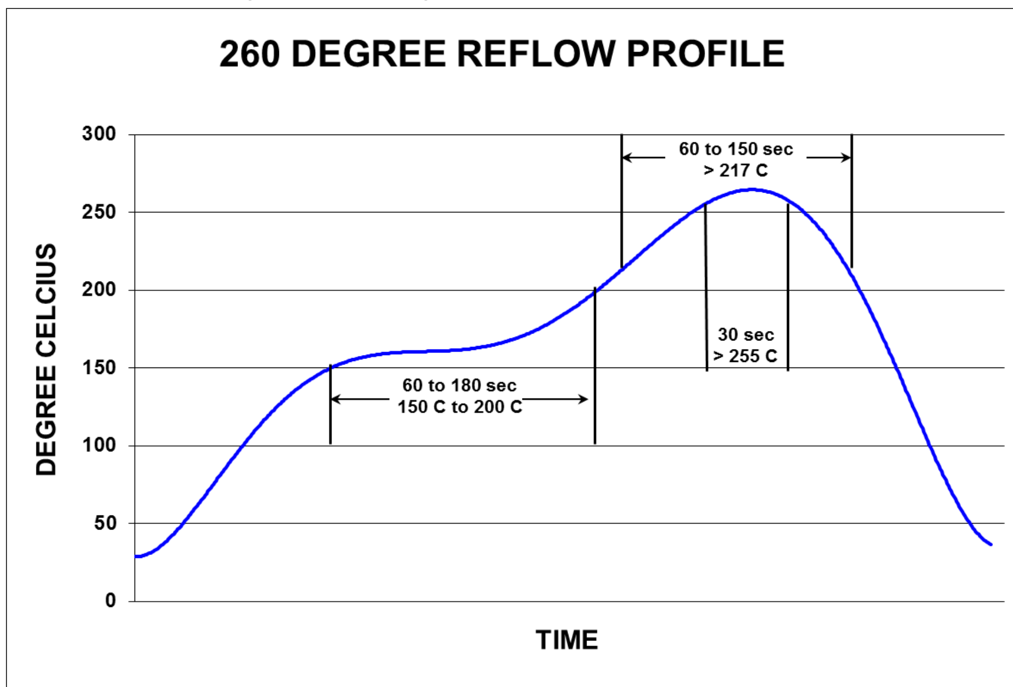
## PQFN 5X6 BOM 5 Ribbon

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.6% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 42.0% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.1% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 45.9% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.1% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00077 | 92.5% | 0.9% |
| | | | Sn | 7440-31-5 | 0.00004 | 5% | 0.0% |
| | | | Ag | 7440-22-4 | 0.00002 | 2.5% | 0.0% |
| Wire Bond | Aluminum Ribbon | 0.00093 | Al | 7429-90-5 | 0.00093 | 100% | 1.1% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.4% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.8% |
| | | | Total Weight (g) | | **0.08122** | | |

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

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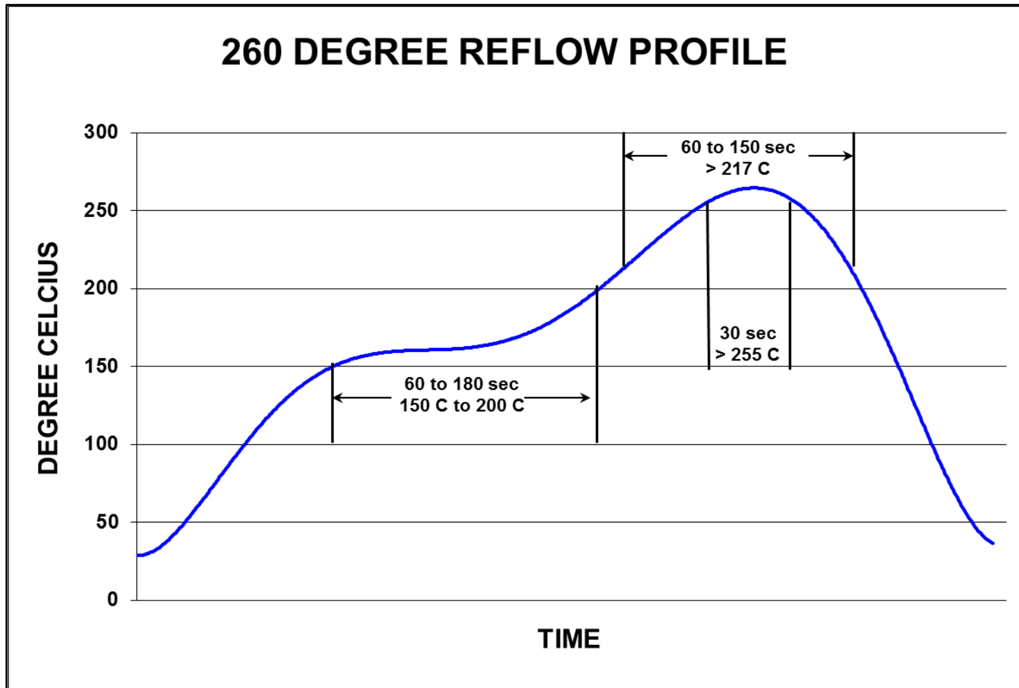
## PQFN 5X6 BOM 6 Ribbon

