PRODUCT/PROCESS CHANGE NOTIFICATION

PCN APG-ABD/13/7951
Dated 28 Jun 2013

VIPower M05 in SOT-223: Transfer from Carsem to Fujitsu Assembly Plant

Table 1. Change Implementation Schedule

Forecasted implementation date for change	01-Oct-2013
Forecasted availability date of samples for customer	21-Jun-2013
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	21-Jun-2013
Estimated date of changed product first shipment	01-Oct-2013

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	see enclosed
Type of change	Package assembly location change
Reason for change	Service / Logistic
Description of the change	Please be informed that on VIPower M0.5 products housed in SOT-223 package we are going transfer the assembly location from Carsem to Fujitsu. Testing location is unchaged (ST Shenzhen).
Change Product Identification	Finished-Good codes
Manufacturing Location(s)	1]Sc Carsem M - Malaysia

DOCUMENT APPROVAL

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

Product Change Notification

VIPower M05 in SOT-223: Transfer from Carsem to Fujitsu assembly plant.

INVOLVED P&L FAMILY: 30

WHAT:
On VIPower M0.5 products housed in SOT-223 we are going to transfer the assembly location from subcontractor Carsem (Malaysia) to Fujitsu (China). Testing Plant (ST Shenzhen) remains unchanged.

Change Matrix

	CARSEM	FUJITSU
Molding Compound	HITACHI CEL9240HF10CT	SUMITOMO EMEG600F
Die Attach	Soft Solder (Pb/Sn 95/5)	Soft Solder (95.5Pb/2Sn/2.5Ag)
Wires	Au 2 mils	Au 2 mils
Lead-plating	Sn (100%)	Sn (100%)
Lead-plating thickness	7 - 20 um	7 - 20 um
Lead Frame	100x110 mils die pad	118x93 mils Std die pad / 160x108 mils Large die pad

WHY:
Logistic.

WHO:
All the Customers VIPower M05 products housed in SOT-223.

WHEN:
Tentative date of change is November 2013
Sample available on request
Qualification report included to this PCN (RR001913CT2235).

WHERE:
Carsem (Malaysia) sending plant – Fujitsu (China) receiving plant.

SOT-223 Package Plant Transfer from Carsem to Fujitsu subcontractors

General Informations	
Commercial Product	**VNL5050N3-E**
Product Line	VNR1
Silicon process technology	VIPower_M05
Package	SOT-223

Locations	
Diffusion fab location	STM CT6 Catania (Italy)
Assembly plant location	Subcontractor - Nantong FUJITSU – (China)
Test plant location	STM Shenzhen (China)
Reliability lab location	STM Catania (Italy)

General Informations	
Commercial Product	**VNL5090N3-E**
Product Line	VNY9
Silicon process technology	VIPower_M05
Package	SOT-223

Locations	
Diffusion fab location	STM AMK6 Ang Mo Kio (Singapore)
Assembly plant location	Subcontractor - Nantong FUJITSU – (China)
Test plant location	STM Shenzhen (China)
Reliability lab location	STM Catania (Italy)

General Informations	
Commercial Product	**VNL5160N3-E**
Product Line	VNL2
Silicon process technology	VIPower_M05
Package	SOT-223

Locations	
Diffusion fab location	STM CT6 Catania (Italy)
Assembly plant location	Subcontractor - Nantong FUJITSU – (China)
Test plant location	STM Shenzhen (China)
Reliability lab location	STM Catania (Italy)

Revision history

REV.	Date of Release	Author	Changes description
0.1	March 29th 2013	F. Palazzolo	Creation

Reliability and electrical test executed by:
S. Di Stefano
Rel. Eng.
IMS Rel Dept. – APG Support

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- 1. Reliability evaluations overview

1.1 Objectives

Aim of this report is to present results of the reliability evaluation on several test vehicles belonging to VIPower M05 family in order to transfer the SOT223 package from Carsem (Malaysia) to Nantong Fujitsu (Malaysia) subcontractors.

The chosen test vehicles are: **VNL5050N3-E** (VNR1 as STM Internal Code), **VNL5090N3-E** (VNY9 as STM Internal Code) and **VNL5160N3-E** (VNL2 as STM Internal Code).

The qualification was based on 3 lots, one lot per vehicle, according to the **AEC_Q100 Rev.G** specification the following tests were performed: Preconditioning (PC), Temperature Humidity Bias (THB), Autoclave (AC), Thermal Cycling (TC), Power Temperature Cycling (PTC, only on VNL5050N3), High Temperature Storage (HTS) as Accelerated Environment Stress (test Group A); High Temperature Operative Life (HTOL, only on VNL5050N3) as Accelerated Lifetime Simulation (test Group B); Wire Bond Pull/Shear tests (WBP, WBS), Solderability (SD), Physical Dimension (PD) as Package Assembly Integrity (test Group C); Gate Leakage (GL) as Electrical Verification (test Group E). The ELFR data are also reported.

1.2 Results

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

Based on the overall positive results we consider the products assembled with the new frame qualified from a reliability point of view.

- 2. Traceability

VNL5050N3-E (VNR1)

Wafer fab information	
Wafer fab manufacturing location	STM CT6 Catania (Italy)
Wafer diameter (inch)	6
Silicon process technology	VIPOWER M0_A5
Die finishing back side	Ti-Ni-Au
Die size	2010 x 2010 micron
Metal materials/levels	Ti/TiN/Ti/AlSiCu 3.2 micron/ 2 level
Passivation	SiN / Polyimide
Lot #	3201037

Assembly Information	
Assembly plant location	Subcontractor Nantong FUJITSU (China)
Package description	SOT-223 Large DIE Pad
Molding compound	Resin SUMITOMO EMEG600F
Wires bonding materials/diameters	Au 2.0 mils
Die attach material	Soft solder Pb/Sn/Ag 95.5/2/2.5
Assy Lots #	GK2450F301

Final Testing Information	
Electrical testing manufacturing location	STM Shenzhen (China)

VNL5090N3-E (VNY9)

Wafer fab information	
Wafer fab manufacturing location	STM AMK6 Ang Mo Kio (Singapore)
Wafer diameter (inch)	6
Silicon process technology	VIPower M0_H5
Die finishing back side	Ti-Ni-Au
Die size	1720 x 1550
Metal materials/levels	2 levels / Ti/TiN/Ti/AlCu (3.2 µm last level)
Passivation	SiN / Polyimide
Lot #	6205KE4

Assembly Information	
Assembly plant location	Subcontractor Nantong FUJITSU (China)
Package description	SOT-223 Standard DIE Pad
Molding compound	Resin SUMITOMO EMEG600F
Wires bonding materials/diameters	Au 2.0 mils
Die attach material	Soft solder Pb/Sn/Ag 95.5/2/2.5
Assy Lots #	GK2460LS01

