



Product Qualification Report

To: Those who may concern
 From: Zexi Hu, Product Engineer, Semicon Champion
 Date: Oct 25, 2022 -Rev 1
 Subject: Qualification Test Result for Semicon Champion TVS TPSMB Product Series

Purpose:

This report is to inform the successful AEC-Q101 qualification test results associated with TVS TPSMB Product Series.

1. Qualification Types (Test Vehicle)

Product Series	Representative Test Sample Part Numbers	Package(Assembly Location)
TPSMB	TPSMB7.0A-VR	ShangHai Jinke Semiconductor Equipment Co., Ltd
	TPSMB150A	

2. Qualification Test Items and Result Summary:

Test Category	Description	Sample P/N	Sample Qty	Test Ref#	Contents/Conditions	Result Summary
Parametric	Electrical Parameters	TPSMB7.0-VR	370	Datasheet	VBR、IR	100% meet published spec.
		TPSMB150A	370			
Surge IPP test	10X1000us Surge Out	TPSMB7.0-VR	5	Datasheet	+/- 1 hit, from rated IPP, 0.1 IPP step	100% passing at 1.2xRated IPP
		TPSMB150A	5			



Reliability Test	Pre-condition (PC)	TPSMB7.0-VR	206	JESD22A-113	Performed on surface mount devices (SMDs) prior to TC,AC, H3TRB,HAST & IOL,PTC stresses only.	0% failure at MSL Level 1
		TPSMB150A	206			
	High Temperature Reverse Bias (HTRB)	TPSMB7.0-VR	77	JESD22-A108	150°C, 1000hrs	0% failure at 1000 hours
		TPSMB150A	77			
	Temperature Cycling (TC)	TPSMB7.0-VR	77	JESD22-A104	-55°C&150°C (air to air),1000 cycles	0% failure at 1000 cycles
		TPSMB150A	77			
	High-temperature High-humidity Reverse Bias(H3TRB)	TPSMB7.0-VR	77	JESD22-A101	85°C, 85%RH, 80%VR,1000 hrs	0% failure at 1000 hours
		TPSMB150A	77			
	Highly Accelerated Stress Test (HAST)	TPSMB7.0-VR	77	JESD22-A101	130°C, 85%RH 80%VR, 96hrs	0% failure at 96 hours
		TPSMB150A	77			
	Resistance to solder heat(RSH)	TPSMB7.0-VR	30	JESD22-B106	260°C(+5,-0),10sec	0% failure after RSH
		TPSMB150A	30	JESD22-A111		
	Solderability(SD)	TPSMB7.0-VR	10	J-STD-002	235°C±5°C, 3sec	0% failure after Solderability
		TPSMB150A	10			
	Moisture Soak Level (MSL)	TPSMB7.0-VR	22	JESD020D	85°C, 85%RH,168hrs	0% failure at MSL Level 1
		TPSMB150A	22			
Destructive Physical Analysis(DPA)	TPSMB7.0-VR	2	AEC-Q101-004 Section	Completed H3TRB or HAST, and TC.	100% meet published spec.	
	TPSMB150A	2				



3. Conclusion

According to the above qualification test results, Semicon Champion concluded that TPSMB product series passed the all the AEC-Q101 Reliability Test at WTC Lab, which is ready to start mass production.

Below is the TPSMB Series Part Number list covered by this report:

TPSMB7.5A, TPSMB8.2A, TPSMB9.1A, TPSMB10A, TPSMB10CA, TPSMB11A, TPSMB11CA, TPSMB12A, TPSMB12CA, TPSMB13A, TPSMB13CA, TPSMB15A, TPSMB15CA, TPSMB16A, TPSMB16CA, TPSMB18A, TPSMB18CA, TPSMB20A, TPSMB20CA, TPSMB22A, TPSMB22CA, TPSMB24A, TPSMB24CA, TPSMB27A, TPSMB27CA, TPSMB30A, TPSMB30CA, TPSMB33A, TPSMB33CA, TPSMB36A, TPSMB36CA, TPSMB39A, TPSMB39CA, TPSMB43A, TPSMB43CA, TPSMB47A, TPSMB47CA, TPSMB51A, TPSMB51CA, TPSMB56A, TPSMB56CA, TPSMB58A, TPSMB58CA, TPSMB62A, TPSMB62CA, TPSMB64A, TPSMB64CA, TPSMB68A, TPSMB68CA, TPSMB75A, TPSMB75CA, TPSMB82A, TPSMB82CA, TPSMB91A, TPSMB91CA, TPSMB100A, TPSMB100CA, TPSMB110A, TPSMB110CA, TPSMB120A, TPSMB120CA, TPSMB130A, TPSMB130CA, TPSMB150A, TPSMB150CA, TPSMB160A, TPSMB160CA, TPSMB170A, TPSMB170CA, TPSMB180A, TPSMB180CA, TPSMB200A, TPSMB200CA, TPSMB210A, TPSMB210CA, TPSMB200A, TPSMB200CA, TPSMB210A, TPSMB210CA, TPSMB220A, TPSMB220CA, TPSMB250A, TPSMB250CA, TPSMB300A, TPSMB300CA, TPSMB350A, TPSMB350CA, TPSMB400A, TPSMB400CA, TPSMB440A, TPSMB440CA, TPSMB480A, TPSMB480CA, TPSMB510A, TPSMB510CA, TPSMB520A, TPSMB520CA, TPSMB530A, TPSMB530CA, TPSMB540A, TPSMB540CA, TPSMB550A, TPSMB550CA, TPSMB600CA, TPSMB650CA