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.6% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 42.0% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.1% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 45.9% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.1% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00079 | 92.5% | 0.9% |
| | | | Sn | 7440-31-5 | 0.00002 | 5% | 0.0% |
| | | | Ag | 7440-22-4 | 0.00002 | 2.5% | 0.0% |
| Wire Bond | Aluminum Ribbon | 0.00093 | Al | 7429-90-5 | 0.00093 | 100% | 1.1% |
| Wire Bond | Gold | 0.00031 | Au | 7440-57-5 | 0.00031 | 100% | 0.4% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.8% |
| | | | Total Weight (g) | | **0.08122** | | |

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

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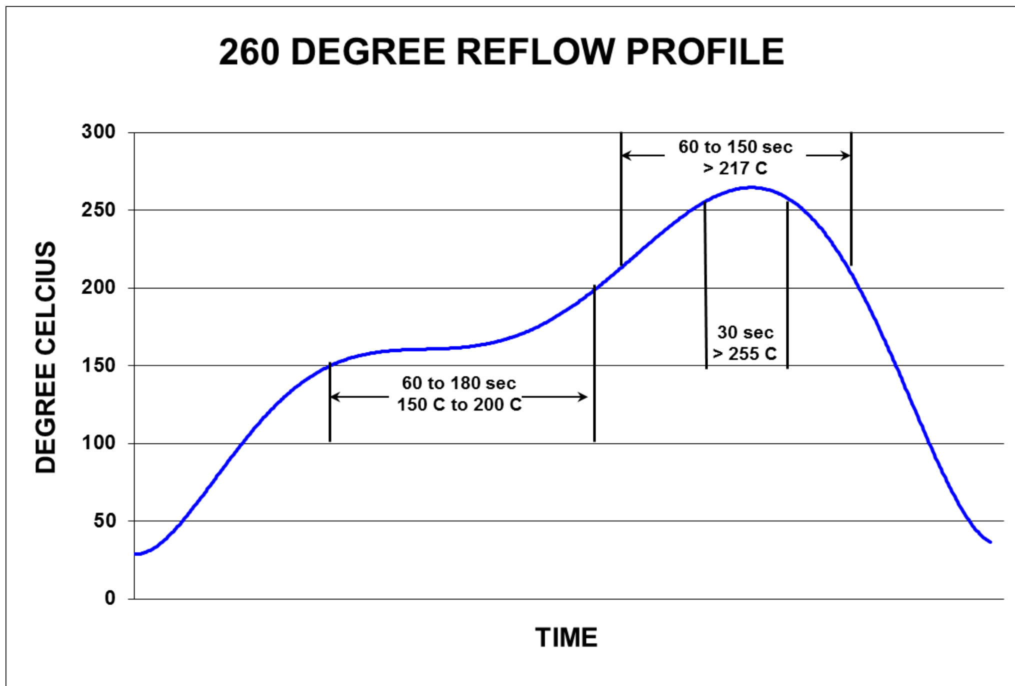
## PQFN 5X6 BOM 7 Ribbon

