



I. SUMMARY

The MH205 is a low-side LO mixer that offers excellent dynamic range packaged in a surface mount SOIC-8 package. An offchip 6-element diplexer is required to separate the IF and RF signals. Section IV of this report details the similarities between this product and the MH1, justifying a claim of qualification by similarity.

II. SCOPE

This report justifies a qualification by similarity to the MH1. The MH205 is produced at WJ Communications' facility in Milpitas, CA and assembled in a SOIC-8 surface mount plastic package. See the [MH1 Qualification Report](#) for a description of the accelerated stress tests used in that qualification plan.

III. APPLICABLE DOCUMENTS

All the test procedures and test methods are consistent with industry standards. The standards referenced in this document are JEDEC standard 22.

IV. QUALIFICATION TEST PLAN

This section considers the items in JEDEC Standard No. 47-A: "Table 3 – Process change qualification guidelines for the selection of tests" to justify qualification of the MH205 by similarity to the MH1.

Design: The circuit topology of the MH205 is identical to that of the MH1. Circuit rerouting is minimal. Only the values of passive circuit elements have changed. The total die area dedicated to capacitive elements has increased by 12%. The largest area capacitor on the MH205 has increased in by 39% over the MH1. The LO balun is 38% larger and has 8 turns instead of 6 turns. From a reliability standpoint, these changes are negligible.

Wafer Process: Both the MH1 and MH205 utilize the same process at WJ Communications' Milpitas, California facility. The wafer dimensions are identical.

Process, Packaging and Assembly: Both the MH1 and MH205 utilize the same leadframe, wire bond material, die attach material, and molding compound. Both devices are packaged and assembled at the same qualified supplier.

For quality purposes, the MH205 was checked for ESD performance with the **Charged Device Model** (JESD22-C101-A) and **Human Body Model** (JESD22-A114). The results and methodology are discussed in Section V. Note the CDM and HBM ESD ratings are the same as that of the MH1.

V. DISCUSSION OF RESULTS

1. CDM (Charged Device Model) ESD Performance

The MH205 mixer has been classified as a **Class III** device for Charged Device Model (CDM) testing according to JEDEC Standard JESD22-C101-A.

PROCEDURE

Twenty-five units from MH205 lot RD067-1 (Wafer 14357070) were serialized and tested in a High Side MH20x fixture. The data consisted of four IP3 measurements, four CL measurements, two L-R measurements, and two L-I measurements. Each device was measured three times in an attempt to average out inaccuracies introduced by test equipment and/or fixture seating problems.

Five units were held at WJ to serve as control units. The remaining twenty units were then sent to Amkor Test Services in San Jose, California to receive the controlled CDM discharge. 5 units received a 250V charge, 5 units received a 500V charge, 5 units received a 750V charge, and 5 units received a 1000V charge. After the parts were returned, WJ again tested each unit three times each to determine the post-discharge characteristics. The five control units were also remeasured at this time to serve as a reference.

The percent change for the device before and after receiving the discharge was calculated as follows:

$$\% \text{Change} = [i \text{ AvgPre} - i \text{ AvgPost} - (\text{CU Pre} - \text{CU Post})] / \text{Typ Pre}$$

where $i \text{ AvgPre}$ = average of the three readings of unit i before receiving the discharge

$i \text{ AvgPost}$ = average of the three readings of unit i after receiving the discharge



CU Pre = average of the fifteen measurements of the five control units measured on the same calibration as unit i on the date pre-discharge data was collected

CU Post = average of the fifteen measurements of the five control units measured on the same calibration as unit i on the date post-discharge data was collected

Typ Pre= average of the 75 measurements made on the date pre-discharge data was collected

If for any unit the %Change calculated above varied by more than 10%, the unit was considered a failure. Failure of a unit implied the product would not pass at the voltage level at which the unit failed. ESD classification was granted by finding the last voltage level at which all five parts passed post-ESD RF testing.

RESULTS

All units passed ESD at all four voltage levels as described above (at 1000V, the maximum percent change was 6.5%). To find the voltage level at which the part would fail CDM ESD, 10 additional units were selected and measured as described above. 5 were exposed to a 1000V CDM charge, and 5 were exposed to a 2000V CDM charge. On this run, two of the five parts tested at 1000V failed the criteria specified above (changes of 10.2% and 19.9%). At 2000V, 3 of the 5 parts failed (average percent change of 262%).

Because the last voltage level at which all three parts passed post-ESD testing was 750V, the product receives a **Class III CDM ESD rating**.

2. HBM (Charged Device Model) ESD Performance

The MH205 mixer has been classified as a **Class 1B** device for Human Body Model (HBM) testing according to JEDEC Standard JESD22-A114.

PROCEDURE

Twenty-five units from MH205 lot RD067-1 (Wafer 14357070) were serialized and tested in a High Side MH20x fixture. The data consisted of four IP3 measurements, four CL measurements, two L-R measurements, and two L-I measurements. Each device was measured three times in an attempt to average out inaccuracies introduced by test equipment and/or fixture seating problems.

Five units were held at WJ to serve as control units. The remaining twenty units were then sent to Amkor Test Services in San Jose, California to receive the controlled HBM discharge. 5 units received a 250V charge, 5 units received a 500V charge, 5 units received a 1000V charge, and 5 units received a 2000V charge. After the parts were returned, WJ again tested each unit three times each to determine the post-discharge characteristics. The five control units were also remeasured at this time to serve as a reference.

The percent change for the device before and after receiving the discharge was calculated as follows:

$$\%Change = [i \text{ AvgPre} - i \text{ AvgPost} - (CU \text{ Pre} - CU \text{ Post})] / Typ \text{ Pre}$$

If for any unit the %Change calculated above varied by more than 10%, the unit was considered a failure. Failure of a unit implied the product would not pass at the voltage level at which the unit failed. ESD classification was granted by finding the last voltage level at which all five parts passed post-ESD RF testing.

RESULTS

The maximum % change at the passing voltage levels was 4.94%. At 1000V, three parts failed (% changes of 15.2%, 41.4%, and 42.1%). At 2000V, all five parts failed (percent changes from 33 to 124%).

Because the last voltage level at which all three parts passed post-ESD testing was 500V, the product receives a **Class 1B HBM ESD rating**.

VI. CONCLUSIONS

This report demonstrates the MH205 is qualified by similarity to the MH1.