Peregrine Semiconductor
Peregrine Semiconductor Corp.
9380 Carroll Park Drive, San Diego, CA. 92121

# Product/Process Change (PCN) Notification

| PCN Number: CO-10781<br>Date Issued: October 15th, 2015<br>PCN Effective Date: December 4th, 2015<br>Product(s) Affected: PE42420<br>Sample Availability: November 6th, 2015<br>Change Control Board Approval #: CO-10781 | Contact: Elizabeth La Greca<br>Title: Director, Sales Operations<br>Phone: 858-795-0106<br>Email: elagreca@psemi.com |
|---|---|

## Change Category:

| | |
|---|---|
| ☐ Wafer Fabrication Process | ☐ Shipping/Labeling |
| ☐ Design/Mask Change | ☐ Equipment |
| ☐ Singulation Process | ☐ Material |
| ☒ Assembly Process – New package laminate | ☐ Product Specification |
| ☐ Electrical Test | ☐ Product End of Life |
| ☐ Manufacturing Site | ☒ Other - Ordering Code |

## Purpose of Change:

Transition to an improved laminate package material for PE42420.

## Description of Change:

Assembly supplier discontinuing current production process (electroless NiAu - ENIG) laminate plating finish and transitioning to (electroless NiPdAu - ENEPIG), an industry standard. Peregrine is taking the opportunity to make this transition in order to assure ongoing laminate supply with improved solderability, reliability and performance.

Reliability, form, fit or function is not affected by this change

Beginning December 4th, 2015 all parts shipped to the customers will be manufactured with Magnachip wafers in the new package laminate.

Ordering Codes

Original ordering code: (Magnachip + ENIG plating finish): PE42420LGBB-Z, EK42420-02

New ordering code: (MagnaChip + ENEPIG plating finish): PE42420C-Z, EK42420-03

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## Package Laminate Comparison

| | Old Laminate | New Laminate |
|---|---|---|
| **Surface Plating** | ENIG | ENEPIG |
| **Materials** | Nickel, Gold | Nickel, Palladium, Gold |
| **Ni Thickness** | 0.005mm min | 0.003-0.006mm |
| **PD Thickness** | N.A | 0.00005-0.0003mm |
| **Gold Thickness** | 0.0003-0.00015 mm | 0.00003mm min |

**Customer Acknowledgement of Receipt*:**

| | | |
|---|---|---|
| ☐ Change Denied<br>*(Include explanation in comments section below)*<br><br>☐ Change Approved | **Name:** | |
| | **Title:** | |
| | **Company:** | |
| | **Date:** | |
| | **Signature:** | |
| **Customer Comments:** | | |

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## Appendix A

PE42420

**Reliability Summary Report**

| Part Number(s): | PE42420 | Product Family: | Switch |
|---|---|---|---|
| Package Type: | 20L 4x4 FCLGA | MSL Rating: | 3 |
| Technology Platform: | ULTRACMOS®4 | | |
| Reliability Summary: | Based on the results of reliability testing, the PE42420 has met the reliability requirements for qualification. | | |

Table 1: Product Design Reliability Results

| Test # | Test Performed | TEST METHOD/ Conditions | Duration | Req'd Sample Size[2] (#LOT x SS) | Actual Sample Size[3] (#LOT x SS) | Result (REJ/SS) |
|---|---|---|---|---|---|---|
| 1 | HTOL | Mil-Std-883 M1005.9/ JESD22-A108 VDD= 5.5V; VCTL= 3.6V; $T_A = T_J$ = 150ºC; | 500 hrs. | 1 x 77 | 3 x 80 | Passed (0/240) |
| 2 | ESD HBM | Mil-Std-883 M3015 | 2.5kV | 1 x 3 devices | 1 x 10 devices | Passed (0/10) |
| 3 | ESD MM | JEDEC JESD22-A115 | 200V | 1 x 3 devices | 1 x 10 devices | Passed (0/10) |

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Table 2: Bump Reliability Results

| Test # | Test Performed | TEST METHOD/ Conditions | Duration | Req'd Sample Size[2] (#LOT x SS) | Actual Sample Size[3] (#LOT x SS) | Result (REJ/SS) |
|---|---|---|---|---|---|---|
| 4 | HTS | Mil-Std-883 M1008.2/ JEDEC JESD22 A103 $T_A$= 175ºC | 500 hrs. | 3 x 30 bumps | 3 x 30 bumps | Passed (0/90) |
| 5 | TC[1] | Mil-Std-883 M1010.8/ JESD22-A104 $T_A$= -65ºC to +150ºC | 500 cyc. | 3 x 30 bumps | 3 x 30 bumps | Passed (0/90) |
| 6 | Bump Dimensions | Mil-Std-883 M2016/ JESD22-B100 | - | 3 x 30 bumps | 3 x 30 bumps | Passed (0/90) |
| 7 | Bumped Die Reflow Evaluation 1 | IPC/JEDEC J-STD-020D.1 6x Reflow 260°C Peak | - | 3 x 30 bumps | 3 x 30 bumps | Passed (0/90) |
| 8 | Bumped Die Reflow Evaluation 2 | IPC/JEDEC J-STD-020D.1 10x Reflow 260°C Peak | - | 3 x 1 dice | 3 x 1 dice | Passed (0/3) |

