A New Generation of RF Switching Matrix for Space Applications

Authored by
Jack Shropshire and H. Minh Tran
Teledyne Relays
Hawthorne, California, USA

CONCLUSION
Advantages of TO-5 Matrix

- Space savings
- Weight savings
- Hermetically sealed contact system
- Proven high reliability space heritage
- Lower actuation power required
- Ability to put more complex switching arrangements on single PCB
- Suitable for performance in S Band

Teledyne Relays Background

- Teledyne Relays is the original inventor of the TO-5 Electromechanical Relay
- 422 Series High Reliability TO-5 Relay has been used in space applications for 30 years
- Coaxial Switches with 30 year heritage
- RF TO-5 Relays with performance to 6 GHz
- Coaxial Switches with performance to 40 GHz

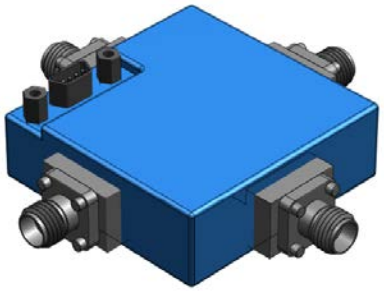



TO-5 Matrix Concept

- Use the latest generation RF relays to build switching structures on high speed laminate printed circuit boards
- Replace heavy, cable intensive, coaxial switches
- Save on weight, physical volume, and cost

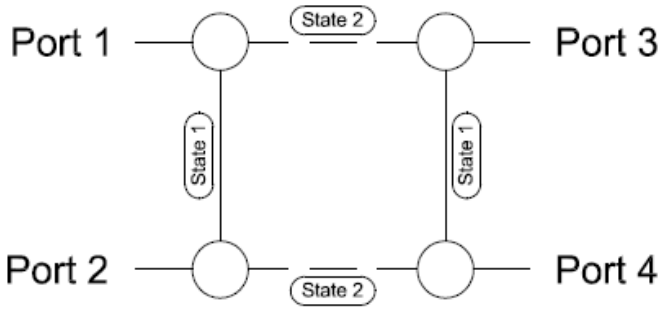
C-Switch Implementation with TO-5 Relays

