



# Quality and Reliability Report High Barrier Diode Qualification

**051-06954 rev -**

**Marki Microwave Inc.**

215 Vineyard Court,  
Morgan Hill, CA 95037

Phone: (408) 778-4200 / FAX: (408) 778-4300

Email: [info@markimicrowave.com](mailto:info@markimicrowave.com)

Proprietary: This Document was originated by and is the property of Marki Microwave.

Unauthorized disclosure is prohibited

215 Vineyard Court, Morgan Hill, CA 95037 | Ph: 408.778.4200 | Fax 408.778.4300 | [info@markimicrowave.com](mailto:info@markimicrowave.com)



## 1. Summary

This document describes the qualification results for the devices used in the MT3 ceramic CQG package. The devices are diodes that have high thresholds for activation. The reliability data was obtained through the performance of specified accelerated stress tests described. This summary shows the devices current status and steps for completed qualification testing.

### 1.1 Devices used for Qualification

- MT3-0113SCQG-2
- MT3-0113QCQG-2

## 2. Scope

The qualification was performed to validate the reliability of the materials and devices used in the CQG package. The results of this report are not limited to the specific product described herein; they apply to a family of products designed at Marki Microwave which use the same assembly materials and processes.

## 3. Product Description and Information

### Assembly and Package Information

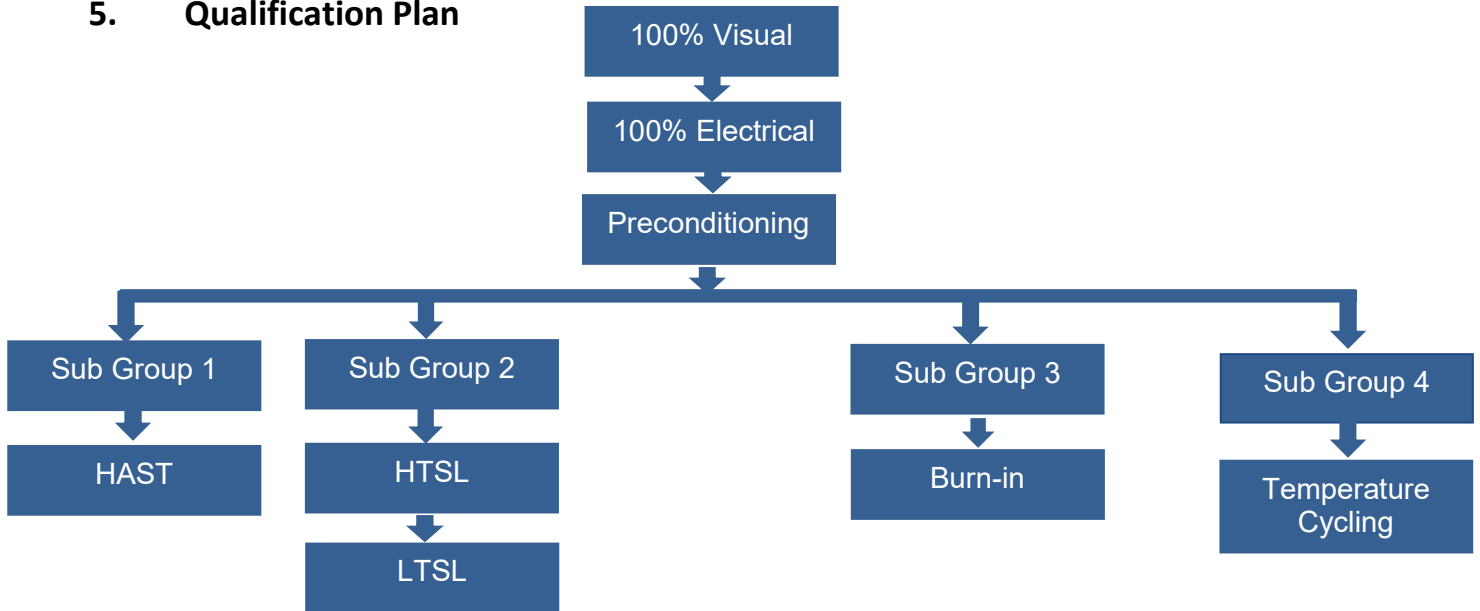
Package Style:	Surface Mount (SM) – CQG
Lead Count:	3
Leadframe Material:	Rogers
Wire Bond:	0.001 AU Thermo Compression Bond
Die Attach:	Silver Epoxy – Epotek H20E
Lid Material:	Ceramic
Semiconductor Die:	GaAs

## 4. Product Qualification Requirements

Qualification testing is being performed to validate the reliable operation of Marki Microwave high barrier diodes. Tests are included to specifically address failure mechanisms related to elevated temperature, temperature cycling and environmental stress. Qualification tests were done in-house.