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Table 3: Package Reliability Results

| Test # | Test Performed | TEST METHOD/ Conditions | Duration | Req'd Sample Size[2] (#LOT x SS) | Actual Sample Size[3] (#LOT x SS) | Result (REJ/SS) |
|---|---|---|---|---|---|---|
| 9 | HTOL | Mil-Std-883 M1005.9/ JESD22-A108 VDD= 5.5V; VCTL= 3.6V; $T_A = T_J$= 150ºC; | 500 hrs. | 3 x 77 | 3 x 80 | Passed (0/239)[5] |
| 10 | HTS | Mil-Std-883 M1008.2/ JESD22-A103 $T_A$= 150ºC | 1,000 hrs. | 1 x 77 | 3 x 95 | Passed (0/285) |
| 11 | HAST[4] | JESD22-A110 VDD= 3.6 V; VCTL= 3.6V; $T_A$= 110ºC; RH= 85%; $P_v$= 1.204 atm | 264 hrs. | 3 x 45 | 3 x 46 | Passed (0/138) |
| 12 | TC[4] | Mil-Std-883 M1010.8/ JESD22-A104 $T_A$= -55ºC to +125ºC | 1,000 cyc. | 3 x 45 | 3 x 90 | Passed (0/269)[5] |

Table 4: Package Assembly Level Reliability Results

| Test # | Test Performed | TEST METHOD/ Conditions | Duration | Req'd Sample Size[2] (#LOT x SS) | Actual Sample Size[3] (#LOT x SS) | Result (REJ/SS) |
|---|---|---|---|---|---|---|
| 13 | Physical Dimensions | Mil-Std-883 M2016/ JESD22-B100 | - | 3 x 10 | 3 x 10 | Passed (0/30) |
| 14 | Die Peel | Subcon Specs. | - | 3 x 2 | 3 x 2 | Passed (0/6) |
| 15 | Solderability | Mil-Std-883 M2003.9/ JESD22-B102 | - | 3 x 3 | 3 x 5 | Passed (0/15) |

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Table 5: Wafer Process Reliability Results

| Test # | Test Performed | TEST METHOD/ Conditions | Duration | Req'd Sample Size[2] (#LOT x SS) | Actual Sample Size[3] (#LOT x SS) | Result (REJ/SS) |
|---|---|---|---|---|---|---|
| 16 | HTOL | Mil-Std-883 M1005.9/ JESD22-A108 VDD= 5.5V; VCTL= 3.6V; $T_A = T_J = 150°C$ | 500 hrs. | 3 x 77 Devices | 3 x 80 Devices | Passed (0/240) |
| 17 | HTS | Mil-Std-883 M1008.2/ JESD22-A103 $T_A$= 150ºC | 1,000 hrs. | 1 x 77 Devices | 1 x 77 Devices | Passed (0/77) |
| 18 | HAST[1] | JESD22-A110 $T_A$= 130ºC; RH= 85%; $P_V$= 2.27 atm; biased | 96 hrs. | 3 x 45 Devices | 3 x 45 Devices | Passed (0/135) |
| 19 | TC[1] | Mil-Std-883 M1010.8/ JESD22-A104 $T_A$= -65ºC to +150ºC | 500 cyc. | 3 x 45 Devices | 3 x 45 Devices | Passed (0/135) |
| 20 | Electro-migration | Internal Specification Doc #57-0001 | >T50 | 3 x 16 | 3 x 16 | Passed (0/48) |
| 21 | Passivation Integrity | Mil-Std-883 M2021.3 | - | 1 wafer | 1 wafer | Passed (0/1) |
| 22 | Destructive Analysis | Mil Std 883 M5009 | N/A | 1 wafer | 1 wafer | Passed (0/1) |
| 23 | Hot Carrier | JESD28 | >T50 | 1 wafer | 1 wafer | Passed (0/1) |
| 24 | TDDB | JESD35 | >T50 | 3 x 2 wafers | 3 x 2 wafers | Passed (0/6) |

[1] *J-STD-020, Level-1 pre-conditioning applied: Moisture Soak at 85°C/85% RH for 168 hours. Reflow at 260+5/-0°C.*

[2] *Required sample size is based on Peregrine Semiconductor's Internal Reliability qualification requirements.*

[3] *Actual sample size may be more than the required sample size to maximize the use of Reliability hardware.*

[4] *J-STD-020, Level-3 pre-conditioning applied: Moisture Soak at 30°C/60% RH for 192 hours. Reflow at 260+5/-0°C.*

[5] *one or more device (s) discounted due to non-process related failure..*