



MICROWAVE SWITCHES & RF COAXIAL RELAYS



THERE IS NO SUBSTITUTE
FOR EXPERIENCE



**DowKey®
Microwave**
CORPORATION

FOUNDED 1945

A **DOVER** TECHNOLOGIES COMPANY

	Maximum Frequency	RF Connector Type	Page
DowKey Microwave Catalog			3
DowKey Part Numbering System			4
RF Power Chart			5
Ordering Information			6
DowKey Microwave Switch Products			
401 Series Failsafe SPDT Switches	26.5 GHz	SMA	8
401 Series Latching SPDT Switches	26.5 GHz	SMA	10
402 Series Failsafe SPDT Switches	12.4 GHz	N	12
402 Series Latching SPDT Switches	12.4 GHz	N	14
403 Series Failsafe SPDT Switches	26.5 GHz	SMA	16
411C Series Failsafe Transfer Switches	18 GHz	SMA	18
411C Series Latching Transfer Switches	18 GHz	SMA	20
412 Series Failsafe Transfer Switches	12.4 GHz	N	22
412 Series Latching Transfer Switches	12.4 GHz	N	24
509 Series Failsafe SPDT Switches	12.4 GHz	PIN	26
521 Series Failsafe SPDT Terminated Switches	18 GHz	SMA	28
521 Series Latching SPDT Terminated Switches	18 GHz	SMA	30
531-561 Series Normally Open Terminated Multi-position Switches	18 GHz	SMA	32
531-561 Series Latching Multi-position Switches	18 GHz	SMA	34
531-561 Series Latching Terminated Multi-position Switches	18 GHz	SMA	36
531-561 Series Normally Open Multi-position Switches	12.4 GHz	N	38
531-561 Series Latching Multi-position Switches	12.4 GHz	N	40
535-565 Series Normally Open Multi-position Switches	18 GHz	SMA	42
571-581 Series Normally Open Multi-position Switches	18 GHz	SMA	44
571-581 Series Normally Open Terminated Multi-position Switches	18 GHz	SMA	46
571-581 Series Latching Multi-position Switches	18 GHz	SMA	48
571-581 Series Latching Terminated Multi-position Switches	18 GHz	SMA	50
591-5A1 Series Normally Open Multi-position Switches	18 GHz	SMA	52
591-5A1 Series Normally Open Terminated Multi-position Switches	18 GHz	SMA	54
591-5A1 Series Latching Multi-position Switches	18 GHz	SMA	56
591-5A1 Series Latching Terminated Multi-position Switches	18 GHz	SMA	58
433-443 Series In-line Latching Multi-position Switches	18 GHz	SMA	60
473-4A3 Series In-line Latching Multi-position Switches	18 GHz	SMA	62
4C3 Series In-line Latching Multi-position Switches	18 GHz	SMA	64
46 Series DPDT Failsafe Switches	1000 MHz	BNC, TNC	66
54 Series SPDT Failsafe Switches	3000 MHz	N, BNC, TNC	68
60 Series SPDT Failsafe Switches	1000 MHz	N, BNC, UHF	70
63 Series SPDT Failsafe Switches	3 GHz	N	72
64 Series Transfer Failsafe Switches	3 GHz	N	74
66 Series SPDT Failsafe Switches	500 MHz	F	76
77 Series SPDT Failsafe Switches	1000 MHz	BNC, F	78

Table of Contents

	Maximum Frequency	RF Connector Type	Page
DowKey Microwave Switch Products (cont.)			
78 Series Multi-position Manual Switches	450 MHz	N, BNC, UHF	80
79 Series Bypass Failsafe Switches	3 GHz	TNC	82
116 Series SP4T Failsafe Switches	2000 MHz	N, BNC, TNC	84
164 Series SPDT Failsafe Switches	1000 MHz	BNC, TNC	86
167 Series Transfer Failsafe Switches	1000 MHz	N, UHF	88
169 Series SPDT Failsafe Switches	2000 MHz	BNC	90
260 Series DPDT 260B Series By-Pass Failsafe Switches	1000 MHz	N, BNC, UHF	92
310 Series SPDT High Power Vacuum Switches	400 MHz	N, HN, SC	94
DowKey/Transco Microwave Switch Products			
Cross Reference Guide			98
909 Type DO Series SPDT Latching Switches	18 GHz	SMA	100
919 Type DO Series SPDT Failsafe Switches	18 GHz	SMA	102
905-915 Type DO Series SPDT Latching and Failsafe Switches	26.5 GHz	3.5mm	104
805 Type D Series SPDT Latching Switches	12.4 GHz	TNC, N	108
810 Type D Series SPDT Failsafe Switches	12.4 GHz	TNC, N	110
900-910 Type DT Series Latching and Failsafe Switches	12.4	TNC	112
800-810 Type DX Series High Power Latching and Failsafe Switches	6.5 GHz	SC	114
808-818 Type PD Series SPDT (MBB) Latching and Failsafe Switches	12.4 GHz	TNC, N	116
700 Type HO Series Transfer Latching Switches	18 GHz	SMA	118
710-715 Type HO & HOF Series Transfer Failsafe Switches	18 GHz	SMA	120
705-745 Type HO Series Transfer Latching and Failsafe Switches	26.5 GHz	3.5mm	122
300 Type H Series Transfer Latching Switches	12.4 GHz	N, TNC	126
310 Type H Series Transfer Failsafe Switches	12.4 GHz	N, TNC	128
700-710 Type HT Series Transfer Latching and Failsafe Switches	12.4 GHz	TNC	130
300-310 Type HX Series Transfer High Power Latching and Failsafe	6.5 GHz	SC	132
143-146 Type MO Series Multi-position Selective Switches	18 GHz	SMA	134
143-146 Type MOI Series Multi-position Selective Switches	18 GHz	SMA	136
154-156 Type MO Series Multi-position Selective Switches	26.5 GHz	3.5mm	138
133-136 Type M Series Multi-position Selective Switches	12.4 GHz	N, TNC	140
133-136 Type MX Series High Power Multi-position Selective Switches	6.5 GHz	SC	142
DowKey/Transco Waveguide Switch Products			
Cross Reference Guide			144
Reference Table for Rigid Rectangular Waveguide			145
Type GR Series 3 or 4 Port Latching and Failsafe Switches	4-18 GHz	WR284-WR62	146
Type GF Series SPDT & Transfer Latching and Failsafe Switches	8.2 GHz	WRD350D24	148
Type GF Series Transfer Latching and Failsafe Switches	18 GHz	WRD750D24	150

Established in 1945, DowKey became the largest producer of electro-mechanical switches when the company was acquired in 1996 by K&L Microwave/Transco under the umbrella of Dover Technologies, division of Dover Corporation with annual revenues in excess of 4 billion dollars.

The company offers switches in the three major markets - Commercial, Military, and Hi-Rel space. DowKey Microwave products are currently used in airborne, sea ground-based, military, missiles, and EW systems as well as commercial communication and instrumentation systems, medical equipment, cellular telephone, two-way paging systems, PCS, PCN, test equipment, commercial airlines and satellite applications.

Although the product specifications listed in the catalog are for commercial switches, Military specification and special environment products are available upon request. All of the switches are specifically designed to take the maximum advantage of standardized parts to minimize cost and delivery.

In the last decade, DowKey's market share has grown at a rapid pace. To meet the demands of a growing company, DowKey has assembled the most experienced management and engineering team in the industry - a team that offers innovative approaches to designs - a team that improves and brings new life to the product line.

These include:

- Broad selection of catalog RF and Microwave switches operating from DC to 18.5 GHz.
- Custom switches operating up to 26.5 GHz.
- Hi-Rel space qualified switches for military and commercial satellites.
- Complex devices using innovations that include other components to form switch matrixes, switch attenuators, IEEE 488 compatible components, and other unique design solutions to our customer's requirements are available.

- A. DowKey Radial multithrow switches in SP3T - SP10T configurations controlled by TTL, or binary logic.
- B. DowKey INTELLIGENT RELAY IN-LINE series of multithrow switches with binary logic inputs.

DowKey, located in Ventura, California - one hour north of the Los Angeles airport, is in the process of expanding its facility to 36,000 square feet. The current facility houses a certified clean room, environmental testing lab with both thermal and thermal shock capability, two 18 inch and one 24 inch diameter thermal vacuum chambers, and a computer controlled shock and vibration system (capable of up to 100g's).

DowKey has made a substantial commitment to quality by providing formal training in team work and quality awareness to every employee of the company.

The DowKey inspection system fully complies with MIL-I-45208. Qualification testing is performed to customer specific requirements including MIL-PRF-3928E. Solderers and soldering inspectors are certified to MIL-STD-2000A. The document change control system insures that product design, methods, and processes remain consistent with customer requirements. DowKey is currently pursuing ISO 9001 certification.

This catalog is intended to be used as a guide in selecting the proper type of switch or switching function for a given application and to identify product families we have delivered to make the system designer's life a little easier. It is important to note that DowKey Microwave does not limit itself to catalog products and will gladly entertain variations to the published specifications. We welcome requests regarding custom integrated components and switch function assemblies. Drawing on DowKey Microwave's technical expertise we can offer a cost effective approach for our customers.