## 5. Qualification Plan



### 5.2 Flow and Conditions

Test Method	Reference	Time / Cycles	Qty	Condition
<b>Preconditioning</b>				
Electrical Test	N/A	N/A		
Temperature Cycling	JESD22-A104	10 Cycles, 10Min Dwells		150°C to -40°C
High Temperature Storage Life (HTSL)	JESD22-103	24Hrs	12	150°C
Lead Free Reflow	N/A	3 Cycles		Peak 250°C
MSL 2	JESD22-A113	168Hrs		168Hrs in 85°C and 60%RH
Electrical Test	N/A	N/A		
Visual Inspection	N/A	N/A		N/A
<b>Sub Group 1</b>				
Biased Highly Accelerated Temperature and Humidity Stress Test (HAST) <i>28dBm Input Power into Pin 3</i>	JESD22-A110	352Hrs	4	105°C, 85%RH
<b>Sub Group 2</b>				
High Temperature Storage Life (HTSL)	JESD22-A103	1000Hrs	2	150°C
Low Temperature Storage Life (LTSL)	JESD22-A119	168Hrs		-40°C
<b>Sub Group 3</b>				
Burn-in ( $T_a = 69^\circ\text{C}$ ) <i>28dBm Input Power into Pin 3</i>	MIL-STD-883 Method 1015	1000Hrs	4	100°C
<b>Sub Group 4</b>				
Temperature Cycling	JESD22-A102	500 Cycles, 10Min Dwells	2	150°C to -40°C



