PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data	
1.1 Company	STMicroelectronics International N.V
1.2 PCN No.	ADG/21/12666
1.3 Title of PCN	VIPower M05 in PSSO-12 and PSSO-16: Conversion to Copper Wire and Mold Compound Change (Bouskoura Plant)
1.4 Product Category	see list
1.5 Issue date	2021-03-17

2. PCN Team	
2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
2.1.2 Phone	+1 8475853058
2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Nicola LIPORACE,Mario ASTUTI
2.1.2 Marketing Manager	Carmelo PISTRITTO
2.1.3 Quality Manager	Vincenzo MILITANO

3. Change		
3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	New direct material part number (same supplier, different supplier or new supplier), Bond wire material, diameter	ST Bouskoura (Morocco)

4. Description of change		
	Old	New
4.1 Description	Au1.3 mils Resin Sumitomo EME7026	Cu 1.2 mils Resin Sumitomo EMEG700LS
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No Impact	

5. Reason / motivation for change	
5.1 Motivation	Quality improvement
5.2 Customer Benefit	QUALITY IMPROVEMENT

6. Marking of parts / traceability of change	
6.1 Description	Dedicated Finished Good Codes

7. Timing / schedule	
7.1 Date of qualification results	2021-03-04
7.2 Intended start of delivery	2021-06-30
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	12666 Validation.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2021-03-17

9. Attachments (additional documentations)

12666 Public product.pdf
12666 Validation.pdf
12666 Details.pdf

10. Affected parts		
10. 1 Current		10.2 New (if applicable)
10.1.1 Customer Part No	10.1.2 Supplier Part No	10.1.2 Supplier Part No
	VN5016AJ-E	
	VN5016AJTR-E	
	VN5025AJ-E	
	VN5025AJTR-E	
	VN5E025AJTR-E	
	VN5E025MJTR-E	
	VND5050AJ-E	
	VND5050AJTR-E	
	VND5050J-E	
	VND5050JTR-E	
	VND5160JTR-E	
	VND5E050ACJTR-E	
	VND5T100AJTR-E	
	VND5T100LAJTR-E	
	VNL5030JTR-E	
	VNQ5E250AJ-E	
	VNQ5E250AJTR-E	
	VND5E050JTR-E	

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PRODUCT/PROCESS CHANGE NOTIFICATION

TITLE	VIPower M05 in PSSO-12 and PSSO-16: Conversion to Copper Wire and Mold Compound Change (Bouskoura Plant)
IMPACTED PRODUCTS	See list
MANUFACTURING STEP	Assembly
INVOLVED PLANT	ST Bouskoura (Morocco)
CHANGE REASON	Quality Improvement - Product Optimization
CHANGE DESCRIPTION	On VIPower products housed in PowerSSO-12 and PowerSSO-16 the following changes will be implemented: - Cu 1.2 mils bonding wire replacing current Au 1.3 mils bonding wire - Molding Compound SUMITOMO EME-G700LS replacing current SUMITOMO EME70260F See below attached details
TRACEABILITY	New dedicated Finished Good Code (Internal Part Number)
VALIDATION	According to AEC-Q100 qualification plan for Integrated Circuits and ZVEI Guidelines: SEM-PA-08 Change of wire bonding SEM-PA-11 Change of Mold Compound
REPORTS	Qualification included to this communication 12666 Validation.pdf

VIPower® in M0-5 Technology in PSSO12 and PSSO16 packages in Bouskoura plant: conversion from 1.3 mils Au to 1.2 mils Cu wire and mold compound change.

Agenda

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Change description

- Aim of this document is to describe the qualification activity performed to convert the 1.3mils gold wire to 1.2mils copper wire and to qualify the new mold compound halogen free for the VIPower® products in M0-5 Technology.
- The PSSO12 and PSSO16 packages are assembled in Bouskoura plant.
- Detailed qualification activity has been performed in order to qualify the 1.2mils copper wire and the halogen free mold compound.
- This report shows the positive results achieved. The new materials are ensuring the same quality and electrical characteristics as the current products assembled in PSSO12 and PSSO16.
- All reliability tests (2XAEC-Q100 requirement) have been completed with positive results.

