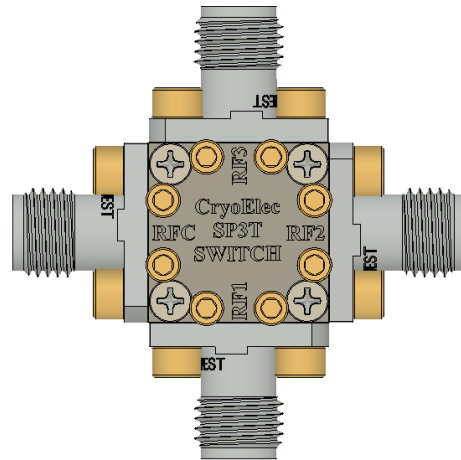


# CryoElec SP3T CryoSwitch

09/2023



SP3T SN#21



Hamdi Mani  
CryoElec LLC  
Chandler, Arizona, USA

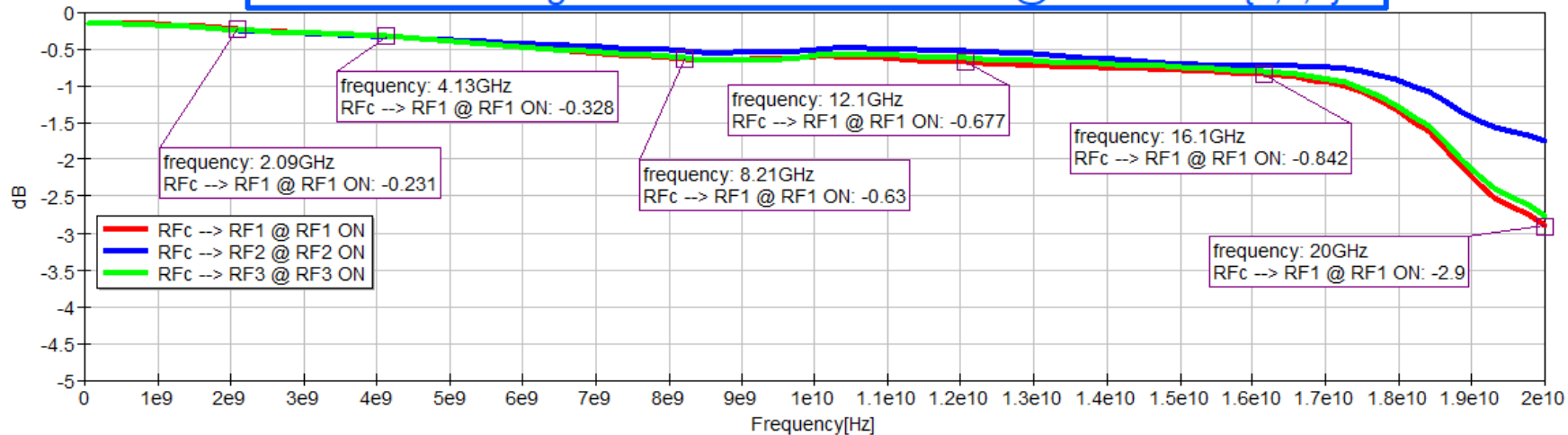
Phone: (626) 676 0143

Email: [info@CryoElec.com](mailto:info@CryoElec.com) [hamdi.mani@gmail.com](mailto:hamdi.mani@gmail.com)