DowKey Part Numbering System

X A B C - D E F G H I J

- (X) RELAY FAMILY**
- 2 Low Frequency
 - 4/5 50 Ohm System
 - 7 75 Ohm System

- (A) CONFIGURATION**
- | | |
|------------|---------|
| 0 SPDT | A SP10T |
| 1 Transfer | B SP11T |
| 2 SPST | C SP12T |
| 3 SP3T | D 6P7T |
| 4 SP4T | |
| 5 SP5T | |
| 6 SP6T | |
| 7 SP7T | |
| 8 SP8T | |
| 9 SP9T | |

- (B) SIZE**
- 1 Std. Case, normally SMA connectors (Radial)
 - 2 Std. Case, normally N Connectors
 - 3 Small Case, normally SMA (Multithrow)
 - 4 Intermediate Cavity, SMA/TNC
 - 5 Miniature Radial
 - 6 Std. Case, normally N connectors (Radial)
 - 9 Microminiature Switch

- (C) SPECIAL OPTIONS**
- | | |
|----------------------------|-------------------------------|
| A High Power | K 26.5 GHz |
| B Bypass (2-4) | L Flange Mount Cavity |
| C Special Mounting Bracket | M Fast Switching |
| | N Remove STD Mounting Bracket |
| D Bypass (1-2) | P Power Connector |
| E Bypass (3-4) | R Reverse Polarity |
| F Bypass (1-3) | |
| G Make Before Break | |
| H HI-REL | S Seal Epoxy, Sand & Dust |
| I Seal, Immersion | T -55°C to +85°C |
| J "D" Type Connector | |

- (D) ACTUATOR COIL TYPE**
- 1 Manual
 - 2 Failsafe, Position 1
 - 3 Pulse Latching
 - 4 Latching, Self Cutoff
 - 5 Normally Open
 - 6 Failsafe, Suppression Diodes
 - 7 Pulse Latching, Suppression Diodes
 - 9 Normally Open, Suppression Diodes

- (J) SPECIAL OPTIONS**
- A TTL HI, Commercial (2.4 - 5.5 Vdc)
 - B TTL HI, Military (2.4 - 5.5 Vdc)
 - C MOSFET Driver, Pulse Latch
 - E CMOS BCD Decoding Logic & MOSFET Driver, Commercial
 - L TTL Logic Low, Commercial (0.0 - 0.8 Vdc)
 - G Other Special Circuit

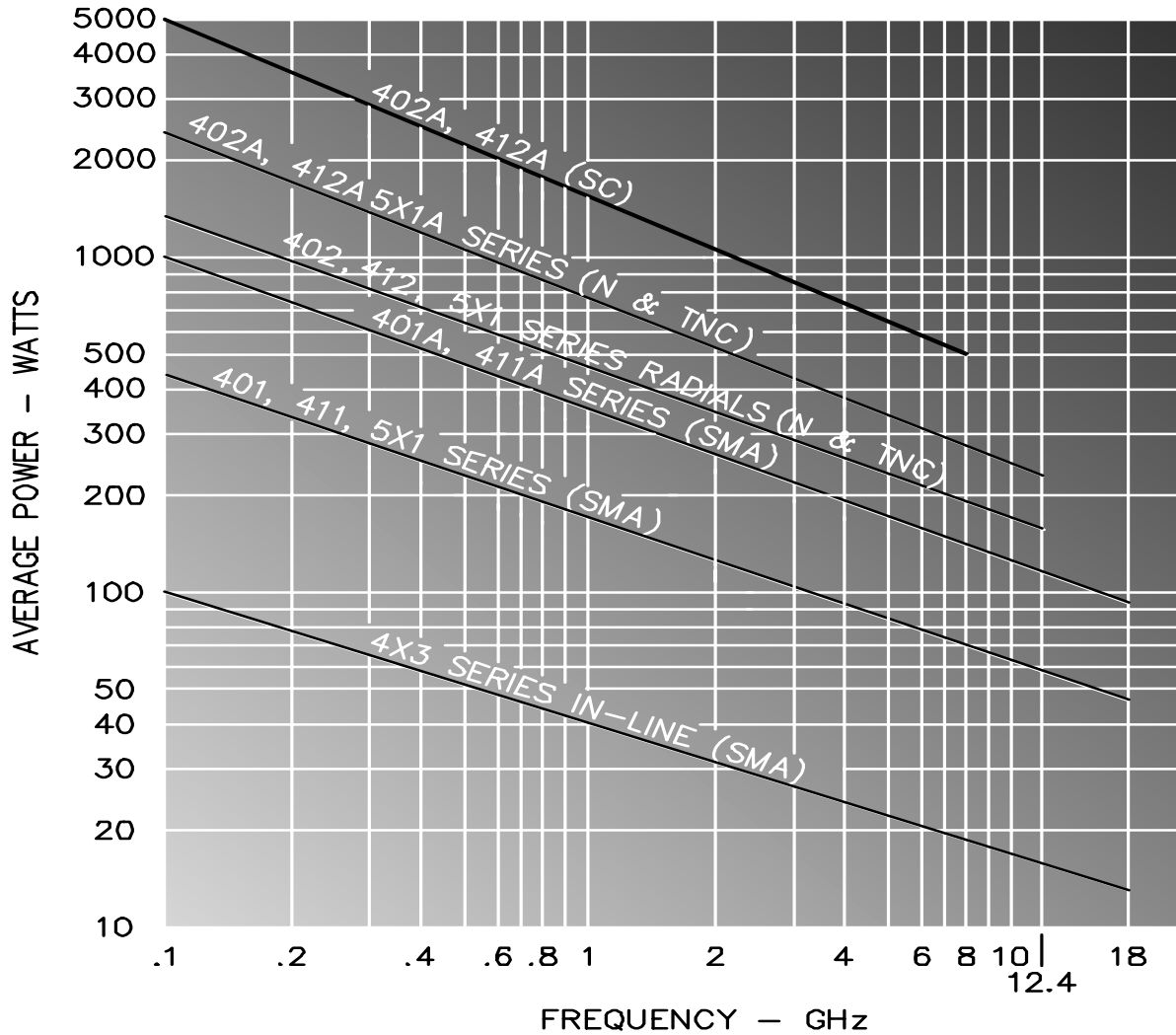
- (I) TERMINATIONS**
- | | |
|---------|---------------------|
| 1 Short | 5 50Ω, 5W |
| 2 Open | 6 50Ω, 10W |
| 3 50 Ω | 7 50Ω, Term, Port 1 |
| 4 75 Ω | 8 50Ω, 2W External |

- (H) AUXILIARY/INDICATOR CONTACTS**
- 0 None
 - 2 Mechanical SPST
 - 3 Mechanical SPDT
 - 4 Mechanical DPDT

- (FG) CONNECTORS**
- 01 N
 - 02 BNC
 - 03 TNC
 - 04 UHF
 - 05 C
 - 07 BMA (OSP)
 - 08 SMA
 - 09 3.5mm (SMA Interface)
 - 14 TPS
 - 19 Pins (PC Board Drop-in)
 - 25 N, High Isolation (NC Port Only)
 - 26 BNC, High Isolation (NC Port Only)
 - 28 UHF, High Isolation (NC Port Only)
 - 32 F (75 Ω)
 - 44 BNC (75Ω)
 - 51 HN
 - 53 SC
 - 72 F (75Ω) High Isolation (NC & NO Ports Only)

- (E) ACTUATOR COIL VOLTAGE**
- | | |
|----------|-----------|
| 0 Manual | 5 110 Vdc |
| 1 6 Vdc | 6 110 Vac |
| 2 12 Vdc | 7 20 Vdc |
| 3 28 Vdc | 8 24 Vdc |
| 4 48 Vdc | 9 15 Vdc |

This chart is based on the following conditions:
 Ambient Temperature= 40° C; Altitude= Sea Level; VSWR= 1.0:1; Non-switching
 UHF connectors are not recommended for applications above 300MHz.
 Please consult factory for additional information.



VSWR	Derating Factor	VSWR	Derating Factor
1.5:1	.96	3.5:1	.07
2.0:1	.88	4.0:1	.64
2.5:1	.84	4.5:1	.06
3.0:1	.75	5.0:1	.56

PACKAGING

All products shipped from the DowKey facility are packaged in accordance with best commercial practices unless otherwise specified in the contract or purchase order.

SHIPPING

Shipment by commercial air freight is recommended to ensure safe handling and prompt deliver. Orders within the continuous U.S. will be shipped Via United Parcel Service unless other directions are received.

TERMS

Standard terms are net, 30 days, F.O.B. Ventura California. There is a \$250 minimum order for shipments to domestic (USA) destinations.

DELIVERY

Most standard products are available from stock or within typical manufacturing lead time of 6-8 weeks after receipt of an order.

PRICES AND SPECIFICATIONS

Quotations for standard catalog items, in any quantity, are available from the factory or the nearest factory authorized representative. Quotations are normally valid for a period of sixty days. Special item pricing is available after definition of customer requirements and consultation with DowKey Microwave Corporation engineering, manufacturing and sales.

APPLICATIONS/TECHNICAL ASSISTANCE

Approximately one-half of DowKey Microwave Corporation's products are items built to customer specifications. These items have been designed and manufactured to satisfy unique requirements. DowKey provides a knowledgeable and experienced engineering staff to work closely with customers in systems design and applications development. This service is available for either the complete design of specialized switching components or switching function subsystems, or in minor modification to existing standard products to meet a customer's specific requirements. DowKey applications engineers will work co-operatively with customer engineering staff to fulfill special requirements.

WARRANTY

DowKey Microwave Corporation warrants all switch products to be free of defects in material or workmanship for a period of one year after the date of initial shipment. The limit of liability under this warranty is to repair or replace any product or part thereof which is returned by the purchaser, and proves defective after examination by DowKey. This warranty does not extend to any products mishandled, misused, or subjected to abuse or neglect in storage, transportation, or use. Please call DowKey's RMA department to receive a return authorization number prior to returning any item under this warranty. Items being returned from locations outside of the U.S. should be sent Via Air Parcel Post unless other means are specifically agreed upon by DowKey Microwave Corporation. Repairs or alterations made without consent or knowledge of DowKey Microwave Corporation will invalidate this warranty. This warranty supercedes all others, either expressed or implied.

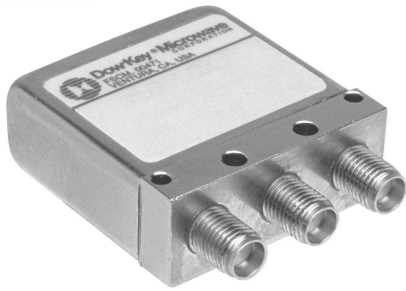
DowKey MICROWAVE CORPORATION continually improves products as new technologies and components become available. We, therefore, reserve the right to alter, amend, discontinue or replace any product and or specifications at our sole discretion in this catalog without prior notice.

DowKey®

Microwave Switches



**DowKey®
Microwave**
CORPORATION



DowKey® 401 Series Failsafe

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 185 mA
28 Vdc 90 mA

Switching Time:

15 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50G, 1/2 Sine, 11mS

Nominal Weight:

2.5 oz., (71g.)

The DowKey Microwave 401 Series SPDT switches perform broadband high performance switching functions extending to 26.5 GHz on selected units.

The 401 Series switching mechanism has a break-before-make configuration, with a balanced actuator which provides excellent tolerance to shock and vibration.

