

AS9100 and ISO 9001 DOD Facility Security (Secret) Ventura California, USA



Your Switch Solutions

Dow-Key Organization

▶ Space Qualified Switches

- Switches
- Switch Assemblies

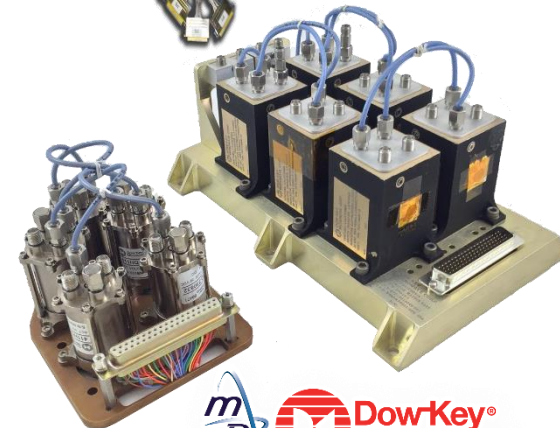
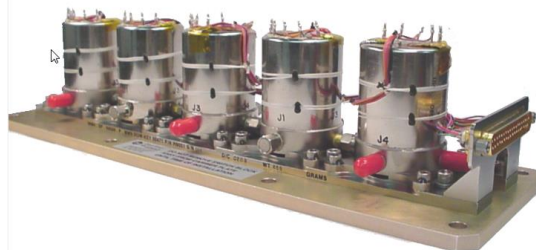


▶ Switching Systems

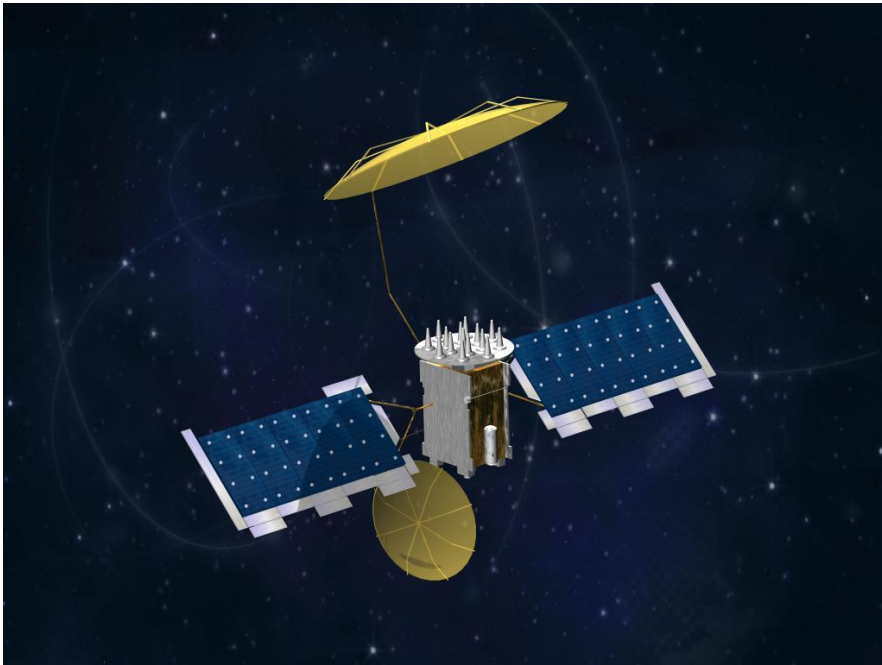
- Solid State Matrix Systems from HF to S-Band
- Electromechanical Matrix Systems from DC to 40GHz
- Custom Solutions and Full Integration

▶ Switches

- Electromechanical Coaxial Switches from DC to 40GHz
- Miniaturized PCB Mounted Switches
- Waveguide Switches up to 70GHz

