



# PRODUCT/PROCESS CHANGE NOTIFICATION

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PCN APG-ABD/13/7713  
Dated 18 Feb 2013

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**VIpower M05 - Activation of 8" Wafer Fab Catania as  
Additional Location**

**Table 1. Change Implementation Schedule**

Forecasted implementation date for change	31-Jul-2013
Forecasted availability date of samples for customer	11-Feb-2013
Forecasted date for <b>STMicroelectronics</b> change Qualification Plan results availability	11-Feb-2013
Estimated date of changed product first shipment	31-Jul-2013

**Table 2. Change Identification**

Product Identification (Product Family/Commercial Product)	see list
Type of change	Waferfab additional location
Reason for change	Service Improvement
Description of the change	In order to improve Capacities and Service 8 inches wafer Fab Catania has been qualified as additional location for VIPower M05 technology products.
Change Product Identification	"V5" traceability code identify 8" wafer fab
Manufacturing Location(s)	1]Catania Ctm8 2]Catania Ctm6



## DOCUMENT APPROVAL

Name	Function
Liporace, Nicola	Marketing Manager
Nicoloso, Riccardo	Product Manager
Minerva, Francesco	Q.A. Manager

## VIpower M05: Activation of 8" Wafer Fab. Catania as Additional Location.

### WHAT

In order to improve Capacities and Service 8 inches wafer Fab Catania has been qualified as additional location for VIpower M05 technology products.

### WHO

All the Customers using below list of products.

Part Number	Samples Availability
VND5004ASP30-E / VND5004ASP30TR-E	wk11-2013
VND5004ATR-E	wk09-2013
VND5004BSP30-E / VND5004BSP30TR-E	wk10-2013
VND5004BTR-E	wk11-2013
VNH5019A-E / VNH5019ATR-E	available
VND5E006ASP-E / VND5E006ASPTR-E	wk32-2013
VN5E010AFH-E / VN5E010AFHTR-E	wk32-2013
VN5E010AHTR-E	wk32-2013
VN5E010MH-E / VN5E010MHTR-E	wk32-2013
VN5E010NAHTR-E	wk32-2013
VN5R003H-E / VN5R003HTR-E	wk32-2013

### WHEN

Change will be implemented according to the following schedule:

- Qualification results enclosed to this PCN (RR004111CT6025).
- Samples availability: see upon table.
- Tentative Implementation on July 2013

### WHERE

Catania 6" (CT6 – CTM6) / Catania 8" (CM5 – CTM8) .

**VIPower M0L5 technology transfer from  
 CTM6 Catania (Italy) to CTM8 Catania (Italy)**

General Informations	
<b>Commercial Product</b>	<b>VND5E006ASP-E</b>
<b>Product Line</b>	VH10
<b>Silicon process technology</b>	VIpower M05
<b>Package</b>	PowerSO16

Locations	
<b>Diffusion fab location</b>	ST CTM8 Catania (Italy)
<b>Assembly plant location</b>	ST Muar (Malaysia)
<b>Test plant location</b>	ST Muar (Malaysia)
<b>Reliability lab location</b>	ST Catania (Italy)

General Informations	
<b>Commercial Product</b>	<b>VND5004B-E</b>
<b>Product Line</b>	VH02
<b>Silicon process technology</b>	VIpower M05
<b>Package</b>	PQFN Power 12x12

Locations	
<b>Diffusion fab location</b>	ST CTM8 Catania (Italy)
<b>Assembly plant location</b>	ASE (Korea)
<b>Test plant location</b>	ST Muar (Malaysia)
<b>Reliability lab location</b>	ST Catania (Italy)

**Author:**  
 F.CERAULO  
 Product Qualification Eng  
 APG Q&R Catania

**Reliability and electrical test executed by:**  
 S.Di Stefano - M.Spitaleri  
 Rel. Eng.  
 APM Rel Dept. – APG Support

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## - 1. Reliability evaluations overview

### 1.1 Objectives

Aim of this report is to present the results of the reliability evaluations performed on **VND5E006ASP-E** (VH10 as ST internal silicon line) and on **VND5004B-E** (VH02 as ST internal silicon line) chosen as test vehicles in order to transfer the VIPower M0L5 technology from ST CTM6 Catania (Italy) 6" wafer fab to ST CTM8 Catania (Italy) 8" wafer fab.

These are multi chip Double High Side Driver products with analog current sense for Automotive Application. The **VND5E006ASP-E** is assembled by ST Muar (Malaysia) in PowerSO-16 package while the **VND5004B-E** is assembled by ASE (Korea) subcontractor in QFPN 12x12 package.

The reliability evaluation was based on three lots, two of them of **VND5E006ASP-E** and one of **VND5004B-E**.

According with the **AEC\_Q100 Rev.G** specification for the Accelerated Environment Stress (test Group A) and the Accelerated Lifetime Simulation (test Group B) the following tests were performed for each lot: Preconditioning (PC), Temperature Humidity Bias (THB), Autoclave (AC), Thermal Cycling (TC), High Temperature Storage (HTS), Power Temperature Cycling (PTC), High Temperature Operative Life (HTOL). An ESD characterization (HBM, CDM), the Latch-UP (LU) and Gate Leakage (GL) control were also done as Electrical Verification (test Group E).

### 1.2 Results

All reliability tests have been completed with positive results, neither functional nor parametric rejects were detected at final electrical testing.

The drift analysis performed at  $T=+25^{\circ}\text{C}$  examining  $I_{\text{OFF}@13\text{V}}$ ,  $R_{\text{ON1}@24\text{V}}$ ,  $K_{1\_CK@16\text{V}}$  (for **VND5E006ASP-E**) and  $I_{\text{OFF}@13\text{V}}$ ,  $R_{\text{ON1}@8\text{V}}$  (for **VND5004B-E**), showed a good stability for all the electrical monitored parameters.

**Based on the overall positive results we consider the products qualified from a reliability point of view.**



## - 2. Traceability

### VND5006ASP-E

<b>Wafer fab information</b>	
<b>Wafer fab manufacturing location</b>	ST CTM6 CATANIA (Italy) as signal part ST CTM8 CATANIA (Italy) as power die
<b>Wafer diameter</b>	6" as signal part, 8" as power die
<b>Silicon process technology</b>	VIpower <b>M05E signal part</b> , VIpower <b>M0L5 power die</b>
<b>Die finishing back side</b>	VNS8 (signal) Raw silicon, VNS9 (power) Ti-Ni-Au
<b>Die size</b>	VNS8 (signal) 3160x1690, VNS9 (power) 5780x5210 micron
<b>Metal materials/levels</b>	VNS8 (signal) Ti/TiN/Ti/AlSiCu / 2 levels (3.2 micron last level) VNS9 (power) Ti/TiN/TiAlCu/ 1 level (4.7 micron)
<b>Die finishing front side</b>	SiN / Polyimide
<b>Diffusion Lots #</b>	Lot 1: VNS8 (signal) 3104685, VNS9 (power) 5105246 Lot 2: VNS8 (signal) 3117932, VNS9 (power) 5105246

<b>Assembly Information</b>	
<b>Assembly plant location</b>	ST Muar (Malaysia)
<b>Package description</b>	PowerSO_16 FRAME PSO-16 4riv 1-4/5-8fused
<b>Molding compound</b>	SUMITOMO EME-G700LS
<b>Wires bonding materials/diameters</b>	Au 1.3mils (on signal) / Al 12mils (on power)
<b>Die attach material</b>	PREFORM Pb/Ag/Sn 97.5/1.5/1 TAPE ADWILL LE-5000P8AS
<b>Assembly Lots #</b>	Lot1: 991191VS01, Lot2: 991191VT01

<b>Final Testing Information</b>	
<b>Electrical testing manufacturing location</b>	ST Muar (Malaysia)

<b>Reliability Information</b>	
<b>Reliability test execution location</b>	ST Catania (Italy)

**VND5004B-E**

<b>Wafer fab information</b>	
<b>Wafer fab manufacturing location</b>	ST CTM6 CATANIA (Italy) as signal part ST CTM8 CATANIA (Italy) as power die
<b>Wafer diameter</b>	6" as signal part, 8" as power die
<b>Silicon process technology</b>	VIpower <b>M05E signal part</b> , VIpower <b>M0L5 power die</b>
<b>Die finishing back side</b>	VNS3 (signal) Ti-Ni-Au, VNI4 (power) Ti-Ni-Au
<b>Die size</b>	VNS3 (signal) 2800x1560, VNI4 (power) 7990x4000 micron
<b>Metal materials/levels</b>	VNS3 (signal) Ti/TiN/TiAlCu / 2 levels (3.2 micron last level) VNI4 (power) Ti/TiN/TiAlCu / 1 level (4.7 micron)
<b>Die finishing front side</b>	VNS3 (signal) SiN / Polyimide, VNI4 (power) Teos + PTeos + SiOn + PIX
<b>Diffusion Lots #</b>	VNS3 (signal) 3120430, VNI4 (power) 5105247