The 401 Series switch utilizes DowKey designed connectors featuring a mechanically captivated center contact which eliminates epoxy staking, and reduces RF leakage. Due to the small size of these switches, only SMA connectors are available.

Typical applications for the 401 Series include:

- Test Equipment Band Selection
- Switch Matrixes
- EW and Missile Systems
- Microwave Radio

RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.10	85	0.10	100
1-4	1.20	80	0.20	50
4-8	1.30	70	0.30	35
8-12	1.40	65	0.40	25
12-18	1.50	60	0.50	10
*18-26.5	1.50	60	0.60	10

* "K" option only. Ex: 401K-2208

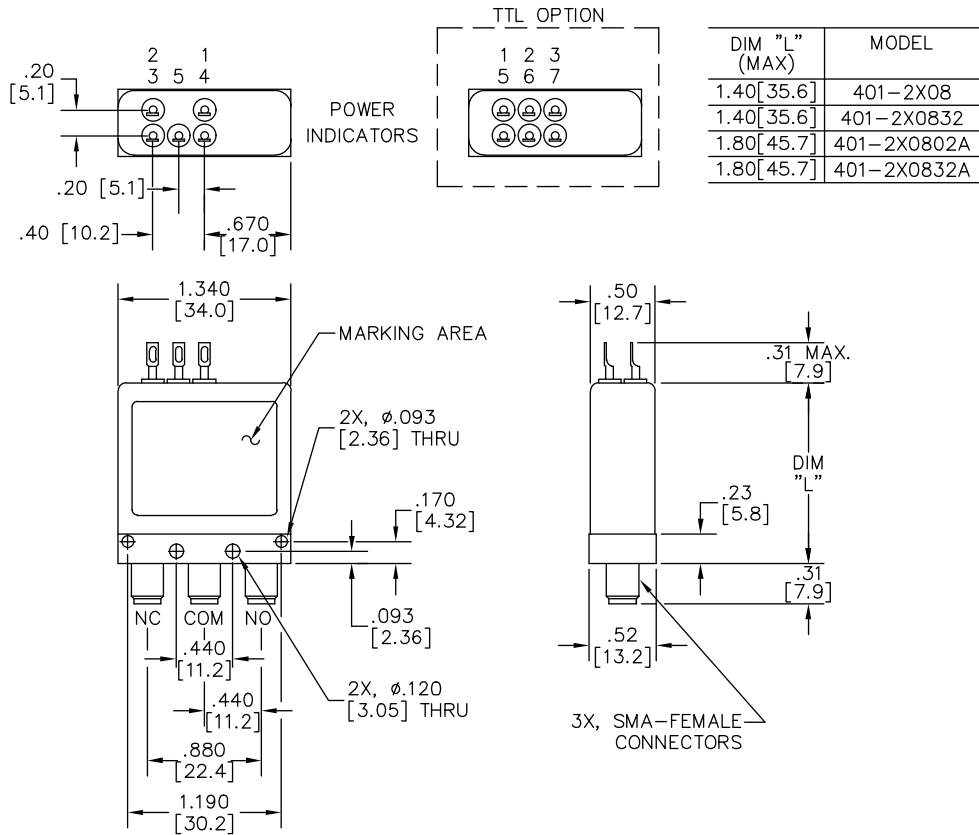
Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
12 Vdc	SMA	401-2208	401-220832
28 Vdc	SMA	401-2308	401-230832

TTL Compatible Logic

12 Vdc	SMA	401-220802A	401-220832A
28 Vdc	SMA	401-230802A	401-230832A

Mechanical

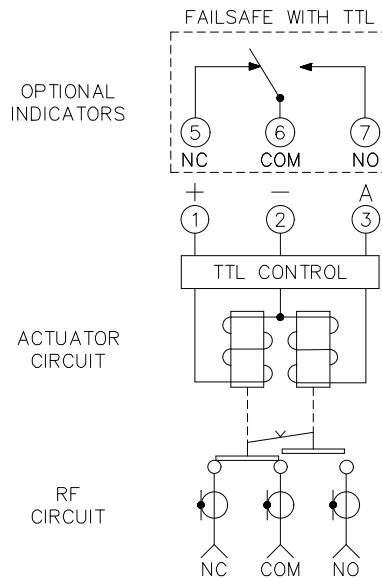
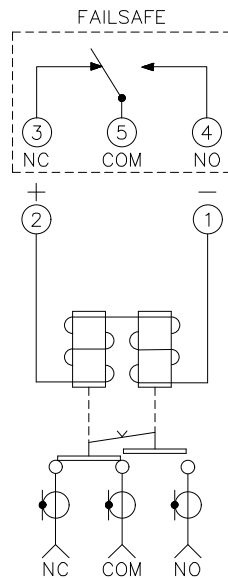


DIM "L" (MAX)	MODEL
1.40 [35.6]	401-2X08
1.40 [35.6]	401-2X0832
1.80 [45.7]	401-2X0802A
1.80 [45.7]	401-2X0832A

Available Options

- Immersion Seal
- 9 PIN "D" Plug
- 5ms Switching Time
- Increased Power Handling
- Operating Voltages:
15, 20, 24 Vdc
- Jan TX TTL Drive Components
- 55°C to +85°C Operation
- DC - 26.5 GHz Operation

Electrical



LOGIC TRUTH TABLE		
RF PATH	INDICATOR PATH	LOGIC INPUT "A"
NC-COM	NC-COM	0
NO-COM	NO-COM	1

"0" = 0.0V-0.8V
"1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION



DowKey® 401 Series Latching

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 218 mA
28 Vdc 108 mA

Switching Time:

15 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50G, 1/2 Sine, 11mS

Nominal Weight:

2.5 oz., (71g.)

The DowKey Microwave 401 Series SPDT switches perform broadband high performance switching functions extending to 26.5 GHz. The 401 Series switching mechanism has a break-before-make configuration, with a balanced actuator which provides excellent tolerance to shock and vibration.

Due to the small size of these switches, only the SMA connectors are available. These DowKey designed connectors feature a mechanically captivated center contact which eliminates epoxy staking, and reduces RF leakage. All self cutoff models include coil suppression diodes.

Typical applications for the 401 Series include:

- Test Equipment Band Selection
- Switch Matrixes
- EW and Missile Systems
- Microwave Radio

RF Characteristics

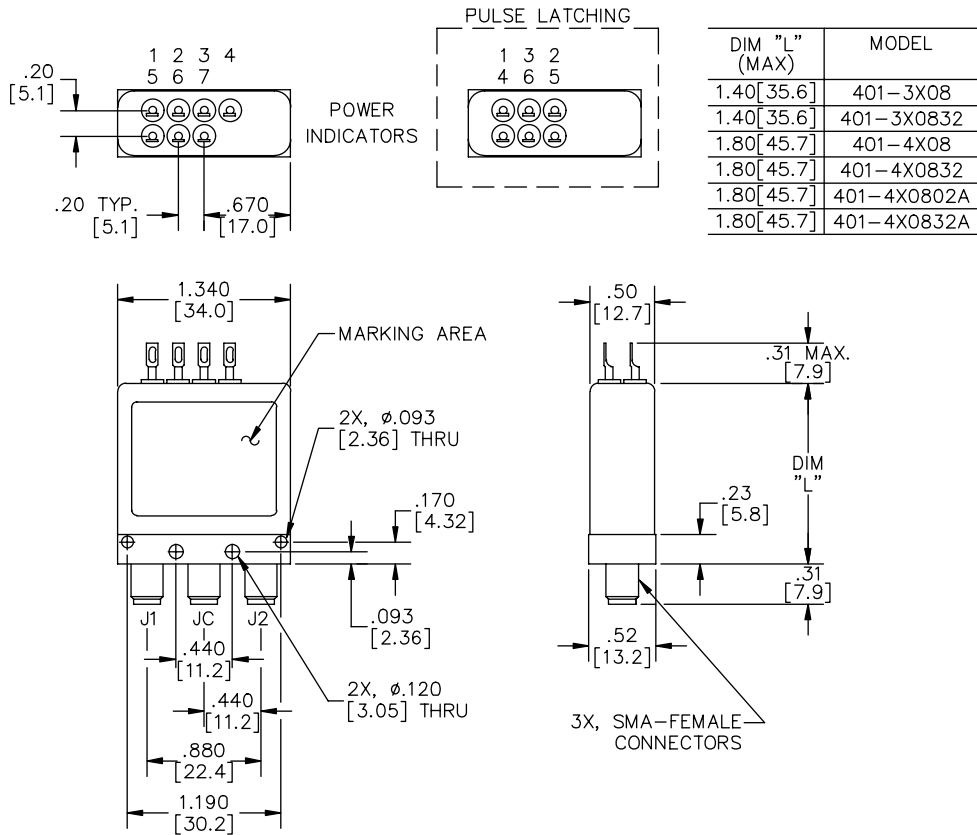
Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.10	85	0.10	100
1-4	1.20	80	0.20	50
4-8	1.30	70	0.30	35
8-12	1.40	65	0.40	25
12-18	1.50	60	0.60	10
*18-26.5	1.50	60	0.60	10

* "K" option only. Ex: 401K-3208

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard SPDT	with Mechanical Indicators
Pulse Latch			
12 Vdc	SMA	401-3208	401-320832
28 Vdc	SMA	401-3308	401-330832
Latching with Self Cut-off			
12 Vdc	SMA	401-4208	401-420832
28 Vdc	SMA	401-4308	401-430832
Latching with Self Cut-Off, TTL Compatible			
12 Vdc	SMA	401-420802A	401-420832A
28 Vdc	SMA	401-430802A	401-430832A

