Reliability Monitor Report

(TQ-1083; Process = HA2, Package = SOIC8)

Abstract

This report summarizes the reliability testing that has been completed to Monitor product produced on the HA2 process & packaged in an SOIC-8 package. The vehicle used for this process monitor was the TQ-1083 product.

The TQ-1083 is fabricated on TriQuint's E/D MESFET GaAs and is packaged in a SOIC8 package. Assembly and encapsulation of the test samples were accomplished at supplier U. Tests, test sample size and failure criteria were defined from TriQuint's Specification REL.021 (Policy and Procedure for Reliability Qualifications of ICs). Most tests outlined in this procedure follow the JEDEC Standard Number 26-A or MIL-STD-883 when applicable.

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Process Description

TriQuint's HA2 process is a Gallium Arsenide (GaAs) semiconductor process fabricated at TriQuint's Hillsboro, Oregon facility. The process is an Ion implanted process combining 1.0 and 0.5 μm gate length MESFETs with the passives and metallization processes used on the TQHiP process.
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Product Description

800-2500 MHz 50-mW Driver Amplifier

The SC-1083, which is equivalent to a TQ9132 Amplifier excepted tested at a different frequency, is part of TriQuint's RFIC Building Block family. It is an 800-2500-MHz amplifier capable of providing moderate output power (50 mW) for a wide variety of transmit and receive applications. The amplifier's input and output are matched to 50 Ohms with internal circuitry, simplifying interfaces to 50 Ohm systems. In addition, DC-blocking capacitors are included on the chip, permitting direct connections to the input and output. Its 8-pin surface-mount package and low cost are well suited to many wireless communications applications.

Test Plan:

Table 1 lists the monitor plan for TQ-1083. This plan is based on the requirements of REL.021
(*The present status of the tests is listed in the following section.*)

Table 1. Device Qualification Test Plan.

	Test Description	Purpose	Specification - Method or Conditions	Sample Size
HTOL	1. Bias Life test	Determine the effect of bias and temp on the device over an extended period of time	JESD22-A108 150°C Junction - 1000 Hours Min	1 Lot 77 (1)
Environmental	1. PreConditioning		JESD22-A113 IR/Convection Reflow @ 235°C	240 (1)
	2. Autoclave	Determine the effect of temp, humidity & pressure on the device over time, unbiased.	JEDEC A102, Condition C 121°C, 100% RH, 15 PSIA unbiased, for 96 Hours	1 Lot 77 (1)
	3. HAST	Determine the effect of temp & humidity on the device under bias.	JESD22-A110 - 96 hr 130°C - 85% RH Non-Condensing	1 Lot 77 (1)
	4. Temperature Cycle	Determine the effect of temp on Material Thermal Mismatch.	JESD22-A104 Cond G -40°C to +125°C 1000 Cycles	1 Lot 77 (1)

Note: HAST, Autoclave, & Temperature Cycle groups received preconditioning. Please see description of preconditioning stresses.

Summary of Results:

Table 2 lists the status and results of the reliability monitor testing.
(*The present status of the tests is listed in the following section*)

Table 2. Monitor Test Results Summary.

Test Description	Sample Size	Status	
Bias Life test	Lot 77 (1)	Lot# 4184 was subjected to 1,000 hr of HTOL with no failures	77 / 0
PreConditioning	1 Lot 240 (1)	Lot# 4184 was subjected to level 1 Preconditioning with no failures	240 / 0
Autoclave	1 Lot 77 (1)	Lot# 4184 was subjected to 96 hr of Autoclave with no failures	77 / 0
HAST	1 Lot 77 (1)	Lot# 4184 was subjected to 96 hr of HAST with no failures	77 / 0
Temperature Cycle	3 Lot 77 (1)	Lot# 4184 was subjected to 1,000 temperature cycles with no failures	77 / 0

Test Status:

HTOL (High Temperature Operating Lifetest) TQS Test#587

Procedure: In general, the life test procedure follows MIL-STD-883, Method 1005, Condition B or JESD22-A108.

Purpose: Life testing is performed for the purpose of demonstrating that device failure rates do not exceed 100 FIT (FIT = Failure unIT = failures per billion device hours) for the first 20 years of life at the specified maximum rated operating temperature.

Results: 77 parts from Lot# 4184 was subjected to 1,000 hr of HTOL with no failures

♦ Environmental Test Group

Preconditioning TQS Test#588

Procedure: Level 1 Preconditioning is performed according to JEDEC Methods A101 & A113.

Purpose: The purposes of preconditioning are:

(1) to determine if any trapped moisture around the device leads will explode the plastic around the leads (popcorning) or cause delamination of the plastic from the chip during the soldering process.

(2) to determine if the solder reflow will have any long-term effect on reliability.

Results: 240 parts from Lot# 4184 was subjected to level 1 Preconditioning with no failures

Autoclave TQS Test#588

Procedure: Un-Biased Autoclave is performed per JESD22-A102

Purpose: The purpose of unbiased autoclave (Accelerated Moisture Resistance Test) is to evaluate the moisture resistance of non-hermetic packaged solid state devices.

Results: 77 parts from Lot# 4184 was subjected to 96 hr of Autoclave with no failures

HAST (Highly Accelerated Temperature & Humidity Stress Test) TQS Test#588

Procedure: HAST is performed according to JESD22-A110; with the parts biased and an environment of 131°C 85% RH for 96 hrs.

Purpose: The purpose of the test is to evaluate the reliability of non-hermetic packaged solid state devices in a biased humid environment. This test usually activates the same type of failures as does biased 85/85 but accelerated by temperature, pressure and humidity.

Results: 77 parts from Lot# 4184 was subjected to 96 hr of HAST with no failures

Temperature Cycle TQS Test#588

Procedure: Temperature cycle is performed according to JESD22-A104 Condition G, -40°C to +125°C, for 1000 cycles.

Purpose: The purpose of the test is to determine the resistance of the part to extremes of high and low temperature and the effect of alternate exposures to these extremes.

Results: 77 parts from Lot# 4184 was subjected to 1,000 temperature cycles from -40ºC to +125ºC with no failures.

Conclusion

Based on the results of the testing described in this report it appears that there are no identifiable problems associated with the HA2 process or the SOIC8 package produced by subcontractor U.