<b>Assembly Information</b>	
<b>Assembly plant location</b>	ASE (Korea)
<b>Package description</b>	PQFN Power 12x12
<b>Molding compound</b>	Sumitomo G700
<b>Wires bonding materials/diameters</b>	Au 1.0mils (on signal) / Al 12mils (on power)
<b>Die attach material</b>	PREFORM Pb/Ag/Sn 95.5/2.5/2 D/A ADHESIVE ABLE 8290
<b>Assembly Lots #</b>	HA131CZA21

<b>Final Testing Information</b>	
<b>Electrical testing manufacturing location</b>	ST Muar (Malaysia)

<b>Reliability Information</b>	
<b>Reliability test execution location</b>	ST Catania (Italy)

## - 3. VND5E006ASP-E - Devices characteristics

### 3.1 Generalities



## VND5E006ASP-E

Double channel high-side driver with analog current sense  
 for automotive applications

### Features

Max transient supply voltage	$V_{CC}$	41 V
Operating voltage range	$V_{CC}$	4.5 to 28 V
Max on-state resistance (per ch.)	$R_{ON}$	5.5 m $\Omega$
Current limitation (typ)	$I_{LMH}$	100 A
Off-state supply current	$I_S$	2 $\mu$ A <sup>(1)</sup>

1. Typical value with all loads connected.

#### ■ General

- Inrush current active management by power limitation
- Very low standby current
- 3.0 V CMOS compatible inputs
- Optimized electromagnetic emissions
- Very low electromagnetic susceptibility
- In compliance with the 2002/95/EC european directive
- Very low current sense leakage

#### ■ Diagnostic functions

- Proportional load current sense
- High current sense precision for wide currents range
- Current sense disable
- Off-state openload detection
- Output short to  $V_{CC}$  detection
- Overload and short to ground (power limitation) indication
- Thermal shutdown indication

#### ■ Protections

- Undervoltage shutdown
- Overvoltage clamp
- Load current limitation
- Self limiting of fast thermal transients
- Protection against loss of ground and loss of  $V_{CC}$
- Overtemperature shutdown with auto restart (thermal shutdown)



- Reverse battery protected with self switch of the PowerMOS (see [Figure 32](#))
- Electrostatic discharge protection

### Applications

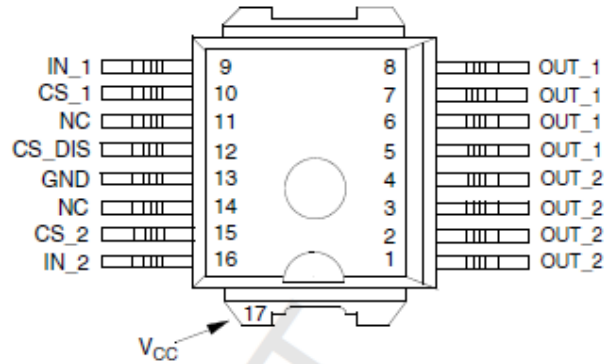
- All types of resistive, inductive and capacitive loads

### Description

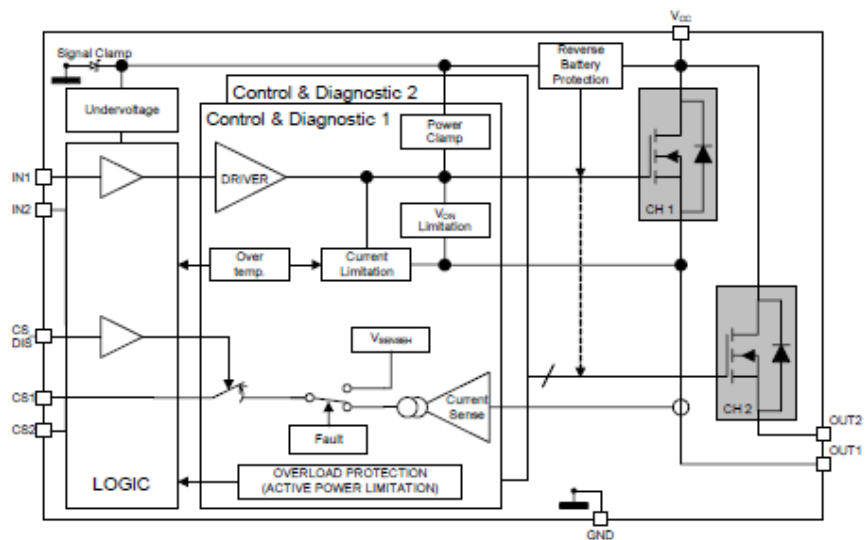
The VND5E006ASP-E is a double channel high-side driver manufactured in the ST proprietary VIPower™ M0-5 technology and housed in the tiny PowerSO-16 package. The VND5E006ASP-E is designed to drive 12 V automotive grounded loads delivering protection, diagnostics and easy 3 V and 5 V CMOS compatible interface with any microcontroller.

The device integrates advanced protective functions such as load current limitation, inrush and overload active management by power limitation, overtemperature shut-off with auto restart and overvoltage active clamp. A dedicated analog current sense pin is associated with every output channel in order to provide enhanced diagnostic functions including fast detection of overload and short-circuit to ground through power limitation indication, overtemperature indication, short-circuit to  $V_{CC}$  diagnosis and ON and OFF-state open load detection. The current sensing and diagnostic feedback of the whole device can be disabled by pulling the CS\_DIS pin high to allow sharing of the external sense resistor with other similar devices.

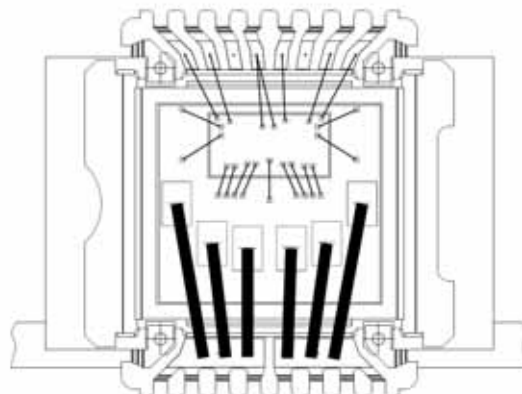
### 3.2 Pins connection



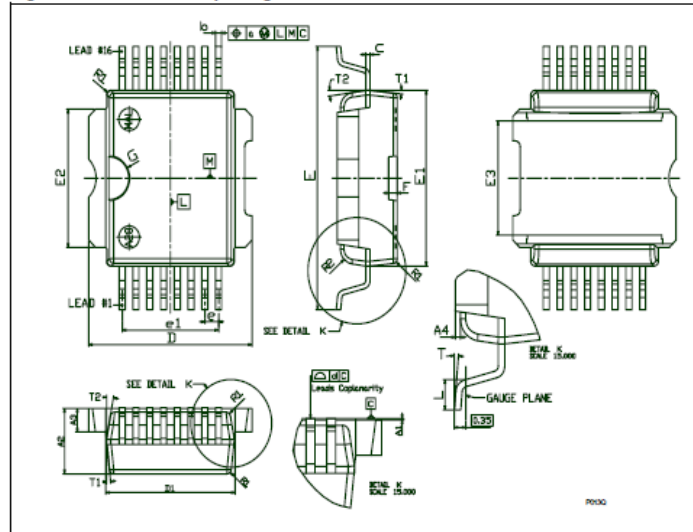
### 3.3 Blocks diagram



### 3.4 Bonding diagram



### 3.5 Package outline/Mechanical data



Dim.	mm		
	Min.	Typ.	Max.
A1	0	0.05	0.1
A2	3.4	3.5	3.6
A3	1.2	1.3	1.4
A4	0.15	0.2	0.25
a		0.2	
b	0.27	0.35	0.43
c	0.23	0.27	0.32
D	9.4	9.5	9.6
D1	7.4	7.5	7.6
d	0	0.05	0.1
E (1)	13.85	14.1	14.35
E1	9.3	9.4	9.5
E2	7.3	7.4	7.5
E3	5.9	6.1	6.3
e		0.8	
e1		5.6	
F		0.5	
G		1.2	
L	0.8	1	1.1
R1			0.25
R2		0.8	
T	2°	5°	8°
T1		6° (typ.)	
T2		10° (typ.)	