Final Testing Information	
Electrical testing manufacturing location	STM Shenzhen (China)

VNL5160N3-E (VNL2)

Wafer fab information	
Wafer fab manufacturing location	STM CT6 Catania (Italy)
Wafer diameter (inch)	6
Silicon process technology	VIPOWER M0_A5
Die finishing back side	Ti-Ni-Au
Die size	1720 x 1060 micron
Metal materials/levels	2 levels / Ti/TiN/Ti/AlCu (3.2 µm last level)
Passivation	SiN / Polyimide
Lot #	3151658

Assembly Information	
Assembly plant location	Subcontractor Nantong FUJITSU (China)
Package description	SOT-223 Standard DIE Pad
Molding compound	Resin SUMITOMO EMEG600F
Wires bonding materials/diameters	Au 2.0 mils
Die attach material	Soft solder Pb/Sn/Ag 95.5/2/2.5
Assy Lots #	GK24512Q01

Final Testing Information	
Electrical testing manufacturing location	STM Shenzhen (China)

- 3. VNL5050N3-E - Devices characteristics

3.1 Generalities

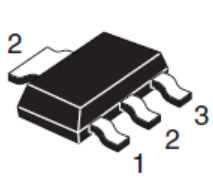
VNL5050N3-E
VNL5050S5-E

OMNIFET III
fully autoprotected Power MOSFET

Features

Type	V_{clamp}	$R_{DS(on)}$	I_D
VNL5050N3-E	41 V	50 mΩ	19 A
VNL5050S5-E			

- 3.0 V CMOS compatible input
- Drain current: 19 A
- ESD protection
- Overvoltage clamp
- Thermal shutdown
- Current and power limitation
- Very low standby current
- Very low electromagnetic susceptibility
- In compliance with the 2002/95/EC european directive
- Open drain status output(a)



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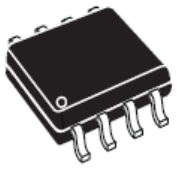
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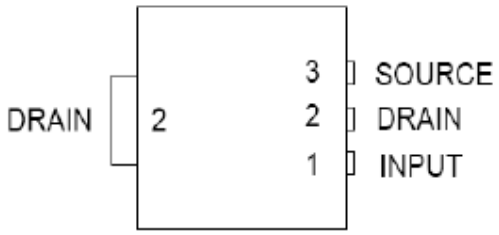
Description

The VNL5050N3-E and VNL5050S5-E are monolithic devices made using STMicroelectronics VIPower Technology, intended for driving resistive or inductive loads with one side connected to the battery. Built-in thermal shutdown protects the chip from overtemperature and short-circuit. Output current limitation protects the devices in an overload condition. In case of long duration overload, the device limits 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. Fast demagnetization of inductive loads is achieved at turn-off.

3.2 Pins connection



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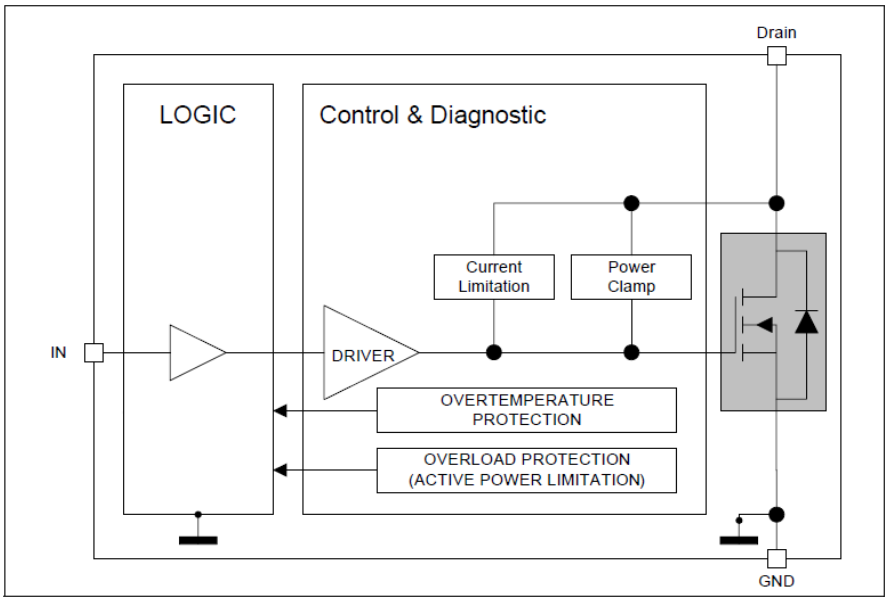
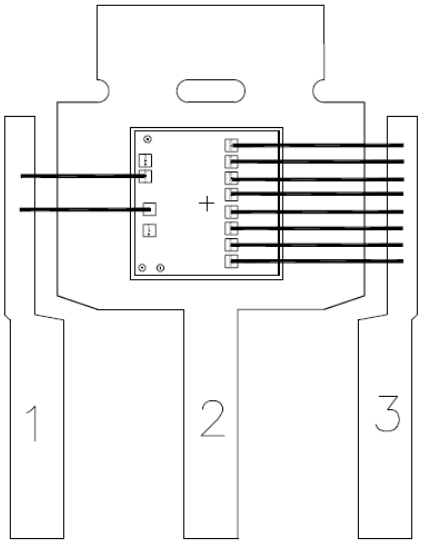
3.3 Blocks diagram



3.4 Bonding diagram



- 4. VNL5090N3-E - Devices characteristics

4.1 Generalities

VNL5090N3-E
VNL5090S5-E

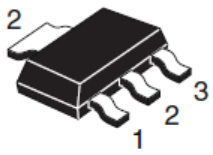
OMNIFET III
fully protected low-side driver

Target specification

Features

Type	V_{clamp}	$R_{DS(on)}$	I_D
VNL5090N3-E	41 V	90 mΩ	13 A
VNL5090S5-E			

- Drain current: 13 A
- ESD protection
- Overvoltage clamp
- Thermal shutdown
- Current and power limitation
- Very low standby current
- Very low electromagnetic susceptibility
- In compliance with the 2002/95/EC european directive
- Open drain status output(a)



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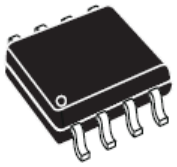

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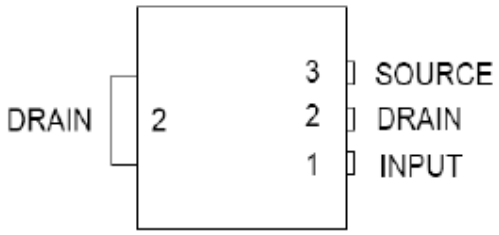
Description

The VNL5090N3-E and VNL5090S5-E are monolithic devices made using STMicroelectronics VIPower Technology, intended for driving resistive or inductive loads with one side connected to the battery. Built-in thermal shutdown protects the chip from overtemperature and short-circuit. Output current limitation protects the devices in an overload condition. In case of long duration overload, the device limits 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. Fast demagnetization of inductive loads is achieved at turn-off.

