PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data	
1.1 Company	STMicroelectronics International N.V
1.2 PCN No.	ADG/23/14252
1.3 Title of PCN	ACEPACK DRIVE: AMB Second Source Suppliers
1.4 Product Category	see list
1.5 Issue date	2023-08-07

2. PCN Team	
2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
2.1.2 Phone	+1 8475853058
2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Giuseppe GULLOTTA
2.1.2 Marketing Manager	Stefano Giovanni PAPPALARDO
2.1.3 Quality Manager	Vincenzo MILITANO

3. Change		
3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	Any change on substrate (part number, supplier, plant, design or composition of any layer, etc..)	ST Shenzhen - China

4. Description of change		
	Old	New
4.1 Description	AMB supplier: DENKA	AMB Supplier: DENKA, ROGERS and HERAEUS
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No Impact	

5. Reason / motivation for change	
5.1 Motivation	Service Improvement - Second Source Supplier
5.2 Customer Benefit	SERVICE CONTINUITY

6. Marking of parts / traceability of change	
6.1 Description	Internal traceability - Date Code

7. Timing / schedule	
7.1 Date of qualification results	2023-08-01
7.2 Intended start of delivery	2023-12-31
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	14252 RERPTD23057_1.0_New AMB from suppliers Rogers and Heraeus as 2nd sources in ACEPACK DRIVE module in STS.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2023-08-07

9. Attachments (additional documentations)
14252 Public product.pdf 14252 Details.pdf 14252 RERPTD23057_1.0_New AMB from suppliers Rogers and Heraeus as 2nd sources in ACEPACK DRIVE module in STS.pdf

10. Affected parts		
10. 1 Current		10.2 New (if applicable)
10.1.1 Customer Part No	10.1.2 Supplier Part No	10.1.2 Supplier Part No
	ADP360120W3	

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Product/process change notification:
ACEPACK DRIVE: AMB Second Source Suppliers

ADG/23/14252

Product family	Technology	Package
SiC MOSFET Power Module		ACEPACK DRIVE

(optional)

Description of the change
Activation of additional AMB suppliers for ACEPACK DRIVE Module

Reason
Service Continuity – Second Source Supplier

Date of implementation
1st shipment is forecasted within Q4/2023

Impact of the change	
Form	No Impact
Fit	No Impact
Function	No Impact
Reliability	No Impact
Processibility	No Impact

Qualification of the change

Qualification included in this communication.

14253 RERPTD23057_1.0_New AMB from suppliers Rogers and Heraeus as 2nd sources in ACEPACK DRIVE module in STS.pdf

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Public Products List

Publict Products are off the shelf products. They are not dedicated to specific customers, they are available through ST Sales team, or Distributors, and visible on ST.com

PCN Title : ACEPACK DRIVE: AMB Second Source Suppliers

PCN Reference : ADG/23/14252

Subject : Public Products List

Dear Customer,

Please find below the Standard Public Products List impacted by the change.

ADP61075W3-L	ADP360120W3-L	ADP480120W3-L
ADP360120W3	ADP480120W3	ADP61075W3
ADP46075W3	ADP280120W3	

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New AMB material from suppliers Rogers and Heraeus as 2nd sources in addition to Denka in ACEPACK DRIVE module assembled in ST Shenzhen (China) Reliability Evaluation Report

General Information on selected Test Vehicles	
Commercial Product	**ADP86012W2DP** **ADP46075W3**
Product Line	**SQKW** **BMHO**
Silicon process Technology	**MOSFET SiC GEN2** **MOSFET SiC GEN3**
Package	**ACEPACK DRIVE**

Note: *this report is a summary of the reliability trials performed in good faith by STMicroelectronics in order to evaluate the electronic device conformance to its specific mission profile for Automotive Application. This report and its contents shall not be disclosed to a third party without previous written agreement from STMicroelectronics or under the approval of the author (see below).*

Revision history

Rev.	Changes description	Author	Date
1.0	First release	T.Lo Piparo ADG Reliability	26th July 2023

Approved by

Function	Location	Name	Date
Division Reliability Manager	ST Catania (Italy)	V.Giuffrida	26th July 2023

Contents

1. Reliability Evaluation Overview

1.1. Objective and reliability strategy

Aim of this document is to present the reliability evaluation results to release in mass production the AMB from qualified suppliers Rogers and Heraeus for the Power Module AcePack Drive, intended for Automotive application, assembled in ST Shenzhen (China) Assembly Plant.

