



**Product Change Notification / JAON-21SZYY684**

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**Date:**

27-Oct-2021

**Product Category:**

Power Discrete Components

**PCN Type:**

Manufacturing Change

**Notification Subject:**

eSign # E000072861 Final Notice: Qualification of MSCO (Microchip - Fab 5) as an additional wafer fabrication site for selected Microsemi Silicon DQ 600V Diode PSDS (Power Switching Discrete Solutions) products.

**Affected CPNs:**

[JAON-21SZYY684\\_Affected\\_CPN\\_10272021.pdf](#)

[JAON-21SZYY684\\_Affected\\_CPN\\_10272021.csv](#)

**Notification Text:**

**PCN Status:**Final Notification

**PCN Type:**Manufacturing Change

**Microchip Parts Affected:**Please open one of the files found in the Affected CPNs section.

Note: For your convenience Microchip includes identical files in two formats (.pdf and .xls)

**Description of Change:**Qualification of MSCO (Microchip - Fab 5) as an additional wafer fabrication site for selected Microsemi Silicon DQ 600V Diode PSDS (Power Switching Discrete Solutions) products.

**Pre and Post Change Summary:**

	Pre Change	Post Change
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Silicon DQ Diode Wafer Fabrication Site	Episil Technologies Inc (EHTW)	Episil Technologies Inc (EHTW)	Microchip Technology Colorado – Fab 5 (MCSO)
Certifications	ISO-9001 IATF16949	ISO-9001 IATF16949	ISO-9001 IATF16949 ISO-14001

**Impacts to Data Sheet:**None

**Change Impact:**None

**Reason for Change:**To improve manufacturability and on-time delivery performance by qualifying MCSO as an additional fabrication site.

**Change Implementation Status:**In Progress

**Estimated First Ship Date:**November 1, 2021 (date code: 2145)

Note: Please be advised that after the estimated first ship date customers may receive pre and post change parts.

**Time Table Summary:**

	October 2021					November 2021				
Workweek	4 0	4 1	4 2	4 3	4 4	4 5	4 6	4 7	4 8	4 9
Qual Report Availability					X					
Final PCN Issue Date					X					
Estimated Implementation Date						X				

**Method to Identify Change:**Traceability code

**Qualification Report:**Please open the attachments included with this PCN labeled as PCN\_#\_Qual\_Report.

**Revision History:**October 27, 2021: Issued final notification.

The change described in this PCN does not alter Microchip's current regulatory compliance regarding the material content of the applicable products.

## **Attachments:**

[PCN\\_JAON-21SZYY684\\_Qual\\_Report.pdf](#)

Please contact your local [Microchip sales office](#) with questions or concerns regarding this notification.

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**MICROCHIP**

**QUALIFICATION REPORT SUMMARY**  
RELIABILITY LABORATORY

**PCN#: JAON-21SZYY684**

**Date**  
**October 22, 2021**

**Qualification of MSCO (Microchip - Fab 5) as an additional wafer fabrication site for selected Microsemi Silicon DQ 600V Diode PSDS (Power Switching Discrete Solutions) products.**

**Purpose:** Qualification of MSCO (Microchip - Fab 5) as an additional wafer fabrication site for selected Microsemi Silicon DQ 600V Diode PSDS (Power Switching Discrete Solutions) products.

**Qualification Summary:**

This qualification is to assess the Automotive grade quality and reliability for the DQ FRED technology fabricated at Microchip Fab 5 location in Colorado Springs, Colorado when subjected to testing outlined in the sampling plan below. This effort is to validate a second source for this technology currently at Epasil Technologies in Taiwan.

The wafer lots used in this qualification are a large die sized variety for this voltage class and therefore is a high  $IF_{(AV)}$  current rated sample to define this product family. It represents a “worst case” scenario for the over-all DQ FRED 600V family of products. Being such, all dies in this family and other package types in addition to the package vehicle used, are included within this product family and qualification result. (TO-247, TO-220 and TO-264.).

The wafer and assembly processes for the part numbers effected share the same methods, materials and tooling. Deviations from them are governed by Microchip-PSDS Change Control requirements.

**Sample Plan.**

Manufactures Part #(s): 2x APT30DQ60BG, 2x APT75DQ60BG  
 Die-Volt(s): 2x 16K4F-060 (1A003), 2x 16F5F-060 (1A005)  
 Qualification Package(s): TO-247.  
 Wafer Fab Lot#(s): 0W0409.1, 0X2194.1, TBD, TBD  
 Package Date Code(s): 2041, 2123, TBD, TBD.