## - 4. VND5004B-E - Devices characteristics

### 4.1 Generalities



## VND5004B-E VND5004BSP30-E

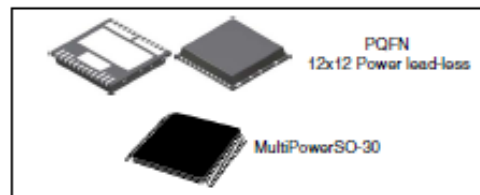
Double 4mΩ high side driver with analog current sense  
for automotive applications

#### Features

Parameters	Symbol	Value
Max transient supply voltage	V <sub>CC</sub>	41 V
Operating voltage range	V <sub>CC</sub>	4.5 to 28 V
Max on-state resistance	R <sub>ON</sub>	4 mΩ
Current limitation (typ)	I <sub>LIMH</sub>	100 A
Off-state supply current	I <sub>S</sub>	2 μA <sup>(1)</sup>

1. Typical value with all loads connected.

- General
  - Inrush current active management by power limitation
  - Very low standby current
  - 3.0 V CMOS compatible input
  - Optimized electromagnetic emission
  - Very low electromagnetic susceptibility
  - In compliance with the 2002/95/EC European directive
- Diagnostic functions
  - Proportional load current sense
  - Current sense disable
  - Thermal shutdown indication
- Protection
  - Undervoltage shutdown
  - Overvoltage clamp
  - Load current limitation
  - Thermal shutdown
  - Self limiting of fast thermal transients
  - Protection against loss of ground and loss of V<sub>CC</sub>



- Reverse battery protection with self switch on of the Power MOSFET (see [Figure 22](#))
- Electrostatic discharge protection application

- All types of resistive, inductive and capacitive loads
- Suitable for power management applications

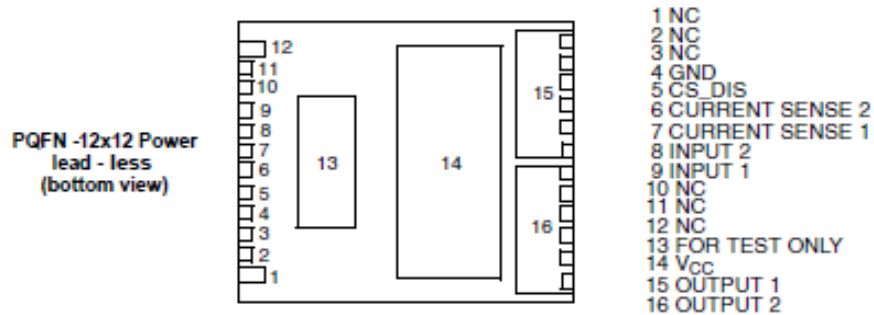
#### Description

The VND5004BTR-E and VND5004BSP30-E are devices made using STMicroelectronics VIPower technology. They are intended for driving resistive or inductive loads with one side connected to ground. Active V<sub>CC</sub> pin voltage clamp and load dump protection circuit protect the devices against transients on the V<sub>CC</sub> pin (see ISO7637 transient compatibility table). These devices integrate an analog current sense which delivers a current proportional to the load current (according to a known ratio) when CS\_DIS is driven low or left open. When CS\_DIS is driven high, the CURRENT SENSE pin is high impedance. Output current limitation protects the devices in overload condition. In case of long duration overload, the devices limit the dissipated power to a safe level up to thermal shutdown intervention. Thermal shutdown with automatic restart allows the device to recover normal operation as soon as a fault condition disappears.

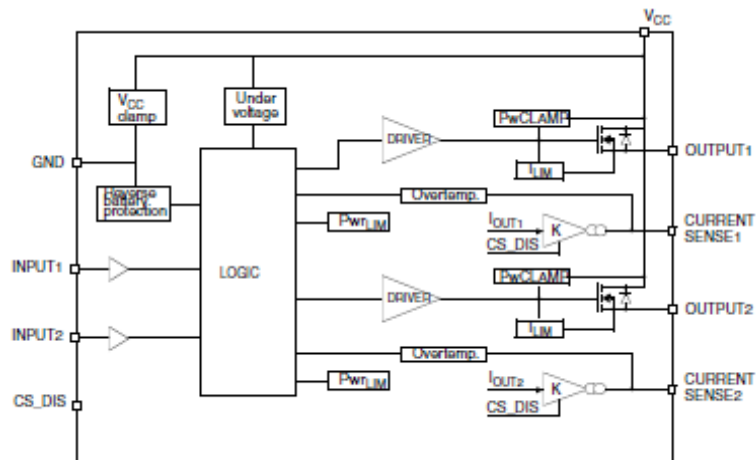
**Table 1. Devices summary**

Package	Order codes		
	Tube	Tape and reel	Tray
PQFN-12x12 power lead-less	-	VND5004BTR-E	VND5004B-E
MultiPowerSO-30	VND5004BSP30-E	VND5004BSP30TR-E	-

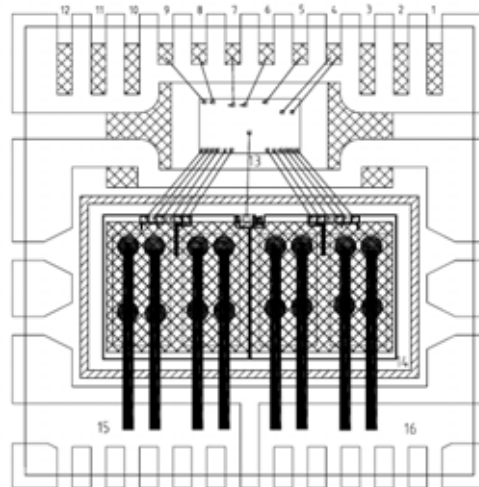
### 4.2 Pins connection



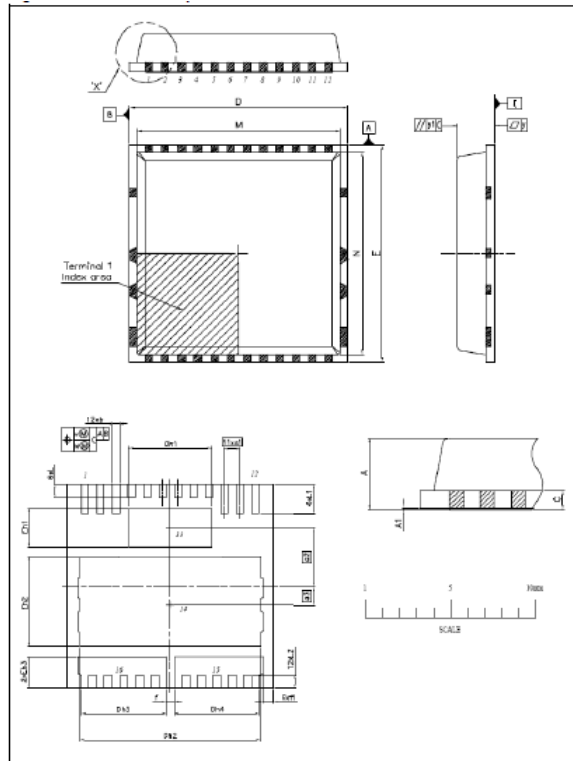
### 4.3 Blocks diagram



### 4.4 Bonding diagram



### 4.5 Package outline/Mechanical data



Symbol	Millimeters		
	Min.	Typ.	Max.
A	2		2.2
A1	0		0.05
b	0.35		0.47
C		0.50	
D	11.90		12.10
Dh1	4.65		4.95
Dh2	10.45		10.65
Dh3	4.80		5
Dh4	4.80		5
E	11.90		12.10
Eh1	2.15		2.45
Eh2	5.15		5.45
Eh3	1.70		2
e1		0.90	
e2		3.45	
e3		1.10	
f		0.50	
H		0.60	
L	0.75		0.95
L1	1.65		1.90
L2	0.76		0.78
M	11.10		11.30
N	11.10		11.30
v		0.1	
w		0.05	
y		0.05	
y1		0.1	