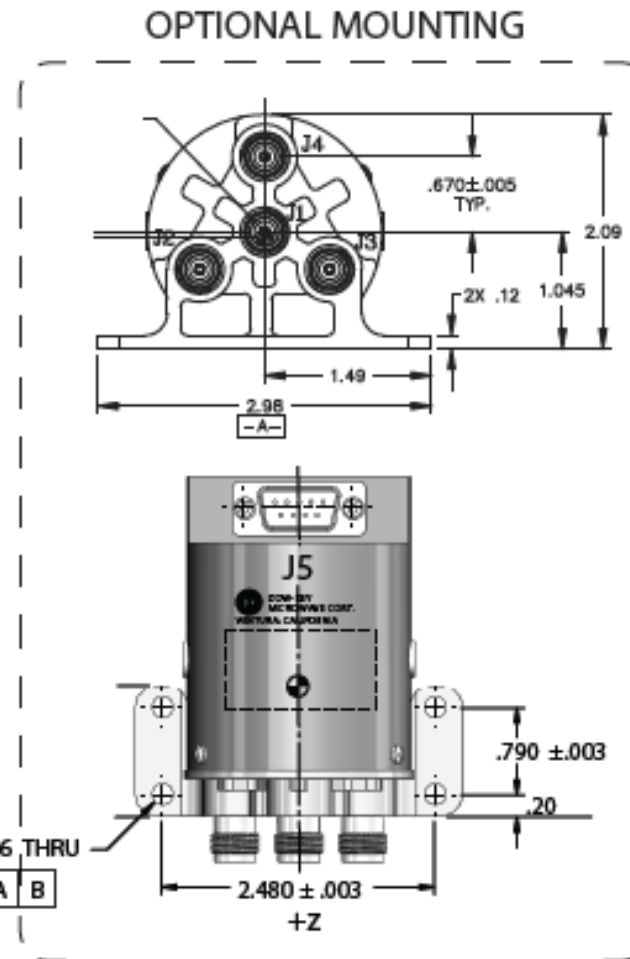
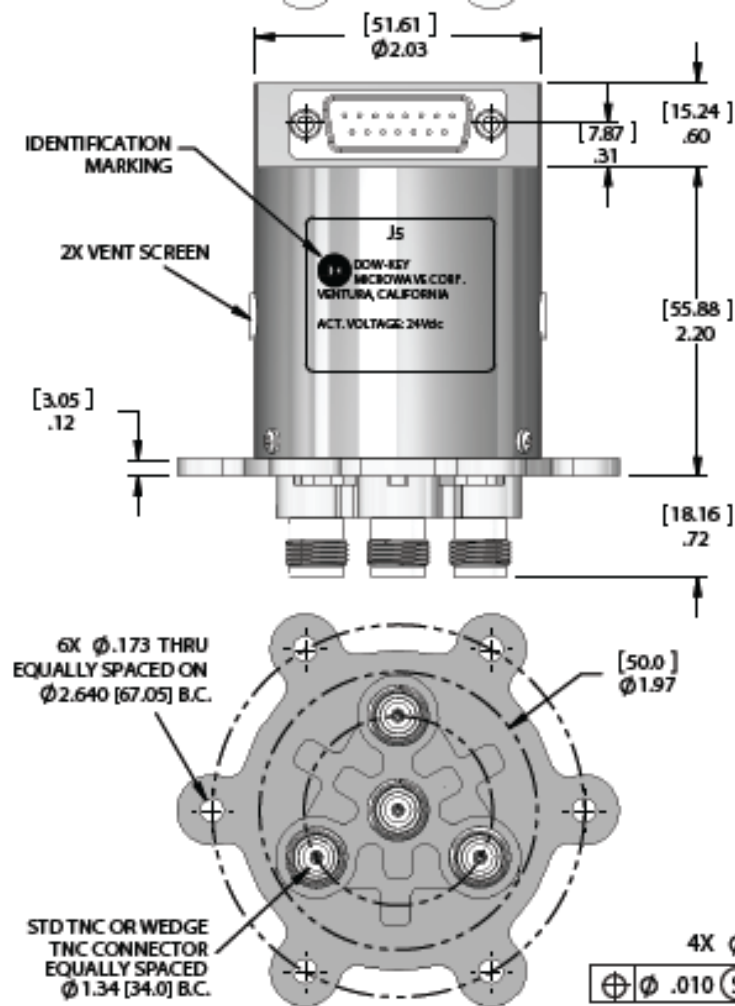