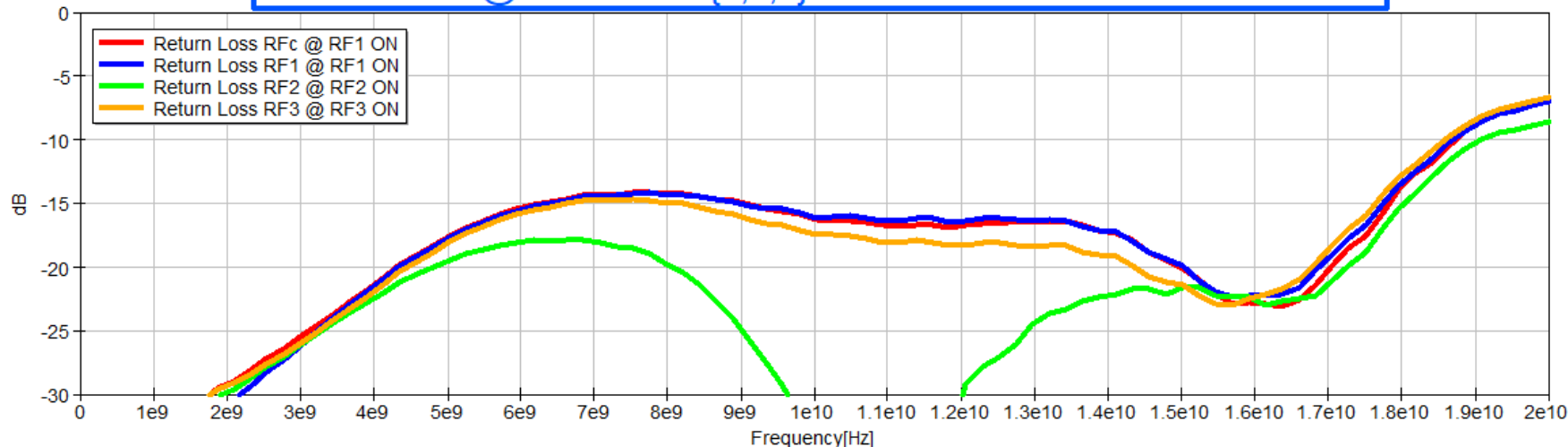
Web: [www.CryoElec.com](http://www.CryoElec.com)

# SP3T CryoSwitch: Insertion & Return Loss @ 300 Kelvin

CryoElec SP3T CryoSwitch SN#21 Insertion Loss @ 300 Kelvin  
 Transmission through 3 Channels: RFc --> RFn @RFn ON n={1,2,3}

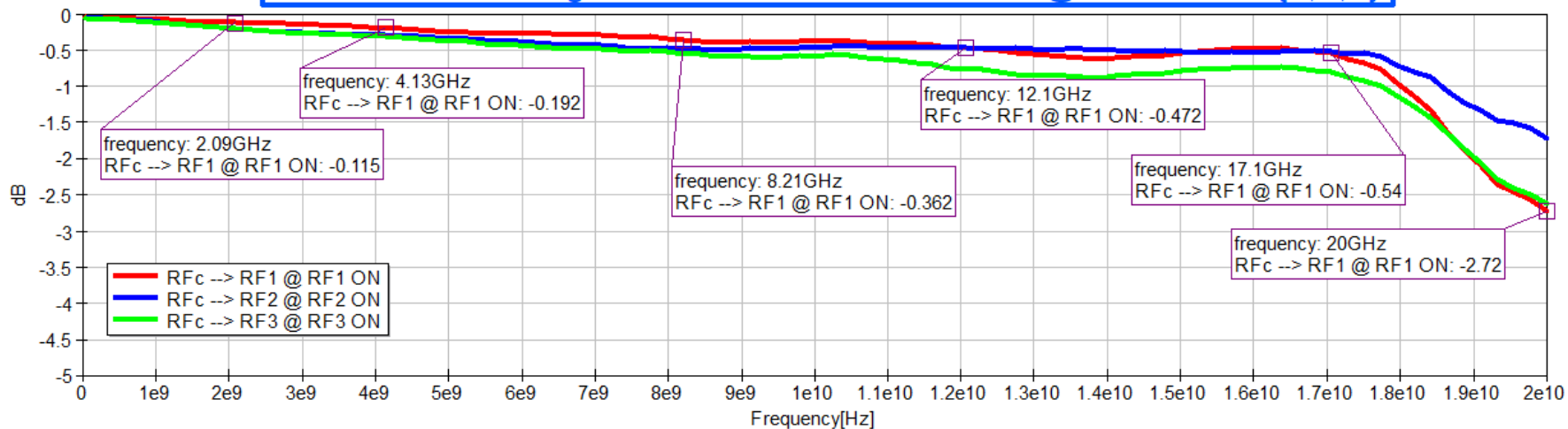


CryoElec SP3T CryoSwitch SN#21 Return Loss @ 300 Kelvin  
 Return Loss @RFn ON n={1,2,3}