4.2 Pins connection



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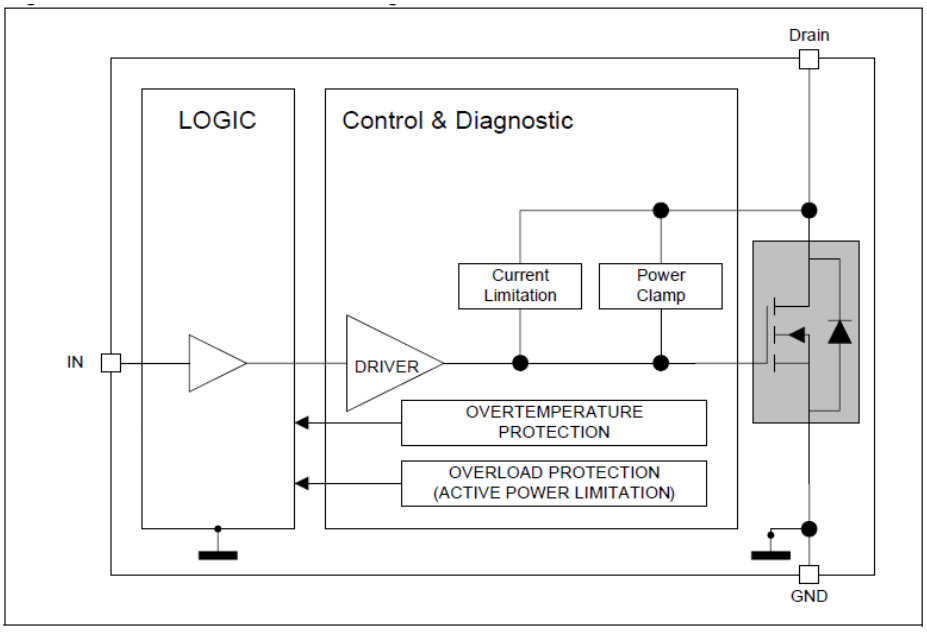
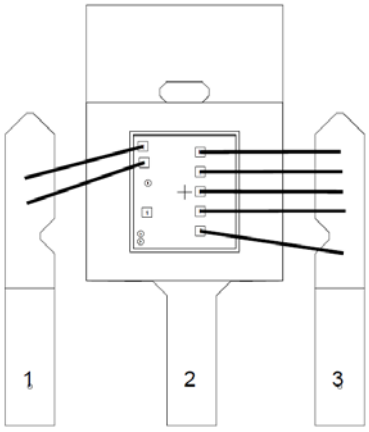
4.3 Blocks diagram



4.4 Bonding diagram



- 5. VNL5160N3-E - Devices characteristics

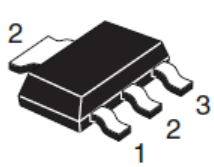
5.1 Generalities

VNL5160N3-E
VNL5160S5-E

OMNIFET III
fully protected low-side driver

Features

Type	V_{clamp}	$R_{DS(on)}$	I_D
VNL5160N3-E	41 V	160 mΩ	3.5 A
VNL5160S5-E			



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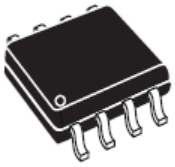
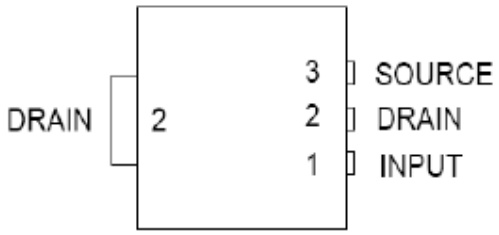

SO-8

- Drain current:3.5A
- ESD protection
- Overvoltage clamp
- Thermal shutdown
- Current and power limitation
- Very low standby current
- Very low electromagnetic susceptibility
- In compliance with the 2002/95/EC European directive
- Open drain status output(a)
- Specially intended for R10W or 2x R5W automotive signal lamps

Description

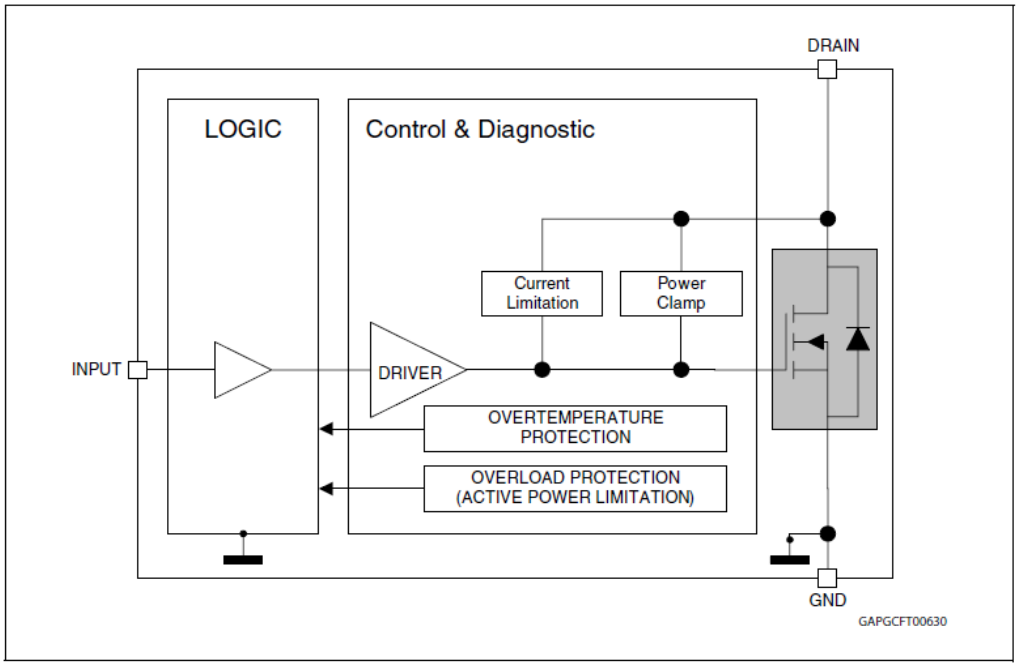
The VNL5160N3-E and VNL5160S5-E are monolithic devices, made using STMicroelectronics® VIPower® Technology, intended for driving resistive or inductive loads with one side connected to the battery. Built-in thermal shutdown protects the chip from overtemperature and short circuit. Output current limitation protects the devices in an overload condition. In the case of a long duration overload, the device limits 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. Fast demagnetization of inductive loads is achieved at turn-off.

