Automotive Discrete Group (ADG)
Power Transistor Division

Process Change Information

STH260N6F6-2 Capacity Extension in HHGrace Foundry

Dear Customer,

Following the continuous improvement of our service and in order to increase productivity, we are pleased to announce that the product STH260N6F6-2 whose silicon is currently manufactured in Catania will be also produced in our qualified foundry HHGrace.
The wafers, and the final assembled products, guarantee the same quality and electrical characteristics as per current production.

In the next pages, we are reporting the qualification plan to reach full maturity.

The change has been classified as **Class 1** according to the ZVEI and ST internal rules.

	Assessment of impact on Supply Chain regarding following aspects - contractual agreements - technical interface of processability/manufacturability of customer - form, fit, function, quality performance, reliability	**Remaining risks on Supply Chain?**	
ID	**Type of change**	**No**	**Yes**
SEM-PW-13	Move of all or part of wafer fab to a different location/site/subcontractor	**P**	**P**

The qualification of the change has been completed

Sincerely Yours!

<table>
<tr><th colspan="2">STH260N6F6-2 / 6 and STP260N6F6 Capacity Extension in HHGrace Foundry</th></tr>
<tr><td>ST Part number:</td><td>ST PN: STripFET™ F6 (60V)
STH260N6F6-2
Package: H2PAK</td></tr>
<tr><td>Reason and background of the change</td><td>To increase flexibility by improving capacity avoiding the risk for the customer to line down due to lack of silicon at FE level.</td></tr>
<tr><td>Detailed description of change(s), including affected type of changes</td><td>The Diffusion Process for the above reported products will be performed also in our subcontractor HHGrace. No change at
Wafer probing level → ST’s AMK EWS
Back End level → Shenzhen</td></tr>
<tr><td>Impact on form, fit, function, or reliability.</td><td>No Impact</td></tr>
<tr><td>Datasheet</td><td>No Impact</td></tr>
<tr><td>Benefit of the change</td><td>Capacity and flexibility increase.</td></tr>
<tr><td>Planned Implementation date for change</td><td>The qualification has been completed according to the following plan:
<table>
<tr><th>Test Vehicles</th><th>N. of Lots</th><th>Type of verification</th><th>Forecast</th></tr>