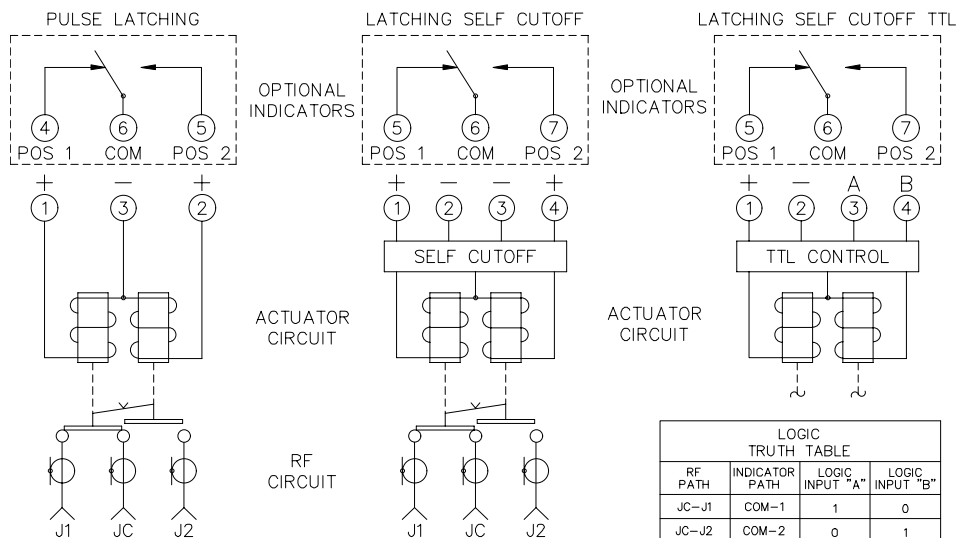
Mechanical



Available Options

- Immersion Seal
- 9 PIN "D" Plug
- 5ms Switching Time
- Increased Power Handling
- Operating Voltages:
15, 20, 24 Vdc
- 55°C to +85°C Operation
- DC - 26.5 GHz Operation

Electrical



"0" = 0.0V-0.8V
"1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION



DowKey® 402 Series Failsafe

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 261 mA
28 Vdc 108 mA

Switching Time:

20 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50G, 1/2 Sine, 11mS

Nominal Weight:

9.0 oz., (260g.)

The DowKey Microwave 402 Series switches are designed for high performance in microwave systems to 12.4 GHz. They are commonly used for any application where high isolation and low VSWR are required. The DowKey designed type "N" connector features a mechanically captivated center conductor which eliminates epoxy staking, and consequently, RF leakage. The balanced actuator is designed for uniform contact pressure in either switch position, which provides low and stable contact resistance over the life of the switch.

Typical applications for the 402 Series include:

- Main/Standby Switching of Transponders, Transmitters, Antennas
- Band Selection
- Polarization Switching

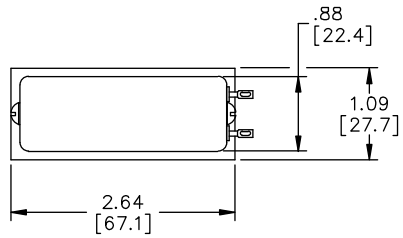
RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.15	85	0.15	350
1-2	1.20	80	0.20	250
2-4	1.25	70	0.25	150
4-8	1.35	65	0.35	120
8-12.4	1.50	60	0.50	100

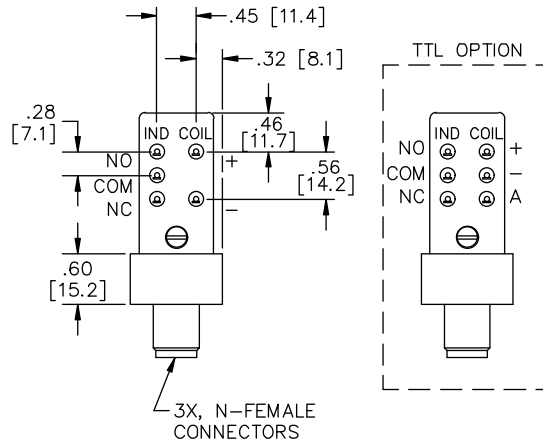
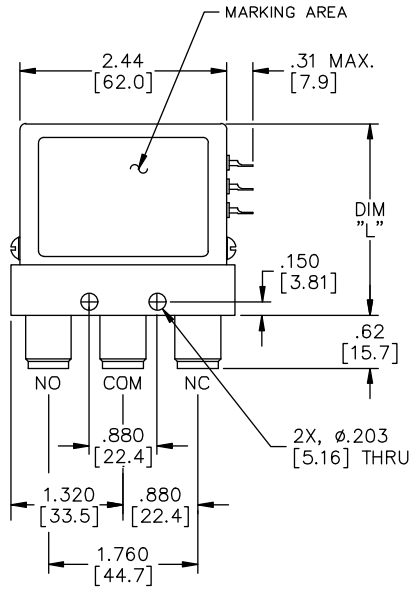
Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
12 Vdc	N	402-2201	402-220132
28 Vdc	N	402-2301	402-230132
TTL Compatible Logic			
12 Vdc	N	402-220102A	402-220132A
28 Vdc	N	402-230102A	402-230132A

Mechanical



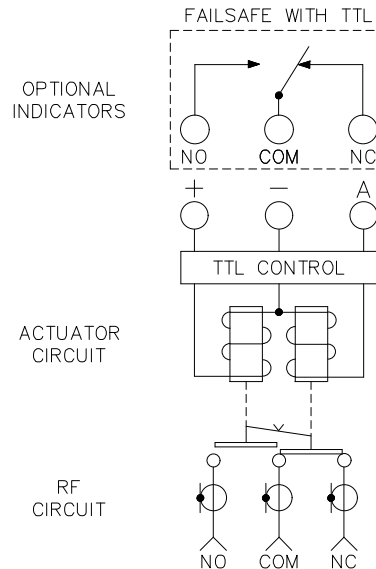
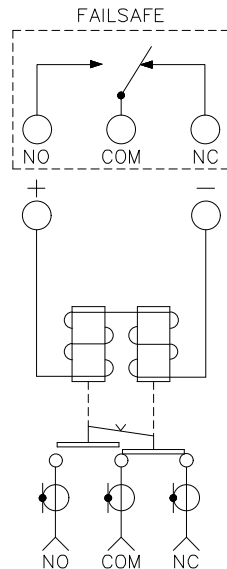
DIM "L" (MAX)	MODEL
2.30 [58.4]	402-2X01
2.30 [58.4]	402-2X0132
2.30 [58.4]	402-2X0102A
2.30 [58.4]	402-2X0132A



Available Options

- Immersion Seal
- 9 PIN "D" Plug
- Increased Power Handling
- Operating Voltages:
15, 20, 24 Vdc
- Jan TX TTL Drive Components
- 55°C to +85°C
- BNC, TNC Connectors
(Consult factory for RF characteristics)

Electrical



LOGIC TRUTH TABLE		
RF PATH	INDICATOR PATH	LOGIC INPUT "A"
NC-COM	NC-COM	0
NO-COM	NO-COM	1

"0" = 0.0V-0.8V
"1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION



DowKey® 402 Series Latching

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 300 mA
28 Vdc 127 mA

Switching Time:

20 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50 G, 1/2 Sine, 11 mS

Nominal Weight:

9.0 oz. (260g.)

The DowKey Microwave 402 Series switches are designed for high performance in microwave systems to 12.4 GHz. They are commonly used for any application where high isolation and low VSWR are required. The DowKey designed type "N" connector features a mechanically captivated center conductor which eliminates epoxy staking, and consequently, RF leakage. The balanced actuator is designed for uniform contact pressure in either switch position, which provides low and stable contact resistance over the life of the switch. A set of auxiliary contacts is optionally available.

Typical applications for the 402 Series include:

- Main/Standby Switching of Transponders, Transmitters, Antennas
- Band Selection
- Polarization Switching

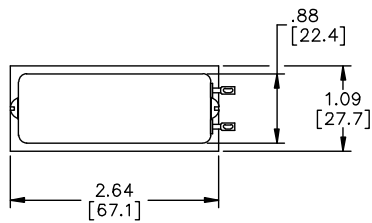
RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.15	85	0.15	350
1-2	1.20	80	0.20	250
2-4	1.25	70	0.25	150
4-8	1.35	65	0.35	120
8-12.4	1.50	60	0.50	100

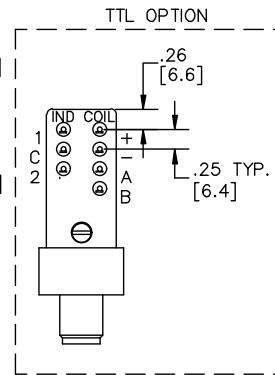
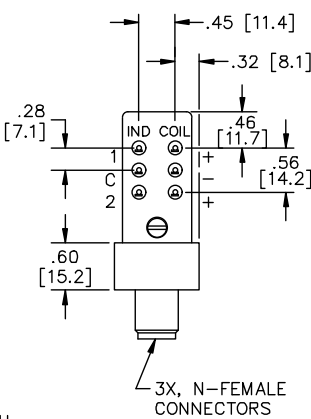
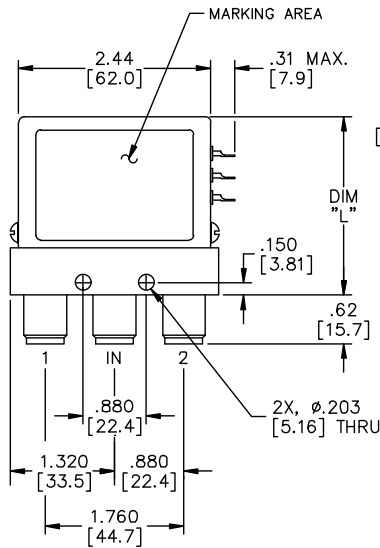
Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
Pulse Latch			
12 Vdc	N	402-3201	402-320132
28 Vdc	N	402-3301	402-330132
Latching with Self Cut-Off			
12 Vdc	N	402-4201	402-420132
28 Vdc	N	402-4301	402-430132
Latching with Self Cut-Off, TTL Compatible			
12 Vdc	N	402-420102A	402-420132A
28 Vdc	N	402-430102A	402-430132A

Mechanical



DIM "L" (MAX)	MODEL
2.30 [58.4]	402-3X01
2.30 [58.4]	402-3X0132
2.40 [61.0]	402-4X01
2.40 [61.0]	402-4X0132
2.40 [61.0]	402-4X0102A
2.40 [61.0]	402-4X0132A