High Power T- Switch

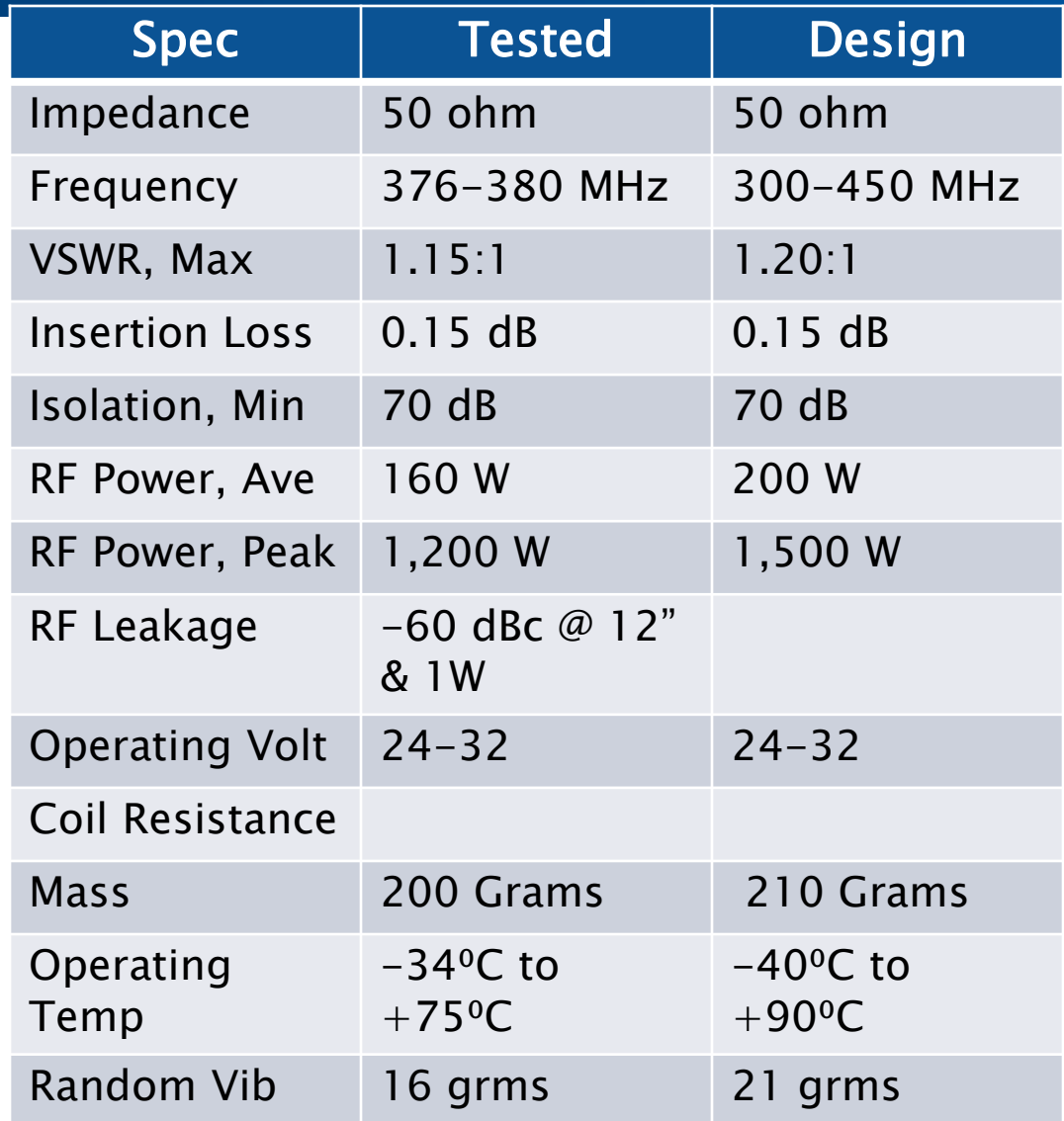


**MUOS (Delivered: 100+
INSAT (Delivered: 60+
G-SAT (Delivered: 30
TDRS-K (Delivered: 6
TDRS-L (Delivered: 4
TDRS-M (Delivered: 4
TDRS- N (Delivered:6
WGS.1 (Delivered: 8
WGS.2 (Delivered: 8
AMOS 5/6 (Delivered 8
BIOMASS (Delivered: 9**

High Power T-Switch



MUOS, 105 DELIVERED



High Power T-Switch Test History



Specifications	INSAT	G-SAT	TDRS
Frequency	1,900 MHz	260 MHz	2,100 MHz
VSWR	1.12:1	1.05:1	1.15:1
Insertion Loss	0.12 dB	0.05 dB	0.12 dB
Isolation	65 dB	75 dB	65 dB
RF Power, Ave	30 W	500 W	72.5
RF Power, Peak	270 W	500 W	296
RF Leakage	-60 dBc	-90 dBc	-60 dBC
Operating V dc	28-43	26-44	23-40
Coil Resistance			
Mass	210	210	200
Operating Temp	-25°C to +85°C	-40°C to +85°C	-19°C to +75°C
Random Vib	17 grms	17 grms	16 grms
Shock			

