PRODUCT TERMINATION NOTIFICATION

PTN APM-DIS/10/5979
Notification Date 10/21/2010

APM - ASD & IPAD Division

Ultrafast Rectifiers in 400V

Replacement by new high performance STTH products

Table 1. Termination Implementation Schedule

Forecasted date of STMicroelectronics **'alternative products replacement'** for customer	14-Oct-2010
Last Order entry date (6 months from the notice for final shipment according to JEDEC standard JESD48-A 'Product Discontinuance')	21-Apr-2011
Last Order delivery date (12 months from the notice for final shipment according to JEDEC standard JESD48-A 'Product Discontinuance')	28-Oct-2011

Table 2. Termination Identification

Product Identification Commercial Product(s) to be terminated	All [SM]BYTxx-400 400V Ultrafast Rectifiers
Reason for termination	technology conversion
Alternate product(s) replacement	See attached

Table 3. List of Attachments

Customer Part numbers list	

DOCUMENT APPROVAL

Name	Function
Paris, Eric	Division Marketing Manager
Duclos, Franck	Division Product Manager

PRODUCT TERMINATION NOTIFICATION

PTN APM-DIS/10/5979

APM - ASD & IPAD Division[1]

Ultrafast Rectifiers in 400V:

Replacement by new high performance STTH products

(1) APM: Analog, Power & MEMS Group - ASD: Application Specific Device - IPAD: Integrated Passive and Active Devices

WHY THIS PRODUCT TERMINATION?

To offer the **full benefit of its latest technology** while completing the rationalization of its product portfolio, ST announces the replacement of **all** [SM]BYTxx-400 **400V Ultrafast Rectifiers** by the **STTHxx04xx** series.

This is the closing step of **ST's technology conversion** initiated five years ago for its **Ultrafast Rectifier range**, the 400V voltages coming last after the conversion of all other voltages from 200 V to 1200 V.

The first **STTHxx04xx devices were introduced** in year 2006 and have since then been widely adopted with benefits in their applications by a **high number of customers** involved in all types of power conversion.

REPLACEMENT SCHEME

Comparative description between current and new product ranges

Like all other **STTH series**, the new 400V devices **feature higher performance** in terms of **operating temperature capability** (Tjmax = 175°C, except for ISOTOP package) and low **leakage current** (value divided by 10 typical), for the benefit of all applications.

Since its introduction, the new 400V range has been extended and now offers a **wider choice** as for:

- **currents** now ranging from **1 A to 2x100 A**,
- **packages** that include new **isolated** and **surface mount** versions.

Some **parametric trade-offs** are also available to better fit specific applications.

The new **STTHxx04xx series** are intended to replace the current parts with same packages **as indicated below**, while featuring **enhanced characteristics** for the benefit of the applications.

There is **no change** in the **packing mode** and in the standard **delivery quantities**. The products are delivered in compliance with the RoHS(1), with no change in the MSL for surface mount devices (Moisture Sensitivity Level 1).

(1) Restriction of the use of certain Hazardous Substances

Package	Part Number	Equivalent STTH	Nearest STTH
D²PAK	BYT30G-400(TR)	**STTH30R04G-TR**	
DO-15	BYT01-400(RL)	**STTH1R04Q(RL)**	**STTH1R04RL**
DO201-AD	BYT03-400(RL) BYT03-400-C2	**STTH3R04RL**	**STTH3R04QRL**
ISOTOP(2)	BYT200PIV-400 BYT230PIV-400 BYT231PIV-400 BYT261PIV-400	**STTH200R04TV1** **STTH61R04TV2** **STTH61R04TV1** **STTH120R04TV1**	
SMB	SMBYT01-400	**STTH1R04U**	**STTH1R04A**
SMC	SMBYT03-400	**STTH3R04S**	**STTH3R04U**
TO-220AB	BYT16P-400	**STTH16R04CT**	
TO-220AC	BYT08P-400	**STTH8R04D**	
TO220-AC Ins	BYT08PI-400RG	**STTH8R04DI**	**STTH8R04FP**
DOP3 Ins	BYT30PI-400	**STTH30R04PI**	

(2) UL recognized under file E81734

Customer specific devices not expressly included in the above table but derived from above product series and housed in same packages are also included in this product termination.

TERMS AND CONDITIONS

Product maturity management:

According to ST's termination process, the current parts in end of life (EOL) have been affected a special maturity code (50) in order to **stop the delivery of samples** and consequently **to avoid their use in new designs**.

Qualification results availability for new series:

The **qualification report** relating to the STTHxx04xx series is annexed to the present document.

Samples availability:

Qualification samples of the replacement products are **available** on request, with delivery according to current lead times.

Product datasheets:

The **datasheets** of the parts suggested for replacement are available on ST's website at address:

http://www.st.com/stonline/products/families/diodes/ultrafast/ultrafast_rectifiers.htm

Termination schedule:

Last buy orders and **last buy shipments** will be honoured as indicated in the schedule below.

Last time sampling	
Parts in termination are not allowed for sampling since	***September 30, 2010***
Last time buy (orders)	
Orders for the discontinued products will be accepted until	***April 21, 2011***
Last time delivery (shipments)	
Products in termination will be delivered at the latest until	***October 28, 2011***
Last time in contracts	
Discontinued products must not be included into	***2011 and further contracts***

We recommend our customers to place their **last time buy orders** for the products in termination from **now** on.

Precaution:

Although the new parts have been designed for direct or nearest replacement of the parts in termination, we recommend our customers to verify their correct suitability in the applications.

Annex:

- 07043QRP REV.D **qualification report.**

QUALIFICATION REPORT

ULTRAFAST 400V STTHxxR04 series in Power packages

Author: Isabelle BALLON
Product Quality Assurance

07-Oct-10

Ref.: 07043QRP
Rev. D

Qualification report
Ultrafast 400V – STTHxxR04 series

REVISION TRACKING

Revision	Date	Description of revision	Name
A	09-Mar-07	Creation in Power packages assembly	I.B.
B	01-Aug-07	Update of packages range for 10A & 20A products	I.B.
C	Sept 07	Update of products range with 1A and 3A serie	A.D.
D	07-Oct-10	Remove of STTH3R04-C1 / STTH3R04-C2 (reference document: PTN APM-DIS/10/5727	I.B.

Qualification report
Ultrafast 400V – STTHxxR04 series

CONTENTS

Qualification report
Ultrafast 400V – STTHxxR04 series

PRODUCT RANGE from 1A and 3A

Part number	Package	Tj	IF (AV)	VRRM	VF (typ)	Trr (typ)	Qualification date
STTH1R04	DO-41	175°C	1A	400V	0.9V	14 ns	Sept-07
STTH1R04Q	DO-15						
STTH1R04A	SMA						
STTH1R04U	SMB						
STTH3R04	DO-201AD		3A		0.9V	18ns	
STTH3R04Q	DO-15						
STTH3R04U	SMB						
STTH3R04S	SMC						

Qualification report
Ultrafast 400V – STTHxxR04 series

PRODUCT RANGE from 8A to 20A

Part number	Package	Tj	IF (AV)	V_{RRM}	VF (typ)	Trr (typ)	Qualification date
STTH8R04D	TO-220AC	175°C	8A	400V	0.90V	25ns	09-Mar-07
STTH8R04FP	TO-220FPAC						
STTH8R04G	D²PAK						
STTH8R04DI	TO-220AC Ins						
STTH10R04G	D²PAK		10A		1.15V	15ns	
STTH10R04D	TO-220AC						
STTH10R04FP	TO-220FPAC						
STTH10R04B	DPAK						
STTH16R04CT	TO-220AB		2x8A		0.90V	25ns	
STTH16R04CFP	TO-220FPAB						
STTH16R04CG	D²PAK						
STTH20R04G	D²PAK		20A		1.15V	18ns	
STTH20R04D	TO-220AC						
STTH20R04FP	TO-220FPAC						
STTH20R04W	TO-247						

Qualification report
Ultrafast 400V – STTHxxR04 series

PRODUCT RANGE from 30A to 200A

Part number	Package	Tj	IF (AV)	V_{RRM}	VF (typ)	Trr (typ)	Qualification date
STTH30R04D	TO-220AC	175°C	30A	400V	0.97V	24ns	09-Mar-07
STTH30R04G	D²PAK						
STTH30R04W	DO-247						
STTH30R04PI	DOP3 Ins						
STTH60R04W	DO-247		60A		0.95V	31ns	
STTH61R04TVx	ISOTOP	150°C	2x30A		0.95V	24ns	
STTH120R04TVx	ISOTOP		2x60A		0.95V	31ns	
STTH200R04TVx	ISOTOP		2x100A		0.87V	40ns	

Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF DIE TECHNOLOGY from 1A and 3A

Part number	Wafer diameter	Die technology	Die metallization (Front side)	Die metallization (back side)
STTH1R04	6''	Planar	Al-TiNiAu	Ti Ni Au
STTH1R04Q				
STTH1R04A				
STTH1R04U				
STTH3R04				
STTH3R04-C1				
STTH3R04-C2				
STTH3R04Q				
STTH3R04U				
STTH3R04S				

DIE / DIFFUSION PLANT LOCATION : STMicroelectronics TOURS (France)

Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF DIE TECHNOLOGY from 8A to 200A

Part number	Wafer diameter	Die technology	Die metallization (Front side)	Die metallization (back side)
STTH8R04xx	6''	Planar	Al	Ti Ni Au
STTH10R04xx				
STTH16R04xx				
STTH20R04xx				
STTH30R04xx				
STTH60R04xx				
STTH61R04xx				
STTH120R04xx				
STTH200R04xx				

DIE / DIFFUSION PLANT LOCATION : STMicroelectronics TOURS (France)

Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF PACKAGE TECHNOLOGY from 1A and 3A

ASSEMBLY DESCRIPTION

Part	Die attach material	Bonding	Frame material	Lead finish material	Package	Molding compound (*)
STTH1R04	Solder preform	Leads (Copper)	NA	Sn	DO-41	Epoxy resin
STTH3R04-xx					DO-201AD	
STTHxR04Q					DO-15	
STTH1R04A	Soft solder (Sn/Pb/Ag)	CLIP	Copper		SMA	
STTHxR04U					SMB	
STTH3R04S					SMC	

Note: (*) epoxy resin flammability is rated UL94V0

ASSEMBLY / TEST PLANT LOCATIONS :
SMA, SMB, SMC : STM Casablanca (Morocco) / Subcontractor in China
DO-41, DO-15, DO-201AB: Subcontractor in China

Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF PACKAGE TECHNOLOGY from 8A to 200A

ASSEMBLY DESCRIPTION

Part	Die attach material	Bonding	Frame material	Lead finish material	Package	Molding compound (*)
STTHxxR04xx	Soft solder (Sn/Pb/Ag)	Aluminium (Al)	Copper Ni plated	Sn	TO-220AC TO-220AB TO-220FPAB TO-220FPAC DOP3 Insulated DO-247 D²PAK	Epoxy resin
STTHxxR04TVx				Ni	ISOTOP	

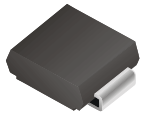
Note: (*) epoxy resin flammability is rated UL94V0

ASSEMBLY / TEST PLANT LOCATIONS :

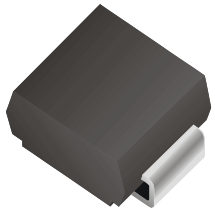
D²PAK: STM Shenzhen (China)
DO-247: STM Long GanG (China)
TO-220AC/TO-220AB: STM Casablanca (Morocco) / STM Shenzhen (China)/STM Long GanG (China)
TO-220FPAC/TO-220FPAB: STM Shenzhen (China)
DOP3 Ins: Subcontractor in Philippines
ISOTOP: STM Casablanca (Morocco)

Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF PACKAGE TECHNOLOGY



SMA



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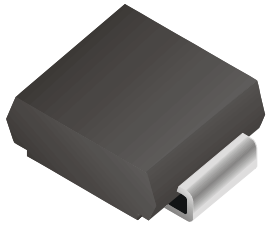
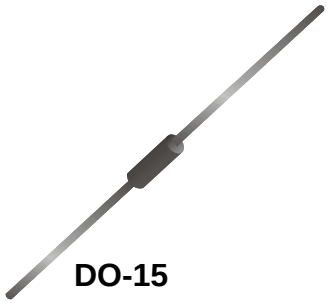


SMC

DO-41

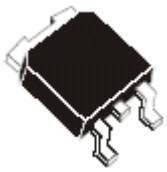


DO-15

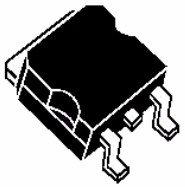
DO-201AD

Qualification report
Ultrafast 400V – STTHxxR04 series

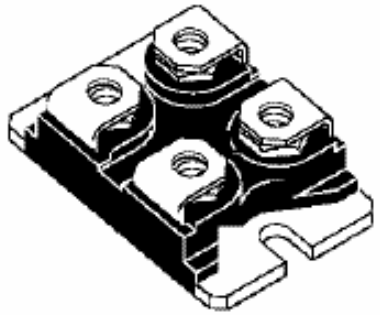
BASICS OF PACKAGE TECHNOLOGY



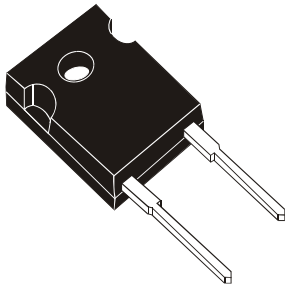
DPAK



D²PAK



ISOTOP™



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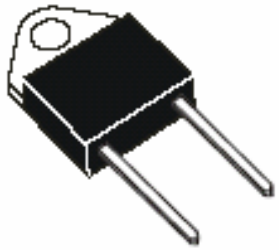
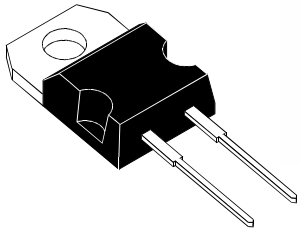
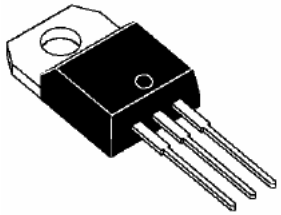


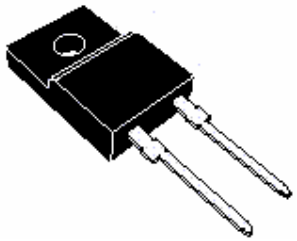
DOP3 Insulated



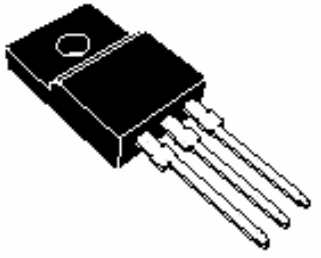
TO-220AC



TO-220AB



TO-220FPAC

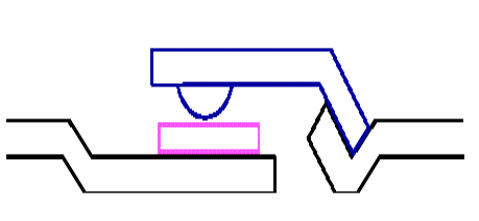


TO-220FPAB

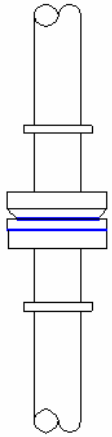
Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF PACKAGE TECHNOLOGY

