# Delivery issue of D2PAK 7L, D2PAK WL, T0247AD, ST0-247, STO220 IRF BE TIJ assembly site

## Executive Summary

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March 4, 2016

# Problem Statement

- IRF has had a distressed supplier issue with one of our lead frame supplier's raw material providers. The raw material supplier was forced into bankruptcy and ordered to cease operations. The situation with the raw material supplier has led to a significant disruption in material supply to our lead frame supplier.
- In order for our lead frame supplier to continue supply they needed to manufacture with a change in source and material from CuNiP to CuFeP alloy to meet our production demands.
- This CuFeP alloy lead frame is used in other IRF volume products.
- In order to ensure continuous supply to our customers, IRF  BE Tijuana assembly site must manufacture the following products using the slightly different leadframe Cu alloy.

| Product | 1st potential manufacture date | Effective Date Code |
|---|---|---|
| D2PAK 7L | March 1, 2016 | 1609 |
| D2PAK WL | March 1, 2016 | 1609 |
| T0-247AD (LL) | April 4, 2016 | 1614 |
| Super T0-247 | April 18th | 1616 |
| Super 220 | May 23, 2016 | 1621 |

# Risk Assessment

- IRF has analyzed this change and consider the conversion from CuNiP to CuFeP very low risk due to CuFeP is used in other IRF products and qualified on similar packages
  - IRF BE TIJ has experience in manufacturing
    - over 72 million of DPAK products using CuFeP alloy and source
    - over 889 million units across D2PAK, TO-220 & TO-247 products using CuFeP alloy from another source
  - IRF Reliability Engineering has qualified the CuFeP lead frame material in previous qualification reports summarized below with no failures

| Package Style | Part Number | Alloy Name | Qty ( Units ) | Qual Report | Date | Qual Level |
|---|---|---|---|---|---|---|
| D2PAK 3L | 44-0069-03 | CuFeP | 308 M | 20637<br>13410 | 10/3/2014<br>3/14/14 | Industrial<br>Automotive |
| D2PAK 5L | 44-0079-01 | CuFeP | 14.6 M | 11619 | 11/18/2011 | Automotive |
| D2PAK 7L | 44-0160-01 | CuFeP | 142 M | 13290 | 1/14/2014 | Automotive |
| D2PAK EIF VI 5L | 44-0212 | CuFeP | 65.8 M | 13462 | 9/30/2012 | Automotive |
| D2PAK EIF VI 7L | 44-0234-01 | CuFeP | 19.1 M | 12765 | 3/8/2013 | Automotive |
| | 44-0216 | CuFeP | 8.1 M | 12358 | 9/8/2010 | Automotive |
| | 44-0220-01 | CuFeP | 6.9 M | 11849 | 2/11/2016 | Automotive |
| TO-220 3L | 44-0155-02 | CuFeP | 219 M | 11813 | 3/14/2014 | Automotive |
| TO-247 3L | 44-0023-02 | | 69. 8 M | 20285<br>20754 | 1/30/2013<br>6/23/14 | Automotive<br>Industrial |
| | 44-1351 | | 3.5 M | 21311 | 9/23/2014 | Automotive |

# Next Steps

- To ensure a smooth transition in our factory to the alternate lead frame material IRF will be doing the following:
  - In Process Monitor:
    - In order to safe launch this change, BE TIJ will increase control plan frequency
  - Supplemental product validation for each package type will begin as product becomes available for reliability testing:

| QP Plan # | Package type |
|---|---|
| QP22141 | D2PAK WL |
| QP22142 | D2PAK 7L |
| QP22144 | TO247 for IGBT & FETS |
| QP22147 | STO247 |
| QP22148 | STO220 |

  - Final Qualification reports targeted between June 7, 2016 and July 29, 2016
  - Supply Plan
    - Continue to produce and put the new Cu Alloy product on hold in FG inventory pending PCN and/or customer approval

# Summary and Next Steps

- Summary:
  - IRF views this change as notifiable PCN and considers this very low risk based on similarities between Cu alloys, manufacturing experience and previous qualifications on similar products and materials
  - Please advise any customer inquires from this communication through your Customer Service or Sales contacts for resolution and advise approval of change to not disrupt supply

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