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Bill Of Material Comparison (PSSO12 package)

Actual Bill of Material	
ITEM	**MATERIAL**
WIRE	1.3 MILS Au
WIRE	2.5 MILS Cu
FRAME	FRAME PSSO 12L Dual gauge
DIE ATTACH	PREFORM Pb/Ag/Sn 95.5/2.5/2
MOLD COMPOUND	RESIN SUMITOMO EME7026

New Bill of Material	
ITEM	**MATERIAL**
WIRE	1.2 MILS Cu
WIRE	2.5 MILS Cu
FRAME	FRAME PSSO 12L Dual gauge
DIE ATTACH	PREFORM Pb/Ag/Sn 95.5/2.5/2
MOLD COMPOUND	RESIN SUMITOMO EME-G700LS

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Bill Of Material Comparison (PSSO16 package)

Actual Bill of Material	
ITEM	**MATERIAL**
WIRE	1.3 MILS Au
WIRE	2.5 MILS Cu
FRAME	FRAME PSSO 16L Dual gauge
DIE ATTACH	PREFORM Pb/Ag/Sn 95.5/2.5/2
MOLD COMPOUND	RESIN SUMITOMO EME7026

New Bill of Material	
ITEM	**MATERIAL**
WIRE	1.2 MILS Cu
WIRE	2.5 MILS Cu
FRAME	FRAME PSSO 16L Dual gauge
DIE ATTACH	PREFORM Pb/Ag/Sn 95.5/2.5/2
MOLD COMPOUND	RESIN SUMITOMO EME-G700LS

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ZVEI Guidelines

- According to ZVEI recommendations, the notification is required.

		Assessment of impact on Supply Chain regarding following aspects - contractual agreements - technical interface of processability/manufacturability of customer - form, fit, function, quality performance, reliability	Remaining risks within Supply Chain?		Understanding of semiconductors experts	Examples to explain
	ID	Type of change	No	Yes		
		ANY				
		DATA SHEET				
		DESIGN				
		PROCESS - WAFER PRODUCTION				
		BARE DIE				
		PROCESS - ASSEMBLY				
x	SEM-PA-08	Change of wire bonding	P	P	Material, diameter, change in bonding diagram and / or change in process resulting in a new technology.	e.g. change from Au to Cu material e.g. change from 25µm to 23µm diameter e.g. change from single to double bond e.g. change from stich bond to stich on ball bond.
x	SEM-PA-11	Change of mold compound / encapsulation material	P	P	Change of mold compound / encapsulation material.	e.g. change to green mold compound e.g. change of filler particles

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Selected Test Vehicles

- VIPower® M0-5 Technology:
  - POWERSSO-12 : VND5T100LAJTR-E (Silicon Line VNZ203)
  - POWERSSO-12 : VN5016AJTR-E (Silicon Line VNC903)
  - POWERSSO-16 : VNQ5E250AJTR-E (Silicon Line VNR903)

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Conclusions

- Detailed qualification activity has been performed in order to qualify the 1.2 mils copper wire and the halogen free mold compound.
- All reliability tests (2x AEC-Q100 requirement) have been completed with positive results.
- Neither functional nor parametric rejects were detected at final electrical test.
- This report shows the positive results achieved. The new materials are ensuring the same quality and electrical characteristics as the current products assembled in PSSO12 and PSSO16 packages.

Public Products List

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

PCN Title : VIPower M05 in PSSO-12 and PSSO-16: Conversion to Copper Wire and Mold Compound Change (Bouskoura Plant)
PCN Reference : ADG/21/12666

Subject : Public Products List

Dear Customer,

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

VND5T100LAJTR-E	VN5E025AJ-E	VN5016AJ-E
VN5016AJTR-E	VNQ5E250AJTR-E	VN5E025AJTR-E
VND5T100AJTR-E	VND5050AJ-E	VN5025AJ-E
VND5050AJTR-E	VN5E025MJTR-E	VNQ5E250AJ-E
VN5025AJTR-E	VND5T100AJ-E	VND5160JTR-E
VNL5030JTR-E	VND5E050ACJTR-E	VND5E050MCJTR-E
VND5050JTR-E	VNL5030J-E	VND5T100LAJ-E
VND5050J-E	VND5E050J-E	VND5E050JTR-E
VN5E025MJ-E		

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Reliability Evaluation Report
Copper 1.2mils wires qualification
Package PSSO12/16 Dual gauge - ST Bouskoura
VIPower M05 Technology

General Information	
Commercial Products:	VN5016AJ-E, VNQ5E250AJ-E, VND5T100LAJ-E
Product Lines:	VNC9, VNR9, VNZ2
Packages:	PwSSO12 DG, PwSSO16 DG
Silicon Technology :	VIPOWER M05

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

Revision history

Rev.	Changes description	Author	Date
1.0	Initial Release	A. Vilardo	24/02/2021

Approved by

Function	Location	Name	Date
Division Reliability Manager	ST Catania (Italy)	A. Marmoni	24/02/2021

TABLE OF CONTENTS

1 RELIABILITY EVALUATION OVERVIEW

1.1 Objective

Aim of this report is to present the results of the reliability evaluation performed on **VN5016AJ-E** (VNC9 as ST silicon line) **VNQ5E250AJ-E** (VNR9 as ST silicon line) and **VND5T100LAJ-E** ((VNR9 as ST silicon line), chosen as test vehicles to qualify the Copper 1.2mils instead of Gold 1.3mils wires for the signal stage of the VIPower products designed in M05 Technology, assembled in package PwSSO12 and PwSSO16 Dual Gauge frame in ST Bouskoura (Morocco) assembly plant.