Available Options

Immersion Seal

9 PIN "D" Plug

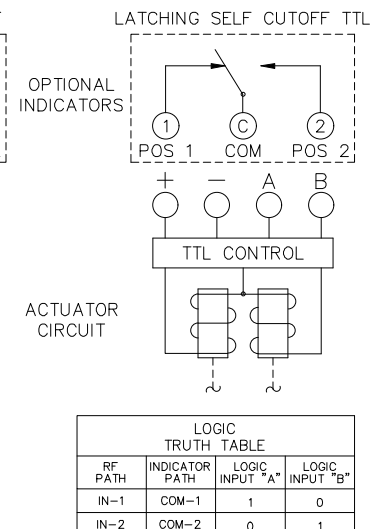
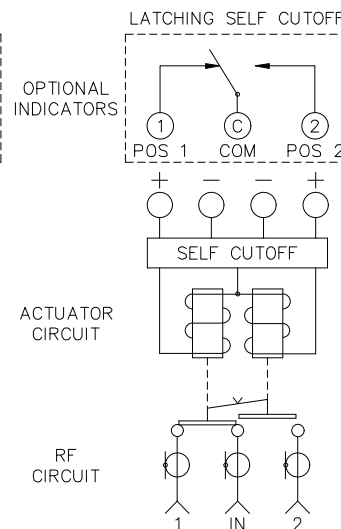
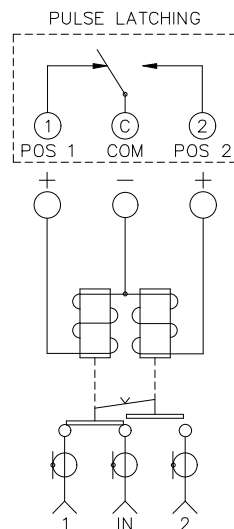
Increased Power Handling

Operating Voltages:
15, 20, 24 Vdc

-55°C to +85°C

BNC, TNC Connectors
(Consult factory for
RF characteristics)

Electrical

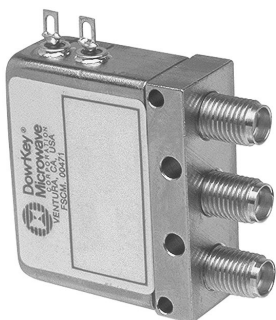


LOGIC TRUTH TABLE			
RF PATH	INDICATOR PATH	LOGIC INPUT "A"	LOGIC INPUT "B"
IN-1	COM-1	1	0
IN-2	COM-2	0	1

"0" = 0.0V-0.8V
"1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION



DowKey® 403 Series Failsafe

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 185 mA
28 Vdc 90 mA

Switching Time:

15 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10 G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50 G, 1/2 Sine, 11 mS

Nominal Weight:

1.5 oz., (42g.)

The DowKey Microwave 403 Series SPDT switches perform broadband and high frequency, switching with extended performance to 26.5 GHz. The 403 Series switching mechanism uses the same break-before-make balanced actuator as the 401 Series failsafe switches. This actuator provides excellent tolerance to shock and vibration.

Due to the small size of these switches, only SMA connectors are available. These DowKey designed connectors feature a mechanically captivated center contact which eliminates epoxy staking, and reduces RF leakage.

Typical applications for the 403 Series include:

- Test Equipment Band Selection
- Switch Matrixes
- EW and Missile Systems
- Microwave Radio

RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.10	85	0.10	100
1-4	1.20	80	0.20	50
4-8	1.30	70	0.30	35
8-12	1.40	65	0.40	25
12-18	1.50	60	0.50	10
*18-26.5	1.50	60	0.50	10

* "K" option only. Ex: 403K-2208

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard
12 Vdc	SMA	403-2208
28 Vdc	SMA	403-2308

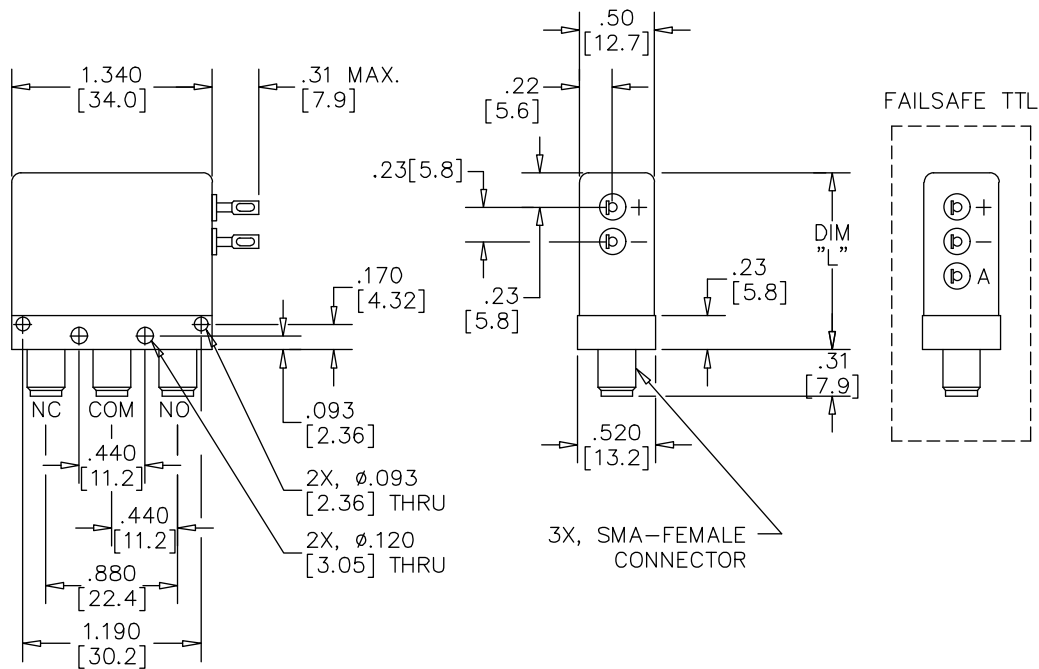
TTL Compatible Logic

12 Vdc	SMA	403-220802A
28 Vdc	SMA	403-230802A

Mechanical



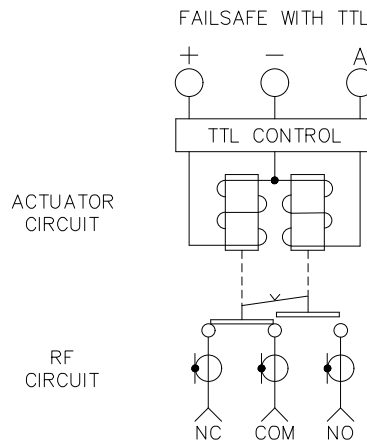
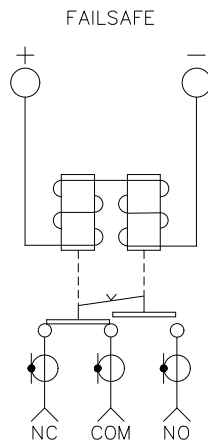
DIM "L" (MAX)	MODEL
1.18 [30.0]	403-2X08
1.40 [35.6]	403-2X0802A



Available Options

- Immersion Seal
- Increased Power Handling
- Operating Voltages:
15, 20, 24 Vdc
- 55°C to +85°C Operation
- DC - 26.5 GHz Operation

Electrical



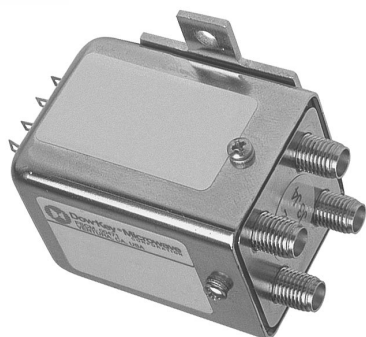
LOGIC TRUTH TABLE		
RF PATH	INDICATOR PATH	LOGIC INPUT "A"
NC-COM	NC-COM	0
NO-COM	NO-COM	1

"0" = 0.0V-0.8V
"1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION

The DowKey Microwave 411 Series is a failsafe transfer switch for use in applications where high isolation, low VSWR, and low insertion loss are critical. The DowKey designed connector features a mechanically captivated center conductor which eliminates epoxy staking, and consequently, RF leakage. The 411 Series features the same reliable balanced actuator designs as are found in the 401 Series.



**DowKey® 411C Series
Failsafe**

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 364 mA
28 Vdc 138 mA

Switching Time:

20 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50 G, 1/2 Sine, 11 mS

Nominal Weight:

4.0 oz., (115g.)

Typical applications for the 411 Series include:

- Switch Matrixes
- Standby Transmitters with Dummy Load
- Alternate Antenna Select

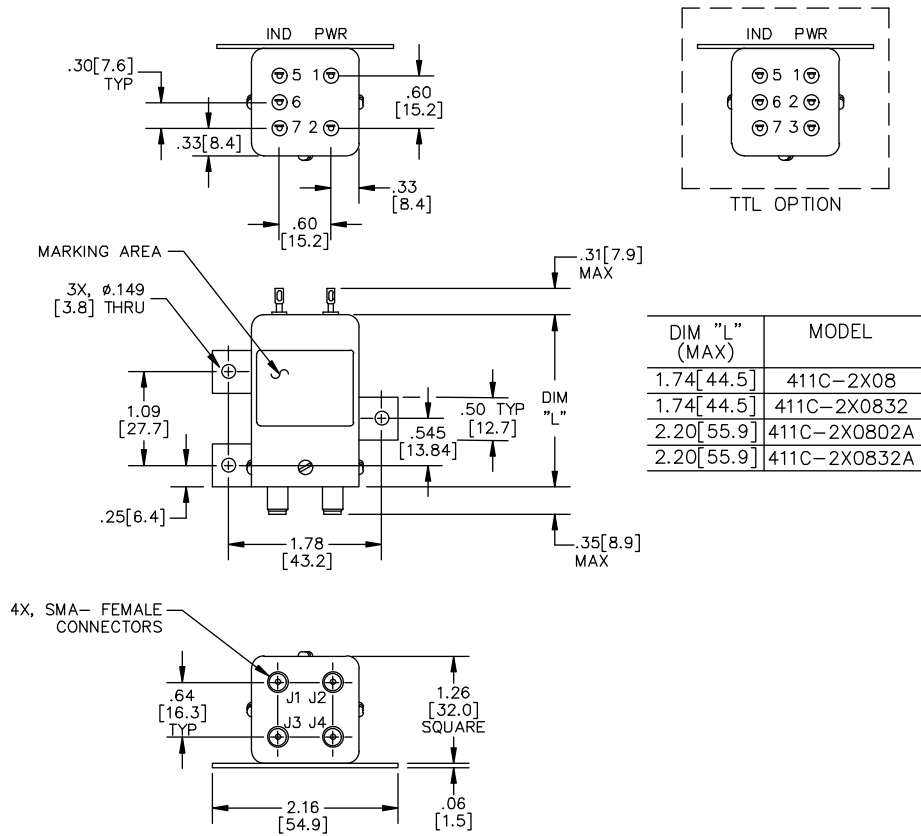
RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.10	85	0.10	200
1-4	1.20	80	0.20	100
4-8	1.30	70	0.30	50
8-12	1.40	65	0.40	35
12-18	1.50	60	0.50	25