INNER ASSEMBLY STRUCTURE



SMA / SMB / SMC



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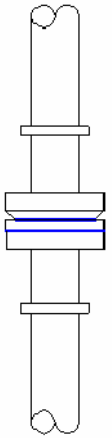
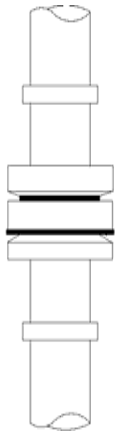


DO-41



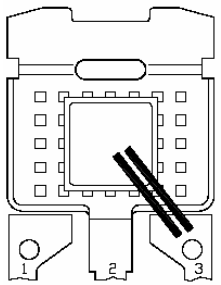
DO-201AD

Note: Generic schemes (die/wire bonding & clip sizes and die design given as example)

Qualification report
Ultrafast 400V – STTHxxR04 series

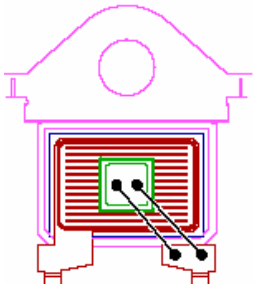
BASICS OF PACKAGE TECHNOLOGY

INNER ASSEMBLY STRUCTURE

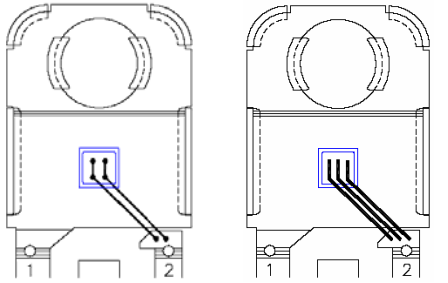


STTH10R04B

DPAK

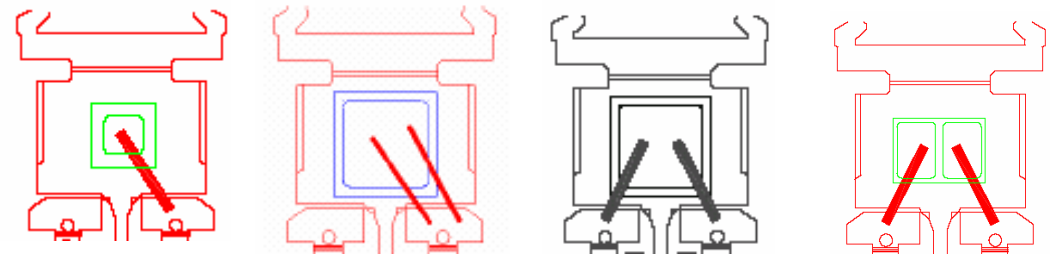


DOP3 Insulated



STTH30R04W **STTH60R04W**

DO-247



STTH8R04G **STTH10R04G** **STTH20R04G** **STTH30R04G** **STTH16R04G**

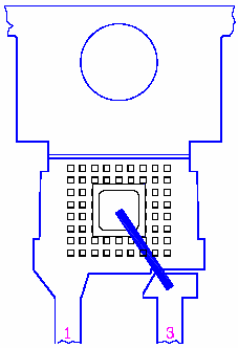
D²PAK

Note : Generic schemes (die / wire bonding sizes and die design given as example)

Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF PACKAGE TECHNOLOGY

INNER ASSEMBLY STRUCTURE



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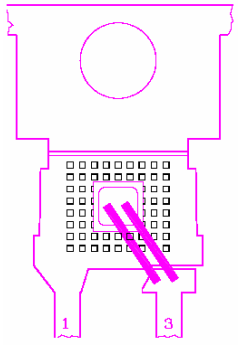
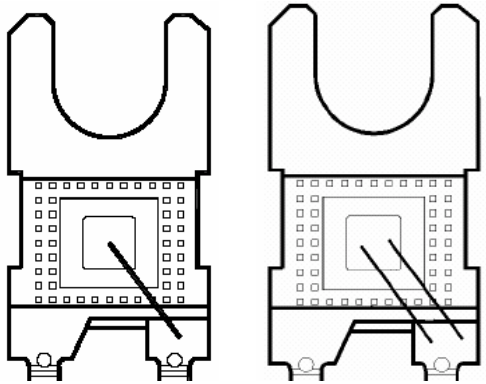
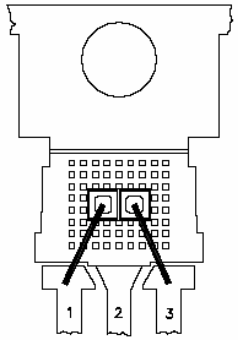


STTH10R04
STTH30R04D

TO-220AC



TO-220FPAC



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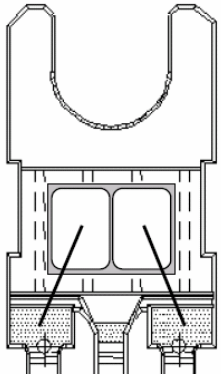


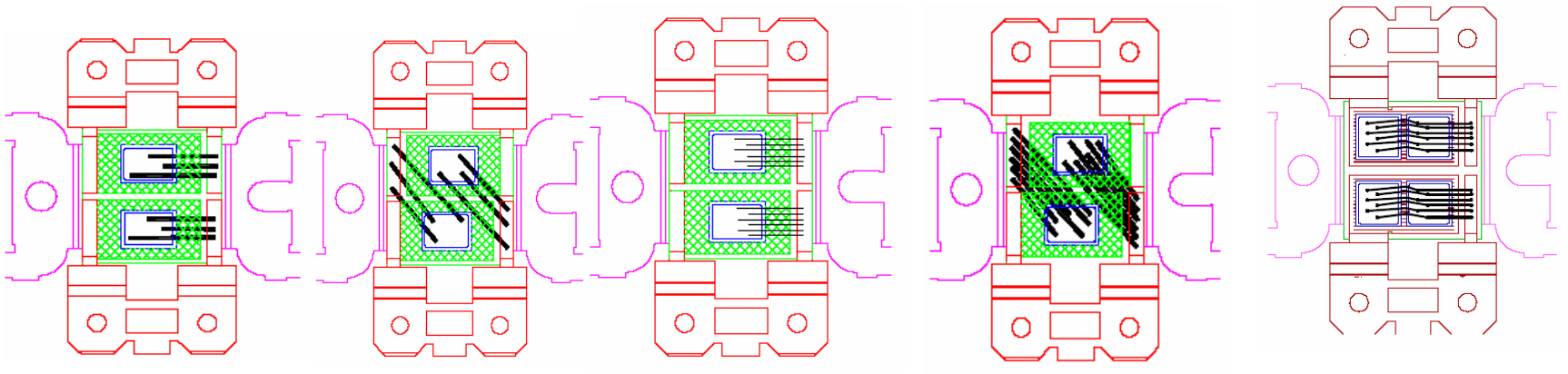
TO-220FPAB

Note : Generic schemes (die / wire bonding sizes and die design given as example)

Qualification report
Ultrafast 400V – STTHxxR04 series

BASICS OF PACKAGE TECHNOLOGY

INNER ASSEMBLY STRUCTURE



STTH61R04TV1 **STTH61R04TV2** **STTH120R04TV1** **STTH120R04TV2** **STTH200R04TV1**

ISOTOP

Note : Generic schemes (die / wire bonding sizes and die design given as example)

Qualification report
Ultrafast 400V – STTHxxR04 series

QUALIFICATION PLAN : GUIDELINES AND DESCRIPTION

* Applicable documents : general procedure SOP2610 (STMicroelectronics) in line with international standard AEC-Q101.

* Guidelines : a product or a family of products is considered qualified when it fulfils the requirements of a qualification plan which covers various aspects such as : development, reliability and manufacturing.

RELIABILITY EVALUATION : TEST SELECTION GUIDELINES

Specific emphasis is put on electrical, thermo mechanical and environmental tests which are intended to accelerate failure mechanisms in order to define the limits of the products when they are submitted to industrial conditions.

The tests performed are split into 2 main families called die oriented tests and package oriented tests.
Tests are selected according to the knowledge of application conditions of the products, failure mode effect analysis performed at design / development, and to the history of the manufacturing process.

The attached sheets provide relevant information on applicable tests, international standards, failure point, failure process, sample size as well as acceptance numbers.

Qualification report
Ultrafast 400V – STTHxxR04 series

RELIABILITY: ABBREVIATIONS AND MEANINGS

* Failure point : Physical localization of failure.

* Failure process : Physical or chemical or other mechanism resulting in a failure.

* F I T : Failure unit ; 1 fit = 1 failure in 10^9 devices - Hours.

* Failure rate : Also called "Lambda - λ" ; it is the incremental change in the number of failures per associated incremental change with time. The failure rate is expressed in fits. Note : MTBF (Mean Time Between Failure) = 1/λ. Currently "λ" is provided in the life-time of the device (constant λ ; exponential modelisation of the population reliability : $R(t) = \frac{N(t)}{N(to)} = e^{-\lambda t}$)

* Accelerating factor :The physical or chemical factor increasing the failure rate.

•Confidence level : A 60% confidence level means there is a 60% possibility that the sample came from a population whose failure rate does not exceed the given failure rate.

* Ea : Activation energy (eV : electron volt). Activation energy is introduced in Arrhenius law It is representative of the failure mechanism involved. Ex : 1eV is used to modelize failure rate when surface charges are involved.

Qualification report
Ultrafast 400V – STTHxxR04 series

RELIABILITY: DIE ORIENTED TESTS

TEST DESCRIPTIONS	FAILURE POINT	FAILURE PROCESS	ACCELERATING FACTORS / ACTIV. ENERGY
HIGH TEMPERATURE REVERSE BIAS (HTRB) JESD22A-108 Tj, 0.8xVRRM ; 1000Hrs	PASSIVATION LAYERS	SURFACE CHARGES ACCUMULATION	TEMPERATURE ELECTRICAL FIELD Ea = 1.0 eV
OPERATING LIFE TEST (OLT) MIL STD 750 Tj max as specified ; rated forward voltage ; 1000Hrs	ACTIVE AREA AND MECHANICAL INTERFACES	LOCAL THERMAL RUNAWAY	TEMPERATURE CURRENT DENSITY

Qualification report
Ultrafast 400V – STTHxxR04 series

RELIABILITY: PACKAGE ORIENTED TESTS

TEST DESCRIPTIONS	FAILURE POINT	FAILURE PROCESS	ACCELERATING FACTORS / ACTIV. ENERGY
THERMAL CYCLING (TCT) JESD22A-104 -55°C/+150°C ; Air / Air ; 1000Cycles	DIE VOLUME DIE ATTACH INTERFACE PASSIVATION LAYERS	SILICON / PACKAGE THERMAL EXPANSION COEFFICIENT MISMATCH	T EXTREMES IN CYCLING.
AUTOCLAVE TEST (PCT) JESD22a-102 121°C ; 2bars ; 100% RH ; 96Hrs	DIE PERIPHERY PASSIVATION	POOR HERMETICITY CONTAMINATION	TEMPERATURE / PRESSURE
TEMPERATURE HUMIDITY BIAS (THB) JESD22A-101 85°C 85%RH ; device reverse biased at 0.8xVrrm up to a maximum of 100V ; 1000Hrs	DIE PERIPHERY PASSIVATION BONDS METALLISATION	POOR HERMETICITY CONTAMINATION CORROSION	HUMIDITY TEMPERATURE VOLTAGE Ea=0.8eV
THERMAL FATIGUE Device powered to assure DTc=55°C; IF; 10K cycles (Time per cycle: 2min. ON / 2min. OFF)	DIE ATTACH	CONTACT DEGRADATION	Tcase

Qualification report
Ultrafast 400V – STTHxxR04 series

RELIABILITY: DIE ORIENTED TESTS CONDITIONS / RESULTS

RELIABILITY TEST	TEST CONDITIONS	RUNNER (*)	RESULTS	EXAMPLE OF DRIFT ANALYSIS
HIGH TEMPERATURE REVERSE BIAS (HTRB)	Tj=110°C, VR=320V, 1000hrs	STTH6004W STTH12004TV1 STTH20004TV1 STTH3R04Q STTH3R04S	0/77 0/77 0/77 0/77 0/77	Graph 1 Graph 2 Graph 3 Graph 4 Graph 5
OPERATING LIFE TEST (OLT)	Tj=150°C, IF, 1000hrs	STTH802CT (*) STTH802CFP (*) STTH1302CT (*)	0/50 0/25 0/40	Graphs 6-7 - Graphs 8-9
		STTH3003CW (*) STTH803D (*)	0/25 0/25	- -
		STTH3R04U	0/77	Graph 10-11

Note: failure criteria :electrical parameter as defined in product data sheet.
(*) selected as per structural similarities procedures according to AEC-Q101 standard.

For HTRB test: The dice of the STTHxxR04 series are manufactured using the die periphery technology used on STTHxx04 series (renamed STTHxxL04 series), qualified devices. Thus, by technological similarities, the dice of the STTHxxR04 series are qualified.

For OLT test: The dice of the STTHxxR04 series are manufactured using the same active area ratio of STTHxx02/STTHxx03 series, qualified devices.

Thus, by technological similarities, the dice of the STTHxxR04 series are qualified.

Qualification report
Ultrafast 400V – STTHxxR04 series

RELIABILITY : PACKAGE ORIENTED TESTS CONDITIONS / RESULTS

RELIABILITY TEST	TEST CONDITIONS	RUNNER (*)	RESULTS	EXAMPLE OF DRIFT ANALYSIS
THERMAL CYCLING (TCT) JESD22A-104	-55°C/+150°C, 1000 cycles (500 cycles for STTH200L06TV1)	STTH6004W STTH12004TV1	0/77 0/77	Graphs 12-13 Graphs 14-15
		STTH200L06TV1 (*)	0/20	Graphs 16-17
		STTH30R06CW (*)	0/50	-
		STTH8R06D	0/150	-
		STTH8R06FP	0/50	-
		STTH8L06FP	0/50	
		STTH3R04Q	0/77	Graphs 18-19
		STTH3R04S	0/77	Graphs 20-21
AUTOCLAVE TEST (PCT) JESD22A-102	133°C ; 3 bars ; 100% RH ; 67Hrs	STTH30R03CW (*) STTH8R06FP STTH15R06FP	0/22 0/22 0/22	- - -
	121°C ; 2 bars ; 100% RH ;96Hrs	STTH15L06D	0/77	-
		STTH3R04S	0/77	Graphs 22-23

Note: failure criteria :electrical parameter as defined in product data sheet.

(*) selected as per structural similarities procedures according to AEC-Q101 standard.