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.6% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 42.5% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.1% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 46.4% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.1% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00079 | 92.5% | 1.0% |
| | | | Sn | 7440-31-5 | 0.00002 | 5% | 0.0% |
| | | | Ag | 7440-22-4 | 0.00002 | 2.5% | 0.1% |
| Wire Bond | Aluminum Ribbon | 0.00093 | Al | 7429-90-5 | 0.00093 | 100% | 1.1% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.4% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.8% |
| | | | Total Weight (g) | | **0.08122** | | |

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

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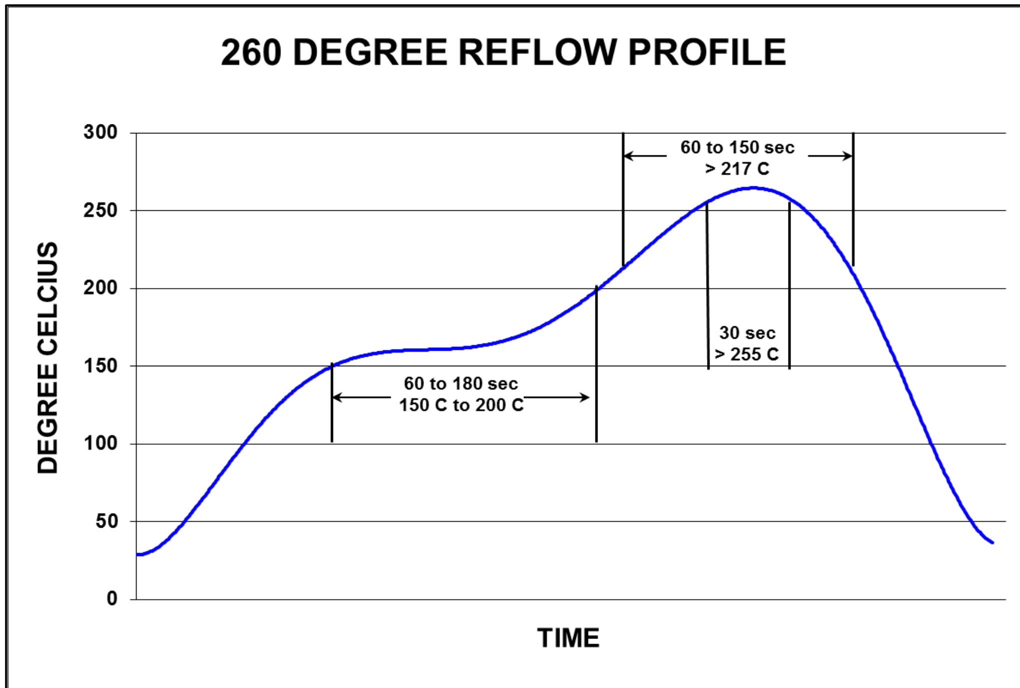
**PQFN 5X6 BOM 8**

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.6% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 42.5% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.1% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 46.4% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.1% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00079 | 95.5% | 1.0% |
| | | | Sn | 7440-31-5 | 0.00002 | 2% | 0.0% |
| | | | Ag | 7440-22-4 | 0.00002 | 2.5% | 0.1% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.4% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.8% |
| | | | Total Weight (g) | | **0.08029** | | |

