

Discrete Devices: MOSFET's, IGBT's, Diodes

		Qualification Level						
		Automotive		Industrial		Consumer		Customer Specific
Industry standards		AEC-Q101		JESD-47		IR internal guidelines		Customer guidelines
Test	Sample Size	Condition ^{1,2,3,4}	Duration	Condition ¹	Duration	Condition	Duration	Reliability qualification per agreed customer contract
High Temperature Reverse Bias (HTRB)	3 X 77	150°C or 175°C, 80% Rated BVdss	1000 hours	150°C or 175°C, 80% Rated BVdss	1000 hours	150°C or 175°C, 80% Rated BVdss	500 hours	
High Temperature Gate Bias (HTGB)	3 X 77	150°C or 175°C, 100% Rated Vgs	1000 hours	150°C or 175°C, 80% Rated Vgs	1000 hours	150°C or 175°C, 80% Rated Vgs	500 hours	
Intermittent Operating Life/ Power cycling (IOL/PTC)	3 X 77	Delta Tj = 100°C Package dependent: Small: 2-minute ON/OFF Medium: 3.5-minute ON/OFF Large: 5 minute ON/OFF Leadless: 2/3-minute ON/OFF	15,000 cycles 8572 cycles 6000 cycles 12,000 cycles	Delta Tj = 100°C Package dependent: Small: 2-minute ON/OFF Medium: 3.5-minute ON/OFF Large: 5 minute ON/OFF Leadless: 2/3-minute ON/OFF	15,000 cycles 8572 cycles 6000 cycles 12,000 cycles	N/A	Not required	
Unbiased Autoclave (AC) or	3 X 77	121°C, 29.7psia, 100%RH	96 hours	121°C, 29.7psia, 100%RH	96 hours	N/A	Not required	
Unbiased Temperature / Humidity (Unbiased HAST)	3 x 77	Not allowed	N/A	130°C/85%RH/33Psia or 110°C/85%RH/17.7Psia	96 hours or 264 hours	N/A	Not required	

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Temperature and Humidity Bias (H3TRB)	3 X 77	85°C/85%RH, 80% rated of Max BVdss up to 100V	1000 hours	85°C/85%RH, 80% rated of Max BVdss up to 100V	1000 hours	85°C/85%RH, 80% rated of Max BVdss up to 100V	500 hours	
or								
High Accelerated Temperature and Humidity Stress Test (HAST)	3 x 77	130°C/85%RH/33Psia, 80% rated of Max BVdss up to 42V	96 hours	130°C/85%RH/33Psia, 80% rated of Max BVdss up to 42V	96 hours	130°C/85%RH/33Psia, 80% rated of Max BVdss up to 42V	96 hours	
Temperature Cycle (TC)	3 X 77	-55°C to 150°C	1000 cycles	-55°C to 150°C	1000 cycles	-55°C to 150°C PQFN: -40C to 125C	500 cycles	
Parametric Verification (PV)	1 X 25	Test samples over device temperature range (Tri-temp)		Samples tested at Room temp	N/A	Samples tested at Room temp	N/A	
MSL Criteria using JESD-022		No TODD (Top Of Die Delamination) after MSL testing		No TODD after MSL testing		TODD allowed if samples pass reliability testing per JESD-022		TODD requirement per agreed customer contract
Process Change Notice		JESD-46C with 6 month minimum notification & customer approval prior to change		JESD-46C: Customer notified 90 days before implementation		Customer notified 30 days before implementation.		Process notification per agreed customer contract

Conditions and additional requirements

- 1 – Family data may be used to qualify one or more products.
- 2 – Exceptions to AEC-Q101 requirements are noted in the qualification report.
- 3 – Performed only as required per AEC-Q101.
- 4- Per AEC Q101- Shift analysis before and after stress test will be analyzed. If the shift is greater than 20% or leakage tests exceed 5 times initial readings or 10 times for moisture testing it will be considered a failure.

PRECONDITIONING REQUIREMENTS

Minimum MSL3 preconditioning per JESD22-A113 is required for surface mount capable devices that are put on TC, H3TRB/HAST, uHAST, AC, or IOL/PTC.

FAILURE CRITERIA

All devices parameters must pass the data sheet specification requirements.

Links:

AEC: <http://www.aecouncil.com/AECDocuments.html>

Jedec: <http://www.jedec.org/standards-documents>