Qualification report
Ultrafast 400V – STTHxxR04 series

RELIABILITY : PACKAGE ORIENTED TESTS CONDITIONS / RESULTS

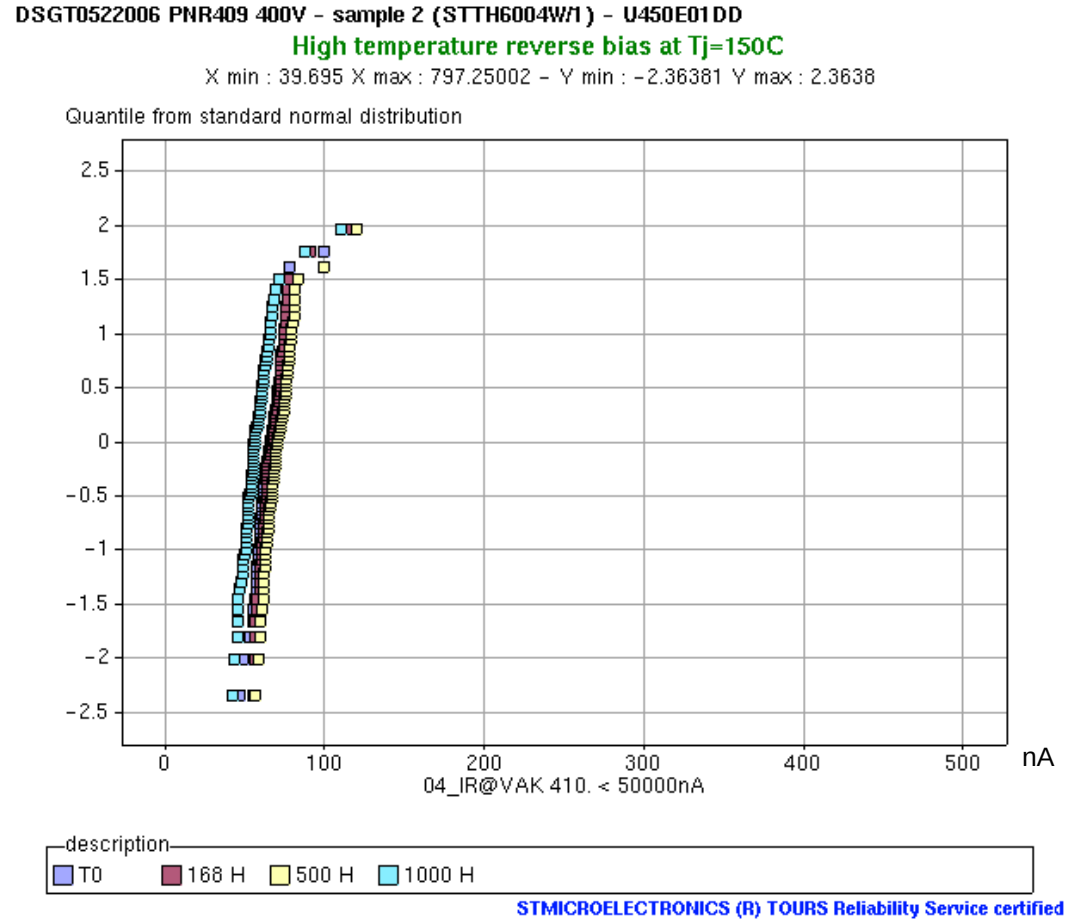
RELIABILITY TEST	TEST CONDITIONS	RUNNER (*)	RESULTS	EXAMPLE OF DRIFT ANALYSIS
HUMIDITY BIAS (THB) JESD22A-101	85°C 85%RH; V=0.8*VR; 1000Hrs	STTH60L06CW (*)	0/40	Graphs 24-25
		STTH30R03CW (*)	0/22	-
		STTH8R06FP STTH15R06FP	0/20 0/20	- -
		STTH3R04S	0/77	Graph 26
THERMAL FATIGUE	DTc = 55°C, 10K cycles	STTH20003TV1 (*) STTH8R06D STTH15R06D STTH8L06FP	0/43 0/65 0/25 0/25	- - - -
		STTH3R04S	0/77	Graphs 27-28

Note: failure criteria :electrical parameter as defined in product data sheet.

(*) selected as per structural similarities procedures according to AEC-Q101 standard.

Qualification report
Ultrafast 400V – STTHxxR04 series

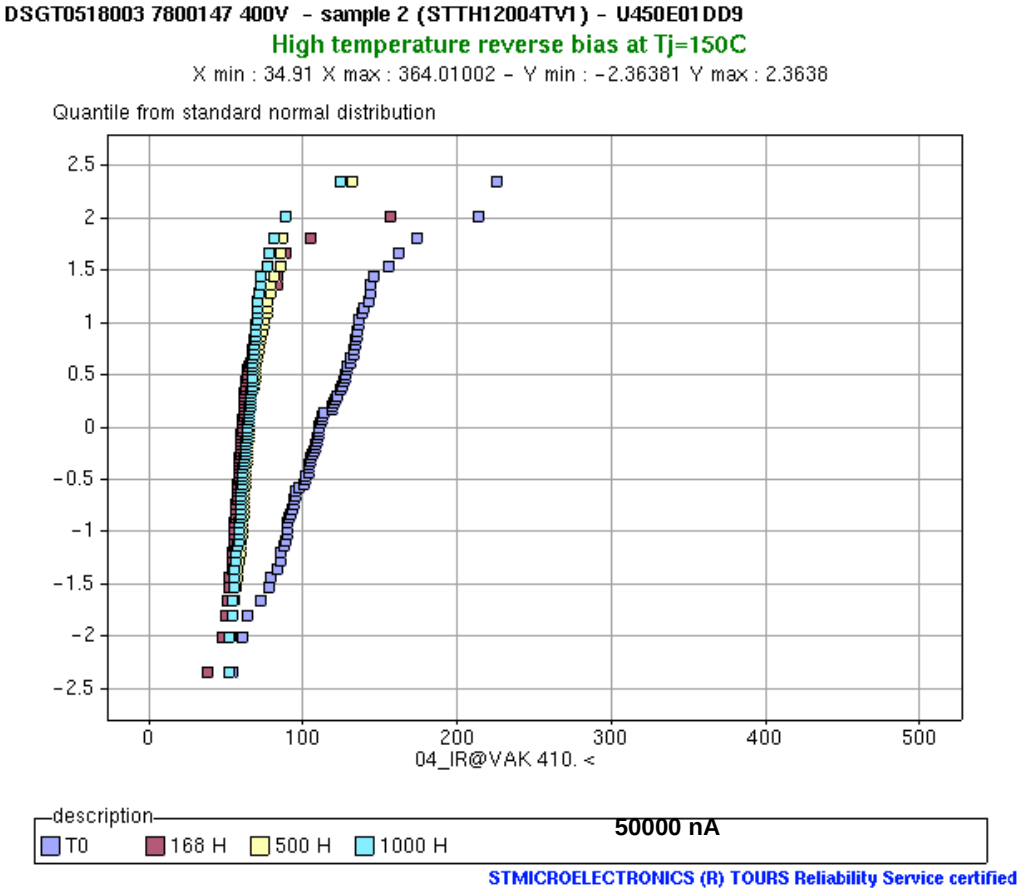
GRAPHS AND STATISTICS FOR HIGH TEMPERATURE REVERSE BIAS (HTRB)



Graph n°1 : IR<50µA at VR=400V (STTH6004W)

Qualification report
Ultrafast 400V – STTHxxR04 series

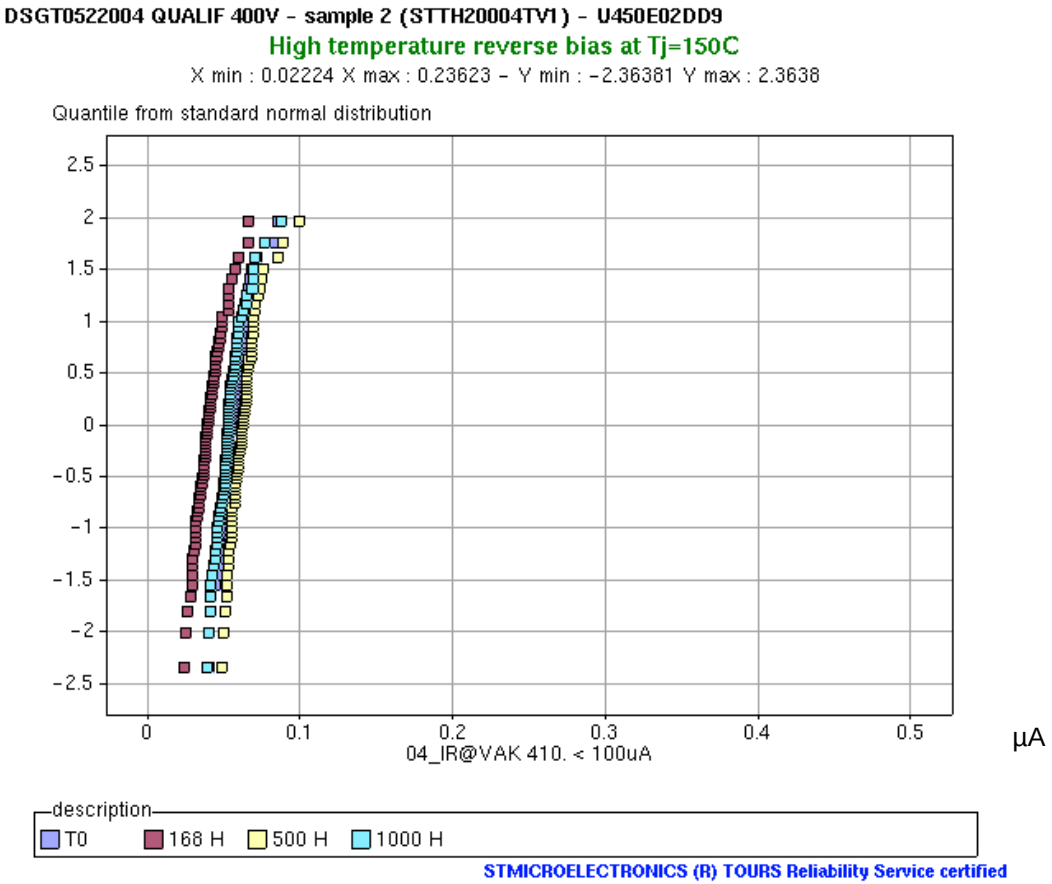
GRAPHS AND STATISTICS FOR HIGH TEMPERATURE REVERSE BIAS (HTRB)



Graph n°2 : IR<50µA at VR=400V (STTH12004TV1)

Qualification report
Ultrafast 400V – STTHxxR04 series

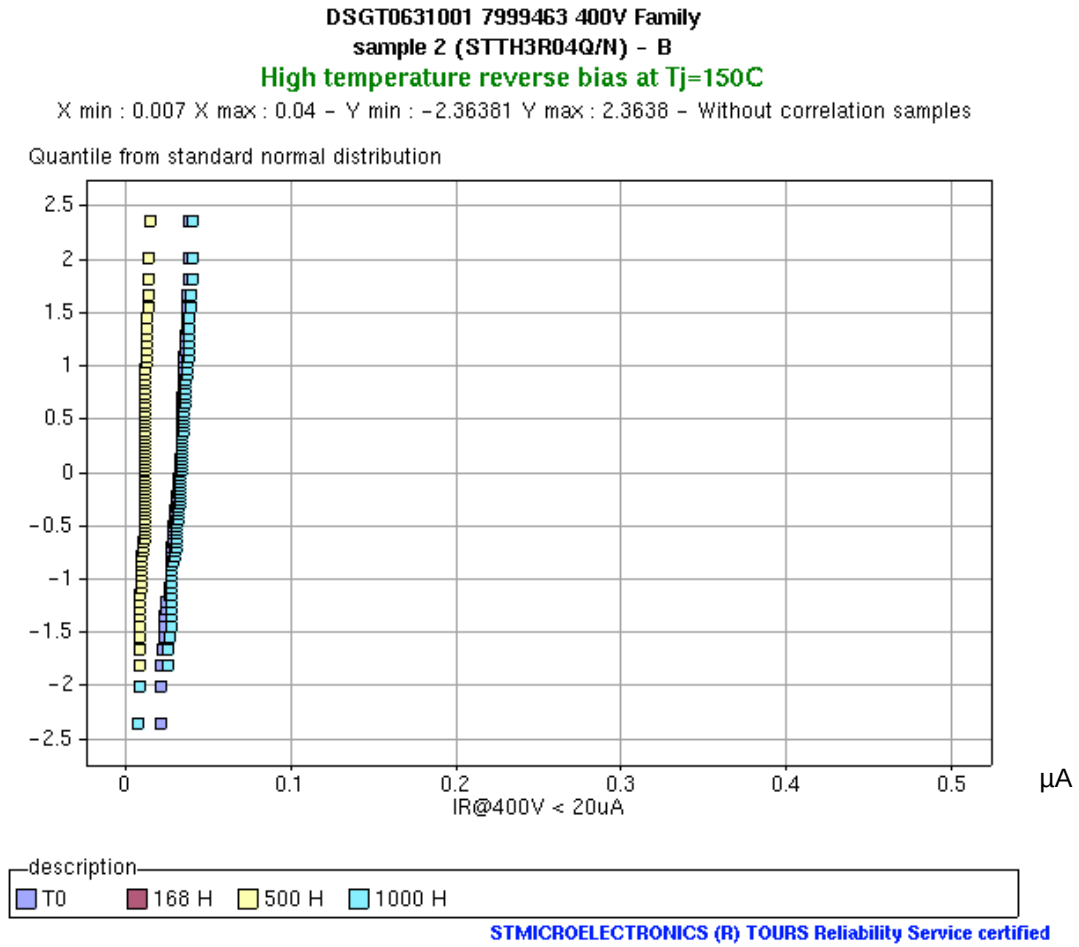
GRAPHS AND STATISTICS FOR HIGH TEMPERATURE REVERSE BIAS (HTRB)



Graph n°3 : IR<100µA at VR=400V (STTH20004TV1)