These devices are monolithic high side driver devices intended for driving resistive or inductive loads for automotive application diffused in ST SG6 Ang Mo Kio (Singapore) 6" Wafer Fab.

1.2 Reliability Strategy and Test Plan

1.2.1 Reliability strategy

Reliability trials performed as part of this reliability evaluation are in agree with ST 0061692 and **AEC-Q100 rev. H Grade 1** specification and are listed in below Test Plan. For details on test conditions, generic data used and specifications references refer to test results summary in section 3.

The reliability evaluation was based on lots assembled in the nominal (NN), higher (HH), lower (LL) Bonding Force and US Power process window.

An extended reliability (2x AEC-Q100 requirement) trough selected stress test with relevant Construction Analysis was performed also covering **AEC-Q006** requirement.

1.2.2 Test Plan

AEC-Q100 TEST PLAN

TEST GROUP	TEST NAME	DESCRIPTION / COMMENTS	TEST FLAG
A Accelerated Environment Stress Tests	PC (JL3)	Preconditioning (JL3+3 reflows simulation)	Yes
	THB	Temperature Humidity Bias	Yes
	AC	Autoclave at 2atm	Yes
	TC	Temperature Cycling	Yes
	PTC	Power Temperature Cycling	Yes
	HTSL	High Temperature Storage Life	Yes
B Accelerated Lifetime Simulation Tests	HTOL	High Temperature Operating Life	Yes
	ELFR	Early Life Failure Rate	Not Applicable
	EDR	Endurance Data Retention	Not Applicable
C Package Assembly Integrity Tests	WBS	Wire Bond Shear	Yes
	WBP	Wire Bond Pull	Yes
	SD	Solderability	Not Applicable
	PD	Physical Dimension	Not Applicable
	SBS	Solder Ball Shear	Not Applicable
	LI	Lead Integrity	Not Applicable
D Die Fabrication Reliability Tests	Test list is reported in section 5	Performed during process qualification	Not Applicable
E Electrical Verification Tests	ESD (HBM)	Electrostatic Discharge (Human Body Model)	Not Applicable
	ESD (CDM)	Electrostatic Discharge (Charged Device Model)	Not Applicable
	LU	Latch Up	Not Applicable
	ED	Electrical distribution	Yes
	FG	Fault grading	Not Applicable
	CHAR	Characterization	Not Applicable
	EMC	Electromagnetic Compatibility	Not Applicable
	SC	Short Circuit Characterization	No
	SER	Soft Error Rate	Not Applicable
	LF	Lead(Pb) Free: (see AEC-Q005)	Not Applicable
F Defect Screening Tests	Test list is reported in section 5	To be implemented starting from first production lot	No
G Cavity Package Integrity Tests	Test list is reported in section 5	N/A: not for plastic packaged devices	Not Applicable

AEC-Q100 TEST PLAN – Robustness

TEST GROUP	TEST	DESCRIPTION / COMMENTS	TEST FLAG
A Accelerated Environment Stress Tests	THB	Temperature Humidity Bias	Yes
	TC	Temperature Cycling	Yes
	PTC	Power Temperature Cycling	Yes
	HTSL	High Temperature Storage Life	Yes

In the below table a comparison between the **AEC-Q100** and **ZVEI** requirements vs the applied ST qualification plan is reported:

	Test Group A					Test Group B		Test Group C				Test Group D					Test Group E					
	THB	AC	TC	PTC	HTSL	HTOL	ELFR	WBS	WBP	SD	PD	EM	TDDB	HCI	NBTI	SM	HBM	CDM	LU	ED	EMC	SC
AEC-Q100	x	x	x	x	x	x		x	x											x		x
ZVEI	x	x	x	x	x	x		x	x											x		x
ST	x	x	x	x	x	x		x	x											x		

Short Circuit (SC) characterization not performed because mainly related to failure mechanism linked to thick wires on power stage while this qualification is addressed to qualify thin wires on signal stage.

1.3 Conclusion

Reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.

The extended reliability (2x AEC-Q100 requirement) trough selected stress test has been completed with positive results, neither functional nor parametric rejects were detected at final electrical testing

SAM analysis performed after the package-oriented stress test, pointed out no delamination at the Die/Molding Compound, Die-Pad/Molding Compound and Die Attach Material interfaces.