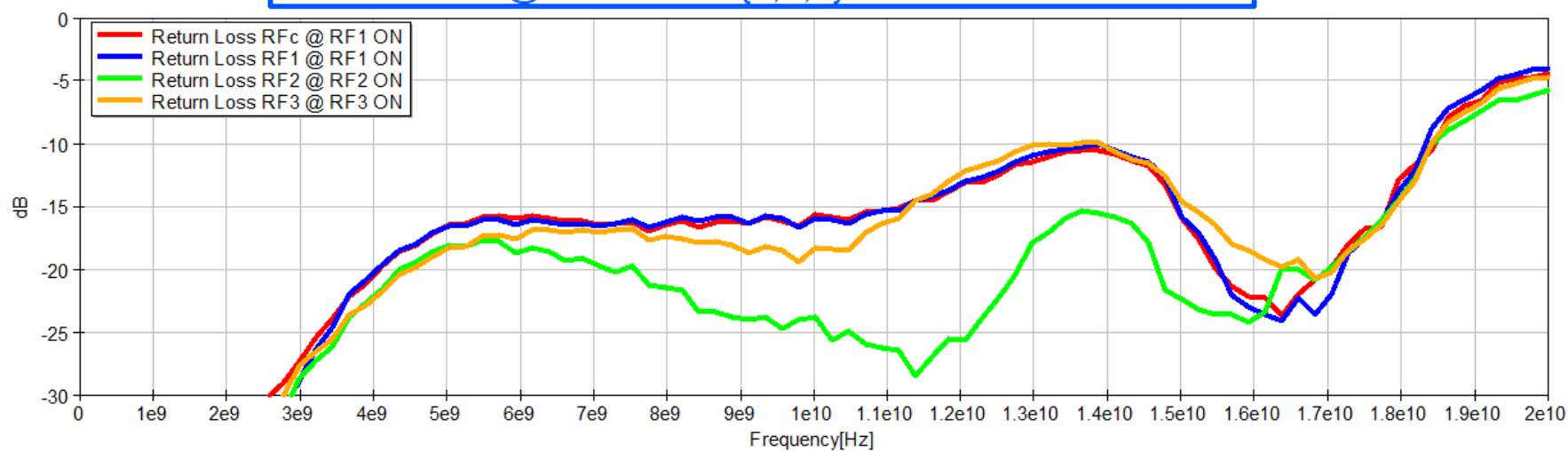


# SP3T CryoSwitch: Insertion & Return Loss @ 15 Kelvin

CryoElec SP3T CryoSwitch SN#21 Insertion Loss @ 15 Kelvin  
 Transmission through 3 Channels: RFc --> RFn @RFn ON n={1,2,3}