Qualification report
Ultrafast 400V – STTHxxR04 series

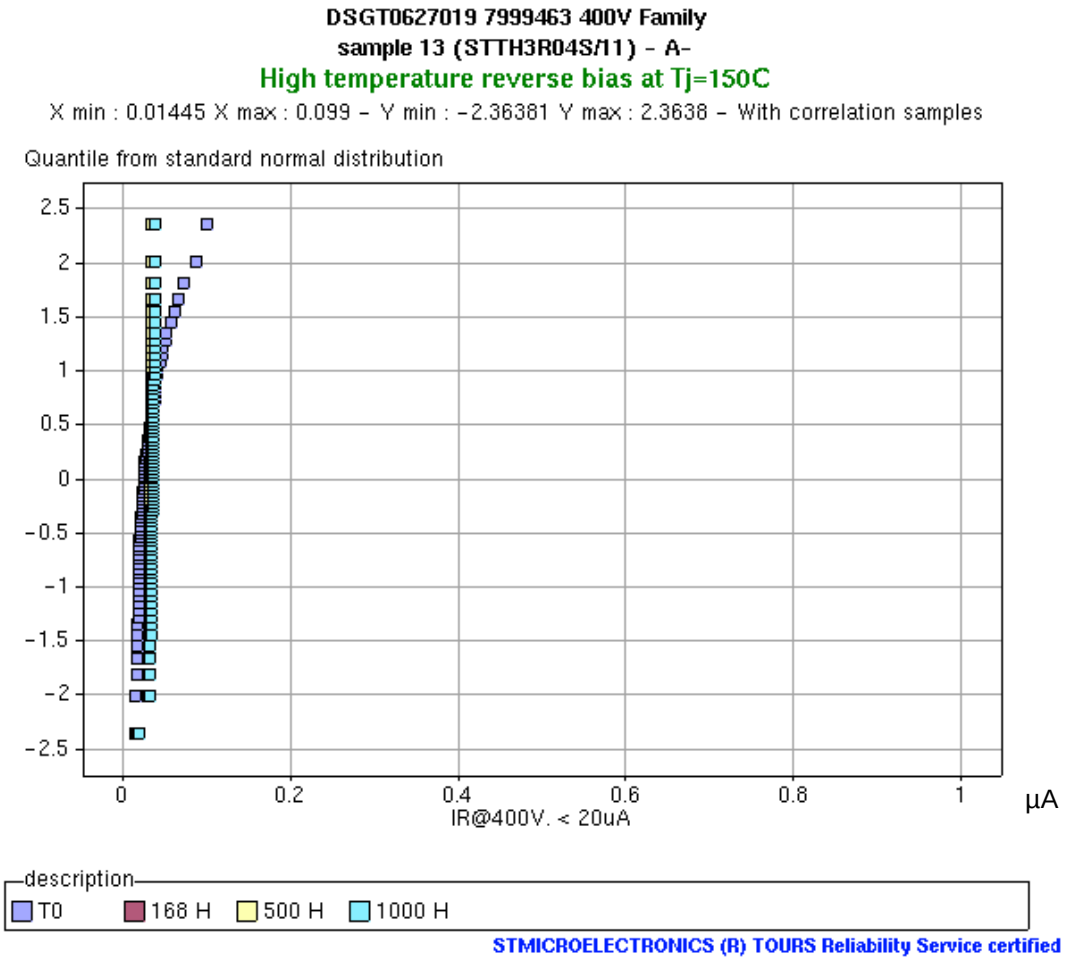
GRAPHS AND STATISTICS FOR HIGH TEMPERATURE REVERSE BIAS (HTRB)



Graph n°4 : IR<20µA at VR=400V (STTH3R04Q)

Qualification report
Ultrafast 400V – STTHxxR04 series

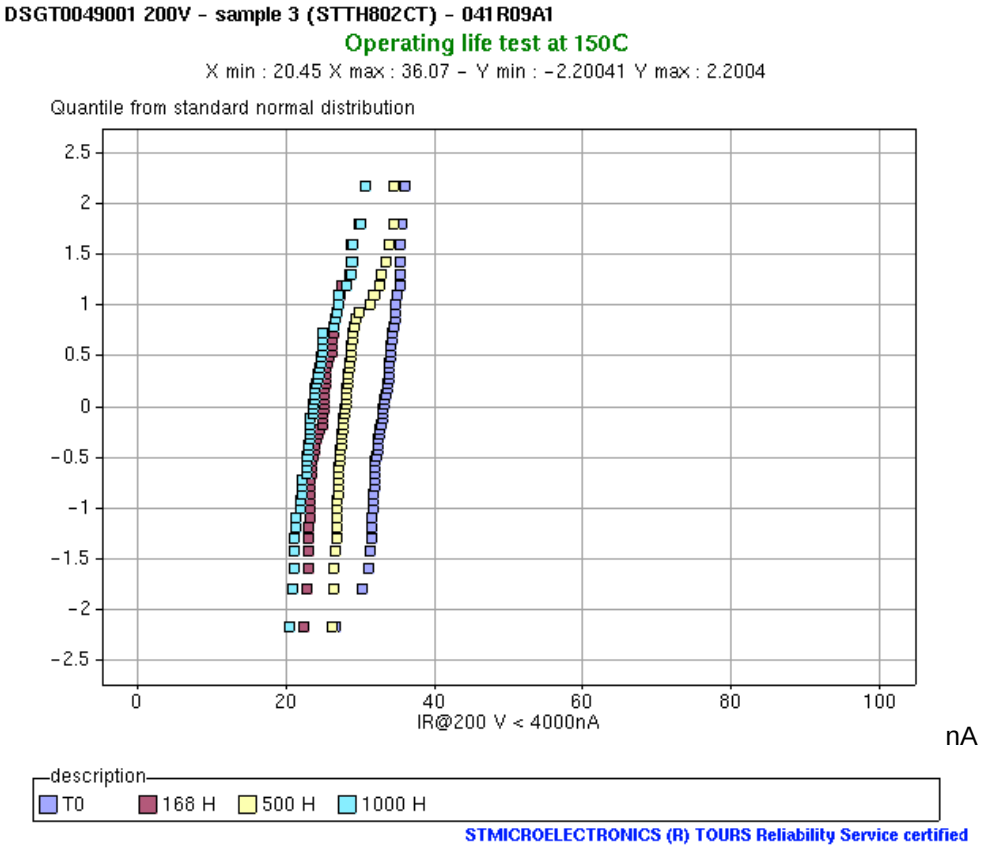
GRAPHS AND STATISTICS FOR HIGH TEMPERATURE REVERSE BIAS (HTRB)



Graph n°5 : IR<20µA at VR=400V (STTH3R04S)

Qualification report
Ultrafast 400V – STTHxxR04 series

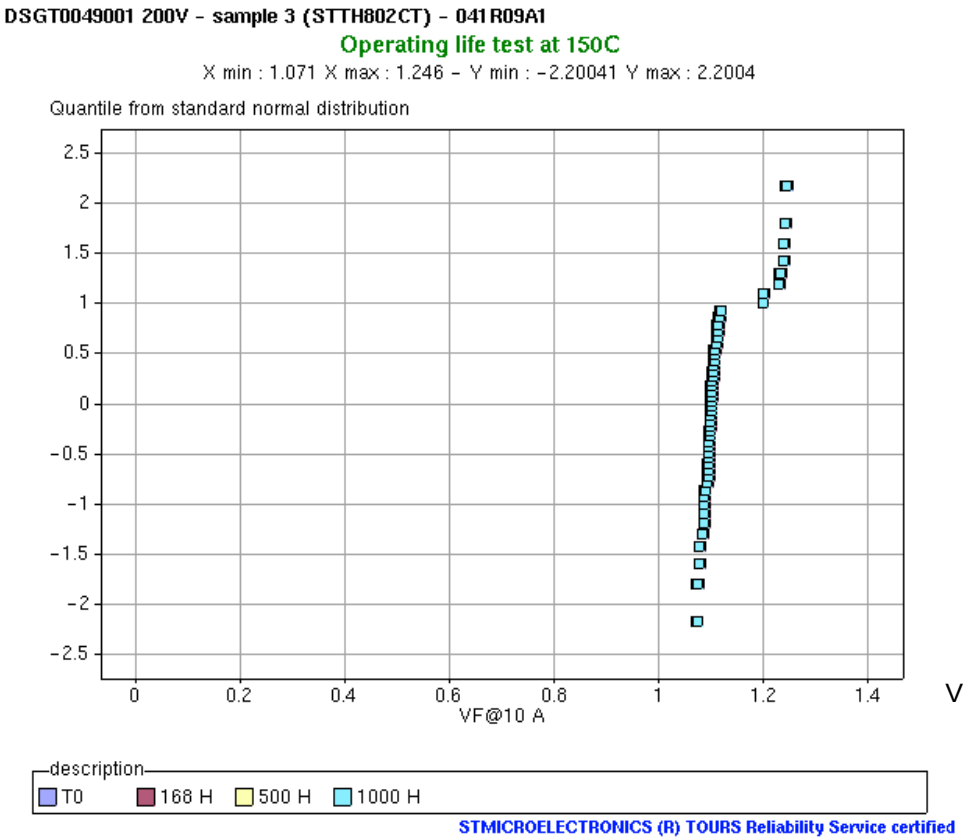
GRAPHS AND STATISTICS FOR OPERATING LIFE TEST (OLT)



Graph n°6 : IR<4µA at VR=200V (STTH802CT)

Qualification report
Ultrafast 400V – STTHxxR04 series

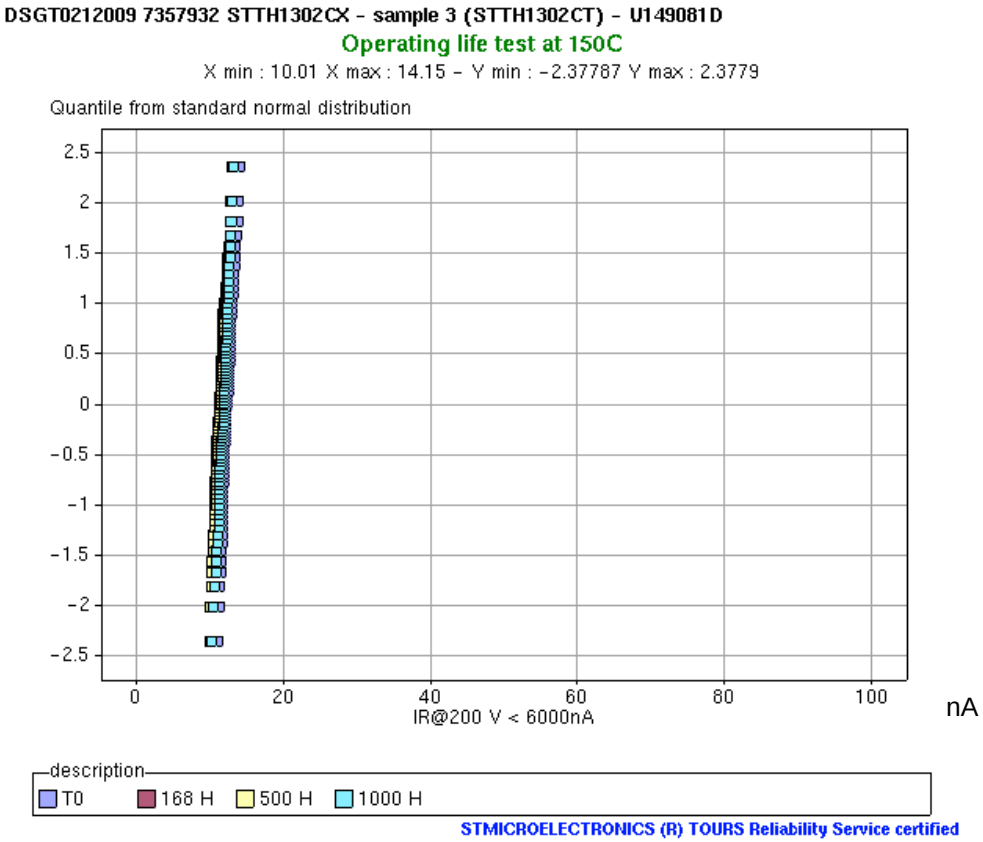
GRAPHS AND STATISTICS FOR OPERATING LIFE TEST (OLT)



Graph n°7 : VF at IF=10A (STTH802CT)

Qualification report
Ultrafast 400V – STTHxxR04 series

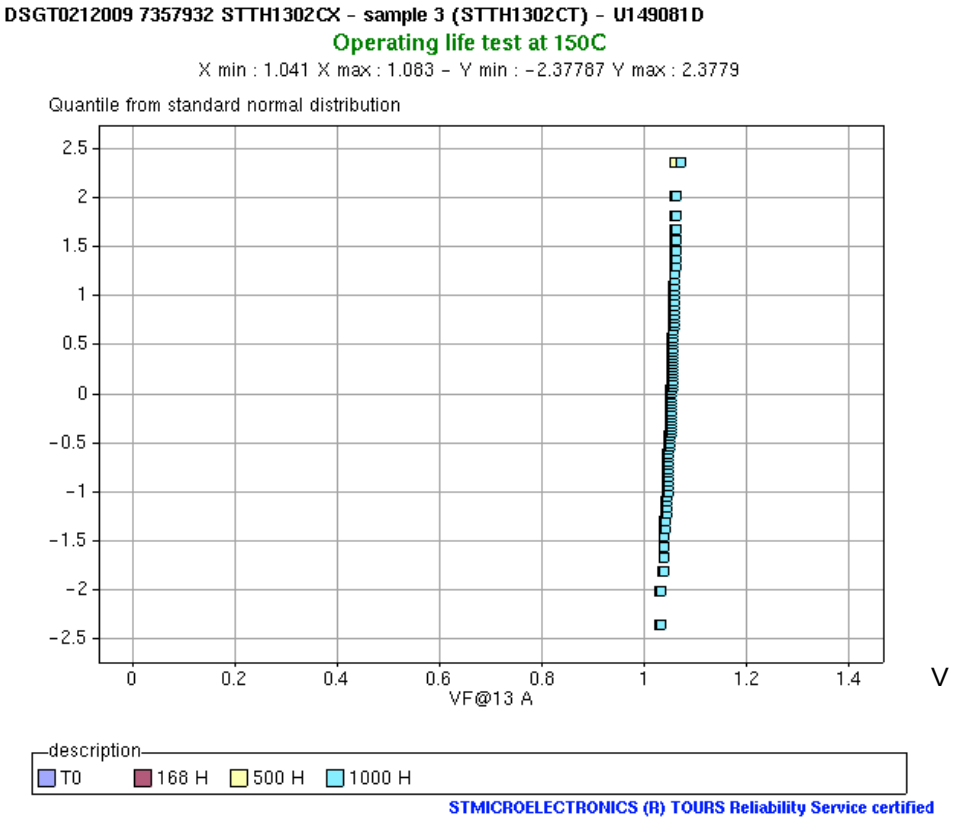
GRAPHS AND STATISTICS FOR OPERATING LIFE TEST (OLT)



Graph n°8 : IR<6µA at VR=200V (STTH1302CT)