To address the technical gap related to AMB coming from other suppliers different from Denka, a dedicated delta reliability evaluation was performed according to **ST 0061692** and **AQG324 Rel03.1/21** specification on lots related to 2 different test vehicles that already passed reliability evaluations in previous years in order to have a robust assessment:

Selcted Test Vehicle	Commercial Product	SiC line	Die size (mm²)	BVDss (V)	Package
A	ADP86012W2DP	SQKW	19.8	1200	AcePack Drive
B	ADP46075W3	BMHO	25.6	750	

Details of each stress test and relevant conditions performed for each Supplier are reported in below Table.

1.2. Test Plan

AQG 324 Test Plan Table

#	TEST NAME	DESCRIPTION / COMMENTS	TEST FLAG
1	QM TEST	Pre- and Post-Stress Electrical Test	Yes
2	IPI/VI/OMA	Internal Physical Inspection/Visual Inspection Optical Microscope Assessment	Yes
3	ISO test	Isolation test	Yes
4	QM-01	Interconnection Layers (**SAM**)	Yes
5	QC-01	Determining Parasitic Stray Inductance (**Lp**)	Yes
6	QC-02	Determining Thermal Resistance (**Rth** measure)	Yes
7	QC-03	Determining Short-Circuit Capability	No
8	QC-04	Insulation Test	Yes
9	QC-05	Determining Mechanical Data	No
10	QE-01	Thermal Shock Test (**TST**)	Yes
11	QE-02	Contactability (**CO**)	No
12	QE-03	Vibration (**V**)	Yes
13	QE-04	Mechanical Shock (MS)	Yes
14	QL-01	Power Cycling (**PCsec**)	No
15	QL_02	Power Cycling (**PCmin**)	Yes
16	QL-03	High Temperature Storage (**HTS**)	No
17	QL-04	Low Temperature Storage (**LTS**)	No
18	QL-05	High Temperature Reverse Bias (**HTRB**)	No
19	QL-06	High Temperature Gate Bias (**HTGB**)	No
20	QL-07	High-humidity High-temperature reverse bias (**H3TRB**)	Yes

1.3. Conclusion

Based on the achieved positive results on evaluations performed in agreement with ST 0061692 guideline and AQG324 Rel03.1/21 specification on the power modules **ADP86012W2DP** and **ADP46075W3,** the AMB coming from suppliers Rogers and Heraeus can be used for production of Power Module assembled in ACEPACK DRIVE in ST Shenzhen (China) assembly plant.

2. Product Characteristics

2.1. Traceability

2.1.1. Wafer Fab information

Wafer fab name / location	CT6" (Catania – Italy)
Wafer diameter (inches)	6"
Silicon process technology	SiC MOSFET GEN2 (SQKW) SiC MOSFET GEN3 (BMHO)
Passivation Die (front side)	SiN/POLYMIDE (SQKW) POLYMIDE (BMHO)
Die finishing back side	Ti-NiV-Ag
Die area (Stepping die size)	4900 x 4040 [µm] (BMHO) 6030 x 4250 [µm] (BMHO)
Metal levels / Materials	1 / Al-Si-Cu

2.1.2. Assembly information

Assembly plant name / location	Shenzhen (China) STM
Package description	ACEPACK DRIVE Plastic Housing Cover PL0002400 PBT GF30
Pin holder	Pin holder Solderable Stdoff Acepack NiP Elbik Final design/material (press fit length, press fit width, press fit position, K55)
NTC	NTC KG3B-35 – 5Kohm +/-5% – 3.2mmx1.65mmx1.65mm SHIBAURA
Solder	Solder Paste Sn/Ag 96.5/3.5 Print. 500g PREFORM Sn/Sb 95/5 OD44.5x63.5 350w/o Sintering Film – TAPE ALPHA DAF Argomax8020 65u 97x97 1pc
Silicon gel	SILGEL WACKER 612AB
Wire bonding material/diameter	– Al, Gate wire 7mils – Al, Source 15 mils
AMB (Ceramic Insulator)	CERAMIC ADRIVE 30L 16x25mm2 SiC BP SelAg

