Radiation Test Report

Total Ionizing Dose Testing of the AD524 Instrument Amplifier

Stephen Buchner (*QSS Group Inc*) and Jim Forney (*Jackson & Tull*)
NASA GSFC
Greenbelt MD 20771

NASA GSFC Co^{60} Facility

July 2003

1. Introduction

Total ionizing dose (TID) testing was performed on the AD524 operational amplifier at the NASA GSFC Co^{60} test facility.

2. Parts Tested

Six AD524SD/883B instrument operational amplifiers from Analog Devices were tested. The date code was 0133 and the lot code was C86000. Figure 1 shows the functional elements of the AD524.

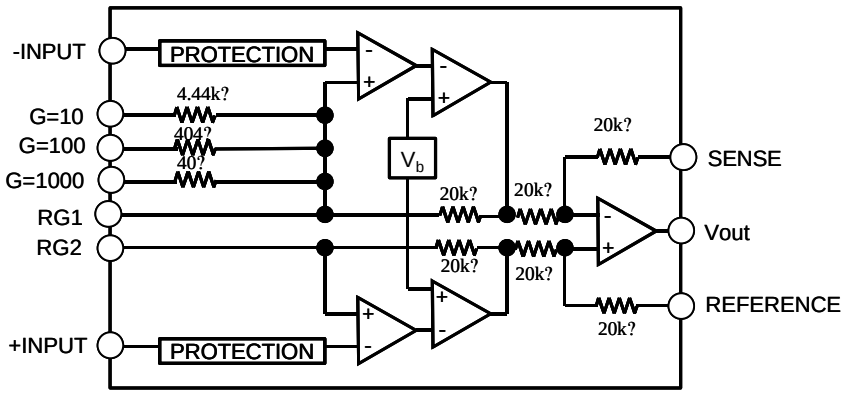

Figure 1. Functional elements of the AD524.

3. Part Configuration

All six parts were mounted in ZIF sockets attached to a board. The gain for all parts was set equal to 1. Bias of +/- 15V was used for the supply, the + input was connected to 5V and the – input was connected to ground. Both prior to and following each incremental radiation dose the parts were tested for changes in electrical parameters. Functionality was also checked after each increment in total dose.

4. Test Conditions

The parts were irradiated under bias in increments of 20 krad(Si), a dose that took approximately 12 hours to complete. Following each incremental radiation dose, the board was removed from the radiation chamber and the six parts tested. An automatic test program on a portable PC was used to control an HP4156B parameter analyzer. The input voltage was ramped from -5V to +5V while the supply currents, the input currents and the output voltage and current were measured.

5. Results

Figure 2 shows the input-offset voltage as a function of TID. The input offset voltage exceeds maximum specified value of 0.2 mV after a dose of 60 krad(Si). Figure 3 shows the output offset voltage as a function of TID. The output offset voltage exceeds the maximum specified value of 5 mV at a TID of 50 krad(Si).