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

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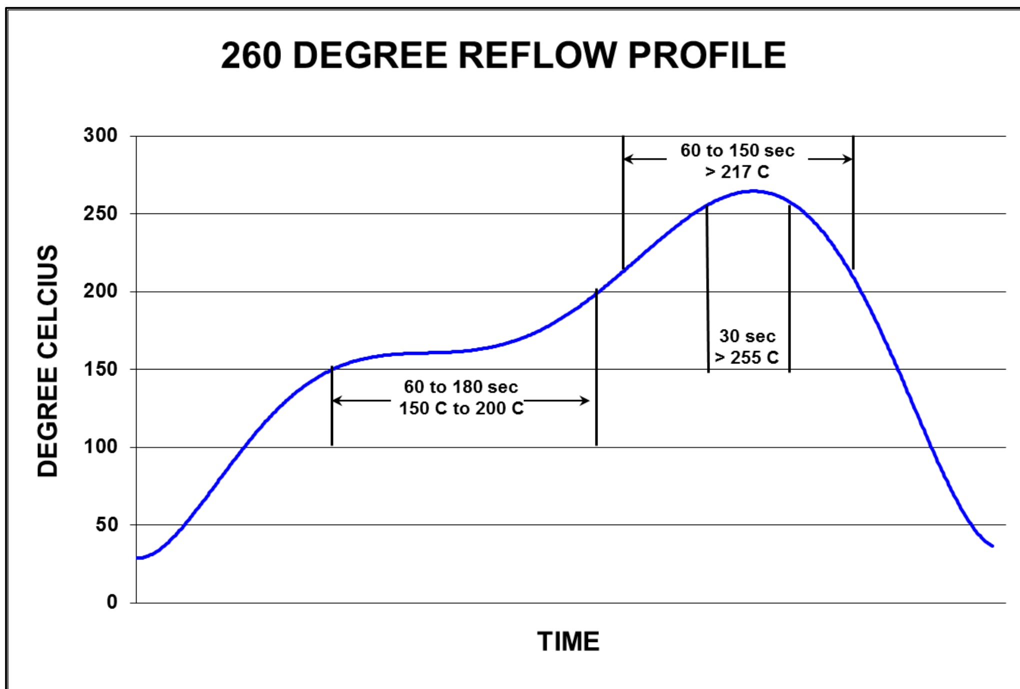
**PQFN 5X6 BOM 9**

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.6% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 42.5% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.1% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 46.4% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.1% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00077 | 92.5% | 1.0% |
| | | | Sn | 7440-31-5 | 0.00004 | 5% | 0.1% |
| | | | Ag | 7440-22-4 | 0.00002 | 2.5% | 0.0% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.4% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.8% |
| | | | Total Weight (g) | | **0.08029** | | |

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

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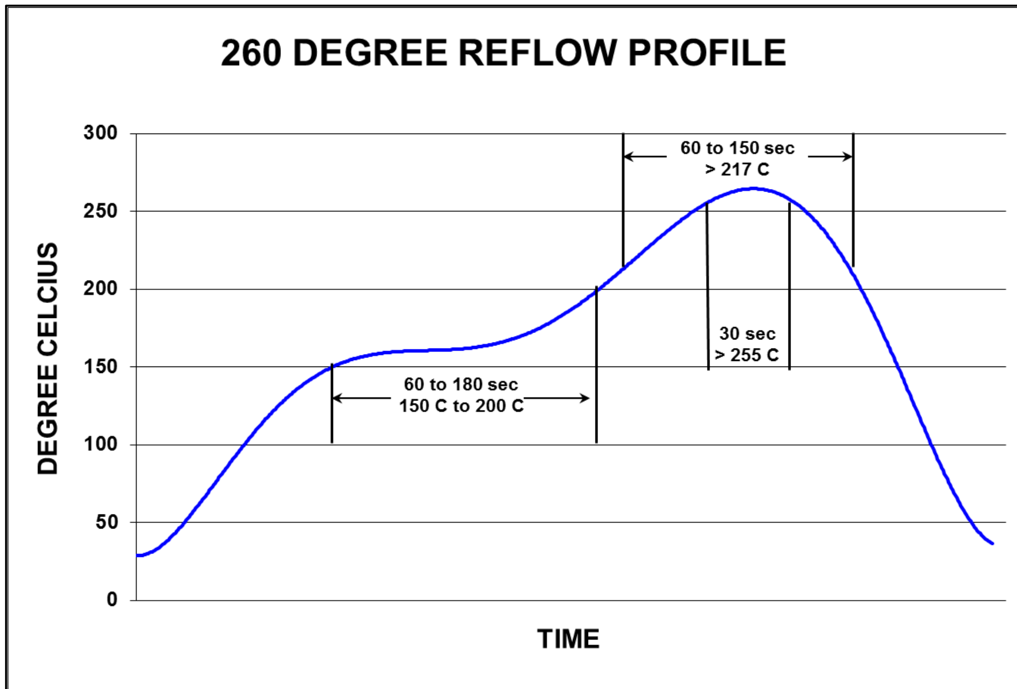
## PQFN 5X6 BOM 10