Wire Bond Pull/Shear tests (WBP, WBS) as Package Assembly Integrity (test Group C) performed before and after the package-oriented stress test avoid abnormal break loads or forbidden failure modes.

Based on the overall results obtained, the Copper 1.2mils wires usage on signal stage of the VIPower products designed in M05 Technology, assembled in package PSSO12 and PPSSO16 Dual gauge frame in ST Bouskoura (Morocco) assembly plant, has positively passed reliability evaluation performed in agreement to **AEC_Q100 Rev.H specification Grade 1**.

2 Product Characteristics

2.1 Generalities

VN5016AJ-E

Single channel high side driver with analog current sense for automotive applications

Features

Max supply voltage	V_{CC}	41V
Operating voltage range	V_{CC}	4.5 to 36V
Max On-State resistance (per ch.)	R_{ON}	16 mΩ
Current limitation (typ)	I_{LIMH}	65A
Off state supply current	I_S	2 µA

- Main features
  - Inrush current active management by power limitation
  - Very low stand-by current
  - 3.0V 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
  - High current sense precision for wide range currents
  - Current sense disable
  - Thermal shutdown indication
  - Very low current sense leakage
- Protection
  - Undervoltage shut-down
  - Overvoltage clamp
  - Load current limitation
  - Self limiting of fast thermal transients
  - Protection against loss of ground and loss of V_{CC}
  - Thermal shut down
  - Reverse battery protection
  - Electrostatic discharge protection

PowerSSO-12

Application

- All types of resistive, inductive and capacitive loads

Description

The VN5016AJ-E is a monolithic device made using STMicroelectronics VIPower M0-5 technology. It is intended for driving resistive or inductive loads with one side connected to ground. Active V_{CC} pin voltage clamp protects the device against low energy spikes (see ISO7637 transient compatibility table). This device integrates 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 in a high impedance condition.

Output current limitation protects the device in overload condition. In case of long overload duration, the device limits the dissipated power to safe level up to thermal shut-down intervention. Thermal shut-down with automatic restart allows the device to recover normal operation as soon as fault condition disappears.

VNQ5E250AJ-E

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

Features

Max supply voltage	V_{CC}	41 V
Operating voltage range	V_{CC}	4 to 28 V
Max on-state resistance (per ch.)	R_{ON}	250 mΩ
Current limitation (typ)	I_{LIMH}	5 A
Off-state supply current	I_S	2 µA(1)

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
  - Compliant with European directive 2002/95/EC
  - Very low current sense leakage
- Diagnostic functions
  - Proportional load current sense
  - High current sense precision for wide currents range
  - Current sense disable
  - Off-state open-load 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}

PowerSSO-16

  - Overtemperature shutdown with auto restart (thermal shutdown)
  - Reverse battery protected
  - Electrostatic discharge protection

Applications

- All types of resistive, inductive and capacitive loads
- Suitable as LED driver
- Suitable as relays driver

Description

The VNQ5E250AJ-E is a quad channel high-side driver manufactured using ST proprietary VIPower™ M0-5 technology and housed in PowerSSO-16 package. The device is designed to drive 12 V automotive grounded loads, and to provide protection and diagnostics. It also implements a 3 V and 5 V CMOS compatible interface for the use 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 providing 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-state 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 share the external sense resistor with similar devices.

VND5T100LAJ-E
VND5T100LAS-E

Double channel high-side driver with analog current sense for 24 V automotive applications

Datasheet – production data

PowerSSO-12

SO-16N

Features

Max transient supply voltage	V_{CC}	58 V
Operating voltage range	V_{CC}	8 to 36 V
Typ on-state resistance (per ch.)	R_{ON}	100 mΩ
Current limitation (typ)	I_{LIM}	22 A
Off-state supply current	I_S	2 µA(1)

1. Typical value with all loads connected.

- General
  - Very low standby current
  - 3.0 V CMOS compatible input
  - Optimized electromagnetic emission
  - Very low electromagnetic susceptibility
  - Compliance with European directive 2002/95/EC
  - Fault reset standby pin (FR_Stby)
  - Optimized for LED application
- Diagnostic functions
  - Proportional load current sense
  - High current sense precision for wide range currents
  - Off-state open-load detection
  - Output short to V_{CC} detection
  - Overload and short to ground latch-off
  - Thermal shutdown latch-off
  - Very low current sense leakage
- Protection
  - Undervoltage shutdown
  - Overvoltage clamp
  - Load current limitation
  - Self limiting of fast thermal transients
  - Protection against loss of ground and loss of V_{CC}
  - Thermal shutdown
  - Electrostatic discharge protection

Application

All types of resistive, inductive and capacitive loads

Description

The VND5T100LAJ-E and VND5T100LAS-E are monolithic devices made using STMicroelectronics® VIPower® technology, intended for driving resistive or inductive loads with one side connected to ground. Active V_{CC} pin voltage clamp protects the devices against low energy spikes.