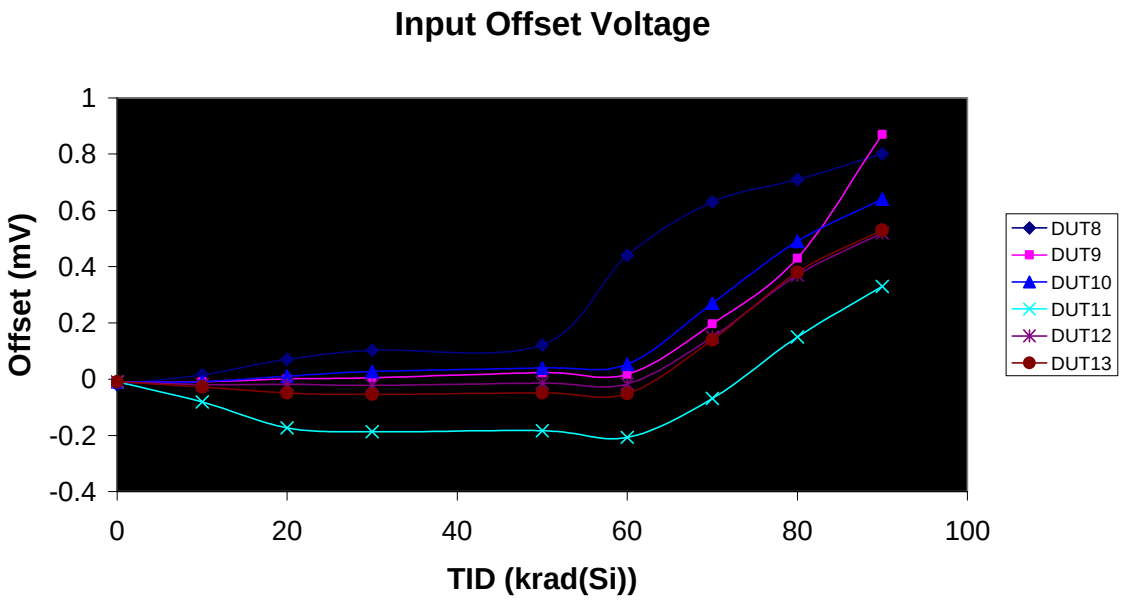

Figure 2. Input-offset voltage as a function of TID for six AD524 instrument operational amplifiers. The results show little change up to 50 krads(Si).

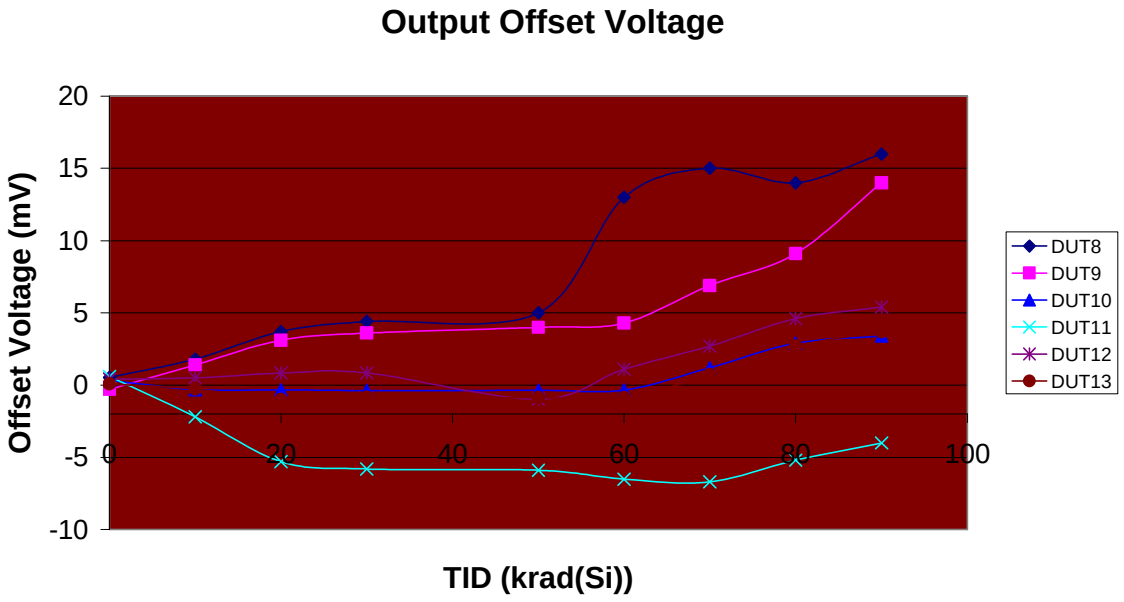

Figure 3. Output-offset voltage as a function of TID for six AD524 instrument operational amplifiers. The results show little change up to 50 krads(Si).

Figure 4 shows the positive input leakage current as a function of TID. The maximum specified input leakage current is 50 nA which is exceeded below a TIDof 10 krad(Si). Figure 5 shows the negative input leakage current as a function of TID. The maximum specified negative input leakage current is 50 nA which is exceeded below a TID of 10 krad(Si).