AEC-Q101 Item	Test	Abv.	Reference	Location	Test Spec.	No. Lots	Sample Size/Lot	Comments
3	External Visual	EV	JESD22 B-101	Ennis	User Specification	4	610	All units submitted for qualification
4	Parametric Verification	PV		Bend	User Specification	4	25	Per Part Number
5	High Temperature Reverse Bias	HTRB	Mil-Std 750 M1038 Cond A	Ennis	1000 Hours @ Ta=175°C, Rated VRRM	4	77+5	Electrical Tests: Pre, 168 hrs, 500 hrs and 1000 hrs.
7	Temperature Cycle	TC	JESD22 A-104	Ennis	400 Cycles, -55°C to 175°C	4	77+5	Electrical Tests: Pre, 250 and 400 Cycles.
12	Destructive Physical Analysis	DPA	AEC-Q101-004					Thermal testing at Pre and 400 Cycles
8	Unbiased Highly Accelerated Stress Test	UHASt	JESD22 A-110	Ennis	96 Hours, Ta=130°C, RH=85%	4	77+5	Electrical Tests: Pre and 96 hrs.
9	Highly Accelerated Stress Test	HAST	JESD22 A-110	Ennis	96 Hours, 42V, Ta=130°C, RH=85%	4	77+5	Electrical Tests: Pre and 96 hrs.
12	Destructive Physical Analysis	DPA	AEC-Q101-004					
10(alt.)	Intermittent Operating Life	IOL	Mil-Std 750 M1037	Ennis	Cycles=60000/ (x+y), Delta Tj=100°C	4	77+5	Electrical Tests: Pre, 6k and 10k Cycles Thermal testing at Pre and 10k Cycles
11	ESD Characterization	CDM	AEC-Q101-001	Chandler	Destruct.	1	30	Use Generic Data
		HBM	AEC-Q101-005	Chandler	Destruct.	1	30	Use Generic Data
15	Resistance to Solder Heat	RSH	JESD22 B-106	Fastech	Per Part Specification	2	30	Use Generic Data
22	Thermal Resistance	TR	JESD24-3	Bend	Per Part Specification	3	10	Performed in Items 7 and 10(alt.)
23	Wire Bond Strength	WBS	Mil-Std 750 M2037	Fastech		2	5	Min. 10 bonds from each lot.
24	Bond Shear	BS	AEC-Q101-003	Fastech		2	5	Min. 10 bonds from each lot.
25	Die Shear	DS	Mil-Std 750 M2017	Fastech		2	5	5 die from each lot

1. The wafer fab lots selected for qualification represents the three lot requirement of the Soft Recovery Diode family as defined in section A1.1.4 In the AEC-Q101 Rev E document.

2. IOL cycles is to be determined by part specific Pon and Poff rise and fall times (x+y), where # cycles = 60000/(x+y).

**Table 2: Reliability tests defined to qualify Fab 5 600V DQ FRED technology.**

### Qualification Pass Fail Criteria:

Conditional qualification achievement and commercial production risk release of all related 600V DQ FRED dies assembled into TO packaging will be assessed at the completion 500 hours of HTRB, 100 Temperature cycles, 96 hours of UHAST and HAST testing for the two 16K4F-060 dies listed in the plan. Full Automotive qualification, it will require successful completion for the full duration of all four lots and tests in Table 2.

Qualification devices, when subjected to the environmental and reliability tests outlined in the sampling plan in table 2, are to remain within data sheet minimum and maximum specifications for their "Key" parameters as well as to within  $\pm 20\%$  of the initial reading. Greater allowances are granted for leakage tests and in the cases of moisture exposure.

If any failures, deviations or observations exceeding these criteria outlined, failure analysis is to be performed to determine the root cause with an Implementation and verification of the corrective action is necessary to justify qualification.

Part Data Sheet Parameter	Measurement Condition (25°C unless specified otherwise.)	Fail Criteria
Forward Voltage (VF), V	IF(Rated)=30A	Greater than 2.4V Greater than $\pm 20\% \Delta$
Reverse Leakage (IR), uA	VR(rated)=600V	Greater than 25uA Greater than 500% Increase (1000% for moisture tests.).
Thermal Resistance (RthJC), °C/W	10 Seconds	Greater than 0.80°C/W Greater than +20% $\Delta$

Table 3: Tested device parameters and conditions.

## Qualification Testing Result:

Figure 1 shows the aggregate “key” parameter results before and after the reliability tests outlined in the qualification plan for the lots from Fab 5 to meet the conditional qualification requirements.