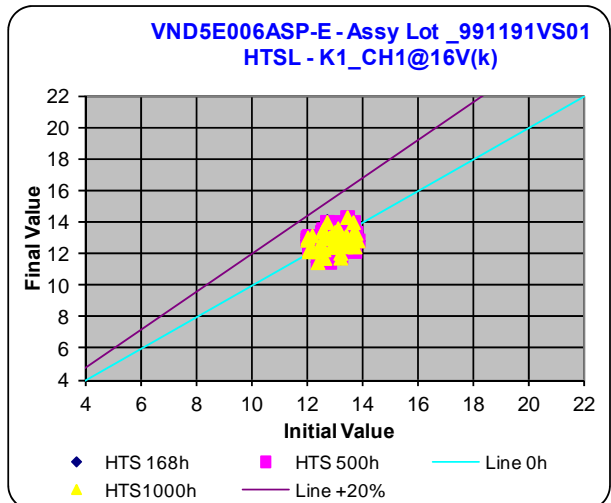
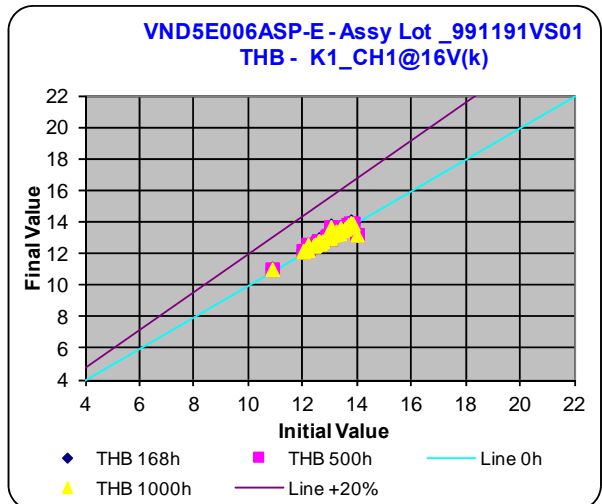
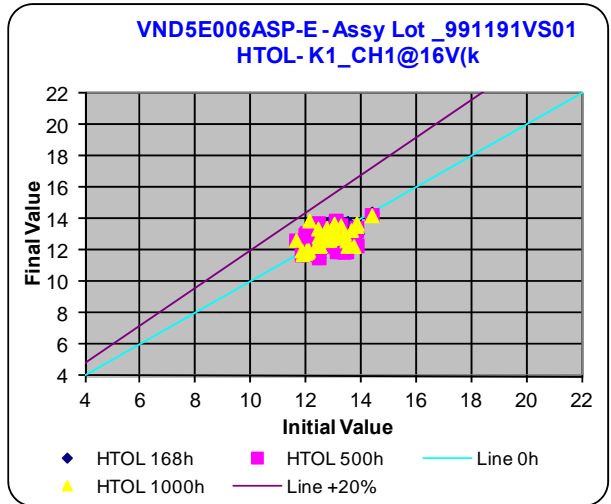
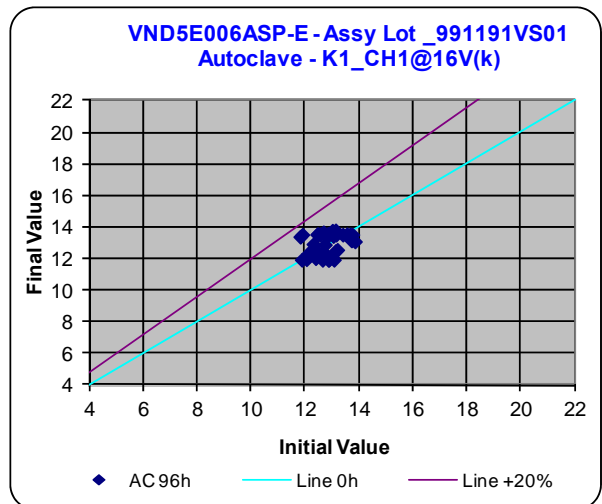
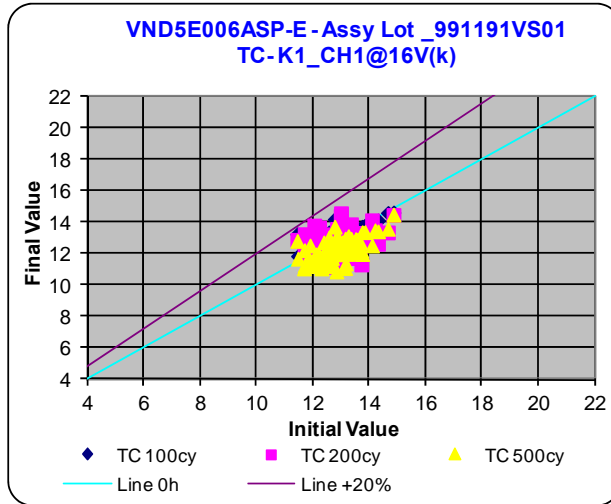


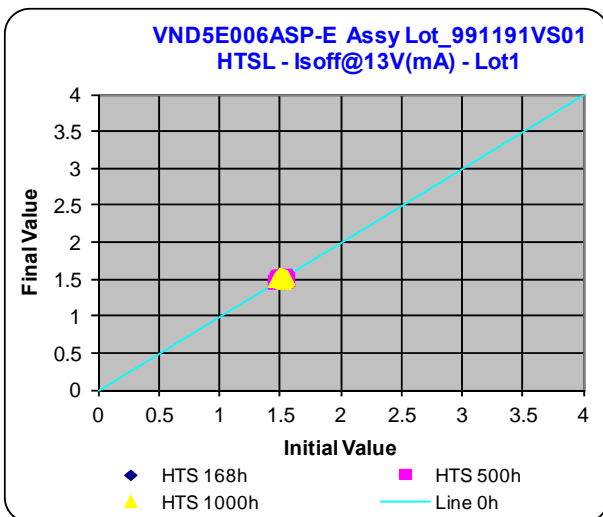
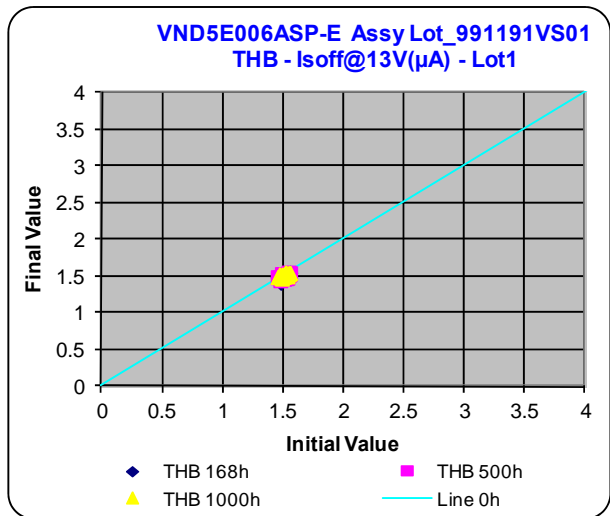
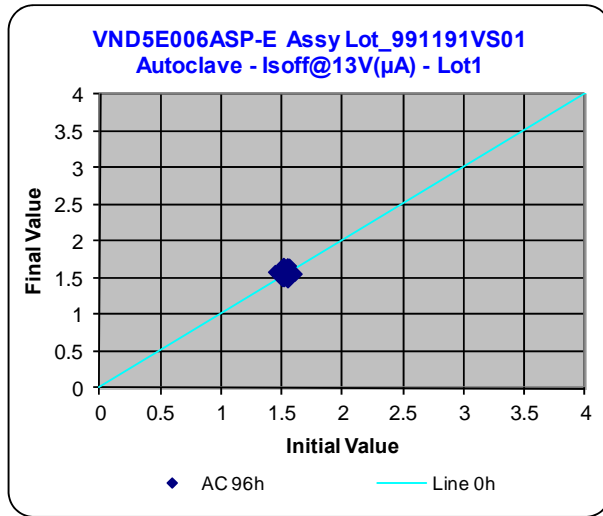
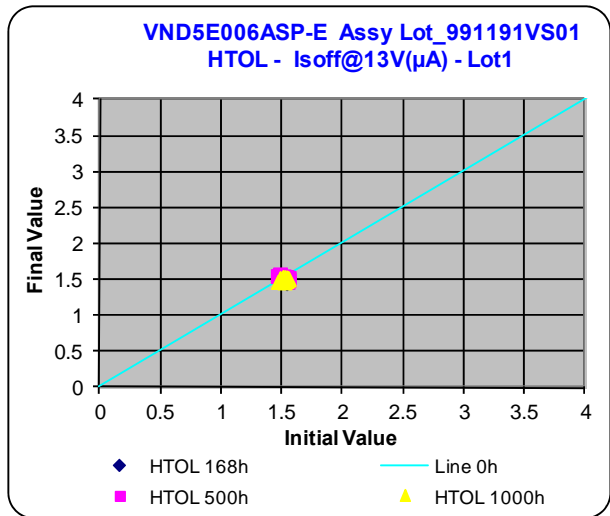
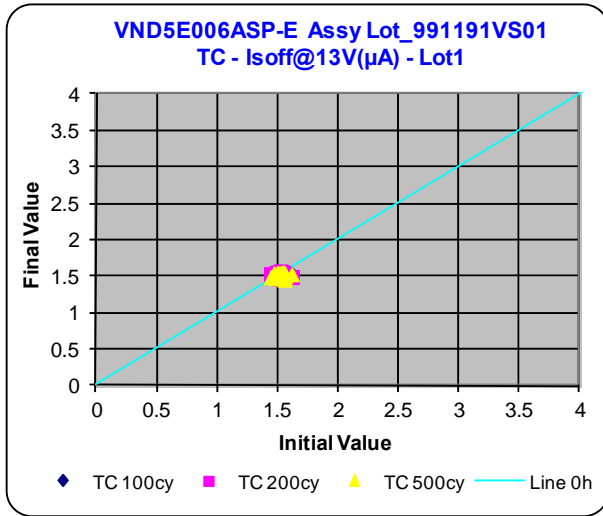
## - 5. Reliability qualification plan and results