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
12 Vdc	SMA	411C-2208	411C-220832
28 Vdc	SMA	411C-2308	411C-230832
TTL Compatible Logic			
12 Vdc	SMA	411C-220802A	411C-220832A
28 Vdc	SMA	411C-230802A	411C-230832A

Mechanical



Available Options

BYPASS (2-4)

BYPASS (1-3)

BYPASS (1-2)

BYPASS (3-4)

9 PIN "D" Plug

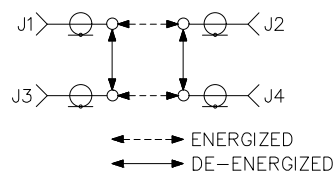
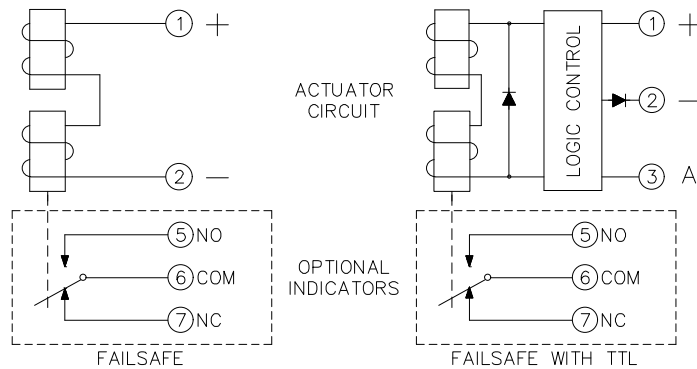
Operating Voltages:
15, 20, 24 Vdc

Jan TX TTL Drive Components

-55°C to +85°C

DowKey Bracket

Electrical

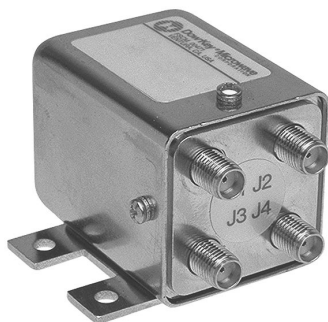


LOGIC TRUTH TABLE		
RF PATH	INDICATOR PATH	LOGIC INPUT "A"
J1-J3/J2-J4	NC-COM	0
J1-J2/J3-J4	NO-COM	1

"0" = 0.0V-0.8V
"1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION



DowKey® 411C Series Latching

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 300 mA
28 Vdc 127 mA

Switching Time:

20 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10 G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50 G, 1/2 Sine, 11 mS

Nominal Weight:

4.0 oz., (115g.)

The DowKey Microwave 411 Series is a latching transfer switch for use in applications where high isolation, low VSWR, and low insertion loss are critical. The DowKey designed connector features a mechanically captivated center conductor which eliminates epoxy staking, and consequently, RF leakage. The 411 Series is available with pulse latching, and latching with self-cutoff actuators. Standard 411 Series latching switches are provided with four DC control terminals which allow the user to wire either a positive (+) or negative (-) common control line. On request, DowKey can provide a three terminal configuration with the common control line internally wired. All logic controlled models include an electronic self-cutoff circuit with suppression diodes.

Typical applications for the 411 Series include:

- Switch Matrixes
- Standby Transmitters with Dummy Load
- Alternate Antenna Select

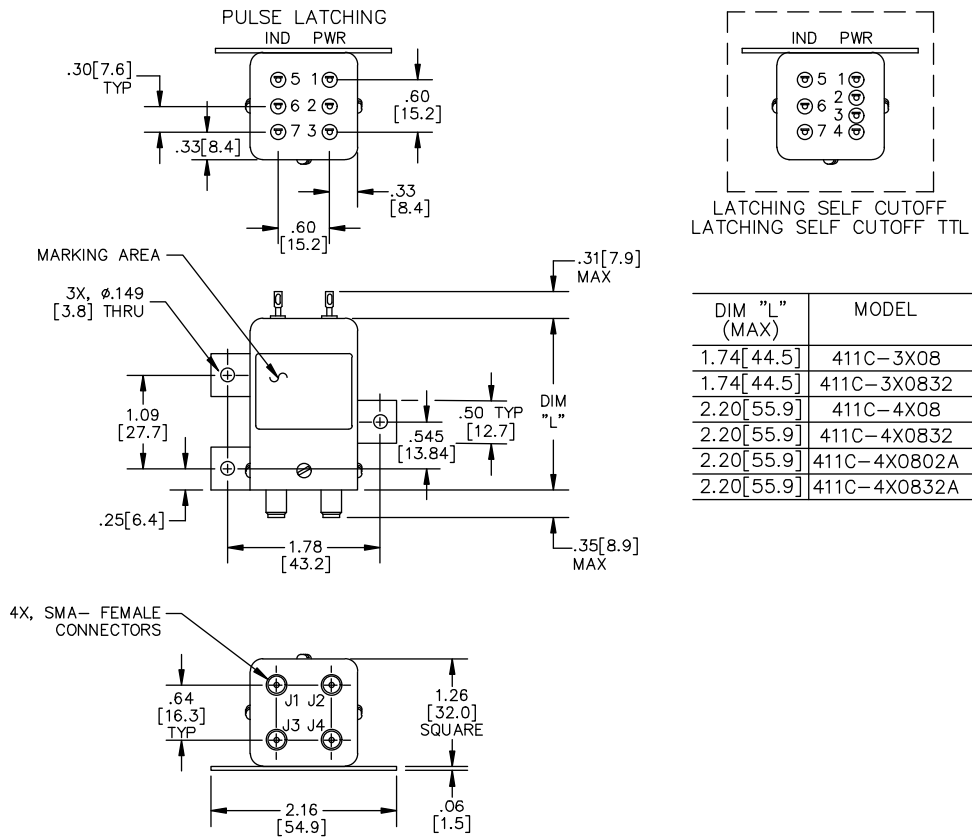
RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.10	85	0.10	200
1-4	1.20	80	0.20	100
4-8	1.30	70	0.30	50
8-12	1.40	65	0.40	35
12-18	1.50	60	0.50	25

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
Pulse Latching			
12 Vdc	SMA	411C-3208	411C-320832
28 Vdc	SMA	411C-3308	411C-330832
Latching with Self Cut-Off			
12 Vdc	SMA	411C-4208	411C-420832
28 Vdc	SMA	411C-4308	411C-430832
Latching with Self Cut-Off, TTL Compatible			
12 Vdc	SMA	411C-420802A	411C-420832A
28 Vdc	SMA	411C-430802A	411C-430832A

Mechanical



DIM "L" (MAX)	MODEL
1.74[44.5]	411C-3X08
1.74[44.5]	411C-3X0832
2.20[55.9]	411C-4X08
2.20[55.9]	411C-4X0832
2.20[55.9]	411C-4X0802A
2.20[55.9]	411C-4X0832A

Available Options

BYPASS (2-4)

BYPASS (1-3)

BYPASS (1-2)

BYPASS (3-4)

Reverse Polarity

9 PIN "D" Plug

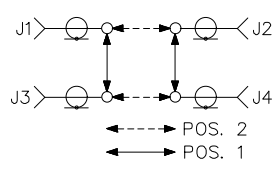
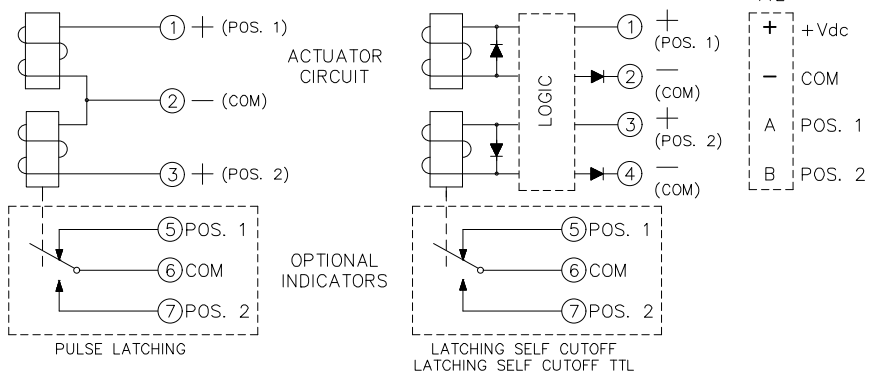
Operating Voltages:
15, 20, 24 Vdc

Jan TX TTL Drive Components

-55°C to +85°C

DowKey Bracket

Electrical

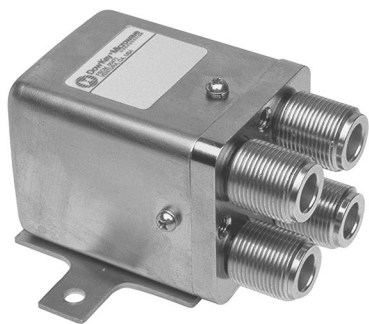


LOGIC TRUTH TABLE			
RF PATH	INDICATOR PATH	LOGIC INPUT "A"	LOGIC INPUT "B"
J1-J3/J2-J4	COM-1	1	0
J1-J2/J3-J4	COM-2	0	1

"0" = 0.0V-0.8V
"1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION



**DowKey® 412 Series
Failsafe**

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 300 mA
28 Vdc 175 mA

Switching Time:

20 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10 G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

30 G, 1/2 Sine, 11 mS

Nominal Weight:

14 oz., (397g.)

The DowKey Microwave 412 Series switches are designed for high performance, high power applications in microwave systems to 12.4 GHz. The RF path is optimized for Type "N" connectors. The DowKey designed connector features a mechanically captivated center conductor. This eliminates epoxy staking, and consequently, RF leakage. All logic controlled models include an electronic self-cutoff circuit.