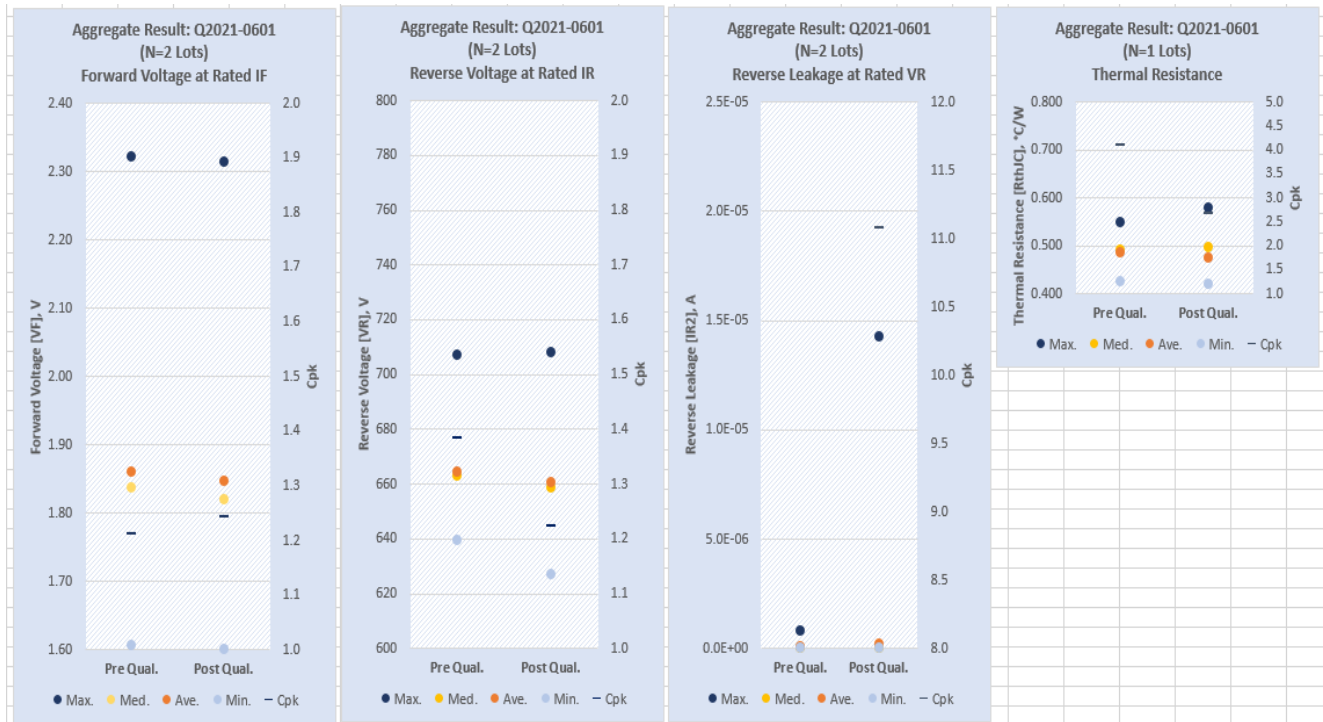


Figure 1: Device “Key Parameters” Pre and Post Reliability Testing.

Table 5 shows the results for the qualification tests outlined in the sample plan above. As of the date of this report, all tests have been completed and no valid failures are to be reported.

Qualification Test	Test Duration	Devices Tested	Device Failures
EV	-	All Devices	0
PV	-	704	0
HTRB	500 Hours	164	0
HAST	96 Hours	164	0
UHAST	96 Hours	164	0
TC RthJC	100 Cycles	106	0

Table 5: Qualification Result.

## Conclusion:

This report summarizes the result for the Fab 5 600V DQ FRED family of devices when evaluated to the tests outlined in the sampling plan in table 2. Based on the over-all results presented, no valid design or fabrication failures related to the device occurred during the testing outlined. As of the date of this report, the 600V Fab 5 DQ FRED series of devices are conditionally qualified for production use.

Affected Catalog Part Numbers (CPN)

APT100GN60LDQ4G  
APT100GT60JRDQ4  
APT150GN60JDQ4  
APT150GN60LDQ4G  
APT15DQ60BCTG  
APT15DQ60BG  
APT15DQ60KG  
APT15DQ60SG  
APT15GP60BDQ1G  
APT15GT60BRDQ1G  
APT200GN60JDQ4  
APT20GN60BDQ1G  
APT20GN60BDQ2G  
APT20GN60SDQ2G  
APT20GT60BRDQ1G  
APT2X100DQ60J  
APT2X101DQ60J  
APT2X30DQ60J  
APT2X31DQ60J  
APT2X60DQ60J  
APT2X61DQ60J  
APT30DQ60BCTG  
APT30DQ60BG  
APT30DQ60BHBG  
APT30DQ60KG  
APT30GN60BDQ2G  
APT30GP60BDQ1G  
APT30GS60BRDQ2G  
APT30GT60BRDG  
APT30GT60BRDQ2G  
APT36GA60BD15  
APT36GA60SD15  
APT40DQ60BCTG  
APT40DQ60BG  
APT40GP60B2DQ2G  
APT40GP60JDQ2  
APT44GA60BD30  
APT47GA60JD40  
APT50GN60BDQ2G  
APT50GN60BDQ3G  
APT50GP60B2DQ2G  
APT50GP60JDQ2  
APT50GS60BRDQ2G  
APT50GT60BRDQ1G  
APT50GT60BRDQ2G  
APT54GA60BD30



APT60DQ60BCTG  
APT60DQ60BG  
APT60DQ60SG  
APT60GA60JD60  
APT60GT60JRDQ3  
APT65GP60JDQ2  
APT65GP60L2DQ2G  
APT68GA60B2D40  
APT68GA60LD40  
APT75DQ60BG  
APT75DQ60D  
APT75DQ60SG  
APT75GN60LDQ3G  
APT75GN60SDQ2G  
APT80GA60LD40  
APT80GP60JDQ3