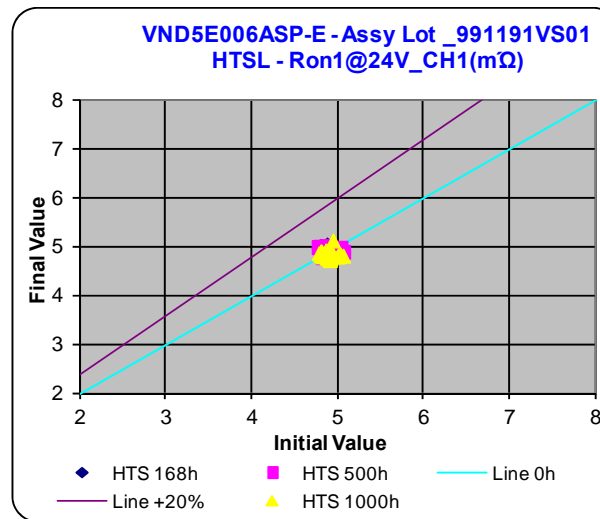
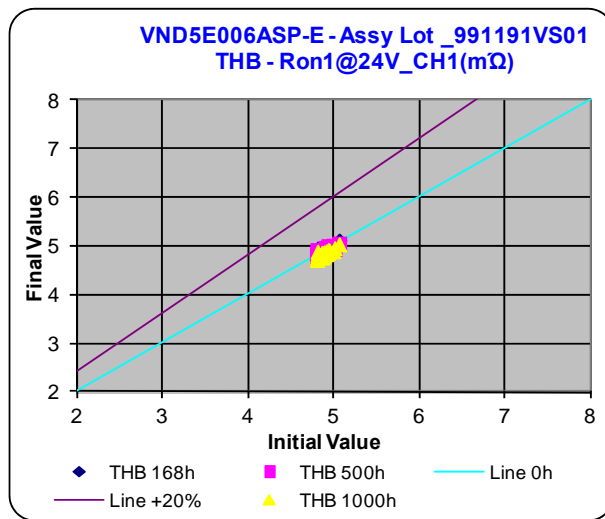
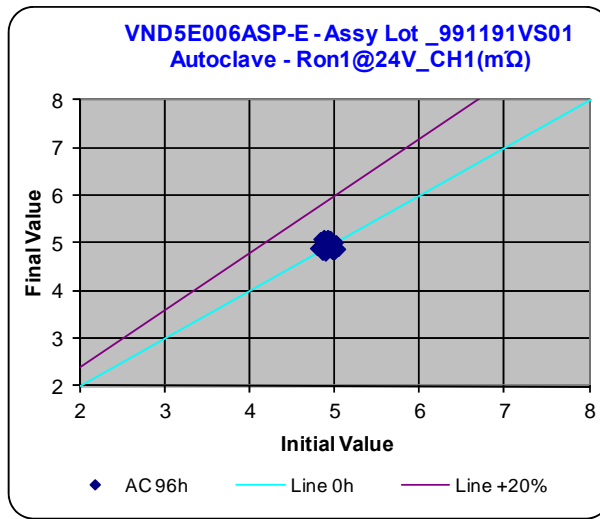
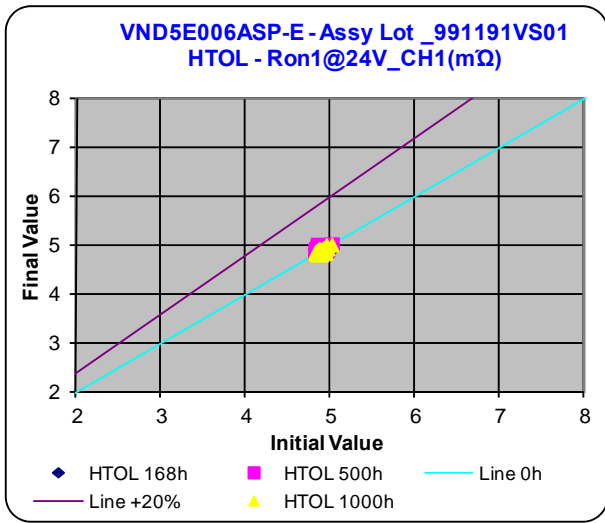
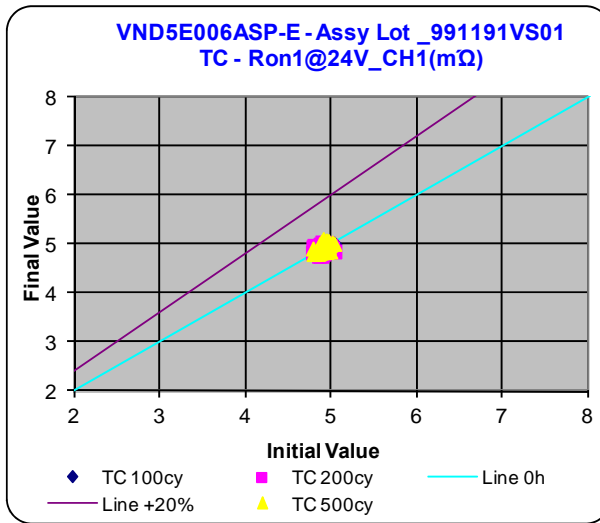
AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
A1	PC Pre Cond	Preconditioning at Jedec Level 3, store 192 hours at Ta=30°C, RH=60%, reflow (3 times) at 250°C	Before THB, AC, TC Reliability executed on units soldered on PCB		
A2	THB Temp Humidity Bias	Ta=85°C, RH=85%, V <sub>CC</sub> =56V for 1000 hours	77/3	0/77/3	2xVND5E006ASP 1xVND5004B
A3	AC Autoclave	Ta=121°C, Pa=2atm, RH=100% for 96 hours	77/3	0/77/3	2xVND5E006ASP 1xVND5004B
A4	TC Temp. Cycling	Ta=-65°C / +150°C for 500 cycles	77/3	0/77/3	2xVND5E006ASP 1xVND5004B
A5	PTC Power Temp. Cycling	Per JA105. Ta=-40°C / +125°C for 1000 cycles. Test before and after at room and hot temperatures.	45/1	0/45/1	Only on VND5E006ASP-E
A6	HTSL High Temp. Storage Life	Ta=150°C for 1000 hours. TST before and after at room and hot temperatures.	45/3	0/45/3	2xVND5E006ASP 1xVND5004B
B1	HTOL High Temp. Op. Life	Bias Static stress (JESD22-A108): Ta=125°C, V <sub>CC</sub> = 56V for 1000 hours	77/3	0/77/3	2xVND5E006ASP 1xVND5004B
E2	ESD HBM		15/1	V <sub>CC</sub> /Output: ±5.0kV CS_DIS/Input: ±4.0kV CS: ±2.0kV	Only on VND5E006ASP-E
E2	ESD HBM		3/1	All pins: ±2.0kV	Only on VND5004B-E
E3	ESD CDM		6/1	<b>All pins: ±750V</b>	Both products
E4	LU Latch-Up		6/1	±100mA	
E8	GL Gate Leakage		6/1	Passed	

