# Final Product Change Notification

February 13, 2017

**Final Product Change Notification #: 2017004F**
**Subject: Lumileds announces product change for transfer of process location**

**Overview**
Lumileds is notifying customers of an upcoming change for some of its products. At this time, Lumileds has completed the validation of the change and is ready to commence production. Based on this successful validation, Lumileds is recommending customer release of the change. The details of the change and supporting documentation are attached below.

| | |
|---|---|
| **Description of Change(s):** | Transfer of processes from in-house to subcon |
| **Customer Impact and Recommended Actions:** | No impact to customer<br>No change of form, fit, function, or reliability |
| **Products affected:** | SnapLED, SuperFlux, SignalSure TS, & Die Sales |
| **Reference Documents/Attachments:** | Attachment A: Affected Part Numbers<br>Attachment B: Change Overview including timeline |
| **Reason for change(s):** | Facilitate decreasing volumes of existing line |
| **Anticipated (positive and negative) impact on form, fit, function or reliability:** | No change of form, fit, function, or reliability |
| **Supplier Qualification plan results, where applicable:** | **See attachment B: Change Overview** |
| **Customer part number(s), if applicable:** | See Attachment A for affected Lumileds part numbers |
| **Date when qualification samples are available, if applicable:** | Samples are currently available upon request |
| **Date when final qualification data are available, if applicable:** | Final qualification data available March 3rd 2017, upon request |
| **Anticipated date when shipments of the changed product can commence:** | On or after May 22nd 2017 |
| **Last Date, if applicable, of manufacture of the unchanged product, if applicable:** | On or after July 21st 2017 |

**Next Steps**
As a next step, please provide acknowledgement of receipt of this FPCN and provide feedback along with any additional requests to your Lumileds Account Manager or Quality Manager no later than **March 17th 2017.** Lack of acknowledgement of the PCN within 30 days constitutes acceptance of the change.

**Contact:**
If you have any questions, or need any further assistance, please contact your Lumileds sales representative.

