



8755 W. Higgins Road  
Suite 500  
Chicago, Illinois USA 60631

---

May 13<sup>th</sup>, 2016

RE: PCN # ESU270-38 – SP4022/4023/4024 series new wafer foundry and alternative backend manufacturing location approval

To our valued customers,

In order to support growing demand, and maintain operational excellence, we are expanding our wafer and packaging capacity of SOD-323 products for Ethernet and power line protection. Littelfuse would like to notify you of a newly approved wafer foundry location and two alternative backend locations for the SP4022/4023/4024 series TVS Diode Array (SPA® Diodes) products. The new wafer foundry is located in China, and the two new alternative backend factories both in China are all fully approved. There are no changes to form or function of the finished product.

Qualification efforts are complete and the new factories are online for immediate shipments. Please see the attached documentation for change detail and affected part numbers.

All affected products have been fully qualified in accordance with established performance and reliability criteria. The attached pages summarize the qualification results. Full qualification data and/or samples will be available upon request.

**Form, fit, function changes:** None  
**Part number changes:** None  
**Effective date:** Aug 13<sup>th</sup>, 2016 or sooner  
**Replacement products:** N/A  
**Last time buy:** N/A

This notification is for your information and acknowledgement. If you have any other questions or concerns, please contact Tim Micun, Product Manager.

We value your business and look forward to assisting you whenever possible.

Best Regards,

Tim Micun  
8755 W. Higgins Road, Suite 500  
Chicago, Illinois USA 60631  
+1 408 409 3657  
[tmicun@littelfuse.com](mailto:tmicun@littelfuse.com)



800 E. Northwest Highway Des Plaines, IL 60016

## Product/Process Change Notice (PCN)

**PCN#:** ESU270-38    **Date:** May 13, 2016

**Product Identification:**

SP4022/4023/4024 series of TVS Diode Array Products

**Implementation Date for Change:**

Aug 13, 2016 or sooner

### Contact Information

**Name:** Tim Micun

**Title:** Product Marketing Manager

**Phone #:** +1 408 409 3657

**Fax#:** N/A

**E-mail:** tmicun@littelfuse.com

### Category of Change:

- Assembly Process
- Data Sheet
- Technology
- Discontinuance/Obsolescence
- Equipment
- Manufacturing Site
- Raw Material
- Testing
- Fabrication Process
- Other: \_\_\_\_\_

### Description of Change:

Approve a new wafer foundry location and two alternate backend assembly, test, and packing locations for SP4022/4023/4024 series products. There are no changes to fit, form & function of the finished product. The affected products have been fully qualified in accordance with all established criteria for performance and reliability. All relevant detail is included in the supplemental pages..

### Important Dates:

- Qualification Samples Available: May 10, 2016                       Last Time Buy:
- Final Qualification Data Available: May 10, 2016
- Date of Final Product Shipment:

### Method of Distinguishing Changed Product

- Product Mark,
- Date Code,
- Other, See (8.0) in the succeeding PCN report for details

### Demonstrated or Anticipated Impact on Form, Fit, Function or Reliability:

N/A

### LF Qualification Plan/Results:

N/A

**Customer Acknowledgement of Receipt:** Littelfuse requests you acknowledge receipt of this PCN. In your acknowledgement, you can grant approval or request additional information. Littelfuse will assume the change is acceptable if no acknowledgement is received within 30 days of this notice. Lack of any additional response within 90 days of PCN issuance further constitutes acceptance of the change.



# PCN Report

## ETR # 79284, 80187, 80858

**Prepared By** : Jordan Hsieh-SPA Product Engineering Manager,  
: Ming-Huan Ko-SPA Product Engineer  
**Date** : May/10/2016  
**Device** : SP4022, SP4023 and SP4024 Series Product  
**Revision** : A

### 1.0 Objective:

The purpose of this project is to change to a new wafer foundry and qualify two alternative assembly locations for SP4022, SP4023 and SP4024 series product. Succeeding pages summarize the physical, electrical and reliability test performed in qualification lot.

### 2.0 Applicable Devices:

Part Numbers	Part Numbers
SP4022-01FTG	SP4022-01FTG-C
SP4023-01FTG	SP4023-01FTG-C
SP4024-01FTG	SP4024-01FTG-C

### 3.0 Assembly, Process & Material Differences/Changes:

#### 3.1 Wafer Supplier Changes

Change wafer supplier of steering die as below table.

P/N	SP4022-01FTG, SP4022-01FTG-C, SP4023-01FTG, SP4023-01FTG-C, SP4024-01FTG and SP4024-01FTG-C		
Material	Original	New	Changed?
Steering Die	Taiwan Base	China Base	Yes

#### 3.2 Material Changes

Add two alternative backend locations for SP4022-01FTG, SP4022-01FTG-C, SP4023-01FTG, SP4023-01FTG-C, SP4024-01FTG and SP4024-01FTG-C as below table.