Qualification report
Ultrafast 400V – STTHxxR04 series

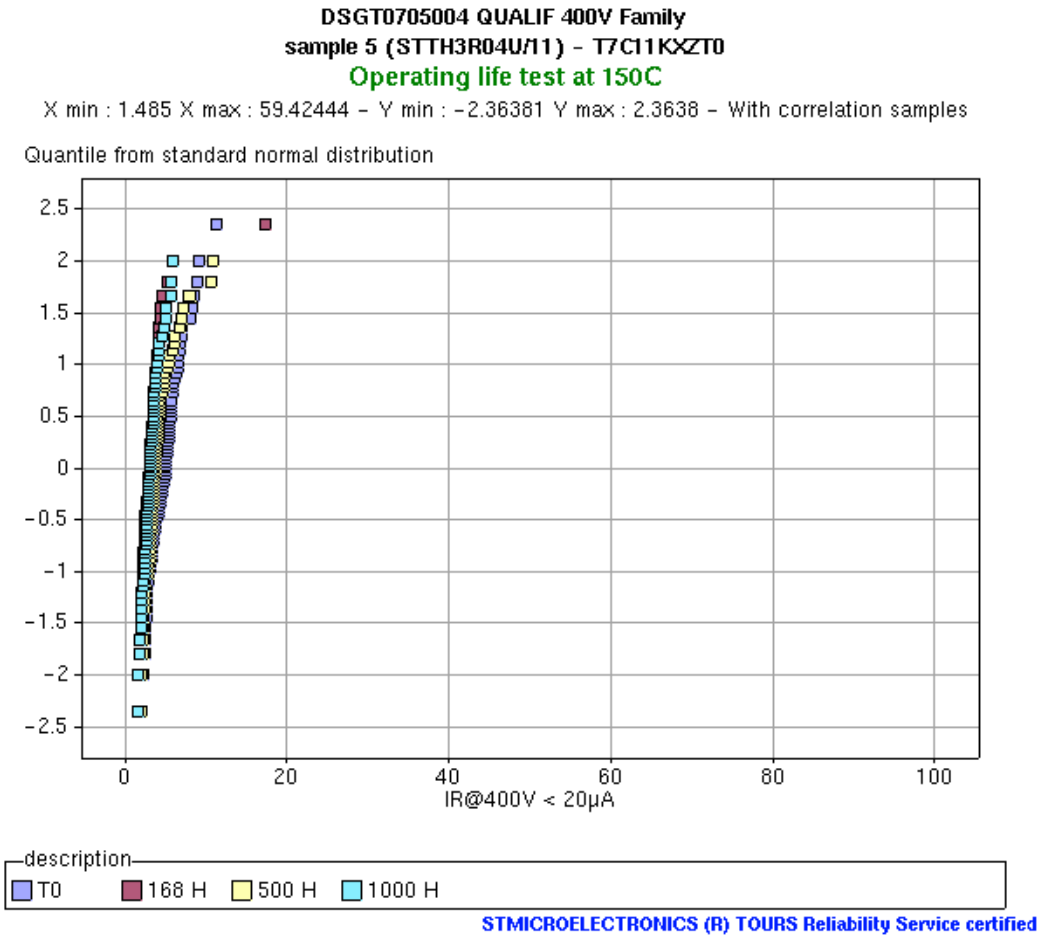
GRAPHS AND STATISTICS FOR OPERATING LIFE TEST (OLT)



Graph n°9 : VF<1.25V at IF=13A (STTH1302CT)

Qualification report
Ultrafast 400V – STTHxxR04 series

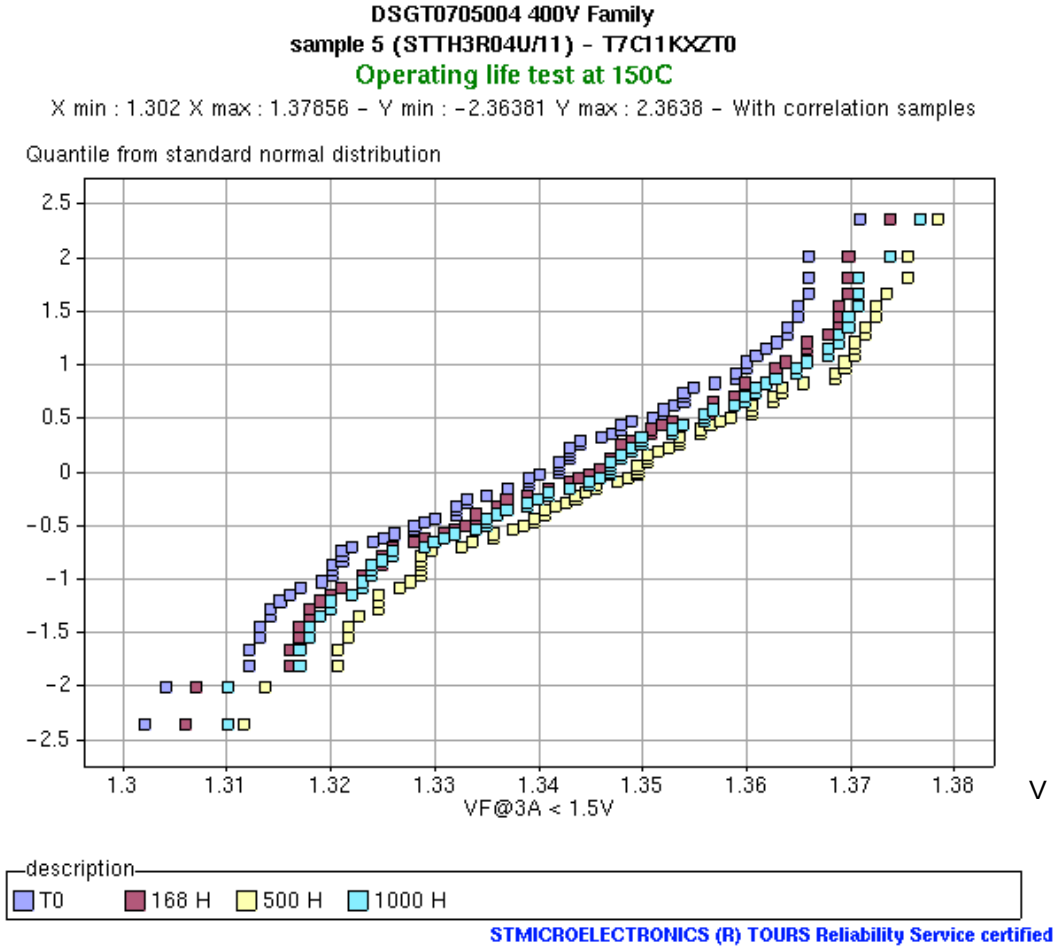
GRAPHS AND STATISTICS FOR OPERATING LIFE TEST (OLT)



Graph n°10 : IR<20µA at VR=400V (STTH3R04U)

Qualification report
Ultrafast 400V – STTHxxR04 series

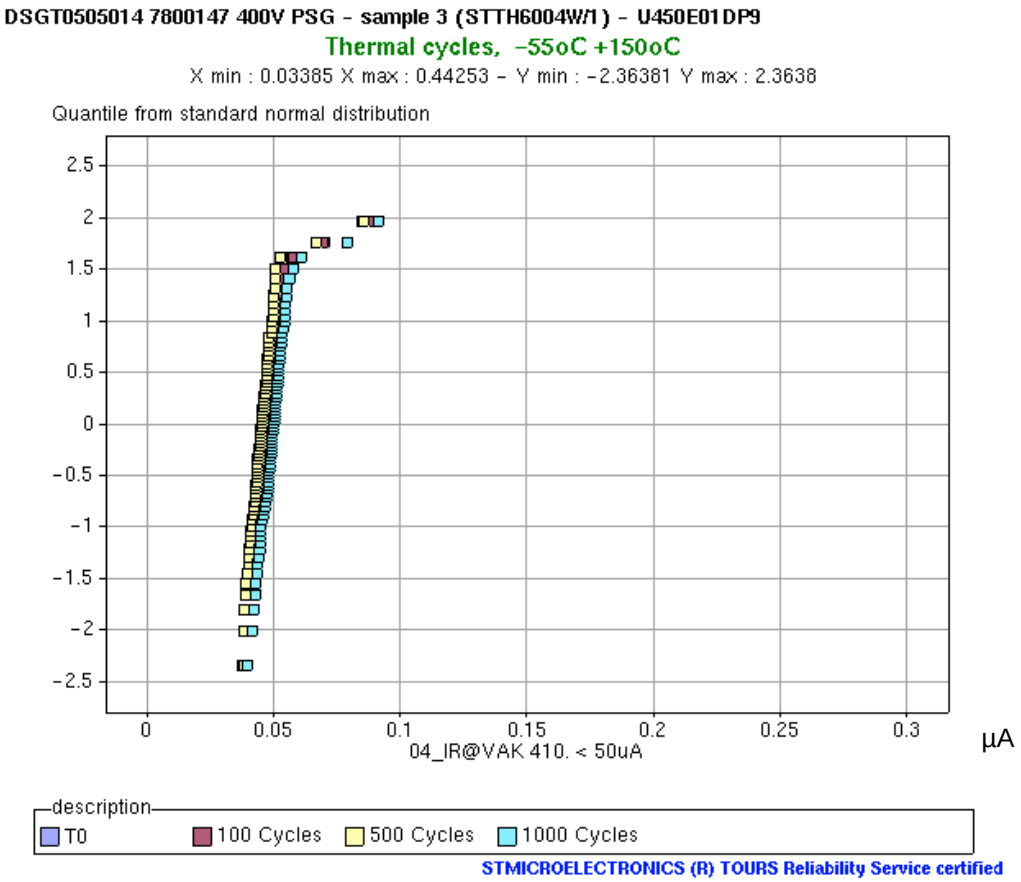
GRAPHS AND STATISTICS FOR OPERATING LIFE TEST (OLT)



Graph n°11 : VF<1.5V at IF=3A (STTH3R04U)

Qualification report
Ultrafast 400V – STTHxxR04 series

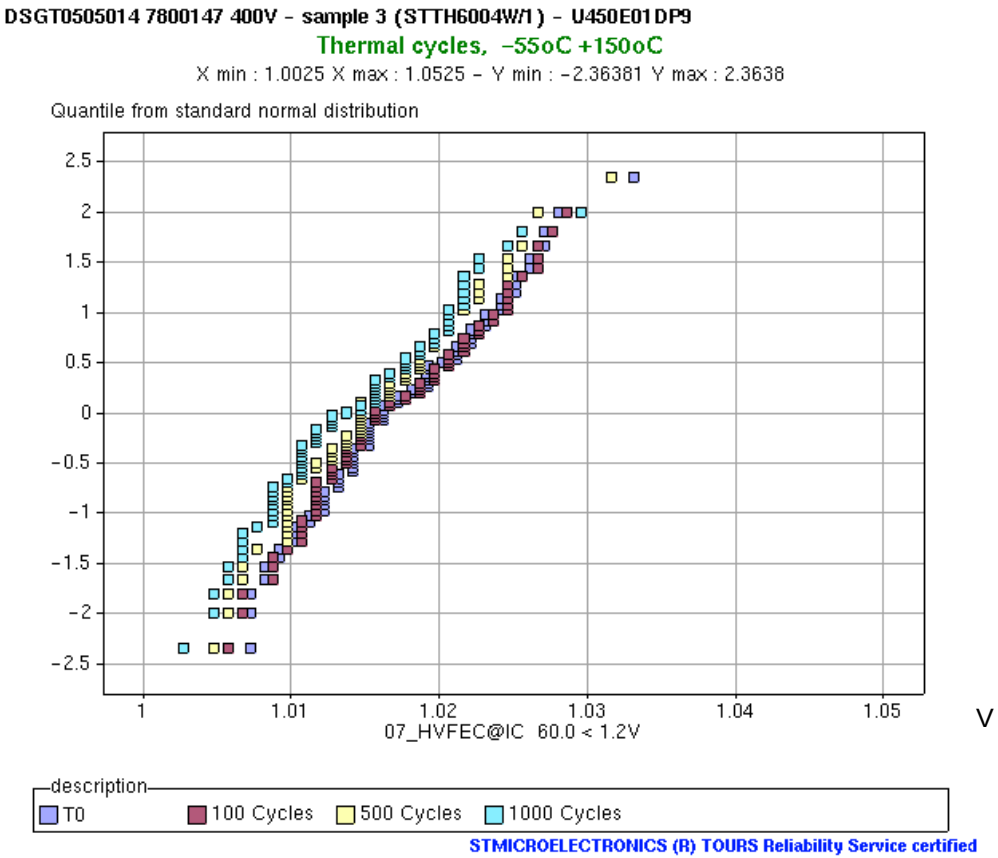
GRAPHS AND STATISTICS FOR THERMAL CYCLING (TCT)



Graph n°12 : IR<50µA at VR=400V (STTH6004W)

Qualification report
Ultrafast 400V – STTHxxR04 series

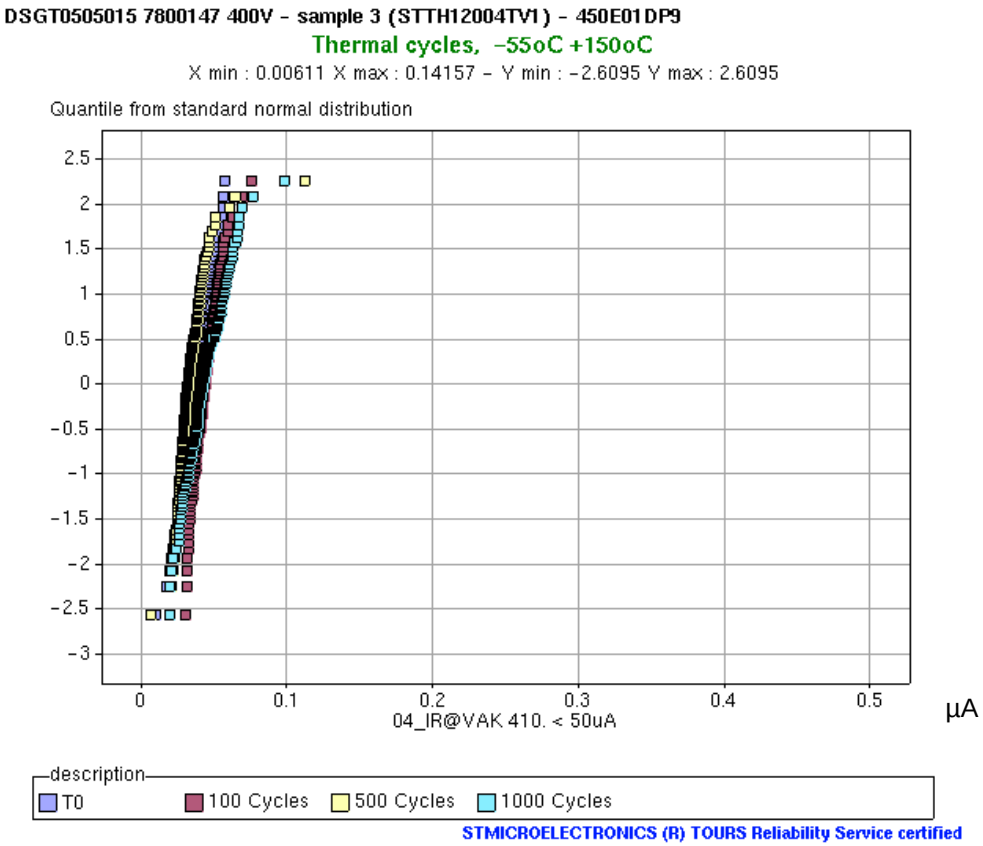
GRAPHS AND STATISTICS FOR THERMAL CYCLING (TCT)



Graph n°13 : VF<1.2V at IF= 60A (STTH6004W)

