PRODUCT RELIABILITY REPORT

Platform: S150E2.0I

--150V E-Mode GaN FET

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1. Platform Information

Platform	S150E2.0I
Product	INN150FQ032A
Package	FCQFN (4mm x 6mm)
BV Rating(V)	150
Process Technology	GaN on Silicon

2. Reliability Tests

Innoscience's E-mode GaN FET was subjected to a variety of reliability tests under the conditions referenced to typical for silicon-based power MOSFET. These test items and results were shown as below:

Product (INN150FQ032A)				
Test Items	**Test Condition**	**Sample Size (Unit x Lot)**	**#Fail**	**Result**
MSL3	T=30°C, RH=60%, 3 x reflow, 192hrs	25 x 3	0 Fail	Pass
HTRB	T=150°C, VD=150V, 1000hrs	77 x 3	0 Fail	Pass
HTGB	T=150°C, VG=5.5V, 1000hrs	77 x 3	0 Fail	Pass
HTS	T=150°C	77 x 3	0 Fail	Pass
TC	-55 to +150°C, Air, 1000Cys.	77 x 3	0 Fail	Pass
H^3TRB	T=85°C, RH=85%, VD=120V, 1000hrs	77 x 3	0 Fail	Pass
HAST	T=130°C, RH=85%, VD=42V, 96hrs	77 x 3	0 Fail	Pass
DHTOL	Tc=125℃, Vin=120V, Vout=36V, Iout=2.8A, fsw=200KHz	8 x 3	0 Fail	Pass
HBM	All Pins	3 x 1	0 Fail	Class 1C
CDM	All Pins	3 x 1	0 Fail	Class C3

3. Reliability Tests

Innoscience's E-mode GaN FET was subjected to a variety of reliability tests under the conditions referenced to typical for silicon-based power MOSFET. These test items and results were shown as below:

Moisture Sensitivity Level (MSL3)

Parts were baked at 125°C for 24 hours, and then subjected to 60%RH at 30°C for a stress period of 192 hours. The parts were also subjected to three cycles of Pb-free reflow in accordance with the IPC/JEDEC standard J-STD-020.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Hrs)
MSL3	INN150FQ032A	T=30°C, RH=60%, 3 x reflow	0	25 x 3	192

High Temperature Reverse Bias (HTRB)

Parts were subjected to 100% of the rated drain-source voltage at the maximum rated temperature for a stress period of 1000 hours. The testing was done in accordance with the JEDEC Standard JESD22-A108.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Hrs)
HTRB	INN150FQ032A	T=150°C, VD=150V, VG=VS=0V	0	77 x 3	1000

High Temperature Gate Bias (HTGB)

Parts were subjected to 5.5V gate-source bias at the maximum rated temperature for a stress period of 1000 hours. The testing was done in accordance with the JEDEC Standard JESD22-A108.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Hrs)
HTGB	INN150FQ032A	T=150°C, VG=5.5V, VD=VS=0V	0	77 x 3	1000

High Temperature Storage Life (HTSL)

Parts were subjected to 150°C for a stress period of 1000 hours. The testing was done in accordance with the JEDEC Standard JESD22-A103.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Hrs)
HTSL	INN150FQ032A	T=150°C	0	77 x 3	1000

Part Level Temperature Cycling (PLTC)

Parts were subjected to temperature cycling between -55°C and +150°C for a total of 1000 cycles. Heating rate and cooling rate of 15°C/min. Dwell time of 5 minutes were used in accordance with the JEDEC Standard JESD22-A104.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Cys)
PLTC	INN150FQ032A	-55 to +150°C, Air	0	77 x 3	1000

High Humidity, High Temperature Reverse Bias (H^3TRB)

Parts were subjected to 80% of the rated drain-source voltage bias at 85%RH and 85°C for a stress period of 1000 hours. The testing was done in accordance with the JEDEC Standard JESD22-A101.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Hrs)
H^3TRB	INN150FQ032A	T=85°C, RH=85%, VD=120V, VG=VS=0V	0	77 x 3	1000

Highly Accelerated Temperature and Humidity Stress Test (HAST)

Parts were subjected to 42V bias at 85%RH and 130°C for a stress period of 96 hours. The testing was done in accordance with the JEDEC Standard JESD22-A110.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Hrs)
HAST	INN150FQ032A	T=130°C, RH=85%, VD=42V, VG=VS=0V	0	77 x 3	96

Dynamic High Temperature Operating Life (DHTOL)

Parts were subjected to DC-to-DC system test adapted buck topology with V_{IN} =120V bias and F_{SW}=200KHz at Tc=125°C for a stress period of 1000 hours. The testing was done in accordance with the JEP-180

Pass criteria: All units efficiency shift lower 0.2%.

Test Item	Product Number	Test Condition	Fail #	Sample Size (Unit x Lot)	Duration (Hrs)
DHTOL	INN150FQ032A	Tc=125°C, Vin=120V, Vout=36V, Iout=2.8A, fsw=200KHz	0	8 x 3	1000

Electro-Static discharge (ESD)

Parts were subjected to HBM (ESDA/JEDEC JS-001) and CDM (ESDA/JEDEC JS-002) test to guarantee that the device can with stand electrostatic voltages during handling.

Pass criteria: All units must pass the min/max limits of the datasheet.

Test Item	Product Number	Test Condition	Passed Voltage	JEDEC Class
HBM	INN150FQ032A	All Pins	(±) 1000V	Class 1C
CDM	INN150FQ032A	All Pins	(±) 1000V	Class C3

Parts were mounted on to FR4 adaptor cards. Adaptor cards with two copper layers were used. The copper layer thickness was between 1 and 2 oz. SAC305 solder was used to mount the DUTs onto the adaptor cards.

Revision/Updated History

Revision	Reason for Change	Date	Prepared by	Approved by
0.5	Initial release	Jun./12/2023	Ziliang Liu	RE: Blanck sun, Director
1.0	Update DHTOL result	Sep./12/2023	Ziliang Liu	RE: Blanck sun, Director