# Attachments

## Attachment A: Affected part numbers

| SnapLed | SuperFlux PB | SuperFlux PBF |
|---|---|---|
| HPWS-FH00-L4000 | HPWT-BD00-00000 | HPWT-BH02-H4000 |
| HPWS-FH00-M2000 | HPWT-BD00-F4000 | HPWT-BH02-J4000 |
| HPWS-FH00-M2500 | HPWT-BH00-F4000 | HPWT-BL02-D4000 |
| HPWS-FH00-M26F0 | HPWT-BH00-F6000 | HPWT-BL02-D4200 |
| HPWS-FH00-M3000 | HPWT-BH00-H2600 | HPWT-BL02-E4000 |
| HPWS-FH00-M4000 | HPWT-BH00-H3000 | HPWT-DD02-00000 |
| HPWS-FH00-N2000 | HPWT-BH00-H4000 | HPWT-DH02-E4000 |
| HPWS-FH00-N2500 | HPWT-BH00-J2000 | HPWT-DH02-F4000 |
| HPWS-FH77-U36GD | HPWT-BH00-J3000 | HPWT-DH02-G4000 |
| HPWS-FH77-V26GD | HPWT-BL00-00000 | HPWT-DH02-H3000 |
| HPWS-FH99-L40A0 | HPWT-BL00-D4200 | HPWT-DH02-H4000 |
| HPWS-FH99-M4000 | HPWT-DD00-00000 | HPWT-DH02-J3000 |
| HPWS-FH99-N20D0 | HPWT-DH00-00000 | HPWT-DH02-J4000 |
| HPWS-FL00-G4200 | HPWT-DH00-E4000 | HPWT-DH02-L4000 |
| HPWS-FL00-H3E00 | HPWT-DH00-F3001 | HPWT-DH62-F2000 |
| HPWS-FL00-H3EF0 | HPWT-DH00-F4000 | HPWT-DL02-00000 |
| HPWS-FL00-J3200 | HPWT-DH00-G3000 | HPWT-DL02-D4000 |
| HPWS-FL00-J3E00 | HPWT-DH00-G4000 | HPWT-DL02-D42A0 |
| HPWS-FL00-L2EA0 | HPWT-DH00-G400M | HPWT-DL02-E4000 |
| HPWS-FL00-L4000 | HPWT-DH00-H2000 | HPWT-DL02-E4200 |
| HPWS-FL00-L4E00 | HPWT-DH00-H2001 | HPWT-DL02-E4E00 |
| HPWS-FL00-M2FG0 | HPWT-DH00-H3000 | HPWT-DL02-F4000 |
| HPWS-FL00-M4000 | HPWT-DH00-H4000 | HPWT-DL62-F3E00 |
| HPWS-TH00-M2000 | HPWT-DH00-J2000 | HPWT-MD02-00000 |
| HPWS-TH00-M3000 | HPWT-DH00-J2001 | HPWT-MD02-F4000 |
| HPWS-TH00-M4000 | HPWT-DH00-J4000 | HPWT-MH02-F4000 |
| HPWS-TH00-W2000 | HPWT-DH60-H3000 | HPWT-MH02-G3000 |
| HPWS-TH77-V26GD | HPWT-DH60-J2000 | HPWT-MH02-G4000 |
| HPWS-TH99-L40A0 | HPWT-DL00-00000 | HPWT-MH02-H3000 |
| HPWS-TL00-J2EH0 | HPWT-DL00-D4000 | HPWT-MH02-H4000 |
| HPWS-TL00-L4E00 | HPWT-DL00-D42A0 | HPWT-MH02-J2000 |
| HPWT-FH00-G2000 | HPWT-DL00-E4000 | HPWT-MH02-J3000 |
| HPWT-FH00-G4000 | HPWT-DL00-E4200 | HPWT-MH02-J4000 |
| HPWT-FH00-H3000 | HPWT-DL00-F4000 | HPWT-MH62-H2000 |
| HPWT-FH00-H4000 | HPWT-DL00-G2E00 | HPWT-MH62-J2000 |
| HPWT-TH00-G4000 | HPWT-DL60-F3200 | HPWT-ML02-00000 |
| HPWT-TH00-H3000 | HPWT-DL60-F4200 | HPWT-ML02-C0200 |
| HPWT-TH00-J3600 | HPWT-MD00-F4000 | HPWT-ML02-D4200 |
| HPWT-TL00-E3200 | HPWT-MH00-00000 | HPWT-ML02-E4000 |
| HPWT-TL00-E4000 | HPWT-MH00-D4000 | HPWT-ML02-E4200 |
| HPWT-TL00-F4000 | HPWT-MH00-E4000 | HPWT-ML02-F4000 |