5.2 Pins connection

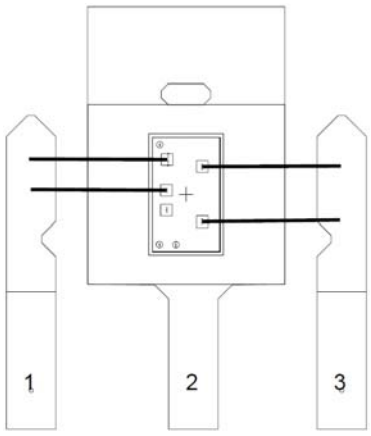


SOT-223

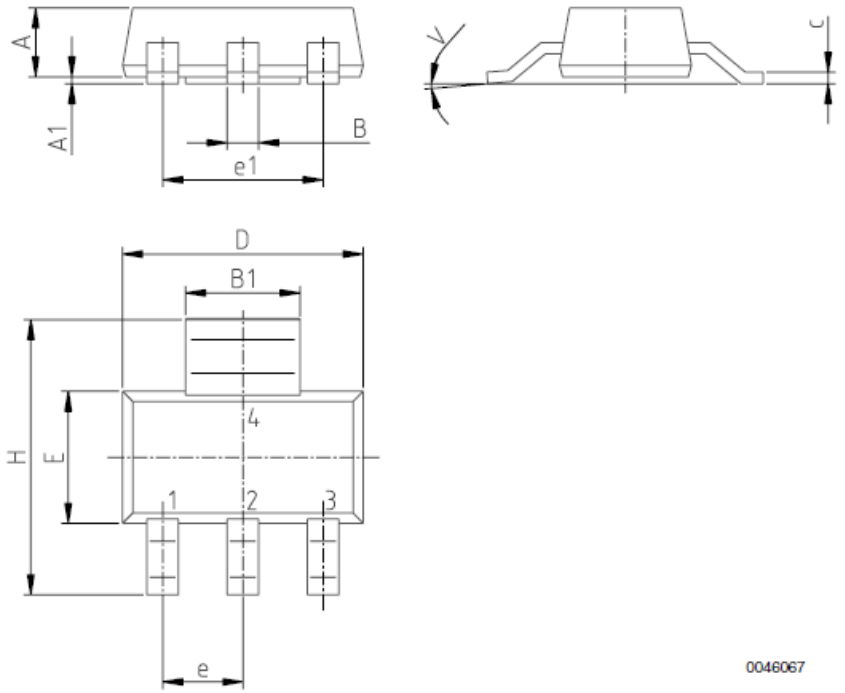
5.3 Blocks diagram



5.4 Bonding diagram



- 6. Package outline/Mechanical data



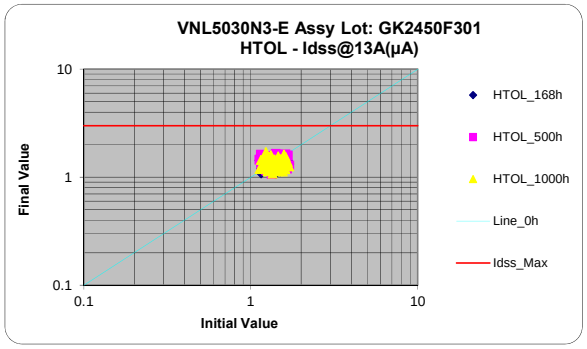
Dim.	mm.			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.8			0.071
B	0.6	0.7	0.85	0.024	0.027	0.033
B1	2.9	3	3.15	0.114	0.118	0.124
c	0.24	0.26	0.35	0.009	0.01	0.014
D	6.3	6.5	6.7	0.248	0.256	0.264
e		2.3			0.09	
e1		4.6			0.181	
E	3.3	3.5	3.7	0.13	0.138	0.146
H	6.7	7	7.3	0.264	0.276	0.287
V	10° (max)					
A1	0.02		0.1	0.0008		0.004

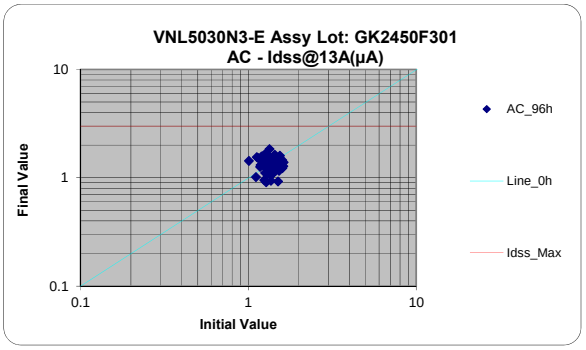
- 7. Reliability qualification plan and results

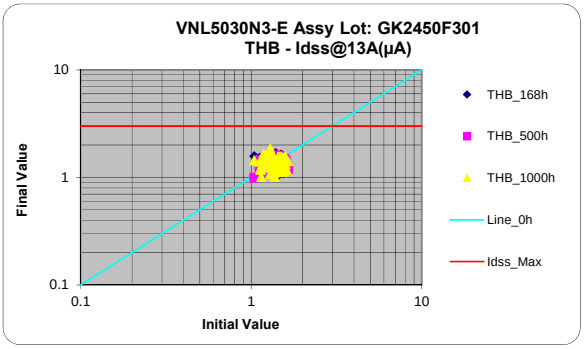
AEC #	Test Name	STM Test Conditions	Sample Size/ Lots	Results Fails/SS/Lots	Comments
A1	**PC** Pre Cond	- Preconditioning according to Jedec JESD22-A113F including 5 Temperature Cycling Ta=-40ºC/+60ºC - Reflow according to level 3 Jedec JSTD020D-1 - 100 Temperature Cycling Ta=-50ºC/+150ºC	Before THB, AC, TC, PTC, HTOL. Reliability executed on units soldered on PCB		
A2	**THB** Temp Humidity Bias	Ta=85ºC, RH=85%, Vcc=24V for 1000 hours	77/3	0/77/3	
A3	**AC** Autoclave	**ES** Environmental Sequence: **TC** (Ta=-65ºC / +150ºC for 100 cycles) + **AC** (Ta=121ºC, Pa=2atm for 96 hours)	77/3	0/77/3	
A4	**TC** Temp. Cycling	Ta=-65ºC / +150ºC for 500 cycles	77/3	0/77/3	
A5	**PTC** Power Temp. Cycling	Per JA105. Ta=-40ºC / +125ºC for 1000 cycles with Inrush, real load 6xR5W lamps	45/1	0/45/1	Only on VNL5050N3
A6	**HTSL** High Temp. Storage Life	Ta=150ºC for 1000 hours.	45/3	0/45/3	
B1	**HTOL** High Temp. Op. Life	Ta=125ºC, Vcc=32V for 1000 hours	77/3	0/77/3	Only on VNL5050N3
B2	**ELFR** Early Life Failure Rate	Parts submitted to **HTOL** per JESD22-A108 requirements; GRADE 1: 24 hours at 150ºC	800/3	Passed	Technology family generic data
C1	**WBS** Wire Bond Shear	Per AEC-Q100-001. See Appendix 3 procedure. 0 and Ppk >= 1.66 or Cpk >= 1.33	30 bonds from minimum 5 of units	Passed	
C2	**WBP** Wire Bond Pull	Per MIL-STD883, M2011 Condition C or D. 0 and Ppk >= 1.66 or Cpk >= 1.33	30 bonds from minimum 5 of units	Passed	
C3	**SD** Solderability		15/1	Passed	
C4	**PD** Physical Dimensions		10/3	Passed	
E8	**GL** Gate Leakage		6/1	Passed	