RF Power Capability-Test History

Program	Switch Description	Program Tested Frequency (MHz)	RF Power Handling Tested	Multipaction Tested	Indicator Contacts	Operating Voltage (VDC)	Tested Temp (°C)	Switch Time @ Cold (mS)	Switch Time @ Hot (mS)	Random Vibration levels Tested (G rms)	Sine Vibration levels Tested	Shield Effectiveness Tested	Pyrotechnic Shock Tested	Actuations Tested
INSAT III	T-Switch with indicator contacts, D connector	1,900-2,300	140 W	380 W	Yes	26-44	-25 to +75	8.4	10-.5	24.4	Not Req'd	Not Req'd	1,000g	100,000
MUOS	T-Switch with indicator contacts, D connector	360-380	180 W	1,500 W	Yes	25.8-32.3	-34 to +91	6.0	11	24.4	① See Plots sheet 2	-90.68dBm @ 370 MHz	② See Plots, sheet 2	200,000
GSAT	T-Switch with indicator contacts, D connector	240-280	180 W	720 W	Yes	26-44	-25 to +75	8.5	10.5	18.44	Not Req'd	-90 dB	100-600 Hz: 15 dB/oct 600-5000 Hz: 700g 5000-10000 Hz: -6 dB/oct	50,000
TDRS	T-Switch with indicator contacts, D connector	2,200-2,300	140 W	380mW	Yes	23-40	-19 to +75	9.0	10.5	18.94	Not Req'd	85 dBuV/m	Not Req'd	300,000
WGS	T-Switch with indicator contacts, D connector	Classified	Classified	Classified	Yes	23-40	-9 to +87	9.9	10.9	12.19	Not Req'd	-98dB	Not Req'd	100,000
NDA in Place	T-Switch with indicator contacts, D connector	4,200-4,800	85 W	340 W	No	21-28	-40 to +80	6.0	10.8	20.3	Not Req'd	N/A	Not Req'd	100,000
Biomass	T-Switch with indicator contacts, micro-D connector	432-438	210 W	1,063 W	Yes	18-35	-30 to +60	9.2	11.8	30.85	5-20Hz: max amp. 20-125Hz: 24g @ 20ct/min	105dBi	100 Hz: 30g 1600 Hz: 2000g 10000 Hz: 2000g	100,000

GLONASS, SAOCOM, MKV

>200 delivered



Spec	Qualified
Impedance	50 ohm
Frequency (GHz)	1.6-4.0
VSWR, Max	1.15:1
Insertion Loss	0.15 dB
Isolation, Min	70 dB
RF Power, Ave	100 W
RF Power, Peak	158 W @ 1.6 GHz
Operating Volt	24-32
Mass	100 Grams
Operating Temp	-30°C to +55°C
Random Vibration	16 G rms