Qualification report
Ultrafast 400V – STTHxxR04 series

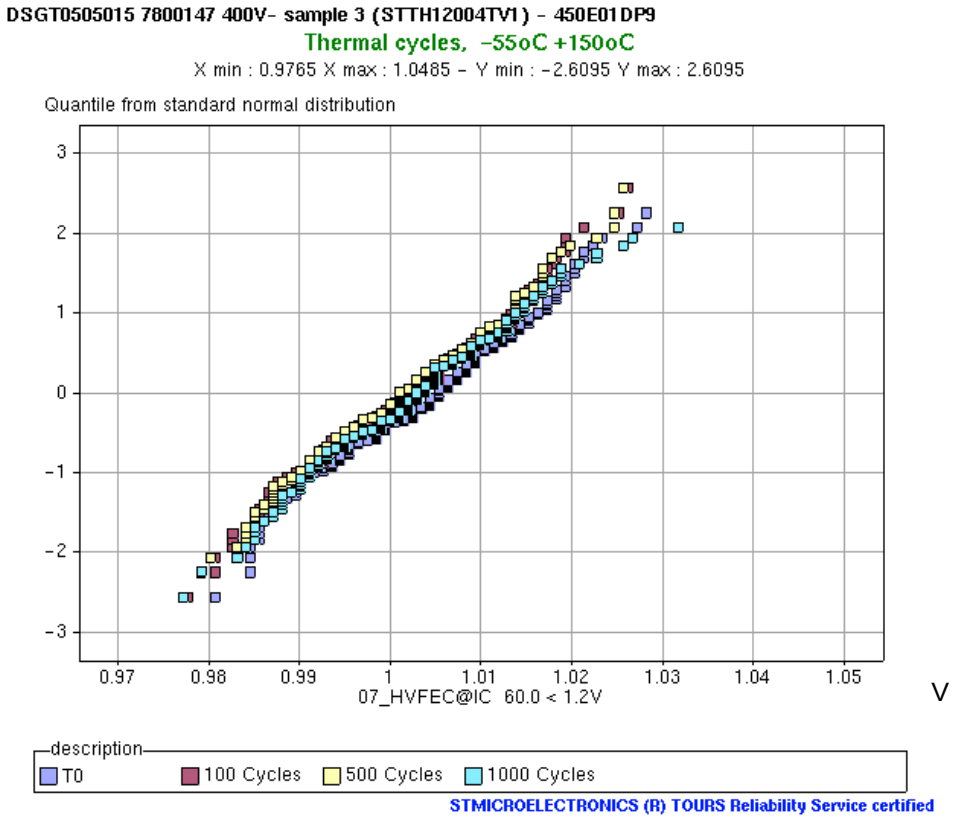
GRAPHS AND STATISTICS FOR THERMAL CYCLING (TCT)



Graph n°14 : IR<50µA at VR=400V (STTH12004TV1)

Qualification report
Ultrafast 400V – STTHxxR04 series

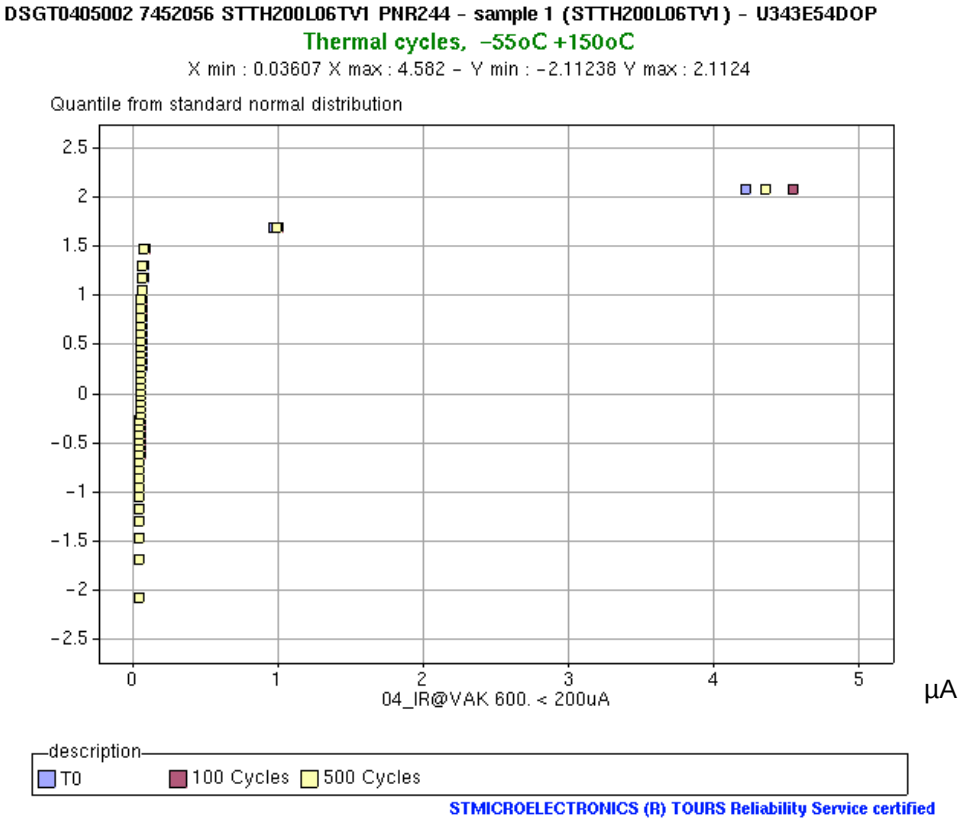
GRAPHS AND STATISTICS FOR THERMAL CYCLING (TCT)



Graph n°15 : VF<1.2V at IF=60A (STTH12004TV1)

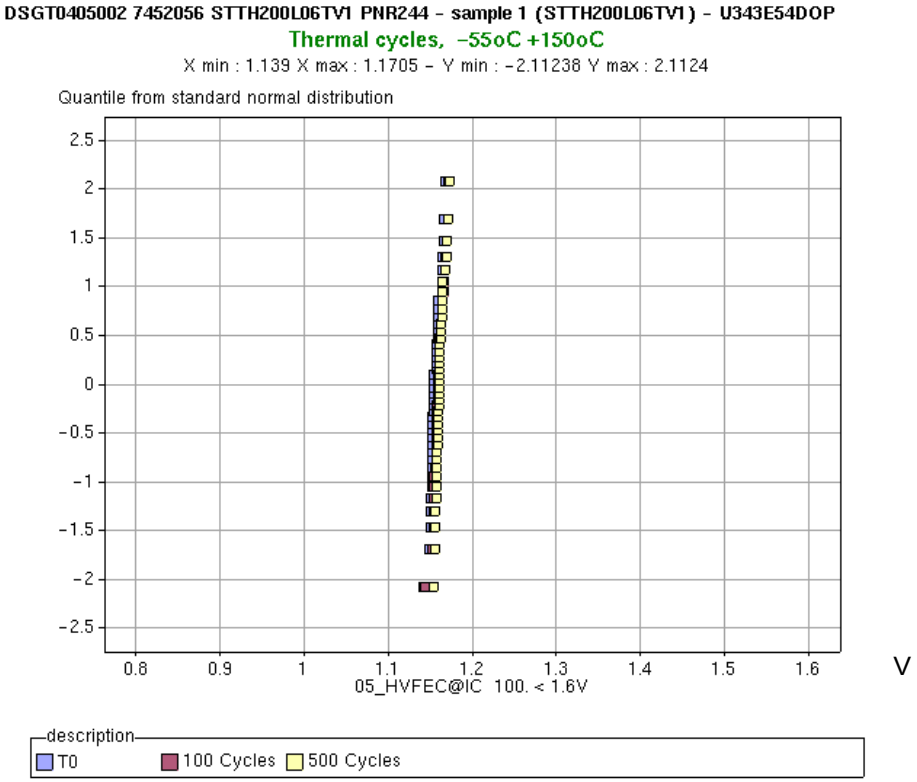
Qualification report
Ultrafast 400V – STTHxxR04 series

GRAPHS AND STATISTICS FOR TEMPERATURE CYCLING (TCT)



Graph 16: IR<100µA at VR=600V (STTH200L06TV1)

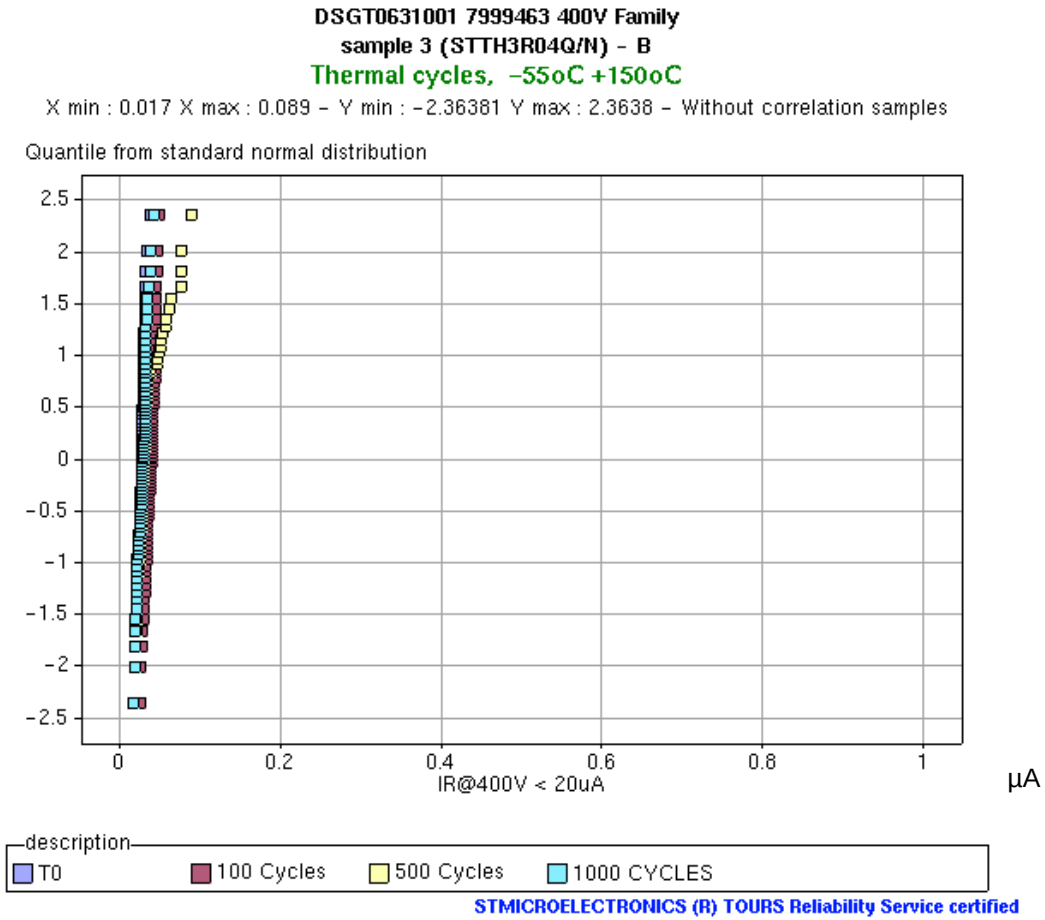
GRAPHS AND STATISTICS FOR TEMPERATURE CYCLING (TCT)



Graph 17: VF<1.55V at IF=100A (STTH200L06TV1)

Qualification report
Ultrafast 400V – STTHxxR04 series

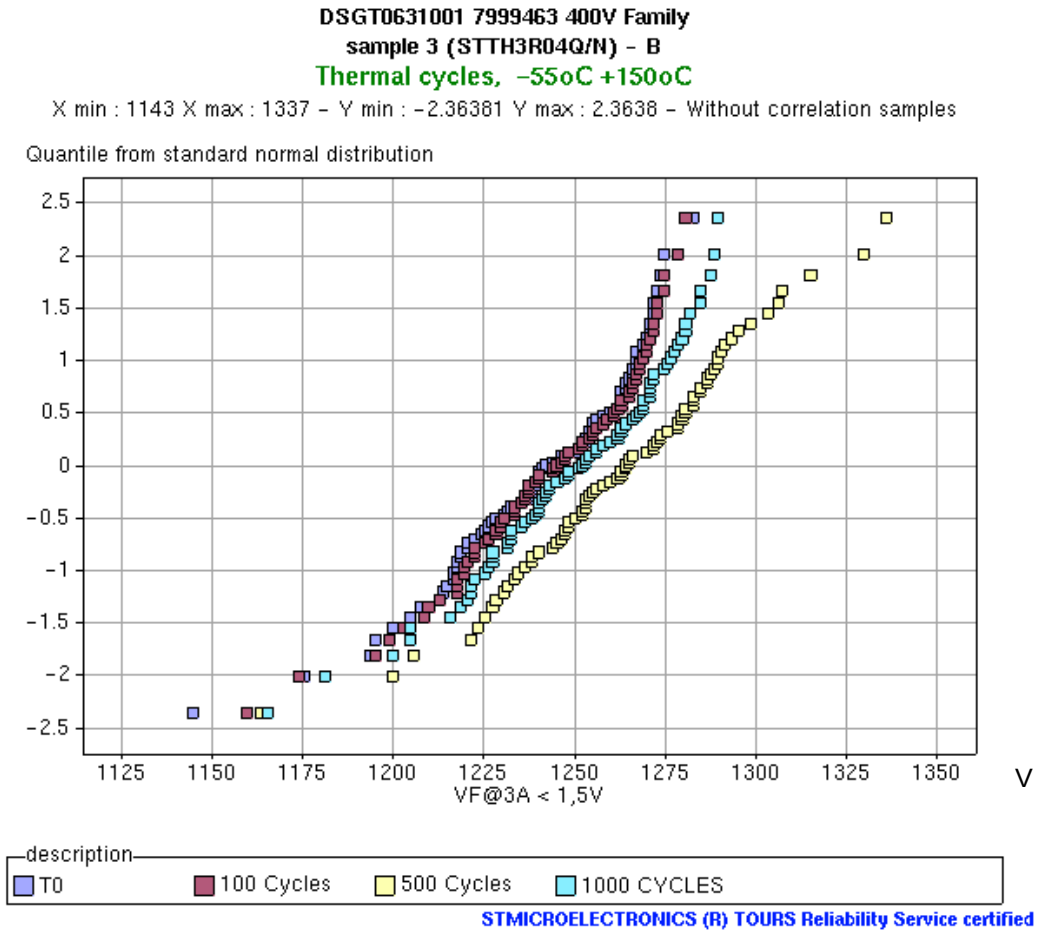
GRAPHS AND STATISTICS FOR TEMPERATURE CYCLING (TCT)



Graph 18: IR<20µA at VR=400V (STTH3R04Q)

