ESD Classification of HMJ7 Devices

Summary

Device:	HMJ7	HMJ7
ESD Classification:	Class 2	Class IV
Value:	Passed up to 2000 V	Passed up to 2000 V
Test:	Human Body Model (HBM)	Charged Device Model (CDM)
Standard:	JEDEC Standard JESD22-A114	JEDEC Standard JESD22-C101

Procedure

Twenty units were serialized and RF characteristics were tested and recorded for each ESD test procedure (HBM and CDM test, 40 total). Testing included five discrete frequencies for IIP3 and conversion loss performance, six frequencies for LO-RF and LO-IF isolation, and six frequencies for spur rejection. Testing was repeated 3 times to minimize test errors. For each test group, the two control units were also tested three times to serve as a reference.

The 36 units were then sent to *Amkor Test Services* in San Jose, California to receive the controlled CDM and HBM discharges. For the CDM testing, 3 units received a 100V charge, 3 units received a 250V charge, 3 units received a 500V charge, 3 units received a 750V charge, 3 units received a 1000V charge, and 3 units received a 2000V charge. For the HBM testing, 3 units received a 250V charge, 3 units received a 500V charge, 3 units received a 1000V charge, 3 units received a 2000V charge, 3 units received a 4000V charge, and 3 units received an 8000V charge. After the respective discharges, the parts were than returned to WJ Communications to determine the post-discharge RF characteristics. The two control units for the HBM and CDM tests (4 total) were re-measured 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 AvgPre = average of the three readings of unit i before receiving the discharge
i AvgPost = average of the three readings of unit i after receiving the discharge
CU Pre = average of the six measurements of the two control units measured before the 18 units were sent out to receive the discharge
CU Post = average of the six measurements of the two control units measured on the date the 18 units were tested after receiving the discharge
Typ Pre: Average of the 60 total measurements taken on the 20 units before the test units were sent to receive the ESD discharge.

If the difference in test results varied by more than 15% between pre-discharge and post-discharge results, the parts were considered failures. If any one of the three devices failed at a given voltage level, the device was said to fail at that level. The classification level was assigned according to the last voltage level at which all three parts passed Post-ESD RF testing according to the test specifications set by WJ Communications.

Results

Failures did not occur on any devices up to 2000 V for the CDM tests, while failures only occurred on units that received an HBM-type charge of greater than 4000 V. For the HBM failures, at 4000V one part failed only one test point (IP3 degraded by 30.7%). At 8000V, all parts failed at most testpoints.