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.6% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 42.5% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.1% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 46.4% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.1% |
| Die Attach | Silver Epoxy | 0.00083 | Ag | 7440-22-4 | 0.00060 | 72% | 0.7% |
| | | | Epoxy | 90598-46-2 | 0.00023 | 28% | 0.3% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.4% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.8% |
| | | | Total Weight (g) | | **0.08029** | | |

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

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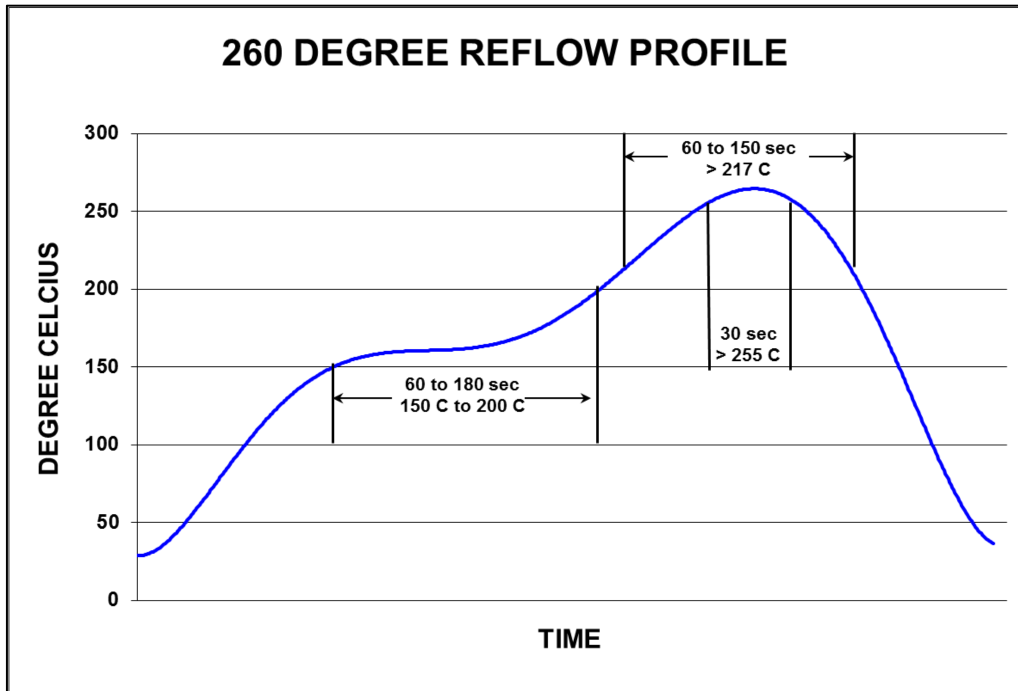
**PQFN 5X6 BOM 11**

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.6% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 42.5% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.1% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 46.4% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.1% |
| Die Attach | Silver Epoxy | 0.00083 | Ag | 7440-22-4 | 0.00060 | 72% | 0.7% |
| | | | Epoxy | 90598-46-2 | 0.00023 | 28% | 0.3% |
| Wire Bond | Copper | 0.00031 | Cu | 7440-50-8 | 0.00031 | 100% | 0.4% |
| Lead Finish | Ni/Pd/Au | 0.00146 | Ni | 7440-02-0 | 0.00135 | 92.4% | 1.7% |
| | | | Pd | 7440-05-3 | 0.00009 | 6.3% | 0.1% |
| | | | Au | 7440-57-5 | 0.00002 | 1.3% | 0.0% |
| | | | Total Weight (g) | | **0.08029** | | |