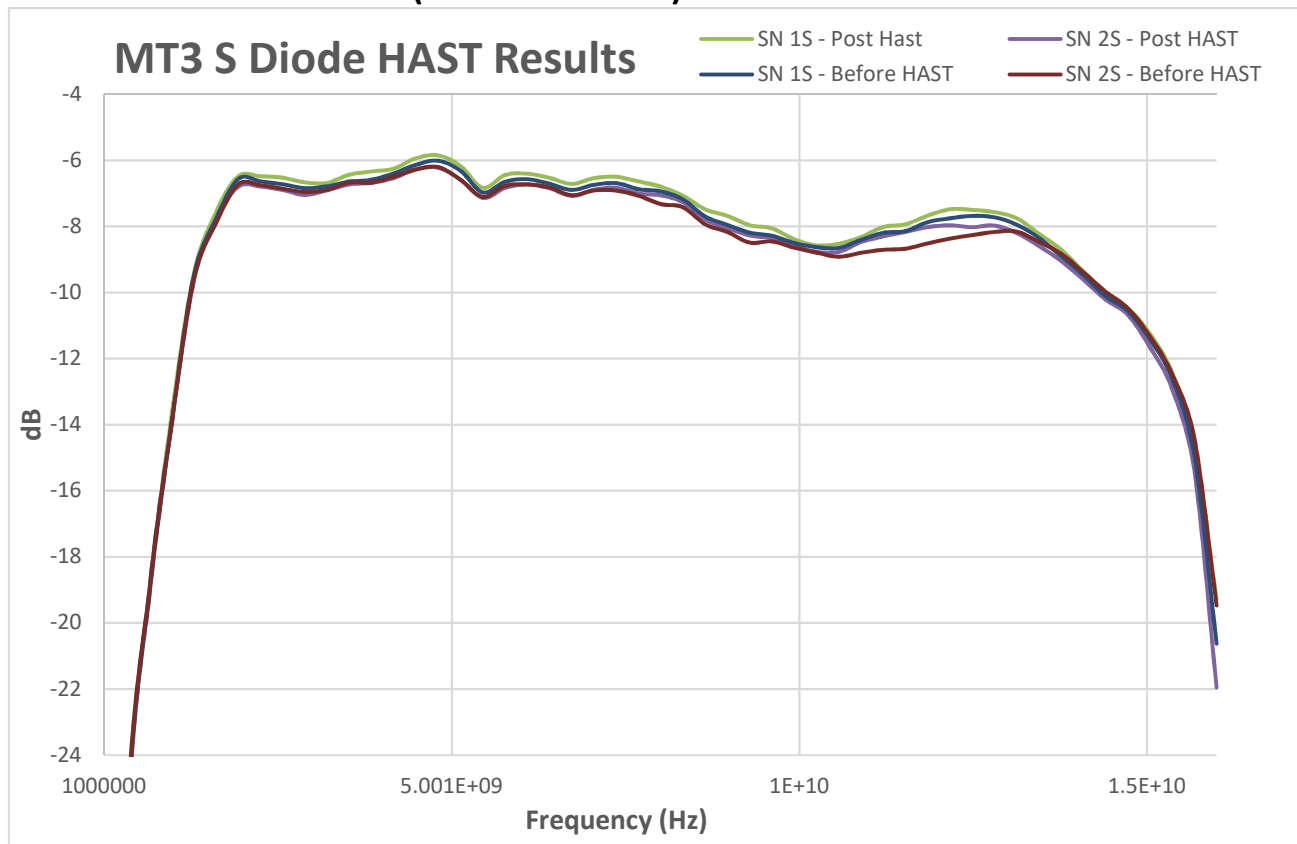
## 6. Qualification Results

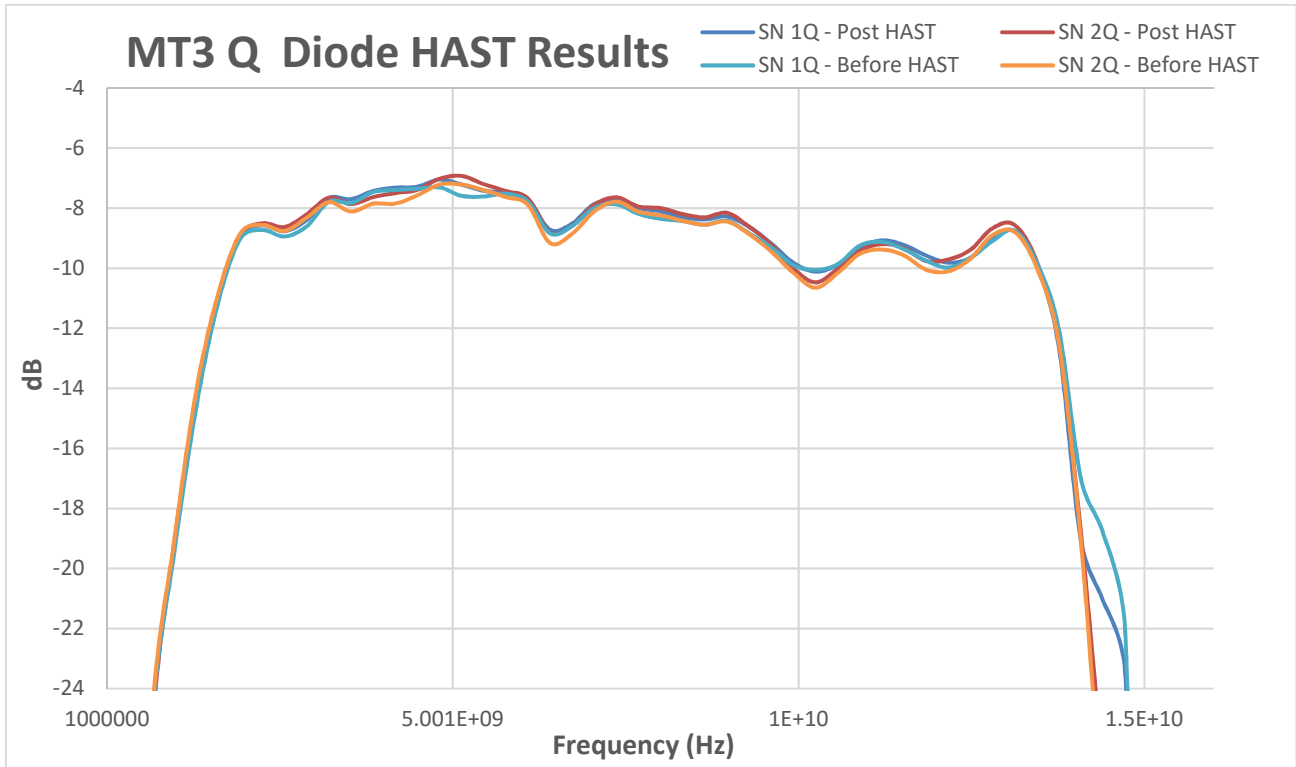
### 6.1 Summary of Test Results

Test Method	Qty	Qty Out	Date	Results
<b>Preconditioning &amp;MSL</b>				
-	12	12	6/7/19	Pass
<b>Sub Group 1 (two MT3-0113SCQG-2 and two MT3-0113QCQG-2)</b>				
Biased Highly Accelerated Temperature and Humidity Stress Test (HAST)	4	4	7/8/19	Pass
<b>Sub Group 2 (one MT3-0113SCQG-2 and one MT3-0113QCQG-2)</b>				
High Temperature Storage Life (HTSL)	2	2	7/22/19	Pass
Low Temperature Storage Life (LTSL)	2	2	7/29/19	Pass
<b>Sub Group 3 (two MT3-0113SCQG-2 and two MT3-0113QCQG-2)</b>				
Burn-in	4	In process	TBD	TBD
<b>Sub Group 4 (one MT3-0113SCQG-2 and one MT3-0113QCQG-2)</b>				
Temperature Cycling	2	2	7/26/19	Pass