GPS III & GLONASS

>200 DELIVERED



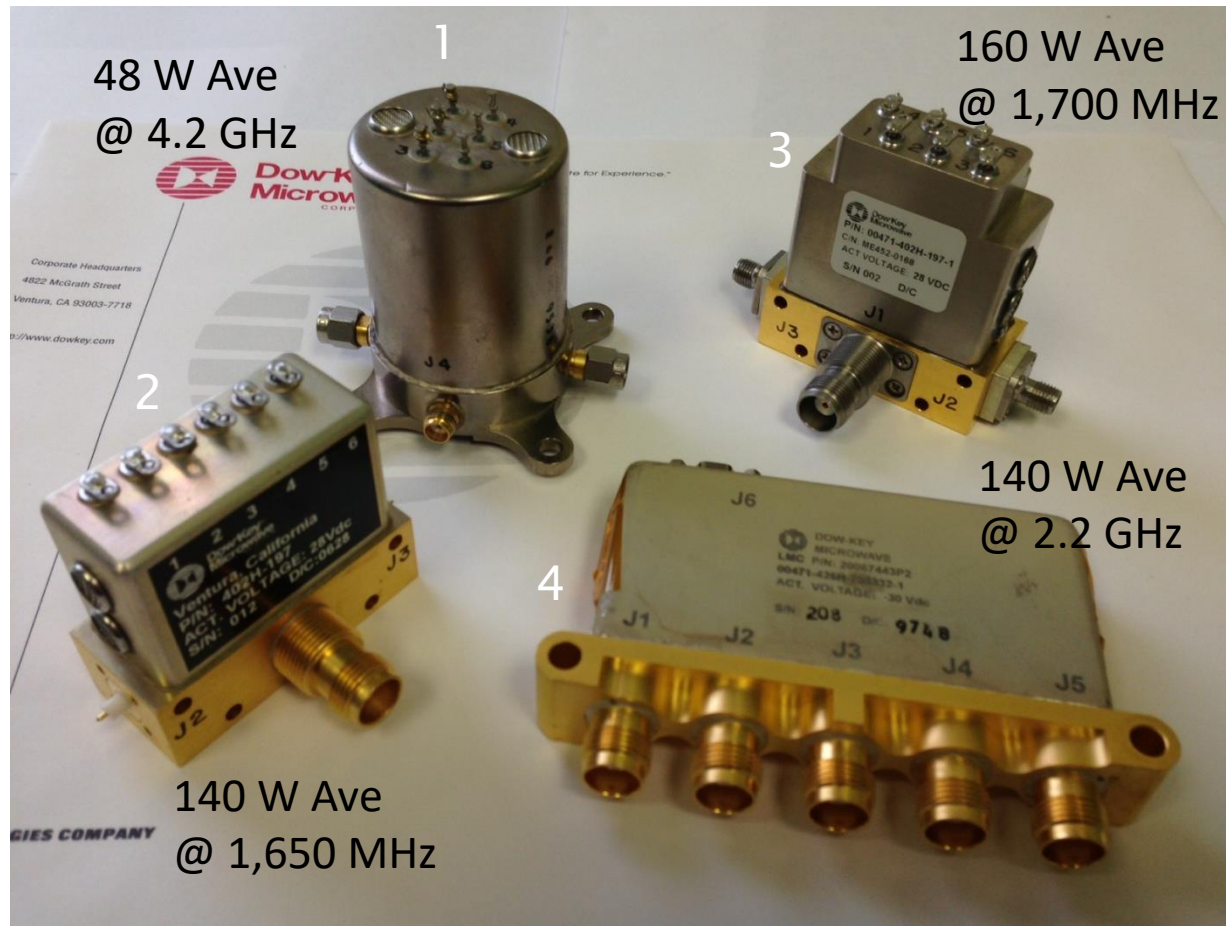
Specification	Tested	Tested
Impedance	50 ohm	50 ohm
Frequency, MHz	250 to 350	1,000 to 1,750
VSWR, Max	1.15:1	1.15:1
Insertion Loss	0.01 dB	0.11 dB
Isolation, Min	70 dB	70 dB
RF Power, Ave	430	300 W
RF Power, Peak	3,000 W	650 W
Operating Voltage	245 - 35	245 - 35
Coil Resistance	150 $\pm$ 5% Ω	150 $\pm$ 5% Ω
Mass	300 Grams	300 Grams
Operating Temp	-34°C to + 85°C	-34°C to + 85°C
Randome Vibration	17.1 grms	17.1 grms

> 140 DELIVERED



Spec	Tested	Design
Impedance	50 ohm	50 ohm
Frequency, MHz	1237 to 1600	1,200 to 2,000
VSWR, Max	1.12:1	1.12:1
Insertion Loss	0.10 dB	0.10 dB
Isolation, Min	75 dB	65 dB
RF Power, Ave	233 W	240 W
RF Power, Peak	932 W	950 W
Operating Volt	22-29	22-29
Coil Resistance	230 $\pm$ 5% Ω	230 $\pm$ 5% Ω
Mass	320 Grams	320 Grams
Operating Temp	-20°C to +80°C	-35°C to +85°C
Random <u>Vib</u>	17.1 <u>grms</u>	24.2 <u>grms</u>