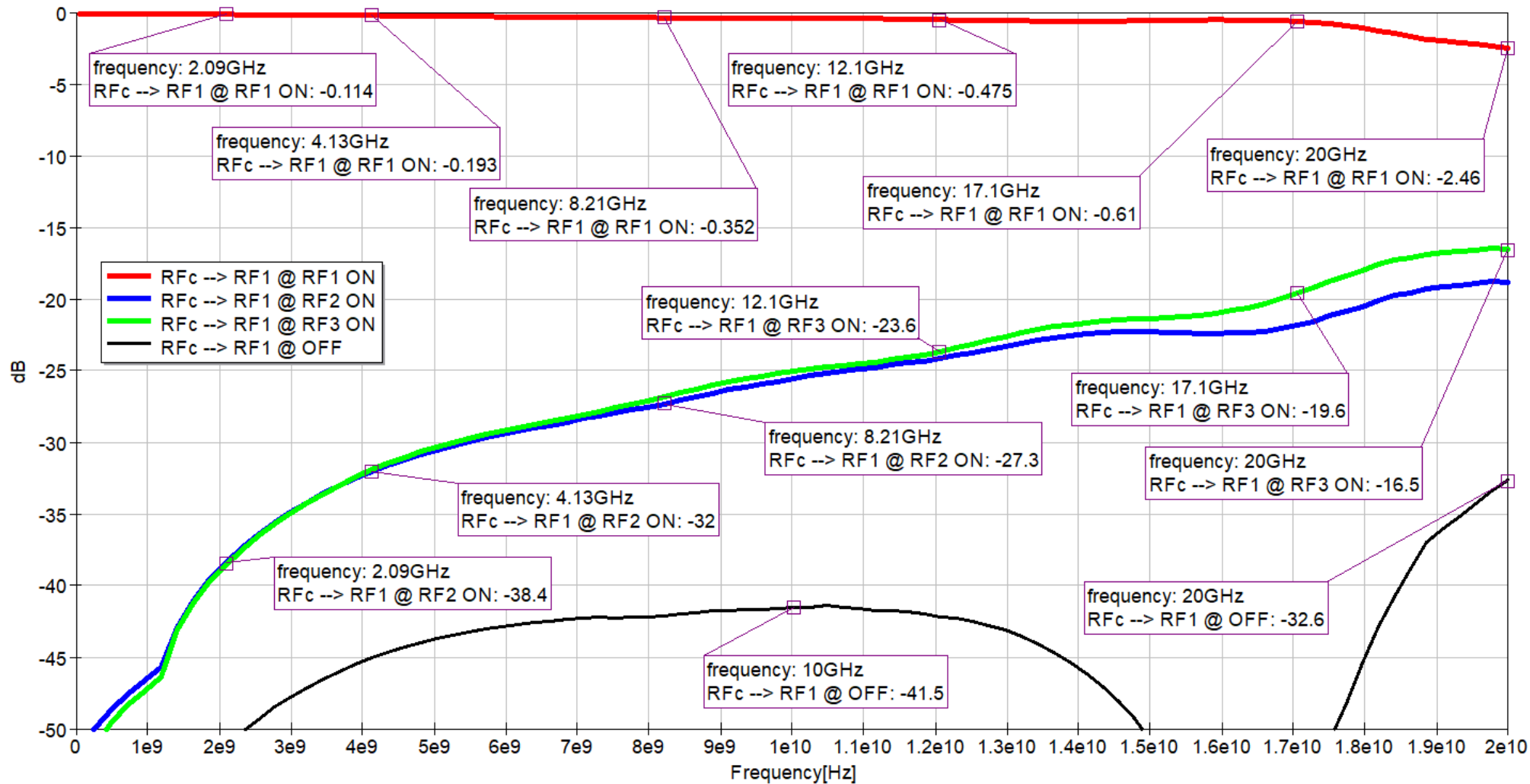


CryoElec SP3T CryoSwitch SN#21 Return Loss @ 15 Kelvin  
 Return Loss @RFn ON n={1,2,3}



# SP3T CryoSwitch: Insertion Loss and Isolation @ 15 Kelvin

CryoElec SP3T CryoSwitch SN#21 Insertion Loss @ 15 Kelvin  
 Transmission: RFc --> RF1 @ RFn ON n={1,2,3}