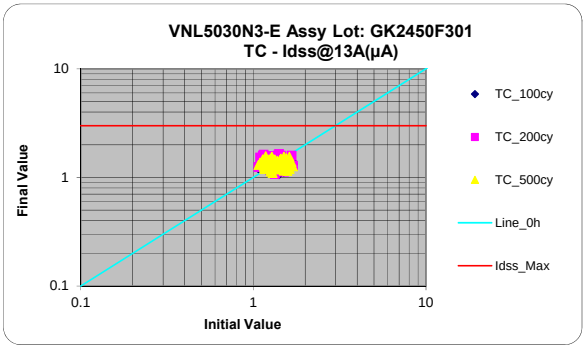
- 8. Electrical drift analysis

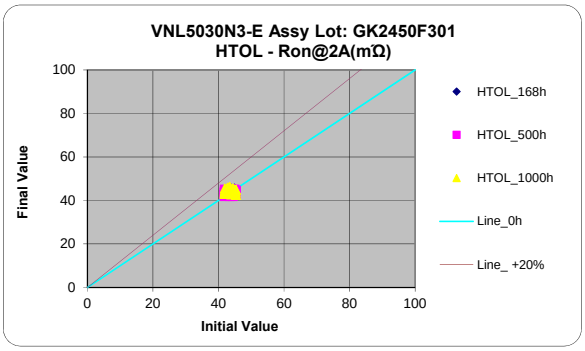
➢ Assy Lot: GK2450F301

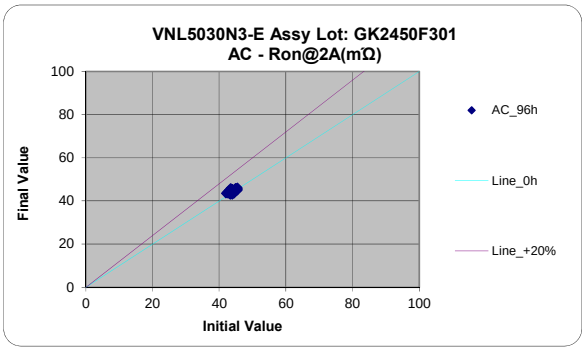


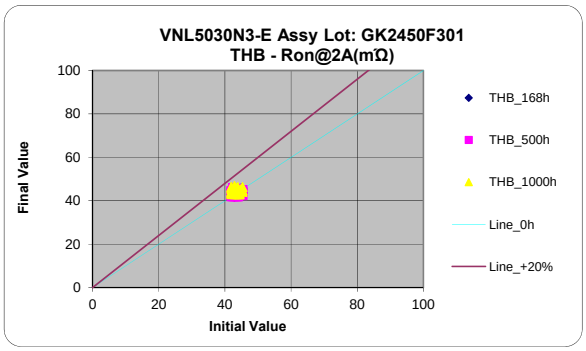


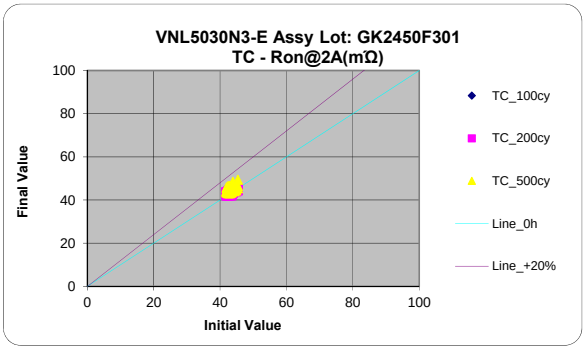


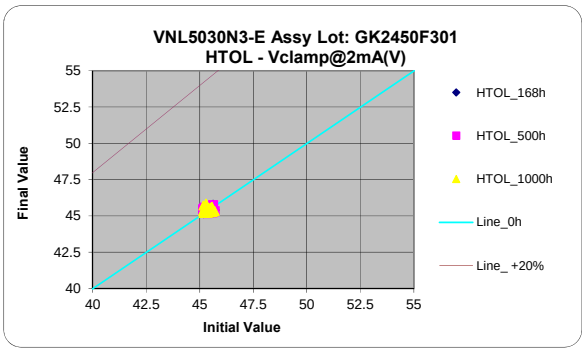


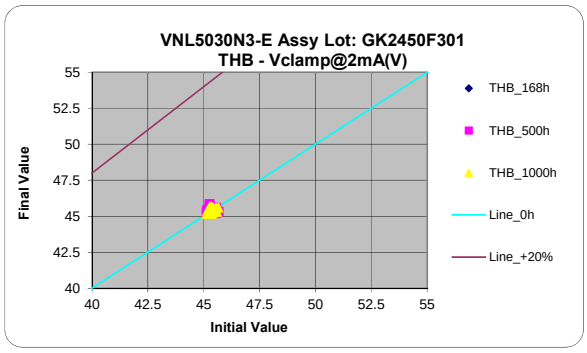


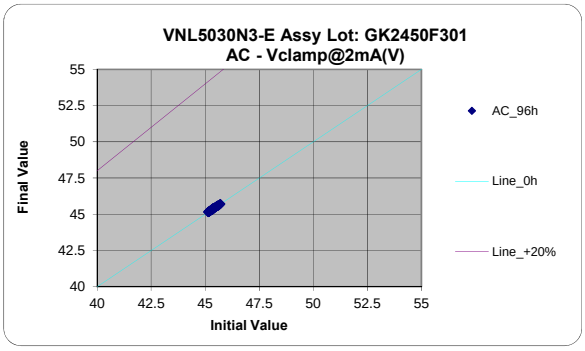


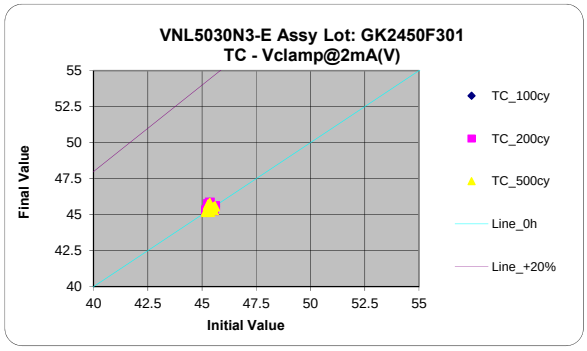




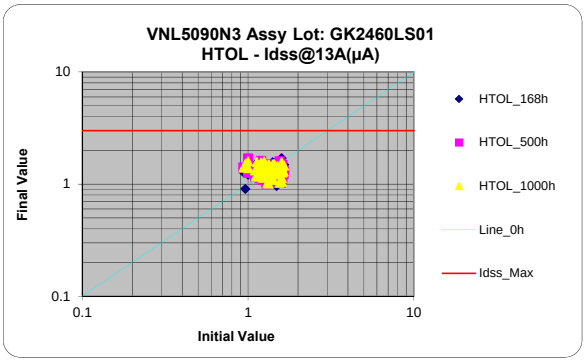


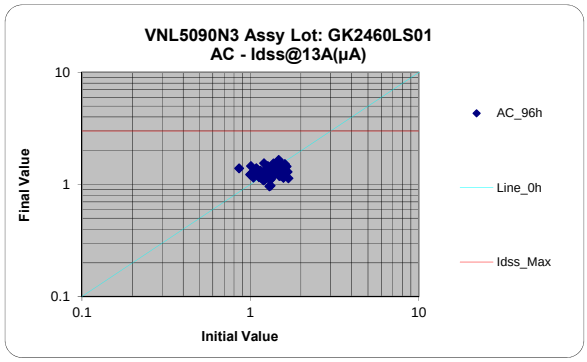


