

## ESD / EOS Protection for GaAs MMIC Switches

Rev. V3

### Introduction

Increasing ESD protection of GaAs devices in various applications is critical to long term reliability of the final products. This application note explains how a simple two device circuit delivers protection levels of 8KV contact discharge and 15KV air discharge.

### The Circuit Components

The circuit components are both surface mount (SMT) and include one inductor (value dependant on specific application) and one Inpaq ESD protection device. In the tests performed, the EGA1 0402 V05A2 protection device was used. See the Inpaq website for complete product information. ([www.inpaq.com.tw](http://www.inpaq.com.tw))

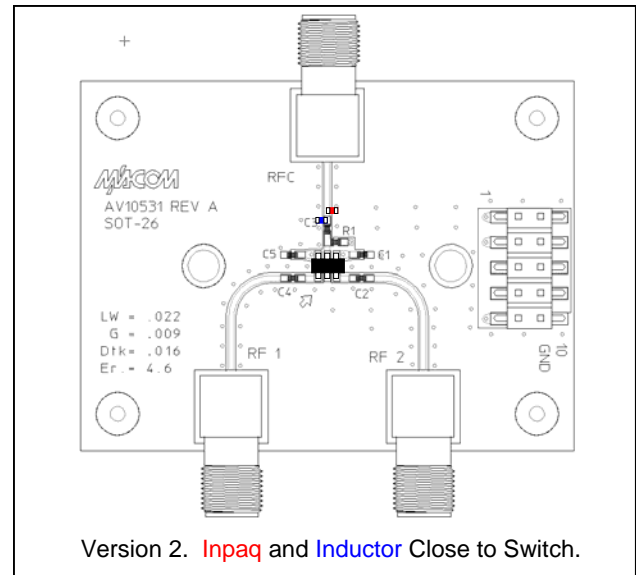
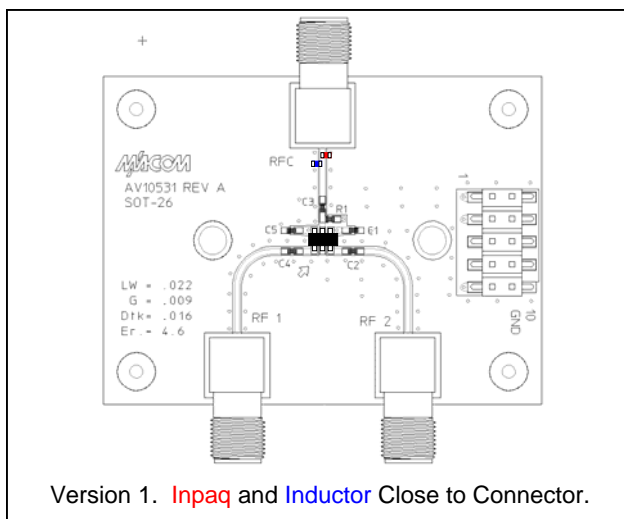
### Implementation

The level of protection provided is independent of part placement and orientation. Placement can be close to the connector port or near the device requiring protection.

The diagrams below show an example using the MASWSS0029 SPDT T/R switch.

In this example, the inductor is a 40nH Coilcraft 0402 wire wound inductor and the EGA1 0402 V05A2 from Inpaq is the ESD over voltage protector.

The inductor is shown in **Blue** and the Inpaq device is shown in **Red**. The distance change from Version 1 to Version 2 is ~0.5".



### Verification

The level of ESD protection provided was verified through a Design of Experiments. This DOE varied component placement, orientation and component type. These variations included:

- Inductor Only
- Inpaq Only
- Inpaq Closest to Connector
- Inductor Closest to Connector

### Results

Although some ESD protection resulted from using the Inpaq device and the inductor alone, both components are needed to provide adequate ESD/EOS protection.

All variations with both an inductor and the Inpaq EGA1 remained functional after ESD strikes of 8KV contact discharge and 15KV air discharge.

### Recommendation

For ESD/EOS protection, an inductor and an Inpaq EGA1 are placed in shunt along the transmission line requiring protection. The component placement is flexible, and since the Inpaq device is available in an 0402 SMT, little additional board space is required to implement this circuit.