RMA data collection recommendations

Introduction

To help expedite the RMA process for customers and Everspin, a new questionnaire and methodology for accepting devices will be implemented.

The new process will help ensure the Everspin Quality and Reliability team has all the required information prior to accepting devices for internal testing and FA analysis.

All the requested data must be gathered prior to any mechanical removal of the offending device. Once a device is removed from the failing environment any possibility for additional data collection is lost.

Contents

Power On Waveforms

For any MRAM device to function correctly the power to the device must be clean and stable. Another requirement is Monotonic behavior when the power supply is initializing. Please attach the Power on wave from to this RMA FA procedure application note. An example of 1.8V device power on sequence below for reference.

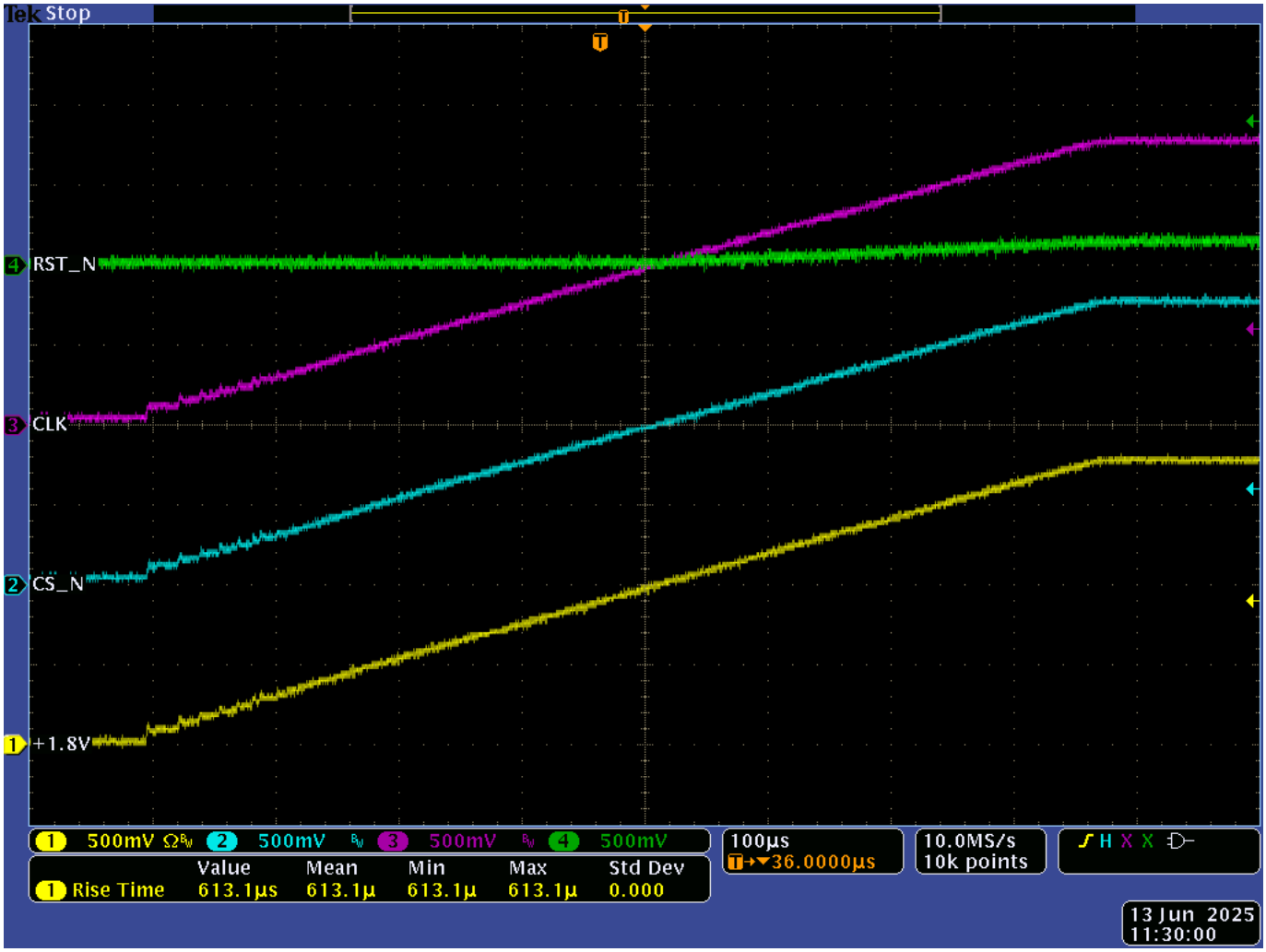

FIGURE 1 EXAMPLE POWER ON WAVEFORM

Device power rail before, during and after device failure

Stable clean power to DUT (Device Under Test) is critical for deterministic behavior. If the power rail is out of specification during testing device behavior can become undefined. Hence the critical requirement of clean stable device power.