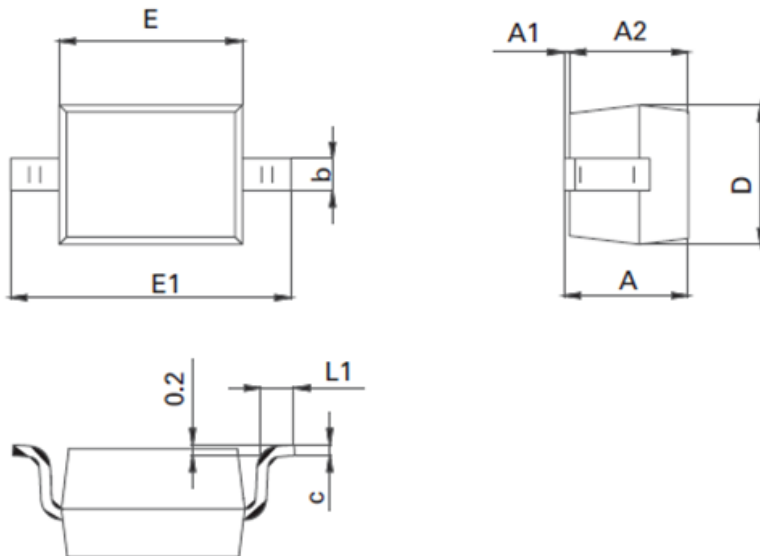
Material	Original Backend Location		New Backend Location 1		New Backend Location 2		Changed?
	Located in China		Located in China		Located in China		
	Material Name	Supplier	Material Name	Supplier	Material Name	Supplier	
Leadframe	N42	Shuen Der Industry	N42	Shuen Der Industry	A42	ASM	Yes
Die Attach Material	84-1LMISR4	Henkel	Eutetic	--	Eutetic	--	Yes
					EXBOND 833C-LW	Bonotec*	
Au Wire	Gold Wire	Heraeus	Gold Wire	MK Electron	Gold Wire	MK Electron	Yes
Molding Compound	ELER-8-100HFE	E'Dale	ELER-8-100HFE	E'Dale	EME-G600	HHCK	Yes
Lead Finish	Tin	Yunnan	Tin	ShangHai SinYang	Tin	Suzhou Nuonengda	Yes

#### 4.0 Packing Method

There will be no changes in the packing method.

#### 5.0 Physical Differences/Changes:

Lead dimension of new backend locations is different with original backend location.





	Original Supplier		Alternative Supplier-1		Alternative Supplier-2	
	Min	Max	Min	Max	Min	Max
A	0.80	1.00	--	1.00	--	1.00
A1	0.00	0.10	0.02	0.10	0.00	0.10
A2	0.80	0.90	--	0.90	0.80	0.90
b	0.25	0.35	--	0.30	0.25	0.35
c	0.08	0.15	0.10 Typical		0.08	0.15
D	1.15	1.45	1.20	1.40	1.20	1.40
E	1.60	1.80	1.60	1.80	1.60	1.80
E1	2.50	2.70	2.55	2.75	2.50	2.70
L1	0.25	0.40	0.22	0.42	0.25	0.40

Unit: mm

**6.0 Reliability Test Results Summary:**

Test Items	Condition	S/S	Results	ETR #
Precondition	Bake 24hr @ 150°C/ 168hrs 85%rh, 85°C sock/3 times 260°C peak temperature reflow	320	0/320	ETR 79284 Qualification for new wafer supplier and alternative assembly supplier-1
DC Blocking(HTRB)	Bias = 3.3V Ta = 150°C Duration = 1008 Hours	80	0/77	
Temperature Cycle	Ta = -55°C to +150°C Duration = 1000 Cycles	80	0/77	
Temperature/Humidity (H <sup>3</sup> TRB)	Bias=3.3V Ta = 85°C, 85% RH Duration = 1008 Hours	80	0/77	
Autoclave	Ta = 121°C, 100%RH, 2atm Duration = 96 Hours	80	0/77	
Moisture Sensitivity Level(MSL)	Refer to Precondition Test	320	0/320	
ESD Test	HBM>8kV, MM>400V	30	0/30	

Test Items	Condition	S/S	Results	ETR #
Precondition	Bake 24hr @ 150°C/ 168hrs 85%rh, 85°C sock/3 times 260°C peak temperature reflow	640	0/640	ETR 80187, 80858 Qualification for new wafer supplier and alternative assembly supplier-2
DC Blocking(HTRB)	Bias = 3.3V Ta = 150°C Duration = 1008 Hours	160	0/160	
Temperature Cycle	Ta = -55°C to +150°C Duration = 1000 Cycles	160	0/160	
Temperature/Humidity (H <sup>3</sup> TRB)	Bias=3.3V Ta = 85°C, 85% RH Duration = 1008 Hours	160	0/160	
Autoclave	Ta = 121°C, 100%RH, 2atm Duration = 96 Hours	160	0/160	
Moisture Sensitivity Level(MSL)	Refer to Precondition Test	640	0/640	
ESD Test	HBM>8kV, MM>400V	60	0/60	


### 7.0 Electrical Characteristic Summary:

There is no change in electrical characteristics. Characterization data is available upon request.

### 8.0 Changed Part Identification:

To distinguish different manufacturing locations please refer to labeling information as CAT NO:

Barcode Scanning Result

(P)PART NO: PSPXXXX-XXXX	HF	Pb Pb- FREE
PART DESCRIPTION	CAT NO: *	
(Q)Q'TY: QXXXX	(K)PO NO: KXXXXXXXX	
(1T)LOT NO: 1TXXXXXX		
(1T)LOT NO:(When necessary) 1TXXXXXX		
 COUNTRY OF ORIGIN" COUNTRY" DATE CODE(MM/DD/YY)		

Original Backend Location	New Backend Location 1	New Backend Location 2
CAT No : S	CAT No : Y	CAT No : F



## **9.0 Recommendations & Conclusions:**

Based on the test results, it is determined that the new wafer foundry and alternative assembly locations are qualified and certified for production of Littelfuse® SP4022/SP4023/SP4024 series products.

## **10.0 Approvals:**

**Jordan Hsieh**  
**SPA Product Engineering Manager**  
**Littelfuse, Hsinchu**