Typical applications for the 412 Series include:

- Switch Matrixes
- Standby Transmitters with Dummy Load
- Alternate Antenna Select

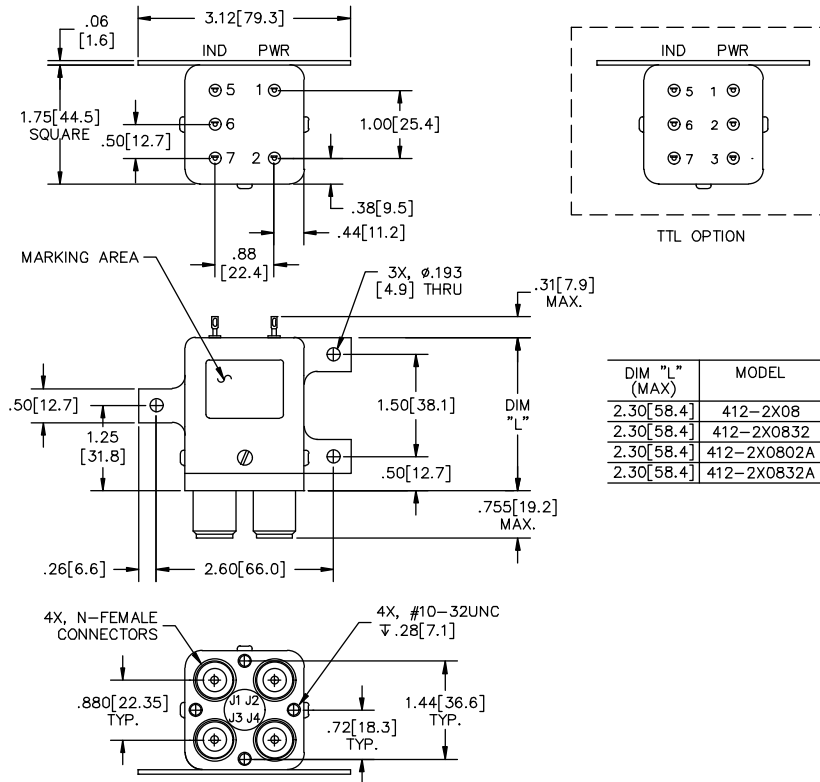
RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.15	85	0.15	1000
1-2	1.20	80	0.20	350
2-4	1.25	70	0.25	250
4-8	1.35	65	0.35	150
8-12.4	1.50	60	0.50	120

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
12 Vdc	N	412-2201	412-220132
28 Vdc	N	412-2301	412-230132
TTL Compatible Logic			
12 Vdc	N	412-220102A	412-220132A
28 Vdc	N	412-230102A	412-230132A

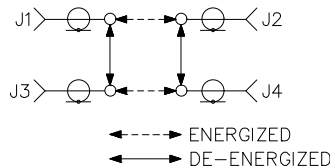
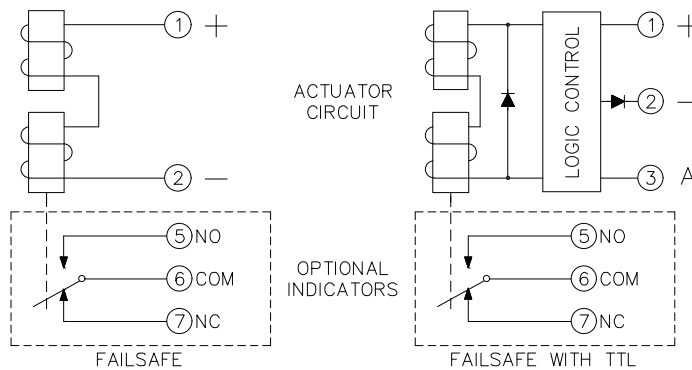
Mechanical



Available Options

- Immersion Seal
- Operating Voltages: 15, 20, 24 Vdc
- Jan TX TTL Drive Components
- 55°C to +85°C Operation
- BNC, TNC Connectors (Consult factory for RF characteristics)
- DowKey Bracket

Electrical

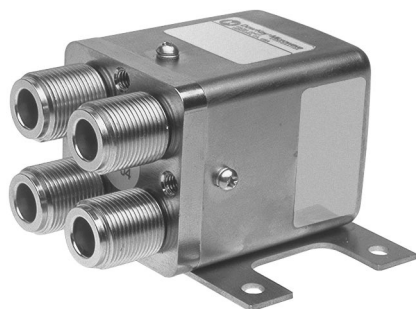


LOGIC TRUTH TABLE		
RF PATH	INDICATOR PATH	LOGIC INPUT "A"
J1-J3/J2-J4	NC-COM	0
J1-J2/J3-J4	NO-COM	1

"0" = 0.0V-0.8V
 "1" = 2.4V-5.5V



**DowKey®
Microwave**
CORPORATION



DowKey® 412 Series Latching

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 300 mA
28 Vdc 175 mA

Switching Time:

20 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10 G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

30 G, 1/2 Sine, 11 mS

Nominal Weight:

14 oz., (397g.)

The DowKey Microwave 412 Series switches are designed for high performance, high power applications in microwave systems to 12.4 GHz. The RF path is optimized for Type "N" connectors. The DowKey designed connector features a mechanically captivated center conductor. This eliminates epoxy staking, and consequently, RF leakage. The switch is available with or without a mounting bracket.

Typical applications for the 412 Series include:

- Switch Matrixes
- Standby Transmitters with Dummy Load
- Alternate Antenna Select

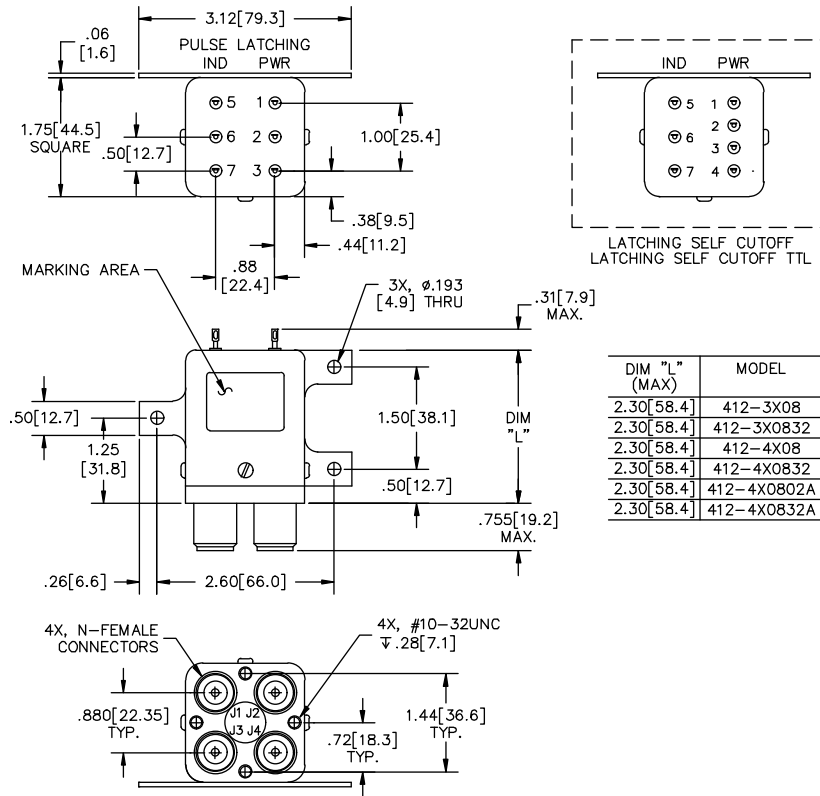
RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-1	1.15	85	0.15	1000
1-2	1.20	80	0.20	350
2-4	1.25	70	0.25	250
4-8	1.35	65	0.35	150
8-12.4	1.50	60	0.50	120

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
Pulse Latch			
12 Vdc	N	412-3201	412-320132
28 Vdc	N	412-3301	412-330132
Latching with Self Cut-Off			
12 Vdc	N	412-4201	412-420132
28 Vdc	N	412-4301	412-430132
Latching with Self Cut-Off, TTL Compatible			
12 Vdc	N	412-420102A	412-420132A
28 Vdc	N	412-430102A	412-430132A

Mechanical



Available Options

Immersion Seal

Operating Voltages:
15, 20, 24 Vdc

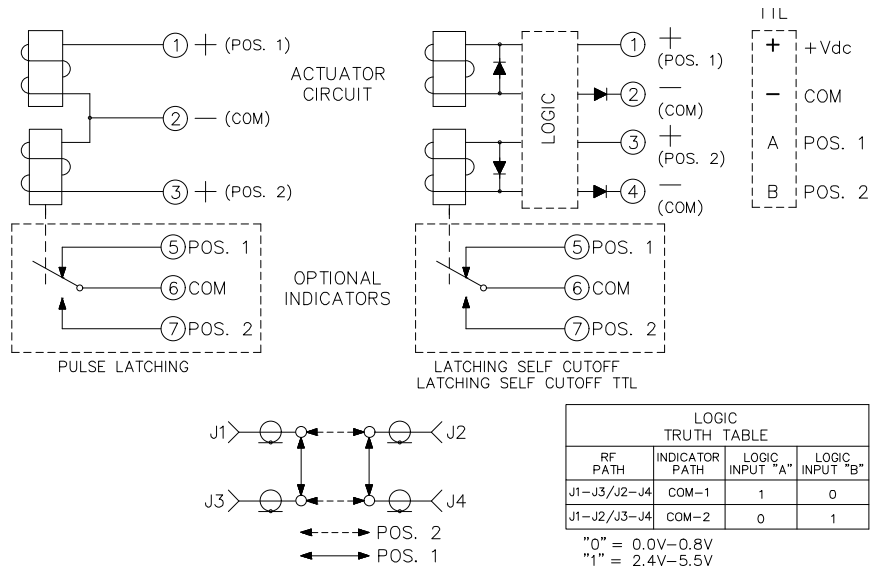
Jan TX TTL Drive Components

-55°C to +85°C Operation

BNC, TNC Connectors
(Consult factory for RF characteristics)

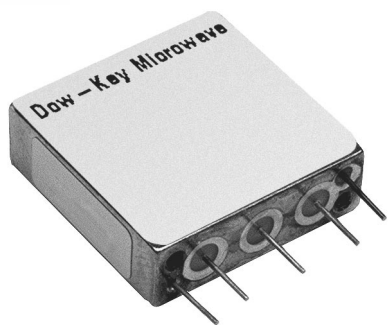
DowKey Bracket

Electrical





**DowKey®
Microwave**
CORPORATION



**DowKey® 509 Series
Failsafe**

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 83 mA
28 Vdc 37 mA

Switching Time:

15 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration:

10 G RMS, 20-2000 Hz

Mechanical Shock:

30 G, 1/2 Sine, 11 mS

Nominal Weight:

0.5 oz., (14.2g.)