Please attach a scope capture of the device power rail prior, during and after the failure event. If possible, use the scopes measurement functions to capture Average, Peak and Min voltage measured at the supply pins to the device. An example of the requested measurements pictured below.

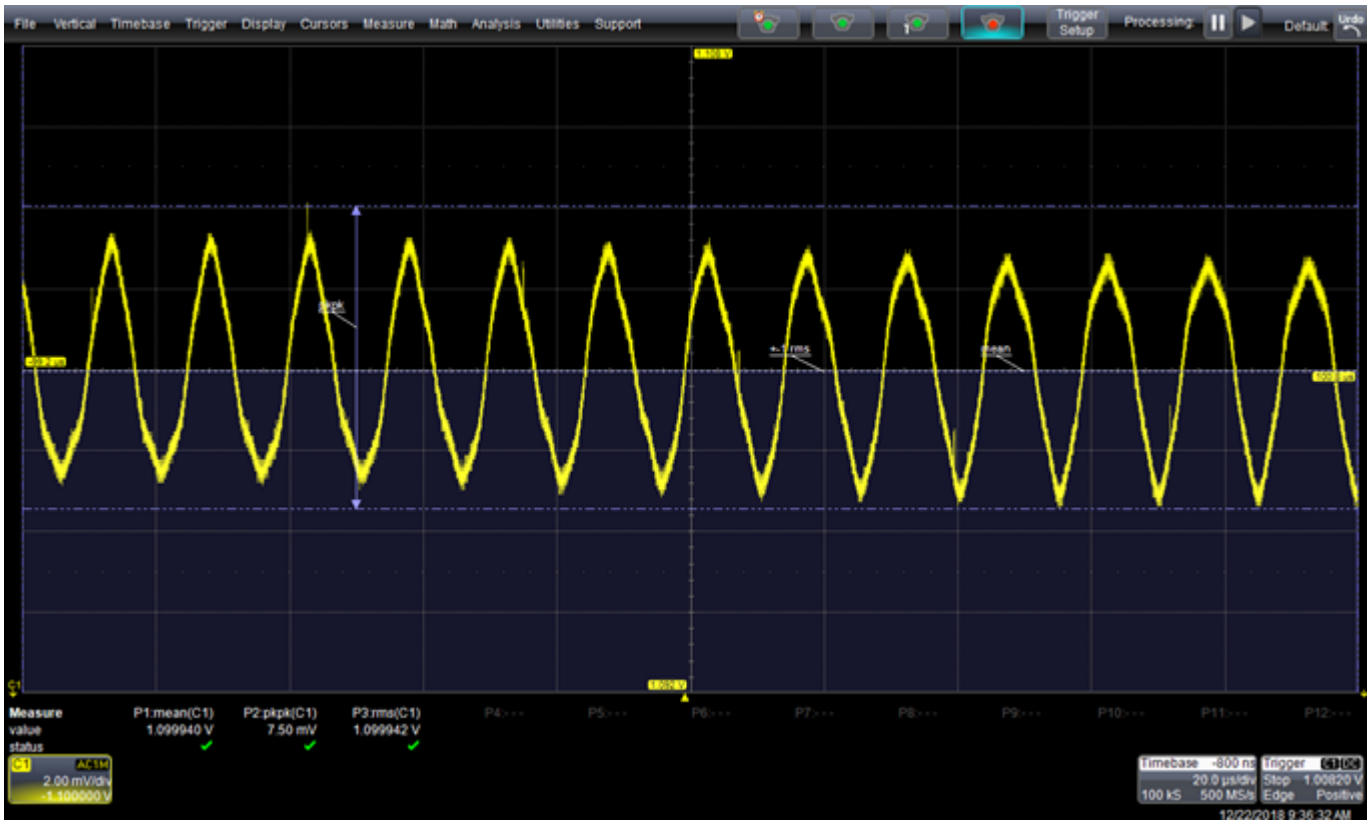

FIGURE 2 EXAMPLE POWER RAIL MEASUREMENT

Device environmental conditions during failure

The device environment can have a significant impact on device behavior and performance.