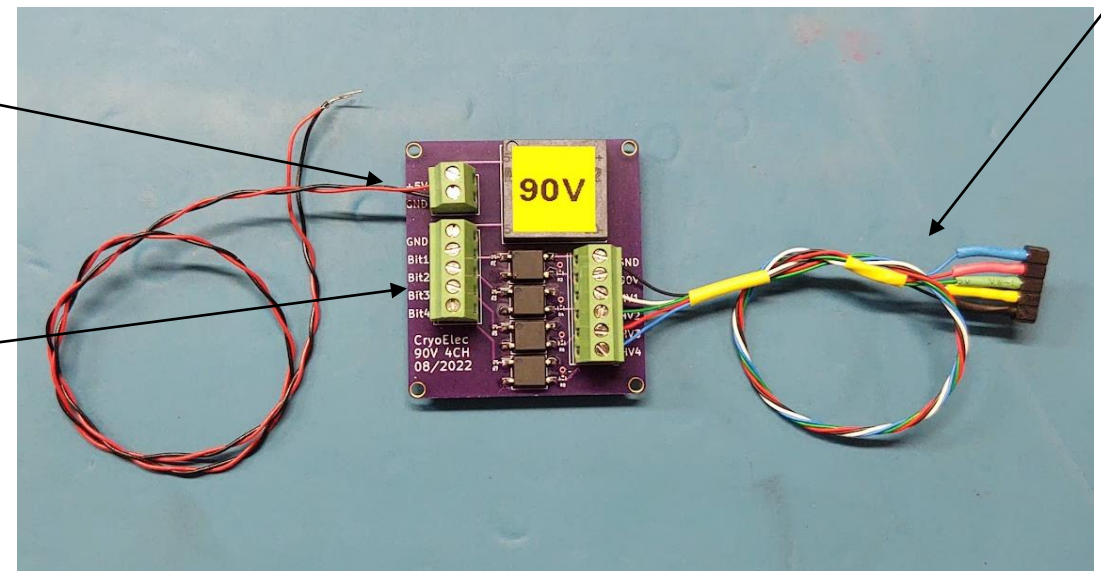


# SP3T CryoSwitch: 90V Control Board and Truth Table

## +5V TO +90V Switch Control Board

+5V DC Input  
(@ 150mA)

Digital Control Bits:  
Connect To digital  
Outputs (5V TTL) of  
A DAQ (Labjack ,  
Arduino,Rpi...)



90V output lines:  
Connect to Switch  
GND, VG1 to VG4



HIGH VOLTAGE

**Warning: 90V High Voltage**  
**Do Not touch**

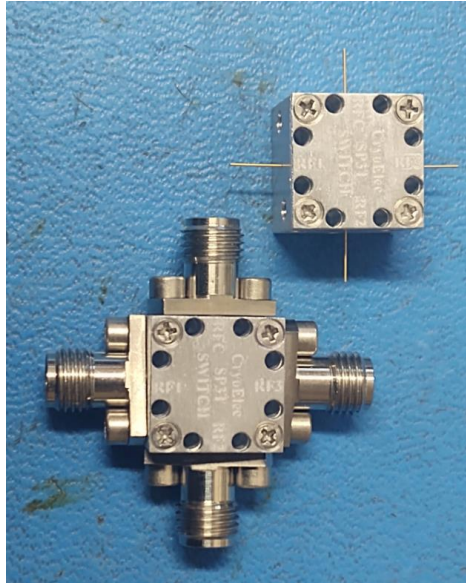
- HVn Enable/Turned “ON” when Bitn “HIGH” (3.3V -5V) n={1,2,3}
- Current drawn by each 90V HV line connected to Switch < 10nA
- “OFF” state: 0V: connects to GND ( do not Float)
- HV Channels optically isolated from digital control Bits
- Current drawn by controller:
  - 43mA @ 5V (All Channels OFF)
  - 50mA @ 5V (ONE Channel ON – 2x 90V gates ON)
- Recommended: Set compliance current (Max Current) to 150mA for 5V supply

CryoElec SP3T Switch Truth Table						
Controller Input Wire		Controller Output Wire		RFc-->RF1	RFc-->RF2	RFc-->RF3
Wire Color	Function	Wire Color	Function			
White	Cbit1	White	VG1	1	1	1
Green	Cbit2	Green	VG2	1	0	0
Red	Cbit3	Red	VG3	0	1	0
Blue	Cbit4	Blue	VG4	0	0	1
Black	GND	Black	GND			