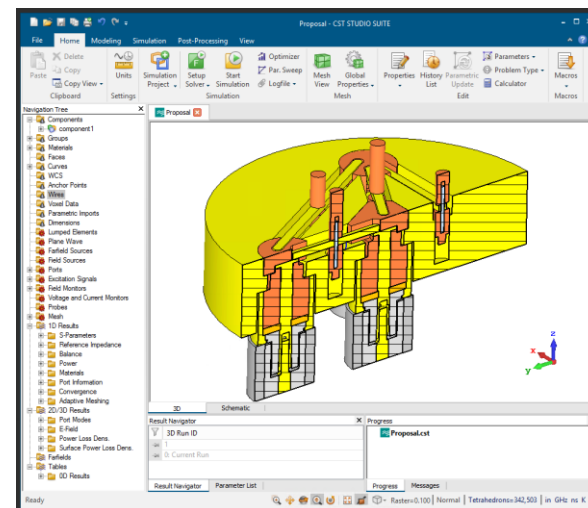
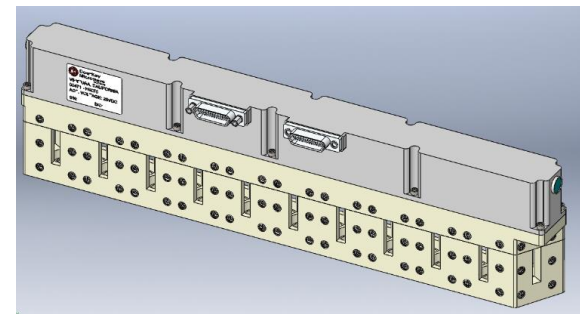
Various high power switches