<tr><td>STH260N6F6-2</td><td>1</td><td rowspan="3">Full electrical characterization
Full reliability</td><td>Completed</td></tr>
<tr><td>STD80N4F6</td><td>1</td><td>Completed</td></tr>
<tr><td>STH320N4F6-2</td><td>1</td><td>Completed</td></tr>
</table></td></tr>
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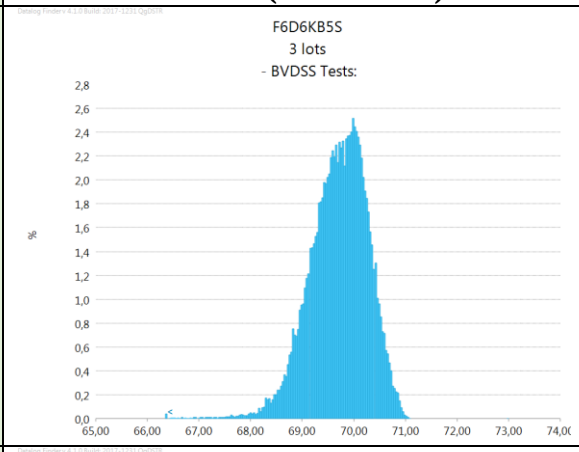
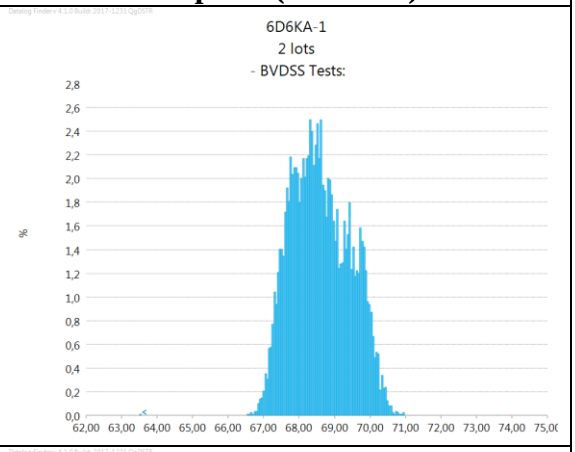
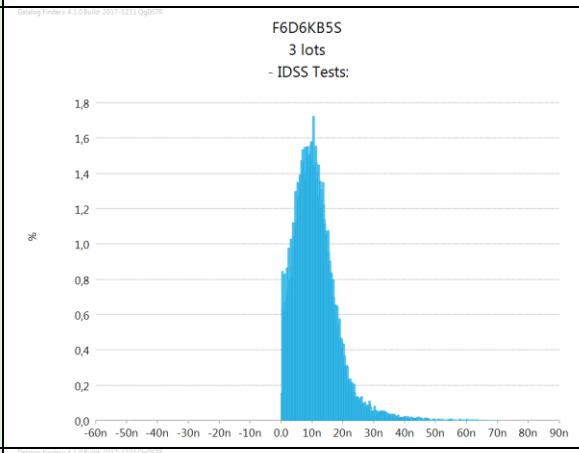
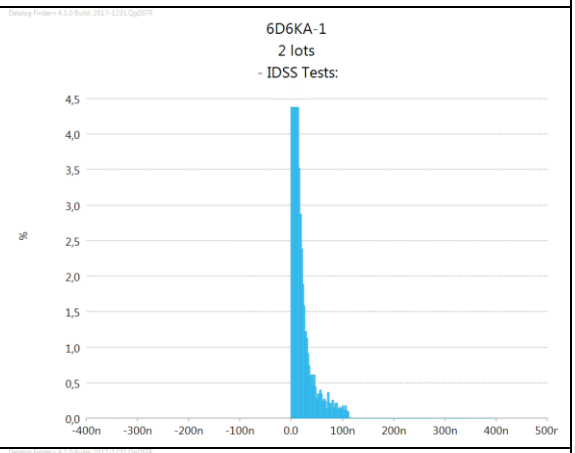
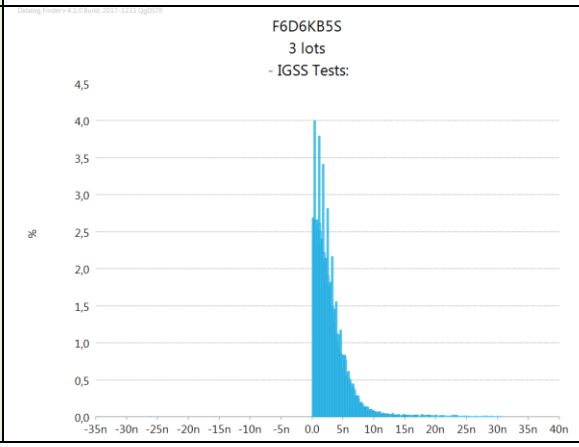
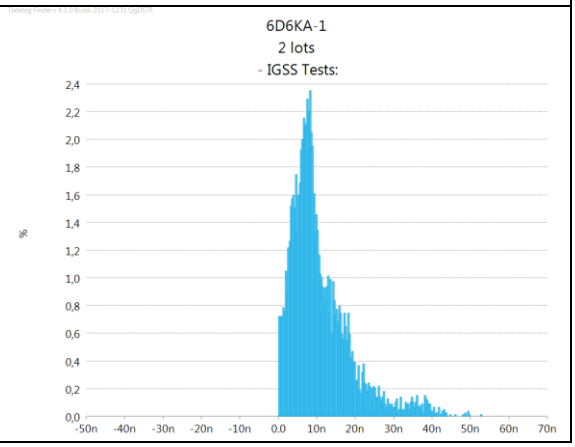
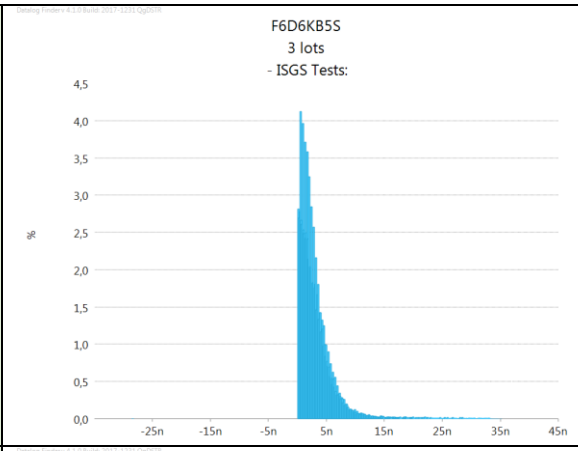
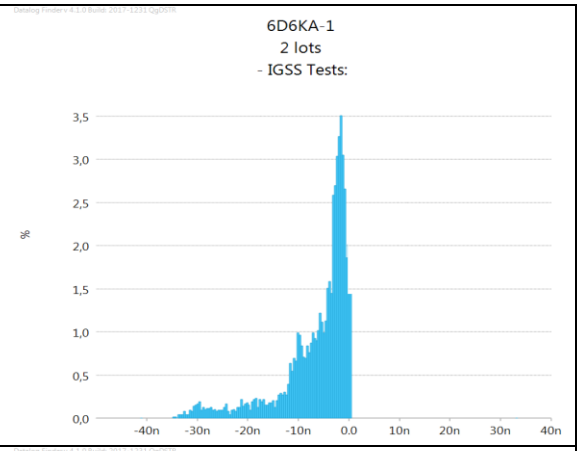
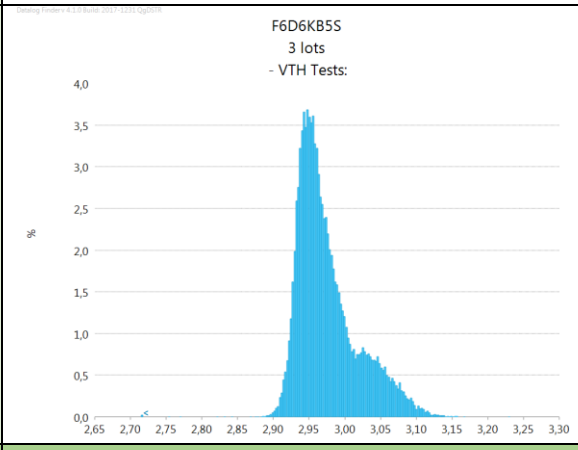
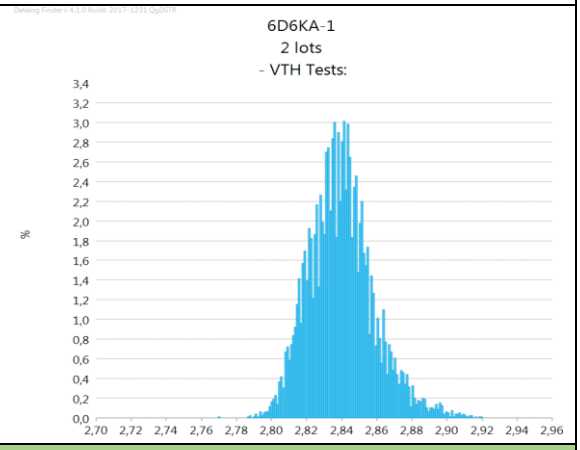
Full Electrical characterization and Comparative analysis	The Electrical Characterization, at wafer level, performed on 3 different lots has demonstrated all the electrical parameters are aligned with current production.	
Test Item	**Current (Catania FE)**	**Proposal (HHG FE)**
BVDSS @ 1mA (Spec. > 60V)		
Idss @ 60V (Spec < 1µA)		
IGSS @ 20V (Spec. < 100nA)		