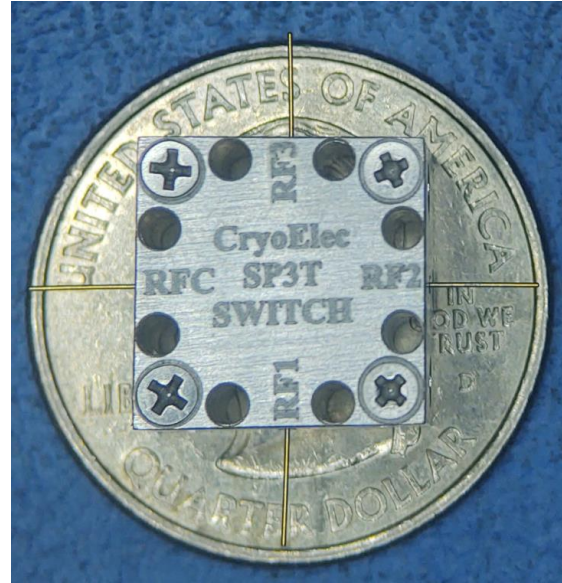
Logic 1 90V Applied Voltage

# SP3T CryoSwitch: Photos of Package

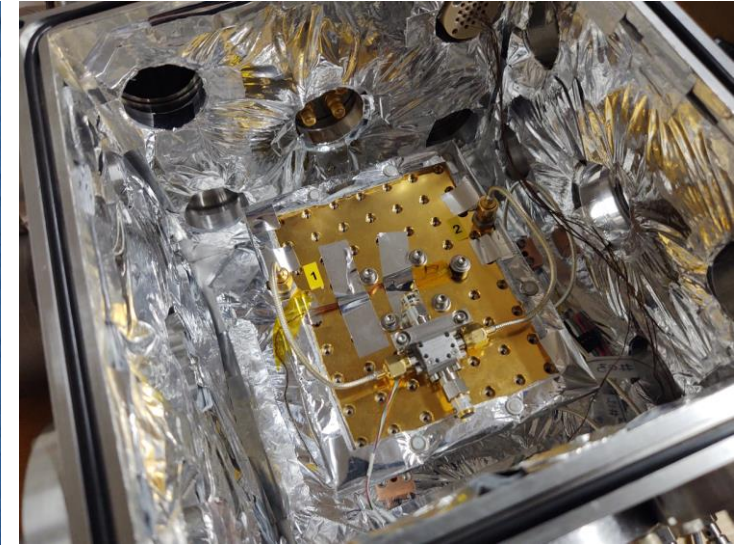
Prototype



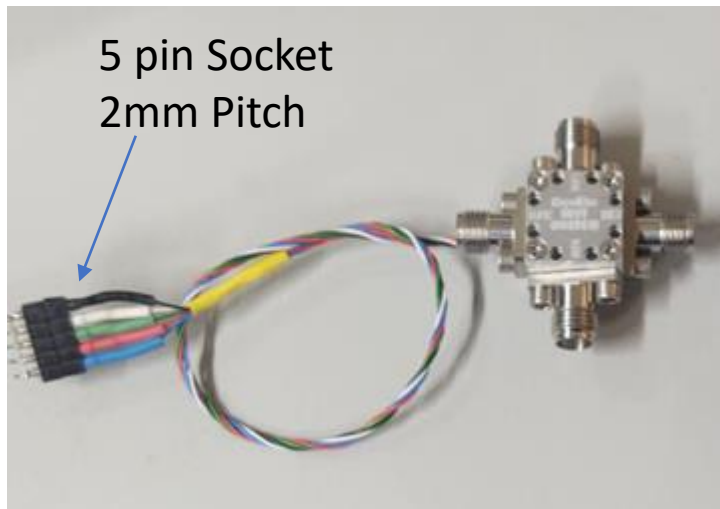
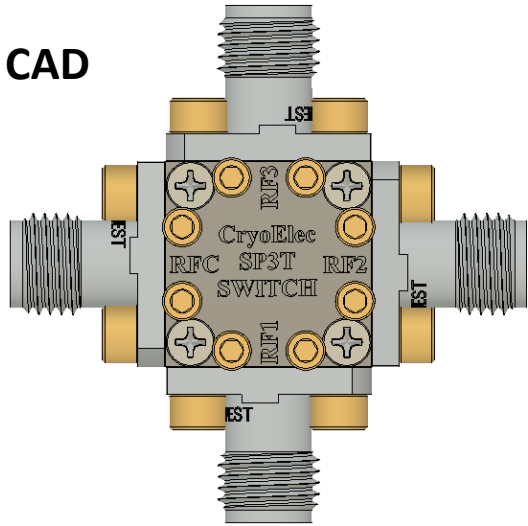
“Drop-in” Package  
 Can be soldered to PCBs