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

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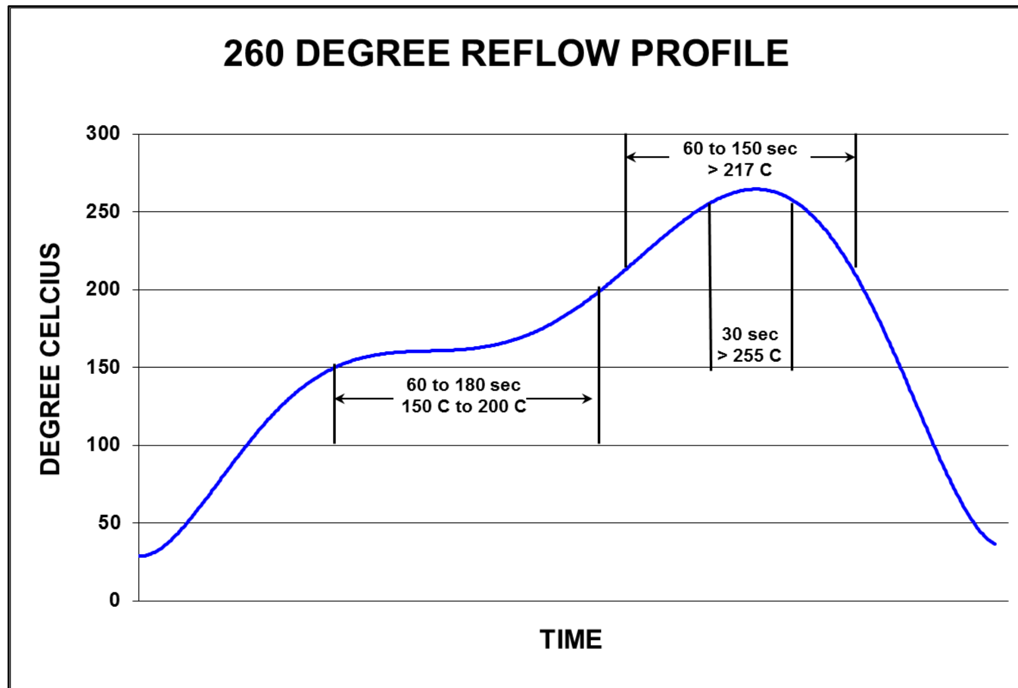
**PQFN 5X6 BOM 12 Copper Clip**

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.5% |
| Encapsulant | Epoxy Resin | 0.03822 | $SiO_2$ | 7631-86-9 | 0.03409 | 89% | 37.8% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 4.6% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 41.3% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.0% |
| Die Attach | Soft Solder | 0.00083 | Pb | 7439-92-1 | 0.00079 | 95% | 0.9% |
| | | | Sn | 7440-31-5 | 0.00004 | 5% | 0.0% |
| Copper Clip | Copper | 0.00995 | Cu | 7440-50-8 | 0.00995 | 100% | 11.0% |
| Wire Bond | Gold | 0.00031 | Au | 7440-57-5 | 0.00031 | 100% | 0.3% |
| Lead Finish | Matte Tin* | 0.00146 | Sn | 7440-31-5 | 0.00146 | 100% | 1.6% |
| | | | Total Weight (g) | | **0.09024** | | |

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




This part is compliant with EU Directive 2011/65/EU (RoHS Directive) 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 III. Further part complies with 3 reflow cycles per JEDEC J-STD-020