These devices integrate an analog current sense which delivers a current proportional to the load current.

Fault conditions such as overload, overtemperature or short to V_{CC} are reported via the current sense pin.

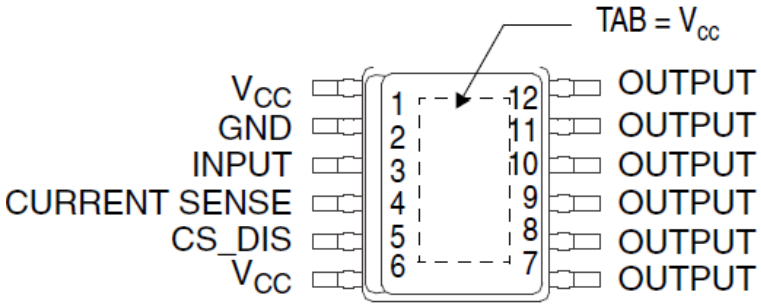
Output current limitation protects the devices in overload condition. The devices latch off in case of overload or thermal shutdown.

The devices are reset by a low level pass on the fault reset standby pin.

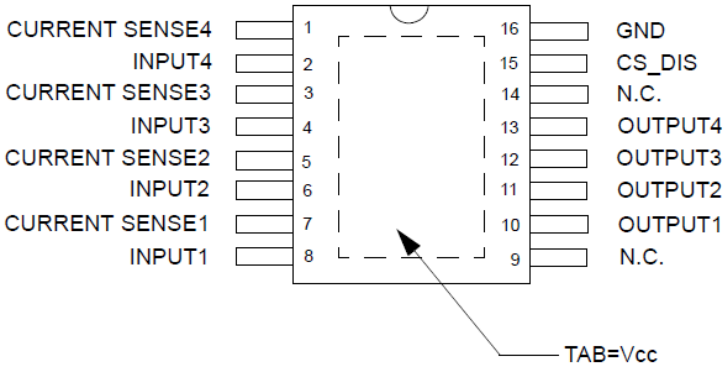
A permanent low level on the inputs and fault reset standby pin disables all outputs and sets the devices in standby mode.