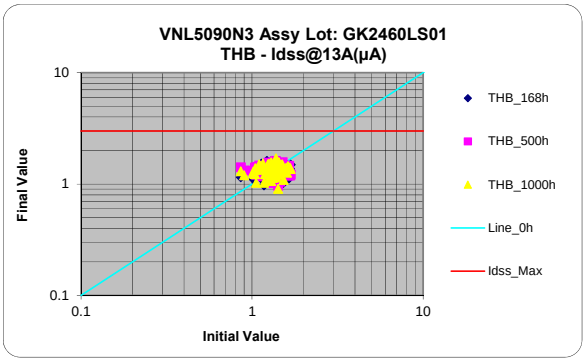


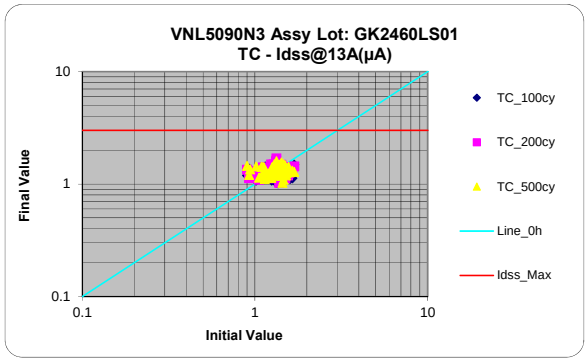


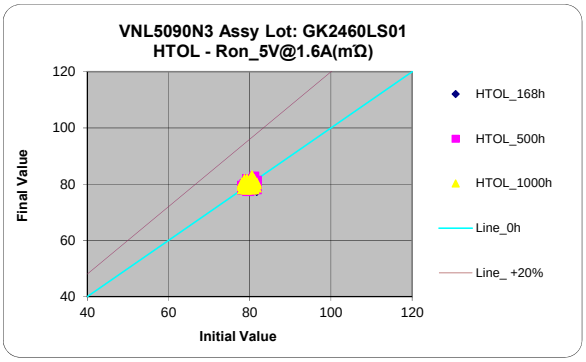
➢ Assy Lot: GK2450F301

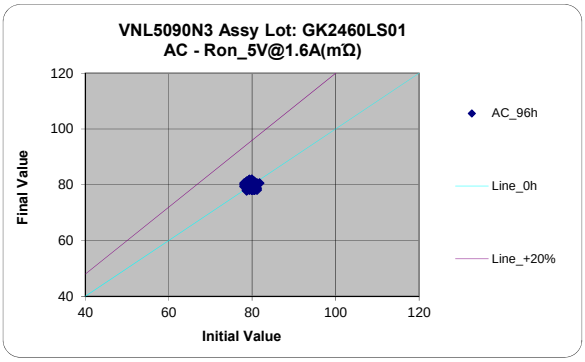


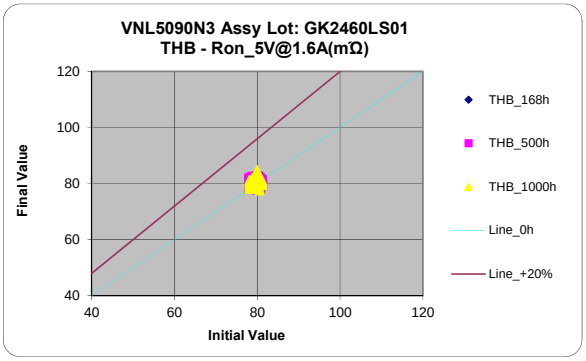


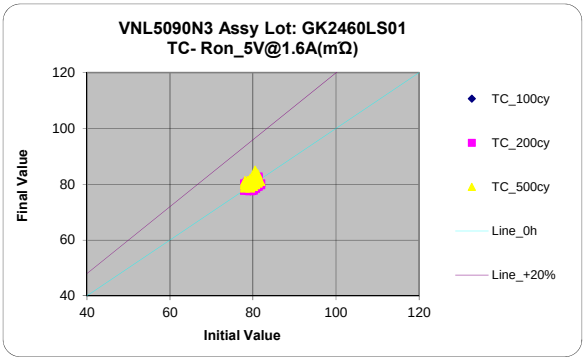


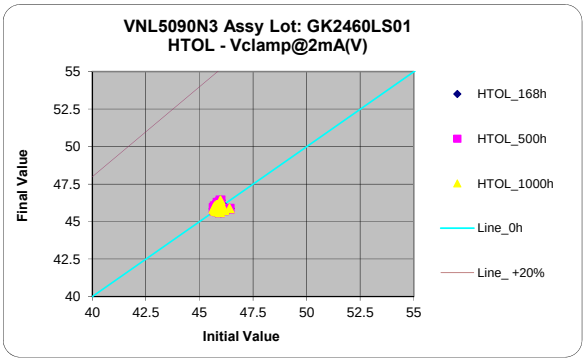


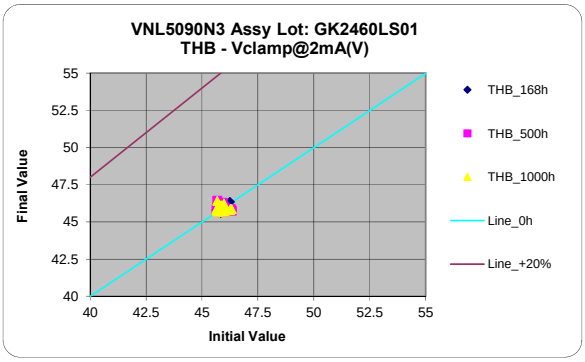

VNL5090N3 Assy Lot: GK2460LS01
HTOL - Ron_5V@1.6A(mΩ)
Final Value
Initial Value
HTOL_168h
HTOL_500h
HTOL_1000h
Line_0h
Line_ +20%