No electrical failures were observed and all units hold visual integrity.

### 6.2 HAST Results (Conversion Loss)







## 7. Qualification Traveler

Description	Method	Condition	Status	Date
Electrical Test		100% Read and Record	Pass	5/21/19
Temperature Cycling (TC)	JESD22-A104 10 Cycles	Ts (min) = -40°C Ts (max) = 150°C Dwell Time = 10 minutes	Pass	5/28/19
High Temperature Storage Life (HTSL)	JESD22-A103	24 Hours, Temp = 150°C 5/31/19	Pass	5/30/19
Preconditioning & MSL 2 (Within 2hrs of HTSL)	JESD22-A113	168 Hour Soak units in 60%RH @ 85°C In: 5/31/19	Pass	6/7/19
Lead free reflow cycles (Within 15min – 4hrs of MSL)		3 Cycles Peak at 250°C	Pass	6/7/19
Visual Inspection			Pass	6/7/19
Electrical Test		100% Read and Record	Pass	6/7/19
QA Review		Pre- Production Release	Pass	6/7/19
<b>Subgroup 1</b>				
Highly Accelerated Temperature and Humidity Stress Test (Biased HAST)	JESD22-A118 352 Hours	Temp = 105°C, RH = 85%. 28dBm Input Power into Pin 3. Start 6/10/19	Pass	7/8/19
Electrical Test for HAST Units			Pass	7/8/19
<b>Subgroup 2</b>				
High Temperature Storage Life (HTSL)	JESD22-A103 1000 Hours	Temp = 150°C In: 6/10/19	Pass	7/22/19
Low Temperature Storage Life (LTSL)	JESD22-A119 168 Hours	Temp = -40°C In:	Pas	7/29/19
Electrical Test		100% Read and Record	Pass	7/29/19
<b>Subgroup 3</b>				
Burn-in	MIL-STD-883 Method 1015	1000Hrs 28dBm Input Power into Pin 3. Start 7/26/19 T <sub>a</sub> = 69°C	In Process	EST → 9/6/19
Electrical Test		100% Read and Record	TBD	EST → 9/13/19
<b>Subgroup 4</b>				
Temperature Cycling (TC)	JESD22-A104 500 Cycles	Ts (min) = -40°C Ts (max) = 150°C Dwell Time = 10 minutes In: 6/10/19	Pass	7/16/19
Electrical Test		100% Read and Record	Pass	7/16/19
<b>Review</b>				
QA Review			TBD	EST → 9/13/19



## 8. Reference Documents

- 7.01 MIL-STD-883 “Department of Defense Test Method Standard, Microcircuit”
- 7.02 JESD22-A102E “Accelerated Moisture Resistance – Unbiased Autoclave”
- 7.03 JESD22-A103 “High Temperature Storage Life”
- 7.04 JESD22-A104 “Temperature Cycling”
- 7.05 JESD22-A108/JESD74 “Early life Failure Rate (ELFR)”
- 7.06 JESD22-A108/JESD85 “High Temperature Operating Life (HTOL)”
- 7.07 JESD22-A110 “Highly Accelerated Temperature and Humidity Stress Test (HAST)”
- 7.08 JESD22-A113 “Preconditioning and MSL”
- 7.09 JESD22-A119 “Low Temperature Storage Life (LTSL)”
- 7.1 051-06834 Marki Microwave Quality and Reliability Report “MT3 in CQG Package”

## Revision History

Rev – Initial Release

*Copyright © 2019, Marki Microwave, Inc. All rights reserved.*

*No part of this document may be reproduced in any form or means, without express permission from Marki Microwave.*

*Marki Microwave Inc. reserves the right to make changes in its products, product flows, or information contained herein without notice.*

*Marki Microwave makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does*

*Marki Microwave assume any liability whatsoever arising out of the use of or application of any product. No license for use of intellectual property (patents, copyrights, or other rights) owned by Marki Microwave or other parties is granted or implied.*