2.2 pin connection

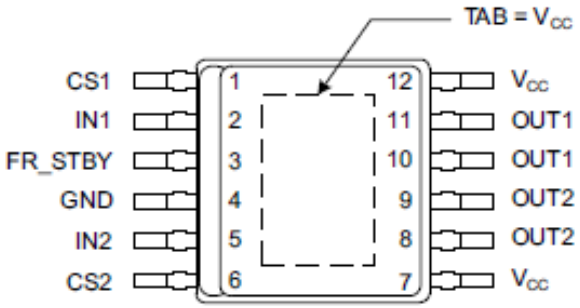
VN5016AJ-E



VNQ5E250AJ-E

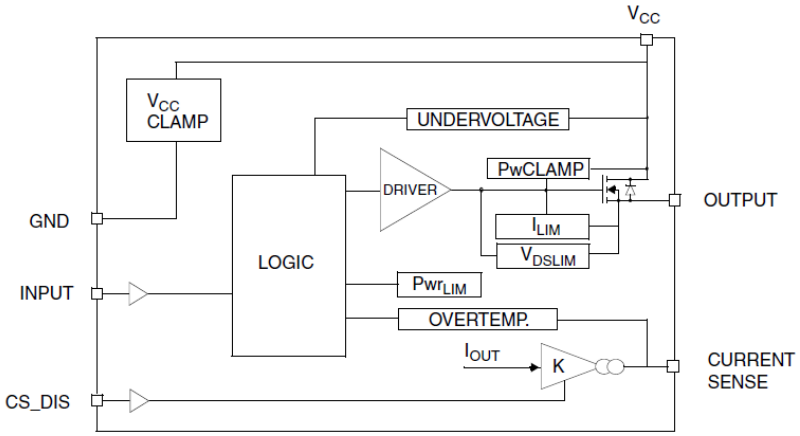


VND5T100LAJ-E

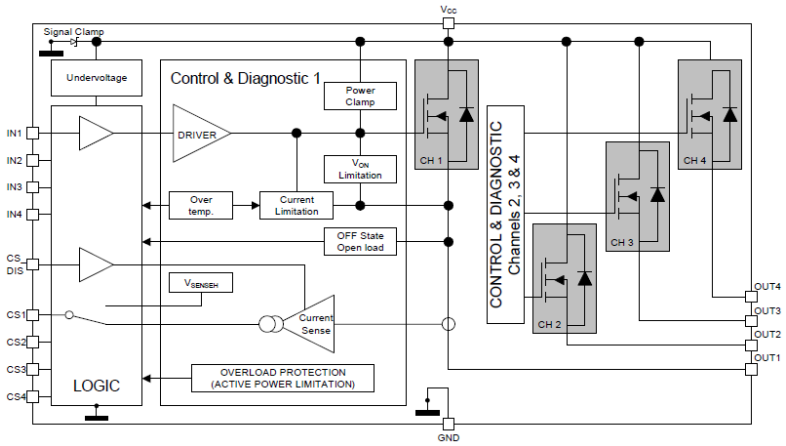


2.3 Block diagram

VN5016AJ-E



VNQ5E250AJ-E



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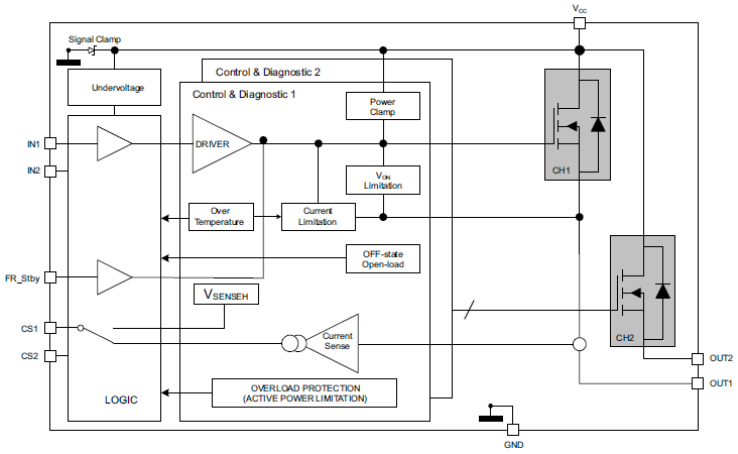
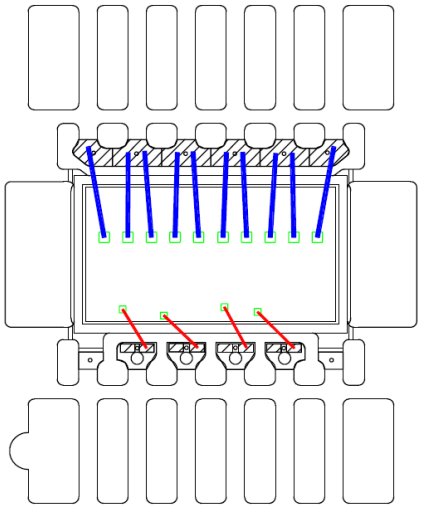
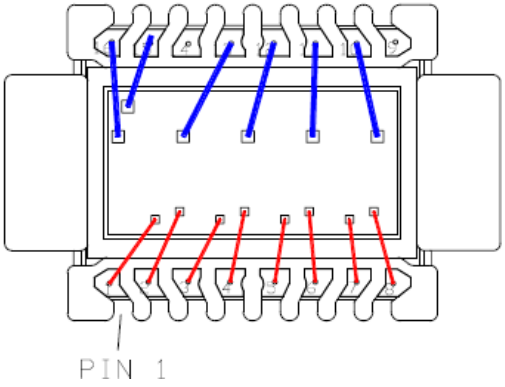


2.4 Bonding diagram

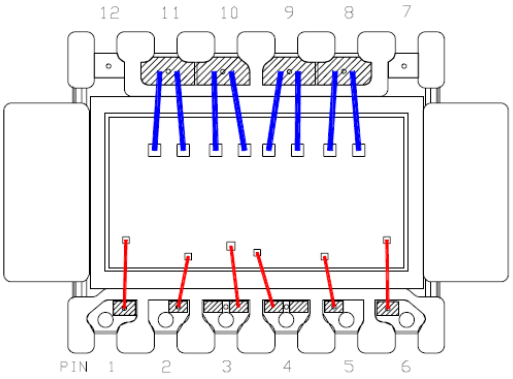
VN5016AJ- E



VNQ5E250AJ-E



VND5T100LAJ-E



2.5 Traceability

2.5.1 Wafer Fab information

Device	VN5016AJ-E	VNQ5E250AJ-E	VND5T100LAJ-E
Wafer fab name / location	ST SINGAPORE (SG6)		
Wafer diameter (inches)	6”		
Silicon process technology	VIPower M0A5		
Die finishing front side	SiN/POLYIMIDE		
Die finishing back side	Ti-Ni-Au		
Die size (micron)	4170 x 2280	4020 x 2040	4040 x 2100
Metal levels/ materials/ thicknesses	2 / last Ti/AlSiCu/ 3.2um	2 / last Ti/TiN/Ti/AlSiCu/ 3.2um	