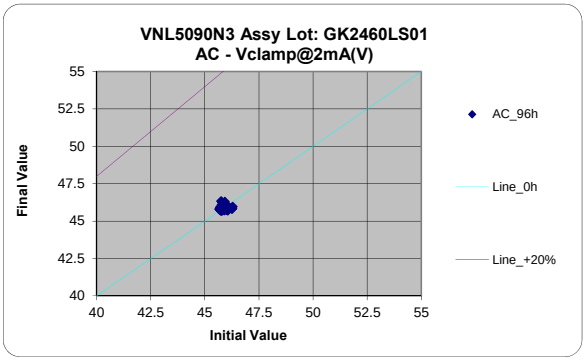

VNL5090N3 Assy Lot: GK2460LS01
AC - Ron_5V@1.6A(mΩ)
Final Value
Initial Value
AC_96h
Line_0h
Line_+20%

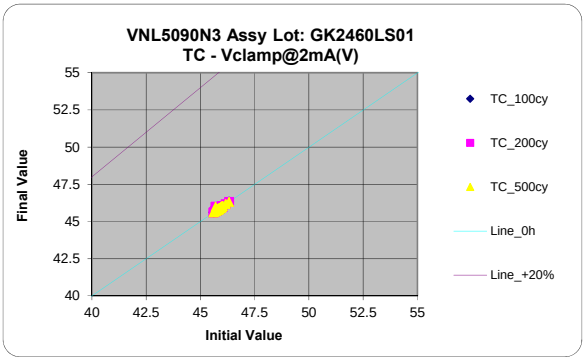

VNL5090N3 Assy Lot: GK2460LS01
THB - Ron_5V@1.6A(mΩ)
Final Value
Initial Value
THB_168h
THB_500h
THB_1000h
Line_0h
Line_+20%


VNL5090N3 Assy Lot: GK2460LS01
TC- Ron_5V@1.6A(mΩ)
Final Value
Initial Value
TC_100cy
TC_200cy
TC_500cy
Line_0h
Line_+20%

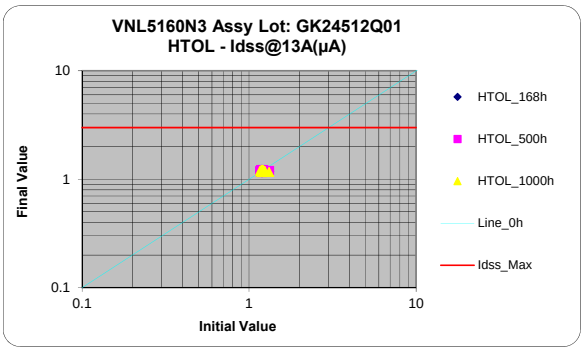

VNL5090N3 Assy Lot: GK2460LS01
HTOL - Vclamp@2mA(V)
Final Value
Initial Value
HTOL_168h
HTOL_500h
HTOL_1000h
Line_0h
Line_ +20%

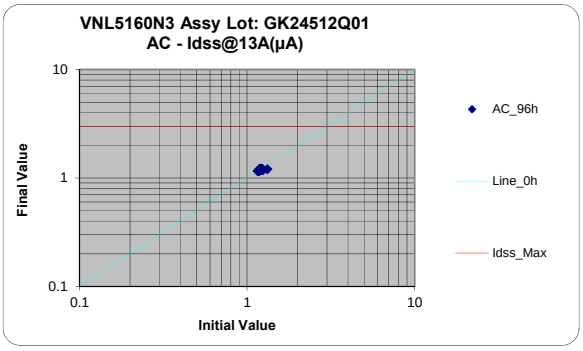

VNL5090N3 Assy Lot: GK2460LS01
THB - Vclamp@2mA(V)
Final Value
Initial Value
THB_168h
THB_500h
THB_1000h
Line_0h
Line_+20%

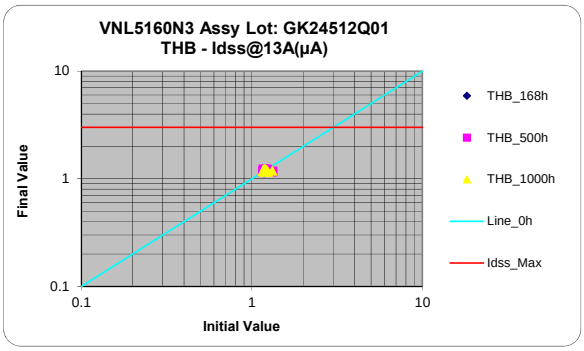

VNL5090N3 Assy Lot: GK2460LS01
AC - Vclamp@2mA(V)
Final Value
Initial Value
AC_96h
Line_0h
Line_+20%

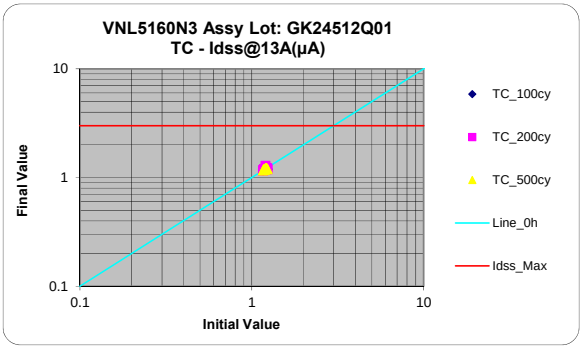

VNL5090N3 Assy Lot: GK2460LS01
TC - Vclamp@2mA(V)
Final Value
Initial Value
TC_100cy
TC_200cy
TC_500cy
Line_0h
Line_+20%