## - 6. Electrical drift analysis

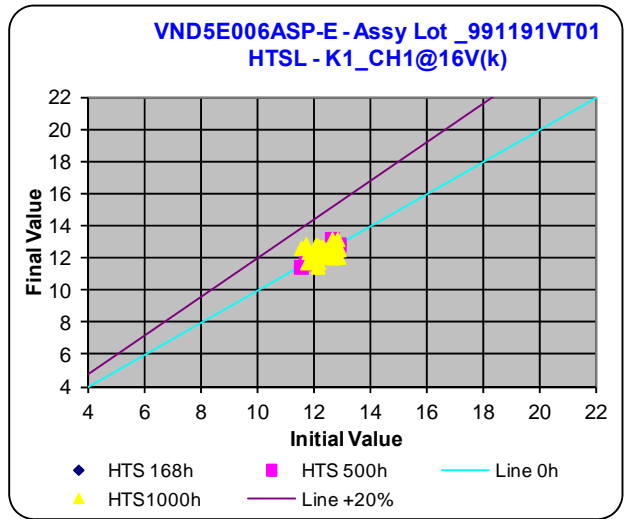
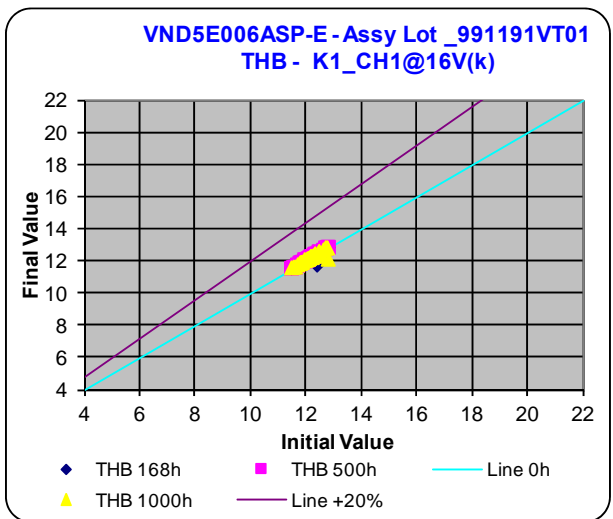
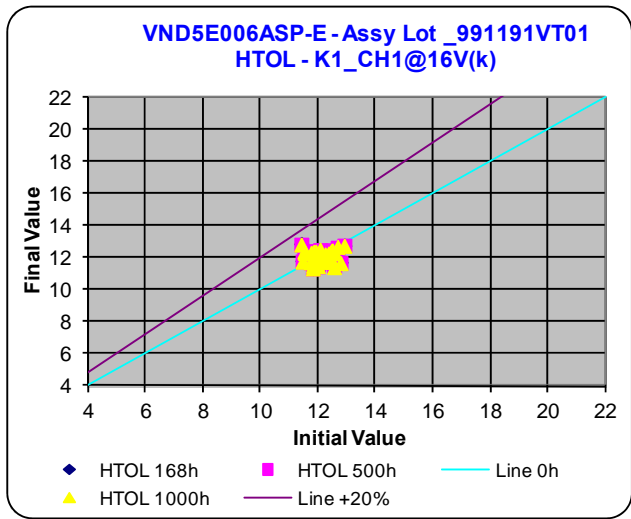
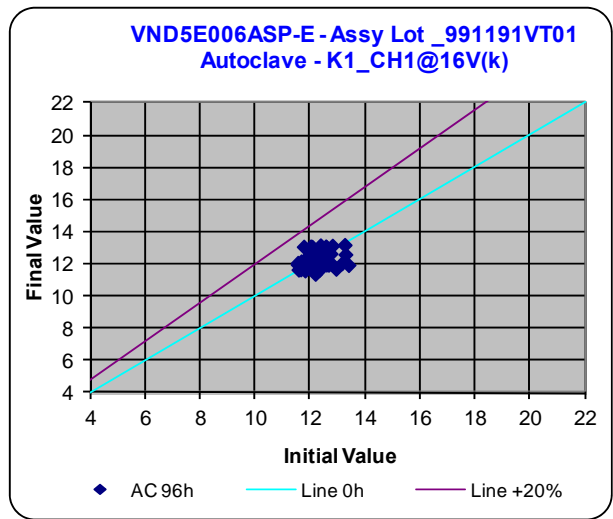
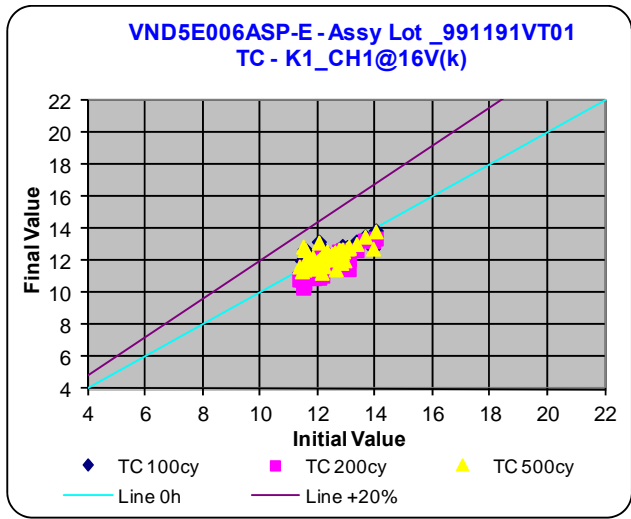
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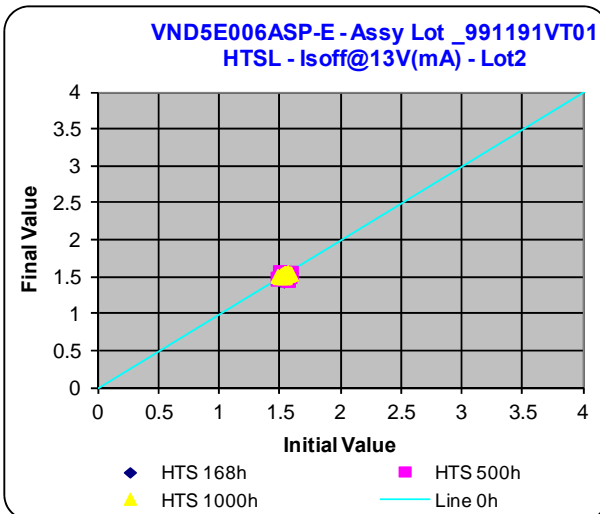
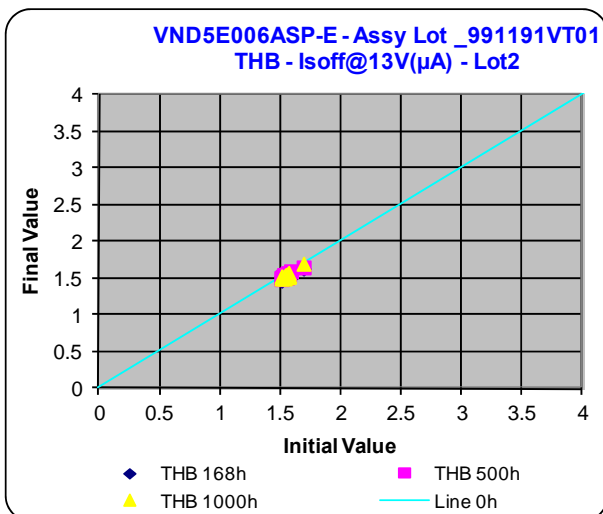
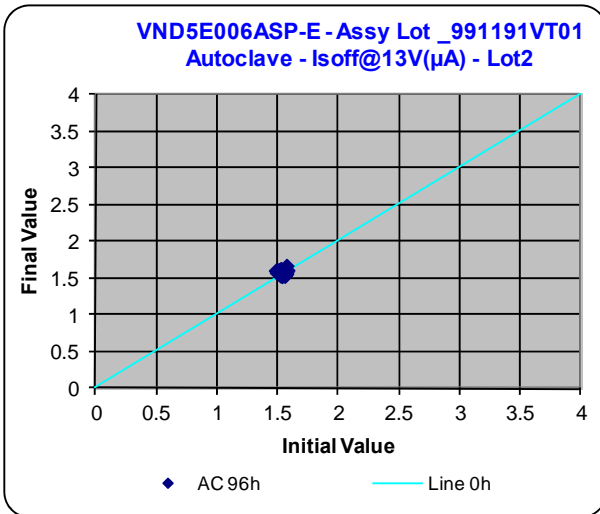
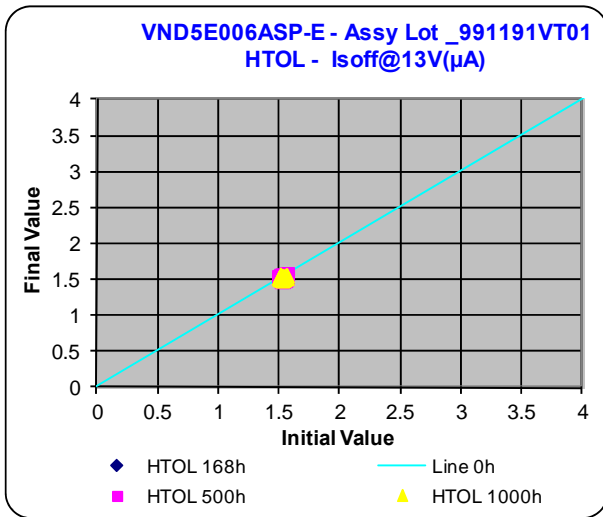
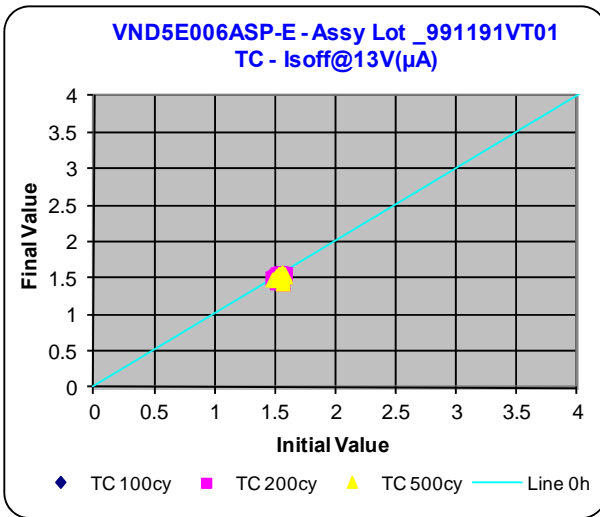