Qualification report
Ultrafast 400V – STTHxxR04 series

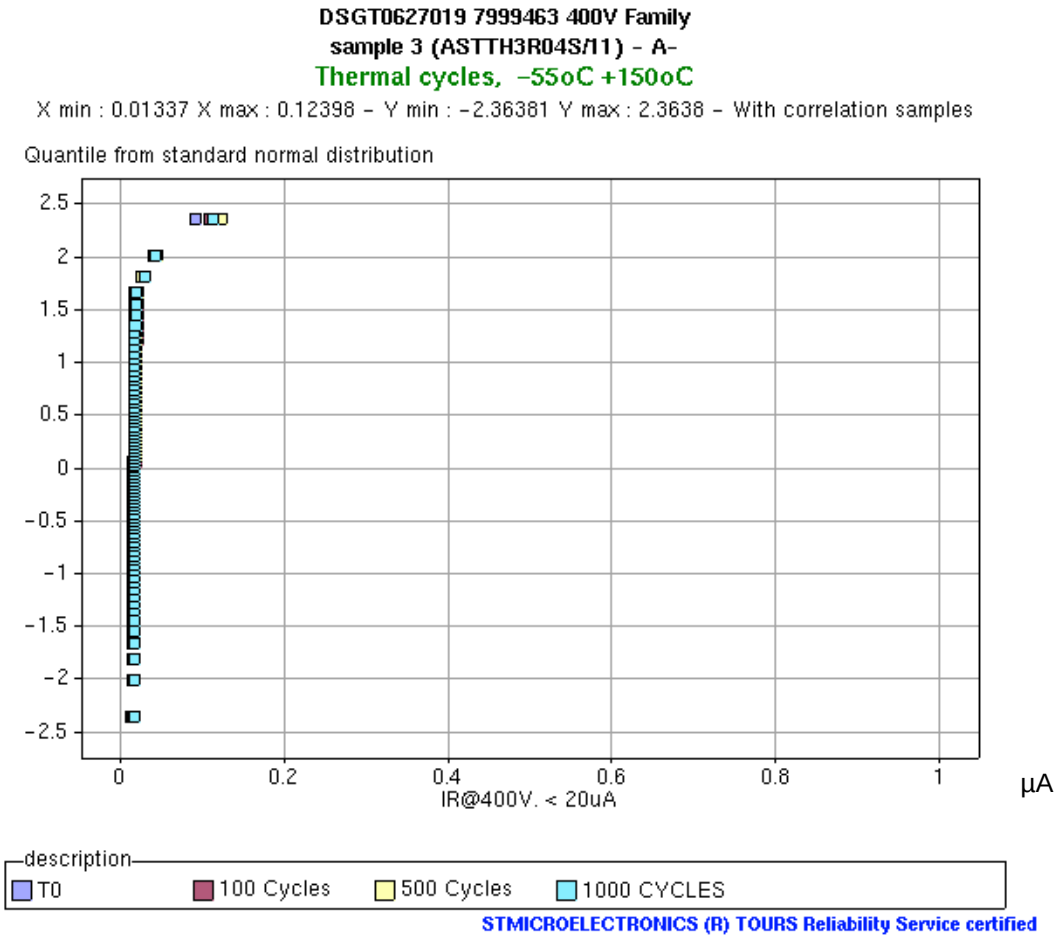
GRAPHS AND STATISTICS FOR TEMPERATURE CYCLING (TCT)



Graph 19: VF<1.5V at IF=3A (STTH3R04Q)

Qualification report
Ultrafast 400V – STTHxxR04 series

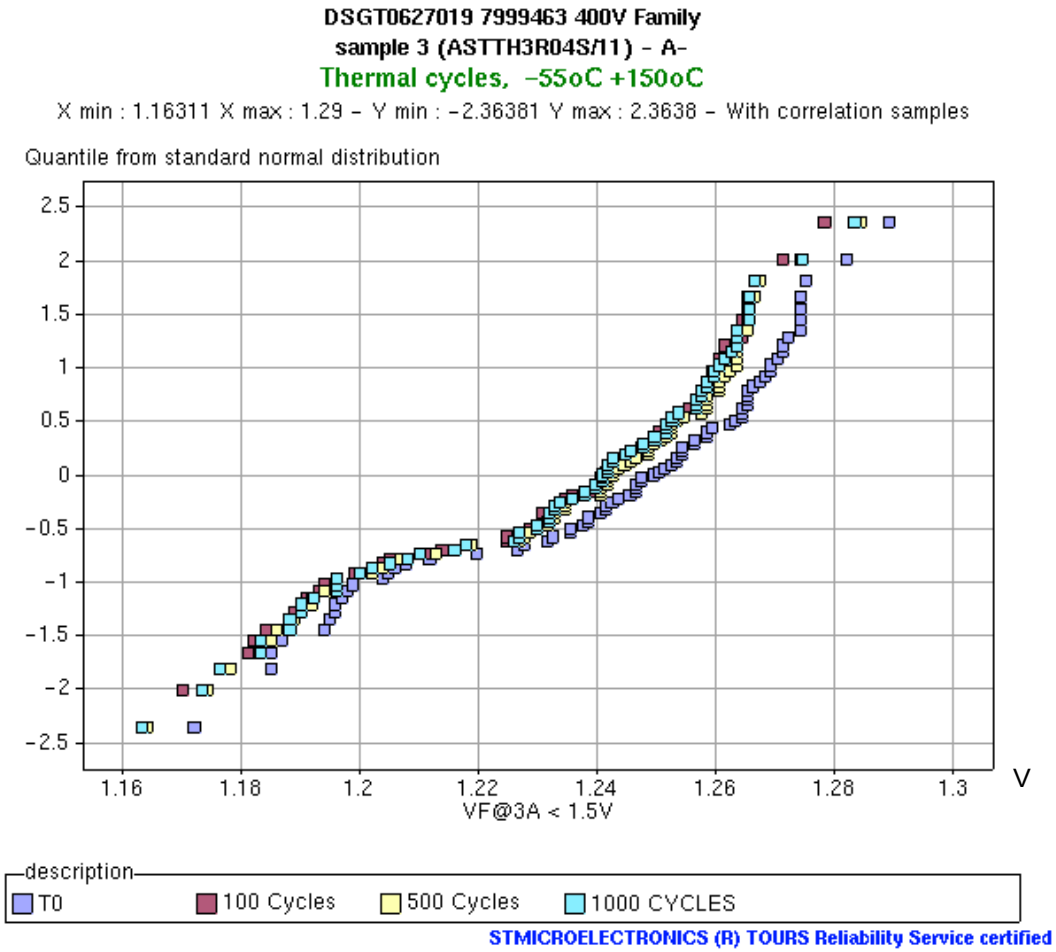
GRAPHS AND STATISTICS FOR TEMPERATURE CYCLING (TCT)



Graph 20: IR<20µA at VR=400V (STTH3R04S)

Qualification report
Ultrafast 400V – STTHxxR04 series

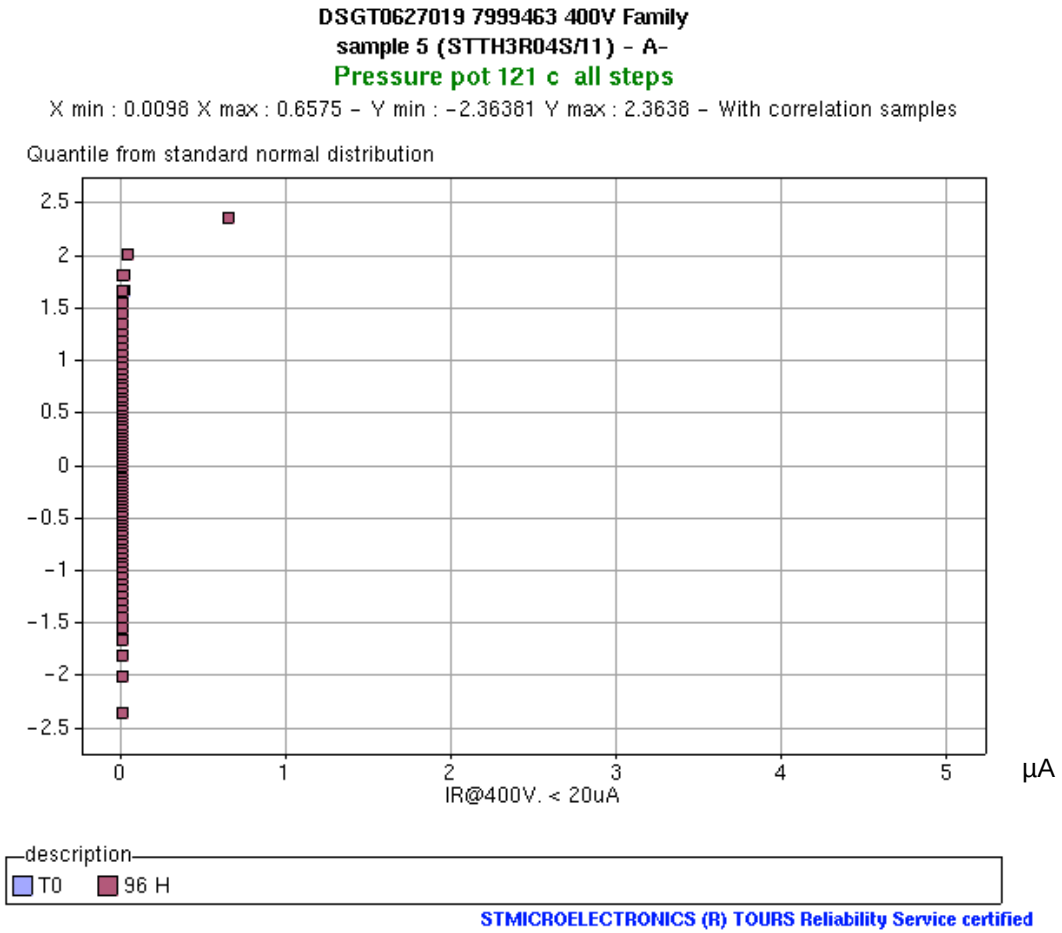
GRAPHS AND STATISTICS FOR TEMPERATURE CYCLING (TCT)



Graph 21: VF<1.5V at IF=3A (STTH3R04S)

Qualification report
Ultrafast 400V – STTHxxR04 series

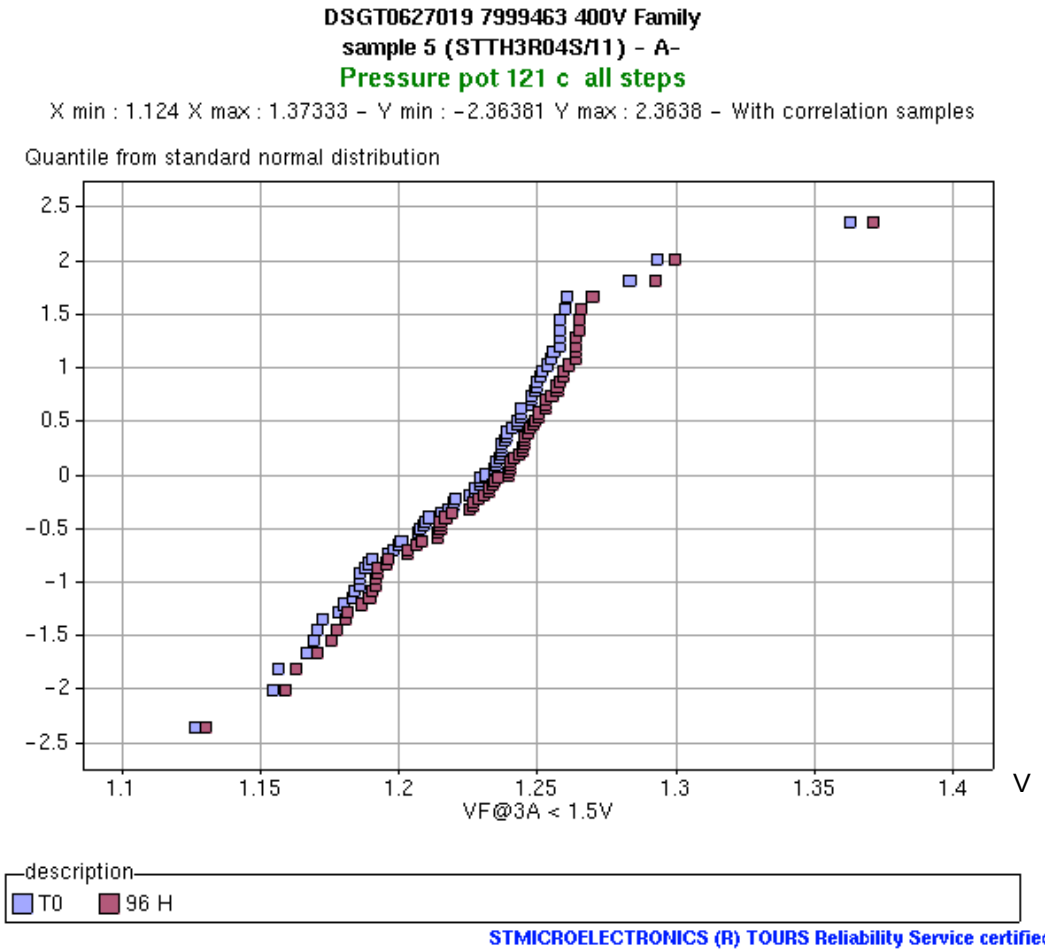
GRAPHS AND STATISTICS FOR AUTOCLAVE TEST (PCT)



Graph 22: IR<20µA at VR=400V (STTH3R04S)

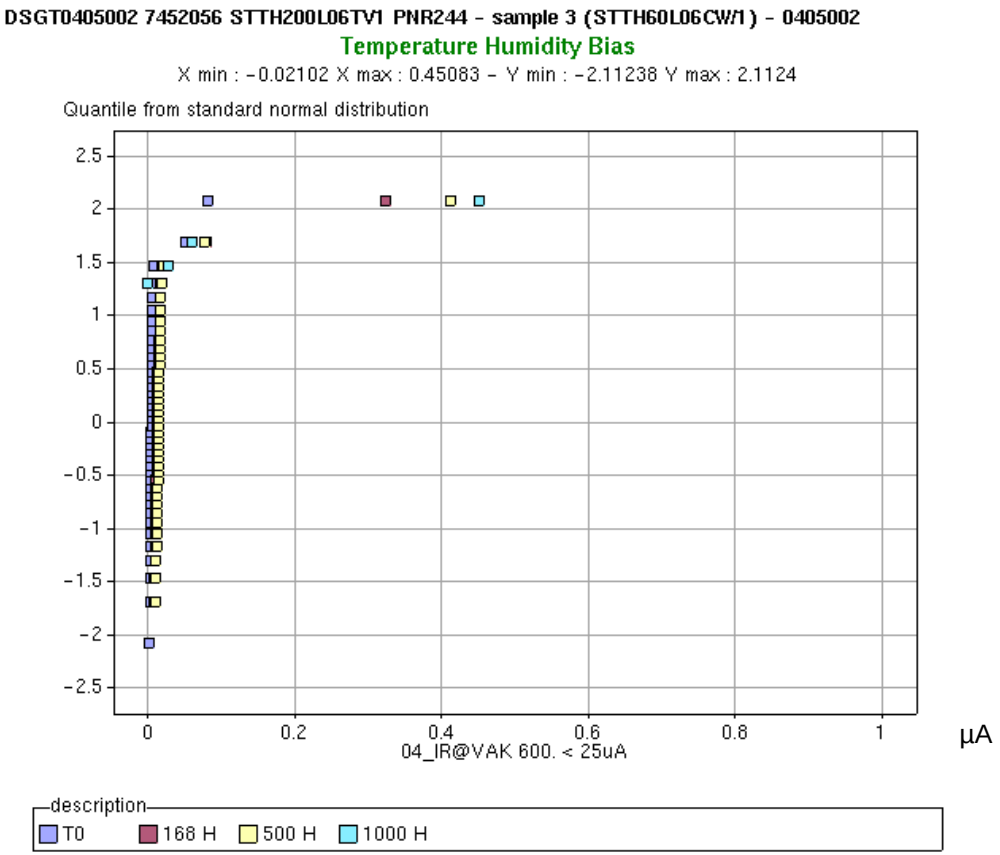
Qualification report
Ultrafast 400V – STTHxxR04 series