| | | |
|---|---|---|
| QPWS-TH99-M3000 | HPWT-MH00-F2000 | HPWT-ML02-F400M |
| SNL150-NO88-J2005 | HPWT-MH00-F3000 | HPWT-ML02-G4000 |
| SNL150-WO88-J2006 | HPWT-MH00-F4000 | HPWT-ML02-G4E00 |
| SSL075-NO88-D4007 | HPWT-MH00-F400M | HPWT-ML62-D40A0 |
| SSL075-WO88-D4000 | HPWT-MH00-G4000 | HPWT-RH02-E4000 |
| SSL075-WO88-D6000 | HPWT-MH00-H2000 | HPWT-RH02-F4000 |
| SSL075-WO88-E3001 | HPWT-MH00-H3000 | HPWT-RH02-G3000 |
| SSL075-WO88-E4000 | HPWT-MH00-H3001 | HPWT-RH02-G4000 |
| SSL075-WO88-F4003 | HPWT-MH00-H4000 | HPWT-RH02-H2000 |
| SSL150-NA88-E4000 | HPWT-MH00-H40T0 | HPWT-RH02-H4000 |
| SSL150-NA88-F3000 | HPWT-MH00-J2001 | HPWT-RH02-J4000 |
| SSL150-NO88-G3014 | HPWT-MH00-J4000 | HPWT-RH92-H26F0 |
| SSL150-NO88-H4000 | HPWT-MH60-H2000 | HPWT-RH92-J20F0 |
| SSL150-NO88-H4034 | HPWT-MH60-H30B0 | HPWT-RL02-D4200 |
| SSL150-NO88-J2005 | HPWT-MH60-H40F0 | HPWT-RL02-E4000 |
| SSL150-NO88-J2021 | HPWT-MH60-J3000 | HPWT-DL02-D4E00 |
| SSL150-NO88-J3000 | HPWT-ML00-00000 | HPWT-ML02-00200 |
| SSL150-NO88-M1009 | HPWT-ML00-C4000 | HPWT-DL02-F4200 |
| SSL150-WA88-H2019 | HPWT-ML00-D4000 | HPWT-MH02-H40F0 |
| SSL150-WA88-H4007 | HPWT-ML00-D400M | **Die Sales** |
| SSL150-WO88-G4000 | HPWT-ML00-D4200 | HWFR-B320-C0000 |
| SSL150-WO88-J2006 | HPWT-ML00-E2000 | HWFR-B420-F0000 |
| SSL150-WO88-J3000 | HPWT-ML00-E400M | HWFR-B520-B5000 |
| HPWS-TH00-L3000 | HPWT-ML00-E4200 | QWFR-C420-L6002 |
| HPWS-TH99-N20D0 | HPWT-ML00-E420M | HWFR-B320-C0000 |
| HPWS-FH00-P3000 | HPWT-ML00-E42C0 | HWFR-B320-C3000 |
| HPWS-FH99-M3000 | HPWT-ML00-F4000 | HWFR-B320-F5000 |
| HPWT-TL00-D4600 | HPWT-ML00-F4300 | HWFR-B420-F0000 |
| HPWS-TL00-G4200 | HPWT-ML00-G4000 | HWFR-B420-F5000 |
| HPWS-TL00-H4200 | HPWT-ML60-F3200 | HWFR-B510-S3045 |
| HPWS-TH00-L4000 | HPWT-RD00-00000 | HWFR-B520-B5000 |
| | HPWT-RH00-F4000 | HWFR-B520-F3000 |
| | HPWT-RH00-G3000 | HWFR-B520-H0000 |
| | HPWT-RH00-G4000 | HWFR-B522-D2000 |
| | HPWT-RH00-H20DM | HWFR-B522-G4000 |
| | HPWT-RH00-H20L0 | HWFR-C420-M6000 |
| | HPWT-RH00-H3000 | QWFR-C420-L6002 |
| | HPWT-RH00-H4000 | HWFR-B520-F5000 |
| | HPWT-RH00-J2000 | HWFR-B320-E0000 |
| | HPWT-RH00-J4000 | HWFR-B320-F0000 |
| | HPWT-RL00-D4200 | |
| | HPWT-RL00-E4000 | |
| | HPWT-RL00-E4E0M | |
| | QPWT-MH00-L400T | |
| | HPWT-DD00-E4000 | |
| | HPWT-MH00-J2000 | |
| | HPWT-RH00-E4000 | |
| | HPWT-RL00-C4200 | |

| | | |
|---|---|---|
| | HPWT-DL00-D4000 | |

| SnapLED Level 2 | |
|---|---|
| A2LH-0000100010270 | QPWG-N679 |
| A2LH-0000100010340 | QPWG-N680 |
| A2LH-0000100010350 | QPWG-N681 |
| A2LQ-0000100010010 | QPWG-N682 |
| A2LQ-0000100010020 | QPWG-N684 |
| A2LQ-0000100010030 | QPWG-N694 |
| A2LQ-0000100010040 | QPWG-N695 |
| A2LQ-0000100010050 | QPWG-N700 |
| A2LQ-0000100010060 | QPWG-N701 |
| A2LQ-0000100010070 | QPWG-N702 |
| A2LQ-0000100010080 | QPWG-N703 |
| A2LQ-0000100010110 | QPWG-N704 |
| A2LQ-0000100010120 | QPWG-N705 |
| A2LQ-0000100010130 | QPWG-N707 |
| A2LQ-0000100010140 | QPWG-N708 |
| A2LQ-0000100010150 | QPWG-N711 |
| A2LQ-0000100010160 | QPWG-N712 |
| A2LQ-0000100010170 | QPWG-N713 |
| A2LQ-0000100010180 | QPWG-N714 |
| A2LQ-0000100010320 | QPWG-N734 |
| A2LQ-0000200010250 | QPWG-N740 |
| A2LQ-0000200010400 | QPWG-N741 |
| HPWG-N500 | QPWG-N742 |
| HPWG-N502 | QPWG-N743 |
| HPWG-N505 | QPWG-N744 |
| HPWG-N509 | QPWG-N525 |
| HPWG-N510 | QPWG-N539 |
| HPWG-N550 | QPWG-N688 |
| HPWG-N552 | QPWG-N693 |
| HPWG-N689 | QPWG-N698 |
| HPWG-N691 | QPWG-N668 |
| QPWG-N670A | QPWG-N669 |
| QPWG-N670B | QPWG-N697 |
| QPWG-N671A | QPWG-N696 |
| QPWG-N671B | QPWG-N699 |
| QPWG-N674 | QPWG-N569 |
| QPWG-N675 | QPWG-N570 |
| QPWG-N677 | QPWG-N597 |
| QPWG-N678 | QPWT-N590 |