IGSS @ -20V (Spec. < 100nA)		
Vth @ 250µA (Spec. 2,0V to 4,0V)		

	Current (Catania FE)		Proposal (HHG FE)	
Parameter	**Datasheet**	**CPK**	**Datasheet**	**CPK**
BVDSS @ 1mA	> 60V	5,2	> 60V	4,2
IDSS @ 60V	< 1µA	3,8	< 1µA	4.1
IGSS @ 20V	< 100nA	6,6	< 100nA	5.7
IGSS @ -20V	< 100nA	6,1	< 100nA	5.2
Vth @ 250µA	2.0V ÷ 4.0V	12,3	2.0V ÷ 4.0V	15,2

Lot Reject Rate (Catania FE vs HHG FE)

BIN Pareto Comparison (At Wafer Probing Level)

Catania FE

Bin	%
Good	96.8%
Cat	1.48%
BVdss	0.24%
Idgo	0.04%
Idss	0.47%
Igss	0.78%
Vth	0.03%
UIS	0.16%
PAT	N/A

HHG FE

Bin	%
Good	96.9%
Cat	0.4%
BVdss	0.7%
Idgo	0.1%
Idss	0.6%
Igss	0.0%
Vth	0.8%
UIS	0.0%
PAT	0.5%

Conclusion

All the checked parameters are inside the accepted tolerances.
Based on what above reported we can confirm the silicon produced in HHG foundry is perfectly aligned with the ones currently in production.

STH260N6F6-6 Capacity Extension in HH-Grace Foundry INDUSTRIAL

General Information	
Commercial Product	: STH260N6F6-6
Product Line	: 6D6K
Product Description	: PowerMOSFET -STripFET™ F6
Package	: H^2PAK
Silicon Technology	: PowerMOSFET
Division	: Power Transistor Division

Traceability	
Diffusion Plant	: HH-Grace
Assembly Plant	: Shenzhen
Reliability Assessment	
Passed	☒

Disclaimer: *this report is a summary of the qualification plan results performed in good faith by STMicroelectronics to evaluate the electronic devices conformance to its specific mission profile for Automotive Application. This report and its contents shall not be disclosed to a third party, except in full, without previous written agreement by STMicroelectronics or under the approval of the author (see below)*

REVISION HISTORY

Version	Date	Author	Changes description
1.0	13 March 2018	A.SETTINIERI	FINAL REPORT

APPROVED BY:
Corrado CAPPELLO
ADG Q&R department - Catania
ST Microelectronics

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1. RELIABILITY EVALUATION OVERVIEW

1.1 Objective

Reliability evaluation for STH260N6F6-6 Industrial Product transfer from CT6" ST`s Catania Fab to HHGrace Foundry.

1.2 Reliability Test Plan

Reliability tests performed on this device are in agreement with internal spec 0061692 specification and are listed in the Test Plan
For details on test conditions, generic data used and spec reference see test results summary at Par.3

TABLE 2

#	Stress	Abrv	Reference	Test Flag	Comments
1	Pre and Post-Stress Electrical Test	TEST	User specification or supplier's standard Specification	Y	
2	External Visual	EV	JESD22B-101	Y	
3	Pre-conditioning	PC	JESD22A-113	Y	
4	High Temperature Storage Life	HTSL	JESD22B-101	Y	
5	High Temperature Gate Bias	HTGB	JESD22A-108	Y	
6	High Temperature Reverse Bias	HTRB	JESD22A-108	Y	
7	ESD Characterization	ESD (HBM, CDM)	ESDA-JEDEC JES-001 and AINSI-ESD S5.3.1	Y	
8	Temperature Cycling	TC	JESD22A-104	Y	
9	Autoclave	AC	JESD22A-102	Y	
10	High Humidity High Temperature Reverse Bias	H3TRB	JESD22A-101	Y	
11	Intermittent Operational Life / Thermal Fatigue	IOL / TF	MIL-STD-750 Method 1037	Y	

1.3 Conclusion

All reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.
Parameter drift analysis performed on samples submitted to die and package oriented test showed a good stability of the main electrical monitored parameters.
Package oriented tests have not put in evidence any criticality.
ESD is accordance with ST spec.