4. MTBF Calculation

Estimate of Failure Rate, MTBF, FITS for a Given Operation Temperature (See note)

Temp °C	% FR/khrs	MTBF (K)	FITS
30	0.0000114	8761727	0.114
55	0.0002112	473400	2.112
85	0.0040922	24437	40.922
100	0.0150628	6639	150.628
125	0.1062561	941	1062.561
150	0.594994	168	5949.940

Note: The **Mean-Time-Between-Failure** (MTBF) in hours and the percent failure rate per 1000 hours (%FR/khr) are computed at a 60% confidence level using the chi square method and the Arrhenius derating model for various junction operating temperatures. For the calculations, a value of 1 eV was used for the activation energy.

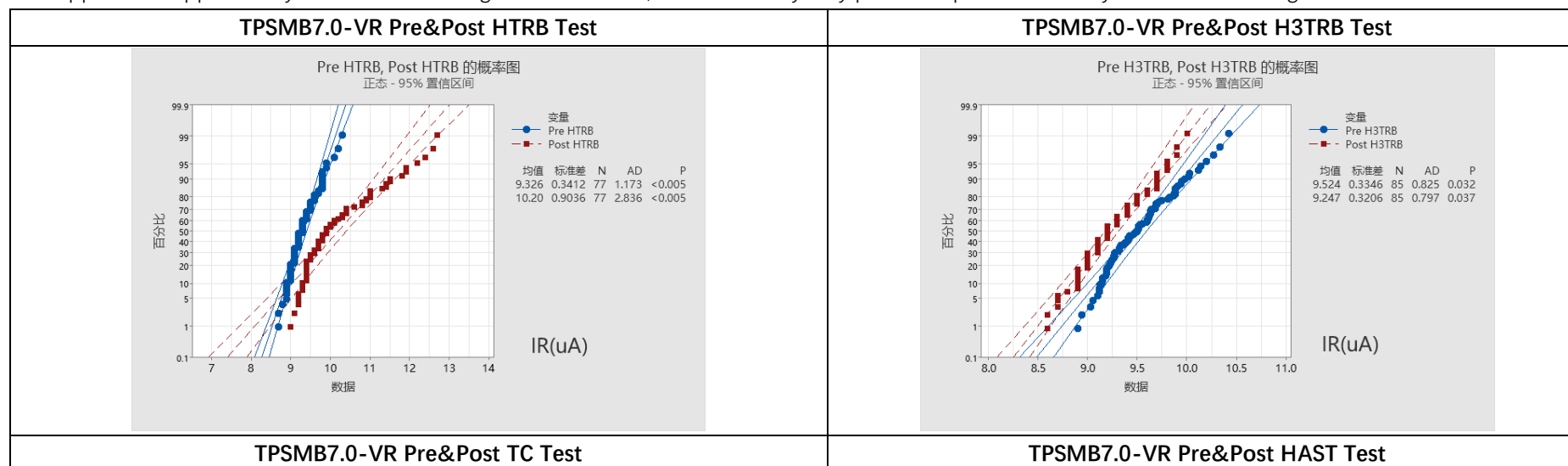


5. Appendix A – Pre & Post Test Electrical Performance Distribution

●Based on our 2 qual lots data , our actual VZ drift is within + 10% (AEC 20%), IR leakage drift is within +50% (AEC 5 times for normal leakage and 10 times for moisture leakage).