2.1.3. Reliability Testing information

Reliability laboratory location	STM Shenzhen (China) for all trials except for Insulation Test tha was performed in STM Catania (Italy)
Electrical testing / location	ATE SPEA

3. Test summary details

3.1. Lot Information

Reliability Lot	AMB supplier	Commercial Product	SiC Line	Assembly lot	Diffusion Lot
1	Denka	ADP86012W2DP	SQKW	GK2429FDRQ	V108277
2		ADP46075W3	BMHO	GK24299901	V202909
3	Rogers	ADP86012W2DP	SQKW	GK2429FD01	V108277
4		ADP46075W3	BMHO	GK242999RR	V202909
5	Heraeus	ADP86012W2DP	SQKW	GK2429FD02	V108277
6		ADP46075W3	BMHO	GK242999RQ	V202909

3.2. Test Summary table for each Supplier validation

Test method revision reference is the one active at the date of reliability trial execution.

#	Test	TEST Description	AQG324 – STM Test Name/Conditions	Lots	Sample size	Results Fail/SS/Lots	Comments
1	QM TEST		User specification or supplier's standard specification	1	36	0/36/1	All qualification parts before/after stress
2	IPI/VI/ OMA			1	36	0/36/1	All qualification parts before/after stress
3	ISO test		According to user specification	1	36	0/36/1	All qualification parts after stress
4	QM-01	Interconnection layer test	SAM analysis	1	12	0/12/1	All parts submitted to QE-01 and QL-02
5	QC-01	IEC 60747-15:2012, section 5.3.2 (double pulse testing)	Parasitic Stray inductance (Lp) double pulse	1	36	0/36/1	All parts submitted to QC-03, QC-04, QE and QL
6	QC-02	IEC 60747-15:2012, section 5.3.6	Thermal Resistance (**Rth**)	1	3	0/3/1	Monitored during Power cycling
7	QC-03	AQG 324	Determining Short-Circuit Capability Hard Switch and Under Load failures	-	-	-	
8	QC-04	AQG 324	Insulation Test	1	6	0/6/1	
9	QC-05		Mechanical Data/User specification	-	-	-	
10	QE-01	IEC 60749-25:2003	Thermal Shock Test (**TST**) Ta= -40°C/125°C, duration= 1000cy 	1	6	0/6/1	
11	QE-02		Contactability (CO)	-	-	-	Withdrawn for the time being on AQG-324
12	QE-03	IEC 60068-2-6 IEC 60068-2-64	Vibration (**V**) T ambient – Vibration profile D as per AQG324 (components installed on sprung masses)	1	6	0/6/1	

13	QE-04	IEC 60068-2-27	Mechanical Shock (**MS**) Peak acceleration = 500m/s2 shock duration = 6ms shock form = half-sine n. shock per direction (±X, ±Y, ±Z) = 10	1	6	0/6/1	
14	QL-01	IEC 60749-34:2011	Power Cycling Short **(Pcsec)**	-	-	-	
15	QL-02	IEC 60749-34:2011	Power Cycling Long (Pcmin) tON >15s, Vbias=tuned for each switch to reach DTj=100°C	1	3	pass	2 switches/module Total 6 sw
16	QL-03	IEC 60749-6:2002	High Temperature Storage (**HTS**) Ta=150°C, duration=1000h	-	-	-	
17	QL-04	JEDEC JESD-22 A119:2009	Low Temperature Storage (**LTS**) Ta=-40°C, duration=1000h	-	-	-	
18	QL-05	IEC 60747-9:2007	High Temperature Reverse Bias (**HTRB**) Vbias= 100% Vds Tj = 150°C duration=1000h	-	-	-	
19a	QL-06	IEC 60747-9:2007	High Temperature Gate Bias (**HTGB**) Vbias = Vgs max = +22V, Tj = 150°C duration=1000h	-	-	-	
19b			Vbias = Vgs max = -10V, Tj = 150°C duration=1000h	-	-	-	
20	QL-07	IEC 60747	High-humidity High-temperature reverse bias (**H3TRB**) Vbias= 80% Vds, Ta = 85°C, RH=85% duration=1000h	1	6	0/6/1	

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