Please provide the Ambient temperature and ~ relative humidity during the failure event.

Device Traffic, Order of operations and repeatability

To facilitate failure reproduction, the traffic or sequence of operations to the device is critical. The failure must be repeatable to allow internal teams the best opportunity for failure reproduction.

To the best of ability please describe the exact traffic generated by the master and sent to the slave device. Please identify the opcodes used during failure sequence.

If applicable, attach the code sequence being run when device failed.

Device Register Contents

The configuration determines how the device behaves or is expected to behave under operation. Depending upon the device the number of configuration and status registers varies. Please provide the following information if applicable.

1) Device Status Register content.
2) Device Interrupt Register content
3) Device Flag Status Register

Device Package Marking

For proper device identification and tracking please provide legible pictures of the device top markings. This will help Everspin track the device Manufacture Date, location and lot codes.

Schematic connection scheme

To verify the connection scheme of the MRAM device please provide the system schematics showing the MRAM connections.

A simple inadvertent addition of a Pull-Up/Pull-Down can have extreme system performance implications.

Device X-Ray

Device X-Ray can be very beneficial If the device is exhibiting systems of a node pulled to GND or VCC.

For example, CS# pulled high, which would preclude any device Reads/Writes since the device cannot be selected. Another example is WP# pulled low. With WP# continuously active all array contents will be Write Protected negating all attempts to write to the device.

The X-Ray allows for identification of broken traces, solder bridges or cold solder joints.

Any example of a device X-Ray is shown in Figure 3 below.

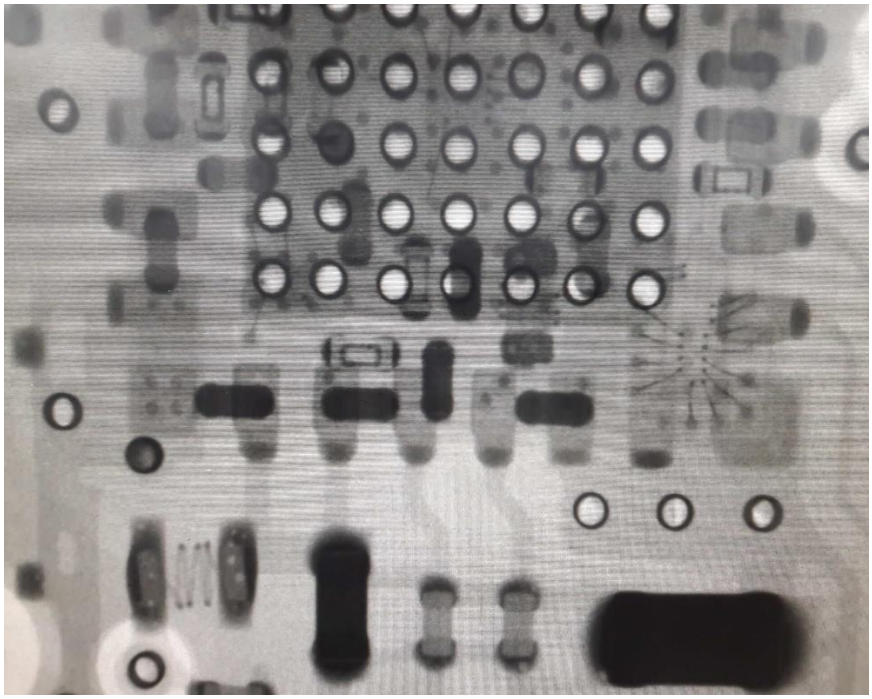

FIGURE 3 DEVICE X-RAY EXAMPLE

Device A->B->A swap

As a final debug and isolation step, a popular system to assist in identifying a faulty component is the A-B-A device swap methodology.

This method involves the below Steps:

1) Remove the suspected device A, from the initial failing system B.
2) Move device A from above to a known good system. If the failure follows component A the device is faulty.
    a. If the system with suspected device functions withing specifications the initial failure is due to system or board failure of system B.
3) As a final verification step, place a known good device in system B from step 1. If the failure is still persistent a known fault/issue is in the system B and not the device A.

Revision History

Rev	Date	Description
1.0	Nov 20, 2025	Initial Release

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