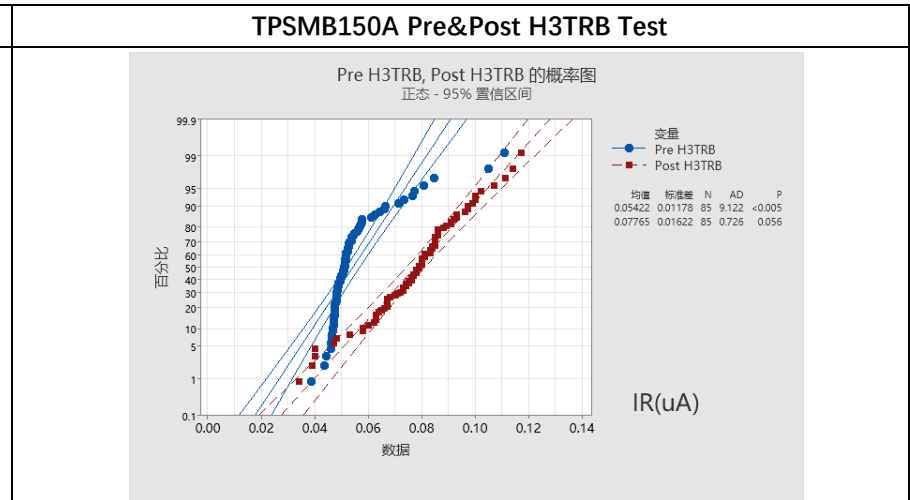
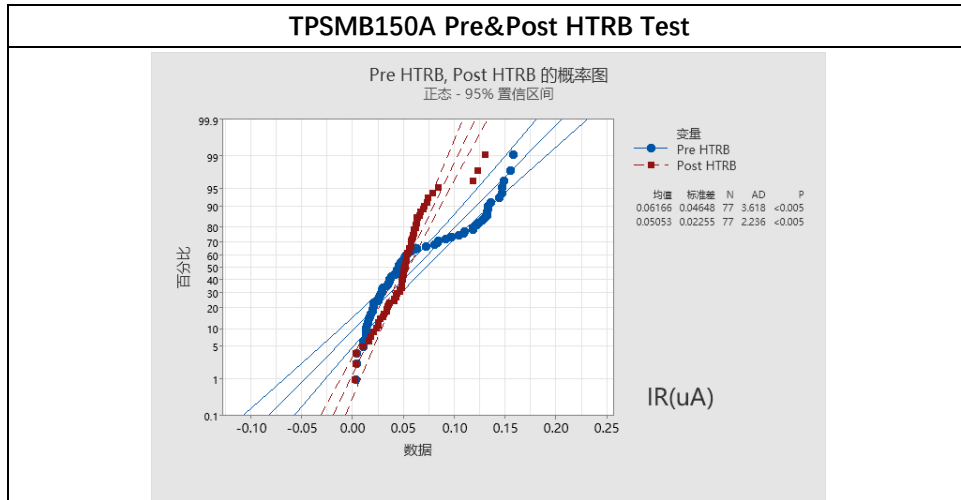
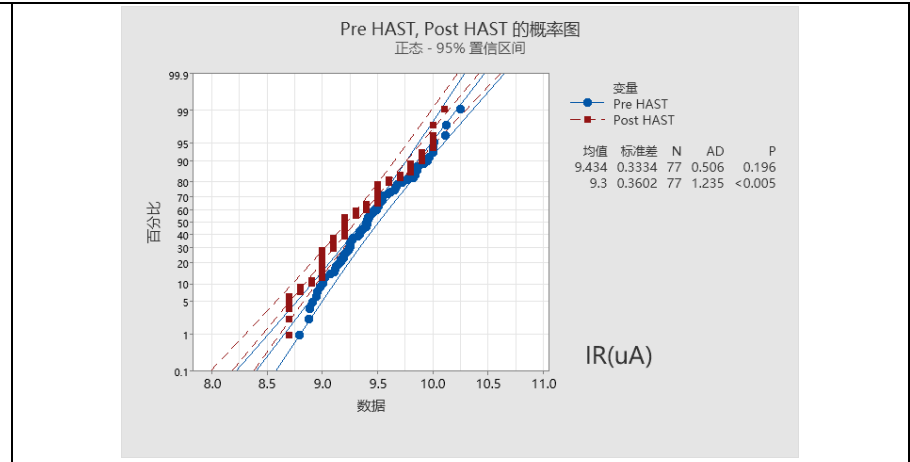
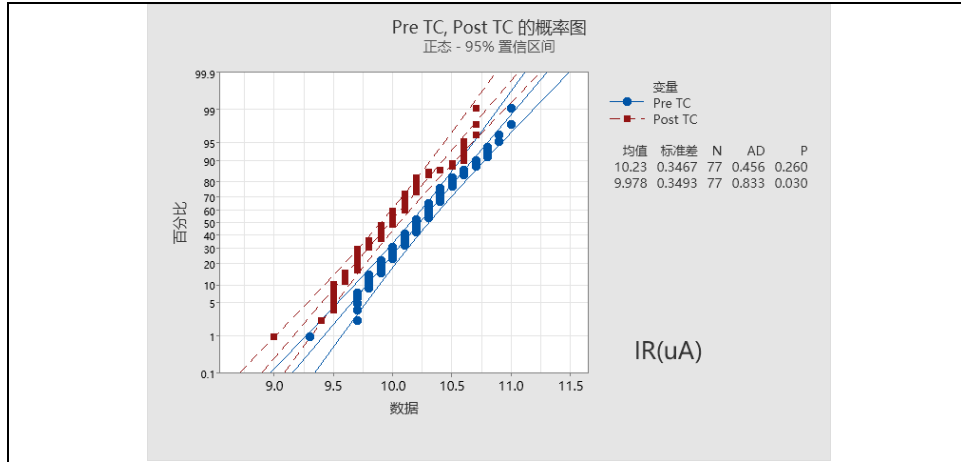
●AEC required :

Parts not remaining within $\pm 20\%$ of the initial reading of each test (with the exception of leakage limits which are not to exceed 10 times the initial value for moisture tests and 5 times leakage the initial value for all others) after completion of environmental testing. Parts exceeding these guidelines must be justified by the supplier and approved by the user. For leakages below 100nA, tester accuracy may prevent a post stress analysis to initial reading





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TPSMB150A Pre&Post TC Test

TPSMB Pre&Post HAST Test