The DowKey Microwave 509 Series SP2T Failsafe switch is a micro-miniature, PC board mount SPDT coaxial switch. The switch was designed specifically for applications where small size, reduced weight, and less power consumption are required. Overall size is only 0.75"x0.75"x0.25" and the weight is 0.5 ounce. The actuator consumes less than one watt which is 30% less power than similar designs.

The RF characteristics are excellent over the DC-12.4 GHz frequency range. Because the 509 is hermetically laser sealed after being vacuum baked and backfilled with an inert gas, it is able to satisfy hot switching requirements. The 509 has been subjected to 50 Watts (CW) hot switching at 1GHZ and had minimal RF degradation after one million cycles.

Typical applications for the 509 Series include:

- Microwave Radio
- EW and Missile Systems
- Repeater Stations

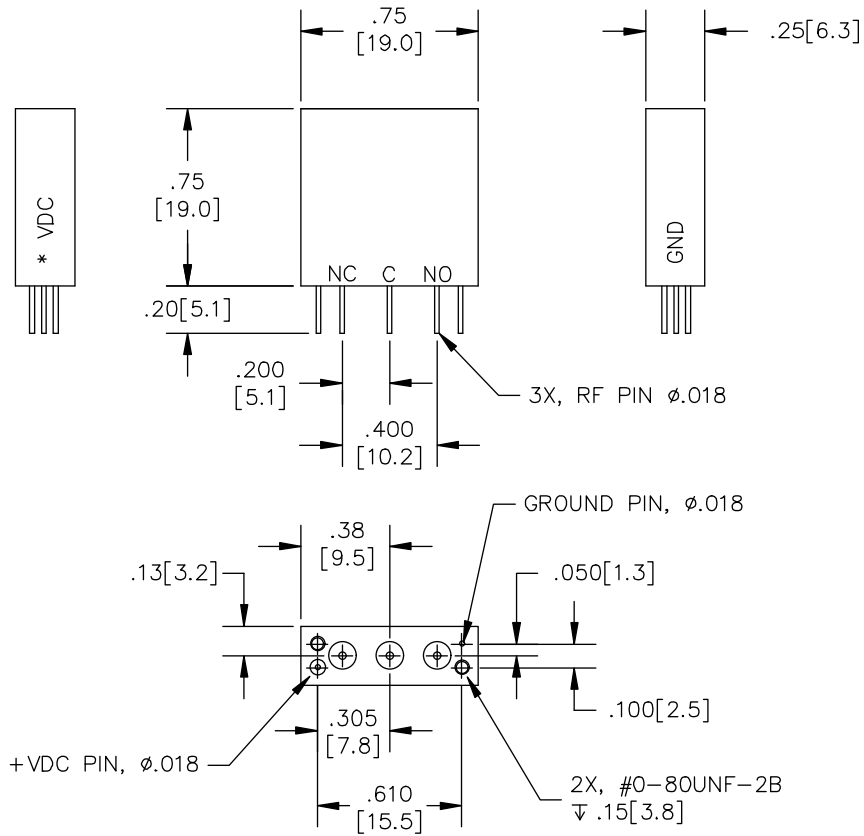
RF Characteristics

Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
DC-1	1.25	60	0.35	50
1-8	1.30	50	0.40	30
8-12.4	1.45	50	0.45	10

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard
12 Vdc	PIN	509-2219
28 Vdc	PIN	509-2319

Mechanical

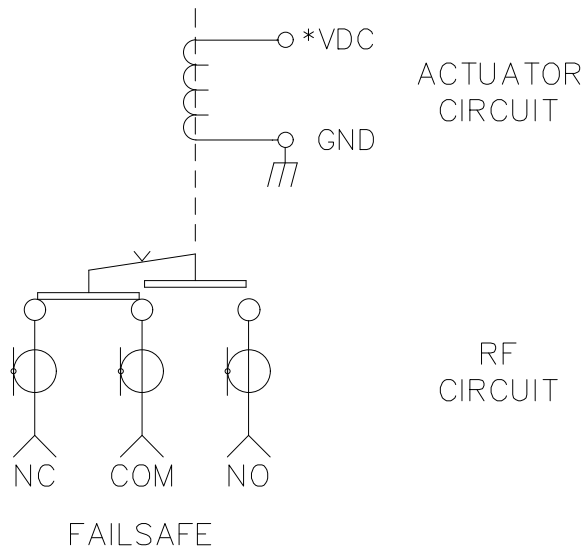


Available Options

Operating Voltages:
15, 20, 24 Vdc

-55°C to +85°C Operation

Electrical





**DowKey®
Microwave**
CORPORATION



**DowKey® 521 Series
Failsafe**

Specifications :

Operating Voltage:

(across temperature range)
12 Vdc (11-14 Vdc)
28 Vdc (24-32 Vdc)

Coil Current (Nominal):

12 Vdc 680 mA
28 Vdc 294 mA

Switching Time:

20 mS maximum

Operating Temperature:

-25°C to +65°C

Mechanical Life, Cycles:

1 x 10⁶ minimum

Vibration, Operating:

10 G RMS, 20-2000 Hz

Mechanical Shock, Non-Operating:

50 G, 1/2 Sine, 11 mS

Nominal Weight:

3.0 oz., (85g.)

The DowKey Microwave 521 Series 2P3T switches offer exceptional isolation and low insertion loss. These characteristics offer unique advantages for switch matrix and critical test applications. The 521 features dual balanced actuators to achieve five port signal transfer, or create an SPDT switch in which the unused RF input is internally connected to a 2 Watt 50 Ohm termination.

Due to the small size of these switches, only the SMA connectors are available.

Typical applications for the 521 Series include:

- Automatic Test Equipment
- Compact Switch Matrixes
- VXI Switch Cards

RF Characteristics

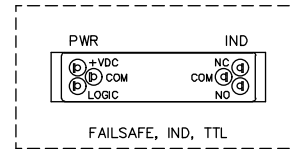
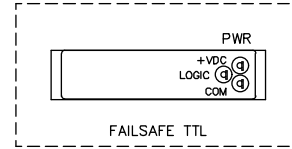
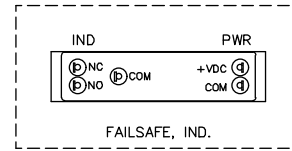
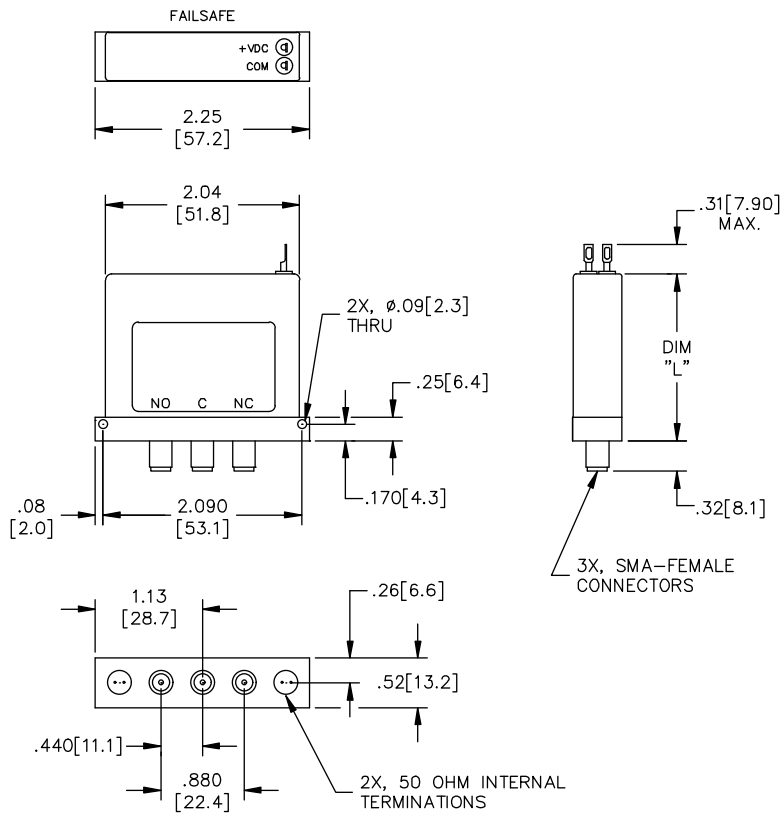
Frequency GHz	VSWR (max)	Isolation dB (min)	Ins. Loss dB (max)	RF Power Watts (CW)
0-4	1.20	70	0.20	100
4-8	1.30	65	0.30	70
8-12	1.40	60	0.40	60
12-18	1.50	60	0.50	45

Power handling capability is for through path only. Optional internal termination is limited to 500 milliwatts dissipation.

Connectors and Part Numbers

Nominal Coil Voltage	Connector Type	Standard	with Mechanical Indicators
12 Vdc	SMA	521-220803	521-220833
28 Vdc	SMA	521-230803	521-230833
TTL Compatible Logic			
12 Vdc	SMA	521-220803A	521-220833A
28 Vdc	SMA	521-230803A	521-230833A

Mechanical



DIM "L" (MAX)	MODEL
1.28 [35.5]	521-2X08
1.53 [38.9]	521-2X0832
1.70 [43.2]	521-2X0802A
1.70 [43.2]	521-2X0832A

Available Options

- Immersion Seal
- 9 PIN "D" Plug
- Operating Voltages:
15, 20, 24 Vdc
- 55°C to +85°C Operation
- 5W, 10W Internal Terminations
- 2W External Terminations
- Unterminated (5 port)

Electrical