| SuperFlux Level 2 |
|---|
| QPWG-C573 |
| QPWG-C574 |
| QPWG-C575 |
| QPWG-C576 |

| |
|---|
| QPWG-C577 |
| QPWG-C578 |
| QPWG-C579 |
| QPWG-C580 |
| QPWG-C581 |
| QPWG-C582 |
| QPWG-C588 |
| QPWG-C589 |
| QPWG-C597 |
| QPWG-C598 |
| QPWT-C597 |

# Attachment B: Change Overview

**(see attached)**

# PCN 2017004F

## Attachment B:

## Change Overview

San Jose February 2017

LUMILEDS

# Transfer of processes from in-house facility (P2) to Subcon (Opto)

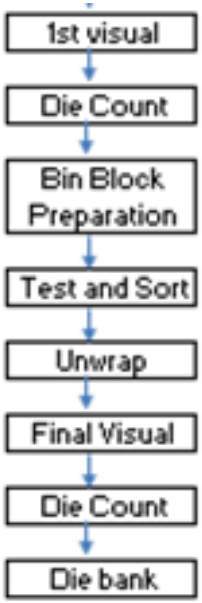
- Purpose
  - Transition of 3 process steps to subcon to accommodate improved process flow of new product manufacturing lines
- Impact of changes
  - No form, fit, function or reliability change
- Processes to be transferred:
  - 1st Visual Inspection, Test and Sort (TnS), 2nd Visual Inspection
- Tester and production reliability test plans
- Qualification timeline