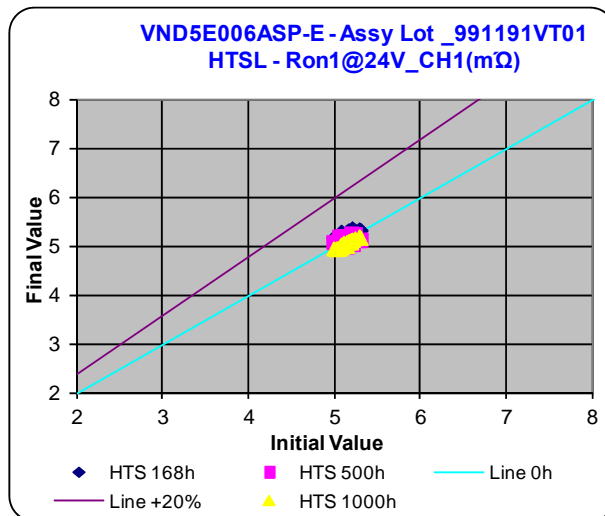
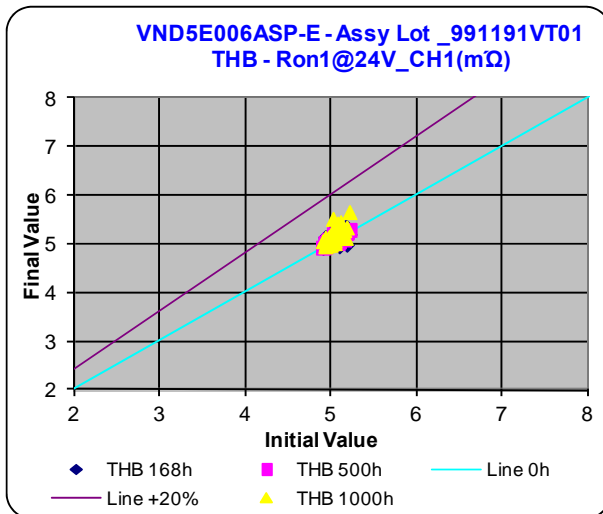
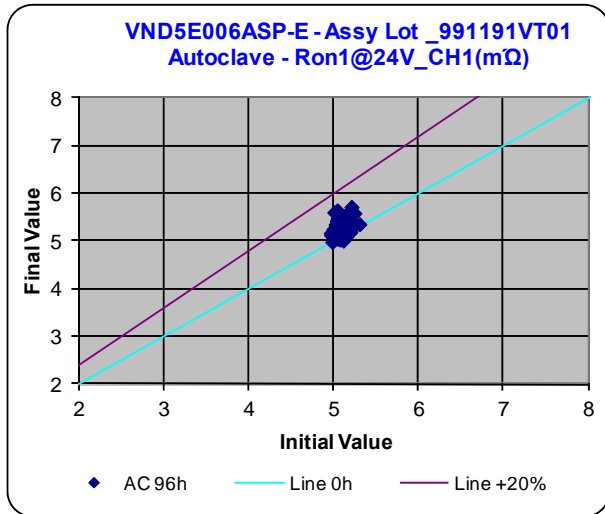
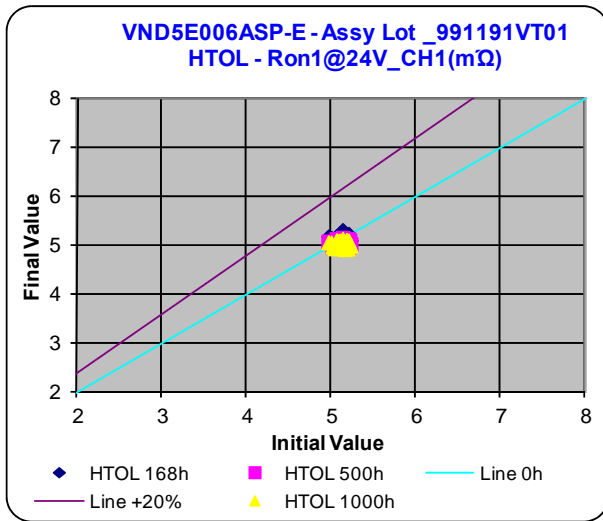
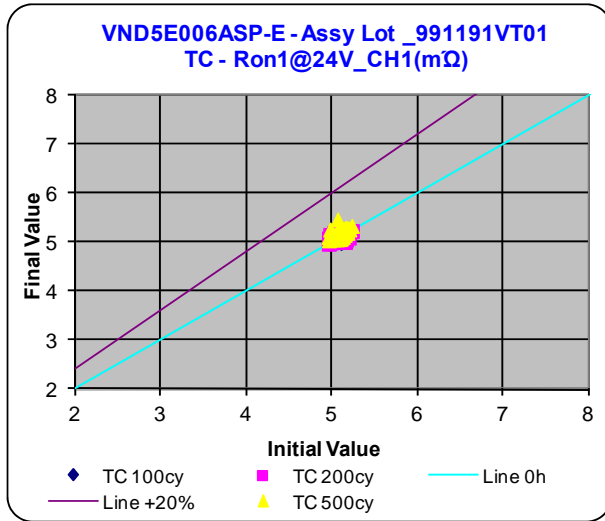