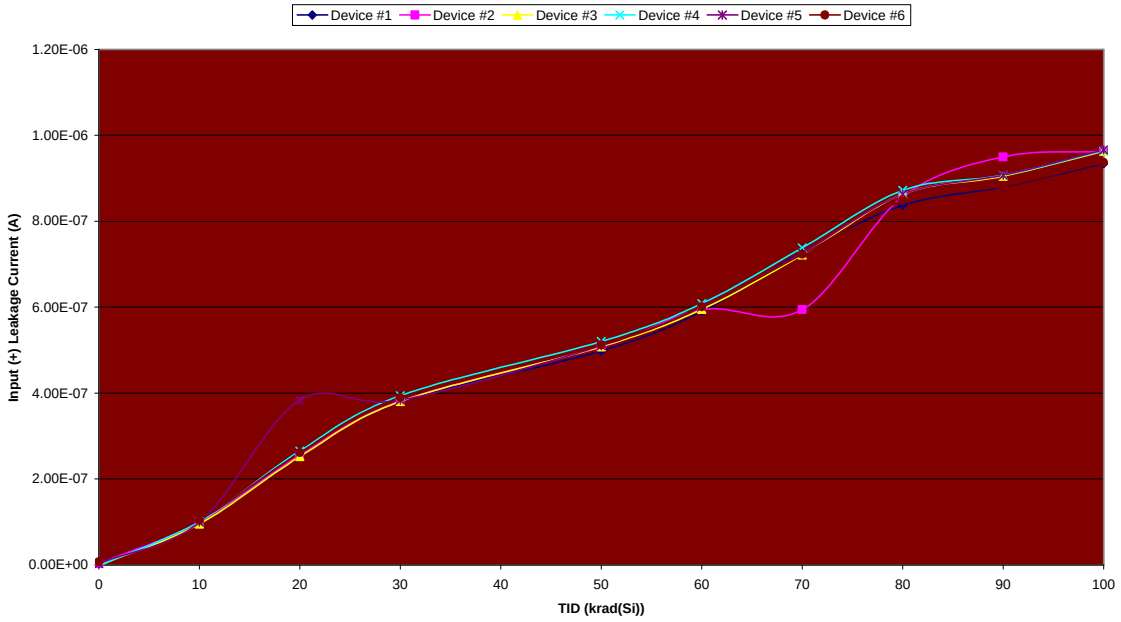

Figure 4. Positive Input Leakage Current as a function of TID for six devices.

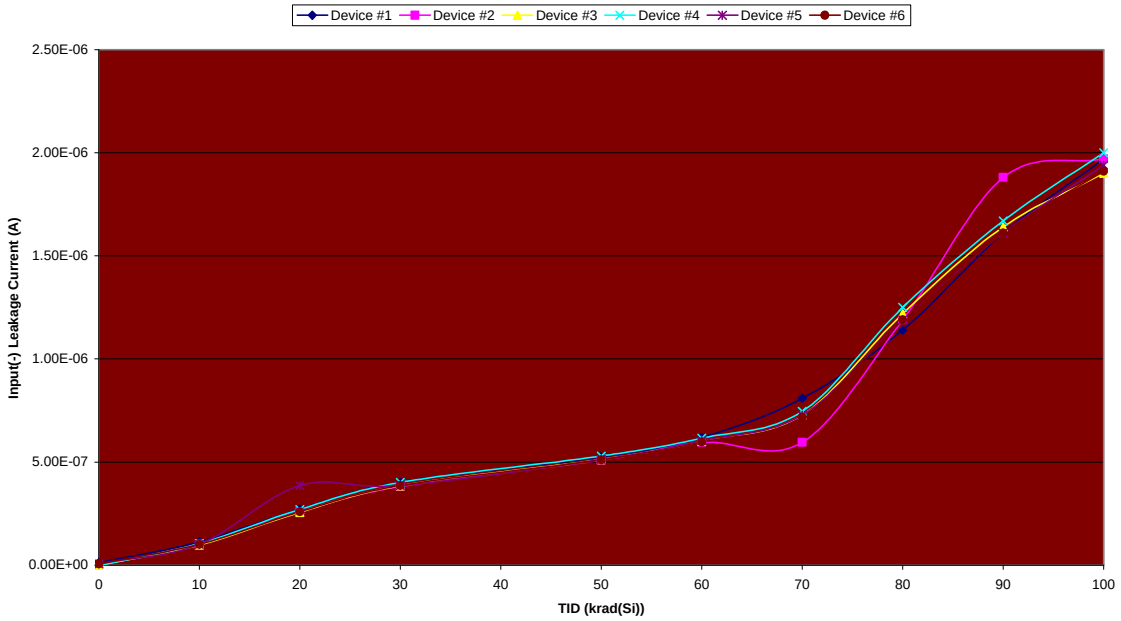

Figure 5. Negative Input Leakage current as a function of TID for six devices.

Figure 6 shows the positive supply leakage current as a function of TID. The quiescent supply leakage current never exceeds the maximum specified value of 5 mA. Figure 7 shows the negative supply leakage current as a function of TID. The quiescent negative supply leakage current never exceeds the maximum specified value of -5 mA.

