

		Approved	
		Quality Systems	
Document #:	100106	Revision:	1
Process Owner:	Ronald Barr	Effective Date:	Oct 27, 2019
Title:	Q101 Qualification Report TP65H050WSQA		

- 1) The purpose of the specification is to document the Qualification Report for TP65H050WSQA
- 2) Scope
 - a) Product(s) in section 1 are fully qualified per AEC-Q101 and released to production
- 3) Qualification Process
 - a) All Fab Lots were processed separately with a discrete amount of time between lots. All lots were assembled using the same Assembly House, on the same assembly line. All lots undergo Final Test using the documented test flow and are screened against documented test limits as appropriate to their part number. All processes and test conditions are documented and maintained under revision control as part of the Transphorm Quality Management System.
 - b) Documented process and test conditions that are used for qualification of products are designated "Process of Record". Changes to the Process of Record are managed through the Process/Product Change Notification Procedure, which is part of the Transphorm Quality Management System.
- 4) ESD Results: 3 parts pass for each test

Product Family	Human Body Model	Charged Device Model
TP65H050WSQA	±700V	±2000V

- 5) Reliability Testing
 - a) All electrical reliability tests were performed in accordance with the following document: "Failure Mechanism Based Stress Test Qualification for Discrete Semiconductors in Automotive Applications" AEC-Q101-Rev D1
 - b) Note that UHAST, HAST tests were run for 3X the standard requirement
 - c) Qualification test results on these products may reference existing qualification results of similar products per the use of generic data as defined in section 2.2 of AEC-Q101 Rev D1
 - d) Failed devices are analyzed for root cause and correction. Only a representative sample need to be analyzed, though some level of analysis will be applied to every failed part. Acceptable root cause and corrective action and successful demonstration of corrective and preventative actions will constitute successful qualification of a device. The part and/or qualification family can be qualified as long as containment of any problems is demonstrated until corrective and/or preventative actions are in place
 - e) Test Conditions for Passing
 - i) All devices must meet electrical test limits as defined in the data sheet or the appropriate generic part specification both before and after stress testing.
 - ii) All devices must also meet the maximum allowed parameter shift conditions per section 2.5 of the Q101 specification as follows.
 - (1) Parametric Shift = (Post Stress Measurement – Pre Stress Measurement)/Pre-Stress Measurement
 - (2) Parametric shift of leakage measurements must be less than 10X for moisture tests and 5X for all other measurements
 - (3) Parametric shift of R_{DS} and V_{GS} must be less than ±20%

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Parameter	Symbol	Conditions	LS L	US L	Unit
Drain to source leakage current	I _{DSS}	V _{DS} = 650V V _{GS} = 0V T _J =25°C		25	μA
Gate to Source Forward Leakage Current	I _{GSS}	V _{GS} =20V		100	nA
Drain source on resistance	R _{DS}	V _{GS} = 10V I _D =25A T _J = 25°C		60	mΩ
Gate Threshold Voltage	V _{GS(th)}	V _{GS} =V _{GS} I _D =1mA	3.3	4.8	V

TEST	SYMBOL	CONDITIONS	SAMPLE	RESULT
High Temperature Reverse Bias	HTRB	T _J =175°C V _{DS} = 650V 1000 HRS	3 lots 77 parts per lot 231 total parts	0 Fails PASS
Highly Accelerated Temp and Humidity Test	HAST	130°C 85% RH 33.3 PSI Bias = 100V 288 HRS	3 lots 77 parts per lot 231 total parts	0 Fails PASS
Temperature Cycle	TC	-55°C / 150°C 2 Cycles / HR 1000 Cycles	3 lots 77 parts per lot 231 total parts	0 Fails PASS
Temperature Cycling Hot Test	TCHT	125°C Test After TC	3 lots 77 parts per lot 231total parts	0 Fails PASS
Power Cycle	PC	25°C / 125°C ΔT = 100°C 15,000 Cycles	3 lots 77 parts per lot 231 total parts	0 Fails PASS
High Temperature Storage Life	HTSL	175°C 1000 HRS	3 lots 77 parts per lot 231 total parts	0 Fails PASS
High Temperature Gate bias (Cascode)	HTGB	175°C 1000 HRS V _{GSS} =18V	3 lots 77 parts per lot 231 total parts	0 Fails PASS
High Temperature Gate bias (HEMT ONLY)	HTGB#2	175°C 1000 HRS V _{GSS} =-35V	3 lots 77 parts per lot 231 total parts	0 Fails PASS
Unbiased Accelerated Stress Test	UHAST	130°C 85% RH 288 HRS	3 lots 77 parts per lot 231 total parts	0 Fails PASS
Destructive Physical Analysis	DPA	Post TC & HAST	3 lots 2 Parts Per Lot	0 Fails PASS