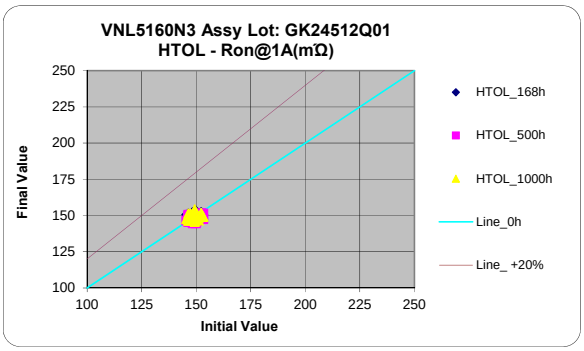
➢ Assy Lot: GK24512Q01

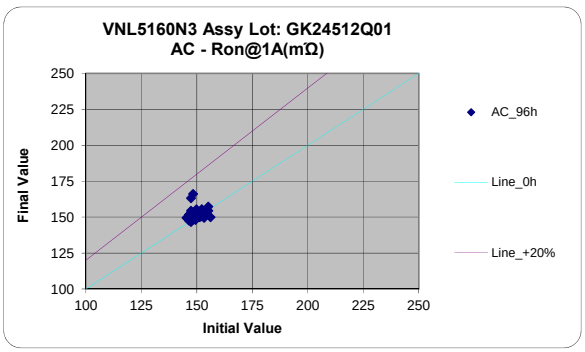


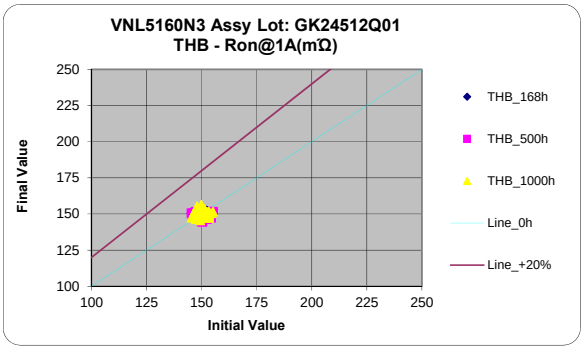


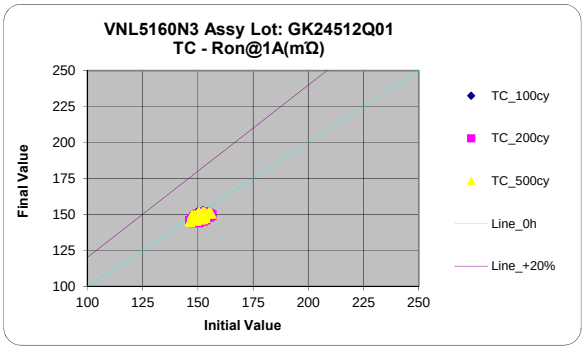


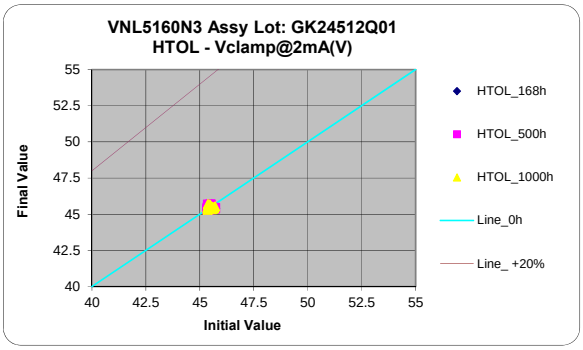


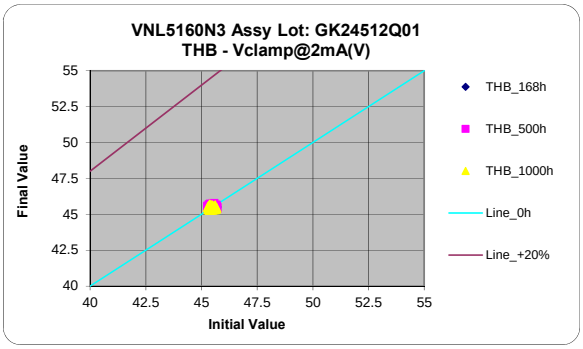


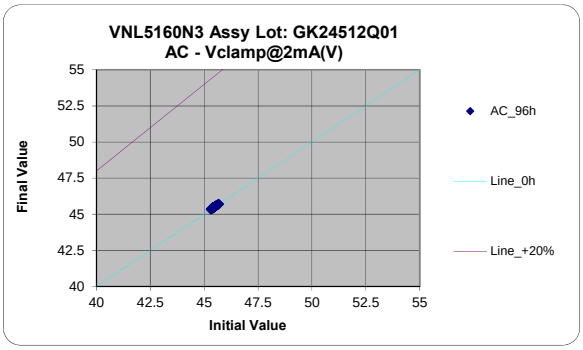


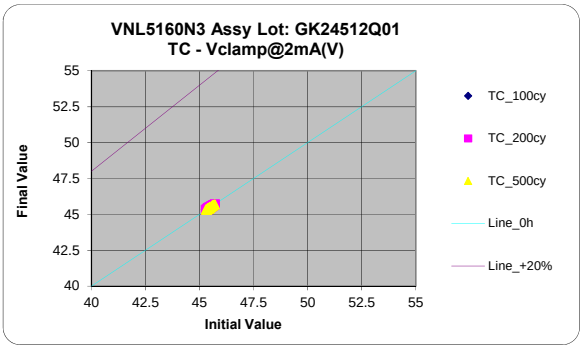





VNL5160N3 Assy Lot: GK24512Q01
HTOL - Vclamp@2mA(V)
Final Value
Initial Value
55
52.5
50
47.5
45
42.5
40
HTOL_168h
HTOL_500h
HTOL_1000h
Line_0h
Line_ +20%


VNL5160N3 Assy Lot: GK24512Q01
THB - Vclamp@2mA(V)
Final Value
Initial Value
55
52.5
50
47.5
45
42.5
40
THB_168h
THB_500h
THB_1000h
Line_0h
Line_+20%


VNL5160N3 Assy Lot: GK24512Q01
AC - Vclamp@2mA(V)
Final Value
Initial Value
55
52.5
50
47.5
45
42.5
40
AC_96h
Line_0h
Line_+20%


VNL5160N3 Assy Lot: GK24512Q01
TC - Vclamp@2mA(V)
Final Value
Initial Value
55
52.5
50
47.5
45
42.5
40
TC_100cy
TC_200cy
TC_500cy
Line_0h
Line_+20%

Public Products List

PCN Title : VIPower M05 in SOT-223: Transfer from Carsem to Fujitsu Assembly Plant
PCN Reference : APG-ABD/13/7951
PCN Created on : 11-JUL-2013

Subject : Public Products List

Dear Customer,

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

ST COMMERCIAL PRODUCT

VNL5050N3TR-E	VNL5090N3TR-E	VNL5160N3TR-E

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