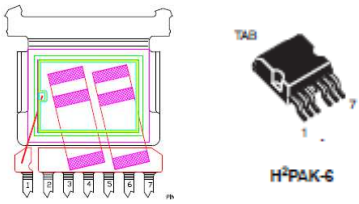
On the basis of the overall results obtained, we can give a positive judgment on the reliability evaluation on the product STH260N6F6-6 produced in HH Grace Foundry in agreement with ST internal spec 0061692

2. DEVICE/TEST VEHICLE CHARACTERISTICS

2.1 Generalities

Power MOSFET STripFET™ F6 60V

2.2 Pin connection



2.3 Traceability

Reference “Product Baseline” document if existing, else provide following chapters/information:

Wafer fab information

Wafer fab information	
Wafer fab manufacturing location	HHGrace Foundry (China)
Wafer diameter (inches)	8
Silicon process technology	Power MOSFET
Die finishing front side (passivation)	TEOS/NITRIDE
Die finishing back side	Ti-Ni-Ag
Die area (Stepping die size)	6340x4600µm^2
Metal levels/Materials	AlCu

Assembly information

Assembly Information	
Assembly plant location	ST Shenzhen (China)
Package code description	H^{2}PAK
Leadframe/Substrate	FRAME H^{2}PAK 7L/ Cu
Die attach material	Preform / Pb-Ag-Sn
Wires bonding materials/diameters	Gate → AlMg 5mils Source → RIBBON Al 80x10 mils
Molding compound	Not HF Molding compound

Reliability testing information

Reliability Testing Information	
Reliability laboratory location	Catania (Italy)
Electrical testing location	Catania (Italy)

3. TESTS RESULTS SUMMARY

3.1 Lot Information

Lot #	Product lines	Package	Wafer Fab	Assembly plant	Note
	6D6K	H^2PAK 6L	HHGrace (China)	ST Shenzhen (China)	
	Product / Technology Family Data				
1	6D6K	H^2PAK 2L	HHGrace (China)	ST Shenzhen (China)	
2	6D4K				
3	6D44	DPAK			

3.2 Test results summary

Test plan results are summarized in the following template.

#	Stress (Abrv)	PC	Std ref.	Conditions	Sample Size (S.S)	Steps	Failure/SS			
							Lot 1	Lot 2	Lot 3	Lot 4
							Product / Technology Family Data			
1	TEST		User specification	All qualification parts tested per the requirements of the appropriate device specification.			0/235	0/235	0/235	0/235
2	External Visual		JESD22B-101	All devices submitted for testing			0/235	0/235	0/235	0/235
3	Pre-conditioning		JESD22 A-113	Dryng 24H @ 125°C Store 168H @ TA=85°C,RH=85% IR Reflow @ 245°C 3 times	All devices to be subjected to H3TRB, TC, AC, IOL	FINAL	Pass	Pass	Pass	
				Dryng 24H @ 125°C Store 168H @ TA=85°C,RH=85% IR Reflow @ 260°C 3 times						Pass
4	HTSL	N	JESD22B-101	TA=175°C	180	1000H	0/45	0/45	0/45	0/45
5	HTRB	N	JESD22 A-108	Tj=175°C ; BIAS= 48V	180	1000H	0/45	0/45		
				Tj=175°C ; BIAS= 32V					0/45	0/45
6	HTGB	N	JESD22 A-108	Tj=175°C ; BIAS= 20V	180	1000H	0/45	0/45	0/45	0/45
7	TC	N	JESD22 A-104	TA=-65°C TO 150°C 1 HOURS / CYCLE	100	500cy	0/25	0/25	0/25	0/25
8	AC	Y	JESD22 A-102	TA=121°C ; PA=2ATM	100	96H	0/25	0/25	0/25	0/25
9	H3TRB	Y	JESD22 A-101	TA=85°C ; RH=85% BIAS= 48V	100	1000H	0/25	0/25	0/25	
				TA=85°C ; RH=85% BIAS= 32V						0/25
10	IOL	Y	MIL-STD-750 Method 1037	ΔTj≥100°C	100	10Kcy	0/25	0/25	0/25	0/25
11	ESD		ESDA-JEDEC JES-001 and AINSI-ESD S5.3.1	CDM / HBM	24		0/3 0/3	0/3 0/3	0/3 0/3	0/3 0/3