ON Semiconductor

FINAL PRODUCT/PROCESS CHANGE NOTIFICATION
Generic Copy

29 Jul 2009

SUBJECT: ON Semiconductor Final Product/Process Change Notification #16299

TITLE: 0APSM: addition of polyimide processing

PROPOSED FIRST SHIP DATE: Based on the current inventory and forecast, first shipment is expected on 15 October 2009.
(Actual date depends on stock at ONSemi and orders placed by the customer)

AFFECTED CHANGE CATEGORY(S): FAB processing: passivation layer

AFFECTED PRODUCT DIVISION(S): Automotive and Power Group (APG)

FOR ANY QUESTIONS CONCERNING THIS NOTIFICATION:
Contact your local ON Semiconductor Sales Office or Bart DeLeersnyder < Bart.DeLeersnyder@onsemi.com>

SAMPLES: Contact your local ON Semiconductor Sales Office

ADDITIONAL RELIABILITY DATA: Available
Contact your local ON Semiconductor Sales Office or Geert Gallopyn < Geert.Gallopyn@onsemi.com>

NOTIFICATION TYPE:

Final Product/Process Change Notification (FPCN)

Final change notification sent to customers. FPCNs are issued at least 90 days prior to implementation of the change.

ON Semiconductor will consider this change approved unless specific conditions of acceptance are provided in writing within 30 days of receipt of this notice. To do so, contact your local ON Semiconductor Sales Office.

DESCRIPTION AND PURPOSE:

Description: Addition of polyimide on top of wafer after completion of the standard processing steps.

Purpose: To improve the quality of the product 0APSM by providing additional protection against the ESDFOS failure mechanism.

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RELIABILITY DATA SUMMARY:

TEMPERATURE HUMIDITY BIAS

Test flow description and results :

TEST	SAMPLE SIZE IC8	FAILURES OBSERVED
Functional Test @ +25°C	3 x 77	0
Functional Test @ +125°C	3 x 77	0
Preconditioning : Moisture soak JEDEC MSL = 3 (192 Hrs @ 30°C/60%RH) + Convection Reflow Soldering (3x @ 240°C)	3 x 77	
Scanning Acoustic Microscopy	3 x 77	0
Functional Test @ +25°C	3 x 77	0
THB 1000Hrs @ 85°C/85%RH	3 x 77	
Functional Test @ +25°C	3 x 77	0
Functional Test @ +125	3 x 77	0

TEMPERATURE CYCLING

Test flow description and results :

TEST	SAMPLE SIZE APSF	SAMPLE SIZE IC8	FAILURES OBSERVED
Functional Test @ +25°C	3 x 77	3 x 77	0
Functional Test @ +85°C	3 x 77		0
Functional Test @ +125°C		3 x 77	0
Preconditioning : Moisture soak JEDEC MSL = 2 (168 Hrs @ 85°C/60%RH) + Convection Reflow Soldering (3x @ 240°C)	3 x 77		
Preconditioning : Moisture soak JEDEC MSL = 3 (192 Hrs @ 30°C/60%RH) + Convection Reflow Soldering (3x @ 240°C)		3 x 77	
Functional Test @ +25°C	3 x 77	3 x 77	0
Temperature Cycling 500x -65/150°C	3 x 77	3 x 77	
Functional Test @ +25°C	3 x 77	3 x 77	0
Functional Test @ +85°C	3 x 77		0
Functional Test @ +125		3 x 77	0

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HIGH TEMPERATURE STORAGE

Test flow description and results :

TEST	SAMPLE SIZE APSF	SAMPLE SIZE IC8	FAILURES OBSERVED
Functional Test @ +25°C	3 x 15	3 x 15	0
Functional Test @ +85°C	3 x 15		0
Functional Test @ +125°C		3 x 15	0
High Temperature Storage 1000 Hrs @ 150°C	3 x 15	3 x 15	
Functional Test @ +25°C	3 x 15	3 x 15	0
Functional Test @ +85°C	3 x 15		0
Functional Test @ +125°C		3 x 15	0

HIGH TEMPERATURE OPERATING LIFETEST

Test flow description and results :

TEST	SAMPLE SIZE	FAILURES OBSERVED
Functional Test @ +85°C	3 x 41	0
Functional Test @ -40°C	3 x 41	0
Functional Test @ +25°C	3 x 41	0
Operating Lifetest 500 Hrs @ 150°C / 5.5V	3 x 41	
Functional Test @ +25°C	3 x 41	0
Operating Lifetest 1000 Hrs @ 150°C / 5.5V	3 x 41	
Functional Test @ +25°C	3 x 41	0