2.5.2 Assembly information

Device	VN5016AJ-E	VNQ5E250AJ-E	VND5T100LAJ-E
Assembly plant name / location	ST BOUSKOURA (MOROCCO)		
Package description	PwSSO12	PwSSO16	PwSSO12
Lead frame finishing (material/thickness)	FRAME PSSO 12L Dual gauge Mtx Opt A	FRAME PSSO 16L Mtx Dual gauge OptA SpAg	FRAME PSSO 12L Dual gauge Mtx Opt B
Die attach material	PREFORM Pb/Ag/Sn 95.5/2.5/2		
Wire bonding material/diameter	Cu D2.5 mils, Cu D1.2 mils		
Molding compound material	RESIN SUMITOMO EME-G700LS		
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL3		

2.5.3 Reliability Testing information

Reliability laboratory location	ST Catania (ITALY)/ ST Bouskoura (MOROCCO)

3 TESTS RESULTS SUMMARY

3.1 Lot Information

Lot #	Device	Diffusion Lot	Assy Lot	Note
1	VN5016AJ-E	6844EVE	Lot 1/A: CZ90304MRR	Assembly configuration LL
			Lot 1/B: CZ90304MRQ	Assembly configuration NN
			Lot 1/C: CZ90304MRP	Assembly configuration HH
2	VN5016AJ-E	6844EX9	Lot 2/A: CZ90304NRR	Assembly configuration LL
			Lot 2/B: CZ90304NRQ	Assembly configuration NN
			Lot 2/C: CZ90304NRP	Assembly configuration HH
3	VN5016AJ-E	6844EV8	Lot 3/A: CZ9040B9RR	Assembly configuration LL
			Lot 3/B: CZ9040B9RQ	Assembly configuration NN
			Lot 3/C: CZ9040B9RP	Assembly configuration HH
4	VND5T100LAJ-E	69219HN	Lot 4/A: CZ0260FBRR	Assembly configuration LL
			Lot 4/B: CZ0260FBRQ	Assembly configuration NN
			Lot 4/C: CZ0260FBRP	Assembly configuration HH
5	VNQ5E250AJ-E	68408Y7	CZ913050RR	Assembly configuration NN

3.2 Test results summary

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

TEST GROUP A – ACCELERATED ENVIRONMENT STRESS TESTS

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
PC	A1	JESD22-A113 J-STD-020	24h bake@125°C, including 5 Temperature Cycling Ta=-40°C/+60°C ACC MSL3 (52h@60C/60%RH) 3x Reflow simulation Peak Reflow Temp= 260°C 100 Temperature Cycling Ta=-50°C/+150°C	12	-	3741	Passed	Before THB/AC/TC/PTC/HTOL
THB	A2	JESD22 A101 JESD22 A110	Ta=85°C, 85%RH, Duration= 1000hrs	6	77	462	0/77/6	Done on lots1,2,3 HH/LL configuration

AC	A3	JESD22 A102 or JESD22 A118 or JESD22-A101	ENV. SEQ. Environmental Sequence TC (Ta=-65°C / +150°C for 100 cycles) + AC (Ta=121°C, Pa=2atm for 96 hours)	10	77	1001	0/77/13	Done on lots1,2,3,4
TC	A4	JESD22 A104	Ta=-55°C /+150 °C Duration= 1000 cyc	13	77	1001	0/77/13	Done on lots1,2,3,4
PTC	A5	JESD22 A105	Ta=-40°C /+125 °C Duration=1000 cyc	1	45	45	0/45/1	Done on lot 1/A
HTSL	A6	JESD22 A103	Ta= 150°C Duration= 1000hrs	13	45	585	0/45/13	Done on lots1,2,3,4,5

TEST GROUP B – ACCELERATED LIFETIME SIMULATION TESTS

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
HTOL	B1	JESD22 A108	TJ=150°C Duration= 1000hrs Bias dynamic stress (**OLT**)	-	-	-	-	Not applicable
HTOL	B1	JESD22 A108	Ta=150°C Duration= 1000hrs Bias static stress (**HTB**)	6	77	462	0/77/6	Done on lots1,2,3 HH/LL configuration
ELFR	B2	AEC-Q100-008	Ta max=150°C Duration=24hrs	-	-	-	-	Not Applicable
EDR	B3	AEC-Q100-005	Specific tests and conditions to be defined in case of NVM	-	-	-	-	Not Applicable