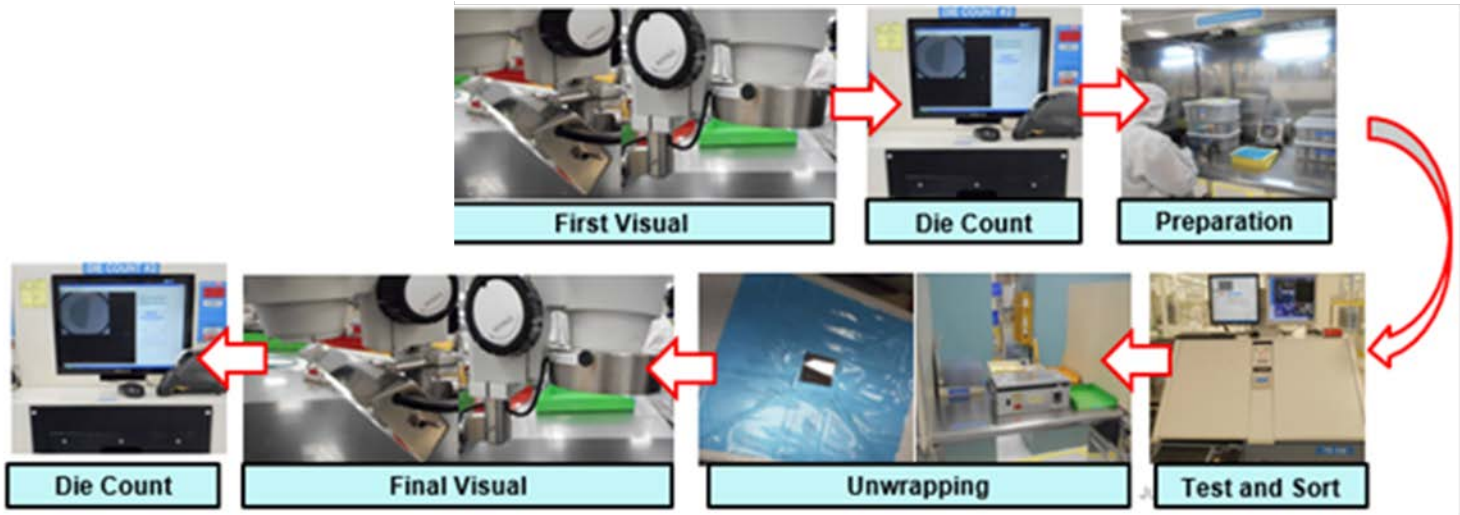
# PCN 2017004F: Change Overview

**Change Summary:**

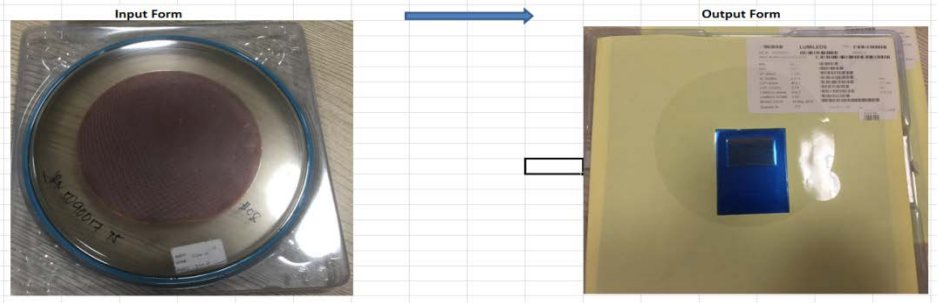
| Die Fab Key Process Step | Saw → | Etch → | 1st Visual → | TnS → | Final Visual |
|---|---|---|---|---|---|
| Current Location | P2 | P2 | P2 | P2 | P2 |
| Propose Location | P2 | P2 | Opto | Opto | Opto |

**Process Flow**




**Product Form:**



# Calibration / Monitoring - Before

NIST

Round Robin every 6 months

Optics Lab PG

Optics Lab SJ

Round Robin DIP Unit

Usage of DIP:
- ✓ Standard Calibration – Once per year
- ✓ Monitor Check – every 12 hours
- ✓ SPC – daily from monitor check data.

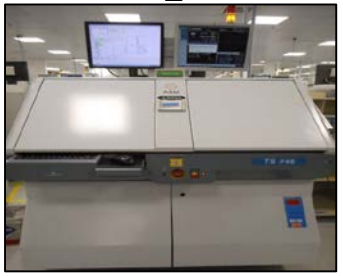
Golden Tester

Daily Validation
Iv, Ldom, Vf

**All Tester at P2**

Production Tester 1

Production Tester 2



Production Tester 3

Production Tester 4

# Calibration / Monitoring - After

NIST

Round Robin every 6 months

Optics Lab PG

Optics Lab SJ

Round Robin DIP Unit

Usage of DIP:
- ✓ Standard Calibration – Once per year
- ✓ Monitor Check – every 12 hours
- ✓ SPC – daily from monitor check data.

Golden Tester

Daily Validation
Iv, Ldom, Vf

**All Tester at Opto**

Production Tester 1

Production Tester 2

Production Tester 3

Production Tester 4

# PCN 2017004F: Tester Qualification & Monitoring Plan

| CTQ | Monitoring Item | Apply To | During Qualification | | Ongoing Monitoring | | |
|---|---|---|---|---|---|---|---|
| | | | Sample Size | Acceptance Criteria | Frequency | Sample size | Method |
| **Tester Accuracy** | Standard DIP Calibration | Opto Golden Tester & Production Tester | 8 units | ☐ IV < +/-5%<br>☐ LDOM < +/- 0.8nm | Every 12 hours | 8 units | SPC Chart |
| **Tester Precision** | Gage Repeatability & Reproducibility | Opto Golden Tester & Production Tester | a. 3 appraisers<br>b. 10 units | ☐ GR&R < 10%<br>☐ ndc > 5 | Every 6 months | a. 3 appraisers<br>b. 10 units | Excel Sheet |
| **Tester Correlation Study with P2 Golden Tester** | TCAP | Opto Golden Tester & Production Tester | 50 dies from golden bin tape | ☐ IV < +/-5%<br>☐ LDOM < +/- 0.8nm | Daily<br>(during production run) | a. Golden tester - 10 dies from golden bin tape<br>b. Production tester - 6 dies from 2 bin tape at production Vs Golden Tester | Excel Sheet |
| | 2 weeks TCAP monitoring | Opto Golden Tester | a. 10 dies from golden bin tape<br>b. 6 dies from 2 bin tape at production | ☐ IV < +/-5%<br>☐ LDOM < +/- 0.8nm | | | |
| **Tester Correlation Study with L1 Tester** | L0 - L1 K factor | Opto Production Tester (overall comparison) | Every qualification lot | Production base line +/- 3 sigma | weekly | Every traceability lot | Boxplot Trend |