Inside the 15K Cryogenic system  
 At CryoElec Arizona



CAD



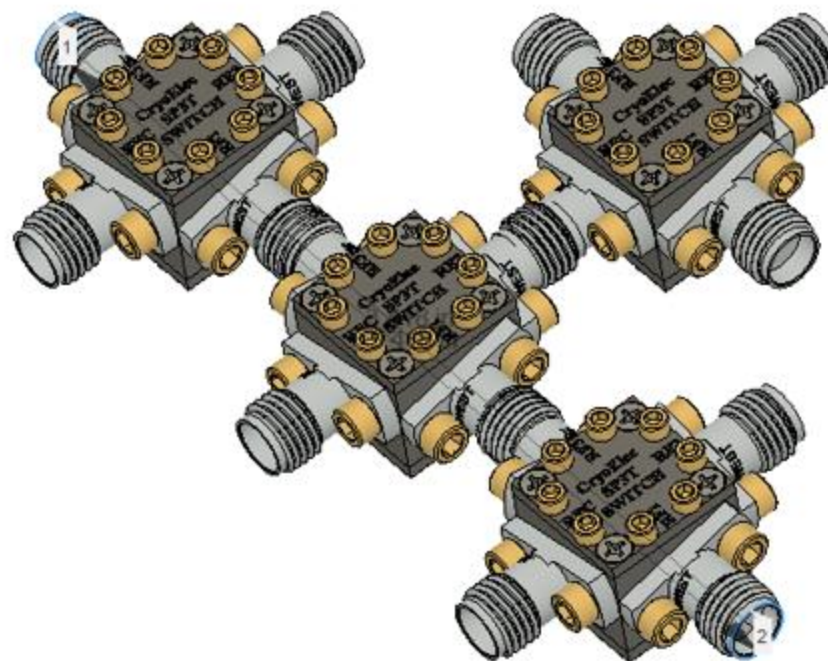
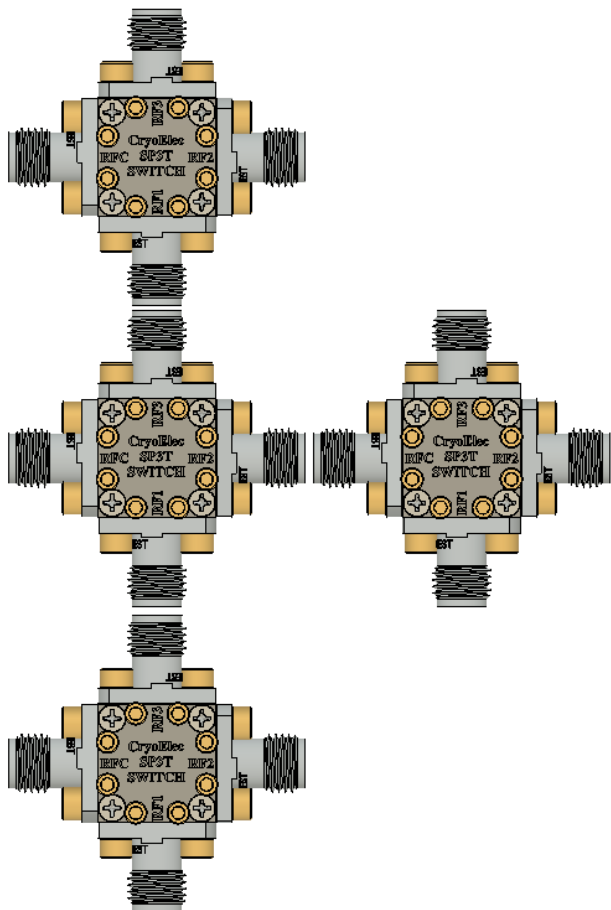
5 pin Socket  
 2mm Pitch