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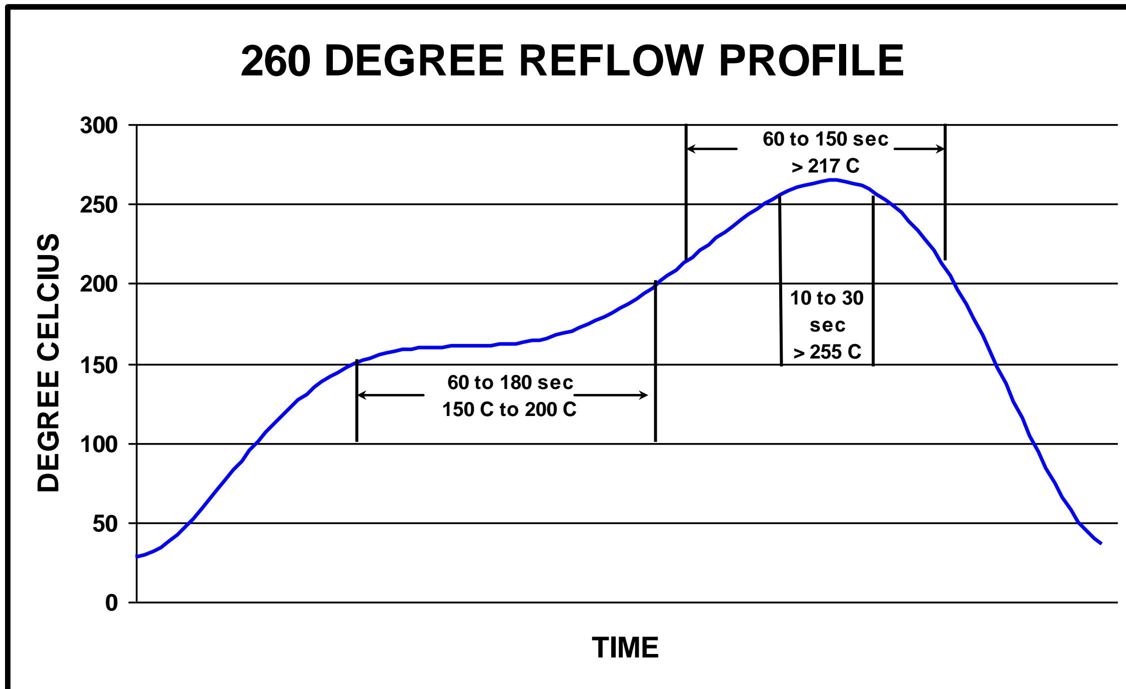
IOR International Rectifier

**PQFN 5X6 BOM 13 Au/Cu Wire**

| Component | Material Name | Material Mass (g) | Element Name Composition | CAS # | Substance Mass (g) | Material Analysis Weight (%) | % of Total Weight |
|---|---|---|---|---|---|---|---|
| Chip | Silicon | 0.00131 | Si | 7440-21-3 | 0.00131 | 100% | 1.62% |
| Encapsulant | Epoxy Resin | 0.03822 | SiO2 | 7631-86-9 | 0.03409 | 89% | 42.13% |
| | | | Epoxy | 90598-46-2 | 0.00413 | 11% | 5.10% |
| Lead Frame | Copper | 0.03816 | Cu | 7440-50-8 | 0.03727 | 98% | 46.06% |
| | | | Fe | 7439-89-6 | 0.00089 | 2% | 1.10% |
| Die Attach | Silver Epoxy | 0.00083 | Ag | 7440-22-4 | 0.0006 | 72% | 0.74% |
| | | | Epoxy | 90598-46-2 | 0.00023 | 28% | 0.28% |
| Wire Bond | Gold | 0.0004 | Au | 7440-57-5 | 0.0004 | 100% | 0.49% |
| Wire Bond | Copper | 0.00053 | Cu | 7440-50-8 | 0.00053 | 100% | 0.66% |
| Lead Finish | NiPdAu | 0.00146 | Ni | 7440-02-0 | 0.00135 | 92.40% | 1.67% |
| | | | Pd | 7440-05-3 | 0.00009 | 6.30% | 0.11% |
| | | | Au | 7440-57-5 | 0.00002 | 1.30% | 0.02% |
| | | | Total Weight (g) | | **0.08091** | | |

* No tin whisker mitigation strategy since there is no tin.



| Test Definition | Test Conditions | Inspection Interval Class 1 and 2 Products | Total Duration Class 1 and 2 Products | Maximum Whisker Length (μm) |
|---|---|---|---|---|
| Room Temperature Humidity | 30± 2°C/60± 3% RH | 1000 hours | 4000 hours | 20 |
| Temperature Humidity Unbiase | 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 | 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 | 0/24 | 0/24 | 0/24 | 0/24 |
| Temperature Humidity | 0/24 | 0/24 | 0/24 | 0/24 |
| **Test** | **500 Cycles** | **1000 Cycles** | **1500 Cycles** | |
| Temperature Cycling | 0/24 | 0/24 | 0/24 | |

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