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EARLY LIFE FAILURE RATE

Test flow description and results :

TEST	SAMPLE SIZE IC8	FAILURES OBSERVED
Functional Test @ 125°C	3 x 800	0
Functional Test @ -40°C	3 x 800	0
Functional Test @ 25°C	3 x 800	0
Dynamic Burn-in 48 Hrs @ Ta = 125°C	3 x 800	
Functional Test @ 25°C	3 x 800	0

Full report is available upon request.

ELECTRICAL CHARACTERISTIC SUMMARY:

ELECTROSTATIC DISCHARGE TEST

Test description and results :

ESD tests performed on Verifier II at ON Semiconductor.
The results reported are compiled from functional test data.

Human Body Model

- test details :
  - Test according to MIL883 method 3015.5 (pin combination 2) ;
  - 3 pulses + / -.
- test results :
  - HBM +/-1000V : 0 failures / 3 devices
  - HBM +/-2000V : 0 failures / 3 devices

No changes in OTP state have occurred.

Conclusion :
The product target for HBM ESD (2 kV) are met.

LATCH-UP TEST

Test flow description and results :

❶ Test description

- conditions : cfr. JEDEC standard EIA/JESD78
  - temperature : 25°C
  - pulse duration : 10 ms

	LV Supplies	HV Supplies
Supply bus information		
Supply bus names	Vreg	VCC&VOTP
Unom	5.0 V	20 V
Utest	5.5 V	25 V
Iddtest	5 mA	5 mA
Supply over-voltage test		
Icomp	100 mA	100 mA
I/O over-current test		
Ucomp (low voltage pins)	-2.8 V ; +8.3 V	
Ucomp (high voltage pins)	-12.5 V ; +37 V	

- failure criterium :
  - Idd > Idd_fail = Iddtest + 5 mA.
  - No functional or parametric failures are allowed.

❷ Test results

- I/O overcurrent test : 0 failures / 4 devices
  No latch-up occurs on any pin, when pulsing up to +100 mA and down to –100 mA, or pulse voltage compliance.

- Supply overvoltage test : 0 failures / 4 devices
  - No latch-up occurs when pulsing up to 8.3 V vs. GND on Vreg, or current compliance.
  - No latch-up occurs when pulsing up to 37 V vs. GND on VCC&VOTP, or current compliance.

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ELECTRICAL DISTRIBUTIONS

Capability analysis :

3 APSC lots have been analysed at QCH test (125° C) and QCC test (-40° C). All tests with a Cpk < 1.67 are addressed in detail in the conclusions of this report.

- **QCH at 125°C**

In the tables below all parameters with Cpk < 1.67 at QCH are selected.

Lot 714769B.1

Test_Name	Units	Lo Lim	Hi Lim	Tst Mean	Std Dev	CPK	Comment
1438001_VPCB_31	lsb	31	32	30.752	0.080	1.050	Site related double distribution; each
2438001_VPCB_31	lsb	31	32	30.767	0.079	1.124	separate distribution has Cpk>1.67
1442006_TDEL_C	us	10	50	17.762	2.319	1.116	Not influenced by polyimide; no yield drop;
2442006_TDEL_C	us	10	50	17.632	2.412	1.055	not a normal distribution; no issue
1460001_ICC_PD	mA	0	5	3.448	0.383	1.351	Site related double distribution; each separate distribution has Cpk>1.67
2431306_DAC functional	mv	0	220	47.041	10.102	1.552	Site related double distribution; each separate distribution has Cpk>1.67

Lot 714823A.1

Test_Name	Units	Lo Lim	Hi Lim	Tst Mean	Std Dev	CPK	Comment
1438001_VPCB_31	lsb	31	32	30.753	0.080	1.056	Site related double distribution; each
2438001_VPCB_31	lsb	31	32	30.766	0.079	1.123	separate distribution has Cpk>1.67
1442006_TDEL_C	us	10	50	17.651	2.298	1.110	Not influenced by polyimide; no yield drop;
2442006_TDEL_C	us	10	50	17.521	2.346	1.068	not a normal distribution; no issue
1460001_ICC_PD	mA	0	5	3.395	0.363	1.475	Site related double distribution; each separate distribution has Cpk>1.67
2431306_DAC functional	mv	0	220	46.724	10.109	1.541	Site related double distribution; each separate distribution has Cpk>1.67