Coaxial C-Switch

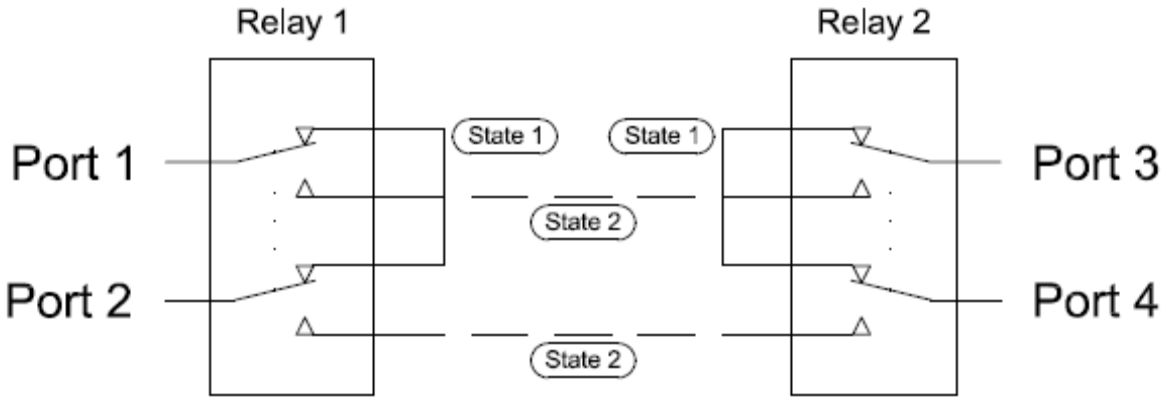


EMR Switch Matrix

C-Switch Implementation with TO-5 Relays



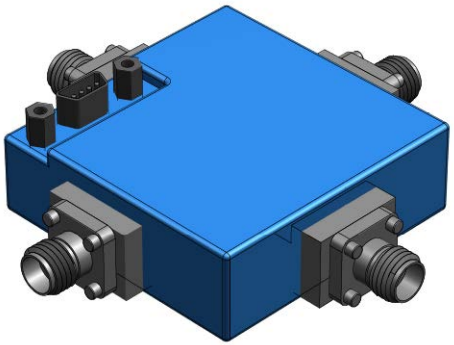
Coaxial C-Switch Schematic



DPDT Implementation

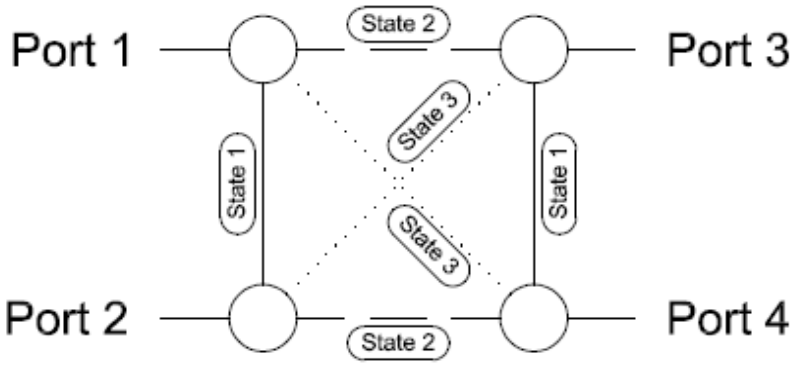
T-Switch Implementation with TO-5 Relays