GRAPHS AND STATISTICS FOR AUTOCLAVE TEST (PCT)



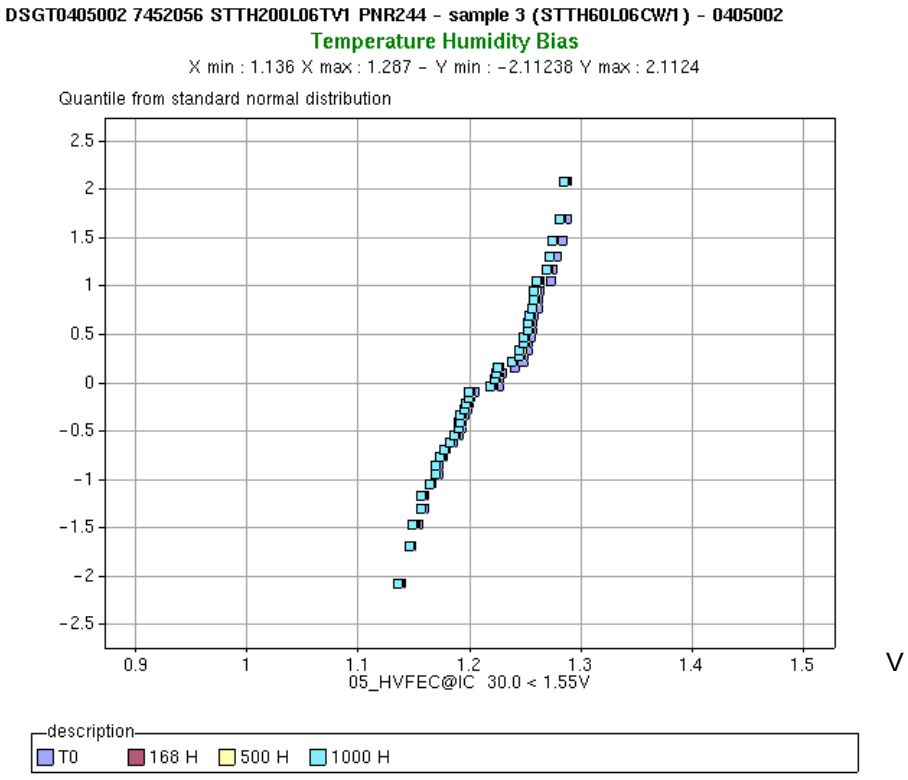
Graph 23: VF<1.5V at IF=3A (STTH3R04S)

GRAPHS AND STATISTICS FOR HUMIDITY BIAS (THB)



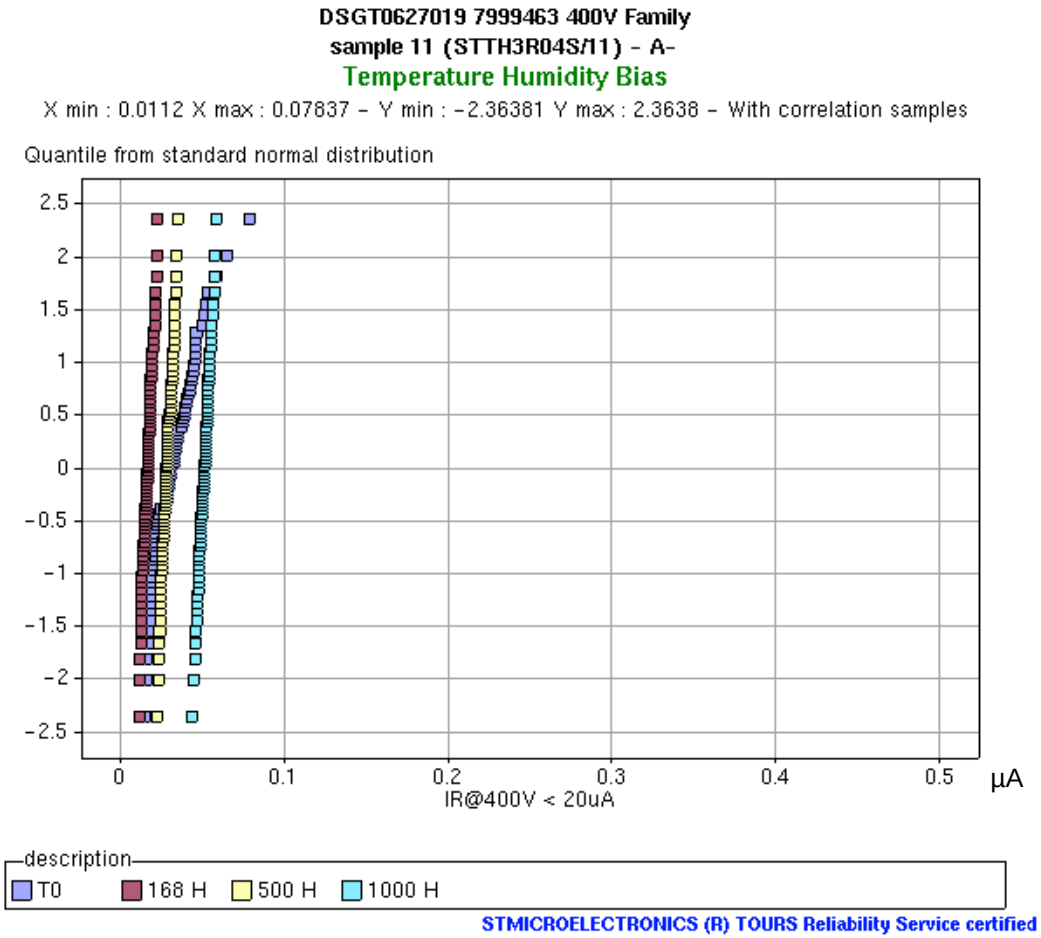
Graph 24: IR<25µA at VR=600V (STTH60L06CW)

GRAPHS AND STATISTICS FOR HUMIDITY BIAS (THB)



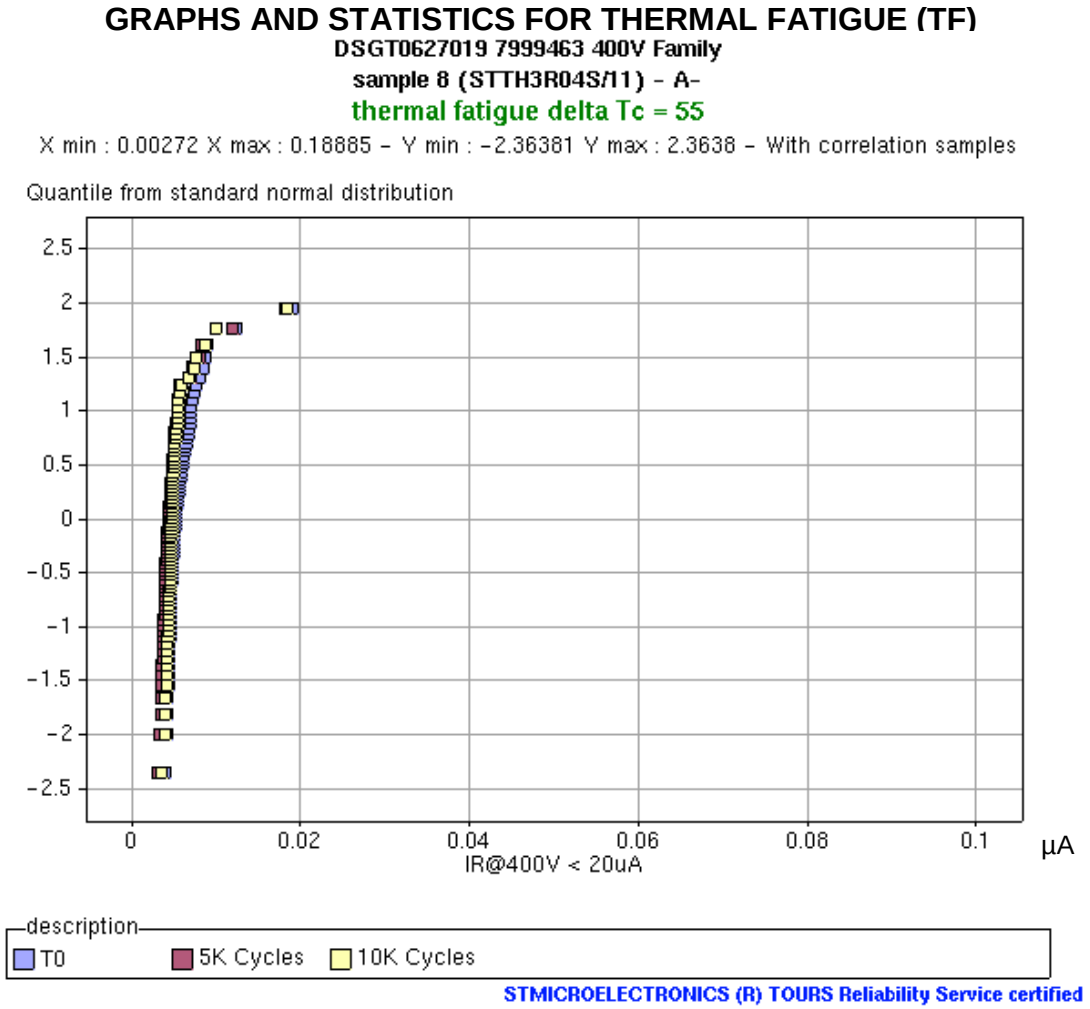
Graph 25: VF<1.55V at IF=30A (STTH60L60CW)

GRAPHS AND STATISTICS FOR HUMIDITY BIAS (THB)



Graph 26: IR<20µA at VR=400V (STTH3R04S)

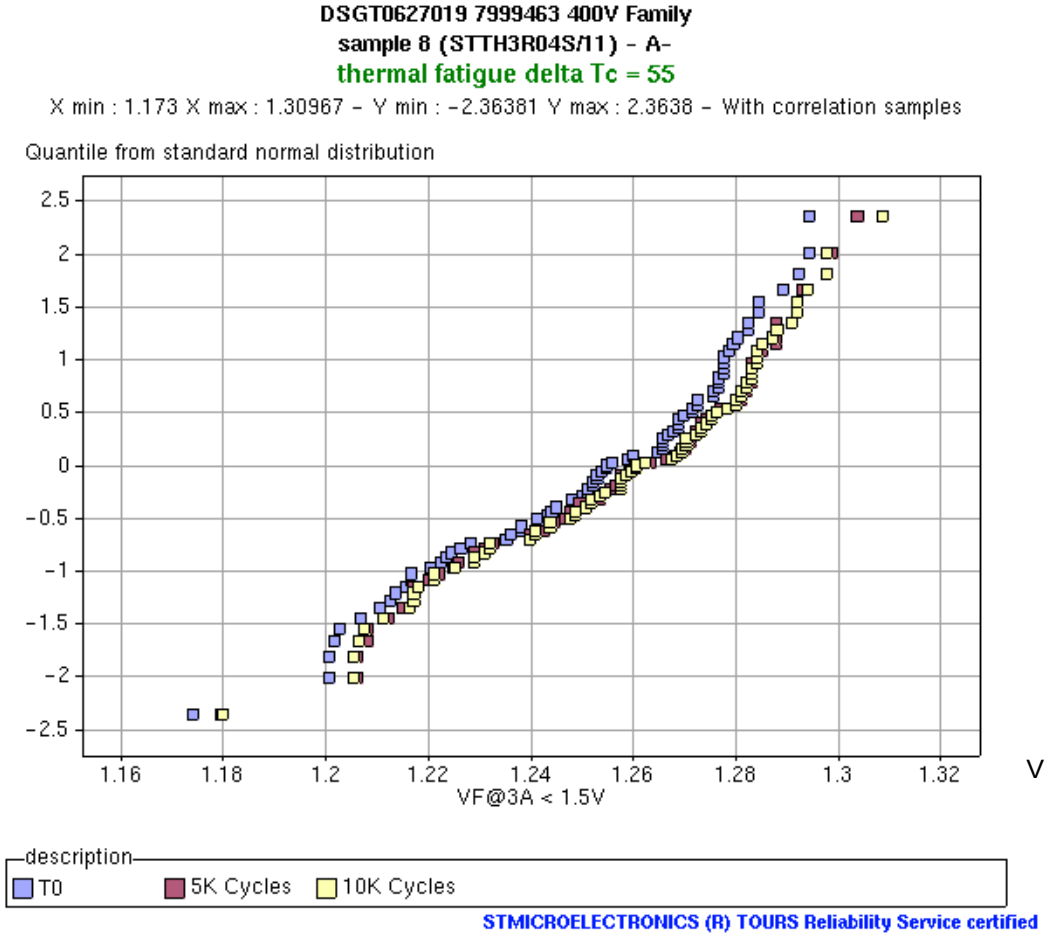
Qualification report
Ultrafast 400V – STTHxxR04 series



Graph 27: IR<20µA at VR=400V (STTH3R04S)

Qualification report
Ultrafast 400V – STTHxxR04 series

GRAPHS AND STATISTICS FOR THERMAL FATIGUE (TF)



Graph 28: VF<1.5V at IF=3A (STTH3R04S)

Qualification report
Ultrafast 400V – STTHxxR04 series

AVERAGE OUTGOING QUALITY LEVEL AT FINAL GATE

Sampling plans at Final quality inspection prior to shipment:

- 200 units per lot for electrical inspection. Acceptance criteria = 0/1
- 315 units per lot for visual and mechanical inspection. Acceptance criteria = 0/1

Ppm calculation:

$$\textbf{Average Output Quality Estimator} = \frac{\text{Total number of defectives on samples with } d \leq (c+1)}{\text{Total number of inspected units in accepted lots}} \times 10^6$$

where *d = defectives on sample*
c = acceptance criteria

PARAMETER INSPECTED	INSPECTION LEVEL	AQL
VISUAL and MECHANICAL	II	0.04%
ELECTRICAL	II	0.065%

Qualification report
Ultrafast 400V – STTHxxR04 series

ASSESSMENT

Qualification plan requirements have been fulfilled without exception.
It is stressed that reliability tests have shown that the devices behave correctly against environmental tests (no failure).
On the other hand, the observed stability of electrical parameters along the accelerated tests proves with confidence the ruggedness of the products and safe operation during their lifetime is consequently expected.

Completion date	Location	Department	Name
07-Oct-2010	STMicroelectronics Rue Pierre et Marie Curie BP7155 37071 TOURS Cedex 2, France	Product Quality Assurance	Isabelle BALLON Quality Assurance E-mail: isabelle.ballon@st.com

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