Lot 714833B.1

Test_Name	Units	Lo Lim	Hi Lim	Tst Mean	Std Dev	CPK	Comment
1438001_VPCB_31	lsb	31	32	30.747	0.080	1.031	Site related double distribution; each
2438001_VPCB_31	lsb	31	32	30.761	0.079	1.096	separate distribution has Cpk>1.67
1442006_TDEL_C	us	10	50	17.590	2.302	1.099	Not influenced by polyimide; no yield drop;

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2442006_TDEL_C	us	10	50	17.752	2.352	1.099	not a normal distribution; no issue
1460001_ICC_PD	mA	0	5	3.380	0.341	1.582	Site related double distribution; each separate distribution has Cpk>1.67
2431306_DAC functional	mv	0	220	45.816	9.814	1.556	Site related double distribution; each separate distribution has Cpk>1.67

Conclusions:

1. All 3 lots have the same tests with Cpk < 1.67 at hot.
2. Most of the tests have site related double distribution. Each separate distribution has Cpk>1.67.
3. Parameter TDEL_C has no normal distribution. It is not influenced by the deposition of polyimide and there is no yield drop for this parameter.

- **QCC at -40°C**

In the tables below all parameters with Cpk < 1.67 at QCC are selected.

Lot 714769B.1

Test_Name	Units	Lo Lim	Hi Lim	Tst Mean	Std Dev	CPK	Comment
1438001_VPCB_31	lsb	31	32	30.734	0.084	0.934	Site related double distribution; each separate distribution has Cpk>1.67
2438001_VPCB_31	lsb	31	32	30.733	0.083	0.941	
1442006_TDEL_C	us	10	50	17.705	2.356	1.090	Not influenced by polyimide; no yield drop; not a normal distribution; no issue
2442006_TDEL_C	us	10	50	17.546	2.312	1.088	
2431306_DAC functional	mv	0	220	51.194	16.196	1.054	Site related double distribution; each separate distribution has Cpk>1.67

Lot 714823A.1

Test_Name	Units	Lo Lim	Hi Lim	Tst Mean	Std Dev	CPK	Comment
1438001_VPCB_31	lsb	31	32	30.744	0.080	1.016	Site related double distribution; each separate distribution has Cpk>1.67
2438001_VPCB_31	lsb	31	32	30.744	0.080	1.014	
1442006_TDEL_C	us	10	50	17.921	2.356	1.121	Not influenced by polyimide; no yield drop; not a normal distribution; no issue
2442006_TDEL_C	us	10	50	18.033	2.310	1.159	
2431306_DAC functional	mv	0	220	50.705	15.767	1.072	Site related double distribution; each separate distribution has Cpk>1.67

Lot 714833B.1

Test_Name	Units	Lo Lim	Hi Lim	Tst Mean	Std Dev	CPK	Comment
1438001_VPCB_31	lsb	31	32	30.740	0.081	0.990	Site related double distribution; each separate distribution has Cpk>1.67
2438001_VPCB_31	lsb	31	32	30.740	0.081	0.993	
1442006_TDEL_C	us	10	50	17.653	2.293	1.113	Not influenced by polyimide; no yield drop; not a normal distribution; no issue
2442006_TDEL_C	us	10	50	17.580	2.353	1.074	
2431306_DAC functional	mv	0	220	50.204	16.431	1.018	Site related double distribution; each separate distribution has Cpk>1.67

Conclusions:

1. All 3 lots have the same tests with Cpk < 1.67 at cold.
2. Most of the tests have site related double distribution. Each separate distribution has Cpk>1.67.
3. Parameter TDEL_C has no normal distribution. It is not influenced by the deposition of polyimide and there is no yield drop for this parameter.

Full report is available upon request.

CHANGED PART IDENTIFICATION:

ON Semiconductor part number affected: 0APSM-001. (Sellable code: 0APSM-002-XTP)
Part with polyimide processing will have part number: 0APSM-002. (Sellable code: 0APSM-002-XTP)

Customer part number: 740 880 00

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AFFECTED DEVICE LIST

0APSM-001 (Sellable code: 0APSM-002-XTP)
0APSM-002 (Sellable code: 0APSM-002-XTP)