Coaxial T-Switch

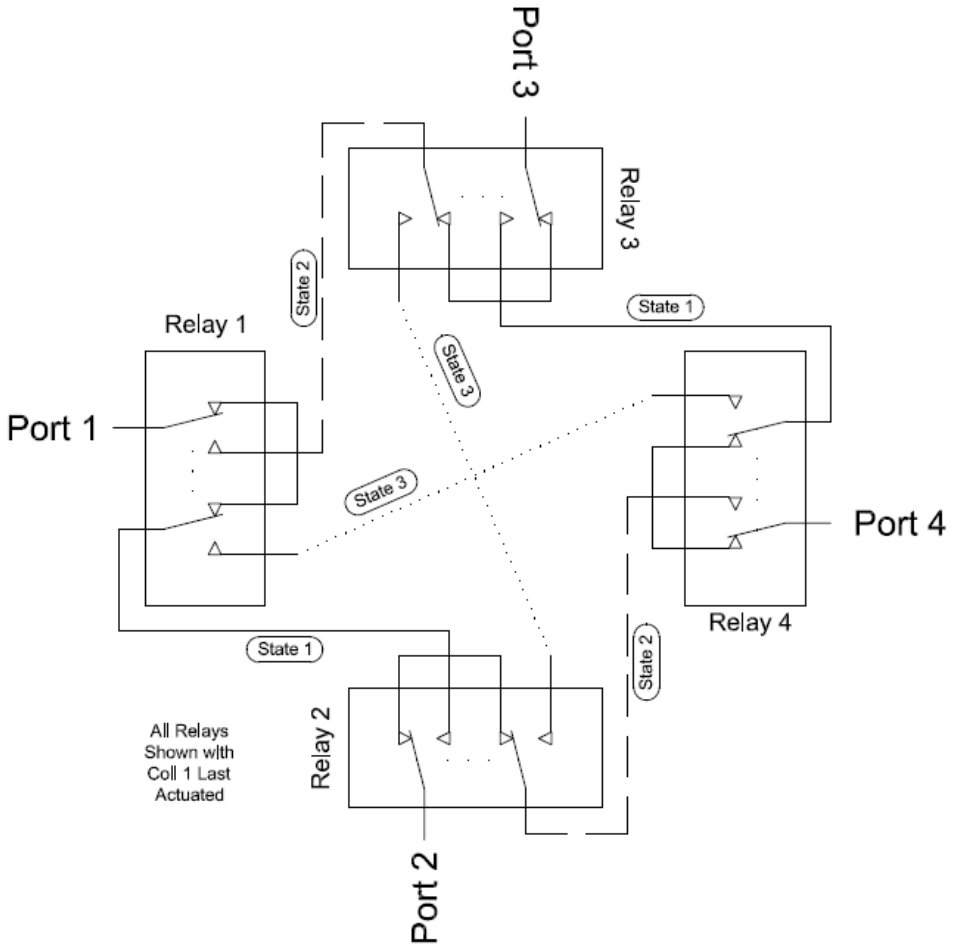


EMR Switch Matrix

T-Switch Implementation with TO-5 Relays

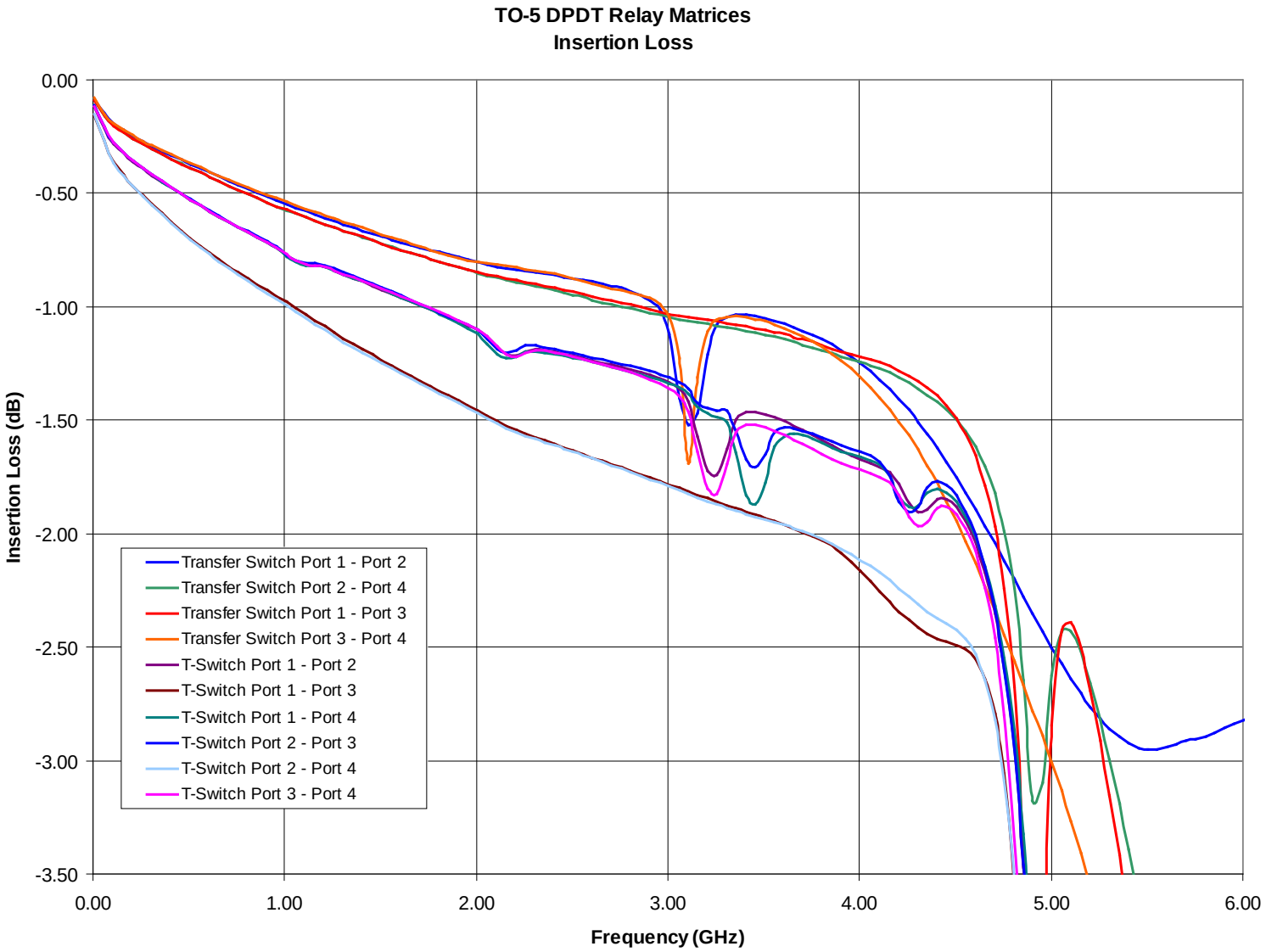


Coaxial T-Switch Schematic



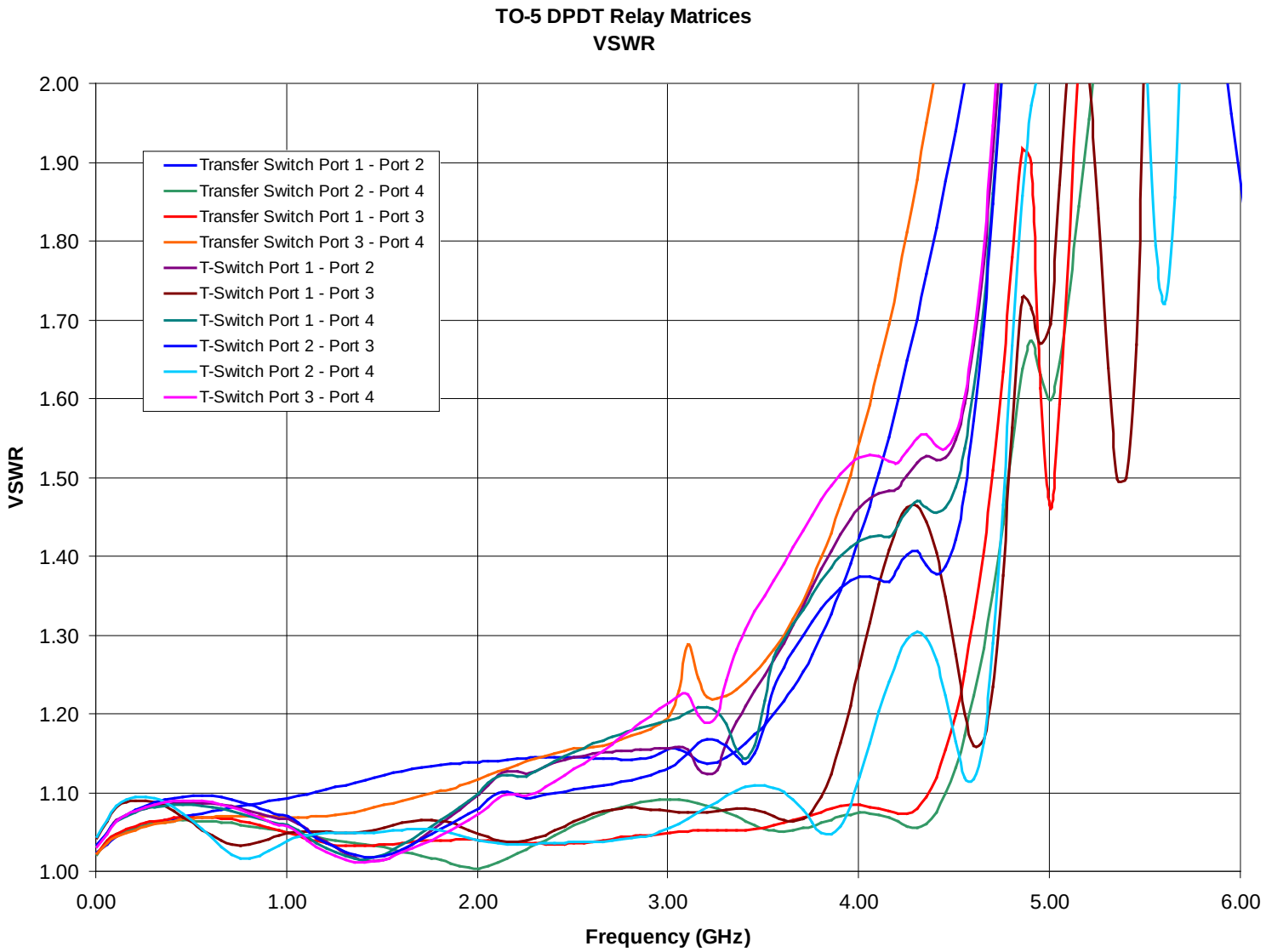
DPDT Implementation

Insertion Loss Measurements