Term/ Definition
GR&R - Gage Repeatability & Reproducibility
TCAP - Tester Calibration and Accuracy Program

* Ongoing monitoring practices of testers used at P2 facility will transfer to subcon facility

# PCN 2017004F: Production Reliability Test Plan

**SNAPLED (JRM & JRN WF/DF DEVICE FAMILY), IEC60810 Ed.4 REL TESTS**

**SNAPLED (JRM & JRN WF/DF DEVICE FAMILY) PARTIAL DIE FAB PROCESS SITE CHANGE QUALIFICATION FROM P2 TO OPTO**
**Transfer partial die fab process [1st Visual - TnS - Final Visual] to OPTO with same equipments used in P2 to OPTO**
**SNAPLED 150 choose for qualification (3 EVALS lots from different timeframe for OPTO die fab process)**

**MAX SPECS: Max If = 350mA. AUTO Max Tj = 155°C**
**Operating Case Temperature tbd°C. Storage Temperature -44°C to 110°C.**
**OP. LIFE: 1K Hrs.. for AUTO / ILLUM. PTMCL: 1000 cycles for AUTO / ILLUM.**

**Acceptance Criteria: No visual failures, Unit |dVf| < 10%, and apply both AUTO and ILLUM criteria.**
**AUTO Criteria: Unit |dPHIv| < 20%, Line and Market Release at 1K Hrs.**
**IECTests: 0 Eval failures to 1K Hrs..**
**Test monopulse at the stress current @25C for Operational Tests. Test monopulse at 5, 150mA @ 25C for Non-Operational Tests (Production Test Conditions).**

| Total Qual Sample Size: | 336 Evals | 112 Controls |
|---|---|---|

| | TEST # | TEST | REFERENCED STANDARD | STRESS CONDITIONS on 3 lots of equal sample size | Test Conditions | 3 LOTS, TOTAL EVALS SAMPLE SIZE | Controls Sample Size | Total Sample | Total Board | TEST POINTS (* End Point) | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IEC | 1 | Pre and Post Electrical Test | internal reference to data sheet | All electrically tested samples, before & after stress. | | ALL | | | | | |
| | 2 | HTOL | JESD22 A108D | 200 mA (Ta=85'C) | ET @5, 150mA | 84 | 28 | 112 | 2 | 24,168,500,1000 hrs | |
| | 3 | TMCL | JESD22-A104D | 15min dwell, 5min transfer, -40°C to 125°C. | ET @5, 150mA | 84 | 28 | 112 | 2 | 20,100,200,500,1000x | |
| | 4 | WHTOL | JESD22 A101C | 85C/85%RH/200mA 1hr ON 1hr OFF | ET @5, 150mA | 84 | 28 | 112 | 2 | 24,168,500,1000 hrs | |
| | 5 | PTMCL | JESD22 A105 Condition A | -40C to 85C @ 200mA 10min dwell / 30min transfer 5min ON/OFF | ET @5, 150mA | 84 | 28 | 112 | 2 | 20,100,200,500,1000x | |
| | | | | | Total Sample | 336 | Total Board: | | 8 | | |

# PCN 2017004F: Timing Plan

| Item | Timing |
|---|---|
| Pilot line qual | WW39 ‘16 |
| Golden tester qual | WW41 ‘16 |
| Samples (SSL150-NO88) | WW49 ‘16 |
| FPCN | WW05 ‘17 |
| PPAP | WW09 ‘17 |
| P3 shipments from Opto | WW21 ‘17 |
| P4 shipments from Opto | WW29 ‘17 |


LUMILEDS

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