1. INSAT >75 SHIPPED
2. GPS 2 >50 SHIPPED
3. GPS 2F >50 SHIPPED
4. ACES, >300 SHIPPED

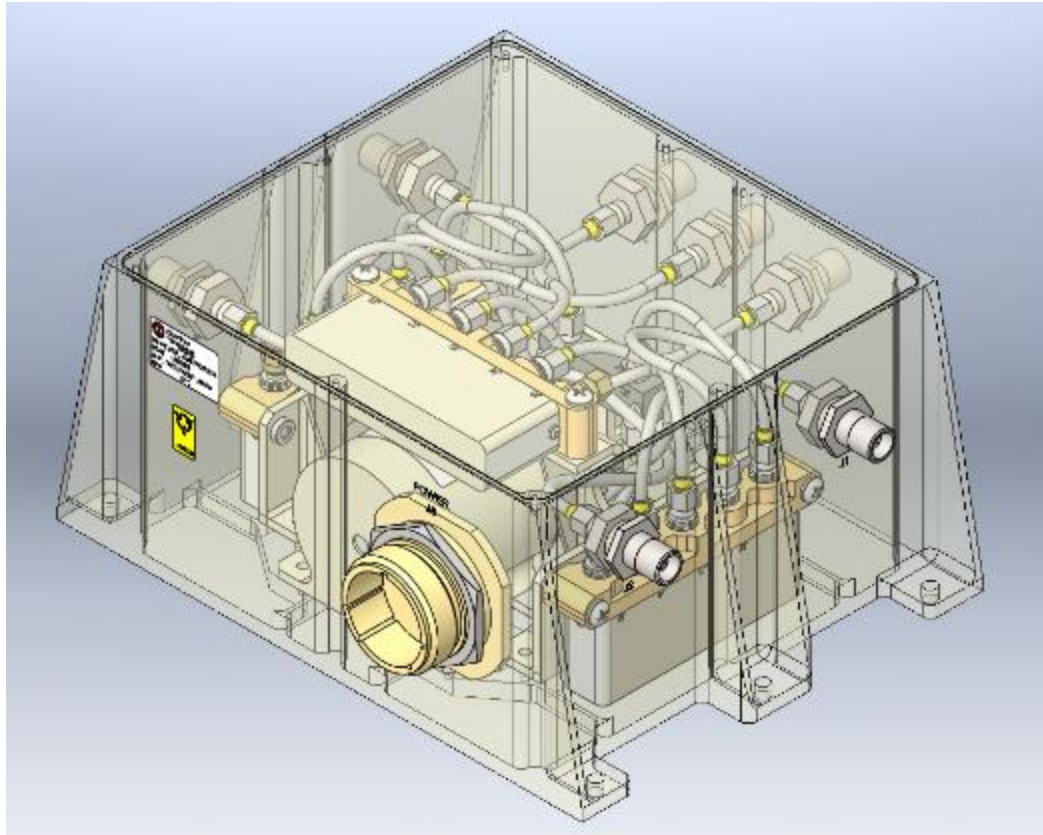
DKM RF Design Tools

- ▶ In house RF and Mechanical design team; Man and Unman space craft.
 - **RF Design Tools:**
 - CST's frequency domain and time domain solvers
 - AWR's Microwave Office & VSS
 - Solidworks
 - Mentor Graphics
 - Large library of RF parts with potential re-use in the right applications
- ▶ **In house inspection**
 - Gages, CMM, Keyence Vision optical comparator and more
- ▶ **In house machine shop**
 - Kitamura CNC machines, Harding lathe and more
- ▶ **In house engineering lab**
- ▶ **In house purchasing**, assembly, test, and quality team
- ▶ **RF switch and matrix designs** : commercial, terrestrial, aviation, and space applications; from mW to kW; from Hz to 70+ GHz; coaxial and waveguides switches; varieties of SP#T, DPDT, to Custom switches; over 150+ different RF connector options; varieties of different RF switch controls (e.g. TTL, canbus, and more)



High Power Hermetically Sealed Space Assembly

Specifications
NDA in place



Coax Offering

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Switch Description	Dow-Key Basic Part Number	RF Connector	Designed Operating Frequency	Program Tested Frequency	RF Handling Power Average	Multipaction Peak	Indicator Contacts	Coil Resistance $\pm 5\%$ @ 20°C	DC Connection	Tested Temp	Vibration levels Tested G rms	Pyrotechnic Shock	Actuations Tested	Mass Grams Max	STD Delivery Time Month ARO*
High Power T-Switch 22-32 VDC Random Selective Actuator	511H-730322	TNC	VHF-Band UHF-Band L-Band-Band S-Band C-Band	300-450 MHz 1,145 1,600 MHz 1,600-2,000 MHz 1,900-2,300 MHz 2,200-2,500 MHz 4.2- 4.8 GHz	180 W 500 W 500 W 140 W 80 W 85W	1,500 W 1,900 W 1,900 W 380 W 320 W	Yes	250Ω	9 Pin D Connector	-35°C to +70°C	24.4	1,000g	200,000	194	8
High Power C-Switch 22-32 VDC	413HAC-730332	TNC	100-400 MHz 300-600 MHz 1,100-1,600 MHz 2-8 GHz	100-360 MHz 300-400 MHz 1,145-1,600 MHz	50 W 300 W 233 W	200 W 300 W 932W	Yes	120Ω	Solder terminal or 9 Pin D connector	-35°C to +70°C	33.2	1,000g	50,000	254	8
Medium Power C-Switch 22-32 VDC	700C77800	High Power SMA	.01 - 8.5 GHz	1500-1700 MHz 2.0 2.5 MHz 7200- 8300 MHz	35 W 8 W 40 W	70 W 64 W 80 W	Yes	310Ω	Solder terminal or 9 Pin D connector	-35°C to +70°C	24.5	1,800g	100,000	215	7
Low power C-Switch 22-32 VDC	707C78800	SMA	0.1 - 18 GHz	All Bands from .01 to 18 GHz	7 W @ L-Band	28 W @ L-Band	Yes	310Ω	Solder terminal or 9 Pin D connector	-35°C to +70°C	24.5	1,000g	100,000	110	7
Light Weight Miniature Low Power C-Switch 22-32 VDC	411HQ-730832	SMA	0.1-27 GHz	0.1 - 27 GHz	2 W: 0.1-2 GHz, 5 W: 2-16 GHz 2 W 16-26.5 GHz	N/A	Yes	260Ω	Solder terminal or flying Leads	-30°C to +75°C	36.5	4,200g	100,000	55	7
High Power SP2T 22-32 VDC	406HJC-730332 406HCJ-730332-7	TNC	1.0 - 2.0 GHz 250-450 MHz	1.0 - 2.0 GHz 250-350 MHz	300 W 430W	650 W 3,000 W	Yes	309Ω	Solder terminal or 9 Pin D connector	-35°C to +85°C	17.2	1,350g	50,000	304	9
Low Power S-P2T 22-32 VDC	909C77700	SMA	0.1 - 18 GHz	0.1 - 18 GHz	2 W: 0.1-2 GHz, 5 W: 2-18 GHz	N/A	Yes	435Ω	Solder terminal or 9 Pin D connector	-35°C to +70°C	24.5	1,000g	100,000	90 with bracket 60 without	7
Low Power SP4T, SP6T & SP7T 24-34 VDC Random Selective Actuator	4X1HJ-730832	SMA	0.1 - 18 GHz	0.1 - 16 GHz	2 W CW	N/A	Yes	240Ω	25 Pin D Connector	-40°C to +85°C	27.3	No data	50,000	280 to 340 per option	8



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