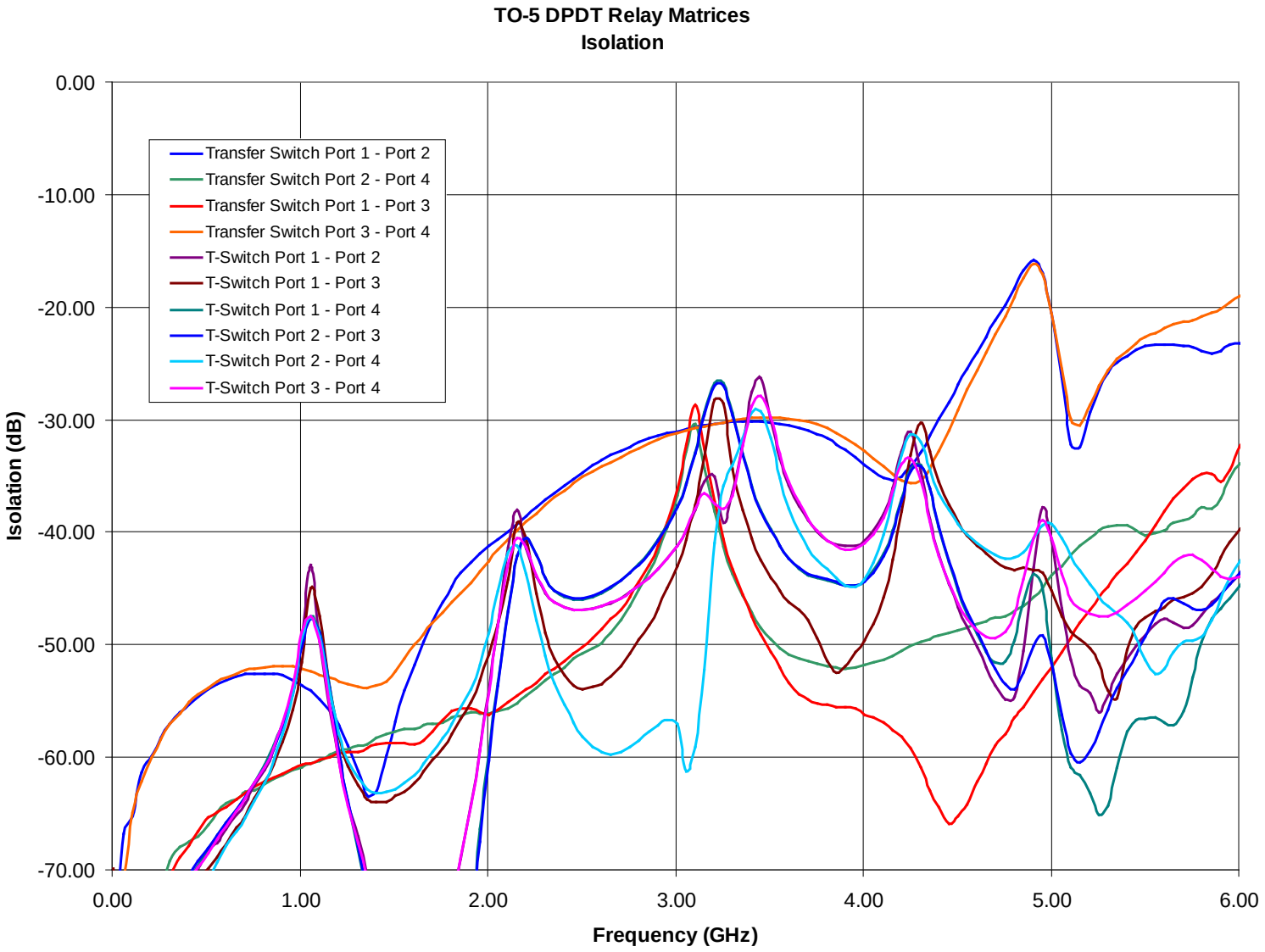


TELEDYNE RELAYS
Everywhereyoulook™

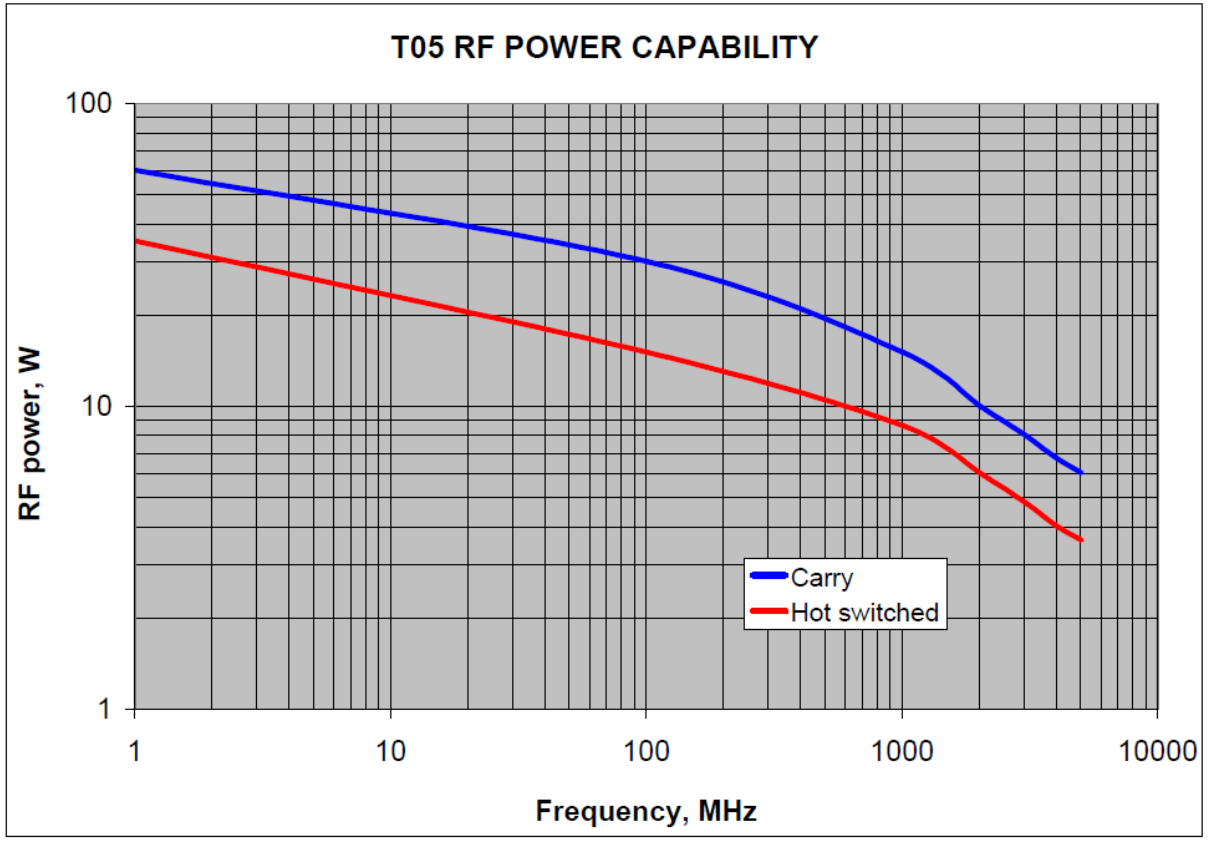
VSWR Measurements



Isolation Measurements



RF Power Handling Capability of TO-5 Relay



Disadvantages of TO-5 Matrix

- Lower frequency performance
- Narrower bandwidth
- Higher insertion loss
- Lower isolation
- Lower RF power handling capability

CONCLUSION
Advantages of TO-5 Matrix

- Space savings
- Weight savings
- Hermetically sealed contact system
- Proven high reliability space heritage
- Lower actuation power required
- Ability to put more complex switching arrangements on single PCB
- Suitable for performance in S Band

Future Improvements

- Higher frequency relays in development will push the frequency range for TO-5 matrices to C and X Bands

TELEDYNE RELAYS
Everywhereyoulook™

www.teledynerelays.com