TEST GROUP C – PACKAGE ASSEMBLY INTEGRITY TESTS

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
WBS	C1	AEC-Q100-001 AEC-Q003	Wire Bond Shear: (Cpk > 1.67)	10	min 5 units	min 15 units	All measurement within spec limits	30 bonds / minimum 5 units / each lot By assembly data
WBP	C2	Mil-STD-883, Method 2011 AEC-Q003	Wire Bond Pull: (Cpk > 1.67)	10	min 5 units	min 15 units	All measurement within spec limits	30 bonds / minimum 5 units / each lot By assembly data
SD	C3	JESD22 B102 JSTD-002D	Solderability: (>95% coverage) 8hr steam aging prior to testing	–	–	–	–	Not Applicable
PD	C4	JESD22 B100, JESD22 B108 AEC-Q003	Physical Dimensions: (Cpk > 1.67)	–	–	–	–	Not Applicable
SBS	C5	AEC-Q100-010 AEC-Q003	Only for BGA package	–	–	–	–	Not Applicable
LI	C6	JESD22 B105	Not required for Surface Mount Devices	–	–	–	–	Not Applicable

TEST GROUP D – DIE FABRICATION RELIABILITY TESTS

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
EM	D1	JESD61	Data, test method and criteria available upon request	–	–	–	–	Not Applicable
TDDB	D2	JESD35	Data, test method and criteria available upon request	–	–	–	–	Not Applicable
HCI	D3	JESD60 & 28	Data, test method and criteria available upon request	–	–	–	–	Not Applicable
NBTI	D4	JESD90	Data, test method and criteria available upon request	–	–	–	–	Not Applicable
SM	D5	JESD61, 87, & 202	Data, test method and criteria available upon request	–	–	–	–	Not Applicable

TEST GROUP E – ELECTRICAL VERIFICATION

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
TEST	E1	User/Supplier Specification	Pre and Post Stress Electrical Test	All	All	All	Passed	All parametric and functional tests
HBM	E2	AEC-Q100-002	Target: ±2kV	–	–	–	–	Not Applicable
CDM	E3	AEC-Q100-011	Target: ±750V on corner pins ± 500V all others	–	–	–	–	Not Applicable
LU	E4	AEC-Q100-004	Current Injection Class II – Level A (+/– 100mA)	–	–	–	–	Not Applicable
ED	E5	AEC-Q100-009 AEC-Q003	Electrical Distributions: (Test @ Rm/Hot/Cold) (where applicable, Cpk >1.67)	13	30	390	Passed	
EMC	E9	SAE J1752/3	Electromagnetic Compatibility (Radiated Emissions)	–	–	–	–	Not Applicable
SC	E10	AEC Q100-012	Short Circuit Characterization	–	–	–		Not Performed
SER	E11	JESD89-1 JESD89-2 JESD89-3	Applicable to devices with memory	–	–	–		Not Applicable
LF	E12	AEC-Q005	Lead(Pb) Free: (see AEC-Q005)	–	–	–		Covered by Test Group A & C

TEST GROUP F – DEFECT SCREENING TESTS

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
PAT	F1	AEC-Q001	Process Average Testing: (see AEC-Q001)	Not performed on qualification lots. It will be implemented starting from first production lot				
SBA	F2	AEC-Q002	Statistical Bin/Yield Analysis: (see AEC-Q002)					

TEST GROUP G - CAVITY PACKAGE INTEGRITY TESTS

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
MS	G1	JESD22 B104	Mechanical Shock	Not Applicable: not for plastic packaged devices				
VFV	G2	JESD22 B103	Variable Frequency Vibration					
CA	G3	MIL-STD-883 Method 2001	Constant Acceleration					
GFL	G4	MIL-STD-883 Method 1014	Gross and Fine Leak					
DROP	G5		Drop Test, Package Drop					
LT	G6	MIL-STD-883 Method 2004	Lid Torque					
DS	G7	MIL-STD-883 Method 2019	Die Shear					
IWV	G8	MIL-STD-883 Method 1018	Internal Water Vapor					

3.2.1 Additional Tests Results Summary (Robustness)

Test	#	Reference	AEC-Q100 STM Test Conditions	Lots	S.S.	Total	Results FAIL/SS/Lots	Comments
THB	A2	JESD22 A101 JESD22 A110	Ta=85°C, 85%RH, Duration= 2000hrs	6	67	402	0/67/6	Done on lots1,2,3 HH/LL configuration
TC	A4	JESD22 A104	Ta=-55°C /+150 °C Duration= 2000 cyc	13	67	871	0/67/13	Done on lots1,2,3,4
HTSL	A6	JESD22 A103	Ta= 150°C Duration= 2000hrs	13	35	455	0/35/13	Done on lots1,2,3,4,5
PTC	A5	JESD22 A105	Ta=-40°C /+125 °C Duration=1000 cyc	1	45	45	0/45/1	Done on lot 1/A

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