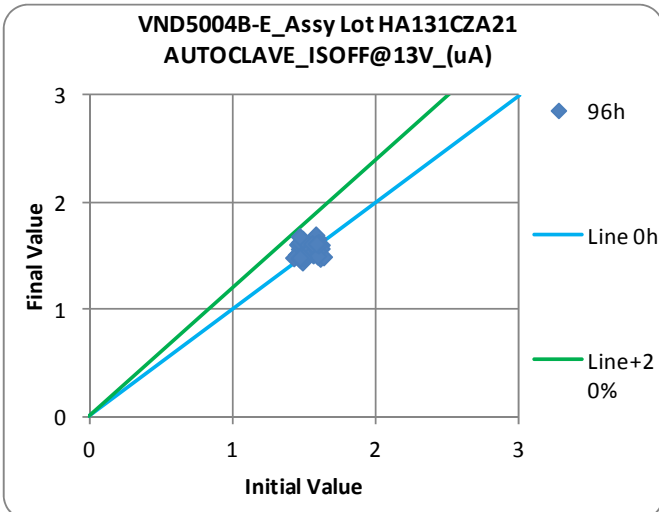
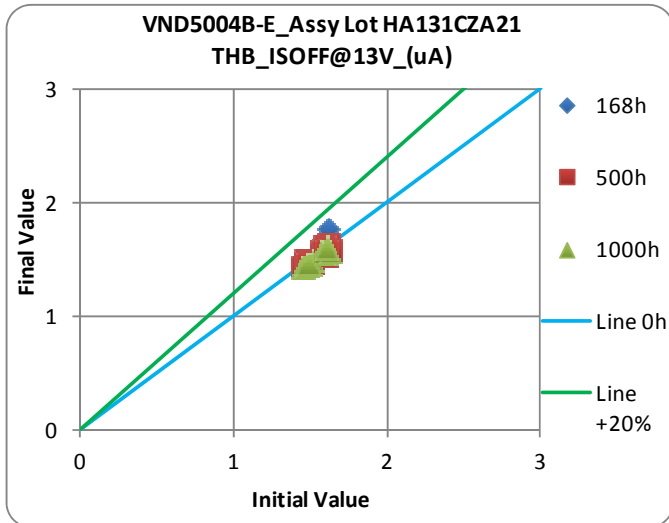
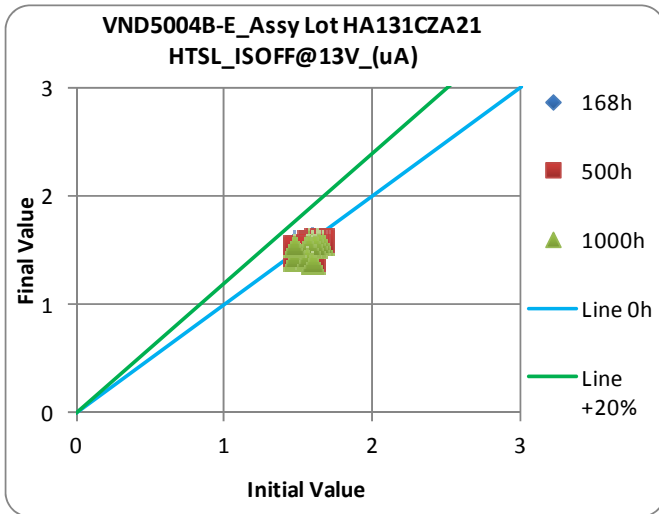
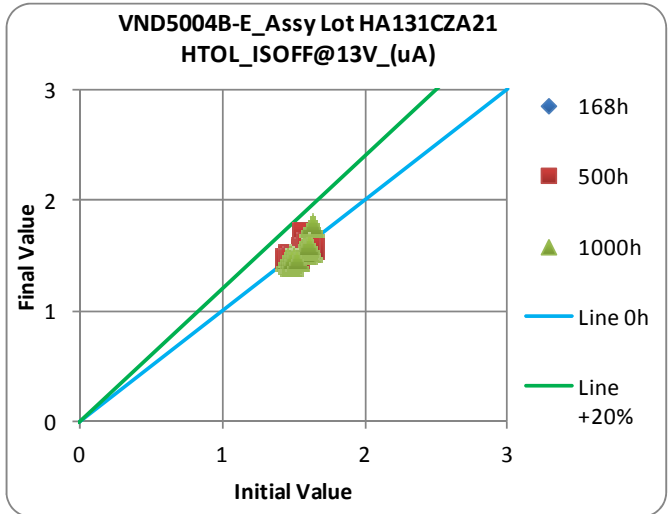
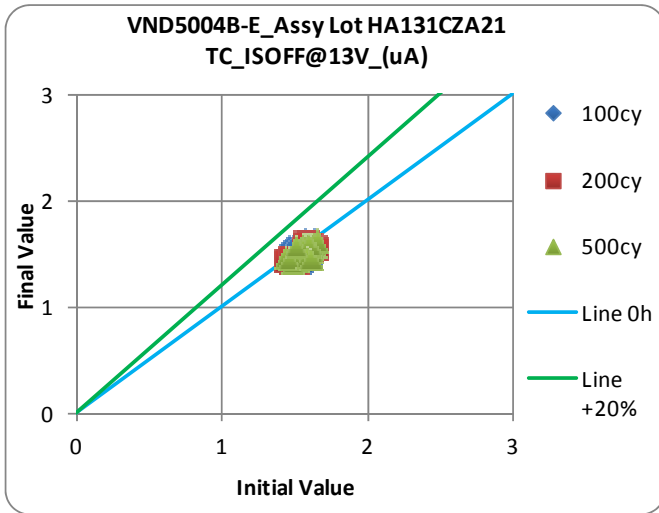
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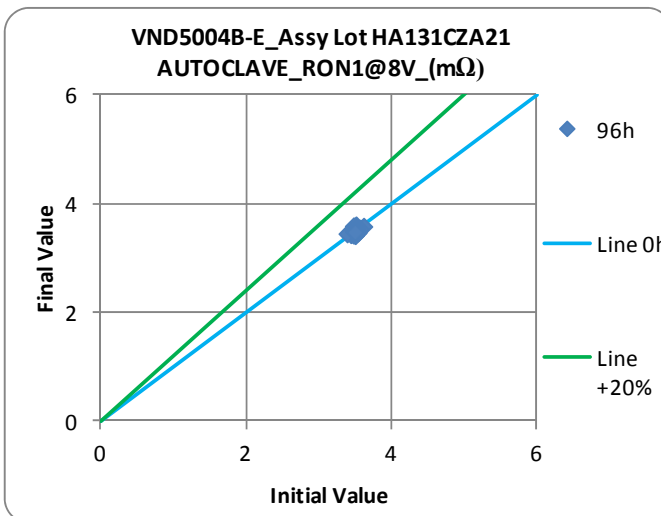
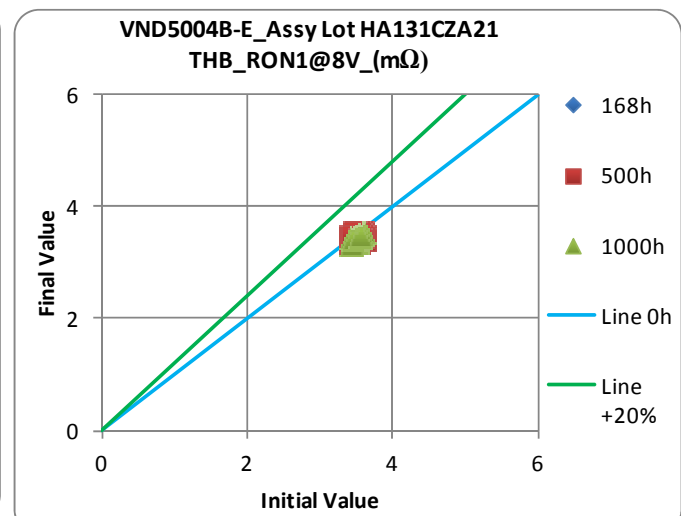
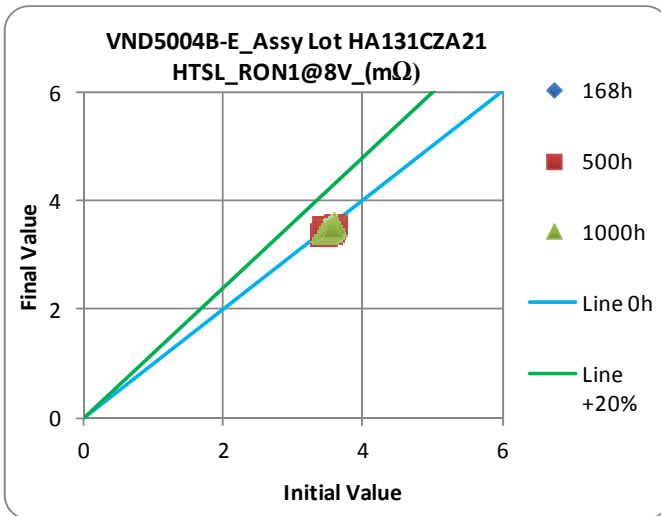
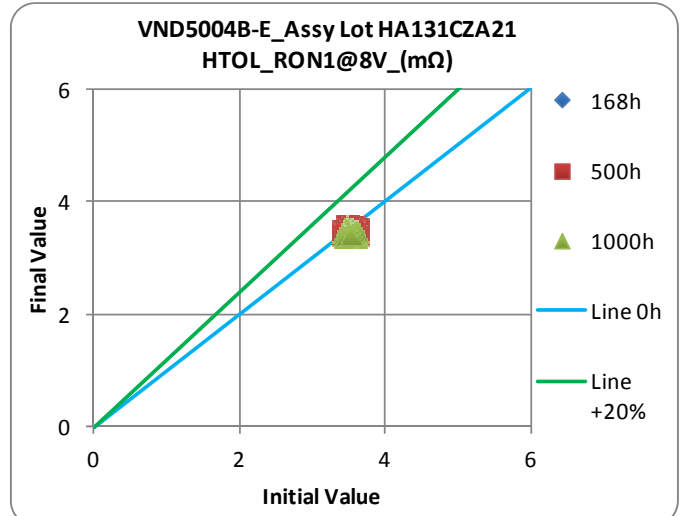
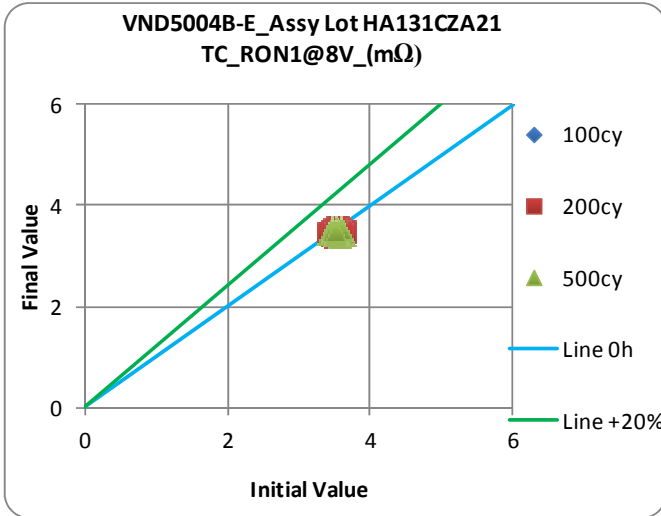




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