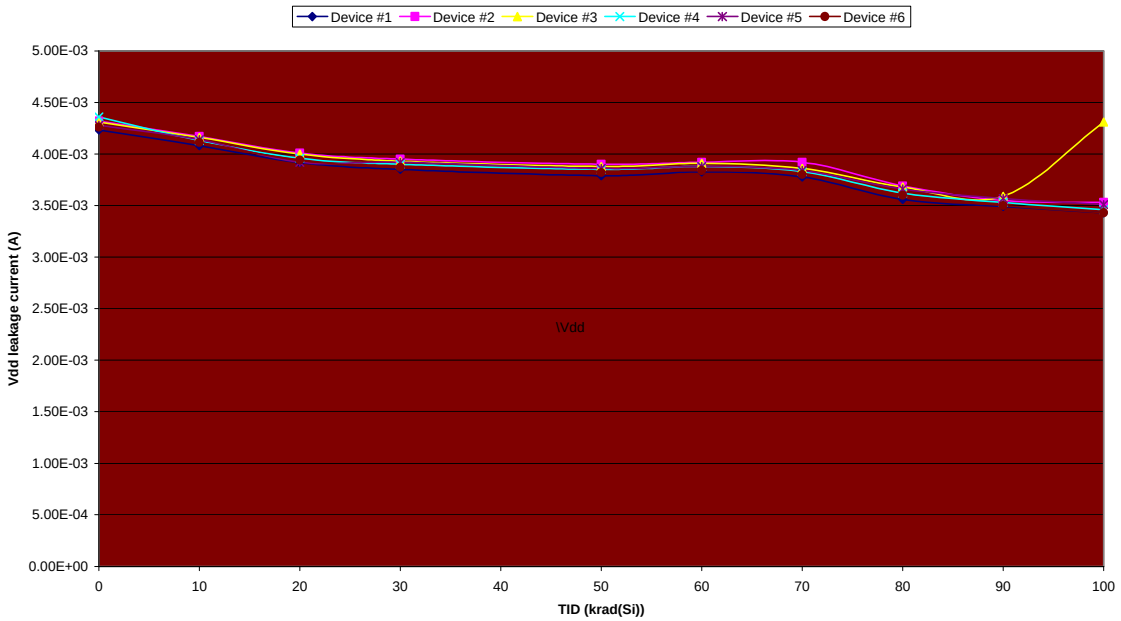

Figure 6. Positive Supply leakage current vs TID.

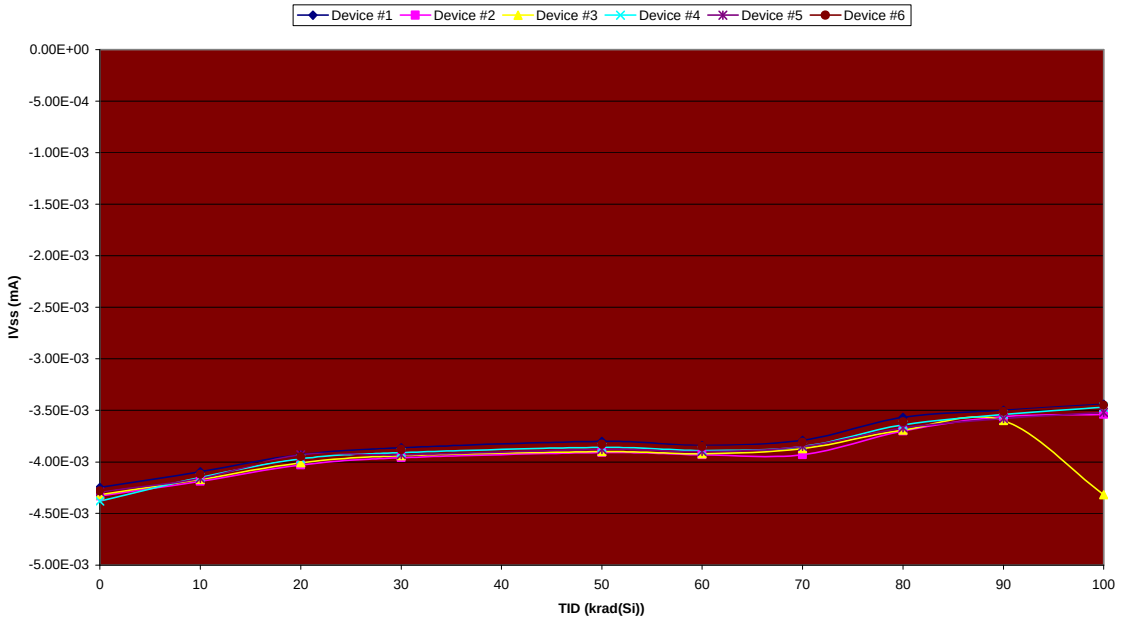

Figure 7. Negative Supply leakage current vs TID.

6. Conclusions

The AD524 meets all specifications for leakage currents and offset voltages up to a TID of 50 krad(Si) except for the input leakage current.