**Low Loss SP3T Miniature Cryogenic Switch**  
**Size: 0.5 x 0.5 x 0.5 in (not including SMAs)**

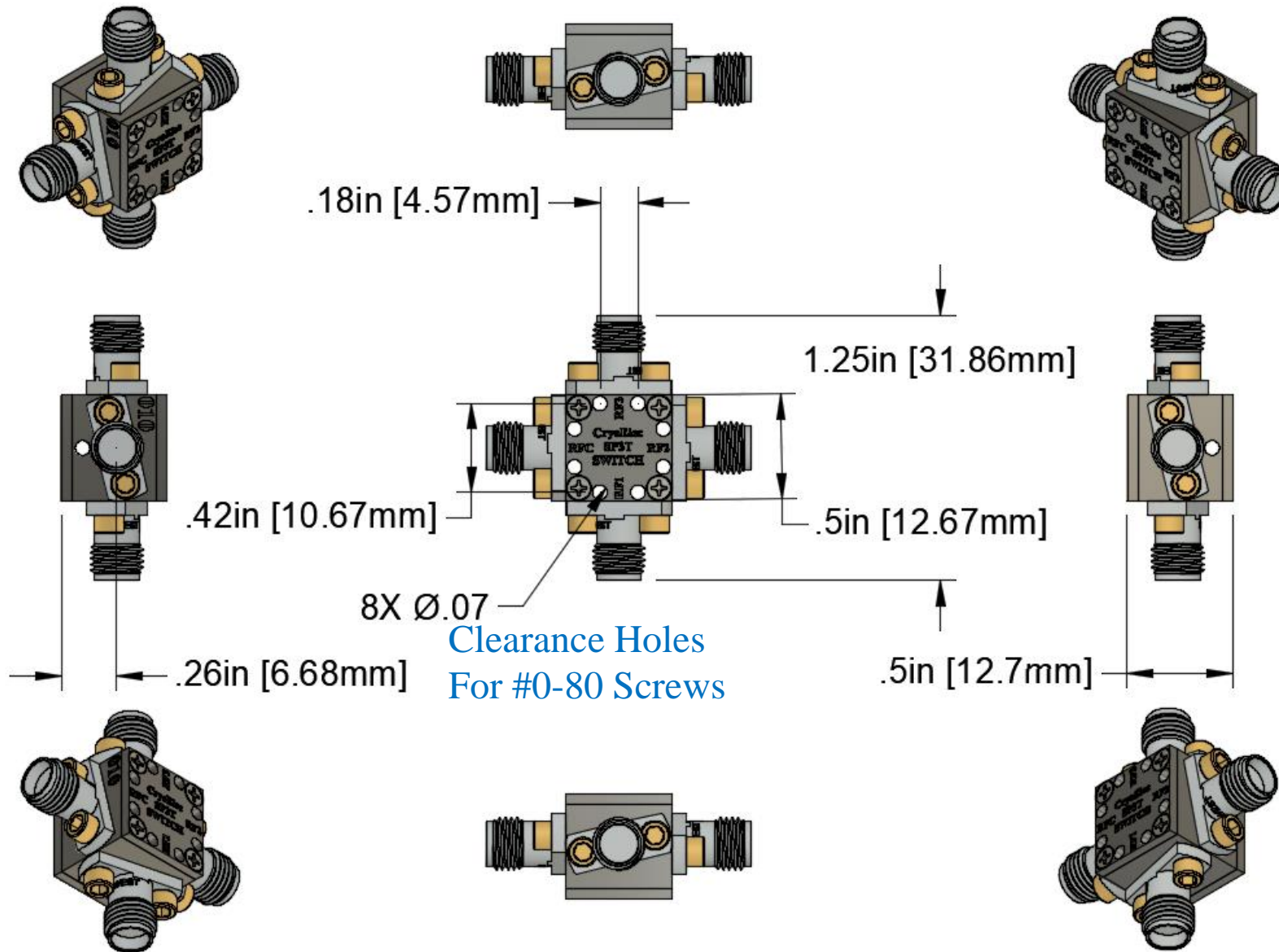
- Many Switch units cooled many times to 13K
- Some units cooled to 50mK
- Works reliably / Repeatable performance
- Loss is very low
- Very low power dissipation (<1uW)
- The 3 paths are symmetric ( have same loss/electrical length)

# SP3T CryoSwitch: Combining 3 x SP3T

SP6T and SP9T Switches can be made by combining 3x or 4x individual SP3T Switches



# SP3T CryoSwitch: Mechanical Drawing







## *Contact Information*

Hamdi Mani  
Engineer  
CryoElec LLC

Chandler, Arizona 85225  
Phone: 626-676-0143

[www.CryoElec.com](http://www.CryoElec.com)

[Info@CryoElec.com](mailto:Info@CryoElec.com)

[Hamdi.mani@gmail.com](mailto:Hamdi.mani@gmail.com)